CR225 User Manual

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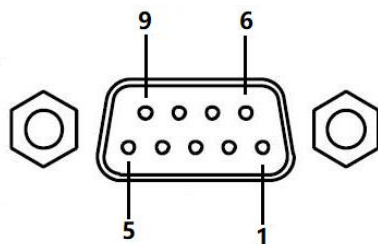
1 Product Introduction

The CR225 converter has two user interfaces. One is CAN-bus interface and the other is RS-232/485/422 interface. Its interface pins are defined as follows.

1.1 RS-232 interface pin definition

RS-232 port is a standard DB9 socket, and pin definition conforms to RS-232 specification. A three-wire connection is used here, as shown below.

Schematic diagram of DB9 pin

Pin definition table

Pin number	Pin name	Pin meaning
1	------	Null
2	TXD	Data sender
3	RXD	Data receiver
4	-------	Null
5	GND	Signal ground
6	-------	Null
7	-------	Null
8	-------	Null
9	-------	Null

1.2 Terminal connector definition

Pin signal definition table of socket

Pin number	Pin name	Pin meaning
1	CAN_L	CANL signal connection
2	CAN_H	CANH signal connection
3	NC	Null

Pin number	Pin name	Pin meaning
4	GND	Ground
5	RS485A	Differential positive level RS485A
6	RS485B	Differential negative level RS485B
7	RS422A	Differential positive level RS422-T+
8	RS422B	Differential negative level RS422-T-
9	PWR-	Negative power supply (with anti-reverse connection function)
10	PWR+	Positive power supply (with anti-reverse connection function)

Note: When the converter is used as the CAN-bus network terminal, 120 ohm resistors (accessories) need to be connected (in parallel) between pins 1 and 2 .

1.3   Signal light

Indicator light status indicator table

Indicator light	Color	Function	Describe
POWER	Red	Power indicator	The light indicates that the power supply is working normally
COM	Yellow	RS-232/485/422 communication status indication	The flashing light indicates that the serial port side is transmitting data
CAN	Yellow	CAN communication status indication	The flashing light indicates that the CAN side is transmitting data

The "POWER" indicator lights up immediately after normal power-up.

The "COM" LED and the "CAN" LED are turned off when the converter is energized.

When there is data transmission on the serial port side, "COM"LED flashes.

When there is data transmission on the CAN side, the "CAN" LED flashes and goes off when there is no data.

In case of CAN bus communication error, the "CAN" LED will always be on.

2   Parameter configuration description

Because there are many communication parameters of CAN-bus bus and RS-232/485/422 serial port, the CR225 converter also opens most of the parameters, which can be set by users to meet the needs of practical applications. CR225 converter configuration, including converter conversion mode, serial port parameters and CAN-bus parameters, etc. Parameters are configured by special configuration software, without hardware jumper configuration.

Note: Before starting to use, it is necessary to configure parameters through RS232, and then access the system.
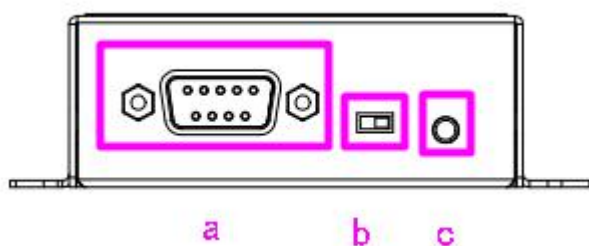
2.1   Configuration switch

In order to make the converter enter the configuration mode, there is a special configuration switch,When the LED lights up, the system will be configured. Then open the configuration software of the upper computer, select the corresponding serial port number, and click "Connect Device" to set the parameters.

Note: status indication

When the light is always on, the device enters configuration mode.

When the light flashes, the device enters normal configuration mode.


Side view of equipment

Note: A: RS232 interface

B: Switch button between configuration mode and normal operation mode

C: Indicator light

2.2   Parameter description

The configuration software interface of CR225 converter is shown in the following figure.

