



# Automatic Tool Changer (ATC) Installation Manual



## Table of Contents

Introduction.....	3
ATC Installation (Mechanical).....	4
ATC Table and Spoil Board.....	4
Mount Tool Bar.....	5
Mount Tool Chuck.....	6
Mounting the Spindle.....	7
Install Pneumatic Assist.....	7
Spindle Cable and Wiring.....	8
Connecting the Pressure Switch.....	8
Connecting the Spindle.....	8
Connecting the VFD Logic Cable.....	9
Connecting and Wiring the Pneumatic Manifold.....	10
ATC Software Setup and Tool Calibration.....	13
Install the ATC Software.....	13
ShopBot Setup (TS).....	14
Software Inputs and Outputs Check.....	17
Inputs.....	17
Outputs.....	18
Basic Function Check.....	18
Additional function checks.....	19
Calibration Cables.....	19
Z Zero Plate.....	19
Fixed Z Zero Plate.....	19
Tool Draw Bar.....	19
Calibrating the ATC.....	20
Home Machine (C3).....	20
Calibration Routine (CN74).....	20
Step 1: Determine Z Height for Calibration.....	21
Step 2: Determine XY Position of Tool Clips.....	22
Step 3: Set Fixed Z-Zero Plate Location.....	23
Step 4: Setup Tool Holders.....	24
Step 5: Zero Tools in Rack (CN72) (Daily Operation).....	26
Step 6: Change Tools (C1).....	26
Step 7: Get Plate Offset (CN73).....	27
Step 8: Zero to Various Z Heights (C2) (Daily Operation).....	28
Regularly Used ATC Files.....	28
Create a Tool Change File.....	29
Spindle Warmup Routine (C5).....	30
Run the File.....	30
If Something Goes Wrong.....	30

## Introduction

The ShopBot Automatic Tool Changer (ATC) automates the bit changing process during projects that require multiple tool changes. The ATC reduces the time a project must remain on the machine by automatically changing bits between cuts, thus eliminating the need to change and calibrate tools by hand.

The ATC system includes:

- A 5HP HSD spindle
- A pneumatically-assisted Z-axis
  - Pneumatic assist line
  - ATC manifold
  - Filter/regulator with low pressure switch
- Six-position tool bar (standard for all width tools), expandable to:
  - 10 tool positions (four-foot wide tool)
  - 12 tool positions (five-foot wide tool)
  - 14 tool positions (six-foot wide tool)
- Fixed-position Z-zero plate
- Chuck holder
- Magnetically removable dust skirt
- ATC interface board

The 5HP HSD spindle assembly is fan-cooled. The ATC requires 7 scfm at 90 psi of clean, dry, un-oiled compressed air. **PORTABLE AIR COMPRESSORS ARE NOT RECOMMENDED**, as they can have trouble maintaining this pressure reliably and have a reduced service life.

The ShopBot ATC is available in the following voltages:

**(#22520) HSD ATC 5HP 220V 1PH PRS4**

**(#22521) HSD ATC 5HP 380/460V 3PH PRS4**

**(#22540) HSD ATC 5HP 230V 3PH PRS4**

## ATC Installation (Mechanical)

This section assumes that the ShopBot has been assembled using the instructions provided in the ShopBot assembly manual. This means that the ShopBot is at a point in which it is able to connect and move under the control of a computer. Wire/cable management may be left until the ATC installation has been completed.



### VERY IMPORTANT!

#### For New Table Setups

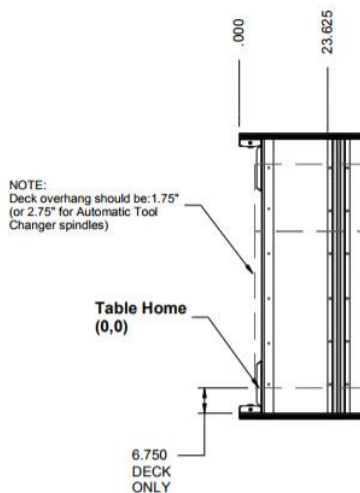
The location of the table legs and bed is extremely critical for an ATC tool. Excess overages of the bed in the X dimension could mean tooling collisions, insufficient cutting area, and dropped tooling. At the end of this section there is a table drawing that shows how the table should be set up. Pay close attention to the relationship between table sides, table legs, and the table surface.

#### For Previously Assembled Tables

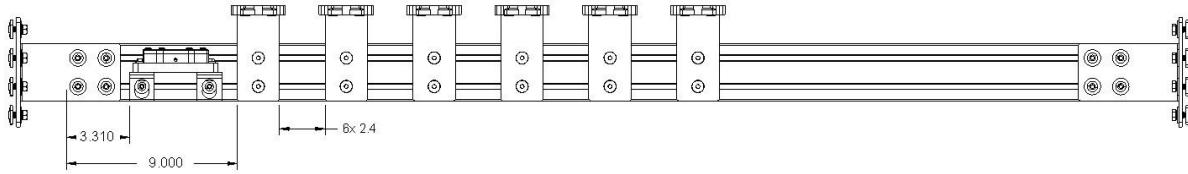
It is possible that the location of the table bed and/or table legs will need to be adjusted to allow for proper use of the ATC. If the table bed and table legs are not in the locations specified in this section (2.75" overhang from front of table), one available option is to move the table sides slightly to avoid replacing the entire table bed. To do this, loosen the bolts that are attached to the table side extrusions (on the sides 8 on each table leg and on the bottoms two on each upper support and cross support) and slide table sides in the positive X direction. The distance they need to be moved is the difference between their current position (usually 1") and the ideal position of 2.75".

## ATC Table and Spoil Board

As noted in the provided table drawings, ATC tools deck mounting should be 2.75" from the front cross support. Verify that the deck has been constructed properly at this time. If possible, wait to complete this document before continuing with deck assembly. Additionally ATC tools that are not equipped with Vacuum tables require a double layer of MDF spoilboard to ensure proper clearance over the ATC toolbar.



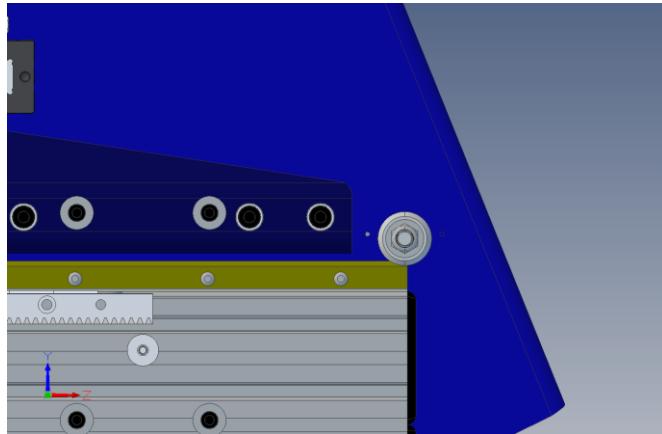
## Mount Tool Bar



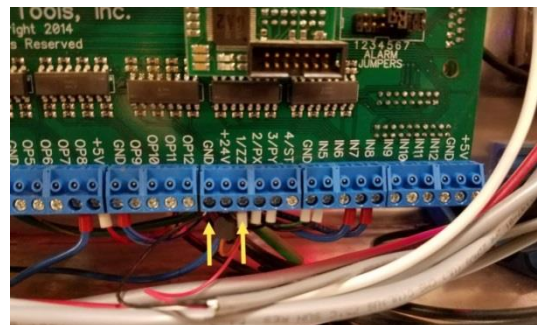
ATC toolbars are shipped pre-assembled. There are three different toolbar lengths, corresponding to 48", 60", and 72" wide tools. The toolbar is installed at the rear of the tool, and provides a mounting location for tool holder clips and fixed Z-zero plate. Toolbars include six tool holders standard. Bit diameter should not exceed 1.25" and total bit length should not exceed 5".

