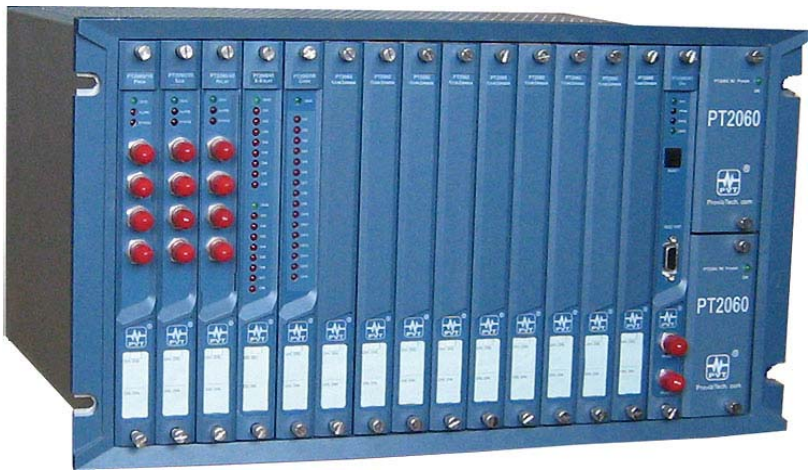
PT2060 Monitor

PT2060/20 SEIS Seismic Module

User Manual

Installation, Operation, Maintenance



ProvibTech, Inc. 11011 Brooklet Drive, Suite 300, Houston, Texas 77099, USA

Phone: +1-713-830-7601, Fax: +1-281-754-4972, Email: pvt@provibtech.com , Web: www.provibtech.com

Contents

Receiving Inspection and Handling Guide

Inspection

Check the devices for possible damage that may have occurred from improper transport. Damages in transit must be recorded on the transport documents. All claims for damages must be made without delay against the shipper within 2 weeks after receipt of shipment at site.

Handling and Storing Considerations

PT2060 should be handled with care while unpacking and installation. Damage to PT2060 is typically caused by rough handling, shock, or electrostatic discharge (ESD).

Be aware of the following precautions while unpacking and handling PT2060 Rack or any module.

- ✓ Please pay attention to the sharp corners/sides of the rack to avoid any of injuries during the installation, transporting and un-installation.
- ✓ All circuit boards and electronic modules associated with this rack contain components which are susceptible to damage caused by electrostatic discharge. It is necessary to discharge any static electricity from yourself and your clothing before handling the rack.
- ✓ Always keep the module in the protective antistatic bag, Whenever it is not installed in a system.

Module Introduction

General Information

ProvibTech's PT2060/20 SEIS seismic module is a four-channel seismic signal conditioner and processing unit. Each channel of the SEIS module can accept any seismic sensors signal input, process it, and outputs the processed data.

Figure 1

The *PT2060 System Configuration* software is used to configure the module's work type, and set its parameters and display information including active value.

PT2060/20 SEIS seismic module can realize the following functions:

- ✓ Acceleration **(4 channels)**
- ✓ Velocity **(4 channels)**
- ✓ Displacement **(4 channels)**
- ✓ Low Frequency acceleration, Velocity or Displacement **(4 channels)**
- ✓ Case Expansion
  Case expansion output—paired **(2 channels)**
  Case expansion output—single **(4 channels)**

Acceleration

Ccase vibration is the fundamental parameter for indicating machine's running status for monitoring rotary machine. Many machine malfunctions, including rotor imbalance, misalignment, bearing wear, shaft cracks and rubs can be detected with these measurements. Acceleration can be used to measure high frequency vibration.

Velocity

Velocity is one of the most commonly used units to indicate the vibration level of rotary machines. Many machine manufactures specify the vibration level in velocity. Velocity can be measured in peak, peak-peak, and RMS.

Figure 1

Displacement

Most of the seismic sensors can not measure displacement directly. Our PT2060/20 SEIS seismic module can measure displacement with the integration of a velocity signal input. Displacement is also widely used in Asia countries to specify the machine running status.

Case Expansion

Large rotating machines, when heated during normal operation, will expand in the axial direction. If the expansion is non-uniform, the machine case will become bent or deformed. This can incur a great stress between the machine case and its foundation.. Case expansion measurements monitor the expansion of the machine by sampling signals from two linear displacement transducers (LVDT). placed on the same end but opposite sides of the machine. Should there develop a difference between the two sensors we know that the machine is not expanding at the same rate on one side of the machine as it is on the other. Alarm set-points are based on the differential input and are used to warn the operator to take actions before the turbine is damaged.

For relatively smaller machines, the absolute thermal expansion due to heat can also cause problems. In these application, single case expansion measurements are required. Alarms can be set at different expansion positions.

Figure 2

Triple Modular Redundant (TMR)

Three PT2060/20 SEIS seismic modules and one PT2060/43 R-RELAY Redundant-Relay module constitute a Triple Modular Redundant system. In this case, the 43 R-RELAY module processes the alarm signals coming from the three PT2060/20 SEIS seismic modules according to the assigned logic. In the system, each PT2060/20 SEIS module works independently and acts just the same as in non-redundant system. This system can give alarm signals to host computer and field operators.

A standard 19″ PT2060 rack can have three TMR systems mounted, slot 1-4, slot 5-8, and slot 9-12. PT2060/43 R-RELAY module can be mounted in slot 4, 8 and 12 only. A 12″ PT2060 rack can have one TMR systems mounted, slot 1-4. Three PT2060/20 SEIS seismic modules must be installed in three adjacent slots. PT2060/43 R-RELAY module must be installed in their right slot. For example, slot 1-3, to construct a TMR with a PT2060/43 R-RELAY module being installed in slot 4. For more information, please refer to *PT2060/43 R-RELAY Redundant-Relay Module User Manual*.

Other Information

Each PT2060/20 SEIS seismic module has four channels. Channel 1 and channel 2 must be configured with the same channel type. So do channel 3 and channel 4. The channel type of channel 1 and 2 can be different from channel type of channel 3 and 4.

PT2060/20 SEIS seismic modules support Alarm trip-multiply (except Case Expansion) and Alarm Bypass. Alarm trip-multiply means that the alarms set-point will be increased during the trip-multiply time period (Twice for Double Multiply and three times for Triple multiply). Alarm Bypass means that the alarm function is prohibited.

Most of the can be interfaced with our PT2060/20 SEIS seismic module. Typical sensors include: TM0782A or any other accelerometers, TM0793V or any other velocity sensors, TM079VD low frequency velocity/displacement sensors. Any constant current type accelerometers or velocity sensors are compatible with the system. The electro-magnetic (coil and spring) type seismic velocity sensors and the negative powered current sensors are not supported by this module.

The main task of PT2060/20 SEIS seismic module is to process the incoming signal from the sensor system, compare the overall with the alarm set-point and output the appropriate status information. It can also output much more information such as GAP, module status, alarm status, alarm event, and system event to the field operator and upper-level control systems.

Module Description

PT2060/20-Back Jumper

The PT2060/20 can accept multiple sensors inputs and give various outputs. The jumper setting is required for different type of sensors. It is also required for some scale setting.

Note
Jumpers are all located in the back panel of the module.

⚠ Warning
The jumper setting must match the scale type of the current channel, or you will get the wrong measurement value! ! ! ! **If change the scale of non-integral vibration mode, you are strongly recommended to check the jumper setting first!**

Basic Steps for Jumper Setting

1. Remove the back panel from PT2060 rack.
   First,please release the two fixing screws by using screwdriver anticlockwise until they are relaxed fully like the follow showing and then pull the two screws to pull out the back panel from the rack.

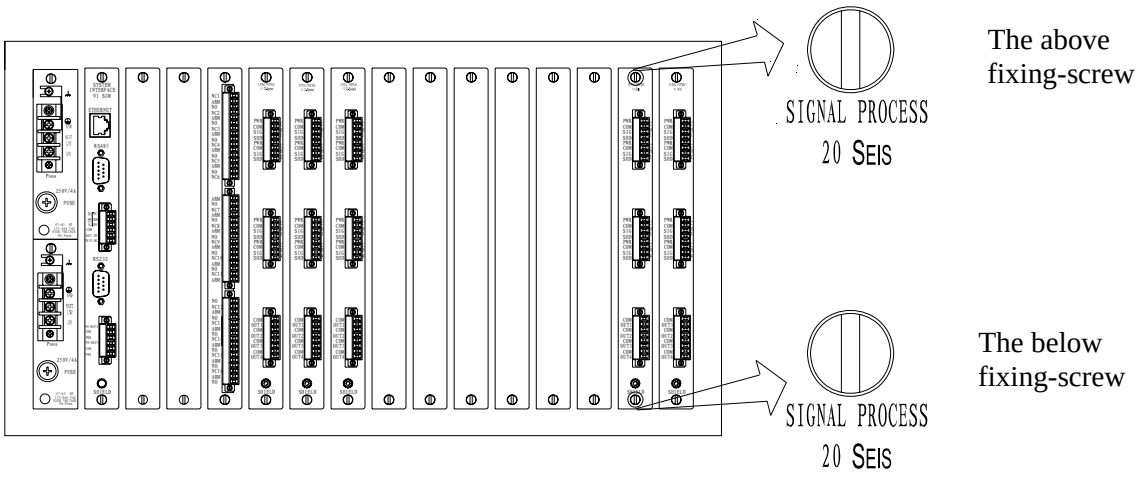


Figure 3

2. Remove the aluminum cover
   Second, please release the two screws in the top and bottom of top cover by using screwdriver anticlockwise until they are relaxed fully like the follow showing and then hold the bottom cover the same time slip the top cover until it is separate from this back pannel.

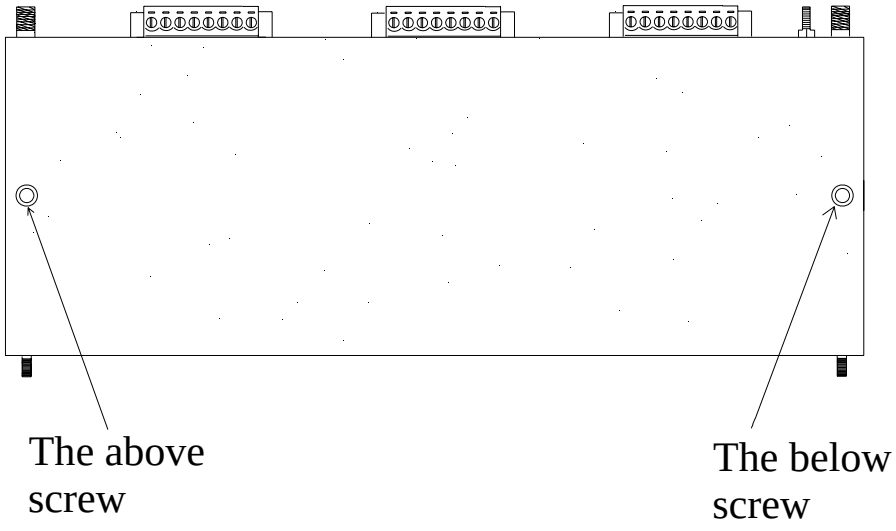


Figure 4

3. After step 1and 2,then you can see the core PCB like Figure 5.
4. Set the jumpers according to the following tables as required.
5. Re-assemble the aluminum cover and insert the back panel into PT2060 system.

Seismic Transducer Input

Channel 1

JP3001 Short circuit 3

J3004 Short circuit (right side)

JP3002 Open circuit 1

Channel 2

JP3003 Short circuit 3

J3009 Short circuit (under side)

JP3002 Open circuit 2

Channel 3

JP3004 Short circuit 3

J3010 Short circuit (left side)

JP3006 Open circuit 1

Channel 4

JP3005 Short circuit 3
J3011 Short circuit (right side)
JP3006 Open circuit 2

Connected with LVDT Transducer

Channel 1

JP3001 Short circuit 2
J3004 Short circuit (right side)
JP3002 Open circuit 1

Channel 2

JP3003 Short circuit 2
J3009 Short circuit (under side)
JP3002 Open circuit 2

Channel 3

JP3004 Short circuit 2
J3010 Short circuit (left side)
JP3006 Open circuit 1

Channel 4

JP3005 Short circuit 2
J3011 Short circuit (right side)
JP3006 Short circuit 2

If the channel works in non-integral vibration mode, customer must select its scale and jumpers.

Note: Integrator type can not work in low frequently condition.

See below for jumper locations.

	Small Scale	Large Scale
Channel 1:	J1001 Short circuit (under side)	J1001 Short circuit (up side)
Channel 2:	J1002 Short circuit (under side)	J1002 Short circuit (up side)
Channel 3:	J2001 Short circuit (up side)	J2001 Short circuit (under side)
Channel 4:	J2002 Short circuit (under side)	J2002 Short circuit (up side)

Small scale is defined as below:

Acceleration input, Acceleration output

- ✓ **Measurement Type: PK** **Full scale high: ≤2.5g;**
- ✓ **Measurement Type: PK-PK** **Full scale high: ≤5g;**
- ✓ **Measurement Type: RMS** **Full scale high: ≤2g;**

Velocity input, Velocity output

- ✓ **Measurement Type: PK** **Full scale high: ≤50mm/s;**
- ✓ **Measurement Type: PK-PK** **Full scale high: ≤100mm/s;**
- ✓ **Measurement Type: RMS** **Full scale high: ≤50mm/s;**

Displacement input, Displacement output

- ✓ **Measurement Type: PK** **Full scale high: ≤60μm;**
- ✓ **Measurement Type: PK-PK** **Full scale high: ≤120μm;**
- ✓ **Measurement Type: RMS** **Full scale high: ≤50μm;**

Note：

Small Scale:

Signal input: ≤ 600 mV(PK-PK);

Large Scale:

Signal input: ≤8 V(PK-PK);

Factory Default Jumper Setting

This is non-integral vibration and small scale mode.

Channel 1: **J1001 Short circuit (under side)**
JP3001 Short circuit 3
J3004 Short circuit (right side)
JP3002 Open circuit 1

Channel 2: **J1002 Short circuit (under side)**
JP3003 Short circuit 3
J3009 Short circuit (under side)
JP3002 Open circuit 2

Channel 3: **J2001 Short circuit (up side)**

JP3004 Short circuit 3

J3010 Short circuit (left side)

JP3006 Open circuit 1

Channel 4: **J2002 Short circuit (under side)**
JP3005 Short circuit 3

J3011 Short circuit (right side)

JP3006 Open circuit 2

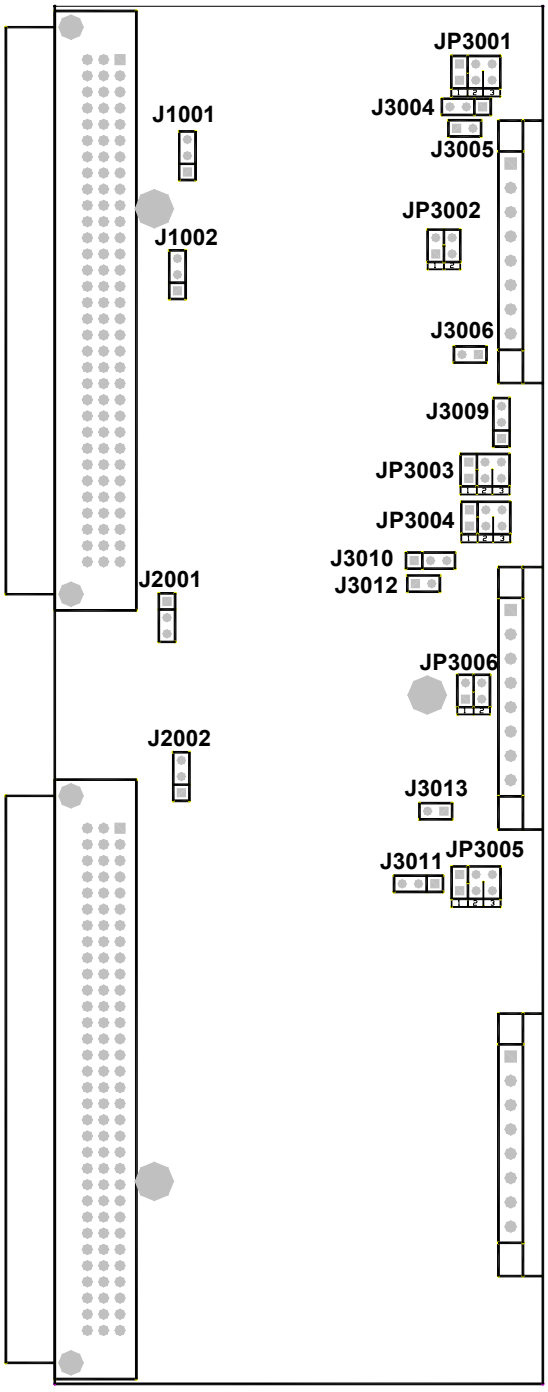


Figure 5 PT2060/20-Back panel jumper location

Hardware

One PT2060/20-Front and one PT2060/20-Back constitute a PT2060/20 SEIS seismic module. The module has on board status indication. There are three LEDs on the PT2060/20-Front panel that display different status conditions of the monitored channels. There are also four buffered output BNC connectors one for each There are four 4-20mA current output terminals on the PT2060/20-Back panel.

LED

PT2060/20 PROX proximity module has on-board status indication. There are three LED that display different status of the monitoring channels.

