

# PT-G503-PHR-PTP Series Quick Installation Guide

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**Moxa Managed PRP/HSR Redundancy Box**

**Version 2.1, July 2020**

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**P/N: 1802005030013**



## Overview

The PT-G503-PHR-PTP series redundancy boxes (RedBoxes) are compliant with the latest standardized redundancy protocols for industrial automation networks, IEC 62439-3 Clause 4 (Parallel Redundancy Protocol, PRP) and IEC 62439-3 Clause 5 (High availability Seamless Redundancy, HSR). PRP/HSR ensures the highest system availability and data integrity for mission-critical applications in electrical substation and/or process automation systems that require zero recovery time redundancy. The redundant protocols Coupling and QuadBox are also supported. The PT-G503-PHR-PTP series comes with three 10/100/1000BaseT(X) and 100/1000BaseSFP slot combo ports. One slot (INTERLINK port) is for an internal link for connecting with a SAN (Singly Attached Node). The other two ports (LAN A and LAN B ports) are for PRP/HSR redundant protocol communications. With this full Gigabit Ethernet port design, the PT-G503-PHR-PTP series provides high performance for PRP/HSR systems. The PT-G503-PHR-PTP series also provides hardware-based IEEE 1588v2 PTP when in end-to-end one-step transparent clock mode for timing-critical applications and isolated dual power inputs with 24/48 VDC or 110/220 VDC/VAC power supply ranges to increase the reliability of the power supply.

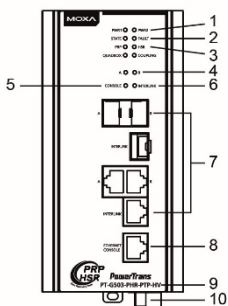
## Package Checklist

The Moxa PT-G503-PHR-PTP series products are shipped with the following items. If any of these items are missing or damaged, please contact your customer service representative for assistance.

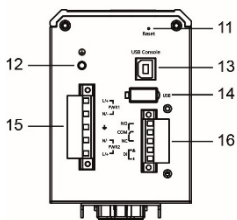
- 1 PT-G503-PHR-PTP redundancy box
- DIN-rail kit
- Protective caps for SFP ports
- USB cable
- Quick installation guide (printed)
- Documentation and software CD
- Warranty card

# Panel Layout

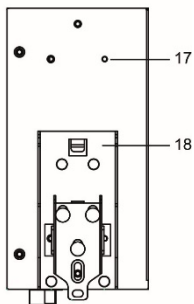
## Front Panel View



## Bottom Panel View

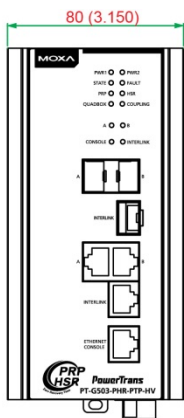


## Rear Panel View

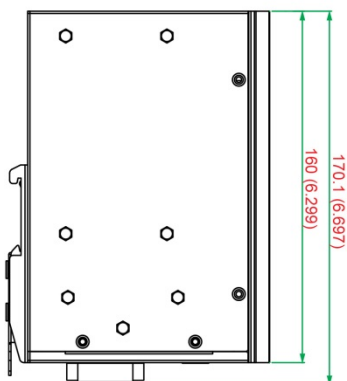


1. Power input PWR1/PWR2 LED
2. State LED / Fault LED
3. PRP/HSR/QUADBOX/COUPLING LED
4. A/B port LED
5. Ethernet console port LED
6. INTERLINK port LED
7. 10/100/1000BaseT(X) A/B port and interlink port or 100/1000BaseSFP slot combo ports
8. 10/100/1000BaseT(X) Ethernet console port
9. Model name
10. Terminal block for power input (PWR1, PWR2)
11. Reset button
12. Screw hole for grounding cable
13. USB console port
14. USB storage port (ABC-02-USB-T)
15. Terminal block for power input
16. Terminal block for DI and Relay 1
17. Screw hole for wall mounting kit
18. DIN-rail kit