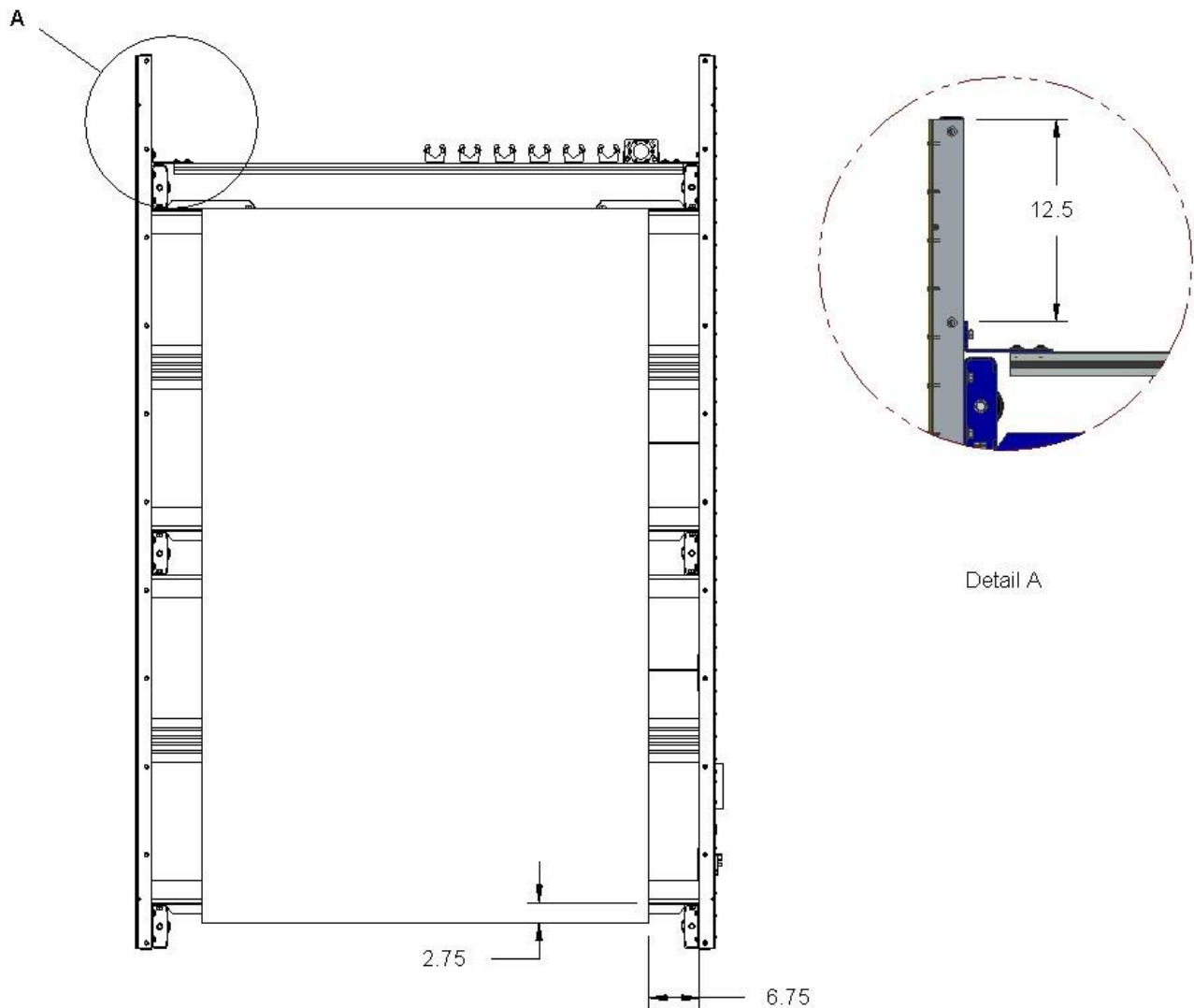
To mount the toolbar, use a 3/16" allen wrench to loosen the 4 button head cap screws connecting each of the two toolbar brackets such that they can be adjusted to span between the table sides. Remove hex cap screws and T-nuts from brackets. Slide T-nuts into the 4 inner slots of the table side. Toolbar brackets should be mounted 12.5" from the table end, as per the drawing on page 7. Before tightening, level the tool bar by placing a level on top of the extrusion in both directions (along X-axis and Y-axis of table) to ensure that the tool bar and table sides are aligned. Tighten with 1/2" wrench.

**Note:** Before fully tightening the mounting bolts, turn on the machine and move the gantry to the positive x extreme to ensure that the spindle will reach the toolbar without hitting the mechanical stops. Mechanical stops should be positioned such that the center of the rear gantry v-wheel's center reaches a minimum of 0.125" from the end of the rail.



The Fixed Z-zero plate can now be wired directly into the control box using the attached 2 conductor cable. Connect the cable to the plate with the attached WAGO connector and wire the black and red wires into ground and input 1 (ZZ) respectively on the control board. Any ground terminal on the control board may be used (the one in the picture may be used by another accessory).





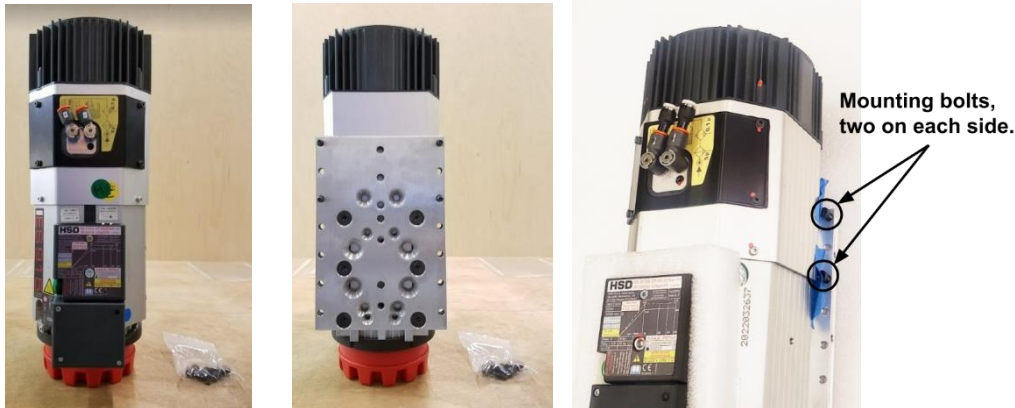
### Mount Tool Chuck

The tool chuck is used to hold the tool holder cone while changing collets and bits. Use 5/16"x3/4" button head screws and T-nuts to mount the tool chuck in the second slot from the bottom of the table extrusion on the inside of the rails. If this location is not optimal, mount the chuck where it is most convenient, taking care not to interfere with the movement of the gantry.





## Mounting the Spindle



The ShopBot ATC is equipped with a 5HP fan cooled HSD spindle. An ATC system requires a minimum of 7 scfm at 90 psi of clean, dry, un-oiled compressed air which will be internally regulated to the following pressures:

Pressure	Purpose
60 psi (4 bar)	Maintain Positive Pressure in spindle body, prevent contamination
90-100 psi (6-7 bar)	Internal drawbar that holds tool holders in place
60-90 psi (4-6 bar)	Pneumatic assist cylinder on Z-axis that balances the weight of the spindle

Power up the ShopBot and position the YZ car so that it is in a location where the front and back of the Z-axis may be reached.

Use the keypad mode (K) on the computer to move the Z-axis to a height close to the table's surface.

Position the ATC Spindle as shown (resting on the red cap) and move the Z-axis up or down using the keypad mode until the holes in the Z-axis align with the 4 mounting screws in the spindle plate. If the table has not yet been assembled, temporarily place a piece of plywood across the cross supports.

Gradually tighten spindle securely to Z-axis with four pre-mounted M6 x 25 socket head screws, and four more loosely packaged M6 x 25 socket head screws. You will find the four packaged screws in the box with the spindle collets and wrench. Depending on the height the spindle is mounted at, only 6 of the 8 screws may be able to be used.