- ✓ OK / IO

  A steady OK / IO LED indicate that the hardware module, and the proximity probe system in the field are working ok.

  Disabled channels will be logically configured as channel OK status.

  If the OK / IO LED is flashing with about one second frequency, it indicates

  A. Channel is ok.

  B. The digital communication between the module and the system are working properly.

- ✓ Alarms

  If the Alarm LED is on, it indicates that some channels on the module are in Alert status and/or some channels on the module are in danger status.

- ✓ Bypass

  The Bypass LED will be on if Bypass terminal is plugged in. With the Bypass on, all channels of the module will not output any alarm.

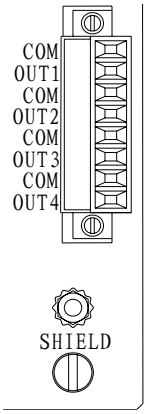


Figure 6

BUF

The four BNC connectors are corresponding to the four channels respectively. The BNCs provide original un-filtered signals for other data acquisition systems.

4-20mA output

ProvibTech supply 4-20mA output on each channel as a default setting for our customer. Each PT2060/20 PROX proximity module has up to four channels of 4-20mA output. Figure 6 shows PT2060/20-Back panel. COM/OUT1, COM/OUT2, COM/OUT3 and COM/OUT4 are the 4-20mA current output terminals of the four channels.

Software

PT2060 has powerful configuration software. A user can perform configurations of PT2060/20 PROX modules via the *PT2060 System Configuration* software. . PT2060/20 can be configured to different modes, full scales, alarms set points, alarm delay etc… In addition, the 4-20mA output can be calibrated. The overall

real-time value of the signal acquired and processed by the PT2060/20 PROX module can be displayed in the software.

Connection: Install the configuration software on a computer, and connect to PT2060 with the communication cable provided (see PT2060/CFG manual for in depth instructions).

In the *Real-time Value and Status* window of the software the following messages are displayed.

Rack, Slot, Channel

PT2060 rack number, PT2060/10 PROX proximity module slot number and channel number.

Real-time Value

The present value of that channel corresponding to its full scale.

GAP Value

For proximity probes, this stands for the distance between the top of the probes and the measured surface.

Alert, Danger

It is the result of comparing the real-time value with assigned alarm set-point. When the real-time value is higher than the high limit or is lower than the low limit, it alarms. True means alarm and False means no alarm.

GAP not OK

It indicates GAP alarm status. When the GAP value exceeds assigned range, GAP not OK alarms. True means alarm and False means no alarm.

Additional Information

PT2060/20 PROX modules are able to provide some additional information such as alarm events and system events. See PT2060/91 Manual for further information.

Specification

Electrical

Power supply:

Internally converted by the rack power supply module

8.0W total typical for this module

Current mode sensor power:

4.0mA nominal @ 25℃

LVDT sensor power:

20VDC, current limited. Less than 50mA on each channel

Signal Input:

Up to four sensors

Input impedance:

> 20KΩ

Nominal Sensitivity:

Accelerometer:

100mV/g (TM0782A) or similar sensor

Velocity sensor:

4 mV/mm/sec (100mV/in/sec)

TM0793V type or similar sensor

Displacement sensor:

4mV/μm (100 mV/mil)

TM079VD type or similar sensor

LVDT Sensor:

0.4V/mm (10V/in): TM0602-A01

0.2V/mm (5V/in): TM0602-A02

0.1V/mm (2.5V/in): TM0602-A03

Any sensitivity specified.

Signal Conditioning:

Vibration Frequency Response (normal frequency):

Acceleration:	240 to 240,000RPM (4 to 4.0 kHz), -3dB
Velocity:	120 to 120,000RPM (2 to 2.0 kHz), -3dB

Vibration Frequency Response (low frequency for non-integral):

Acceleration:	30 to 6,000RPM (0.5 to 100.0Hz), -3dB
Velocity:	30 to 6,000RPM (0.5 to 100.0Hz), -3dB
Displacement:	30 to 6,000RPM (0.5 to 100.0Hz), -3dB

Accuracy:

< ±1% FS @25℃

Signal processing:

The input signal can be processed with:

Peak

Peak to peak

RMS

DC

Static and Status Values:

Each of the options for this monitor module has been defined with static values. Those values can be accessed via the 4-20mA output or from the digital communication protocols.

Vibration:

Direct, GAP, OK, Alert, Danger, Bypass, Trip-multiply

Case Expansion:

Direct, GAP, OK, Alert, Danger, Bypass

Overall in 4-20mA output:

Max transfer distance: 300m (1000ft)

Proportion to the monitor full scale. Each channel has its own overall vibration output. The short of the 4-20mA will not affect system performance.

Maximum load:

300Ω

Resolution:

Less than 0.33% FS

Buffered Output:

On the PT2060/20-Front panel, each channel has one BNC connector. The output is the unfiltered raw signal.

Max transfer distance: 300m (1000ft)

Output impedance:

550Ω

Alarm:

Alarm set-point:	Each channel has two alarm set-points which can be field adjusted from 0 to 100% FS.
Set-point accuracy:	Better than 0.1% FS
Set-point repeatability:	Within 0.1% FS
Alarms:	Normally latching or normally non-latching
Alarm delay:	Alert delay can be set from 1 to 60 seconds with time interval of 1 second Danger delay can be set from 1 to 60 seconds with time interval of 1 second Danger delay also includes a 0.1 seconds option

LED Indicators:

OK / IO:	green, on off or flash
Alarms:	red
Bypass:	red

Approvals:

CE;

CSA:

Non-incendive, class I, div.2, Grps.ABCD, T4, -40℃ to +75℃

Certificate Number: 2011996

Environmental

Temperature:

Operation: -20℃ ~ +65℃

Storage: -40℃ ~ +85℃

Humidity:

95% non-condensing

Physical

Each module comes with two major components: the PT2060/20-Front assembly and the PT2060/20-Back assembly.

Dimensions:

241mm(9.5in)×24.5mm(0.96in)

For 19″ rack, they can be mounted in any slot from 1 to 12.

For 12″ rack, they can be mounted in any slot from 1 to 6.

Weight:

1.0 kg (2.0 lb)

Module Configuration and Channel Setup

SEIS module can process signals from most seismic sensors system including acceleration, velocity, displacement, and case expansion. To deal with these signals, the PT2060/20 SEIS seismic module and *PT2060 System Configuration* software are needed.

Hardware Configuration

Each PT2060/20 SEIS seismic module occupies a slot in the system rack. A standard 19″ rack can contain 12 PT2060/20 modules at most, and the PT2060/20 modules can be mounted only in slot 1 to12. A 12″ rack can contain 6 PT2060/20 modules at most, and the PT2060/20 modules can be mounted only in slot 1 to 6.

Before using the module, users need to determine the channel measurement mode. There are three channel measurement modes: non-integral mode, integral mode and LVDT.

Non-integral mode:

- Acceleration input and acceleration output (A-A)
- Velocity input and velocity output (V-V)
- Displacement input and displacement output (D-D)

Integral mode:

- Acceleration input and velocity output (A-V)
- Velocity input and displacement output (V-D)

LVDT mode:

- LVDT input and case expansion output-paired
- LVDT input and case expansion output-single

Note: Some these different channel measurement modes are set up with jumpers located on rear panel. For more detailed information, please refer to PT2060/20-Back Jumper.

Scales definition of non-integral channel measurement

For non-integral channels, there are two scales to choose.

✓ **Acceleration input and acceleration output (A-A)**
If the PK Full-Scale range is less than or equal to 2.5g or the PK-PK Full-Scale range is less than or equal to 5g or the RMS Full-Scale range is less or equal to 2g, small scale should be chosen. Otherwise please choose large scale.

✓ **Velocity input and velocity output (V-V)**
If the PK Full-Scale range is less than or equal to 50mm/s or the PK-PK Full-Scale range is less than or equal to 100mm/s or the RMS Full-Scale range is less than or equal to 50mm/s, small scale should be chosen. Otherwise please choose large scale.

✓ **Displacement input and displacement output (D-D)**
If the PK Full-Scale range is less than or equal to 60μm or the PK-PK Full-Scale range less than or equal to 120μm or the RMS Full-Scale range less than or equal to 50μm, small scale should be chosen. Otherwise please choose large scale.

Connection between host computer and PT2060

To configure PT2060/20, communication between *PT2060 System Configuration* software and PT2060/20 module has to be established. This communication is normally setup via. PT2060/91, the system interface module. As Figure 7 shows, Computer will connects PT2060/91, the System Interface Module via the RS232 on the front panel or RS485 or RS232 on the back panel. Please consult *PT1060/91 SIM User Manua*l for more details.

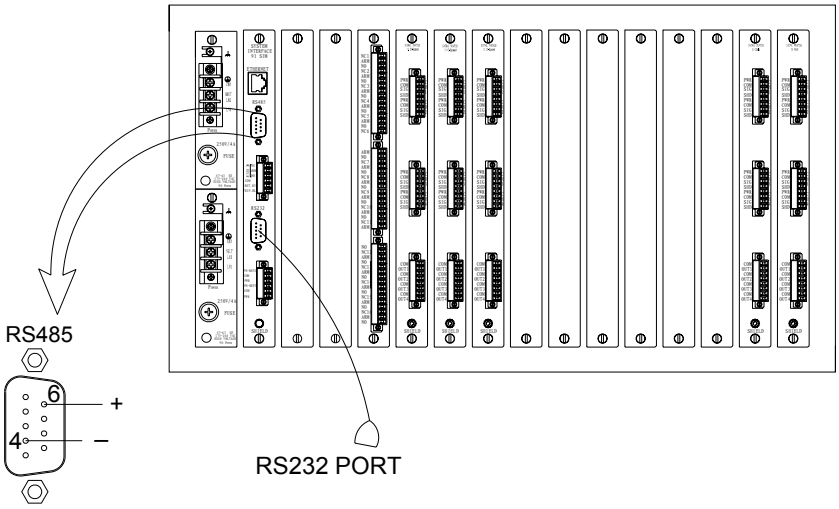


Figure 7

Modeule Type and Channel Configuration Setting

Configuration Software General Operation

PT2060 System Configure software is an important part of test and maintenance of PT2060. PT2060 parameters are configured and the running status is displayed via the software,. For more detailed information, please refer to *PT2060 System Configure* software user manual.

The figure below is the main rack window of the software. There are seven main items in the window.

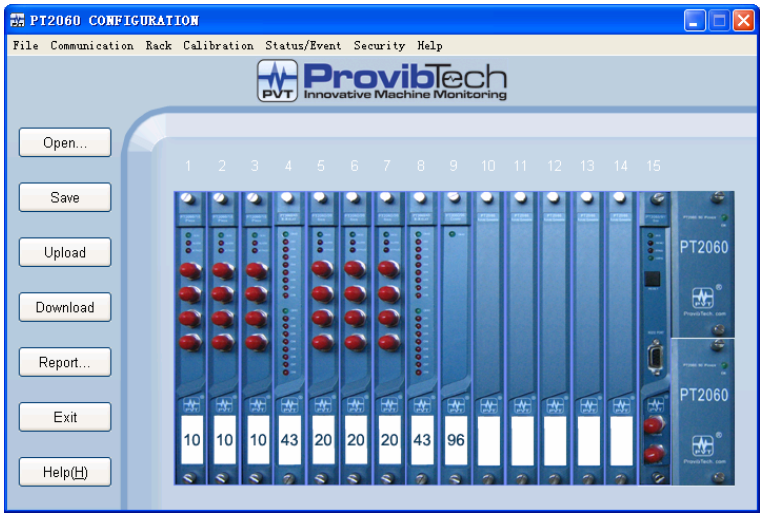


Figure 8

Menu item File relates to file operations such as open, save and save as of a configuration file. Also, the item *System Setup* in it is used to alternate the system measurement unit. See the figure below.

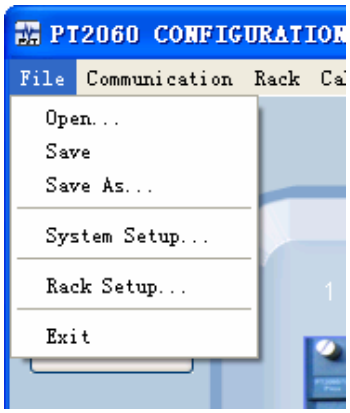


Figure 9

Menu item *Communication->Upload* is used to upload all configuration parameters from the PT2060 rack currently connected to the computer and *Communication->Download* is used to download all configuration

parameters to the currently connected PT2060 rack.

From *Communication Setup*, connection with PT2060 monitor can be established. Setup communication parameters and click button *Download* to re-set the parameters for the PT2060 rack.

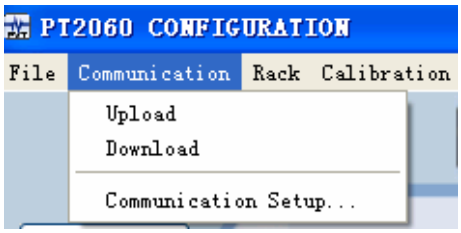


Figure 10

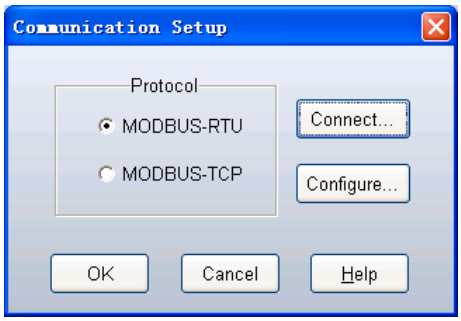


Figure 11

Menu item *Rack* relates to rack operations. Its sub items are listed below.

- Rack Clock Setup
  Configure system clock of the PT2060 rack.
- Rack Reset Setup
  Reset all alarms of the PT2060 rack.
- Factory Information
  Operations related to factory information.
- Configurable Modbus Registers
  Operations related to Modbus Registers of the rack.
- Signal Module Status Control
  Operations related to alarm bypass and multiply alarms.
- Self-Test
  Let the rack go into self-test mode. This is useful for troubleshooting.

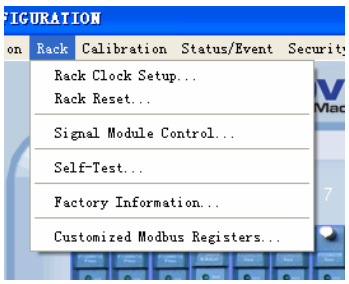


Figure 12

Menu item *Calibration* contains two sub-items, *General Calibration* and *Factory Calibration*. The users could perform general calibration only.

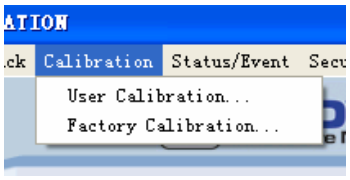


Figure 13

Menu item *Status/Event* contains operations related to current status and alarm events (recent 500 records), such as reading or deleting. Its sub item *Real-time Value and Status* is used to display the real time overall vibration level and the alarm status for all channels. Sub item *Modbus Range Setup* is used to set a coefficient to PT2060 in order to make it compatible with other devices based on the standard Modbus.

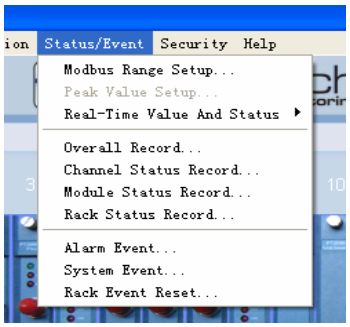


Figure 14

Item *Security* is used for security consideration. Here you can enter different passwords for various permissions. The Factory Password allows factory permission and is for the factory staff only. You can modify the passwords here and set effective time for them. If the period is expired, password has to be reentered to continue your working.

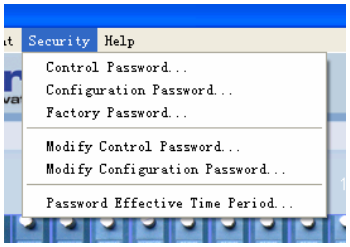


Figure 15

The item *Help* introduces detailed operation steps to the user. It is a quick way to become acquainted with the software.

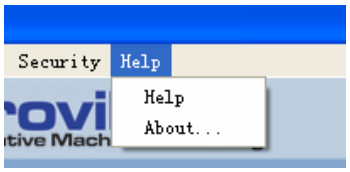


Figure 16

Module Function Description

Alarm Type

PT2060/20 SEIS module has two alarm types, alert and danger.

Alarm can be configured to one of the two alarm types, Alert and Gap. If the chosen type is Alert, in *Real-time value and Status* window of *PT2060 System Configuration* software, the column Alert indicates whether it is in alert status, and the column Danger indicates whether it is in danger status. If the chosen type is GAP, in the software window, the column Alert indicates whether the GAP voltage exceeds the assigned value and the column Danger indicates whether it is in danger status.

GAP not OK

When a certain channel of PT2060/20 SEIS module has GAP voltage exceeding the set range, it will turn to GAP not OK status, and the OK / IO LED will be off.

If the current channel's alarm type is Alert, When GAP is not OK, it can be seen from *Real-time Value and Status* interface of *PT2060 System Configuration*, that:

- ✓ Real time value equals to full scale low limit
- ✓ GAP value normally displayed, is the current GAP voltage
- ✓ Alert is False, Danger is False (alarm latching has higher privilege than GAP not OK. If before turning to GAP not OK, alarm latched already, Alert and Danger will not change).

