The products of our laser cutting system which you have already bought:

1.BMC1204 : Motion controller Card, X\Y Axis controller, Laser and Gas.
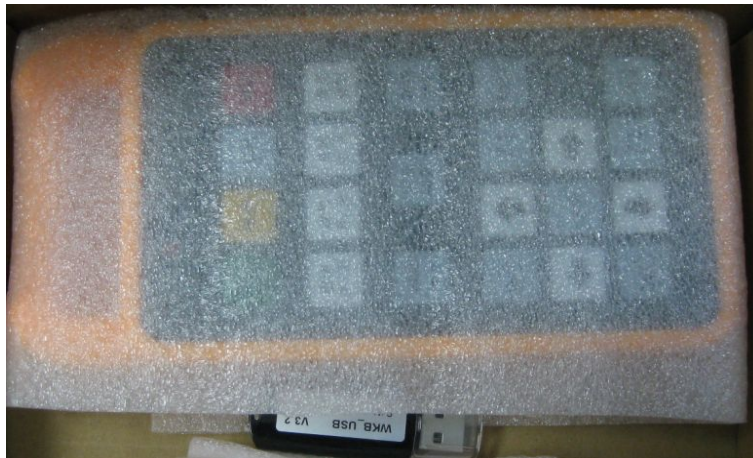
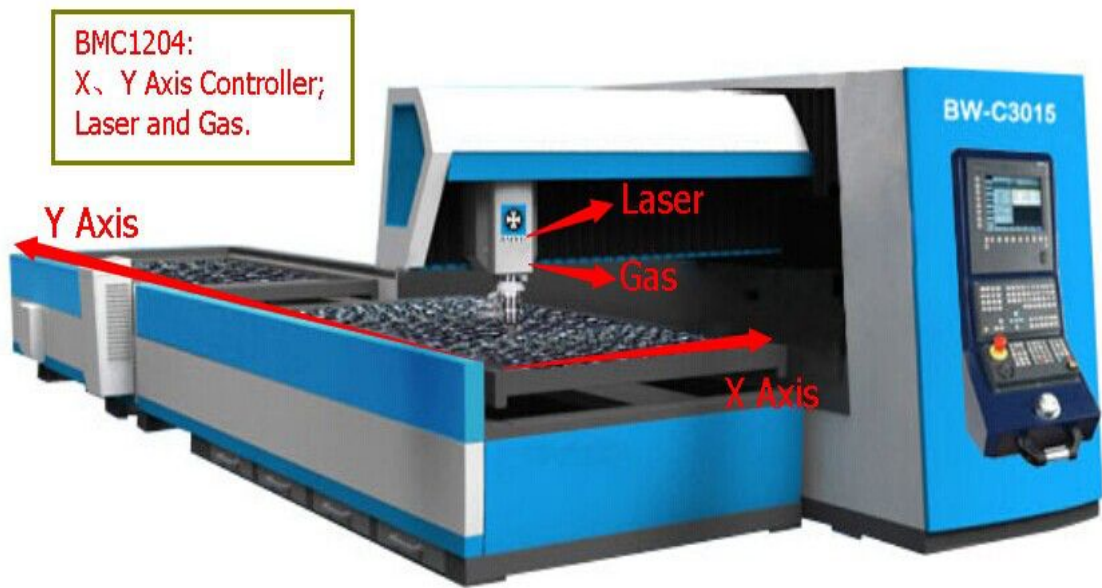**2.BCS100 :** Height controller \ Z Axis controller.

3.CYPCUT: Laser cutting software and a Micro Dog.

  Download from www.fscut.com or get it from our technical personnel.

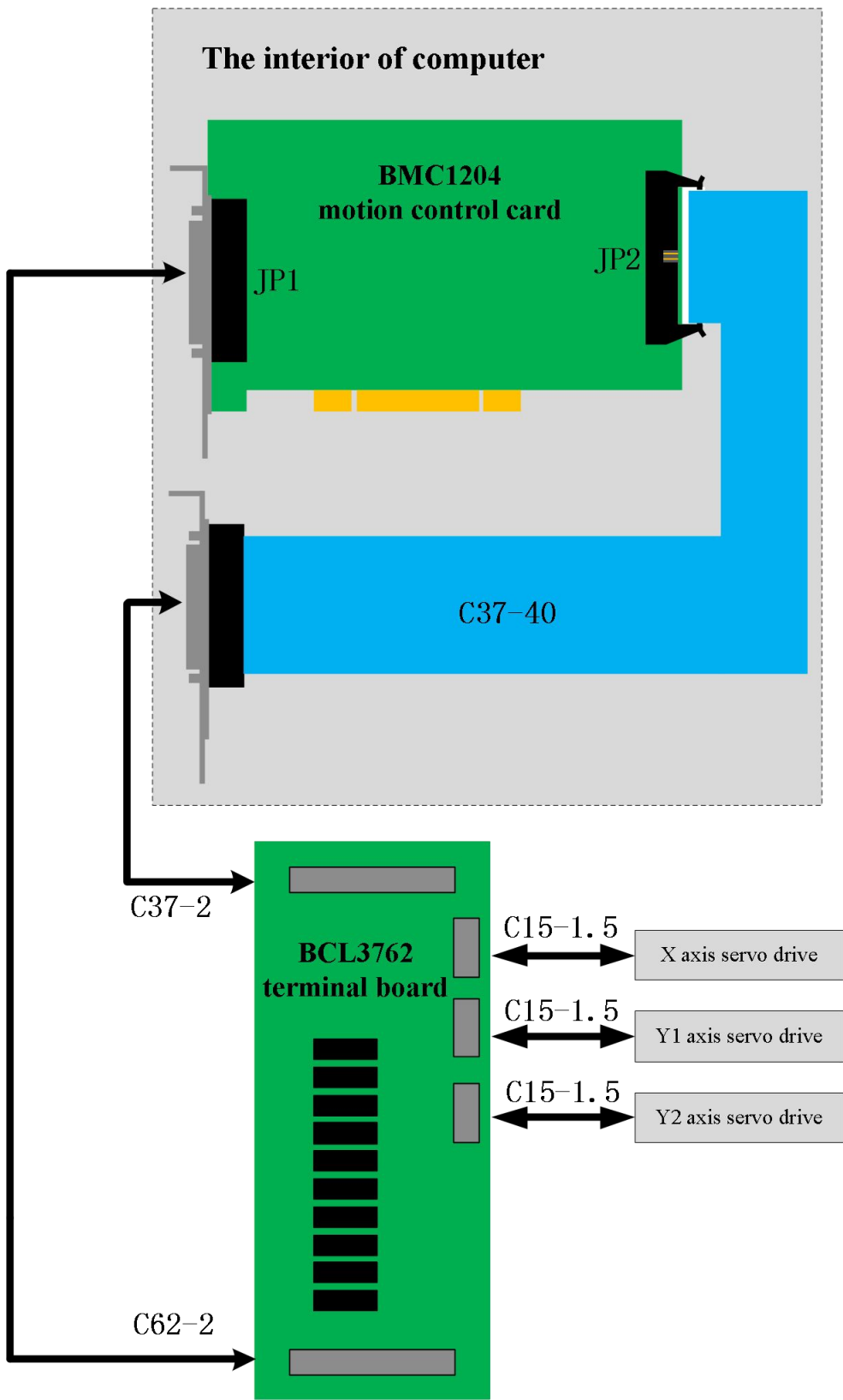**4.WKB:** Wireless Keyboard and a USB receiver.

