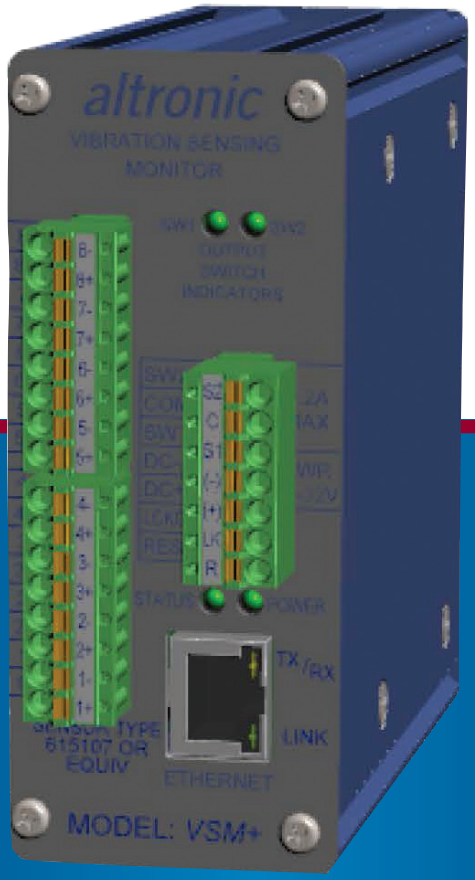
Installation & Operating Manual

VSM+ Vibration Sensing Monitor for PLC

Form VSM+ IOM 9-14

altronic
HOERBIGER Engine Solutions



ODVA APPROVAL PENDING

1.0 PLC+ Function-Specific I/O Modules

1.1 The PLC+ product line was developed by Altronic to allow easy integration of engine/compressor/generator function specific I/O through Ethernet to industry standard PLCs. The PLC+ Modules are designed to seamlessly deliver efficient, hazardous area approved, cost effective I/O functions that are not normally available by off-the-shelf PLC hardware.

1.2 The PLC+ modules were designed with Rockwell Automation Control Logix and Compact Logix controllers in mind. EtherNet/IP implemented in the PLC+ Modules, along with Modbus/TCP allow seamless communication over Ethernet to Rockwell Automation PLCs as well as a wide range of other industrial PLCs.

1.3 The PLC+ Monitors are based upon taking a time tested Altronic designed and tested specialty I/O function such as analog and digital I/O, vibration, detonation, speed, and others and marrying it to a communications board packaged in a rugged, cost effective shock and dust-resistant package.

WARNING: Deviation from this installation/operating manual may lead to improper operation of the monitored machine which could cause personal injury to operators or other nearby personnel.

CAUTION: The VSM vibration monitor is certified for use in Class I, Groups C & D, Division 2 hazardous locations when installed in accordance with these instructions.

The sensor input leads connected to this device operate at a low voltage and power level and MUST NOT CONTACT any external voltage source. Damage to the system will result from connection between the input sensor leads and the ignition system or any AC or DC power source above 36 Vdc.

WARNING: The VSM+ must be configured prior to use.

2.0 VSM+ Description

2.1 The VSM+ Vibration Sensing Monitor is a module in the PLC+ product line. It uses the patented vibration monitoring technique of the VSM-800 and adds an integrated Ethernet port. It is designed to protect industrial engines, compressors, and associated equipment from damage caused by excessive vibration. It accepts up to 8 industry-standard, low-cost, broadband, piezoelectric vibration sensors that are used to transform mechanical vibrations into electrical signals which are then evaluated by the VSM+. Each input channel operates independently of the other. It is designed for use as a component of a PLC+ Control Panel, or as a stand-alone product. PLC+ panels use one or more such devices for engine control and monitoring. The integral Ethernet port allows the monitored values to be communicated to a PC, PLC, or other communications device using either Modbus/TCP or EtherNet/IP protocol. These values can be displayed on an HMI display and compared to user adjustable setpoint levels for alarm and shutdown.

2.2 The VSM+ is a flexible I/O device. It is designed around the Altronic VSM-800 stand-alone Vibration Monitor. The VSM+ is functionally similar to the VSM-800 but without the LCD display and keypad and is packaged in a compact rugged rail-mount package. The VSM+ adds a built-in Ethernet communications port that allows communication to a PLC network. Therefore the VSM+ can be applied as a “Stand Alone” I/O device, as a “basic” input device, or a combination of each to a PLC. The distinction is that with a stand-alone implementation the output switches, remote lockout, reset, timers, and other functions provided by the VSM+ are utilized. The basic application uses the vibration signals from the VSM+ but all other control is done in the PLC.

2.3 The VSM+ is housed in a 4.5” x 4.25” rugged anodized aluminum case. It mounts on a DIN rail using the DIN-rail-clip on the back of the unit. Pluggable Phoenix Contact-type connectors with push-in spring-cage connectors are used for connections. A standard RJ45 connector is used for Ethernet communications. The power requirement is 10 to 32Vdc, 0.20Amp max.

2.4 For proper operation, these instructions must be adhered to strictly.

2.5 This manual does not cover every aspect of installation of the VSM+ because it is very similar to the VSM-800. For additional information that does not appear in this manual, please refer to the Installation/Operation manual VSM IOM. The VSM IOM manual can be found on the Altronic website www.altronic-llc.com

3.0 Mounting

3.1 Mount the VSM+ inside a control panel or to a suitable flat surface. A DIN-rail-mounting-clip on the back of the unit is used to mount the unit on a standard 35mm DIN rail. When mounting the Monitor to the DIN rail, angle the top of the unit towards the rail and slide the top of the clip over the top of the rail. Firmly push the unit towards the rail until it snaps into place. To remove, grab the Monitor firmly on the top of the unit and apply downward pressure to compress the latch spring. Rock the bottom of the unit away from the rail.

WARNING: This monitor is OPEN type equipment that must be used within a suitable enclosure.

4.0 Wiring (SEE WIRING DIAGRAMS)

4.1 GENERAL

Take care not to damage the insulation and take precautions against damage from vibration, abrasion or liquids in conduits. Never run sensor, low voltage power, current loop, communications, or output switch wires in the same conduit as the ignition wiring or other high energy wiring such as AC line power, etc. Keep wires at least 12 inches away from all high voltage wiring.

Keep secondary wires to spark plugs and other high voltage wiring at least 12 inches (205mm) away from vibration sensors and their wiring.

NOTE: Altronic HIGHLY RECOMMENDS the use of resistor spark plugs and/or spark plug leads with all digital instrumentation as a means of reducing the impact of RFI (radio frequency interference) on operation.

4.2 POWER WIRING

Connect the power input wires to terminals (DC+) and (DC-); power requirement is 10 to 32Vdc, 0.20Amp max. Connect the minus terminal (DC-) to panel ground, which must be the same as the ground on the monitored device. This device must be powered from a Class 2 power supply. It is recommended that the current from the power supply to the Monitor be limited through a properly sized surge tolerant fuse or electronic breaker.

WARNING: DO NOT connect the minus terminal directly to AN IGNITION SYSTEM COMMON COIL GROUND ON THE ENGINE.

4.3 VIBRATION SENSOR WIRING

The vibration sensors generate low voltage bipolar signals in the millivolt range. Refer to form VSM IOM for mounting details. Each vibration sensor requires two wires. Use a two-conductor cable of 20-22AWG (Altronic 693134-x or equivalent) to wire the vibration sensor to the sensor input terminals on the front of the VSM+. The sensor cables should be run in rigid conduit or Sealtite/Liquidtite to protect the wires from breakage. The shield wire can be grounded on one end if it is determined that spurious electrical noise is affecting sensor output.

4.4 OUTPUT SWITCH WIRING

Exceeding a setpoint value will cause the user-programmable output switch to turn ON/OFF with respect to its common. The VSM contains two output switches. Switch 1 is typically used for alarm and switch 2 is typically used for shutdown. Output switch 1 will trip when an input value exceeds its alarm setpoint value. Output switch 2 will trip when an input value exceeds its shutdown setpoint value. These switches are solid state, form C (N/O and N/C) break-before-make contacts and are isolated from the power supply. Switch 1 is closed with the absence of power and switch 2 is open with the absence of power. The switches are rated at 32Vdc, 200mA and the N/O switch has a unique internal overload current protection circuit. If an overload occurs, the internal circuitry limits current to safe levels. When the overload is removed, the relay resumes its normal ON characteristics. These switches can be wired to engine management systems, an Altronic annunciator system or to pilot duty relays as shown by the wiring diagrams; see Figure 5.

4.5 RJ45 ETHERNET COMMUNICATIONS WIRING

The VSM+ can communicate to other instruments, PC's, or PLCs via the Ethernet communications port. Use data grade Category 5E Shielded Twisted Pair (STP) or Unshielded Twisted-Pair (UTP) cable that has a 100Ω characteristic impedance that meets the EIA/TIA Category Five (CAT-5) wire specifications. Max wire length is 100 meters / 325 feet.

NOTE: The use of Category 5E STP cable (Shielded Twisted Pair) with shielded RJ45 plug connectors is strongly recommended for installations in harsh industrial environments and/or in the presence of strong electrical fields.

4.6 HAZARDOUS AREA OPERATION

The VSM+ is CSA certified for CLASS I, DIVISION 2, GROUPS C & D areas as a component only and is required to be installed in a suitable enclosure where the

suitability of the combination is subject to the local inspection authority having jurisdiction. The power connections to the VSM must be in accordance with the National Electrical Code and in Canada, the Canadian Electrical Code. In addition, the following requirements must be met:

1. **Run the sensor wires leaving the panel in a separate conduit from all other wiring and keep them separate throughout the installation.**

2. **Power, input, and output wiring must have a grade of insulation capable of withstanding an AC voltage of 500 volts RMS.**

3. **In general, run wires in separate conduits and junction boxes from high voltage wires such as ignition, fuel valve, and other high voltage wiring**.

WARNING: Do not disconnect equipment in Div. 2 environment unless power is switched off or the area is known to be non-hazardous.

5.0 Overview

5.1 The VSM+ senses shock and vibration from the remote mounted vibration sensors and outputs a velocity amplitude number in the range of 0 to 1023. The velocity amplitude number is unitless and in this manual is referred to as the vibration reference number.

5.3 The VSM+ vibration sensor is an automotive type accelerometer. It generates a low voltage signal proportional to vibration intensity. The sensor inputs to the VSM+ are differential and are not referenced to ground.

5.4 Each channel can be configured differently from the others with its own unique alarm and shutdown setpoint value, startup delay timer value, sensor gain value, and trip delay time value.

5.5 There are two output switches, switch 1 is for alarm and switch 2 is for shutdown. Switch 1 is normally closed and switch 2 is normally open with lack of power. These switches are isolated from ground and turn-on to switch common.

6.0 Front Panel LED Indicators

6.1 **POWER** – When the unit is powered, the green "POWER" LED will be on.

6.2 **STATUS** – The status indicator is multi-purpose. It contains several "blink" patterns.

- EtherNet/IP communications mode – one long, one short blink at ¼-second rate
- Modbus/TCP communications mode – short blinks at ¼ second rate
- "wink" mode – steady short blinks at 1/8 second rate for the selected time

6.3 **ETHERNET** – The Ethernet port contains two LED's that are built into the RJ45 connector. The green LINK LED will be on solid if the Ethernet port has successfully established a connection. The yellow RX/TX light signals network activity.

6.4 **OUTPUT SWITCH INDICATORS** – Each of the built-in output switches (SW1 and SW2) have an LED indicator. The LED turns on when the switch is activated.

7.0 Reset

7.1 Reset can be initiated in one of two ways: by pulling the remote reset terminal on the monitor low, or by sending a reset command via communications. RESET resets the Start-Up Timer and places the output switches in the non-tripped condition.

8.0 Startup Lockout

8.1 The Startup Lockout terminal on the monitor is used to lock out the Alarm and

Shutdown output switches from tripping during machine startup when above normal vibrations may occur. The output switches are locked out or disabled when the terminal is low or grounded. For an engine compressor application this terminal can be wired to an oil pressure switch. For loss of oil pressure the switch should be grounded. When the terminal is released, (ungrounded) the Start Delay Timer for each channel commences. The output switches will remain locked-out for each individual channel until the timer for each channel ends. Each channel will become armed when the timer for that channel expires.

9.0 Alarm and Shutdown

9.1 The ALARM and SHUTDOWN setpoints are high setpoints. If the vibration level goes above the alarm setpoint, switch #1 will activate. If the vibration level goes above the shutdown setpoint, switch #2 will activate. Each setpoint can be set anywhere within the range of the monitor, or off.

10.0 Protocols

10.1 The PLC+ Monitors support EtherNet/IP (Ethernet Industrial Protocol) and Modbus/TCP (Modbus over TCP/IP).

10.2 EtherNet/IP – EtherNet/IP is a communication protocol developed and used by Rockwell Automation for use in their Allen Bradley brand PLCs. It is managed by Open DeviceNet Vendors Association (ODVA) (www.odva.org) and is designed for use in process control and other industrial automation applications. Some other vendors using EtherNet/IP are Omron, Schneider Electric, Harting, Phoenix Contact, Opto 22, Wago Corporation, and Yaskawa. EtherNet/IP uses objects to communicate to and from the PLC+ Monitors and the PLC. An object model is a collection of related data values and common elements of the PLC+ monitor. The object model is listed at the end of this manual.

10.3 Modbus/TCP – Modbus/TCP is Modbus over Ethernet. It is very similar to Modbus RTU. The Modbus registers are the same. The memory map of the Modbus registers are listed at the end of this manual.

11.0 EDS File (Electronic Data Sheet)

11.1 The EDS file is used for Monitor configuration and to commission it on an EtherNet/IP network. It is an ASCII text file that describes the Monitors' device type, product revision, and its configurable parameters on the EtherNet/IP network.

11.2 An EDS file for the VSM+ can be found enclosed on the media with this document and on the Altronic ftp site; it may also be downloaded from the onboard web page.

