ADT-HC6500

Flame/Plasma Controller

User Manual
(Hardware)

Motion Control Total Solution

ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD

5th Floor, 27-29th Building, Tianxia IC Industrial Park, Yiyuan road, Nanshan District,

Shenzhen Post code: 518052

Tel: 0755-26722719 (20 lines) Fax: 0755-26722718

E-mail：Adtech@21cn.com http://www.adtechcn.com

Copyright Statement

Remark:

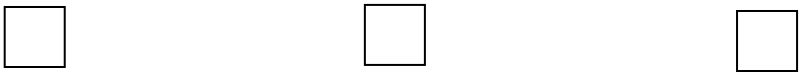
1. This user manual is strictly emended and checked by ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD, however, it is not guaranteed that the user manual has no any mistake or error.
2. ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD commits itself to improving the product functions and the service quality consistently. Therefore, the company reserves the right of changing any products as described, any software program, and the content of the user manual, without prior notice.

ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD

Upgrade Information

Item No.	Version No.	Revision Date	Remark
XT20090305	3.0	2010-1-11	Edition 3

Note: Meanings of the three numbers in version number are as follows:



Library main version No. Library secondary version No. Reserved

Remark:

This user manual is strictly emended and checked by ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD, however, it is not guaranteed that the user manual has no any mistake or error.

ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD commits itself to improving the product functions and the service quality consistently. Therefore, the company reserves the right of changing any products as described, any software program, and the content of the user manual, without prior notice.

Safety Notice

Read this safety notice before operating.

I. Notice

1、 Notice on safety:

- Original copy of safety notice should be dispensed to every operator.
- Do not open the controller cover without permission; otherwise, it would be out of the range of guarantee.
- Cut off the power supply in case the machine is not used for a long time.
- Pay attention not to drop any dust or iron powder into the controller.
- Do not pour any liquid into the controller.
- Handle with care, and do not cause any damage.
- Abide by the accident prevention provision and regulations.
- Abide by the accident prevention provision and regulations on Oxygen cutting.
- Wear the mask when performing the plasma arc cutting, for the plasma arc will generate UV-b radiation.

2、 Notice on correct application:

- Our control system is capable of anti-interfering, but it is still required that your plasma power supply have shielding function and the plasma controller have good grounding. Otherwise, it will bring serious result.
- Please set all parameters of the controller strictly according to the user manual; otherwise, it may lead to failure of control system or even cause serious consequences.
- The controller uses the 24V DC power supply. To avoid short circuit, please pay attention to the voltage, negative or positive electrode of power supply when installing.
- Good grounding measures are required if the controller is used combining with plasma cutting machine.
- Do not insert or pull out any output plug of controller while the power supply is connected; otherwise, it will damage the inside of controller.
- If the output relay is non-solid-state relay, a freewheeling diode should be connected in parallel on relay coil. Check the applied power supply to see whether it is up to requirements, avoid burning out the controller.
- Controller lifetime has a great relationship with ambient temperature. Install a cooling fan if the temperature in processing area is too high. The allowable ambient temperature of the controller is between 0°C and 60°C.
- Do some protection measures if the machine is used in high temperature, damp, or dusty environment, or environment with corrosive gas.
- In place with strong vibration, add a rubber anti-vibration pad to weaken the vibration.

II. Statement:

We offer one year factory warranty or lifetime maintenance for any malfunction arising under the normal use. In case of man-made damage or if the warranty expired, ADTECH will charge a certain cost price of parts. However, the warranty is not applied to the following conditions:

- The label of serial number is torn down.
- Any damage caused by personal factors
- Any damage caused by natural disasters
- Disassembly, modification, or repair without permission

III. Maintenance:

1. Notice for maintenance and inspection:
   - Cut off the power supply of major loop before maintaining or repairing the controller.
   - To prevent the accident, the operator should confirm the power supply is cut off.
2. Inspection item and period:

Under the general operating conditions (Daily average 30°C, load rate 80%, operating ratio 12 hours per day), carry out the following inspections to do the route and periodical inspections.

Route inspection	Daily	● Check whether the ambient temperature, dust and foreign matters exceed the criteria ● Check whether there is abnormal vibration or sound
Periodical inspection	Half year	● Check whether the firm parts are loosened ● Check whether the terminal board is damaged

Content

Chapter I. Function Introduction

I. Function introduction

HC6500 flame controller is a high performance, multi-functional motion controller, whose control circuit uses the high-speed microprocessor and large custom-tailor IC chip, featuring the multilayer printed board. The display is 10.4" color LCD screen, and the attached software integrates advantages from home and oversea factories. For this reason, the controller features stable hardware and perfect software, and is a reliable flame/ plasma controller with high performance ratio. According to the customer's demand, HC6500 will be divided into A/B series:

HC6500-A series include 44-channel DI, 16-channel DO, 4-axis pulse/direction signal output, interface featuring true/false bilateral drive, external keyboard interface, USB port (principal and subordinate), and RS232 communication interface.

