IT-232-CAN

Interface Converter

User Manual

Statement

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Revision History

Version No.	Date	Reason
V1.0.0	2016-02	Creating Documents

Notes

In reading this manual, please pay attention to the following symbols,

：Information necessary to explain.

：Special attention.

Content

Chapter 1 Summarize

1.1 Introduction

IT-232-CAN is used for data exchange between CAN-Bus field bus and RS-232 bus interface converter, and supports Modbus RTU protocol. IT-232-CAN interface converter integrated a RS-232 channel and a CAN-Bus channel can be easily embedded using RS-232 interface for communication nodes, do not need to change the original hardware architecture enables the device to obtain the CAN-Bus communication interface, to achieve between the equipments of RS-232 and CAN-Bus network connection and data communication. RS-232 channel IT-232-CAN devices to support a variety of baud rate, the range is 300bps~115200bps. CAN-Bus channel support CiA recommended a variety of standard baud rate and user-defined baud rate, the range of 2.5Kbps~1Mbps. IT-232-CAN interface converter provides three types of data conversion: transparent conversion, encryption conversion and Modbus protocol conversion.

Its exterior design supports DIN-Rail mounting and Wall mounting, which is convenient for engineering application. The board comes with a photoelectric isolation module, complete electrical isolation control circuit and CAN-Bus communication circuit, so that the IT-232-CAN converter has a strong anti-interference ability, greatly improving the system in the harsh environment of the use of reliability.

1.2 Product Features

- Support CAN 2.0A and CAN 2.0B protocol, in compliance with the ISO/DIS 11898 specification
- Bidirectional data communication between CAN-Bus and RS-232
- Integrated 1 CAN-Bus communication interface, support for user-defined baud rate
- Integrated 1 RS-232 three pins type communication interface, communication rate between 300~115200bps can be set
- Provide three kinds of data conversion modes: transparent conversion, transparent with the identity conversion, Modbus protocol conversion
- CAN-Bus circuit using 2000V AC electrical isolation, support 8KV electrostatic protection (air discharge)
- CAN-Bus baud rate 2.5k~1Mbps
- Maximum frame rate: 500 frames per second
- DC9~48V wide voltage supply input, power supply support reverse connection
- IP40 protection grade, DIN-Rail or wall mounting installation
- -40-75℃ working temperature

1.3 Specification

Serial Interface

Standard: RS-232

RS-232 signal: RXD, TXD, GND

Parity bit: None, Even, Odd, Space, Mark

Data bit: 8bit

Stop bit: 1bit, 2bit

Band rate: 300bps～115200bps

Loading: point to point

Transfer distance: no more than 15m

Connector: DB9 Female

CAN-Bus Interface

Standard: CAN2.0A, CAN2.0B

CAN-Bus signal: CANL, CANH, GND, RES+, RES-

Band rate: 2.5K～1Mbps

Transfer distance: 40m~10Km

Power supply

Input voltage: 9~48VDC

Type of input: 2 bits terminal block

No-load consumption: .0.86W@9VDC

Full-load consumption: 0.89W@9VDC

Power support reverse connection

Working environment

Working temperature: -40～75℃

Storage temperature: -40～85℃

Relative Humidity: 5%~95% (no condensation)

Mechanical Structure

Shell: IP40 protect grade, metal shell

Installation: DIN-Rail or Wall mounting

Weight: 238g

Size (W×H×D): 69mm×22mm×100mm

Industry Standard

EMI: FCC Part 15, CISPR (EN55022) class A

EMS: EN61000-4-2 (ESD), Level 3

Shock: IEC 60068-2-27

Free fall: IEC 60068-2-32

Vibration: IEC 60068-2-6

Certification

CE, FCC, RoHS, UL508 (Pending)

Warranty: 3 years

Chapter 2 Hardware Description

2.1 Interface Description
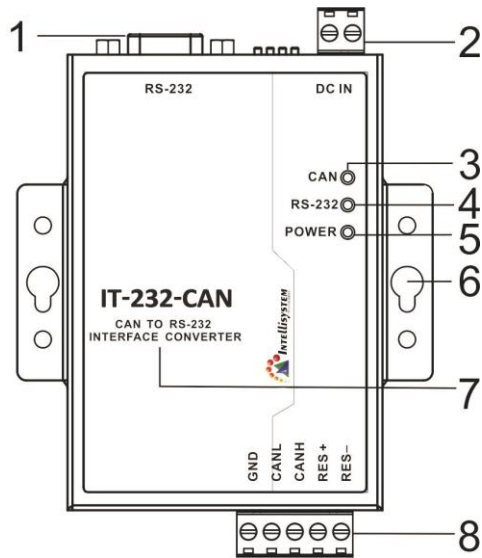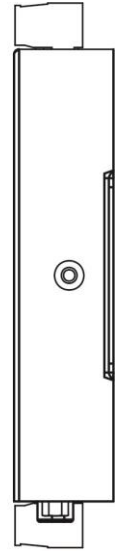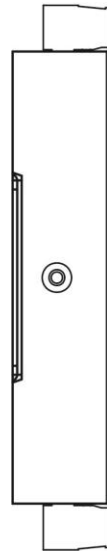
Top view   Side view
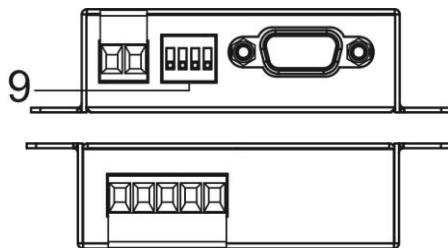
Front and Rear view

1. RS-232 Serial port (DB9F)

2. Power input terminal block

3. CAN-Bus Link/ACT LED

4. Serial port transmits and receives data LED

5. Power indicator

6. Wallmount screw hole

7. Equipment information

8. CAN port terminal block

9. DIP switch

2.2 Interface Description

2.2.1 Power Input
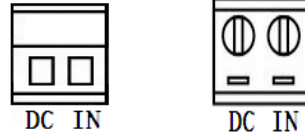
IT-232-CAN interface converter provide DC power input, voltage input is the two terminal form, plug type 2 core spacing of 5.08mm terminals, wherein the power input range of 9 ~ 48VDC. The power support is not polarity that the device can still work normally after the reverse.

2.2.2 Communication Interface

CAN-Bus interface

| NO.	Name	Define
1	GND	Protective Ground
2	CANL	CANL Signal Line
3	CANH	CANH Signal Line
4	RES+	External Terminal Resistor (+)
5	RES-	External Terminal Resistor (-)

CAN terminals
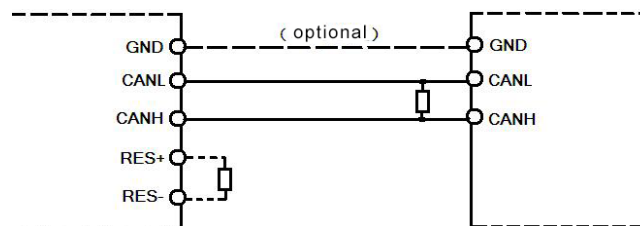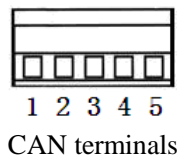
While IT-232-CAN device connects with the CAN-Bus network via twisted pair, CANL connects with CANL, CANH connects with CANH. According to the ISO11898 standard, to reduce signal reflections on the CAN-Bus and enhance the reliability of communication, terminal matching resistor is usually added to 2 endpoints of the bus. The size of terminal matching resistor is decided by the characteristic impedance of cable transmission, such as twisted pair's characteristic impedance is 120Ω, the 2 endpoints on the bus should be connected 120Ω terminating resistor. IT-232-CAN can set external terminating resistor, when the device is connected with the CAN-Bus network via a twisted pair, only use resistor to short circuit between the twisted pair ports RES+ and RES- to achieve terminal resistor accession, as shown below.
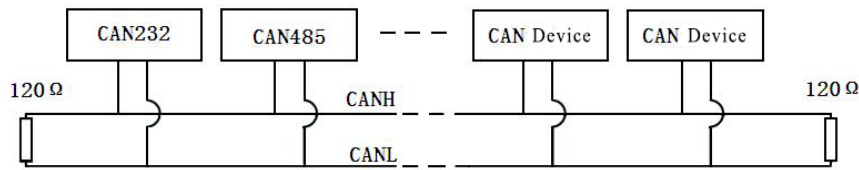
When the IT-232-CAN converter is used as the CAN-Bus network terminal, the two pin is connected to a resistance of 120Ω, otherwise no need to install a 120Ω resistor.

