

BUELEC

100/1000Base-T1-TX- HMTD
BUELEC 100/1000Base-T1 to RJ45
(100/1000Base-TX)
Automotive ,Connector HMTD

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



| Data | Version | Description |
|------------|---------|-------------|
| 2024/11/1 | V10 | |
| 2025/06/12 | V11 | |
| 2025/11/11 | V12 | |

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1 Introduction

1.1 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 Board HMTD Adapter Board | Type C DC Jack | Marvell 88Q2112 | RTL8211FI | 50 × 20× 83 |
| 100/1000Base-T1-TX-TE | TE MATENET Male | Type C DC Jack | Marvell 88Q2112 | RTL8211FI | 50 × 20× 83 |
| 100/1000Base-T1-TX-HMTD | HMTD Male | Type C DC Jack | Marvell 88Q2112 | RTL8211FI | 50 × 20× 83 |

1.2 Product Description

The BUELEC 100/1000Base-T1-TX- HMTD 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.

T1 Port update to (HMTD Male,E6S20A-40MT5-Z), Power update to support Both Type C and DC Jack(6-30V)

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.

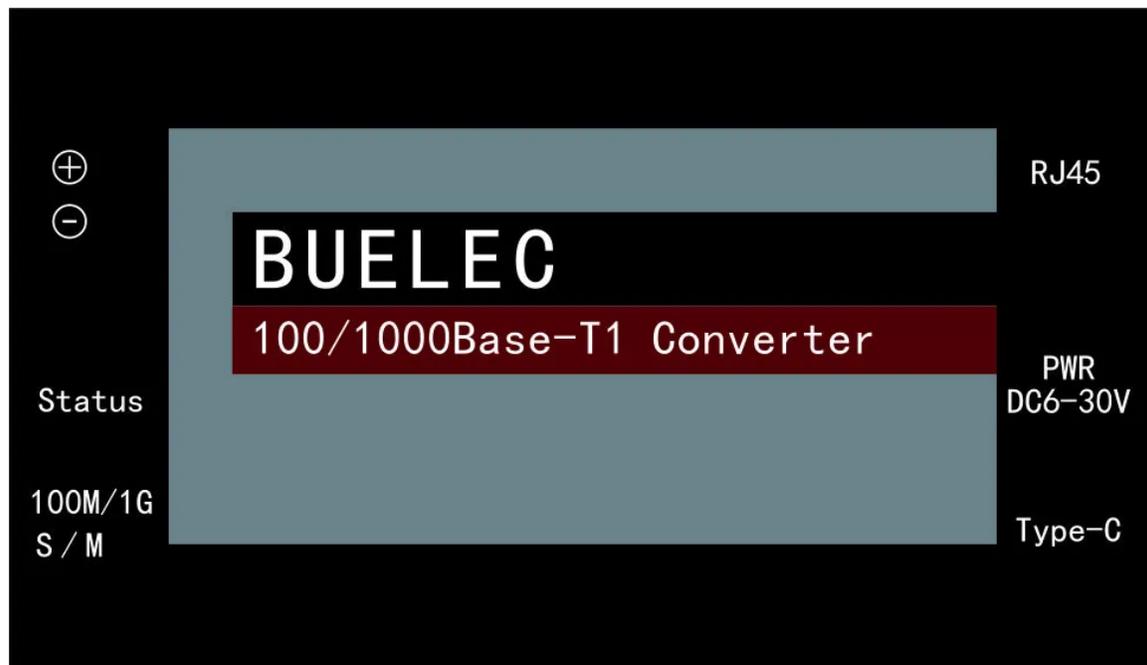
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- **Robust Protection:** Integrated over-voltage, over-current, and ESD (electrostatic discharge) protection safeguards against electrical surges, meeting automotive-grade reliability standards.
- **Industrial-Grade Durability:** Engineered to industrial 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 (**HMTD Male,E6S20A-40MT5-Z**) on one side and RJ45 port on the other; Selected powered via **USB Type-C (DC 5V ± 0.5V, ≤355mA) Or DC-Jack (6-30V)** for flexible deployment.

