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1900/65A General Purpose Equipment Monitor

Product Manual



BENTLY
Nevada

NOTE



For information about Modbus communications, refer to the 1900/65A Modbus Gateway User Guide (172250-01)

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Contacting Bently Nevada

Mailing Address	1631 Bently Parkway South Minden, NV 89423 USA
Telephone	1 775 782 3611 1 800 227 5514
Fax	1 775 215 2873
Internet	www.bently.com

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1 1900/65A Description

The 1900/65A General Purpose Equipment Monitor is a machinery vibration monitor designed to continuously monitor and protect equipment used in a variety of applications and industries.

Figure 1-1. 1900/65A Monitor.



1.1 Feature Summary

- Continuous monitoring and protection suitable for auto-shutdown applications
- Monitor can be used for stand-alone or networked operation
- Small package. Monitor Module: 7.75” x 5.88” x 2.93” Monitor Module with attached Display Module: 7.75” x 5.88” x 3.85”
- May be DIN rail or bulkhead mounted
- Accepts 18 to 36 Vdc power. Optional 110-220 Vac external supply is available
- Four transducer inputs with support for vibration, position or speed
- Four thermocouple or RTD temperature inputs
- Up to four processed variables per channel with independent integration and filter control
- Internal OK checking with status

- Independent Alert and Danger setpoints
- Trip Multiply alarm support
- Six relay outputs. Relay operation is programmable
- Buffered outputs for each transducer channel
- Four configurable 4–20 mA recorder outputs
- Modbus over TCP/IP communication support
- Serial Modbus communication over RS-232 or RS-485 support
- Optional fiberglass housing with window
- Painted or stainless steel weatherproof door for panel mount display
- Hazardous area approvals

1.1.1 Inputs

Transducer channels 1 through 4 are software configured to monitor vibration, position or rotational speed. Each channel can support 2 and 3 wire accelerometers, piezo-electric velocity sensors, proximity sensors and inductive sensors.

Temperature channels 5 through 8 are software configurable to support thermocouples (types E, J, K or T) or RTDs (100Ω platinum, 120Ω nickel or 10Ω copper).

1.1.2 Outputs

Six relay outputs are available that can be programmed to open or close contacts according to user-defined logic statements operating on the OK, Alert and Danger statuses of any channel, or combination of channels. Four 4–20 mA recorder outputs are provided. Each recorder output can be software configured to output any variable from any channel.

The input signal on each transducer input (CH1 - CH4) is also available on a dedicated buffered output.

1.1.3 Configuration

Monitor operation is defined by creating a configuration file using software running on a laptop or PC and downloading the file to the monitor through the built-in Ethernet connection. Configuration information is stored permanently in non-volatile memory, and can be uploaded to the PC for changes.

1.1.4 Modbus Communications

The 1900/65A can be ordered with an optional Modbus Gateway that supports Modbus over TCP/IP, and serial Modbus communications over RS-232 or RS-485.

1.2 Monitor Components

1.2.1 Monitor Module

The primary component of the 1900/65A Monitor is the Monitor Module which provides all data acquisition and communication functions.

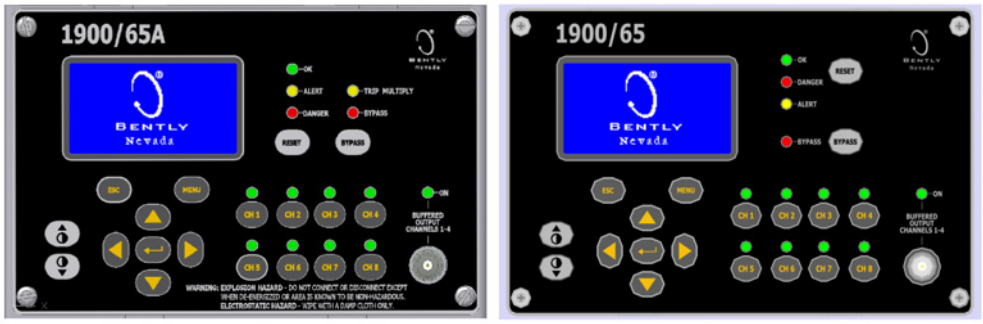
1.2.2 Display Module

The 1900/65A Monitor can operate with an optional display/keypad when an application requires being able to view channel information or make minor configuration changes as a stand-alone package. If desired, the display can be mounted up to 250 feet from the Monitor Module.

NOTE

The 1900/65A and 1900/65 display modules are interchangeable with either the 1900/65A or 1900/65 monitor modules (Figure 1-2).

Figure 1-2. The 1900/65A and 1900/65 Display Modules.



1.2.3 Configuration Software

The 1900 Configuration Software is a Windows® operating system application that creates and manages the configuration file, uploads and downloads monitor configurations, views monitor data and provides monitor firmware upgrade tools.

2 Receiving and Handling

2.1 Receiving Inspection

Visually inspect the monitor for obvious shipping damage. If shipping damage is apparent, file a claim with the carrier and submit a copy to Bently Nevada, LLC.

2.2 Handling Considerations

Circuit boards contain devices that are susceptible to damage when exposed to electrostatic charges. Damage caused by obvious mishandling of the board will void the warranty. Personnel must be grounded with a suitable grounding strap (such as 3M Velostat No. 2060) before handling or maintaining electronic hardware.

2.3 Disposal Statement

Customers and third parties that are in control of product at the end of its life or at the end of its use are solely responsible for proper disposal of product. No person, firm, corporation, association or agency that is in control of product shall dispose of it in a manner that is in violation of United States state laws, United States federal laws, or any applicable international law. Bently Nevada, LLC is not responsible for disposal of product at the end of its life or at the end of its use.

3 Installing the Hardware

This chapter provides information about installation planning, mounting and wiring the 1900/65A monitor.

3.1 Planning the Installation

NOTE



Refer to the *1900/65A Field Wiring Diagram Package* (173089) for additional wiring information

3.1.1 Mounting Location

Consider the following issues when planning the installation of the monitor:

Environmental considerations: Ensure the monitor is not exposed to temperature and humidity outside the limits defined in the *1900/65A Specifications and Ordering Information Document* (173401-01). If the monitor is located where it can be exposed to condensation, salty air, corrosives, or excessive particulates, mount it in a suitable housing.

Power availability: The monitor must be mounted near a source of 18 – 36 Vdc, or an external 24 Vdc supply can be used to power the monitor from the facility AC mains voltage.

Network access: If the monitor will be connected to a network access point (hub, switch, or wireless adapter) limit the Ethernet cable length to 100 metres (91.44 ft.) or less.

IMPORTANT



If the unit will not be connected to a network during normal operation, be sure to allow for temporary access between the Monitor Module and a portable computer (i.e., laptop) to download or upload configurations.

Cable routing: As a rule of thumb, short transducer cable runs are better than long runs. Mounting the monitor close to the machinery being monitored is recommended when practicable. In any case, observe the maximum cable limits defined in the wiring section.

3.1.2 Hazardous Areas

The 1900/65A Monitor Module and Display Module can be installed in Class 1, Division 2 Hazardous areas per the *1900/65A Field Wiring Diagram Package* (173089).

3.2 Mounting the Monitor Module

NOTE

Installation and mounting information for the Display Module is covered in Chapter 8.

The 1900/65A Monitor Module may be clipped on a DIN rail or mounted on a flat surface using a bulkhead mounting plate. A weatherproof housing is also available.

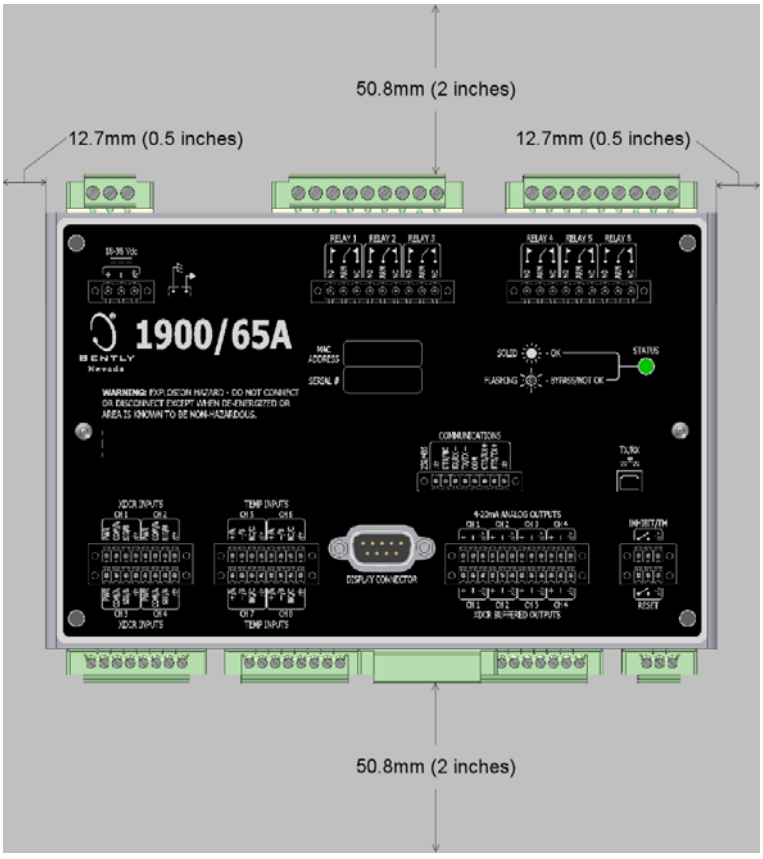
3.2.1 Orientation

The 1900/65A Monitor Module and Display Module may be mounted in any orientation. However, for best performance of the cold junction compensation sensor, mount the monitor vertically as shown in Figure 3-1.

3.2.2 Clearances

Allow adequate clearance around the monitor to permit ventilation of the electronics and to provide adequate space while working with cable and connectors. A suggested clearance space is shown in Figure 3-1.

Figure 3-1. Suggested clearance.



3.2.3 DIN Rail Mounting Preparation

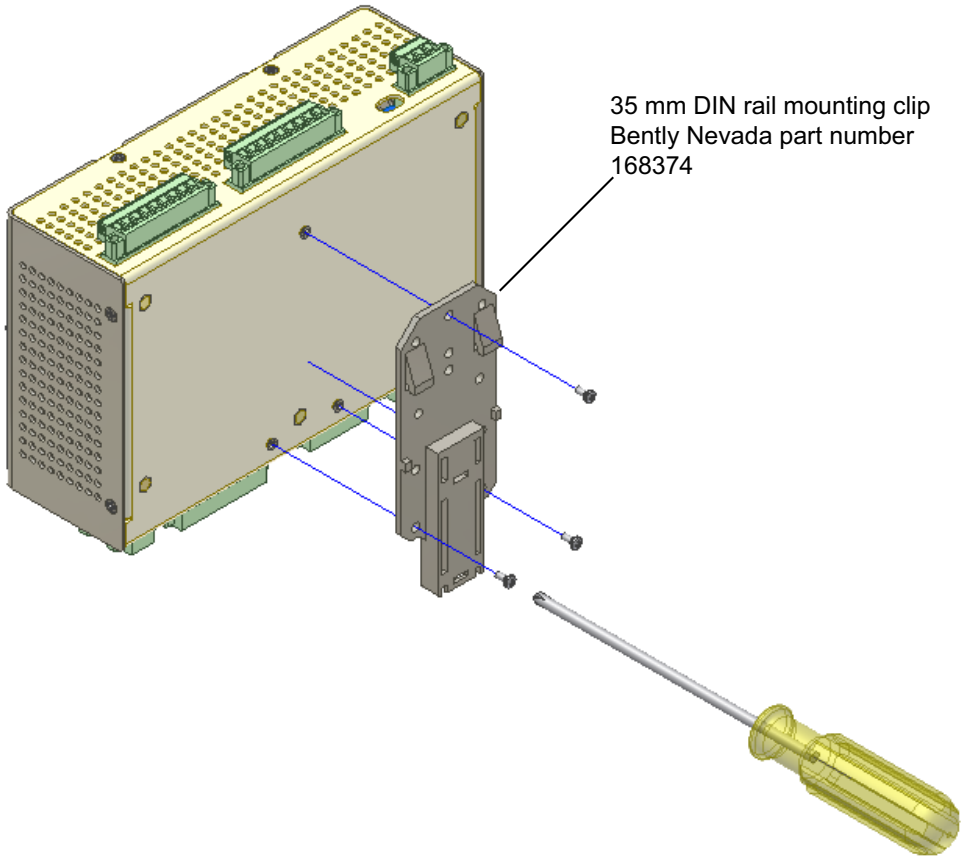
3.2.3.1 Install the DIN Rail Clip

The DIN rail clip is installed on the back of the Monitor Module using three 4-40 x 0.25 inch pan head screws as shown in Figure 3-2.

CAUTION

Long screws will damage the Monitor Module! Limit the length of the screws so they will not protrude into the Monitor Module chassis by more than 5 mm, (0.2 in).

Figure 3-2. Installing the DIN rail clip to the Monitor Module.



3.2.3.2 Prepare the DIN Rail

The Monitor Module clip mounts on a 19.7 cm, (7.75 inch) section of TS35/7.5 or TS35/15 DIN rail. If a power supply or other equipment shares the same rail, allow at least 1.3 cm, (0.5 in) of space on ether side of the Monitor Module.

3.2.3.3 Clip Monitor to DIN Rail

Engage the top of the DIN Rail clip and push the unit against the DIN rail until the bottom clip engages.

The Monitor Module can be removed from the DIN rail by inserting a screw-driver into the slot on the bottom clip and pulling the clip downward. When the bottom clip disengages from the DIN rail, rotate the Monitor case outward and lift it from the rail.

3.2.4 Installing the Bulkhead Mounting Plate

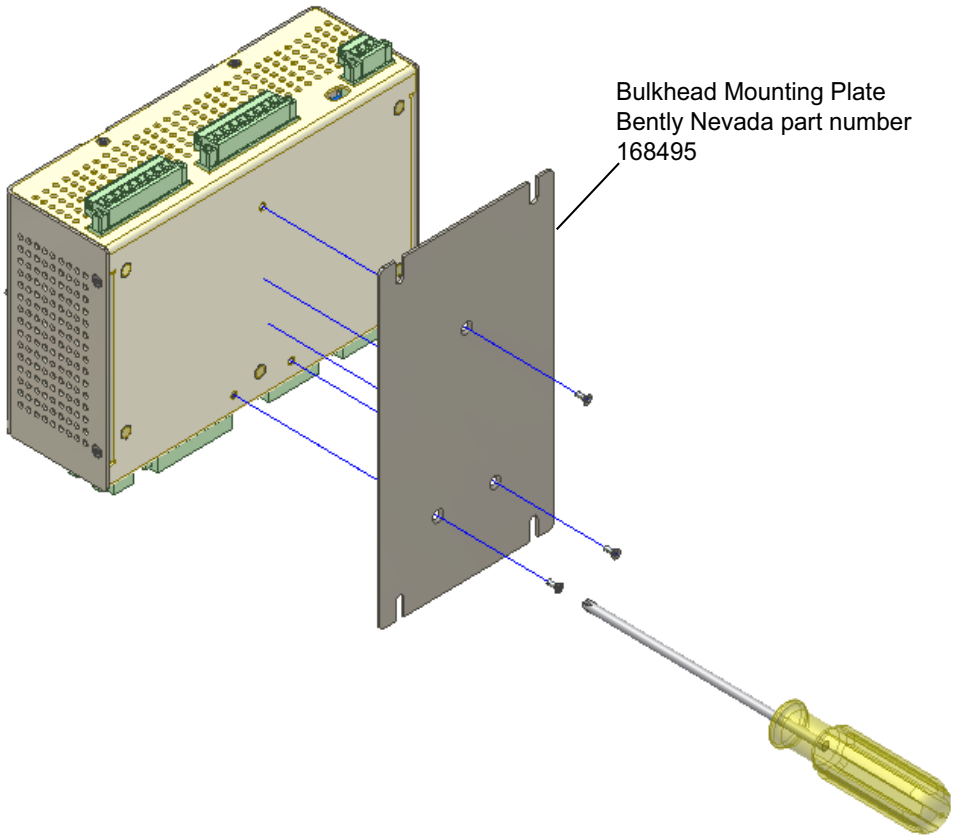
To facilitate mounting on a flat surface, A bulkhead mounting plate can be installed on the back of the Monitor Module as shown in Figure 3-3. Use three 4-40 x 0.188 inch screws for a 0.063 inch thick plate.

CAUTION



Long screws will damage the Monitor Module! Limit the length of the screws so they will not protrude into the Monitor Module chassis by more than 5 mm, (0.2 in).

Figure 3-3. Installing a bulkhead or mounting plate.



3.2.5 Weatherproof Housing Installation

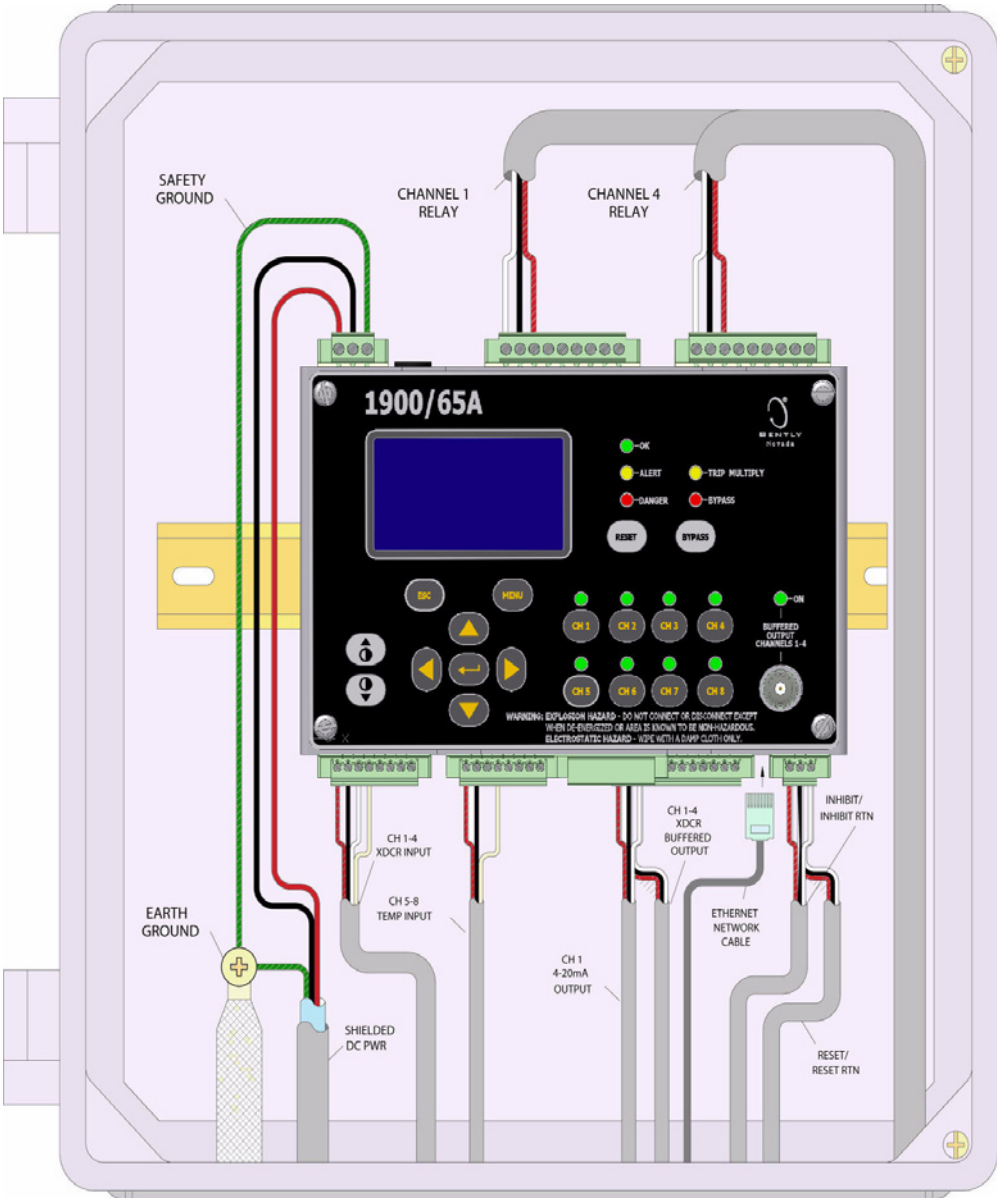
CAUTION



Never install conduit into the top of the housing. Condensation in the conduit will drip into the monitor and damage or destroy the monitor.

1. Select an enclosure with dimensions large enough to contain the Monitor Module and Display Module fastened to the DIN rail. Provide adequate clearance around the monitor case for dressing the cables. Figure 3-4 shows a suitable typical housing layout.

Figure 3-4. Example housing installation. Installation can vary according to application.



2. Remove the subpanel from the housing.
3. Punch or drill conduit/cable entry holes in the housing.
4. Mount the housing on a suitable surface or structure.
5. Determine a suitable layout for the monitor, external power supply and communication components (if used), and DIN rail.
6. Install the DIN rail onto the subpanel.
7. Dress each conduit entry hole with appropriate fittings and install conduit.
8. Install subpanel in housing.
9. Clip the Monitor and power supply (if used) onto the DIN rail.
10. Feed cables into the enclosure.
11. Wire cables to the Monitor Module connectors as described in Paragraph 3.3.

NOTE



If you are also mounting an external 24 V supply or other accessories with the monitor, be sure to enlarge the layout accordingly.

3.3 Wiring The Monitor

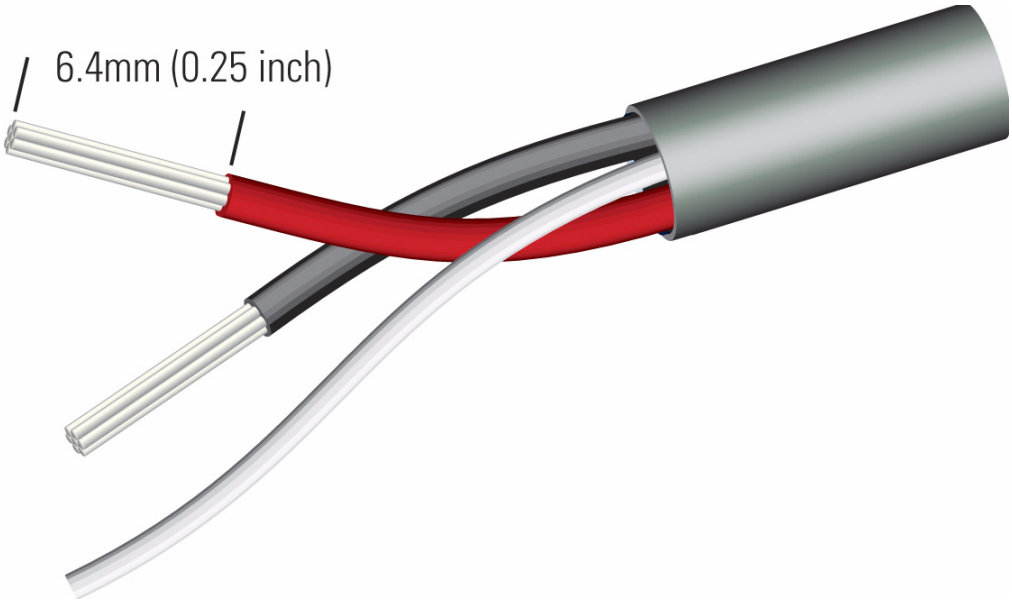
The connectors on the Monitor Module consist of a receptacle and a removable terminal block. To make wiring each connector easier and to reduce the possibility of damage, remove the terminal block from its receptacle before making connections to the terminal block.

3.3.1 Wire Preparation

Follow this general procedure when wiring a cable to a terminal block. Details are shown in Figure 3-5.

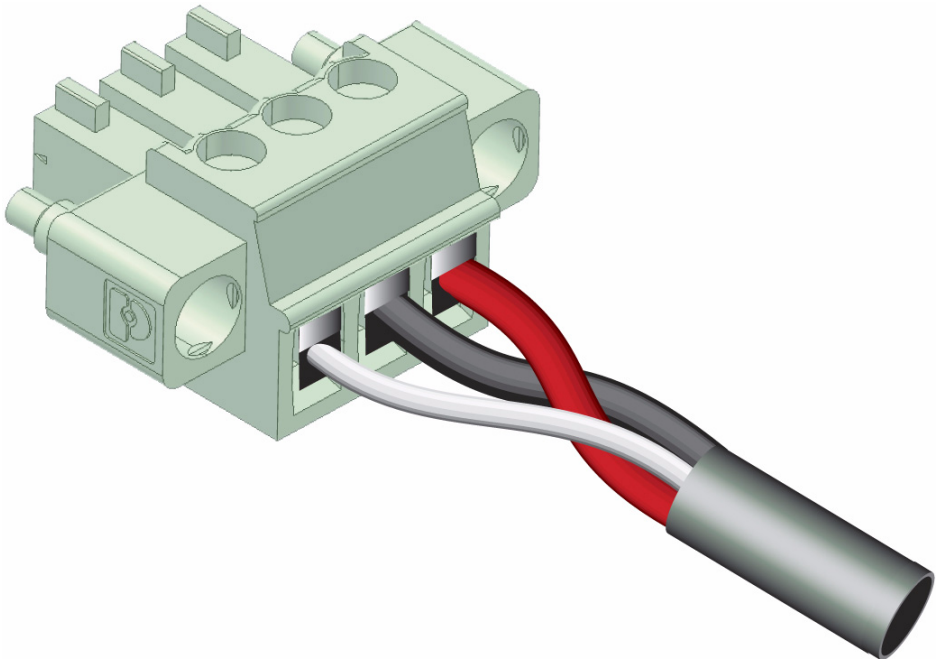
1. Strip 38 – 50 mm (1.5 – 2 in), of cable sheathing from the end of cable.
2. Trim shield material back to sheathing to expose the insulated wires.
3. Cut each wire to a length of about 25 mm (1 inch), from the end of the sheath.
4. Cut the drain wire to a length of about 38 mm (1.5 in), from the end of the sheath. If drain wire is not used, trim it back to the sheath.
5. Strip 6 mm, (0.25 in) of insulation from the end of each wire.

Figure 3-5. Prepared cable with wires stripped to proper length.



6. Insert each wire into the terminal block. Tighten each terminal block screw to hold the wires in place.
7. Trim the drain wire to length and insert it into the terminal block and tighten the screw.

Figure 3-6. Finished connection.



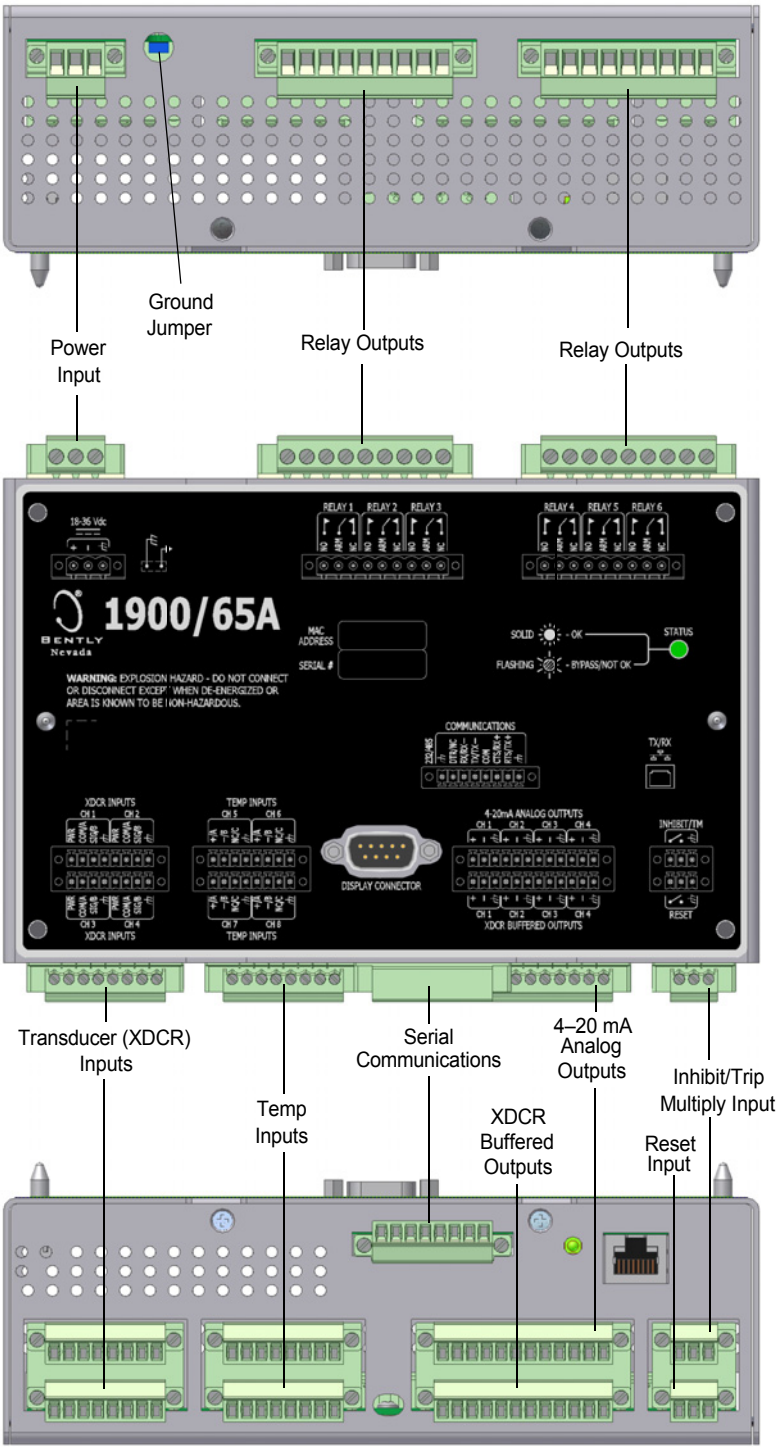
8. Repeat steps 1 through 7 for the remaining connections.

3.4 Terminal Block Connections

3.4.1 Terminal Block Signal/Pin Assignments

The Monitor Module label clearly marks the signal/pin assignments for each connector on the front label. Figure 3-7 is provided here for reference.

Figure 3-7. Terminal block signal/pin assignments are printed on the Monitor Module.

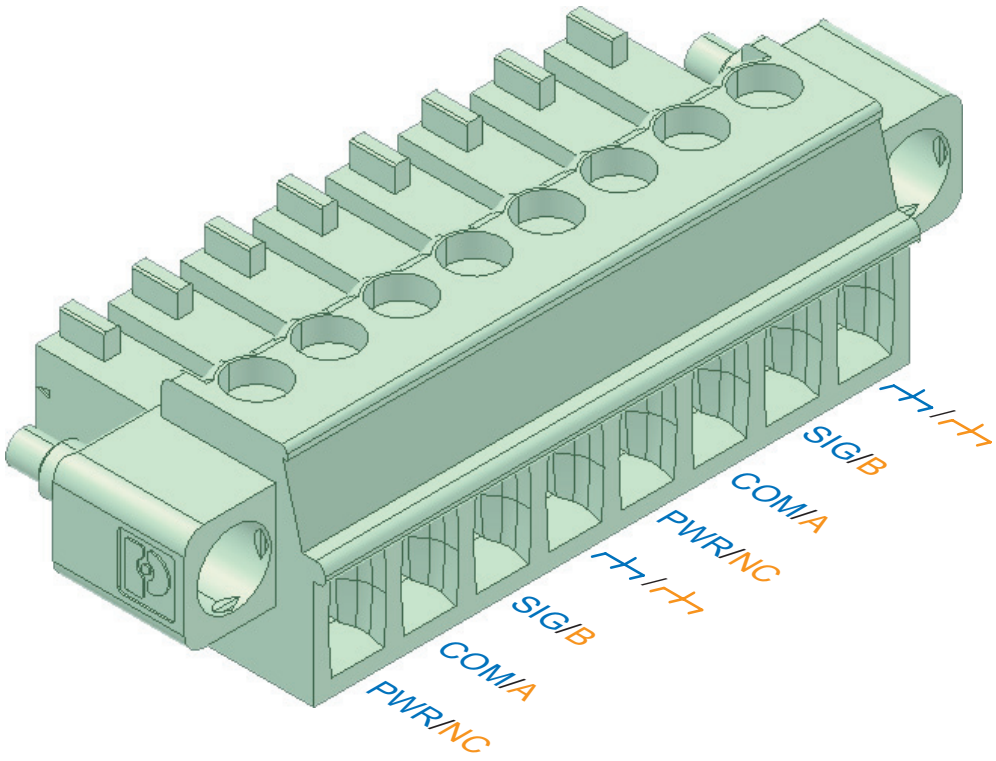


3.4.2 Transducer (XDCR) Inputs

Figure 3-7, shows the location of the two transducer input connectors and references them as *XDCR Inputs*. Figure 3-8 shows the signal orientation for each connector. For vibration measurements, each input supports 2-wire and 3-wire accelerometers or piezo-electric velocity sensors or 3-wire proximity sensors. For speed measurements, each input supports 3-wire proximity sensors or inductive sensors. Transducer wiring diagrams are available in the *1900/65A Field Wiring Diagram document* (173089).

Recommended Cable: Two or three conductor shielded depending on transducer type. Wire gauge, 28 to 16 AWG. Maximum cable length is a function of the type of transducer used. Refer to the transducer documentation for maximum cable length.

Figure 3-8. Transducer terminal block signal orientation, CH1 through CH4. Connections are the same on both connectors.



3.4.3 Temperature Inputs

Figure 3-7, shows the location of the two temperature input connectors and references them as *Temp Inputs*. Each temperature input supports either thermocouples (types E, J, K, and T) or RTDs (100 Ω platinum, 120Ω nickel and 10Ω copper). You may configure any combination of thermocouples and RTDs on the four inputs.

3.4.3.1 Thermocouples

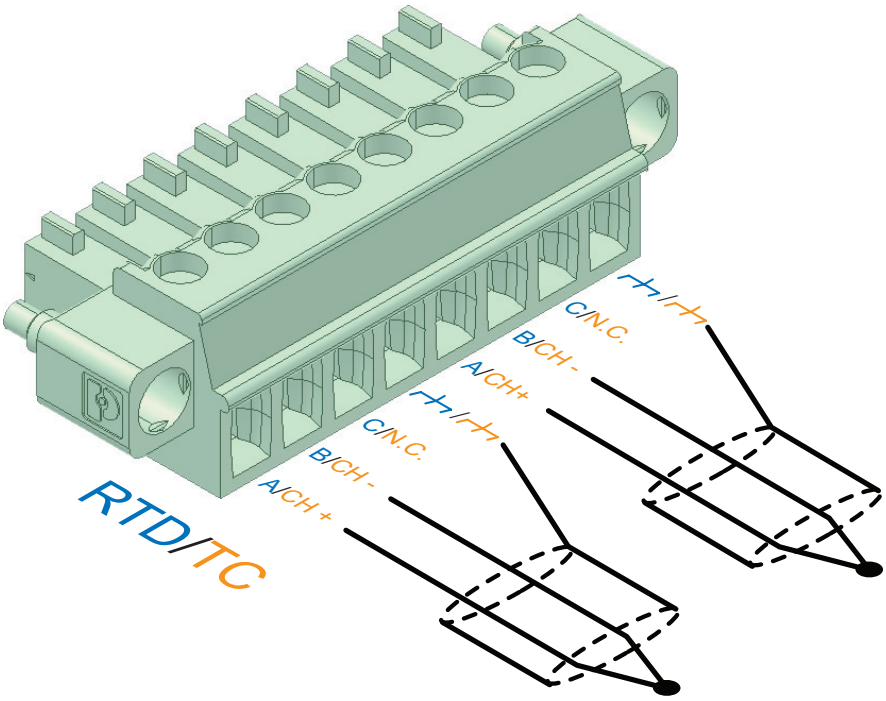
Figure 3-9 shows the proper connection of thermocouples to either temperature connector.

Recommended Cable: Type of thermocouple, wire gauge, and maximum cable length depends on the temperature range and purpose of your application. Refer to application information from your thermocouple supplier. Table 3-1 shows the thermocouples supported by the 1900/65A.

Table 3-1. Supported thermocouples and color codes.

Thermocouple type	(+) wire	(-) wire
E type	Purple	Red
J type	White	Red
K type	Yellow	Red
T type	Blue	Red

Figure 3-9. Thermocouple signal orientation for either temperature connectors (CH5 through CH8).



3.4.3.2 RTDs

Figure 3-10 shows the proper connection of 2-wire RTDs on either temperature connector. Figure 3-11 shows the proper connection of two 3-wire RTDs.

Supported RTD Types: 100Ω Platinum 385, 100Ω platinum 392 120Ω nickel 672, or 10Ω copper 427.

IMPORTANT RTDs have relatively low resistance. Because of this, wire resistance can substantially affect the accuracy of RTD measurements, especially 10Ω copper RTDs. Minimize wire resistance by keeping cable runs short.

Recommended Cable: Two or three conductor shielded depending on RTD type. Wire gauge, 28 to 16 AWG. Keep cable runs short to minimize cable resistance (a fraction of an ohm is desirable).

Figure 3-10. 2-wire RTD signal orientation for either temperature connector (CH5 through CH8).

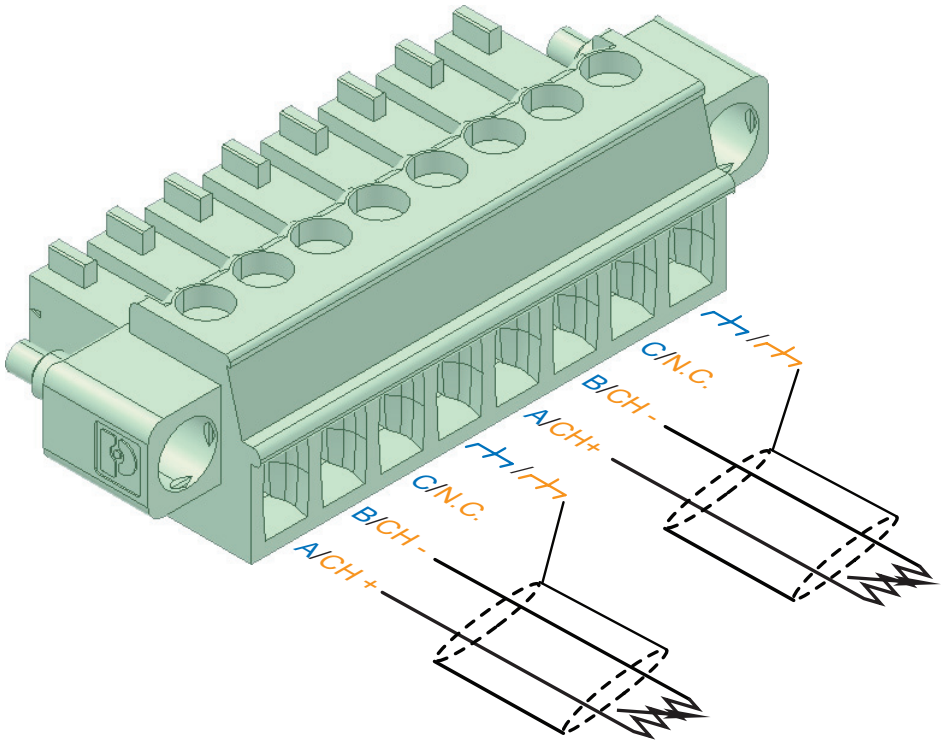
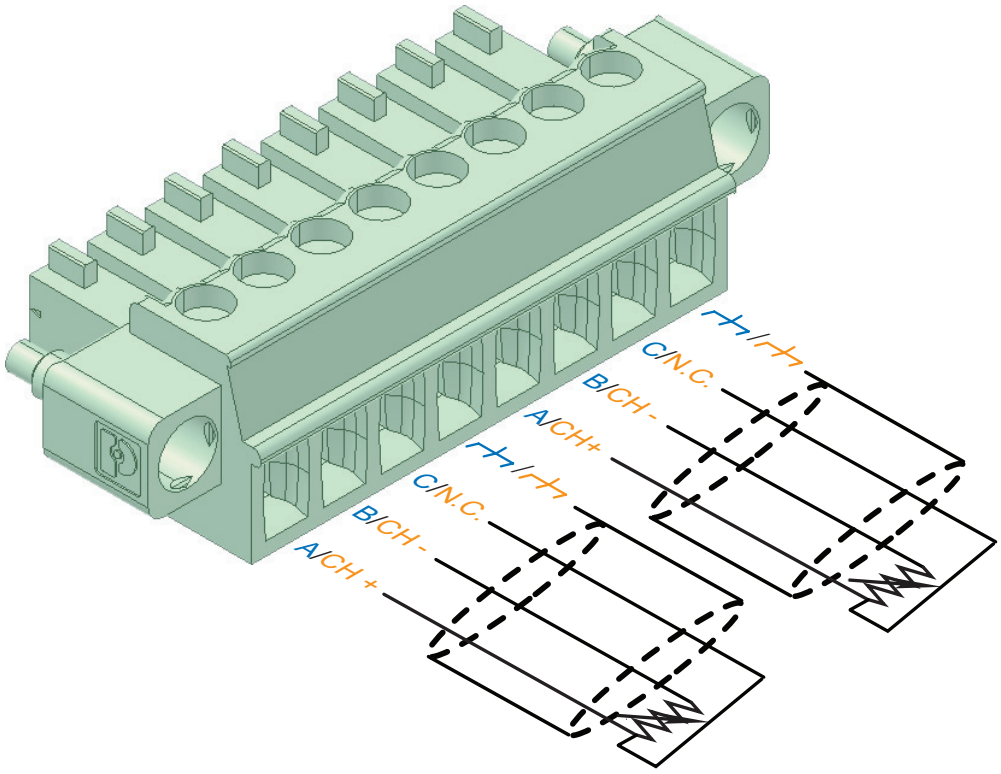


Figure 3-11. 3-wire RTD signal orientation for either temperature connector (CH5 through CH8).



3.4.4 4–20 mA Analog Outputs

The 4–20 mA outputs are electrically isolated and require an external 18 Vdc to 36 Vdc source of loop power as shown in Figure 3-12.

Figure 3-12. 4-20 mA output connection.

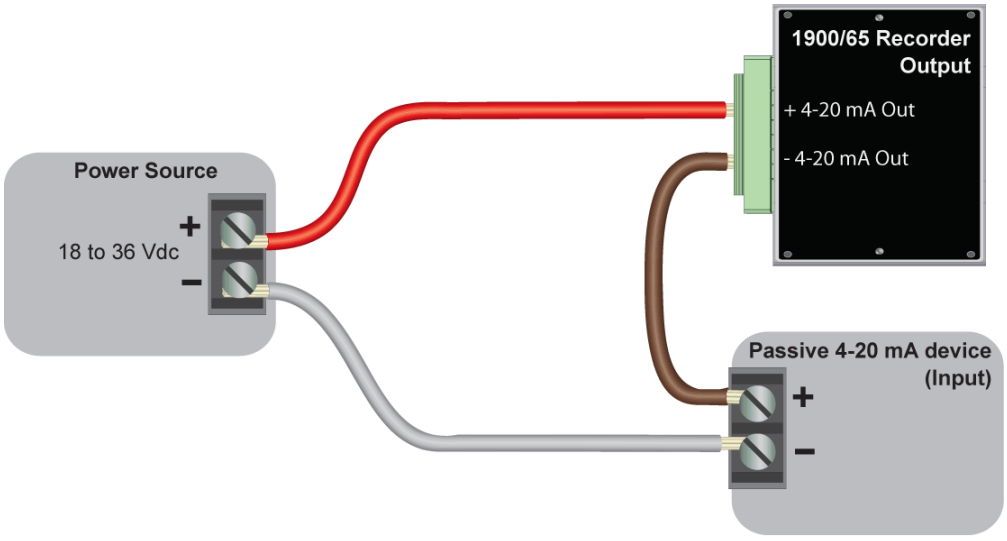
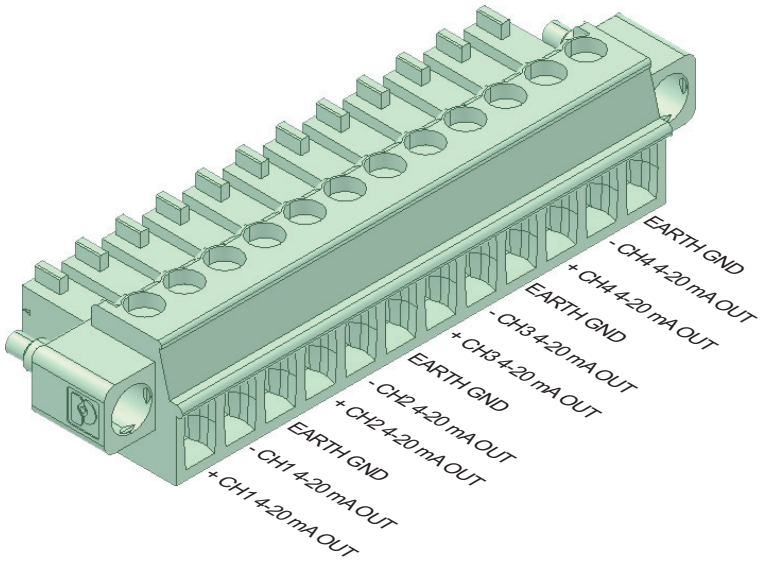


Figure 3-13 shows the signal orientation for the connector.

Recommended Cable: Two conductor twisted pair. Wire Gauge, 28 to 16 AWG. Limit length of wire so that total loop resistance is less than 600Ω.

Figure 3-13. 4–20 mA Outputs terminal block signal orientation, CH1 Through CH4.

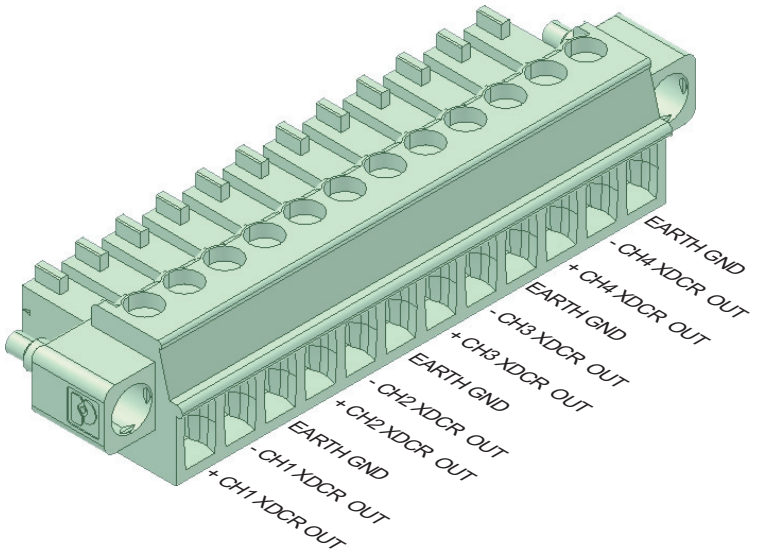


3.4.5 Transducer (XDCR) Buffered Outputs

Figure 3-14 shows the signal orientation for the connector.

Recommended Cable: Two conductor shielded. Wire gauge, 28 to 16 AWG

Figure 3-14. Transducer Buffered Outputs terminal block signal orientation, CH1 Through CH4.

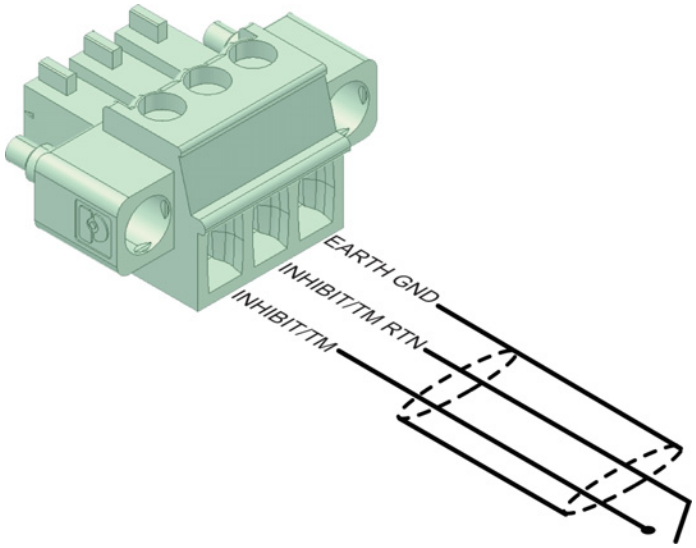


3.4.6 Inhibit/Trip Multiply Input

This input can be configured to either inhibit alarms or enable trip multiply when a contact closure is sensed. Figure 3-15 shows the signal orientation for the connector.

Recommended Cable: Two conductor shielded. Wire gauge, 28 to 16 AWG.

Figure 3-15. Inhibit/Trip Multiply Input terminal block signal orientation.

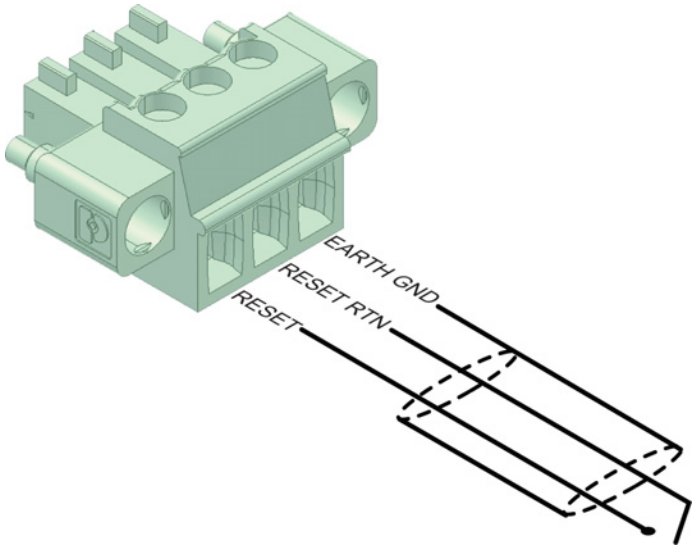


3.4.7 Reset Input

This input can be configured to reset the monitor when a contact closure is sensed. Figure 3-16 shows the signal orientation for the connector.

