

PRO VIBRATION SWITCH FAMILY

Installation Manual



OVERVIEW

The PRO440/6000 is a versatile, programmable vibration protection instrument. Within its standard configuration, the electronic switch is an economical single set point vibration switch loaded with standard features and packaged in industrial grade housing.

PRO switches can be configured via a real time remote operator interface membrane keypad or a USB interface to a PC. This capability allows users to tailor the switch specifically to their monitoring needs. In addition, an isolated proportional 4-20 mA output and a buffered output give easy access to the machine vibration signal.

The PRO switch accepts most accelerometer or velocity inputs. It can also accept and power a 4-20 mA loop powered sensor to become a field monitor. When fully configured, the switch provides local machine protection with an optional alphanumeric readout.


GENERAL SAFETY SUMMARY

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified. Only qualified personnel should perform installation and un-installation procedures.

CONNECT AND DISCONNECT PROPERLY

Do not connect or disconnect this product while it is connected to the live power source.

GROUND THE PRODUCT

The housing of this product should be connected to earth ground.  Before attempting to turn on the product ensure the housing of this product is properly grounded.

OBSERVE ALL TERMINAL RATINGS

To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product installation manual for further ratings information before making connections to the product.

DO NOT OPERATE WITHOUT COVER

Do not operate this product with cover removed.

AVOID EXPOSURE TO CIRCUITRY

Do not touch exposed electrical connections and components when power is present.

DO NOT OPERATE WITH SUSPECT FAILURES

If you suspect there is damage to this product, have it inspected by qualified personnel.

SAFETY TERMS AND SYMBOLS

Terms that appear in this manual:



WARNING: Warning statements identify conditions or practices that could result in injury or loss of life.



CAUTION: Caution statements identify conditions or practices that could result in damage to these products or other property.

Symbols that may appear on the products:



Danger
High
Voltage



Attention
Refer to
Manual



Protective
(Earth)
Terminal



Functional
Ground

INSTALLATION

Mechanical Housing

There are two types of the housing for the vibration switch.



PRO440 housing



PRO6000 housing

The sensitive axis of the switch can be mounted on any radial axis, although the horizontal axis is preferred so that unit can see maximum vibrations. The horizontal axis also reduces the temperature exposure as compared to the vertical axis.

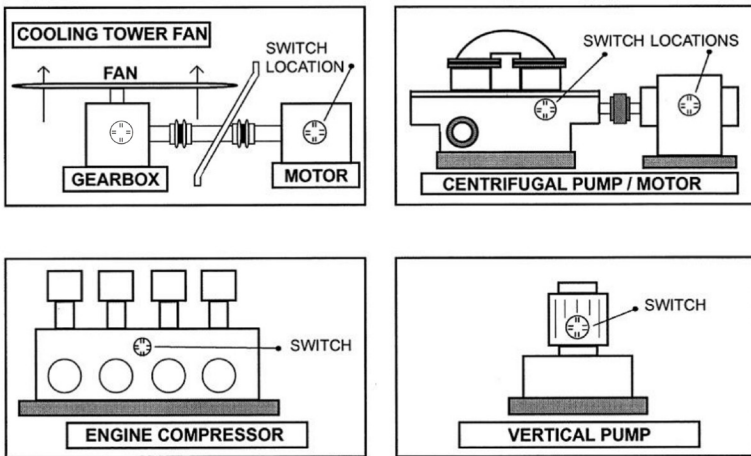



Figure 1: Placement of the switch within the Application

The optional display can be rotated +/- 60 degree to bring it to a readable position.

The switch is designed to dissipate internal heat by conduction through its base. Hence, it is important to keep the mounting surface at or below the switch max temperature limit of 185°F. If the equipment being monitored is going to exceed this limit, consideration should be given to either using one of the remote transducers, or thermally isolating the switch.

Although seal tight and other flexible conduit have been used successfully, in areas of extreme humidity or moisture it is recommended that an "SO" type cable together with a suitable rain-tight CGB fitting be used.

 **NOTE:** Do not install the switch in such a position that is difficult to connect to and to disconnect from the target machine/motor as shown in the Figure 3.

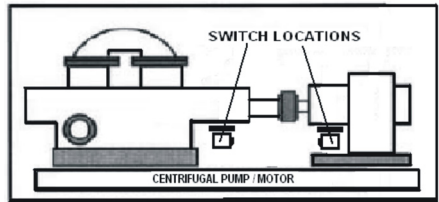


Figure 3

WIRING

Alphanumerical display board must be removed to access the terminal strips / field interface.

Remove the display board to allow wiring to the terminal strips on the switch.

