Moxa ToughNet Switch

TN-5508-4PoE/TN-5516-8PoE Series

Layer 2 M12 managed PoE Ethernet switches

Hardware Installation Guide

Fourth Edition, July 2010

Overview

The ToughNet TN-5508-4PoE/TN-5516-8PoE series M12 managed Ethernet switches are designed for industrial applications in harsh environments. The TN series switches use M12 and other circular connectors to ensure tight, robust connections, and guarantee reliable operation against environmental disturbances, such as vibration and shock. The wide selection of 24/48/72 VDC, or 110/220 VDC/VAC dual redundant power supplies increases the reliability of your communications. The TN-5508-4PoE/TN-5516-8PoE Series switches provide 16 Fast Ethernet M12 ports, 8 of which are 10/100BaseT(X) PoE compliant.

TN-5508-4PoE/TN-5516-8PoE switches provide up to 15.4 watts of power per PoE port, and allow power to be supplied to connected devices (such as surveillance cameras, wireless access points, and IP phones) when AC power is not readily available or is cost-prohibitive to provide locally. Models with an extended operating temperature range of -40 to 75°C are also available. The TN-5508-4PoE/TN-5516-8PoE series Ethernet switches are compliant with EN50155/50121-3-2/50121-4 (railway applications), NEMA TS2 (traffic control systems), and e-Mark (vehicles) requirements, making the switches suitable for a variety of industrial applications.

Package Checklist

Your ToughNet TN-5508-4PoE/TN-5516-8PoE switch is shipped with the following items. If any of these items is missing or damaged, contact your customer service representative for assistance.

- 1 Moxa ToughNet switch
- Hardware installation guide
- CD-ROM with user's manual, Windows utility, and SNMP MIB file
- Moxa product warranty statement
- M12 to DB9 console port cable
- 2 protective caps for console and relay output ports
- Panel mounting kit

Features

Anti-Vibration Circular Connectors for Robust Links

- M12 D-coding 4-pin female connectors for Fast Ethernet 10/100BaseT(X) ports
- M12 A-coding 5-pin male connectors for console and relay output
- M23 6-pin male connector for power input

Dual, Isolated Redundant Power Inputs

- Supports 24 VDC (16.8 to 36 VDC), isolated
- Supports 48 VDC (46 to 50 VDC)
- Supports 72 VDC (50.4 to 100.8 VDC), isolated
- Supports 110/220 VDC/VAC (88 to 300 VDC, 85 to 264 VAC), isolated
- Dual redundant, parallel load-sharing power supplies

High Performance Network Switching Technology

- IPv6 ready, certified by the IPv6 Logo Committee
- IEEE 1588 PTP (Precision Time Protocol) for the precise time synchronization of networks
- DHCP Option 82 for IP address assignment with different policies
- Modbus/TCP industrial Ethernet protocol
- Turbo Ring, Turbo Chain,and RSTP/STP (IEEE802.1w/D)
- IGMP Snooping and GMRP for filtering multicast traffic from industrial Ethernet protocols
- Port-based VLAN, IEEE802.1Q VLAN, and GVRP protocol to ease network planning
- QoS (IEEE802.1p/1Q and TOS/DiffServ) to increase determinism
- 802.3ad, LACP for optimum bandwidth utilization
- IEEE802.1X and https/SSL to enhance network security
- SNMP v1/v2c/v3 for different levels of network management
- RMON for efficient network monitoring and proactive capability
- Bandwidth management prevents unpredictable network status
- Lock port restricts access to authorized MAC addresses only
- Port mirroring for online debugging
- Automatic warning by exception through email, relay output
- Automatic recovery of connected devices' IP addresses
- Line-swap fast recovery
- LLDP for automatic topology discovery through network management software
- Configurable through Web browser, Telnet/Serial console, and Windows utility
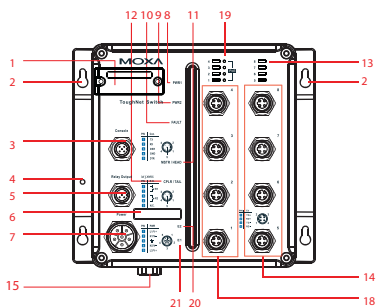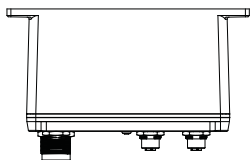
Designed for Industry-specific Applications

