

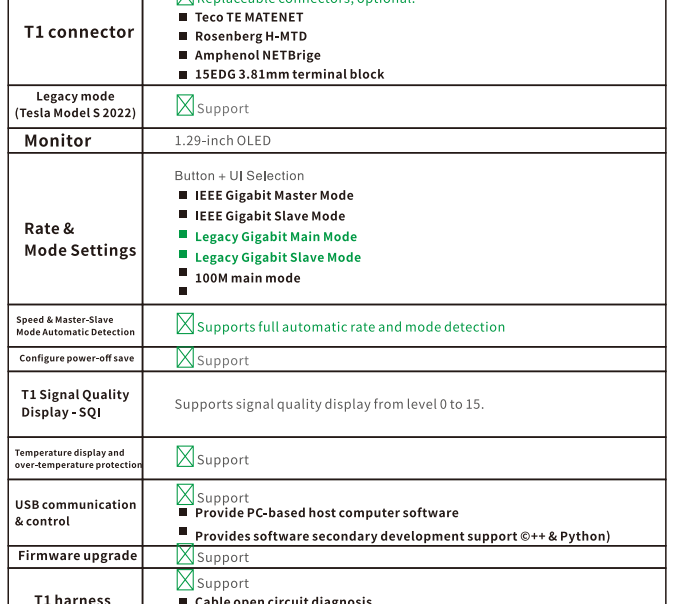
DT-9108

Gigabit Automotive Ethernet Converter

Please read the product manual carefully before using the product.

一、Product Overview

The RAD.NEPTUNE series is a media converter (also known as an Ethernet physical layer converter) designed for automotive Ethernet applications. This product series bridges standard Ethernet and automotive Ethernet, converting the automotive Ethernet physical layer BroadR-Reach (100/1000BASE-T1) to the Fast Ethernet physical layer (100/1000BASE-TX). This product only converts the two different Ethernet physical layers and does not modify the original Ethernet packets (no latency, transparent transmission). It allows communication between 100/1000BASE-T1 ECUs and typical PCs, Ethernet switches, and routers. Typical use cases include testing, simulation, diagnostics, and ECU flashing.



This product boasts a compact and elegant design, a simple and easy-to-use interface, and is suitable for most Ethernet-to-vehicle Ethernet conversion scenarios.

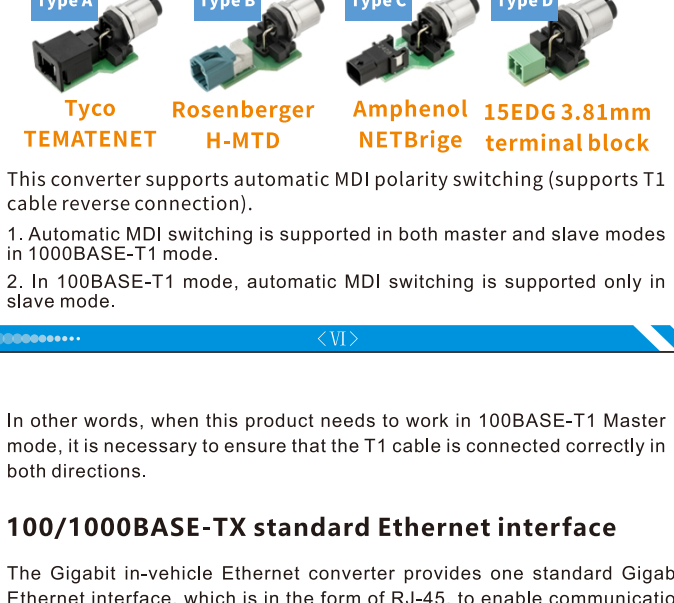
二、Product Features

- Compatible with all mainstream chips for 100/1000BASE-T1, including Marvell, NXP, TI, Broadcom, and Microchip.
- Automatic mode switching, automatically adjusting to Master/Slave, 1000M/100M, and IEEE/Legacy modes based on the peer's mode.
- In addition to standard T1 communication, supports advanced functions such as signal quality testing, harness diagnostics, active packet transmission, loopback mode, and Legacy mode.
- Real-time data display: bandwidth ratio between T1 and RJ45 and between RJ45 and T1.
- Supports host computer control, open-source control protocol, and Python interface code.
- 1000BASE-T1 mode supports cable lengths up to 15M (ordinary unshielded twisted pair cable).
- 100 BASE-T1 mode supports cable lengths up to 50M (ordinary unshielded twisted pair cable).
- Uses aviation-grade connectors, supporting various interface adapter replacements.
- A buzzer sounds to alert you when connecting or disconnecting.
- Equipped with a high-definition OLED display for intuitive status information.
- Supports DC power or USB Type-C power supply, with a power supply range of 5~36V, compatible with car and truck voltages.
- Product dimensions: 140.7mm x 84mm x 46.5mm.
- Power consumption: Maximum power consumption 1.5W.

