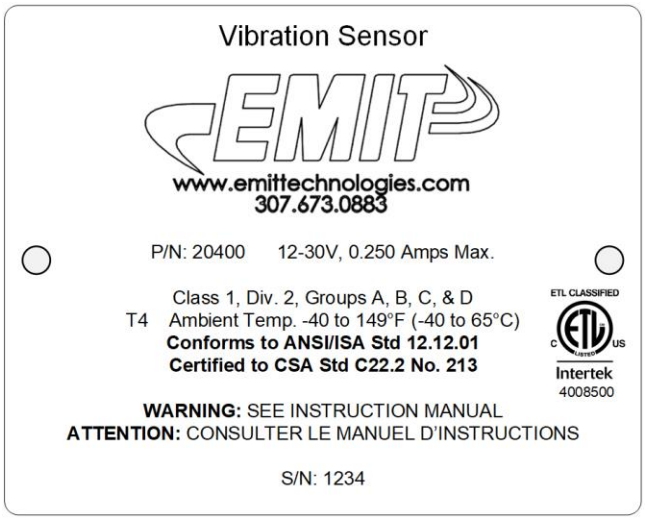
Vibration Sensor (20400)

Installation, Operation, and Troubleshooting Manual

Document Date: 21 Feb 2025
Document Number: VIB_EXT01
Revision: 0.14

Table of Contents

C1D2 Notice



Standards

Nonincendive Electrical Equipment For Use In Class I And II, Division 2 And Class III, Divisions 1 And 2 Hazardous (Classified) Locations [ISA 12.12.01:2015]

Nonincendive Electrical Equipment For Use In Class I And II, Division 2 And Class III, Divisions 1 And 2 Hazardous (Classified) Locations [CSA C22.2#213:2016 Ed.2]

Models

Vibration Sensor (20400)

For use in: Class I, Division 2, Groups A, B, C, D, T4
Ambient Temp: -40°C to +65°C

Hardware and System Overview

The Vibration Sensor is an essential tool for monitoring and protecting the mechanical integrity of an engine and compressor package from what could potentially be a serious and expensive failure. Typically, traditional vibration sensors operate using a magnet and spring adjustment to trip when generally more vibration is present. This crude system does not provide any information as to what went wrong or exactly how much vibration was present at the time of trip. The EMIT Vibration Sensor provides similar protection but also includes data and information necessary to understand more about the fault. If the Vibration Sensor is connected to an EMIT DCT or EIM, the vibration trip setpoint can be set for a precise vibration or variance and the history can be displayed for analysis or diagnostics purposes. Up to sixteen Vibration Sensors can be configured into one system.

Features include:

- Measurement of vibration acceleration up to 8*g*
- Measurement of vibration velocity standard scale to 0 – 2 inches per second (IPS)
- Connection via CAN-bus to EMIT panels – does not require any Brain (Annunciator) inputs
    - Up to 16 vibration sensors can be used per panel
- Wide 12 – 30v input power option
- When used with EMIT panel, datalogs vibration levels for easy trending and downloading
- 4-20mA output option for use with non-EMIT panels as an analog input sensor

Specifications

Power

- 12 – 30VDC power supply input range
- Typical power consumption: 2W
- Maximum power consumption: 4W

Environmental

- Temperature: -40°C to +65°C (-40°F to 149°F) T4
- Humidity: 5% - 90%, non-condensing

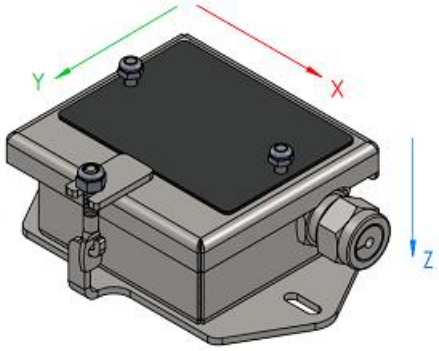
Communication

- Controller Area Network (CAN) network for communication to EIM or DCT EMIT modules
- USB host for datalog access and software updates
- 4-20mA output for connection to third party annunciators

Installation

Physical Installation

The sensor should be rigidly mounted to the area of vibration measurement – compressor frame, compressor cylinder, engine, or cooler. Ideally, the sensor should be mounted so that the main modes of vibration are in the same plane as the sensor lid. For example, if using on a compressor frame the sensor should be mounted on the top in any orientation or on the front of the frame in any orientation, but not on the right or left side. The 'Z' direction shown below is least sensitive.



