



Desktop MAX Automatic Tool Changer (ATC) User Manual



Read “Desktop MAX Quick Start Guide” before continuing with this document

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Introduction

Before continuing with the ATC setup it is important to have followed the “[Desktop MAX Quick Start Guide](#)”

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:

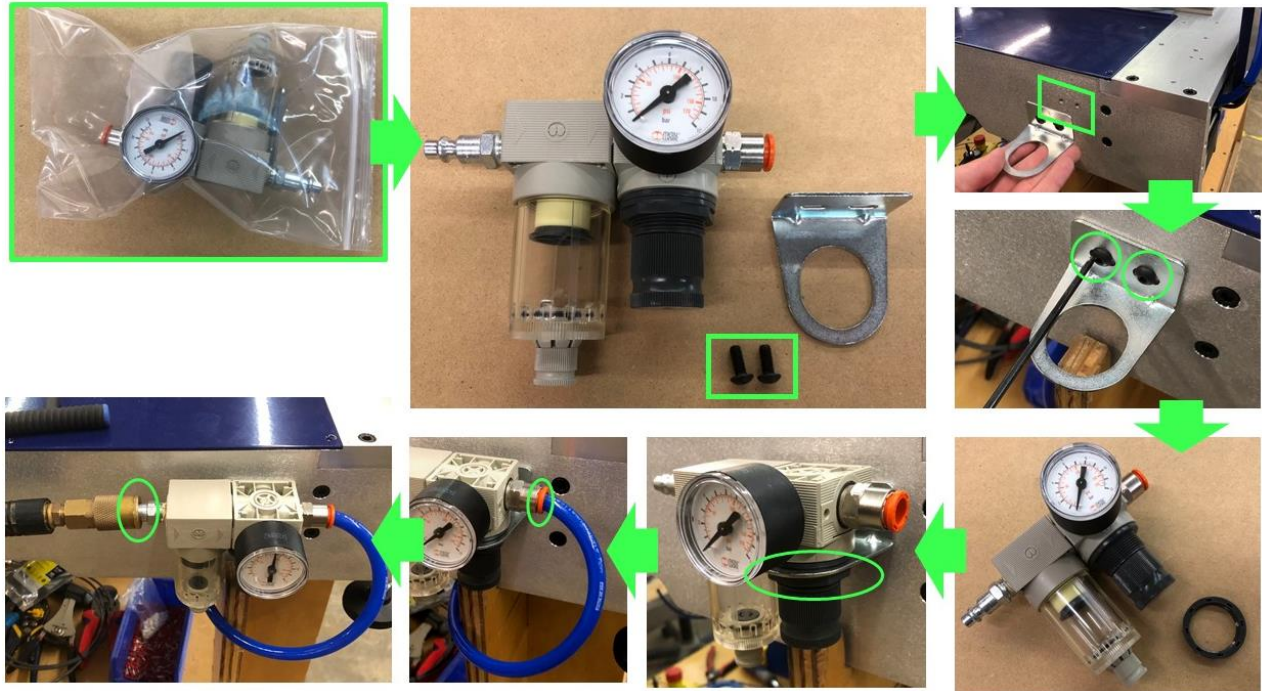
- A 1HP Teknomotor spindle
- Filter/regulator with low pressure switch
- Six-position tool bar
- Magnetically removable dust skirt
- ATC interface board

The 1HP Teknomotor spindle assembly is fan-cooled. The ATC requires 4 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.

It is not recommended to leave a tool holder in the ATC spindle when not using the machine. When you are done using the machine all tool holders should be removed and stored in the tool rack at the rear of the tool. Using the software to change to tool #0 (explained on page 17) will accomplish this.

Connecting the Pneumatics

Locate the filter/regulator included with your tool. Inside the bag will be a mounting bracket and two M5x12mm Button Head Screws. First, attach the mounting bracket to the rear of the tool on the corner opposite the red power switch. Remove the plastic nut from the regulator and drop the regulator into the bracket and thread the nut onto the regulator to lock it in place. Pull the blue main pneumatics hose from under the tool and insert it into the orange quick-connect fitting. Plug your shop's air-line into the fitting on the left side of the filter.



