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Capacitive Torch Height Controller

CHC-300 Instruction

(Laser cutting revision)



SAFETY:

- ◆ Please read this manual fully before use CHC-300
- ◆ DO NOT open cabinet of THC unless trained technician.
- ◆ DO NOT adjust the sealed resister.
- ◆ Turn off Powersupply if when THC is unused.
- ◆ DO NOT put liquid on THC.
- ◆ Attention Anti-dust work, DO NOT let metal dust into THC.

Installation Note:

- ◆ CHC-300 uses AC&DC24V, $\pm 30\%$
- ◆ GND Port must be well grounded, GND resister $\leq 1\Omega$.
- ◆ UP/DOWN on THC must be same to Z-axis Lifter

To Customer:

- ◆ We only supply to re-seller as CNC cutting machine manufacturer, engineering company... end-user please contact our local distributor for product supplying.
- ◆ We offer technical support to all distributors and users of our product.
- ◆ The product is under ONE year warranty since delivery, and enjoys life-long service and support.

IMPORTANT NOTE:

All our THCs have been tested in our workshop before delivery, all commissioning work has been done. Please NOT change the setting without informing your supplier.

ShenZhen HYD CNC Technology CO.,LTD

1 Intro

1.1 Basic specs

- Power supply:
CHC-300: AC&DC24V, $\pm 30\%$
- DC motor used on lifter:
CHC-300: DC12V~DC24V (THC's powersupply depends on the DC motor, i.e. if motor is 12V, the powersupply should be AC/DC 15V.)
- Output current:
CHC-300: 1~12A, max: 300W。
- Work temperature: THC-10 \sim 60 $^{\circ}$ C;
HF cable: -10 \sim 200 $^{\circ}$ C;
- Accuracy: ± 0.1 mm (matters with lifter design);
Auto height range: from cutting material surface 1mm — 20mm.
- HF-cable:200mm \sim 1300mm。
- Product size shows as figure 1-1
L*W*H: 176mm * 105mm * 50mm。

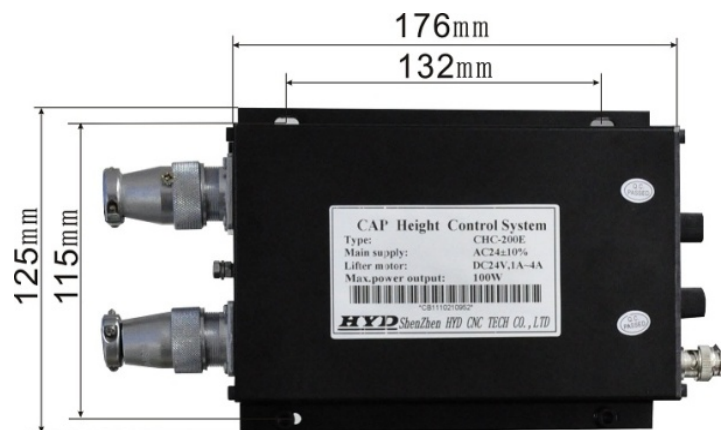


Figure 1-1

1.2 New features

Comparing to CHC-200D, CHC-300 has new features as follow,

- 1、 Increased more indicators to shows different states of THC.
- 2、 Output of collision-alarm, which is optical isolation output from THC, can be sent to CNC's Alarm input to freeze machine's move. This signal is effective on both manual/auto mode. The max output is 200mA, capable to drive most relays.
- 3、 Anti-collision function. On manual/auto mode, when metal or low-conductive item like hand touches sensor ring, THC would send out collision signal and lift torch up until no collision exist.
- 4、 When HF cable is disconnected or weakly connected, it would be indicated on the disconnection indicator. So after installation of HF cable, just shake the HF cable, the connection will be showed by the indicator.
- 5、 Sensitive and Accuracy is increased 100%.
- 6、 CHC300 uses programmable logic design, which is adjustable according to customer's request. It can be controlled by High/Low Level, and limit/auto signal can be normally open or closed, without any change on circuit, and still with high reliability on anti-interference.
- 7、 It supports YAG laser cutting. On laser cutting, it needs DC motor and ball-screw to secure the motor starts with low voltage(better below 2v). And it will not use sensor ring, but needs customer to design the sensing device, we can offer design diagram for reference.

1.3 Work elements

CHC-300 work elements: It detects the distance between Sensor and the cutting material (steel, metal material) via detecting the capacitance between the two parts, and keep the two parts at a set distance by control the DC motor move. CHC-300 is a closed-loop control system, with 4 parts: Position Signal Sensing, Signal Process, Logic Control and Motor Drive.

