Chapter4: M88200 Absolute Casing Vibration Monitor

4.1 Introduction

This chapter takes you through all aspects of M88200 Vibration Monitor and is useful for installation, testing and configuring as required. M88200 Dual Channel Vibration Monitor forms part of MIL8800 On-Line Protection Monitor series for monitoring the critical machinery.

Each monitor is a stand-alone / independent monitor and uses its own power supply, relays, has its own terminal board for the inputs and outputs and has its own membrane key-pad for programming. Sensor power is on board suitable for the sensors it accepts input from.

All the monitors of MIL8800 series of monitors are designed to API670 standard of protection monitoring and have passed through the EMI and EMC and the Safety tests to have conferred CE Marking.

4.2 Application

The M88200 Casing Vibration Monitor is designed for measuring bearing vibration which is generally measured on the bearing casing and hence also known as Absolute Bearing Vibration. It is possible to measure acceleration or velocity using M88200 monitor with accelerometer input while the velocity and displacement with Piezo Velocity Sensor Input. The measurement units are available both in MKS and FPS measurement units.

The monitor can employed to measure the vibration of Turbo-Generator sets or the Boiler Feed Pumps or the industrial fans such as ID, FD, PA or the centrifuges, pumps and motors, or most of the rotary machines.

For intrinsically safe applications the sensor needs to be ATEX certified or equivalent and can be connected to the monitor in the safe area in the control room through suitable safety barrier.

The monitor provides RS485/Modbus communication and also isolated 4-20mA DC Current output for connecting to the DCS or PLC or such Data Acquisition centralized systems.

In the most unlikely event of failure of one module, each monitor being a stand-alone, only two channels of measurement are affected. This eliminates the need for a redundant power supply unit and avoids Common Mode failure.

4.3 Monitor Description

The M88200 is a Two Channel Casing Vibration Monitor that takes input from Two Wire Constant Current Accelerometer sensor that gives the acceleration (100mV/g) or velocity (4mV/mm/s) signal output.

Monitor provides Auxillary Sensor Power short circuit protected through 4mA current source diode. However, correct connection for polarity of sensor power must be ensured, else the transducers are likely to get damaged.

The system schematic of the module is shown in Figure 1. The two channels are processed parallel to monitor the overall vibration. The actual value is displayed on the LCD Display and in terms of the percentage of Full Scale Range on the two independent bars on the large hundred segments Bar Graph Display. It can also be programmed as percentage of Alarm / Trip level that facilitates operator to see how much away each channel is from its set Alarm / Trip level irrespective of the units of measurement or the full scale range.

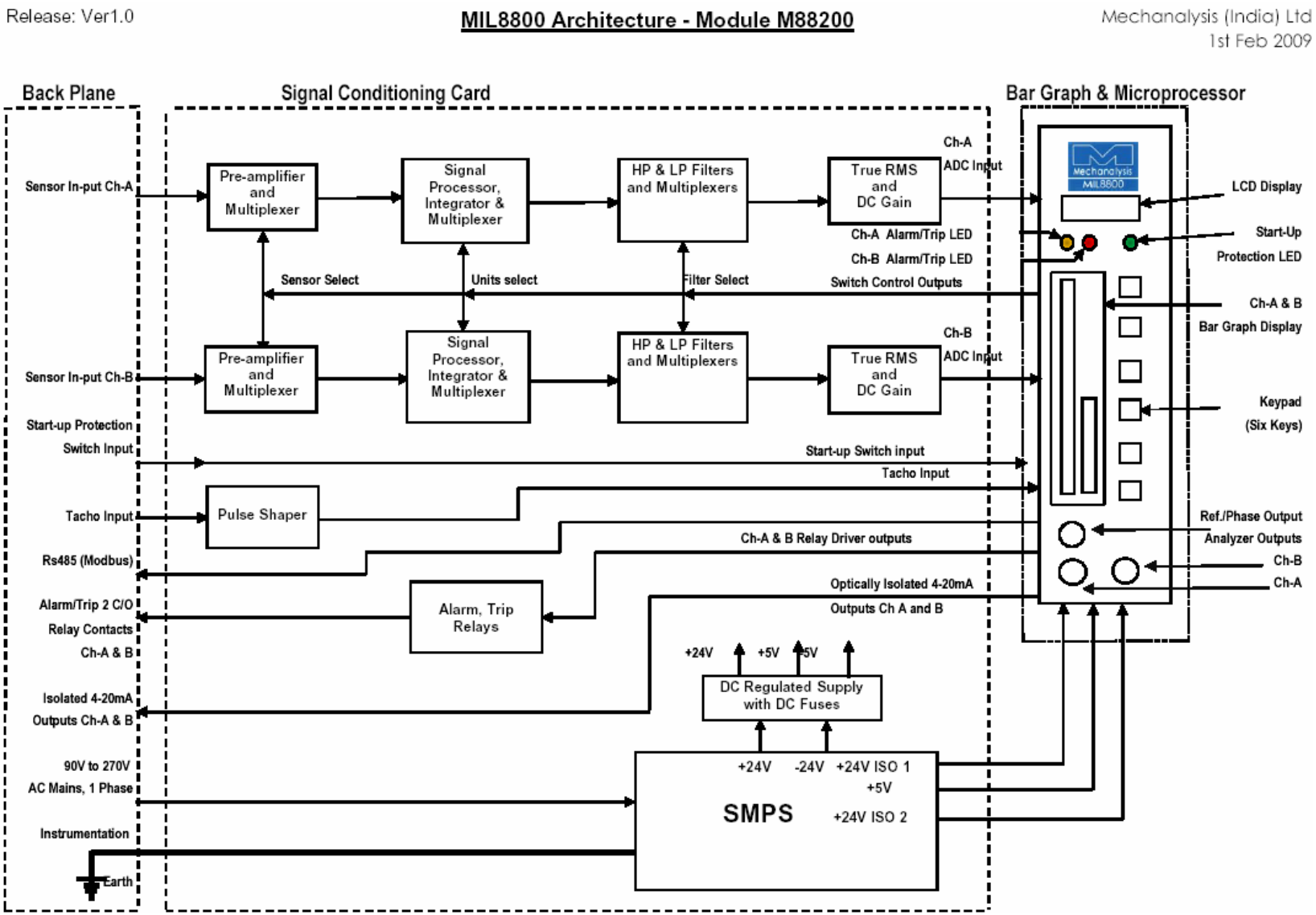

Figure 1 M88200 Monitor System Architecture

The monitor is fully programmable from the Front Panel Membrane Key-pad for all the parameters such as the Sensor Input Units and the Sensitivity, Full Scale Display Range and the Measurement Units, Alarm / Trip levels and the associated Time Delay, Failsafe / Non-Failsafe and Latching or Non-Latching mode associated with Relays, Start-up protection delay period, filters, etc.

HP / LP Filters are provided to select the band width and to get rid of unwanted low frequency and high frequency signals as required. For Velocity measurement the 10Hz-1 KHz filter selection is recommended to meet ISO standard requirement.

The Isolated 4-20mA DC current output is automatically calibrated to selected full scale range. This is provided for external use e.g. to connect to the DCS or PLC or for remote indication. It can take load up to 600 Ohms.

Independent Alarm and Trip comparison is provided for each channel. The Pre-set Alarm / Trip level are compared with the input signal, its occurrence is indicated on Dual embedded LED (Yellow for Alarm and Red for Trip) on the front panel while a pair of change-over potential free relay contacts are brought out on the rear Terminal Board for annunciation.

During the Power ON delay the 4-20mA DC current output is pulled down below 4mA while during this initialization delay the monitor undergoes self check; the 4-20mA is pulled down below 4mA so that DCS is informed of unhealthy signal transmission.

In the event of Transducer Failure (TX FAIL) or Over-Range the 4-20mA DC current output is pulled down below 4mA promptly reporting invalid signal and is also indicated on the front panel display by flashing bar-graph.

Start-Up Protection is provided for each channel for which the desired star-up period can be programmed. Start-up input terminals needs shorting to activate Start-Up Protection. While the Trip is de-activated the Alarm is active during Star-Up period and the actual process parameters are displayed.

Analyzer Outputs / buffered Time Wave Form signal (TWF) Outputs one per channel with transducer Bias Voltage is made available on the Front Panel BNC connectors to facilitate analysis from the control room.

The Reference Phase TTL output and the Speed Measurement is provided if the 1 Pulse (2V pk-pk) per Revolution Tacho Input or ECP input is connected. The output is the pulse train of 0-5V DC in phase with the input and can be used for balancing purposes.

