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MOXA TN-5916 ToughNet NAT Router Installation Guide

TN-5916 Series
Quick Installation Guide
Moxa ToughNet NAT Router
Version 3.1, January 2021
Technical Support Contact Information
www.moxa.com/support

Contents

Overview

The ToughNet TN-5916 is a high performance M12 Layer 3 NAT Router that supports Layer 3 routing functionality to facilitate the deployment of applications across networks. The TN-5916 NAT router uses M12 and other circular connectors to ensure tight, robust connections and guarantee reliable operation against environmental disturbances, such as vibration and shock. The TN-5916 NAT router supports isolated power in the 24 to 110 VDC power input range, allowing the same model to be used at different sites around the globe, and provides up to 16

Fast Ethernet M12 ports with 4 bypass relay ports. Furthermore, with a -40 to 75°C operating temperature and IP54-rated waterproof enclosure, the router can be deployed in harsh environments. The TN-5916 series Ethernet routers are compliant with EN 50155/50121-4 requirements, making the router suitable for a variety of industrial applications.

Package Checklist

Your ToughNet TN-5916 NAT router 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 NAT router
- 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
- Quick installation guide (printed)
- 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 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.

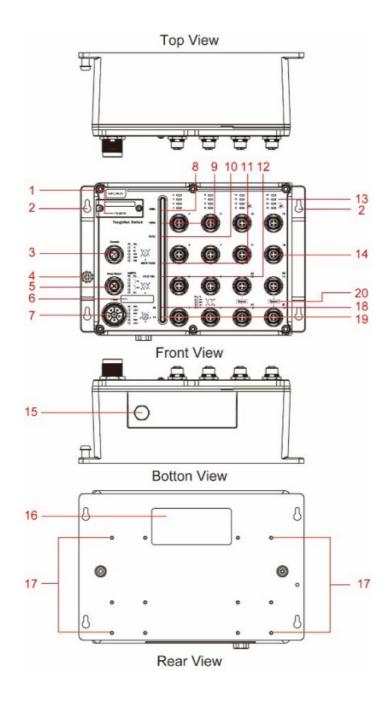### Designed for Industry-specific Applications

- Bypass relay ensures non-stop data communication in the event the router stops working due to a power failure.
- EN 50155/50121-3-2 compliant. See specs for details about compliance with specific parts of the EN 50155 specifications.
- -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-5916 Panel Layouts

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-5916 series

19. E1 LED: Not used by the TN-5916 series
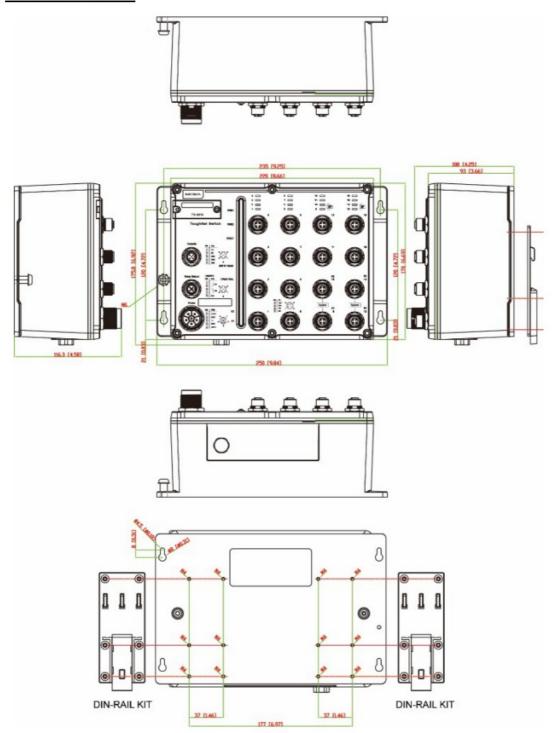
20. Ports 9-10, 13-14 with relay bypass function

NOTE On the TN-5916-ETBN, ETB ports representing DIR1 are marked as A1 and B1, and ports representing DIR2 are marked as A2 and B2.

⚠ **ATTENTION**

DO NOT open or remove the vent (#15). Removing the seal will invalidate the warranty.

