

# TRDP-MVB

# Datasheet

# Foreword

## Notational Conventions

The following categorized signal words with defined meaning might appear in the manual.

Signal Words	Meaning
 DANGER	Indicates a high potential hazard which, if not avoided, will result in death or serious injury.
 CAUTION	Indicates a potential risk which, if not avoided, could result in property damage, data loss, lower performance, or unpredictable result.
 ANTISTATIC	Indicates static sensitive equipment.
 DANGER! ELECTRIC SHOCK	Indicates High voltage danger.
 TIPS	Provides methods to help you solve a problem or save you time.
 NOTE	Provides additional information as the emphasis and supplement to the text.

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# 1 Overview

## 1.1 Introduction

The Yacer TRDP-MVB embedded communication module provides one redundant MVB interface, two Ethernet interfaces and UART serial port, supports TRDP protocol and implement protocol conversion between MVB, TRDP, serial port and Ethernet interface.

Tiny size, 2.0mm pin interface. +3.3V power supply, industrial wide temperature, suitable for embedded custom applications.



## 1.2 Applications

- Protocol conversion between TRDP and UDP ;
- Protocol conversion between TRDP and serial port ;
- Protocol conversion between MVB and Ethernet interface ;
- Protocol conversion between MVB and serial port ;
- Train Control and Management System (TCMS);
- Train Communication Network (TCN);
- Embedded application and development.

## 1.3 Features

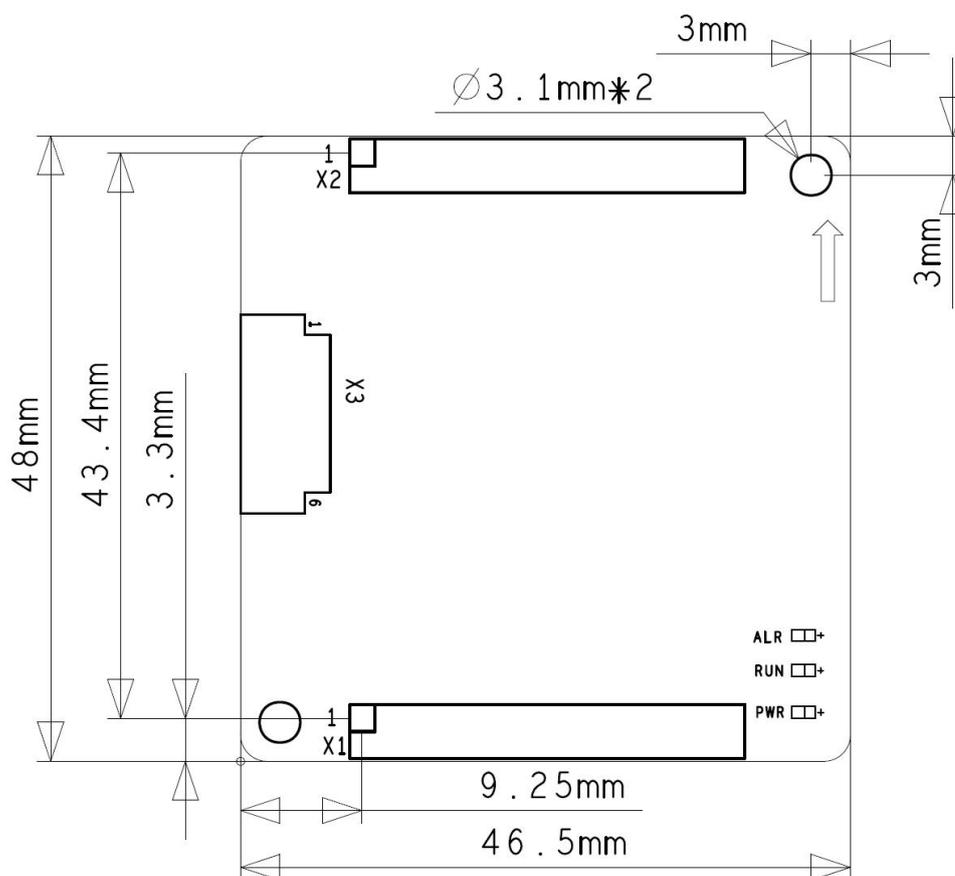
- Two 100M Ethernet PHY, supports TRDP and UDP protocol;
- One MVB redundant interface, supports MVB slave protocol;
- Supporting PD data acquisition function of MVB-bus;
- Two extended serial port, optional one CAN interface;
- Open and flexible configuration management;
- +3.3V power supply, low power consumption;
- Small size, Industrial wide temperature.

## 1.4 Technical Specifications

Item	Parameters	Details
Ethernet Interface	Number	2 x 100M PHY
	Rate	100 Mbps, supports MDI/MDIX adaptive
	Network protocol	TRDP, UDP
	Programming interface	UDP Server, UDP Client, supports unicast / multicast / broadcast
Serial Port	Number	2 x 3.3V LVCMOS
	Duplex mode	full-duplex, half-duplex
	Working mode	UART
	Baud rate	≤ 921.6 Kbps
MVB Interface	Number	1 x 3.3V LVCMOS
	Media support	EMD, ESD
	Protocol support	Device_Status, Process_Data(PD)
	Number of PD ports	16
Optional CAN Interface	Level standard	3.3V LVCMOS
	Working mode	CAN 2.0A, CAN 2.0B, ISO 11898
	Baud rate	≤ 1 Mbps
Configuration Management	Configuration tool	yacer-DMS configuration management software
	Configuration interface	<ul style="list-style-type: none"> <li>● Dedicated DMS-UART interface (with the help of yacer DMS-UART-8P configuration cable)</li> <li>● Ethernet interface,</li> <li>● Serial port</li> </ul>
Power Requirements	Power Supply	+3.3 VDC
	Power consumption	< 2W
Mechanical Characteristics	Connector	2x 30 PIN double row pin connectors (2*15) with 2.0mm pitch
	Dimensions	46.5 mm x 48 mm

Item	Parameters	Details
	Weight	25 g
Operating Environment	Operating temperature	-40 ~ +85°C
	Storage temperature	-40 ~ +85°C
	Operating humidity	5 ~ 95% RH (no condensation)

## 1.5 Mechanical Dimensions



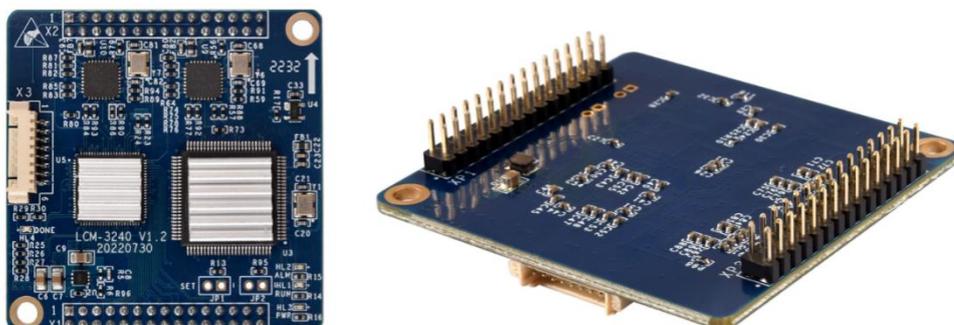
## 1.6 Order Information

Model	MVB Interface	Ethernet Interface	Serial port	CAN Interface
TRDP-MVB-400	1 x MVB	2 x 100M PHY	2 x UART	None
TRDP-MVB-400C	1 x MVB	2 x 100M PHY	2 x UART	1 x CAN

## 2 Hardware and Physical Interfaces

### 2.1 Appearance

The top and bottom view of TRDP-MVB are as follows.



