

HDLC-UDP

Datasheet

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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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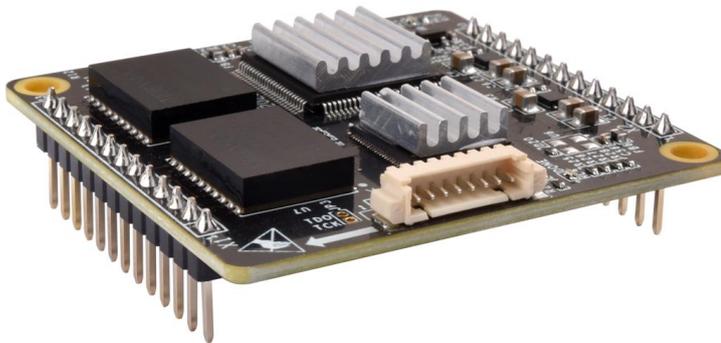
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1 Overview

1.1 Introduction

The Yacer HDLC-UDP isolated embedded communication module, providing one 100M Ethernet PHY interface, two isolated RS-485/422 synchronous & asynchronous serial port and one CMOS extended synchronous & asynchronous serial port, to realize the protocol conversion between HDLC and UDP

46.5 × 48mm tiny size, 2.54mm pin connector. + 5V power supply, low power consumption. Industrial wide temperature, suitable for embedded applications.



1.2 Features

- One 10/100M Ethernet PHY interface, supporting UDP protocol;
- Two Isolated RS-485/422 synchronous & asynchronous serial port;
- One CMOS extended synchronous & asynchronous serial port;
- All serial ports support synchronous HDLC and asynchronous UART working mode;
- Encoding formats support NRZI, DBPL, Manchester and Differential Manchester;
- Open and flexible configuration management;
- +5V power supply, low power consumption;
- Small size, Industrial wide temperature.

1.3 Applications

- Protocol conversion between HDLC and UDP;
- Protocol conversion between synchronous and asynchronous serial port;
- Train Control and Management System (TCMS);
- Train Communication Network (TCN);
- Embedded development and application.

1.4 Order Information

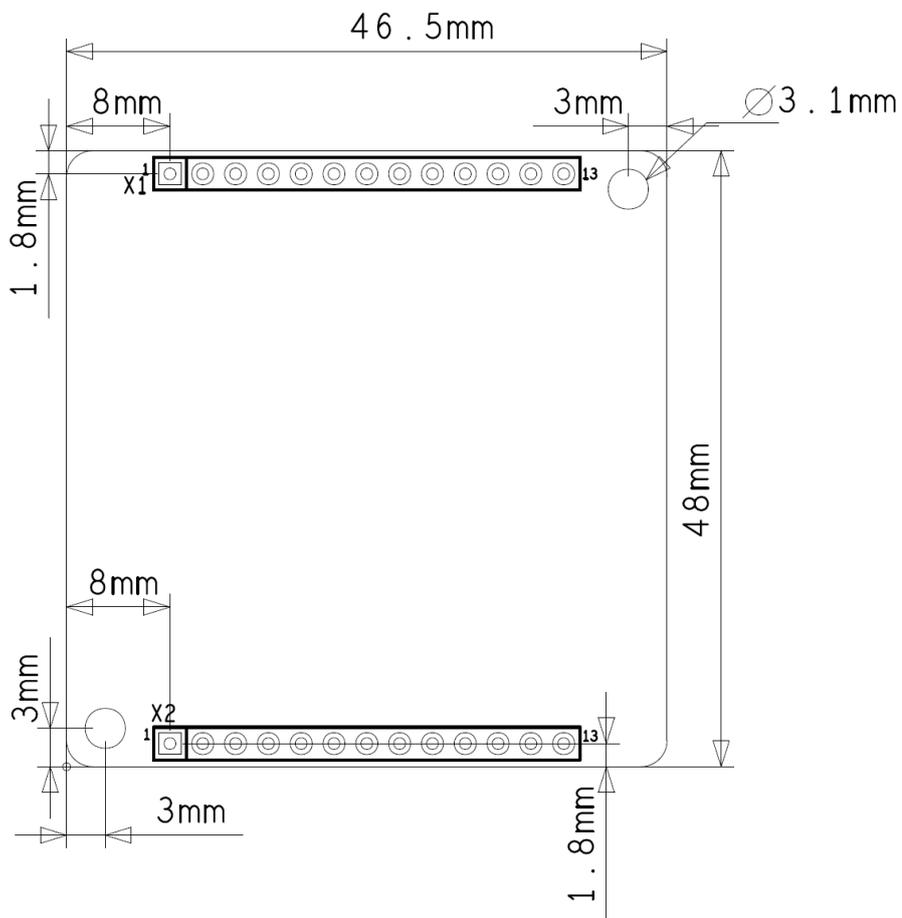
Model	Description
HDLC-UDP-200	2 x Isolated RS-485/422 + 1 x Ethernet PHY

1.5 Technical Specifications

Item	Parameters	Details
Isolated Synchronous and Asynchronous Serial S1, S2	Interface type	RS-485/422 with isolated serial port
	Working mode	Synchronous HDLC, Asynchronous UART
	Encoding format	NRZI, DBPL(Differential Bi-Phase Level), Manchester, Differential Manchester,
	Baud rate	≤ 1 Mbps
	Isolation	2.5 kVrms
CMOS Synchronous and Asynchronous Serial S3	Level standard	3.3V LVCMOS
	Duplex type	Full-duplex, Half-duplex
	Working mode	Synchronous HDLC, Asynchronous UART
	Baud rate	≤ 1 Mbps
Ethernet Interface	Number	2 x 10/100M PHY
	Rate	10/100 Mbps, supporting MDI/MDIX adaptive
	Protocol	TCP/IP
	Programming Interface	UDP Server, UDP Client, support unicast / multicast / broadcast
Configuration Management	Configuration interface	Special DMS-UART interface (by DMS-UART-8P cable) Ethernet interface
	Configuration tool	yacer-DMS configuration management software
Power Requirements	Power Supply	+5 VDC
	Power consumption	< 2W
	Connector	Two 2.54mm pitch 13-pin single-row male connectors

Item	Parameters	Details
Mechanical Characteristics	Dimensions	46.5 x 48 mm
	Weight	15 g
Operating Environment	Operating temperature	-40 ~ +85°C
	Storage temperature	-40 ~ +85°C
	Operating humidity	5 ~ 95% RH (no condensation)

1.6 Mechanical Data

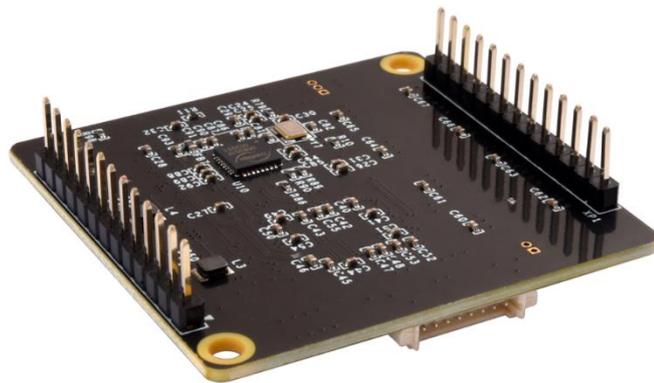
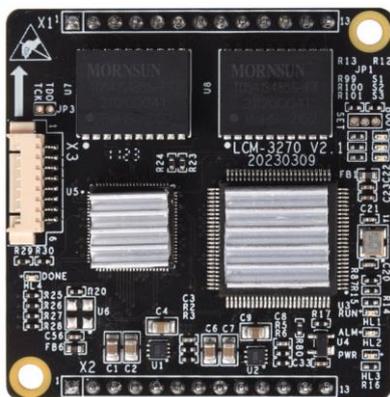


