



a N.A.C.S.L. Company

*"The Way CNC Was Meant to Be"*

## Disclaimer

Thank you for purchasing a ShopSabre CNC Plasma machine. The following instructions should have you up and running within a few hours. Please read these instructions carefully, but remember if you have any trouble we are here to help.

Assembly services are available for a fee through ShopSabre CNC. To order assembly assistance, please call 1-800-493-6021 and speak with your sales person for additional details and pricing. We will schedule a ShopSabre technician to come to your facility as soon as possible. Scheduling is subject to technician's current availability.

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**WARNING**

**WARNING**

**WARNING**

**WARNING**

**WARNING**

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The assemblies you are about to work with are very heavy (up to and including 6,500 pounds), and if not handled properly could cause injury, dismemberment, or possibly death. If you proceed to assemble your new ShopSabre CNC machine, you assume all responsibility and liability should there be injury of any kind or death. If you do not understand and agree with these disclaimers, please do not use this product and return all materials to the place of purchase.

These instructions are only meant as a guide, and are not the only method that may be used. If you feel there is a safer method, please use it. **Please use safety and caution as you proceed.**

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## Chapter 1

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## Section A: Receiving the Machine

Depending on your method of shipment your machine will arrive to you in one of two ways, on a flatbed truck (Figure 1A) or in an enclosed truck (Figure 1B). You will need a minimum 7,500-pound fork lift with at least 8' fork extensions to safely unload your machine.

Figure 1A



Correct method of lifting off of flat bed

Figure 1B



Correct method of lifting



It is the purchaser's responsibility to examine all shipments from ShopSabre at time of receipt, note any damage on the Bill of Lading, and notify the carrier. Any damages not noted at time of receipt **will not be eligible for warranty or repair.**

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## Section B: Unloading the Machine

If the machine was shipped on an open flatbed truck please skip to page 6.

When receiving the machine please review the packing slip provided to make sure all components have been received. All machine components will be located underneath the machine (Figure 2A). In order to lift your machine off of the pallet, first remove all bolts securing it to the pallet. There are 6 bolts that need to be removed before lifting the table (Figure 2B). After removing all bolts, lift the table off the pallet (Figure 2C) and set into place.

Figure 2A



Figure 2B



Figure 2C



Correct Fork Placement



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## Section C: Machine Placement and Leveling

After lifting the machine off the pallet, it is time to place the machine in the designated area. **If you are unclear about machine placement please contact our tech support team at 1-800-493-6021 for advice about machine placement and room design.** Once in designated area the machine will need to be leveled. Located under the table on all four corners are leveling pucks (Figure 3A). Using a 6' level, and the leveling pucks below, level the machine. Once the machine is level, unwrap all the shrink-wrapped components. For shipping purposes there are 2 bolts in the machine to prevent movement during transit. Figure 3B show the locations of these brackets. **These brackets must be removed before the machine is turned on.**

Figure 3A



Figure 3B



If a Hypertherm plasma cutter was purchased with the machine the accessories for the machine will be inside the Hypertherm box as shown below. If one was not purchased with the machine you will receive a separate box containing these items.



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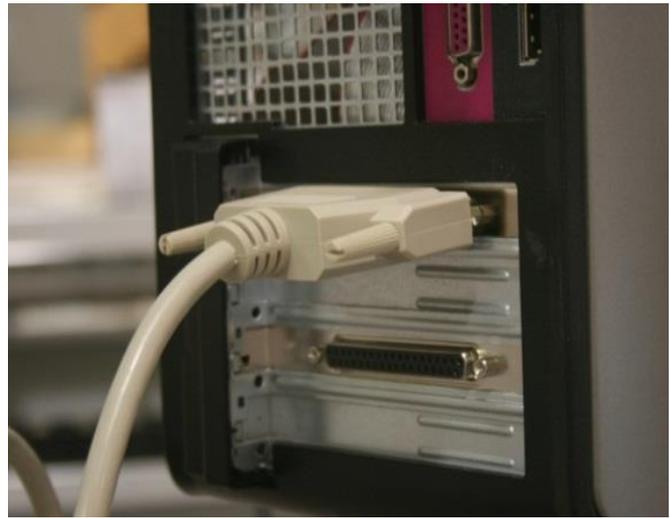
Once all brackets are removed it is time to install the 37 Pin data cables. **Figure 3C** and **3D** show the appropriate ports the 37 pin data cables should plug into. One cable should plug into the blue colored port in the back of the computer and the other side should plug into the port labeled “Blue Port” on the control box (**Figure 3E**). The second cable should plug into the black colored port on the computer and the “Black Port” on the control box. **Note: If you reverse these connections your machine WILL NOT run.**

**Figure 3C – Back of Computer**



Blue and Black ports on the back of the computer

**Figure 3D**



Installing the cables to the computer

**Figure 3E – Control Box**



These labels correspond with the colors on the back of the computer in **Figure 3C**

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**Note:** With Windows 10, Microsoft has removed any way to turn off Windows Updates. This is unfortunate as Windows will not only randomly update, but also randomly shut down the computer, even if you are in the middle of a project and even if the machine is cutting. **We recommend you manually check for Windows Updates each morning before beginning work, or set automatic updates to complete before or after working hours when the machine is not in use. Make sure the control screen is closed when updates are being performed. If you do not, the machine could shut down during work. Not only will the machine stop cutting, but you will lose your zeros, and any other settings you’ve changed since the control screen was last opened.**

As an order of operations, we recommend first installing any updates, then opening WinCNC, and lastly opening any other programs to be used (Chrome, EnRoute, etc). In this way, WinCNC will have memory priority.

**NOTE:** There are a lot of cables that will run each between the table, the control box, and the plasma cutter itself. It is absolutely critical that these wires be run cleanly and neatly, with ideally no coils of wire, and absolutely no coils near the plasma cutter itself. These systems are very sensitive to external electromagnetic interference and the plasma power supplies are huge sources of EMI during normal operations, with voltage spikes at the tip of the torch up to and including 10,000 volts. We have found that many problems on plasma machines are solved simply by running wires properly and running the light bulb test on your ground rod to make sure it is a good ground. If wires must cross, make sure they cross at 90 degrees, and try to avoid coils or loops if at all possible. Ideally, you will want to locate the power supply a minimum of several feet from the control box and other wires.

It is also critical that your *building* have a proper earth ground rod. Although commonly used, structural steel beams built into concrete footings or pads are not true earth grounds and will not replace a grounding rod that conforms to NEC specifications and which has been tested after installation in your location.

Below is a link to a Hypertherm article about how to nullify noise. Use the address below or go to Hypertherm.com and search for “noise” to read about best practices.

<https://www.hypertherm.com/en-US/learn/articles/how-to-nullify-noise/>

## Section D: Diode and Grounding

If the table has a water bed it will come with a diode on the back. This is important to help reduce and avoid electrical feedback to sensitive electronic components. The ground from the plasma power unit (Hypertherm, for example) should attach to the end of this diode. The earth ground (covered in more detail in the next section) will attach to a bolt threaded just to the right of the diode. While the table will physically function with those cables reversed, or even no earth ground at all, there is a high probability of poor cuts or shorter life of your components which may not be covered under warranty.

If the table is a blow-through table with no water pan it will not have a diode. In this case, both the work ground and the Earth ground will go to the same bolt.



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## Section E: Grounding Test



**CAUTION: You must follow the subsequent instructions carefully!** It is extremely important that you follow the subsequent instructions. If you do not, you will have erratic torch height behavior. Every machine is tested in our shop and certified to function properly on several material types before shipping.



### ShopSabre Plasma and Hypertherm Setup

You should now have the ShopSabre CNC Plasma unpacked and assembled. Next, unpack the Hypertherm Plasma Unit. Install the torch per Hypertherm directions. Using the magnet attached to the torch, stick the torch on the Z head. Route your cable away from the servo wiring tracks. You can cross them at a ninety-degree angle.

On the back of the ShopSabre CNC Plasma machine, you will find a bolt stud. This is the main grounding lug that you must connect to a ground stake (and the Hypertherm ground *if* you do not have a water table).

Connect the wire to the Machine grounding lug and the Hypertherm grounding lug.

Now you must provide a path to **Earth Ground**. This ground is usually created by drilling a hole in the concrete and driving a 10 ft. copper grounding rod (buy 3 or 4 at Lowes or Home Depot) into the earth below. You should NOT use a stake from your main electrical system. You must supply a wire that is at least 10 gauge (larger is better) and attach it to the ground lug on the back of the machine and to the copper rod. It is better to use stranded wire.

**NOTE: Just because you have driven a stake into the ground does not guarantee you have an earth ground.** The following information is proven fact. All of the major manufacturers of plasma equipment and CNC equipment use and rely on this information.

Dirt is not by itself conductive. Many elements come into play to make it conductive enough to be an earth ground.

The biggest conductivity issue is moisture. Once a building is built and the concrete is poured, the ground underneath starts to dry out. Once the ground is dry, it loses conductivity.

We have heard of instances where eight or nine ground rods had to be driven to find a suitable earth ground, and have heard of people who have had to drill down eighty or ninety feet, (yes 90 FEET!) to find a suitable ground.

In our facility we had to connect to a copper water pipe that we were absolutely certain went into the earth and connected to our well.

A vast number of buildings today do not even have a good earth ground at the stake for their electrical box. Again, **do not** use the ground rod for your electrical system.

There are a couple of common ways in which you can test if you have a good earth ground. One is to have your electrician perform an earth ground test, and the other is called a light bulb test, also to be performed by an electrician.

Typically, having an electrician perform an earth ground test is the most expensive method as it does require special equipment. However, we would encourage you to contact your local electric company to inquire if they offer the service and the cost if they do.

The second method is called the light bulb test. **WARNING:** This test is to be performed by a certified electrician, or it could result in injury or death by electric shock. The following is offered as information to be relayed to an electrician. ShopSabre CNC is not responsible for any injury or death that may occur if you choose to not heed this warning.

The electrician will need a 100-watt light bulb in a plastic or porcelain fixture. This is the type that is commonly used in construction when a building is being framed.

On one side of the light bulb fixture the electrician will apply power (hot leg). The other side will be attached to the stud on the table to where the ground rod is connected. The neutral wire from the same circuit will be attached to a volt meter (reading AC volts) and the other side of the volt meter will go to the ground rod. There should be no more than 0.75 volts on the meter. If there is more than 0.75 volts the ground is **no good**. Please see diagram on page 13.

**Here are a few ways to improve ground:**

- 1) Simply pour water down the hole.
- 2) Add salt to the water mixture being poured into the hole.
- 3) Drill a larger hole, pouring a mixture of sand and rock salt down the hole, driving the stake into that mixture.

Any of these could potentially improve the conductivity of the earth ground.

Once you are certain that you have a proper earth ground, connect a wire from the ground lug on the back of the machine to the ground stake using the clamp that came with the ground stake.

Now you are ready to try your system out.

