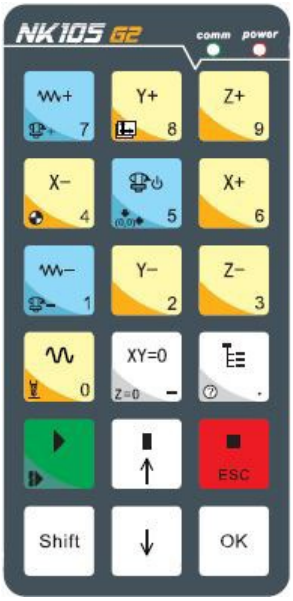
HD II Tabletop CNC Router

NCstudio Controller



This document will provide a quick guide to the set up and operation of the Techno HD II Tabletop CNC Router equipped with the NCstudio controller.

The HD II Tabletop CNC Router is powered by high precision, stepper motors and controlled by a hand-held NCstudio controller.

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Techno CNC Systems
NK105G2
HD II Tabletop Manual

Safety Instructions

READ THESE INSTRUCTIONS THOROUGHLY BEFORE OPERATING MACHINE. DO NOT OPERATE MACHINE IF YOU ARE UNFAMILIAR WITH THESE SAFE OPERATING INSTRUCTIONS. DO NOT OPERATE MACHINE WITHOUT KNOWING WHERE THE EMERGENCY STOP SWITCH IS LOCATED.

WARNING: IMPROPER OR UNSAFE OPERATION OF THE MACHINE WILL RESULT IN PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT.

1. Keep fingers, hands, and all other objects away from machine while power is on.
2. Disconnect power to all system components when not in use, when changing accessories, and before servicing.
3. Do not loosen, remove, or adjust machine parts or cables while power is on.
4. Exercise care with machine controls and around keyboard to avoid unintentional starting.
5. Make sure voltage supplied is appropriate to specifications of components.
6. Machines must be plugged into three-pronged grounded outlets. Do not remove the grounding plug or connect into an ungrounded extension cord.
7. Keep cables and cords away from heat, oil, and sharp edges. Do not overstretch or run them under other objects or over work surfaces.
8. Use proper fixtures and clamps to secure work. Never use hands to secure work.
9. Do not attempt to exceed limits of machine.
10. Do not attempt to use machine for purposes other than what is intended.
11. Use machine only in clean, well-lit areas free from flammable liquids and excessive moisture.
12. Stay alert at all times when operating the machine.
13. Always wear safety goggles.
14. Do not wear loose-fitting clothing when operating machine. Long hair should be protected.
15. Always maintain proper balance and footing when working around the machine.
16. Maintain equipment with care. Keep cutting tools clean and sharp. Lubricate and change accessories when necessary. Cables and cords should be inspected regularly. Keep controls clean and dry.
17. Before using, check for damaged parts. An authorized service center should perform all repairs. Only identical or authorized replacement parts should be used.
18. Remove any adjusting keys and wrenches before turning machine on.
19. Do not operate the machine unattended.
20. Follow all safety instructions and processing instructions in the MSDS for the material being processed.
21. Use proper precautions with dust collection systems to prevent sparks and fire hazards.
22. Make sure to have proper fire extinguishing equipment on hand at all times.

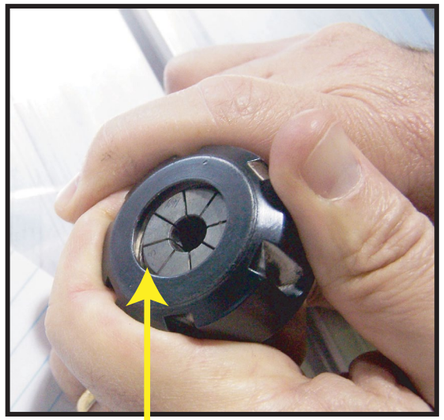
PREVENT FIRE HAZARDS by using the proper feeds, speeds, and tooling while operating your Techno machine. For example, setting feeds and speeds too low and/or using dull tool bits creates friction at the material. The friction generates heat which can result in a fire that can be drawn through the vacuum table or dust collector without warning. Fire hazard from friction heating caused by dull tools is possible when cutting certain materials, especially composite material such as wood composites, MDF and Particleboard.

WARNING!
THE SPINDLE WILL BE DAMAGED
IF UNBALANCED EQUIPMENT IS USED.

