# TRDP-UART

# Datasheet

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Building Blocks of Communication

# 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. |

# Table of Contents

# 1 Overview

## 1.1 Introduction

The Yacer TRDP-UART micro embedded NIC module provides one 100M Ethernet PHY interface, one UART extended interface and optional CAN interface. Implement protocol conversion between TRDP protocol, serial port or CAN bus.

30x35 mm micro size, 2.0mm pin interface. +3.3V power supply, low power consumption. Industrial wide temperature, suitable for embedded applications.

## 1.2 Features

- One 10/100M Ethernet PHY, supports TRDP;
- One UART extended serial port;
- Optional one CAN bus interface;
- +3.3V power supply, low power consumption;
- Small size, Industrial wide temperature.

## 1.3 Applications

- Protocol conversion between TRDP and UART;
- Protocol conversion between TRDP and CAN bus interface;
- Train Control and Management System (TCMS);
- Train Communication Network (TCN);
- Embedded application and development.

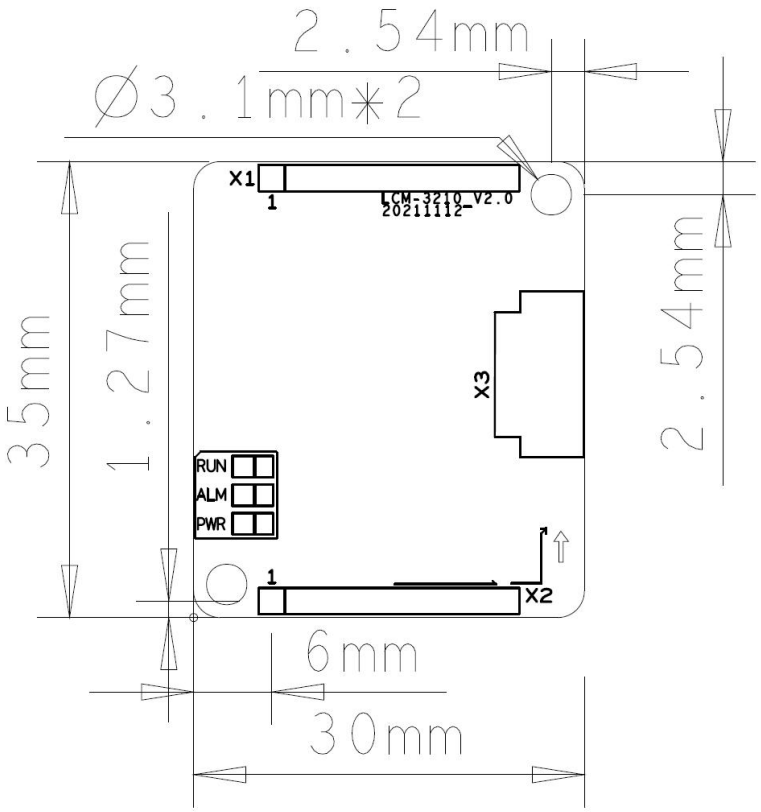
## 1.4 Order Information

| Model | Ethernet Interface | Extended Interface |
|---|---|---|
| TRDP-UART-200 | 1 x 10/100M PHY | UART |
| TRDP-UART-200C | 1 x 10/100M PHY | UART + CAN |

## 1.5 Technical Specifications

| Item | Parameters | Details |
|---|---|---|
| Ethernet Interface | Number | 1 x 100M PHY |
| | Rate | 100 Mbps full-duplex |
| | Protocol | TRDP PD |
| UART Interface | Level standard | 3.3V LVCMOS |
| | Duplex type | full-duplex, half-duplex |
| | Baud rate | ≤ 921.6 Kbps |
| CAN Interface | Level standard | 3.3V LVCMOS |
| | Working mode | CAN 2.0A, CAN 2.0B, ISO 11898 |
| | Baud rate | ≤ 1 Mbps |
| Power Requirements | Power Supply | +3.3 VDC |
| | Power consumption | < 1W |
| Mechanical Characteristics | Connector | 2.0 mm pin connector |
| | Dimensions | 30 mm x 35 mm |
| | Weight | < 15 g |
| Operating Environment | Operating temperature | -40 ~ +85℃ |
| | Storage temperature | -40 ~ +85℃ |
| | Operating humidity | 5 ~ 95% RH (no condensation) |

## 1.6 Mechanical Dimension Drawings

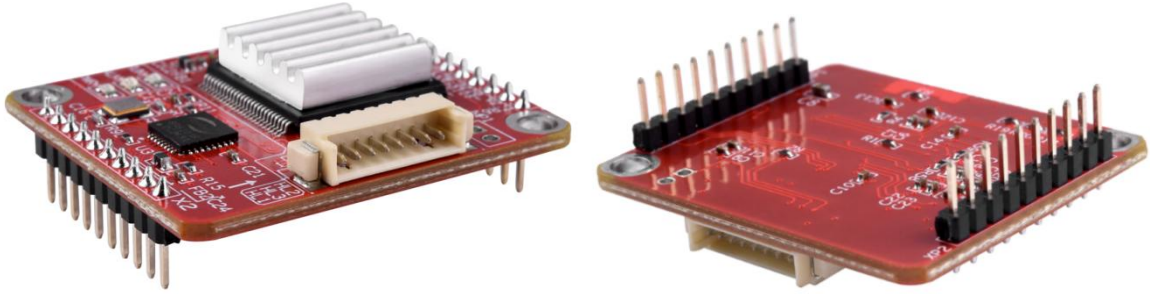


# 2 Hardware and Physical Interfaces

## 2.1 Appearance

The top and bottom view of TRDP-UART are as follows, and the signals are drawn out through connector X1 and X2.

