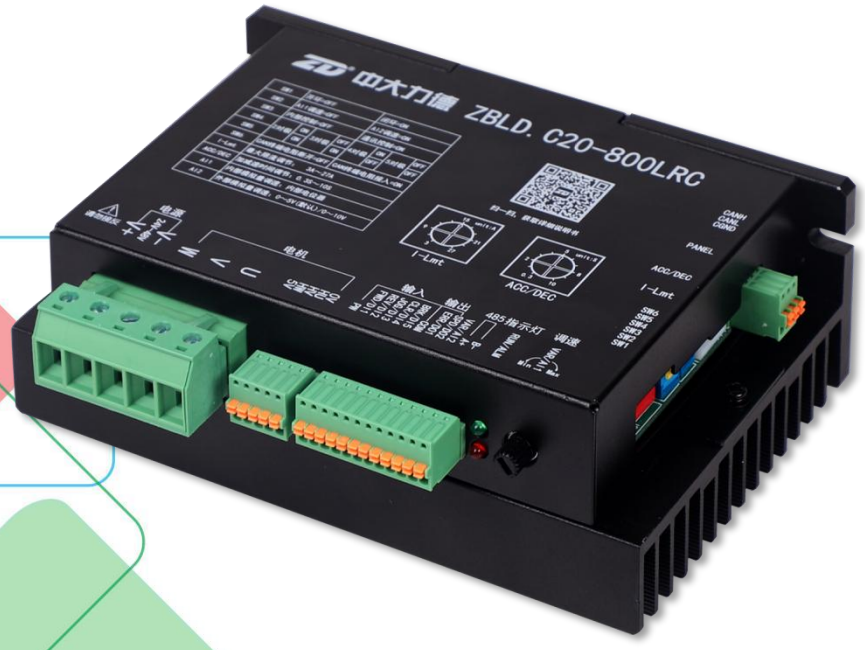
Synergy Asia Solution

Low-voltage Embedded Brushless Drive

SBLD.C20-800LRC User Manual



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Update Summary

The table below summarizes the revisions and updates to this document since the last version was released.

Version	Date	Revision Details	Revised by
V1.01	2021.03.03	New Creation	沈扬阳
V1.02	2021.08.10	Revised Description of Pole Pair Number Setting Method	沈扬阳
V1.03	2021.09.25	Updated contact information	华容妤
V1.04	2022.01.11	Updated PLC Wiring Diagram	沈扬阳

Before Use

Before operating this product, please carefully read and observe the relevant safety information to ensure personal safety and product safety.

危险 **DANGER** 	■ When performing wiring operations and installing the drive, always ensure that the power supply is turned off. ■ The circuit components on the internal PCB of the drive are susceptible to electrostatic discharge (ESD). Do not touch the circuit board by hand unless proper anti-static measures have been taken. ■ Do not modify any internal components or wiring of the drive without authorization. ■ Do not operate this product in environments with moisture, corrosive gases, or flammable gases, as this may result in electric shock or fire. ■ The drive and its accessories should be installed away from open flames, heat sources, and flammable materials. ■ Before the machinery starts operation, adjust and set the parameters according to the application requirements. Incorrect parameter settings may cause loss of control or equipment malfunction. ■ Before starting the machine, ensure that the emergency stop device can be activated at any time. ■ When powering on, ensure that the motor shaft remains stationary and does not rotate due to mechanical inertia or other factors. ■ Do not change wiring while the power is on, as this may result in electric shock or personal injury.
警告 **WARING** 	■ Do not apply a DC power supply to the drive output I/O terminals. ■ The rated power supply voltage for the drive installation system is DC 24V－48V. ■ First test the drive and motor under no-load conditions to confirm normal operation, then connect the load to avoid unnecessary hazards. ■ Do not switch the power supply on and off frequently. If continuous power cycling is required, limit it to no more than once per minute. ■ Do not use this product for vertical load lifting or lowering applications. ■ Only qualified professional personnel are permitted to install, wire, and service the drive.

Note:

1、In order to explain product details in detail, this manual may illustrate the product with the enclosure removed or safety covers disassembled. During actual operation, the enclosure must be properly installed and wiring must be correctly connected in accordance with the specifications. Operate the product strictly according to this manual to ensure safety.

2、The icons and illustrations in this manual are provided for explanatory purposes and may differ slightly from the actual product; however, this will not affect customer rights or product functionality.

3、If the product documentation is updated or revised, please visit the *SAS Transmission* official website (www.motorsas.com) or the official *Line* public account (see QR code below) to obtain the latest version. No separate notice will be given.

4、For issues related to product usage, please consult drive technical support (see QR code below).

SAS Transmission Official *Line* Account　　Drive Technical Support

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1. Product Inspection and Description

1.1 Product Inspection

To prevent any oversight during purchase and transportation, please carefully inspect the items listed below:

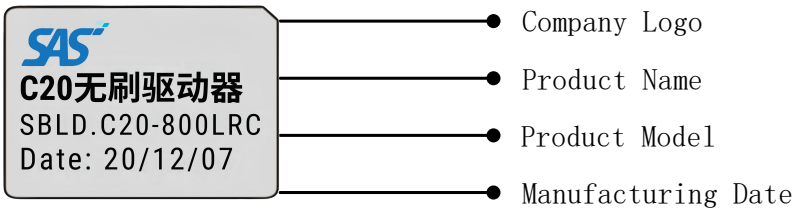
- Confirm that the product is the intended model: Check the model number on the drive package nameplate. Refer to the model description in the following section.
- Check for external damage: Visually inspect the product for any damage or scratches.
- Check for loose screws: Verify that no screws are loose or missing.
- Check for missing accessories: Verify all items against the complete component list below.

If any of the above conditions are found, please contact our company or authorized distributor immediately for proper resolution.
A complete and operational drive package includes:

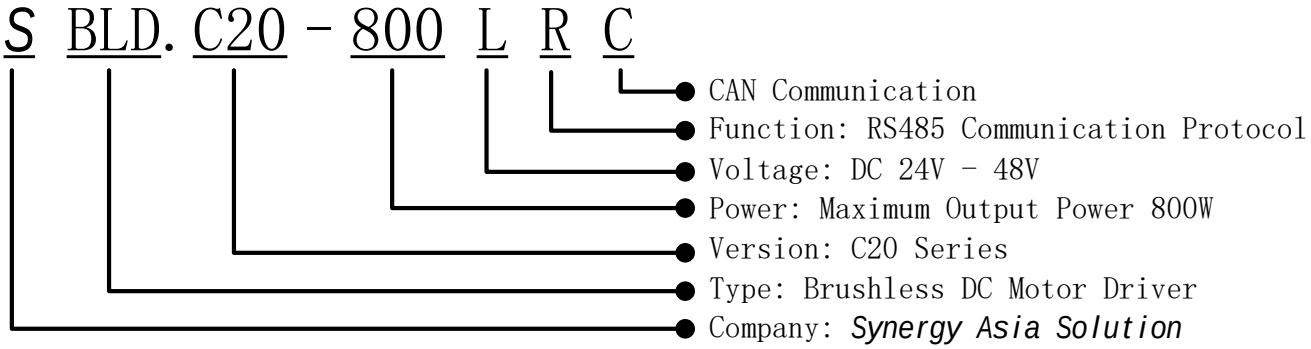
(1) SBLD.C20-800LRC Driver —— 1 unit
(2) 5-Pin Power/Motor Phase Terminal —— 1 piece
(3) 12-Pin I/O Terminal —— 1 piece
(4) 5-Pin Hall Effect Sensor Terminal —— 1 piece
(5) 3-Pin CAN Communication Terminal —— 1 piece
(6) Port Connection Wire/AWG24 —— 5 pieces

1.2 Nameplate / Model Description

Nameplate Description:



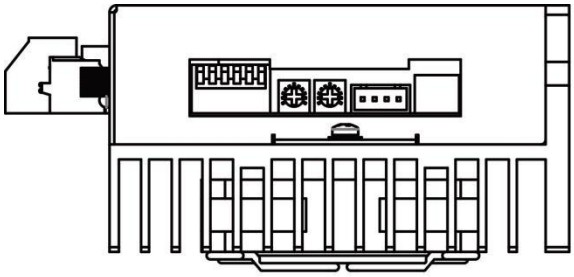
Model Description:



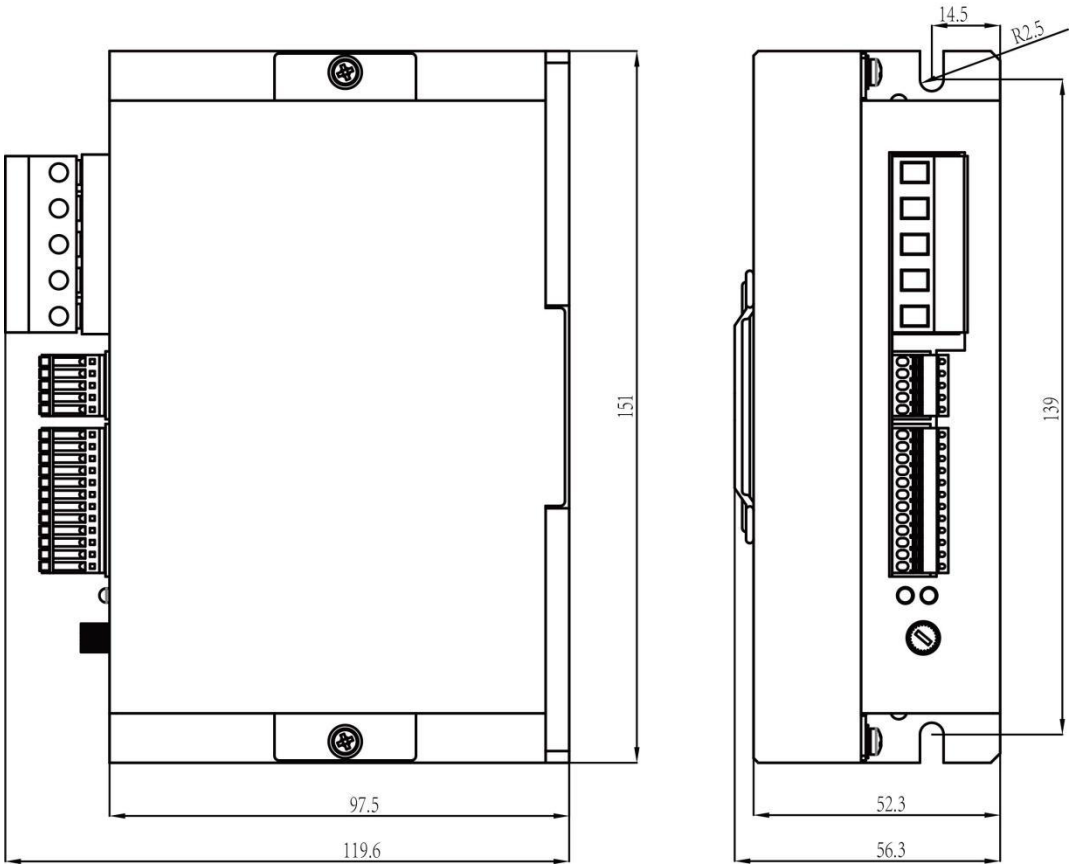
Model Description	
Input Voltage	DC24V~48V(±10%)
Output Current	3.0A~27A (Can adjust the current limit output value via the adjustment knob)
Output Power	DC24V，400W
	DC48V，800W
Compatible Motor	DC24V，Motor ≤ 400W
	DC48V，Motor ≤ 800W
Default Speed	3000rpm
Number of Pole Pairs	5 (Other pole pair numbers can be set via DIP switches or the keypad)
Digital Inputs	DI1~DI5 NPN/PNP
Digital Outputs	DO1: Fault Output DO2: Speed Output
Analog Inputs	External Analog Voltage or PWM (0 - 5 V / 10 V)
HDI Input	Available
Adjustment Knob	Speed Adjustment Knob, Acceleration Adjustment Knob, Current Limiting Adjustment Knob
Cooling Method	Natural air cooling
Communication	RS485 Modbus communication: Baud rate 1200 - 57600 / Frame interval ≥ 30ms; CAN Modbus, CANopen communication
Protection Rating	IP20
Protection Functions	Under-voltage, Over-voltage, Over-current, Overload, Locked-rotor, Short-circuit, Phase loss, Over-temperature, etc.
External Keypad (Optional)	Supported
Type	Internal type
Operating Mode	Open-loop, Closed-loop (Control accuracy ± 0.5%)
Braking	Electromagnetic braking

2. Product Dimensions, Environmental Conditions, and Installation

2.1 Product Dimension Drawings



Unit : mm.



2.2 Operating, Storage, and Transportation Environmental Characteristics

The drive must not be exposed to harsh environments such as dust, direct sunlight, corrosive or flammable gases, oil, humidity, water droplets, or vibration. The salt content in the air must be maintained below 0.01 mg/cm² per year.				
Protection Rating		IP20: Prevents ingress of solid foreign objects with a diameter greater than 12 mm; no moisture protection.		
Environmental Characteristics	Ambient Temperature	Operation	Standalone Installation	-10~40℃ －20 to－10℃ or 40 to 50℃ (derating required)
			Side-by-side Installation	-10~30℃ －20 to－10℃ or 30 to 40℃ (derating required)
		Storage	-33~65℃	
		Transportation	-20~50℃	
		Non-condensing, Non-freezing		
	Rated Humidity	Operation	Max.85%	
		Storage / Transportation	Max.90%	
		Condensation Prohibited		
	Atmospheric Pressure	Operation	86~106kPa	
		Storage / Transportation	70~106kPa	
	Altitude	Operable at altitudes below 1000 m (derating is required above 1000 m; see Section 2.2.2).		
Package Drop	Storage / Transportation	Dropping from a height is prohibited; risk of damage exists.		
Vibration	Operation/Storage/ Transportation	Continuous vibration is prohibited.		
Shock	Operation/Storage/ Transportation	Excessive shock is prohibited.		

2.2.1 Storage Environment Conditions

Before installation, this product must be kept in its original packaging. If the unit is not to be used temporarily, in order to ensure compliance with the company's warranty terms and facilitate future maintenance, please observe the following storage requirements:

1、Store in a clean, dry, and dust-free location.

2、Ensure that the ambient temperature and relative humidity of the storage location are within the specified ranges.

3、Avoid storage in environments containing corrosive gases or liquids.

4、It is recommended to keep the product properly packaged and stored on shelves or flat surfaces.

2.2.2 Operating Environment Conditions

Operating Conditions	Ambient Temperature Limits
Abnormal Ambient Temperature Operation	When operating at the rated current, the ambient temperature must be within －10 to 40℃. If the ambient temperature exceeds 40℃, the rated current must be reduced by 2.5% for each 1℃ increase. The maximum allowable ambient temperature is 50℃.
High-Altitude Operation	When the drive is used at an altitude of 0－1000 m, it may be operated under standard operating limits. When used at an altitude of 1000－2000 m, for every 100 m increase in altitude, the rated current shall be reduced by 1% or the operating ambient temperature shall be reduced by 0.5 ° C. For operation at altitudes above 2000 m, please contact the manufacturer.

For long-term operation, it is recommended to use the product in an ambient temperature below 40℃ and install it in a well-ventilated location to ensure reliable performance.

In areas where the altitude exceeds 1000 m, due to reduced air density resulting in decreased insulation strength and poorer heat dissipation, derated operation is required. Operation in high-altitude areas is not recommended.

In addition, the operating conditions shall include:

1、Locations without large heat-generating equipment;

2、Locations free from water droplets, vapor, dust, and oily dust;

3、Locations free from corrosive or flammable gases and liquids;

4、Locations free from floating dust and metallic particles;

5、Solid locations without vibration;

6、Locations free from electromagnetic noise interference.

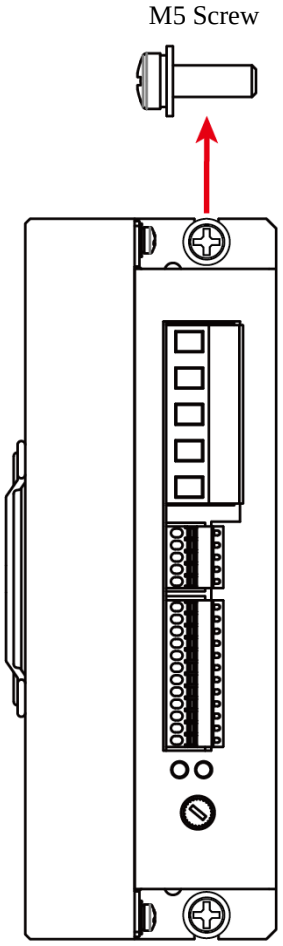
2.3 Installation Instructions

This product is designed for wall-mount installation. It is recommended to use screws with washers for fastening (as shown in the figure below).It is recommended to install the unit on a metal mounting surface with good heat dissipation. The recommended hole pitch (spacing) on the mounting surface is between 139 and 141 mm.Ensure proper grounding; otherwise, there is a risk of fire hazards.

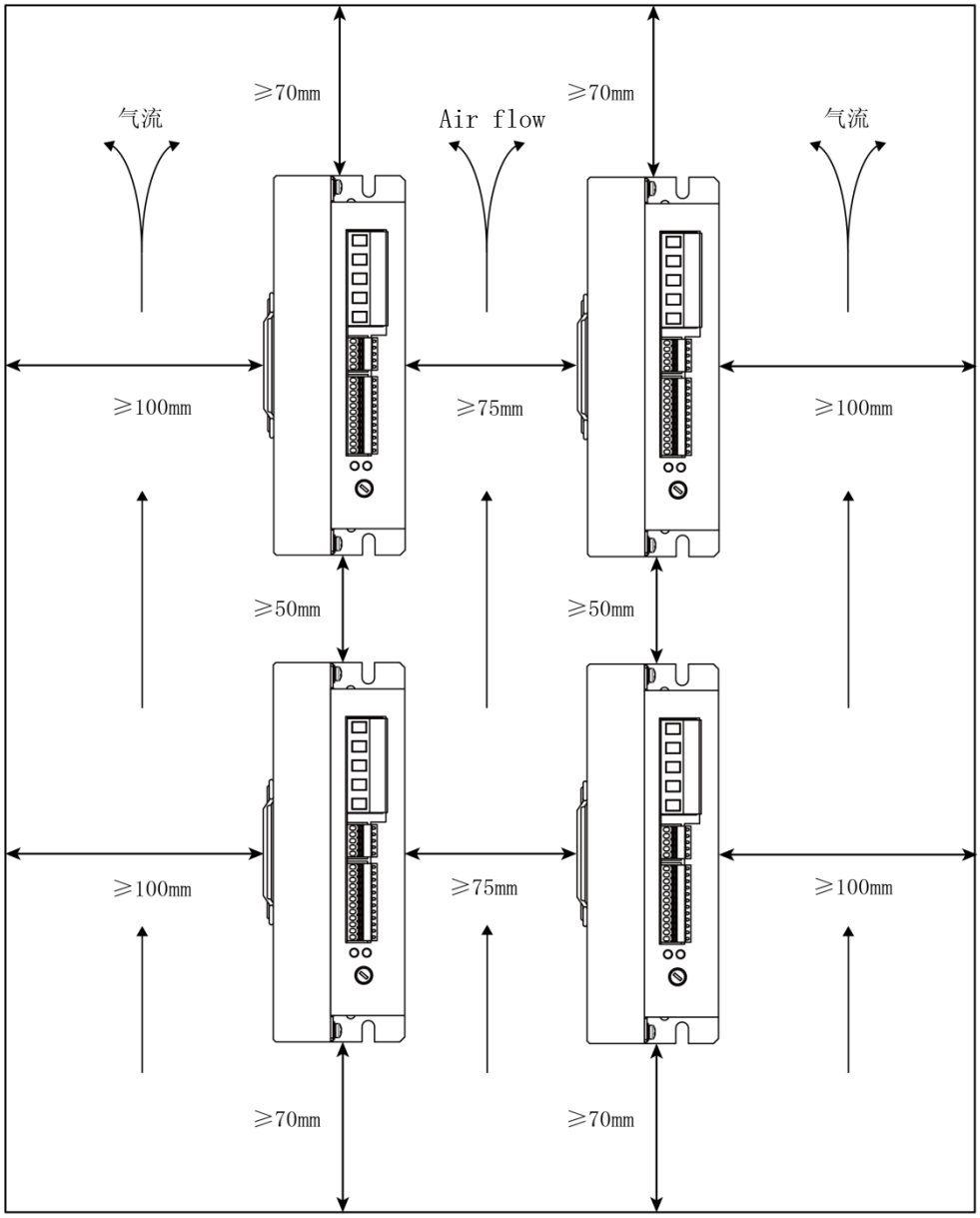
Recommended installation clearance for drives: When installing multiple drives side-by-side, to ensure adequate heat dissipation, please maintain an installation clearance of 75 mm or more. This product is equipped with a cooling fan at the bottom; please ensure sufficient space for ventilation.

When using RS-485 communication, CAN communication, or side ports, please increase the installation distance and pay attention to the cable routing/layout (refer to Section 6.2).

The installation diagram and installation clearance diagram are shown in the figures below:


M5 Screw





*The clearance distance between drives in the installation diagram is not to scale; please refer to the textual annotations for actual dimensions.

Precautions

Users shall pay special attention to the following items:

1、The connection cable between the drive and the motor must not be stretched tightly to prevent loosening or disconnection;

2、When securing the drive, all mounting screws must be firmly tightened;

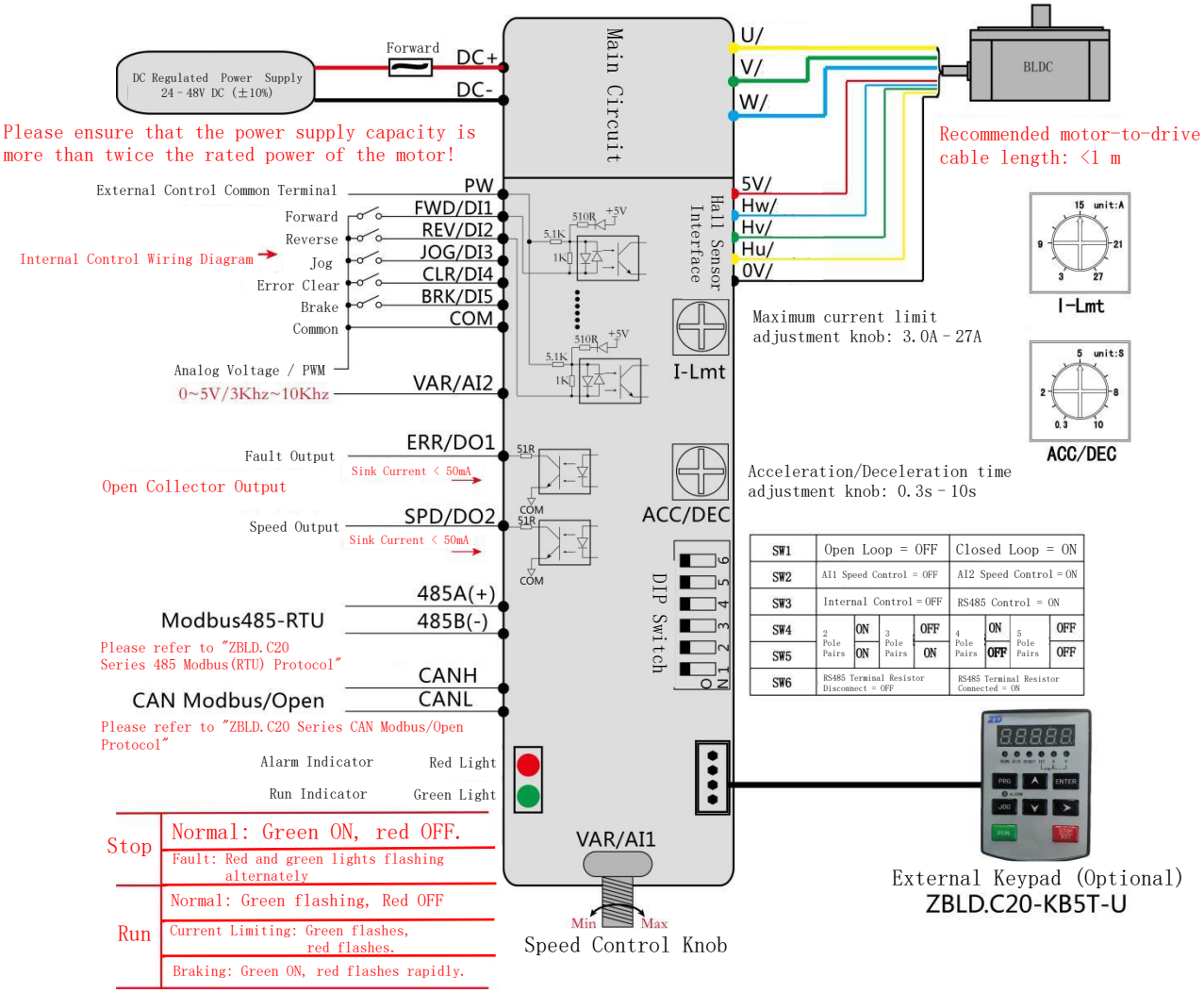
3、The motor shaft center must be well aligned (good concentricity) with the equipment shaft center;

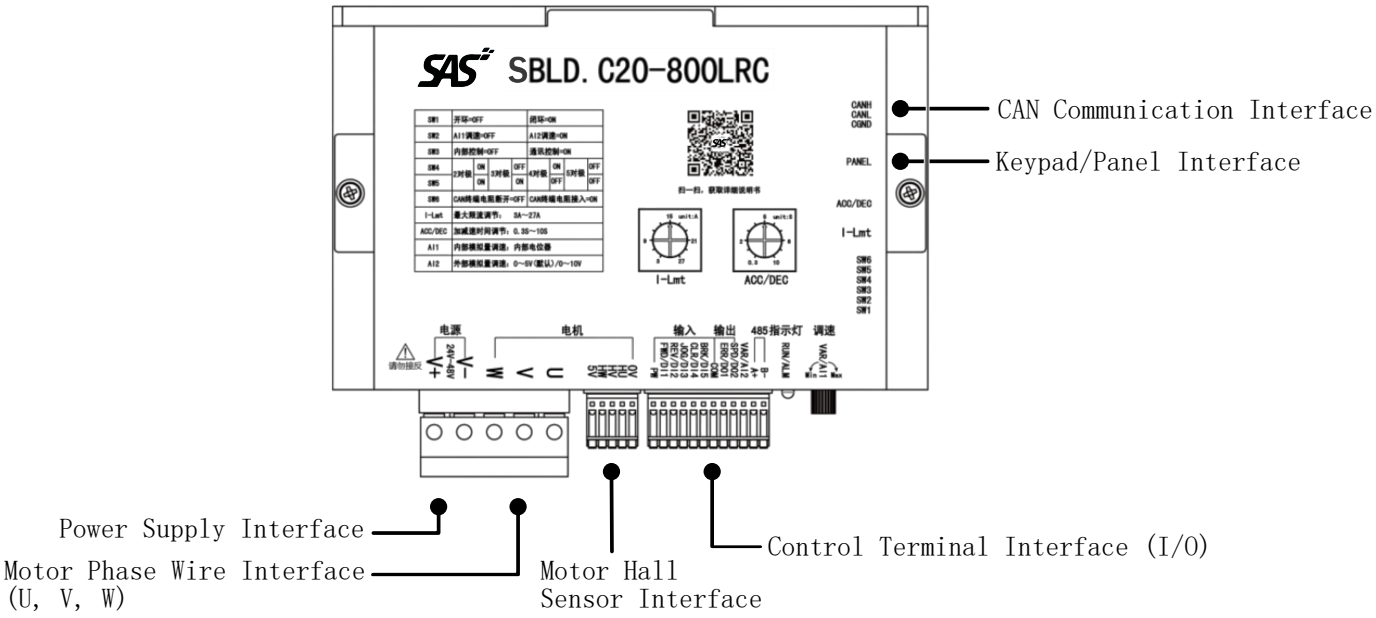
4、The screws used to secure the motor must be firmly tightened.

3. Wiring Method

3.1 Wiring Diagram

The following figure shows the wiring diagram of the C20-800LRC





Precautions:

1、Before wiring, be sure to switch off the power supply. Wiring work shall be carried out by qualified personnel to ensure personal safety;

2、Do not connect the power supply cable to terminals other than the power input terminals, otherwise the drive may be damaged;

3、 The grounding terminal must be properly grounded;

4、Ensure that all screws between terminals and conductors are firmly tightened to prevent loosening due to vibration;

5、When wiring, select the conductor size in accordance with applicable electrical regulations;

6、Ensure that the power supply capacity is more than twice the rated power of the motor;

7、It is recommended that the length of the cable between the motor and the drive be less than 1 m;

8、After completing the wiring, please recheck the following items:

(1) Are all connections correct (especially check whether the power supply wiring is correct)?

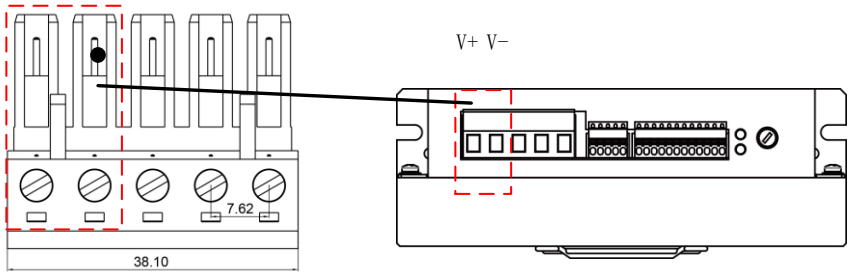
(2) Are there any missing connections?

(3) Are there any short circuits between terminals or short circuits to ground?

