SDLC-CPCI/PXI

Datasheet

Email：yacer@yacer.cn
Web：www.yacer.com.cn

yacer 亚册
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.
 ATIC	Indicates static sensitive equipment.
 R! IC 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 SDLC-CPCI/PXI Hi-Speed Synchronous Serial Card, provides 4 high-speed RS-232/422/485 multiprotocol serial ports to support synchronous HDLC/SDLC protocol. One Gigabit Ethernet port, realizes protocol conversion between serial port and Ethernet, supports Ethernet bridge function via serial port.

Support Compact PCI 3U standard, support PXI bus specification, drive-free.

Overview

1.2 Applications

- Protocol conversion between the serial port and Ethernet
- Ethernet Bridging Through Serial Port
- Conversion between synchronous and asynchronous serial ports
- Serial Port One Way Multiplexing
- High-speed synchronous serial data communication and conversion
- Telemetry, measurement and control data acquisition and transmission
- Satellite, radio data transmission
- Air Traffic Control (ATC), Air Traffic Management (ATM)
- CPCI Bus Application and PXI Bus Application

1.3 Features

- One 10/100/1000M Ethernet interface
- 4 synchronous/asynchronous serial ports, Maximum Baud rate up to 20 Mbps
- Synchronous HDLC/SDLC, Asynchronous UART, Bit stream, etc.
- NRZ, NRZI, DBPL, Manchester and Differential Manchester encoding formats
- Super-long frame support, maximum frame length 8192 bytes

- Compatible with CPCI 3U and PXI 3U specifications
- Driver-free, without the host resources occupancy
- Industrial wide temperature

1.4 Technical Specifications

Table 1-1 Technical Specifications

Item	Parameters	Details
Serial Ports	Quantity	4
	Connector	1 x D Sub 44(Female)
	Working mode	Synchronous HDLC/SDLC
		Asynchronous UART
		Synchronous Bit stream
	Interface type (Configurable by software)	RS-232
		RS-422
		RS-485
	Duplex mode (Configurable by software)	Full-duplex
		Half-duplex
	Encoding format	NRZ
		NRZI
		Manchester
		Differential Manchester
		DBPL(Differential Bi-Phase Level)
	Baud rate	Synchronous NRZ: ≤ 20 Mbps
		Other Synchronous: ≤ 10 Mbps
		Asynchronous:≤ 3 Mbps
	Synchronous clock	Normal, slave and master clock mode

Item	Parameters	Details
	ESD protection	±15 KV
Ethernet Interface	Connector	1 x RJ-45
	Speed	10/100 Mbps, Auto MDI/MDI-X
	Network protocol	TCP/IP
	Programming interface	UDP Server, UDP Client; Unicast/Multicast/Broadcast
	Ethernet bridge	Serial Ethernet bridge
Secondary Development Support	CPU	Arm cortex-a9 processor, main frequency 500 MHz
	Memory	DDR3, 128MB
	FLASH	Version space 6MB, Configuration space 1MB
	Interfacer	Data interaction based on shared memory with CPU
Computer Bus	CPCI	Compact PCI 3U
	PXI	PXI 3U
	Driver	Driver free
Configuration Management	Configuration tool	yacer-DMS configuration management software
	Configuration interface	Ethernet Interface
Power Requirements	Power Supply	4 ~ 17 VDC
	Power consumption	< 3 W
	Power interface	CPCI or PXI bus power supply
Mechanical Characteristics	Dimensions	160 mm x 100 mm
	Weight	180g
Operating Environment	Operating temperature	-40 ~ +70℃
	Storage temperature	-40 ~ +85℃
	Operating humidity	5 ~ 95% RH (no condensation)

1.5 Baud rate range

Table 1-2 Baud rate range

Interface type	Working mode	Encoding format	Baud rate
RS-232	Asynchronous		⩽ 500 Kbps
RS-232	Synchronous	NRZ	⩽ 500 Kbps
RS-232	Synchronous	NRZI, DBPL, Manchester, Diff Man	⩽ 250 Kbps
RS-422/485	Asynchronous		⩽ 3.5 Mbps
RS-422/485	Synchronous	NRZ	⩽ 20 Mbps
RS-422/485	Synchronous	NRZI, DBPL, Manchester, Diff Man	⩽ 10 Mbps

1.6 Order Information

Table 1-3 Order Information

Model	Serial Ports	Ethernet	Bus Specification
SDLC-CPCI-200-3U	2 x Asynchronous + 2 x Synchronous/Asynchronous	1 x 10/100/1000M	CPCI/PXI 3U
SDLC-CPCI-400-3U	4 x Synchronous/Asynchronous	1 x 10/100/1000M	CPCI/PXI 3U
SDLC-CPCIE-200-3U	2 x Asynchronous + 2 x Synchronous/Asynchronous	1 x 10/100/1000M	CPCIe/PXIe 3U
SDLC-CPCIE-400-3U	4 x Synchronous/Asynchronous	1 x 10/100/1000M	CPCIe/PXIe 3U

2 Hardware and Physical Interface

2.1 Appearance

CPCI panel leads out serial interface (S1 - S4) and Ethernet interface (GE), the other end is CPCI Bus connector.

Appearance

2.2 LED Indicators

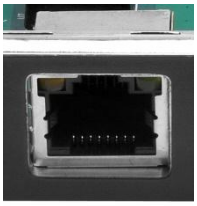
Table 2-1 LED Description

LED	Description
ALARM	Alarm indicator, on when the device is not ready to start or in case of failure, and constantly off during normal operation
RUN	Running indicator, flashing during normal operation
POWER OUT	Power working indicator, constantly on when the device working
POWER IN	Power input indicator, constantly on after power on

2.3 Ethernet Interface

10/100/1000M Ethernet, adopts RJ-45 connector support for auto MDI/MDI-X crossover.

Ethernet Interface



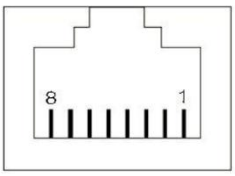


Table 2-2 Ethernet Interface

RJ-45	Signal
1	DA +
2	DA -
3	DB +
4	DC +
5	DC -
6	DB -
7	DD +
8	DD -

2.4 Serial Port

2.4.1 Functional Description

Serial port supports synchronous HDLC/SDLC protocol and asynchronous UART working modes, and encoding formats support NRZI, Manchester, differential Manchester, DBPL, etc.

Serial ports support three physical layer standards, RS-232, RS-422 and RS-485. They can be set arbitrarily by software as required.

Serial port

2.4.2 Pin Definition

Serial ports S1~S4 share a DB44 female connector. It can be converted to the quad DB9 male connector with the standard 4-wire YC9-44T.

Serial ports pin

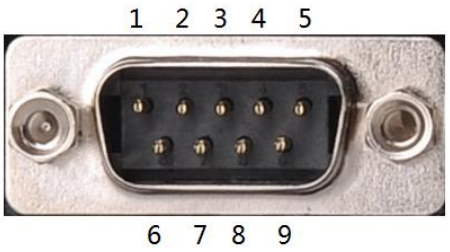


Table 2-3 Baud rate range

DB44 Female		RS-232	RS-422	RS-485	YC9-44T Cable
Serial	PIN	Full-duplex	Full-duplex	Half-duplex	DB9 Male
S1	32	TxData1	TxData1 +	Data1 +	S1-5
	31		TxData1 -	Data1 -	S1-9
	18	TxClock1	TxClock1 +	Clock1 +	S1-4
	3		TxClock1 -	Clock1 -	S1-8
	1	RxData1	RxData1 +		S1-1
	16		RxData1 -		S1-6
	17	RxClock1	RxClock1 +		S1-2
	2		RxClock1 -		S1-7
	33	GND	GND	GND	S1-3
S2	4	TxData2	TxData2 +	Data2 +	S2-5
	19		TxD2ata -	Data2 -	S2-9
	22	TxClock2	TxClock2 +	Clock2 +	S2-4
	7		TxClock2 -	Clock2 -	S2-8
	5	RxData2	RxData2 +		S2-1

DB44 Female		RS-232	RS-422	RS-485	YC9-44T Cable
Serial	PIN	Full-duplex	Full-duplex	Half-duplex	DB9 Male
	20		RxData2 -		S2-6
	21	RxClock2	RxClock2 +		S2-2
	6		RxClock2 -		S2-7
	35	GND	GND	GND	S2-3
S3	8	TxData3	TxData3 +	Data3 +	S3-5
	23		TxData3 -	Data3 -	S3-9
	26	TxClock3	TxClock3 +	Clock3 +	S3-4
	11		TxClock3 -	Clock3 -	S3-8
	9	RxData3	RxData3 +		S3-1
	24		RxData3 -		S3-6
	25	RxClock3	RxClock3 +		S3-2
	10		RxClock3 -		S3-7
	39	GND	GND	GND	S3-3
S4	12	TxData4	TxData4 +	Data4 +	S4-5
	27		TxData4 -	Data4 -	S4-9
	30	TxClock4	TxClock4 +	Clock4 +	S4-4
	15		TxClock4 -	Clock4 -	S4-8
	13	RxData4	RxData4 +		S4-1
	28		RxData4 -		S4-6
	29	RxClock4	RxClock4 +		S4-2
	14		RxClock4 -		S4-7
	43	GND	GND	GND	S4-3

3 Building Configuration Environment

3.1 How to get configuration management software yacer-DMS

Users can obtain the configuration management software package, yacer-DMS.zip, by two ways as follow:

- “Tools” directiory of the USB-Disk attached with SDLC-CPCI/PXI
- The software channel of the official website http://en.yacer.cn/softwares/det/yacer-dms

3.2 Run software yacer-DMS

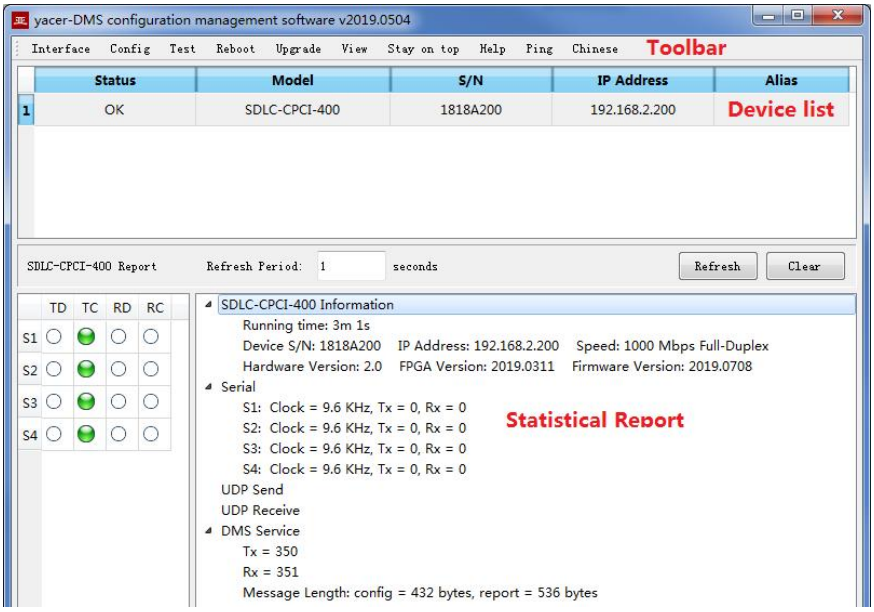
The yacer-DMS is a portable software, to unzip the yacer-DMS.zip and then enter the directory yacer-DMS and then run the execute file yacer-DMS.exe.