2 Components

2.1 For YAG laser cutting

2.1.1 laser THC components

On laser cutting, CHC-300 needs user to design the sensing parts according to laser torch head, so we only supply the THC control module and HF cable. Other parts like sensor ring, insulation parts are not included, shows as Figure 2-2, Note:

The laser THC appearance is same as flame cutting THC, but inside control circuit is different.

Laser THC's HF cable supplied according to customer's request, below 1000mm.

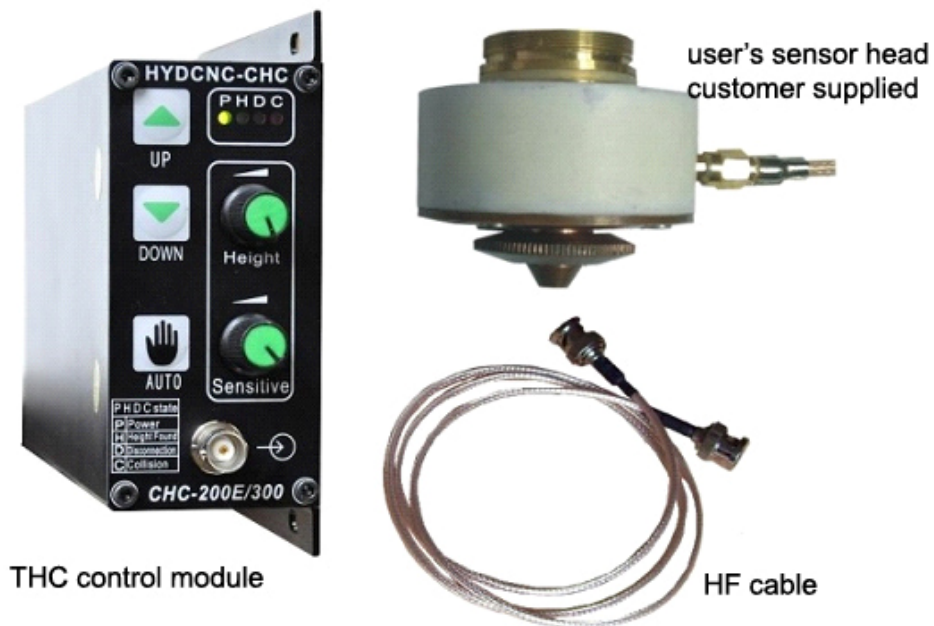


Figure 2-1

2.1.2 Laser THC installation and notice

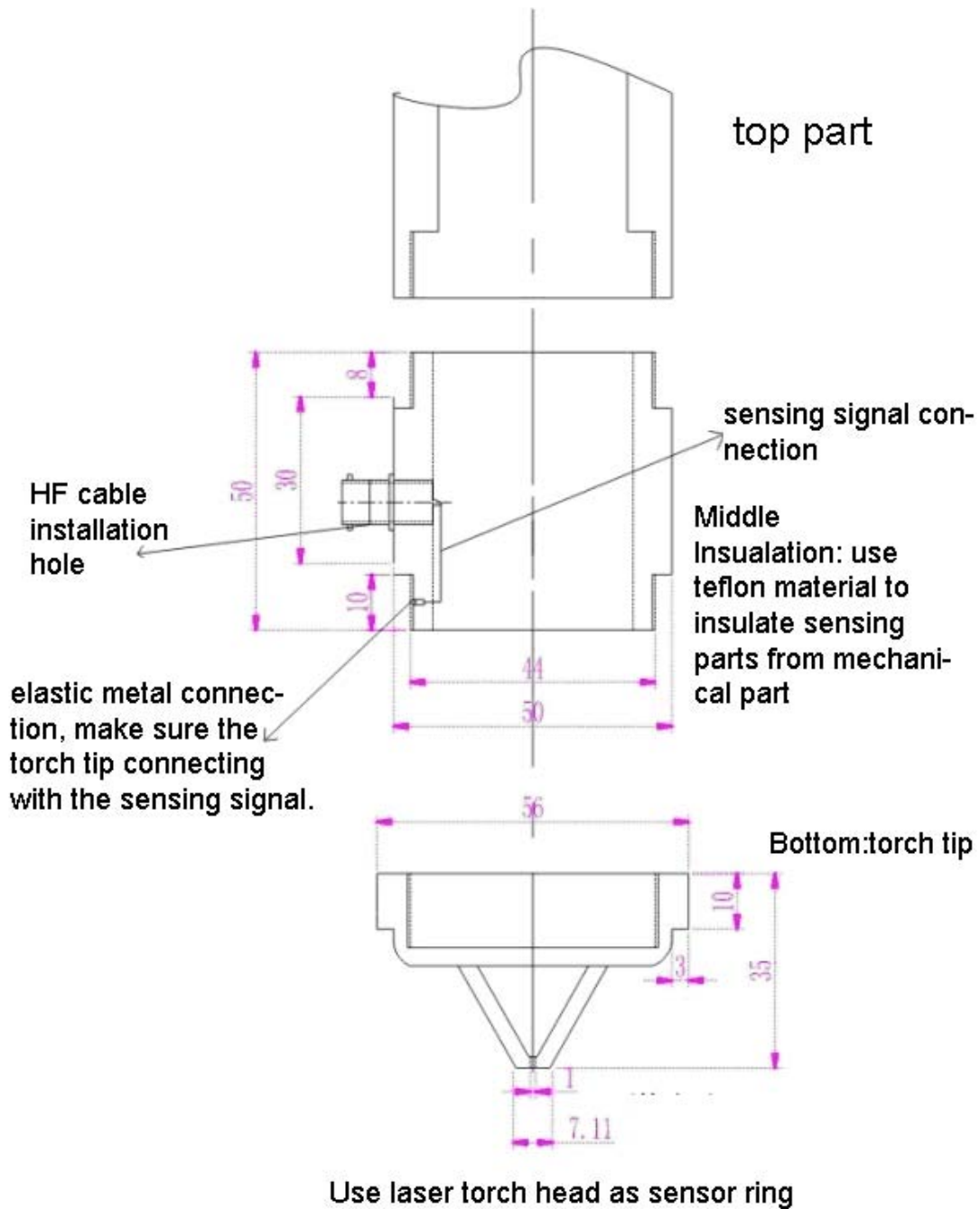


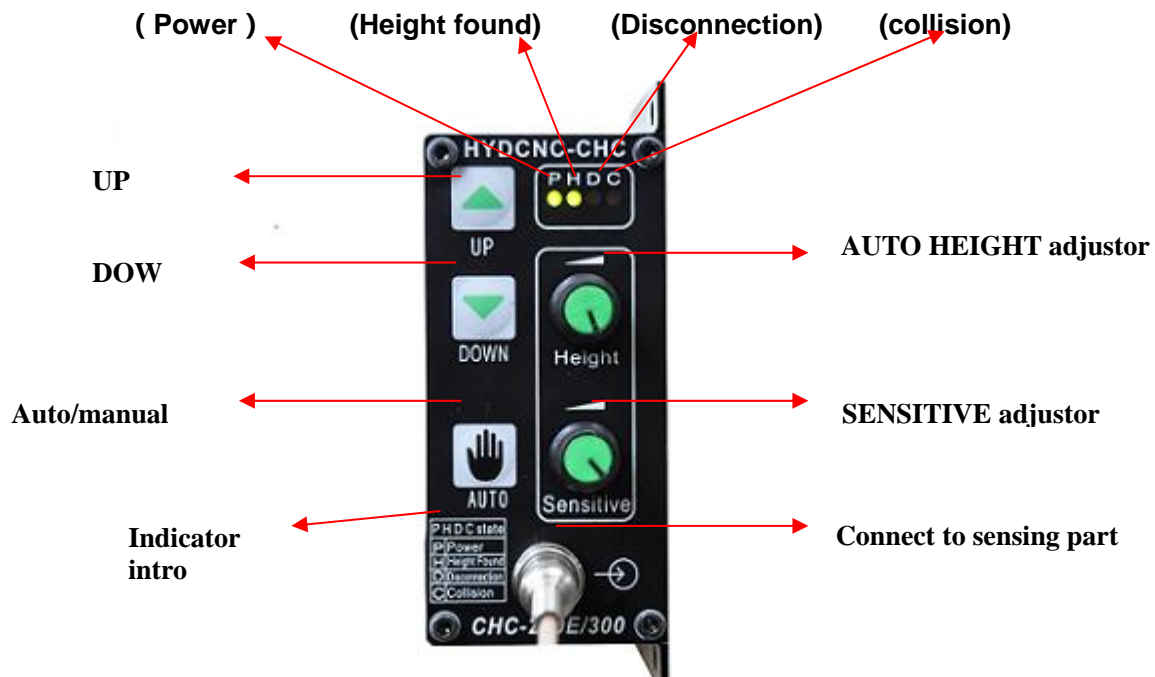
Figure 2-2

Note:

- 1、Sensing part must be metal material.
- 2、Sensor part must bigger than 1cm²
- 3、Sensing part must be insulated from the fixing device.