三、Application scenarios

- Repair and Diagnostics:** The in-vehicle system connects to standard network tools for rapid fault detection and ECU remapping/upgrades.
- Information Sharing:** Vehicle data is uploaded to the cloud or local server for easy management and analysis.
- Multimedia Content Transmission:** The in-vehicle entertainment system connects to external devices via standard Ethernet for streaming content transmission.
- Vehicle Monitoring:** Real-time video from the in-vehicle monitoring camera is transmitted to an external monitoring system.
- In-Vehicle Application Integration:** Integrates different vehicle applications, using standard network interfaces for data interaction and control.

四、External dimensions



五、Interface Description

This product offers a standard DC interface and a Type-C power supply interface.

- USB Type-C: Supports power supply and communication; a standard 5V 500mA power supply is sufficient.
- DC Interface: Supports 5~36V DC power supply, compatible with vehicle power supplies, suitable for cars and trucks. The product comes standard with a 12V DC power supply; using the included power supply is recommended.



六、Interface Description

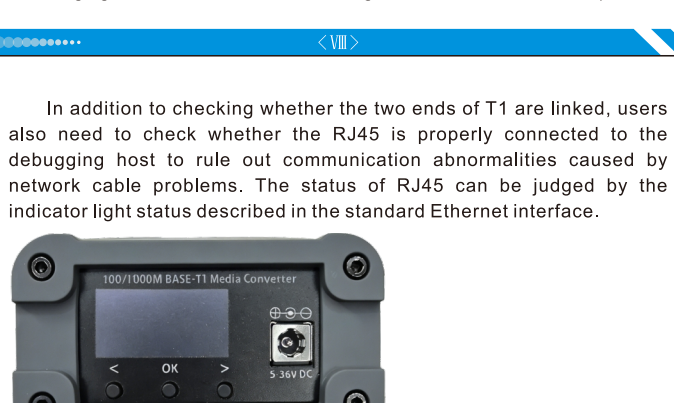


Image: Converter's on-board Ethernet differential interface

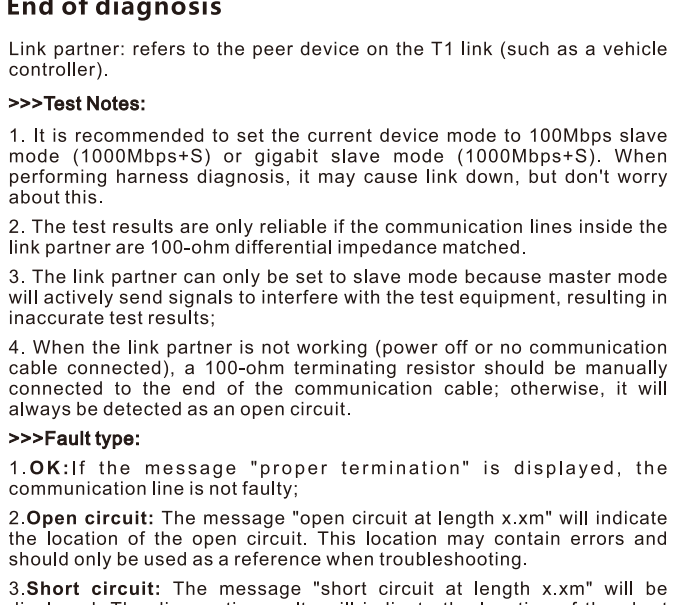
As shown in the diagram, when the vehicle Ethernet interface is facing the user, the interface on the right side of the connector is TX- (TRXM: negative terminal of the transmit/receive signal), and the interface on the left side is TX+ (TRXP: positive terminal of the transmit/receive signal). Simply put, these two interfaces represent the positive and negative terminals of the differential signal, respectively. The user needs to ensure that the differential signal is correctly connected to the differential signal of the peer device (P<--->P; M<--->M(N)).

- The following four types of adapters can be selected and combined as needed
- Type A: Tyco TEMA7ENET
 - Type B: Rosenberger H-MTD
 - Type C: Amphenol NETBrige
 - Type D: 15EDG3.81mm

- This converter supports automatic MDI polarity switching (supports T1 cable reverse connection).
- Automatic MDI switching is supported in both master and slave modes in 1000BASE-T1 mode.
 - In 100BASE-T1 mode, automatic MDI switching is supported only in slave mode.