X3 is configuration interface used to connect the DMS-UART-8P configuration cable and configure it online through the management computer's USB interface.



## 2.2 LED Indicators

| Item | Description |
|---|---|
| RUN | Running indicator, green light flashing during normal operation |
| ALM | Alarm indicator<br>● Initialization phase blinking: waiting for the host computer configuration command<br>● Normal operation status off: the device is working normally<br>● Normal operation status on: device failure |
| PWR | Power indicator, always on after power on |

## 2.3 X1: 1x10 2.0mm pitch connector

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | VCC3V3 | I | Power input, +3.3VDC |
| 2 | RESET_IN | I | Module reset input, active low. Module has POR function, pins can be left floating |
| 3 | NC | | Standby, must be left floating |

| Pin | Name | Type | Description |
|---|---|---|---|
| 4 | UART_TxD | O | Serial port data transmit |
| 5 | UART_RxD | I | Serial port data receive |
| 6 | UART_TX_EN | O | Serial port transmit enable, active high, for half-duplex |
| 7 | AUX_UART_TxD | O | Auxiliary serial port data transmit |
| 8 | AUX_UART_RxD | I | Auxiliary serial port data receive |
| 9 | AUX_UART_TX_EN | O | Auxiliary serial port transmit enable, active high, for half-duplex |
| 10 | GND | | Signal ground |

## 2.4 X2: 1x10 2.0mm pitch connector

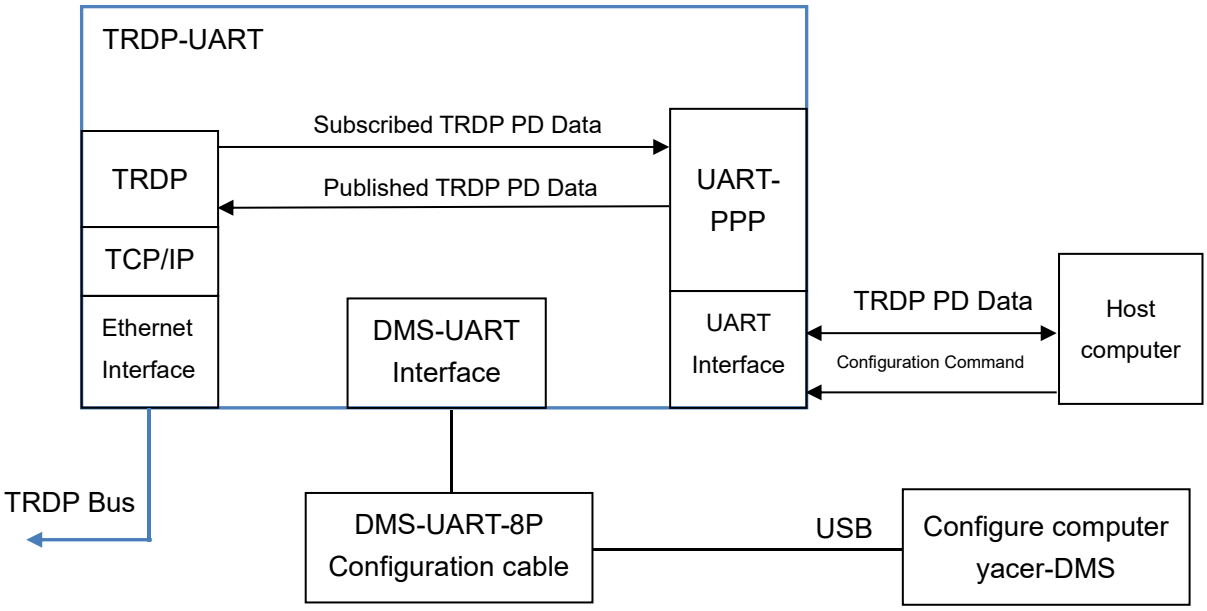
| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | GND | | Signal ground |
| 2 | CAN_RX | I | CAN interface data receive |
| 3 | CAN_TX | O | CAN interface data transmit |
| 4 | NC | | Standby, must be left floating |
| 5 | ETH_LED | O | Ethernet Link/Act indication, driving LED positive |
| 6 | ETH_TX+ | | Ethernet PHY interface Tx+, external network transformer required |
| 7 | ETH_TX- | | Ethernet PHY interface Tx-, external network transformer required |
| 8 | ETH_RX+ | | Ethernet PHY interface Rx+, external network transformer required |
| 9 | ETH_RX- | | Ethernet PHY interface Rx-, external network transformer required |
| 10 | GND | | Signal ground |

# 3 System and Configuration

## 3.1 Function Diagram

The TRDP-UART system implements the data conversion between TRDP and UART as shown in the following diagram.

- TRDP Send: The host computer sends data to the UART interface of TRDP-UART through the serial port, and the TRDP-UART converts to TRDP PD data and sends it out through Ethernet;
- TRDP Receive: TRDP-UART will 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-UART 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.

## 3.2 Module Configuration

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

### 3.2.1 Static Configuration

The TRDP-UART module has internal FLASH memory to save the configuration. When the module is in normal running operation, the user can configure the TRDP-UART 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.