3 THC control and connection

3.1 operation panel intro.



Indicators:

- P Power:** Power indicator, red, Off means no power supply.
- H Height Found:** Turn on when torch reaches auto height, green.
- D Disconnection:** Disconnection indicator, red. When HF cable is unconnected or disconnected, it turns on. On auto mode, if disconnection happens, torch would keep lifting up until it's solved.
- C Collision:** Turn red when sensor ring collision happens, both on manual/auto mode. Torch would keep lifting up until collision disappears. At this moment, press Down doesn't work. If HF cable short-connected with shield net, it is same as collision to THC.

Buttons on operation panel

Up/Down Button

It is active on any mode. Priority is always given to Manual mode. For UP and Down, priority's given to UP. In case HF gets problem, it's always on UP mode, so the Down doesn't work.

Auto Button

Press the AUTO button, THC is always on Auto Mode, no matter there is a auto signal from outside or not. During cutting, THC needs to work on Auto Mode and it should be controlled by CNC, having

nothing to do with this **Auto** button

Height

It is used to adjust cutting torch height during Auto Mode. Height increases when it is turned clockwise. At the first commissioning, turn clockwise maximum to reach the highest height.

Sensitive

On Auto Mode, the Sensitive increases when it is turned clockwise.

Sensor Port

One end of HF Cable link with the socket, the other end link with the sensor groupware

3.2 THC Connectors

As figure 3-2 shows, CHC-300 has only two connectors for installation, one is to CNC (X1-CNC), the other one is to lifter motor (X2-TORCH).

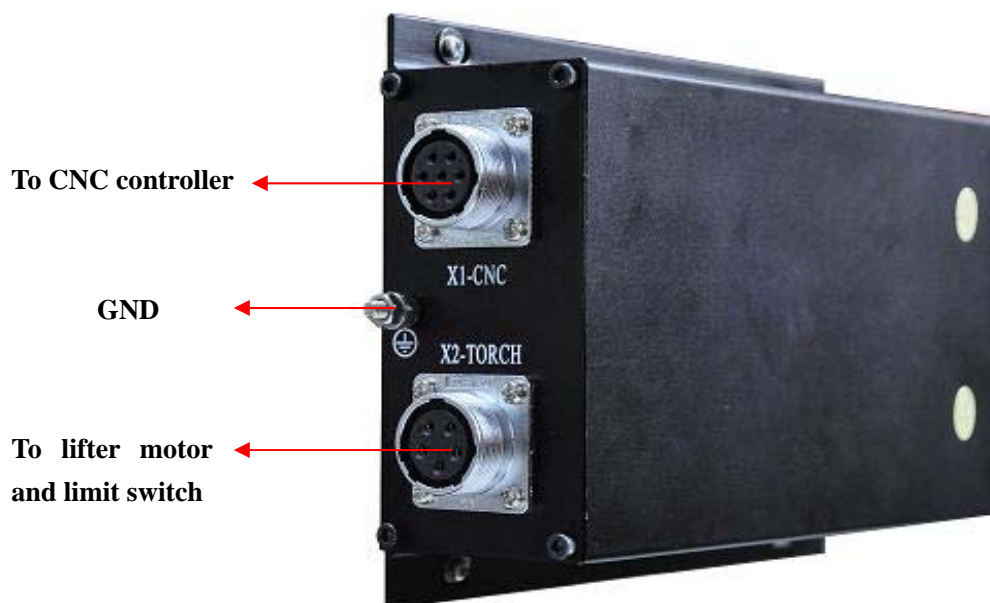


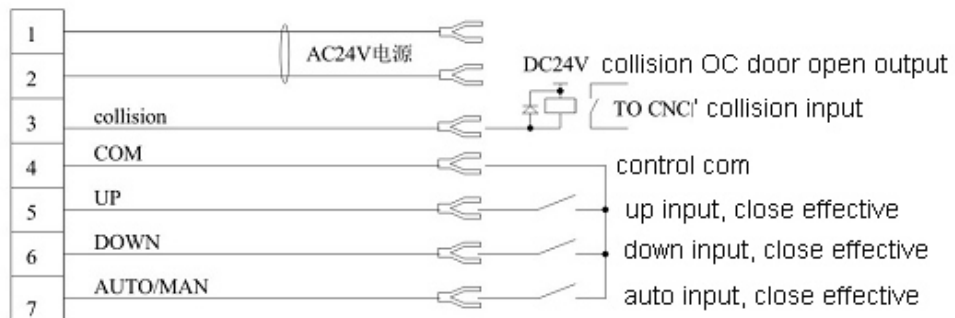
Figure 3-2

3.2.1、X1- CNC (TO CNC)

