

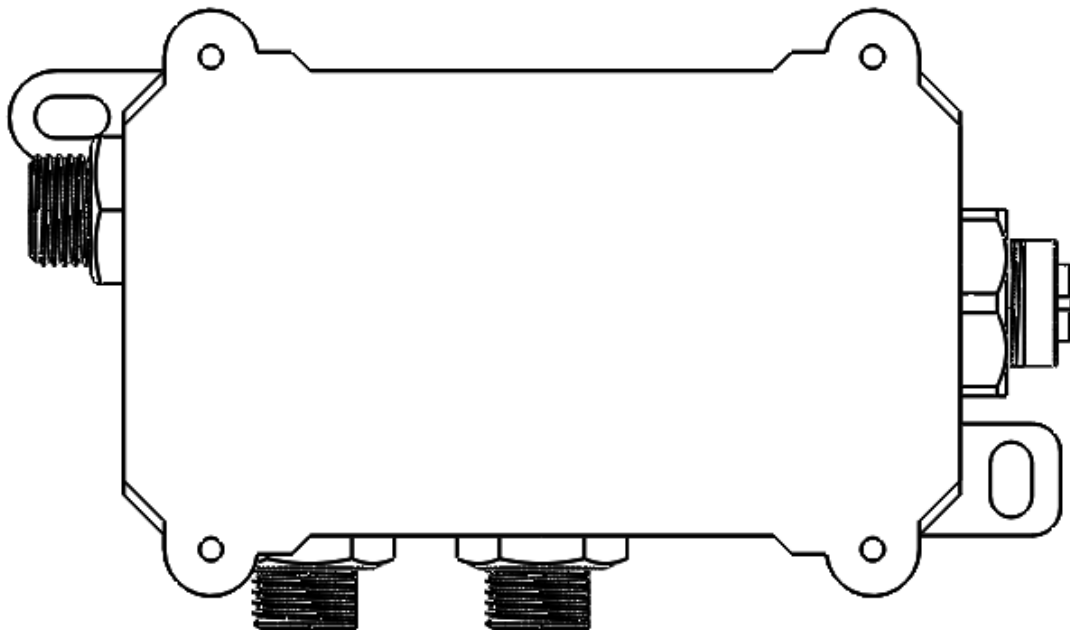


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1. Product overview

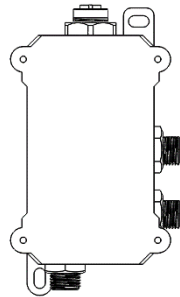
The protocol converter is used for the external system to start and stop N series outboards, adjust the speed, display system information, etc. The protocol converter has 3 RS485 interfaces, which can support up to two N series outboards to be connected at the same time. The protocol converter communicates with the built-in communication system of the outboard by wire, and automatically recognizes and connects to all models of ePropulsion N series outboards. Users can easily control it by setting software or serial port commands on PC.

1.1 Features

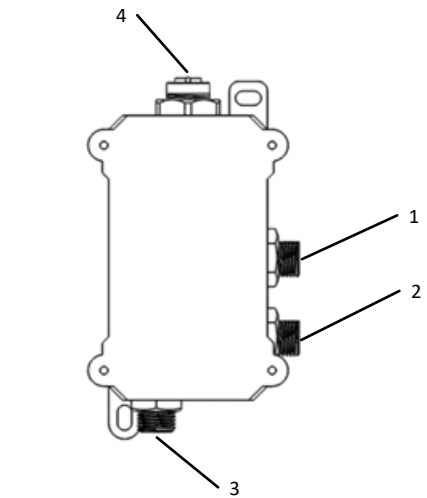
- Support two N series outboard motors at the same time
- Baud rate 34800 bps
- Support RS485 transceiver automatic switching
- RS485 with TVS, overcurrent and other protection

1.2 In the package

Unpack the package and check if there is any damage caused during transport. Check all the items inside the package against the below list. If there is any transport damage or lack of any listed item, please contact your dealer immediately.

