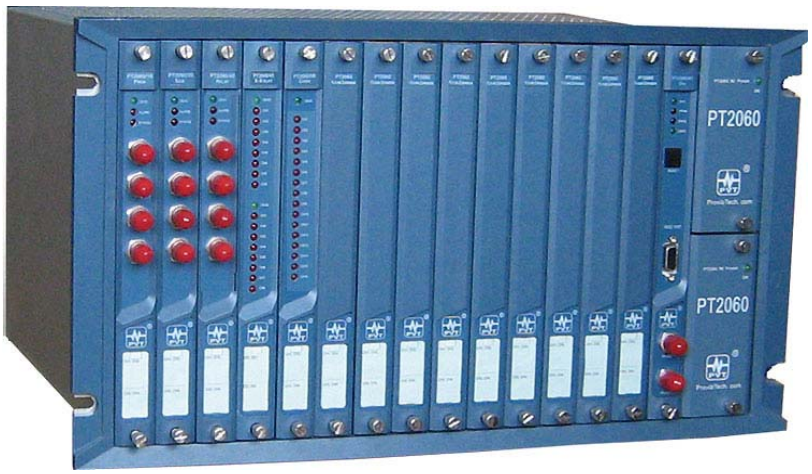
PT2060 Monitor

PT2060/53 O-SPEED Over-speed System

User Manual

Installation, Operation, Maintenance



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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 claimed without delay against the shipper and before the installation.

Handling and Storing Considerations

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

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

- ✓ Please have attention about 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 should be necessary to discharge any static electricity from yourself and your clothing before handling the rack.
- ✓ Whenever the module is not installed in a system, always keep it in the protective antistatic bag.

PT2060/53 Module Introduction

General Information

ProvibTech's PT2060/53 O-SPEED over-speed System provides a highly reliable, triple redundant over-speed protection system. PT2060/53 O-SPEED over-speed module can accept speed from both proximity probe and magnetic pickup signal input. It can output the following measurements:

- ✓ Over-speed protection

The following function only for channel 3 and channel 4.

- ✓ Radial vibration: monitoring shaft vibration, single or dual XY **(2 channels)**
- ✓ Axial/ Thrust position: monitoring shaft thrust position, with 5mm, 8mm, and 11 mm proximity probes **(2 channels)**
- ✓ Eccentricity **(1 channel)**
- ✓ Differential expansion **(2 channels)**
- ✓ Low-frequency vibration **(2 channels)**
- ✓ Speed output **(1 channel)**
- ✓ Zero speed and speed **(1 channel)**
- ✓ Reverse rotational protection output **(1 channel)**

Figure 1

Voting

PT2060/53 O-SPEED Over-speed System supports two out of three voting.

Redundancy Requirement

To reach the maximum system reliability, PT2060/53 requires redundant power supplies. Alarms Trip multiply PT2060/53 modules are required. With three over-speed modules, system will perform two out of three redundant logic.

To maximum system reliability, ProvibTech highly recommend customer utilize three over-speed modules and one redundant alarm module as an over-speed protection system.

Alarm Option

PT2060/53 of O-SPEED System will output alarms to drive the redundant PT2060/43 module. The redundant alarm module will perform redundant logic or simply deliver the individual alarms from each channel to up-level control system for logic output.

The main task for PT2060/53 O-SPEED module is to process the incoming signal, compare it with the alarm set-point and output the appropriate status information. The status information will be routed to PT2060 internal bus for other modules to sharing. It is also directly output to the redundant alarm module for process.

A PT2060/53 O-SPEED System consists of three PT2060/53 O-SPEED modules and one PT2060/43 R-RELAY Redundant-Relay module. A standard 19″ PT2060 rack can contain three such systems at most, slot 1-4, slot 5-8 and slot 9-12 are the defined slots to hold the sub-systems. PT2060/43 R-RELAY modules can be mounted in slot 4, slot 8 or slot 12 only. A standard 12″ PT2060 rack can contain one such system, slot 1-4. In the case, PT2060/43 R-RELAY module is mounted in slot 4. Three PT2060/53 O-SPEED modules must be installed in three adjacent slots. For example, three PT2060/53 O-SPEED modules installed in slot 1-3 and a PT2060/43 R-RELAY module installed in slot 4 constitute an over-speed system.

A PT2060/53 O-SPEED module contains three channels: the first channel is an over-speed protection channel; channel 3 and 4 can be used as two PT2060/10 channels. Any PT2060/10 mode can be configured into these two channels.
For PT2060/53 O-SPEED Over-speed System, the PT2060/43 R-RELAY Redundant-Relay module works only with the first channel of the PT2060/53 module. The rest of the channels will have no effect to the relay module.

In PT2060/53 O-SPEED Over-speed System, PT2060/53 O-SPEED modules measure machine rotation speed and provide real-time value, GAP voltage, and 4-20mA current to users. It also provides alarm status and OK status to PT2060/43 R-RELAY Redundant-Relay module of the system. The PT2060/43 R-RELAY module receives the messages from PT2060/53 modules and conducts Boolean calculation of these messages and output calculated result trough the LEDs, and the relays. Working in the over-speed system, PT2060/43 R-RELAY Redundant-Relay module can run in *Default 53 Mode* or *Individual Mode*. For more details, please refer to *PT2060/43 R-RELAY Redundant-Relay Module User Manual*.

Warning

When the 3rd and the 4th channel of a PT2060/53 O-SPEED module are used as PT2060/10 module, its operation and configuration are the same as the normal PT2060/10 PROX module. Please refer to PT2060/10 PROX manual for more information.

This manual describes the application of PT2060/53 O-SPEED module in O-SPEED system mainly.

The system should be installed in the rack and configured by software *PT2060 System Configuration*. *PT2060 System Configuration* configures parameters for PT2060/53 O-SPEED System. It will also display various messages including real-time value, GAP voltage and alarm status, alarm event and system event.

Module Description

Hardware

The hardware of PT2060/53 O-SPEED Over-speed System consists of up to three PT2060/53 O-SPEED modules and one PT2060/43 R-RELAY Redundant-Relay module.

PT2060/53 O-SPEED module has status indication on board. There are three LEDs that display different status of the monitored channels on front panel. There are four BUFs of the four channels and 4-20mA current output port on the back panel. This manual mainly describes the application of PT2060/53 O-SPEED module in PT2060/53 O-SPEED Over-speed System. The functions of PT2060/43 R-RELAY Redundant-Relay module are described in *PT2060/43 R-RELAY Redundant-Relay Module User Manual*.

Software

PT2060/53 O-SPEED Over-speed System needs *PT2060 System Configuration* to cooperate with it. Relevant introduction of the software is described in *PT2060/10 PROX Proximity Module User Manual* and *PT2060 system Configuration User Manual*. PT2060/43 R-RELAY Redundant-Relay module relevant introduction of the software is described in *PT2060/43 R-RELAY Redundant-Relay Module User Manual* and *PT2060 system Configuration User Manual*.

Specifications

Electrical

PT2060/53 O-SPEED Over-speed System includes three PT2060/53 O-SPEED modules and a PT2060/43 R-RELAY Redundant-Relay module.

PT2060/53 O-SPEED Over-speed Module

Power supply:

Internally converted by the rack power supply module

8.0W total typically for each module

Signal Input:

Input impedance:

> 20KΩ

Input voltage range:

+10 to -24VDC

Input frequency:

The PT2060/53 module will support 1 - 255 events per revolution with a maximum full scale range of 60000 rpm and a maximum input frequency of 10 kHz.

Start at 1RPM (0.0167Hz) for proximity probes

Start at 200RPM (3.3Hz) for magnetic pickup

Sensors:

Proximity probes

Magnetic pickups

Overall in 4-20mA Output:

Maximum distance:

300m (1000ft)

Proportional to monitor full-scale; each channel has its own overall speed output. The short of the 4-20mA will not affect system performance.

Maximum Load:

300Ω

Accuracy:

+/-0.1RPM (< 100RPM)

+/-1.0RPM (> 100 and < 10,000RPM)

0.01% (> 10,000 and < 60,000RPM)

Threshold:

Auto:

> 1.0 V pk-pk

Manual:

> 0.5 V pk-pk. Trigger level can be programmed from -17VDC to -3VDC

Hysteresis:

0.5 - 2.5 V user selectable

Alarm Time Delay:

< 30ms for frequency (pulses) over 300Hz

Rack Space:

Require four slots for an over speed protection system.

Buffered Output:

On the front panel, each channel has one BNC connector. The output is the unfiltered raw signal.

Output impedance:

550Ω

Maximum distance:

300m (1000ft)

Proximity Transducer Power:

-24VDC, current limited. Less than 50mA on each channel

Alarm:

Alarm set-point:

Each channel has single alarm set-point which can be field adjusted from 0 to 100% FS.