ATC Software Setup and Tool Calibration

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

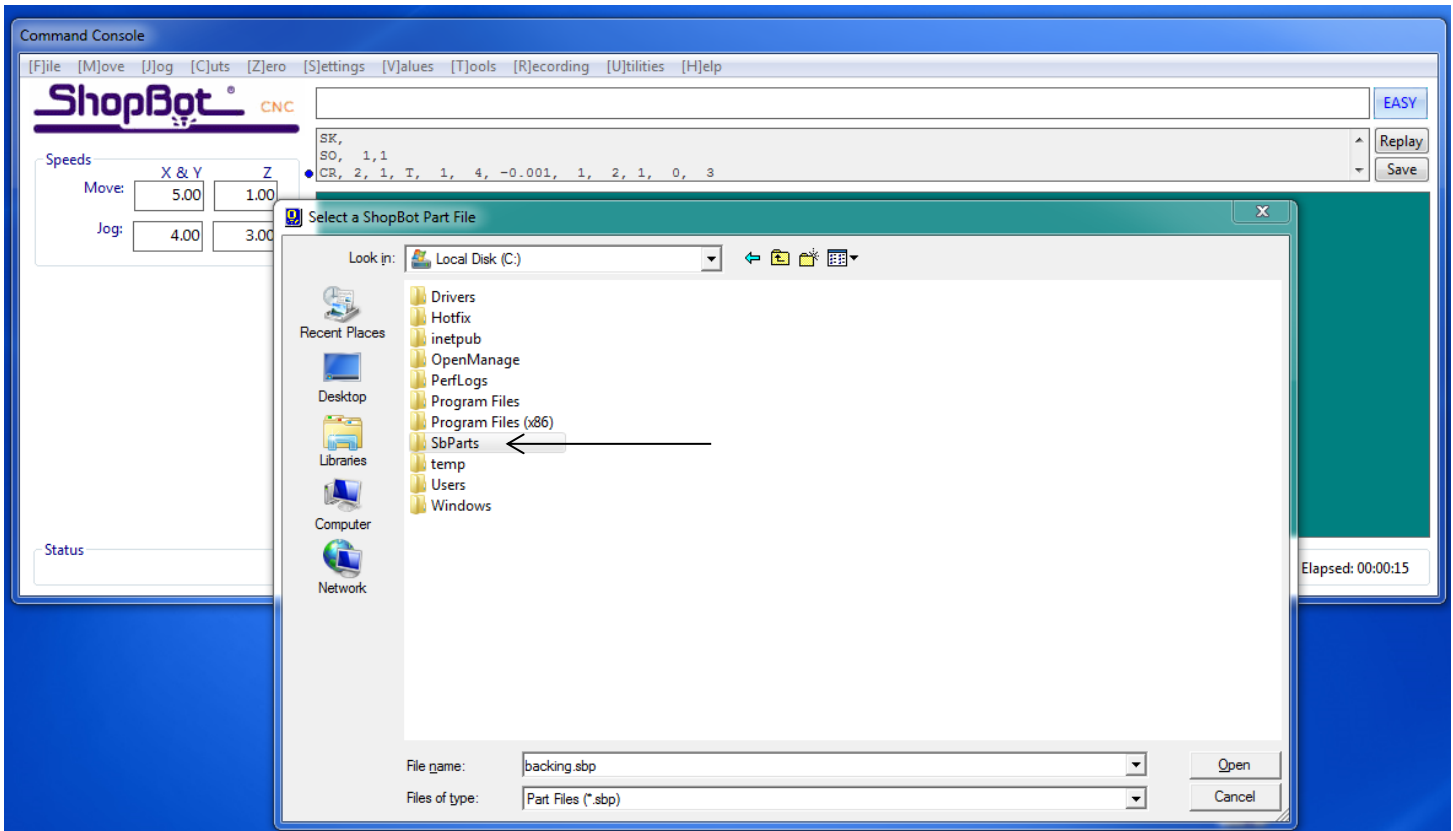
Install the ATC Software

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”

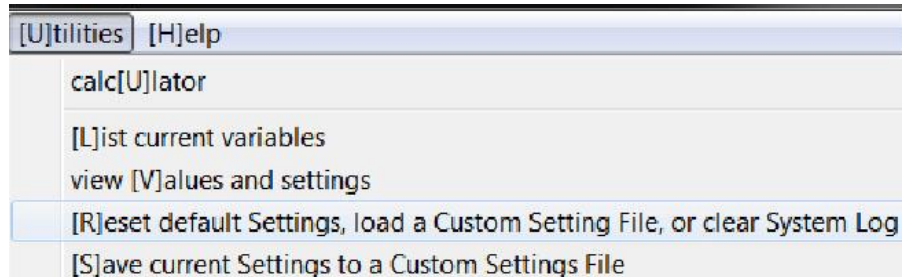
at <http://www.shopbottools.com/ShopBotDocs/software.htm>