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.
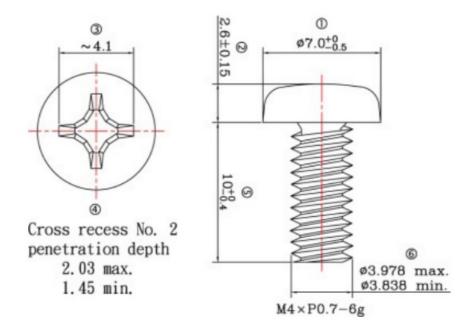
Mounting Dimensions (unit = mm)

TN-5916 Series

Panel/Wall Mounting

STEP 1:
Mounting the TN-5916 to a wall requires 4 screws. Use the ToughNet router 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.

③
~4.1

Cross recess No. 2
penetration depth
2.03 max.
1.45 min.

④

① $\varnothing 7.0^{+0}_{-0.5}$

② 2.6 ± 0.15

⑤ $10^{+0}_{-0.4}$

⑥ $\varnothing 3.978$ max.
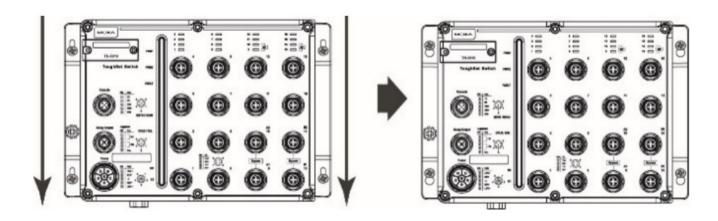$\varnothing 3.838$ min.

M4×P0.7−6g

Do not screw the screws in all the way—leave a space of about 2 mm to allow room for sliding the ToughNet router 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 router.

STEP 3:
Once the screws are fixed in the wall, hang the ToughNet router on the 4 screws through the large opening of the keyhole-shaped apertures, and then slide the router downwards. Tighten the four screws for added stability.
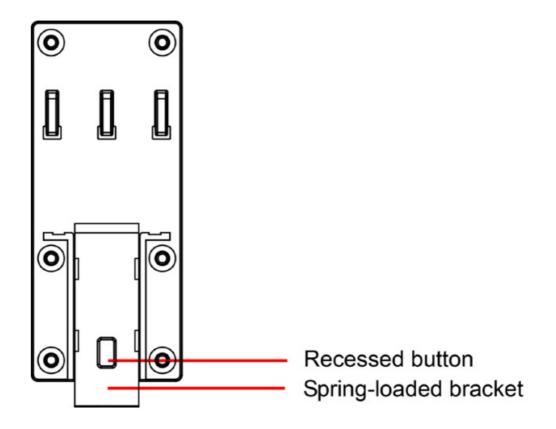

NOTE To provide greater protection from vibration and shock, use screws with shaft diameter between 6.0 mm and 7.0 mm, and fix the ToughNet router onto the wall directly through the large opening of the keyhole-shaped apertures.

DIN-Rail Mounting (optional)
Use the optional DIN-rail mounting kit (DK-DC50131, must be purchased separately) to mount the TN-5916 on a 35 mm DIN-rail.

STEP 1:
Use 12 screws (6 screws per plate) to attach the two DIN-rail attachment plates to the rear panel of the router.

Recessed button
Spring-loaded bracket
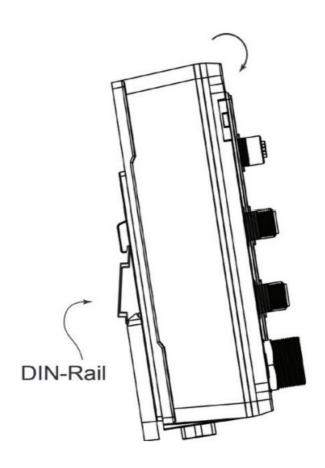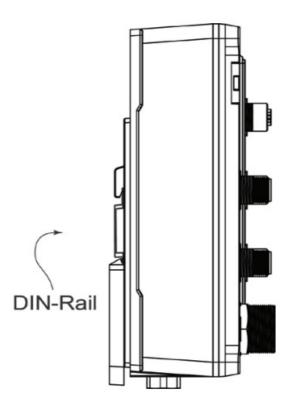
STEP 2:
If the spring-loaded bracket is locked in place, push the recessed button to release it. Once released, you should feel some resistance from the spring as you slide the bracket up and down a few millimeters in each direction.
STEP 3:
Position the ToughNet router on the DIN-rail, tilted, so the clamps hook over the top edge of the rail.
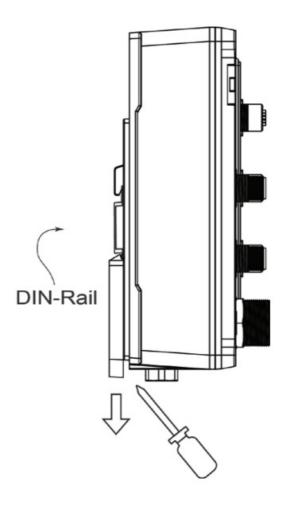
DIN-Rail

STEP 4:
Swing the router down fully onto the DIN-rail, until both clamps completely latch.

