Techno **Inc.** *SINCE 1986*
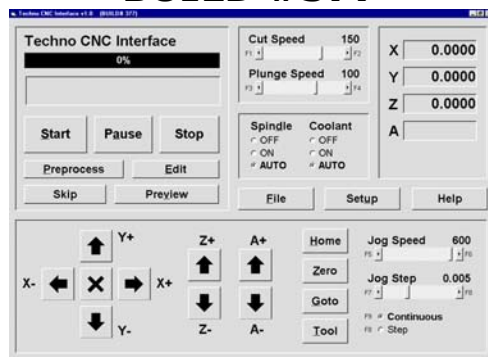**CNC ROUTER SYSTEMS**

TECHNO CNC SERVO GCODE INTERFACE

From Build #377

BEGINNER TUTORIALS

BUILD #377

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HTM03130510

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6. Compliance
The customer shall notify TECHNO in writing of any unauthorized use in the event that such unauthorized use does not cease.

SAFE OPERATION OF YOUR MACHINE

Read these instructions thoroughly BEFORE operating machine

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.

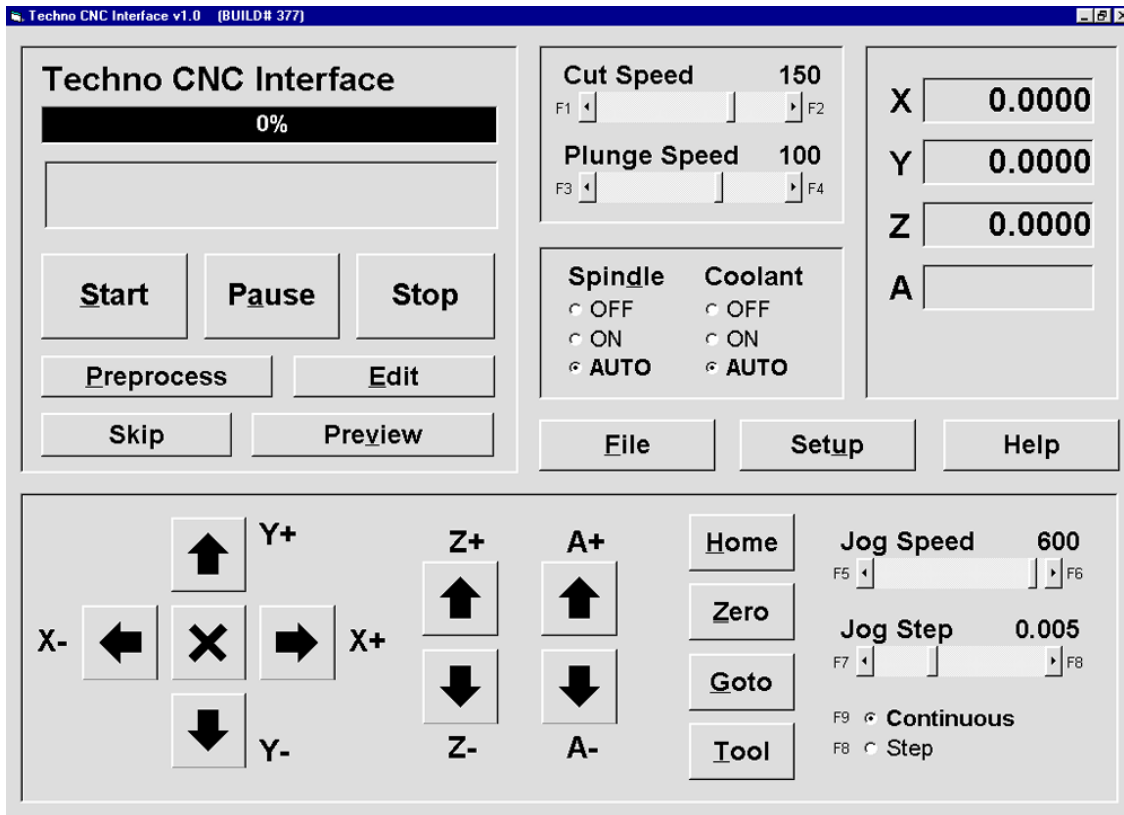18. Remove any adjusting keys and wrenches before turning machine on.

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 without you knowing it. Be very careful when cutting composite material, especially wood composites like MDF and Particleboard.

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.

Table of Contents

For more descriptions of Interface Functions see PDF Manual on Techno CD

I. The Techno CNC Interface

NOTE: For *Standard LC Machines* and *Tabletop Routers* the 5.75" long **PCI Interface Card** is installed. For the *LC Plus* and *RG Series Machines* the 9.25" **PCI Controller Card** and Riser Card are installed. For *Premium Class Machines* the PCI Controller Card is factory installed.

Loading Card(s) & Software

1. Turn off your computer, unplug the power cord and remove the cover.

WARNING: Ground yourself during installation.

2. Remove PCI card from its protective packaging and locate an available PCI slot.

NOTE: The PCI card's connectors mate with the PC Mother Board in only one way. Do not force installation.

3. Gently but firmly insert the PCI card into the vacant PCI slot. Secure with screw.

For **Standard LC Machines** and **Tabletop Routers, Skip to Step 4.**

For **LC Plus** and **RG Series Machines** continue to Step 3a.

   3a. Locate another available PCI slot and secure Riser Card (no PCI connections required).

   3b. Connect the Riser Card to the PCI card using the ribbon cable provided.
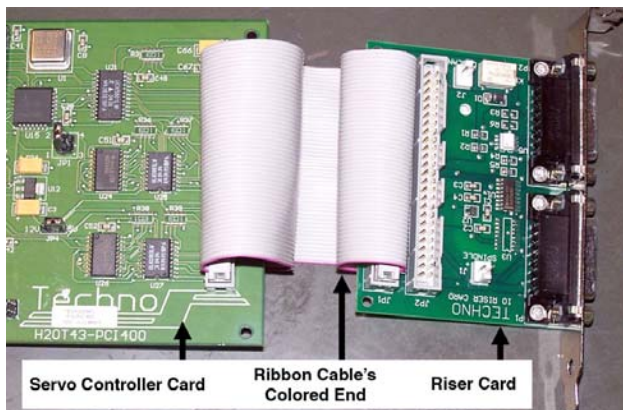
Servo Controller Card   Ribbon Cable's Colored End   Riser Card

WARNING: The colored end of the ribbon cable MUST BE attached to each card's PIN 1 connector. On PCI card, PIN1 is side closest to Techno logo. On Riser card, it is the side where "TECHNO IO RISER CARD" is printed.

   3c. Connect Start Stop Box connector to the P2 Riser Card Connector (opposite side of the colored ribbon).

   NOTE: If you are operating a four axes machine, then you will have to connect the touchpad to the Riser Card's P1 connector.

4. Close the computer.

5. Connect the cable from the Servo Control Box to the PCI card. Power on.

WARNING: Make sure all other applications are closed before attempting to install the Interface, including virus protection software and disable any network card connections.

6. When Windows starts it will detect the PCI card as "new hardware." When prompted to search for a suitable driver insert the Techno CD.

7. When prompted for "optional search locations" choose computer's CD-drive.

8. Select the *Setup Techno CNC Interface* button on the Interface prompt and follow the onscreen instructions.

NOTE: Keep the Techno CD in a safe place. It contains addition documentation (PDF files).

9. Start the Interface by selecting **TECHNO CNC INTERFACE** in your **START/PROGRAMS** menu.

Main Menu
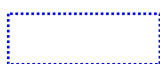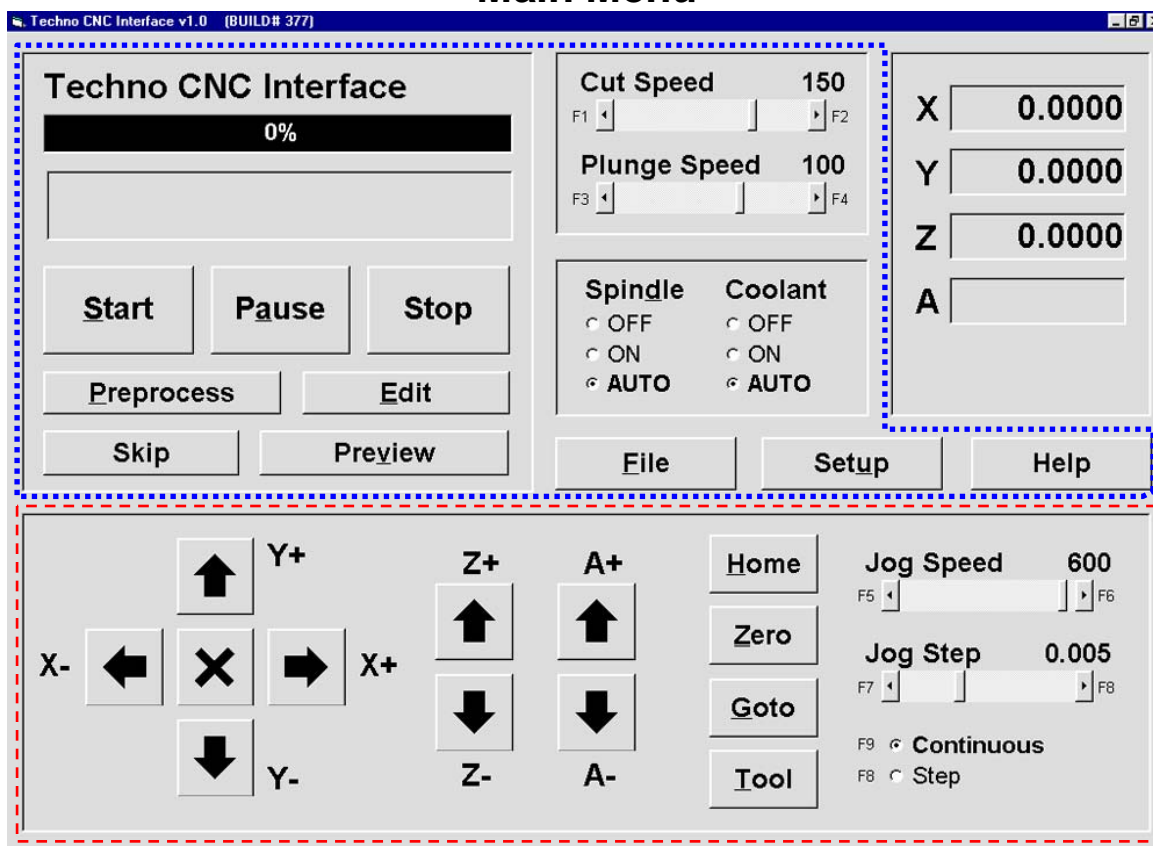
The Techno CNC Interface Main Menu is extremely user-friendly. There are two primary functions through which all the controls are used: **JOGGING** and **FILE EXECUTION**.

Jogging the machine is synonymous with *moving the machine's axes*. All of the Main Menu's jogging functions either actively jog the machine or set up parameters and controls to jog the machine. In the lower portion of the Main Menu (shown above) are the jogging controls. Also, see the Position Counters in the top right quadrant of the Main Menu. These counters give a constant numerical position of where you jog any axis. The following page will provide a brief overview of the jogging functions.

File execution refers to the *retrieval, manipulation and actual running of a GCODE file*. In this Main Menu you can: view the file's toolpath, edit code, set speeds and parameters and start-pause and-resume a program run. The upper portion of the Main Menu allows you do perform all these tasks and more. See page 7 for a brief overview of the various file execution functions.

The Main Menu's upper right quadrant displays the Interface's *Positional Display*. This function is useful in both Jogging and File Execution operations. While jogging, you can track the distance of travel for your axes, and while running a file, the Positional Display shows the actual travel of the axes in motion.