3.3 Main Window of yacer-DMS Software

Below is the main window of the configuration and management software yacer-DMS, including three parts:

- Toolbar: Function operation buttons;
- Device List: Displaying the basic information and running status of the on-line device;
- Statistical Report: Displaying the receive/transmit indication & statistics, and device details of the specified device.

Main Window of yacer-DMS Software



3.4 Statistical Report

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

3.4.1 Control Panel

Control Panel

Table 3-1 Control Panel

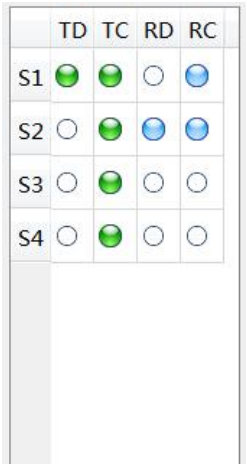
Control Widget	Function
Refresh Period: 1 seconds	Set the refresh period of report
Refresh	Manually refresh the statistical report
Clear	Clear the statistical report

3.4.2 Receive/transmit indication

The receiving/transmit indicator panel is on the left side of the statistical report. The flashing of the indicator icon indicates that the signal lines of the corresponding serial ports have waveform changes:

- TD: Transmit Data Line Signal Indication
- TC: Transmit Clock Line Signal Indication
- RD: Receive Data Line Signal Indication
- RC: Receive Clock Line Signal Indication

Receive/transmit indication



3.4.1 Information Panel

The information panel is located on the right side of the statistical report, showing the following contents:

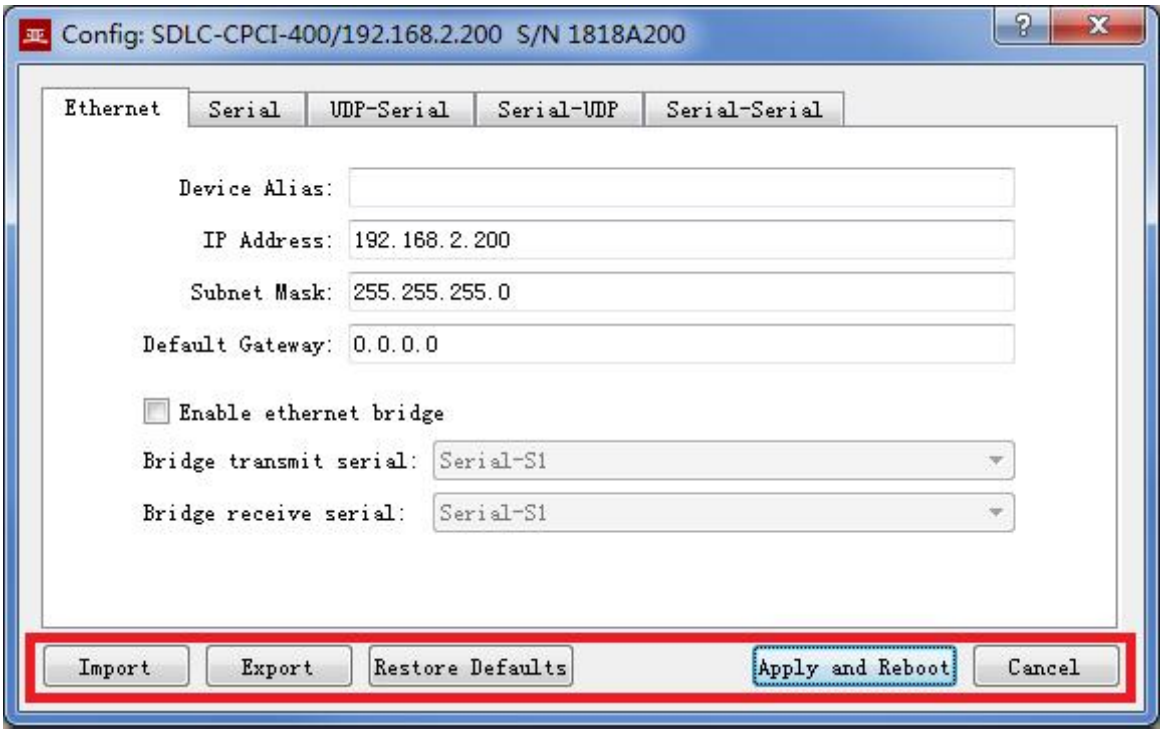
- Device Information: Running time, serial number, IP address, version number
- Serial Port: Working clock, data and receive/transmit statistics of all serial ports
- UDP Transmit: Displaying the relevant transmitted packets of the UDP Client for each enabled serial port to UDP entry
- UDP Receive: Displaying the relevant received packets of the UDP Server for each enabled UDP to serial port entry
- DMS Service: Displaying the information receive/transmit statistics of the configuration management between the device and the configured management computer

3.5 Configure Device

Click on the ”Config” button on the toolbar or double-click on the specified device in the device list; yacer-DMS pops up the configuration dialog.

According to the interface and function, the dialog divides the configuration item into several configuration pages.

Configure Device



The following operation buttons are located at the bottom of the dialog:

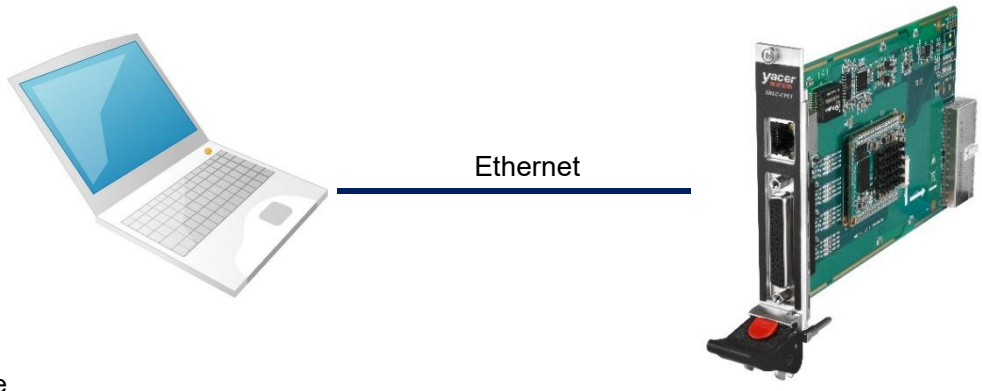
Table 3-2 Configure Device

Buttons	Function
Import	Open the configuration file and read the refreshed configuration dialog content
Export	Save the configuration content of the current dialog to the file
Restore Defaults	Refresh the dialog content with the device's default factory configuration
Apply and Reboot	Write the configuration content of the dialog into the device and restart the device to bring the configuration into effect
Cancel	Cancel the current configuration operatio

3.6 Configuration through Ethernet port

Connect the Ethernet port of SDLC-CPCI/PXI to the management computer over the network cable, running yacer-DMS configuration management software on the computer can monitor the running state and configure the parameters of SDLC-CPCI/PXI.

Configuration through Ethernet port



figure

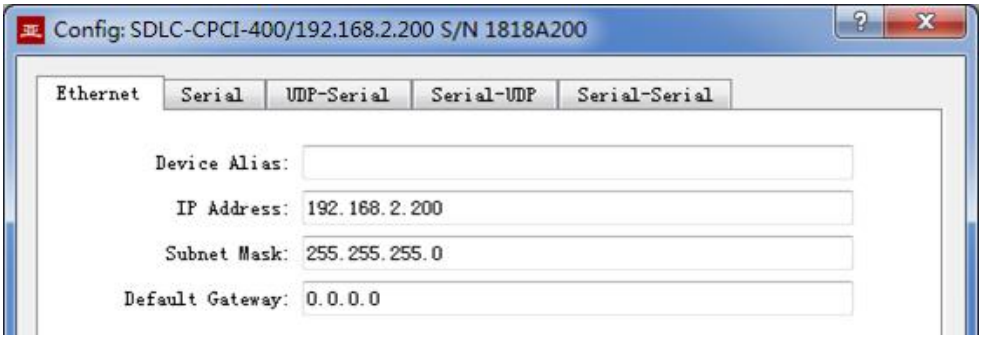
4 Function and Configuration

4.1 Ethernet Interface

4.1.1 Device alias

It allows users to set an alias for the SDLC-CPCI, thus adding description to the device or helping to remember the identification.

Device alias

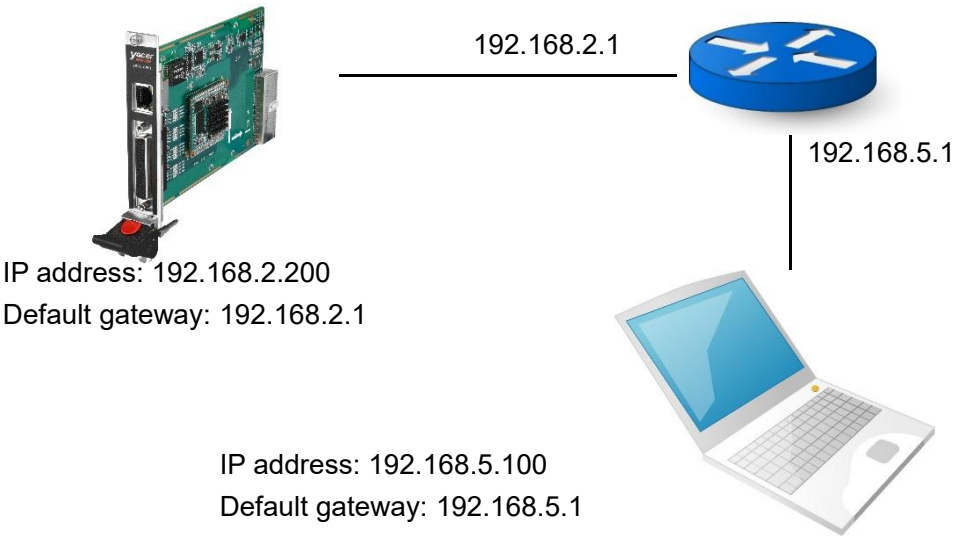


4.1.2 Default Gateway

By default, the default gateway is 0.0.0.0, representing that there is no gateway configuration.

If SDLC-CPCI needs to communicate with the host on other subnet, it must rely on an external router. At this time, the SDLC- CPCI's IP address must be on the same subnet with the IP address of the connected router port. Meanwhile, the IP address of router is set to the default gateway.

Default Gateway

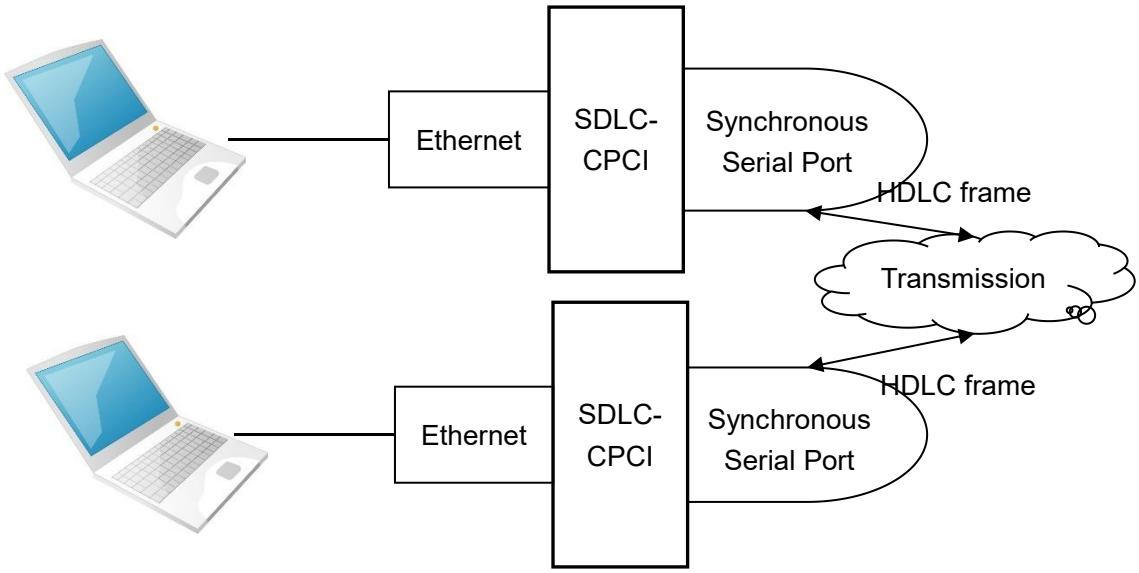


As shown above, the IP address of SDLC-CPCI and remote PC is 192.168.2.200 and 192.168.5.100 respectively. As they do not belong to the same subnet, they must rely on the router for communication. SDLC- CPCI and PC need to set the IP address of the connected router port to the default gateway of this device.