The sensor should be mounted as rigidly as possible to the machinery being measured. A more direct mounting to the machinery results in better sensitivity and reduced spurious harmonics.

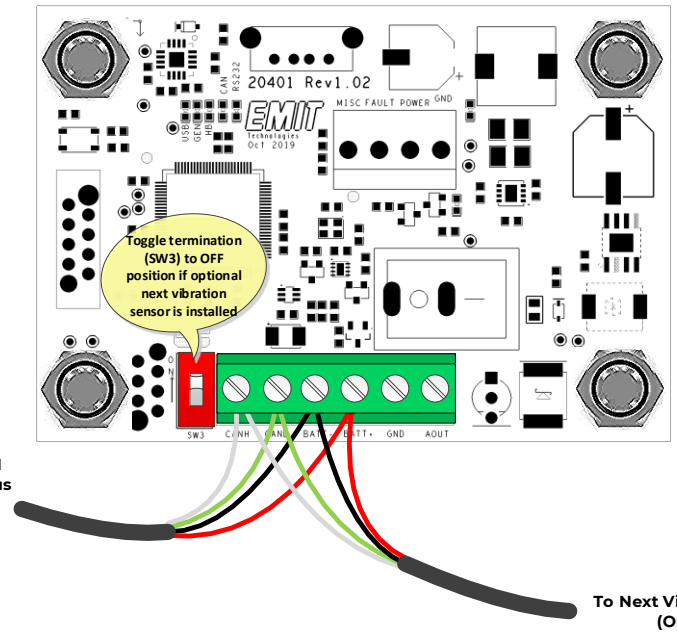
After wiring (see below section) the power switch should be left in the 'on' position and the box closed with the latch. The box should not be opened during normal operation or when power is applied unless the area is known to be non-hazardous.

Wiring

The vibration sensor is wired by running wire into the cord grip or attaching a conduit fitting to the same location. The sensor can be wired as a CAN sensor (for EMIT panels), or a 4-20 mA sensor (for other panels). These examples are shown below.

Wiring to EMIT Panel

In This Example
White – CAN H
Green – CAN L
Black – BATTERY- IN
Red – BATTERY+ IN



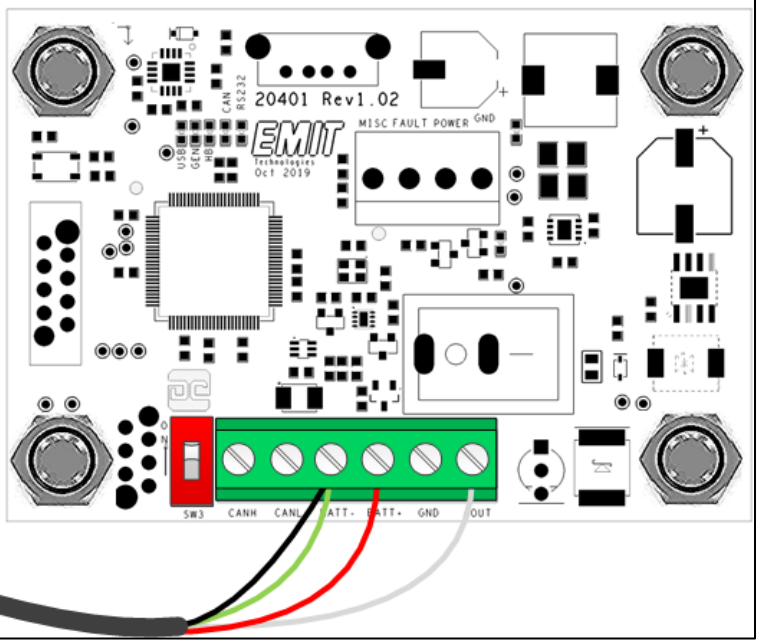
To Panel Power / CAN Connection, or previous Vibration Sensor