Also in this case he channels' output current ought to be set to 3.0±0.16mA.

If the current channels' alarm type is GAP, when GAP is not OK, it can be seen from *Real-time Value and Status* interface of *PT2060 System Configuration*, that:

- ✓ Real time value equals to full scale low limit
- ✓ GAP value is normally displayed, is the current GAP voltage
- ✓ Alert is True, indicating that it is in GAP not OK status
- ✓ Danger is False (alarm latching has higher privilege than GAP not OK. If before turning to GAP not OK, it has Danger latched already, Danger will not change)

In this case the channels' output current ought to be set to 3.0±0.16mA.

Bypass

There are two types of bypass, hardware bypass and software bypass. When hardware bypass is activated, the Bypass LED becomes on (When software bypass is activated, the LED does not come on). Both types of bypass do not affect monitor performance except the alarms. Bypass will inhibit Danger alarm, Alert alarm and GAP alarm. The default status is inactive. Bypass has a higher privilege than alarm latch.

A channel bypass status may result from the following conditions:

- ✓ PT2060/20 SEIS module has never been configured.
- ✓ PT2060/20 SEIS module is in configure mode.
- ✓ Channel of PT2060/20 SEIS module has an invalid configuration.
- ✓ PT2060/20 SEIS is in power up self-test.
- ✓ Fatal error is found during self-test.
- ✓ Alarming is bypassed via *PT2060 System Configuration.*
- ✓ *Alarming is bypassed via PT2060/91 SIM module.*
- ✓ Channel of PT2060/20 SEIS module is disabled.

Alarm Trip-Multiply

PT2060/20 module also supports alarms trip-multiple (with shaft vibration and low frequency vibration).

Trip-multiply will temporarily increase the alarm (Alert and Danger) set-points. Trip-multiply is normally applied by manual (operator) action during startup to allow a machine to pass through high vibration ranges without trigger monitor alarms. Such high vibration ranges may include system resonances and other abnormal transient conditions.

The function of trip-multiply is fulfilled through software under the hardware control i.e. the software multiply function takes effect only after a multiply terminal has been plugged in the socket on the PT2060/91 SIM System Interface module. When alarm type is Alert, this function is valid for both alarm levels alert and danger. When alarm type is GAP voltage, this function is valid only for danger. When double multiply is set, alarm occurs after real-time value reaches two times higher than alarm set-point value; When triple multiply is set, alarm occurs after real-time value reaches three times higher than alarm set-point value. The default status is inactive.

Channel Disable

When a channel is un-used, it should be disabled. In this case, from the window *Real-Time Value and Status* it can be seen that GAP not OK, Alert and Danger turn false and GAP value becomes 10.0V. The Real time value is full scale low or zero for position and temperature channels.

Parameter Configuration

Connect the host computer and the PT2060, and start *PT2060 System Configuration software*. Click the button *Upload* and the parameters of the PT2060 will be uploaded to the software.

Click the picture of the module you want to configure to open a configuration window for that module, where all parameters can be edited. Download or upload the configuration information according to the need. It needs configuration password when first download. The default password is 1234.

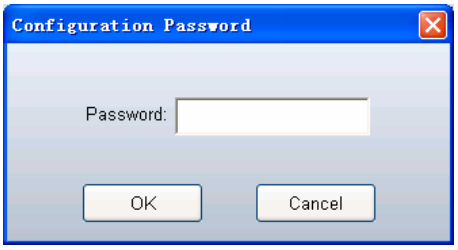


Figure 17

Application Advisory
ProvibTech **recommends strongly** that the original configuration setting be uploaded and saved before performing any modifications to the PT2060/20 inner parameters.

Warning
PT2060 is unable to alarm and protect in configuration status!!!

Acceleration Input, Acceleration Output

PT2060/20 SEIS seismic module supports measurement type of Acceleration input, acceleration output.

Channel Type

Acceleration input, acceleration output

Transducer Type

The measurement type of Acceleration input, acceleration output can be combined with many models of sensors such as:

TM0782A

Any 100mv/g sensor

Transducer Sensitivity

This is the most important parameter that corresponds to the transducer output sensitivity. This value is typically expressed as milli volt per measure unit. The default value is 100mv/g.

Alert Time Delay, Danger Time Delay

This is how long the module will delay before changing into alarm status after having detected that real-time value exceeds the alarm set-point. The user can modify it as needed. The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. The user can modify them from 1s to 60s as per the need.

Full Scale High, Full Scale Low

This is the high limit and low limit of the system full scale. After setting these, the various alarm hysteresis values are determined. The default value is 1/64 of Full scale high. By default full scale low is 0. The full scale high value is determined according to the application.

Measurement Type

For the PT2060/20 SEIS seismic module acceleration mode the default measurement type is PK. The User can change to PK-PK, or RMS.

Measurement Unit

You can alternate between metric and English units. For acceleration mode, the default setting is “g”, no matter what is the measurement unit.

Figure 18

Alert Type

Alert or Gap. Alert type means that the module outputs an alarm when the real-time value exceeds the alert and/or danger set-point set by the *PT2060 System Configuration* software. Gap type means that the module outputs an alarm when the gap voltage is not OK. Every channel of the module is capable of producing an Alarm indication. These indications can be used in relay alarm drive logic which is configured in the Relay module.

Frequency

It can be Normal or Low frequency. For more information, please refer to the *Electrical* specifications.. The default value is Normal.

Channel Enabled

This item controls whether or not the channel is to be used (If the box is checked (√), the channel is enabled). When it is disabled, the output current of this channel is 4mA. The default status is enabled.

Alarm Latching

This causes the PT2060/20 SEIS seismic module to retain an Alarm status after the alarm condition has cleared. The latching mode allows to know if an alarm set-point has been exceeded since the last rack

reset. Pressing the reset button on the Rack PT2060/91 SIM Module will reset all latched alarms in the PT2060 rack if the current proportional value is less than the set-point value. You can also reset the rack by using the software PT2060 System Configuration. The Event list of the monitor will provide information about faulty transducers even if non-latching is selected. The default status is latched and users can modify it.

Set Point

The alarm threshold is set here. There are two levels of alarm. The value can be set to some certain percentage of FS. The default factory setting of Danger high is 75%, Alert high is 50%. Gap alarm also has two levels. The default factory setting of GAP high is 17V, GAP low -2V. When the alarm condition is satisfied, PT2060 goes into alarm status.

The figure below is an example of PT2060/20 SEIS seismic module acceleration configuration.

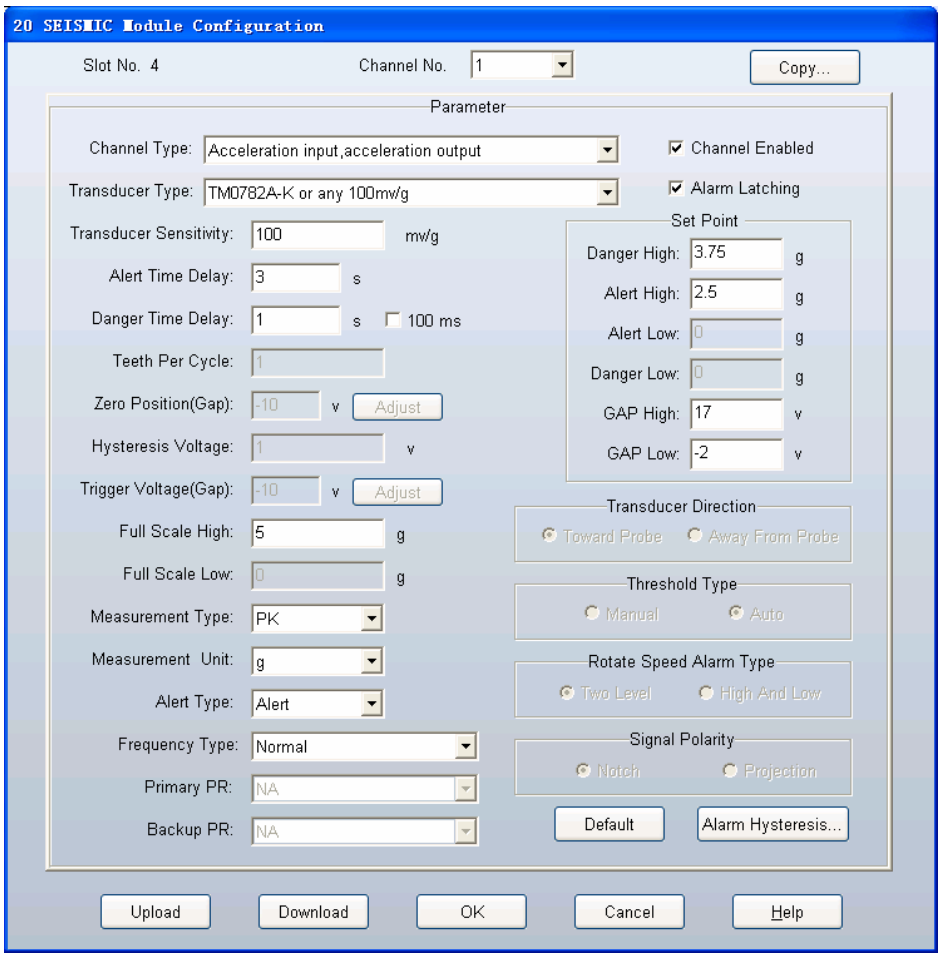


Figure 19

Acceleration Input, Velocity Output

The PT2060/20 SEIS seismic module supports Acceleration input, velocity output velocity monitoring. In this case, the signal from an acceleration transducer is integrated inside the monitor. The optional full scale includes 20, 25, 50, 100mm/s, 1.0, 2.0, 4.0ips.

The following parameters are required to be set properly.

Channel Type

Acceleration input, velocity output

Transducer Type

There are many models of transducers that can be connected such as:

TM0782A

Any 100mv/g

Transducer Sensitivity

Default value is 100mv/g.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. The user can modify them from 1s to 60s as needed.

Full Scale High, Full Scale Low

Full scale low is set to 0mm/s and Full scale high is set to 50mm/s by default. The user can set this parameter as desired. After these items have been set, the hysteresis of various alarms is determined. The default value is 1/64 of Full scale high.

Measurement Type

For the PT2060/20 SEIS seismic module acceleration input, velocity output mode, the default measurement type is RMS. The user can select PK-PK or PK instead.

Measurement Unit

For the PT2060/20 SEIS seismic module Acceleration input, velocity output mode, the measurement unit can be ips (imperial) or mm/s (metric). The Default setting is mm/s.

Alert Type

The default alert type is Alert. The User can change it to Gap as needed.

Frequency Type

For more information, please refer to *Electrical*. The default value is Normal.

Channel Enabled, Alarm Latching

The default status is enabled and latched. The user can modify it.

Set Point

Default factory setting of Danger high is 37.5mm/s, of Alert high is 25mm/s. Default setting for GAP High is 17V, GAP Low is -2V.

The figure below is an example of Acceleration input, velocity output configuration.

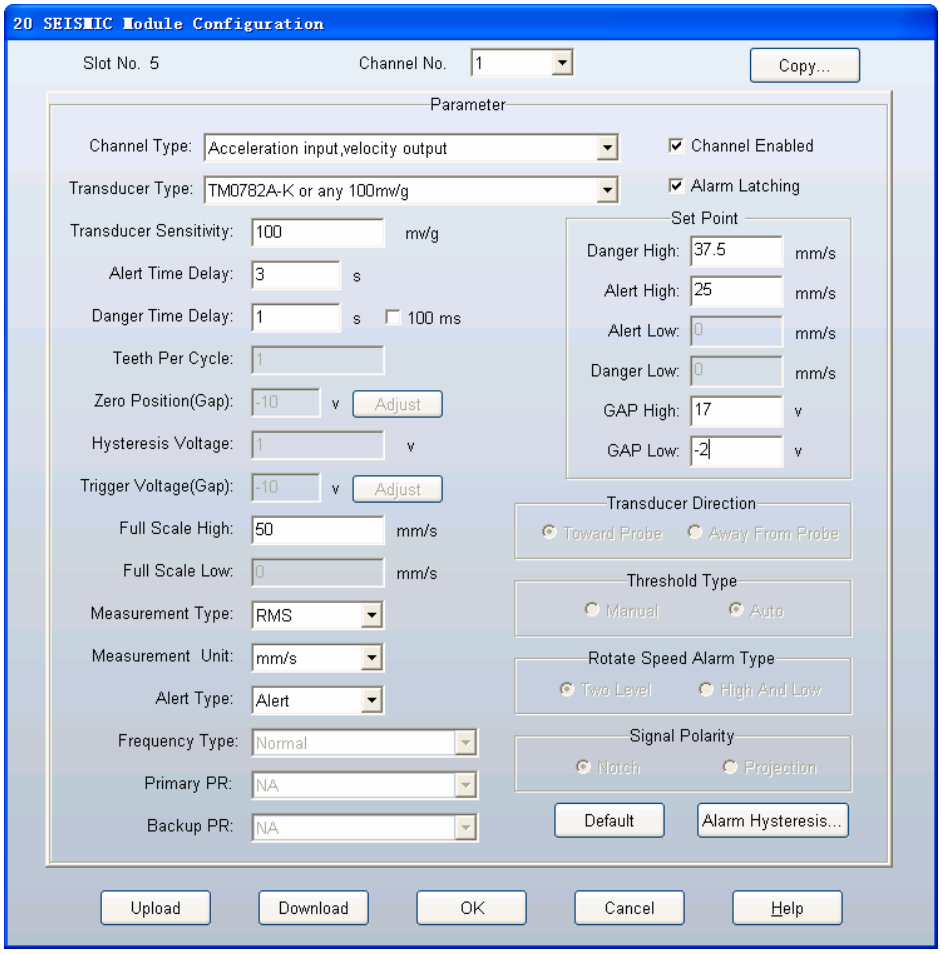


Figure 20

Velocity Input, Velocity Output

The PT2060/20 SEIS seismic module supports Velocity input, velocity output through velocity monitoring mode. In this case, a velocity transducer is required. Full scale can be 20, 25, 50, 100mm/s, or 1.0, 2.0, 4.0ips.

The following parameters are critical for this mode.

Channel Type

Velocity input, velocity output

Transducer Type

Many models of transducers can be connected for this mode, such as.

TM0793V
TM079VD
330525
330750
330500
Other Current mode Transducer

Transducer Sensitivity

This is related to the connected transducer and can be modified by users. If transducer type is TM0793V, the default is 4.0mv/mm/s.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. The User can modify them from 1s to 60s as needed.

Full Scale High, Full Scale Low

The full scale low is set to 0mm/s and Full scale high is set to 50mm/s by default. The User could set this parameter as per the real situation. After these items have been set, the hysteresis of various alarms is determined. The default value is 1/64 of Full scale high.

Measurement Type

For PT2060/20 SEIS seismic module velocity input, velocity output mode, the default measurement type is RMS. User can select PK-PK or PK instead.

Measurement Unit

For PT2060/20 SEIS seismic module velocity input, velocity output mode, the measurement unit can be ips (imperial) or mm/s (metric). The default setting is mm/s.

Alert Type

The default alert type is Alert. The User can change it to Gap as per the need.

Frequency

It could be Normal or Low frequency. For more information refer to the *Electrical* section of this manual. The default value is Normal.

Channel Enabled, Alarm Latching

The default status is enabled and latched. The user can modify it.

Set Point

The default factory setting of Danger high is 37.5mm/s, of Alert high is 25mm/s. Default setting for GAP High is 17V, GAP Low is -2V.

The figure below shows an example of Velocity input, velocity output configuration.

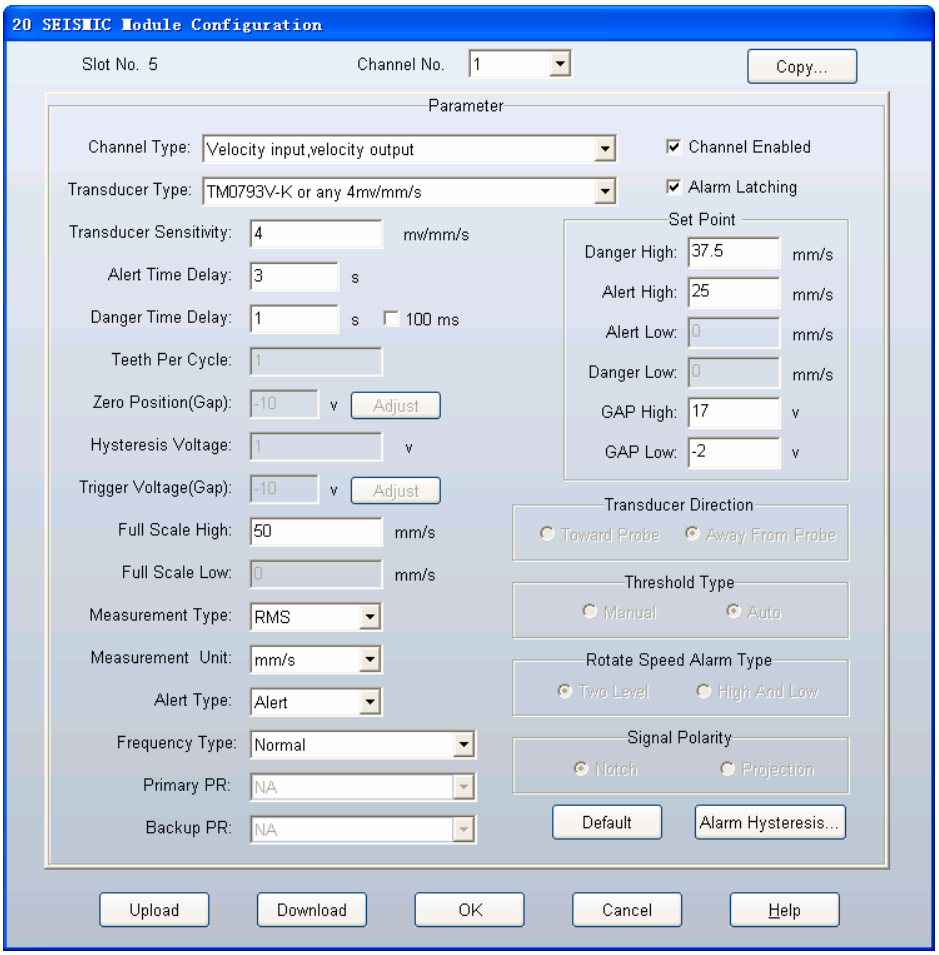


Figure 21

Velocity Input, Displacement Output

The PT2060/20 SEIS seismic module supports Velocity input, displacement output displacement measurement. The signal from the transducer is integrated before the system samples and processes it. The full scale can be 100, 200, 500μm and 5.0, 10, 20mil.