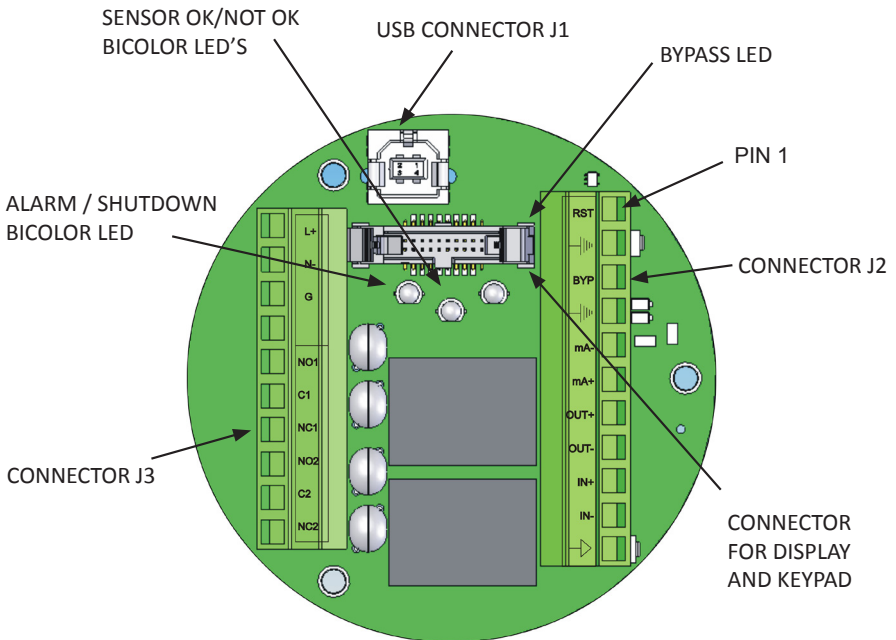


Figure 4: Interface Board Top View

Pin No.	Connections	Description
L+	AC L OR 24V +ve	Live of Mains OR +ve terminal of 24V DC power supply
N-	AC N OR 24V –ve	Neutral of Mains OR –ve terminal of 24V DC power supply
G	EARTH E	Earth of mains OR Earth of DC power supply
	Not used	N/A
NO1	NO LIM1	ALARM Relay NO
C1	COM LIM1	ALARM Relay COM
NC1	NC LIM1	ALARM Relay NC
NO2	NO LIM2	SHUTDOWN Relay NO
C2	COM LIM2	SHUTDOWN Relay COM
NC2	NC LIM2	SHUTDOWN Relay NC

Table 1: J3 Terminal strip for Power connections

The power required is indicated on the nameplate. The voltage supply must be within the following limits:

- 24VDC: 22 to 26V DC
- VAC: 85 to 265V AC, 50/60 Hz

CONNECTING ALARM & SHUTDOWN RELAY OUTPUTS

Potential free contacts for Alarm and Shutdown signals are provided on the terminal blocks as shown in Table 1.

At the LIM1 terminals, loads like enunciators, lamps etc. can be connected between NO1 & C1 or between NC1 & C1. Maximum load is 10A for both the outputs.

The internal shutdown switch circuit is designed to be wired in series with the external shutdown circuit i.e. motor starter, contactor, etc. At LIM2 terminals the load should be connected.

The maximum load that can be connected to the LIM1 OR LIM2 is 10A.

Pin No.	Connections	Functions
RST	RESET +	Reset Switch +Ve Terminal
	RESET - Common	Reset Switch –Ve Terminal
BYP	Bypass +	Bypass Switch +Ve Terminal
	Bypass - Common	Bypass Switch –Ve Terminal
mA-	Analog O/P Common	4-20 mA Common
mA+	Analog O/P +	4-20 mA Output
OUT+	Buffer O/P +	Input Signal Buffer Output
OUT-	Buffer O/P Common	Buffer Output Common
IN+	Ext Sensor+_IN	+ve terminal of Sensor Output
IN-	Ext Sensor-_IN	-ve terminal of Sensor Output
	SHIELD	Shield

Table 2: J2 Terminal strip for I/O connections

Pin No.	Connections	Functions
1 (RST+)	RESET+ (signal)	Reset Switch +Ve Terminal
2 (RST-)	RESET- (common)	Reset Switch –Ve Terminal
3 (BYP+)	Bypass+ (signal)	Bypass Switch +Ve Terminal
4 (BYP-)	Bypass- (common)	Bypass Switch –Ve Terminal
5 (mA-)	Analog Output- (common)	4-20 mA Common
6 (mA+)	Analog Output+ (signal)	4-20 mA Output
7 (OUT+)	Buffer Output+ (signal)	Buffer Output Signal
8 (OUT-)	Buffer Output – (common)	Buffer Output Common
9 (IN+)	External Sensor+ (signal)	External Sensor Input +Ve Terminal
10 (IN-)	External Sensor- (common)	External Sensor Input –Ve Terminal
11 (SHLD)	External Sensor Shield	External Sensor Shield Connection

Table 3: J2 Terminal on Interface Board Connection Descriptions

CONNECTING THE RESET INPUT

If remote reset capability is desired, connect the Reset terminals to the remotely located momentary NO (Normally Open) push button switch. User is expected to connect a potential free contact at these terminals. The necessary excitation for this Reset Switch is provided by the vibration switch. The RESET input clears all the latched alarms when the reset input is momentarily closed. The resetting of alarms occurs only after the input is below the alarm set points. The reset switch does not play any role in non latching type of alarms. To reduce the noise pick up, a shielded wire is preferred.

CONNECTING THE BYPASS INPUT

The bypass input forcefully disables the relays from entering into alarm or shutdown states. Connect Bypass terminals to the remotely located NO (Normally Open) toggle switch. Close the switch to short the bypass contacts and put the switch in bypass mode. The necessary excitation for this Bypass Switch is provided by the vibration switch. To reduce the noise pick up, a shielded wire is preferred.

CONNECTING THE ANALOG OUTPUT

Proportional analog 4-20mA output is provided from the vibration switch. 4 mA corresponds to zero vibration; 20mA corresponds to full scale vibrations as set by range mA. The 4-20 mA output is self-powered (sourcing) and therefore requires no external power source. The 4-20 mA output is electrically isolated from the switch power supply. Shielded wire is recommended to reduce the noise pick up. In case of any malfunction like sensor not ok, the analog output is dropped to 3.6 mA.