BMC 1204 :

BCS 100:
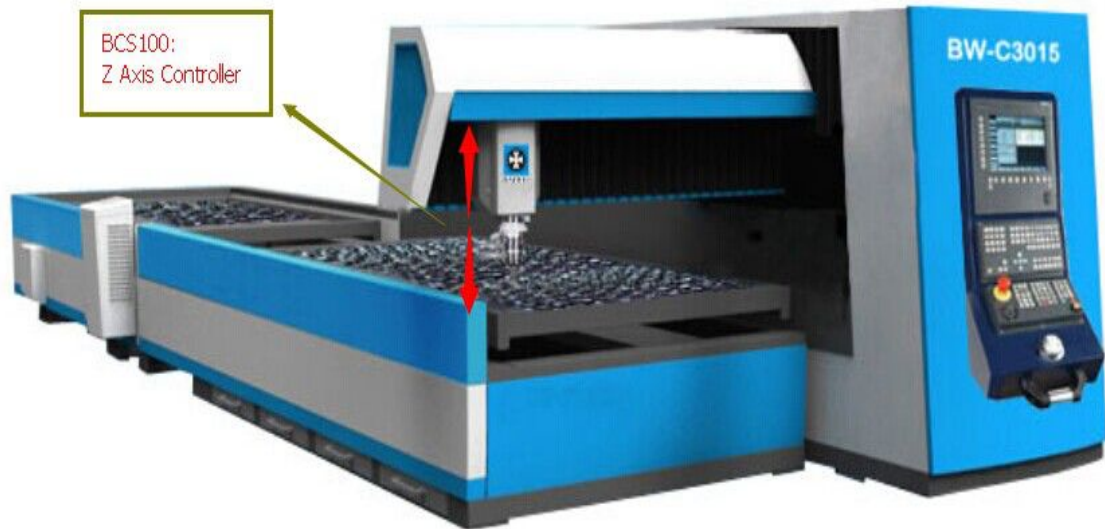
How To Connect BMC 1204 Card :

The interior of computer

BMC1204
motion control card

JP1

JP2

C37-40

C37-2

BCL3762
terminal board

C15-1.5 → X axis servo drive

C15-1.5 → Y1 axis servo drive

C15-1.5 → Y2 axis servo drive

C62-2

62-pin cable

37-pin cable

37-40 cable

37-pin cable

62-pin cable

BMC 1204

PCI slot

37-40 cable
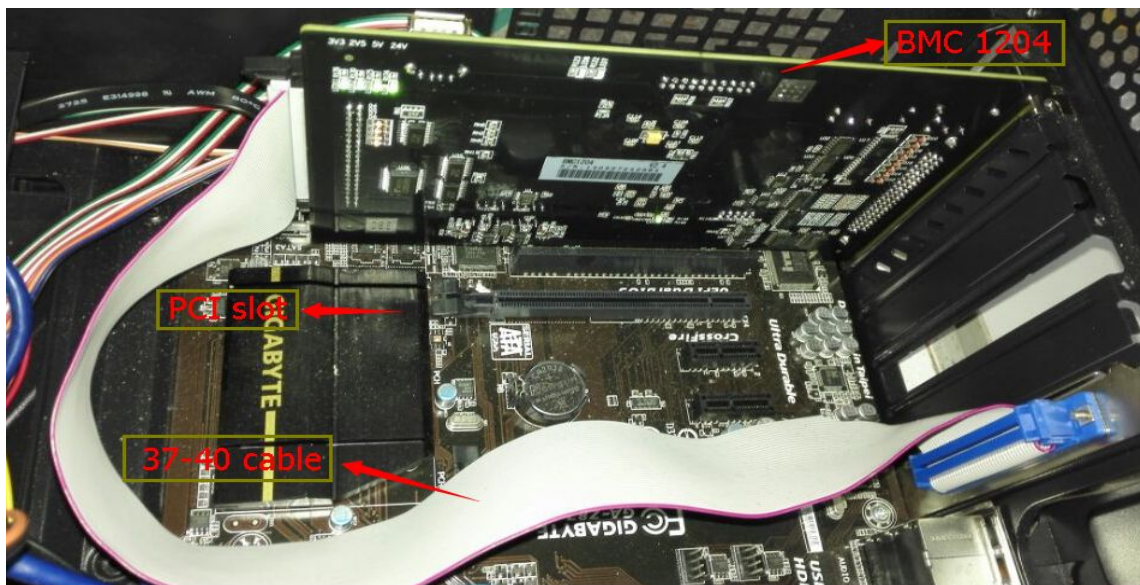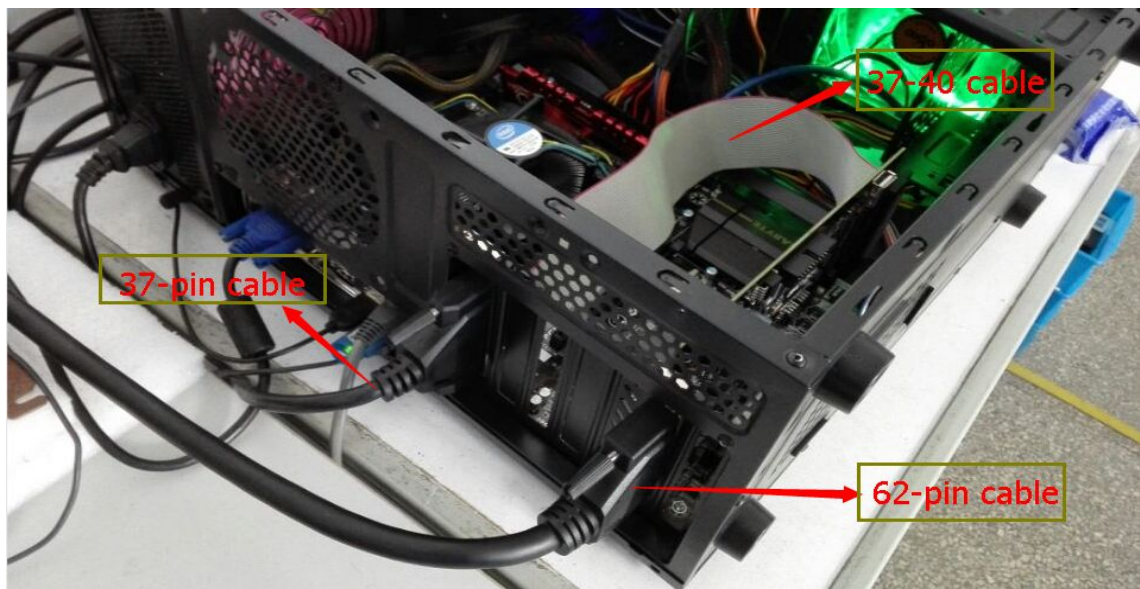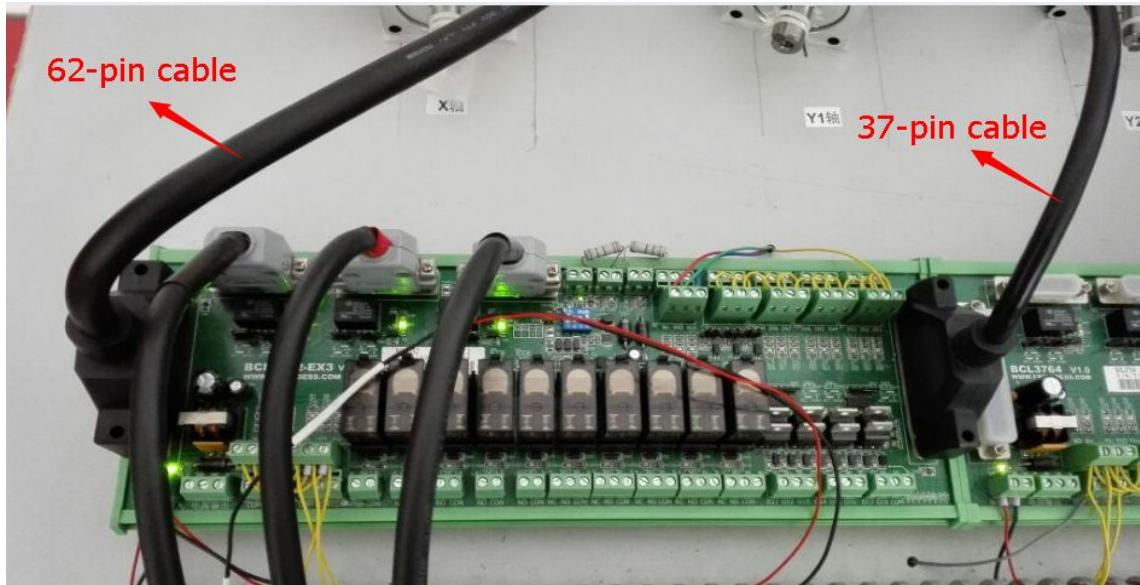
The details of the Installation Steps:

⚠️	Please carefully handle them, and touch effective grounded metal parts before touching control card system or inserting/removing control card to prevent static electricity from damaging motion control card, and please wear electricity-proof gloves

(1) Shut down computer, insert control card into PCI slot, and fix control card and catch screw of expansion winding displacement;

(2)Start the computer and "Found New Hardware Wizard" pops up; click "Cancel" button as shown below. If this window does not pop up, it means control card is not inserted correctly, so please repeat step one;

(3)Install CypCut software, simultaneously BMC 1204 card driver and softdog;

(4)Open the device manager to confirm the installation successfully. If the following icon appeared:
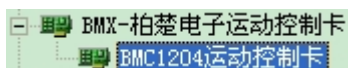
 it show that the installation was successful.

Recovery processing

(1) if starting the computer, "Found New Hardware Wizard" does not popup, or control card cannot be found in device manager, which means control card is not inserted correctly. Please replace PCI slot or computer, insert and fix control card then, and reinstall the software.

(2) if there is yellow exclamation mark with the device, please double click

PCI Device ,open attribute page and select "details".

(3) The first half of "device instance ID" is PCI\VEN_6125&DEV_1204, which means the computer correctly identifies motion control card and software installation may fail. Please reinstall Cypcut software. If it fails again, please contact with our technician;

(4) The first half of "device instance ID" is not PCI\VEN_6125&DEV_1204, which means the computer doesn't identify motion control card. Please shut down the computer,change the PCI slot, fix the control card again and reinstall the software.

(5) If step three still fails, control card may be damaged, please contact with our technician.

The configuration terminal board of BMC1204 is BCL3762-V5.0 :

The interface of BCL3762 includes : DB62-pin、37-pin socket; 15-pin X\Y axis Servo;Laser signal; 24V Power Input; X\Y limit or origin signal; 18 Output and 12 Input.
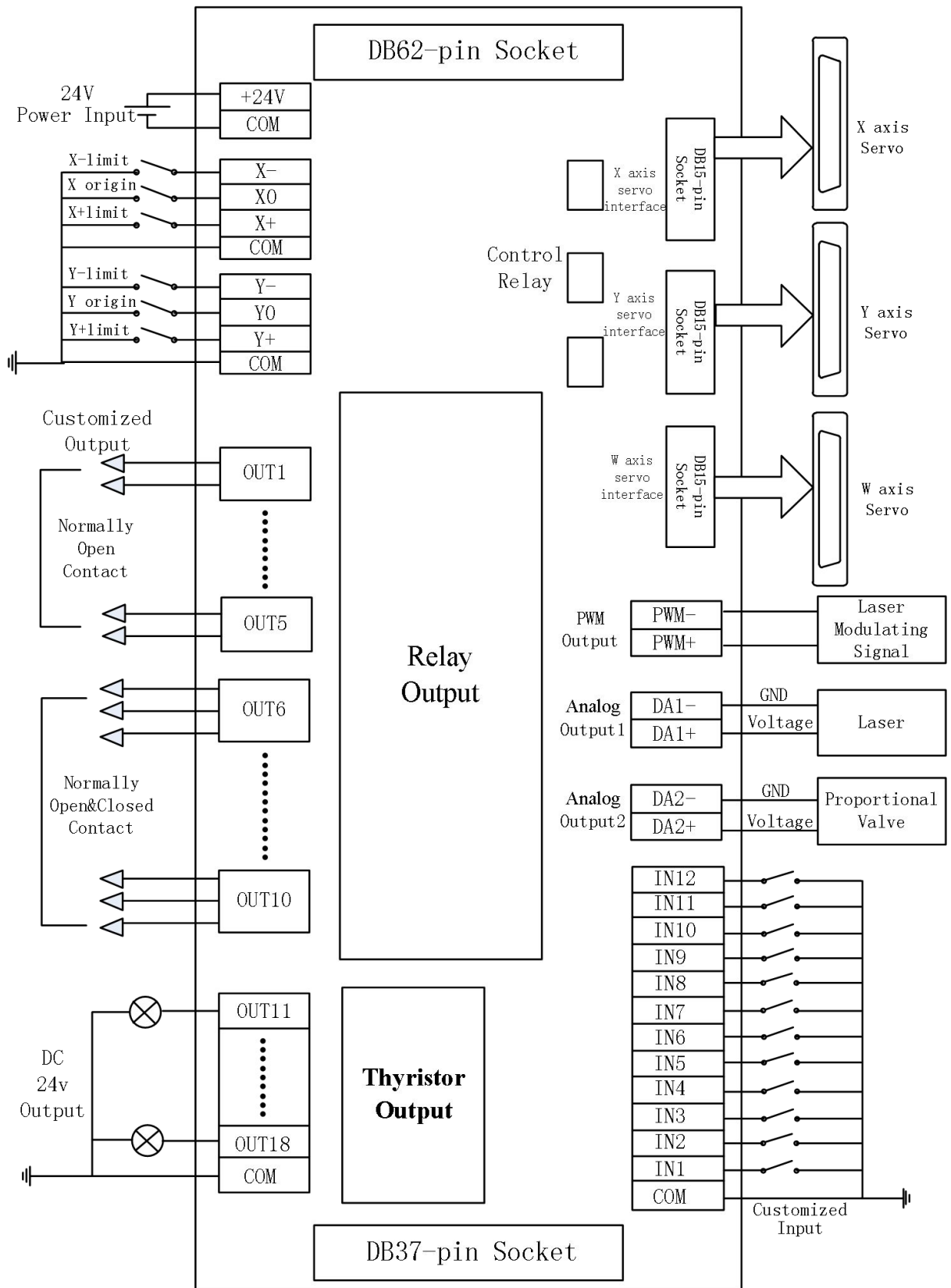
Servo control interface：

The three servo control interfaces on BCL3762 are DB15 two-row bores, and pin definition as below:
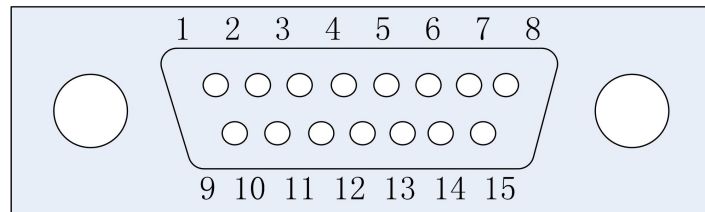
15-pin servo control interface					
Pin	Line color	Signal	Pin	Line color	Signal
1	yellow	PUL+	9	yellow-black	PUL-
2	blue	DIR+	10	Blue-black	DIR-
3	black	A+	11	Black-white	A-
4	orange	B+	12	Orange-black	B-
5	red	Z+	13	red-black	Z-
6	green	SON	14	purple	ALM
7	Green-black	CLR	15	Brown-black	0V
8	brown	24V			