Items	Qty./Unit	Figure
Protocol converter	1 set	
Communication cable 5m	1 pcs	

1.3 Parts



No.	Definition	Description
1	RS485 communication interface 1	Connect with the left motor
2	RS485 communication interface 2	Connect with the right motor
3	RS485 communication interface 3	Connect MCU or PC
4	CAN communication interface	Reserved

1.4 Definition of communication cable

Color	Definition	Description
yellow	GND	
green	RS485 Phase B	
blue	RS485 Phase A	
brown	+5V	Can be defaulted

1.5 Specifications

Communication method	RS485
Baud rate	38400 bps
Weight	0.15kg
Dimensions	90mm x 50mm x 40mm _

2. Power Supply

Please follow the steps below to supply power to the protocol converter by connecting with a communication cable.

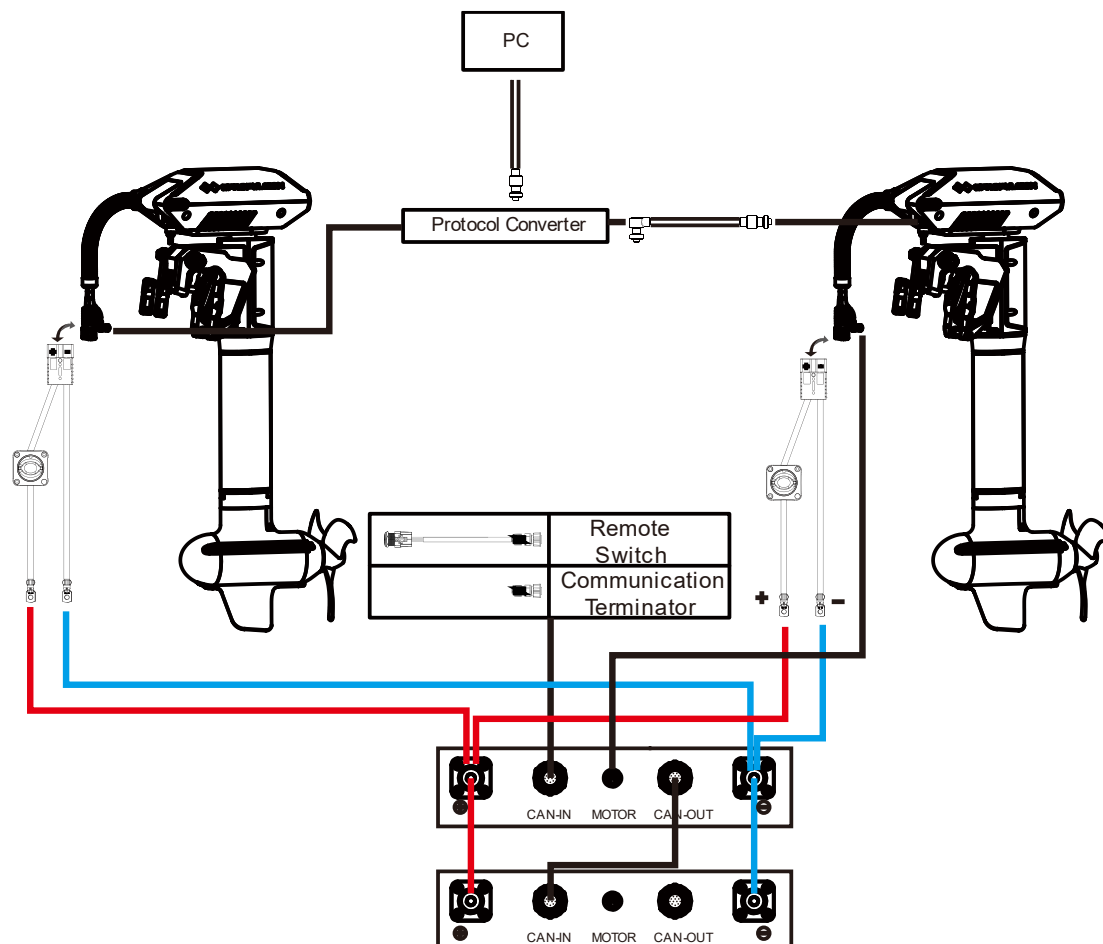
Use the communication cable to connect the protocol converter with the motor. Connect the protocol converter with either the left or right motor to start supplying power to the protocol converter.

3. Communication Protocol

3.1 Communication Protocol

The physical layer of the protocol converter is RS485 bus, 1 start bit, 8 data bits, 1 stop bit, 1 parity check bit.

