

CNC Controller Expanding Control (I/O) PCB

Support Position Control.&.Speed Control Mode CNC controller

Support Maximum Four Plasma/Oxy-fuel Cutting Torches

HYD-VII Instruction Manual

Revised on 12-10-2011

HYD CNC

<http://www.hydcnc.com>

Overview

HYD designs Shape Cutting System Expanding Control (I/O) PCB HYD-VII to standardize the shape cutting system expanding control PCB on market. It is made of Modularization circuit, designed according to the Control Target, Control Mode, and CNC controller; to reach the aim of professional cutting control, easy installation, convenient maintenance, cost-effective price, high reliability.

Key Features,

- 1、 HYD-VII I/O ports are directly connected with CNC controller via isolation connection. The electrical level of I/O ports could be Low Level or High Level. Output is connected to CNC controller by Optical Isolation, Input is Relay Isolation. It can work with most CNC controllers on the market, such as EDGE and VIII of Hypertherm, FASTCNC, FORAGE, BURNY....etc.
- 2、 It could simultaneously control FOUR cutting torches, plasma torch or gas torch.
- 3、 Torch Height Control could be with or without THC; it supports capacitive THC and Arc voltage THC both. All the Control Targets and inside circuits are isolated.
- 4、 User only needs to install external 12/24V power (supplied by HYD) for the HYD-VII, all system control functions is done by HYD-VII control circuit, no more external wiring needed.
- 5、 All Control Targets adopt modularization design, every torch is controlled by a plug PCB separately, and all torch control PCBs are the same, which makes installation and maintenance very easy. And all PCBs of torch control are gathered at the designated place.

1、Consist of HYD-VII

HYD-VII consists Four-Torch Shape Cutting System Expanding Control(I/O) PCB, Cutting Operation Panel, Logic Control PCB, Torch Control PCB and External 12/24V Power. All will be introduced in this manual.

1. 1 4-Torch Shape Cutting System Expanding Control(I/O) PCB

(I/O) PCB connects with CNC controller and directly controls all Control Targets. Through the connection between I/O PCB and CNC controller, it reaches the connection between I/O PCB and Servo Drive, Input and Output isolation with CNC controller, and the isolation between I/O PCB and Control Targets. As Figure 1-1 shows,

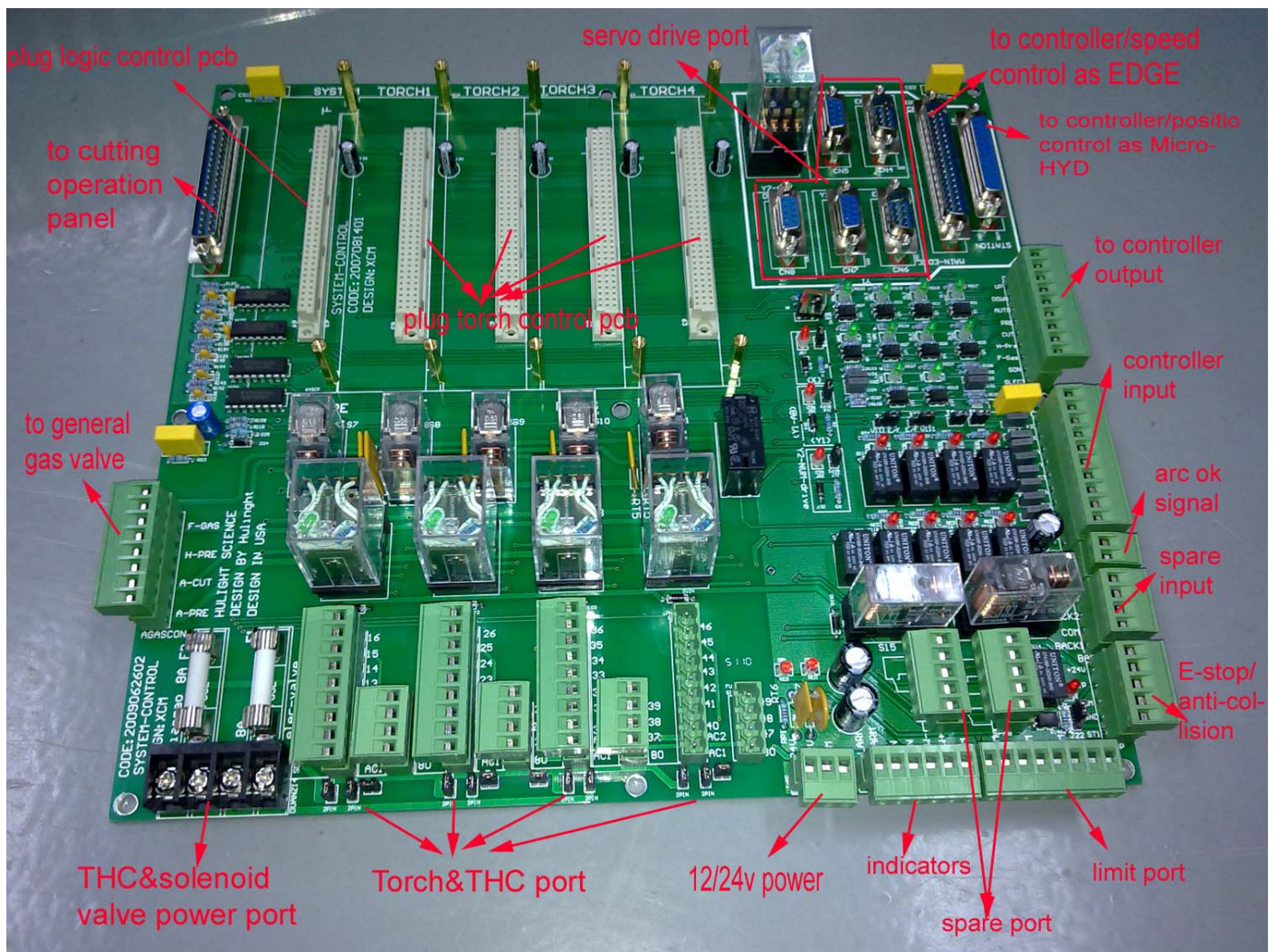


Figure 1-1 System Control PCB (Support 1~4 torches)

1. 2 Cutting Operation Panel

- A、 If CNC controller with keyboard/touch-screen, like EDGE-II, it can supplied without keyboard.
- B. Cutting Operation Panel with PC keyboard suitable for CNC controller without keyboard like MICRO-EDGE.



Figure 1-2 cutting operation panel with Keyboard

1. 3 Logic Control PCB

Logic Control PCB is the Core part of System Control PCB, every HYD-VII needs one pc of Logic Control PCB. As Figure 1-4 shows,



Figure 1-3 Logic Control PCB

1. 4 Torch Control PCB

One Torch Control Pcb controls one torch, it is plug in PCB, for controlling of Torch UP,DOWN, THC, Plasma Start...etc.

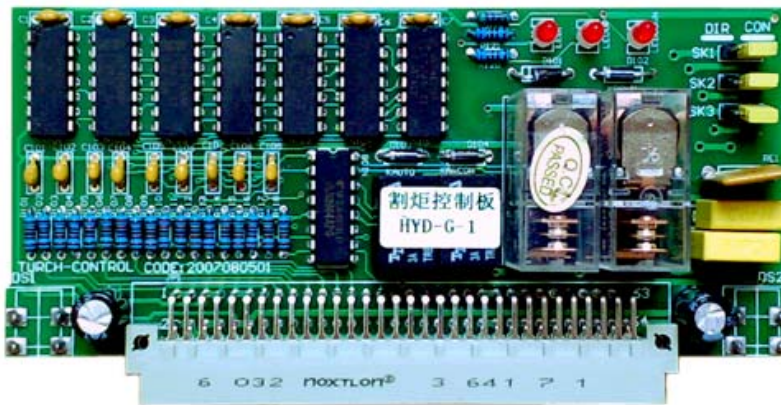


Figure 1-4 Torch Control PCB

If it is two plasmas cutting, for twin plasma torches simultaneous cutting control, it needs two special Torch Control Pcb's as follow,

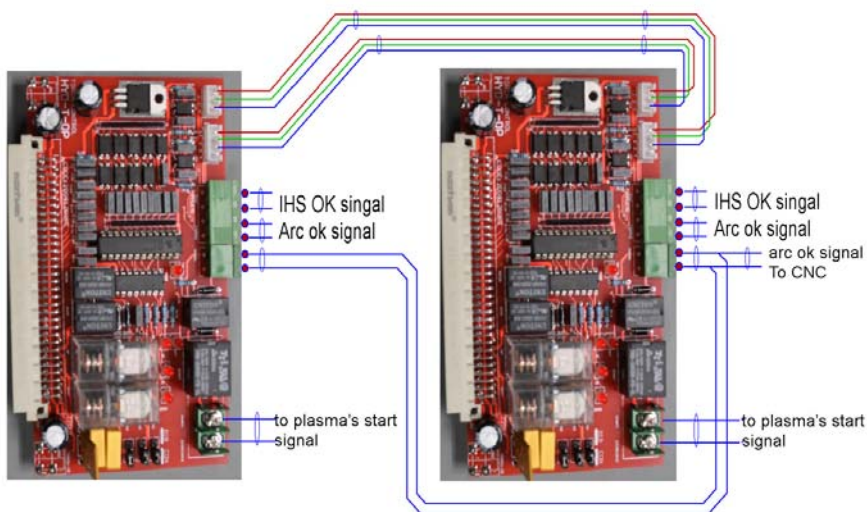


Figure1-5 twin plasma torch control pcb

1. 5 External 12/24V Power

Powersupply for I/O PCB.