3.2 Ports

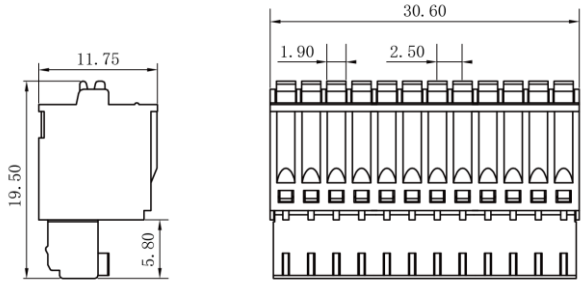
3.2.1 Power Interface

Plug-in terminal block with screw-type connection. Use a flat-head screwdriver (bit diameter ≤ 3mm). Power input range is DC 24V~48V. Wire according to the markings on the top cover. Do not reverse polarity.



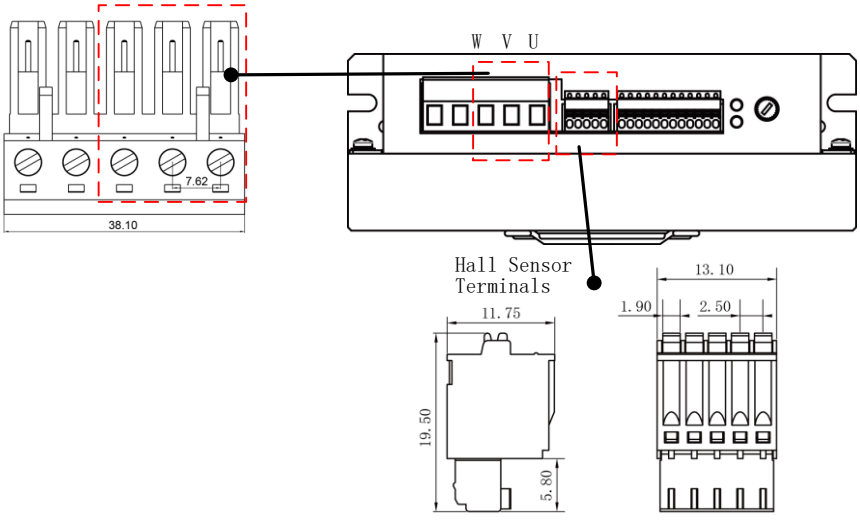
3.2.2 Control Terminal

12-pin pluggable terminal block with spring-clamp connection. Use a flat-head screwdriver (blade width ≤ 2 mm). During wiring, press the button above the wiring hole, insert the conductor, and then release the button. The wire is securely connected when it does not come loose.



3.2.3 Motor Interface

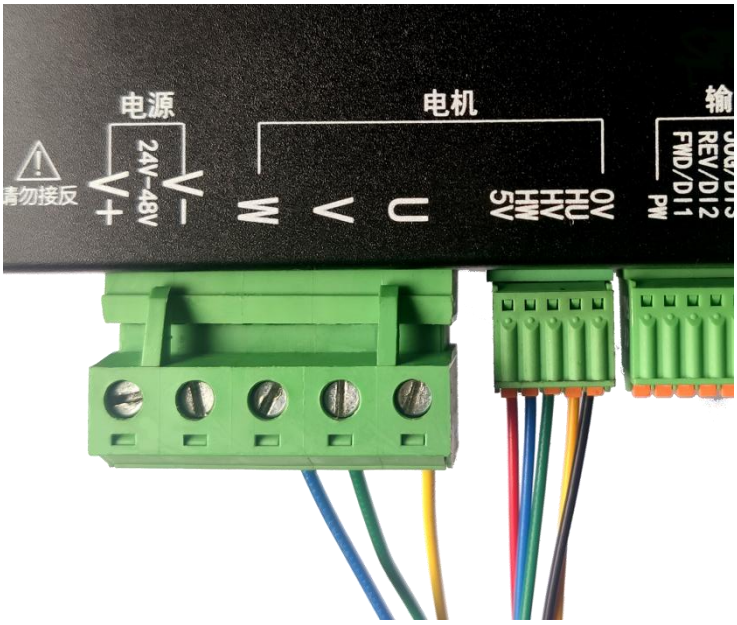
The low-voltage motor phase wires and Hall sensor wires are separated.
The motor phase wires use screw-type terminals and require a Phillips screwdriver (tip diameter ≤ 3 mm).
The Hall sensor terminals use spring-clamp connections and require a flat-head screwdriver (blade width ≤ 2 mm).



Description of Wiring Signal Correspondence and Wire Colors (Zhongda Motor Models)

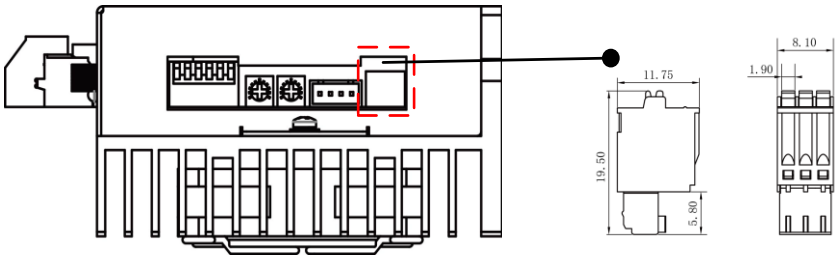
Signal	W	V	U	5V	HW	HV	HU	0V
Wire Color	Thick Blue	Thick Green	Thick Yellow	Red	Blue	Green	Yellow	Black

Wiring Diagram:



3.2.4 CAN Communication Interface

The CAN communication interface is a 3-pin pluggable terminal block using a spring-cage connection method. Use a flat-head screwdriver (blade width ⩽ 2mm) for operation. For detailed CAN communication wiring and functional usage, please refer to Chapter 7.



3.2.5 Keyboard Interface

The keyboard interface is a USB port. The keyboard connection cable is an externally purchased keyboard accessory (see Section 4.2.1).

IV. Operating Instructions

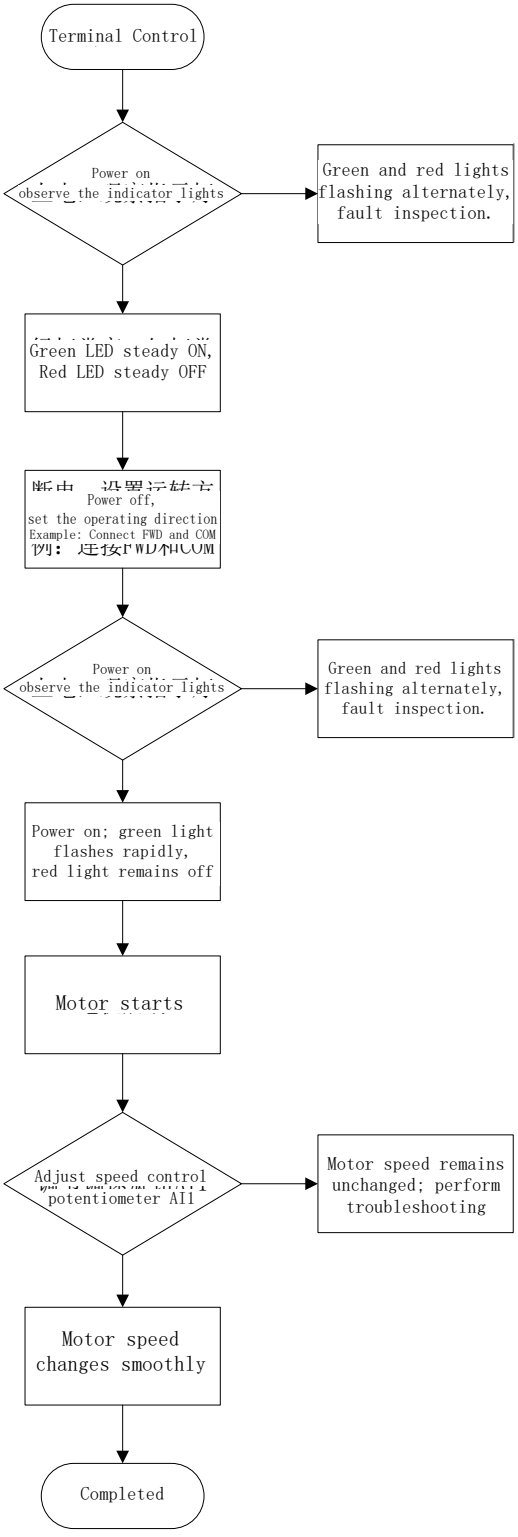
Precautions:

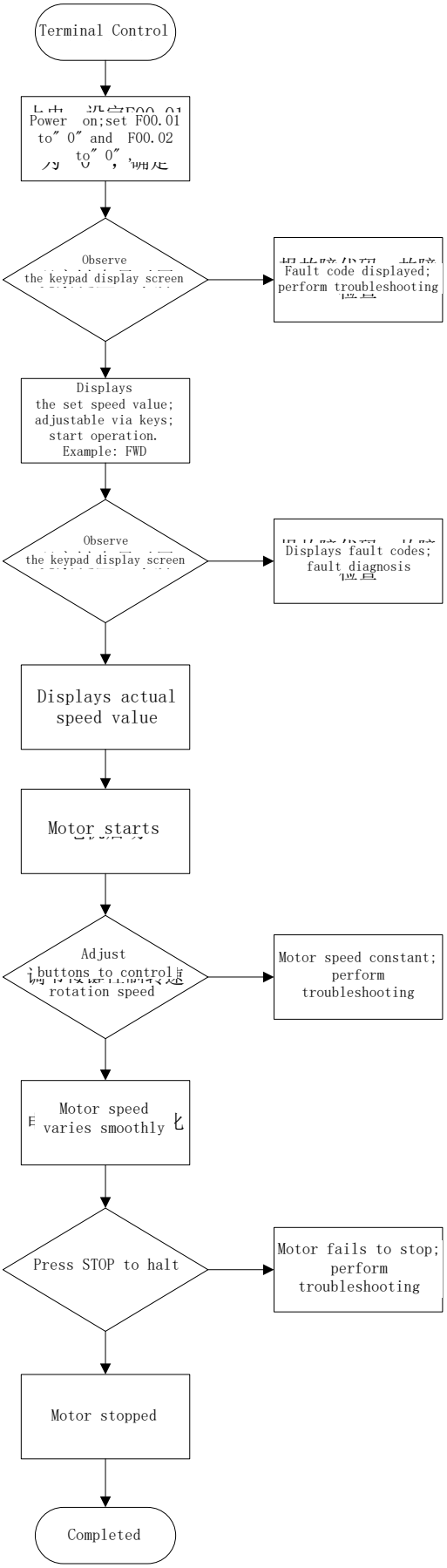
1、Unless otherwise specified, the factory default setting for this product is terminal control. Keyboard control requires the purchase of a keyboard accessory (SBLD.C20-KB5T-U).

2、The keyboard function codes listed in this manual are applicable to the SBLD.C20-800LRC product, as well as other C20 series products. For details, please refer to the C20 Series Keyboard Function Code User Manual.

3、A basic understanding of this product is required before operation, which should be performed by professional personnel.

4、Please perform a no-load commissioning (test run) before formal use. The figure below shows the no-load commissioning flowchart
(Left: Terminal Control; Right: Keyboard Control; Factory Default Settings).


Terminal Control
Power on
observe the indicator lights
Green and red lights flashing alternately, fault inspection.
Green LED steady ON,
Red LED steady OFF
Power off,
set the operating direction
Example: Connect FWD and COM
Power on
observe the indicator lights
Green and red lights flashing alternately, fault inspection.
Power on; green light flashes rapidly, red light remains off
Motor starts
Adjust speed control potentiometer All
Motor speed remains unchanged; perform troubleshooting
Motor speed changes smoothly
Completed


Terminal Control
Power on;set F00.01 to" 0" and F00.02 to" 0"
Observe
the keypad display screen
Fault code displayed; perform troubleshooting
Displays
the set speed value;
adjustable via keys;
start operation.
Example: FWD
Observe
the keypad display screen
Displays fault codes; fault diagnosis
Displays actual speed value
Motor starts
Adjust
buttons to control
rotation speed
Motor speed constant; perform troubleshooting
Motor speed
varies smoothly
Press STOP to halt
Motor fails to stop; perform troubleshooting
Motor stopped
Completed

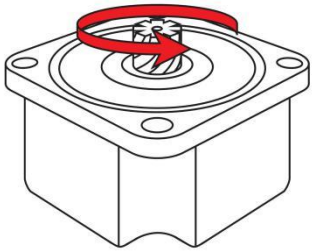
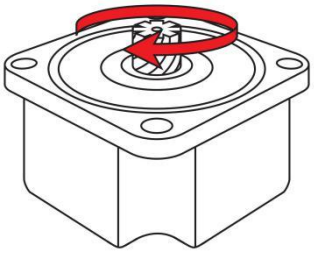
4.1 Terminal Control

4.1.1 Port Overview

Users who have not purchased the keypad can refer to the default values of the keypad function codes to understand the specific product parameters (see Section 4.2.3).

Port	Name	Function
Power Input Port	PW	Used for external power supply NPN/PNP wiring
Input	FWD/DI1	Analog Signal
	REV/DI2	Reverse Rotation
	JOG/DI3	Jog Operation
	CLR/DI4	Reset
	BRK/DI5	Brake (Electromagnetic Brake)
Common Terminal	COM	
Output	ERR/DO1	Fault Output (Open Collector Output)
	SPD/DO2	Speed Output (Open Collector Output)
Analog Signal	VAR/AI2	Analog Voltage/PWM(0-5 V / 10 V)
485	A+	RS485+
	B-	RS485-

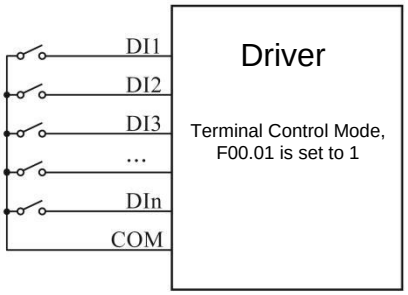
Motor rotation direction under factory default settings (the default direction may vary depending on the motor pole pairs; be sure to perform a no-load test before use to confirm the rotation direction):

FWD	REV
	

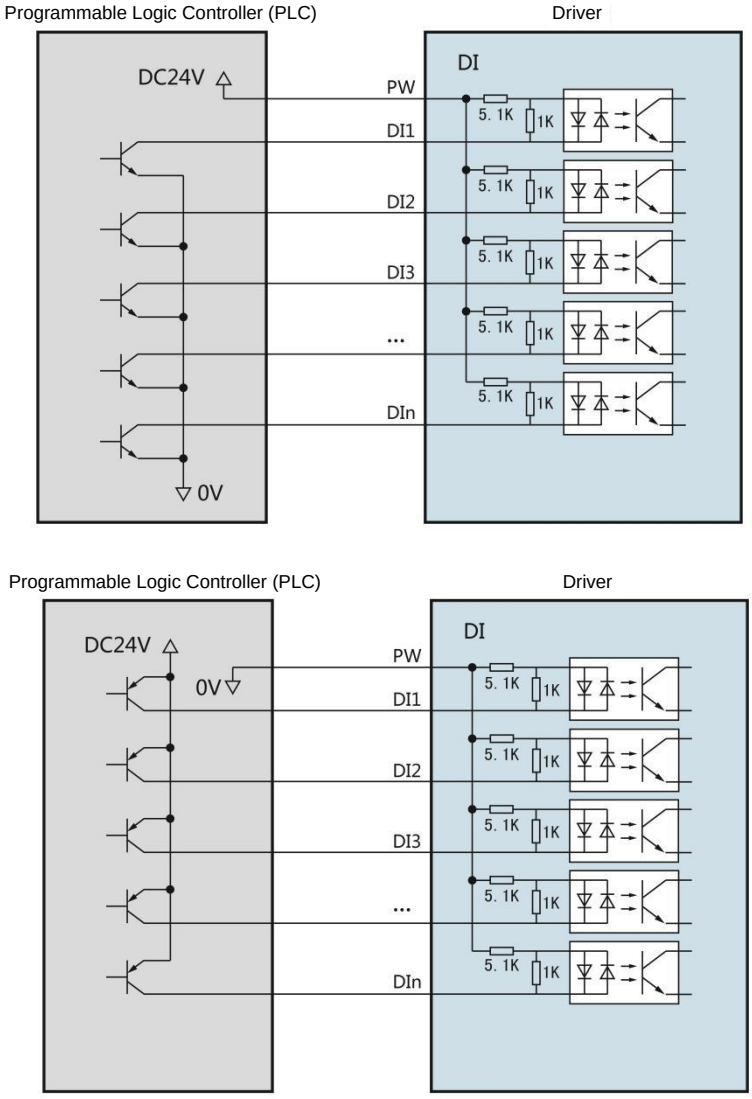
4.1.2 Input Terminals

- In terminal control mode, directly short the input terminal (FWD) with the common terminal (COM) to run the motor in forward direction;
- Short the input terminal (REV) with the common terminal (COM) to run the motor in reverse direction;
- When the jog terminal (JOG) is connected to the common terminal (COM), jog operation is enabled and the motor runs at low speed;
- When a drive fault occurs, connect the reset terminal (CLR) with the common terminal (COM) to perform a reset operation;
- During operation, when the brake terminal (BRK) is connected to the common terminal (COM), the motor enters braking state. Except for emergency safety braking, braking should be avoided when the motor is running at high speed or with large load inertia. To reduce response time, it is recommended to reduce the speed to a safe range before applying the brake.

Users may connect external switches (relays) as required.



External PLC (NPN/PNP). The following figure shows the wiring diagram:



Note:

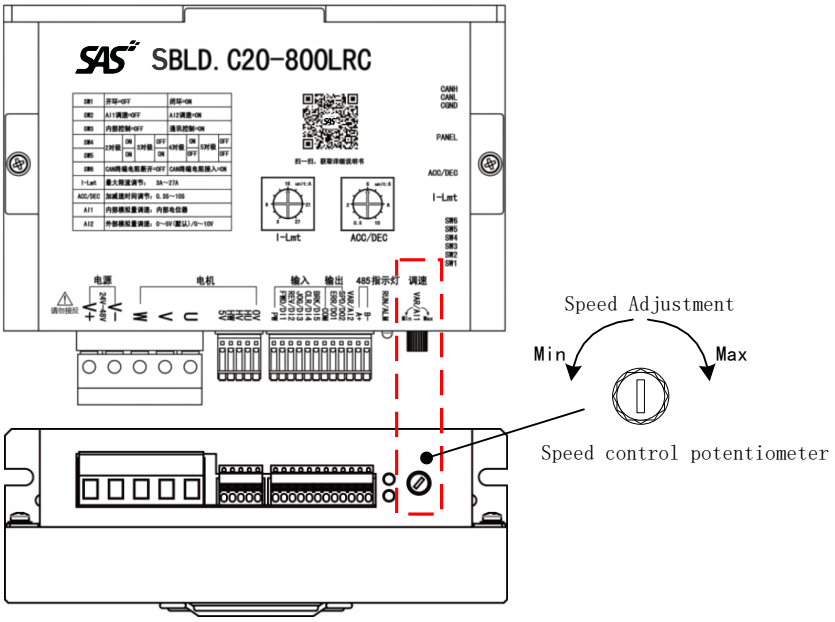
1、Do not connect the FWD and REV terminals simultaneously

2、Avoid changing the rotation direction while the motor is running at high speed; it is recommended to stop the motor before switching direction

3、If the braking function is used, calculate the safe braking speed to ensure that the motor speed is below this value when braking is applied.

4.1.3 Analog AI1 (Built-in Potentiometer) Speed Reference

The Analog AI1 (built-in potentiometer) speed reference is the factory default speed reference selection of this product. The speed can be adjusted by turning the potentiometer.
Adjustment can be made by hand or with a flat-head screwdriver (tip diameter ≤ 3.6 mm). Turning the potentiometer clockwise increases the speed, while turning it counterclockwise decreases the speed.

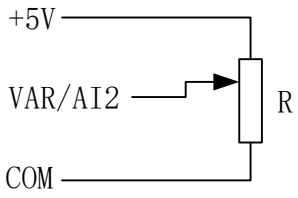


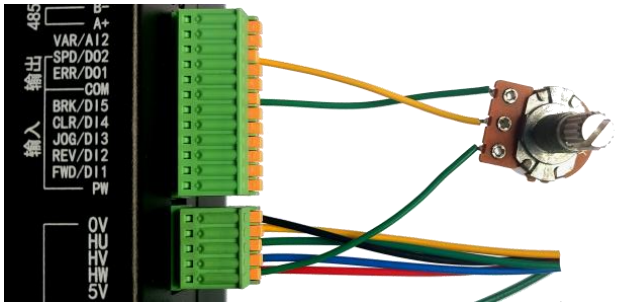
4.1.4 I-Lmt Current Limit Adjustment Knob

The I-Lmt current limit adjustment knob is the factory default method for current limiting on this product. Use a Phillips screwdriver (tip diameter ≤ 3 mm) for adjustment. Turning the potentiometer clockwise increases the current, while turning it counterclockwise decreases the current. Maximum current limit adjustment range: 3 A to 15 A.

4.1.5 Analog Input AI2 (External Voltage) Speed Reference

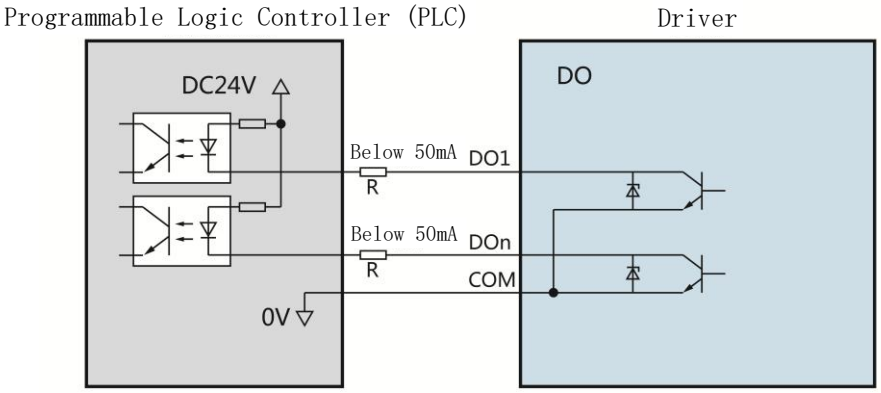
For Analog Input AI2 (External Voltage) speed reference, the function code F00.02 must be set to "2" via the keypad. The speed is adjusted by varying the external input voltage (default 0 - 5V). Users need to provide their own external potentiometer (recommended resistance: 10kΩ).
If an external voltage input of 0 - 10V is required, the function code F05.39 must be set to "10" via the keypad, setting the upper input limit to 10V. The figures below show the schematic diagram and the actual wiring diagram.





4.1.6 Output Terminals

Open Collector (OC) Output; the sink cur r ent must be less than 50mA. The d efault function for por t DO1 is Fault Output, and for por t DO2 is Speed Output. These output selections can be mod ified via function cod es F06.01 and F06.02 using the keypad .



4.1.7 RS485 Communication Port

This product supports RS485 communication control and utilizes the MODBUS (RTU) protocol (Refer to Chapter 6).

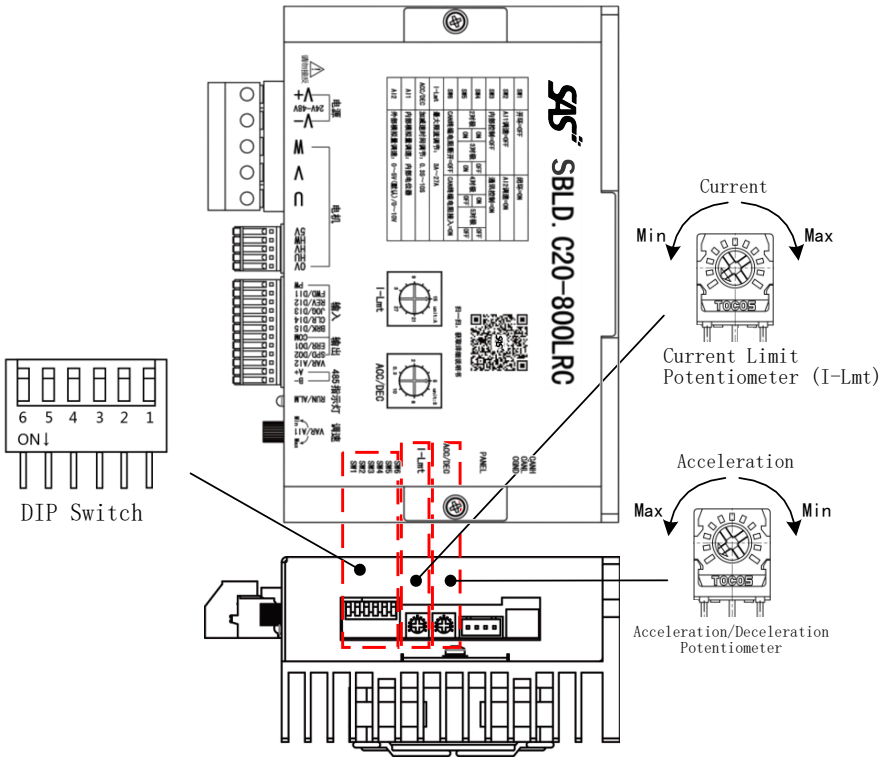
4.1.8 CAN Communication Port

This product supports CAN communication control and utilizes the MODBUS protocol (Refer to Chapter 7) and CANopen protocol (Refer to Chapter 8).

Analog ACC/DEC (Built-in Rotary Potentiometer) Acceleration/Deceleration Time Command

The analog ACC/DEC (built-in rotary potentiometer) command is the factory default selection for acceleration and deceleration time; adjusting the knob directly modifies the ACC/DEC duration., To set acceleration and deceleration times independently, change function code F00.08 to 0 via the keypad, then configure F00.11 (Acceleration Time) and F00.12 (Deceleration Time).

Use a Phillips screwdriver (tip diameter ⩽ 3mm) for adjustment. Rotating the potentiometer clockwise increases the ACC/DEC time (decreases acceleration), while rotating counter-clockwise decreases the ACC/DEC time (increases acceleration).



4.1.10 DIP Switches

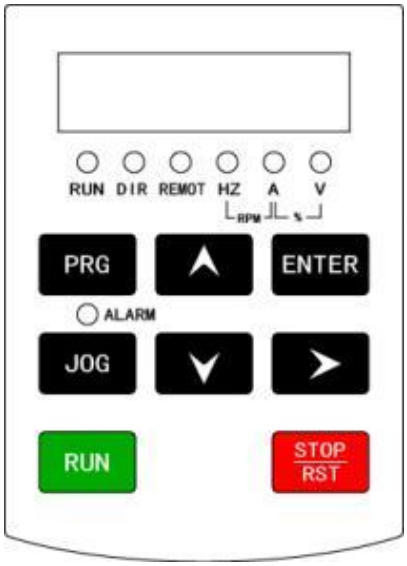
The DIP switches consist of six positions, SW1 to SW6. Setting the switch to the down position indicates ON, which is the factory default control mode of the drive.

SW1 (Open-loop/Closed-loop Selection)	Open-loop=OFF				Closed-loop=ON			
SW2 (Analog Signal Selection)	AI1=OFF				AI2=ON			
SW3 (Control Mode Selection)	Internal=OFF				485=ON			
SW4 (Motor Pole Pair Matching)	2 Pole Pairs	ON	3 Pole Pairs	OFF	4 Pole Pairs	ON	5 Pole Pairs	OFF
SW5 (Motor Pole Pair Matching)		ON		ON		OFF		OFF
SW6 (Whether to connect the termination resistor)	485 termination resistor enabled = ON							

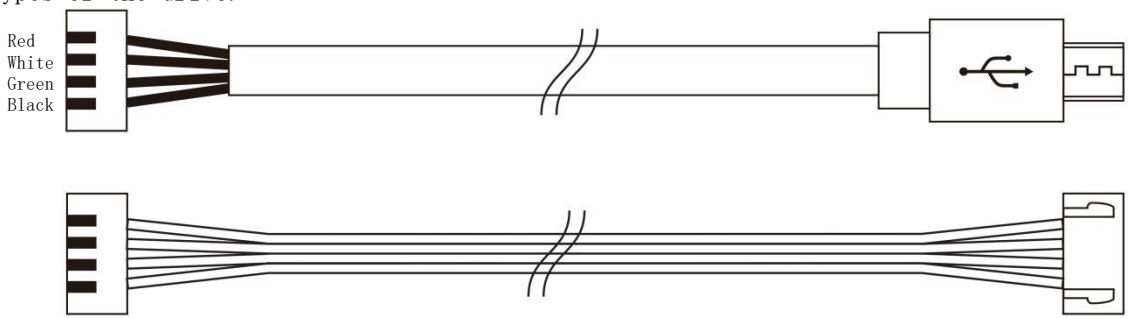
4.2 Keypad Control

4.2.1 Keypad Overview

The external keypad SBLD.C20-KB5T-U can be used to set drive parameters and read drive status.



Select the appropriate keypad connection cable according to the different keypad interface types of the drive.



Keyboard connection cable, length 500mm.

No.	Name	Description		
1	Digital Display Area	5-digit digital display for showing function codes, operating parameters, and fault alarms.		
2	Status indicator lamp	RUN		Off: Stop status; Flashing: Parameter identification; On: Operating status
		DIR		Off: Forward rotation; On: Reverse rotation
		REMOT		Off: Keypad control; Flashing: Terminal control; On: Communication control
		ALARM		Off: No fault; Flashing: Pre-alarm status; On: Fault status
3	Unit indicator lamp	Hz		Frequency unit
		A		Current unit
		V		Voltage unit
		RPM		Speed unit
		%		Percentage
4	Button area	PRG	Programming key	Enter or exit the first-level menu
		ENTER	Confirm key	Enter menu screens level by level and confirm parameter settings
		∧	Increment key	Increment of data or function codes
		∨	Decrement key	Decrement of data or function codes
		>	Right-shift key	On the stop and run display screens, the display parameters can be cyclically selected by right-shifting; when modifying parameters, the digit position to be edited can be selected.
		JOG	Jog key	Start jog operation (JOG key available only on the external keypad)

No.	Name	Description		
		RUN	Run key	Start operation
		STOP/RST	Stop/Reset key	In run status, used to stop operation In fault status, used for reset operation.

