

# PHOENIX

## SERIES CNC PLASMA CUTTER MANUAL



### Safety Information!

1. Before operating, ensure proper ventilation.
2. DO NOT operate this machine without proper training.
3. DO NOT operate unattended.
4. DO NOT wear jewelry or loose clothing when operating machine.
5. Wear proper eye protection.
6. Wear proper protective clothing.
7. Keep clothing and hair away from the Torch and hot metals.
8. Keep all areas around the Torch free of flammable materials, including but not limited to wood, flammable material scraps, clothing, cleaning solvents, plastic and more.
9. In case of emergency, have fire extinguishing equipment available.
10. Make sure the Ground Clamp (Work Lead) is connected to material being cut.
11. Before servicing, disconnect all power sources.



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# PLASMA FORKLIFT GUIDE

## I. SAFETY WARNING:



**DO NOT LIFT OR  
MOVE MACHINE  
USING GANTRY**

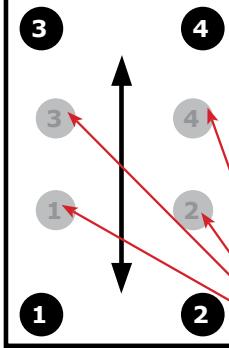


**Fig. 1.1**

- Please note the 4 Forklift Tubes on the front and rear of the machine.
- If required, there are 4 Forklift Tubes on the sides of the machine.

**1.1**

Rear of Machine



Front of Machine

**2.1**

## II. MEASURING FORKS AND FORKLIFTING MACHINE

Left Side



**23"**

Right Side



**23"**

**Fig. 2.1**

**Measuring the distance between the forks.  
(shown in Fig 2.1).**

**2.2**

**Be very careful not to damage the wiring and/  
or the plumbing underneath the machine.**

**Take care not to damage the  
machine.** Slowly move in close to the  
machine.

Forklift your machine up from the  
floor and remove the wooden pallet.



**Fig. 2.2**

**28"**

**It is recommended that you have professional riggers conclude the installation if you are uncomfortable with this method.**

**i. SAFETY INFORMATION:**



**WARNING! READ, FOLLOW AND UNDERSTAND THE TORCH MANUAL BEFORE BEGINNING USE.**

- 1) Use a welding screen when operating Plasma Torch.
- 2) Wear proper eye protection.
- 3) Wear proper protective clothing.
- 4) Disconnect all power before adjusting, loading, or replacing any materials or consumables on the machine table or torch.
- 5) **CUT MATERIAL AND MACHINE WILL REMAIN HOT FOR MANY MINUTES AFTER PLASMA TORCH HAS BEEN SHUT OFF. LET COOL ACCORDINGLY. ALWAYS USE GLOVES TO AVOID BURNS AND SHARP EDGES.**
- 6) Disconnect all power before servicing the CNC machine or torch. The machine may have multiple power sources, disconnect all power sources.
- 7) Ensure proper ventilation is setup and used during operation of Plasma Torch.
- 8) Install Plasma Cutter on a non-flammable surface only.
- 9) Keep all areas around the Plasma Torch free of flammable materials, including but not limited to wood, flammable material scraps, clothing, cleaning solvents, plastic and more.
- 10) Keep clothing, hair, and jewelry away from the Plasma Torch and hot metals.
- 11) Do not operate unattended.
- 12) Have appropriate fire extinguishing equipment available in case of emergency.
- 13) Refer to MSDS for material being cut for material-specific safety instructions. Stainless steel can be particularly dangerous.

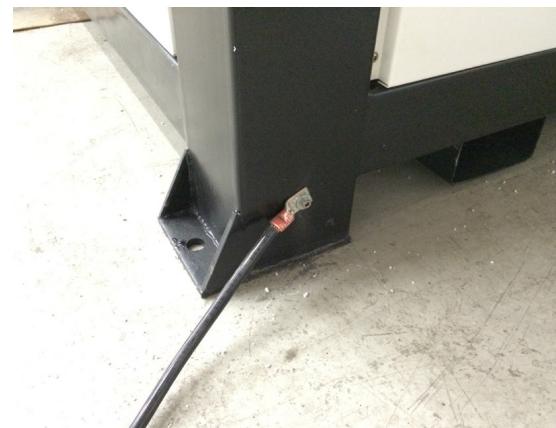
**DANGER!****MULTIPLE POWER SOURCES**

Disconnect All Power Sources before Servicing

This Equipment has 2 Power Sources  
To Disconnect Power:  
Unplug power cord to this panel from receptacle.  
And Disconnect and lock out power to Plasma Torch.



The Techno CNC Plasma System is powered by 220 Volt single phase power.

**WORK LEAD TERMINAL**

Please make sure the CNC Plasma is properly grounded using the grounding lug provided on the rear leg of the machine.

**Make sure the Ground Clamp (Work Lead) is connected to material being cut.**

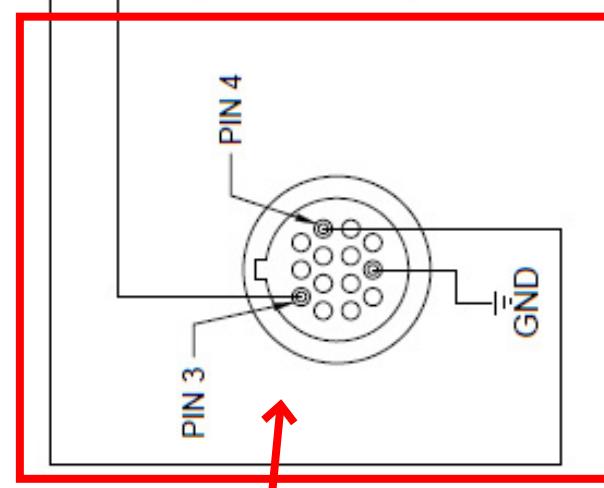
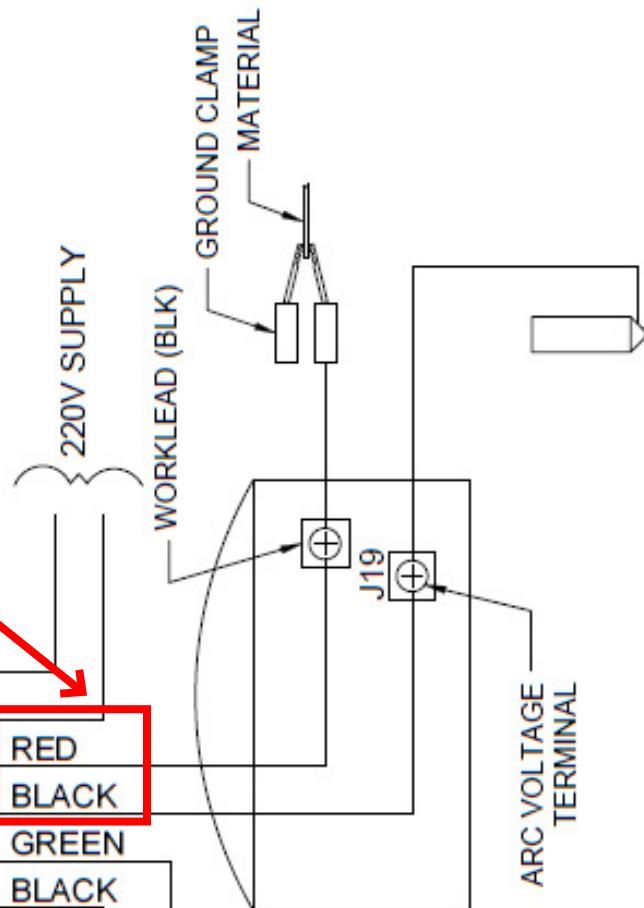
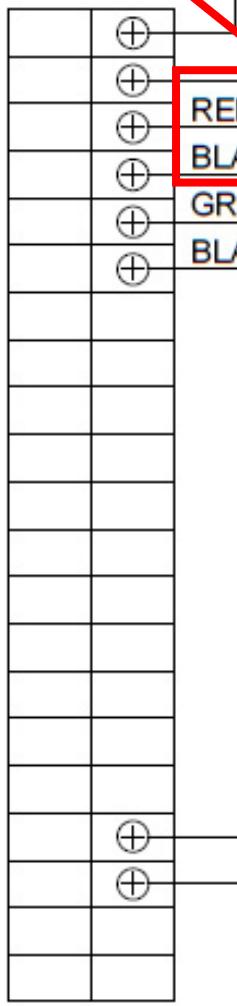


Have a licensed electrician perform all electrical connections based on your electrical codes!