Set-point accuracy:

+/-1 RPM

LED Indicators:

OK / IO: green

Alarms: red

Bypass: red

Approvals:

CE;

CSA:

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

Certificate Number: 2011996

PT2060/43 R-RELAY Redundant-Relay Module

Please refer to *PT2060/43 R-RELAY Redundant-Relay Module User Manual*.

Environmental

Temperature:

Operation: -20℃ to +65℃

Storage: -40℃ to +85℃

Humidity:

95% non-condensing

Physical

PT2060/53 O-SPEED Over-speed Module

Each module comes with two components: the front panel assembly and the back panel assembly.

Dimensions:

241mm (9.5in) X 24.5mm (0.96in)

For 19″ rack, mounts in any one of the following slots:

1-3, 5-7, 9-11.

For 12″ rack, mounts in slot 1-3.

Weight:

1.0 kg (2.0 lbs)

PT2060/43 R-RELAY Redundant-Relay Module

Please refer to *PT2060/43 R-RELAY Redundant-Relay Module User Manual*.

Module Configuration and Channel Setup

In a PT2060/53 O-SPEED Over-speed System, PT2060/53 O-SPEED module can accept either proximity probe or magnetic pickup signal input. Monitor function has to be configured by the software *PT2060 System Configuration before using*. The following description of software configuration setting is based on PT2060 System Configuration software.

Hardware Configuration

Each PT2060/53 O-SPEED Over-speed System occupies four slots. A standard 19″ rack can contain three such sub-systems at most. A 12″ rack can contain one such sub-systems only.

To configure PT2060/53, communication between PT2060-CFG software and PT2060/53 module has to be established. This communication is normally setup via PT2060/91, the system interface module. As Figure 2 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 Manual* for more details.

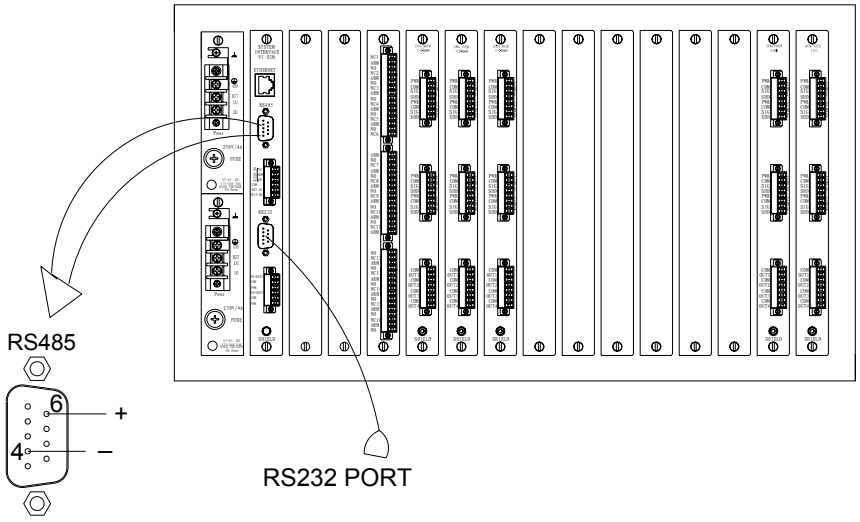


Figure 2

Module Type, Channel Configuration Setting

Configuration Software General Operation

PT2060 System Configuration software is an important part of configuring, controlling and maintaining the PT2060 system. The software is used to configure PT2060 internal parameters and display PT2060 running status. Refer to *PT2060 System Configure User Manual* for its details.

The figure below is the main frame window of *PT2060 System Configuration*, where are seven main menu items.

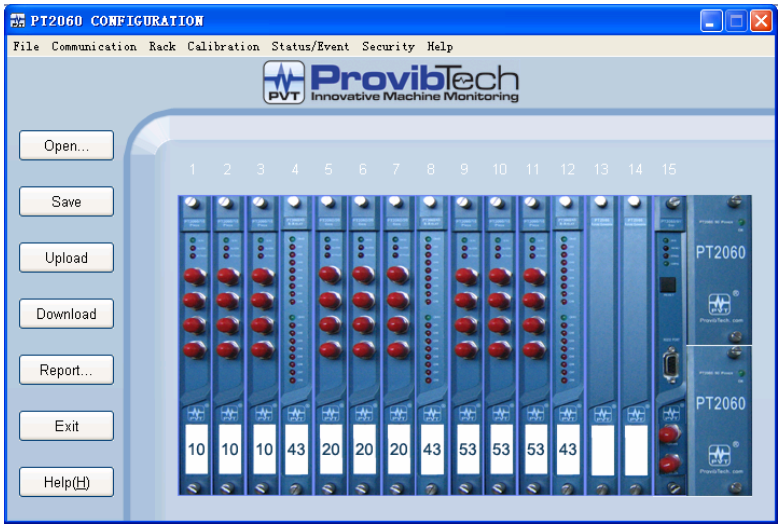


Figure 3

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.

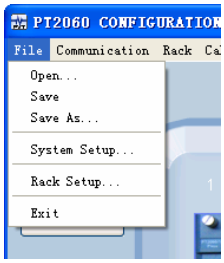


Figure 4

Menu item *Communication->Upload* is used to upload all messages of the PT2060 rack currently connected to the computer and *Communication->Download* is used to download all messages configured in the computer 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.

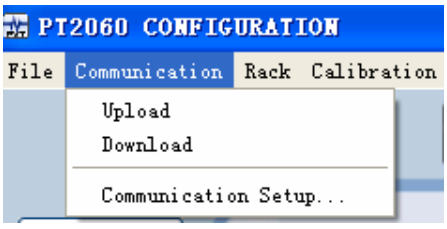


Figure 5

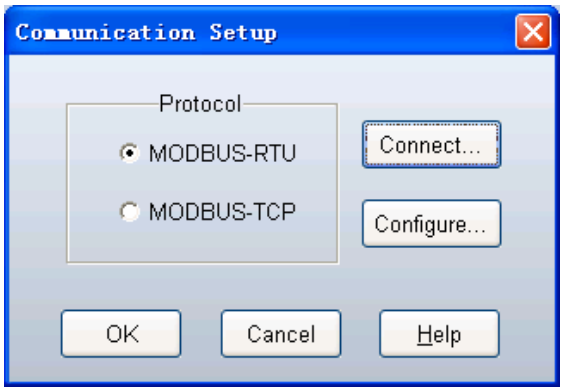


Figure 6

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

Rack Clock Setup: Setup system clock for the PT2060 rack.
Rack Reset: 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 Control: Operations related to alarm bypass and Alarms Trip multiply alarms.
Self-Test: To make the rack go into self-test mode. This is useful for troubleshooting.

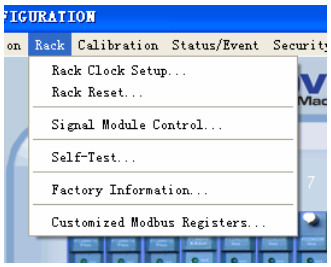


Figure 7

Menu item *Calibration* contains two subs, *User Calibration* and *Factory Calibration*. Users could perform *User calibration* only.

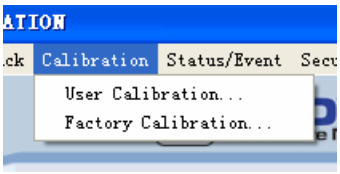


Figure 8

Menu item *Status/Event* contains operations related to current status and alarm history (recent 500 records), such as reading or deleting. Its sub item *Real-time Value and Status* is used to display the messages of 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.

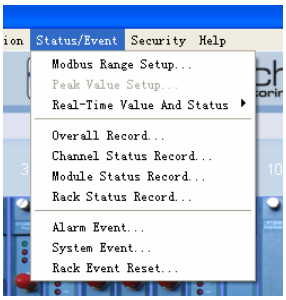


Figure 9

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

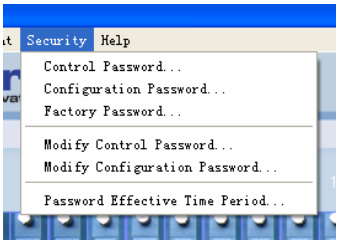


Figure 10

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

Figure 11

PT2060/53 O-SPEED Module Function Description

GAP not OK

When the GAP voltage is above the Upper OK limit and below the Lower OK limit, the OK / IO LED on the front panel is off. The GAP not OK status in the window *Real-Time Value and Status* is true. If alarms are true and those alarms have been configured as latching, after GAP becomes not OK, they retain true.