Serial port connection

RS-232 side is DB9 Female. The 3-PIN definition is as follows:

DB9 Female
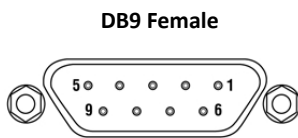
PIN	RS-232	
1	—	—
2	TxD	Transmit
3	RxD	Received
4	—	—
5	GND	Signal
6/7/8/9	—	—

2.3 LED Indicator

LED indictor light on the top panel of product, the function of each LED is described in the table as below.

System statue LED		
LED	Indicate	Description
PWR	ON	Power is connected/Function natural
	OFF	Power is disconnected or function nu-natural
CAN	ON	CAN-Bus port connect successfully
	Flashing	CAN-Bus port has data transmission
	OFF	CAN-Bus port connect unsuccessfully
RS-232	ON	Serial port connect successfully
	Flashing	In transmitting/ receiving data
	OFF	None data receive/ transmit

2.4 DIP Switch

The converter front panel provide 4 bit DIP switch to set function (ON is effective). 1 and 4 keep for future function. 2 is for configuration mode settings. 3 is recovery default factory. Please power off and power on when you change the status of DIP switch.

2.5 Device installation

Before installation, confirm that the work environment meet the installation require, including the power needs and abundant space.

1. Avoid in the sunshine, keep away from the heat fountainhead or the area where in intense EMI.

2. Examine the cables and plugs that installation requirements.

3. Screws, nuts, tools need to be prepared in advance of your own.

4. Power requirements: 9~48VDC

5. Environments: Working temperature: -40～75℃ - Working humidity: 5%～95%

6. Support wall or DIN-Rail mounted

Wiring Requirements

Cable laying need to meet the following requirements:

1. It is needed to check whether the type, quantity and specification of cable match the requirement before cable lying.

2. It is needed to check the cable is damaged or not, factory records and quality assurance booklet before cable lying.

3. The required cable specification, quantity, direction and laying position need to match construction requirements, and cable length depends on actual position.

4. All the cable cannot have break-down and terminal in the middle.

5. Cables should be straight in the hallways and turning.

6. Cable should be straight in the groove, and cannot beyond the groove in case of holding back the inlet and outlet holes. Cables should be banded and fixed when they are out of the groove.

7. User cable should be separated from the power lines. Cables, power lines and grounding lines cannot be overlapped and mixed when they are in the same groove road. When cable is too long, it cannot hold down other cable, but structure in the middle of alignment rack.

8. Pigtail cannot be tied and swerved as less as possible. Swerving radius cannot be too small (small swerving causes terrible loss of link). Its banding should be moderate, not too tight, and should be separated from other cables.

9. It should have corresponding simple signal at both sides of the cable for maintaining.

Chapter 3 Appearance and Dimension

Appearance:
IT-232-CAN

Dimension （Unit: mm）
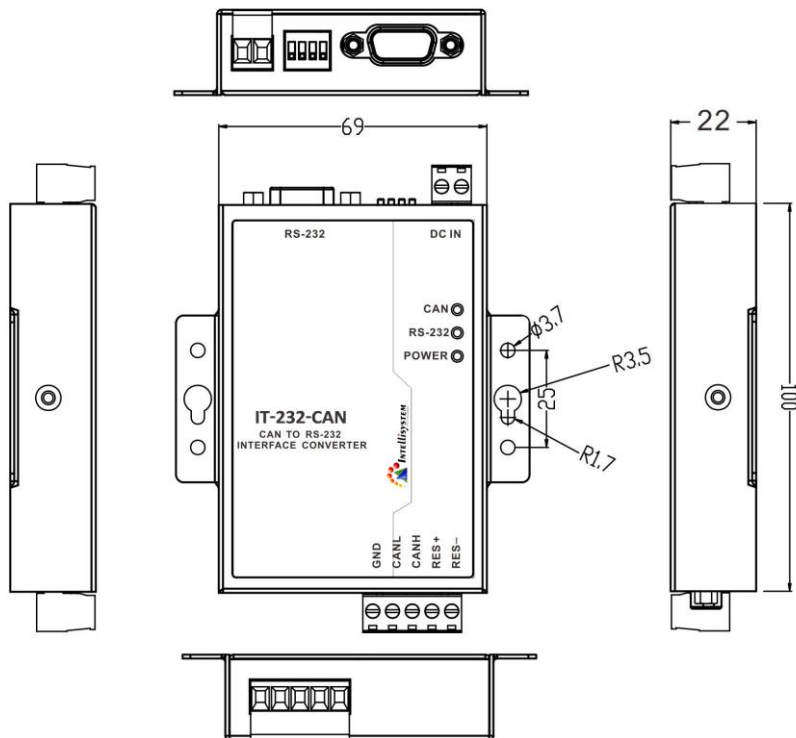
Chapter 4 Packing List

The first time use this product, please check the packaging is intact or not and the attachment is complete or not at first.

Item	Quality
Interface Converter	1pcs
User manual	1pcs
Documentation and software CD	1pcs
Warranty card	1pcs
Terminal resistance 120Ω	1pcs

Chapter 5 Overview of Product Configuration

IT-232-CAN converter configuration, including converter conversion, serial port and CAN-Bus parameters etc... Parameter configuration is done through special configuration software without hardware configuration. In normal before use and need to pre configured IT-232-CAN converter conversion parameters. If there is no configuration, then IT-232-CAN converter will use the default parameters.

5.1 Product configuration

In order to make the converter enter configuration mode, with a special configuration of the DIP switch that RS-232 interface side of the DIP switch pin 2. Pin 2 is allocated to ON enable end, the converter enter configuration mode. Pin 2 is allocated to number end, the converter power on into "normal operation" mode. Enter the configuration steps are as follows:

1. The converter switch pin 2 is allocated to the ON side, and then power on;
2. Connecting the converter and the computer with serial line;
3. Open the configuration software, connect the device, open the serial port, and set parameters.