This wire is pre-wired into the Hypertherm unit and is a grey, two conductor wire.

Please route it through the controller cabinet port and attach it to the left hand terminal block as shown below.

### PLASMA CONNECTION TERMINAL STRIP



This black circular connector is put inside the CNC cabinet during transport. Run it through the exit port and connect it to the Hypertherm unit

## Ia. Techno CNC Plasma Installation

**1.1** The Electronics are housed in the large controller box as shown in Figure 1.1. When unpacking the machine, avoid twisting the plastic conduit that guides the cables to the motors.



Fig. 1.1

**1.4** Guide the cable through the hole on the side of the enclosure and attach the hand-held controller to the DB 15 terminal.

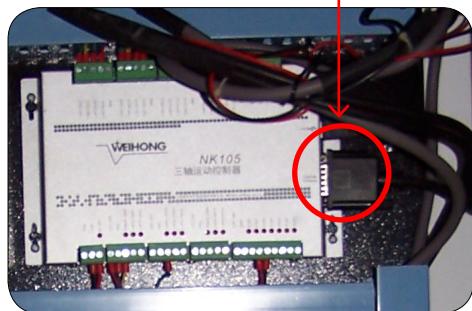


Fig. 1.4

**1.2** Open the front of the controller box (shown in Fig 1.2).



Fig. 1.2

**1.5** Hang the hand-held controller on the side of control box. It is now ready for use.



Fig. 1.5

**1.3** Unpack the hand-held controller and carefully attach this to the controller board.



Fig. 1.3

**1.6** The terminal for the 220 volt connection is located at the bottom of the box.

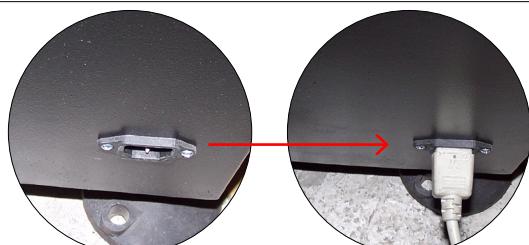


Fig. 1.6



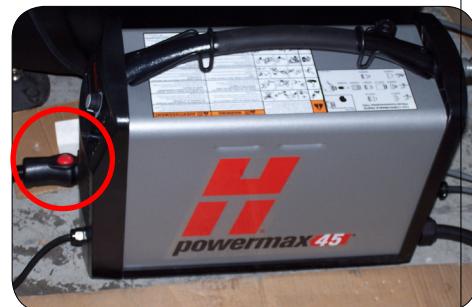
**WARNING:** Read this setup thoroughly before running the machine. Have a licensed electrician perform all electrical connections based on your local codes!

## Ib. Plasma Torch Connections

### For control connections, see schematics.

When hooking up the plasma torch, be sure to use appropriate power. See Hypertherm documentation or refer to quote for details.

Please read and understand the Hypertherm torch manual before operating the machine.



### Make sure the torch is plugged in.

Both the Hypertherm torch and the plasma machine need compressed air to operate. If there is no air going to the plasma machine, you will receive an error on the handheld saying "torchalm". You will NOT be able to move both the x and y axis until compressed air is connected to the machine.

The error "torchalm" will also appear when the torch is not in its correct position. This acts as an e-stop if the torch knocks into something while in motion.

### Compressed air is required to operate



## II. NC studio Controller Functionality

### 2.1 Control Panel Functions.

Figures 2.1a and 2.1b show the buttons and their functions.



Fig. 2.1a



Fig. 2.2b

**Switch can be used for fumigation (optional.)**

### 2.2 Enabling The Machine.

Pressing the green button applies power to the controller and enables the motors.



(Note that the red POWER button will light up if the Emergency Stop is pressed during operation.)

Fig. 2.2

## 2.3 Operational quick start tutorial:

After all connections have been made to the CNC Plasma machine and torch, you are now ready to run a file.

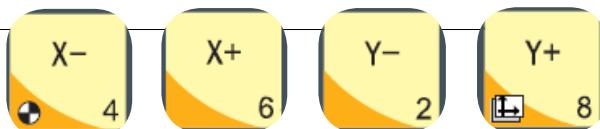
**Step 1-**  
Turn on power to the machine and plasma torch.



**Step 2-**  
You will be prompted by the hand held controller "Back to Ref. Point".  
  
**WARNING:**  
Before answering "OK" flip the switch "Torch up" on the microstep panel to raise the torch so that it does not drag across the material when the X and Y axes home.



**Step 3-**  
Locating X/Y origin.



Jog the machine to the desired X/Y start position by pressing the X and Y directional keys. For this example we will assume the lower left hand corner or first quadrant of the part is the origin or 0,0.

Once located, press the key XY=0, and answer "OK" to "Are you sure to clear wo". The display should now show X and Y coordinate values of 0.000



**Step 4-**  
Before running a file, we want to test the torch touch off. Make sure the material is under the torch for this test and the work lead is attached to the raw stock. Press the button on the Microstep control panel "Zero Test". The torch should lower to the material, touch off, and retract.



**Step 5-**

Insert the memory stick into the port on the front of the control box. The hand held should recognize the connection and prompt you to read the stick; answer "Yes".



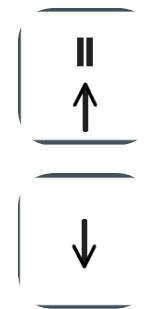
To load a program press



Using the arrow up/down keys move to "2.USB files"; press "OK". Again using up/down key select desired NC program you wish to run and press.



The file will load into memory.

