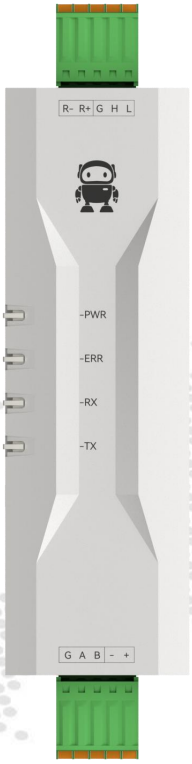
Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



EID091-A101 & EID091-A101-S User Manual

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1. Overview

1.1 Introduction



The EID091-A101 and EID091-A101-S are CANFD-to-RS485 converters independently developed by Chengdu EBYTE Electronics Technology Co., Ltd. These products are powered by 8–28 V DC, support ISO and Bosch CANFD protocols, and are compatible with CAN 2.0 A/B. They support five operating modes and feature spring terminals for external connections, facilitating quick wiring.
The EID091-A101 is the isolated version; the EID091-A101-S is the non-isolated version.

1.2 Features

- Supports a wide DC power supply range of 8 – 28 V and reverse polarity protection;
- Supports CANFD and is compatible with CAN;
- Supports ISO and Bosch CANFD protocols;
- Supports CAN 2.0 A/B protocols;
- Features an indicator light to display the device’s operating status;
- Built-in 120Ω matching resistor;
- RS485 baud rate support: 1200 – 3 Mbps, default 115,200 bps;
- Arbitration field baud rate support: 5 K – 1 Mbps, default 500 Kbps;
- Data field baud rate support: 100 K – 5 Mbps, default 2 Mbps (invalid in CAN mode);
- Supports custom baud rate settings;
- Supports frame filtering settings;
- Supports five operating modes: transparent conversion, transparent conversion with tags, format conversion, Modbus conversion, and custom protocol conversion;
- Supports configuration via AT commands and a host computer;
- Supports restoring factory defaults;
- Industrial-grade design, operating temperature: -40° C to 85° C;

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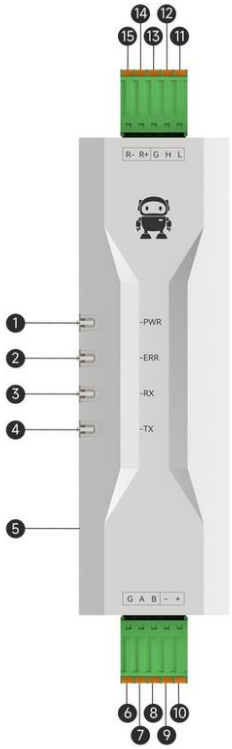
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2. Introduction to Hardware Specification Design

2.1 Basic Specifications

Key Specifications	Specifications
Power Supply Voltage	DC 8–28 V
Operating Current	Standby power consumption: approx. 19.7 mA @ 12 V, 11.2 mA @ 24 V;
RS485 Baud Rate	Transmit/receive power consumption: approx. 23.7 mA @ 12 V, 13 mA @ 24 V;
Arbitration Field Baud Rate	1,200–3 Mbps, default 115,200 bps
Data Field Baud Rate	5K–1 Mbps, default 500 Kbps
Operating Temperature	100 K–5 Mbps, default 2 Mbps (not applicable in CAN mode)
Operating Humidity	–40°C to 85°C, industrial grade

2.2 Interface Description



No.	Name	Pin Functions
1	PWR	Power indicator: Remains lit when powered on (blue)

