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<http://www.hydcnc.com>

Instruction Manual

Arc Voltage Torch Height Controller XPTHC-100

Trademark: **HYD**



Please check this manual fully before use, and contact us for any further explanation

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1、 Brief Introduction

1.1 It can match almost all plasma cutters. Based on the Constant Current Characteristic of Plasma power supply, THC monitors the torch height change during cutting process via detecting the change of plasma Arc Voltage, to reach the aim of controlling the Height of Cutting Torch.

1.2、 Basic functions :

A、 Auto Initial Height Sensing(IHS) :

Torch Retaining Cap IHS and Proximity Switch IHS (NPN and PNP), Proximity Switch IHS is backup for Torch Retaining Cap IHS during cutting dirty/rusty workpiece, **needing the Anti-bump fixture designed by us (optional to customer)**. The touch-off circuit enables the torch head retract whenever it is in risk of crashing during cutting.

B、 Auto Torch Cutting Height Control.

C、 Display of the Set Arc Voltage and the Actual Arc Voltage:

The Set Arc Voltage and Actual Arc Voltage would be displayed on THC, helping operator follow work of CNC. **We set 30V (adjustable) as Over Arc Voltage Protection (OAVP) according to our years practice, it is to protect cutting torch on Kerf Crossing, Corner Turning.** When the Actual Arc Voltage is higher than Set Arc Voltage 30V, Auto Height Control Mode stops to avoid torch head diving.

D、 Support under-water cutting, on Auto IHS mode

It is our invention of underwater cutting on IHS of Retaining Cap. This function is optional to customers.

F、 Lifting torch head on IHS Disabled status.

On IHS Disabled status, jogging torch head down until it reaches workpiece, when Arc Starts, torch head would lift up automatically to the Set Height set via the button SET-IHS.

G、 Lifting on TURN ON or Arc Off:

When CNC is TURN ON or Arc Off, THC would lift cutting torch for 2 seconds, **please notice this Function during commissioning, avoiding the possible damage of limit switch or lift device.**

H. Arc Voltage Enable output:

Setting the Button Set-PIERE, to delay the sending out of this signal (Arc Voltage Enable), the signal is produced by detecting the existence of arc voltage, output is Switch Signal.

I. Manual Operation:

Many functions can be operated on operation panel such as setting Auto/Manual Up and Down, test of IHS and Arc Start...etc

J. Auto Operation:

After Arc Start signal was given by the CNC, THC completes IHS automatically---Plasma Start---Arc Transfer---Arc Voltage Enable signal. Plasma cutter starts to cut when it receives Arc Voltage Enable signal.

K. Arc Voltage Divide:

Isolation Voltage Divide detection, the Voltage Divide ratio is 100:1.

2、 Specification

- Input Power : AC24V \pm 5%, 50Hz/60Hz
- Down/Up Motor : DC24V DC MOTOR
- Motor Drive: PWM ;
- Output Current : 1A-4A, Load capacity : 100W,
- Working temperature : -10 \circ 60 \circ C
- Voltage Divide ratio :100:1
- **Control accuracy : \pm 1V \circ \pm 3V**
- Size : length *width *height : 320mm*260mm*90mm
- The speed of lifting :1000mm/min \circ 2000mm/min(Contact the supplier if it exceeds the range of speed)

3、 THC Work Process

3.1、 Mode 1 :

When the Arc Starting signal (IHS enabled) that connected with CNC is the 4th stitch of the 10-pin aviation socket, THC starts with IHS, then drives plasma start arc, when Transfer Arc produced, THC sends Arc Voltage Enable signal to CNC to start cut. When THC sends Arc Start signal to plasma, it delays guiding arc voltage into THC, after that, if THC is on Auto Mode and the CNC has already sent Auto Height Control signal, then the THC is on Auto Height Control status.

3.2、 Mode 2 :

When the Arc Start signal (IHS disabled) that connected with CNC is the 5th stitch of the 10-pin aviation socket, THC lifts torch to the height set by Set-IHS, without IHS, driving plasma start arc directly. When Transfer Arc produced, THC sends Arc Voltage Enable signal to CNC to start cut. Meanwhile, it delays guiding arc voltage into THC, after that, if THC is on Auto Mode and the CNC has already sent Auto Height Control signal, then the THC is on Auto Height Control status

4、 Function of Operation Panel

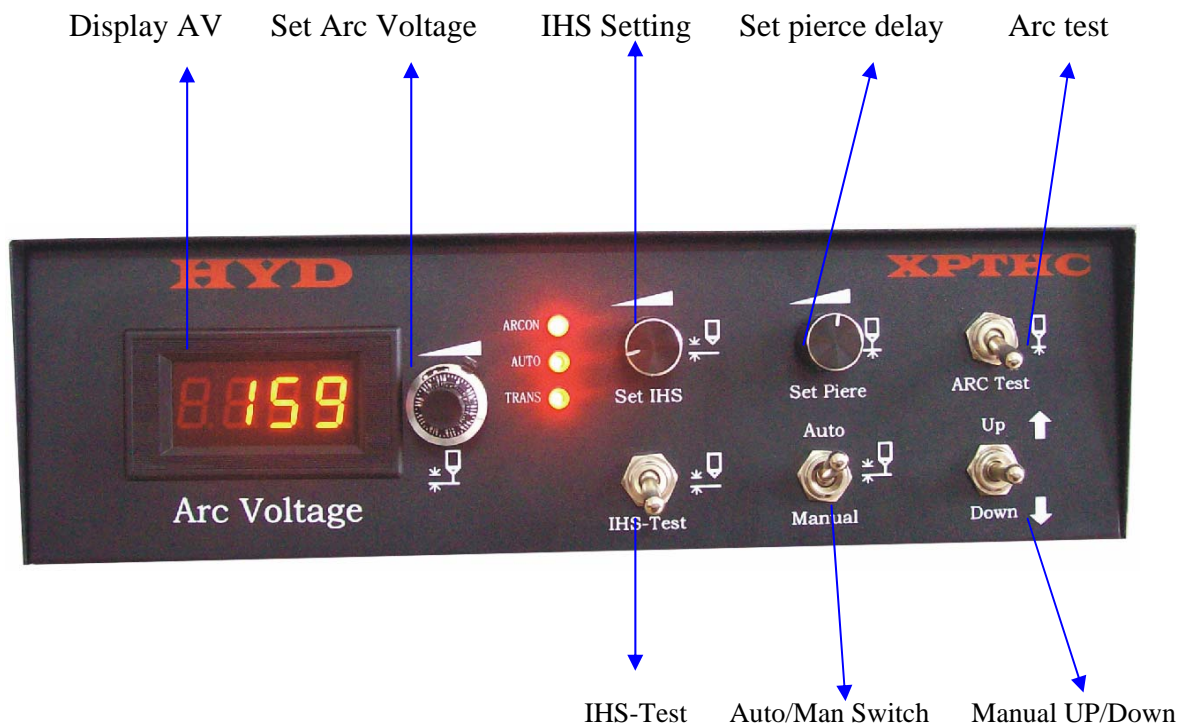


Figure 1: Operation Panel

Arc Voltage

Before the Arc Start it shows the Set Arc Voltage, after it shows the Actual Arc Voltage.