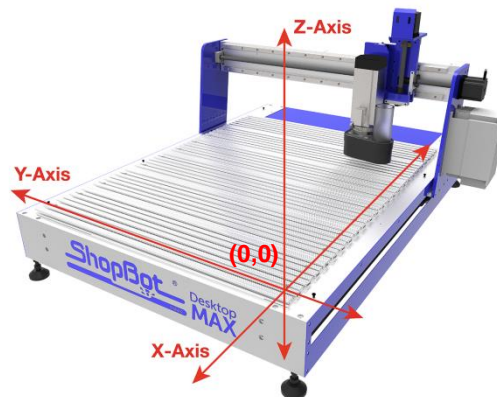
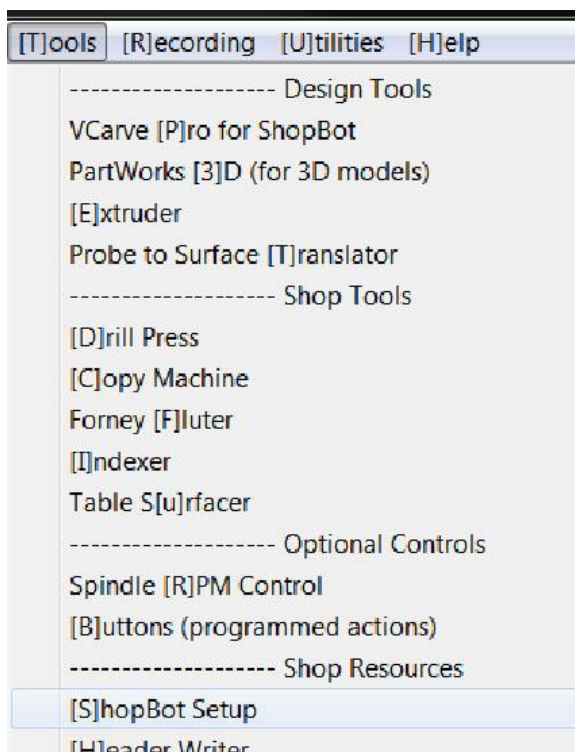
Note: If there are personal files within the “SbParts” folder, be sure to rename or move this folder so the files are not lost.

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 machine (under the “PRS ShopBots” folder, then ShopBot_PRSDesktopMAX3624.sbd) Follow prompts clicking Ok to reset default settings.



Move the cutter to the location that is to be X and Y “0, 0” (the reference point for programming) on the table(close the KeyPad if opened). Open the ShopBot control software and open the “ShopBot Setup” option 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 the bottom of the window. Select the radio button marked “MAX ATC”. Click “Next”.



ShopBot Setup (Z Zero Plate)

Now let's get down to the real work. The first step is to set up a Z-axis zeroing program. It's done by connecting a flat metal plate to one of the input switch connections in your control box, and then running the C2 custom cut to run a z-zeroing routine.

First, though, you'll need to give us some values.

The ACTUAL thickness of the contact plate that you'll be using. Measure carefully... your zeroing will only be as accurate as this measurement.

The input switch number that your zeroing plate is connected to. Most people connect it to input #1, but if you have some other accessory that's connected to input #1 that could cause interference you might want to use a different input.

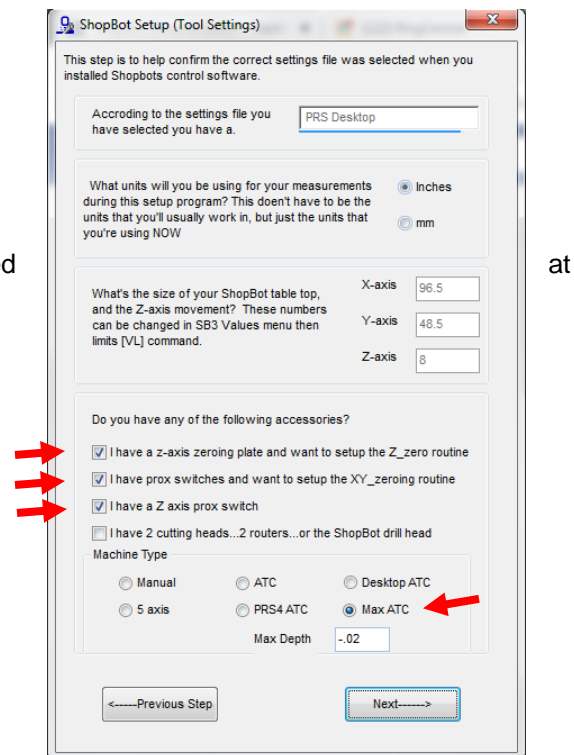
If you prefer you can pick a location on the table that the tool ALWAYS goes to when you run your Z-zero routine. I can give a more consistent result from your Z-zeroing routine but can be a problem if you do a lot of bit changes and don't want to move back each time you re-zero.