The RS485 / MODBUS Protocol Communication is provided for communication with DCS, PLC or such Data Acquisition systems. Each monitor must be allotted its unique Module Address ranging from 1-255 that is programmable. And thus the Channel A is addressed as the Module Address with suffix ‘A’ while the Channel B with suffix ‘B’. e.g. Channel A of the monitor address 4 bears address 4A while the Channel B as 4B.

Figure 2 shows the assembly of the monitor showing the different components. Figure 3 and Figure 4 depicts the wiring details of MIL500 Series accelerometer and MIL544 Inductive Velocity Sensor to the MIL88200 Monitor respectively.

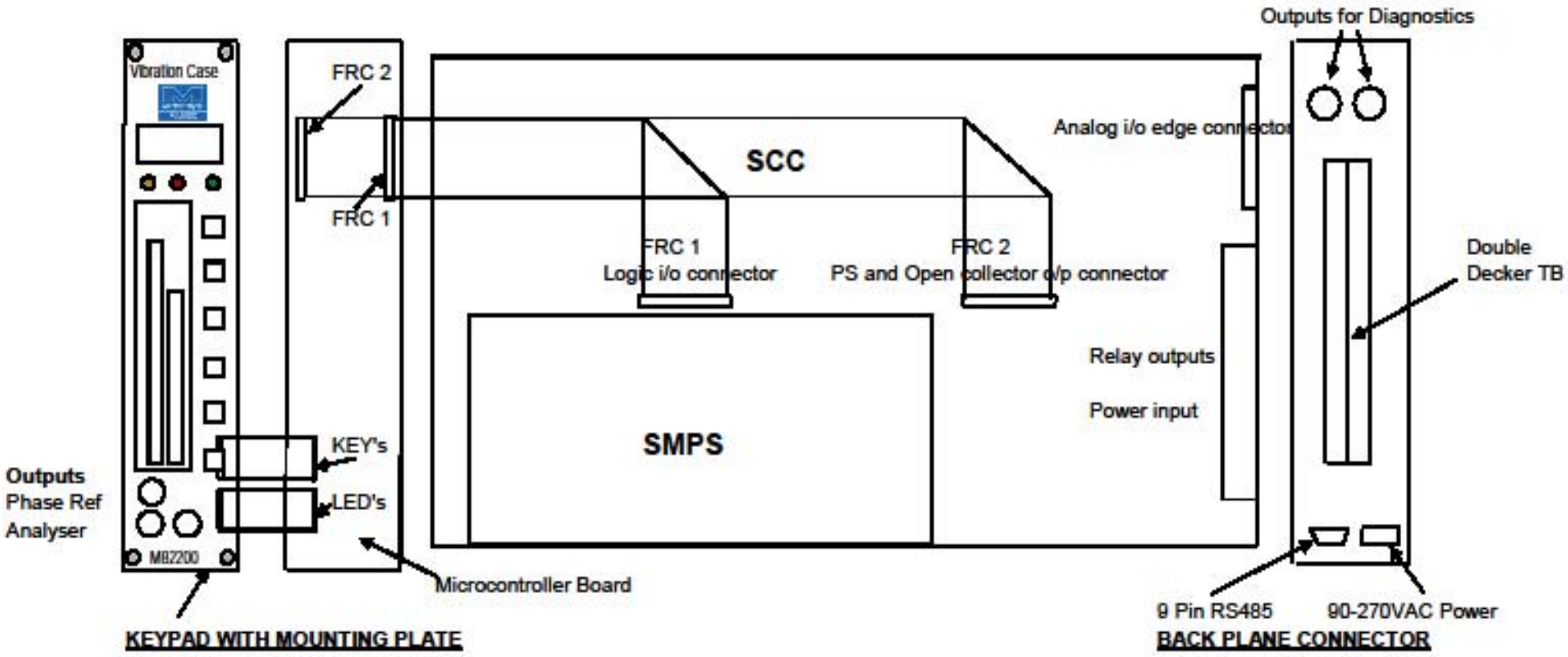

Figure 2 M88200 Monitor Assemblies

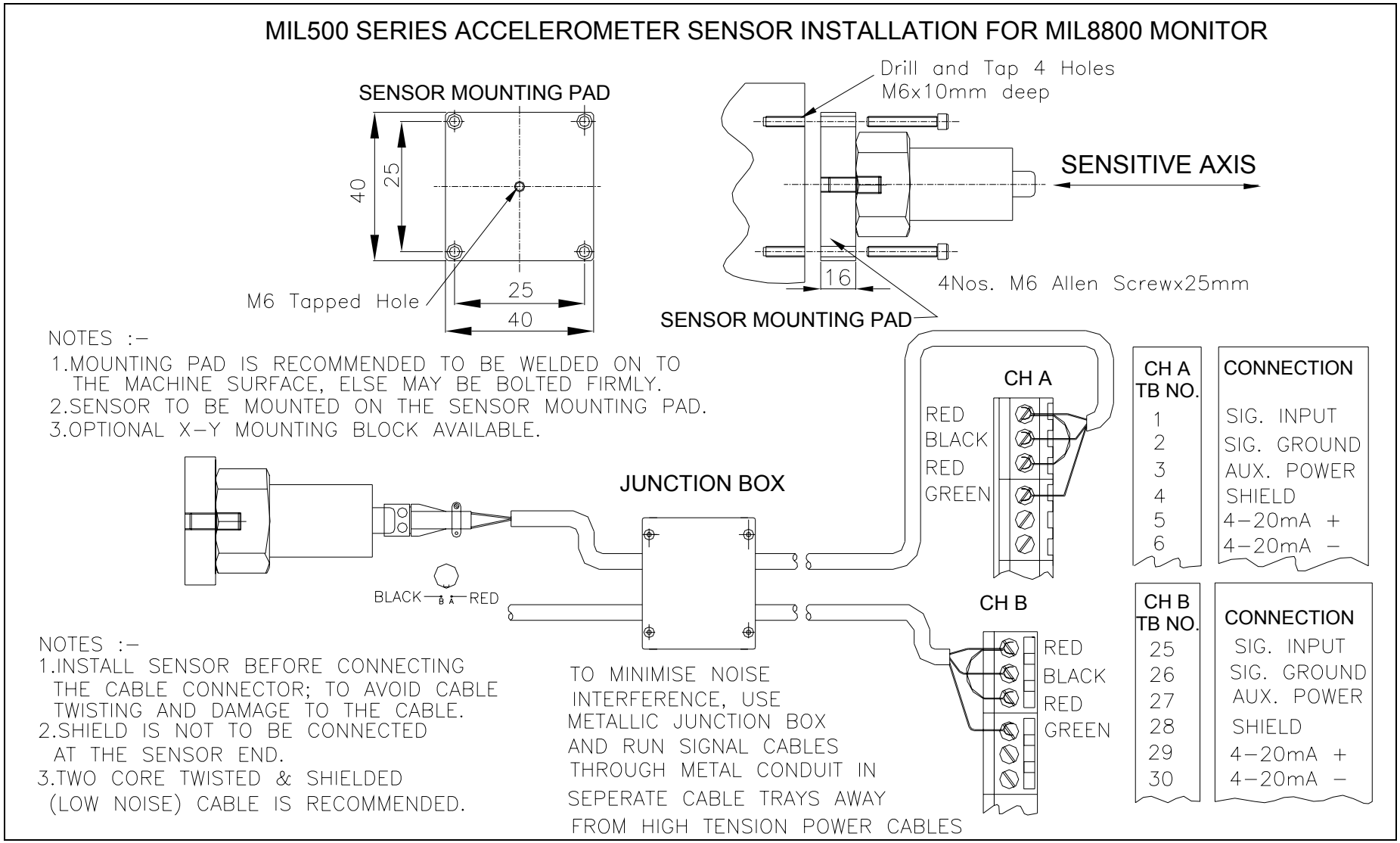

Figure 3 MIL500 Series Accelerometer Connection Diagram to M88200 Monitor

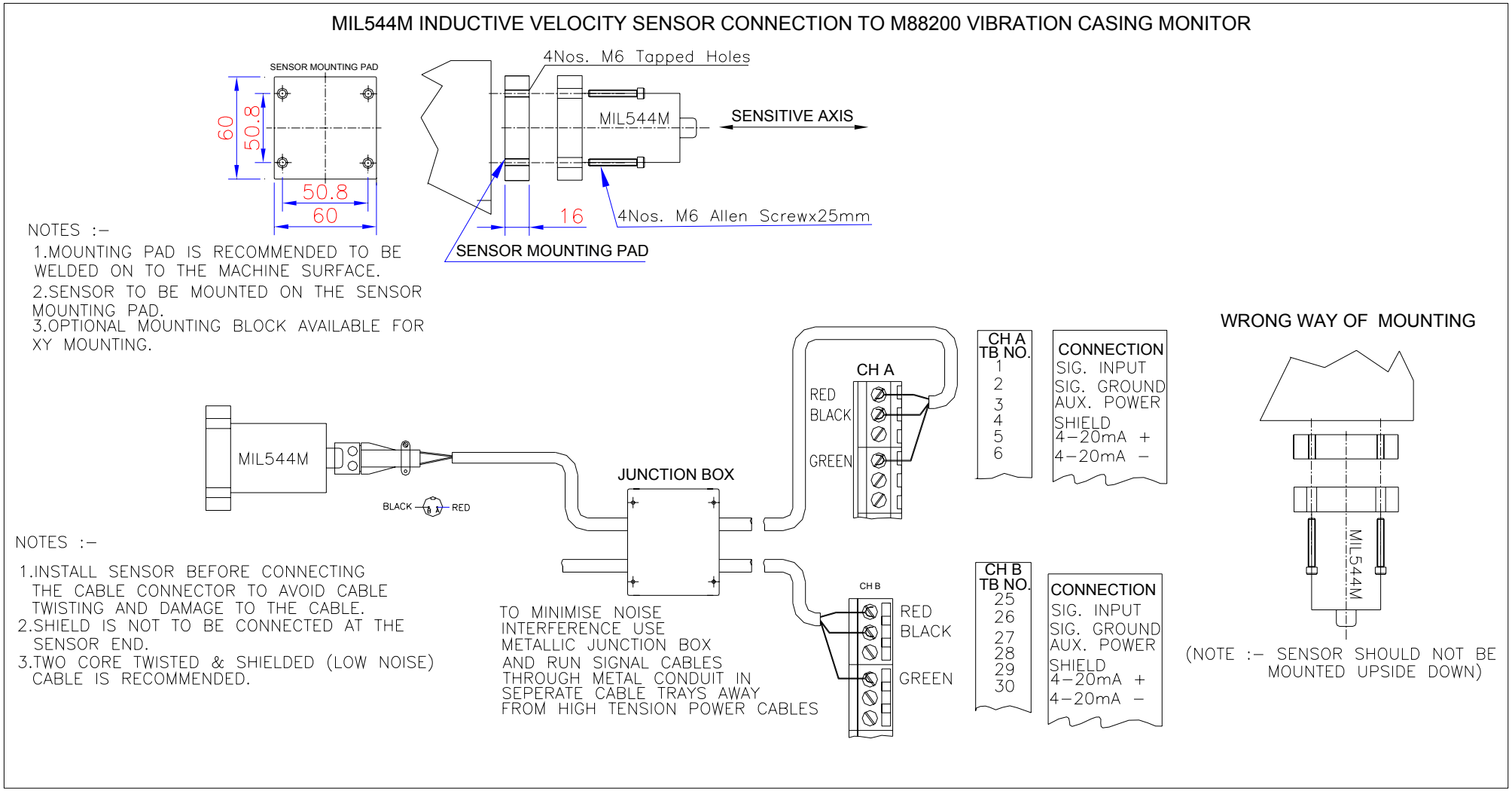

Figure 4 MIL544 Series Inductive Velocity Sensor Connection Diagram to M88200 Monitor

4.4 Monitor Installation

The monitor M88200 accepts input from contact type two-wire constant current type of accelerometer sensor with 100mV/g or 4mV/mm/sec output. MIL can supply, among a comprehensive range of vibration sensors available, typically MIL521 accelerometer and MIL531 Piezo Velocity Sensors. There is a separate section on vibration sensors in this manual.

4.4.1 Monitor Main Rack Installation

MIL8800 Machinery Protection Monitor that comes in standard 19" Main Rack (5U) is designed for panel mounting in a control room for easy access to the operator. The rear side of the monitor must be accessible for installation, wiring, commissioning and future servicing.

However, if the monitor is required to be installed outdoor, it must be installed in free standing cabinet conforming to IP65 (or at least IP55) level of protection, but not compromising on the accessibility to the operator. If the anticipated minimum temperature is below 0 Deg C, the enclosure must be provided with temperature controlled heater. Care must be taken to prevent excessive heating from direct sunlight.

Please ensure that the selected location is not subject to dripping or rain water or to the excessive heat from some other instrument beneath the MIL8800 monitor. Sufficient clearance of 3" above and below and 2" on the sides of the monitor is recommended for proper ventilation. Though the MIL8800 monitor is designed and manufactured to withstand severe environmental conditions, reasonable care is required considering the complexity of the microprocessor based electronic instrument; it will reward you with long trouble free service.

The MIL8800 monitor should not be installed in hazardous area. It should not be installed in highly corrosive chlorinated or similar airborne gases area. There are options such as installing the monitor in a purgeable enclosure that should be the last inevitable option; Mechanalysis (India) Limited do not recommend and it will void warranty/guarantee of the MIL8800 monitor.

4.4.1.1 Power Disconnection - It is necessary to ensure 'Power Disconnection Switch' for monitor Main Rack is easily accessible and reachable for quick power disconnection if the emergency so arises.