4.1.3 Ethernet Bridging enable

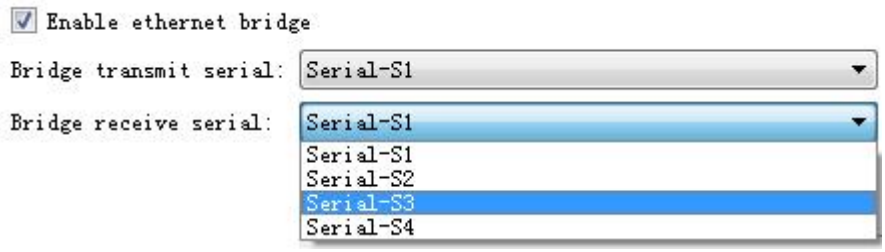
A pair of SDLC-CPCI is used to build the Ethernet bridges, and the remote extension of Ethernet is realized by other transmission equipment via serial port.

Ethernet Bridging



Check the “Enable Ethernet bridge” checkbox to enable the Ethernet bridging function, providing the function to achieve the transparent Ethernet bridges by means of sending/receiving the serial port via bridging.

Enable Ethernet bridge



When the Ethernet bridging function is enabled, the following functions are disabled:

- IP address of the machine: SDLC-CPCI acts as the bridging device without the IP address itself any more
- UDP to Serial Conversion
- Serial to UDP Conversion

4.2 Serial Port

4.2.1 Working mode of the serial port

The working mode of serial port can be divided into synchronous and asynchronous, all working modes of SDLC-CPCI support for are described in the table below.

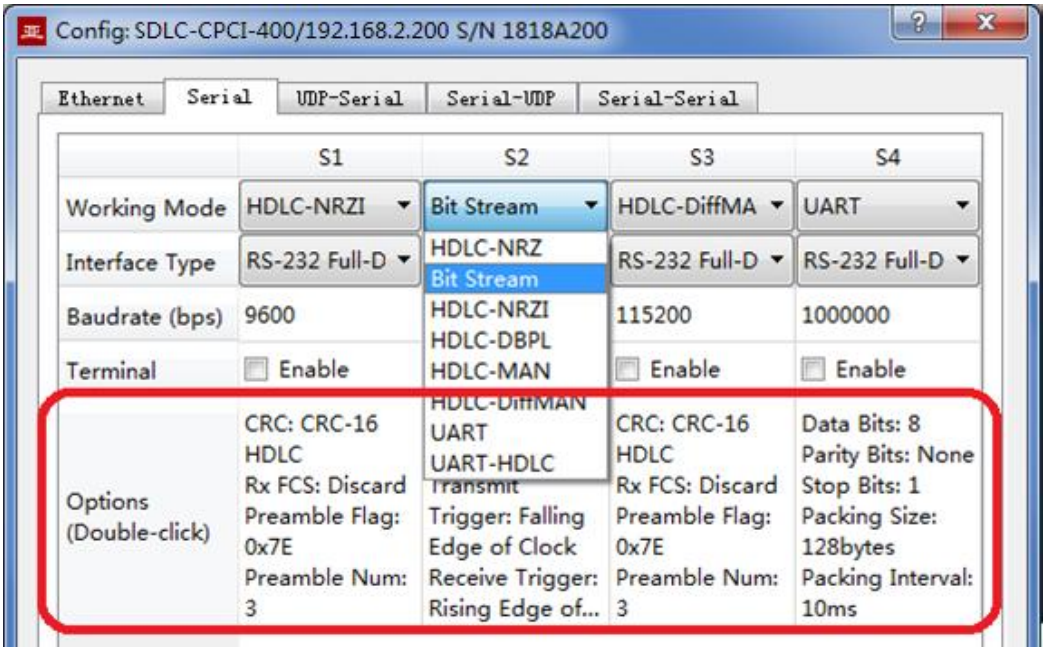
Table 4-1 Serial working modes

Working Mode		Description
Synchronous	HDLC-NRZ	Synchronous HDLC protocol based on the NRZ encoding
	Bit Stream	Serial Bit data based on the receive clock sampling
	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, equivalent to the serial port on the common computer
	UART-HDLC	UART-based similar HDLC communication protocol

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.

Serial Options



4.2.2 Interface type selection

The physical interface type of serial port can be selected as RS-232, RS-422 or RS-485 by "interface type".

4.2.3 Baud rate configuration

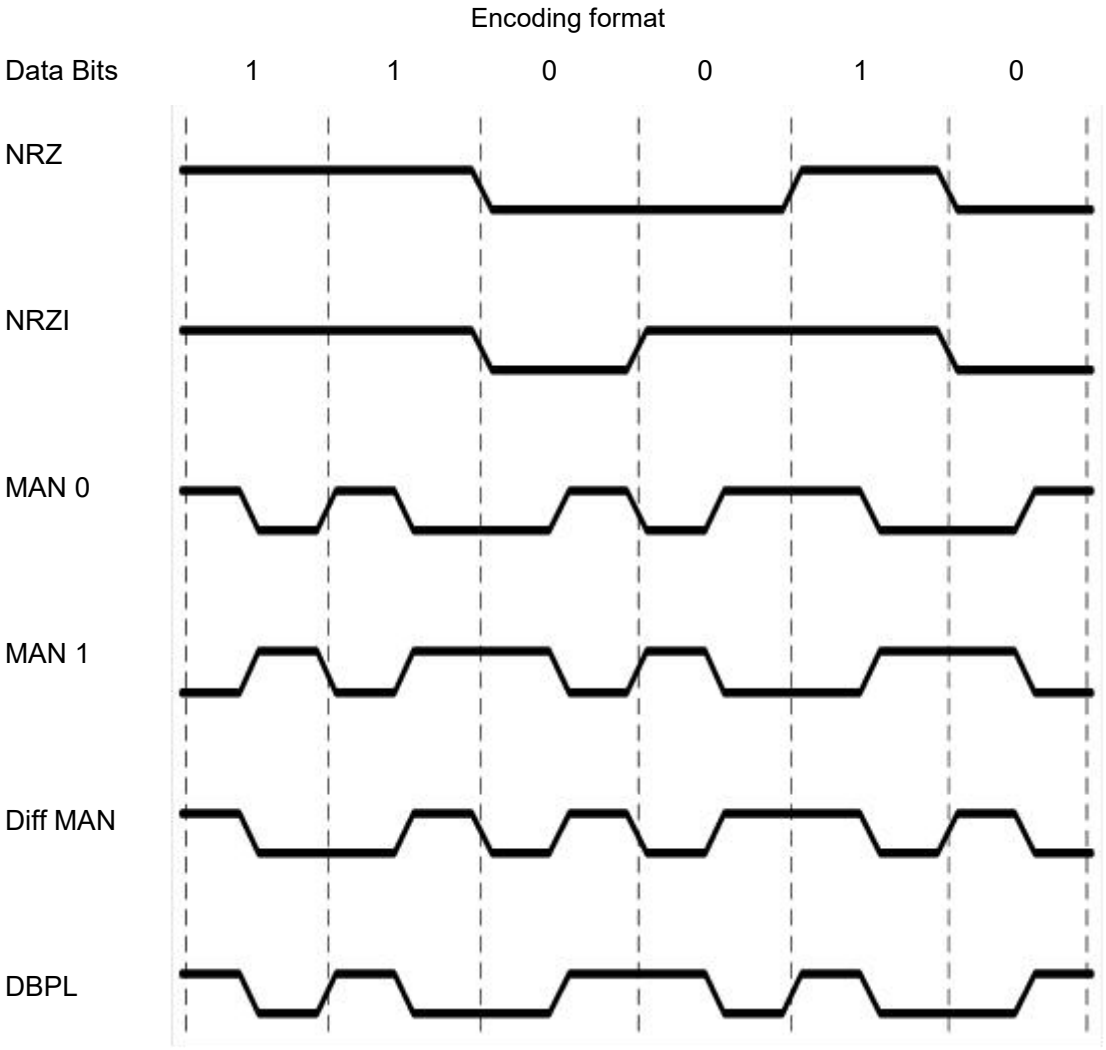
The "baud rate" configures the communication rate of the serial port. For the synchronous working modes such as HDLC-NRZI, HDLC-DBPL, HDLC-MAN, HDLC-DiffMAN and all asynchronous working modes, the baud rate of both sides of the communication must be the same in order to ensure the correct transmission of data.

4.2.4 Terminal configuration

"Terminal" is meaningful only when the interface type is RS-485 half-duplex. In generally, the terminal as a node of RS485 bus needs to enable the “terminal” function. When "terminal" is enabled, SDLC-CPCI provides 120 ohms matching.

4.2.5 Encoding format of the synchronous serial port

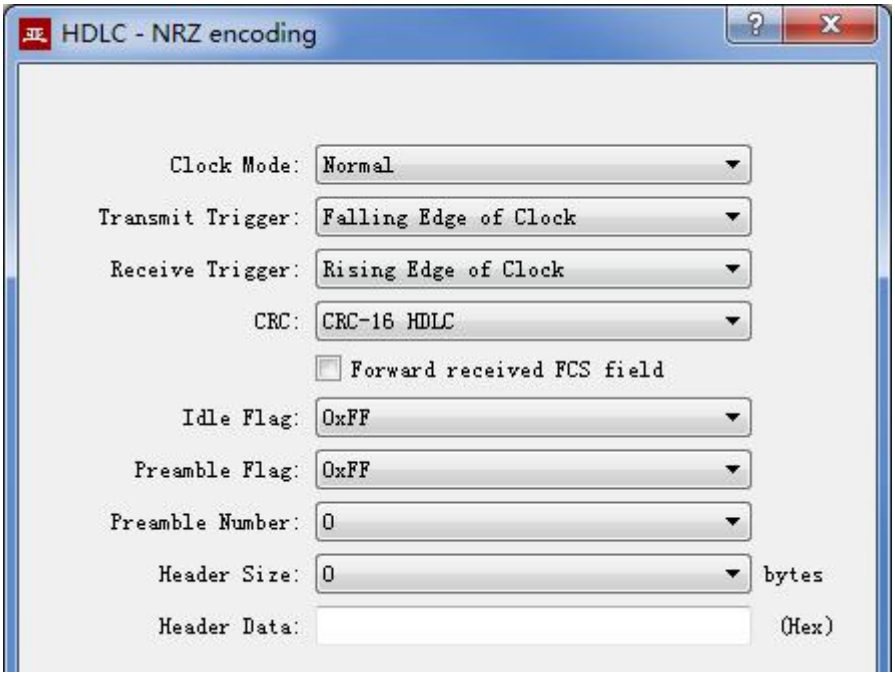
For HDLC-NRZ, HDLC-NRZI, HDLC-DBPL, HDLC-MAN, HDLC-DiffMAN and other synchronous working modes, the link layer adopts the HDLC protocol with the encoding format difference as follows:


Encoding format
Data Bits
1
1
0
0
1
0
NRZ
NRZI
MAN 0
MAN 1
Diff MAN
DBPL

4.2.6 HDLC-NRZ Option

HDLC-NRZ is the common synchronous working mode. This encoding format relies on receiving and receiving clock signals to achieve data bit synchronization, so the configuration of clock parameters is particularly important.