The following parameters are required.

Channel Type

Velocity input, displacement output

Transducer Type

Many models of transducers can be connected to the module, including:

TM0793V
330525
330750
330500
Other Current mode Transducer

Transducer Sensitivity

This is related to the connected transducer and can be modified by users. If transducer type is TM0793V, the default is 4.0mv/mm/s.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. The Users can modify them from 1s to 60s as need.

Full Scale High, Full Scale Low

Full scale low is set to 0μm and Full scale high is set to 200μm by default. The User could set this parameter as needed. After these items have been set, the hysteresis of various alarms is determined. The default value is 1/64 of Full scale high.

Measurement Type

The Default option is PK-PK. A User can change it to PK, RMS.

Measurement Unit

It can be imperial or metric i.e. mil or μm. The default option is μm. Refer to Acceleration input, acceleration output configuration.

Alert Type

The default alert type is Alert. The user can change it to Gap as need.

Frequency

For more information refer to *Electrical* section of this manual.. The default value is Normal.

Channel Enabled, Alarm Latching

The default status is enabled and latched. User can modify it.

Set Point

Default factory setting of Danger high is 150μm, of Alert high is 100μm. Default setting for GAP High is 17V, GAP Low is -2V.

The figure below is an example of Velocity input, displacement output configuration.

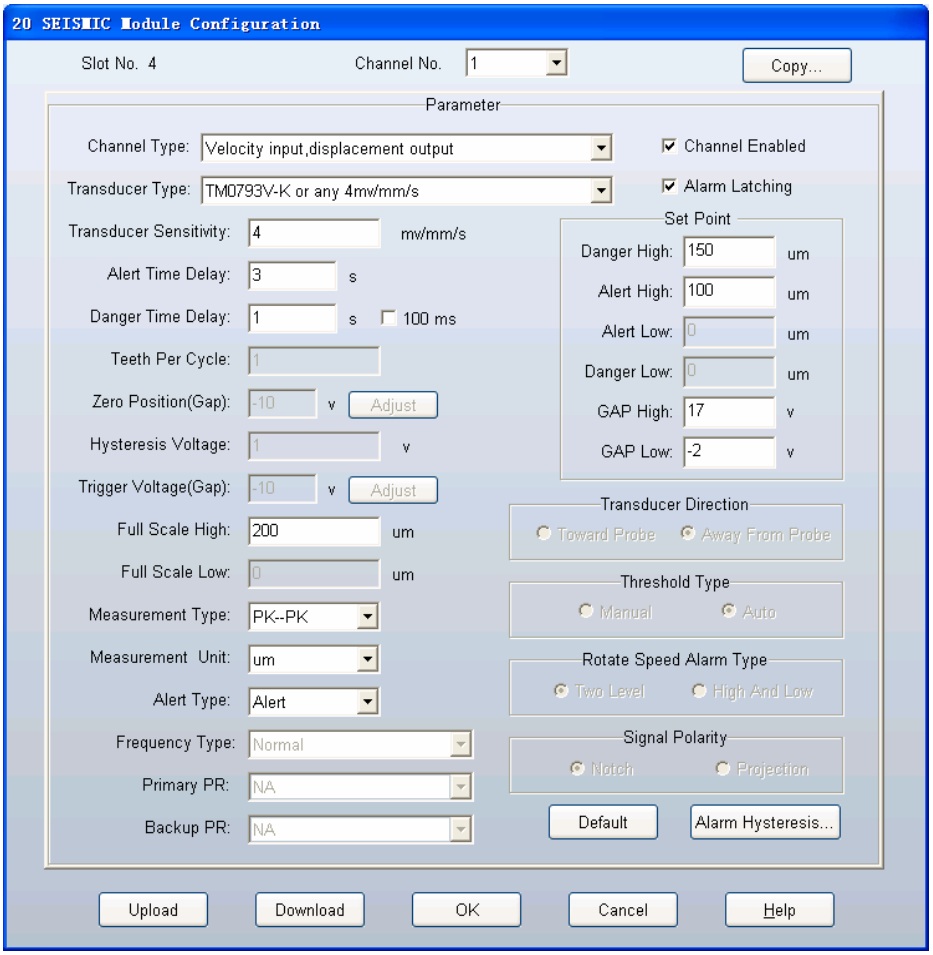


Figure 22

Displacement Input, Displacement Output

The PT2060/20 SEIS seismic module supports Displacement input, displacement output displacement measurement. Its full scale can be set to 100, 200, 500μm, or 5.0mil, 10mil, 20mil.

The following parameters are required.

Channel Type

Displacement input, displacement output

Transducer Type

Many models of transducers can be connected to PT2060/20 SEIS seismic module to implement Displacement input, displacement output displacement measuring.

TM079VD

Other Current mode Transducer

Transducer Sensitivity

This is in relation to the connected transducer. The user can modify it. If transducer type is TM079VD, the default is 4mv/μm.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. The user can modify them from 1s to 60s as needed.

Full Scale High, Full Scale Low

Full scale low is set to 0μm and Full scale high is set to 500μm by default. The user can set this parameter as needed. After these items have been set, the hysteresis of various alarms is determined. The default value is 1/64 of Full scale high.

Measurement Type

Default option is PK-PK. The user can change it to PK, RMS.

Measurement Unit

It can be imperial or metric i.e. mil or μm. Default option is μm.

Alert Type

The default alert type is Alert. The user can change it to Gap as need.

Frequency

For more information please refer to *Electrical*.

Channel Enabled, Alarm Latching

The default status is enabled and latched. The user can modify it.

Set Point

Default factory setting of Danger high is 375μm, of Alert high is 250μm. Default setting for GAP High is 17V, GAP Low is -2V.

The figure below is an example of Displacement input, displacement output configuration.

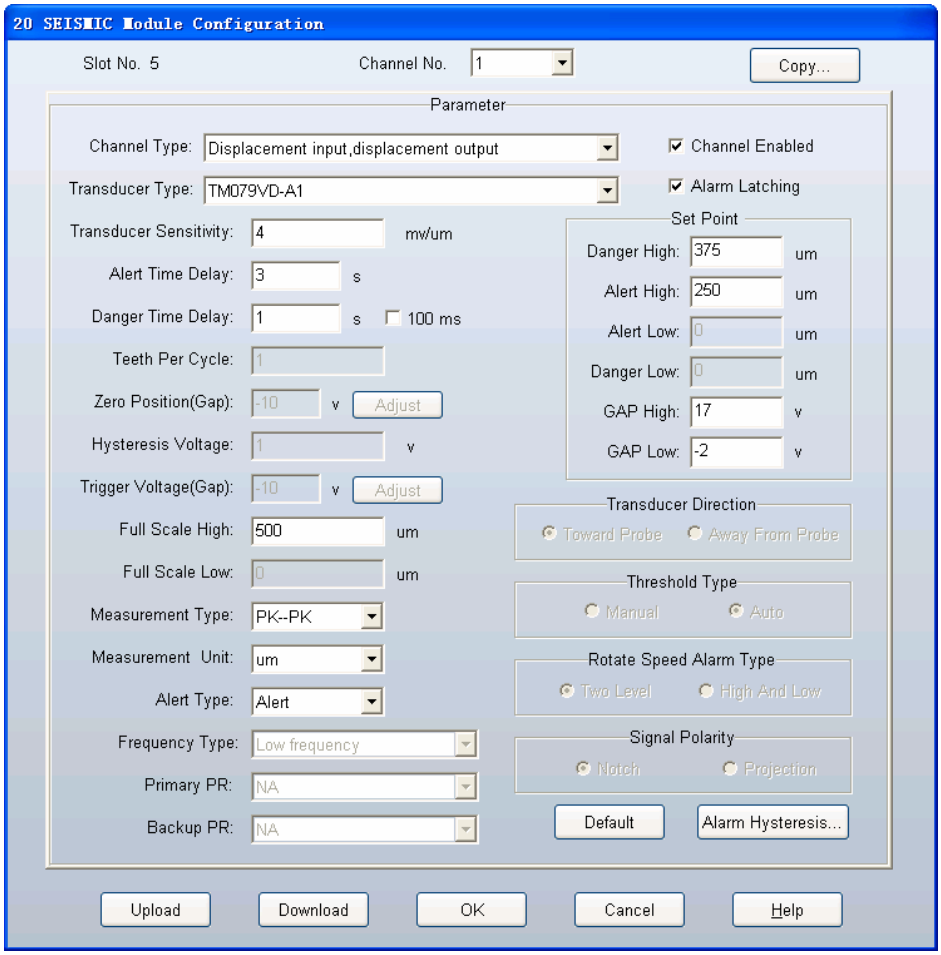


Figure 23

Dual LVDT Input, Case Expansion Output

Case expansion works in two modes,

Single LVDT input, Case expansion output;

Dual LVDT input, Case expansion output.

The PT2060/20 SEIS seismic module supports Dual LVDT input &Case expansion output. It is also called synthesis mode. In this mode, two channels are combined together as a group. Channel 1 and 2 form one group and channel 3 and 4 form another. The first channel of a group outputs the processed overall from the transducer connected to this channel. The second channel of the group outputs the value of the second channel subtracted from the value of the first channel. In this mode, disable status and GAP not OK status of both channels are tied together. The disable status of the second channel is always compatible with the first channel. GAP not OK status of both channels effect each other. If any one of them becomes not OK, both of them turn not OK.

The second work mode is called single mode. In this mode all channels of PT2060/20 SEIS seismic module work independently and have no relation to each other.

Case expansion supports LVDT transducers with any sensitivity. Full scale can be set to 25, 50, 100mm, 1inch, 2inch, 4inch.

Single LVDT Input

Channel 1/3

Channel Type

LVDT input, Case expansion Single Input

Transducer Type

TM0602-A01: 0.4V/mm (10V/in)

TM0602-A02: 0.2V/mm (5V/in)

TM0602-A03: 0.1V/mm (2.5V/in)

Other LVDT differential expansion transducer

Transducer Sensitivity

This is relative to the connected transducer and can be changed by the user. The default value is 0.4v/mm.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. The user can modify them from 1s to 60s as need.

Zero Position

The user can enter it manually or click “Adjust” button to let the system get it automatically. Its range is 0 to 10V.

Full Scale High, Full Scale Low

Full scale low is set to 0mm and Full scale high is set to 25mm by default. The user can set this parameter as needed .After these items have been set, the hysteresis of various alarms is determined. The default value is 1/64 of Full scale high.

Measurement Type

The default option is AVERAGE.

Measurement Unit

This can be imperial or metric, i.e. inch or mm. The default option is mm.

Alert Type

The default alert type is Alert. The user can change it to Gap as need.

Channel Enabled, Alarm Latching

The default status is enabled and latched. The user can modify it.

Set Point

The default factory setting of Danger high is 18mm, and Alert high is 13mm, Default setting for GAP High is 10V, GAP Low is -2V.

Upscale Direction

Case expansion measuring has relation to the Upscale direction. The user can choose the direction as needed. Toward Probe direction means that the larger the real-time value, the higher the GAP voltage. Away from Probe direction means that the larger the real-time value, the lower the GAP voltage. The default direction is Toward Probe.

Assuming a set up as pictured below, and assuming that if the target moved in the direction of the arrow with an INCREASE in expansion, LVDT 1 would be set up as Away From Probe, and LVDT 2 would be set up as Toward Probe.

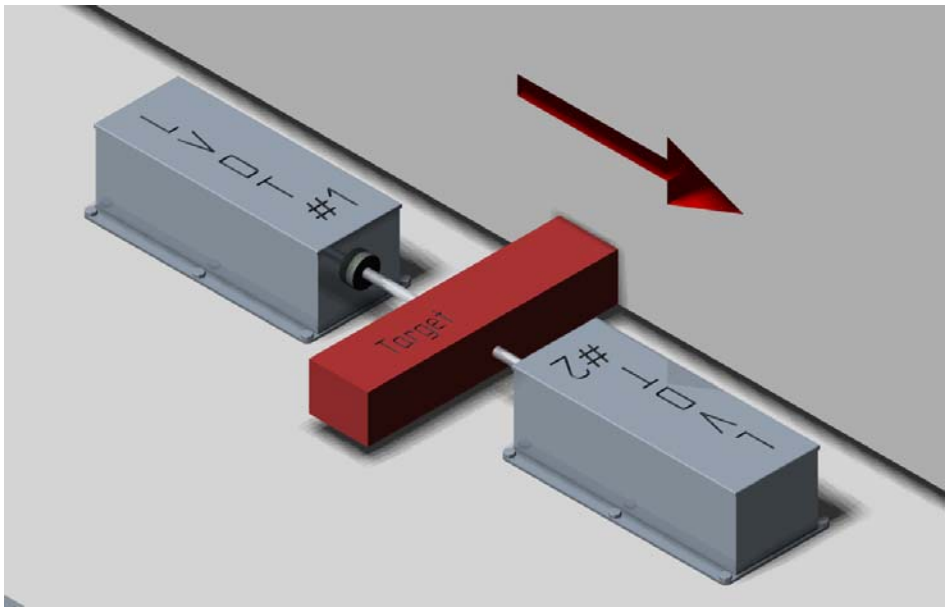


Figure 24

Paired LVDT Input

The figure below is an example of channel 1 or channel 3 configuration which are the first channel in a group configured in case expansion synthetic mode. This is the same as single mode except for the Channel Type.

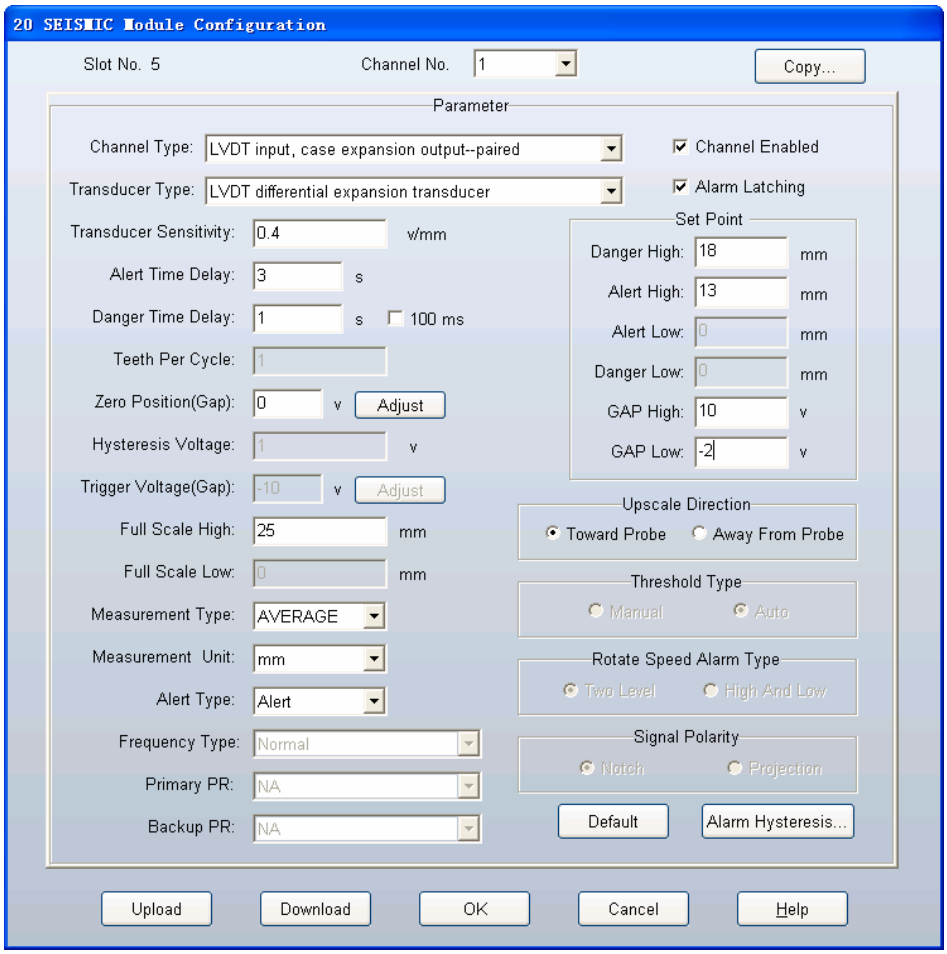


Figure 25

For working in paired / synthetic mode, two channels in the group should be configured at the same time. The first channel should be configured as it is shown above. The second channel should be as below.

