PT2060 Monitor

PT2060/91 SIM System Interface Module User Manual

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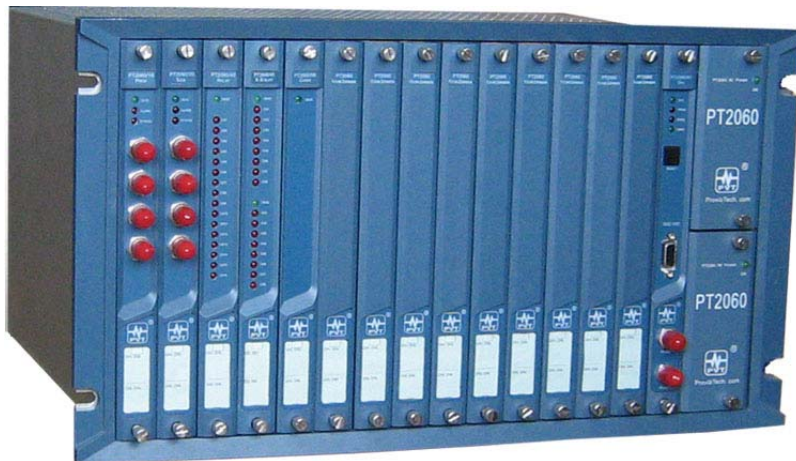
ProvibTech, Inc.   11011 Brooklet Drive, Suite 300, Houston, Texas 77099, USA

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 PT2060/91 SIM system Interface module is a communication and system management module. The System Interface Module provides serial communications between the PT2060 Monitor System and plant information systems such as a distributed control systems (DCS) or a programmable logic controllers (PLC). The System Interface Module collects data from other modules in the rack over a high-speed internal network and sends this data to the information system upon request.

The System Interface Module is also able to communicate via Ethernet with a host computer. The host can be Modbus protocol based controllers or computers with PT2060 Rack Configuration and Data Acquisition software.

The PT2060/91 SIM system Interface module can realize the following functions:

Control

- ✓ Contacts
- ✓ Rack Reset
- ✓ Trip Multiply
- ✓ Bypass
- ✓ OK Relay

Security

- ✓ Control password
- ✓ Configuration password
- ✓ Factory password

Communications Ports

- ✓ Front Panel RS-232 Port
- ✓ Back Panel RS-485 Port
- ✓ Back Panel RS-232 Port
- ✓ Back Panel Ethernet Port

Event Lists
- ✓ System Event List

- ✓ Alarm Event List

SIM has the following functions

- ✓ Communication with up-level control system.
- ✓ Configuration of the rack system, each module and each channel.
- ✓ Customization of the name for each channel.
- ✓ Storage of System Events and Alarm Events.
- ✓ Connection to other racks.
- ✓ Dual phase references.
- ✓ Speed output.
- ✓ Signal of phase reference output with peak to peak
- ✓ Gap voltage output
- ✓ Virtual address configuration and mapping.

Figure 1

Hardware Considerations

The slots in the rack are numbered from 1 to 16, counting from left to right. The System Interface module is always in slot 15.

Statuses

The System Interface Module returns both module and channel status. This section describes the available status indicators and where they can be found.

Module Status

OK

This indicates if the System Interface Module is functioning correctly or not. A not OK status is returned under the condition of Hardware Failure.

If the Module OK status goes not OK then the system OK Relay on the SIM system Interface module will be driven not OK.

Channel Status

OK

This indicates whether or not a fault has been detected on the channel or within the module. If the Channel OK status goes not OK then the system OK Relay on the SIM system Interface module will be driven not OK.

LED Descriptions

The LEDs on the front panel of the SIM system Interface module indicate the operating status of the module as shown in the following figure.
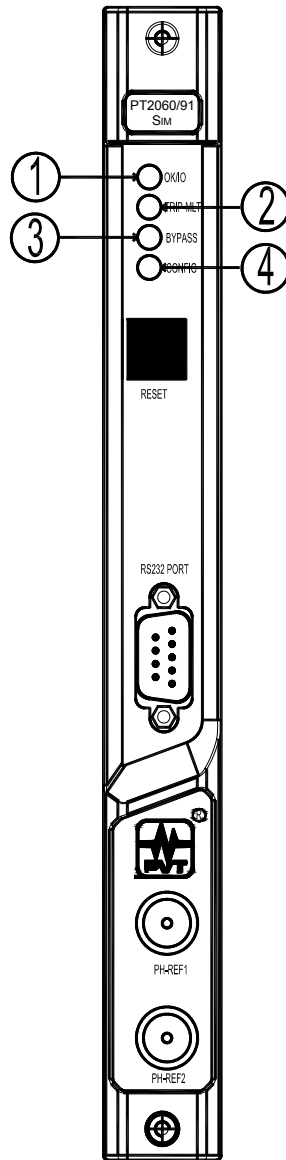

Figure 2

- ✓ OK/IO LED
- ✓ TRIP-MLT LED
- ✓ BYPASS LED
- ✓ CONFIG LED

System Reset to Factory Setting

Modbus RTU RS-232/RS-485

Press the RESET button on the front panel of PT2060/91 before applying power and keep it pressed for 6 seconds after power is on. Some parameters of the SIM module will be reset to default setting such as:
✓ Communication baud rate: 19200
✓ 2 stop bits, No parity bit
✓ Control password: 1234
✓ Configuration password: 1234

Modbus TCP

Press the RESET button on the front panel of PT2060/91 before applying power and keep it pressed for 6 seconds after power is on. Some parameters of the SIM module will be reset to default setting such as:
✓ IP Address: 192.168.1.211
✓ Subnet Mask: 255.255.255.0
✓ Gateway Mask: 192.168.1.1
✓ Control password: 1234
✓ Configuration password: 1234

Phase Reference

As a required function to each rack, dual phase references are integrated into the SIM module as a default setting. The two phase reference channels will supply phase reference information to all the channels on the rack.

Other Information

The slots in a standard 19″ rack are numbered from 1 to 16, counting from left to right. The PT2060/91 system interface module can be mounted in slot 15. The slots in a 12″ rack are numbered from 1 to 9, counting from left to right. The PT2060/91 SIM system Interface module can be mounted in slot 8.

Specifications

Electrical

Power supply:

Internally converted by the rack power supply module

3.7W total typical for each module

Phase reference signal Input:

Input impedance: > 20KΩ

Input voltage range:

magnetic pickup: +15VDC ~ -15VDC

Proximity probes: 0 ~ -24VDC

Input signal frequency: 0~20kHz

Sensors for Phase reference:

Proximity probes; magnetic pickup sensor (nonsupport for previous version)

Parameters for Proximity probes:

Input frequency: The PT2060/91 module supports 1 - 255 events per revolution with a

maximum full scale range of 60000 rpm.

Valid frequency: >0.0167Hz

Threshold:

Auto: > 2.0V pk-pk signal amplitude (at least 2Hz), Trigger level is calculate

automatically.

Manual: > 0.6V pk-pk signal amplitude (at least 0.017Hz). Trigger level

programmable from -17VDC to -3VDC.

Hysteresis: 0.5 - 2.5 V user selectable

Power supply: -24VDC for proximity probe driver.

current limited. Less than 50mA on each channel

Parameters for magnetic pickup:

Input frequency: The PT2060/91 module supports 1 - 255 events per revolution with a

maximum full scale range of 60000 RPM.

Valid frequency: >3.3Hz（least 2Vpkpk）

Hysteresis: 0.5 - 2.5 V user selectable

Power supply: Need no power.

Phase Reference buffer:

On the front panel, each channel has one BNC connector. Original phase

reference signal can be selected to output. modulated square wave can be

selected to output for previous version.

amplitude of signal: -23V~14V

Output Impedance: 150Ω

Speed output:

The PT2060/91 module provides the function to measure machine speed in

RPM from the two transducers. Input range of 1 to 1,200,000 RPM (0.017 Hz

to 20 kHz), the measurable RPM scale is from 1 to 60000 RPM (0.017 Hz to 1000 Hz), The real-time updating RPM can be observed from the PT2060 Configuration software.

Accuracy:

$\pm$1 RPM

Pk to Pk value:

When the input frequency of transducer is more than 0.1 Hz, the PT2060/91 module will automatically calculate the peak-to-peak swing of the sensor's signal, and display the Pk to Pk Value via PT2060-CFG.

Gap voltage:

When frequency of the input Proximity transducer's signal is more than 0.5 Hz, the PT2060/91 module will display the gap voltage of the Proximity transducer via PT2060-CFG., otherwise, display the real time Value when frequency of the input Proximity sensor's signal is less than 0.5 Hz.

LED Indicators:

OK/IO: green

It Indicates that the PT2060/91 Module is operating correctly When the OK/IO led is Flashing. If the OK/IO led is off, please check probe driver and cable of Phase reference.

TRIP-MLT: red

It will go on when system is in Trip-MLT.

BYPASS: red

It will go on when system is in BYPASS.

CONFIG: green

It will go on when the system is in CONFIG, And OK/IO LED is on but not flashes.

Modbus communication:

RS-232 (2): one on front and one on back panel.

RS-485 (1): on the back panel of module. The available baud rate values are: 1200, 2400, 4800, 9600, 19.2 k, 38.4 k and 115.2 k baud. RS-485 cable can run up to maximum 1220 meters (4000 ft).

Ethernet (1): On the back panel of module, 10Mbps, IEEE802.3. There is only (1) active Modbus communication port.

System Alarm:

There will be a dedicated relay for indication of system OK status. This is an energized relay; it indicates a system error for one of the system components when the energized relay changes status.

Relays:

Seal: Epoxy

Capacity: 2A/240VAC or 2A/24VDC, resistive load

Relay type: SPDT

Isolation: 1000VDC

Approvals:

CE;

CSA: Non-incendive,classI,div.2,Grps.ABCD,T4@Ta= -40℃ to +75℃

Certificate Number: 2011996

Environmental

Temperature:

Operation: -20℃ to +65℃

Storage: -40℃ to +85℃

Humidity:

95% non-condensing

Physical

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

Dimensions and Location:

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

This module has to be located in the second slot from the right hand side of the rack (slot 15)

Weight: 1.2kg (2.01 lbs)

Configuration Setting and Application

Configuration Information

This section describes how the System Interface Module is configured using the PT2060 Configuration Software. It also describes any configuration considerations associated with this module. For the details regarding the operation of software, refer to the PT2060 Monitoring System Rack Configuration and Utilities Guide and the Rack Configuration Software.

Application Alert

You can't use Modbus RS-232/RS-485 and Modbus TCP at the same time! Only one communications interface can be used at a time!

Modbus TCP

Modbus TCP is an Internet protocol. Ethernet is a long-standing office networking protocol that has gained universal world-wide acceptance. It is also an open standard that is supported by many manufacturers and its infrastructure is widely available and largely installed. Consequently, its TCP/IP suite of protocols is used world-wide and even serves as the foundation for access to the World Wide Web as many devices already support Ethernet.

For PT2060/91 SIM System Interface Module, an Ethernet Crossover cable is needed to connect the system to a PC directly. The Speed of communication can be up to 10Mb/s. The PT2060/91 SIM System Interface Module is able to communicate via Ethernet with up to five hosts. Hosts can be Modbus TCP protocol based.

Factory Default Communications Settings

Modbus RTU RS-485 / RS-232

Communication setting:	19200bps, 8 data bits, no parity, 2 stop bits
Rack Address setting:	PT2060/91 module's Rack Address is 1.
Control password:	1234
Configuration password:	1234

Modbus TCP

IP Address setting:	192.168.1.211
Subnet Mask setting:	255.255.255.0
Gateway Address setting:	192.168.1.1
Rack Address setting:	PT2060/91 module's Rack Address is 1.
Control password:	1234
Configuration password:	1234

ProvibTech   Phone: +1-713-830-7601 Fax: +1-281-754-4972   sales@provibtech.com , www.provibtech.com

Configuration Password and Control Password

To enhance the security of PT2060 operation, the system involves a control password and configuration password.

Control Password:

If the Control password entered in this field does not match the password entered in the Rack Configuration some parameters, such as communication baud rate and Modbus registers, can not be modified.
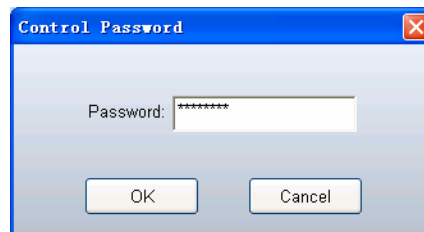

Figure 3

Configuration Password

If the Configuration password entered in this field does not match the password entered in the Rack Configuration some operations, such as modification of other modules, are restricted.
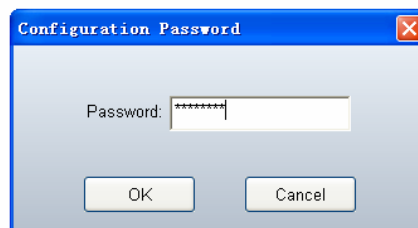

Figure 4

Communication with the SIM module

The SIM module can communication to the upper-level PLC/DCS systems via Modbus RTU communication protocol. Information about the system, rack, modules, channels, and sensors can be collected and communicated to the control system. It can also perform system reset, trip-multiply, and bypass via Modbus.

The communication port can perform only one communication function, such as a Modbus connection to control system or a PT2060-MON system. Further communication and Ethernet connection can be done via the communication module PT2060/91. Please refer to this module for more details.

Setting Communication Parameters

The PT2060 Communication Setup lets you set the communication parameters for the HOST Computer on the System interface Module.
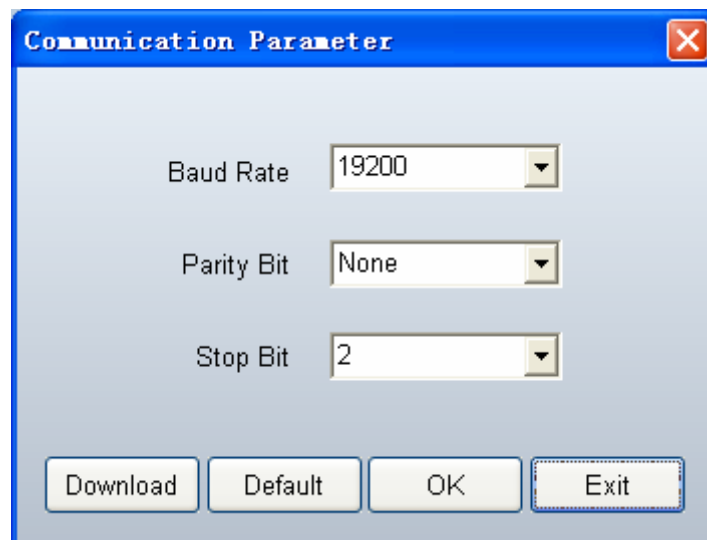
Communication with Modbus RTU

Figure 5

Parity Used for error checking
    None: No parity error checking is used.
    Odd: Each word has an odd number of 1 bit.
    Even: Each word has an even number of 1 bit.
Baud Rate: This is the rate of communication between the System Interface Module and the DCS. The available values are: 1200, 2400, 4800, 9600, 19.2K, 38.4K, and 115.2K baud.
Stop Bits: Signifies the end of the character. One or two bits can be used.