4.2.2 Keypad Operation

The drive has three levels of operation menus. The three menu levels are as follows:

1、Function code group number (Level 1 menu): e.g. F00;

2、Function code index (Level 2 menu): F00.00;

3、Function code value (Level 3 menu): 50.00 Hz.

Step	Key Operation
1 Power On 2 Set Command Source 3 Set Frequency Source 4 Set Frequency Value 5 Return to Secondary Menu 6 Keypad Run / Stop	

In the third-level menu state, if no digit is flashing, it indicates that the function code cannot be modified. Possible reasons are:

1) The function code is a read-only parameter, such as running frequency or fault code;

2) The function code is a stop-write parameter and can only be modified after the drive is stopped.

4.2.3 Function Codes

The parameters of the C20 drive are grouped by function into a total of 11 groups from F00 to F10. Other undisplayed groups are reserved. Each function group contains several function codes.

Attribute description: "R/W" read/write; "R/W*" read/write when stopped; "RO" read-only; "N" reserved.

Parameter	Name	Setting range	Default value	Attribute
F00 Basic Function Group				
F00.00	Control mode	0: Test mode 1: Hall open-loop 2: Hall closed-loop 3: DIP switch setting (SW1 effective on some models)	3	R/W*
F00.01	Run command selection	0: Keypad run command channel (LED off) 1: Terminal run command channel (LED flashing) 2: Communication run command channel (LED on) 3: DIP switch setting (SW3 effective on some models)	3	R/W
F00.02	Speed reference selection	0: Keypad digital setting 1: Analog input AI1 setting (potentiometer)	5	R/W

Parameter	Name	Setting range	Default value	Attribute
		2: Analog input AI2 setting(external voltage) 3: MODBUS communication setting 4: Multi-speed setting 5: DIP switch setting (SW2 and SW3 effective on some models) 6: Simple PLC setting(F04 group) 7: High-speed pulse input setting (select HDI in F05.00) 8: CAN communication setting (available on some models)		
F00.03	Maximum running frequency	F00.04~500.00Hz	250.00Hz	R/W*
F00.04	Minimum running frequency	0.00Hz~F00.03(Maximum frequency)	5.00Hz	R/W*
F00.05	Communication run command channel selection	0: MODBUS communication channel 1: CAN communication channel (available on some models)	0	R/W*
F00.06	Pole pair number setting selection	0: Function code setting (F02.05) 1: DIP switch setting (available on some models)	1	R/W*
F00.07	Current setting selection	0: Function code setting (F02.04) 1: Analog setting (available on some models)	1	R/W*
F00.08	Acceleration/Deceleration time setting selection	0: Function code setting (F00.11, F00.12) 1: Analog setting (effective for keypad and terminals)	1	R/W*
F00.09	Jog frequency setting	0.00Hz~F00.03(Maximum frequency)	10.00Hz	R/W
F00.10	Keypad frequency setting	0.00Hz~F00.03(Maximum frequency)	250.00Hz	R/W
F00.11	Acceleration time 1	0.1~600.0s	1.0s	R/W
F00.12	Deceleration time 1	0.1~600.0s	1.0s	R/W
F00.13	Running direction selection	0: Run in default direction 1: Run in reverse direction 2: Reverse operation disabled	0	R/W
F00.14	Carrier frequency setting	8.0~20.0kHz	机型确定	R/W*
F00.15	Parameter reset selection	0: No operation 1: Restore function code default values 2: Restore CANopen communication parameter default values 3: Restore all parameters	0	R/W*
F01 Start/Stop Control Group				
F01.05	Stop mode selection	0: Deceleration stop 1: Free stop	1	R/W
F01.06	Forward/Reverse dead time	0.000~9.999s	0.200s	R/W
F01.07	Reserved	0~1	0	R/W*
F01.08	Electronic braking current limit point	0.1%~200.0%	5.0%	R/W
F01.09	Electronic braking adjustment time	0.1~999.9s	5.0s	R/W
F01.10	Stop speed	0.00 - 50.00 Hz, effective during deceleration stop	0.20Hz	R/W
F01.11	Forward/Reverse switching limit frequency	0.0 - 500.0 Hz, effective during deceleration stop	50.0Hz	R/W
F01.12	Electronic braking torque holding time	0.1~600.0s	0.0s	R/W

Parameter	Name	Setting range	Default value	Attribute
	Time			
F01.13	Deceleration stop braking enable	0: Disabled 1: Enable braking during deceleration stop (effective when F01.05 = 0)	1	R/W
F01.14	Deceleration ratio numerator	1~9999 Displayed Speed = Motor Speed / (Gear Ratio Numerator / Gear Ratio Denominator)	1	R/W
F01.15	Deceleration ratio denominator		1	R/W
F02 Motor Parameter Group				
F02.00	Motor rated power	15~2200W	Model identification	R/W*
F02.01	Motor rated frequency	0.01Hz~500Hz	Model identification	R
F02.02	Motor rated speed	1~9999rpm	Model identification	R
F02.03	Motor rated voltage	0~1200V	Model identification	R
F02.04	Motor rated current	0.8~999.9A	Model identification	R/W*
F02.05	Motor pole pairs	1~20	5	R/W*
F02.08	Special parameter settings	Bit 0: 0 = Hall counting in default direction 1 = Hall counting reversed (F09.29, F09.30) Bit 1: 0 = Speed display shows actual value 1 = Speed display shows set value	0	R/W*
F03 Control Parameter Group				
F03.00 ~ F03.18	Reserved	Reserved	16.0	N
F04 Simple PLC and Multi-speed Group				
F04.00	Simple PLC mode	0: Stop after one run 1: After one run, keep running at the final value 2: Cyclic operation 3-n: Cyclic operation for(n-1)times,then stop; maximum n is 9999	0	R/W
F04.01	Multi-speed 0	-100.0~100.0%	0.0%	R/W
F04.02	Multi-speed 1	-100.0~100.0%	0.0%	R/W
F04.03	Multi-speed 2	-100.0~100.0%	0.0%	R/W
F04.04	Multi-speed 3	-100.0~100.0%	0.0%	R/W
F04.05	Multi-speed 4	-100.0~100.0%	0.0%	R/W
F04.06	Multi-speed 5	-100.0~100.0%	0.0%	R/W
F04.07	Multi-speed 6	-100.0~100.0%	0.0%	R/W
F04.08	Multi-speed 7	-100.0~100.0%	0.0%	R/W
F04.09	Multi-speed 8	-100.0~100.0%	0.0%	R/W
F04.10	Multi-speed 9	-100.0~100.0%	0.0%	R/W

Parameter	Name	Setting range	Default value	Attribute
F04.11	Multi-speed 10	-100.0~100.0%	0.0%	R/W
F04.12	Multi-speed 11	-100.0~100.0%	0.0%	R/W
F04.13	Multi-speed 12	-100.0~100.0%	0.0%	R/W
F04.14	Multi-speed 13	-100.0~100.0%	0.0%	R/W
F04.15	Multi-speed 14	-100.0~100.0%	0.0%	R/W
F04.16	Multi-speed 15	-100.0~100.0%	0.0%	R/W
F04.17	Stage 0 running time	0.0~999.9s(m)	0.0s	R/W
F04.18	Stage 1 running time	0.0~999.9s(m)	0.0s	R/W
F04.19	Stage 2 running time	0.0~999.9s(m)	0.0s	R/W
F04.20	Stage 3 running time	0.0~999.9s(m)	0.0s	R/W
F04.21	Stage 4 running time	0.0~999.9s(m)	0.0s	R/W
F04.22	Stage 5 running time	0.0~999.9s(m)	0.0s	R/W
F04.23	Stage 6 running time	0.0~999.9s(m)	0.0s	R/W
F04.24	Stage 7 running time	0.0~999.9s(m)	0.0s	R/W
F04.25	Stage 8 running time	0.0~999.9s(m)	0.0s	R/W
F04.26	Stage 9 running time	0.0~999.9s(m)	0.0s	R/W
F04.27	Stage 10 running time	0.0~999.9s(m)	0.0s	R/W
F04.28	Stage 11 running time	0.0~999.9s(m)	0.0s	R/W
F04.29	Stage 12 running time	0.0~999.9s(m)	0.0s	R/W
F04.30	Stage 13 running time	0.0~999.9s(m)	0.0s	R/W
F04.31	Stage 14 running time	0.0~999.9s(m)	0.0s	R/W
F04.32	Stage 15 running time	0.0~999.9s(m)	0.0s	R/W
F04.33	PLC restart mode selection	0: Restart operation from the first stage 1: Continue operation from the stage frequency at the interruption	0	R/W*
F04.34	Multi-step time unit selection	0: Seconds (s) 1: Minutes (m)	0	R/W*
F05 Input Terminal Parameter Group				
F05.00	HDI function selection	0: DI3 as standard I/O input 1: DI3 as HDI high-speed pulse input	0	R/W*
F05.01	DI1 terminal function selection	0: No function 1: Forward run 2: Reverse run 3: Three-wire run control 4: Forward jog 5: Reverse jog 6: Free stop 7: Fault reset	1	R/W*
F05.02	DI2 terminal function selection		2	R/W*
F05.03	DI3 terminal function selection		4	R/W*
F05.04	DI4 terminal function selection		7	R/W*
F05.05	DI5 terminal function selection		0	R/W*
F05.06	DI6 terminal function selection		0	R/W*

Parameter	Name	Setting range	Default value	Attribute
F05.07	DI7 terminal function selection	8: Electronic braking 9: External fault input 10 - 13: Reserved 14: Forward limit 15: Reverse limit 16: Multi-speed 1 17: Multi-speed 2 18: Multi-speed 3 19: Multi-speed 4 Others: Reserved	0	R/W*
F05.08	DI8 terminal function selection		0	R/W*
F05.09	Reserved		0	R/W*
F05.10	Input terminal polarity selection	0x000~0x1FF	0x000	R/W
F05.11	Digital input filter time	0.000~1.000s	0.010s	R/W
F05.12	Virtual terminal setting	0x000 - 0x10F (0: Disabled, 1: Enabled) BIT0: DI1 virtual terminal BIT1: DI2 virtual terminal BIT2: DI3 virtual terminal BIT3: DI4 virtual terminal BIT4: DI5 virtual terminal BIT5: DI6 virtual terminal BIT6: DI7 virtual terminal BIT7: DI8 virtual terminal	0x000	R/W*
F05.13	Terminal control operation mode	0: Two-wire control 1 1: Two-wire control 2 2: Three-wire control 1 3: Three-wire control 2	0	R/W*
F05.14	DI1 terminal ON delay time	0.000~9.999s	0.000s	R/W
F05.15	DI1 terminal OFF delay time	0.000~9.999s	0.000s	R/W
F05.16	DI2 terminal ON delay time	0.000~9.999s	0.000s	R/W
F05.17	DI2 terminal OFF delay time	0.000~9.999s	0.000s	R/W
F05.18	DI3 terminal ON delay time	0.000~9.999s	0.000s	R/W
F05.19	DI3 terminal OFF delay time	0.000~9.999s	0.000s	R/W
F05.20	DI4 terminal ON delay time	0.000~9.999s	0.000s	R/W
F05.21	DI4 terminal OFF delay time	0.000~9.999s	0.000s	R/W
F05.22	DI5 terminal ON delay time	0.000~9.999s	0.000s	R/W

Parameter	Name	Setting range	Default value	Attribute
F05.23	DI5 terminal OFF delay time	0.000~9.999s	0.000s	R/W
F05.24	DI6 terminal ON delay time	0.000~9.999s	0.000s	R/W
F05.25	DI6 terminal ON delay time	0.000~9.999s	0.000s	R/W
F05.26	DI7 terminal ON delay time	0.000~9.999s	0.000s	R/W
F05.27	DI7 terminal ON delay time	0.000~9.999s	0.000s	R/W
F05.28	DI7 terminal ON delay time	0.000~9.999s	0.000s	R/W
F05.29	DI7 terminal ON delay time	0.000~9.999s	0.000s	R/W
F05.30	Reserved	0.000~9.999s	0.000s	R/W
F05.31	Reserved	0.000~9.999s	0.000s	R/W
F05.32	AI1 lower limit value	0.00V~F05.34	0.50V	R/W
F05.33	AI1 lower limit corresponding setting	-300.0%~300.0%	0.0%	R/W
F05.34	AI1 upper limit value	F05.32~10.00V	8.50V	R/W
F05.35	AI1 upper limit corresponding setting	-300.0%~300.0%	100.0%	R/W
F05.36	AI1 input filter time	0.000s~9.999s	0.030s	R/W
F05.37	AI2 lower limit value	0.00V~F05.39	0.20V	R/W
F05.38	AI2 lower limit corresponding setting	-300.0%~300.0%	0.0%	R/W
F05.39	AI2 upper limit value	F05.37~10.00V	4.80V	R/W
F05.40	AI2 upper limit corresponding setting	-300.0%~300.0%	100.0%	R/W
F05.41	AI2 input filter time	0.000s~9.999s	0.030s	R/W
F05.42	AI3 lower limit value	0.00V~F05.44	0.50V	R/W
F05.43	AI3 lower limit corresponding setting	-300.0%~300.0%	0.0%	R/W
F05.44	AI3 upper limit value	F05.42~10.00V	8.50V	R/W
F05.45	AI3 upper limit corresponding setting	-300.0%~300.0%	100.0%	R/W
F05.46	AI3 input filter time	0.000s~9.999s	0.030s	R/W
F05.47	AI4 lower limit value	0.00V~F05.49	0.50V	R/W
F05.48	AI4 lower limit corresponding setting	-300.0%~300.0%	0.0%	R/W
F05.49	AI4 upper limit value	F05.47~10.00V	8.50V	R/W
F05.50	AI4 upper limit corresponding setting	-300.0%~300.0%	100.0%	R/W
F05.51	AI4 input filter time	0.000s~9.999s	0.030s	R/W

Parameter	Name	Setting range	Default value	Attribute
F05.52	HDI lower limit frequency value	0.00KHZ~F05.54	0.00KHZ	R/W
F05.53	HDI lower limit corresponding setting	-100.0%~100.0%	0.0%	R/W
F05.54	HDI upper limit frequency value	F05.52~20.00KHZ	19.99KHZ	R/W
F05.55	HDI upper limit corresponding setting	-100.0%~100.0%	100.0%	R/W
F05.56	HDI input filter time	0.000s~9.999s	0.030s	R/W
F06 Output Terminal Parameter Group				
F06.00	Reserved	0~1	0	R/W*
F06.01	DO1 output selection	0: Invalid 1: Running 2: Forward running 3: Reverse running 4: Jog running 5: Drive fault 6: Overload pre-alarm 7: Underload pre-alarm 8: Communication virtual terminal output 9: DC bus undervoltage 10: Speed output (Hall signal) Others: Reserved	5	R/W
F06.02	DO2 output selection		10	R/W
F06.03	DO3 output selection		0	R/W
F06.04	DO4 output selection		0	R/W
F06.05	Output terminal polarity selection	00~0F	00	R/W
F06.06	DO1 ON delay time	0.000~9.999s	0.000s	R/W
F06.07	DO1 OFF delay time	0.000~9.999s	0.000s	R/W
F06.08	DO2 ON delay time	0.000~9.999s	0.000s	R/W
F06.09	DO2 OFF delay time	0.000~9.999s	0.000s	R/W
F06.10	DO3 ON delay time	0.000~9.999s	0.000s	R/W
F06.11	DO3 OFF delay time	0.000~9.999s	0.000s	R/W
F06.12	DO4 ON delay time	0.000~9.999s	0.000s	R/W
F06.13	DO4 OFF delay time	0.000~9.999s	0.000s	R/W
F07 Fault and Protection Group				
F07.00	Drive or motor overload/underload pre-alarm selection	0x000 - 0x131 LED units digit: 0: Motor overload/underload pre-alarm, relative to the motor rated current 1: Drive overload/underload pre-alarm, relative to the drive rated current LED tens digit: 0: Continue running after drive overload/ underload alarm 1: Continue running after underload alarm; stop operation after overload fault 2: Continue running after overload alarm; stop operation after underload fault	0x000	R/W

Parameter	Name	Setting range	Default value	Attribute
		3: Stop operation after the drive reports an overload/underload fault LED hundreds digit: 0: Continuous detection 1: Detection during constant-speed operation		
F07.01	Overload pre-alarm detection level	F07.03~200%	140%	R/W
F07.02	Overload pre-alarm detection time	0.1~999.9s	1.0s	R/W
F07.03	Underload pre-alarm detection level	0%~F07.01	50%	R/W
F07.04	Underload pre-alarm detection time	0.1~999.9s	1.0s	R/W
F07.05	Motor overload protection selection	0: No protection 1: Protection enabled	0	R/W*
F07.06	Motor overload protection factor	20.0%~120.0%	100.0%	R/W
F07.07	MOS self-test enable	0: Disabled 1: Enabled	0	R/W*
F07.08	Automatic current limiting level	10.0%~420.0% (Relative to the drive)	260.0%	R/W*
F07.09	Fault auto-reset time	0.0~999.9s：Auto-reset time	5.0s	R/W
F07.10	Fault auto-reset count	0: No automatic reset 1 - 9999: Reset count	0	R/W
F07.11	Stall detection time	0.0~999.9s：Stall detection	3.0s	R/W*
F07.12	Stall current limit	1.0~200.0% (Relative to the drive rated current)	70.0%	R/W*
F07.13	UP/DN keypad function setting	0: Speed reference fine adjustment (effective only for keypad speed reference) 1: UP for forward jog, DN for reverse jog (Effective only on the keypad stop or run display screen)	0	R/W
F07.14	Undervoltage fault detection time	0~9.999s	1.0s	R/W
F07.15	Phase loss detection time	0~999.9s	3.0s	R/W
F07.16	User password	0: Clear user password 1 - 9999: Enable user password protection	0	R/W
F07.19	Fan control	0: Fan runs only during operation 1: Fan runs continuously		
F08 Communication Group				
F08.00	RS-485 Slave Address	1 - 247, 0 is the broadcast address	1	R/W*
F08.01	RS-485 Communication Baud Rate Setting	0：1200BPS 1：2400BPS 2：4800BPS 3：9600BPS 4：19200BPS (Default value) 5：38400BPS 6：57600BPS Note: Some drives do not support baud rate modification.	4	R/W*
F08.02	RS-485 Data Bits and Parity Setting	0: No parity (N, 8, 1) for RTU	0	R/W*

Parameter	Name	Setting range	Default value	Attribute
		1: Even parity (E, 8, 1) for RTU 2: Odd parity (O, 8, 1) for RTU 3: No parity (N, 8, 2) for RTU Note: Some drives do not support parity setting modification.		
F08.03	RS-485 Communication Response Delay	0~200ms	5	R/W*
F08.04	RS-485 Communication Timeout Fault Time	0.0 (disabled), 0.1 - 60.0 s	0.0s	R/W*
F08.05	Reserved		0	R/W*
F08.06	RS-485 Communication Fault Handling Action Selection	0x0 - 0x1 LED ones digit: 0: Write operation with response 1: Write operation without response	0x00	R/W*
F08.10	CAN Slave Address	1~127	1	R/W*
F08.11	CAN Baud Rate	0: 10K(Supported by some models only) 1: 20K 2: 50K 3: 100K 4: 125K(Default) 5: 250K 6: 500K 7: 1M	4	R/W*
F08.12	CAN Communication Response Delay	0~200ms	5ms	R/W*
F08.13	CAN Communication Protocol Selection	0: CAN Modbus protocol 1: CANopen protocol (some models)	0	R/W*
F08.14	CAN Function Setting	CANopen function settings BIT0 - BIT7: BIT0: Action selection when in non-Operational state during operation 0 = Stop and report fault E.CAN5 1 = Keep previous state BIT1: Heartbeat timeout action selection 0 = Stop and report fault E.CAN4 1 = Keep previous state BIT2: Enable CAN receive/transmit fault 0 = Disable faults E.CAN2, E.CAN3 1 = Enable faults E.CAN2, E.CAN3 CAN Modbus function settings BIT8 - BIT15: BIT8: CAN Modbus broadcast response selection 0 = No response to broadcast 1 = Response to broadcast	0x00	R/W*
F09 Monitoring Parameter Group				
F09.00	Set Frequency	0.00Hz~F00.03	0.00Hz	RO
F09.01	Output Frequency	0.00Hz~F00.03	0.00Hz	RO
F09.02	Ramp Reference Frequency	0.00Hz~F00.03	0.00Hz	RO

Parameter	Name	Setting range	Default value	Attribute
F09.03	Output Voltage	0.0~1200.0V	0.0V	RO
F09.04	Output Current	0.00~100.00A	0.00A	RO
F09.05	Set Speed	0~65535RPM	0RPM	RO
F09.06	Motor Speed	0~65535RPM	0RPM	RO
F09.07	Output Power	0~2200W	0W	RO
F09.08	DC Bus Voltage	0.0~2000.0V	0V	RO
F09.09	Hall Value	0~7	0	RO
F09.10	Software Version	1.00~99.99	1.00	
F09.11	Current Fault Type	0: No fault 1: Hardware overcurrent during acceleration(E.OCH1) 2: Hardware overcurrent during deceleration(E.OCH2) 3: Hardware overcurrent at constant speed(E.OCH3) 4: Overcurrent during acceleration (E.OC1) 5: Overcurrent during deceleration (E.OC2) 6: Overcurrent at constant speed (E.OC3) 7: Overvoltage during acceleration (E.OV1) 8: Overvoltage during deceleration (E.OV2) 9: Overvoltage at constant speed (E.OV3) 10: DC bus undervoltage fault (E.Uv) 11: Motor overload (E.OL1) 12: Drive overload (E.OL2) 13: Hall sensor fault (E.HALL) 14: Stall fault (E.LOC) 15: Rectifier module overtemperature (E.OH1) 16: Inverter module overtemperature fault (E.OH2) 17: External fault (E.EF) 18: RS-485 communication fault (E.485) 19: Current detection fault (E.CUr) 20: Inverter unit U-phase protection (E.OUt1) 21: Inverter unit V-phase protection (E.OUt2) 22: Inverter unit W-phase protection (E.OUt3) 23: Electronic overload (E.OL3) 24: Underload fault (E.LL) 25: MOS short-circuit fault (E.Sht) 26: Panel communication error (E.boAd) 27: EEPROM storage fault (E.EEP) 28: MOS conduction fault (E.Cnd) 29: Hardware overcurrent feedback fault (E.OCHF) 30: Output phase loss fault (E.POUT) 31: CAN bus-off fault (E.CAN1) 32: CAN transmit error (E.CAN2) 33: CAN receive error (E.CAN3) 34: Internal communication fault (E.Conn) 35: CANopen heartbeat timeout (E.CAN4) 36: CANopen NMT operation fault (E.CAN5)	0	RO
F09.12	Previous Fault Type (Last Fault)		0	RO
F09.13	Second Previous Fault Type		0	RO
F09.14	Third Previous Fault Type		0	RO
F09.15	Fourth Previous Fault Type		0	RO

Parameter	Name	Setting Range	Default	Attribute
F09.16	Inverter Temperature	-20.0~120.0℃	0.0℃	RO
F09.17	Digital Input (DI) Terminal Status	0000~1FF BIT0：DI1 Terminal BIT1：DI2 Terminal BIT2：DI3 Terminal BIT3：DI4 Terminal BIT4：DI5 Terminal	0	RO
F09.18	Digital Output (DO) Terminal Status	0000~000F Bit0：DO1 Bit1：DO2	0	RO
F09.19	AI1 Input Voltage	0.00~10.00V	0.00V	RO
F09.20	AI2 Input Voltage	0.00~10.00V	0.00V	RO
F09.21	AI3 Input Voltage	0.00~10.00V	0.00V	RO
F09.22	Peak Current	0.00~100.00A	0.00A	RO
F09.23	DIP Switch Status	0x00~0xFF	0x00	RO
F09.24	Rated Current Setting Value	0.00~100.00A	0.00A	RO
F09.25	AI4 Input Voltage	0.00~10.00V	0.00V	RO
F09.26	HDI Input Frequency	0.00~20.00KHZ	0.00KHZ	RO
F09.27	Simple PLC Cycle Count	0~9999	0	RO
F09.28	Pole Pair Setting Value	1~20	0	RO
F09.29	Hall Count High 16-bit	0~65535	0	RO
F09.30	Hall Count Low 16-bit	0~65535	0	RO

4.3 Host Computer Software

4.3.1 Software Introduction

1、DriverStudio is the host computer software for Zhongda Leader drive products. It supports the online debugging functions for Zhongda Leader C20 model brushless drives equipped with RS485 communication.

DriverStudio, in combination with our company's series of brushless drives, provides the following functions to meet the requirements of most motion control applications:

1、Parameter Configuration and Management
2、Motor Parameter Monitoring
3、Motor Motion Control
4、User-defined Simple PLC and Multi-speed Control
5、Current and Historical Fault Display and Monitoring
6、Advanced User Operation Functions, etc.

4.3.2 Software Acquisition Method

Log in to the official website at www.zd-motor.com, click on "Product Center → Drive", find the host computer software page, and proceed to download.

After downloading and installing the software, click "Help → Software Help" to view the user manual/instruction documentation.



5 Status Display and Troubleshooting

Precautions:

2. Except for faults requiring parameter modification via the keypad, all other maintenance must be performed with the power off.
3. Ensure the indicator lights or keypad are functioning correctly before use.
4. Do not move the device, perform wiring, or carry out maintenance while the indicator lights are on.
5. After initial troubleshooting, a trial run test is recommended.
6. Routine maintenance should be performed by professional personnel who are familiar with the operation of this product.
7. If the fault cannot be resolved, do not disassemble the drive casing without authorization. Please contact sales or technical support.

5.1 Indicator Light Fault Reporting

The table below shows the display modes of the indicator lights under different driver statuses. Refer to this to confirm the current operating status.

Standby	Normal: Green solid, Red off
	Fault: Red and Green flash alternately to show fault code
Running	Normal: Green flashing, Red off
	Current Limiting: Green flashing, Red flashing
	Brake: Green solid, Red flashing rapidly

When a fault is detected, the Red/Green LEDs flash alternately to show the cause. Users can troubleshoot based on the code.

Green flashes once = 5 Red flashes once = 1

Fault Code = (Number of Green Light Flashes * 5) + Number of Red Light Flashes

Code	Fault Name	LED Indicator	Fault Cause	Solution
1	Hardware Overcurrent (Accel)	0 Green 1 Red	1. Accel/Decel too fast 2. Low voltage 3. Insufficient driver power 4. Sudden load change 5. Inter-phase short circuit 6. External EMI interference	1. Increase Accel/Decel time 2. Check input voltage 3. Select higher power driver 4. Inspect load condition 5. Check/replace cable or motor 6. Check for EMI sources
2	Hardware Overcurrent (Decel)	0 Green 2 Red		
3	Hardware Overcurrent (Const)	0 Green 3 Red		
4	Software Overcurrent (Accel)	0 Green 4 Red		
5	Software Overcurrent (Decel)	0 Green 5 Red		
6	Software Overcurrent (Const)	1 Green 1 Red		
7	Overvoltage (Accel)	1 Green 2 Red	1. High input voltage 2. Rapid FWD/REV switching 3. Driven by external force (Regenerative state)	1. Check power voltage 2. Increase FWD/REV switching time 3. Add external braking unit/resistor
8	Overvoltage (Decel)	1 Green 3 Red		
9	Overvoltage (Const)	1 Green 4 Red		
10	Bus Undervoltage Fault	1 Green 5 Red	1. Low input voltage 2. Fast accel, external power protection 3. Power supply voltage drop 4. Driver hardware abnormal	1. Check power input 2. Increase acceleration time 3. Reset fault 4. Contact technical support

Code	Fault Name	LED Indicator	Fault Cause	Solution
11	Motor Overload	2 Green 1 Red	1. Low input voltage 2. Motor power is too high 3. Motor stall or sudden load change	1. Check power input 2. Set motor rated current 3. Reduce load and check motor/mechanical parts
12	Driver Overload	2 Green 2 Red	1. Low input voltage 2. Acceleration time is too short 3. Excessive load	1. Check power input 2. Increase acceleration time 3. Replace with a higher-grade controller
13	Hall Sensor Fault	2 Green 3 Red	1. Hall sensor wire disconnection 2. External electromagnetic interference (EMI)	1. Check Hall sensor wiring 2. Check for sources of interference
14	Stall Fault	2 Green 4 Red	1. Excessive load 2. Motor is jammed	1. Check mechanical connections 2. Check motor wiring
16	Driver Overheat	3 Green 1 Red	1. Excessive load 2. Abnormal driver hardware	1. Cooling treatment 2. Derating usage
19	Current Sensing Fault	3 Green 4 Red	1. Driver hardware damage	1. Replace driver
27	Parameter Storage Fault	5 Green 2 Red	1. Reached max read/write cycle limit	1. Power cycle (Restart)
29	Overcurrent Feedback	5 Green 2 Red	1. Driver hardware damage	1. Replace driver
30	Output Phase Loss	5 Green 5 Red	1. U/V/W output phase missing 2. Driver hardware damage	1. Check U/V/W for secure connection 2. Replace driver

5.2 Common Panel Faults

The table below shows fault codes indicated by the driver when a shutdown occurs due to a detected fault. Users can troubleshoot based on these codes.