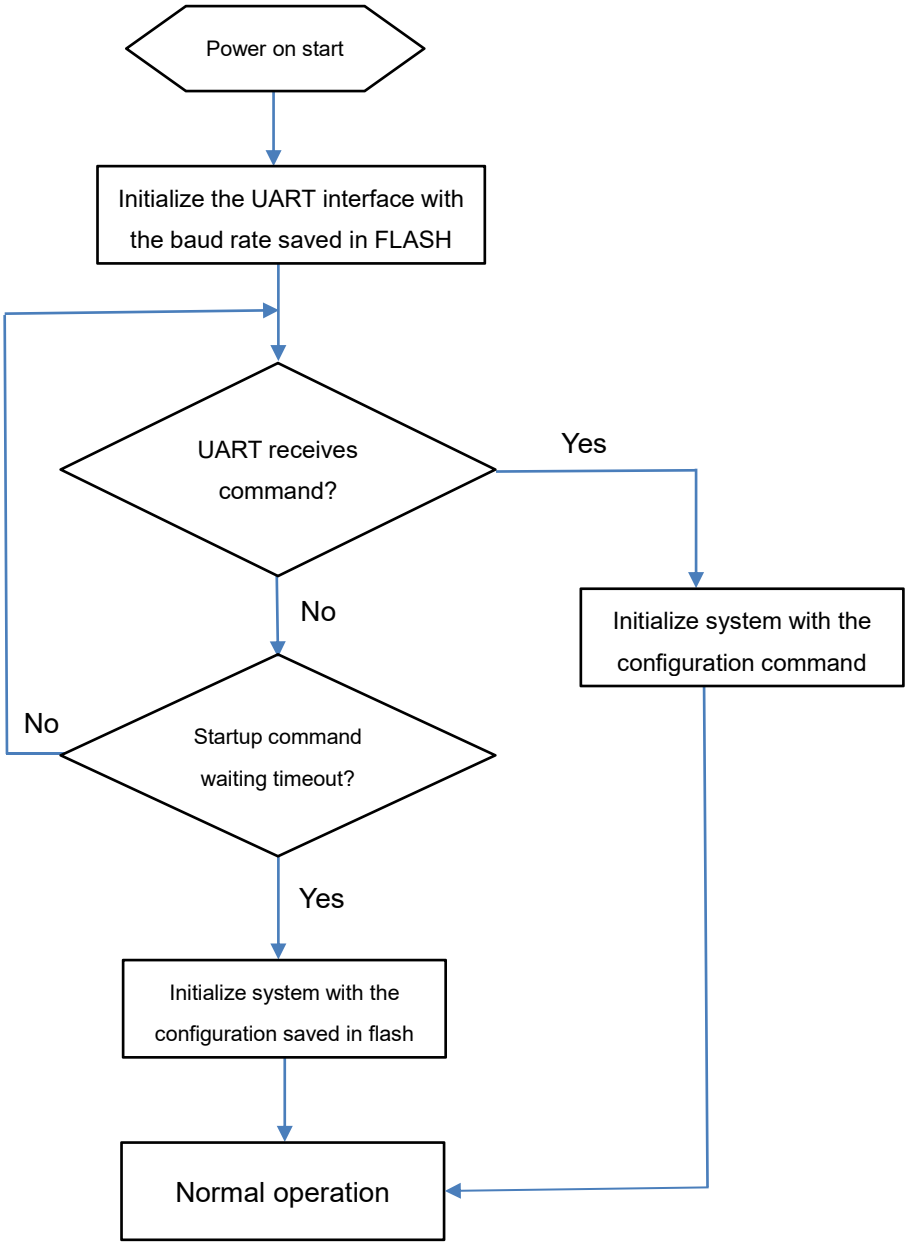
### 3.2.2 Dynamic Configuration

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-UART is initialized with the configuration parameters carried by the command. If the configuration command is not received within the timeout, the TRDP-UART 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:

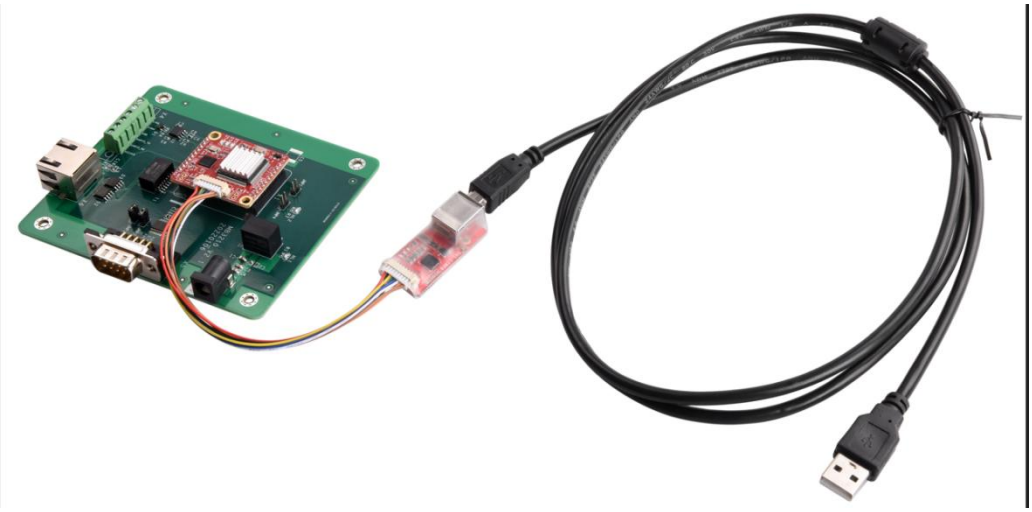
- In the “Softwares” directory of the accompanied U disk of TRDP-UART;
- Software channel on the official website (www.yacer.com.cn).