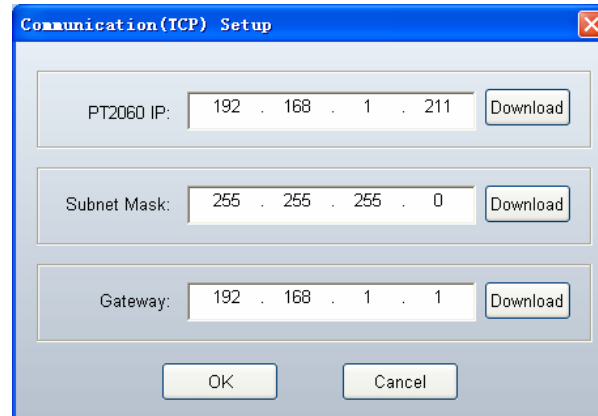**Communication with Modbus TCP**

Figure 6

The PT2060/91 SIM System Interface Module's parameters can be set through the Ethernet Port on the Back board.

IP Address

IP (Internet Protocol) Address is the unique address for an Ethernet network device. The IP address is a string of 4 numbers each from 0 to 255. For networks managed through an Information Technology department, consult the network administrator for a valid IP address.

For example: 192.168.1.211

Subnet Mask

The Subnet Mask identifies which bits of the IP address are address bits for the physical network. Typically, the Subnet Mask is the same for the LAN (local area network), however, consult the network administrator for valid setting.

For example: 255.255.255.0

Gateway Address

Consult your network administrator for valid setting.

For example: 192.168.1.1

System Configuration

Each channel can be configured by PT2060-CFG through SIM module. Two RS-232 ports located on both front and back panel can be accessed for configuration.

History Event Storage

The PT2060/91 SIM system Interface module will store up to 500 system events and alarm events. These events can be accessed from the PT2060/91 through Modbus or PT2060-CFG system configuration software.

Channel name customization

The PT2060/91 SIM system Interface module supports the function to customize name for each channel. It is convenient for user to identify channels in the work field. Refer to the following figure, the length for each name can maximize 30 characters. Click the right button on the slot which to be configured in the rack, choose set channel names, the following figure can be opened.
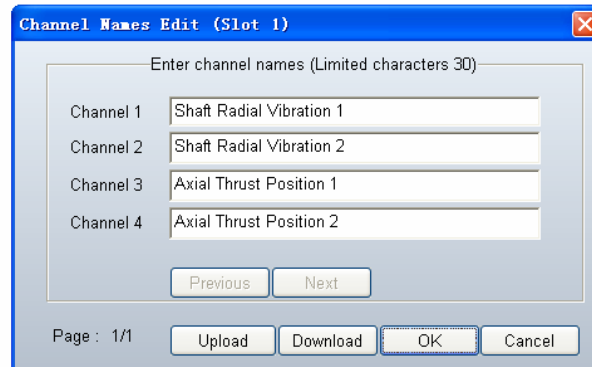

Figure 7

Power Configuration

This section describes the options available on power module configuration screen. The PT2060/91 SIM system Interface module supports the function to configure power type, the user can configure the power module type base on the Rack power Configuration.

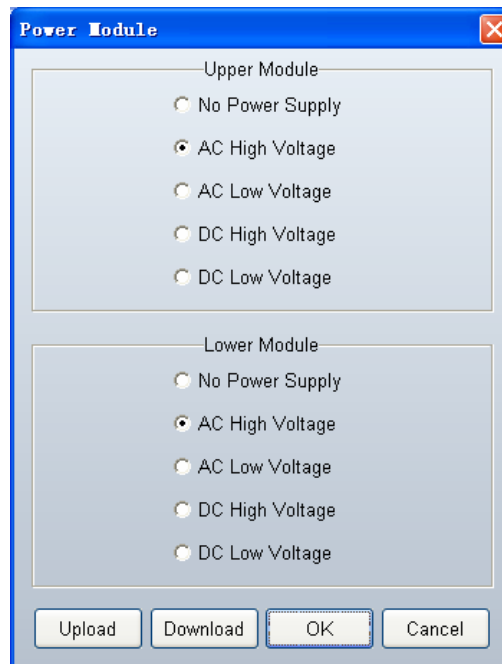The following power supplies can be installed in the PT2060 rack:

Figure 8

Rack Interconnection

Several racks can be connected via their RS-485 PORTs based on standard Modbus protocol. Each rack should be assigned a different address. The system configuration can be done through one of the RS-485 Ports on the connected rack system.
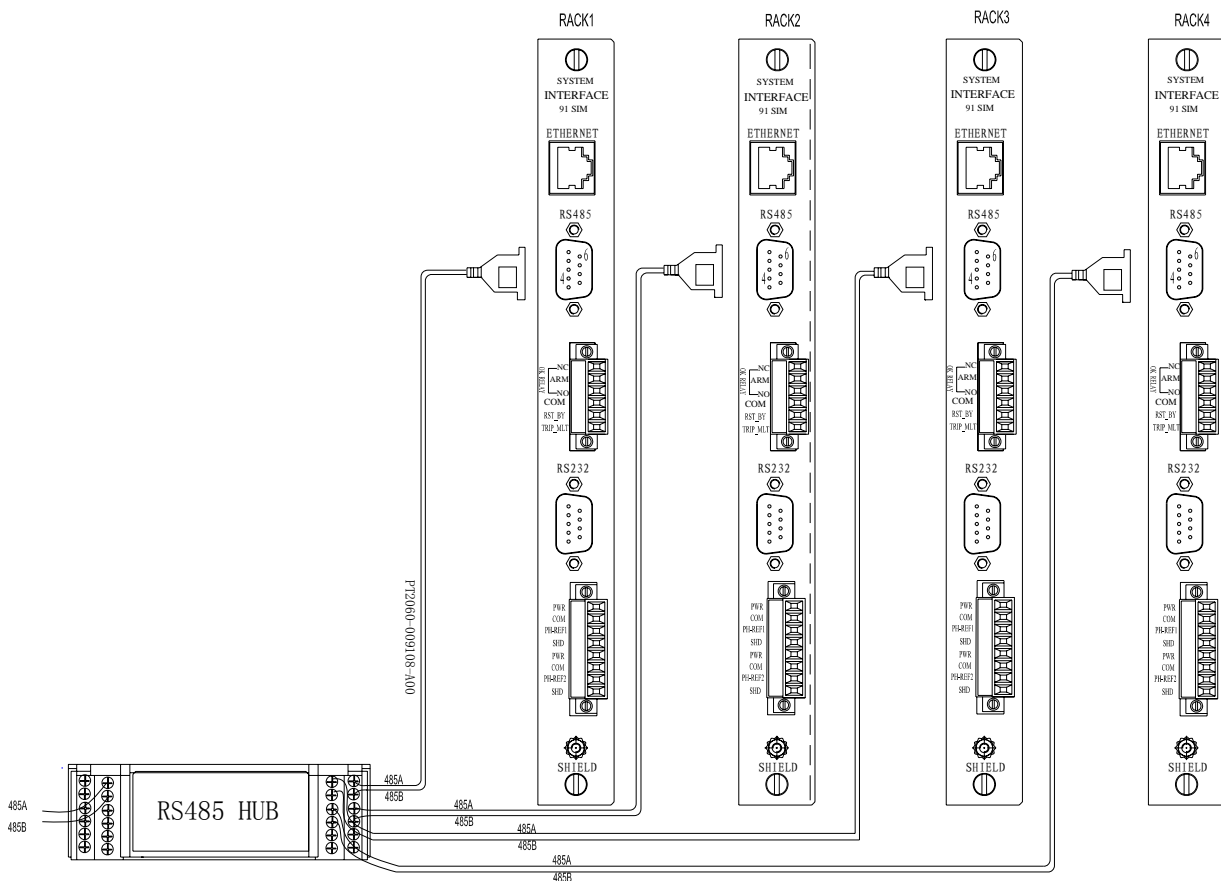

Figure 9

Several racks can be connected via their Ethernet PORTS based on standard Modbus protocol. Each rack should be assigned a different address. The system configuration can be done through one of the Ethernet Ports on the connected Ethernet switch.
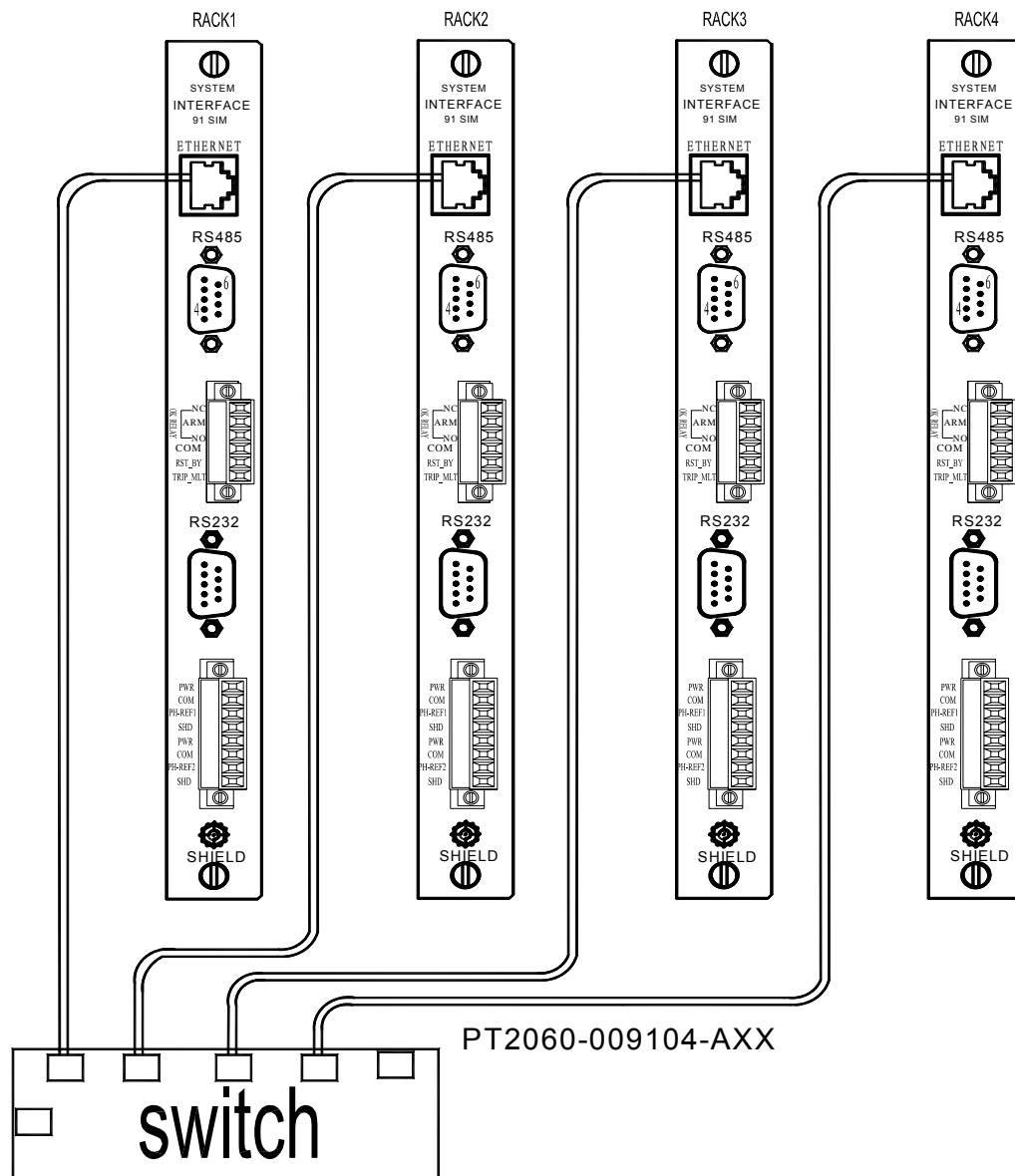

Figure 10

Mapping Modbus Registers

The real address of the dispersed channel measured value can be arbitrarily mapped to continuous virtual register addresses by PT2060-CFG. It improves the communication efficiency and realizes the data monitoring rapidly and perfectly.

Mapping Modbus Registers is a reserved area of the Modbus register map that consists of 512 registers. These registers allow you to assign important status to consecutive registers so that the communication with the PT2060 rack is more efficient and the need for supporting hardware is reduced.

Users can click the channel or slot that you want to configure in the left window, and drag and drop the mouse to the responding virtual address in the right hand window. Consequently, click the Download button when you finish the configuration of registers, assign all dispersed registers to a set of consecutive registers, and get all values from virtual addresses configured expediently. If you want to check the configuration of the modbus registers, you can click the Upload button to get the current configuration of modbus registers.

For example, we can configure Slot3_Channel6's register 30575 to any register between 31501 and 32012 and its Channel's status register 44054 can be also configured to the corresponding register between 45017 and 45272. Please refer to the following picture.
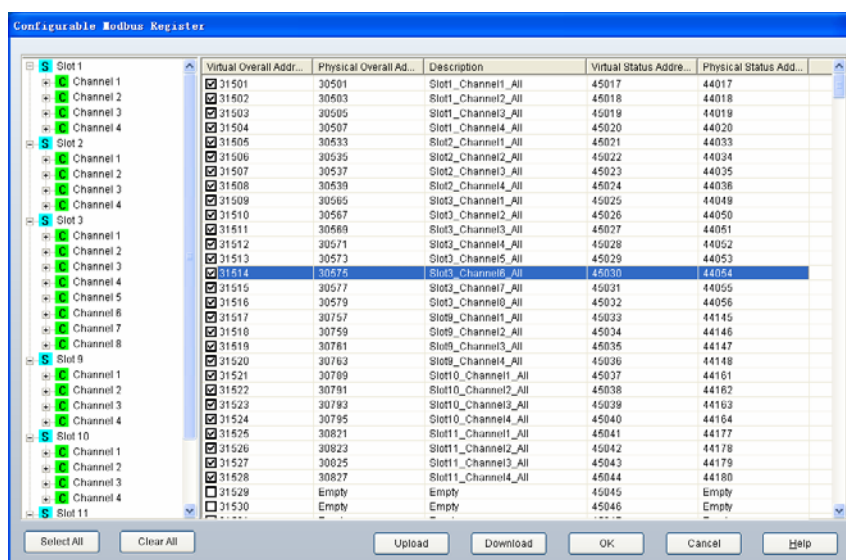

Figure 11

Configure a Communication interface Module by using the PT2060 Rack Configuration Software to complete the following tasks:

✓ Set the communication parameters for the ports on the System interface Module.
✓ Assign data from rack modules to reserved addresses (Configurable Modbus Registers) in the System interface Module.