DIN-Rail

To remove the Moxa ToughNet Router 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 router.

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

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.
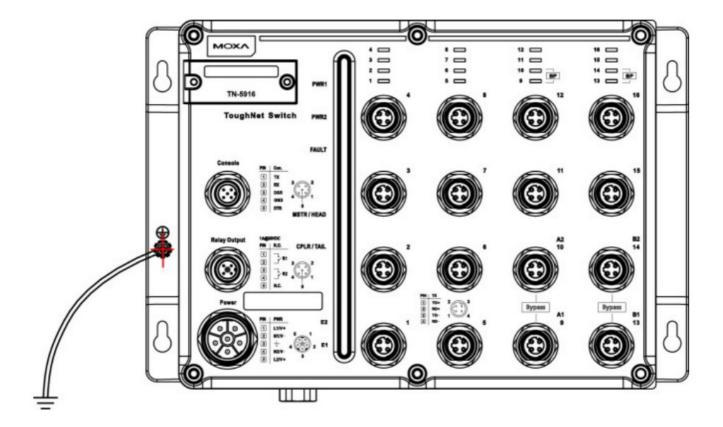
  NOTE: Do not run signal or communications wiring and power wiring through the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.

- 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 NAT Router

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.
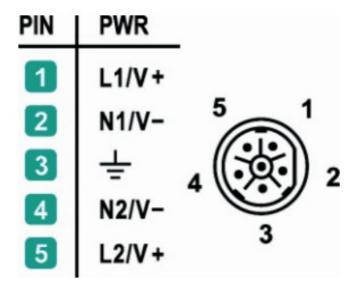

⚠️ **ATTENTION**

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-5916 series routers support two sets of power supplies—power input 1 and power input 2. The M23 6-pin male connector on the TN-5916's front panel is used for the dual power inputs.

Pinouts for the Power Input Port on the TN-5916

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-5916's power input port.

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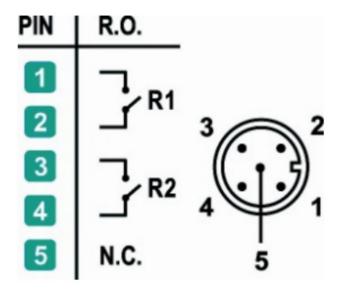
⚠️ **ATTENTION**

Before connecting the TN-5916 to the power input, make sure the power source voltage is stable.

Connecting the Relay Outputs

Each TN-5916 router has two sets of relay outputs—relay output 1 and relay output 2.The M12 A-coded 5-pin male connector on the TN-5916 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-5916's Relay Output Port

PIN | R.O.
1, 2 — R1
3, 4 — R2
5 — N.C.

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.
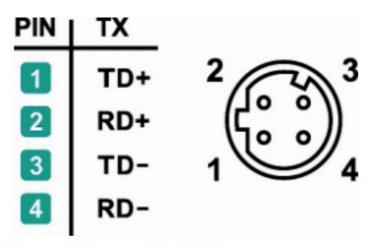
Connecting the Data Lines

10/100BaseT(X) Ethernet Port Connection

All TN-5916 models have 16 10/100BaseT(X) Ethernet ports (4-pin shielded M12 connector with D coding). The 10/100TX ports located on the TN-5916 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/Router-type) connected to the port.

