TN-G4500 Series
Quick Installation Guide

Moxa ToughNet Switch

Version 1.0, May 2020

Overview

The ToughNet TN-G4500 Series of M12 managed Ethernet switches are designed for railway applications, including rolling stock and wayside installations. The switches use M12 and other circular connectors to ensure tight, robust connections, and guarantee reliable operation in industrial environments where vibration and shock are commonplace. These PoE switches are classified as power source equipment (PSE); they provide up to 30 watts of power per port, and can be used to power IEEE 802.3at/af compliant powered devices (PDs), such as IP cameras, wireless access points, and IP phones.

The TN-G4500 Series has push-pull M12 connectors that are tailor-made for push-pull cables in order to facilitate quick installation, and also allow M12 rotary cables to be utilized. The 24 to 110 VDC wide power input range and isolated dual power inputs not only allow the same type of power source at different sites around the globe, but also increase the reliability of communications systems. Furthermore, the -40 to 70°C operating temperature capability make the switches suitable for deployment in harsh environments. The TN-G4500 series of Ethernet switches are compliant with the essential sections of EN 50155, covering operating temperature, power input voltage, surge, ESD, and vibration, as well as conformal coating and power insulation, which makes the switches suitable for a variety of industrial applications.

Package Checklist

Your ToughNet TN-G4500 switch is shipped with the following items. If any of these items are missing or damaged, please contact your customer service representative for assistance.

- TN-G4500 switch
- 10 protective caps for Ethernet ports, console port, and USB storage port (already fixed on switch)
- Panel mounting kit
- Quick installation guide (printed)
- Warranty card

Features

Anti-Vibration Push-Pull/Circular Connectors for Robust Links

- M12 X-coded 8-pin female connectors for 1G or 10G Ethernet ports
- M12 B-coded 5-pin female connector for serial console port
- M12 A-coded 5-pin female connector for USB storage port
- M12 K-coded 5-pin male connector for power input

Isolated Power Inputs

- Supports 24 to 110 VDC (16.8 to 137.5 VDC)

High Performance Network Switching Technology

- Provides up to 30 watts per PoE port with a total power budget of 120 watts per switch
- IPv6 Ready logo awarded (IPv6 Logo Committee certified)
- DHCP Option 82 for IP address assignment with different policies
- Turbo Ring and Turbo Chain (recovery time < 50 ms @ 250 switches), and STP/RSTP/MSTP for network redundancy
- IGMP snooping and GMRP for filtering multicast traffic

- EtherNet/IP and Modbus/TCP industrial Ethernet protocols supported
- Port-based VLAN, IEEE 802.1Q VLAN, and GVRP to ease network planning
- QoS (IEEE 802.1p/1Q and ToS/DiffServ) allows real-time traffic classification and prioritization
- IEEE 802.3ad, LACP for optimum bandwidth utilization
- SNMPv1/v2c/v3 for different levels of network management
- TACACS+, SNMPv3, IEEE 802.1X, HTTPS, and SSH to enhance network security
- RMON for efficient network monitoring and proactive capability
- Bandwidth management prevents unpredictable network status
- Lock port allows access by only authorized MAC addresses
- Port mirroring for online debugging
- Automatic warning by exception through email and relay output
- Line-swap fast recovery
- LLDP for automatic topology discovery in network management software
- Configurable by web browser, Telnet/serial console, CLI, and Windows utility
- Loop protection prevents network loops

Designed for Industry-Specific Applications

- Complies with all EN 50155 mandatory test items*
- -40 to 70°C operating temperature range
- Panel mounting installation capability

*This product is suitable for rolling stock railway applications, as defined by the EN 50155 standard. For a more detailed statement, click here: www.moxa.com/doc/specs/EN_50155_Compliance.pdf