Once a channel has gone not OK status, the output current of this channel is 3.0 ±0.16mA.

Notes: Usually, Alert type can be configured as either alert or gap alarm. When PT2060/53 module is used for PT2060/53 O-SPEED Over-speed System, it does not support GAP alarm.

Bypass

This indicates when the module has bypassed alarming. Both digital port and hardware port can trigger bypass mode. When it is hardware bypassed, the Bypass LED on the front panel comes on. When it is software bypassed, the LED does not come on. No matter what is the case, the measured value will not be affected except the alarms on the module. Bypass is valid for Alert type and GAP type alarms. Bypass has higher priority than alarm latching does.

The system is not bypassed by default.

A channel bypass status may result from the following conditions:

- ✓ PT2060/53 O-SPEED module has never been configured
- ✓ PT2060/53 O-SPEED module is in configuration mode
- ✓ Channel of PT2060/53 O-SPEED module has an invalid configuration
- ✓ PT2060/53 O-SPEED module is in power up self-test
- ✓ Fatal error found during self-test
- ✓ Alarming is bypassed via *PT2060 System Configuration* software
- ✓ Channel of PT2060/53 O-SPEED module is disable

Alarms Trip multiply

In PT2060/53 O-SPEED Over-speed System, PT2060/53 O-SPEED module channels working in speed measuring mode does not support Alarms Trip multiply alarm.

Channel Disable

If PT2060/53 O-SPEED module is configured into channel disable status, The GAP not OK is False. Alarms are False. GAP value is 10.0V and real-time value is full scale low.

Parameter Configuration

After the host computer and the PT2060 are connected. Start PT2060-CFG configuration software. In the main window of the software, click the button *Upload* to upload all PT2060 messages.

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 or. The default password is 1234.

Figure 12

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

Warning
ProvibTech **recommends strongly** that the original configuration setting must be uploaded and saved before performing any modifications to PT2060/53 inner parameters.

In PT2060/53 O-SPEED Over-speed System, the configuration procedure of PT2060/43 R-RELAY Redundant-Relay module is referred to *PT2060/43 R-RELAY Redundant-Relay Module User Manual*.

PT2060/53 O-SPEED modules support over-speed measure. Proximity probes or magnetic pickups should be mounted in radial direction.

PT2060/53 O-SPEED modules measure the shaft rotation speed, provide measured message to the user, and give alarm messages to the PT2060/43 R-RELAY Redundant-Relay module to implement the function of over-speed protection.

While working in the PT2060/53 O-SPEED Over-speed System, only the first channel of PT2060/53 O-SPEED module is in use. Its configuration procedure is the same as of PT2060/10 Speed.

Configuration Considerations

Consider the following items before configuring a PT2060/53 O-SPEED Over-speed System:

1. All modules in the Over-speed system must have identical configurations.
2. A three-module Over-speed protection System is the most reliable.
3. When a full-scale range is modified, the set-points associated with this proportional value should be re-adjusted.
4. PT2060/53 Over-speed protection System provides fast response relays for shutdown purposes. Do not use any other PT2060 system relays for Over-speed shutdown.
5. PT2060/53 Over-speed protection System is only one of several components in an Over-speed Shutdown System. All components must be verified for proper operation.

Over-speed Parameter Setting

Typical full scale cam be set to 3000, 3600, 6000, 10000, 60000RPM.

Channel Type

Over-speed

Transducer Type

PT2060/53 O-SPEED modules can interface with many kinds of transducers:

- TM0180/5m
- TM0180/9m
- TM0105/5m
- TM0105/9m
- TM0110/5m
- TM0110/9m
- 3300/8mm/5m, 5mm/5m
- 3300/8mm/9m, 5mm/9m
- 7200/8mm/5m, 5mm/5m
- 7200/8mm /9m, 5mm/9m
- 3300/11mm/5m
- 3300/11mm/9m
- 7200/11mm/5m
- 7200/11mm/9m
- Other 8mm Proximity probe transducer
- Other 5mm Proximity probe transducer
- Other 11mm Proximity probe transducer
- Magnetic pickup

Transducer Sensitivity

This is the most important parameter in monitoring process. The value is related to the transducer type. When the transducer type is anyone of proximity probes, this value is set by the system and also can be modified manually. This value is typically expressed as millivolt per unit (for example mV/mil for displacement). Default value is 8mv/μm. When the transducer type is magnetic pickup, this item invalidates.

Alert Time Delay, Danger Time Delay

PT2060/53 O-SPEED Over-speed System doesn't support alarm time delay.

Teeth Per Cycle

Teeth number on the gear. The number of input pulses per shaft revolution when observing an integral multi-event signal source, such as a gear. The Events per Revolution may be specified as a number between 1 and 255 with four decimals . Default is 60 . User could set it according to the actual value in the field. For example, if there are 24 teeth on the gear, teeth per cycle can be set to 23.9998 to slightly adjust the rotation speed according to the need in the field.

Hysteresis Voltage

The voltage level above and below the threshold value which is required to "trigger" the input signal from the transducer. The larger the hysteresis, the greater the immunity to noise on the input signal. When the input signal passes the threshold voltage plus 1/2 of the Hysteresis voltage, the signal goes high. When the input signal returns to the threshold voltage minus 1/2 of the Hysteresis voltage, the signal goes low. The default

value is 1V and user could modify it between 0.5-2.5V.

Trigger Voltage

The Trigger Value is the nominal voltage that the Hysteresis is centered about. The system gives a default value. When Manual Threshold is selected, user could modify it manually or by clicking the button *Adjust* to let the system get it automatically. Default is -10V.

Full Scale High, Full Scale Low

These determine the low limit and high limit of full scale. Full scale low is set to 0 by default. Full scale high can be set by user as per actual situation. After these are set, the alarm hysteresis is determined. Alarm hysteresis default is 10RPM constantly.

Notes: All set-points have an Alarm Hysteresis value. The Alarm Hysteresis band for an over set-point is below the set-point and the Alarm Hysteresis band for an under set-point is above the set-point. For example, if an over-speed set-point is set at 3,000 rpm, the hysteresis is 10RPM. The module would enter over-speed alarm at 3,000 rpm but would not go out of alarm until the speed has fallen to 2,990 rpm.

Measurement Type

User could choose desired type from the drop list. Default is NA.

Measurement Unit

From the menu item *File-System Setup* a window, like the following figure, can be opened where user could alternate the measurement unit. For over-speed measuring, it is RPM constantly.

Figure 13

Alert Type

Alert type means that PT2060/53 O-SPEED modules give out alarm message, when the measured value exceeds or equals to alert and/or danger set-point assigned by *PT2060 System Configuration*. Every channel of a monitor is capable of producing an Alert indication. These indications can be used in relay alarm drive logic which is configured in the Relay.

When a PT2060/53 O-SPEED module works in PT2060/53 O-SPEED Over-speed System, it does not support GAP alarm.

Channel Enabled

Channel Enabled lets you control whether or not the monitor channel is used. (If the box is checked (√), the channel is used). Its default status is checked. User could modify it as need.

Alarm Latching

Causes the PT2060/53 O-SPEED module to retain an alarm status after the alarm condition has gone away. The latching alarm mode allows you to determine if an alarm set-point has been exceeded or equaled since the last rack reset. The rack reset contact or reset button on the 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 *PT2060 System Configuration* software. Non-latching alarm causes the PT2060 monitor to remove an alarm status after the alarm condition has gone away. The Event list for the monitor will provide

information about faulted transducers even if non-latching is selected. The default status is latched. User could modify it.

Set Point

This is set for PT2060/53 O-SPEED modules' alarm threshold. There are two levels of alert alarm. It can be set to some certain percentage of full scale. Danger High is set to 75% and Alert High is set to 50% by default. PT2060/53 O-SPEED modules in PT2060/53 O-SPEED Over-speed System do not support GAP alarm.

The GAP OK voltage range is related to the transducer type. When the transducer type is anyone of proximity probes, this value is set by the system and also can be modified manually. The default settings are -24V and -1V for GAP High and GAP Low respectively. When the transducer type is magnetic pickup, this item invalidates.

Notes: Timed OK Channel Defeat, an option that prevents a channel from returning to an OK status until that channel's transducer has remained in an OK state for the specified period of time. The time is set to 15 seconds. The time protects against false trips caused by intermittent transducers.

Threshold Type

The threshold options are Auto and Manual.

The threshold type is related to the transducer type. When the transducer type is anyone of proximity probes, there are two choices, *Auto* and *Manual*. If the expected average running speed of the machine is less than 200 RPM, Manual threshold is suggested. When the transducer type is magnetic pickup, the default value is *Auto*. The value can't be modified manually.