3.2 Block diagram of communication module



3.3 Communication bottom layer configuration

Baud rate	38400 bit/s
Master sends instruction cycle	30ms
Slave response time	Respond to command within 5ms
Send data mode	big endian
Left Motor control address	0x01 (default)
Right motor control address	0x02 (default)

3.4 communication format

Head code	Address	Data length	Command	Data 0	Data 1	Data n	Check	End code
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Head code: 0x28

Address: address of the slave device, 1byte

Command: represents the meaning of the instruction, 1 byte

Data: the data contained in this command, high-byte first, low-byte after. For example: 0x1234, data 0 = 0x12, data 1 = 0x34

Check: data length ^ command ^ data 0 ^ data 1 ^.....^data n, 1 byte

End code: 0x29

3.5 Communication content

3.5.1 The throttle control board sends to the protocol converter

Head code	Address	Data length	Command	Data 0	Data 1	Check	End code
0x28	Left address or right address	3	0x2C _	Direction: 0x00= backward 0x01= forward	Throttle: 0-0x7F means 0-100%	BCC	0x29

3.5.2 The protocol converter replies to the throttle control board (reply in turn)

Command summary

No.	Command code	Command description	Sending method
1	0XA1	Left Motor information	Reply in turn
2	0XA2	Left GPS information	Reply in turn
3	0XA3	left battery information	Reply in turn
4	0XA4	Protocol converter information	Reply in turn
5	0XA5	Right Motor information	Reply in turn
6	0XA6	Right GPS information	Reply in turn
7	0XA7	Right battery information	Reply in turn
8	0XA8	Driver version information	Reply in turn
9	0XA9	Adapter board version information	Reply in turn
10	0xAA	Left and right throttle and direction information	Reply in turn
11	0xAB	Machine running time information	Reply in turn
12	0XAC	Protocol converter version information	Reply in turn
13	0XAD	Temperature information	Reply in turn
14	0XAE	Left motor bus current information	Reply in turn
15	0XB0	Right motor bus current information	Reply in turn

Command details

(1) Left motor information

Head code	0x28
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Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XA1
Data 0	Bit 0: motor blocked-1 fault, 0 normal; Bit 1: motor over temperature-1 fault, 0 normal; Bit 2: MOS over temperature-1 fault, 0 normal; Bit 3: overcurrent-1 fault, 0 normal; Bit 4: 8301 fault-1 fault 0 normal; Bit 5: driver communication fault (sent from the driver)-1 fault, 0 normal Bit 6: temperature sensor fault-1 fault, 0 normal Bit 7: Mos over temperature warning-1 warning, 0 normal
Data 1	Motor power high 8 bits, unit: 1W
Data 2	Motor power low 8 bits, unit: 1W
Data 3	Motor rotational speed high 8 bits, unit: 1rpm
Data 4	Motor rotational speed low 8 bits, unit: 1rpm
Data 5	Bit 0: overvoltage-1 fault, 0 normal Bit 1: drive communication fault (judged by throttle) -1 fault, 0 normal Bit 2: battery communication fault-1 fault, 0 normal Bit 3: undervoltage-1 fault, 0 normal Bit 4: phase loss-1 fault, 0 normal Bit 5: motor idling-1 fault, 0 normal Bit 6: motor control fault-1 fault, 0 normal Bit 7: reserved
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(2) Left GPS information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XA2
Data 0	Left GPS speed high 8 bits, unit: 0.01m/s
Data 1	Left motor running time high 8 bits, unit: 1min
Data 2	Left motor running time low 8 bits, unit: 1min
Data 3	Left motor running distance high 8 bits, unit: 0.1km
Data 4	Left motor running distance low 8 bits, unit: 0.1km
Data 5	Left GPS speed low 8 bits, unit: 0.01m/s
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(3) Left battery information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XA3
Data 0	Battery status information (ePropulsion use only)
Data 1	Battery voltage high 8 bits, unit: 0.1V
Data 2	Battery voltage low 8 bits, unit: 0.1V
Data 3	Battery percentage high 8 bits, unit: 1%
Data 4	Battery percentage low 8 bits, unit: 1%
Data 5	Reserved
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5