Figure 1-6

Follow is the picture of CNC system using 4-torch I/O Card



2、 I/O PCB Connection and Function Introduction

2. 1 THC power and Solenoid valve power port (SP2)

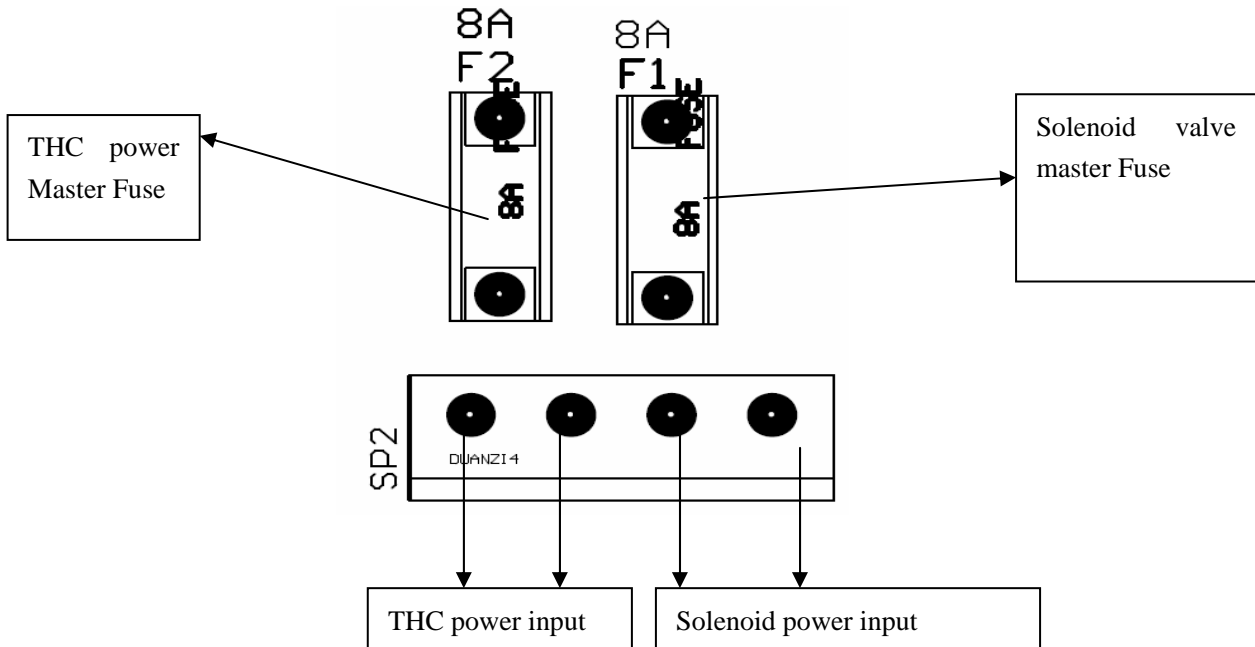


Figure 2-1 THC, Electromagnetic Valve Power Port

Note: THC power supplied from SP2 is sent to all cutting torches via J1~J12.

2. 2 CNC Controller Connector

2. 2. 1 Position Control Connection Definition (CN3)

It mainly defines according to FASTCNC controller Position Control Mode definition. But for other CNC controller of Position Control Mode, it still works if it connected follow this definition.

Position Control Mode connected to CNC controller via CN3 (DB 25PIN)

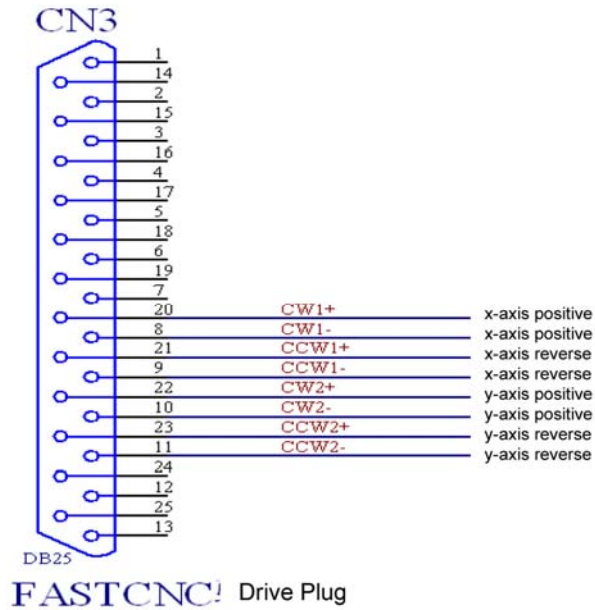


Figure 2-2 position control mode CN3 pin definition

2. 2. 2 Speed Control Mode Connection Definition (CN2)

It defines according to MICRO-EDGE controller Speed Control port definition. But for other CNC controller of Speed Control Mode, it still works if it connected follow this definition.

Speed Control Mode connected with CNC controller via CN2 (D37-pin plug)

Figure 2-4 OC (open collector) connection, on this mode, J21 should be on E/F position.

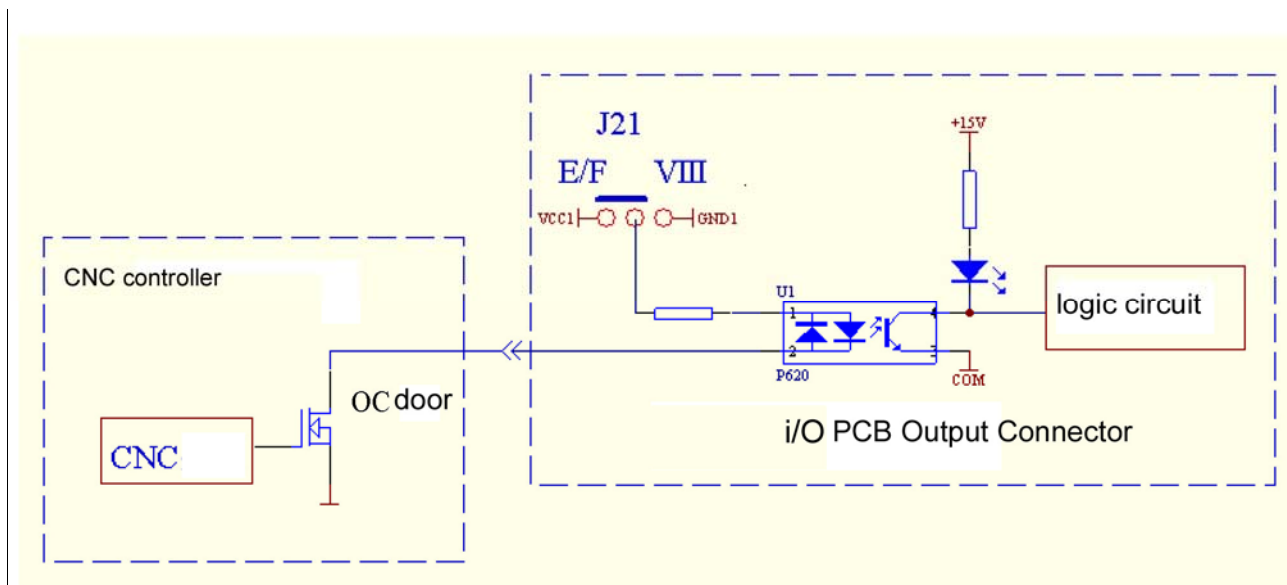


Figure 2-4

Figure 2-5 High Level Voltage Connection, J21 should be on VIII.

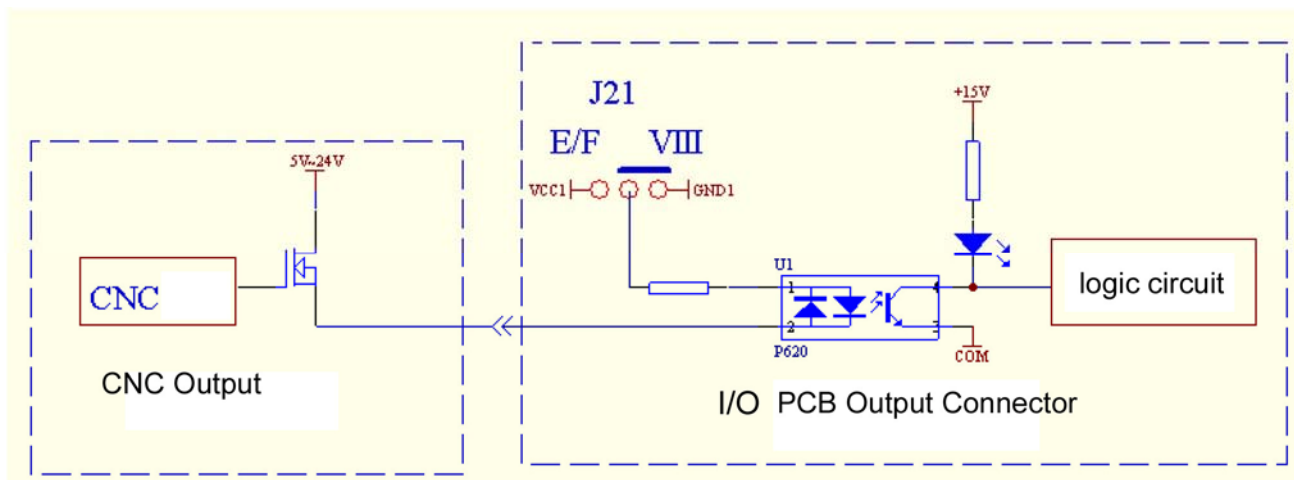


Figure 2-5

2. 3. 2 CNC OUTPUT Connector Definition (CNCOUT)