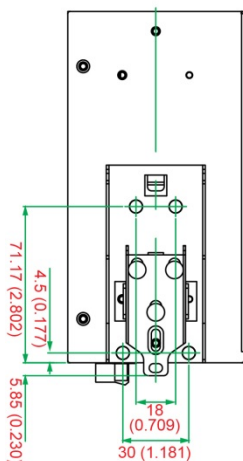
## Mounting Dimensions (unit = mm (inch))



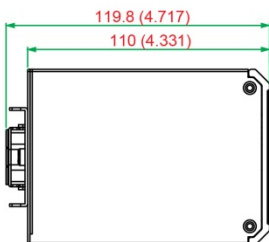
Front View



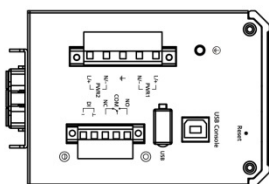
Side View



Rear View



Top View



Bottom View

## DIN-Rail Mounting

The metal DIN-rail kit is fixed to the back panel of the PT-G503-PHR-PTP when you take it out of the box. Mount the PT-G503-PHR-PTP on corrosion-free mounting rails that meet the EN 60715 standard.

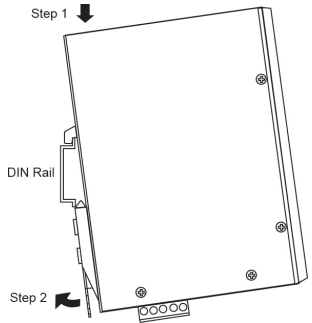
## Installation

### STEP 1:

Insert the upper lip of the DIN-rail into the DIN-rail mounting kit.

### STEP 2:

Press the PT-G503-PHR-PTP towards the DIN-rail until it snaps into place.



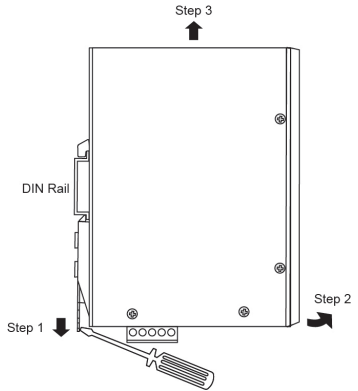
## Removal

### STEP 1:

Pull down the latch on the mounting kit with a screwdriver.

### STEP 2 & 3:

Slightly pull the PT-G503-PHR-PTP forward and lift up to remove it from the DIN-rail.

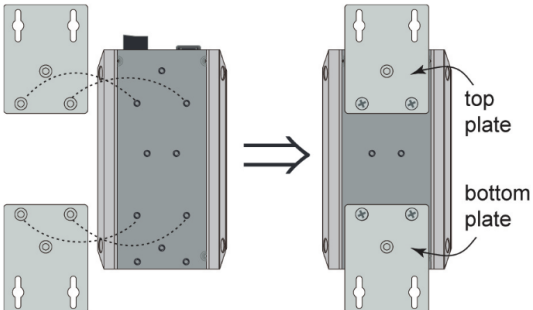


## Wall Mounting (optional)

For some applications, you will find it convenient to mount the PT-G503-PHR-PTP on the wall, as shown in the following figures.

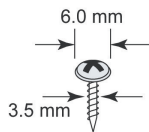
### STEP 1:

Remove the aluminum DIN-rail attachment plate from the PT-G503-PHR-PTP rear panel, and then attach the wall mount plates as shown in the diagram below.



### STEP 2:

Mounting the PT-G503-PHR-PTP to a wall requires 6 screws. Use the PT-G503-PHR-PTP, with wall mount plates attached, as a guide to mark the correct locations of the 6 screws. The heads of the screws should be less than 6.0 mm in diameter, and the shafts should be less than 3.5 mm in diameter, as shown in the figure at the right.



**NOTE** Before tightening the screws into the wall, make sure the screw head and shank size are suitable by inserting the screw into one of the keyhole-shaped apertures of the wall mounting plates.

DO NOT screw the screws in completely—leave a space of about 2 mm to allow room for sliding the wall mount panel between the wall and the screws.