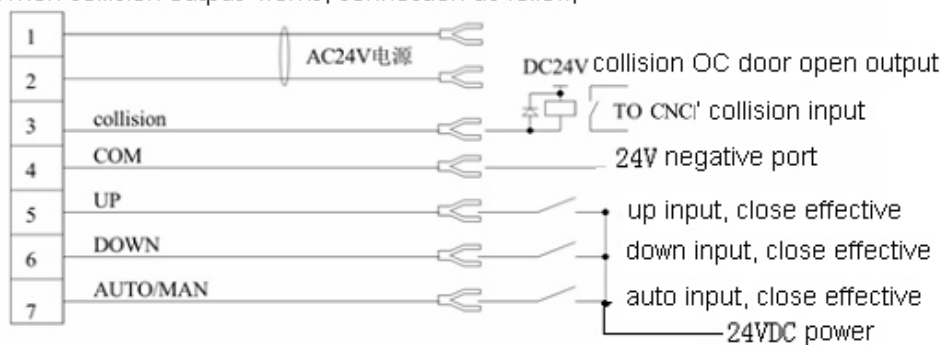
It is a 7-pin socket, pin definition as follow,

| Pin | signal | Specs |
|-------|-----------|--|
| 1 , 2 | POWER | CHC200E: AC24V |
| 3 | Collision | Collision output to CNC, OC door open output Max drive current :200mA |
| 4 | COM | I/O COM |
| 5 | UP | Up control, low-level effective |
| 6 | DOWN | Down control, low-level effective |
| 7 | AUTO/MAN | Auto control, low-level effective |

7-pin socket connection



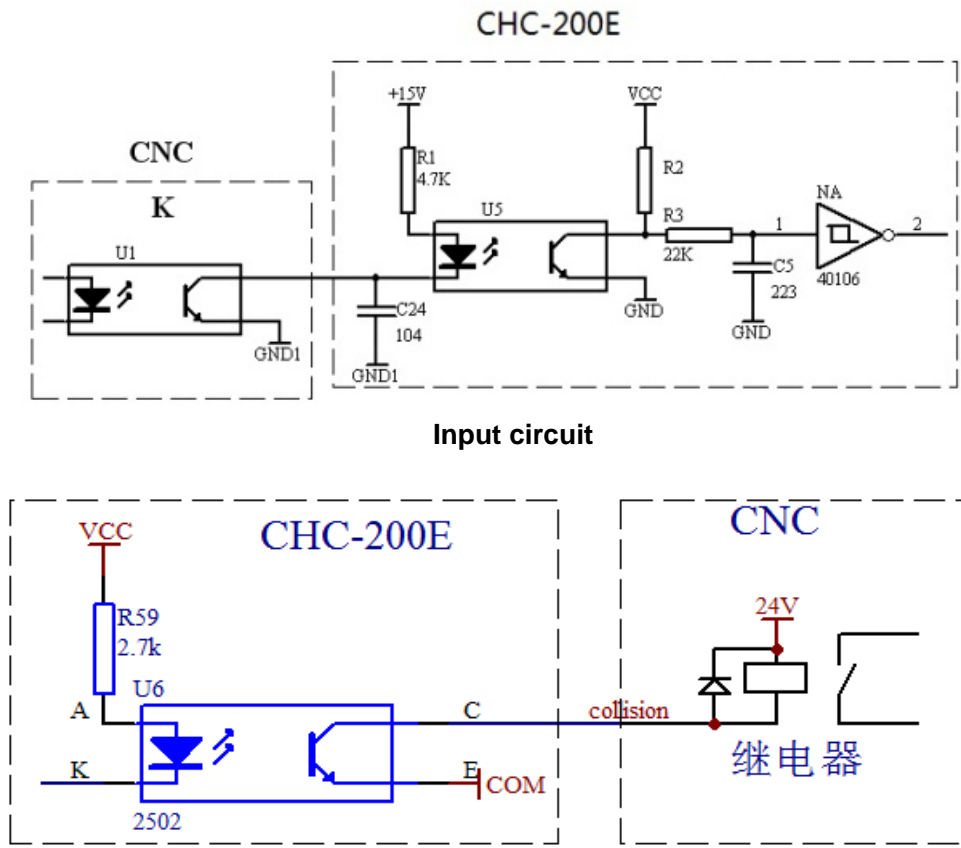
When collision output works, connection as follow,