Recommended Optional Accessories

- CBL-M12XMM8PRJ45-Y-200-IP67: 2-meter M12-to-RJ45 Cat-5 UTP Ethernet cable with IP67-rated 8-pin male X-coded crimp type M12 connector
- CBL-M12XMM8P-Y-300-IP67: 3-meter M12-to-M12 Cat-5 UTP Ethernet cable with IP67-rated 8-pin male X-coded crimp type M12 connector
- CBL-M12XMM8P-Y-100-IP67: 1-meter M12-to-M12 Cat-5 UTP Ethernet cable with IP67-rated 8-pin male X-coded crimp type M12 connector
- M12X-8PMM-IP67-HTG: Field-installable M12 X-coded crimp type, slim design connector, 8-pin male, IP67-rated
- A-CAP-M12F-M-PP: Metal Cap for M12 female push-pull connector

Panel Layouts

Top View

Front View
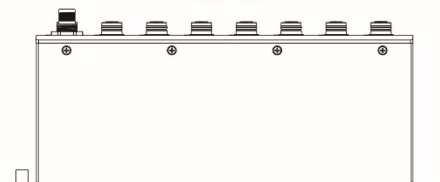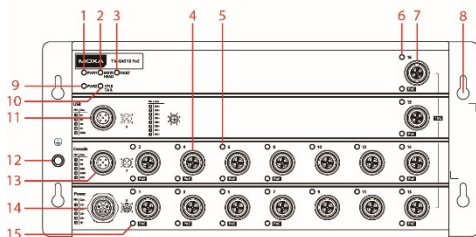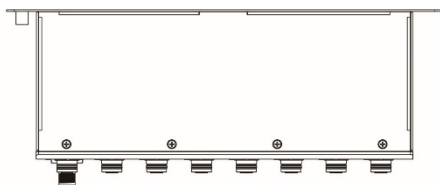
Bottom View
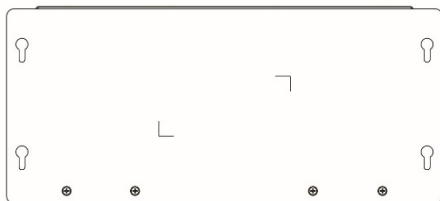
Rear View

1. PWR1 LED: for power input 1
2. MSTR/HEAD LED: for ring master or chain head
3. FAULT LED
4. 10/100/1000BaseT(X) port (M12 X-coded 8-pin female connector)
5. 10/100/1000BaseT(X) port LED
6. 10G BaseT(X) port LED
7. 10G BaseT(X) port (M12 X-coded 8-pin female connector)
8. Screw holes for panel mounting kit
9. PWR2 LED: for power input 2
10. CPLR/TAIL LED: for ring coupler or chain tail
11. USB port
12. Grounding screw
13. Console port
14. Power input port (M12 K-coded 5-pin male connector)
15. PoE LED

Mounting Dimensions (unit = mm)
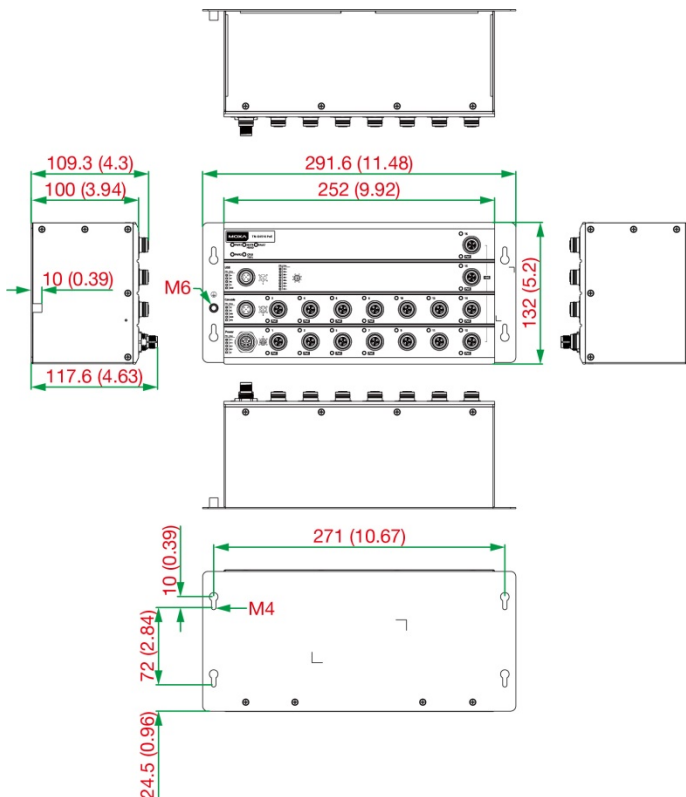
Panel/Wall Mounting

STEP 1: Mounting the TN-G4500 to a wall requires 4 screws. Use the ToughNet switch as a guide to mark the correct positions of the 4 screws.