As Figure 2-6shows,

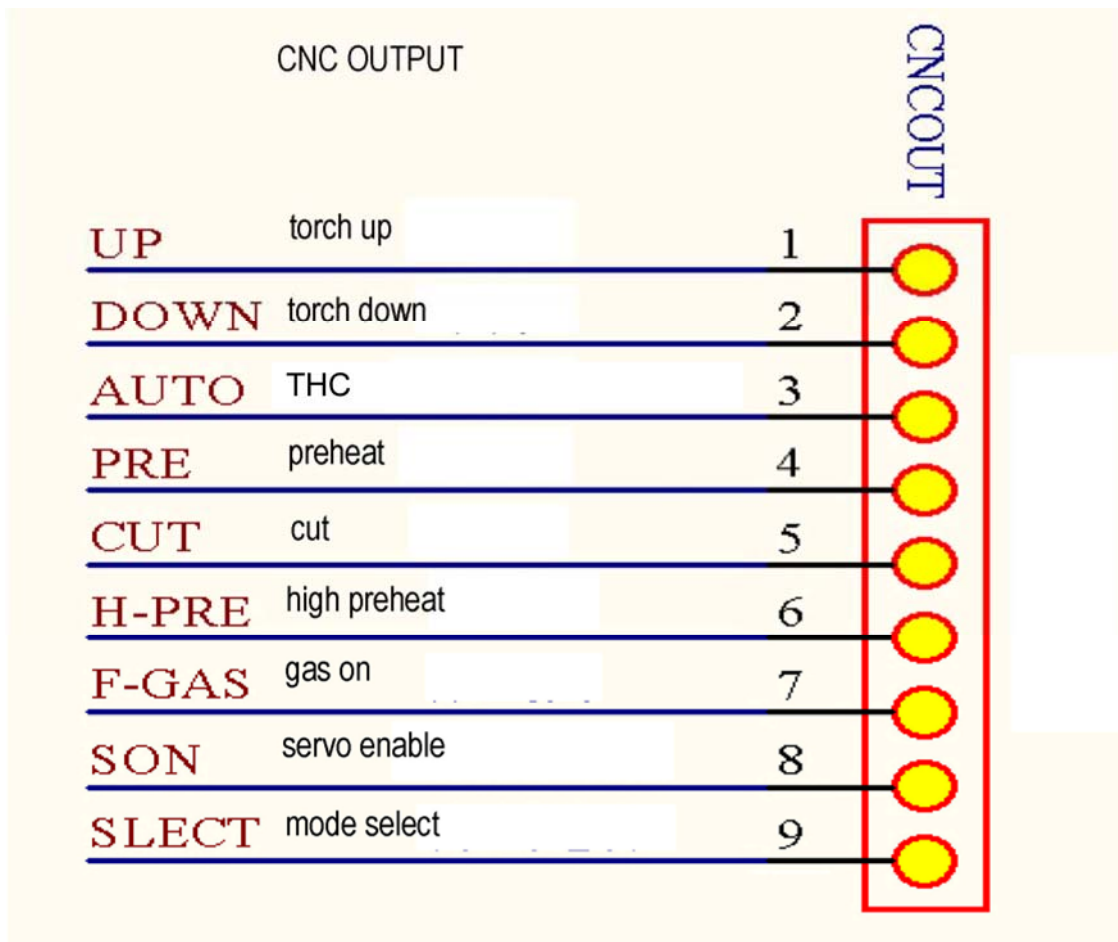


Figure 2-6 CNCOUT Definition

2. 3. 3 CNC Input Connection Jumper Setting(J14)

CNC Input is connected to CNCIN of System Control PC, could be High Level, Low Level two mode of connection via Jumper setting. As Figure 2-7 shows,

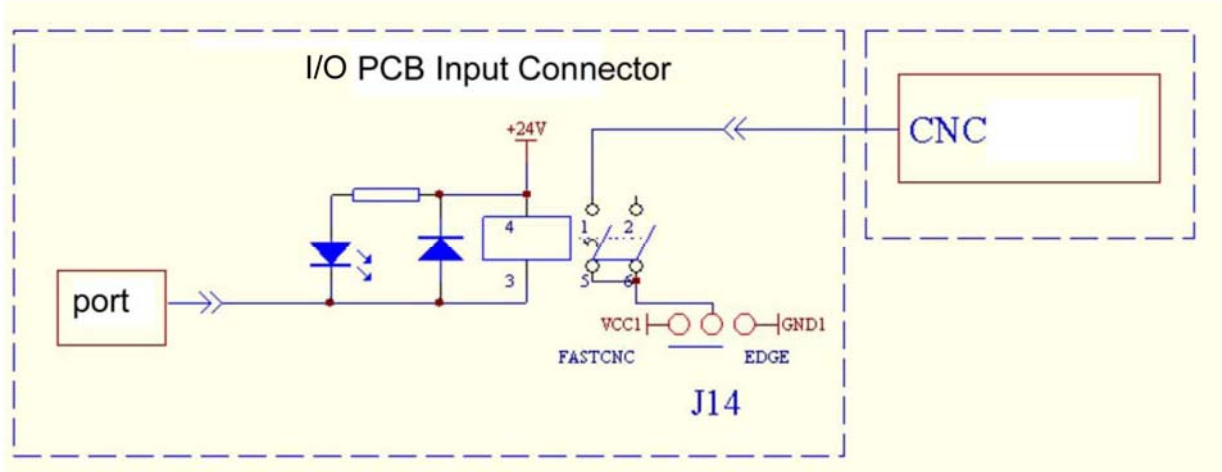


Figure 2-7 Input Connection

- 1、 If the Input port of CNC is Low Level, Jumper J14 should be on EDGE.
- 2、 If the Input port of CNC is High Level, Jumper J14 should be on FASTCNC, (FASTCNC,

Hypertherm VIII).

3、 The connection is optical isolated.

2. 3. 4 CNC Input Connection Definition (CNCIN)

As Figure 2-8 shows,

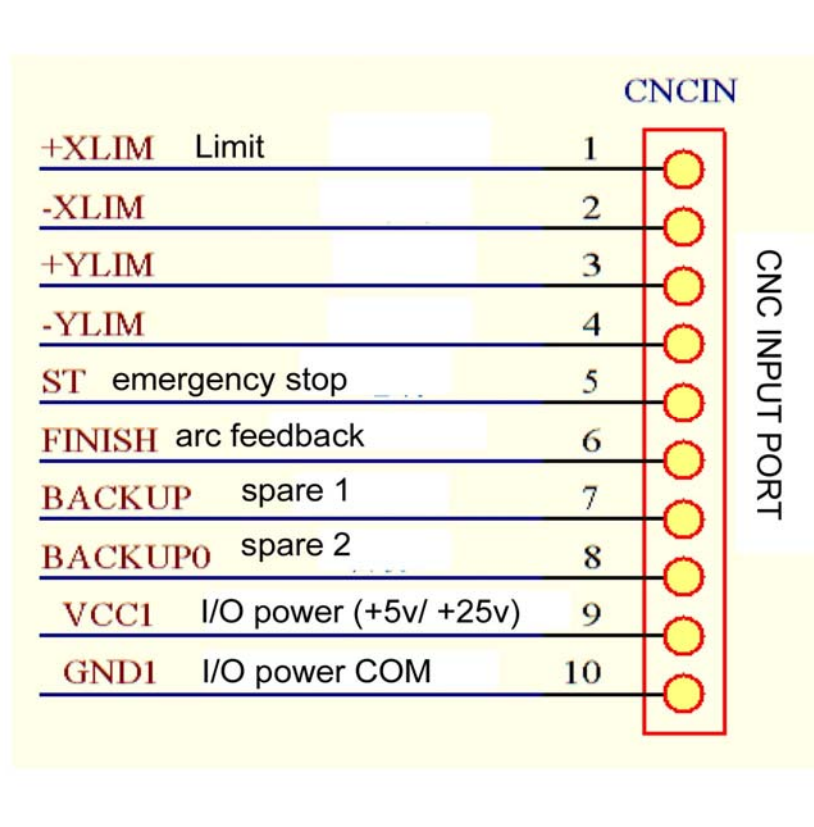


Figure 2-8

2. 3. 5 CNC Connection Power Jumper Setting (J19、J20)

J19、J20 are Power Jumper setting between CNC Power and I/O PCB, setting as follow,

- 1、 If CNC controller I/O needs external powersupply, J19 and J20 should be connected, J19 connected to negative port, J20 positive, and the power is +24V, ie. FASTCNC.
- 2、 If CNC I/O not need external powersupply, ie. EDGE series, J19, J20 should be unconnected.

2. 4 Servo Drive Connector

I/O PCB offers two axis drive connectors on Position Control Mode, could drive three servo motors. One on X axis, two on Y axis (Y1 is master axis, Y2-A/B is slave axis of A/B Drive.).

I/O PCB offers two axis drive connectors on Speed Control Mode, could drive three servo motors. One on X axis, two on Y axis (Y1 is master axis, Y2-A/B is slave axis of A/B Drive.)

2. 4. 1 Servo Drive Connector Definition (CN5、CN7、CN8)

CN5、CN7、CN8 Pin definition as Figure 3-9, everyone has its own Control Target:

CN5: X axis drive, should be connected on both Position Control and Speed Control.

CN7: Y (Y1) master axis drive, should be connected on both Position Control and Speed Control.

CN8: Y2-AB (Y slave axis) drive, only work on Position Control Mode, Pulse Drive Signal comes from Y driving axis encoder Frequency Divide Output.