Jogging Functions
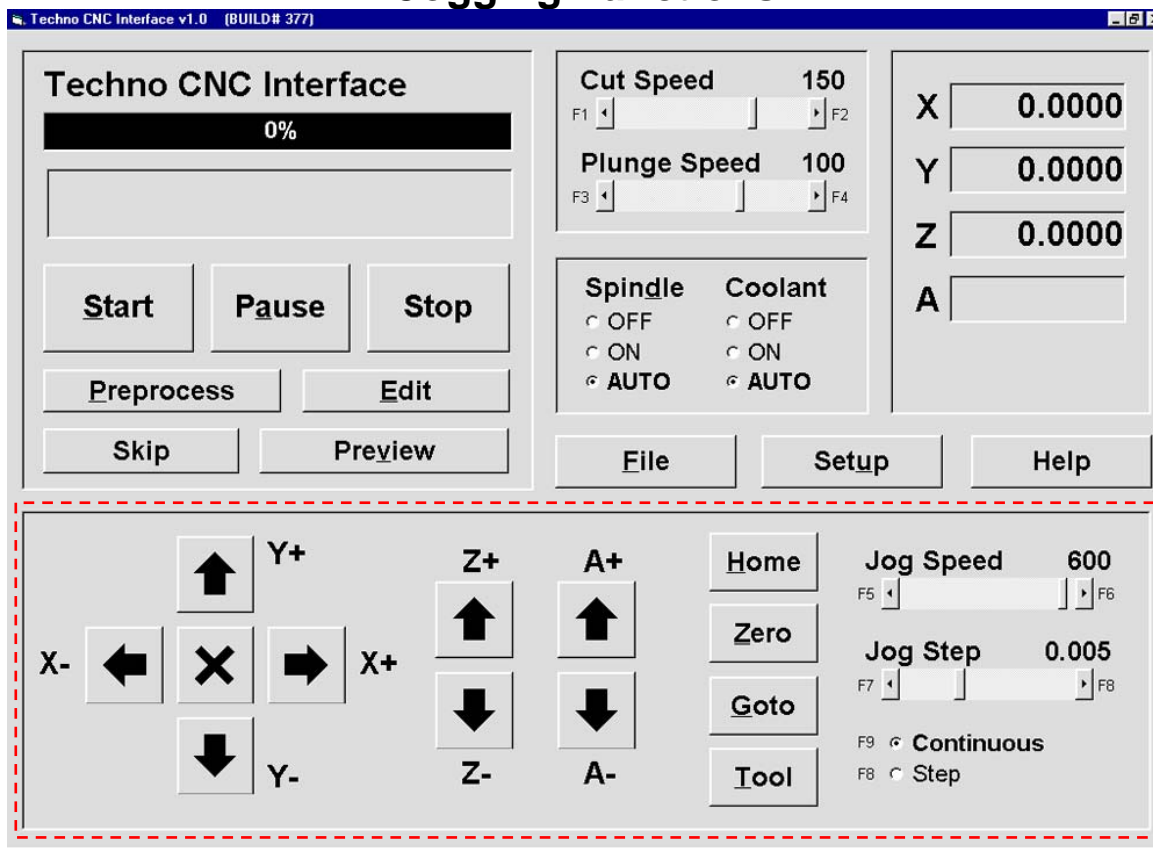
Notice the square buttons with the black arrows. Each of those buttons will move an axis in the direction designated by the letter and value adjacent to it (i.e. Y+). If the **Continuous** radio button is selected, you can hold down a jog button and the axis will move 'continually'. If you have **Step** selected, the axis will only move one step-size at a time. The **Jog Step** scroll bar sets the incremental distance. The **Jog Speed** scroll bar sets the speed at which the axes will travel while jogging.

Notice the Positional Display Counters during jogging. The travel values will go into negative numbers as well as positive numbers. The A-axis represents the availability for a fourth axis.

The column of four buttons (**Home**, **Zero**, **Goto**, and **Tool**) all allow you to perform shortcut operations. Submenus scroll-out on top of the Main Menu when these buttons are selected.

☞ The **Home** button moves an axis or all axes to a specified distance away from the axis' limit switch (also known as Machine Home).

☞ The **Zero** button allows you to set an axis or all axes' position counters to zero.

☞ The **Goto** button allows you to move an axis or all axes to a specified location or move them all to the Machine Origin (by pressing Origin).

☞ The **Tool** button brings up a Toolchange Operations window that allows you to manipulate the different aspects of a toolchange application (i.e. touch off Z-axis zero position).

6

File Execution Functions
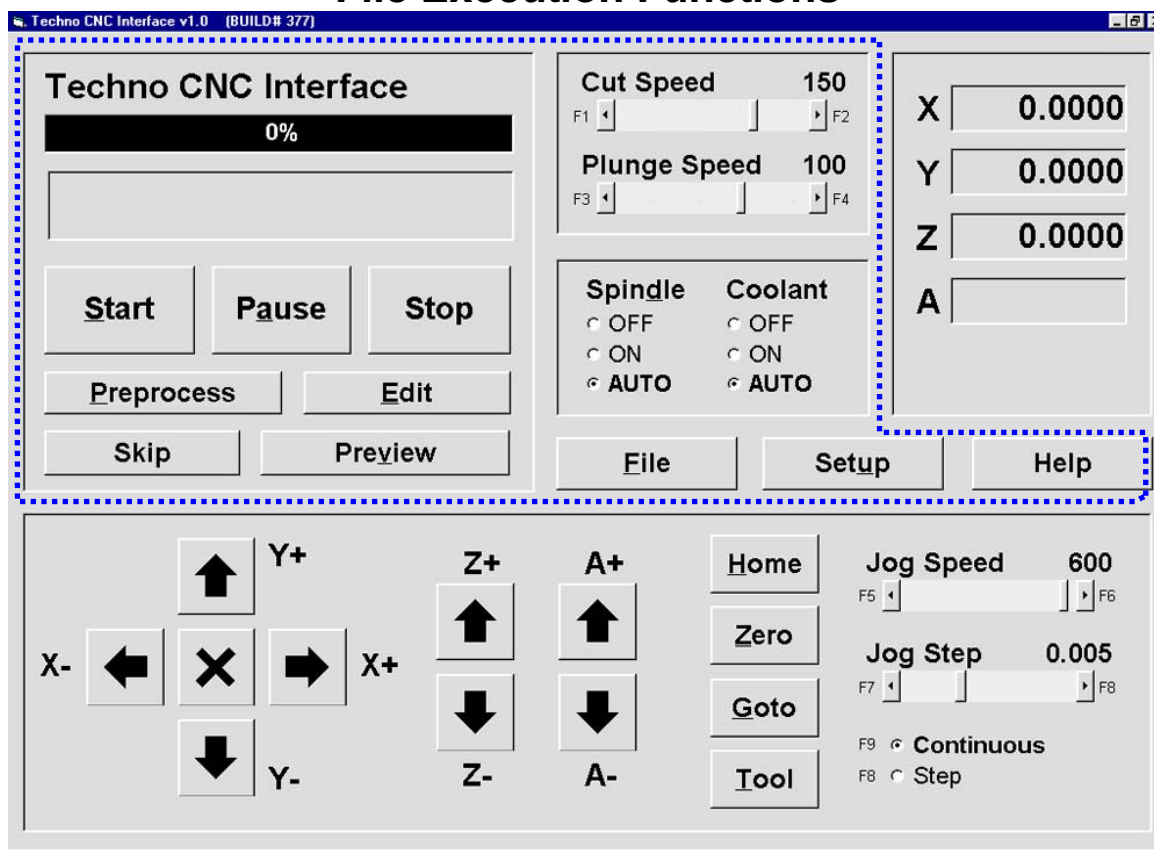
In any File Execution, the first step is to retrieve a file. The **File** button opens a window that allows you to search your PC to retrieve and open a file.

Once you have your file, if you want to edit the code, click the **Edit** button. If you want to Preview the file's toolpath, use the **Preview** button. And before you can even use the **Start**, **Pause or Stop** functions, the file must always be **Preprocess**-ed. Notice how the Progress Bar displays the status of the preprocess function (in a completion percentage) as well as the percentage and current GCODE commands of a file being run.

The **Cut** & **Plunge Speed** scroll bars are file execution parameters. Use them to adjust the speed at which the axes (X, Y = **Cut**; Z = **Plunge**) travel during a cutting command. The **Spindle** & **Coolant** radio buttons are another set of controls for file execution. Use these controls according to your program requirements.

The **Setup** button brings up the Setup Window with its bookmarked submenu display screen. From here you can set file execution parameters ranging from Feedrates to Scale Factors.

II. Basic Machine Operations Tutorial

This simple tutorial employs and explains the main functions of the Techno CNC GCODE Interface by running the sample program, **2box.nc**. If you have any difficulty with the tutorial or are just learning to use your machine, we recommend reading the INTERFACE FUNCTIONS before proceeding.
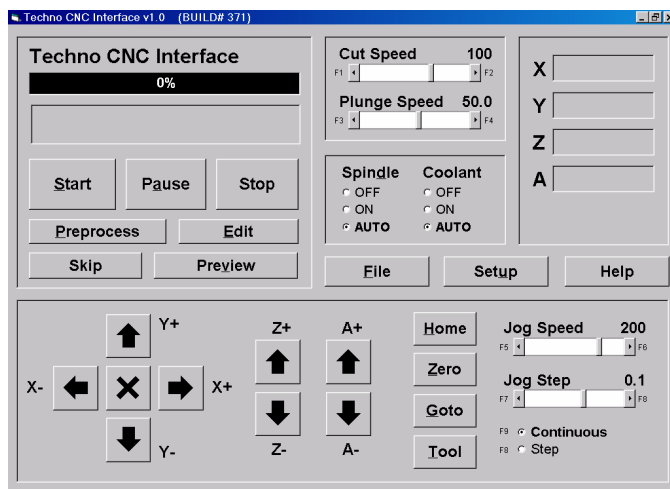
Note: This Tutorial was written assuming you have already setup the touchpad and have a tool bit loaded.

1. Start the Interface

    A. From your computer's Start menu, choose Programs/Techno CNC Interface.
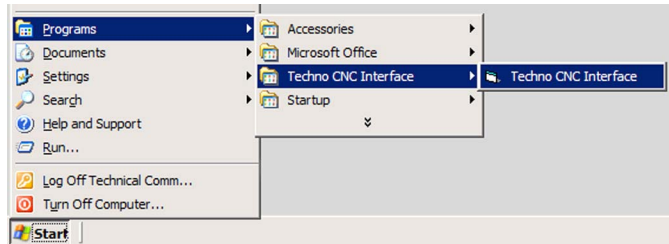
    The **Main** Menu appears:

Note: This tutorial is written assuming your **X/Y Machine Orientation** is set to the Interface default setting of -1 If this has somehow been altered, go into **SETUP/SYSTEM** and make sure the X/Y Orientation is set to -1.

2. Home the Machine

    A. Press Home

    The **Home** Menu appears:

    B. Press ALL
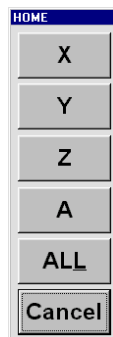
3. Zero the Z-axis

Note: Prop the touchpad on top of something high enough so that your Z-axis zero position is well above the table surface (see picture below). Do this to ensure that the tool bit does not travel into the table. The prop height is supposed to represent the height of the material to be cut. After you zero the Z-axis, remember to remove the prop.
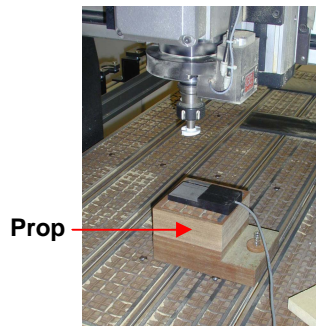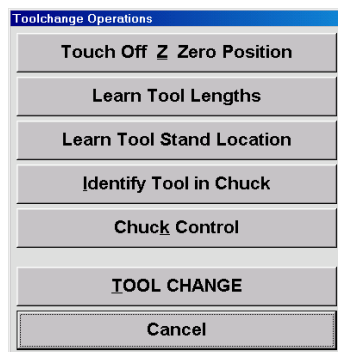

    A.   Jog your tool over the touchpad

Note: Prior to zeroing the Z-axis, we will test the touchpad and see if it is working properly. Follow the Steps and Warning below.