2 Hardware and Physical Interfaces

2.1 Appearance

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

X3 is the special DMS-UART 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, flashing during normal operation
ALARM	Alarm indicator, on when the device is not ready or fails, and off during normal operation
POWER	Power indicator, always on after power on

2.3 Pin Definition

2.3.1 X1: 1x13 2.54mm pitch connector

Pin	Name	Type	Description
1	S1_5V_OUT	O	Isolated serial S1 power out
2	S1_TxD +	O	Positive wire isolated serial S1 transmit
3	S1_TxD -	O	Negative wire isolated Serial S1 transmit
4	S1_RxD +	I	Positive wire isolated serial S1 receive
5	S1_RxD -	I	Negative wire isolated serial S1 receive
6	S1_GND		Ground isolated serial S1
7	NC		Standby, this pin must be left floating
8	S2_5V_OUT	O	Isolated serial S2 power out
9	S2_TxD +	O	Positive wire isolated serial S2 transmit
10	S2_TxD -	O	Negative wire isolated serial S2 transmit
11	S2_RxD +	I	Positive wire isolated serial S2 receive
12	S2_RxD -	I	Negative wire isolated serial S2 receive
13	S2_GND		Ground isolated serial S2

NOTE

- To work in RS-485 half duplex mode, the user must short circuit the serial ports TXD + and RXD +, TXD - and RXD -.
- 5V_OUT is +5V DC output, which is only used for bus up-pull and cannot be used for external power supply. It can be suspended if not used.
- No pull-up, pull-down and matching resistors in HDLC-UDP board.

2.3.2 X2: 1x13 2.54mm pitch connector

Pin	Name	Type	Description
1	GND		Logical Ground
2	ETH_RX+		Rx+ for Ethernet PHY interface, external network transformer required
3	ETH_RX-		Rx- for Ethernet PHY interface, external network transformer required
4	ETH_TX+		Tx+ for Ethernet PHY interface, external network transformer required
5	ETH_TX-		Tx- for Ethernet PHY interface, external network transformer required
6	NC		Standby, this pin must be left floating
7	S3_TxEn	O	CMOS serial transmit enable, high-level enable
8	S3_RxD	I	CMOS serial data receive
9	S3_TxD	O	CMOS serial data transmit
10	RESET_IN	I	Module reset, active low. Power-On Reset supported, Pin can be suspended.
11	NC		Standby, this pin must be left floating
12	+5V	I	Power input, +5 VDC
13	GND		Logical Ground

3 Building Configuration Environment

3.1 Connect Management Computer to HDLC-UDP

HDLC-UDP provides a variety of configuration management methods to meet different application scenarios.

After the HDLC-UDP is configured, the configuration parameters are saved in FLASH on the HDLC-UDP board, and will be automatically loaded to work every time HDLC-UDP is powered on or restarted in the future.

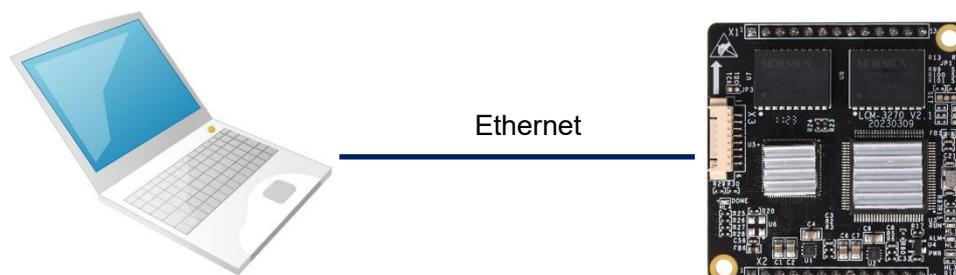
3.1.1 Configure with special DMS-UART interface

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



3.1.2 Configuration with Ethernet Interface

Users can connect the HDLC-UDP to the management computer via Ethernet, and run yacer-DMS configuration management software on the computer to configure and manage the HDLC-UDP.



3.2 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 HDLC-UDP;
- Software channel on the official website (www.yacer.com.cn).

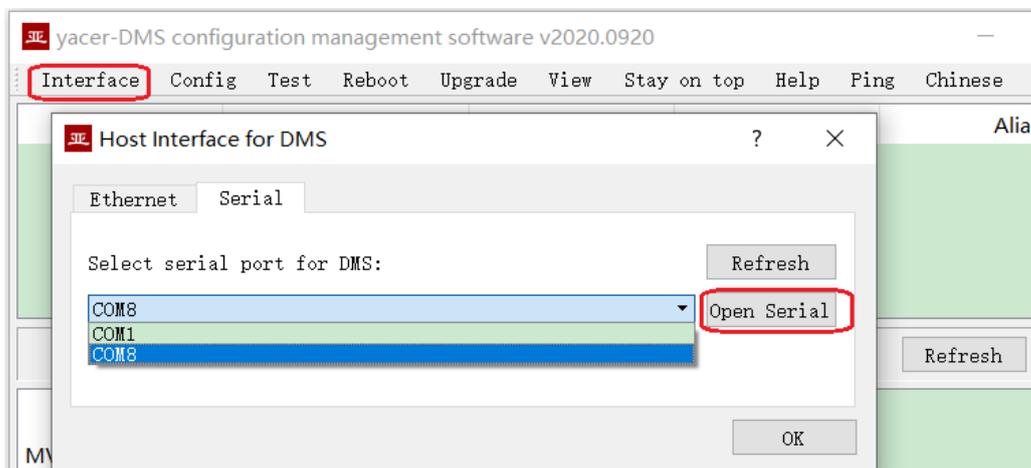
3.3 Run yacer-DMS software

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

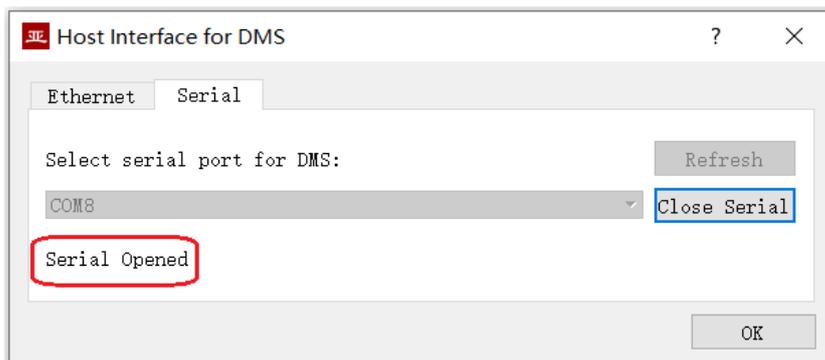
3.4 Select & Open Configuration Serial Port

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 HDLC-UDP from the drop-down list, and click “Open Serial” button.



