BC series servo driver instruction manual

Shenzhen ONKE Technology Co., LTD

BC Series Servo Drive Model Description

BC PC -090 10 -OP E GT

A series of
BC/BC2

Input order
P:pulse A:analog R:RS485
C:CANopen

power supply voltage
030:7-30VDC 090:18-90VDC
135:18-135VDC 180:18-180VDC

Rated current
10:11Arms 15:16Arms 30:30Arms
100:100Arms 250:250Arms

Special requirements
GT:Green terminal
RTR:Reduce temperature rise
MD:subsize LG:Large size

feedback
E:Incremental A/B orthogonal encoder
A:Absolute value (Tamagawa RS485)
CH:Digital Hall

Special function
OP:Pulse output
HUB:Servo hub

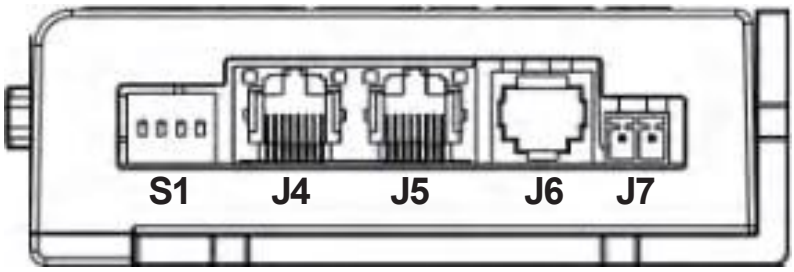
Attention to:
1.The driver supply voltage must be greater than or equal to the rated voltage of the motor

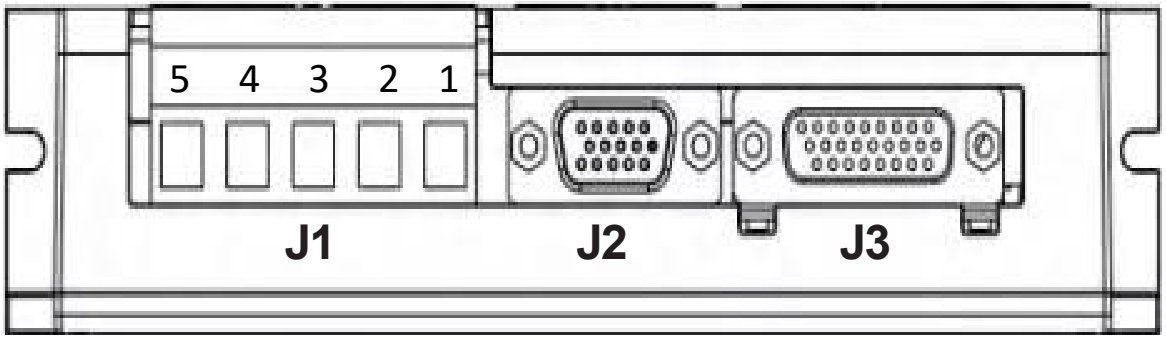
2.The rated current of the driver must be greater than or equal to the rated current of the motor

BC series drive specification summary table

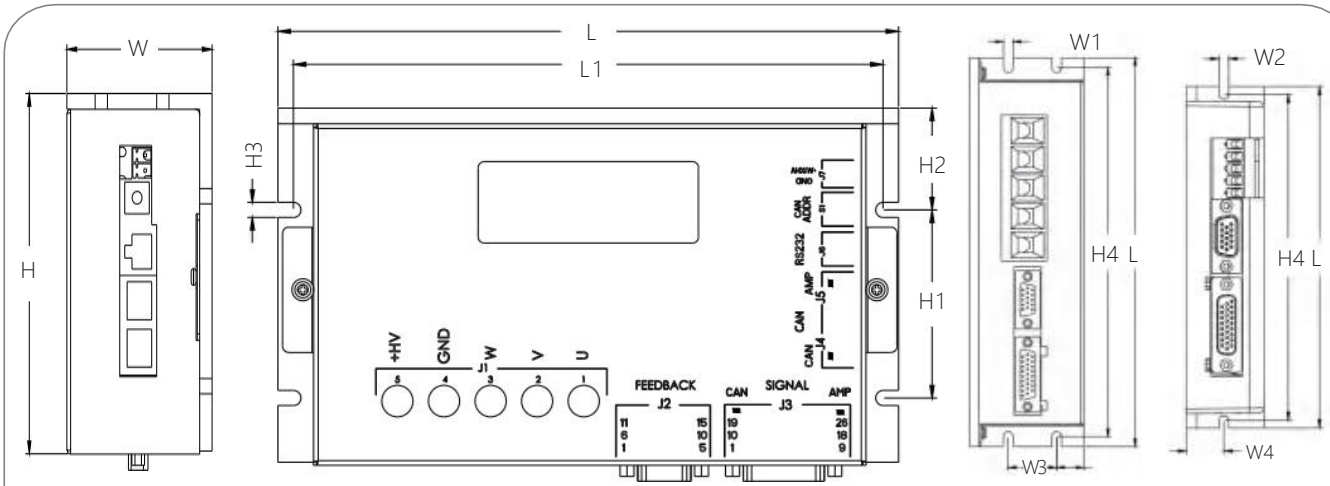
Driver model	service voltage	Rated current Arms	Peak current Apk6S rms	Feedback type	Overall dimensions	weight
BCPC-09002-OPE/A	18~90 VDC	2A	6A	incremental | Absolute value	141*90*32mm	0.35kg
BCPC-09005-OPE/A		6A	18A			
BCPC-09010-OPE/A		11A	33A			
BCPC-09015-OPE/A		16A	40A			
BCPC-09020-OPE/A		21A	60A		167*100*35mm	0.45kg
BCPC-09030-OPE/A		30A	60A			
BCPC-09035-OPE/A		35A	70A			
BCPC-09050-OPE/A		50A	100A		200*114*59mm	1.10kg
BCPC-09070-OPE/A		70A	140A			
BCPC-09085-OPE/A		85A	170A			
BCPC-090100-OPE/A		100A	200A		221*140*59mm	1.45kg
BCPC-090140-OPE/A		140A	280A		221*140*85mm	1.8kg
BCPC-090210-OPE/A-MD		210A	300A			
BCPC-090210-OPE/A-LG		210A	300A		265*140*85mm	2.2kg
BCPC-090250-OPE/A		250A	330A			
BCPC-18015-OPE/A	18~180 VDC	16A	32A		167*100*35mm	0.45kg
BCPC-18035-OPE/A		35A	70A		200*114*59mm	1.10kg
BCPC-18050-OPE/A		50A	100A			
BCPC-18070-OPE/A		70A	140A		221*140*59mm	1.45kg
BCPC-180100-OPE/A		100A	200A		265*140*85mm	2.2kg
BCPC-13570-OPE/A	18~135 VDC	70A	140A		221*140*59mm	1.45kg
BCPC-135100-OPE/A		100A	200A		221*140*85mm	1.8kg
BCPC-135140-OPE/A		140A	200A			
BCPC-125210-OPE/A		210A	300A		265*140*85mm	2.2kg