12.0 Embedded Web Server

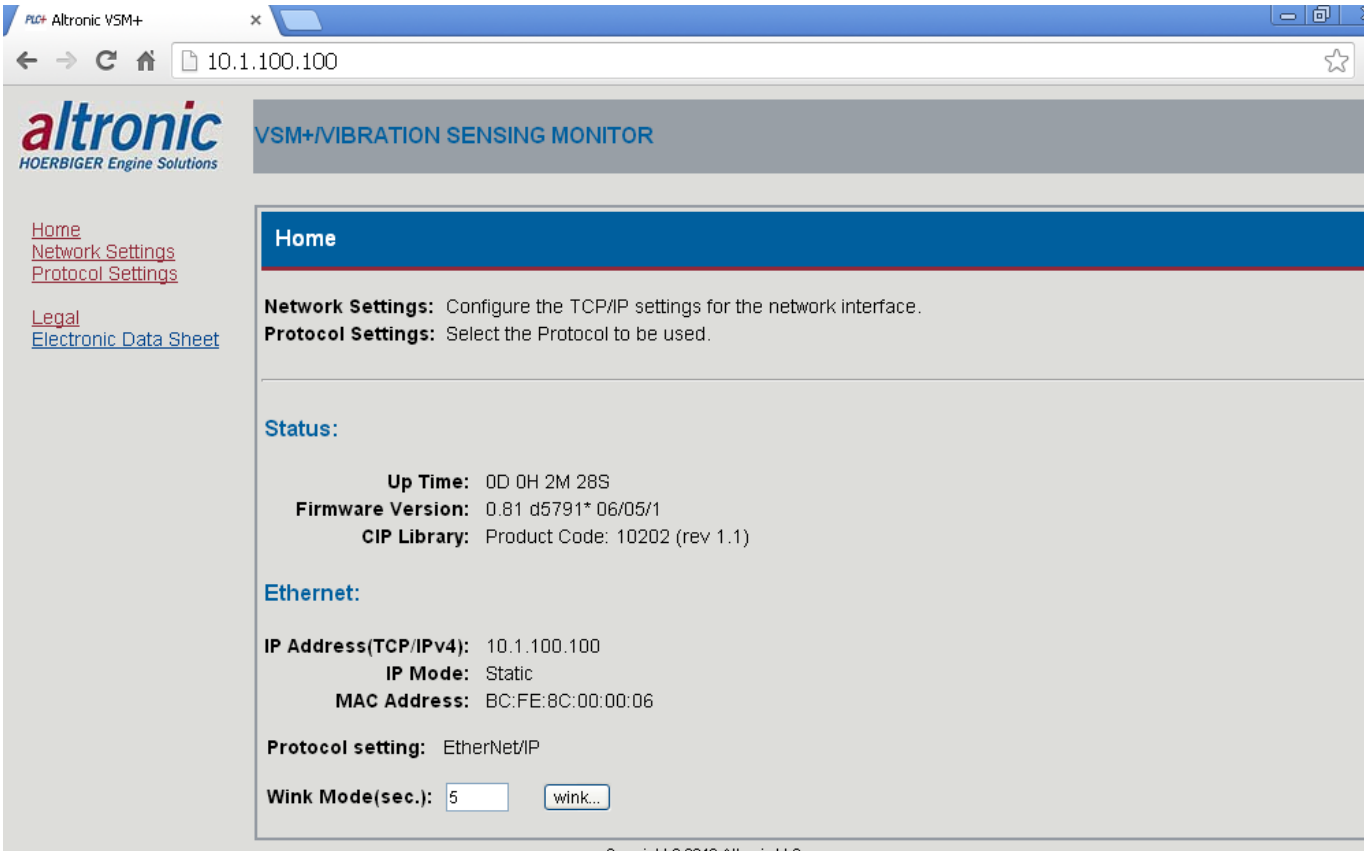
12.1 Each PLC+ Monitor has a built-in web server that allows it to be set up. The embedded web server can be used to view and set the network settings and the protocol settings. For connection details see wiring diagram at the end of this manual.

12.2 The PLC+ Monitors support Auto MDI/MDI-X crossover. A straight-through Ethernet cable may be used to connect the PC to the PLC+ Monitor. A straight-through connection through an Ethernet switch or hub on a network may also be used.

12.3 Once connected and powered, open your web browser and type the IP address assigned to the Monitor in the "Address" bar; http://10.1.100.100 for example. The Monitors home page will be displayed.

NOTE: The default parameters are:
Static IP Address: 10.1.100.100
Subnet Mask:255.255.255.0
Protocol Setting: EtherNet/IP

12.4 Home Page – The Home Page will show the current firmware version, Network Settings, Protocol Settings and allows execution of the “Wink” mode.



Default Settings are shown

Status:

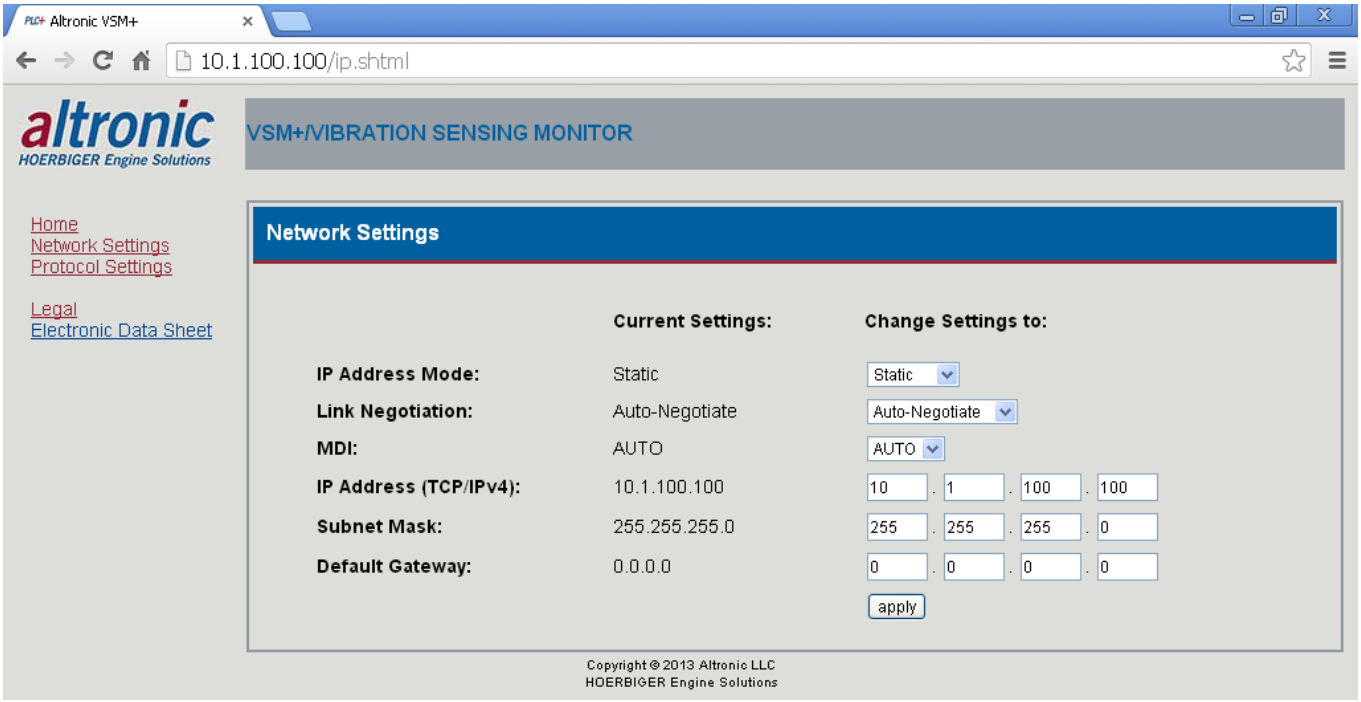
- Up Time – The Up Time is the time between power cycles.
- Firmware Version – The Firmware Version is the revision level and the date it was compiled
- CIP Library – The CIP Library is the personality code of the product and rev level.

Ethernet:

- IP Address – The IP Address is a node identification number for the device on the network. The current IP address is shown.
- IP Mode – IP Mode shows the current Static, DHCP, BootP, or AutoIP IP address assignment type.
- MAC Address – The MAC Address is the unique Hardware identifier of the Monitor assigned by the factory.
- Protocol Setting – Shows the current protocol; either EtherNet/IP or Modbus/TCP.
- Wink Mode – The “wink” mode is used to identify a Monitor in the network. When the wink mode is commanded the “STATUS” LED on the Monitor with the displayed IP address, will blink with short blinks at a rate of 1/8 second. This can be used by the integrator or technician to identify which unit is being talked to. The number of seconds the unit will “wink” for can be selected from 1 to 60 seconds.

13.0 Network Settings

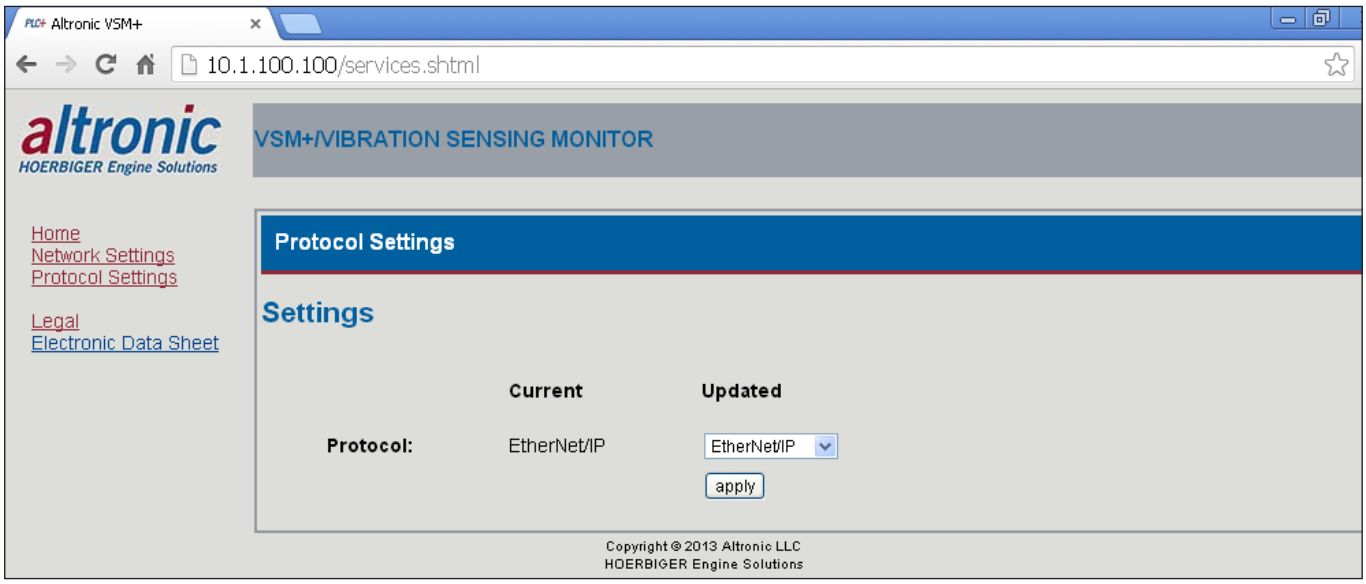
13.1 Select the Network Settings page to change the network settings for this Monitor. Press the apply button to save the new settings. The following network settings can be selected.



Default settings are shown

IP Address Mode:

- Static – A Static IP Address is a fixed IP Address for the Monitor.
- DHCP, AutoIP, BOOTP – Dynamic Host Configuration Protocol (DHCP), link-local address (AutoIP), Bootstrap Protocol (BOOTP) are network discovery protocols that allow the Monitor to be automatically discovered on the network and be assigned the necessary information like an IP address, Subnet Mask, and Gateway by a server connected to the network to allow communication on the network.
- Link Negotiation – Auto-Negotiate, 100 Full Duplex, 100 Half Duplex, 10 Full Duplex, 10 Half Duplex. Auto negotiation chooses the highest performance transmission mode the network supports.
- MDI – A Medium Dependent Interface (MDI), Auto, MDI, MDI-X, is the physical and electrical selection. Auto detects if the connection would require a crossover connection and automatically selects for the correct connection.
- IP Address – The IP Address is an identification number assigned to a device. The PLC+ Monitors are set to a default IP address of 10.1.100.100 when received. See section 15.2 on how to return the IP address to the default setting.
- Subnet Mask – A Subnet Mask is used to distinguish between the host portion of the IP address and the network.
- Default Gateway – The Default Gateway is the node on the network that facilitates communication with other networks. The default gateway setting is optional. For networks that do not have a gateway, this should be set to 0.0.0.0.



14.0 Protocol Settings

14.1 Select the Protocol Settings page to change the protocol for this Monitor. The selections are EtherNet/IP or Modbus/TCP. Press the apply button to save the new settings.

15.0 Default Network Settings

15.1 The VSM+ Monitor is shipped with default network settings to allow the integrator to start at known settings. The following are the default Network Settings:

- IP Address Mode: Static
- Link Negotion: Auto-Negotiate
- MDI: Auto
- IP Address: 10.1.100.100
- Subnet Mask: 255.255.255.0
- Default Gateway: 0.0.0.0

15.2 The Monitor can, at any time, be returned to the default network settings.

1. Power the Monitor
2. Locate the small hole on the bottom of the Monitor in line with the Ethernet connector.
3. Unwrap a paper clip. Insert the end into the hole to activate the reset switch. The switch has tactile feedback. Press and hold the switch on for 5 seconds.
4. Observe the Status LED indicator on the front panel; after a few seconds it will blink in rapid succession indicating the network settings have gone back to the default configuration.
5. Open your web browser and type the default IP address in the “Address” bar: http://10.1.100.100, the monitor home page will be displayed. The network settings on the PC may need to be reconfigured in order to communicate with the device.

NOTE: The Protocol setting is not affected by the reset switch and will remain the same.

16.0 Configuring the VSM+

16.1 Since operating conditions differ, the VSM+ Vibration Sensing Monitor must be customized for each application. Each parameter is described below. The configuration parameter values must be carefully chosen.

NOTE: The VSM+ vibration monitor must be configured prior to use.

16.2 SENSOR GAIN

The SENSOR GAIN adjustment is used to increase or decrease the signal gain from the sensor. If the signal from the sensor results in the reading being too low or too high with the current gain value, the gain can be used to bring the reading into the desired range. Each channel can be individually set from 64 (a small gain value) to 0 (a large gain value). A value of 64 maps to a gain value of .111. A value of 0 maps to a gain value of 2.0. Consult the gain chart in the Modbus table section for further information. If possible, it is suggested to use a similar gain value for all channels. By using a similar gain value for all channels, with respect to each other, a larger vibration will be displayed as a larger value and a smaller vibration will be displayed as a smaller value.

16.3 TRIP DELAY TIME

The TRIP DELAY TIME is used to delay tripping the output switches during a sudden momentary increase in a monitored vibration level. Should a sudden momentary increase in a vibration level occur caused by a one-time impact that is shorter in duration than the Trip Delay Time the monitor will show the impact but the output switches will not trip. Harmful vibrations are typically of the repeating type and will last longer than the Trip Delay Time. Each channel can be individually set from 0 to 15 seconds.

WARNING: Excessive vibration for an extended time period can result in equipment damage and/or personal injury. adjust the trip delay time for the shortest required duration.

16.4 OUTPUT SWITCHES

There are two output switches, typically switch 1 is for ALARM and switch 2 is for SHUTDOWN. Each switch can be set to be active or inactive, shelf or failsafe, and latching or non-latching. Shelf state is when the outputs are in the same condition with no faults as when unpowered; failsafe is when they are opposite. In non-latching mode, the output switch changes state when the setpoints come out of violation; in latching mode, a reset event is required to clear the switches from the tripped state. Unpowered states for the switches are closed for SW 1 and open for SW 2.