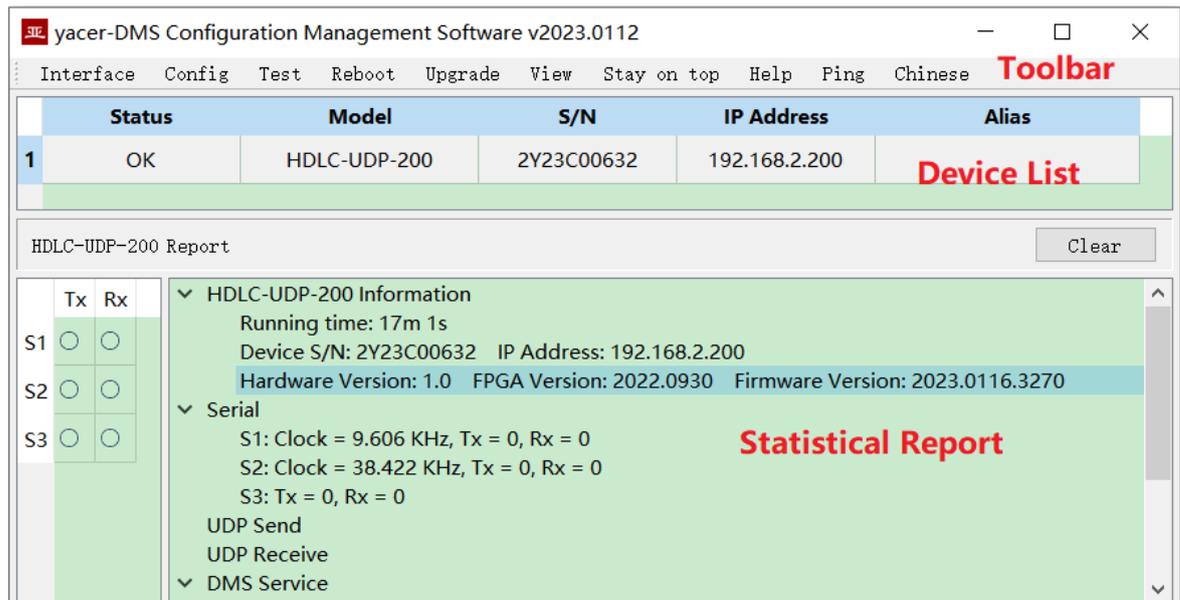
If the serial port is successfully opened, the status is as follows:



3.5 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.



3.6 Statistical Report

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

3.6.1 Control Panel

HDLC-UDP-200 Report Clear	
Control Widget	Function
<input type="button" value="Clear"/>	Clear the statistical report

3.6.2 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.

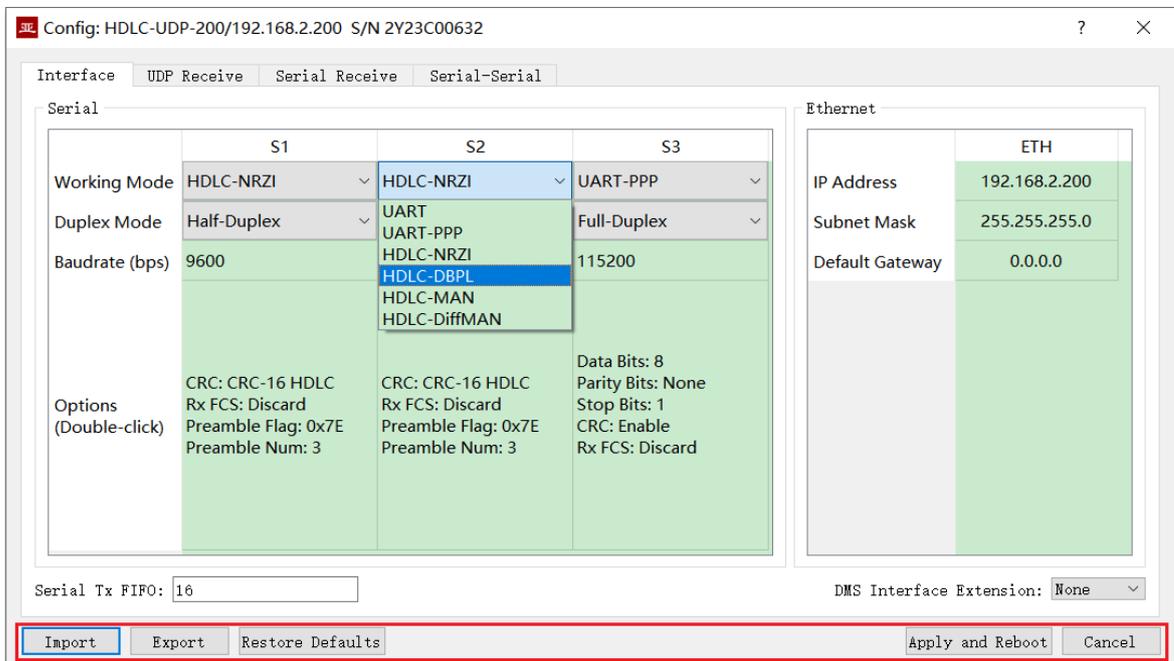
	Tx	Rx	
S1	<input type="radio"/>	<input type="radio"/>	
S2	<input type="radio"/>	<input type="radio"/>	
S3	<input type="radio"/>	<input type="radio"/>	

3.6.3 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, IP address and Version number;
- Serial: Operating clock frequency and data receive/transmit statistics of all serial ports;
- UDP Send: Send packets of the UDP Client for each enabled serial port to UDP entry;
- UDP Receive: Received packets of UDP server for each enabled UDP to serial port entries;
- DMS Service: DMS message receive/transmit statistics.

3.7 Configuring Device



The following action buttons are included at the bottom of the dialog box.

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

<input type="button" value="Restore Defaults"/>	Refresh the configuration dialog with the factory paramters
<input type="button" value="Apply and Reboot"/>	Write the configuration parameters in the dialog to the deivce, and restart the device to make the configuration take effect
<input type="button" value="Cancel"/>	Cancel current configuration operation

4 Function and Configuration

4.1 Ethernet Interface

Users can modify the IP address, subnet mask and default gateway of HDLC-UDP.

The default gateway is set to 0 when there is no need to communicate with devices across network segments.

Ethernet	
	ETH
IP Address	192.168.2.200
Subnet Mask	255.255.255.0
Default Gateway	0.0.0.0

4.2 Serial Configuration

4.2.1 Working Mode

Serial S1, S2, S3 support the following working modes

Working Mode		Description
Synchronous	HDLC-NRZI	Synchronous HDLC protocol based on the NRZI encoding
	HDLC-DBPL	Synchronous HDLC protocol based on the DBPL (Differential Bi-Phase-Level) encoding
	HDLC-MAN	Synchronous HDLC protocol based on the Manchester encoding
	HDLC-DiffMAN	Synchronous HDLC protocol based on the differential Manchester encoding formats
Asynchronous	UART	Universal asynchronous serial port working mode, equivalent to the serial port on the common computer
	UART-PPP	Frame transmission on UART interface using PPP protocol

Serial			
	S1	S2	S3
Working Mode	HDLC-NRZI	HDLC-NRZI	UART-PPP
Duplex Mode	Half-Duplex	UART UART-PPP	Full-Duplex
Baudrate (bps)	9600	HDLC-NRZI HDLC-DBPL HDLC-MAN HDLC-DiffMAN	115200
Options (Double-click)	CRC: CRC-16 HDLC Rx FCS: Discard Preamble Flag: 0x7E Preamble Num: 3	CRC: CRC-16 HDLC Rx FCS: Discard Preamble Flag: 0x7E Preamble Num: 3	Data Bits: 8 Parity Bits: None Stop Bits: 1 CRC: Enable Rx FCS: Discard

Users can select the desired working mode from the “working mode” combo box. Due to different parameter configuration of each working mode, contents of the “Options” cell will be adjusted automatically according to the determined working mode.

If further configuration of working parameters of the selected working mode is required, mouse double-click on the “Options” cell to pop up the parameter configuration dialog.

