

UIROBOT

User Manual

UIM2533
Industrial USB - CAN Gateway



UIM2533

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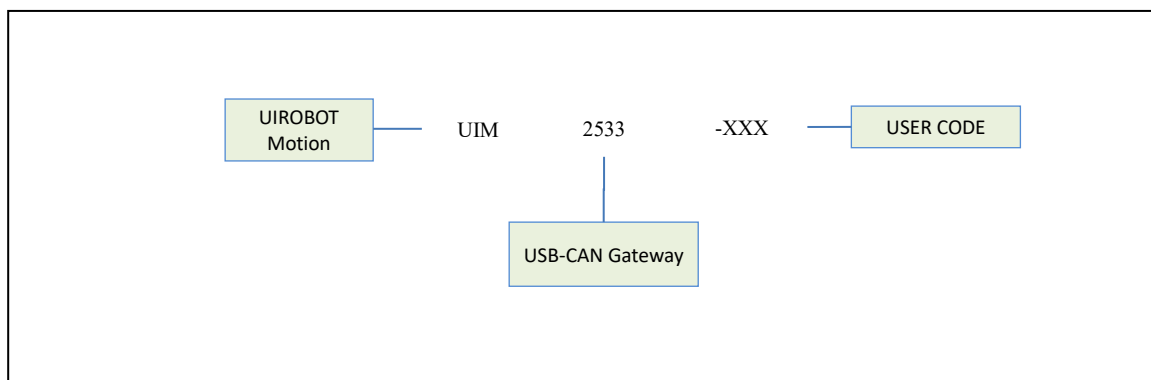
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UIM2533 USB-CAN Gateway Model



Revision History

| Manual version | Revision date | Change |
|----------------|---------------------------------|-----------------|
| V1.0 | November 1 st , 2023 | initial version |
| | | |

UIM2533 Industrial USB - CAN Gateway

UIM2533 is an industrial USB 2.0 to CAN gateway. Users can send instructions through UIM2533 to control UIM series servo stepper, AC servo motion controller and I/O controller products.

UIROBOT provides complete SDK, dll, lib, so, and sample codes based on C++, C#, etc., for Linux, Windows 32 bit and 64 bit.

Control System

- Robust DSP hardware
- Fault tolerance, fail safe user interface
- Provide complete SDK, lib and dll
- Provide C++, C# sample codes

USB communication

- USB 2.0
- USB Mini B socket with screw lock

CAN Networking

- Active CAN 2.0, 1 Mbps Max.
- 1500V photoelectric isolation
- Support 3 kinds of CAN IDs: Node ID, Group ID and Global ID

Other







- Wide voltage input 12~48VDC
- Aluminum alloy casing, sturdy and durable for easy heat dissipation

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Safety

To prevent personal injury and property damage, please be sure to pay attention to the following before use.

| | Precautions | Consequences of neglect |
|---|---|-------------------------|
|  | Do not use it in humid, corrosive, flammable gas environments or places near flammable substances | Fire or malfunction |
|  | Do not use the wire when it is soaked in oil/water | Fire or malfunction |
|  | Do not frequently power on / off | Malfunction |
|  | Never modify, disassemble or repair by yourself | Fire, malfunction |
|  | Power supply voltage must meet the product requirements | Malfunction |
|  | Cut off the power when not in use for a long time | Fire , malfunction |

Maintenance

Please perform regular maintenance and inspection on the controller for safe use. Please pay attention to the following during maintenance and inspection:

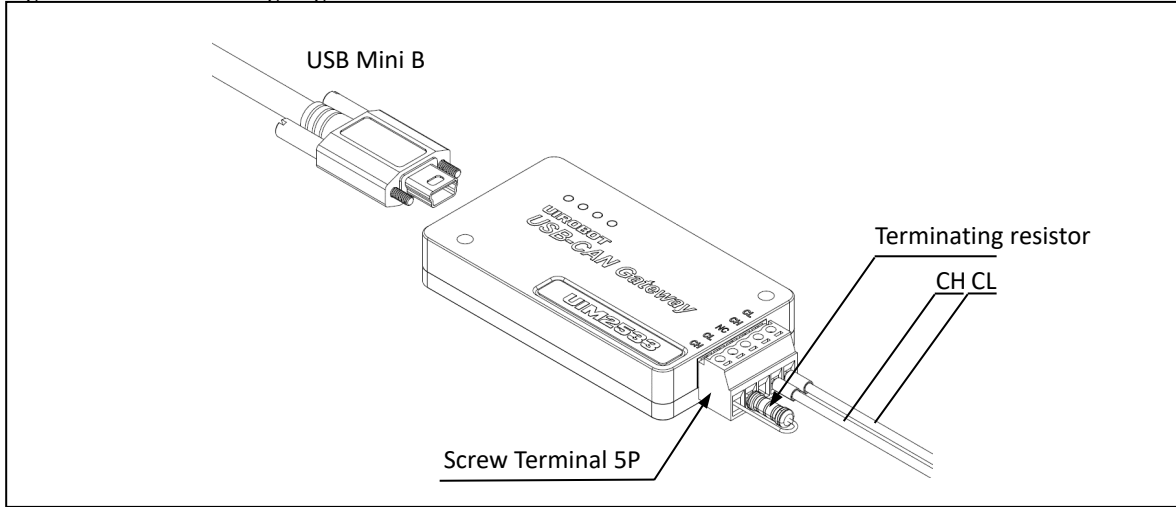
- ① When performing an insulation resistance test, be sure to disconnect all connections, otherwise malfunction may result.
- ② Do not use gasoline, thinner, alcohol, acidic and alkaline cleaning agents to avoid discoloration or damage to the casing.