Set Arc Voltage:

Based on the thickness of steel plate being cut and cutting speed, it shall be set according to the parameter offered by Plasma, and it will be showed on operation panel. Set Arc Voltage decides the Torch Height during cut, the higher the arc is, the higher the Torch Height will be. On Auto mode, adjust the Set Voltage means adjusting the Torch Height.

Set IHS :

Set Initial Height, turn clockwise, the height increases; the IHS is reached by Time-Delay.

IHS Test

Every time we dial it up once, it would check IHS one time, which is used to check whether it is a workable IHS or not.

Set-PIERE:

Set the Delay Time from Plasma Start to CNC starts cut (the arc voltage is delayed to guide into THC), the Arc Voltage Enable signal would be sent to CNC only after arc voltage is detected by THC.

Auto/Manual :

Set THC' s auto or manual mode. Meanwhile enables the Auto Signal between connectors of CNC and THC, (for EDGE system, the Auto Signal shall be connected as Normally Closed.)

ARC Test :

Dial up and hold on to test the Plasma Arc Start. During test, Torch lifts up an IHS height.

Up/Down :

Manual operation button of Up and Down.

ARCON :

It is ON means Arc Start is processing, note: the ARCON is off during IHS, if the Arc Start with IHS Enable, it will turn on only after IHS is completed.

AUTO :

On means it is on Auto mode, four conditions have to be satisfied: 1, the Auto signal has been added on operation panel; 2, the Auto signal connected with CNC system enables; 3, arc voltage has been guided in THC; 4, Actual Arc Voltage not exceeds Set Arc Voltage 30v. (Note: we usually set as 30v; it can be adjusted through adjustable resistance RP104

according to customer' s situation.)

TRANS :

On means THC has detected arc voltage, and sent out Arc Voltage Enable signal.

5、 Voltage Divider

5.1、 None Isolation Voltage Dividing

The simplest way to divide the plasma arc voltage is None Isolation Voltage Divide by Resister directly.

Figure2: None Isolation Voltage Divide circuit

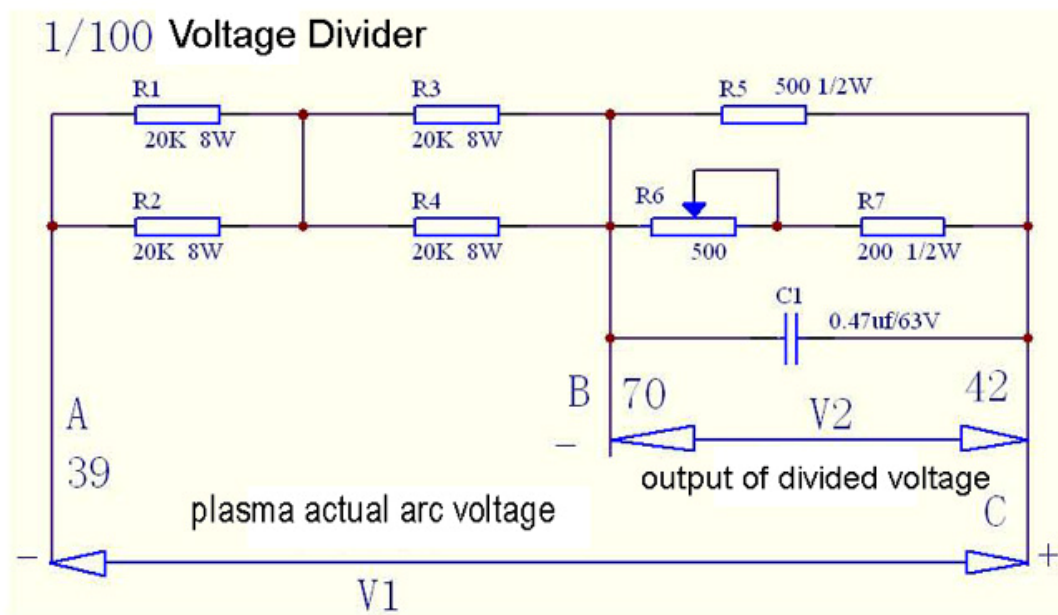


Figure2: None Isolation Voltage Divide circuit

Note: The Arc Voltage that goes into THC is electronegative, if the electrode is mis-connected; the Auto Height Control is inactive.