End code	0x29
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(4) Protocol Converter information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XA4
Data 0	Bit 0: kill switch-1 normal, 0 not attached Bit 1: whether the left throttle need to return to zero position-1 not required, 0 required Bit 2: whether the right throttle need to return to zero position-1 not required, 0 required Bit 3: whether the left and right throttles are at zero position at the same time-1 yes, 0 no Bit 4-bit5: left motor gear-1 backward, 2 forward, 3 neutral Bit 6-bit7: right motor gear-1 backward, 2 forward, 3 neutral
Data 1	Bit 0: whether the dual remote control is on or not-1 on, 0 off Bit 1: Whether SYNC mode-1 yes, 0 no Bit 2: whether DOCK mode-1 yes, 0 no Bit 3: Whether NROM mode-1 yes, 0 no Bit 4: whether the throttle need to be recalibrated-1 yes, 0 no Bit 5: whether the left throttle has a value (1 - 127) -1 yes, 0 no Bit 6: whether the right throttle has a value (1 - 127) -1 yes, 0 no Bit 7: SYNC mode control mode-1 left, 0 right
Data 2	0= Dual remote control power button is switched on 1= Dual remote control power button is switched off
Data 3	The number of satellites found by left GPS
Data 4	The number of satellites found by right GPS
Data 5	Throttle Calibration Status 1=recalibration required 3=throttle is at the max forward position 4=throttle is at zero position 5=throttle is at the max backward position 8=calibration succeeded 9=calibration failed
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(5) Right motor information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XA5
Data 0	Bit 0: motor blocked-1 fault, 0 normal; Bit 1: motor over temperature-1 fault, 0 normal; Bit 2: MOS over temperature-1 fault, 0 normal; Bit 3: overcurrent-1 fault, 0 normal; Bit 4: 8301 fault-1 fault 0 normal; Bit 5: driver communication fault (sent from the driver)-1 fault, 0 normal Bit 6: temperature sensor fault-1 fault, 0 normal Bit 7: Mos over temperature warning-1 warning, 0 normal
Data 1	Motor power high 8 bits, unit: 1W
Data 2	Motor power low 8 bits, unit: 1W
Data 3	Motor rotational speed high 8 bits, unit: 1rpm

Data 4	Motor rotational speed low 8 bits, unit: 1rpm
Data 5	Bit 0: overvoltage-1 fault, 0 normal Bit 1: drive communication fault (judged by throttle) -1 fault, 0 normal Bit 2: battery communication fault-1 fault, 0 normal Bit 3: undervoltage-1 fault, 0 normal Bit 4: phase loss-1 fault, 0 normal Bit 5: motor idling-1 fault, 0 normal Bit 6: motor control fault-1 fault, 0 normal Bit 7: reserved
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(6) Right GPS information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XA6
Data 0	Right GPS speed high 8 bits, unit: 0.01m/s
Data 1	Right motor running time high 8 bits, unit: 1min
Data 2	Right motor running time low 8 bits, unit: 1min
Data 3	Right motor running distance high 8 bits, unit: 0.1km
Data 4	Right motor running distance low 8 bits, unit: 0.1km
Data 5	Right GPS speed low 8 bits, unit: 0.01m/s
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(7) Right battery information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XA7
Data 0	Battery status information (ePropulsion use only)
Data 1	Battery voltage high 8 bits, unit: 0.1V
Data 2	Battery voltage low 8 bits, unit: 0.1V
Data 3	Battery percentage high 8 bits, unit: 1%
Data 4	Battery percentage low 8 bits, unit: 1%
Data 5	Reserved
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(8) Driver version information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XA8
Data 0	Left driver hardware version
Data 1	Left driver software version
Data 2	Left driver product type 1. 6kw machine 2. 3kw machine 3. 1kw machine

Data 3	Right driver hardware version
Data 4	Right driver software version
Data 5	Right driver product type 1. 6kw machine 2. 3kw machine 3. 1kw machine
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(9) Adapter board version information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XA9
Data 0	Left adapter board hardware version
Data 1	Left adapter board software version
Data 2	Year and month of left adapter board Year = 2017 + ((data2) & 0xF0)>>4 -1 Month = (data2) & 0x0F
Data 3	Right adapter board hardware version
Data 4	Right adapter board software version
Data 5	Year and month of right adapter board Year = 2017 + ((Data 5) & 0xF0)>>4 -1 Month = (data5) & 0x0F
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(10) left and right throttle and direction information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XAA
Data 0	Left throttle target value 0- 127
Data 1	Right throttle target value 0- 127
Data 2	Left throttle current value 0- 127
Data 3	Right throttle current value 0- 127
Data 4	Left throttle direction information-1 forward, 0 backward
Data 5	Right throttle direction information-1 forward, 0 backward
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(11) Machine running time information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XAB
Data 0	Left driver total running time high 8 bits, unit: 1h
Data 1	Left driver total running time low 8 bits, unit: 1h
Data 2	Right driver current running time high 8 bits, unit: 1min
Data 3	Right driver current running time low 8 bits, unit: 1min
Data 4	Right driver total running time high 8 bits, unit: 1h

