100/1000Base-T1-TX-E User Manual

Data	Version	Description
2024/11/1	V10	

1 Introduction

1.1 Low Cost Product Series

Product Name	T1 Interface	Power Supply	T1 Phy	Tx Phy	Size LxHxW(mm)
100/1000Base-T1-TX-E	15EDG3.81mm-2P MATENET Adapter MATENET Adapter	Type C	Marvell 88Q2112	RTL8211FI	50 × 20× 83
100/1000Base-T1-TX-TE	MATENET Male, 2302461-9	Type C DC Jack	Marvell 88Q2112	RTL8211FI	50 × 20× 83
100/1000Base-T1-TX-HMDT	H-MDT Male, E6S20A-40MT5-Z	Type C DC Jack	Marvell 88Q2112	RTL8211FI	50 × 20× 83

1.2 Product Description

The BUELEC 100/1000Base-T1-TX-E is a compact, high-performance media converter designed to bridge automotive single-pair Ethernet (100/1000BASE-T1) networks with standard twisted-pair Gigabit Ethernet (100/1000BASE-TX) infrastructure.

Utilizing the Marvell 88Q2112 PHY for T1 interface and Realtek RTL8211FI PHY for TX interface, this converter ensures seamless interoperability between modern automotive Ethernet systems and traditional IT/networking environments.

It is ideal for in-vehicle diagnostics (DoIP), smart cockpit domain controller flashing/upgrades, ADAS camera/radar development and debugging, industrial automation, and fleet management applications.