Daily inspections and periodic inspections should be carried out according to the following items.

| Type | Period | Check Item |
|---------------------|-----------|---|
| Daily Inspection | Every day | <ul style="list-style-type: none">• Confirm the operating temperature and humidity• No foreign matter entering• Abnormal vibration, sound and odor• Abnormal power supply voltage• Damaged wiring parts |
| Periodic Inspection | 1 year | <ul style="list-style-type: none">• No looseness in the fastening parts• Broken terminal blocks and loose fastening parts |

Hardware

Figure 0-1: UIM2533 wiring diagram



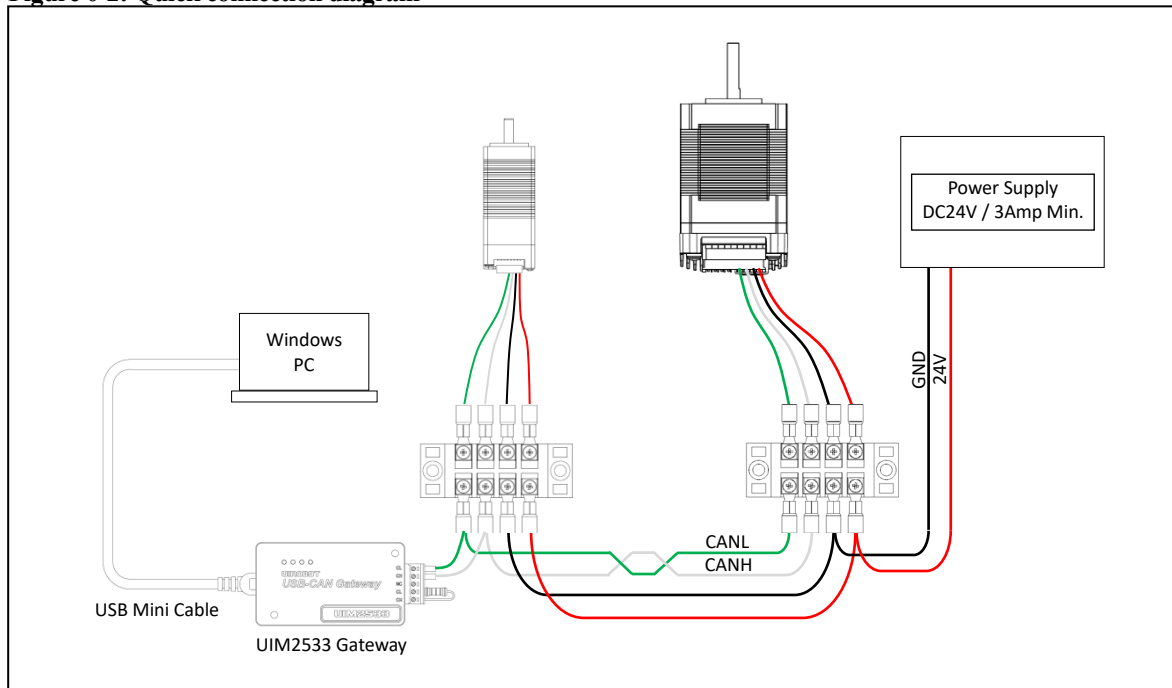
| Label | Illustrate |
|-------|-------------------------|
| CH | CANH signal wire(white) |
| CL | CANL signal wire(green) |

Quick Start

The following explains how to quickly build and run a motor system consisting of 2 servo stepper motors equipped with UIM342 controllers and 1 UIM2533 gateway.

- 1) Wiring the system as shown below. Double check the wiring before turn on the power.

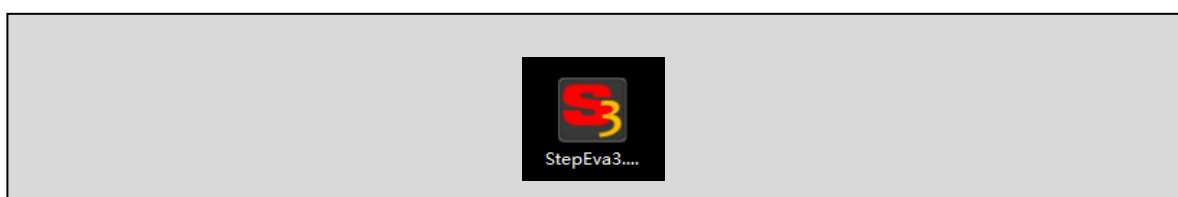
Figure 0-2: Quick connection diagram



⚠ WARNING

- Avoid using star connections. When the CAN cable length exceeds 20 meters, dedicated CAN cables should be used. The length of branch cable to each node should not exceed 20 cm.
 - UIM2533 has a built-in terminal resistor, which can be activated by the toggle switch. It is recommended to connect a 120-ohm terminal resistor to the other end of the CAN cable.
 - **Strictly avoid hot-plugging while the power is on.** Hot-plugging may lead to ground loss (i.e. the power supply V+ is connected while V- is disconnected). In such instances, power V+ will flow into other UIM devices via the CAN cable, causing the burnout of multiple UIM devices.
 - Connect all UIM devices to a common ground. Activating a high-power device can raise the voltage on one ground significantly. Without a common ground, this elevated voltage may flow via the CAN cable to other grounds of other devices, risking the burnout of multiple devices.
- 2) Download and click to run the Windows based control panel “StepEva3”.

