TN-5816A/5818A Series
Hardware Installation Guide

Moxa ToughNet Switch

First Edition, November 2014

Overview

The ToughNet TN-5816A/5818A switches are high performance M12 Layer 3 Ethernet switches that support Layer 3 routing functionality to facilitate the deployment of applications across networks.
TN-5816A/5818A switches use M12 and other circular connectors to ensure tight, robust connections and guarantee reliable operation against environmental disturbances, such as vibration and shock.
TN-5816A/5818A switches support isolated power in the 24 to 110 VDC power input range, allowing the same model to be used at different sites around the globe. TN-5816A/5818A switches provide up to 16 Fast Ethernet M12 ports with 2 bypass relay ports, and 2 Ethernet interface Gigabit ports with bypass relay functionality. Furthermore, with a -40 to 75°C operating temperature and IP54-rated waterproof enclosure, the switches can be deployed in harsh environments. The TN-5816A/5818A series Ethernet switches are compliant with essential sections of EN 50155, covering operating temperature, power input voltage, surge, ESD, and vibration, as well as conformal coating and power insulation, making the switches suitable for a variety of industrial applications.

Package Checklist

Your ToughNet TN-5816A/5818A switch is shipped with the following items. If any of these items is missing or damaged, please contact your customer service representative for assistance.

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

Features

Anti-Vibration Circular Connectors for Robust Links
- M12 D-coding 4-pin female connectors for Fast Ethernet 10/100BaseT(X) ports.
- M12 X-coded 8-pin connector for Gigabit Ethernet 10/100/1000BaseT(X) ports
- M12 A-coding 5-pin male connectors for console and relay output.
- M23 6-pin male connector for power input.

Dual Isolated Power Inputs
- 24 to 110 VDC (16.8 to 137.5 VDC), isolated.

Designed for Industry-specific Applications
- Two Gigabit Ethernet ports to meet high bandwidth requirements.
- Bypass relay ensures non-stop data communication in the event the switch stops working due to a power failure.
- EN 50155/50121-3-2 compliant. See specs for details about compliance with specific chapters of EN 50155.
- -40 to 75°C operating temperature range.
- IP54, rugged high-strength case.
- 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
- 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
- CAP-M12F-M: Metal cap for M12 female connector
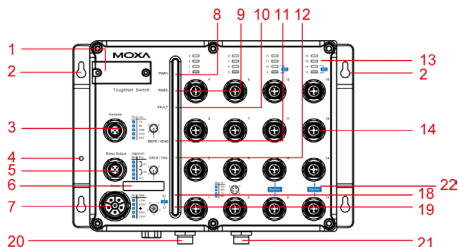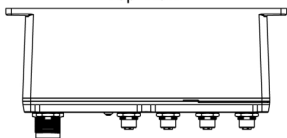- DK-DC50131: DIN-rail mounting kit, 50 x 131 mm

TN-5816A Panel Layouts
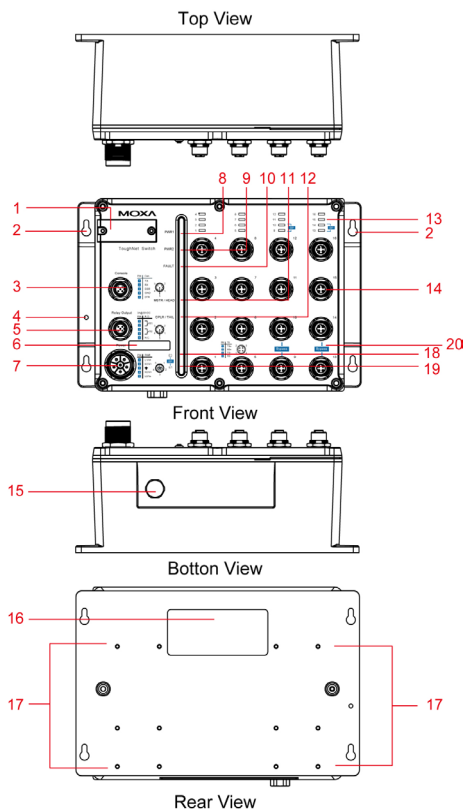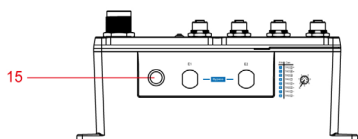
Top View