CONNECTING THE BUFFER OUTPUT

Raw signal from the sensor is available at the terminal block. It is capable of driving a cable with a capacitance of up to 0.02uF. The buffered output provides connection terminals to access the “raw” output of the vibration sensor. Continuous short circuit protection is provided for the buffer output.

CONNECTING THE EXTERNAL SENSOR

Connect external sensors between IN + & IN - terminals for acquisition. The following types of sensor can be connected to the switch:

- External Accelerometer
- Piezo-electric velocity
- Electromechanical velocity (Metrix 5485C)
- 4-20mA Transmitter input

WIRING RECOMMENDATIONS

For incoming power and switch outputs use approved wire of 14 AWG (1.5sq. mm) or smaller. For reset and bypass functions use a twisted pair cable to reduce electrical noise pick up.

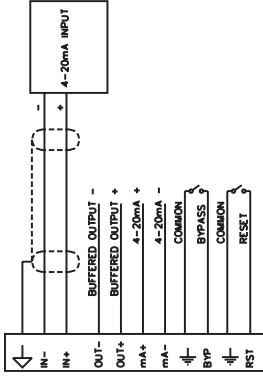
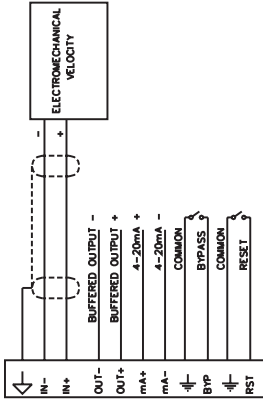
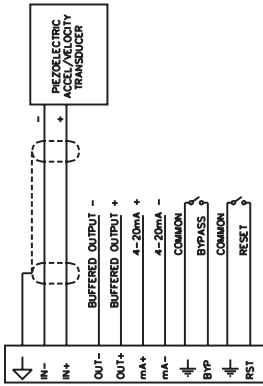
The dynamic sensor signal output is available at the terminal strip. For the Analog & Buffer dynamic signal outputs a shielded twisted pair cable is recommended. The shield should be common at the receiver end only. For the dynamic buffer signal output the capacitance of the cable run must not exceed 0.02uF. It is highly recommended that all power wiring should be routed separately from the output signals to reduce AC/transient noise pick up.

No stress should be given on the terminal block wiring. If such protection is not provided by the conduit system, some form of stress relief must be installed where wiring exits the housings.

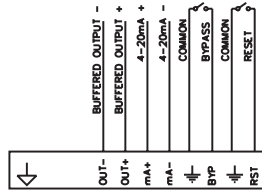
To assure compatibility with EMC standards, any signal level wiring for transducer, reset or 4-20 mA, etc. should utilize shielded cable in EMI proof conduit, separate from any power wiring.

WIRING DIAGRAM

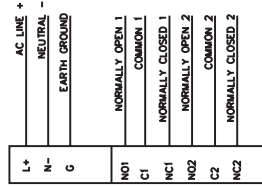
PRO SWITCH WITH EXTERNAL SENSORS



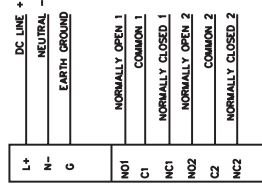
PRO SWITCH WITH INTERNAL SENSOR



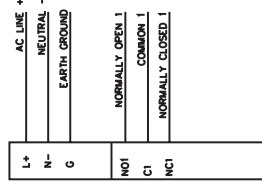
PRO SWITCH WITH AC POWER W/2 RELAYS



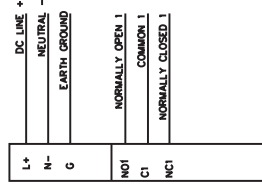
PRO SWITCH WITH DC POWER W/2 RELAYS

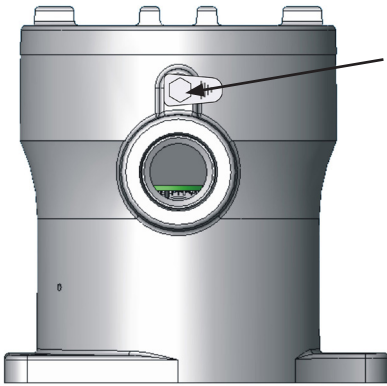


PRO SWITCH WITH AC POWER W/1 RELAY

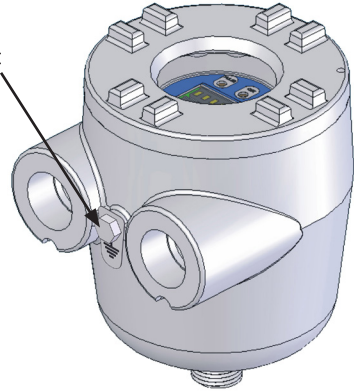


PRO SWITCH WITH DC POWER W/2 RELAYS





PRO440 Housing



PRO6000 Housing

The Earth wire from the input power supply should be connected to the Ground Point on the Switch Housing as shown above.

CONFIGURATION / CALIBRATION OF THE PRODUCT

Within the Display, the user can configure the switch using alphanumeric display and keypad.

If display is removed, the PRO configuration software (User software) is available to the customer for configuration and for diagnostic tests of the product. This software is available as a free download at www.metrixvibration.com

The interface between the product & PC is via USB. For this interface the USB connector is available on the interface board as shown in the "Figure 4: Interface Board Top View". A USB cable is required.

CONFIGURATION USING THE OPTIONAL DISPLAY

Insert the power cord into the J3 terminal connector per Table 1 and switch ON the system. The power up sequence should be as mentioned below. After power up, the switch enters into Measurement Mode.

With the optional display, the switch automatically displays the vibrations, read by the sensor as per the configuration. Type and Unit of measurement are displayed on the second line of the display.