AIR SUPPLY MUST BE FILTERED AND DRY.

COLLETING GUIDELINES

WRONG!



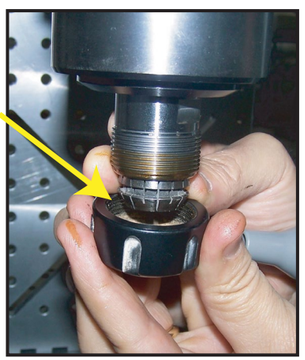
This picture shows an improper assembly. Notice the gap and angle of the collet in relation to the nut. The collet is not flush to the end of the collet nut. Correct this assembly before using.

RIGHT!

The picture above is how your collet nut assembly should look: the end of the collet is flush with the bottom surface of the collet nut. You will hear and feel a "SNAP" as the collet properly goes into the collet nut. Once it is assembled, then "SCREW" the nut onto the threaded spindle end.

DO NOT PUSH THE COLLET INTO THE SPINDLE AT ANY TIME!

Only the proper assembly should be screwed onto the spindle.



FOR TOOLCHANGE AND FIXED COLLET SPINDLES:

ONLY USE TOOLHOLDERS, COLLET NUTS AND TOOLS THAT ARE BALANCED TO MEET OR EXCEED THE MAX RATED SPEED OF THE SPINDLE.

Fig. 1.4

I. Techno HD II Tabletop Quick Set up

Fig. 1.1

1.1 - The electronics are housed in the enclosure located at the back of the machine displayed in Figure 1.1. The enclosure does not need to be moved or handled during the unpacking of the machine.

Fig. 1.2

1.2 - Have a suitably qualified person connect power to the controller. The machine requires 220V single phase power in order to operate. Plug the power cable into the rear of the machine as shown in figure 1.2

Connecting the Power

The customer is responsible to hardwire or install mating plug on supplied 10 ft. wire. You will need to supply your own plug. Have a suitable qualified person attach the correct plug in compliance with the wiring standards in your area. The machine must be connected to a 220V, single phase, 15A circuit.

The cable that we supply will be one of two types.
It may either be a cable with a brown, blue, and green/yellow wire or a cable with a black, white, and green wire. (Fig 1.3)
Power is connected as follows:
Green or Green/Yellow conductor is always ground .
The two other conductors will be the hot leads.

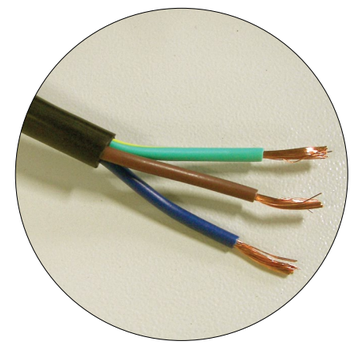


Fig. 1.3

1.5 Control Panel Functions.

Figure 1.5 shows the machine control panel buttons and functions.

Fig. 1.5

Fig. 1.6

1.6 Enabling The Machine.
First make sure the Emergency Stop is not depressed by giving it a ¼ turn clockwise. Then, activate the machine by pressing the green POWER button. Power is now applied to the machine. The green light will now light up.

II. HD II Tabletop Start-Up

When the machine first powers on, the display on the controller will light up and say “Starting System”. (Fig. 2.1a)

Once the system has booted it will ask the user “Back to reference point?” Fig 2.2b

Fig. 2.1a

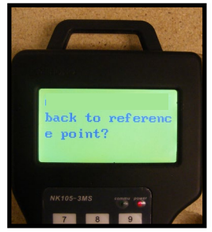


Fig. 2.2b

Fig. 2.3c

This is also known as ‘homing’ the machine. It refers to the process of the machine finding its mechanical home position.

From this point, the user has two options;
Home the machine or cancel the homing process. We recommend that you home the machine every time you start up.

This will abort the sequence and the machine will stay still.

There will be no reference position and break points, offsets and all functions that rely on a reference position will be invalid.