16.5 OUTPUT SWITCH #1

Output switch #1 is designed to be used as an alarm. The switch is activated when an alarm setpoint value is violated for any monitored sensor.

16.5.1 ACTIVE

If the data value is 1, then output switch #1 will activate. If the data value is 0, then output switch #1 will not activate.

16.5.2 SHELF OR FAILSAFE STATE

Switch #1 is a closed switch when in the shelf state (with the absence of power). The switch can be configured for either failsafe or shelf state. When set to Shelf state, the output switch will be closed when no setpoint values are violated. When set to Failsafe, the output switch will be open when no setpoint values are violated. If set to Failsafe and the power is lost to the Monitor, the output switch will change states (it will close).

16.5.3 NONLATCH OR LATCH

Switch #1 can be configured for latching or non-latching. When set to Latch the switch will stay tripped continuously until it is reset by the active communication protocol, the power is cycled, or the reset terminal is grounded. When set to Non latch the switch will stay tripped if any channel's reference number is above the setpoint values. It will automatically reset when the values have returned to within the limits plus the hysteresis time set. Default is 5 seconds.

16.5.4 TRIP ON BAD SENSOR SETPOINT

A bad sensor will cause switch 1 or 2 to activate if enabled (default switch 1) when the vibration level drops below the bad sensor set point. Either output switch #1 or #2 can be configured to take action.

16.6 OUTPUT SWITCH #2

Output Switch #2 is designed to be used as a shutdown output. The switch is activated when a shutdown setpoint value has been violated. The switch can be connected to an Altronic Annunciator System, an ignition low voltage shutdown input, or to pilot-duty relays.

16.6.1 ACTIVE

If the data value is 1, then output switch #2 will activate. If the data value is 0, then output switch #2 will not activate.

16.6.2 SHELF or FAILSAFE STATE

Switch #2 is an open switch when in the shelf state (with the absence of power). The switch can be configured for either Failsafe or Shelf state. When set to Shelf state, the output switch will be open for normal run conditions. When set to Failsafe, the output switch will be closed for normal run conditions. If set to Failsafe and the power is lost to the Monitor, the output switch will change states (it will open).

16.6.3 NON LATCH or LATCH

Switch #2 can be configured for latching or non-latching. When set to Latch, the switch will stay tripped continuously until it is reset by the active communication protocol, the power is cycled, or the reset terminal is grounded. When set to non latch, the switch will stay tripped if any channel's reference number is above the setpoint value. It will automatically reset when the value has returned to within the limits plus the hysteresis time set. The default hysteresis time is 5 seconds.

17.0 Available Protocols in the VSM+, EtherNet/IP and Modbus/TCP

17.1 The VSM+ Vibration Sensing Monitor is part of a system designed to easily interface to popular PLCs, SCADA systems and computers. The VSM+ has two user-selectable communication protocols, EtherNet/IP and Modbus/TCP. The built-in WEB SERVER is used to select the protocol. See section 12.0 EMBEDDED WEB SERVER to select the protocol.

17.2 EtherNet/IP – Ethernet Industrial Protocol is Ethernet combined with an industrial application layer protocol targeted to industrial PLCs. The EtherNet/IP protocol is used by Allen Bradley in their Compact Logix and Control Logix PLCs. The EtherNet/IP is used in many other PLC manufacturers as well.

17.3 The data for EtherNet/IP is arranged as a collection of objects. Objects divide the functionality of a device into logically related subsets. This collection of related data values and common elements of the device make up its object model.

18.0 EtherNet/IP Object Models

18.1 The following Objects are used in the VSM+.

OBJECT (ID)	TYPE
Identity (01h)	Required
Message Router (02h)	Required
Assembly (04h)	Device-specific
Connection Manager (06h)	Required
TCP Object (F5h)	Required
Ethernet Link Object (F6h)	Required
QoS (48h)	Pre-defined
Parameter (0Fh)	Pre-defined
Parameter Group (10h)	Pre-defined
Group (12h)	Pre-defined
File (37h)	Pre-defined
Sensor (68h)	Vendor Specific
VSM (69h)	Vendor Specific
Log (70h)	Vendor Specific

18.2 **Identity Object (01h – 1 instance)**
The identity object provides identification of, and general information about, the VSM+.

ATTR ID	NAME	DATA TYPE	DATA VALUE	Access RULE
Class Attributes				
1	Revision	UINT	1	GET
Instance Attributes				
1	Vendor Number	UINT	1250_{DEC}	GET
2	Device Type, Generic	UINT	$2b_{HEX}$	GET
3	Product Code Number	UINT	$27DA_{HEX}$	GET
4	Product Major Revision Product Minor Revision	USINT USINT	02 30	GET
5	Status Word (see definition below)	WORD	See Below	GET
6	Product Serial Number (unit mac address)	UDINT	Unique 32 Bit Val	GET
7	Product Name **Structure of:** Product Name Size Product Name String	 USINT USINT[0-32]	 7 “VSMPlus”	GET
Status Word				
Bit	**Bit = 0**	**Bit = 1**		
0	No I/O Connection	I/O Connection Allocated		
1-15	Unused	Unused		

CHART CONTINUES…

Common Services			
SVC CODE	IMPLEMENTED FOR		
	CLASS LEVEL	INSTANCE LEVEL	SERVICE NAME
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single
05_{HEX}	No	Yes	Reset

Reset Service Code				
SVC CODE	CLASS	INSTANCE	DATA[1]	DESCRIPTION
05h	01h	01h	00h	Force software reset.
05h	01h	01h	01h	Reload factory settings and reset.

[1] This device requires that the attribute be left blank and that the valve be entered in the data field.

18.3 **Message Router Object (02h)**

The message router object provides a messaging connection point through which a client may address a service to any object class or instance residing in the VSM+.

The VSM+ has no supported attributes.

18.4 **Assembly Object (04h)**

The Assembly Object binds attributes of multiple objects, which allows data to or from each object to be sent or received over a single connection. Assembly objects can be used to bind input data or output data. The terms "input" and "output" are defined from the network's point of view. An input will produce data on the network and an output will consume data from the network.

ATTR ID	NAME	DATA TYPE	DATA VALUE	ACCESS RULE
Class Attributes				
1	Revision	UINT	1	GET
2	Max Instance	UINT	255	GET
Instance 64H Attributes (Input Instance 1)				
3	Input Data (T->O)	INT[14]	See below	GET
Instance 65H Attributes (Output Instance 1)				
3	Output Data (O->T)	INT[52]	See below	SET
Instance 66H Attributes (Configuration Instance)				
Most I/O clients include a configuration path when opening an I/O connection to a server. Use of Configuration Instance is optional.				
Instance FDH Attributes (Output Only Instance)				
This instance allows clients to produce output data without monitoring the input data.				
Instance FEH Attributes (Input only Instance)				
This instance allows clients to control the input without providing output data.				
Instance FFH Attributes (Heartbeat Instance – Listen Only)				
This instance allows clients to monitor input data without providing output data.				

Common Services			
SVC CODE	IMPLEMENTED FOR		
	CLASS LEVEL	INSTANCE LEVEL	SERVICE NAME
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single
05_{HEX}	No	Yes	Reset

18.5 Input Assembly Data "Target to Originator" (T->O)

INDEX	NAME	MIN	MAX	EQUIV MODBUS REGISTER
0	Vibration Channel 1	0	1023	30015
1	Vibration Channel 2	0	1023	30016
2	Vibration Channel 3	0	1023	30017
3	Vibration Channel 4	0	1023	30018
4	Vibration Channel 5	0	1023	30019
5	Vibration Channel 6	0	1023	30020
6	Vibration Channel 7	0	1023	30021
7	Vibration Channel 8	0	1023	30022
8	Supply Voltage (*100)	700	3500	30010
9.0	Reserved	0	1	10001
9.1	Reserved	0	1	10002
9.2	SW1 Active	0	1	10003
9.3	SW2 Active	0	1	10004
9.4	Reserved	0	1	10005
9.5	Reserved	0	1	10006
9.6	Reserved	0	1	10007
9.7	Reserved	0	1	10008
9.8	CAL R/W	0	1	10009
9.9	Watchdog	0	1	10010
9.10	Reset	0	1	10011
9.11	Reserved	0	1	10012
9.12	Startup Locked Out	0	1	10013
9.13	Alarm	0	1	10014
9.14	Reserved	0	1	10015
9.15	Reserved	0	1	10016
10.0	Bad Sensor 1	0	1	10017
10.1	Bad Sensor 2	0	1	10018
10.2	Bad Sensor 3	0	1	10019
10.3	Bad Sensor 4	0	1	10020
10.4	Bad Sensor 5	0	1	10021
10.5	Bad Sensor 6	0	1	10022
10.6	Bad Sensor 7	0	1	10023
10.7	Bad Sensor 8	0	1	10024
10.8	Reserved	0	1	10025
10.9	Reserved	0	1	10026
10.10	Reserved	0	1	10027
10.11	Reserved	0	1	10028
10.12	Reserved	0	1	10029
10.13	Reserved	0	1	10030
10.14	Reserved	0	1	10031

CHART CONTINUES...

INDEX	NAME	MIN	MAX	EQUIV MODBUS REGISTER
10.15	Reserved	0	1	10032
11.0	Critical High 1	0	1	10033
11.1	Critical High 2	0	1	10034
11.2	Critical High 3	0	1	10035
11.3	Critical High 4	0	1	10036
11.4	Critical High 5	0	1	10037
11.5	Critical High 6	0	1	10038
11.6	Critical High 7	0	1	10039
11.7	Critical High 8	0	1	10040
11.8	Reserved	0	1	10041
11.9	Reserved	0	1	10042
11.10	Reserved	0	1	10043
11.11	Reserved	0	1	10044
11.12	Reserved	0	1	10045
11.13	Reserved	0	1	10046
11.14	Reserved	0	1	10047
11.15	Reserved	0	1	10048
12.0	Vibration High 1	0	1	10049
12.1	Vibration High 2	0	1	10050
12.2	Vibration High 3	0	1	10051
12.3	Vibration High 4	0	1	10052
12.4	Vibration High 5	0	1	10053
12.5	Vibration High 6	0	1	10054
12.6	Vibration High 7	0	1	10055
12.7	Vibration High 8	0	1	10056
12.8	Reserved	0	1	10057
12.9	Reserved	0	1	10058
12.10	Reserved	0	1	10059
12.11	Reserved	0	1	10060
12.12	Reserved	0	1	10061
12.13	Reserved	0	1	10062
12.14	Reserved	0	1	10063
12.15	Reserved	0	1	10064
13.0	Channel Armed 1	0	1	10065
13.1	Channel Armed 2	0	1	10066
13.2	Channel Armed 3	0	1	10067
13.3	Channel Armed 4	0	1	10068
13.4	Channel Armed 5	0	1	10069
13.5	Channel Armed 6	0	1	10070
13.6	Channel Armed 7	0	1	10071
13.7	Channel Armed 8	0	1	10072
13.8	Reserved	0	1	10073

INDEX	NAME	MIN	MAX	EQUIV MODBUS REGISTER
13.9	Reserved	0	1	10074
13.10	Reserved	0	1	10075
13.11	Reserved	0	1	10076
13.12	Reserved	0	1	10077
13.13	Reserved	0	1	10078
13.14	Reserved	0	1	10079
13.15	Reserved	0	1	10080
14	Communication Status[1]	-32767	32767	Not Applicable
15.0	Switch 1 Control Echo	0	1	00001
15.1	Switch 2 Control Echo	0	1	00002
15.2	Reserved	0	1	00003
15.3	Reserved	0	1	00004
15.4	Reserved	0	1	00005
15.5	Switch 1 Enable Echo	0	1	00006
15.6	Switch 1 Failsafe Echo	0	1	00007
15.7	Switch 1 Latching Echo	0	1	00008
15.8	Bad Sensor Switch Select Echo	0	1	00009
15.9	Switch 2 Enable Echo	0	1	00010
15.10	Switch 2 Failsafe Echo	0	1	00011
15.11	Switch 2 Latching Echo	0	1	00012
15.12	Reserved	0	1	00013
15.13	Reserved	0	1	00014
15.14	Reserved	0	1	00015
15.15	Startup Lockout Echo	0	1	00016

[1] Internal system diagnostic data

18.6 Output Assembly Data "Originator to Target" (O->T)

INDEX	NAME	MIN	MAX	DEFAULT	EQUIV MODBUS REGISTER
0	Gain 1	0	63	14	40041
1	Gain 2	0	63	14	40061
2	Gain 3	0	63	14	40081
3	Gain 4	0	63	14	40101
4	Gain 5	0	63	14	40121
5	Gain 6	0	63	14	40141
6	Gain 7	0	63	14	40161
7	Gain 8	0	63	14	40181
8	Lag Filter	1	255	240	40013
9	Status Control[1]	-32767	32768	0	Not Applicable
10.0	Switch 1 Control	0	1	0	00001
10.1	Switch 2 Control	0	1	0	00002

CHART CONTINUES...

INDEX	NAME	MIN	MAX	DEFAULT	EQUIV MODBUS REGISTER
10.2	Reserved	0	1	0	00003
10.3	Reserved	0	1	0	00004
10.4	Reserved	0	1	0	00005
10.5	Switch 1 Enable	0	1	0	00006
10.6	Switch 1 Failsafe	0	1	0	00007
10.7	Switch 1 Latching	0	1	0	00008
10.8	Bad Sensor Switch Select	0	1	0	00009
10.9	Switch 2 Enable	0	1	0	00010
10.10	Switch 2 Failsafe	0	1	1	00011
10.11	Switch 2 Latching	0	1	0	00012
10.12	Reserved	0	1	0	00013
10.13	Reserved	0	1	0	00014
10.14	Reserved	0	1	0	00015
10.15	Startup Lockout	0	1	0	00016

[1] Internal system diagnostic data

18.7 Configuration Assembly Data

INDEX[1]	NAME	MIN	MAX	DEFAULT	EQUIV MODBUS REGISTER
0	Reserved 1	-32767	32767	0	Not Applicable
1					
2	Alarm Setpoint 1	0	999	700	40044
3					
4	Shutdown Setpoint 1	0	999	800	40045
5					
6	Bad Sensor Setpoint 1	0	999	0	40046
7					
8	Start Delay 1	0	999	60	40056
9					
10	Trip Delay 1	0	15	3	40057
11					
12	Reserved 2	-32767	32767	0	Not Applicable
13					
14	Alarm Setpoint 2	0	999	700	40064
15					
16	Shutdown Setpoint 2	0	999	800	40065
17					
18	Bad Sensor Setpoint 2	0	999	0	40066
19					
20	Start Delay 2	0	999	60	40076
21					
22	Trip Delay 2	0	15	3	40077
23					

INDEX[1]	NAME	MIN	MAX	DEFAULT	EQUIV MODBUS REGISTER
24	Reserved 3	-32767	32767	0	Not Applicable
25					
26	Alarm Setpoint 3	0	999	700	40084
27					
28	Shutdown Setpoint 3	0	999	800	40085
29					
30	Bad Sensor Setpoint 3	0	999	0	40086
31					
32	Start Delay 3	0	999	60	40096
33					
34	Trip Delay 3	0	15	3	40097
35					
36	Reserved 4	-32767	32767	0	Not Applicable
37					
38	Alarm Setpoint 4	0	999	700	40104
39					
40	Shutdown Setpoint 4	0	999	800	40105
41					
42	Bad Sensor Setpoint 4	0	999	0	40106
43					
44	Start Delay 4	0	999	60	40116
45					
46	Trip Delay 4	0	15	3	40117
47					
48	Reserved 5	-32767	32767	0	Not Applicable
49					
50	Alarm Setpoint 5	0	999	700	40124
51					
52	Shutdown Setpoint 5	0	999	800	40125
53					
54	Bad Sensor Setpoint 5	0	999	0	40126
55					
56	Start Delay 5	0	999	60	40136
57					
58	Trip Delay 5	0	15	3	40137
59					
60	Reserved 6	-32767	32767	0	Not Applicable
61					
62	Alarm Setpoint 6	0	999	700	40144
63					

CHART CONTINUES...