### STEP 3:

Once the screws are fixed in the wall, insert the four screw heads through the large parts of the keyhole-shaped apertures, and then slide the PT-G503-PHR-PTP downwards, as indicated. Tighten the four screws for added stability.

## Wiring Requirements



### ATTENTION

#### Safety First!

Be sure to disconnect the power before installing and/or wiring your Moxa PRP/HSR redundancy box.

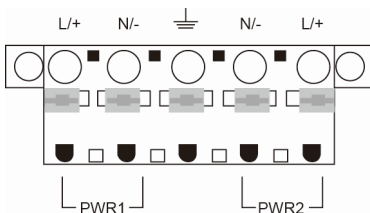
Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

Be sure to read and follow these important guidelines:

- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.  
**NOTE:** Do not run signal or communications wiring and power wiring through the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.
- Use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- Keep input wiring and output wiring separate.
- When necessary, you should label the wiring to all devices in the system.

## Grounding the PRP/HSR Redundancy Box

Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw to the grounding surface prior to connecting devices.

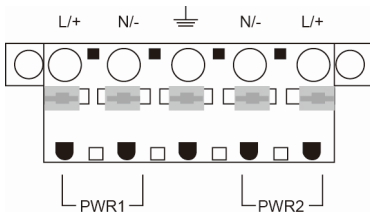


### ATTENTION

This product is intended to be mounted to a well-grounded mounting surface, such as a metal panel.

## Wiring the Dual Power Inputs

In order to support redundancy, the power system of the PT-G503-PHR-PTP is designed to work with two independent (Separated Neutral Lines) power sources.



Take the following steps to wire the dual power inputs:

**STEP 1:** Insert the neutral/line (N/L) AC or negative/positive (-/+ ) DC wires into the terminals.

**STEP 2:** To keep the AC or DC wires from pulling loose, use a small flat-blade screwdriver to tighten the wire-clamp screws on the front of the terminal block connector.

**STEP 3:** Insert the plastic terminal block connector prongs into the terminal block receptor, which is located on the PT's bottom panel.

**NOTE** For the HV model with AC wires, each wire from the power supply source must be within 85 to 264 VAC RMS. To measure and ensure the AC voltage for the PWR1 of L/+ and PWR2 of L/+ is within the correct range, please use a qualified Digital Multi-meter (e.g. Fluke 85V or equivalent) before connecting and applying the power source to the PT-G503 PWR1 and PWR2 input terminals.

**NOTE** If you intend to only use one power input, be sure to disconnect the other power input (unplug the power cord or disconnect the power input from the L and N contacts). Only one power input LED will be on.

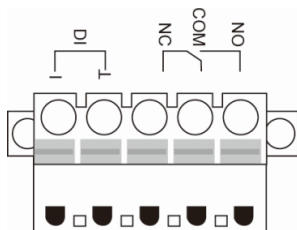


## ATTENTION

Before connecting the PT-G503-PHR-PTP to the AC or DC power inputs, make sure the power source voltage is stable.

## Wiring the Digital Inputs

The PT-G503-PHR-PTP has one digital input, DI 1. The DI consists of two contacts from the 5-pin terminal block connector on the PT-G503-PHR-PTP's bottom panel. The remaining contacts are used for the PT-G503-PHR-PTP's Relay 1. The top view of the terminal block connector is shown below.



Take the following steps to wire the digital input:

**STEP 1:** Insert the negative (ground)/positive DI wires into the  $\pm$ /I1 terminals.

**STEP 2:** To keep the DI wires from pulling loose, use a small flat-blade screwdriver to tighten the wire-clamp screws on the front of the terminal block connector.

**STEP 3:** Insert the plastic terminal block connector prongs into the terminal block receptor, which is located on the PT-G503-PHR-PTP's bottom panel.

## Auto MDI/MDI-X Connection

The Auto MDI/MDI-X function allows users to connect the PT-G503-PHR-PTP's 10/100/1000BaseT(X) ports to any kind of Ethernet device, without needing to pay attention to the type of Ethernet cable being used for the connection. You may use either a straight-through cable or cross-over cable to connect the PT-G503-PHR-PTP to Ethernet devices.