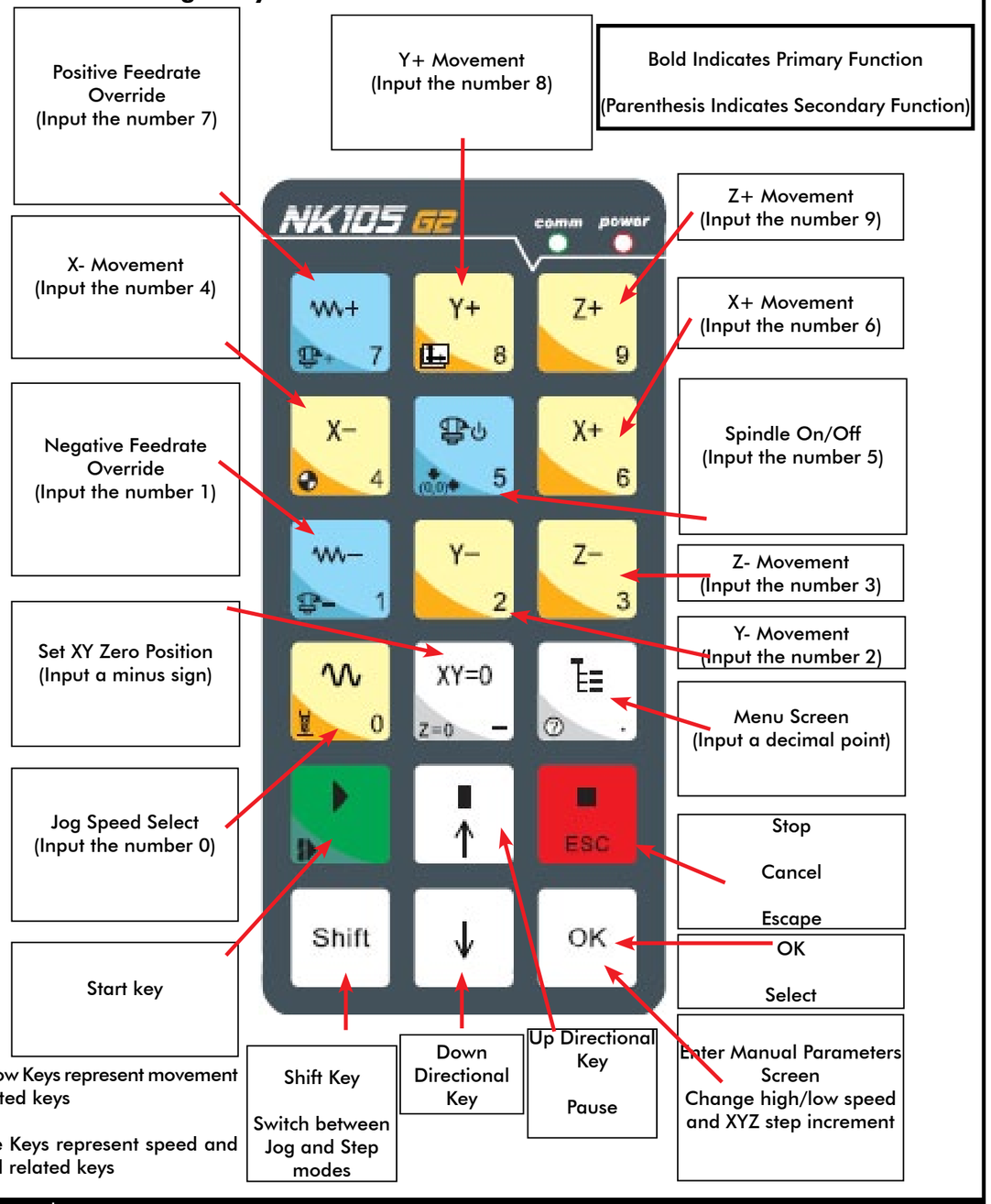
This will cause the machine to first move the Z-axis to the top of travel, then the X and Y axis will move simultaneously, to the home /reference position. A sensor on the gantry is used to locate this position. (Fig 2.3c)

The homing procedure can be canceled at anytime by pressing ESC.

Once the machine has moved to the end of travel on each axis, it will stop and enter an IDLE state and will be ready to use.

You should test all machine functions before beginning to cut. The functions are displayed in the next section.

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.