Auto: The trigger threshold is automatically set to a value that is midway between the most positive peak and the most negative peak of the input signal. This value tracks any changes in the input signal. Auto threshold requires minimum signal amplitude of 1Vpp and minimum frequency of 0.0167 Hz.

Manual: The trigger threshold is set by the user to any value in the range of -8V to -14V. Manual threshold requires that the minimum signal amplitude would be 500 millivolt with peak to peak.

Signal Polarity

Notch

An output pulse, produced for use by the modules that is triggered by the leading edge of a negative-going pulse in the input signal. If a magnetic pickup is used, set Notch/Projection setting to Notch.

Projection

An output pulse, produced for use by the modules that is triggered by the leading edge of a positive-going pulse in the input signal.

Peak Value

The maximum speed recorded by the PT2060/53 since the last peak value reset occurred. Click the drop down list *Peak Value Setup* of menu *status/Event* to open *Peak value* window where peak value is present, see figure 14 and 15.

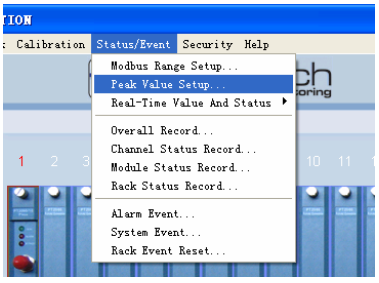


Figure 14

PT2060/53 retains the peak value even after loss of module power. Click the the Reset button in configuration software as the figure 15 shows, the Peak value will be reset to the present speed. Clicking the Reset button can reset the peak values of the current corresponding slots and channels, while Reset All can reset the peak values of all the speed type channels.

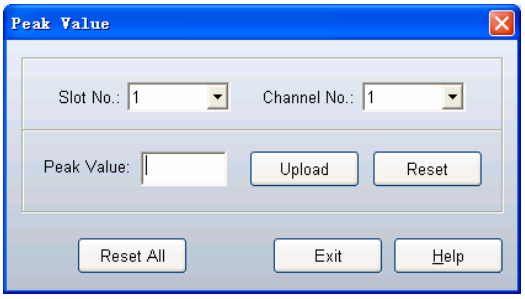


Figure 15

The following figure is an example of configuration.

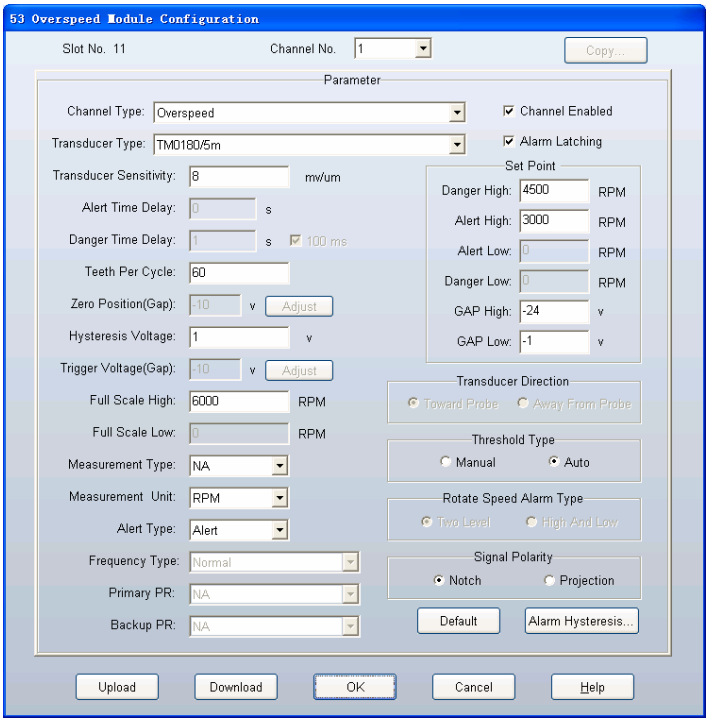


Figure 16

Transducer List

The transducers PT2060/53 O-SPEED modules can be connected with:

Transducer input		Module output
Proximity Transducer	TM0180/5m TM0180/9m TM0105/5m TM0105/9m TM0110/5m TM0110/9m 3300/8mm/5m, 5mm/5m 3300/8mm/9m, 5mm/9m 7200/8mm/5m, 5mm/5m 7200/8mm /9m, 5mm/9m 3300/11mm/5m 3300/11mm/9m 7200/11mm/5m 7200/11mm/9m Other 8mm Proximity probe transducer Other 5mm Proximity probe transducer Other 11mm Proximity probe transducer	Over-speed
Magnetic pickup	TM0605	

Module Control and Real-time Monitoring

PT2060/53 O-SPEED Over-speed System can measure rotation speed and give out high speed alarm via the *PT2060 System Configuration* software. The description in this section is based on PT2060 System Configuration software. For more detailed information, please refer to PT2060 System Con*figuration* software user manual.

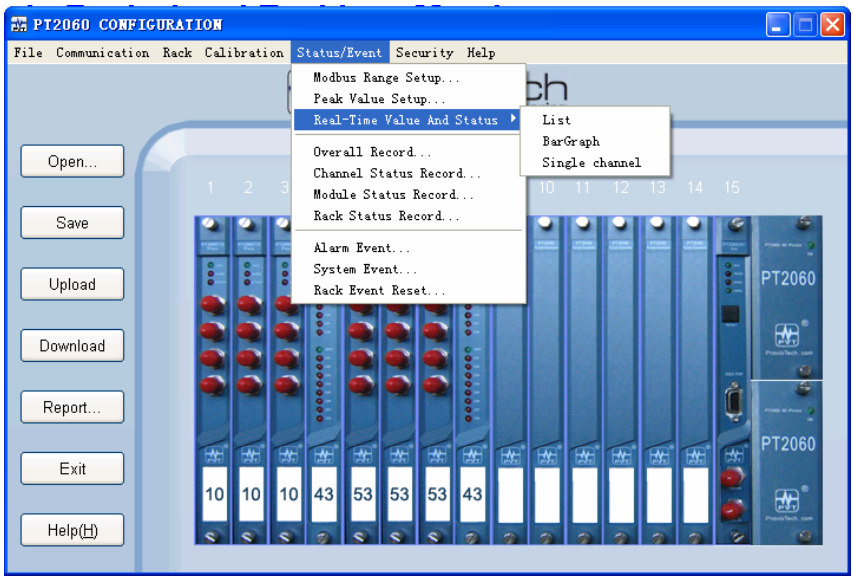
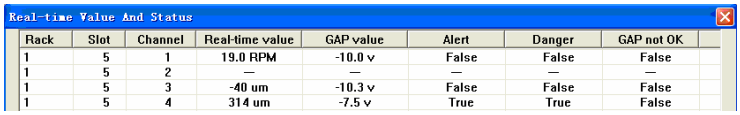


Figure 17

Calibration, control, and maintenance of PT2060/53 O-SPEED module are performed with *PT2060 System Configuration* software which is shown in above figure.

When PT2060 is in RUN state, from menu item *Status/Event->Real-Time Value and Status->List* open the real-time monitoring window, as shown in the following figure.



Rack	Slot	Channel	Real-time value	GAP value	Alert	Danger	GAP not OK
1	5	1	19.0 RPM	-10.0 v	False	False	False
1	5	2	—	—	—	—	—
1	5	3	-40 um	-10.3 v	False	False	False
1	5	4	314 um	-7.5 v	True	True	False

Figure 18

In this window Real-time value, GAP value, alarm message are shown. Rack number, slot number, channel number are seen at a glance. Besides, PT2060/53 O-SPEED modules can save various history events and working status including alarm events, system events, channel status records, module status records, and rack status records. Refer to section Troubleshooting.

PT2060/53 O-SPEED modules support alarm bypass, self-test functions. Alarm bypass is segregated into software bypass and hardware bypass. Self-test is implemented through software control. In the PT2060/53 O-SPEED Over-speed System, PT2060/53 O-SPEED module channels, which is set to measuring speed,

does not support Alarms Trip multiply alarm. Working in other type of systems, it behaves the same as PT2060/10 PROX module. See section PT2060/10 PROX module maintenance.

In PT2060/53 O-SPEED Over-speed System, PT2060/43 R-RELAY Redundant-Relay module should be configured to “53 Default type” or “53 Individual type”. The procedure of configuration is referred to *PT2060/43 R-RELAY Redundant-Relay Module User Manual*.

Hardware Module Operation

Besides the software monitoring, PT2060/53 O-SPEED module hardware can directly provide some messages of monitored equipment.

There are four BUF on the front panel and four current output ports on the back panel corresponding to the four channels. This enhanced the versatility of the module. User could acquire desired signals from these ports in the field. In PT2060/53 O-SPEED over-speed system, only the first BUF is used on PT2060/53 module.