+24V,0V:24V DC power supply for servo drive;

SON:servo on,the output of servo enable signal;

ALM:alarm,the input of servo alarm signal;

PUL+,PUL-:pulse(PULS),differential output signal;

DIR+,DIR-:direction(DIR),differential output signal;

A+,A-,B+,B-,Z+,Z-:three phase of encoder,input signal;

Please read below information when connecting driver of other brands:

(1) Please determine whether the type of servo driver SON signal you select with active low level (It is ON when connecting with 24V GND break-over)

(2) Determine servo driver parameters are: pulse signal type is "pulse + direction"

(3) Determine whether servo driver input terminal with external crash stopping signal input and the signal logic

(4) Before servo trial operation, provide 24 V power supply for terminal board, for servo needs 24 V power supply provided by terminal board

(5) if driver still cannot run, confirm that driver parameter is not using "positive &negative input inhibit"

(6) Connect shielding layer of signal line with servo driver case

Please see the figure below for connection of Panasonic, Yaskawa servo drivers：

DB15 servo interface   Panasonic MINAS-A servo 50-pin interface

PIN	No.		No.	PIN
PUL+	1	Shielded wire	3	PULS1
PUL-	9		4	PULS2
DIR+	2		5	SIGN1
DIR-	10		6	SIGN2
A+	3		21	OA+
A-	11		22	OA-
B+	4		48	OB+
B-	12		49	OB-
Z+	5		23	OZ+
Z-	13		24	OZ-
24V	8		7	COM+
SON	6		29	SRV-ON
CLR	7		31	A-CLR
ALM	14		37	ALM+
0V	15		41	COM-
			36	ALM-

DB15 servo interface   Yaskawa Σ-V servo 50-pin interface

PIN	No.		No.	PIN
PUL+	1	Shielded wire	7	PULS
PUL-	9		8	*PULS
DIR+	2		11	SIGN
DIR-	10		12	*SIGN
A+	3		33	PAO
A-	11		34	*PAO
B+	4		35	PBO
B-	12		36	*PBO
Z+	5		19	PCO
Z-	13		20	*PCO
24V	8		47	+24V IN
SON	6		40	/S-ON
CLR	7		44	/ALM-RST
ALM	14		31	ALM+
0V	15		1	SG
			32	ALM-

Laser connection：

Here are some fiber lasers as examples, and lasers of other brands are similar.

IPG_YLR type laser 25-pin plug

1	safety interlock channel 1
2	safety interlock channel 2
3	safety interlock channel 2
4	safety interlock channel 1

Computer
RS232 DB9

5	RS232 Tx
6	RS232 Rx
7	RS232 COM

BCL3762_V5.0
terminal board

Dial switch
ON
1 2 3 4

PWM output

| PWM– |
| PWM+ |

| 15 | laser modulation+ |
| 16 | laser modulation– |

Any one of the relay outputs
(control PWM-enabled+)

| NO |
| CON |

Notes: The remote start button is not recommended, for it is easy to cause laser breakdown.

Any one of the relay outputs
(control PWM-enabled–)

| NO |
| CON |

Any one of the relay outputs
(control remote start)

| NO |
| CON |

| 10 | remote start button |
| 11 | remote start button |

SPI-500W R4 Laser Systems
InterLock

1	safety interlock channel 1
2	safety interlock channel 2
4	safety interlock channel 2
5	safety interlock channel 1

Computer
RS232 DB9

RS232 Comms Port

2	RS232 Tx
3	RS232 Rx
5	RS232 COM

BCL3762_V5.0
terminal board

Dial switch

ON

1 2 3 4

PWM output

| PWM- |
| PWM+ |

Any one of the relay outputs
(control PWM-enabled+)

| NO |
| CON |

Any one of the relay outputs
(control PWM-enabled-)

| NO |
| CON |

Mod Input TTL

| laser modulation+ |
| laser modulation- |
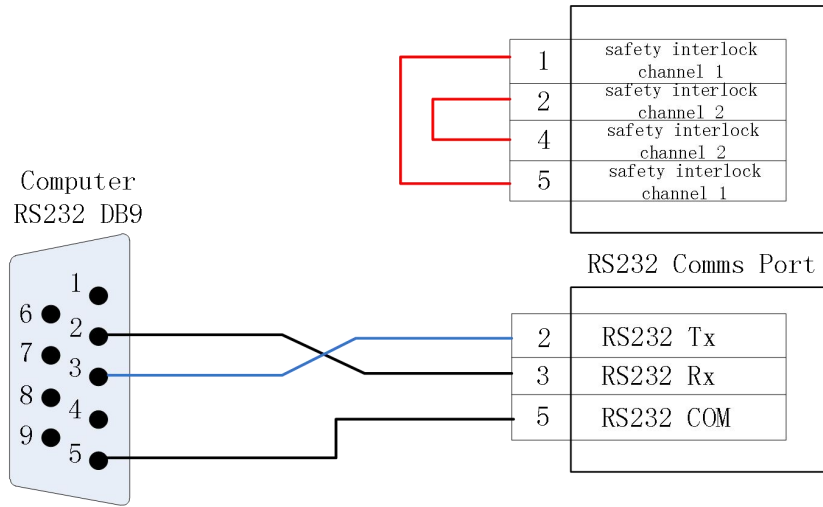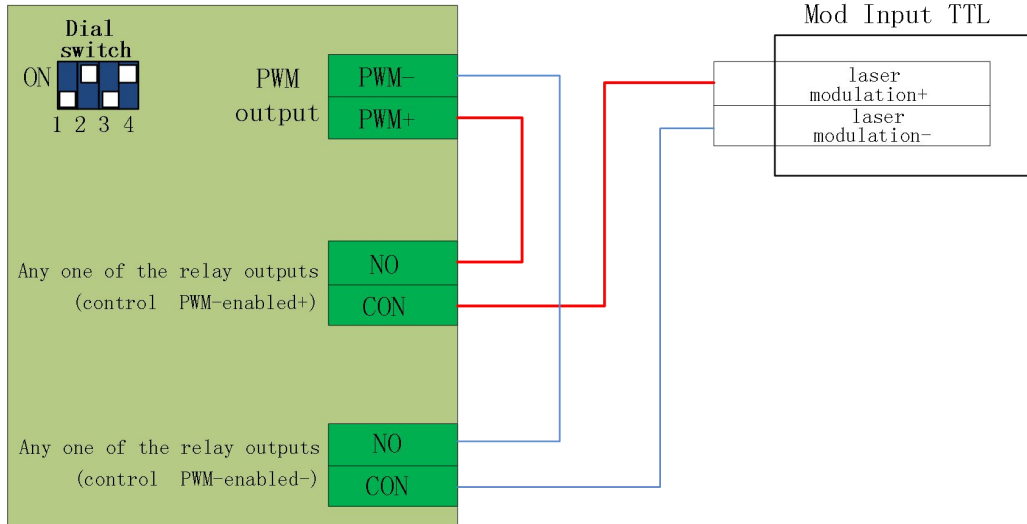
RayCus-400/500W Laser
InterLock