To Next Vibration Sensor (Optional)

Wiring as 4-20 mA Sensor

In This Example
White – 4-20mA Out
Green – 4-20mA Gnd*
Black – BATTERY- IN
Red – BATTERY+ IN

*Optional



To Panel

The Vibration Sensor contains a single non-removable terminal block. The terminal block points include terminals for communicating via CAN to the EMIT module network, battery terminals for powering the system, and outputting an optional 4-20mA signal through a single wire.

Wiring is attached by loosening the cover bolt to open the lid and attaching the wires to the screw posts. It is recommended that ferrules be used on wire ends. Excess wire/cable should be pulled out of the box to minimize the change of wire breakage from vibration movement. The cord grip or conduit connection to the box should be tight to ensure that the ingress protection of the enclosure is not affected.

⚠	When replacing the cover, only tighten the nut enough to seal the gasket.

CAN Wiring (EMIT Panel)

If the Vibration Sensor is being wired to only one device (i.e. at the end of a daisy chain network), the red CAN termination switch should be toggled UP away from the closest board edge. If the Vibration Sensor is being wired in between multiple modules (i.e. somewhere in the middle of a daisy chained network) as indicated in the graphic above by the optional 2nd wire harness, the red CAN termination switch should be toggled DOWN towards the closest board edge. The diagrams below illustrate this concept.

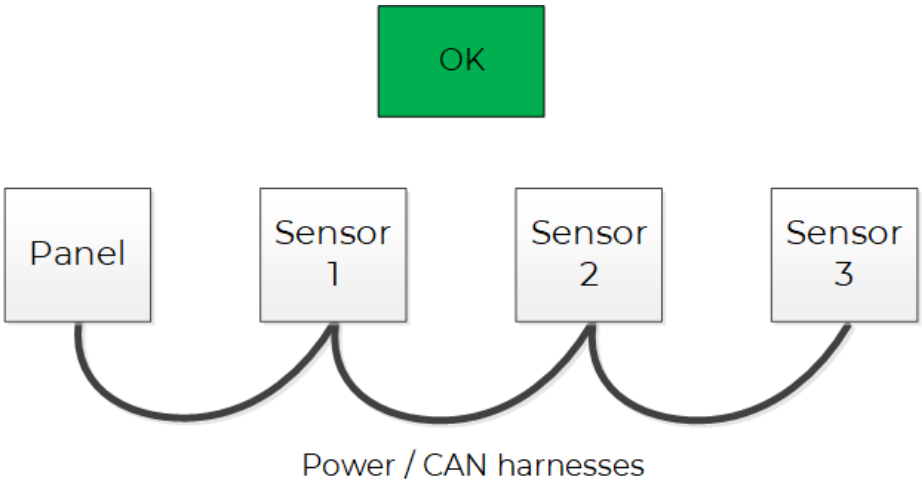


Figure 1. Good CAN wiring - the CAN cables form one chain. In this example Sensor 1 and 2 will be unterminated, and sensor 3 will be terminated (the other terminated connection will be the touchscreen in the panel).