5.2 Introduction of Software
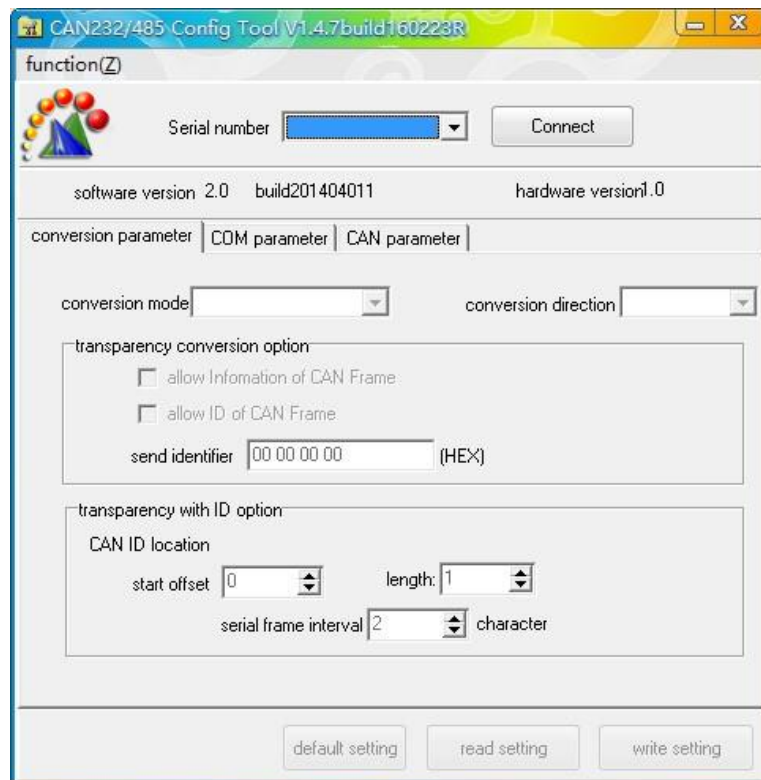
(Figure 5.2)

IT-232-CAN converter configuration software is included in the CD products. The interface of the software is shown in figure 5.2. Set the software to memory and display parameters of the IT-232-CAN converter the last

successful set (if it fails, parameter settings will not be saved), avoid the user forgetting your own configuration. The product can be used to dial the code switch to restore factory settings set.

In the converter enter configuration mode, to set the parameters in the software or software that is not connected to the converter. After choosing the conversion mode, open software parameters associated with the conversion mode, and set the parameters and not related to unavailable, avoid the error set.

5.2.1 Conversion parameter

Conversion mode

The conversion mode includes four modes can be selected: transparent, transparent tape identification conversion, Modbus protocol conversion and data conversion (the specific function of each mode see explain that the sixth chapter application).

Conversion direction

Bidirectional converter: serial bus data will be converted to the CAN-Bus, CAN-Bus data will also be converted to serial bus.

Only serial bus to CAN-Bus: only the serial bus data will be converted to the CAN bus, but CAN bus data will not be converted to serial bus.

Only CAN-Bus to serial bus: only the CAN bus data will be converted to the serial bus, but serial bus data will not be converted to CAN bus.

By change the direction of choice, can eliminate the interference of data conversion is not required on the bus.

Allow the CAN-Bus frame information forwarded to the serial frame:

This parameter is used only in the transparent conversion mode, when selected, converter work will add CAN-Bus message frame information of the first byte in the serial frame. Frame information not to convert the CAN-Bus is not selected.

Allow the CAN-Bus frame ID forwarded to the serial frame:

This parameter is used only in the transparent conversion mode, when selected, when the converter operates will add CAN-Bus frame ID information between the serial frame data and frame information (if allowed frame information conversion). CAN-Bus Frame ID is not selected when no conversion.

Send identifier

Send identification frame only in the transparent conversion mode available, said in the serial data is converted into a CAN-Bus message, CAN-Bus message frames ID value; attention in identification mode conversion is invalid, because at this time send the frame ID by the serial frame data filling.

The identifier (frame ID) is the actual CAN-Bus packet ID value (byte order from left to right for the high byte to the low byte), such as the value of "00 00 00 0A" (HEX), said the frame ID is 10.
On the effective use and also   the "frame type", if the choice of the standard frame, then frame identifier is 11 effective, then the

value range is 0 ~ 7FF (HEX), beyond the invalid, and only take low 11-bit identifier.

If the choice is "extended frame", then the frame identifier is 29 effective, then the value range is 0 ~ 1F FF FF FF (HEX), beyond the invalid, and only a low 29-bit identifier.

The position of the CAN-Bus frame ID in the serial frame:

The function only effective in the transparent tape identification parameter conversion mode. Convert the CAN-Bus message in the serial data, start byte frame ID CAN-Bus message in the serial frame offset address ID and frame length (see 6.2 transparent with mark conversion).

When the frame length of ID in the standard frame can be filled with 1 to 2 bytes, respectively corresponding to the CAN-Bus message ID1, ID2. When the extended frame can be filled with 1 to 4 bytes of ID1, ID2, ID3 and ID4. The standard frame when ID is 11, expressed as ID1.2 ~ ID1.0 and ID2.7 ~ ID2.0 and ID2.7 ~ ID2.3; ID2.7～ID2.3 keep unused (filled with 0). The corresponding relation table as follows:

Frame ID format	ID1.7～ID1.3	ID1.2～ID1.0	ID2.7～ID2.0
The actual value of ID frame	Retain（00000）	ID.10～ID.08	ID.07～ID.00

Extended frame ID 29, the ID1 of the high 3 bits reserved unused (with 0 filling). The corresponding relation table as follows:

Frame ID format	ID1.7～ID1.5	ID1.4～ID1.0	ID2.7～ID2.0	ID3.7～ID3.0	ID4.7～ID4.0
The actual value of ID frame	Retain（000）	ID.28～ID.24	ID.23～ID.16	ID.15～ID.08	ID.07～ID.00

The time interval between the serial frames as a character of the time:

Only in the transparent identification conversion mode. When the user to send the serial converter frame, the time interval between two serial frames, the time interval to send a single character as the unit of time. Here you can set the 2~10 character of the optional time.

The serial number of characters frame interval can be set only with the identity transformation mode. The actual time interval must be set and frame the user consistent, otherwise it may lead to the incomplete conversion frame. The time significance of transferring a single character is: under the corresponding baud rate, serial ports to send a character (10 bit) need time by 10 divided by the corresponding baud rate.

For example: at 9600 baud rate, serial frame interval number of characters for 4, transmit a single character (10 bit per character) is (10/9600) s and the actual time interval between the serial frames are obtained: (10/9600) X4 = 4.17 (ms), namely the time interval between two serial frames at least 4.17ms.

Contains the CAN-Bus frame information:

This parameter is used only in the data conversion mode, when selected, when the converter operates will frame serial frame first byte will add CAN-Bus message. If not selected then the converter does not convert CAN-Bus frame information.

Contains the CAN-Bus frame ID:

This parameter is used only in the transparent conversion mode, when selected, when the converter operates will add CAN-Bus frame ID information between the serial frame data and frame information (if allowed frame information conversion). Frame ID of CAN-Bus is not selected when no conversion.

Send frame:

This parameter only in the data conversion mode can be converted into CAN-Bus, said the message in the serial data frame, the identification of domain CAN-Bus message (frame ID) value (16 hexadecimal data).