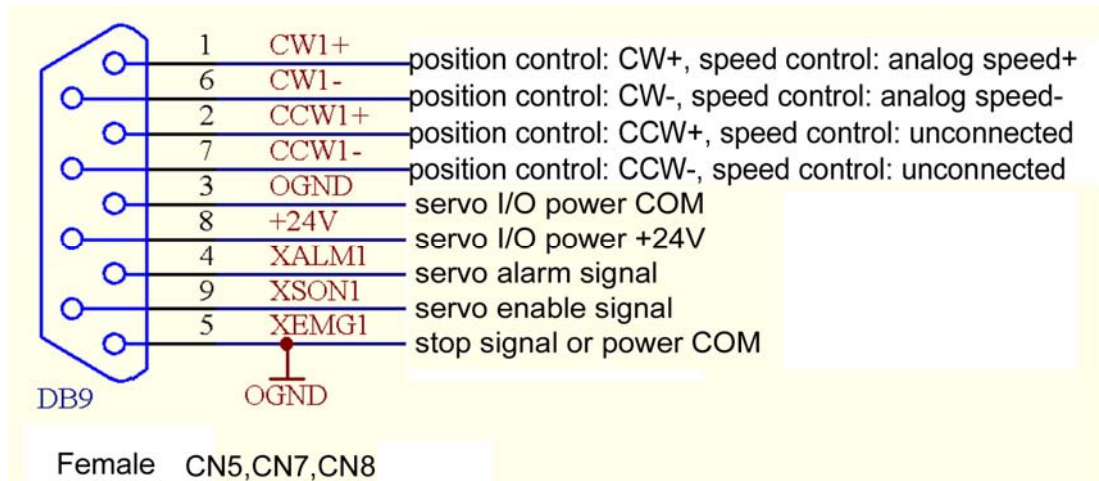


Figure 2-9 CN5、CN7、CN8 Connectors

2. 4. 2 CNC Servo Encoder Frequency Divide Output , feedback to CNC (CN4、CN6)

CN4: X axis Servo Encoder Frequency Divide Output, as Position Feedback Signal sent to CNC via CN2, only connected on Speed Control Mode.

CN6: Y drive axis Servo Encoder Frequency Divide Output, as Y drive axis Position Feedback Signal sent to CNC via CN2, connected on Speed Control Mode, also connected if slave axis exists on Position Control Mode.

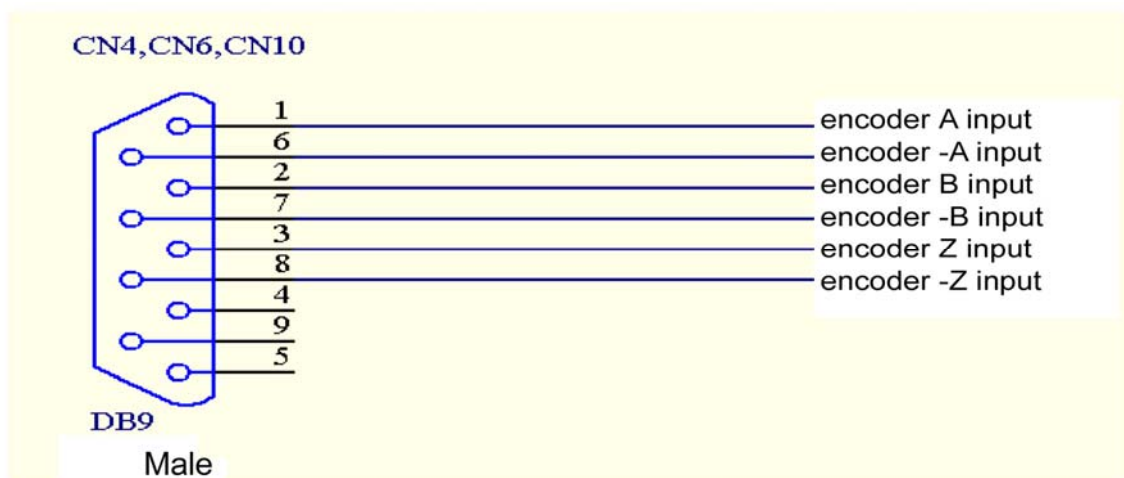


Figure 2-10 CN4、CN6 Definition

2. 4. 3 Servo Alarm Signal Jumper Setting. (J15、J16、J17、J18)

J15: X axis Servo Alarm Jumper, needs to be unconnected if Servo installed. Indicator 1SF is OFF

when Servo alarming.

J16: Y1 master axis Servo Alarm Jumper, needs to be unconnected if Servo installed. Indicator 2SF is OFF when Servo alarming.

J17: Y1 (Y1-A/B) slave axis Servo Alarm Jumper, needs to be unconnected if Servo installed. Indicator 3SF is OFF when Servo alarming.

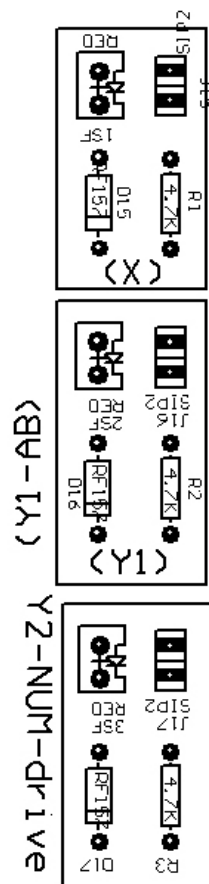


Figure 2-11 Servo Alarm Jumper Setting

2. 5 Control Target of I/O PCB

2. 5. 1 Limit Signal Input (LIMIT)

As Figure 2-12, includes +X、-X、+Y、-Y Limit, separately matches CNC Input +X、-X、+Y、-Y.

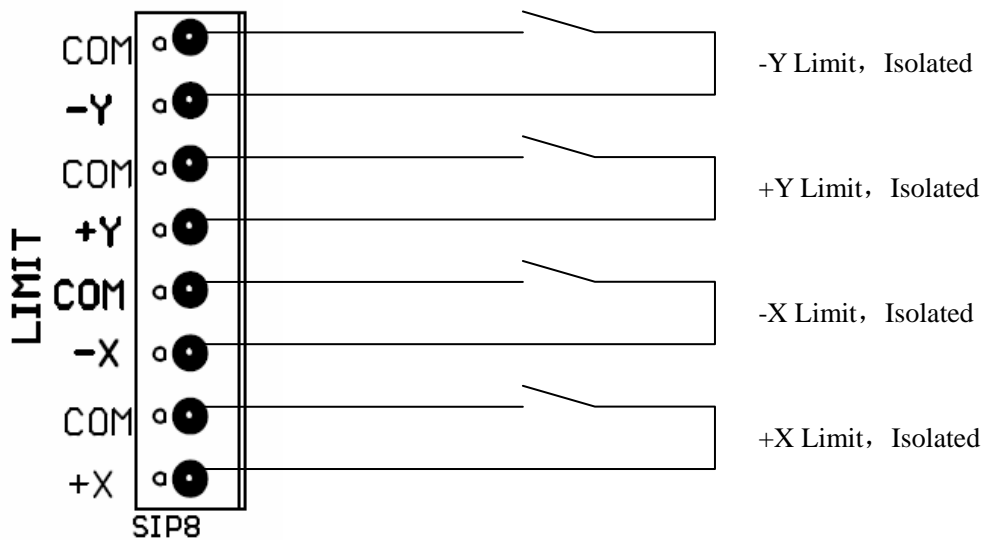


Figure 2-12

2. 5. 2 Spare Input Port (BACKUP)

Figure 2-13, Connector BACK1 after isolation, matches to BACKUP(spare 1) of CNCIN Port, Connector BACK2 after isolation, matches to BACKUP(spare 2) of CNCIN Port.

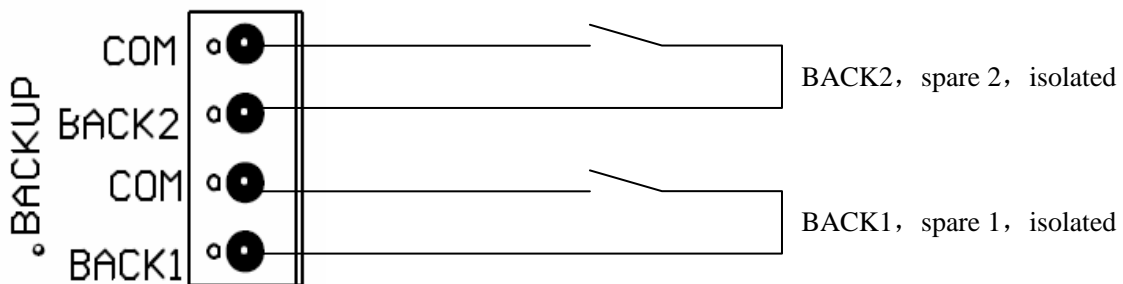


Figure 2-13

2. 5. 3 Arc Feedback (Arc OK) Input Port (FINISH)

Figure 2-14, If several Arc Feedback Signals come together, they could be connected together.

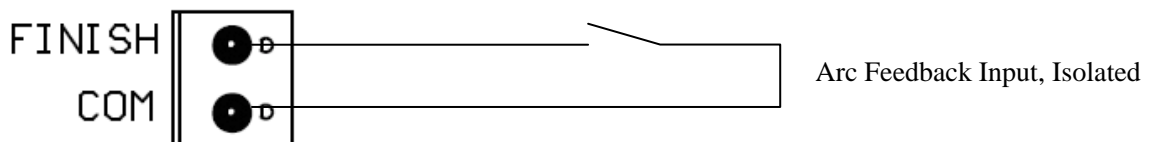


Figure 2-14

2. 5. 4 Emergency Stop and Anti-Collision Input Port(STOP)

Figure 2-15, Problem happens to any of Emergency Stop, Anti-Collision Input, and Servo Alarm, it will

be sent to CNC via Input of CNC.

Emergency Stop connects to Switch Contact Signal, usually it is installed on the rack beam of CNC machine.

Anti-Collision Input connects to Proximity Switch, effective if connected, usually PNP type.