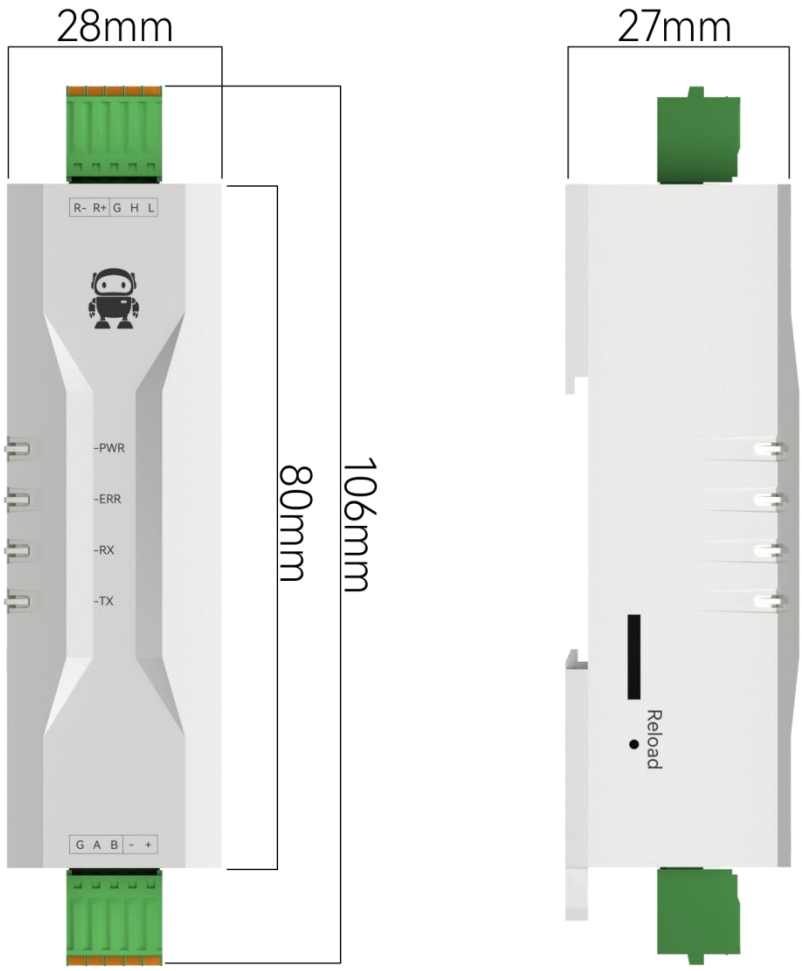
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2	ERR	Error indicator: Remains lit when a bus error occurs (red); turns off when the bus is restored
3	RX	Data indicator: Flashes (green) when receiving data via the serial port
4	TX	Data indicator: Flashes (green) when transmitting data via the serial port
5	Restore	Restore button: Press and hold for 5 seconds or longer to restore factory settings
6	G	RS485 signal ground
7	A	RS485 bus data A
8	B	RS485 bus data B
9	-	Power supply negative terminal: 8V–28V DC
10	+	Power supply positive terminal: 8V–28V DC
11	L	CAN(FD) bus low
12	H	CAN(FD) bus high
13	G	CAN(FD) bus ground
14	R+	120-ohm matching resistor positive; short to R- to enable
15	R-	120-ohm matching resistor negative; short to R+ to enable

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2.3 Dimension Drawing



3. Model Description

3.1 Transparent Conversion Mode

Transparent Conversion: The converter converts bus data from one format to another exactly as is, without adding or modifying any data. This allows for the exchange of data formats without altering the data content; to the buses at both ends, the converter appears “transparent,” hence the term “transparent conversion.”

1. Serial Frame to CAN(FD) Message:

All data from the serial frame is sequentially filled into the data field of the CAN(FD) message frame. As soon as the module detects data on the serial bus, it immediately receives and converts it. The CAN(FD) message frame information (frame type section) and frame ID are derived from the user’s prior configuration, and both the frame type and frame ID

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remain constant throughout the conversion process.

2. CAN(FD) Message to Serial Frame Conversion:

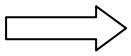
During conversion, all data in the CAN(FD) message's data field is sequentially transferred to the serial frame. If "Enable Frame Information" is checked during configuration, the module will directly populate the "Frame Information" byte of the CAN(FD) message into the serial frame. If "Enable Frame ID" is checked, the "Frame ID" bytes from the CAN(FD) message will also be fully populated into the serial frame.

Note: To receive CAN(FD) frame information or frame IDs via the serial interface, you must enable the corresponding functions. Only then can the corresponding information be received.