As the 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 Connect Management Computer to TRDP-UART

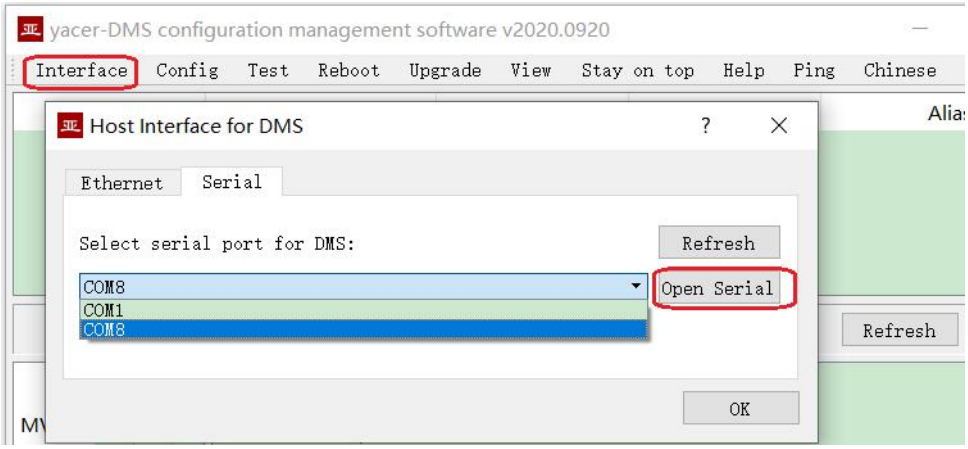
Connect the special DMS-UART interface (X3) of TRDP-UART to the USB interface of the computer with the DMS-UART-8P configuration cable.



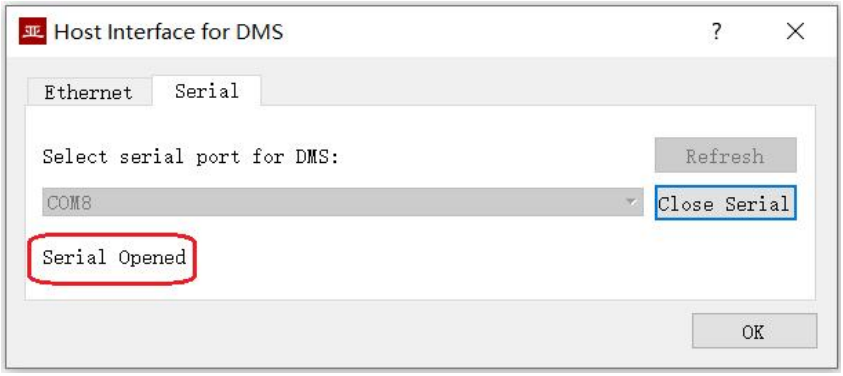
### 4.2.2 Select & Open Configuration Serial Port

When DMS-UART-8P configuration line 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-UART from the drop-down list, and click “Open Serial” button.



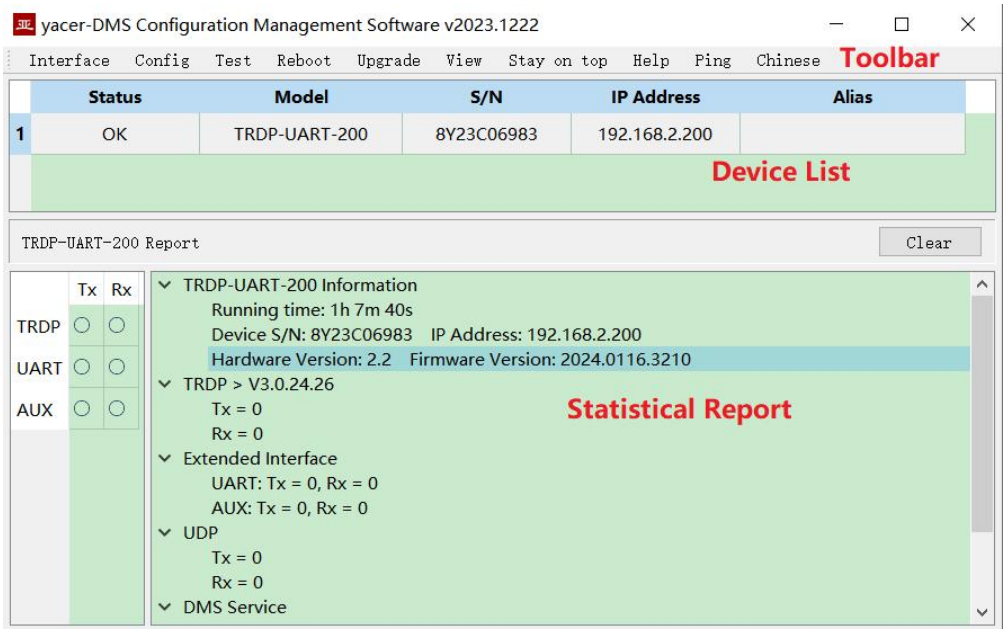

If the serial port is successfully opened, the status is as follows:




## 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: Displaying the basic information and operation status of online devices;
- Statistical Report: Displaying the receive/transmit indication & statistics, and device details.



# 4.4 Statistical Report

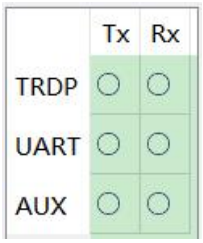
The statistical report has three panels: control panel, receive/transmit indication panel and information panel.