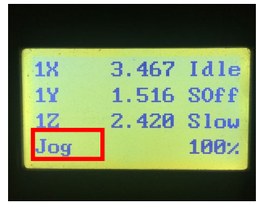
Key icon	Function
Shift + W+ 7	Increase spindle RPM
Shift + Y+ 8	Switch between work (relative) and machine (absolute)
Shift + X− 4	Go to XYZ home (mechanical origin)
Shift + 5	Go to current work (relative) origin
Shift + W− 1	Decrease spindle RPM
Shift + 0	Set Z zero position using Touch-Off pad
Shift + XY=0 Z=0	Set Z zero position manually not using Touch-Off pad
Shift +	Resume from breakpoint M0 command
Shift +	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.

Press 'OK' to change high and low speeds, see section 3.3.

Select between high and low Jog speeds

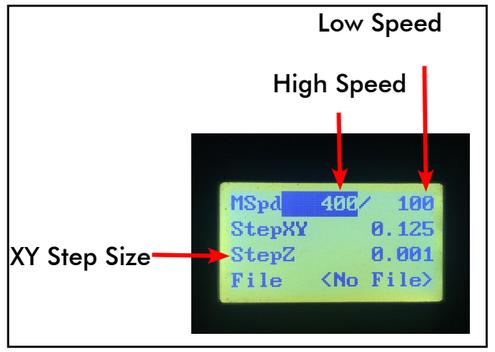
3.2- Stepping the machine.
To move the machine in increments, press down one of the Yellow directional keys on the keypad while in Stepping mode. The keypad has X+,X-,Y+,Y-,Z+,Z- printed on the keys to indicate direction.

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.

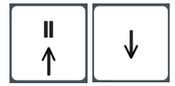
Press 'OK' to change step size, see section 3.3

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.

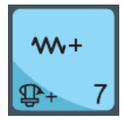
To Exit out of this screen and return to the main menu press ESC.

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)

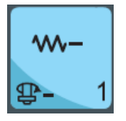
3.4- Feedrate Override.
While running a G-Code file, the user can manually override the feedrate or cutting speed of the program. The range of the override goes from 10% to 120% of the original feedrate.

The user can override the feedrate using the following keys:



Increase Feedrate

OR



Decrease Feedrate

3.5- 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.

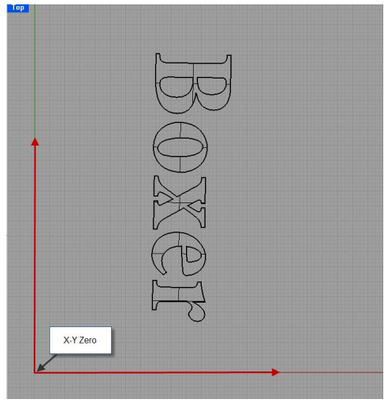
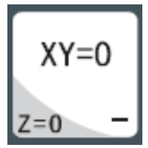


Fig. 3.3a

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.



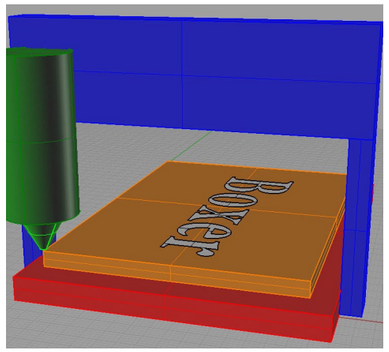


Fig.3.3b

There are two methods for setting the Z-axis zero position:

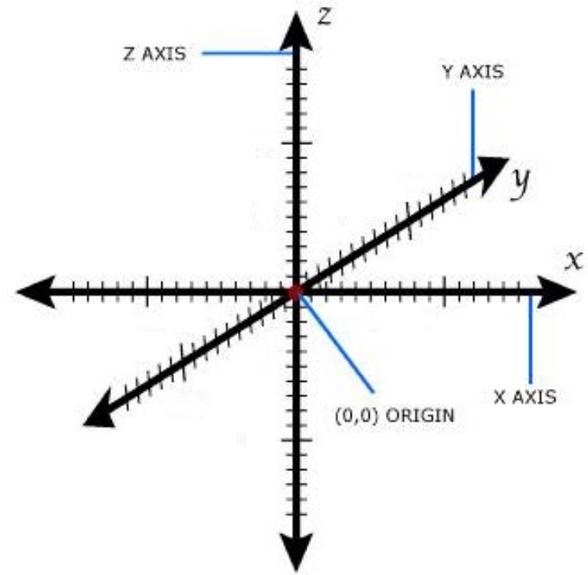
1. Manual Method: Use the Z-axis directional arrows on the keypad to move the router to the top of the material. Switch to Step Mode to slowly move the machine into position. When the router bit is in position press shift/aux and the Z=0 button as shown.