## Communication Connections

Each PT-G503-PHR-PTP has 4 types of communication ports:

- 3 Gigabit Ethernet ports: 3 10/100/1000BaseTX and 3 100/1000BaseSFP ports
- 1 Ethernet console port
- 1 USB console port (type B connector)
- 1 USB storage port (type A connector)



## 10/100/1000BaseT(X) Ethernet Port Connection

The 10/100/1000BaseT(X) ports located on the front panel are used to connect to Ethernet-enabled devices. Most users will choose to configure these ports for Auto MDI/MDI-X mode, in which case the port's pinouts are adjusted automatically depending on the type of Ethernet cable used (straight-through or cross-over), and the type of device (NIC-type or HUB/Switch-type) connected to the port.

In what follows, we give pinouts for both MDI (NIC-type) ports and MDI-X (HUB/Switch-type) ports. We also give cable wiring diagrams for straight-through and cross-over Ethernet cables.

### 10/100Base T(x) RJ45 Pinouts

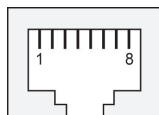
#### MDI Port Pinouts

Pin	Signal
1	Tx+
2	Tx-
3	Rx+
6	Rx-

#### MDI-X Port Pinouts

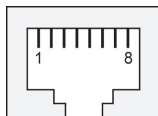
Pin	Signal
1	Rx+
2	Rx-
3	Tx+
6	Tx-

#### 8-pin RJ45

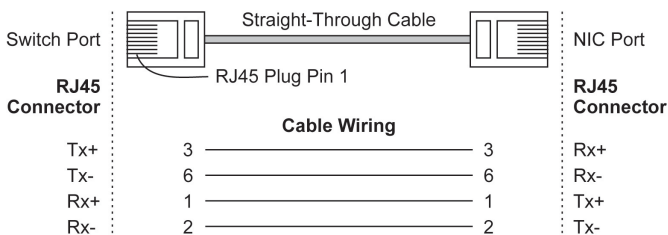


### 1000Base T(x) RJ45 Pinouts

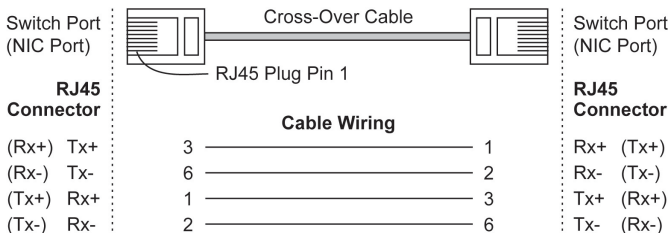
Pin	MDI	MDI-X
1	BI_DA+	BI_DB+
2	BI_DA-	BI_DB-
3	BI_DB+	BI_DA+
4	BI_DC+	BI_DD+
5	BI_DC-	BI_DD-
6	BI_DB-	BI_DA-
7	BI_DD+	BI_DC+
8	BI_DD-	BI_DC-



### RJ45 (8-pin) to RJ45 (8-pin) Straight-Through Cable Wiring



### RJ45 (8-pin) to RJ45 (8-pin) Cross-Over Cable Wiring



## 100Base-FX or 1000Base-X SFP Fiber Port

The Gigabit Ethernet ports on the PT-G503-PHR-PTP are SFP slots, which require 100Base-FX/1000Base-X or Gigabit mini-GBIC fiber transceivers to work properly. Moxa provides complete transceiver models for various distance requirements.

