GCAN-IO-8X01

Remote I/O Coupler

User Manual



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1. Function Introduction

1.1 Functional Overview

The GCAN-IO-8X01 series Remote I/O Coupler is a high-performance, general-purpose remote I/O module developed in-house by our company based on the CANopen bus, Modbus bus and EtherCAT bus. It helps users reduce costs, simplify wiring and improve system reliability. These I/O terminal modules can be expanded in a modular way. With the GCAN-IO-8X01 Remote I/O Coupler and the GC-bus expansion technology, I/O connections can be established very easily. A complete node consists of one Remote I/O Coupler, 1 to 32 terminal modules in any combination, and one end terminal module.

A Remote I/O Coupler can connect up to 32 expanded I/O terminal modules. The GC series expanded I/O modules include digital input and output modules, analog input and output modules, pulse input and output modules, and others. For detailed selection, please refer to Chapter 1.6 of this manual.

1.2 Model Designation

GCAN - IO - 8 X 01

GCAN	**IO**	**8**	**X**	**01**
Registered trademark	Remote I/O Coupler series	Bus coupler	Bus protocol: 0 = CANopen; 1 = Modbus; 2 = EtherCAT	Series code

1.3 Module Models and Functions

Model	**GCAN-IO-8001**	**GCAN-IO-8101**	**GCAN-IO-8201**
CANopen	Slave protocol	-	-
Modbus TCP	-	Slave protocol	-
Modbus RTU	-	Slave protocol	-
EtherCAT	-	-	Slave protocol

1.4 Device Parameters

GCAN-IO-8001

Item	**Specification**
Protocol	CANopen slave
CANopen baud rate (bps)	1000k, 500k, 250k, 125k, 100k, 50k, 20k, 10k
PDO mode	Synchronous, cyclic synchronous, event-driven, polled
Number of bus terminal modules	32
Configuration method	Automatic configuration

Number of PDOs (CANopen)	Determined by the expanded I/O modules
Other CANopen features	Guarding / node guarding, emergency message, variable mapping
DIP switch	Sets baud rate and node ID

GCAN-IO-8101

Item	Specification
Protocol	Modbus slave
Modbus bus protocol	Modbus TCP, Modbus RTU
Interfaces	RS485, Ethernet port
Serial baud rate	600 bps ~ 115200 bps
Ethernet function	Static acquisition; timeout disconnect; automatic recovery of connection resources after disconnection to reliably establish a TCP connection
Number of bus terminal modules	32
Configuration method	Automatic configuration
Bus interface	RJ45

GCAN-IO-8201

Item	Specification
Protocol	EtherCAT slave
Connection method	2 x RJ45
Transmission medium	Ethernet CAT5 cable
Transmission distance	100 m between stations
Transmission rate	100 Mb/s
Number of bus terminal modules	32
Configuration method	Automatic configuration

Electrical and environmental parameters

Item	Specification
Coupler input power supply	Rated 24 V DC; tolerance -15% / +20%
Number of expanded I/O modules	Up to 32
Temperature	-40 °C ~ +85 °C
Relative humidity	10% ~ 95%, non-condensing
Altitude	The installation altitude must not exceed 2000 m
Pollution	Pollution degree 2

Vibration	5 Hz ~ 8.4 Hz, 3.5 mm displacement, constant amplitude; 8.4 Hz ~ 150 Hz, 1 g acceleration, X/Y/Z axes, 10 cycles per axis
IP rating	IP20

1.5 Power Calculation

The power consumption of the system consists of two parts: the power consumption of the coupler main control module and the power consumption of the expanded I/O modules.

Interface	Power calculation
Coupler power supply	Rated 24 V DC power supply, maximum power consumption approximately 10 W
I/O power supply	Power consumption depends on the model of the expanded I/O module; see I/O Module Selection - Power Consumption

1.6 I/O Module Selection

The GCAN-PLC series products consist of one programmable main control module, several GC series I/O modules (such as GC-1416 and GC-2416), and one terminal resistor module.

At present, the GC series programmable controller expansion modules include four categories: digital input expansion modules, digital output expansion modules, analog input expansion modules and analog output expansion modules. The detailed selection table is shown below.

Module type	Model	Function	Channels	Power consumption per module
Digital input	GC-1416	Basic digital PNP or NPN	16	Approx. 0.1 W
Digital input	GC-1804	Counter	4	Approx. 0.1 W
Digital output	GC-2416	Basic digital PNP	16	Approx. 0.1 W + single-channel power consumption x number of channels (see the I/O module user manual)
Digital output	GC-2516	Basic digital NPN	16	
Digital output	GC-2304	PWM	4	
Analog input	GC-3008	Voltage input, -5 V ~ +5 V	8	Approx. 0.1 W
Analog input	GC-3028	Voltage input, -10 V ~ +10 V	8	
Analog input	GC-3048	Current input, 0 ~ 20 mA	8	

Analog input	GC-3058	Current input, 4 ~ 20 mA	8	
Analog input	GC-3068	Voltage input, 0 ~ +5 V	8	
Analog input	GC-3078	Voltage input, 0 ~ +10 V	8	
Analog output	GC-4004	Voltage output, -5 V ~ +5 V	4	Approx. 0.1 W
Analog output	GC-4024	Voltage output, -10 V ~ +10 V	4	
Analog output	GC-4044	Current output, 0 ~ 20 mA	4	
Analog output	GC-4054	Current output, 4 ~ 20 mA	4	
Analog output	GC-4064	Voltage output, 0 ~ 5 V	4	
Analog output	GC-4074	Voltage output, 0 ~ 10 V	4	

2. Device Installation and Use

This chapter describes in detail the installation method, wiring method, meanings of the indicators and meanings of the interfaces of the GCAN-IO-8X01 Remote I/O Coupler.

2.1 Module Appearance

The GCAN-IO-8X01 series Remote I/O Couplers have the same dimensions (see the drawing). Taking the GCAN-IO-8201 as an example, the dimensions are shown in Figure 2.1.