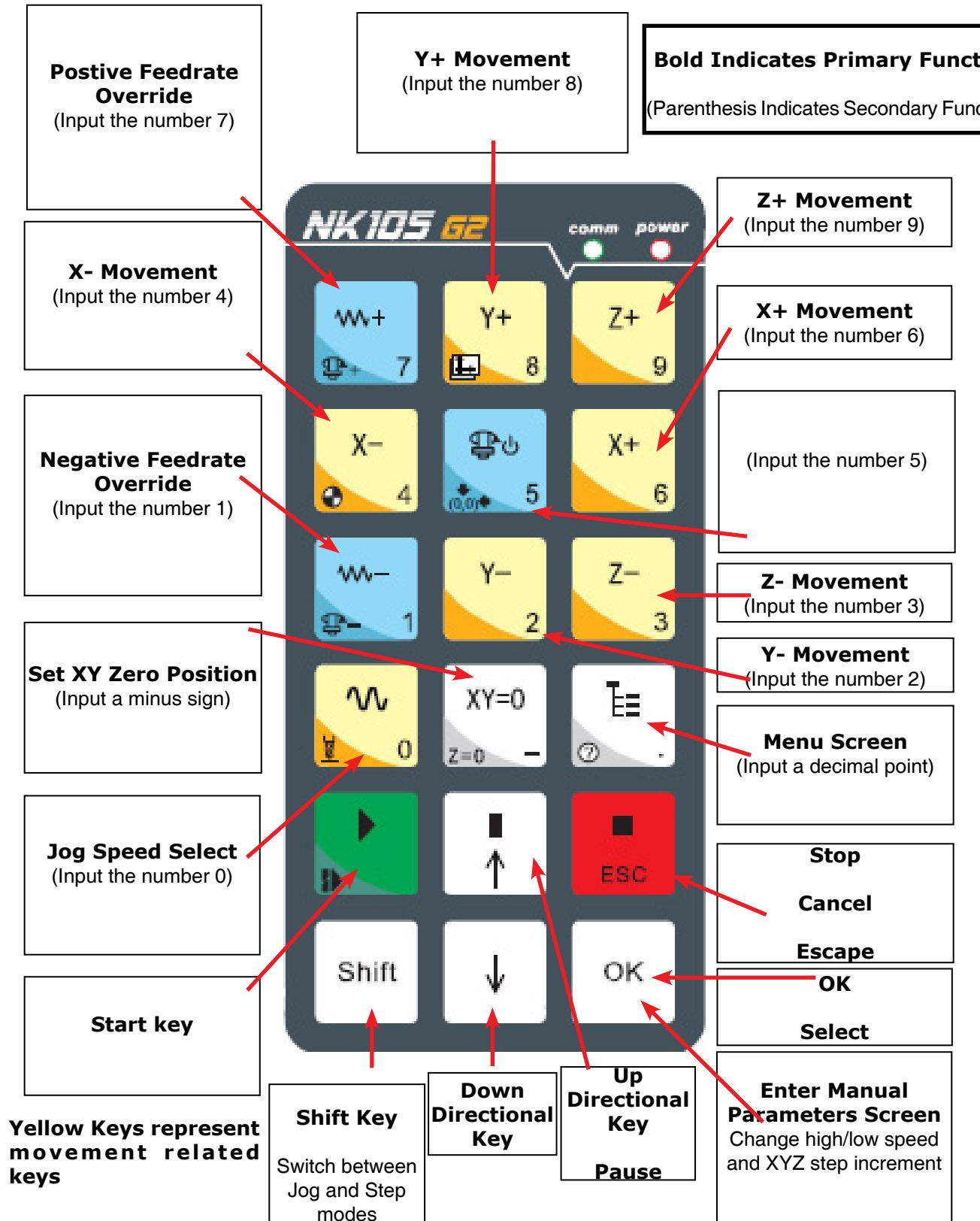
**Step 6-**

Press play.



The machine will automatically touch off and set the height for cutting then proceed to execute the NC program.

## Single Keystroke Functions on the Handheld Pendant



**Shift Commands / Combination Keystrokes**

To use the shift commands, you must press and hold the shift key and then select a second key to use the Shift Command function.

Key icon	Function
	Increase spindle RPM
	Switch between work (relative) and machine (absolute)
	Go to home (mechanical origin)
	Go to current origin
	Decrease spindle RPM
	Resume from breakpoint
	Open help screen

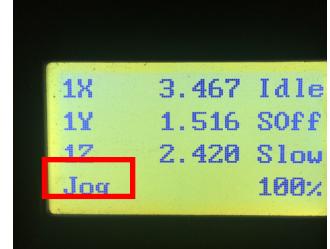
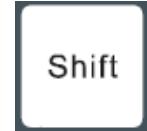
### III. Operating Tutorials.

#### 3.0- Switching Movement to Step or Jog.

There are two modes that allow the user to control the movement of the machine: Jog and Step. To switch between these modes press the "Shift" button. The mode will be displayed on the bottom left of the screen.

**Jog-** Also known as continuous mode. When a directional arrow is pressed, the machine will move in that direction until the button is released.

**Stepping**- Also known as step mode. When a directional arrow is pressed, the machine will move an exact amount, as dictated by the manual parameters page. To move again, you must release the button and press it again.



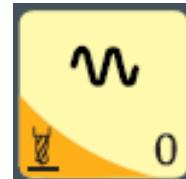
#### 3.1- Jogging the machine and changing from High/Low Jog Speed.

To Jog the machine, hold down one of the Yellow directional keys on the keypad while in Jog mode. The keypad has X+,X-,Y+,Y-,Z+,Z- printed on the keys to indicate direction.

The machine has two speeds, High and Low.  
When the machine starts it will be in the Low speed.

To toggle between low and high speed press the Jog Speed Select Button. You can only toggle speed when in Jog Mode.

The LCD will display High or Low on the right of the screen.



Select between high and low  
Jog speeds

#### 3.2- Stepping the machine.

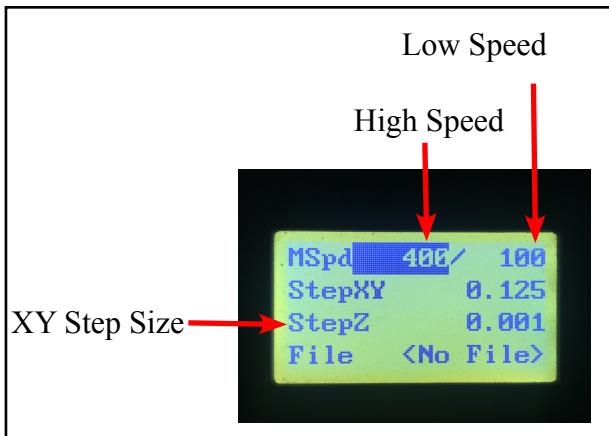
To move the machine in increments, press down one of the Yellow directional keys on the keypad while in Stepping mode. The keypad has X+,X-,Y+,Y-,Z+,Z- printed on the keys to indicate direction.

This will move the machine in predetermined increments in the axis selected.  
By default, the X and Y axes will move in .005 inches and the Z axis will move in .001 inches.

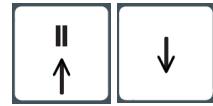
### 3.3- Modifying the Jog Speed and Step Size

The machine can be jogged at two speeds, low and high. You can also change the increments in which the machine will move in Step mode. These speeds are set in the Manual Parameters page.

To access the Manual Parameters page press OK from the Main Screen



To move the cursor, use the Up and Down directional arrows.  
Enter a new value.  
Press OK to accept that value.



Set the High and Low speed to a suitable value.  
Adjust the Step value as needed.

To Exit out of this screen and return to the main menu press ESC.



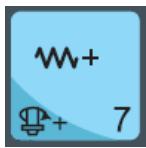
**Warning:** Adjust the step size carefully. If you set the step size to an excessive value, the machine will move by that value and could damage the machine.

When inputting a decimal increment, you must enter the value as 0.###  
Zero+decimal+(your increment)

### 3.4- Feedrate Override.

While running a G-Code file, the user can manually override the feedrate or cutting speed of the program. The range of the override goes from 10% to 120% of the original feedrate.

The user can override the feedrate using the following keys:



Increase  
Feedrate

OR



Decrease  
Feedrate

### 3.5- Torch Height Control (THC)

The Torch height is automatically controlled during processing through the microstepper THC unit shown below.



#### Explanation of Controls:

**Auto/Manual:** This switch controls the THC mode, auto and manual. When the switch is set for auto, the THC automatically controls the height of the torch. When the switch is set for manual, the THC operates by the users settings. The LCD screen shows the mode status.

**Torch up/Torch Down:** This controls the Z axis movement up and down. The LCD screen shows up or down.

**Arc strike:** This performs an arc strike test and will only work while in manual mode. When you press the button, the Hypertherm plasma power source will get an arc strike signal. The THC shows the arc voltage value and the LCD displays "ARC" is on.

**Zero test:** This will test the position and initial height of the plasma torch, the torch will drop down, touch the material and then move to its pre-set height above the material. This can be canceled using the torch up/down switch.

**Sensitivity:** Refers to the tolerance of the Arc Voltage setting. Recommended value of 5. Also changes values by increments of 1.