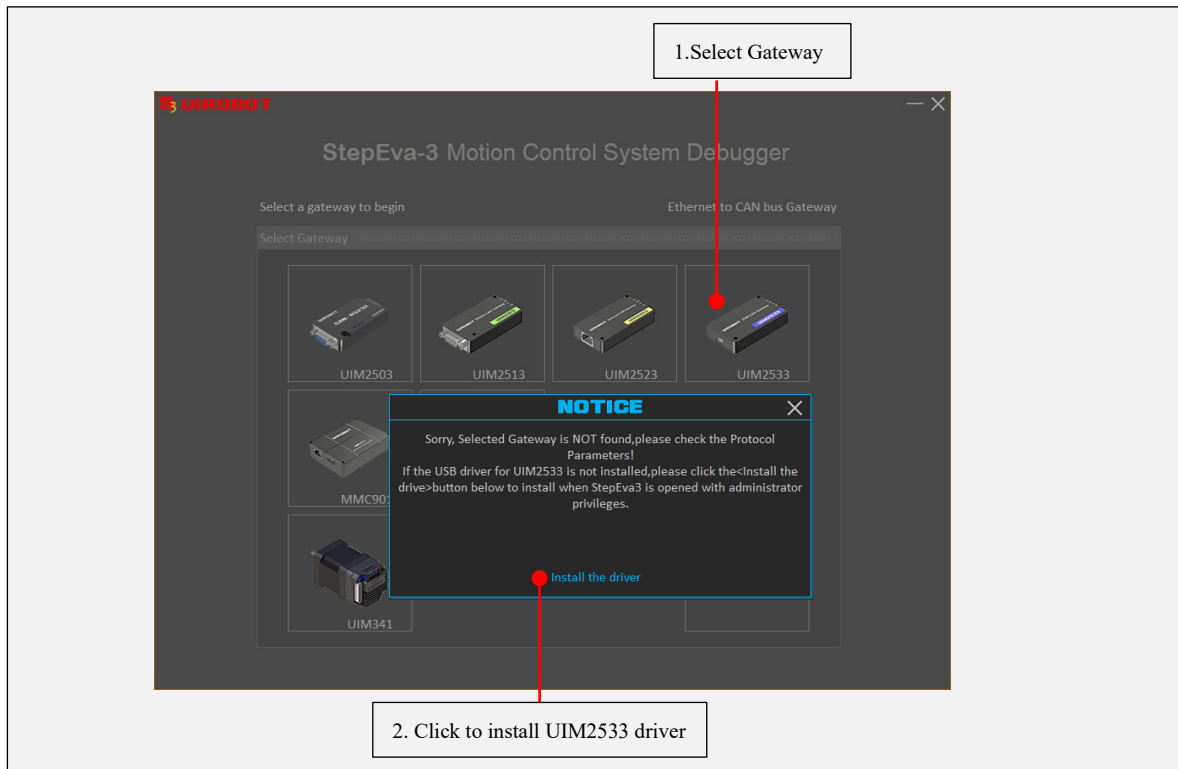
Figure 0-3: Icon of StepEva3



UIM2533

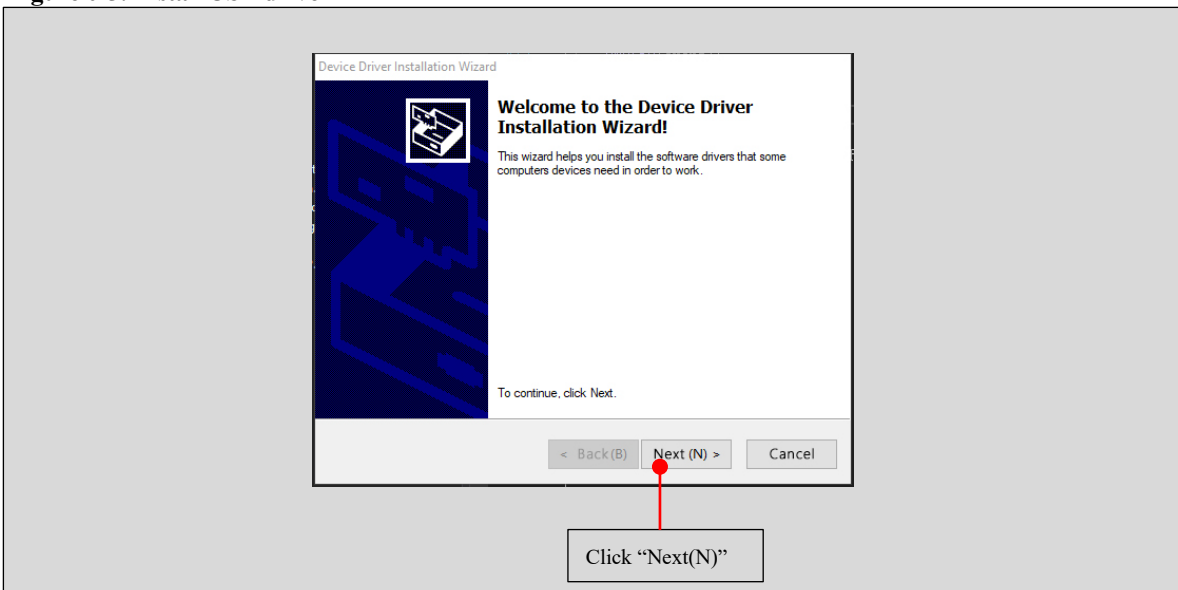
- 3) Click to select the UIM2533 Gateway. If the UIM2533 driver is not installed, click to install the driver according to the dialog box prompt in the figure below.

Figure 0-4: Gateway selection



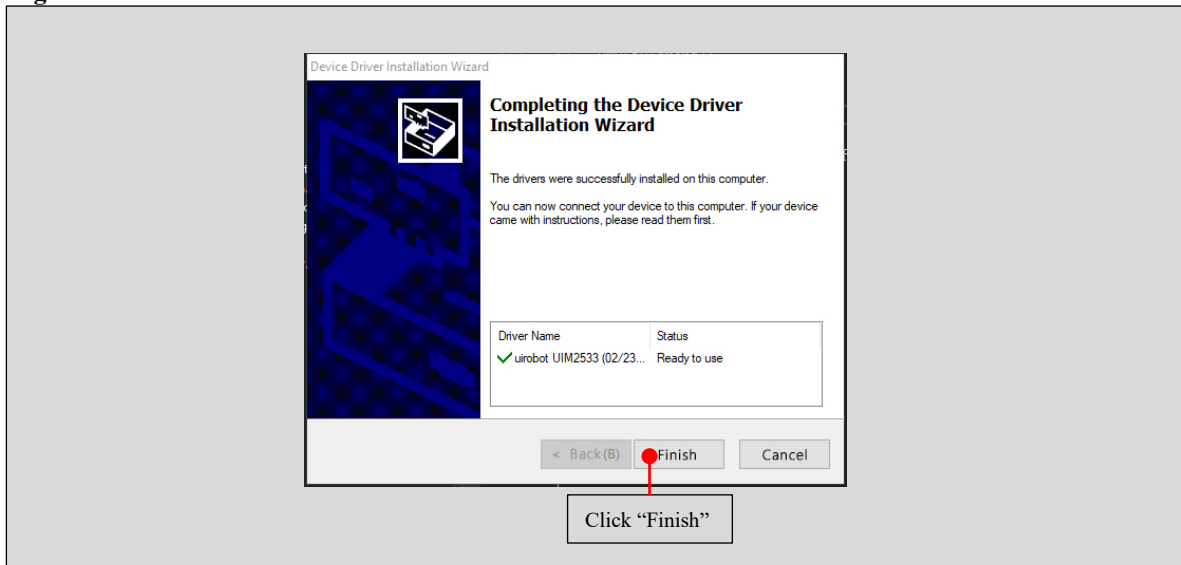
- 4) After clicking to install the driver, Figure 0-5 below will pop up. Click "Next Page". After the installation is completed, Figure 0-6 will be displayed. Click "Finish" to return to the gateway selection page. At this time, click UIM2533 again to enter the control interface.