- Three rotary switches for setting the last 3 digits of the IP address makes maintenance even easier
- Redundant dual power inputs
- Power failure, port break alarm by relay output
- EN50155/EN50121-3-2/EN50121-4, NEMA TS2, and e-Mark compliant
- -40 to 75°C operating temperature range (for "-T" models)
- IP54/IP67, rugged high-strength housing
- Panel mounting or DIN-Rail mounting installation capability
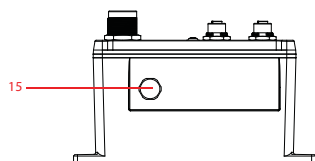
Recommended Optional Accessories

- CBL-M23(FF6P)/OPEN-BK-100 IP67: 1-meter M23 to 6-pin power cable with IP67-rated female 6-pin M23 connector
- A-PLG-WPM23-01-IP67: M23 cable connector, female 6-pin, crimp type
- CBL-M12D(MM4P)/RJ45-100 IP67: 1-meter M12-to-RJ45 Cat-5E UTP Ethernet cable with IP67-rated male 4-pin M12 D-coded connector
- CBL-M12(FF5P)/OPEN-100 IP67: 1-meter M12-to-5-pin power cable with IP67-rated female 5-pin M12 A-coded connector
- M12D-4P-IP68: Field-installable M12 D-coded screw-in connector, male 4-pin, IP68-rated
- M12A-5P-IP68: Field-installable M12 A-coded screw-in connector, female 5-pin, IP68-rated
- A-CAP-M12F-MIP67-PAK04: Caps for M12 D-coded 4-pin male connectors, metal and IP67-rated; 4 pieces in one pack
- DK-DC50131: DIN-Rail mounting kit, 50 x 131 mm
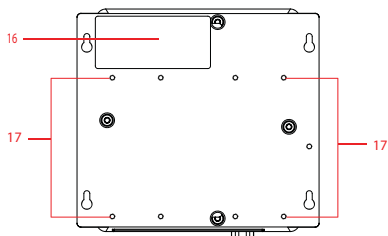
TN-5508-4PoE Panel Layouts
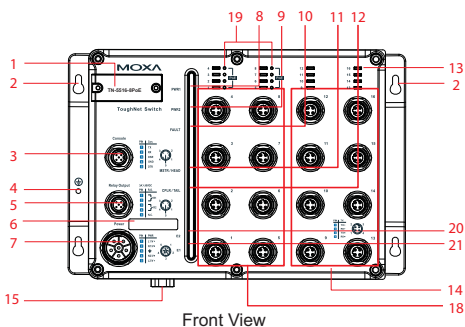
Top View

Front View

Bottom View

Rear View

1. 3 rotary switches and protective cover with model name
2. Screw holes for panel mounting kit
3. Console port
4. Grounding screw
5. Relay output port
6. Power input voltage range indication
7. Power input port (male 6-pin shielded M23 connector)
8. PWR1 LED: for power input 1

9. PWR2 LED: for power input 2
10. FAULT LED
11. MSTR/HEAD LED: for ring master or chain head
12. CPLR/TAIL LED: for ring coupler or chain tail
13. TP port's 10/100 Mbps LED
14. 10/100BaseT(X) port (female 4-pin shielded M12 connector with D coding)
15. Waterproof vent
16. Product label
17. 12 screw holes for DIN-Rail mounting kit
18. 10/100BaseT(X) PoE port (female 4-pin shielded M12 connector with D coding)
19. LED for PoE port
20. E1 LED: Not used by the TN-5508-4PoE/TN-5516-8PoE series
21. E2: LED: Not used by the TN-5508-4PoE/TN-5516-8PoE series

TN-5516-8PoE Panel Layouts

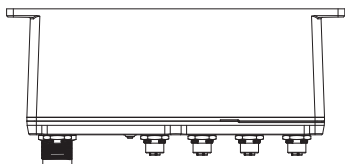Top View

Front View

Bottom View

Rear View

1. 3 rotary switches and protective cover with model name
2. Screw holes for panel mounting kit
3. Console port
4. Grounding screw
5. Relay output port
6. Power input voltage range indication
7. Power input port (male 6-pin shielded M23 connector)
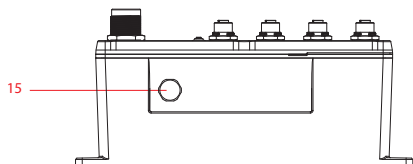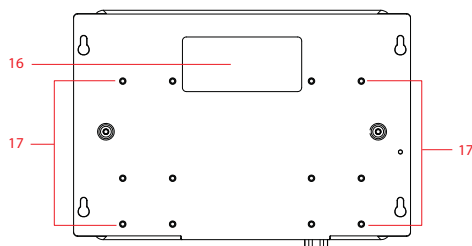8. PWR1 LED: for power input 1