X-axis: Y-axis:

☒ Yes, I want to always zero my Z axis at the same place on my table

< Previous Step 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.



ShopBot Setup (Tool Settings)

This step is to help confirm the correct settings file was selected when you installed Shopbots control software.

According to the settings file you have selected you have a.

What units will you be using for your measurements during this setup program? This doesn't have to be the units that you'll usually work in, but just the units that you're using NOW

☒ Inches ☐ mm

What's the size of your ShopBot table top, and the Z-axis movement? These numbers can be changed in SB3 Values menu then limits [VL] command.

X-axis: Y-axis: Z-axis:

Do you have any of the following accessories?

☒ I have a z-axis zeroing plate and want to setup the Z_zero routine

☒ I have prox switches and want to setup the XY_zeroing routine

☒ I have a Z axis prox switch

☐ I have 2 cutting heads...2 routers...or the ShopBot drill head

Machine Type

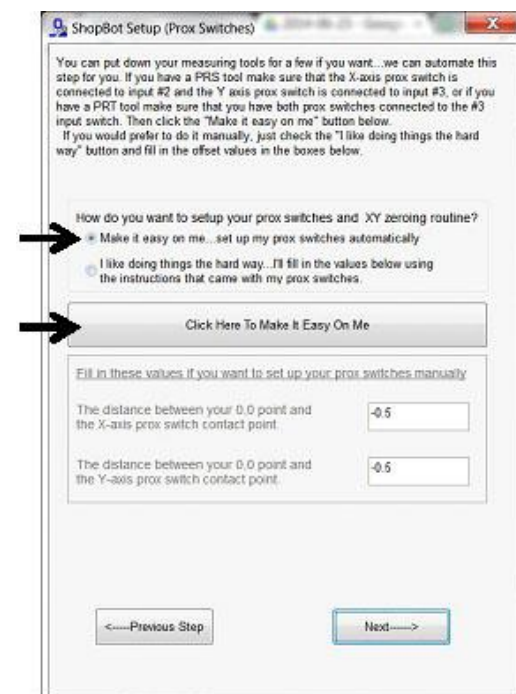
☐ Manual ☐ ATC ☐ Desktop ATC

☐ 5 axis ☐ PRS4 ATC ☒ Max ATC

Max Depth:

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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”



ShopBot Setup (Prox Switches)

You can put down your measuring tools for a few if you want...we can automate this step for you. If you have a PRS tool make sure that the X-axis prox switch is connected to input #2 and the Y axis prox switch is connected to input #3, or if you have a PRT tool make sure that you have both prox switches connected to the #3 input switch. Then click the “Make it easy on me” button below. If you would prefer to do it manually, just check the “I like doing things the hard way” button and fill in the offset values in the boxes below.

How do you want to setup your prox switches and XY zeroing routine?

☒ Make it easy on me...set up my prox switches automatically

☐ I like doing things the hard way...I'll fill in the values below using the instructions that came with my prox switches.

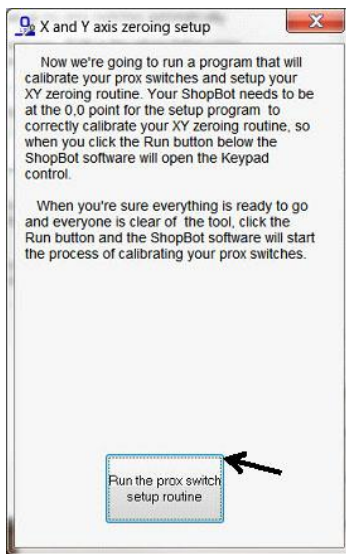
Click Here To Make It Easy On Me

Fill in these values if you want to set up your prox switches manually

The distance between your 0.0 point and the X-axis prox switch contact point.

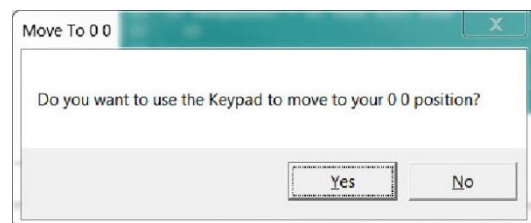
The distance between your 0.0 point and the Y-axis prox switch contact point.