B series include 60-channel DI, 36-channel DO, 4-axis pulse/direction signal output, 4-axis ABZ-phase coder feedback input, 2-channel analog voltage output, external keyboard interface, USB port (principal and subordinate), RS232 communication interface, and standard network interface. In the following we are going to introduce the hardware functions of HC6500-B series.

II. Features

1. SANSUNG series S3C2410A processor (ARM9), primary frequency: 200MHz
2. Adopt the super large programmable FPGA, real time multitask control technology and hardware interpolation technology, ensuring a high stability during the operation;
3. With reasonable process structure, cooperating with all photovoltaic isolation control, and featuring powerful anti-interference performance;
4. With 64M SDRAM
5. With 64M Nand FLASH ROM (data storage, 50M can be simulated as USB disk)
6. Support USB1.1 equipment interface
7. Support USB host-port interface (capable of reading USB disk)
8. Support TCP/IP network interface
9. Four-channel stepper/servo motor pulse photovoltaic isolation output, maximum frequency 2MHz
10. Frequency error of pulse output is less than 0.1%;
11. Pulse output can be single-pulse (pulse + direction) or double-pulse (pulse+ pulse) mode;
12. Any 2-4 axes linear interpolation;
13. Linear acceleration/deceleration;
14. Stepper motor or servo motor is provided. High micro-stepping driver is used, with high precision and stable operation, capable of reading real-time logic position, actual position, and driving speed during the operation;
15. RS232 (±15KV electrostatic protection);
16. Capable of programming on-line with only a serial port cable and a USB cable; no coder is needed;
17. Capable of connecting external keyboard
18. With buzzer alarm
19. 10.4" color LCD display, with user-friendly and easy-to-use operating interface

III. Specifications

Digital input:

Channel: 44, all photovoltaic isolation
Input voltage: 12-24V
High level>4.5V
Low level<1.0V
Isolation voltage: 2500V DC
Optocoupler input delay time≤0.1mS

Counting input:

Channel: 4-axis Z-phase coding input, all photovoltaic isolation
Maximum counting frequency: 2MHz
Input voltage: 5V (If you use 24V, the internal current limiting resistance should be changed to 2K)
High level >1.5V
Low level <1.0V
Isolation voltage: 2500V DC

Pulse output:

Channel: 4-axis pulse, 4-axis directions, all photovoltaic isolation
Maximum pulse frequency: 2MHz
Output type: 5V differential output
Output mode: Pulse + Direction, or Pulse + Pulse

Digital output:

Output channel: 16 channels, all photovoltaic isolation
Output type: NPN open-collector output 5-24VDC, rated current 0.5A, maximum current of single channel can reach 1A

RS-232 baud rate (bps):

1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

IV. Application environment

Power supply:	88 ~ 264VAC, 125 ~ 373VDC, frequency: 47 ~ 63Hz, Typical value: AC220V 50HZ
Power consumption:	No-load power consumption <15W
Operating temperature:	-10°C —50°C
Storage temperature:	-20°C—80°C
Operating humidity:	20%—95%
Storage humidity:	0%—95%