4.2.2 Duplex Mode

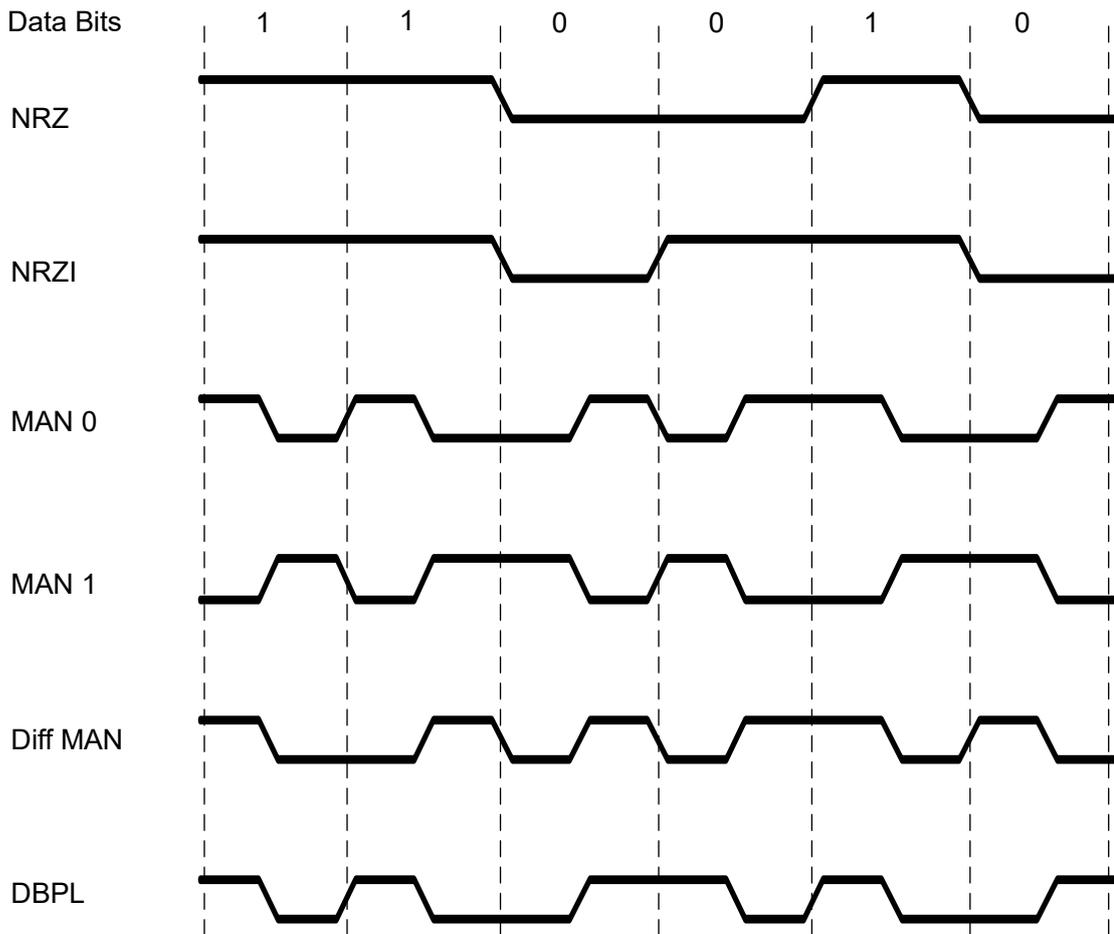
Full duplex and half duplex are optional and must be consistent with the hardware design.

4.2.3 Baud Rate

The baud rate setting of serial port must be exactly the same as the baud rate configuration of the opposite device to ensure reliable and stable data communication.

4.2.4 Encoding Format of Synchronous Serial Port

For HDLC-NRZI, HDLC-DBPL, HDLC-MAN, HDLC-DiffMAN and other synchronous working modes, the link layer adopts the HDLC protocol with the encoding format difference as follows:



4.2.5 HDLC-NRZI Options

The option dialog of the HDLC-NRZI working mode is shown as follows:

The dialog box contains the following settings:

- CRC: CRC-16 HDLC
- Forward received FCS field
- Preamble Flag: 0x7E
- Preamble Number: 3 bytes

4.2.5.1 CRC

To verify the correctness of data communication, CRC functionality should be enabled.

By default, the CRC-16-HDLC check mode should be selected for HDLC communication.

The dropdown menu shows the following options:

- CRC-16 HDLC (Selected)
- Disable
- CRC-16 HDLC
- CRC-16 SDLC

CRC Type	Description
Disable	CRC disable: <ul style="list-style-type: none"> Send: No CRC calculation, no FCS field for HDLC frame Receive: No CRC checking
CRC-16 HDLC	16-bit ISO HDLC CRC verification
CRC-16 SDLC	16-bit IBM SDLC CRC verification

4.2.5.2 Forward received FCS field

This configuration will only take effect if CRC is enabled.

The HDLC frame structure is shown in the following table, where FCS is the frame check sequence field.

Opening Flag	Address Field	Control Field	Information Field	FCS Field	Closing Flag
0x7E	1 Byte	1 Byte	Variable length	CRC 2 bytes	0x7E
0x7E	User Data			CRC 2 bytes	0x7E

If this check box is checked, the user data + FCS field is forwarded.

If this check box is not checked, HDLC-UDP, after receiving HDLC frames and performing CRC checks, discards the FCS field of the last 2 bytes of data and forwards only user data.

4.2.5.3 Preamble Flag & Number

In half-duplex communication, it is often necessary to add preamble flags in front of the frame for receiver synchronization. The most common is to add 2-5 0x7E flag.

Preamble Flag: 0x7E

Preamble Number: 3

4.2.6 HDLC-DBPL Options

HDLC-DBPL uses the Differential Bi-Phase Level encoding format, and its Options dialog box is shown below:

CRC: CRC-16 HDLC

Forward received FCS field

Preamble Flag: 0x7E

Preamble Number: 3

The parameters of HDLC-DBPL have the same meaning as HDLC-NRZI.



NOTE

It is important to note that many claims that DBPL encoding is in fact differential Manchester encoding, so users need to carefully refer to the definition of the Synchronous Serial Encoding Format chapter to choose the correct working mode.

4.2.7 HDLC-DiffMAN (differential Manchester) Options

The Differential Manchester Options dialog box is shown below. The parameters of HDLC-DiffMAN have the same meaning as HDLC-NRZI.

4.2.8 HDLC-MAN (Manchester) Options

HDLC-MAN work mode advanced options dialog box is shown below:

In addition to the same configuration parameters as NRZI, the Manchester encoding format has parameters with the meaning of edges with low to high waveforms for data lines:

- 0: Low to high edges represent logical 0;
- 1: Low to high edges represent logic 1.

4.2.9 UART Options

UART is a type of character stream communication. Data bits, parity bits and stop bits define the basic working parameters of the asynchronous serial port, which must be identical to the configuration of opposite device.

Generally, data bits are defined as 8 bits (1 byte), so that UART corresponds to the communication of byte streams.

Data Bits:	8	▼
Parity Bits:	None	▼
Stop Bits:	1	▼
Rx Packing Size:	128	bytes
Rx Packing Interval:	10	ms

When converting the byte stream of UART into HDLC frame, if every byte is converted into a frame for transmission, the overhead is too large and the efficiency is too low.

In order to improve the efficiency, HDLC-UDP will buffer the received byte stream, and then send out a HDLC frame composed of several buffered bytes. This process is called packing.

Packing is controlled by two parameters, which are called Packing Size & Packing interval.

4.2.9.1 Packing Size

For example, if the Packing Size is set to 128 bytes, then when UART receives 128 bytes, a packet will be formed for forwarding.

Rx Packing Size:	128	bytes
------------------	-----	-------

4.2.9.2 Packing Interval

For example, the above example sets the Packing Interval to 10ms. If the UART does not receive new data after 10ms, the data in the buffer will be forwarded as a packet regardless of whether 128 bytes are received.

Rx Packing Interval:	10	ms
----------------------	----	----

4.2.10 UART-PPP Options

When the serial port works in the asynchronous UART mode, the serial port sends and receives the character stream without head and tail. In order to transmit an 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.