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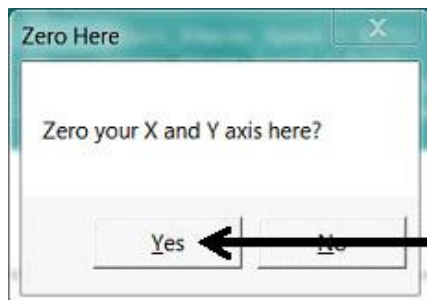
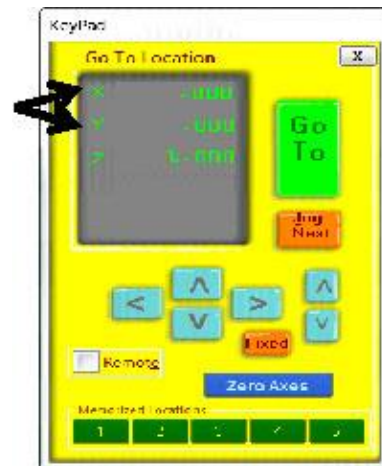


The next screen is “X and Y axis zeroing setup”. Read this screen and click “Run the prox switch setup routine”.

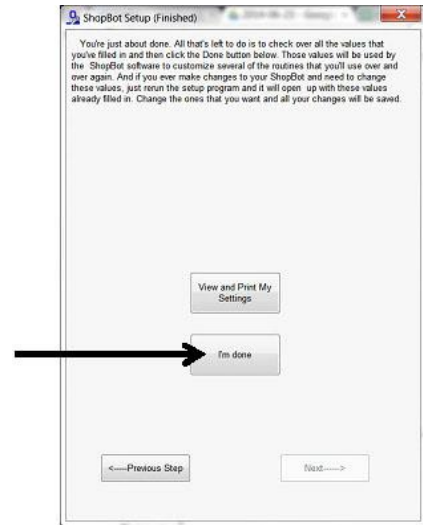
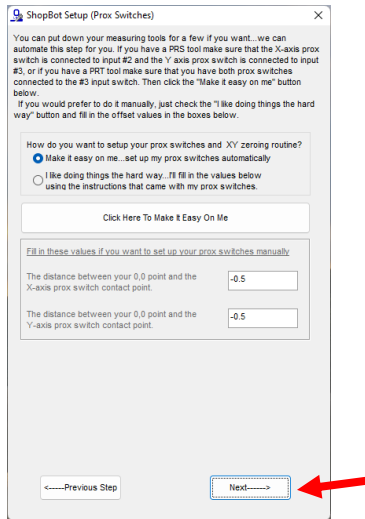
Follow the prompts from the pop-up screens. Select “Yes” to open the keypad for any adjustment to the X and Y “0, 0” home position. The default home position is the corner of the spoilboard near the machine’s natural “0,0”, but you can set it wherever you want if you are using a specific jig or fixture.



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”.



Click next and Read through the "ShopBot Setup (Finished)" window and click "I'm done."

Setting Limits

Run the homing routine (C3) to be sure everything is zeroed. (If asked "Tool Holder Not in spindle! Resetting values for zero too" click OK or if asked "Enter the number of the tool in the spindle" enter 1)

In the Shopbot 3 software, click on the large "Cut Part" button. Navigate to the C:\SbParts\ on your computer and select the file named "Set Limits.sbp" select Open then hit Enter to activate the start button. This will set and record the table limits based on the extents of the limit switches.

Additional function checks

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 gantry.

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.



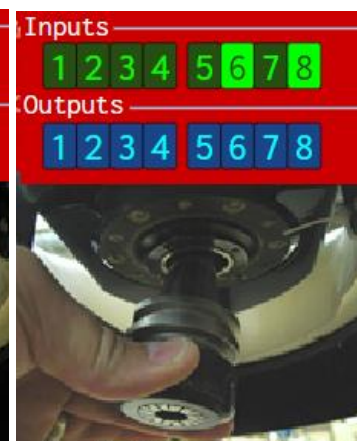
Tool Draw Bar

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

Press the green button on the back of the gantry. 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.

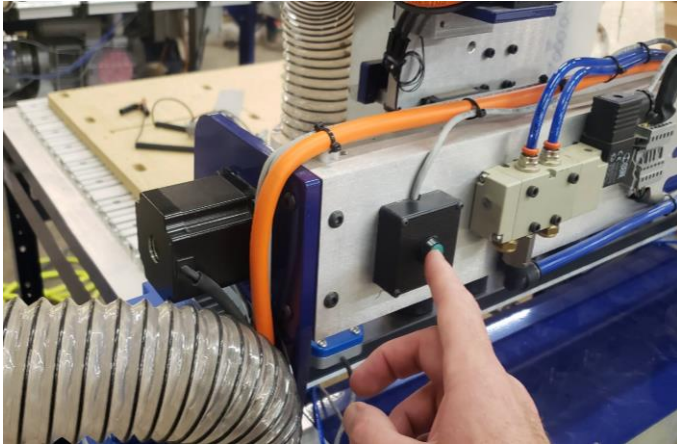
Release the green button. The drawbar will close, capturing the tool holder. Input “7” should light up, and input “8” should turn off.