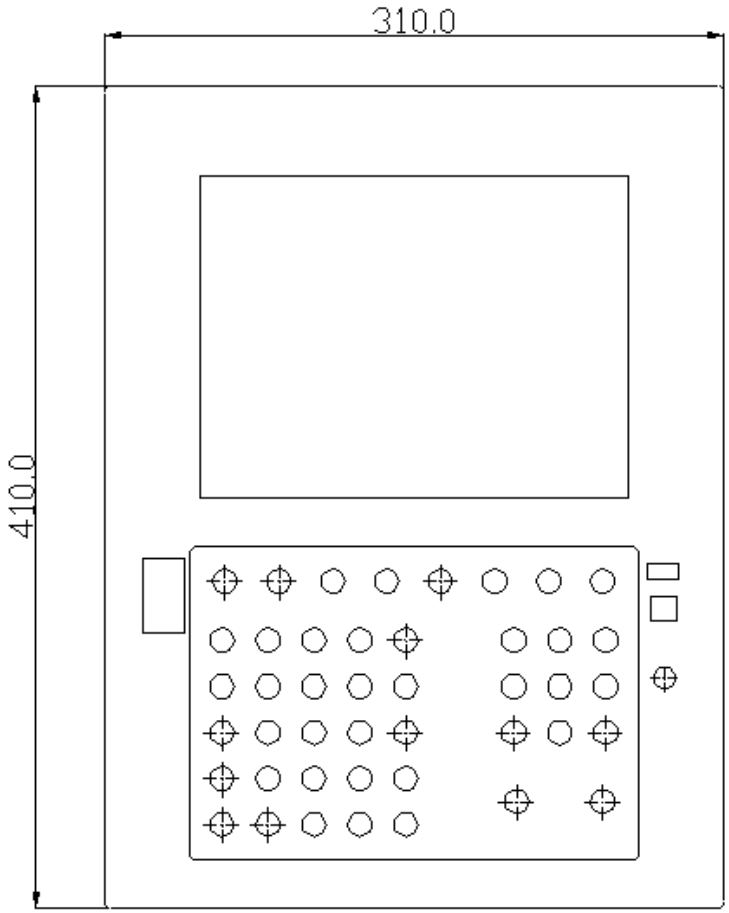
V. Scope of application

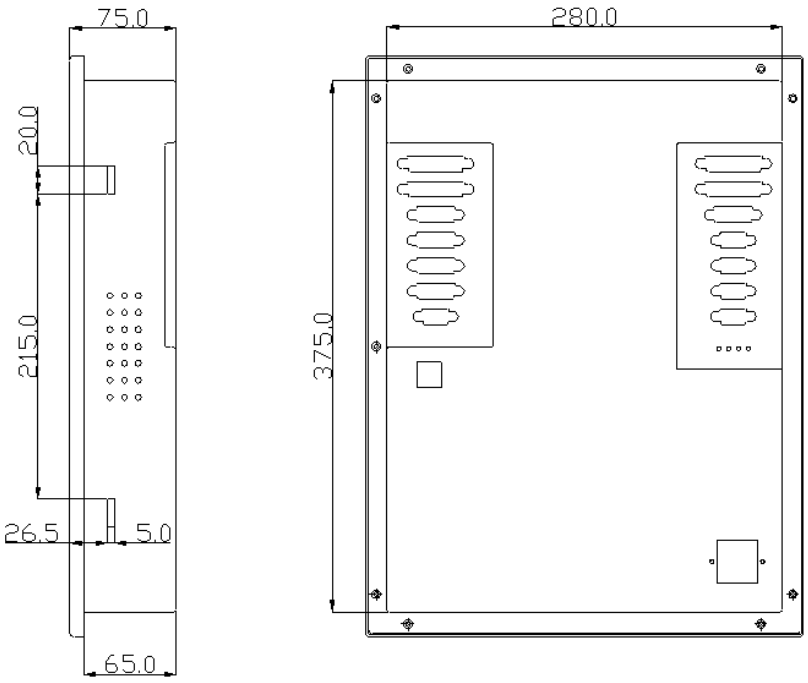
- 1~4 axis flame cutting, and plasma cutting
- 1~4 stepping/servo motor control

Chapter II Product Description

Product structure

I. Diagram of overall dimension





II. Guide of controller type selection

According to the interface, HC6500 can be divided into two types, function A and function B, in order to satisfy the demand of different customers. Customers can custom-tailor different models according to their different requirements. Interfaces of function A and B may be different (subject to the actual objects), and the silk-screen is alike. For details, see the table below:

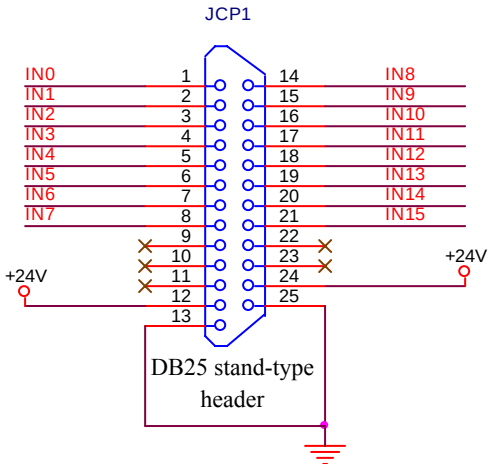
Hardware	Function A	Function B
Input	16 inputs +16 extended inputs +10 handheld box inputs	60 inputs: 16 inputs +16 extended inputs +4 alarm inputs +12 coder feedback inputs +10 handheld box inputs +2 hand wheel inputs
Output	16-channel output	36-channel output: 16 outputs +16 extended outputs (need external power supply) +4 axis standby outputs
Pulse output	4-axis pulse and direction output (featuring true/false bilateral drive interface)	4-axis pulse and direction output
Communication port	Keyboard, USB (Primary and secondary), RS232	Keyboard, USB (Primary and secondary) RS232, standard network output
Coder		4-axis ABZ-phase coder feedback input
Analog output		2-channel analog voltage output

Comparison of function A and B of HC6500 flame cutting system

Chapter III Electrical connection

I. Definition diagram of terminals

☞ **XS1 JCP1 Line S/N description (16-channel input)**

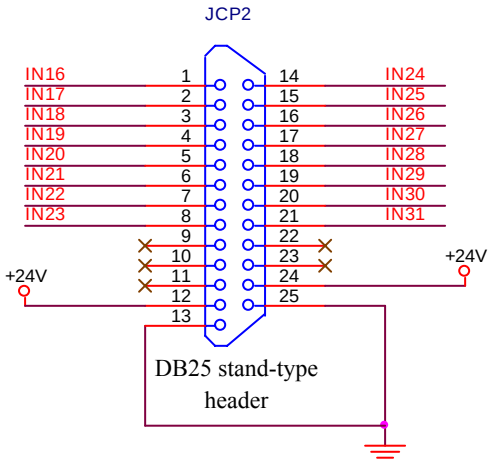


Machine input interface

Line S/N	Name	Function
1	IN0	X positive limit
2	IN1	Y positive limit
3	IN2	Arc voltage detection
4	IN3	Manual pause
5	IN4	Manual X + (void)
6	IN5	Manual Y + (Void)
7	IN6	Manual acceleration (Void)
8	IN7	Initial positioning
9	NC	Not connected
10	NC	
11	NC	
12	+24V	Common end of input, input the external +12~+24V power supply
13	GND	Power supply grounding
14	IN8	X negative limit
15	IN9	Y negative limit
16	IN10	Manual emergency stop
17	IN11	Manual start (Void)
18	IN12	Manual X – (Void)
19	IN13	Manual Y – (Void)
20	IN14	Manual deceleration (Void)
21	IN15	Perforating lower limit (Void)
22	NC	Not connected
23	NC	