Full Scale Data Range

A value between 128 and 16384 is the maximum value in the full-scale range. The Current Proportional Values and the Primary Values will be scaled between 0 and the selected value and the result will be given via modbus. The default is 16384.
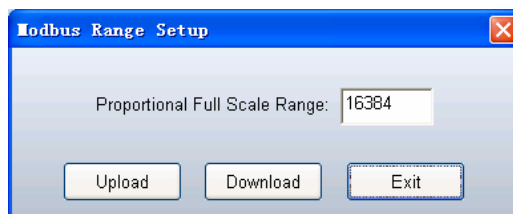

Figure 12

Overall = Modbus Output (full scale high – full scale low) / Proportional full scale range + full scale low.

or example, for a monitor channel that is operating as shown in the following table

Parameter	Value
Direct Full-scale range	0 – 10 mil
Modbus output	8192
Proportional Full-scale Range	16384

Calculate the output as follows:

$$\text{Overall} = 8192 * (10 – 0) / 16384 + 0 = 5 \text{ mil}$$

As another example lets say that we have a range of 0-10mils and we are reading 4 mils. Then we can say that:

Parameter	Value
Direct Full-scale range	0 – 10 mil
Overall	4 mil
Proportional Full-scale Range	16384

Output = Full scale range * (overall – full scale low) / (full scale high – full scale low)

$$\text{Output} = 16384(4-0)/(10-0)$$
$$= 16384 (0.4)$$
$$= 6553.6 \text{ (or 6554)}$$

So the value sent to the PLC will be 6554.

Parameter Setting for the Dual Channels Phase Reference

Phase reference works in two modes, manual and auto.

Channel Parameter setup:

Channel No

PT2060/91 SIM system interface module has two phase reference channels. Choose any one to configure.

Channel Enable

This check box enables or disables a phase reference channel. If no phase reference transducer is connected to this channel, then this box should be unchecked.

Trigger voltage

The Trigger Value is the nominal voltage that the peak-to-peak swing of the sensor's signal is centered about. If Auto threshold is selected, the module will automatically determine the peak-to-peak swing of the sensor's signal and set the Trigger value to the mid point. If Manual Threshold is selected, the user can input the Trigger value for the module to use.

Teeth per cycle

It refers to the teeth number on the gear. The integer 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 an integer between 1 and 255. By default it is1.

Hysteresis voltage

It is 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. By default it is 1V. The User could modify it in the range of 0.5V-2.5V. This item has no relation to shaft vibration measuring.

GAP Value

For proximity probes, this stands for the distance between the top of the probes and the measured surface. Default factory setting of GAP high is -24V, GAP low -1V.

Transducer Degrees

This specifies the transducer location on the machine. The Transducer angle is 0 to 180 degrees left or right , The following figure shows this for horizontal shafts.
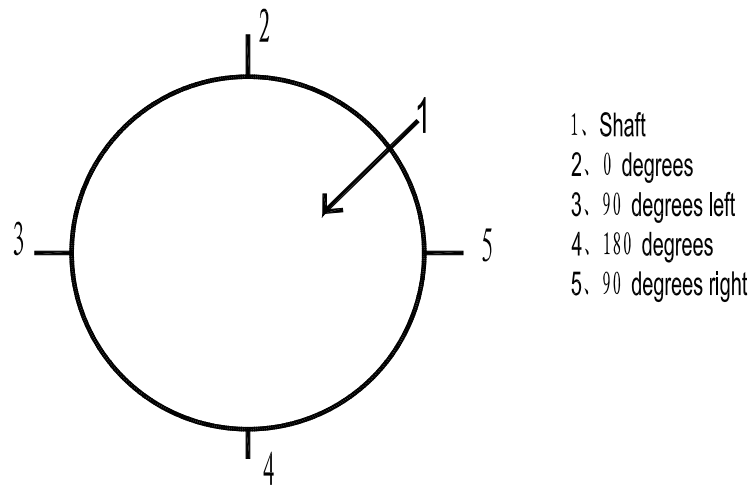
1、Shaft
2、0 degrees
3、90 degrees left
4、180 degrees
5、90 degrees right

Figure 13

Threshold type

For proximity probes, the threshold options can be Auto threshold or Manual threshold. For magnetic pickup, threshold is only Auto threshold.

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 2Vpp and minimum frequency of 2 Hz.

Threshold type

For proximity probes, the threshold options can be Auto threshold or Manual threshold. For magnetic pickup, threshold is only Auto threshold.

Signal Polarity

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

Figure 14

Manual: The trigger threshold is set by the user to any value in the range of -3V to -17 volts. Manual threshold requires minimum signal amplitude of 0.6 VPP.

Figure 15

At first, measure and observe the phase signal which you want to use by oscilloscope, record the maximum voltage and minimum voltage.

Then, calculate the Trigger voltage value. Trigger voltage value = (maximum voltage + minimum voltage) / 2. Select Manual item and choose Channel no. in the window above.

At last, input Trigger voltage value, click Download button to set the parameters.

It is recommended that parameters should be verified after they have been configured.

PT2060/91 Operation

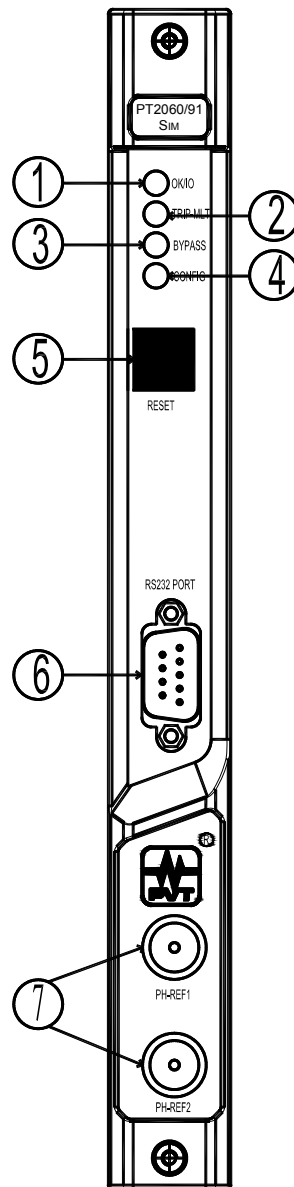# *Views of the Front Panel*

Figure 16

1. **OK/IO LED**

   OK/IO LED will go on when PT2060/91 works well. If OK/IO LED is off, please check probe driver and cable of Phase reference.

2. **TRIP-MLT LED**

   It will go on when system is in Trip-MLT

3. **BYPASS LED**

   It will go on when in BYPASS.

4. **CONFIG LED**

   It will go on when the system is in CONFIG, And OK/IO LED is on but not flashes.

5. **RESET**

   Enable the system reset.

6. **RS-232 port**

   PT2060 should connect with the up-controller by this port.

7. **Phase Reference Output**

   Each channel has one BNC connector. The output is the Original phase reference signal. The output is the phase reference signal for previous version.

I/O Module Description

The PT2060 has two RS-232 ports, an RS-485 port, and an Ethernet port. Via these a computer can communicate with PT2060.

RS-232 ports and RS-485 port uses optical isolators, Ethernet port uses an isolating transformer

This section describes how to use the connectors on the I/O modules and how to wire.

1.   Ethernet

The PT2060 can connect with the Network through the Ethernet port. It supports TCP/IP protocols. RJ45 connector is used in most application.
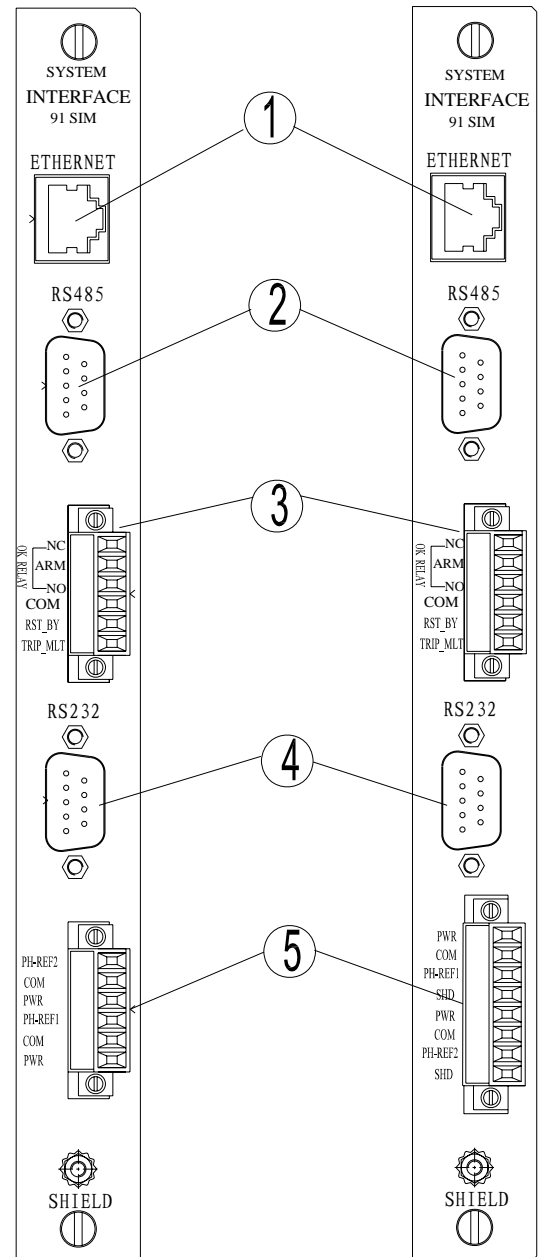
Previous version

Figure 17

2. **RS-485**

The PT2060 can connect with the PT2060-CFG via RS-485. A PT2060 rack has two pairs of RS-485 signals, 485A1-485B1 and 485A2-485B2.

The communication rate is limited by the baud rate selected between the host computer and the PT2060 SIM system Interface module. Connect 485A1 with the Modbus RS-485 I/O converter 485-A, and 485B1 with the Modbus RS-485 I/O converter 485-B. Communication can also be established through 485A2-485B2 pair with the Modbus RS-485 I/O converter.

When connecting the Modbus RS-485 I/O converter to a host device or to another I/O module, the connections are made per the diagram below. See the following table for connector designations.
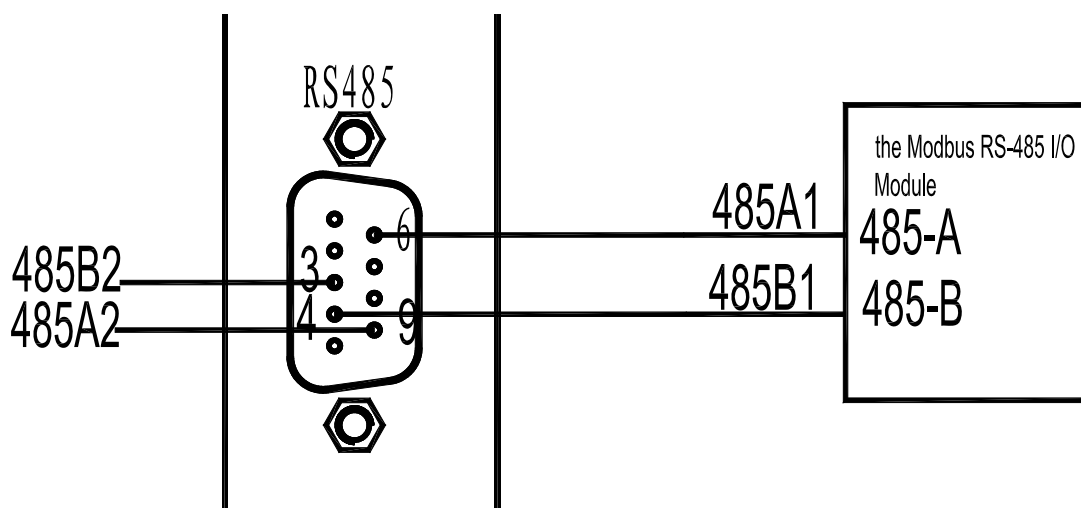

Figure 18

RS-485 port definition:

Pin number(9pin)	Definition
6	485A1
4	485B1
9	485A2
3	485B2
5	COM

3. **TRIP-MLT alarm, BYPASS and OK RELAY**

Activate the TRIP-MLT alarm and BYPASS by shorting the respective contact to COM.

The OK Relay is normally energized and is used to indicate whether the PT2060 Monitoring System is

---

ProvibTech   Phone: +1-713-830-7601 Fax: +1-281-754-4972   sales@provibtech.com , www.provibtech.com

OK. The OK relay will change state with the failure of any module.

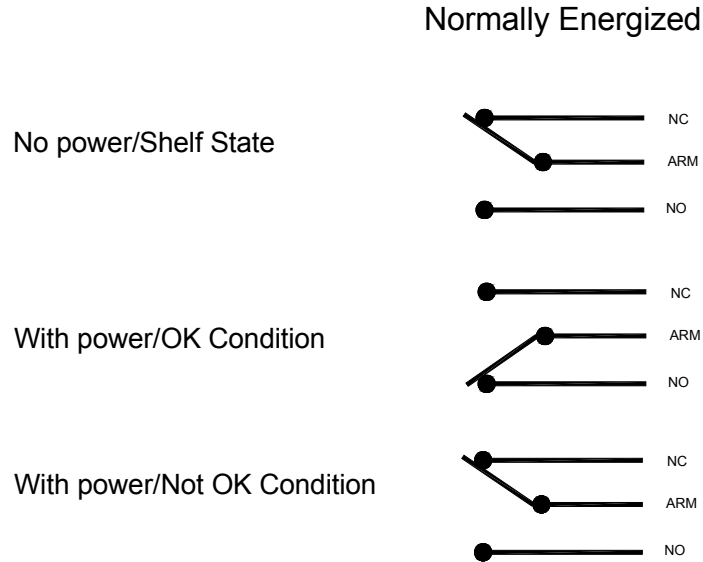The following diagrams show the different ways the OK Relay can be wired:

Normally Energized

No power/Shelf State

NC
ARM
NO

With power/OK Condition

NC
ARM
NO

With power/Not OK Condition

NC
ARM
NO

Figure 19

NO	Normally Open.
ARM	Armature.
NC	Normally Closed.

COM	Common
RST_BY	Enable Hardware Bypass status (restrain the alarm of Alert and Danger) when it is in contact with COM
TRIP_MLT	Enable the Trip Multiply function (set up using PT2060 Configuration Software) when it is in contact with COM.