### Install Pneumatic Assist

The pneumatic assist line should be installed as per document **SBG 00275-PRS4 Pneumatic Assist Install** at this time. Turn off the main air supply switch and verify that the gauge reads 0 psi. Leave the e-chains open during this step so the spindle cable can be run through them in the next step.

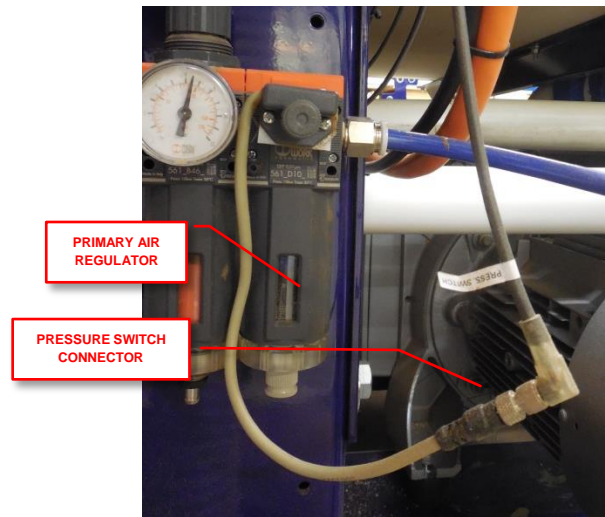


## Spindle Cable and Wiring

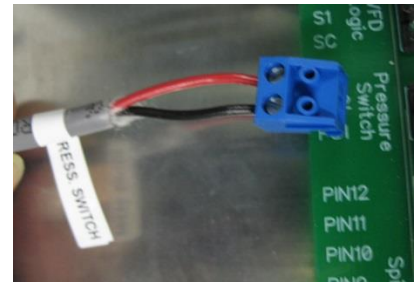
This portion of the installation covers spindle power and control box cabling as well as pneumatic lines.

### Connecting the Pressure Switch

Locate the pressure switch on the primary air regulator. Attach the threaded pressure switch cable to the wire coming out of the pressure switch. Route the two pin terminal block end into the control box.



Inside the control box, route the pressure switch cable to the ATC interface board. Connect the blue two pin terminal block to the location marked "pressure switch."



### Connecting the Spindle

Using a 3mm allen wrench, remove the small socket head screw from the front face of the spindle plug.





Plug the cables into the mating plug of the HSD spindle, taking note of the orientation of the cable plugs and being careful not to bend any of the pins. Insert the plug firmly into the socket and secure the socket head screw to lock the plug in place. Route the cabling from the spindle through the Y-axis E-chain into the control box and over to the left side of the ATC interface board.



Before locking cables into the Y-axis E-chain, manually move the Z-axis to both of its extents of travel to make sure there is enough slack in the cables for the Z-axis to move freely.

The spindle sensor cable has a 12 pin male Wago connector and will connect into the corresponding female piece on the ATC board inside the control box.



Find the female Wago connector on the board identified as "spindle sensor cable." Connect the male Wago connector into the ATC interface board.



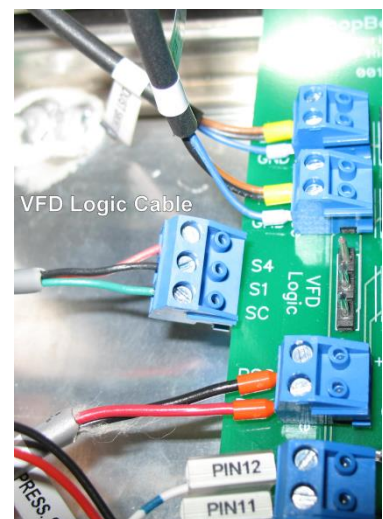
## Connecting the VFD Logic Cable

The VFD logic cable allows the ShopBot Control software to turn the spindle on and off.

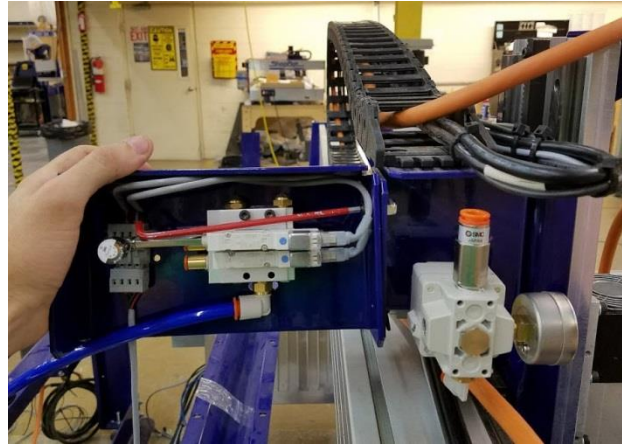
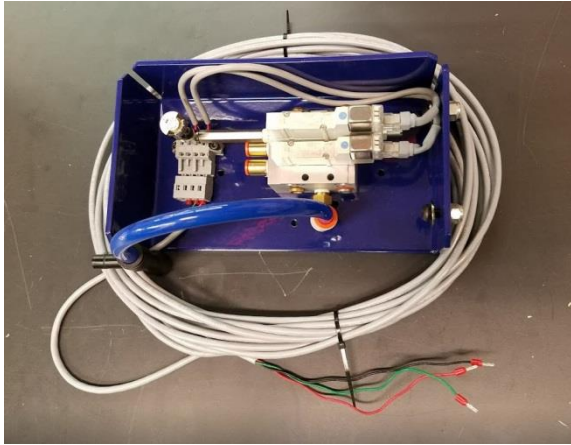
Starting at the VFD, find the cable marked "VFD Logic"

Inside the control box, connect the small blue terminal block to the location marked "VFD Logic" on the ATC board.

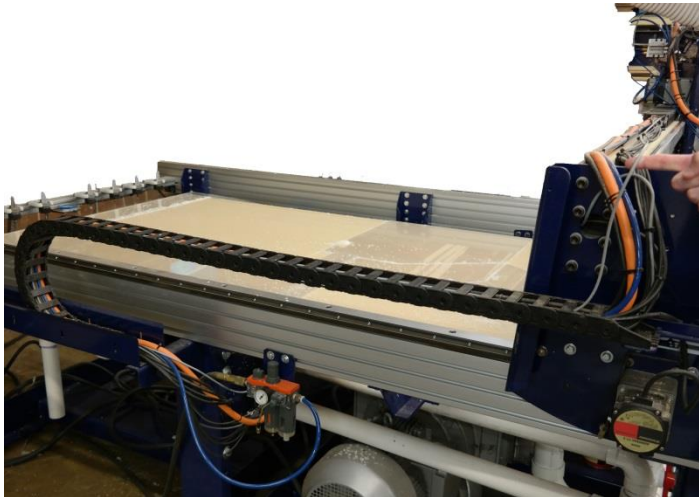
Ensure the wires are attached with red connected to S4, black connected to S1, and green connected to SC.



## Connecting and Wiring the Pneumatic Manifold

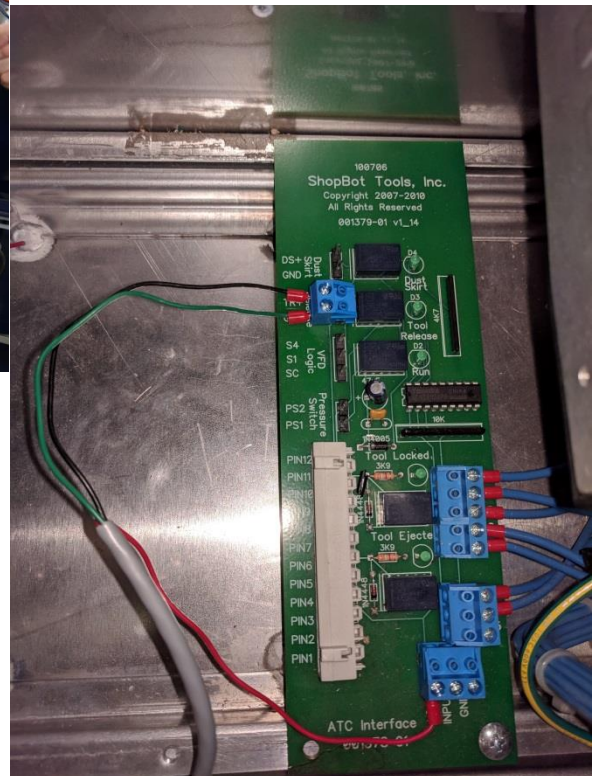


Using a 4mm hex wrench and adjustable wrench, connect the ATC manifold to the Y-Echain Bracket on the rear of the YZ car using the pair of pre-mounted hardware as shown above.