NRZ Options



4.2.6.1 Clock mode

There are three clock modes for the synchronous serial port, normal, slave clock &master clock.

Clock modes selection

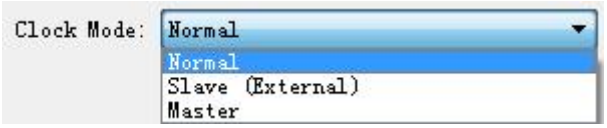


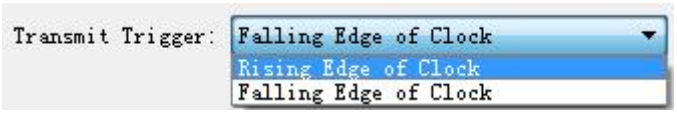
Table 4-2 Clock modes

Clock Mode	Transmit Clock	Receive Clock
Normal	Generation from the local device, output through pin TxC.	Generation from the peer device, input through pin RxC.
Slave Clock (External)	Generation from the peer device,input through pin RxC. TxC output synchronizes with RxC automatically	Generation from the peer device, Input through pin RxC.
Master Clock	Generation from the local device, output through pin TxC.	Generation from the local device, ignoring the clock of pin RxC.

The slave clock mode is also called as the external clock working mode. When the peer device is the DCE, SDLC-CPCI is often configured as the slave clock mode and transmits data with the clock provided by the DCE, ensuring the data transmission across the whole network based a clock and avoiding packet loss concerns caused due to different clock sources.

4.2.6.2 Transmit trigger

Transmit trigger



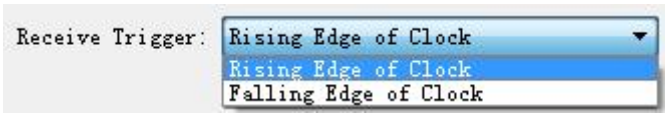
Transmit trigger defines the generation clock edge of the new data bit:

- Falling edge of clock: A new data bit is generated on the falling edge of clock
- Rising edge of clock: A new data bit is generated on the rising edge of clock

For communications that follow the HDLC protocol specification, the clock drop edge should be selected to trigger new data transmission. There are also some special applications where users use non-standard communication and use rising edge to trigger new data transmission.

4.2.6.3 Receive trigger

Receive trigger



Receive trigger defines the sampling clock edge of the serial port receive data:

- Rising edge of clock: Data on the RxD line is read on the rising edge of the RxC signal
- Falling edge of clock: Data on the RxD line is read on the falling edge of the RxC signal

In accordance with HDLC protocol specification for communication, since the falling edge is used to trigger new data, considering the stable time of new data, in order to ensure the correct reading of data, the receiving trigger must be configured as the clock rising edge.

The local receive trigger configuration is determined according to the transmit trigger of the remote terminal device:

Table 4-3 The local reveive trigger configuration

Remote Transmit Trigger	Local Receive Trigger
Falling edge of clock	Rising edge of clock
Rising edge of clock	Falling edge of clock

4.2.6.4 CRC

In order to verify the correctness of data communication, CRC function should be enabled.

By default, configure the protocol CRC check type with CRC-16-HDLC as the most commonly used type for the HDLC protocol communication.

CRC selection

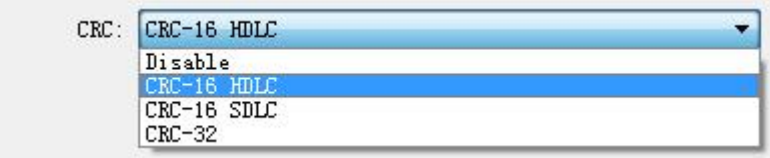


Table 4-4 CRC Description

CRC	Description
Disable	CRC disable: ● No CRC calculation for data transmission or FCS field for HDLC frame ● No CRC check for data receiving
CRC-16 HDLC	Adopt the 16-bit IBM HDLC CRC check method
CRC-16 SDLC	Adopt the 16-bit IBM SDLC CRC check method
CRC-32	Adopt the 32-bit ISO HDLC CRC check method

4.2.6.5 Forward received FCS field

CAUTION

This configuration is only effective with CRC enable.

FCS field

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

Table 4-5 CRC Description

Opening Flag	Address Field	Control Field	Information Field	FCS Field	Closing Flag
0x7E	1 byte	1 byte	Variable length	CRC 2/4 bytes	0x7E
0x7E	User data			CRC 2/4 bytes	0x7E

NOTE

If this option is checked, then forward the user data and FCS field.

NOTE

If this option is not checked, SDLC-CPCI will discard the 2/4-byte FCS field at the end of data and only forward the user data after the receive HDLC frame check is passed.

4.2.6.6 Idle Flag

The definition of HDLC inter frame filling content, the default should be 0xFF.

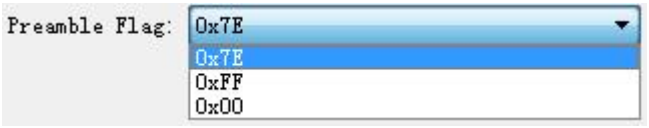
Idle Flag

4.2.6.7 Preamble flag and number

During the half-duplex communication, a preamble flag is often required in front of the frame for receiving party synchronization, and the most commonly used method is to add 2~5 0x7E.

For full duplex applications, the Preamble number is often unrequired, set it to 0(no preamble).

Preamble Flag



Preamble Number

4.2.6.8 Header size and data

Header size

Header data

As shown above, the header size is defined as 2, and the header data is defined as FF 03.

- While sending HDLC, the FF 03 is added before the user data, and HDLC frame data is composed with user data.
- When receiving HDLC, SDLC-CPCI discards the first two bytes of HDLC frame data as the frame header, and only forwards the subsequent data to the user..

Table 4-6 Header size and data

Opening Flag	Frame Header	User Data	FCS Field	Closing Flag
0x7E	0xFF 0x03	Variable length	CRC 2/4byte	0x7E

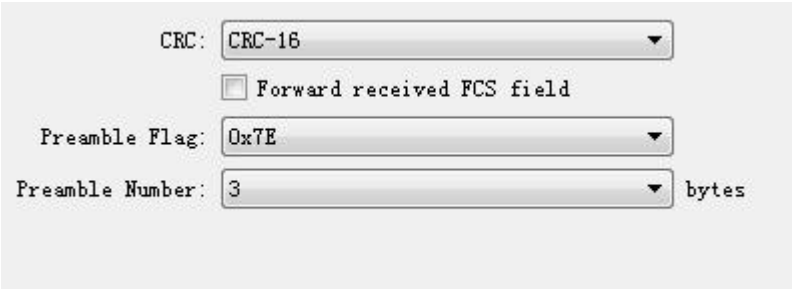
4.2.7 HDLC-NRZI/DBPL/MAN-Diff Option

Unlike the NRZ encoding format, the NRZI DBPL, MAN and MAN-Diff encoding format data contains clock information, which only requires that the baud rate of the both communication sides should be the same, instead of the clock mode, transmit trigger, receive trigger and other parameters.

Refer to the HDLC-NRZ parameter configuration for configuration of CRC, FCS, Preamble Flag and Preamble number.

The option dialog of the HDLC-NRZI/DBPL/MAN-Diff working modes is shown as follows:

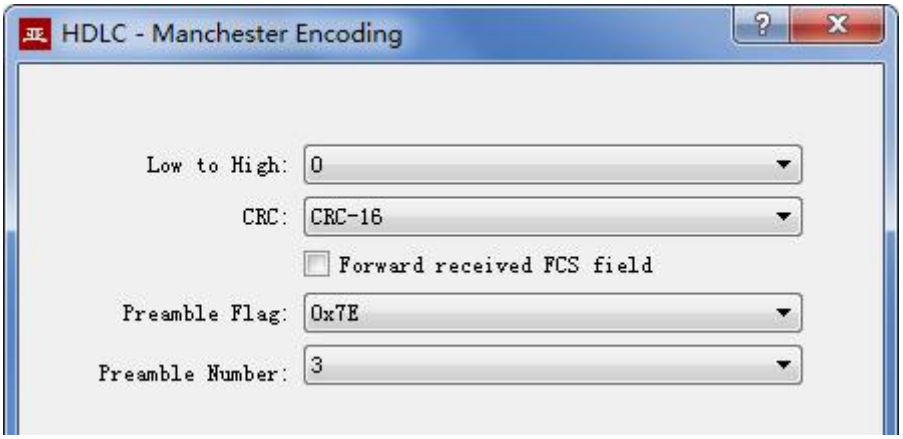
HDLC-NRZI/DBPL/MAN-Diff Options



4.2.8 HDLC-MAN (Manchester) Option

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

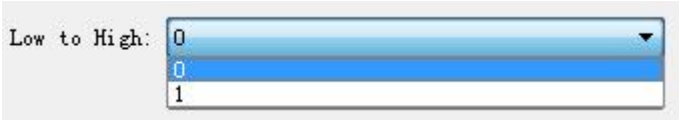
HDLC-MAN Options



Except for the configuration parameters same as NRZI, parameters with the data line low-to-high transition definition are included for the Manchester encoding format:

- 0: Low-to-high transition indicates the logic 0;
- 1: Low-to-high transition indicates the logic 1;

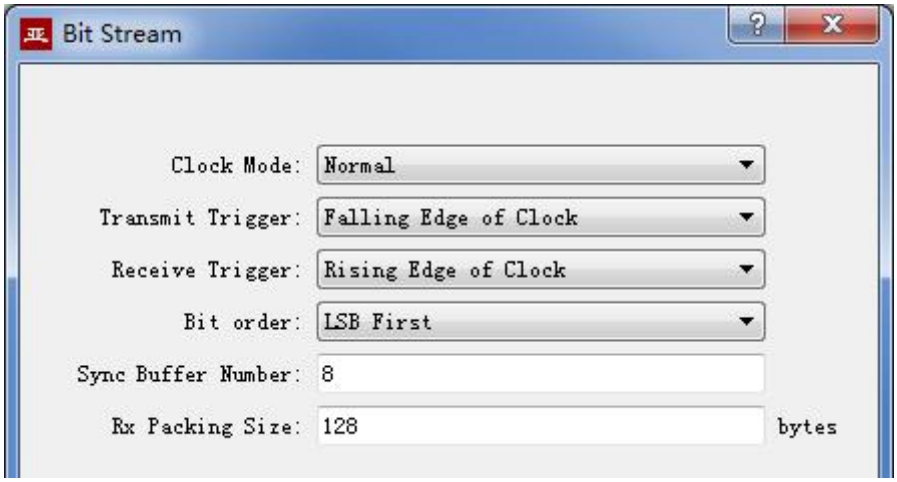
Low-to-high transition definition selection



4.2.9 Bit Stream Option

The rising or falling edge of each clock cycle samples the 1bit data on the data line, which forms a UDP message and sends to the destination IP after receiving a byte with the packet length by forming a byte with each 8bit.

Bit Stream Options



Refer to the HDLC-NRZ parameter configuration for configuration of clock mode, transmit trigger and receive trigger.

The online bit stream is stored in the computer or system memory in the form of byte. The receive/transmit sequence determines the conversion mode of byte and bit.