Front View

Botton View

Rear View

1. Model name
2. Screw holes for panel mounting kit
3. Console port
4. Grounding screw
5. Relay output port
6. Power input voltage range indicator
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. E2 LED: Not used by the TN-5816 series
19. E1 LED: Not used by the TN-5816 series
20. Ports 9-10, 13-14 with relay bypass function
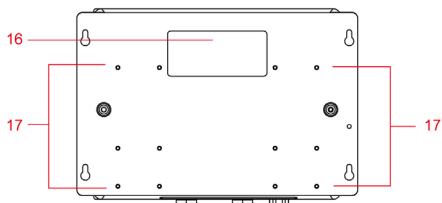
TN-5818A Panel Layouts

Top View

Front View

Bottom View

Rear View

1. Model name
2. Screw holes for panel mounting kit
3. Console port
4. Grounding screw
5. Relay output port
6. Power input voltage range indicator
7. Power input port (male 5-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. E2 LED: Down-side E2 Gigabit port's 10/100/1000 Mbps LED
19. E1 LED: Down-side E1 Gigabit port's 10/100/1000 Mbps LED

20. Gigabit Ethernet port E1 (corresponding to port 17 in the TN-5818A User's Manual; ports 17-18 support relay bypass function)
21. Gigabit Ethernet port E2 (corresponding to port 18 in the TN-5818A User's Manual; ports 17-18 support relay bypass function)
22. Ports 9-10, 13-14 with relay bypass function


⚠️ **ATTENTION**

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

Ports (including 3, 5, and 14) that are not in use must be tightly covered with protective caps (an optional accessory) to ensure IP54/IP67-rated protection.
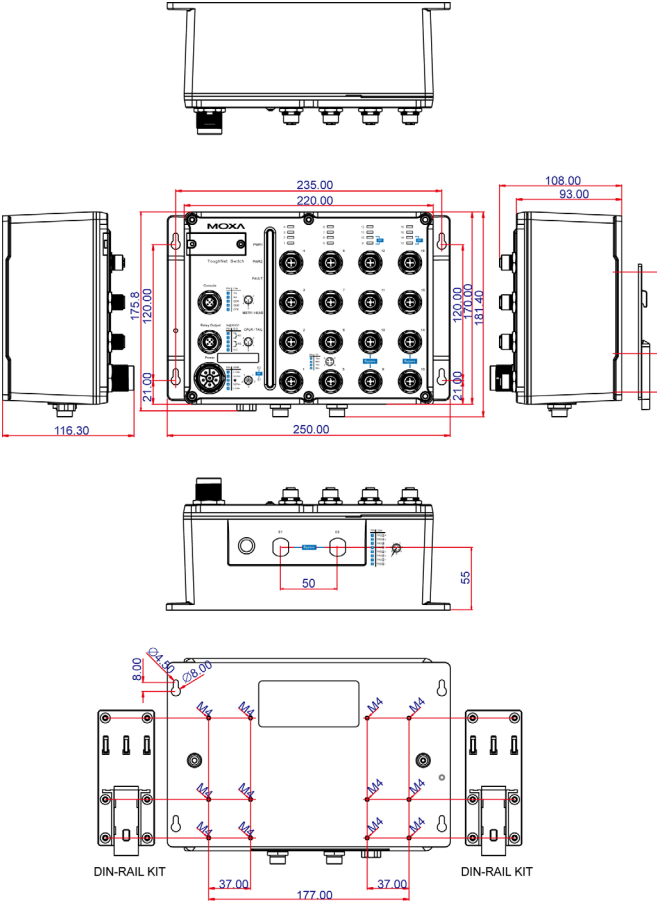
After the rotary switches (1) are set, the protective cover must be properly affixed to ensure IP54-rated protection.