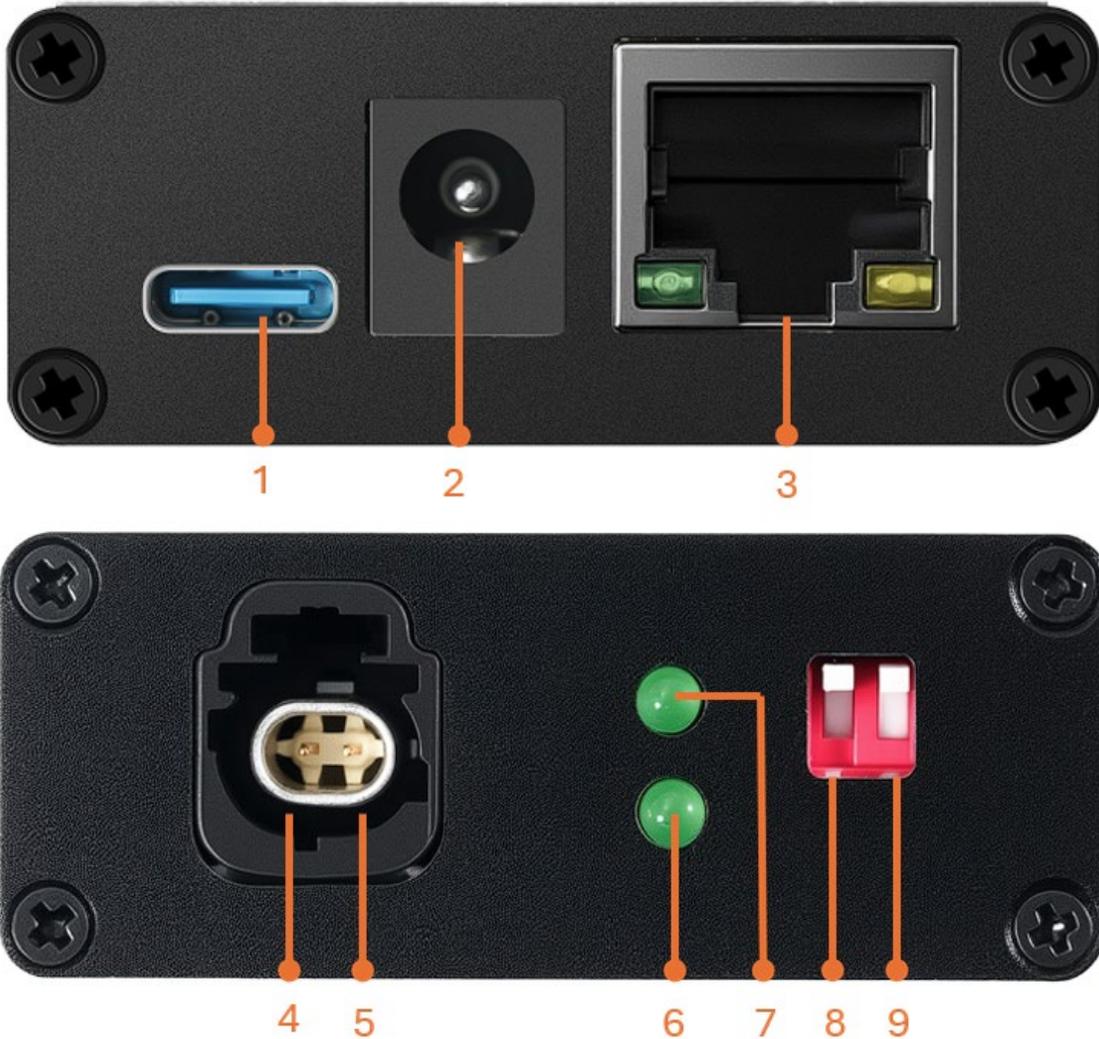
2 Hardware

2.1 Interfaces and Indicators (Detailed Description)



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| | Interface | Description |
|-----|-----------|-----------------|
| (1) | Power | (DC 5V). |
| (2) | Power | DC Jack (6-30V) |