The protocol conversion formats are as follows:

Conversion of serial frames to CAN messages (transparent conversion mode):

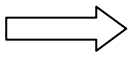
Serial Frame	
0	Data 1
1	Data 2
2	Data 3
3	Data 4
4	Data 5
5	Data 6
6	Data 7
7	Data 8



CAN Messages	
Frame Information	User Configuration
Frame ID	User Configuration
	User Configuration
Data Field	Data 1
	Data 2
	Data 3
	Data 4
	Data 5
	Data 6
	Data 7
	Data 8

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Converting CAN Messages to Serial Frames (Transparent Conversion Mode):

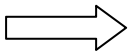
<table>
<tr><th colspan="2">CAN Messages</th><th rowspan="2"></th><th colspan="2">Serial Frame</th></tr>
<tr><th>Frame Information</th><th>User Configuration</th><th>Frame Information</th><th>User Configuration</th></tr>
<tr><td rowspan="2">Frame ID</td><td>User Configuration</td><td rowspan="10"></td><td rowspan="2">Frame ID</td><td>User Configuration</td></tr>
<tr><td>User Configuration</td><td>User Configuration</td></tr>
<tr><td rowspan="8">Data Field</td><td>Data 1</td><td>0</td><td>Data 1</td></tr>
<tr><td>Data 2</td><td>1</td><td>Data 2</td></tr>
<tr><td>Data 3</td><td>2</td><td>Data 3</td></tr>
<tr><td>Data 4</td><td>3</td><td>Data 4</td></tr>
<tr><td>Data 5</td><td>4</td><td>Data 5</td></tr>
<tr><td>Data 6</td><td>5</td><td>Data 6</td></tr>
<tr><td>Data 7</td><td>6</td><td>Data 7</td></tr>
<tr><td>Data 8</td><td>7</td><td>Data 8</td></tr>
</table>

Converting Serial Frames to CANFD Messages (Transparent Conversion Mode):

CAN Messages	
Frame Information	User Configuration

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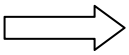
Serial Frame	
0	Data 1
1	Data 2
2	Data 3
3	Data 4
…	…
45	Data 46
46	Data 47
47	Data 48



Frame ID	User Configuration
	User Configuration
Data Field	Data 1
	Data 2
	Data 3
	Data 4
	…
	Data 46
	Data 47
	Data 48

Converting CANFD messages to serial frames (transparent conversion mode):

CAN Messages	
Frame Information	User Configuration
Frame ID	User Configuration
	User Configuration
Data Field	Data 1
	Data 2
	Data 3
	Data 4
	…
	Data 62



Serial Frame	
Frame Information	User Configuration
Frame ID	User Configuration
	User Configuration
0	Data 1
1	Data 2
2	Data 3
3	Data 4
4	…
5	Data 62

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	Data 63		6	Data 63
	Data 64		7	Data 64

3.2 Transparent Bar Marker Conversion Mode

Transparent ID conversion is a specialized application of transparent conversion. By including CAN(FD) message ID information within serial frames, CAN(FD) messages with different IDs can be transmitted as needed. This enables users to more conveniently build their own networks using the module and implement custom application protocols. This method automatically converts the ID information in the serial frame into a CAN(FD) bus frame ID. By specifying the starting position and length of the ID information within the serial frame during configuration, the module extracts this frame ID during conversion and populates the frame ID field of the CAN(FD) message with it, serving as the ID for the CAN(FD) message when forwarding the serial frame. When converting a CAN message into a serial frame, the CAN(FD) message ID is also converted and placed at the corresponding position in the serial frame.

1. Converting a Serial Frame to a CAN(FD) Message:

The start address and length of the CAN(FD) message's "Frame ID" within the serial frame can be set via configuration. The start address ranges from 0 to 7, and the length ranges from 1 to 2 (standard frame) or 1 to 4 (extended frame). During conversion, based on the predefined configuration, all "Frame IDs" of the CAN(FD) messages within the serial frame are converted to the corresponding Frame ID fields in the CAN(FD) messages (if the number of Frame IDs in the serial frame is fewer than the number of Frame IDs in the CAN(FD) message, the high-order byte of the Frame ID in the CAN(FD) message is padded with zeros). other data is converted sequentially. If a single CAN(FD) message does not contain all the data from the serial frame, the same ID is used as the CAN(FD) message's frame ID to continue the conversion until the serial frame is fully converted.