4.4.1.2 Shielding and Grounding

The electrical signals from sensors are weak and hence are susceptible to the interference from electrical noise. The sources of electrical noise are the power lines running in the vicinity of the sensors or their cables or by walkie-talkies, mobile towers, electrostatic discharge, lightning, or large electrical motors, generators or transformers etc. in proximity. It can cause erroneous monitor readings or spurious occurrence of alarm or trip, etc.

Each module of the MIL8800 monitor comes with EMI filter installed and the earthing is properly extended to the front facia and Digital and Signal Ground from the Mains Power input Earth point. The Main Rack of the MIL8800 system provides required shielding; however, the monitor must be extended instrumentation earth for proper earthing and shielding. MIL8800 has passed through the EMI/EMC tests (standard IEC 61238) and safety tests (standard IEC 61010) of CE Marking.

To minimize the RFI interference, the sensor cable and other signal cables twisted pair individually shielded and overall shielded cable type should be used and they must be run through metal conduits and must be isolated from high voltage power cables using separate cable trays.

4.4.1.3 Installation of Main Rack and its Modules

Main Rack must be properly supported at the back as instructed in the Installation drawing. Proper Instrumentation Earth must be extended and firmly connected to the 'Earth' terminal separately provided in the monitor Main Rack at the inside of the rear.

Monitor modules should be firmly inserted in the module slots in the Main Rack for proper connectivity to the connectors on the Back Plain. The module must get inserted smoothly without extra force. The screws on the front panel when properly screwed will ensure proper installation of the module.

Main Rack should not be powered unless all the wiring is completed following the instructions in the Installation Drawings.

- DO NOT Plug-In or Plug-Out the module while the Main Rack is AC Mains powered; it may cause damage to the module.
- DO NOT use megger or similar testing device if the transducer or sensor is connected to the module; it may cause damage.
- Aux Power to the transducer must be checked and then connected to the sensor for right polarity else it may cause damage to the sensor.

4.4.1.4 Alarm, Trip and TX Fail Relays

Each module of MIL8800 series monitor provides you with a set of 2C/O Potential Free Relay Contacts one each for ALARM and TRIP. They can be programmed from the Front Panel Key-pad for FS (Fail Safe) / NFS (Non Fail Safe) or Latched / Un-latched mode with desired activation Time Delay up to 30 seconds and the Hysterisis up to 10 Counts (equals 10 Least Counts) of units of measurement.
TX FAIL relay for Sensor is common to both the channels (one per module) .
For all the relays the contacts are potential free and can be used up to 24V DC or 230V AC, 5Amp resistive load for annunciation purposes.