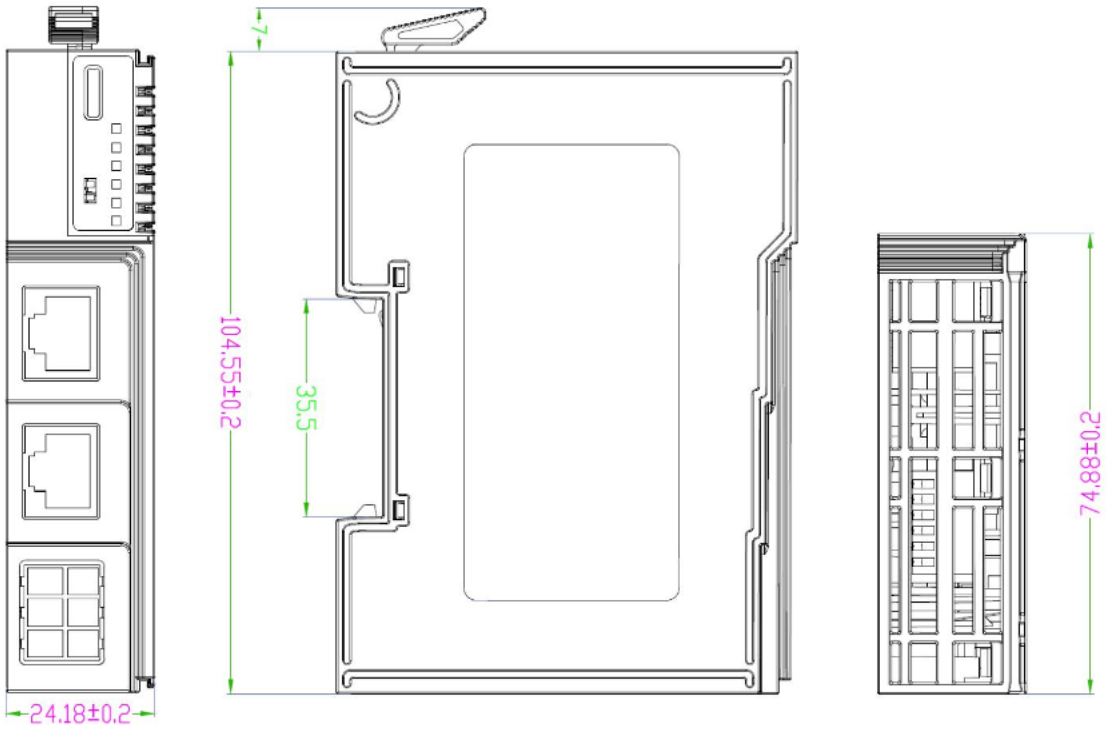


Figure 2.1 GCAN-IO-8201 EtherCAT Remote I/O Coupler Appearance and Dimensions

2.2 Module Installation

The locked and unlocked states of the GCAN-IO-8X01 Remote I/O Coupler are shown in Figure 2.2. When the module is not mounted on the rail, keep the rail lock in the locked state. If it remains unlocked for a long time, the lock may fail.

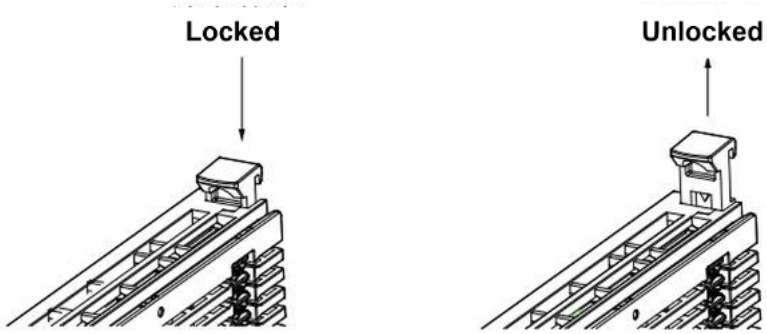


Figure 2.2 Locked and Unlocked States of the GCAN-IO-8X01 Remote I/O Coupler Module

The installation method of the GCAN-IO-8X01 Remote I/O Coupler is shown in Figure 2.3. You can use a flat-blade screwdriver to assist installation and removal. First mount the GCAN-IO-8X01 Remote I/O Coupler on the rail, then press the lock until a "click" is heard.

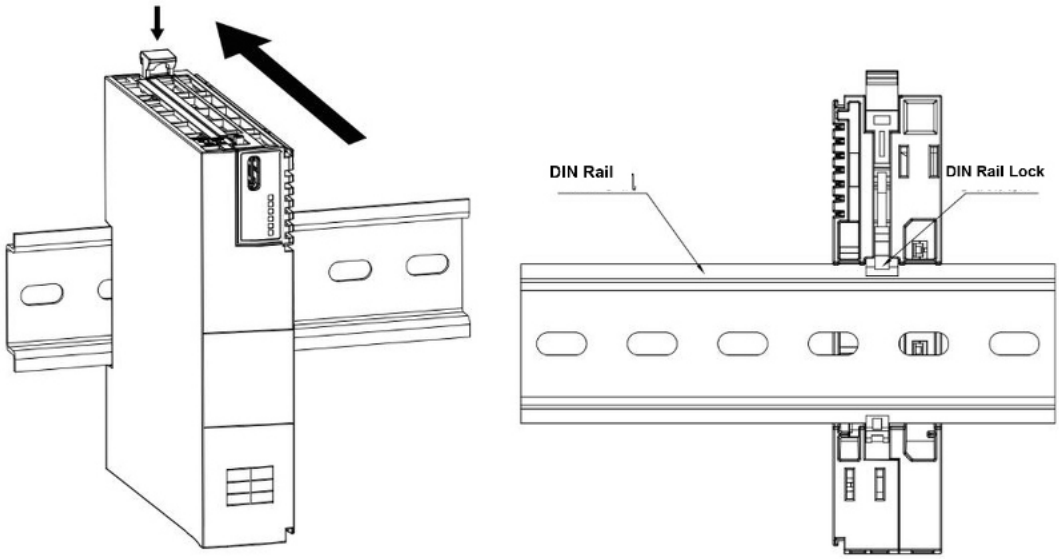


Figure 2.3 Installation of the GCAN-IO-8X01 EtherCAT Remote I/O Coupler Module

The GCAN-IO-8X01 Remote I/O Coupler can connect up to 32 distributed bus terminal modules. When inserting a bus terminal module, always follow the groove and insert modules in sequence to the right of the existing modules, then press the lock until a "click" is heard. At the far right end of the node, you need to install the end terminal module. Pay attention to the installation direction of the end terminal. This terminal ensures the data transmission and power supply of the GC-Bus.