BC series terminal definition





BC series dimensions drawing



Model number	L	L1	W	W1	W2	W3	W4	H	H1	H2	H3	H4
BCPC-02~15A	141	134	32	/	4.5	/	15.5	90	51	18	4.5	134
BCPC-20~35A	167	160	35	/	2-4.5	/	19.5	100	51	22	4-4.5	160
BCPC-50A~85A	200	190	59	4-5.0	/	25	/	114	60	32.5	4-4.8	190
BCPC-100A	221	211	59	5	/	25	/	140	60	45	4.8	211
BCPC-140A210A	221	211	85	5	/	25	/	140	/	/	/	211
BCPC-250A	265	255	85	5	/	25	/	140	/	/	/	255

1、Product introduction：

1. 1 An overview of the

BC Series programmable intelligent servo drive is a universal, high performance, DC powered, compact full digital servo drive. Brushless servo motor position, speed, torque control. Support incremental encoder, digital hall feedback; Absolute encoder Tama Agawa protocol;rotary transformer (external conversion card).

1. 2 Technical characteristics

◆Control mode: position, speed, torque；

◆Programmable protection: position error, over current, over voltage or under voltage, I2t, output short circuit, overload and other multi-directional protection functions；

◆Drive motor type: brushless motor, servo motor, wheel motor；

◆Position feedback: incremental encoder, digital Hall feedback; Absolute encoder Tama Agawa protocol;rotary transformer (external conversion card).

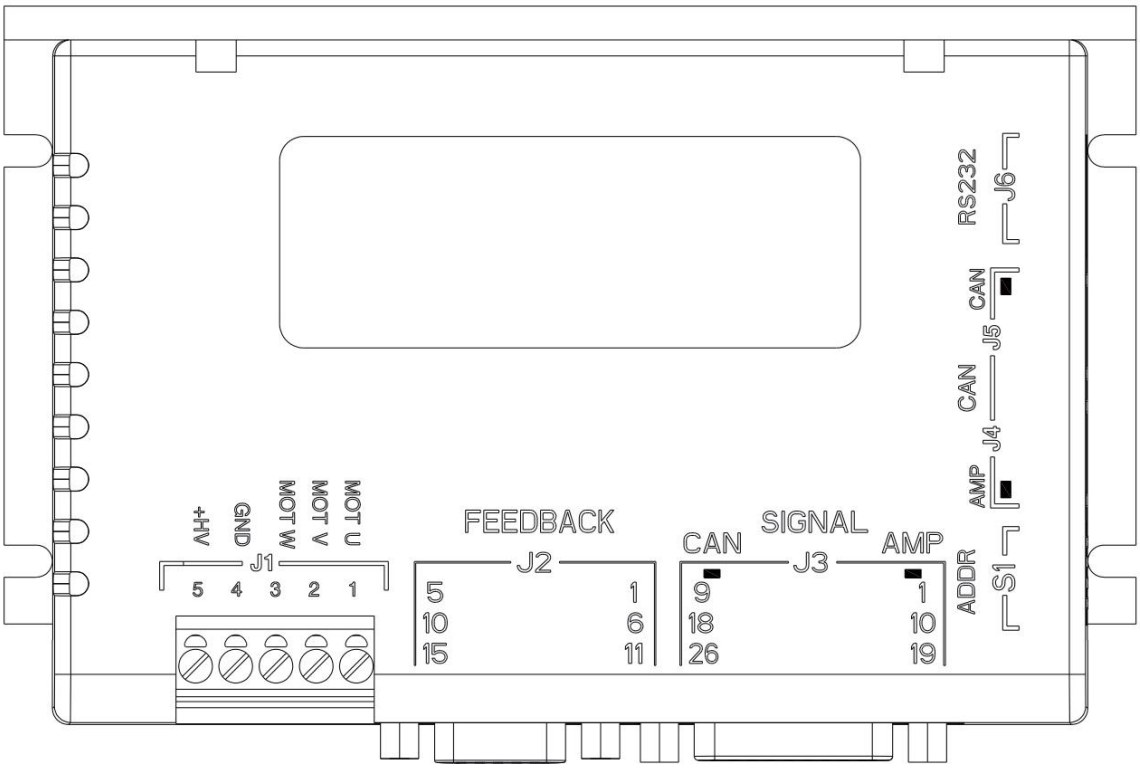
◆Pulse response frequency up to 2MHz, with digital filtering function.