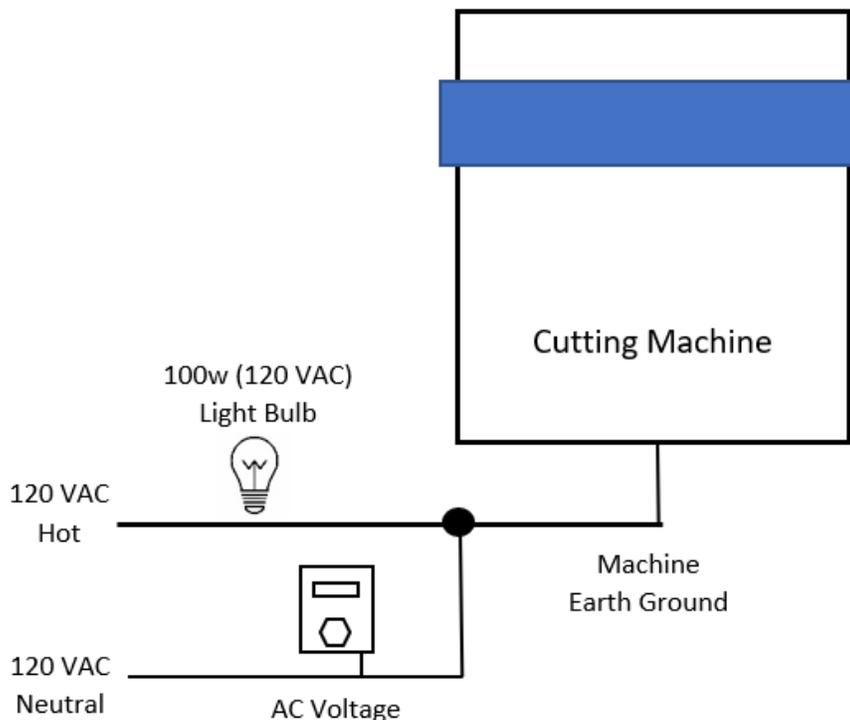
## Ground Integrity Test Procedure

**Warning:** All work must be performed by qualified personnel

Use the following procedure during the installation of plasma systems or any time a poor ground is suspected.

This test can only be performed using 120 VAC with a neutral connected to chassis ground at the power distribution panel.

The cutting machine must be grounded to a good earth using a conductor larger than 10 gauge (mm<sup>2</sup>)



## Section F: Computer Setup

At this point the machine is now ready to be powered. Plug the control box power plug into the appropriate receptacle or outlet. Depending on the options of the machine, the power will either be 220-volt single phase or standard 110-volt. Please refer back to the Sales Agreement for the machine power specs. **If you are unclear about your machine specs, please contact our tech support team at 1-800-493-6021.** To power up your control box there will be a switch located on the front of the box (**Figure 4A**). Turn the switch to the "ON" position. Also, turn "ON" your computer and monitor. When the computer finishes booting up and is at the main Windows screen there will be an icon labeled ShopSabre Plasma (**Figure 4B**). If the machine is a combination table, there will be two or three icons labeled ShopSabre Plasma, ShopSabre Router, and/or ShopSabre Oxy. Locate the appropriate icon and double click. The next screen that appears is the WinCNC machine interface. **Figure 4C** shows an example of a router control screen. Please proceed to the next chapter "Machine Operation".

Figure 4A

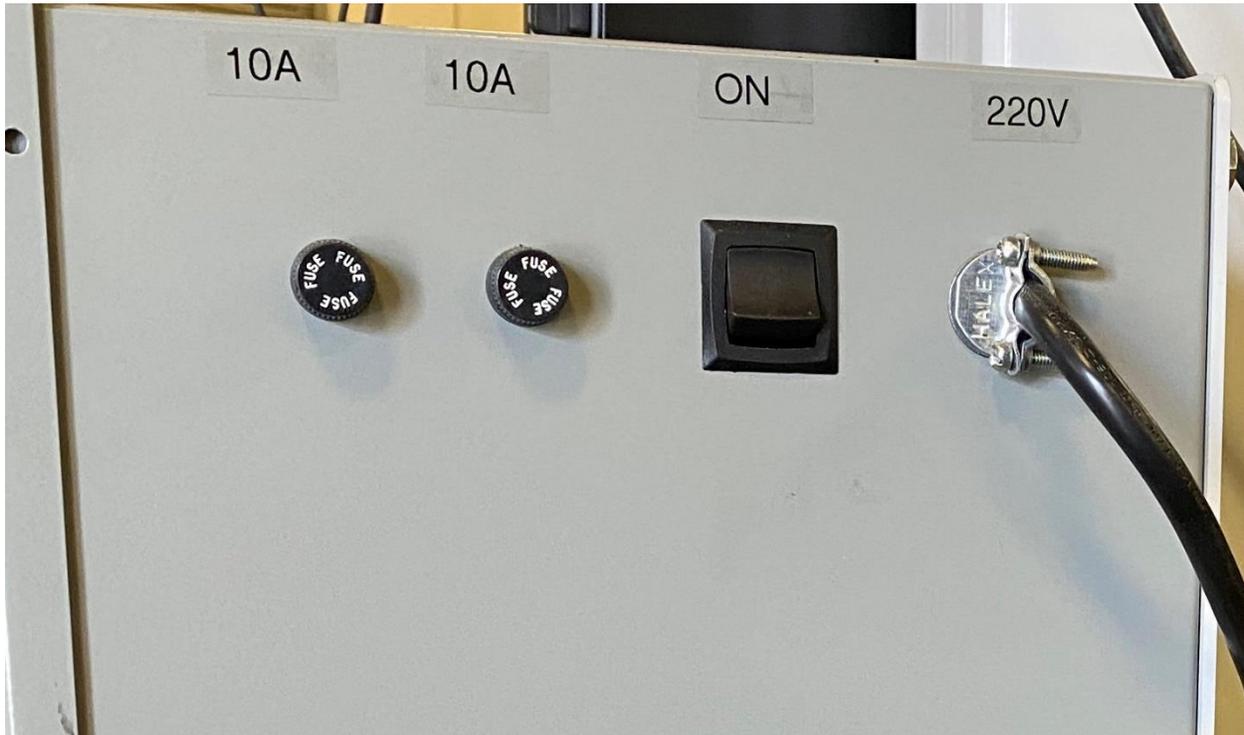
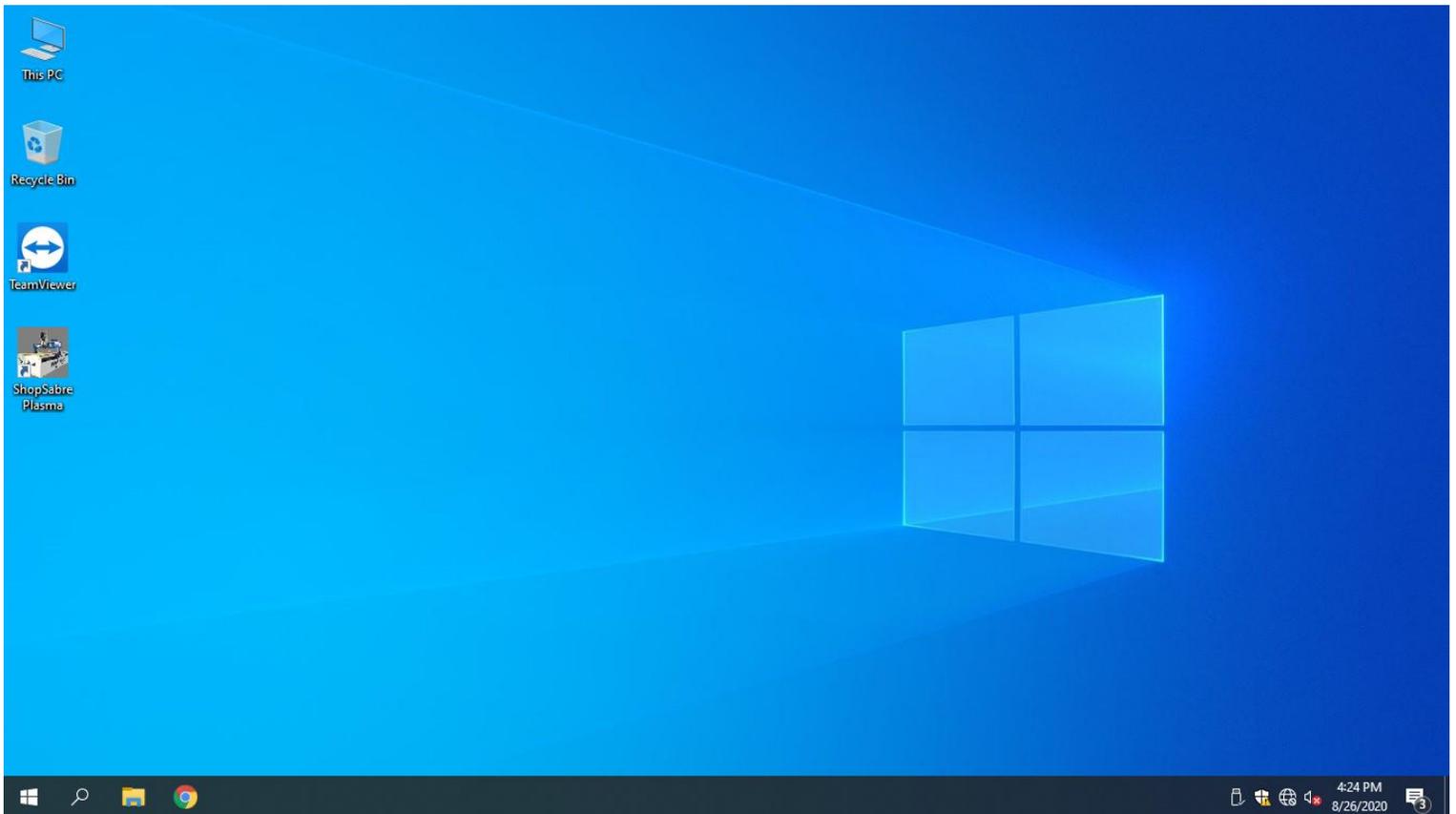
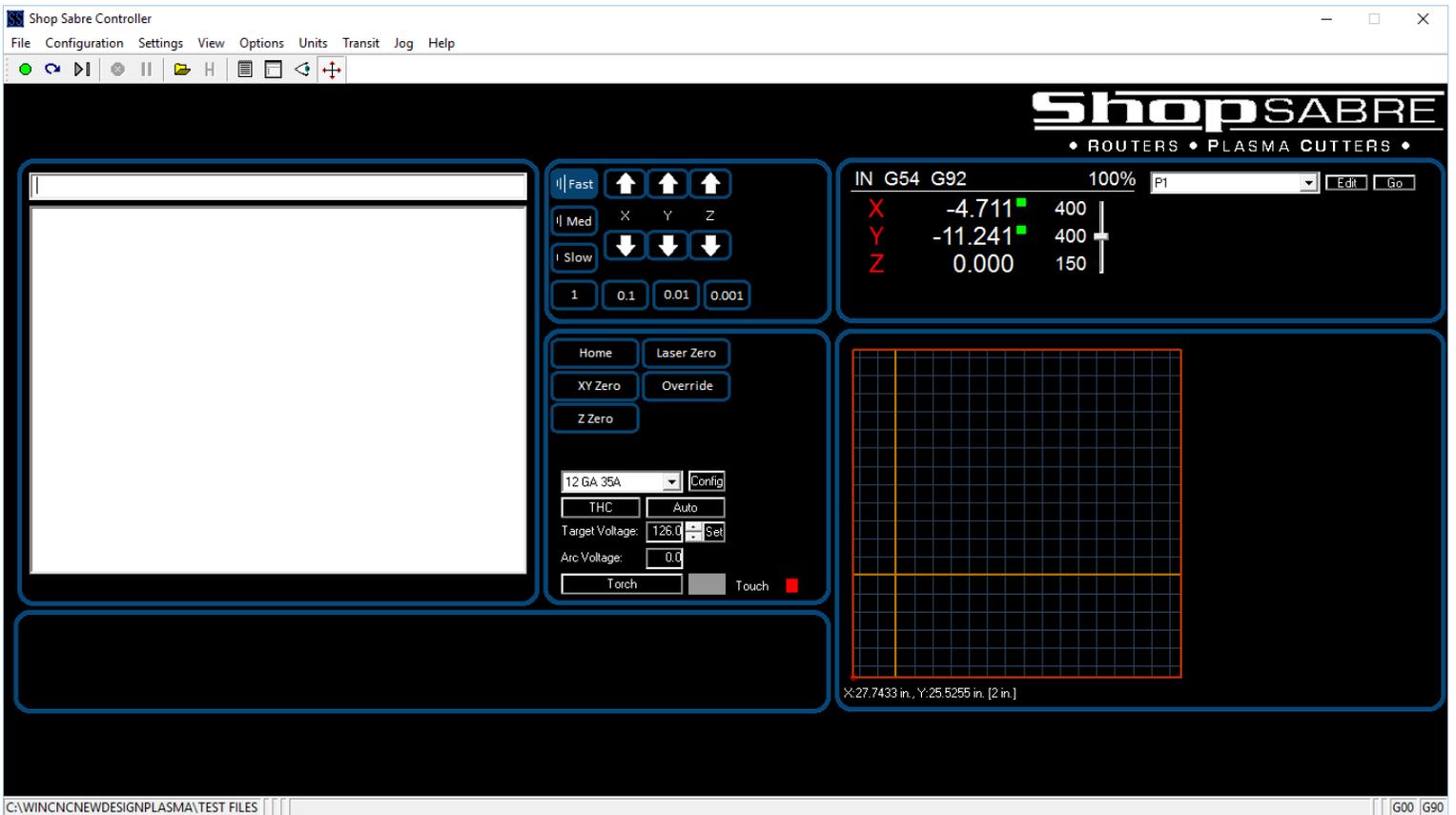