STEP 2: Use the 4 screws in the panel mounting kit. If you would like to use your own screws, make sure the screw head is **between 6.0 mm and 7.0 mm** in diameter and the shaft is less than **4.0 mm** in diameter, as shown at the right.

Cross recess No. 2
penetration depth
2.03 max.
1.45 min.
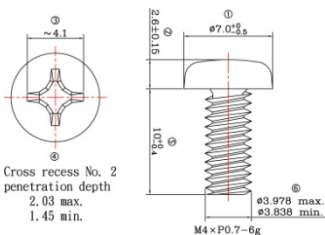
Do not screw the screws in all the way—leave a space of about 2 mm to allow room for sliding the ToughNet switch between the wall and the screws.

> **NOTE** Before tightening the screws into the wall, make sure the screw head and shaft size are suitable by inserting the screw through one of the keyhole-shaped apertures of the ToughNet switch.

STEP 3: Once the screws are fixed in the wall, hang the ToughNet switch on the 4 screws through the large opening of the keyhole-shaped apertures, and then slide the switch downwards. Tighten the four screws for added stability.
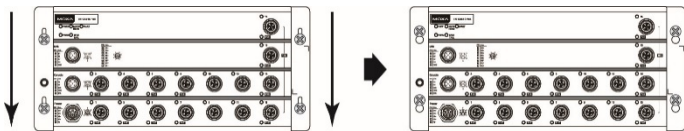
> **NOTE** To provide greater protection from vibration and shock, use screws with shaft diameter between 6.0 mm and 7.0 mm, and fix the ToughNet switch onto the wall directly through the large opening of the keyhole-shaped apertures.

Wiring Requirements

> ⚠️ **WARNING**
>
> Turn the power off before disconnecting modules or wires. The correct power supply voltage is listed on the product label. Check the voltage of your power source to make sure you are using the correct voltage. Do NOT use a voltage greater than what is specified on the product label.
>
> These devices must be supplied by a SELV source as defined in the Low Voltage Directive 2006/95/EC and 2004/108/EC.

> ⚠️ **ATTENTION**
>
> **Safety First!**
> Be sure to disconnect the power cord before installing and/or wiring your Moxa switch. This device has UL 62368-1 approval. Use copper conductors only, 70°C, and tighten to 4.5 pound-inches. For use in pollution degree 2 environments.

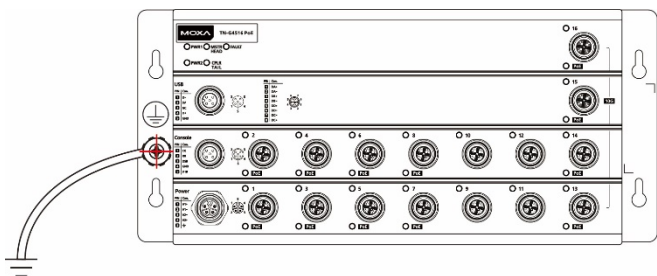> ⚠️ **ATTENTION**
>
> **Safety First!**
> Observe all electrical codes dictating the maximum current allowable for each wire size. If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

Please read and follow these 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.
- You can 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 separated.
- It is strongly advised that you label wiring for all devices in the system when necessary.

Grounding the ToughNet Switch

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

> ⚠️ **ATTENTION**
>
> To ground this product to earth, use a green and yellow AWG 16 or higher grounding cable.

> ⚠️ **ATTENTION**
>
> This product is intended to be mounted to a well-grounded mounting surface such as a metal panel.