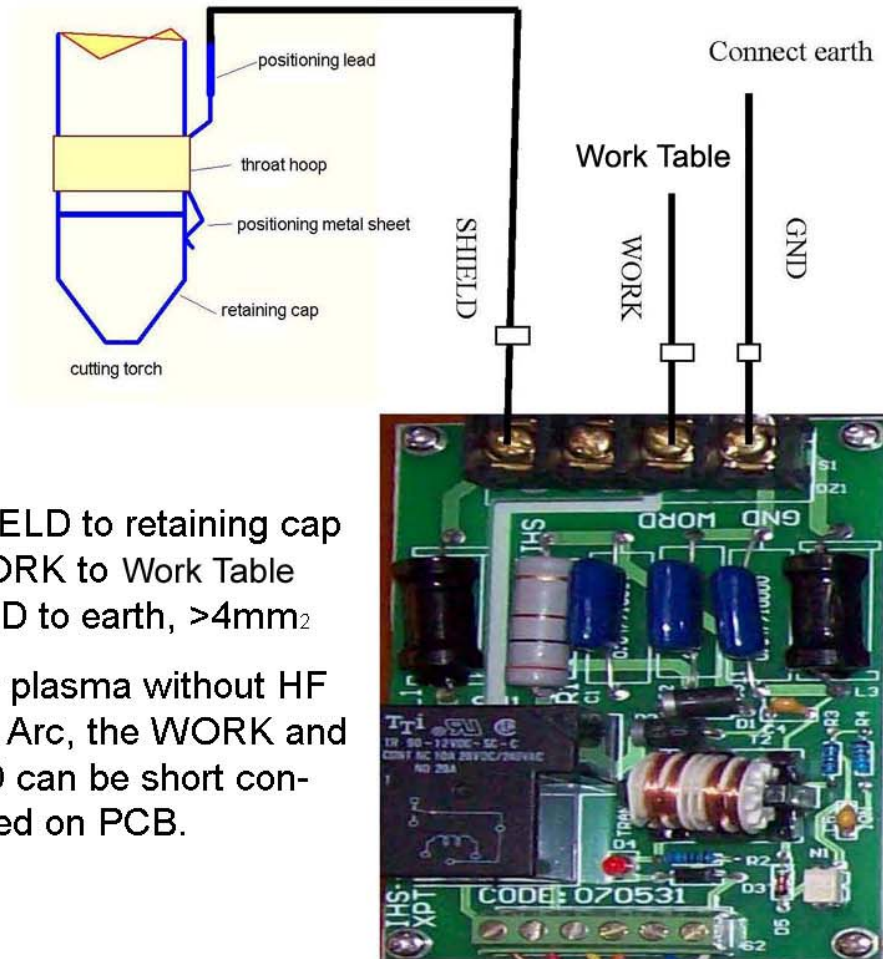
As None Isolation Voltage Divide is directly connected with Plasma Power Supply, to enable THC escape from interference caused by the HF during Plasma Arc Start, the Divided Arc Voltage guided into THC is Time-Delayed.

It just needs to prolong the time of guiding Arc Voltage into THC, this interference can be avoid effectively.

5.2、 Isolation Voltage Dividing

Plasma Arc Voltage is divided by Voltage Divider (offered with THC) on 100:1 via None Isolation Voltage Divide mode, guided into THC after processed by Isolation circuit. This

The Torch Retaining Cap should be metal, so the metal can be electric with steel plate. XPTHC-100 has a piece of Isolated IHS plate that can be fixed in the THC directly, the connection showed as Figure 4 below:



- . SHIELD to retaining cap
- . WORK to Work Table
- . GND to earth, >4mm²
- . For plasma without HF Pilot Arc, the WORK and GND can be short connected on PCB.

Figure 4 : Connection of Torch Retaining Cap IHS

Working Process of torch retaining cap IHS :

After THC received Arc Start signal from CNC, torch moves down; when Retaining Cap reaches the workpiece, THC receives this signal then drives torch to the set height, after IHS, Arc starts. This mode can be used on Contact Arc Start plasma, or HF Arc Start plasma; cutting above water or under water.

Note: 1. Under Torch Retaining Cap(TRC), the JPT1 on control PCB should be connected to PNP, as showed on Figure 5.
 2. Under Proximity Switch(PS) or PS and TRC both on working, JPT1 should be connected to NPN. When PS is PNP type, JPT2 is on PNP; NPN type, JPT2 is on NPN.(JPT1 decides IHS mode, JPT2 decides PS type.)

6.2、 Proximity Switch IHS (NPN and PNP).

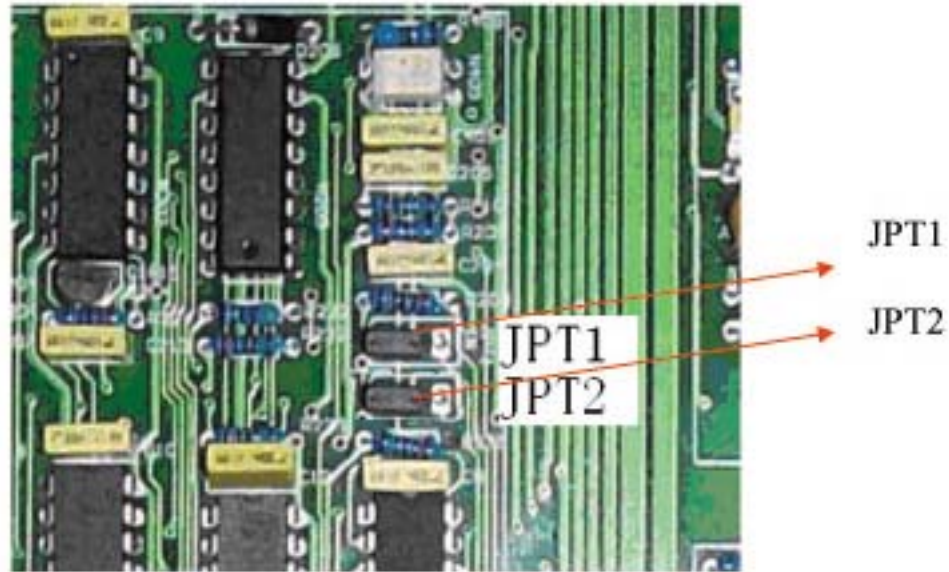


Figure 5: JPT1 Setting of Slip Wire

Under Proximity Switch IHS, user needs to use our Anti-bump fixture, introduced on Figure 12, (This fixture is not included in THC offer, optional to customer).

Proximity Switch IHS is backup for Torch Retaining Cap IHS, for cutting dirty or rusty steel plate. It can work separately or simultaneously with Torch Retaining Cap. During cutting dirty or rusty workpiece, if the sensitivity of Torch Retaining Cap is affected, then Proximity Switch will secure cutting goes properly.

It is connected via Switch IHS on THC,

Once THC received Arc Start signal from CNC, torch moves down, when it reaches workpiece, Proximity Switch leaves proximity position, THC receives this signal, lifts torch to the set height, (Proximity Switch recovers during lifting). After IHS, THC drives plasma Start Arc.

Proximity Switch IHS is suitable for all plasma IHS.

Parallel connection can be used on Proximity Switch.