5.2.2 COM parameter
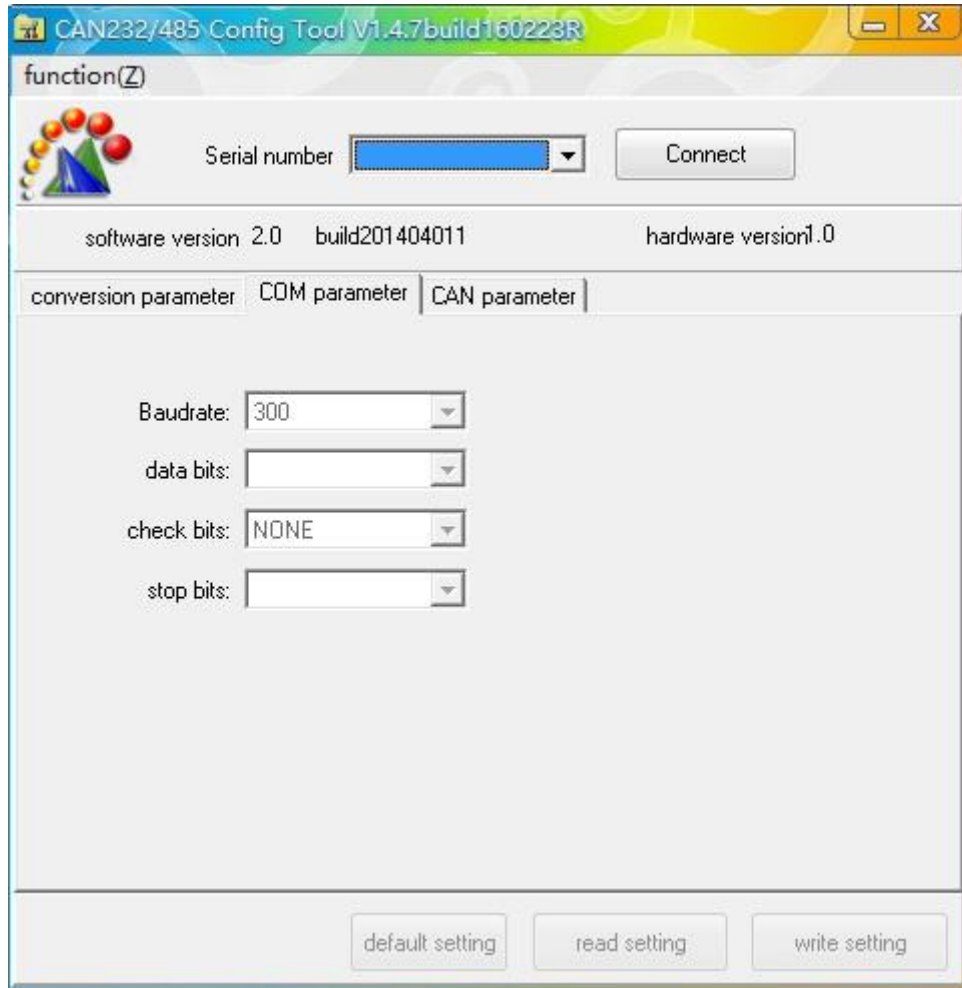
(Figure 5.2.2)

Baud rate: 300bps～115200bps

Serial parity: none, even and odd, marks, spaces and stop these 6 options.

No matter what kind of check mode converter, serial transmission of data bits is 8. No parity only add 1 start bit and 1 stop bit (10 bit), the other four modes plus 1 parity bits or stop bit (total of 11).

5.2.3 CAN-Bus parameter
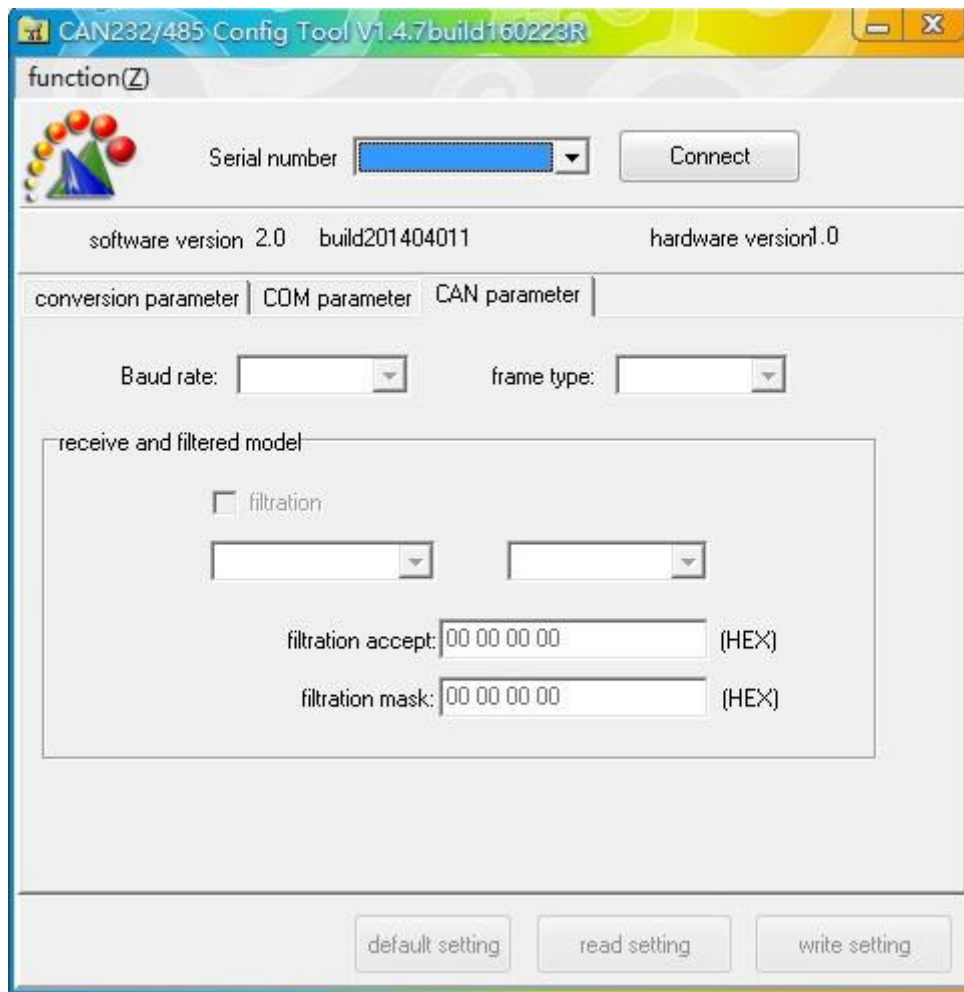
(Figure 5.2.3)

Baud rate: baud rate of CAN bus standard, the baud rate is CIA recommended list.

Frame type: in frame type conversion of the CAN-Bus message, a standard frame and extended frame optional, does not support remote frame.

Receiving filter mode: receiving converter, filter on CAN-Bus message.
Filtering options: filtering invalid or effective filtering.
Receive frame options: receive only the standard frame or receive only the extended frame.
The ID option: do not distinguish between ID or distinguish ID (ID associated with receiving the identifier).

Filter acceptance code (HEX):
Fill in the data format is 16 hexadecimal form, with "spaces" separated between each 8 bit byte.
If it is a standard frame, then the frame of ID is only 11, so the maximum filtering acceptance code" 0x07 FF ", the invalid part of more than 11-bit identifier, software only low 11-bit identifier.
If the extended frame, then the frame of ID is 29, so the maximum filtering acceptance code" 0x1F FF FF FF ", the invalid part of more than 29-bit identifier, software only low 29-bit identifier.

Filter mask off code (HEX):

Fill in the data format is 16 hexadecimal form, with "spaces" separated between each 8 bit byte.

If it is a standard frame, then the frame of ID is only 11, so the maximum filtering acceptance code" 0x07 FF ", the invalid part of more than 11-bit identifier, software only low 11-bit identifier.

If the extended frame, then the frame of ID is 29, so the maximum filtering acceptance code" 0x1F FF FF FF ", the invalid part of more than 29-bit identifier, software only low 29-bit identifier.

If the filter acceptance code and filter mask off code according to phase and operation value equal to frame ID and filter mask off code according to phase and operation value, then receives the frame, or else not to receive.

5.2.4 Keys description

Default setting: can be restored to the factory default parameters.

Read setting: the existing parameters of converter is read out and displayed on the panel.

Write setting: after setting the parameters in, click the button to write configuration parameters of converter.

Chapter 6 Application Description

6.1 Transparent conversion

Transparent conversion mode converter receives side bus data immediately sent to the other side of the bus conversion. So based on data stream way, maximally improve the speed of the converter, but also improve the buffer utilization, because in the reception at the same time converter also in converting and transmitting and vacated the receive buffer.

15

6.1.1 Frame format

Serial bus frame: is the data stream, can also be a protocol data. Communication format: 1 start bit, 8 data bits, 1 stop bit.
CAN-Bus frame: CAN-Bus message frame format

6.1.2 Conversion mode

1.   Serial frames conversion CAN-Bus message
All the serial data frames in order to fill Data Field of CAN-Bus message frame. If the converter detects the serial bus data immediately received and converted.