POWER UP SEQUENCE

After switching ON the electronic switch the following start up sequence is displayed:

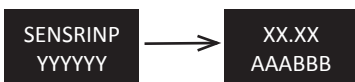


Figure 5: Power Up Sequence

YYYYYY represents the sensor type as per the configuration.

XX.XX represents measured value. AAA represents the measurement unit. BBB represents the measurement type i.e. RMS / PK.

USER INTERFACE DESCRIPTION

The user interface for the switch is a 2 line X 8 character alphanumeric display and 4 button keypad. Using this Keypad and display user can navigate through Trip Settings, Reset, Configuration, Diagnostic and Measurement mode.

After powering on, the switch displays the configured sensor type and waits for the power up delay. The user can enable menu options by pressing the MENU key and then can navigate the menus and their options using other keys. The Default mode for the Switch is measurement mode. If a key is not pressed for 60 sec. it automatically goes into the measurement mode.

KEYBOARD FUNCTIONS

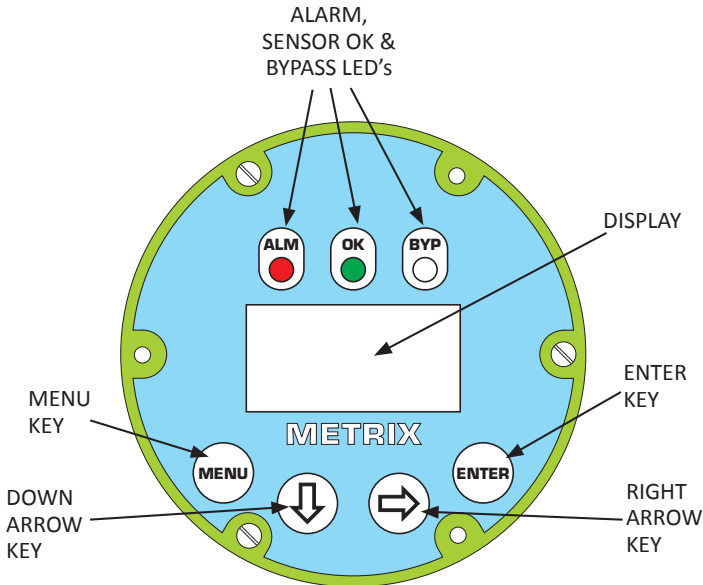


Figure 6: Keyboard and Display

Menu Key: The MENU key can be used at anytime to return to the Main Menu for selection of different modes. When the MENU key is pressed the Main Menu options are displayed. There are 5 Main Menu options, described in later sections.

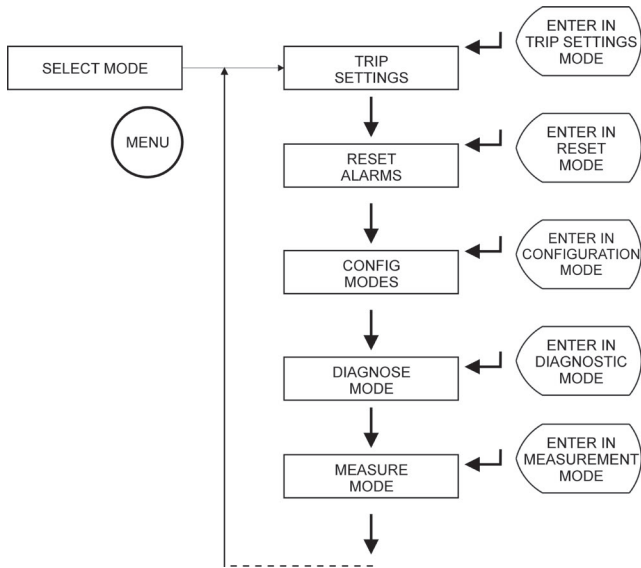
↓ **(Down arrow key):** By pressing this key the user can navigate through various menu and sub-menu options. This key also functions as an increment key during numerical entry.

↵ **(Enter key):** This key is used to enter into a selected menu. It is also used to confirm/store entered values.

→ **(Right arrow):** This key is used to position the cursor at the desired place during numerical entry. The cursor moves in a left to right direction.

MAIN MENU

The GUI interface is menu driven. Each menu may have lower level submenus The GUI Main menu map is as follows.



The default mode for the switch is measurement mode. The user can select a different mode by pressing MENU key, by pressing ↓ moving through all modes.

User can operate switch in one of the following modes:

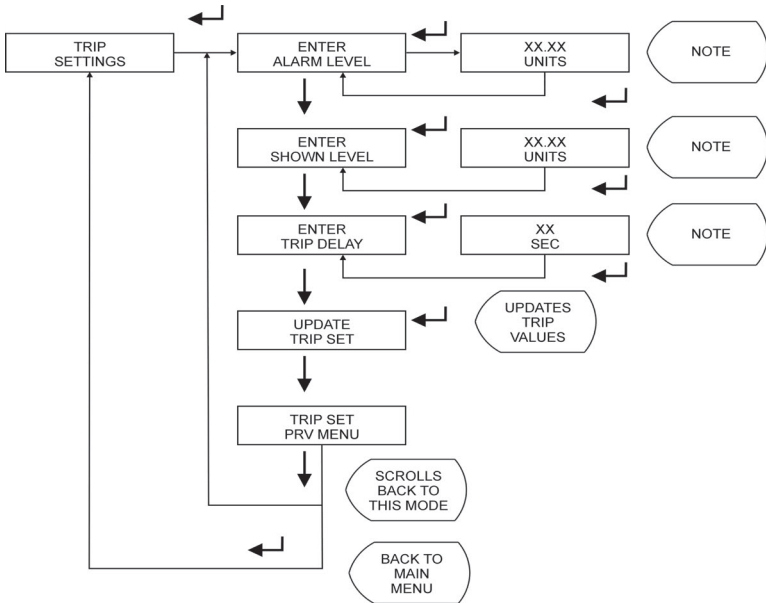
- Trip setting
- Reset Alarms
- Configuration
- Diagnostic
- Measurement mode

SUB MENUS

The following sub-submenus will be displayed for each selected switch mode.