Calibrating the ATC

Calibration Routine (Patience is required, take it slow)

If this is your first time setting up the machine, or you are setting it up on a new computer, the ShopBot software needs to know the location of the tool holders. To run this routine, insert an empty tool holder (no collet or bit) into the spindle using the green button on the rear of the gantry.



Press the green button on the back of the gantry



Insert a tool holder into the spindle

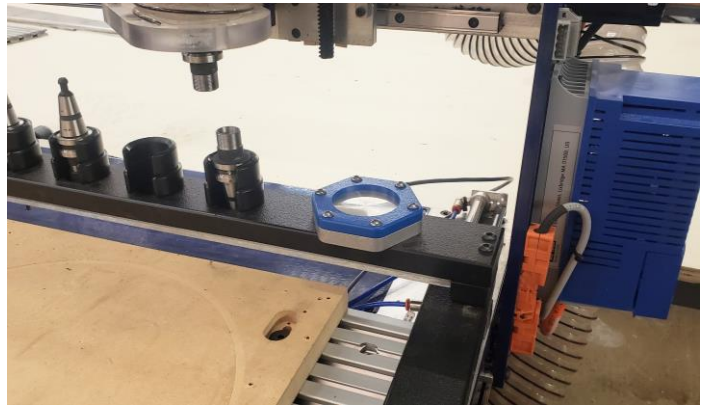
In the Shopbot 3 software, click on the large “Cut Part” button. Navigate to the C:\SbParts folder\Custom\ATC on your computer and select the file named “ATC_DT_Calibrate” select Open then hit Enter to activate the start button.

Follow prompts, (If asked to enter a tool number enter 1) The machine will first home the X, Y and Z axes. The tool should end up at the home location previously set in the ShopBot Setup routine. Next you will be prompted to extend the toolbar, press OK on this prompt and the “spindle start” prompt. Then there will be a prompt on the screen asking you to use the keypad to move the machine to the location of tool number 1. This is the tool closest to the fixed Z-zero plate on the tool bar. Press OK to this prompt. Before moving the tool, insert an empty tool holder *upside down* in the location of tool number 1.

Insert empty tool holder (no collet or bit) upside down in the location for tool number 1 (closest to the fixed Z-Zero plate).



Using the keypad, move the machine towards the first tool holder location, making sure the Z is high enough to clear the tool in the tool bar.



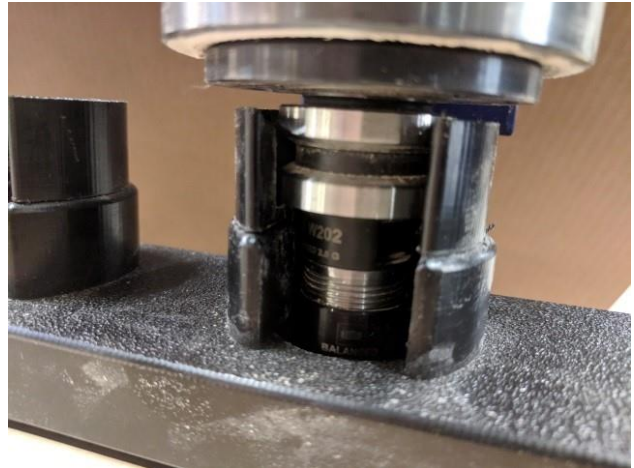
Once you get it close to the tool holder, press the “Fixed” button in the keypad. This will only allow the machine to move a small distance with each keypress. Move the tool holder down so it is close to the tool holder in the tool bar, and center it with the tool holder. Try to be as exact as possible.



Close the keypad. The Z will raise up automatically. Remove the tool holder from the tool bar, then slowly lower the Z so the tool holder that is in the spindle goes down into the toolclip, making sure it is not touching the sides. While doing this, periodically spin the tool holder with your fingers. It should spin freely and not drag on the sides of the toolclip.



With the bit still centered in the holder, continue lowering it until it is almost touching the bottom of the holder. Or, lower it until it no longer spins easily and then raise it back up slightly until it does. Once the tool holder is in the proper spot, close the keypad.