七、Main Function Operation Instructions

The system boots up to the main interface by default. Main interface display information:

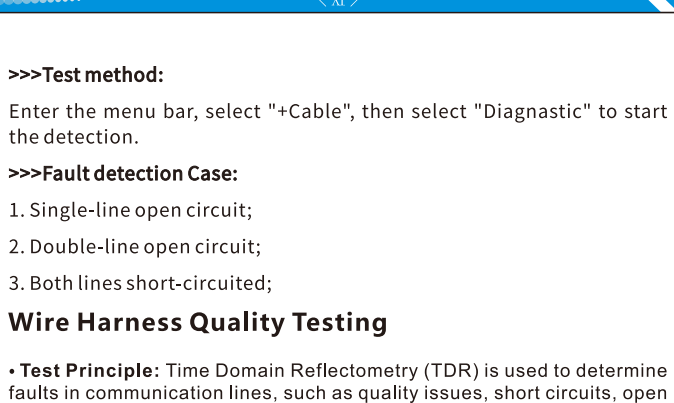


The vehicle-mounted Ethernet converter also has two indicator lights, with the following meanings:

Link: Link indicator. An illuminated indicator means the device is successfully connected; an off indicator means the device is not successfully connected.

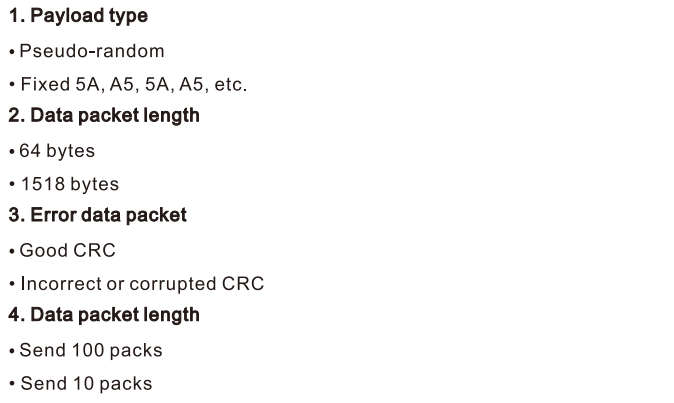
PWR: Power indicator signal.

RJ45 port indicator light description



- 2024 Production Batch
- Green Indicator:** A solid light indicates a successful connection between the converter and the connected PC or host.
 - Yellow Indicator:** A flashing indicator indicates that data is being transmitted on the RJ45 port.
- 2025 Production Batch
- Green Indicator:** In 100BASE-TX mode, a solid light indicates a successful connection between the converter and the PC or host; a flashing light indicates that data is being transmitted on the RJ45 port.
 - Yellow Indicator:** In 1000BASE-TX mode, a solid light indicates a successful connection between the converter and the PC or host; a flashing light indicates that data is being transmitted on the RJ45 port.

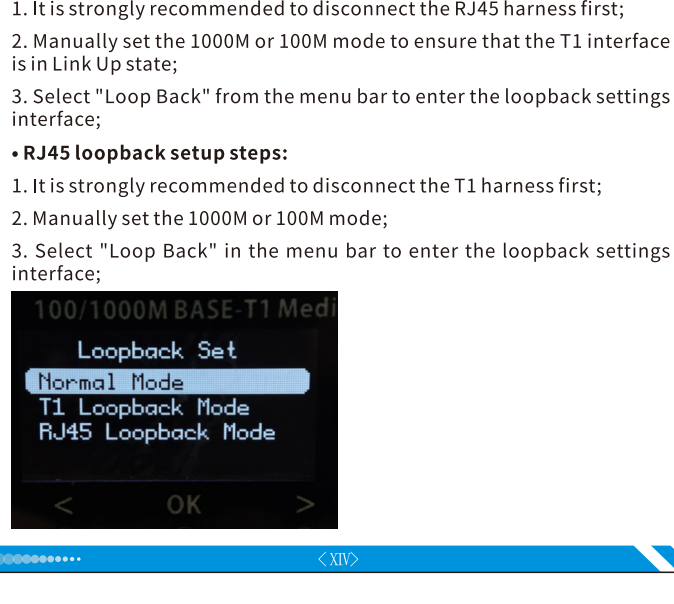
In addition to checking whether the two ends of T1 are linked, users also need to check whether the RJ45 is properly connected to the debugging host to rule out communication abnormalities caused by network cable problems. The status of RJ45 can be judged by the indicator light status described in the standard Ethernet interface.