**Height:** Arc Voltage. Also changes values by increments of 10.

**Up/down:** Press in or twist this knob to access the main menu. Also selects different parameters inside the main menu.

**Display:**

**Manu:** This light is on when THC is in Manual Mode or without the Auto signal from the CNC controller.

**Auto:** This light is on when THC is in Auto Mode or when receiving the Auto signal from CNC controller.

**Up:** This light is on when moving the torch up.

**Down:** This light is on when moving the torch down.

**Lim+:** This light is on when the torch is moved along the Z axis to its upper limit.

**Lim-:** This light is on when the torch is moved along the Z axis to its lower limit.

**Zero:** This light is on after pressing "Zero Test".

**Arc:** This light is on after pressing "Arc Strike".

**Display Parameters:**

**ARC:** Shows the actual arc voltage value after arc strike, 000 is for no arc voltage value.

**SetArc:** User set Arc voltage value determined according to the plate thickness and cutting speed. These values can be obtained from the cut chart in the Hypertherm manual. The arc voltage value determines the torch height to the plate. The larger the value, the higher the height. In auto mode, during cutting, the arc voltage value is automatically adjusted based off cutting feedback.

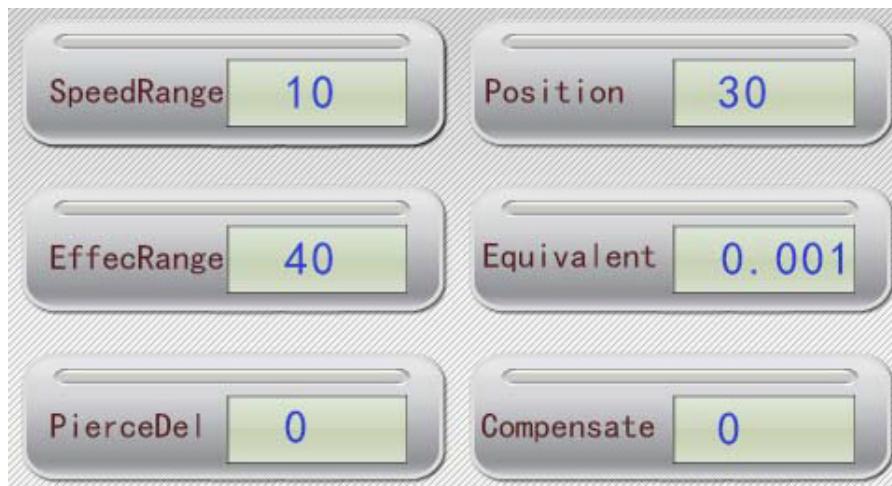
**Sensitivity:** The response speed of the automatic torch height control. The smaller the value the slower the torch height adjustment response.

**THC Main Menu:**

The THC main menu is accessed by pressing in or twisting the Up/Down knob

Values are adjusted by using the Sensitivity (+1) or Height (+10) knobs

Press "Zero Test" button to return to main screen.

**Main Menu Settings:**

**SpeedRange:** Similar to Sensitivity. The larger the speed range, the slower the THC motor control. A higher value will have slower tracing speed, a value too low will cause motor shaking. Recommended value 10.

**EffecRange:** Effective Range. This sets the upper and lower limits of the THC Arc Voltage control in Auto mode. Recommended value of 40.

**PierceDel:** Pierce Delay. This sets the torch on delay time in milliseconds. This value is preconfigured in the NC studio controller. See 3.6 for details.

**Position:** Also known as location height. This is the initial height in millimeters of the torch after the "Zero Test". Recommended value of 30. Value needs to be changed with material thickness. Refer to the correct cut chart in your Hypertherm manual for this value.

**Equivalent:** Do not change this value. Represents the Z axis distance per pulse.

**Compensate:** Zero or One, this setting will compensate the difference between set location height and actual location height.

**THC Sub Menu:**

Press and hold "Zero Test" button on the main menu to access the Sub Menu.  
These settings relate to the Z-axis motor control and have been preconfigured for your machine. It is recommended not to change these values.

**Sub Menu Settings:**

**StartSpeed:** Default speed of the THC motor. Unit: mm/min.

**TopSpeed:** Maximum speed of the THC motor. Unit: mm/min.

**SpeedRate:** Motor acceleration factor. The larger the value is, the longer the acceleration time.

**AutoHSpeed:** Auto High Speed. Maximum speed during Auto mode. Will not exceed TopSpeed value.

**autoLSpeed:** Auto Low Speed. Minimum speed during Auto mode. Will not exceed auto high speed value.

**Language:** 0 for Chinese, 1 for English.

**Setting the Plasma Cut Parameters:**

Please refer to your Hypertherm Powermax Manual's cut chart to ensure proper settings. Maximum cut speeds are the fastest speeds possible to cut material without regard to cut quality. Recommended cut speeds are a good starting point for finding the best quality cut. You will need to adjust the speeds for your application and your table to obtain the desired cut quality.

Arc current (amps)	Material thickness	Torch-to-work distance (in)			Pierce time delay (sec)	Recommended		Maximum	
			Initial pierce height			Cut Speed (ipm)	Voltage (V)	Cut Speed (ipm)	Voltage (V)
30	0.018 in (26 Ga)	0.06	0.15 in	250%	0.0	360	117	400*	118
	0.030 in (22 Ga)					340	116	400*	117
	0.036 in (20 Ga)					320	115	400*	117
	0.060 in (16 Ga)				0.2	225	111	280	115
45	0.036 in (20 Ga)	0.06	0.15 in	250%	0.0	380	115	400*	112
	0.060 in (16 Ga)					350	116	400*	115
	0.075 in (14 Ga)					280	117	360	115
	0.105 in (12 Ga)					190	117	240	115
	0.135 in (10 Ga)				0.1	140	117	175	115
	0.188 in (3/16 in)					85	118	110	115
	0.250 in (1/4 in)					60	120	75	116
	0.375 in (3/8 in)					32	122	40	116
	0.500 in (1/2 in)				Edge start recommended	20	132	25	125
	0.625 in (5/8 in)					11	138	14	127
	0.750 in (3/4 in)					8	140	10	131
	1.000 in (1 in)					4	146	5	142

**The cut chart on page 20 is being used as an example. It is from the Hypertherm PowerMax45 manual. It represents the cut chart for shielded consumables on Mild Steel with English Units.**

In this example, we will be cutting 16 Ga mild steel and we will use the recommended settings. These are merely recommended settings, you will need to adjust accordingly.

We will use the cut chart from left to right.

First, we will select our Arc Current. The PowerMax 45 is capable of 45 amps so we will start there. We will set the control knob on the PowerMax 45 unit to 45 amps.

Next, we choose our material thickness. In this example we will be using 16 Ga.

As we move from left to right, we can use and set various parameters.

Torch-to-work distance is our working “Position” value. Since we are in inches, we will multiply this value by 25.4 mm/inch to get our middle “Position” value in mm. However we will use the Initial Pierce height as our actual “position” value and make sure our “EffectRange” is large enough to encompass our Torch-to-work distance.

Now we will set our Pierce time delay, as shown in seconds but the setting on the THC is in milliseconds so multiply the value by 1000.

Our cut speed will be 350 inches per minute. You will use this value when creating the toolpath of the part to be cut.

Our SetArc value will be 116V. Use the height knob on the main screen of the THC to set this value.

### **3.6 - Pierce Delay on the Automatic Torch Height Control Display**

To change your Pierce Delay time variable, you must navigate to the sub menu of the THC by turning the up | down knob.

Use the up | down knob to select Pierce Delay.  
Use the +1 or +10 knob to change the value.



Units are in milliseconds.