## 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.



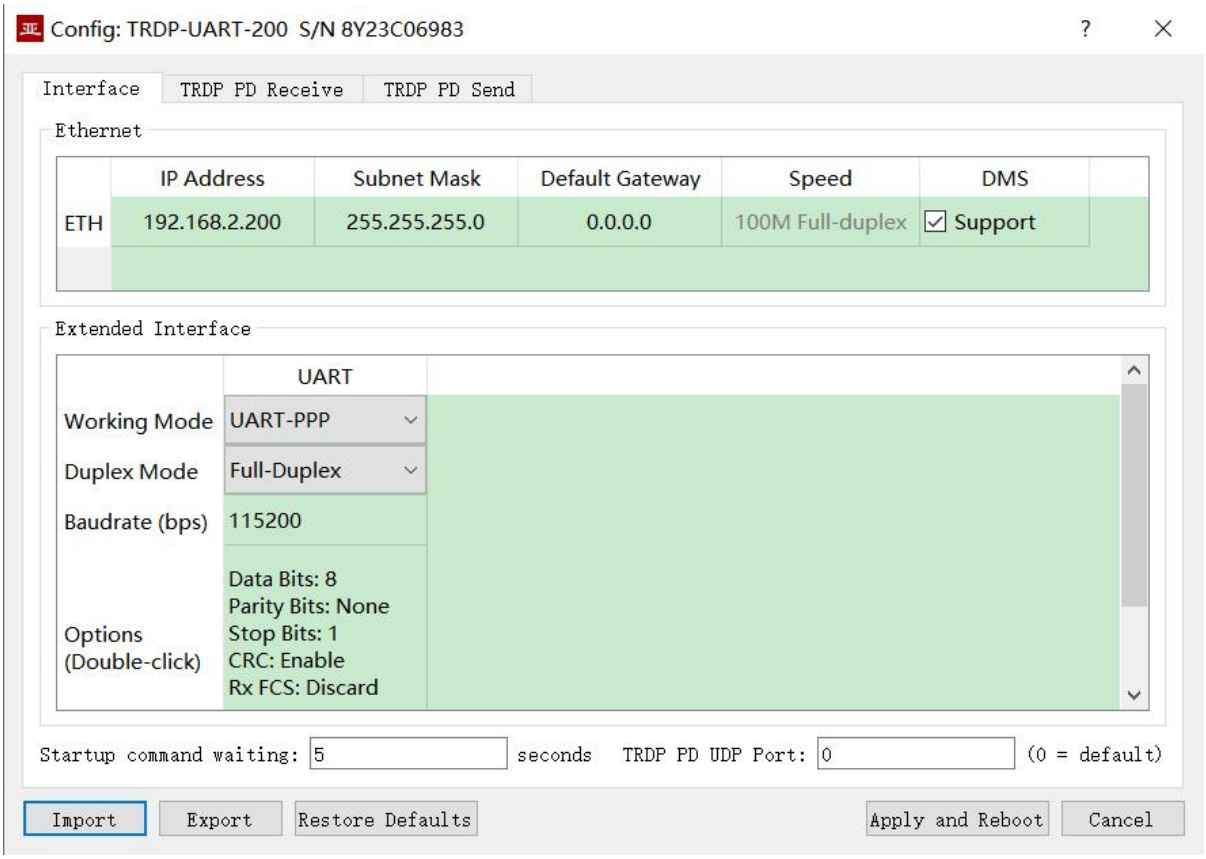

## 4.4.3 Information Panel

The right side of the statistical report is the information panel, which can display the following contents:

- Device information: Running time, S/N and Version number;
- TRDP: TRDP protocol transceiver statistics;
- Extended Interface: Receive/transmit statistics of UART and CAN ports;
- UDP: UDP transceiver statistics;
- DMS Service: DMS message receive/transmit statistics.

# 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 |
|---|---|
| Import | Open the configuration file, read the configuration parameters refresh the configuration dialog |
| Export | Export configuration parameters from the configuration dialog to a file for saving |
| Restore Defaults | Refresh the configuration dialog with the factory paramters |
| Apply and Reboot | Write the configuration parameters in the dialog to the deivce, and restart the device to make the configuration take effect |
| Cancel | Cancel current configuration operation |

# 4.6 Interface Configuration

## 4.6.1 Function Description

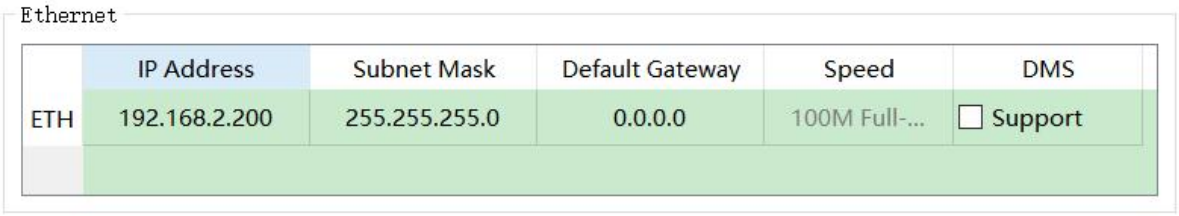
This page is used to configure the operating modes and parameters of the Ethernet interface and serial port.

## 4.6.2 Ethernet Interface Configuration

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

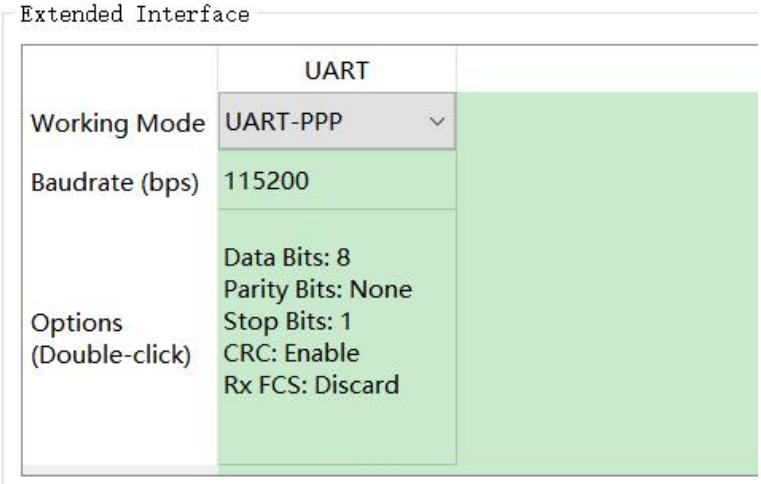
Because TRDP runs in the network port, Ethernet is forced to set to 100M full duplex mode.