OK RELAY
NC
ARM
NO
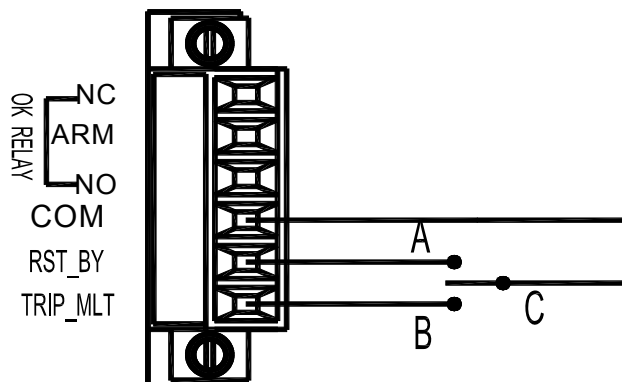COM
RST_BY
TRIP_MLT
A
B
C

Figure 20

4. RS-232

The PT2060 can connect with the upper level controller via RS232. The cable will go between the RACK RS-232 connector on PT2060 System rack and the HOST computer.

The communication rate is limited by the baud rate selected between the host computer and the PT2060 SIM system Interface module.
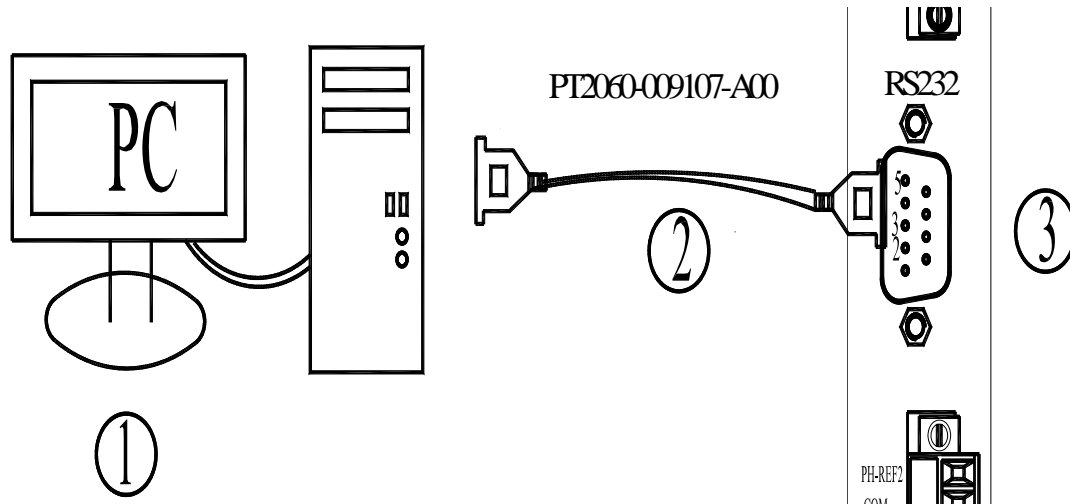

Figure 21

1) The Host Computer
2) Cross serial cable
3) RS-232 Port

RS-232 port definition:

Pin number(9pin)	signal	Name
2	RX	Receiving
3	TX	Transmitting
5	COM	Common reference

5. Phase reference input port

The PT2060/91 has two phase reference input channels as shown below. Phase reference outputs can be observed with an oscilloscope from the BNC which is fixed in the front panel. Figure 22 is for previous version.
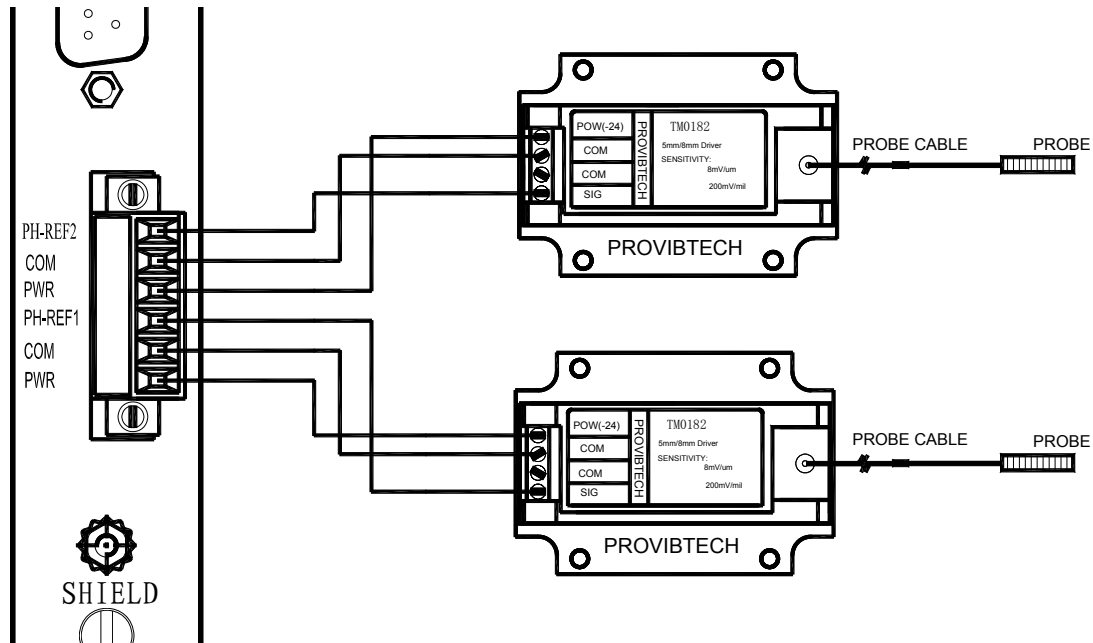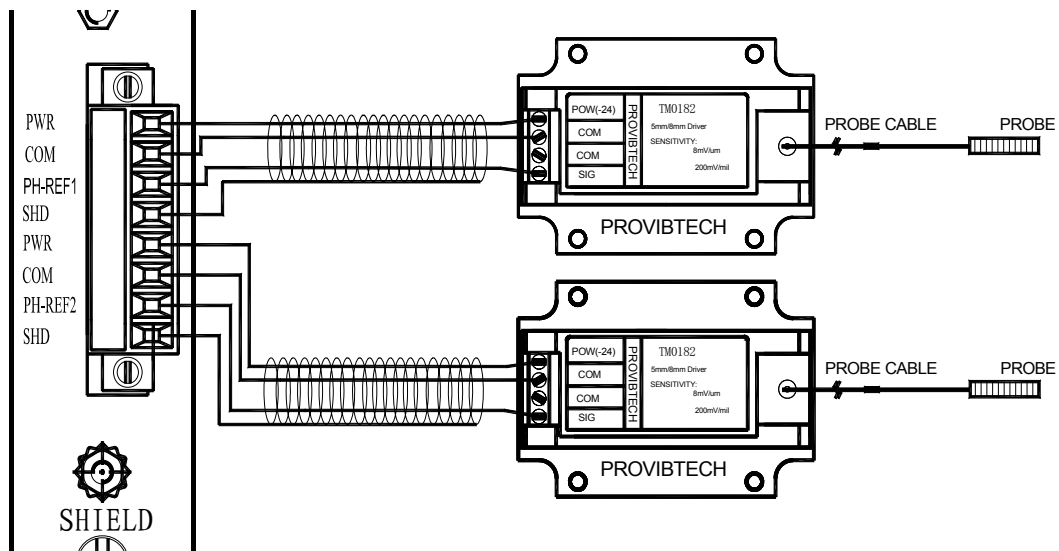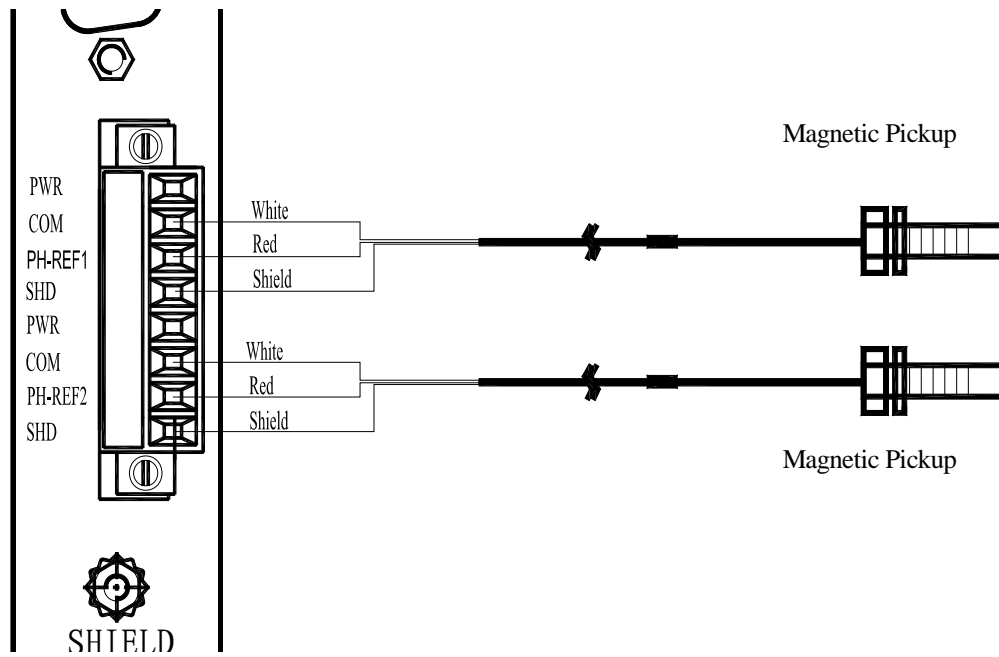
Figure 22

Figure 23

Figure 24

Protocols

Modbus Protocol

Register Map

This section describes the function codes, addressing notation, and registers supported by the Communication Module.

Supported Function Codes

Modbus Function Code		Communication Module Data
Code	Meaning	
02	Read Input Status	Rack, Module, and Channel Status
03	Read Holding Registers	Full-scale Data Range, Module Type ,Password Setup Success, Get time from the Monitor
04	Read Input Registers	Overall and GAP Voltage, Time for the Last Reading
06 And 16	Preset Single Register And Preset Multiple	Channel Configuration, Monitor Trip Multiply, Monitor Alarm Inhibit, Monitor Reset, Communication Baud-rate, Stop Bit, Parity Bit, IP Address Setup Monitor Time and Date ,Password Setup
17	Report Slave ID	Family ID

Register allocation

Data Type	Function Code	Format of the request address (0 is the base)	Address allocation MODBUS format (1 is the base)
Overall and GAP Voltage	4	500-1011	30501-31012
Time for the Last Reading	4	1012-1018	31013-31019
Module Status	2	10-137	10011-10138
Channel Status	2	138-2185	10139-12186
Rack Status	2	2186-2193	10187-12194
Channel Configuration	6	0-1	40001-40002
Password Setup Success	3	11	40012
Get time from the Monitor	3	80-86	40081-40087
Monitor Trip Multiply	6	94	40095
Monitor Alarm Inhibit	6	95	40096
Monitor Reset	6	96	40097
Success of the Last Command	3	100-112	40101-40113
Full-scale Data Range	3,6	113	40114
Input Control Password	16	173-176	40174-40177
Real-time Value (virtual register)	4	1500-2011	31501-32012
Channel Status (virtual register)	3	5016-5271	45017-45272
Repeated Channel Status	3	4016-4271	44017-44272
Repeated Overall and GAP Voltage	3	1000-1512	41001-41512

Status List

Signal module's status (Read Only)

  Address: 10139 - 12186

  Channel's first address=10139+128(slot-1) + 8(ch-1)

Each slot takes up to 128 data address. Each module can have up to 16 channels.

Each channel takes up to 8 data address that is 8 status.

  Slot = 1-16

  Ch = 1-16 (channel)

  Example: In First channel at first slot (Slot 1 Ch 1).

10139=0/1	OK/NOT OK
10140=0/1	NOT Alert/Alert
10141=0/1	NOT Danger/Danger
10142=0/1	NOT Bypass/Bypass
10143=0/1	NOT Trip Multiply/Trip Multiply
10144=0/1	NOT Off/Off
10145=0/1	Gap Ok/Gap Not Ok
10146	Un-used

Status parameter:

NOT OK:	channel not working right
Alert:	channel in the first alarm status (alert)
Danger:	channel in the second alarm status (danger)
Bypass:	channel is in bypass status. Alarms will not be engaged (inhibit)
Trip Multiply:	the set point of the alarms has been increased to double or triple depend on configuration
Gap not ok:	the sensor is not working properly

Bit	Channel Statuses
0	Channel not OK
1	Channel Alert / Alarm 1
2	Channel Danger / Alarm 2
3	Channel In Bypass Mode
4	Channel Trip Multiply Mode
5	Channel Off
6	Channel Gap
7	----

ProvibTech Phone: +1-713-830-7601 Fax: +1-281-754-4972 sales@provibtech.com , www.provibtech.com

34

Starting Addresses for Channel Statuses

PT2060 Rack Slot Number	Modbus PC Format	Query Format
1	10139	138
2	10267	266
3	10395	394
4	10532	531
5	10651	650
6	10779	778
7	10907	906
8	11035	1034
9	11163	1162
10	11291	1290
11	11419	1418
12	11547	1546
13	11675	1674
14	11803	1802
15	11931	1930
16	12059	2058

Signal module status (Read Only)

Address: 10011- 10138

Total 256 address. Each module takes up to 8 addresses (8 status)

First address on each module = 10011+8(slot-1)

Slot = 1-16

Example: status of the first module

10011=0/1	OK/NOT OK
10012=0/1	NOT Alert/Alert
10013=0/1	NOT Danger/Danger
10014=0/1	NOT Bypass/Bypass
10015=0/1	NOT Trip Multiply/Trip Multiply
10016=0/1	NOT Off/Off
10273=0/1	Gap Ok/Gap Not Ok
10274	Un-used

Status parameter:

NOT OK: module is not working properly.

Alert: some channels on the module are in the first alarm (alert).

Danger: some channels on the module are in the second alarm (danger).

Bypass: some channels are under bypass (alarm-inhibit).

Trip Multiply: the alarm set-point has been doubled or tripled.

Off: some channels are not working.

Gap Not Ok: some sensors are not working properly.

Rack monitor address (Read Only)

12187 =0/1	OK/NOT OK
12188 =0/1	NOT Alert/Alert
12189 =0/1	NOT Danger/Danger
12190 =0/1	NOT Bypass/Bypass
12191 =0/1	NOT Trip Multiply/Trip Multiply
12192 =0/1	NOT Off/Off
12193 =0/1	Gap Ok/Gap Not Ok
12194	Un-used

Status parameter:

NOT OK: module is not working properly.

Alert: some channels on the module are in the first alarm (alert).

Danger: some channels on the module are in the second alarm (danger).

Bypass: some channels are under bypass (alarm-inhibit).

Trip Multiply: the alarm set-point has been doubled or tripled.

Off: some channels are not working.

Gap Not Ok: some sensors are not working properly.