Note: If the ID length is greater than 2, the frame type sent by the device will be set to "Extended Frame." In this case, the user-configured frame ID and frame type are invalid; they are determined by the data within the serial frame. The frame ID range for standard frames is 0x000–0x7ff, represented as Frame ID 1 and Frame ID 0, respectively, where Frame ID 1 is the high byte. The frame ID range for extended frames is 0x00000000–0x1fffffff, represented as Frame ID 3, Frame ID 2, Frame ID1, and Frame ID0, where Frame ID3 is the high byte.

2. Converting CAN(FD) Messages to Serial Frames:

For CAN(FD) messages, a frame is forwarded immediately upon receipt. During each forwarding, the ID in the received CAN(FD) message is converted accordingly based on the preconfigured position and length of the CAN(FD) frame ID within the serial frame. Other data is forwarded sequentially. It is important to note that, whether for serial frames or CAN(FD) messages, the frame format (standard or extended) must comply with the preconfigured frame format requirements during operation; otherwise, communication may fail.

The protocol conversion format is as follows:

Conversion of serial frames to CAN messages (transparent with tag conversion mode):

Serial Frame	
0	Data 1(ID1)

	CAN Messages	CAN Message x
Frame Information	User Configuration	User Configuration

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1	Data 2(ID0)
2	Data 3
3	Data 4
4	Data 5
5	Data 6
6	Data 7
7	Data 8
…	…
N	Data N
Address N	Data N



Frame ID	Data 1(ID1)	Data 1(ID1)
	Data 2(ID0)	数据 2(ID0)
Data Field	Data 3	Data ...
	Data 4	Data N-1
	Data 5	Data N
	Data 6	
	Data 7	
	Data 8	
	Data 9	
	Data 10	

Converting CAN Messages to Serial Frames (Transparent Conversion Mode with Identifiers):

CAN Messages		Serial Frame
Frame Information	Frame Information	ID1
Frame ID	ID1	ID0
	ID0	Data 1
Data Field	Data 1	Data 2
	Data 2	Data 3
	Data 3	Data 4
	Data 4	Data 5
	Data 5	Data 5
	Data 5	Data 7
	Data 7	Data 8
	Data 8	



Converting a serial frame to a CANFD message (transparent mode with tag conversion):

Serial Frame		CANFD Messages	CANFD Message x

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0	Data 1(ID1)		Frame Information	User Configuration	User Configuration
1	Data 2(ID0)		Frame ID	Data 1(ID1)	Data 1(ID1)
2	Data 3			Data 2(ID0)	Data 2(ID0)
3	Data 4		Data Field	Data 3	Data ...
4	Data 5			Data 4	Data N-1
5	Data 6			Data 5	Data N
6	Data 7			Data 6	
7	Data 8			Data 7	
…	…			Data 8	
N	Data N			Data 9	
Address N	Data N			Data 10	

Converting CANFD Messages to Serial Frames (Transparent Mode with Tag Conversion):

CAN Messages			Serial Frame
Frame Information	Frame Information		ID1
Frame ID	ID1		ID0
	ID0		Data 1
Data Field	Data 1		Data 2
	Data 2		Data 3
	Data 3		Data 4
	Data 4		…
	…		Data 62
	Data 62		Data 63
	Data 63		Data 64
	Data 64		

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3.3 Protocol Mode

Depending on the configured CAN protocol mode, there are two scenarios: CAN format conversion and CANFD format conversion. The difference lies in the fixed number of bytes for each corresponding format.