Fault No.	Fault Code	Fault Name	Root Cause Troubleshooting	Solution
1	E.OCH1	Hardware Acceleration Overcurrent	1、Acceleration / Deceleration is too fast 2、Voltage is too low 3、Driver power rating is too small 4、Sudden load increase 5、Ground fault or phase-to-phase short circuit 6、External heavy interference source	1、Increase Accel/Decel time 2、Check input power voltage 3、Select a driver with higher power rating 4、Check for load short circuit or locked rotor 5、Check/Replace cables or motor 6、Check for sources of strong interference
2	E.OCH2	Hardware Deceleration Overcurrent		
3	E.OCH3	Hardware Constant Speed Overcurrent		
4	E.OC1	Software Acceleration Overcurrent		
5	E.OC2	Software Deceleration Overcurrent		
6	E.OC3	Software Constant Speed Overcurrent		
7	E.OV1	Acceleration Overvoltage	1、Input voltage is too high 2、Electronic braking force is too strong	1、Check power supply voltage 2、Modify electronic braking parameters
8	E.OV2	Deceleration Overvoltage		
9	E.OV3	Constant Speed Overvoltage		
10	E.UV	Bus Undervoltage Fault	1、Power supply voltage is low 2、Acceleration too fast, external power protection tripped 3、Momentary power failure 4、Driver hardware abnormality	1、Check grid input power 2、Increase acceleration time 3、Momentary power failure 4、Driver hardware abnormality
11	E.OL1	Motor Overload	1、Power supply voltage is too low 2、Motor rated current setting is improper 3、Motor locked rotor or sudden load change	1、Check power supply voltage 2、Set motor rated current 3、Reduce load and check motor/mechanical condition

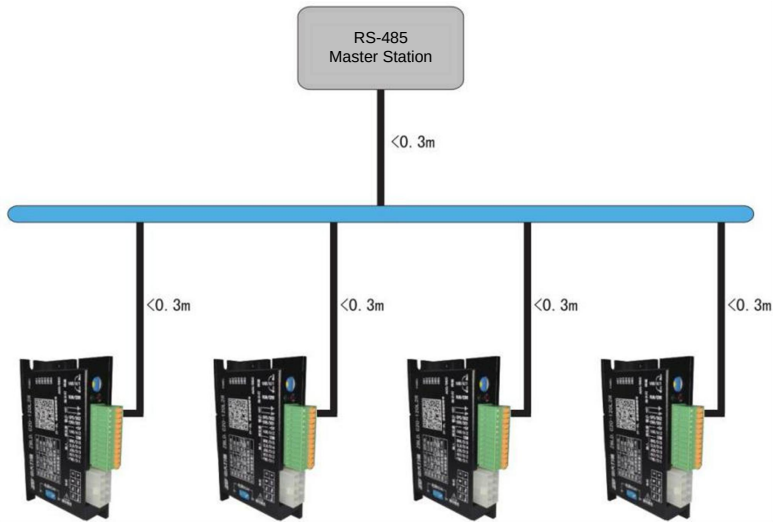
Fault No.	Fault Code	Fault Name	Root Cause Troubleshooting	Solution
				condition
12	E.OL2	Driver Overload	1、Acceleration time is too fast 2、Power supply voltage is too low 3、Excessive load	1、Increase acceleration time 2、Check power supply voltage 3、Change to a larger power rating driver
13	E.HALL	Hall Sensor Fault	1、Hall wire disconnection 2、External heavy interference source	1、Check Hall wiring connection 2、Check for sources of strong interference
14	E.LOC	Locked Rotor Fault	1、Excessive load 2、Motor is mechanically jammed 3、Motor phase-to-phase short circuit	1、Change to a larger power rating driver 2、Check motor mechanical connection 3、Check wiring
15	E.OH1	Module Overheat 1	1、Ambient temperature is too high 2、Thermistor is damaged 3、Inverter module is damaged	1、Reduce ambient temperature 2、Replace the entire unit
16	E.OH2	Module Overheat 2		
17	E.EF	External Input Fault	External fault input terminal	Check terminal input source
18	E.485	485 Communication Fault	1、Incorrect Baud rate or data parity settings 2、Communication line fault 3、Incorrect communication address 4、Communication affected by strong interference	1、Detect Baud rate parameter settings 2、Check communication lines 3、Check communication address settings 4、Replace with shielded wire and improve anti-interference
19	E.CUr	Current Detection Fault	Circuit abnormality	Replace the driver
20	E.OUT1	Inverter U-Phase Fault	1、Acceleration too fast 2、Inverter circuit damaged 3、Malfunction caused by interference	1、Increase acceleration time 2、Replace power components 3、Check for sources of strong interference
21	E.OUT2	Inverter V-Phase Fault		
22	E.OUT3	Inverter W-Phase Fault		
23	E.OL3	Electronic Overload Fault	Overload pre-alarm function is set	Detect load and overload pre-alarm point
24	E.LL	Electronic Underload Fault	Underload pre-alarm function is set	Detect underload value and underload pre-alarm point
25	E.Sht	Short Circuit Fault	1、MOS or Inverter unit short circuit 2、Phase line shorted to ground	1、Replace the driver 2、Check wiring
26	E.boAd	Keypad Communication Fault	1、Poor keypad wire contact or disconnection 2、Keypad wire is too long and affected by interference	1、Check or replace wiring 2、Check environment to eliminate interference
27	E.EEP	Parameter Storage Fault	1、EEPROM damaged 2、Reached the upper limit of power-on write cycles	1、Reset to clear fault 2、Re-power the unit 3、Seek technical support
28	E.Cnd	Conduction Fault	1、Motor not connected during self-check 2、MOS or Inverter unit damaged	1、Check motor wiring 2、Replace the drive
29	E.OCHF	Overcurrent Feedback Fault	Drive hardware damage	Replace the drive
30	E.POUT	Output Phase Loss	1、U/V/W output phase loss 2、Abnormal drive hardware	1、Check wiring from drive to motor 2、Seek technical support
31	E.CAN1	CANBus-off	Too many errors	Check CAN network and reconnect

Fault No.	Fault Code	Fault Name	Root Cause Troubleshooting	Solution
32	E.CAN2	CAN Transmission Error	Too many transmission error frames	Check CAN nodes, wiring, and baud rate
33	E.CAN3	CAN Reception Error	Too many reception error frames	1、Check baud rate 2、Check for interference sources
34	E.Conn	Internal Comm. Fault	Internal hardware damage	Replace the drive
35	E.CAN4	Heartbeat Timeout	CANopen slave-to-consumer configuration time reached	1、Clear the fault 2、Check if CAN node is online 3、Check CANopen configuration
36	E.CAN5	NMT Operation Fault	While motor is running, CANopen slave receives NMT init, stop, etc. commands	1、Clear the fault 2、Stop the motor before changing NMT state

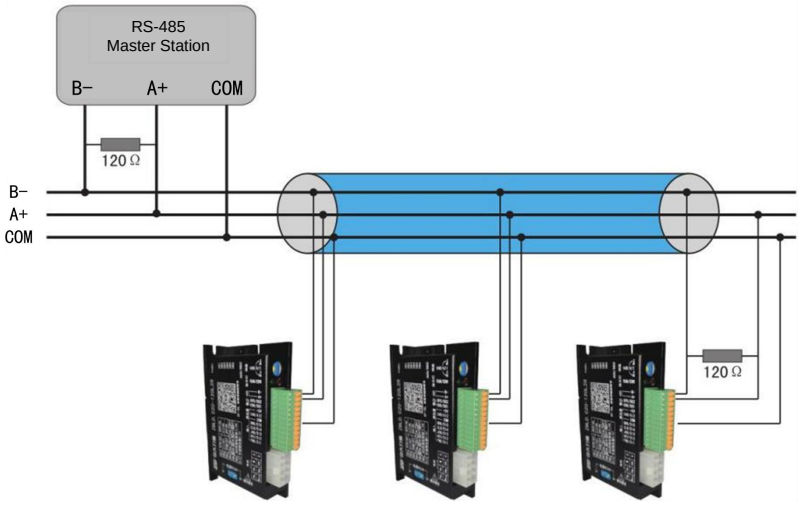
6. RS485 Communication

6.1 485 Communication Network

The connection method for the RS-485 communication network is a Bus Topology, as shown in the figure below.



Each 485 transceiver device is connected to the bus. The length of each branch (stub) should not exceed 10m; otherwise, it may cause signal reflection and result in communication issues. The figure below is a wiring schematic diagram.



1、It is recommended to use Shielded Twisted Pair (STP) cables. Connect two 120Ω termination matching resistors at both ends of the bus to prevent signal reflection. The shield layer should generally be reliably grounded at a single point.

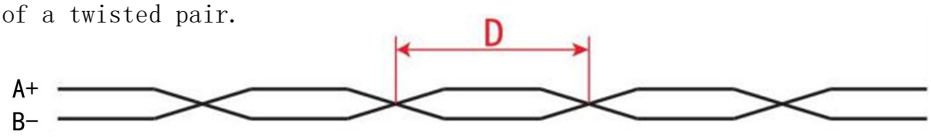
2、Use a multimeter to measure the resistance between A+ and B- to verify if the termination resistors are correctly installed. The normal resistance value should be approximately 60Ω (two resistors in parallel).

3、The maximum number of connected devices is 128.

4、For long-distance RS-485 communication, the common ground (COM) of different 485 circuits must be interconnected.

6.2 485 Communication Cable

Twisted pair cables are recommended for RS-485 communication networks. Twisted pairs provide excellent resistance to high-frequency magnetic field noise interference and reduce the cable's external electromagnetic radiation. The figure below shows a schematic of a twisted pair.



The twist pitch (D) of the twisted pair should be less than 2cm; the smaller the pitch, the better the anti-interference performance.

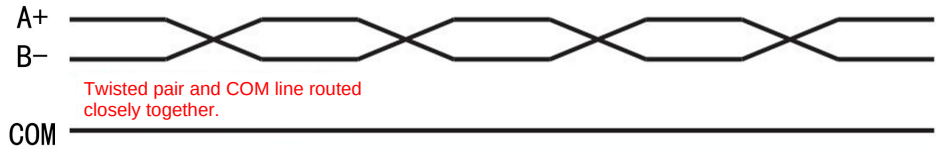
For short-distance, low-speed communication, shielded twisted pair (STP) cables can be used to increase immunity to interference, with the shield grounded to PE at both ends. For long-distance, high-speed communication, shielded cables are not recommended. Large distributed capacitance between the shield and the signal wires can cause transmission signal propagation delay.

Recommended Bus Cable Specifications:

Wiring Distance	Signal Cable
Within 200m	0.3mm^2, Twisted Pair, Jacketed Cable
200-500m	0.5mm^2, Twisted Pair, Jacketed Cable
500-1200m	0.75mm^2, Shielded Twisted Pair, Jacketed Cable
Above 1200m	1.0mm^2, Shielded Twisted Pair, Jacketed Cable, with Repeater at 1200m

6.2.1 485 Recommended Wiring Methods for 485 Communication

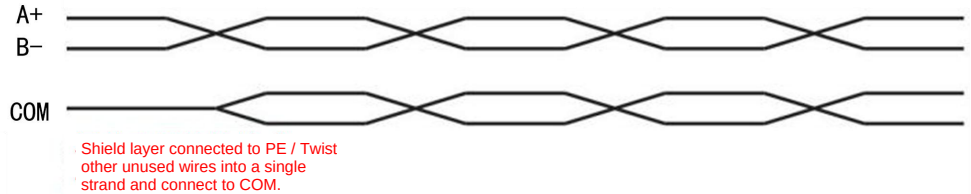
Recommended Scheme 1



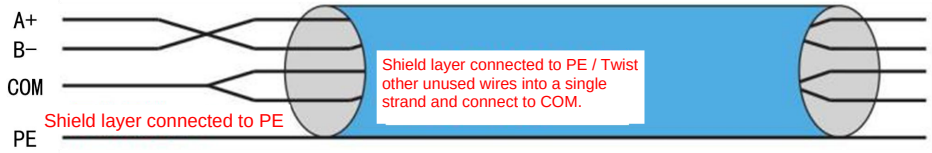
Recommended Scheme 2



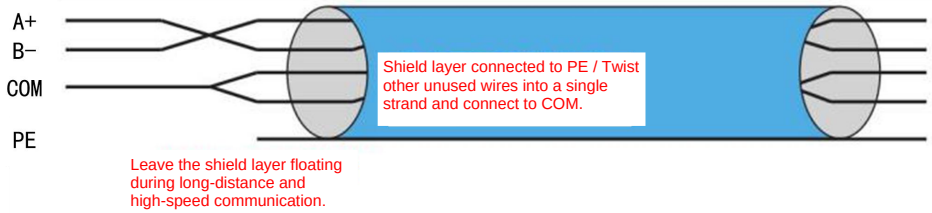
Recommended Scheme 3



Recommended Scheme 4

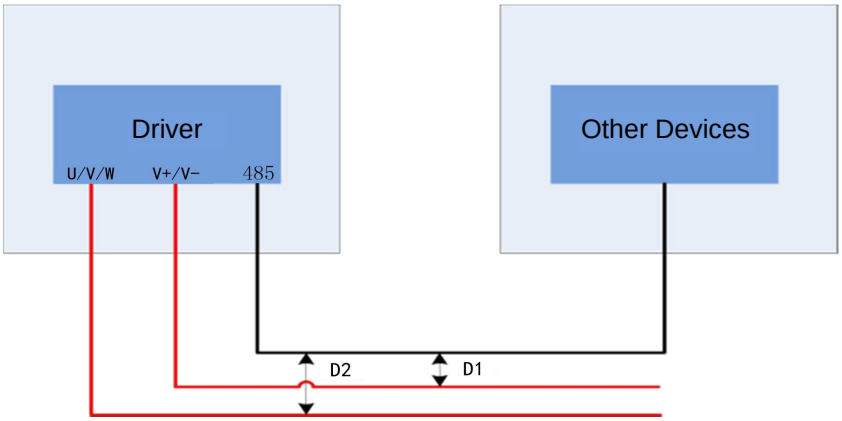


Recommended Scheme 5



6.2.2 Recommended Layout for RS485 Communication Cables

RS485 communication is susceptible to interference. If it is placed near an interference source during on-site layout, problems can easily occur. Recommended wiring methods:



Interference-prone lines and RS485 lines should be routed perpendicularly as much as possible. When routed in parallel, the distance (D1) between power lines and RS485 signal lines must be > 10cm, and the distance (D2) between U/V/W motor output lines and RS485 signal lines must be > 20cm.

After exiting the cabinet, power lines, U/V/W motor cables, and RS485 communication lines should be routed separately. If interference-prone lines and RS485 lines are routed within the same cable tray/trunking, the spacing must adhere to the same principles mentioned above.

6.3 System Settings

In order to enable the SBLD.C20 series drivers to accurately access the RS-485 bus network, the relevant function codes must be configured.

Parameter	Name	Setting Range	Default	Property
F00.00	Control Mode	0: Test Mode 1: Hall Open Loop 2: Hall Closed Loop 3:DIP switch settings (SW1 is effective for certain models)	3	R/W*
F00.01	Run Command Selection	0: Keypad run command channel (LED extinguished) 1: Terminal run command channel (LED flashing)	3	R/W

Parameter	Name	Setting Range	Default	Property
		2: Communication run command channel (LED lights up) 3: DIP switch settings (SW3 effective on some models)		
F00.02	Speed Command Selection	0: Keyboard digital setting 1: Analog AI1 (Potentiometer knob) 2: Analog AI2 (External voltage) 3: MODBUS communication 4: Multi-step speed setting 5: DIP switch settings (SW2, SW3 effective on some models) 6: Simple PLC setting (Group F04) 7: High-speed pulse input (F05.00 selects HDI) 8: CAN communication (Effective on some models)		
F00.05	Communication Run Command Channel Selection	0: MODBUS communication channel 1: CAN communication channel (Valid for some models)	0	R/W*
F08.00	485 Slave Address	1~247, 0 is broadcast address (Default driver address is 1)	1	R/W*
F08.01	485 Communication Baud Rate Setting	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS (Default) 5: 38400BPS 6: 57600BPS Note: Some drives do not support modifying the baud rate.	4	R/W*
F08.02	485 Data Bit Verification Setting	0: No parity (N, 8, 1) for RTU 1: Even parity (E, 8, 1) for RTU 2: Odd parity (O, 8, 1) for RTU 3: No parity (N, 8, 2) for RTU Note: This drive does not support changing parity settings.	0	R/W*
F08.03	485 Communication Response Delay	0~200ms	5	R/W*
F08.04	485 Communication Timeout Fault Time	0.0 (Disabled), 0.1~60.0s (Triggers E.485 alarm and stops if no comms within set time)	0.0s	R/W*
F08.05	Reserved		0	R/W*
F08.06	485 Communication Processing Action Selection	0x0~0x1 LED Units digit: 0: Response to Write command 1: No response to Write command	0x00	R/W*

6.4 Data Frame Format

MODBUS--RTU Mode				
Address Code	Function Code	Data	Check Code	
ADDR	CMD	DATA	CRC16_L	CRC16_H
1Byte	1Byte	nBytes	1Byte	1Byte
Baud Rate: 19200 (Default), Start Bit: 1 bit, Data Bit: 8 bit, Parity: None, Stop Bit: 1 bit				
Under MODBUS RTU mode, if the interval between two characters exceeds 1.5 times the character time, the data is invalid. If the interval exceeds 3.5 times the character time, the frame is considered complete, and a new frame can begin.				

Note:

a. Slave Address: 1 Byte

0x00(0)----Broadcast address; Slaves do not respond during broadcasting. Used for group control of multiple units.

0x01(1)-0x7F(127)----Slave addresses;

0x80(128)-0xff(255)----System reserved, do not use;

b. Function Code: 1 Byte

0x03(3)---------- Read Holding Registers;

0x06(6)---------- Write Single Register;

0x10(16)----------Write Multiple Registers;

c. Data: n Byte

Different instructions have different data formats!

d. Checksum: 2 Byte

CRC16 calculation targets: Address + Function Code + Data;

CRC16 Algorithm: MODBUS(x16+x15+x2+1);

CRC checksum: Send Low Byte first, then High Byte.

6.4.1 0x03 Read Register Operation

1、0x03(Read register) Data frame format

Master Request			
Frame Data	Data Length	Data Content	Note
Address	1Byte	0x01-0xf7	
Function Code	1Byte	0x03	
Register Address	2Byte	0x2000-0x30ff	High Byte + Low Byte
Quantity of Registers	2Byte	0x0001	High Byte + Low Byte
Checksum (CRC)	2Byte	CRC16L+CRC16H	Low Byte + High Byte
Response after Slave receives correctly			
Frame Data	Data Length	Data Content	Note
Address	1Byte	0x01-0xf7	
Function Code	1Byte	0x03	
Byte Count	1Byte	0x02	Total bytes in data area
Data	2Byte	Read data content	High Byte + Low Byte
Checksum	2Byte	CRC16L+CRC16H	Low Byte + High Byte
Response after Slave receives with Exception			
Frame Data	Data Length	Data Content	Note
Address	1Byte	0x01-0xf7	
Function Code	1Byte	0x83	Msb=1
Exception Code	1Byte	0x00-0xff	See 6.4.4 Exception Code for details
Checksum	2Byte	CRC16L+CRC16H	Low Byte + High Byte

Note:

All register addresses are 2 bytes; the high byte is transmitted first, followed by the low byte.

All register data are 2 bytes; the high byte is transmitted first, followed by the low byte.

This operation is only applicable to registers of type W/R, W/R*, or R.

2、0x03 (Read Holding Registers) Examples

A) Read register data 0x0001 from Slave ID 0x01

Master	Address	Function Code	Register Address		Quantity of Registers		Checksum	
			High Byte	Low Byte	High Byte	Low Byte	Low Byte	High Byte
	0x01	0x03	0x20	0x01	0x00	0X01	CRCL	CRCH
Slave	Address	Function Code	Byte Count		Data		Checksum	
					High Byte	Low Byte		
	0x01	0x03	0x02		0x00	0X01	CRCL	CRCH

B) Exception when reading register data 0x0001 from Slave ID 0x01

Master	Address	Function Code	Register Address		Quantity of Registers		Checksum	
			High Byte	Low Byte	High Byte	Low Byte	Low Byte	High Byte
	0x01	0x03	0x20	0x01	0x00	0X01	CRCL	CRCH
Slave	Address	Function Code	Exception Code				Checksum	
	0x01	0x83	See 6.4.4 Exception Code for details				CRCL	CRCH

6.4.2 0x06 Write Single Register Operation

1. 0x06 (Write Single Register) Data Frame Format

Master Request			
Frame Data	Data Length	Data Content	Note
Address	1Byte	0x01-0xf7	
Function Code	1Byte	0x06	
Register Address	2Byte	0x2000-0x30ff	High + Low Byte
Data	2Byte	Write Data Value	High + Low Byte
Checksum	2Byte	CRC16L+CRC16H	Low + High Byte
Response after Slave receives correctly			
Frame Data	Data Length	Data Content	Note
Address	1Byte	0x01-0xf7	
Function Code	1Byte	0x06	
Register Address	2Byte	0x2000-0x30ff	High + Low Byte
Data Content	2Byte	Written Data Value	High + Low Byte
Checksum	2Byte	CRC16L+CRC16H	Low + High Byte
Response after Slave receives with Exception			
Frame Data	Data Length	Data Content	Note
Address	1Byte	0x01-0xf7	
Function Code	1Byte	0x86	Msb=1
Exception Code	1Byte	0x00-0xff	See 6.4.4 Exception Code for details
Checksum	2Byte	CRC16L+CRC16H	Low + High Byte

Notes:

All register addresses are 2 bytes, high byte first, low byte last.

All register data are 2 bytes, high byte first, low byte last.

This operation only applies to W/R or W/R* type registers.

2、0x06 (Write Single Register) Examples

A) Write data to register 0x2001 of Slave ID 0x01

	Address	Function Code	Register Address		data		Checksum	
			High Byte	Low Byte	High Byte	Low Byte	Low Byte	High Byte
Master	0x01	0x06	0x20	0x01	0x00	0X01	CRCL	CRCH
	Address	Function Code	Register Address		data		Checksum	
			High Byte	Low Byte	High Byte	Low Byte		
Slave	0x01	0x06	0x20	0x01	0x00	0X01	CRCL	CRCH

B) Exception when writing data to register 0x2001 of Slave ID 0x01

	Address	Function Code	Register Address		data		Checksum	
			High Byte	Low Byte	High Byte	Low Byte	Low Byte	High Byte
Master	0x01	0x06	0x20	0x01	0x00	0X01	CRCL	CRCH
	Address	Function Code	Exception Code				Checksum	
Slave	0x01	0x86	See 6.4.4 Exception Code for details				CRCL	CRCH

6.4.3 0x10 Write Multiple Registers Operation

1. 0x10 (Write Multiple Registers) Data Frame Format

Master Request			
Frame Data	Data Length	Data Content	Description
Address	1Byte	0x00-0xf7	
Function Code	1Byte	0x10	
Starting Address	2Byte	0x2000-0x30ff	High + Low Byte
Quantity of Registers	2Byte	N	High + Low Byte
Total number of data bytes	1Byte	2*N	
Data	2*NByte		High + Low Byte
Checksum	2Byte	CRC16L+CRC16H	Low + High Byte
Response after Slave receives correctly			
Frame Data	Data Length	Data Content	Description
Address	1Byte	0x01-0xf7	
Function Code	1Byte	0x10	
Starting Address	2Byte	0x2000-0x30ff	High + Low Byte
Quantity of Registers	2Byte	N	High + Low Byte
Checksum	2Byte	CRC16L+CRC16H	Low + High Byte
Response after Slave receives with Exception			
Frame Data	Data Length	Data Content	Description
Frame Data	1Byte	0x01-0xf7	
Address	1Byte	0x90	Msb=1
Function Code	1Byte	0x00-0xff	See 6.4.4 Exception Code for details
Exception Code	2Byte	CRC16L+CRC16H	Low + High Byte

Notes:

All register addresses are 2 bytes, high byte first, low byte last.

All register data are 2 bytes, high byte first, low byte last.

This operation only applies to W/R or W/R* type registers.

2、Example of 0x10 (Write Multiple Registers)

Write data to registers 0x2000 and 0x2001 of Slave ID 0x01

<table>
<tr><td rowspan="5">Master</td><td rowspan="2">Address</td><td rowspan="2">Function Code</td><td colspan="2">Starting Register Address</td><td colspan="2">Quantity of Registers</td><td colspan="2" rowspan="2">Total number of data bytes</td></tr>
<tr><td>High Byte</td><td>Low Byte</td><td>High Byte</td><td>Low Byte</td></tr>
<tr><td>0x01</td><td>0x10</td><td>0x20</td><td>0x00</td><td>0x00</td><td>0x02</td><td colspan="2">0x04</td></tr>
<tr><td colspan="2">Register 1 Data</td><td colspan="2">Register 2 Data</td><td colspan="2" rowspan="2">Checksum</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>High Byte</td><td>Low Byte</td><td>High Byte</td><td>Low Byte</td></tr>
<tr><td colspan="2">Data 1</td><td colspan="2">Data 2</td><td>CRCL</td><td>CRCH</td><td colspan="2"></td></tr>
<tr><td rowspan="3">Normal Response</td><td rowspan="2">Address</td><td rowspan="2">Function Code</td><td colspan="2">Starting Register Address</td><td colspan="2">Quantity of Registers</td><td colspan="2" rowspan="2">Checksum</td></tr>
<tr><td>High Byte</td><td>Low Byte</td><td>High Byte</td><td>Low Byte</td></tr>
<tr><td>0x01</td><td>0x10</td><td>0x20</td><td>0x00</td><td>0x00</td><td>0x02</td><td>CRCL</td><td>CRCH</td></tr>
<tr><td rowspan="2">Exception Response</td><td>Address</td><td>Function Code</td><td colspan="4">Exception Code</td><td colspan="2">Checksum</td></tr>
<tr><td>0x01</td><td>0x90</td><td colspan="4">See section 6.4.4 for Exception Codes</td><td>CRCL</td><td>CRCH</td></tr>
</table>

6.4.4 Exception Codes

MODBUS Exception Codes		
Exception Code	Meaning	Description
0x01	Illegal Function	Slave device does not support this command or is in an incorrect state to process this request.
0x02	Illegal Data Address	The data address requested by the master/host is out of range.
0x03	Illegal Data Value	The received data contains values that are not permitted.
0x04	Slave Device Failure	Invalid setting during a parameter write operation, such as write-enable (0x200E) not being activated.
0x05	Password Error	The password written to the verification address is incorrect.
0x06	Frame Error	Incorrect data frame length or incorrect CRC check in RTU format.
0x07	Parameter Read-Only	The parameter being modified by the master/host is a read-only parameter.
0x08	Parameter Not Modifiable During Run	The parameter being modified by the master/host cannot be changed while the system is running.

6.5 Register List

Function Description	Address Definition	Data Meaning Description	R/W Characteristics
Communication Control Command	2000H	0001H: Forward Run	W/R
		0002H: Reverse Run	
		0003H: Forward Jog	
		0004H: Reverse Jog	
		0005H: Stop	
		0006H: Coast to Stop (Emergency Stop)	
		0007H: Fault Reset	
		0008H: Jog Stop	
		0009H: Braking Stop	
Communication Setting Address	2001H	Communication Set Speed (0~3000 RPM)	W/R
	2002H	Motor Pole Pairs (1~20)	W/R*
	2003H	Acceleration Time (1~6000 (Unit: 0.1s))	W/R
	2004H	Deceleration Time (1~6000 (Unit: 0.1s))	W/R
	2005H	Control Mode Selection (0~3) 0: Test Mode 1: Open Loop 2: Closed Loop 3: DIP Switch Setting (SW1 Valid), Model Dependent	W/R*
	2006H	Run Command Selection (0~4) 0: Keypad Run Command Channel 1: Terminal Run Command Channel 2: Communication Run Command Channel 3: DIP Switch Setting (SW3 Valid), Model Dependent	W/R
	2007H	Speed Reference Selection (0~5) 0: Keypad Digital Setting 1: Analog Input AI1 Setting(Potentiometer) 2: Analog Input AI2 Setting(External Voltage) 3: MODBUS Communication Setting 4: Multi-step Speed Setting 5: DIP Switch Setting (SW2, SW3 Valid), Model Dependent 6: Simple PLC Reference	W/R
	2008H	Slave Communication Address 1~127, 0 is Broadcast	W/R*
	2009H	Communication Baud Rate Setting (0~6) 0: 1200 BPS 1: 2400 BPS 2: 4800 BPS 3: 9600 BPS	W/R*

Function Description	Address	Data Meanin Description	R/W Characteristics
		4：19200BPS(Default) 5：38400BPS 6：57600BPS Note: Only available on some models.	
	200AH	Virtual Input Terminal Command, Range: 0x00~0x0F	W/R
	200BH	Virtual Output Terminal Command, Range: 0x00~0x0F	W/R
	200EH	Communication Write Enable for Function Codes (Groups F00~F10): 0: Write Disabled (Default) 1: Write Enabled	
	200FH	Restore Function Code to Default: 0： 1：Restore Default Parameters	W/R*
	2010H	Communication Position Reference (Reserved)	W/R
	2011H	Hall Counter Operation(Software Version Dependent): 0：No Action 1：Clear Hall Counter (Reset to 0)	W/R
	2012H	Stop Mode Selection (Software Version Dependent): 0：Deceleration Stop (Ramp to Stop) 1：Coast to Stop (Free Run Stop)	W/R
Drive Status Word 1	2100H	0001H：Forward Running	R
		0002H：Reverse Running	
		0003H：Drive Standby / Stopped	
		0004H：Drive Fault / Trip	
		0005H：Drive OFF State	
		0006H：Electronic Braking State	
Drive Status Word 2	2101H	Bit0：=0： Bus voltage not ready =1： Bus voltage ready Bit4：=0： No Overload =1： Overload Bit5~Bit6： =00：Keypad Control =01：Terminal Control =10：Communication Control Bit7：=0： Keypad Disconnected =1： Keypad Connected	R
Drive Fault Code	2102H	See Fault Type Description	R
Drive Identification Code	2103H	C20 Series 0x0020	R
Target Frequency	3000H	0~Fmax（Unit：0.01Hz）	R
Output Frequency	3001H	0~Fmax（Unit：0.01Hz）	R

Function Description	Address	Data Description	R/W
Ramp Reference Frequency	3002H	0~Fmax（Unit：0.01Hz）	R
Output Voltage	3003H	0.0~2000.0V（Unit：0.1V）	R
Output Current	3004H	0.0~300.00A（Unit：0.01A）	R
Set Speed	3005H	0~3000（Unit：1RPM）	R
Motor Output Speed	3006H	0~3000（Unit：1RPM）	R
Motor Output Power	3007H	0~2200W	R
DC Bus Voltage	3008H	0.0~2000.0V（Unit：0.1V）	R
Hall Value	3009H	0~7	R
Software Version	300AH	1.00~99.00	R
Last Fault Type	300BH	Refer to Fault Type Description	R
Inverter Temperature	300CH	-20.0℃~120℃(Supported by some hardware models)	R
Input Terminal Status	300DH	000~1FF	R
Output Terminal Status	300EH	00~0F	R
Analog Input 1 Voltage	300FH	0.00~10.00V（Unit：0.01V）	R
Analog Input 2 Voltage	3010H	0.00~10.00V（Unit：0.01V）	R
Analog Input 3 Voltage	3011H	0.00~10.00V（Unit：0.01V）	R
Reserved	3012H	0~65535	R
Hall Count High 16-bit	3013H	0~65535 (Software version dependent)	R
Hall Count Low 16-bit	3014H	0~65535 (Software version dependent)	R

Register Parameter Attribute Description:

Attribute	Description
W/R	Parameters can be Read and Written at any time regardless of the drive state.
W/R*	Parameters can be Read at any time, but can only be Written when the drive is in Stop mode.
R	Parameters are Read-only and cannot be modified.