INDEX[1]	NAME	MIN	MAX	DEFAULT	EQUIV MODBUS REGISTER
64	Shutdown Setpoint 6	0	999	800	40145
65					
66	Bad Sensor Setpoint 6	0	999	0	40146
67					
68	Start Delay 6	0	999	60	40156
69					
70	Trip Delay 6	0	15	3	40157
71					
72	Reserved 7	-32767	32767	0	Not Applicable
73					
74	Alarm Setpoint 7	0	999	700	40164
75					
76	Shutdown Setpoint 7	0	999	800	40165
77					
78	Bad Sensor Setpoint 7	0	999	0	40166
79					
80	Start Delay 7	0	999	60	40176
81					
82	Trip Delay 7	0	15	3	40177
83					
84	Reserved 8	-32767	32767	0	Not Applicable
85					
86	Alarm Setpoint 8	0	999	700	40184
87					
88	Shutdown Setpoint 8	0	999	800	40185
89					
90	Bad Sensor Setpoint 8	0	999	0	40186
91					
92	Start Delay 8	0	999	60	40196
93					
94	Trip Delay 8	0	15	3	40197
95					
96	Number of Channels	1	8	8	40014
97					
98	Switch Hysteresis Time	0	15	3	40016
99					

[1] Actual values are INT unless otherwise specified, and can be directly copied from a corresponding UDT.

18.8 Connection Manager Object (06h)

This object is used for connection and connectionless communication, including establishing connections across multiple subnets.

18.9 TCP/IP Interface Object (F5h – 1 instance)

The TCP/IP Interface Object provides the mechanism to configure a device's TCP/IP network interface. Examples of configurable items include the device's IP Address, Network Mask, and Gateway Address.

ATTR ID	NAME	DATA TYPE	DATA VALUE	Access RULE
Class Attributes				
1	Revision	UINT	1	GET
Instance Attributes				
1	Status[1]	DWORD	1	GET
2	Configuration Capability[2]	UINT[]	5	GET
3	Configuration Control[3]		0	GET
4	Physical Link Object[4]-			GET
	A Structure of:			
	Path Size	UINT	2	
	Path	Array of WORD	20F6H.. 2401H	
5	Interface Configuration[5]			GET
	A Structure of:			
	IP Address	UDINT	0	
	Network Mask	UDINT	0	
	Gateway Address	UDINT	0	
	Name Server	UDINT	0	
	Name Server 2	UDINT	0	
	Domain Name Size	UINT	0	
	Domain Name	STRING	0	
6	Host Name[6]			GET
	A Structure of:			
	Host Name Size	UINT	0	
	Host Name	STRING	0	

Common Services

SVC CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS LEVEL	INSTANCE LEVEL	
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single
10_{HEX}	No	Yes	Set_Attribute_Single

[1] See section 5-3.2.2.1 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.
[2] See section 5-3.2.2.2 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.
[3] See section 5-3.2.2.3 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.
[4] See section 5-3.2.2.4 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.
[5] See section 5-3.2.2.5 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.
[6] See section 5-3.2.2.6 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.

18.10 **EtherNet Link Object (F6h – 1 instance)**
The Ethernet Link Object maintains link-specific counters and status information for an IEEE 802.3 communications interface.

ATTR ID	NAME	DATA TYPE	DATA VALUE	ACCESS RULE
Class Attributes				
1	Revision	UINT	1	GET
Instance Attributes				
1	Interface Speed[1]	UDINT	100 (default)	GET
2	Interface Flags[2]	DWORD	3 (default)	GET
3	Physical Address[3]	USINT Array[6]	0 default)	GET

Common Services

SVC CODE	IMPLEMENTED FOR		
	CLASS LEVEL	INSTANCE LEVEL	SERVICE NAME
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single

[1] See section 5-4.2.2.2 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.

[2] See section 5-4.2.2.1 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.

[3] See section 5-4.2.2.3 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.

18.11 **QoS Object (48h – 1 instance)**
The QoS Object provides a means to configure certain QoS-related behaviors in EtherNet/IP devices.

ATTR ID	NAME	DATA TYPE	DATA VALUE	ACCESS RULE
Class Attributes				
1	Revision	UINT	1	GET
Instance Attributes				
4	DSCP Urgent	USINT	[1]	GET/SET
5	DSCP Scheduled	USINT	[1]	GET/SET
6	DSCP High	USINT	[1]	GET/SET
7	DSCP Low	USINT	[1]	GET/SET
8	DSCP Explicit	USINT	[1]	GET/SET

Common Services

SVC CODE	IMPLEMENTED FOR		
	CLASS LEVEL	INSTANCE LEVEL	SERVICE NAME
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single
10_{HEX}	No	Yes	Get_Attribute_Single

[1] See section 5-6.4.2 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on these attributes.

18.12 **Parameter Object (OFh – 208 instances)**

The parameter object along with the parameter group and group objects provide an alternate path to the data provided by the vendor specific objects: “Sensor”, “VSM”, and “Log”.

ATTR ID	NAME	DATA TYPE	DATA VALUE	ACCESS RULE
Class Attributes				
1	Revision	UINT	1	GET
2	Max Instance ID	UINT	208	GET
3	Number of Instances	UINT	208	GET
4	Attribute List	UINT,UINT[]	15,[7-21]	GET
5	Service List	UINT,UINT[]	1,[1]	GET
6	Max Object Attribute ID	UINT	9	GET
7	Max Instance Attribute ID	UINT	21	GET
8	Parameter Class Descriptor	WORD	0000000000001011b	GET
9	Configuration Assembly Instance	UINT	0	GET
Instance Attributes				
1	Parameter Value	[data type]	See Tables below	GET/SET
2	Link Path Size	USINT		GET
3	Link Path	Packed EPATH		GET
4	Descriptor	WORD	[1]	GET
5	Data Type	USINT	Refer to referenced data	GET
6	Data Size	USINT		GET
7	Parameter Name String	SHORT_STRING	*Same as “Tag” for referenced item*	GET
8	Units String	SHORT_STRING	*Same as “Tag” for referenced item*	GET
9	Help String	SHORT_STRING	*Same as Get_Label service for referenced item*	GET
10	Minimum Value	[data type]	Refer to referenced data	GET
11	Maximum Value	[data type]		GET
12	Default Value	[data type]		GET
13	Scaling Multiplier	UINT	1	GET
14	Scaling Divisor	UINT	1	GET
15	Scaling Base	UINT	1	GET
16	Scaling Offset	INT	0	GET
17	Multiplier Link	UINT	0	GET
18	Divisor Link	UINT	0	GET
19	Base Link	UINT	0	GET
20	Offset Link	UINT	0	GET
21	Decimal Precision	USINT	0	GET

Common Services

SVC CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS LEVEL	INSTANCE LEVEL	
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single
10_{HEX}	No	Yes	Get_Attribute_Single
01_{HEX}	No	Yes	Get_Attribute_All

18.13 **"Sensor" Object Parameter Mapping (Group Instance 1)**
Instance (Parameter Group Instance)

Attribute	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)
1	1	19	37	55	73	91	109	127
2	2	20	38	56	74	92	110	128
3	3	21	39	57	75	93	111	129
4	4	22	40	58	76	94	112	130
5	5	23	41	59	77	95	113	131
6	6	24	42	60	78	96	114	132
7	7	25	43	61	79	97	115	133
8	8	26	44	62	80	98	116	134
9	9	27	45	63	81	99	117	135
10	10	28	46	64	82	100	118	136
11	11	29	47	65	83	101	119	137
12	12	30	48	66	84	102	120	138
13	13	31	49	67	85	103	121	139
14	14	32	50	68	86	104	122	140
15	15	33	51	69	87	105	123	141
16	16	34	52	70	88	106	124	142
17	17	35	53	71	89	107	125	143
18	18	36	54	72	90	108	126	144

18.14 **"VSM" Object Parameter Mapping**

	Instance (Parameter Group Instance)
Attribute	1 (9)
1	145
2	146
3	147
4	148
5	149
6	150
7	151
8	152
9	153
10	154
11	155
12	156
13	157
14	158
15	159
16	160
17	161
18	162

	Instance (Parameter Group Instance)
19	163
20	164
21	165
22	166
23	167
24	168
25	169
26	170
27	171
28	172
29	173
30	174
31	175
32	176

18.15 **"Log" Object Parameter Mapping (Group Instance 2)**

	Instance (Parameter Group Instance)										
Attribute	**1 (10)**	**2 (11)**	**3 (12)**	**4 (13)**	**5 (14)**	**6 (15)**	**7 (16)**	**8 (17)**	**9 (18)**	**10 (19)**	**11 (20)**
1	177	178	179	180	181	182	183	184	185	186	187

	12 (21)	**13 (22)**	**14 (23)**	**15 (24)**	**16 (25)**	**17 (26)**	**18 (27)**	**19 (28)**	**20 (29)**	**21 (30)**	**22 (31)**
	188	189	190	191	192	193	194	195	196	197	198

	23 (32)	**24 (33)**	**25 (34)**	**26 (35)**	**27 (37)**	**28 (37)**	**29 (38)**	**30 (39)**	**31 (40)**	**32 (41)**
	199	200	201	202	203	204	205	206	207	208

18.16 **Parameter Group Object (10h – 41 instances)**

The parameter object along with the parameter group and group objects provide an alternate path to the data provided by the vendor specific objects: "Sensor", "VSM", and "Log".

ATTR ID	NAME	DATA TYPE	DATA VALUE	ACCESS RULE
Class Attributes				
1	Revision	UINT	1	GET
2	Max Instance ID	UINT	41	GET
3	Number of Instances	UINT	41	GET
4	Attribute List	UINT,UINT[]	0	GET
5	Service List	UINT,UINT[]	1,[1]	GET
6	Max Object Attribute ID	UINT	6	GET
		Instance Attributes		
1	Group Name String	SHORT_STRING	Object name and instance index if applicable: "sensor[2]" or "vsm"	GET

CHART CONTINUES...

ATTR ID	NAME	DATA TYPE	DATA VALUE	ACCESS RULE
2	Number of members in group	UINT	Refer to tables above	GET
3	Parameter Instance of first member	UINT		GET
4-n	Parameter Instance of n^{th} member	UINT		GET

Common Services

SVC CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS LEVEL	INSTANCE LEVEL	
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single
01_{HEX}	No	Yes	Get_Attribute_All

18.17 **Group Object (12h – 2 instances)**

The parameter object along with the parameter group and group objects provide an alternate path to the data provided by the vendor specific objects: “Sensor”, “VSM”, and “Log”.

ATTR ID	NAME	DATA TYPE	DATA VALUE	ACCESS RULE
Class Attributes				
1	Revision	UINT	1	GET
2	Max Instance ID	UINT	2	GET
3	Number of Instances	UINT	2	GET
4	Attribute List	UINT,UINT[]	6,[1-4,6-7]	GET
5	Service List	UINT,UINT[]	1,[1]	GET
6	Max Object Attribute ID	UINT	7	GET
7	Max Instance Attribute ID	UINT	7	GET
Instance Attributes				
1	Number of Attributes	USINT	See tables above	GET
2	Attribute List	USINT[]		GET
3	Number of bound instances	USINT		GET
4	Binding	Array of: UINT: Class ID UINT: Instance ID		GET
6	Owner Vendor ID	UINT	1250	GET
7	Owner – Serial Number	UDINT	This device’s serial number (see Identity Object)	GET

Common Services

SVC CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS LEVEL	INSTANCE LEVEL	
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single
01_{HEX}	No	Yes	Get_Attribute_All

18.18 **File Object (37h – 2 instances)**

The file object allows easy access to the device EDS and icon files from within a PLC control environment.

ATTR ID	NAME	DATA TYPE	DATA VALUE	ACCESS RULE
Class Attributes				
1	Revision	UINT	1	GET
2	Max Instance ID	UINT	201	GET
3	Number of Instances	UINT	2	GET
4	Attribute List	UINT,UINT[]	1,[11]	GET
5	Service List	UINT,UINT[]	1,[77]	GET
6	Max Object Attribute ID	UINT	32	GET
7	Max Instance Attribute ID	UINT	11	GET
32	Directory	Array of: UINT: Instance Number STRINGI: Instance_Name STRINGI: File_Name	[{200, (ENG)"EDS and Icon Files", (ENG)"EDS.txt"}, {201, (ENG)"Related EDS and Icon Files", (ENG)"EDSCollection.gz"}]	GET
Instance C8H Attributes (EDS file)				
1	State[2]	USINT	2 (Default – Loaded)	GET
2	Instance Name	STRINGI	(ENG)"EDS and Icon Files"	GET
3	Instance Format Version	UINT	1	GET
4	File Name	STRINGI	(ENG)"EDS.txt"	GET
5	File Revision	USINT: Major_Revision USINT: Minor_Revision	0[1] 3	GET
6	File Size	UDINT	8292[1]	GET
7	File Checksum	INT	-20137[1]	GET
8	Invocation Method	USINT	255	GET
9	File Save Parameters	BYTE	00000000b	GET
10	File Type[3]	USINT	1	GET
11	File Encoding Format[4]	USINT	0	GET
Instance C9H Attributes (Icon file)				
1	State[2]	USINT	2 (Default – Loaded)	GET
2	Instance Name	STRINGI	(ENG)"Related EDS and Icon Files"	GET
3	Instance Format Version	UINT	1	GET
4	File Name	STRINGI	(ENG)"EDSCollection.gz"	GET
5	File Revision	USINT: Major_Revision USINT: Minor_Revision	0[1] 8	GET
6	File Size	UDINT	433[1]	GET
7	File Checksum	INT	10478[1]	GET
8	Invocation Method	USINT	255	GET
9	File Save Parameters	BYTE	00000000b	GET
10	File Type[3]	USINT	1	GET
11	File Encoding Format[4]	USINT	1 (compressed)	GET

CHART CONTINUES...