Channel 2/4

Channel Type

The same as that of the first channel.

Transducer Type

It copies from the first channel.

Transducer Sensitivity

It copies from the first channel.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. The user can modify them from 1s to 60s as need.

Zero Position

The user can enter this manually or click the “Adjust” button to let the system get it automatically. Its range is 0 to 10V.

Full Scale High, Full Scale Low

The full scale low is set to -25mm and Full scale high is set to 25mm by default. The user could set this parameter according to as per the real situation. After these items have been set, the hysteresis of various alarms is determined. The default value is 1/64 of Full scale high.

Measurement Unit

Can be inch or mm. The default option is mm.

Alert Type

The default alert type is Alert. The user can change it to Gap as need.

Channel Enabled, Alarm Latching

The default status is enabled and latched. The user can modify it.

Set Point

The default factory setting of Danger high is 18mm, Alert high is 13mm, Alert low is -13mm, Danger low is -18mm. By default setting for GAP High is 10V, GAP Low is -2V.

Upscale Direction

The default direction is Toward Probe. See above for explanation.

The figure below is an example of channel 2 or channel 4 configuration which are the second channel in a group configured in case expansion synthetic mode.

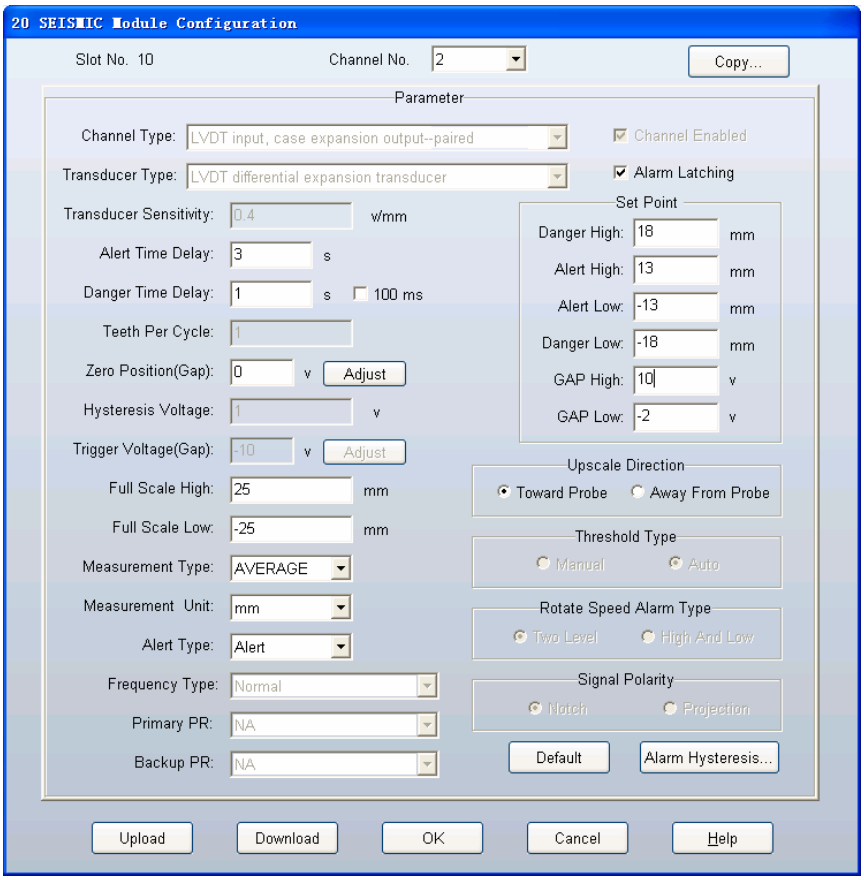


Figure 26

Transducer List

These are the transducers that can be connected to PT2060/20 SEIS seismic module.

Transducer input	Transducer type and sensitivity	Monitor output
Acceleration Transducer	TM0782A with 100mV/g or any current mode accelerometer.	Acceleration Velocity
Velocity Transducer	TM0793V with 4 mv/mm/s or any current mode velocity sensors. Such as 330525 330750 330500	Velocity Displacement
Displacement	TM079VD with 4mV/um or any other current mode transducers	Displacement
LVDT	TM0602-A01: 0.4V/mm (10V/in) TM0602-A02: 0.2V/mm (5V/in) TM0602-A03: 0.1V/mm (2.5V/in) Consult with ProvibTech for other LVDT transducer	Case expansion

Module Control and Real-time Monitoring

PT2060/20 SEIS seismic module processes signals from transducers and outputs various parameters such as Acceleration, Velocity, Displacement or Case Expansion. Real-time data can be monitored by the *PT2060 System Configuration* software. In this chapter, the illumination is based on PT2060 System Configuration. For more detailed information, please refer to *PT2060 System Configuration* software user manual.

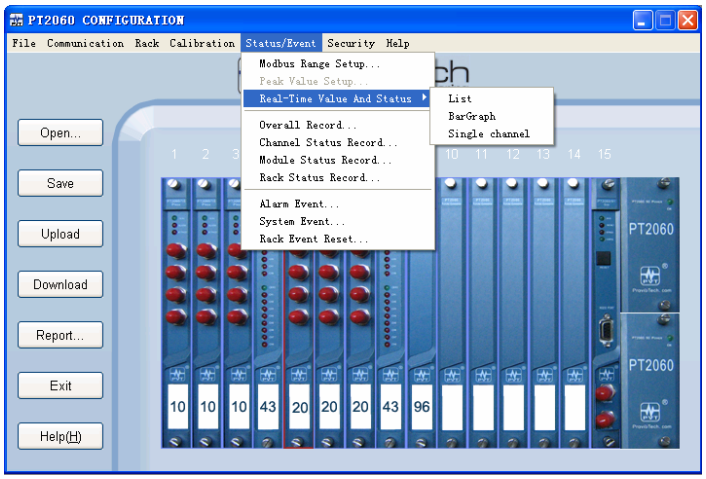


Figure 27

The main rack window of PT2060 System Configuration is shown in the figure above. Clicking the menu item *Status/Event->Real-Time Value and Status* opens the Real-time monitoring window. It is as shown in figure below.

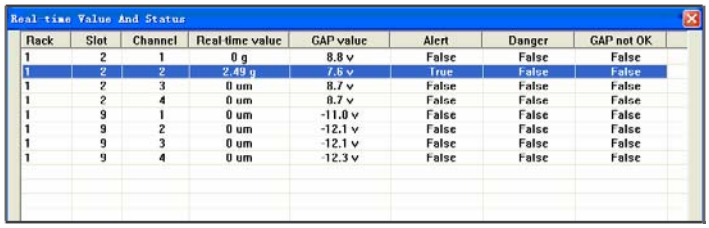


Figure 28

In the window *Real-time Value and Status*, real time value, gap voltage, alert status, rack number, slot number and channel number are shown.

The PT2060/20 SEIS module also saves history events and working status, including alarm events, system events, channel status records, module status records, and rack status records. See section "*Troubleshooting*" for details.

The PT2060/20 SEIS module supports alarm bypass, multiply alarm (except case expansion) and self-test functions. Alarm bypass has two types, software bypass and hardware bypass. The multiply alarm is implemented through the software with a trip multiply connection on the rear of the PT2060/91 SIM card. The Self-test is fulfilled under the software control.

Hardware Module Operation

Front, Back Panel and Functions

PT2060/20-Front Panel

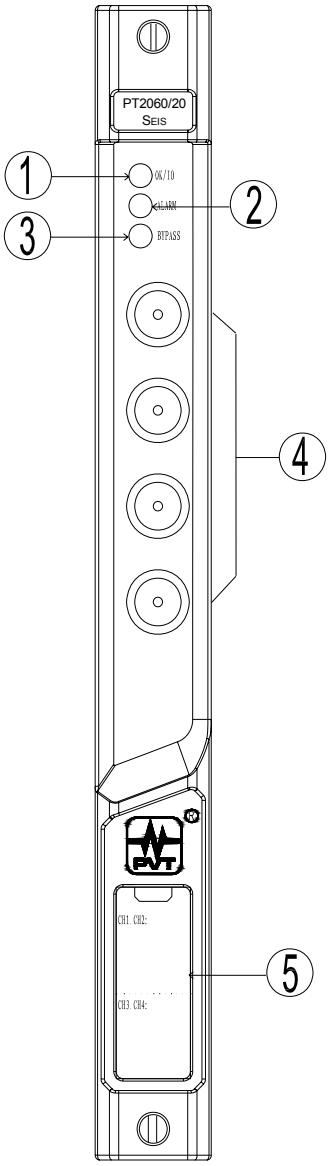


Figure 29

1. OK / IO LED

   Flash (1Hz): All channels are ok. Digital communication is ok.

   On without flash: All channels are ok but No digital communication.

   Off: One or more channels are not ok.

2. Alarm LED

   On: One or more channels have alarms. The alarms can be either alert or danger or both.

   Off: All channels on the module are in normal status. No alarms engaged.

3. Bypass LED

   On: bypass mode. All alarms on this module are inhibited (no alarms will be engaged).

   Off: Normal operation mode.

4. Buffered output

   The four BNC connectors are corresponding to the output of the 1, 2, 3 and 4 channels. The buffered output is the unfiltered raw signal outputted by BNC connector (except small scale of acceleration and velocity output).

5. Channel label

   Customer is able to mark channels on the label in the field. A label can be marked by removing the front plastic cover with a flat screw driver.

PT2060/20-Back Panel

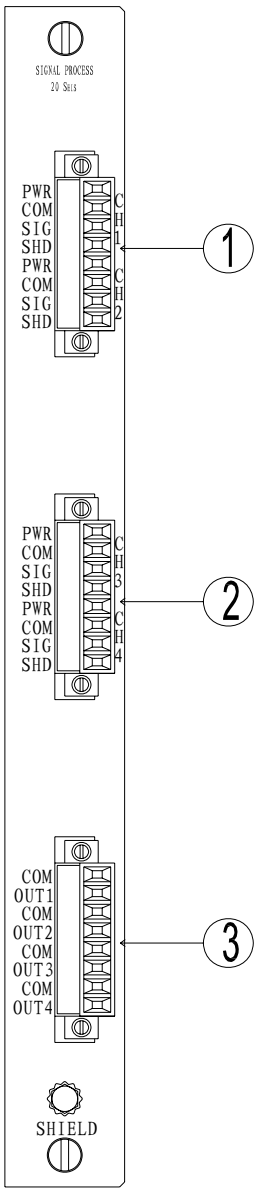


Figure 30

1. The terminal for sensor input of channel 1 and channel 2

   The screw on top and bottom are used to mount the connector. You may loosen the screws to remove the connector.

2. The port for sensor input of channel 3 and channel 4.

   See description above.

3. 4-20mA output

   As a standard feature, each channel has a 4-20mA output. The output is proportional to the full scale of each channel.The maximum load is 300Ω.