| | | |
|-----|---------------------|---|
| (3) | RJ45 | 100/1000BASE-T Ethernet port. Connects to PCs, switches, or other network devices using 4 standard twisted-pair cable (CAT6 recommended). |
| (4) | HMTD T1 + | 100/1000Base-T1 Port TRX_P + |
| (5) | HMTD T1 - | 100/1000Base-T1 Port TRX_N - |
| (6) | Status LED | Dual-function system and link/activity indicator: <ul style="list-style-type: none">• Solid Green: System self-test passed and device is operating normally. |
| (7) | Status LED | <ul style="list-style-type: none">• Solid (T1 Link): 100/1000BASE-T1 link established.• Blinking: Data transmission/reception in progress on T1 interface. |
| (8) | 100M/1000M Switch | UP: 1000M Down:100M |
| (9) | Slave/Master Switch | UP:Master Down:Slave |

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 |

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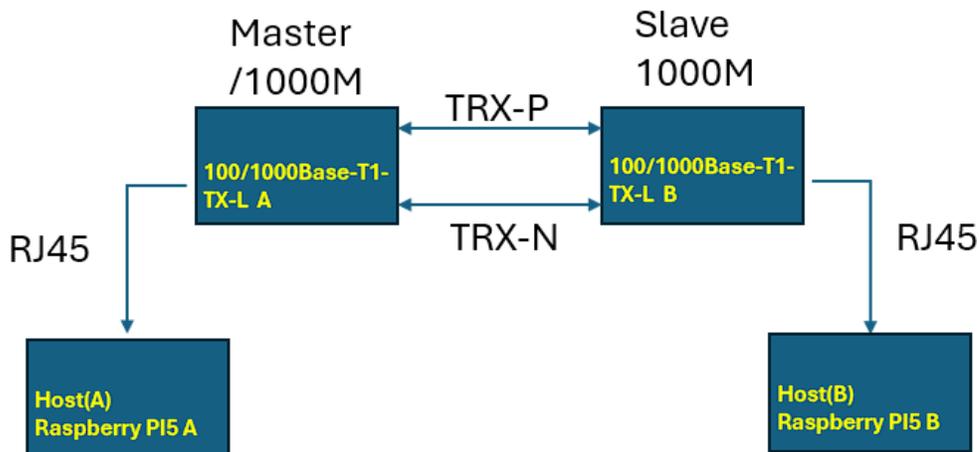
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| | |
|------------------------------|---------------------------|
| Operating Current | ≤ 355mA |
| Operating Temperature | -40°C to +85°C |
| Operating Humidity | 0~95% RH (non-condensing) |
| Dimensions LxHxW | 50mm × 20mm × 83mm |

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 Connection Diagram



Note:

There must be one device set as Master, Another One set as Slave.
Both of the devices should set to the same Speed.

4 User Guide for Linux Os

We use 2 Raspberry PI5, one as client(Master) and one as server(Slave)

Hardware connection as chapter 3.

4.1 Install iperf3

Open terminal window of both raspberry pi5.

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

**Note: Do not choose iperf3 as a daemon automatically.
Or it will fail when you run next boot.**

Download python scripts from our github.

```
sudo git clone https://github.com/buelec-tech/100-1000Base-T1-TX-L
```

4.2 Turn off WI-FI

4.3 Set IP And Ping

Host A As Client (190.19.1.9), Host B As Server (190.19.1.90)

| Host A (Raspberry PI5 A), Client | Host B (Raspberry PI5 B), Server |
|---|--|
| sudo ifconfig eth0 down sudo ifconfig eth0 190.19.1.9 sudo ifconfig eth0 up | sudo ifconfig eth0 down sudo ifconfig eth0 190.19.1.90 sudo ifconfig eth0 up |

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

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

- If work, then go ahead with chapter 4.4
- If it does not work, re-check connection follow chapter3