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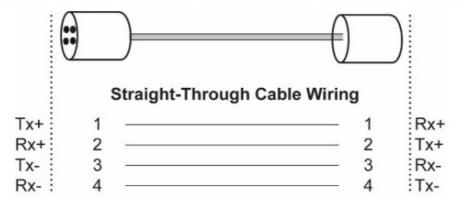

PIN | TX
1 | TD+
2 | RD+
3 | TD−
4 | RD−

Housing: shield

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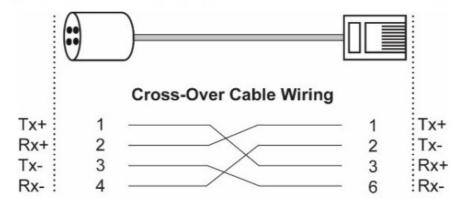
Cross-Over Cable Wiring

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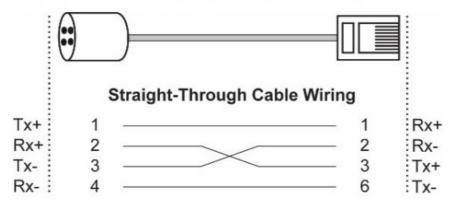
M12 (4-pin, M) to M12 (4-pin, M) Straight-Through Cable Wiring

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-Through Cable Wiring

Straight-Through Cable Wiring

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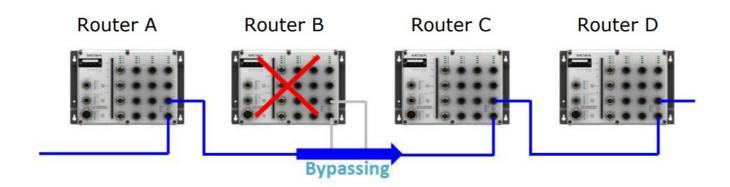
Bypass Relay Function

The TN-5916 is equipped with a bypass relay function. When the router 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

router 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 Router B loses power, then the two bypass functional ports will be bypassed through the relay circuit and the transmission line from Router A to B and the transmission line from Router 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 Router A to B and from B to C must be no more than 100 meters. This way, if the two adjacent nodes (router 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™ routers 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 router'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 router is either the Master of this Turbo Ring, or the Head of this Turbo Chain.
		Blinking	When the TN router 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 router is neither the Master of this Turbo Ring, nor the Head of this Turbo Chain.
CPLR/ TAIL	GREEN	ON	When the TN router 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 router 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.

Specifications

Technology	
Standards	IEEE 802.3 for 10BaseT IEEE 802.3u for 100BaseT(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 802.3ad for static Port Trunk

Protocols	IGMPv1/v2, SNMPv1/v2c/v3, DHCP Server, TFTP, SNTP, SMTP, RMON, HTTP, HTTPS, Telnet, Syslog, SSH, SNMP Inform, LLDP, RIP V1/V2, VRRP, TTDP (for ETBN model), TRDP (for ETBN model)
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
Router Properties	
Priority Queues	4
Max. Number of Available VLANs	16
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 1 A @ 30 VDC

Power Requirements	
Input Voltage	WV: 24 to 110 VDC (16.8 to 137.5 VDC)
Input Current	0.85 A @ 24 VDC, 0.17 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)	250 ´ 175.8 ´ 116.3 mm (9.84 ´ 6.92 ´ 4.58 in)
Weight	4030 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	UL/cUL 508, EN 60950-1 (LVD)

EMC	EN 55032, EN 55024
EMI	CISPR 32, FCC Part 15B Class A
EMS	IEC 61000-4-2 ESD: Contact 6 kV; Air 8 kV IEC 61000-4-3 RS: 80 MHz to 1 GHz: 20 V/m IEC 61000-4-4 EFT: Power 2 kV; Signal 2 kV IEC 61000-4-5 Surge: Power 2 kV; Signal 2 kV IEC 61000-4-6 CS: 10 V IEC 61000-4-8
Rail Traffic	EN 50155*, EN 50121-4, EN 45545-2

*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**

Shock	EN 50155, EN/IEC 61373
Freefall	IEC 60068-2-32
Vibration	EN 50155, EN/IEC 61373

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

status.

MTBF (mean time between failures)

Time	556,025 hrs.
Standard	Telcordia SR332

Warranty

Warranty Period	5 years
Details	**www.moxa.com/warranty**

Documents / Resources

TN-5916 Series Quick Installation Guide **Moxa ToughNet NAT Router** **Version 3.1, January 2021** Technical Support Contact Information www.moxa.com/support **MOXA** © 2021 Moxa Inc. All rights reserved. P/N: 1802059160012	[**MOXA TN-5916 ToughNet NAT Router**](#) [pdf] Installation Guide TN-5916 ToughNet NAT Router, TN-5916, ToughNet NAT Router, NAT Router, Router

References

- [**User Manual**](#)