Field-wiring Diagram

Field-wiring Diagram for TM0793V or Similar Sensors

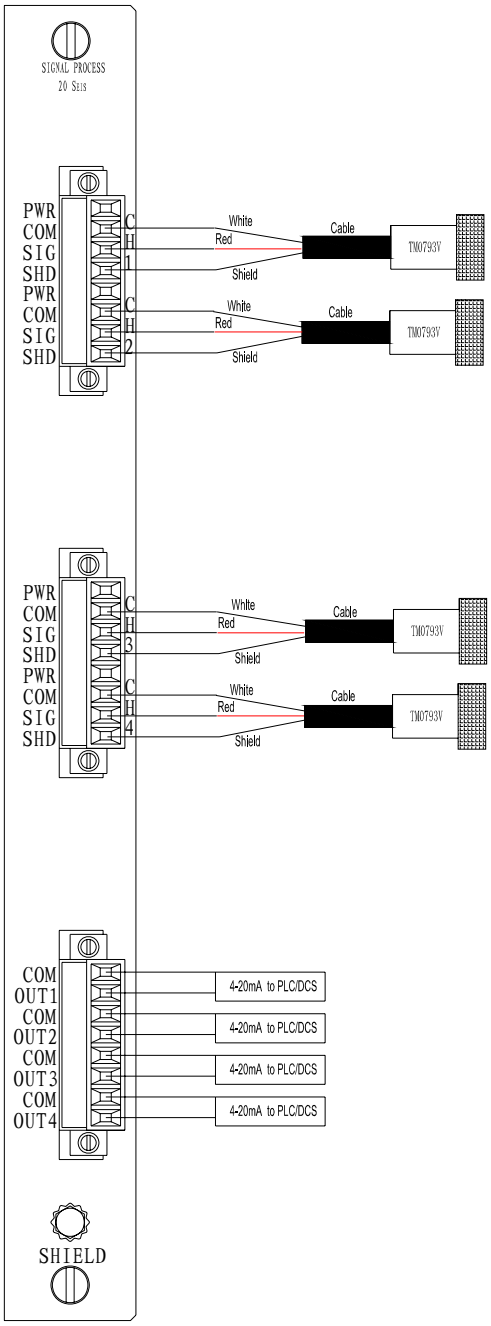


Figure 31

Field-wiring Diagram for TM0794V

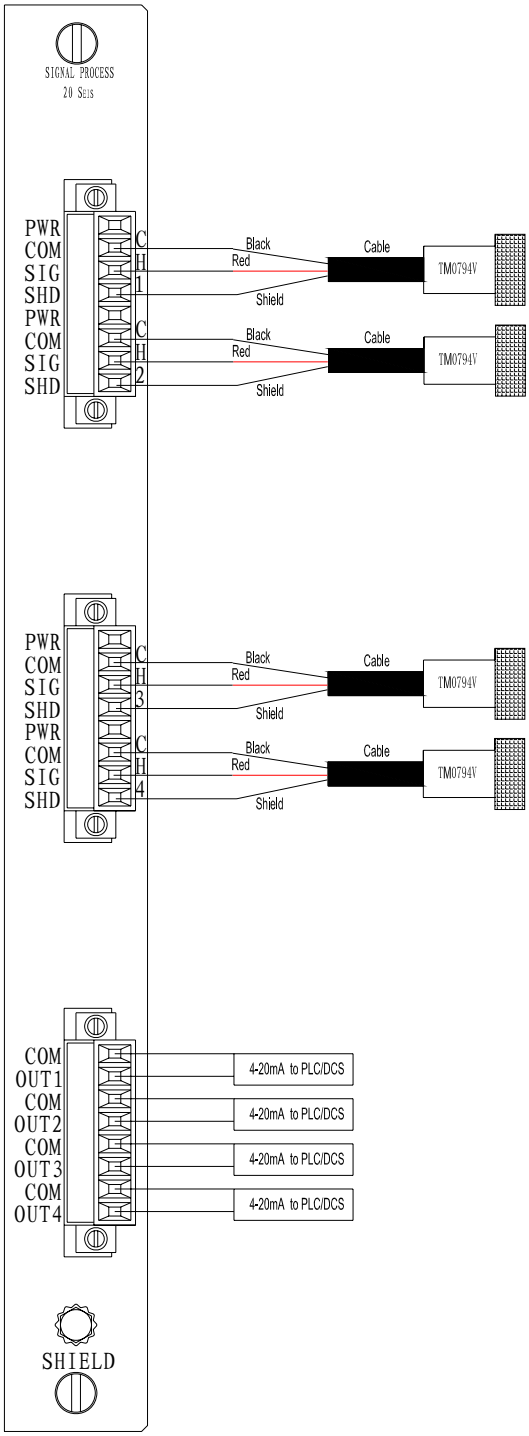


Figure 32

Field-wiring Diagram for TM079VD

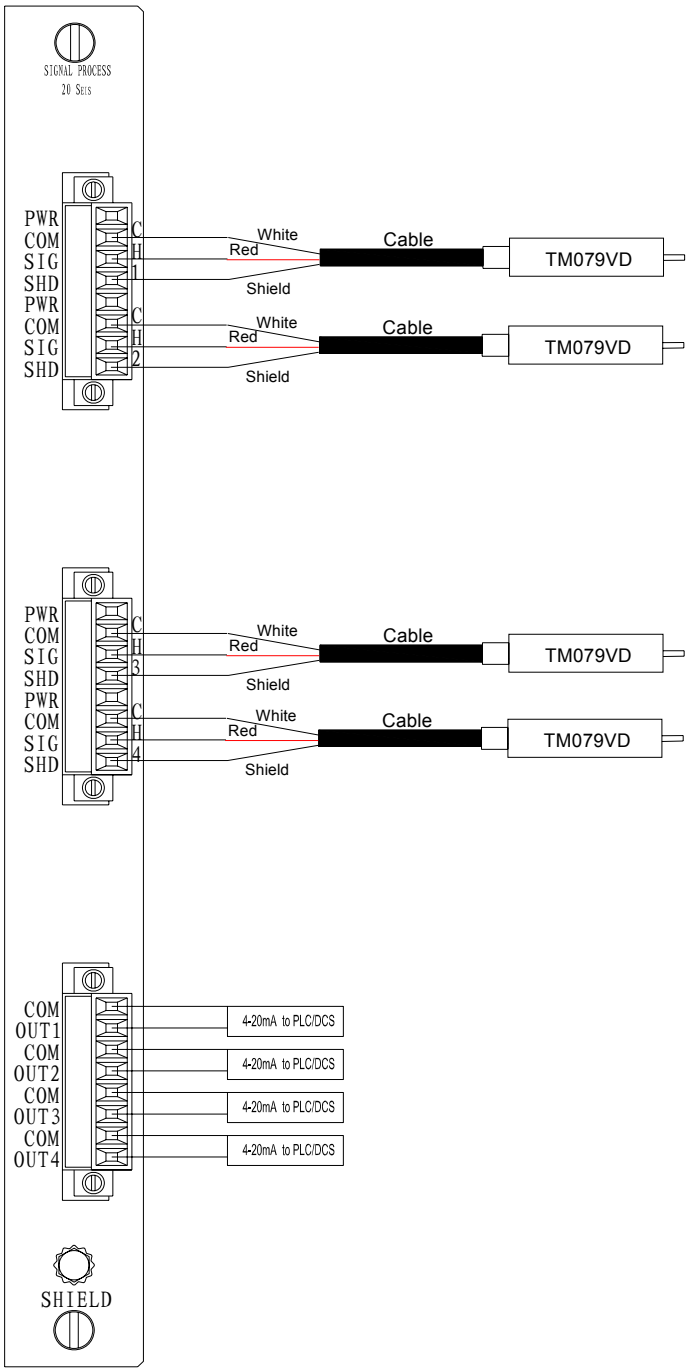


Figure 33

Field-wiring Diagram for TM0782A-K

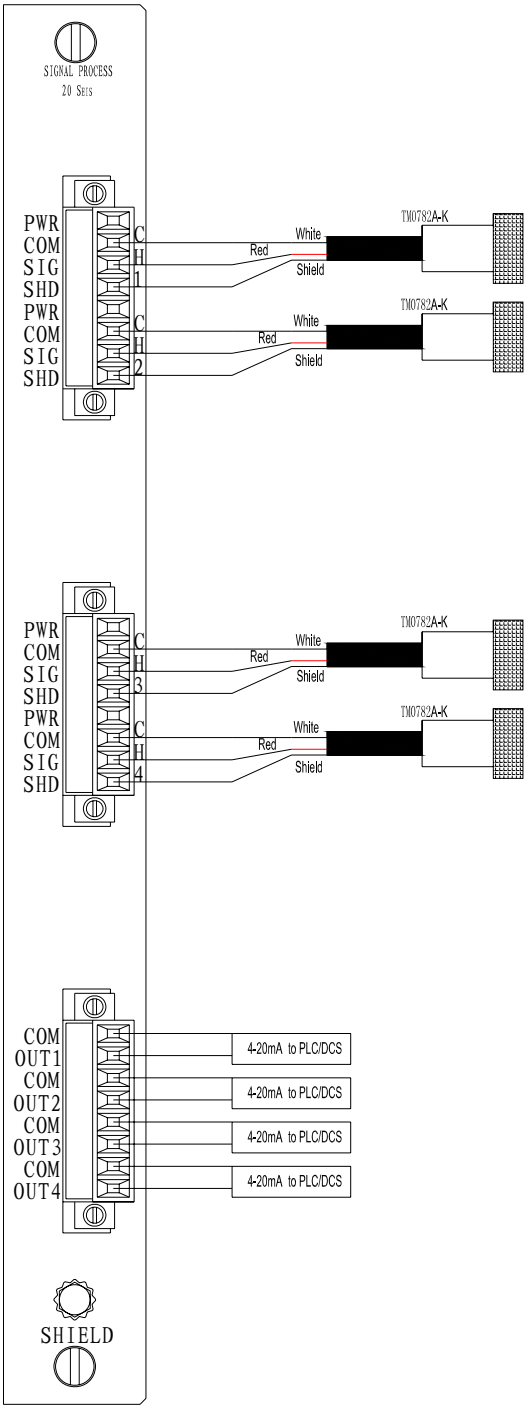


Figure 34

Field-wiring Diagram for electro-magnetic velocity sensor

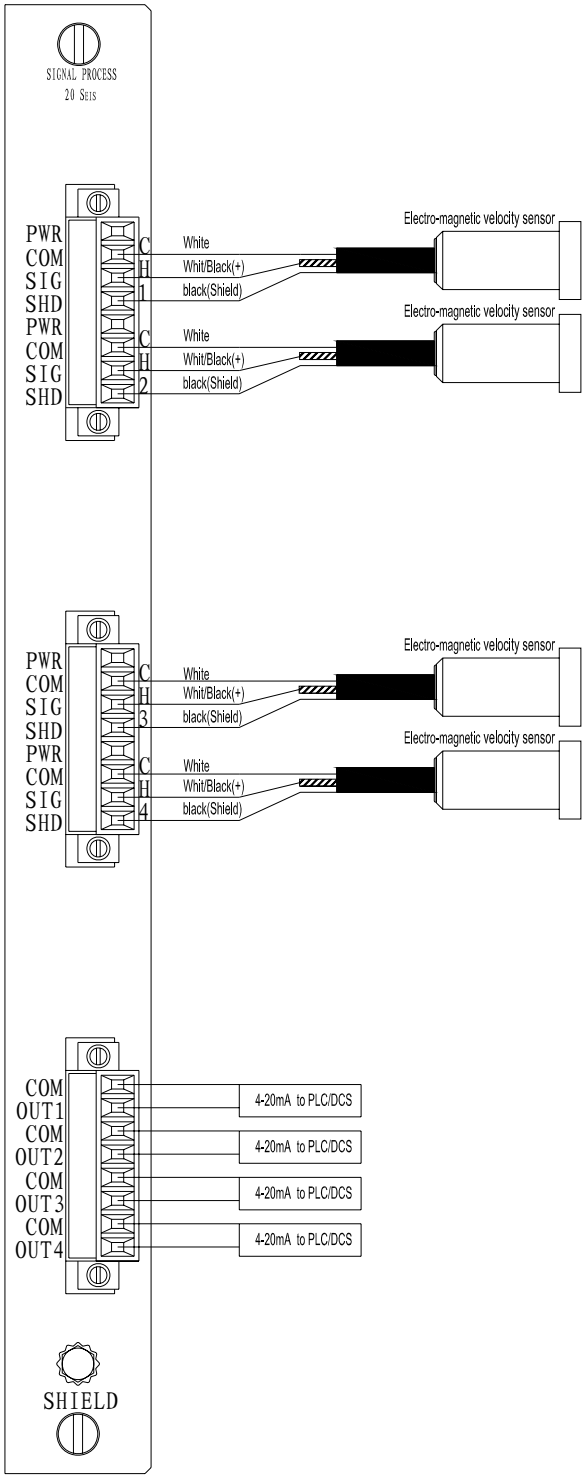


Figure 35

Field-wiring Diagram for LVDT

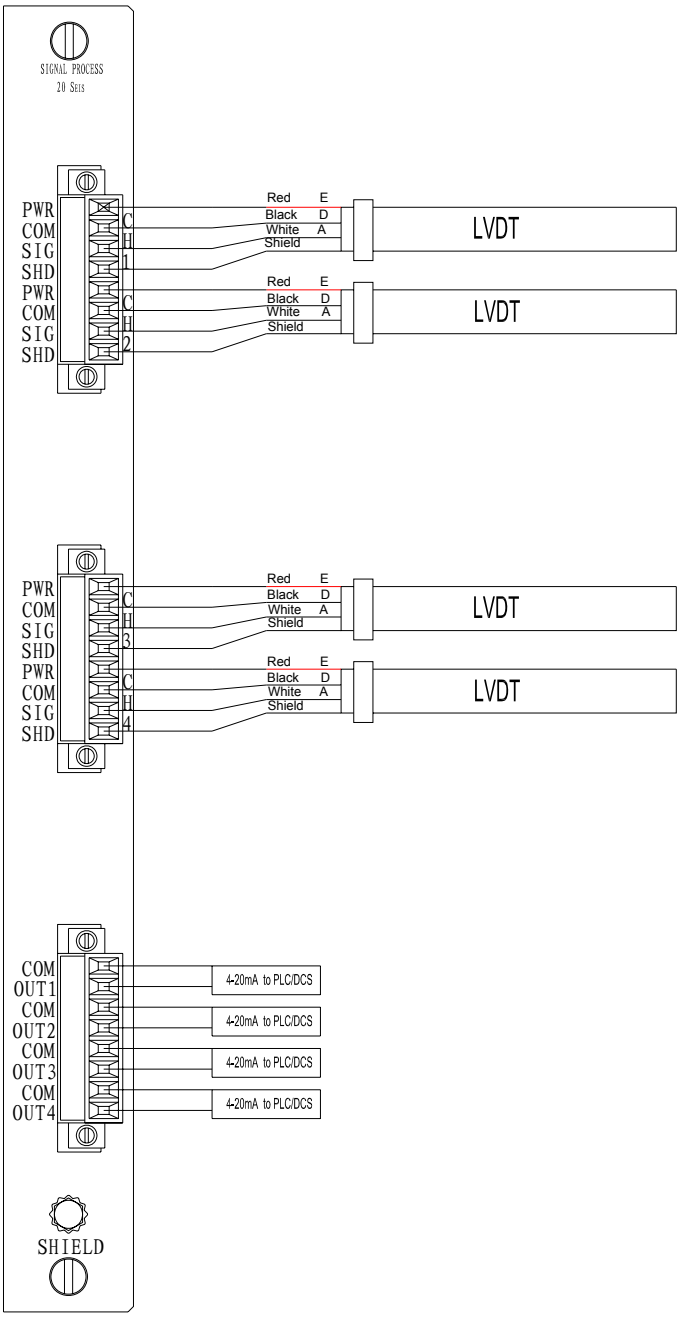


Figure 36

Field-wiring Diagram for Hazardous Area Application

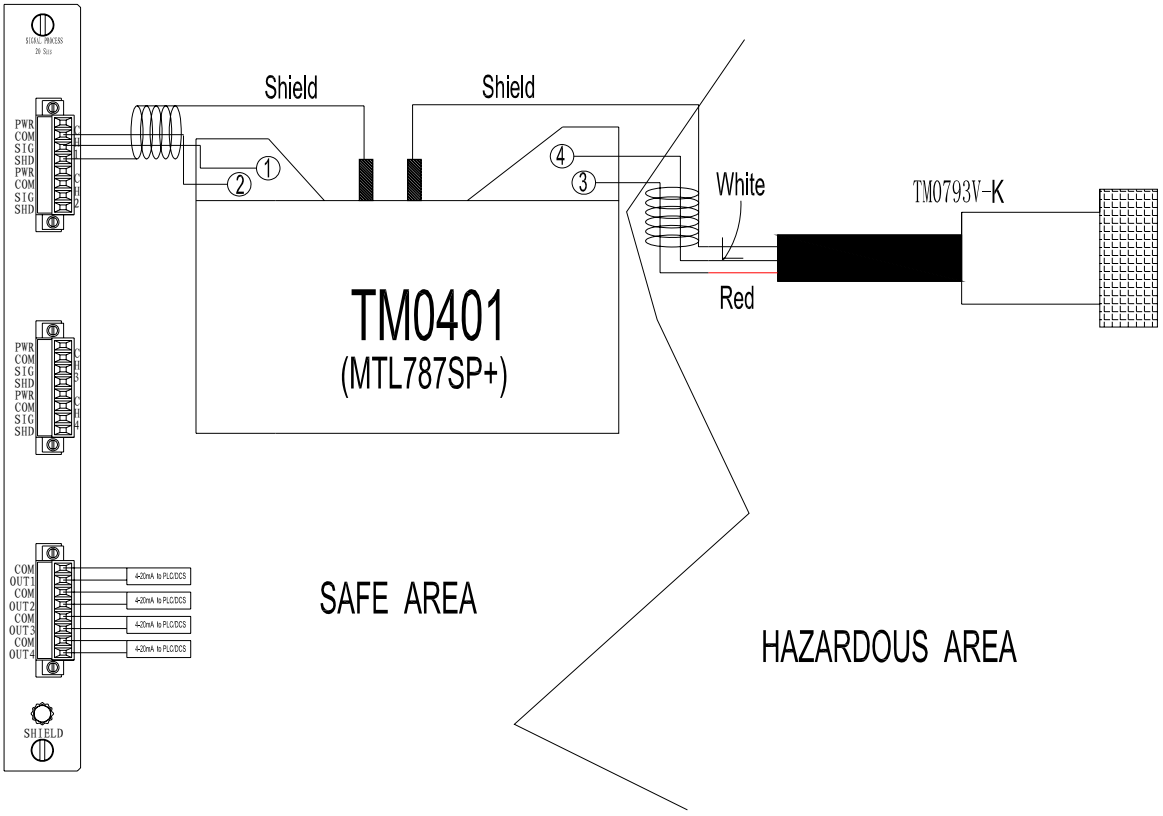


Figure 37

Maintenance

Instruction

User should not repair components inside a PT2060/20 PROX proximity module. The maintenance described here covers the test of the module and procedures to check whether it works properly. It also covers the linearity verification. But if the module behaves abnormally the module should be replaced.

This section describes how to check the PT2060/20 PROX proximity modules working status and the calibration of the output current in the following sections.

- Periodic maintenance
- Tool preparations
- Build of the maintenance environment
- Configuration software operation
- Module test
- Current calibration
- Exceptional module treatment

Periodic Maintenance

This maintenance interval is very important. Usually, a yearly maintenance is sufficient. If PT2060/20 PROX modules work in extraordinary circumstance, user should shorten the interval according to the actual situation.

Extraordinary circumstance means that

- PT2060 is used to monitor some critical equipment
- PT2060 works in high temperature, high humidity, and corrosive environment

Preparation

Tool Preparation

The following instruments are needed for PT2060/10 PROX proximity module maintenance:

- ✓ Personal computer with PT2060-CFG software installed.
- ✓ Two 4 1/2 digital multi-meters (one for current measurement, one for voltage measurement)
- ✓ One signal generator (two, if phase reference is needed)
- ✓ One oscilloscope
- ✓ Associated cables

Build of Maintenance Environment

Typical maintenance environment can be built by following these steps.

1. Make test terminals.
   Refer to appendix for the method to make terminals.
2. Make bypass terminal.
   Refer to appendix for the method to make terminals.
3. Make multiply terminal.
   Refer to appendix for the method to make terminals.
4. Install the software *PT2060 System Configuration* on a PC.
5. Save PT2060 configuration setting to a file, Power off the PT2060, demount it from the equipment and transfer it to a workbench.

Application Advisory
ProvibTech **recommends strongly** that the original configuration setting must be uploaded and saved before performing any modifications to PT2060/20 inner parameters.

6. Connect PC serial port to PT2060 with a standard communication cable.
7. Get the signal generator and the oscilloscope ready.
8. Get two multimeters ready.

Software Preparation

Get familiar with the software functions listed below before conducting the test.(See PT2060/CFG Manual for more information).

- ✓ Upload, download, save configuration.
- ✓ Enable/disable channels and alarm function.
- ✓ Bypass channels and Alerts.
- ✓ Set channel multiply alarm.
- ✓ Observe real-time value and alarm status.

On powering on, the system will upload PT2060 configuration setting automatically. This could also be done by clicking the button *Upload*. After setting parameters, click the button *Download* to send data to PT2060 or save to a file.

Module Test

The PT2060/20 SEIS seismic module supports many measurement types (Acceleration input, acceleration output; Acceleration input, velocity output; Velocity input, velocity output; Velocity input, displacement output; Displacement input, displacement output; LVDT input, Case expansion output-paired; LVDT input, Case expansion output-single). Each module has four channels which are divided into two groups. Channel 1 and channel 2 form one group and channel 3 and channel 4 form another. The channels in the same group should have same measurement types.

⚠ Warning
High voltage! Contact could cause shock, burns, or death. Do not touch exposed wires or terminals.

Application Alert
Tests will exceed alarm set-point levels causing alarms to activate. This could result in a relay contact state change.

Application Alert
Disconnecting field wiring will cause a not OK condition.

Test for Acceleration Output, Velocity Output, Displacement Output Mode

The test mentioned here is for the following five measurement types only.

- ✓ Acceleration input, acceleration output
- ✓ Acceleration input, velocity output
- ✓ Velocity input, velocity output
- ✓ Velocity input, displacement output
- ✓ Displacement input, displacement output

1. System construction

Determine the tested group, channel 1, 2 for example. Ensure proper jumper setting for channel type., Plug the terminal into the port of channel 1 and 2 on the rear panel. Plug the black lead of a multimeter into port COM and the red lead into the OUT port, OUT1 for channel 1 for example. Set the multimeter to measure direct current. Connect the negative pin of the electrolytic capacitor of the terminal to a signal generator's output. Connect related BUF located on the PT2060/20-Front panel to an oscilloscope. Run the software System Configuration.

2. Test of power on

On powering the machine, the OK, Alarm LED is to light for about three seconds.

3. Test of communication

Click the button *Upload* on the *PT2060 System Configuration software* main rack window to upload PT2060's parameter. Save these parameters to a file as the original data for recovery.