6.6 Examples of Common Commands

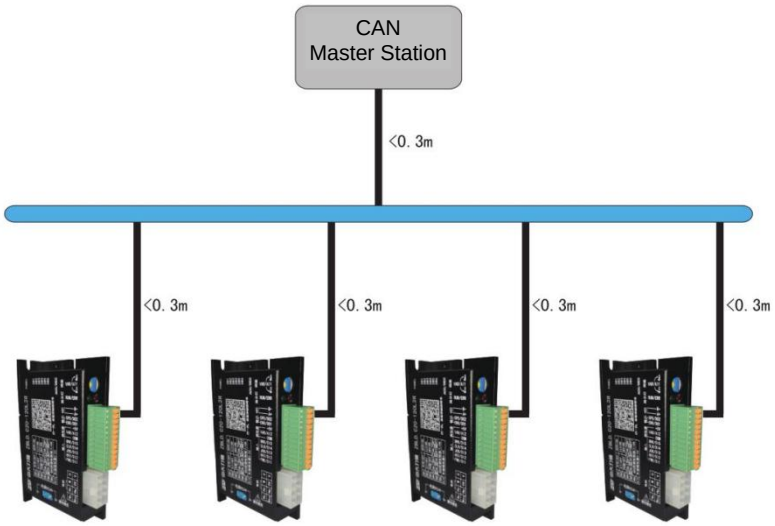
Communication Settings: Slave Address: 0x01, Baud Rate: 19200, Data Format: N-8-1

Operation	Data Frame	Description
Forward Run	Send data: 01 06 20 00 00 01 43 CA Response data: 01 06 20 00 00 01 43 CA	Write 0x01 to address 2000H
Reverse Run	Send data: 01 06 20 00 00 02 03 CB Response data: 01 06 20 00 00 02 03 CB	Write 0x02 to address 2000H
Stop	Send data: 01 06 20 00 00 05 42 09 Response data: 01 06 20 00 00 05 42 09	Write 0x05 to address 2000H
Fault Reset	Send data: 01 06 20 00 00 07 C3 C8 Response data: 01 06 20 00 00 07 C3 C8	Write 0x07 to address 2000H
Set Speed	Send data: 01 06 20 01 0B B8 D4 88 Response data: 01 06 20 01 0B B8 D4 88	Write 0x0BB8 to address 2001H; Set speed to 3000 RPM
Enable Parameter Writing	Send data: 01 06 20 0E 00 00 E3 C9 Response data: 01 06 20 0E 00 00 E3 C9	Write 0x01 to address 200FH
Read Function Code	Send data: 01 03 00 0A 00 01 A4 08 Response data: 01 03 02 13 88 B5 12	Value of Function Code F00.10 is 50.00Hz (1388H)
Write Function Code	Send data: 01 06 00 0A 09 C4 AE 0B Response data: 01 06 00 0A 09 C4 AE 0B	Write the value of F00.10 as 25.00Hz (09C4H)
Read Status Word 1	Send data: 01 03 21 00 00 01 8E 36 Response data: 01 03 02 00 05 78 47	Read Address 2100H
Read Status Word 2	Send data: 01 03 21 01 00 01 DF F6 Response data: 01 03 02 00 41 78 74	Read Address 2101H
Read Fault Code	Send data: 01 03 21 02 00 01 2F F6 Response data: 01 03 02 00 0A 38 43	Read Address 2102H Fault Code: 0x0A Undervoltage Fault
Read Failed	Send data: 01 03 00 32 00 01 25 C5 Response data: 01 83 02 C0 F1	Failed to read Function Code F00.50 Address Error: 0x02
Write Failed	Send data: 01 06 00 00 00 05 49 C9 Response data: 01 86 03 02 61	Write value 5 to Function Code F00.00 Data Error: 0x03

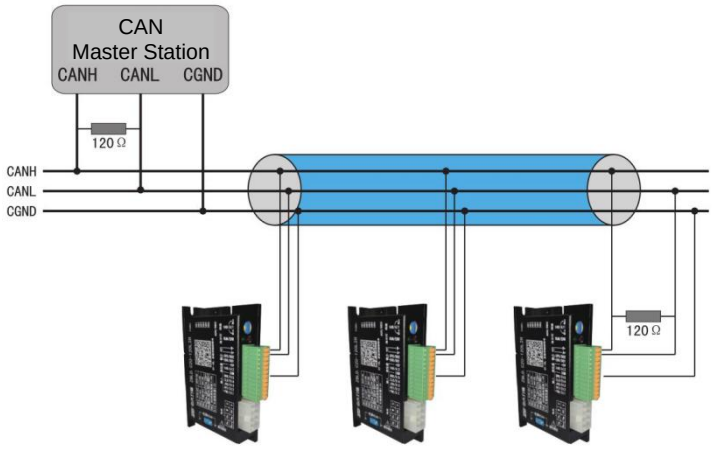
7. CAN Modbus Communication

7.1 CAN Communication Network

The connection method of the CAN communication network is a bus topology, as shown in the figure below.



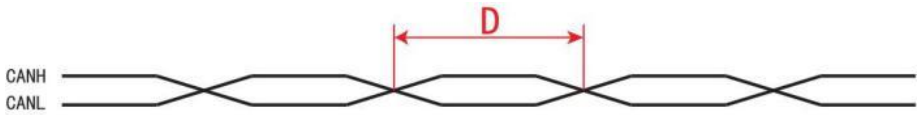
Each CAN transceiver device is connected to the bus, and the length of each branch (stub) must not exceed 0.3m. Otherwise, signal reflection will occur, causing communication issues. The figure below is a schematic wiring diagram.*



5. It is recommended to use shielded twisted-pair cables for connection. Two 120Ω termination resistors should be connected at both ends of the bus to prevent signal reflection. The shielding layer should generally be reliably grounded at a single point.
6. Use a multimeter to measure the resistance between CANH and CANL to verify if the field termination resistors are correct. The normal resistance value should be approximately 60Ω (two resistors in parallel).
7. The maximum number of connected devices is 64.
8. For long-distance communication between CAN devices, the common ground (CGND) of different CAN circuits must be interconnected to ensure equal reference potential between different communication devices.

7.2 CAN Communication Cable

It is recommended to use twisted-pair cables for CAN communication networks. Twisted-pair cables have excellent resistance to high-frequency magnetic field noise interference and can also reduce external radiation from the cable. The twist pitch (D) of the twisted pair should be less than 2cm; the smaller the twist pitch, the better the anti-interference effect. The figure below is a schematic of a twisted-pair cable.



2. For short-distance, low-speed communication, shielded twisted pair (STP) cables can be used to enhance EMI immunity; the shield layer should be grounded to PE at both ends.。
3. For long-distance, high-speed communication, shielded cables are not recommended. This is due to the high distributed capacitance between the shield and the signal lines, which causes propagation delay in the transmitted signals.
4. The CAN communication function of the ZBLD.C20 series drivers supports several different baud rates; the communication distance depends on the baud rate and the type of communication cable used.

Description of Supported Baud Rates:

Baud Rate (bps)	1M	500K	250K	125K	100K	50K	20K
Length (m)	25	100	250	500	500	1000	1000

CAN Communication Transmission Distance, Rate, and Node Relationships:

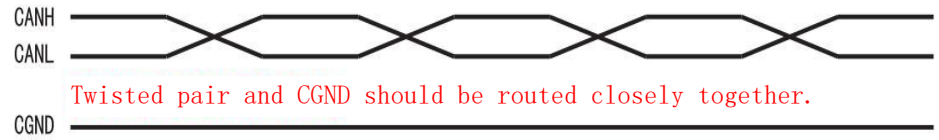
No.	Transmission Distance	Data Rate	Number of Nodes	Wire Gauge
1	25m	1Mbps	64	0.20mm2
2	100m	500kbps	64	0.35 mm2
3	550m	100kbps	64	0.50 mm2
4	1100m	50kbps	64	0.75 mm2

communication, cables with different wire gauges do not significantly affect the transmission distance; however, it is recommended to use the largest possible wire gauge. The transmission distances for 2 nodes at various wire gauges and data rates are shown in the table below:
Relationship between Wire Gauge and Communication Distance:

Wire Gauge	500kbps	1Mbps
3×0.3mm2	95m	30m
3×0.5mm2	95m	30m
3×0.75mm2	100m	30m

7.2.1 Recommended Wiring Methods for CAN Communication

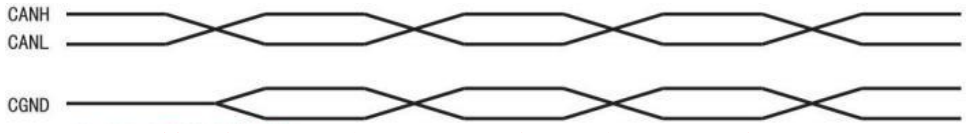
Recommended Option 1



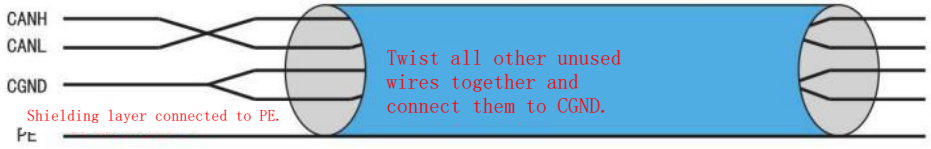
Recommended Option 2



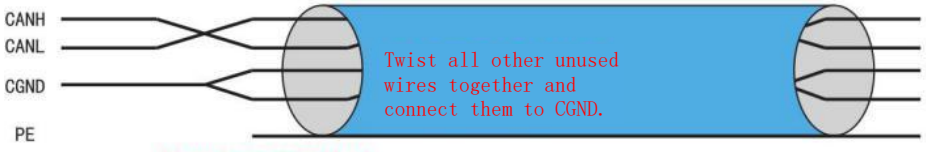
Recommended Option 3



Recommended Option 4



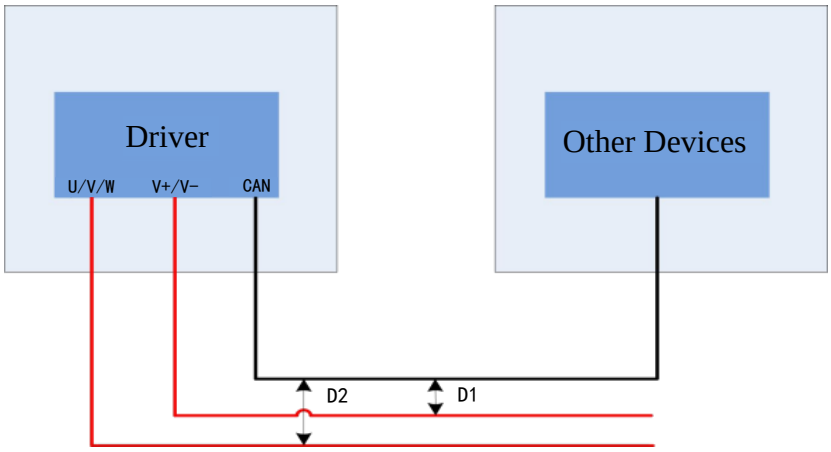
Recommended Option 5



For long-distance high-speed communication, keep the shielding layer floating (disconnected).

7.2.2 Recommended CAN Communication Cable Layout

CAN communication is susceptible to interference. If the site layout is close to interference sources, issues can easily arise. The recommended wiring methods are as follows:



Lines carrying interference and CAN lines should be routed perpendicularly whenever possible. When routed in parallel, the distance (D1) between power lines and CAN signal lines must be >10cm, and the distance (D2) between U/V/W (motor power) lines and CAN signal lines must be >20cm;

After exiting the cabinet, the power lines, U/V/W motor power lines, and CAN communication lines must be routed separately. If interference lines and CAN communication lines are routed within the same cable tray (trunking), the routing separation distances must follow the same principles mentioned above.

7.3 System Settings

General Parameter Description:

Item	Description
Link Layer Protocol	CAN Bus
Application Layer Protocol	Custom CAN Modbus Protocol
CAN-ID Type	11bit-CAN2.0A
Baud Rate	1M、500K、250K、125K(Default)、100K、50K、20K
Maximum Number of Nodes	63 nodes
CAN Frame Length	0~8 bytes
Application Layer CAN Frame Type	Data Frame; Remote Frames are not supported
Terminal Matching Resistor	120 Ohm

In order to enable the SBLD.C20 series drivers to accurately access the CAN bus network, the relevant function codes must be configured.

Function Code	Name	Setting Range	Setting Value
F00.00	Control Mode Selection	0: Test Mode 1: Hall Open-loop 2: Hall Closed -loop 3: DIP Switch Setting; SW1 valid on some models	2
F00.01	Operation Command Selection	0: Keypad command channel; LED off 1: Terminal command channel; LED blinking 2: Communication command channel; LED on 3: DIP Switch Setting; SW3 valid on some models	2
F00.02	Speed Reference Selection	0: Keypad digital setting 1: Analog AI1 setting; Knob potentiometer 2: Analog AI2 setting; Exter nal voltage 3: MODBUS communication setting 4: Multi-step speed setting 5: DIP Switch setting; SW2~3 settings 6: Simple PLC setting; Group F04 7: High-speed pulse input setting 8: CAN communication setting	8
F00.05	Communication Channel Selection	0: RS485 MODBUS Comm. 1: CAN Communication	1
F08.10	CAN Slave Address	1~127	1
F08.11	CAN Baud Rate	0: 10K (valid on some models) 1: 20K 2: 50K 3: 100K 4: 125K (Default) 5: 250K 6: 500K 7: 1M	4

Function Code	Name	Setting Range	Setting Value
F08.12	CAN Communication Response Delay	0~200ms	5
F08.13	CAN Communication Protocol	0：CAN Modbus Protocol; Default 1：CANOpen Protocol	0
F08.14	CAN Function Settings	CANOpen Function Settings BIT0~BIT7: BIT0:Action selection for Non-Operational state during runtime 0=Stop and report fault E.CAN5 1=Maintain previous state BIT1:Hear tbeat timeout action selection 0=Stop and report fault E.CAN4 1=Maintain previous state BIT2:Enable CAN Transmit/Receive fault detection 0=Disable E.CAN2 and E.CAN3 faults 1=Enable E.CAN2 and E.CAN3 faults CANModbus Function Settings BIT8~BIT15: BIT8:CANModbus broadcast response selection 0=No response to broadcast 1=Response to broadcast	0
F00.15	Parameter Restoration Settings	0：No operation 1：Restore function codes 2：Restore CANOpen communication parameters 3：Restore all parameters	0

7.4 CAN Modbus Data Frame Format

Modbus Data Frame Format

CAN Identifier ID (11-bit)		Frame Data (8 Bytes)	
Master Address	Slave Address	Function Code	Content
M_ADDR	S_ADDR	CMD	DATA
3Bit	8Bit	1 Byte	7Bytes
Baud Rate: 125K (Default), only Standard Frames are supported.			

CAN Identifier Format

CAN Identifier ID (11-bit)	Parameter Description
Master Address (BIT8~BIT10)	0~7: Master Address
Slave Address (BIT0~BIT7)	0: Broadcast Communication 1~127: Slave Address Point-to-Point Communication

Note: During point-to-point communication, the Master and Slave addresses must not be the same.

Function Code Commands

Function Code (CMD)	Parameter Description
03h	Read Command, supports reading 1~2 parameters
06h	Write Command, supports writing only 1 parameter at a time
08h	Diagnostic Function, for testing purposes

7.4.1 Read Register Operation

Read Register Data Frame Format

Master Request			
Frame Data	Data Length	Data Content	Description
Function Code	1 Byte	0x03	
Register Address	2 Byte	See register address	High byte + Low byte
Byte Count	2 Byte	1~2	High byte + Low byte
Slave Normal Response			
Frame Data	Data Length	Data Content	Description
Function Code	1 Byte	0x03	
Register Address	2 Byte	~	Same as Master's register address
Byte Count	1 Byte	0x02	Total number of bytes in data area
Data 1	2 Byte	Read data 1 content	High byte + Low byte
Data 2	2 Byte	Read data 2 content	Data present when reading 2 registers
Slave Exception Response			
Frame Data	Data Length	Data Content	Description
Function Code	1 Byte	0x83	Exception response MSB is 1
Register Address	2 Byte	~	Same as Master's read register address
Exception Code	1 Byte	0x00-0x08	See section 7.4.3 Exception Codes for details

All register address data are 2 bytes, with High Byte first and Low Byte last.

Read Register Data 2001h~2002h

Master	Identifier ID	Function Code	Register Address		Number of Registers			
					High Byte	Low Byte		
	0x701	0x03	0x20	0x01	0x00	0x02		
Slave	Identifier ID	Function Code	Register Address		Data 1		Data 2	
					High Byte	Low Byte	High Byte	Low Byte
	0x701	0x03	0x20	0x01	0x03	0xE8	0x00	0x05

Read Register Data Exception

Master	Identifier ID	Function Code	Register Address		Number of Registers		
			High Byte	Low Byte	High Byte	Low Byte	
	0x701	0x03	0x20	0x30	0x00	0x01	
Slave	Identifier ID	Function Code	Register Address		Exception Code		
			High Byte	Low Byte			
	0x701	0x83	0x20	0x30	See 7.4.3 Exception Codes for details		

7.4.2 Write Register Operation

Write Register Data Frame Format

Master Request			
Frame Data	Data Length	Data Content	Description
Function Code	1 Byte	0x06	
Register Address	2 Byte	See Register Address List	High Byte + Low Byte
Byte Count	2 Byte	Data Content to be Written	High Byte + Low Byte
Slave Normal Response			
Frame Data	Data Length	Data Content	Description
Function Code	1 Byte	0x06	
Register Address	2 Byte	See Register Address List	High Byte + Low Byte
Byte Count	2 Byte	Data Content to be Written	High Byte + Low Byte
Slave Exception Response			
Frame Data	Data Length	Data Content	Description
Function Code	1 Byte	0x86	Most Significant Bit of Exception Response is 1
Register Address	2 Byte	~	Same as Host Write Register Address
Exception Code	1 Byte	0x00-0x08	See 7.4.3 Exception Codes for details

Writing 2001h Register Data

Master	Identifier ID	Function Code	Register Address		Data	
			High Byte	Low Byte	High Byte	Low Byte
	0x701	0x06	0x20	0x01	0x03	0xE8
Slave	Identifier ID	Function Code	Register Address		Data	
			High Byte	Low Byte	High Byte	Low Byte
	0x701	0x06	0x20	0x01	0x03	0xE8

Write Register Exception

Master	Identifier ID	Function Code	Register Address		Data	
			High Byte	Low Byte	High Byte	Low Byte
	0x701	0x06	0x20	0x01	0x10	0x00
Slave	Identifier ID	Function Code	Register Address		Exception Code	
			High Byte	Low Byte		
	0x701	0x86	0x20	0x01	Refer to 7.4.3 Exception Codes	

7.4.3 Communication Exception Codes

Exception Code	Meaning	Description
0x01	Illegal Function	The slave device does not support this command or is unable to process this request.
0x02	Illegal Data Address	The data address requested by the master (host) is out of range.
0x03	Illegal Data Value	The received data contains values that are not permitted.
0x04	Operation Failed	The parameter setting is invalid during a write operation; for example, write enable (0x200E) was not activated when writing a function code.
0x05	Password Error	The password entered into the password verification address is incorrect.
0x06	Data Frame Error	The length of the data frame is incorrect, or the format is invalid.
0x07	Parameter is Read-Only	The parameter the master (host) attempted to modify during a write operation is a read-only parameter.
0x08	Parameter Unwritable During Operation	The parameter the master (host) attempted to modify during a write operation cannot be changed while the system is running.

7.5 CAN Modbus Register List

Function Description	Address Definition	Data Meaning Description	Attribute
Communication Control Commands	2000H	0001H: Forward Run	W/R
		0002H: Reverse Run	
		0003H: Forward Jog	
		0004H: Reverse Jog	
		0005H: Stop	
		0006H: Emergency Stop	
		0007H: Fault Reset	
		0008H: Jog Stop	
Communication Setpoint Addresses	2001H	Communication Speed Setpoint (0~3000, Unit: 1RPM)	W/R
	2002H	Motor Pole Pair Number (1~20	W/R*
	2003H	Acceleration Time (1~6000, Unit: 0.1s)	W/R
	2004H	Deceleration Time (1~6000, Unit: 0.1s)	W/R
	2005H	Control Mode Selection (0~3): 0: Test Mode 1: Open Loop 2: Closed Loop 3: DIP Switch Settings (SW1 active), Model Dependent	WR*
	2006H	Run Command Source Selection (0-4) 0: Keypad command channel 1: Terminal control command channel 2: Communication command channel 3: DIP switch settings (SW3 active), model dependent	W/R
	2007H	Frequency/Speed Reference Selection (0-5): 0: Keypad digital setting 1: Analog Input AI1 (Potentiometer) 2: Analog Input AI2 (External Voltage) 3: RS485 communication setting 4: Multi-step speed setting 5: DIP switch settings (SW2-3 active), model dependent 6: Simple PLC reference 7: High-speed pulse input setting 8: Communication setting (Selected models)	W/R
	2008H	CAN Communication Slave Ad d r ess 1-247	W/R*

Function Description	Address Definition	Data Meaning Description	Attribute
	2009H	CAN Communication Baud Rate Setting (0-7): 0: 10K 1: 20K 2: 50K 3: 100K 4: 125K (Default) 5: 250K 6: 500K 7: 1M	W/R*
	200AH	Communication Command Channel Selection: 0: RS485 Communication Channel (Default) 1: CAN Communication Channel	W/R*
	200EH	Communication Function Code Write Enable: (Groups F00-10): 0: Function codes NOT writable via CAN (Default) 1: Function codes writable via CAN	W/R
	200FH	Restore Function Code Defaults: 0: No operation 1: Restore function codes 2: Restore CANOPEN communication parameters 3: Restore all parameters	W/R*
Drive Status Word 1	2100H	0001H: Forward Running	R
		0002H: Reverse Running	
		0003H: Drive Standby / Stopped	
		0004H: Drive Fault	
		0005H: Drive OFF State	
		0006H: Electronic Braking	
Drive Status Word 2	2101H	Bit0: =0: Bus Voltage Not Established =1: Bus Voltage Established Bit4: =0: Overload =1: Normal Load Bit5~Bit6: =00: Keypad Control =01: Terminal Control =10: Communication Control	R
Drive Fault Code	2102H	Same as Keypad Fault Codes (Refer to Section 5.2)	R
Drive Identification Code	2103H	C20 Series ——0x0020	R
Set Frequency	3000H	0~Fmax (Unit: 0.01Hz)	R
Output Frequency	3001H	0~Fmax (Unit: 0.01Hz)	R
Ramp Reference Frequency	3002H	0~Fmax (Unit: 0.01Hz)	R

Function Description	Address Definition	Data Meaning Description	Attribute
Output Voltage	3003H	0.0~2000.0V（Unit：0.1V）	R
Output Current	3004H	0.0~300.00A（Unit：0.01A）	R
Set Speed	3005H	0~3000（Unit：1RPM）	R
Motor Output Speed	3006H	0~3000（Unit：1RPM）	R
Motor Output Power	3007H	0~2200W	R
DC Bus Voltage	3008H	0.0~2000.0V（Unit：0.1V）	R
Hall Sensor Value	3009H	0~7	R
Software Version Number	300AH	1.00~99.00	R
Current Fault Type	300BH	Same as keypad fault codes (See Section 5.2)	R
Inverter Temperature	300CH	-20.0℃~120℃ (Supported by partial hardware)	R
Input Terminal Status	300DH	000~1FF	R
Output Terminal Status	300EH	00~0F	R
Analog Input 1 Voltage	300FH	0.00~10.00V（Unit：0.01V）	R
Analog Input 2 Voltage	3010H	0.00~10.00V（Unit：0.01V）	R
Analog Input 3 Voltage	3011H	0.00~10.00V（Unit：0.01V）	R

Register Attribute Description

Attribute	Description
W/R	Indicates that the parameter set value can be read or written regardless of the driver's state.;
W/R*	Indicates that the parameter set value can be written only when the driver is in a stop state, and can be read in any state.
R	Indicates that the parameter is read-only and cannot be written.

7.6 Application Examples of CAN Modbus

7.6.1 Point-to-Point Communication

Master Address: 0x07, Slave Address: 0x01, Default Baud Rate: 125Kbps.

Point-to-Point Communication Examples

Operation	Data Frame	Description
Diagnostics Function	Send : ID=0x701, Data = 08 00 01 02 03 04 05 Response : ID=0x701, Data = 08 00 01 02 03 04 05	Diagnostic Test CMD=08h
Write Forward Run Command	Send : ID=0x701, Data = 06 20 00 00 01 Response : ID=0x701, Data = 06 20 00 00 01	Write 0x01 to Address 2000H
Write Reverse Run Command	Send : ID=0x701, Data = 06 20 00 00 02 Response : ID=0x701, Data = 06 20 00 00 02	Write 0x02 to Address 2000H
Write Stop Command	Send : ID=0x701, Data = 06 20 00 00 05 Response : ID=0x701, Data = 06 20 00 00 05	Write 0x05 to Address 2000H
Write Fault Reset Command	Send : ID=0x701, Data = 06 20 00 00 07 Response : ID=0x701, Data = 06 20 00 00 07	Write 0x07 to Address 2000H
Write Target Speed Reference	Send : ID=0x701, Data = 06 20 01 0B B8 Response : ID=0x701, Data = 06 20 01 0B B8	Write 0x0BB8 to Address 2001H, Set Speed 3000RPM
Write Function Code Enable	Send : ID=0x701, Data = 06 20 0E 00 01 Response : ID=0x701, Data = 06 20 0E 00 01	Write 0x01 to Address 200FH
Read Function Code	Send : ID=0x701, Data = 03 00 0A 00 01 Response : ID=0x701, Data = 03 00 0A 02 13 88	Read Function Code F00.10 value: 50.00Hz (1388H)
Write Function Code	Send : ID=0x701, Data = 06 00 0A 09 C4 Response : ID=0x701, Data = 06 00 0A 09 C4	Write Function Code F00.10 value: 25.00Hz (09C4H)
Read Status Word 1	Send : ID=0x701, Data = 03 21 00 00 01 Response : ID=0x701, Data = 03 21 00 02 00 05	Read Address 2100H
Read Status Word 2	Send : ID=0x701, Data = 03 21 01 00 01 Response : ID=0x701, Data = 03 21 01 02 00 41	Read Address 2101H
Read Fault Code	Send : ID=0x701, Data = 03 21 02 00 01 Response : ID=0x701, Data = 03 21 02 02 00 0A	Read Address 2102H, Fault Code: 0x0A
Diagnostics Function	Send : ID=0x701, Data = 08 00 01 02 03 04 05 Response : ID=0x701, Data = 08 00 01 02 03 04 05	Diagnostic Test CMD=08h
Read Command Failed	Send : ID=0x701, Data = 03 00 32 00 01 Response : ID=0x701, Data = 83 00 32 02	Read Function Code F00.50 Failed, Address Error: 0x02
Write Command Failed	Send : ID=0x701, Data = 06 00 00 00 05 Response : ID=0x701, Data = 86 00 00 03	Write Function Code F00.00 with value 5 Failed, Data Error: 0x03

7.6.2 Broadcast Communication

Master Address 0x07, Slave Address 0x01, Default Baud Rate 125Kbps;
Set function code F08.14 to configure whether the broadcast command has a response: BIT8=0 for Broadcast No Response, BIT8=1 for Broadcast With Response.

Examples of Broadcast Communication with Response

Operation	Data Frame	Description
Read Status Word 1 (2100h)	Send : ID=0x700, Data = 03 21 00 00 01 Response: ID=0x701, Data = 03 21 00 02 00 05	With Response
Write Function Code Enable (200Eh)	Send : ID=0x700, Data = 06 20 0E 00 01 Response: ID=0x701, Data = 06 20 0E 00 01	With Response
Write Function Code (F00.10h)	Send : ID=0x700, Data = 06 00 0A 09 C4 Response: ID=0x701, Data = 06 00 0A 09 C4	With Response

Examples of Broadcast Communication without Response

Operation	Data Frame	Description
Read Status Word 1 (2100h)	Send: ID=0x700, Data = 03 21 00 00 01	No Response
Write Function Code Enable (200Eh)	Send: ID=0x700, Data = 06 20 0E 00 01	No Response
Write Function Code (F00.10h)	Send: ID=0x700, Data = 06 00 0A 09 C4	No Response

7.7 CAN Fault Handling

For faults related to the C20 series drive itself, please refer to Chapter 5 for clearing methods. This section only describes the troubleshooting and clearing methods for communication-related faults.