4.4.1.5 Installation Drawings

1) Main Rack dimensional details (actual dimensions, cut-out dimensions and mounting screw position details)
2) Power wiring (should include Disconnection facility)
3) Alarm and Trip Relay details, RS485, 4-20mA
4) Accelerometer sensor and input connections
5) Piezo-Velocity sensor and input connections
6) ECP sensor and input connections
7) LVDT sensor and input connections
8) RTD sensor and input connections
9) Thermocouple sensor and input connections
10) Potentiometer sensor and input connections
11) Start-up Connection

4.4.1.6 M88200 Monitor Back Plane – Terminal Connections and Other Details

SNo.	Function	TB No. CH A	Edge Conn.	Function	TB No. CH B	Edge Conn.
1	SIG INPUT	1	EC1-1	SIG INPUT	25	EC1-2
2	SIG GND (0V)	2	EC1-3	SIG GND (0V)	26	EC1-4
3	SENSOR POWER	3	EC1-5	SENSOR POWER	27	EC1-6
4	SHIELD	4	EC1-3	SHIELD	28	EC1-4
5	4-20mA (+) Ch A	5	EC1-7	4-20mA (+) Ch A	29	EC1-8
6	4-20mA (-) Ch A	6	EC1-9	4-20mA (-) Ch A	30	EC1-10
7	UNUSED	7	EC1-11	UNUSED	31	EC1-12
8	UNUSED	8	EC1-13	UNUSED	32	EC1-14
9	ALARM NO - 1	9	EC2-1	ALARM NO - 1	33	EC2-13
10	ALARM COM - 1	10	EC2-3	ALARM COM - 1	34	EC2-15
11	ALARM NC - 1	11	EC2-5	ALARM NC - 1	35	EC2-17
12	ALARM NO - 2	12	EC2-2	ALARM NO - 2	36	EC2-14
13	ALARM COM - 2	13	EC2-4	ALARM COM - 2	37	EC2-16
14	ALARM NC - 2	14	EC2-6	ALARM NC - 2	38	EC2-18
15	TRIP NO - 1	15	EC2-7	TRIP NO - 1	39	EC2-19
16	TRIP COM - 1	16	EC2-9	TRIP COM - 1	40	EC2-21
17	TRIP NC - 1	17	EC2-11	TRIP NC - 1	41	EC2-23
18	TRIP NO - 2	18	EC2-8	TRIP NO - 2	42	EC2-20
19	TRIP COM - 2	19	EC2-10	TRIP COM - 2	43	EC2-22
20	TRIP NC - 2	20	EC2-12	TRIP NC - 2	44	EC1-24
21	TX FAIL - NO	21	EC2-26	TACHO SIG IN	45	EC1-18
22	TX FAIL - COM	22	EC2-25	TACHO GND (0V)	46	EC1-20
23	GND	23	EC1-17	TACHO SUPPLY (-24V DC)	47	EC1-22
24	START-UP CH A	24	EC1-15	START-UP CH B	48	EC1-16

SNo.	Function	Connector CN3	Edge Connector	Function	Connector CN2	Edge Connector
1	**MAINS SUPPLY**			**RS485 COM PORT**		
2	PHASE (LINE)	1	EC2 - 27, 28	TX (+)	6	EC1 - 29
3	NEUTRAL	2	EC2 - 29, 30	TGND	5	EC1 - 30
4	EARTH	3	EC2 - 31, 32	GND	5	EC1 - 31
5	-	-	-	TX (-)	7	EC1 - 32

NOTES:

1) *The M88200 Casing Vibration Monitor provides +24V DC auxillary sensor power through a 4mA Constant Current type of current source diode.*
2) *The +24V DC Auxillary Sensor Power Supply is fully short circuit protected but the reverse polarity is likely to do permanent damage to the sensor. So, the polarity needs to be confirmed before connecting sensor to the monitor.*
3) *The sensor to monitor distance could be as high as 600 Mtr. For longer distance the current source needs to be of higher current rating. This needs to be informed at the time of placing the order or else MIL Commissioning Engineer will be able to do the needful but such alterations will not be considered as product malfunctioning.*
4) *Once the sensor is connected the +24V DC will drop down to the sensor Bias Voltage that may range from +8V Dc to +14V DC. If the Bias Voltage is <8V DC or >14V DC, the sensor needs replacement.*
5) *The TX Fails settings are required to be TX Fail LO and HI : +/-2V DC of the prevailing sensor bias voltage.*

4.5 Front Panel Description

The front panel of M88200 monitor is shown in Figure 5. It consists of two bargraphs, showing the parameter level for each channel relative to full-scale. Above the bargraph, the display shows the actual values for both the inputs.

- **Programmable**
- **Password Protected**
- **Key Pad Alarm Acknowledgement**
- **Clear Display**
- **Bar Graph**
- **Digital Display of Units**
- **Phase reference O/P**
- **Analyser/Buffered Output**

Figure 5 M88200 Monitor Front Panel description

The features and functionality of the front panel is described in brief below:

1) Two Displays –

- 16x2 LCD display is used to display the actual process value in normal operation mode. The upper (first) line displays Channel A amplitude and its measurement units while the lower (second) line displays that of Channel B. In PROGRAM mode this display is used

- Bar Graph display has two bar graphs to indicate the percentage level with respect to the select full-scale range/set Trip Level / Set Alarm Level.

2) Three BNC Connectors –

- The two BNC's in the lower row, Analyzer Outputs (A and B), provide buffered raw signal (TWF) along with the sensor bias voltage for channel A and B.

- The third BNC is the Reference Phase (PHASE REF.) output that is available when the 1 pulse/revolution Tacho input or ECP input is connected. The output is 0-5V DC pulse train synchronous with the input.

3) LED's –

There are two dual LED's to indicate Alarm and Trip occurrence for each channel located above the corresponding bar graph. Yellow LED is for Alarm and the Red for Trip. Star-Up LED is the isolated one. The Start-Up enabling and the time delay is independent even then the LED indication on the front panel is common to both the channels.

4) Key-Pad –

There are six basic keys in two groups. The top four keys PROG, ▲ (up arrow), SHIFT and BACK are for programming purposes while the remaining two keys ACK and NEXT are for operator's use. The detailed use for the keys is explained below:

PROG	To enter into the Programming mode. Then before entering actual programming by entering correct password allows you to get into Calibration.
▲	Up Arrow key is for selecting from the options and for incrementing the number 0 to 9.
SHIFT	For shifting digit from left to right.
BACK	To go a step back.
ACK	For acknowledging the Alarm / Trip occurrence.
NEXT	For operator to view screens such as Bias Voltage, Set Alarm level, Set Trip level, Speed of the machine (subject to tacho input connected), Monitor module and firmware version.

4.6 M88200 Monitor Programming

This section describes the programming steps of the M88200 monitor. All the controls to configure the M88200 monitor are on the front panel. The steps are described below -

Program Operations	Display Output	Comments
Apply 90-270V AC mains 50/60 Hz, 1Ø input to L, N. The 'E' Earthing must be connected to proper Instrumentation Earth.	**Mechanalysis M88200**	Power ON self check time-delay of 4-5 seconds.
After the initial Power ON time-delay it automatically switches over to Bargraph Display Mode .	**A:00.00 g Pk B:000.0 mm/s Pk**	Top row for channel A
● Press and hold ***PROG*** key for 2-3 seconds. **Enter correct password -** ● Press SHIFT key, the cursor will blink below the left most digit. ● Use ▲ key to increment and select the required number. ● Likewise use SHIFT and ▲ keys to enter correct four digit Password. ● Press PROG key and go to the next step - Change Password option.	**PROGRAM MODE Password:0000**	The default four digit password at the time of despatch is '0000'. Changing to your own password is recommended for security. An incorrect password entry will cause Program Mode exit.
● Use ▲key to select **Yes / No** **No** - To reject Password changing. **Yes** - To Change the Password ● Press ***PROG*** key - - 'No' takes you to the next step Module Address select. - 'Yes' allows to Enter New Password.	**Change Password No**	An option to change the password if so desired. At this stage too you can escape to the next step by pressing PROG key.
● Press ***PROG*** key to retain existing Password and escape to the next step. **To enter new password -** ● Press ***SHIFT*** key, the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Press ***SHIFT*** to select the next digit ● Likewise use ***SHIFT*** and ▲ keys and enter correct four digit Password. ● Press ***PROG*** key and go to the next step.	**New Password xxxx**	At this stage too you can escape to the next step by pressing PROG key. You can enter new four digit Password of your choice. However, there is no option to re-enter and correct. Contact Mechanalysis if the Password is lost.
● Press PROG key if the required Module Address exists and escape to the next step. **To enter new Module Address -** ● Press ***SHIFT*** key, the cursor will blink below the left most digit. ● Use ▲ key to increment and select the required number. ● Likewise use '***SHIFT'*** and ▲ keys and enter correct three digit Module Address. ● Press ***PROG*** key and go to the next step.	**Module Address 001**	Module Address must be unique, else the RS485 Communication won't be through. Module address from 1-255 only can be entered.
● Use ▲key to select 4800 / 9600 / 19200 / 38400. ● Press ***PROG*** key and go to the next step.	**Baud Rate 9600**	