◆Communication mode：

1. RS232 serial interface, baud rate up to 115KB；
2. RS485 MODBUS RTU serial interface, baud rate up to 115KB;
3. CAN communication, compatible with CANopen DS-402, baud rate up to 1MHz，Support PVT, zero return, interpolation ；

Note：Only one RS485 or CAN can be selected

◆Power supply voltage：18-90(135/180)VDC；



1.3 Servo drive electrical specifications

Position control	Command control mode			Pulse, ±10V analogue, CANopen, RS485 MODBUS RTU
	Input signal	Pulse instruction	Input pulse pattern	Includes "direction + pulse", "A, B phase orthogonal pulse", "CW/CCW pulse" three command forms.
			Signal format	Open collector
			Maximum pulse frequency	Open collector：（Max. 500Kpps）
		Analog instruction	Voltage range	Input voltage range ±10V
			Input impedance	Differential input impedance=5KΩ
Speed control	Command control mode			PWM、RC model aircraft signal、±10V analogue、CANopen、RS485 MODBUS RTU
	Input signal	PWM	Polarity	PWM=0∽100%，polarity=1/0
			Nonpolar	PWM=50% +/-50%，
			Frequency range	Minimum 1 kHz，maximum 100 kHz
			Minimum pulse width	220ns
		RC model aircraft signal		
		Analog instruction	Voltage range	Input voltage range ±10V
			Impedance	Differential input impedance =5KΩ
Current control	Command control mode			±10V analogue、CANopen、RS485 MODBUS RTU
	Input signal	PWM	Polarity	PWM=0∽100%，polarity=1/0
			Nonpolar	PWM=50% +/-50%，
			Frequency range	Minimum 1 kHz，maximum 100 kHz
			Minimum pulse width	220ns
		Analog instruction	Voltage range	Input voltage range ±10V
			Impedance	Differential input impedance =5KΩ
I/O signal	Digital input IN		Number of Ports	12 (IN6, IN7, IN8, IN9, IN10 are high-speed ports, maximum voltage 12V), other input ports maximum input voltage 24V.
			Signal format	NPN,PNP（The software setup input is NPN or PNP）
			Settable function	Servo enable, external reset, forward/reverse limit, motor stop, high-speed pulse input, etc.
	Digital output OUT		Number of Ports	3
			Signal format	NPN (low level effective), can withstand the maximum current 300mABC, the maximum voltage 30VBC
			Settable function	Fault signal, lock control
Function	LED indicator			Drive status indication, communication indication
	Communications functions	RS-232	Baud rate	9600-115200
			Agreement	Full duplex mode, ASCII or binary format
		RS485	Baud rate	9600-115200
			Agreement	MODBUS RTU
		CAN	Baud rate	20kbit/s-1Mbit/s
			Agreement	Canopen application layer DS-301V4.02
			Equipment	Dsp-402 device driver and motion control,Support PVT, zero return, interpolation.
	Protection function			Over-voltage,over-current,under-voltage,overload,overheat, encoder abnormality, position tracking error, etc. protection
Use environment	Installation location			Non-corrosive gas, flammable gas, etc
	Altitude			Below 1000 m
	Temperature			0℃~+50℃
	Humidity			5%~95%RH，No condensation of water droplets
	Resistance to vibration/impact			Less than 4.9m/s2/ less than 19.6m/s2

2、Definition of wiring port

2.1 Power input terminal J1

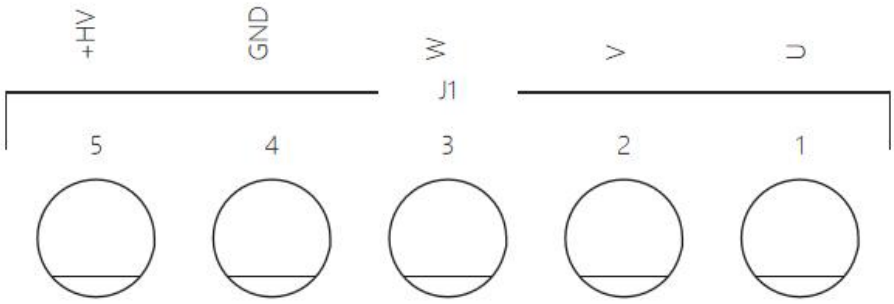


Figure 2.1 Ohm gauge terminal receptacle

serial number	define	terminal	Wiring instructions
1	U	Motor power line U phase	Must be connected to the motor one by one according to the label
2	V	Motor power line V phase	
3	W	Motor power line W phase	
4	GND	Input power -	+18~90(135/180)VDC
5	+HV	Input power +	

2.2 Motor encoder input terminal J2

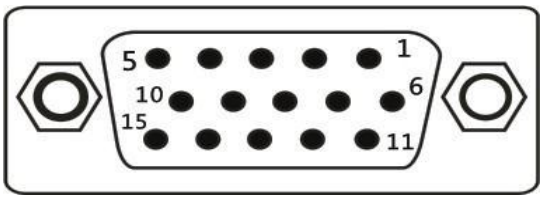


Figure 2.2 three rows of DB15 female seats

pin	define	function	pin	define	function
1	NTC*	NTC resistance temperature sensor wiring	9	W+	Motor encoder W+ input
2	NTC*		10		
3	U+	Motor encoder U+ input	11	B-(DAT-)	Motor encoder B- input (Absolute value coder DAT-)
4	+5V	Motor signal line +5V	12	B+(DAT+)	Motor encoder B+ input (Absolute value coder DAT+)
5	0V	Motor signal cable GND	13	A-	Motor encoder A- input
6	V+	Motor encoder V+ input	14	A+	Motor encoder A+ input
7	Z-	Motor encoder Z- input	15	IN5*	Temperature switch sensor wiring
8	Z+	Motor encoder Z+ input			

Note: 1. For hub motor, if the encoder input signal is single-ended open-collector signal, A connects to pin 13 and B connects to pin 11;

2. *If you need Need NTC resistance temperature sensor input function, order please indicate;

3. *If the temperature switch sensor input function is required, connect to pin 1 and pin 15, order please indicate