TRIP SETTINGS

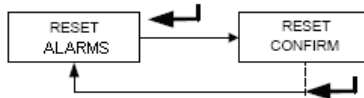
In this menu the user will be able to change parameter related to trip level and trip delay.



Note: By pressing \rightarrow key the digit of a displayed number shall blink and same digit can be incremented using \downarrow key. The edited number should be confirmed by \leftarrow key.

RESET ALARMS

The user can reset the alarms in latched condition by selecting Confirm Reset.



CONFIGURATION MENU

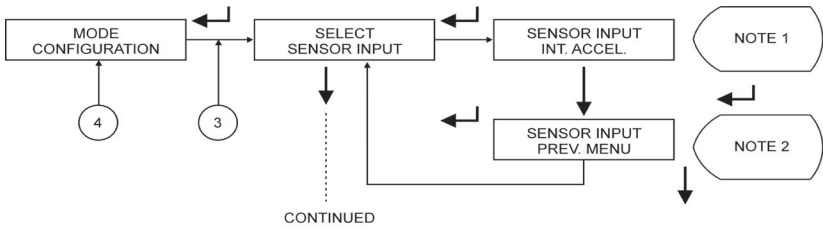
The sub-menu and configuration options available to the user in configuration mode are as shown in the flowchart below.


In the configuration, user is allowed to modify / alter the following parameters, depending upon the type of sensor:

- Sensitivity
- Sensitivity Unit
- Measurement Unit

- Full scale range
- Alarm Setpoint
- Shutdown Setpoint
- Power On Delay
- Trip Delay
- Latching / Non Latching type of alarm
- Energized / Non energized state of alarm
- Measurement mode – RMS / True Peak

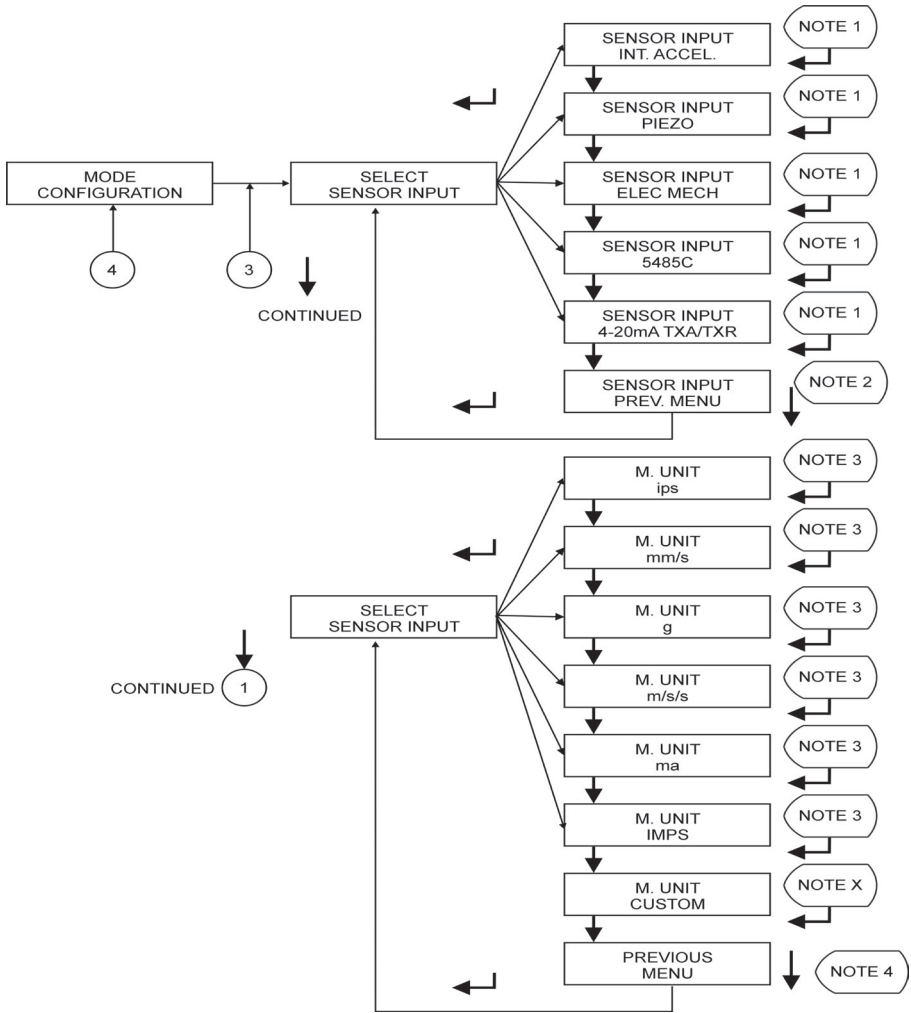
INTERNAL SENSOR TYPE SELECTION



Note 1: By pressing  key the sensor type shall selected and will display “SELECT SENSRI NP” screen. For the switches configured for Internal Accelerometer type of sensor no other choices are available.