Rack monitor parameter list

Channel Setup

REG=40001[bit15-0] =1-17: Slot

REG=40002[bit15-0] =1-16: Channel

Password Setup OK

REG=40012[bit15-0] =0-3: password information

0: Not Ok   1: OK

Time and Date (Read Only)

Enquiry for the time and the date of the monitor

REG=40081[bit15-0] =0-99: year

REG=40082[bit15-0] =1-12: Month

REG=40083[bit15-0] =1-31: Day

REG=40084[bit15-0] =0-23: Hours

REG=40085[bit15-0] =0-59: minutes

REG=40086[bit15-0] =0-59: Seconds

REG=40087[bit15-0] =0-100: 1/100 second

Trip Multiply (Read/Write)

REG=40095[BIT15-0] =0: Rack Not Trip Multiply

REG=40095[BIT15-0] =1: Rack Trip Multiply

Alarm Inhibit (Bypass) (Read/Write)

REG=40096[BIT0] =0/1: Alarm/Alarm bypass

Monitor Reset (Write Only)

REG=40097[BIT0] =0/1: Alarm not reset /alarm reset

Full Scale Range

REG=40114[bit15-0] = 4096~16384

A value between 4096 and 16384 that is the maximum value in the full-scale range. The Current Proportional Values and the Primary Values will be scaled between 0 and the selected value.

Input Control Password: Total 8 Registers（Write Only）

REG=40174-40177;

    40174[bit15-8] = ASCII Code //first ASCII code of control password of rack

    40174[bit7-0] = ASCII Code //second ASCII code of control password of rack

    40175[bit15-8] = ASCII Code //third ASCII code of control password of rack

    40175[bit7-0] = ASCII Code //fourth ASCII code of control password of rack

    40176[bit15-8] = ASCII Code //fifth ASCII code of control password of rack

    40176[bit7-0] = ASCII Code //sixth ASCII code of control password of rack

    40177[bit15-8] = ASCII Code //seventh ASCII code of control password of rack

    40177[bit7-0] = ASCII Code //eighth ASCII code of control password of rack

Overall and Gap voltage (Read Only)

address = 30501+32(slot-1)+2(ch-1)+ n

slot： 1-16

ch： 1-16

n： parameters.

0: Overall

1: Gap voltage

Example:

REG=30501: overall of the first channel on the first slot.

REG=30502: gap voltage of the first channel on the first slot.

The unit of the gap voltage is in mV. It can be from 0 to full scale.

The value to PLC = Full scale range * (overall – full scale low) / (full scale high – full scale low)

REG=31013[0-99]: year
REG=31014[1-12]: month
REG=31015[1-31]: day
REG=31016[0-23]: hour
REG=31017[0-59]: minute
REG=31018[0-59]: second
REG=31019[0-100]: 1/100 second
Last Read Proportional Time Stamp

Last Read Proportional Value or Status Time Stamp Address		Field Name	Code Range	Notes
1012	31013	Year	00 -99*	Months are in sequential order (e.g. 1 = Jan)
1013	31014	Month	1 - 12	
1014	31015	Day	1 - 31	
1015	31016	Hour	0 - 23	
1016	31017	Minute	0 - 59	24-hour clock: 12 = Noon and 00 = Midnight
1017	31018	Second	0 - 59	
1018	31019	1/100 Second	0 - 99	
* Year = 00 implies the year 2000				

Real-time Value (Virtual register)

The Real-time Value (Virtual register) can be mapped arbitrarily by The PT2060 CFG, The real address of the dispersed channel measured value can be configured in the continuous virtual register address via PT2060-CFG, in order to increase communication efficiency.
REG=31501 [bit15-0] - REG=32012 [bit15-0]

Channel Status (Virtual register)

REG=45017 [bit15-0] - REG=45272 [bit15-0]
Channel Status (Virtual register) can be mapped arbitrarily by PT2060-CFG, For the convenience of the user the real address of channel status can be configured in the continuous virtual register address via PT2060-CFG..

Repeated Channel Status

The repeated data registers contain duplicated data in different registers for some Modbus devices that only support the 4XXXX series registers, so that we can get channel status data expediently.

Repeated Overall and GAP Voltage

The repeated data registers contain duplicated data in different registers for some Modbus devices that only support the 4XXXX series registers, so that we can get Overall and GAP Voltage expediently.

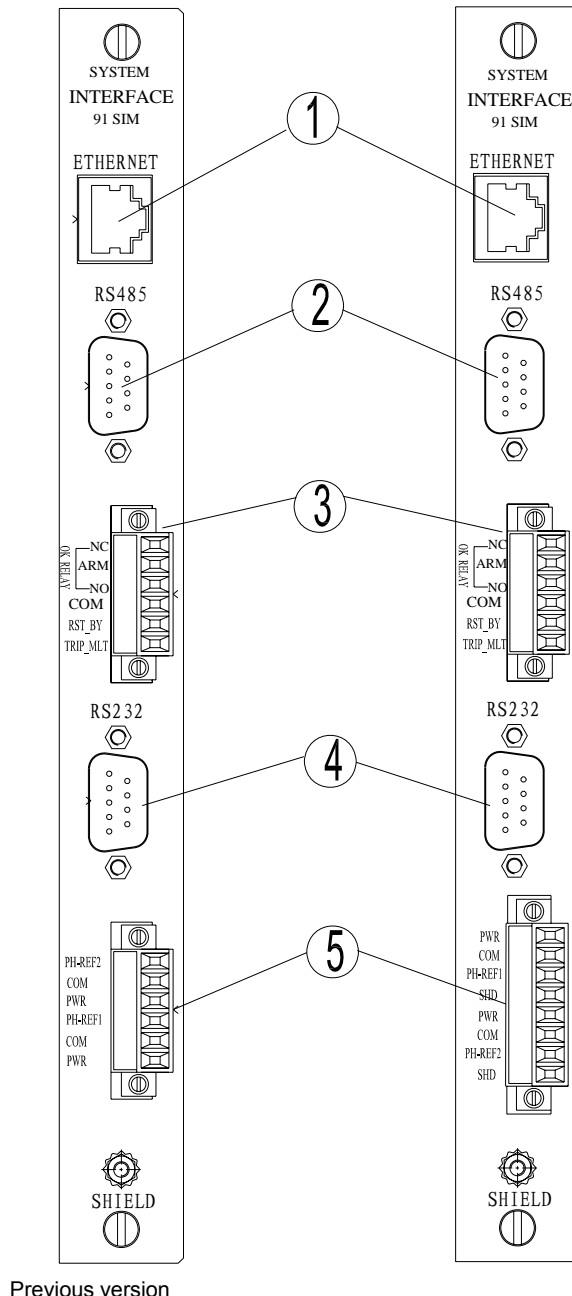# Hardware Module Operation

PT2060/91 Field-wiring Diagram

Common industry interfaces are provided on the back panel. Figure 25 is the diagrammatic sketch.

1. **Ethernet**

   It is used to connect PT2060 with the Network.

2. **RS-485**

   It is used to connect PT2060 could connect with the up-controller.

3. **TRIP-MLT alarm, BYPASS and OK RELAY**

   Affect the TRIP-MLT alarm and BYPASS by this.

   The OK Relay is normally energized and is used to indicate whether the PT2060 Monitoring System is OK.

4. **RS-232**

   This is used to connect PT2060 with the upper-controller.

5. **Reference input port**

   PT2060/91 has two phase reference input channels as shown above.

Previous version

Figure 25

Field-wiring Diagram for PT2060/91

Modbus TCP:

Please refer to the following diagram, connect all rack Ethernet Ports with Switch, and connect PC's Ethernet Port with Switch. Communication can be established via different IP Addresses.

PT2060 default setting:

IP Address setting:	192.168.1.211
Subnet Mask setting:	255.255.255.0
Gateway Address setting:	192.168.1.1
Rack Address setting:	PT2060/91 module's default Rack Address is 1

The user can use the Ethernet direct communication Cable (PT2060-009105) to connect PLC, DCS, or PC with PT2060. One end shall be connected to PLC, DCS, or PC, and the other end connected to PT2060 SIM system Interface module. Configure the PC of the user as following:

First, right click *my network places* on the desktop, select *properties* to open a *Local*
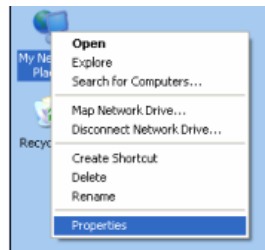
figure 26

Area Connection Window and right click *Local Area Connection*,
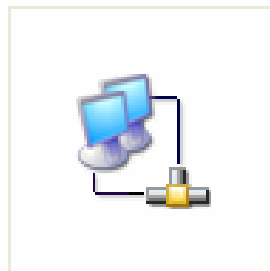
Local Area Connection

Figure 27

select *properties* to open *Local Area Connection*'s window,
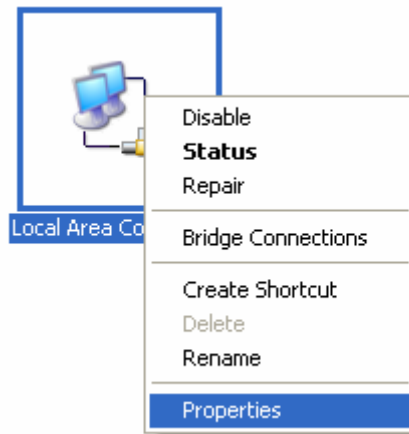
Figure 28

select *internet Protocol(TCP/IP)* , click the *Properties* button,
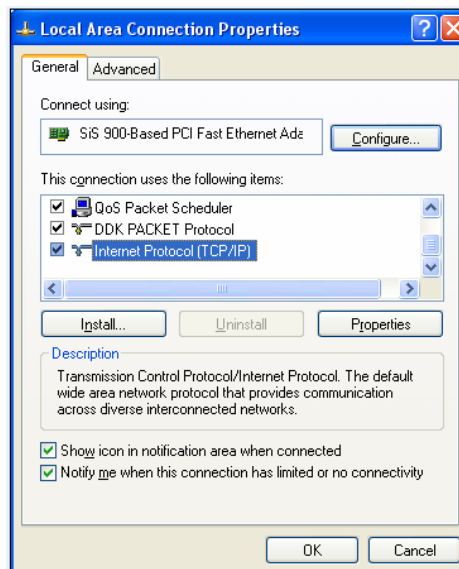
Figure 29

Set the following parameter,
IP Address setting: 192.168.1.XXX （1-254）
Subnet Mask setting: 255.255.255.0
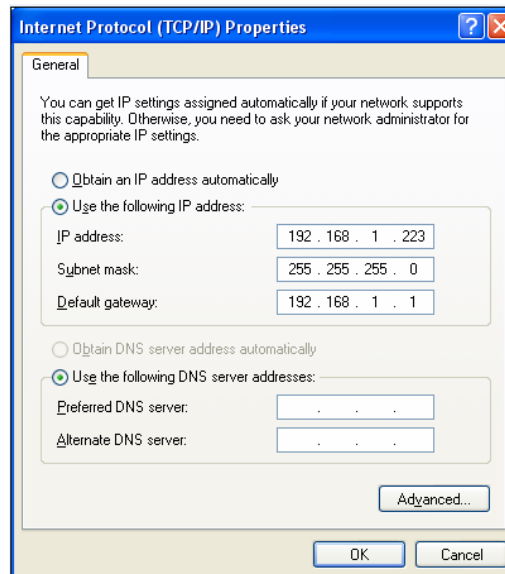Gateway Address setting: 192.168.1.1

Figure 30

Click the *OK* button to finish the configuration. Open PT2060-CFG, choose Modbus-TCP option, so that communication can be established between PLC, DCS or PC and PT2060. Several racks can be connected via Ethernet switch (PT2060-009100) and Ethernet internet Cables (PT2060-009104). Each rack should be assigned a different address. The system configuration can be done through one of the Ethernet Ports of the Switch on the connected rack system.
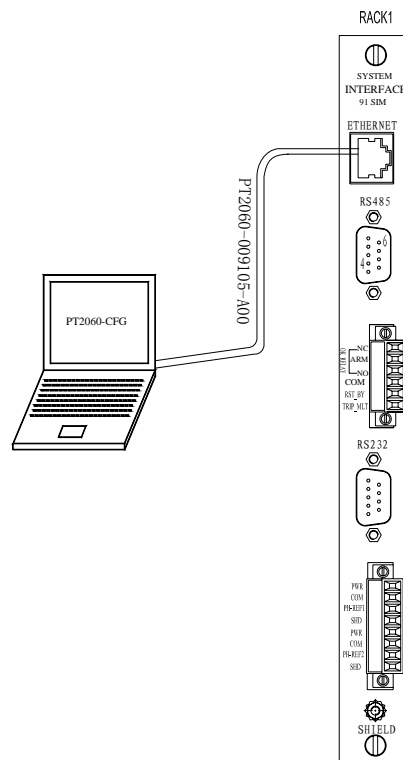
Figure 31