Bit order

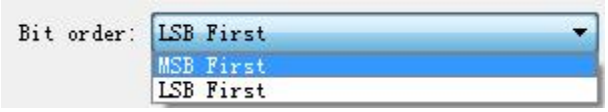


Table 4-7 Bit order description

Receive/Transmit Sequence	Transmit Operation	Receive Operation
MSB first	First transmit the high-bit byte	Data received first is placed on the byte high bit
LSB first	First transmit the low-bit byte	Data received first is placed on the byte low bit

The Sync buffer number is the number of buffers sent by a synchronous Bit stream when sending data. A certain number of packets are cached in advance, and then the sending of Bit stream is started. It maintains the coherence of Bit stream data.

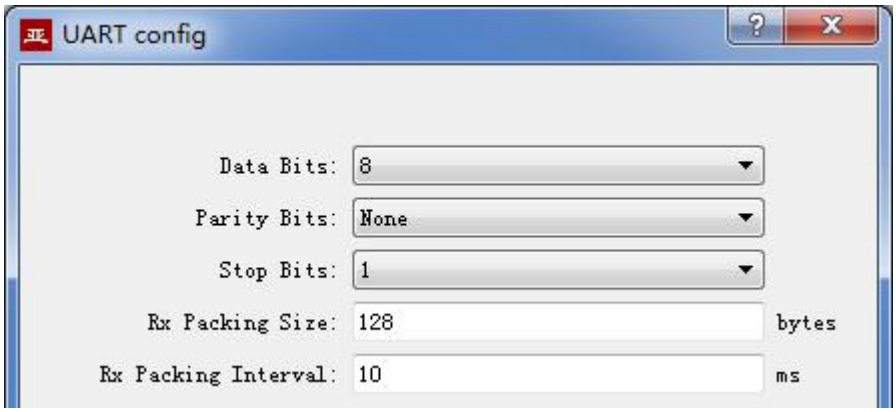
Sync buffer number and Rx packing size

4.2.10 UART Option

UART is a means of character stream communication; data bits, parity bits and stop bits define the basic working parameters of the asynchronous serial port, which must be configured identically to the opposite terminal device.

Generally, data bits are defined as 8, i.e. one byte, and UART corresponds to the byte stream communication.

UART Options



When the UART byte stream is converted into a UDP message or HDLC frame, it is too costly and inefficient if each byte is converted to a UDP message for transmission.

To improve efficiency, protocol converter buffers the received byte stream and forms a number of buffered bytes into a UDP message to send, of which this process is called as packet.

Packets are controlled with two parameters, namely the packet length and the packet interval.

4.2.10.1 Rx packing size

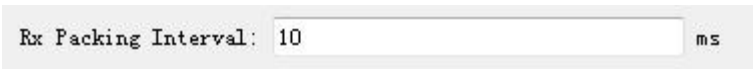
For example, if the packet length is set to 128 bytes, then it will form a UDP message to send after UART receives the full 128 bytes.

Rx packing size

4.2.10.2 Rx Packing interval

As shown in the example above, the packet interval 10ms is set, and if no new byte data is received over 10ms, it will form the buffer data as a packet to forward no matter whether it has received the full 128 bytes.

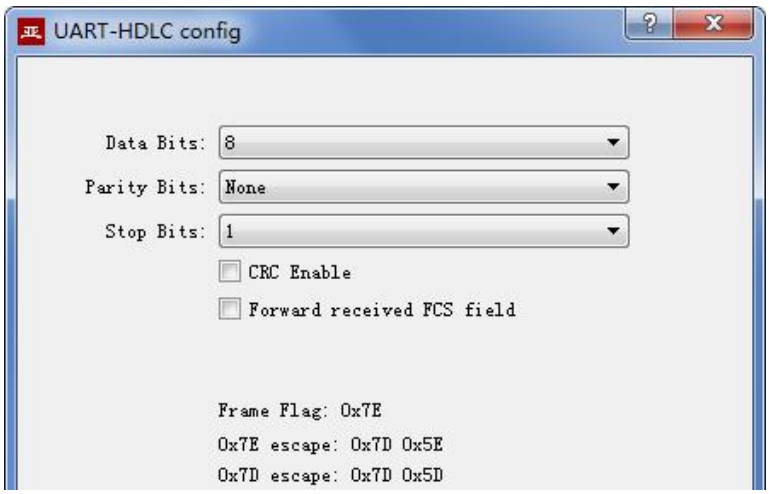
Rx packing interval



4.2.11 UART-HDLC Option

The UART-HDLC working mode is a custom protocol by Yacer which form the asynchronous HDLC frame on the basis of the normal UART communication by packaging the byte stream. Therefore, the asynchronous serial port can perform the packet-based communication with the UDP message and synchronous HDLC frame.

UART-HDLC Options



The UART-HDLC frame format adds 0x7E before and after the packet as the opening flag and closing flag with the frame structure as follows:

Table 4-8 UART-HDLC frame format

opening Flag	Information Field	FCS Field	closing Flag
0x7E	2~1470 bytes of data	2-byte CRC data	0x7E

As the information field and FCS field may appear 0x7E, perform the character escape on such fields before transmission 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:

Table 4-9 Escape operation of data transmit

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

The escape operation of data receive is as follows:

Table 4-1 Escape operation of data receive

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

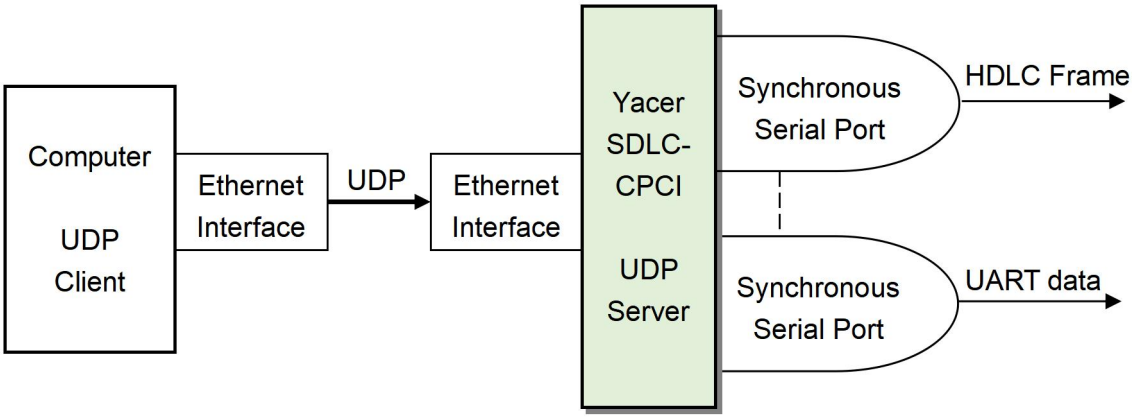
4.3 UDP to Serial Conversion

4.3.1 Application model

With SDLC-CPCI, PC or server can realize the transmit function of the synchronous HDLC serial port.

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

UDP to Serial conversion

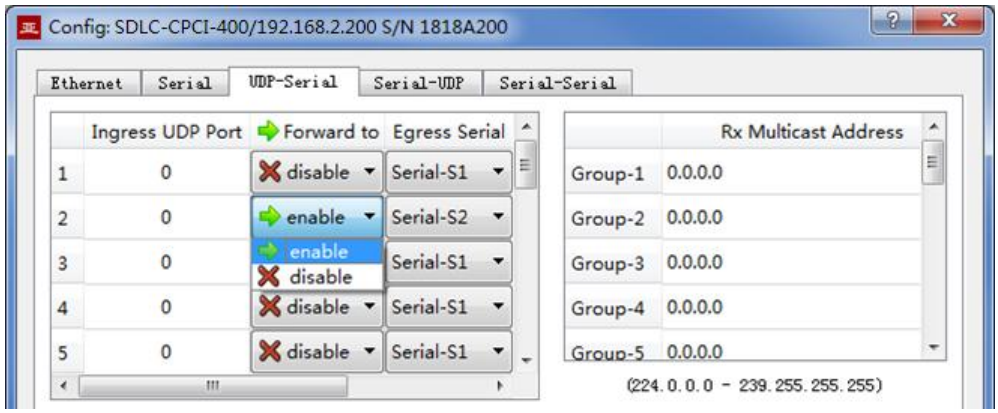


4.3.2 Forward Configuration

Set the UDP to serial port. Each row represents the forwarding entry from a UDP port to the serial port while “enable” is selected with three forwarding strategies to be achieved:

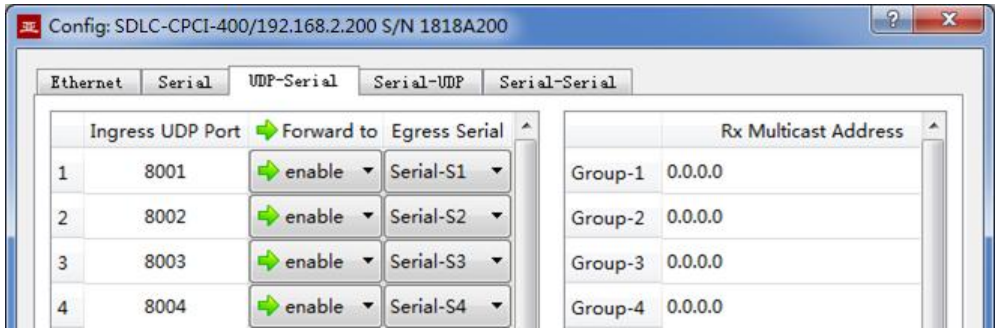
- Forwarding: Data received by the specified UDP port can be forwarded to the specified serial port.
- Multiplexer: Data received by several different UDP ports can be forwarded to the same serial port.
- Demultiplexer: Data received from the same UDP port can be forwarded to the different serial ports.

UDP forward configuration



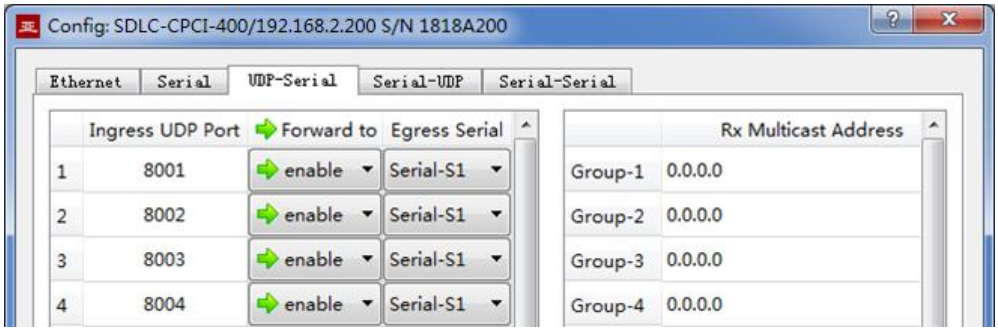
Forwarding: The following configuration realizes the application, where data received from 4 UDP ports and distributed to 4 serial ports:

UDP forwarding



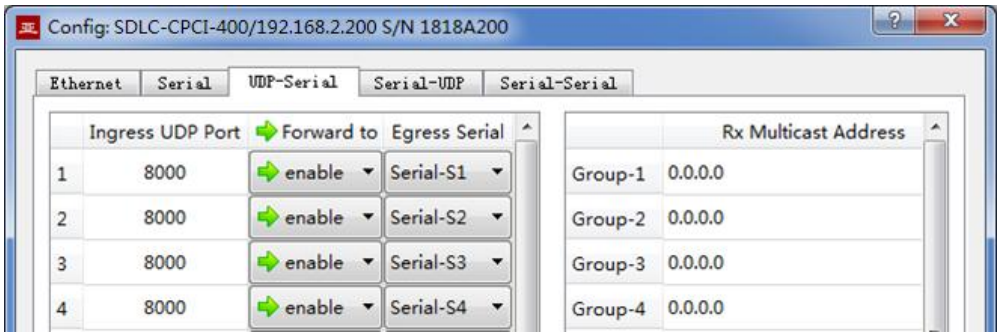
Multiplexer: The following configuration realizes the application, where data received from 4 UDP ports and distributed to 1 serial port:

UDP multiplexer



Demultiplexer: The following configuration realizes the application, where data received from 1 UDP and distributed to 4 serial ports:

UDP demultiplexer



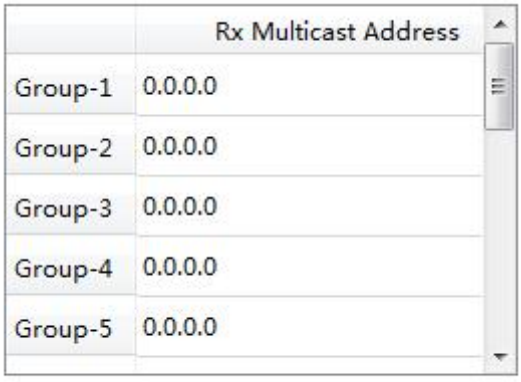
4.3.3 Receive multicast

If users need to receive the multicast UDP message, add the required multicast address from the right “Rx Multicast Address” list.