After the converter enters the configuration mode, the parameters can be set by the software, otherwise the software will prompt that it cannot be connected. After setting the parameters, click "Write Config" to write the parameters into the device for solidification. The meanings of the main configuration parameters are described in detail with reference to the configuration software.
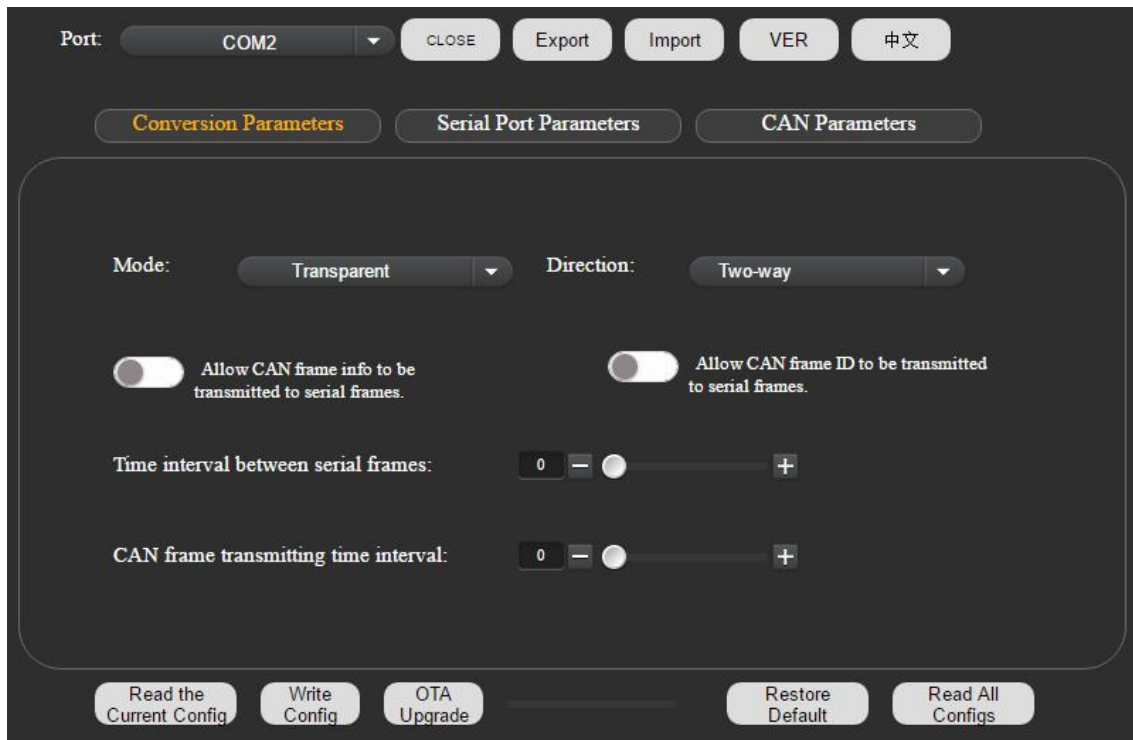
Configure software interface

2.2.1 Conversion parameters

[Conversion mode] There are four conversion modes to choose from:

- Transparent conversion

- Transparent conversion with Logo

- Format conversion

- Modbus mode

[Change direction]

- Two-way

- The converter converts the data from serial bus to CAN bus, and also converts the data from CAN bus to serial bus.

- Serial port to CAN only

- Only the data of serial bus is converted to CAN bus, and the data of CAN bus is not converted to serial bus.

- CAN to serial port only

- Only the data of CAN bus is converted to serial bus, and the data of serial bus is not converted to CAN bus.

[Allow CAN frame information to be forwarded to serial frame]

This parameter is only used in "transparent conversion" mode.

When this parameter is selected, the frame information of CAN message will be added to the first byte of serial frame when the converter works. When unselected will does not convert CAN frame information.

[Allow CAN frame identification to be forwarded to serial frame]

This parameter is only used in "transparent conversion" mode,When this is selected, the frame ID of CAN message will be added before the frame data and after the frame information of serial frames when the converter works (if frame information conversion is allowed). When unselected will does not convert the CAN frame ID.

[Position of CAN frame identifier in serial frame]

This parameter is only used in "Transparent conversion with Logo" mode.

When serial port data is converted into CAN message, the start byte of CAN message frame ID is in the offset address of serial frame and the length of frame ID. The length of frame ID CAN be filled with 1-2 bytes in standard frame, corresponding to ID1 and ID2 of CAN message respectively, and 1-4 bytes ID1, ID2, ID3 and ID4 can be filled in extended frame.

The standard frame ID is 11 bits, and the extended frame ID is 29 bits.

[The time interval between serial frames is the time of X characters]

Only used in "Transparent conversion with Logo" mode.

The minimum time interval between two serial frames when the user sends serial frames to the converter, which takes "the time of transmitting a single character" as the unit. Here, the time set to 2~10 characters is optional.

The actual time interval of user frames must be consistent with the setting (the frame interval time sent by users had better over the setting time), otherwise, the conversion of frames may be incomplete.

The meaning of "time to transmit a single character" is: the time required for serial port to transmit a character (10 bits) at the corresponding baud rate, that is, divide 10 by the corresponding baud rate. For example, at the baud rate of 9600bps, the "serial frame time interval character number" is 4, and the "transmission time of a single character (10 bits per character)" is (10/9600) s,The actual time interval between serial frames is (10/9600) * 4 = 4.17 (ms), that is, the time interval between two serial frames is at least 4.17ms.

2.2.2 Serial port parameters

[Baud rate]

The baud rate of serial port can be selected from 600 bps to 230400 bps.

[Data bit]

Optional between 5~8 bits.

[Stop bit]

1 and 2 bits are optional.

[Parity check]

There are five options: no check, even check, odd check, forced to 0 and forced to 1 .

[Mode switching]

RS232 mode, RS485 mode and RS422 mode can be selected.

2.2.3 CAN parameter

[Baud rate]

Besides the standard baud rate recommended by CIA in the list (sampling point 75 ~ 83.5%, SJW = 2, 3), there is also a "custom option",If you need to customize it, please contact us or refer to the baud rate calculation software.

[Frame type]

The frame type of CAN message during conversion can be selected from standard frame and extended frame.