● Use ▲key to select **Even / Odd / None**.● Press ***PROG*** key and go to the next step.	**Choose Parity Even**	Even' is recommended.
● Use ▲key to select **1 / 2** Number of Channels. ● Press ***PROG*** key and go to the next step.	**No. of Channels 2**	The option allows to select either one or two channels only. For choosing '1', Channel A is selected by default. There is no option not to choose both the channels.
● Use ▲key to select **Yes / No** **No -** To aoid 'Trip Bypass'. **Yes** - To select 'Trip Bypass'. ● Press ***PROG*** key and go to the next step.	**Trip Bypass No**	**CAUTION** - If 'Yes' is selected, the Trip will never occur, actually the machine being monitored will be in unsafe condition.
● Use ▲key to select from - **Alarm Set / Trip Set / FS Range**. ● Press ***PROG*** key and go to the next step.	**Bar Graph % of FS Range Set**	Alarm Set' option if selected across the MIL8800 system, operator can at a glance see how far each channel is away from the safe limit irrespective of the unit of measurement and range of each channel.
To select to program Channel A - ● Use ▲key to select **Yes / No** **Yes -** To choose Channel A programming. **No -** To escape to Channel B programming. ● Press ***PROG*** key and 'Yes' - takes to 'A - Sns Units?' select. 'No' - takes to 'Channel B Prog'.	**Channel A Prog Yes**	**IMPORTANT NOTICE -** **For any change in the Sensor or the Measurement Unit -** **1) Alarm / Trip settings may change.** **2) All program settings must be checked for its correctness.**
To select sensor - Chl A ● Use ▲key to select from - **mV/g / mV/m/s/s / mV/mm/s / mV/i/s** ● Press ***PROG*** key and go to the next step.	**A Sns Units ? mV/g**	A - depicts Channel A Sns - depicts Sensor mV/m/s/s - depicts $mV/m/s^2$ Option is to choose from 2-Wire Constant Current Velocity or Acceleration putput sensors.
To enter correct sensitivity - Chl A ● Press ***'SHIFT'*** key**,** the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter correct sensitivity. ● Press ***PROG*** key and go to the next step.	**A Sns - 100.0 mV/g**	**CAUTION** - The module M88200 is designed for 100mV/g sensitivity sensor and the sensitivity setting is limited to its +/-20% variation. Sensitivity beyond 120mV/g may affect linearity at upper end of the specified full scale range. Next version will have better options.
To select measurement unit - Chl A● Use ▲key to select from - Chl A **gPk / gRMS / m/s/s Pk / m/s/s RMS / mm/s Pk / mm/s RMS / i/s Pk / i/s RMS** OR **mm/s Pk / mm/s RMS / i/s Pk / i/s RMS / micron P-P / micron Pk / mil P-P / mil Pk** f ● Press ***PROG*** key and go to the next step.	**A Unit gPk**	gPk appears for mV/g sensor selected at 'A Sns Units ?' above.mm/s appears for mV/mm/s sensor selected at 'A Sns Units ?' above.**Note** - The module is designed to provide only one stage integration, so, for acceleration sensor acceleration and velocity while for velocity sensor velocity and displacement measurements are possible.
To set the Full Scale Range - Chl A ● Press ***SHIFT*** key**,** the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter dsired Full Scale Range value. ● Press ***PROG*** key and go to the next step.	**A-FS gPk 10.00**	A - depicts Channel A FS - depicts Full Scale Range m/s/s - depicts m/s^2 Maximum Full Scale Range settings - 10.00 gPk, 7.00 gRMS, 100.0 m/s/s , 70.0 m/s/s, 150.0 mm/s Pk, 100.0 mm/s RMS, 6.000 i/s Pk, 4.000 i/s RMS

To set the Floor Noise as percentage of Full Scale Range selected above - Chl A ● Use ▲ key to increment and select the desired percentage level. ● Press ***PROG*** key and go to the next step.	**A Floor Noise % 01**	Floor Noise % is set as % of Full Scale Range selected and can be set upto 10%, lower the better. If Floor Noise is set at 2%, the true signal or the noise or background vibration signal upto 2% is ignored, no digital or bargraph display. However, above 2%, actual vibration level is shown (for example 2.1% signal input is measured and displayed as 2.1%).
To set the TX Fail HI - Chl A ● Press ***'SHIFT'*** key, the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter correct value. ● Press ***PROG*** key and go to the next step.	**A - TX Fail HI 30.0V**	2.0V above and 2V below the actual sensor bias voltage is recommended for TX Fail HI and TX Fail LO settings. TX Fail event checks for the bias voltage of the sensor. However, as a thumb rule the MIL supplied sensors perform healthy if it maintains bias voltage between 8-14 V DC.
To set the TX Fail LO - Chl A ● Press ***'SHIFT'*** key, the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter correct value. ● Press ***PROG*** key and go to the next step.	**A - TX Fail LO 30.0V**	2.0V above and 2V below the actual sensor bias voltage is recommended for TX Fail HI and TX Fail LO settings. TX Fail event checks for the bias voltage of the sensor. However, as a thumb rule the MIL supplied sensors perform healthy if it maintains bias voltage between 8-14 V DC.
To select Filter Out mode - Chl A● Use ▲key to select from **In / Out**. **Out** - To select Filter-Out / Overall measurement **In** - To select Filter-In LP / HP filters● Press ***PROG*** key and - Out - takes to Start-up Protection select. In - takes to LP Filter select option.	**A - Filter Out**	The frequency response in Filter Out mode is +/-10% of the reading +/- 2LC.
To select Low Pass Filter - Chl A ● Use ▲key to select from - **1 KHz / 5 KHz / 10 KHz** upper cut-off Low Pass filter ● Press ***PROG*** key and go to the next step.	**A - Filter LP 10 KHz**	LP - depicts Low Pass Low Pass Filter has upper cut-off frequency and M88200 allows to choose from 1K, 5K or 10K Hz. The Accuracy is +/- 10% and cut-off is at 3dB (20%)
To select High Pass Filter - Chl A ● Use ▲key to select from - **5 Hz / 10 Hz / 20 Hz** lower cut-off High Pass filter ● Press ***PROG*** key and go to the next step.	**A - Filter HP 10 Hz**	HP - depicts High Pass High Pass Filter has lower cut-off frequency and M88200 allows to choose from 5 Hz, 10 Hz or 20 Hz. The Accuracy is +/- 10% and cut-off is at 3dB (20%)
To select Start-up Protection option - Chl A ● Use ▲key to select **Disable / Enable**. **Enable -** To enable Start-Up Protection option. **Disable -** To disable Start-Up Protection option. ● Press ***PROG*** key and go to the next step. Disable - takes to Ch A - 4mA Adj. Enable - takes to Start-up Delay select.	**A - Start up Disable**	Start-up Protection ensures Alarm and Trip are deactivated and the 4-20mA is <4mA for the set start-up time delay.

To set the Start-up time delay - Chl A ● Press ***SHIFT*** key, the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use ***SHIFT*** and ▲ keys and enter required time delay. ● Press PROG key and go to the next step.	**A - Start up Delay : 001 Min**	Start-up time delay is settable upto 120 Minutes in multiples of one minute.
To set 4mA isolated out put - Chl A ● Short the input pins to ensure 0mV input. ● Connect DMM between output terminals on the Back Plane. ● Use ▲key to increment (4mA output) and ***SHIFT*** key to decrement (4mA output). ● Press ***PROG*** key and go to the next step.	**A - Adj 4mA 26**	Can set up to 60 counts. The 4mA is set around 30 counts. The total settable range is +/- 0.15mA approx. This is the only parameter settable on-line. It means as the counts are incremented or decremented the 4-20mA output changes immediately.
To set the Trip level - Chl A● Press ***'SHIFT'*** key**,** the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter desired Trip level.● Press ***PROG*** key and go to the next step.	**A Trip Set 01.99**	Max Trip Level is 1 least count less than the Full Scale Range selected. If Full Scale Range is 5.00 gPk, the Trip Level can be set to 4.99 gPk max.
To set Trip Hysterisis level - Chl A ● Press ***'SHIFT'*** key**,** the cursor will blink below the left most digit. ● Use ▲ **key** to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter desired Hysterisys for Trip. ● Press ***PROG*** key and go to the next step.	**A Tr Hysterisis 02**	Max 30 counts can be set. 5 Counts that equates 5 LC's are recommended. Hysterisis is an important setting as it avoids relay hunting.
To set Trip Relay in Fail Safe / Non Fail Safe mode - Chl A ● Use ▲**key** to select **Non Fail Safe / Fail Safe.** **Non Fail Safe** - Normally de-energised Relay energises when the input signal exceeds pre-set Trip level. **Fail Safe** - Normally energised Relay de-energises when the input signal exceeds the pre-set Trip level ● Press ***PROG*** key and go to the next step.	**A Tr FS/NFS Non Fail Safe**	NFS - Non-Fail-Safe is the standard mode where the relay is de-energised in healthy condition and gets energised on alarm / trip occurrence. FS - Fail-Safe is that where relay is held energised in healthy condition while it is de-energised on occurrence of alarm / trip. However, the relay by virtue that it is in energised condition is considered to be safe.
To select Trip Relay Latching option - Chl A ● Use ▲**key** to select '**Disabled / Enabled**'. **Disabled** - Relay energises and de-energises as Trip activates and de-activates. **Enabled** - Relay energises as Trip activates but de-energises iff acknowledged and the trip de-activates. ● Press ***PROG*** **key** and go to the next step.	**A Tr Latching Disabled**	
To set Trip Time Delay - Chl A ● Press ***'SHIFT'*** **key,** the cursor will blink below the left most digit. ● Use ▲ **key** to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ **keys** and enter required time delay. ● Press ***PROG*** **key** and go to the next step.	**A Tr Delay Time 05Sec**	Max Time Delay - 0-60 Seconds settable. Recommended time delay of 5 seconds. Time delay must be incorporated to avoid spurious occurrence of alarm / trip.