### 3.7- Adjusting the XYZ Zero position/WCS/User Origin.

XYZ zero position, Working Coordinate System (WCS), and User Origin are all the same thing.

Different CAM systems and users just name the concept differently. For convenience XYZ zero position will be used in the rest of this manual.

XYZ zero position is the location point on a drawing in a CAD/CAM package where X,Y and Z all equal zero.

Generally, XY zero is on the bottom left corner and Z zero is the top of the part. In fig 3.3a the letters are located away from the XY zero, all points representing positive integers.

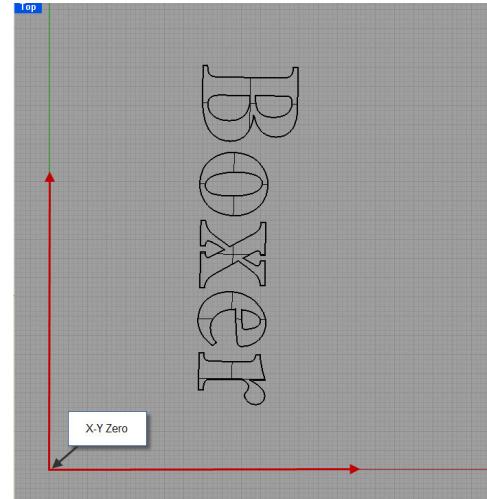


Fig. 3.3a

In Fig 3.3b the object represents the material the letters will be cut from. The machine should be jogged to the corner of the material by using the directional arrows on the keypad.

Once the machine is in location press  
to set XY zero. The coordinates on the  
controller will change to 0,0.  
XY zero is now set.

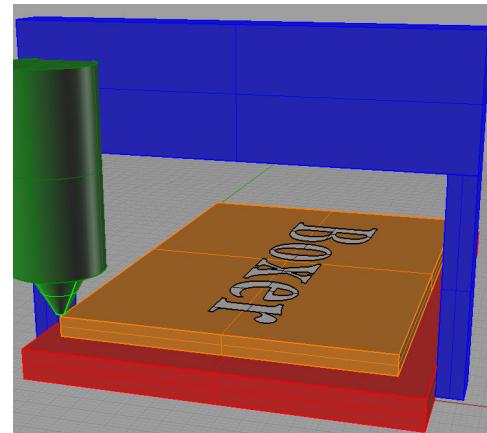
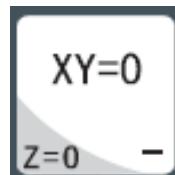
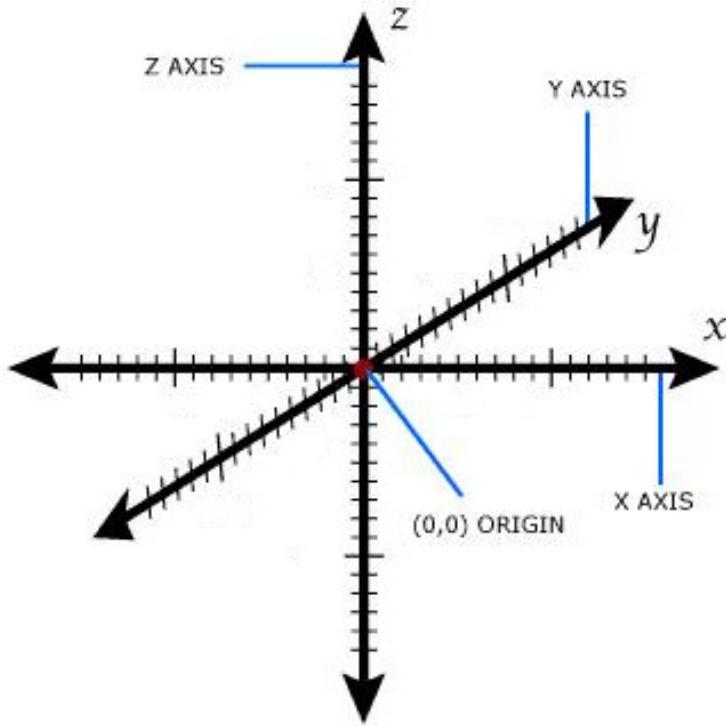


Fig.3.3b



### 3.8- Loading a G-code File.

Press the Menu button.



Select “2.USB files” to access the flash drive.

Only a G-code file with an “nc” extension will show.

Scroll through the files with



Select file by pressing OK.



Then load the file by pressing 1.



Note:

Files can be copied from this USB to the controller using the “2” button  
Local disk space is limited!

Once a file is copied locally, it can also be selected from the jog speed /step size screen

### 3.9- Running a G-code file.

Once the XYZ origin has been set as per section 3.4 and the file has been loaded as per section 3.5 the user is ready to run the G-code file.

To run the G-code file simply press the start button



Once the spindle has reached speed the machine will move into position to start the first cut.

The file can be paused while running by pressing



To resume the file press



To abort the file at any time press



**Note:**

When the machine pauses, the spindle will stop and the Z axis will move to the Z clearance/Safe height to allow inspection of the part.

If the machine is jogged off the part during a pause, it will lose its position and when the file is resumed it will start from the new position.

When using multiple tools it is best to create separate files for each tool.

The last file can be resumed at a breakpoint by pressing.



## IV. Advanced Tutorials.

### 4.1- Alternating between Override and Programmed Feedrates.

The controller can run G-code files with speed set by the user on the keypad, override speed, or with speed set in the CAM package/G-code file, programmed speeds.

To determine what speed protocol will be used, do the following:

In the main screen, press menu



to enter the menu screen .

Use the



key to scroll the cursor and highlight

**4. oper param**

Press OK to select.

Use the



and



key scroll the cursor and highlight

**8. ignore F code**

**9. ignore S code**

Press OK to select.

**Note:**

**The F or S Option.**

F stands for Feed rates, and S stands for Spindle RPMS.

**Note:**

“**No**” means speed in the G-code file will be obeyed.

“**Yes**” means speed will be overrode by the controller.

#### 4.2 Setting the Override Speed for a G-code file.



From the main screen, press Menu to access the Menu screen.



Use the arrow keys to move the cursor and highlight **4. oper param**

Press OK to select this option and enter the Operations Parameters screen



Use the arrow keys to move between each option and press enter to select the option.

Press OK to edit the data and use the number keys to enter data.

Press OK to save data and Cancel to exit out of the screen.

Keep pressing cancel until you return to the main screen.



**G00 Speed** is the rapid speed, or the speed the machine moves when the cutter is above the material.

**GXX Speed** is the speed the machine moves when the cutter is in the material. This speed will vary with cutter size, material, cutter type, etc.

More parameters in

**5. MFR param**

### 4.3 Setting the Table Size.

From the main screen, press Menu to access the Menu screen.



Use the arrow keys to move the cursor and highlight **5. MFR param**



Press OK to select.

**Password: 33587550**

The MFR parameters screen will now open.

Use the arrow keys to move the cursor and highlight **4. Machine stroke**



Press OK to select.

Use the arrow keys to highlight a value, press OK to edit the value, and press OK to save it.



Press Cancel when the value is highlighted to abort the edit.

Use the arrow keys to scroll down the screen until the negative values are displayed.

When all the edits are complete, press Cancel to exit out of this screen.  
Keep pressing cancel until you return to the main screen.

**The asterisk \*** on this setting indicates that the machine must be powered down and the axes homed in order for these new values to take affect.

If these values are incorrect it will effect the running of the machine.

If the values are too small, the machine will stall/stop when it reaches the value entered.

If the value is too big, it is possible for the machine to hit the end of travel and damage could occur.

## V. Machine Lubrication.

### 5.1 Lubricating the X-Y Rack and Pinion.

Lubrication is important with rack and pinion gearing systems. A thin film of grease should always be present on the contacting tooth flanks to minimize metal to metal contact.