2.3 Control signal I/O terminal J3

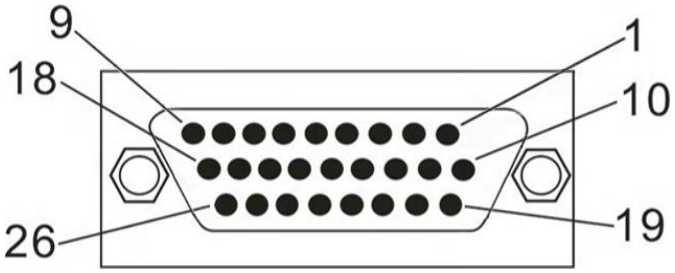


Figure 2.3 Three rows of DB26 female seats

pin	define	function	pin	define	function
1	GND	grounding	14	IN10	custom
2	Ref-	Analog quantity - input	15	IN5	Motor temperature
3	Ref+	Analog quantity + input	16	OUT1	custom
4	IN1	Hardware enable only	17	OUT2	custom
5	IN2	custom	18	OUT3	custom
6	IN3	custom	19	GND	power ground
7	IN4	custom	20	+5V	5V power output (100mA)
8	IN11	custom	21	EONZ-	Motor encoder output signal Z-
9	IN12	custom	22	EONZ+	Motor encoder output signal Z+
10	IN6	custom	23	EONB-	Motor encoder output signal B-
11	IN7	custom	24	EONB+	Motor encoder output signal B+
12	IN8	custom	25	EONA-	Motor encoder output signal A-
13	IN9	custom	26	EONA+	Motor encoder output signal A+

Note: Only incremental encoders can output motor encoder signals.

2.4 CAN (RS485)communication terminal J4&J5

The driver communication port has two kinds, one is the crystal head, the other is the 6p terminal, defined as follows

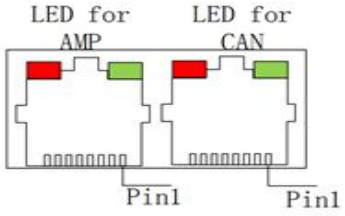


Figure 2.4. RJ45 8-pin crystal socket

RJ45Defined as follows

pin	definition	function
1	CANH (RS485_A)	CANH signal(RS485_A signal)
2	CANL (RS485_B)	CANL signal(RS485_B signal)
3/7	GND	Communication power grounding

Note: The two RJ45 ports in J4/J5 are defined in the same way to facilitate bridging during communication.

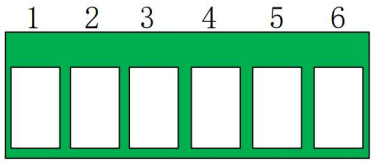


Figure 2.4.2 6P terminal

6P wiring terminals are defined as follows

pin	definition	function
1	CANH（RS485_A)	CANH signal(RS485_A)
2	CANH（RS485_A)	CANH signal(RS485_A)
3	C_GND	communicatively
4	C_GND	communicatively
5	CANL(RS485_B)	CANL signal(RS485_B)
6	CANL(RS485_B)	CANL signal(RS485_B)

3、 Definition of indicator Status

3.1 Drive status indicator（AMP）

Red/green leds tell us the status of the drive by changing color and blinking or not. Possible scenarios include:

Green/no flash	drive is OK and enabled
Green/Slow blinking	drive is OK but not enabled. After enabled, it can run
Green/Flash	Positive limit switch or negative limit switch is effective, the motor will only move in the direction not prohibited by the limit switch
Red/Fixed	Instantaneous failure, after troubleshooting amplifier restart operation
Red/flashing	Lock the fault and restart the amplifier to resume operation

3.2 CAN Communication indicator

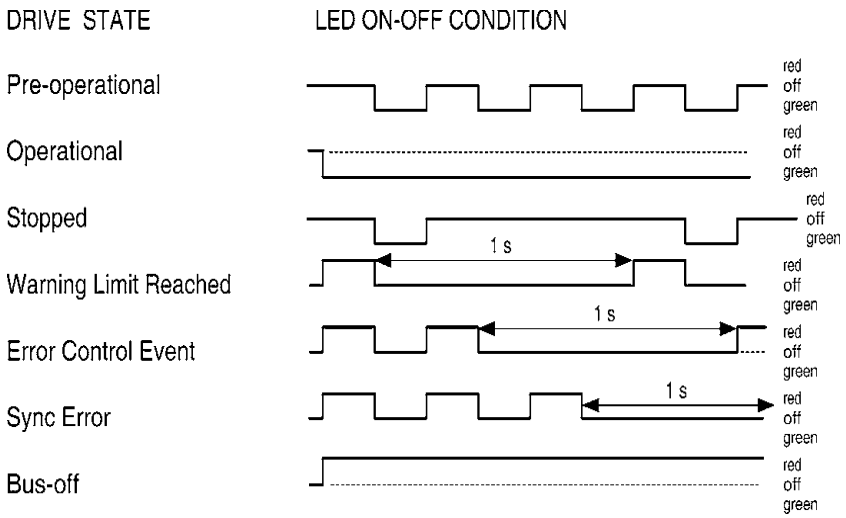
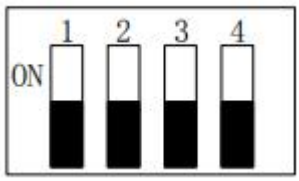


Figure 3.2 CAN communication indicators

3.3 ADDR S1 DIP switch

The switch is used to dial the driver communication station number, and the switch is dialed according to the BCD code encoding mode

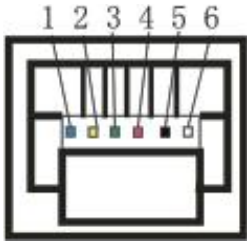


S1Indicates the station number of the DIP switch

S1 switch Number	Corresponding station number
1	1
2	2
3	4
4	8

For example, to set the station number to 3, S1 switch 1,2 to ON, other OFF,1+2=3; If you want to set the station number to 12, switch S1 3,4 to ON, and the others to OFF,4+8=12

3.4 Serial communication terminal J6

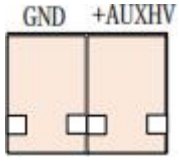


pin	definition	function
2	RXD	RS232 communication receiver
3	GND	Communication power grounding
5	TXD	RS232 communication sender

Figure 3.6 RJ11 6-pin crystal head holder

3.5 Auxiliary power supply J7

If there is a driver with J7 socket, this is the auxiliary power port. If necessary, you can connect it. If connected,+HV is disconnected from power and +AUXHV is powered on, but there is no action when issuing commands