In CAN format conversion, a CAN frame is fixed at 13 bytes, which include the CAN frame header, frame ID, and frame data. In this conversion mode, the configured CAN ID is invalid because the identifier (frame ID) transmitted at this time is populated by the frame ID data from the format serial frame described above. The configured frame type is also invalid; the frame type is determined by the frame information in the format serial frame. The format is as follows:

CAN Fixed-Format Serial Frame (13 Bytes)		
Frame Information	Frame ID	Frame Data
1Byte	4Byte	8Byte

In CANFD format conversion, a fixed 69 bytes represent the data for a CANFD frame. These 69 bytes consist of CAN frame information, the frame ID, and the frame data. In this conversion mode, the configured CANFD ID is invalid because the identifier (frame ID) transmitted at this time is populated with the frame ID data from the format serial frame described above. The configured frame type is also invalid; the frame type is determined by the frame information in the format serial frame. The format is as follows:

CANFD Fixed-Format Serial Frame (13 bytes)		
Frame Information	Frame ID	Frame Data
1Byte	4Byte	64Byte

The frame information is shown in the table below:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
FF	RTR	EDL	BRS	DLC3	DLC2	DLC1	DLC0

- FF: Indicator for standard and extended frames; 0 indicates a standard frame, 1 indicates an extended frame;
- RTR: Indicator for remote and data frames; 0 indicates a data frame, 1 indicates a remote frame; in CANFD mode, this can only be 0;
- EDL: Indicator for CAN and CANFD; 0 indicates CAN, 1 indicates CANFD;
- BRS: Baud rate switching enable indicator; 0 indicates no rate switching, 1 indicates variable rate switching; valid only in CANFD mode; this bit must be 0 in CAN mode;
- DLC3–DLC0: Indicates the data length of this CAN (CANFD) message.
- The frame ID is 4 bytes long; standard frames have 11 valid bits, and extended frames have 29 valid bits.

Extension Frame ID 0x12345678	Standard Frame ID 0x3FF

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0x12	0x34	0x56	0x78

0x00	0x00	0x03	0xFF

1、Converting Serial Frames to CAN (FD) Messages:

When converting serial frames to CAN(FD) messages, if a segment of fixed-byte data within a fixed-byte-aligned serial data frame does not conform to the standard format, the system will skip converting that segment and proceed to convert the subsequent data. If you find that certain CAN(FD) messages are missing after conversion, please check whether the fixed-byte-length serial data format for the corresponding messages conforms to the standard format.

2、Converting CAN(FD) Messages to Serial Frames:

In this mode, you must strictly adhere to the fixed-byte serial data format to ensure a successful conversion. If the valid data is shorter than the fixed length, it must be padded with zeros to the fixed length. During conversion, first ensure that the frame information is correct and that the data length is specified correctly; otherwise, the conversion will not proceed.

3.4 Modbus Protocol Conversion Mode

The Modbus protocol is a standard application-layer protocol widely used in various industrial control applications. This protocol is open, offers strong real-time performance, and features robust communication verification mechanisms, making it highly suitable for applications with high reliability requirements.

The module uses the standard Modbus RTU protocol format on the serial port side, so it not only supports users' use of the Modbus RTU protocol but can also interface directly with other devices that support Modbus RTU. On the CAN(FD) side, a simple and easy-to-use segmented communication format has been defined to implement Modbus communication. The module's role remains that of protocol validation and forwarding, supporting the transmission of the Modbus protocol rather than acting as a Modbus master or slave; users can simply communicate according to the Modbus protocol.

Note: In this conversion mode, the configured CAN(FD) ID is invalid, as the identifier (frame ID) sent at this time is populated by the address field in the Modbus RTU serial frame.

The serial interface uses the standard Modbus RTU protocol, so user frames must comply with this protocol. If a transmitted frame does not conform to the Modbus RTU format, the module will discard the received frame without converting it. For messages longer than the maximum data length of a CAN(FD) message, the module will segment and reassemble the data, continuing the conversion according to the segmentation protocol until the conversion is complete.

Section Marker	Paragraph Type		Segment Counter				
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0

- Segmented Message Flag: Indicates whether the message is a segmented message. A value of 0 indicates a standalone message, while a value of 1 indicates that the frame is part of a segmented message.
- Segment Type: Indicates whether it is the first, intermediate, or last segment.