| b | safety interlock channel 1 |
| c | safety interlock channel 1 |

Computer
RS232 DB9

1
6 2
7 3
8 4
9 5

COMMAND RS232

2	RS232 Tx
3	RS232 Rx
5	RS232 COM

BCL3762_V5.2
terminal board

Dial switch
ON
1 2 3 4

PWM output

| PWM- |
| PWM+ |

INPUT MOD

| laser modulation+ |
| laser modulation- |

Any one of the relay outputs
(control PWM-enabled+)

| NO |
| CON |

Any one of the relay outputs
(control PWM-enabled-)

| NO |
| CON |
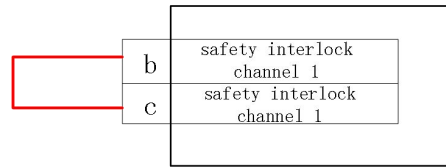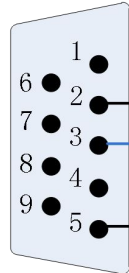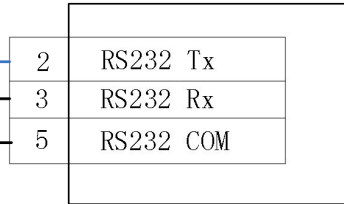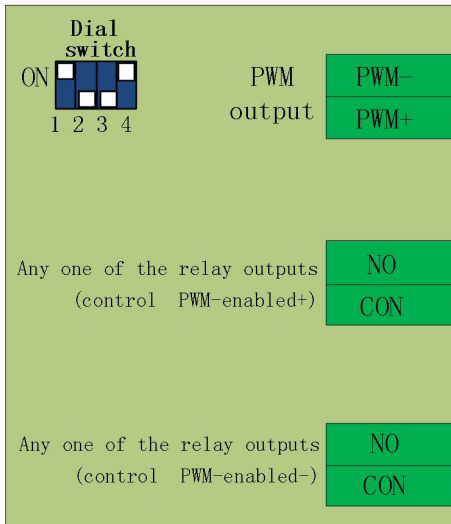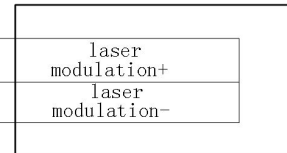
Max ChuangXin Laser 500W

InterLock

| Cooling Interlocking |
| Cooling Interlocking |
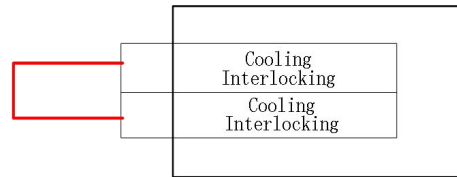
BCL3762_V5.2 terminal board

Laser interface

Dial switch

ON

1 2 3 4

Power output

| PWM- |
| PWM+ |

| laser modulation+ |
| laser modulation- |

Any one of the relay outputs
(control PWM-enabled+)

| NO |
| CON |

Any one of the relay outputs
(control PWM-enabled-)

| NO |
| CON |

Any one of the thyristor outputs
(control light emit-enabled
and the red light)

| OUT17 |
| OUT18 |
| COM |

| Red light+ |
| Light emit-enabled+ |
| Light emit-enabled- |
| Red Light- |

Any one of the inputs
(control laser alarm)

| IN |
| COM |

| PD+ |
| PD- |

How To Connect BCS100 :

List of Standard Accessories :
- BCS100 master controller   x1
- Preamplifier   x1
- Laser cutting head (short focal length, with ceramic part and nozzle)   x1
- Thermostable cable (140mm, the length can be customized)   x1
- Sensor signal cable (20m, the length can be customized)   x1
- DB15 plug (pin)   x1
- DB15 plug (jack)   x1
- Manual   x1

Wiring Instructions：

The detailed interface layout of BCS100 wiring terminal is as shown below:

Dorsal view

USB

24V 0V FG

15 14 13 12 11 10 9

9 10 11 12 13 14 15

8 7 6 5 4 3 2 1

1 2 3 4 5 6 7 8

Sensor   Input and output   Servo   Net   Power
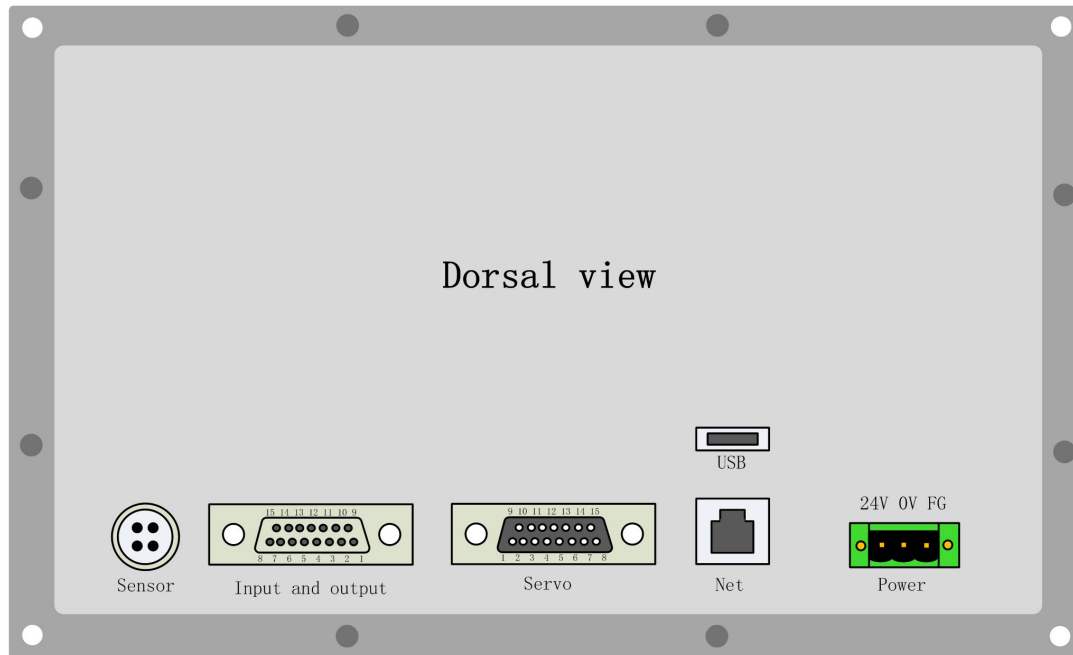
1.Power Interface Instructions

24V 0V FG

To machine main
metal part
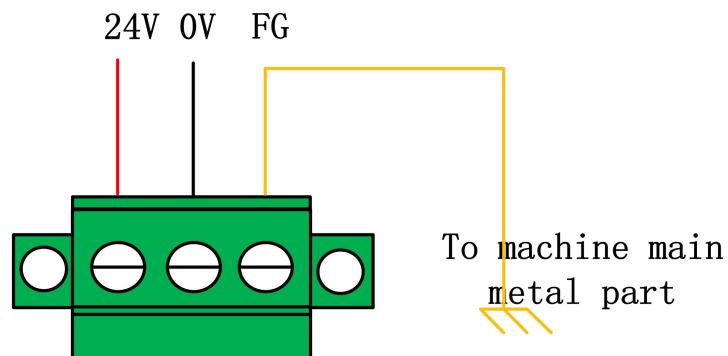
The machine casing is the negative electrode of the measured capacitor. In order to ensure the steady operation of measured circuit, it is required to reliably connect "FG pin" of power interface to the machine casing (i.e., have good conduction with machine casing), and preamplifier casing also must have good conduction with machine casing. The specific indicator is that D.C. impedance is always less than 10 ohms, or the actual following effect may be poor.