The correct installation direction of the end terminal is shown in the figure below.

When a node is correctly assembled, there will be no visible gaps between terminal modules. If the modules are not correctly assembled, the entire node will not operate normally.



Correct Installation Direction of the End Terminal Module

2.3 Module Removal

As shown in Figure 2.4, use a flat-blade screwdriver or similar tool to pry the rail lock upward, then pull the module outward at the raised part to remove it.

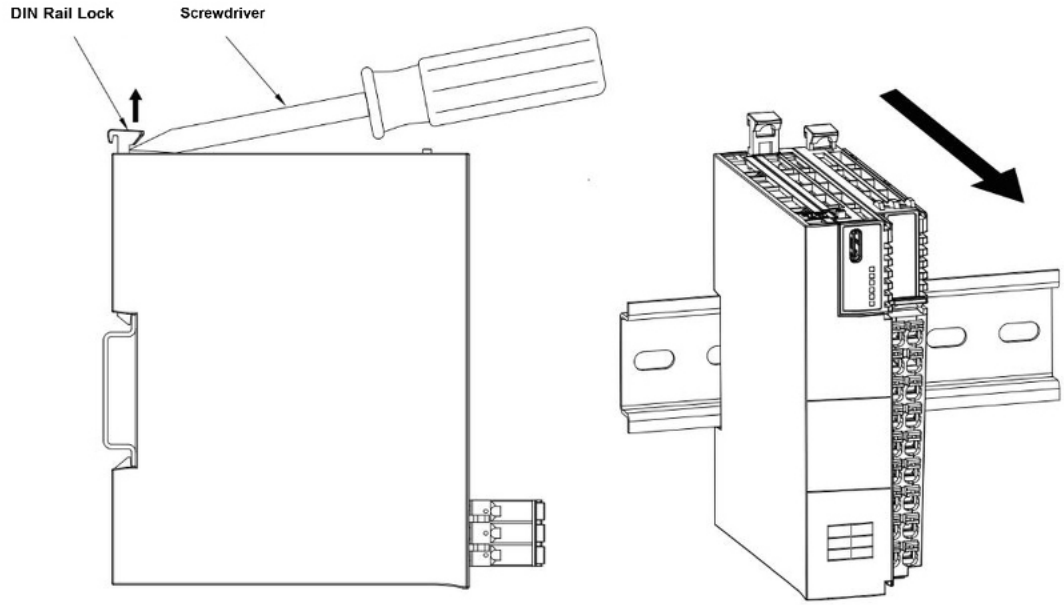
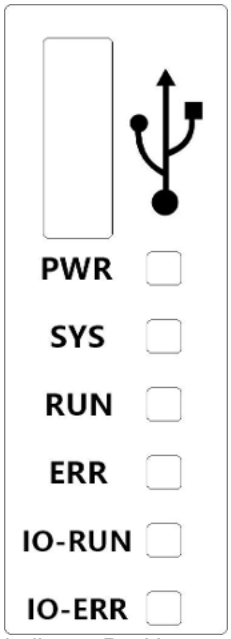


Figure 2.4 Removal of the GCAN-IO-8X01 Remote I/O Coupler

2.4 Wiring Method

Use a cable with a flat terminal connector; align the terminal connector with the round hole of the corresponding channel and insert it. To remove a wire, insert a flat-blade screwdriver into the corresponding orange square hole next to the channel, press down firmly, the clamp in the corresponding round hole will loosen and the wire can be easily pulled out.



Indicator Positions on the GCAN-IO-8X01 Remote I/O Coupler

2.5 System Status Indicators

The GCAN-IO-8X01 Remote I/O Coupler has a set of status indicators to indicate the status of the power supply, system, bus and so on.

The specific functions of the indicators are listed in Table 2.1. When the indicators are in different states, the status of the GCAN-IO-8X01 module is shown in Table 2.2.

Indicator	Color	Indication
PWR	Green	Power indication
SYS	Green	System indication
RUN	Green	Connection indication
ERR	Red	Error indication
IO RUN	Green	Internal bus running indication
IO ERR	Red	Internal bus error indication

Table 2.1 GCAN-IO-8X01 Remote I/O Coupler Module Indicators

Indicator	State	Indication
PWR	Steady on	Power supply normal
	Off	Power supply abnormal
SYS	Flashing	System running normally
	Other	System running abnormally
RUN	Flashing	Connection to the master normal
	Off	Connection to the master abnormal or not connected
ERR	Flashing	Connection to the master abnormal or not connected
	Off	Running normally
IO RUN	Flashing	Internal bus running normally
	Off	Internal bus stopped
IO ERR	Steady on	Internal bus running error
	Off	No internal bus running error

Table 2.2 GCAN-IO-8X01 Remote I/O Coupler Module Indicator States

3. Using the GCAN-IO-8001 CANopen Coupler

3.1 Coupler Interfaces

The appearance of the GCAN-IO-8001 is shown in Figure 3.1. The GCAN-IO-8001 CANopen Remote I/O Coupler includes one communication interface and one USB interface. The communication interface includes one CAN bus interface, and the USB interface can be used to upgrade the firmware.