Common Services

SVC CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS LEVEL	INSTANCE LEVEL	
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single
01_{HEX}	No	Yes	Get_Attribute_All
$4B_{HEX}$	No	Yes	Init_Upload
$4D_{HEX}$	No	Yes	Init_Partial_Read
$4F_{HEX}$	No	Yes	Upload

[1] These values are subject to change without notice.
[2] See section 5-42.2 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.
[3] See section 5-42.2 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.
[4] See section 5-42.8 of "Volume 2: EtherNet/IP Adaptation of CIP™" from ODVA for more details on this attribute.

18.19 Sensor Object (68h – 8 instances)

The Sensor Objects gives access to the configuration and run-time parameters of the individual vibration sensor channels.

ATTR ID	NAME	DATA TYPE	DATA VALUE (MIN)	DATA VALUE (MAX)	ACCESS RULE
Class Attributes					
1	Revision	UINT	1		GET
2	Max Instance ID	UINT	8		GET
3	Number of Instances	UINT	8		GET
4	Attribute List	UINT,UINT[]	18,[1-18]		GET
5	Service List	UINT,UINT[]	5,[14,16,1,2,76]		GET
6	Max Object Attribute ID	UINT	7		GET
7	Max Instance Attribute ID	UINT	18		GET
Instance Attributes					
1	Channel Label	STRING, DINT, SINT[82]	2	12	GET/SET
2	Prescale	INT	0	8	GET/SET
3	Gain	INT	0	63	GET/SET
4	Bandpass	INT	0	63	GET/SET
5	Time Constant	INT	0	31	GET/SET
6	Alarm Setpoint	INT	0	999	GET/SET
7	Shutdown Setpoint	INT	0	999	GET/SET
8	Bad Sensor Setpoint	INT	0	999	GET/SET
9	Offset	INT	0	500	GET/SET
10	Scalar	INT	0	9999	GET/SET
11	Label Type	INT	0	48	GET/SET
12	Start Delay	INT	0	999	GET/SET
13	Trip Timer	INT	0	15	GET/SET
14	Vibration Level	INT	0	1024	GET
15	Sensor Bad	SINT	0	1	GET
16	Switch 1 Tripped	SINT	0	1	GET

ATTR ID	NAME	DATA TYPE	DATA VALUE (MIN)	DATA VALUE (MAX)	ACCESS RULE
17	Switch 2 Tripped	SINT	0	1	GET
18	Channel Armed	SINT	0	1	GET

Common Services

SVC CODE	IMPLEMENTED FOR		
	CLASS LEVEL	INSTANCE LEVEL	SERVICE NAME
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single
10_{HEX}	No	Yes	Set_Attribute_Single
01_{HEX}	No	Yes	Get_Attribute_All
02_{HEX}	No	Yes	Set_Attribute_All
$4C_{HEX}$	No	Yes	Get_Label

Service Description for "Get_Label" (4CH)
The "Get_Label" service provides a simple, human readable, description of the data point in question. This service is roughly equivalent to the "Read Label (fn 101, 102, 103, and 104)" service available through Modbus. The request must specify the Attribute ID for which the label is to be read and returns a STRINGI containing the label.

Service Description for "Key_Command" (4BH)
The "Key_Command" service provides a method for sending discrete commands to the module. These commands can be used to reset the device state machine, clear, or acknowledge alarms. It provides easy access to anything that requires momentary or event based access. This service provides similar access to the device as the 40255 and 40256 Modbus registers. When using this service, the attribute should be omitted. The message payload is an array as follows:

Index	Data	Data Type
0	Key Command Number	SINT
1	Key Command Compliment[1]	SINT
2	Key Command Argument 1	SINT
3	Key Command Argument 2	SINT

[1] This value is a bitwise inversion of index 0.

18.20 **VSM Object (69h – 1 instance)**
The Sensor Objects are custom objects specific to the VSM+

18.21 **LOG Object (70h – 32 instances)**
The Sensor Objects are custom objects specific to the VSM+

ATTR ID	NAME	DATA TYPE	DATA VALUE (MIN)	DATA VALUE (MAX)	ACCESS RULE
Class Attributes					
1	Revision	UINT	1		GET
2	Max Instance ID	UINT	32		GET
3	Number of Instances	UINT	32		GET
4	Attribute List	UINT,UINT[]	1,[1]		GET
5	Service List	UINT,UINT[]	5,[14,16,1,2,76]		GET
6	Max Object Attribute ID	UINT	7		GET
7	Max Instance Attribute ID	UINT	1		GET
Instance Attributes					
1	Event Log Entry	UINT	See Event log section (pg 27)		GET

CHART CONTINUES…

Common Services

SVC CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS LEVEL	INSTANCE LEVEL	
$0E_{HEX}$	Yes	Yes	Get_Attribute_Single
$4C_{HEX}$	No	Yes	Get_Label

19.0 Modbus/TCP

Modbus/TCP is Modbus over Ethernet. The Modbus registers are similar to the VSM-400 and VSM800. The registers are listed below.

Location	Label	0	1	Default	Notes
Read/Write bits					
00000's	Global Functions				
00001	Reserved				
00002	Reserved				
00003	Reserved				
00004	Reserved				
00005	Reserved				
00006	Switch 1 Enabled (1=on)	Off	On	1	
00007	Switch 1 State (0=SHELF 1=FS)	shelf	failsafe	0	switch 1 setup
00008	Switch 1 Type (1=Latched)	non-latch	latch	0	
00009	Bad Sensor Switch Select (0=SWITCH 1)	0	1	0	0 = SWITCH 1, 1 = SWITCH 2
00010	Switch 2 Enabled (1=on)	Off	On	1	
00011	Switch 2 State (0=SHELF 1=FS)	shelf	failsafe	0	switch 2 setup
00012	Switch 2 Type (1=Latched)	non-latch	latch	0	
00013	RESERVED				
00014	RESERVED				
00015	RESERVED				
00016	STARTUP LOCKOUT (1 = LOCKOUT)			0	
00017 THROUGH 00128	RESERVED				

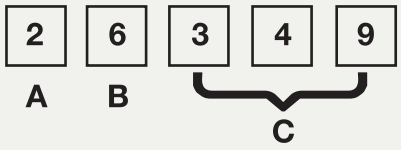
Location	Label		0	1	Notes
Read only bits					
10000's	Global Functions				
10001	RESERVED				
10002	RESERVED				
10003	Switch 1 Activated		No	Yes	Output switch 1 activated by vibration
10004	Switch 2 Activated		No	Yes	Output switch 2 activated by vibration
10005 THROUGH 10008	RESERVED				
10009	Factory Calibrate R/W		Read only	Write	Factory Calibration Read/Write
10010	Watchdog		No	Yes	
10011	System Resetting		No	Yes	Reset condition is active
10012	RESERVED				
10013	Startup Locked Out Externally		outputs active	outputs inactive	Startup terminal is active
10014	Alarm/Shutdown Present		no alarms	alarms	Alarm/Shutdown is present
10015	RESERVED				
10016	RESERVED				
	Input #	Individual Functions			
10017	1	Sensor Status	OK	Bad Sensor	Sensor is detected and operating properly or is not detected
10018	2	Sensor Status	OK	Bad Sensor	Sensor is detected and operating properly or is not detected
10019	3	Sensor Status	OK	Bad Sensor	Sensor is detected and operating properly or is not detected
10020	4	Sensor Status	OK	Bad Sensor	Sensor is detected and operating properly or is not detected
10021	5	Sensor Status	OK	Bad Sensor	Sensor is detected and operating properly or is not detected
10022	6	Sensor Status	OK	Bad Sensor	Sensor is detected and operating properly or is not detected
10023	7	Sensor Status	OK	Bad Sensor	Sensor is detected and operating properly or is not detected
10024	8	Sensor Status	OK	Bad Sensor	Sensor is detected and operating properly or is not detected
10025 THROUGH 10032	RESERVED				
10033	1	SW 2 (SHUTDOWN) SETPOINT	OK	vibration detected	SHUTDOWN SETPOINT Exceeded on Input 1
10034	2	SW 2 (SHUTDOWN) SETPOINT	OK	vibration detected	SHUTDOWN SETPOINT Exceeded on Input 2
10035	3	SW 2 (SHUTDOWN) SETPOINT	OK	vibration detected	SHUTDOWN SETPOINT Exceeded on Input 3

Location	Input #	Individual Functions	0	1	Notes
10036	4	SW 2 (SHUTDOWN) SETPOINT	OK	vibration detected	SHUTDOWN SETPOINT Exceeded on Input 4
10037	5	SW 2 (SHUTDOWN) SETPOINT	OK	vibration detected	SHUTDOWN SETPOINT Exceeded on Input 5
10038	6	SW 2 (SHUTDOWN) SETPOINT	OK	vibration detected	SHUTDOWN SETPOINT Exceeded on Input 6
10039	7	SW 2 (SHUTDOWN) SETPOINT	OK	vibration detected	SHUTDOWN SETPOINT Exceeded on Input 7
10040	8	SW 2 (SHUTDOWN) SETPOINT	OK	vibration detected	SHUTDOWN SETPOINT Exceeded on Input 8
10041 THROUGH 10048	RESERVED				
10049	1	SW1 (ALARM) SETPOINT	OK	vibration detected	ALARM SETPOINT Exceeded on Input 1
10050	2	SW1 (ALARM) SETPOINT	OK	vibration detected	ALARM SETPOINT Exceeded on Input 2
10051	3	SW1 (ALARM) SETPOINT	OK	vibration detected	ALARM SETPOINT Exceeded on Input 3
10052	4	SW1 (ALARM) SETPOINT	OK	vibration detected	ALARM SETPOINT Exceeded on Input 4
10053	5	SW1 (ALARM) SETPOINT	OK	vibration detected	ALARM SETPOINT Exceeded on Input 5
10054	6	SW1 (ALARM) SETPOINT	OK	vibration detected	ALARM SETPOINT Exceeded on Input 6
10055	7	SW1 (ALARM) SETPOINT	OK	vibration detected	ALARM SETPOINT Exceeded on Input 7
10056	8	SW1 (ALARM) SETPOINT	OK	vibration detected	ALARM SETPOINT Exceeded on Input 8
10057 THROUGH 10064	RESERVED				
10065	1	Channel 1 Armed Status	Not Armed	Armed	
10066	2	Channel 2 Armed Status	Not Armed	Armed	
10067	3	Channel 3 Armed Status	Not Armed	Armed	
10068	4	Channel 4 Armed Status	Not Armed	Armed	
10069	5	Channel 5 Armed Status	Not Armed	Armed	
10070	6	Channel 6 Armed Status	Not Armed	Armed	
10071	7	Channel 7 Armed Status	Not Armed	Armed	
10072	8	Channel 8 Armed Status	Not Armed	Armed	
10073 THROUGH 10128	RESERVED				

Location	Label		Size(bits)	Notes
Read only bytes				
30000's	Global Functions			
30001	InStat 001-016			MISC.
30002	InStat 017-032			BAD SENSOR Status
30003	InStat 033-048			SHUTDOWN SETPOINT Status
30004	InStat 049-064			ALARM SETPOINT Status
30005	InStat 065-080			ARMED Status
30006	InStat 081-096			
30007	InStat 097-112			
30008	InStat 113-128			
30009	RESERVED			
30010	Supply Voltage (1234 = 12.34V)		16	Voltage measured at supply terminals
30011	RESERVED			
30012	RESERVED			
30013	RESERVED			
30014	FACTORY			
	Input #	Individual Functions	Min	Max
30015	Ch 1	Vibration Level	0	1023
30016	Ch 2	Vibration Level	0	1023
30017	Ch 3	Vibration Level	0	1023
30018	Ch 4	Vibration Level	0	1023
30019	Ch 5	Vibration Level	0	1023
30020	Ch 6	Vibration Level	0	1023
30021	Ch 7	Vibration Level	0	1023
30022	Ch 8	Vibration Level	0	1023
30023 THROUGH 30029	RESERVED			

Location	Label
30030	Event Log 00 (MOST CURRENT/NEWEST)
30031	Event Log 01
30032	Event Log 02
30033	Event Log 03
30034	Event Log 04
30035	Event Log 05
30036	Event Log 06
30037	Event Log 07
30038	Event Log 08
30039	Event Log 09
30040	Event Log 10
30041	Event Log 11
30042	Event Log 12
30043	Event Log 13
30044	Event Log 14
30045	Event Log 15
30046	Event Log 16
30047	Event Log 17
30048	Event Log 18
30049	Event Log 19
30050	Event Log 20
30051	Event Log 21
30052	Event Log 22
30053	Event Log 23
30054	Event Log 24
30055	Event Log 25
30056	Event Log 26
30057	Event Log 27
30058	Event Log 28
30059	Event Log 29
30060	Event Log 30
30061	Event Log 31 (Maximum) (LEAST CURRENT/OLDEST)
30062 THROUGH 30128	RESERVED

EVENT LOG FORMAT



A → 1 = ALARM
2 = SHUTDOWN
3 = BAD SENSOR

B → CHANNEL # 1 – 8

C → CAPTURED VALUE AT TRIP POINT

Location	Label	Min	Max	Default	Notes
Read/Write bytes					
40000's	Global Functions				
40001	Coils 001-016	00000	65535		MISC.
40002	Coils 017-032	00000	65535		
40003	Coils 033-048	00000	65535		
40004	Coils 049-064	00000	65535		
40005	Coils 065-080	00000	65535		
40006	Coils 081-096	00000	65535		
40007	Coils 097-112	00000	65535		
40008	Coils 113-128	00000	65535		
40009 through 40012	RESERVED				
40013	Lag Filter Gain Value (1-255)	1	255	240	
40014	Number of Channels (1-8)	1	8	8	
40015	FACTORY	1	65535	10	
40016	Switch Hysteresis Time (0-15)	0	15	5	
40017	FACTORY	00000	65535	20000	
40018	Offset Ch's 1–4	0	+500	0	Factory Calibration
40019	Offset Ch's 5–8	0	+500	0	Factory Calibration
40020	Dynamic Filter Step Size	0	1024	50	Factory Set
40021	Dynamic Filter Gain Delay	0	255	15	Factory Set
40022 THROUGH 40039	RESERVED				
40040	Ch#1 Prescale (0-8)	0	8	0	
40041	Ch#1 Gain (0-63)	0	63	14	SEE GAIN CHART
40042	Ch#1 BP filter freq (0-63)	0	63	63	Factory Set
40043	Ch#1 time const (0-31)	0	31	31	Factory Set
40044	Ch#1 (ALARM) Setpoint (0-999)	0	999	700	
40045	Ch#1 (SD) Setpoint (0-999)	0	999	800	
40046	Ch#1 Bad Sens. Setpoint (0-999)	0	999	0	
40047	Ch#1 Output Offset	0	500	0	
40048	Ch#1 Output Scalar (1234=12.34)	0	9999	100	
40049	Ch#1 Label Type (0-48)	0	48	0	
40050	Ch#1 Custom Label chars 1 2	00000	65535	22616	ASCII CHAR 1 LOW, CHAR 2 HIGH, IN DECIMAL
40051	Ch#1 Custom Label chars 3 4	00000	65535	22616	
40052	Ch#1 Custom Label chars 5 6	00000	65535	22616	
40053	Ch#1 Custom Label chars 7 8	00000	65535	22616	
40054	Ch#1 Custom Label chars 9 10	00000	65535	22616	
40055	Ch#1 Custom Label chars 11 12	00000	65535	22616	
40056	Ch#1 Start Delay Timer (0-999)	0	999	60	
40057	Ch#1 Trip Delay Timer (0-15)	0	15	3	SECONDS
40058	Ch#1 RESERVED	00000	65535	00000	
40059	Ch#1 RESERVED	00000	65535	00000	