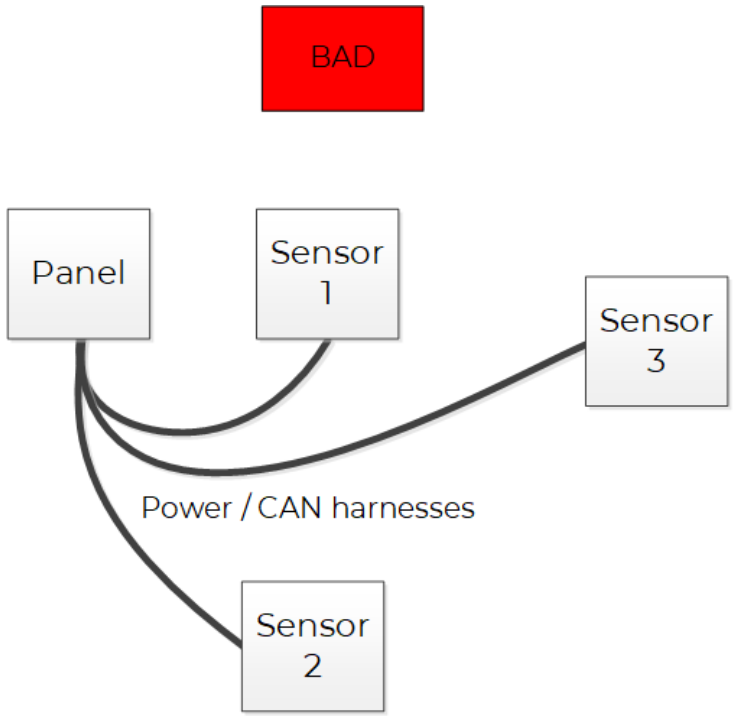
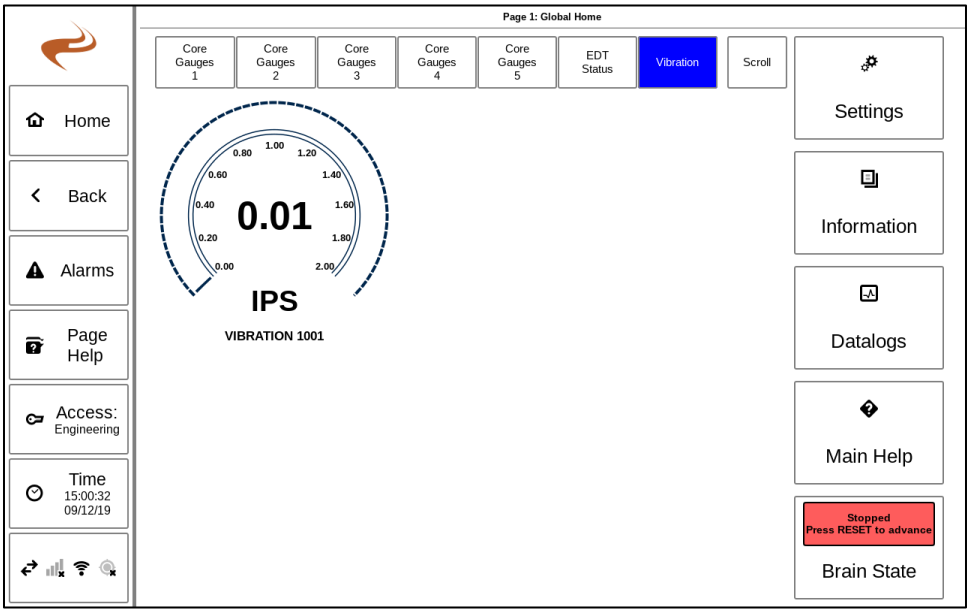


Figure 2. Bad CAN wiring - the CAN cables do not form a single chain.