[Filter]

Multiple filtering modes can be set. CR225 has the ability of hardware to perform acceptance filtering, so that selective reception can minimize the network load from the network. When setting the acceptance filter, switch to the filter setting tab, and check the "Enable Filter" option to enable the acceptance filter function. CR225 configures the storage space for acceptance filtering to be 2KB, and the storage space occupied by various ID resources cannot exceed this value. The resources and quantities occupied by various ID types are listed in the following table.

ID type	Occupied resources (Byte)
Standard frame single ID filtering	2
Standard frame group ID filtering	4
Extended frame single ID filtering	4
Extended frame group ID filtering	8

Example: If the acceptance standard frame ID is 0x08 and 0x12, and the extension frame group ID is 0x55 to 0x66, the following configuration is required, as shown in the following figure.
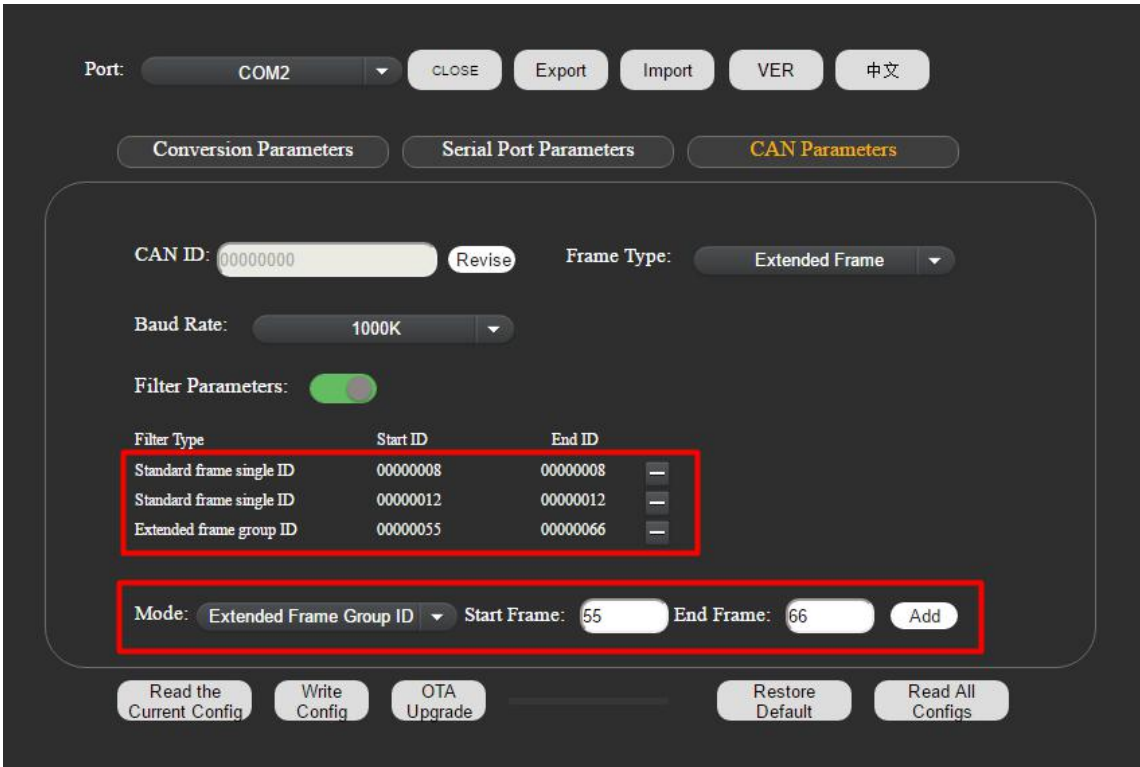
Setting of filter parameters

3 Introduction to Conversion

CR225 converter is an intelligent protocol converter. The converter provides four conversion modes to choose from, including:

- Transparent conversion

- Transparent conversion with Logo

- Format conversion

- Modbus conversion

3.1 Transparent conversion

The meaning of transparent conversion is that the converter only converts the bus data of one format into the data format of another bus without attaching or modifying the data. In this way, the data format is exchanged without changing the data content, and the converter is as transparent as the bus at both ends.

In this way, the communication burden of users will not be increased, but the data can be converted as it is in real time, and the transmission of data with large flow can be undertaken.

In transparent conversion mode, the converter receives the data from one bus and immediately converts it and sends it to the other bus. So in a data stream way to deal with, which maximizes the speed of the converter and improves the utilization rate of the buffer, because the converter is also converting and sending while receiving, and the buffer that can be received is vacated.

Figure 1 Transparent conversion mode

3.2 Instructions and conversion demonstration

3.2.1 Serial frame to CAN message

All the data of the serial frame are sequentially filled into the data field of the CAN message frame. As soon as the converter detects that there is data on the serial bus, it immediately receives and converts it.

The frame information (frame type part) and frame ID of the converted CAN message come from the user's prior configuration, and the frame type and frame ID remain the same during the conversion process. The corresponding format of data conversion is shown in Figure 1 .

If the received serial frame length is less than or equal to 8 bytes, characters 1 to n(n is the serial frame length) are sequentially filled into 1 to n byte positions of the data field of the CAN message (as shown in Figure 2, n is 7).

Figure 2 Serial frame length is less than or equal to 8 bytes

If the number of bytes in the serial frame is more than 8, the processor takes 8 characters from the first character of the serial frame and fills them into the data field of CAN message in turn for the first time. The remaining serial frame data is filled into the data field of the second frame CAN message until the data is converted.