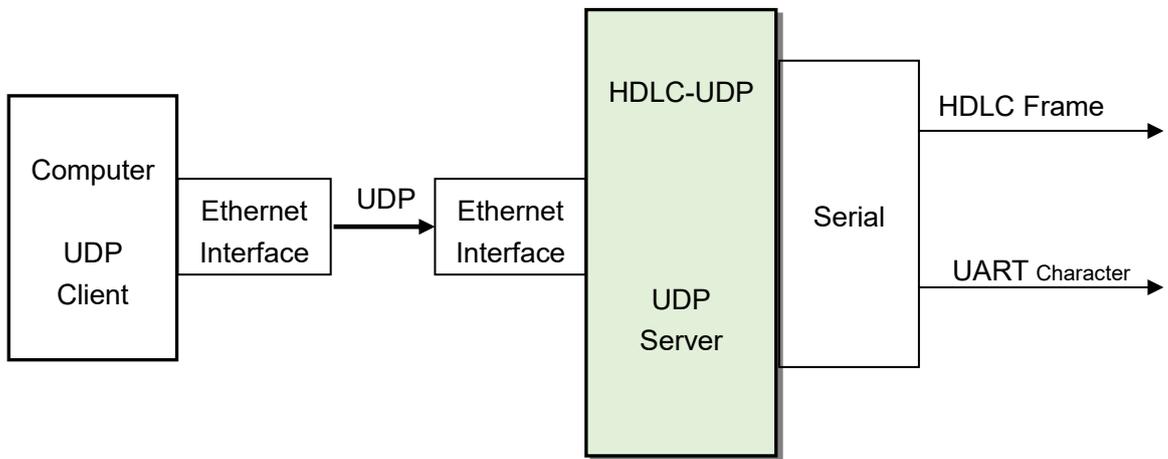
Data Bits:	8	▼
Parity Bits:	None	▼
Stop Bits:	1	▼
	<input checked="" type="checkbox"/>	CRC Enable
	<input type="checkbox"/>	Forward received FCS field

4.3 UDP to Serial Configuration

4.3.1 Function Description

With HDLC-UDP, a PC or server can realize the data send function of the synchronous HDLC, UART or CAN.

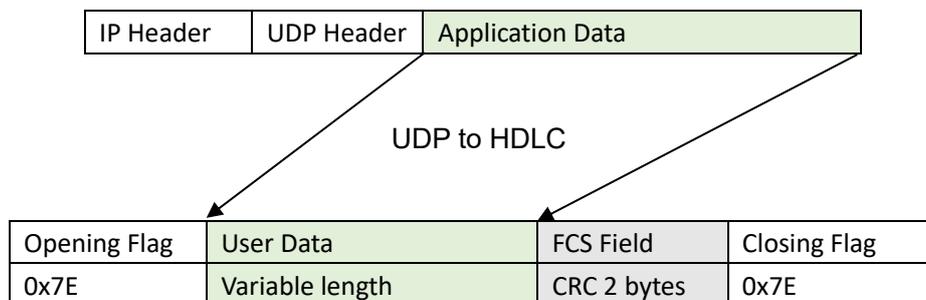
The typical application is shown as follows. PC sends a UDP message over the Ethernet interface as the UDP Client, and HDLC-UDP sends it out from the synchronous serial port after converting the received UDP message into the HDLC frame.



4.3.2 Protocol Conversion

The most typical application of UDP to HDLC is shown in the figure below. HDLC-UDP loads UDP application data into the user data area of HDLC frame, then calculates CRC and fills FCS field to form a complete HDLC frame for sending.

In order to reduce the computational load of the computer and the complexity of user programming, generally, the UDP message does not contain the FCS field of HDLC, which is calculated and filled by HDLC-UDP.



4.3.3 Forward Configuration

Set UDP to serial ports, each line represents a UDP port to serial forwarding entry, select "enable" to take effect.

接口配置				UDP接收		串口接收		串口转串口	
	本端 接收UDP端口	➔ 转发至	串口输出		组播接收地址				
1	8001	<input checked="" type="radio"/> enable	串口-S1		组 1	0.0.0.0			
2	8002	<input checked="" type="radio"/> enable	串口-S2		组 2	0.0.0.0			
3	8003	<input checked="" type="radio"/> enable	串口-S3		组 3	0.0.0.0			
4	0	<input type="radio"/> disable	串口-S1 串口-S2 串口-S3		组 4	0.0.0.0			

4.3.4 Receive UDP Multicast

If users need to receive a multicast UDP message, add the required multicast address to the "Rx Multicast Address" list on the right.

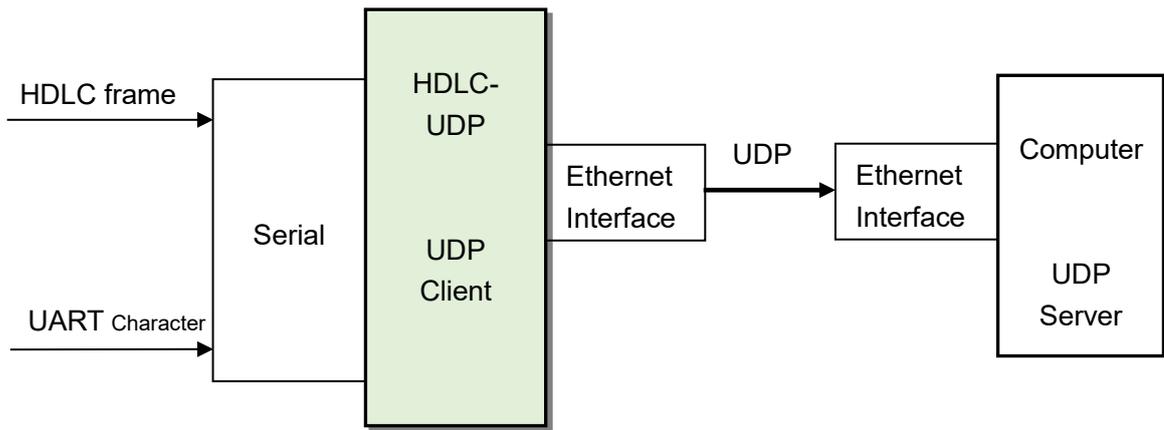
Range of the multicast address is 224.0.0.0 ~ 239.255.255.255, 224.8.8.8 is the configuration management address for HDLC-UDP and cannot be used by users.

The multicast address configured as 0.0.0.0 indicates that the entry is not valid.

4.4 Serial to UDP Configuration

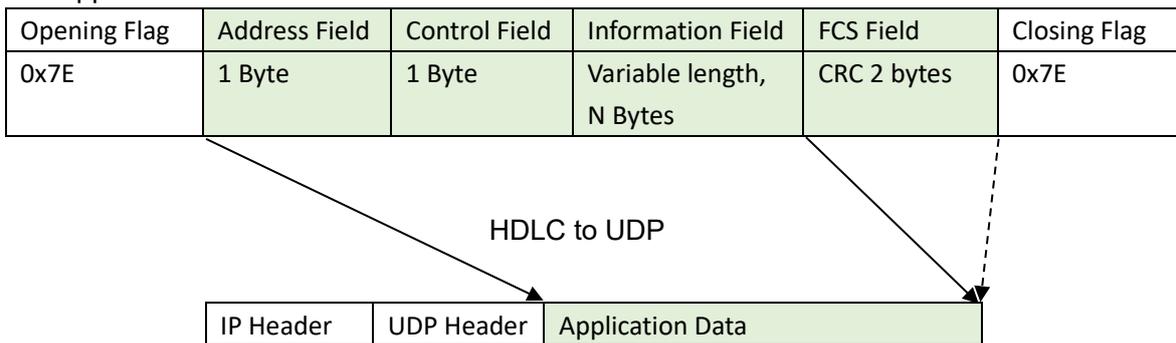
4.4.1 Function Description

HDLC-UDP receives HDLC frames through synchronous serial ports, receives UART strings through asynchronous serial ports and subpackages them, converts the above data frames or packets into UDP messages, and sends the messages to computers or servers through Ethernet interface according to configuration.