7. Interface Connection

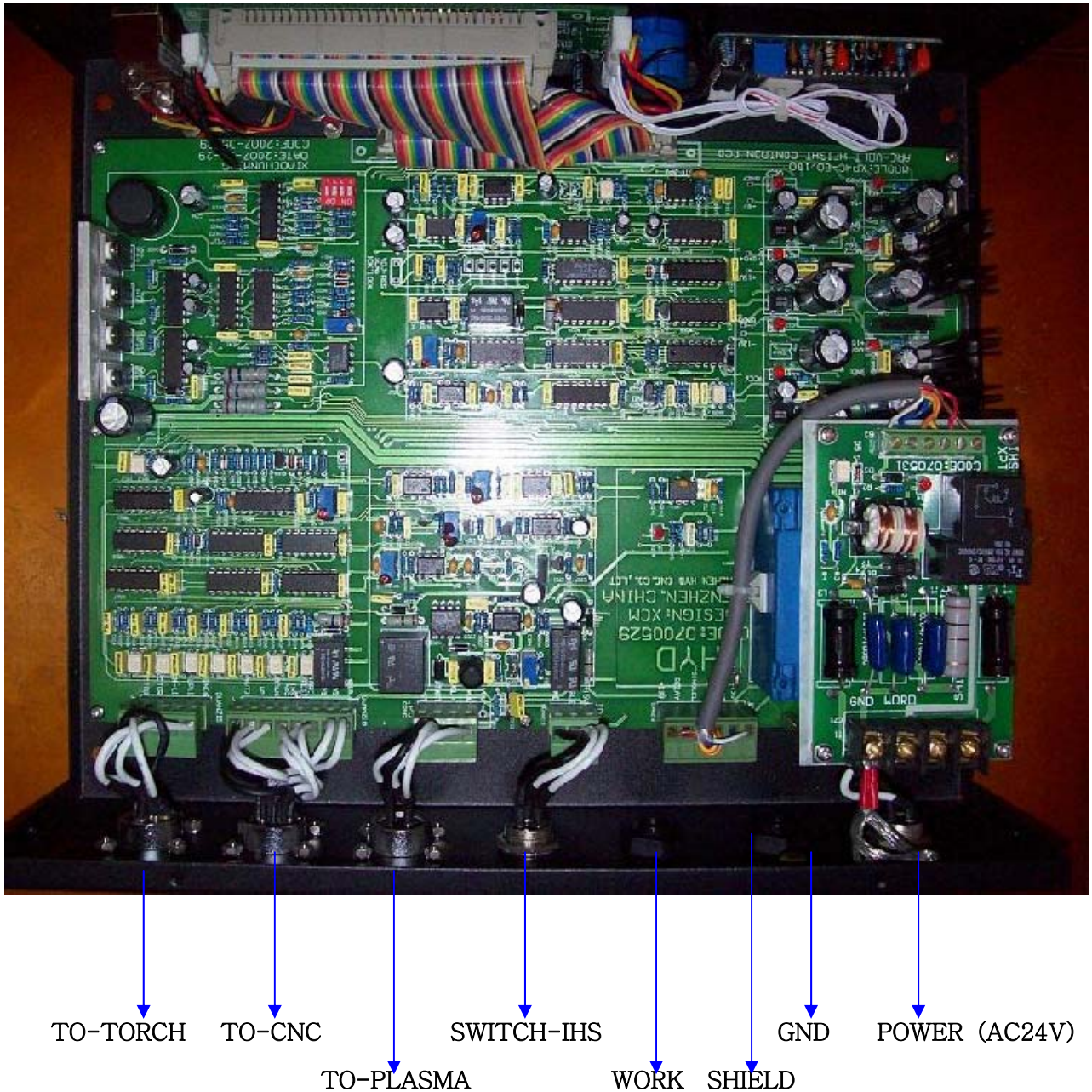


Figure 6 : Interface of XPTHC-100

Connection details as follow,

7.1、 Power(AC 24V) (Connect JP1)

XPTHC-100 works under AC 24V, usually it can be directly connected to the AC 24V Power Supply of plasma cutter, if not available, it needs Voltage Transformer (customer supplied).

7.2、 TO TORCH (Connect JP7).

Figure 7 shows the motor output.

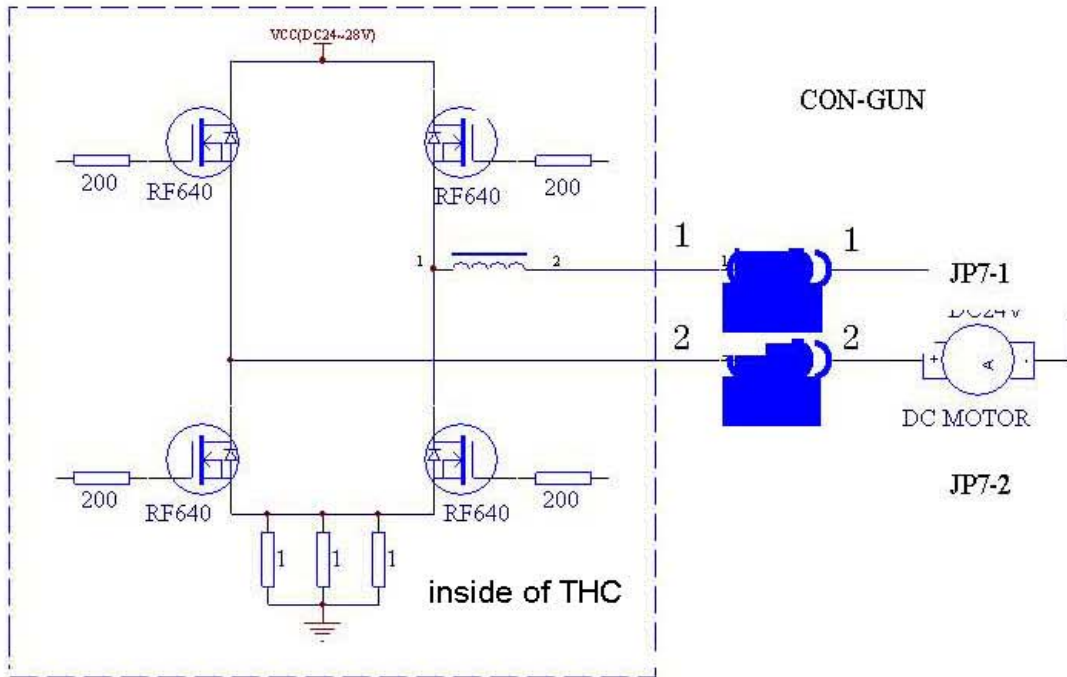


Figure 7 : Motor Output

Figure 8 shows the Up and Down interface connection.