Communication Fault Recovery

Fault Display	Fault Name	Fault Cause	Fault Handling
E.CAN1	CAN Bus-off Fault	Excessive errors	Check the CAN network and reconnect.
E.CAN2	CAN Transmit Error	Excessive transmit error frames	Check CAN nodes, wiring, and baud rate.
E.CAN3	CAN Receive Error	Excessive receive error frames	Check the baud rate and check for interference sources.
E.CAN4	Heartbeat Timeout	Slave station reached the consumer configuration time	Check if the CAN node is online, or check CANopen configuration, then clear the fault.
E.CAN5	NMT Operational Fault	Received NMT commands such as "Reset" or "Stop" while the motor is running	Clear the fault. Before changing the NMT state, ensure the motor has stopped running.

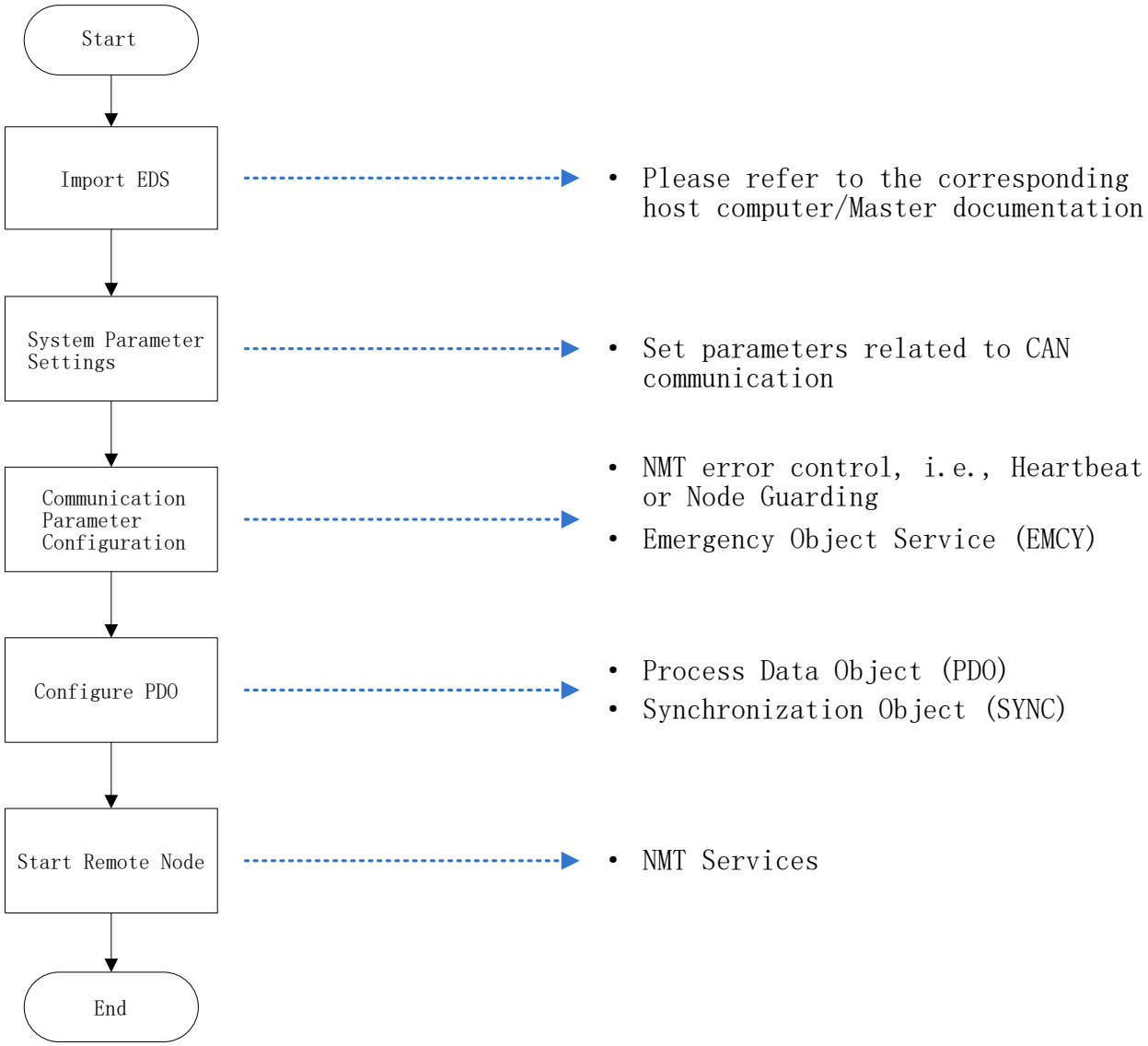
8. CANopen Communication

8.1 CANopen Communication Network

For CAN communication network cable layout, please refer to sections 7.1-7.2.

8.2 CANopen Communication Network Configuration

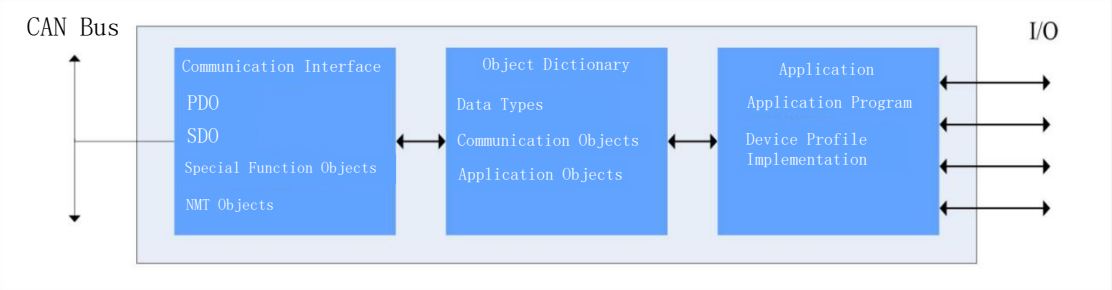
The setup workflow for CANopen usage is as follows:



Note 1: For the usage of SDO, please refer to section 8.4.2 for details.

8.2.1 CANopen Protocol Overview

CANopen is an application layer protocol for network transmission systems based on the CAN serial bus, adhering to the ISO/OSI reference model. Different devices in the network exchange data with each other through an Object Dictionary (OD) or objects. Among them, the master node can acquire or modify data in the Object Dictionary list of other nodes via Process Data Objects (PDO) or Service Data Objects (SDO).The CANopen device model is shown in the figure below.

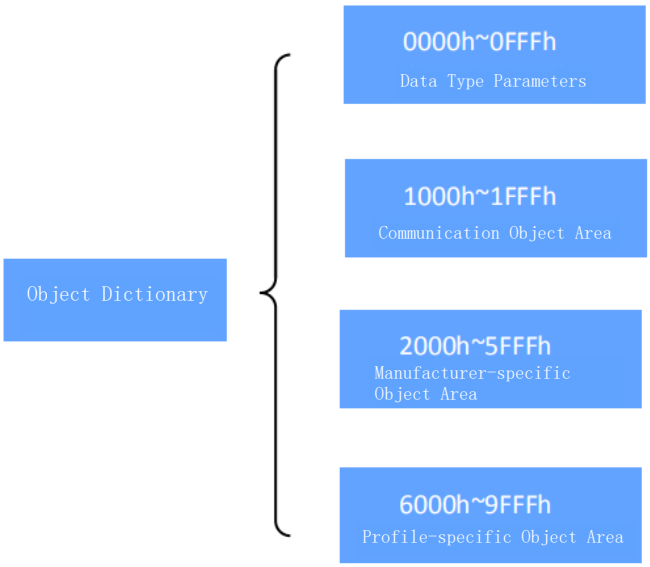


8.2.2 Object Dictionary

The Object Dictionary is the most critical part of the device specification. It is an ordered collection of parameters and variables, containing all parameters for device description and device network status. It consists of a group of objects that can be accessed across the network in an ordered and predefined manner.

The CANopen protocol utilizes an Object Dictionary with a 16-bit Index and an 8-bit Sub-index. The structure of the Object Dictionary is shown in the table below.

Index	Description
000	Unused
0001h—001Fh	Static Data Types (Standard data types, e.g., Boolean, Integer16)
0020h—003Fh	Complex Data Types (Predefined structures composed of simple types, such as PDO, SDO)
0040h—005Fh	Manufacturer-specific Complex Data Types
0060h—007Fh	Static Data Types defined by Device Profile
0080h—009Fh	Complex Data Types d efined by Device Pr ofile
00A0h—0FFFh	Reserved
1000h—1FFFh	Communication Profile Area (e.g., Device Type, Error Register, Number of supported PDOs)
2000h—5FFFh	Manufacturer-specific Profile Area (e.g., Function Code Mapping)
6000h—9FFFh	Standardized Device Profile Area (e.g., CiA 402 / DSP-402 Profile)
A000h—FFFFh	Reserved



The mapping relationship between the Drive Function Codes and the Object Dictionary is as follows:

Object Dictionary Index = 0x5000 + Function Code Group Number

Object Dictionary Sub-index = Hexadecimal offset within the Function Code Group + 1

Example: Function Code F01.10 corresponds to Object Dictionary entry 0x5001-0B

The descriptions of each object in the Object Dictionary are organized by category.

Example:

The Object Dictionary contains a Motor Control object at 2000h, which describes control commands, parameter settings, etc. The object definition is as follows:

如下：

对象字典按分类描述举例

Index	Sub-index	Name	Meaning
2000h	00h	2000h Number of sub-indices	Number of objects, excluding itself
2000h	01h	Communication Control Command	Commands such as Forward/Reverse, Fault Reset, etc.
2000h	02h	Communication Target Speed	0~3000rpm
2000h	03h	Motor Pole Pairs	1~20 Pole pairs

8.2.3 Common Communication Objects

1、Network Management Object (NMT)

Network Management objects include Boot-up messages, Heartbeat protocols, and NMT messages. Based on a Master-Slave communication model, NMT is used to manage and monitor each node in the network. It primarily fulfills three functions: Node State Control, Error Control, and Node Boot-up.

2、Service Data Object (SDO)

- Includes Receive SDO (R-SDO) and Transmit SDO (T-SDO).
- By using Index and Sub-index, SDO allows the client to access entries in the device's Object Dictionary.
- SDO is implemented via CMS objects in multiple domains within the CAL. It allows the transmission of data of any length; when data exceeds 4 bytes, it is fragmented into several messages.
- The protocol is a confirmed service type, generating a response for every message. SDO request and response messages consist of 8 bytes.

3、Process Data Object (PDO)

- Includes Receive PDO (RPDO) and Transmit PDO (TPDO).
- Used for real-time data transmission, where data is transferred from a producer to one or more consumers. Data transmission is limited to 1 to 8 bytes.
- Each CANopen device contains 8 default PDO channels: 4 Transmit PDO (TPDO) channels and 4 Receive PDO (RPDO) channels.
- PDOs support both synchronous and asynchronous transmission modes, which are determined by the communication parameters corresponding to that PDO.
- The content of a PDO message is predefined, determined by the mapping parameters corresponding to that PDO.

4、Synchronization Object (SYNC)

The SYNC object is a message periodically broadcasted to the CAN bus by the CANopen Master to provide a basic network clock signal. Each device can decide, based on its own configuration, whether to use this event to perform synchronous communication with other network devices.

5、Emergency Object (EMCY)

A message sent when an internal communication failure or an application error occurs within the device.

7.2.4 Communication Object Identifier

The Communication Object Identifier (COB-ID) determines the priority of an object during communication and serves as the identification for the communication object.The COB-ID corresponds directly to the 11-bit identifier of CAN 2.0A. The 11-bit COB-ID consists of two parts: a 4-bit Function Code and a 7-bit Node ID (Node Address). The following table describes the composition of the COB-ID:

10	9	8	7	6	5	4	3	2	1	0
Function Code				Node Address						

Each communication object in CANopen has a default COB-ID, which can be read via SDO (Service Data Object), and some can be modified via SDO. The object list is shown in the table below:

Communication Object	Function Code	Node ID	COB-ID	Object Dictionary Index
NMT (Network Management)	0000b	0	0h	-
SYNC (Synchronization Object)	0001b	0	80h	1005h, 1006h
EMCY (Emergency Object)	0001b	1~127	80h + Node ID	1014h
TPDO1	0011b	1~127	180h + Node ID	1800h
RPDO1	0100b	1~127	200h + Node ID	1400h
TPDO2	0101b	1~127	280h + Node ID	1801h
RPDO2	0110b	1~127	300h + Node ID	1401h
TPDO3	0111b	1~127	380h + Node ID	1802h
RPDO3	1000b	1~127	400h + Node ID	1402h
TPDO4	1001b	1~127	480h + Node ID	1803h
RPDO4	1010b	1~127	500h + Node ID	1403h
T_SDO	1011b	1~127	580h + Node ID	1200h
R_SDO	1100b	1~127	600h + Node ID	1200h
Error Control	1110b	1~127	700h + Node ID	1016h, 1017h

Example: The COB-ID for TPDO2 of Slave Node No. 4 is 280h + 4 = 284h.

8.3 System Settings

To enable the SBLD.C20 series drives to accurately connect to the CANopen fieldbus network, relevant function codes must be configured.

System Setting Function Code Table

Function Code	Name	Setting Range	Set Value
F00.00	Control Mode Selection	0: Test Mode 1: Hall Open-loop 2: Hall Closed-loop 3: DIP Switch Setting - SW1 valid for some models	2
F00.01	Run Command Selection	0: Keypad control channel (LED Off) 1: Terminal control channel (LED Flashing) 2: Communication control channel (LED On) 3: DIP switch setting (SW3 valid for some models)	2
F00.02	Speed Reference Selection	0: Keypad digital setting 1: Analog AI1 (Potentiometer) 2: Analog AI2 (External voltage) 3: MODBUS communication setting 4: Multi-step speed setting 5: DIP switch (SW2~3 settings) 6: Simple PLC setting (Group F04) 7: High-speed pulse input setting 8: Communication setting	8
F00.05	Communication Channel Selection	0: RS485 MODBUS communication 1: CAN communication	1
F08.10	CAN Slave Address	1~127	1
F08.11	CAN Baud Rate	0: 10K (Valid for some models) 1: 20K 2: 50K 3: 100K 4: 125K (Default) 5: 250K 6: 500K 7: 1M	4
F08.12	CAN Response Delay	0~200ms	5
F08.13	CAN Protocol	0: CAN Modbus protocol (Default) 1: CANOpen protocol	1

Function Code	Name	Setting Range	Set Value
F08.14	CAN Function Settings	CANOpen Function Settings BIT0~BIT7: BIT0: Action selection for non-Operational state during runtime 0= Stop and report fault E.CAN5 1= Maintain previous state BIT1: Heartbeat timeout action selection 0= Stop and report fault E.CAN4 1= Maintain previous state BIT2: Enable CAN transmission/reception fault 0= Disablue E.CAN2 、E.CAN3 faults 1= Enable E.CAN2 、E.CAN3 faults CANModbus Function Settings BIT8~BIT15: BIT8:CANModbus broadcast response selection 0= No response to broadcast 1= Respond to broadcast	0
F00.15	Parameter Restoration Settings	0: No operation 1: Restore function codes 2: Restore CANOPEN communication parameters 3: Restore all parameters	0

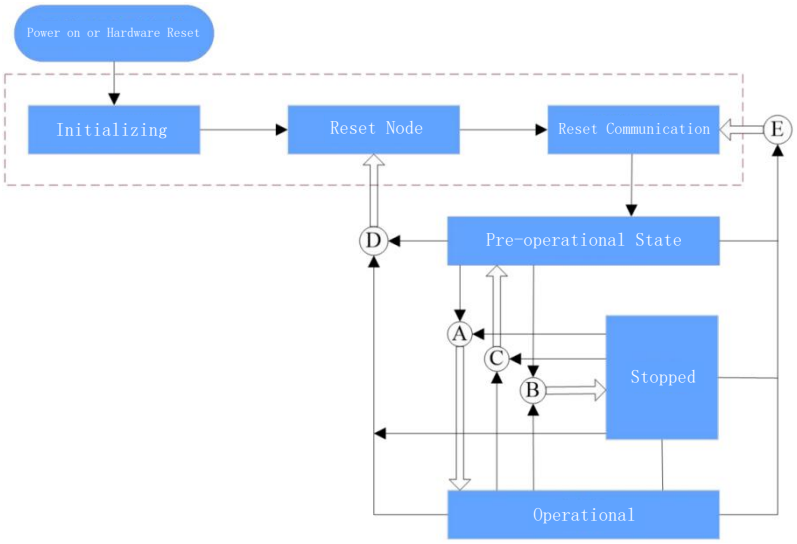
8.4 Communication Objects

8.4.1 Network Management (NMT)

The Network Management (NMT) system is responsible for initializing, starting, and stopping the network and the devices within the network. It operates as a Master/Slave system. There is one and only one NMT Master in a CANopen network, which can configure the CANopen network, including itself.

8.4.1.1 NMT Services

Among these, some state transitions are implemented automatically internally, while others must be triggered by the NMT Master sending NMT messages. Details are shown in the figure below.



The transitions marked with letters in the diagram above are implemented by NMT messages. Only the NMT Master can send NMT control messages. The message format is shown in the table below.

NMT Message Format

COB-ID	RTR	Data / Bytes	
		0	1
0x000	0	Command Specifier	Node_ID

The COB-ID of an NMT message is fixed at "0x000".

The Data Field consists of two bytes: The first byte is the Command Specifier (CS), which indicates the control function of the frame, as described in the table below. The second byte is the CANopen Node-ID. When it is 0, it acts as a broadcast message, affecting all slave devices in the network.

NMT Message Commands

Command Specifier	Transition Code	Description
0x01	A	Start Remote Node command
0x02	B	Stop Remote Node command
0x80	C	Enter Pre-operational State command
0x81	D	Reset Node command
0x82	E	Reset Communication command

After the device is powered on, it will automatically enter the Initialization state, which includes Initializing, Reset Node, and Reset Communication. Initializing loads the parameters for each module, while Reset Node restores the Manufacturer-specific Profile Area and the Standardized Device Profile Area of the Object Dictionary to their last saved values. Reset Communication restores the Communication Profile Area parameters in the Object Dictionary to their last saved values.

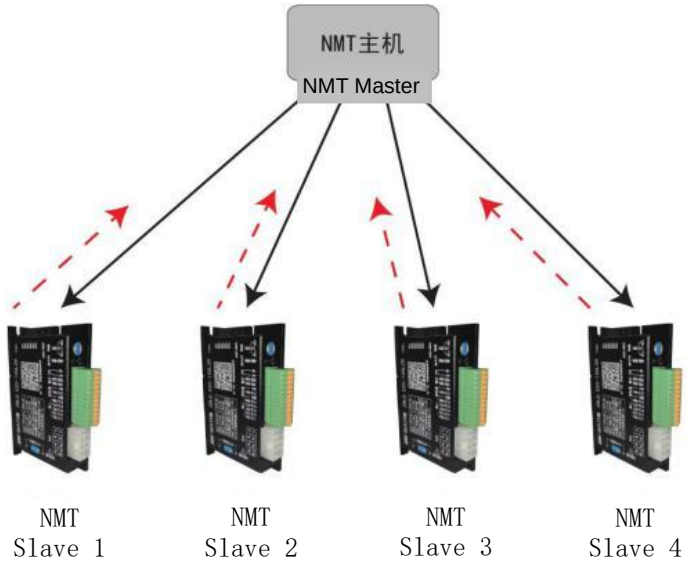
Then the device sends a Boot-up message and automatically enters the Pre-operational state; this state serves as the primary state for node configuration. After completing the configuration, the node requires the NMT Master to send an NMT message to enter the Operational state. The Operational state is the standard operating mode for CANopen, where all modules should function normally. When the NMT Master sends a "Stop Node" message, the device enters the Stopped state, and only the NMT module remains functional for CANopen communication.

The following table shows the CANopen services supported under various NMT states:

Service	Pre-operational	Operational	Stopped
Process Data Object (PDO)	No	Yes	No
Service Data Object (SDO)	Yes	Yes	No
Sync Object (SYNC)	Yes	Yes	No
Emergency Object (EMCY)	Yes	Yes	No
Network Management (NMT)	Yes	Yes	Yes
Error Control	Yes	Yes	Yes

8.4.1.2 NMT Heartbeat Function

The NMT Heartbeat is primarily used to detect whether devices in the network are online and to monitor their current state. The Heartbeat mode adopts a Producer-Consumer model. CANopen devices transmit Heartbeat messages based on the cycle period configured in the "Producer Heartbeat Time" object (Index 1017h), with the unit in milliseconds (ms). Nodes in the network that possess the Heartbeat Consumer function monitor the Producer according to the "Consumer Heartbeat Time" set in object (Index 1016h). If a Heartbeat message from the corresponding Producer node is not received within the defined Consumer Heartbeat Time, the node is considered to have a fault. Once the Producer Heartbeat Time (1017h) is configured, the node's Heartbeat function is activated and starts generating Heartbeat messages. After configuring the valid sub-index for the Consumer Heartbeat Time (1016h), monitoring begins immediately upon receiving the first Heartbeat frame from the corresponding node.



Heartbeat Explanation Schematic Diagram

The Master sends Heartbeat messages according to its Producer Time. If a Slave monitoring the Master does not receive a Heartbeat message within the time period specified by the sub-index of object 1016h, the Master is considered to be disconnected (Dropped Station). The time value of a sub-index in 1016h must be ≥ Master Producer Time ×2, otherwise, it is prone to false reports where the Slave incorrectly assumes the Master has dropped offline.

The Slave sends Heartbeat messages at intervals defined by object 1017h. If the Master (or another Slave) monitoring this Slave does not receive a Heartbeat message within the Consumer Time, that Slave is considered to be disconnected. 1017h×2 ≤ Consumer Time of the Master (or other Slave) monitoring that Slave; otherwise, it is prone to false reports of a Slave disconnection. The Heartbeat message format is shown in the table. The data segment contains only one byte; the most significant bit (MSB) is fixed at "0", and the other bits are consistent with the Node Guarding response message states in the table below.

Heartbeat Message

COB-ID	RTR	Data
0x700+Node-ID	0	Status Word

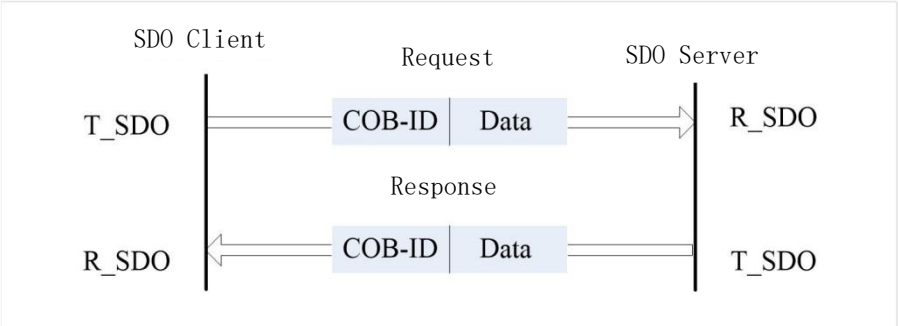
The drive acts as both a Heartbeat Producer and a Heartbeat Consumer. It can simultaneously serve as a Heartbeat Consumer for up to 5 different nodes. It is recommended that the Heartbeat Producer time should not be less than 20ms, while the Heartbeat Consumer time shouldnot be less than 40ms and should be at least 2 times the corresponding Producer's heartbeat time.

8.4.2 Service Data Object (SDO)

The Service Data Object (SDO) establishes a connection with the Object Dictionary through object indices and sub-indices. Via SDO, the contents of objects in the Object Dictionary can be read, or the object data can be modified where permitted.

8.4.2.1 SDO Transmission Framework

The SDO transmission method follows a Client-Server model, which is a request-response (one-to-one) interaction. SDO The process is initiated by the SDO Client within the CAN bus network, and the SDO Server provides the response. Therefore, data exchange between SDOs requires at least two CAN messages to be implemented, and the CAN identifiers (CAN-IDs) of these two messages are different. The SDO transmission model is shown in the figure below.



SDO Client Read / Write Object Words in the SDO Server

8.4.2.2 SDO Transmission Messages

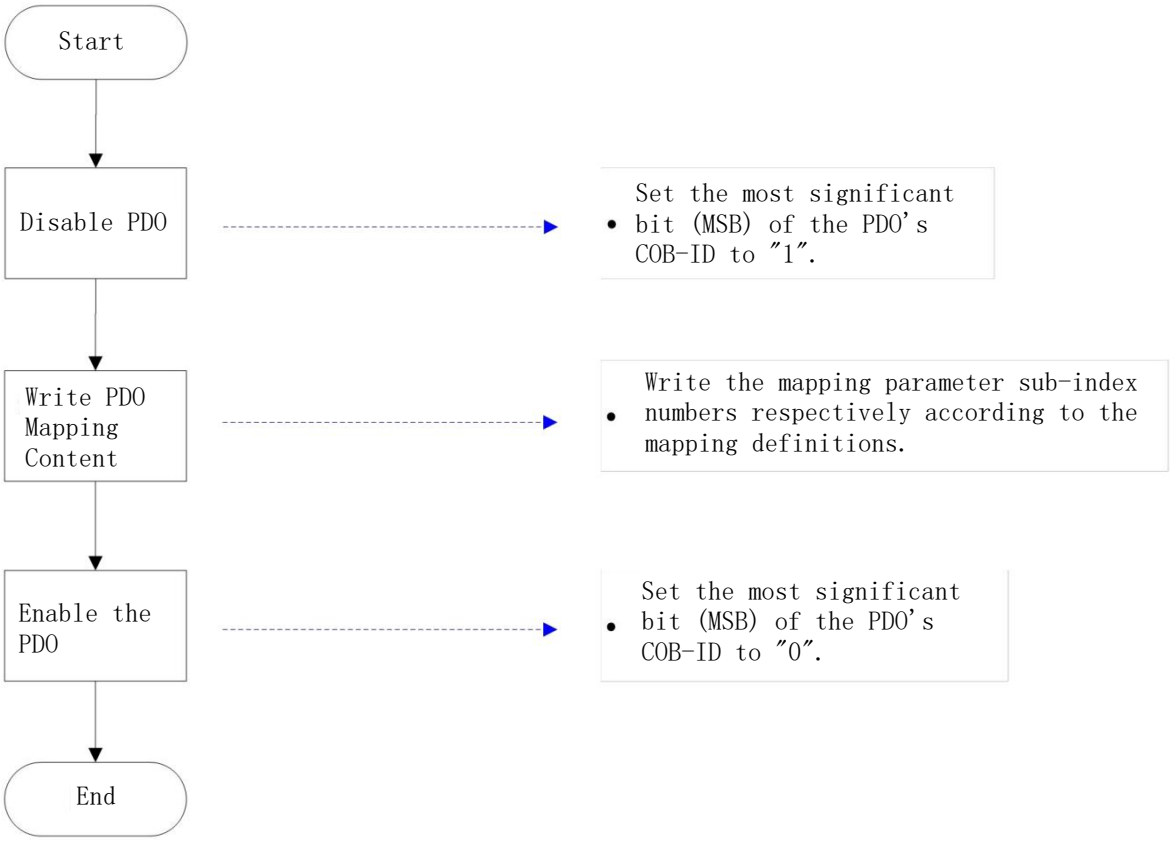
SDO transmission is classified into two types: object data transmission of up to 4 bytes and object data transmission exceeding 4 bytes. For data up to 4 bytes, the Expedited SDO transfer method is used. For data exceeding 4 bytes, Segmented or Block transfer methods are employed. The C20 drive only supports Expedited SDO transfer and Segmented transfer. An SDO transmission message consists of a COB-ID and a Data Segment. As shown in the table below, the COB-IDs for T_SDO (Transmit SDO) and R_SDO (Receive SDO) messages are distinct. As shown in the table below, the COB-IDs for T_SDO (Transmit SDO) and R_SDO (Receive SDO) messages are distinct. All SDO message data segments must consist of 8 bytes. The SDO transmission message format is shown in the table below:

COB-ID	Data							
580h+Node_ID/	0	1	2	3	4	5	6	7
600h+Node_ID	Command	Index	Sub-index		Data			

8.4.3 Process Data Object (PDO)

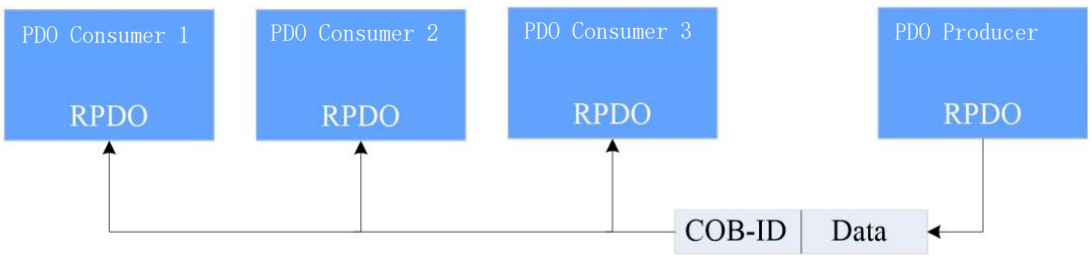
Process Data Objects (PDOs) are used to transmit real-time data and are the primary method of data transmission in CANopen. Since PDO transmission does not require an acknowledgment (unconfirmed service) and the PDO length can be less than 8 bytes, the transmission speed is high.

The PDO mapping configuration follows the process below:



8.4.3.1 PDO Transmission Framework

PDO transmission follows the Producer-Consumer model. This means that a TPDO (Transmit PDO) generated by a Producer on the CAN bus network can be received by one or more RPDOs (Receive PDOs) on the network based on the COB-ID. The transmission model is shown in the figure below. Currently, the drive's CANopen communication only supports point-to-point PDO transmission mode.