24	+24V	Common end of input, input the external +12~+24V power supply
25	GND	Power supply grounding

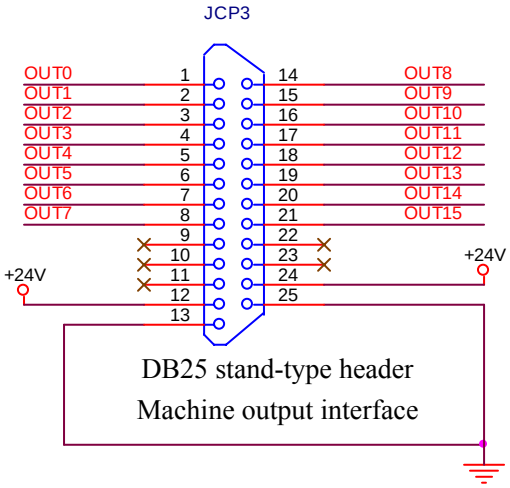
☞ **XS9 JCP2 Line S/N description (16 –channel extended input)**



Machine extended input interface

Line S/N	Name	Function
1	IN16	Z positive limit
2	IN17	A positive limit
3	IN18	X axis zero
4	IN19	Y axis zero
5	IN20	Z axis zero
6	IN21	A axis zero
7	IN22	General input
8	IN23	General input
9	NC	Not connected
10	NC	
11	NC	
12	+24V	Common end of input, input the external +12~+24V power supply
13	GND	Grounding
14	IN24	Z negative limit
15	IN25	A negative limit
16	IN26	General input
17	IN27	General input
18	IN28	General input
19	IN29	General input
20	IN30	General input
21	IN31	General input
22	NC	Not connected
23	NC	
24	+24V	Common end of input, input the external +12~+24V power supply
25	GND	Grounding

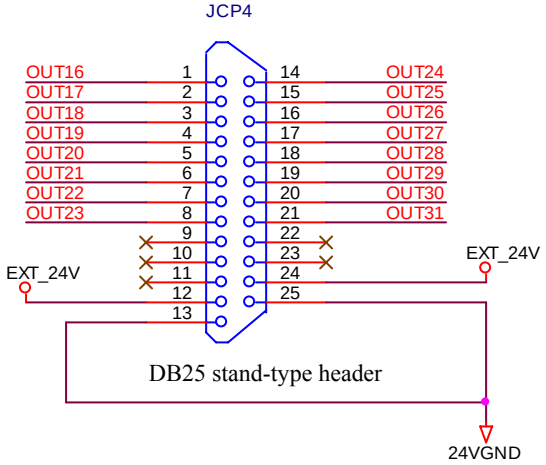
☞ XS2 JCP3 Line S/N description (16-channel input)



Line S/N	Name	Function
1	OUT0	Acetylene
2	OUT1	Cutting torch rising
3	OUT2	Ignition
4	OUT3	High preheating oxygen
5	OUT4	Low oxygen (Reserved)
6	OUT5	Stir (Reserved)
7	OUT6	Front line (Reserved)
8	OUT7	Drill down (Reserved)
9	NC	Not connected
10	NC	
11	NC	
12	+24V	Input the external +12~+24V power supply
13	GND	Common end of output, also the power supply grounding
14	OUT8	Cutting control
15	OUT9	Cutting gun falling
16	OUT10	Low preheating oxygen
17	OUT11	Preheating oxygen
18	OUT12	Dusting (Reserved)
19	OUT13	Height adjusting control
20	OUT14	Drill up (Reserved)
21	OUT15	Oxygen in flame (drill selection- not available)
22	NC	Not connected
23	NC	
24	+24V	Input the external +12~+24V power supply
25	GND	Common end of output, also the power supply grounding

☞ XS10 JCP4 Line S/N description (16 extended output)

This interface should be connected to the external 24V power supply.



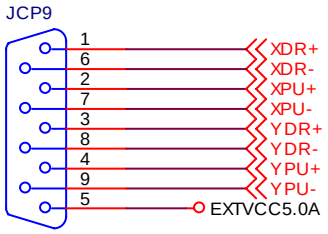
Extended output interface (need to connect external 24V power supply)

Line S/N	Name	Function
1	OUT16	OUT16—OUT23 general output
2	OUT17	
3	OUT18	
4	OUT19	
5	OUT20	
6	OUT21	
7	OUT22	
8	OUT23	
9	NC	Not connected
10	NC	
11	NC	
12	EXT_24V	External +24V power supply input (not together with system 24V power supply, you should extend external 24V power supply when operating)
13	GND	Common end of output, also the external +24V grounding (connected with internal 24V grounding)
14	OUT24	OUT24—OUT31 general output
15	OUT25	
16	OUT26	
17	OUT27	
18	OUT28	
19	OUT29	
20	OUT30	
21	OUT31	
22	NC	Not connected
23	NC	

24	EXT_24V	External +24V power supply input (not together with system 24V power supply, you should extend external 24V power supply when operating)
25	GND	Common end of output, also the external +24V grounding

Restricted by the machine size, the capacity of internal switching power supply is limited. To ensure the stable operation of system, you should add an external 24V DC power supply when using the extended 16-channel output of OUT16—OUT31. Connect the 24V power supply to pin 12 and 24, and the power supply grounding to pin 13 and 25.