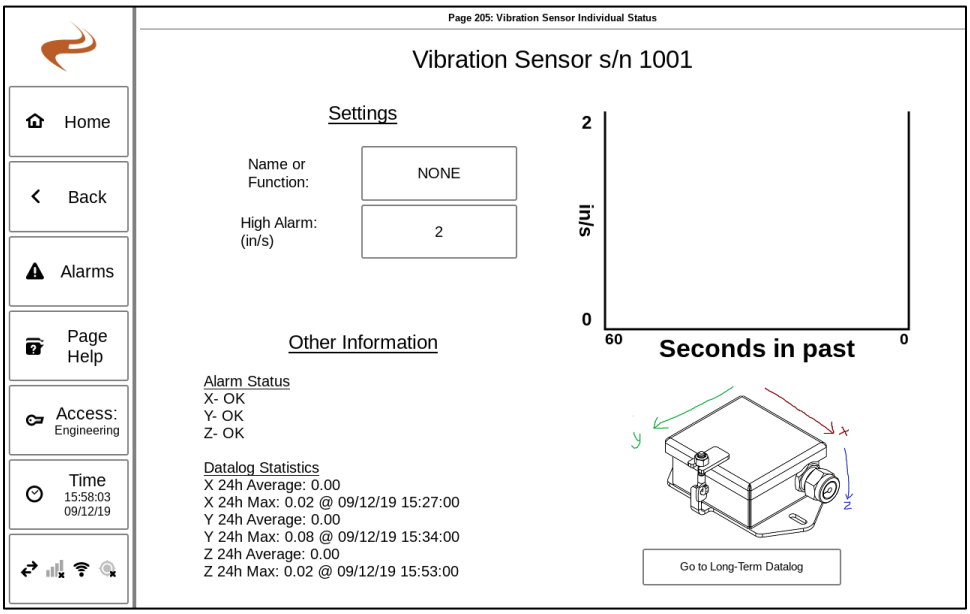
Note that if the panel has multiple modules, the module at the old end of the chain will be switch from terminated to unterminated since it is changing from the end to the middle of the CAN chain. In most cases this will be the Brain module. If an EMIT Ignition is present on the system, the ignition will have to be switched to unterminated and a harness for CANH and CANL ran from the ignition to the first vibration sensor.

EMIT Panel Setup

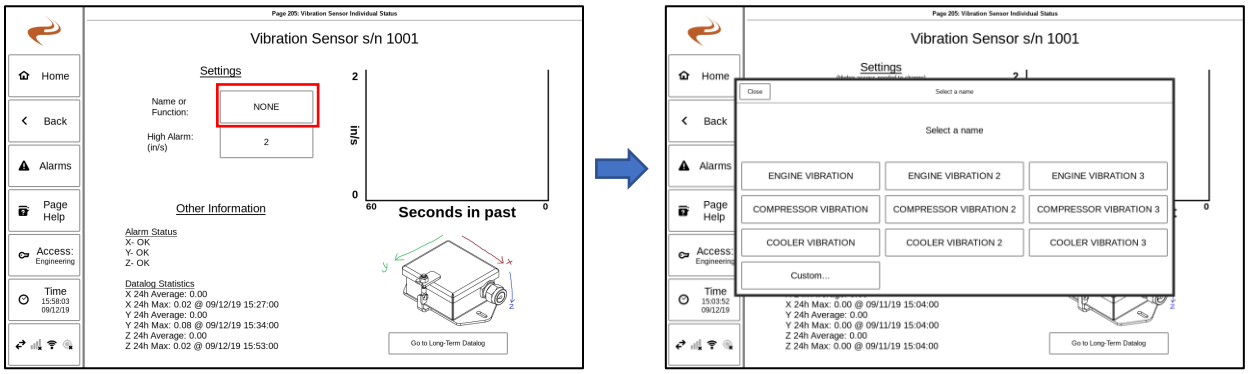
After attaching and powering up the sensors, a new tab for “Vibration” should apper on the DCT home page, with each sensor attached shown. The sensors will not yet be named and instead will be listed by serial number.



Selecting a gauge will bring up the individual sensor information page.



If in *Setup* or higher Access level, the Name and High Alarm can be assigned. Selecting the name allows for a selection of the name.



If a custom name is desired, “Custom…” can be selected and another name can be entered.