9. PWR2 LED: for power input 2
10. FAULT LED
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⚠️ **ATTENTION**

DO NOT open or remove the vent (#**15**). Once the seal has been removed, the warranty becomes invalid.

Exposed connectors (including **3, 5, 14** and **18**) when not in use must be tightly covered with protective caps (an optional accessory) to ensure IP54/IP67-rated protection.

After the rotary switches (**1**) are set, the protective cover must be properly affixed to ensure IP54/IP67-rated protection.

Mounting Dimensions (unit = mm)

<u>**TN-5508-4PoE Series**</u>
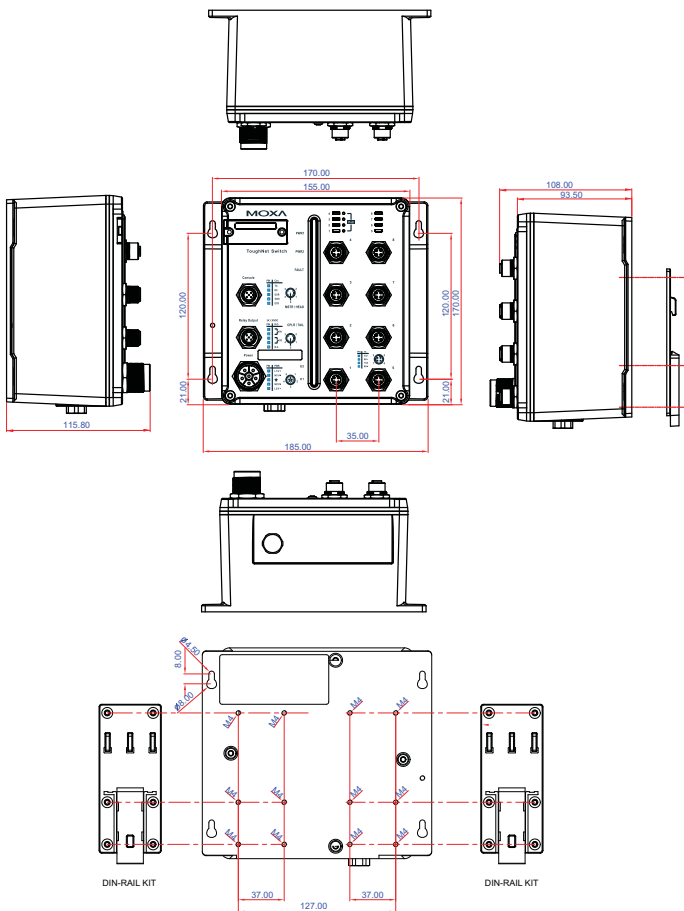
TN-5516-8PoE Series

Panel/Wall Mounting

STEP 1:

Mounting the TN-5508-4PoE/TN-5516-8PoE switches to a wall requires 4 screws. Use the ToughNet switch as a guide to mark the correct positions of the 4 screws.

STEP 2:

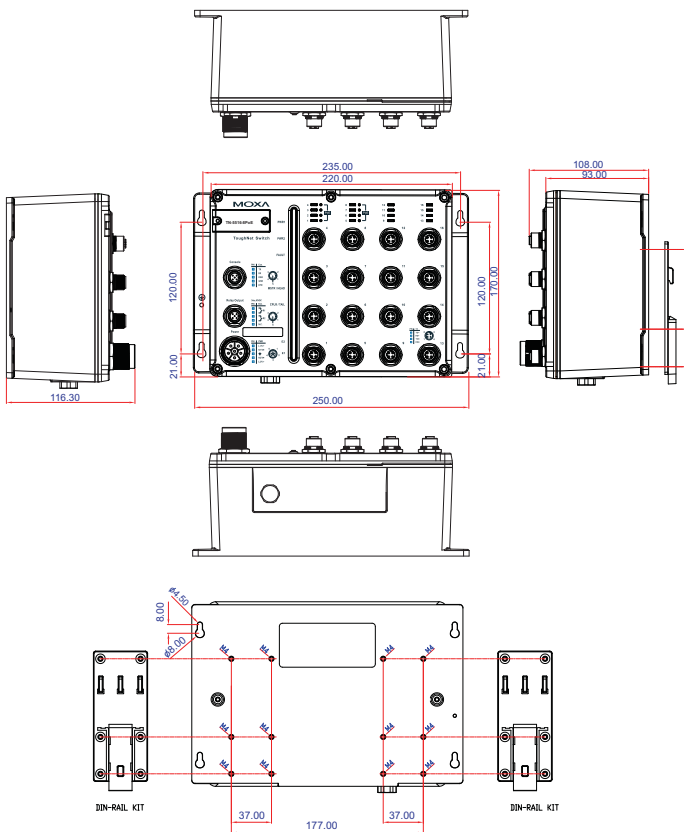Use the 4 screws in the panel mounting kit. If you would like to use your own screws, make sure the screw head is **between 6.0 mm and 7.0 mm** in diameter and the shaft is less than **4.0 mm** in diameter, as shown at the right.

6.0 - 7.0 mm

< 4.0 mm
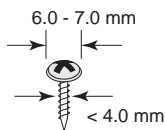
Do not screw the screws in all the way—leave a space of about 2 mm to allow room for sliding the ToughNet switch between the wall and the screws.

| **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.
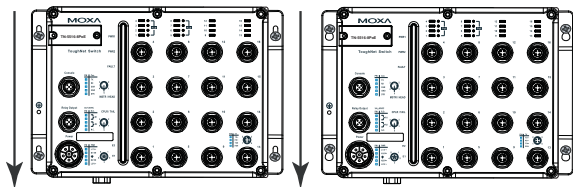

NOTE To provide greater protection from vibrations and shocks, use screws with shaft diameter between 6.0 mm and 7.0 mm, and fix the ToughNet switch onto the wall directly through the large opening of the keyhole-shaped apertures.

DIN-Rail Mounting (optional)

You can mount the TN-5508-4PoE/TN-5516-8PoE on a 35 mm DIN-Rail with the optional DK-DC50131 DIN-Rail mounting kit (must be purchased separately).

Recessed button
Spring-loaded bracket

STEP 1:

Use 12 screws (6 screws per plate) to attach the two DIN-Rail attachment plates to the rear panel of the switch.

STEP 2:

If the spring-loaded bracket is locked in place, push the recessed button to release it. Once released, you should feel some resistance from the spring as you slide the bracket up and down a few millimeters in each direction.

STEP 3:

Position the ToughNet switch on the DIN-Rail, tilting the switch to hook the clamps over the top edge of the rail.
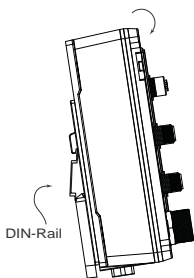
STEP 4:

Swing the switch into a vertical position until both clamps latch completely to the DIN-Rail,.
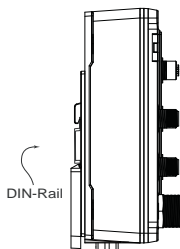
DIN-Rail

DIN-Rail

To remove the Moxa ToughNet Switch from the DIN-Rail, use a screwdriver to pull out the two spring-loaded brackets from the bottom until they are fixed in the "locked" position. Next, reverse Steps 3 and 4 above.

DIN-Rail
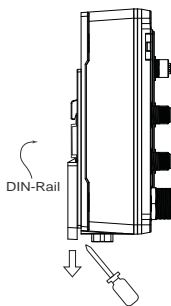
Wiring Requirements

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 UL508 approval. Use copper conductors only, 60/75°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.

Be sure to read the following 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.

- We strongly advise that you label wiring for all devices in the system.