Warning: If at any time you need to stop the touchpad test, hit the ESC button on your keyboard or the red E-stop button.

    B.   Press **Tool**

The **Tool** Menu appears:

The Test: Here we will start the *Touch Off Process*. The Z-Axis will automatically travel down to the touchpad. If the touchpad is working properly, once the tool bit (or spindle head) comes into contact with the pad, the Z-axis will retract immediately. This test involves the user manually raising the touchpad up to the spindle during the *Touch Off Process* as the Z-axis is descending (see picture below). When you lift the touchpad up to the tool bit, if the Z-axis retracts, then the touchpad is operational. If the Z-axis DOES NOT retract, then immediately press the ESC keyboard button (or E-Stop button) to stop the *Touch Off Process*. Then, check your touchpad setup before returning to this tutorial.

    C.   Press **Touch Off Z Zero Position**

The Z-axis will automatically descend.

D. Manually lift the touchpad to the tool bit and then gently touch the pad to the tool.

Note: If the Z-axis retracts upon contact, continue to Step 3-E. If it does not retract, check your touchpad setup before returning to this tutorial.

E. Using the arrow buttons on the Interface's Main Menu jog your tool over the touchpad, which should be placed on top of a prop.

F. Press Tool

G. Press Touch Off Z Zero Position

The Z-axis will automatically lower the Z-axis to the touchpad and retract when it makes contact. This *Touch Off Z Zero Position* process sets your Z-axis zero position automatically.

Note: You can now remove the touchpad and the prop from the table surface.

4. Zero the X and Y Axes

A. Jog the X/Y axes to a central position on your gantry table.

Note: Zero positions are frequently set at the front left corner of your workpiece.

B. Press Zero

The **Zero** Menu appears:

C. Press X

This will Zero the X-axis.

D. Repeat process for Y-axis.

ZERO

| X |
| Y |
| Z |
| A |
| ALL |
| Cancel |
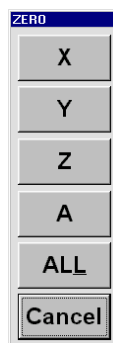
5. Open File to Run

    A. Press | File |

    The **File** Window appears:
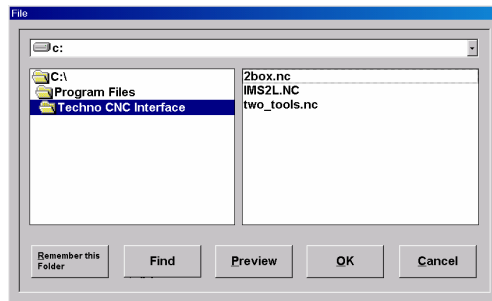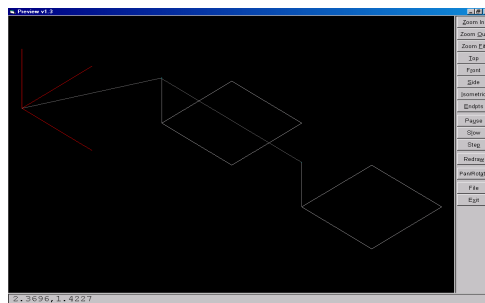

    B. Highlight **2box.nc** and press | OK |

6. Preview the File

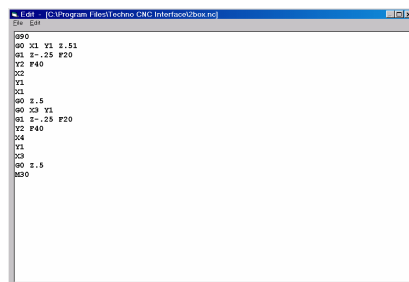   A. Press | **Preview** |

    The **Preview** Window appears

   B. Manipulate the toolpath using the buttons along the right side.

    C. Press | Exit | to close window

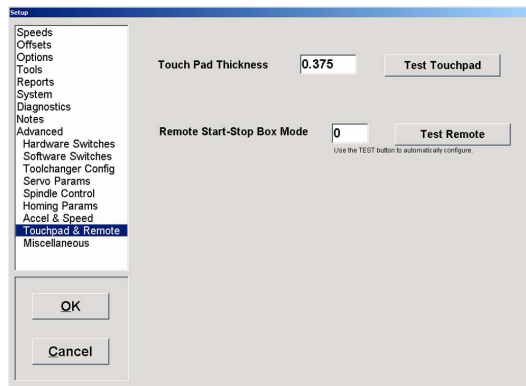   D. Press | **Edit** |

    The **Edit** Window appears:

Note: Previewing the GCODE commands in Step 5-D is not required for running a file, but it is a useful feature to know.

    F. Press `Close`

7. Check Speeds and Parameters

    A. Press **Setup**

    The **Setup** Window appears:

    B. Navigate through the different bookmarked submenus by clicking on the names in the left-side display screen.

    C. Press `Cancel` to exit Setup without making any changes.

8. Preprocess the File

    A. Press **Preprocess** .

    Watch the **Progress** bar move from left to right.

Warning: Before you begin to run a file, remember the different methods you have to stop the program run. For emergencies always use the **E-Stop Button**, located on your controller or start stop box. For non emergencies or to pause and resume a program run, use the **Pause Button** on your Start Stop Box.

    Check that your **Z-Axis** zero position provides enough space between the tool and the table so that when you run the file the tool does not plunge into the table. In addition to checking the **Z-Axis**, jog both the **X** and **Y Axes** to the center of the table because the file will not run if it is at the end of any axes.

9. Run the File

    A. Press `Start` .

III. Tool Stand Locations Tutorial

For Automatic Tool Change Spindles Only!

In this Tutorial you learn the important task of setting your tool stand locations. You will learn the process of setting the first two tool stand locations; after that follow the same directions for any additional stands. You must complete this (and the next) Tutorial before starting the Automatic Tool Change Tutorial (Chapter V).

Note: This Tutorial was written assuming that:
  1. You have already setup the touchpad.
  2. Your tool stands are located at the side of the machine the X-axis will home to (left if you are standing in front of the machine).

If you have a ROTARY CAROUSEL TOOLCHANGER, the settings are programmed at the factory. Call Techno for any additional information or troubleshooting

1. START THE INTERFACE

   A. From your computer's Start menu, choose Programs/Techno CNC Interface.
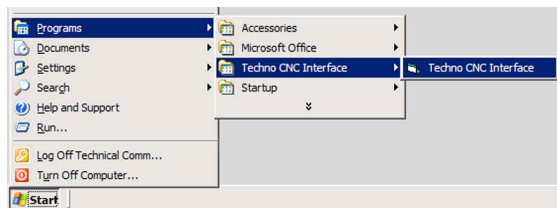
   The Techno CNC Interface Main Menu appears:
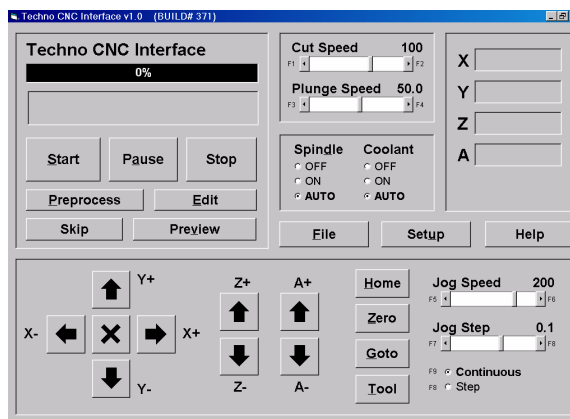
2. HOME THE MACHINE

   A. Press **Home**

   The **Home** Menu appears:

   B. Press **ALL**

A Word on Chuck Control
The process of teaching a tool stand location entails opening and closing the spindle's chuck, while selecting a specified time delay to either load the tool holder into the chuck or catch a tool holder as the chuck opens and releases it. Make sure you are not distracted when performing OPEN/CLOSE chuck operations.

3. EMPTY CHUCK AND TOOL STANDS 1 & 2, THEN PLACE THE TOOL HOLDERS OFF TO THE SIDE.

If a tool holder is currently in the chuck, follow these directions to remove it.
To remove a tool holder from the chuck, be ready to move yourself over to the chuck within a 10 seconds. You need to be able to do this in order retrieve the tool holder before it is released. Once the chuck is opened, it releases the tool holder causing it to drop from the spindle. Retrieve the tool holder in this manner: firmly cradle and grip the sides of the tool holder prior to the chuck opening. When the chuck opens it will release the tool holder into your grip.

Warning: Do not place your hand, palm-up, under the tool to catch the tool holder. A sharp tool may cut you when the tool is released.

A. Press [**Tool**] , then [**Chuck Control**]

The **Chuck Control** Window appears:
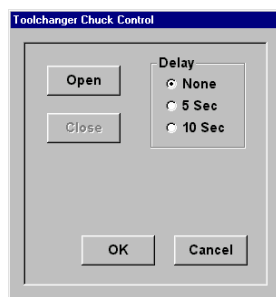
B. Select '10 Sec' Delay and press [**Open**] .
C. Go directly to the chuck and place your hand firmly around the tool holder, above the tool bit. When the chuck opens, it will release the tool holder into your hands. Place the tool holder off to the side.

Note: These directions are for one person to complete these tasks. If you have a co-worker that can help, instruct him to cradle and catch the tool holder while you operate the chuck control in the Interface.
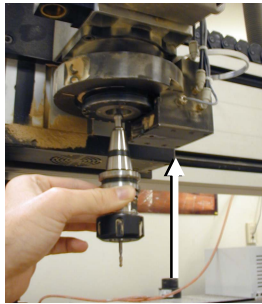
4. LOAD TOOL HOLDER 1.

Identify the tool holder with the longest bit, this should be designated tool holder 1. Prepare to load tool holder 1 and CLOSE the chuck around it. Make sure to place the top of the tool holder cone all the way up into the spindle chuck. When the chuck closes, it will grasp tool holder 1 and lift it into the chuck a fraction of an inch. Allow for this lift.

A. Press [**Tool**] , then [**Chuck Control**] .

B. Select '10 Sec' Delay and then [**Close**] .

C. Place the top of the tool holder 1 cone all the way up into the spindle chuck (see picture below) and wait the 10 seconds for the chuck to close, lifting tool holder 1 into the chuck.

D. Press [Cancel] to return to Main Menu.

5. JOG TOOL HOLDER 1 TO TOOL STAND 1

The process of setting tool stand location requires highly accurate positioning and therefore, this process should not be rushed.

A. Jog tool holder 1 just outside the opening of tool stand 1 (see picture below). If you are a 'one-person' operation, you will need to move the keyboard as close to the tool stands as possible. A closer position will better enable you to set the right location. If you have a co-worker available to help you, have him stand by the tool stand and direct you while you jog the machine.
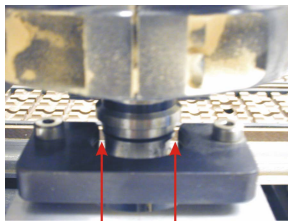
Equal space on either side

Note: At this point the positioning and margin for error gets pretty tight. We compensate for this by switching from 'Continuous' to 'Step'.