Figure 4B



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Figure 4C



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## Section G: Machine Power

The following is a list of general plug types and power requirements your machine may need. If you have questions about the options you purchased or which plugs you may need, please contact our tech support team at 1-800-493-6021. ALL ELECTRICAL WORK MUST BE PERFORMED BY A CERTIFIED ELECTRICIAN. Max Pro and XPR plasma cutting units are only available on ShopMaster machines.

Model	Option	Plug
<b>SideKick</b>		
<b>110v Single Phase</b>	Control Box:	(Qty 1) NEMA 5-15 plug, 15 amps
	PC + Monitor:	(Qty 2) NEMA 5-15 plug, 15 amps
<b>Router Option</b>		
	Porter Cable Option:	(Qty 1) NEMA 5-15 plug, 15 amps
	2.2HP Spindle:	Hardwired 220v, 20 amps, single phase or three phase
	4HP Spindle:	Hardwired 220v, 30 amps, single phase or three phase

Model	Option	Plug
<b>ShopMaster</b>		
<b>220v Single Phase</b>	Control Box:	(Qty 1) NEMA L6-20, 20 amps

C-Aire Compressors	208/230 Volt	
<b>(A050V060-1230) 60 Gallon</b>	Single Phase 21/19.1 amps	30 Amp, Hard-wired
<b>(A050V080-1230) 80 Gallon</b>	Single Phase 21.0/19.0 amps	40 Amp, Hard-wired

<b>Dust Collector: 208-240v only</b>		
<b>3HP Cyclone</b>	Single Phase:	30-amp circuit; Plug not included. Recommend (Qty 1) NEMA L6-30 plug
<b>2HP Shop Fox</b>	Single Phase:	20-amp circuit; Plug not included. Recommended (Qty 1) NEMA 6-20 plug
<b>3HP Shop Fox</b>	Single Phase:	30-amp circuit; Plug not included. Recommended (Qty 1) NEMA 6-30 plug
<b>5HP Grizzly</b>	Single Phase:	Manufacturer recommended 40-amp circuit; Plug not included.

Continued on next page

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PowerMax		
<b>PowerMax 45 XP</b>		
<b>Single Phase</b>	200-240v	39-32 amps
	400v	11 amps
	480v	10 amps
<b>PowerMax 65</b>		
<b>Single Phase</b>	200v	52 amps
	208v	50 amps
	240v	44 amps
	480v	22 amps
<b>Three Phase</b>	200v	32 amps
	208v	31 amps
	240v	27 amps
	480v	13 amps
	600v	13 amps
<b>PowerMax 85</b>		
<b>Single Phase</b>	200v	70 amps
	208v	68 amps
	240v	58 amps
	480v	29 amps
<b>Three Phase</b>	200v	42 amps
	208v	40 amps
	240v	35 amps
	480v	18 amps
	600v	17 amps
<b>PowerMax 105</b>		
<b>Three Phase Only</b>	200v	58 amps
	208v	56 amps
	240v	49 amps
	480v	25 amps
	600v	22 amps
<b>PowerMax 125</b>		
<b>Three Phase Only</b>	480v	31 amps
	600v	24 amps

Continued on next page

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MaxPro 200		
<b>Three Phase Only</b>		
	200/208v	108/104 amps
	220v	98 amps
	240v	90 amps
	380v	57 amps
	400v	54 amps
	415v	52 amps
	440v	49 amps
	480v	45 amps
	600v	36 amps

XPR		
<b>XPR 170-Three Phase Only</b>		
	200v	117 amps
	208v	112 amps
	220v	106 amps
	240v	97 amps
	380v	62 amps
	400v	59 amps
	415v	56 amps
	440v	53 amps
	480v	49 amps
	600v	39 amps
<b>XPR 300- Three Phase Only</b>		
	200v	206 amps
	208v	198 amps
	220v	188 amps
	240v	172 amps
	380v	109 amps
	400v	103 amps
	415v	99 amps
	440v	94 amps
	480v	86 amps
	600v	69 amps

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## Section H: Installing and Changing Consumables

### ---READ THIS SECTION BEFORE PROCEEDING---

Plasma torches have consumable tips that MUST match the settings that are selected in the configuration screen. How to select those settings properly is covered in Chapter 2 of this manual. However, poor cut quality WILL result if these are not matched. Each different material, thickness and amperage will require a specific tip for best quality and will have to be changed out before cutting. For instance, although a 125 Amp consumable CAN cut at 45 Amps, the kerf size will be different and the quality of the cut will be reduced. DO NOT cut with an amperage above what the consumables are rated for (i.e., do not use 45A tips to cut at 65A).

Hypertherm has various resources made available to consumers on their website about what to look for when assessing cut quality and consumable wear. Here is one example:

<https://www.hypertherm.com/en-US/customer-support/consumables-and-torches/for-powermax-and-max-systems/>

This manual also has a section for FAQs about cut quality and what can be expected on [Page 53](#) and [Page 55](#) respectively.

Hypertherm supplies many cut charts within their user manual for each plasma power supply. It is the operator's responsibility to consult these charts. As a reference, we have included these pages generically as a reference from within the ShopSabre controller configurations page (Error! Reference source not found.). However, these may not always be up to date with the latest Hypertherm numbers. See the example on the next page. Also, your specific environment and usage have a very large impact on the quality of cuts and longevity of consumables as well as the exact settings you will need. Hypertherm provides approximate values in their charts for idealized situations which will most likely need to be modified through experience due to your specific situation.

Their manuals also contain troubleshooting FAQs. If the Hypertherm has an error code on-screen (for example, 0-30) you can find the meaning of the code in their manual included with the ShopSabre machine.

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## 9 Cut Charts and Marking Charts

**Mild Steel - 45 A - Air - Shielded**

Needs to be ohmic sensing to work with our touch system.  
This does not change between consumable sets.

**Metric**

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		Kerf Width
		mm	%		mm/min	volts	mm/min	volts	
2				0.2	5560	128	2910	125	
3					396				
4				0.4	280				
					143				
					102				
					780				
					540				
					310				
					170				
					110				

Shield and nozzle change with every consumable change and swirl ring changes for fine cut consumables.

Most common consumable parts to change. If the nozzle-hole is ovalar it needs to be changed. If the electrode-hole is big enough for a ball point pen to fit it needs to be changed. Generally, wears together with nozzle and should be changed at the same time.

**English**

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Cut Sp				
inches	inches	inches	%	seconds	in/min	volts	in/min	volts	inches
16 GA				0.1	249	128	320	124	0.053
14 GA				0.2	225	128	320	125	0.054
12 GA				0.4	129	128	181	128	0.057
3/16	0.06	0.15	250	0.5	85	129	122	127	0.059
1/4				0.6	48	130	72	127	0.061
3/8				0.8	33	130	38	133	0.069
1/2				1	18	141	24	139	0.077
5/8					13	146	16	141	0.082
3/4					7				
7/8					6				
1					4				

These settings are important for the config screen (Chapter 2)

**Gas flow rate - slpm / scfh**

151 / 320	Hot (cutflow)
184 / 390	Cold (postflow)

Source: Hypertherm PowerMax 45 XP manual

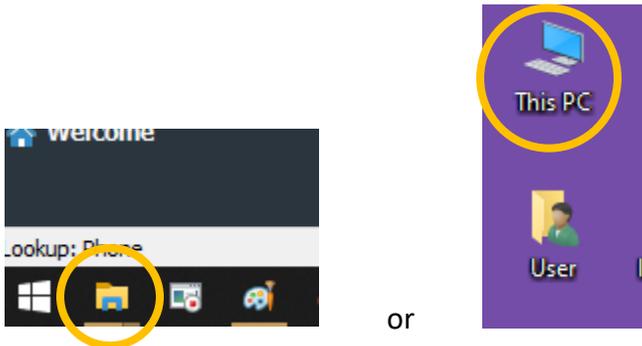
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## Section I: EnRoute Fabrication NDriver Setup

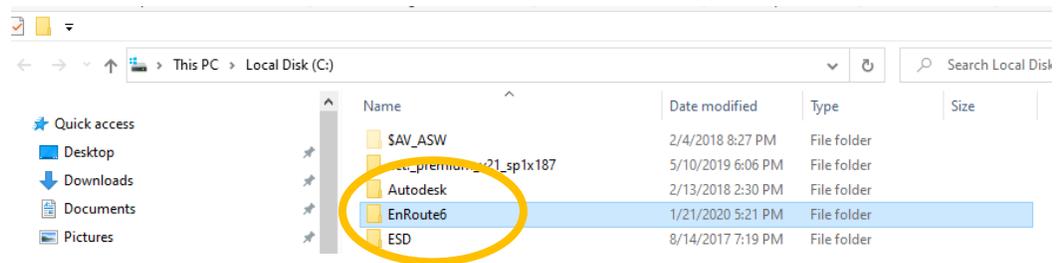
Note: EnRoute does not come pre-installed on the machine's PC and should typically be installed on an office PC where drawing will be done. This setup is necessary for whichever computer you choose to install EnRoute on before you can produce a part from EnRoute. If this setup is not done correctly, the torch will not touch off of material, or fire, or the g-code it outputs may be incompatible with the controller. EnRoute's license may only be active on a single computer and must be removed before being installed on a second PC.

Thank you for purchasing EnRoute Fabrication for your plasma cutting needs. This document will take you through the steps to get your EnRoute Cam software to output the correct Gcode for your new ShopSabre CNC plasma cutting machine. Please follow these steps once you have successfully installed your EnRoute Fab software. Please note that you will need to follow these steps for every computer that you install EnRoute Fab software on.