### 2.2 LED Indicators

Item	Description
RUN	Running indicator, green light flashing during normal operation
ALM	Alarm indicator <ul style="list-style-type: none"> <li>Initialization phase blinking: waiting for the host computer configuration command</li> <li>Normal operation status off: the device is working normally</li> <li>Normal operation status on: device failure</li> </ul>
PWR	Power indicator, always on after power on

## 2.3 Pin Definition

### 2.3.1 X1: 2x15 2.0mm pitch connector

Pin	Signal	Type	Description
1	GND		Logic ground
2	GND		Logic ground
3	UART_TXD	O	Primary serial port data transmission
4	UART_RXD	I	Primary serial port data reception
5	NC		Standby, this pin must be left floating
6	NC		Standby, this pin must be left floating
7	UART_TX_EN	O	Primary serial transmitter enable control, enable level is high
8	UART_LED	O	Primary serial transmit/receive indication, drive LED negative
9	AUX_TXD	O	Standby serial port data transmission
10	AUX_RXD	I	Standby serial port data reception
11	NC		Standby, this pin must be left floating
12	NC		Standby, this pin must be left floating
13	AUX_TX_EN	O	Standby serial transmitter enable control, enable level is high
14	AUX_LED	O	Standby serial transmit/receive indication, drive LED negative
15	GND		Logic ground
16	GND		Logic ground
17	MVB_A_TXD	O	MVB Line A transmit
18	MVB_A_RXD	I	MVB Line A receive
19	NC		Standby, this pin must be left floating
20	NC		Standby, this pin must be left floating
21	MVB_A_TX_EN	O	MVB Line A transmitter enable control, enable level is high
22	NC		Standby, this pin must be left floating
23	MVB_B_TXD	O	MVB Line B transmit
24	MVB_B_RXD	I	MVB Line B receive
25	NC		Standby, this pin must be left floating
26	NC		Standby, this pin must be left floating
27	MVB_B_TX_EN	O	MVB Line B transmitter enable control, enable level is high
28	NC		Standby, this pin must be left floating
29	GND		Logic ground
30	GND		Logic ground

## 2.3.2 X2: 2x15 2.0mm pitch connector

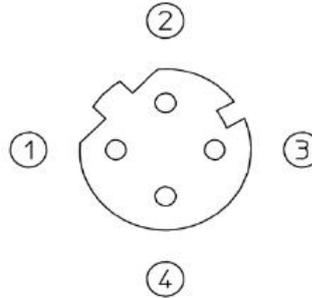
Pin	Signal	Type	Description
1	GND		Logic ground
2	GND		Logic ground
3	VCC3V3	I	Power input, +3.3 VDC
4	VCC3V3	I	Power input, +3.3 VDC
5	NC		Standby, this pin must be left floating
6	NC		Standby, this pin must be left floating
7	RESET_IN	I	Module reset input, active low. Power-On Reset supported, Pin can be suspended.
8	NC		Standby, this pin must be left floating
9	NC		Standby, this pin must be left floating
10	NC		Standby, this pin must be left floating
11	LED_RUN	O	System operation indication, active low
12	LED_ALARM	O	System alarm indication, active low
13	CAN_TX	O	CAN interface data transmission
14	CAN_RX	I	CAN interface data reception
15	GND		Logic ground
16	GND		Logic ground
17	ETH1_TX+		Tx+ for Ethernet PHY interface 1, external network transformer required
18	ETH1_TX-		Tx- for Ethernet PHY interface 1, external network transformer required
19	ETH1_RX+		Rx+ for Ethernet PHY interface 1, external network transformer required
20	ETH1_RX-		Rx- for Ethernet PHY interface 1, external network transformer required
21	LED_ETH1		Link/Act indication for Ethernet 1, drives positive LED
22	NC		Standby, this pin must be left floating
23	ETH2_TX+		Tx+ for Ethernet PHY interface 2, external network transformer required
24	ETH2_TX-		Tx- for Ethernet PHY interface 2, external network transformer required
25	ETH2_RX+		Rx+ for Ethernet PHY interface 2, external network transformer required
26	ETH2_RX-		Rx- for Ethernet PHY interface 2, external network transformer required
27	LED_ETH2		Link/Act indication for Ethernet 2, drives positive LED
28	NC		Standby, this pin must be left floating
29	GND		Logic ground
30	GND		Logic ground

## 2.4 Ethernet Interface Development

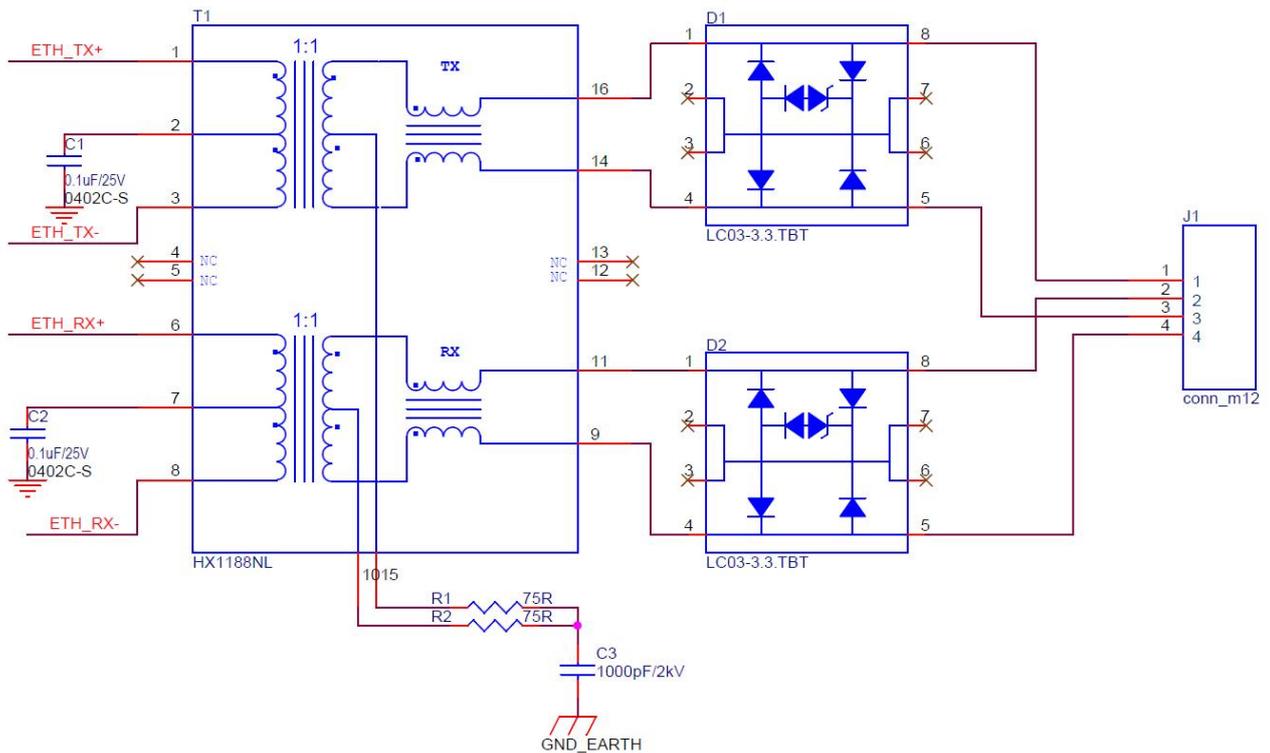
### 2.4.1 M12 Connector

The train Ethernet interface uses the M12 connector (D-type coded hole) of IEC 61706-2-101 standard. The socket front view and pins are defined as follows:

Pin	Description
1	TD +
2	RD +
3	TD -
4	RD -



### 2.4.2 Reference Circuit



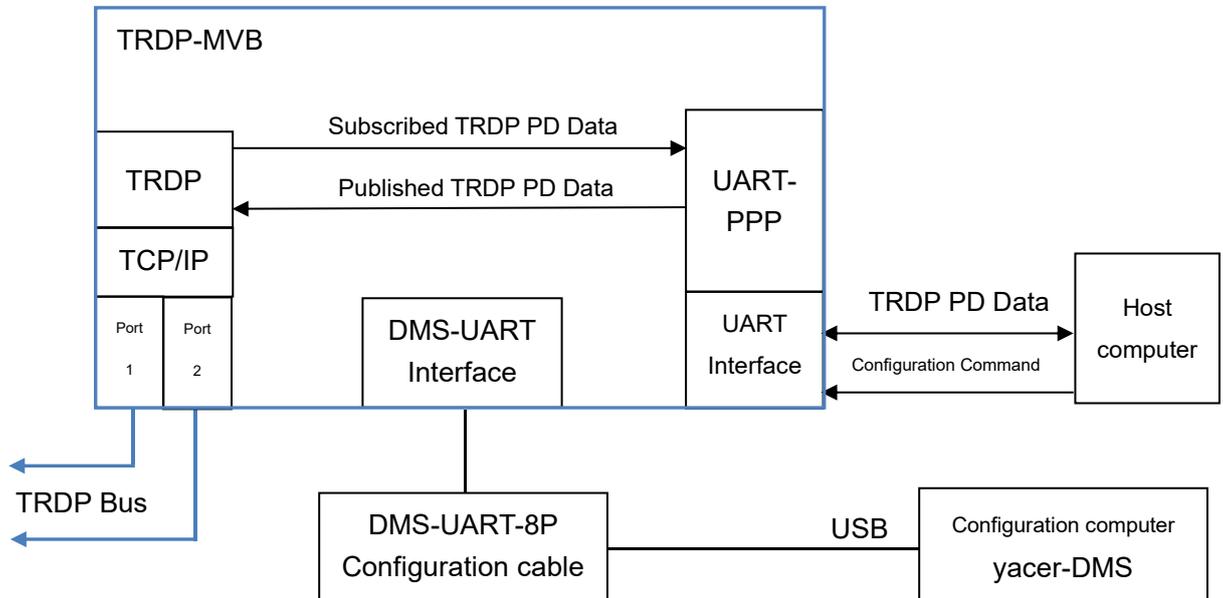
## 3 System and Configuration

### 3.1 Function Diagram

#### 3.1.1 TRDP to UART Working Mode

The two Ethernet ports of TRDP-MVB can be configured to support the TRDP protocol. TRDP-MVB interacts data with the host computer through UART. The process is as follows

- TRDP Send: The host computer sends data to the UART interface of TRDP-MVB through the serial port, and TRDP-MVB converts to TRDP PD data and sends it out through Ethernet;
- TRDP Receive: TRDP-MVB receive the subscribed TRDP PD data from the Ethernet port and forward it to the host computer via the UART interface.



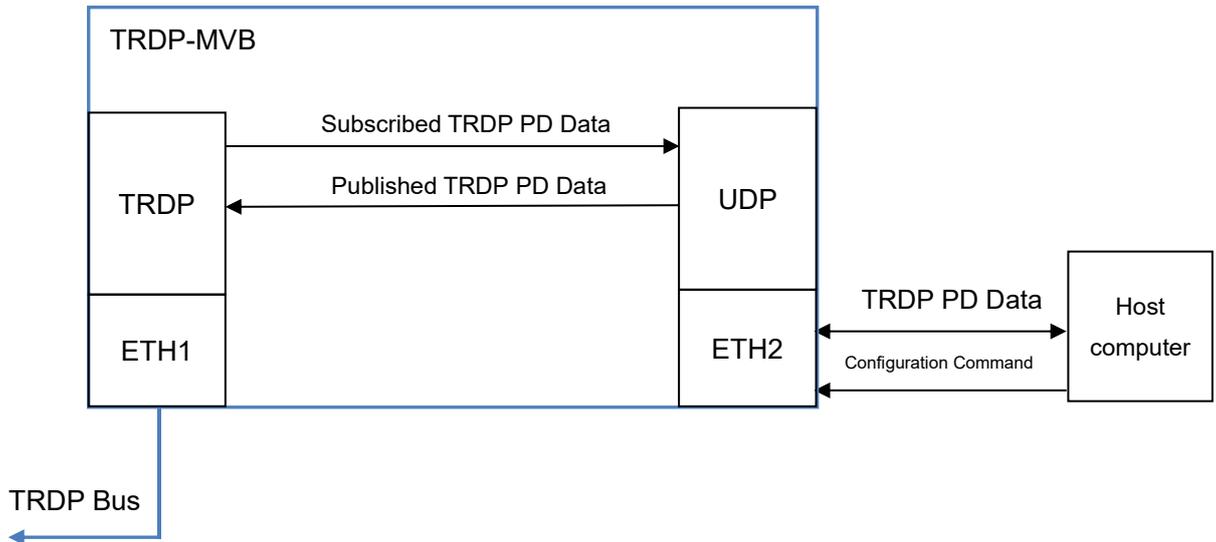
For reliable data transmission with the host computer through the UART interface, the TRDP-MVB uses the UART-PPP protocol to encapsulate the data.

For the UART-PPP library and data command format required for the software development of the host computer, please contact the manufacturer's technical support.

#### 3.1.2 TRDP to UDP Working Mode

The data conversion between TRDP and UDP can be achieved by configuring ETH1 of TRDP-MVB as TRDP and ETH2 as UDP mode, and the process is as follows:

- TRDP Send: The host computer sends UDP data to the ETH2 of TRDP-MVB, and TRDP-MVB converts to TRDP PD data and sends it out through ETH1;
- TRDP Receive: TRDP-MVB receives the subscribed TRDP PD data from ETH1, converts it into UDP messages and forwards it to the host computer via ETH2.



At the same time, the host computer can run the yacer-DMS configuration management software to manage the configuration of TRDP-MVB via Ethernet.

## 3.2 Module Configuration

TRDP-MVB provides a variety of easy and flexible configuration functions to meet the different application scenarios of users.

### 3.2.1 Static Configuration

The TRDP-MVB module has internal FLASH memory to save the configuration. When the module is in normal running operation, the user can configure the TRDP-MVB using the following methods:

- Interactive configuration via the DMS-UART interface using the yacer-DMS configuration management software;
- The host computer gives the configuration commands through the UART interface.

The new configuration generated by the above method is saved in FLASH and the configuration takes effect after the module is rebooted.