Note 2: By pressing  key interface scrolls back to “SENSRI NP INT ACCEL” screen.

EXTERNAL SENSOR TYPE SELECTION WITH OTHER PARAMETERS



Note 1: By pressing ← key the sensor type shall selected and will display “SELECT SENSRINP” screen. (For conformation, by pressing ← desired setting will display by pressing ← back to “SELECT SENSRINP”).

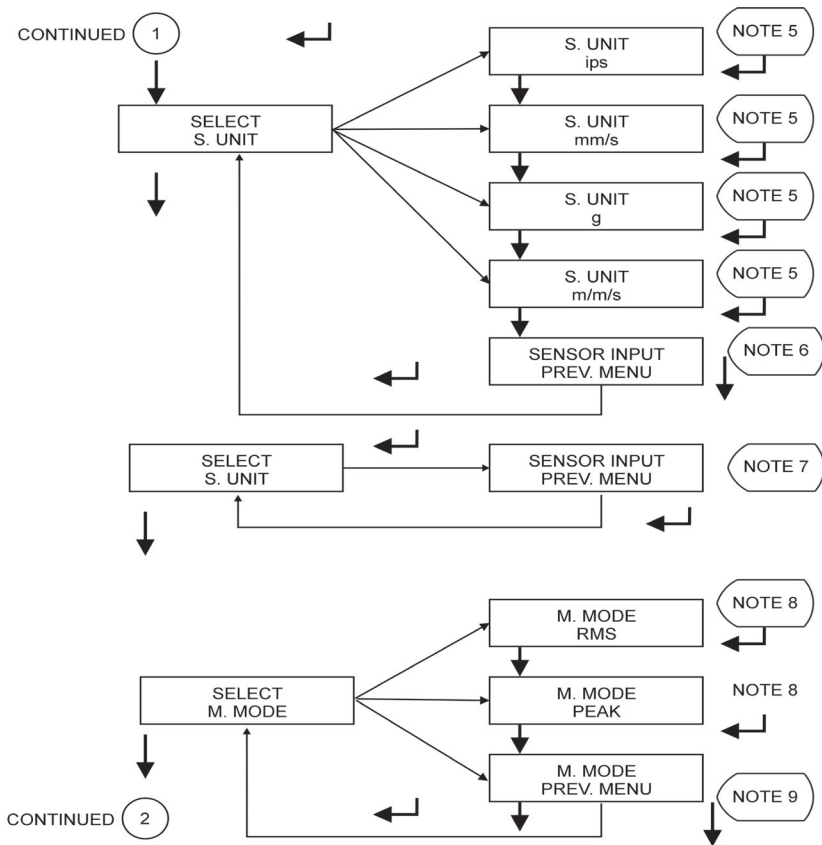
Note 2: By pressing ↓ key the interface scrolls through all sensor type choices.

Note 3: By pressing ← key the measurement unit will be selected and shall display “SELECT M.UNIT” screen.

Note 4: By pressing ↓ key interface scrolls back to all unit choices.

Note X: Default Custom Unit is deg C or the custom unit will be as per the configuration sent via User software.

Custom units are only applicable to 4-20mA inputs.



Note 5: By pressing \leftarrow key the sensitivity unit will be selected and will display "SELECT S. UNIT" screen.

Note 6: By pressing \downarrow key interface scrolls back to "S.UNIT ips" screen.

Note 7: By pressing \rightarrow key the digit of a displayed number shall blink and same digit can be incremented by using \downarrow key. The edited number should be confirmed by \leftarrow key.

Note 8: By pressing \leftarrow key the measurement mode shall get selected and shall display "SELECT M.MODE" screen.

Note 9: By pressing \downarrow key interface scrolls back to "MEASMODE RMS" screen.

Note 10: By pressing \leftarrow Key the alarm type shall get selected and shall display "SELECT ALARMTYPE" screen.

Note 11: By pressing \downarrow key interface scrolls back to "LATCHING" screen.

Note 12: By pressing \leftarrow Key the relay type shall selected and should display "SELECT RLY TYPE" screen.