Recommended Cable: Two conductor shielded. Wire gauge, 28 to 16 AWG

Figure 3-16. Reset Input terminal block signal orientation.



3.4.8 Ethernet Port

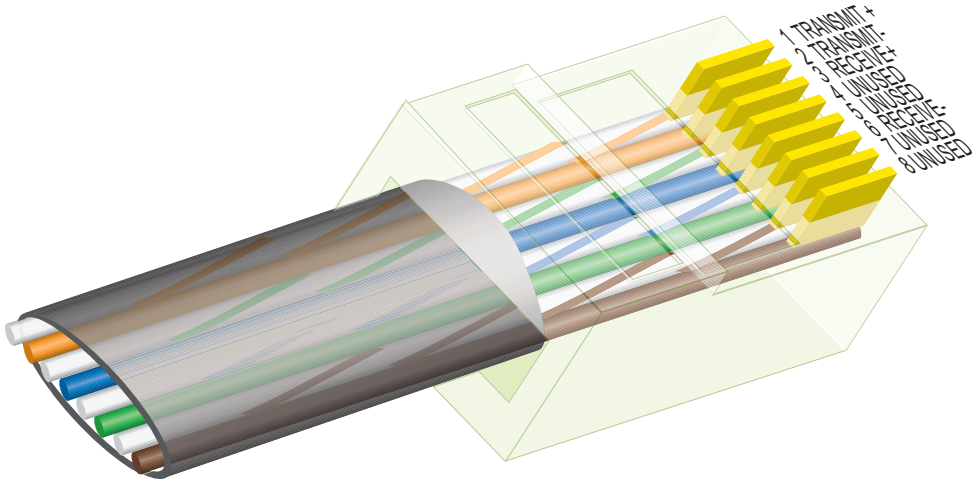
The Ethernet port may be connected into a network or directly to a computer. However, a different cable must be used for each kind of connection. Paragraphs 3.4.8.1 and 3.4.8.2 provide the definitions for each cable.

3.4.8.1 Network connection

Use a *straight-through* cable when you want to connect the monitor to a network through a switch or hub or to a network wall receptacle.

Recommended Cable: Category 5 or Category 5e unshielded twisted pair cable. Maximum cable Length: 100 metres (91.44 feet). Connector Type: RJ-45.

Figure 3-17. Ethernet connector signal orientation.



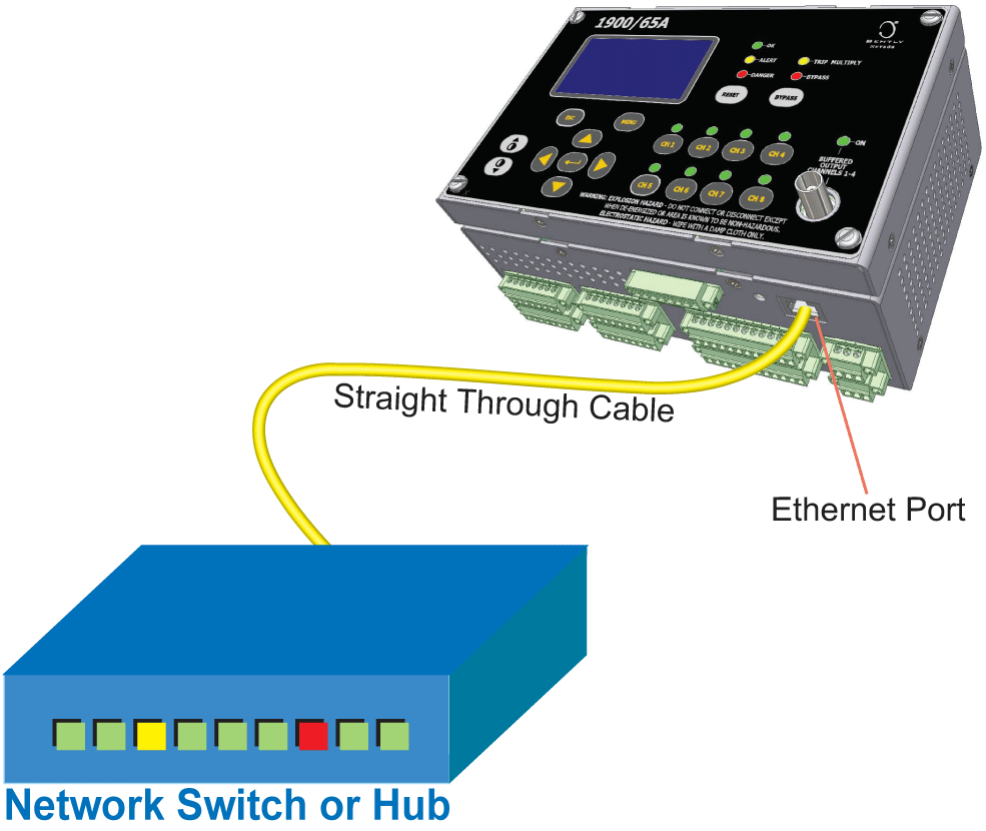
If you assemble your own cable, match the connector pins and cable conductors as shown in Figure 3-17 and Table 3-2. This is a *straight-through* cable.

Table 3-2. Ethernet cable signal definitions and color codes, straight-through connection.

Monitor Module	Pin Number	Wire Color Reference		Network Hub or Switch
TRANSMIT+	1	White-Orange stripe		TRANSMIT+
TRANSMIT-	2	Orange		TRANSMIT-
RECEIVE+	3	White-Green stripe		RECEIVE+
UNUSED	4	Blue		UNUSED
UNUSED	5	White-Blue stripe		UNUSED
RECEIVE-	6	Green		RECEIVE-
UNUSED	7	White-Brown stripe		UNUSED
UNUSED	8	Brown		UNUSED

Network Connection Example: Connect the Monitor Module to a hub or switch as shown in Figure 3-18. Monitor IP address assignment is covered in Paragraph 6.7.

Figure 3-18. Network connection using a straight through cable.



3.4.8.2 Direct Computer Connection

Use a direct connection when:

- You want to configure the monitor but don't have or need access to a network
- You want to bench test the monitor without connecting to a network

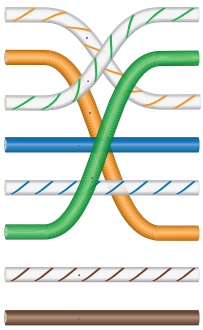
NOTE

Paragraph 6.7 Discusses changing network settings and addresses.

Recommended Cable: Category 5 or Category 5e unshielded twisted pair cable. Maximum cable Length:100 metres (91.44 feet). Connector Type: RJ-45.

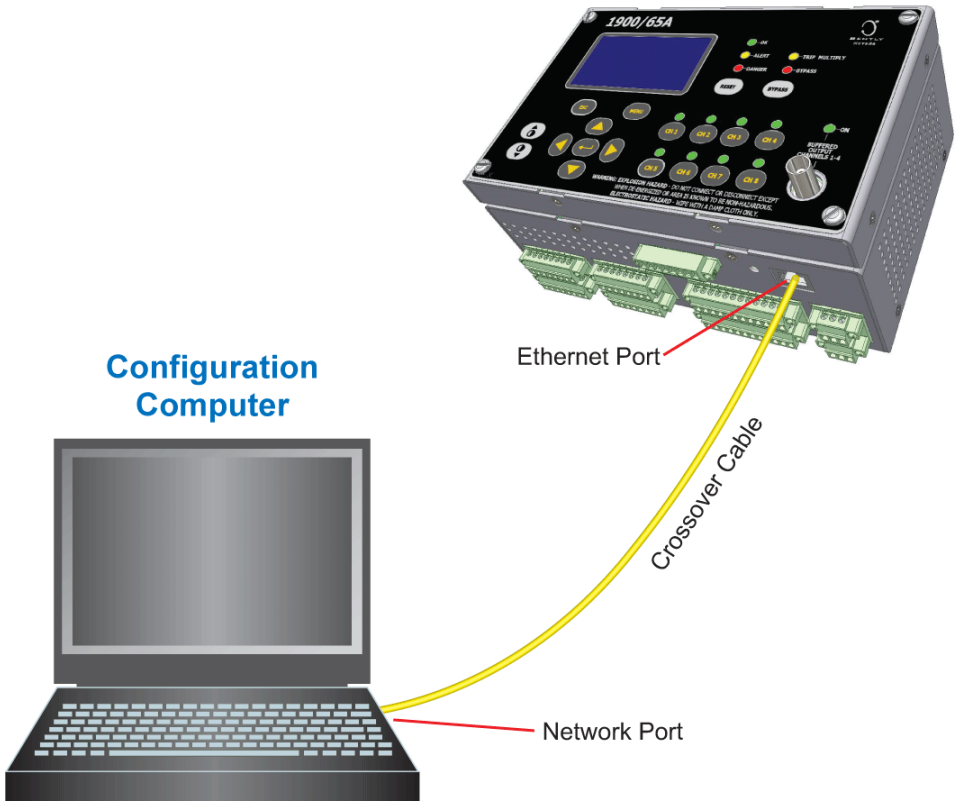
If you assemble your own cable, match the connector pins and cable conductors as shown in Table 3-3. This is a *crossover* cable.

Table 3-3. Ethernet crossover cable signal definitions and color codes.

Monitor Module	Pin Number	Wire Color Reference		Pin Number	Computer
TRANSMIT+	1	White-Orange stripe		1	TRANSMIT+
TRANSMIT-	2	Orange		2	TRANSMIT-
RECEIVE+	3	White-Green stripe		3	RECEIVE+
UNUSED	4	Blue		4	UNUSED
UNUSED	5	White-Blue stripe		5	UNUSED
RECEIVE-	6	Green		6	RECEIVE-
UNUSED	7	White-Brown stripe		7	UNUSED
UNUSED	8	Brown		8	UNUSED

Direct Computer Connection Setup: Connect the computer and Monitor Module as shown in Figure 3-19.

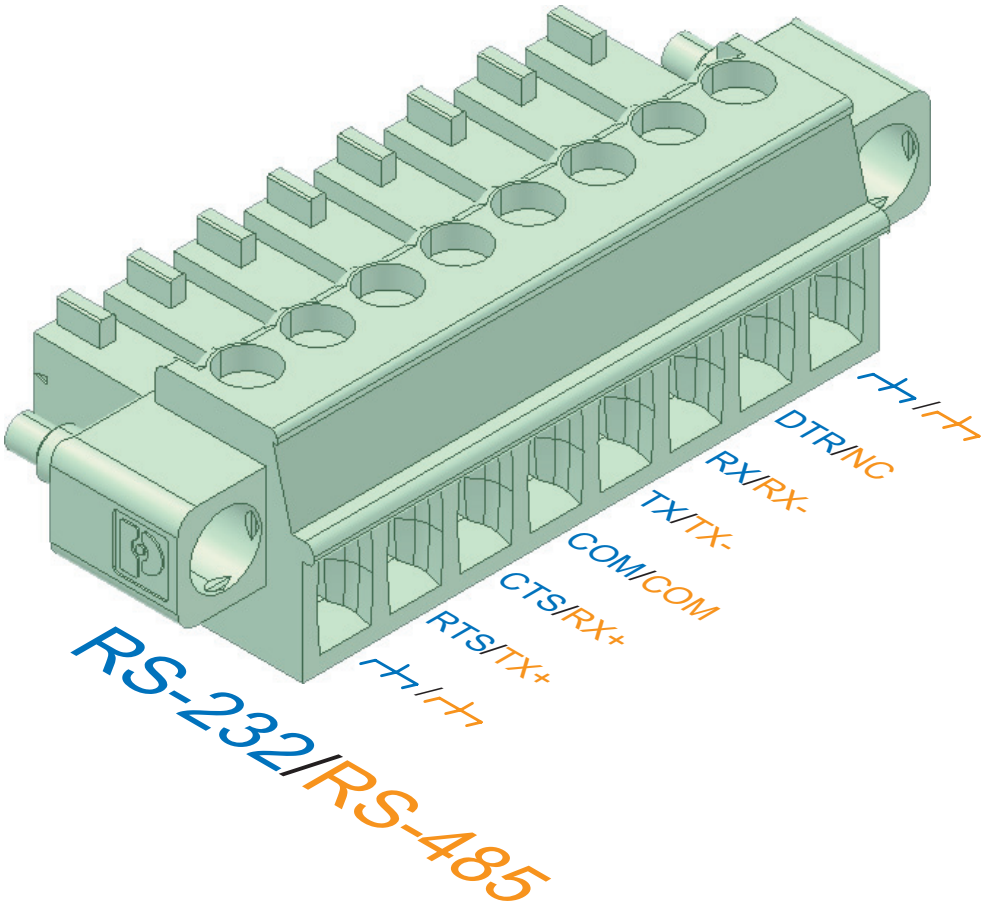
Figure 3-19. Direct connection using a crossover cable.



3.4.9 Serial Ports

The RS-232 and RS-485 ports are provided for communicating to Modbus devices having a serial link. RS-232 permits a single connection between a 1900/65A and a Modbus master RS-232 port. RS-485 permits one or more 1900/65As to be connected to a single Modbus Master RS-485 port. RS-232 and RS-485 share conductors on the Communications connector, so the 1900/65A will support either RS-232 or RS-485, but not both simultaneously. Figure 3-20 shows the signal orientation for the connector.

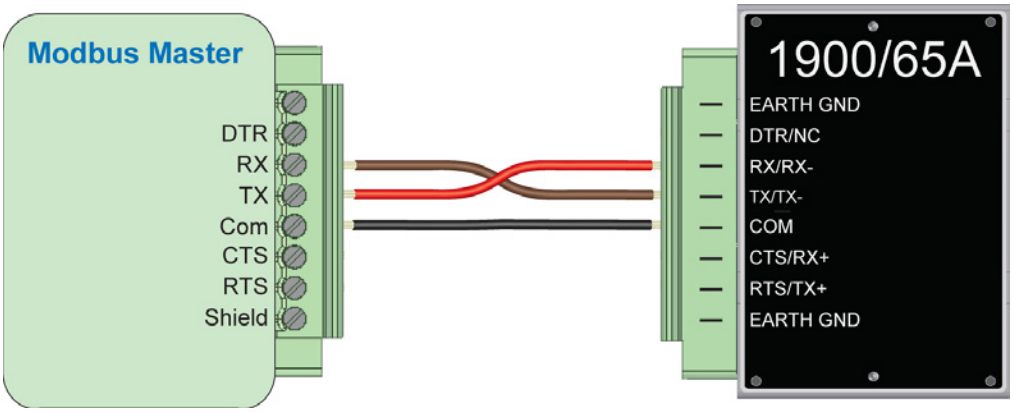
Figure 3-20. RS-232 and RS-485 connections are shared on the communications connector.



3.4.9.1 RS-232

Recommended Cable: Multiple conductor. Wire gauge, 28 to 16 AWG Maximum cable length: 50 feet (15.24 metres).

Figure 3-21. RS-232 connections.



3.4.9.2 RS-485 (EIA-485)

One or more 1900/65A monitors may be connected to a single Modbus master device using the RS-485 bus connection. The total number of devices on a bus must not exceed 32. A 4-wire connection is shown in Figure 3-22.

NOTE

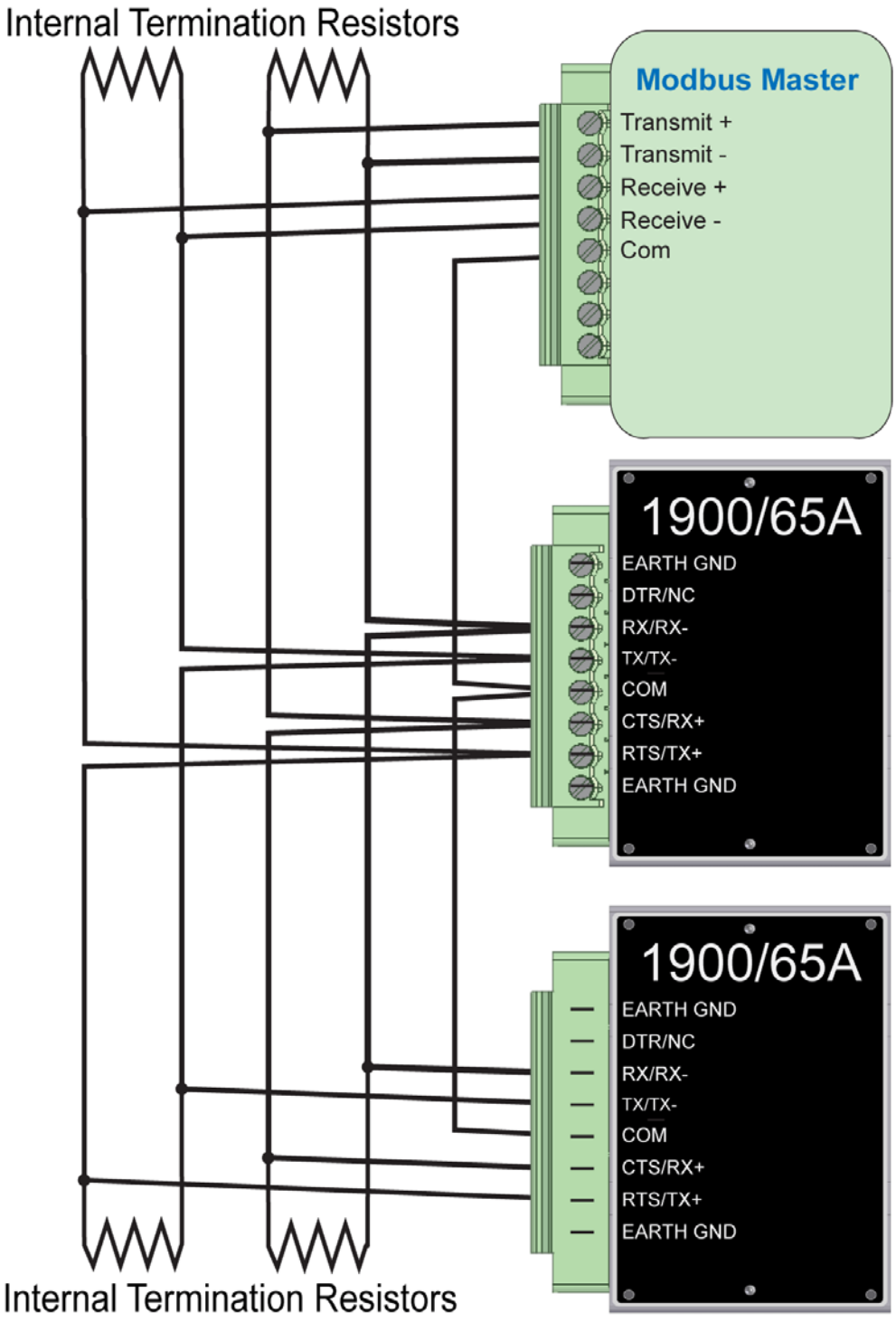
2-wire RS-485 connections are supported by the 1900/65A, But the 4-wire connection is recommended. Use RX+ and RX- for 2-wire RS-485 connections.

Configuration details are provided in the *1900/65A Modbus User Guide*.

Recommended Cable: Shielded twisted pair cable with signal commons (com) connected using the cable shield. Wire gauge, 28 to 16 AWG. Maximum cable Length is a function of baud rate and cable characteristics. See The *Modbus Over Serial Line Specification and Implementation Guide*.

Termination Resistors: Typically 120Ω, one resistor is located at both ends of each bus to minimize reflections that impair the quality of communication. Figure 3-22 shows discrete termination resistors connected to each bus, but RS-485 devices typically have internal termination resistors that may be enabled or disabled. A device at either end of the bus must provide termination, but other devices must have the termination resistor disconnected (unterminated). Configuration details are provided in the *1900/65A Modbus User Guide*.

Figure 3-22. RS-485 connections from a Modbus master to two monitors. Use twisted pair wire, shield is optional.



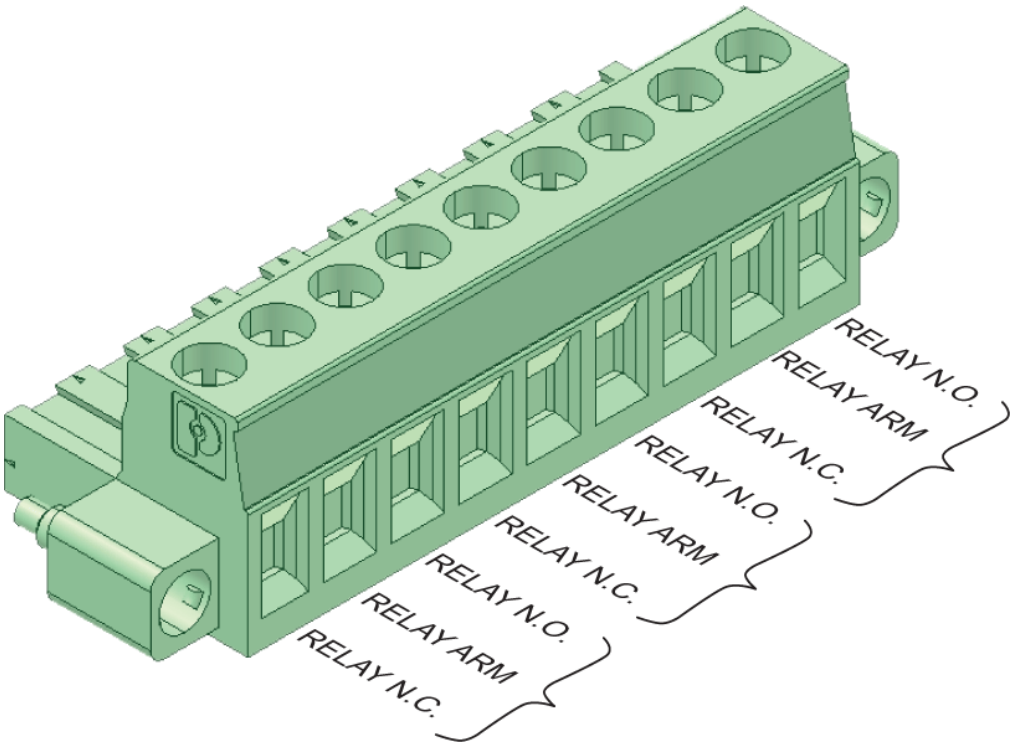
3.4.10 Relay Outputs

WARNING High voltage present could cause shock, burns, or death. Do not touch exposed wires or terminals.

Figure 3-23 shows the signal orientation for each connector.

Recommended Cable: Two or three conductor cable or individual wires, 24 to 12 AWG

Figure 3-23. Relay outputs terminal block signal orientation, Relays 1 through 6, three relays per connector.



3.4.11 Power Input

WARNING Loss of power could result in mis-trips or false trips. Use an uninterruptable power supply for critical applications

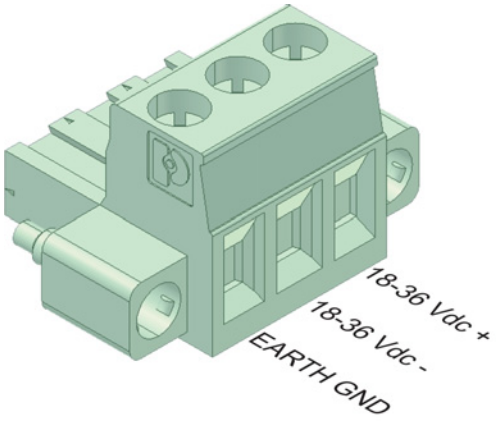


Figures 3-24 shows the signal orientation for the connector.

Recommended Cable: Twisted pair, sheathed or unsheathed, 24 to 12 AWG.

Recommended Ground Wire: 12 AWG stranded. Install ground wire per appropriate codes or regulations.

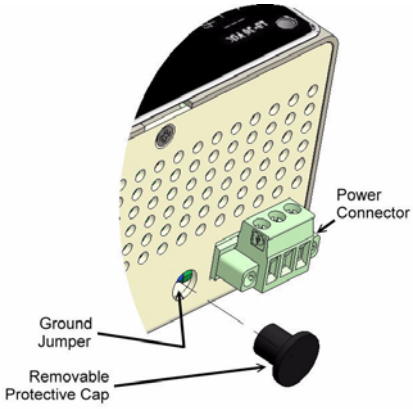
Figure 3-24. Power Input block signal orientation.



3.4.12 Ground Jumper

The 1900/65A may be used with safety barriers that are connected to earth ground. To prevent ground loops disconnect the 1900/65A signal ground from chassis ground by removing the jumper located next to the power connector as shown in Figure 3-25.

Figure 3-25. Ground jumper access.



4 Installing the Software

4.1 System Requirements

Software may be installed on a notebook or desktop computer having these minimum requirements:

- Microsoft® Windows® 2000 or Windows XP Operating System
- 800 MHz Pentium® III class processor or better
- 256 MB RAM minimum
- 8 MB Video Card or better
- 8X CD-ROM drive or faster
- 100 MB available hard drive space
- 10 BaseT or100BaseTX Ethernet interface (10 or 100 MB/s)
- 1024 x 768 screen resolution or better

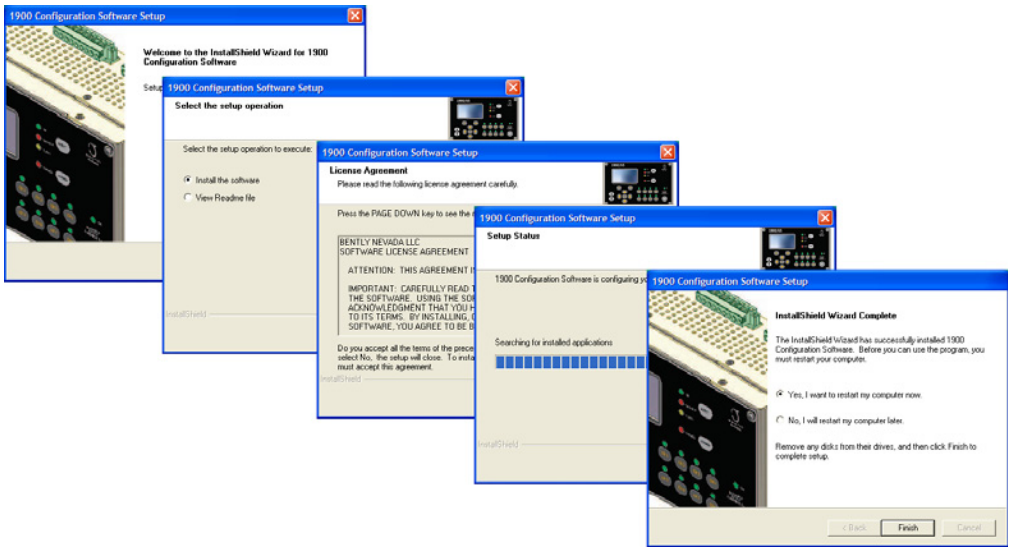
4.2 Installing the Software

You must install the 1900 Configuration Software from the Software CD onto your hard drive. You cannot run the program from the CD.

To install the software:

1. Insert the 1900 Configuration Software Disc in the CD-ROM drive of the computer.
2. The 1900 Configuration Software Setup will launch automatically (if it doesn't launch, browse to the CD-ROM drive and execute setup.exe).
3. Follow the setup Instructions (similar to Figure 4-1.)

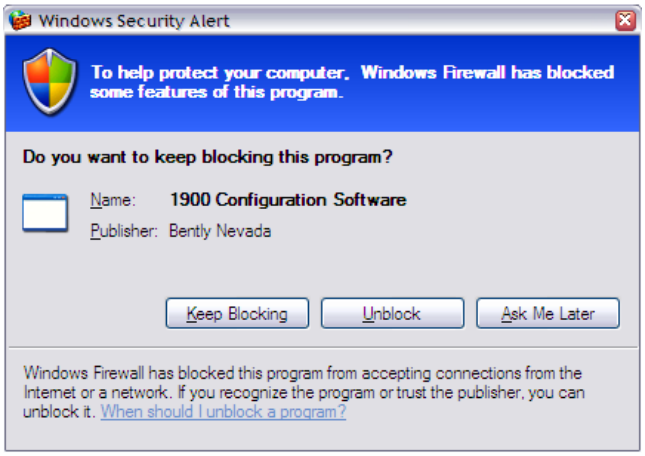
Figure 4-1. Installation sequence.



4.3 Removing a Firewall Block

If you run a personal firewall on your computer, you may have to unblock the configuration software depending how the firewall is set. For example, When you run the software for the first time, the Microsoft Windows XP firewall will indicate the program is blocked and give you the opportunity to unblock it (Figure 4-2).

Figure 4-2. Windows XP firewall message indicating the 1900 Configuration Software is blocked.



Click the *Unblock* button to permit the firewall to allow the 1900 Configuration Software to access the network.

5 The Configuration Structure

This chapter introduces the configuration structure and describes how it relates to the monitor.

5.1 Configuration Overview

Before the monitor can be deployed, the Monitor Module's network settings and hardware must be *configured* in order to perform in a particular application. Use the 1900 Configuration Software to assign a static IP address, create a configuration and download it to the monitor connected to your network.

The 1900/65A Monitor uses a flexible configuration structure to define how input information is processed and used. Transducer channels 1, 2, 3 and 4 support acceleration, velocity and displacement transducers. Temperature channels 5, 6, 7 and 8 support thermocouples (types E, K, J and T) and RTDs (platinum, nickel and copper). A single configuration can be used with more than one monitor.

A configuration can be seen as a layered structure with the following items related as shown in Figure 5-1:

Configuration: This is a user-created file that represents one or more 1900/65A monitors in a facility or on a machine train.

Monitor: Contains the configuration for a specific 1900/65A monitor on the network.

Channel Type: One of up to seven types (acceleration, recip acceleration, velocity, recip velocity, radial vibration, thrust position or rotational speed) on channels 1 through 4 plus temperatures on channels 5 through 8. The channel type must correspond to the type of transducer connected to the input.

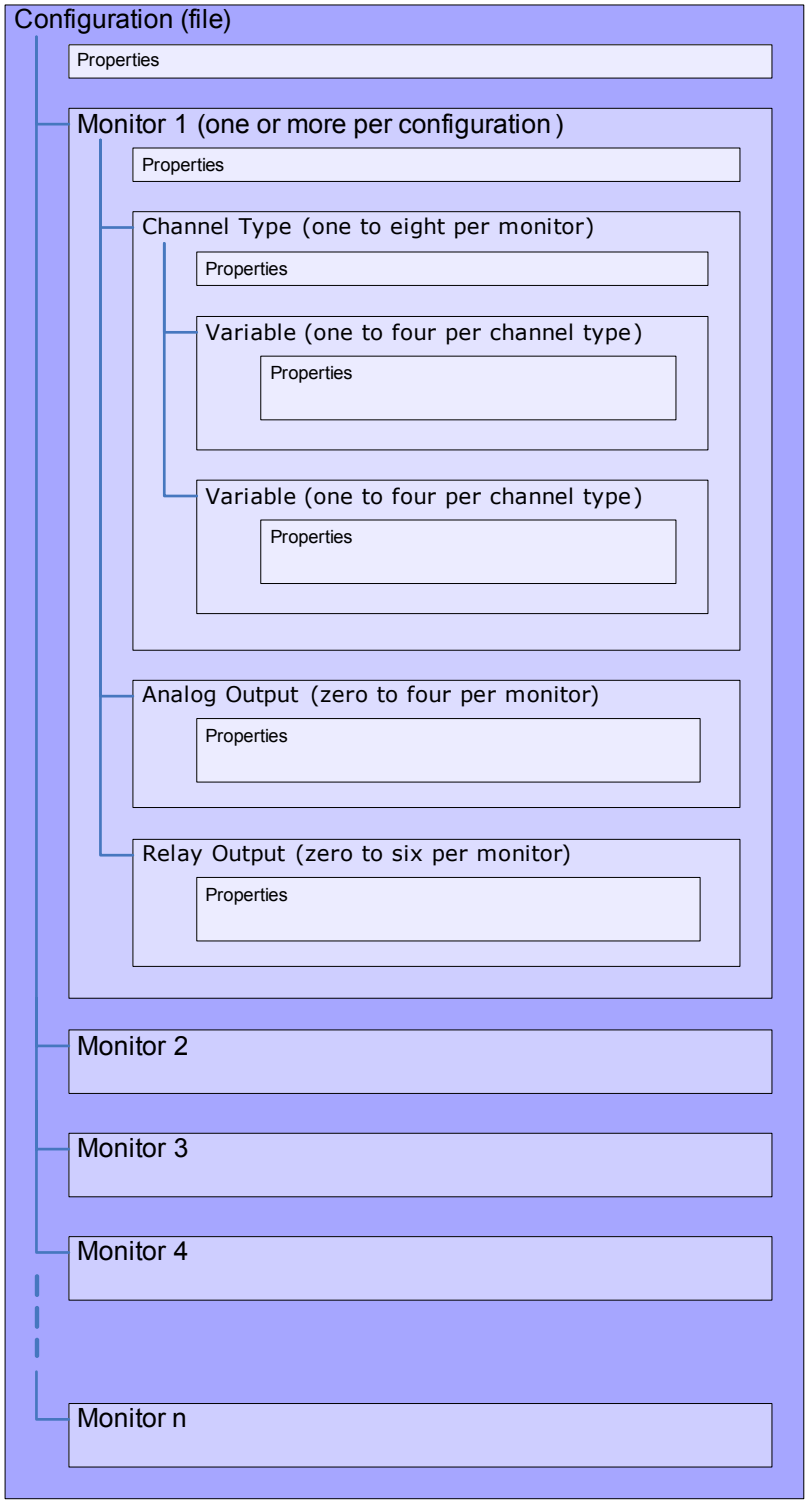
Variables: Defines the kind of measurements obtained from the input signal source after the raw signal is processed and filtered.

Analog Output: Up to four 4–20 mA outputs may be assigned to represent a variable from any of the eight inputs.

Relay Output: Up to six relay outputs behaving according to how you program them to respond to logical combinations of status states available from the monitor, from a channel, or from a variable.

Properties: Objects in the hierarchy have one or more properties that can be edited. Properties define how an object works.

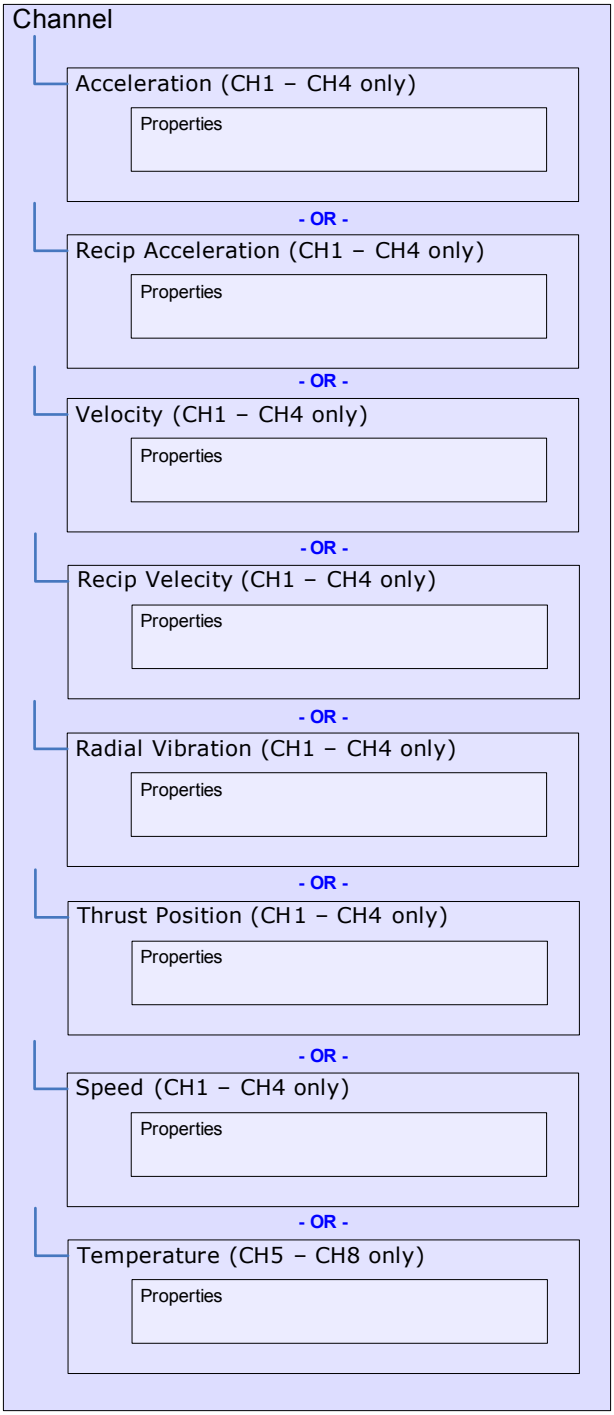
Figure 5-1. Configuration structure.



5.2 Channel Types

Channel types define the function and kind of processing that will be applied to an input signal. Each type also limits the kind of *variables* or measurement values that are derived from an input, as well as the kind of transducer that can be used. The types supported by the 1900/65A are shown in Figure 5-2.

Figure 5-2. Channel types.



Channel types include:

Acceleration: Configures the channel to support accelerometers and to process information derived from acceleration.

Recip Acceleration: Configures the channel to support accelerometers and to process information derived from reciprocating machine acceleration.

Velocity: Configures the channel to support piezo-electric velocity transducers and to process information derived from velocity.

Recip Velocity: Configures the channel to support piezo-electric velocity transducers and to process information derived from reciprocating machine velocity.

Radial Vibration: Configures the channel to support proximity probes and to process information derived from radial shaft vibration.

Thrust Position: Configures the channel to support proximity probes and to process information derived from shaft position values.

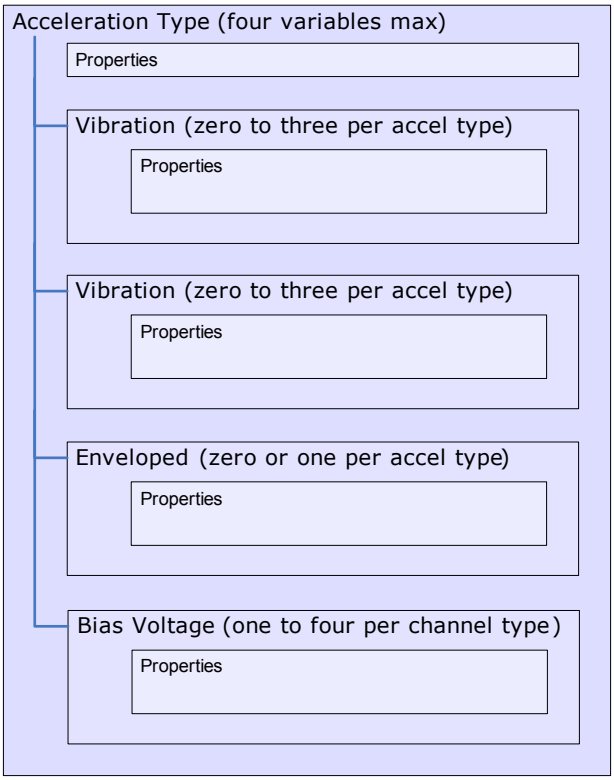
Speed: Configures the channel to support proximity probes or inductive sensors and to process rotational speed information derived from sensing the rate of passage of a notch or projection.

Temperature: Configures the channel to support temperature measurements derived from thermocouples or RTDs.

5.2.1 Acceleration and Recip Acceleration Types

The *Acceleration* and *Recip Acceleration types* supports two and three wire acceleration sensors and can process three different kinds of *variables* on a maximum of four variable outputs (Figure 5-3).

Figure 5-3. Acceleration type and variables.



5.2.1.1 Acceleration and Recip Acceleration Variables

An *Acceleration* or *Recip Acceleration variable* defines how the transducer signal is filtered and processed to provide a specific kind of acceleration measurement. Each acceleration channel type continuously processes up to four variables per channel.

Vibration: Defines a band-pass filtered measurement of acceleration. Zero to three vibration variables may be specified.

Enveloped: Defines a measurement based on the acceleration enveloping algorithm. Zero or one enveloped variables may be specified.

Bias Voltage: Defines a measurement of the transducer bias voltage. One to four bias voltage measurements may be specified.

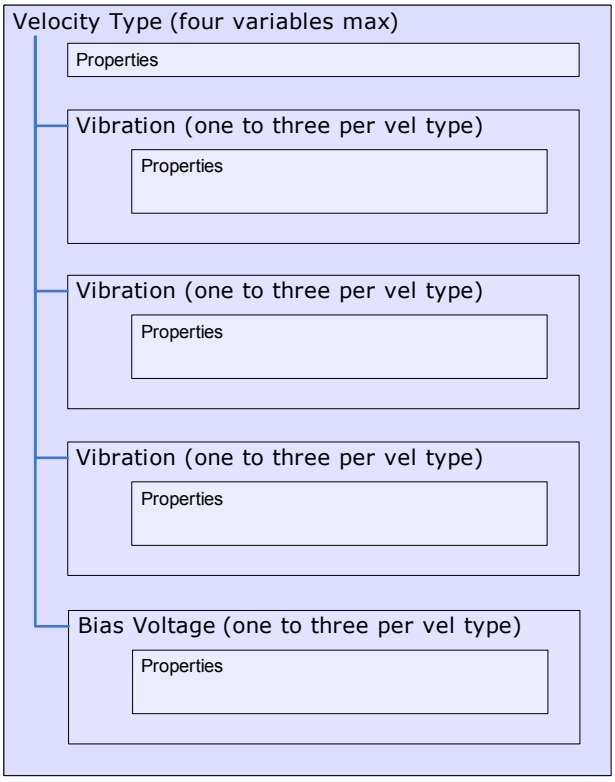
5.2.1.2 Properties

Properties provide control over scaling, filtering, and setpoint parameters for each kind of variable. Acceleration variable properties are covered in detail in Paragraph 6.2.7.1.

5.2.2 Velocity and Recip Velocity Type

The velocity and Recip Velocity channel type supports two-wire piezo-electric velocity sensors and can process two different kinds of variables for a maximum of four variable outputs (Figure 5-4)

Figure 5-4. Velocity channel type and variables.



5.2.2.1 Velocity and Recip Velocity Variables

A velocity *variable* defines how the transducer signal is filtered and processed to provide a specific kind of velocity measurement. Each velocity channel type continuously processes up to four variables per channel.

Vibration: Defines a band-pass filtered measurement of velocity. One to three vibration variables may be specified.

Bias Voltage: Defines a measurement of the transducer bias voltage. One to three bias voltage variables may be specified.

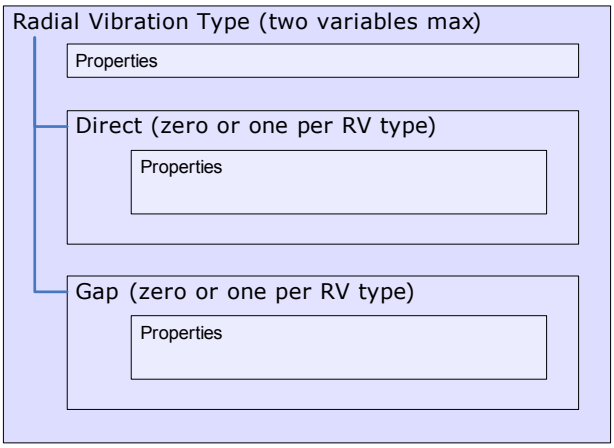
5.2.2.2 Properties

The properties provide control over scaling, filtering, and setpoint parameters for each kind of variable. Velocity variable properties are covered in detail in Paragraph 6.2.7.6.

5.2.3 Radial Vibration Type

The Radial Vibration type is designed to measure radial shaft motion using proximity sensors and can process two different kinds of variables for a maximum of two variable outputs (Figure 5-5).

Figure 5-5. Radial Vibration type and variables.



5.2.3.1 Radial Vibration Variables

A radial vibration *variable* defines how the transducer signal is filtered and processed to provide a measurement of shaft vibration. Each radial vibration channel type continuously processes up to two variables per channel.

Direct: Defines a band-pass filtered measurement of radial vibration. Zero or one radial vibration variable may be specified.

Gap: Defines a measurement of the proximity sensor bias voltage. Zero or one gap variable may be specified.

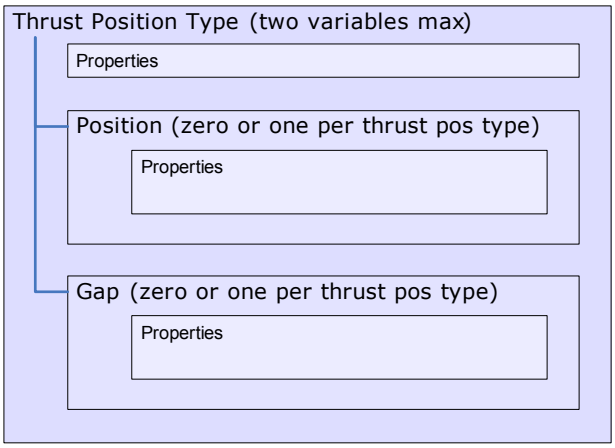
5.2.3.2 Properties

Properties provide control over scaling, filtering, and setpoint parameters for the direct and gap variables. Radial vibration variable properties are covered in detail in Paragraph 6.2.7.8.

5.2.4 Thrust Position Type

The thrust position channel type is designed to measure axial shaft motion using proximity sensors and can process two different kinds of variables for a maximum of two variable outputs (Figure 5-6).

Figure 5-6. Thrust Position type and variables.



5.2.4.1 Thrust Position Variables

A thrust position *variable* defines how the transducer signal is processed to provide shaft axial position measurements. Each thrust position channel type continuously processes up to two variables per channel.

Position: Defines a filtered measurement of axial shaft position. Zero or one position variable may be specified.

Gap: Defines a measurement of the proximity sensor bias voltage. Zero or one gap variable may be specified.

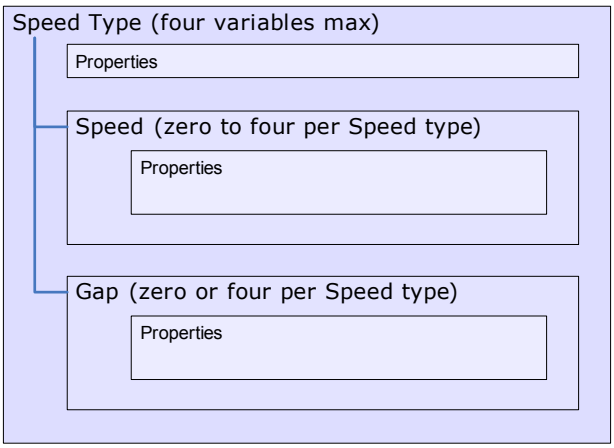
5.2.4.2 Properties

Properties provide control over scaling, filtering, and setpoint parameters for the position and gap variables. Thrust position variable properties are covered in detail in Paragraph 6.2.7.9.

5.2.5 Speed Type

The Speed channel type is designed to measure rotational speed using proximity sensors or inductive sensors and can process two different kinds of variables for a maximum of four variable outputs (Figure 5-7).

Figure 5-7. Speed type and variables.



5.2.5.1 Speed Variables

A speed *variable* defines how the transducer signal is processed to provide shaft rotational speed measurements. Each speed channel type continuously processes up to four variables per channel.

Speed: Defines a measurement of shaft rotational speed. Zero to four speed variables may be specified.

Gap: Defines a measurement of the sensor bias voltage. Zero to four gap variables may be specified.

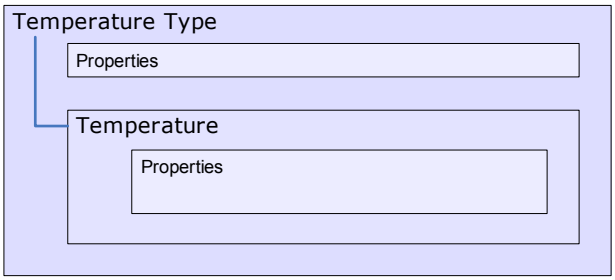
5.2.5.2 Properties

Properties provide control over scaling, events per revolution, and setpoint parameters for the speed variables. Speed variable properties are covered in detail in Paragraph 6.2.7.12.

5.2.6 Temperature Type

Channels 5 through 8 support type E, J, K and T thermocouples or 100Ω platinum, 120Ω nickel or 10Ω copper RTDs (Figure 5-8).

Figure 5-8. Temperature type.



5.2.6.1 Temperature Variable

A temperature *variable* defines how a temperature sensor signal is processed to provide temperature measurements. The thermocouple or RTD type is defined as one of the temperature properties.

5.2.6.2 Properties

Properties provide control over the range and setpoint parameters for the temperature variable. Temperature variable properties are covered in detail in Paragraph 6.2.7.13

5.2.7 Analog Outputs (4–20 mA)

Each monitor provides four 4–20 mA recorder outputs that can be configured to output any variable from any active channel. The output current is proportional to the full scale range of the variable being output.

5.2.7.1 Properties

The Analog Output properties give access to selecting the *2 mA Clamp* feature and assigning a variable for output. Analog Output properties are covered in detail in Paragraph 6.2.8.

5.3 Relay Outputs

Each monitor provides six relays with normally open or normally closed outputs (SPDT contacts). The state of each relay is a function of the following:

- Relay Property settings
  - Normally energized or normally de-energized
  - Latching or non-latching

- Relay input logic (user defined AND/OR functions)
  - Status Inputs
  - Voting Type
  - Logic equation

Setting relay properties and defining the relay input logic are covered in detail in Paragraph 6.2.9.