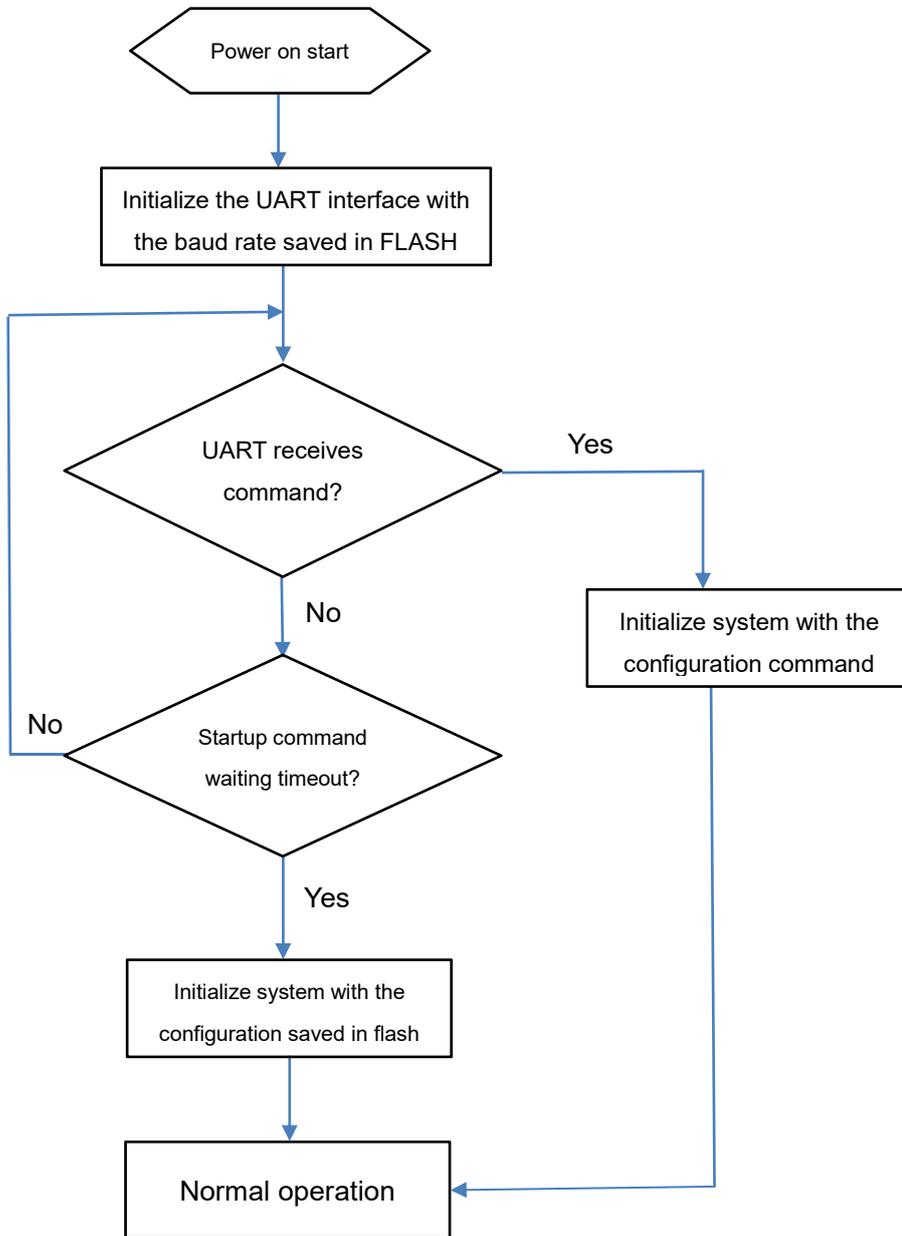
### 3.2.2 Dynamic Configuration

When the module is powered up, the UART interface is initialized with the baud rate parameters saved in FLASH (factory default 115200bps) and waits for a configuration command from the host computer.

If a legitimate configuration command is received within the waiting time window, the TRDP-MVB is initialized with the configuration parameters carried by the command. If the configuration command is not received within the timeout, the TRDP-MVB is initialized with the configuration saved in FLASH.

The size of the wait time window is 5 seconds by default and can be modified by static configuration. If the window is set to 0, the configuration is initialized by loading directly from FLASH.

### 3.3 Startup Process



## 4 yacer-DMS Configuration Management

### 4.1 Get configuration management software yacer-DMS

The user can obtain a compressed package yacer-DMS.zip of configuration management software in the following ways:

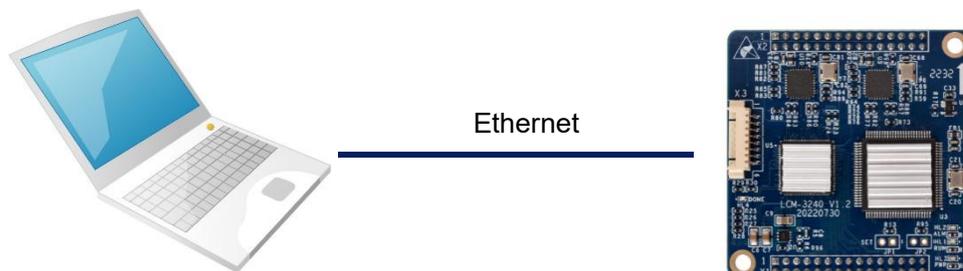
- In the “Softwares” directory of the accompanied U disk of TRDP-MVB;
- Software channel on the official website ([www.yacer.com.cn](http://www.yacer.com.cn)).

The yacer-DMS is a free-installation application software, unzip yacer-DMS.zip, enter the working directory and double click the file yacer-DMS.exe to run.

### 4.2 Building Configuration Environment

#### 4.2.1 Configuration via Ethernet interface

Connect the management computer with any Ethernet interface port of TRDP-MVB through network cable, and run yacer-DMS configuration management software on the computer to configure the parameters and monitor running status of TRDP-MVB.



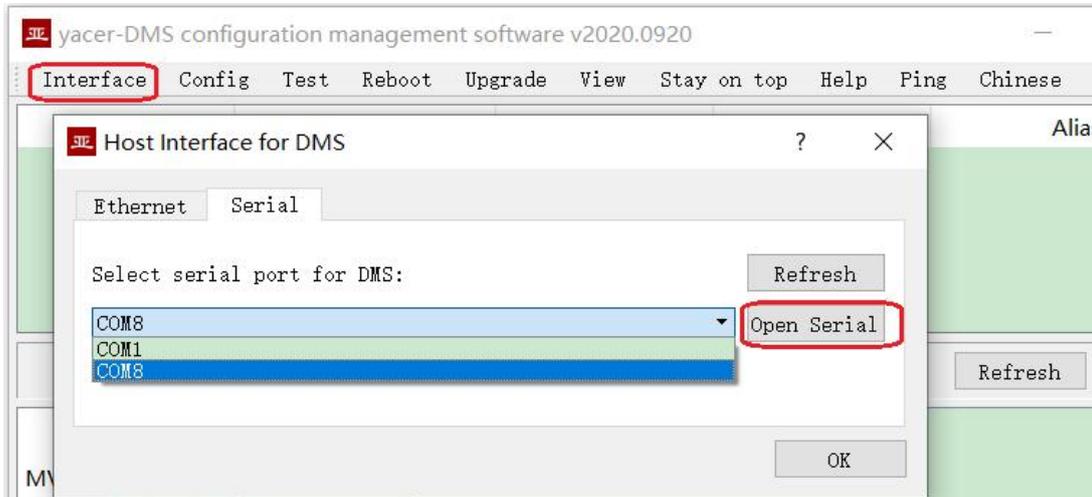
#### 4.2.2 Configuration via DMS-UART (X3) interface

If the TRDP-MVB's Ethernet port is occupied, the DMS-UART-8P configuration cable can be used to connect the TRDP-MVB's DMS-UART interface (X3) to the computer's USB port.