4.4.2 Protocol Conversion

To ensure the integrity of user data, HDLC-UDP places complete HDLC frames in UDP application data and forwards them to UDP Server.



4.4.3 Forward Configuration

Set serial ports to UDP, each line represents a serial to UDP port forwarding entry.

Interface	UDP Receive	Serial Receive	Serial-Serial
	Ingress Serial	➔ Forward to	Remote Rx IP Address Remote Rx UDP Port
1	Serial-S1	● enable	192.168.2.80 8000
2	Serial-S2	● enable	192.168.2.255 9000
3	Serial-S3	● enable	224.10.10.10 10000
4	Serial-S1	✘ disable	0.0.0.0 0

As shown in the figure above, three Serial to UDP entries are configured to implement:

- Serial port S1 to UDP unicast, destination IP address 192.168.2.80 and destination UDP port 9000;
- Serial port S2 to UDP broadcast, all hosts in the network can receive data from S2 at port 9000;
- Serial port S3 to UDP multicast, only computers joined 224.10.10.10 groups in the network can receive data from S3.

4.4.4 How UDP Server Identifies Source Serial ports

In converged applications, HDLC frames originating from multiple different serial ports need to be forwarded to a server or computer for uniform processing. In this case, a strategy is needed to let the computer know which serial port the UDP message is received from.

4.4.4.1 Identify Source Serial Port Based on Destination UDP Port

As shown in the figure below, set different forwarding destination UDP ports for each serial port. As a UDP Server, computer receives data on different UDP ports: the message received on port 8001 comes from serial port S1, and the message received on port 8002 comes from serial port S2.

Interface	UDP Receive	Serial Receive	Serial-Serial	
	Ingress Serial	➔ Forward to	Remote Rx IP Address	Remote Rx UDP Port
1	Serial-S1	enable	192.168.2.80	8001
2	Serial-S2	enable	192.168.2.80	8002

4.4.4.2 Identify Source Serial Port Based on Source UDP Port

UDP Server needs to listen and receive data on multiple UDP ports when using the destination UDP port to identify the source serial port scheme. When the number of serial ports is large, not only does UDP Server consume too much port resources, but also the complexity of configuration and programming increases a lot.

To simplify the implementation of the UDP Server side, we can forward each transformation to the same port of the UDP Server using the configuration shown below. *Yacer HDLC-UDP automatically adjusts the source port number of UDP message according to the source serial port when forwarding, where serial port S1 forwards UDP message with source port 8001 and serial port S2 with 8002, increasing gradually below.*

In this way, UDP Server only needs to listen and receive data on one port (in the example below, 8000), and then differentiate the source serial ports based on the source UDP port. If there are multiple HDLC-UDP, UDP Server can distinguish the source devices through the source IP.

Interface	UDP Receive	Serial Receive	Serial-Serial	
	Ingress Serial	➔ Forward to	Remote Rx IP Address	Remote Rx UDP Port
1	Serial-S1	<input checked="" type="radio"/> enable	192.168.2.80	8000
2	Serial-S2	<input checked="" type="radio"/> enable	192.168.2.80	8000

4.5 Serial to Serial

Configure the forwarding relationship between serial ports, as shown in the following figure to achieve bidirectional forwarding between isolated serial port S1 and extended serial port S3

Interface	UDP Receive	Serial Receive	Serial-Serial	
	Forward	S1 Egress	S2 Egress	S3 Egress
S1 Ingress	➔ Forward to	<input type="checkbox"/> Enable	<input type="checkbox"/> Enable	<input checked="" type="checkbox"/> Enable
S2 Ingress	➔ Forward to	<input type="checkbox"/> Enable	<input type="checkbox"/> Enable	<input type="checkbox"/> Enable
S3 Ingress	➔ Forward to	<input checked="" type="checkbox"/> Enable	<input type="checkbox"/> Enable	<input type="checkbox"/> Enable

UART-PPP with Tag: 0x5A + serial ID

If "UART-PPP with Tag" is checked, 0x5A tag and serial ID field (1 byte) will be added before UART-PPP frame. It is not recommended to check it when forwarding serial port one-to-one. When two serial port inputs are forwarded to one serial port, this option can be checked to enable the host computer to get the source serial port information.

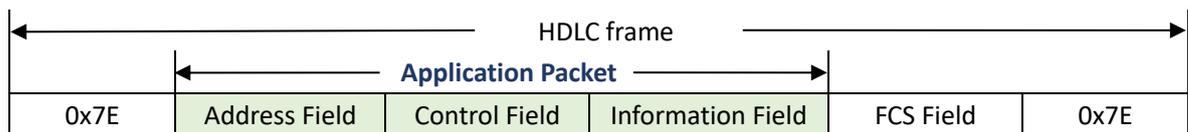
5 Forwarding Function & Data Format

5.1 HDLC Interface Data Format

5.1.1 HDLC Frame

Synchronous HDLC interface transfers data based on HDLC frames. A complete HDLC frame consists of several fields between the leading flag and the closing flag, including address field, control field, information field and FCS field for CRC check.

For HDLC-UDP, instead of distinguishing between address field, control field, and information field, they are uniformly presented as application packets to the upper application to fill in and process the UART packet format.

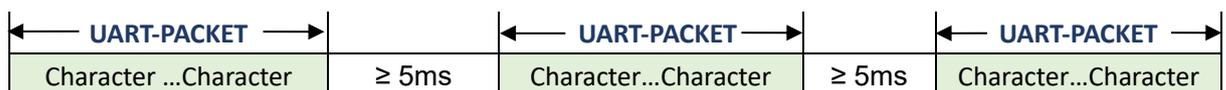


5.2 UART Interface Data Format

5.2.1 UART-PACKET Data Packet

When UART extended interface works in UART mode, there is a character stream without head or tail received from the serial port, where there is no information used to perform unpacking or deframing.

HDLC-UDP adopts the time information for unpacking, allowing users to define the packet interval of UART. For example, if the packet interval is 5ms, when no new characters are received over 5ms, then a UART-PACKET packet receiving is considered to be complete.



5.2.2 UART-PPP Frame

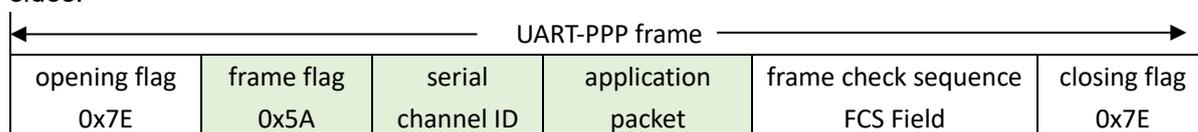
When the UART extended interface works in UART-PPP mode, another strategy is used to provide the UART with unpacking capability.

First insert two bytes before applying the packet:

- 0x5A: UART-PPP frame identification;
- serial ID: identify the corresponding serial port forwarding channel, 1 for serial port S1, 2 for serial port S2.

Calculates the CRC check value of 0x5A + serial ID + packet, generates a 2-byte FCS frame check field, and then adds 0x7E as the start and end flags to form an UART-PPP frame.

This strategy does not require increasing the additional packet interval and can make full use of the communication bandwidth, but increases the processing complexity of both communication sides.