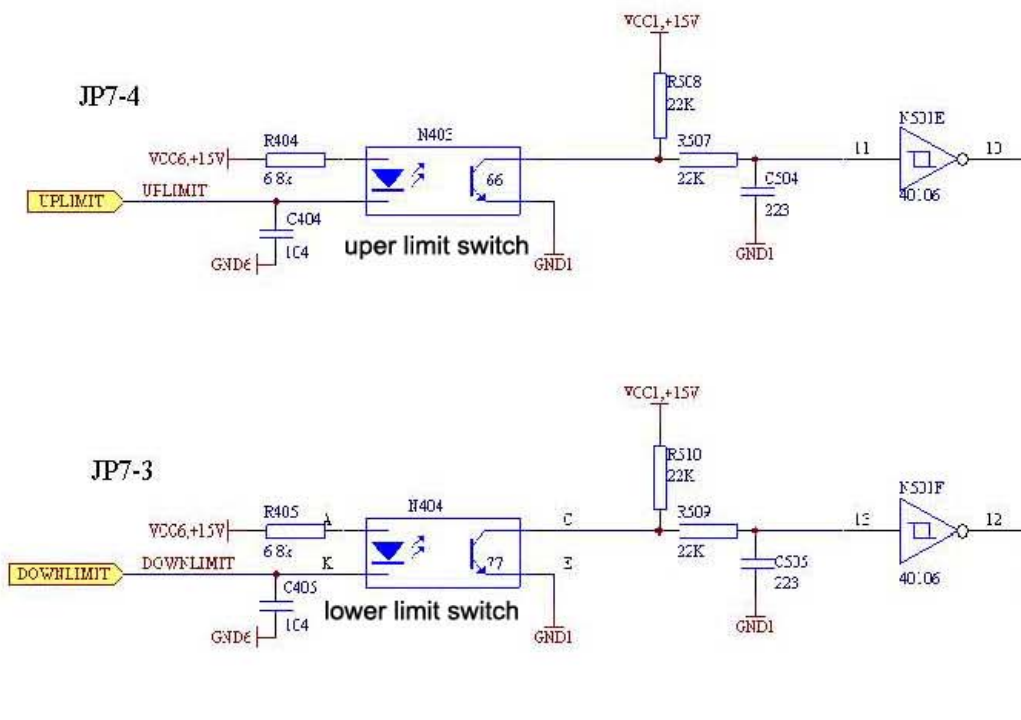


Figure 8 : Upper limit /lower limit connection

7.3. Connect to Plasma Interface

The 4-pin socket of TO-PLASMA connects the JP5 port. The connection of Plasma as Figure 9

TO-PLASMA (Connect JP5)

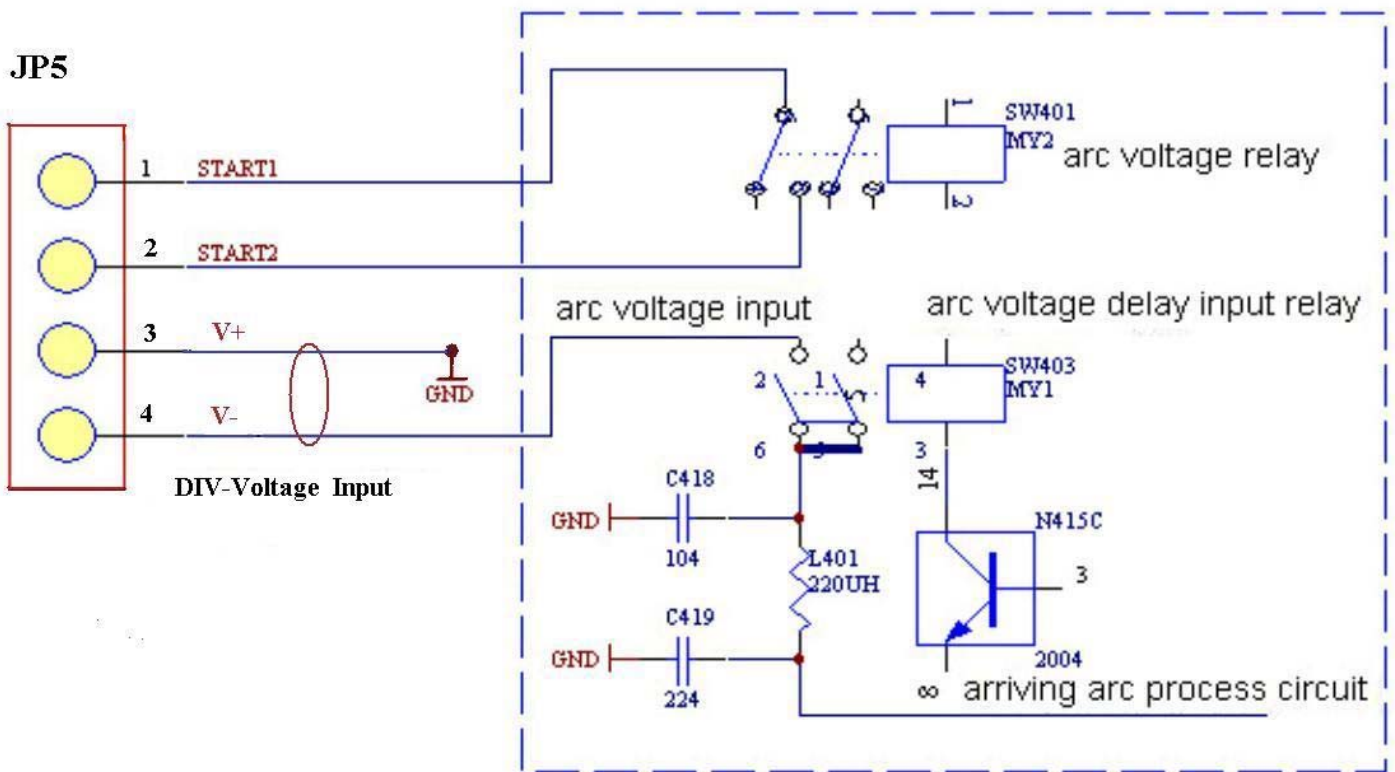


Figure 9 : TO PLASMA connection (with plasma)

There are detailed wiring figure at the end of this manual (Figure 12) shows the connection of THC control module, Plasma, CNC, Lifter, Torch Retaining Cap IHS, Proximity Switch IHS.