4. Test of parameter setting

Right click on the picture of the tested module to open its configuration window where you can ensure that the settings are correct.

5. Test of OK status

Observe the changing of OK LED as you adjust the variable resistor of the terminal plugged into the signal input port (It winks only when all enabled channels on the module are OK). When the OK LED gose off, the output current is about 3.0 ±0.16mA which you could read from on the ampere meter.

6. Test of linearity

Firstly, adjust the potentialmeter of test terminal, until the GAP value is about 10V. Feed a channel with some certain magnitudes of signal at the frequency actually used in the field according to the following table. Measure the output current with an ampere meter. If the linearity does not satisfy the requirement, please re-calibrate it (refer to the next section).

Percentage of full scale	0%	25%	50%	75%	100%
4～20mA (mA)	4.00±0.16	8.00±0.16	12.00±0.16	16.00±0.16	20.00±0.16

Notes: There is an implicit relationship between Real-time Value and input signal.

Acceleration input, acceleration output: signal of 0-1.0V (100mv/g PK), 80Hz, PK FS is 0-5g;
signal of 0-1.414V(100mv/g PK), 80Hz, RMS FS is 0-5g;

Velocity input, velocity output: signal of 0-0.4V (4mv/mm/s PK), 80Hz, PK FS is 0-50mm/s;
signal of 0-0.566V (4mv/mm/s PK), 80Hz, RMS FS is 0-50 mm/s;

Displacement input, displacement output: signal of 0-0.8V (4mv/μm PK), 80Hz, PK-PK FS is 0-200μm;
signal of 0-0.8V (4mv/μm PK), 80Hz, PK FS is 0-100μm;

Acceleration input, velocity output: signal of 0-0.513V (100mv/g PK), 80Hz, PK FS is 0-50mm/s;
signal of 0-0.725V (100mv/g PK), 80Hz, RMS FS is 0-50mm/s;

Velocity input, displacement output: signal of 0-0.402V (4mv/mm/s PK), 80Hz, PK-PK FS is 0-200μm;
signal of 0-0.804V (4mv/mm/s PK), 80Hz, PK FS is 0-200μm

Example:

Assume that it is PT2060/20 SEIS seismic module Displacement input, displacement output in the field. The PK-PK Full-Scale is 200μm. In this case, the signal magnitude corresponding to Full-Scale is at 0.8V and the output current is 20.00±0.16mA.

7. Test of alarm

When the input signal is higher than the alarm set-point, the alarm LED located on the PT2060/20-Front panel should become on. This is also displayed in the *Real-time Value and Status* window on the host computer. If alarm latch is not set, the alarm will be reset as soon as the input signal is removed. Otherwise, it

will be latched and can be reset only by pressing RESET button located on the front panel of the communication module (or clicking the menu item *Rack->Rack Reset Setup* of the software). Check whether it was reset from *Real-time Value and Status* window. Any channel's alarm will light up the alarm LED and make the module change to alarm status.

8. Test of BUF

If it is required, user could conduct BUF test. Adjust the input signal and check the buffered output with an oscilloscope,if they are comparable. Tune the potentiometer to make its output at -10V and observe the buffered output with an oscilloscope. The noise signal PK-PK value should be less than 50mV.

The figure below shows how to connect an oscilloscope to BUF.

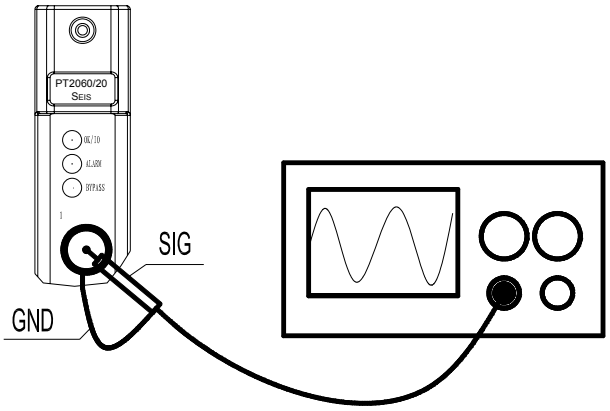


Figure 38

9. Test of software bypass

Checking the Channel Bypass switch will cause the module to indicate a "bypass" status. This feature should be used if you wish to temporarily disable a channel on a module. In *Signal Module status Control* window of the software, select slot number and channel number and tick Alert Bypass and/or Danger Bypass as you need. Download it by clicking the button *Download*. Supply a signal higher than alert or danger set- and no alarm will occur, i.e. specified channel's alarm status is bypassed.

10. Test of hardware bypass

Feed a signal higher than alert or danger set-point to a channel. Plug the prepared bypass terminal in the socket located on the back panel of communication module. Bypass LED of the PT2060/10 PROX proximity module should light up and the Alarm LED should go off. Meanwhile, the alarm mark in the *Real-time Value and Status* window of the software vanishes. On unplugging the bypass terminal, the alarm reappears.

11. Test of multiply logic

In *Signal Module status Control* window of the software, select slot number and channel number and check none or Double Multiply or Triple Multiply as you need. Download it by clicking the button *Download*. Plug the prepared multiply terminal in the socket located on the back panel of communication module. Feed the channel with a signal. The alarm occurs when the magnitude of the signal is as high as double or triple of alert or danger threshold.

12. Test ofvoltage

Normal voltage is critical for measurement. it is different, For different measurement type. Please test the voltage according to the steps described in the *Appendix*.

13. Test of redundant power

Feed channel 1 with a signal corresponding to 50% of Full-Scale. At this time, the output current of this channel is about 12.00±0.16mA. Pull out the lower power module and the output current should keep in this range. Push the lower power module and pull out the upper one, and the current should be stable too.

Test for Case Expansion Output

The test mentioned here is for LVDT input, case expansion output-paired and LVDT input, case expansion output-single only.

1. System construction

Determine the tested group, channel 1 and 2 for example. Jumper for selecting the type of transducer connected to channel 1 and 2, Plug the terminal for LVDT into the port of channel 1 and 2 on the rear panel. Plug the black pen of an ampere meter into port COM and the red pen of the ampere meter into OUT port, OUT1 for channel 1 for example. Set the ampere meter to measure direct current.

2. Test of power on

Refer to test of acceleration output, velocity output and displacement output mode.

3. Test of system communication

Refer to test of acceleration output, velocity output and displacement output mode.

4. Test of parameter setting

Refer to test of acceleration output, velocity output and displacement output mode.

5. Test of OK status

Refer to test of acceleration output, velocity output and displacement output mode.

6. Test of Linearity

Signal the module channels by adjusting the variable resistor of the terminal according to the table below. Measure the output current with a multimeter. If the linearity does not satisfy the requirement, please re-calibrate it (refer to the next section).

Percentage of full scale	0%	25%	50%	75%	100%
4～20mA (mA)	4.00±0.16	8.00±0.16	12.00±0.16	16.00±0.16	20.00±0.16

Notes:

In “LVDT input, case expansion output-single” measurement mode, four channels work independently. So, the test steps are the same for all of the four channels. The voltage corresponding to the full scale is (sensitivity x full scale) in the test of linearity. For example, the tested channel’s transducer is in positive direction. Its sensitivity is 0.4V/mm and full scale is 0-25mm. At the time, corresponding to the “Percentage of full scale” of 100%, the provided voltage to the terminal is 0.4V/mm*25mm=10V. For LVDT input, case expansion output-paired measurement mode, the steps to test the first channel is analogous to that carried for LVDT input, case expansion output-single measurement mode. The steps to test the second channel are different. The provided voltage is the difference of channel 1 and 2. For example, the first channel’s sensitivity is 0.4V/mm and full scale is 0-25mm. the second channel’s sensitivity is 0.4/mm and full scale is -25~25mm. If the transducer is mounted in positive direction and the voltage difference between channel 1 and channel 2 is -10V, the real-time value of channel 2 will be -25mm and its corresponding output current be 4.00±0.16mA.

7. Test of direction

The measurement direction for PT2060/20 case expansion measurement mode is optional. Default option is positive direction. In this case, the input signal is proportional to the output (real-time value, current, GAP). Otherwise, it will be reciprocally proportional to the output. For example, in LVDT input, case expansion output measurement mode, when the transducer is in positive direction, sensitivity is 0.4V/mm, full scale is 0-25mm, providing a signal of 10V will get a real-time value of 25mm, output current of 20.00±0.16mA and GAP of 10V. If the transducer direction is negative, providing a signal of 10V will get a real-time value of 0mm, output current of 4.00±0.16mA, and GAP of 0V.

8. Test of alarm

Refer to test of acceleration output, velocity output and displacement output mode.

9. Test of BUF

Refer to test of acceleration output, velocity output and displacement output mode.

10. Test of software bypass

Refer to test of acceleration output, velocity output and displacement output mode.

11. Test of hardware bypass

Refer to test of acceleration output, velocity output and displacement output mode.

12. Test of power

Normal voltage is critical for measurement. It is different for different measurement type. Please test the voltage according to the steps described in the *Appendix*.

13. Test of redundant power

Refer to test of acceleration output, velocity output and displacement output mode.

Current Calibration

The user should not repair the components inside PT2060/20 SEIS module. However, if the linearity of current output does not satisfy the requirement according to the test result conducted as described above, user could re-calibrate these channels.

Current calibration follows these steps.

1. Connect a multimeter to the current output port in serial. Plug Red lead into OUT and black lead into COM.
2. Click menu item *Calibration->User Calibration*, enter password to open calibration window. See the following figure. Select the slot number and channel number to be calibrated.

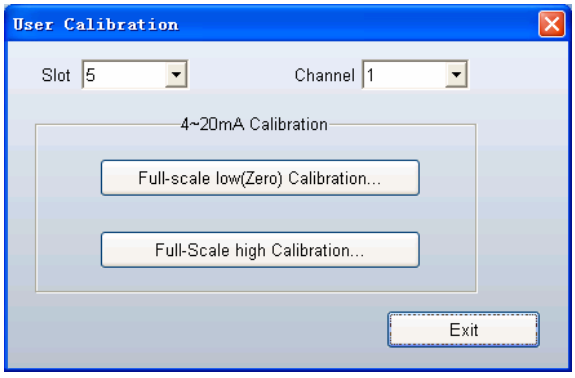


Figure 39

3. The whole procedure is implemented in the 4-20mA Calibration.

Click the button *Full-scale low(Zero) Calibration* to open the zero calibration window(figure 39). Follow the steps showed in the window to implement calibration. First, click the button *Start Calibration* in step1, then read the output current value from multimeter, after it settled down. Enter this value (three significant decimal digits) in the text area in step2 . After that, click the button *Full-scale low Calibration* in step3 to download. Wait till the multimeter outputs a right value. Click Exit to exit the zero calibration.

Figure 40

4. Click the button *Full-scale high Calibration*. Click OK button in the WARNING window(figure41). Enter YES in the Warning dialogue (figure 42) and click OK to open the calibration window(figure 43). Follow the steps showed in the window to implement calibration.

First, click the button *Start Calibration* in step1, then read the output current value from multimeter, after it has settled down. Enter this value (three significant decimal digits) in the text area in step2 . After that, click the button *Full-scale high Calibration* in step3 to download. Wait untill the multimeter outputs a steady value. Click Exit to exit the high calibration.

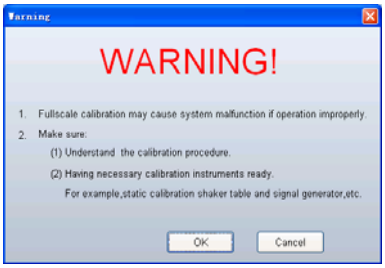


Figure 41

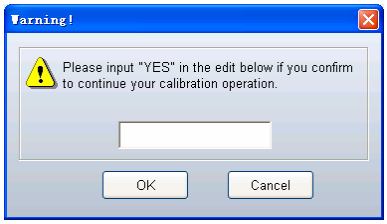


Figure 42

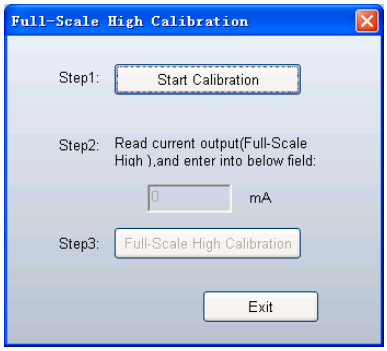


Figure 43

5. Click the button *Exit* to go back to the RUN state. You could optionally do linearity test again to check the calibrating result. If you are not satisfied, you could redo it.

Exceptional Module Treatment

In case of finding some exceptions after the test, except the linearity problem which can be solved by calibrating, users should not repaire it by themselves. Users could substitute it with a spare PT2060/20 SEIS seismic module and contact ProvibTech office.

Troubleshooting

Assessing PT2060/20 SEIS seismic module status and troubleshooting by analyzing the status of LEDs, System event list, Alarm event list are described in this chapter.

LED

The three LEDs located on the PT2060/20-Front panel are OK / IO LED, Alarm LED and Bypass LED. They directly indicate the operation status of the module.

OK / IO LED

Flash: All enabled channels are OK and the digital communication is ok.

On without flash: All enabled channels are OK and no digital communication. This means that the PT2060/20 SEIS seismic module has problems in communicating with the system.

Off: One or more channels are not ok. The reasons may be: one or several channel's GAP exceeds the GAP alarm range; the connection of transducer is broken; the transducer is damaged; the module fails. If the first is the reason, it will have a delay of 15s, when the module turns from GAP not OK to OK status. Try to solve it by performing these: remounting the module, resetting it and checking the cable and the transducer.

Alarm LED

On: One or more channels have alarms. When alarm mode is chosen, the alarms can be either alert or danger or both. When GAP mode is chosen, the alarms can be either GAP or danger.

Off: All channels on the module are in normal status. No alarms engaged.
If the system works improperly, the reasons may be: the connection of transducer is broken; the transducer is damaged; the module fails. Try to solve it by performing these: remounting the module, resetting it and checking the cable and the transducer.

Bypass LED

On: PT2060 is in hardware Bypass mode. All alarms on this module are inhibit from alarming (no alarms will be engaged). The real-time value and current output of PT2060/20 SEIS seismic module are not affected by this.

Off: Normal operation mode.

If this works improperly, it may be caused by the failure of PT2060/20 SEIS seismic module or PT2060/91 SIM System Interface Module. In this case, please contact the closer ProvibTech office.

Real-time Value and Status

From *Real-time Value and Status* window, as shown in the following figure, user may unveil some problem.

Alert

False: When alarm type is Alert, it means there is no alert. When alarm type is GAP, it means there is no GAP alarm.

True: When alarm type is Alert, it means there is an alert. When alarm type is GAP, it means there is a GAP alarm.

Danger

False: It means there is no danger alarm no matter what alarm type is.

True: It means there is a danger alarm no matter what alarm type is.

GAP not OK

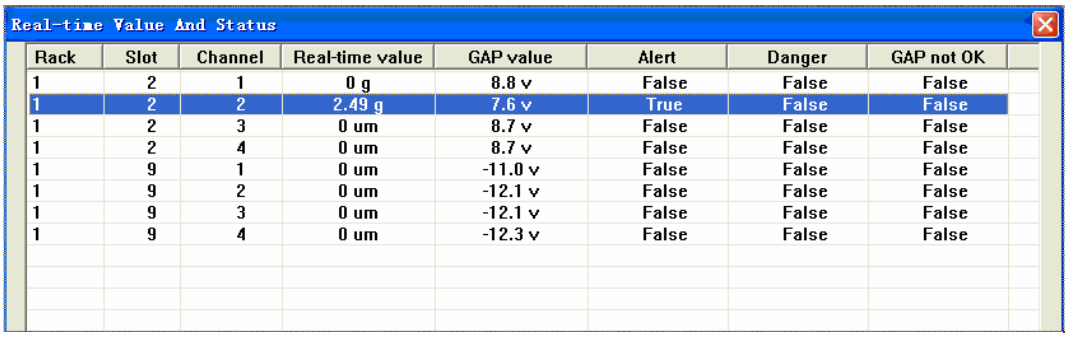
False: The channel is OK.

True: The channel is GAP not OK. The reasons may be:

a. the sensor's GAP is out of range;

b. the connection may fail;

c. the sensor is damaged. If the reason is a, there will be a delay of 15s, when it turns from GAP not OK to OK status.



Rack	Slot	Channel	Real-time value	GAP value	Alert	Danger	GAP not OK
1	2	1	0 g	8.8 v	False	False	False
1	2	2	2.49 g	7.6 v	True	False	False
1	2	3	0 um	8.7 v	False	False	False
1	2	4	0 um	8.7 v	False	False	False
1	9	1	0 um	-11.0 v	False	False	False
1	9	2	0 um	-12.1 v	False	False	False
1	9	3	0 um	-12.1 v	False	False	False
1	9	4	0 um	-12.3 v	False	False	False

Figure 44

System Event List

The System event list of PT2060/20 SEIS seismic module can be seen in the software *PT2060/20 System Configuration*. This list contains the 500 most recent events.

Click menu item *Status/Event->System Event* of the software to open a new window like the figure below.