Figure 3 Serial length is greater than 8 bytes

3.2.2 CAN message to serial frame

For CAN bus messages, one frame is forwarded as soon as it received.

During conversion, all data in the data domain of CAN message are sequentially converted into serial frames. If Allow "CAN frame information to be forwarded to serial frame" and "Allow CAN frame identification to be forwarded to serial frame" are not checked, only data will be converted.
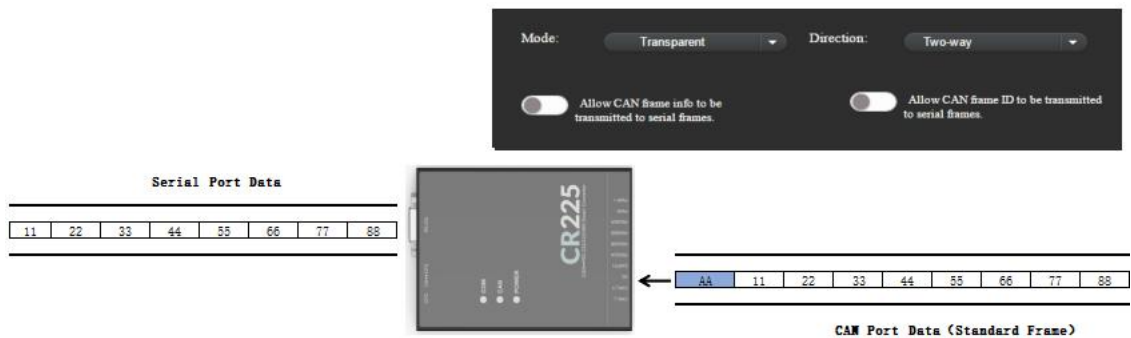

Figure 4 CAN message to serial frame

If "Allow CAN frame information to be forwarded to serial frame" is checked during configuration, the converter will fill the frame information of CAN message into the first byte of serial frame.
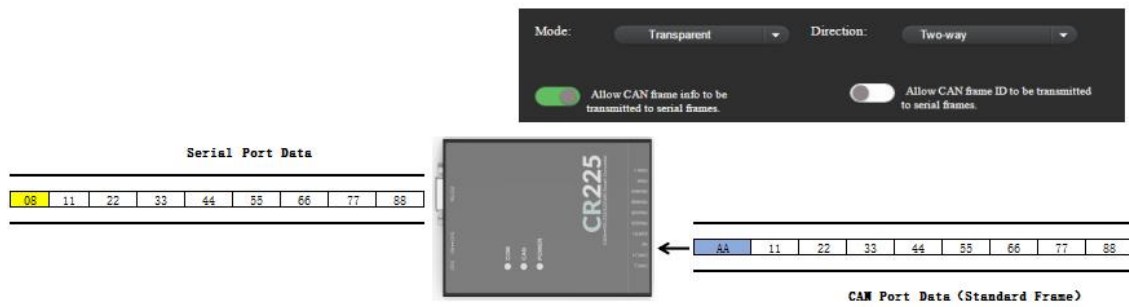
Figure 5 allows CAN frame identification to be forwarded to serial frames

For example:

- If the CAN frame is 8 bytes of standard frame data, the first byte of serial port is 08;

- If CAN frame is standard frame with 6 bytes of data, the first byte of serial port is 06;

- If the CAN frame is 8 bytes of extended frame data, the first byte of serial port is 88;

- If the CAN frame is 6 bytes of extended frame data, the first byte of serial port is 86;

If "Allow CAN frame ID to be forwarded to serial frame" is checked, the frame ID of CAN message will also be filled into serial frame, with standard frame ID occupying 2 bytes and extended frame ID occupying 4 bytes.
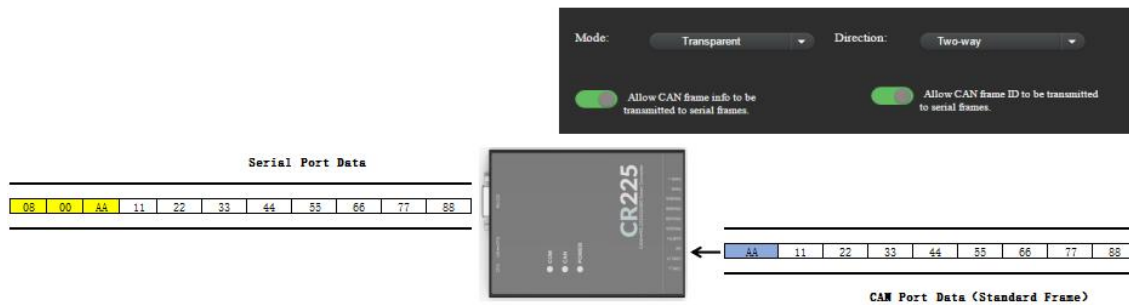

Figure 6 allows CAN frame identification to be forwarded to serial frames

For example, assume that the CAN message ID is AA and the data is 11 22 33 44 55 66 77 88:

- If the CAN frame is a standard frame, the serial port message is **00 AA** 11 22 33 44 55 66 77 88;

- If the CAN frame is an extended frame, the serial message is **00 00 00 AA** 11 22 33 44 55 66 77 88；

3.3 Transparent conversion with Logo

Transparent conversion with Logo is a special use of transparent conversion, and no protocol is attached. This conversion mode is based on the common characteristics of common serial frames and CAN messages, which which makes the two different Bus types can easily establish the same communication network.