Modbus TCP for DCS, PLC communication

PLC OR DCS
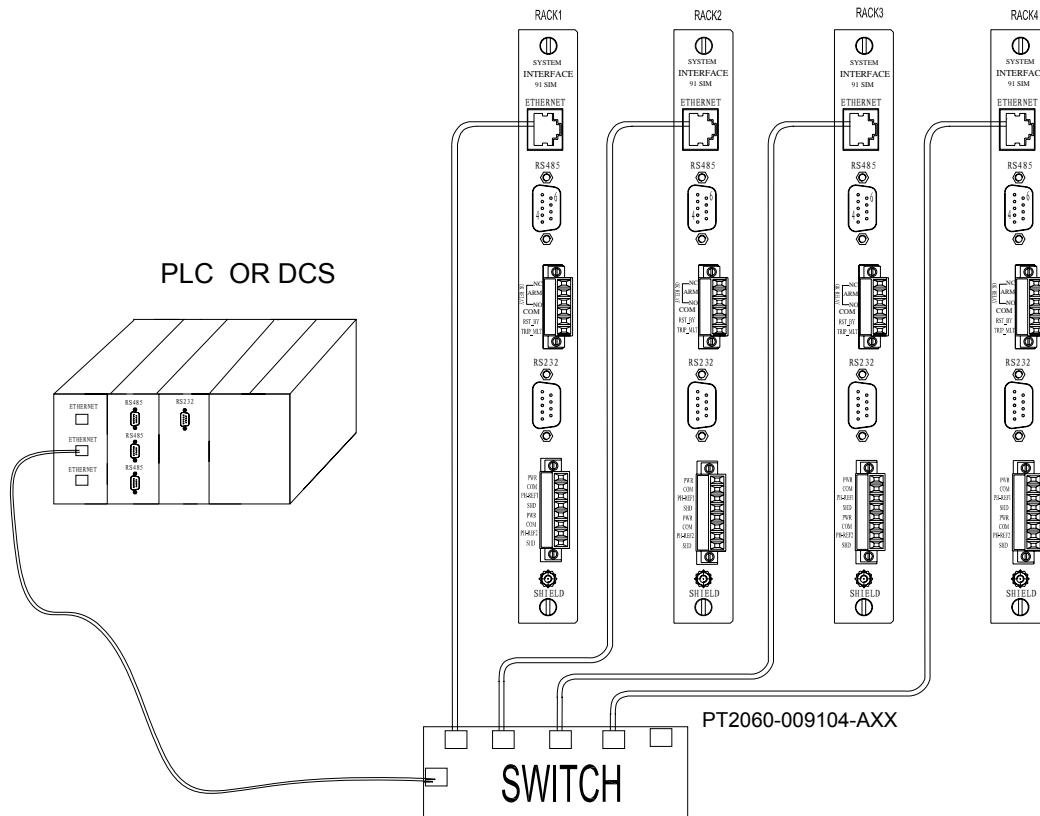
Figure 32

Modbus RS-485 for DCS, PLC communication
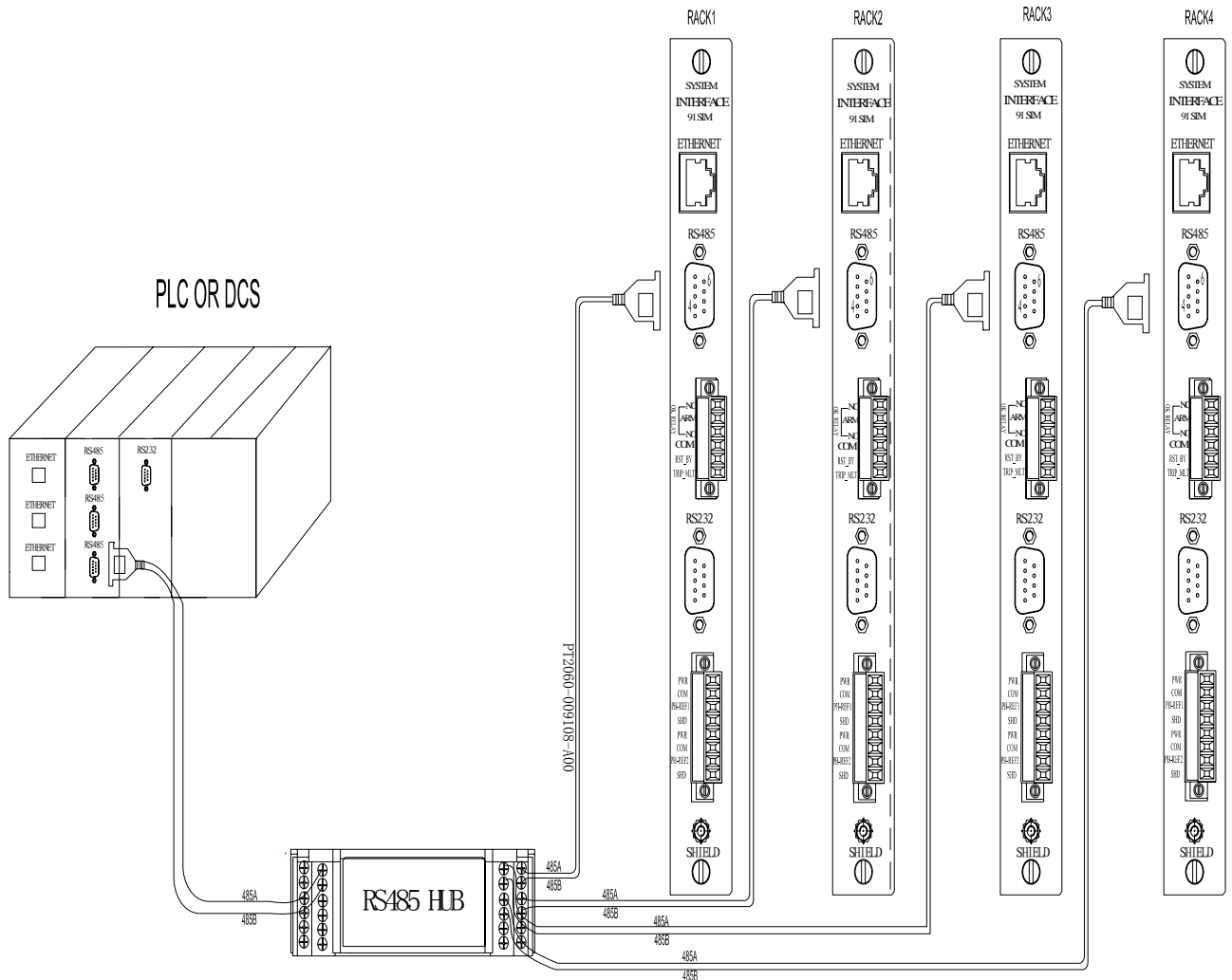
Figure 33

Modbus RS-232 for system configuration

The user can connect one PT2060/91 SIM system Interface module via RS-232 Port. For more details refer to the following diagram. The user can choose USB to RS-232 Converter (PT2060-009102) to connect PC with PT2060, and use serial communication Cable (PT2060-009107), one end connected to RS-232 Converter, and the other end connected to PT2060 SIM system Interface module. The communication rate is limited by the baud rate selected between the host computer and the first PT2060 SIM system Interface module. It can be established through PT2060-009102. Open PT2060-CFG, to configure information of PT2060.
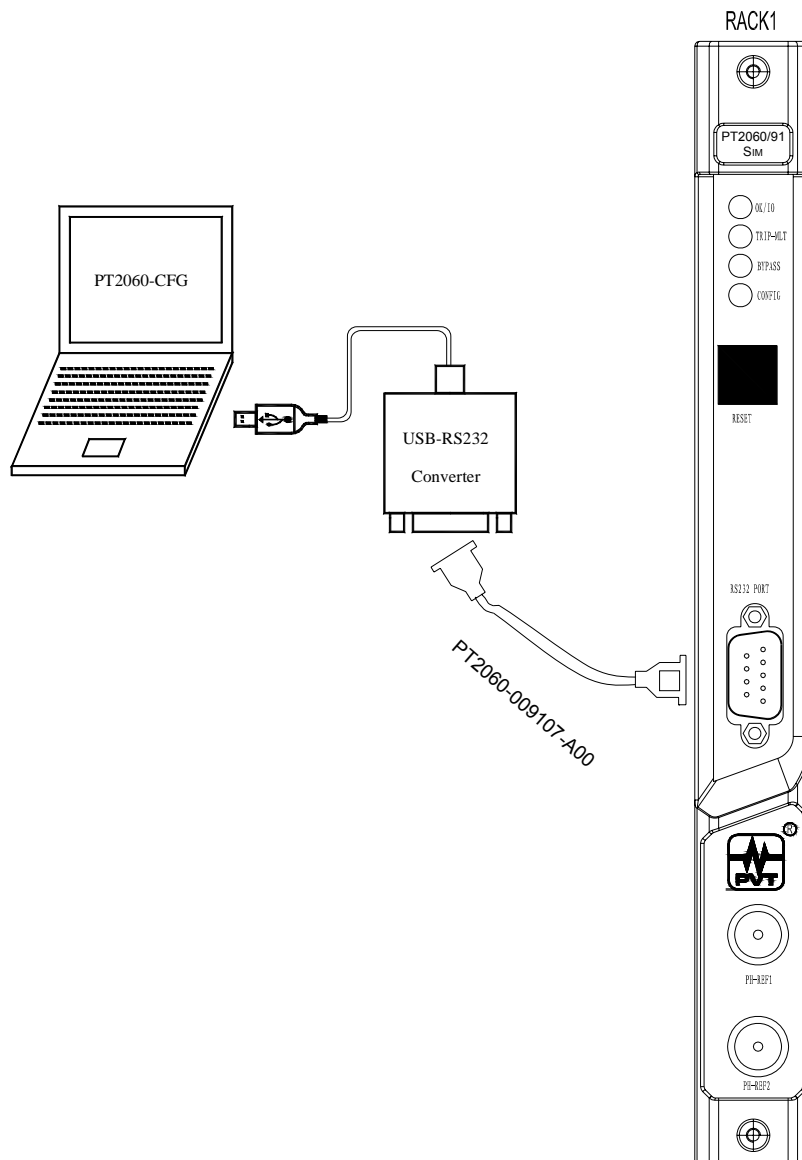

Figure 34

TRIP-MLT，BYPASS

The hardware will be in BYPASS when the A is connected with C and TRIP-MLT when B is connected with C.
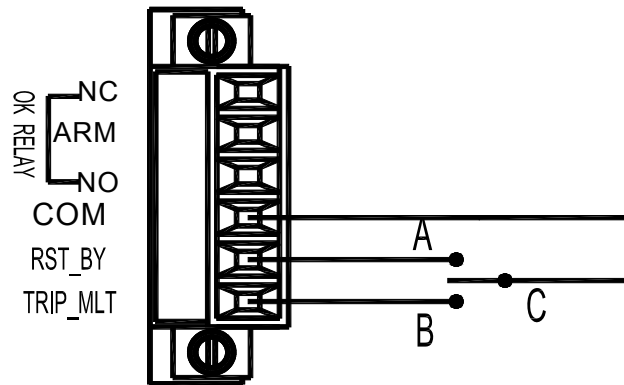

Figure 35

There are two Phase reference input ports in PT2060/91 as shown in the following figure. Phase reference signals of the two channels are input from this two ports. The method of the transducer connection is shown in the following figures. Figure 36 is for previous version.
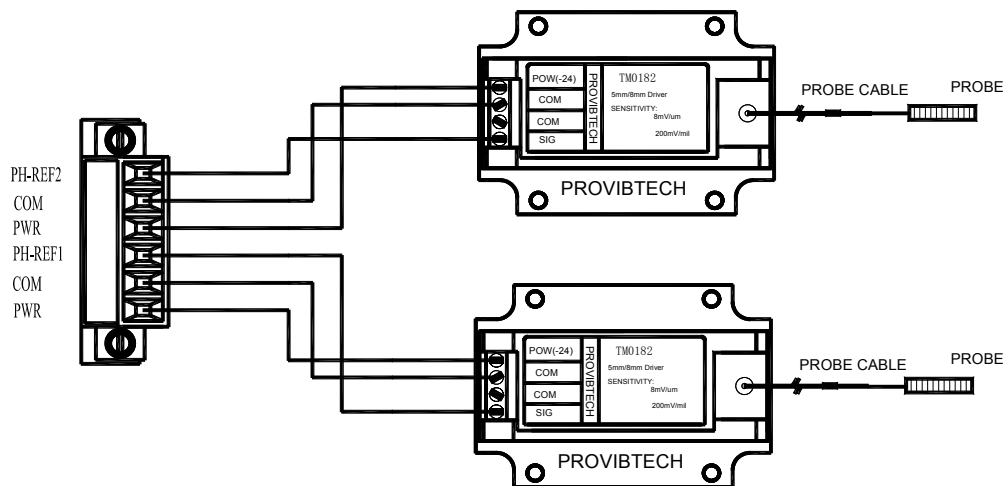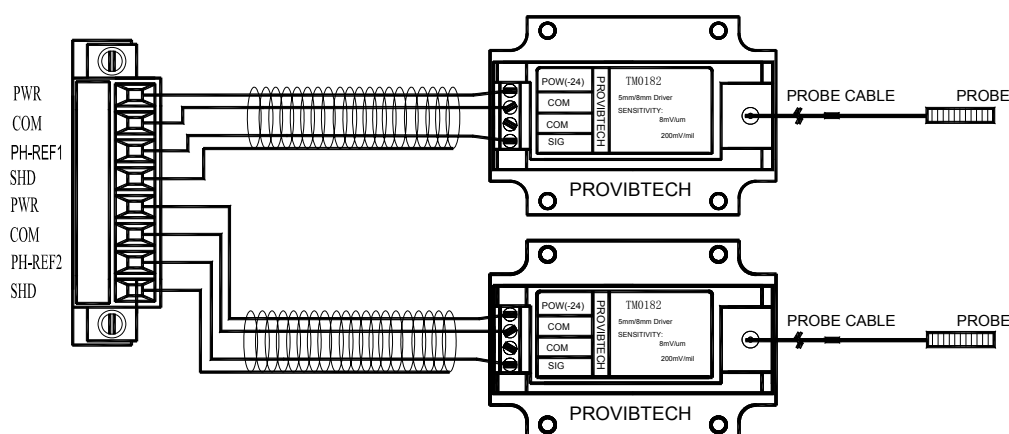

Figure 36

Figure 37

List for available transducers：

Proximity probes	TM0180/5m TM0180/9m TM0105/5m TM0105/9m
magnetic pickup	TM0605

Jumper for transducer selection (nonsupport for previous version).

Phase reference channels accept two different transducers, Proximity probes or magnetic pickup. Each can be selected by setting the Jumper which is fixed on the front panel. As the following figure shown, jumper S901 is for the first channel, S903 is for the second channel. The factory default is Proximity probes.

Following are basic steps for jumper setting:

1   Make sure the power is off, remove the front panel from PT2060 rack.
2   Remove the aluminum cover of the front panel.
3   Setup the jumpers. Short circuit (left side) is for Proximity probes, right side is for magnetic pickup.
4   Re-assembly the aluminum cover and insert the front panel into PT2060 system.
5   Power on, and change the response phase channel's parameters base on hardware configuration.
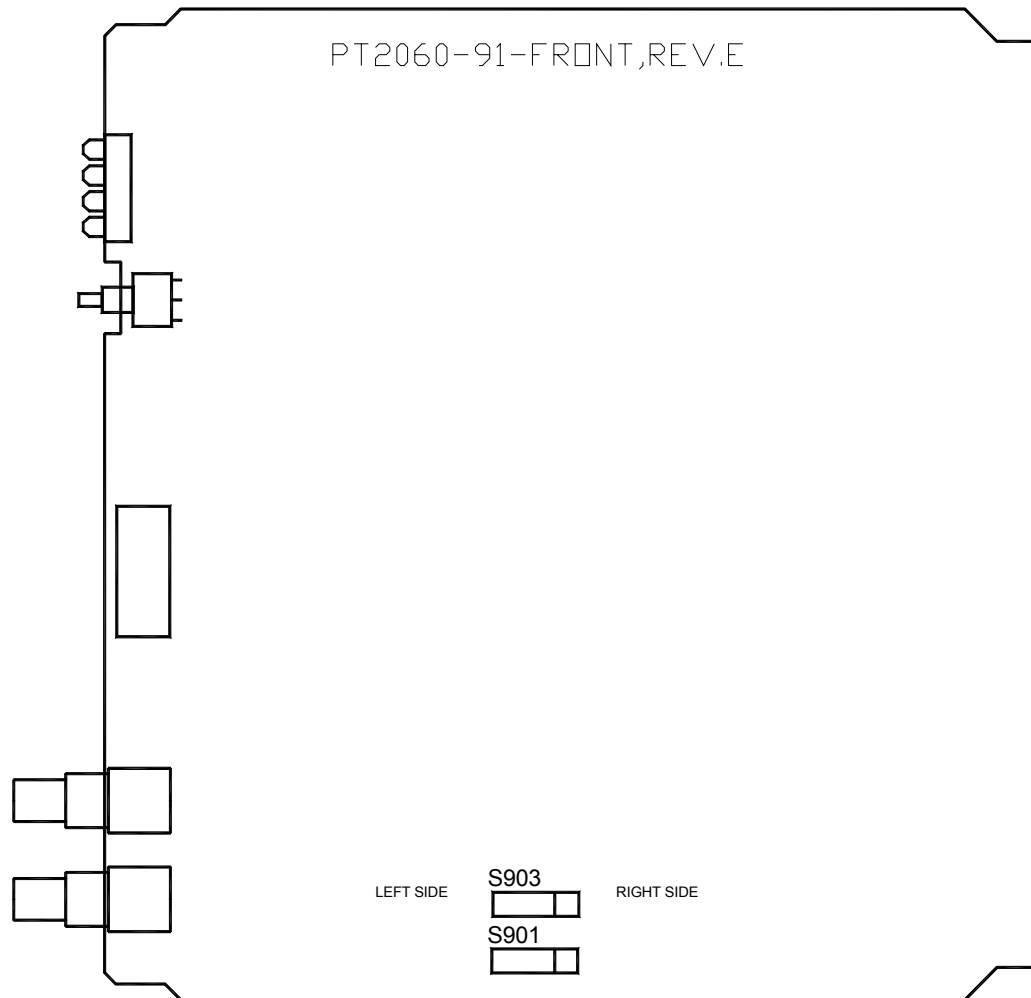6   The operation is completed.