Lithium grease lubrication is recommended over oil, as the oil lubrication will flow away from tooth flanks.

The grease should be applied to the rails at regular intervals, depending on the usage of the machine. Use a small brush to coat both rails on the side of the Y-axis and the single rail across the X-axis. Fig 5.1



Fig 5.1

### 5.2 Lubricating the X-Y-Z Rails

The rail carriage bearings are sealed and protected with wipers. The rails should be lightly oiled to allow smooth operation. Avoid a build up of debris on the rails by blowing them off with air, or wiping them down with a rag. The rails do not need to be lubricated as often as the rack, once a month should be sufficient.

Fig 5.2



X Axis

Z Axis

Y Axis

### 5.3 Lubricating Z Ballscrew

The Z axis uses a ballscrew and ballnut instead of a Rack and Pinion. The ballnut has a nipple for applying lubrication to the mechanism. Fig 5.3a

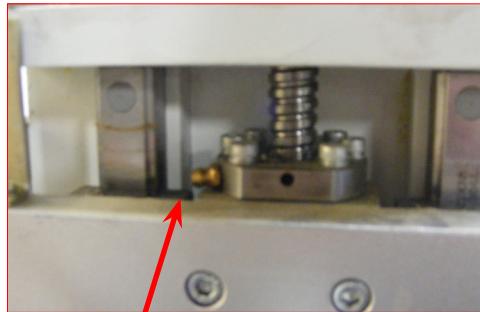


Fig 5.3a

Lithium grease is pumped into the lubrication point with the application gun provided with the machine. Fig 5.3b



Fig 5.3b

### 5.4 Recommended Lubricants.

*Lithium Based Grease:*  
Alvania Grease No. 2(Shell)  
or Equivalent.

Techno Part No.  
H90Z00-8670T8

*Oil:*  
Vactra No. 2s(mobile)  
Tonner Oil or Equivalent.  
Techno Part No.  
H90200-LUBE002

*Oil and Grease Kit:*  
Techno Part No.  
H90Z00-LUBEKIT2

**NOTE: AVOID A BUILD UP OF DEBRIS ON MOVING PARTS. CLEAN OFF ANY DEBRIS TO AVOID DAMAGING THE MACHINE.**

## Appendix

### Plasma Control Settings

#### High/Low Speeds and Step Distances (from main screen, press 'OK')

MSpd: 800 / 100

Step XY: 0.005

Step Z: 0.005

File: (active file name)

Note: These numbers can vary.

All following settings can be found by pressing the 'Menu' key and are worded/abbreviated as you would see them on screen.

*Note: All settings with '\*' on screen requires reboot to take effect.*

1. LOCAL FILES
2. USB FILES
3. OPERATIONS
  1. Back to REF Point
    1. All Home
    2. Z Home
    3. X Home
    4. Y Home
  2. Rect Machining
    1. Params Setting
      - Engr Depth
      - Each Depth
      - Tool Dia
      - Nose Gap
      - Height
      - Width
      - X Init
      - Y Init
      - Mode Horiz Mill
      - EXECUTE
    2. Load the Last
  3. Select Line No
    - Total: \_\_\_\_\_
    - StartLine: \_\_\_\_\_
    - EndLine: \_\_\_\_\_
    - EXECUTE NOW
  4. Machining Info
    - Time
    - X: \_\_\_\_\_
    - Y: \_\_\_\_\_
    - Z: \_\_\_\_\_

### **Settings (continued)**

- 
- 5. Park MCS Site
    - 1. Park Mode
      - Not Move
      - To Park Site
      - To WCS Origin
    - 2. Park Site
      - 1. Input Site
        - Input Park Site
          - X: \_\_\_\_\_
          - Y: \_\_\_\_\_
          - Z: \_\_\_\_\_
        - 2. Select Site
          - Select Current Position As
          - Park Pos by [OK] Key
          - Return by [ESC] Key
    - 6. Select WCS
      - G54 WCS
      - G55 WCS
      - G56 WCS
      - Select by [OK]
    - 4. Oper Param
      - 1. G00 Speed
        - 394.00 in/min
      - 2. GXX Speed
        - 230.00 in/min
      - 3. Back REF First
        - NO
      - 4. Offset →
        - 1. Public Offset
          - 1. X
          - 2. Y
          - 3. Z
        - 2. Work Offset
          - 1. G54 Offset →
            - 1. X
            - 2. Y
            - 3. Z
      - 5. Cycle Process →
        - 1. Cycle Process
          - NO
        - 2. Cycle Times
          - 2
        - 3. Cycle Interval
          - 0 ms

*(settings repeat through G59)*

### **Settings (continued)**

- 
- 6. Ignore F Code  
YES
  - 7. Ignore S Code  
YES
  - 8. Ratio on Manu\*  
NO
  - 9. DXF Params →
    - 1. 1<sup>st</sup> Point as 0\*  
YES
    - 2. Shape Process\*  
NO
    - 3. Metric Size\*  
NO
  - 10. ENG Params →
    - 1. Lifting Height\*  
0.039
    - 2. Tool Change Tip\*  
YES
    - 3. Cycle Times\*  
1
    - 4. Deep Hole Mode\*  
0
    - 5. Retract Amount\*  
0.25
    - 6. Select Tool No\*  
YES
  - 11. Type Para
    - 1. Use Servo  
YES
    - 2. Detect Arc  
YES
  - 12. Delay Sett
    - 1. Arc Delay  
800ms
    - 2. Torch Up Delay  
1000ms
    - 3. Torch Down Delay  
2000ms
    - 4. Torch Down Delay  
1000ms
    - 5. Open Cylin Delay  
2000ms
    - 6. Closed Cylin Delay  
5000ms
-

### **Settings (continued)**

- 
- 13. Corner Cont
    - 1. Corner Toleran  
0.039 inch
    - 2. Corner Option  
0
  - 14. Machine EFF
    - 1. G00 Speed  
394.00 in/min
    - 2. GXX Speed  
230.00 in/min
    - 3. Back REF First  
NO
    - 4. SGL Axis Acc  
47.000 in/sec^2
    - 5. Max Turn Acc  
94.000 in/sec^2
    - 6. REF Circle Radius  
0.197 inch
    - 7. REF Circle Speed  
230.00 in/min
    - 8. Corner Toleran  
0.039 inch
    - 9. Corner Option  
0
    - 10. Smoothing Time  
0.024s
  - 11. Type Para
    - 1. Use Servo  
YES
    - 2. Detect Arc  
YES
  - 12. Delay Sett
    - 1. Arc Delay  
800ms
    - 2. Torch Up Delay  
1000ms
    - 3. Torch Down Delay  
2000ms
    - 4. Torch Down Delay  
1000ms
    - 5. Open Cylin Delay  
2000ms
    - 6. Closed Cylin Delay  
5000ms
-

### **Settings (continued)**

15. ENG Unit

YES

5. MFR Param

**PASSWORD: 33587550**

1. Velocity →

1. Max Angle

120.000 deg

2. Startup Speed

0.000 in/min

3. Single Axis Acc

47.000 in/sec<sup>2</sup>

4. Max Turn Acc

94.000 in/sec<sup>2</sup>

5. Jerk

314.961 in/sec<sup>3</sup>

6. Short Seg Spd Lmt

YES

7. SPDLMT Length

0.020 inch

8. REF Circle Radius

0.197 inch

9. REF Circle Speed

230.000 in/min

2. Axis Output Dir →\*

X: Positive

Y: Positive

3. Pulse Equiv →\*

X: 0.0033200

Y: 0.0033200

4. Machine Stroke →

1. Strk Upper Lmt →

X:

Y: *varies depending on machine size*

2. Strk Lower Lmt →

X: 0

Y: 0

5. Ref Point Set →

1. RefP Speed →

X: 70.866 in/min

### **Settings (continued)**

Y: 70.866 in/min

2. RefPDir  
X: Negative  
Y: Negative
3. Retract Dist  
1. X Retract Dist  
0.079 inch
2. Y Retract Dist  
0.079 inch

6. Y Rotary Axis →
  1. Y as Rotary Axis\*  
NO
  2. Rotary Y Pulse  
0.006 deg/pulse
  3. MM as Unit  
NO
  4. Rev Work Radius  
0.394
  5. Rotary Takeoff  
0.291 rad/s
  6. Rotary Y Acc  
6.98 rad/s<sup>2</sup>
  7. Max Rotary Vel  
30 r/min
7. Backlash Set
  1. Compensation on  
NO
  2. Axis Backlash →\*  
X: 0.0  
Y: 0.0  
Z: 0.0

8. Enable S Algo  
YES
9. Arc Incriment  
YES
10. Forward Look Seg  
50
11. Sign of BK REF  
YES
12. G00 Feed 100%\*  
YES
13. Smoothing Time

## **Settings (continued)**

-----  
0.024s

6. Param Upkeep
  1. Backup Params
  2. Restore Params
  3. Factory Params
  4. Export Params
  5. Import Params
7. System Upkeep
  1. Language
    1. Chinese
    2. English
  2. Export Log
  3. System Update
  4. Register
  5. Help

Spec: Help Message Show Delay  
Value: 60  
Unit: S
  6. Reboot
  7. Exit
  8. Diagnosis
    1. System Info
      1. Software Version
      2. Card No
      3. Remaining Time
      4. Register Tmes
    2. Port List
    3. Keypress Diag
    4. Import Diag
    5. Outport Diag

### **Notes On the G-code File**

If a part requires multiple tools, it is best to output a different file for each part.

If the G-code file references a tool number higher than T10, then the controller will give an error at the start of the file. M6 T1 to M6 T10 are allowed.

In general it is best to remove T commands by telling the CAM package that the machine is not a tool changer machine, or insuring that the Tool number does not exceed 10.

G92 is the Axis presetting command, when this command is encountered in the G-code file the XYZ zero position is set at the position the machine is in at that time.

In general it is best to remove this from the G-code file, or if it is in the G-code file, make sure the machine is at the origin before you press start.

The controller will recognise G54 to G59 offset commands.

See the NK105 G2 manual for more details on these commands.

### **Acceleration Set**

Under the menu MFR Params, there is a sub menu called Velocity.

This menu controls the acceleration and cutting motion of the machine.

The Defaults for these parameters are:

Jerk	310
Single Axis Acc	25
Max Turn Acc	100

A low Max Turn Acc will result in arcs that move in a jerky motion or at a slow speed.

## Changing to a Different Offset (a new X Y Zero location)

There are 6 available X Y Zero locations that can be set up.

The offset number is displayed to the left of the Z X Z display 1 through 6 as shown below

**Press Menu**



→ **Operations**

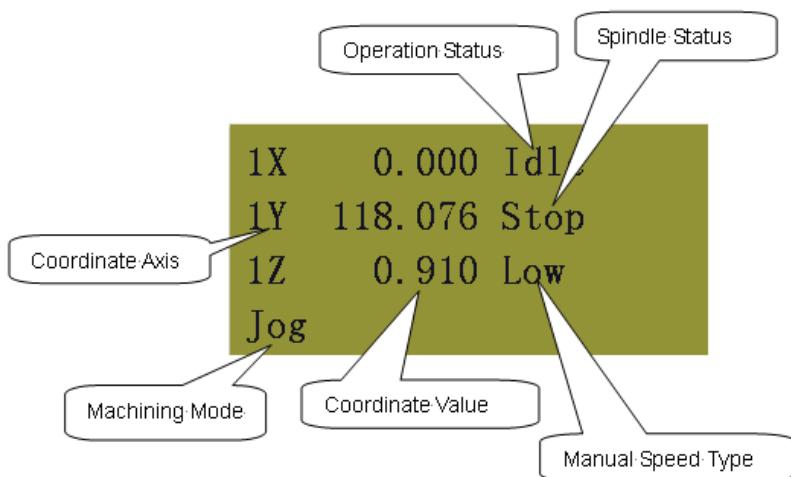
→ **Select WCS**

**G54**

**Origin 1**

**G55**

**Origin 2 . . .**



Each offset can have its own X Y and Z Zero

These additional offsets can be used to locate parts on different locations on the table

however for ease of use you can use just one offset as we did in training.

If the machine ever starts to cut in what appears to be the wrong location on the table, there is a chance you have accidentally selected a different offset.

Using the 4<sup>th</sup> Axis on the Techno Plasma

*Note: The 4<sup>th</sup> axis on this stepper plasma machine is not a true 4<sup>th</sup> axis. You can only use this to do “wrapping” tool paths. This means that the file is designed as a regular, flat, 3-axis file, which is scaled so that the width matches the circumference of round stock. Then, instead of cutting flat, the rotary is substituted for the X-axis and the cut follows the circumference of the stock, as if it is being “wrapped” around it.*

To change from normal 3-axis operation to rotary operation, you must change some settings in the controller:

1. Press the menu button on the keypad. Go to and press OK to select “5. MFR Param”. The password is 33587550.
2. Go to and press OK to select “3. Pulse Equiv”. Make note of the X-axis value, it should be .00332.
3. Calculate the new pulse equivalent value based on the diameter of the cylindrical stock being used through the following equation:

$$\text{Rotary Pulse Equivalent} = (25.4 * \pi * D) / 128000$$

Where D is the diameter of the rotary stock in inches.

4. Enter the calculated value for *Rotary Pulse Equivalent* in the location for X under Pulse Equiv. To input a decimal number, please press 0 (zero) first, then the button for the decimal point and then the numbers.
5. Exit the menu and restart the machine. The new settings will now be applied.
6. Now jog to your starting point and set your X and Y origin. This position should be above the rotary part. *Note: The X-axis will most likely move at a different speed than normal and the coordinates will not look right.*
7. Flip the switch in the front of the machine into Rotary mode.
8. Run your part

To revert back to normal 3-axis operation, follow the first two steps and then put the original value, .00332, into the X-axis pulse equivalent variable, then reboot the machine to apply the changes.

#### TECHNO CNC SYSTEMS LIMITED WARRANTY & COVERAGE

##### Limited Warranty on Techno Brand Products

Subject to the terms and conditions set forth in this warranty document, Techno CNC Systems LLC (“Techno”) warrants its Techno brand products (“Product” or “Products”) to the original purchaser for a period of one (1) year against defects in material and workmanship under normal use and conditions (“Product Limited Warranty”). The Product Limited Warranty commences on the date of Product shipment from Techno facilities and expires one (1) year from the ship date (“Product Warranty Period”).

Spare or replacement parts (“Part” or “Parts”) for Techno Products are warranted to the original purchaser for a period of ninety (90) days against defects in material and workmanship under normal use and conditions (“Parts Limited Warranty”). A Parts Limited Warranty commences on the date of a Part shipment from Techno facilities and expires ninety (90) day from the ship date (“Parts Warranty Period”).

A Product Limited Warranty may be validly transferred to one additional party by the original purchaser provided that a reregistration fee is paid to Techno within seven (7) days of transfer of the Product and prior to the expiration of the Warranty Period. Reregistration of any Product warranty does not extend the Warranty Period. A Parts Warranty is not transferable.

Product Limited Warranty and Parts Limited Warranty are hereinafter referred to collectively as “Limited Warranty.” Product Warranty Period and Parts Warranty Period are hereinafter referred to collectively as “Warranty Period.”