Figure 0-5: Install USB driver 1



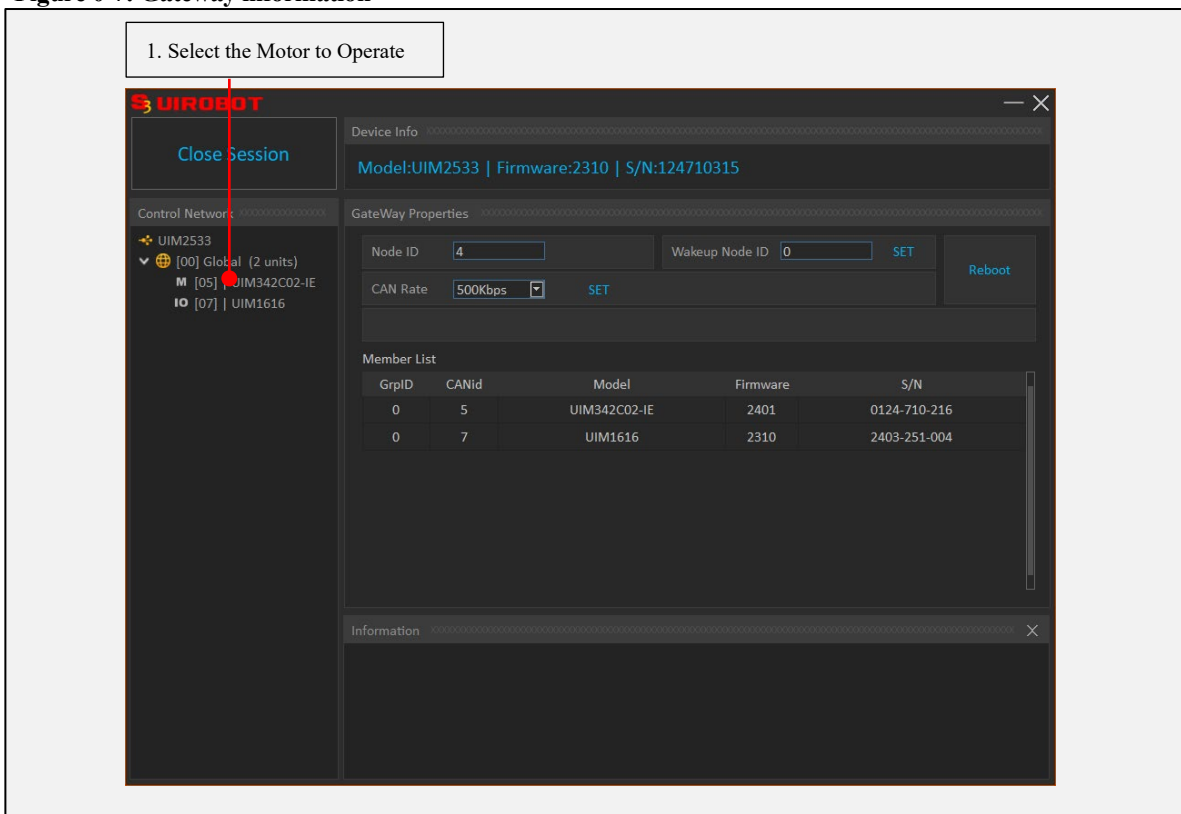
UIM2533 USB-CAN gateway

Figure 0-6: Install USB driver 2



- 5) Click to select the corresponding motor, and select the device to be operated in the device list on the left in Figure 0-7.

Figure 0-7: Gateway information



- 6) Refer to the corresponding User Manual of the selected device to operate.

Specifications

Absolute Maximum Ratings

Ambient temperature under bias.....-40°C to 85°C
Storage temperature -65°C to +150°C
Voltage on V+ with respect to V- -0.3V to 50V

Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Operating Conditions (at ambient temperature 25°C)

| Parameter | Min | Max | Units |
|---------------------|-----|-----|-------|
| Supply voltage (DC) | 12 | 48 | Volt |
| Input Current | 0 | 100 | mA |

Operating Environment

| | |
|-----------------------|--|
| Cooling | Free Air |
| Environment | Avoid dust, oil mist and corrosive gases |
| Operating temperature | -40 °C ~85 °C |
| Humidity | <80%RH, no condensation, no frost |
| Vibration | 3GMax |
| Storage | -65 °C ~ 150 °C |

Communication Interface

| | |
|----------------|---|
| CAN | Active CAN 2.0 |
| CAN Physical | 2 wires, CANH, CANL, twisted pair |
| CAN Driver | <ul style="list-style-type: none">• Max. 1 Mbps• Meets ISO-11898 standard physical layer requirements.• 1500V Isolated• Differential bus |
| User Interface | USB 2.0 |
| USB Physical | USB Mini B |

Other

| | |
|------------|--------------------|
| Dimensions | 68mm x 38mm x 12mm |
| weight | 0.15 Kg |

1.0 Protocol

This section introduces UIM2533's Instruction Set, Reply (ACK), Error Reporting, and Real-time Notification.

1.1 Instruction and Reply (ACK)

UIM2533 and the user controller exchange information using UIMessages, as shown in Figure 1-1. The length of a UIMessage is fixed to 16 bytes.

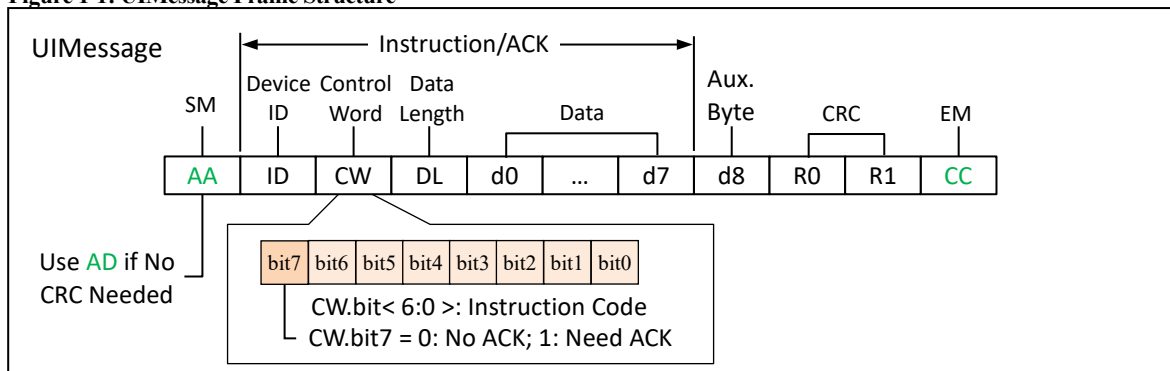
Instruction is a functional message from user controller to UIM devices.

ACK is the reply message from UIM devices, after receiving an instruction.

For "Set" instructions, the ACK message is typically a repeat of the instruction.

For "Get" instructions, the ACK message provides the data being queried.

Figure 1-1: UIMessage Frame Structure



SM Start of Message. If need CRC, using 0xAA, else using 0xAD instead.

ID UIM Devices' ID (1 byte), could be one of the 4 types listed below:

- 1) UIM342's Node ID, configurable via instruction,
- 2) Group ID of UIM devices, configurable via instruction,
- 3) Global ID = 0, fixed, or
- 4) UIM2533's Node ID = 4, fixed.