Run the ferruled side of the 3-conductor 30' ATC cable from the pneumatic manifold through the Y and X cable carriers and into the control box.

If the ATC was purchased with a new machine, this cable will be pre-wired through the Y cable carrier. Connect this cable to the harness on the ATC manifold. The cable should already be run through the X cable carrier with the rest of the motor wires at this point and the end should be in the control box. Connect the cable to the ATC interface board as shown in the picture to the right.



**Black** to TR+ on "Tool Release" Terminals  
**Green** to GND on "Tool Release" Terminals  
**Red** to +24V at bottom of board as shown to the right

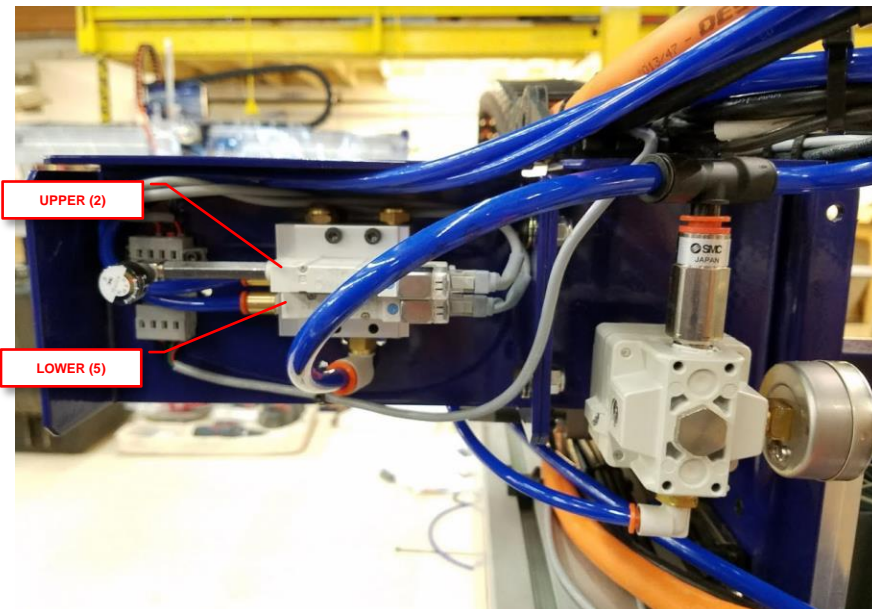
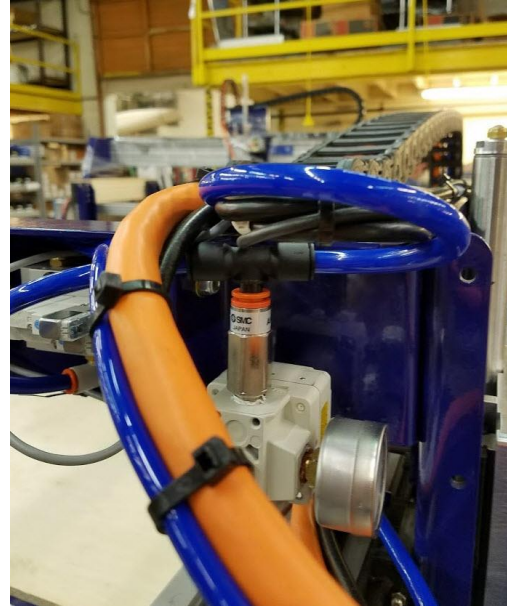


The 3/8" hose with a T-fitting on the end can now be run to the regulator. The T-fitting should be inserted into the regulator stem first as shown in the picture at right.

Run the pair of 1/4" blue tubes included with the pneumatics manifold from push-in connectors on the manifold to the push-in connectors marked **5** and **2** on the spindle.

The spindle's push-in connector marked **5** should connect to the lower of the two push-in connectors on the manifold (this is the spindle's drawbar which will actuate tool pickup and release).

The spindle's push in connector marked **2** should run to the upper of the two push in connectors on the manifold with a regulator (this is supply for positive pressure air to the spindle which will remain open when the tool is on). The lines are longer than they need to be for many applications and can be trimmed with a utility knife or pair of sharp scissors.



Turn on the pneumatics switch at the filter regulator manifold (near control box mounted to the table side) and verify that the pressure there is between 90 and 100 psi. Using too long of an air hose or an air hose of a small diameter can cause a lower pressure at the tool than what the main compressor tank is capable of. Using at least a 3/8" diameter air hose that is a maximum of 50' in length is recommended.

The small regulator for the spindle's positive pressure should be set to 60 psi (note that the gauge reads in 1/10ths). The red LED on the positive pressure solenoid should be on when the control box is on and the drivers are reset.



## ATC Software Setup and Tool Calibration

This portion of the installation covers the software setup and tool calibration.

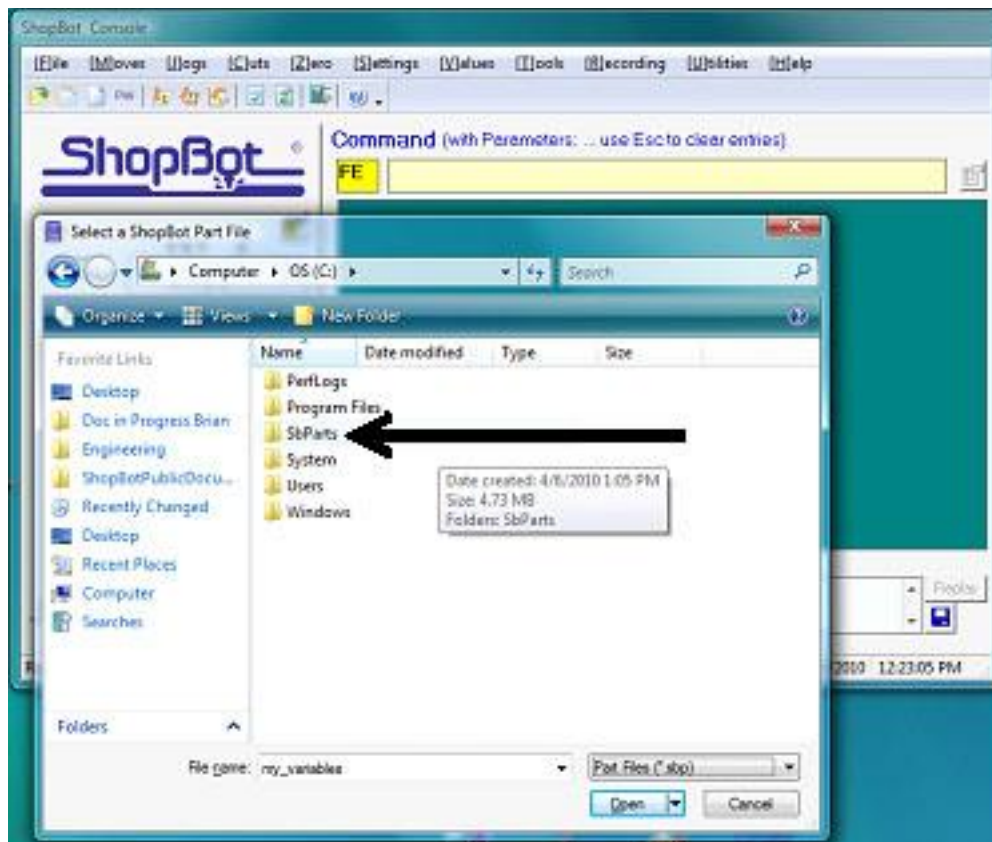
### Install the ATC Software

Download the latest ShopBot control software from the ShopBot website:

<http://www.shopbottools.com/mSupport/controlsoftware.htm>

If an earlier version of the ShopBot control software is present, uninstall the software and install the most recent version. Refer to “Uninstall/Reinstall ShopBot and VCarve Software”

at <http://www.shopbottools.com/ShopBotDocs/software.htm>

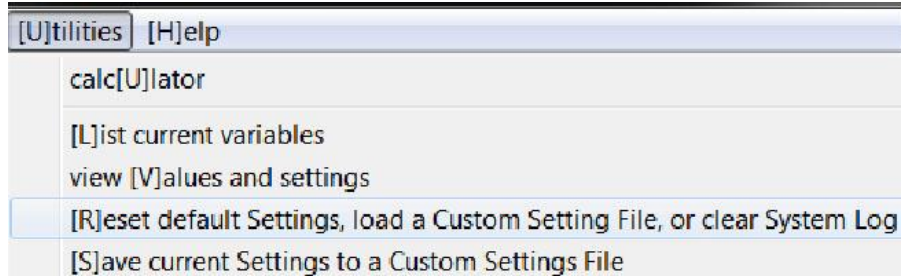


**Note:** If there are personal files within the “SbParts” folder, be sure to rename or move this folder so the files are not lost.

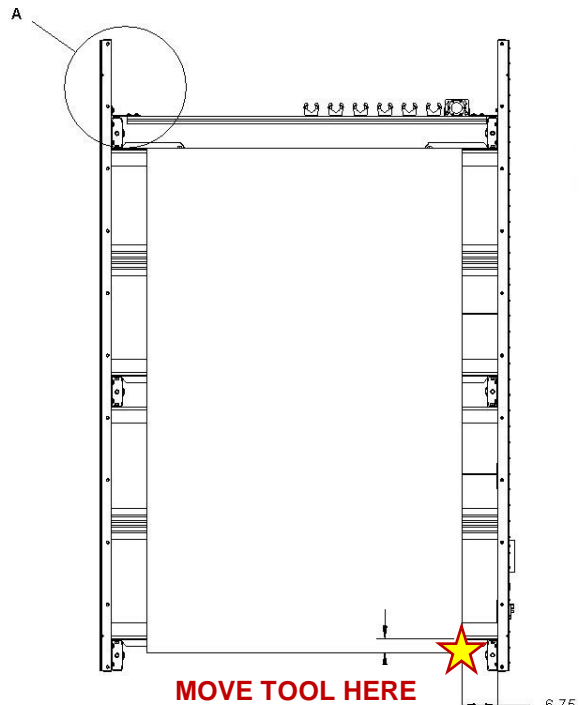
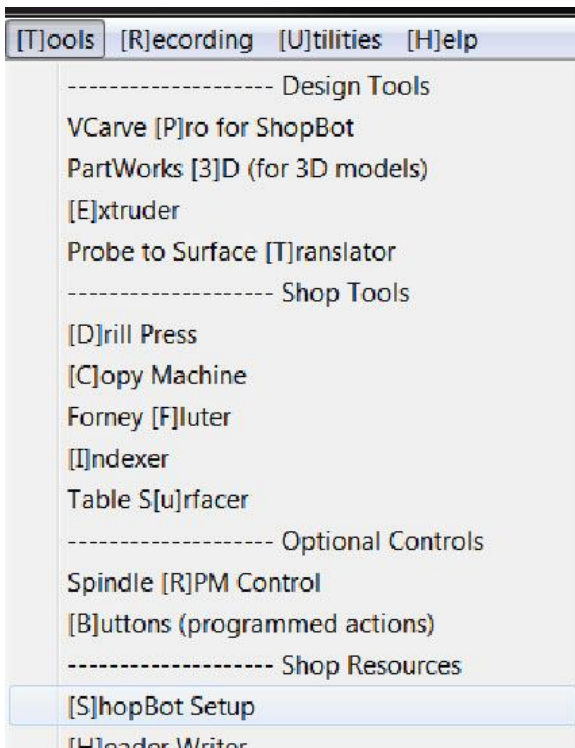


## ShopBot Setup (TS)

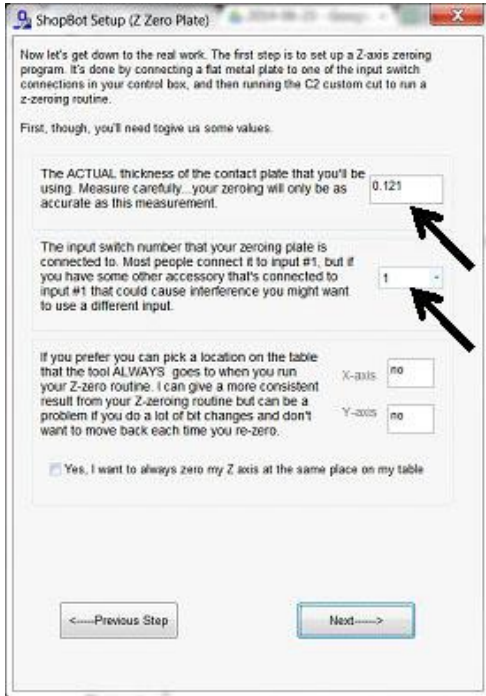
Type in “UR” or go to “Utilities” pull-down menu and select “Reset default Settings”. Select the file name that correctly describes the table size, making sure it ends with ATC.



Move the cutter to the location that is to be “0, 0” (the reference point for programming) on the table. Open the ShopBot control software and open the “ShopBot Setup” file in the “Tools” drop-down (TS). Read through the window and click “Next”. The second window is the “Tool Settings”.

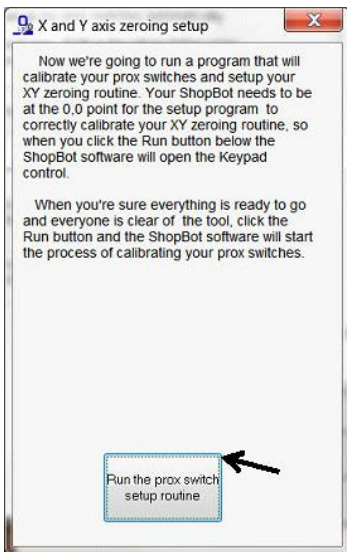
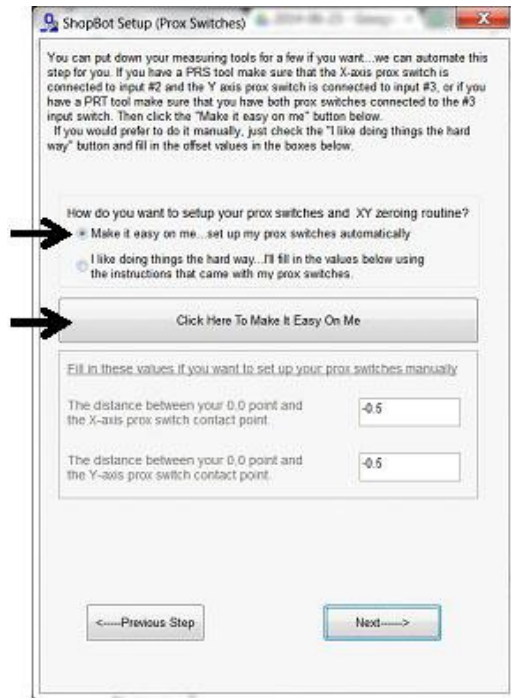


Go step-by-step through this window while verifying information about the machine. Make sure that the check boxes for the Z zero plate and proximity switches are checked at the bottom of the window. Select the radio button marked ATC4. (If your ATC tool has a pneumatically actuated dust foot please call ShopBot for support and an alternate document).