In this way, the "address" in the serial frame CAN be converted into the identification field of the CAN message, in which the starting position and length of the serial frame "address" can be configured, so in this way, the converter can adapt to the user-defined protocol to the maximum extent.

Transparent conversion with Logo is a special use of transparent conversion, which is beneficial for users to set up their own network and use their own application protocols more conveniently through the

converter. In this way, the address information in the serial frame is automatically converted into the frame ID of CAN bus. As long as the converter is told in the configuration that the address is at the starting position and length of the serial frame, the converter extracts this frame ID and fills it in the frame ID field of the CAN message as the ID of the CAN message when forwarding the serial frame. When the CAN message is converted into a serial frame, the ID of the CAN message is also converted into the corresponding position of the serial frame.

Note that in this conversion mode, "CAN ID" in the "CAN Parameter" item of the configuration software is invalid, because the identifier (frame ID) sent at this time is filled with the data in the above serial frame.

In this mode, the key lies in the subcontracting of serial port messages. Complete serial data frames must be obtained when converting with identification, and the time interval between two frames is taken as the frame division by the converter. And the interval can be set by the user. The maximum length of serial frame is the length of buffer: 2048 bytes.

The frame format of CAN frame is set by [CAN parameter]-[frame type] on the configuration page.

The first data detected by the converter in the idle state of the serial bus is used as the first character of the received frame. The time interval between characters in the frame during transmission must be less than or equal to the configured serial port frame interval, as shown in Figure 1 .
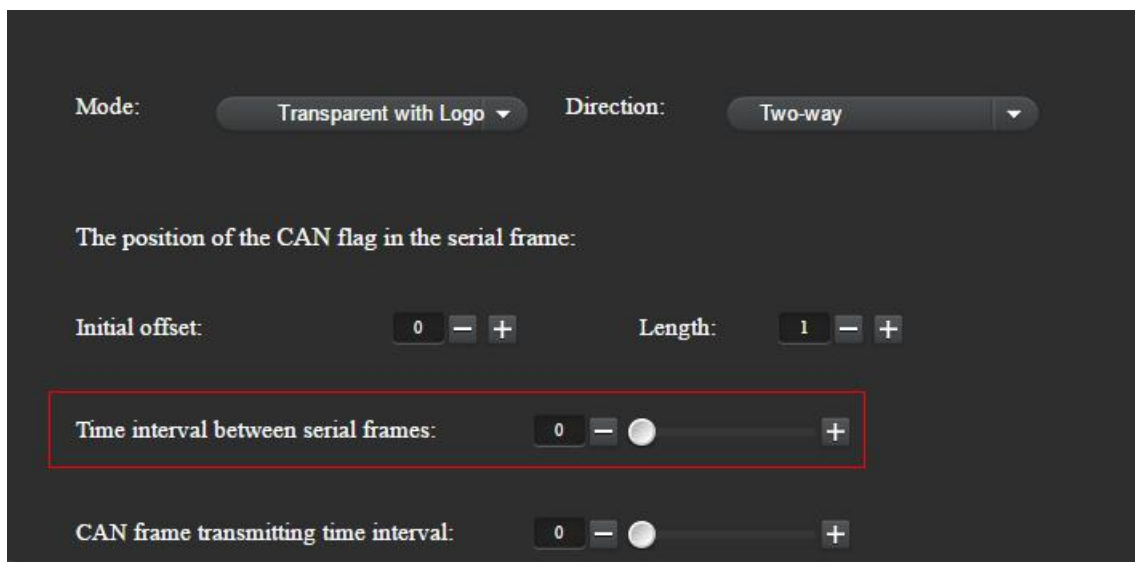

Figure 1 Transparent conversion with Logo parameter setting

If no character is received within the transmission time of [Time Interval between serial frames] after the converter receives a character, the transmission of this frame ends, and this character is taken as the last character of this frame.

3.4   Instructions and conversion demonstration

3.4.1 Serial frame to CAN message

The starting offset and length of the CAN identifiercarried in the serial frame CAN be set by configuration. The starting offset range is 0 ~ 7, and the length range is 1 ~ 2 (standard frame range: 0~7FF) or 1 ~ 4 (extended frame range: 0~1FFFFFFF).