Attention: Please contact us if you are not sure about your connection, to avoid damage of PCB of THC, or malfunction.

7.4 TO-CNC (connected with JP6.)

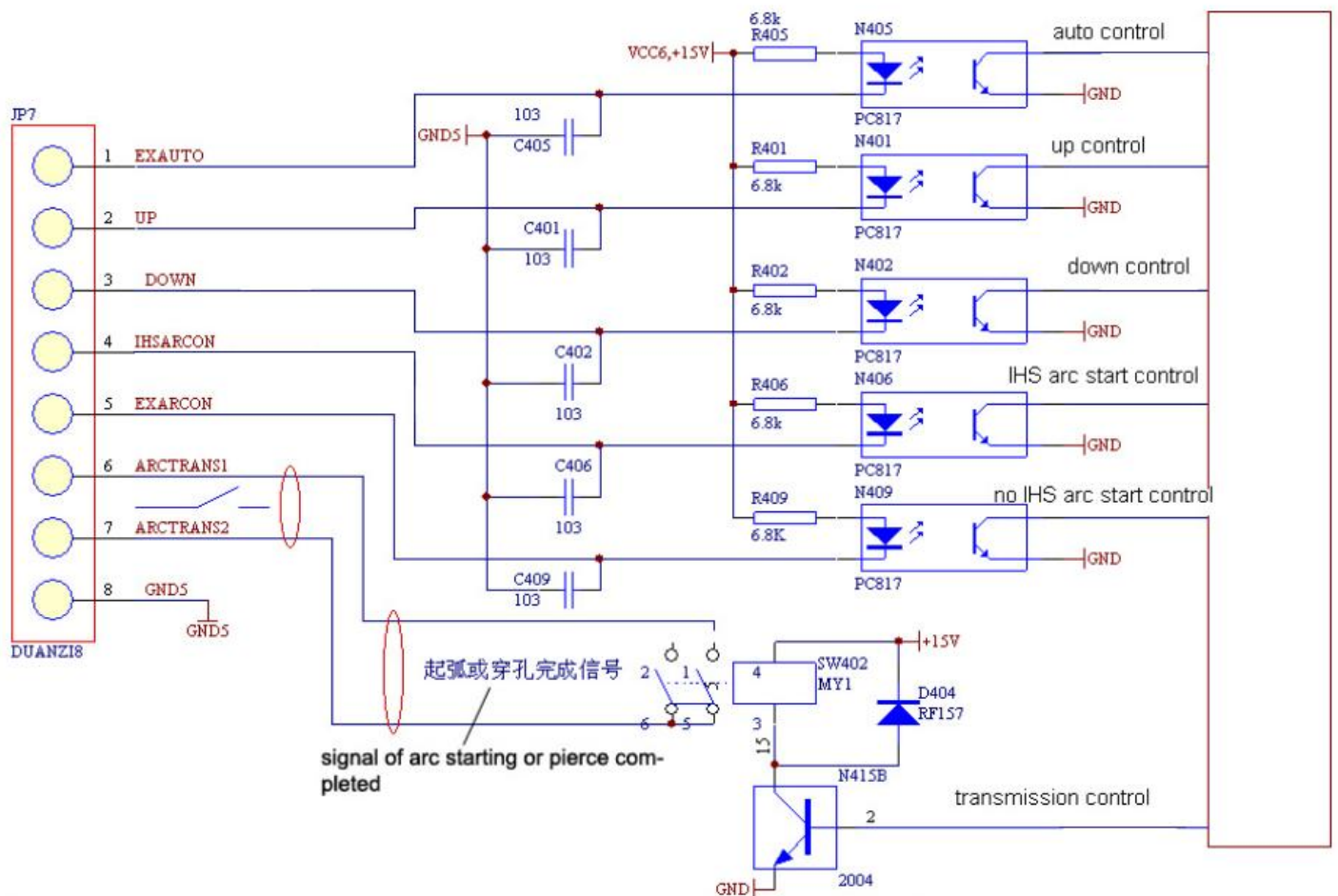


Figure 10. Connection between THC and CNC

The interface between THC and CNC adopts Optical Isolation.

TO CNC have 6 ports as below respectively,

- A、 (EXAUTO) Auto/Manual : Low Level input is AUTO; High Level is Manual.
- B、 UP : Low Level---UP.
- C、 DOWN : Low Level---DOWN.
- D、 (Arc Start signal IHS Enabled)IHSARCON : Low Level active, IHS first, then Arc Start automatically,
- E、 (Arc Start signal IHS Disabled)EXARCON : Low Level active, Arc Starts directly, torch lifts to an initial height automatically. So in this mode, the torch should reach workpiece first before Arc Start.
- F、 ARCTrans1、 ARCTrans2 : Switch Signal output.