1. Find "File Explorer" on your task bar or "This PC" on your desktop:

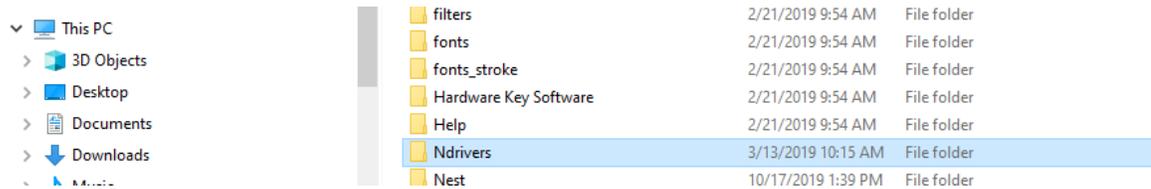


2. Find the EnRoute folder and double click on it to open.

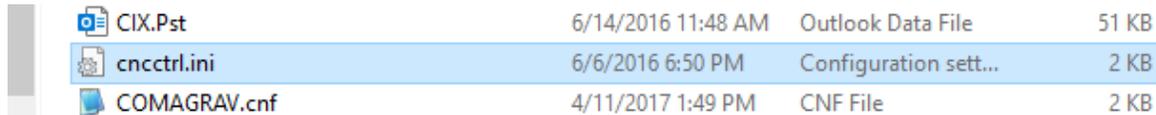


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3. Find the NDrivers folder and double click on it to open.



4. Find the “cncctrl.ini” File and double click on it to open. (If Windows does not understand which program to open this file with, click on the option to select a program and select “Notepad” from the list).



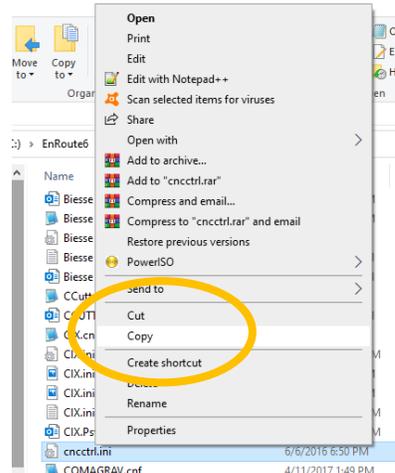
5. Once open, you will see configurations for different types of machines. Scroll down until you get to:

**[Plasma]**

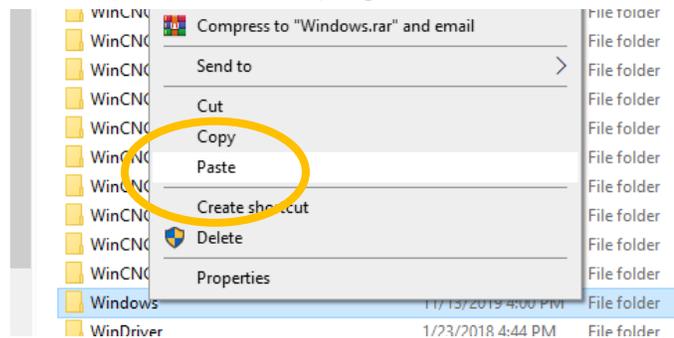
and delete the “**g53**” on the **StartLine1=** line and add “**G53Z**” to the Endline 2. (It should look like the example below).

```
[Plasma]
StartLine1=
StartLine2=m65
StartLine3=
StartLine4=
PromptForThickness=NO
EndLine1=M66
Endline2=G53Z
Endline3=
Endline4=
TorchOn=M61
Torchoff=M62
```

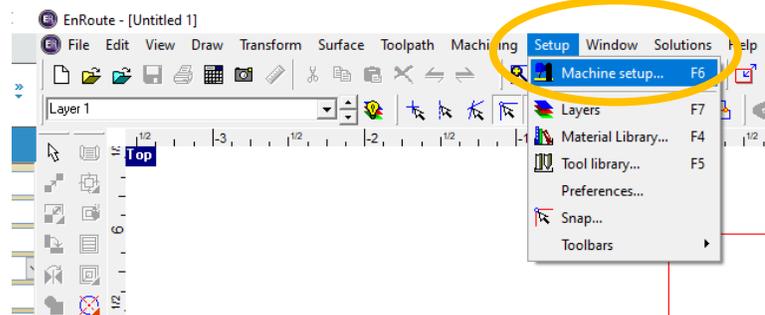
6. Go to "File" and "Save" or hit "Ctrl+S" to save the changes.
7. Close the "Notepad" file.
8. Now, back in the "NDrivers" folder, right click on the "cncctrl.ini" file and "Copy" the file.



9. Click twice on the back arrow that is at the top left of the window.
10. Find the "Windows" folder (on Local Disk C:), right click on it and click "paste".



11. Now close all windows and open your "EnRoute Fab" software from the desktop icon.
12. Click on the new file icon to start a new template, select your sheet size and click "OK".
13. Click on "Setup" at the top of the page and click "Machine setup"



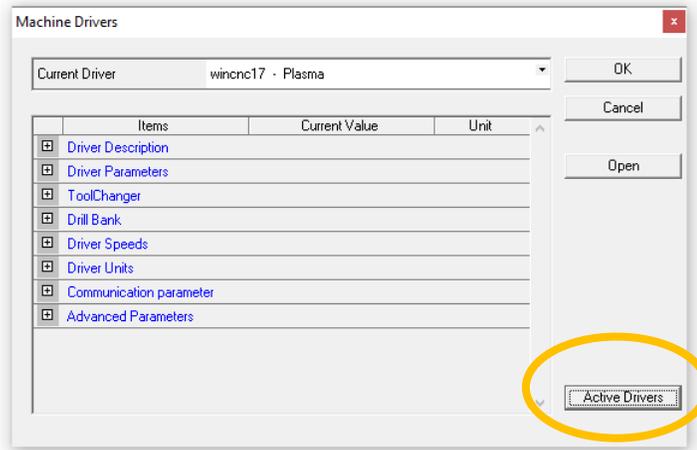
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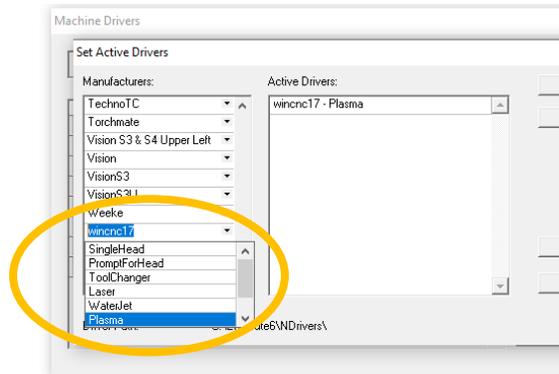
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14. Click on "Active Drivers" on the lower right side of the "Machine Drivers" window.



15. Scroll all the way down to the bottom of the Manufacturers' list to the left and click on the drop-down arrow next to "wincnc17"



16. Click on "Plasma". This will put the WinCNC driver into the "Active Drivers" list.

17. Click on the other driver that's listed in "Active Drivers" and click "Remove", so that the only driver listed is the "wincnc17 - Plasma"

18. Click "OK"

19. Now it will display your "wincnc17 - Plasma" driver in the "Current Driver" box.

20. Now your EnRoute NDriver is setup and ready to produce Gcode for your ShopSabre plasma machine.

You may find more help regarding EnRoute Fabrication at:

<http://www.enroutesoftware.com/Applications/Fabrication.aspx>

or please feel free to contact our ShopSabre technical support staff for any questions.

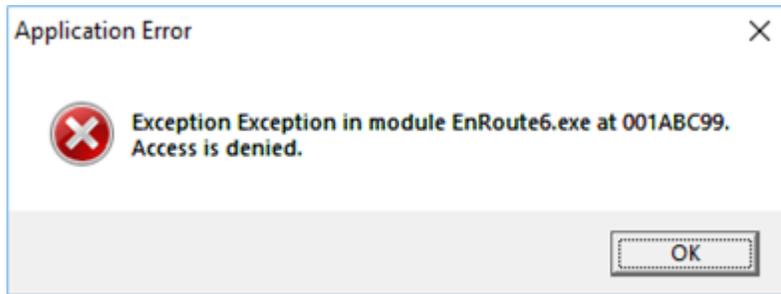
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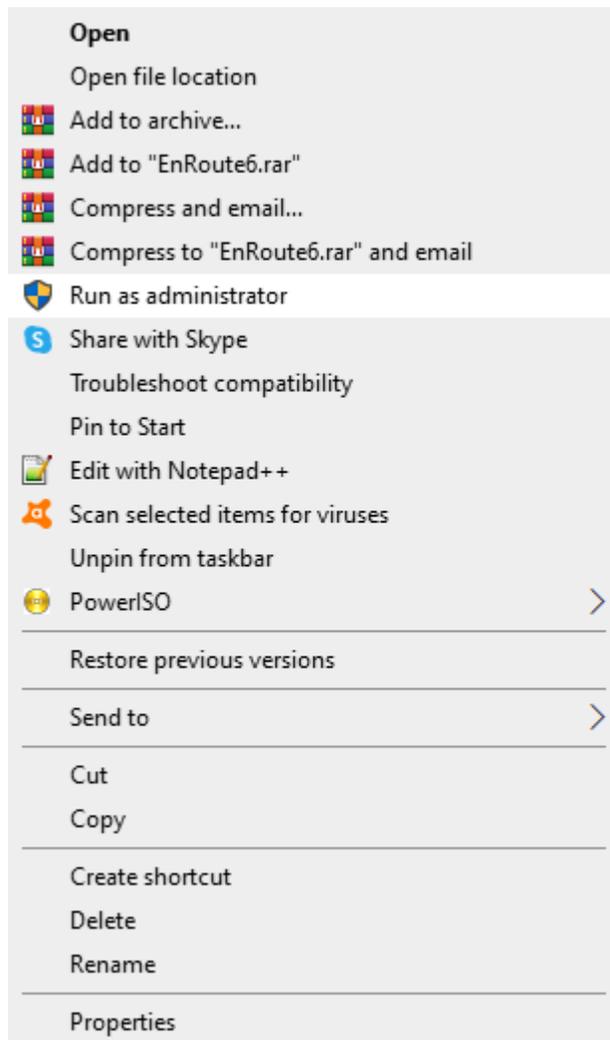
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When running EnRoute for the first time you may see this error:



If this is the case, simply right click on the icon for EnRoute and click "Run as Administrator". This will only need to be done one time, after which it will open normally.