During conversion, all CAN frame ID correspondences in serial frames are converted into the frame ID field of CAN message according to the prior configuration (if the number of frame ID is less than the number of frame ID in CAN message, the lower byte of frame ID in CAN message is filled with 0), and other data are converted in sequence, as shown in Figure 2.
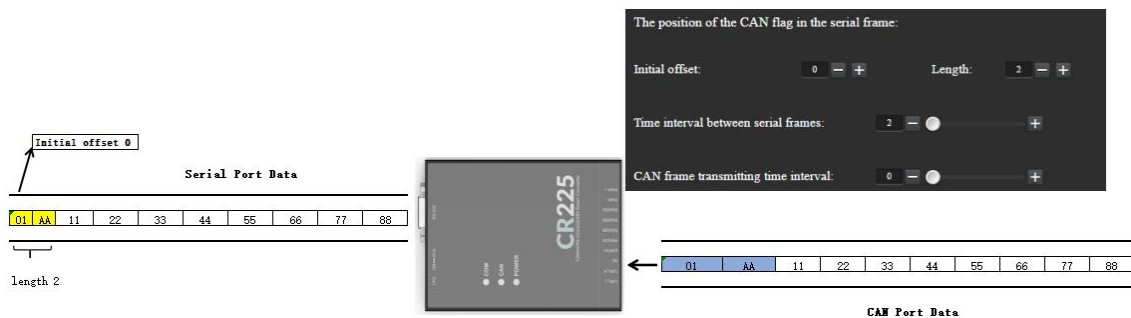

Figure 2 Serial frame to CAN message (Transparent conversion with Logo)

If the serial frame data is not converted in one frame of CAN message, the same ID is used as the ID of the second frame of CAN message to continue the conversion, as shown in Figure 3 .
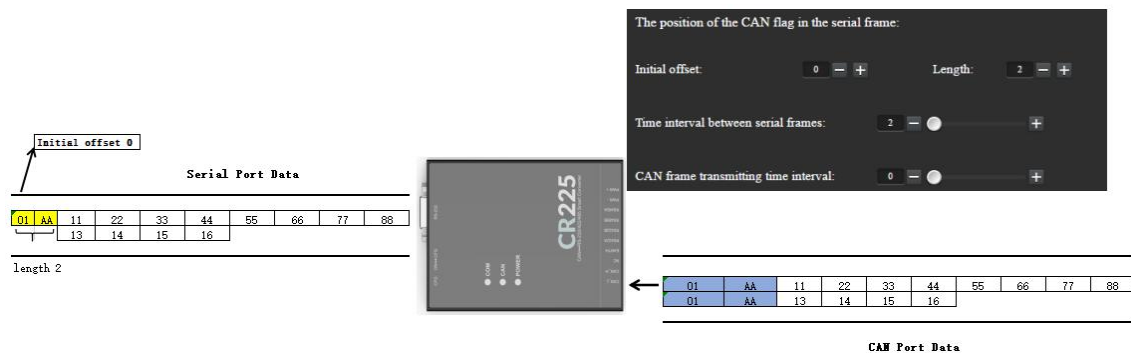

Figure 3 Serial frame too long transition

3.4.2 CAN message to serial frame

For CAN messages, one frame is forwarded immediately after receiving one frame, and the ID in the received CAN message is converted according to the position and length of the pre-configured CAN frame ID in the serial frame every time. Other data are forwarded in sequence, as shown in Figure 4.7 .

It is worth noting that CAN messages, whether they are standard frames or extended frames, will be converted according to the set length.

> Eg. the stated length is 2:
>
> CAN extended frame, ID: 11 AA, data: 11 22 33 44 55 66 77 88
>
> Serial port frame: **11 AA** 11 22 33 44 55 66 77 88
>
> CAN extended frame, ID: 11 22 AA, data: 11 22 33 44 55 66 77 88
>
> Serial port frame: **22 AA** 11 22 33 44 55 66 77 88

3.5 Format conversion

Format conversion is the simplest usage mode, the data format is 13 bytes, that is, the fixed 13 bytes of serial frame data correspond to a CAN message, and the 13 bytes include CAN information+ID+data. By correctly configuring frame information (the first byte of data), standard frames, extended frames and even remote frames can be flexibly sent out. The details of standard frames, extended frames and even remote frames can be obtained by correctly parsing 13-byte serial frames.

CR225 data conversion format, as shown in fig,1, each CAN frame contains 13 bytes, which include CAN information+ID+data.

> Note that in this conversion mode, [CAN ID] and [Frame Type] under the configuration software [CAN Parameters] page are invalid, because the identifier (frame ID) and frame type sent now will be filled with the above 13-byte serial frame.

In this mode, attention should be paid to strictly following the serial data format of 13 bytes,Each frame is fixed with 13 bytes,If it is insufficient, it must be filled with 0 .
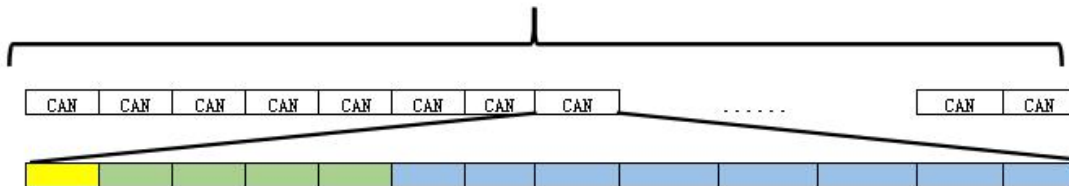
Note:

A can data frame contains 13 bytes.

①Yellow box indicates frame information: 1 byte in length, which is used to identify some information of the can frame, such as type and length.

FF: Identification of standard frame and extension frame, where 1 is extension frame and 0 is standard frame.

RTR: Identification of remote frame and data frame, where 1 is remote frame and 0 is data frame.