Field-wiring Diagram for Phase Reference in Hazardous Area Application

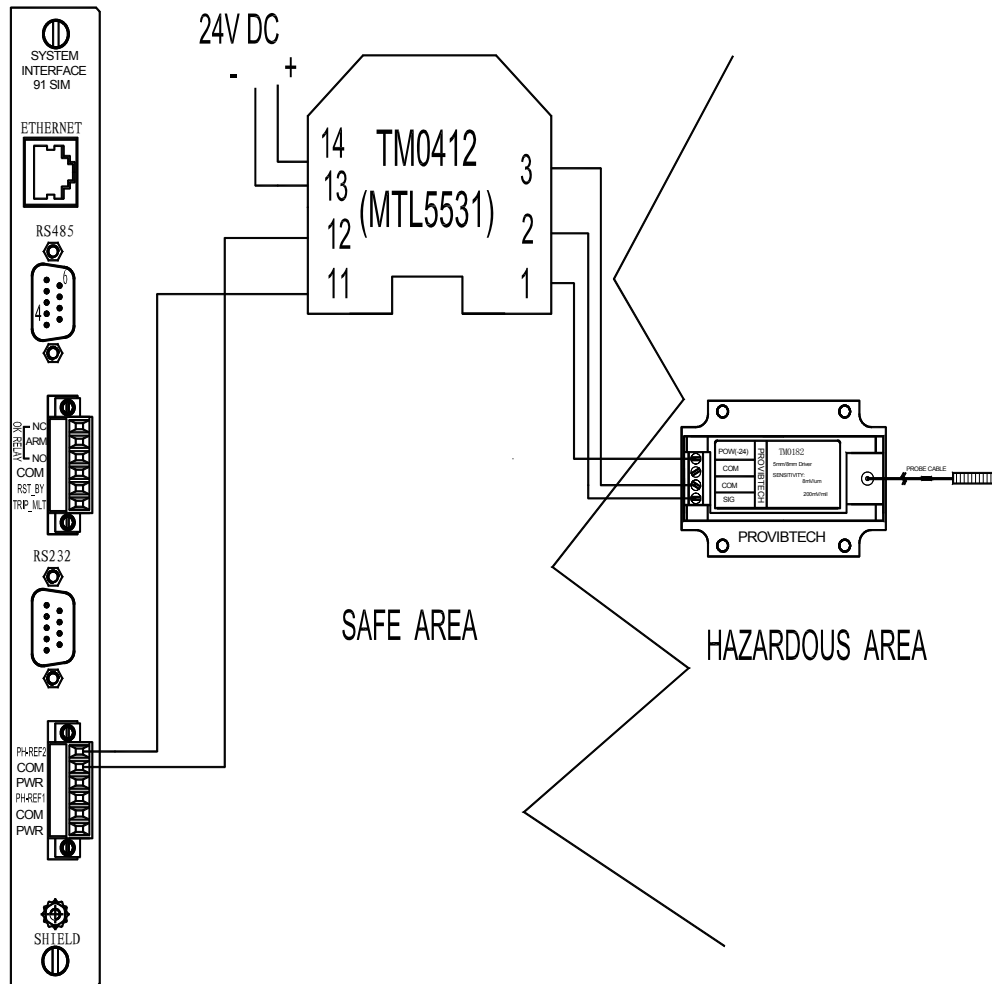Figure 39 Previous version

Figure 40

Maintenance

This section describes how to verify that the SIM system Interface module and the I/O modules are operating correctly.

Periodic Maintenance

We recommend that the machine should be maintained every year. The procedure is described as follows.

Preparation Work

Tool Preparations

The following instruments are needed for PT2060/91 SIM System Interface Module maintenance:
- ✓ Personal computer
- ✓ One digital Multimeter
- ✓ One Signal generator
- ✓ One oscilloscope
- ✓ Some terminals
- ✓ Cross Serial Communication Cable
- ✓ Ethernet Cross Cable
- ✓ RS-232 or RS-485 device

Build of the Maintenance Environment

Typical maintenance environment can be built by these steps.
1. Make terminals
   Refer to appendix for the method to make terminals.
2. Install the software PT2060 System Configuration on a PC.
3. Save PT2060 configuration settings 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 settings must be uploaded and saved before performing any modification to it and restore it after maintenance has been done!

---

4. Connect PC serial port to PT2060 with a communication cable.
5. Get the signal generator and the oscilloscope ready.
6. Get multimeter ready.

ProvibTech   Phone: +1-713-830-7601 Fax: +1-281-754-4972   sales@provibtech.com , www.provibtech.com

Software Preparation

On powering on, the system will upload PT2060 configuration settings automatically via the PT2060/91 SIM system interface module. This can also be done by clicking the Upload button. After finished setting parameters, click the button Download to send data to PT2060 or save to a file.

PT2060 Phase Reference Testing

Instruments: a signal generator, an oscilloscope, a multimeter, a personal computer, PT2060-CFG software, two electrolytic capacitor of 2200µF/35V, two potential meters of 10kOhm, a cross serial cable(PT2060-009107-A00), a USB to RS-232 converter and a USB to RS-485 converter.

Communication mode: RS-232 or RS-485(only one at a time)

Testing steps:

✓ If RS-232 is chosen, please connect PT2060 system interface module to a PC with a cross cable. If RS-485 is chosen, connect PT2060 system interface module to a PC through a USB-RS-485 converter.

✓ Input Phase reference signal: For the details to connect the phase reference terminal, please consult appendix for details.

✓ Use PT2060-CFG to configure phase reference parameters. Typical setting are:

Trigger voltage: -10v
Teeth per cycle: 1
Hysteresis voltage: 1v
Threshold type: Auto

Download the parameters to the module. Adjust the frequency of the input signal (1-3kHz) and observe the buffered output with an oscilloscope. If the frequency of buffered output varies with the input signal, and display accurate speed via PT2060-CFG, it means the phase reference is working correctly.
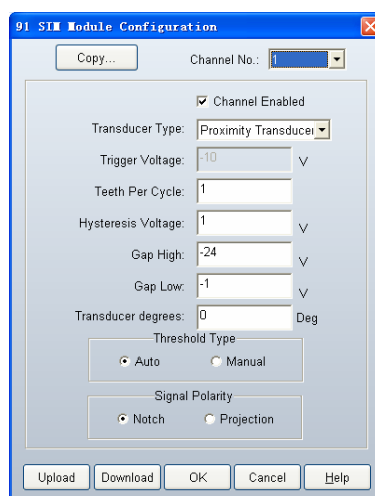

Figure 41
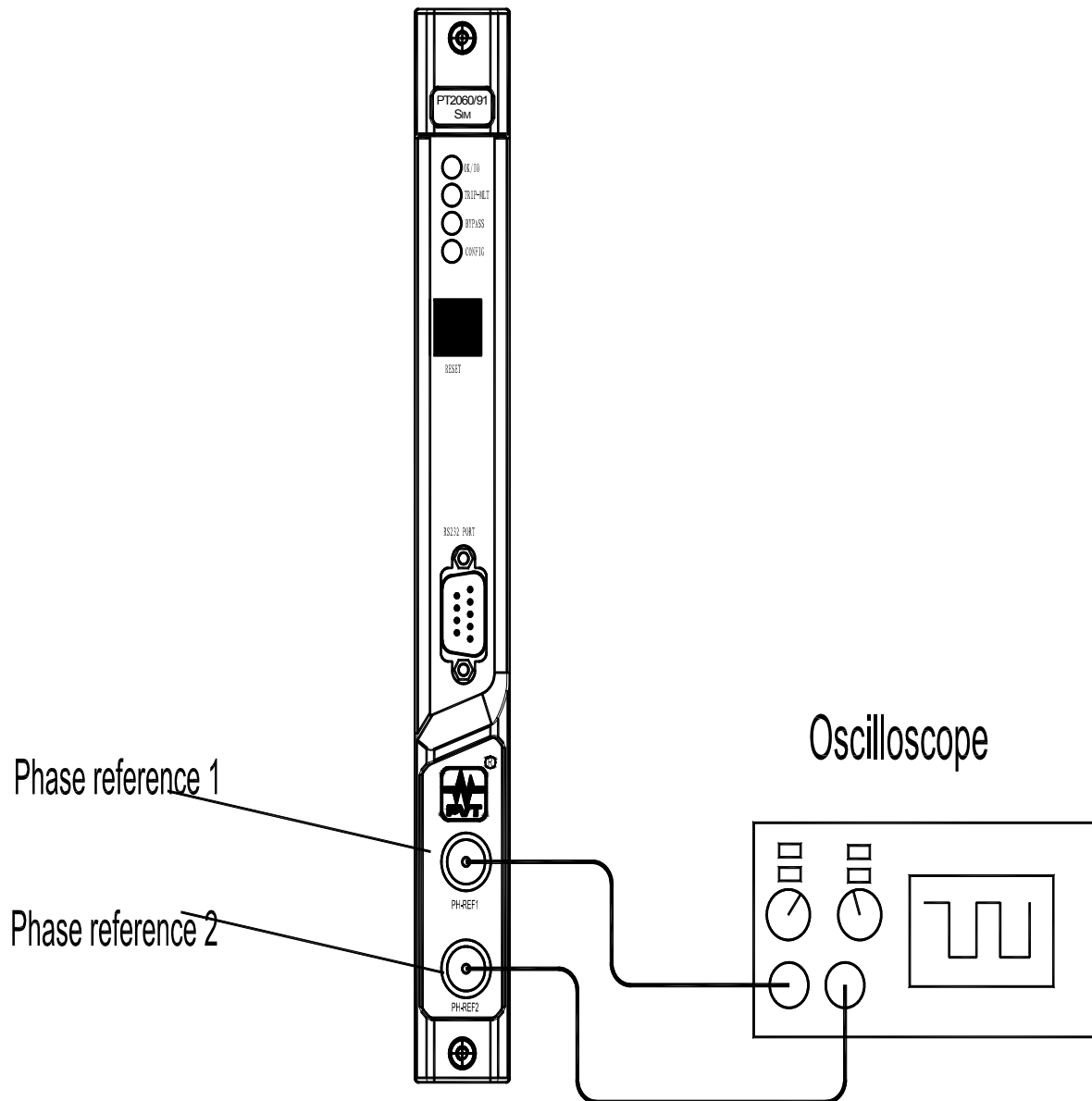
✓   Test the signal in the front panel by oscilloscope

Figure 42

Verifying Voltage of Back Panel
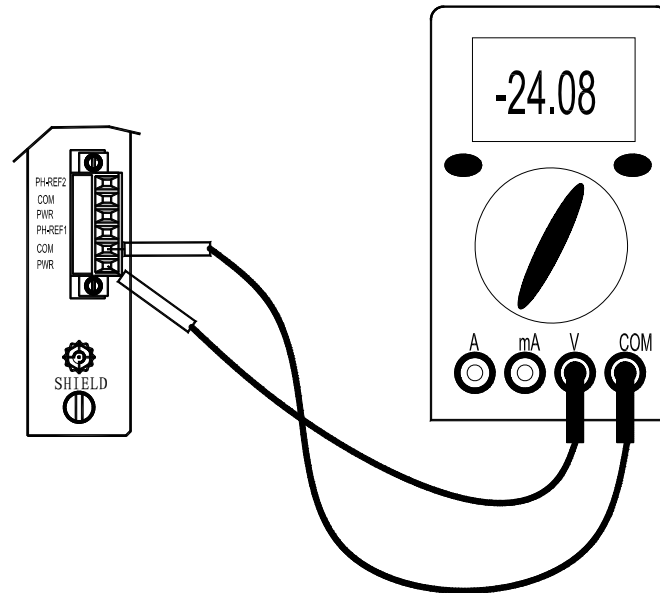
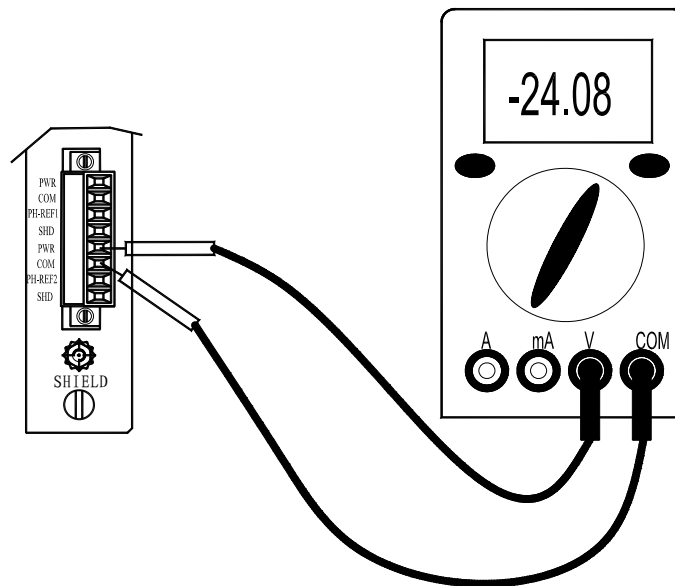PT2060/91 Back Panel

Figure 43 Previous version

Figure 44

As above picture indicates, the measured value of two phase reference input terminals is about -24V.

Troubleshooting

Test of Power-on

All LEDs on the front panel of PT2060 system interface module will light for 3 seconds at power on. The self-test of all modules needs 10 seconds. After that the communication can be started.

Please note that communication can not be made during the test of power- on.

System Event List (Read Only)

The System event list of PT2060/91 SIM system Interface module could be seen in the PT2060 System Configuration software. This list contains the most recent 500 events.