Mounting Dimensions (unit = mm)

TN-5816A Series
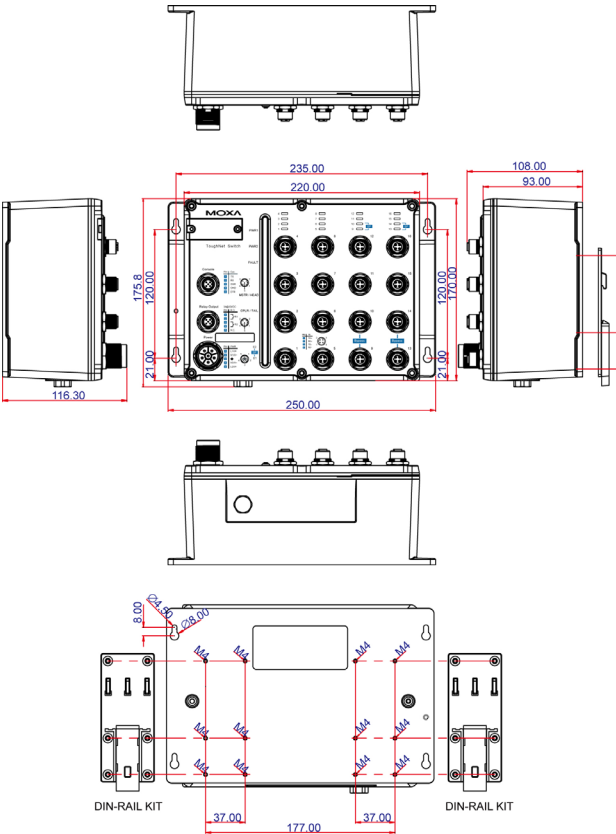
TN-5818A Series

Panel/Wall Mounting

STEP 1:
Mounting the TN-5816A/5818A 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.
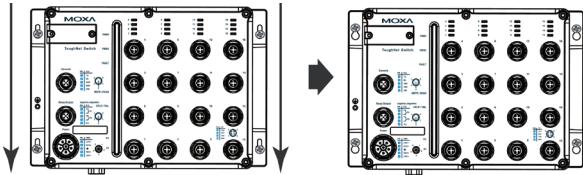
6.0 - 7.0 mm

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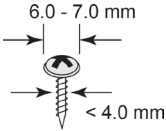
Do not screw the screws in all the way—leave a space of about 2 mm to allow room for sliding the ToughNet switch between the wall and the screws.

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.

DIN-Rail Mounting (optional)

Use the optional DIN-rail mounting kit (DK-DC50131, must be purchased separately) to mount the TN-5816A/5818A on a 35 mm DIN-rail.

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.
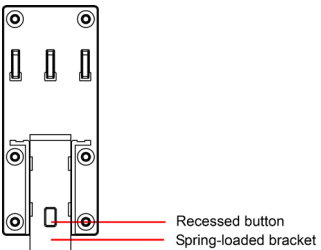
STEP 3:
Position the ToughNet switch on the DIN-rail, tilted so the clamps hook over the top edge of the rail.
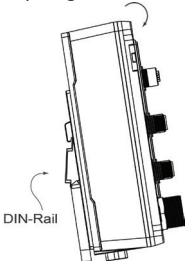
STEP 4:
Swing the switch down fully onto the DIN-rail, until both clamps completely latch.

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 a "locked" position. Then, 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.
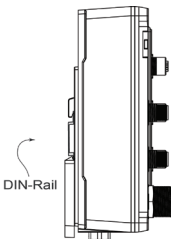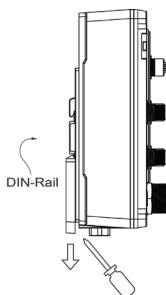
These devices must be supplied by a SELV source as defined in the Low Voltage Directive 2006/95/EC and 2004/108/EC.

⚠️ **ATTENTION**

Safety First!

Be sure to disconnect the power cord before installing and/or wiring your Moxa switch.

This device has UL 508 approval. Use copper conductors only, 60 to 75°C, and tighten to 4.5 pound-inches. For use in pollution degree 2 environments.
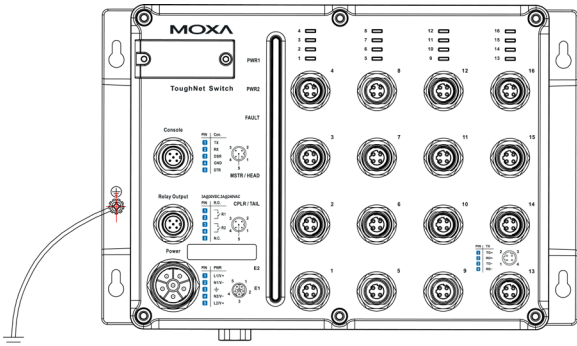
⚠️ **ATTENTION**

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.