5.3.1 Properties

Normally energized or normally de-energized: A normally de-energized relay operates as indicated in the diagram on the monitor overlay. When the relay is not active, the normally closed contact is closed, and the normally open contact is open. A normally energized relay inverts the operation of the contacts. When the relay is not active the normally closed contact is open, and the normally open contact is closed. Relay properties give access to selecting this behavior for each relay.

Latching or non-latching: A latching relay will switch contact states when an input status event occurs and remain in this state until manually reset. A non-latching relay will switch contact states when an input status event occurs, but will immediately return to the inactive state when the status event ends. Relay properties give access to selecting this behavior for each relay.

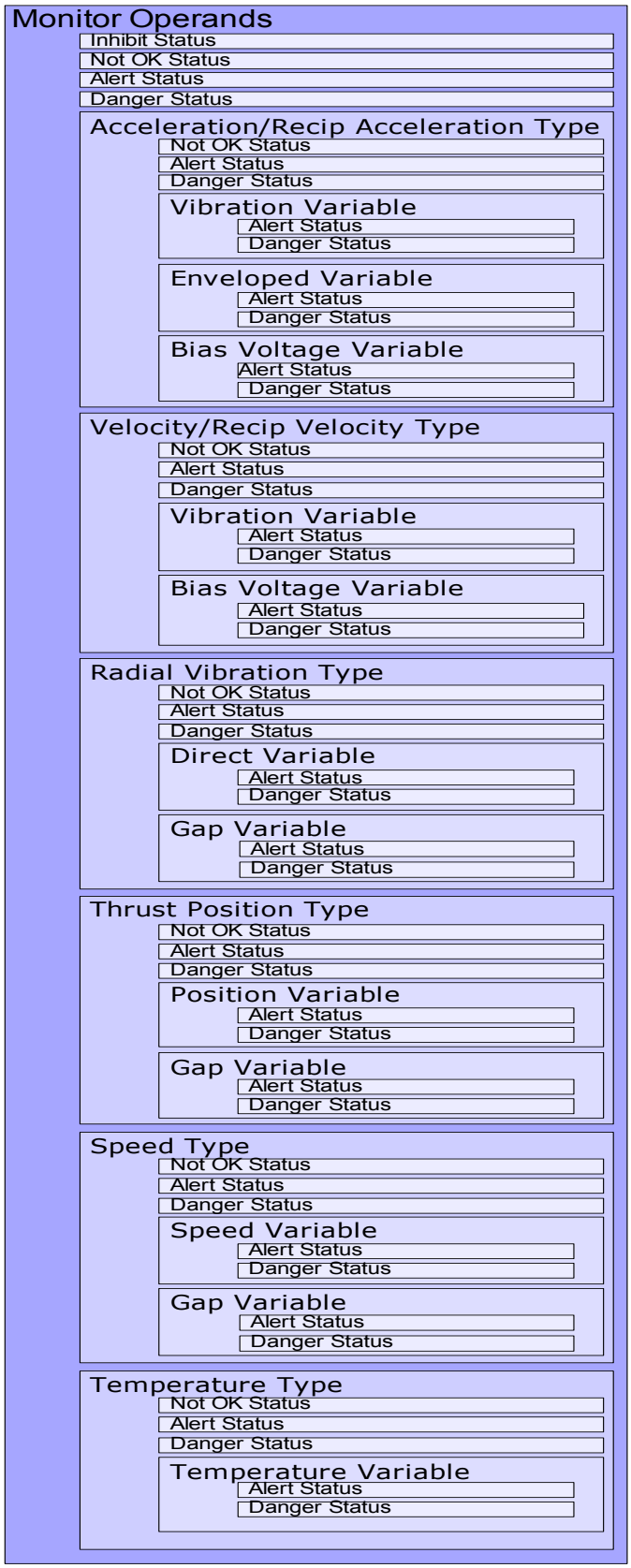
5.3.2 Relay Input logic

Status Inputs: Logic statements can be defined to operate on any *Inhibit, OK, Alert* or *Danger* status available in the 1900/65A monitor. Figure 5-9 shows the statuses that are available in the monitor.

Voting Type: The relay logic uses The *AND* and *OR* logical operators. The voting type defines how the AND operator operates under Bypass conditions. Normal AND voting ignores the statuses of any bypassed channel. True AND voting includes the status of any bypassed channel.

Logic Equation: Logic statements use OK, Alert and Danger statuses as operands. Logic statements use AND and OR as logical operators.

Figure 5-9. 1900/65A statuses.



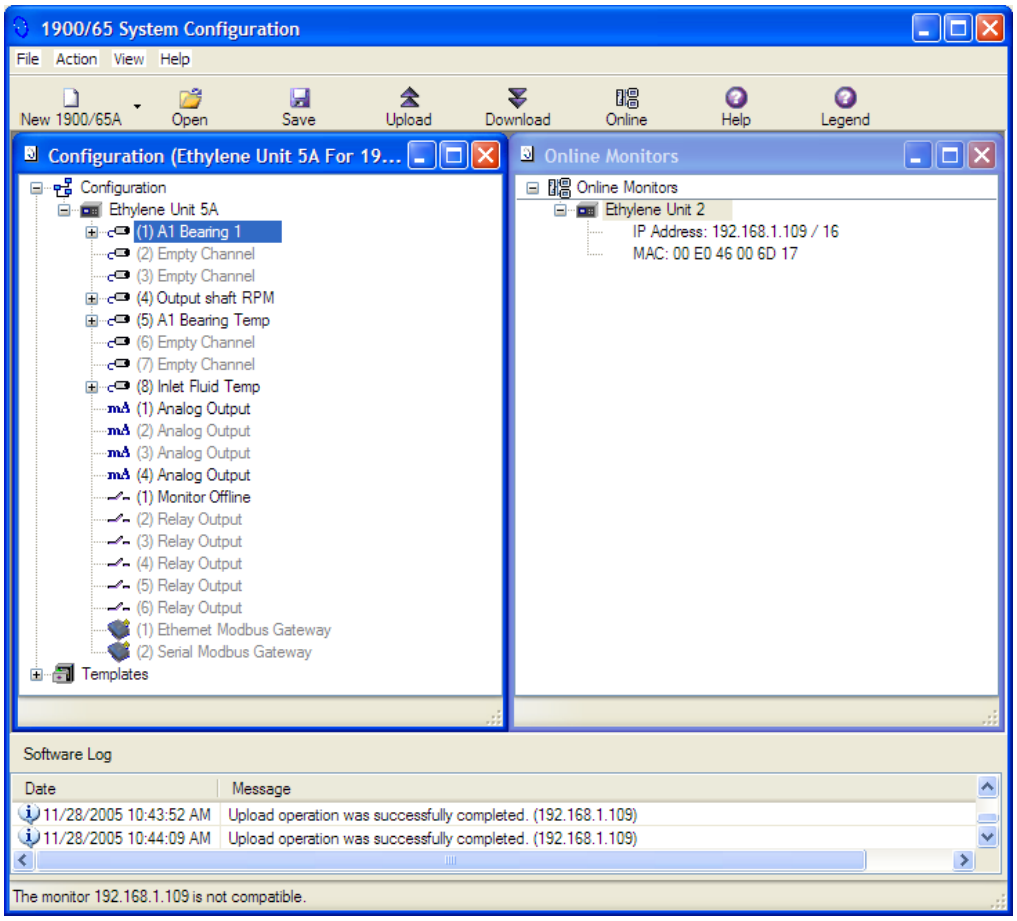
6 Configuring the Monitor

This chapter describes use of the 1900 Configuration Software and shows how to perform common configuration tasks. If you are not familiar with the configuration structure used by the 1900/65A monitor, refer to Chapter 5 for an overview.

6.1 Configuration Window Definitions

The main window components are shown in Figure 6-1.

Figure 6-1. The 1900 Configuration Software window.



Configuration Window: Displays a tree structure showing the configuration of one or more monitors and templates. Configurations in this window are not active, and can be edited without affecting the online monitors.

Online Monitor Window: Displays a tree structure showing the 1900/65A monitors that are online. Monitors in this window are active and available to execute various utility commands.

Software Log Window: Displays status information relating to recent configuration events. The log can potentially list several hundred event messages with the most recent listed first. The log is not editable. Three types of messages are listed:



Information: Provides information about the results of a command or event, and implies a successful completion or outcome.



Warning: An Alert indication that implies a possibly unintended result that may require further attention.



Error: An indication that the command or event failed and must be corrected before proceeding further.

NOTE

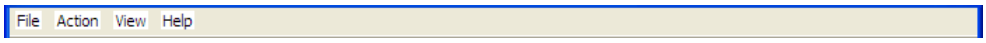


If the message is too long to be fully displayed in the window, double-click on the message to open the complete message in a separate window.

Status bar: Located at the bottom of the window. Displays information about the current action being performed.

6.1.1 Menu Bar Commands

Figure 6-2. Menu Bar commands.



6.1.1.1 File Menu

The File menu contains commands for creating, opening, saving and exporting configuration files. Click on *File* to open this menu.

Download Selected Monitors: Transfers the configuration from the configuration window to one or more online monitors. Same command as *Download* on the Toolbar (paragraph 6.1.2.5).

New 1900/65: Adds a 1900/65 monitor branch to the configuration tree. This is the same command as *New* on the Toolbar (paragraph 6.1.2.1).

New 1900/65A: Adds a 1900/65A monitor branch to the configuration tree. This is the same command as *New* on the Toolbar (paragraph 6.1.2.1).

Export to CSV: Saves the configuration in Comma Separated Values (CSV) format for export to a spreadsheet.

Import from CSV: Opens a Modbus configuration information stored in Comma Separated Values (CSV) format.

6.1.1.2 Action Menu

The Action menu is context sensitive. If the configuration window is open and a branch in the configuration is selected, the menu shown in Figure 6-3 will open. If the Online Monitors window is open and selected, the menu shown in Figure 6-4 will open instead. Click on *Action* to open this menu.

Figure 6-3. The Action menu when focus is on the Configuration window.

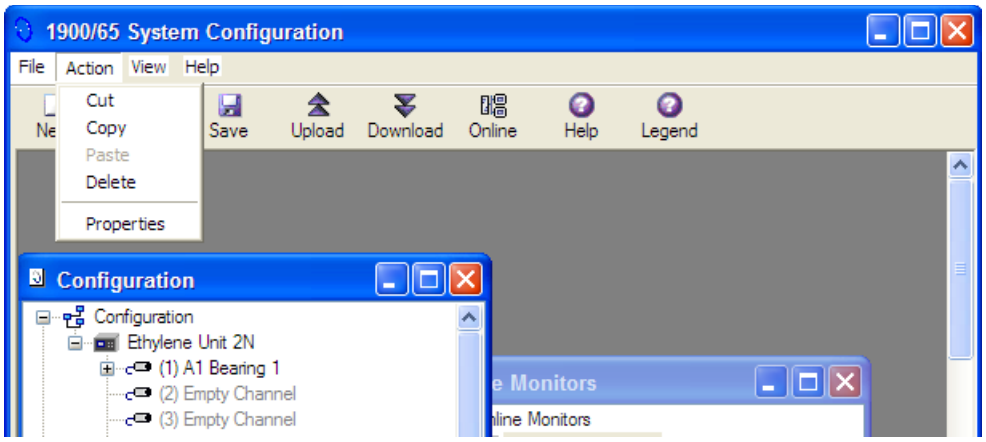
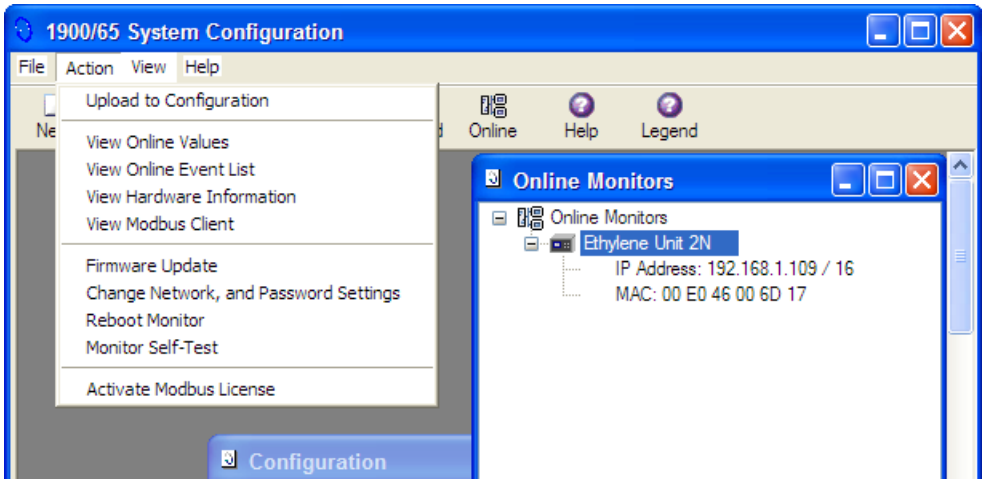


Figure 6-4. The Action menu when focus is on the Online Monitors window.



6.1.1.3 View Menu

Contains commands for opening the Configuration window, the Online Monitors window and commands for tiling and cascading open windows.

6.1.1.4 Help menu

Contains online help access.

6.1.2 Toolbar Commands

Figure 6-5. ToolBar commands.



6.1.2.1 New

Adds a 1900/65A or 1900/65 monitor branch to the configuration tree. One new branch is added with each click of the *New* button. Use the down arrow to the right of this button to select the version of monitor.

6.1.2.2 Open

Opens an existing Configuration file. Click on the *Open* button to look in a particular directory and select a configuration file to open in the configuration window.

6.1.2.3 Save

Saves the configuration shown in the configuration window to a file. When the *Save* button is clicked the first time, the Save As window will open so you can specify a directory and name for the file. Subsequent clicks will then directly save the configuration to this file.

6.1.2.4 Upload

Adds the configuration from an online monitor to the configuration displayed in the Configuration window.

NOTE



The monitor must be configured with a valid IP address for the configuration to upload successfully. Troubleshooting information is available in Chapter 10.

Figure 6-6. Upload configuration.



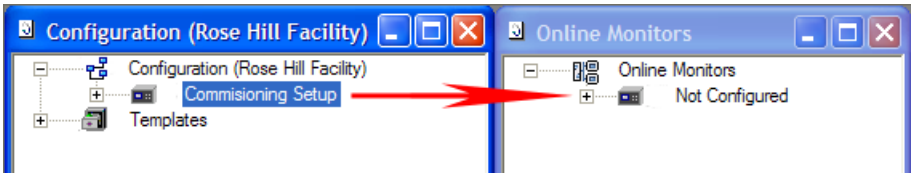
6.1.2.5 Download

Transfers a copy of the configuration in the Configuration window to one or more online monitors.

NOTE

The monitor must be configured with a valid IP address for the configuration to download successfully. Troubleshooting information is available in Chapter 10.

Figure 6-7. Download configuration.



6.1.2.6 Online

Refreshes the display of monitors in the Online Monitors window by searching for active monitors on the network.

6.1.2.7 Help

Opens the Online Help file.

6.1.2.8 Legend

A summary of the icons used by the 1900 Configuration Software are shown in Table 6-1.

Table 6-1. Icon summary.

Icon	Name	Description
	Configuration group	Used on the configuration tree to hold a collection of monitors
	Monitor	Represents a monitor
	Channel	Represents a monitor channel
	Variable	Represents a channel variable
mA	Analog Output	Represents a 4-20 mA output
	Relay	Represents a relay output
	And	Logical *AND* operator for relay Boolean logic
	Or	Logical *OR* operator for relay Boolean logic
	Modbus Gateway	Represents the Modbus communications link
	Coil	A Modbus block type that allows bit addressing and read/write access

Table 6-1. Icon summary. (Continued)

Icon	Name	Description
	Discrete	A Modbus block type that allows bit addressing and read only access
	Input Registers	A Modbus block type that allows word (16-bit) addressing and read only access
	Holding Registers	A Modbus block that allows word (16-bit) addressing and read/write access
	Help	Launch help for the active window
	New	Add a new monitor to the configuration dialog
	Open	Allows a configuration file (.cfg) to be opened in the configuration dialog
	Save	Save the current configuration to a configuration file (.cfg)
	Online	Operations that communicate with the monitor are represented with this symbol (Online Monitors, Online Values, Modbus Client)
	Danger	Component is in a Danger state
	Alert	Component is in a Alert state
	Not OK	Transducer is in a Not OK state
	Bypass	Indicates normal operation of the monitor is being bypassed due to user request or operating conditions
	Monitor Alarm Inhibit	Indicates monitor alarms are being bypassed from the software, front-panel or hardware jumper
	Trip Multiply	Indicates monitor trip multiply is activated
	Unlock	Indicates online monitor configuration is unlocked and can be changed
	Lock	Indicates online monitor configuration is locked and requires a password to change the configuration

6.2 Create/Edit a Configuration

A *Configuration* is a file that describes how a 1900/65A monitor will perform. You download this file into a monitor to set up its hardware to support various transducers and temperature sensors. The configuration also defines how the raw transducer signals will be processed into useful information.

Creating a new configuration involves opening a new configuration file and assigning *Channel Types* to each input channel. *Variables* are then assigned to each channel type and properties are set. The configuration also assigns *Analog Outputs* to variables and defines *Relay Behavior* with logic statements. This process is detailed in the following sections.

NOTE

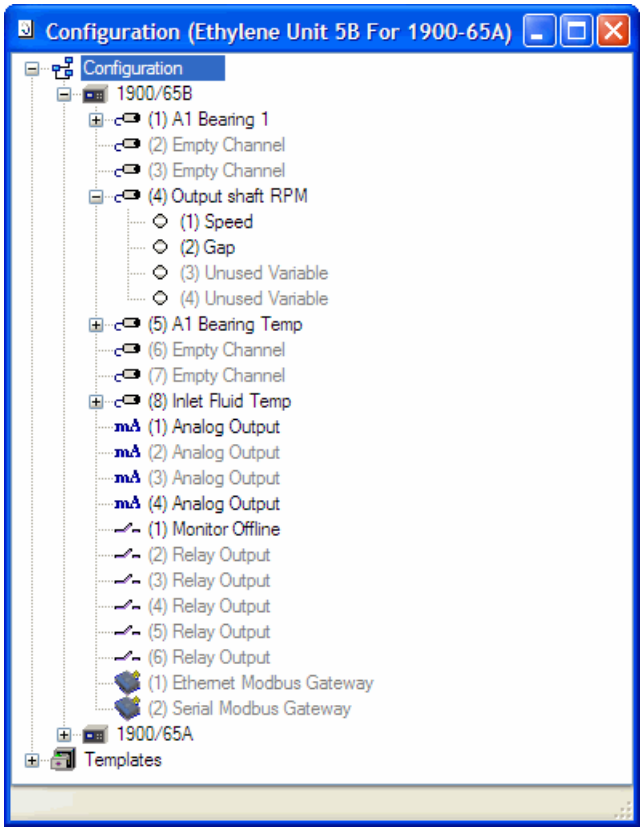


Configuration of the Ethernet Modbus Gateway and the Serial Modbus Gateway is covered in the 1900/65A Modbus Gateway User Guide – 172250-01

6.2.1 Configuration Window

The configuration window is the working space for creating and editing a configuration before downloading it into a monitor or group of monitors.

Figure 6-8. Configuration Window.



6.2.1.1 Configuration structure

The configuration itself is represented as a tree structure having four levels:

Configuration (first level): This contains the whole configuration and is saved as a file. A configuration can have one or more 1900/65A or 1900/65 monitors.

Monitor (second level): Contains the configuration for a specific 1900/65A or 1900/65 monitor.

Channel Type (third level): One of up to seven transducer types (acceleration, recip acceleration velocity, recip velocity, radial vibration, thrust position or speed) on channels 1 through 4 plus temperatures on channels 5 through 8. The channel type corresponds to the type of transducer connected to the input.

Variables (fourth level): Defines the kind of measurements obtained from the input signal source after the raw signal is processed and filtered.

Outputs are also included as part of each monitor:

Analog Output: Up to four 4–20 mA outputs may be assigned to represent a variable from any of the eight inputs.

Relay Output: Up to six relay outputs may be made active. Each active relay will control its output state according to how you program them to respond to logical combinations of status states available from the monitor, from a channel, or from a variable.

Ethernet Modbus Gateway: Allows configuration of the Modbus register map used with the optional Ethernet Modbus Interface.

Serial Modbus Gateway: Allows configuration of the Modbus register map used with the optional Serial Modbus Interface.

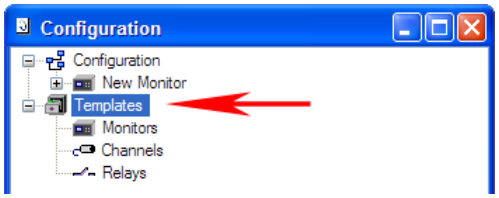
6.2.1.2 Navigating Through the Configuration Tree

A plus sign located as a node on a branch (⊞) indicates additional branches may be opened below this node. Click it to view these branches. A minus sign (⊟) indicates the branch is fully open. Click it to close the branch.

6.2.1.3 Templates

The Template branch (Figure 6-9) is a storage location where you may paste a copy of a monitor, channel or relay configuration to use as a template when duplicating or creating a similar configuration.

Figure 6-9. Templates branch.



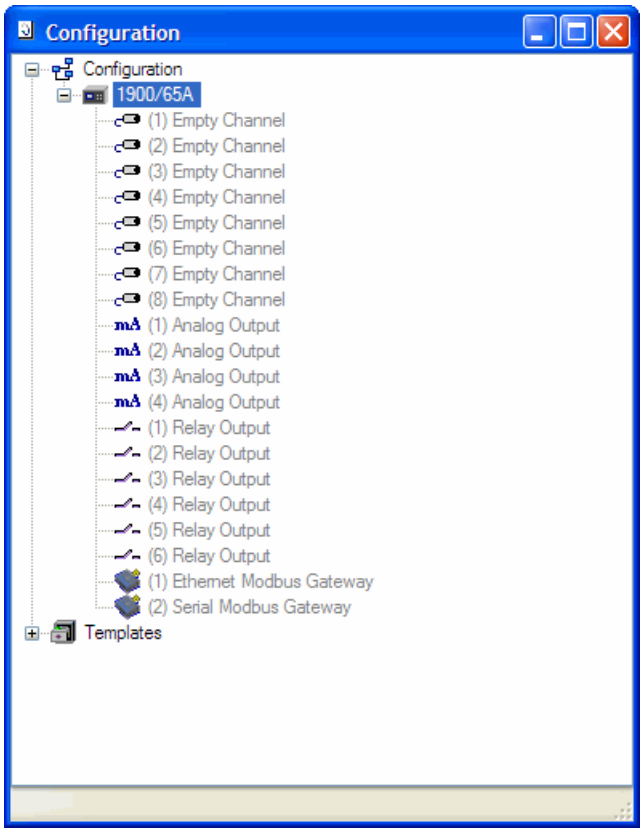
6.2.2 Create a Configuration File

1. Launch the configuration software and click *New* on the Toolbar to create a new monitor (Figure 6-10).

6.2.3 Edit Monitor Properties

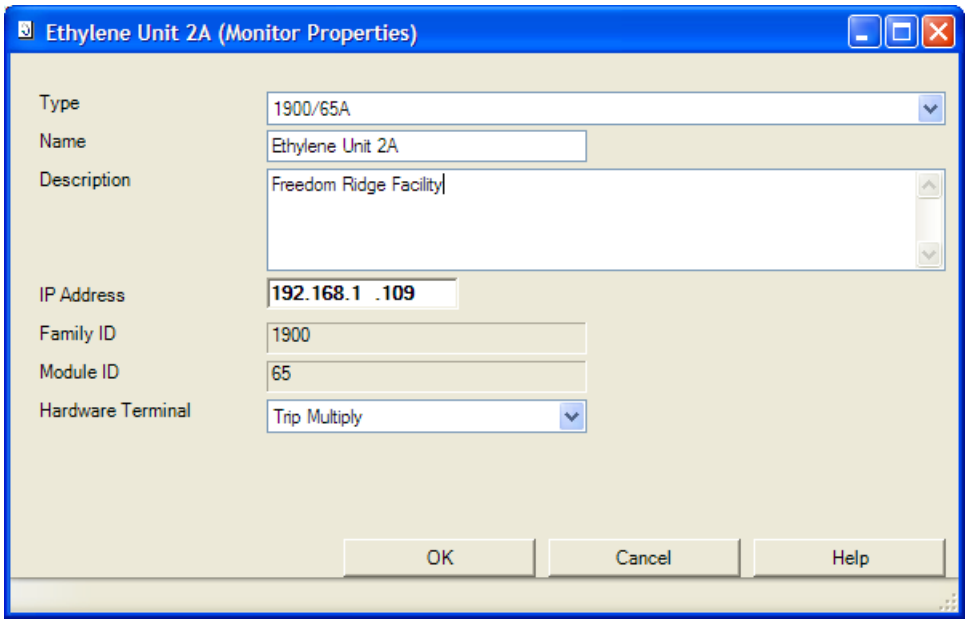
1. Click the *plus* icon at the new monitor node. The node will expand and show the current channels, analog outputs, relay output nodes and Modbus Gateways (Figure 6-10).

Figure 6-10. Expanded New Monitor node.



2. Right-click on the new monitor. The context menu will open.
3. Click on *Properties* at the bottom of the menu. The Properties window will open (Figure 6-11). Edit the properties in this window as needed for your application.

Figure 6-11. Monitor properties window.



Type: Select the type of monitor hardware being configured, 1900/65 or 1900/65A.

Name: Enter an appropriate name for this monitor according to your own preferences or naming conventions.

Description: Enter any additional information or notes appropriate for this device.

IP Address: Enter the IP address that has been (or will be) assigned to this monitor. Monitor address assignment is covered in paragraph 6.7.

NOTE

Every new 1900/65A monitor is shipped from the factory with the IP address set to 192.168.0.1, and the subnet mask set to 255.255.0.0

Family ID: Fixed value. Always 1900 to identify this Bently Nevada product family.

Module ID: Fixed value. Always 65 to identify monitor.

Hardware Terminal: Select how the contact closure on the Inhibit/Trip Multiply input is used (Paragraph 3.4.6):

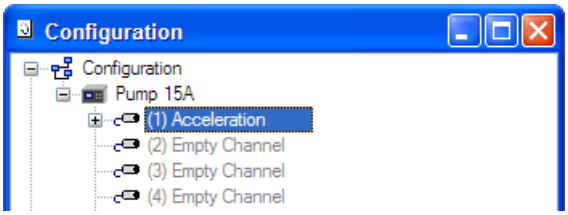
- *Inhibit*: Contact closure will inhibit all monitor alarms while contact is closed.
- *Trip Multiply*: Contact closure will enable Trip Multiply on all alarm setpoints while contact is closed.

6.2.4 Assign Transducer Channel Types to a Monitor

IMPORTANT Acceleration, Recip Acceleration, Velocity, Recip Velocity, Radial Vibration, Thrust Position or Speed channel types can be assigned only to channels 1–4. Temperature channel types can be only assigned to channels 5–8.

1. Right-click on one of the empty channels in the configuration structure. The context menu will open.
2. Click on one of the available channel types in the context menu. The selected channel type will be assigned to the selected channel (Figure 6-12).

Figure 6-12. Acceleration Type assigned to Channel 1.

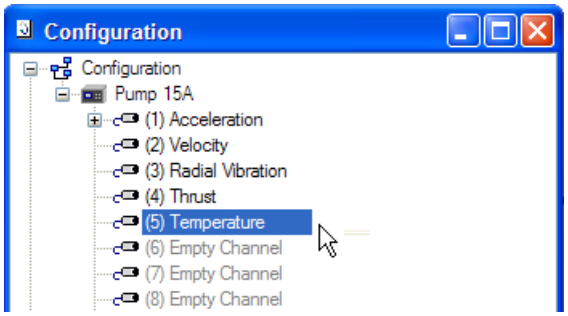


3. If additional transducer channels are needed, assign an appropriate transducer type to the remaining first four channels.

6.2.5 Assign a Temperature Type

1. Right-click on one of the empty Channels (5 – 8) to assign a Temperature type to a channel. The Temperature type is available only on channels 5, 6, 7 or 8.
2. Click on *Temperature* in the context menu. The Temperature channel type will be assigned to the selected channel (Figure 6-13).

Figure 6-13. Temperature channel type assigned to Channel 5.



3. Additional temperature channels can be assigned on channels 6, 7 and 8 as needed.

Which Channel Type do I Use?

Assign a Channel Type to a particular channel according to the kind of transducer you intend to connect to that channel.

Acceleration and Recip Acceleration (CH1 – CH4)

Configures the channel to support accelerometers and to process acceleration oriented information.

Velocity and Recip Velocity (CH1 – CH4)

Configures the channel to support velocity transducers and to process velocity oriented information.

Radial Vibration (CH1 – CH4)

Configures the channel to support proximity probes and to process position based radial shaft vibration information.

Thrust Position (CH1 – CH4)

Configures the channel to support proximity probes and to process position based axial shaft position information.

Speed (CH1 – CH4)

Configures the channel to support proximity probes or inductive sensors monitoring a shaft reference (notch or projection) and to process speed based information (Events per Revolution).

Temperature (CH5 – CH8 only)

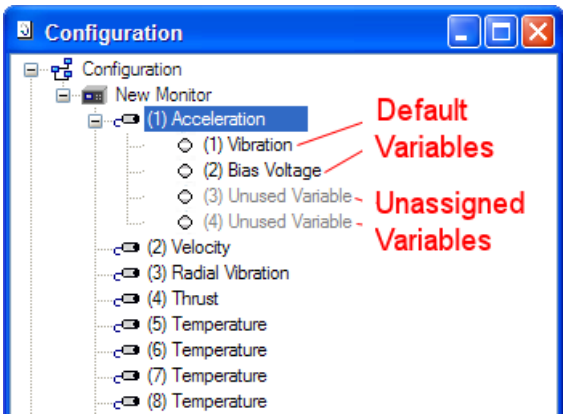
Configures the channel to support thermocouples or RTDs and to process temperature measurements.

6.2.6 Assign Variables to Channel Types

This example uses Channel 1 with an Acceleration Type assigned to it. The process is similar for other Channel Types.

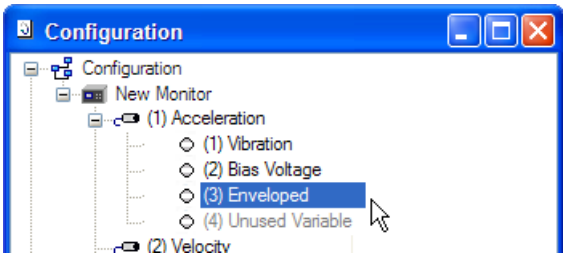
1. Expand the Channel 1 node. Click the Channel 1 *plus* icon. The Channel 1 node will expand and show the four variables reserved for an Acceleration Type (Figure 6-14).

Figure 6-14. Acceleration variables.



2. Assign a new variable. Right-click on an *Unused Variable*. The Context Menu will open.
3. Click on one of the listed variables in the Context Menu. The selected variable will be assigned to the active Channel Type (Figure 6-15).

Figure 6-15. New variable assigned to an Acceleration Channel Type.



Which Variable do I Use?

Each channel type is capable of processing one or more variables. When you select a variable, you are defining how the transducer signal is processed into useful data. Variables for each channel type are summarized here.

Acceleration or Recip Acceleration

Vibration – Defines a band-pass filtered measurement of acceleration. Zero to three vibration variables may be specified.
Enveloped – Defines a measurement based on the acceleration enveloping algorithm. Zero or one enveloped variables may be specified.
Bias Voltage – Defines a measurement of the transducer bias voltage. One to four bias voltage measurements may be specified.

Velocity or Recip Velocity

Vibration – Defines a band-pass filtered measurement of velocity. One to three vibration variables may be specified.
Bias Voltage – Defines a measurement of the transducer bias voltage. One to three bias voltage variables may be specified.
Radial Vibration
Direct – Defines a band-pass filtered measurement of radial vibration. Zero or one radial vibration variable may be specified.
Gap – Defines a measurement of the proximity sensor bias voltage. Zero or one gap variable may be specified.

Thrust Position

Position- Defines a filtered measurement of axial shaft position. Zero or one position variable may be specified.
Gap – Defines a measurement of the proximity sensor bias voltage. Zero or one gap variable may be specified.

Speed

Gap – Defines a measurement of the sensor bias voltage. Zero to four gap variables may be specified.
Speed- Defines a measurement of rotational velocity. Zero to four speed variables may be specified.

Temperature

Temperature – Defines a temperature measurement from a thermocouple or RTD temperature sensor.

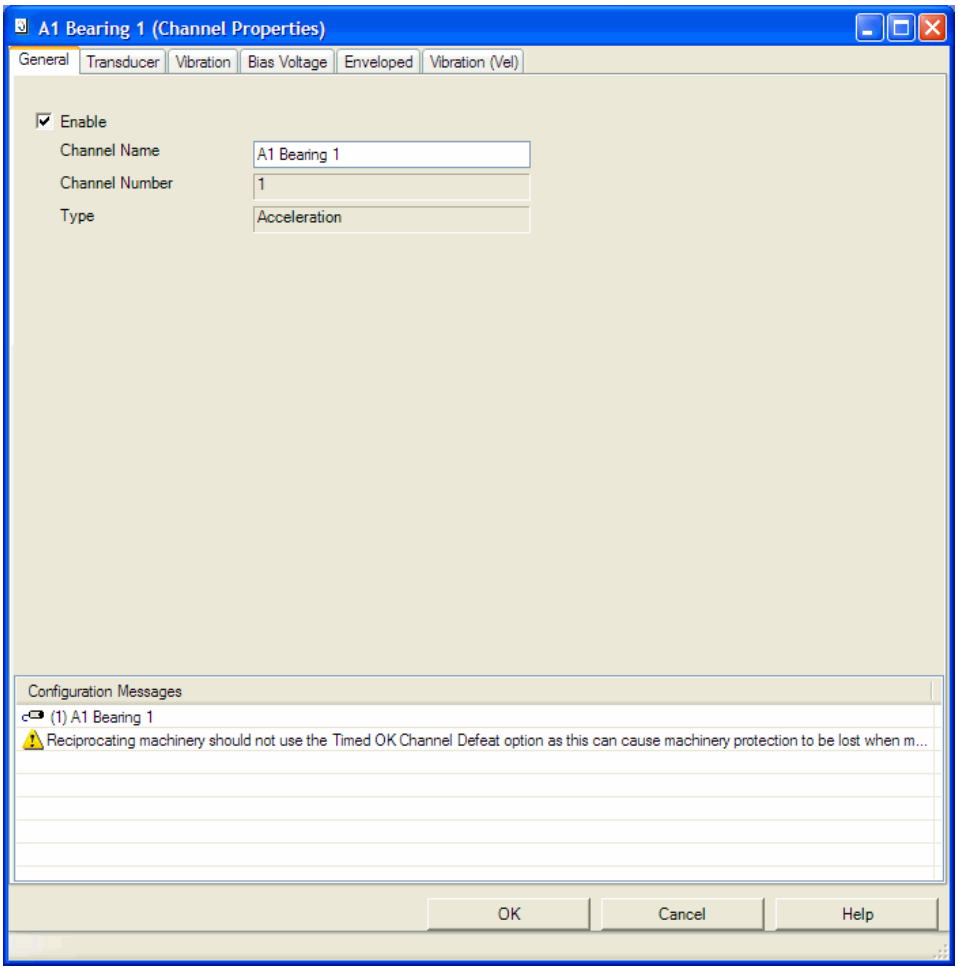
6.2.7 Edit Channel Properties

1. Right-click on the Type name (acceleration in this example) to open the Context menu.
2. Click on *Properties* at the bottom of the context menu to open the tabbed Properties Window (Figure 6-16). Edit the properties for each tab as described in the following sections.

6.2.7.1 General Tab, Typical Properties

Click on the General tab. The general page will come up to the top of the tab stack (Figure 6-16). Edit the properties in this window as needed for your application.

Figure 6-16. Channel Properties General Tab.



Enable: Check box. A check enables this variable. An empty box disables it, but retains the property values so the variable can be enabled later without having to re-enter this information.

Channel Name: Enter an appropriate name for this channel according to your own preferences or naming conventions.

Channel Number: Fixed value. Assigned 1 through 8 according to which hardware channel the properties apply to.

Type: Fixed Value. Same as the channel type (Acceleration, Recip Acceleration, Velocity, Recip Velocity, Radial Vibration, Thrust, Speed or Temperature).

Configuration Messages: Displays status information relating to recent configuration events. The log is not editable. Three types of messages are listed:

Information: Provides reminder information about the results of configuration state, and implies a successful completion or outcome.

Warning: An Alert indication that implies a possibly unintended result that may require further attention.

Error: An indication that the command or event failed and must be corrected before proceeding further.

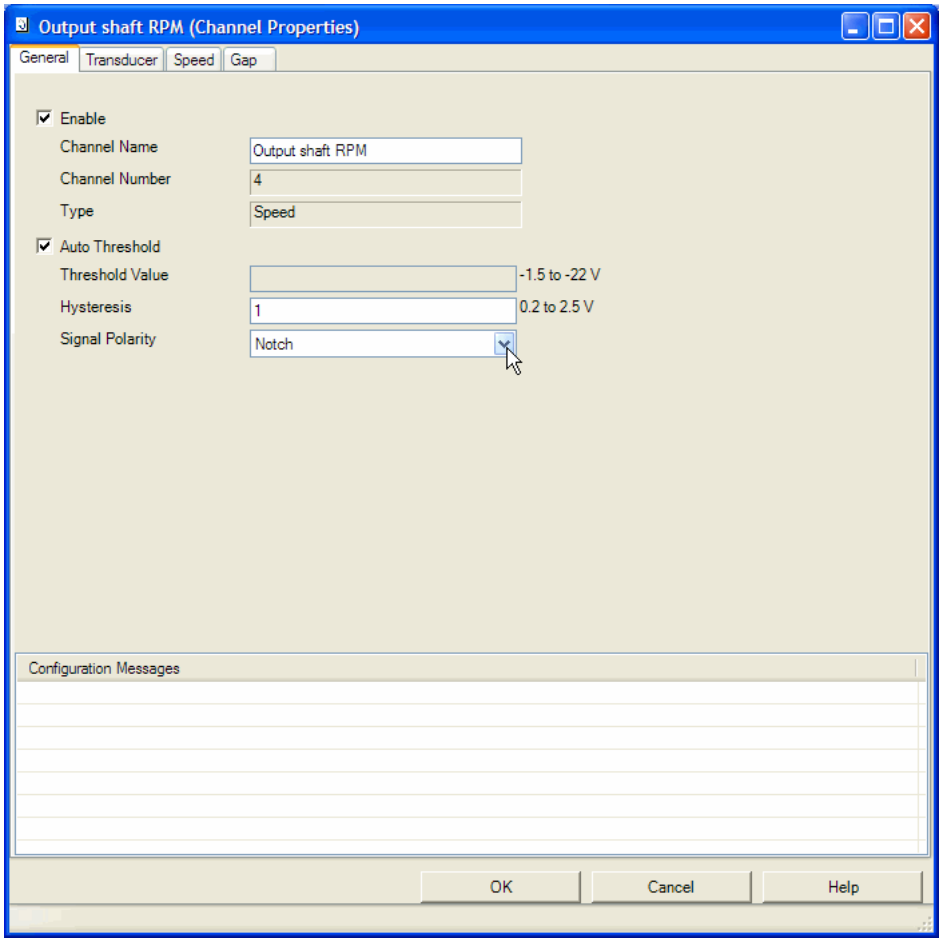
NOTE

If the message is too long to be fully displayed in the window, double-click on the message to open the complete message in a separate window.

6.2.7.2 General Tab, Speed Properties

Click on the General tab. The General tab will come to the top of the stack. When configuring a Speed channel, the general page also contains speed options (Figure 6-17). Edit the properties in this window as needed for your application.

Figure 6-17. Speed Channel Properties General Tab.



Enable: Check box. A check enables this variable. An empty box disables it, but retains the property values so the variable can be enabled later without having to re-enter this information.

Channel Name: Enter an appropriate name for this channel according to your own preferences or naming conventions.

Channel Number: Fixed value. Assigned 1 through 4 according to which hardware channel the properties apply to.

Type: Fixed Value. Same as the channel type (Speed).

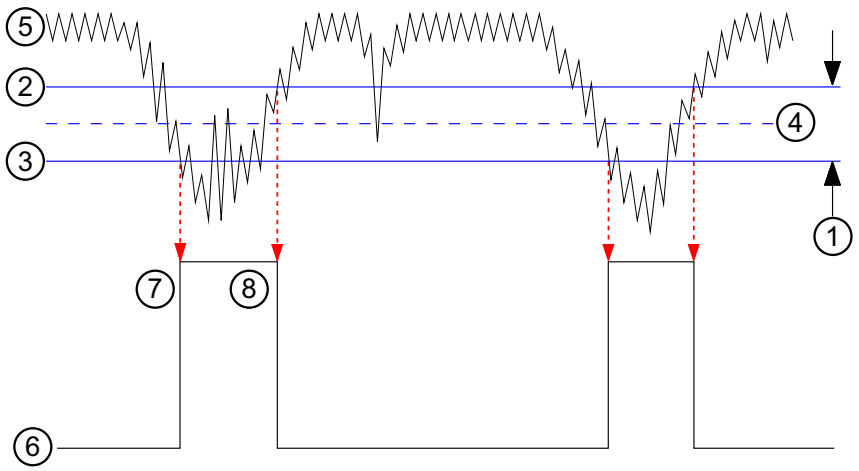
Auto Threshold: Check to enable automatic threshold determination of the speed signal.

Threshold Value: Enter a voltage to manually define the trigger point used to sense the start of the timing pulse used by the speed function to calculate RPM. A typical value might be halfway between the maximum and minimum sensor output voltage. Uncheck Auto Threshold to activate this text box. An adjustable hysteresis voltage is also applied with the threshold voltage to improve noise immunity as described below.

Hysteresis: Enter a value between 0.2 and 2.5 volts (default = 1 volt). Hysteresis works as shown in Figure 6-18. The hysteresis voltage (1) sets upper (2) and lower (3) trigger points above and below the threshold voltage (4). This prevents spurious output pulses caused by noise transitioning through a single threshold, and converts a potentially noisy input waveform (5) to a clean digital waveform (6).

To drive a change in the output (7), the speed waveform voltage (5) must pass through the lower trigger point (threshold - 1/2 hysteresis). Before the output can change state again (8), the input voltage must pass through the upper trigger point (threshold + 1/2 hysteresis) preventing output changes caused by noise. The larger the hysteresis value, the greater the immunity to noise on the input signal.

Figure 6-18. Hysteresis diagram.



Signal polarity: Select *Notch* or *Projection* to define the polarity of the speed pulse. Figure 6-19 shows how the Notch and Projection selections affect the output polarity when a proximity sensor is viewing a notch. Figure 6-20 shows how the Notch and Projection selections affect the output polarity when a proximity sensor is viewing a projection.

If an inductive sensor is used, select *Notch* since in most cases the positive side of the signal will be clipped at 10 volts.

NOTE

For the 1900/65A, the minimum pulse width is 50µS. The maximum number of events per revolution is 10khz.

Figure 6-19. Signal polarity selection effect on waveform, Notched shaft.

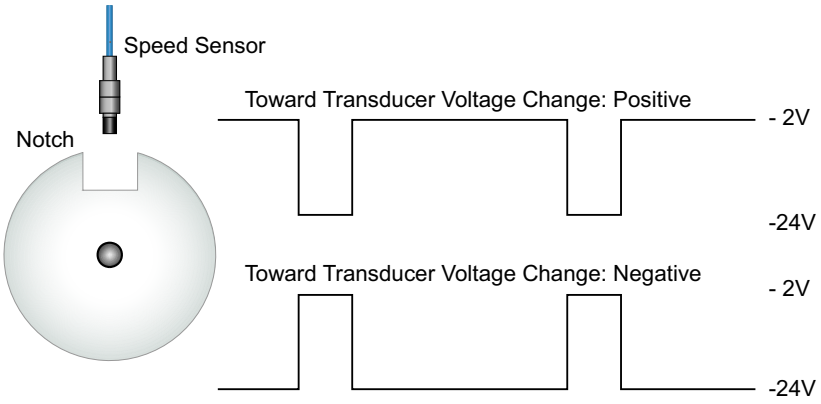
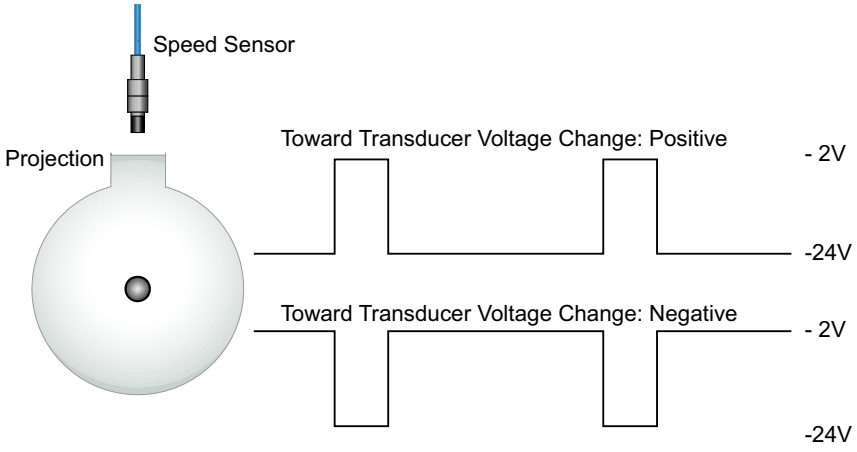


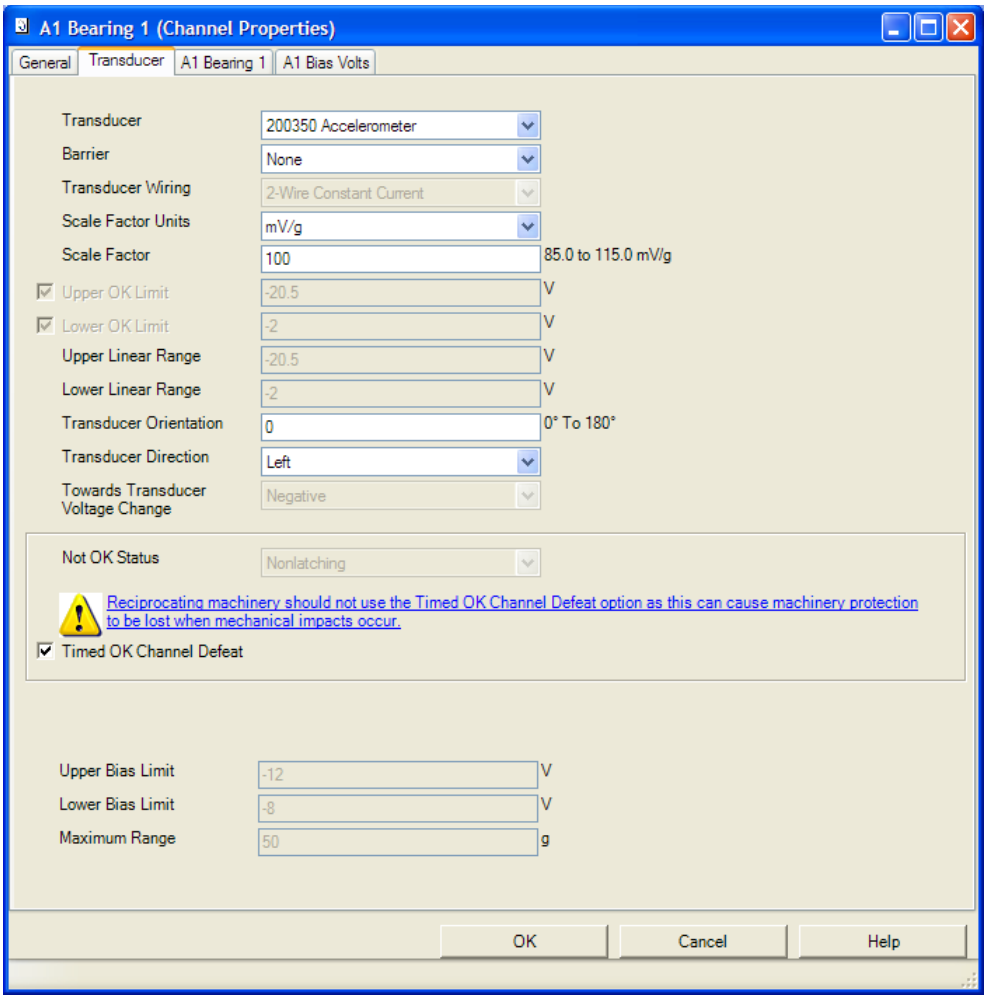
Figure 6-20. Signal polarity selection effect on waveform, Projection on shaft.



6.2.7.3 Transducer Tab, Typical Setup

Click on the Transducer tab. When configuring a non-temperature channel (channels 1 through 4), this transducer page will come up to the top of the tab stack (Figure 6-21). Edit the properties in this window as needed for your application.

Figure 6-21. Channel Properties Transducer tab.



Transducer: Select the transducer used by this channel from the list. If a Bently Nevada transducer is used, select the appropriate Bently Nevada model number and the remaining transducer configuration will be preset. If the transducer is not manufactured by Bently Nevada, select “Nonstandard”.

Barrier: Select the safety barrier model number used by this channel from the list.

Transducer Wiring: Power source wiring is usually predetermined and set when transducer is selected and can’t be changed. If the channel type is Acceleration, Recip Acceleration, Velocity, or Recip Velocity, and transducer is Nonstandard, the power source must be selected according to the needs of

the transducer. Two types of transducer power are supported by the Monitor Module:

- 2-wire Constant Current
- 3-wire -24Volt

Units: Select the engineering units used by the transducer scale factor. The list contains English or Metric units.