To set the Alarm level - Chl A ● Press ***'SHIFT'*** key, the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter desired Trip level. ● Press ***PROG*** key and go to the next step.	**A Alarm Set 01.99**	Max Alarm Level is 1 least count less than the Trip Level selected. If the Trip Level is 5.00 gPk, the Alarm Level can be set to 4.99 gPk max.
To set Alarm Hysterisis level - Chl A ● Press ***'SHIFT'*** key, the cursor will blink below the left most digit. ● Use ▲ **key** to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter desired Hysterisys for Trip.● Press ***PROG*** key and go to the next step.	**A Al Hysterisis 02**	Max 30 counts can be set. 5 Counts that equates 5 LC's are recommended.Hysterisis is an important setting as it avoids relay hunting.
To set Alarm Relay in Fail Safe / Non Fail Safe mode - Chl A ● Use ▲**key** to select **Non Fail Safe / Fail Safe.** **Non Fail Safe** - Normally de-energised Relay energises when the input signal exceeds pre-set Trip level. **Fail Safe** - Normally energised Relay de-energises when the input signal exceeds the pre-set Trip level ● Press ***PROG*** key and go to the next step.	**A Al FS/NFS Non Fail Safe**	NFS - Non-Fail-Safe is the standard mode where the relay is de-energised in healthy condition and gets energised on alarm / trip occurrence. FS - Fail-Safe is that where relay is held energised in healthy condition while it is de-energised on occurrence of alarm / trip. However, the relay by virtue that it is in energised condition is considered to be safe.
To select Alarm Relay Latching option - Chl A ● Use ▲**key** to select '**Disabled / Enabled**'. **Disabled** - Relay energises and de-energises as Trip activates and de-activates. **Enabled** - Relay energises as Trip activates but de-energises iff acknowledged and the trip de-activates. ● Press ***PROG*** **key** and go to the next step.	**A Al Latching Disabled**	
To set Alarm Time Delay - Chl A ● Press ***'SHIFT'*** **key,** the cursor will blink below the left most digit. ● Use ▲ **key** to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ **keys** and enter required time delay. ● Press ***PROG*** **key** and go to the next step.	**A Al Delay Time 05Sec**	Max Time Delay - 0-60 Seconds settable. Recommended time delay of 5 seconds. Time delay must be incorporated to avoid spurious occurrence of alarm / trip.
At this point the option is to select Channel B programming or jump back to Chl A program or Exit programming - ● Use ▲key to select from - **Yes / Exit To Bargraph / Jump To A Prog** **Yes -** To choose Channel B programming. **Exit To Bargraph -** To exit programming. **Jump to A Prog** - Back to Ch A Program. ● Press ***PROG*** key - **Yes** - takes to Channel B programming. **Exit To Bargraph** - exits programming. **If 'Jump To A Prog'** - Will take you back to Ch A Program.	**Channel B Prog Yes**	

Here you have an option to copy Channel A program settings to Channel B program settings● Use ▲key to select **Yes / No Yes** - Will copy the program settings and exit to Bargraph display **No** - Will take you through all the settings for Channel B as in Channel A programming	**Copy Ch A Setup No**	
To select sensor - Chl B ● Use ▲key to select from - **mV/g / mV/m/s/s / mV/mm/s / mV/i/s** ● Press ***PROG*** key and go to the next step.	**B Sns Units ? mV/g**	B - depicts Channel B Sns - depicts Sensor mV/m/s/s - depicts mV/m/s^2 Option is to choose from 2-Wire Constant Current Velocity or Acceleration putput sensors.
To enter correct sensitivity - Chl B ● Press ***'SHIFT'*** key**,** the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter correct sensitivity. ● Press ***PROG*** key and go to the next step.	**B Sns - 100.0 mV/g**	**CAUTION** - The module M88200 is designed for 100mV/g sensitivity sensor and the sensitivity setting is limited to its +/-20% variation. Sensitivity beyond 120mV/g may affect linearity at upper end of the specified full scale range. Next version will have better options.
To select measurement unit - Chl B ● Use ▲key to select from - Chl A **gPk / gRMS / m/s/s Pk / m/s/s RMS / mm/s Pk / mm/s RMS / i/s Pk / i/s RMS** OR **mm/s Pk / mm/s RMS / i/s Pk / i/s RMS / micron P-P / micron Pk / mil P-P / mil Pk** f ● Press ***PROG*** key and go to the next step.	**B Unit gPk**	gPk appears for mV/g sensor selected at 'B Sns Units ?' above. mm/s appears for mV/mm/s sensor selected at 'B Sns Units ?' above. **Note** - The module is designed to provide only one stage integration, so, for acceleration sensor acceleration and velocity while for velocity sensor velocity and displacement measurements are possible.
To set the Full Scale Range - Chl B ● Press ***SHIFT*** key**,** the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter dsired Full Scale Range value. ● Press ***PROG*** key and go to the next step.	**B-FS gPk 10.00**	B - depicts Channel B FS - depicts Full Scale Range m/s/s - depicts m/s^2 Maximum Full Scale Range settings - 10.00 gPk, 7.00 gRMS, 100.0 m/s/s , 70.0 m/s/s, 150.0 mm/s Pk, 100.0 mm/s RMS, 6.000 i/s Pk, 4.000 i/s RMS
To set the Floor Noise as percentage of Full Scale Range selected above - Chl B● Use ▲ key to increment and select the desired percentage level. ● Press ***PROG*** key and go to the next step.	**B Floor Noise % 01**	Floor Noise % is set as % of Full Scale Range selected and can be set upto 10%, lower the better.If Floor Noise is set at 2%, the true signal or the noise or background vibration signal upto 2% is ignored, no digital or bargraph display. However, above 2%, actual vibration level is shown (for example 2.1% signal input is measured and displayed as 2.1%).
To set the TX Fail HI - Chl B ● Press ***'SHIFT'*** key**,** the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter correct value. ● Press ***PROG*** key and go to the next step.	**B - TX Fail HI 30.0V**	2.0V above and 2V below the actual sensor bias voltage is recommended for TX Fail HI and TX Fail LO settings. TX Fail event checks for the bias voltage of the sensor. However, as a thumb rule the MIL supplied sensors perform healthy if it maintains bias voltage between 8-14 V DC.