4.4 TCP Test

Open Host B (190.19.1.90) Terminal, Set as server

```
sudo iperf3 -s
```

Note: if your system does not install iperf3, follow chapter 4.1

Open Host A (190.19.1.9) Terminal, send data.

```
sudo iperf3 -c 190.19.1.90 -n 8000M -i 30
```

```
Connecting to host 190.19.1.90, port 5201
[ 5] local 190.19.1.9 port 48790 connected to 190.19.1.90 port 5201
[ ID] Interval          Transfer      Bitrate      Retr  Cwnd
[ 5]  0.00-30.00 sec    3.27 GBytes  937 Mbits/sec  0    518 KBytes
[ 5]  30.00-60.00 sec    3.27 GBytes  936 Mbits/sec  0    518 KBytes
[ 5]  60.00-71.63 sec    1.27 GBytes  937 Mbits/sec  0    518 KBytes
-----
[ ID] Interval          Transfer      Bitrate      Retr
[ 5]  0.00-71.63 sec    7.81 GBytes  937 Mbits/sec  0
[ 5]  0.00-71.64 sec    7.81 GBytes  937 Mbits/sec  0
                                     sender
                                     receiver
```

4.4 UDP Test

Open Host B (190.19.1.90) Terminal, Set as server

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```
sudo iperf3 -s
```

Open Host A (190.19.1.9) Terminal , Set as client and send data.

```
sudo iperf3 -c 190.19.1.90 -u -b 8000M -l 8k -n 1000M
```

```
Connecting to host 190.19.1.90, port 5201
[ 5] local 190.19.1.9 port 38178 connected to 190.19.1.90 port 5201
[ ID] Interval      Transfer      Bitrate      Retr  Cwnd
[ 5]  0.00-30.00  sec  3.27 GBytes  937 Mbits/sec  0    544 KBytes
[ 5]  30.00-60.00  sec  3.27 GBytes  937 Mbits/sec  0    1.37 MBytes
[ 5]  60.00-71.63  sec  1.27 GBytes  936 Mbits/sec  0    1.37 MBytes
-----
[ ID] Interval      Transfer      Bitrate      Retr
[ 5]  0.00-71.63  sec  7.81 GBytes  937 Mbits/sec  0
[ 5]  0.00-71.63  sec  7.81 GBytes  936 Mbits/sec
sender
receiver
iperf Done.
```

5 User Guide for Windows

We use 2 windows computers, one as client(Master) and one as server(Slave)

Hardware connection as chapter 3.

5.1 Install iperf3

Download from our github link:

<https://github.com/buelec-tech/100-1000Base-T1-TX-L> unzip iperf3.6_64bit.zip

5.2 Turn off firewalls

5.3 Set IP And Ping

| | |
|----------------------|-----------------------|
| Computer A IP,Client | Computer B IP ,Server |
|----------------------|-----------------------|

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| | |
|---|--|
| <p>General</p> <p>You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.</p> <p><input type="radio"/> Obtain an IP address automatically</p> <p><input checked="" type="radio"/> Use the following IP address:</p> <p>IP address: <input type="text" value="190 . 19 . 1 . 9"/></p> <p>Subnet mask: <input type="text" value="255 . 255 . 0 . 0"/></p> <p>Default gateway: <input type="text" value="190 . 19 . 1 . 1"/></p> <p><input type="radio"/> Obtain DNS server address automatically</p> <p><input checked="" type="radio"/> Use the following DNS server addresses:</p> <p>Preferred DNS server: <input type="text" value="8 . 8 . 8 . 8"/></p> <p>Alternate DNS server: <input type="text" value="8 . 8 . 4 . 4"/></p> <p><input type="checkbox"/> Validate settings upon exit Advanced...</p> | <p>General</p> <p>You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.</p> <p><input type="radio"/> Obtain an IP address automatically</p> <p><input checked="" type="radio"/> Use the following IP address:</p> <p>IP address: <input type="text" value="190 . 19 . 1 . 90"/></p> <p>Subnet mask: <input type="text" value="255 . 255 . 0 . 0"/></p> <p>Default gateway: <input type="text" value="190 . 19 . 1 . 1"/></p> <p><input type="radio"/> Obtain DNS server address automatically</p> <p><input checked="" type="radio"/> Use the following DNS server addresses:</p> <p>Preferred DNS server: <input type="text" value="8 . 8 . 8 . 8"/></p> <p>Alternate DNS server: <input type="text" value="8 . 8 . 4 . 4"/></p> <p><input type="checkbox"/> Validate settings upon exit Advanced...</p> |
| 190.19.1.9 255.255.0.0 190.19.1.1 8.8.8.8 8.8.4.4 | 190.19.1.90 255.255.0.0 190.19.1.1 8.8.8.8 8.8.4.4 |

Open Terminal (Admin) on Computer A, Switch to the iperf3 directory