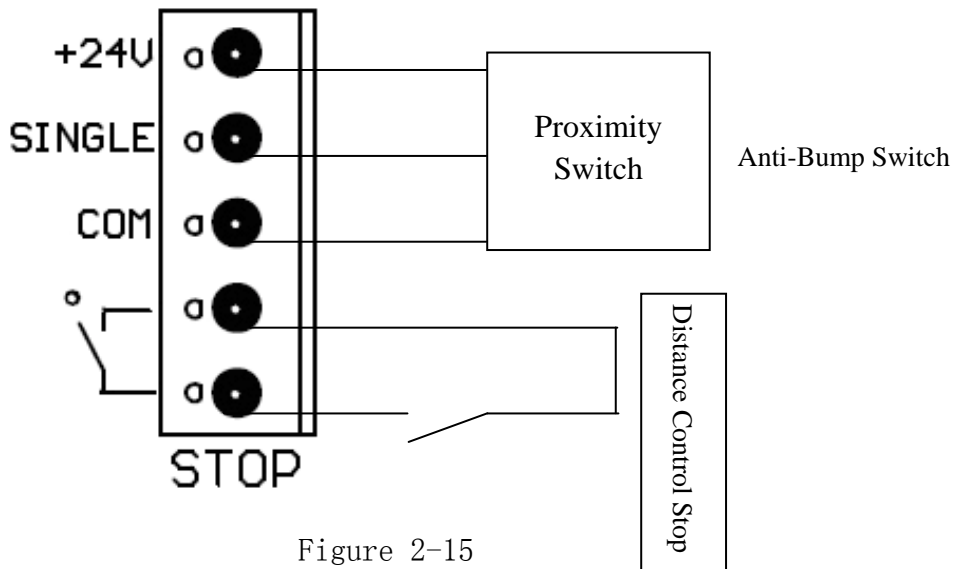


Figure 2-15

2. 5. 5 Flame Cutting General Gas Road Connection (AGASCON)

Refer to Figure 2-16: Solenoid valve power volt depends on the valve power input port, usually it is AC24V power.

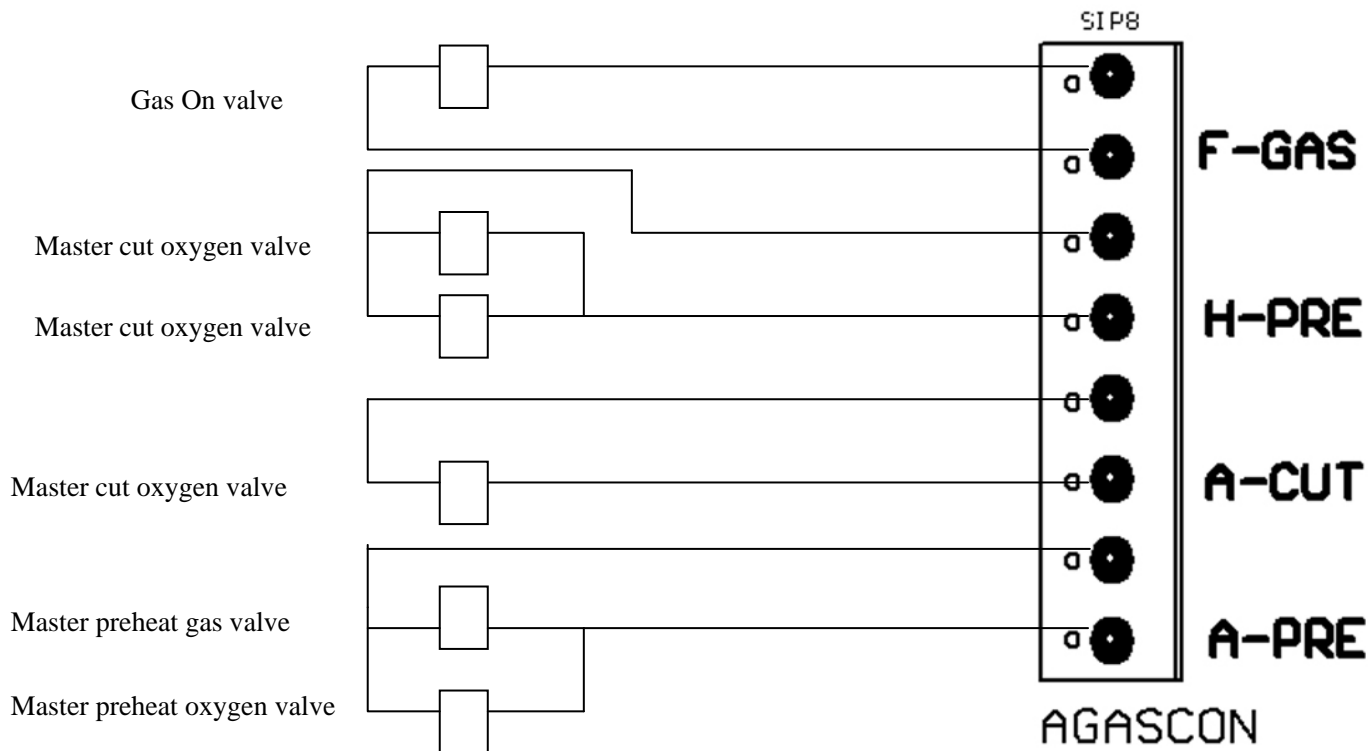


Figure 2-16

2. 5. 6 Torch Gas Road Output Port (FUGUN)

Every torch has one gas road connector, installation please refer to Figure 2-17, Note:In this System the voltage is the same between Fire Starter and solenoid valve.

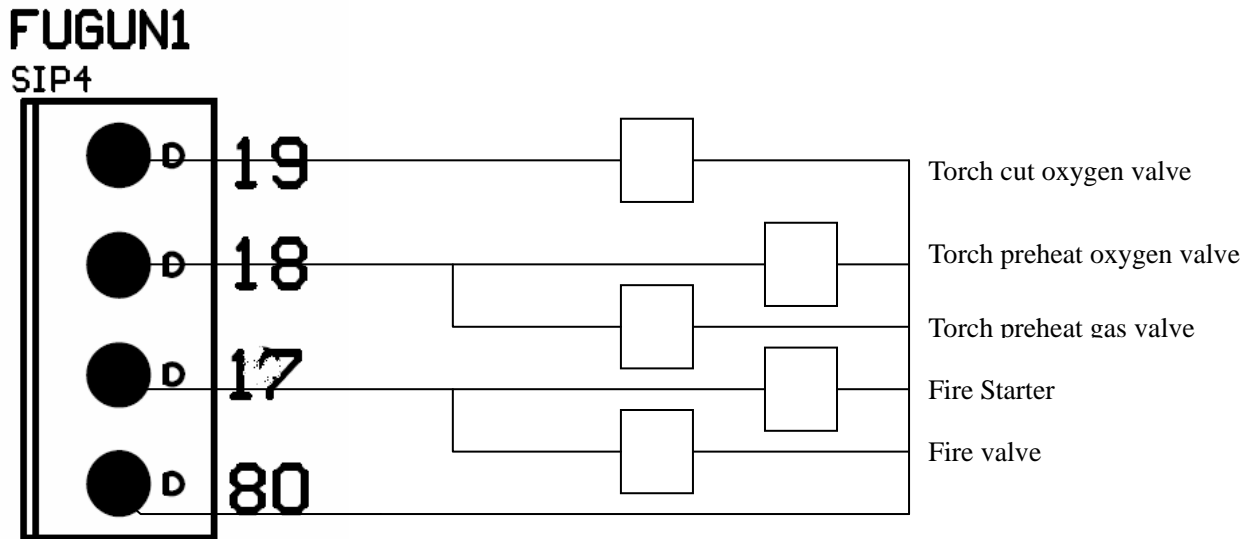


Figure 2-17

2. 5. 7 Power, Run, Alarm Indicator Connector (DISPLAY)

This design is for display convenience, definition as Figure 2-18.

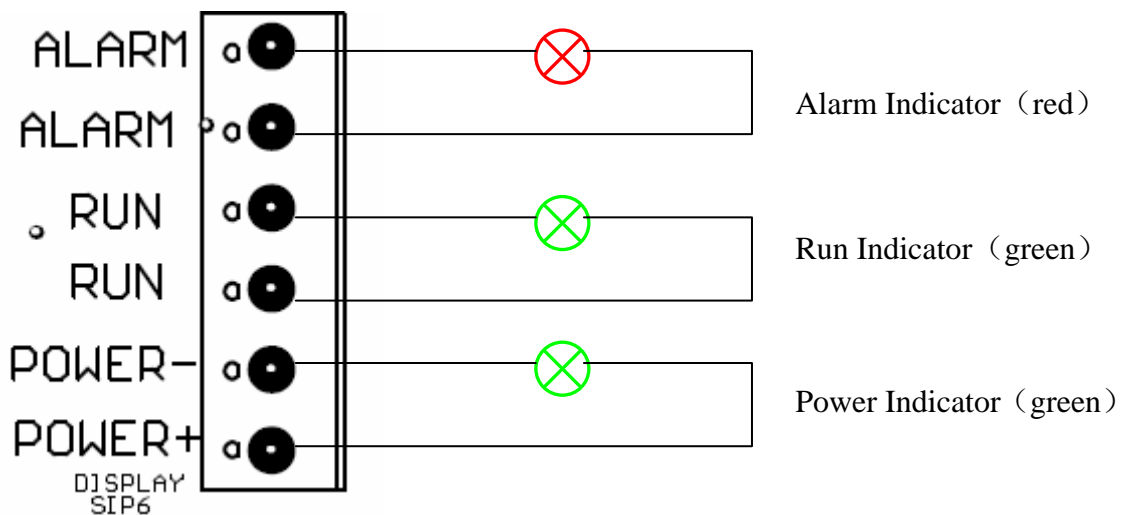


Figure 2-18

2. 5. 8 Spare Port (SPA5、SPA6)

Spare Port is designed to increase CNC system function, not use in normal time. All connectors are

Relay Output, has Normally Open Contact and Normally Closed Contact. User could use it according to different situation.

SPA5、SPA6 Output could be controlled by B1, B2, or external switch, SPA5-----Relay S15, SPA6-----Relay S16.