Place value	Meaning	Description
0	First paragraph	If the segment counter contains the value 0, this is the first segment in the segment

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		series.
1	Middle paragraph	Indicates that this is an intermediate segment.
2	Last paragraph	Indicates the last segment.

- Segment Counter: A flag for each segment that indicates the segment's sequence number within the entire message; the counter value corresponds to the segment number. This allows verification during reception to determine if any segments have been lost. A total of 5 bits are used, with a range of 0 to 31.

For CAN messages, the segmented message format is as follows:

Position Number	7	6	5	4	3	2	1	0
Frame Information	FF	RTR	EDL	BRS	DLC（Data Length）			
Frame ID3	X	X	X	ID.28-ID.24				
Frame ID2	ID.23-ID.16							
Frame ID1	ID.15-ID.8							
Frame ID0	ID.7-ID.0							
Data 1	Section Marker	Paragraph Type	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							

When transmitting CANFD messages, the segmented message format is as follows:

Position Number	7	6	5	4	3	2	1	0
Frame Information	FF	RTR	EDL	BRS	DLC（Data Length）			

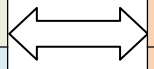
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Frame ID3	X	X	X	ID.28-ID.24
Frame ID2	ID.23-ID.16			
Frame ID1	ID.15-ID.8			
Frame ID0	ID.7-ID.0			
Data 1	Section Marker	Paragraph Type	Segment Counter	
Data 2	Character 1			
Data 3	Character 2			
Data 4	Character 3			
…	…			
Data 62	Character 61			
Data 63	Character 62			
Data 64	Character 63			

For Modbus protocol data on the CAN(FD) bus, no cyclic redundancy check (CRC16) is required. The module receives the data according to the segmented protocol; after parsing a frame, it automatically adds a cyclic redundancy check (CRC16), converts it into a Modbus RTU frame, and transmits it to the serial bus. If the received data does not conform to the segmented protocol, that data group is discarded and not converted.

CAN Mode Conversion Format:

Modbus RTU Frame
Address Field
Function Code
Data Field
CRC Field



CAN Messages	CAN Message 1	CAN message x
Frame Information	Frame Information	Frame Information
Frame ID3	0x00	0x00
Frame ID2	0x00	0x00
Frame ID1	0x00	0x00
Frame ID0	Frame ID (User-defined)	Frame ID (User-defined)
Data 1	[Using the Paragraph Agreement]	[Using the Paragraph

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		Agreement]
Data 2	Address Field	Data Field
Data 3	Data Field	
Data 4		
Data 5		
Data 6		
Data 7		
Data 8		

CANFD Mode Conversion Format:

Modbus RTU Frame
Address Field
Function Code
Data Field
CRC Field

CANFD Messages	CANFD Message 1	CAN message x
Frame Information	Frame Information	Frame Information
Frame ID3	0x00	0x00
Frame ID2	0x00	0x00
Frame ID1	0x00	0x00
Frame ID0	Frame ID (User-defined)	Frame ID (User-defined)
Data 1	[Using the Paragraph Agreement]	[Using the Paragraph Agreement]
Data 2	Address Field	Data Field
Data 3		

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	Data Field	

3.5 Custom Protocol Conversion Mode

The serial frame format must fully comply with the specifications of the custom protocol and include all content required for the serial frame in the user-configured mode. If any bytes other than those in the data field are incorrect, the frame will not be transmitted successfully. A serial frame contains the following: frame header, frame length, frame information, frame ID, data field, and frame trailer.

Note: In this mode, the frame ID and frame type configured by the user are invalid; data will be forwarded based on the format within the serial frame.