Front, Back Panels and Functions

Front Panel

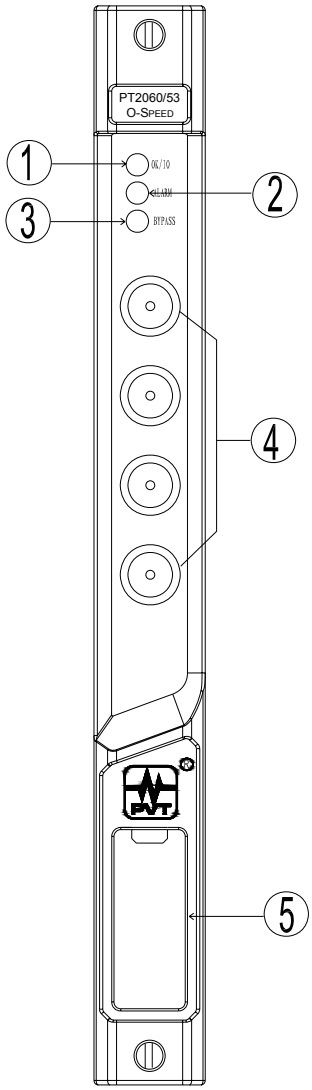


Figure 19

1. OK / IO LED
2. Alarm LED
3. Bypass LED
4. Buffered output

The output is raw unfiltered sensor signal to portable data collector.

5. Channel label

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

Back Panel

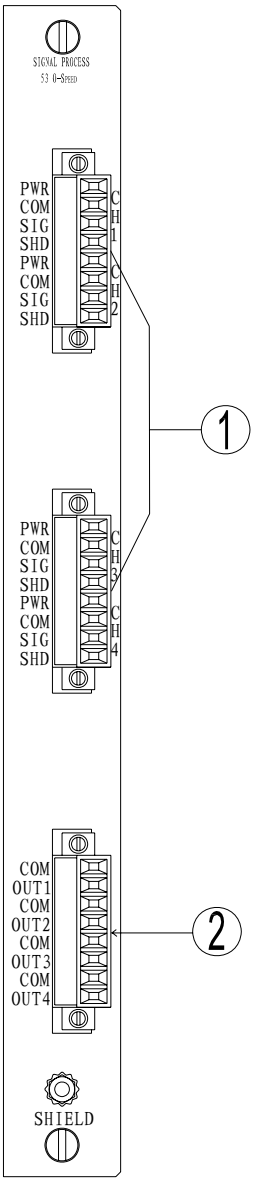


Figure 20

1. Signal port

The arrow is pointing the port which the channel 1 receives the signal (PT2060/53 module in the over-speed system has only a channel).

2. 4-20mA output

Be proportional to the full scale, standard 4-20mA output. Connect with PLC or DCS.

Field-wiring Diagram

Field-wiring Diagram for all 5mm, 8mm and 11mm Probe Systems

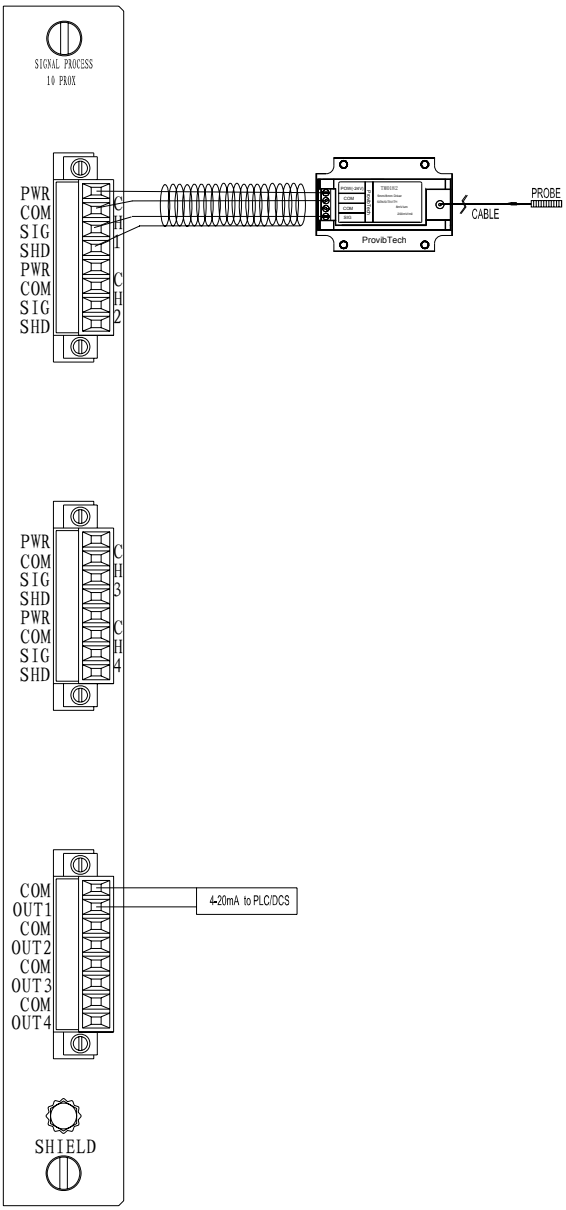


Figure 21

Field-wiring Diagram for Magnetic Pickup Systems

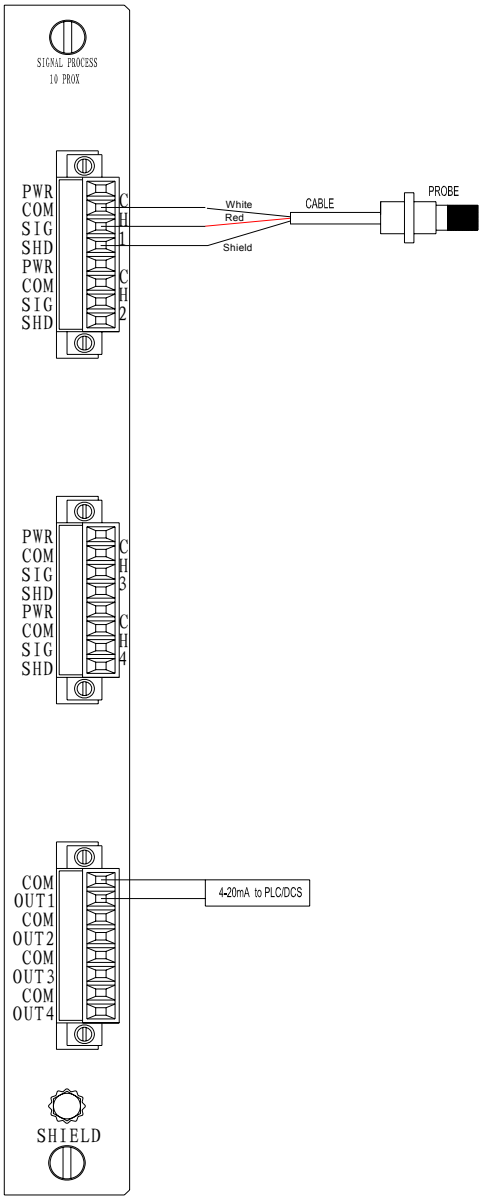


Figure 22

Field-wiring Diagram for Hazardous Area Application

With TM0412 as the barrier. For other barriers, please consult ProvibTech for tech support.