If collision output used, DC 24V power negative should connect to COM
change JP3 Jumper position to control 24VDC input

Figure 3-3

CHC-300 to CNC (X1-CNC),input/output both use optical isolation, UP/DOWN/AUTO is external signal input to THC, Collision output from THC. All those signals share same COM. The input/output shows as Figure 3-4,



Input circuit

Output circuit

Figure 3-4

3.2.2 X2-TORCH (to torch lifter motor)

It is a 5-pin socket, pin definition as follow,

| Pin | signal | specs |
|-------|-------------------------|--|
| 1 , 2 | DC Motor Drive (Output) | DC motor connection Max 100W PWM |
| 3 | LIMIT COM | Limit COM |
| 4 | Down LIMIT (Input) | Down limit input Limit switch normally closed |
| 5 | Up LIMIT (Input) | Up limit input Limit switch normally closed |

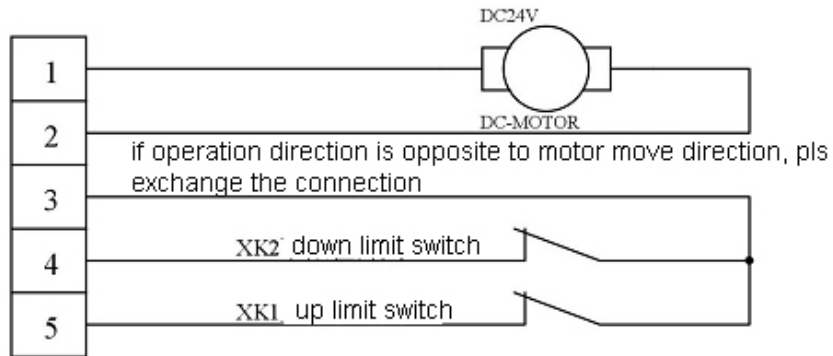


Figure 3-5

Note:

- 1、 Pin 1、 2 are DC motor connector, H bridge drive, PWM speed control.
- 1、 CHC-300 limit switch logic can be changed according to user's situation(normally open or normally closed), Limit switch connection as figure 3-6.

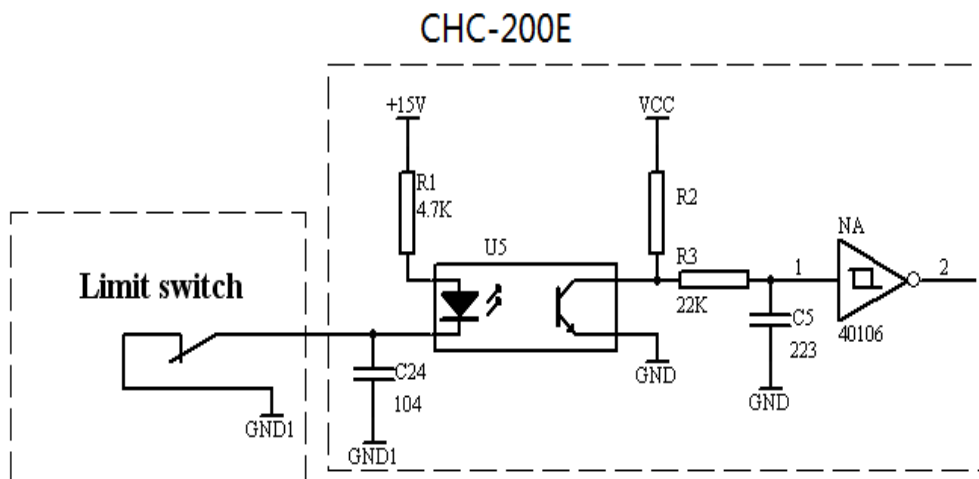
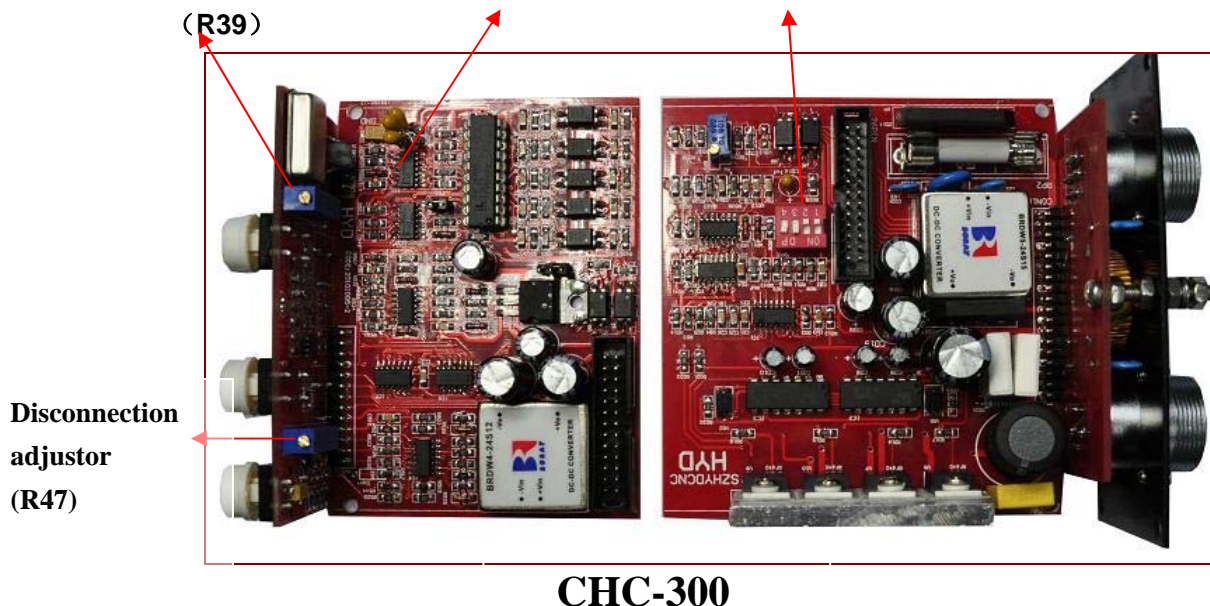