B. Change the radio button in the lower right hand corner of the Main Menu from **Continuous** to **Step**. Then change the Step Jog value to 0.01. You can change the Jog Step value exactly by double-clicking on the words above the scroll bar. A sub window appears. Enter the value 0.01 and press OK. Now, when you jog, one click will move the axis 0.01 inch per click.

6. POSITION TOOL HOLDER 1 IN TOOL STAND 1

A. Carefully jog tool holder 1 into the middle of tool stand 1. Make sure you can freely spin tool holder 1 (with your hand).
B. Jog the Z-axis down (Z-) one click at a time until tool holder 1 comes into contact with the tool stand plate (see picture below). Then Jog the Z-axis up (Z+) 4 clicks.
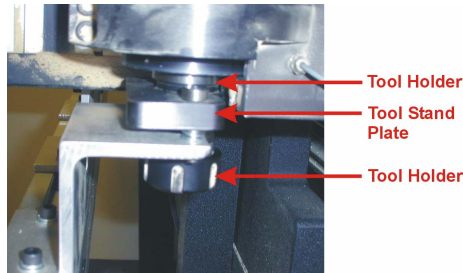
Note: From this position we begin the finishing touches for setting the tool stand location. We are going to do the following:

☞ Find the X-axis tool stand middle position (Step 7)

☞ Find the Y-axis tool stand middle position (Step 7)

☞ Find the appropriate Z-axis tool stand position height (Step 8)

☞ Set the tool stand location (Step 9)

7. FIND THE X AND Y-AXES TOOL STAND MIDDLE POSITIONS

A. Jog tool holder 1 to the middle of the tool stand 1 along the X-axis. At the desired middle position you should be able to spin the tool holder, using your hand, without obstruction.

To determine a highly accurate X-axis middle position, jog the tool holder in a positive direction (X+) until tool holder 1 cannot spin freely and easily.

Warning: Do not jog beyond the point where the tool cannot spin at all.

Then, counting the number of jog-clicks, jog the X-axis in a negative direction (X-) until tool holder 1 reaches the other side of the tool holder. Take the number of jog-clicks it took to get from one side (X+) of the tool stand to the other (X-), divide by 2, and jog back that number of clicks to a very exact middle position. **Example**: if the total number from one side to the other was 20 (20/2=10), then jogging back 10 jog-clicks (X+) will be an accurate center position for the X-axis.

B. Repeat process for the Y-axis.

8. SET THE Z-AXIS POSITION

A. Jog the Z-axis down (Z-) until tool holder 1 initially contacts the tool stand plate (see picture below). Jog down 2 more jog-clicks (Z-).
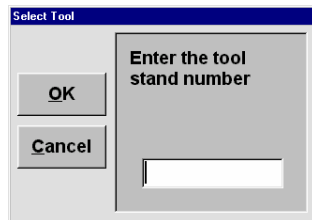
Tool Holder
Tool Stand Plate
Tool Holder
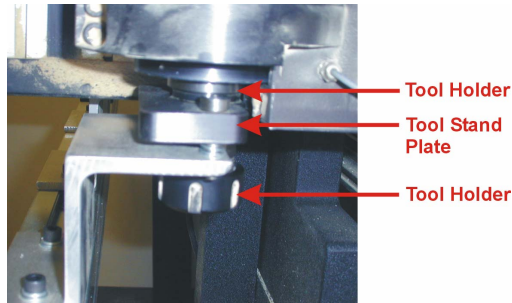
Warning: DO NOT go more than 3 clicks down on the Tool stand Plate (using a 0.01 Jog Step).

9. TEACH THE TOOL STAND LOCATION
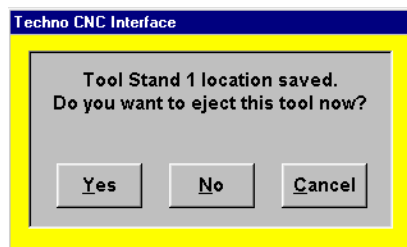
We are now ready to set the tool stand location.

A. Press [**Tool**] , then [**Learn Tool Stand Location**] .

The **Learn Tool Stand Location** pop-up window appears:

B. Type 1, and hit [**OK**] .

A window appears confirming your saved tool stand location, and asking you whether or not you want to eject the tool now.

C. Press [**Yes**] .

The Machine will now drop off tool holder 1 in tool stand 1.

Note: If there is a problem setting the tool stand location, start over beginning at Step 3. When programming tool changes, whatever tool is in this holder will now be referred to as Tool 1 (or in GCODE terms T1). For instance, if a 1/4" tool is placed in the holder and the program calls for T1 to be 1/8", the machine will not be able to identify this mistake*. **It is the programmer/operators responsibility to make sure the proper tools are placed in the designated holders.** Now, perform the tests in steps 10 and 11.

10. Test A: Pick-up

Here we want to make sure that the position just programmed is suitable for picking up tool holder 1 from tool stand 1.

A. Press [**Tool**], then [**TOOL CHANGE**].

B. From the pop-up window, type 1 and press [**OK**].

The machine should now travel back to tool stand 1 and pick tool holder 1. If this works, continue on to Test B in Step 11.

11. Test B: Drop-off

Here we want to make sure that the position just programmed is suitable for dropping-off tool holder 1 into tool stand 1.

A. Press [**Tool**], then [**TOOL CHANGE**].

B. From the pop-up window, type 0 and press [**OK**].

The machine should now travel back to tool stand 1 and drop-off tool holder 1. If this works, tool stand 1 has been properly set.

Note: Before starting the setup for tool holder 2, switch back to **Continuous**, while jogging to tool stand 2. Once you get tool holder 2 at the opening of tool stand 2, then switch back to **Step** at 0.01 inch.

10. Repeat this process for tool holder 2, and tool stand 2.

Note: Substitute the #2 for any instance the Tutorial mentions #1 (Tool holder 1 or Tool stand 1). For example, in Step 9-B, type 2 (not 1) before hitting the OK button.

Make sure you set a tool stand location for tool holder 2. Chapter VI, **Automatic Tool Change Tutorial** will require two tools. If you wish to set any additional tool stand Locations (i.e. 3, 4…), that's fine, just know that for now, we require at least 1 & 2.

IV. Tool Lengths Tutorial

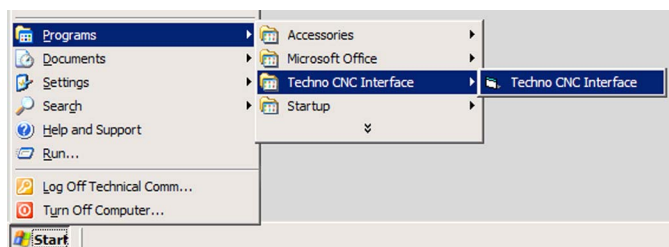*For Automatic & Manual Quick-Change Tool Change Spindles Only!*

Tool Change operations often involve tool bits of varying lengths. The touchpad is used to record each tool length for one reason: to compensate and thus maintain a consistent Z-axis zero position. In this Tutorial, you learn the important task of calibrating the length of each tool bit for each tool holder. You will learn this process for the first two tool holders; after that follow the same directions for any additional tool holders. You must complete this (and the previous) Tutorial before starting the Automatic Tool Change Tutorial.

Note: This Tutorial was written assuming that:
   1. You have already setup the touchpad.
   2. Your tool stands are located at the side of the machine the X-axis will home to (left if you are standing in front of the machine).
   3. You have already completed *III. Tool Stand Locations Tutorial*.
   4. You have loaded two tool bits of varying lengths into two tool holders.

1. START THE INTERFACE

    A. From your computer's Start menu, choose Programs/Techno CNC Interface.

The Techno CNC Interface Main Menu appears:
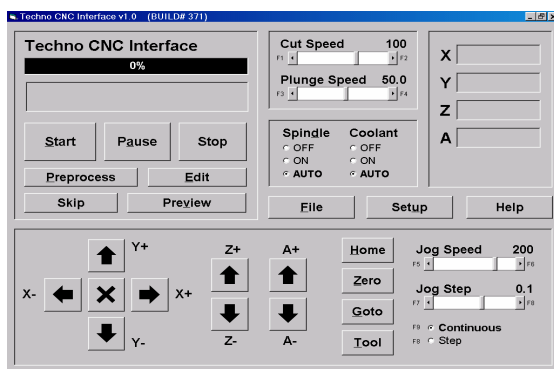
2. HOME THE MACHINE

    A. Press **Home**

The **Home** Menu appears:

    B. Press **ALL**
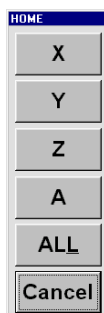
A Word on Chuck Control for Manual Quick-Change Tool Changes
The process of Learning/Calibrating Tool Lengths entails opening and closing the chuck, while selecting a specified time delay to either load the tool holder into the chuck or retrieve a tool holder as the chuck opens and releases it. Make sure you are not distracted when performing OPEN/CLOSE chuck operations.

A Word on the Touchpad
The touchpad should always be placed in the same place for all the tools being calibrated. The Interface already knows the thickness of the touch pad (0.375). So, when the tool bit comes in contact with the touchpad and retracts the Z-axis, the Interface records the position, less the touchpad thickness.

3. PLACE THE TOUCHPAD ON THE TABLE SURFACE

Note: For Automatic Tool Changers: We begin this section assuming you have already set tool stand locations 1 & 2. If you have not done so, complete the previous tutorial (III. Tool Stand Location).

Automatic or Manual Quick-Change, that is the question…
The previous tutorial, Learn Tool Stand Locations, applied to Automatic Tool Change operations, only. The subject of this tutorial, however, applies to both Automatic and Manual Quick-Change spindles. Thus, when relevant, we will explain the appropriate procedure for both.

4. LOAD TOOL 1

Tool 1 should be the tool holder with the longest tool bit.

For Automatic Tool Changer

If tool holder 1 is in the chuck, skip to Step 5. If tool holder 1 is not in the chuck, continue to Step 4-A.

A.   Press [**Tool**], then [**TOOL CHANGE**].

The **Select Tool** pop-up window appears:
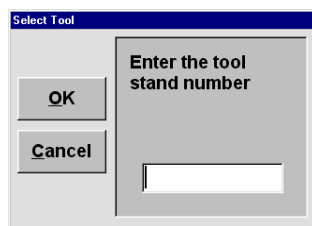
B.   Type 1 and press [**OK**].

The machine will now retrieve tool holder 1 from tool stand 1.

For automatic tool changers, skip to Step 5.

For Manual Quick-Change Tool Changer

If tool holder 1 is in the chuck, skip to Step 5; if tool holder 1 is not in the chuck, continue to Step 4-C.

Note: If there is not a tool holder present in the chuck, then continue to Step 4-C, BUT skip over Step 4-E. (so, in this case your progress would be as follows: Step 4-C, Step 4-D, Step 4-F, Step 4-G, etc.)

Warning: Manually retrieve a tool holder in this manner: firmly cradle and grip the sides of the tool holder prior to the chuck opening. When the chuck opens it will release the tool holder into your grip. Do not place your hand, palm-up, under the tool to catch the tool holder. A sharp tool may cut you when the tool is released.

C. Press Tool , then Chuck Control .

The **Chuck Control** window appears:
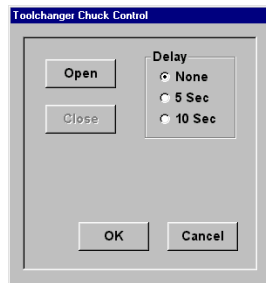
D. Select '10 Sec' Delay and press Open .