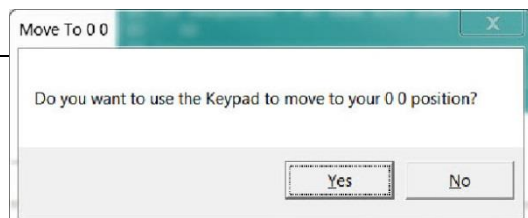


In the “ShopBot Setup (Z Zero Plate)” screen, measure the thickness of the plate and enter that value. Make sure the input switch is set to “1”. DO NOT check the “Yes, I want to always zero my Z axis at the same place on my table”. Click “Next”

At the “ShopBot Setup (Prox Switches)” screen, select “Make it easy on me...” and click the “Click Here To Make It Easy On Me” button to start the zeroing routine.

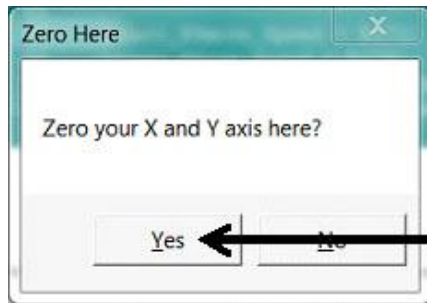


The next screen is “X and Y axis zeroing setup”. Read this screen and click “Run the prox switch setup routine”.

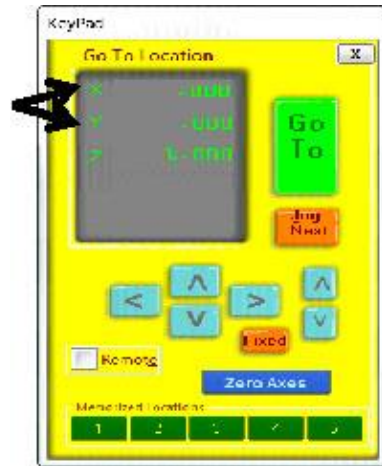


Follow the prompts from the pop-up screens. Select “Yes” to open the keypad for any adjustment to the “0, 0” home position, then click “OK”.

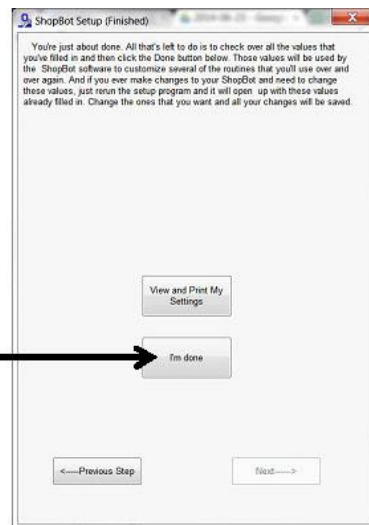
Move the machine to the zero point, and hit “ESC” to exit the keypad mode.



Click “Yes” to zero out the X and Y axes and click “OK”.



Read through the “ShopBot Setup (Finished)” window and click “I’m done.”



## Software Inputs and Outputs Check

Ensure that all of the inputs and outputs are being recognized by the automatic tool changer (ATC) by checking for each of the cases outlined in this section.

### Inputs

Inputs are signals that the software receives from devices that cause the tool to have a specific reaction.

**Input 1** – The Z zero plate and the fixed Z zero are connected to this input. When either of these plates are connected to a ground, the circuit is closed and input “1” on the ShopBot position screen lights up. The tool’s fixed z-zero plate does not require a grounding clip, however use of the standard z-zero plate does.

**Input 2** – The X-axis proximity switch is connected to this input. During normal operation, the input “2” light will be off in the ShopBot position screen. If the X-axis proximity switch passes the proximity targets, the light will turn on. Among other things, this feature will be used for homing the X and Y positions and for limiting the safe table cutting boundaries.

**Input 3** – The Y-axis proximity switch is connected to this input. During normal operation, the input “3” light will be off in the ShopBot position screen. If the Y-axis proximity switch passes the proximity targets, the light will turn on. Among other things, this feature will be used for homing the X and Y positions and for limiting the safe table cutting boundaries.

**Input 4** – This input is connected to the stop switch. When active, the switch allows for use of the tool and when inactive, the connection is severed and the tool comes to a stop.

**Input 5** – The Z-axis proximity switch is connected to this input. During normal operation, the input “5” light will be ON in the ShopBot position screen. When the Z-axis proximity switch passes the proximity targets, the light will be turned OFF. This switch will be used most often for a reference location in zeroing the bits in the tool rack and for limiting the safe Z cutting boundary.

**Input 6** – NA

**Input 7** – Drawbar closed. Lights when tool holder is properly inserted into spindle and clamped.

**Input 8** – Drawbar open. Lights when tool holder is ejected.

## Outputs

Outputs are signals that ShopBot software is sending to cause a desired action. Unused outputs can be programed to activate other peripherals using an optional relay board.

**Output 1** – Runs the spindle.

**Output 2** – NA

**Output 3** – NA

**Output 4** – Turns on during machine operation (safety flashing screen). Required for spindle “on” signal.

**Output 5** – NA

**Output 6** - NA

**Output 7** – NA

**Output 8** - Toggles the spindle drawbar open /close (releases tool holders from spindle).

**Caution: When the spindle is not spinning it is possible to drop the tools from the spindle if Output 8 is activated.**

## Basic Function Check

Check that all systems involved are working properly, starting with the proximity switches.



In keypad mode (K) move the X-axis into the proximity target using the left arrow on the keypad. The proximity switch will have a red LED lit until it comes across the proximity target, when it will turn off. Moving off the top of the target should cause the LED to come back on. This should also be evident in the ShopBot position screen when looking at input “2”, the light will turn from black (normally closed) to green (open).

In keypad mode (K), move the Y-axis into the proximity target using the down arrow on the keypad. The proximity switch will have a red LED lit until it comes across the proximity target, when it will turn off. Moving off of the target should cause the LED to come back on. This should also be evident in the ShopBot position screen when looking at input “3”.



In keypad mode (K), move the Z-axis into the proximity target using “Page Up” on the keypad. The proximity switch will have a red LED lit until it comes across the proximity target, when it will turn off. Moving off the top of the target should cause the LED to come back on. This should also be evident in the ShopBot position screen when looking at input “5”. Input “5” will appear green until the target is hit then the input goes black.



## Additional function checks

### Calibration Cables

To check calibration cables, insert plug end of the calibration and grounding clip into socket located on the YZ car. If the Z zero plate is connected to this socket, you will have to unplug it to connect the calibration cables. The calibration clip will be designated by the red grips and the grounding clip by the black grips.



Touch the calibration clip (red) to the grounding clip (black) and make sure that input “1” lights up green on the ShopBot position screen.

### Z Zero Plate

To check the Z zero plate, insert the plug end of the Z zero plate cable into the socket located on the YZ car. If the calibration cables are connected to this socket, you will have to unplug them to connect the Z Zero plate.

Touch the Z zero plate grounding clip to the Z zero plate and make sure that input “1” lights up green on the position screen.

### Fixed Z Zero Plate

To check the fixed Z zero plate, simply press down firmly on the plate. Input “1” should light up green on the position screen while the plate is pressed. The light should go off again when the plate is released.



### Tool Draw Bar

Make sure your compressed air supply is on for the following checks.

Press the green button on the side of the spindle. While the button is depressed the internal draw bar will open, allowing the spindle to accept tools. While the draw bar is open, a rush of air will be heard, and input “8” will be lit.

With the green button still depressed, insert a tool holder into the spindle and hold it there.

Release the green button. The drawbar will close, capturing the tool holder. Input "7" should light up, and input "8" should turn off.



## Calibrating the ATC

### Home Machine (C3)

Type C3 in the ShopBot 3 software or use the XY home icon in the position window. The tool should end up at the home location previously set in the ShopBot Setup routine.

### Calibration Routine (CN74)

The ATC calibration routine (CN74) is programmed to find and record the clip locations. This document will walk through the process.

Take out the calibration clip and drill rod that came with the ATC. Connect the Wago plug to the mating socket on the YZ car. The grounding clip is also attached to this same plug.



The red calibration clip will be clipped to the bottom of an empty tool holder as it is moved through all of the clip positions.