Figure 3-6 Limit input

3.3 THC inside circuit instruction

THC inside circuit configuration as follow,

Balance point adjustor **JP2 discon Jumper** **Frequency/current set**



CHC-300

Figure 3-7

1、 Balance point adjustor (R39)

It is to control THC find the balance point on Auto mode (balance point—torch stops at this position when it reaches the set auto height). This adjustor has passed commissioning before delivery, so no need user's adjusting. Unless the sensor ring installation changes or HF cable changes.

2、 Disconnection protection adjustor(R47)

On auto mode, lift torch up when HF cable disconnected to protect torch. It has been set well before delivery, no need user's adjusting, unless HF cable length changed.

3、 JP2 disconnection protection jumper

Disconnection protection is non-effective when it is un-plugged. Testing as follow, disconnect HF cable, press Auto button, if JP2 plugged torch lift up, if un-plugged, torch lift down. The original setting is JP2 PLUGGED, when the indicator(Disconnection) turns on, and THC is on Auto mode, torch would lift up.

4、 Drive Frequency and Current set:

Motor drive circuit is H Bridge Circuit, and adjust speed via PWM.

PWM frequency changed between 9KHz and 18KHz, controlled by SP2, showed as figure 3-7.

Usually when motor is below 30W, we use 18KHz, when motor is above 30W, we use 9KHz, the original set is 9KHz.

Current feedback circuit as follow,

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

Figure 3-8

4. Installation and Commissioning.

4.1 Commissioning.

4.1.1 Test after installation

Up/Down connects with GND, motor moves up and down, firstly make sure on Manual mode, torch up/down is same direction as Up/Down control button.

Auto/Manual connects with GND, THC is on Auto Mode. When it is open, the manual mode is active.

On Auto mode, if the sensor is not connected with THC and THC is under disconnection protection, the indicator Disconnection would turn on, cutting torch would keep lifting up. If sensor is connected with THC, the cutting torch should stop at a position via adjusting the **Height** button (THC finds the Auto Height),

On Auto Mode, the height of cutting torch is under control of **Height** button. At first commission,

always turn clockwise maximum to get the highest height, then turn anti-clockwise, the height decreases. In case over adjusted, cutting torch touches the workpiece; motor will be on a shocking-state.

THC always drives motor to make sensor close to the Balance Position (the set Auto Height), and it stops when ring is around the Balance Position, 0.1m lower or higher). The closer, the more slowly the motor runs.

Auto sensitivity meets the request of THC when sensor is 5—20mm away from workpiece.

4.1.2 Commissioning when THC meets problem

A、Disconnection and Collision

Disconnection

When installation is well done, but Disconnection indicator is on, it means THC is under disconnection protection, can not work under auto mode. In this situation, user should have changed a longer HF cable, or a different cable not meet THC's request, the commission work as follow,

Disconnect HF cable with THC, the indicator keeps ON, connect it back.