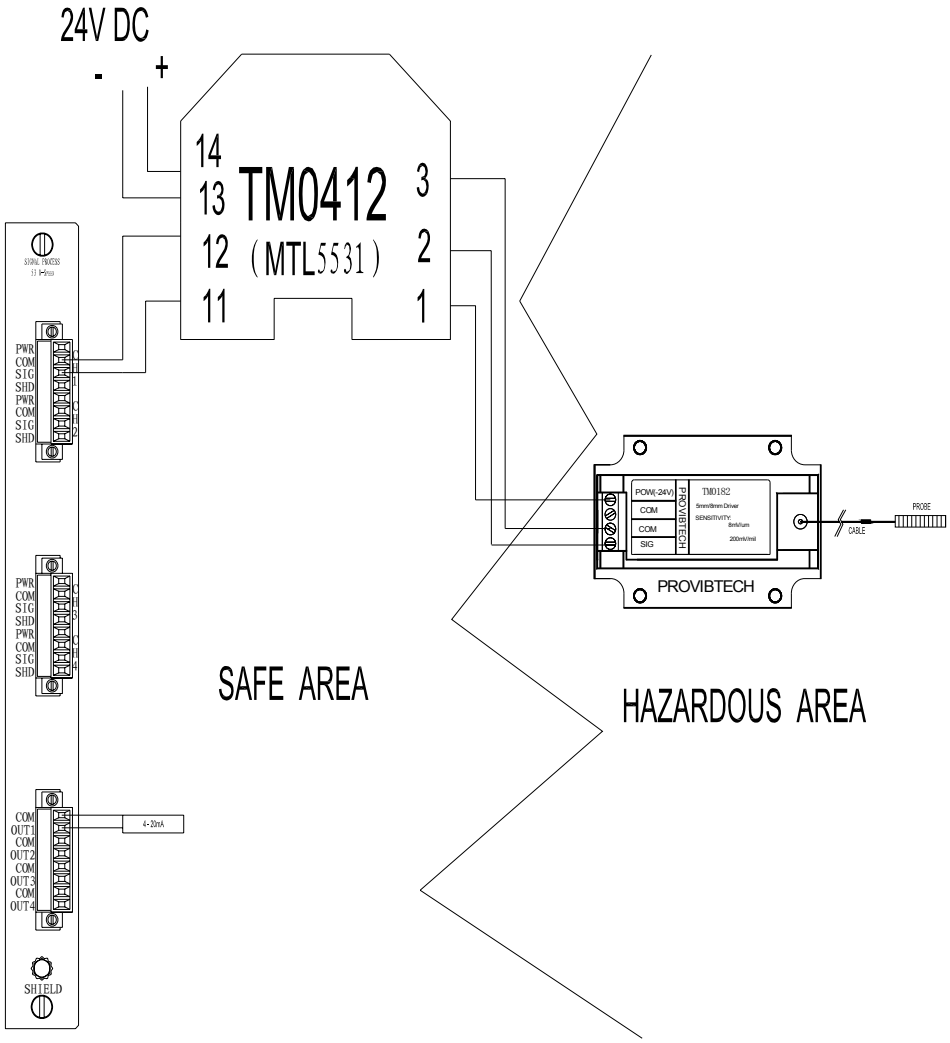


Figure 23

Module Maintenance

The maintenance of PT2060/53 O-SPEED Over-speed System includes two parts: PT2060/53 O-SPEED module and PT2060/43 R-RELAY module. The former is described in this section and the latter is referred to *PT2060/43 R-RELAY Redundant-Relay Module User Manual*.

Components inside a PT2060/53 O-SPEED module can not be repaired in the field. The maintenance mentioned here means to check channel working status and determine whether it is in good condition. If the linearity of some channels is not perfect, user could perform current calibration. If other faults are discovered, please substitute for it with another spare part.

It is described how to check channel working status and how to calibrate output current in several sections.

- ✓ Periodic maintenance
- ✓ Tool preparation
- ✓ Build of maintenance environment
- ✓ Software operation
- ✓ Module check
- ✓ Current calibration
- ✓ Exceptional module treatment

Periodic Maintenance

The time interval is very important for PT2060 maintenance. Generally, a yearly maintenance is sufficient. If the equipment is used in an extraordinary circumstance, user should shorten the maintenance interval according to the situation in the field.

Extraordinary circumstance means that

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

Besides, the maintenance interval should be adjusted according to the present result.

Preparations

Tool Preparation

The following tools are needed for PT2060/53 maintenance:

- ✓ One Personal Computer
- ✓ Two digital multi-meters for voltage measuring and current measuring
- ✓ Signal generator
- ✓ Oscilloscope
- ✓ Some terminals

Build of Maintenance Environment

Follow these steps to build maintenance environment.

1. Make test terminals

Refer to *Appendix* for the procedure.

2. Make bypass terminals

Refer to appendix for the procedure.

3. Install *PT2060 System Configuration* software in a PC.
4. Connect the PT2060 to a PC using a communication cable.
5. Save the configuration setting of PT2060 to maintain to a file. Power it off, demount it from the equipment, and move it to a workbench.

Application Advisory
ProvibTech **recommends strongly** that the original configuration setting must be uploaded and saved before performing any modification to it and restore it after maintenance has been done!

6. Get a signal generator set, and the oscilloscope ready.
7. Get two multimeters ready.

Software Preparation

You should be familiar with these functions:

- ✓ Upload, download, save configuration parameters
- ✓ Enable/disable channels and alarms latching
- ✓ Bypass channels' latching
- ✓ Observe *real-time value and status*

On powering on and open the configuration software, the system uploads configuration parameters automatically. You could also click the button *Upload* in the main frame window of the software to get all of the configuration parameters and click the button *Download* to save them to the machine, after you have done your modifications.

Click on the picture of PT2060/53 O-SPEED module to open PT2060/53 O-SPEED Module Configuration window. At the right-up corner, there are items Channel enable and alarm latching. They are checked by default.

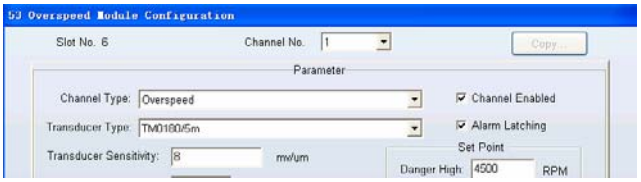


Figure 24

From menu item "*Rack->Signal Module Control*" open the status control window, where slot number and alarm set-point multiplication and bypass status are specified. Click the button *Download* to save it to PT2060/53 O-SPEED module. The PT2060/53 O-SPEED module has no relation to alarm set-point multiplication function, when it works in PT2060/53 O-SPEED Over-speed System.

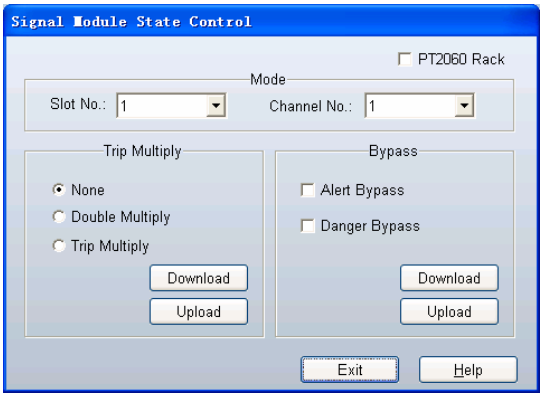


Figure 25

Module Testing

When PT2060/53 O-SPEED module works in the PT2060/53 O-SPEED Over-speed System, it is only the first channel that needs to be tested. When it works as other modules, the channel 3 and 4 are also need to be test. For the latter testing, refer to the relevant section of *PT2060/10 PROX Proximity Module User Manual*.

⚠ 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!

1. System construction

If transducer type is anyone of proximity probes, take one proximity terminal. Plug the terminal into the first channel of PT2060/53 back panel. Connect the red pen of an ampere meter to OUT pin of the current output

port and connect the black pen to GND pin on that port. Set the ampere meter to measure direct current. Feed a signal to the channel through the positive pin of the electrolytic capacitor (220μF/50V) of the terminal. Connect an oscilloscope to the BUF of the first channel.

If transducer type is magnetic pickup, take one magnetic terminal. Plug the terminal into the first channel of PT2060/53 back panel. Connect the red pen of an ampere meter to OUT pin of the current output port and connect the black pen to GND pin on that port. Set the ampere meter to measure direct current. Feed a signal to the terminal. Connect an oscilloscope to the BUF of the first channel.

Turn on the PC and invoke the configuration software.

2. Test of powering on

On powering, OK / IO LED and Alarm LED should be on for 3s or so that indicates that the channel is operating correctly.

3. Test of communication

Click the button *Upload* to obtain the parameters and save them in a safe place. If the upload failed, check whether PC and PT2060 are set correctly and connected reliably.

4. Test of parameter setting

Click the picture of the tested module in the *PT2060 System Configuration* software main frame window to open its configuration window where you could make some modifications. After that, you could download it and re-upload it again to compare whether they are changed correctly.

5. Test of OK status

Disable PT2060/53 O-SPEED module's channel 3 and 4.

If transducer type is one of proximity probes, tune the variable resistor (10kOhm) of the terminal plugged in the first channel. Observe OK / IO LED status (it flashes only when all enabled channel are OK). When the variable resistor is out of the assigned OK range, the OK / IO LED will go off. At this time, the output current is 3.0 ±0. 16mA.

If transducer type is magnetic pickup, the OK / IO LED is always on.

6. Test of linearity

According to the configured full scale and frequency in the field, provide a signal to the first channel using a generator set. Check the output current to see whether it suffices the linearity requirement. If it is not perfect, you can perform recalibration:

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: The magnitude of the input signal is 8V. Change the frequency as per the full scale. If the current full scale is 0-6000RPM, number of teeth is 1, then the frequency should be in the range 0-100Hz.