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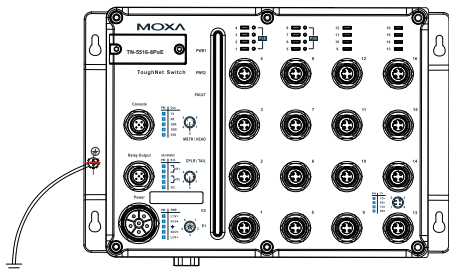
<table>
<tr><td>⚠️</td><td>**ATTENTION**
This product is intended to be mounted to a well-grounded mounting surface such as a metal panel.</td></tr>
</table>

Connecting the Power Supplies

The ToughNet TN-5508-4PoE/TN-5516-8PoE series switches support two sets of power supplies—power input 1 and power input 2. The M23 6-pin male connector on the TN-5508-4PoE/TN-5516-8PoE front panel is used for the dual power inputs.

Pinouts for the power input port on the TN-5508-4PoE/TN-5516-8PoE

PIN	PWR
1	L1/V +
2	N1/V −
3	⏚
4	N2/V −
5	L2/V +

Pinouts for the power input port on the TN-5508-4PoE/TN-5516-8PoE

Pin	Description	Usage
1	PWR1 Live / DC +	Connect "PWR1 Live / DC +" to the Live terminal when using an AC power source or to the positive (+) terminal when using a DC power source.
2	PWR1 Neutral / DC -	Connect "PWR1 Neutral / DC –" to the Neutral terminal when using an AC power source or to the negative (-) terminal when using a DC power source.
3	Chassis Ground	Connect the "Chassis Ground" to the safety ground terminal for AC inputs or to the equipment ground bus for DC inputs.
4	PWR2 Neutral / DC -	Connect "PWR2 Neutral / DC –" to the Neutral terminal when using an AC power source or to the negative (-) terminal when using a DC power source.
5	PWR2 Live / DC +	Connect "PWR2 Live / DC +" to the (Live) terminal when using an AC power source or to the positive (+) terminal when using a DC power source.

STEP 1:

Plug your power cord connector to the power input port of the TN-5508-4PoE/TN-5516-8PoE switch.

STEP 2:

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

⚠ ATTENTION

Before connecting the TN-5508-4PoE/TN-5516-8PoE to the power input, make sure the power source voltage is stable.

Connecting the Relay Outputs

Each TN-5508-4PoE/TN-5516-8PoE switch has two sets of relay outputs—relay output 1 and relay output 2. The M12 A-coded 5-pin male connector on the TN-5508-4PoE/TN-5516-8PoE's front panel is used for the two relay outputs. Use a power cord with an M12 A-coded 5-pin female connector to connect the relay contacts. You can purchase an M12 power cable from Moxa; the model number is CBL-M12 (FF5P)/OPEN-100 IP67.

Pinouts for the relay output port on TN-5508-4PoE/TN-5516-8PoE
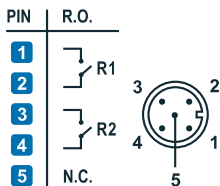
N.C.: Not connected

FAULT:

The two sets of relay contacts of the M12 A-coded 5-pin male connector are used to detect user-configured events. The two wires attached to the fault contacts form an open circuit when a user-configured event is triggered. If a user-configured event does not occur, the fault circuit remains closed.

Connecting the Data Lines

10/100BaseT(X) Ethernet Port Connection

All TN-5508-4PoE/TN-5516-8PoE models have 16 10/100BaseT(X) Ethernet ports (4-pin shielded M12 connector with D coding). The 10/100TX ports located on the TN-5508-4PoE/TN-5516-8PoE front panel are used to connect to Ethernet-enabled devices. 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 10/100BaseT(X) Ports on the TN-5508-4PoE/TN-5516-8PoE
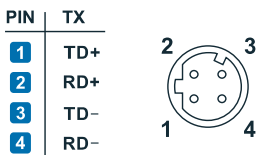
Housing: shield

Pinouts for the RJ45 (8-pin) Port

RJ45 (8-Pin)
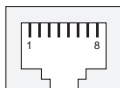
MDI Port Pinouts

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

MDI-X Port Pinouts

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

M12 (4-pin, M) to M12 (4-pin, M) Cross-Over Cable Wiring

Cross-Over Cable Wiring

Tx+	1		1	Tx+
Rx+	2		2	Rx+
Tx-	3		3	Tx-
Rx-	4		4	Rx-
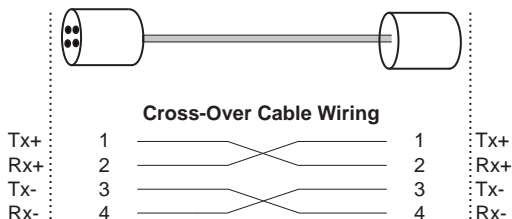
M12 (4-pin, M) to M12 (4-pin, M) Straight-Trough Cable Wiring