```
Terminal
Terminal (Admin) cd F:\iperf3.6_64bit

ping -i 190.19.1.9 190.19.1.90 # ping from 190.19.1.9(client)
PS F:\iperf3.6_64bit> ping -i 190.19.1.9 190.19.1.90

Pinging 190.19.1.90 with 32 bytes of data:
Reply from 190.19.1.90: bytes=32 time=2ms TTL=128
Reply from 190.19.1.90: bytes=32 time=2ms TTL=128
Reply from 190.19.1.90: bytes=32 time=2ms TTL=128
Reply from 190.19.1.90: bytes=32 time=3ms TTL=128

Ping statistics for 190.19.1.90:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 3ms, Average = 2ms
```

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5.4 100M Test

Open Host B (190.19.1.90) Terminal, Set as server

```
.\iperf3.exe -B 190.19.1.90 -s # Host B listen
```

Open Host A (190.19.1.9) Terminal, Set as client and send data.

```
.\iperf3.exe -c 190.19.1.90 -B 190.19.1.9 -w 100M -t 10 # Host A send data
```

```
PS F:\iperf3.6_64bit> .\iperf3.exe -c 190.19.1.90 -B 190.19.1.9 -w 100M -t 10
warning: Ignoring nonsense TCP MSS 0
Connecting to host 190.19.1.90, port 5201
[ 5] local 190.19.1.9 port 9557 connected to 190.19.1.90 port 5201
[ ID] Interval      Transfer      Bitrate
[ 5] 0.00-1.00    sec    111 MBytes    933 Mbits/sec
[ 5] 1.00-2.00    sec    11.2 MBytes    94.4 Mbits/sec
[ 5] 2.00-3.00    sec    11.4 MBytes    95.3 Mbits/sec
[ 5] 3.00-4.00    sec    11.4 MBytes    95.5 Mbits/sec
[ 5] 4.00-5.00    sec    11.2 MBytes    94.4 Mbits/sec
[ 5] 5.00-6.00    sec    11.4 MBytes    95.3 Mbits/sec
[ 5] 6.00-7.00    sec    11.2 MBytes    94.4 Mbits/sec
[ 5] 7.00-8.00    sec    11.4 MBytes    95.5 Mbits/sec
[ 5] 8.00-9.00    sec    11.2 MBytes    94.4 Mbits/sec
[ 5] 9.00-10.00   sec    11.4 MBytes    95.4 Mbits/sec
-----
[ ID] Interval      Transfer      Bitrate
[ 5] 0.00-10.00   sec    213 MBytes    179 Mbits/sec      sender
[ 5] 0.00-10.13   sec    114 MBytes    94.6 Mbits/sec      receiver
```

5.4 1000M Test

Open Host B (190.19.1.90) Terminal, Set as server

```
.\iperf3.exe -B 190.19.1.90 -s # Host B listen
```

Open Host A (190.19.1.9) Terminal, Set as client and send data.

```
.\iperf3.exe -c 190.19.1.90 -B 190.19.1.9 -w 100M -t 1
# -c <host address> ,-B <Client address >
```

6 Packing List

| No. | Item | Quantity | Unit |
|-----|-------------------------------|----------|------|
| 1 | 1000BASE-T1-TX-HMTD Converter | 1 | pcs |
| 2 | Type-C USB Power Cable | 1 | pcs |
| 3 | CAT6 Ethernet Cable | 1 | pcs |
| 4 | 12V Power Adapter | 1 | pcs |

6.1 Accessories Recommend

<https://www.buelec-tech.com/product/1000base-t1-cable-h-mdt/>