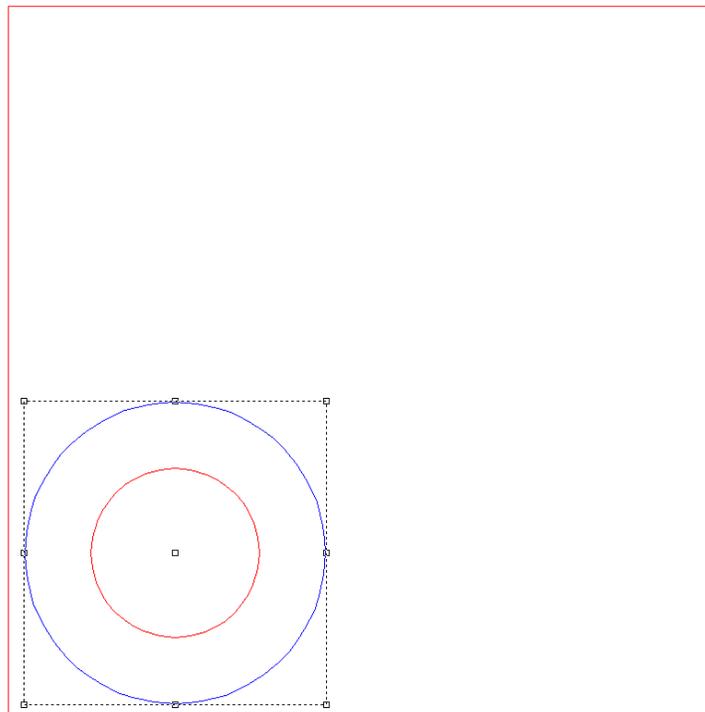


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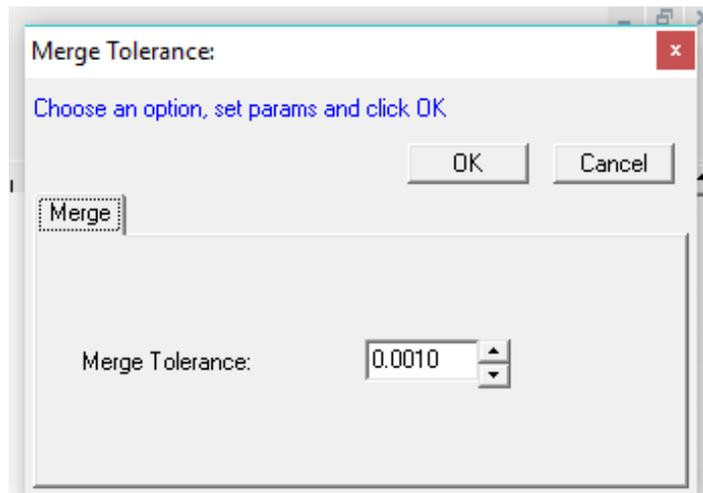
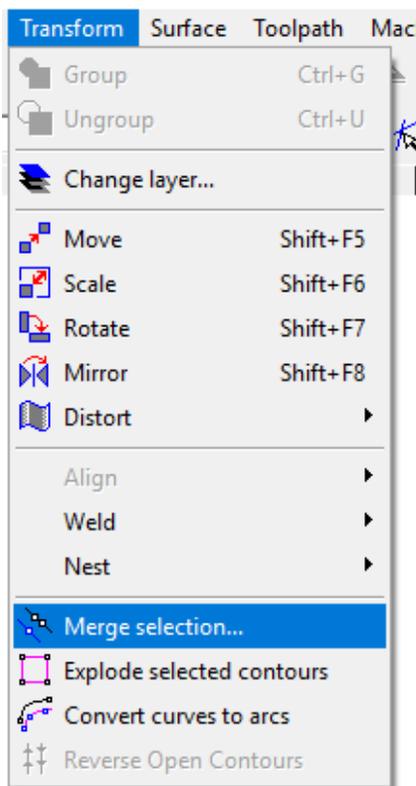
## Section J: Outputting Files with EnRoute

Sending files to the machine using EnRoute is typically a four-step process. **Note: This is not a tutorial on how to fully utilize EnRoute. This is a basic overview of exporting a cut file to your ShopSabre CNC machine.** You can also utilize EnRoute’s tutorial videos on [YouTube](#)

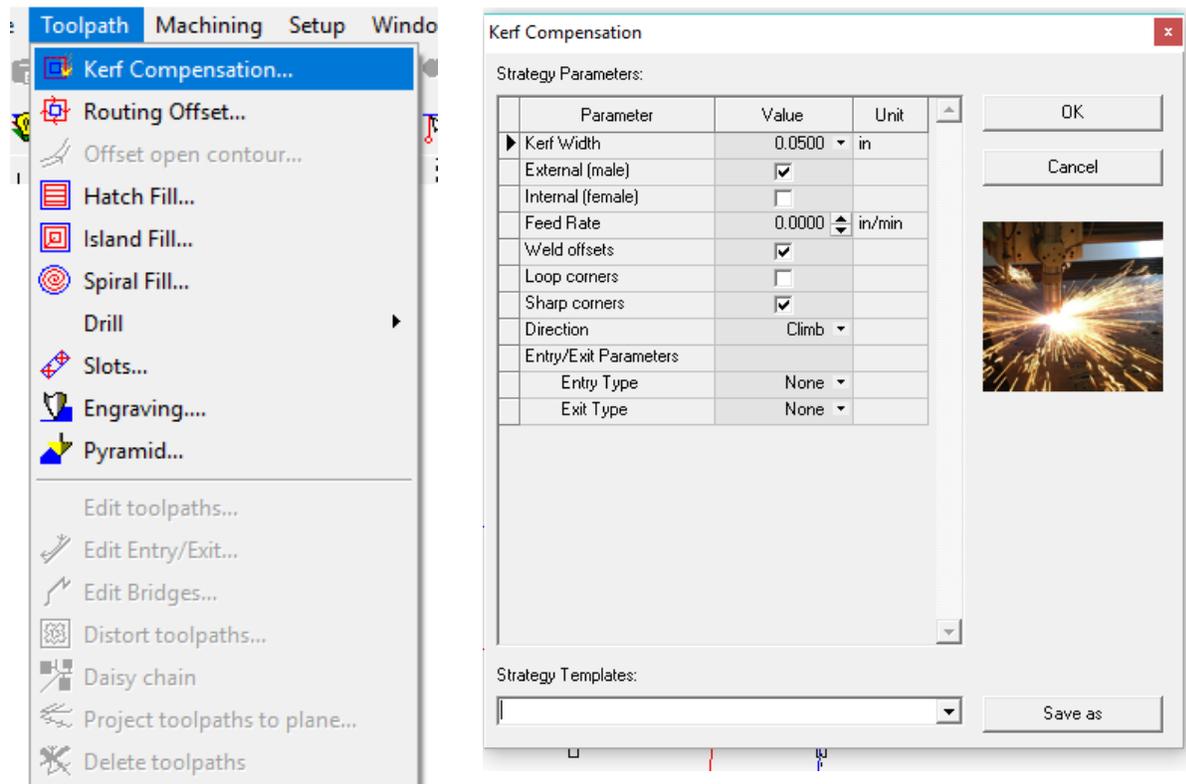
**Step one:** Draw or import what you want to cut. Generally, it should fit within your red cut area, but the ShopSabre machine doesn’t care where it is as long as it’s within the soft limits of the machine. The lower left corner of your red box is your XY zero point on the machine. If both inside and outside geometry exists, the inside should be red and outside is blue. If there are pink lines, it will not toolpath correctly.



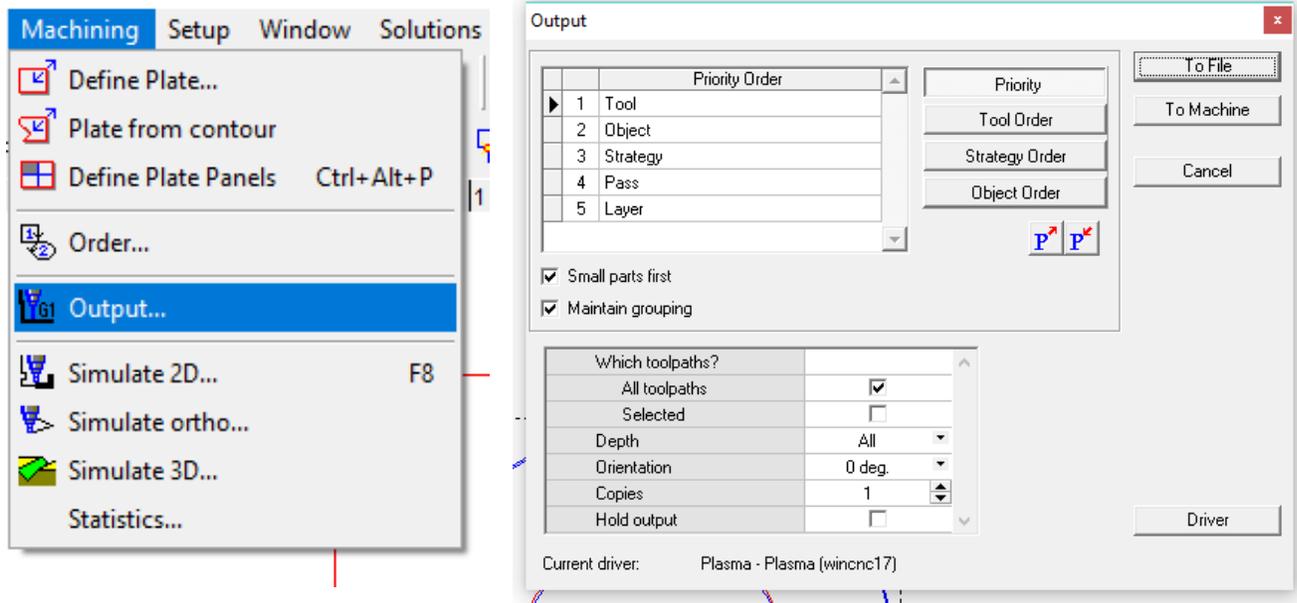
**Step two:** Merge the drawing. If any editing has been done to your drawing, or the drawing has been imported from an external source, you will want to merge the drawing (this is step 2). This will open a new dialog box for merge tolerance. Typically, the default of 0.0010 will work. If the lines stay pink after a merge, one possible option is to increase that tolerance, watching for any changes it makes to your geometry. If it does change, you'll want to undo this operation.



**Step three:** Once your cut lines are blue and red, the third step is to apply your toolpath. Kerf Compensation will do this. If you have both blue and red in your selected part, leaving the Kerf Compensation set at “External” will appropriately apply toolpaths to both. This is also the time to add entries and exits if you want them.

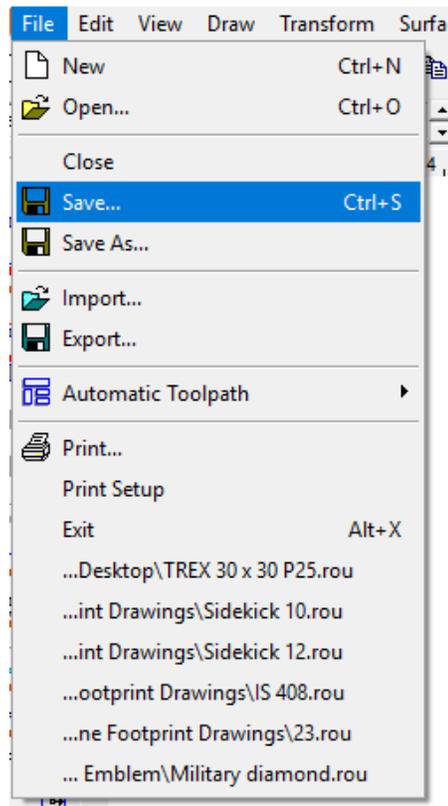


**Step four:** You will do an output and choose “To File”. Here we can see our driver, at the bottom, is set to the correct driver.



This will allow you to save a “.tap” file which the machine will run. **Note:** If you run the file and the machine runs the cut lines in the air without firing the torch it means the NDriver setup was not completed correctly. Please revisit the previous section.

You will also want to save your file as a “.rou” EnRoute Drawing. This is not required for the machine to function. However, a “.tap” is not modifiable. If you only save your .tap file, you will not be able to change your drawing and re-output a cut file.