E. Go directly to the chuck and place your hand firmly around the tool holder, above the tool bit. When the chuck opens, it will release the tool holder into your hands. Place the tool holder off to the side.

F. Place tool holder 1 in chuck.
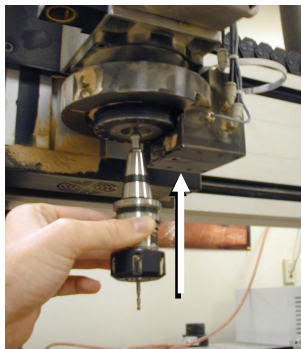
Note: Prepare to load tool holder 1 and close the chuck around it. Place the top of the tool holder cone all the way up into the spindle chuck. When the chuck closes, it will grasp the tool holder and lift it into the chuck a fraction of an inch. Allow for this lift.

G. Select '10 second' delay, and press Close .

H. Press Cancel to return to Main Menu.

5. JOG TOOL HOLDER 1 INTO POSITION AND TEST TOUCHPAD

Calibrating tool lengths is a pre-programmed process of the Interface. Once you activate this process the machine runs on its own. However, we will perform a test prior to going all the way through this process to make sure the touchpad is activated and working properly.

Warning: Remember to use the **E-Stop Button**, located on your controller or start stop box, to immediately stop the machine.

A. Jog tool holder 1 over the touchpad, about 4 to 5" above.

Note: Although in this Tutorial we are learning how to set tool lengths, for the purpose of *testing* the touchpad, it's better to use **TOUCH OFF Z ZERO POSITION**, rather than the **LEARN TOOL LENGTHS** button. After the test is complete, then we will use the **LEARN TOOL LENGTHS** button.

B. Press [**Tool**] .

The **Tool** Menu appears:
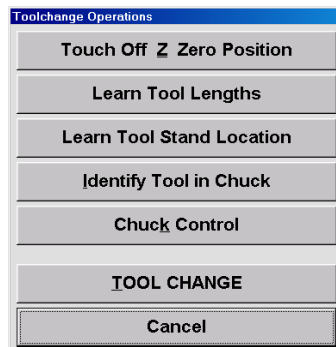
In Step 5-C the Z-axis will start to descend. Normally, you would wait until the Z-axis brings the tool bit to the touchpad and then, if working properly, the Z-axis would retract. For our test, however, we want you to pick up the touchpad and bring it to the tool holder right after the Z-axis begins its descent (see picture below). If the touchpad is working properly, the Z-axis will retract as soon as it makes contact with the tool.

C. Press [**Touch Off Z Zero Position**] .

Warning: If the Z-axis DOES NOT retract (after Step 5-D), press the **E-Stop Button**, located on your controller or start stop box, to immediately stop the machine.

D. Once the Z-axis begins it descent, pick up the touchpad and gently make contact with the tool holder or bit.

Note: If the Z-axis retracts upon contact, continue to Step 6-A. If it does not retract, press the **E-Stop Button** to stop the Z-axis and check your touchpad setup before returning to this Tutorial.

6. LEARN TOOL LENGTH FOR TOOL 1

A. Re-position tool holder 1 over the touchpad, about 4 to 5" above.

B. Press [**Tool**] , then [**Learn Tool Lengths**] .

The **Learn Tool Lengths** window appears:
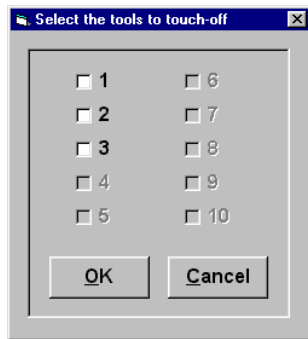
C. Click inside the box next to #1 (so that a check appears) and press OK .

Note: After Step 6-C, the Z-axis will begin its descent toward the touchpad. When the tool bit contacts the touchpad, the Z-axis will travel back up and the Interface will record the tool length for tool holder 1.

7. RETURN TOOL HOLDER 1 AND LOAD TOOL HOLDER 2

For Automatic Tool Changer

A. Press Tool , then TOOL CHANGE .

The **Select Tool** pop-up window appears:
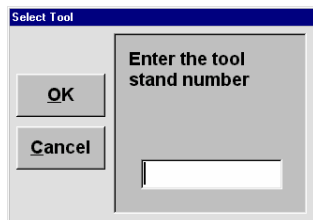
B. Type 2 and press OK .

Machine will return tool holder 1 to its tool stand, then retrieve tool holder 2 from its tool stand. For an ATC spindle, continue to Step 8.

For Manual Quick-Change Tool Changer

C. Press Tool , then Chuck Control .

D. In the **Chuck Control** window select '10 second' delay and press Open .

E. Go directly to the chuck and place your hand firmly around the tool holder 1, above the tool bit. When the chuck opens, it will release tool holder 1 into your hands. Place it off to the side.

F. Place tool holder 2 in chuck.

Note: Prepare to load tool 2 and close the chuck around it. Place the top of the tool holder cone all the way up into the spindle chuck. When the chuck closes, it will grasp the tool holder and lift it into the chuck a fraction of an inch. Allow for this lift.

    G. Select '10 second' delay, and press `Close` .

    H. Press `Cancel` to return to Main Menu.

8. REPEAT STEP 6 FOR TOOL HOLDER 2

Substitute the #2 for any instance the Tutorial mentions #1 (or tool holder 1).

9. REMOVE TOOL HOLDER 2 FROM CHUCK

For Automatic Tool Changer

    A. Press `Tool` , then `TOOL CHANGE` .

    B. Type 0, then press `OK` .

Machine will return tool holder 2 to its tool stand, without picking-up any other tool holder.

For Manual Quick-Change Tool Changer

    C. Press `Tool` , then `Chuck Control` .

    D. From the **Chuck Control** window select a '10 Sec' Delay and press `Open` .

    E. Go directly to the chuck and place your hand firmly around the tool holder, above the tool bit. When the chuck opens, it will release the tool holder into your hands. Place the tool holder off to the side.

Now tool 1 and tool 2 should have the same zero position, even if they have radically different tool lengths. The Interface will remember and keep these tool length offsets until you go through the process re-teaching them again. To view the tool lengths in the Interface go to **Setup/Tools**.

# V. Automatic Tool Change Tutorial

This tutorial employs and explains the main functions of the Techno CNC GCODE Interface as they pertain to an Automatic Tool Change (ATC) operation. Here you will learn the initial steps and functions by running the sample program, **2tools.nc**. If you have any difficulty with the tutorial or are just learning to use your machine, we recommend reading the INTERFACE FUNCTIONS before proceeding.
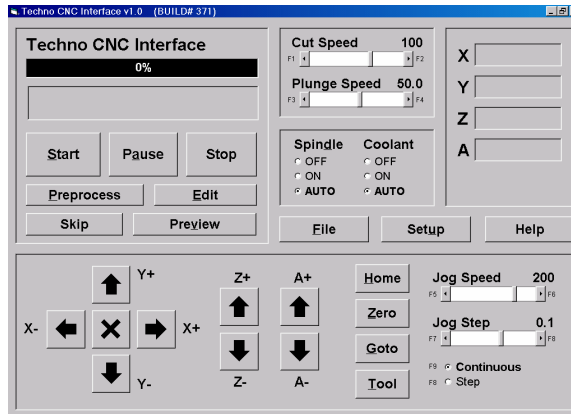

Note: This Tutorial was written assuming that:
   1. You have already setup the touchpad.
   2. You have already set the tool stand locations and tool length offsets for at least the first two tools (as instructed in Chapters III and IV).

1. START THE INTERFACE

   A.   From your computer's Start menu, choose Programs/Techno CNC Interface
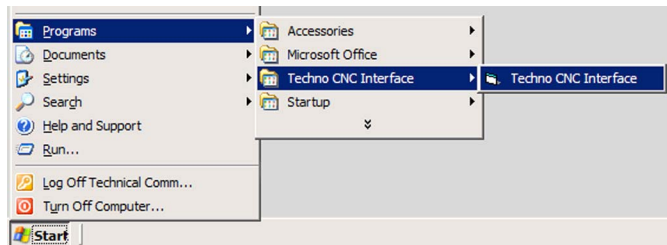
   The Techno CNC Interface Main Menu appears:

2. HOME THE MACHINE

   A.   Press [Home]

   The **Home** Menu appears:
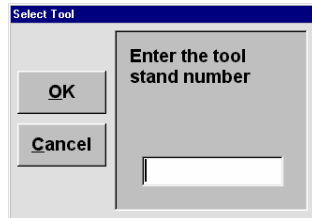
   B.   Press [ALL]
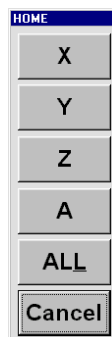
3. LOAD TOOL HOLDER 1.

If tool holder 1 is in the chuck, skip to Step 4. If tool holder 1 is not in the chuck, continue to Step 3-A.

A. Press Tool , then TOOL CHANGE .

The **Select Tool** pop-up window appears:

B. Type **1** and press OK .

The machine will now retrieve tool holder 1 from tool stand 1.

4. ZERO THE Z-AXIS

Note: Prop the touchpad on something high enough so that the Z-axis zero position will be set well above the table surface (see picture below). Do this to ensure that the tool bit does not travel into the table or material during the program run. Make sure remember to remove the prop after you zero the Z-axis.
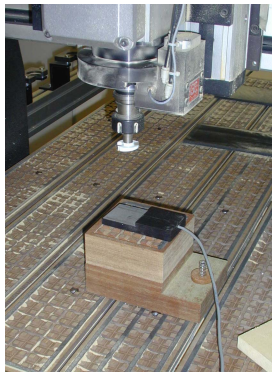
A. Jog your tool over the touchpad.

Prior to Zeroing the Z-axis, we will test the touchpad and if it is working properly, then we will Zero the Z-axis. Follow the Steps and Warning below.

Warning: Remember to use the **E-Stop Button**, located on your controller or start stop box, if you need to immediately stop the machine.
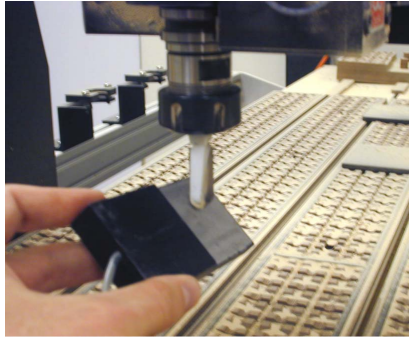
B. Press Tool .

The Test: Here we will start the *Touch Off Process*, wherein the Z-Axis will automatically travel down to the touchpad. If the touchpad is working properly, once the tool comes into contact with the pad, the Z-axis will retract immediately. This test involves the user manually lifting the touchpad up to the tool, as in Step 3-D (see picture below). When you lift the touchpad up to the tool, if the Z-axis retracts, then the pad is operational. If the Z-axis DOES NOT re-tract, immediately press red E-stop button to stop the Z-axis. Then, check your touchpad setup before returning to this Tutorial.

C. From the **Tool** Menu press [Touch Off Z Zero Position] .

The machine will automatically lower the Z-axis.

D. Manually lift the touchpad to the tool and then gently touch the pad to the tool (see picture below).

If the Z-axis retracts upon contact, continue to Step 3-E. If it does not retract, check your touchpad setup before returning to this Tutorial.

E. Jog your tool over the touchpad.

F. Press [Tool] .

G. Press [Touch Off Z Zero Position] .

The Z-axis will automatically lower the Z-axis to the touchpad and retract when it makes contact.

H. Clear the touchpad and the prop from the table surface.

5. ZERO THE X AND Y AXES

A. Jog the X/Y axes to a central position on your gantry table.

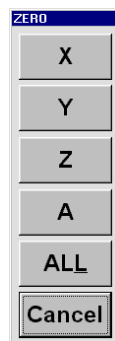**Note:** Zero positions are frequently set at the front left corner of your workpiece.