The reserved value is 0, and the non-writable value is 1 .

D3~D0: Identify the data length of the CAN frame.

② The green box indicates the frame ID: 4 bytes in length, 11 bits in the standard frame and 29 bits in the extended frame.

The following example is an extended data frame with ID 0x12345678, which contains 8 bytes of data (11h, 22h, 33h, 44h, 55h, 66h, 77h, 88h)

The following example is a standard data frame with ID 0x3ff, which contains 6 bytes of data (11h, 22h, 33h, 44h, 55h, 66h)

| 06h | 00h | 00h | 03h | FFh | 11h | 22h | 33h | 44h | 55h | 66h | 00h | 00h |

3.6 Modbus conversion

Modbus conversion means to convert UART data and CAN data of Modbus protocol.

Modbus protocol is a standard application layer protocol, which is widely used in various industrial control occasions. The protocol is open, real-time, and has a good communication verification mechanism, which is very suitable for occasions with high communication reliability requirements. The converter uses the standard Modbus RTU protocol format on the serial port side, so the converter not only supports users to use Modbus RTU protocol, but also can directly interface with other devices supporting Modbus RTU protocol.

In the CAN side, an easy-to-use segmented communication format is developed to realize Modbus communication. The converter still plays the role of protocol verification and forwarding, and supports the transmission of Modbus protocol, instead of Modbus master or slave,Users can communicate according to Modbus protocol.

Modbus conversion function CAN only be used when CAN bus device messages can be edited.

On the CAN side, an easy-to-use segmented communication format is developed to realize Modbus communication. The converter still plays the role of protocol verification and forwarding, and supports the transmission of Modbus protocol, instead of Modbus master or slave,Users can communicate according to Modbus protocol.

Note:

In this conversion mode, [CAN ID] of [can parameter] of configuration software is invalid, because the identifier (frame ID) sent at this time is filled by the address field (node ID) in Modbus RTU serial frame.

3.7 Frame format

3.7.1 Serial frame (Modbus RTU)

Serial frame Modbus RTU transmission format is 1 start bit, 8 data bits and 1 stop bit. The maximum frame length is buffer length: 2048 bytes.

3.7.2 CAN frame

The CAN terminal is implemented by a segmentation protocol, which defines a method for segmenting and recombining information with a length greater than 8 bytes, as shown in Figure 1 below.
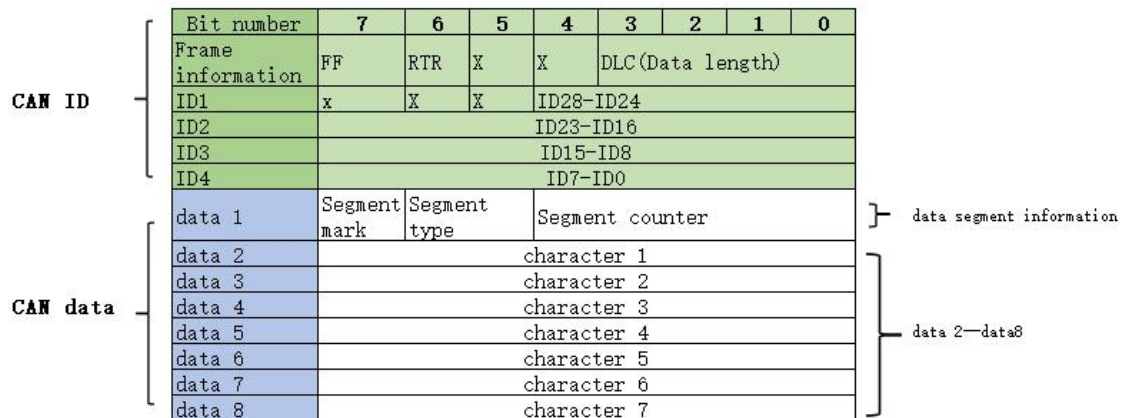
Figure 1 Implementation of CAN message segmentation protocol

The transmitted Modbus protocol content can start from "Data 2" byte. If the protocol content is larger than 7 bytes, the remaining protocol content will continue to be converted according to this segmented format until the conversion is completed.

One byte (8 bit) of segment control information of Data1:

- **Segment message marker (bit7)**

- Indicates whether the message is a segmented message. This bit is 0 for a single message, and 1 for a frame belonging to the segmented message.

- **Segment type (bit6, bit5)**

- Used to distinguish Modbus frames, in which Modbus frames are segmented, and their values are defined as shown in Table 1:

Table 1 Segment type bit value

Bit value (Bit6, Bit5)	meaning	instruction
00	The first segment	If the segment counter contains a value of 0, then this is the first segment in the segmentation series
01	The middle section	Indicates that this is an intermediate segment, and there can be multiple intermediate segments
10	The last section	Mark the last segment

- **Segment counter (bit4-bit0)**

Used to distinguish the serial number of segments in Modbus message of the same frame, which can verify whether the segments of the same frame are complete.

3.8   Conversion demo

Figure 2 Modbus conversion example

- The address field (Modbus node ID) of Modbus RTU message is converted into the ID of CAN message.

    (Extended or standard frame, set under configuration software [CAN parameter]-[frame type]).