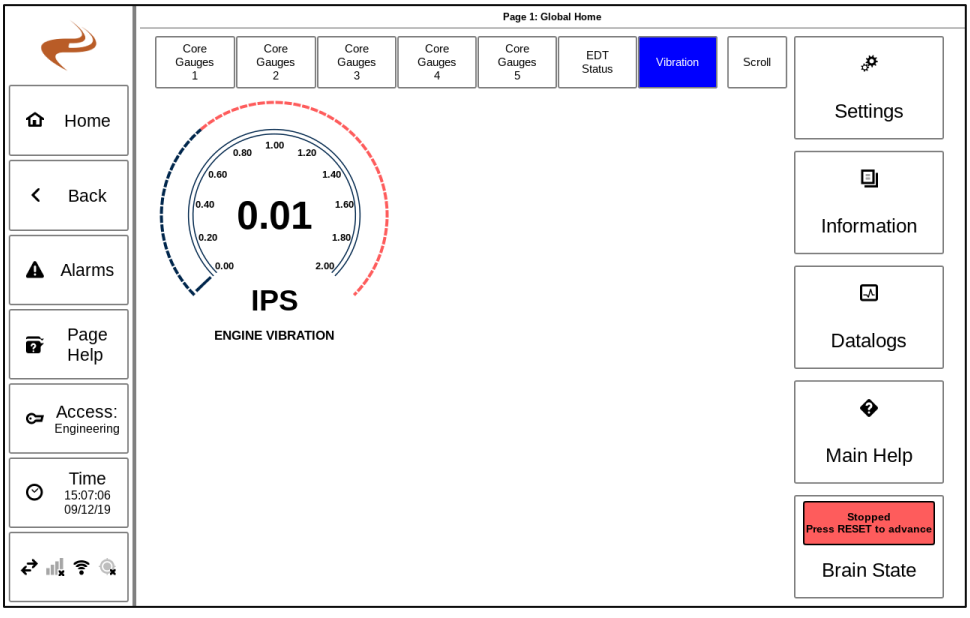
After a sensor is named, the live vibration graph will begin to update.

The High Alarm box can be selected to choose a new high vibration alarm, in inches per second (IPS) peak. General rules of thumb for all types of machinery are:

- Less than 0.2 IPS = Good
- 0.2 – 0.4 IPS = Fair
- 0.4 – 0.6 IPS = Rough
- 0.6 – 0.8 IPS = Very rough
- 0.9 IPS = Danger

The engine, compressor, or cooler manufacturer may have suggested vibration alarm levels.

If any configuration adjustments are made on the individual sensor status page, select “Submit Changes” to save. The home page will show the new sensor name.

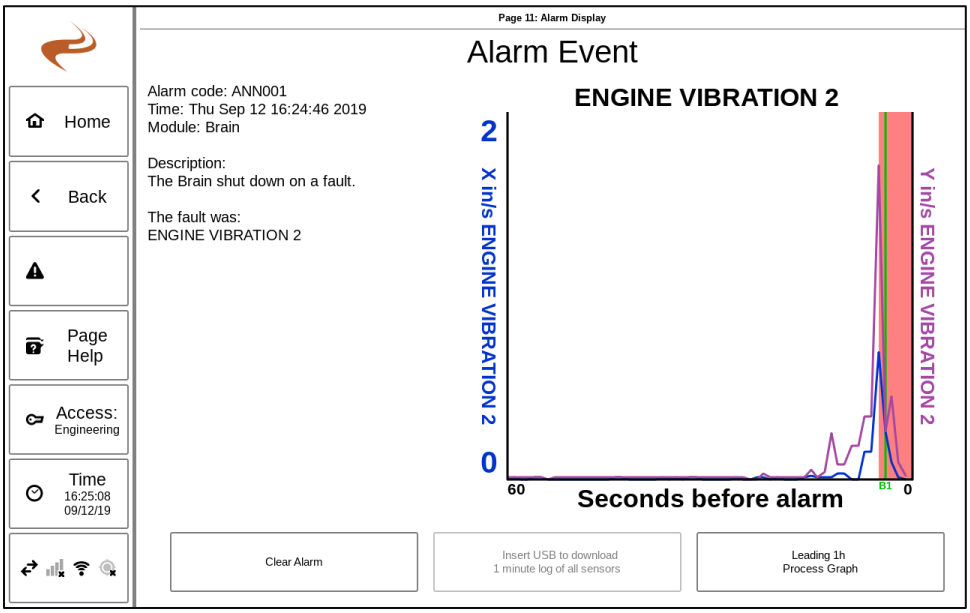


Datalogs

The system logs each sensor's X, Y, and Z vibration to the normal DCT data log for a period of one month. This log can be viewed and downloaded on the "Datalogs" page.