Scale Factor: Enter the scale factor used by the transducer.

Upper OK Limit : The OK limit is used by the monitor to determine if the sensor is functioning properly. Value is predefined if a Bently Nevada transducer is selected.

Lower OK Limit: The OK limit is used by the monitor to determine if the sensor is functioning properly. Value is predefined if a Bently Nevada transducer is selected.

Upper Linear Range: Enter the upper linear range in volts for the transducer used by this channel. Value is preset and fixed if a Bently Nevada transducer was selected for this channel.

Lower Linear Range: Enter the lower linear range in volts for the transducer used by this channel. Value is preset and fixed if a Bently Nevada transducer was selected for this channel.

Transducer Orientation: Enter the angular location of the transducer on the machine. The orientation angle range is 0° to 180° left or right as observed from the driver to the driven end of the machine train. 0° is defined as “up”.

Transducer Direction: Select *Left* or *Right* to indicate which side of the 0° reference the transducer is mounted.

Towards Transducer Voltage Change: Select *Positive* or *Negative* to indicate the direction of voltage change when the motion of the observed shaft or casing movement is towards the transducer.

Not OK Status: Select *Latching* or *Nonlatching* to set the persistence of a Not OK indication. A Latching Not OK status will go active when a Not OK status event occurs and remain in this state until manually reset. A Nonlatching Not OK status will go active when a Not OK status event occurs and remain in this state only for as long as the event is active.

Timed OK Channel Defeat: Check box. Enter a check in this box to enable this command. Remove the check to disable it. Timed OK/Channel Defeat minimizes the chance of false alarms caused by faulty transducer wiring. It does this by preventing new alarms from any variable on a channel while it is Not OK. It also prevents new alarms for a timed period after the channel becomes OK. This is to allow time for the transducers output to settle.

WARNING



Catastrophic failures on reciprocating machines can cause extremely high vibration conditions. Under extreme conditions, the vibration can be so large that it exceeds the transducer's operating range and causes a transducer *Not OK* condition. If this happens, and *Timed OK Channel Defeat* is enabled, the monitor Alert and Danger alarms are immediately bypassed resulting in loss of machine protection until the Timed OK Channel Defeat resets itself about 30 seconds after the event.

For applications that monitor reciprocating machines, it is recommended that you disable the Timed OK Channel Defeat.

NOTE

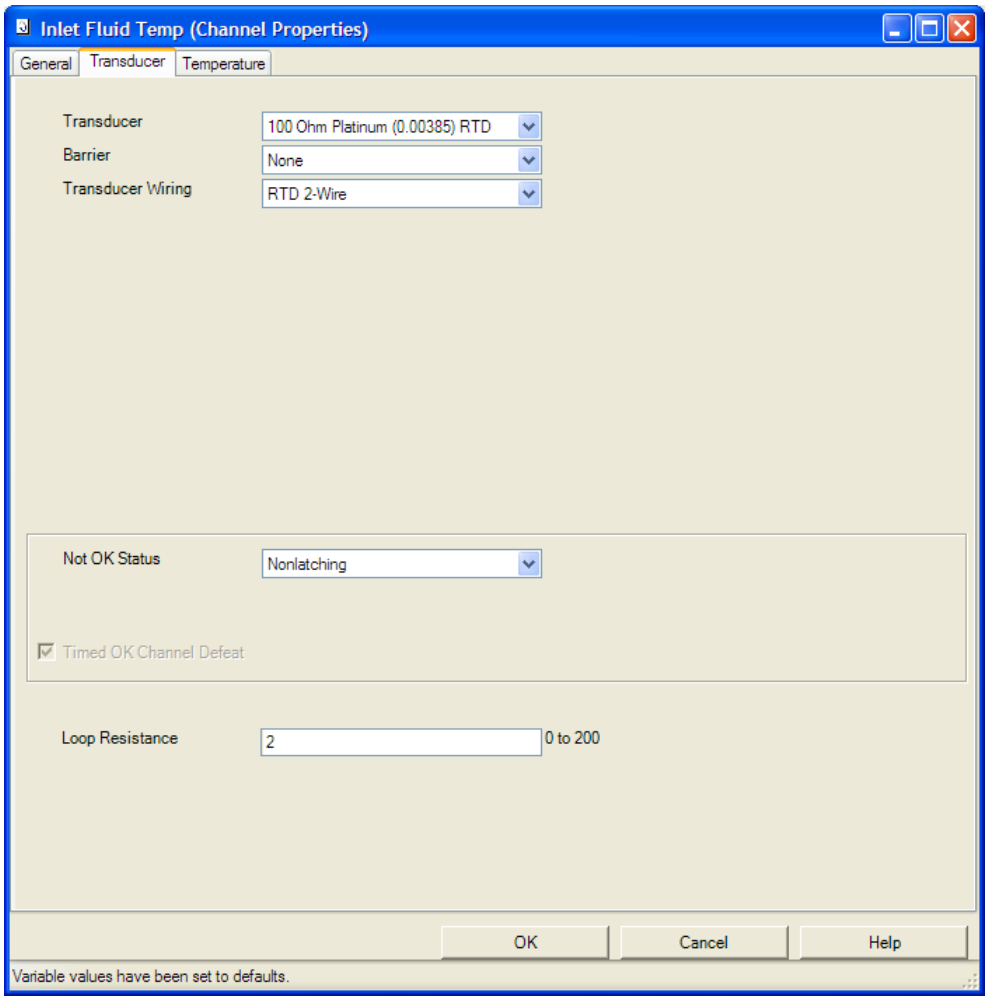


Timed Ok Channel Defeat is an option on Acceleration, Recip Acceleration, Velocity and Recip Velocity channel types. It is always enabled for RV and Temperature channel types, and is never enabled for Thrust channel type. By definition, it is enabled on acceleration and velocity channel types and inactive on recip channel types.

6.2.7.4 Transducer Tab, Temperature Setup

Click on the Transducer tab. When configuring a temperature channel (channels 5 through 8), the temperature transducer page will come up to the top of the tab stack (Figure 6-22). Edit the properties in this window as needed for your application.

Figure 6-22. Channel Properties Temperature Transducer tab.



Transducer: Select the temperature transducer used by this channel from the list of Thermocouples or RTDs.

Barrier: Select the safety barrier model number used by this channel from the list.

Transducer Wiring: selections apply only to RTDs. Two types of RTD connections are supported:

- 2-wire (no sense leads used)
- 3-wire (The sense lead is connected to side A of the RTD)

Not OK Status: Select *Latching* or *Nonlatching* to set the persistence of a Not OK indication. A Latching Not OK status will go active when a Not OK status

event occurs and remain in this state until manually reset. A Nonlatching Not OK status will go active when a Not OK status event occurs and remain in this state only for as long as the event is active.

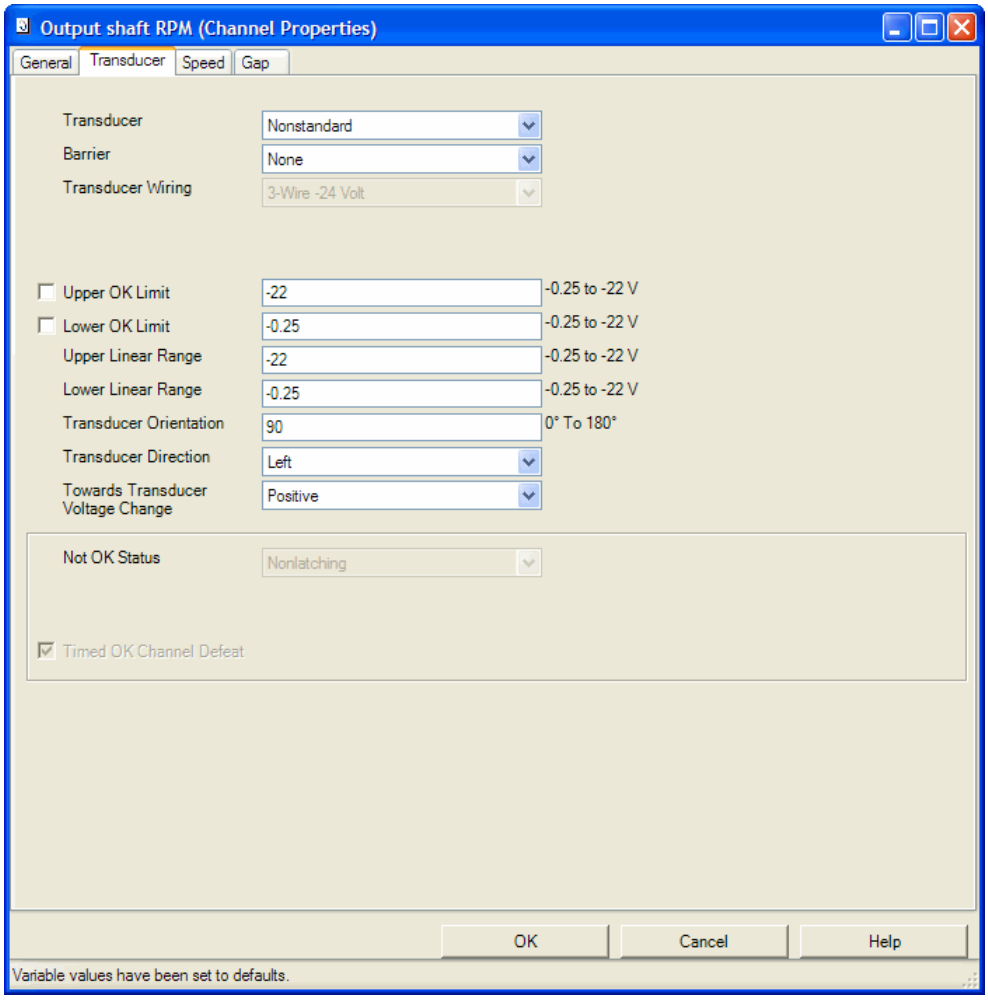
Timed OK Channel Defeat: Check box always checked and enabled. Timed OK/Channel Defeat minimizes the chance of false alarms caused by faulty transducer wiring. It does this by preventing new alarms from any variable on a channel while it is Not OK. It also prevents new alarms for a timed period after the channel becomes OK. This is to allow time for the transducers output to settle.

Loop Resistance: Active only if *2-wire RTD* transducer wiring is selected. Enter the measured value of the conductor loop resistance from the monitor to the 2-Wire RTD and back to the monitor. Do not include the resistance of the RTD element itself. This will improve measurement accuracy by factoring this resistance into the temperature calculation.

6.2.7.5 Transducer Tab, Speed Setup

Click on the Transducer tab. When configuring a speed channel (channels 1 through 4), this transducer page will come up to the top of the tab stack (Figure 6-23). Edit the properties in this window as needed for your application.

Figure 6-23. Channel Properties Transducer tab. Properties set for an inductive sensor.



Transducer: Select the transducer used by this channel from the list. If a Bently Nevada proximity probe is used, select the appropriate Bently Nevada model number and the remaining transducer properties will be preset. If the transducer is an inductive sensor, select *Nonstandard*.

Barrier: Select the safety barrier model number used by this channel from the list. None is the default.

Transducer Wiring: When setting properties for a proximity probe, select *3-wire -24Volt*. When a non-standard transducer is used (e.g. inductive sensor) this value is not selectable, and is fixed as *3-wire -24Volt*.

Upper OK Limit : The OK limit is used by the monitor to determine if the sensor is functioning properly. Value is predefined if a Bently Nevada transducer is selected. Uncheck this OK limit When a non-standard transducer is used (e.g. inductive sensor).

Lower OK Limit: The OK limit is used by the monitor to determine if the sensor is functioning properly. Value is predefined if a Bently Nevada transducer is

selected. Uncheck this OK limit When a non-standard transducer is used (e.g. inductive sensor).

Upper Linear Range: Enter the upper linear range in volts for the transducer used by this channel. Value is preset and fixed if a Bently Nevada transducer was selected for this channel.

Lower Linear Range: Enter the lower linear range in volts for the transducer used by this channel. Value is preset and fixed if a Bently Nevada transducer was selected for this channel.

Transducer Orientation: Enter the angular location of the transducer on the machine. The orientation angle range is 0° to 180° left or right as observed from the driver to the driven end of the machine train. 0° is defined as “up”.

Transducer Direction: Select *Left* or *Right* to indicate which side of the 0° reference the transducer is mounted.

Towards Transducer Voltage Change: Select *Positive* or *Negative* to indicate the direction of voltage change when the motion of the observed shaft or casing movement is towards the transducer.

Not OK Status: Select *Latching* or *Nonlatching* to set the persistence of a Not OK indication. A Latching Not OK status will go active when a Not OK status event occurs and remain in this state until manually reset. A Nonlatching Not OK status will go active when a Not OK status event occurs and remain in this state only for as long as the event is active.

Timed OK Channel Defeat: Check box always checked and enabled. Timed OK/Channel Defeat minimizes the chance of false alarms caused by faulty transducer wiring. It does this by preventing new alarms from any variable on a channel while it is Not OK. It also prevents new alarms for a timed period after the channel becomes OK. This is to allow time for the transducers output to settle.

6.2.7.6 Vibration Tab Properties

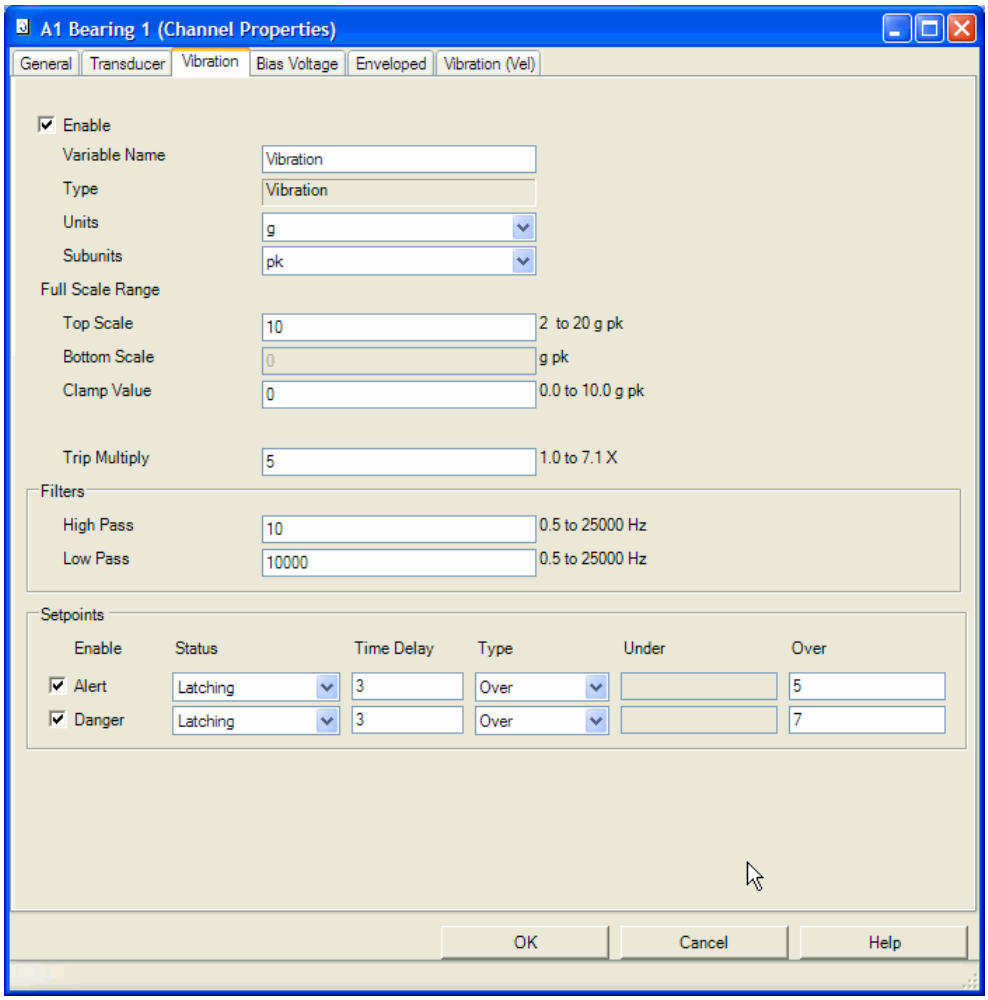
Click on the Vibration tab. The vibration page will come up to the top of the tab stack (Figure 6-24). Edit the properties in this window as needed for your application.

NOTE



Vibration properties are unique to the Acceleration, Recip Acceleration, Velocity and Recip Velocity channel types.

Figure 6-24. Channel Properties Vibration tab.



Enabled: Check box. A check enables this variable. An empty box disables it, but retains the property values so the variable can be enabled later without having to re-enter this information.

Variable Name: Use the predefined name or enter a new name according to your own preferences or naming conventions.

Type: Fixed value. Same as the channel type (Acceleration, Recip Acceleration, Velocity, Recip Velocity, Radial Vibration, Thrust or Temperature). If the text box is shaded, value is pre-defined or is not used.

Units: Select the engineering units that you prefer to use. Acceleration or Recip Acceleration (g or m/s^2). Velocity or Recip velocity (in/s or mm/s). If velocity units are chosen, the variable will be integrated from acceleration to velocity.

CAUTION



Integration of low frequency signals adds an extreme amount of gain to the sensor signal.

Even though the monitor is capable of integrating signals down to very low frequencies the noise floor of the sensor and cable may result in a very high system noise floor. When integrating signals with high pass filters set below 10 Hz make sure to test the system noise floor.

Subunits: Select the kind of amplitude measurement, *rms* (root-mean-square) or *pk* (peak).

Top Scale (Full Scale Range): Enter the expected full scale value in engineering units for this measurement.

Bottom Scale (Full Scale Range): Zero for vibration variables.

Clamp Value: Enter a value between zero and the full scale range. The clamp value will be used for the analog output when this channel is bypassed or defeated.

Trip Multiply: Enter a value to use as an alarm setpoint multiplier when trip multiply is active. Trip multiply temporarily increases the alarm setpoints by the factor you enter here to avoid unintentional shutdown of the equipment being monitored.

High Pass: Enter the desired lower frequency limit of the pass band. This value defines the corner frequency for the high-pass filter.

Low Pass: Enter the desired upper frequency limit of the pass band. This value defines the corner frequency for the low-pass filter.

Alert: Check box. A check enables Alert monitoring and status for this variable. An empty box disables it.

Danger: Check box. A check enables Danger monitoring and status for this variable. An empty box disables it.

Status: Select *Latching* or *Nonlatching* to set the persistence for both the Alert or Danger statuses. A Latching Alert or Danger status will go active when a setpoint value is violated and remain in this state until manually reset. A Nonlatching Alert or Danger status will go active when a setpoint value is violated and remain in this state only for as long as the violation exists.

Time Delay: Enter a value of 1 to 60 seconds for the Alert and Danger setpoints. A setpoint violation must remain active for at least as long as this time delay before the Alert or Danger status goes active.

Type: Setpoint alarms can only be configured as *Over* for this channel type.

Under: Not applicable for this channel type.

Over: Enter the Over setpoint alarm level in engineering units for this measurement. If the text box is shaded, value is pre-defined or is not used.

6.2.7.7 Enveloped Tab Properties

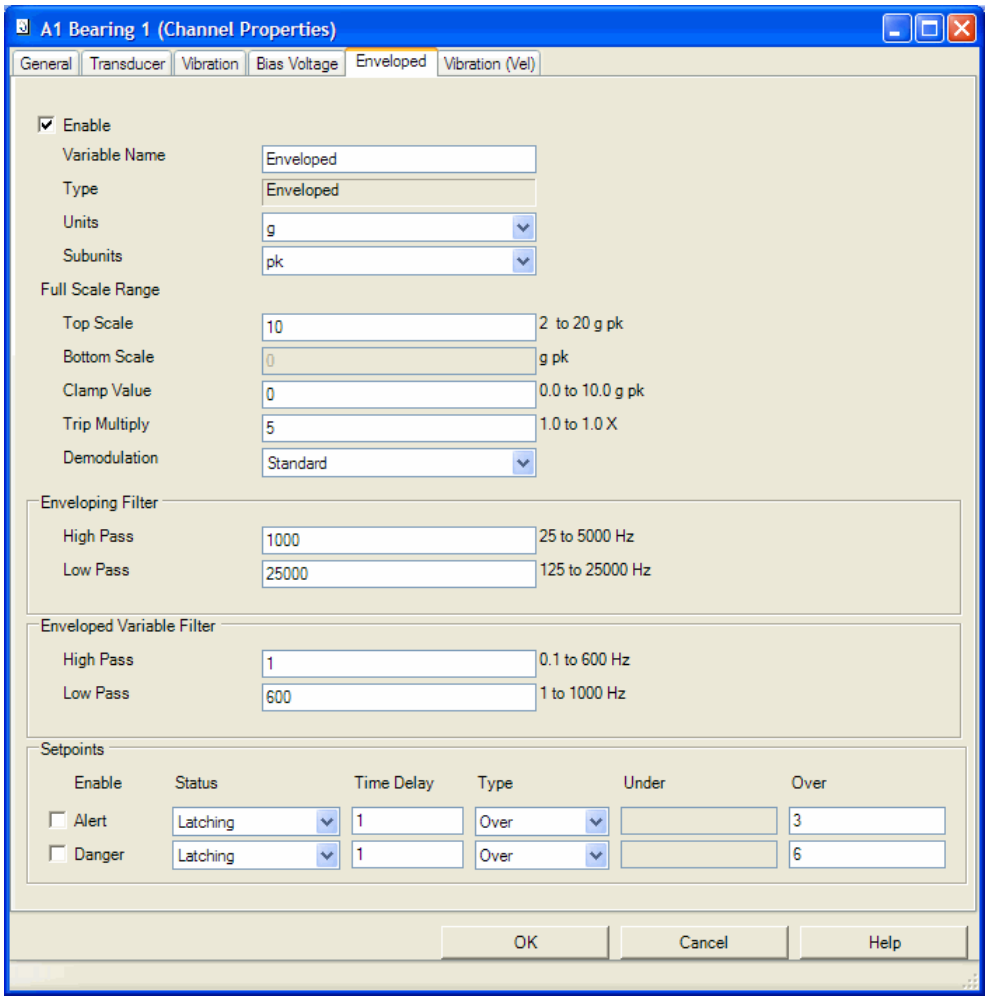
Click on the Enveloped tab. The enveloped page will come up to the top of the tab stack (Figure 6-25). Edit the properties in this window as needed for your application.

NOTE



Enveloped properties are unique to the Acceleration and Recip Acceleration channel types. However, enveloped is not necessarily used on recip applications.

Figure 6-25. Channel Type Properties Enveloped tab.



Enabled: Check box. A check enables this variable. An empty box disables it, but retains the property values so the variable can be enabled later without having to re-enter this information.

Variable Name: Use the predefined name or enter a new name according to your own preferences or naming conventions.

Type: Setpoint alarms can only be configured as *Over* for this channel type.

Units: Select english or metric (g or m/s^2).

Subunits: Select the kind of amplitude measurement, *rms* (root-mean-square) or *pk* (peak).

Top Scale (Full Scale Range): Enter the expected full scale value in engineering units for this measurement.

Bottom Scale (Full Scale Range): Zero for enveloped variables.

Clamp Value: Enter a value between zero and the full scale range. The clamp value will be used for the analog output when this channel is bypassed or defeated.

Trip Multiply: Enter a value to use as an alarm setpoint multiplier when trip multiply is active. Trip multiply temporarily increases the alarm setpoints by the factor you enter here to avoid unintentional shutdown of the equipment being monitored.

Demodulation: Select Standard or Enhanced demodulation. Standard demodulation uses a low-pass filter to demodulate the impulse signals. Enhanced demodulation uses a proprietary peak detections method to enhance the signal to noise ratio.

Enveloping Filter High Pass and Low Pass: Enter the desired upper and lower frequency limit of the enveloping band-pass filter. The enveloping filter is used to remove the high amplitude vibration signal around the running speed. This filter is set to pass the high-frequency signal generated by repetitive impulses. Typically the low-pass corner is set about 200X running speed.

Enveloped Variable Filter High Pass and Low Pass: Enter the desired upper and lower frequency limit of the enveloped variable band-pass filter. The enveloped variable filter is applied to the resulting waveform after it has been demodulated by the enveloping algorithm. Use the enveloped variable filter as you would any other vibration variable filter to focus on machine speed vibration, bearing frequencies, or gear mesh frequencies.

Alert: Check box. A check enables Alert monitoring and status for this variable. An empty box disables it.

Danger: Check box. A check enables Danger monitoring and status for this variable. An empty box disables it.

Status: Select *Latching* or *Nonlatching* to set the persistence for both the Alert or Danger statuses. A Latching Alert or Danger status will go active when a setpoint value is violated and remain in this state until manually reset. A Nonlatching Alert or Danger status will go active when a setpoint value is violated and remain in this state only for as long as the violation exists.

Time Delay: Enter a value of 1 to 60 seconds for the Alert and Danger setpoints. A setpoint violation must remain active for at least as long as this time delay before the Alert or Danger status goes active.

Type: Setpoint alarms can only be configured as *Over* for this channel type.

Under: Not applicable for this channel type.

Over: Enter the Over setpoint alarm value in engineering units for this measurement.

6.2.7.8 Direct Properties Tab

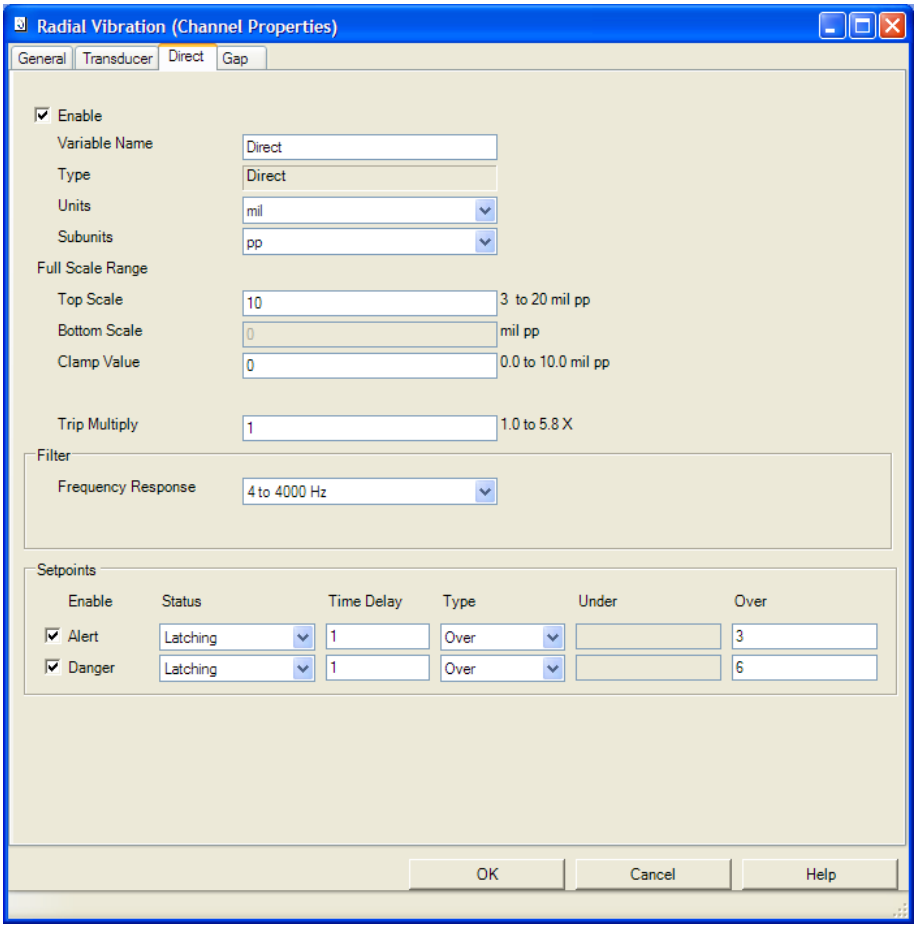
Click on the Direct tab. The direct page will come up to the top of the tab stack (Figure 6-26). Edit the properties in this window as needed for your application.

NOTE



Direct properties are unique to the Radial Vibration channel type.

Figure 6-26. Channel Properties Direct tab.



Enabled: Check box. An empty box disables it, but retains the property values so the variable can be enabled later without having to re-enter this information.

Variable Name: Use the predefined name or enter a new name according to your own preferences or naming conventions.

Type: Fixed value (Direct).

Units: Select the engineering units for displacement (mil or µm).

Subunits: Select the kind of amplitude measurement, *pp* (peak-to-peak).

Top Scale (Full Scale Range): Enter the expected full scale value in engineering units for this measurement.

Bottom Scale (Full Scale Range): zero for vibration variables.

Clamp Value: Enter a value between zero and the full scale range. The clamp value will be used for the analog output when this channel is bypassed or defeated.

Trip Multiply: Enter a value to use as an alarm setpoint multiplier when trip multiply is active. Trip multiply temporarily increases the alarm setpoints by the factor you enter here to avoid unintentional shutdown of the equipment being monitored.

Frequency Response: Enter the desired pass band (*1 to 600* Hz or *4 to 4000* Hz).

Alert: Check box. A check enables Alert monitoring and status for this variable. An empty box disables it.

Danger: Check box. A check enables Danger monitoring and status for this variable. An empty box disables it.

Status: Select *Latching* or *Nonlatching* to set the persistence for both the Alert or Danger statuses. A Latching Alert or Danger status will go active when a setpoint value is violated and remain in this state until manually reset. A Nonlatching Alert or Danger status will go active when a setpoint value is violated and remain in this state only for as long as the violation exists.

Time Delay: Enter a value of 1 to 60 seconds for the Alert and Danger setpoints. A setpoint violation must remain active for at least as long as this time delay before the Alert or Danger status goes active.

Type: Setpoint alarms can only be configured as *Over* for this channel type.

Under: Not applicable for this channel type.

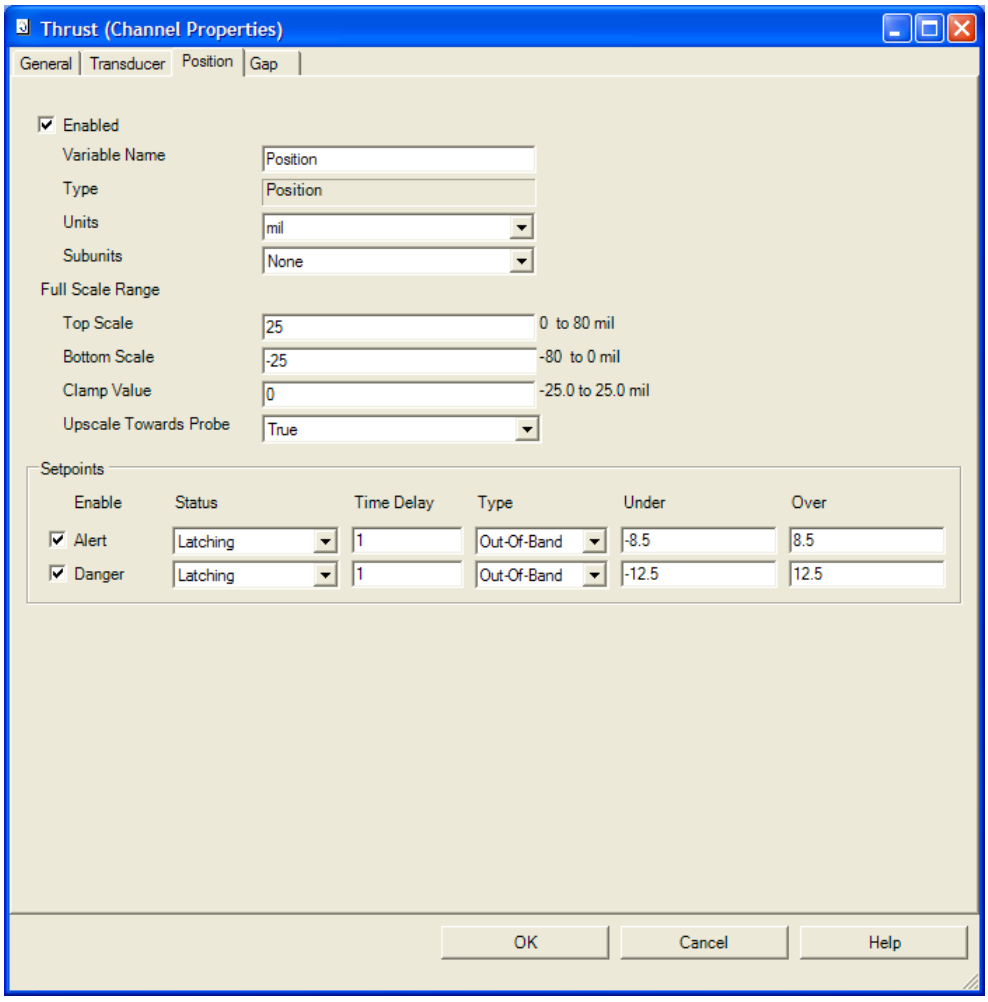
Over: Enter the Over setpoint alarm value in engineering units for this measurement.

6.2.7.9 Position Properties Tab

Click on the Position tab. The position page will come up to the top of the tab stack (Figure 6-27). Edit the properties in this window as needed for your application.

NOTE Position properties are unique to the Thrust channel type.

Figure 6-27. Channel Type Properties Position tab.



Enabled: Check box. A check enables this variable. An empty box disables it, but retains the property values so the variable can be enabled later without having to re-enter this information.

Variable Name: Use the predefined name or enter a new name according to your own preferences or naming conventions.

Type: Fixed value (Position).

Units: Select the engineering units for displacement (mil or µm).

Subunits: *None* is the only selection.

Top Scale (Full Scale Range): Enter the expected value in engineering units for this measurement.

Bottom Scale (Full Scale Range): Enter the minimum value. The full scale range is equal to the top scale minus the bottom scale.

Clamp Value: Enter a value between zero and the full scale range. The clamp value will be used for the analog output when this channel is bypassed or defeated.

Upscale Towards Probe: Select *True* or *False*. True implies axial shaft movement is positive towards the transducer.

Alert: Check box. A check enables Alert monitoring and status for this variable. An empty box disables it.

Danger: Check box. A check enables Danger monitoring and status for this variable. An empty box disables it.

Status: Select *Latching* or *Nonlatching* to set the persistence for both the Alert or Danger statuses. A Latching Alert or Danger status will go active when a setpoint value is violated and remain in this state until manually reset. A Nonlatching Alert or Danger status will go active when a setpoint value is violated and remain in this state only for as long as the violation exists.

Time Delay: Enter a value of 1 to 60 seconds for the Alert and Danger setpoints. A setpoint violation must remain active for at least as long as this time delay before the Alert or Danger status goes active.

Type: Select *Over*, *Under* or *Out-of-Band* to specify how the setpoint alarm level is violated. The triggering events are defined below:

- *Over* – Value is greater than the over setpoint alarm level.
- *Under* – Value is less than the under setpoint alarm level
- *Out-of-Band* – Value is greater than the over setpoint alarm level or less than the under setpoint alarm level.

Under: Enter the Under setpoint alarm value in engineering units for this measurement.

Over: Enter the Over setpoint alarm value in engineering units for this measurement.

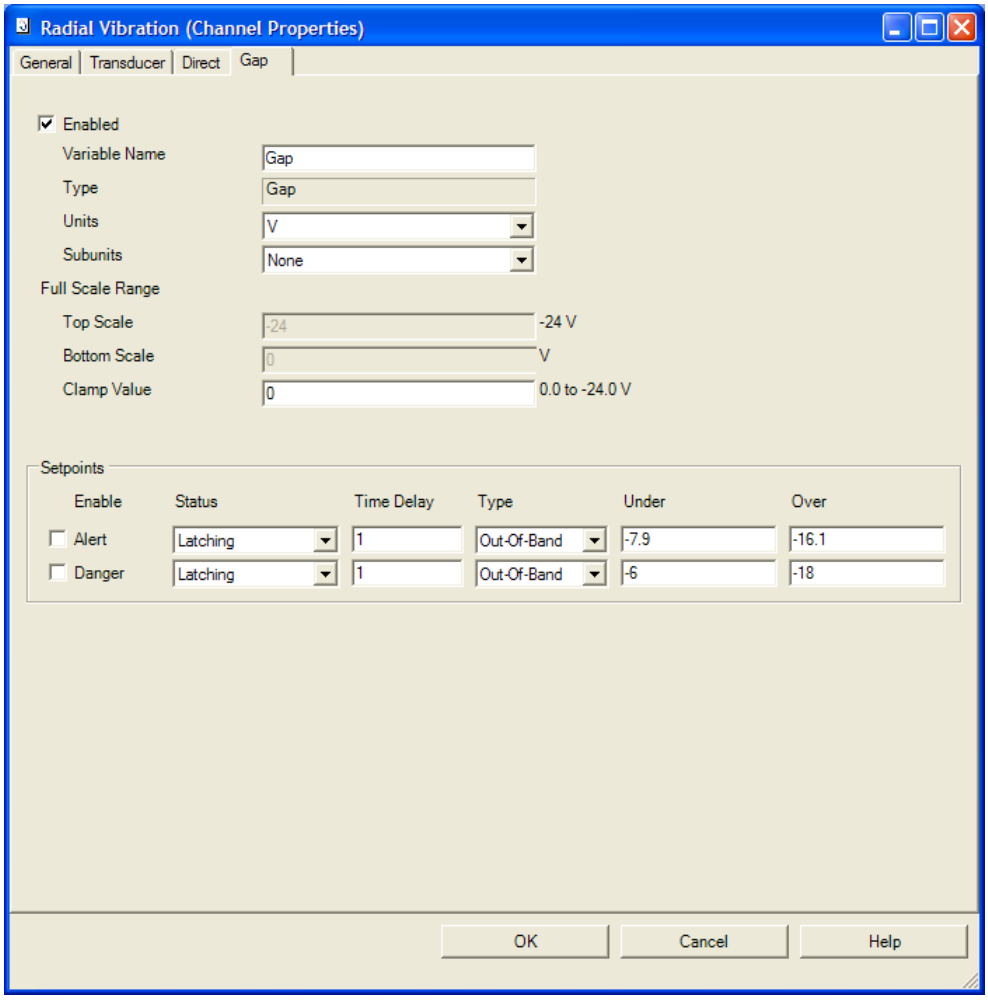
6.2.7.10 Gap Properties Tab

Click on the Gap tab. The gap page will come up to the top of the tab stack (Figure 6-28). Edit the properties in this window as needed for your application.

NOTE

Gap properties are unique to the Radial Vibration, Thrust and Speed channel types.

Figure 6-28. Channel Type Properties Gap tab.



Enabled: Check box. A check enables this variable. An empty box disables it, but retains the property values so the variable can be enabled later without having to re-enter this information.

Variable Name: Use the predefined name or enter a new name according to your own preferences or naming conventions.

Type: Fixed value (Gap).

Units: Single selection (V).

Subunits: Single selection (None).

Top Scale (Full Scale Range): Fixed value. -24 Volts.

Bottom Scale (Full Scale Range): Fixed value. 0 volts.

Clamp Value: Enter a value between zero and the full scale range. The clamp value will be used for the analog output when this channel is bypassed or defeated.

Alert: Check box. A check enables Alert monitoring and status for this variable. An empty box disables it.

Danger: Check box. A check enables Danger monitoring and status for this variable. An empty box disables it.

Status: Select *Latching* or *Nonlatching* to set the persistence for both the Alert or Danger statuses. A Latching Alert or Danger status will go active when a setpoint value is violated and remain in this state until manually reset. A Nonlatching Alert or Danger status will go active when a setpoint value is violated and remain in this state only for as long as the violation exists.

Time Delay: Enter a value of 1 to 60 seconds for the Alert and Danger setpoints. A setpoint violation must remain active for at least as long as this time delay before the Alert or Danger status goes active.

Type: Select *Over*, *Under* or *Out-of-Band* to specify how the setpoint alarm level is violated. The triggering events are defined below:

- *Over* – Value is greater than the over setpoint alarm level.
- *Under* – Value is less than the under setpoint alarm level
- *Out-of-Band* – Value is greater than the over setpoint alarm level or less than the under setpoint alarm level.

Under: Enter the Under setpoint alarm value in engineering units for this measurement.

Over: Enter the Over setpoint alarm value in engineering units for this measurement.

6.2.7.11 Edit Bias Voltage Properties Tab

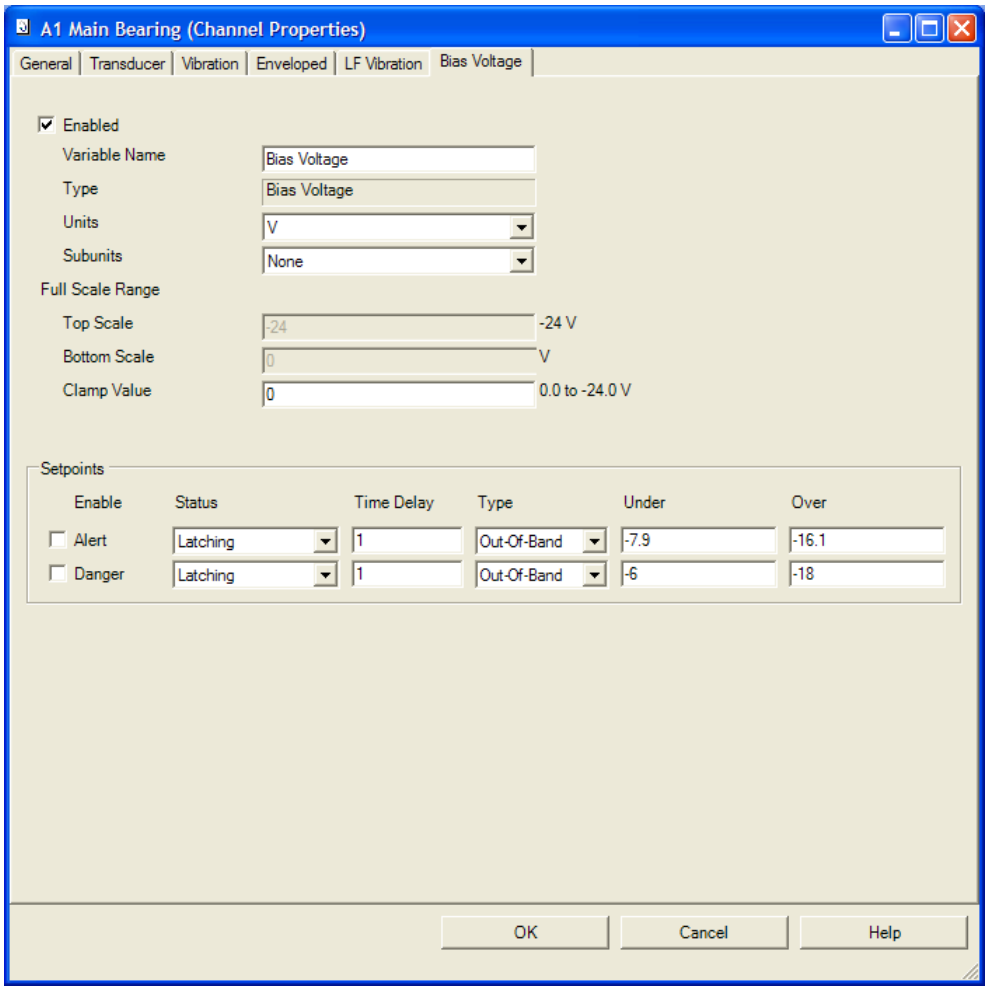
Click on the Bias Voltage tab. The bias voltage page will come up to the top of the tab stack (Figure 6-29). Edit the properties in this window as needed for your application.

NOTE



Bias Voltage properties are unique to Acceleration, Velocity, Recip Accel and Recip Velocity channel types.

Figure 6-29. Channel Type Properties Bias Voltage tab.



Enabled: Check box. A check enables this variable. An empty box disables it, but retains the property values so the variable can be enabled later without having to re-enter this information.

Variable Name: Use the predefined name or enter a new name according to your own preferences or naming conventions.

Type: Fixed value (Bias Voltage).

Units: Single selection (V).

Subunits: Single selection (None).

Top Scale (Full Scale Range): Fixed value. -24 Volts.

Bottom Scale (Full Scale Range): Fixed value. Zero volts.

Clamp Value: Enter a value between zero and the full scale range. The clamp value will be used for the analog output when this channel is bypassed or defeated.

Alert: Check box. A check enables Alert monitoring and status for this variable. An empty box disables it.

Danger: Check box. A check enables Danger monitoring and status for this variable. An empty box disables it.

Status: Select *Latching* or *Nonlatching* to set the persistence of the Alert (Danger) status. A Latching Alert (Danger) status will go active when a setpoint value is violated and remain in this state until manually reset. A Nonlatching Alert (Danger) status will go active when a setpoint value is violated and remain in this state only for as long as the violation is active.

Time Delay: Enter a value of 1 to 60 seconds for the Alert and Danger setpoints. A setpoint violation must remain active for at least as long as this time delay before the Alert or Danger status goes active.

Type: Select *Over*, *Under* or *Out-of-Band* to specify how the setpoint alarm level is violated. The triggering events are defined below:

- *Over* – Value is greater than the over setpoint alarm level.
- *Under* – Value is less than the under setpoint alarm level
- *Out-of-Band* – Value is greater than the over setpoint alarm level or less than the under setpoint alarm level.

Under: Enter the Under setpoint alarm value in engineering units for this measurement.

Over: Enter the Over setpoint alarm value in engineering units for this measurement.

6.2.7.12 Speed Tab Properties

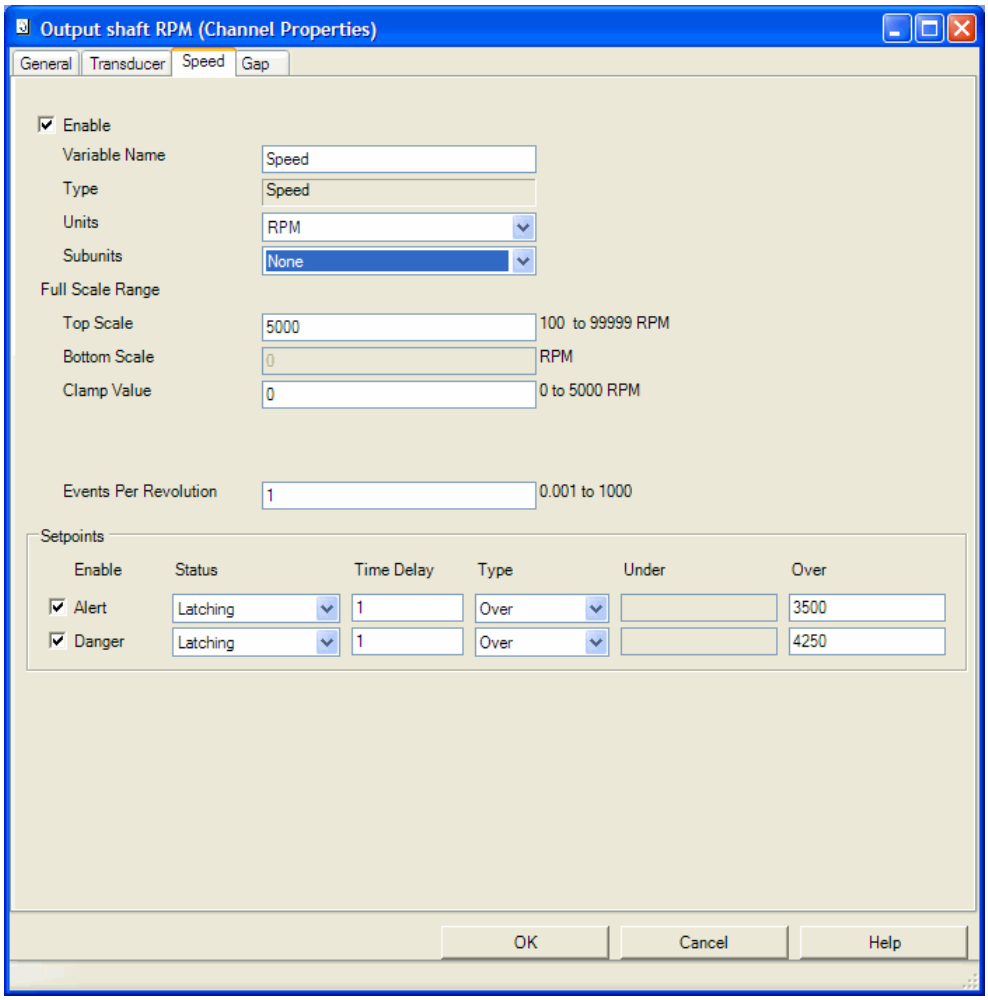
Click on the Speed tab. The speed page will come up to the top of the tab stack (Figure 6-30). Edit the properties in this window as needed for your application.

NOTE



Speed properties are unique to the Speed channel type.

Figure 6-30. Channel type properties Speed tab.



Enable: Check box. A check enables this variable. An empty box disables it, but retains the property values so the variable can be enabled later without having to re-enter this information.

Variable Name: Use the predefined name or enter a new name according to your own preferences or naming conventions.

Type: Fixed value (Speed).

Units: Single selection (RPM).

Subunits: Single selection (None).

Top Scale (Full Scale Range): Enter Maximum expected RPM.

Bottom Scale (Full Scale Range): Fixed value. 0 RPM.

Clamp Value: Enter a value between zero and the full scale range. The clamp value will be used for the analog output when this channel is bypassed or defeated.

Events Per Revolution: Enter the ratio of speed transducer pulses for each revolution of the target shaft. The default value is 1 and values ranging from 0.001 to 1000 are acceptable.

Figure 6-31 shows a speed sensor observing the target shaft with a notch. In this case, the sensor will count one event each revolution and you would enter 1.