☞ **XS4 JCP9 Line S/N description (X, Y motor drive port)**

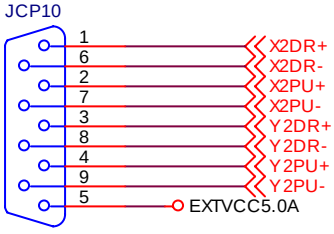


DB9 stand-type header

Motor X, Y

Line S/N	Name	Function
1	XDR+	X axis direction +
6	XDR-	X axis direction -
2	XPU+	X axis pulse +
7	XPU-	X axis pulse -
3	YDR+	Y axis direction +
8	YDR-	Y axis direction -
4	YPU+	Y axis pulse +
9	YPU-	Y axis pulse -
5	EXTVCC5.0A	Provide external +5V power supply A, especially used for the common-anode connection of driver

☞ **XS5 JCP10 Line S/N description (Motor Y2)**



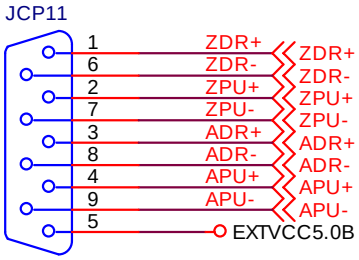
DB9 stand-type header

Motor Y2

Line S/N	Name	Function
1	X2DR+	The definitions of these interfaces are the same as those of JCP9, but without electrical connection.
6	X2DR-	
2	X2PU+	

7	X2PU-	
3	Y2DR+	
8	Y2DR-	
4	Y2PU+	
9	Y2PU-	
5	EXTVCC5.0A	

☞ **XS6 JCP11 Line S/N description (Z, A motor drive port)**

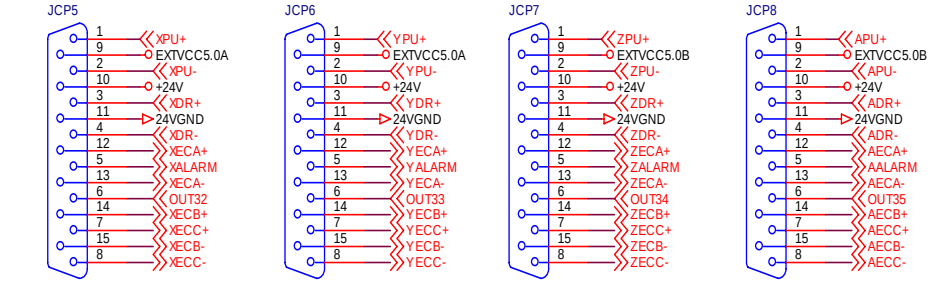


DB9 stand-type header

Motor Z, A

Line S/N	Name	Function
1	ZDR+	Z axis direction +
6	ZDR-	Z axis direction -
2	ZPU+	Z axis pulse +
7	ZPU-	Z axis pulse -
3	ADR+	A axis direction +
8	ADR-	A axis direction -
4	APU+	A axis pulse +
9	APU-	A axis pulse -
5	EXTVCC5.0B	Provide external +5V power supply B, especially used for the common-anode connection of driver

☞ **XS11, XS12, XS13, XS14 JCP5, JCP6, JCP7, JCP8 Line S/N description (X, Y, Z, A-axis motor control)**

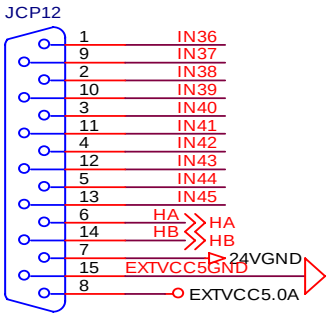


DB9 stand-type header DB9 stand-type header DB9 stand-type header DB9 stand-type header

X axis Y axis Z axis A axis

Line S/N	Name	Function
1	nPU+	Pulse signal +
2	nPU-	Pulse signal -
3	nDR+	Direction signal +
4	nDR-	Direction signal -
5	IN	General input, can be used as alarm input (X-32 Y-33 Z-34 A-35)
6	OUT	General output (X-32 Y-33 Z-34 A-35)
7	nECZ+	Coder Z-phase input +
8	nECZ-	Coder Z-phase input -
9	PUCOM	Used for driver with single-end input
10	+24V	Provide external 24V power supply
11	24VGND	
12	nECA+	Coder A-phase input +
13	nECA-	Coder A-phase input -
14	nECB+	Coder B-phase input +
15	nECB-	Coder B-phase input -