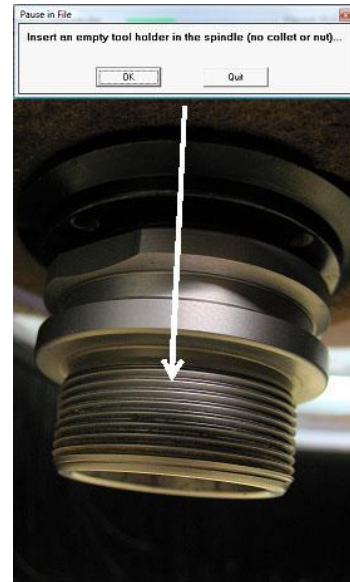
The black clip is will be clipped to the tool holder that is in the spindle.

Type "CN74" into the ShopBot 3 software to begin the routine. Enter the number of tool clips that are mounted on the ATC.

Click yes if X and Y were zeroed. Otherwise, click "No" and return to the Homing the Machine (C3) step.

### Step 1: Determine Z Height for Calibration

Press the green button located on the side of the spindle, and insert an empty tool holder.

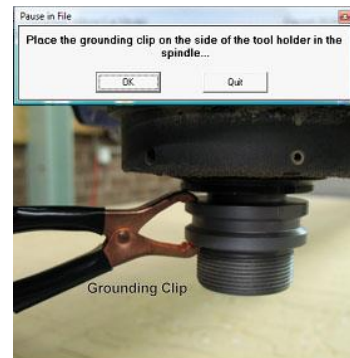


Place a second, empty tool holder, inverted in clip position #1.

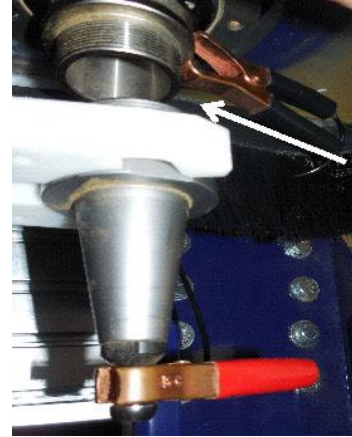
Use the keypad to move the spindle over the inverted tool holder in clip position #1. Position the two faces about 1 inch apart and visually center the top tool holder over the inverted one as closely as possible. Hit "ESC".



Place the black grounding clip on the tool holder in the spindle.



Place the red calibration clip on the bottom of the inverted tool holder in position #1.



Click OK to make the Z-axis move down and touch off the inverted tool holder and then raise up to a safe distance and move back towards Y=0.

Click "OK" to continue.

Press the green button to remove the empty tool holder in the spindle.

**Caution: Grasp the tool holder before pressing the green button.**

## Step 2: Determine XY Position of Tool Clips

Snap the 1/4" collet into the collet nut, then screw the assembly onto the tool holder. Insert the 1/4" drill rod into the collet and tighten. Press the green button to place the tool holder with the drill rod back into the spindle.



Clip the black grounding clip to the top of the drill rod and the red calibration clip to the bottom of the inverted tool holder.

Use the keypad to lower the Z-axis so that the drill rod is about 1/4" below the plane of the inverted tool holder. Make sure that the grounding clip is not between the drill rod and the side of the tool holder.

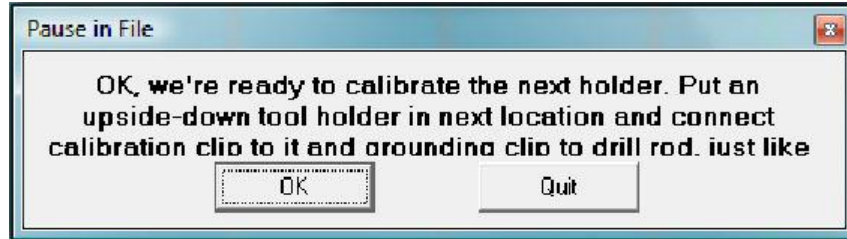


**Note:** This should only be a move in the Z-axis so that the tip of the drill rod is below the top edge of inverted clip. Do not move X or Y axes.

The ShopBot will run a routine and then prompt for the next clip position. Hit "ESC" to continue.

**Note:** The routine will start on the outside edges before touching off the inside edges.

Move the inverted tool holder to the next clip position and repeat the procedure for every clip position indicated at the beginning of the file.



**Note:** If something goes wrong during the file, the calibration routine will need to be restarted (C3).

Read every screen and double-check before clicking to the next page. Done properly, this will only need to be done once.

### Step 3: Set Fixed Z-Zero Plate Location

Run the homing routine (C3) to be sure everything is zeroed.

Load the file "ATC\_FixZ\_Plate.sbp" located in "C:\SbParts\Custom\ATC\ ATC\_FixZ\_Plate.sbp". This file will set the location of the fixed Z zero plate to set a base zero height of the bits. This should only need to be run once during the setup procedures.

Click "OK".

Use the keypad to move the spindle over the center of the fixed Z zero plate. Once satisfied with the positioning of the spindle, hit "ESC". This will set the fixed Z zero plate location in the X and Y.





#### Step 4: Setup Tool Holders

Locate the tool holder, collet, collet nut, and desired bit. Make sure that the collet is sized for the shank diameter of the bit that will be installed.

Drop a tool holder (cone side down) into the tool chuck.



Press and hold the button on the side of the tool chuck. Rotate the tool holder until it seats into the chuck. Release the button to lock it into place.



Snap the collet into the collet nut and thread the assembly onto the tool holder. Ensure the collet is the correct size for the bit needed.



Install the bit in the collet and hand tighten the collet nut so that the bit does not slip down into the collet.



Tighten the collet nut to 100 ft/lbs with the ER32 spanner wrench.  
Do not over-tighten.



Press the button on the tool chuck to remove the tool holder from the tool chuck. Remove the tool holder from the tool chuck.



Place the loaded tool holders into the desired clip locations.  
Do not put one into the spindle at this time. Make sure the bits are facing **down**.



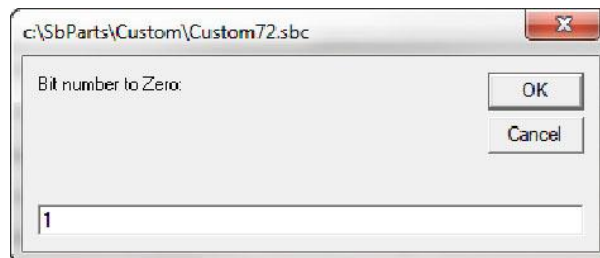
## Step 5: Zero Tools in Rack (CN72) (Daily Operation)

This step will zero each tool in the rack to ensure that bits of different lengths will all cut to the same depth. It is good practice to run this full routine (for all bits) at the beginning of each work period. If a new bit is added to the rack (or an existing bit is replaced), use this routine to calibrate it to the other bits in the rack.

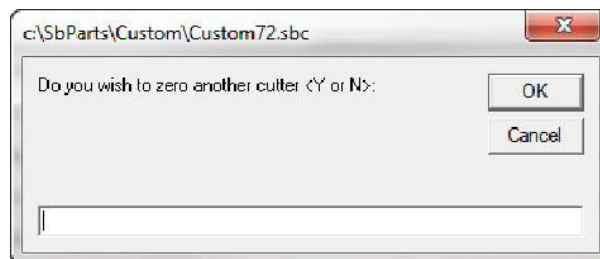
Ensure that there is no tool holder in the spindle. Run the homing routine (C3). A screen will open confirming that tool #0 (empty spindle) is correct.

Type "CN72" (custom number 72), to run the ATC zero tools in rack file.

Enter the number of the bit to zero and then click "OK". The tool will move to the fixed z-zero plate and plunge until it makes contact with the plate)

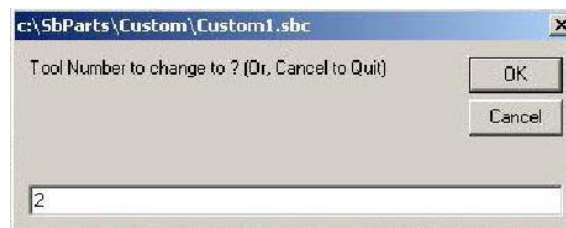


If more bits need to be zeroed, answer "YES". If not, then type "N". Click "OK" to continue.