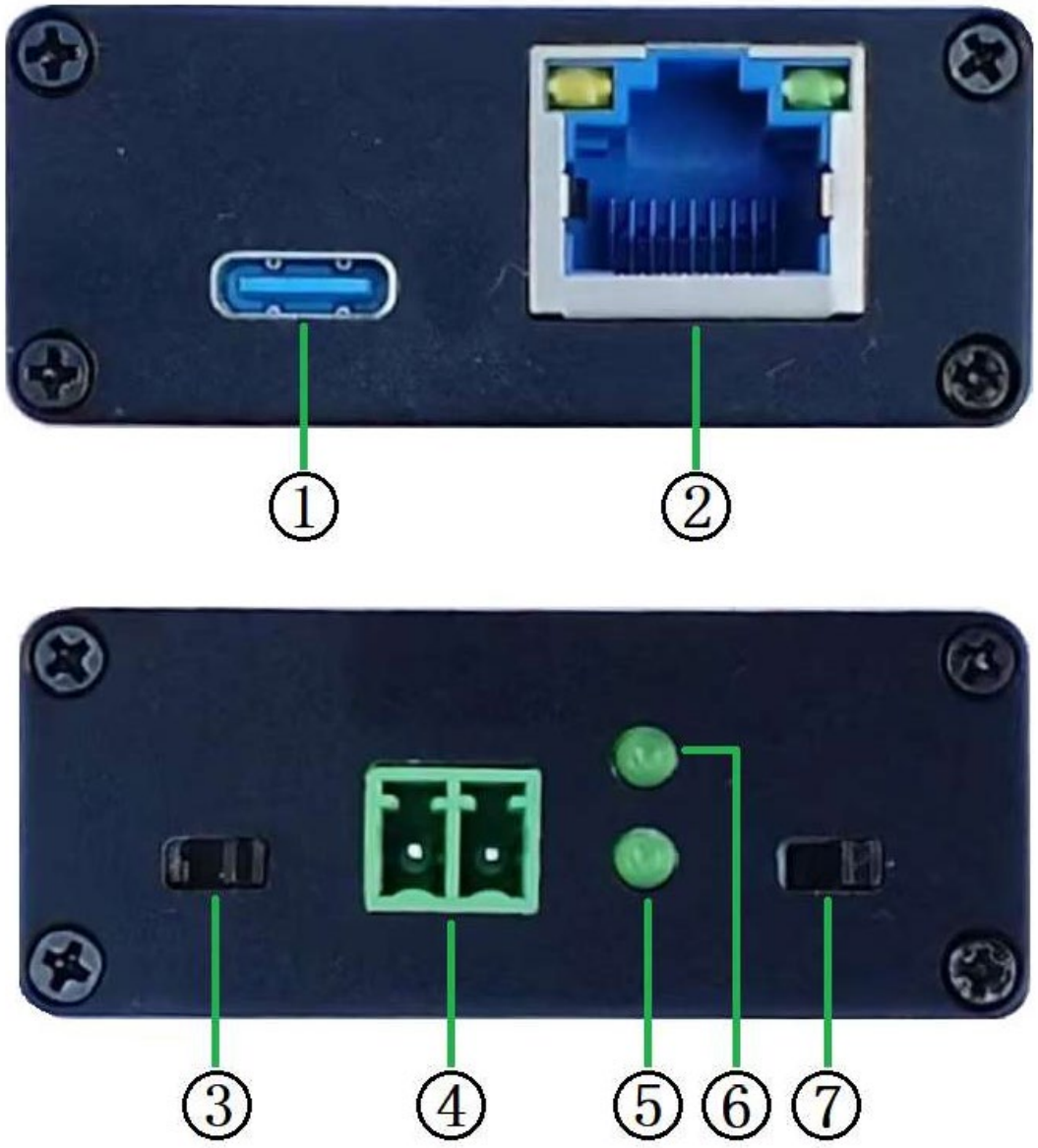
1.3 Product Features

- **Protocol Compliance:** Fully supports IEEE 802.3bw (1000BASE-T1) for automotive single-pair Ethernet and IEEE 802.3ab (1000BASE-T) for traditional Gigabit Ethernet, enabling reliable data transmission in mixed-network setups.
- **High-Speed Performance:** Delivers up to 1 Gbps full-duplex transmission rates over both T1 (single twisted pair) and TX (RJ45) interfaces, with auto-negotiation for 100/1000 Mbps compatibility and low-latency forwarding.

- **Robust Protection:** Integrated over-voltage, over-current, and ESD (electrostatic discharge) protection safeguards against electrical surges, meeting automotive-grade reliability standards.
- **Industrial-Grade Durability:** Engineered to industrial standards with a wide operating temperature range (-40°C to +85°C), humidity tolerance (0-95% RH non-condensing), vibration resistance, and EMI shielding, making it suitable for harsh environments like vehicles, factories, and outdoor installations.
- **Advanced Networking Support:** Includes IEEE 802.1Q VLAN tagging for traffic segmentation, QoS prioritization, and enhanced security in multi-device ecosystems.
- **Plug-and-Play Design:** Compact form factor (50mm x 20mm x 83mm) with standard T1 differential signal terminal (15EDG3.81mm-2P) on one side and RJ45 port on the other; powered via USB Type-C (DC 5V ± 0.5V, ⩽355mA) for flexible deployment.

2 Hardware

2.1 Interfaces and Indicators (Detailed Description)



	Interface	Description
(1)	**Power**	USB Type-C power input (DC 5V). Connects via included Type-C USB cable for stable power supply.
(2)	**RJ45**	100/1000BASE-T Ethernet port. Connects to PCs, switches, or other network devices using **4 pairs** of standard twisted-pair cable (CAT6 recommended).
(3)	**Slave/Master Switch**	Physical toggle switch for 100/1000BASE-T1 **Master/Slave mode selection**. Mode change takes effect immediately upon switching.
(5)	**Status LED**	Dual-function system and link/activity indicator: • **Solid Green**: System self-test passed, and device is operating normally.
(6)	**Status LED**	• **Solid (T1 Link)**: 100/1000BASE-T1 link established. • **Blinking**: Data transmission/reception in progress on T1 interface.
(4)	**+ / – (T1 Port)**	100/1000BASE-T1 differential signal interface using **15EDG3.81mm-2P terminal block**. Connects to ECU or other automotive Ethernet devices via a single twisted pair.
(7)	**100M/1000M Switch**	Physical toggle switch for selecting **100 Mbps or 1000 Mbps** mode on the 100/1000BASE-T1 interface. Speed change takes effect immediately.

2.2 Typical Applications

PC/ARM ↔ RJ45 ↔ [1000BASE-T1-TX-E] ↔ Automotive Device / Network

Input Protocol	Output Protocol	Applications
100BASE-Tx	100BASE-T1	Vehicle diagnostics (DoIP), smart cockpit flashing, ADAS sensor debugging
1000BASE-Tx	1000BASE-T1	High-speed camera/radar data, ECU programming, R&D testing

The 1000BASE-T1-TX-E enables seamless conversion between industrial Ethernet and automotive single-pair Ethernet networks.