Data 5	Right driver total running time low 8 bits, unit: 1h
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(12) Protocol converter version information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XAC
Data 0	Protocol converter hardware version
Data 1	Protocol converter software version
Data 2	Protocol Converter Box Year and Month Year = 2017 + ((data2) & 0xF0)>>4 -1 Month = (data2) & 0x0F
Data 3	Bit 0: whether the left driver is hydrogeneration function enable-1 enable, 0 not enable Bit 1: whether the fan of the left driver has faults-1 failure, 0 normal Bit 2: whether the right driver is hydrogeneration function enable -1 enable, 0 not enable Bit 3: whether the fan of the right driver has faults -1 failure, 0 normal Bit 4: whether the left driver needs to clear the throttle value by the PC-1 yes, 0 no Bit 5: whether the left driver needs to clear the throttle value by the PC-1 yes, 0 no Bit 6: Reserved Bit 7: Reserved
Data 4	Left driver current running time high 8 bits, unit: 1min
Data 5	Left driver current running time low 8 bits, unit: 1min
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(13) Temperature information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XAD
Data 0	Left motor temperature, unit: 1°C offset +40
Data 1	Left driver MOS temperature, unit: 1°C offset +40
Data 2	Left driver module temperature, unit: 1°C offset +40
Data 3	Right motor temperature, unit: 1°C offset +40
Data 4	Right driver MOS temperature, unit: 1°C offset +40
Data 5	Right driver module temperature, unit: 1°C offset +40
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(14) Left motor bus current information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XAE

Data 0	Left motor DC bus current high 8 bits
Data 1	Left motor DC bus current low 8 bits
Data 2	Left motor output current high 8 bits
Data 3	Left motor output current low 8 bits
Data 4	0
Data 5	0
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

(15) Left and right motor bus current information

Head code	0x28
Address	0x03 (display address)
Data length	7 (command bytes + data bytes)
Command	0XB0
Data 0	Right motor DC bus current high 8 bits
Data 1	Right motor DC bus current low 8 bits
Data 2	Right motor output current high 8 bits
Data 3	Right motor output current low 8 bits
Data 4	0
Data 5	0
Check code	Data Length ^ Command ^ Data 0 ^ Data 1 ^ Data 2 ^ Data 3 ^ Data 4 ^ Data 5
End code	0x29

3.6 Communication process

The throttle control board control the start and stop of the motor by sending "0x2C" command every 30ms~100ms, and the protocol converter replies status information in turn. If the protocol converter do not receive the command more than 5s, it will stop immediately.

3.7 Modify left and right throttle address protocol

The default address of throttle is: left 0x01, right 0x02.

If you want to change the communication address of the left and right throttles, perform the following operations:

Step 1: The master sends a command to modify the communication address of the left and right throttles

Head code	Address	Data length	Command	Data 0	Data 1	Check	End code
0x28	0x01	3	0x8a	0x0a	0x05	0x86	0x29

The Protocol Converter replies to the address modification request command

Head code	Address	Data length	Command	Data 0	Data 1	Check	End code
0x28	0x01	3	0x8b	Left throttle address	Right throttle address	BCC	0x29

Step 2: After receiving the command from the protocol converter, the mater sends the modified address command of the left and right throttles.

Head code	Address	Data length	Command	Data 0	Data 1	Check	End code
0x28	0x 01	3	0x8c	New Left Throttle Address	New right throttle address	BCC	0x29

The protocol converter replies to the command to modify the address of the left and right throttles.

Head code	Address	Data length	Command	Data 0	Data 1	Check	End code
0x28	0x01	3	0x8d	New Left Throttle Address	New right throttle address	BCC	0x29

Step 3: After the master receives the command from the protocol converter, the communication addresses of the left and right throttles have been modified and saved in the FLASH, which has a power-off memory function. The modified address is: user-defined left and right throttle addresses.

Note: The address can only be modified once when the power is turned on. Please mark the dual remote control operation with the modified address to prevent confusion with the dual remote control operation with the default address.