## Step 6: Change Tools (C1)

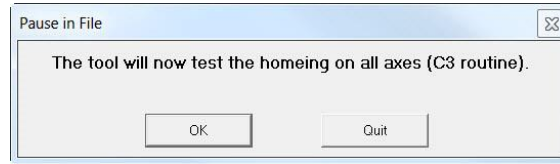
Insert bit into conical tool holder and place it in the desired tool clip location. Type C1 to run the custom number 1 "Change Tools" routine. A screen will ask which tool should be selected. Once that tool is entered, click "OK" and the ATC will drop off the current tool being held and select the desired tool. If there is currently a tool in the spindle be sure that there is an empty tool clip in the correct location to receive it.



To check what tool the software thinks is in the spindle head, open "C:\Sbparts\Custom\ATC\_Local\_Data\ATC\_tool\_variables.sbc".

Look at line #3, &ToolIn= (Current tool) will show the tool last changed to.

## Step 7: Get Plate Offset (CN73)



**Note:** This file is included with ShopBot Versions 3.8.28 and later. Users of earlier version can add it by contacting ShopBot technical support.

This routine will establish where the C3 (XYZ zero) routine will set the Z zero level. Normally this is at the table bed. This routine needs to be run whenever the location of the table bed has changed, such as after re-surfacing the spoilboard. If a tool is not loaded in the spindle, select one before running this routine. Any tool can be used as they have all been zeroed to the fixed plate. Type “CN73” (custom number 73) in the ShopBot control software to run the ATC get plate offset file.

Use the keypad to move to the location where the Z level is located. If zeroing to a specific fixture, move the tool over it. Close the keypad when the tool is at the desired position.



Place the grounding clip on the collet or bit and place the regular Z zero plate below the bit (this routine does not use the fixed Z zero plate). Click “OK”, and the routine will touch off the zero plate and save the offset from the fixed Z zero plate. When the plate is removed, the tool will confirm the proximity switch locations and new Z zero level.

Every time the C3 routine is run the tool will be zeroed at this stored level.

**NOTE:** Pay attention to where Z zero is set in the CAM file to avoid damaging the table surface or cutting the wrong depth.

## Step 8: Zero to Various Z Heights (C2) (Daily Operation)

ATC users will only have to zero one bit to their material or bed height each time the Z zero position is changed. The remaining bits in the tool rack will also reference the new position.

Once all of the bits have been zeroed to the fixed Z zero plate, any bit can be used to zero to the surface using the regular Z zero plate.



When the bit is located over the area needed to set as zero, type "C2" ("Zero Z-Axis w/ Z zero Plate").

Place the Z zero plate under the bit and place the grounding clip on it. Click "OK" when both are in place. The Z-axis will touch off the plate twice, and record this distance for use on all the tools until this Z offset is reset.

This records a Z offset height within the ShopBot user variables and applies this to all the other tools in the tool rack.



Note that the Z offset is reset to the Z home position any time the C3 routine is run. To permanently change the Z home position, refer to the Get plate offset (CN73) section of this document.

## Regularly Used ATC Files

C1	Change tool
C2	Zero Z-axis using Z-zero plate
C3	Home X, Y, and Z-axes using proximity switches
C5	Spindle warmup routine
C6	Turn spindle on
C7	Turn spindle off
C9	Automatic tool change called within a part file
CN72	Zero tools in rack
CN73	Get plate offset (set Z-axis home position)
CN74	Calibration for tools in rack

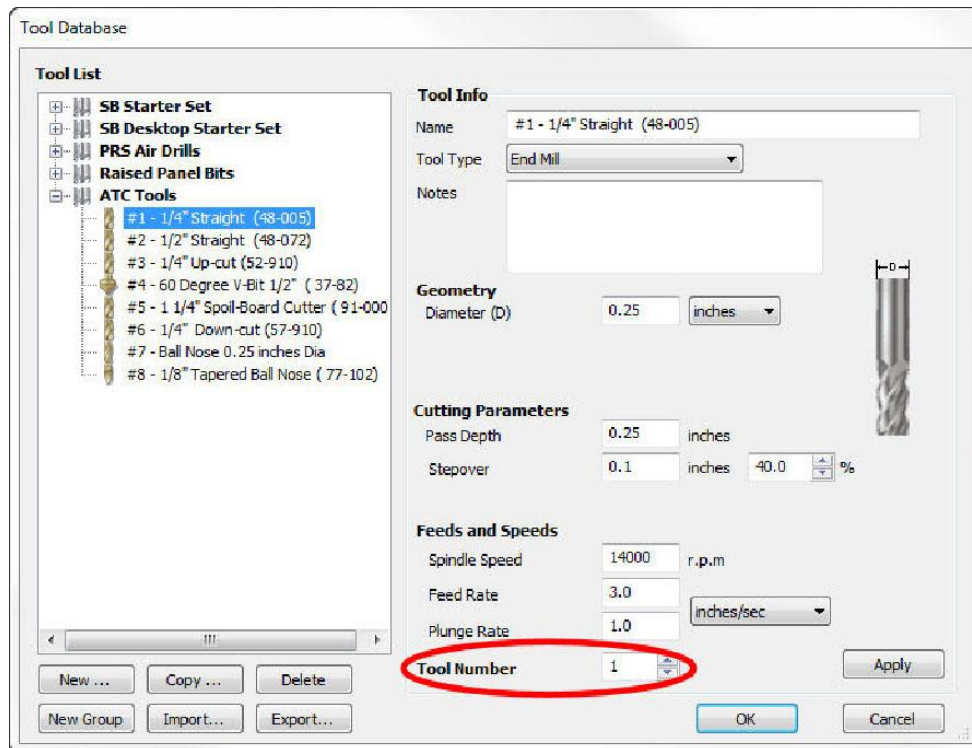


## Create a Tool Change File

The design software must first have the information to enable the ATC to do a tool change. For the software to work correctly, the tooling must be designated to specify particular tool holders.

When setting up a tool database inside the design software, create a group named “Tool Changer” or “ATC”. This will allow separation of tools that are setup specifically for the tool changer.

Within the group, create new tools that will be used with the ATC. The tools created need to have the same tool number in the characteristics of the tool as the location of that tool holder on the ATC. This tool number within the design software is what dictates what tool is selected during the tool changing process.



Create a drawing within the design software and toolpath it using the tools under the tool changer group that you have created. When all toolpaths are created, set the order of the tool paths under the Toolpath List. Select the save icon (disk) under “Toolpath Operations”. Make sure that the proper post processor is selected. In VCarve Pro it will read:

ShopBot TC (Inch)(\* .sbp) or ShopBot TC (MM)(\* .sbp).

In Aspire it will be:

ShopBot(inch)(Toolchange)w/speed(\* .sbp) or ShopBot(mm)(Toolchange)w/speed(\* .sbp).

**NOTE: Pay attention to where Z zero is set in the CAM file to avoid damaging the table surface or cutting the wrong depth.**

## **Spindle Warmup Routine (C5)**

Before running an ATC file, make sure that the spindle has been properly warmed-up. Failure to warm the spindle could lead to premature spindle failure. Type C5 (“Spindle Warm-up Routine”) to start the 9 minute routine that ramps the RPM through 3 different speeds and then shuts off. If the machine sets idle for longer than an hour, run the warm-up routine. If unsure whether or not to run the warm-up cycle, go ahead and run it to be safe.

## **Run the File**

Open the file and run by typing (FP) or clicking the “Load Part File” button on the ShopBot position screen.

## **If Something Goes Wrong**

If for some reason the ATC does something that is out of sorts, use the (C3) command. This will home the machine and reset it back to the original table base coordinates. Always verify X, Y, and Z locations before continuing.