CAN-Bus message frame information and frame ID is user pre configured, keep these parameters in the serial CAN-Bus message frame conversion process unchanged, as shown below.

If you receive the serial frame length is less than or equal to 8 bytes, in order 1~n characters (n is serial frame length) to fill the Data Field CAN-Bus packet 1~n byte location.

If the number of bytes of serial frames is greater than 8, then the processor from the serial frame first began to take the first character, 8 characters were filled into CAN-Bus packet Data Field. The data is sent to the CAN Bus, then convert serial frame data to fill the rest of the Data Field of the CAN-Bus message, until the data is converted.

Serial frame
Data 1
Data 2
Data 3
Data 4
Data 5
Data 6
Data 7

CAN-Bus message (standard frame)	
Frame information	User setting
Frame ID	User setting
	User setting
Data Field	Data 1
	Data 2
	Data 3
	Data 4
	Data 5
	Data 6
	Data 7
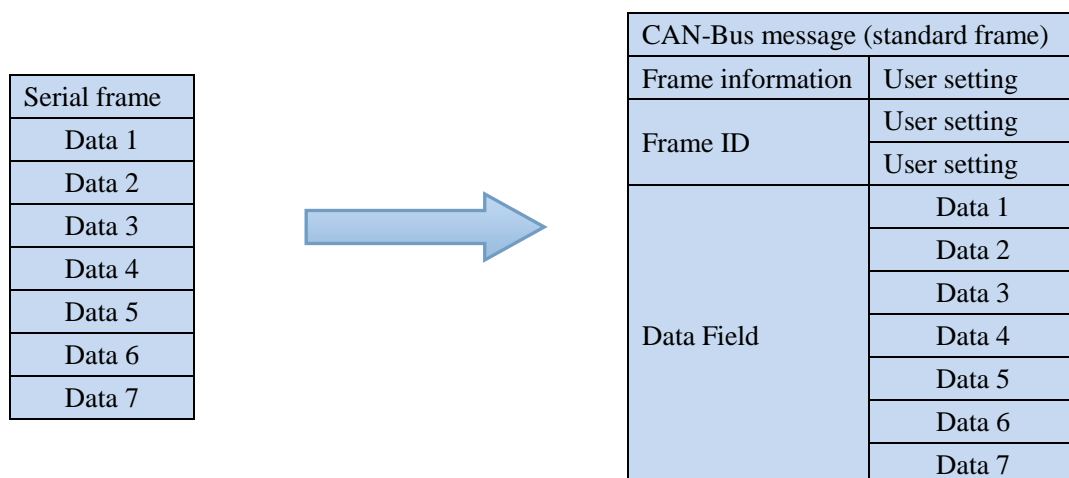
2. CAN-Bus message to serial frame

Received CAN-Bus message one frame immediately forwarded a frame.

The conversion of the CAN-Bus packets in the Data Field data are converted to serial frames. If in the configuration of the time frame information conversion enabled option "conversion", so the converter will frame bytes of information CAN-Bus message directly to the serial frame filling. If the frame ID conversion enabled option "conversion", so will the CAN-Bus message "ID frame" to fill all the bytes of serial frame.

Serial frame
Frame information
Frame ID 1
Frame ID 2
Data 1
Data 2
Data 3
Data 4
Data 5
Data 6
Data 7

CAN-Bus message (standard frame)	
Frame information	User setting
Frame ID	User setting
	User setting
	Data 1
	Data 2
	Data 3
Data Field	Data 4
	Data 5
	Data 6
	Data 7
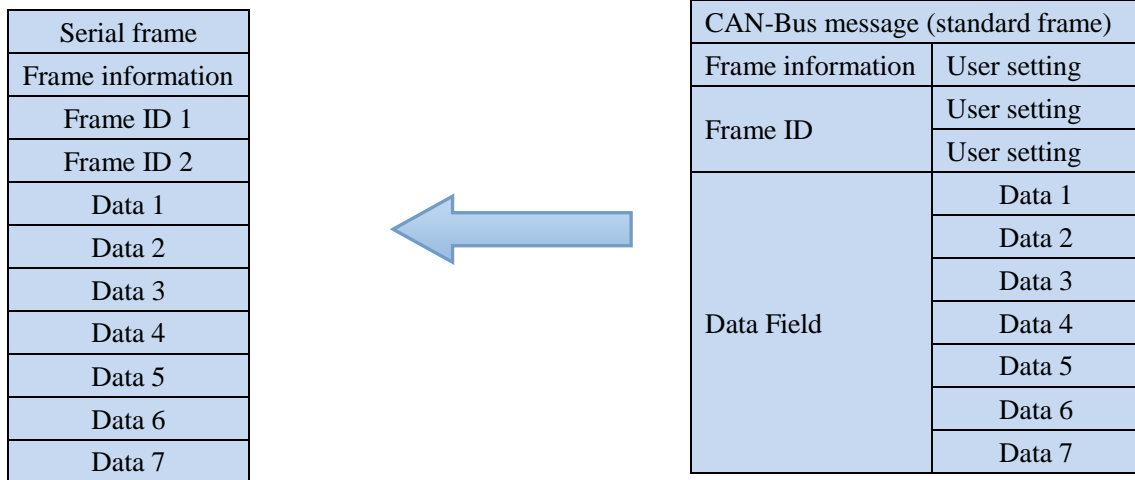
6.1.3 Conversion example

1. Serial frames conversion CAN-Bus message

The hypothetical configuration into CAN-Bus message frame information for "standard frame", frame ID1, ID2 were 00, 60, then convert the format shown below.

Serial frame
01
02
03
04
05
06
07
08
09
10
11
12
13

	CAN message 1	CAN message 2
Frame information	08	08
Frame ID 1	00	00
Frame ID 2	60	00
	01	09
	02	10
	03	11
	04	12
Data Field	05	13
	06	
	07	
	08	
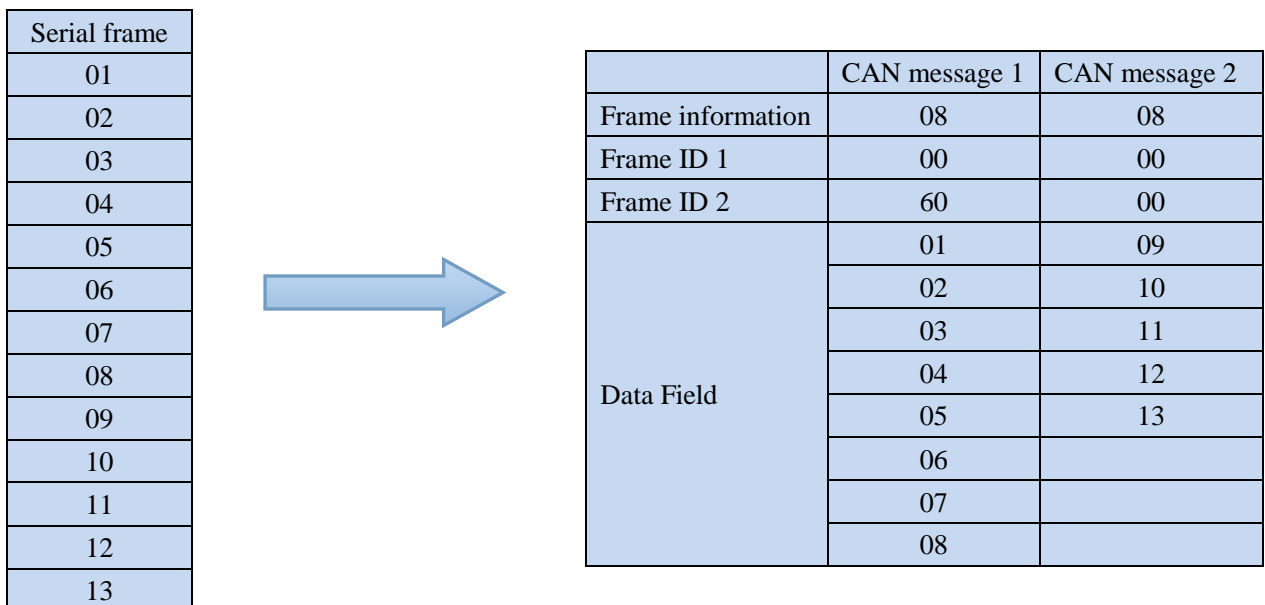
2. CAN-Bus message to serial frame

The configuration for frame information conversion of the CAN-Bus message, but the ID frame is not converted.