7. Test of alarm

Disable the PT2060/53 O-SPEED module's channel 3 and 4. Provide a signal to the first channel. Observe the change of the Alarm LED, when the signal exceed or equal to any set-point and check the status in the *Real-time Value and Status* window.

If the channel is not alarm latched, the alarm status will be reset after the input signal is removed. Otherwise, it can be reset only by pressing the button RESET (or clicking menu item RACK->Rack Reset Setup). Check the status in the *Real-time Value and Status* window. This part has also relation to alarm hysteresis.

8. Test of BUF

If necessary, users can perform BUF testing.

Tune the signal generator and monitor the BUF output with an oscilloscope which should be conformable with

the input one.

If transducer type is one of proximity probes, adjust the variable resistor to make it outputs a voltage of about -10V and check the BUF output noise which should be less than 50mV.

If transducer type is magnetic pickup, check the BUF directly, the output noise should be less than 50mV.

This figure shows how to connect an oscilloscope to the BUF.

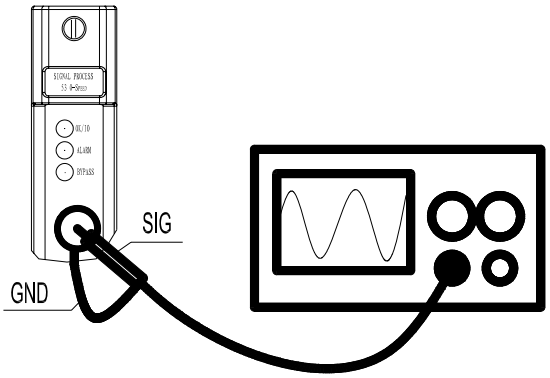


Figure 26

9. Test of software bypass

Checking the Channel Bypass switch will cause the module to indicate a "bypass" status but can not illuminate the module bypass LED. Set Alert bypass and/or danger bypass for the tested channel and adjust the input signal. When the signal reaches the magnitude corresponding to alarm threshold, the machine does not give alarm signal, i.e. it is prohibited.

10. Test of hardware bypass

Provide a signal to make the system alarm. Plug in a bypass terminal into the socket on the back panel of PT2060/91 SIM module. Bypass LED of the PT2060/53 O-SPEED module should be on and Alarm LED should be off. The alarm status in *Real-time Value and Status* window disapear. Unplug the terminal and the system goes on to alarm.

11. Test of voltage

Power supply is critical for PT2060/53 O-SPEED module to work properly. Measure the voltages of the channels as per the figure below. They should be about -24V.

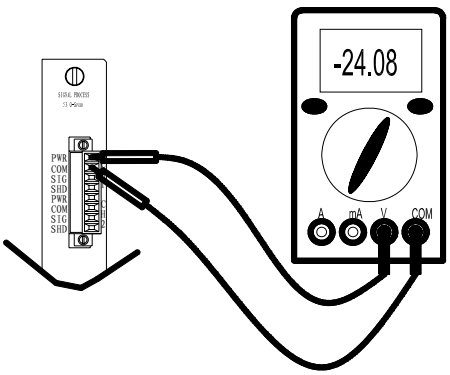


Figure 27

12. Test of redundant power

Provide channel 1 with a signal correspond to 50% of full scale. the output current should be 12±0.16mA. Demount the lower power module and observe the output current whether it is stable. Remount the lower power module and demount the upper power module and observe the output current.

Current Calibration

Users should not repair the components inside PT2060/53 O-SPEED modules. However, if some channels' linearity is not satisfied after the testing, user can perform current calibration.

1. Connect the red pen of an ampere meter to OUT pin of the current output port; connect the black pen to COM pin of that port.
2. Click menu item *Calibration->User Calibration* and enter password to open calibration window. See the following figure. Select the slot number and channel number to be calibrated.

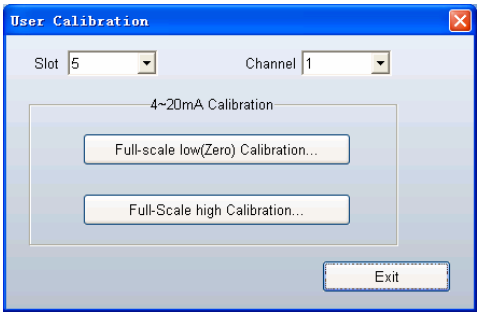


Figure 28

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 29). Follow the steps showed in the window to perform 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.

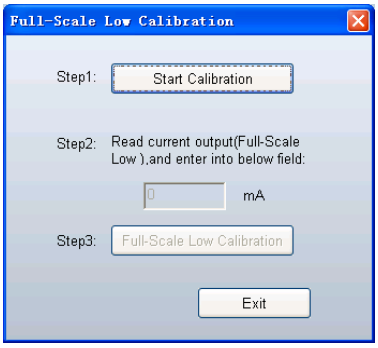


Figure 29

4. Click the button *Full-scale high Calibration*. Click OK button in the WARNING window(figure 30). Enter YES in the Warning dialogue (figure 31) and click OK to open the calibration window(figure 32). 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 high Calibration* in step3 to download. Wait till the multimeter outputs a right value. Click Exit to exit the high calibration.

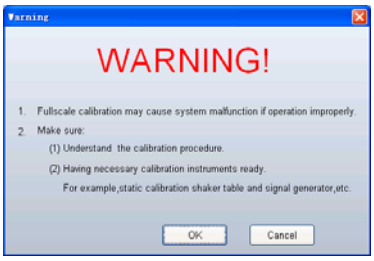


Figure 30

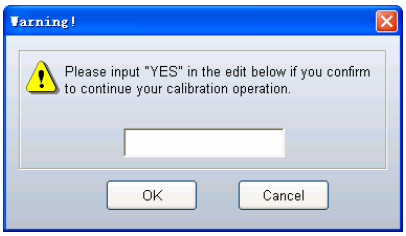


Figure 31

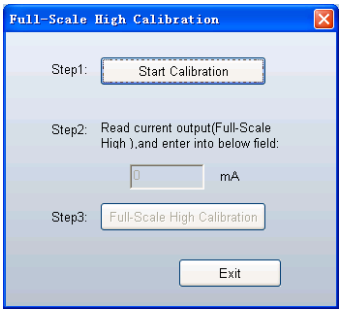


Figure 32

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 does not satisfy, you could redo it.

Exceptional Module Treatment

Some exceptions may be discovered through the testing mentioned above. Except the linearity problem which could be solved by recalibrating, users sould treat it in no case. Please substitute it by a spare part and contact ProvibTech office.

Troubleshooting

PT2060/53 O-SPEED Over-speed System Troubleshooting consists of two parts: PT2060/53 O-SPEED module Troubleshooting and PT2060/43 R-RELAY Redundant-Relay module Troubleshooting.

Troubleshooting relative to PT2060/43 R-RELAY modules is described in *PT2060/43 R-RELAY Redundant-Relay Module User Manual*.

This section describes how to solve the problems in operation and analyze the status from the LED, Real-time Value and Status, system event list, and alarm event list.

LED

There are OK / IO LED, Alarm LED, and Bypass LED on the front panel. They directly reflect the status of PT2060/53 O-SPEED modules. If something abnormal happened, users could make a simple judgment.

OK / IO LED

Flash: All enabled channel are okay. Digital communication is ok.
On without flash: All enabled channels are ok. No digital communication. This means the PT2060/53 O-SPEED module has a problem with communication.
Off: One or more channels are not ok.

If OK / IO green LED is off, the reason may be: some of enabled channels have GAP alarms; the connection to transducers has broken; the proximity transducers are damaged; module is damaged. If the first reason caused the problem, there is a 15s delay before the module changes from NOT OK status to OK status.

Try these to solve the problems: adjust transducers' position to make the GAP value normalized; remount the module; reset; check probes and connection cable.

Alarm LED

On: One or more channels have alarms. When alarm type is Alert, the alarms can be either alert or danger or both. When alarm type is GAP, the alarms can be either GAP or danger.
Off: All channels on the module are in normal status. No alarms engaged.
If Alarm red LED does not work, it may be caused by that: the module is failed; transducers are broken. Try these to solve the problem: remount the module; reset; check probes and connection cable.

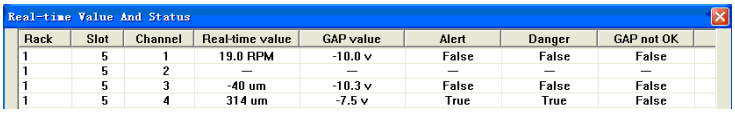
Bypass LED

On: PT2060 system is in hardware Bypass mode. All alarms on this module are inhibited from alarming (no alarms will be engaged). PT2060/53 O-SPEED module's real-time values and current outputs are not affected.
Off: Abnormal operation mode.