1. Converting serial frames to CAN (FD) messages:

The serial frame format must conform to the specified frame format. Since the CAN(FD) frame format is message-based, the serial frame format is byte-oriented. Therefore, to facilitate user convenience, the serial frame format has been aligned with the CAN(FD) frame format. The serial frame specifies the start and end of a frame—namely, the “frame header” and “frame trailer” in AT commands—which users can configure themselves. Frame length refers to the length from the start of the frame information to the end of the last data byte, excluding the serial frame trailer. Frame information is divided into extended frames and standard frames. Standard frames are fixed at 0x00, and extended frames are fixed at 0x80. Unlike transparent conversion and transparent conversion with identifiers, in custom protocol conversion, the frame information content remains fixed regardless of the data length contained in each frame’s data field. When the frame type is a standard frame (0x00), the two bytes following the frame type represent the frame ID, with the most significant byte first; when the frame information is an extended frame (0x80), the four bytes following the frame type represent the frame ID, with the most significant byte first.

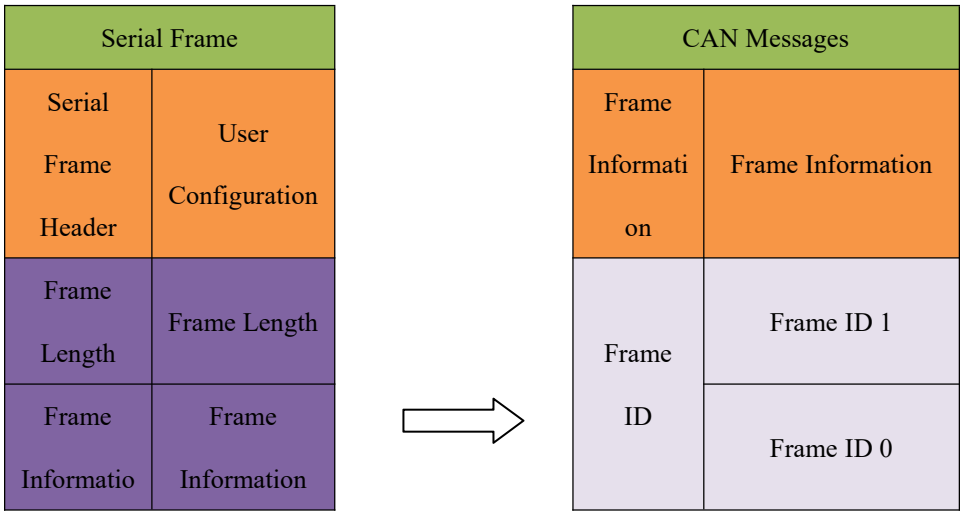
Note: In custom protocol conversion, the frame information content remains fixed regardless of the length of the data contained in each frame’s data field. The frame ID must fall within the valid ID range; otherwise, an ID error may occur.

2. Converting CAN (FD) messages to serial frames:

CAN(FD) bus messages are forwarded on a per-frame basis as they are received. The module sequentially converts the data in the CAN(FD) message data field and adds data such as the frame header, frame length, and frame information to the serial frame; this is essentially the reverse process of converting a serial frame into a CAN(FD) message.

The protocol conversion format is as follows:

Conversion of a serial frame to a CAN message (custom protocol conversion mode):



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n			
Frame ID	Frame ID 1	Data Field	Data 1
	Frame ID 0		Data 2
Data Field	Data 0		Data 3
	Data 1		Data 4
	...		Data 5
	Data 6		Data 6
	Data 7		Data 7
	Data 8		Data 8
End of Serial Frame	User Configuration		

Converting CAN Messages to Serial Frames (Custom Protocol Conversion Mode):

CAN Messages			Serial Frame	
Frame Information	Frame Information		Serial Frame Header	User Configuration
Frame ID	Frame ID 1		Frame Length	Frame Length
	Frame ID 0		Frame Information	Frame Information
Data Field	Data 1		Frame ID	Frame ID 1
	Data 2			Frame ID 0
	Data 3		Data Field	Data 0
	Data 4			Data 1
	Data 5			...
	Data 6			Data 7

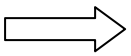
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	Data 7			Data 8
	Data 8		End of Serial Frame	User Configuration

Converting Serial Frames to CANFD Messages (Custom Protocol Conversion Mode):