B. Press [Zero] .

The **Zero** Window appears:
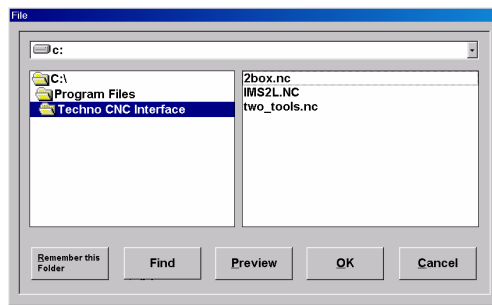
C. Press [X] .

This will Zero the X-axis.

D. Repeat process for Y-axis.

ZERO

| X |
| Y |
| Z |
| A |
| ALL |
| Cancel |

6. OPEN TOOL CHANGE FILE
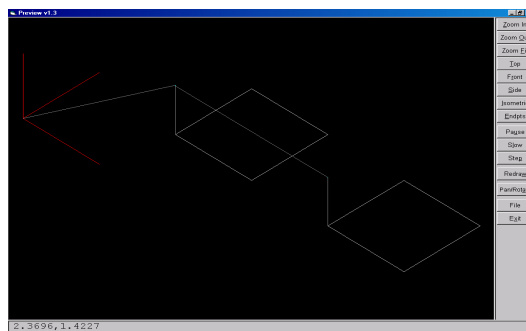
A. Press [File] .

The **Open File** Window appears:

B. Locate your Techno CNC Interface folder and highlight **2tools.nc**, press [OK].

7. PREVIEW THE FILE

A. Press [**Preview**].

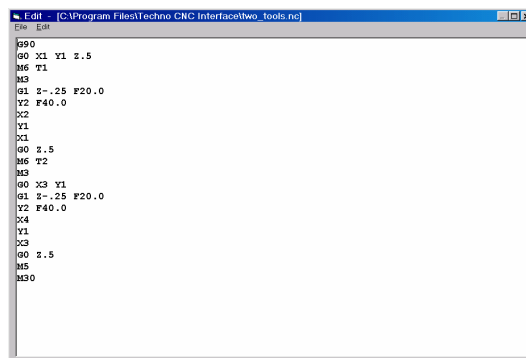The **Preview** Window appears

B. Manipulate the toolpath using the buttons along the right side.

C. Press [Exit] to close window.

D. Press [**Edit**].
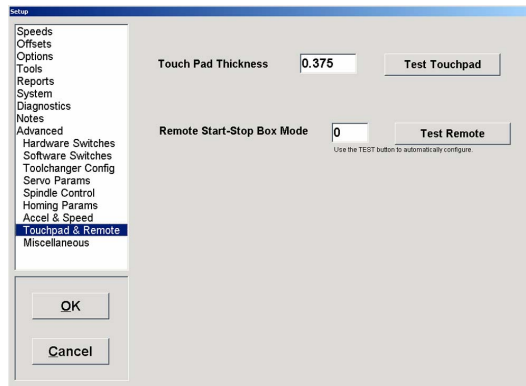
The **Edit** Window appears:

Note: Step 5-D (Edit/Step) is not a mandatory function to run a file; it is, however, a useful feature to know.

D. Press [Close].

8. CHECK SPEEDS AND PARAMETERS

    A. Press [**Setup**] .

    The **Setup** Window appears:

    B. Navigate through the different bookmarked submenus by clicking on the names in the left-side display screen.

Warning: Do not change any parameters in Setup. We will run **2tools.nc** using the Interface's default settings.

    C. Press [**Cancel**] to exit Setup.

9. PREPROCESS THE FILE

    A. Press [**Preprocess**] .

    Watch the Progress bar move from left to right.

Warning: Before you begin to run a file, remember the different methods you have to stop the program run. For emergencies always use the **E-Stop Button**, located on your controller or start stop box. For non emergencies or to pause and resume a program run, use the **Pause Button** on your Start Stop Box.

    Check that your **Z-Axis** zero position provides enough space between the tool and the table so that when you run the file the tool does not plunge into the table. In addition to checking the **Z-Axis**, jog both the **X** and **Y Axes** to the center of the table because the file will not run if the machine as at the end of any axes.

10. RUN THE FILE

Warning: Remember to use the **E-Stop Button**, located on your controller or start stop box, if you need to immediately stop the machine.

    A. Press [**Start**] .

Watch how the machine runs **2tools.nc**. Notice, how the machine stops, returns Tool 1 and retrieves Tool 2 to finish the file.

# VI. Manual Quick-Change Tool Change Tutorial

This tutorial employs and explains the main functions of the Techno CNC GCODE Interface as they pertain to a Manual Quick-Change Tool Change operation. You will learn the initial steps and functions by running the sample program, **2tools.nc**. If you have any difficulty with the tutorial or are just learning to use your machine, we recommend reading the INTERFACE FUNCTIONS before proceeding.

Note: This Tutorial was written assuming that:
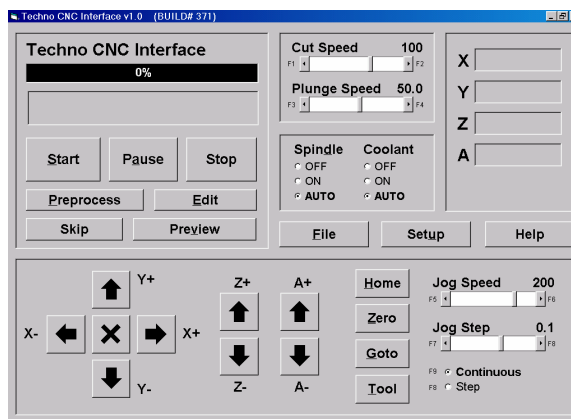   **1.** You have already setup the touchpad.
   2. You have already set tool length offsets for at least the first two tools (as instructed in Chapters IV).

1. START THE INTERFACE

   A. From your computer's Start menu, choose Programs/Techno CNC Interface.
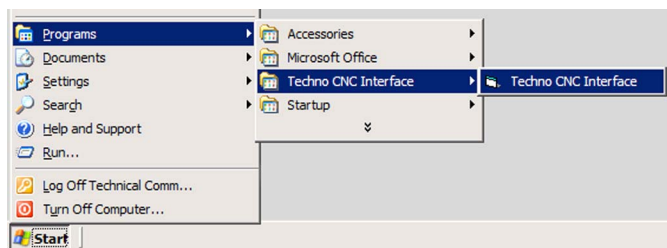
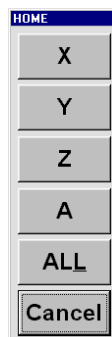   The Techno CNC Interface Main Menu appears:

2. HOME THE MACHINE

   A. Press **Home** .

   The **Home** Window appears:

   B. Press **ALL** .

3. LOAD TOOL HOLDER 1.

If tool holder 1 is in the chuck, skip to Step 4. If tool holder 1 is not in the chuck, continue to Step 3-A.

*If a Tool Holder is currently in the Chuck, follow these directions to remove it.*
Retrieve the tool holder in this manner: firmly cradle and grip the sides of the tool holder prior to the chuck opening. The chuck opens when you press the Toggle Switch on the Manual Quick-Change box, which is adjacent to the spindle. Do not place your hand, palm-up, under the tool to catch the tool holder. A sharp tool may cut you when the tool is released.

Note: If the chuck is already empty, skip step Step 3-A and go directly to Step 3-B

    A. Open the chuck by pressing the Toggle Switch on the Manual Quick-change box (see picture below), retrieve the existing tool holder and put it of to the side.

    B. Insert tool holder 1 into the spindle (see picture below).
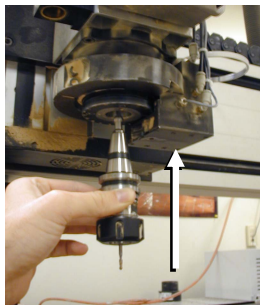
Note: When the chuck closes, it will grasp the tool holder and lift it into the chuck a fraction of an inch. Allow for this lift.

    C. Press the chuck switch to close the chuck.

4. ZERO THE Z-AXIS

Note: Prop the touchpad on something high enough so that your Z-axis zero position will be well above the table surface (see picture below). Do this to ensure that the tool does not travel into the table or material during the program run. Then, after you zero the Z-axis, remember to remove the prop.
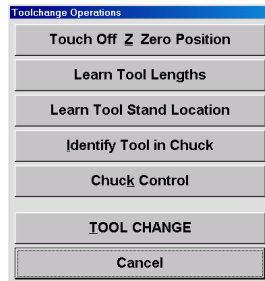
A. Jog your tool over the touchpad.

Note: Prior to Zeroing the Z-axis, we will test the touchpad and if it is working properly, then we will Zero the Z-axis. Follow the Steps and Warning below.

Warning: Remember to use the **E-Stop Button**, located on your controller or start stop box, if you need to immediately stop the machine.

B. Press Tool .

The **Tool** Window appears:

The Test: Here we will start the *Touch Off Process*, wherein the Z-Axis will automatically travel down to the touchpad. If the touchpad is working properly, once the tool comes into contact with the pad, the Z-axis will retract immediately. Our test involves the user manually lifting the touchpad up to the tool, as in Step 3-D (see picture below). When you lift the touchpad up to the tool, if the Z-axis retracts, then the pad is operational. If the Z-axis DOES NOT re-tract, press the red E-stop button to stop the Z-axis. Then, check your touchpad setup before returning to this Tutorial.

C. Press Touch Off Z Zero Position .

The machine will automatically lower the Z-axis.
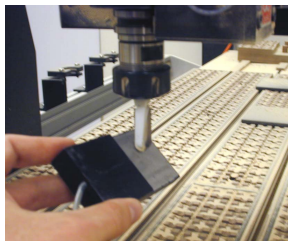
D. Manually lift the touchpad to the tool and then gently touch the pad to the tool (see picture above).

Note: If the Z-axis retracts upon contact, continue to Step 3-E. If it does not retract, check your touchpad setup and return to the beginning of this section of the tutorial after you have the correct setup.

E. Jog your tool over the touchpad.

F. Press Tool .

G. Press Touch Off Z Zero Position .

The machine will automatically lower the Z-axis to the touchpad and retract when it makes contact.

Note: You can now clear the touchpad AND the prop from the gantry table.

5. ZERO THE X AND Y AXES

    A. Jog the X/Y axes to a central position on your gantry table.

Note: Zero positions are frequently set at the front left corner of your workpiece.
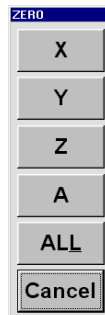
    B. Press [**Zero**] .