CW Control Word (1 byte)

- 1) CW.bit <6:0> is the function code (0x00...0x7F).
- 2) For instruction: if CW.bit7=1, UIM will ACK, if CW.bit7=0, UIM will not ACK.
- 3) For ACK: CW.bit7 = 0.

DL Valid number of bytes of data (1 byte)

d0...d7 Data bytes, low byte first.

d8 Auxiliary byte, don't care

R1:R0 RTU CRC16, range covers AA...d8, refer to Appendix- 2 for source code.

EM End of Message; is fixed to 0xCC.

UIM2533

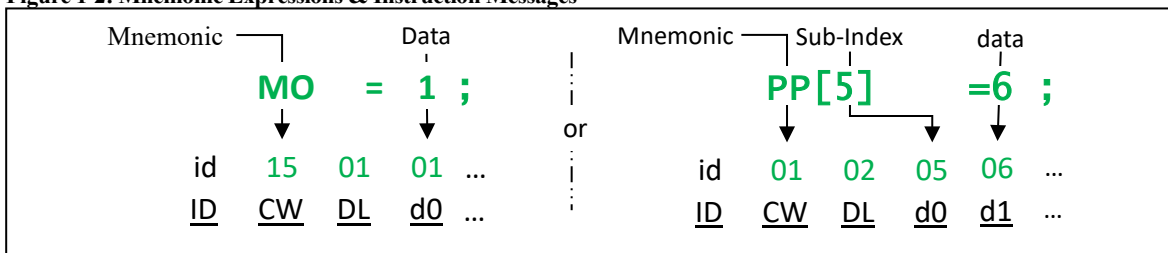
1.2 Mnemonic

For user convenience, UIM products provide a set of mnemonics used to represent various instruction codes. For example:

| mnemonic | Script code | Function |
|----------|-------------|-------------------------|
| MO | 0x15 | Turn on/off motor drive |

The relation between mnemonic expressions and instructions is shown below:

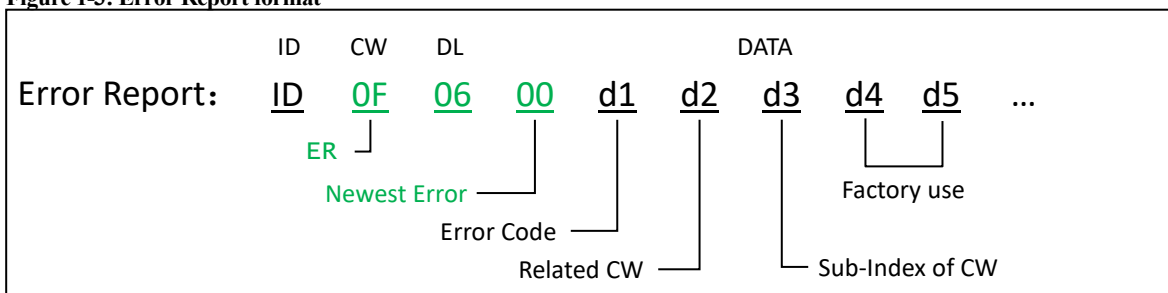
Figure 1-2: Mnemonic Expressions & Instruction Messages



1.3 Error Report

When a UIM device receives a wrong instruction, it will not execute the instruction, instead, it will reply an error message. Meanwhile, users can use ER[*i*] to get the latest error and the previous 7 historical errors. The format of an error message is listed below:

Figure 1-3: Error Report format



d1 - Error Code;

| Error code of UIM2533 | Description |
|-----------------------|-----------------------------|
| 0x32 | Instruction Syntax error |
| 0x33 | Instruction Data error |
| 0x34 | Instruction Sub-Index error |

d2 – CW related to the error;

For example, d2 = SN indicates an error on previous SN instruction.

d3 – Sub-Index of the CW related to the error;

For example, d2= PP; d3 = 5 indicates an error on previous PP[5] instruction.

d4, d5 – Factory use, don't care.

2.0 Instruction Set

This chapter provides details of instructions for UIM 2533.

Notice:

1. Unless otherwise specified, all message bytes are in hex format;
2. The instruction examples all use the SM of 0xAD (i.e., no CRC);
3. This chapter only lists UIM2533 related instructions. Please refer to the relevant user manual for other UIM device's instructions.
4. Abbreviation definitions are listed below:
 - a) INST – Instruction;
 - b) ACK – Acknowledgment / Reply;
 - c) SM – Start of Message;
 - d) EM – End of Message;

UIM2533

2.1 PP[i] Protocol Parameter

Protocol Parameter

| CW | Disable ACK | 0x01 | Request ACK | 0x81 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|------------------------------------|--|----------------|----|----|----|----|----|----|----|-----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| DATA | Sub-Index(i) | unsigned 8 bit | Data | unsigned 8 bit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | PP[i] Get Protocol Parameters INST data length 1 Data d0 (=i) ACK data length 2 Data d0 (=i), d1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PP[i]=N Set Protocol Parameters INST data length 2 Data d0 (=i), d1 ACK data length 2 Data d0 (=i), d1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | i | Description | Value (N) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 5 | CAN bit rate (bps) | 0: 1000K 1: 800K 2: 500K 3: 250K 4: 125K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Node ID | Get Node ID: UIM2533 ID fixed = 4. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Example GET | <table border="1"> <thead> <tr> <th>INST</th> <th>ID</th> <th>CW</th> <th>DL</th> <th>d0</th> <th>d1</th> <th>d2</th> <th>d3</th> <th>d4</th> <th>d5</th> <th>d6</th> <th>d7</th> </tr> </thead> <tbody> <tr> <td></td> <td>04</td> <td>81</td> <td>01</td> <td>05</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> </tr> </tbody> </table> <p>Sub-Index d0 = 5 (CAN bitrate).</p> | | | | | | | | | | | | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 81 | 01 | 05 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 81 | 01 | 05 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>ACK</th> <th>ID</th> <th>CW</th> <th>DL</th> <th>d0</th> <th>d1</th> <th>d2</th> <th>d3</th> <th>d4</th> <th>d5</th> <th>d6</th> <th>d7</th> </tr> </thead> <tbody> <tr> <td></td> <td>04</td> <td>01</td> <td>02</td> <td>05</td> <td>01</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> </tr> </tbody> </table> <p>Sub-Index d0 = 5 (CAN bitrate); Date d1 = 1 (800 K).</p> | | | | | | | | | | | | ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 01 | 02 | 05 | 01 | 00 | 00 | 00 | 00 | 00 | 00 | |
| ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 01 | 02 | 05 | 01 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Example SET | <table border="1"> <thead> <tr> <th>INST</th> <th>ID</th> <th>CW</th> <th>DL</th> <th>d0</th> <th>d1</th> <th>d2</th> <th>d3</th> <th>d4</th> <th>d5</th> <th>d6</th> <th>d7</th> </tr> </thead> <tbody> <tr> <td></td> <td>04</td> <td>81</td> <td>02</td> <td>05</td> <td>02</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> </tr> </tbody> </table> <p>Sub-Index d0 = 5 (CAN bit rate); Date d1 = 2 (SET 500 K).</p> | | | | | | | | | | | | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 81 | 02 | 05 | 02 | 00 | 00 | 00 | 00 | 00 | 00 |
| | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 81 | 02 | 05 | 02 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>ACK</th> <th>ID</th> <th>CW</th> <th>DL</th> <th>d0</th> <th>d1</th> <th>d2</th> <th>d3</th> <th>d4</th> <th>d5</th> <th>d6</th> <th>d7</th> </tr> </thead> <tbody> <tr> <td></td> <td>04</td> <td>01</td> <td>02</td> <td>05</td> <td>02</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> <td>00</td> </tr> </tbody> </table> <p>Sub-Index d0 = 5 (CAN bit rate); Date d1 = 2 (500 K).</p> | | | | | | | | | | | | ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 01 | 02 | 05 | 02 | 00 | 00 | 00 | 00 | 00 | 00 | |
| ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 01 | 02 | 05 | 02 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Note | <ul style="list-style-type: none"> The value of PP[i] will be saved to FLASH memory with a 10,000 write lifespan. Within a specific CAN network, Node IDs and Group IDs of all devices should never be overlapped. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