If the DMS column 'support' check box is checked, yacer-DMS is allowed to configure and manage TRDP-UART through Ethernet interface.



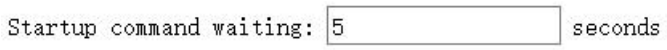

## 4.6.3 UART Configuration

Communication between TRDP-UART 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.



### 4.6.4 Startup Command Waiting Time Configuration

Users can set the startup command waiting time to adjust the dynamic configuration time window.

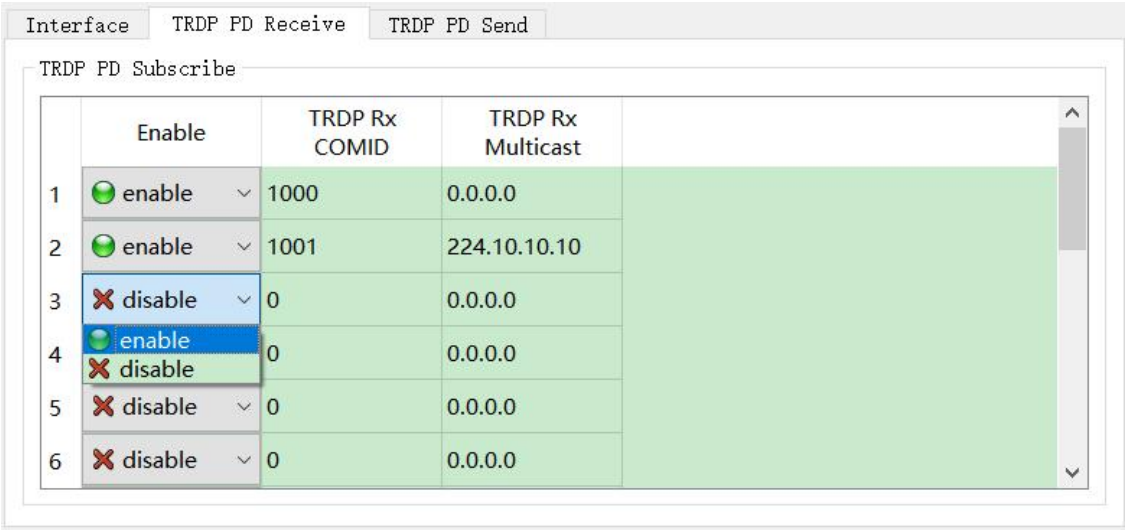



### 4.6.5 TRDP PD Port

TRDP process data UDP port, if set to 0 works on default port 17224.

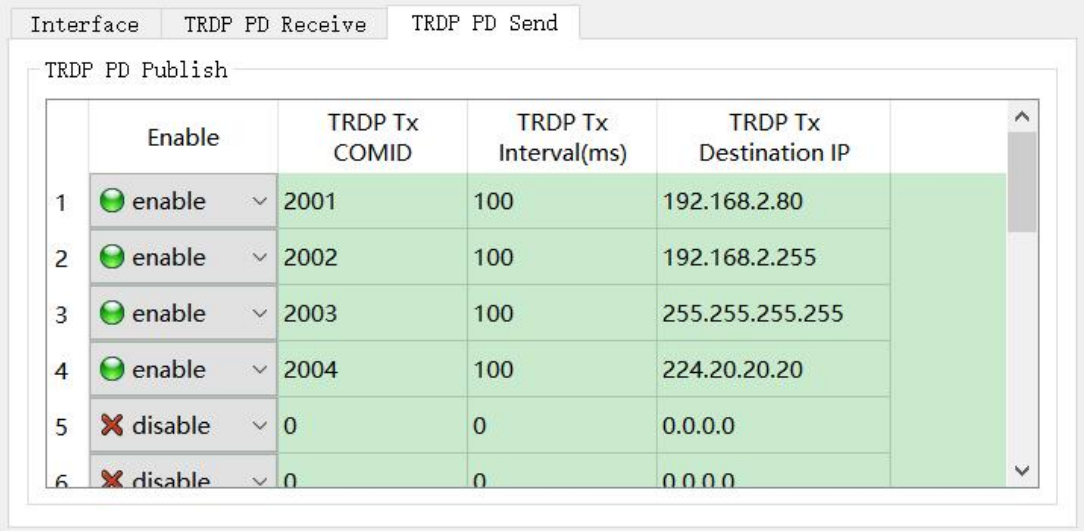

## 4.7 TRDP PD Receive Configuration

This page can configure up to 16 TRDP subscription PD entries and supporting multicast reception.