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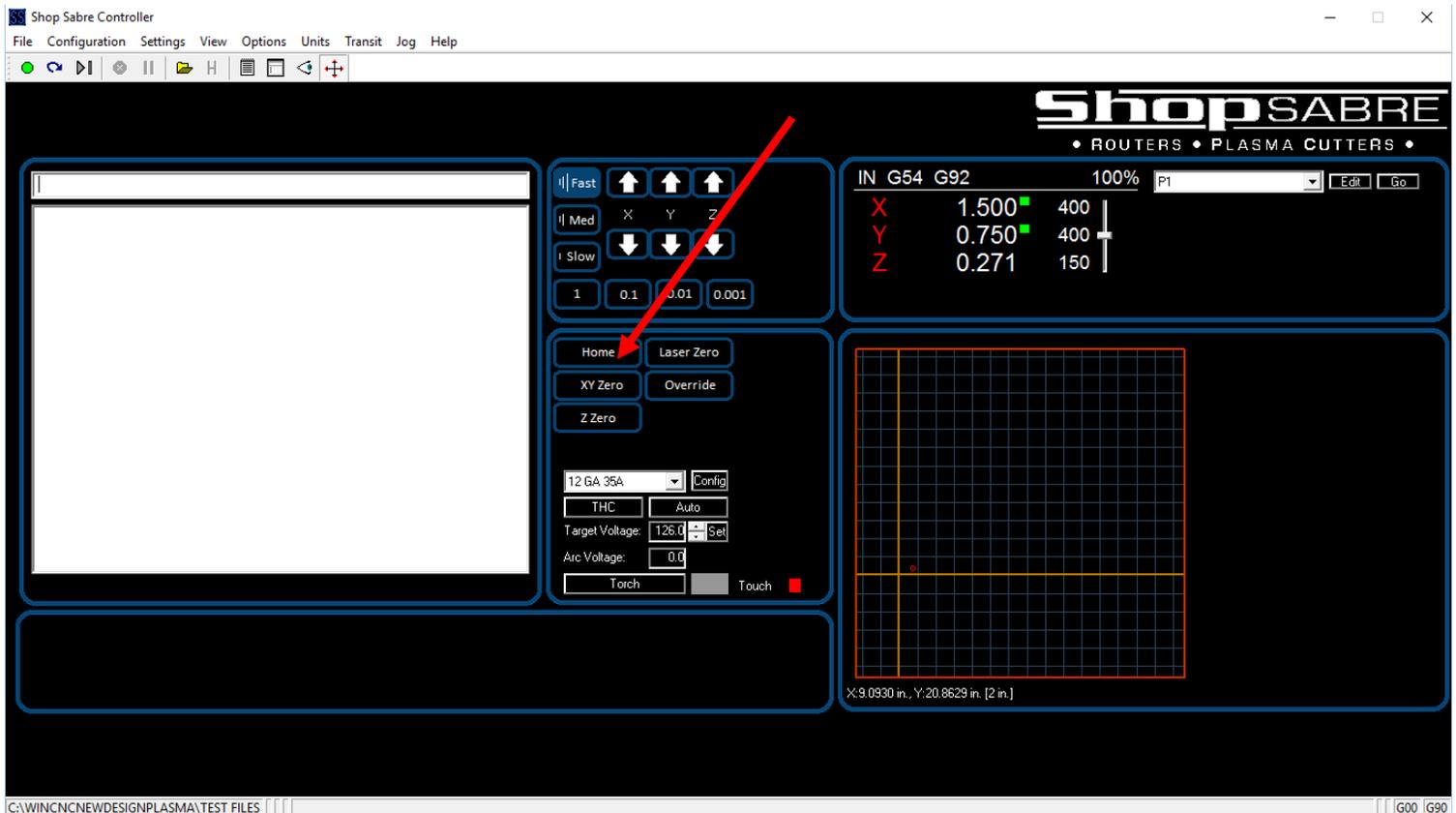
## Chapter 2

- A. Homing Your Machine, [Page 33](#)
- B. Quick Keys, [Page 34](#)
- C. Setting a Work Zero, [Page 35](#)
- D. Setting a Work Zero with Laser Sights, [Page 37](#)
- E. Choosing Your Configuration, [Page 39](#)
- F. Running a Demo Part, [Page 40](#)
- G. Features of the ShopSabre Controller, [Page 42](#)
- H. Wireless Pendant, [Page 43](#)
- I. Plasma Defense and Water Level, [Page 44](#)

## Section A: Homing Your Machine

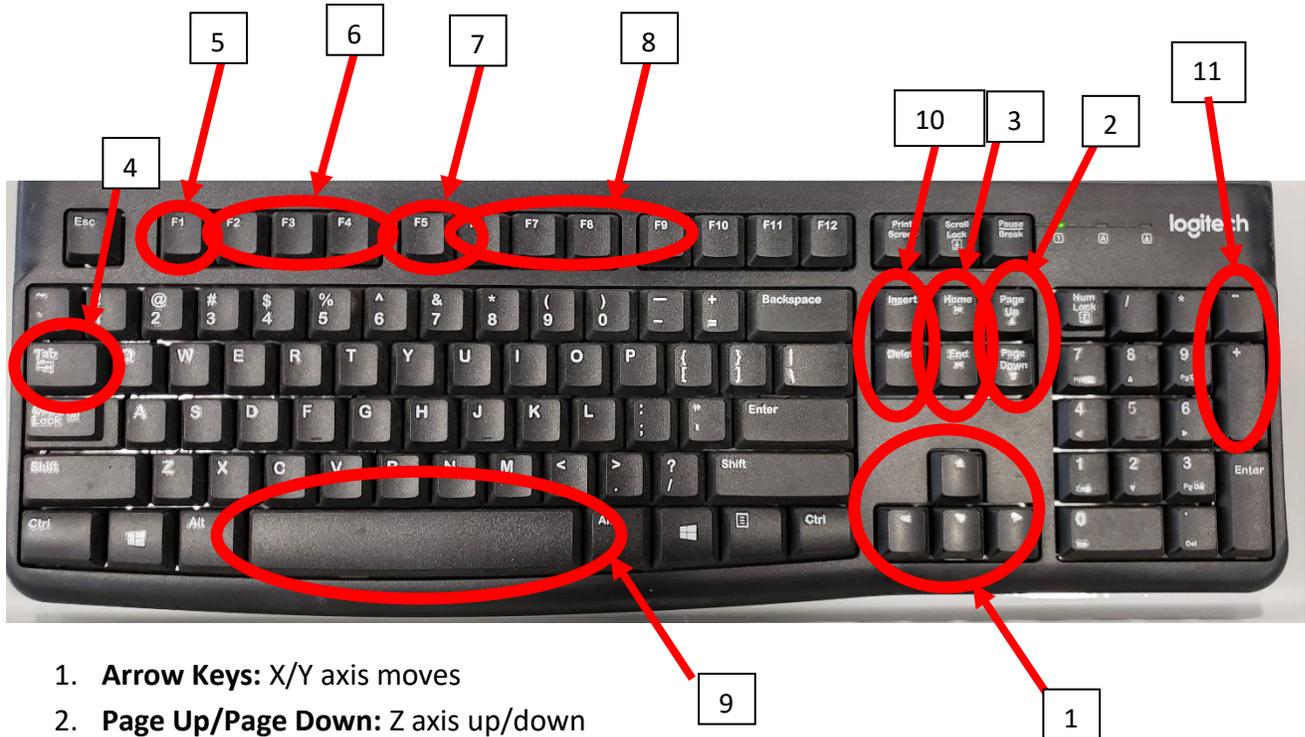
Before your machine will operate you will need to "HOME" your machine. In **figure 5A** it shows the "Home" button on your CNC control screen. Click this button. At this time your machine will start moving into its "Home" position which is located at the front left corner of the table. **Note: The front left corner is the default home position. If you have specified a different location for the default home position your machine might end up in a different location.** Once your machine has reached its "Home" position you are ready to start cutting.

Figure 5A



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## Section B: Quick Keys



1. **Arrow Keys:** X/Y axis moves
2. **Page Up/Page Down:** Z axis up/down
3. **Home/End:** 4<sup>th</sup> axis rotation or W axis up down
4. **Tab Key:** Command/Job history window
5. **F1:** Help
6. **F2-F4:** Transit speeds: slow, medium, fast
7. **F5:** Clear screen
8. **F6-F9:** Jog increments: 0.001, 0.01, 0.1, 1
9. **Spacebar:** Pause a running program
10. **Insert/Delete:** Increase/decrease feed rate override by 1%
11. **Number Pad + and -:** Target voltage increase/decrease by 1v

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## Section C: Setting a Work Zero

Now it's time to set a "working zero". Set your piece of scrap material on the table and move your machine so that the spindle or plasma head is centered over the bottom left corner of the material (**Figure 6A**). On your control screen single click the "XY Zero" Button **Figure 6B**. You have now set a temporary work position. In most cases, your machine will do an automatic touch off on the material before each cut, so it is not necessary to use the "Z Zero" button and you are now ready to run your file. **Note: if you have purchased the laser sight option you can use the laser to set this zero. Refer to the next section in the manual.**