Note: 1、 Relay S15 has to be Twin Contact Relay (model: OMRON-G2R-2, DC24V), the rest relay could be Single Contact Relay (model: OMRON-G2R-1, DC24V);

2、 The Connection of Expand Control PCB is noted on I/O PCB.

Figure 2-19 shows the connection of Expanding Control.

SPA3、SPA4、SPA5、SPA6

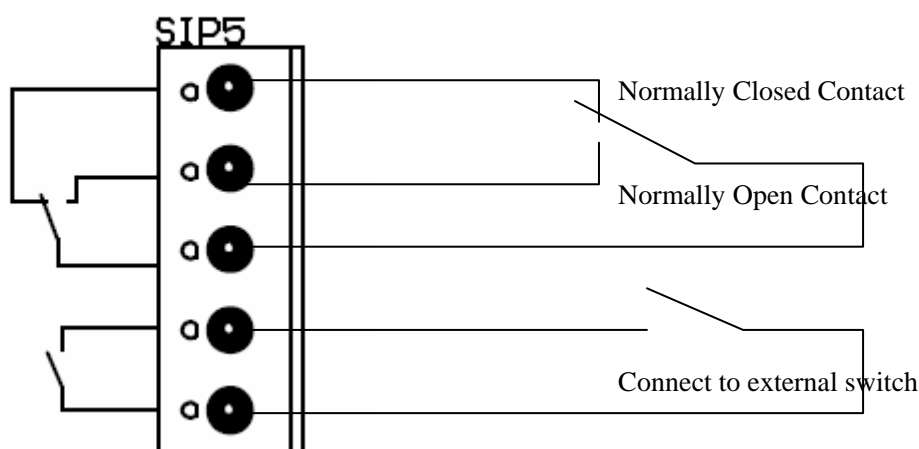


Figure 2-19

3、 I/O PCB Function Parts

3. 1 Cutting Operation Panel

3. 1. 1 PC keyboard

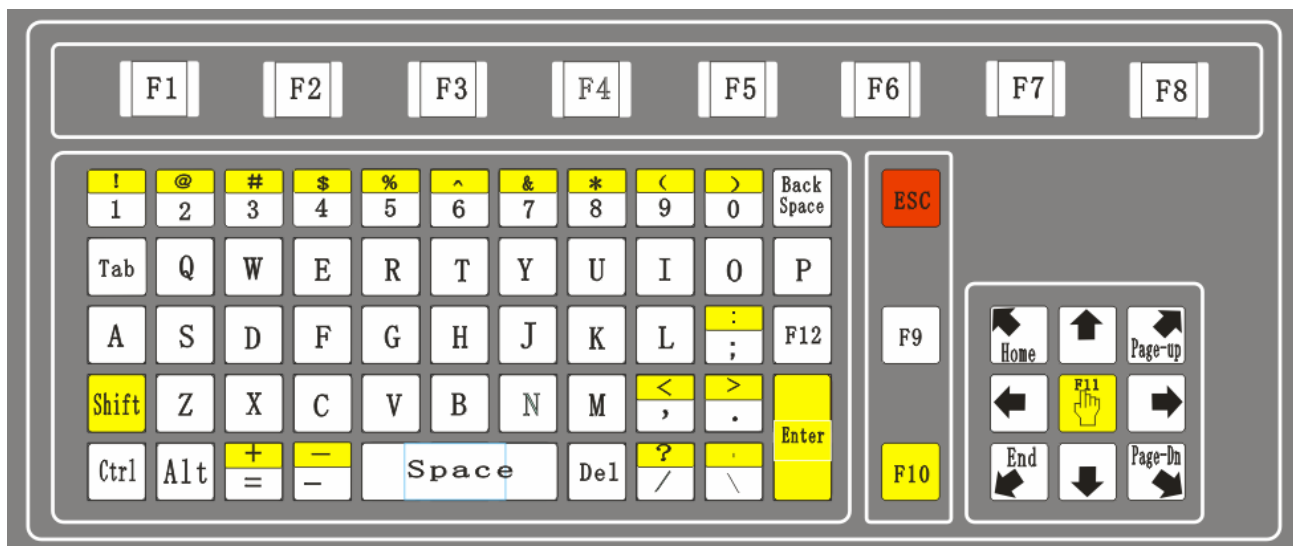


Figure 3-1 PC keyboard

Refer to figure 3-1, it has 72 keys, almost the same as normal pc keyboard, we changed a little, according to the cutting operation habit.

3. 1. 3 Cutting Operation Panel Function

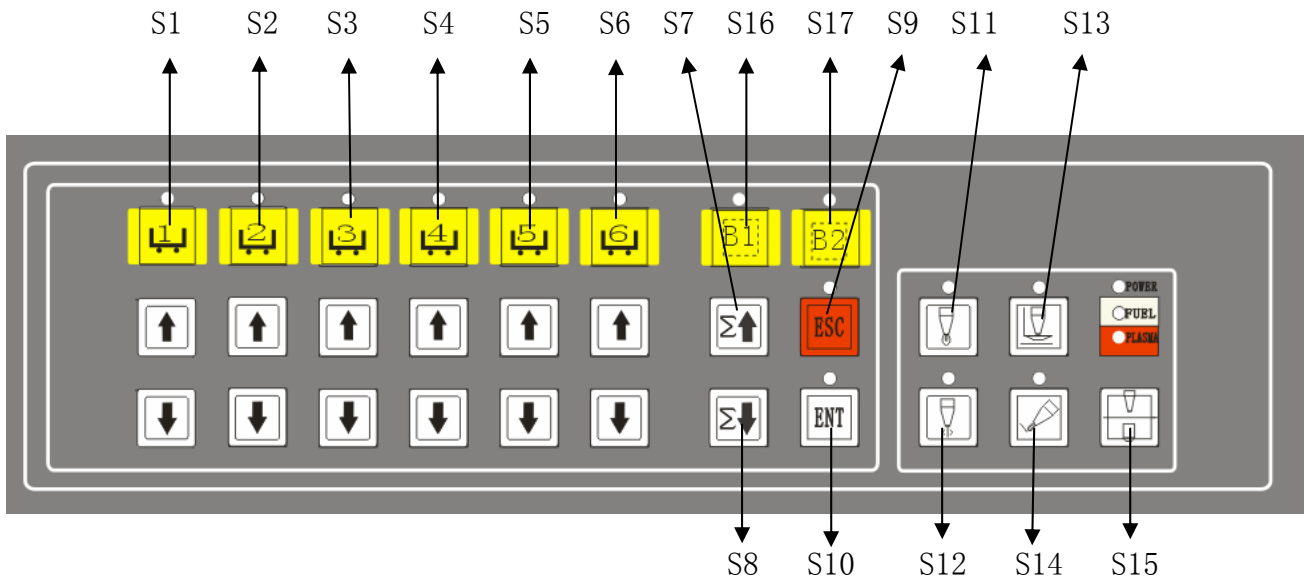


Figure 3-2 Cutting Operation Panel

Refer to figure 2-2, it has 27 keys.

S1~S6: Choose cutting torch, Alternate Work Mode, the Arrow key below control the matched torch Up or Down, Instantaneous Work Mode.

S7、S8: Manual operation of General Up and Down, Instantaneous Work Mode

S9、S10: S10 lock the chosen torch, S9 release the lock function。

S11: Preheat operation key, Alternate Work Mode, effective in gas cutting.

S12: Alternate Work Mode, manual control Gas Feed on Gas cutting; manual control Arc Start on plasma cutting

S13: Auto Height Control Enable key, Alternate Work Mode, only it is enabled, cutting torch would be on Auto Height Control. When the Auto Height Control indicator flashes 2 times/second, Auto Height Control enables, until the indicator ON, then cutting torch is on Auto Height Control Mode.

S14: Fire Key, Instantaneous Work Mode, effective on Gas cutting

S15: Choose cutting mode, switch between plasma cutting and gas cutting. When the related indicator is

on, it is on named cutting mode. When it is done automatically, this signal is completed by CNC controller via designated code.

S16、S17: Spare key, please refer to **3.1.4.**

3. 1. 4 Special function of B1、 B2

B1, B2 on Operation Panel are used to control Relay S15, S16 on System Control PCB, and output via SPA5, SPA6.

B1 could be used to control Servo Enable Signal. If CNC has no Servo Enable Signal, please take off Jumper J22, and set J13 at position of FASTCNC, then B1 on operation Panel could start Servo Enable.

If B1 is used to control Servo Enable Signal, then Relay SPA5 shall be reserved.

3. 1. 5 Cutting Operation Panel Port Definition.