## 4.8 TRDP PD Send Configuration

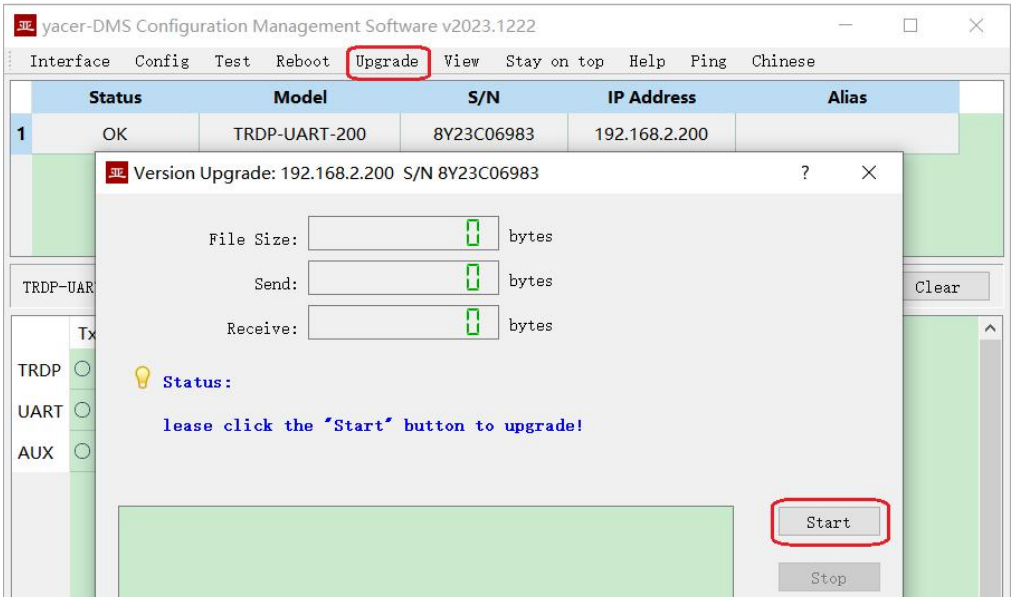
TRDP-UART receives data from the host computer through the UART interface, refreshes the PD buffer of the TRDP protocol, and then sends PD data periodically according to the PD release configuration, whose destination address can be unicast, multicast or broadcast.




# 4.9 Firmware Version Upgrade

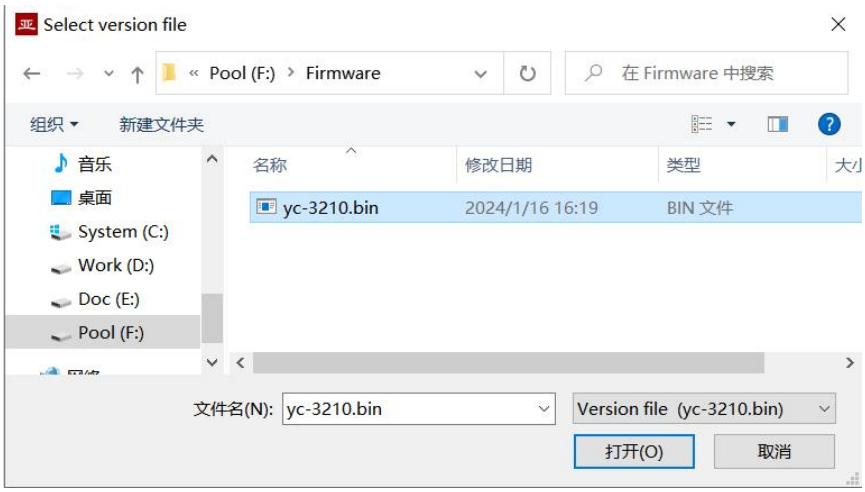
## 4.9.1 Start Upgrade

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



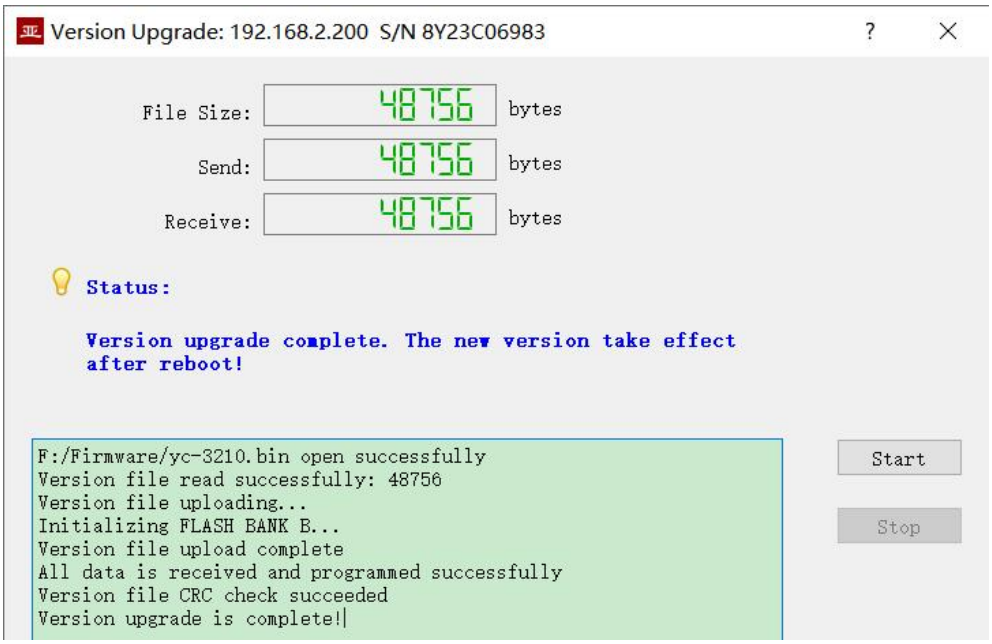

## 4.9.2 Select Version File

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.




## 4.9.3 Complete Upgrade

When the page displays “Version upgrade is complete” status, it indicates that the version upgrade is completed.