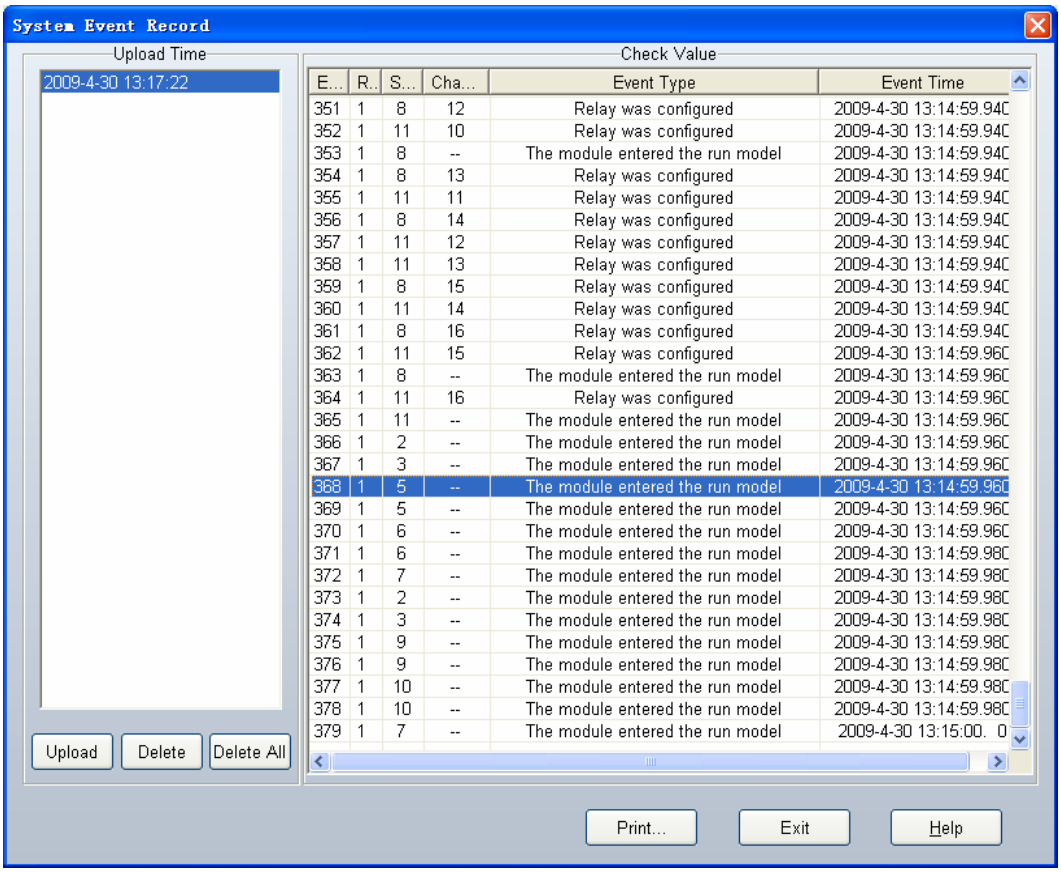


Figure 45

Click the button *Upload* at left-bottom corner of the window to obtain the new system events. In the left area, there is a list of upload time which is the time you perform an upload from PT2060 rack. Click one of these items to get its detail event list in the right field. Event without channel number means it does not concern any channel. For example take the highlighted line in figure above, the PT2060/20 SEIS seismic module in slot 5 entered run mode.By browsing this event list, you will be able to know what happened recently. It may help the user to solve some problems.

The protocol of system event is shown as below.

If you could not solve the problem by yourself, please save all system events for our service staff.

Alarm Event List

Like System event, the software deals with alarm event list in the same way. It also keeps 500 recent alarm events.Click menu item *Status/Event->Alarm Event* of the software to open a new window like figure below.

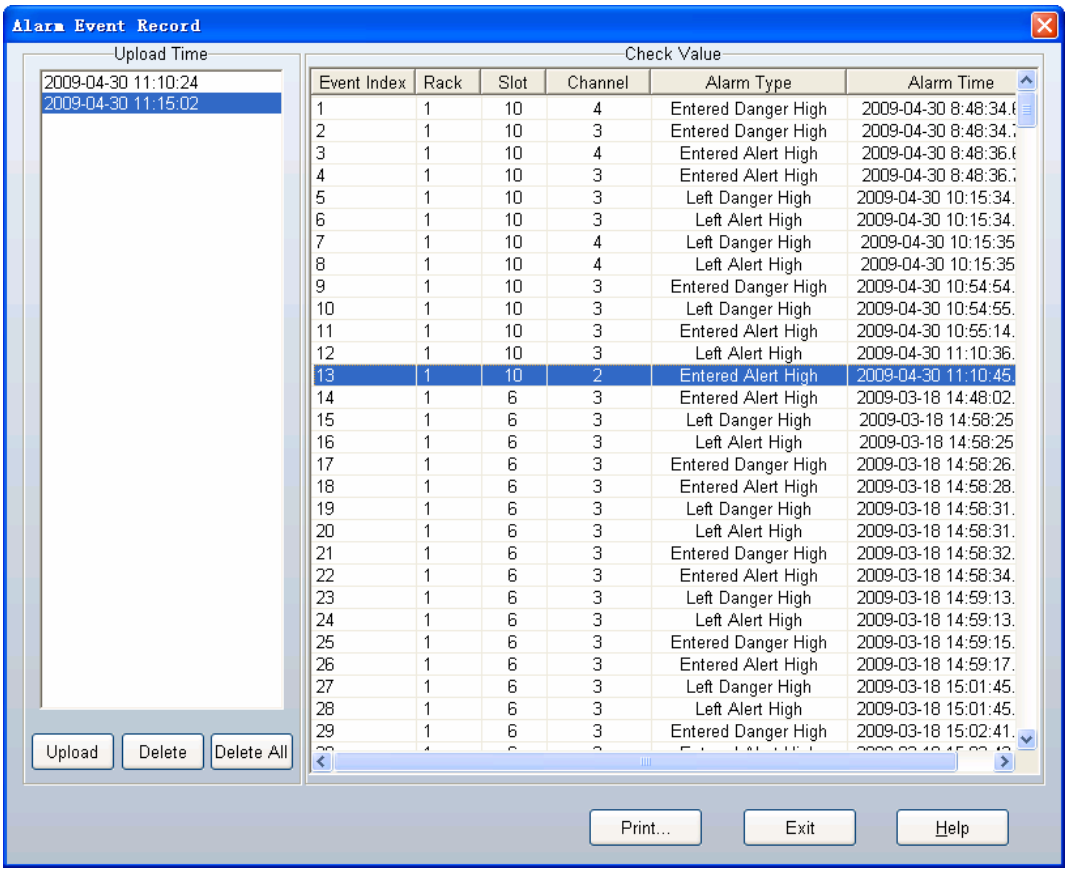


Figure 46

Click the button *Upload* at left-bottom corner of the window to obtain the new Alarm events. In the left field, there is a list of upload time which is the time you perform an upload from PT2060 rack. Click one of these items to get its detail event list in the right field. For example take the highlighted line in figure above, the PT2060/20 SEIS seismic module in slot 10 entered alarm status at 11:10:45 in the day 04/30/09. By browsing this event list, you will be able to know what happened recently. It may help you to solve your problem.

If you could not solve the problem by yourself, please save these message for our service staff.

Exceptional Module Treatment

If you suspect that the PT2060/20 SEIS seismic module has several problems, please contact ProvibTech factory.

Other Information

Ordering Information

Each PT2060/20 SEIS seismic module consists of two boards, PT2060/20-Front and PT2060/20-Back. There is only one type PT2060/20-Front, but the PT2060/20-Back should be configured with jumpers according to your applications.

PT2060/20-AX

AX: Back-panel IO module

A0: Current mode accelerometers and velocity sensors

A3: Low frequency sensors (TM079VD)

A4: LVDTs

A5: Electro-magnetic Velocity sensor(5485c)

Warning

It **must be** specified in the purchase order, when PT2060/20 SEIS seismic modules are to be used for Low Frequency (f<2Hz) measurement!!!

Optional Accessories

There are several accessories for selecting:

PT2060-002000: PT2060/20 Front panel

PT2060-002001: PT2060/20 Back panel

Examination

The encapsulation of PT2060 can protect modules from damage. As soon as the material is received, user should examine whether it is damaged and whether it is caused by transportation. Please contact the courier, if it has happened.

If no damage is found and the system does not work properly, please check the user manual first. If the problem can not solve, please contact the closest ProvibTech office.

Factory Configuration

When user purchases PT2060/20 SEIS seismic modules, please choose the module type according to ordering information described above. If user does not give configuration details, the modules will be configured with the following setting.

Acceleration Input, Acceleration Output

Channel Type: Acceleration input, acceleration output		Channel Enabled:	checked
Transducer Type: TM0782A or any 100mv/g		Alarm Latching:	checked
Transducer Sensitivity: 100 mv/g			
Alert Time Delay:	3s	Danger High:	3.75g
Danger Time Delay:	1s	Alert High:	2.5g
Full Scale High:	5g	GAP High:	17v
Full Scale Low:	0g	GAP Low:	-2v
Measurement Type:	PK		
Measurement Unit:	g		
Alert Type:	Alert		
Frequency:	Normal		

Velocity Input, Velocity Output

Small scale, main setting are:			
Channel Type: Velocity input, velocity output		Channel Enabled:	checked
Transducer Type: TM0793V		Alarm Latching:	checked
Transducer Sensitivity: 4.0 mv/mm/s			
Alert Time Delay:	3s	Danger High:	37.5mm/s
Danger Time Delay:	1s	Alert High:	25mm/s
Full Scale High:	50mm/s	GAP High:	17v
Full Scale Low:	0mm/s	GAP Low:	-2v
Measurement Type:	RMS		
Measurement Unit:	mm/s		
Alert Type:	Alert		
Frequency:	Normal		

Acceleration Input, Velocity Output

Channel Type: Acceleration input, velocity output		Channel Enabled:	checked
Transducer Type: TM0782A or any 100mv/g		Alarm Latching:	checked
Transducer Sensitivity: 100mv/g			
Alert Time Delay:	3s	Danger High:	37.5mm/s
Danger Time Delay:	1s	Alert High:	25mm/s
Full Scale High:	50mm/s	GAP High:	17v
Full Scale Low:	0mm/s	GAP Low:	-2v
Measurement Type:	RMS		

Measurement Unit: mm/s
Alert Type: Alert
Frequency: Normal

Velocity Input, Displacement Output

Channel Type: Velocity input, displacement output
Transducer Type: TM0793V
Transducer Sensitivity: 4mv/mm/s
Alert Time Delay: 3s
Danger Time Delay: 1s
Full Scale High: 200μm
Full Scale Low: 0μm
Measurement Type: PK-PK
Measurement Unit: μm
Alert Type: Alert
Frequency: Normal

Channel Enabled: checked
Alarm Latching: checked

Danger High: 150μm
Alert High: 100μm
GAP High: 17v
GAP Low: -2v

Displacement Input, Displacement Output

Large scale, main setting:
Channel Type: Displacement input, displacement output
Transducer Type: TM079VD
Transducer Sensitivity: 4mv/μm
Alert Time Delay: 3s
Danger Time Delay: 1s
Full Scale High: 500μm
Full Scale Low: 0μm
Measurement Type: PK-PK
Measurement Unit: μm
Alert Type: Alert
Frequency: Low frequency

Channel Enabled: checked
Alarm Latching: checked

Danger High: 375μm
Alert High: 250μm
GAP High: 17v
GAP Low: -2v

LVDT Input, Case Expansion Output-Paired

Two channels in a group should be configured simultaneously.

Channel 1/3

Channel Type: LVDT input, case expansion output-paired
Transducer Type: LVDT differential expansion transducer
Transducer Sensitivity: 0.4v/mm
Alert Time Delay: 3s
Danger Time Delay: 1s
Zero Position(GAP): 0V
Full Scale High: 25mm
Full Scale Low: 0mm
Measurement Type: AVERAGE

Channel Enabled: checked
Alarm Latching: checked

Danger High: 18mm
Alert High: 13mm
GAP High: 10V
GAP Low: -2V
Transducer Direction: Toward Probe

Measurement Unit: mm
Alert Type: Alert

Channel 2/4

Channel Type: LVDT input, case expansion output-paired
Transducer Type: LVDT differential expansion transducer
Transducer Sensitivity: 0.4v/mm
Alert Time Delay: 3s
Danger Time Delay: 1s
Zero Position(GAP): 0V
Full Scale High: 25mm
Full Scale Low: -25mm
Measurement Type: AVERAGE
Measurement Unit: mm
Alert Type: Alert

Channel Enabled: checked
Alarm Latching: checked
Danger High: 18mm
Alert High: 13mm
Alert Low: -13 mm
Danger Low: -18 mm
GAP High: 10V
GAP Low: -2V
Transducer Direction: Toward Probe

LVDT Input, Case Expansion Output-Single

Channel Type: LVDT input, case expansion output-single
Transducer Type: LVDT differential expansion transducer
Transducer Sensitivity: 0.4v/mm
Alert Time Delay: 3s
Danger Time Delay: 1s
Zero Position(GAP): 0V
Full Scale High: 25mm
Full Scale Low: 0mm
Measurement Type: AVERAGE
Measurement Unit: mm
Alert Type: Alert

Channel Enabled: checked
Alarm Latching: checked
Danger High: 18mm
Alert High: 13mm
GAP High: 10V
GAP Low: -2V
Transducer Direction: Toward Probe

Warning

If Measurement type is not specified, PT2060/20 module's channels are configured in Velocity input, velocity output, small scale mode by default.

Appendix

Preparing Test Terminals

The test terminal is compatible with terminal for LVDT sensor, if the tested PT2060/20 SEIS seismic module is to work in the mode of LVDT input; Case expansion output-paired or LVDT input; Case expansion output-single.

For any other modes, the test terminal is compatible with terminal for current mode sensor.

Terminal for LVDT Sensor

Take a input terminal block plug and a potentiometer of 10KOhm. Fix the movable pin of the potentiometer to SIG input. Connect one of the other two pins to COM, and the other pin to PWR.

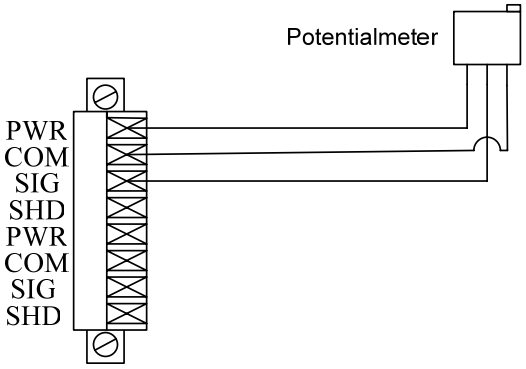


Figure 47

Terminal for Current Mode Sensor

Take a input terminal block plug and a potentiometer of 10KOhm and an electrolytic capacitor of 220μF/50V. Solder the movable pin of potentiometer and the positive pin of the electrolytic capacitor together and then connect it to SIG pin on the port. Connect one of the other two pins of the potentialmeter to COM and left PWR unconnected. Leave the other pin of the electrolytic capacitor floating, through which the signal will come in.

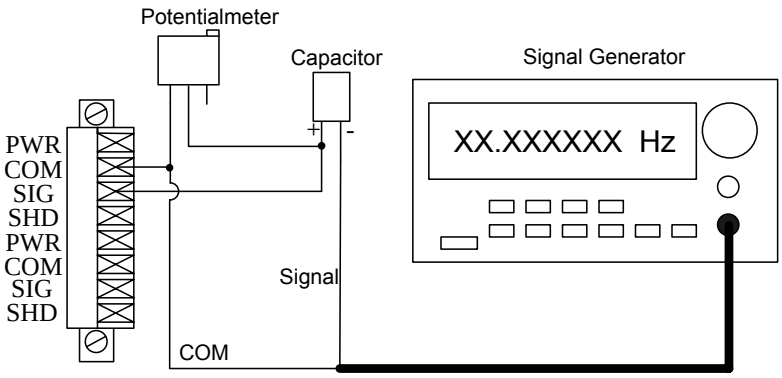


Figure 48

Bypass

Short connect the RST_BY pin and GND pin located on PT2060/91-Back panel will bring the machine into bypass condition.

Triple Multiply

Short connect the ALM_MU pin and GND pin located on PT2060/91-Back panel will bring the machine into triple condition.

Module Power Testing

When seismic transducers are connected, please test the power as shown in the figure below, channel current should be at about 4.00mA.

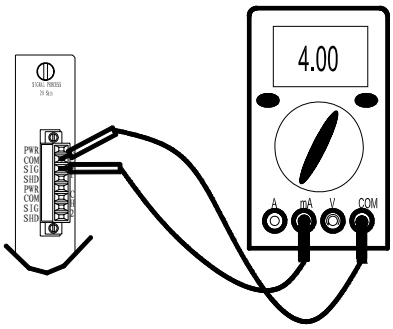


Figure 49

When LVDT transducers are connected, as shown in the figure below, voltage between PWR and COM should be at about 19V.

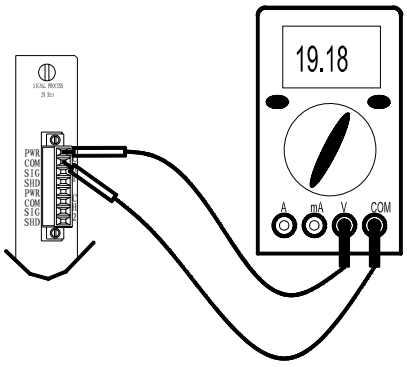


Figure 50