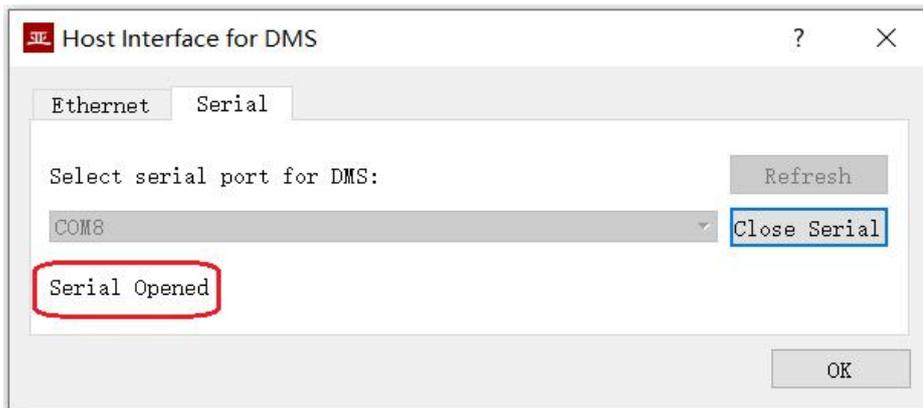


When DMS-UART-8P configuration cable is connected to the management computer USB interface, the computer will add a USB simulation serial port.

Click the “Interface” button on the toolbar to pop up the “Host Interface for DMS” configuration dialog. Enter the “Serial” page, select the serial port of the computer connected to TRDP-MVB from the drop-down list, and click “Open Serial” button.



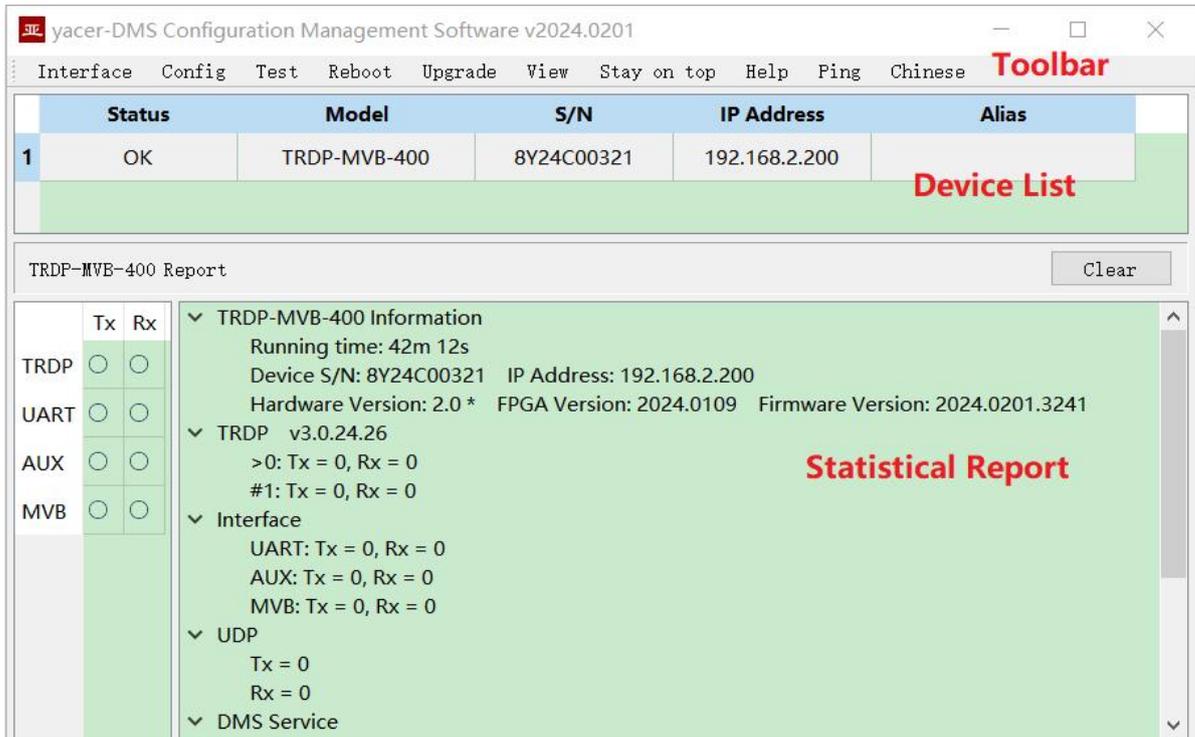
If the serial port is successfully opened, the status is as follows:



## 4.3 Main Window of yacer-DMS

The following figure is the main interface of the configuration management software, which can be divided into three parts:

- Toolbar: Functional operation buttons;
- Device List: Display the basic information and operation status of online devices;
- Statistical Report: Display the receive/transmit indications, device details, and data transmit/receive statistics.



## 4.4 Statistical Report

The statistical report has three panels: control panel, receive/transmit indication panel and information panel.

### 4.4.1 Control Panel

Statistical reports are refreshed once per second, and the statistics can be cleared by clicking the "Clear" button.



### 4.4.2 Receive & Transmit Indication Panel

- Tx: The interface sends a frame of data, corresponding Tx indicator blinks once;
- Rx: The interface receives a frame of data, corresponding Rx indicator blinks once.

	Tx	Rx
TRDP	<input type="radio"/>	<input type="radio"/>
UART	<input type="radio"/>	<input type="radio"/>
AUX	<input type="radio"/>	<input type="radio"/>
MVB	<input type="radio"/>	<input type="radio"/>

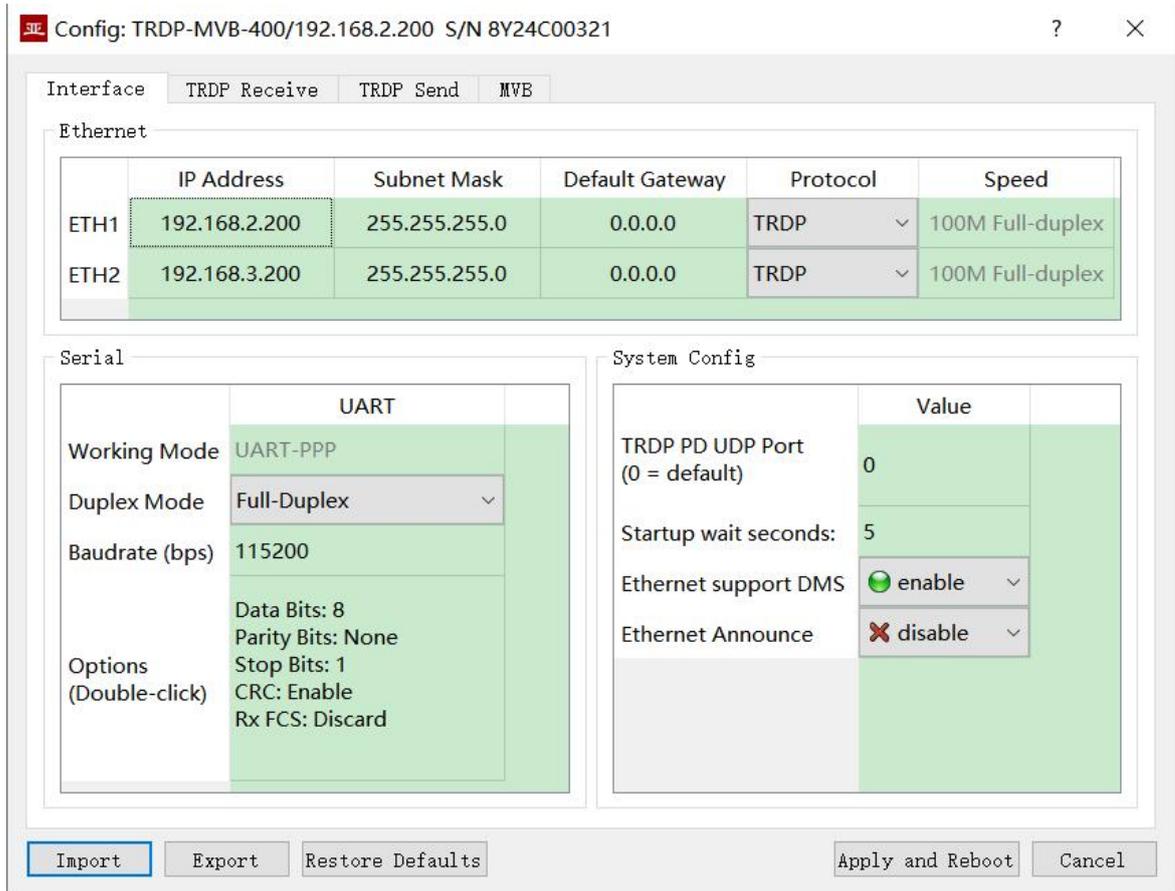
### 4.4.3 Information Panel

Display the following content:

- Device information: Running time, S/N, IP address and Version number;
- TRDP: TRDP protocol receive/transmit statistics;
- Extended Interface: Receive/transmit statistics of serial ports;
- UDP: UDP receive/transmit statistics;
- DMS Service: Displays receive/transmit statistics on configuration management messages between the device and the management computer

## 4.5 Configure Device

Click the 'Config' button on the toolbar or double-click the selected device in the device list, yacer-DMS pops up the configuration dialog. According to the interface and function, the dialog divides the configuration items into several configuration pages.



The bottom of the dialog box includes the following operation buttons:

Button	Function
	Open the configuration file, read the configuration parameters refresh the configuration dialog
	Export configuration parameters from the configuration dialog to a file for saving

Button	Function
	Refresh the configuration dialog with the factory parameters
	Write the configuration parameters in the dialog to the device, and restart the device to make the configuration take effect
	Cancel current configuration operation

## 4.6 Interface Configuration

### 4.6.1 Function Description

This page is used to configure the working modes and parameters of the Ethernet interface and serial port.

### 4.6.2 Ethernet Interface Configuration

Configure the IP address, subnet mask and default gateway for the Ethernet interface here.

By default, ETH1 and ETH2 are configured in TRDP protocol mode, and the Ethernet port is forced to be 100M full duplex.

Interface	TRDP Receive	TRDP Send	MVB			
Ethernet						
	IP Address	Subnet Mask	Default Gateway	Protocol		Speed
ETH1	192.168.2.200	255.255.255.0	0.0.0.0	TRDP	∨	100M Full-duplex
ETH2	192.168.3.200	255.255.255.0	0.0.0.0	TRDP	∨	100M Full-duplex

### 4.6.3 UART Configuration

Communication between TRDP-MVB and host PC via UART interface. Since UART sends and receives the character stream without head and tail. In order to transmit a packet, a UART-PPP frame is constructed by adding 0x7E as the start and end marks at the beginning and end of the packet, and inserting a frame check sequence.

Serial

	UART
Working Mode	UART-PPP
Duplex Mode	Full-Duplex
Baudrate (bps)	115200
Options (Double-click)	Data Bits: 8 Parity Bits: None Stop Bits: 1 CRC: Enable Rx FCS: Discard

## 4.6.4 System Configuration

System configuration includes the following:

- TRDP PD UDP Port: TRDP process data UDP port, if set to 0 it works on the default port 17224;
- Start Command Wait Seconds: User can set the start command wait time here to adjust the dynamic configuration time window;
- Ethernet Support DMS: If enabled allows the Ethernet port to support yacer-DMS configuration;
- Ethernet Auto Notification: Used for internal debugging by the manufacturer, the user should Disable this function.

## 4.7 TRDP Receive Configuration

This page can configure up to 16 TRDP subscription PD entries.

If the destination IP is a legitimate unicast, multicast or broadcast address, the subscribed TRDP PD data is forwarded to the destination IP in real time through the Ethernet port.

If the destination IP is 0, the subscribed TRDP PD data is forwarded to the host computer through the UART interface.

Interface TRDP Receive TRDP Send MVB

TRDP PD Subscribe

	Enable	TRDP Rx COMID	TRDP Rx Multicast
1	<input checked="" type="radio"/> enable	1001	0.0.0.0
2	<input checked="" type="radio"/> enable	1002	224.10.10.10
3	<input checked="" type="radio"/> enable	1003	0.0.0.0
4	<input checked="" type="radio"/> disable	0	0.0.0.0
5	<input checked="" type="radio"/> enable	0	0.0.0.0
6	<input checked="" type="radio"/> disable	0	0.0.0.0

Data Forward to

Dest IP Address:  Dest UDP Port:

## 4.8 TRDP Send Configuration

When the UDP receive port is 0, TRDP-MVB receives data from the host computer through the UART interface, refreshes the PD buffer of the TRDP protocol, and then sends PD data periodically according to the PD release configuration, whose destination address can be unicast, multicast or broadcast.

When the UDP receive port is a legal port number, the TRDP-MVB receives the PD data to be forwarded via Ethernet. If you wish to receive multicast data, you need to set the corresponding receive multicast address.

Interface TRDP Receive TRDP Send MVB

Data Receive from

Rx UDP Port:  Rx Multicast:

TRDP PD Publish

	Enable	TRDP Tx COMID	TRDP Tx Interval(ms)	TRDP Tx Destination IP	TRDP Tx Destination IP2
1	<input checked="" type="radio"/> enable	2000	32	192.168.2.80	192.168.3.80
2	<input checked="" type="radio"/> enable	2001	50	224.10.10.10	224.10.10.10
3	<input checked="" type="radio"/> enable	2002	16	224.11.11.11	224.11.11.11
4	<input checked="" type="radio"/> disable	0	0	0.0.0.0	0.0.0.0
5	<input checked="" type="radio"/> enable	0	0	0.0.0.0	0.0.0.0
6	<input checked="" type="radio"/> disable	0	0	0.0.0.0	0.0.0.0

## 4.9 MVB Configuration

The MVB configuration page is shown below, with the MVB interface and forwarding configuration on the left, and the PD port configuration table on the right.

The screenshot shows the MVB configuration window with the following sections:

- MVB Options (Double-click):** Address: 10, T\_Source: 5BT, T\_Ignore: 42.7us, Medium: EMD, Line: Both.
- Rx UDP Port:** 0
- Rx Multicast:** 0.0.0.0
- Tx Dest IP:** 0.0.0.0
- Tx UDP Port:** 0
- PD Acquisition:** Disabled
- MVB Read-Only:** Disabled

PD Port Type	PD Port	Port Size
<input type="radio"/> Sink Port	1000	32 bytes
<input checked="" type="radio"/> Source Port	2000	32 bytes
<input checked="" type="radio"/> Disable	0	2 bytes
<input checked="" type="radio"/> Disable	0	2 bytes
<input type="radio"/> Sink Port	0	2 bytes
<input checked="" type="radio"/> Source Port	0	2 bytes
<input checked="" type="radio"/> Disable	0	2 bytes
<input checked="" type="radio"/> Disable	0	2 bytes
<input checked="" type="radio"/> Disable	0	2 bytes
<input checked="" type="radio"/> Disable	0	2 bytes
<input checked="" type="radio"/> Disable	0	2 bytes
<input checked="" type="radio"/> Disable	0	2 bytes

### 4.9.1 MVB Interface Configuration

Double-click the cell corresponding to the MVB interface configuration to bring up the MVB parameter configuration dialog.

Device Address:  0 - 4095

Media Type:

Line Mode:

T\_Source:  BT (1BT = 0.667us)

T\_Ignore:  us (0 = 42.7us)

#### 4.9.1.1 Device Address

Users configure device address in the range of 0 to 4095 according to field requirements.