IMPORTANT The update rate and alarm response time can be very slow when operating at low speeds when triggering on one event per revolution.

Figure 6-31. Speed sensor observing a notch on the target shaft.

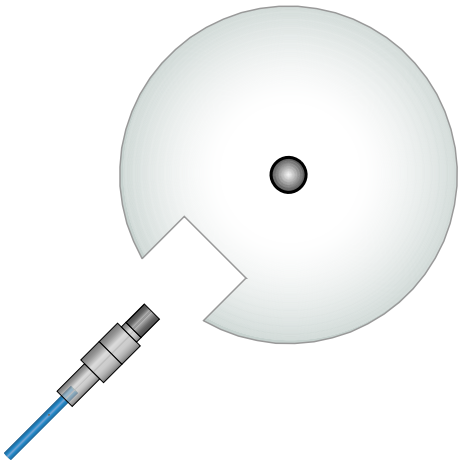
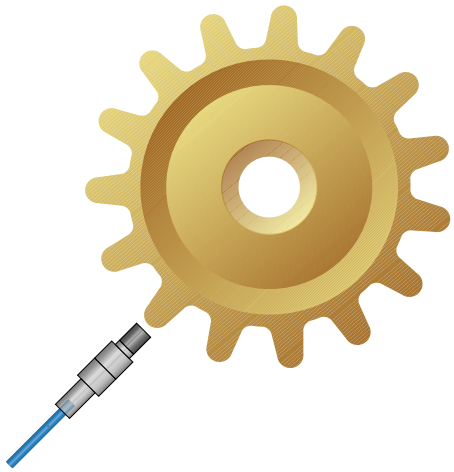


Figure 6-32 shows a speed sensor observing a gear on the target shaft with 15 teeth. The sensor will count 15 events each revolution, and you would enter *15*.

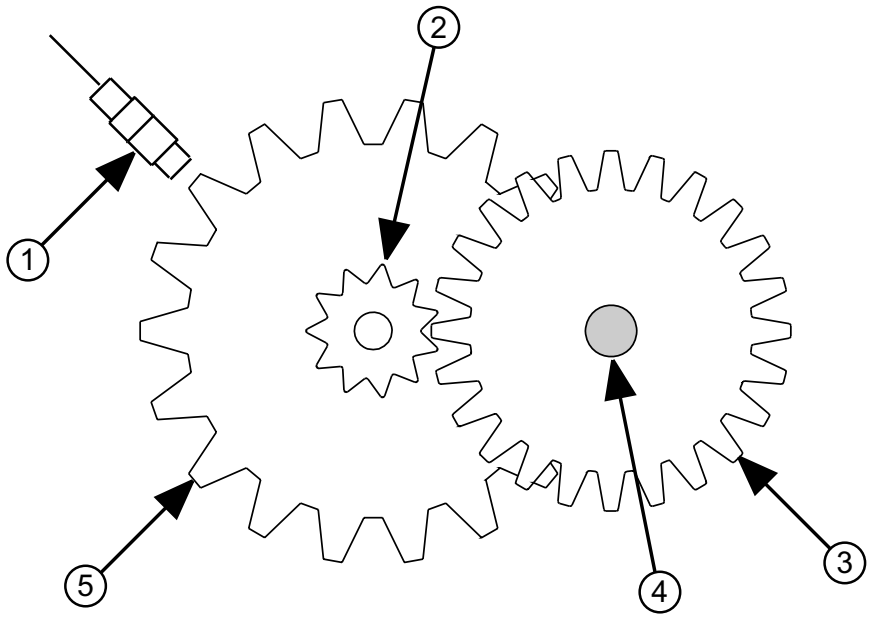
Figure 6-32. Speed sensor observing a gear on the target shaft.



Shaft speed can also be determined indirectly through a drive train as shown in Figure 6-33. In this example, the speed probe (1) is observing an 18-tooth gear (5) on the same shaft with an 11-tooth gear (2). The 11-tooth gear is driven from a 24-tooth gear (3). The monitor is to indicate the speed of the shaft on the 24-tooth gear (4). In this case, the events per revolution must be calculated:

Events Per Revolution = (24 / 11) x 18 = 39.2727

Figure 6-33. Measuring shaft speed indirectly through a drive train.



Alert: Check box. A check enables Alert monitoring and status for this variable. An empty box disables it.

Danger: Check box. A check enables Danger monitoring and status for this variable. An empty box disables it.

Status: Select *Latching* or *Nonlatching* to set the persistence for both the Alert or Danger statuses. A Latching Alert or Danger status will go active when a setpoint value is violated and remain in this state until manually reset. A Nonlatching Alert or Danger status will go active when a setpoint value is violated and remain in this state only for as long as the violation exists.

Time Delay: Enter a value of 1 to 60 seconds for the Alert and Danger setpoints. A setpoint violation must remain active for at least as long as this time delay before the Alert or Danger status goes active.

Type: Select *Over*, *Under* or *Out-of-Band* to specify how the setpoint alarm level is violated. The triggering events are defined below:

- *Over* – Value is greater than the over setpoint alarm level.

- *Under* – Value is less than the under setpoint alarm level
- *Out-of-Band* – Value is greater than the over setpoint alarm level or less than the under setpoint alarm level.

Under: Enter the Under setpoint alarm value in engineering units for this measurement.

Over: Enter the Over setpoint alarm value in engineering units for this measurement.

6.2.7.13 Temperature Tab Properties

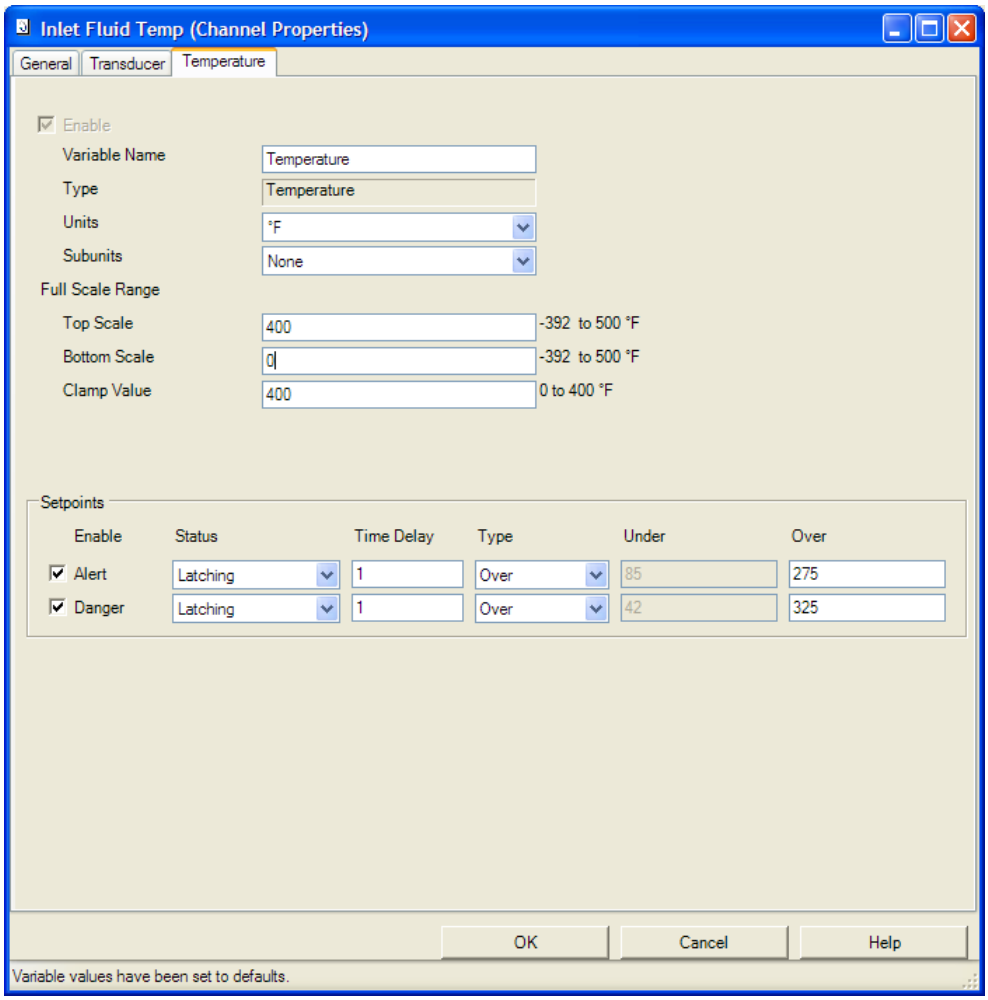
Click on the Temperature tab. The temperature page will come up to the top of the tab stack (Figure 6-34). Edit the properties in this window as needed for your application.

NOTE



Temperature properties are unique to Temperature channel type.

Figure 6-34. Channel Type Properties Temperature tab.



Variable Name: Use the predefined name or enter a new name according to your own preferences or naming conventions.

Type: Fixed value (Temperature).

Units: Select degrees Fahrenheit (°F) or degrees Celsius (°C).

Subunits: Single selection (None).

Top Scale: Enter maximum expected temperature. Must be within the temperature range of the selected thermocouple or RTD shown at the right of the text box.

Bottom Scale: Enter minimum expected temperature. Must be within the temperature range of the selected thermocouple or RTD shown at the right of the text box.

Clamp Value: Enter a value between zero and top scale. The clamp value will be used for the analog output when this channel is bypassed or defeated.

Alert: Check box. A check enables Alert monitoring and status for this variable. An empty box disables it.

Danger: Check box. A check enables Danger monitoring and status for this variable. An empty box disables it.

Status: Select *Latching* or *Nonlatching* to set the persistence for both the Alert or Danger statuses. A Latching Alert or Danger status will go active when a setpoint value is violated and remain in this state until manually reset. A Nonlatching Alert or Danger status will go active when a setpoint value is violated and remain in this state only for as long as the violation exists.

Time Delay: Enter a value of 1 to 60 seconds for the Alert and Danger setpoints. A setpoint violation must remain active for at least as long as this time delay before the Alert or Danger status goes active.

Type: Select *Over*, *Under* or *Out-of-Band* to specify how the setpoint alarm level is violated. The triggering events are defined below:

- *Over* – Value is greater than the over setpoint alarm level.
- *Under* – Value is less than the under setpoint alarm level
- *Out-of-Band* – Value is greater than the over setpoint alarm level or less than the under setpoint alarm level.

Under: Enter the Under setpoint alarm value in engineering units for this measurement.

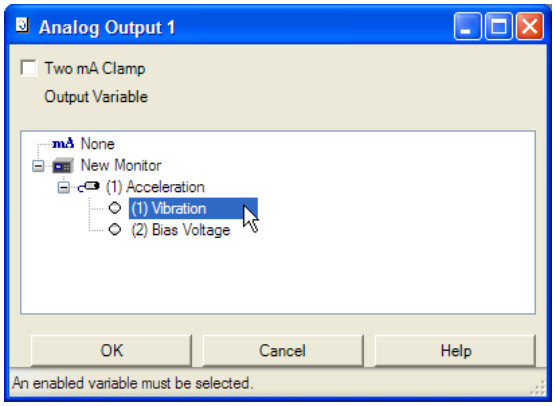
Over: Enter the Over setpoint alarm value in engineering units for this measurement.

6.2.8 Configure an Analog Output

Up to four 4–20 mA outputs may be assigned to represent a variable from any of the eight inputs.

1. In the configuration window right-click on the analog output object (Analog outputs 1 – 4) you want to assign a variable to and select Properties. The Analog Outputs window will open (Figure 6-35). Variables are available in the branch below the channel type.

Figure 6-35. Analog Outputs window.



2. Assign a variable to the selected output by clicking on it (Figure 6-35).
3. Check the *Two mA Clamp* check box to override the clamp specified in the channel properties tab with a value of 2 mA.

Analog Output Clamp

An analog output will be clamped when:

- The channel that the variable belongs to is...
  - NOT OK *and...*
  - It is configured for Timed OK Channel Defeat *and...*
  - The variable is not Bias Voltage or Gap
  - The variable is speed and has a 50% or greater change in period
- A hardware failure occurs
- The channel is in Bypass mode

6.2.9 Configure a Relay Output

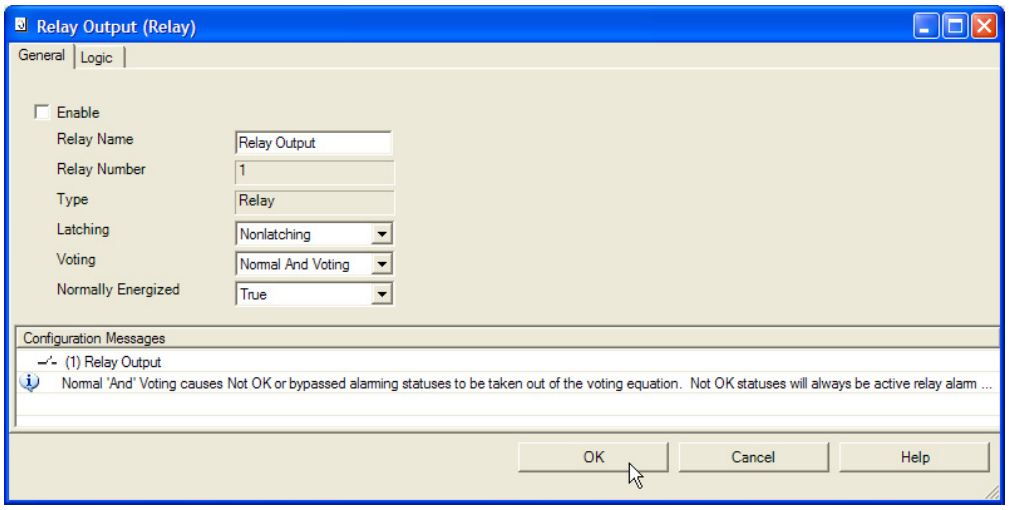
Up to six relay outputs may be made active. Each active relay will control its output state according to how you program them to respond to logical combinations of status states available from the monitor, from a channel, or from a variable.

6.2.9.1 Access

1. Right-click on the Relay output object (Relay outputs 1 – 6) you want to configure and select *Properties*. The relay window will open (Figure 6-36).

6.2.9.1.1 Relay Outputs General Tab

Figure 6-36. Relay Outputs General tab.



Enable: Check box. A check enables this relay. An empty box disables it, but retains the property values so the it can be enabled later without having to re-enter this information.

Relay Name: Enter an appropriate name for this relay according to your own preferences or naming conventions.

Relay Number: Fixed value. Assigned 1 through 6 according to which relay output the properties apply to.

Type: Fixed Value. Always Relay.

Latching: Select *Latching* or *Nonlatching* to set the persistence of the relay output state. A latching relay will switch contact states when the input relay logic goes true and remain in this state until manually reset. A nonlatching relay will switch contact states when the input relay logic goes true, but will immediately return to the inactive state when the status event ends.

Voting: Select *Normal AND Voting* or *True AND Voting*. The relay logic uses The *AND* and *OR* logical operators. The voting type defines how the AND operator operates in the sidebar below.

What Kind of Voting Do I Use?

Normal AND Voting

Normal AND Voting causes bypassed statuses to be taken out of the voting equation. Alarming statuses become bypassed when the corresponding channel is Not OK and is configured for Timed Ok Channel Defeat, or if the variable is Speed and has a 50% or greater change in period. Alarming statuses can also become bypassed by enabling Monitor Alarm Inhibit, Channel Bypass or Channel Danger Bypass.

Not OK and Monitor Alarm Inhibit statuses are not removed from the voting equation. Not OK statuses will always be active alarm statuses unless the corresponding channel is bypassed.

True AND voting

True AND voting causes bypassed statuses to remain in the voting equation. Note however, that because a parameter is in bypass, it can never drive an alarm. Alarming statuses become bypassed when the corresponding channel is Not OK and is configured for Timed Ok Channel Defeat, or if the variable is Speed and has a 50% or greater change in period. Alarming statuses can also become bypassed by enabling Monitor Alarm Inhibit, Channel Bypass or Channel Danger Bypass.

Thus, using True AND will never drive an alarm if one of the alarming statuses in the voting equation is in bypass. Not OK statuses will always be active alarm statuses unless the corresponding channel is bypassed. Monitor Alarm Inhibit will always be an active alarming parameter.

Examples

Case 1: Radial Vibration, Speed and Temperature Channel Types

Alarms are ALWAYS defeated for these Channel Types when in a Not OK condition, the relay will never activate when an operand in the logic equation is from a channel that is Not OK or bypassed.

Case 2: Acceleration and Velocity Channel Types

Alarms can be OPTIONALLY defeated for these Channel Types when in a Not OK condition and the Timed Ok Channel Defeat option has been enabled, the relay will never activate when a channel in the *AND voting* voting logic is Not OK or bypassed. If the defeat option has been disabled then the relay may activate when an operand in the logic equation is from a channel that is Not OK or bypassed

Case 3: Thrust Channel Type

Alarms can NOT be defeated for this Channel type. The relay logic will continue to use the current alarm state of all statuses in the voting logic (since none of them can be defeated) and allow the relay to potentially activate.

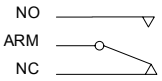
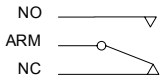
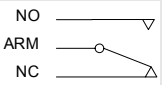
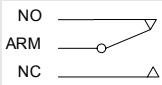
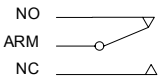
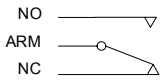
WARNING



Extreme care must be taken with this option. Such a configuration may result in failure to alarm if one or more alarming parameters are Not OK or bypassed.

Normally energized: Select *True* to set the relay to *Normally energized* operation. Select *False* to set the relay to *Normally de-energized* operation. Relays behave as shown in Table 6-2. When a normally de-energized relay is not active, the normally closed contact is closed, and the normally open contact is open. A normally energized relay inverts the operation of the contacts. When the relay is not active the normally closed contact is open, and the normally open contact is closed.

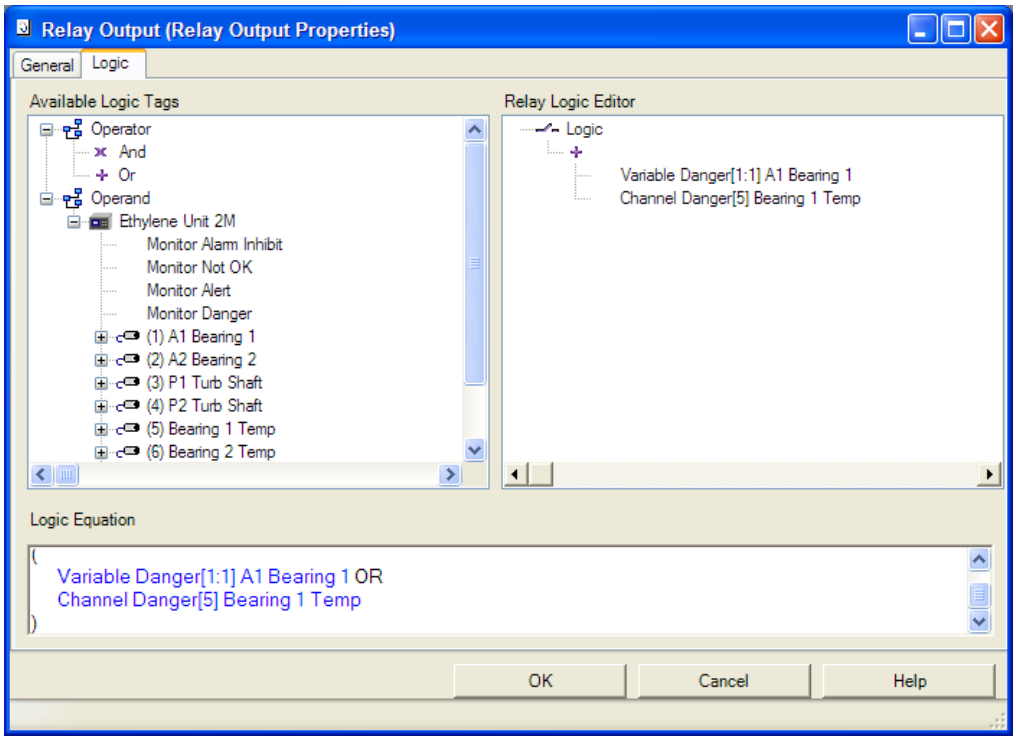
Table 6-2. Alarm relay operation.

Alarm State	Normally De-energized	Normally Energized
No Power		
With Power, Relay not active		
With Power, Relay active		

IMPORTANT Energized relays will go to their non-energized state when power is lost. Choose normally de-energized to avoid false trips when power is lost. Choose normally energized to avoid a missed trip when power is lost.

6.2.9.2 Relay Outputs Logic Tab

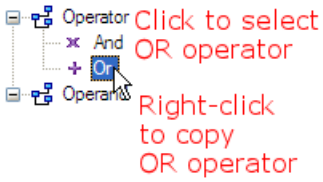
Figure 6-37. Relay Outputs Logic tab.



Use this window to define relay logic for each relay output. A logic equation is created by using the mouse pointer to drag and drop or right-click button to copy Operators (AND, OR) and Operands (Not OK and Alarm statuses) from the left window and paste them in the right window to create a logic diagram representing the logic that will activate the relay. The logic will be displayed as an equation in the logic equation window.

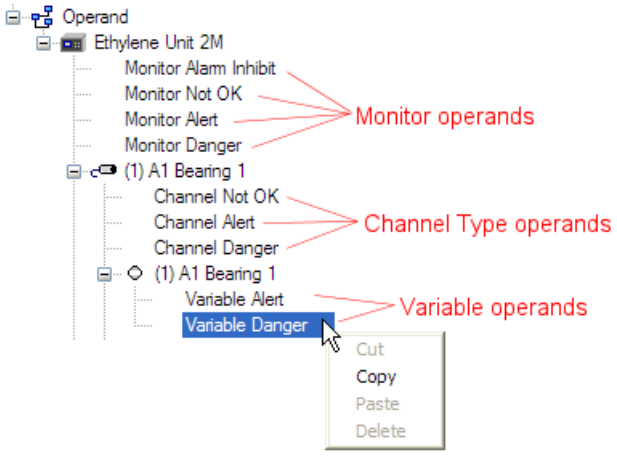
6.2.9.2.2 Operators

Figure 6-38. AND and OR operators.



6.2.9.2.3 Operands

Figure 6-39. Operands.



6.2.9.2.4 Logic Equation Example.

This example shows how to create the following logic:

Figure 6-40. Example Result.

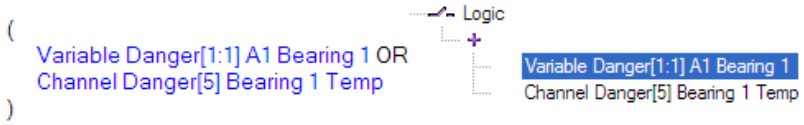
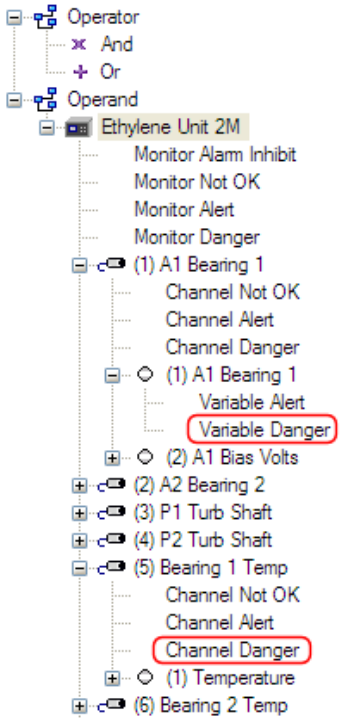


Figure 6-41. Example Operators and Operands.



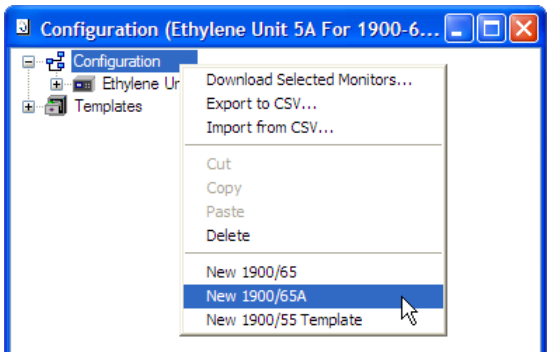
1. Right-click the *OR* operator. Click *Copy*.
2. Right-click on *Logic* in the Equation editor window to open the context menu. Click *Paste*. The *OR* operator will be displayed.
3. Right-click on *Channel 1 Vibration 1 Variable Alert*. Click *Copy*.
4. Right click the *OR* operator. Click *Paste.* The *Variable Alert* will be displayed.
5. Right-click on *Channel 2 Position 1 Variable Alert*. Click *Copy*.
6. Right click the *OR* operator. Click *Paste.* The *Variable Alert* will be displayed.

The end result will look like Figure 6-40.

6.3 Add Monitors to a Configuration

1. Right-click on the *Configuration* object. The context menu will open (Figure 6-42).
2. Click on *New 1900/65A*. A new monitor will be added to the configuration. If you are replacing a 1900/55 monitor and wish to emulate the functions of the 1900/55 monitor, Click on *New 1900/55 Monitor*.

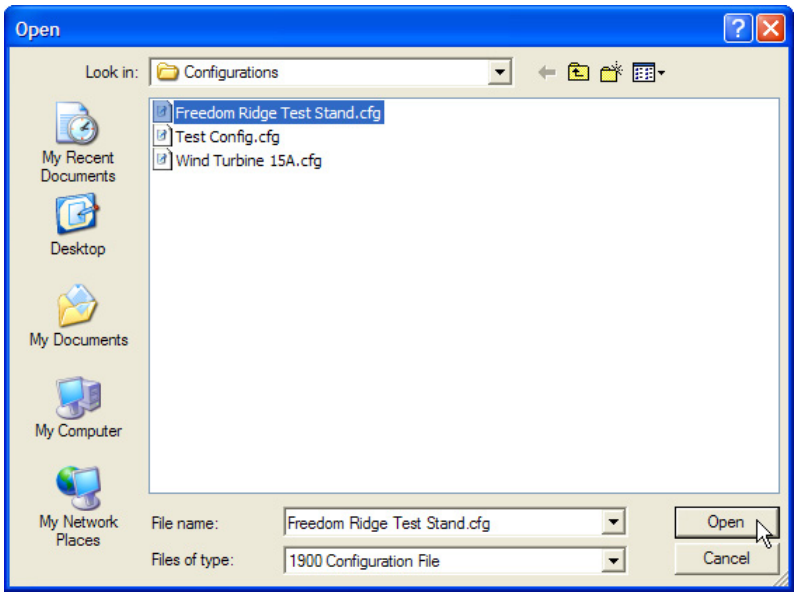
Figure 6-42. Configuration context menu.



6.4 Open an Existing Configuration File

1. Do one of the following:
   A. Click the *Open* icon in the Toolbar
   B. Click *File>Open...* on the Menu bar
2. Use the Open window to navigate to the directory containing the configuration file (Figure 6-43).
3. Click on the configuration file you wish to open to highlight it.
4. Click the *Open* Button. This configuration will display in the Configuration window.

Figure 6-43. Open window.



6.5 Configuring Computer for Direct Connection

To communicate with the Monitor Module using a direct connection, you must provide your computer with a static IP address. The following procedure describes how to change the IP addressing from dynamic to static.

NOTE

This setup requires changing the computer network settings. This computer will not communicate with its regular network until they are restored. Make a note of the original settings so you may restore them later.

1. If you are running a personal firewall on your computer, turn it off.
2. Open the Local Area Connection Properties:
   – Click *Start* > *Control Panel*. The Control Panel window will open.
   – Double click the *Network Connections* icon (shown below). The Network Connections Window will open.

Figure 6-44.

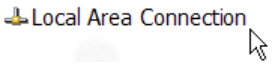


NOTE

The figures shown are for Windows XP. Windows 2000 images will differ.

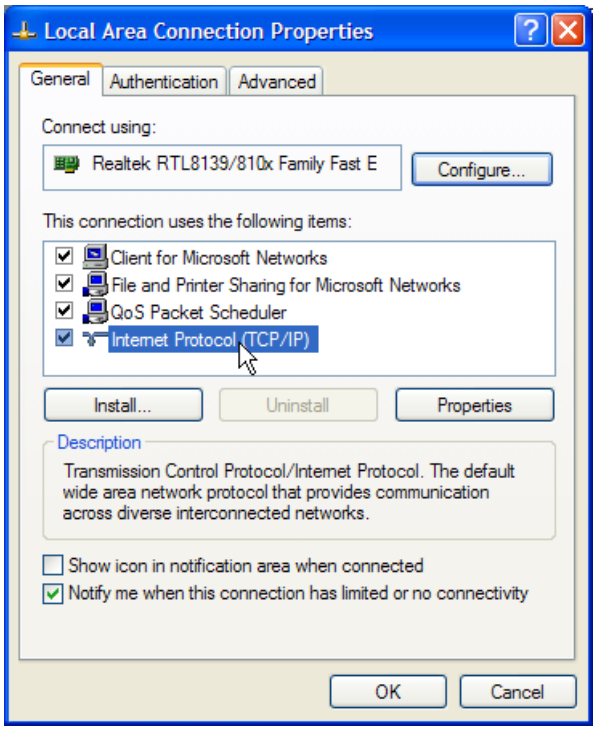
– In the *Network Connections Window,* double-click the Local Area Connection link (shown below). The *Local Area Connection Status* window will open.

Figure 6-45.



– In the *Local Area Connection Status* window, Click the *Properties* button. The *Local Area Connection Properties* window will open (Figure 6-46).

Figure 6-46.



3. Specify a static IP address
   – Double click on the Internet Protocol (TCP/IP) link. The I*nternet Protocol Properties* window will open (Figure 6-48).

Figure 6-47.

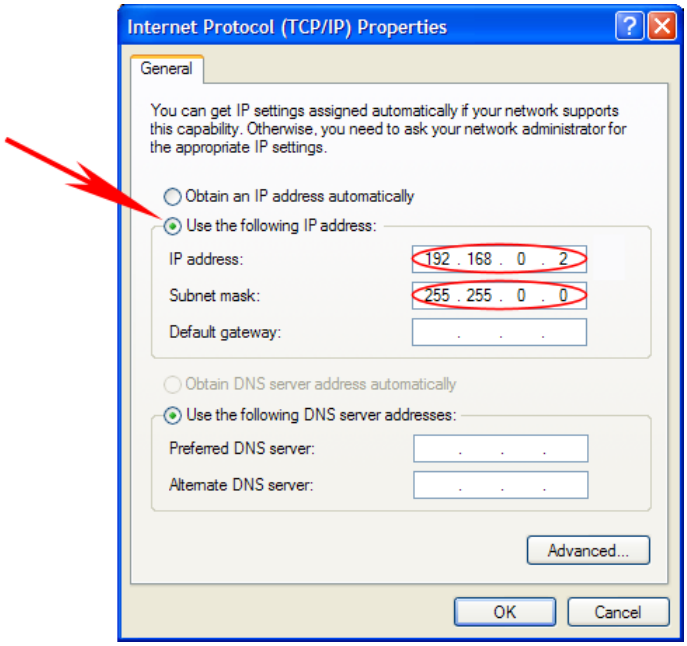


– Select *Use the following IP address*
– Enter IP address 192.168.0.2
– Enter subnet mask 255.255.0.0
– Click the *OK* button to close this window
– Close the remaining open windows

NOTE

IP address in this example will work for new, unconfigured monitors shipped from Bently Nevada. To ensure communications the monitor and your computer must be in the same network domain. Usually this means that the first two groups of the IP address match. Consult your IT specialist for specifics.

Figure 6-48. Static IP address and mask.

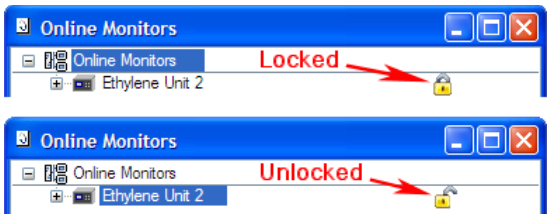


Communication is now enabled.

6.6 Is Online Monitor Locked?

If the online monitor configuration is password protected, a lock icon will show if the monitor is locked or unlocked (Figure 6-49). If the monitor is locked, you may *view* information, but you must enter the correct password to *change* data, reboot, or update firmware.

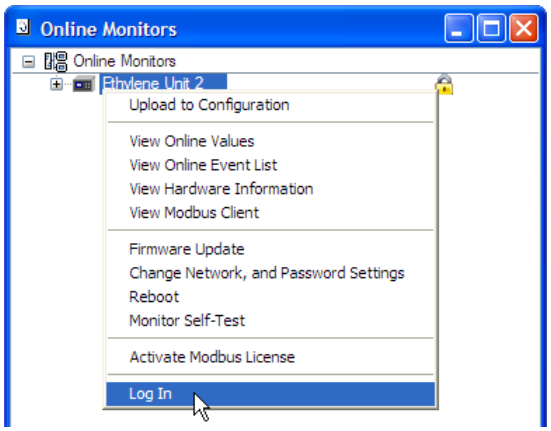
Figure 6-49. Monitor Locked and Monitor Unlocked icons.



To unlock a monitor:

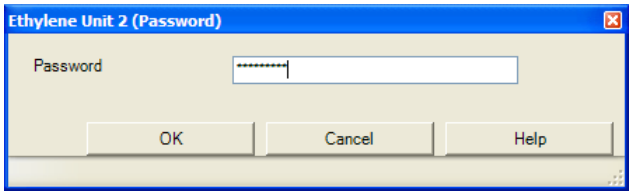
1. In the Online monitor window, right-click on the monitor of interest to open the context menu (Figure 6-50).

Figure 6-50. Monitor context menu, Log In selection.



2. Click on *Log In.* The Password window will open (Figure 6-51).

Figure 6-51. Password window.



3. Enter the password and click *OK*. If the correct password is entered, the monitor will remain unlocked for the remainder of the configuration session.

To lock a monitor:

1. In the Online monitor window, right-click on the monitor of interest to open the context menu (Figure 6-50).
2. Click on *Log Out.*

6.7 Changing Network and Password Settings

The Monitor name, IP Address/Subnet Mask, Display Passcode and Configuration Password may be changed using the *Change Network and Password* window shown in Figure 6-53. To access this window:

1. If monitor is locked, unlock it (Paragraph 6.6), or provide password when prompted in this procedure.
2. In the Online Monitors window, right-click on the monitor of interest to open the context menu (Figure 6-52).
3. Click on *Change Network and Password Settings.* The window will open.

Figure 6-52. Monitor context menu.

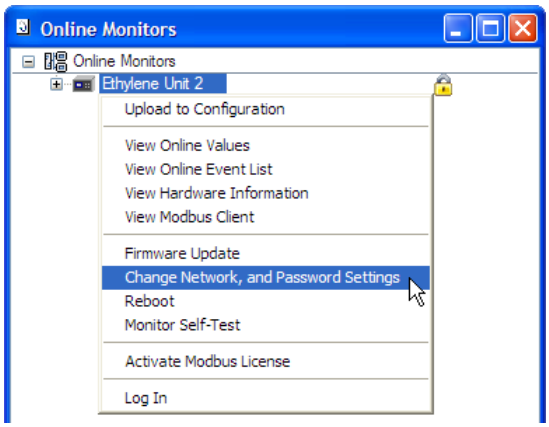
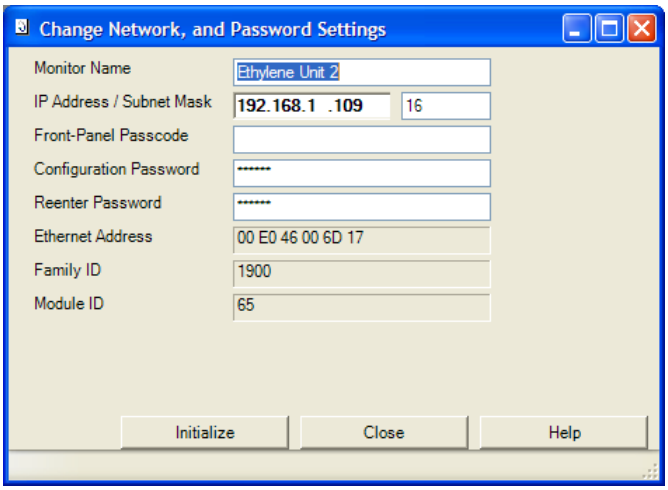


Figure 6-53. Change Network and Password window.



Monitor Name: Enter an appropriate name for this monitor according to your own preferences or naming conventions.

IP Address/Subnet mask: To change the IP address, Enter the new value. The subnet mask default is /16 (255.255.0.0). Valid subnet masks are listed in Table 6-3.

NOTE



The monitor must be assigned a valid IP address for the subnet it will communicate on. Contact your network administrator for assistance.

Table 6-3. Valid subnet masks.

Prefix	Subnet Mask
/8	255.0.0.0
/9	255.128.0.0
/10	255.192.0.0
/11	255.224.0.0
/12	255.240.0.0
/13	255.248.0.0
/14	255.252.0.0
/15	255.254.0.0
/16	255.255.0.0
/17	255.255.128.0
/18	255.255.192.0
/19	255.255.224.0
/20	255.255.240.0
/21	255.255.248.0
/22	255.255.252.0
/23	255.255.254.0
/24	255.255.255.0

Front Panel Passcode: The Front Panel Passcode restricts access to configuration changes and Monitor resets via the Display Module until the correct passcode is entered. To assign a passcode, enter a four digit value using only numbers 1 – 8.

Configuration Password: The Configuration Password restricts changes via the configuration software by requiring entry of the correct password before making changes. To assign a password, enter one to twelve alphanumeric characters.

Reenter Password: Reenter the password to confirm it.

Ethernet Address: Fixed value. Displays the MAC address (Media Access Control Address) assigned to the monitor hardware.

Family ID: Fixed value. Always 1900 to identify this Bently Nevada product family.

Module ID: Fixed value. Always 65 to identify this monitor.

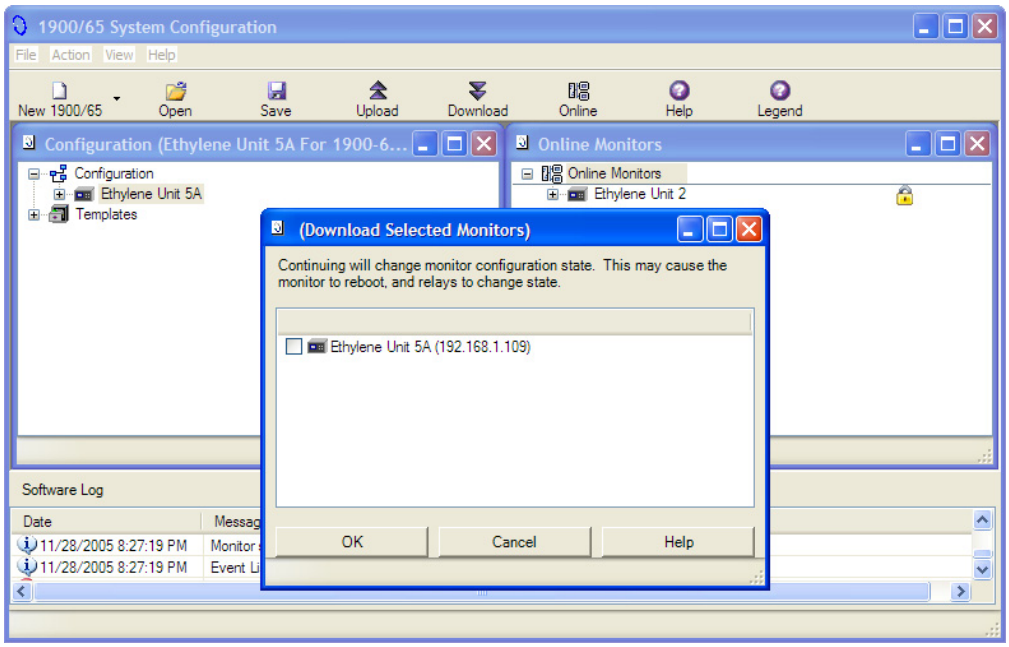
Initialize Button: Click to save any changes to the values displayed in this window and to close the window.

Close Button: Click to close this window without saving any changed values.

6.8 Download a Configuration to a Monitor

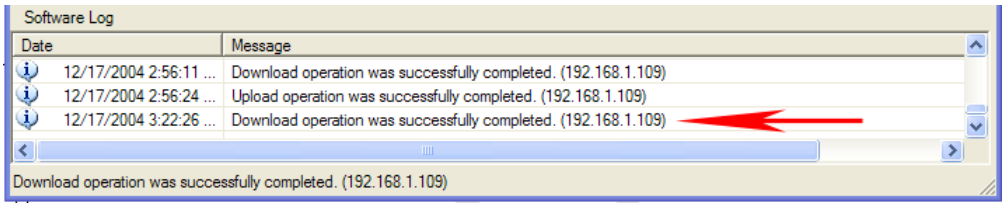
1. Click *Online* in the toolbar to refresh the Online Monitor window. Confirm the monitor you want to download to is active.
2. Open the configuration file that contains the monitor configuration you want to download (see Paragraph 6.4).
3. Click *Download* in the toolbar. The Download Selected Monitors window will open (Figure 6-54).

Figure 6-54. Download Selected Monitors window.



4. Check the monitors you want to download.
5. Click the button. When the download is complete, the software log will indicate a successful download (Figure 6-55).

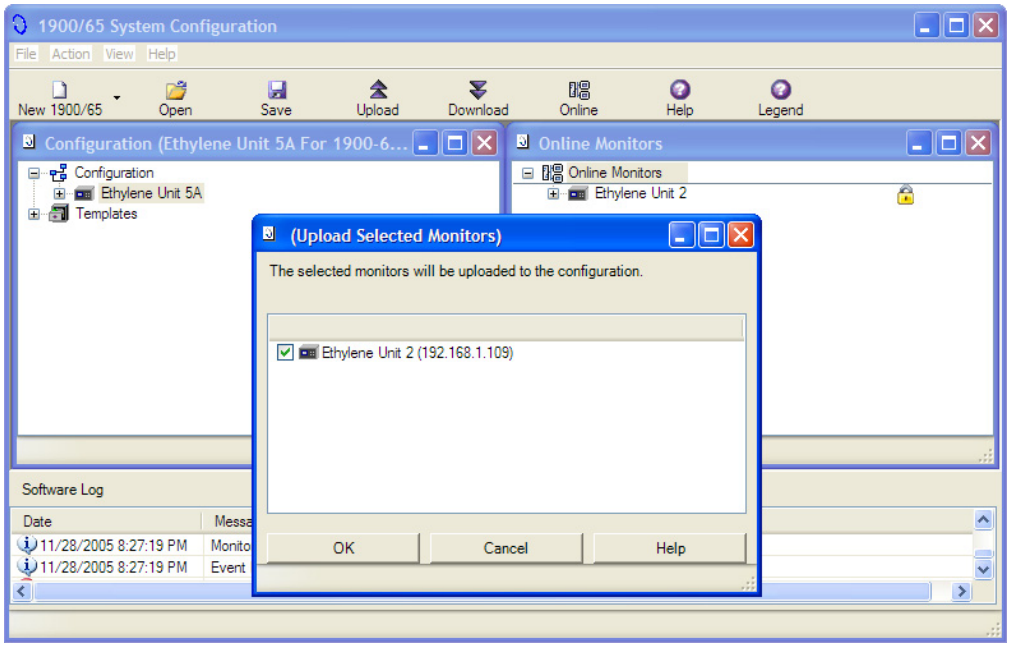
Figure 6-55. Software log.



6.9 Upload a Configuration from a Monitor

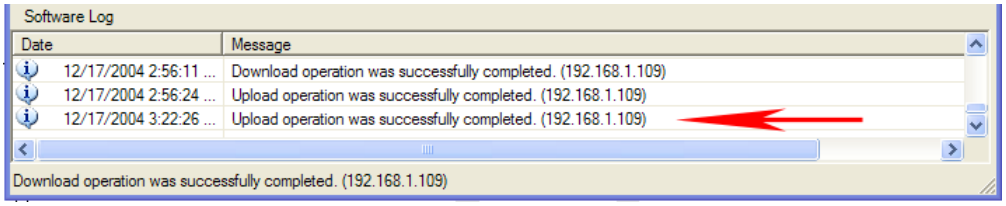
1. Click *Upload* in the toolbar. The Upload Selected Monitors window will open (Figure 6-56).

Figure 6-56. Upload Selected Monitors window.



2. Check the monitors you want to upload.
3. Click the *OK* button. When the upload is complete, the software log will indicate a successful upload (Figure 6-57).

Figure 6-57. Software log.



6.10 View Online Values

The Online Monitor window is the working space for viewing and working with monitors connected to the network. To open this window, click *online* in the toolbar.

6.10.1 Online Monitor Structure

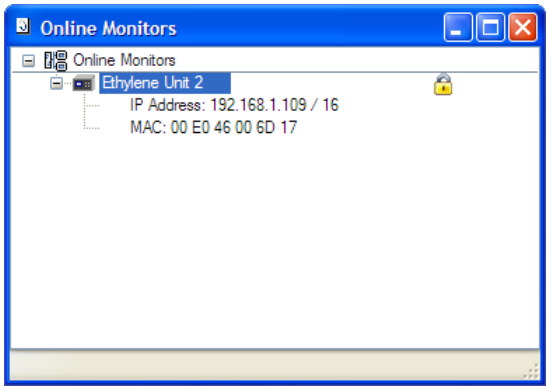
The Online Monitor Structure is represented as a tree having three levels:

First level: This level represents the network.

Second level: This level displays all 1900/65A monitors responding to a network search.

Third level: Displays the IP address and MAC address for the monitor.

Figure 6-58. Online Monitor Window.

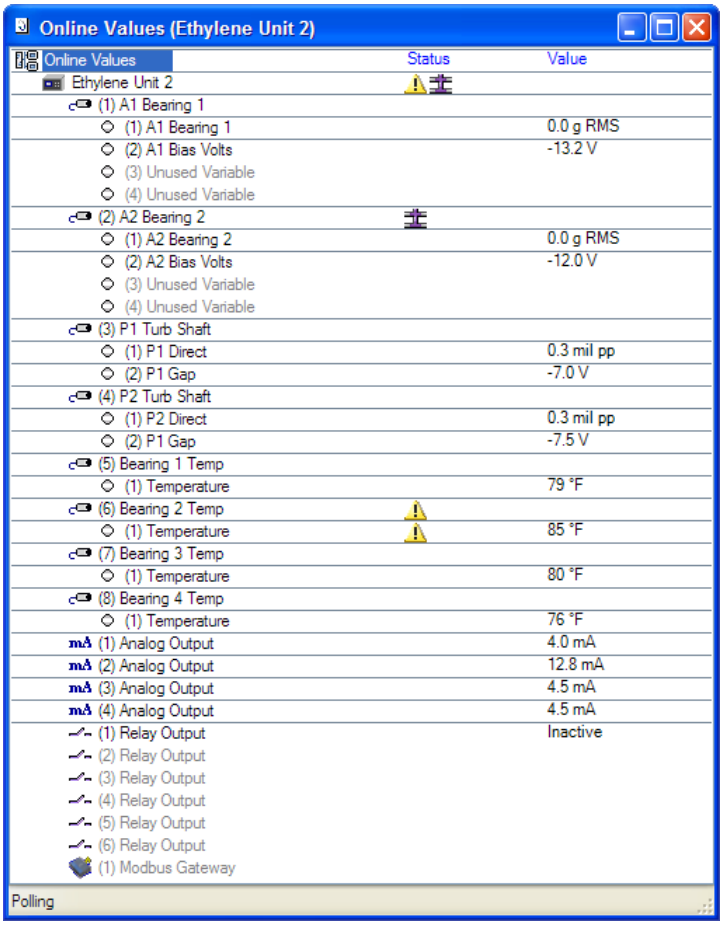


6.10.2 Open Online Values Window

To access this window:

1. From the Online Monitors window (Figure 6-58), right-click on the monitor you want to view. A context window will open.
2. Click on *View Online Values*. The Online Values window will open (Figure 6-59).

Figure 6-59. Online Values window. Alert and bypass icons in the status column indicate A2 bearing 2 (channel 2) is bypassed, and the Bearing 2 temperature variable is exceeding an Alert setpoint.



6.11 Adjust Online Parameters

IMPORTANT Alarms are not disabled during adjustment. Changed alarm values take effect immediately.

Context menus provide access to the following functions for online values:

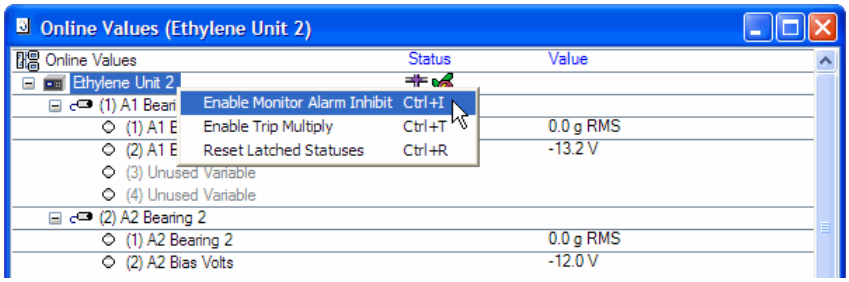
- Enable/Disable Monitor Alarm Inhibit
- Reset Latched Statuses
- Enable/Disable Channel Danger Alarm Bypass
- Enable/Disable Channel Bypass
- Enable/Disable Trip Multiply
- Adjust Scale Factor
- Adjust Zero Position

- Adjust Setpoints
- Adjust Threshold

6.11.1 Enable/Disable Monitor Alarm Inhibit

1. In the *Online Values Window,* right-click on the Monitor object. The context menu will open (Figure 6-60).
2. Click on Enable (Disable) Monitor Alarm Inhibit. A dialog will open.
3. Click the Yes button. Monitor Alarms will be Enabled (Disabled). The Bypass symbol and the Alarm inhibit symbol in the status column indicates the alarms are bypassed and inhibited.