7.5. SWITCH IHS (Connect JP3 for Proximity Switch IHS)

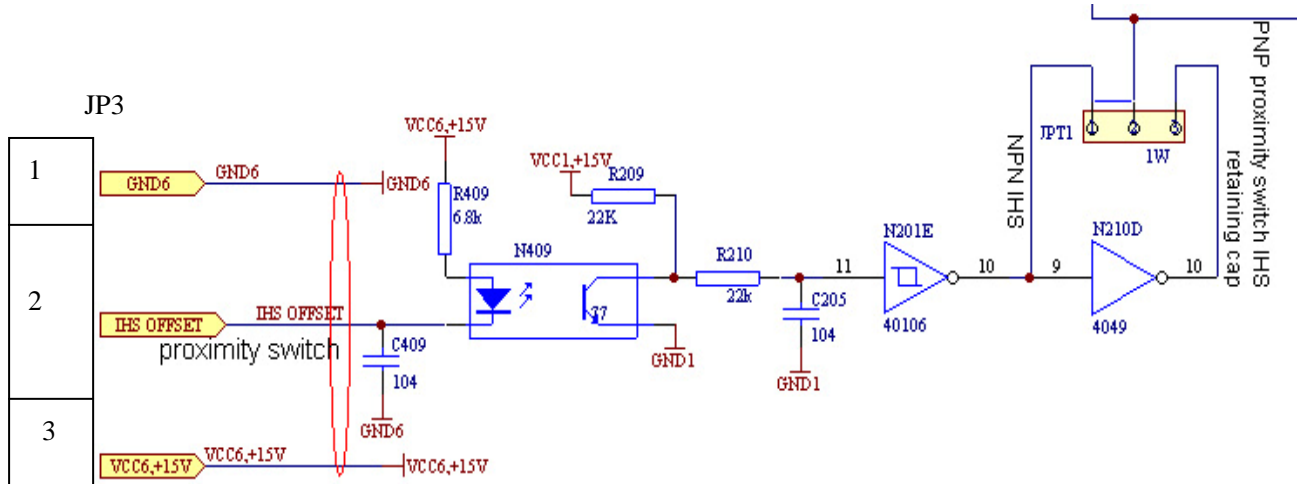


Figure 11 : Connection of Proximity Switch IHS(SWITCH IHS)

7.6. Current Feedback Circuit Setting. The relationship between adjusting the SP2 current and the ON/OFF of Switch.

| Current | 1-8 | 2-7 | 3-6 | 4-5 |
|---------|----------------------------------|-----|-----|-----|
| 4A | OFF : PWM=9KHZ ON : PWM=18KHZ | OFF | OFF | OFF |
| 3A | | OFF | OFF | ON |
| 2A | | OFF | ON | ON |
| 1A | | ON | ON | ON |

8. THC Assembly Wiring Figure (Figure 12 ---- go to end of the manual)

9. Maintenance

9.1. Please CONTACT US if you are not sure about solution for follow situation or your supplier from whom you bought.

| Serial Number | Malfunction | Cause | Solution |
|---------------|---|---|---|
| 1 | No display, black screen | No +5V voltage on the voltage meter | Check +5V voltage VCC3 |
| 2 | No rotation of motor or only one direction rotates. | 1、 damage of drive IR2110 | 1、 replace IR2110 |
| | | 2、 drive voltage + 15V, failure | Check drive voltage VCC4 |
| | | 3、 protection of over-current | D606 ∞ D609 (IRF640) is damaged or mechanical blocked |
| 3 | Once turn on, cutting torch keeps lifting。 (NPN) | 1.Proximity switch is not installed well in the open-circuit condition | Install the Proximity switch perfectly |
| | | 2、 damage of Proximity switch | Replace Proximity switch (signal : 2mm, NPN) |
| 4 | Can not Start Arc automatically after the IHS | 1、 damage of Proximity switch, no return signal | Replace Proximity switch |
| | | 2、 IHS time is too short, no return signal | Prolong the IHS switch |
| 5 | Instability of controlling arc voltage | 1、 check the connection with earth 2、 check the water-proof 3、 over-sensitive | |
| 6 | CNC starts to work before the accomplishment of Arc Start | Setting time of SET-PIERE is too short | 1、 increase SET-PIERE time 2、 adopt the arc feedback signal of Plasma itself |
| 7 | Plasma Arc Start before the IHS | using the EXARCON signal, the delay-time of CNC controlling is too short | Prolong the delay time of CNC IHS |

| | | |
|----|---|--|
| 8 | Cutting torch can not start arc | <ol style="list-style-type: none"> 1、 Confirm the working situation of Plasma power 2、 Check the height of IHS 3、 Check the cutting torch fittings |
| 9 | Arc of Torch can not transfer to work piece | <ol style="list-style-type: none"> 1、 Check the connection of working lead 2、 Check the cutting torch fittings |
| 10 | Cutting torch move before piercing hole completed | Prolong the time of piercing hole in the CNC system |
| 11 | CNC control starts, cutting torch heads down immediately | <ol style="list-style-type: none"> 1、 Increase“ Set Arc Voltage” 2、 Prolong the automatic time in the CNC system 3、 Decrease the Over Voltage Protection No.(30V) 4、 Check the situation of Auto signal or Corner signal of CNC system |
| 12 | Plasma arc out after the arc transferring and piercing hole | <ol style="list-style-type: none"> 1、 Delay-time is too long |
| 13 | During IHS, the cutting torch touches the steel plate but no movement upwards. | <ol style="list-style-type: none"> 1、 Time of HIS is too short 2、 Induced lead connect with protection badly |
| 14 | Cutting torch keeps heading down after touching work piece, and no Arc Start | <ol style="list-style-type: none"> 1、 Weak contact between detecting cable and retaining cap. 2、 Proximity switch is damaged 3、 “ WORK” in THC is bad connection with earth |
| 15 | Cutting torch is unsteadily on auto mode | <ol style="list-style-type: none"> 1、 THC is over sensitive, regulate RP501 2、 THC damaged |
| 16 | THC is too slow on tracking, on auto-state | <ol style="list-style-type: none"> 1、 THC is over sensitive, regulate RP501 |
| 17 | Arc off during the cutting, and Arc voltage Enable signal keeps sending out, machine still runs | <p>problem : THC can not stop immediately since it works with arc voltage signal.</p> <p>solution : adopt the arc feedback signal of Plasma itself</p> |

9.2、 Cancel function of Cutting Torch Lift after Arc off,(Please contact us if you are no sure about it)

The function of Auto Lift would choke the lifting device if the Limit switch not installed yet or doesn' t work properly. So if the CNC has Auto Control function for Up and Down, you can cancel the Torch Auto Lift function on control PCB.

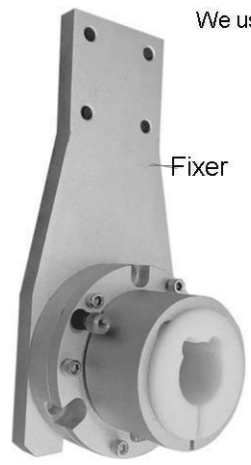
Cancel the R234 on the control PCB or Cancel the C218 on the control PCB.

We set 30v as Over Arc Voltage Protection (OAVP) according to our years practice, it is to protect cutting torch from diving during Kerf Crossing; it should NOT be changed before carefully checking. THC would cancel the function of Auto Height Control if the Actual Arc Voltage is higher than Set Arc Voltage 30V. So if OAVP is too small, the Auto Height Control function can not work.