Cutting Operation Panel connect to CNC via Plug DB37/F-D labeled as Operation. Definition as Figure 3-3 shows,

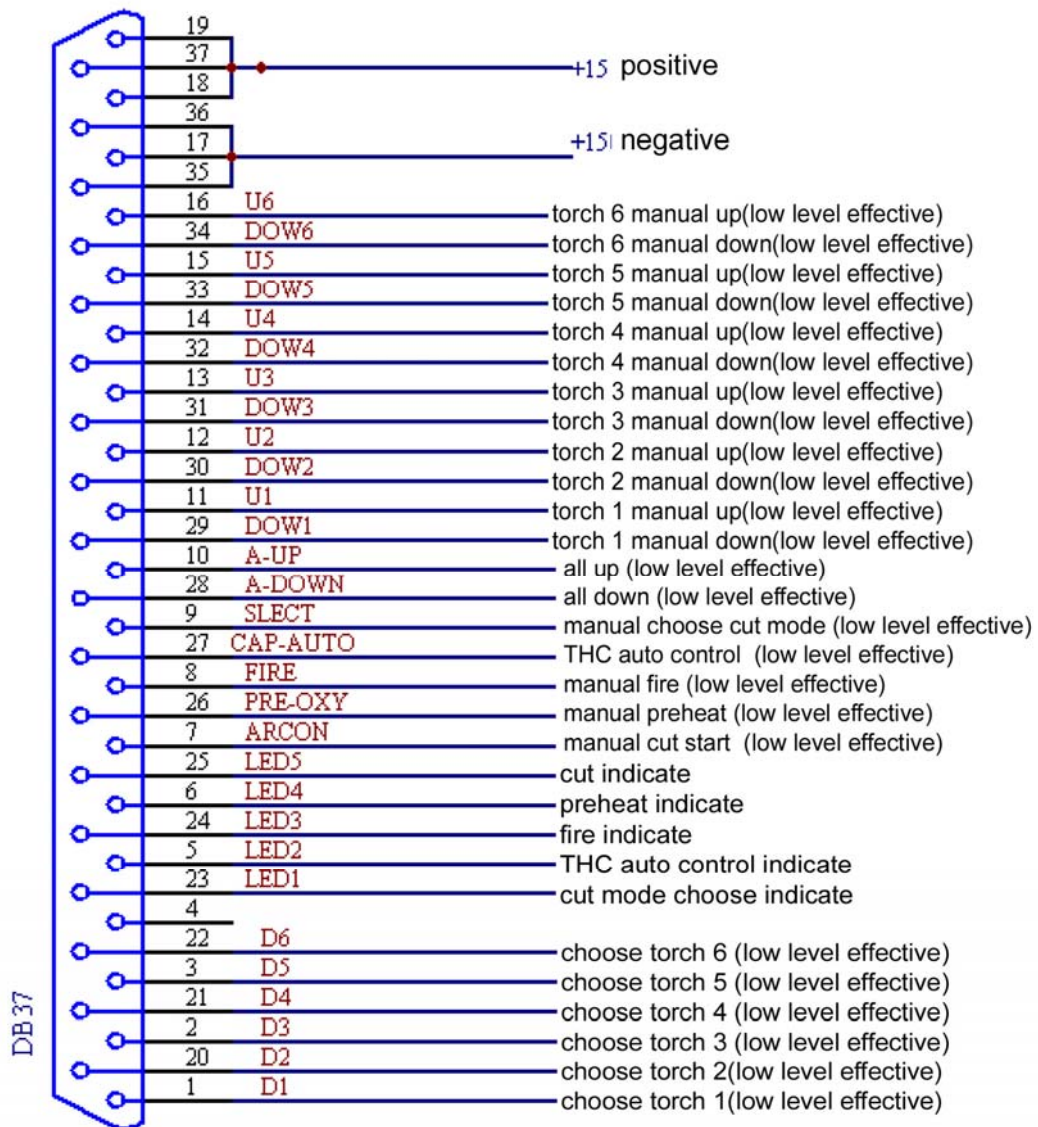


Figure 3-3

3. 2 Logic Control PCB

3. 2. 1 Function of Logic Control PCB

Logic Control PCB is the Logic Control Circuit for CNC plasma/flame cutting functions to Manual/Auto control the Control Target. CNC I/O signals, Manual Control and Indication function of THC, plasma Arc Start, and operation panel all are under control of Logic Control PCB which is the key part of I/O PCB.

3. 2. 2 Logic Control PCB pin definition

As Figure 3-4 shows,

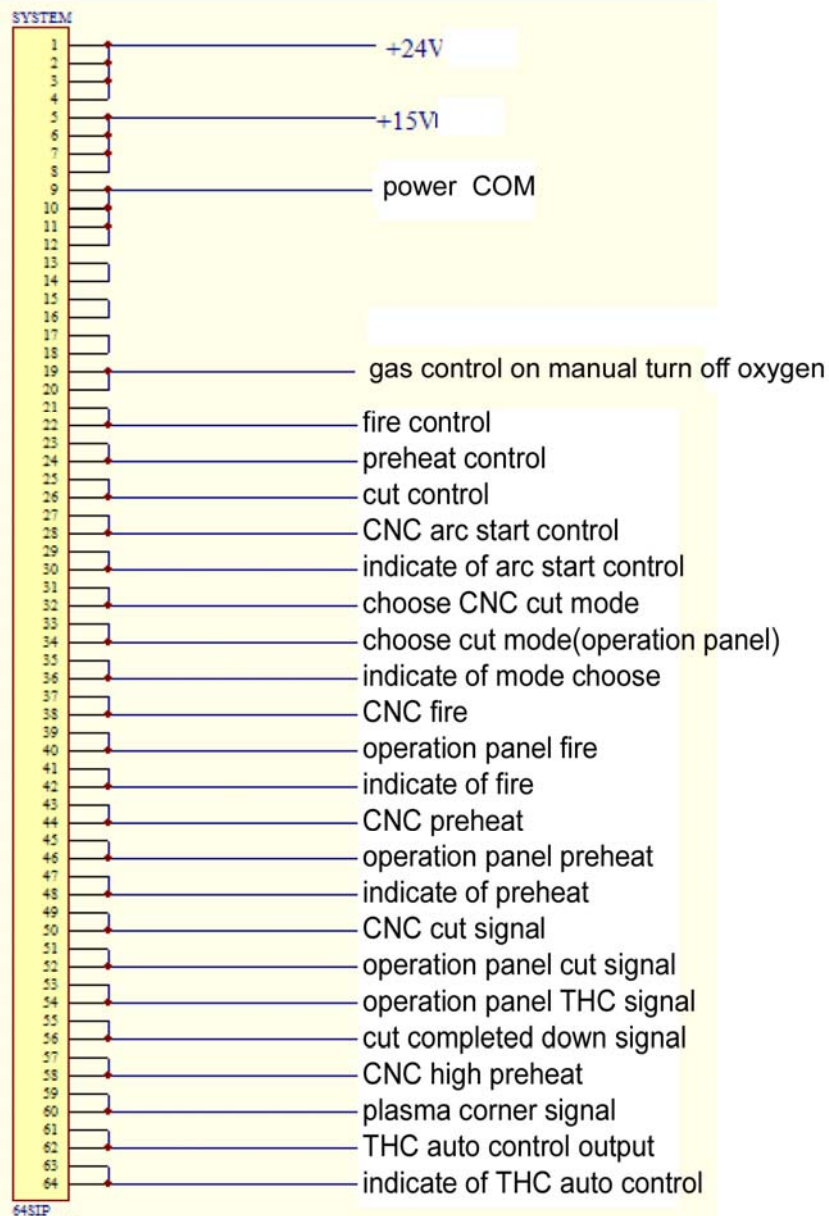


Figure 3-4

3. 3 Torch Control PCB Function

3. 3. 1 Torch Control PCB Function

Cutting Torch Control PCB is designed for controlling single cutting torch Up and Down, and plasma cutting, functions as follow,

- A. For connection of Capacitive THC and Arc Voltage THC;
- B. For Up and Down Control without THC;
- C. For Plasma Arc Start with/without THC;
- D. Plasma cutting could be controlled by Capacitive THC and Arc Voltage THC;
- E. For Up and Down Priority Control.

3. 3. 2 Setting on condition of with/without THC

Refer to Figure 3-5, With THC, Put Switch SK1、SK2、SK3 to CON Position;

Without THC, Put Switch SK1、SK2、SK3 to DIR position.

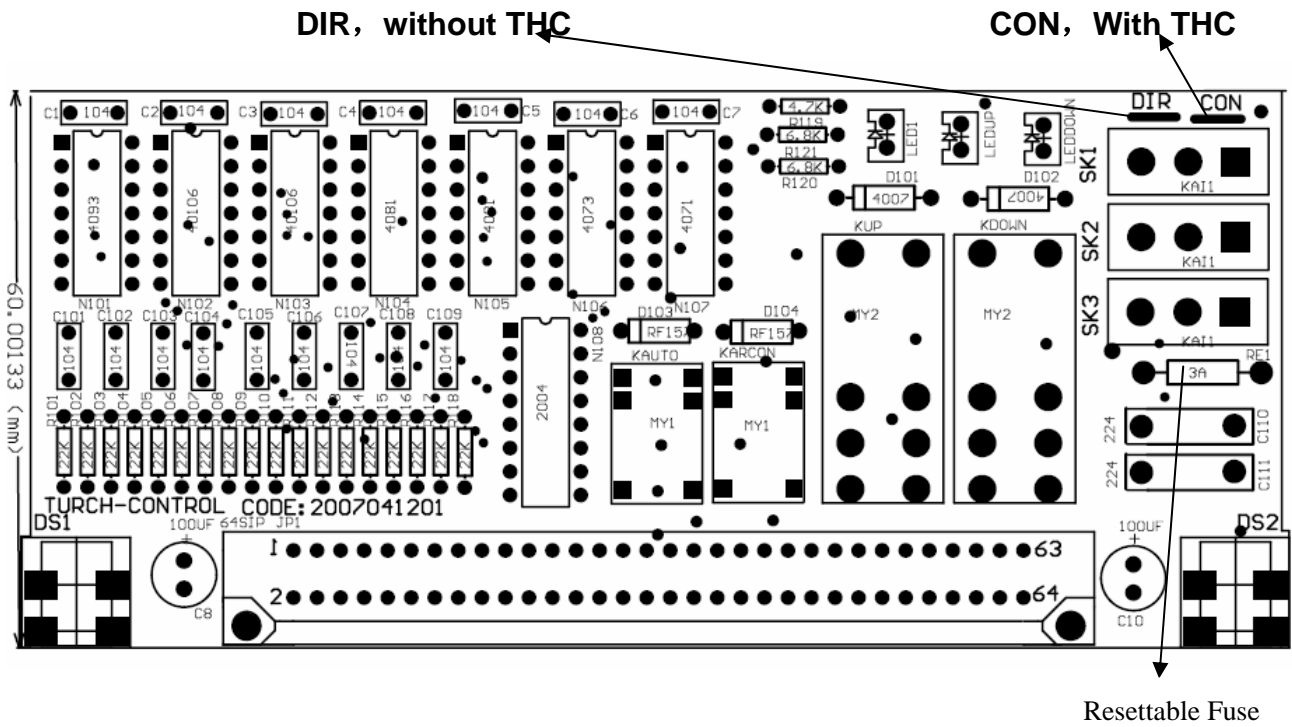


Figure 3-5

3. 3. 3 Torch Port connection (with THC)

Every torch has one THC connector, labeled as follow:

- | | |
|---------------------|-----------------------|
| 1#Torch-----THCGUN1 | 2# Torch -----THCGUN2 |
| 3#Torch-----THCGUN3 | 4# Torch -----THCGUN4 |

Refer to Figure 3-6, THCGUN1 is THC connector of 1#torch, 2#~4#torch function is same as Figure 3-6 shows.