Zero Z-axis

2. Tool Calibration Block: Place the touch off block on top of the material and under the cutter. Press shift/aux and 0 simultaneously. The spindle will slowly move down until it touches the touchpad. The Z axis will now be set to the top of the material.

Activate Z-Touch off procedure.

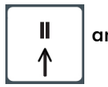
The Z coordinate will now read 'Z 0.000'



3.6- 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 with show.

Scroll through the files with  and 

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

3.7- 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 3.6 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.

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

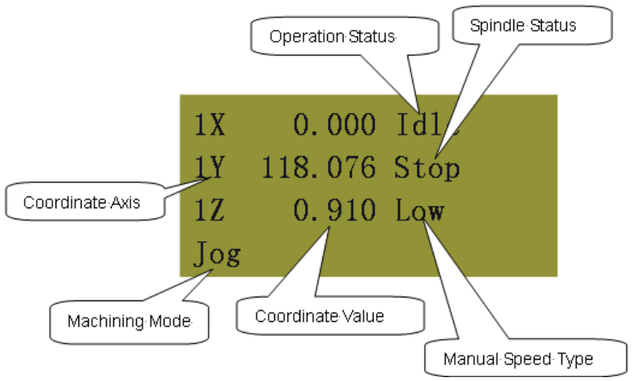
Press Menu 

→ Operations

→ Select WCS

G54 Origin 1

G55 Origin 2 . . .



Each offset can have it 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.

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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.

HD II Tabletop Settings

Website:support.technocnc.com | Call: 631-648-7481

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: _____
    5. Park MCS Site

HD II Tabletop Settings

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        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 ny [ESC] Key
    6. Select WCS
        G54 WCS
        G55 WCS
        G56 WCS
        Select by [OK]
4. Oper Param
    1. G00 Speed
        200.00 in/min **(HD II Tabletop)**
    2. GXX Speed
        100.00 in/min **(HD II Tabletop)**
    3. Back REF First
        YES
    4. Lifts on Pause*
        0.5 inch
    5. Offset →
        1. Public Offest
            1. X
            2. Y
            3. Z
        2. Work Offset
            1. G54 Offset →
                1. X
                2. Y
                3. Z *(settings repeat through G59)*
    6. Cycle Process →
        1. Cycle Process
            NO
        2. Cycle Times
            1
        3. Cycle Interval

HD II Tabletop Settings

0 ms
4. S-Off in Intev
NO
7. G73-G83 Retract
0.0 inch
8. Ignore F Code
NO
9. Ignore S Code
NO
10. Spindle Stop →
1. S off at Pause*
YES
2. S off at Stop*
YES
3. S off at End
Yes
11. Ratio on Manu*
NO
12. DXF Params →
1. Lifting Height*
2. Process Depth*
3. 1st Point as 0*
NO
4. Shape Process*
NO
5. Bottom Process*
NO
6. Metric Size*
NO
13. 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
14. Tool Change →
1. ATC Capacity*

HD II Tabletop Settings

10
2. Current Tool No
1
3. Tool Offset
1. Tool 1
X: _____
Y: _____
Z: _____ *(settings repeat through tool 10)*
15. ENG Unit
YES
5. MFR Param **PASSWORD: 33587550**
1. Velocity →
1. Decel Dist
0.394 inch
2. Approach Speed
20.00 in/min
3. Single Axis Acc
20.00 in/sec^2
4. Max Turn Acc
100.00 in/sec^2
5. Jerk
300.00 in/sec^3
6. Max Speed of Z
125.00 in/min
7. Short Seg Spd Lmt
YES
8. SPDLMT Length
0.1 inch
9. Enbl Plunge Rate
NO
10. Z Plunge Cut Spd
50.00 in/min
11. REF Circle Radius
0.1 inch
12. REF Circle Speed
100.00 in/min
2. Axis Output Dir →*
X: Positive
Y: Positive
Z: Negative
3. Pulse Equiv →*
X: 0.0031250 **(HD II Tabletop)**
Y: 0.0031250 **(HD II Tabletop)**
Z: 0.0031250 **(HD II Tabletop)**