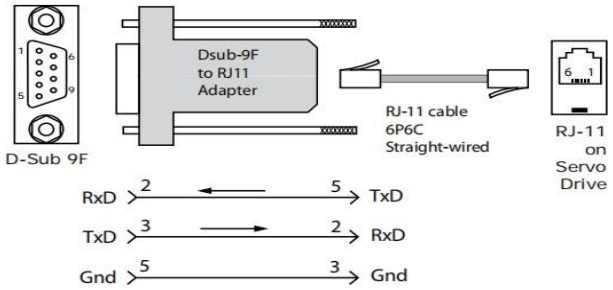


GND	0V
+AUXHV	+24V (or ≤ mains voltage)

4、Control port hardware description

4.1 RS-232 Communications (RXD，TXD，GND)

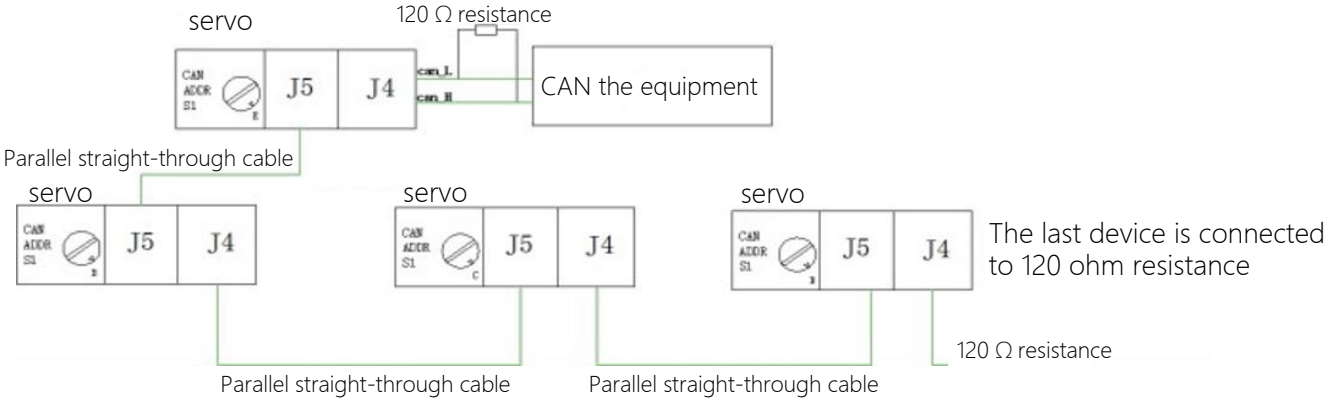
The serial ports are full-duplex and three-wire (RXD, TXD, GND)RS-232, with a baud rate from 9600 to 115200. The wiring terminal is J6 through the debugging software or serial port debugging tool. The debugging cables are shown as follows



4.2 CAN bus (CANH,CANL,GND) and RS485 wiring

CAN bus is based on CAN V2.0B physical layer. The signals of CAN physical layer include CANH, CANL and GND, and communicate with CANopen protocol. Electrical interface uses TJA1051 high speed transceiver. The physical address of the drive CAN communication ranges from 0 to 127. The default address is 0. You can change the rS-232 communication port address, reset or restart the drive to take effect. Through the CAN communication interface, a very effective combination of high data rate and low cost multi-axis motion control system CAN be realized. The wiring terminal is J4/J5.The RS485 bus connection is the same as that of CAN.

CAN network CAN be connected as shown below:



Note: The total resistance on the CAN network is 60 ohms. If the first driver on the CAN device has a resistance, no resistance is required

4.3 Analog signal input (Ref+,Ref-)

±10Vdc differential analog input, maximum input voltage ±10Vdc, input impedance about 5.36K, resolution 12 bits. The analog signal can be used for torque, speed and position control.

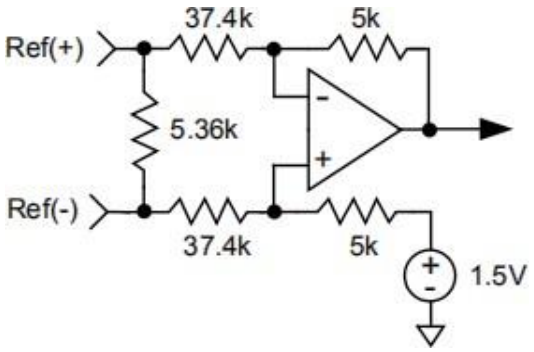


Figure 4.3.1 Analog hardware input circuit

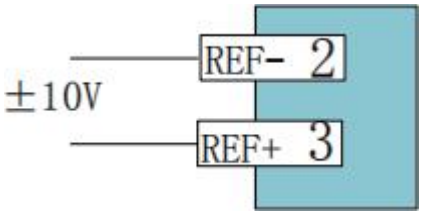


Figure 4.3.2 Analog input wiring of external power supply

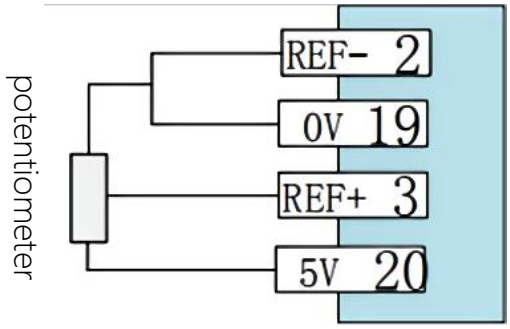


Figure 4.3.3 Analog input wiring of internal power supply

4.4 Digital input signal

BC series servo has 12 digital input ports, 11 have programmable function, drive power PWM output and security enable fixed by IN1 control, through this port can achieve power circuit hardware cut off.

According to the port function of controller and RC filtering time of hardware, the input signal port can be divided into universal input port and high-speed input port, and the function of each port can be changed programmatically.