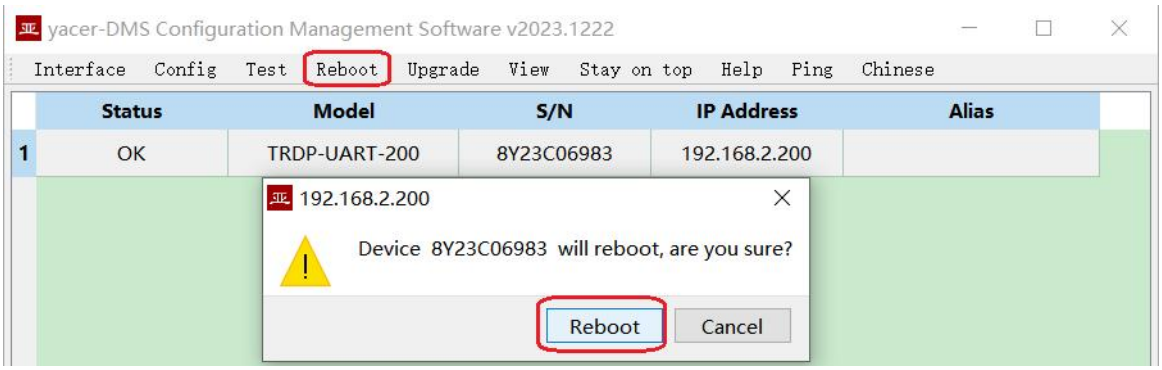



## 4.9.4 Confirm Upgrade

After the upgrade is completed, power up the device again, observe the version information in the statistical report, and determine whether the new version is successfully updated by the version date.

## 4.10 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.



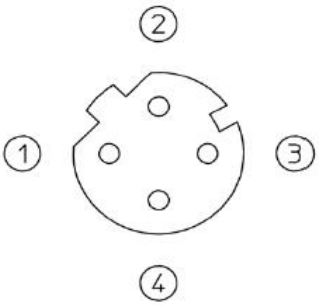
# 5 Hardware Development

## 5.1 Ethernet Interface Development

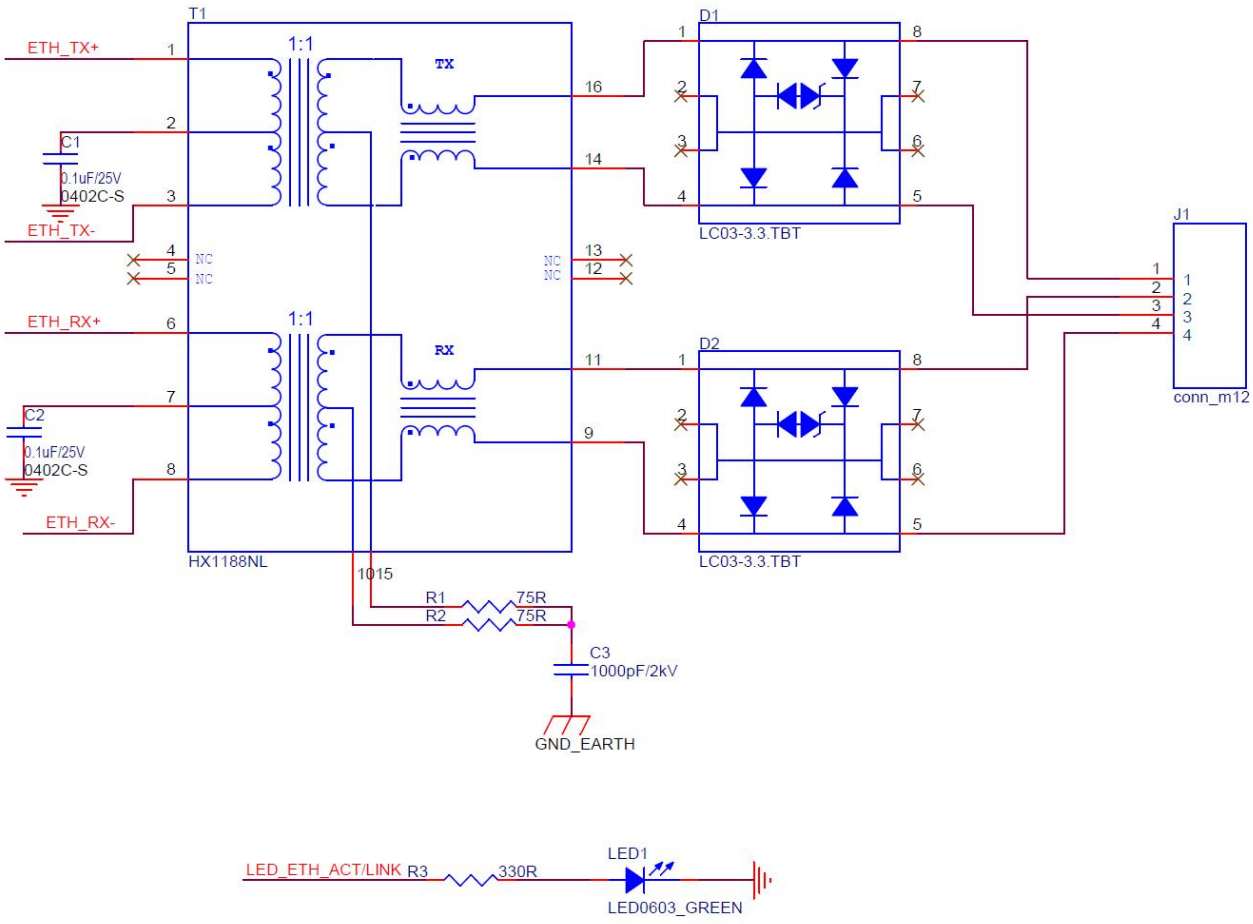
### 5.1.1 M12 Connector

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 - |




### 5.1.2 Reference Circuit



# 6 Software Development

Reference:

- *TCN-PACKET Programming Manual*
- *TCN-UMS Programming Manual*

UART-PPP protocol implementation C code:

- yacer_uart_ppp.c

# 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.