UIM2533 USB-CAN gateway

2.2 ML Model

System Settings

| CW | Disable ACK | 0x8B | Request ACK | 0x8B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|--|------|-------------|------|---------------------|--------|----|----|----|----|----|--|------|----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|--------|--------|---------|------|------|------|----|---------------------|------|
| DATA | n/a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | ML Get the model, function module and firmware version INST data length 0 Data n/a ACK data length 8 Data d0, d1, d2, d3, d4, d5, d6, d7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Example GET | <table style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 10%;">INST</th> <th style="width: 5%;">ID</th> <th style="width: 5%;">CW</th> <th style="width: 5%;">DL</th> <th style="width: 5%;">d0</th> <th style="width: 5%;">d1</th> <th style="width: 5%;">d2</th> <th style="width: 5%;">d3</th> <th style="width: 5%;">d4</th> <th style="width: 5%;">d5</th> <th style="width: 5%;">d6</th> <th style="width: 5%;">d7</th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black; text-align: center;">04</td> <td style="border: 1px solid black; text-align: center;">8B</td> <td style="border: 1px solid black; text-align: center;">00</td> <td style="border: 1px solid black; text-align: center;">00</td> <td style="border: 1px solid black; text-align: center;">00</td> <td style="border: 1px solid black; text-align: center;">00</td> <td style="border: 1px solid black; text-align: center;">00</td> <td style="border: 1px solid black; text-align: center;">00</td> <td style="border: 1px solid black; text-align: center;">00</td> <td style="border: 1px solid black; text-align: center;">00</td> <td style="border: 1px solid black; text-align: center;">00</td> </tr> </tbody> </table> <table style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 10%;">ACK</th> <th style="width: 5%;">ID</th> <th style="width: 5%;">CW</th> <th style="width: 5%;">DL</th> <th style="width: 5%;">d0</th> <th style="width: 5%;">d1</th> <th style="width: 5%;">d2</th> <th style="width: 5%;">d3</th> <th style="width: 5%;">d4</th> <th style="width: 5%;">d5</th> <th style="width: 5%;">d6</th> <th style="width: 5%;">d7</th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black; text-align: center;">04</td> <td style="border: 1px solid black; text-align: center;">0B</td> <td style="border: 1px solid black; text-align: center;">08</td> <td style="border: 1px solid black; text-align: center; color: blue;">19</td> <td style="border: 1px solid black; text-align: center; color: blue;">21</td> <td style="border: 1px solid black; text-align: center; color: blue;">00</td> <td style="border: 1px solid black; text-align: center; color: blue;">00</td> <td style="border: 1px solid black; text-align: center; color: blue;">00</td> <td style="border: 1px solid black; text-align: center; color: blue;">00</td> <td style="border: 1px solid black; text-align: center; color: blue;">00</td> <td style="border: 1px solid black; text-align: center; color: blue;">00</td> </tr> </tbody> </table> <p>UIM2533 model information (Data d0...d7) refer to the following table:</p> <table style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 25%;">Model</th> <th style="width: 12.5%;">d0</th> <th style="width: 12.5%;">d1</th> <th style="width: 12.5%;">d2</th> <th style="width: 12.5%;">d3</th> <th style="width: 12.5%;">d5: d4</th> <th style="width: 12.5%;">d7: d6</th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black; text-align: center;">UIM2533</td> <td style="border: 1px solid black; text-align: center;">0x19</td> <td style="border: 1px solid black; text-align: center;">0x21</td> <td style="border: 1px solid black; text-align: center;">0x00</td> <td style="border: 1px solid black; text-align: center;">xx</td> <td style="border: 1px solid black; text-align: center;">Firmware version</td> <td style="border: 1px solid black; text-align: center;">xxxx</td> </tr> </tbody> </table> <p>x – Factory use.</p> | | | | | | | | | | | | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 8B | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 0B | 08 | 19 | 21 | 00 | 00 | 00 | 00 | 00 | 00 | Model | d0 | d1 | d2 | d3 | d5: d4 | d7: d6 | UIM2533 | 0x19 | 0x21 | 0x00 | xx | Firmware version | xxxx |
| INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 8B | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 0B | 08 | 19 | 21 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Model | d0 | d1 | d2 | d3 | d5: d4 | d7: d6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UIM2533 | 0x19 | 0x21 | 0x00 | xx | Firmware version | xxxx | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