8.4.3.2 PDO Objects

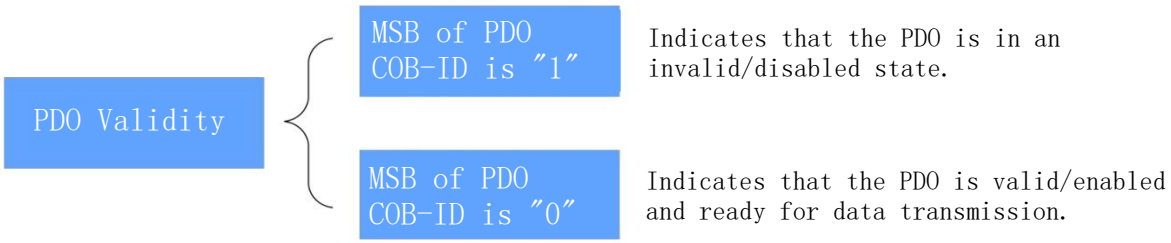
Based on the difference between reception and transmission, PDOs can be classified into RPDO (Receive PDO) and TPDO (Transmit PDO).PDO The final transmission method and content of a PDO are collectively determined by its Communication Parameters and Mapping Parameters.The C20 series drives utilize 4 RPDOs and 4 TPDOs to implement PDO transmission. The relevant object list is as follows:

Name		COB-ID	Communication Object	Mapping Object	COB-ID
RPDO	1	200h + Node_ID	1400h	1600h	200h + Node_ID
	2	300h + Node_ID	1401h	1601h	300h + Node_ID
	3	400h + Node_ID	1402h	1602h	400h + Node_ID
	4	500h + Node_ID	1403h	1603h	500h + Node_ID
TPDO	1	180h + Node_ID	1800h	1A00h	180h + Node_ID
	2	280h + Node_ID	1801h	1A01h	280h + Node_ID
	3	380h + Node_ID	1802h	1A02h	380h + Node_ID
	4	480h + Node_ID	1803h	1A03h	480h + Node_ID

8.4.3.3 PDO Communication Parameters

1、CAN Identifier of the PDO

The CAN Identifier of a PDO is its COB-ID (Communication Object Identifier), which contains control bits and identification data that determine the PDO's bus priority.。The COB-ID is located at Sub-index 01h of the Communication Parameters (RPDO: 1400h to 1403h, TPDO: 1800h to 1803h). The most significant bit (MSB) determines whether the PDO is valid (enabled/disabled).

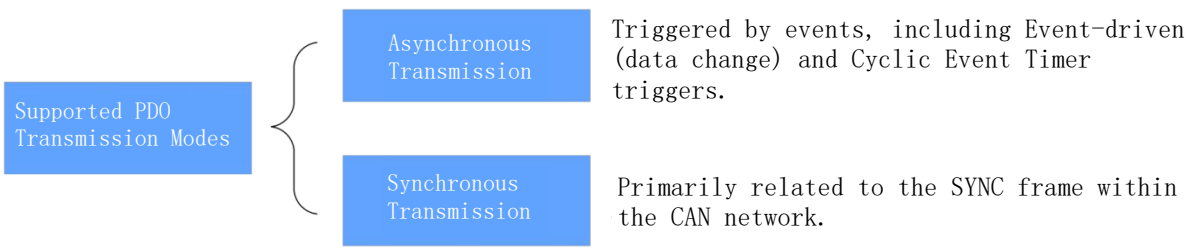


PDO Validity Description

The drive only supports point-to-point PDO transmission; therefore, the lower 7 bits of the COB-ID must correspond to the node's Station Address (Node-ID).Example: For a node with Station ID 4, the COB-ID of TPDO3 in an invalid state should be "80000384h". Writing "384h" to this COB-ID indicates that the PDO is now activated.

2. PDO Transmission Types

The PDO Transmission Type is located at Sub-index 02 of the Communication Parameters (RPDO: 1400h - 1403h, TPDO: 1800h - 1803h). It determines which transmission mode the PDO follows.



Supported PDO Transmission Modes

Communication Parameters (RPDO: 1400h－1403h, TPDO: 1800h－1803h) Sub-index 02: Different values represent different Transmission Types, which define the methods for triggering TPDO transmissions or processing received RPDOs. The specific correspondences are shown in the table below.

PDO Trigger Methods

Transmission Type Value	Synchronous		Asynchronous
	Cyclic	Acyclic	
0		√	
1~240	√		
241~253	-		
254、255			√

- When the Transmission Type of a TPDO is 0, if the mapped data changes and a SYNC frame is received (in that specific order), the TPDO will be transmitted.
- When the Transmission Type of a TPDO is 1－240, the TPDO will be transmitted upon receiving the corresponding number of SYNC frames.
- When the Transmission Type of a TPDO is 254 or 255, the TPDO will be transmitted if the mapped data changes or the Event Timer expires.
- The Transmission Type for RPDO only supports 254 or 255, meaning the received data is directly updated to the application.

3. Inhibit Time

The Inhibit Time is configured for TPDOs and is stored in Sub-index 03 of the Communication Parameters (1800h－1803h). This prevents the CAN network from being continuously occupied by lower-priority PDOs. The unit for this parameter is 100μs. Once the value is set, the transmission interval for the same TPDO must not be less than the time corresponding to this parameter.

Example:

If the Inhibit Time for TPDO2 is set to 300, the TPDO transmission interval will not be less than 30ms.

4. Event Timer

The Event Timer is defined for TPDOs using Asynchronous Transmission (Transmission Types 254 or 255) and is located at Sub-index 05 of the Communication Parameters (1800h－1803h). The Event Timer can be regarded as a type of trigger event that initiates the corresponding TPDO transmission. If other events, such as data changes, occur within the timer's period, the TPDO will still be triggered, and the Event Timer will be reset immediately.

8.4.3.4 PDO Mapping Parameters

PDO Mapping Parameters contain pointers to the Process Data that the PDO needs to transmit or receive, including the Index, Sub-index, and Object Length. The data length for each PDO can be up to 8 bytes, and one or more objects can be mapped simultaneously. Sub-index 0 records the number of objects mapped to the specific PDO, while Sub-indices 1 to 8 contain the mapped content. The definition of the PDO Mapping Parameter content is shown in the table below:

Bits	31	.....	16	15	.....	8	7	.....	0
Meaning	Index			Sub-index			Object Length		

The Index and Sub-index together determine the location of the object within the Object Dictionary. The Object Length specifies the precise bit length of the object, represented in hexadecimal, as follows:

Relationship Table between Object Length and Object Bit Length

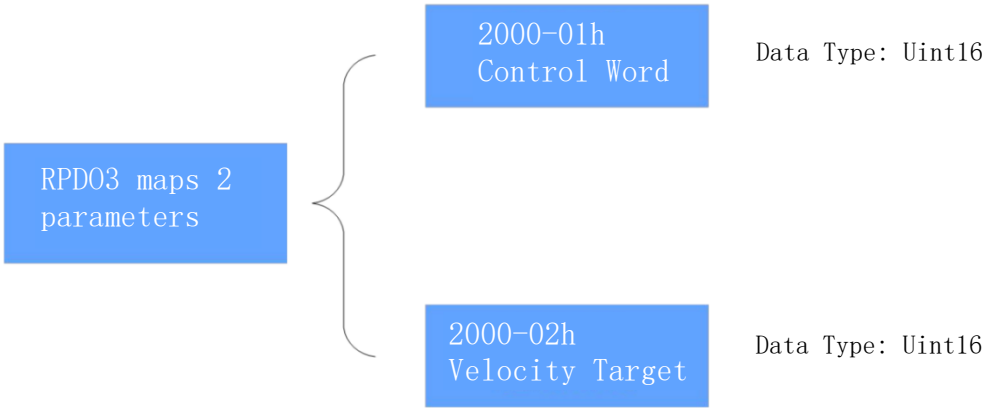
Object Length	Bit Length
08h	8 bits
10h	16 bits
20h	32 bits

Example:

The mapping parameter for the 16-bit Control Word (2000h-01) is represented as 20000110h. The PDO mapping relationship is explained with the following example.

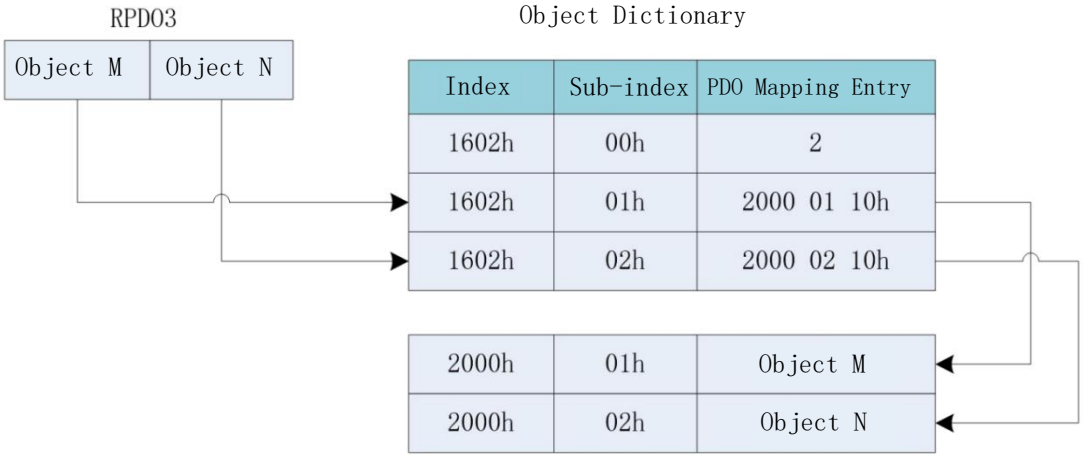
Example:

RPDO3 maps 2 parameters, which are:



Example of RPDO3 Mapping Relationship

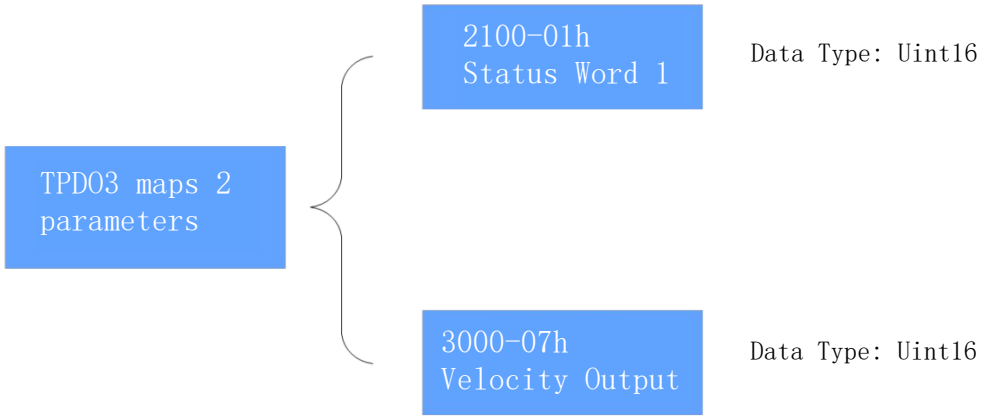
The total mapping length is 4 bytes (2+2). That is, the RPDO3 data segment consists of 4 bytes during transmission. Its mapping relationship is shown in the figure.



Example Diagram of RPDO Mapping Relationship

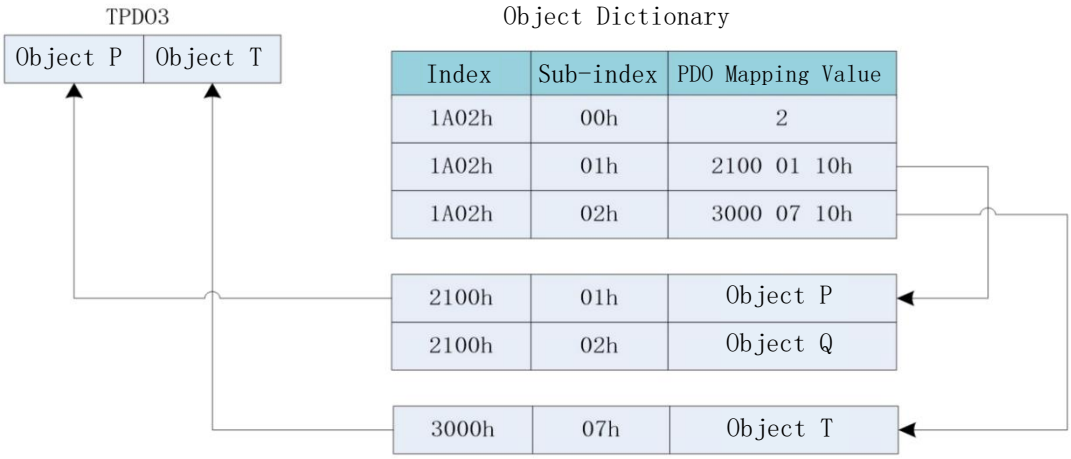
The mapping mechanism for TPDO (Transmit PDO) is identical to RPDO, but in the opposite direction. The RPDO decodes incoming data based on the mapping relationship, while the TPDO encodes outgoing data according to the mapping relationship.

Example: TPDO3 maps two parameters, which are:



Example of TPDO3 Mapping Relationship

The total mapping length is 4 bytes (2+2), meaning the data segment of TPDO3 during transmission is 4 bytes. Its mapping relationship is shown in the figure below.

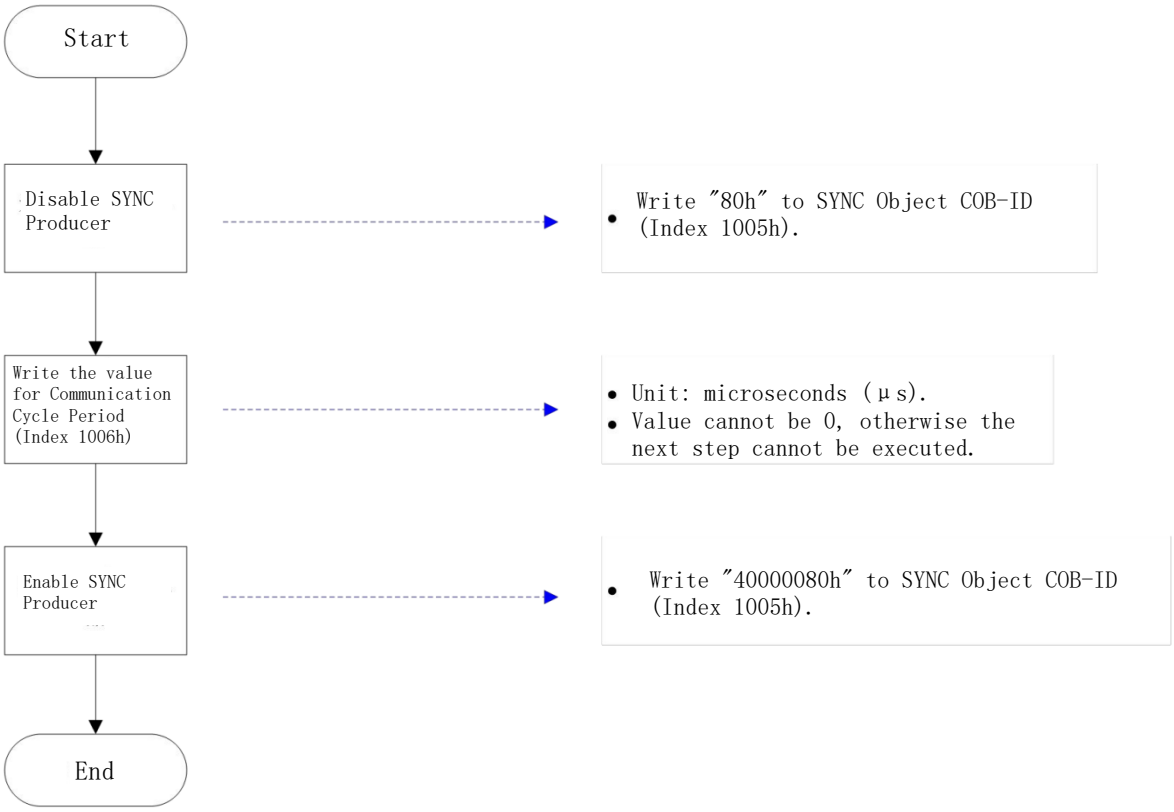


Example Diagram of TPDO Mapping Relationship

8.4.4 Synchronization Object (SYNC)

The Synchronization Object (SYNC) is a special mechanism used to coordinate and synchronize the transmission and reception between multiple nodes, specifically for the synchronous transmission of PDOs.

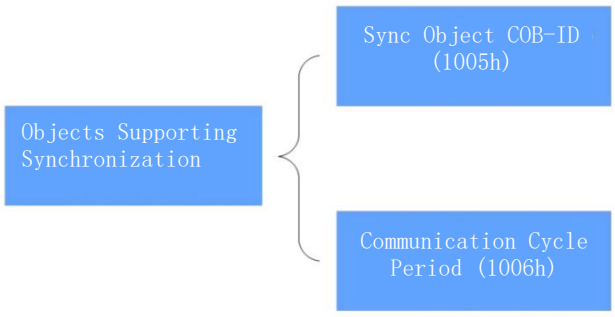
The configuration process for the SYNC generator is as follows:



C20 series drives are not recommended to use a Synchronization Cycle Period lower than 5ms.

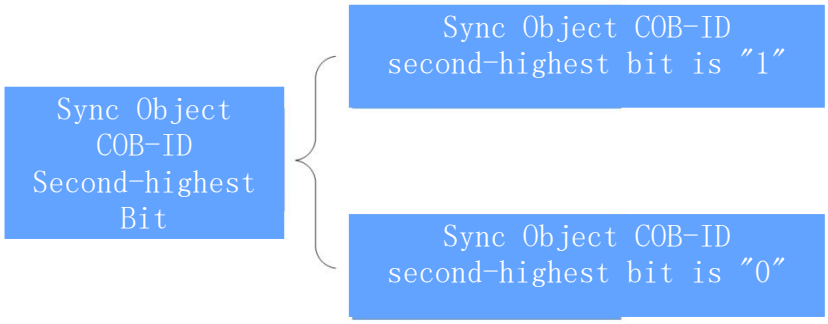
8.4.4.1 SYNC Producer

The C20 drive is not only a SYNC Consumer, but can also function as a SYNC Producer. The supported objects related to synchronization are the SYNC Object COB-ID (1005h) and the Communication Cycle Period (1006h).



Description of Objects Supporting Synchronization

The second most significant bit of the Sync Object COB-ID determines whether the Sync Generator is activated.

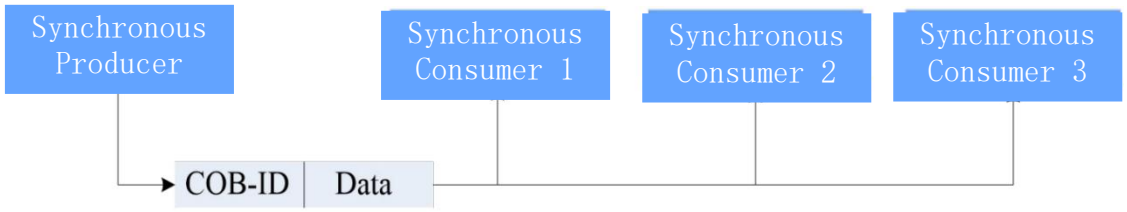


Description of Activating the SYNC Producer

The synchronous cycle period applies only to the SYNC producer, in microseconds (μs), indicating the interval at which the node generates synchronous objects.

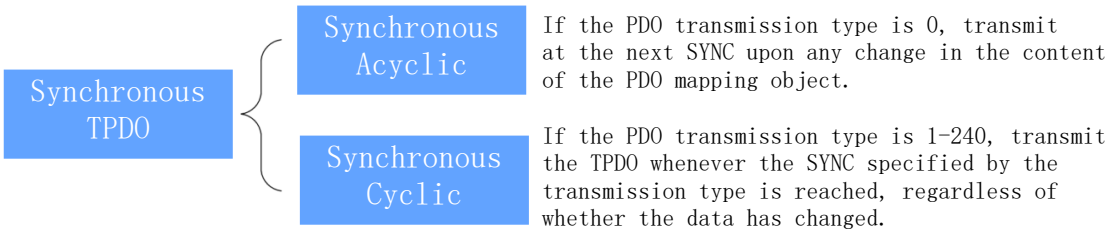
8.4.4.2 Synchronous Object Transmission Framework

Similar to PDO transmission, synchronous object transmission follows the producer-consumer model. The SYNC producer transmits the SYNC frame, and all other nodes on the CAN network can act as consumers to receive the SYNC frame without acknowledgment. Only one active SYNC producer is allowed on the same CAN network. The synchronous object transmission framework is shown in the figure.



Synchronous Transmission Framework Diagram

The transmission of synchronous PDO is closely related to the SYNC frame. Synchronous TPDO is divided into synchronous cyclic and synchronous acyclic types.



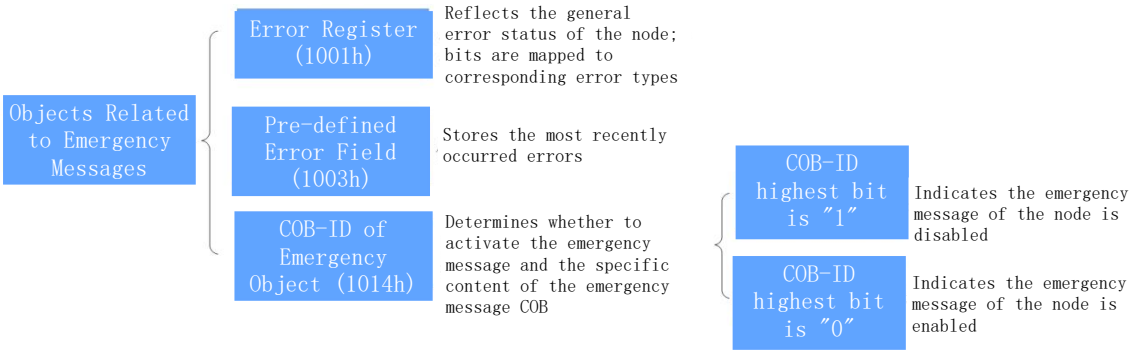
Synchronous TPDO Illustration Diagram

Example:

The transmission type of TPDO1 is 0, and the transmission type of TPDO2 is 20. TPDO1 mapped data will be transmitted at the next SYNC only when a change occurs, while TPDO2 will transmit the PDO after every 20 SYNC cycles regardless of whether the data has changed.

8.4.5 Emergency Object Service (EMCY)

When a CANopen node encounters an error, according to the standardized mechanism, the node transmits an Emergency frame. The Emergency message follows the producer-consumer model. After a node reports a fault, other nodes on the CAN network may choose to handle it. The drive acts only as an Emergency message producer and does not process Emergency messages from other nodes.



Description of Objects Related to Emergency Messages

When a node fault occurs, regardless of whether the Emergency Object is activated, the error register and the predefined error field must be updated.

The Emergency message content shall comply with the following specifications:

Emergency message content specification

COB-ID	0	1	2	3	4	5	6	7
80h+Node_ID	Error Code		Error Register	Reserved	Additional Byte			

The error register shall always be consistent with 1001h:

- When a communication abnormality occurs, the error code shall comply with DS301 requirements, and the additional byte shall be zero during communication faults.
- When a user-defined fault occurs in the drive, the error code shall be 0xFF00, and the additional byte shall indicate the user-defined error code.
  For detailed definitions of error codes and additional bytes, refer to Section 8.5.

8.5 Fault handling

When communication or the drive is abnormal, the C20 series drive sends an emergency message to the network as a producer, or sends an abort response when an SDO transfer error occurs. Nodes related to the emergency message include node error codes and auxiliary information.

8.5.1 Fault recovery method

For faults occurring in the C20 series drive itself, the clearing method is described in Chapter 5. This section only describes the fault clearing method for the communication part.

Fault display	Fault name	Fault cause	Fault handling
E.CAN1	CAN Bus-off Fault	Too many errors	Check the CAN network and reconnect.
E.CAN2	CAN Transmit error	Too many transmit error frames	Check CAN nodes, wiring, and baud rate.
E.CAN3	CAN Receive error	Too many receive error frames	Check the baud rate and check for interference sources.
E.CAN4	Heartbeat timeout	Time for slave to reach consumer configuration time	Check whether the CAN node is online, or check the CANopen configuration, then clear the fault.
E.CAN5	NMT Operation fault	When the motor is running, it receives NMT commands such as initialization or stop commands.	Clear the fault. When changing NMT state, stop the motor first.

8.5.2 SDO transfer abort codes

Abort code	Function description
0503 0000	Toggle bit not alternated
0504 0000	SDO protocol timeout
0504 0001	Invalid or unknown client/server command specifier
0504 0005	Memory overflow
0601 0000	Object access not supported
0601 0001	Attempt to read a write-only object
0601 0002	Attempt to write a read-only object
0602 0000	Object does not exist in object dictionary
0604 0041	Object cannot be mapped to PDO
0606 0000	Hardware error causing object access failure
0607 0010	Data type mismatch or service parameter length mismatch
0609 0011	Sub-index does not exist
0609 0030	Value out of parameter range
0609 0031	Written parameter value too large
0609 0032	Written parameter value too small
0800 0000	General error
0800 0021	Data cannot be transmitted or saved to the application due to local control
0800 0022	Data cannot be transmitted or saved to the application due to current device state

8.6 Object dictionary

8.6.1 Object classification description

★Terminology

"Index": Specifies the position of each object in the object dictionary, represented in hexadecimal.
"Data type": Please refer to the data type description table.

Data type	Value range	Data length	DS301 Value
Int8	-128~+127	1 Byte	0002
Int16	-32768~+32767	2 Byte	0003
Int32	-2147483648~+ 2147483647	4 Byte	0004
Uint8	0~255	1 Byte	0005
Uint16	0~65535	2 Byte	0006
Uint32	0~4294967295	4 Byte	0007
String	ASCII	-	0009

"Access type": Please refer to the access type description table.

Access type	Description
RW	Read/write
RW*	Writable when stopped, readable at any time
WO	Write only
RO	Read only
CONST	Constant, read only

"Object classification": Please refer to the object classification description table.

Category	Meaning	DS301 Value
VAR	Simple single value, including data type Int8、Uint16、String	7
ARR	Data block with the same data type	8
REC	Data block with different data types	9

8.6.2 Object group 1000h parameters

The 1000h object group contains parameters required for CANopen communication. All communication parameters cannot be mapped to PDO.