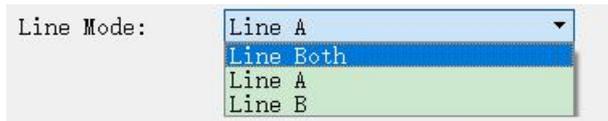
#### 4.9.1.2 Media Type

According to the application requirements, users can choose the medium type.

Media Type:

- ESD
- ESD
- EMD

### 4.9.1.3 Line Mode



Users can choose:

- Line Both: double-line redundancy;
- Line A: A line single line mode;
- Line B: B line single line mode.

### 4.9.1.4 Other Parameters

Using default values, users do not modify or adjust as much as possible.

## 4.9.2 Ethernet, Serial to MVB Configuration

When the receive UDP port is 0, TRDP-MVB receives the data from the host through the UART interface and refreshes the time buffer of the PD source port. When the MVB interface receives a process data request from the master station, TRDP-MVB automatically sends a process data response carrying the latest data content.

When the UDP receive port is a legal port number, TRDP-MVB receives the PD data via Ethernet. If you wish to receive multicast data, you need to set the corresponding receive multicast address.

Rx UDP Port	8000
Rx Multicast	0.0.0.0

## 4.9.3 MVB to Ethernet, Serial Port Configuration

If the forwarding destination IP is a legal unicast, multicast or broadcast address, the PD data of the MVB sink port received by TRDP-MVB is forwarded to the destination IP via the Ethernet port in real time.

If the destination IP is 0, the PD data of the MVB sink port is forwarded to the host unit via the UART interface.

Tx Dest IP	192.168.2.80
Tx UDP Port	8000

## 4.9.4 PD Acquisition

"PD Acquisition" is set to:

- Enable: TRDP-MVB receives all PD frames on the MVB bus and forwards them to the host computer;
- Disable: TRDP-MVB only receives data from the sink port in the PD port configuration table.

PD Acquisition	<input checked="" type="checkbox"/> Disable	9	<input checked="" type="checkbox"/> D
MVB Read-Only	<input checked="" type="checkbox"/> Disable	10	<input checked="" type="checkbox"/> D
	<input checked="" type="checkbox"/> Disable		
	<input checked="" type="checkbox"/> Disable		

If the MVB Read-only mode is Enable, the TRDP-MVB module works in pure receive mode and does not output all frames including device status and PD to the MVB bus.

## 4.9.5 PD Port Configuration Table

The default version of TRDP-MVB supports the configuration of up to 16 process data ports. If users need to configure more PD ports, please contact the manufacturer for customization.

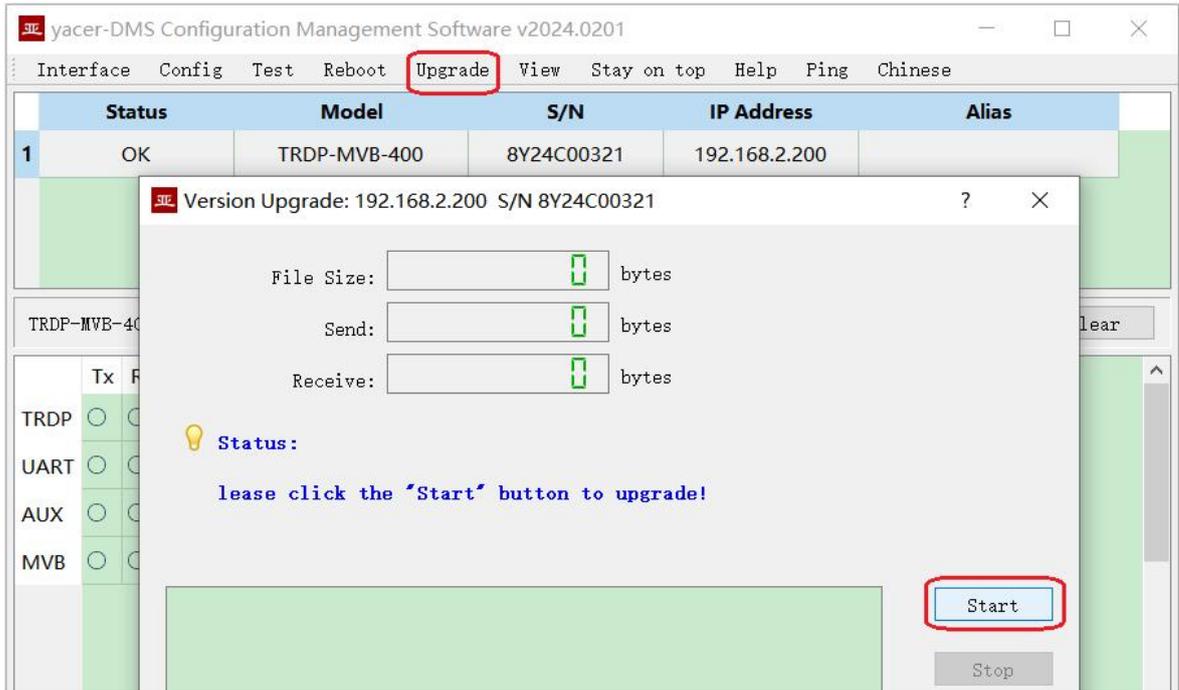
Each PD port entry includes the following parameters:

- PD Port Type: Sink or Source port, disable means this entry is invalid;
- PD Port: Set port number 0 ~ 4095;
- Port Size: 2, 4, 8, 16, 32 bytes correspond to 0 ~ 4 of fcode;

## 4.10 Firmware Version Upgrade

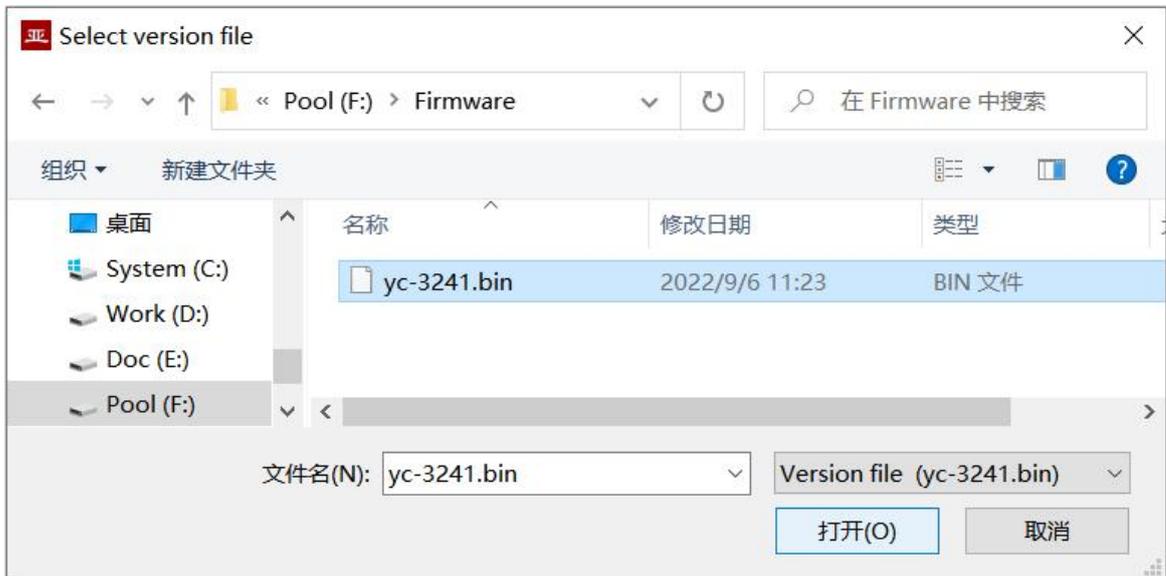
### 4.10.1 Start Upgrade

Click the “Upgrade” button on the toolbar to pop up the version upgrade dialog, and then click the “Start” button.