    The **Zero** Window appears:

    C. Press [**X**] .
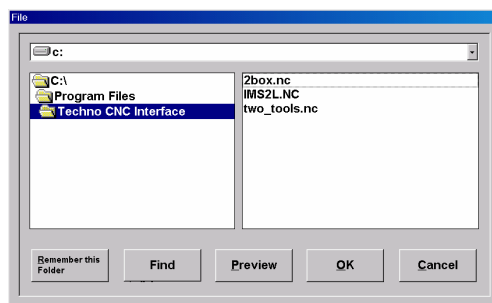
    This will Zero the X-axis.

    D. Repeat process for Y-axis.

6. OPEN MANUAL QUICK-CHANGE TOOL CHANGE FILE

    A. Press [**File**] .
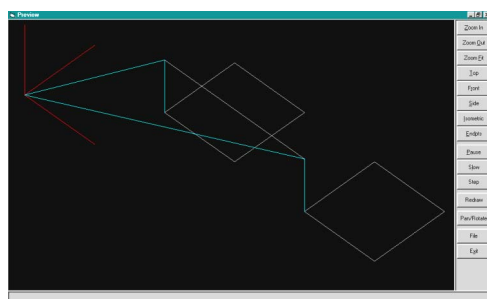
    The **Open File** Window appears:

    B. Highlight **2tools.nc** and press [**OK**] .

7. PREVIEW THE FILE

    A. Press [**Preview**] .
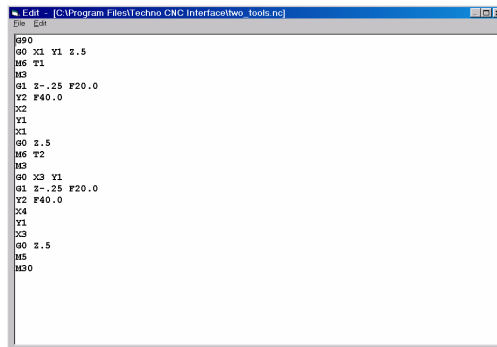
    The **Preview** Window appears:

    B. Manipulate the toolpath using the buttons along the right side.

C. Press ⬚ Exit ⬚ to close window.

D. Press ⬚ **Edit** ⬚ .
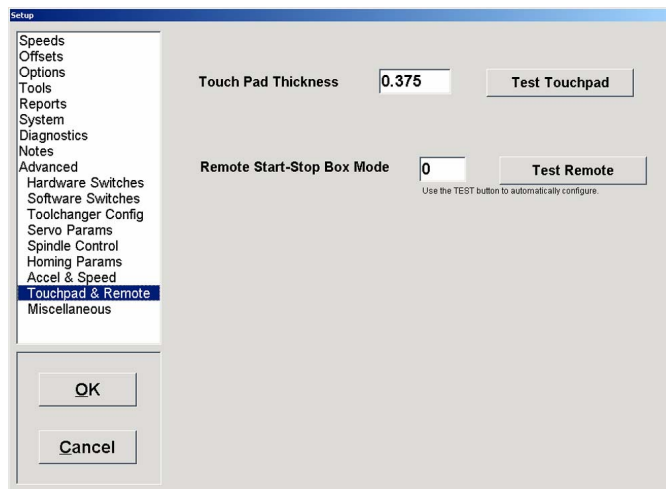
The **Edit** Window appears:

Note: Step 5-D (Edit/Step) is not a mandatory function to run a file; it is, however, a useful feature to know.

F. Press ⬚ Close ⬚.

8. CHECK SPEEDS AND PARAMETERS

A. Press ⬚ **Setup** ⬚ .

The **Setup** Window appears:

B. Navigate through the different bookmarked submenus by clicking on the names in the left-side display screen.

Warning: Do not change any parameters in Setup. We will run **2tools.nc** using the Interface's default settings.

C. Press ⬚ **Cancel** ⬚ to exit Setup.

9. PREPROCESS THE FILE

    A. Press **Preprocess** .

Watch the Progress bar move from left to right.

10. START THE FILE

Warning: Before you begin to run a file, remember the different methods you have to stop the program run. For emergencies always use the **E-Stop Button**, located on your controller or start stop box. For non emergencies or to pause and resume a program run, use the **Pause Button** on your Start Stop Box.

Check that your **Z-Axis** zero position provides enough space between the tool and the table so that when you run the file the tool does not plunge into the table. In addition to checking the **Z-Axis**, jog both the **X** and **Y Axes** to the center of the table because the file will not run if it is at the end of any axes.

    A. Press **Start** .

Approximately half way through the file, you will be instructed to load tool 2. Follow the onscreen prompts.

10. CHANGE TO TOOL 2

    C. Remove tool 1 using the chuck toggle switch.
    D. Insert tool 2 and close chuck (also using Toggle Switch).

The machine will now complete the file using tool 2.

VII. Manual Tool Change Tutorial

This tutorial employs and explains the main functions of the Techno CNC GCODE Interface as they pertain to a Manual Tool Change operation. You will learn the initial steps and functions by running the sample program, **2tools.nc**. If you have any difficulty with the tutorial or are just learning to use your machine, we recommend reading the INTERFACE FUNCTIONS before proceeding.

You will need some cutting material, at least 1.5 inches in height, that will be used only to set the Z-axis Zero Position at a high enough level that the cutter will not come close to contacting the gantry table. The sole purpose of this Tutorial is to familiarize the user with the process of changing cutters/tools during a tool change program. You will use the cutting material to set the Z-axis (and X/Y Zero) Part-Zero Position, then you will remove the material from the gantry.

1. START THE INTERFACE

> A.   From your computer's Start menu, choose Programs/Techno CNC Interface.
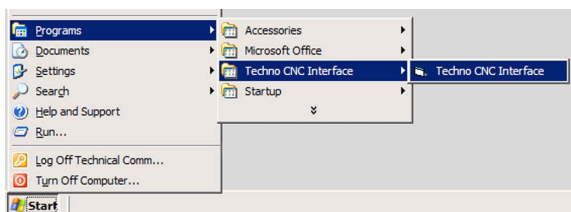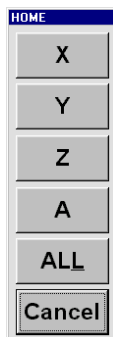

> The Techno CNC Interface Main Menu appears:
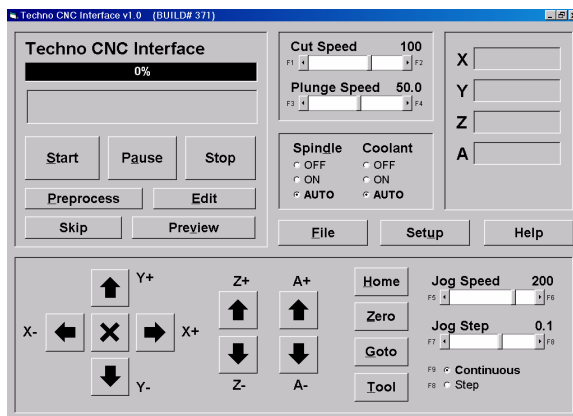
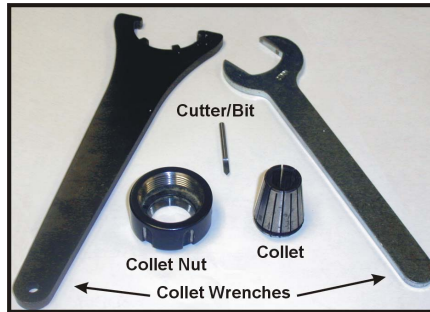**2.** HOME THE MACHINE

> A.   Press Home .
>
> The **Home** Window appears:
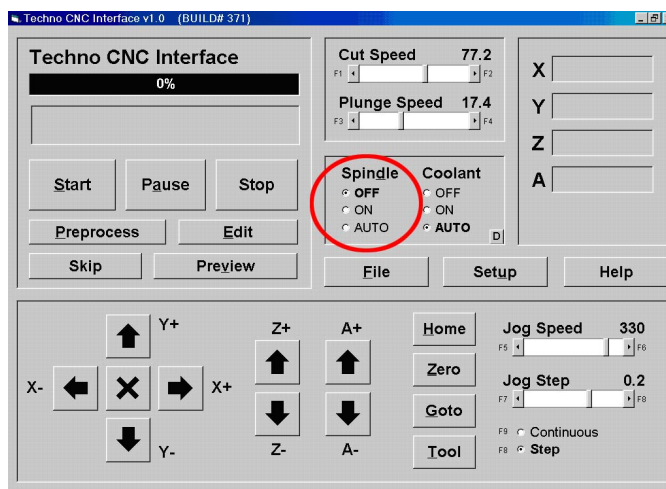>
> B.   Press ALL .

3. INSERT CUTTER/TOOL 1 INTO SPINDLE.

If tool 1 is already inserted, skip to Step 4.

Cutter/Bit

Collet

Collet Nut

Collet Wrenches

Warning: Turn **OFF** power to the spindle before removing or replacing the collet!

A. Remove the collet and collet nut from spindle, using the collet wrenches provided. Separate collet from collet nut.

It is important to know exactly how the collet fits into the collet nut. If not done properly, this could <u>damage</u> your spindle.

B. Insert collet into collet nut and then turn upside down. See pictures below.

Improper Fit

Proper Fit

C. Press down on top of the collet nut to snap the two together for proper fit.

D. Screw the collet nut (with collet properly inserted) onto the spindle. Continue screwing until either you cannot go any further by hand or the collet hole is too small to fit the cutter / tool bit.

E. Get a coworker to help you secure the cutter in the collet. Have your coworker hold the cutter in the collet while you secure it with the collet wrenches.


4. ZERO THE Z-AXIS

**Note:** Take your time while zeroing the Z-Axis. Perform each step slowly and deliberately.

A. Find some cutting material at least 1.5 inches in height to use as a decoy. Place the cutting material on the gantry table in a central, but easy to reach location.

B. Place a regular piece of paper on top of the cutting material.
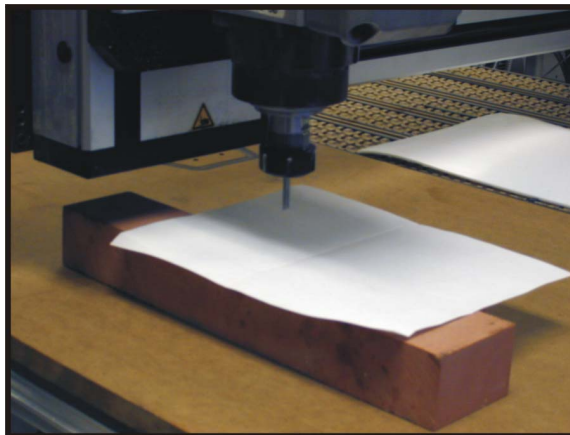
C. Using the Z Jog Buttons to jog the Z-axis down about 1/4 to 1/2-inch above the paper.
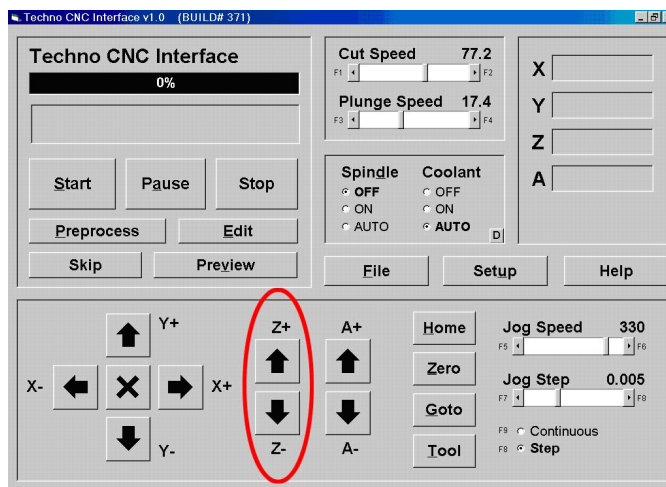
D. In the Interface, switch from **Continuous** to **Step** (just click on the **Step** radio button or pressing F8 on your keyboard, see picture).
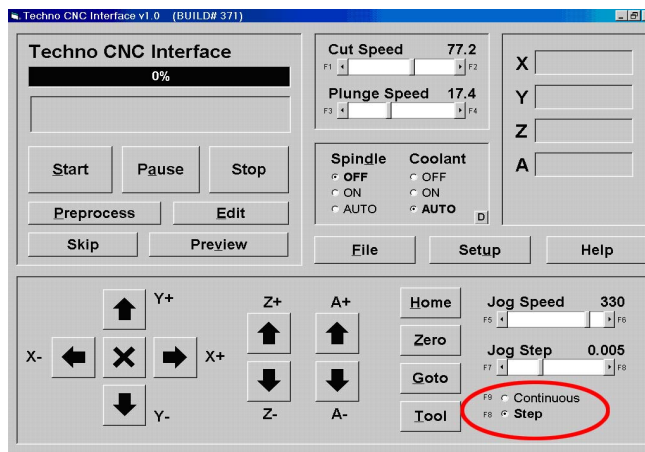
E. Now adjust the **Jog Step** controls to read 0.02 (or thereabouts).