Serial frame
07
01
02
03
04
05
06
07

CAN message (standard frame)	
Frame information	07
Frame ID 1	00
Frame ID 2	00
Data Field	01
	02
	03
	04
	05
	06
	07

17
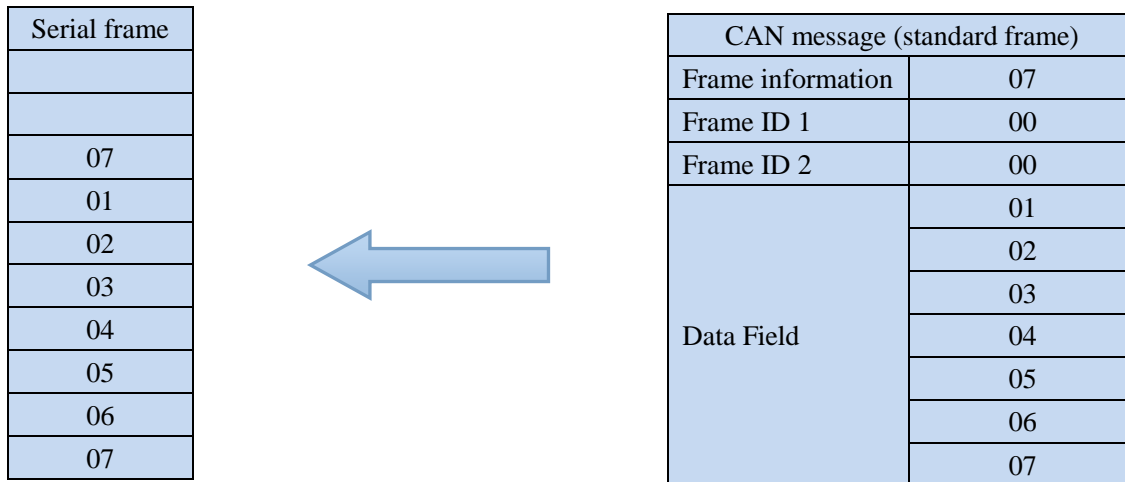
6.2 Transparent with the identity conversion

Transparent with the identity conversion is a special use that the user through the converter more convenient to set up their own network, using a custom application protocol.

The way to address information in the serial frame automatically converted into CAN bus frame ID. Just in the configuration told the converter address in the starting location and length of the serial frame converter in converting extract the frame ID filled in the CAN-Bus message frames ID field. As the serial frame conversion CAN-Bus message ID. When in the CAN-Bus message into serial frames that the CAN-Bus message ID will also convert the corresponding position in the serial frame.

Note that in the conversion mode, the configuration software CAN-Bus parameters to send invalid identifier, because the identifier transmitted (ID frame) filled by serial data in the frame.

6.2.1 Frame format

Serial bus frame: With the identity transformation, must obtain a complete serial data frame, converter with two frames of the time interval between frames as division. And the interval can be set by the users. The maximum length of the serial frame buffer length: 255 bytes.

The first data converter in serial bus idle state detected as the first character of the received frames. Transmission character in the frame interval must be less than or equal to n-bit transmission characters (n value by the upper computer configuration in advance) the time (to transmit a character is included with the character of digit divided by the corresponding baud rate). If the converter in the receiver to a character after less than equal to n-bit characters of the transmission time no character is received, converter that the frame transmission ended, the character as the frame of the last character.

CAN bus frame: The CAN-Bus message format unchanged, only the corresponding ID of the CAN-Bus frame will be converted to serial frames.
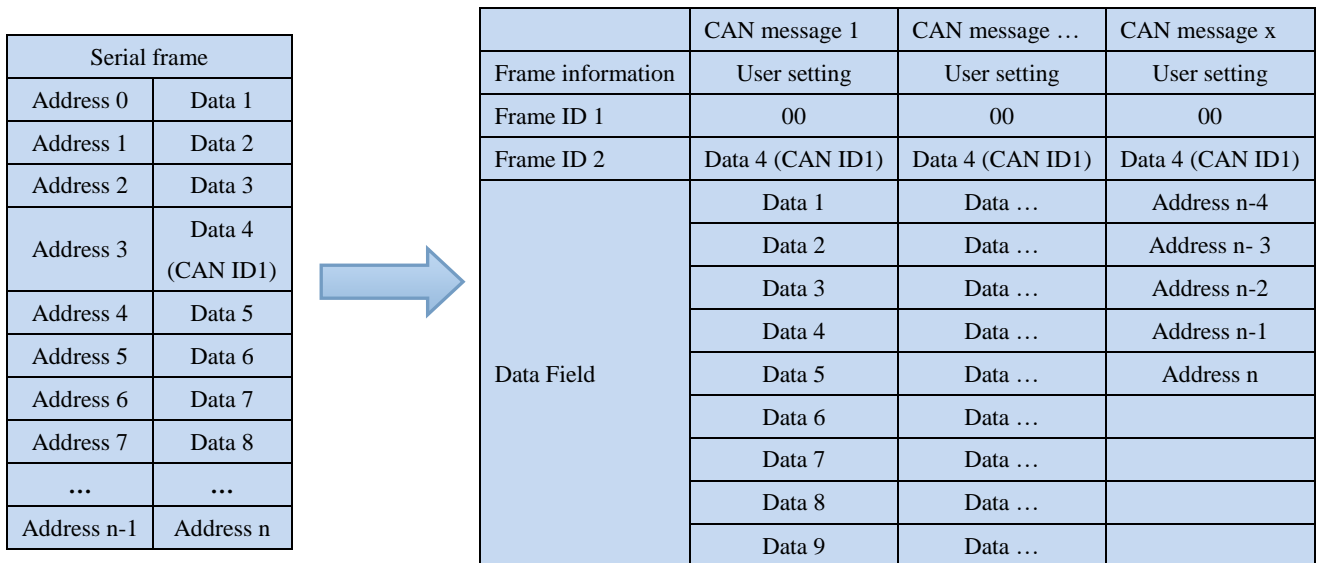
6.2.2 Conversion mode

1. Serial frames conversion CAN-Bus message

CAN-Bus with serial frame identification in serial frame start address and length can be set by the configuration. 0 ~ 7 is the starting address and length are respectively 1~ 2 (standard frame) or 1 ~ 4 (extended frame).

Conversion according to the prior configuration the serial frame ID of CAN-Bus frame corresponding to all converted to the CAN-Bus message frames ID field (if the frame ID number is less than the CAN-Bus message frames a ID number, then the CAN-Bus message of the filling order is frame ID1 to ID4, and the rest of the ID fill to 0), other data sequentially conversion.

If a CAN-Bus packet will not end frame serial data conversion, while still using the same ID as the frame of the CAN-Bus message ID to continue converting serial frame until the conversion is complete.