### Multi-mode:

1000BaseSX	0 to 550 m, 850 nm (50/125 $\mu$ m, 400 MHz x km) 0 to 275 m, 850 nm (62.5/125 $\mu$ m, 200 MHz x km)
1000BaseLX	0 to 1100 m, 1310 nm (50/125 $\mu$ m, 800 MHz x km) 0 to 550 m, 1310 nm (62.5/125 $\mu$ m, 500 MHz x km)

### Single mode:

1000BaseLH	0 to 10 km, 1310 nm (9/125 $\mu$ m, 3.5 PS/(nm x km))
1000BaseLHX	0 to 40 km, 1310 nm (9/125 $\mu$ m, 3.5 PS/(nm x km))
1000BaseZX	0 to 80 km, 1550 nm (9/125 $\mu$ m, 19 PS/(nm x km))

### Multi-mode:

100BaseFX	0 to 5 km, 1300 nm (50/125 $\mu$ m, 800 MHz x km) 0 to 4 m, 1300 nm (62.5/125 $\mu$ m, 500 MHz x km)
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### Single mode:

100BaseFX	0 to 40 km, 1310 nm (9/125 $\mu$ m, 3.5 PS/(nm x km))
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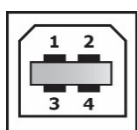
The concept behind the LC port and cable is quite straightforward. Suppose you are connecting devices I and II. Unlike electrical signals, optical signals do not require a circuit in order to transmit data. Consequently, one of the optical lines is used to transmit data from device I to device II, and the other optical line is used to transmit data from device II to device I, for full-duplex transmission.

Remember to connect the Tx (transmit) port of device I to the Rx (receive) port of device II, and the Rx (receive) port of device I to the Tx (transmit) port of device II. If you make your own cable, we suggest labeling the two sides of the same line with the same letter (A-to-A and B-to-B, as shown below, or A1-to-A2 and B1-to-B2).

## USB Console Connection

The PT-G503-PHR-PTP has one USB console port (type B connector), located on the bottom panel. Use the USB cable (provided in the product package) to connect the PT-G503-PHR-PTP's console port to your PC's USB port and install the USB driver (available in the software CD) on the PC. You may then use a console terminal program, such as Moxa PComm Terminal Emulator, to access the PT-G503-PHR-PTP's console configuration utility.

### USB Console Port (Type B Connector) Pinouts



Pin	Description
1	D- (Data-)
2	VCC (+5V)
3	D+ (Data+)
4	GND (Ground)

### USB Storage Connection

The PT-G503-PHR-PTP has one USB storage port (type A connector) on the bottom panel. Use Moxa's ABC-02-USB-T automatic backup configurator to connect the PT-G503-PHR-PTP's USB storage port for configuration backup, firmware upgrade, or system log file backup.

## ABC-02-USB Installation

Plug the ABC-02-USB into the PT-G503-PHR-PTP's USB storage port. If you would like to secure the ABC-02-USB to the wall, we suggest using an M4 screw.

### USB Storage Port (Type A Connector) Pinouts



Pin	Description
1	VCC (+5V)
2	D- (Data-)
3	D+ (Data+)
4	GND (Ground)

## Restore Factory Defaults Button

Press and hold the Reset button for 5 seconds to load the factory default settings. Use a pointed object, such as a straightened paper clip or toothpick, to depress the Reset button. This will cause the STATE LED to blink once a second. After depressing the button for 5 continuous seconds, the STATE LED will start to blink rapidly. This indicates that factory default settings have been loaded and you can release the reset button.

**NOTE** Do NOT power off the PRP/HSR redundancy box when loading default settings.

## LED Indicators

LED	Color	State	Description
PWR 1	Amber	ON	Power is being supplied to the main system's power input PWR1
		OFF	Power is not being supplied to the main system's power input PWR1
PWR 2	Amber	ON	Power is being supplied to the main system's power input PWR2
		OFF	Power is not being supplied to the main system's power input PWR2
STATE	Green	ON	System has passed self-diagnosis test on boot-up and is ready to run
		Blinking	<ol style="list-style-type: none"><li>System is undergoing the self-diagnosis test</li><li>System detects the ABC-02 USB plugged into the USB storage port</li><li>Blinks once per second when pressing the reset button for 5 seconds</li><li>Blinks rapidly when the reset button has been pressed continuously for 5 seconds, indicating that the device will be reset to factory defaults</li></ol>
	Red	ON	System failed self-diagnosis on boot-up. <ul style="list-style-type: none"><li>RAM Test Fail / System Info. Read Fail / Switch Initial Fail / PTP PHY Error.</li><li>FW Checksum Fail / Uncompress Fail (+ Green Coupler lit on: SW FAIL)</li></ul>