Range of the multicast address is 224.0.0.0 ~ 239.255.255.255, 224.8.8.8 is the configuration management address of the SDLC-CPCI and users can’t use this address.

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

Receive multicast



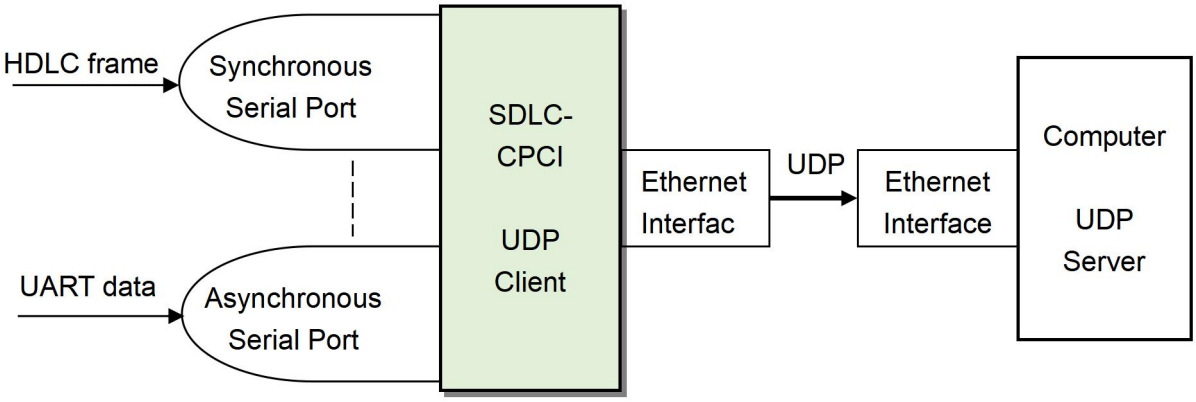
(224.0.0.0 - 239.255.255.255)

4.4 Serial to UDP Conversion

4.4.1 Function description

The serial port to UDP function figures is shown below. SDLC-CPCI receives the synchronous HDLC frame or asynchronous UART frame from other devices over the serial interface, converts it into the UDP message and sends to PC or server over Ethernet.

Serial to UDP conversion

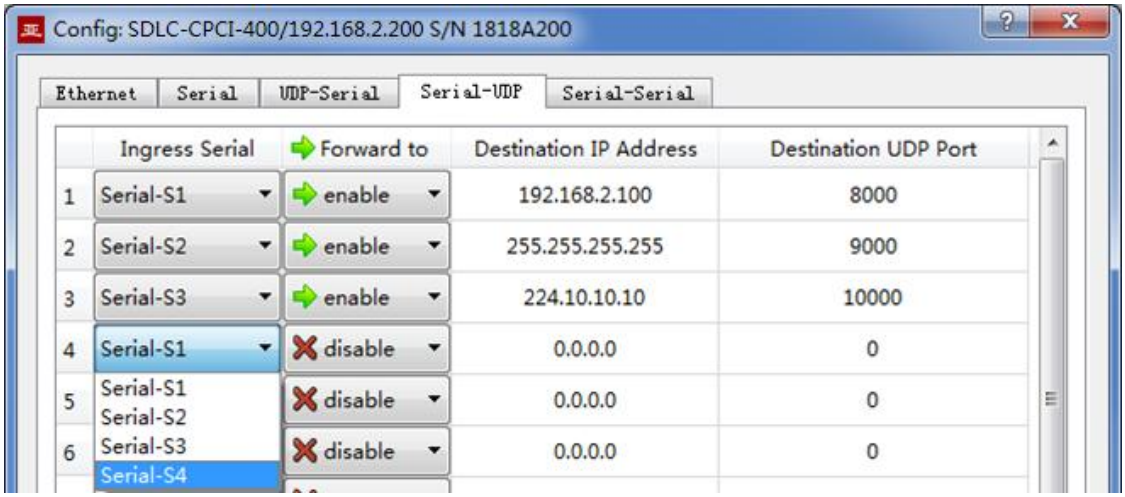


4.4.2 Forward Configuration

Set the serial port to UDP. Each row represents the forwarding entry from a serial port to the destination UDP port while “enable” is selected with three forwarding strategies to be achieved:

- Forwarding: Data received from the specified serial port can be forwarded to the UDP port of specified destination IP.
- Multiplexer: Data received from several different serial ports can be forwarded to the same UDP port of the same destination IP.
- Demultiplexer: Data received from the same serial port can be forwarded to the different UDP ports of the different destination IP.

Serial forward configuration



As shown above, three serial port to UDP entries are configured for achieving the following items:

- Serial port S1 to UDP unicast, with the destination IP address as 192.168.2.80 and destination UDP port as 8000
- Serial port S2 to UDP broadcast, all hosts on the subnet can receive data from S2 at the 9000 port
- Serial port S3 to UDP multicast, only the PC joining Group 224.10.10.10 on the network can receive data from S3.

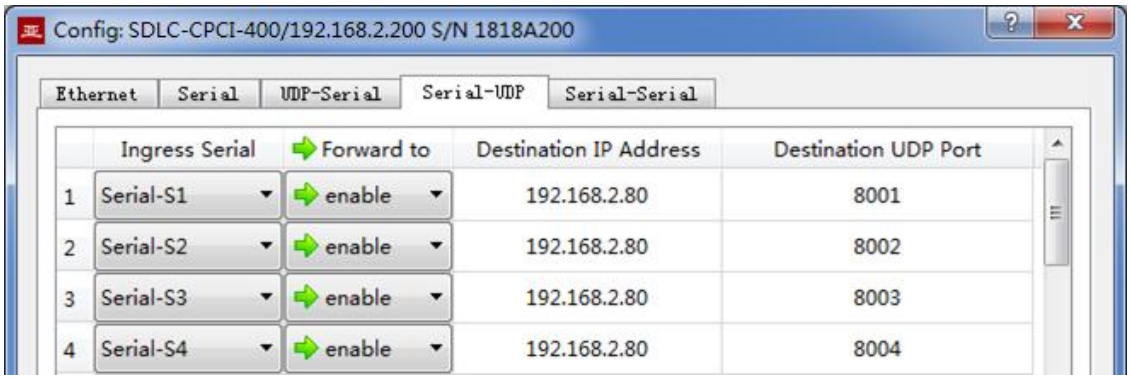
4.4.3 How does the UDP server identify the source serial

In multiplexer applications, the HDLC frame from several different serial ports needs to be forwarded to the same server or PC. In this case, a strategy enables server or PC to know which serial port the received UDP message data is from.

4.4.3.1 Distinguish the source serial port according to the source UDP port

As shown below, set different forwarding destination UDP ports for each serial port. The UDP Server PC receives data at the different UDP ports. Message received at port 8001 is from the serial port S1 while message received at port 8004 is from the serial port S4.

Serial forward example



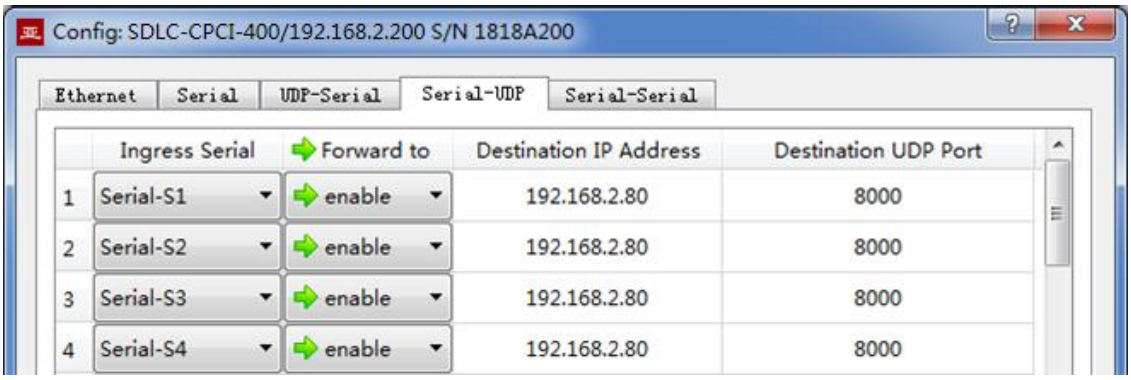
4.4.3.2 Distinguish the source serial port according to the source UDP port

When the source serial port is identified with the destination UDP port, UDP Server needs to listen and receive data on a plurality of UDP ports. In case there are many serial ports, not only the UDP Server port occupies too many resources, the configuration and programming complexity also increases significantly.

In order to simplify implementation of the UDP Server side, we can use the configuration example below, forwarding each conversion to the same port of the UDP Server. ***During yacer's SDLC-CPCI forwarding, it will automatically adjust the source port number of the UDP message according to the source serial port. The source ports of the UDP message forwarded by the serial ports S1 and S2 are 8001 and 8002 respectively; the following is gradually increasing.***

Thus, UDP Server only needs to listen and receive data at a port (8000 in the example below) and distinguishes the source serial port according to the source UDP port. If several SDLC-CPCIs are provided, UDP Server can distinguish the source device via the source IP.