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**

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

Connecting the Power Supplies

The ToughNet TN-5816A/5818A series switches support two sets of power supplies—power input 1 and power input 2. The M23 6-pin male connector on the TN-5816A/5818A's front panel is used for the dual power inputs.
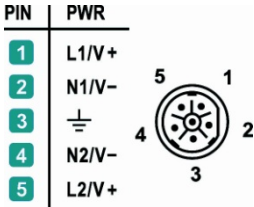
Pinouts for the power input port on the TN-5816A/5818A

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

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

STEP 1:
Plug the power cord connector into the TN-5816A/5818A's power input port.

STEP 2:
Screw in the nut on the power cord connector to the power input connector (on the switch) to ensure a tight connection.

> ⚠️ **ATTENTION**
>
> Before connecting the TN-5816A/5818A to the power input, make sure the power source voltage is stable.

Connecting the Relay Outputs

Each TN-5816A/5818A 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-5816A/5818A 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 TN-5816A/5818A's relay output port
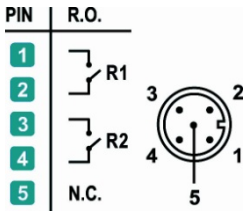
N.C.: Not connected

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-5816A/5818A models have 16 10/100BaseT(X) Ethernet ports (4-pin shielded M12 connector with D coding). The 10/100TX ports located on the TN-5816A/5818A 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.

10/100BaseT(X) Port Pinouts
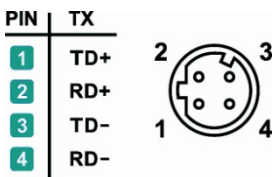
Housing: shield

10/100/1000BaseT(X) M12 (8-pin) Port Pinouts

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

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

Tx+	1		1	Tx+
Rx+	2	✕	2	Rx+
Tx-	3		3	Tx-
Rx-	4	✕	4	Rx-

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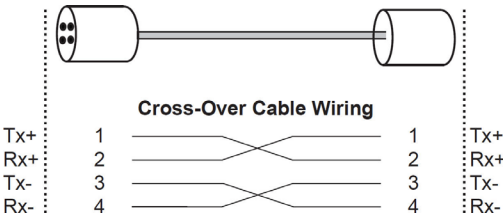
M12 (4-pin, M) to M12 (4-pin, M) Straight-Through Cable

Wiring

Tx+	1		1	Rx+
Rx+	2		2	Tx+
Tx-	3		3	Rx-
Rx-	4		4	Tx-

Straight-through Cable Wiring
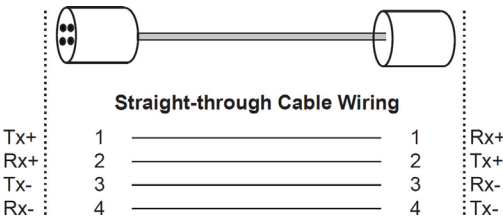
M12 (4-pin, M) to RJ45 (8-pin) Cross-Over Cable Wiring

Tx+	1		1	Tx+
Rx+	2		2	Tx-
Tx-	3		3	Rx+
Rx-	4		6	Rx-

Cross-Over Cable Wiring
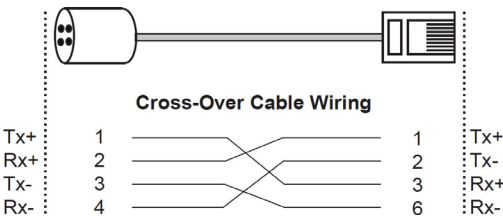
M12 (4-pin, M) to RJ45 (8-pin) Straight-Through Cable

Wiring

Cross-Over Cable Wiring

Tx+	1	—	1	Tx+
Rx+	2	╳	2	Tx-
Tx-	3	╳	3	Rx+
Rx-	4	—	6	Rx-
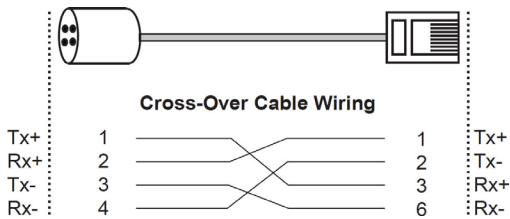
Bypass Relay Function

The TN-5816A/5818A is equipped with a bypass relay function. When the switch is operating normally, these bypass ports work in the same way as the other ports. That is, frame ingressions are processed and then forwarded. If the switch stops working due to a power failure, the bypass relay function will be triggered to ensure non-stop data communication.