Straight-through Cable Wiring

Tx+	1		1	Rx+
Rx+	2		2	Tx+
Tx-	3		3	Rx-
Rx-	4		4	Tx-
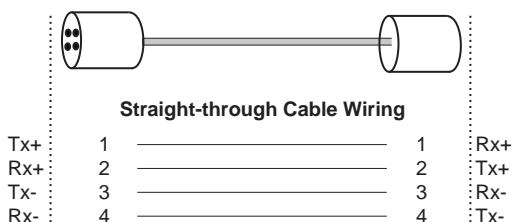
M12 (4-pin, M) to RJ45 (8-pin) Cross-Over Cable Wiring

Cross-Over Cable Wiring

Tx+	1		1	Tx+
Rx+	2		2	Tx-
Tx-	3		3	Rx+
Rx-	4		6	Rx-
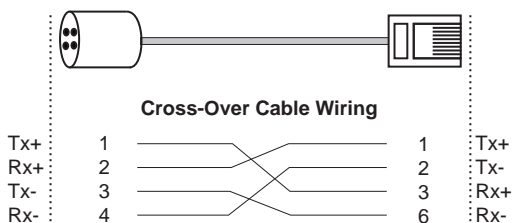
M12 (4-pin, M) to RJ45 (8-pin) Straight-Trough Cable Wiring

Straight-through Cable Wiring

Tx+	1		1	Rx+
Rx+	2		2	Rx-
Tx-	3		3	Tx+
Rx-	4		6	Tx-
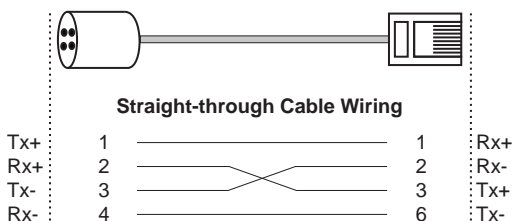
Rotary Switch IP Address Settings

The ToughNet TN-5508-4PoE/TN-5516-8PoE switches have 3 rotary switches on the front panel for configuring the IP address without using a PC, making onsite configuration extremely convenient. This can be especially helpful when you need to replace a faulty switch quickly.

STEP 1: Remove the protective cover by unscrewing the 2 screws with an Allen wrench (also called an Allen key or hex key).

STEP 2: Use a flat-bladed screwdriver to rotate the 3 rotary switches to point to the chosen numbers.

STEP 3: Replace the protective cover and then tighten the screws to the proper torque.

STEP 4: Restart the ToughNet switch to enable the newly configured IP address.

NOTE	1. "Hardware-based IP configuration" only supports IPv4 address settings.
	2. "Hardware-based IP configuration" is enabled only when the 3 rotary switches are set to values ranging from 001 to 254. The ToughNet switch's IP address will be configured as "192.168.127.xxx", where "xxx" are valid value numbers set by the rotary switches.
	3. When enabled, "Hardware-based IP configuration" overrides the "Auto IP Configuration" described in the "IP Settings" section in the user's manual.
	4. Disable "Hardware-based IP configuration" by setting the 3 rotary switches to 000 (the factory default).
	5. If the rotary switch numbers are set to an invalid combination (255 to 999), the ToughNet switch will use the fixed IP address 192.168.127.253 by default.

⚠️ **ATTENTION**

The protective cover must be fixed properly to ensure IP54/IP67 protection. When tightening the screws, use a torque wrench set to set the torque to 4 kgf-m. Note that applying a larger torque may damage the plastic protective cover.