- The converter provides three buttons:
- Left Pitch:** Selects upwards; press and hold for more than 3 seconds to reset the converter system.
 - OK/Exit Pitch:** Selects whether to enter or exit the settings interface.
 - Right Pitch:** Selects downwards; press and hold for more than 3 seconds to save settings.

七、Main Function Operation Instructions

The system boots up to the main interface by default. Main interface display information:



The main display interface consists of three parts:

- Left side area: Displays BASE-T1 status information, including communication status, communication speed, master/slave mode status, and communication monitoring.
- Middle area: Displays the current setting mode, real-time network bandwidth information, and network signal quality.
- Right side area: Displays RJ45 terminal status information, including connection status, communication speed, full-duplex/half-duplex status, and device temperature.

Explanation of status information:

- "Slave": The converter is currently in slave mode.
- "Master": The converter is currently in master mode.
- "1000M": Currently in Gigabit Ethernet mode.
- "1G+L": The converter is currently in Gigabit Legacy mode.
- "100M": Currently in 100Mbps Ethernet mode.
- "100MR": Currently in 100Mbps mode, but the polarity of the connection cable has been reversed.
- "SQI": Communication Quality Indicator, ranging from 0 to 15. A higher number indicates better communication quality.

Operating Mode Descriptions:

- "Auto Mode":** Automatic mode. The converter automatically switches between Gigabit/100Mbps speed, master/slave mode, and IEEE/Legacy mode based on the conditions of the peer device, and automatically adjusts the cable polarity.
- "M+100M":** Set to 100Mbps speed plus master mode.
- "S+100M":** Set to 100Mbps speed plus slave mode.
- "M+1000M":** Set to Gigabit speed plus master mode.
- "S+1000M+L":** Set to Gigabit speed plus master mode and Legacy mode.
- "S+1000M+L":** Set to Gigabit speed plus slave mode and Legacy mode.

On the main interface, use the "<" key and the ">" key to switch working modes.

End of diagnosis

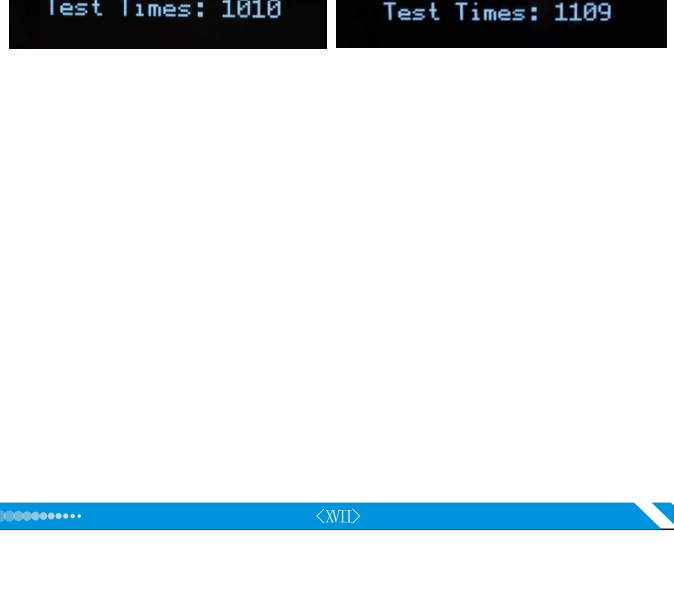
Link partner: refers to the peer device on the T1 link (such as a vehicle controller).

>>>Test Notes:

- It is recommended to set the current device mode to 100Mbps slave mode (100Mbps+S) or gigabit slave mode (1000Mbps+S). When performing harness diagnosis, it may cause link down, but don't worry about this.
- The test results are only reliable if the communication lines inside the link partner are 100-ohm differential impedance matched.
- The link partner can only be set to slave mode because master mode will actively send signals to interfere with the test equipment, resulting in inaccurate test results;
- When the link partner is not working (power off or no communication cable connected), a 100-ohm terminating resistor should be manually connected to the end of the communication cable; otherwise, it will always be detected as an open circuit.

>>>Fault type:

- OK:** If the message "proper termination" is displayed, the communication line is not faulty;
- Open circuit:** The message "open circuit at length x.m" will indicate the location of the open circuit. This location may contain errors and should only be used as a reference when troubleshooting.
- Short circuit:** The message "short circuit at length x.m" will be displayed. The diagnostic results will indicate the location of the short circuit. This location may contain errors and should be used as a reference only when troubleshooting.