And if disconnect HF cable at the other side, indicator still is ON. If not ON, then turn R47 Anti-clockwise till the indicator turns on.

Connect the HF cable back, if the indicator is not turn off, then turn R47 clock-wise till it turns off.

Collision

CHC-300 has Anti-collision function, it is effective on both manual/auto mode. When steel or other conductive item touches sensor ring, torch lift up, and the collision signal is sent out from the Pin3 of 7-pin socket(OC door), when CNC receives this signal, machine pauses and waits for treatment of collision. When collision happens, the C indicator(collision) on operation panel turns on, shows as figure 4-2,

When manually press Down button, sensor ring touches steel, the C indicator flashes, torch will move up/down on steel.

Normally human's hand touches sensor ring, C indicator would turn on and send out collision signal.

If user changes HF cable, or HF cable spec changes, C indicator might turn on, like follow situation, HF cable short-circuit, once it happens, C indicator turns on, torch lift up. It could be confirmed by checking the HF cable shield net and Signal connect or not.

HF cable gets longer, it needs to adjust R39 to find the Balance point, then THC can work right on Auto mode, and C indicator will turn off.



Figure 4-2 collision happens“C” indicator is on

B、None collision or disconnection

As the difference of cutting torch, THC can not find the Balance Position in all range of Height adjustor, torch keeps lifting up or down. In this situation, DO NOT open the THC cabinet, just do it as follow introduction, shows as Figure 4-3.

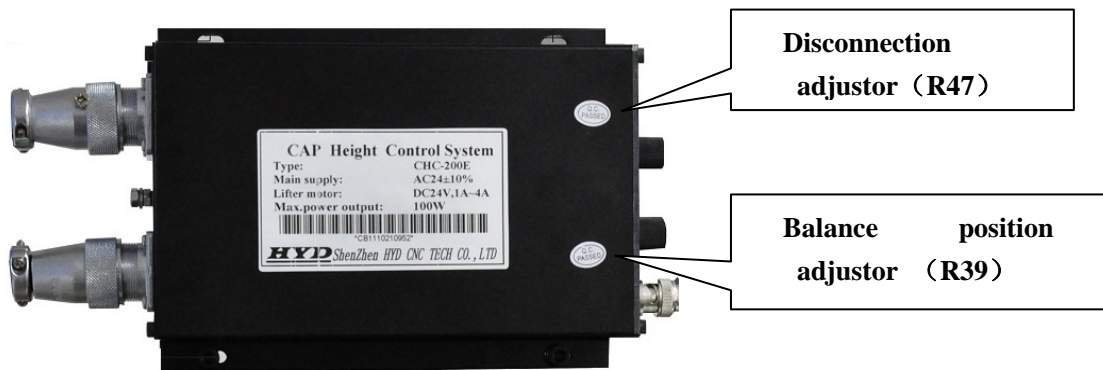


Figure 4-2

Note: Firstly to confirm the two situations when torch keeps lifting up before adjusting

- 1、 On auto mode, THC controls torch up/down to find the Balance point, if the Auto height is set too high, torch would keep lifting up. Manual control torch down is effective, because Manual control has priority against Auto Control. In this situation it needs to adjust the Height Button, further adjust R39.
- 2、 On auto mode, when HF cable is disconnected or short-connected, or collision happens, THC lifts torch up for protection, Manual control down is non-effective. This Up has priority against Down.

In situation 1, Press AUTO button and hold, turn Height button clockwise maximum. Then, motor would control sensor moves, please turn Height button left/right, torch should stop at some position (Balance Point—Auto Height). If not, please use a small screwdriver to adjust R39 as follow step, **(no need to open THC cabinet, just the screwdriver passes the small hole).**

First, set on Manual mode, lift torch up over 50mm against steel plate.

Press Auto button to turn Auto on, if torch lift down, means Auto Height is too low, then adjust R39 clockwise to raise the auto height. If torch lift up, means Auto height is too high, turn anti-clockwise

Please protect the adjust Resistor to avoid damage, Do Not exceed 1/4 round on every turn, and make record of turn direction.

Every time after turned R39, turn Auto mode on, to check the torches move for Balance Point.

When torch can stops at a set height by adjusting R39, then turn Height button to set the Auto height at right high on Auto mode.

Note: The THC has passed all commissioning work before delivery, please NOT adjust the inside resistor without informing your supplier.

The adjustable resistor spec

| Mark no | spec | function |
|----------------|-------------|---------------------------------|
| R39 | 1K | Auto height adjusting |
| R47 | 20K | Disconnection protection |