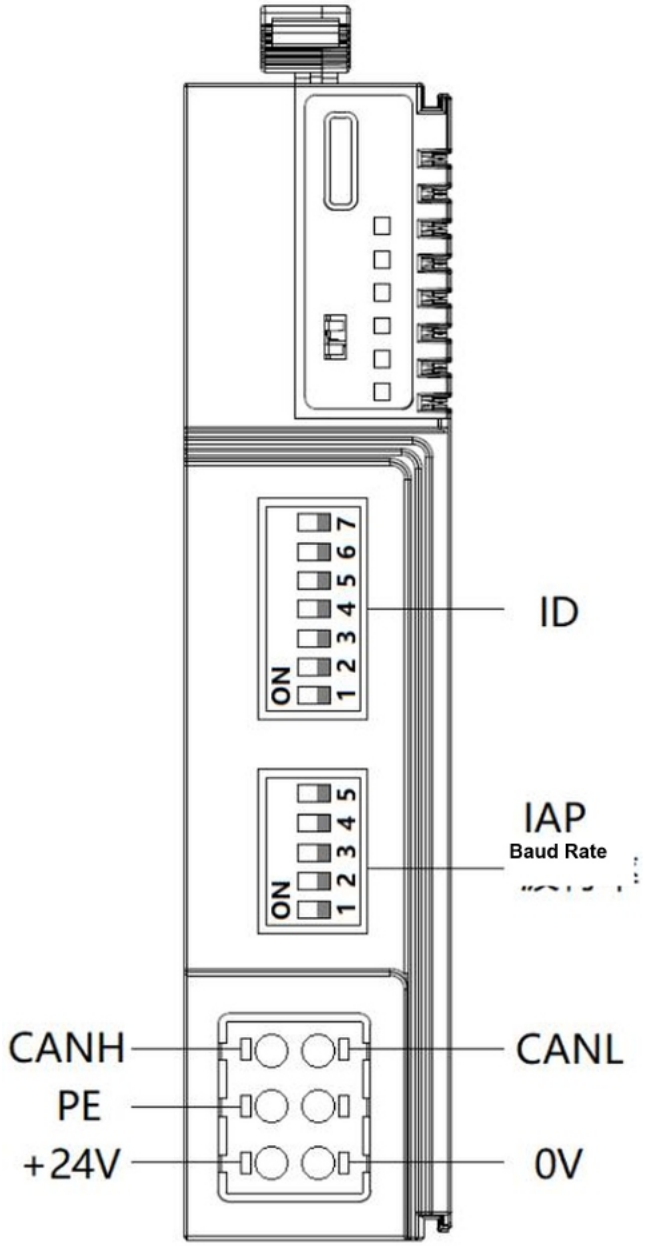


Figure 3.1 GCAN-IO-8001 CANopen Remote I/O Coupler Appearance

Terminal	Meaning	Terminal	Meaning
CANH	CAN bus high	CANL	CAN bus low
PE	Shield	NC	NC
+24V	24 V power input	0V	Power GND

Table 3.1 Definitions of the CAN and Power Wiring Terminals of the GCAN-IO-8001 CANopen Remote I/O Coupler

3.2 Communication via CAN Bus

The connection method of the GCAN-IO-8001 module to the CAN bus is described in Figure 3.2. Communication can be established simply by connecting CAN_H to CAN_H and CAN_L to CAN_L.

The CAN-bus network uses a linear topology. The two farthest ends of the bus need 120 Ω terminating resistors; if the number of nodes is greater than 2, the intermediate nodes do not need 120 Ω terminating resistors. For branch connections, the length should not exceed 3 m. The CAN-bus connection is shown in Figure 3.2.

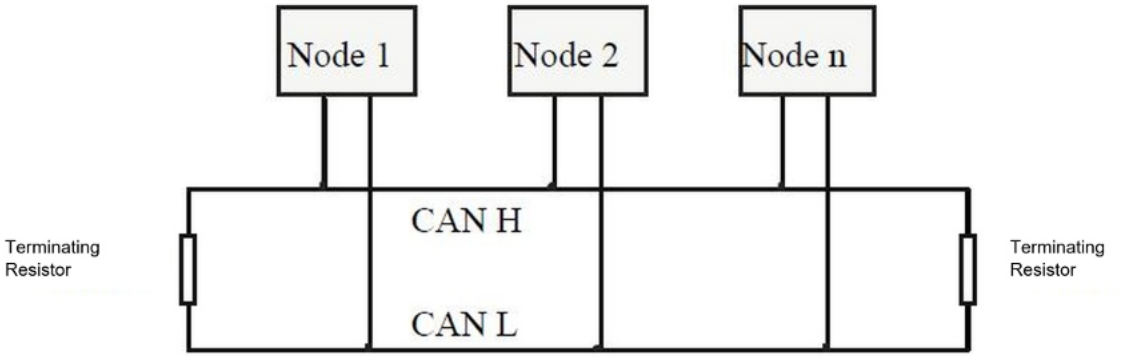


Figure 3.2 Topology of a CAN-bus Network

Please note: the CAN-bus cable can be ordinary twisted pair or shielded twisted pair. The theoretical maximum communication distance mainly depends on the bus baud rate. The relationship between the maximum bus length and the baud rate is shown in Table 3.2. If the communication distance exceeds 1 km, ensure that the wire cross-section is larger than Φ1.0 mm²; the specific specification depends on the distance and is generally increased appropriately as the distance increases.

Baud rate	**Bus length**
1 Mbit/s	25 m
500 kbit/s	100 m
250 kbit/s	250 m
125 kbit/s	500 m
50 kbit/s	1.0 km
20 kbit/s	2.5 km
10 kbit/s	5.0 km
5 kbit/s	13 km

Table 3.2 Reference Table of Baud Rate and Maximum Bus Length

3.3 CAN Bus Terminating Resistor

To enhance the reliability of CAN communication and eliminate signal reflection interference at the CAN bus terminals, matching terminating resistors are usually added to the two farthest endpoints of the CAN bus network, as shown in Figure 3.3. The value of the terminating resistor is determined by the characteristic impedance of the transmission cable. For example, if the characteristic impedance of the twisted pair is 120 Ω, the two endpoints of the bus should also integrate 120 Ω terminating resistors. If other nodes on the network use different transceivers, the terminating resistor must be calculated separately.