Serial frame	
Address 0	Data 1
Address 1	Data 2
Address 2	Data 3
Address 3	Data 4 (CAN ID1)
Address 4	Data 5
Address 5	Data 6
Address 6	Data 7
Address 7	Data 8
…	…
Address n-1	Address n

	CAN message 1	CAN message …	CAN message x
Frame information	User setting	User setting	User setting
Frame ID 1	00	00	00
Frame ID 2	Data 4 (CAN ID1)	Data 4 (CAN ID1)	Data 4 (CAN ID1)
Data Field	Data 1	Data …	Address n-4
	Data 2	Data …	Address n- 3
	Data 3	Data …	Address n-2
	Data 4	Data …	Address n-1
	Data 5	Data …	Address n
	Data 6	Data …	
	Data 7	Data …	
	Data 8	Data …	
	Data 9	Data …	

2. CAN-Bus message to serial frame

For the CAN-Bus message, immediately received a frame forwarding a frame when forwarding according to the CAN-Bus frame ID configuration in advance in the serial frame length and the position of the CAN-Bus message received in the ID of the corresponding conversion.

Note that both the serial frames or CAN-Bus message in the application of the frame format (standard frame or extended frame) should be consistent with the prior frame format of configuration requirements, otherwise it may cause the unsuccessful communication.

Serial frame
Data 1
Data 2
Data 3
Frame ID 1
Data 4
Data 5
Data 6
Data 7
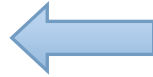
CAN message (standard frame)	
Frame information	Frame information
Frame ID	Frame ID 1
	Frame ID 2
Data Field	Data 1
	Data 2
	Data 3
	Data 4
	Data 5
	Data 6
	Data 7

6.2.3 Conversion example

1. Serial frames conversion CAN-Bus message

Assume that CAN-Bus identifies the starting address in the serial frame is 2, the length is 3 (extended frame case), serial frames and converted into CAN-Bus message results are shown as follows. Among them, two CAN-Bus packet switching with the same ID.

Serial frame	
Address 0	Data 1
Address 1	Data 2
Address 2	Data 3 (CAN ID1)
Address 3	Data 4 (CAN ID2)
Address 4	Data 5 (CAN ID3)
Address 5	Data 6
Address 6	Data 7
Address 7	Data 8
Address 8	Data 9
Address 9	Data 10
Address 10	Data 11
Address 11	Data 12
Address 12	Data 13
Address 13	Data 14
Address 14	Data 15

	CAN message 1	CAN message 2
Frame information	18	15
Frame ID 1	00	00
Frame ID 2	Data 3 (CAN ID1)	Data 3 (CAN ID1)
Frame ID 3	Data 4 (CAN ID2)	Data 4 (CAN ID2)
Frame ID 4	Data 5 (CAN ID3)	Data 5 (CAN ID3)
Data Field	Data 1	Data 12
	Data 2	Data 13
	Data 6	Data 14
	Data 7	Data 15
	Data 8	
	Data 9	
	Data 10	
	Data 11	

2. CAN-Bus message to serial frame

Assume that CAN-Bus identifies the starting address in the serial frame is 2, the length is 3 (extended frame case), CAN-Bus message and converted into serial frames results are shown as follows.

Serial frame
Data 1
Data 2
10
20
30
40
Data 3
Data 4
Data 5
Data 6
Data 7

CAN message (standard frame)	
Frame information	17
Frame ID	10
	20
	30
	40
Data Field	01
	02
	03
	04
	05
	06
	07
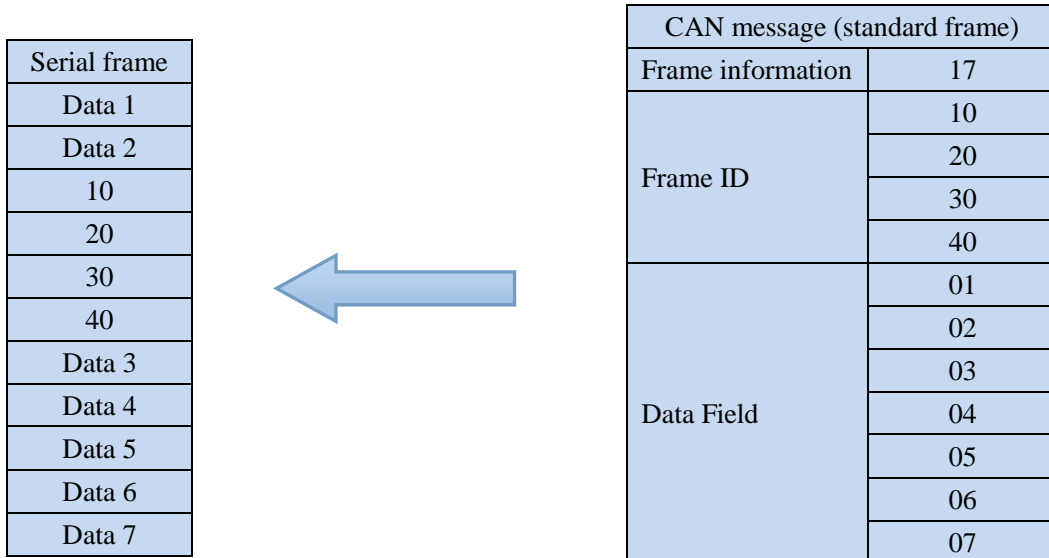
6.3 Modbus RTU conversion

Modbus protocol is an application layer protocol is a standard, widely used in various kinds of occasions. The protocol is open, real-time communication, authentication mechanism is good, very suitable for applications requiring high reliability communication.

Converter at the serial side using the standard Modbus RTU protocol format, so the converter not only allows users to use Modbus RTU protocol converter can also directly and other support Modbus RTU protocol device interface.

In the CAN bus side, the converter made a simple piecewise format to achieve Modbus communication. The converter in which the role is still protocol verification and forward transmission, support Modbus protocol, it is not Modbus host or slave machine, the user can according to the protocol of Modbus communication.

6.3.1 Frame format

Serial bus frame: The serial interface is used in the standard Modbus RTU protocol, so the user can meet the frame of this Agreement (see Appendix: Modbus protocol). If the transmission frame does not conform to Modbus RTU format, then the converter will discard the received frame, without conversion.

Modbus RTU transmission format converter uses 1 start bit, 8 data bits, and 1 stop bit.
The maximum length of Modbus RTU frame buffer length: 255 bytes.

CAN bus frame: CAN bus side of the equipment used to Modbus protocol need to define a reliable transmission format, where the use of a piecewise protocol, which defines a length greater than 8 bytes of information method for segmentation and reorganization.

Make reference to the segment transfer protocol message segment in DeviceNet. Segmented message format are shown in (to extend the frame as an example, standard frame is just a different length of the frame ID, other the same format), transmission of Modbus protocol can from "data 2" start byte, if the file is greater than 7 bytes, then the rest of the file within the volume according to the paragraphing continue the conversion until completion of the conversion.

Table 6.3.1.1 CAN2.0 Extended Frame Format

	7	6	5	4	3	2	1	0
Frame information	FF	RTR	x	x	DLC（data length）			
Frame ID1	x	x	x	ID.28—ID.24				
Frame ID2	ID.23—ID.16							
Frame ID3	ID.15—ID.8							
Frame ID4	ID.7—ID.0							
Data 1	Segment Mark			Segment Counter				
Data 2	Character 1							
Data 3	Character 2							
Data 4	Character 3							
Data 5	Character 4							
Data 6	Character 5							
Data 7	Character 6							
Data 8	Character 7							

Segment Mark: The message is segmented message or a separate message. If the value of 0 is a separate message, a value of 1 is a message in Segment.

Segment type: indicate that the packet is not segmented, the first segment, the middle segment, or the last segment.

Table 6.3.1.2 Segment type position

Position	Type	Describe
00	No segment	That message does not segment
01	The first segment	If the segment counter has a value of 0, so this is the first stage in the series
10	The middle segment	That this is an intermediate segment
11	The last segment	Mark the last segment

Segment Counter: Mark each segment, the segment in the message number, if it is a 'N' segment, then counter value is 'N'. So at the receiver can verify whether the segment is lost, so the sectional counting ranges: 1-63 (bit 0~5).