☞ XS3 JCP12 Line S/N description (Hand-held box interface)

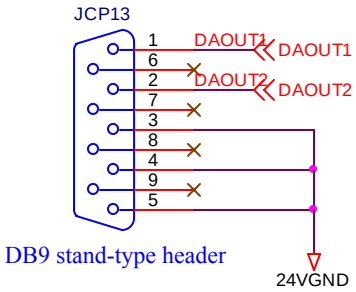


DB15 stand-type header

Hand-held box interface

Line S/N	Name	Function
1	IN36	Digital input
2	IN38	Digital input
3	IN40	Digital input
4	IN42	Digital input
5	IN44	Digital input
6	HA	Hand wheel input (+5V power supply)
7	24VGND	24V common grounding
8	EXT_VCC	Isolated +5V power supply for hand wheel
9	IN37	Digital input
10	IN39	Digital input
11	IN41	Digital input
12	IN43	Digital input
13	IN45	Digital input
14	HB	Hand wheel input (+5V power supply)
15	EXT_GND	Isolated +5V power supply grounding

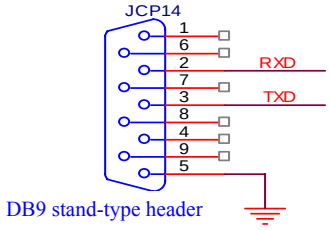
☞ XS7 JCP13 Line S/N description (analog voltage output)



Analog voltage output interface

Line S/N	Name	Function
1	DAOUT1	Analog voltage output (0V—10V+)
2	DAOUT2	Analog voltage output (0V—10V+)
3	24VGND	Provide internal24V grounding
4		
5		
6	Not connected	
7		
8		
9		

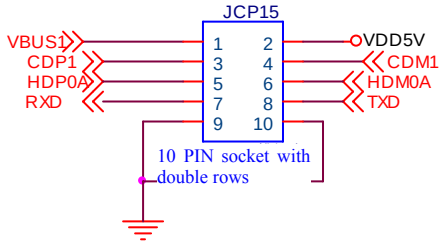
☞ XS15 JCP14 rear serial port



Rear serial port

Line S/N	Name	Function
1		Not connected
2	RXD	Receiving serial port data
3	TXD	Transmitting serial port data
4		Not connected
5	GND	Signal grounding
6	Not connected	
7		
8		
9		

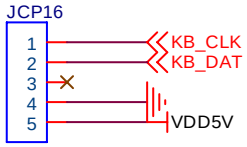
☞JCP15 front serial port/USB interface



Front serial port/USB interface

Line S/N	Name	Function
1	VBUS1	Secondary VBUS
2	VDD5V	Primary VCC
3	CDP1	Secondary D+
4	CDM1	Secondary D-
5	HDP0A	Primary D+
6	HDM0A	Primary D-
7	RXD	Receiving serial port data (connected with rear serial port RXD)
8	TXD	Transmitting serial port data (connected with rear serial port TXD)
9	GND	Signal GND
10	GND	Signal GND

☞JCP16 internal keyboard interface

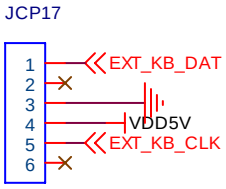


5 PIN socket with single row

Internal keyboard interface

Line S/N	Name	Function
1	KB_CLK	Clock
2	KB_DAT	Data
3	NC	Not connected
4	GND	Power supply grounding
5	VDD5V	+5V power supply

☞ **XS8 JCP17 101-key standard keyboard interface**

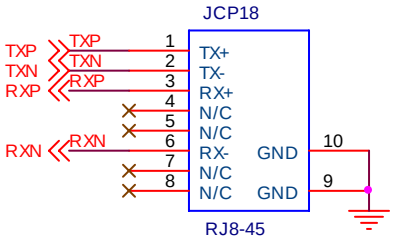


Standard keyboard interface

External 101-key standard keyboard interface

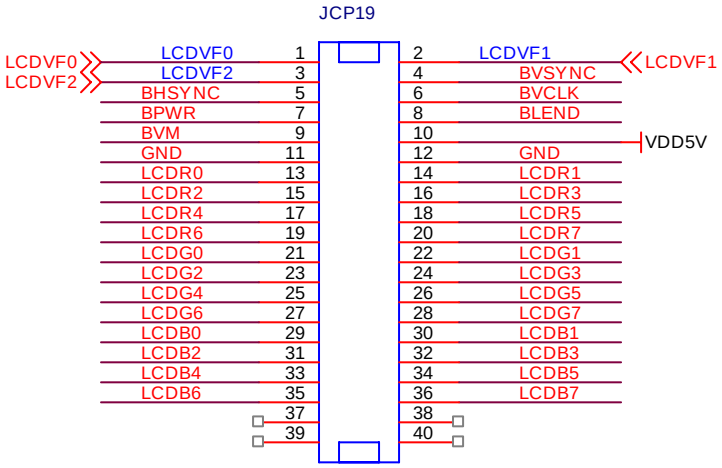
Line S/N	Name	Function
1	KB_DAT	Data
2	NC	Not connected
3	GND	Power supply grounding
4	VDD5V	+5V power supply
5	KB_CLK	Clock
6	NC	Not connected