4.4.1 Universal input signal terminal（IN1、IN2、IN3、IN4、IN5）)

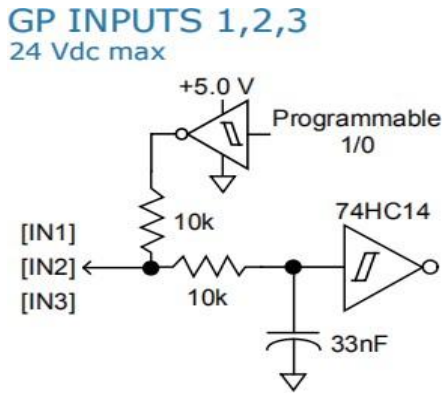


Figure 4.4.1 IN1-IN3 hardware input circuit

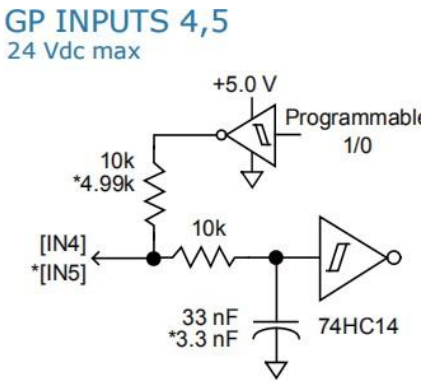


Figure 4.4.2 IN4-IN5 hardware input circuit

IN1, IN2, IN3, IN4, and IN5 are universal input signal terminals. The control logic and function can be set programmatically. IN1 is fixed for driver enable control, IN5 is mainly used for motor temperature protection input, through the software parameter setting high/low level takes effect.

4.4.2 High speed input signal terminal (IN6, IN7, IN8, IN9, IN10)

IN6, IN7, IN8, IN9,IN10 are high-speed input terminals. In addition to being used as general terminals, they can also be used as high speed pulse input. The pulse input port is fixed as (IN9,IN10).