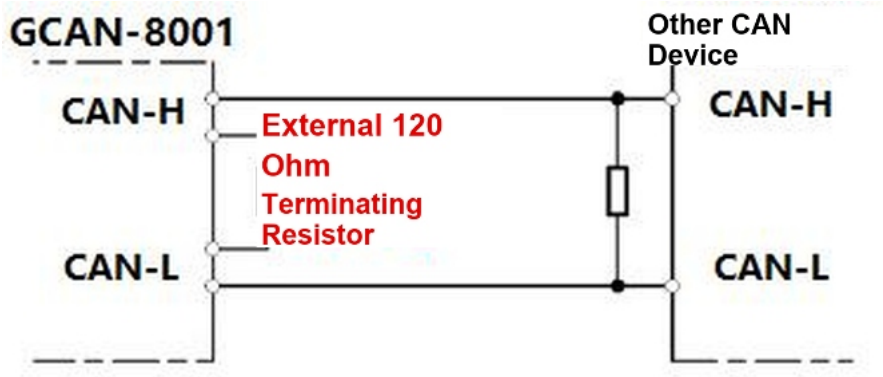


Figure 3.3 Connection of the GCAN-IO-8001 to Other CAN Node Devices

Please note: the GCAN-IO-8001 module does not integrate a 120 Ω terminating resistor. If the number of nodes is greater than 2, the intermediate nodes do not need 120 Ω terminating resistors. When a terminating resistor is needed, connect its two ends to CAN_H and CAN_L respectively, as shown in Figure 3.3.

3.4 CAN Node ID Configuration

As shown in Figure 3.4, when each bit of the DIP switch is set to the "ON" position, the bit is "1"; if it is set to the "OFF" position, the bit is "0". Bits 1 to 7 of the DIP switch are used to set the node ID (MAC ID) of the module. Bit 7 is the least significant bit and bit 1 is the most significant bit. The node ID (MAC ID) of the module is the sum of the decimal values corresponding to each bit. The valid range of the node ID (MAC ID) set by the DIP switch is 0 to 127.

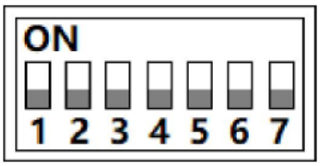
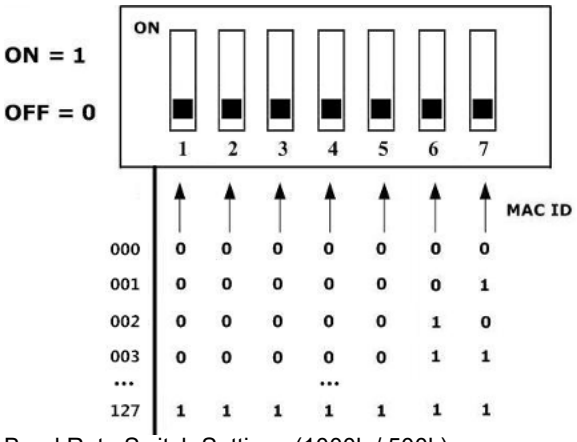


Figure 3.4 CAN Node ID Configuration

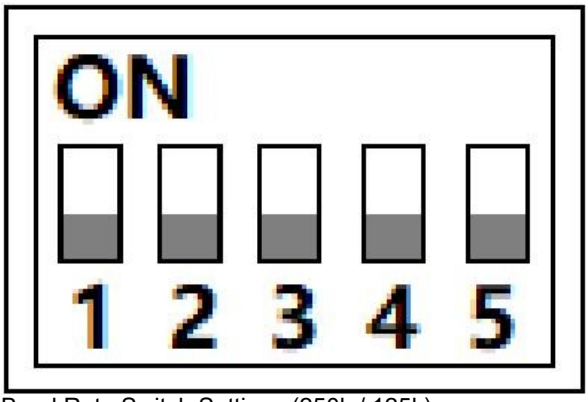
3.5 CAN Baud Rate Configuration

Bits 1 to 4 of the DIP switch are used to set the baud rate of the module. The correspondence between the baud rate and the switch settings is shown in Table 3.3.

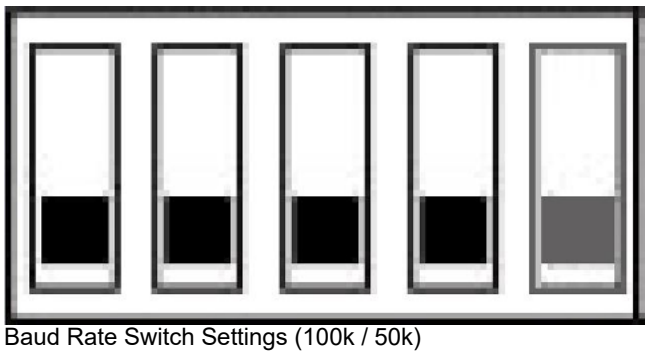
Please note: bit 5 of the DIP switch is the IAP switch, which is OFF (down) by default. Do not toggle it.



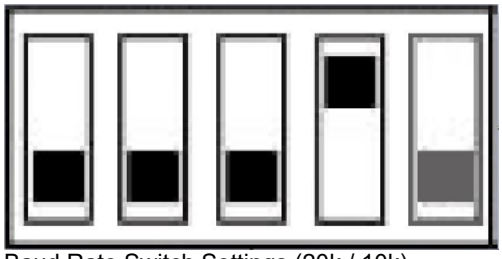
Baud Rate Switch Settings (1000k / 500k)



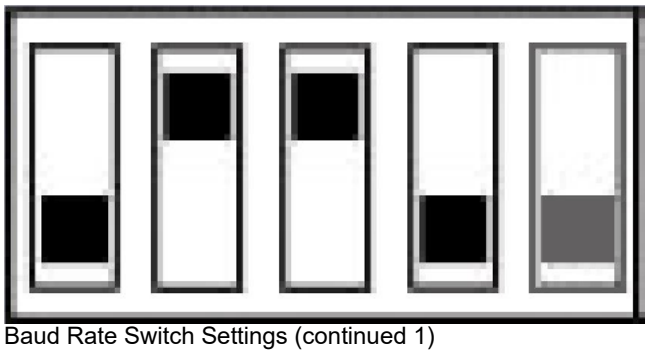
Baud Rate Switch Settings (250k / 125k)