Figure 6-60. Monitor context menu, Enable Alarm Inhibit.



Monitor Inhibit Behavior

Enabling Monitor Inhibit will disable Alert and Danger alarms for the entire monitor. Monitor Inhibit will cause the monitor to:

- Unlatch any latched alert or danger alarm statuses for the entire monitor
- Prevent any new alert or danger alarm statuses for the entire monitor
- The monitor and all channel bypass statuses will be set to true
- monitor alarm inhibit status will be set to true

The bypass status is indicated by the following:

- The bypass LED on the display module will turn on
- The status LED on the monitor module will blink
- A bypass event will be placed in the event list

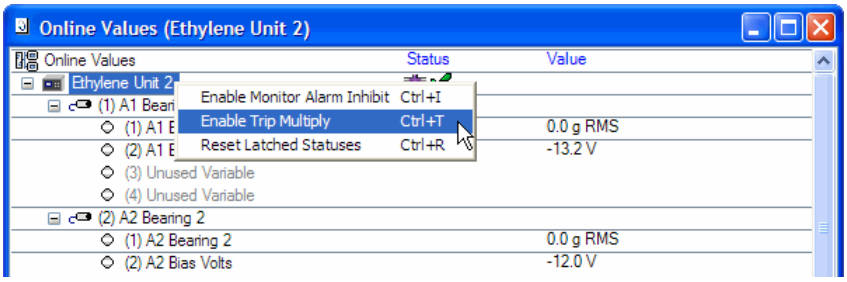
Channel bypass will *NOT* unlatch any previously latched relays

6.11.2 Enable/Disable Trip Multiply

1. In the *Online Values Window,* right-click on the Monitor object. The context menu will open (Figure 6-61).
2. Click on Enable (Disable) Trip Multiply. A dialog will open.

3. Click the Yes button. Monitor Trip Multiply will be Enabled (Disabled). The Trip Multiply symbol in the status column indicates the alarm setpoint levels have been multiplied up according to their configured trip multiply setting.

Figure 6-61. Monitor context menu, Enable Trip Multiply.



Trip Multiply Behavior

Enabling Trip Multiply will cause the monitor to:

- Increase alarm setpoint levels by the configured trip multiply setting. Trip Multiply applies only to setpoints on vibration variables, and it will have an effect only if the trip multiply value configured for the variable is greater than one

The Trip Multiply status is indicated by the following:

- The Trip Multiply LED on the display module will turn on
- A Trip Multiply event will be placed in the event list

Enabling or Disabling Trip Multiply will *NOT* unlatch any previously latched relays

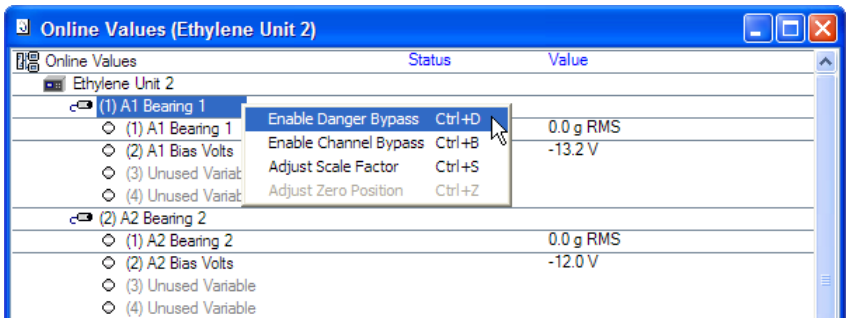
6.11.3 Reset Latched Statuses

1. Right-click on the Monitor object. The context menu will open (Figure 6-61).
2. Click on *Reset Latched Statuses*. A dialog will open.
3. Click the *Yes* button. Latched statuses will be reset.

6.11.4 Enable/Disable Channel Danger Alarm Bypass

1. Right-click on the Channel Level object. The context menu will open (Figure 6-62).
2. Click on *Enable* (Disable) *Danger Bypass*. A dialog will open.
3. Click the *Yes* button. The Channel will be bypassed (Enabled). The Bypass symbol in the status column indicates the alarms are bypassed. The Bypass symbol also propagates to the monitor level.

Figure 6-62. Channel Type context menu. Enable Danger Bypass selection is shown.



Channel Danger Bypass Behavior

Enabling Channel Danger Bypass will disable the Danger alarm for that channel. Channel Danger Bypass will cause the monitor to:

- Unlatch any latched danger alarm statuses for that channel
- Prevent any new danger alarm statuses for that channel
- The channel and monitor bypass statuses will be set to true

The bypass status is indicated by the following:

- The bypass LED on the display module will turn on
- The status LED on the monitor module will blink
- A bypass event will be placed in the event list

Channel bypass will *NOT* Unlatch any previously latched relays.

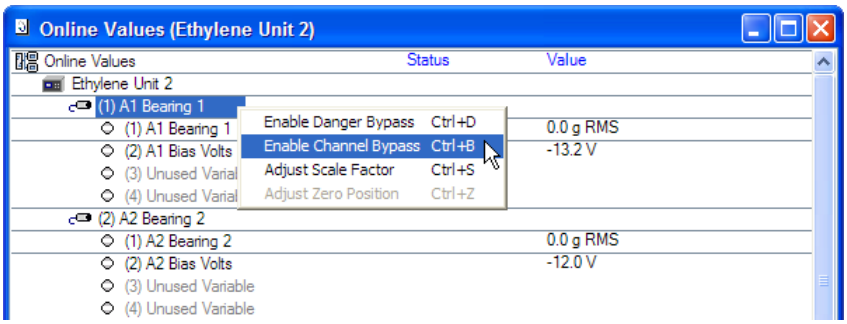
The difference between channel bypass and channel danger bypass is that:

- Channel danger bypass only effects danger alarms
- Channel danger bypass does not reset Not Ok statuses
- Channel danger bypass does not set that channel's variables to invalid

6.11.5 Enable/Disable Channel Bypass

1. Right-click on the Channel level object. The context menu will open (Figure 6-63).
2. Click on *Enable* (Disable) *Channel Bypass*. A dialog will open.
3. Click the *Yes* button. The channel will be bypassed (Enabled). The Bypass symbol in the status column indicates the alarms are bypassed. The Bypass symbol also propagates to the monitor level.

Figure 6-63. Channel Type context menu. Enable Channel Bypass selection is shown.



Channel Bypass Behavior

Enabling Channel Bypass will disable the Alert and Danger alarms for that channel. Channel Bypass will cause the monitor to:

- Unlatch any latched alarm statuses for that channel
- Prevent any new alarm statuses for that channel
- Drive all variables to invalid for that channel
- The Not Ok status will go to false even if latched for that channel
- The channel and monitor bypass statuses will be set to true

The bypass status is indicated by the following:

- The bypass LED on the display module will turn on
- The status LED on the monitor module will blink
- A bypass event will be placed in the event list

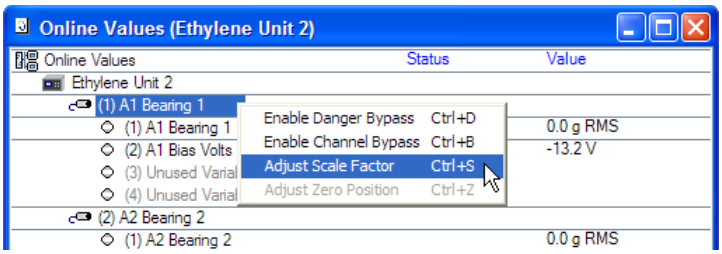
Channel bypass will *NOT* unlatch any previously latched relays.

Channel bypass should be used if you wish to temporarily disable a channel on a module. If the channel is to be permanently disabled, turn off or delete the channel with the configuration software.

6.11.6 Adjust Scale Factor

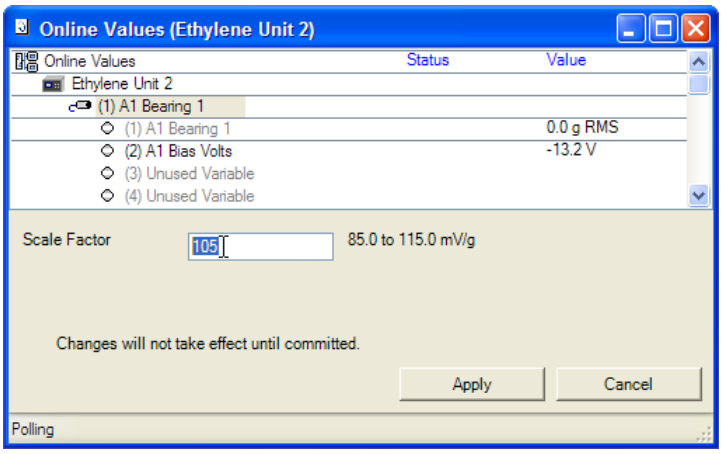
1. Right-click on the Channel Level object. The context menu will open (Figure 6-64).

Figure 6-64. Context menu. Adjust Scale Factor selection.



2. Click on *Adjust Scale Factor*. A scale factor text box will open at the bottom of the window (Figure 6-65).
3. Enter a new scale factor in the text box and click *Apply*. A confirmation dialog will open.

Figure 6-65. Scale factor adjustment window.

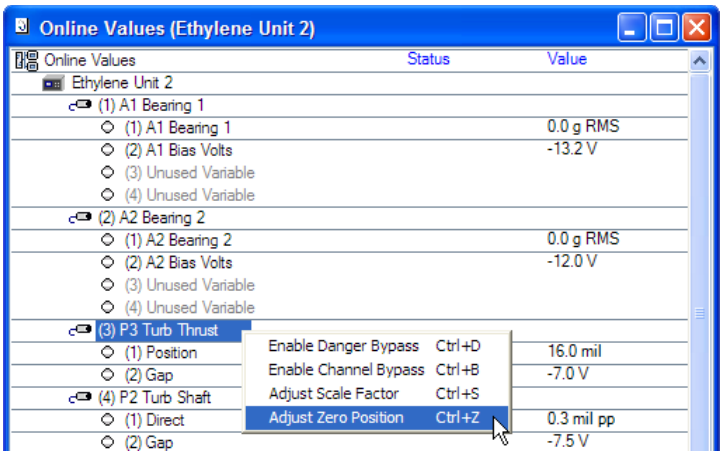


4. Click the *Yes* button in the confirmation window to commit the new scale factor or *No* to retain the original scale factor.

6.11.7 Adjust Zero Position

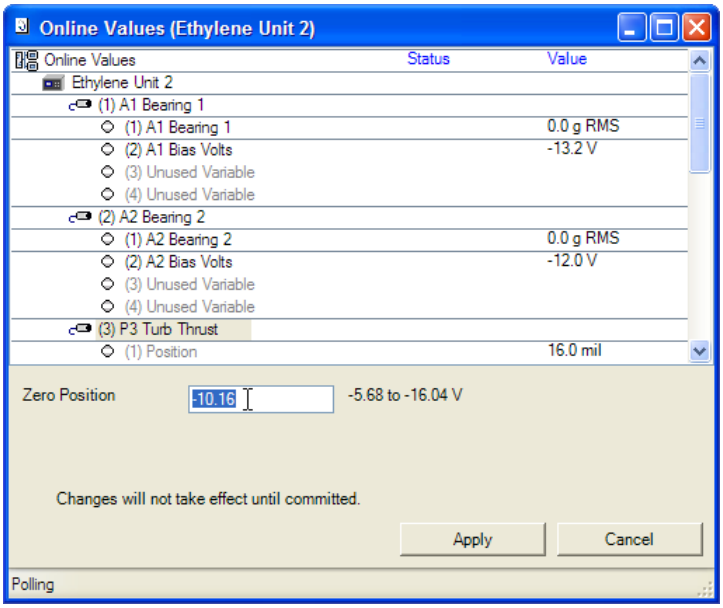
1. Right-click on the Channel Level object. The context menu will open (Figure 6-66).

Figure 6-66. Context menu. Adjust Zero Position selection.



2. Click on *Adjust Zero Position*. A zero position text box will open at the bottom of the window (Figure 6-67).
3. Enter a new zero position voltage in the text box and click *Apply*. A confirmation dialog will open.

Figure 6-67. Zero position adjustment window.

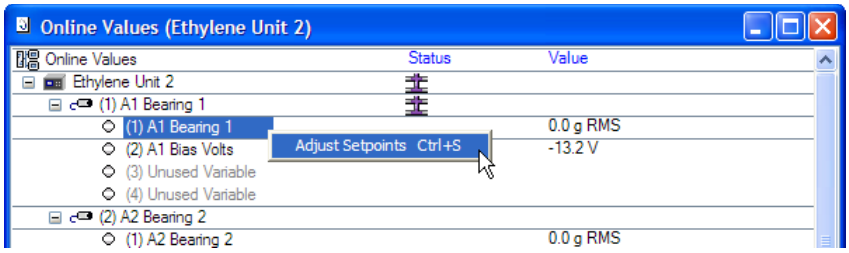


4. Click the *Yes* button in the confirmation window to commit the new zero position voltage or *No* to retain the original zero position voltage.

6.11.8 Adjust Setpoints

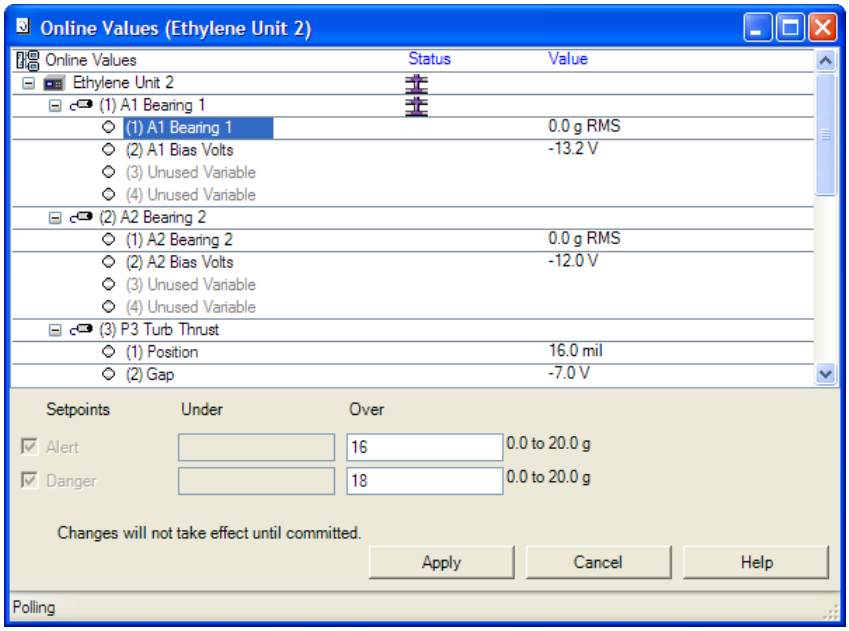
1. Right-click on the Variable level object. The context menu will open (Figure 6-68).

Figure 6-68. Context menu. Adjust Setpoints selection.



2. Click on *Adjust Setpoints*. A setpoint adjust text box will open at the bottom of the window (Figure 6-69).
3. Enter new setpoint values in the text boxes and click *Apply*. A confirmation dialog will open.

Figure 6-69. Setpoint adjustment window.

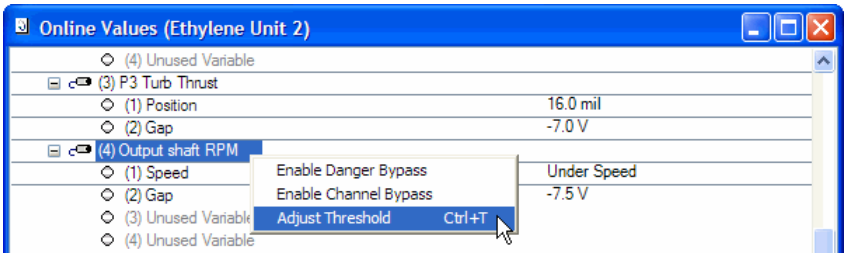


4. Click the Yes button in the confirmation window to commit the new setpoint values or No to retain the original setpoint values.

6.11.9 Adjust Threshold (Speed)

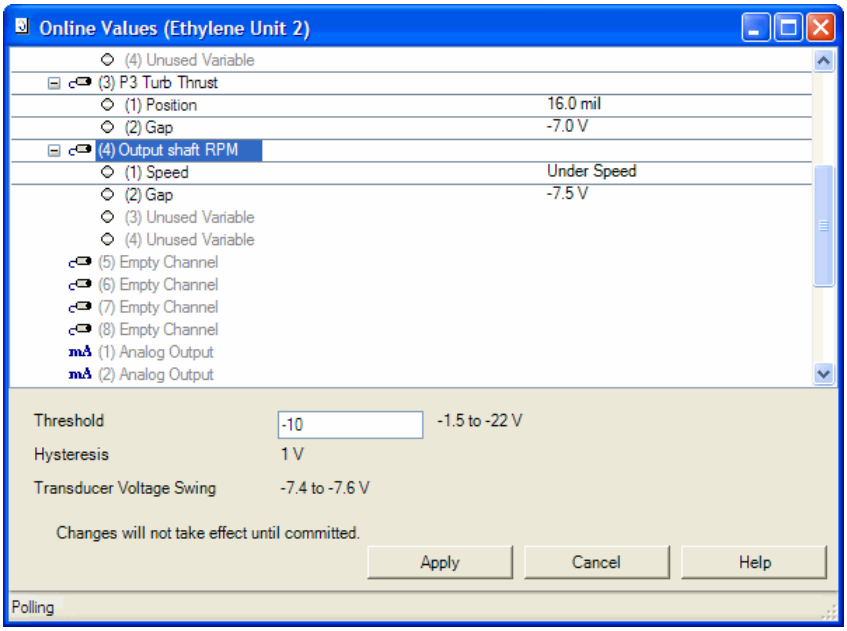
1. Right-click on the Variable level object. The context menu will open (Figure 6-70).

Figure 6-70. Context menu. Adjust Threshold selection.



2. Click on *Adjust Threshold*. A threshold adjust text box will open at the bottom of the window (Figure 6-71).
3. Enter the new threshold voltage in the text box and click *Apply*. A confirmation dialog will open.

Figure 6-71. Threshold adjustment window.



4. Click the Yes button in the confirmation window to commit the new threshold voltage or No to retain the original threshold voltage.

7 Configuration Export and Import

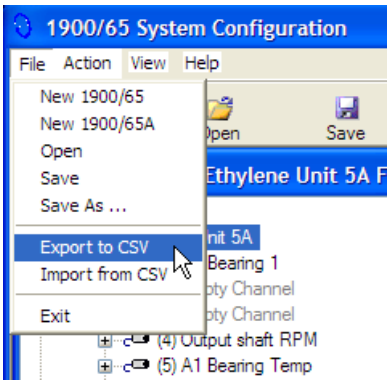
This chapter describes how to export and import configuration data.

7.1 Exporting a Configuration File

To export a Configuration file from a monitor configuration:

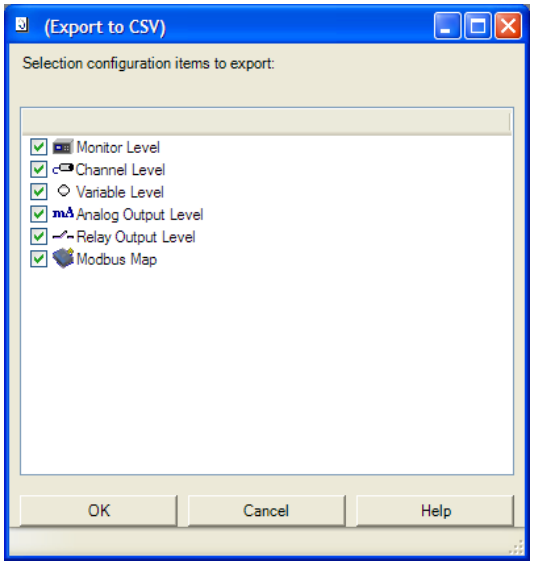
1. Open or upload the configuration you want to export to the *Configuration Window*.
2. Click on *File>Export to CSV* (Figure 7-1). The (*Export to CSV)* window will open (Figure 7-2).

Figure 7-1.



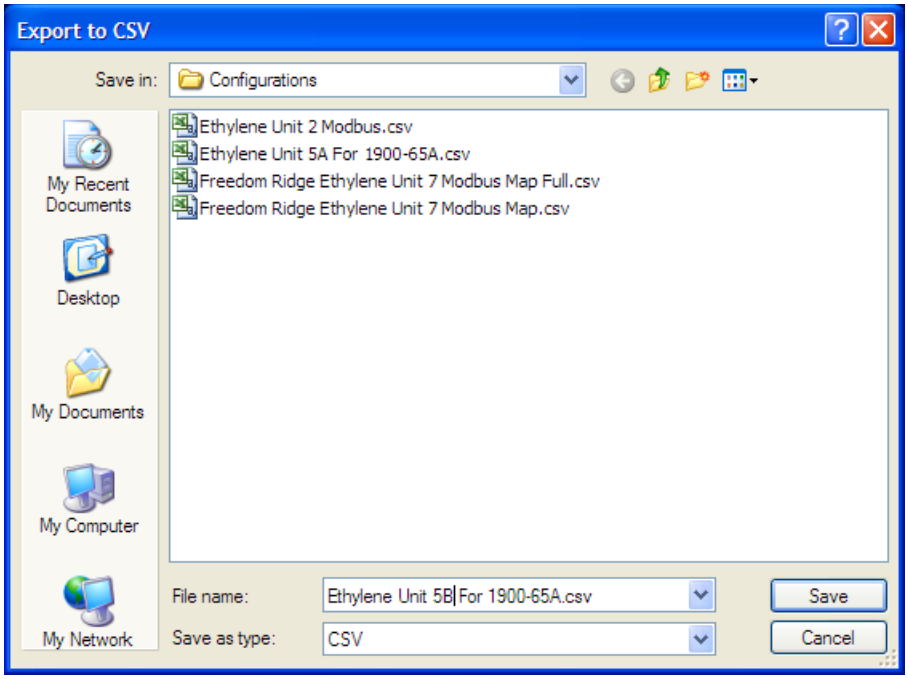
3. Click the check box for each configuration item you want to export and then click *OK*. The (*Export to CSV)* window will open (Figure 7-3).

Figure 7-2. Export to CSV window.



4. Navigate to the directory where you want to save the export file.
5. Enter the file name of the CSV file to create.
6. Click *Save* to save the file and complete the export.

Figure 7-3. Saving the export file.



7.2 Exported Configuration File Examples

The export function saves a configuration file in standard *Comma Separated Values* (CSV) format. A CSV file is a text file that is compatible with spreadsheet programs like Microsoft Excel and text editors like Wordpad. An example of an exported configuration file opened in a spreadsheet program is shown in Figure 7-4. The same file opened in a text editor is shown in Figure 7-5.

Figure 7-4. Exported Configuration file viewed in a spreadsheet.

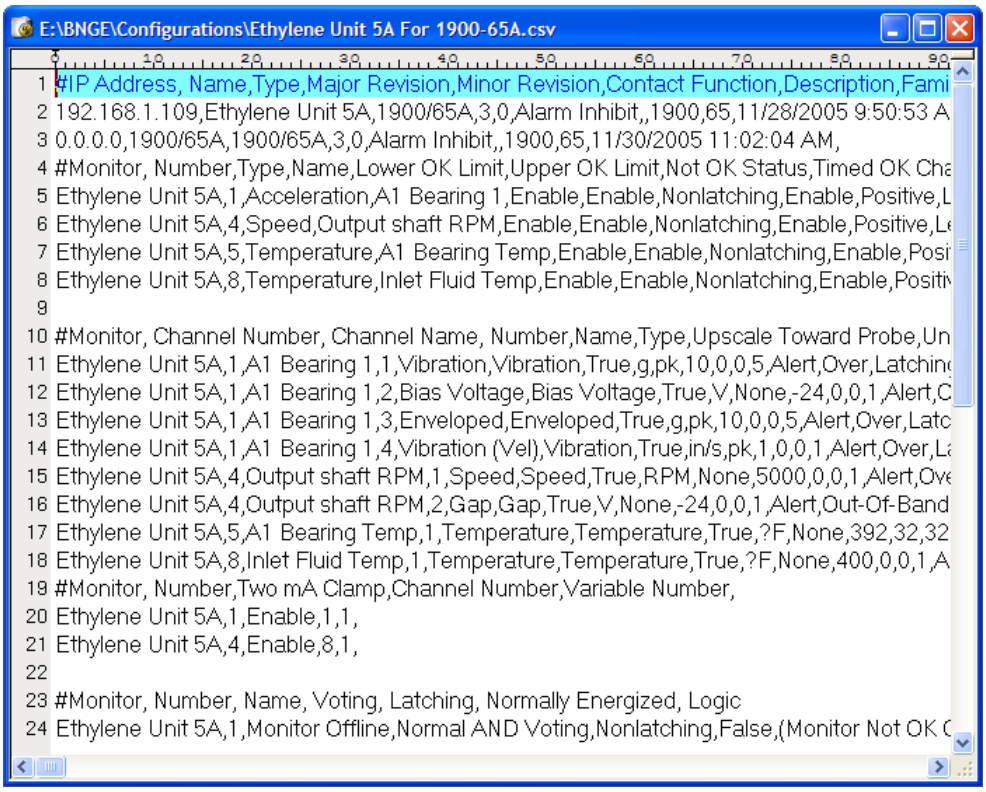
Ethylene Unit 5A For 1900-65A.csv

	A	B	C	D	E	F	G	H
1	#IP Address	Name	Type	Major Revision	Minor Revision	Contact Function	Description	Family ID
2	192.168.1.109	Ethylene Unit 5A	1900/65A	3	0	Alarm Inhibit		1900
3	0.0.0.0	1900/65A	1900/65A	3	0	Alarm Inhibit		1900
4	#Monitor	Number	Type	Name	Lower OK Limit	Upper OK Limit	Not OK Status	Timed OK Channel Defeat
5	Ethylene Unit 5A	1	Acceleration	A1 Bearing 1	Enable	Enable	Nonlatching	Enable
6	Ethylene Unit 5A	4	Speed	Output shaft RPM	Enable	Enable	Nonlatching	Enable
7	Ethylene Unit 5A	5	Temperature	A1 Bearing Temp	Enable	Enable	Nonlatching	Enable
8	Ethylene Unit 5A	8	Temperature	Inlet Fluid Temp	Enable	Enable	Nonlatching	Enable
9								
10	#Monitor	Channel Number	Channel Name	Number	Name	Type	Upscale Toward Probe	Units
11	Ethylene Unit 5A	1	A1 Bearing 1	1	Vibration	Vibration	TRUE	g
12	Ethylene Unit 5A	1	A1 Bearing 1	2	Bias Voltage	Bias Voltage	TRUE	V
13	Ethylene Unit 5A	1	A1 Bearing 1	3	Enveloped	Enveloped	TRUE	g
14	Ethylene Unit 5A	1	A1 Bearing 1	4	Vibration (Vel)	Vibration	TRUE	in/s
15	Ethylene Unit 5A	4	Output shaft RPM	1	Speed	Speed	TRUE	RPM
16	Ethylene Unit 5A	4	Output shaft RPM	2	Gap	Gap	TRUE	V
17	Ethylene Unit 5A	5	A1 Bearing Temp	1	Temperature	Temperature	TRUE	?F
18	Ethylene Unit 5A	8	Inlet Fluid Temp	1	Temperature	Temperature	TRUE	?F
19	#Monitor	Number	Two mA Clamp	Channel Number	Variable Number			
20	Ethylene Unit 5A	1	Enable	1	1			
21	Ethylene Unit 5A	4	Enable	8	1			
22								
23	#Monitor	Number	Name	Voting	Latching	Normally Energized	Logic	
24	Ethylene Unit 5A	1	Monitor Offline	Normal AND Voting	Nonlatching	FALSE	(Monitor Not OK OR Monitor Alarm Inhibit)	
25								

Ethylene Unit 5A For 1900-65A

A CSV file organizes data into multiple columns with each row representing the data for one register. Columns are delimited with commas in the text file. The first row defines the content of each column.

Figure 7-5. Exported Configuration file viewed in an ASCII text editor.



7.3 Creating a Configuration File For Import

NOTE Only Modbus register data may be imported.

To create a CSV file with a text editor or spreadsheet:

1. Create a header row to define the data contained in each column. The header row must contain these terms separated with a comma:

   ```
   Monitor, IP Address, Group Name, Modbus Address
   Block, Start Address, Address, Bit, Type,Channel,
   Variable, Setpoint, Size, Modbus Minimum, Modbus
   Maximum, Minimum, Maximum, Units, Description
   ```

2. List the appropriate data in each subsequent row below the header:

   ```
   Ethylene Unit 7,192.168.1.109,Coils,Coils,00001,
   0001,,Not OK,,,,1,0,65535,0,,,
   ```

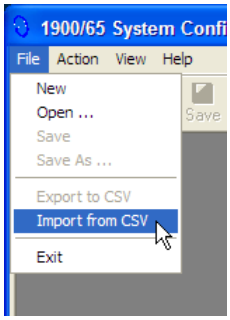
The following rules apply for CSV validation:

- Data must be valid
- All errors are reported to the user after import is complete by line, field and description
- Registers are validated for input type, channel, variable type, and address
- Register types must be valid for their block type
- Empty lines are skipped
- Lines preceded by the pound sign (#) are skipped
- A register must have the correct fields defined for a given register type

7.4 Importing a Configuration File

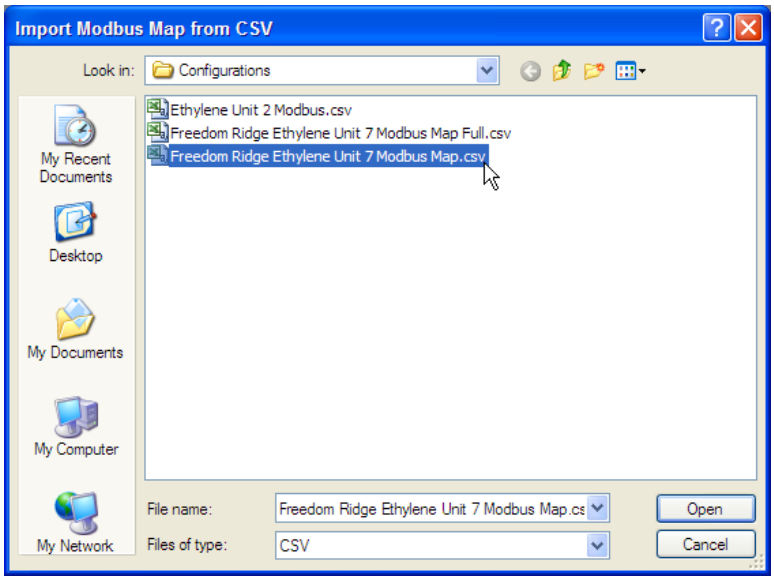
1. Click *File>Import from CSV* on the menu bar (Figure 7-6). The *Import Configuration File* window will open (Figure 7-7).

Figure 7-6.



2. Locate and select the desired CSV file to import. Click *Open*. The file will be loaded as a configuration.

Figure 7-7.



8 Display Module

The Display Module provides a local data display, a keypad for minor configuration, and access to the raw transducer signals.

The data display can show:

- Configured variables
- Monitor level, channel level, and variable level statuses
- Alert, Danger, and Not Ok statuses
- Configuration settings

These items can be adjusted using the display and keypad:

- Monitor Inhibit
- Channel and Danger Bypass
- Alert and Danger alarm setpoints
- Variable full scale range
- Transducer scale factor
- Thrust zero position
- Speed threshold level
- Security settings and passcode
- Trip Multiply
- Display options

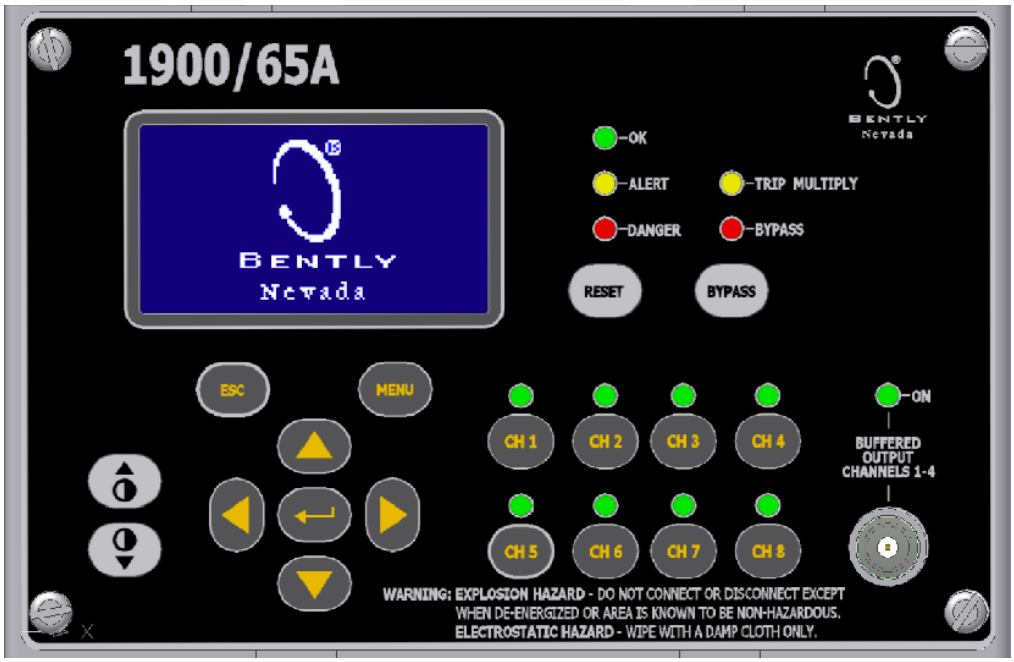
The raw transducer signals from channels 1-4 can be routed to the buffered output BNC connector for monitoring with an external device.

NOTE



The 1900/65A and 1900/65 display modules are interchangeable with either the 1900/65A or 1900/65 monitor modules. Figure 1-2 shows both display modules.

Figure 8-1. 1900/65A Display Module.



The Display Module plugs onto the front of the Monitor Module through a 9-pin D-type connector. If desired, the display can be mounted up to 250 feet from the Monitor Module using an extension cable available from Bently Nevada. See the *1900/65A Specifications and Ordering Information document* (173401-01) for cable options.

The Display Module and Monitor Module are both *hot pluggable*, meaning you can safely connect and disconnect the Display Module onto an active Monitor Module with no fear of damage or data loss. This makes it practical to have a single Display Module on hand for use with a family of Monitor Modules for periodic maintenance or inspection.

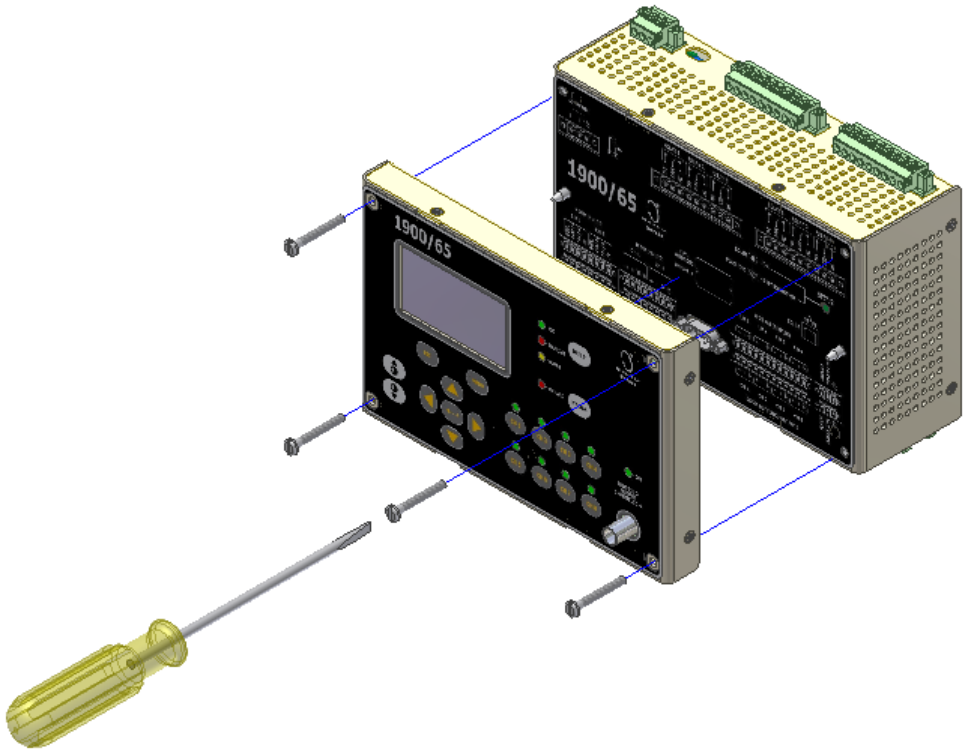
8.1 Mounting the Display Module

The Display Module can be installed directly onto the Monitor Module or mounted remotely on a panel. A weatherproof door is also available for protecting a panel mounted Display Module from the elements.

8.1.1 Installing the Display on the Monitor Module

1. Plug the Display Module onto the front of the Monitor Module. Alignment pins on the front of the Monitor Module will ensure proper alignment.
2. Fasten the modules together using four 8-32 x 1.00 inch pan head screws as shown in Figure 8-2.

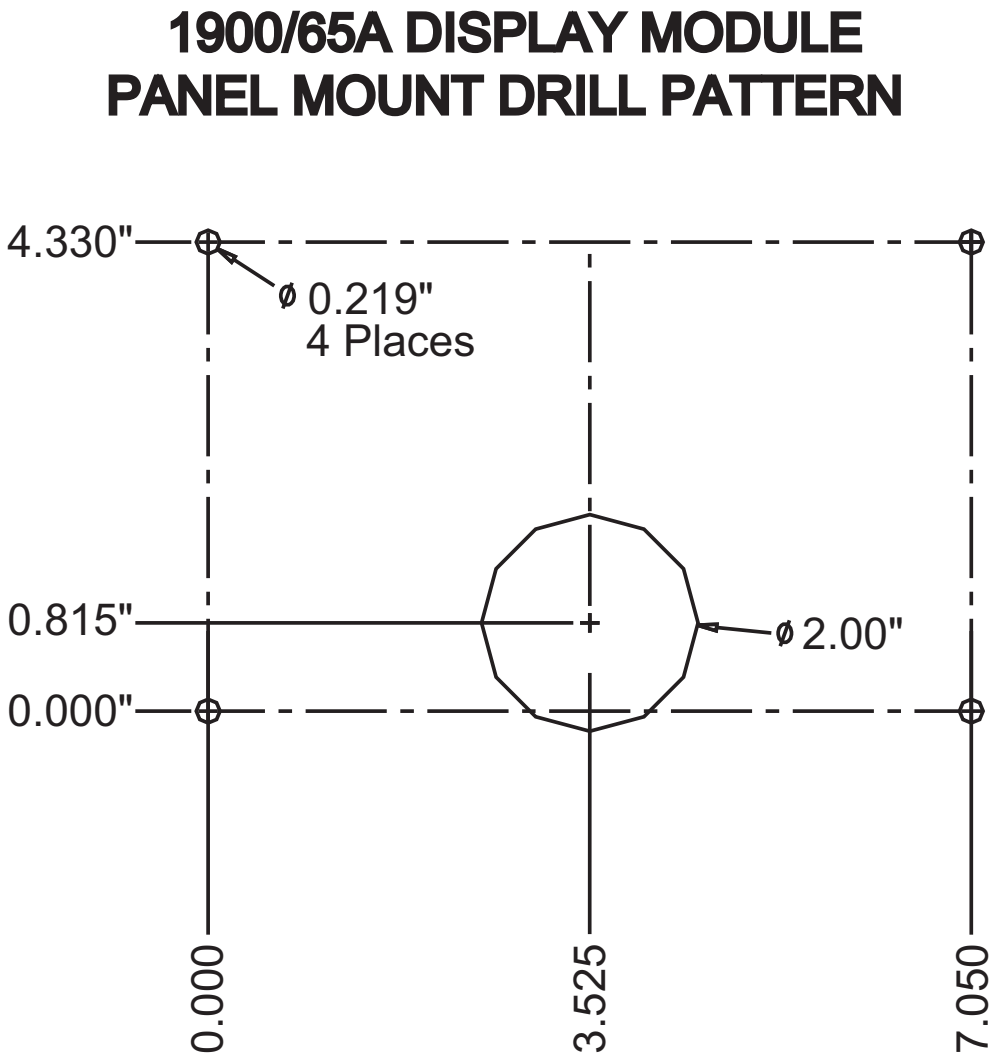
Figure 8-2. Mounting the Display Module onto a Monitor Module.



8.1.2 Mounting the Display on a Panel

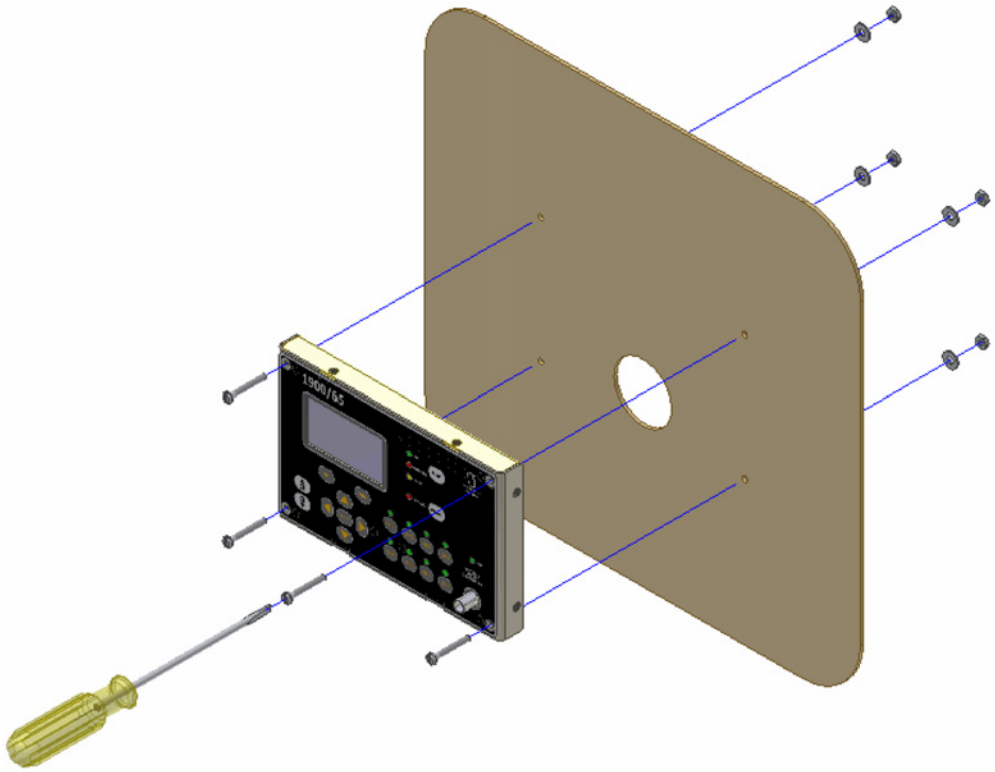
1. Prepare the panel by drilling four 5.5 mm (0.219 inch) holes and one 51 mm (2 inch) hole per the hole pattern shown in figure Figure 8-3. The large hole provides clearance for the connector.

Figure 8-3. Hole Pattern for mounting display on a panel.



2. Fasten the Display Module to the plate with four 8-32 x 1.50 inch pan head screws, four #8 washers and four #8 nuts as shown in Figure 8-4.

Figure 8-4. Mounting the Display Module on a panel or surface.



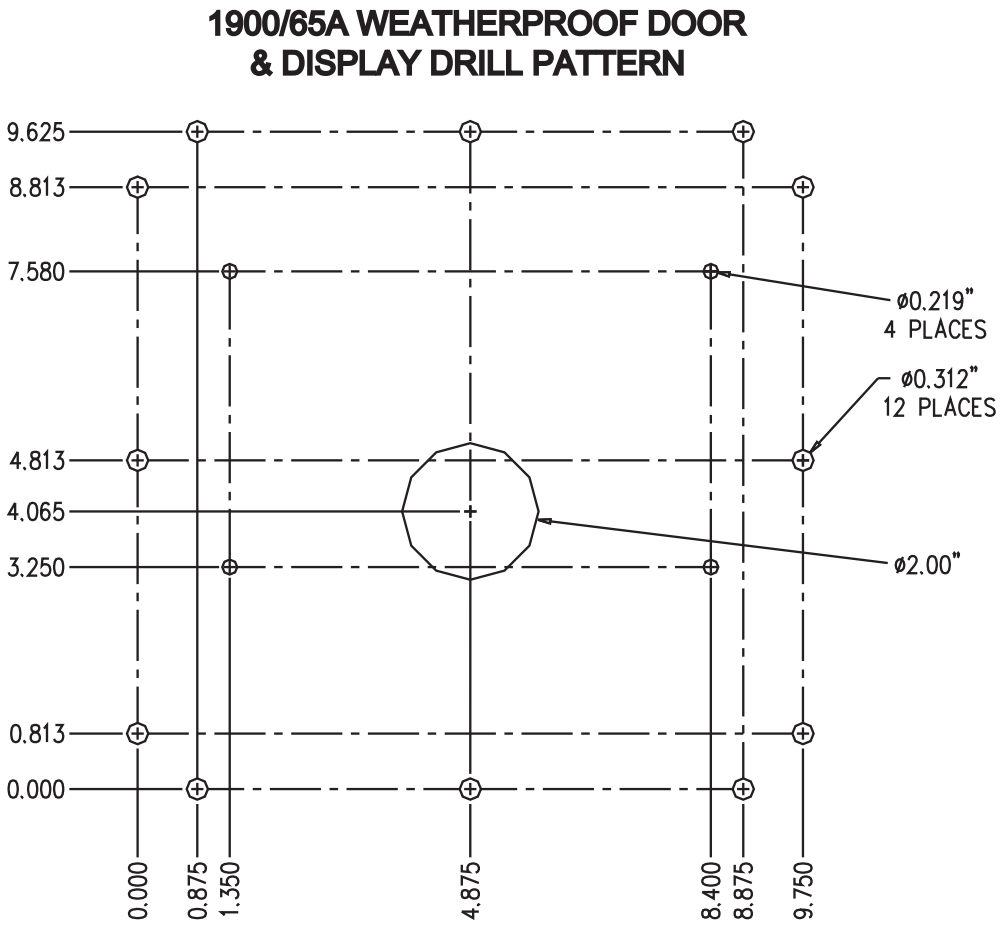
3. Connect the Display Module to the Monitor Module using one of the extension cables referenced in the *Specifications and Ordering Information document* (173401-01) The Display Module may be located up to 250 ft. from the Monitor Module.

8.1.3 Mounting a Display and Weatherproof Door

The weatherproof door assembly (Figure 8-6) provides a windowed, sealed enclosure that mounts over a panel mounted display. See the *1900/65A Specifications and Ordering Information document* (173401-01) for ordering information

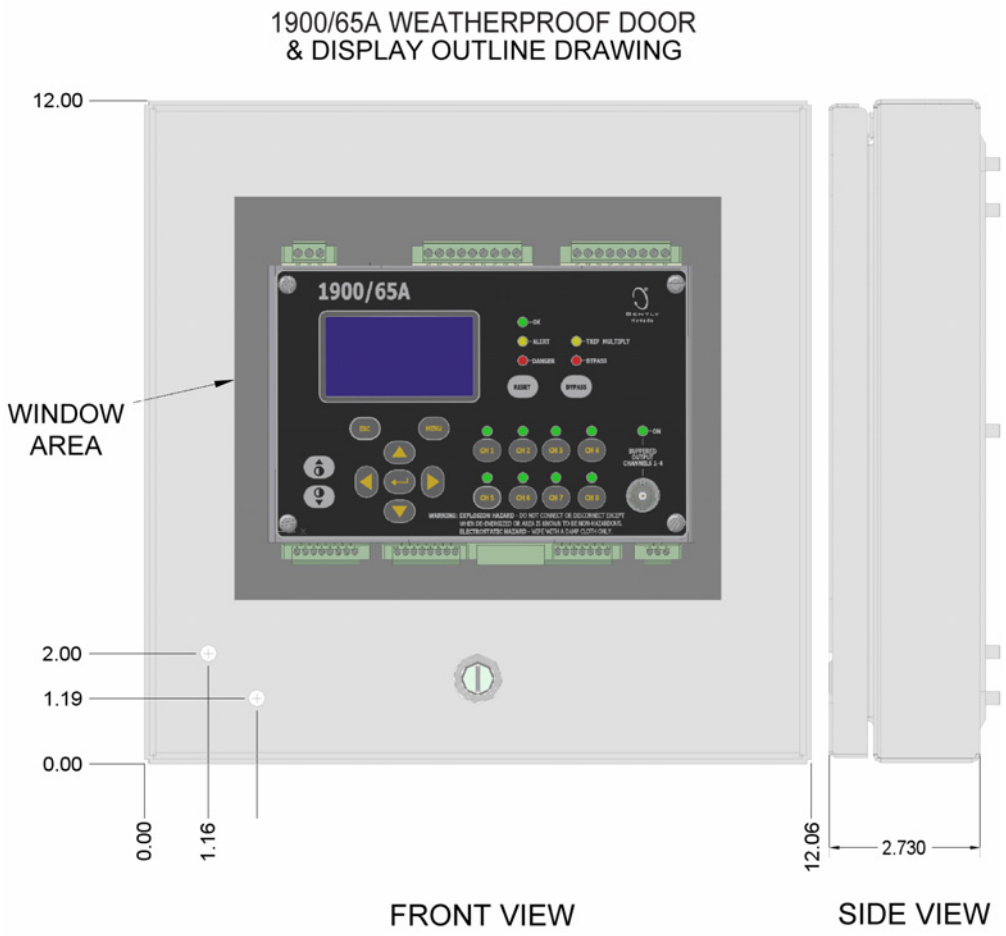
1. Prepare the panel by drilling twelve 8.0 mm (0.312 inch) holes, four 5.5 mm (0.219 inch) holes and one 51 mm (2 inch) per the hole pattern shown in figure Figure 8-5.