2.Servo connection and setting

8   7   6   5   4   3   2   1

15 14 13 12 11 10 9
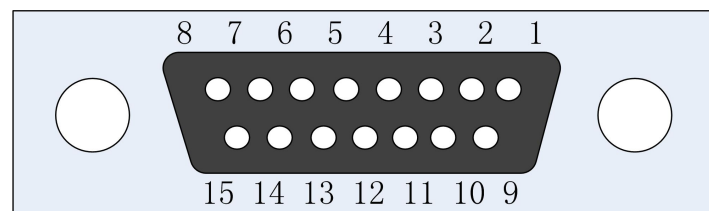
15-pin female servo control interface				
Pin	**Signal name**		**Pin**	**Signal name**
1	DA (with an analog output of -10~10V)		9	AGND (Analog ground)
2	0S (Zero speed clamp)		10	0V (Power ground)
3	A+ (Encoder A+)		11	(Encoder A-)
4	B+ (Encoder B+)		12	(Encoder B-)
5	Z+ (Encoder Z+)		13	Z- (Encoder Z-)
6	SON (Servo on)		14	ALM (Alarm signal)
7	CLR (Clear alarm)		15	0V (Power ground)
8	24V (Power output)			

Wiring diagram of Panasonic servo：

BCS100 servo interface   Panasonic MINAS-A servo 50 pin interface

Pin	No.		No.	PIN
DA	1		14	SPR/TRQR
AGND	9		15	GND
A+	3		21	OA+
A−	11		22	OA−
B+	4		48	OB+
B−	12		49	OB−
Z+	5		23	OZ+
Z−	13		24	OZ−
24V	8		7	COM+
0S	2		26	ZEROSPD
SON	6		29	SRV−ON
CLR	7		31	A−CLR
0V	10		36	ALM−
ALM	14		37	ALM+
0V	15		41	COM−

shielded wire
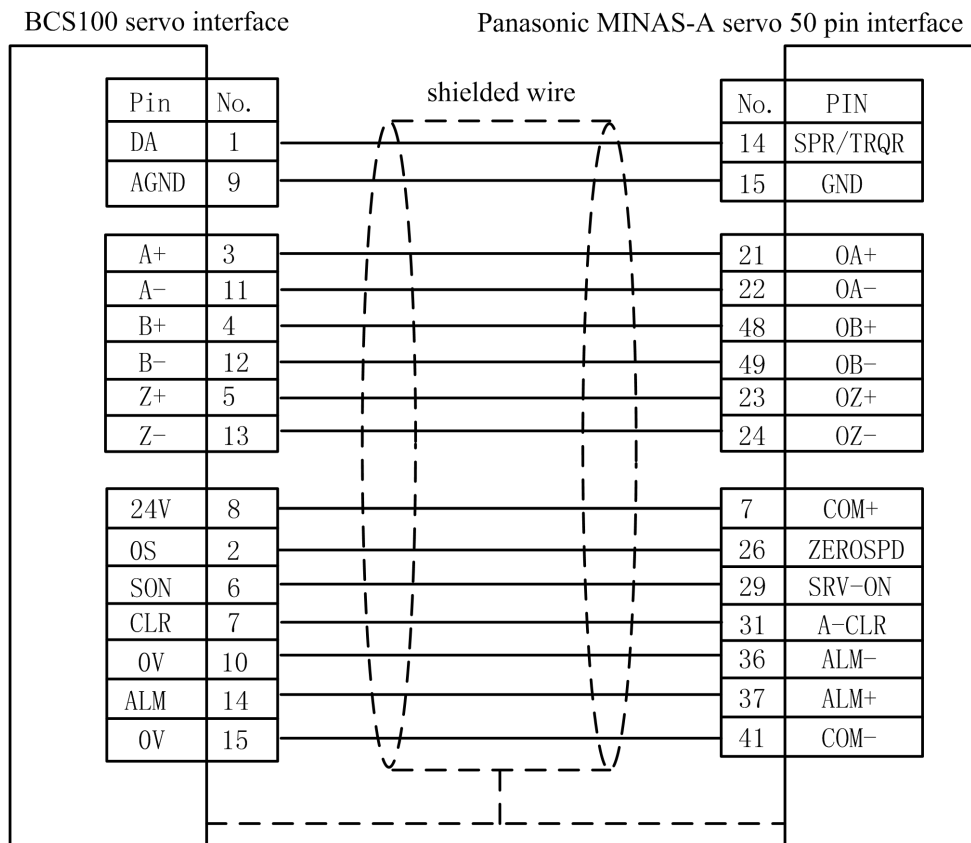
Wiring diagram of Yaskawa servo：

BCS100 servo interface   Yaskawa Σ-V servo 50 pin interface

Pin	No.
DA	1
AGND	9

Pin	No.
A+	3
A−	11
B+	4
B−	12
Z+	5
Z−	13

Pin	No.
24V	8
OS	2
SON	6
CLR	7
0V	10
ALM	14
0V	15

shielded wire

No.	Pin
5	V−REF
6	SG

No.	Pin
33	PAO
34	/PAO
35	PBO
36	/PBO
19	PCO
20	/PCO

No.	Pin
47	+24 VIN
41	/P−CON
40	/S−ON
44	/ALM−RST
32	ALM−
31	ALM+
1	SG
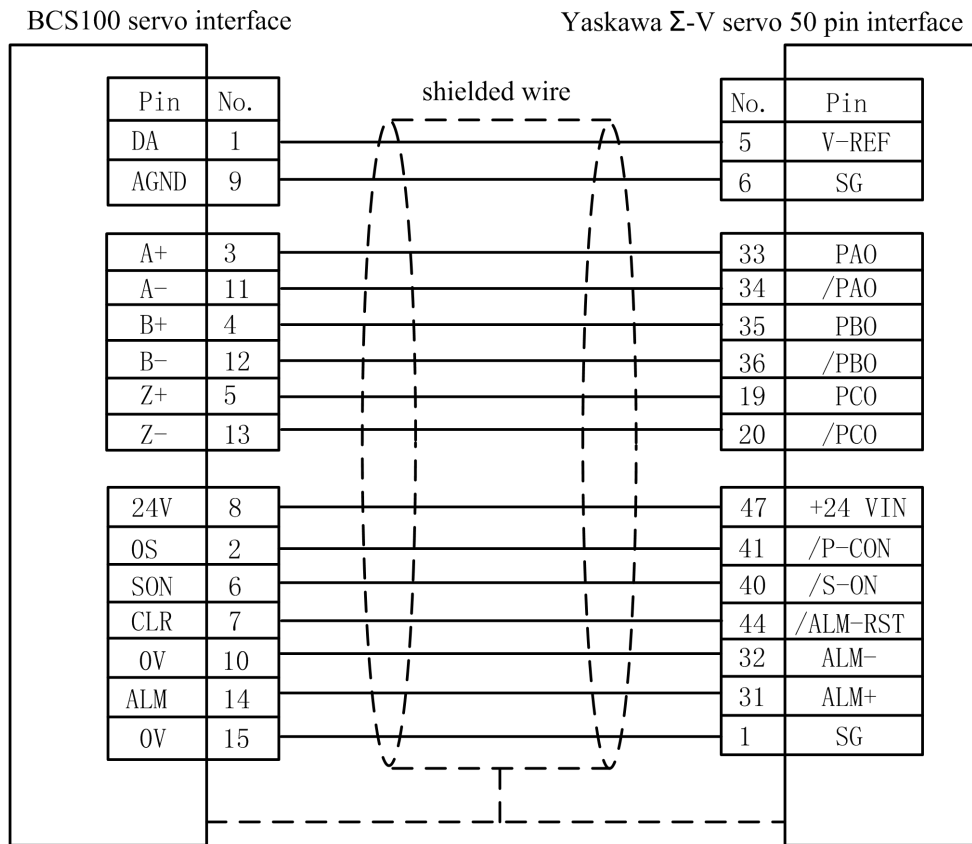
Corresponding to the wiring modes above, the servo parameters are set as follows:

Panasonic A5 series:

Parameter No.	Recommended value	Description
Pr001	1	Control mode: It must be set speed mode.
Pr002	3	Real-time automatic adjustment: The recommended setting is vertical axis mode.
Pr003	17	Servo rigidity, the recommended range is from Grade 14 to Grade 20.
Pr302	500	Input the gain of speed command.
Pr315	1	Enable zero speed clamp function.