To set the TX Fail LO - Chl B ● Press ***'SHIFT'*** key, the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter correct value. ● Press ***PROG*** key and go to the next step.	**B - TX Fail LO 30.0V**	2.0V above and 2V below the actual sensor bias voltage is recommended for TX Fail HI and TX Fail LO settings. TX Fail event checks for the bias voltage of the sensor. However, as a thumb rule the MIL supplied sensors perform healthy if it maintains bias voltage between 8-14 V DC.
To select Filter Out mode - Chl B ● Use ▲key to select from **In / Out**. **Out** - To select Filter-Out / Overall measurement **In** - To select Filter-In LP / HP filters ● Press ***PROG*** key and - Out - takes to Start-up Protection select. In - takes to LP Filter select option.	**B - Filter Out**	The frequency response in Filter Out mode is +/-10% of the reading +/- 2LC.
To select Low Pass Filter - Chl B ● Use ▲key to select from - **1 KHz / 5 KHz / 10 KHz** upper cut-off Low Pass filter ● Press ***PROG*** key and go to the next step.	**B - Filter LP 10 KHz**	LP - depicts Low Pass Low Pass Filter has upper cut-off frequency and M88200 allows to choose from 1K, 5K or 10K Hz. The Accuracy is +/- 10% and cut-off is at 3dB (20%)
To select High Pass Filter - Chl B ● Use ▲key to select from - **5 Hz / 10 Hz / 20 Hz** lower cut-off High Pass filter ● Press ***PROG*** key and go to the next step.	**B - Filter HP 10 Hz**	HP - depicts High Pass High Pass Filter has lower cut-off frequency and M88200 allows to choose from 5 Hz, 10 Hz or 20 Hz. The Accuracy is +/- 10% and cut-off is at 3dB (20%)
To select Start-up Protection option - Chl B● Use ▲key to select **Disable / Enable**. **Enable -** To enable Start-Up Protection option. **Disable -** To disable Start-Up Protection option.● Press ***PROG*** key and go to the next step. Disable - takes to Ch A - 4mA Adj. Enable - takes to Start-up Delay select.	**B - Start up Disable**	Start-up Protection ensures Alarm and Trip are deactivated and the 4-20mA is <4mA for the set start-up time delay.
To set the Start-up time delay - Chl B ● Press ***SHIFT*** key, the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use ***SHIFT*** and ▲ keys and enter required time delay. ● Press PROG key and go to the next step.	**B - Start up Delay : 001 Min**	Start-up time delay is settable upto 120 Minutes in multiples of one minute.
To set 4mA isolated out put - ChL B ● Short the input pins to ensure 0mV input. ● Connect DMM between output terminals on the Back Plane. ● Use ▲key to increment (4mA output) and ***SHIFT*** key to decrement (4mA output). ● Press ***PROG*** key and go to the next step.	**B - Adj 4mA 26**	Can set up to 60 counts. The 4mA is set around 30 counts. The total settable range is +/- 0.15mA approx. This is the only parameter settable on-line. It means as the counts are incremented or decremented the 4-20mA output changes immediately.
To set the Trip level - Chl B ● Press ***'SHIFT'*** key, the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter desired Trip level. ● Press ***PROG*** key and go to the next step.	**B Trip Set 01.99**	Max Trip Level is 1 least count less than the Full Scale Range selected. If Full Scale Range is 5.00 gPk, the Trip Level can be set to 4.99 gPk max.

To set Trip Hysterisis level - Chl B ● Press ***'SHIFT'*** key**,** the cursor will blink below the left most digit. ● Use ▲ **key** to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter desired Hysterisys for Trip. ● Press ***PROG*** key and go to the next step.	**B Tr Hysterisis 02**	Max 30 counts can be set. 5 Counts that equates 5 LC's are recommended. Hysterisis is an important setting as it avoids relay hunting.
To set Trip Relay in Fail Safe / Non Fail Safe mode - Chl B ● Use ▲**key** to select **Non Fail Safe / Fail Safe.** **Non Fail Safe** - Normally de-energised Relay energises when the input signal exceeds pre-set Trip level. **Fail Safe** - Normally energised Relay de-energises when the input signal exceeds the pre-set Trip level ● Press ***PROG*** key and go to the next step.	**B Tr FS/NFS Non Fail Safe**	NFS - Non-Fail-Safe is the standard mode where the relay is de-energised in healthy condition and gets energised on alarm / trip occurrence. FS - Fail-Safe is that where relay is held energised in healthy condition while it is de-energised on occurrence of alarm / trip. However, the relay by virtue that it is in energised condition is considered to be safe.
To select Trip Relay Latching option - Chl B● Use ▲**key** to select '**Disabled / Enabled**'. **Disabled** - Relay energises and de- energises as Trip activates and de-activates. **Enabled** - Relay energises as Trip activates but de-energises iff acknowledged and the trip de-activates.● Press ***PROG*** **key** and go to the next step.	**B Tr Latching Disabled**	
To set Trip Time Delay - Chl B ● Press ***'SHIFT'*** **key,** the cursor will blink below the left most digit. ● Use ▲ **key** to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ **keys** and enter required time delay. ● Press ***PROG*** **key** and go to the next step.	**B Tr Delay Time 05Sec**	Max Time Delay - 0-60 Seconds settable. Recommended time delay of 5 seconds. Time delay must be incorporated to avoid spurious occurrence of alarm / trip.
To set the Alarm level - Chl B ● Press ***'SHIFT'*** key**,** the cursor will blink below the left most digit. ● Use ▲ key to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter desired Trip level. ● Press ***PROG*** key and go to the next step.	**B Alarm Set 01.99**	Max Alarm Level is 1 least count less than the Trip Level selected. If the Trip Level is 5.00 gPk, the Alarm Level can be set to 4.99 gPk max.
To set Alarm Hysterisis level - Chl B ● Press ***'SHIFT'*** key**,** the cursor will blink below the left most digit. ● Use ▲ **key** to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ keys and enter desired Hysterisys for Trip. ● Press ***PROG*** key and go to the next step.	**B Al Hysterisis 02**	Max 30 counts can be set. 5 Counts that equates 5 LC's are recommended. Hysterisis is an important setting as it avoids relay hunting.
To set Alarm Relay in Fail Safe / Non Fail Safe mode - Chl B ● Use ▲**key** to select **Non Fail Safe / Fail Safe.** **Non Fail Safe** - Normally de-energised Relay energises when the input signal exceeds pre-set Trip level. **Fail Safe** - Normally energised Relay de-energises when the input signal exceeds the pre-set Trip level ● Press ***PROG*** key and go to the next step.	**B Al FS/NFS Non Fail Safe**	NFS - Non-Fail-Safe is the standard mode where the relay is de-energised in healthy condition and gets energised on alarm / trip occurrence. FS - Fail-Safe is that where relay is held energised in healthy condition while it is de-energised on occurrence of alarm / trip. However, the relay by virtue that it is in energised condition is considered to be safe.

To select Alarm Relay Latching option - Chl B ● Use ▲**key** to select '**Disabled / Enabled**'. **Disabled** - Relay energises and de-energises as Trip activates and de-activates. **Enabled** - Relay energises as Trip activates but de-energises iff acknowledged and the trip de-activates. ● Press ***PROG* key** and go to the next step.	**B Al Latching Disabled**	
To set Alarm Time Delay - Chl B● Press ***'SHIFT'* key,** the cursor will blink below the left most digit. ● Use ▲ **key** to increment and select the desired number. ● Likewise use '***SHIFT'*** and ▲ **keys** and enter required time delay.● Press ***PROG* key** and go to the next step.	**B Al Delay Time 05Sec**	Max Time Delay - 0-60 Seconds settable.Recommended time delay of 5 seconds.Time delay must be incorporated to avoid spurious occurrence of alarm / trip.
To exit to Bargraph or to go back to Chl A programming - ● Use ▲**key** to select **'Bargraph / To A Program'** **Bargraph -** Enables exit program mode. **To A Program -** Takes back to Chl A programming option.	**Exit to?**	

4.7 M88200 Monitor Calibration

- Obtain a proper work permit. This is to ensure annunciation system, the DCS/PLC or such systems in the loop are isolated from the MIL8800 system.
- Disconnect the power to the MIL8800 system main rack.
- The monitor module need NOT be removed from its position.
- Remove the incoming signal cables to Chanel A and B. This is to ensure that the sensor is not powered and the Aux. Power +24V prevailing on TB-3 and TB-27 is isolated from signal input (+) TB-1 and TB-25.

4.7.1 Measuring / Test Equipments

The following test equipments are needed for the calibration of MIL8800 Monitor module –

- Function Generator,
- Digital Multi-meters,
- Oscilloscope,
- DC Source +24V DC.

NOTE:

1) Ensure calibration of all the test and measuring equipment is valid.

4.7.2 Calibration Steps - MIL8800 Vibration Module

1. Connect input signal wires to TB 1 (+ve) and TB 2 (-ve) for channel A and TB 25 (+ve) and TB 26 (-ve) for channel B.
   Note - Input signal to the Channel A and B can be fed simultaneously by shorting TB 1 & TB 25; TB 2 & TB 26
2. Switch ON the power to the MIL8800 Vibration Monitoring Module and wait for 2-3 seconds when it displays 'Mechanalysis' in the upper row and 'M88200' in the lower row of the top green LCD display and until it returns to process display Bar Graph mode when it displays input signal value and programmed measurement units.
3. Now press 'PROG' switch and hold it pressed for 2-3 seconds till you get into 'PROGRAM MODE' option.
4. Now enter the correct password and enter programming.