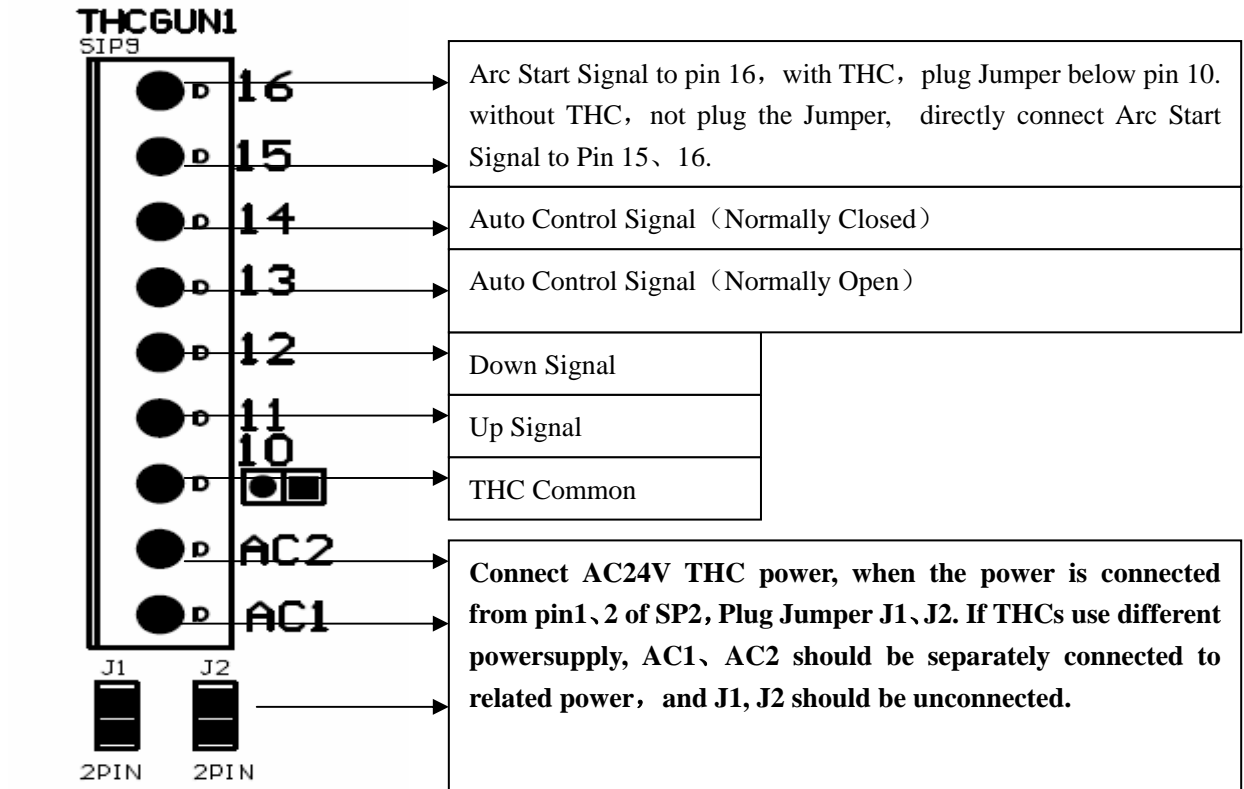


Figure 3-6

3. 3. 4 Torch Port Connection(without THC)

Refer to Figure 3-7, THCGUN1 is THC connector of 1#Torch, 2#~4#Toch function is the same.

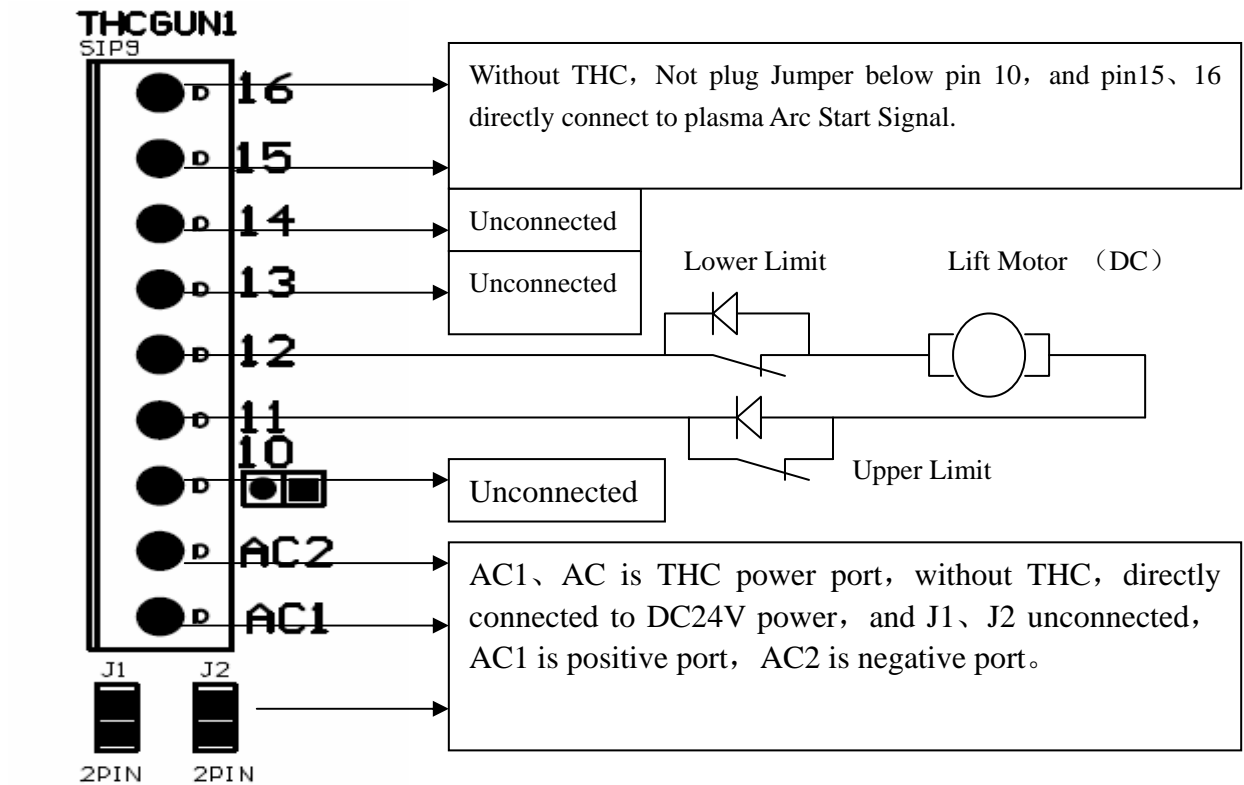


Figure 3-7

3. 3. 5 Introduction of Torch Up and Down Priority.

Torch Up and Down Priority designed as follow:

- A、 Between Up and Down, Up has Priority;
- B、 Between Manual and Auto, Manual has Priority.

3. 4 I/O PCB Powersupply

3. 4. 1 I/O PCB Powersupply port (SP1)

I/O PCB shares one DC24V/A powersupply and one DC 12V/0.8A powersupply, and supplied via SP1 port. DC24V supports Relay work, DC12V supports Logic Control Circuit. These two powersupply are both supplied by a Switch Powersupply.

- Note:
- 1、 The output 27V/2A, should be adjusted to 24V;
 - 2、 If the load of 24V is not enough, please install a 10W/60R Resistor at output to match the Load.
 - 3、 It is just reference, customer could supply replacement locally.

3. 4. 2 Switch Power Connection(reference of our Switch Power)

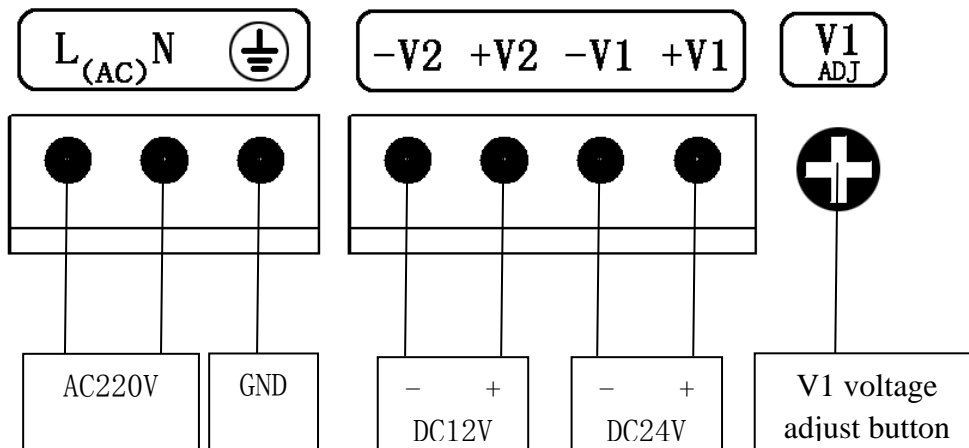


Figure 3-8