The tool should then move the Z up and travel over to the general location of the last tool clip on the rack. Repeat the above steps, starting with inserting an empty tool holder upside down in the last tool location. Make small adjustments in the X and Y position by using the “**FIXED**” key on the keyboard. After lowering the Z and centering the two tool holders, close the keypad. You are finished with the calibration routine, there is no need to lower the tool holder into the tool clip as previously done.

Set Fixed Z-Zero Plate Location

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

In the Shopbot 3 software, click on the large “Cut Part” button. Navigate to the C:\SbParts folder\Custom\ATC on your computer and select the file named “ATC_FixZ_Plate.sbp” select Open then hit Enter to activate the start button. 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” when the following prompt appears.



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



Remove the tool holder when this routine is done by pressing the green button on the back of the gantry.

Setup Tool Holders

Locate the tool holders, collet, collet nuts (shipped on the tool holders), and desired bits. Make sure that the collets are sized for the shank diameters of the bits that will be installed.

Remove the collet nut from a tool holder and insert it into the spindle using the green button on the back of the gantry.



Select the appropriate sized collet for the bit you want to use, then press it into the collet nut until it snaps into place. It is **VERY IMPORTANT** that the collet is inserted into the collet nut before it is installed in the tool holder. Failure to install the collet into the nut may cause damage to the tool holder.



Thread the collet nut onto the tool holder that is in the spindle.



Insert the desired bit into the collet.



Tighten the collet nut to 42 ft/lbs with the ER16 spanner wrench and 17mm shaft wrench. Do not over-tighten.



Remove tool holder from spindle using the green button and place it into the tool clip that you would like that bit assigned to. Repeat this process for the other tool holders and place them in the tool bar as well. Do NOT leave a tool holder in the spindle at this time.



Change Tools (C1)

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

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.



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

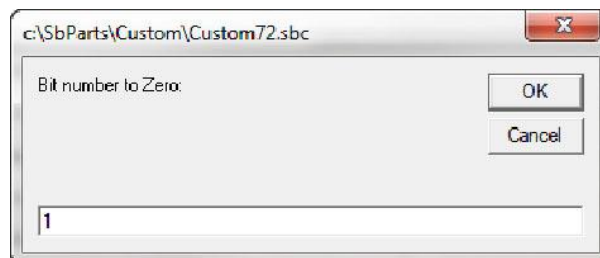
Zero Tools in Rack (CN72) (Daily Operation)

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

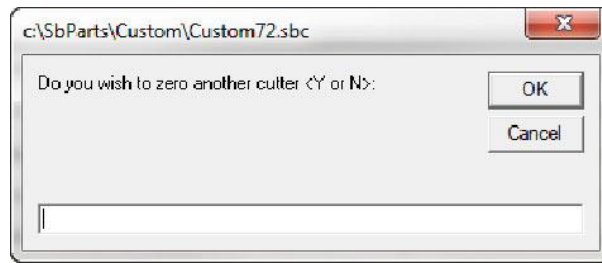
This step will zero each tool in the rack to ensure that bits of different lengths will all cut to the same depth. If a new bit is added to the rack (or an existing bit is replaced), use this routine to calibrate it to the other bits in the rack.

Type “CN72” (custom number 72) then OK, to run the ATC zero tools in rack file.

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

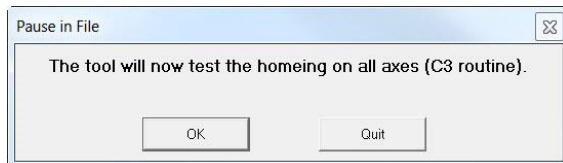


If more bits need to be zeroed, answer “YES”. If not, then type “N”. Click “OK” to continue.



Get Plate Offset (CN73)

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.

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.

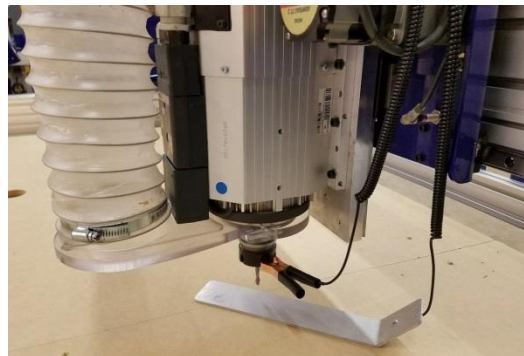
Once all of the bits have been zeroed to the fixed Z zero plate, any bit can be used to zero to the surface using the regular Z zero plate.