4.7.3 Accelerometer Sensor input calibration

5. Select sensor type mV/g, set sensitivity to 100.0mV/g, and choose measurement unit gPk for both the channels A and B.
6. Exit Program mode and then get into the Programming Mode again.
7. Enter correct Password that has been given to you. You will see the Firmware version.
8. Press PROG switch to enter Calibration domain, following display will appear -

Channel A Zero Tare

xxxx **yyyy**

(Current CAL Counts) (Last CAL Counts)

9. Feed in 0.0mV AC signal for which Short the Input Terminals 1(+ve) and 2 (-ve) for Channel A and terminal 25 (+ve) and 26 (-ve) for Channel B.
10. The Current CAL Counts for zero input for channel A is displayed. Ignore the small difference between the Last CAL Counts and Current CAL Counts. However, if the difference is more than 50 counts, please send the monitor module to MIL for servicing.
11. To upload and store the Current CAL Counts press ^ (Up Arrow) key, the Last CAL Counts are now replaced by the Current CAL Counts. However, the Current CAL Count update continues and the difference up to 5 Counts may be ignored. This completes Zero Cal for channel A.
12. Now press PROG key repeatedly until the following display appears -

    Channel B Zero Tare
    xxxx yyyy
    (Current CAL Counts) (Last CAL Counts)
13. Please ensure signal input is 0.0mV AC rms. Repeat steps 10 and 11 so as to complete zero cal for channel B. Thus Zero Cal for both the channels A and B is done.
14. Now press BACK key repeatedly until the following display appears –

    Channel A Span
    xxxx yyyy
    (Current CAL Counts) (Last CAL Counts)
15. Feed in 707.0mV AC rms @ 100Hz at the input terminals 1(+ve) and 2 (-ve) for Channel A and terminal 25 (+ve) and 26 (-ve) for Channel B.

16. The Current CAL Counts for Span/Full Scale input for channel A is displayed. Ignore the small difference between the Last CAL Counts and Current CAL Counts. However, if the difference is more than 100 counts, please send the monitor module to MIL for servicing.
17. To upload and store the Current CAL Counts press ^ (Up Arrow) key, the Last CAL Counts are now replaced by the Current CAL Counts. However, the Current CAL Count update continues and the difference of 5-10 Counts may be ignored. This completes Span/Full Scale Cal for Channel A.
18. Now press PROG key repeatedly until the following display appears -

    Channel B Span
    xxxx yyyy
    (Current CAL Counts) (Last CAL Counts)
19. Please ensure signal input is 707.0mV AC rms. Repeat steps 16 and 17 so as to complete Span/Full Scale Cal for channel B. Thus Span/Full Scale Cal for both the channels A and B is done.
20. Now press BACK key repeatedly until the following display appears –

    Zero Bias Voltage Ch A
    xxxx yyyy
    (Current CAL Counts) (Last CAL Counts)
21. Now disconnect AC signal input and feed in 0.0V DC across terminals TB 1 (+ve) and TB 2 (-ve) terminals for channel A and across TB 25 (+ve) and TB 26 (-ve) for channel B.
    Note - Input signal to the Channel A and B can be fed simultaneously by shorting TB 1 & TB 25; TB 2 & TB 26

22. The Current CAL Counts for Zero Bias Voltage input for channel A is displayed. Ignore the small difference between the Last CAL Counts and Current CAL Counts. However, if the difference is more than 50 counts, please send the monitor module to MIL for servicing.
23. To upload and store the Current CAL Counts press ^ (Up Arrow) key, the Last CAL Counts are now replaced by the Current CAL Counts. However, the Current CAL

Count update continues and the difference up to 5 Counts may be ignored. This completes Zero Bias Voltage Cal for Channel A.

24. Now press PROG key repeatedly until the following display appears –

Zero Bias Voltage Ch B
xxxx yyyy
(Current CAL Counts) (Last CAL Counts)

25. The Current CAL Counts for Zero Bias Voltage input for channel B is displayed. Ignore the small difference between the Last CAL Counts and Current CAL Counts. However, if the difference is more than 50 counts, please send the monitor module to MIL for servicing.
26. To upload and store the Current CAL Counts press ^ (Up Arrow) key, the Last CAL Counts are now replaced by the Current CAL Counts. However, the Current CAL Count update continues and the difference up to 5 Counts may be ignored. This completes Zero Bias Voltage Cal for Channel B and thus for Channel A and B.

27. Now press BACK key repeatedly until the following display appears –

Span Bias Voltage Ch A
xxxx yyyy
(Current CAL Counts) (Last CAL Counts)

28. Now feed in +24.0V DC across terminals TB 1 (+ve) and TB 2 (-ve) terminals for channel A and across TB 25 (+ve) and TB 26 (-ve) for channel A.

29. The Current CAL Counts for Span Bias Voltage input for channel A is displayed. Ignore the small difference between the Last CAL Counts and Current CAL Counts. However, if the difference is more than 100 counts, please send the monitor module to MIL for servicing.
30. To upload and store the Current CAL Counts press ^ (Up Arrow) key, the Last CAL Counts are now replaced by the Current CAL Counts. However, the Current CAL Count update continues and the difference of 5-10 Counts may be ignored. This completes Span Bias Voltage Cal for Channel A.

31. Now press PROG key repeatedly until the following display appears –

Span Bias Voltage Ch B
xxxx yyyy
(Current CAL Counts) (Last CAL Counts)

32. The Current CAL Counts for Zero Bias Voltage input for channel B is displayed. Ignore the small difference between the Last CAL Counts and Current CAL Counts. However, if the difference is more than 50 counts, please send the monitor module to MIL for servicing.
33. To upload and store the Current CAL Counts press ^ (Up Arrow) key, the Last CAL Counts are now replaced by the Current CAL Counts. However, the Current CAL Count update continues and the difference up to 5 Counts may be ignored. This completes Span Bias Voltage Cal for Channel B and thus for Channel A and B.

34. Press PROG twice and exit Calibration domain to Bar Graph display mode.

35. Now disconnect DC input voltage.

4.7.4 Accelerometer Sensor Input Calibration

36. Follow steps 3-4 and get into 'PROGRAM MODE' option.
37. Select sensor type mV/g, set sensitivity to 100.0mV/g, and choose measurement unit mm/s Pk for both the channels A and B.
38. Repeat steps from 6 – 35.

4.7.5 Velocity Sensor Input Calibration

39. Follow steps 3-4 and get into 'PROGRAM MODE' option.

40. Select sensor type mV/mm/s, set sensitivity to 4.000mV/mm/s, and choose measurement unit mm/s Pk for both the channels A and B.

41. Follow steps 6-14.

42. Feed in 441.0mV AC rms @ 100Hz at the input terminals 1 (+ve) and 2 (-ve) for Channel A and terminal 25 (+ve) and 26 (-ve) for Channel B.

43. Follow steps 16-35.

4.7.6 Piezo Velocity Sensor Input Calibration

44. Follow steps 3-4 and get into 'PROGRAM MODE' option.

45. Select sensor type mV/mm/s, set sensitivity to 4.000mV/mm/s, and choose measurement unit microns Pk-Pk for both the channels A and B.

46. Repeat steps from 6 – 35.

4.8 Performance Specifications

Power ON

Following is displayed for 4-5 sec on the small LCD Display -' MECHANALYSIS 'M88200 '
Bar Graph display is blank
LED's are OFF
ALARM and TRIP Relays of both the channels are de-activated.
TX FAIL Relay common to both the channels is de-activated.
LCD and Bar Graph readings for all input pins in open condition

Signal Input Accelerometer -

Noise <2% for zero input
Amplitude linearity in Filter Out mode for ICP Accelerometer 100mV/g is < 1.0%
Frequency response in Filter Out mode
Filter response for HP, LP and combination there of
Over Range - Isolated 4-20mA output of both the channels < 4mA
Sensitivity variation 4mV/mm/s +/- 50%
Measurement units - gPk, gRMS, m/s/sPk, m/s/sRMS, mm/sPk, mm/sRMS, i/sPk, i/sRMS

Signal Input Piezo Velocity Sensor

Noise <2% for zero input
Amplitude linearity in Filter Out mode for ICP Accelerometer 4mV/mm/s is < 1.0 %, no load & full load
Frequency response in Filter Out mode
Filter response for HP, LP and combination there of
Over Range - Isolated 4-20mA output of both the channels < 4mA
Sensitivity variation 4mV/mm/s +/- 50%
Measurement units - mm/sPk, mm/sRMS, i/sPk, i/sRMS, micronsPk-Pk, micronsPk, milPk-Pk, milPk

Alarm & Trip

Activates when reaches set point and resets below the Hysterisis set
FS / NFS – Fail Safe and Non-Fail Safe modes
Latching Enable / Disable
Time Delay unto 30 seconds
Hysterisis upto 30 LC's
Relay Contact full load, 5Amp resistive load @ 230V AC

Key-pad and LED's -

Functional check

Start-up Attenuation -

Functional check

Trip By-Pass -

Functional check

TX Fail -

Functional check

RS485 Communication -

Functional check

Analyzer Outputs -

Functional check

Phase Ref Output time lag < 2.0 µsec

Functional check