As the application packet and FCS field may appear 0x7E, the sender and receiver shall perform the character escape on the application packet and FCS field with the escape rules as follows:

- 0x7E: Escaped to two characters, 0x7D 0x5E
- 0x7D: Escaped to two characters, 0x7D 0x5D
- Other characters: No escape

The escape operation of data transmit is as follows:

Original Data	Actual Transmit Data
0x7E	0x7D 0x5E
0x7D	0x7D 0x5D
Others	No Change

The escape operation of data transmit is as follows:

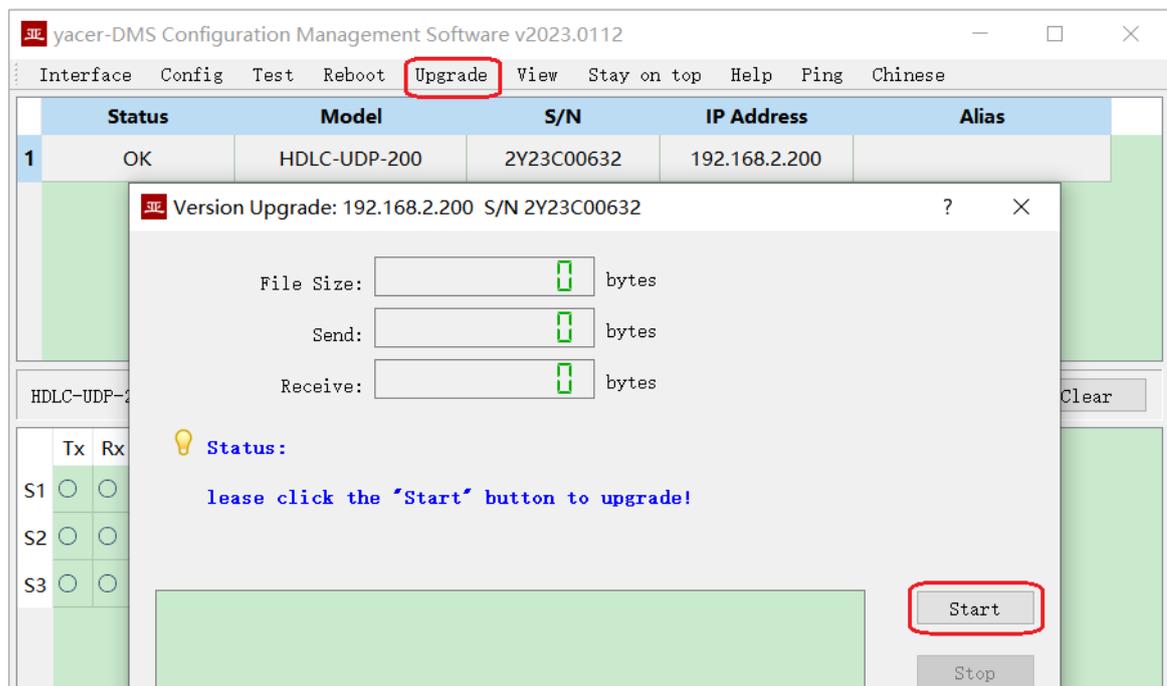
Actual Receive Data	Data
0x7D 0x5E	0x7E
0x7D 0x5D	0x7D
Others	No Change

6 System Maintenance

6.1 Firmware Version Upgrade

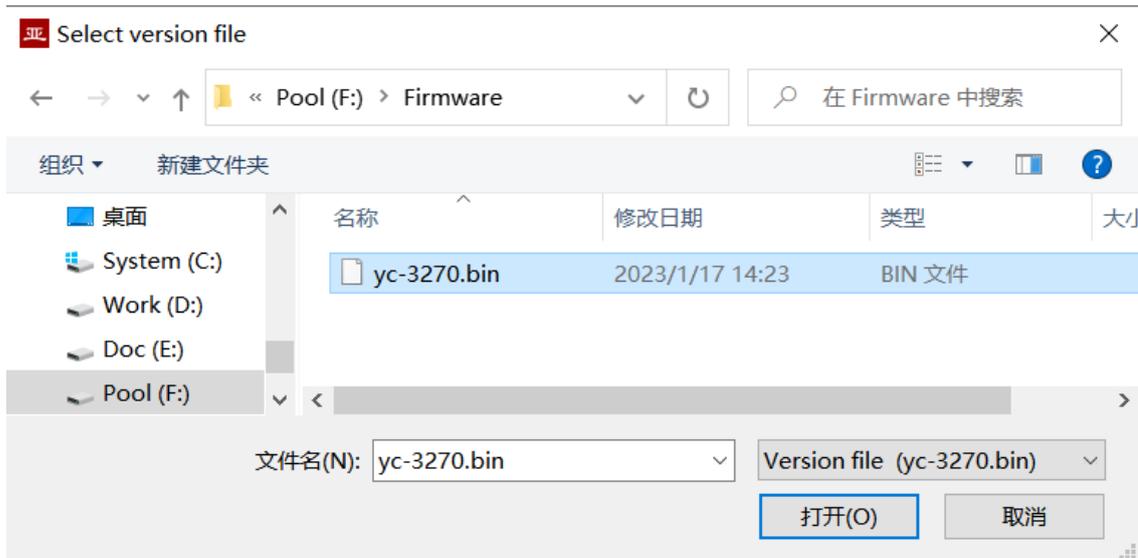
6.1.1 Start Upgrade

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



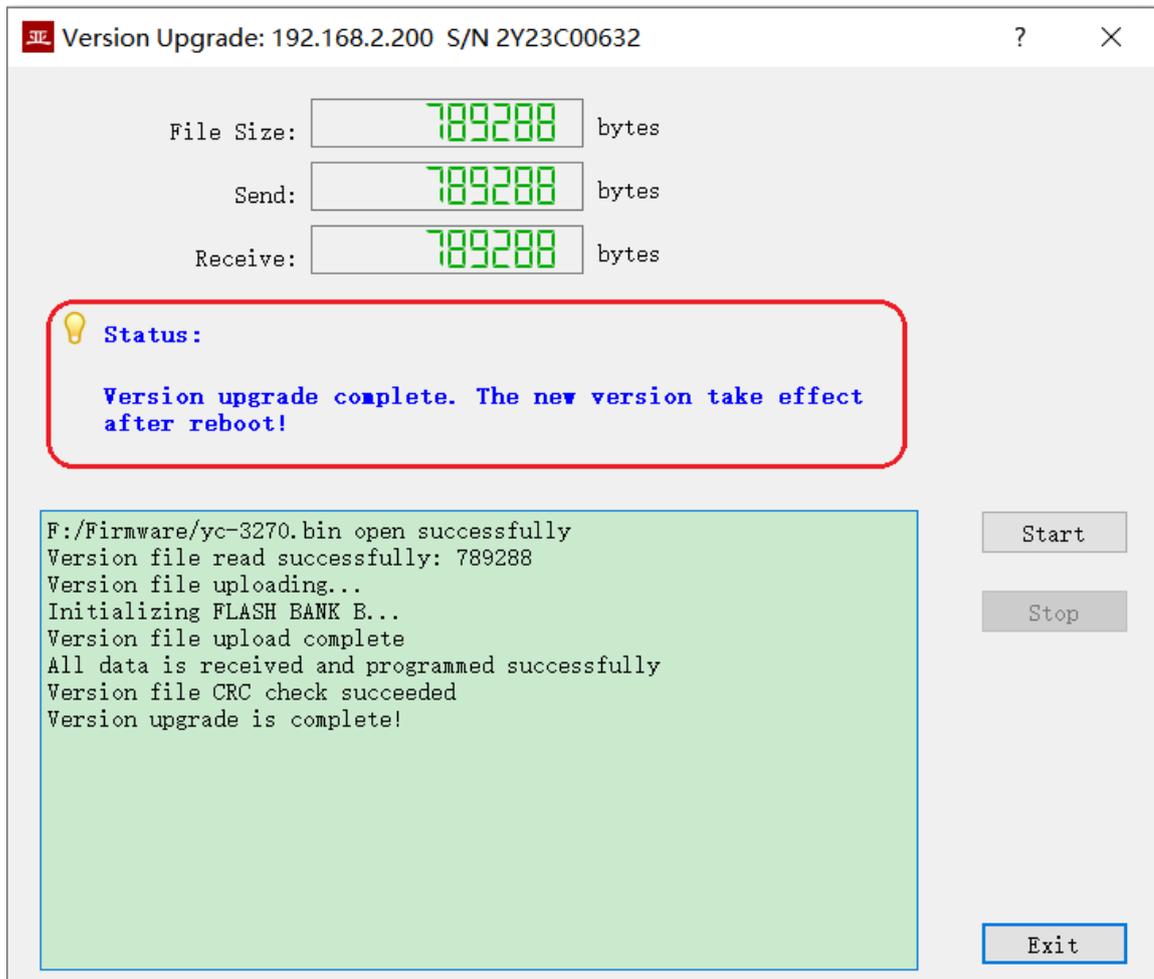
6.1.2 Select Version File

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.