Figure 6A

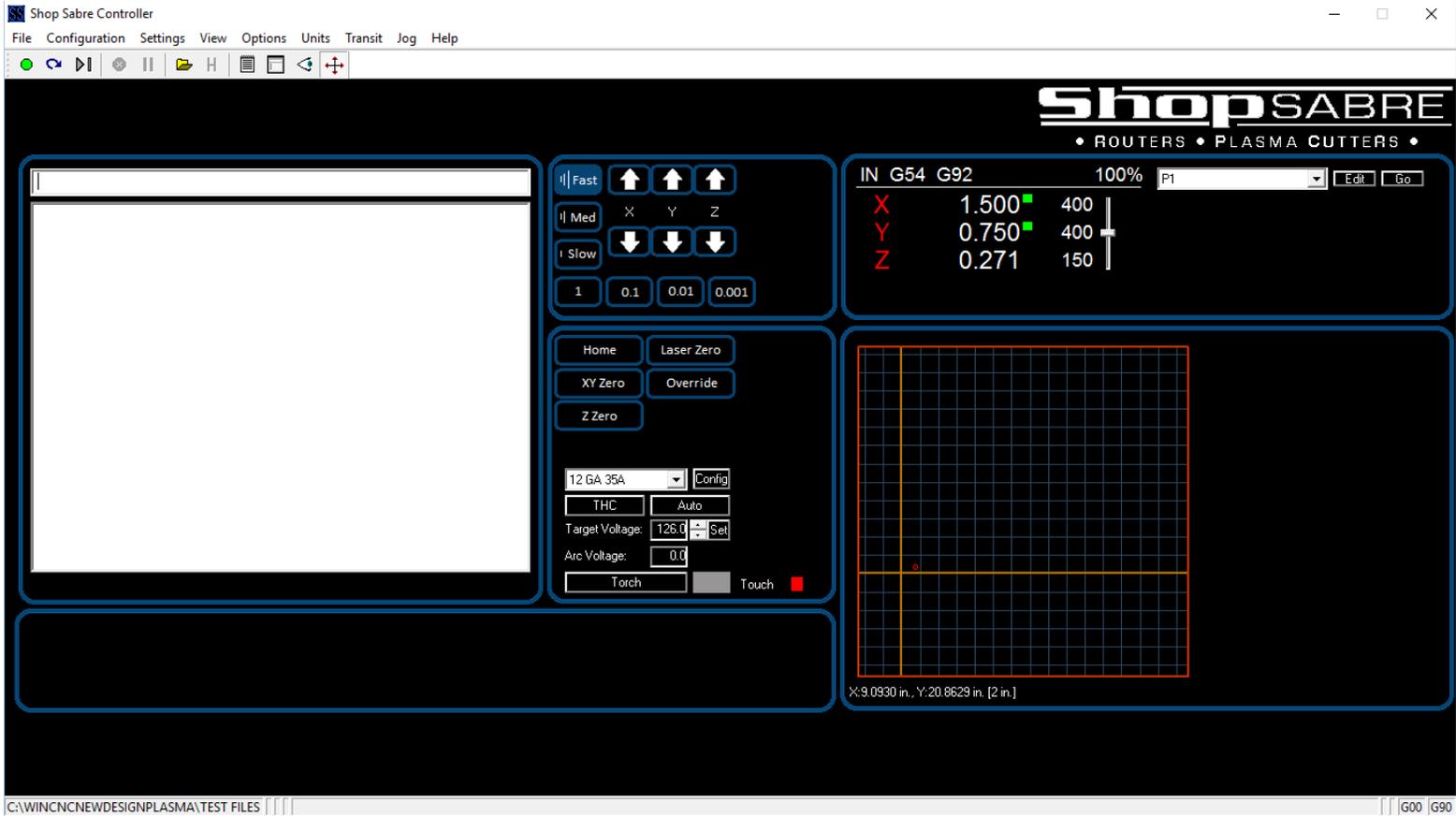


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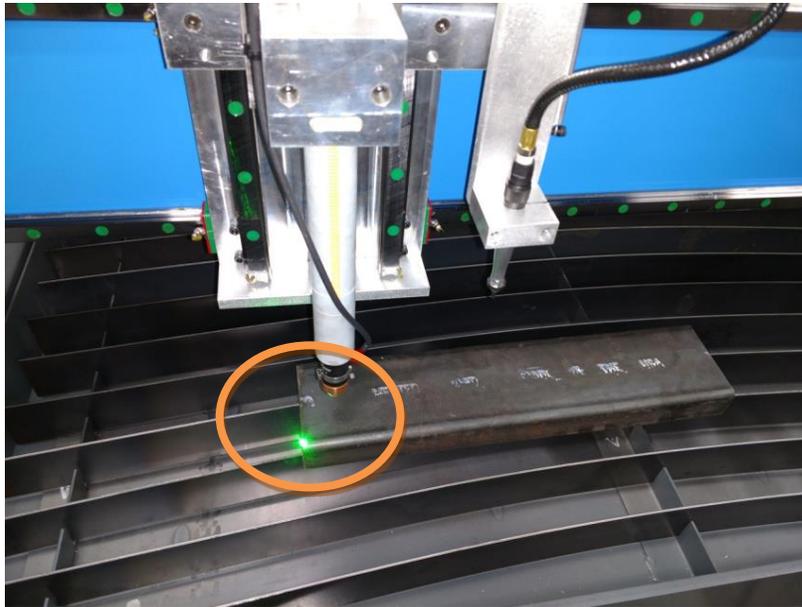
Figure 6B



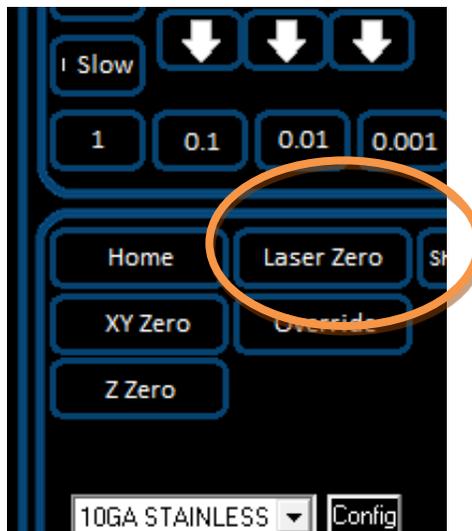
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## Section D: Setting a Work Zero with Laser Sights

If you ordered the laser sight option, you can easily set your working zero using this dot. Line up the dot with the front left corner of your work piece:



On screen you will find a button labeled "Laser Zero":



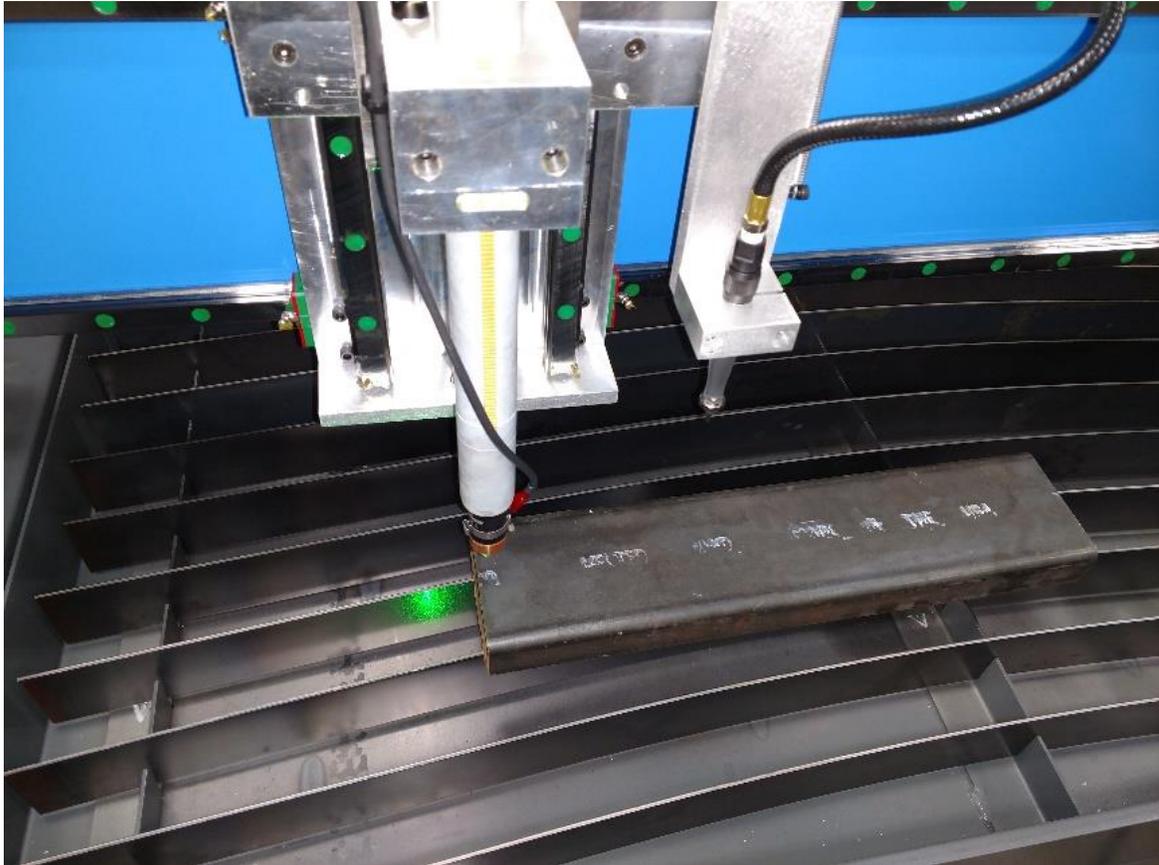
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Pressing this button will automatically set the XY Zero point at the position of the laser dot and move the center of the torch to that point:



At this point you are ready to run your file.

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## Section E: Choosing Your Configuration

Before running a part, you must select your configuration from the drop-down list on the controller:



These settings have been pre-programmed from the Hypertherm operator's manual included with your machine. **Note: selecting the wrong settings can result in anything from poor cut quality or errors on both the plasma cutter and the machine to damage or excessive wear to the consumables.** It is also possible to modify these settings or create your own for a material that is not listed. Press the "Config" button next to the drop-down menu. To add your own, press the "add" button first and fill in the information. The screenshot below describes the different options. If an option is not described below you can ignore it.

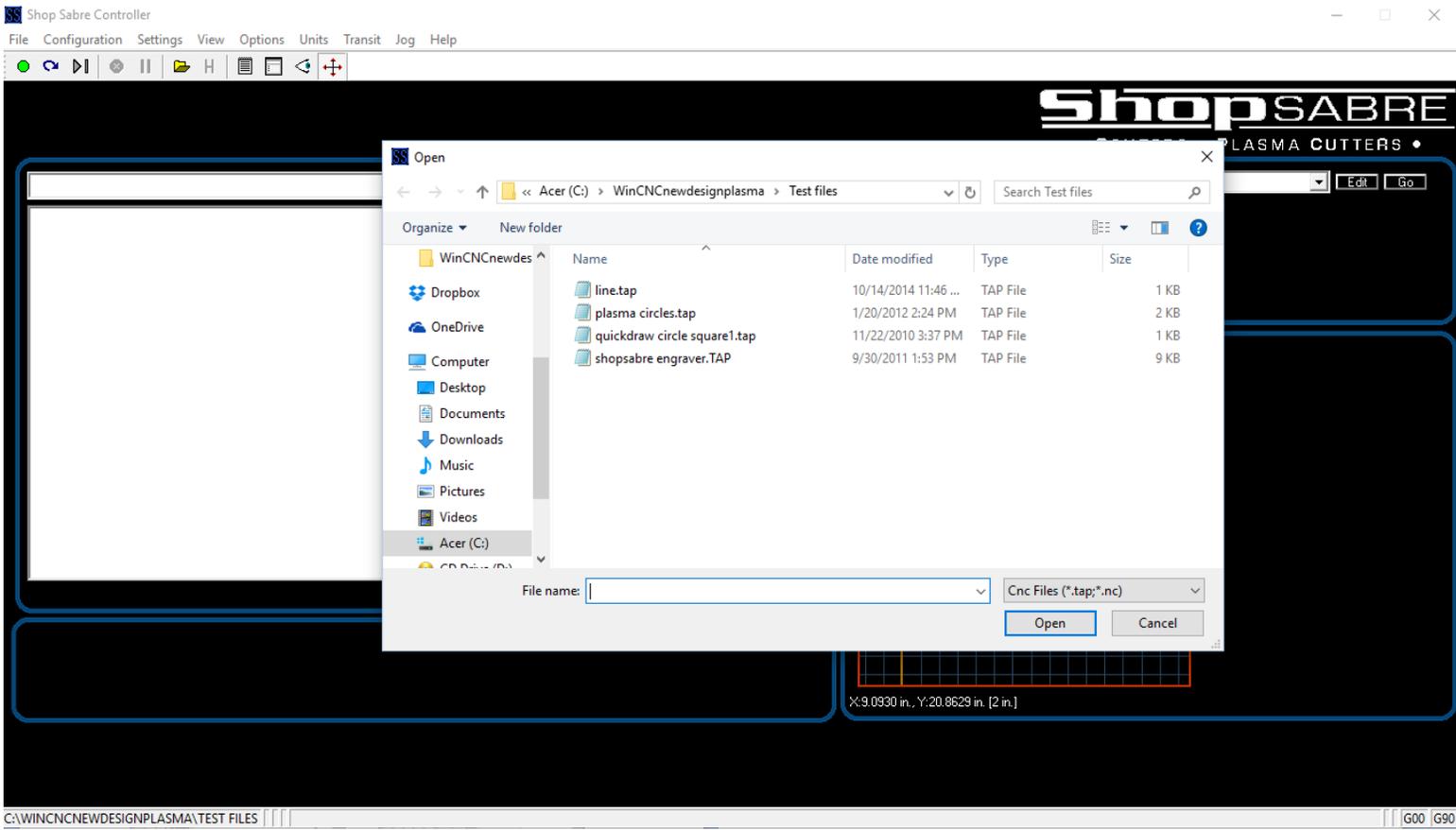
1. Name of configuration. Must be unique
2. Cutting amperage. Necessary if you have purchased the Auto Amp & Air option
3. Torch Tip Info will open the page from the Hypertherm manual
4. Manual PSI setting. The Hypertherm will regulate itself if no PSI is specified.
5. Cutting speed
6. Automatic height control voltage. Raise this if the torch drags; lower it if it cuts too high
7. Pierce delay from the manual
8. If the ends of cut lines are blowing out on the bottom of the work piece, increase this slightly.
9. Torch will touch-off for z0 on each new cut if the new pierce point is more than this distance from the previous pierce. Thinner plate should have smaller numbers here; reduce this if your plate warps frequently.
10. Pierce height from the manual
11. Cutting height from manual. If THC mode (#13) is disabled, torch will stay at this height while cutting.
12. How long to cut at cutting height (#11) before following plate contour. Should be a minimum of 2 seconds. Higher numbers for thicker plate.
13. Torch Height Control mode. **Disabled** will not raise/lower torch to follow contours. **Automatic** is standard and will use your specified target voltage. **Auto Sense** will not be used with most cutters and should not be selected.