Serial receive example

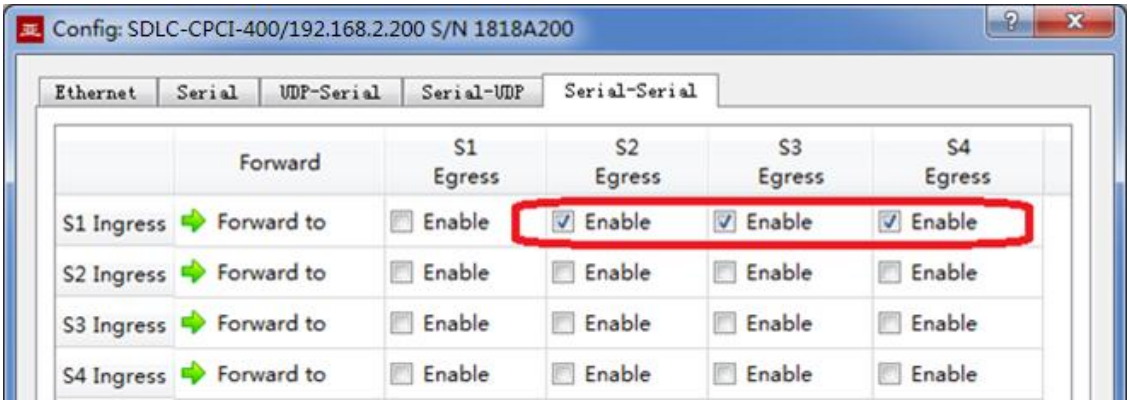


4.5 Serial Port to Serial Port

Serial-serial can forward the input data of the specified serial port to other serial port outputs, which is mainly used for:

- Conversion between synchronous and asynchronous serial ports
- Serial port Demultiplexer: Divide the single serial port data into multi-channel data. Unlike the common demultiplexer, it is realized by SDLC-CPCI, the different baud rates and clock modes can be set for each-channel serial port, avoiding the packet loss caused by clock inconsistency

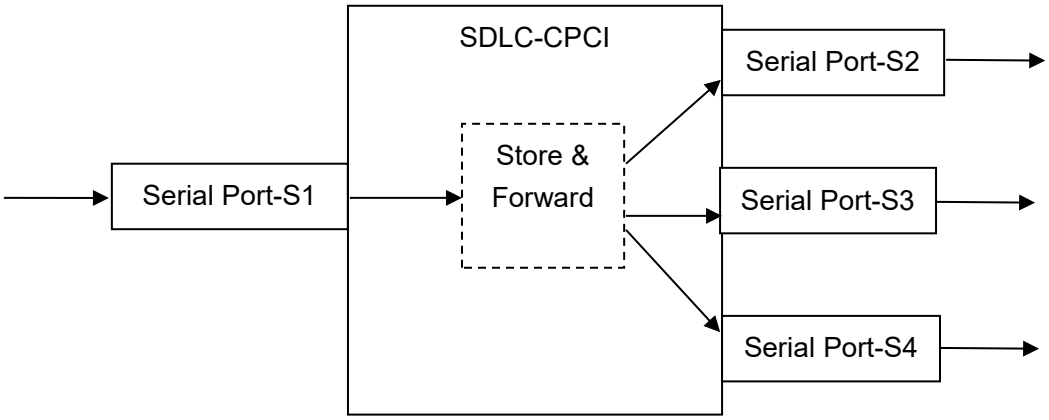
Serial to serial example



As shown above , the configuration realizes the application of the input demultiplexing of the serial port S1 to S2, S3 and S4 outputs. SDLC-CPCI performs storing and forwarding on the

received data. Even if the baud rate and clock mode of S1, S2, S3 and S4 are different, packet will not loss.

Serial to Serial figure



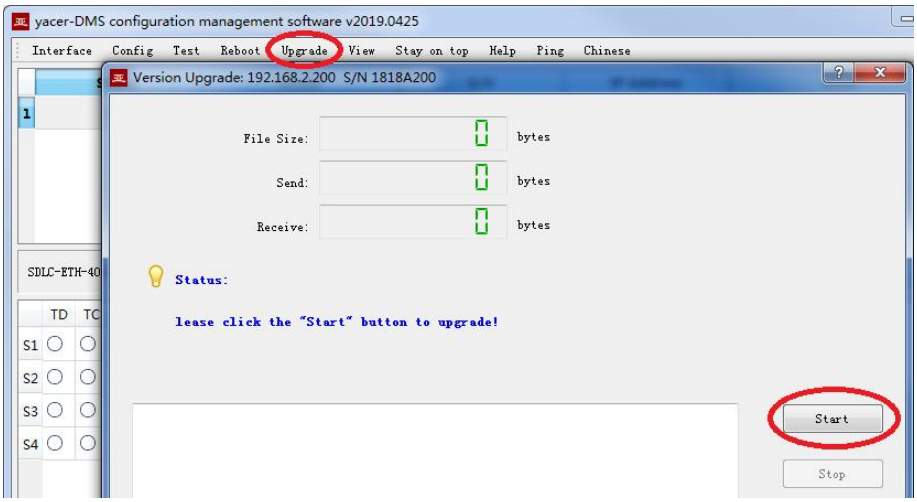
5 System Maintenance

5.1 Firmware Version Upgrade

5.1.1 Start updating

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

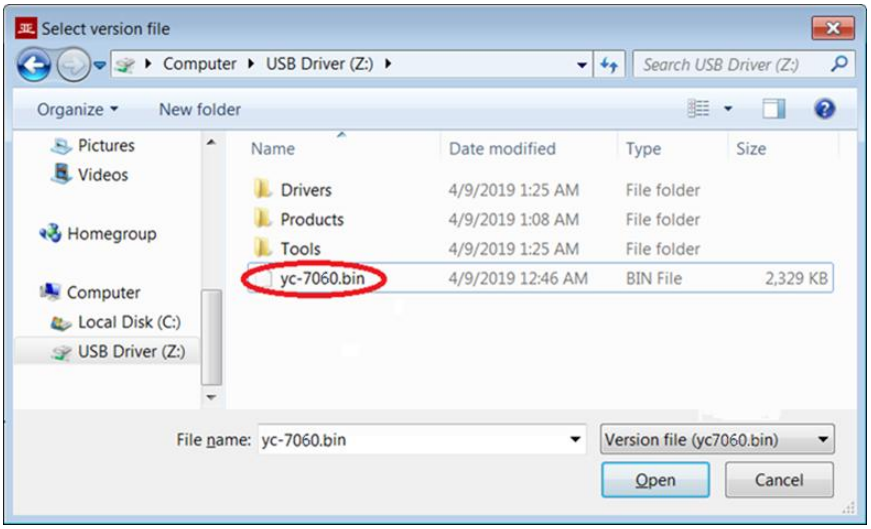
Start updating



5.1.2 Locate Firmware Version

The “Selection version file” dialog pops up. Locate the folder for storing the latest version of firmware, select and click “Open” to start updating.

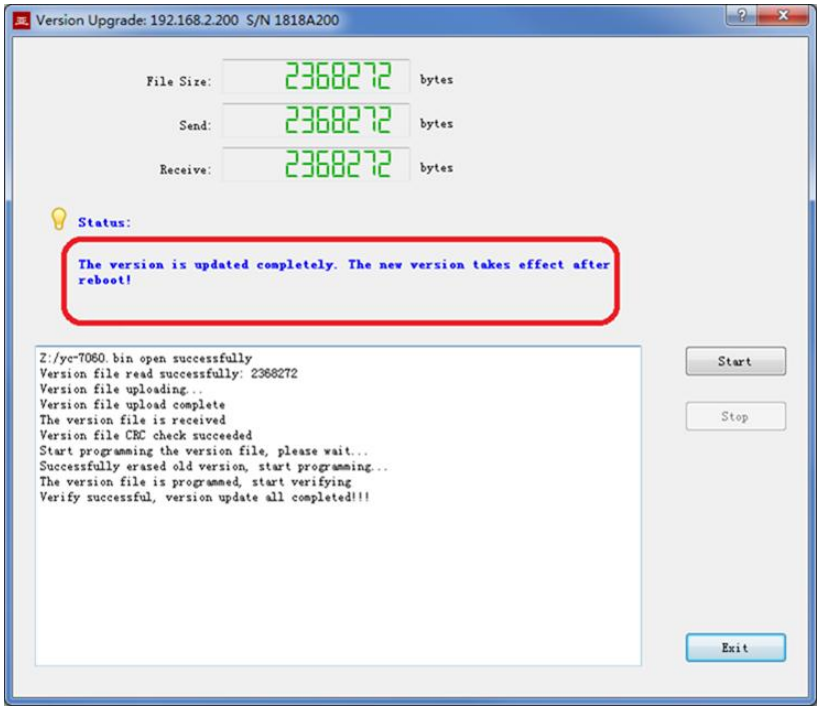
Locate Firmware Version



5.1.3 Upgrade Completed

After completion of upgrade, “Version Update Completed” displaying on the page indicates that the version update is completed.

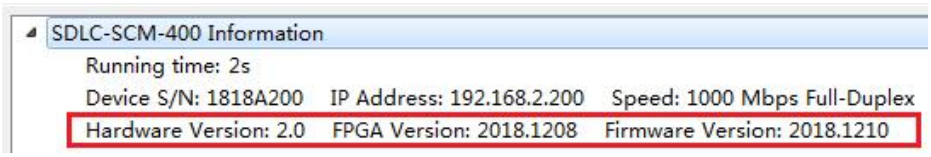
Upgrade completed



5.1.4 Upgrade Confirmation

After completion of update, re power-on the device, observe the version information in the statistical report and determine whether the new version is updated successfully via the version date.

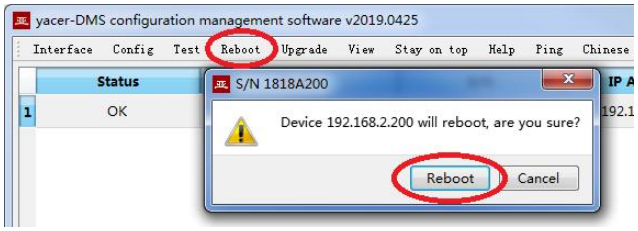
Upgrade Confirmation



5.2 Device Reboot

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

Reboot



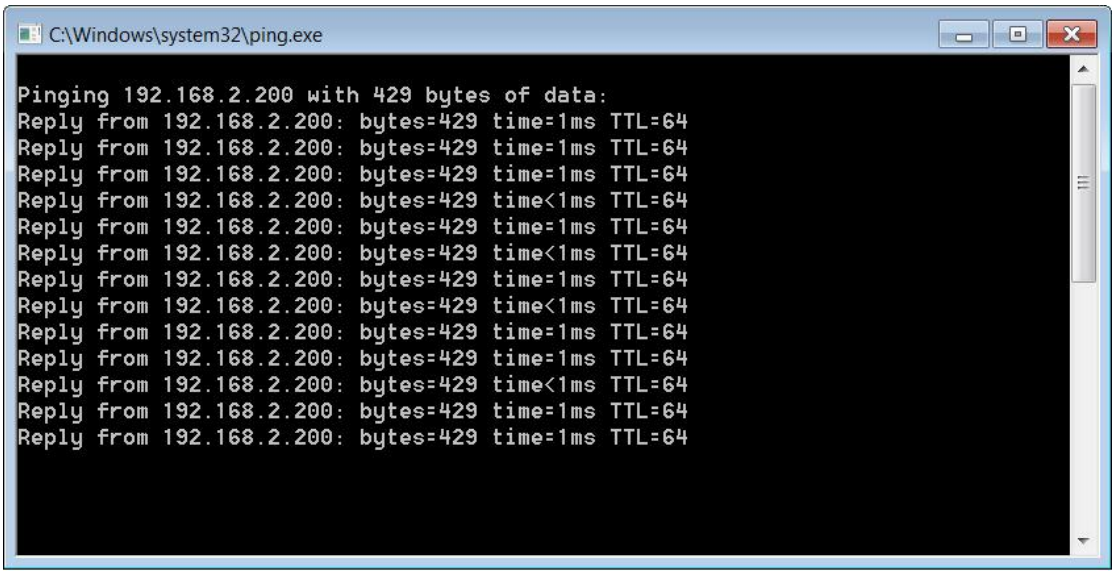
5.2 Ping

By clicking on the “Ping” button on the toolbar, DMS will start the ping command automatically for the selected device so as to check whether the network connection is normal between the configuration management computer and SDLC-CPCI.

Before performing the Ping command, ensure that the IP address of PC and SDLC-CPCI is on the same subnet first.

If the SDLC-CPCI enables Ethernet bridging, the IP address of the device is invalid and the Ping command cannot reply.