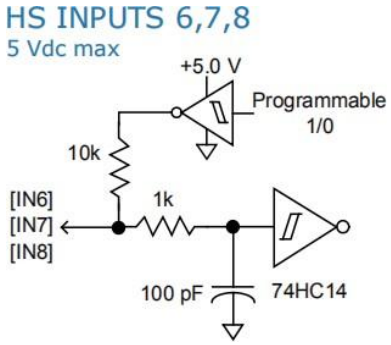


Figure 4.4.3 IN6,7,8 internal hardware diagram

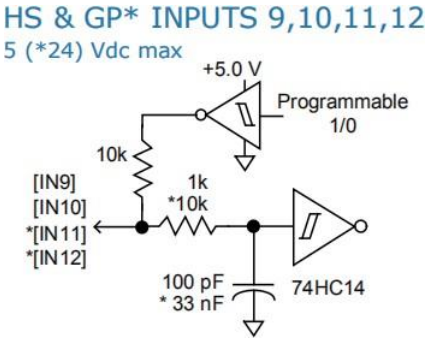


Figure 4.4.4 IN9,10,11,12 internal hardware diagram

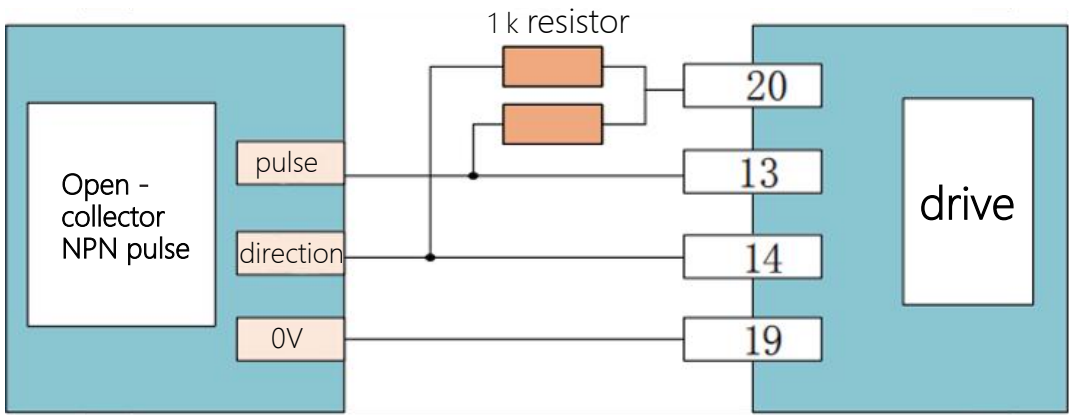


Figure 4.4.5 Open-collector NPN pulse input diagram

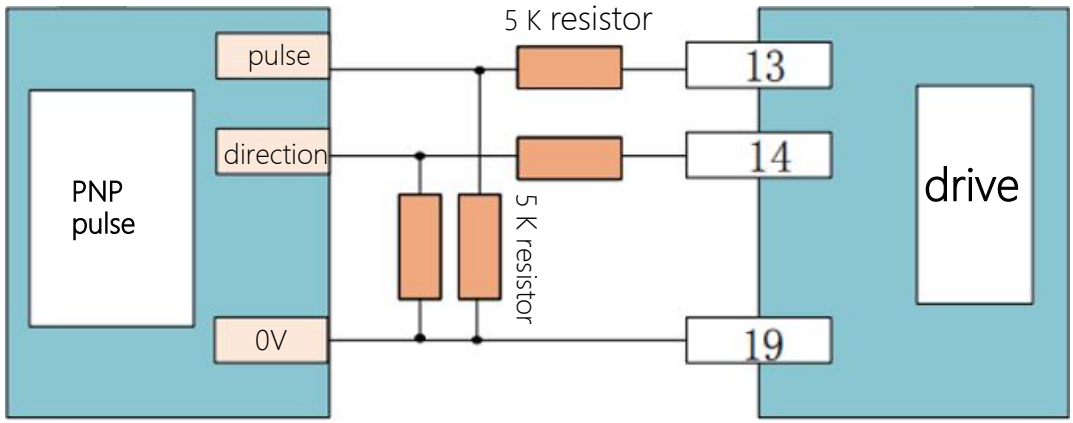


Figure 4.4.6 PNP pulse input diagram

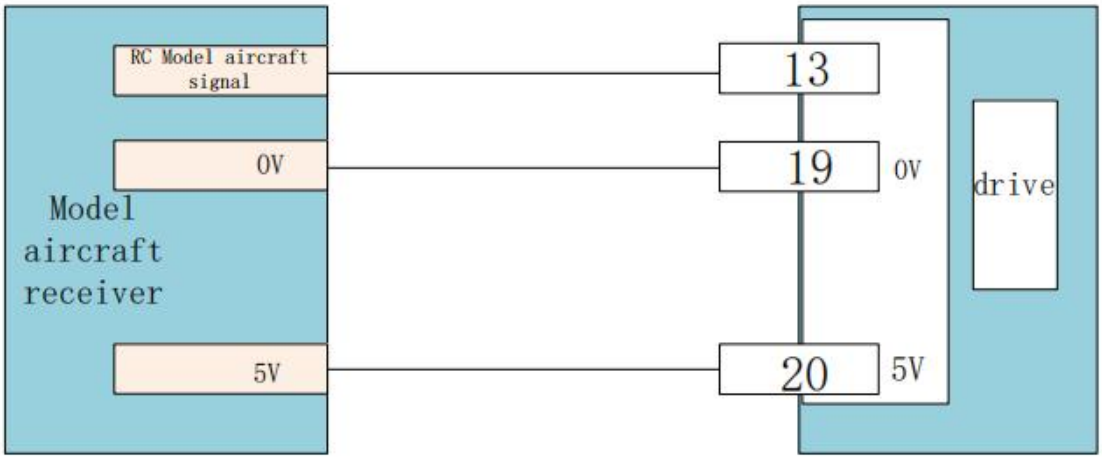


Figure4.4.7 RC model signal wiring diagram

4.5 Digital output signal

BC series driver has 3 digital output, digital output IO port with MOSFET open output, internal through the diode series 1k resistor to pull up to 5V, the port can withstand voltage up to 24VBC, the current can withstand up to 300mADC. The output function of the port can be changed according to internal programming.

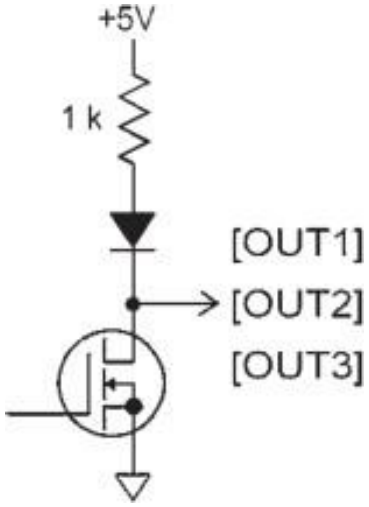


Figure 4.5 Digital output hardware circuit

4.5.1 motor locks the brake

The digital output ports OUT1, OUT2 and OUT3 can all be set as motor lock brake control. In the case of no fault and motor enabling, the brake is energized and the brake is released. In the case of any fault, the brake power is quickly disconnected to stop the motor. Since the motor brake is a perceptual device, the reverse current return diode must be connected in parallel.

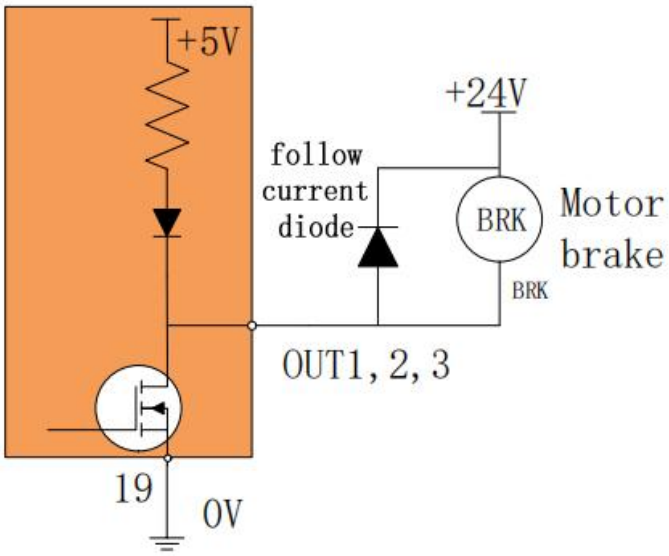


Figure 4.5.1 External circuit of motor brake

4.6 PWM signal input

4.6.1 Single-ended PWM duty cycle =0~100% pulse control

The motor speed and torque can be controlled by PWM signal, including single-end PWM duty cycle + direction signal