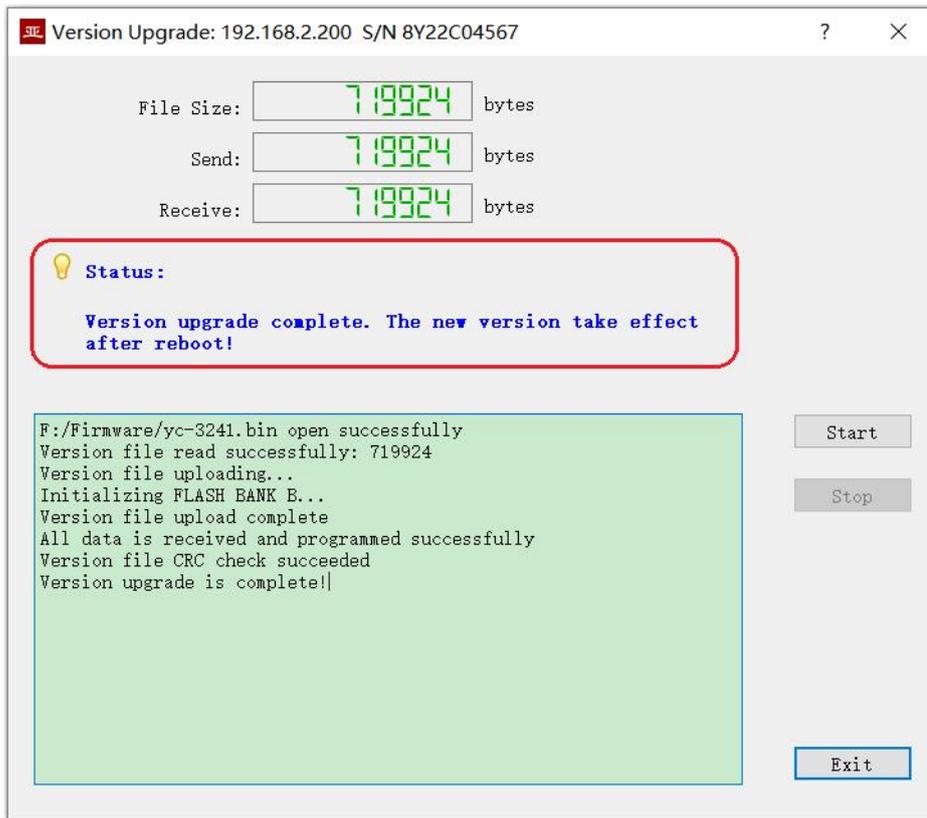
## 4.10.2 Select Version File

Pop up the "Select version file" dialog, and find the folder where the latest firmware version is stored, select the corresponding file, and click "Open" to start the update.



## 4.10.3 Complete Upgrade

After the update is completed, the status of the page will show "Version Update Complete", which means the update is complete. Click the "Exit" button to close the update window.



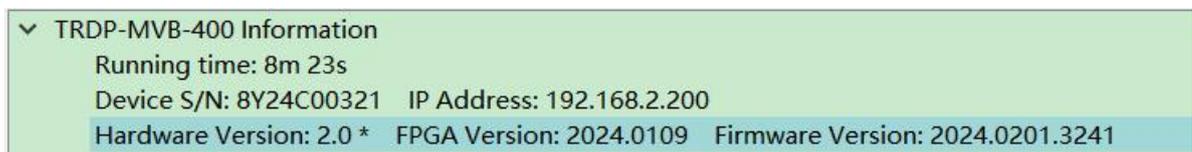
#### 4.10.4 Re-powering takes effect

The device is re-powered. Wait for a minute or so for the new version to start taking effect.



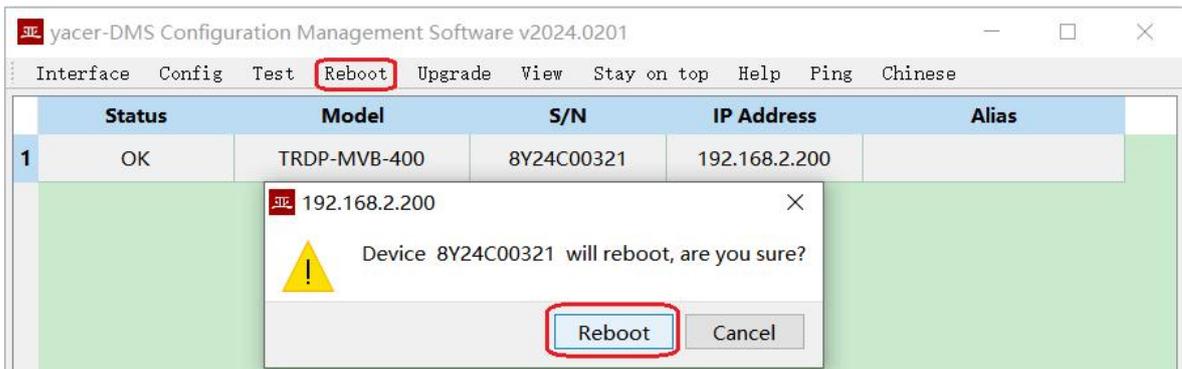
#### 4.10.5 Confirm Upgrade

Observe the version information in the statistics report after the device has finished booting and determine whether the update was successful by the version date.



### 4.11 Reboot Device

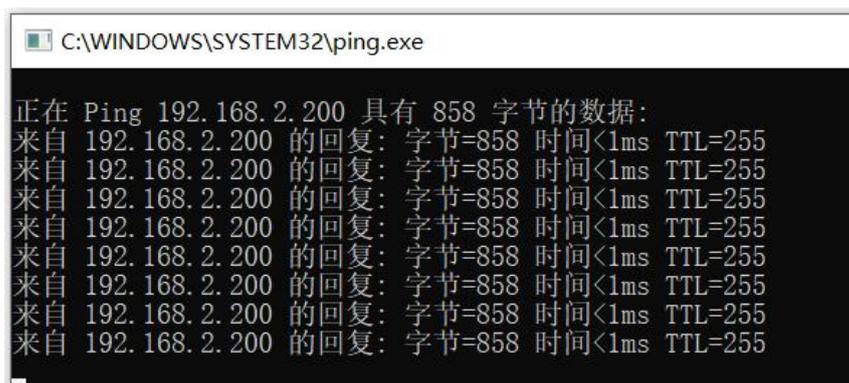
Click the “Reboot” button on the toolbar to pop up the device reboot dialog, and then click the “Reboot” button to reboot the device.



## 4.12 Ping

By clicking the "Ping" button on the toolbar, DMS automatically starts the ping command on the selected device to check whether the network connection between the configuration management computer and TRDP-MVB is working properly.

Before executing the Ping command, first make sure that the IP addresses of the computer and TRDP-MVB are in the same subnet.



## About the Manual

- The manual is for reference only. If there is inconsistency between the manual and the actual product, the actual product shall prevail.
- We are not liable for any loss caused by the operations that do not comply with the manual.
- All the designs and software are subject to change without prior written notice. The product updates might cause some differences between the actual product and the manual. Please contact the customer service for the latest program and supplementary documentation.
- There still might be deviation in technical data, functions and operations description, or errors in print. If there is any doubt or dispute, we reserve the right of final explanation.
- Upgrade the reader software or try other mainstream reader software if the manual (in PDF format) cannot be opened.
- Please visit our website, contact the supplier or customer service if there is any problem occurring when using the device.
- If there is any uncertainty or controversy, we reserve the right of final explanation.