This change from **Continuous** to **Step** allows you to set specific distances per one Jog-click. For example, after setting the Jog Step control to 0.02, every time you **single**-click the Z jog button, the Z-Axis will move **just** 0.02 in distance.
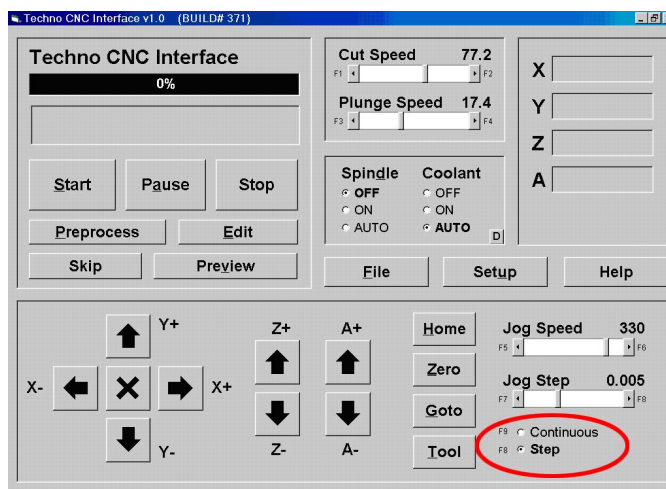
F: Slowly, Single-click the Z-axis down toward the paper until it's *almost*, but definitely not touching.

G. Now adjust the **Jog Step** controls again to read 0.005

39
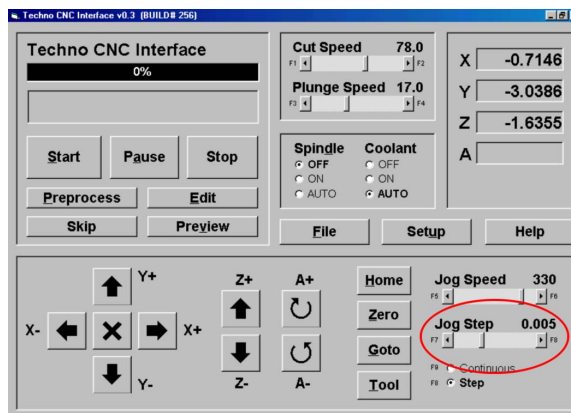
H. Now single-click the Z-axis toward the paper. Stop. Try to move the paper. If it moves freely, single-click again. Stop. Try to move paper.
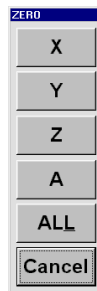
Continue this process until the cutter pinches the paper. Once the paper no longer moves, you are ready to zero the Z-axis.

J. Press Zero .

The **Zero** Window appears:

C. Press Z .

This will zero the Z-axis.

5. ZERO THE X AND Y AXES

A. Jog the X/Y axes to a central position on your gantry table.

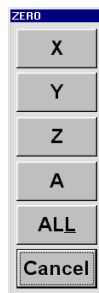**Note:** Zero positions are frequently set at the front left corner of your workpiece.

B. Press Zero .

The **Zero** Window appears:

C. Press X .

This will Zero the X-axis.

D. Repeat process for Y-axis.

IMPORTANT! DO NOT PROCEED UNTIL YOU REMOVE the cutting material from the gantry and Jog the Z-axis up a safe distance from the gantry table. This is just a Tutorial to familiarize the user with the tool change process and the Interface in general, NOT an actual cutting application! Remove the cutting material to set the Z part-zero position and jog the Z-axis up.

6. OPEN MANUAL TOOL CHANGE FILE

A. Press File .
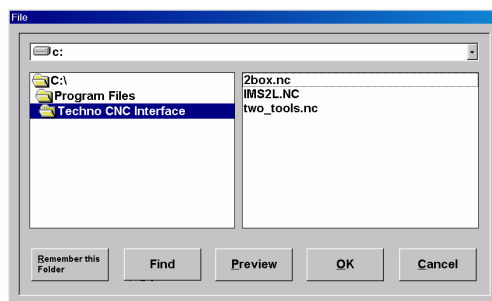
The **Open File** Window appears:
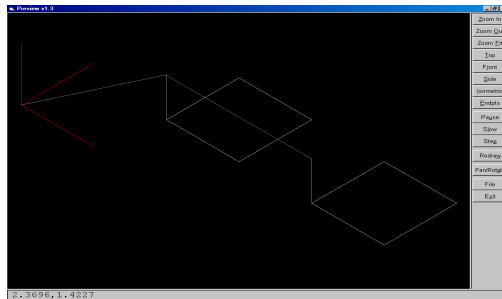
B. Highlight **2tools.nc** and press OK .

7. PREVIEW THE FILE

    A. Press **Preview** .
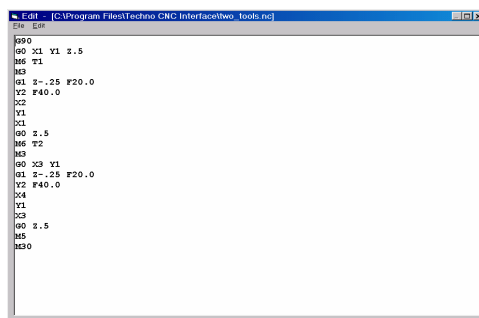
    The **Preview** Window appears:

    B. Manipulate the toolpath using the buttons along the right side.

    C. Press Exit to close window.

    D. Press **Edit** .

    The **Edit** Window appears:

Note: Step 5-D (Edit/Step) is not a mandatory function to run a file; it is, however, a useful feature to know.

    D. Press Close .

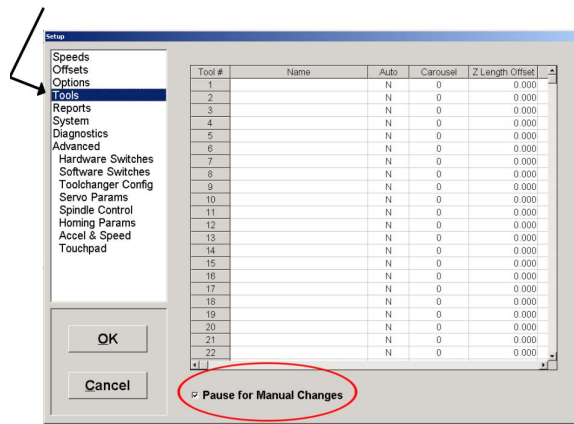**8.** SET THE **PAUSE FOR MANUAL CHANGES** FUNCTION IN SETUP

Warning: Do not change any parameters in Setup except those specified in this Tutorial. We will run **2tools.nc** using the Interface's default settings. Read the INTERFACE FUNCTIONS manual, before changing any parameters.

    A. Press **Setup** .

    The **Setup** Window appears.

Note: Navigate through the different bookmarked submenus by clicking on the names in the left-side display screen.

    B. Click on **Tools**

C. Select the **Pause for Manual Changes** function at the bottom of the **Setup/Tools** Window (see picture above). This function is activated when a check is in the box.

Note: This Tutorial also assumes your speeds/feeds are set correctly (i.e. in the neighborhood of 25 inches/per/minute).
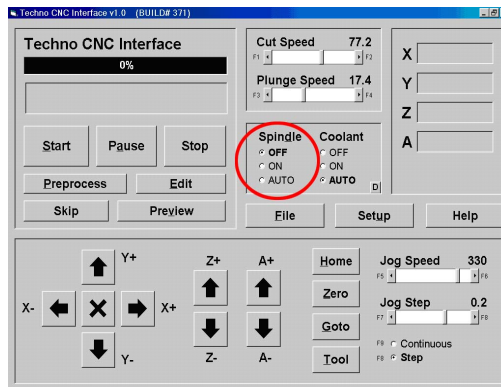
D. Press [**OK**] to exit **Setup** and to save any changes made.

9. PREPROCESS THE FILE

A. Press [**Preprocess**].

Watch the Progress bar move from left to right.

10. TURN SPINDLE POWER OFF

Since this is not a live cutting Tutorial, the Spindle does not need to be activated.
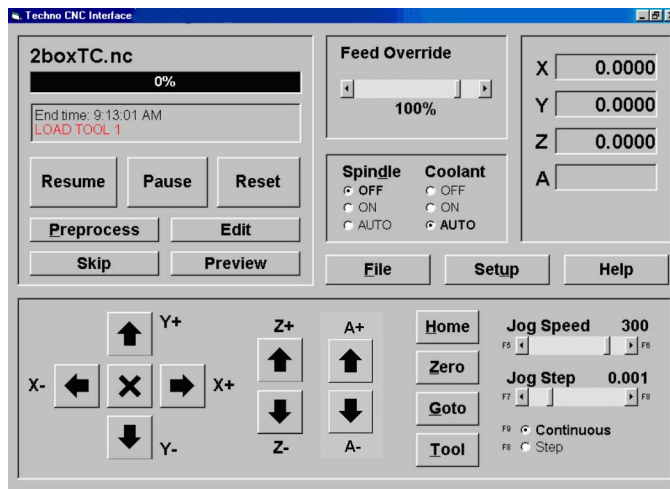
11. START THE FILE

Warning: Before you begin to run a file, remember the different methods you have to stop the program run. For emergencies always use the **E-Stop Button**, located on your controller or start stop box. For non emergencies or to pause and resume a program run, use the **Pause Button** on your Start Stop Box.

Check that your **Z-Axis** zero position provides enough space between the tool and the table so that when you run the file the tool does not plunge into the table. In addition to checking the **Z-Axis**, jog both the **X** and **Y Axes** to the center of the table because the file will not run if it is at the end of any axes.
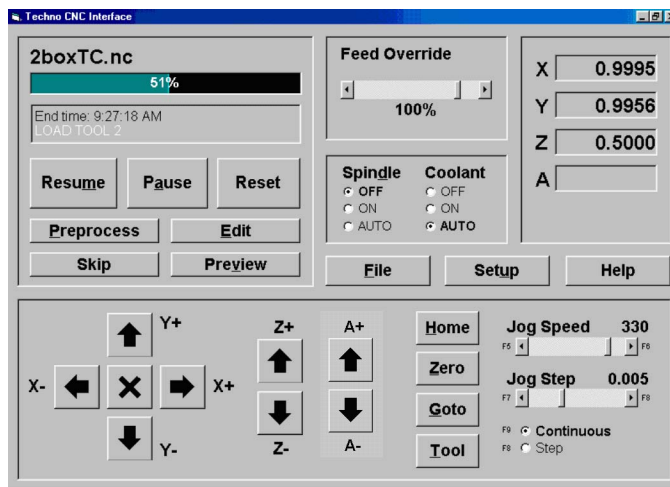
A. Press **Start** .

You will be prompted to load tool 1:

B. Since we already did that in Step 3, simply press **Resume** to start the program.

Approximately half way through the file, you will be instructed to load Tool 2.

Note: When the file stops for the tool change, if the Z-axis is too low for easy-access, jog the Z-axis up and/or over to perform the tool change.

Load tool 2 by following ALL the directions in Step 3, including zeroing the Z-axis (reset the cutting material so you can zero the new cutter using the same reference point(s) as the first). Simply, substitute tool 2 wherever it references tool 1.

C. Load cutter/tool 2.

D. Press **Resume** .

The Interface will now finish the program run using tool 2.