>>>Test method:

Enter the menu bar, select "+Cable", then select "Diagnostic" to start the detection.

>>>Fault detection Case:

- Single-line open circuit;
- Double-line open circuit;
- Both lines short-circuited;

Wire Harness Quality Testing

- Test Principle:** Time Domain Reflectometry (TDR) is used to determine faults in communication lines, such as quality issues, short circuits, open circuits, impedance mismatches, faulty connectors, and termination mismatches. The device transmits a signal of known amplitude (+1V) downwards along the communication line (MDIP/MDIN), and the transmitted signal continues to travel along the line until it is reflected back from the location of the defect.
- Test Method:** Enter the menu, select "+Cable", then select "Quality". The test will start automatically and display the total number of tests since power-on.

- Ensure the T1 interface and link partner are in the link-up state;
- Test results include insertion loss (IL) and return loss (RL), with displayed values ranging from 0 to 15. Higher values indicate better harness quality. Results are for reference only.

Packet generator

This device includes a very simple packet generator. The packet generator can be configured with parameters to combine and produce the following different types of data.

- Payload type**
 - Pseudo-random
 - Fixed 5A, 5A, 5A, A5, etc.
- Data packet length**
 - 64 bytes
 - 1518 bytes
- Error data packet**
 - Good CRC
 - Incorrect or corrupted CRC
- Data packet length**
 - Send 100 packs
 - Send 10 packs
 - Send 1 pack
- Continuous sending

Usage: Select "+Packet Generator" in the menu. After entering, you can modify the above parameters as needed. After modification, select "Packet Control" to see the following interface. Click the button to clear the screen, go back, start/pause. Exiting will stop sending packets.

Test packet generation

Test packet generation: The data packets are generated and output by the device through the BASE-T1 port. The generated data packets need to be viewed on a PC at the other end, either in loopback mode or by connecting an onboard Ethernet converter. The results captured using Wireshark are shown in the following figure:

Loop mode

How to use: Go to "+System" in the menu bar, then go to "Loopback Set" to select the mode.

- T1 loopback setup steps:**
 - It is strongly recommended to disconnect the RJ45 harness first;
 - Manually set the 1000M or 100M mode to ensure that the T1 interface is in Link Up state;
 - Select "Loop Back" from the menu bar to enter the loopback settings interface;

- RJ45 loopback setup steps:**
 - It is strongly recommended to disconnect the T1 harness first;
 - Manually set the 1000M or 100M mode;
 - Select "Loop Back" in the menu bar to enter the loopback settings interface;

Principle Explanation

T1 loop:

The data received through the T1 interface is processed internally by the device and then looped back through the T1 interface.

RJ45 loopback:

Data received through the RJ45 interface is processed internally by the device and then looped back through the RJ45 interface.

System Settings

Select "+System" from the menu, which contains several system function settings.

- Save Configuration Information:** Saves the link mode configuration from the main interface. The saved configuration will be enabled by default upon restart (long press >3 seconds in the configuration interface has the same effect).
- Reset PHY:** Resets the PHY of both RJ45 and T1, restoring factory settings.
- Link Count:** Records the number of successful links and their duration.
- Set Buzzer Time:** Modifies the buzzer time between 0-100ms.

八、Troubleshooting

Various faults frequently occur when using Ethernet-related products, which may be due to improper wiring, faulty cables, or incompatible operating modes leading to connection failures. This product also provides corresponding fault detection methods to address these issues.

LINK failure

When using this product, you can determine whether there is an L-link fault by observing the status of the LINK port. "x" indicates not LINK, and "v" indicates LINK.

This function allows you to observe which end is experiencing a problem. RJ45 connectors generally don't malfunction when the interface is properly connected, unless there's a network card fault or a line problem. T1-side LINK issues usually stem from the mode selection; master/slave modes must correspond on both ends, and the speed mode must also be selected accordingly. After checking these, proceed with hardware troubleshooting.

To improve user experience and prevent LINK failures caused by incorrect working mode settings, this product also includes an automatic mode in the working mode selection. When in automatic mode, the device will automatically match the link partner and establish a LINK.

Product Warranty Card

Customer Information

Model:	
Date of purchase:	
User telephone:	
Address:	
Distributor:	
Agency address:	
User telephone:	Dealer stamp valid

Intenance Records

Repair times	Date	Fault	Treatment measures	Repair work NO.

Electronic products are guaranteed for one year, and other products are guaranteed for two years. Damage caused by human factors or product burnout caused by improper operation is not included in the scope of warranty.