Yaskawa Σ-V series:

Parameter No.	Recommended value	Description
Pn000	00A0	Speed control with zero-position fixation function.

Pn00B	-	Set to 0010 when using single-phase power.
Pn212	2500	Number of pulses output by the encoder per revolution. The pulse parameter of corresponding BCS100 per revolution is 10,000.
Pn300	6.00	The speed gain of corresponding height controller is 500 r/v/min.
Pn501	10000	Zero fixed value.
Pn50A	8100	Forward rotation is enabled.
Pn50B	6548	Reverse rotation is enabled.

3.Description of Input and Output Interface
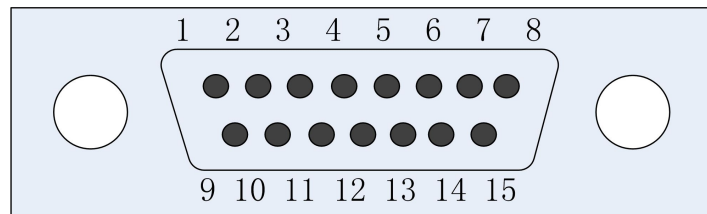
15-pin male input and output interface				
Pin	**Signal definition**		**Pin**	**Signal definition**
1	24V (Power output)		9	DA1 (0~10V analog quantity)
2	DA2 (0~10V analog quantity)		10	AGND (Analog ground)
3	OUT1 (Cutting in place)		11	OUT2 (Reserved)
4	OUT3 (Alarm)		12	OUT4 (Punching in place)
5	IN1 (Cutting tracking)		13	IN2 (Move to aligning coordinate)
6	IN3 (Quick lift up)		14	IN4 (Stop)
7	**IN5 (Upper limit)**		**15**	**IN6 (Lower limit)**
8	0V (Power ground)			

Notes:

1. Output ports (OUT1~OUT4) are all open drain output, and they are connected with the power ground for outputting.

2. Input ports (IN1~IN6) are all active low level input, and the input is enabled when the input ports are connected with the power ground.

3. 2-channel analog output of height controller is 0 to 10V, and it can be used for controlling the pressure of auxiliary gas and the power of air conditioner and laser.

4. When the cutting head punches to place, OUT4 will output a desired signal with a width of 200ms. When the cutting lead follows to the cutting height, OUT1 will output continuous desired signal.

4.Description of Sensor Interface
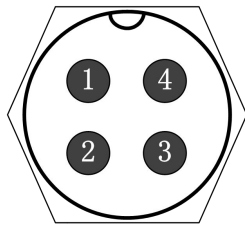
1:Connect with pin 1 of the cable
2:Connect with pin 2 of the cable
3:Connect with pin 3 of the cable
4:Connect with shield of the cable

4-pin signal transmission cable of sensor can be manufactured with 3-pin shielded cable and 2 4-pin air plugs. It is required to connect Pin, 1, 2 and 3 together, and connect Pin 4 to shielding layer during the manufacturing process.

Debugging Steps：

After the installation, users need to debug the controller as follows:

Set servo parameters. See "servo parameters" in Chapter V for details.

After powering on and completing the initialization, enter the parameter interface and set "mechanical parameters".

Go back to <main interface> to check whether the travel switch is enabled. If it is an optoelectronic switch, the interface will display "upper limit is enabled" when blocking the upper limit with shade; it will display "lower limit is enabled" when blocking the lower limit.

Enter <test interface> to conduct open-loop jog, and check whether the rotation direction of motor is right. If the direction is wrong, please change the servo direction parameters. And then conduct open-loop jog again, please change the encoder direction parameters if the encoder signal is inverse (mechanical parameters).
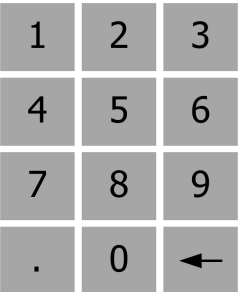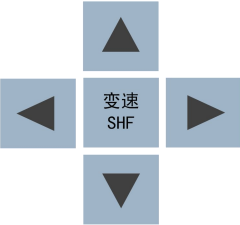
Enter <calibration interface>, and conduct "servo calibration" to eliminate the zero shift of servo.

Return to the origin manually, and turn on the power-on reset function on the interface of <reset parameters>.

Enter <calibration interface> and do "capacitance calibration" for the follower.

Modify other parameters as required after completing the steps above.