Figure 8-5. Hole Pattern for panel mounting a display and weatherproof door.



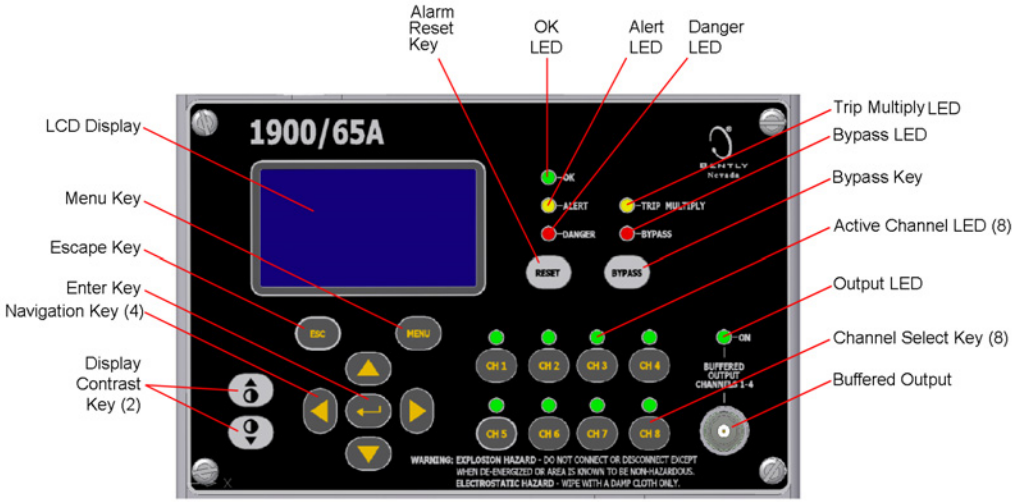
2. Fasten the Display Module to the plate with four 8-32 x 1.50 inch pan head screws, washers and nuts as shown in Figure 8-4.
3. Connect the Display Module to the Monitor Module using one of the extension cables referenced in the *Specifications and Ordering Information document* (173401-01).
4. Fasten the weatherproof door to the panel or surface.

Figure 8-6. Weatherproof door for panel or surface mounted display.



8.2 Display Module Reference

Figure 8-7. Display Module.



LCD: 128 x 64 pixel blue mode high visibility display module with backlight.

Alarm Reset Key: The reset key is always active. Use this key to reset any latched alarms and relays. If the condition driving the status no longer exists, pressing the reset key will:

- Reset all latched Alert statuses
- Reset all latched Danger statuses
- Reset all latched Not OK statuses
- Reset all latched relays

OK LED: A status indicator that implies proper monitor operation and wiring integrity to sensors.

- *OFF* – Monitor is not powered or not functioning properly or the monitor has detected a fault with one of the sensors
- *On* – Monitor and sensors are functioning properly and protection is enabled
- *Flashing (2 Hz)* – The Monitor and sensors are OK and functioning correctly. Protection is enabled, but the monitor has been Not OK since the last reset

Alert LED: Indicates an Alert setpoint violation.

- *Off* – No channels are currently in an Alert condition, and have not been since the last reset
- *On* – One or more channels are currently in an Alert condition, or an Alert condition has been latched into the monitor since the last reset

Danger LED: Indicates a Danger setpoint violation.

- *Off* – No channels are in a Danger condition and have not been since the last reset
- *On* – One or more channels are in a Danger condition, or a Danger condition has been latched into the monitor since the last reset

Trip Multiply LED: Indicates Trip Multiply is active. When this LED is on, the alert and danger setpoints for one or more channels are temporarily increased to higher than normal levels.

Bypass LED: Indicates Monitor Inhibit, Channel Bypass or Channel Danger Bypass status is active, and at least one channel is disabled and is not monitoring inputs.

- Off – The monitor is not in inhibit, and no channels are currently in Bypass or Danger Bypass
- On – The monitor is in Inhibit, or one or more channels are currently in Bypass or Danger Bypass and not monitoring inputs

Bypass Key: The Bypass key is always active. Pressing the Bypass key will display the Bypass menu. The Bypass menu allows you to change the Inhibit status at the monitor level or the Bypass status at the channel level.

Buffered Output LED: When a signal is available on the Buffered Output connector, the Output LED will be ON. It is OFF when no signal is available. When the LCD is showing the Home display, no signal is available and the buffered output will be off.

Active Channel LEDs: Eight LEDs representing the eight input channels.

- ON – Channel is configured as on
- OFF – Channel is configured as off

Channel Select Key: Pressing a Channel key when in display mode will display detail information about that channel. Pressing a channel key in menu mode will display a detailed menu for that channel. Pressing a channel key in any mode makes the signal for that channel available on the buffered output key.

Buffered Output: This is a BNC connector that provides access to any one of the four transducer input signals on channels 1 – 4. Channel selection is made by pressing one of the channel select keys. Output is buffered and short-circuit protected. When the display is at the Home screen, the buffered output is not active.

Display Contrast Adjust Keys: The Contrast Adjust Keys are always active. Press and hold the up arrow to increase contrast. Press and hold the down arrow to decrease contrast.

Navigation Key: Navigation keys are used to navigate through menus.

Enter Key: Pressing the Enter key will choose the highlighted item.

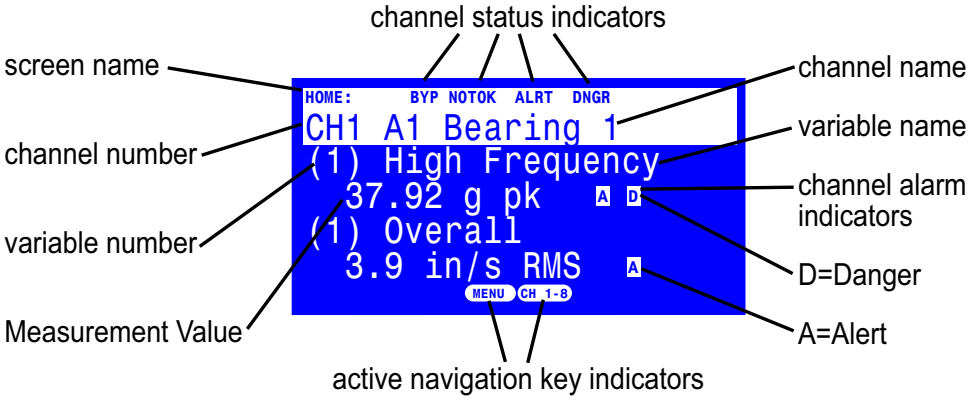
Escape Key: Pressing the Escape key will move the menu up one level each time the key is pressed. If the escape key is pressed at the main menu level the display will come out of menu mode and return to Home screen.

Menu Key: Pressing the Menu key from the channel display screen will take you to the Channel Menu screen. Pressing the Menu key from the Home screen will take you to the Main Menu screen.

8.3 Display Layout

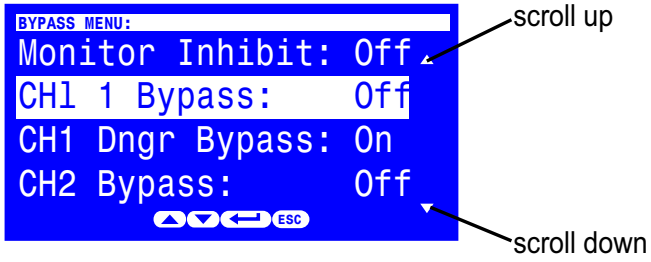
The Home and Bypass screens are used as examples in Figure 8-8 and Figure 8-9, but the information shown is relevant to all screens. The inverted top row always shows the screen name and channel level statuses. The inverted second row indicates channel number and channel name. The non-inverted section of the screen shows the variable numbers, names, value, units, and alarm statuses of the first two configured variables. The icons in the bottom row indicate which keys are active for navigation.

Figure 8-8. LCD Screen components.



When additional information can be scrolled into the viewing window, arrow indicators will be displayed as shown in Figure 8-9.

Figure 8-9. Scrolling arrows. Use the up and down arrows keys on keypad to scroll data up and down.



8.4 Display Operation

CAUTION



Configuration changes from the front panel display are immediately stored in the Monitor Module.

8.4.1 Power-up Screen

This screen appears when the Display Module is plugged in to the Monitor Module or when power is applied to the pair. It indicates the Display Module is booting up. It will display for about 3 seconds, and then display the *Establishing Connection* screen.

Figure 8-10.



8.4.2 Establishing Connection Screen

This screen indicates the Display Module is establishing communications with the Monitor Module. Once communication is active, the *Home* screen will appear.

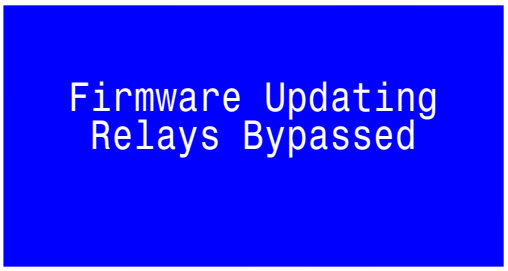
Figure 8-11.



8.4.3 Firmware Update Screen

This screen will be displayed while the configuration software is downloading a firmware revision to the Monitor Module. This is a different operation from downloading a configuration to the monitor.

Figure 8-12.



8.4.4 Home screen

Home screen is active under normal operating conditions. It cycles through active channels and displays their current variable values.

Figure 8-13.



NOTE



When Home screen is displayed, the buffered output is not active.

8.4.5 Channel Display Screen

This screen is similar to the home screen except it does not rotate through channels. Instead, you must manually select a channel for display. The screen remains at the selected channel until you exit, change the channel, or select the menu.

Figure 8-14.



If channel 1 through 4 is displayed, the transducer signal for the displayed channel will also be routed to the buffered output connector. Temperature channels 5 through 8 are never routed to the buffered output.

8.4.6 Bypass Menu Screen

NOTE



Bypass behavior is described in the following sidebars:

Monitor Inhibit Behavior

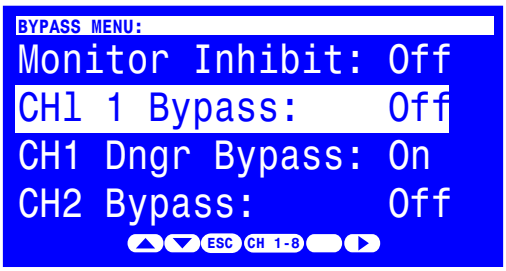
Channel Danger Bypass Behavior

Channel Bypass Behavior

This screen displays the Bypass states for the Monitor and CH1 – CH8 and permits you to change these states.

To change the Bypass status of the monitor or a channel, use the up or down Arrow key to scroll the highlight to a bypass selection.

Figure 8-15.



Press the Enter key to select the highlighted monitor or channel bypass state. Use the up or down arrow to change the state to On or Off.

Press Enter to accept the selection. The change is accepted when the entire line is highlighted.

8.4.7 Main Menu Screen

This screen allows you to change configuration settings. To adjust a setting, use the up or down arrows to highlight the desired selection and press enter.

Figure 8-16.



8.4.7.1 Channel Menu

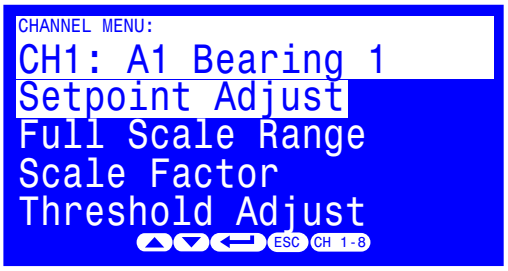
This screen allows you to change configuration settings. To adjust a setting, use the up or down arrows to highlight the desired selection and press enter. If channels 1 – 4 are selected, the buffered output will be active.

NOTE



The channel type of the displayed channel determines which configuration options are available on this screen.

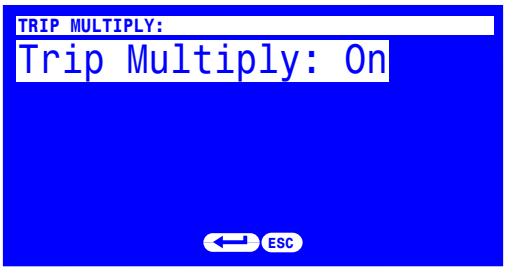
Figure 8-17.



8.4.7.2 Trip Multiply

Enter this screen to enable or disable the trip multiply function.

Figure 8-18.



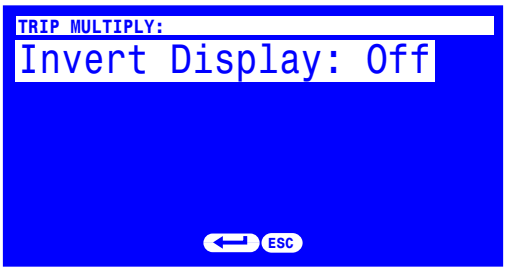
Pressing enter moves the highlighting from the feature to the value. Once the value is highlighted, use the up or down button to change the value.

8.4.7.3 Display Options

Enter this screen to invert the display background and foreground.

Use the up and down arrows to highlight the invert display feature. Inverting the display provides better visibility in direct sunlight.

Figure 8-19.



Pressing enter moves the highlighting from the feature to the value. Once the value is highlighted, use the up or down button to change the value.

8.4.7.4 Security Options

Use this screen to enable passcode protection for configuration screens, bypass settings, alarm resets and the security options screen.

Upon entry to this screen, *Security: Off (On)* is highlighted.

Figure 8-20.



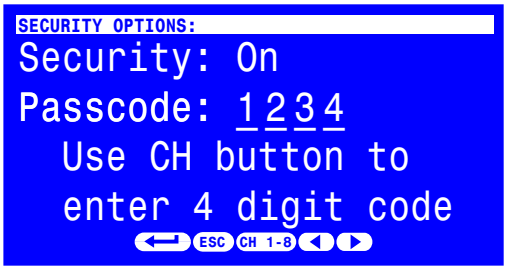
Press *Enter* to highlight only *Off (On)*. Use the *up* or *down* button to change this setting to *Off (On)* and Press *Enter.*

Figure 8-21.



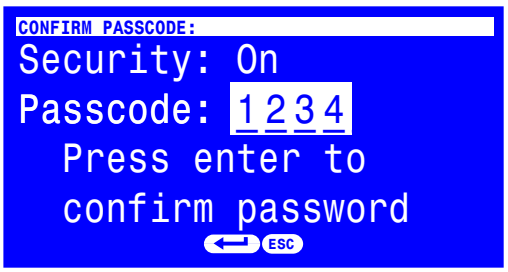
After setting *Security: On*, use the channel buttons (CH 1- CH 8) to enter a four digit passcode. The code can only be numbers between 1 and 8. Press *Enter* to save this passcode.

Figure 8-22.



Press *Enter* again to confirm your change and return to the *Home* screen. Passcode security is now enabled.

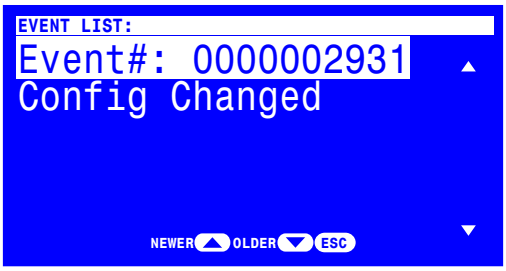
Figure 8-23.



8.4.7.5 Event List

Use this screen to view a list of events recorded by the monitor. The event list is stored in non-volatile memory, and holds up to 200 events. Events are listed in order of occurrence as a numbered sequence ranging from 1 to 65535. When the buffer is full, the oldest events will drop off as new events are added. See Appendix, A Event List for the complete list of possible events.

Figure 8-24.

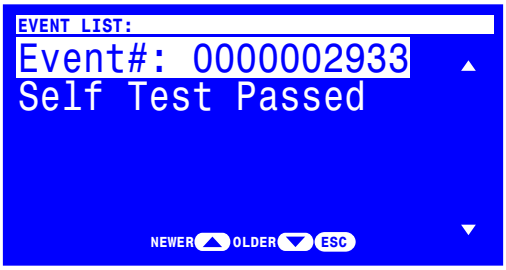


Use the up and down arrow keys to scroll through the list. Newer events are located towards the top of the list.

8.4.7.6 Run Self Test

Select this option to initiate the monitor self test. Upon successful completion of the test, the following screen is displayed:

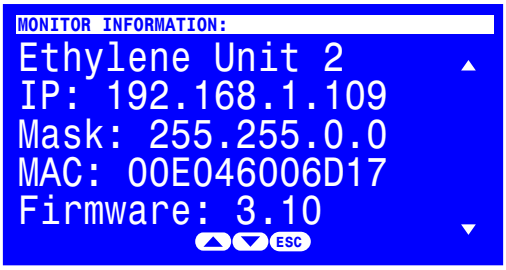
Figure 8-25.



8.4.7.7 Monitor Information

Use this screen to view Monitor Module identification information.

Figure 8-26.

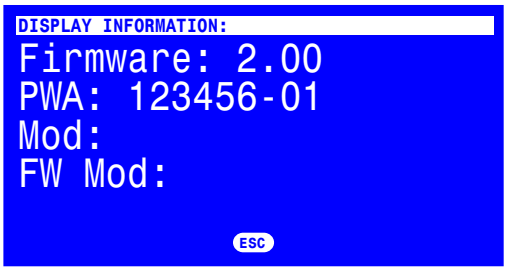


Use the up and down arrow keys to scroll through the information.

8.4.7.8 Display Information

Use this screen to view Display Module identification information.

Figure 8-27.

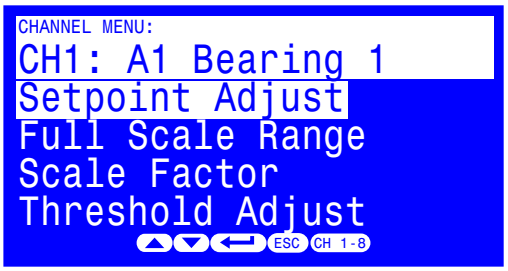


Use the up and down arrow keys to scroll through the information.

8.4.8 Channel Menu Screen

This screen allows you to access settings for the currently selected channel. Use the *up* or *down* arrows to highlight the desired selection and press *Enter*.

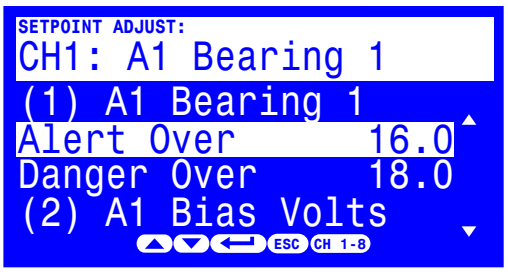
Figure 8-28.



8.4.8.1 Setpoint adjust Screen

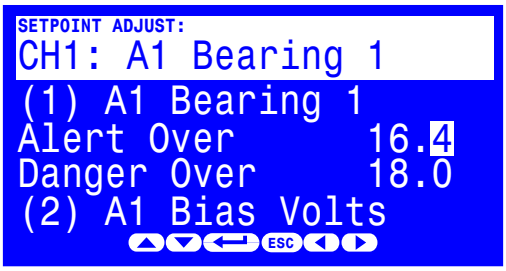
Use this screen to change alarm setpoints.

Figure 8-29.



Use the *up* or *down* arrows to highlight the desired alarm setting and press *Enter* to highlight the setpoint value. Use the arrows to move the cursor through the digits and change the values.

Figure 8-30.

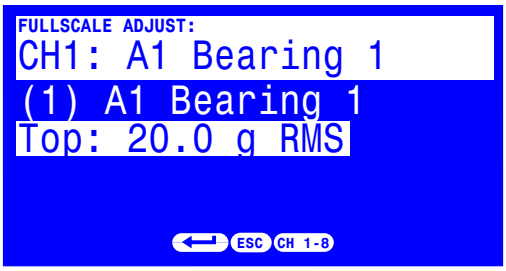


Press enter to accept the new value or escape to cancel the change.

8.4.8.2 Full Scale Range Adjust Screen

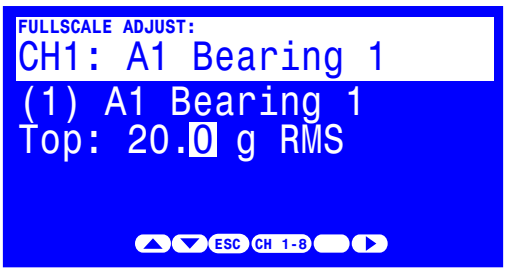
Use this screen to change the full scale range.

Figure 8-31.



Press *Enter* to highlight the full scale value. Use the arrows to move the cursor through the digits and change the values.

Figure 8-32.

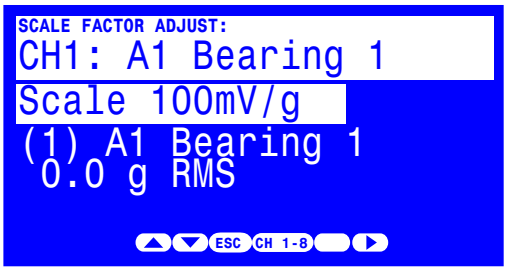


Press enter to accept the new value or escape to cancel the change.

8.4.8.3 Scale Factor Adjust Screen

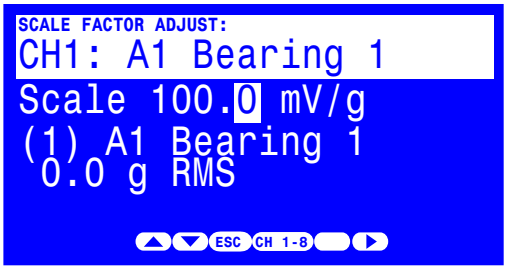
Use this screen to change the transducer scale factor.

Figure 8-33.



Press *Enter* to highlight the scale factor value. Use the arrows to move the cursor through the digits and change the values.

Figure 8-34.

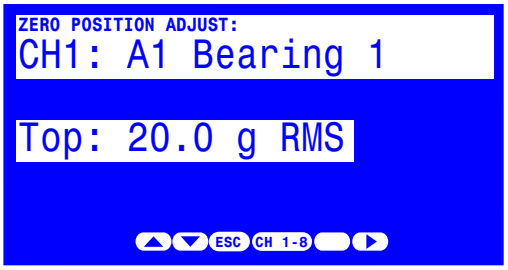


Press enter to accept the new value or escape to cancel the change.

8.4.8.4 Zero Position Adjust Screen

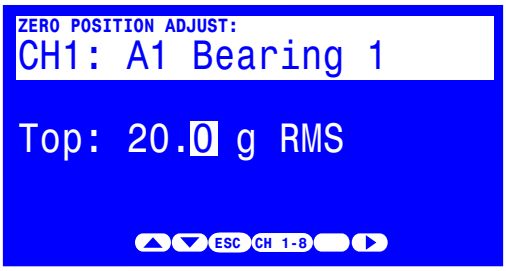
Use this screen to change the transducer zero position.

Figure 8-35.



Press enter to begin adjusting the value, or the CH1 – CH4 keys to adjust a different channel. Once the value is selected, use the left and right arrows to move the cursor, and the up and down arrows to adjust the value.

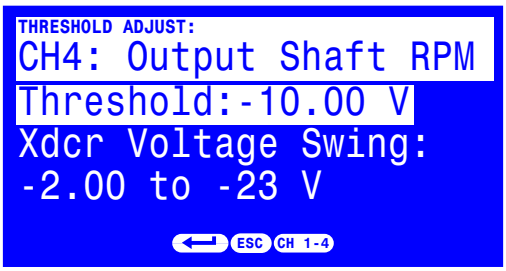
Figure 8-36.



8.4.8.5 Threshold Adjust Screen

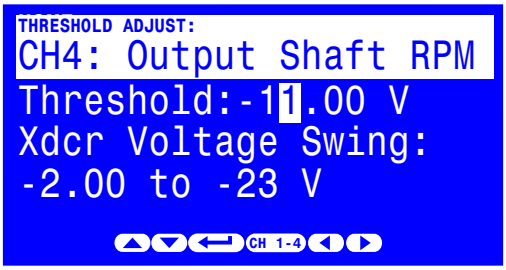
Use this screen to change a speed channel threshold (trigger) voltage.

Figure 8-37.



Press enter to begin adjusting the value. Once the value is selected, use the left and right arrows to move the cursor, and the up and down arrows to adjust the value.

Figure 8-38.

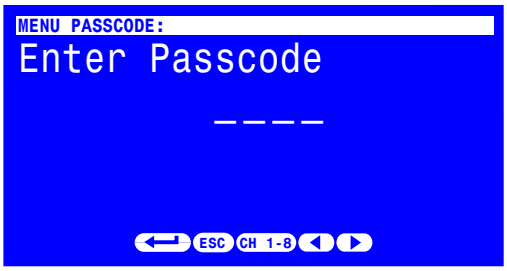


8.4.9 Menu Passcode Screen

When security is turned on, you must enter the correct security code to access configuration screens, bypass settings, alarm resets and the security options screen.

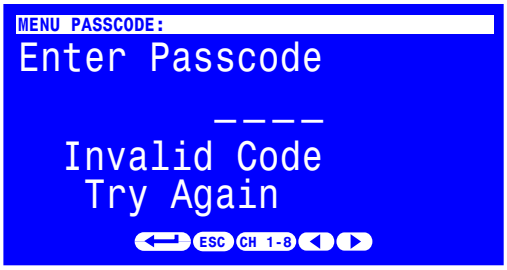
If security is active, the menu passcode screen will open when you access a configurable feature, bypass setting, or reset. To open the feature, enter the correct code and press *Enter.* Security will be disabled for 5 minutes.

Figure 8-39.



If the wrong passcode is entered, the display will indicate it is wrong and prompt you to try again.

Figure 8-40.



9 Maintenance

Maintaining a 1900/65A consists of periodically inspecting the unit and testing the alarms and relays to verify proper operation.

CAUTION Maintenance and verification should be performed by qualified personnel only. These services are available from Bently Nevada, LLC.

CAUTION Circuit boards and components inside 1900/65A cannot be repaired in the field. Units that are not operating correctly should be replaced with a spare. Repair services are available from Bently Nevada, LLC.

9.1 Choosing a Maintenance Interval

WARNING The 1900/65A General Purpose Equipment Monitor is a low maintenance instrument. However, when used for critical applications or when personal safety is concerned, we recommend that monitor functions should be verified on a periodic basis.

Use the following approach to choose a maintenance interval:

1. Start with an interval of one year.
2. Shorten the interval if either of these conditions apply:
   - The monitored machine could pose a risk to personnel or the environment.
   - The monitor operates in a harsh environment such as in extreme temperature, high humidity, or in a corrosive atmosphere.
3. At each interval, review the results of the previous verifications and *ISO Procedure 10012-1* to adjust the interval.

9.2 Basic Inspection

9.2.1 Monitor Module

With power applied to the unit, inspect the following items:

STATUS LED: When the Monitor Module is powered up, confirm the Status LED is on and is not flashing.

TX/RX LED: When the Ethernet cable is plugged in to the RJ-45 network connector and the cable is connected to your facility network, confirm the LED is illuminated mostly green. Flashes of yellow are normal and indicate network activity. If a network cable is not plugged in, the TX/RX LED will flash only yellow at a slow rate of about once every 4 seconds.

9.2.2 Display Module

With power applied to the unit, inspect the following items:

LCD Display: LCD is lighted and readable.

OK LED: In the absence of a Not OK condition, the OK LED should be illuminated green.

Alert LED: In the absence of an Alert condition, the Alert LED should be off.

Danger LED: In the absence of a Danger condition, the Danger LED should be off.

Bypass LED: When the monitor is not inhibited and no channels are in Bypass mode, the Bypass LED should be off.

Trip Multiply LED: When Monitor Trip Multiply mode is inactive, the Trip Multiply LED should be off.

Buffered Output Channel Selection (CH1-CH4): Monitor the buffered output with an oscilloscope and verify each active channel may be observed when selected by pressing its selection button.

9.2.3 Electrical Connections

Inspect the electrical connections and verify they are in good condition. Connections must have no corrosion or loose wires.

9.2.4 Weatherproof Enclosure

Inspect the weatherproof enclosure for good sealing. Moisture or dust must not migrate into the enclosure.

9.2.5 Cleaning the Monitor

Blow dust from unit with compressed air. If additional cleaning is required, use only a mild detergent solution applied with a damp cloth or sponge to clean the unit. Avoid solvents or abrasive cleaners.

CAUTION



Remove power from the unit before cleaning. Wring out the sponge or cloth thoroughly. Use care not to contaminate the inside of the case, the connectors or the electronics with water. Allow unit to dry thoroughly before applying power.

9.3 Verifying Alarms and Relays

Alarms are verified by applying a test signal, varying the input signal level through alarm setpoints, and observing that the alarm status changes. Alarm status changes can be observed on the Display Module, or in the Online Values window of the configuration software. Relay state changes are verified by measuring continuity across the relay contacts.

APPLICATION ALERT



Testing will cause alarm setpoint levels to be exceeded, causing alarms to activate. This could result in a relay contact state change.

WARNING



High voltage present. Contact could cause shock, burns, or death. Disconnect power before touching exposed wires or terminals.

9.3.1 Verifying Vibration Variable Alarms

9.3.1.1 3-Wire Setup

Use this setup to test 3-wire sensors on proximity and acceleration channel types.

Required Test Equipment:

- Power Supply
- Multimeter, 4½ digits
- Function Generator

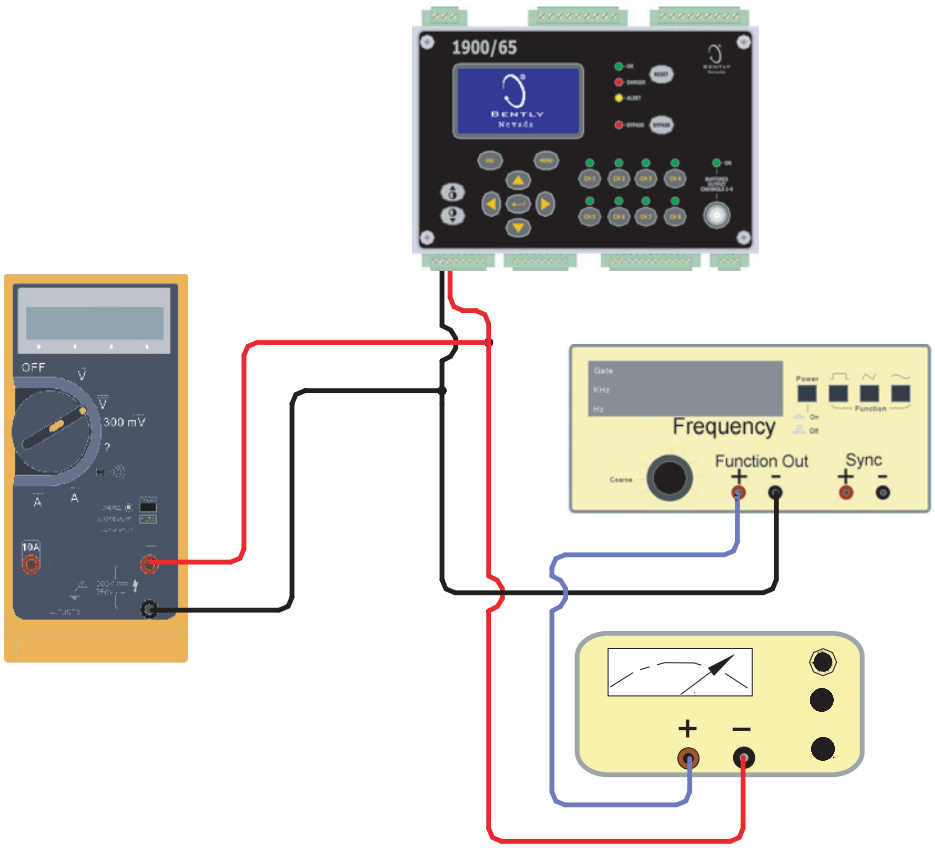
Connect the 1900/65A monitor as shown in Figure 9-1. Connector pinouts for CH1 – CH4 are shown in Figure 3-8.

NOTE



SIG/B must always be negative with respect to *COM/A*.

Figure 9-1. Test setup for 3-wire sensors on proximity and acceleration channel types.



9.3.1.2 2-Wire Setup

Use this setup to test 2-wire sensors on velocity and acceleration channel types.

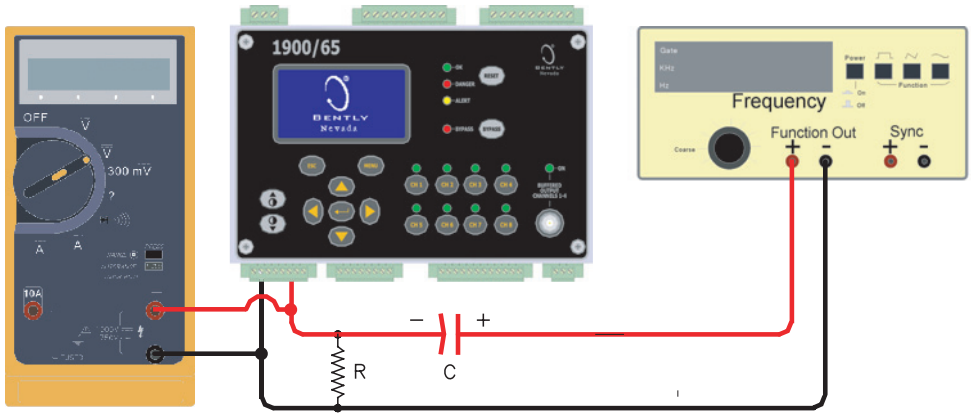
Required Test Equipment

- Multimeter, 4½ digits
- Function Generator
- 10 to 50 µF capacitor
- 3 to 4 kΩ resistor

Connect the 1900/65A monitor as shown in Figure 9-2. Connector pinouts for CH1 – CH4 are shown in Figure 3-8.

NOTE *SIG/B* must always be driven negative with respect to *COM/A.*

Figure 9-2. Test setup for 2-wire sensors on acceleration and velocity channel types.



9.3.1.3 Test Procedure for Vibration Variable Alarms

1. Disconnect COM/A and SIG/B field wiring from the channel that is going to be tested.
2. Disconnect the wiring from the relay that is going to be tested.
3. Connect the circuit shown in Figure 9-1 or Figure 9-2 depending on the type of sensor. In both cases SIG/B must be biased negative with respect to COM/A.
4. For 3-wire sensors, set the DC power supply to simulate the bias voltage of the transducer being used. This is typically 9 to 12 volts. For 2-wire sensor configurations the resistor shown in Figure 9-2 will provide the necessary bias voltage. If in doubt about the bias voltage check the configuration software to see what the ok limits are, then set the bias voltage half way between the upper ok and the lower ok voltage.
5. Calculate the RMS value of input voltage that is equivalent to the alert and danger setpoints. If setpoints are configured in peak or peak to peak, they will have to be converted to RMS first.
6. Peak is equal to (peak-peak)/2
7. For a Sine wave only, RMS is equal to (peak) x (0.707)
8. setpoint voltage = (setpoint value) x (transducer scale factor)
9. Set the signal generator to produce a sine wave at a frequency that is in the middle of the configured pass band for the variable being tested. Note that the corner frequency of the input circuit shown in Figure 9-2 is as high as 5 Hz. If the test frequency is below 50 Hz, use a 100 µF capacitor in the test circuit.
10. Set the signal generator voltage just below the alarm setpoint. The Alarm should not be activated.
11. Slowly increase the voltage until the alarm is activated. Record this voltage.
12. Verify the correct alarm value by converting alarm voltage back to vibration units.

13. Verify relay state change with an ohmmeter.
14. Repeat steps 1 through 10 for remaining channels.

9.3.2 Verifying Position, Gap, and Bias Alarms

Use this procedure to verify alarms and relays for position, Gap, and Bias variables for all channel types. This method can be used for both 2-wire and 3-wire sensors.

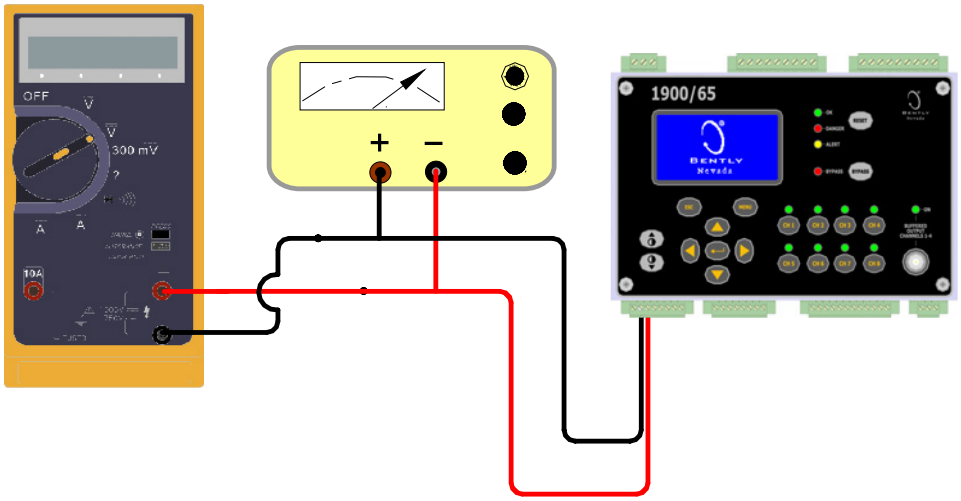
9.3.2.1 Setup for Verifying Position, Gap and Bias Variable Alarms

Required Test Equipment

- Power Supply (single channel)
- Multimeter, 4½ digits

Connect the 1900/65A monitor as shown in Figure 9-3. Connector pinouts for CH1– CH4 are shown in Figure 3-8.

Figure 9-3. Test setup for verifying position, gap and bias variable alarms.



NOTE *SIG/B* must be negative with respect to *COM/A.*

9.3.2.2 Procedure for Verifying Position Variable Alarms

1. Disconnect COM/A and SIG/B field wiring from the channel that is going to be tested.
2. Disconnect the wiring from the relay that is going to be tested.
3. Connect the circuit shown in Figure 9-3. SIG/B must be biased negative with respect to COM/A

4. Set the DC power supply to simulate the zero position and record this voltage.
5. Adjust the voltage until the alarm status changes. Record this voltage.
6. Calculate the actual alarm setpoint based on the difference in voltage between the measured setpoint voltage and the zero position voltage.
7. Actual Setpoint = (measured voltage difference) / (transducer scale factor)
8. Verify the correct alarm value by comparing the actual setpoint to the configured setpoint.
9. Verify relay state change with an ohmmeter.
10. Repeat steps 1 through 8 for remaining channels.

9.3.2.3 Procedure for Verifying Gap and Bias Variable Alarms

1. Disconnect COM/A and SIG/B field wiring from the channel that is going to be tested.
2. Disconnect the wiring from the relay that is going to be tested.
3. Connect the circuit show in Figure 9-3. SIG/B must be biased negative with respect to COM/A.
4. Set the DC power supply to simulate the Bias voltage.
5. Adjust the voltage until the alarm status changes. Record this voltage.
6. Verify the correct alarm value by comparing the measured voltage to the configured voltage.
7. Verify relay state change with an ohmmeter.
8. Repeat steps 1 through 7 for remaining channels.

9.3.3 Verifying Temperature Alarms

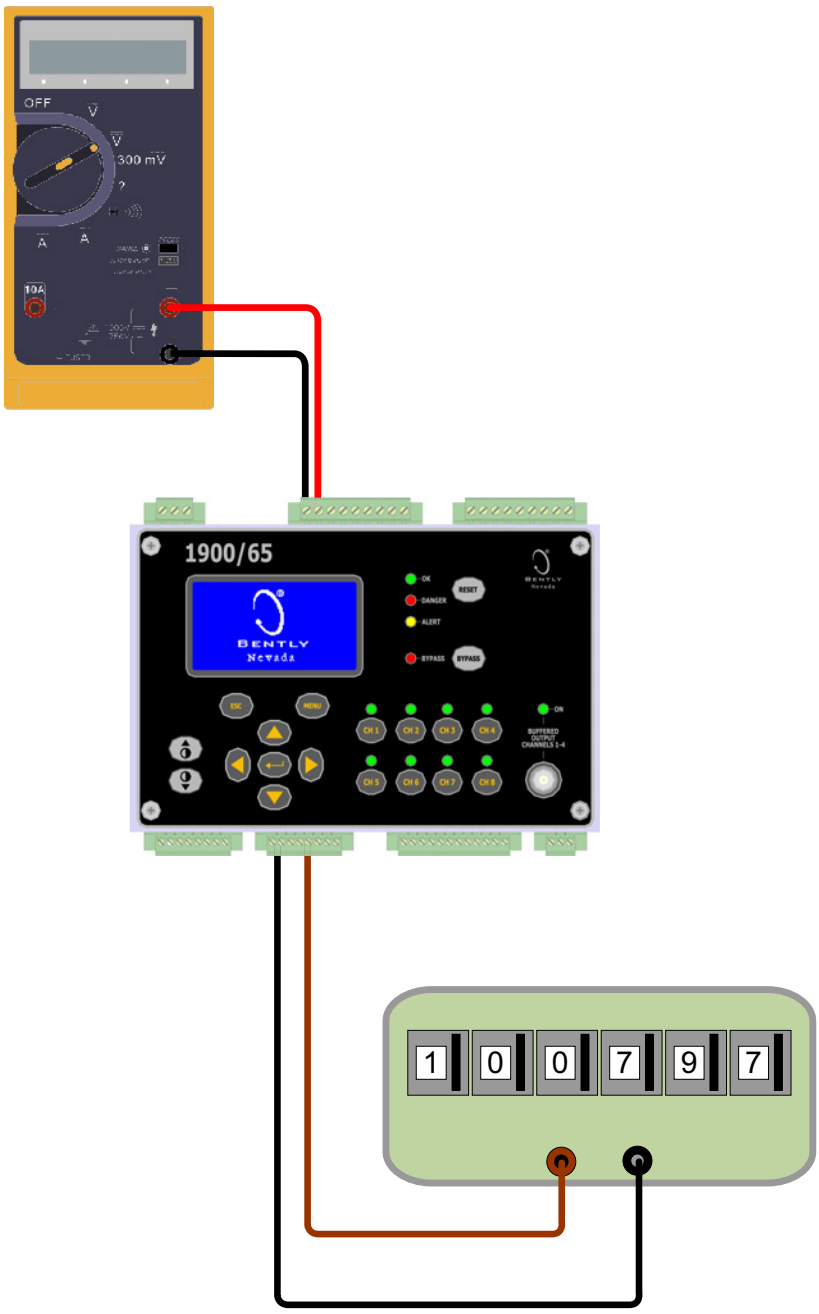
Required Test Equipment:

- A process calibrator (millivolt source) capable of calibrating and driving thermocouple inputs at the alarm temperatures.
- A decade box resistor capable of simulating the changing RTD resistance values at the alarm temperatures
- Ohmmeter

9.3.3.1 Procedure for Thermocouple-driven Temperature Alarms

1. Disconnect thermocouple wires from the channel being tested.
2. Disconnect the wiring from the relay being tested.
3. Connect the process calibrator to the thermocouple channel being tested using the same type of thermocouple wire this channel is configured for.
4. Set the process calibrator output to a temperature slightly below the setpoint. Verify the alarm LED is not active.

Figure 9-4. Thermocouple test setup.

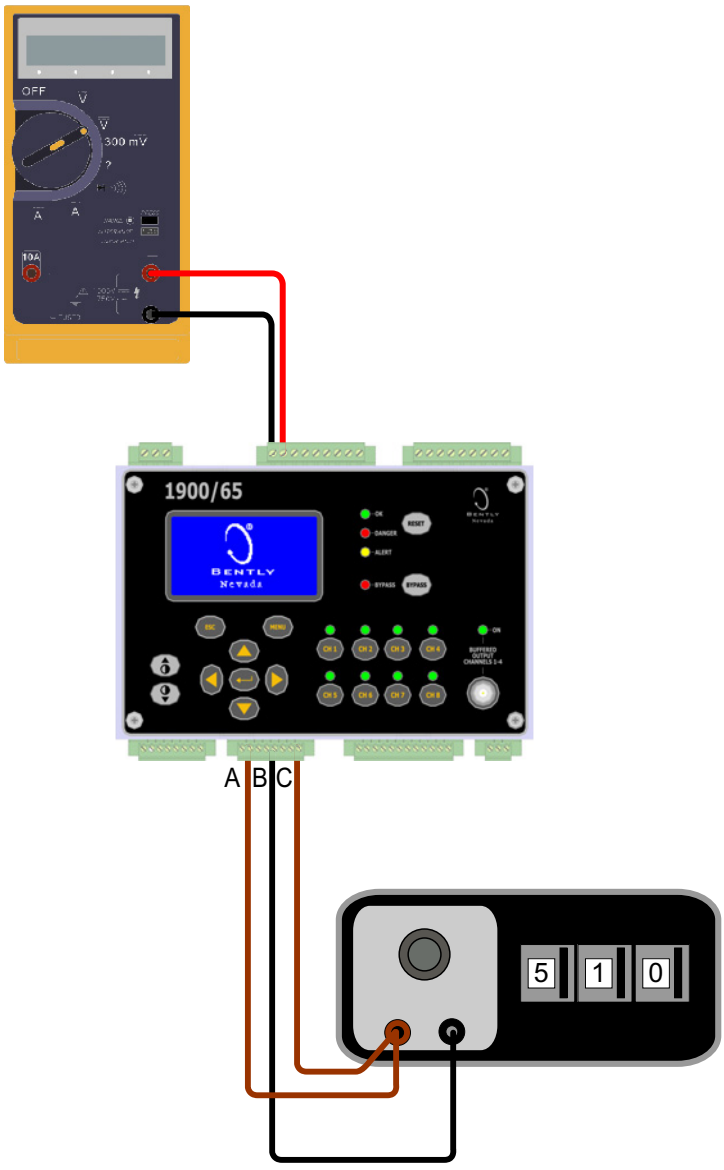


5. Use the ohmmeter to verify the relay contacts are not in an alarm state.
6. Slowly increase the process calibrator output until the alarm LED goes active. Record this value.
7. Use the ohmmeter to verify the relay contacts are in the alarm state.
8. Verify this simulated temperature and the programmed setpoint temperature match.
9. Repeat steps 1 through 8 for the remaining thermocouple-driven temperature channels.

9.3.3.2 Procedure for RTD-driven Temperature Alarms

1. Disconnect RTD wires from the channel that is being tested.
2. Disconnect the wiring from the relay that is being tested.
3. Connect the decade box resistor to the RTD channel (Figure 9-5). Keep wires short to minimize errors.
4. Connect the ohmmeter to the relay contacts (Figure 9-5) to observe their state (open or closed).

Figure 9-5. RTD Test setup.



5. Use the RTD tables in Appendix F to determine a resistance value equivalent to a temperature a few degrees below the alarm setpoint. Record this value.
6. Set the decade box resistor to this value. Verify that the alarm LED is not active.

7. Observe the ohmmeter to verify the relay contacts are not in an alarm state.
8. Slowly increase the decade box resistor resistance until the alarm LED goes active.
9. Observe the ohmmeter to verify the relay contacts are in the alarm state.
10. Measure the decade box resistor value that caused the alarm to go active. Record this value.
11. Use the RTD tables in Appendix F to convert the decade box resistor value the its equivalent temperature. Record this temperature.
12. Verify this simulated RTD temperature and the programmed setpoint temperature match.

Repeat steps 1 through 11 for the remaining RTD-driven temperature channels.

9.3.4 Verifying Speed Alarms

Use this procedure to verify alarms and relays for Speed variables on Speed Channel types. Use the 3-wire test setup for this test.

Required Equipment:

- Power Supply
- Multimeter, 41/2 digits
- Function Generator

9.3.4.1 Setup for Verifying Speed Variable Alarms

Connect the 1900/65A monitor as shown in the 3-Wire Setup, Figure 9-1. Connector pinouts for Ch1 - Ch4 are shown in Figure 3-8.

NOTE SIG/B must always be negative with respect to COM/A.

9.3.4.2 Test Procedure for Speed Variable Alarms

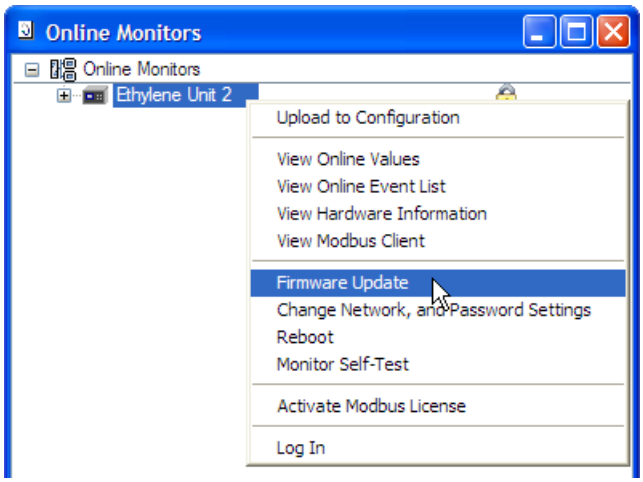
1. Disconnect the COM/A and SIG/B field wiring from the channel that is going to be tested.
2. Disconnect the wiring from the relay that is going to be tested.
3. Connect the circuit as shown in the 3-Wire Setup, Figure 9-1. Connector pinouts for Ch1 - Ch4 are shown in Figure 3-8.
4. Set the DC power supply voltage halfway between the upper and lower OK limits for the transducer selected. (If Manual Threshold is used set the power supply voltage to the value configured for the Threshold level.)