Connecting the Power Supplies

ToughNet TN-G4500 Series switches support dual power inputs—power input 1 and power input 2. The M12 K-coded 5-pin male connector on the TN-G4500 Series switches' front panel is used for the dual power inputs.

Pinouts for the power input port

PIN	PWR
1	V1+
2	V1−
3	V2−
4	V2+
PE	GND
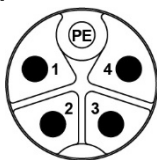
Pin	Description	Usage
1	PWR1 / DC +	Connect "PWR1 Live / DC +" to the positive (+) terminal when using a DC power source.
2	PWR1 / DC −	Connect "PWR1 Neutral / DC −" to the negative (−) terminal when using a DC power source.
3	PWR2 / DC −	Connect "PWR2 Neutral / DC −" to the negative (−) terminal when using a DC power source.
4	PWR2 / DC +	Connect "PWR2 Live / DC +" to the positive (+) terminal when using a DC power source.
PE	Chassis Ground	Connect the "Chassis Ground" to the equipment ground bus for DC inputs.

STEP 1: Plug your power cord connector into the power input port of the TN-G4500 switch.

STEP 2: Screw the nut on your power cord connector into the power input connector on the switch to ensure a tight connection.

⚠️ **ATTENTION**

Before connecting the TN-G4500 Series to the power input, make sure the power source voltage is stable.

⚠️ **ATTENTION**

Do not power on the TN-G4500 Series before connecting the M12 power connector.

Connecting the Data Lines

Ethernet Port Connection

The TN-G4500 Series has 12 10/100/1000BaseT(X) Ethernet ports (M12 X-coded 8-pin female connector) and 4 10G BaseT(X) Ethernet ports. Most users 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.
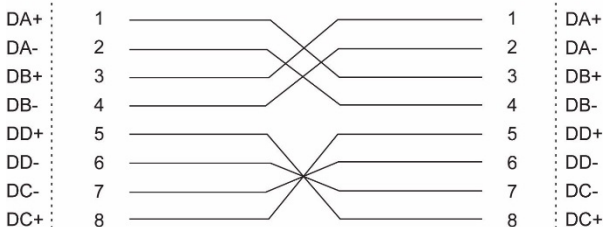
Pinouts for the M12 (8-pin) Port

PIN	Con.
1	DA +
2	DA −
3	DB +
4	DB −
5	DD +
6	DD −
7	DC −
8	DC +

M12 (8-pin, M) to M12 (8-pin, M) Cross-Over Cable Wiring
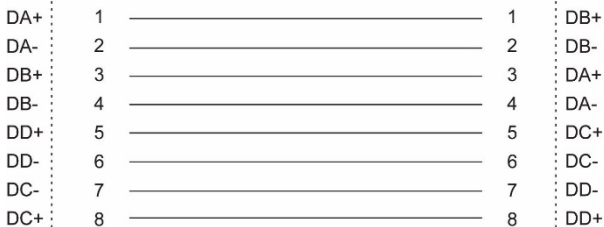
Cross-Over Cable Wiring (MDI to MDI)

DA+	1		1	DA+
DA-	2		2	DA-
DB+	3		3	DB+
DB-	4		4	DB-
DD+	5		5	DD+
DD-	6		6	DD-
DC-	7		7	DC-
DC+	8		8	DC+

M12 (8-pin, M) to M12 (8-pin, M) Straight-Trough Cable Wiring

Straight-through Cable Wiring (MDI to MDI-X)

DA+	1		1	DB+
DA-	2		2	DB-
DB+	3		3	DA+
DB-	4		4	DA-
DD+	5		5	DC+
DD-	6		6	DC-
DC-	7		7	DD-
DC+	8		8	DD+

M12 (8-pin, M) to RJ45 (8-pin) Cross-Over Cable Wiring

Cross-Over Cable Wiring (MDI to MDI)