HD II Tabletop Settings

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4. Machine Stroke →
    1. Strk Upper Lmt →
    X: 23.071
    Y: 35.039
    Z: 0.100
    2. Strk Lower Lmt →
    X: 0.787
    Y: 0.000
    Z: 8.465
5. Ref Point Set →
    1. RefP Speed →
    X: 50 in/min
    Y: 50 in/min
    Z: 40 in/min
    2. RefPDir
    X: Negative
    Y: Negative
    Z: Positive
    3. Retract Dist
    1. X Retract Dist
    0.079 inch
    2. Y Retract Dist
    0.079 inch
    3. Z Retract Dist
    0.079 inch
6. Spindle Set →
    1. Spindle Gears*
    7
    2. On/Off Delay
    5000 ms
    3. Initial Gear*
    6
    4. Max Spdl Speed*
    24000
7. 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

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    0.291 rad/s
    6. Rotary Y Acc
    6.98 rad/s^2
    7. Max Rotary Vel
    30 r/min
8. Backlash Set
    1. Compensation on
    NO
    2. Axis Backlash →*
    X: 0.0
    Y: 0.0
    Z: 0.0
9. Calib Thickness
    0.665 inch *(will vary slightly)*
10. Enable S Algo
    YES
11. Arc Incriment
    YES
12. Forward Look Seg
    50
13. Sign of BK REF
    YES
14. Safety Height*
    0.5 inch
15. Lube →
    1. Enable Auto Lube
    NO
    2. Time Interval
    5000s
    3. Duration
    5s
16. G00 Feed 100%*
    YES
17. Smoothing Time
    0.0s
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

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2. English
2. Export Log
3. System Update
4. Register
5. Help
   Spec: Help Message Show Delay
   Value: 6000
   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

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All Techno CNC Systems, LLC., mechanical components are warranted against manufacturer's defects in material and workmanship for a period of one (1) year from the time of shipment from Techno CNC Systems, LLC., facilities. All Techno CNC Systems, LLC., electrical components are similarly warranted for a period of one (1) year from the time of shipment from Techno CNC Systems, LLC., facilities. Techno CNC Systems, LLC.,'s sole obligation under this warranty is limited to repairing the product or, at its option, replacing the product without additional charge, provided the item is properly returned to Techno CNC Systems, LLC., for repair as described below. The provisions of this warranty shall not apply to any product that has been subjected to tampering, abuse, improper setup or operating conditions, misuse, lack of proper maintenance, or unauthorized user adjustment. Techno CNC Systems, LLC., makes no warranty that its products are fit for any use or purpose to which they may be put by the customer, whether or not such use or purpose has been disclosed to Techno CNC Systems, LLC., in specifications or drawings previously or subsequently provided, and whether or not Techno CNC Systems, LLC.,'s products are specifically designed and/or manufactured for such a purpose. NOTE: Drive motors (servo or stepper) are considered "mechanical components".

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Before returning any equipment in or out of warranty, the customer must first obtain a return authorization number and packing instructions from Techno CNC Systems, LLC.,. No claim will be allowed nor credit given for products returned without such authorization. Proper packaging and insurance for transportation is solely the customer's responsibility. After approval from Techno CNC Systems, LLC., the product should be returned with a statement of the problem and transportation prepaid. If, upon examination, warranted defects exist, the product will be repaired or replaced at no charge, and shipped prepaid back to the customer. Return shipment will be by common carrier (i.e., UPS). If rapid delivery is requested by customer, then such transport is at the customer's expense. If an out-of-warranty situation exists, the customer will be notified of the repair costs immediately. At such time, the customer must issue a purchase order to cover the cost of the repair or authorize the product to be shipped back as is, at the customer's expense. In any case, a restocking charge of 20% will be charged on all items returned to stock.

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Repairs are ordinarily done at Techno CNC Systems, LLC.,'s Ronkonkoma, New York facility, where all necessary instrumentation is available. This instrumentation is difficult to transport, so field service is severely limited, and will only be supplied at Techno CNC Systems, LLC.,'s discretion. If field service is required and is performed at Techno CNC Systems, LLC.,'s sole discretion, all relevant expenses, including transportation, travel time, subsistence costs, and the prevailing cost per hour (eight hour minimum) are the responsibility of the customer.

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