Description of Keys

Keyboard	Function
Functional key	F1 F2 F3 F4 Achieve the functions prompted by the interface.
Number key Decimal point Backspace key	1 2 3 / 4 5 6 / 7 8 9 / . 0 ← : Used for digital input, and mainly for parameter input
Arrow key	▲ ◄ 变速 SHF ► ▼ : Used for switching cursor and inching follower, and the key of "SHF" can switch the jog speed.
Control key	跟随关 SHUT / 跟随快 FAST / 跟随高 +0.1 / 停止 STOP / 确定 ENT / 跟随开 FOLLOW / 跟随慢 SLOW / 跟随低 -0.1 / 回原点 ORG / 取消 ESC : <SHUT> : The cutting head will automatically rise to the stop position while shutting the follower. <FOLLOW>: Open the following function. <FAST> and <SLOW>: Used for adjusting the following gain level. <+0.1> and <-0.1>: Used for adjusting the following height. <STOP>: Immediately stop all movements. <ORG>: Immediately implement the movement to go back to the origin and correct mechanical coordinates. <ENT>: Confirm the current operation. <ESC>: Cancel the operation and go back.

```
                                              ┌─────────────────────┐
                                         ┌───▶│   Servo calibrate   │
                                         │    └─────────────────────┘
                      ┌───────────┐      │    ┌─────────────────────┐
                 ┌───▶│ Calibrate │──────┼───▶│ Capacitance calibrate│
                 │    └───────────┘      │    └─────────────────────┘
                 │                       │    ┌─────────────────────┐
                 │                       └───▶│     Self adjust     │
                 │                            └─────────────────────┘
                 │                            ┌─────────────────────┐
                 │                       ┌───▶│       Technic       │
                 │                       │    └─────────────────────┘
                 │                       │    ┌─────────────────────┐
                 │                       ├───▶│        Speed        │
                 │                       │    └─────────────────────┘
                 │                       │    ┌─────────────────────┐
                 │                       ├───▶│       Origin        │
                 │                       │    └─────────────────────┘
   ┌──────┐      │    ┌───────────┐      │    ┌─────────────────────┐
   │ Main │──────┼───▶│ Parameter │──────┼───▶│        Jog          │
   └──────┘      │    └───────────┘      │    └─────────────────────┘
                 │                       │    ┌─────────────────────┐
                 │                       ├───▶│      Mechanic       │
                 │                       │    └─────────────────────┘
                 │                       │    ┌─────────────────────┐
                 │                       ├───▶│        Net          │
                 │                       │    └─────────────────────┘
                 │                       │    ┌─────────────────────┐
                 │                       ├───▶│       Alarm         │
                 │                       │    └─────────────────────┘
                 │                       │    ┌─────────────────────┐
                 │                       └───▶│        Edge         │
                 │                            └─────────────────────┘
                 │    ┌───────────┐
                 ├───▶│   Test    │
                 │    └───────────┘
                 │                            ┌─────────────────────┐
                 │                       ┌───▶│      Version        │
                 │                       │    └─────────────────────┘
                 │                       │    ┌─────────────────────┐
                 │    ┌───────────┐      ├───▶│     Alarm info      │
                 └───▶│ Advanced  │──────┤    └─────────────────────┘
                      └───────────┘      │    ┌─────────────────────┐
                                         ├───▶│      Restart        │
                                         │    └─────────────────────┘
                                         │    ┌─────────────────────┐
                                         └───▶│     System set      │
                                              └─────────────────────┘
```
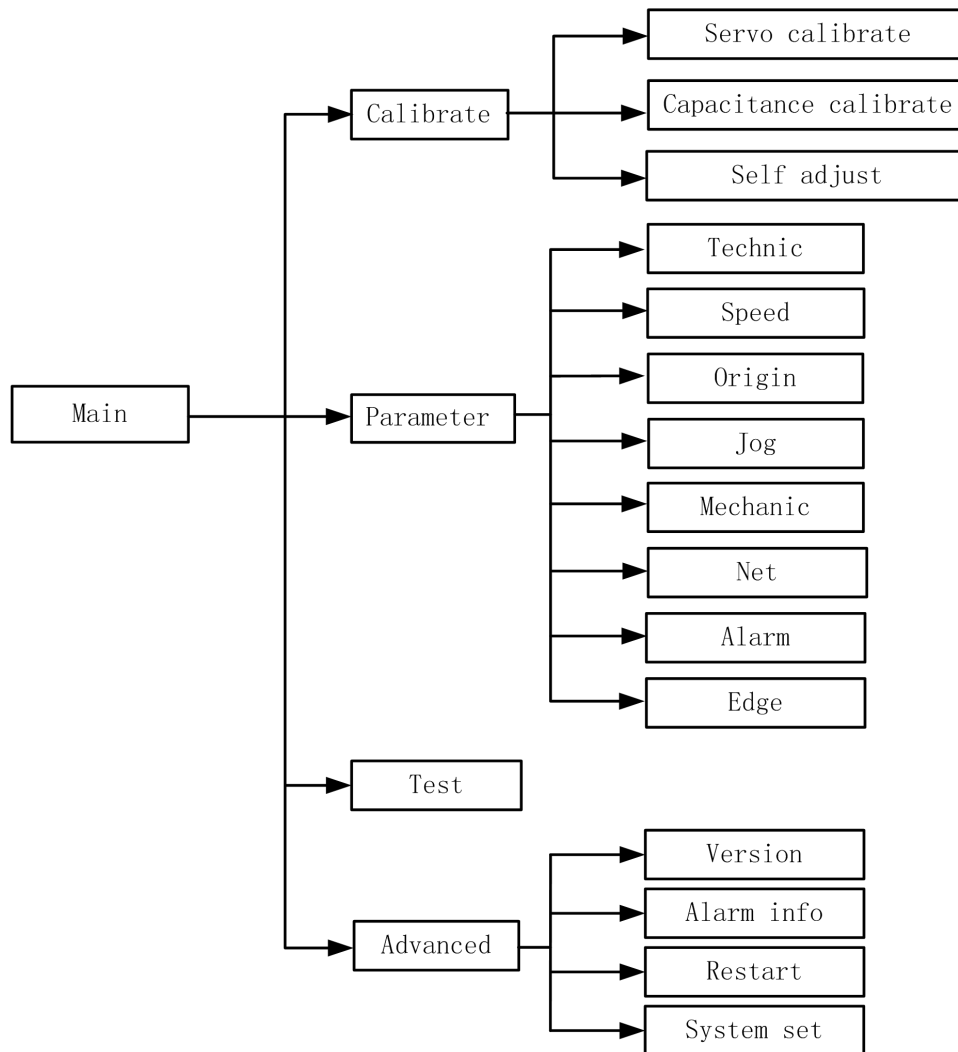
Main Interface

It will automatically enter<main interface>after the system is powered on and the initialization is completed, as shown below:
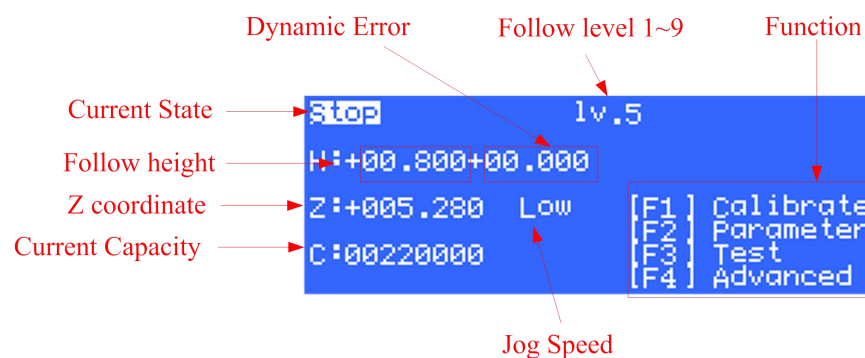
The displays on the main interface include:

Current status: display the current motion state of the following system. The motion states are as follows:

A. Stopped: Z-axis is in an idle state.

B. Decel: There will be a very short transition state for slow stop after receiving a stop instruction in motion state. It will change into "stop" state after completely stopping.

C. Moving: It is the movement of Z-axis while lifting up during processing.

D. Follow: The follower follow the board while conduct punching and cutting operations.

E. Origin: Go back to the mechanical origin of Z-axis.

F. Jogging: Manually jog Z-axis.

G: Lift up: It is the process to shut the follower off, and lift it to the stop position.

Following gain level: The level of following gain ranges from 1 to 30. The large level is, the smaller average error is, the quicker follow acts, and the stronger slope move ability is. But if gain is too high, there may be self-oscillation. It is recommended to set this parameter by self adjustment.

Following height: The actual following height can be adjusted with a step of 0.1mm after pressing the button<+0.1> and <-0.1>. The following mode can be changed through pressing <SHUT> and <FOLLOW>. After pressing "SHUT", the axis will automatically raise to the stopping coordinates (it defaults to the position of Z= 0; the stopping coordinates can be modified after pressing <F2> to enter the parameter interface).

In addition, in the Ethernet control mode, the following height is set by CypCut software.

Dynamic error: In the following state, this value reflects the real-time error during following movement.

Distance H between follower and board surface: Within the capacitance measurement range (calibration range), the distance between follower and board surface is "following height" plus "dynamic error". When exceeding the measuring range, "set following height" plus "dynamic error" is identically equal to the calibration range.

Current Z-axis coordinates: After homing to origin, a mechanical coordinate system is established at Z-axis. The coordinate will increase when moving down.

Current capacitance value C: The principle of systematical sampling is to get the distance through measuring the capacitance between the follower and polar plate. The closer the follower is to the board, the greater the capacitance value is. The capacitance will change to Zero while the follower hits the board.

Jog speed of Z-axis: <L> represents low jog speed and <H> represents high jog speed. The jog speed stalls can be switched through pressing the button <SHF>. You can press the buttons < ↑ > and < ↓ >to jog.