2.3 Product Specifications

Parameter	Specification
Input Voltage	5V ± 0.5V
Operating Current	≤ 355mA
Operating Temperature	-40°C to +85°C
Operating Humidity	0~95% RH (non-condensing)
Dimensions LxHxW	50mm × 20mm × 83mm

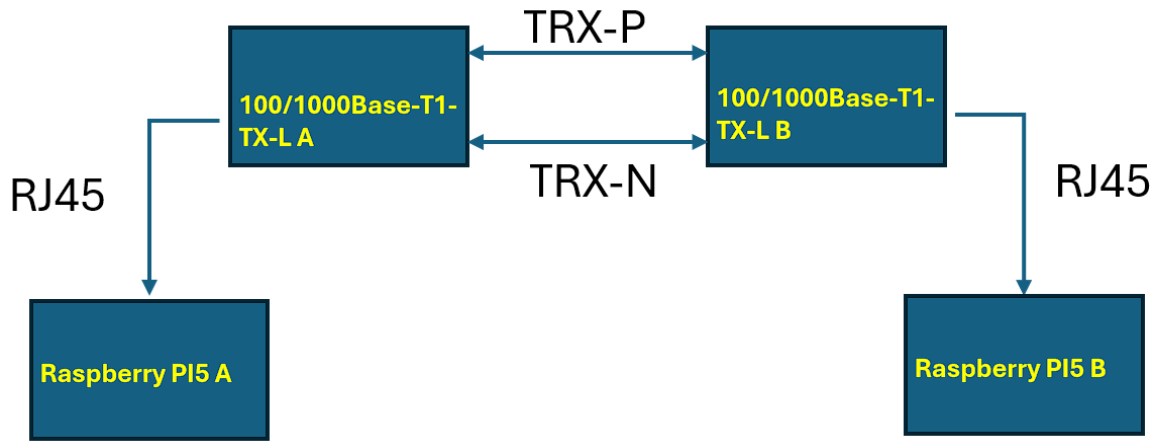
2.4 Automotive Ethernet Transmission Distance

T1 Speed Mode	Cable Type	Max Distance
100BASE-T1	Unshielded Twisted Pair (UTP)	20 m
100BASE-T1	Shielded Twisted Pair (STP)	50 m
1000BASE-T1	Unshielded Twisted Pair (UTP)	15 m
1000BASE-T1	Shielded Twisted Pair (STP)	40 m

3 Software

We use two 100/1000Base-T1-TX-L and two Raspberry PI5 with RJ45 over 2-wire T1 network, The converters communicate with each other via T1 2-Wire. Connection as below

3.1 Connection



3.2 Turn off WI-FI for both PI5

3.3 Set IP for PI5 A

Open PI5 A Terminal window

```
sudo ifconfig eth0 down
sudo ifconfig eth0 190.19.1.9
sudo ifconfig eth0 up
```

3.4 Set IP for PI5 B

Open PI5 B Terminal window

```
sudo ifconfig eth0 down
sudo ifconfig eth0 190.19.1.90
sudo ifconfig eth0 up
```

3.5 Ping from PI5 A To PI5 B

Open PI5 A Terminal window,run below command check if network connected.

If yes, then close the ping window, follow chapter3.6

If not, then check if chapter 3.1 connection is right

```
sudo ping eth0 -i 190.19.1.90
```

3.6 Listen from PI5 B

Open PI5 B Terminal window

```
sudo iperf3 -s
```

Note: if your system does not install iperf3, follow chapter 3.9

3.7 TCP Test from Raspberry PI5 A

Open PI5 A Terminal window

```
sudo iperf3 -c 190.19.1.90 -n 800000M -i 30
```

Note: if your system does not install iperf3, follow chapter 3.9

3.8 UDP Test from Raspberry PI5 A

Open PI5 A Terminal window

```
sudo iperf3 -c 190.19.1.90 -u -b 1024M -l 8k -n 1000M
```

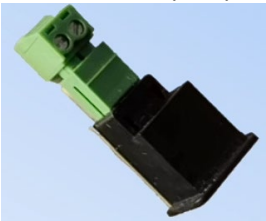
Note: if your system does not install iperf3, follow chapter 3.9

3.9 ipfer3 installation

```
sudo apt-get install iperf3
```

Note: Please do not choose iperf3 as a daemon automatically. Or it will failed when you run it from next boot.

4 Packing List

No.	Item	Quantity	Unit
1	1000BASE-T1-TX-E Converter	1	pcs
2	2-Pin Terminal Block (15EDG3.81mm-2P)	1	pcs
3	Type-C USB Power Cable	1	pcs
4	CAT6 Ethernet Cable	1	pcs
5	TE MATEnet (1x1) 150mm pigtail to terminal block 	1	pcs
6	Rosenberger HMD-T 150mm pigtail to terminal block 	1	pcs

5 Accessories Recommend