LED	Color	State	Description
FAULT	Red	ON	1. System has failed, or is under quick inspection 2. The relay signal contact is open 3. ABC-02 loading/saving failure
		OFF	The system is operating normally
PRP	Green	ON	PRP is working
		OFF	PRP is not enabled
HSR	Green	ON	HSR is working
		OFF	HSR is not enabled
QUADBOX	Green	ON	QuadBox function is working
		OFF	QuadBox function is not enabled
COUPLING	Green	ON	PRP/HSR Coupling function is working
		OFF	PRP/HSR Coupling function is not enabled
Link/Act/ Speed (A, B, InterLink, Ethernet Console)	Green	ON	When there is a secure connection (or link) to a 1000 Mbps device on any port.
		Blinking	When data is being transmitted or received at 1000 Mbps.
	Amber	ON	When there is a secure connection (or link) to 10/100 Mbps Ethernet device on any port.
		Blinking	When data is being transmitted or received at 10/100 Mbps.
Off	OFF	Link down or no link	

## Specifications

Interface	
Gigabit Ethernet	3 x 10/100/1000BaseT(X) ports or 100/1000BaseSFP combo ports
Console Port	Ethernet console (10/100/1000 Mbps RJ45), USB-serial console (Type B connector)
Storage Port	USB storage (Type A connector for ABC-02-USB)
LED Indicators	PWR 1, PWR 2, STATE, FAULT, PRP, HSR, QUADBOX, COUPLING, 100/1000M
Alarm Contact	One relay output with current carrying capacity of 1 A @24 VDC
Digital Inputs	One input with the same ground, but isolated from the electronics <ul style="list-style-type: none"> <li>+13 to +30 V for state "1"</li> <li>-30 to +3 V for state "0"</li> <li>Max. input current: 8 mA</li> </ul>
Power	
Input Voltage	WV: 24/48 VDC (18 to 72 VDC) HV: 110/220 VDC/VAC (88 to 300 VDC and 85 to 264 VAC)
Input Current	Max. 0.660/0.360 A @ 24/48 VDC Max. 0.150/0.080 A @ 110/220 VDC Max. 0.260/0.170 A @ 110/220 VAC
Connection	5-pin terminal block
Overload Current Protection	Present

Reverse Polarity Protection	Present
<b>Physical Characteristics</b>	
Housing	Aluminum alloy, IP40 protection
Dimensions	80 x 160 x 110 mm (3.15 x 6.30 x 4.33 in)
Weight	1210 g (2.69 lb)
Installation	DIN-rail mounting
<b>Environmental Limits</b>	
Operating Temperature	-40 to 85°C (-40 to 185°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Ambient Relative Humidity	5 to 95% (non-condensing)
<b>Warranty</b>	
Warranty Period	5 years
Details	See <a href="http://www.moxa.com/warranty">www.moxa.com/warranty</a>

## Restricted Access Locations

- This equipment is intended to be used in Restricted Access Locations, such as a computer room, with access limited to SERVICE PERSONNEL or USERS who have been instructed on how to handle the metal chassis of equipment that is so hot that special protection may be needed before touching it. The location should only be accessible with a key or through a security identity system.
- External metal parts of this equipment are extremely hot!! Before touching the equipment, you must take special precautions to protect your hands and body from serious injury.

## Power Connection Wiring

You should always connect both power supplies when using this device, and disconnect both power supplies when this device is not in use. If only one power supply is connected, you could receive a hazardous electric shock by touching the unconnected terminals of the other power supply.

All power connection wiring must be done by a qualified electrician and follow the National Electrical Code, ANSI/NFPA 70, and Canadian Electrical Code, Part I, CSA C22.1. An IEC certified or UL listed single-phase type circuit-breaker, rated for a maximum of 20 A, should be installed between main circuit and the device.



### ATTENTION

This device complies with Part 15 of the FCC rules. Operation is subject to the following conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received including interference that may cause undesired operation.