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 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 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 the 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.
Ports LEDs			
TP (10/100M)	AMBER	ON	TP port's 10 Mbps link is active.
		Blinking	Data is being transmitted at 10 Mbps.
		Off	TP port's 10 Mbps link is inactive.
	GREEN	On	TP port's 100 Mbps link is active.
		Blinking	Data is being transmitted at 100 Mbps.
		off	TP port's 100 Mbps link is inactive.
PoE	AMBER	On	Power is being supplied to a Powered Device (PD)
		Off	Power is **not** being supplied to a Powered Device (PD)

Specifications

Technology	
Standards	IEEE 802.3 for 10BaseT IEEE 802.3u for 100BaseT(X) IEEE 802.af PoE IEEE 802.3x for Flow Control IEEE 802.1D for Spanning Tree Protocol IEEE 802.1w for Rapid STP IEEE 802.1Q for VLAN Tagging IEEE 802.1p for Class of Service IEEE 802.1X for Authentication IEEE 802.3ad for Port Trunk with LACP
Protocols	IGMP v1/v2 device, GMRP, GVRP, SNMP v1/v2C/v3, DHCP Server/Client, DHCP Option 66/67/82, BootP, TFTP, SNTP, SMTP, RARP, RMON, HTTP, HTTPS, Telent, SSH, Syslog, LLDP, IEEE 1588 PTP, Modbus/TCP, IPv6
MIB	MIB-II, Ethernet-like MIB, P-BRIDGE MIB, Q-BRIDGE MIB, Bridge MIB, RSTP MIB, RMON MIB Group 1, 2, 3, 9
Flow Control	IEEE802.3x flow control, back pressure flow control
Switch Properties	
Priority Queues	4
Max. Number of Available VLANs	64
VLAN ID Range	VID 1 to 4094
IGMP Groups	256
Interface	
Fast Ethernet	Front cabling, M12 connector, 10/100BaseT(X) auto negotiation speed, F/H duplex mode, and auto MDI/MDI-X connection
Console Port	M12 A-coding 5-pin male connector
System LED Indicators	PWR1, PWR2, FAULT, MSTR/HEAD, CPLR/TAIL
Port LED Indicators	10/100M (Fast Ethernet port)
Alarm Contact	Two relay outputs in one M12 A-coding 5-pin male connector with current carrying capacity of 3 A @ 30 VDC
Rotary Switches	For setting the last 3 digits of the IP address

Power Requirements	
Input Voltage	24: 24 VDC (16.8 to 36 CVD) 48: 48 VDC (46 to 50 VDC) 72: 72 VDC (50.4 to 100.8 VDC) HV: 110/220 VDC/VAC (88 to 300 VDC, 85 to 264 VAC)
Input Current	TN-5508-4PoE Series: Max. 3.5 A @ 24 VDC Max. 1.8 A @ 48 VDC Max. 0.92/0.47 A @ 110/220 VDC Max. 0.77/0.39 A @ 110/220 VAC TN-5516-8PoE Series: Max. 7.5 A @ 24 VDC Max. 3 A @ 48 VDC Max. 1.95/0.975 A @ 110/220 VDC Max. 1.83/0.91 A @ 110/220 VAC
Connection	M23 6-pin male connector
Overload Current Protection	Present
Reverse Polarity Protection	Present
Physical Characteristics	
Housing	Metal, IP54 protection (with protective caps on unused ports)
Dimensions (W × H × D)	TN-5508-4PoE series: 185 x 170 x 110 mm (7.28 x 6.69 x 4.33 in) TN-5516-8PoE series: 250 x 170 x 110 mm (9.84 x 6.69 x 4.33 in)
Weight	TN-5508-4PoE Series: 2140g TN-5516-8PoE Series: 4000g
Installation	Panel mounting, DIN-Rail mounting (with optional kit)
Environmental Limits	
Operating Temperature	Standard Models: 0 to 60°C (32 to 140°F) Wide Temp. Models: -40 to 75°C (-40 to 167°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Operating Humidity	5 to 95% (non-condensing)
Regulatory Approvals	
Safety	UL508 (Pending)
Rail Traffic	EN50155, EN50121-3-2, EN50121-4 (Pending)
Road Traffic	NEMA TS2 (Pending), e-Mark (Pending)
EMI	FCC Part 15, CISPR (EN55022) class A

EMS	EN61000-4-2 (ESD), level 3
	EN61000-4-3 (RS), level 4
	EN61000-4-4 (EFT), level 3
	EN61000-4-5 (Surge), level 3
	EN61000-4-6 (CS), level 3
	EN61000-4-8
	EN61000-4-11
	EN61000-4-12
Shock	IEC61373
Freefall	IEC60068-2-32
Vibration	IEC61373

Note: Please check Moxa's website for the most up-to-date certification status.

WARRANTY	
Time Period	5 years
Details	See www.moxa.com/warranty

Technical Support Contact Information

www.moxa.com/support

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