Location	Label	Min	Max	Default	Notes
40060	Ch#2 Prescale (0-8)	0	8	0	
40061	Ch#2 Gain (0-63)	0	63	14	SEE GAIN CHART
40062	Ch#2 BP filter freq(0-63)	0	63	63	Factory Set
40063	Ch#2 time const (0-31)	0	31	31	Factory Set
40064	Ch#2 (ALARM) Setpoint (0-999)	0	999	700	
40065	Ch#2 (SD) Setpoint (0-999)	0	999	800	
40066	Ch#2 Bad Sens. Setpoint (0-999)	0	999	0	
40067	Ch#2 Output Offset	0	500	0	
40068	Ch#2 Output Scalar (1234=12.34)	0	9999	100	
40069	Ch#2 Label Type (0-48)	0	48	0	
40070	Ch#2 Custom Label chars 1 2	00000	65535	22616	ASCII CHAR 1 LOW, CHAR 2 HIGH, IN DECIMAL
40071	Ch#2 Custom Label chars 3 4	00000	65535	22616	
40072	Ch#2 Custom Label chars 5 6	00000	65535	22616	
40073	Ch#2 Custom Label chars 7 8	00000	65535	22616	
40074	Ch#2 Custom Label chars 9 10	00000	65535	22616	
40075	Ch#2 Custom Label chars 11 12	00000	65535	22616	
40076	Ch#2 Start Delay Timer (0-999)	0	999	60	
40077	Ch#2 Trip Delay Timer (0-15)	0	15	3	
40078	Ch#2 RESERVED	00000	65535	00000	
40079	Ch#2 RESERVED	00000	65535	00000	
40080	Ch#3 Prescale (0-8)	0	8	0	
40081	Ch#3 Gain (0-63)	0	63	14	SEE GAIN CHART
40082	Ch#3 BP filter freq (0-63)	0	63	63	Factory Set
40083	Ch#3 time const (0-31)	0	31	31	Factory Set
40084	Ch#3 (ALARM) Setpoint (0-999)	0	999	700	
40085	Ch#3 (SD) Setpoint (0-999)	0	999	800	
40086	Ch#3 Bad Sens. Setpoint (0-999)	0	999	0	
40087	Ch#3 Output Offset	0	500	0	
40088	Ch#3 Output Scalar (1234=12.34)	0	9999	100	
40089	Ch#3 Label Type (0-48)	0	48	0	
40090	Ch#3 Custom Label chars 1 2	00000	65535	22616	ASCII CHAR 1 LOW, CHAR 2 HIGH, IN DECIMAL
40091	Ch#3 Custom Label chars 3 4	00000	65535	22616	
40092	Ch#3 Custom Label chars 5 6	00000	65535	22616	
40093	Ch#3 Custom Label chars 7 8	00000	65535	22616	
40094	Ch#3 Custom Label chars 9 10	00000	65535	22616	
40095	Ch#3 Custom Label chars 11 12	00000	65535	22616	
40096	Ch#3 Start Delay Timer (0-999)	0	999	60	
40097	Ch#3 Trip Delay Timer (0-15)	0	15	3	
40098	Ch#3 RESERVED	00000	65535	00000	
40099	Ch#3 RESERVED	00000	65535	00000	
40100	Ch#4 Prescale (0-8)	0	8	0	
40101	Ch#4 Gain (0-63)	0	63	14	SEE GAIN CHART
40102	Ch#4 BP filter freq (0-63)	0	63	63	Factory Set

Location	Label	Min	Max	Default	Notes
40103	Ch#4 time const (0-31)	0	31	31	Factory Set
40104	Ch#4 (ALARM) Setpoint (0-999)	0	999	700	
40105	Ch#4 (SD) Setpoint (0-999)	0	999	800	
40106	Ch#4 Bad Sens. Setpoint (0-999)	0	999	0	
40107	Ch#4 Output Offset	0	500	0	
40108	Ch#4 Output Scalar (1234=12.34)	0	9999	100	
40109	Ch#4 Label Type (0-48)	0	48	0	
40110	Ch#4 Custom Label chars 1 2	00000	65535	22616	ASCII CHAR 1 LOW, CHAR 2 HIGH, IN DECIMAL
40111	Ch#4 Custom Label chars 3 4	00000	65535	22616	
40112	Ch#4 Custom Label chars 5 6	00000	65535	22616	
40113	Ch#4 Custom Label chars 7 8	00000	65535	22616	
40114	Ch#4 Custom Label chars 9 10	00000	65535	22616	
40115	Ch#4 Custom Label chars 11 12	00000	65535	22616	
40116	Ch#4 Start Delay Timer (0-999)	0	999	60	
40117	Ch#4 Trip Delay Timer (0-15)	0	15	3	
40118	Ch#4 RESERVED	00000	65535	00000	
40119	Ch#4 RESERVED	00000	65535	00000	
40120	Ch#5 Prescale (0-8)	0	8	0	
40121	Ch#5 Gain (0-63)	0	63	14	SEE GAIN CHART
40122	Ch#5 BP filter freq (0-63)	0	63	63	Factory Set
40123	Ch#5 time const (0-31)	0	31	31	Factory Set
40124	Ch#5 (ALARM) Setpoint (0-999)	0	999	700	
40125	Ch#5 (SD) Setpoint (0-999)	0	999	800	
40126	Ch#5 Bad Sens. Setpoint (0-999)	0	999	0	
40127	Ch#5 Output Offset	0	500	0	
40128	Ch#5 Output Scalar (1234=12.34)	0	9999	100	
40129	Ch#5 Label Type (0-48)	0	48	0	
40130	Ch#5 Custom Label chars 1 2	00000	65535	22616	ASCII CHAR 1 LOW, CHAR 2 HIGH, IN DECIMAL
40131	Ch#5 Custom Label chars 3 4	00000	65535	22616	
40132	Ch#5 Custom Label chars 5 6	00000	65535	22616	
40133	Ch#5 Custom Label chars 7 8	00000	65535	22616	
40134	Ch#5 Custom Label chars 9 10	00000	65535	22616	
40135	Ch#5 Custom Label chars 11 12	00000	65535	22616	
40136	Ch#5 Start Delay Timer (0-999)	0	999	60	
40137	Ch#5 Trip Delay Timer (0-15)	0	15	3	
40138	Ch#5 RESERVED	00000	65535	00000	
40139	Ch#5 RESERVED	00000	65535	00000	
40140	Ch#6 Prescale (0-8)	0	8	0	
40141	Ch#6 Gain (0-63)	0	63	14	SEE GAIN CHART
40142	Ch#6 BP filter freq (0-63)	0	63	63	Factory Set
40143	Ch#6 time const (0-31)	0	31	31	Factory Set
40144	Ch#6 (ALARM) Setpoint (0-999)	0	999	700	
40145	Ch#6 (SD) Setpoint (0-999)	0	999	800	

Location	Label	Min	Max	Default	Notes
40146	Ch#6 Bad Sens. Setpoint (0-999)	0	999	0	
40147	Ch#6 Output Offset	0	500	0	
40148	Ch#6 Output Scalar (1234=12.34)	0	9999	100	
40149	Ch#6 Label Type (0-48)	0	48	0	
40150	Ch#6 Custom Label chars 1 2	00000	65535	22616	ASCII CHAR 1 LOW, CHAR 2 HIGH, IN DECIMAL
40151	Ch#6 Custom Label chars 3 4	00000	65535	22616	
40152	Ch#6 Custom Label chars 5 6	00000	65535	22616	
40153	Ch#6 Custom Label chars 7 8	00000	65535	22616	
40154	Ch#6 Custom Label chars 9 10	00000	65535	22616	
40155	Ch#6 Custom Label chars 11 12	00000	65535	22616	
40156	Ch#6 Start Delay Timer (0-999)	0	999	60	
40157	Ch#6 Trip Delay Timer (0-15)	0	15	3	
40158	Ch#6 RESERVED	00000	65535	00000	
40159	Ch#6 RESERVED	00000	65535	00000	
40160	Ch#7 Prescale (0-8)	0	8	0	
40161	Ch#7 Gain (0-63)	0	63	14	SEE GAIN CHART
40162	Ch#7 BP filter freq (0-63)	0	63	63	Factory Set
40163	Ch#7 time const (0-31)	0	31	31	Factory Set
40164	Ch#7 (ALARM) Setpoint (0-999)	0	999	700	
40165	Ch#7 (SD) Setpoint (0-999)	0	999	800	
40166	Ch#7 Bad Sens. Setpoint (0-999)	0	999	0	
40167	Ch#7 Output Offset	0	500	0	
40168	Ch#7 Output Scalar (1234=12.34)	0	9999	100	
40169	Ch#7 Label Type (0-48)	0	48	0	
40170	Ch#7 Custom Label chars 1 2	00000	65535	22616	ASCII CHAR 1 LOW, CHAR 2 HIGH, IN DECIMAL
40171	Ch#7 Custom Label chars 3 4	00000	65535	22616	
40172	Ch#7 Custom Label chars 5 6	00000	65535	22616	
40173	Ch#7 Custom Label chars 7 8	00000	65535	22616	
40174	Ch#7 Custom Label chars 9 10	00000	65535	22616	
40175	Ch#7 Custom Label chars 11 12	00000	65535	22616	
40176	Ch#7 Start Delay Timer (0-999)	0	999	60	
40177	Ch#7 Trip Delay Timer (0-15)	0	15	3	
40178	Ch#7 RESERVED	00000	65535	00000	
40179	Ch#7 RESERVED	00000	65535	00000	
40180	Ch#8 Prescale (0-8)	0	8	0	
40181	Ch#8 Gain (0-63)	0	63	14	SEE GAIN CHART
40182	Ch#8 BP filter freq (0-63)	0	63	63	Factory Set
40183	Ch#8 time const (0-31)	0	31	31	Factory Set
40184	Ch#8 (ALARM) Setpoint (0-999)	0	999	700	
40185	Ch#8 (SD) Setpoint (0-999)	0	999	800	
40186	Ch#8 Bad Sens. Setpoint (0-999)	0	999	0	
40187	Ch#8 Output Offset	0	500	0	

Location	Label	Min	Max	Default	Notes
40188	Ch#8 Output Scalar (1234=12.34)	0	9999	100	
40189	Ch#8 Label Type (0-48)	0	48	0	
40190	Ch#8 Custom Label chars 1 2	00000	65535	22616	ASCII CHAR 1 LOW, CHAR 2 HIGH, IN DECIMAL
40191	Ch#8 Custom Label chars 3 4	00000	65535	22616	
40192	Ch#8 Custom Label chars 5 6	00000	65535	22616	
40193	Ch#8 Custom Label chars 7 8	00000	65535	22616	
40194	Ch#8 Custom Label chars 9 10	00000	65535	22616	
40195	Ch#8 Custom Label chars 11 12	00000	65535	22616	
40196	Ch#8 Start Delay Timer (0-999)	0	999	60	
40197	Ch#8 Trip Delay Timer (0-15)	0	15	3	
40198	Ch#8 RESERVED	00000	65535	00000	
40199	Ch#8 RESERVED	00000	65535	00000	
40200 THROUGH 40256	RESERVED	00000	65535	00000	

GAIN CHART

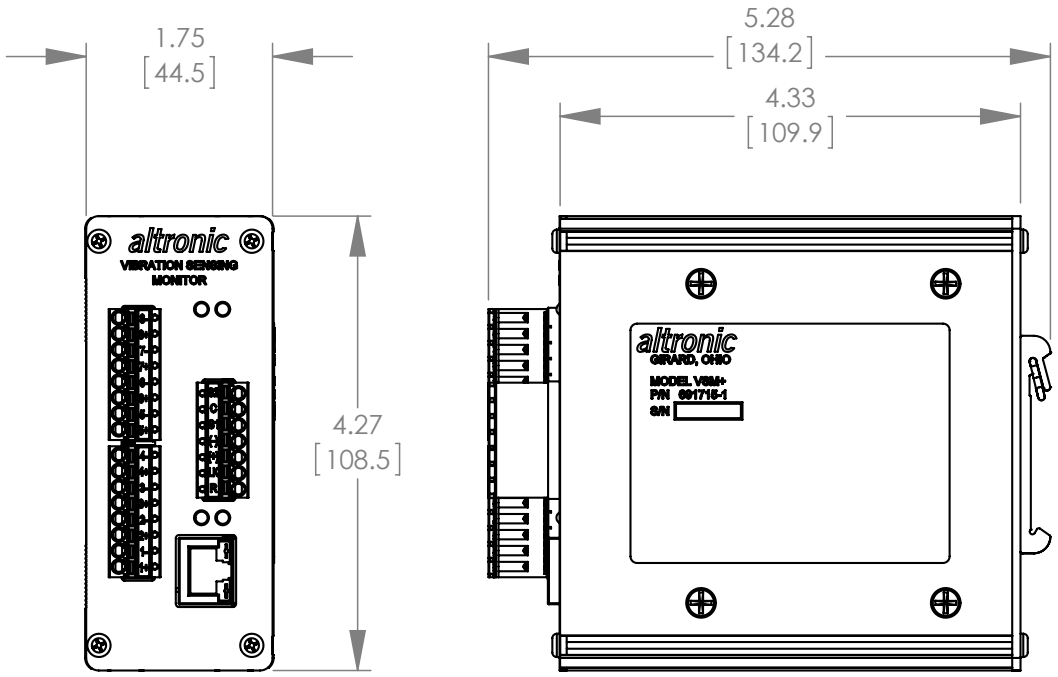
Register Value	Gain
0	2.000
1	1.882
2	1.778
3	1.684
4	1.600
5	1.523
6	1.455
7	1.391
8	1.333
9	1.280
10	1.231
11	1.185
12	1.143
13	1.063
14	1.000
15	0.944
16	0.895
17	0.850
18	0.810
19	0.773
20	0.739
21	0.708
22	0.680

Register Value	Gain
23	0.654
24	0.630
25	0.607
26	0.586
27	0.567
28	0.548
29	0.500
30	0.471
31	0.444
32	0.421
33	0.400
34	0.381
35	0.364
36	0.348
37	0.333
38	0.320
39	0.308
40	0.296
41	0.286
42	0.276
43	0.267
44	0.258
45	0.250

Register Value	Gain
46	0.236
47	0.222
48	0.211
49	0.200
50	0.190
51	0.182
52	0.174
53	0.167
54	0.160
55	0.154
56	0.148
57	0.143
58	0.138
59	0.133
60	0.129
61	0.125
62	0.118
63	0.111

FIGURES SECTION:

FIGURE 1. MOUNTING DIMENSIONS AND SPECIFICATIONS



SPECIFICATIONS:

POWER REQUIRED: DC POWER 10-32 VDC, 0.20 AMP. MAX.