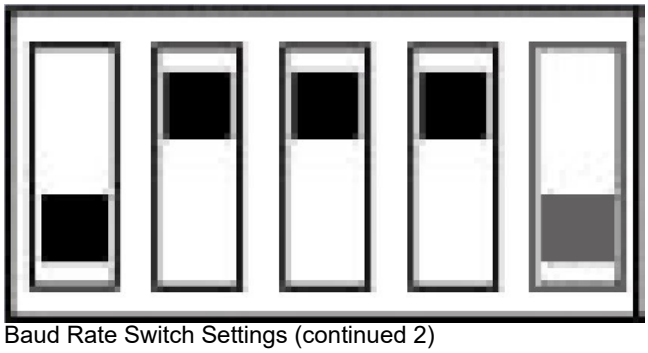
Baud Rate Switch Settings (100k / 50k)



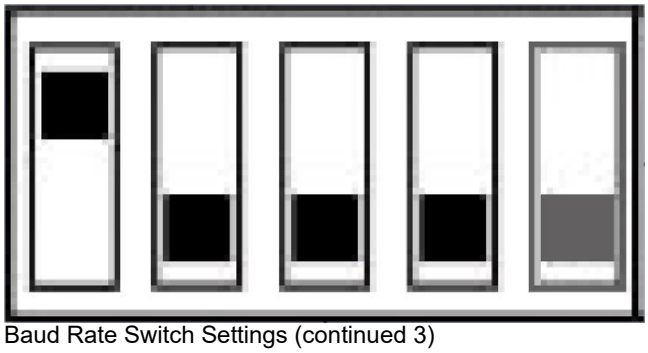
Baud Rate Switch Settings (20k / 10k)



Baud Rate Switch Settings (continued 1)



Baud Rate Switch Settings (continued 2)



Baud Rate Switch Settings (continued 3)

Table 3.3 CAN Baud Rate Configuration

3.6 GCAN-8001 Object Dictionary

Communication parameter area

Index	Subindex	Name	Type	Attr.	Default	Description
0x1000	-	Device Type	UINT32	RO	0	Device type
0x1001	-	Error Register	UINT8	RO	0	Current error type
0x1005	-	COB-ID SYNC	UINT32	RW	0x00000080	-
0x1006	-	Communication Cycle Period	UINT16	RW	0x00002710	-
0x1007	-	Sync Window Length	UINT32	RW	0	-
0x1009	-	Manufacturer hardware version	STRING	CONST	-	Hardware version
0x100A	-	Manufacturer software version	STRING	CONST	-	Software version

0x100C	-	Guard Time	UINT16	RW	0x03E8	Node guarding time, 1 second by default
0x100D	-	Life Time Factor	UINT8	RW	0	-
0x1010	-	store parameters	UINT8	RO	-	Save parameters
	1	Save all parameters	UINT32	RW	-	Save all object parameters
0x1011	-	restore default parameters	UINT8	RO	-	Restore parameters
	1	Restore all object parameters	UINT32	RW	-	Restore all object parameters
0x1014	-	COB-ID of emergency message	UINT32	RW	0x80+NODE-ID	COB-ID of emergency message
0x1016	-	Consumer heartbeat time	UINT8	RO	-	Consumer heartbeat time
	1	Consumer heartbeat time	UINT32	RW	-	Consumer heartbeat time
0x1017	-	Producer Heartbeat Time	UINT16	RW	0	Producer heartbeat time
0x1018	0	number of Entries	UINT8	RO	1	-
	1	Vendor-ID	UINT32	RO	0x00000449	Vendor code of Shenyang Guangcheng Technology Co., Ltd. in CiA
0x1200	0	Number of entries	UINT8	RO	2	-
	1	COB-ID Client -> Server (rx)	UINT32	RO	0x600	-
	2	COB-ID Server -> Client (tx)	UINT32	RO	0x580	-

RPDO communication parameters

Index	Subindex	Name	Type	Attr.	Default	Description
0x1400	-	RPDO 1	UINT8	RO	-	RPDO1 communication parameters
	1	COB-ID used by RPDO	UINT32	RW	0x00000200 + NODEID	COB-ID of RPDO1
	2	Transmission type of RPDO	UINT8	RW	0xFF	Transmission type of RPDO1
	3	inhibit time	UINT16	RW	0x0	Inhibit time

	5	event timer	UINT16	RW	0x0	Event timer
0x1600	-	RPDO1 mapping parameters	UINT8	RW	-	RPDO1 mapping parameters
	1~8	RPDO 1 mapping object	UINT32	RW	0x30010008	RPDO1 mapping object

TPDO communication parameters

Index	Subindex	Name	Type	Attr.	Default	Description
0x1800	-	TPDO1	UINT8	RO	-	TPDO1 communication parameters
	1	COB-ID used by TPDO	UINT32	RW	0x00000180 + NODEID	COB-ID of TPDO1
	2	Transmission type of TPDO	UINT8	RW	0xFE	Transmission type of TPDO1
	3	Inhibition time	UINT16	RW	0x14	Inhibit time
	5	Event time	UINT16	RW	0x0	Event timer
0x1A00	-	TPDO1 mapping parameters	UINT8	RW	-	TPDO1 mapping parameters
	1~8	TPDO1 mapping object	UINT32	RW	-	TPDO1 mapping object

Device status

Index	Subindex	Name	Type	Attr.	Default	Description
0x2000	0	Set TXPDO inhibit time	UINT8	RO	0x04	-
	1	TXPDO1 inhibit time	UINT8	RW	0x14	-
0x3000	0	Set DI Value	UINT8	RO	0	-
0x3001	0	Set DO Value	UINT8	RO	0x02	-

4. Using the GCAN-IO-8101 Modbus Coupler

4.1 Coupler Interfaces

The appearance of the GCAN-IO-8101 is shown in Figure 4.1. The GCAN-IO-8101 Modbus Remote I/O Coupler includes two communication interfaces and one USB interface. The communication interfaces include one Ethernet interface and one RS485 interface.