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

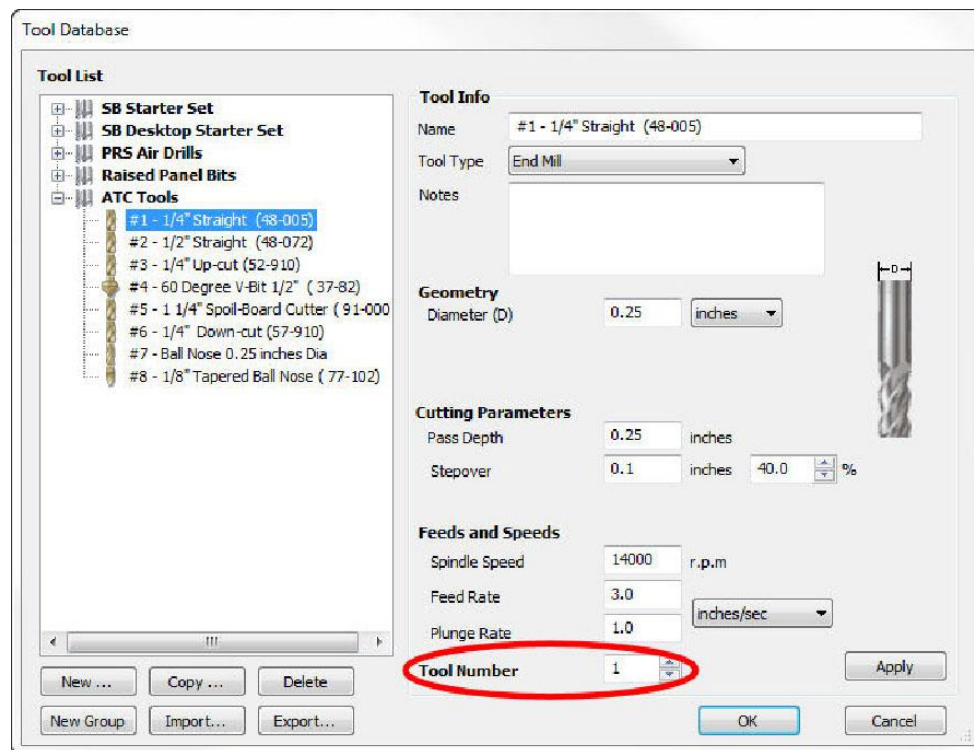
C1	Change tool
C2	Zero Z-axis using Z-zero plate
C3	Home X, Y, and Z-axes using proximity switches
C5	Spindle warmup routine
C6	Turn spindle on
C7	Turn spindle off
C9	Automatic tool change called within a part file
CN72	Zero tools in rack
CN73	Get plate offset (set Z-axis home position)

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 runs the spindle and then shuts it off. On desktop models there is no automatic speed control. It is recommended to run the spindle at 12,000rpm for the first 3 minutes, 15,000rpm for the next 3 minutes, and 18,000rpm for the last 3 minutes of the routine. 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.

Troubleshooting

To check what tool the software thinks is in the spindle head, open "C:\Sbparts\Custom\ATC_Local_Data\ATC_tool_variables.sbc".

Issue: The spindle is not releasing the tool holder when changing tools.

Resolution: The spindle manufacturer recommends that the spindle not be left holding a tool overnight or for any extended period of time; leaving a tool in overnight may cause the tool holder to "stick" in the spindle. Use the 17mm wrench to apply pressure and push the tool holder out if this occurs. Also, confirm that the regulator on your filter/regulator unit is set to supply 90psi to your tool; inadequate air pressure can prevent the spindle's draw bar from opening completely when trying to drop off a tool.

Issue: The tool is not aligning the tool holders with the tool clips when dropping off or picking up bits.

Resolution: Re-calibrate your tool clip locations using the calibration routine covered in the "Calibrating ATC" section of this document.

Issue: Depth of cut is inconsistent between bits.

Resolution: Re-measure your bit length using the "CN72" routine referenced in the "Zero Tools in Rack" section of this document.

Issue: The tool is not cutting in the correct location.

Resolution: The default "origin" point for cuts designed in v-carve is the bottom, left hand corner of the cut area. Be sure to run the C3 "homing" routine before starting a cut in order to align the tool to this origin location. The JH (Jog Home) command can be used to send the tool to its origin.

Issue: The tool was cutting fine but suddenly started cutting in the wrong place part-way through a cut

Resolution: If the tool is unable to complete a motion either due to an obstacle (ex. hard metal fixture) or being driven at excessive speed (ex. 10 inches per second at full depth in $\frac{3}{4}$ " plywood) it will lose its reference position and need to be re-homed using the C3 routine. This does no damage to the motors on the tool, however the motors will not be able to recover their correct position.

If in doubt – contact the ShopBot tech support team; give us a call at 886-680-4466 or send an email to support@shopbottools.com