☞ **XS16 JCP18 standard network interface**



Standard network interface

☞**JCP19 10.4" LCD interface**



CON40A, 2.54mm*20*2 uses straight pin

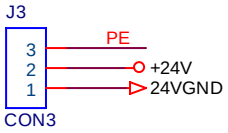
☞Power supply

This system is powered by 220V municipal power supply directly. The zero line and front line are connected according to the electrical specifications standard, L represents the front line and N represents the zero line. If the applied voltage is not 220V AC, you need to re-evaluate the specifications of fuse.

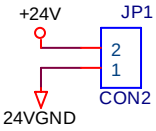
Interface of internal power supply:

J3: Lead-in interface of system 24V power supply, the wiring is defined as follows: (Refer to the silk-screen on PCB)

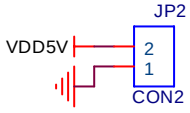
Pay attention to the specifications of fuse at SI1 on the PCB. Please use the 250V, 4A fuse.



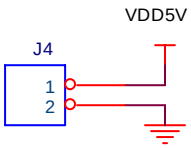
JP1: Input interface of switching power supply for converting 24V to 5V, the wiring is defined as follows: (Refer to the silk-screen on PCB)



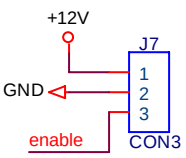
JP2: Output interface of switching power supply for converting 24V to 5V, the wiring is defined as follows: (Refer to the silk-screen on PCB)



J4: 5V power supply interface for downloading program, the wiring is defined as follows: (Refer to the silk-screen on PCB)

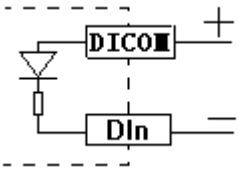


J7: Interface of backlight power supply, the wiring is defined as follows: (Refer to the silk-screen on PCB)



II. Connection mode of interface and description

1) Connection mode of input signal



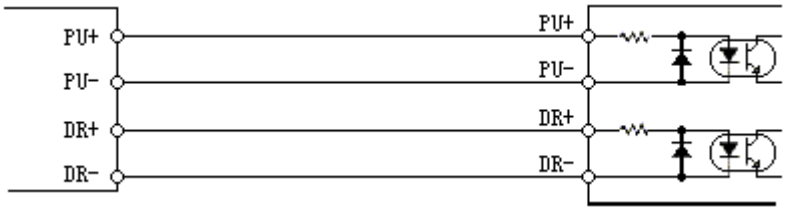
Optical coupler input

The common end of HC6500 input signal is connected to the positive terminal of system +24V power supply, and the input point is connected to the corresponding terminal. The input points are all low level effective. The current of single input could not exceed 15mA or less than 5mA.

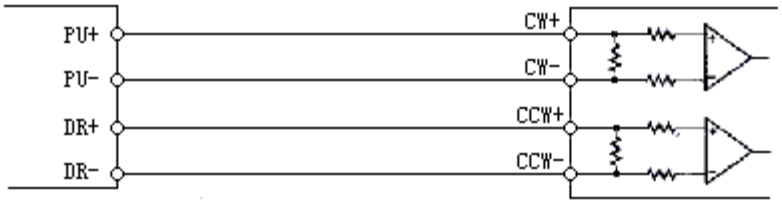
2) Connection mode of pulse output signal

Differential mode:

For stepper motor driver with individual pulse and direction input, and most of servo motor driver, it is recommended to use this mode to get the better anti-interference performance.



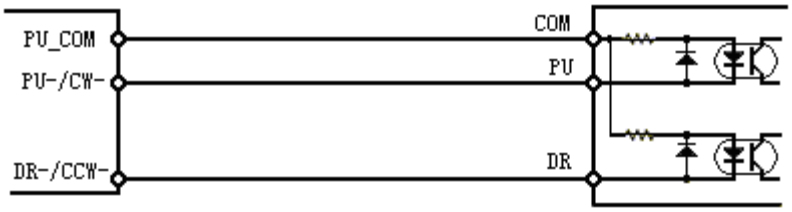
Stepper motor driver



Servo motor driver

Single-end mode:

It is applicable to the earlier stepper motor driver whose pulse and direction anodes are connected together.



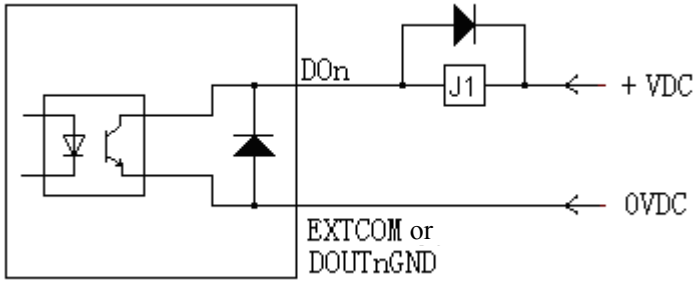
Stepper motor driver

Note: It is not applicable to the some stepper motor drivers whose pulse and direction cathodes are connected together.