5. Set the signal generator to output a 5 Vpp square wave at a frequency just under the alarm setpoint.
6. Slowly change the frequency until the alarm is activated. Record this frequency.
7. Verify the correct alarm value by converting the alarm frequency back to RPM units.
8. Verify the relay state change with an ohmmeter.
9. Repeat steps 1-8 for the remaining channels.

9.4 Firmware Upgrade Procedure

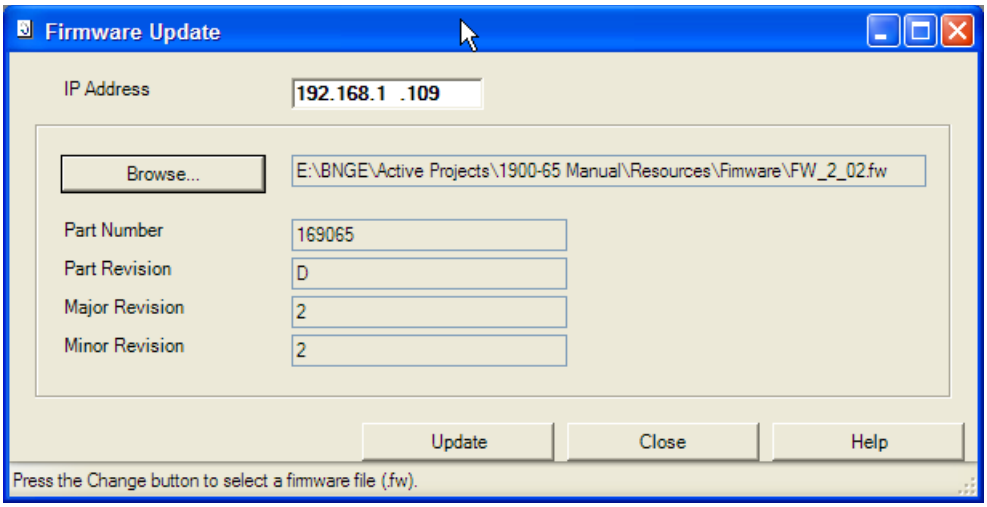
1. Open the 1900 Configuration Software.
2. Click the *Online* icon (located in the Toolbar) to locate the 1900/65A monitors on your network.
3. Right-click on the monitor you want to upgrade. The context menu will open.

Figure 9-6. Context Menu. Click on Firmware Update.



4. Click on *Firmware Update*. The firmware update window will open.

Figure 9-7. Firmware Update window.



5. Click the change button to locate the firmware file. Verify the correct *.fw file is located in the dialog window.
6. Click the *Update* button to complete the Firmware upgrade.

9.5 Self Tests

The monitor has three categories of self test: cyclic, power-up, and user-invoked.

Power-Up Tests: Power-up self test is performed automatically each time monitor power is applied. A series of basic tests and transducer OK tests are performed. Upon completion of the tests, if no errors are present, the monitor will perform Timed OK/Channel Defeat and monitoring will resume in 30 seconds.

Cyclic Tests: Cyclic self test is performed automatically during monitor operation. Errors are logged in the event list.

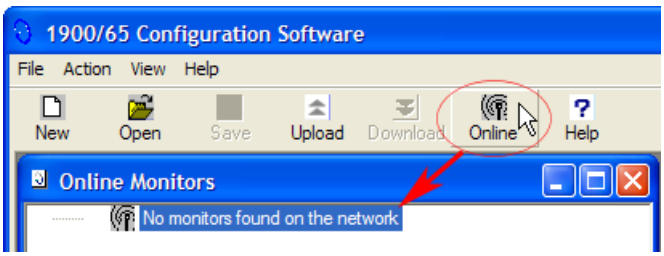
User-invoked Tests: The User may invoke the power-up self test from the monitor context menu if the Online Monitor window is open. It may also be invoked from the Display Module menu.

10 Troubleshooting

10.1 I Can't Communicate with the Monitor

- When the **Online** button is pressed, the network search returns the message *"No monitors found on network"*.
- When the **Online** button is pressed, the network search does not display a specific monitor even though other monitors are shown.

Figure 10-1. No monitors found.



10.1.1 Personal Firewall is Blocking Monitor

If you are running a personal firewall on your computer, it may be blocking communications to the monitor.

To check if this is the cause, do the following:

1. Turn off or disable the firewall.
2. Click the Online button in the 1900 Configuration Software Toolbar (Figure 10-1).

If the Online Monitors window now shows one or more monitors (Figure 10-2), the firewall is blocking the monitor's IP address.

Figure 10-2. Online monitor shown in the Online Monitor Window.



Solution: Add the monitor IP address to the firewall's trusted zone. Expand the monitor branch (click on the plus sign) to view its IP address. Do one of the following:

- Add this address to your firewall's trusted zone. Review your firewall's documentation for instructions.

- Change the monitor IP address to fall within your firewall's trusted range of IP addresses. See Paragraph 6.7 for instructions.

10.1.2 System Firewall is Blocking Ports used by the Monitor.

The 1900/65A monitor uses ports 56011 and 56012 for UDP communication. A system firewall between your computer and the monitor may be blocking these ports.

Solution: Enable ports 56011 and 56012 through the firewall for inbound and outbound UDP communications. See your firewall documentation or contact your IT help desk for instructions.

10.1.3 Wrong Network Cable.

When connecting directly to a network or to a hub, switch, or router, use a straight-through cable (see Paragraph 3.4.8.1). When connecting directly to a computer, use a crossover cable (see Paragraph 3.4.8.2).

Solution: Inspect the cable and replace with the correct type for the application.

10.1.4 Unreachable Monitor Network Address.

The monitor and computer must have the same network prefix (network number) in order to communicate.

Example: If your computer has an address of 66.214.0.100 and your network uses a subnet mask of **255.255**.0.0 (/16), the monitor must be assigned network prefix **66.214**.xxx.xxx. This means addresses 66.214.0.1 through 66.214.0.99 and 66.214.0.101 through 66.214.255.254 are valid for the monitor if they are not already assigned to another device on the network. Values 66.214.0.0 (subnet address) and 66.214.255.255 (broadcast address) are reserved by the network.

Solution: Use the same network prefix as defined by your network subnet mask and computer address.

10.1.5 Routing Table Does Not Recognize New Monitor

If you replace a monitor and program the new monitor with the same IP address that was used in the old monitor, the network may not be able to communicate with this new monitor for a significant amount of time. Some networks are slow to update network routing tables when a new monitor, with a new MAC address, is programmed with the IP address previously used by the old monitor.

Solution: Program the new monitor with a different static IP address.

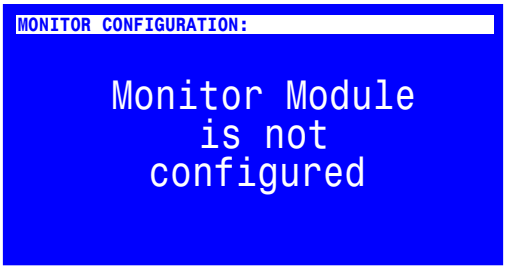
10.2 Display Module Fault Displays

The Display Module can output the several fault displays on the LCD. These displays are included here with possible causes and solutions.

10.2.1 Monitor Not Configured

This screen indicates the Monitor Module is not configured for operation.

Figure 10-3.



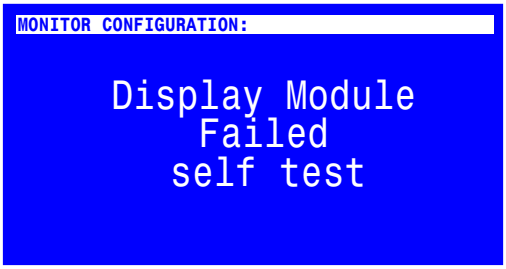
Possible Cause: Monitor does not contain a configuration.

Solution: Download a configuration file into the Monitor Module. See Paragraph 6.8 for instructions.

10.2.2 Self Test Screen

This screen indicates the Display Module has failed self test.

Figure 10-4.



Possible Cause: Hardware failure.

Solution: Contact Bently Nevada, LLC.

Appendix A Event List

Table A-1. 1900/65A Event list.

Event Code	Description	Level	Direction
1	1900 Has Rebooted	1900	none
2	Not Ok	Channel	Enter/Exit
3	Alert	Variable	Enter/Exit
4	Danger	Variable	Enter/Exit
5	Relay Active	Relay Channel	Enter/Exit
6	Config Changed	1900 or Channel or Variable	none
7	Config Change Failed	1900 or Channel or Variable	none
8	Reset Latching[a]	1900	none
9	MonitorInhibit[b]	1900	Enter/Exit
10	Bypass[c]	Channel	Enter/Exit
11	Danger Bypass[d]	Channel	Enter/Exit
12	Flash Memory Failure	1900	none
13	Config Lost[e]	1900	none
14	Inhibit/Bypass Lost 1900[f]	none	
15	Events Lost[g]	1900	none
16	Self Test Passed	1900	none
17	Self Test Failed	1900	none
18	A/D Failure	Channel	Enter/Exit
19	CJC Failure	1900	Enter/Exit
20	HCS08 Failure	1900	Enter/Exit
21	+12 V Failure	1900	Enter/Exit
22	-24 V Failure	1900	Enter/Exit
23	+1.4 V Failure	1900	Enter/Exit
24	+2.5 V Failure	1900	Enter/Exit
25	Display Fault[h]	1900	Enter/Exit
26	+3.3 V Failure	1900	Enter/Exit
27	+5 V Failure	1900	Enter/Exit
28	Modbus Enabled	1900	Enter/Exit
29	Port Failure[i]	1900	Enter/Exit
30	Trip Multiply[j]	1900	Enter/Exit
31	Xdcr Signal Too Slow[k]	Variable	None
32	Xdcr 50% Error[l]	Variable	None

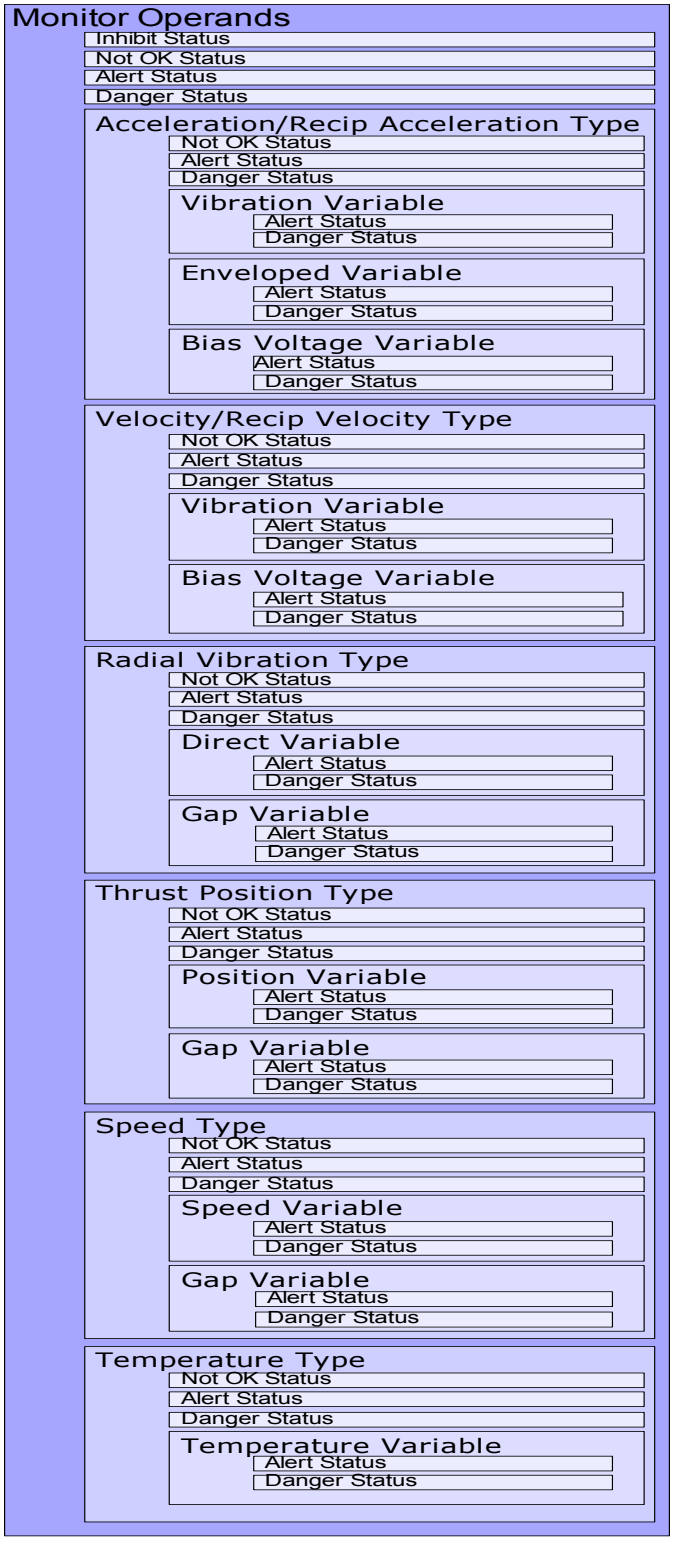
Table A-1. 1900/65A Event list. (Continued)

Event Code	Description	Level	Direction
33	Xdcr Signal Is Valid[m]	Variable	None
34	Serial Port Reset[n]	1900	None

a.Reset Latching: The reset button was pressed, the reset terminals were closed, or a reset command was issued from the 1900 config software.
b.MonitorInhibit: Enter and Exit is based on the monitor inhibit terminals, a monitor inhibit command issued from the 1900 config software or the Display Module.
c.Bypass: Enter and Exit is based on a channel Bypass command issued from the 1900 config software or the Display Module.
d.Danger Bypass: Enter and Exit is based on a channel Danger Bypass command issued from the 1900 config software or the Display Module.
e.Config Lost: The box's configuration is corrupt and can no longer be used. User must download a new configuration.
f.Inhibit/Bypass Lost: The box's monitor inhibit, channel bypass, and channel Danger Bypass settings are corrupt and can no longer be used. All these options have been defaulted back to off. User must download these settings again to enable them.
g.Events Lost: Events occurred faster than they could be added into flash, so some events were not saved.
h.Display Fault: The node voltage used to power the Display Module is out of spec. There could be a problem in the cable.
i.Port Failure: A hardware failure has occurred in one of the monitor's internal components. This failure will affect the operation of all the temperature channels.
j.Trip Multiply: Enter and Exit is based on the monitor inhibit / trip multiply terminals, a trip multiply command issued from the 1900 config software or the Display Module.
k.The input signal for the speed variable is too slow. The input is either slower than 1 event per minute or the calculated speed for the variable is below 1 RPM.
l.Xdcr 50% Error: The input signal frequency for the speed variable is changing too quickly. This check is performed when the variable is reading greater than 100 RPM. This usually means that there is loose wiring or noise is coupling on the input line. Input signal frequencies above the 10,000 events per second operational limit can also cause this problem.
m.Xdcr Signal Is Valid: The input signal for the speed variable was previously invalid but is now working properly.
n.Serial Port Reset: A hardware failure has been detected in the monitor's serial communications port. It has been reset in an attempt to resolve the problem. This reset may have resulted in the loss of a serial Modbus message or a corrupted Modbus response.

Appendix B Statuses

Figure B-1. Monitor, Channel Type and Variable statuses.



B.1 Statuses

B.1.1 Monitor Not Ok

Operation: Status will be true if any enabled channel is not ok (see Channel Not Ok).

Exceptions: Although the “Return Unconfigured, Disabled or Bypassed Channels as Not Ok” option can alter Modbus Channel Not Ok statuses, it has no affect on the Monitor Not Ok status. In determining the Monitor Not Ok status, channels that are unconfigured, disabled, or which have the channel bypass switch set will not cause the Monitor Not Ok status to be true.

B.1.2 Monitor Danger

Operation: Status will be true if any enabled channel is in danger (see Channel Danger).

Exceptions: None.

B.1.3 Monitor Alert

Operation: Status will be true if any enabled channel is in alert (see Channel Alert).

Exceptions: None.

B.1.4 Monitor Bypass

Operation: Status will be true if any of the following cases are true:

- Monitor alarm inhibit is active (see Monitor Alarm Inhibit)
- Any enabled channel is in bypass (see Channel Bypass)

Exceptions: None.

B.1.5 Monitor Alarm Inhibit

Operation: Status will be true if any of the following cases are true:

- Monitor alarm inhibit terminals are shorted
- Monitor alarm inhibit switch is active

Exceptions: None.

B.1.6 Monitor Alarm Inhibit Switch

Operation: This register contains the current status of the alarm inhibit software setting. It will be 0 if the Monitor Alarm Inhibit Switch is off, and it will be 1 if the switch is on. A read of this register will return its current state. Writing 0 to this register will disable it. Writing any non-zero value to this register will

enable it. The value of this switch can also be changed through the 1900 Configuration software or from the display module.

Exceptions: None.

B.1.7 Monitor Trip Multiply

Operation: Status will be true if any of the following cases are true:

- Monitor trip multiply terminals are shorted
- Monitor trip multiply switch is active

Exceptions: None.

B.1.8 Monitor Trip Multiply Switch

Operation: This register contains the current status of the trip multiply software setting. It will be 0 if the Monitor Trip Multiply Switch is off, and it will be 1 if the switch is on. A read of this register will return its current state. Writing 0 to this register will disable it. Writing any non-zero value to this register will enable it. The value of this switch can also be changed through the 1900 Configuration software or from the display module.

Exceptions: None.

B.1.9 Channel Not Ok

Operation: Status will be true if any of the following cases are true:

- The channel's transducer is outside the ok limits
- There is a latched not ok status
- Timed ok channel defeat timer has not expired
- The "Return Unconfigured, Disabled or Bypassed Channels as Not Ok" option is enabled, and one of those conditions applies. This option has no affect on the non-Modbus channel not ok status.
- There is a node voltage failure that is affecting this channel
- There is an A/D failure on this channel
- There is an HCS08 failure
- There is a CJC failure, and this is a TC temperature channel

Exceptions: If the "Return Unconfigured, Disabled or Bypassed Channels as Not Ok" option is disabled, and one of those conditions applies, the status will be false.

B.1.10 Channel Danger

Operation: Status will be true if any enabled variable belonging to the channel is in danger.

Exceptions: If the channel is unconfigured or disabled, the status will be false.

B.1.11 Channel Alert

Operation: Status will be true if any enabled variable belonging to the channel is in alert.

Exceptions: If the channel is unconfigured or disabled, the status will be false.

B.1.12 Channel Bypass

Operation: Status will be true if any of the following cases are true:

- Monitor alarm inhibit is active (see Monitor Alarm Inhibit register)
- Channel Bypass Switch is active
- Channel Danger Bypass Switch is active
- An enabled variable belonging to the channel is invalid and has enabled setpoints with non-latched alarms (see Variable Invalid)
- Timed ok channel defeat timer has not expired and a variable belonging to the channel has enabled setpoints with non-latched alarms.

Exceptions: If the channel is unconfigured or disabled, the status will be false.

B.1.13 Channel Bypass Switch

Operation: This register contains the current status of the channel bypass software setting. It will be false if the Channel Bypass Switch is off, and it will be true if the switch is on. A read of this register will return its current state. Writing 0 to this register will disable it. Writing any non-zero value to this register will enable it. The value of this switch can also be changed through the 1900 Configuration software or from the display module.

Exceptions: If the channel is unconfigured or disabled, the status will be false. Writing to it will return a SLAVE DEVICE FAILURE error.

B.1.14 Channel Danger Bypass Switch

Operation: This register contains the current status of the channel danger bypass software setting. It will be 0 if the Channel Danger Bypass Switch is off, and it will be 1 if the switch is on. A read of this register will return its current state. Writing 0 to this register will disable it. Writing any non-zero value to this register will enable it. The value of this switch can also be changed through the 1900 Configuration software or from the display module.

Exceptions: If the channel is unconfigured or disabled, the status will be false. Writing to it will return a SLAVE DEVICE FAILURE error.

B.1.15 Channel Disabled

Operation: Status will be true if the channel is unconfigured or disabled. Otherwise it will be false.

Exceptions: None.

B.1.16 Variable Invalid

Operation: Status will be true if any of the following cases are true:

- The channel that the variable belongs to is not ok, timed ok channel defeat is enabled, and this variable is not gap or bias voltage
- Channel bypass switch is active on this variable's channel
- The "Return Unconfigured or Disabled Variables as Invalid" option is enabled, and one of those conditions applies.
- There is a node voltage failure that is affecting this variable's channel
- There is an A/D failure on this variable's channel
- There is an HCS08 failure
- There is a CJC failure, and this is a TC temperature variable
- The variable is speed, the speed is greater than 100 RPM and there is currently a delta speed error.

Exceptions: If the "Return Unconfigured or Disabled Variables as Invalid" option is disabled, and one of those conditions applies, the status will be false.

B.1.17 Variable Danger

Operation: Status will be true if the variable is in danger.

Exceptions: If the variable is unconfigured or disabled, the status will be false.

B.1.18 Variable Alert

Operation: Status will be true if the variable is in alert.

Exceptions: If the variable is unconfigured or disabled, the status will be false.

B.1.19 Variable Disabled

Operation: Status will be true if the variable is unconfigured or disabled. Otherwise the status will be false.

Exceptions: None.

B.1.20 Variable Underspeed

Operation: Status will be true if the variable is speed and is less than 1 RPM, or if the speed input signal is less than 1 event per minute.

Exceptions: If the variable is unconfigured or disabled, the status will be false.

B.1.21 Variable 50% Error

Operation: Status will be true if the variable is invalid due to a speed input signal that had a period change of more than 50% between consecutive periods. This detection is only performed if the speed is greater than 100 RPM.

Exceptions: If the variable is unconfigured or disabled, the status will be false.

B.1.22 Relay Asserted

Operation: Status will be true if the relay logic configured to drive the relay is currently true.

Exceptions: If the relay is unconfigured or disabled, the status will be false.

Appendix C 1900/55 Replacement

The 1900/65A monitor can serve as an upgrade or as a replacement for the 1900/55 Fan Monitor. The information in this chapter summarizes how to replace a 1900/55 monitor with a 1900/65A monitor.

C.1 1900/55 Removal

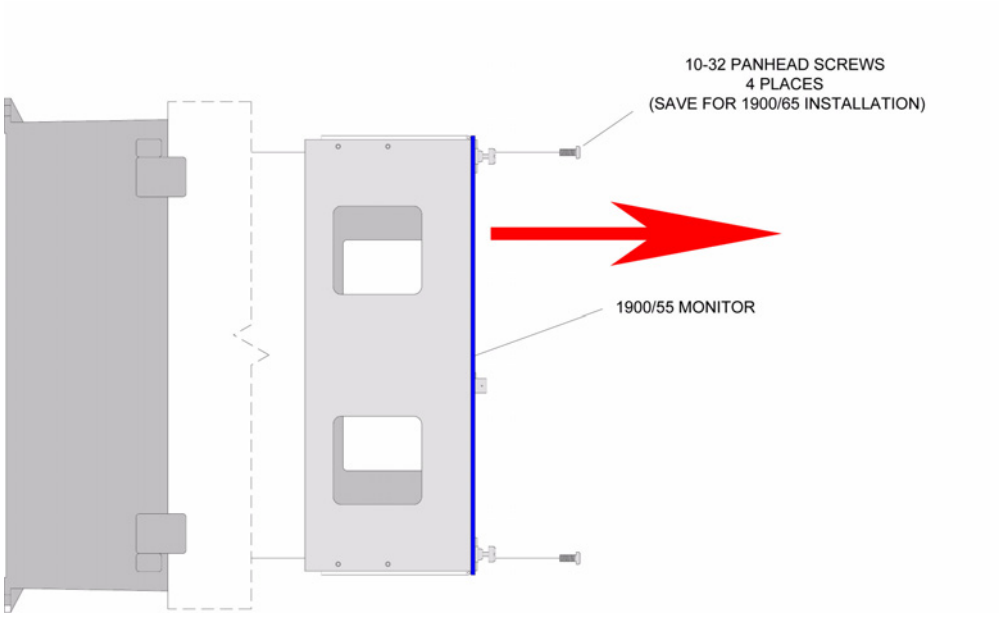
1. Disable power to the 1900/55 monitor and to its relays.

WARNING High voltage present could cause shock, burns, or death. Do not touch exposed wires or terminals.



2. Open the 1900/55 door to expose cables and wires.
3. Disconnect AC mains from the monitor.
4. Remove terminal blocks from the monitor. Leave the cables and wiring connected to the terminal blocks for now.
5. Remove the 1900/55 monitor chassis as shown in Figure C-1.

Figure C-1. 1900/55 Removal



C.2 Transfer cables to New Terminal Blocks

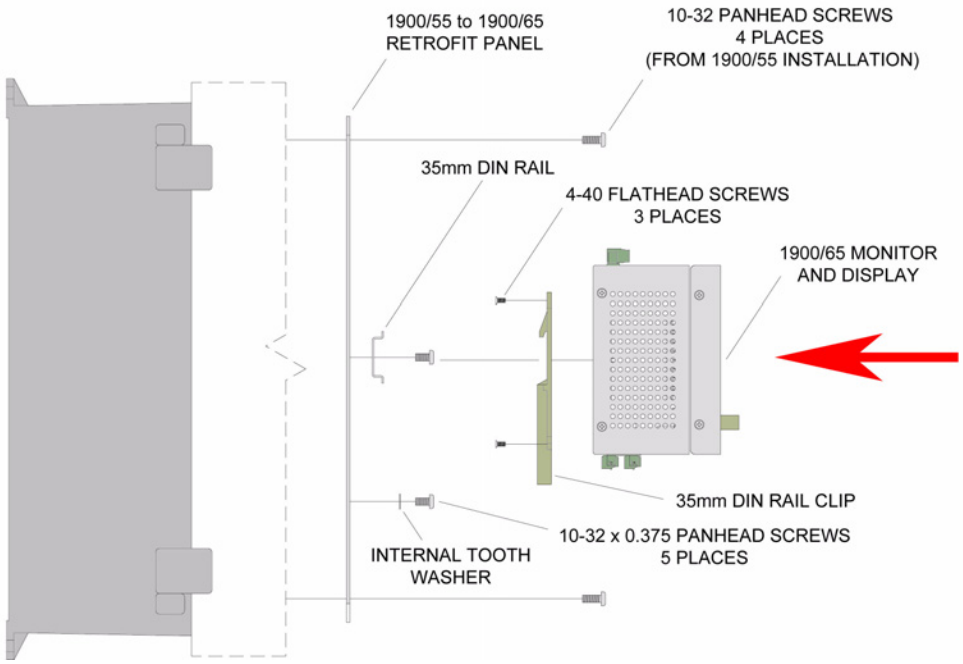
Move wires and cables from the 1900/55 terminal blocks to the 1900/65A terminal blocks as detailed in Paragraph 3.4.

C.3 1900/65A Installation

Install the 1900/65A monitor as shown in Figure C.2:

1. Install the DIN rail onto the retrofit panel.
2. Install retrofit panel in housing.
3. Clip the Monitor and local power supply (if used) onto the DIN rail.
4. Connect terminal blocks into Monitor Module.
5. Install Display Module.

Figure C-2. 1900/65A Installation

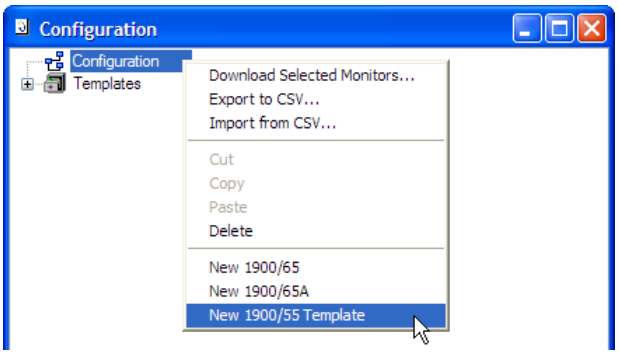


C.4 1900/65A Configuration

Create a new configuration using the New 1900/55 Template:

1. Right-click on the Configuration object. The context menu will open.
2. Click on *New 1900/55 Monitor* (Figure C-3). A configuration emulating the 1900/55 monitor will open.

Figure C-3. 1900/55 template in the context menu.



Edit this configuration as needed and download it to the monitor. Monitor configuration is covered in Chapter 6.

Appendix D References

D.1 Specifications and Ordering Information

- 173401-01 – 1900/65A Specifications and Ordering information

  Contains a summary of the monitor capabilities, specifications, approvals information, ordering instructions and an accessories list.

D.2 1900/65 Modbus Gateway User Guide

- 172250-01– 1900/65 Modbus Gateway User Guide

D.3 Modbus Specifications

- Modbus Application Protocol version 1.1a
- Modbus Messaging on TCP/IP Implementation Guide version 1.0a
- Modbus Over Serial Line Specifications and Implementation Guide version 1.0

Documents are available free of charge at: www.modbus.org

D.4 Field Wiring Diagram

- 173089 – 1900/65A Field Wiring Diagram

D.5 Approvals Installation Drawing

- 173404 CE Installation Drawing

D.6 Acceleration Enveloping Information

- Machinery Message: *Acceleration Enveloping - Higher Sensitivity, Earlier Detection* Orbit magazine – 2nd quarter 2004 issue

  Acceleration Enveloping is a useful technique for detecting rolling element bearing failures at early stages of degradation.

Appendix E RTD Lead Wire Errors

Table E-1. Typical copper lead wire resistance, ohms per foot.

Lead wire AWG	Ω/ft at 20°C
12	.0016
14	.0025
16	.0040
18	.0064
20	.0102
22	.0161
24	.0257

Table E-2. Lead wire temperature sensitivity, ohms per degrees C.

RTD Element type	Temperature range	Base resistance	Temperature coefficient	Sensitivity (avg. Ω/°C 0 to 100 °C)
Platinum	-200 to 850 °C	100Ω at 0°C	0.00385	0.385
Platinum	-200 to 700 °C	100Ω at 0°C	0.00392	0.392
Copper	-100 to 260 °C	10Ω at 25°C	0.00427	0.039
Nickel	-100 to 260 °C	120Ω at 0°C	0.00672	0.806

Because an RTD is a resistance type sensor, any resistance in the field wiring between the RTD and the 1900/65A will cause an offset error in the RTD measurement. Using a 3 wire RTD connection will reduce this offset error to a negligible level. If a three wire connection is not available, the 1900/65A configuration software can compensate for the offset error caused by the wiring resistance. However, it can't compensate for changes in wire resistance caused by temperature changes.

To estimate the temperature error in an uncompensated 2-wire system, multiply the total length of the wires by the appropriate value in Table E-1. Then divide by the sensitivity of the RTD element from Table E-2 to obtain an error in degrees C. For Example:

RTD: 2-wire 100Ω platinum 0.00385 element

Lead wire: 24 AWG leads, 50 feet long

Ambient temperature range of lead wire: 25° C - 60° C

Total wire resistance = 100 ft x 0.0257Ω / ft = 2.57Ω

Approx. offset error = 2.57Ω / (0.385 Ω / °C) = 6.7°C

Copper resistance changes approx. 0.4%/ °C

Approx. resistance change = (2.57Ω x 0.4%/ °C x 60°C)/(100)
= 0.617Ω

Approx. ambient temp change error = 0.617 /(0.385 / C)
= 1.6 C

Appendix F RTD Conversion Tables

Table F-1. 10Ω copper (α=0.00427) RTD

Temperature °C	Copper α=0.00427	Temperature °C	Copper α=0.00427	Temperature °C	Copper α=0.00427
-200	1.058	-50	7.104	100	12.897
-190	1.472	-40	7.490	110	13.283
-180	1.884	-30	7.876	120	13.669
-170	2.295	-20	8.263	130	14.055
-160	2.705	-10	8.649	140	14.442
-150	3.113	0	9.035	150	14.828
-140	3.519	10	9.421	160	15.217
-130	3.923	20	9.807	170	15.607
-120	4.327	30	10.194	180	15.996
-110	4.728	40	10.580	190	16.386
-100	5.128	50	10.966	200	16.776
-90	5.526	60	11.352	210	17.166
-80	5.923	70	11.738	220	17.555
-70	6.318	80	12.124	230	17.945
-60	6.712	90	12.511	240	18.335
				250	18.726

Table F-2. 120Ω nickel (α=0.00672) RTD

Temperature °C	Nickel α=0.00672	Temperature °C	Nickel α=0.00672	Temperature °C	Nickel α=0.00672
-80	66.600	30	142.060	140	238.836
-70	73.103	40	149.800	150	248.950
-60	79.620	50	157.745	160	259.295
-50	86.165	60	165.900	170	269.894
-40	92.755	70	174.268	180	280.770
-30	99.410	80	182.849	190	291.949
-20	106.150	90	191.639	200	303.455
-10	113.003	100	200.640	210	315.310
0	120.000	110	209.854	220	327.536
10	127.168	120	219.290	230	340.144
20	134.518	130	228.950	240	353.140
				250	366.531

Table F-3. 100Ω Platinum (α=0.00392)

Temperature °C	Platinum α=0.00392	Temperature °C	Platinum α=0.00392	Temperature °C	Platinum α=0.00392
-200	16.996	100	139.261	400	250.000
-190	21.374	110	143.123	410	253.509
-180	25.719	120	146.972	420	257.007
-170	30.031	130	150.810	430	260.493
-160	34.314	140	154.637	440	263.967
-150	38.570	150	158.451	450	267.429
-140	42.799	160	162.254	460	270.880
-130	47.003	170	166.045	470	274.319
-120	51.185	180	169.825	480	277.746
-110	55.345	190	173.592	490	281.161
-100	59.485	200	177.348	500	284.565
-90	63.606	210	181.092	510	287.957
-80	67.709	220	184.825	520	291.337
-70	71.795	230	188.545	530	294.706
-60	75.866	240	192.254	540	298.062
-50	79.922	250	195.951	550	301.407
-40	83.963	260	199.637	560	304.740
-30	87.991	270	203.310	570	308.062
-20	92.007	280	206.972	580	311.372
-10	96.009	290	210.623	590	314.670
0	100.000	300	214.261	600	317.956
10	103.979	310	217.888	610	321.231
20	107.946	320	221.503	620	324.493
30	111.902	330	225.106	630	327.744
40	115.845	340	228.697	640	330.984
50	119.777	350	232.277	650	334.211
60	123.697	360	235.845	660	337.427
70	127.606	370	239.402	670	340.631
80	131.503	380	242.946	680	343.824
90	135.388	390	246.479	690	347.004

Table F-4. 100Ω Platinum (α=0.00385)

Temperature °C	Plantains α=0.00385	Temperature °C	Plantains α=0.00385	Temperature °C	Plantains α=0.00385
-200	18.520	180	168.478	560	300.754
-190	22.825	190	172.173	570	304.010
-180	27.096	200	175.856	580	307.254
-170	31.335	210	179.528	590	310.487
-160	35.543	220	183.188	600	313.708
-150	39.723	230	186.836	610	316.918
-140	43.876	240	190.473	620	320.116
-130	48.005	250	194.098	630	323.302
-120	52.110	260	197.712	640	326.477
-110	56.193	270	201.314	650	329.640
-100	60.256	280	204.905	660	332.792
-90	64.300	290	208.484	670	335.932
-80	68.325	300	212.052	680	339.061
-70	72.335	310	215.608	690	342.178
-60	76.328	320	219.152	700	345.284
-50	80.306	330	222.685	710	348.378
-40	84.271	340	226.206	720	351.460
-30	88.222	350	229.716	730	354.531
-20	92.160	360	233.214	740	357.590
-10	96.086	370	236.701	750	360.638
0	100.000	380	240.176	760	363.674
10	103.903	390	243.640	770	366.699
20	107.794	400	247.092	780	369.712
30	111.673	410	250.533	790	372.714
40	115.541	420	253.962	800	375.704
50	119.397	430	257.379	810	378.683
60	123.242	440	260.785	820	381.650
70	127.075	450	264.179	830	384.605
80	130.897	460	267.562	840	387.549
90	134.707	470	270.933	560	300.754
100	138.506	480	274.293	570	304.010
110	142.293	490	277.641	580	307.254
120	146.068	500	280.978	590	310.487
130	149.832	510	284.303	600	313.708
140	153.584	520	287.616	610	316.918
150	157.325	530	290.918	620	320.116
160	161.054	540	294.208	630	323.302
170	164.772	550	297.487	640	326.477

Table F-5. 100Ω Platinum (α=0.00385)

Temperature °C	Platinum α=0.00385	Temperature °C	Platinum α=0.00385	Temperature °C	Platinum α=0.00385
650	329.640	720	351.460	790	372.714
660	332.792	730	354.531	800	375.704
670	335.932	740	357.590	810	378.683
680	339.061	750	360.638	820	381.650
690	342.178	760	363.674	830	384.605
700	345.284	770	366.699	840	387.549
710	348.378	780	369.712		

Glossary

Numbers

10BaseT

10BaseT is a version of Ethernet operating at 10 Mbps and is defined by the IEEE 802.3 standard.

100BaseTX

Often called *Fast Ethernet*, 100BaseTX is a version of Ethernet operating at 100 Mbps and is defined by the IEEE 802.3u standard.

Abbreviations

cm – centimetre

deg – degrees (angular)

g – g (acceleration due to gravity on earth).

Hz – frequency

in/s – inches per second (velocity)

m – metre

m/s^2 – metre per second per second (acceleration)

mm – millimetre

mm/s – millimetre per second (velocity)

pk – zero-to-peak (amplitude)

pp – peak-to-peak (amplitude)

rms – root-mean-square

rpm – revolutions per minute (shaft rotative speed).

A

Accuracy

The ratio, often expressed in percent, of the error to the full-scale meter reading, or the error to the actual input value. Often confused with inaccuracy, which is the departure from the true value into which all causes

of error are combined. The word “accuracy” is often incorrectly used as a synonym for repeatability.

Accelerometer

An accelerometer is an inertial transducer which converts the acceleration characteristic of mechanical vibration into a proportional electric signal.

ADU

Application Data Unit. An enclosing wrapper for a PDU that adds addressing information and error check data.

Alarm

A status event that occurs when a measured or calculated value exceeds a pre-defined limit for a minimum period of time. The 1900/65A monitor provides Alert and Danger alarms.

Alarm Inhibit

A function that causes the monitor to suppress all alarm statuses from changing state. Alarm Inhibit is a temporary state that allows the user to perform routine maintenance around the machine being monitored without risk of causing an unintended alarm event.

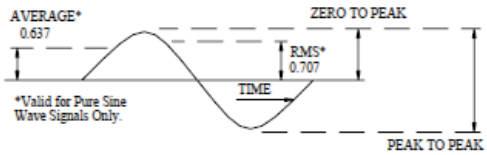
Alert

The less severe of two possible alarm states. An Alert state is active when the magnitude of an input signal exceeds a threshold or goes out of band for a pre-defined duration.

Amplitude

The magnitude of periodic dynamic motion (vibration). Amplitude is typically expressed in terms of signal level (millivolts or milliampere) or the engineering units of the measured variable (mils, micrometers, inches per second, etc). The amplitude of a signal can be measured in terms of peak-to-peak, zero-to-peak, rms, or average.

Figure G-1.



AMPLITUDE

Axial

In the same direction as the shaft centerline.

Axial position

The average position, or change in position, of a rotor in the axial direction with respect to some fixed reference. Typically, the reference is the thrust bearing support structure or other casing member close to the thrust bearing.

B

Band-pass filter

A filter which has a single transmission band extending from a finite lower corner frequency greater than zero to a finite upper corner frequency. The corner frequencies are defined as those points on either side of the center frequency where the amplitude is attenuated by 3 dB. At the center frequency, the signal amplitude is not attenuated.

Bypass

A state where the monitoring and alarming function of a channel, variable or monitor is disabled. Affected outputs are driven to the Clamp Value during a Bypass state.

C

Calibration

A procedure during which known values of the measured variable are applied to a transducer or readout instrument and corresponding output readings are verified or adjusted as necessary.

Channel type

Channel type defines the function and kind of processing that will be applied to an input signal. Each type also limits the kind of variables or measurement values that will be derived from this input, as well as the kind of transducer that can be used. Channel types include Acceleration, Recip Acceleration, Velocity, Recip Velocity, Radial Vibration, Thrust Position and Temperature.

Clamp Value

The value that an output goes to when the associated channel is bypassed or defeated (for example, when a problem occurs with the transducer). The clamp value can be between zero and the full-scale range.

Constant current accelerometer

A transducer that outputs an analog voltage proportional to acceleration. Electrical power is provided to the transducer from the monitor by sending a constant supply current over a two wire cable. The output signal is also developed across the cable conductors.

Contacts

The current carrying components of a switch or relay that can be opened to interrupt current flow or closed to allow current flow.

D

Danger
: The more severe of two possible alarm states. A Danger state can be set to activate when the magnitude of an input signal exceeds a threshold or goes out of band for a pre-defined duration.

DCS
: See Distributed Control System.

display computer
: Personal computer running Bently Nevada 1900 Configuration Software.

Distributed Control System
: A generic term used to describe a plant-wide or enterprise-wide information architecture used to monitor and control distributed equipment remotely.

DSP
: Digital Signal Processor. An integrated circuit that filters and conditions the input signals.

E

Electromagnetic Interference
: An electrical/magnetic disturbance that interrupts or degrades the effective performance of electronics or electrical equipment.

EMI
: See Electromagnetic Interference.

Enveloping:
: A diagnostic method useful for detecting faults in rolling element bearings at an early stage of development before the fault causes component failure. The information of interest is extracted from the spectrum of the envelope that modulates the resonant waveform output by the de facto transducer/structural system. Enveloping can also be used to detect faults in gearboxes and electric motors.

Ethernet
: A LAN (local area network) protocol defined by the IEEE as the 802.3 standard. See also 10BaseT and 100BaseTX.

F

Frequency Response
: The variation in the amplitude and phase of a signal in a physical system as a function of frequency.

G

g
: The value of acceleration yielded by the force of gravity, which varies somewhat with the earth latitude and elevation of the point of observation. By international agreement, the value of 9.8 m/s² (386 in/s², 32.17 ft/s²) has been chosen as the standard acceleration due to gravity.

Gap
: See Probe Gap.

H

Hertz (Hz)
: A unit of frequency measurement represented by one cycle per second.

host computer
: Personal computer running Bently Nevada 1900 Configuration Software.

I

Inches/second
: Abbreviation: in/s. Engineering unit for velocity is inches/second, zero to peak. See also Velocity.

Internet Protocol
: Acronym: IP. A computer networking protocol that divides data into packets and routes these data packets from a source computer to a destination computer over a network.

IP
: See Internet Protocol.

J

Journal
: The portion of a shaft inside the fluid-lubricated bearing which transmits applied loads to bearing supports.

K

Keyphasor® Pulse
: A change in the output signal of the Keyphasor® Transducer caused by a once-per-turn event such as a key or keyway on a rotating shaft.

L

Lateral vibration
: See Radial vibration.

LED
: See Light Emitting Diode.

Latching relay
: A latching relay will switch contact states when the input relay logic goes true and remain in this state until manually reset.

Light Emitting Diode
: Acronym: LED. An indicator device on the front panel of the monitor that illuminates to indicate an event or operating state. Light Emitting Diodes may be red, yellow or green in color.

Linearity (Calibration)
: The closeness of a calibration curve to a specific straight line, expressed as the maximum deviation of any calibration point from the specified straight line, within any one calibration increment.

Low-Pass Filter
: A filter having a single transmission band extending from zero frequency (or the lower frequency response limit of the transducer or instrument) to some finite upper corner frequency (defined as the point where amplitude is attenuated by 3 dB).

M

MAC Address
: The Media Access Control Address is a unique 48-bit value assigned to the hardware of a network interface or any device that communicates over Ethernet.

mil
: A unit of length or displacement equal to 0.001 inch or one mil. One mil equals 25.4 micrometres or 0.0254 mm.

m/s^2
: Metric units for acceleration in metres per second per second peak. One *m/s^2* equals 0.1019 g.

mm (millimetre)
: A unit of length or displacement equal to 0.001 metre. One mm equals 0.03937 in.

mm/s
: Metric units for velocity in millimetres/second peak. One mm/s equals 25.4 in/s.

Monitor status
: The status of the OK, Alert, and Danger conditions at the monitor level.

MRO
: Maintenance, Repair and Operation.

N

Normally closed
: A reference to the normal state of switch or relay contacts. For relays, this implies the contacts are in the closed position when relay is unpowered or inactive.

Non-latching relay
: A nonlatching relay will switch contact states when the input relay logic goes true, but will immediately return to the inactive state when the status event ends.

Not OK
: A status indication that implies the wiring between a channel input terminal and the transducer is either open circuit (broken wire) or shorted between conductors. If a channel has Not OK Channel Defeat enabled and registers a Not OK indication, the Alert and Danger detection for that channel will be disabled.

Normal AND Voting
: AND voting in which bypassed statuses are removed from the voting equation.

Normally-energized relay
: A normally-energized relay inverts the operation of the contacts. The *normally closed* contact is open, and the normally open contact is closed.

Normally open
: A reference to the normal state of switch or relay contacts. For relays, this implies the contacts are in the open position when relay is unpowered or inactive.

O

OK

A status indication that implies the wiring between a channel input terminal and the transducer is connected properly and the transducer connection is not open circuit (broken wire) or shorted between conductors. Alert and Danger detection for a channel will be enabled only if the channel registers an OK state.

Ones-based

Implies that an address for a register is relative to a starting address of X00001, and the first register in a block has an address of X00001. By definition, Modbus addresses are provided as one-based values.

P

PCS

See Process Control System.

PDU

See Protocol Data Unit.

PLC

See Programmable Logic Controller

Probe Gap

The physical distance between the face of a proximity probe tip and the observed surface. The distance can be expressed in terms of displacement (mils, micrometres) or in terms of voltage (volts). Standard polarity convention dictates that a decreasing gap results in an increasing (less negative) output signal.

Process Control System

A system which responds to input signals from the process, its associated equipment, other programmable systems and/or an operator and generates output signals causing the process and its associated equipment to operate in the desired manner.

Programmable Logic Controller

Acronym: PLC. A microprocessor-based control device often used as a component in a process control system. PLCs typically use Modbus protocol for communication.

Protocol Data Unit

Fundamental message of the Modbus protocol.

Proximitor®

A Bently Nevada signal conditioning device which provides output signals proportional to both the average and dynamic probe gap distances. Also called a proximity sensor. Proximitor is a Bently Nevada registered trademark.

Proximity Probe

A non-contacting device which measures the displacement motion and position of an observed surface relative to the probe mounting location. Typically, proximity probes used for rotating machinery measurements operate on the eddy current principle and measure shaft displacement motion and position relative to the machine bearing(s) or housing.

R

Radial vibration

Shaft dynamic motion or casing vibration which is measured in a direction perpendicular to the shaft axis, sometimes called lateral vibration.

register

16 bit word in memory used as an interface to the Modbus protocol.

Resistance Temperature Detector

A device used to measure temperatures based on the relationship between electrical resistance and temperature of a film or wire made from plantinum, or other material.

RFI

Radio frequency interference. See Electromagnetic Interference.

Repeatability

The quality of a transducer or readout instrument to produce measurements, under the same conditions, within narrow limits. Precision is the measure of repeatability.

response time

When used in the Modbus context, The time from when the Modbus Communication Module receives a request to when it sends out a response.

rms

Square root of the arithmetic mean of a set of squared instantaneous values. Used as a measure of amplitude; rms equals 0.707 x peak (sine wave only). (0.707 = 1/square root of 2

RTD

See Resistance Temperature Detector.

S

Scale factor

The change in output voltage per change in input of a transducer.

Sensitivity

The ratio of the change in the output to a change in the input. See Scale factor.

status
When used in the Modbus context, status can mean either alarm status or control bit status. Status is discrete data, which usually is represented as a single bit in a 16 bit word.

T

TCP/IP
Transmission Control Protocol/Internet Protocol. A network protocol which allows data to be transmitted between devices.

Thermocouple
A thermoelectric device used to measure temperatures. A thermocouple consists of two wires made of dissimilar metals that are joined at the temperature sensing end. A voltage potential is developed at the point of contact that is proportional to the temperature of the point of contact.

Transducer
A device for translating the magnitude of one quantity into another quantity. The second quantity often has units of measure different from the first and serves as the source of a useful signal.

Trip Multiply
A monitoring system feature whereby alarm setpoints are temporarily elevated during start-up to allow the monitored machine to pass through a balance resonance without generating spurious vibration alarms. This is especially useful for machines employing rolling element bearings which have less damping than fluid-film bearings. Trip Multiply in the 1900/65A is activated and deactivated by sensing the state of a relay contact or switch, which is usually manually controlled by an operator.

True AND voting
AND voting in which bypassed statuses are included the voting equation.

Type E Thermocouple
A Thermocouple made from Chromel (+) and Constantan (-) and provides an operating range of -100°C to +1000°C (-148°F to +1832°F). See also Thermocouple.

Type J Thermocouple
A Thermocouple made from Iron and Constantan and provides an operating range of 0°C to +760°C (+32°F to +1400°F). See also Thermocouple.

Type K Thermocouple
A Thermocouple made from Chromel and Alumel and provides an operating range of 0°C to +1370°C (+32°F to +2498°F). See also Thermocouple.

Type T Thermocouple
A Thermocouple made from Copper and Constantan and provides an operating range of -160°C to +400°C (-256°F to +752°F). See also Thermocouple.

V

Velocity

The time rate of change of displacement. Typical units for velocity are Inches/second or millimetres/second, zero to peak. Velocity measurements are used to evaluate machine housing and other structural response characteristics. Electronic integration of a velocity signal yields displacement, but not position.

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