DA+	1		1	DA+
DA-	2		2	DA-
DB+	3		3	DB+
DB-	4		4	DC+
DD+	5		5	DC-
DD-	6		6	DB-
DC-	7		7	DD+
DC+	8		8	DD-
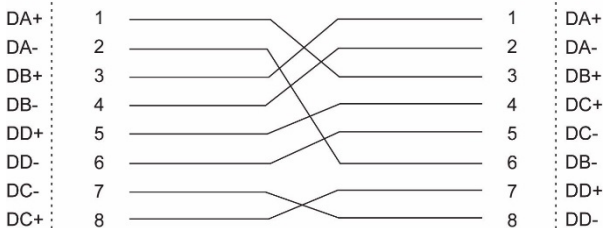
M12 (8-pin, M) to RJ45 (8-pin) Straight-Trough Cable Wiring

Straight-through Cable Wiring (MDI to MDI-X)

DA+	1		1	DB+
DA-	2		2	DB-
DB+	3		3	DA+
DB-	4		4	DD+
DD+	5		5	DD-
DD-	6		6	DA-
DC-	7		7	DC+
DC+	8		8	DC-
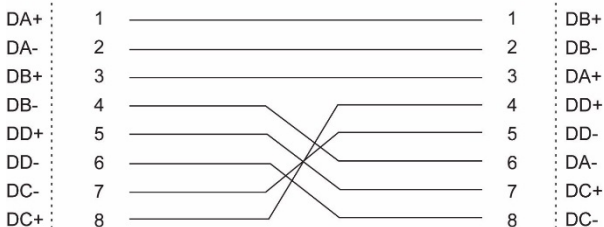
LED Indicators

Several LED indicators are located on the ToughNet switch's front panel. The function of each LED is described in the table below.

LED	Color	State	Description
System LEDs			
PWR1	AMBER	ON	Power is being supplied to power input PWR1.
		OFF	Power is not being supplied to power input PWR1
PWR2	AMBER	ON	Power is being supplied to power input PWR2.
		OFF	Power is not being supplied to power input PWR2.
FAULT	RED	ON	When the corresponding PORT alarm is enabled, and a user-configured event is triggered.
		OFF	When the corresponding PORT alarm is enabled and a user-configured

LED	Color	State	Description
			event is not triggered, or when the corresponding PORT alarm is disabled.
MSTR/ HEAD	GREEN	ON	When the TN switch is either the Master of this Turbo Ring, or the Head of this Turbo Chain.
		Blinking	When the TN switch is Ring Master of this Turbo Ring and the Turbo Ring is broken, or it is the Chain Head of this Turbo Chain and the Turbo Chain is broken.
		OFF	When the TN switch is neither the Master of this Turbo Ring, nor the Head of this Turbo Chain.
CPLR/ TAIL	GREEN	ON	When the TN switch enables the coupling function to form a back-up path in this Turbo Ring, or it is the Tail of this Turbo Chain.
		Blinking	When Turbo Chain is down.
		OFF	When the TN switch disables the coupling function of Turbo Ring, or it is not the Tail of the Turbo Chain.
FAULT + MSTR/HEAD + CPLR/TAIL	Rotate Blinking Sequentially		When ABC-02 is importing or exporting files.
Port LEDs			
GE Ports (10/100/ 1000M, for copper ports)	AMBER	On	GE port's 10 or 100 Mbps link is active.
		Blinking	Data is being transmitted at 10 or 100 Mbps.
		OFF	GE port's 10 or 100 Mbps link is inactive.
	GREEN	ON	GE port's 1000 Mbps link is active.
		Blinking	Data is being transmitted at 1000 Mbps.
		OFF	GE port's 1000 Mbps link is inactive.
10GE (100/1000M/ 2.5G/5G/10G, for copper ports)	AMBER	On	The port's 100 or 1000 Mbps link is active.
		Blinking	Data is being transmitted at 100 or 1000 Mbps.
		OFF	The port's 100 or 1000 Mbps link is inactive.
	GREEN	ON	The port's 2.5, 5, or 10 Gbps link is active.
		Blinking	Data is being transmitted at 2.5, 5, or 10 Gbps.
		OFF	The port's 2.5, 5, or 10 Gbps link is inactive.
PoE Ports	AMBER	ON	Power is being supplied to a Powered Device (PD).
		OFF	Power is not being supplied to a Powered Device (PD).