Index	Sub-index	Name	Attribute	Mapping	Type	Unit	Default value
1000h	-	Device type	RO	NO	Uint32	VAR	0x00
1001h	-	Error register	RO	NO	Uint8	VAR	0x0
1003h	-	Predefined error field	RO	NO	Uint32	ARR	-
	1~4h	Error field	RW	NO	Uint32	-	0
1005h	-	Synchronization message COB-ID	RW	NO	Uint32	VAR	0x80
1006h	-	Cyclic synchronization period (unit: μs)	RW	NO	Uint32	VAR	0
1008h	-	Manufacturer device name	CONST	NO	String	VAR	ZBLD.C20
1009h	-	Hardware version	CONST	NO	String	VAR	Vx.xx

Index	Sub-index	Name	Attribute	Mapping	Type	Unit	Default value
100Ah	-	Software version	CONST	NO	String	VAR	Vx.xx
100Ch	-	(Reserved)	RW	NO	Uint16	VAR	0
100Dh	-	(Reserved)	RW	NO	Uint8	VAR	0
1010h	-	Save parameters “save”	RW	NO	Uint32	ARR	0
	1h	Save all object parameters	RW	NO	Uint32	-	1
	2h	Save communication object parameters	RW	NO	Uint32	-	1
1011h	0h	Restore default parameters “load”	RW	NO	Uint32	ARR	-
	1h	Restore default parameters of all objects	RW	NO	Uint32	-	1
	2h	Restore default communication object parameters	RW	NO	Uint32	-	1
1014h	-	Emergency message COB-ID	RW	NO	Uint32	VAR	0x80+Node_ID
1016h	-	Consumer heartbeat time	RW	NO	Uint32	ARR	-
	1~5h	Consumer heartbeat time	RW	NO	Uint32	-	0
1017h	-	Producer heartbeat time (unit: ms)	RW	NO	Uint16	VAR	0
1018h	-	Device object description	RO	NO	/	REC	-
	1h	Vendor ID	RO	NO	Uint32	-	0x2896
	2h	Device code	RO	NO	Uint32	-	0x000C20xx
	3h	Device revision number	RO	NO	Uint32	-	0x00000100
1200h	-	SDO Server parameters	RO	NO	SDO parameter	REC	-
	1h	Client to server COB-ID	RO	NO	Uint32	-	0x600 +Node_ID
	2h	Server to client COB-ID	RO	NO	Uint32	-	0x580 +Node_ID
1400h	-	RPDO1 Parameter	RW	NO	PDO parameter	REC	-
	1h	RPDO1 of COB-ID	RW	NO	Uint32	-	0x00000200 +Node_ID
	2h	RPDO1 Transmission type	RW	NO	Uint8	-	255
1401h		RPDO2 Parameter	RW	NO	PDO parameter	REC	-
	1h	RPDO2 of COB-ID	RW	NO	Uint32	-	0x00000300 +Node_ID
	2h	RPDO2 Transmission type	RW	NO	Uint8	-	255
1402h		RPDO3 Parameter	RW	NO	PDO parameter	REC	-
	1h	RPDO3 of COB-ID	RW	NO	Uint32	-	0x00000400 +Node_ID
	2h	RPDO3 Transmission type	RW	NO	Uint8	-	255
1403h		RPDO4 Parameter	RW	NO	PDO parameter	REC	-
	1h	RPDO4 of COB-ID	RW	-	Uint32	-	0x00000500 +Node_ID
	2h	RPDO4 Transmission type	RW	NO	Uint8	-	255
1600h		RPDO1 Mapping parameter	RW	NO	RPDO mapping parameters	REC	-

Index	Sub-index	Name	Attribute	Mapping	Type	Unit	Default value
	1~8h	RPDO1 Mapped object	RW	NO	Uint32	-	-
1601h		RPDO2 Mapping parameter	RW	NO	RPDO mapping parameters	REC	-
	1~8h	RPDO2 Mapped object	RW	NO	Uint32	-	-
1602h		RPDO3 Mapping parameter	RW	NO	RPDO mapping parameters	REC	-
	1~8h	RPDO3 Mapped object	RW	NO	Uint32	-	-
1603h		RPDO4 Mapping parameter	RW	NO	RPDO mapping parameters	REC	-
	1~8h	RPDO4 Mapped object	RW	NO	Uint32	-	-
1800h	-	TPDO1 Mapping parameter	RW	NO	PDO parameters	REC	-
	1h	TPDO1 of COB-ID	RW	NO	Uint32	-	0x40000180 +Node_ID
	2h	TPDO1 Transmission type	RW	NO	Uint8	-	255
	3h	Inhibit time	RW	NO	Uint16	-	-
	5h	Event timer	RW	NO	Uint16	-	-
1801h	-	TPDO2 Communication parameters	RW	NO	PDO parameters	REC	-
	1h	TPDO2 of COB-ID	RW	NO	Uint32	-	0xC0000280 +Node_ID
	2h	TPDO2 Transmission type	RW	NO	Uint8	-	255
	3h	Inhibit time	RW	NO	Uint16	-	-
	5h	Event timer	RW	NO	Uint16	-	-
1802h	-	TPDO3 Communication parameters	RW	NO	PDO parameters	REC	-
	1h	TPDO3 of COB-ID	RW	NO	Uint32	-	0xC0000380 +Node_ID
	2h	TPDO3 Transmission type	RW	NO	Uint8	-	255
	3h	Inhibit time	RW	NO	Uint16	-	-
	5h	Event timer	RW	NO	Uint16	-	-
1803h	-	TPDO4 Communication parameters	RW	NO	PDO parameters	REC	-
	1h	TPDO4 of COB-ID	RW	NO	Uint32	-	0xC0000480 +Node_ID
	2h	TPDO4 Transmission type	RW	NO	Uint8	-	255
	3h	Inhibit time	RW	NO	Uint16	-	-
	5h	Event timer	RW	NO	Uint16	-	-
1A00h	-	TPDO1 Communication parameters	RW	NO	PDO mapping parameters	REC	-
	1h	TPDO1 Mapped object	RW	NO	Uint32	-	-
1A01h	-	TPDO2 Mapping parameter	RW	NO	PDO mapping parameters	REC	-
	1h	TPDO2 Mapped object	RW	NO	Uint32	-	-
1A02h	-	TPDO3 Mapping parameter	RW	NO	PDO mapping parameters	REC	-

Index	Sub-index	Name	Attribute	Mapping	Type	Unit	Default value
	1h	TPDO3 Mapped object	RW	NO	Uint32	-	-
1A03h	-	TPDO4 Mapping parameter	RW	NO	PDO mapping parameter	REC	-
	1h	TPDO4 Mapped object	RW	NO	Uint32	-	-

8.6.3 Object group Parameters 2000h - 3000h

The object group 2000h - 3000h is a manufacturer-defined object dictionary related to the motor. Some parameters correspond to function codes. All objects in this area support PDO mapping.

Control parameters 2000h

Index	Sub-index	Name	Attribute	Mapping	Type	Unit	Default value
2000h	01h	Communication control commands: 01H: Forward run 02H: Reverse run 03H: Forward jog 04H: Reverse jog 05H: Stop 06H: Free stop 07H: Fault reset 08H: Jog stop Note: Parameters are not saved after power-off	W/R	YES	Uint16	-	0
	02h	Communication speed setting: 0~3000RPM Note: Parameters are not saved after power-off	W/R	YES	Uint16	-	0
	03h	Motor pole pairs: 1 - 20	W/R*	YES	Uint16	-	5
	04h	Acceleration time 1~6000（Umit：0.1S）	W/R	YES	Uint16	-	10
	05h	Deceleration time 1~6000（Umit：0.1S）	W/R	YES	Uint16	-	10
	06h	Control mode selection: 0: Test mode 1: Open-loop 2: Closed-loop 3: DIP switch setting (SW1)	W/R*	YES	Uint16	-	机型相关
	07h	Run command source selection: 0: Keypad run command channel 1: Terminal run command channel 2: Communication run command channel 3: DIP switch setting (SW3)	W/R	YES	Uint16	-	机型相关

Index	Sub-index	Name	Attribute	Mapping	Type	Unit	Default value
	08h	Speed reference selection: 0: Keypad digital setting 1: Analog input AI1 setting 2: Analog input AI2 setting 3: RS485 communication setting 4: Multi-step speed setting 5: DIP switch setting (SW2~3) 6: Simple PLC setting 7: High-speed pulse input setting 8: CAN communication setting	W/R	YES	Uint16	-	1
	09h	CAN Communication slave address 1~247	W/R*	YES	Uint16	-	1
	0Ah	CAN Communication baud rate setting 0：10K 1：20K 2：50K 3：100K 4：125K(Default) 5：250K 6：500K 7：1M Note: Only available on certain models 10K	W/R*	YES	Uint16	-	4
	0Eh	Communication command channel selection 0: RS485 communication channel 1: CAN communication channel	W/R*	YES	Uint16	-	机型相关
	0Fh	Function code write enable 0: Function codes cannot be written via CAN communication 1: Function codes can be written via CAN communication Note: Parameters are not saved after power-off	W/R	YES	Uint16	-	0
	10H	Parameter restore setting 0: No operation 1: Restore function codes 2: Restore CAN communication parameters 3: Restore all parameters	W/R*	YES	Uint16	-	0

Status parameter 2100h

Index	Sub-index	Name	Attribute	Mapping	Type	Unit	Default value
2100h	01h	Status word 1: 01H: Forward running 02H: Reverse running 03H: Drive stopped 04H: Drive fault condition 05H: Drive OFF state 06H: Electronic brake status	RO	TPDO	Uint16	-	0
	02h	Status word 2: Bit0: =0:DC bus voltage not established =1:DC bus voltage established Bit4: =0: No overload =1: Overload Bit5~ Bit6: =00b: Keypad control =01b: Terminal control =10b: Communication control	RO	TPDO	Uint16	-	0
	03h	Current fault code: Refer to the fault code table in Section 5.2	RO	TPDO	Uint16	-	0
	04h	Drive series: 20h(C20 Series)	RO	TPDO	Uint16	-	0x20

Status parameter 3000h

Index	Sub-index	Name	Attribute	Mapping	Type	Unit	Default value
3000h	01h	Set frequency: 0~Fmax (Unit: 0.01Hz)	RO	TPDO	Uint16	-	0
	02h	Output frequency: 0~Fmax (Unit: 0.01Hz)	RO	TPDO	Int16	-	0
	03h	Ramp reference frequency: 0~Fmax (Unit: 0.01Hz)	RO	TPDO	Uint16	-	0
	04h	Output voltage: 0~20000 (Unit: 0.1V)	RO	TPDO	Uint16	-	0
	05h	Output current: 0~30000 (Unit: 0.01A)	RO	TPDO	Uint16	-	0
	06h	Set speed: 0~3000 (Unit: 1RPM)	RO	TPDO	Uint16	-	0
	07h	Motor output speed: 0~3000 (Unit: 1RPM)	RO	TPDO	Uint16	-	0
	08h	Motor output power: 0~2200 (Unit: W)	RO	TPDO	Uint16	-	0

Index	Sub-index	Name	Attribute	Mapping	Type	Unit	Default value
	09h	DC bus voltage: 0~20000（Unit：0.1V）	RO	TPDO	Uint16	-	0
	0Ah	Hall value: 0~7	RO	TPDO	Uint16	-	0
	0Bh	Software version number :1.00~99.00	RO	TPDO	Uint16	-	-
	0Ch	Fault record: See fault description in Section 5.2	RO	TPDO	Uint16	-	0
	0Dh	Inverter temperature: -200~1200（Unit：0.1℃）	RO	TPDO	Uint16	-	0
	0Eh	Input terminal status : 00h~1FFh	RO	TPDO	Uint16	-	0
	0Fh	Output terminal status : 00~0F	RO	TPDO	Uint16	-	0
	10h	Analog input 1 voltage: 0~1000（Unit：0.01V）	RO	TPDO	Uint16	-	0
	11h	Analog input 2 voltage: 0~1000（Unit：0.01V）	RO	TPDO	Uint16	-	0
	12h	Analog input 3 voltage: 0~1000（Unit：0.01V）	RO	TPDO	Uint16	-	0
	13h	Reserved	RO	TPDO	Uint16	-	0
	14h	Hall counter high 16 bits: 0~65535	RO	TPDO	Uint16	-	0
	15h	Hall counter high 16 bits: 0~65535	RO	TPDO	Uint16	-	0

8.6.4 Detailed description of Object Dictionary 1000h group parameters

Index 1000h	Name	(Device Type)			Data structure	VAR	Data type	Uint32
	Attribute	RO	Mappable	NO	Range	Uint32	Default value	0x0000
The device type parameter is used to describe the device sub-protocol or the application profile in use.								

Index 1001h	Name	(Error Register)			Data structure	VAR	Data type	Uint8
	Attribute	RO	Mappable	NO	Range	Uint8	Default value	0x00

The device uses bitwise encoding to represent error type information as shown in the table below:

Bit	Meaning	Bit	Meaning
0	Normal	4	Communication
1	Current	5	Sub-protocol
2	Voltage	6	Reserved
3	Temperature	7	Manufacturer-defined

When an error occurs, the corresponding error bit is set to “1”, and if any error exists, bit 0 must always be “1”.

Index 1003h	Name	(Pro-defined Error Field)			Data structure	VAR	Data type	Uint32
	Attribute	RO	Mappable	NO	Range	-	Default value	-
Sub-index 00h	Name	(Number of Errors)			Data structure	-	Data type	Uint8
	Attribute	RW	Mappable	NO	Range	0~4	Default value	0
Only 0 can be written; all error records will be cleared.								
Sub-index 1~4h	Name	(Standard Error Field)			Data structure	-	Data type	Uint32
	Attribute	RW	Mappable	NO	Range	Uint32	Default value	0

When the sub-index is 0, it cannot be read.
When an error occurs, the error shall be stored in the following format:

31 16	15 0
Manufacturer error code	Standard error code

MSB LSB

Index 1005h	Name	(COB-ID SYNC Message)			Data structure	VAR	Data type	Uint32
	Attribute	RW	Mappable	NO	Range	Uint32	Default value	0x80

Only 0x80h and 0x40000080h can be written.
When 0x80h is written, the SYNC producer is disabled.
When 0x40000080h is written, the SYNC producer is enabled.
Before enabling the SYNC producer, the SYNC Cycle Period (1006h) must be configured to a non-zero value.

Index 1006h	Name	(Communication Cycle Period)			Data structure	VAR	Data type	Uint32
	Attribute	RW	Mappable	NO	Range	Uint32	Default value	0
Applicable only to the SYNC producer, unit in microseconds (us), recommended to be greater than 5 ms								

Index 1008h	Name	(Manufacturer Device Name)			Data structure	VAR	Data type	String
	Attribute	CONST	Mappable	NO	Range	String	Default value	ZBLD .C20

Index 1009h	Name	(Manufacturer Hardware Version)			Data structure	VAR	Data type	String
	Attribute	CONST	Mappable	NO	Range	String	Default value	Vx.xx

Index 100Ah	Name	(Manufacturer Software Version)			Data structure	VAR	Data type	String
	Attribute	CONST	Mappable	NO	Range	String	Default value	Vx.xx
x.xx：Software version number upgrade record								

Index 1010h	Name	(Store Parameters)			Data structure	VAR	Data type	Uint32
	Attribute	RW	Mappable	NO	Range	Uint8	Default value	0

Saving parameters means storing the current parameter values into the EEPROM. The saved values will be loaded the next time the EEPROM is accessed (power cycle, node reset, or communication reset), and the last saved values will be used.
When saving parameters, in addition to specifying the sub-index corresponding to the save area, it is also required to write “save” in ASCII code. Writing any other value will fail to save the parameters. The corresponding write relationships are as follows:

MSB LSB

ASCII	e	v	a	s
Hexadecimal (base 16)	65h	76h	61h	73h

Value	Meaning
0	Parameters are neither saved automatically nor saved by command
1	Parameters are saved by command only and not saved automatically
2	Parameters are saved automatically only and do not accept command-based saving
3	Parameters can be saved both automatically and by command

The return value read from the corresponding sub-index indicates the method by which the parameters of that sub-index are saved.

Sub-index 00h	Name	(Highest Sub-index Supported)			Data structure	VAR	Data type	Uint8
	Attribute	RO	Mappable	NO	Range	4	Default value	4
Sub-index 01h	Name	(Save All Parameters)			Data structure	VAR	Data type	Uint32
	Attribute	RO	Mappable	NO	Range	-	Default value	1
Save all parameters of the Object Dictionary list								

Sub-index 02h	Name	(Save Communication Parameters)			Data structure	VAR	Data type	Uint32
	Attribute	RO	Mappable	NO	Range	-	Default value	1
Save parameters of Object Group 1000h								
Sub-index 03h	Name	(Save Application Parameters)			Data structure	VAR	Data type	Uint32
	Attribute	RO	Mappable	NO	Range	-	Default value	1
Save parameters of Object Group 6000h (reserved)								
Sub-index 04h	Name	(Save Manufacturer Defined Parameters)			Data structure	VAR	Data type	Uint32
	Attribute	RO	Mappable	NO	Range	-	Default value	2
Save parameters of Object Groups 2000h to 5FFFh								

Index 1011h	Name	(Restore Default Parameters)			Data structure	VAR	Data type	Uint32
	Attribute	RW	Mappable	NO	Range	-	Default value	0

Restoring default parameters writes the default values back to the EEPROM and does not take effect immediately. The values will be loaded from the EEPROM the next time it is accessed (power cycle, node reset, or communication reset), at which point the default (factory) settings will be applied.
When restoring default parameters, in addition to specifying the sub-index corresponding to the restore area, it is also required to write “load” in ASCII code. Writing any other value will fail to restore the default parameters. The corresponding write relationships are as follows:

MSB LSB

ASCII	d	a	o	l
Hexadecimal (base 16)	64h	61h	6Fh	6Ch

Value	Meaning
0	The device cannot restore default parameters
1	The device can restore default parameters

The return value read from the corresponding sub-index indicates the method by which the default parameters of that sub-index are restored.

Sub-index 00h	Name	(Highest Sub-index Supported)			Data structure	VAR	Data type	Uint8
	Attribute	RO	Mappable	NO	Range	4	Default value	4
Sub-index 01h	Name	(Restore All Default Parameters)			Data structure	VAR	Data type	Uint32
	Attribute	RO	Mappable	NO	Range	-	Default value	1
Restore all parameters of the Object Dictionary list								
Sub-index 02h	Name	(Restore Communication Parameters)			Data structure	VAR	Data type	Uint32
	Attribute	RO	Mappable	NO	Range	-	Default value	1
Restore parameters of Object Group 1000h								

Index 1014h	Name	COB-ID (COB-ID Emergency Message)			Data Structure	VAR	Data Type	Uint32
	Attribute	RW	Mappable	NO	Range	-	Default Value	0x80+ Node_ID
The most significant bit indicates whether the device emergency message should be disabled. Only the value “0x80+Node_ID” can be written to this bit to enable the device emergency message. Write “0x80000080+Node_ID” to disable the emergency message. When the emergency message is active, its COB-ID must be consistent with this object.								

Index 1016h	Name	(Consumer Heartbeat Time)			Data Structure	VAR	Data Type	Uint32
	Attribute	RW	Mappable	NO	Range	-	Default Value	-

The parameters include the monitored node address and the actual consumer time. This time must be greater than the corresponding node’s heartbeat producer time (unit: ms). It is not allowed to configure two consumer times for the same node. The parameter details are as follows:

MSB LSB

31 24	23 16	15 0
Reserved	Monitored Address	Monitoring Time

Sub-index 00h	Name	(Highest Sub-index Supported)			Data Structure	VAR	Data Type	Uint8
	Attribute	RO	Mappable	NO	Range	5	Default Value	5
Sub-index 1~5h	Name	(Consumer Heartbeat Time)			Data Structure	-	Data Type	Uint32
	Attribute	RW	Mappable	NO	Range	Uint32	Default Value	0

Index 1017h	Name	(Producer Heartbeat Time)			Data Structure	VAR	Data Type	Uint16
	Attribute	RW	Mappable	NO	Range	Uint16	Default Value	0
Unit ms。								

Index 1018h	Name	(Identity Object)			Data Structure	REC	Data Type	-
	Attribute	RO	Mappable	NO	Range	Uint16	Default Value	0
Sub-index 00h	Name	(Highest Sub-index Supported)			Data Structure	VAR	Data Type	Uint8
	Attribute	RO	Mappable	NO	Range	4	Default Value	4
Sub-index 01h	Name	ID(Vendor-ID)			Data Structure	-	Data Type	Uint32
	Attribute	RO	Mappable	NO	Range	Uint32	Default Value	0x2896
Sub-index 02h	Name	(Product Code)			Data Structure	-	Data Type	Uint32
	Attribute	RO	Mappable	NO	Range	Uint32	Default Value	0xC2003
Sub-index 03h	Name	(Revision Number)			Data Structure	-	Data Type	Uint32

	Name	RO	Mappable	NO	Range	Uint32	Data Type	0x100
Sub-index	Attribute	Reserved			Data Structure	-	Default Value	Uint32
04h	Name	RO	Mappable	NO	Range	Uint32	Data Type	0

Index 1200h	Name	SDO (SDO Server Parameter)			Data Structure	REC	Data Type	SDO Parameter
	Attribute	RO	Mappable	NO	Range	-	Default Value	0
The default SDO always exists and is a read-only constant.								
Sub-index 00h	Name	(Highest Sub-index Supported)			Data Structure	VAR	Data Type	Uint8
	Attribute	RO	Mappable	NO	Range	2	Default Value	2
Sub-index 01h	Name	COB-ID (COB-ID Client → Server)			Data Structure	VAR	Data Type	Uint32
	Attribute	RO	Mappable	NO	Range	-	Default Value	0x600 + Node_ID
Sub-index 02h	Name	COB-ID (COB-ID Server → Client)			Data Structure	VAR	Data Type	Uint32
	Attribute	RO	Mappable	NO	Range	-	Default Value	0x580 + Node_ID

Index 1400~ 1403h	Name	RPDO (RPDO Communication Parameter)			Data Structure	REC	Data Type	RPDO Parameter
	Attribute	RW	Mappable	NO	Range	-	Default Value	0
Sub-index 00h	Name	Highest Sub-index Supported			Data Structure	VAR	Data Type	Uint8
	Attribute	RO	Mappable	NO	Range	5	Default Value	5
Sub-index 01h	Name	RPDO or COB-ID (COB-ID Used by RPDO)			Data Structure	-	Data Type	Uint32
	Attribute	RW	Mappable	NO	Range	-	Default Value	See below

Only the most significant bit (MSB) can be modified. An MSB of "0" indicates that the PDO is active (Enabled), while an MSB of "1" indicates that the PDO is inactive (Disabled). Factory default settings are as follows:

1400h ： 0x00000200 + Node_ID
1401h ： 0x00000300 + Node_ID
1402h ： 0x00000400 + Node_ID
1403h ： 0x00000500 + Node_ID

Sub-index 02h	Name	RPDO (Transmission Type)			Data Structure	-	Data Type	Uint8
	Attribute	RW	Mappable	NO	Range	-	Default Value	255

This value can only be modified when the PDO is inactive. Different values represent different PDO transmission types, as shown in the table below.

Value	Description
0	Synchronous Acyclic

1~240	Synchronous Cyclic
254,255	Asynchronous Cyclic

Index 1600~ 1603h	Name	RPDO Mapping Parameter			Data Structure	REC	Data Type	RPDO Mapping Parameter
	Attribute	RW	Mappable	NO	Range	-	Default Value	0
This object can only be modified when the PDO is inactive. The total mapped object length must not exceed 64 bits. Only byte-wise mapping is supported; bit-wise mapping is not supported.								
Sub-index 00h	Name	PDO (Number of Mapped Application Objects in PDO)			Data Structure	VAR	Data Type	Uint8
	Attribute	RO	Mappable	NO	Range	1~4	Default Value	-
Sub-index 1~4h	Name	RPDO (Application Object)			Data Structure	-	Data Type	Uint32
	Attribute	RW	Mappable	NO	Range	-	Default Value	-

The index and sub-index of the mapped object must exist in the Object Dictionary and have writable and mappable attributes. Write them into the corresponding sub-index in the following format:

31 16	15 8	7 0
Index	Sub-index	Object Length

MLB LSB

RPDO Default Mapping Content

1） RPDO1：1600h

Sub-index	Value	Description
0	1	Map 1 Object
1	0x20000110	Control Word 2000h-sub1-16bit

2） RPDO2：1601h

Sub-index	Value	Description
0	1	Map 1 Object
1	0x20000210	Speed Setpoint 2000h-sub2-16bit

3） RPDO3：1602h

Sub-index	Value	Description
0	2	Map 2 Object
1	0x20000110	Control Word 2000h-sub1-16bit
2	0x20000210	Speed Setpoint 2000h-sub2-16bit

4） RPDO4：1603h

Sub-index	Value	Description
0	4	Map 4 Object
1	0x20000410	Acceleration Time 2000h-sub4-16bit
2	0x20000510	Deceleration Time 2000h-sub5-16bit
3	0x00	Reserved
4	0x00	Reserved

Index 1800~ 1803h	Name	TPDO Communication Parameters			Data Structure	REC	Data Type	TPDO Parameter
	Attribute	RW	Mappable	NO	Range	-	Default Value	0
Sub-index 00h	Name	Highest Sub -index Supported			Data Structure	VAR	Data Type	Uint8
	Attribute	RO	Mappable	NO	Range	-	Default Value	6
Sub-index 01h	Name	TPDO of COB-ID (COB-ID Used by TPDO)			Data Structure	-	Data Type	Uint32
	Attribute	RW	Mappable	NO	Range	-	Default Value	See below

Only the highest bit can be modified. A highest bit of "0" indicates that the PDO is valid, while a highest bit of "1" indicates that the PDO is invalid.
The next highest bit indicates whether the PDO can be triggered by a remote frame. The C20 series driver does not support this function, so this bit is meaningless. It is recommended to set it to "1" to indicate that remote frame triggering of this PDO is not allowed.

The factory settings are as follows:

1800h ： 0x40000180 + Node_ID
1801h ： 0xC0000280 + Node_ID
1802h ： 0xC0000380 + Node_ID
1803h ： 0xC0000480 + Node_ID

Sub-index 02h	Name	TPDO (Transmission Type)			Data Structure	-	Data Type	Uint8
	Attribute	RW	Mappable	NO	Range	-	Default Value	255

This value can only be modified when the PDO is in an invalid state. Different values represent different PDO transmission types, as shown in the table below:

Value	Meaning
0	Synchronous Non-Cyclic
1~240	Synchronous Cyclic
254,255	Asynchronous Cyclic

Sub-index 03h	Name	Inhibit Time			Data Structure	-	Data Type	Uint16
	Attribute	RW	Mappable	NO	Range	-	Default Value	0

This value can only be modified when the PDO is inactive. The unit is 100 μs; a value of "0" indicates no inhibit time.

Sub-index 05h	Name	Event Timer			Data Structure	-	Data Type	Uint16
	Attribute	RW	Mappable	NO	Range	-	Default Value	0

This value can only be modified when the PDO is inactive. The unit is 1 ms; a value of "0" indicates no Event Timer.

Index 1A00~ 1A03h	Name	TPDO (TPDO Mapping Parameter)				REC	Data Type	RPDO Mapping Parameter
	Attribute	RW	Mappable	NO	Range	-	Default Value	0

This object can only be modified when the PDO is inactive. The total mapped object length must not exceed 64 bits. Only byte-wise mapping is supported; bit-wise mapping is not supported.

Sub-index 00h	Name	PDO (Number of Mapped Application Objects in PDO)	Data Structure	VAR	Data Type	Uint8

	Attribute	RO	Mappable	NO	Range	1~4	Default Value	-
Sub-index 1~4h	Name	TPDO of each mapped object (Application Object)			Data Structure	-	Data Type	Uint32
	Attribute	RW	Mappable	NO	Range	-	Default Value	-

The index and sub-index of the mapped object must exist in the Object Dictionary list, with attributes set to writable and mappable. Write them into the corresponding sub-index according to the following format:

31 16	15 8	7 0
Index	Sub-index	Object Length

MLB LSB

TPDO Default Mapping Content

TPDO1：1A00h

Sub-index	Value	Description
0	1	Map 1 Object
1	0x21000110	Status Word 1 2100h-sub1-16bit

TPDO2：1A01h

Sub-index	Value	Description
0	1	Map 1 Object
1	0x30000710	Speed Output 3000h-sub7-16bit

TPDO3：1A02h

Sub-index	Value	Description
0	2	Map 2 Object
1	0x21000110	Status Word 1 2100h-sub1-16bit
2	0x30000710	Speed Output 3000h-sub7-16bit

TPDO4：1A03h

Sub-index	Value	Description
0	4	Map 2 Object
1	0x21000110	Status Word 1 2100h-sub1-16bit
2	0x30000710	Speed Output 3000h-sub7-16bit
3	0x30000510	Current Output 3000h-sub5-16bit
4	0x30000C10	Fault Record 3000h-sub12-16bit

9. Basic Inspection and Maintenance

9.1 Basic Inspection

Inspection Items	Inspection Details
General Inspection	Periodically check whether the mounting parts of the driver, terminals and wiring, and the screws at the connection between the motor shaft and the mechanical equipment are loosened.
	Perform periodic inspections to prevent oil, water, metal particles, or other foreign matter from entering the driver.
	If the driver is installed in an environment with harmful gases or heavy dust, appropriate measures must be taken to prevent their ingress.
	When modifying wiring, ensure the wiring sequence is correct; otherwise, it may result in hazardous conditions.
Pre-operation Inspection (Power OFF)	Before wiring, ensure that the power supply is disconnected and the motor has completely stopped.
	Proper insulation must be applied to the connection points of the wiring terminals.
	Wiring must be correctly performed to avoid damage or abnormal operation.
	Check that no conductive objects such as screws or metal fragments, or flammable materials, are present inside the driver.
	Ensure that the external control switch is in the OFF position.
	To avoid failure of the electromagnetic brake, check whether the immediate stop circuit and power cutoff circuit are functioning properly.
	If electronic equipment used near the driver is affected by electromagnetic interference, apply appropriate measures or devices to reduce the interference.
	Ensure that the externally applied voltage level to the driver is correct.
Pre-operation Inspection (Power ON)	When the motor is running, ensure that the connection cables do not come into contact with mechanical parts causing abrasion, or experience pulling/tension.
	If the motor exhibits vibration caused by the driver or generates excessive operating noise, please contact the manufacturer.
	Verify that all parameter settings are correct, as differences in mechanical characteristics may result in unexpected operation.
	When resetting parameters, ensure that the driver is in the STOP state before proceeding; otherwise, it may cause faults.
	Check whether the LED indicator display shows any abnormalities.
	Check whether the keypad display and command settings show any abnormalities.

9.2 Maintenance and After-Sales Service

Routine Maintenance

- Store and operate the equipment under appropriate environmental conditions.
- Regularly clean the exterior of the driver and motor to prevent dust and dirt accumulation.
- Do not disassemble any mechanical parts during cleaning and maintenance.
- Clean the gaps of the driver enclosure periodically to prevent foreign matter from entering.
- Avoid prolonged operation in extreme environments, which may lead to driver failure.

Component Service Life

- Electrolytic Capacitor

The service life is mainly affected by ambient temperature and operating conditions. According to the supplier's specifications, under the maximum operating temperature of 105°C, the service life is 7,000 hours. Under ideal conditions, for every 10°C decrease in operating temperature, the service life doubles. If stored unused for a long period, the electrolyte inside the capacitor will gradually lose its activity; therefore, the rated voltage should be periodically applied to maintain electrolyte performance.

- Rotary Potentiometer

Total rotational angle 250° ±10°; rotational life 100 cycles; resistance variation $\Delta R/R \leq \pm(2\Omega + 3\%)$.

- Long Shaft Potentiometer

The shaft rotates at 600 cycles/hour (one back-and-forth motion counted as one cycle). After 24 hours of operation, the total rotation is 5,000–8,000 cycles, with an effective rotation angle exceeding 90%. The total rotational life is 10,000 ±200 cycles. Total resistance variation is ±15% of the initial value.

- MTBF

Mean Time Between Failures (MTBF) > 500,000 hours

After-Sales Service

- If any issues occur during use, please contact the sales department or technical support. Contact details for technical support can be found at the end of this manual.
- This product is covered by a one-year warranty from the date of shipment. Free repair service will be provided within the warranty period.
- Under normal operating conditions and in accordance with this manual, if a failure occurs, please contact the sales department to return the product for repair. For efficient troubleshooting, please provide a detailed description of the failure cause or symptoms.
- The following conditions are considered the user's responsibility:

  1、Damage caused by improper use, or unauthorized repair and modification
  2、Damage caused by dropping or transportation after delivery
  3、Damage caused by operation beyond the specified product limits
  4、Damage caused by fire, earthquake, lightning, wind disasters, chloride corrosion, or other natural disasters
  5、Damage caused by intrusion of water, oil, metal particles, or other foreign substances

Components with specified service life are excluded from warranty coverage if operated beyond their rated service life.

Synergy Asia Solution Co., Ltd.

ฝ่ายขาย : *080-7780778*

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