If Bypass red LED does not work, it may be caused by that: the PT2060/53 O-SPEED module fails. In this case, please contact ProvibTech office.

Real-time Value and Status

From *Real-time Value and Status* interface, you may acquire something useful.



Rack	Slot	Channel	Real-time value	GAP value	Alert	Danger	GAP not OK
1	5	1	19.0 RPM	-10.0 v	False	False	False
1	5	2	—	—	—	—	—
1	5	3	-40 um	-10.3 v	False	False	False
1	5	4	314 um	-7.5 v	True	True	False

Figure 33

Alert

False: When alarm type is Alert, it means there is no Alert alarm. When alarm type is GAP, it means there is no GAP alarm.
True: When alarm type is Alert, it means there is an Alert alarm. When alarm type is GAP, it means there is a GAP alarm.

Danger

False: There is no Danger alarm, in despite of the alarm type.
True: There is a Danger alarm, in despite of the alarm type.

GAP not OK

False: The channel is in okay status.
True: The channel is in GAP not OK status. The reason may be that: the transducers' GAP voltage is out of range; some transducers are broken; the connection cable is not reliable. If the first reason caused the problem, there is a 15s delay before the module changes from GAP not OK status to OK status.

System Event List

PT2060/53 O-SPEED modules' system event list will be displayed in the software PT2060 System Configuration. It lists 500 recent events.
Select *Status/Event->System Event* from the main menu; go into this interface as shown below.

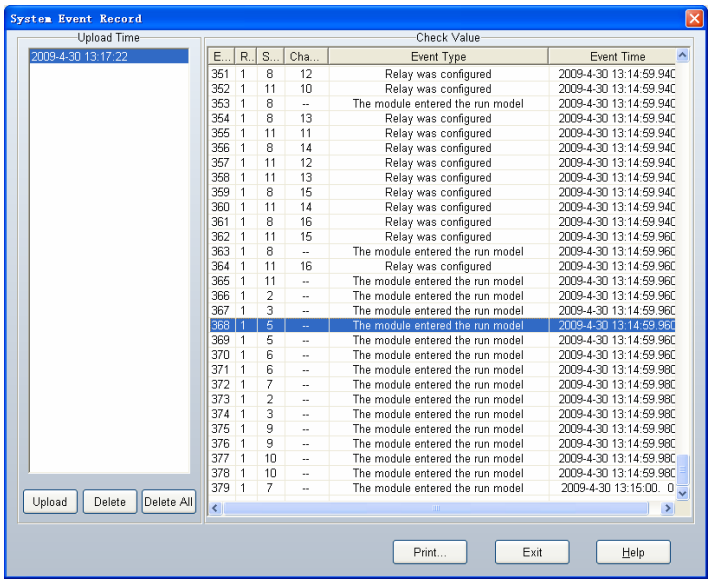


Figure 34

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. Take the highlighted line in figure above for example, the PT2060/53 O-SPEED module in slot 6 entered run model sometime. By browsing this event list, you will be able to know what happened recently. It may help the user to solve some problems.

If you could not solve the problem by yourself, please save all information for ProvibTech 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 the figure below.

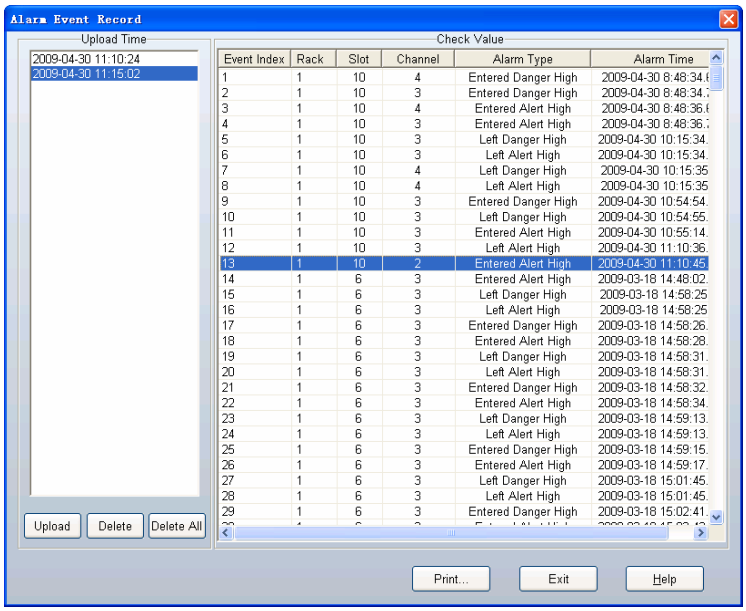


Figure 35

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. 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 messages for ProvibTech service staff.

Exceptional Module Treatment

If you find PT2060/53 O-SPEED modules in problem from the above analyses, please contact ProvibTech office.

Additional Information

Ordering Information

A PT2060/53 O-SPEED module consists of a front panel and a back panel. Please make your order as per the code.

PT2060/53-AX:

AX: Back-panel IO module

A0: Basic IO module

Optional Accessories

There are several accessories for selecting:

PT2060-005300: PT2060/53 Front panel

PT2060-005301: PT2060/53 Back panel

Examination

The encapsulation of PT2060 can protect modules from all kind of damage. As soon as the reception, user should examine the conducts whether it is damaged and whether it is caused by transportation. Please contact the carrier, if it 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 closer ProvibTech office.

Factory Default Configuration

When customers purchase PT2060/53 O-SPEED Over-speed System, if no detailed request, it will be configured with the following setting and shipped to the customers.

PT2060/53 O-SPEED Module Configuration Setting

Channel 1

Channel Type: Overspeed

Transducer Type:	TM0180/5mm	Channel Enabled:	checked
Transducer Sensitivity:	8.0mv/μm	Alarm Latching:	checked
Teeth per Cycle:	60	Danger High:	4500RPM
Hysteresis Voltage:	1V	Alert High:	3000RPM
Full Scale High:	6000RPM	GAP High:	-24V
Full Scale Low:	0RPM	GAP Low:	-1V
Measurement Unit:	RPM	Threshold Type:	Auto
Alert Type:	Alert	Signal Polarity:	Notch

Appendix

Terminal for Proximity Probe

Take an 8 pin plug(pin distance 3.8mm) like what is shown in the figure below, a potentianmeter of 10KOhm and an electrolytic capacitor of 220μF/50V (1000μF/35V if used for low frequency testing). Solder the movable pin of the potentialmeter and the negative pin of the electrolytic capacitor together and then connect it to SIG pin on the port. Connect the other two pins of the potentialmeter to PWR and COM respectively. Left the positive pin of the electrolytic capacitor float, through which the signal will come in.

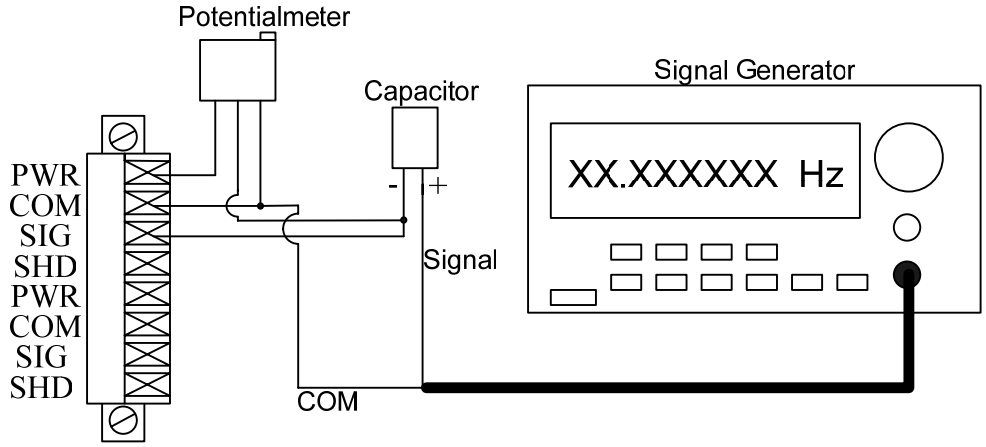


Figure 36

Terminal for Magnetic Pickup

Take an 8 pin plug (pin distance 3.8mm) like what is shown in the figure above and two short wires. Connect one wire to SIG, and other wire to COM.

Bypass Terminal

Take a six pin plug (centre distance 3.8mm), and short RST_BY and GND pins according to the label on the back panel of the PT2060/91 SIM module.

Alarms Trip multiply Terminal

Take a six-pin plug (centre distance 3.8mm), and short ALM_MU and GND pins according to the label on the back panel of the PT2060/91 SIM module.