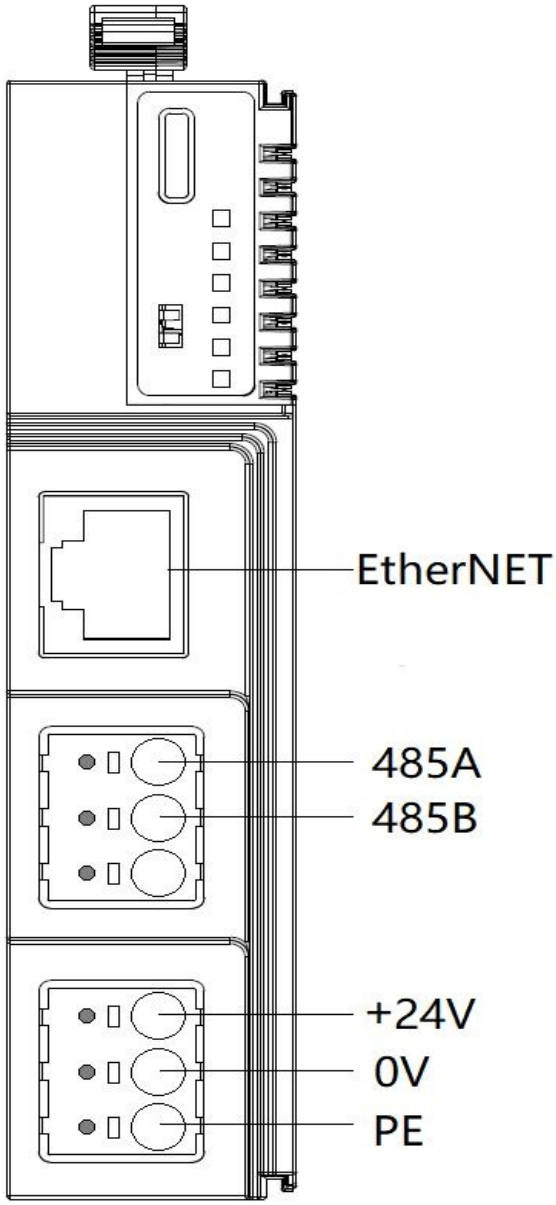


Figure 4.1 GCAN-IO-8101 Modbus Remote I/O Coupler Appearance

Terminal	No.	Meaning
485A	1	RS485 A+
485B	2	RS485 B-
NC	3	NC

+24V	1	24 V power input
0V	2	Power GND
PE	3	Shield

Table 4.1 Definitions of the RS485 and Power Wiring Terminals of the GCAN-IO-8101 Modbus Remote I/O Coupler

4.2 Communication Connection

The GCAN-8101 supports the standard Modbus protocol and is a standard Modbus slave device. It supports Modbus TCP and Modbus RTU communication.

The GCAN-8101 uses standard serial levels (RS485), so the module can be directly connected to devices with an RS485 interface.

Users can use a standard Category 5 or higher network cable to connect directly to the LAN interface of the GCAN-8101 module and establish communication.

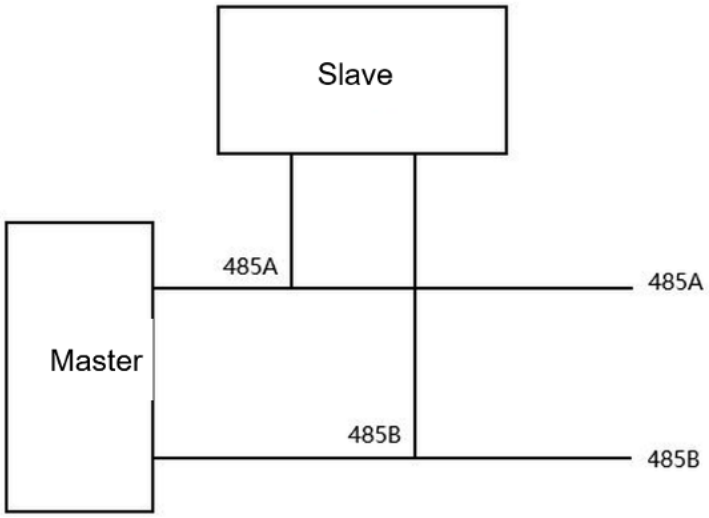


Figure 4.2 Modbus Communication Connection

5. Using the GCAN-IO-8201 EtherCAT Coupler

5.1 Coupler Interfaces

The appearance of the GCAN-IO-8201 is shown in Figure 5.1. The GCAN-IO-8201 EtherCAT Remote I/O Coupler includes two communication interfaces and one USB interface. The communication interfaces include one EtherCAT/IN and one EtherCAT/ OUT (RJ45). The USB interface can be used to upgrade the firmware.