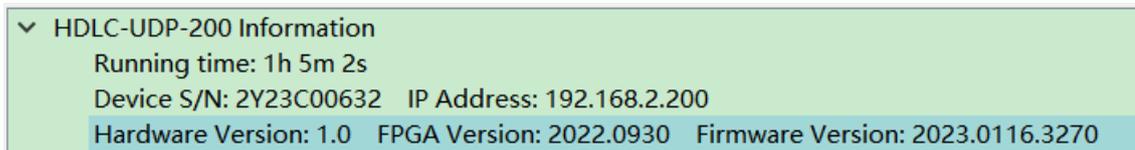
6.1.3 Complete Upgrade

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



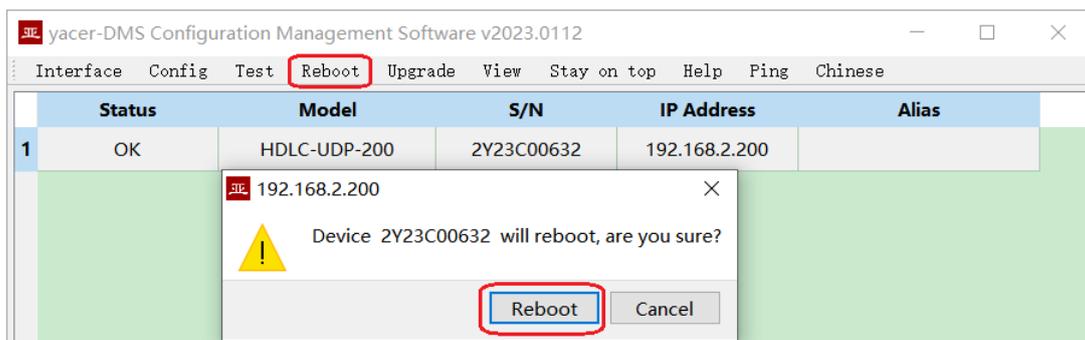
6.1.4 Confirm Upgrade

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.



6.2 Reboot Device

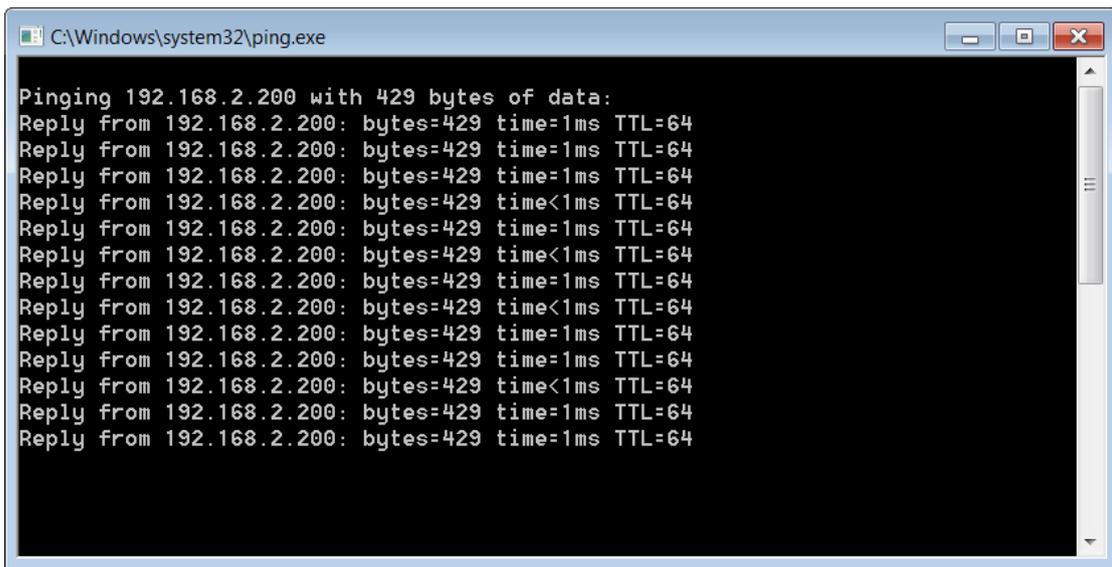
Click the "Reboot" button on the toolbar to pop up the device reboot dialog, and then click the "Reboot" button to reboot the device.



6.3 Ping

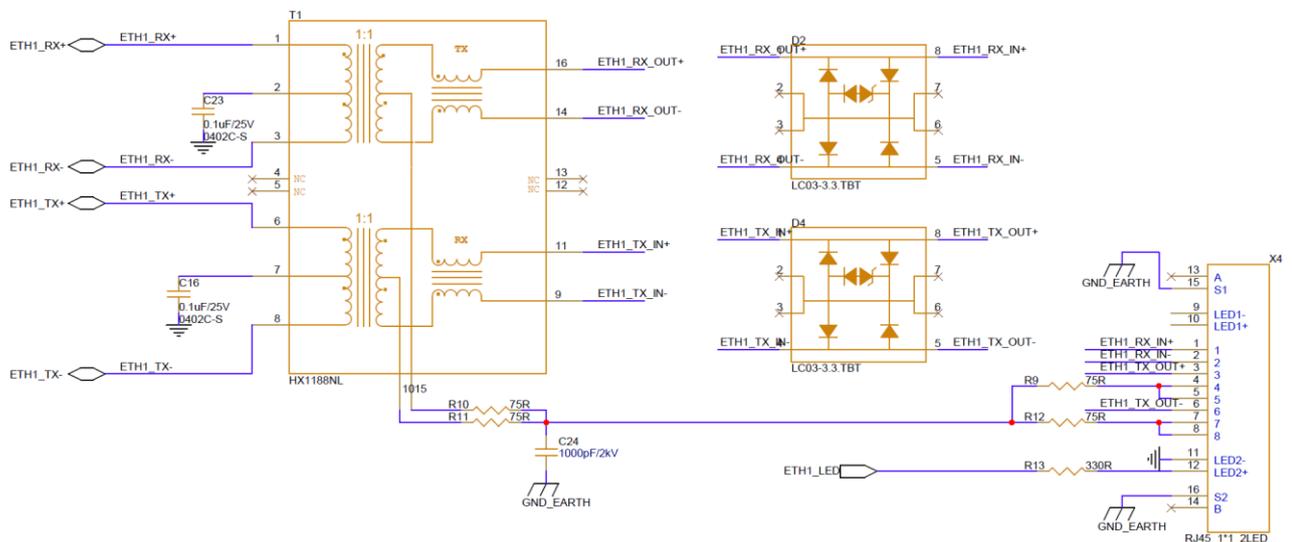
By clicking the "Ping" button on the toolbar, DMS automatically starts the ping command on the selected device to check whether the network connection between the configuration management computer and HDLC-UDP is working properly.

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



7 Hardware Development

7.1 Ethernet Interface Development



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.