UIM2533

2.3 SN Serial Number

System Settings

| CW | Disable ACK | 0x8C | Request ACK | 0x8C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|--|------|-------------|------|------|----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|
| DATA | n/a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| description | <p>SN Get the serial number of the device</p> <p>INST data length 0 Data n/a</p> <p>ACK data length 8 Data d0, d1, d2, d3, d4, d5, d6, d7</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Query example | <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <thead> <tr> <th style="width: 10%;">INST</th> <th style="width: 10%;">ID</th> <th style="width: 10%;">CW</th> <th style="width: 10%;">DL</th> <th style="width: 10%;">d0</th> <th style="width: 10%;">d1</th> <th style="width: 10%;">d2</th> <th style="width: 10%;">d3</th> <th style="width: 10%;">d4</th> <th style="width: 10%;">d5</th> <th style="width: 10%;">d6</th> <th style="width: 10%;">d7</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;">04</td> <td style="text-align: center;">8C</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <thead> <tr> <th style="width: 10%;">ACK</th> <th style="width: 10%;">ID</th> <th style="width: 10%;">CW</th> <th style="width: 10%;">DL</th> <th style="width: 10%;">d0</th> <th style="width: 10%;">d1</th> <th style="width: 10%;">d2</th> <th style="width: 10%;">d3</th> <th style="width: 10%;">d4</th> <th style="width: 10%;">d5</th> <th style="width: 10%;">d6</th> <th style="width: 10%;">d7</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;">04</td> <td style="text-align: center;">0C</td> <td style="text-align: center;">08</td> <td style="text-align: center;">01</td> <td style="text-align: center;">02</td> <td style="text-align: center;">03</td> <td style="text-align: center;">04</td> <td style="text-align: center;">05</td> <td style="text-align: center;">06</td> <td style="text-align: center;">07</td> <td style="text-align: center;">08</td> </tr> </tbody> </table> <p>Data [d3:d2:d1:d0] = 0x04030201 (Serial number 0067305985). [d5:d4] = 0x0605 (Manufacturer ID 1541). [d7:d6] = 0x0807 (Vendor ID 2055).</p> | | | | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 8C | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 0C | 08 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 |
| INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 8C | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 0C | 08 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

2.4 ER[i] Error Report

System Settings

| CW | Disable ACK | 0x0F | Request ACK | 0x8F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--------------------------------------|-------------|----------------|----|-------------|----|--------------------------------------|----|----------------------------|----|---------------------------|---------|-------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| DATA | Sub-Index(i) | Unsigned 8 bit | Data | Unsigned 8 bit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| describe | ER[i] Get Error Report INST data length 1 Data d0 (=i) ACK data length 6 Data d0 (=i), d1, d2, d3, d4, d5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ER[i]=0 Clear Error Report INST data length 2 Data d0 (=i), d1, d2 ACK data length 6 Data d0 (=i), d1, d2, d3, d4, d5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">i</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Get / Clear The latest error content</td> </tr> <tr> <td style="text-align: center;">6</td> <td>Get / Clear Power on error</td> </tr> <tr> <td style="text-align: center;">10</td> <td>Get / Clear latest errors</td> </tr> <tr> <td style="text-align: center;">11...18</td> <td>Get / Clear the last 2 ... 9 errors</td> </tr> </tbody> </table> | | | | i | Description | 0 | Get / Clear The latest error content | 6 | Get / Clear Power on error | 10 | Get / Clear latest errors | 11...18 | Get / Clear the last 2 ... 9 errors | | | | | | | | | | | | | | | | | | | | | | |
| | i | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 | Get / Clear The latest error content | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Get / Clear Power on error | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Get / Clear latest errors | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11...18 | Get / Clear the last 2 ... 9 errors | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Refer to chapter 1.3 “Error Report” for the description of d0, d1, d2, d3, d4, d5. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Query example | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>INST</th><th>ID</th><th>CW</th><th>DL</th><th>d0</th><th>d1</th><th>d2</th><th>d3</th><th>d4</th><th>d5</th><th>d6</th><th>d7</th> </tr> </thead> <tbody> <tr> <td></td><td>04</td><td>8F</td><td>01</td><td style="color: red;">00</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td> </tr> </tbody> </table> <p style="color: red; margin-left: 20px;">Sub-Index d0 = 0 (Get the latest error).</p> | | | | | | | | | | | | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 8F | 01 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 8F | 01 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>ACK</th><th>ID</th><th>CW</th><th>DL</th><th>d0</th><th>d1</th><th>d2</th><th>d3</th><th>d4</th><th>d5</th><th>d6</th><th>d7</th> </tr> </thead> <tbody> <tr> <td></td><td>04</td><td>0F</td><td>06</td><td style="color: red;">00</td><td style="color: blue;">14</td><td style="color: blue;">81</td><td style="color: blue;">00</td><td style="color: blue;">00</td><td style="color: blue;">00</td><td>00</td><td>00</td> </tr> </tbody> </table> <p style="color: red; margin-left: 20px;">Sub-Index d0 = 0 (The latest error).</p> <p style="color: blue; margin-left: 20px;">Data d1 = 0x14 (Error Code, CAN message sending timeout (no response)); d2 = 0x81 (CW related to the error, 0x81 is PP); d3 = 0x00 (Sub-Index of the CW related to the error); d4, d5 = 0x00 (reserved).</p> <p style="margin-left: 20px;">Sum up, "Gateway sent the PP[0], but no response is received."</p> | | | | | | | | | | | | ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 0F | 06 | 00 | 14 | 81 | 00 | 00 | 00 | 00 | 00 | |
| ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 0F | 06 | 00 | 14 | 81 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Setting example | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>INST</th><th>ID</th><th>CW</th><th>DL</th><th>d0</th><th>d1</th><th>d2</th><th>d3</th><th>d4</th><th>d5</th><th>d6</th><th>d7</th> </tr> </thead> <tbody> <tr> <td></td><td>04</td><td>8F</td><td>02</td><td style="color: red;">00</td><td style="color: blue;">00</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td> </tr> </tbody> </table> <p style="color: red; margin-left: 20px;">Sub-Index d0 = 0 (latest error); Data d1 = 0 (clear).</p> | | | | | | | | | | | | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 8F | 02 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 8F | 02 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>ACK</th><th>ID</th><th>CW</th><th>DL</th><th>d0</th><th>d1</th><th>d2</th><th>d3</th><th>d4</th><th>d5</th><th>d6</th><th>d7</th> </tr> </thead> <tbody> <tr> <td></td><td>04</td><td>0F</td><td>06</td><td style="color: red;">00</td><td style="color: blue;">00</td><td style="color: blue;">00</td><td style="color: blue;">00</td><td style="color: blue;">00</td><td style="color: blue;">00</td><td>00</td><td>00</td> </tr> </tbody> </table> <p style="color: red; margin-left: 20px;">Sub-Index d0 = 0 (latest error); Data d5 ...d1 = 0 (no error).</p> | | | | | | | | | | | | ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 0F | 06 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | |
| ACK | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 04 | 0F | 06 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | | | | | | | | | |

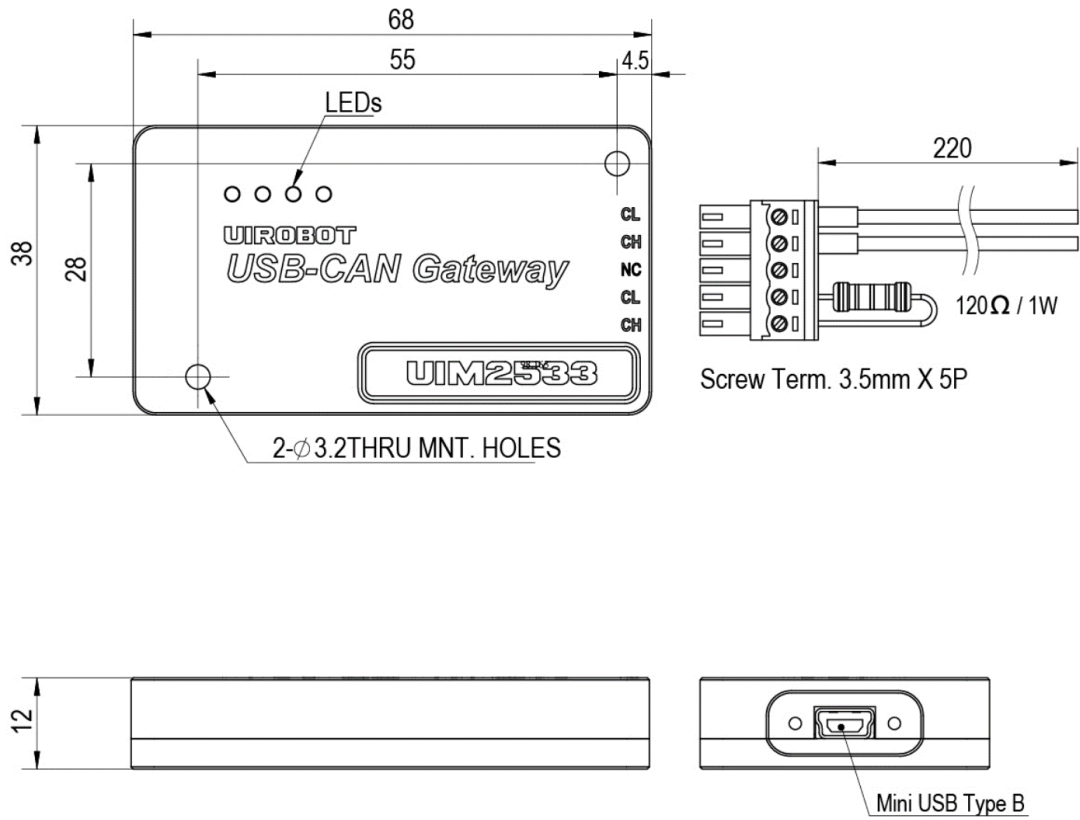
2.5 SY[i] System Operation

System Settings

| CW | Disable ACK | 0x7E | Request ACK | 0x7E | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|--|----------------|-------------|------|------|-------------|----|-------------------|----|--------------------------|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|
| DATA | Sub-Index(i) | Unsigned 8 bit | Data | n/a | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | <p>SY[i] System Operation INST data length 1 Data d0 (=i) No ACK</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; text-align: center;">i</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>Reboot the device</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Restore factory defaults</td> </tr> </tbody> </table> | | | | i | Description | 1 | Reboot the device | 2 | Restore factory defaults | | | | | | | | | | | | | | | | | | |
| i | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Reboot the device | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Restore factory defaults | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Setting example | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 8%;">INST</th> <th style="width: 8%;">ID</th> <th style="width: 8%;">CW</th> <th style="width: 8%;">DL</th> <th style="width: 8%;">d0</th> <th style="width: 8%;">d1</th> <th style="width: 8%;">d2</th> <th style="width: 8%;">d3</th> <th style="width: 8%;">d4</th> <th style="width: 8%;">d5</th> <th style="width: 8%;">d6</th> <th style="width: 8%;">d7</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;">04</td> <td style="text-align: center;">7E</td> <td style="text-align: center;">01</td> <td style="text-align: center; color: red;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> <td style="text-align: center;">00</td> </tr> </tbody> </table> <p style="margin-top: 5px;">Sub-Index d0 = 1 (Reboot the device). ACK: n/a</p> | | | | INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | 04 | 7E | 01 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| INST | ID | CW | DL | d0 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | | | | | | | | | | | | | | | | | |
| | 04 | 7E | 01 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | | | | | | | | | | | | | | | | | |

Appendix-1 Dimensions

Unit: mm



Appendix-2 RTU CRC16 Source Code

UIMessage uses CRC-16 (modbus) algorithm. For details, please refer to Online CRC-8 CRC-16 CRC-32 Calculator (crccalc.com) . The source code used in the calculation is listed below .

```
// CRC low byte table
```

```
unsigned char tblCRCLo [ 256] = {
0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7, 0x05, 0xC5, 0xC4, 0x04, 0xCC, 0x0C, 0x0D,
0xCD, 0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09, 0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B,
0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C, 0xDC, 0x14, 0xD4, 0xD5, 0x15, 0xD7, 0x17, 0x16,
0xD6, 0xD2, 0x12, 0x13, 0xD3, 0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3, 0x32, 0x36, 0xF6,
0xF7, 0x37, 0xF5, 0x35, 0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A, 0x3B, 0xFB, 0x39,
0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE, 0x2E, 0x2F, 0xEF, 0x2D, 0xED, 0xEC,
0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26, 0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0xE0, 0xA0, 0x60,
0x61, 0xA1, 0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xA4, 0x6C, 0xA4, 0x6C,
0xAF, 0x6F, 0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B,
0x7A, 0xBA, 0xBE, 0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5, 0x77, 0xB7, 0xB6, 0x76,
0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0, 0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57,
0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59,
0x58, 0x98, 0x88, 0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C, 0x44,
0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80, 0x40 };
```

```
// CRC high byte table
```

```
unsigned char tblCRCHi [ 256] = {
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80,
0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01,
0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80,
0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40 };
```

```
// Calculate CRC, * buf points to 0xAA ID CW ... d8 data sequence, qty = 13 bytes
```

```
unsigned short RtuCrc16(unsigned char* buf, unsigned int qty)
{
    unsigned char crcH = 0xFF;
    unsigned char crcL = 0xFF;
    int idx = 0;

    while (qty-->0)
    {
        idx = crcL ^ *buf++;
        crcL = crcH ^ tblCRCHi [ idx ];
        crcH = tblCRCLo [ idx ];
    }

    return ( crcH << 8) | crcL ;
}
```