Serial Frame	
Serial Frame Header	User Configuration
Frame Length	Frame Length
Frame Information	Frame Information
Frame ID	Frame ID 1
	Frame ID 0
Data Field	Data 0
	Data 1
	...
	Data 62
	Data 63
	Data 64
Serial Frame End	User Configuration

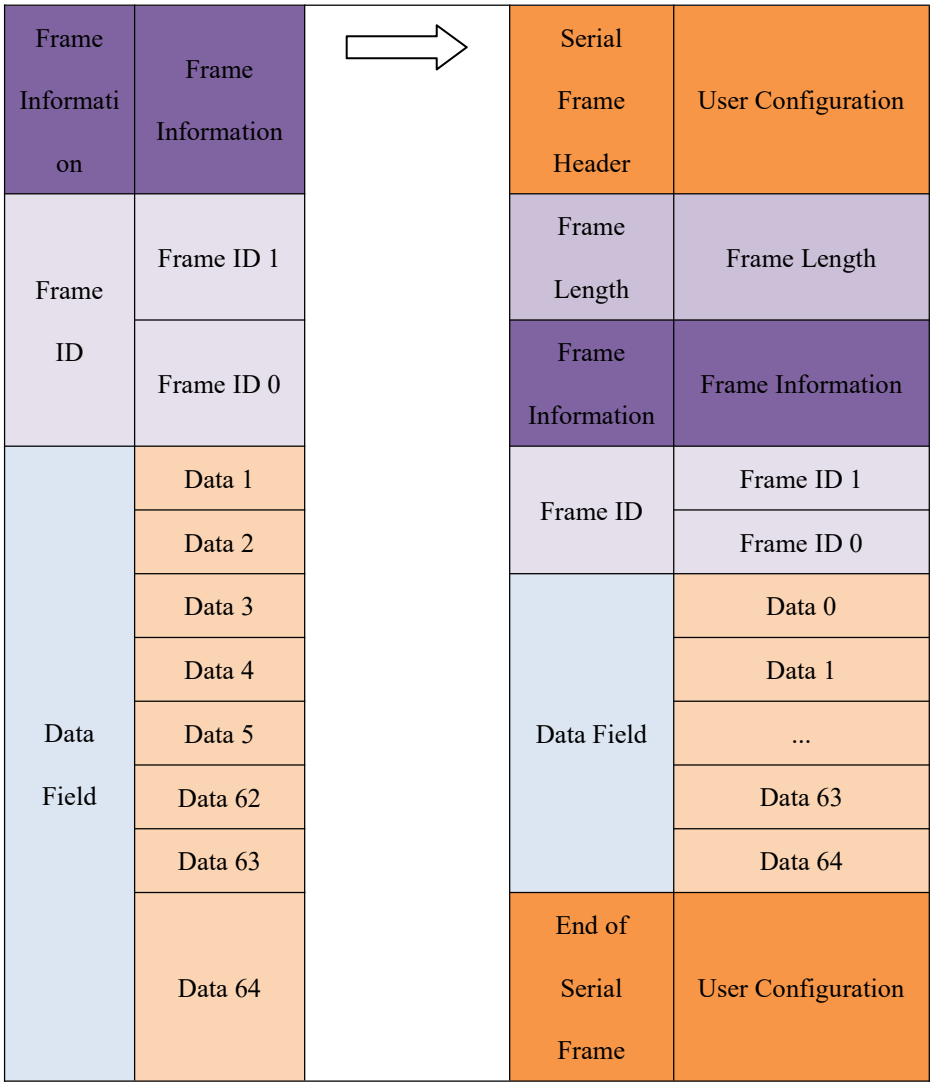


CAN Messages	
Frame Information	Frame Information
Frame ID	Frame ID 1
	Frame ID 0
Data Field	Data 1
	Data 2
	Data 3
	Data 4
	Data 5
	Data 62
	Data 63
	Data 64

Converting CANFD Messages to Serial Frames (Custom Protocol Conversion Mode):

CAN Messages		Serial Frame

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Revision history

Version	Revision Date	Revision Notes	Maintainer
1.0	2026-04-29	Initial Version	ZYD

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