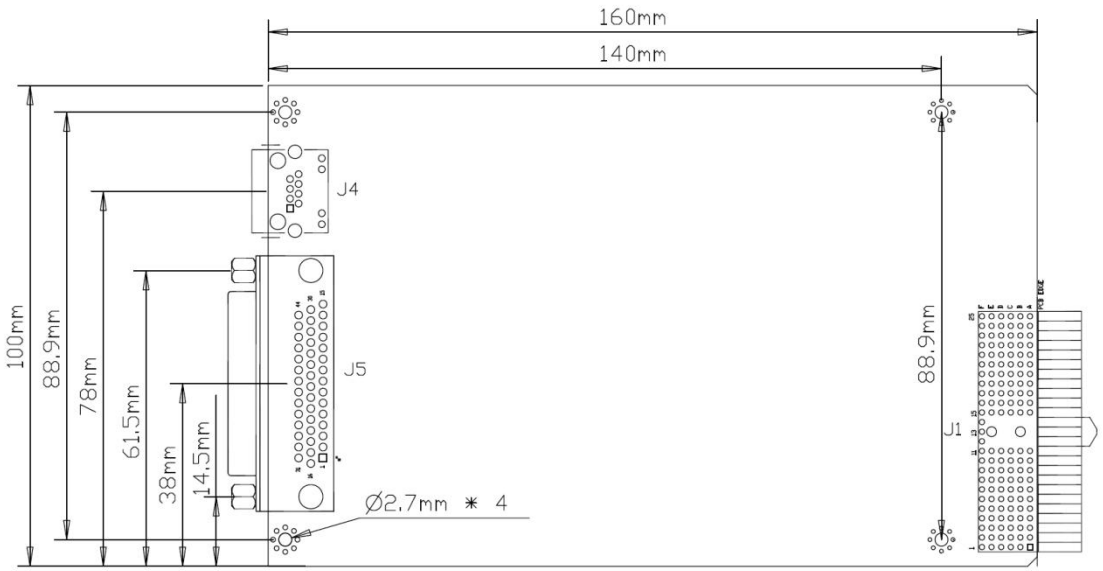
Ping



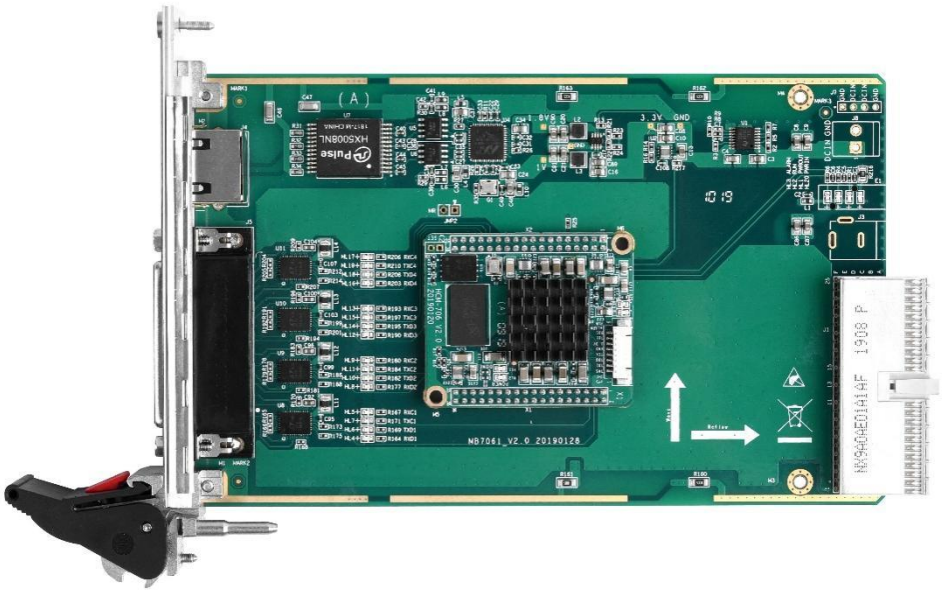
6 Mechanical characteristics and installation

6.1 Dimension

Dimension



Top view



7 Development and Application

7.1 Serial port data conversion

7.1.1 Application packet and conversion model

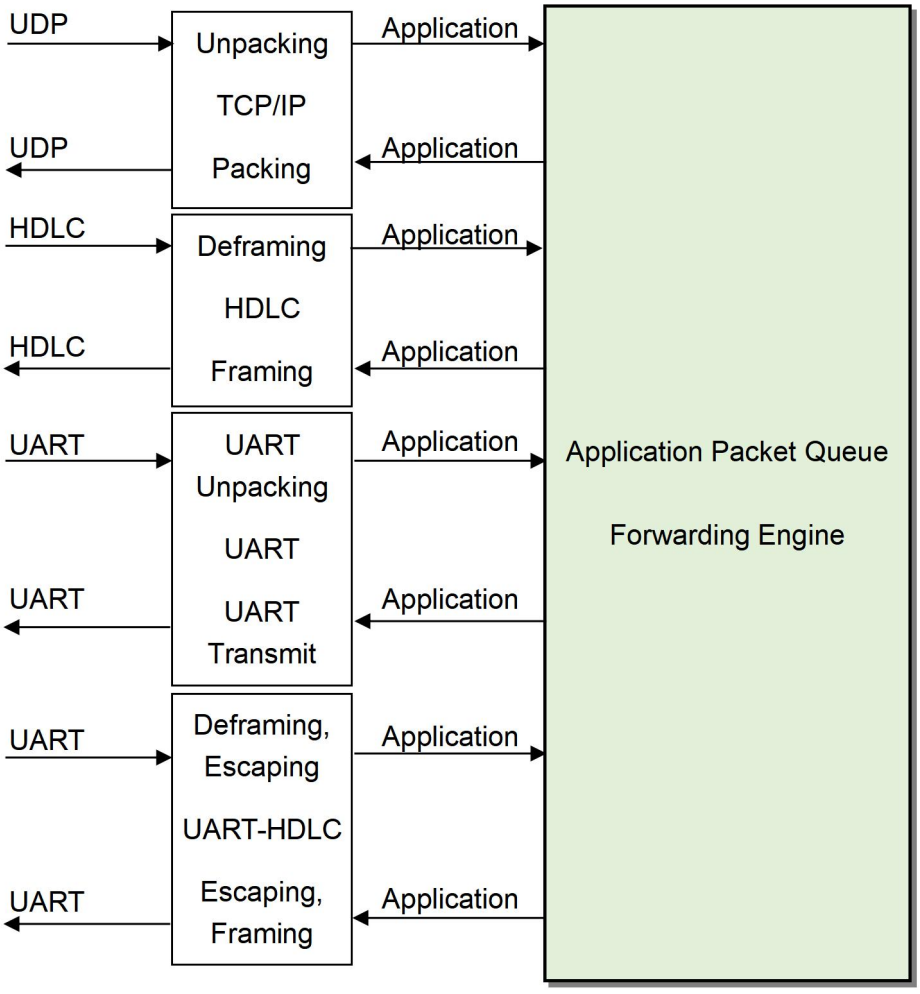
Serial port data conversion includes:

- Protocol conversion between the serial port and UDP
- Data conversion between synchronous and asynchronous serial ports

Upon receiving, the receiving and processing module of different types of interfaces unpacks or deframes the data, extracts the application packet, and sends it to the system queue.

SDLC-CPCI's forwarding engine will read the application packet and send it to the transmission module of each interface according to the forwarding configuration. It sends modules for framing or packing operation on application packets to generate different types of protocol packets or data frames, which will be sent out through the physical interface.

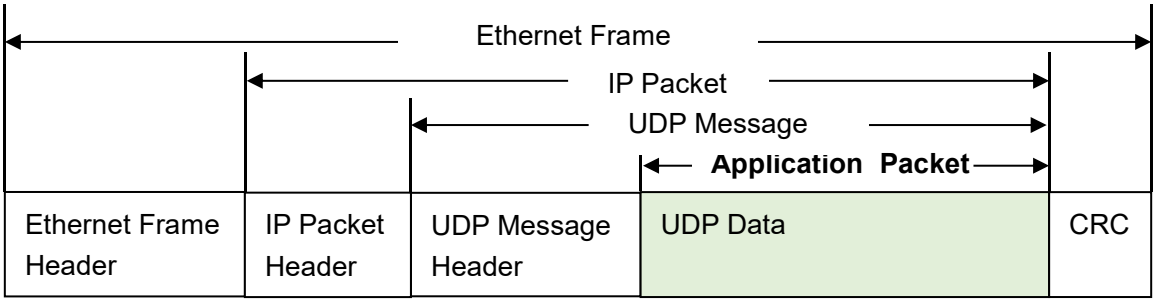
conversion model figure



7.1.2 UDP message format

In the UDP protocol, the application packet is packaged in the data area of the UDP message. Each UDP packet contains a complete application packet.

UDP message format

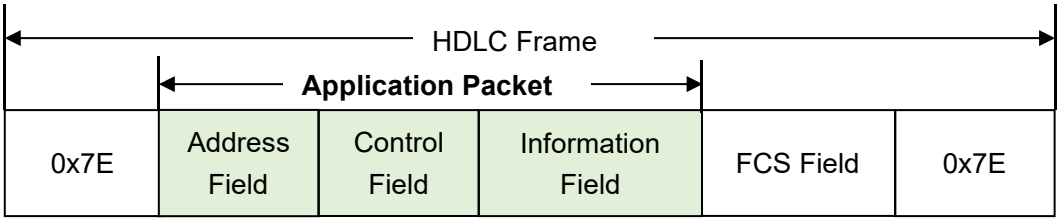


7.1.3 HDLC frame format

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 SDLC-CPCI, 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

HDLC frame format

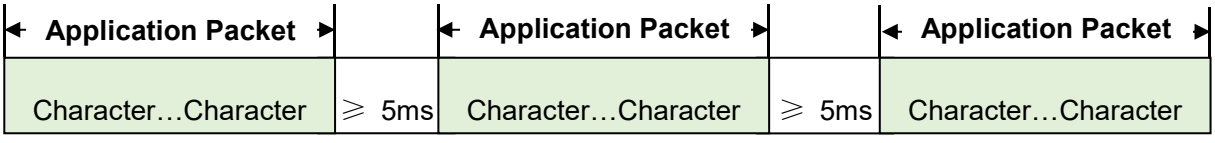


7.1.4 UART data packet

When the serial port is working in the asynchronous 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.

SDLC-CPCI 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 the packet receiving is considered to be complete.

UART data packet



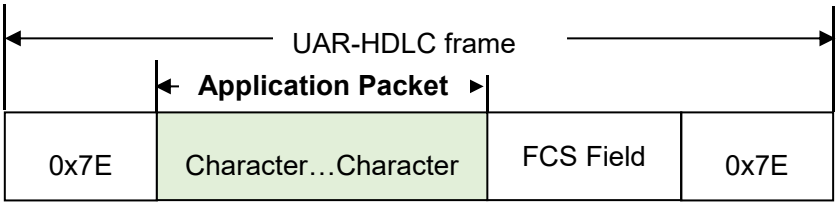
In the actual application, data transmission is not allowed during the packet interval; otherwise, it may result in a waste of communication bandwidth, and the higher the baud rate is, the more serious the waste is.

7.1.5 UART-HDLC frame format

The UART-HDLC working mode adopts another strategy to provide the unpacking capacity for UART. As shown in the following figure, the data sender calculates the application packet's CRC and adds the 0x7e to the head and tail as the leading and closing flags to form an UART-HDLC 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.

UART-HDLC figure



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:

Table 7-1 The escape operation of data transmit

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

The escape operation of data transmit is as follows:

Table 7-2 The escape operation of data transmit

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

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.
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