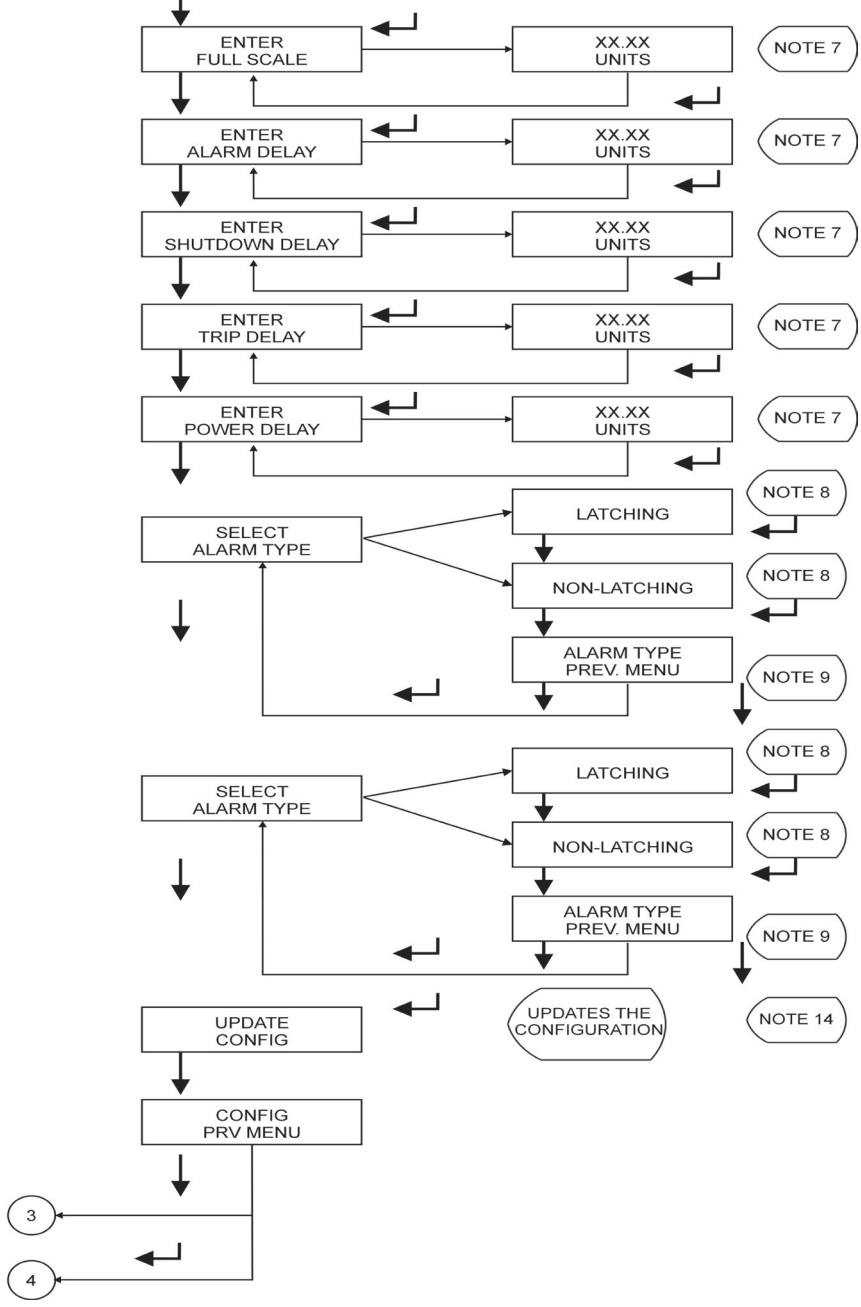
Note 13: By pressing \downarrow key interface scrolls back to "ENERGIZED" screen.

Note 14: By pressing \leftarrow key the configuration shall get updated and screen shall display "UPDATING".

Note 15: Changing unit, value and mode will reset the full scale value, as well as alarm and shut down level.

Be sure to double check full scale for desired value before "Update Config".