Vibration Sensor Alarms

If any axis peak velocity goes over the configured alarm limit it will trigger a shutdown. The Brain will be signaled over CAN to go to a faulted state. The DCT will register a standard shutdown event, and the alarm event can be viewed or downloaded normally.

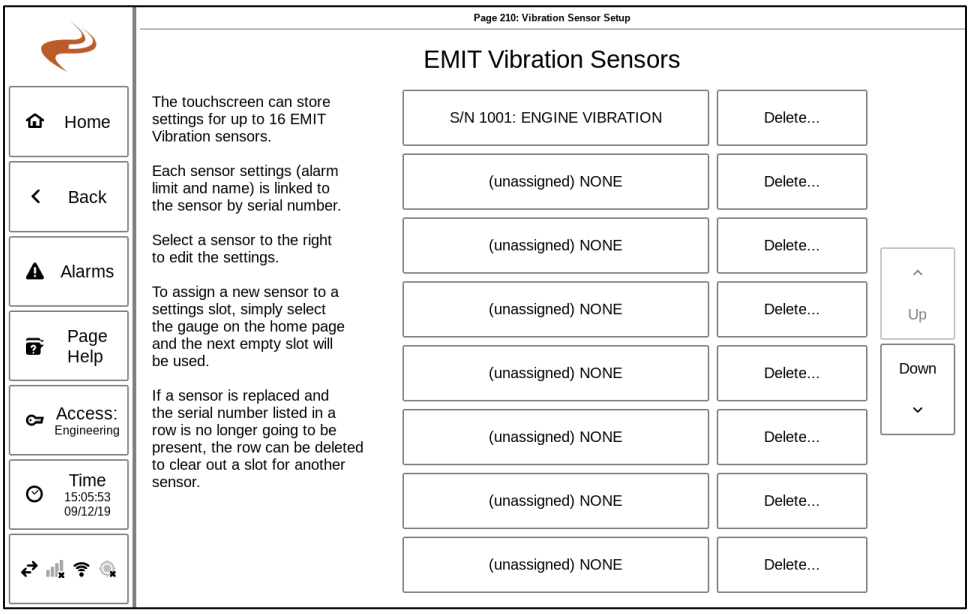


Timeout Alarm

Once a vibration sensor is powered up, the Brain will expect it to be present. If ever the sensor stops communicating the Brain will trigger a shutdown. This protects the equipment from damage in the case of sensor failure, wire breakages, etc. If this alarm is triggered falsely because a sensor was changed, simply cycle power on the Brain to reset its sensor table.

Changing a Sensor

If a sensor is ever changed, the setup steps above can be used to re-configure the sensor. The DCT has 16 slots for configuring sensors and stores settings tied to a specific sensor serial number. Because of this, when a sensor is changed the old sensor settings "waste" a configuration slot. Since there are 16 slots available this is rarely an issue, but if some old sensors need to be cleared out of the system it can be done on the Vibration Sensor Setup page. This page is reached from the home page "Settings" -> "EMIT Sensors" -> "Vibration Sensors".



On this page, all sensors ever configured are shown. If one or more are no longer present, the “Delete…” button can be selected on that row to clear out that sensor settings from the system.

Sheridan, Wyoming
2571 N Main St, Sheridan, WY 82801
P.O. Box 6785, Sheridan, WY 82801

Phone: 307-673-0883 | Fax: 307-673-0886

info@emittechnologies.com

Technical forum: http://forum.emittechnologies.com/

www.emittechnologies.com