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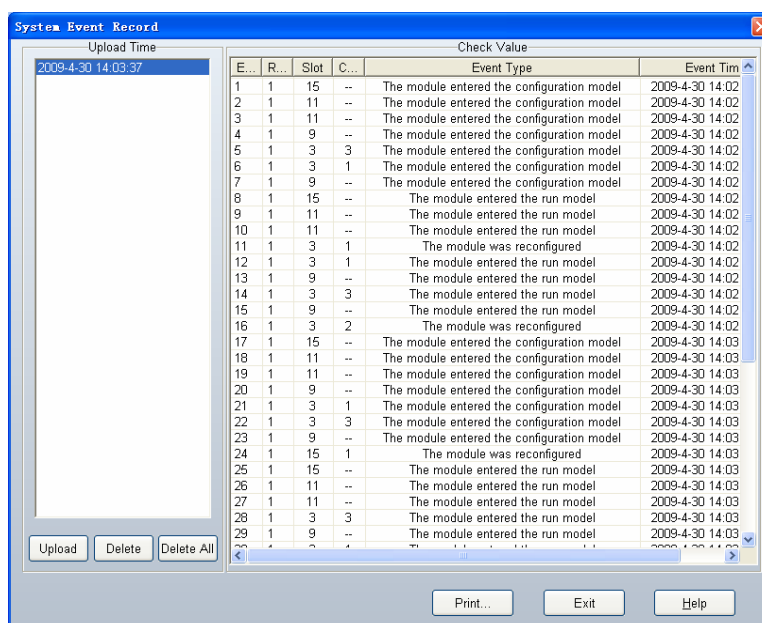

Figure 45

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 the PT2060 rack. Click one of these items to get its detailed event list in the right field. Events without channel numbers mean they do not concern any particular channel.

Alarm Event List (Read Only)

The Alarm event list of the PT2060/91 SIM system Interface module can be seen in the PT2060 System

Configuration software. This list contains the most recent 500 events.

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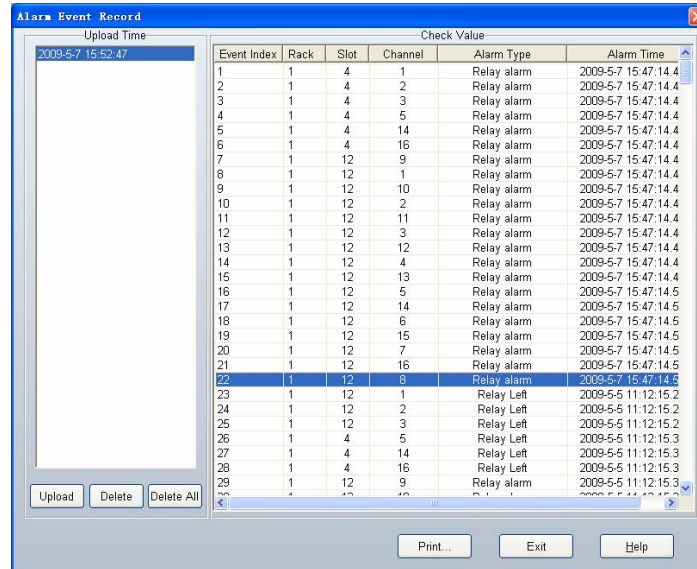

Figure 46

Click the button *Upload* at left-bottom corner of the window to obtain the new Alarm events. In the left area, there is a list of upload times which is the time you performed an upload from the PT2060 rack. Click one of these items to get its detailed event list in the right field.

Additional Information

Ordering Information

PT2060/91-AX

AX: System IO Type

    A0: Modbus RTU RS-485/ RS-232 module (with PT2060-009102)

    A1: Modbus TCP module (with PT2060-009105-A00)

Accessories

Optional Accessories:

PT2060-009100

    SCALANCE X-108: 8-port industrial unmanaged Ethernet switch, wide temp. It is produced by Siemens Co., Ltd. The switch is used to connect many computers and other network device. It can provide 8 Ethernet ports, and support 10/100M. Provibtech suggests that user should choose two TM900 which provide redundancy 24VDC power for PT2060-009100(SCALANCE X-108).

    Features

- Provides 8 Fast Ethernet ports with Auto MDI/MDI-X.
- Supports 10/100Mbps Auto Negotiation.
- Provides compact size with DIN-rail/Wallmount.
- Supports redundant 18~32 VDC power input.
- Diagnosis on device by means of LEDs (power, link status, data traffic) and signal contact.
- Simple fault signal contact set-up using the SET button.
- Supports wide operating temperatures from -20~70℃.

TM900-GX

    TM900 is used to provide 24VDC power with PT2060-009100(SCALANCE X-108), The output of the power converter is isolated from its input. Additionally, the output is short-circuit protected and the input is ESD and fuse protected.

    GX: Mount

    G0: 35mm DIN-rail mount

    G1: Plate mount

    Electrical

    AC Power Input:

      90-250VAC@200mA

    Power Output:

      Voltage: 24VDC±5%

      Current: 800mA

Isolation:
  1000VAC
Fuse:
  2.0A, 250VAC

Physical
Dimensions:
Height: 75mm (2.95")
Weight: 1.0kg (2.0 lbs)

Environmental
Temperature:
  Operation: -40°C to +75°C.
  Storage: -50°C to +100°C
Humidity:
  90% non-condensing

Certification
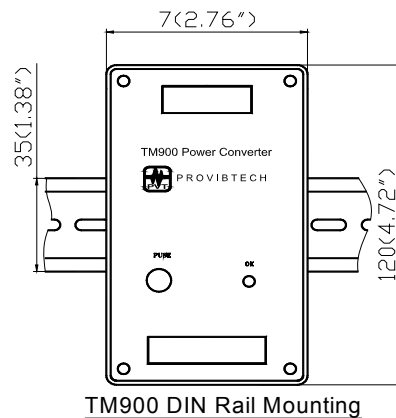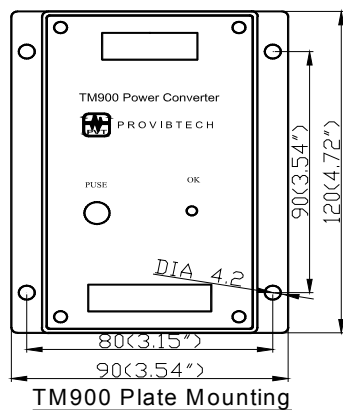CE certified with EMC compliance

Figure 47

Figure 48

PT2060-009101
  USB to RS-485 Converter with PT2060-009106-A00 Communication Cable

PT2060-009102
  USB to RS-232 Converter with PT2060-009107-A00 cross communication cable.

PT2060-009103
  RS-485 HUB.

PT2060-009104-AXX

Switch to PT2060/91/96 Ethernet internet Cable RJ45

AXX Cable length

A00 3   meters   (9.8 feet)

A01 15 meters   (49.2 feet)

A02 75 meters   (246 feet)

PT2060-009105-AXX

PLC, DCS to Pt2060/91/96 Ethernet direct communication Cable RJ45 Port

AXX Cable length

A00 3   meters   (9.8 feet)

A01 15 meters   (49.2 feet)

A02 75 meters   (246 feet)

PT2060-009106-AXX

USB to RS-485 Converter to PT2060/91/96 serial communication Cable RS-485

AXX Cable length

A00 3   meters   (9.8 feet)

A01 15 meters   (49.2 feet)

A02 100 meters   (328 feet)

PT2060-009107-AXX

PC to PT2060/91/96 Cross Serial Communication Cable RS-232

AXX Cable length

A00 1.5   meters   (5 feet)

PT2060-009108-AXX

PT2060/91/96 to RS485 HUB cable RS-485

AXX Cable length

A00 3   meters   (9.8 feet)

A01 15 meters   (49.2 feet)

A02 100 meters   (328 feet)

PT2060-009109-AX

AX   Panel type

A0   PT2060/91 Modbus RTU RS-485/ RS-232 Front panel

A1   PT2060/91 Modbus TCP Front panel

PT2060-009110-AX

AX   Panel type

A0   PT2060/91 Modbus RTU RS-485/ RS-232 back panel

A1   PT2060/91 Modbus TCP back panel

Rack Address Setting

If the user wants to communicate with more than one PT2060, we must configure the individual racks with individual rack addresses   .

The following steps need to be followed to set the Rack Address.

Power off the PT2060 rack.

Remove PT2060/91 front board from the PT2060 rack..

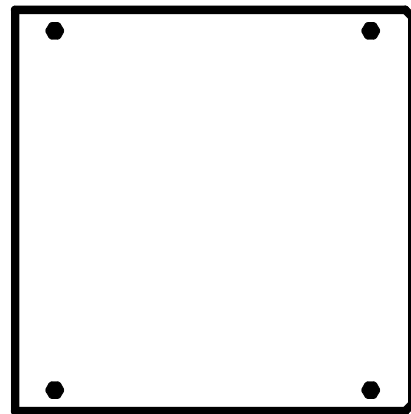Remove the front cover board from PT2060/91 front board, please refer to Figure 49.

Configure the switch state according to user's requirement (see below).

Install the front cover board of PT2060/91 module.

Insert PT2060/91 front board into PT2060 rack to finish the modification of rack address switch state.
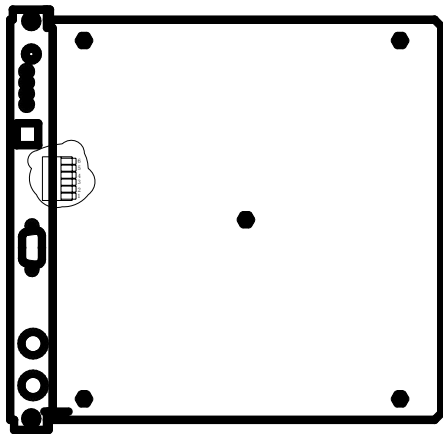
The front board of PT2060/91 module   The front cover board of PT2060/91 module

Figure 49

There is a switch with 6 Pins on the front board, refer to the following picture, the rack address is 1.
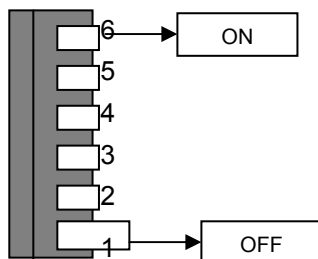
Figure 50

The detail of calculating rack address refers to the following chart.

	Pin number						Calculate rack address	Rack address
	1	2	3	4	5	6		
Switch Current State	OFF	ON	ON	ON	ON	ON	$2^{(1-1)} = 1$	1
	ON	OFF	ON	ON	ON	ON	$2^{(2-1)} = 2$	2
	OFF	OFF	ON	ON	ON	ON	$2^{(2-1)} + 2^{(1-1)} = 3$	3
	ON	ON	OFF	ON	ON	ON	$2^{(3-1)} = 4$	4
	OFF	ON	OFF	ON	ON	ON	$2^{(3-1)} + 2^{(1-1)} = 5$	5
	ON	OFF	OFF	ON	ON	ON	$2^{(3-1)} + 2^{(2-1)} = 6$	6
	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
	OFF	OFF	OFF	OFF	OFF	OFF	$2^{(6-1)} + 2^{(5-1)} + 2^{(4-1)} + 2^{(3-1)}$ $+ 2^{(2-1)} + 2^{(1-1)} = 63$	63

Appendix Ⅰ

The Appendix Ⅰ shows how to configure the phase reference terminal.

Take a plug with 3.8mm centre distance. the plug must be 8 pins, For previous version, the plug must be 6 pins, And prepare two potentiometers of 10kΩ, two electrolytic capacitors of 2200μF/35V and a Signal Function Generator; connect them as shown in the figure below. Figure 51 is for previous version.
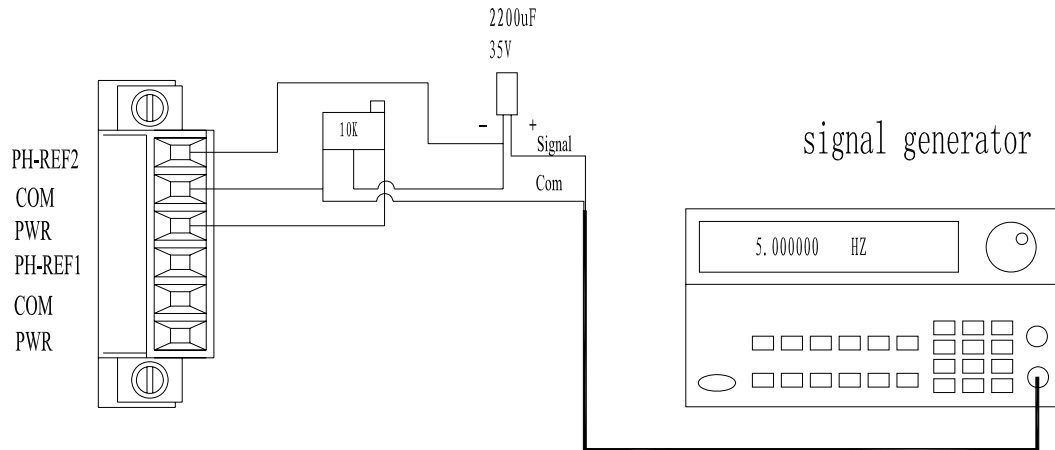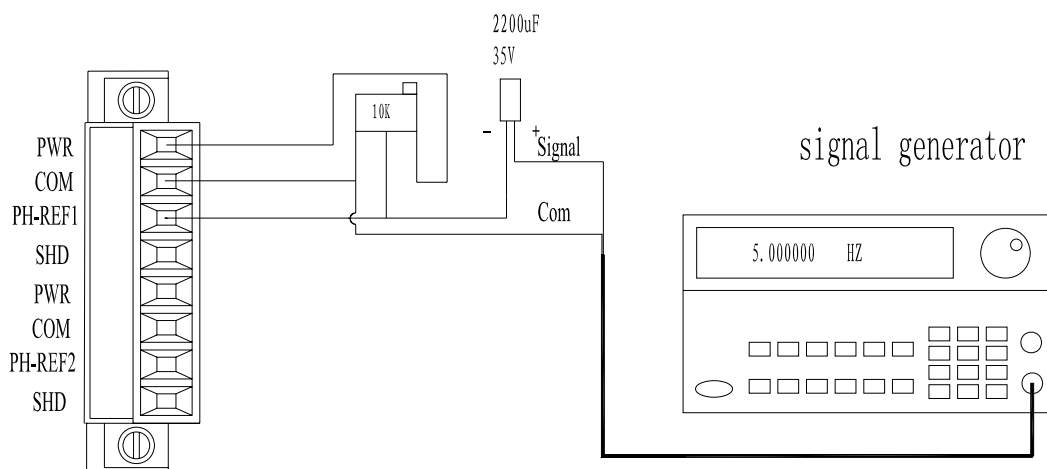

Figure 51

Figure 52

Adjust the potentiometers to assure that the voltage between the pin of phase reference 1 and COM is around -10V. Do the same for phase reference 2. The Signal Function Generator generates a signal to imitate the actual signal from the probe. This can be tested according to the method in the PT2060 Phase Reference Testing section.