##### What Is Covered Under the Limited Warranty

During the Warranty Period, Products and Parts that Techno deems validly subject to a warranty claim will be repaired or replaced, in Techno’s sole discretion, without charge. Repaired items may include new or refurbished replacement parts. Replaced items may be new or may be manufactured from serviceable used parts. Items that have been repaired and/or replaced will be warranted only for the unexpired portion of the applicable Warranty Period to the original purchaser.

As a condition to this Limited Warranty, customers shall have read the operator’s manual and registered the Product or Part with Techno within 30 days of purchase.

##### What Is Not Covered Under the Limited Warranty

Events that are not covered under this Limited Warranty include:

- \* Product/Part damage resulting from third-party parts, accessories or systems connected to or used in conjunction with the Product/Part that have adversely affected its operation, performance or durability.
- \* Product/Part damage caused by normal wear, accidents, improper maintenance, improper use or abuse, alterations, or failure to follow operation and maintenance instructions contained in the operator’s manual.
- \* Products/Parts purchased from any supplier, distributor or dealer not authorized by Techno.
- \* Labor costs including, but not limited to, such costs as the removal and reinstallation of a component or assembly.
- \* Insurance and packing costs for a defective items returned to Techno by the customer.
- \* Product/Part damage caused by electrical surges, improper venting, flooding, fire, freezing, corrosive atmospheric elements, abnormal external temperature, or any event of force majeure such as riot or act of war.
- \* Noise or vibration unless it is the result of defective material or workmanship of the Product/Part.
- \* Claims of defective Products or Parts not made in conformance with Techno’s return policy as set forth below.
- \* Transport costs for defective items that require more than one (1) shipping to remedy a claimed defect.

\* Claims for personal injuries, incidental or consequential damages, or economic loss (profit or revenue), however caused. i.e. any other incidental, consequential, indirect, special and/or punitive damages, whether based on contract, warranty, tort (including, but not limited to, strict liability or negligence), patent infringement, or otherwise, even if advised of the possibility of such damages. Some states do not allow the exclusion or limitation of certain damages, so the above exclusion or limitation may not apply to a particular customer depending on location.

\* Claims for Product components or Parts that are warranted separately by their respective manufacturer. Available warranties covering those components are furnished with each Product and Part. Techno CNC Systems does not assume any warranty obligation or liability for components covered exclusively by the stated warranty of a component's respective manufacturer(s). Techno's Limited Warranty shall be void in the event of an occurrence of any of the following:

- \* Failure by the Original Purchaser to register the Product within thirty (30) days of its purchase.
- \* Where applicable, failure to validly reregister the Product within seven (7) days of transfer of the Product and prior to the expiration of the Warranty Period.
- \* Improper installation of the Product, including but not limited to, installation in violation of applicable rules, laws or building codes, and installation for non-recommended uses.
- \* Accident, abuse or misuse of the Product.
- \* Failure to follow or comply with the user's operational manual.
- \* Modification, alteration, addition of non-approved components, or misapplication of the Product or Part in any manner.
- \* Repairs and service conducted by personnel unauthorized by Techno.
- \* Modifications to, and tampering with, the Product or Part.
- \* Use of non-standard parts or accessories without prior written approval from Techno.
- \* Use of Product or part for purposes for which the item was not designed or intended.

#### Warranty Limitations

Techno's maximum liability hereunder is limited to the original purchase price of the Product or Part.

Techno assumes no responsibility for the selection of any Product or Part for a specific application absent Techno's written approval of such application, and makes no general representations whatsoever in respect to any such selection.

**THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED. ALL OTHER WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHETHER EXPRESSED, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING, ARE HEREBY DISCLAIMED. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE OF THIS WARRANTY DOCUMENT.**

**TECHNO SHALL NOT BE LIABLE FOR INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL, PUNITIVE OR OTHER SIMILAR DAMAGES THAT MAY ARISE, INCLUDING LOST PROFITS, DAMAGE TO PROPERTY OR INJURIES TO A PERSON, LOSS OF USE, INCONVENIENCE, OR LIABILITY ARISING FROM THE INSTALLATION, SERVICE OR USE OF THE PRODUCT OR PART.**

**UPON THE EXPIRATION OF THE LIMITED WARRANTY PERIOD, TECHNO'S LIABILITY UNDER THIS WARRANTY SHALL TERMINATE.**

Some states do not allow the contractual exclusion or limitation of incidental or consequential damages or personal injury, so the limitations set forth herein may not apply to all customers in all locations.

#### How To Obtain Warranty Repair/Replacement

All defective items covered under the Limited Warranty must be properly returned to Techno for inspection. Techno reserves the right to not accept returns unless the returned item is accompanied by proof of original purchase, a return authorization number ("RAN") from Techno, and shipped in accordance with packaging and

A shipping instructions given to the customer by Techno. Claims and requests for a RAN must be made within seven (7) days of discovery of a defect. Proper packaging and insurance for transportation is solely the customer's responsibility. All returned items must be sent to the Techno facility located in Ronkonkoma, New York (or such other place as Techno specifically designates to the customer) with a statement of the problem and transportation prepaid. If, upon examination, Techno determines that a warranted defect exists, the returned item will be repaired or replaced in Techno's sole discretion at no charge, and shipped prepaid back to the customer. Return shipment will be by common carrier of Techno's choosing. If rapid delivery is requested by customer, then such transport expense shall be borne by the customer.

Warranty inspections and repairs are performed at Techno's New York facility, where all necessary diagnostic and repair equipment is available. This equipment is difficult to transport and field service is accordingly severely limited and will only be supplied at Techno's sole discretion. If field service is required, all service call expenses including transportation, travel time, subsistence costs, and the prevailing cost per hour (eight hour minimum) are the responsibility of the customer.

In the event that support diagnostics of a covered Product or Part requires an item to be shipped more than one (1) time for any given claimed warranty defect, then the customer shall bear all transport costs.

If an out-of-warranty situation exists, the customer will be notified of the repair or replacement cost. At such time, the customer must issue a purchase order to cover the cost of the repair/replacement or authorize the item to be shipped back to the customer at the customer's expense. In all cases, a restocking charge of twenty (20%) percent will be charged to the customer on all items returned to stock.

Warranty claims will not be reviewed or remedied unless the warranty registration is received by Techno within thirty (30) days of the purchase date. All warranty issues must be handled through Techno.

Techno customer service can be reached by calling 6316487481

#### Additional Terms & Conditions

**TECHNO RESERVES THE RIGHT TO CHANGE DESIGNS, SPECIFICATIONS, PRICES AND ANY APPLICABLE DOCUMENTATION WITHOUT NOTICE TO THE CUSTOMER.**

Techno is not liable for delay or failure to perform any obligation hereunder by reason of circumstances beyond Techno's reasonable control. These circumstances include, but are not limited to, accidents, acts of God, strikes or labor disputes, laws, rules, or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials, and any other event beyond Techno's control. No legal action arising out of any claimed breach of this Limited Warranty may be brought by the more than one (1) year following date of purchase of a Product or Part. This Agreement shall be governed in all respects by the laws of the State of New York, United States of America. Any legal action brought by a customer against Techno must be brought in the state courts of the State of New York, Second Judicial Department. Some states do not allow the contractual limitation of time periods for bringing suit so the limitations set forth herein may not apply to all customers in all locations.

The terms and conditions contained herein shall constitute the entire agreement concerning the Limited Warranty described herein. No oral or other representations are in effect. No dealer, distributor, or individual is authorized to amend, modify, or extend this Limited Warranty in any manner and only the warranty expressed in this warranty document is extended herein by Techno. Statements made outside this warranty document, such as in dealer advertising or presentations, whether oral or written, do not constitute warranties by Techno and should not be relied upon.

Section headings contained in this warranty document are for informational purposes only and may not be used to limit the terms and conditions set forth in this warranty document.

Form H1219