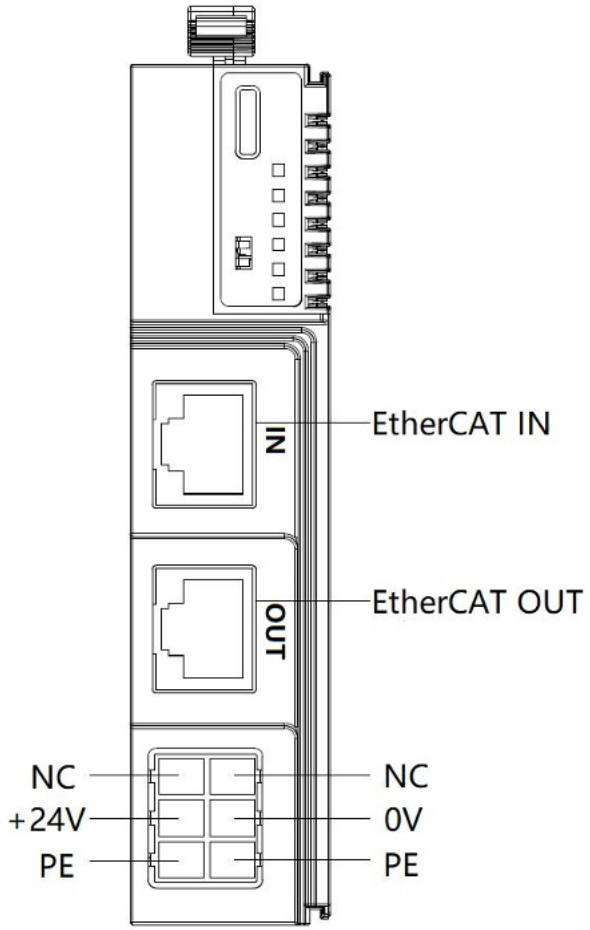


Figure 5.1 GCAN-IO-8201 EtherCAT Remote I/O Coupler Communication and Power Terminal Block

Terminal	Meaning	Terminal	Meaning
NC	NC	NC	NC
+24V	24 V power input	0V	Power GND
PE	Shield	PE	Shield

Table 5.1 Definitions of the Power Wiring Terminals of the GCAN-IO-8201 EtherCAT Remote I/O Coupler

5.2 Communication Connection

The GCAN-IO-8201 EtherCAT Remote I/O Coupler uses an Ethernet CAT5 cable

(Category 5 twisted pair) to connect to the EtherCAT master (IN) and other slave devices (OUT). The GCAN-IO-8201 EtherCAT Remote I/O Coupler is equipped with two RJ45 interfaces, which allow users to conveniently insert the GCAN-IO-8201 EtherCAT Remote I/O Coupler into the EtherCAT bus.

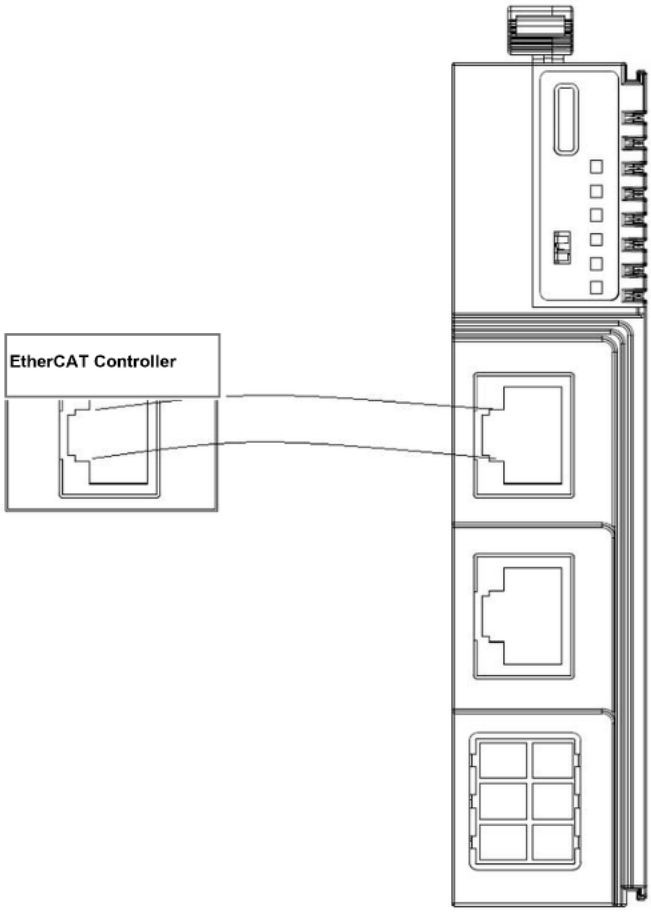


Figure 5.2 Connection of the GCAN-IO-8201 EtherCAT Remote I/O Coupler to an EtherCAT Controller

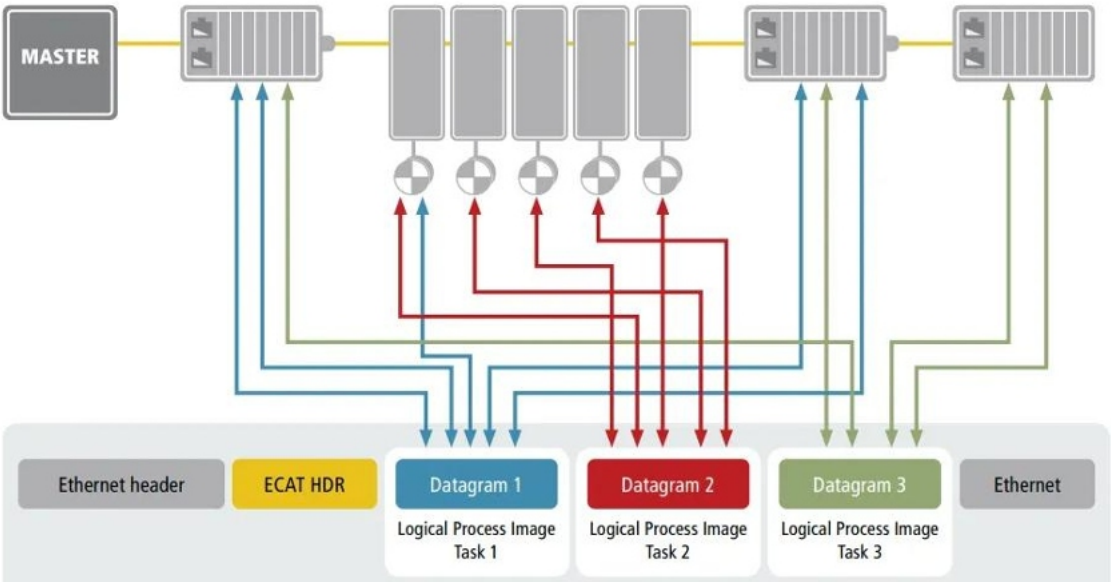


Figure 5.3 Data Flow of the GCAN-IO-8201 EtherCAT Remote I/O Coupler Connected to the Bus

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