- Function code and data field, converted to data 2 ~ data 7 of CAN message.

- CRC check bytes are not converted into CAN messages, and there is no need for serial frame check bytes in CAN messages, because CAN bus itself has a good verification mechanism.

"Data 1" of each CAN message is used to fill in segmentation information (0x81, 0xC2), which is not converted into Modbus RTU frame, but only used as frame format to confirm frame information.
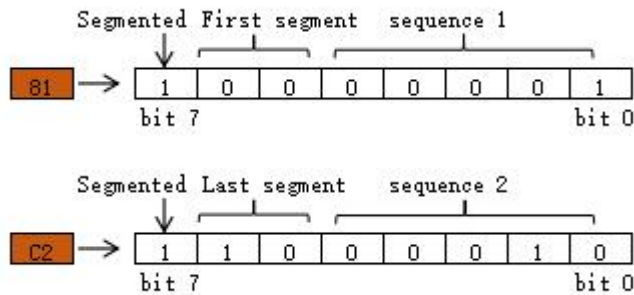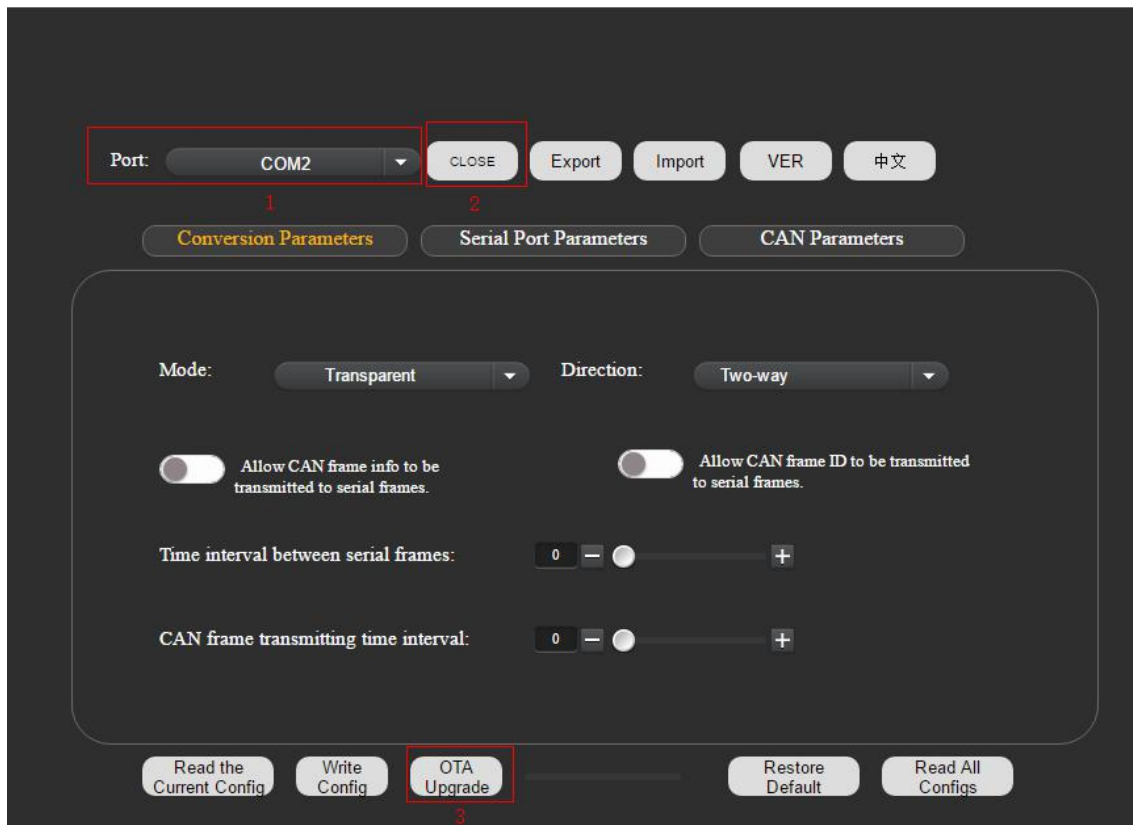

Figure 3 significance of 1 byte control of can message data
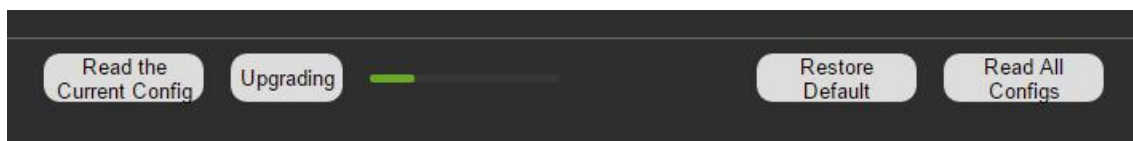
3.9   Firmware upgrade

Upgrade file: ST _ firmware _ OTA _ cc _ v1.1.6-c.bin (software package)

4 Upgrade Steps

Upgrade configuration diagram

1: Select the serial port number connected with PC

2: Start connection

3: Select the local location of the firmware file, and then double-click the file to upgrade the firmware immediately. The specific upgrade diagram is shown below.

Upgrading schematic diagram

Note: Please do not power off the machine during this process.