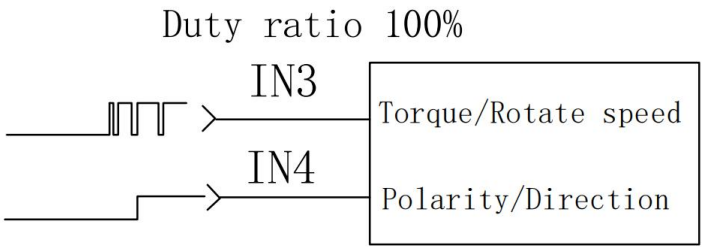
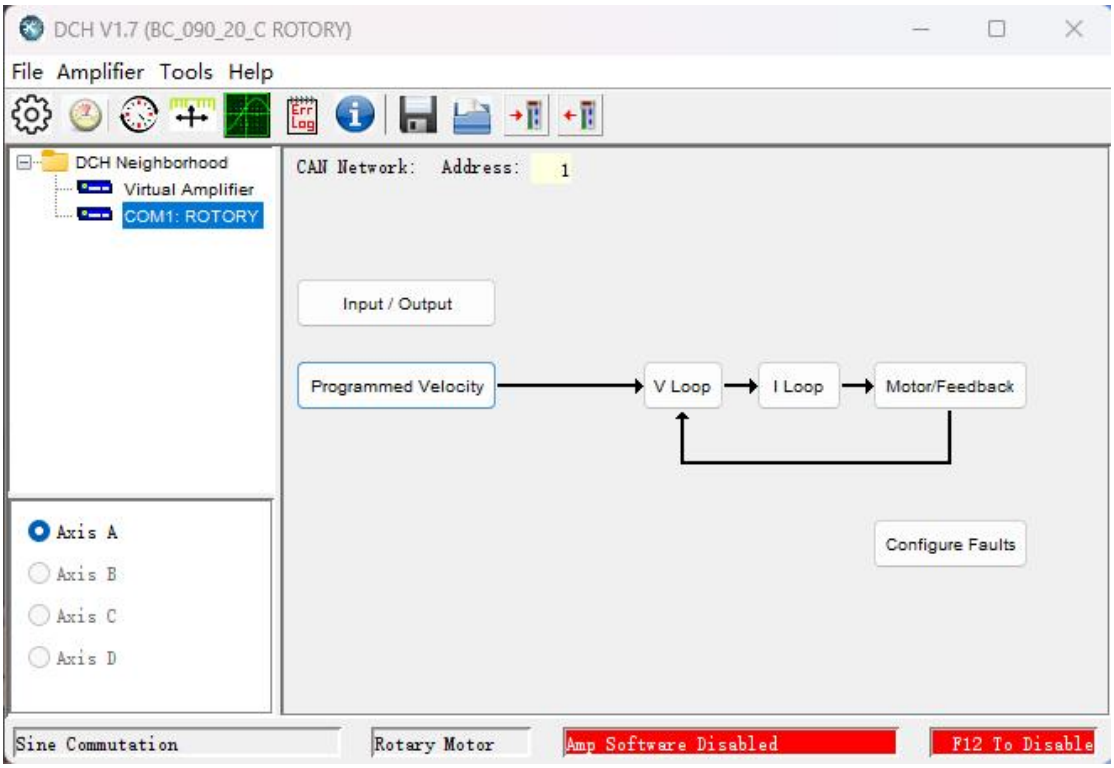


Figure 4.6.1 100% duty cycle + direction control

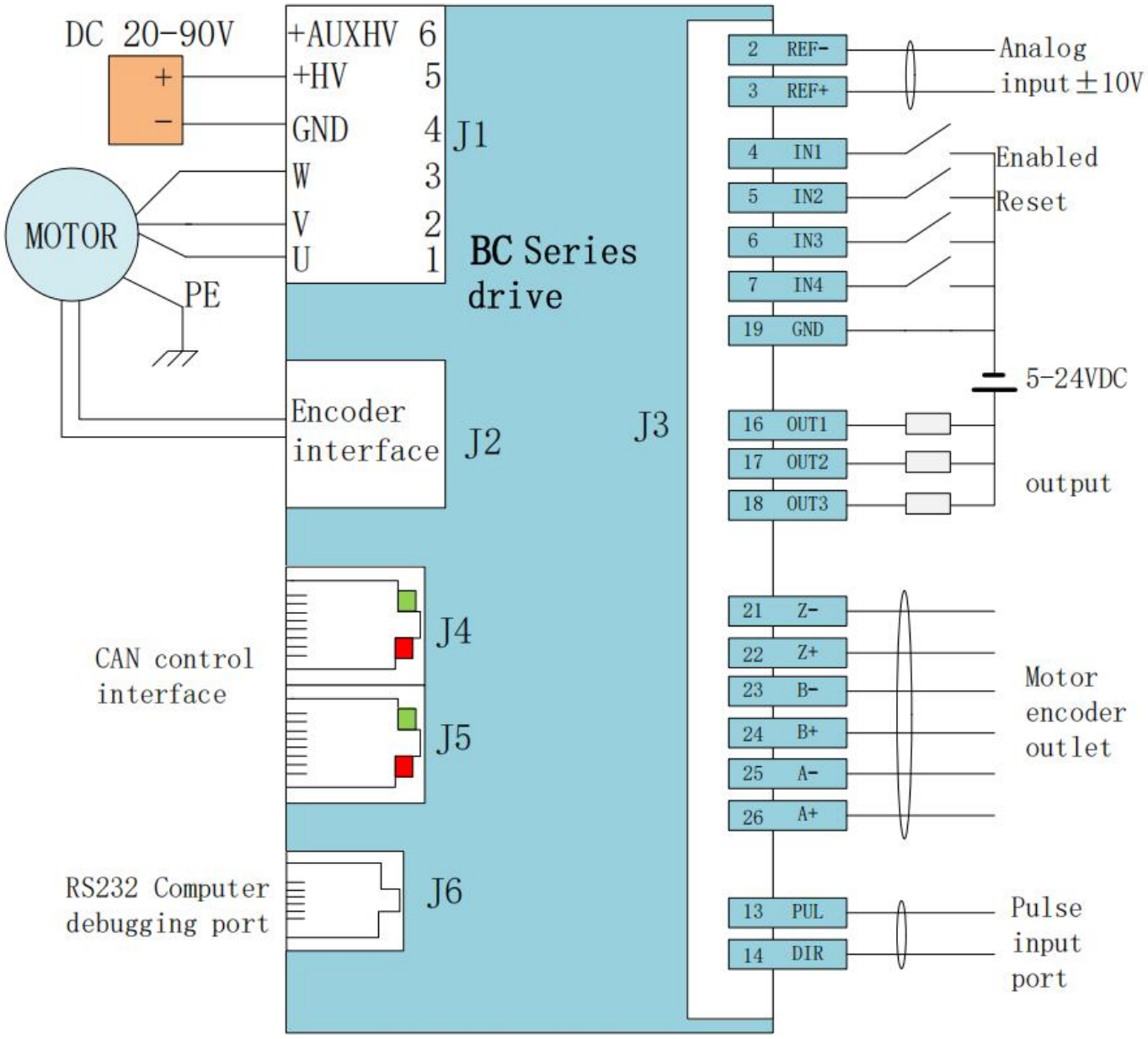
5 Driver parameter setting

BC series drive can be through RS232 serial port, through DCH tuning software can set parameters, monitor motor status, collect data waveform, etc. Complete system debugging quickly and intuitively. For details, see the debugging software instructions.



6、 BC servo system wiring diagram

6.1 Typical wiring diagram



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