Especially note that the 5th pin EXTVCC5.0A **is exclusively used in non-differential connection of motor pulse. It should not be used for other purposes, or it may damage the internal circuit of controller. Any two pins of PU+, PU-, DR+ and DR- cannot be connected together or used in parallel; otherwise, it may damage the internal circuit.**

4) Connection mode of output signal

The digital output of this control system is the open-collector output. The common end should be connected with GND of external power supply, and the output point is low level effective. Connect the load between +24V power supply and output point. The internal output circuit has complete protecting measures, including over-current protection, over-voltage protection, short-circuit protection, and follow current protection. However, if an external inductive load such as relay is used, please connect a freewheeling diode at the two ends of relay coil as follows:



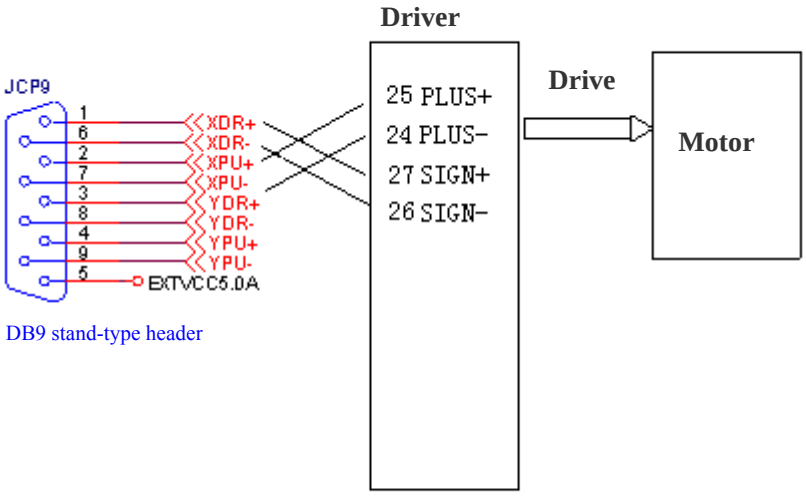
It is suggested that the supply voltage be < 24V; it is better not to exceed 30V. Positive and negative poles should not be connected reversely and the load should not be in short circuit; otherwise, it may cause unexpected damage.

Chapter IV: Examples of Connection

Example 1

Connecting ADTECH JaBao servo motor driver:

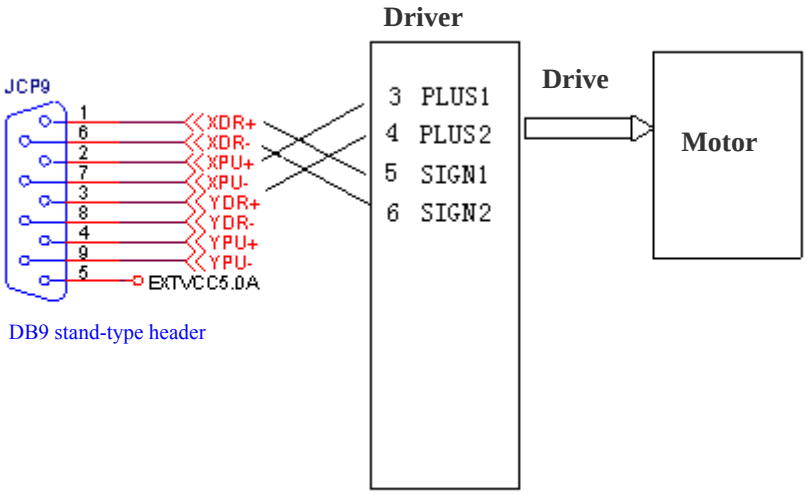
The following diagram shows the connection of controller with ADTECH JaBao servo motor driver:



Example 2

Connecting Panasonic servo motor driver:

The following diagram shows the connection of Panasonic A4 series servo motor driver:



Annex. Keyboard

HC6500 control system has self-contained keys, and the standard PC keyboard interface is also supported. Here we are going to introduce the corresponding relationship between standard PC keyboard and the keyboard of control system.

Picture ① Controller keyboard

The above picture shows the keyboard of cutting control system HC6500. For detailed functions, please refer to the software user manual.

The following picture shows the standard PC keyboard:

Picture ② Standard PC keyboard (Optional)

Comparison of keys on optional standard PC keyboard and controller keyboard is listed as below:

Comparison of standard PC keyboard and controller keyboard

S/N	Standard PC keyboard	Controller keyboard
1	F1-F8	F1-F8
2	F9	START
3	F10	STOP
4	F11	Manual
5	F12	Help
6	Direction key	Direction key
7	HOME	PREV
8	END	NEXT
9	ESC	CANCEL
10	DELETE	DELETE
11	[	S↑
12	]	S↓
13	;	F↑
14	‘	F↓
15	26 letters	26 letters
16	Number keys	Number keys

Numbers and letters of controller keyboard adopt the compound key. For detailed input methods, please refer to the user manual on software.