AMBIENT TEMPERATURE RANGE: -40°C TO 80°C (-40°F TO 176°F)

MOUNTING: MOUNTS TO 35MM DIN RAILS

ENCLOSURE: EXTRUDED ALUMINUM, NEMA TYPE 1

INTEGRAL ETHERNET PORT FOR COMMUNICATIONS TO A PLC/PC OR OTHER COMMUNICATION DEVICE

SENSORS: UP TO 8 PIEZOELECTRIC VIBRATION SENSOR; BOSCH 0 261 231 148, ALTRONIC 615107, OR EQUIVALENT.

INPUT FREQUENCY RANGE: 4 HZ TO 1KHZ.

SENSOR SCAN RATE: 0.5 SECONDS.

OUTPUT SWITCH LOCKOUT TERMINAL: ACTIVATED BY PULLING TERMINAL LOW.

STARTUP OUTPUT LOCKOUT TIMER: 0 TO 999 SECONDS, ONE PER CHANNEL.

REMOTE RESET INPUT: ACTIVATED BY MOMENTARILY PULLING INPUT LOW.

OUTPUT SWITCH TRIP DELAY TIMER: 0 TO 15 SECONDS, ONE PER CHANNEL

OUTPUT SWITCH: TWO PROGRAMMABLE SOLID STATE SWITCHES,RATED 32 VDC,
0.2 AMP CONTINUOUS, OPTICALLY ISOLATED FROM POWER SUPPLY.
ONE FOR ALARM, ONE FOR SHUTDOWN.

SWITCH CONFIGURATIONS: NC / NO, FAILSAFE / SHELF

CONNECTOR, ETHERNET PORT: SHIELDED RJ45 SOCKET

NETWORK WIRING INTERFACE: AUTO MDI/MDIX

COMMUNICATION PROTOCOLS: Modbus/TCP, ETHERNET/IP

CONNECTIONS: UP TO 5 CONNECTIONS

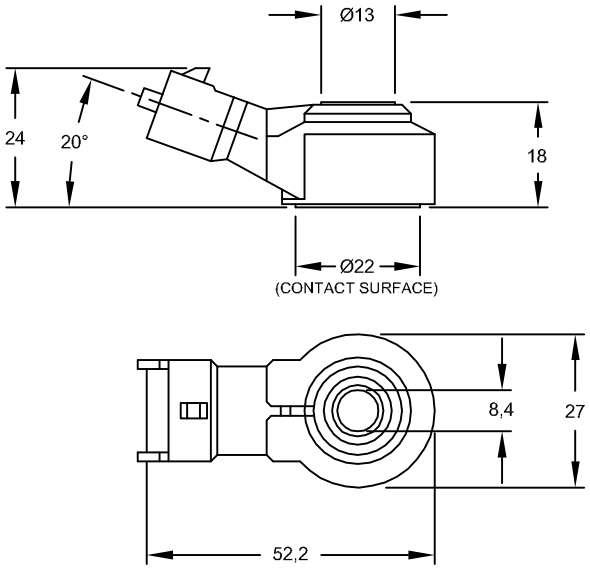
DATA RATE: AUTO SENSED 10/100 Mbps

ADDRESS: AUTO IP, BOOT P, STATIC

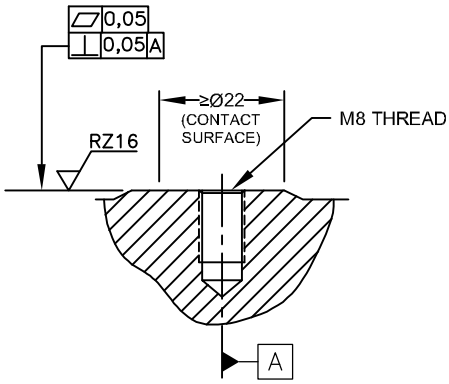
IP ADDRESS: DEFAULT STATIC IP ADDRESS IS 10.1.100.100

HAZARDOUS AREA CLASSIFICATION: CLASS I, DIV. 2, GROUPS C & D FOR DIRECT HOOKUP,
TEMP CODE T4, MAX. AMBIENT TEMP. 80°C.

FIGURE 2. MOUNTING, DIMENSIONS, AND SPECS – VIBRATION SENSORS



NOTE: DIMENSIONS ARE IN MILLIMETERS.



MOUNTING HOLE

SPECIFICATIONS:

FREQUENCY RANGE: 1Hz - 20kHz

MEASURING RANGE: 0.1 - 400 g

SENSITIVITY AT 5 kHz: 26 ± 8 mV/g

OPERATING TEMPERATURE RANGE: -40°C - +150°C

INSTALLATION:

MOUNTING BOLT: GREY CAST IRON: M8 X 25; GRADE 8.8
ALUMINUM: M8 X 30; GRADE 8.8

TIGHTENING TORQUE (OILED PERMITTED): 20 ± 5 N/m; 15 ± 1 Ft/Lb

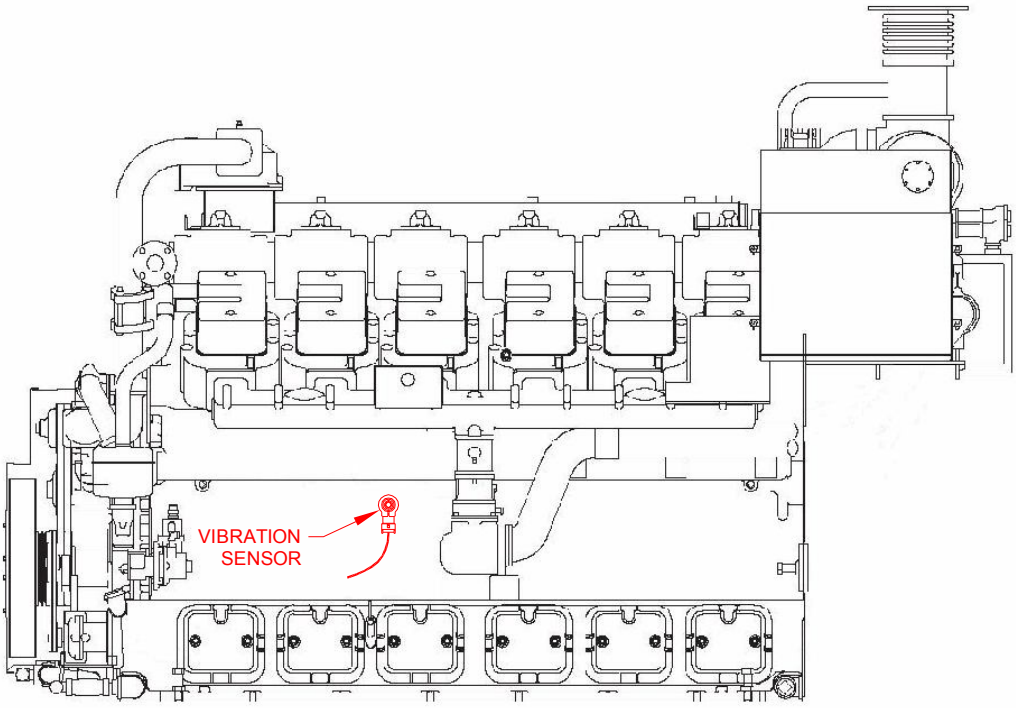
MOUNTING POSITION: ARBITRARY

SENSITIVITY: PARALLEL WITH MOUNTING BOLT

INSTALLATION INSTRUCTIONS:

MOUNT THE VIBRATION SENSORS TO A SMOOTH SURFACE (COUNTERBORE IF NECESSARY) ON THE MACHINE TO BE MONITORED. A SURFACE THAT IS NOT SMOOTH WILL GIVE ERRATIC READINGS. ANGULAR MOUNTING POSITION IS ARBITRARY. DRILL AND TAP THE PART PERPENDICULAR TO THE SURFACE, TAKING CARE NOT TO PENETRATE THE WATERJACKET.

FIGURE 3A. TYPICAL SENSOR MOUNTING LOCATIONS

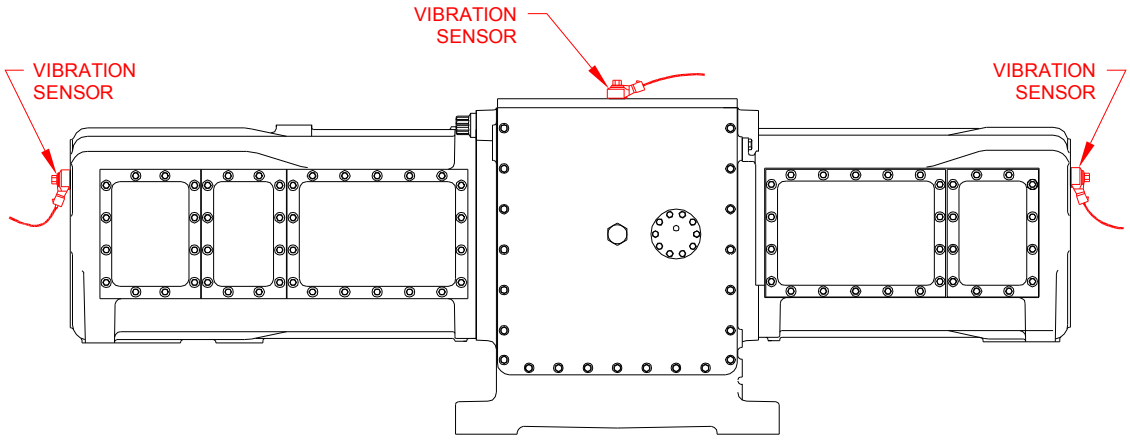


NOTES:

1. THE VIBRATION SENSOR IS MOST SENSITIVE PARALLEL TO THE MOUNTING BOLT.

2. MOUNT VIBRATION SENSOR ON BOTH SIDES OF ENGINE BLOCK.

ENGINE

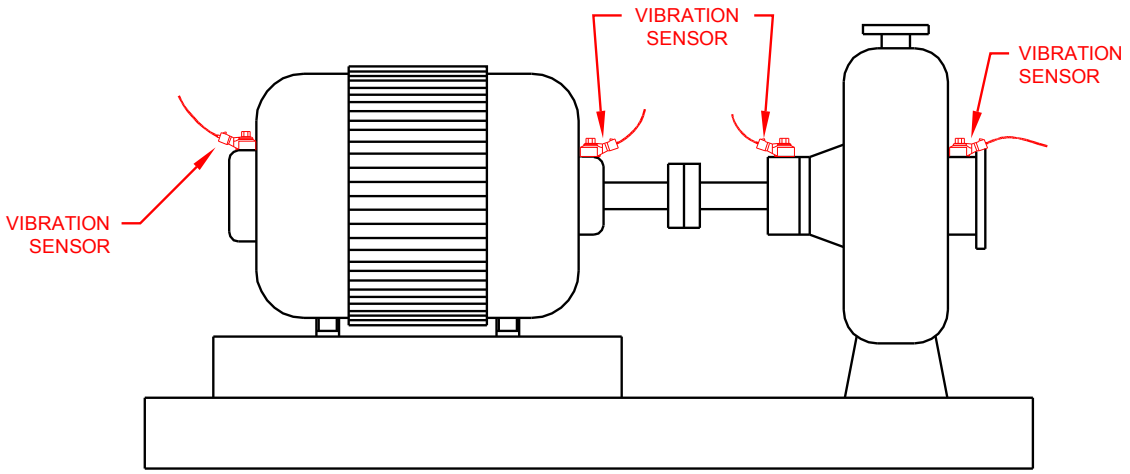


NOTES:

1. MOUNT VIBRATION SENSOR ON COMPRESSOR FRAME AND AT EACH HEAD.

COMPRESSOR

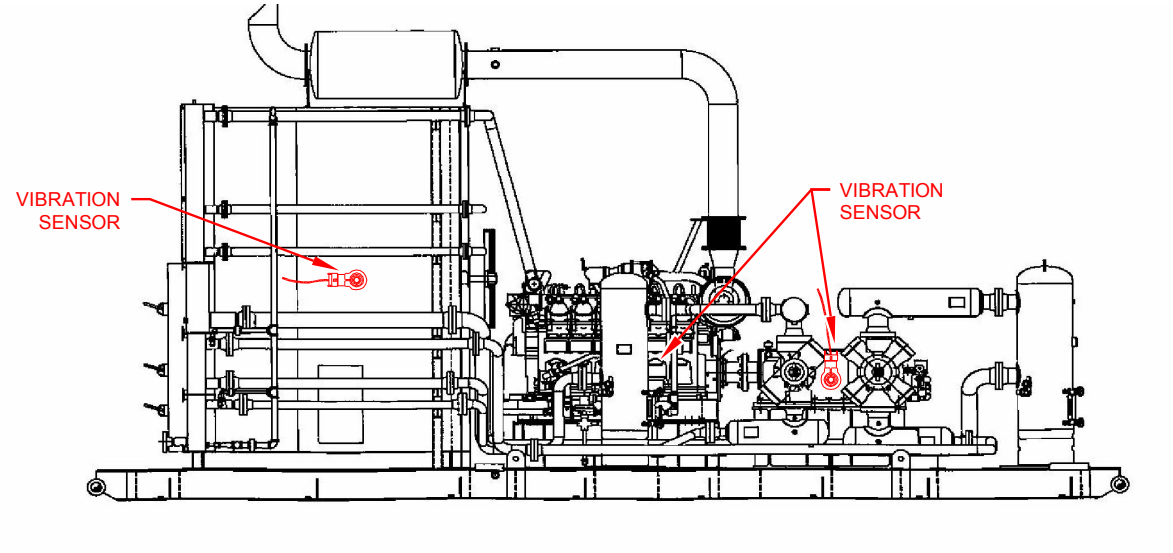
FIGURE 3B. TYPICAL SENSOR MOUNTING LOCATIONS



NOTES:

1. THE VIBRATION SENSOR IS MOST SENSITIVE PARALLEL TO THE MOUNTING BOLT.
2. MOUNT VIBRATION SENSOR PERPENDICULAR TO THE AXIS OF ROTATION.
3. MOST EFFECTIVE POSITION IS ON THE BEARING HOUSING; CLOSE TO THE CENTERLINE OF ROTATION.