The figure below illustrates the bypass relay function. For example, if Switch B loses power, then the two Gigabit ports will be bypassed through the relay circuit and the transmission line from Switch A to B and the transmission line from Switch B to C will interconnect automatically, ensuring that power continues to be supplied.

The bypass relay function helps the network recover from single-node failures in a linear topology.
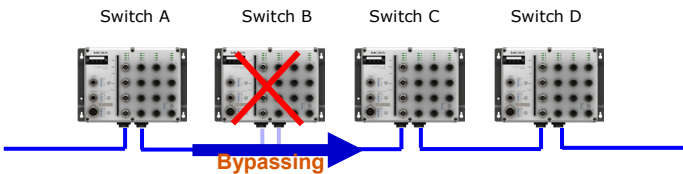
Since the maximum segment length of category 5 twisted-pair cable is 100 meters, cable length must be considered when designing a network that utilizes this function. For example, the total length of the cables from Switch A to B and from B to C must be no more than 100 meters. This way, if the two adjacent nodes (switch B and C for example) encounter a power failure, there will be no stoppage, provided that the total length of the cables A-to-B, B-to-C, and C-to-D are no more than 100 meters.

The bypass relay function works best for networks with linear topologies. ToughNet™ switches with bypass relay function are not recommended to be used in networks that employ ring topologies because network loops may occur when redundancy protocols such as RSTP or TurboRing™ are applied.

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 Turbo Chain is down.
		OFF	When the TN switch disables the coupling function of the Turbo Ring, or it is not the Tail of the Turbo Chain.
Port 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.
E1/E2 (10/100/ 1000M)	AMBER	On	TP port's 10 or 100 Mbps link is active.
		Blinking	Data is being transmitted at 10 or 100 Mbps.
		Off	TP port's 10 or 100 Mbps link is inactive.
	GREEN	On	TP port's 1000 Mbps link is active.
		Blinking	Data is being transmitted at 1000 Mbps.
		Off	TP port's 1000 Mbps link is inactive.

Specifications

Technology	
Standards	IEEE 802.3 for 10BaseT
	IEEE 802.3u for 100BaseT(X)
	IEEE 802.3ab for 1000BaseT(X)
	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	IGMPv1/v2, GMRP, GVRP, SNMPv1/v2c/v3, DHCP Server/Client, BootP, TFTP, SNTP, SMTP, RARP, RMON, HTTP, HTTPS, Telnet, Syslog, DHCP Option 66/67/82, SSH, SNMP Inform, Modbus TCP, LLDP, IEEE 1588 PTP, IPv6, RIP V1/V2, OSPF, VRRP
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
Gigabit Ethernet	M12 X-coded 8-pin connector, 10/100/1000BaseT(X) auto negotiation speed, F/H duplex mode, auto MDI/MDI-X connection and bypass relay function
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), 10/100/1000M (Gigabit Ethernet port)
Alarm Contact	Two relay outputs in one M12 A-coding 5-pin male connector with current carrying capacity of 1 A @ 30 VDC

Power Requirements	
Input Voltage	WV: 24 to 110 VDC (16.8 to 137.5 VDC)
Input Current	TN-5816ABP Series: 1.1 A @ 24 VDC, 0.23 A @ 110 VDC TN-5818A-2GTXBP Series: 1.24 A @ 24 VDC, 0.26 A @ 110 VDC
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-5816A Series: 250 x 175.8 x 116.3 mm (9.84 x 6.92 x 4.58 in) TN-5818A Series: 250 x 181.4 x 116.3 mm (9.84 x 7.14 x 4.58 in)
Weight	TN-5816A Series: 2990 g TN-5818A Series: 3160 g
Installation	Panel mounting, DIN-Rail mounting (with optional kit)
Environmental Limits	
Operating Temperature	-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
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
Shock	IEC61373
Freefall	IEC60068-2-32
Vibration	IEC61373
Note: Please check Moxa's website for the most up-to-date certification status.	
WARRANTY	5 years Details: See www.moxa.com/warranty