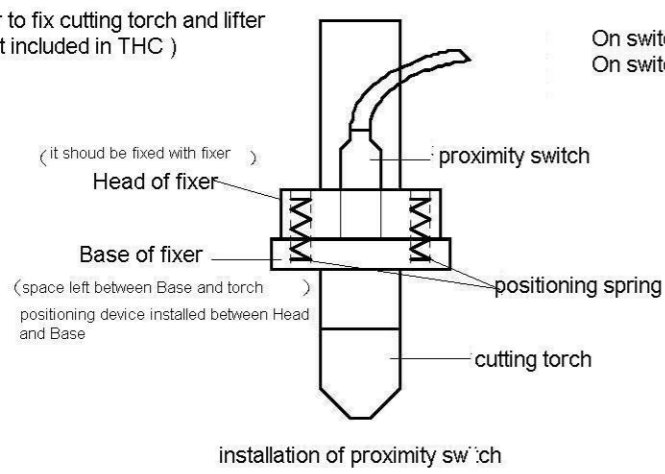
OAVP can be adjusted via adjusting PR104 on control circuit panel. Turn one round clockwise, 4v decreased, anti-clockwise, 4v increased.

Some advice,

1. When Torch Retaining Cap adopted, we suggest customers use Anti-bump Fixer to fix cutting torch and lifter and connected it with Retaining Cap. In practice, when the contact between Retaining Cap and workpiece is weak (especially the workpiece is Rusty or Dirty steel plate,) Proximity Switch takes effect, it is more effective to protect cutting torch. If Torch Retaining Cap and Proximity Switch both installed, both will be active during cutting.
2. When it is using proximity switch function, we suggest try some more proximity switches, and all switched by outside circuit.
3. **The wire connecting Voltage Divider and THC must be SHIELD cable, and shall be separated away from Arc Start cable.**
4. When the CNC can not receive the Arc Start Enable signal, it should use Time-Delay to run the CNC. In other word, after CNC sent Arc Start signal, delay the CNC' s Running.



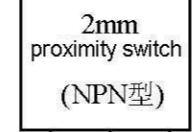
We use fixer to fix cutting torch and lifter (not included in THC)



installation of proximity switch

On switch positioning, connecting Close, JPT1 is at PNP
On switch positioning, connecting Open, JPT1 is at NPN

switch positioning mode



receptacle 3 2 1

3-pin abut socket (D16)

receptacle 3 2 1

receptacle 3 2 1

receptacle 3 2 1

receptacle 3 2 1

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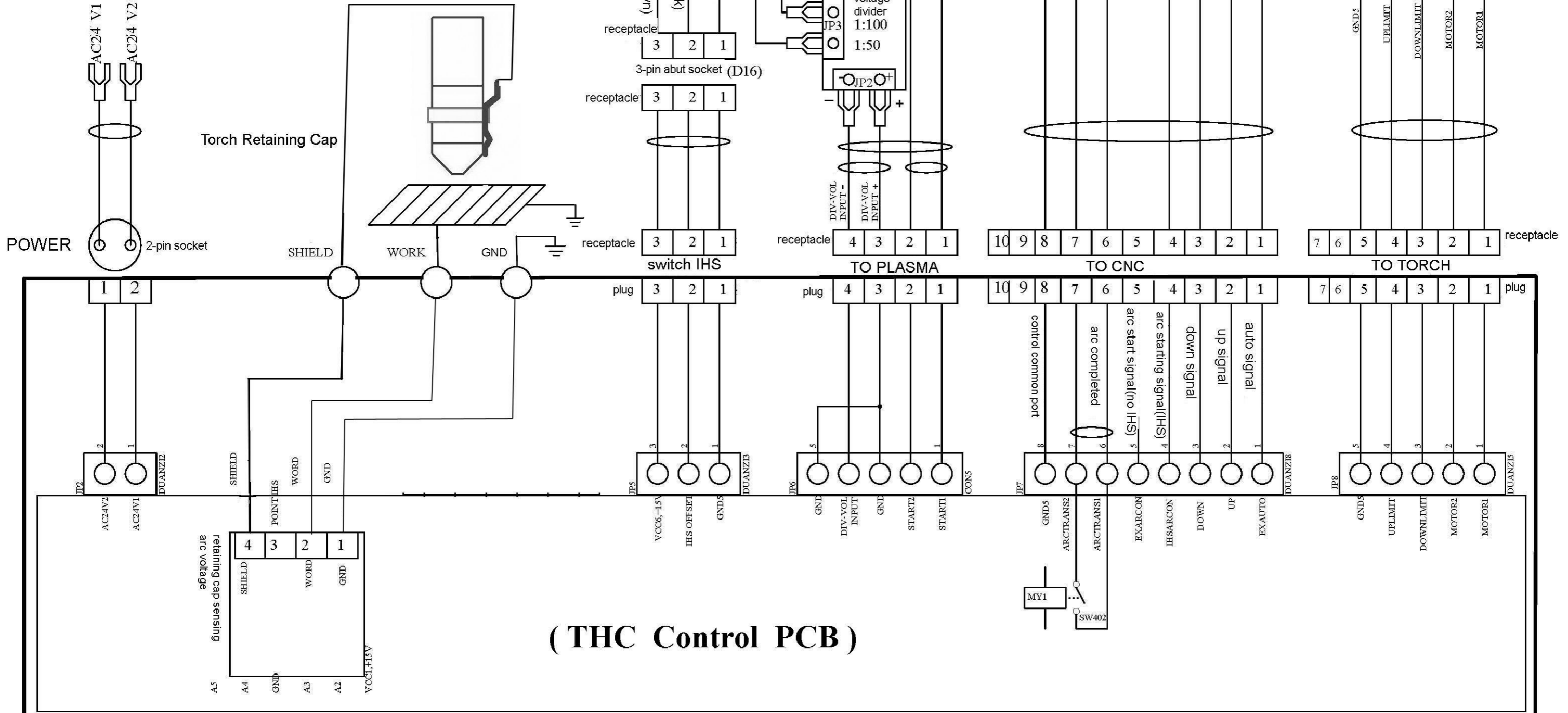
receptacle 3 2 1

receptacle 3 2 1

AC220V

Arc voltage - + arc starting signal

connected to CNC



(THC Control PCB)