MOTOR / PUMP



NOTES:

1. MOUNT VIBRATION SENSOR ON A RIGID LOCATION ON THE COOLER FRAME CLOSE TO CENTERLINE OF FAN SHAFT.
2. MOUNT VIBRATION SENSORS ON ENGINE BLOCK AND COMPRESSOR FRAME.

COOLER / ENGINE / COMPRESSOR

FIGURE 4. WIRING DIAGRAM – SENSOR INPUTS

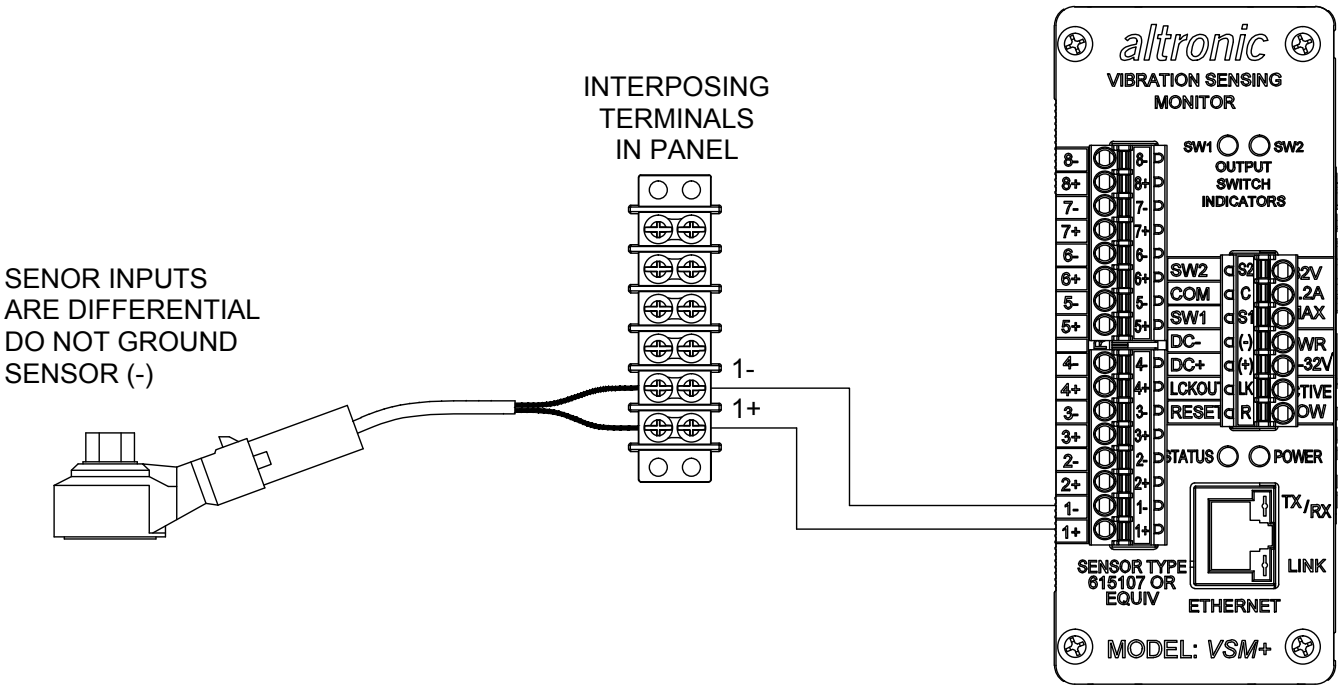
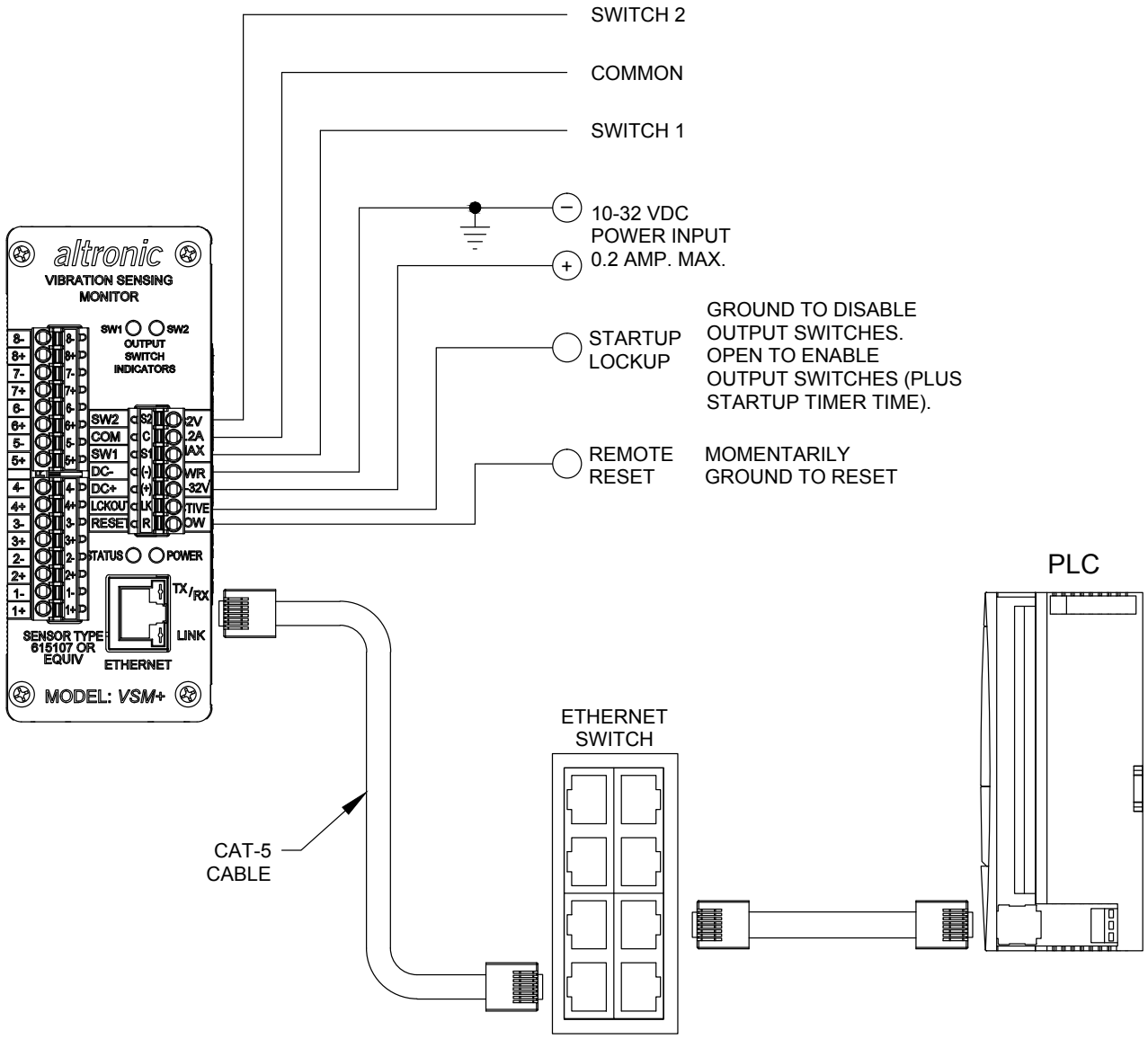


FIGURE 5. WIRING DIAGRAM – ETHERNET SWITCH



NOTES:

1. POWER WIRING,
   MUST BE POWERED FROM A CLASS 2 POWER SUPPLY. IT IS RECOMMENDED THAT THE CURRENT FROM THE POWER SUPPLY TO THE MODULE BE LIMITED THROUGH A PROPERLY SIZED SURGE TOLERANT FUSE OR ELECTRONIC BREAKER.

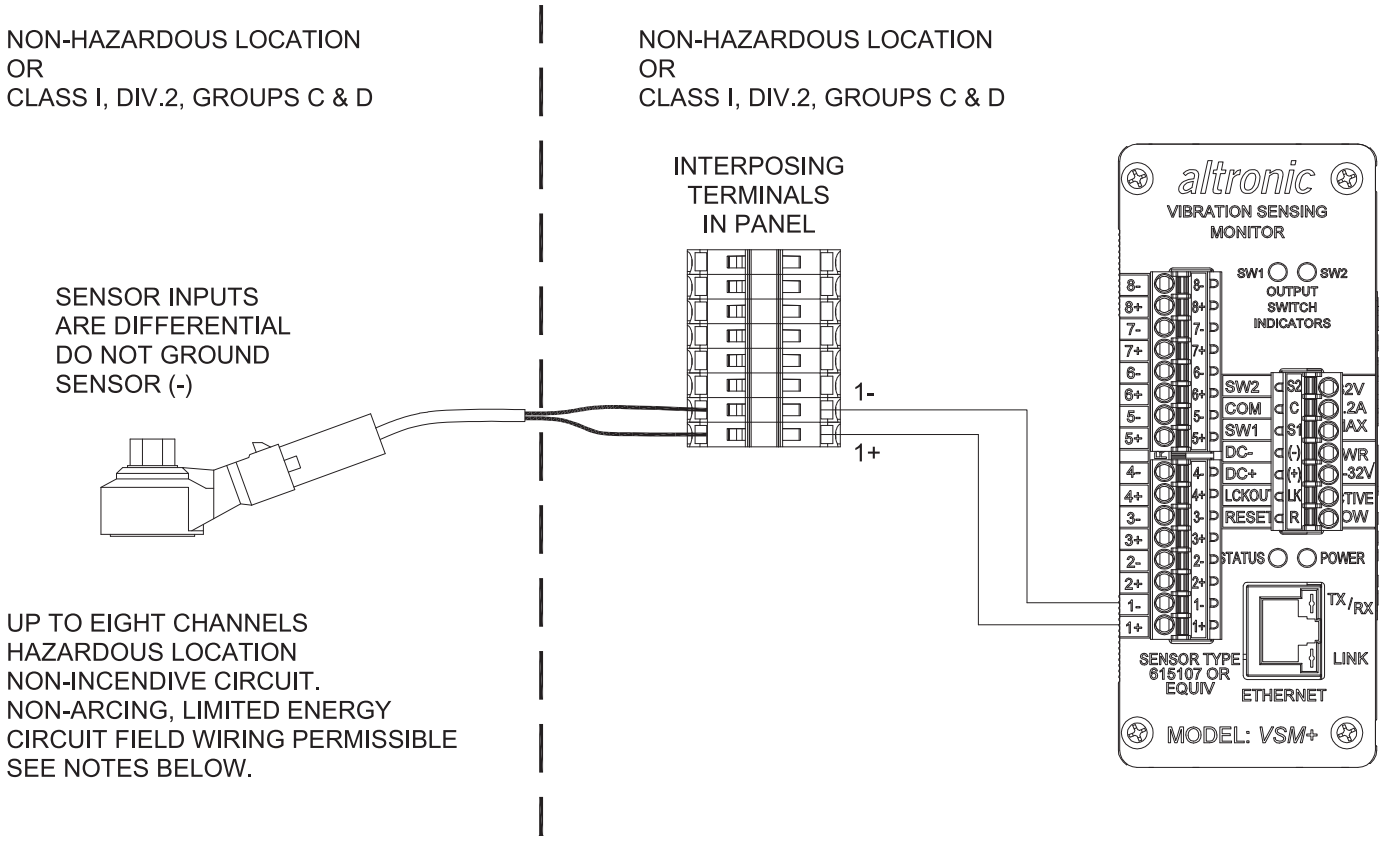
2. RJ45 ETHERNET COMMUNICATIONS WIRING,
   USE DATA GRADE CATEGORY 5E SHIELDED TWISTED-PAIR (STP) OR UNSHIELDED TWISTED-PAIR (UTP) CABLE THAT HAS A 100Ω CHARACTERISTIC IMPEDANCE THAT MEETS THE EIA/TIA CATEGORY FIVE (CAT-5) WIRE SPECIFICATIONS. MAX WIRE LENGTH IS 100 METERS / 325 FEET.

3. OUTPUT SWITCHES ARE RATED 32 VDC, 200 mA MAX. EACH SWITCH TURNS ON TO COMMON WHICH IS ISOLATED FROM DC-.

4. SWITCH 1 IS A CLOSED SWITCH WITH THE ABSENCE OF POWER AND IS TYPICALLY USED FOR AN ALARM OUTPUT.

5. SWITCH 2 IS AN OPEN SWITCH WITH THE ABSENCE OF POWER AND IS TYPICALLY USED FOR A SHUTDOWN OUTPUT.

FIGURE 6. WIRING DIAGRAM – HAZARDOUS LOCATIONS



NOTES:

1. THE VSM+ IS CSA CERTIFIED FOR CLASS I, DIVISION 2, GROUPS C & D AREAS AS A COMPONENT ONLY AND IS REQUIRED TO BE INSTALLED IN A SUITABLE ENCLOSURE WHERE THE SUITABILITY OF THE COMBINATION IS SUBJECT TO THE LOCAL INSPECTION AUTHORITY HAVING JURISDICTION.

2. U.S. INSTALLATION MUST BE IN ACCORDANCE WITH ARTICLE 500 OF THE NEC(R)(ANSI/NFPA 70) AND ANSI/ISA RP 12.06 AND APPLICABLE LOCAL CODES. CANADIAN INSTALLATIONS MUST BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE, CSA C22.1, PART 1, APPENDIX F AND APPLICABLE LOCAL CODES.

3. WIRING TO OR FROM THE VSM+, WHICH ENTERS OR LEAVES THE SYSTEM ENCLOSURE, MUST UTILIZE WIRING METHODS SUITABLE FOR CLASS I, DIVISION 2 HAZARDOUS LOCATIONS, AS APPROPRIATE FOR THE INSTALLATION. RUN THE SENSOR WIRES LEAVING THE PANEL IN A SEPARATE CONDUIT FROM ALL OTHER WIRING AND KEEP THEM SEPARATE THROUGHOUT THE INSTALLATION.

4. POWER TO THE VSM+ MUST BE FROM A CLASS 2 POWER SUPPLY.

5. THE INTERCONNECTION FROM THE VSM+ TO THE SENSORS HAS BEEN ASSESSED AS NON-INCENDIVE CIRCUITS. NON-INCENDIVE FIELD WIRING AND NON-INCENDIVE CIRCUIT WIRING PRACTICES AS CALLED OUT IN THE CANADIAN ELECTRICAL CODES, CSA C22.1 PART 1, APPENDIX F AND NON-INCENDIVE FIELD WIRING PRACTICES AS CALLED OUT IN THE ARTICLE 500 OF THE NEC(R)(ANSI/NFPA 70) ARE ACCEPTABLE.