6.3.2 Conversion mode

The process of conversion in the lateral side of the serial CAN-Bus converter, will only receive a complete and correct Modbus RTU frame will be converted, otherwise no action.

As shown below, the address domain Modbus RTU protocol into CAN-Bus message frame ID ID4 (extended frame) ID2 (standard frame), marks the same in the conversion process.

CAN message	CAN message 1	CAN message 2
Frame information	Frame information	Frame information
Frame ID 1	00	00
Frame ID 2	00	00
Frame ID 3	00	00
Frame ID 4	Address field	Address field
Data Field	The use of segmentation protocol	The use of segmentation protocol
	Function code	Data field
	Data field	

Modbus RTU frame
Address field
Function code
Data field
CRC field
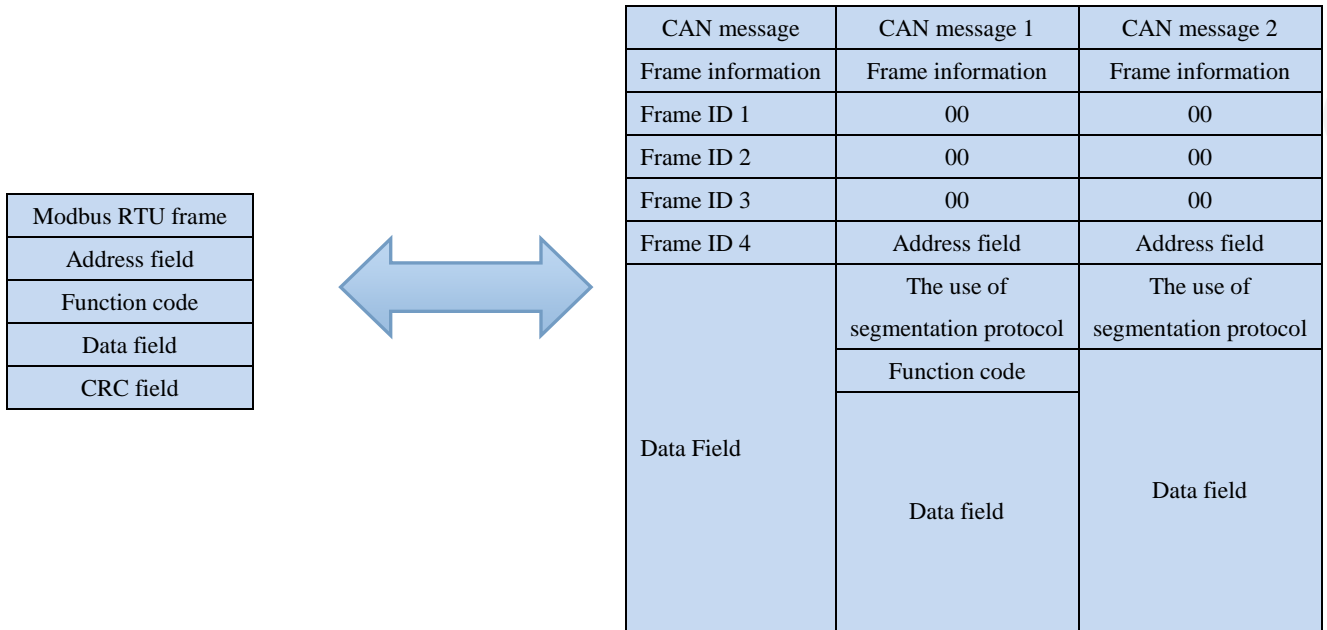
CRC check byte not converted to CAN-Bus message, CAN-Bus message need not check byte with serial frames, because CAN bus itself has better check mechanism.

Conversion is Modbus RTU protocol content -- function code and data domain, when converting them sequentially conversion in data field can report the frame (from the beginning of the second byte of data, the first data byte is piecewise protocol), due to the Modbus RTU frame length are different according to different function code. CAN-Bus message frame can only transmit 7 data, so the converter will be sent messages of Modbus RTU frame into CAN-Bus long segment with the segmented CAN-Bus protocol. The user receives in the CAN-Bus node take the function code and data processing domain can be.

For CAN bus Modbus protocol data without cyclic redundancy check (CRC16) converter in accordance with sub protocol to receive end receiver frame analysis automatically cycle redundancy check (CRC16), converted into Modbus RTU frame is sent to the serial bus. If the received data does not comply with segment protocol, the data conversion shall be discarded.

6.3.3 Conversion example

In configured to expand the frame, as shown below, in the Modbus RTU frame into the CAN bus message, address 0x08 directly to fill the frame ID4, the other frame ID fill 0x00 and in the conversion process of the frame to remain in this frame ID does not change.

When a CAN-Bus message does not handle Modbus packet, CAN-Bus message using sub protocol. Each CAN-Bus packet "data 1" are used to fill the segment information (0x81, 0xC2), the information is not converted to the Modbus RTU frame, only as a frame format is used to verify the information frame. Function code and data domain values are filled in the CAN-Bus message data from 2 ~ 8.

Modbus RTU frame	
Address field	08
Function code	11
Data field	00
	01
	00
	02
	04
	00
	0A
	01
	02
CRC field	ED
	69

CAN message	CAN message 1	CAN message 2
Frame information	18	14
Frame ID 1	00	00
Frame ID 2	00	00
Frame ID 3	00	00
Frame ID 4	08	08
Data Field	81	C2
	11	0A
	00	01
	01	02
	00	
	02	
	04	
	00	

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6.4 Attention Matters

➢ Recommended for use in low speed system, the converter is not suitable for high-speed data transmission.

➢ After the configuration mode and normal mode switch, power must restart, otherwise still is the implementation of the original work mode, and cannot achieve the success of switching.

➢ In the transparent identity conversion and Modbus RTU conversion, note that the CAN-Bus frame type and frame type software configuration must be the same, otherwise not successful communication.

➢ In the transparent identity conversion and Modbus RTU conversion, serial frames transmission must meet the configured time requirements, otherwise it may lead to communication error.

➢ The CAN bus is half duplex, so the data conversion process, to ensure orderly on both sides of the bus data. If both sides at the same time to send a large number of data bus converter, will likely lead to incomplete data conversion.

➢ Using IT-232-CAN converter, should pay attention to both sides of the bus baud rate and data transmission time interval rationality, conversion should consider the affordability of the low baud rate of bus data.

For example, when CAN bus were converted to serial bus, CAN bus can reach the rate of thousands of frames per second, but the serial bus only to the hundreds of frames per second. So when the CAN bus speed too fast will result in incomplete data conversion.

General CAN-Bus baud rate should be about 3 times the baud rate of serial baud rate, data transmission will be more uniform. Because in the transmission data on the bus also added other functional domains, equivalent to an increase of the length of the data, so the same baud rate can transmission time will be longer than the time of serial bus.

Chapter 7 Repair and Service

The company provides a three-year product warranty, from the date of shipment. According to the product specifications, during the warranty period, the company will be free to repair or replace the product if the product has any failure or operation fails. However, these commitments do not cover damage caused by improper use, accident, natural disaster, improper operation or incorrect installation.

To ensure that consumers benefit from our managed series switches, try to get help in the following ways:

Internet service.

Make a call to our technical office.

Return or replace product.

7.1 Internet Service

Please visit www.intellisystem.it

7.2 Make a call to our technical office

You can call our technical support office, the company has professional technical engineers to answer your questions and help you resolve your problems at the first time.

7.3 Repair or Replace

Please to confirm with our technical staff if your product need to repair, replace or return, and then contact our sales man to get a deal with the problem. The above should be in accordance with the company's handler to negotiate for treatment with our technical and salesman to complete the repair, replacement or return.