CONTINUED 1



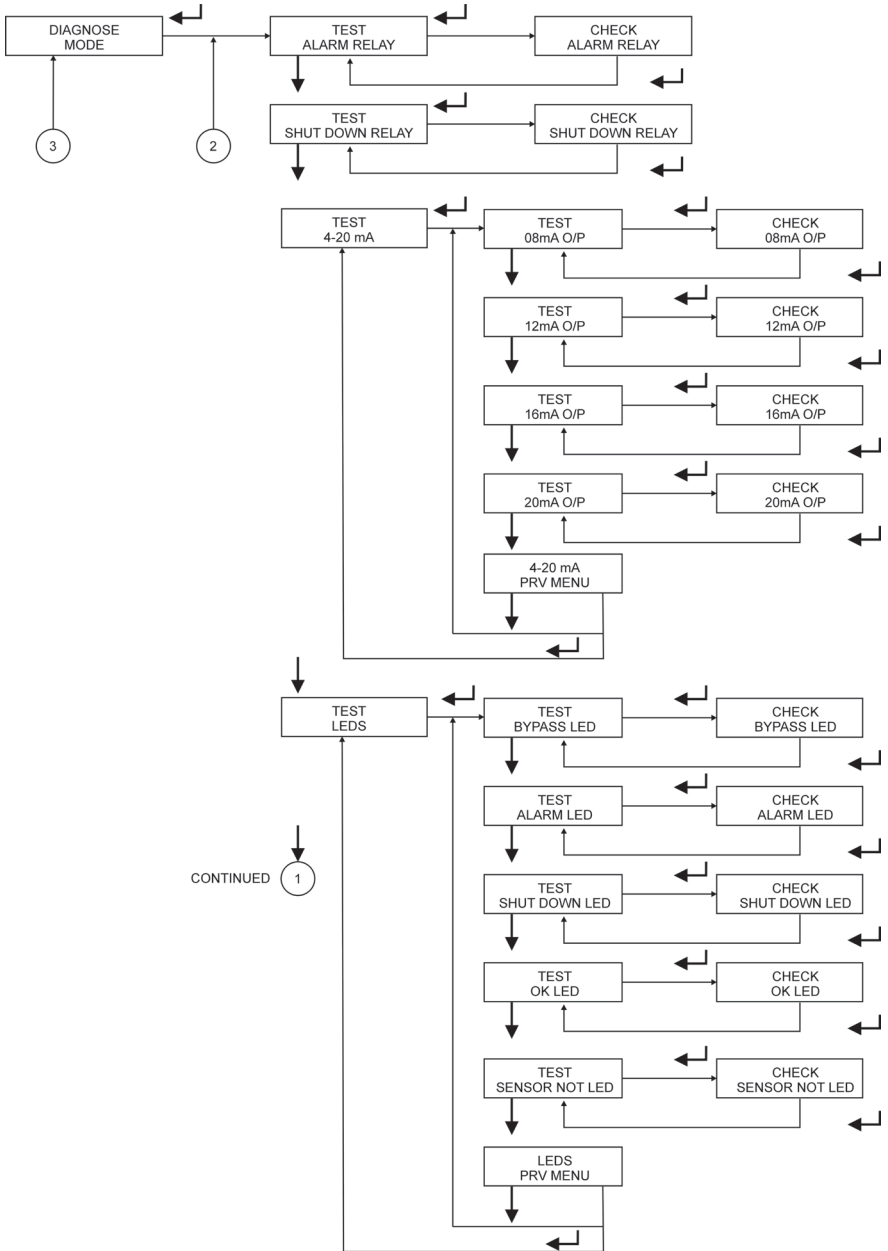
CONFIGURATION PARAMETERS DEPENDENCY

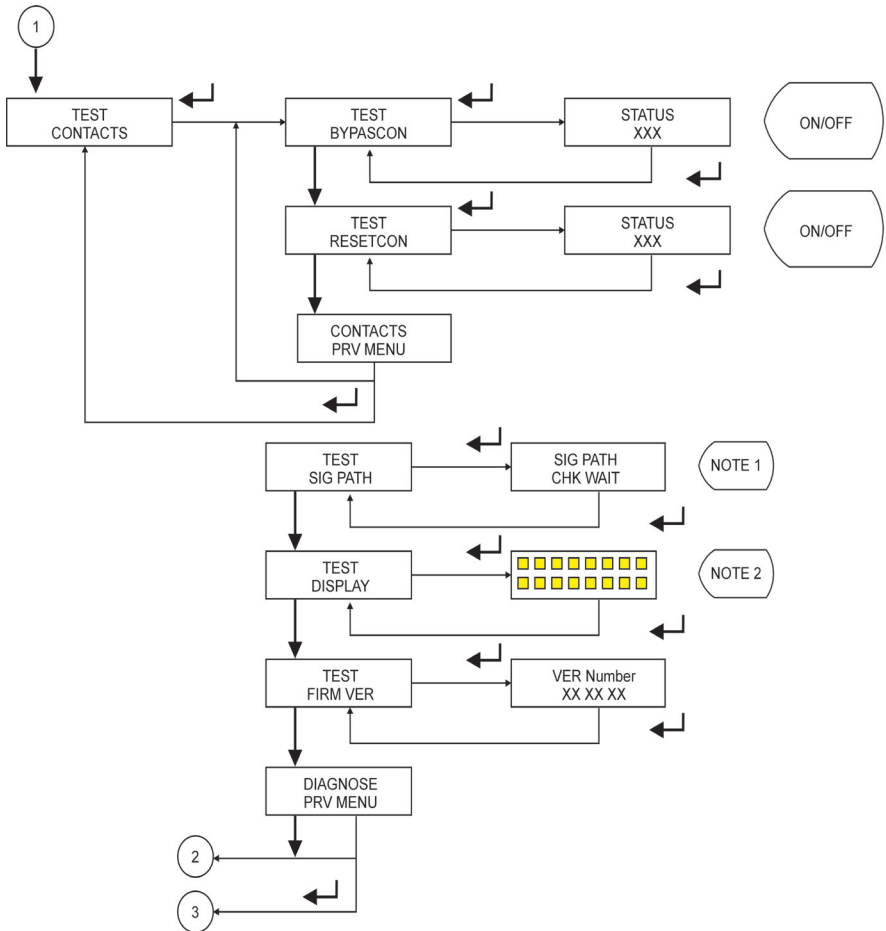
If the user changes the configuration parameter such as sensor type, sensitivity, measurement unit etc, then some dependable parameters are also required to be changed.

Configuration Parameter	Dependable Parameter
Sensor Input Type	Sensor Sensitivity
	Load Resistance
	Measurement Units
	Full Scale Range
	Trip Levels
Sensor Sensitivity	Full Scale Range
	Trip Levels
Measurement Units	Full Scale Range
	Trip Levels
RMS or Peak Detection	Trip levels

DIAGNOSTIC

Diagnostic tests shall be performed to test the Switch hardware functionality, using inbuilt diagnostic firmware as shown in flowchart below.





Note 1: During the signal path check, the switch displays “SIG PATH CHK WAIT” on and internally conducts different self tests. If any no. of tests fails, the display will show the respective error messages in a sequence. These error messages are as follow:

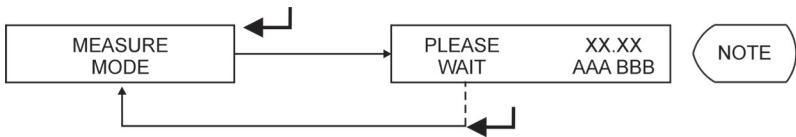
- SIG PATH CHK ERR
- EEPROM SUM ERR
- +24V FAIL ERR
- SENSOR OK ERR
- RELAY ERR
- LED ERR
- INT ERR

If there is no error the display shows “SIG PATH CHK OK” message.

Note 2: By pressing ← key the display will turn ON all the pixels of the Alphanumeric Display for a while as shown.

MEASURE

Measure Mode is used to display the measured vibrations as per the configuration.



Note: XX.XXX represents measured quantity. AAA represents the measurement unit. BBB represents the measurement type i.e. RMS / PK.

ENVIRONMENTAL INFORMATION



This electronic equipment was manufactured according to high quality standards to ensure safe and reliable operation when used as intended. Due to its nature, this equipment may contain small quantities of substances known to be hazardous to the environment or to human health if released into the environment. For this reason, Waste Electrical and Electronic Equipment (commonly known as WEEE) should never be disposed of in the public waste stream. The “Crossed-Out Waste Bin” label affixed to this product is a reminder to dispose of this product in accordance with local WEEE regulations. If you have questions about the disposal process, please contact Metrix Customer Service.

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