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## Section F: Running a Demo Part

This next step applies for all CNC machines. After you have placed your scrap piece on the table top, it is time to open up the demo file located on your hard drive. On your ShopSabre controller screen click File and then Open. Select the C: drive and open up the WinCNCplasma folder. In the WinCNCplasma folder you will see another folder labeled "Test Files", click to open this folder. In this folder (Figure 7A) you will see several files including “plasma circles.tap”. Figure 7B shows an example of what your screen should now look like. Notice in the input bar it is labeled “plasma circles.tap”. Now at this point you have set your machine zeros and loaded your file to be cut. **Note: If you are running a router machine this would be the time to turn on your spindle.**

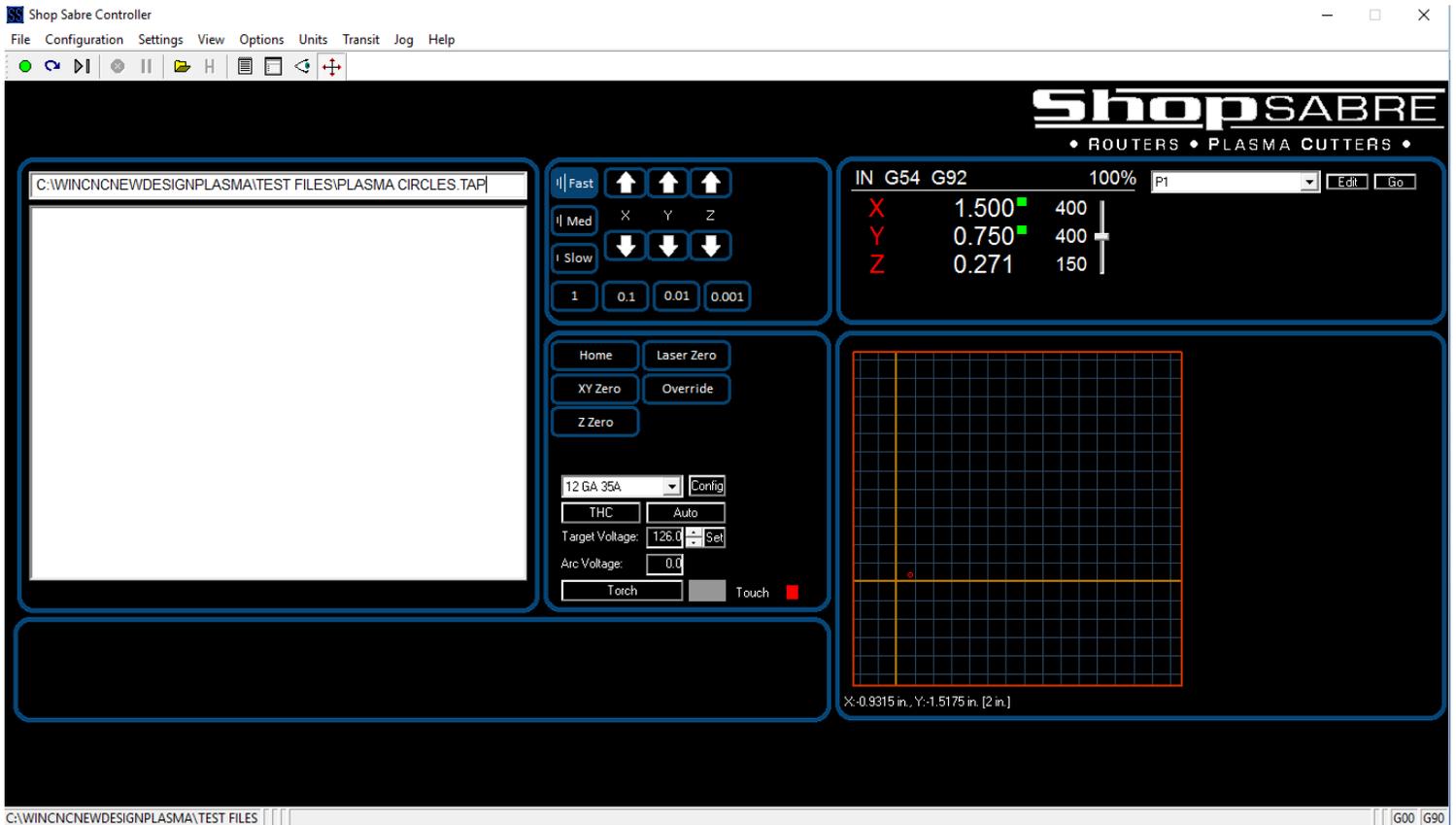
Figure 7A



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Your next step is to execute the file. You have two ways of doing this: by hitting the enter key on your keyboard, or by single clicking the green button on the control screen. Note: To stop the machine at any time either hit the emergency stop switch located on the front of the machine, hit the escape key on your keyboard, or press the red stop sign on the toolbar.

Figure 7B



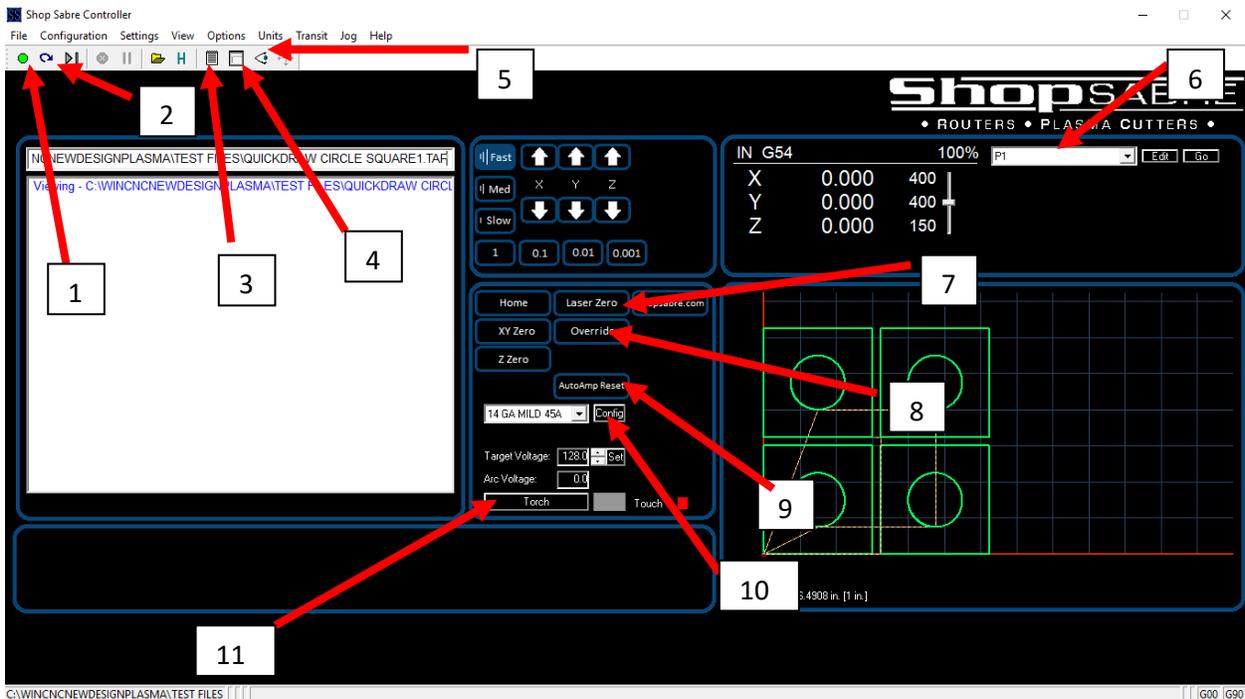
After your machine is finished cutting the demo part remove the demo piece and inspect the part for straightness and cut quality. Your machine has gone through many hours of testing at ShopSabre, however, shipping your machine across the U.S. or even the ocean could cause some minor misalignments. If there are any issues please don't hesitate to call our tech support line at 1-800-493-6021.

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## Section G: Features of the ShopSabre Controller

Note: If you purchased a touch-screen setup from ShopSabre the layout of the screen may differ, but the functionality and buttons will be the same.

1. Start Button - Starts and runs all programs
2. Restart Button - Reruns a program exactly where it was stopped
3. Edit Pad - Allows you to edit the G-Code
4. Simulation Button - Tells you what and where an error is in the G-Code
5. View Button - Will run the program in simulation mode and display part on grid
6. Position Recorder - Allows you to save positions across the table, like Park or Unload
7. If you have the laser sight option, you will move the laser to your XY zero point and press the Laser Zero button.
8. If you have the collision detection option, you will see an Override button, to clear the collision
9. AutoAmp Reset – If you purchased Auto Amp and Air control: if for any reason the Hypertherm is turned on AFTER the control screen is already open this button resets their communication (for instance, if you turn off the Hypertherm to change consumables, you must use this button after turning it back on)
10. Config screen, where you will input your torch settings
11. Will manually fire the torch outside of a program, and will depress while a program fires the torch.



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## Section H: Wireless Pendant

The ShopSabre controller is capable of utilizing a wireless pendant as an add-on option. This gives the operator the ability to be away from the keyboard and still jog the machine, set zeros, abort, and more. If you purchased this option, you must plug in the USB receiver for the pendant before turning on the ShopSabre control screen. If you have not purchased this option, it is available as an upgrade.



1. The pendant's screen will turn off after a time of not being used. This turns it back on
2. Homes the machine
3. Moves the machine to your current XY work zeros at rapid speed
4. Moves the machine to a user-changeable park position
5. Cycles between Trans, Jog, Feed rate and spindle RPM changing
6. If #5 is on Trans, will cycle between Slow, Medium and Fast. If #5 on Jog, will cycle between 1", 0.1", 0.01", 0.001".
7. Starts, pauses, and unpauses a file that has been opened from the computer.
8. Sets the current torch location as an XY work zero
9. Sets the current torch location as a Z work zero. This is unnecessary if the touch option is purchased.
10. If a second vertical axis (W) or indexer (A) axis exists, sets the current location as W or A work zero
11. Changing this dial will select which axis the Manual Pulse Generator (12) controls when turned.
12. Manual Pulse Generator. Turning this dial sends pulse signals to WinCNC. If #16 is set to X, Y, Z or A then turning the MPG will jog or transit that axis. If set to Spindle and the spindle speed option has been purchased it will change RPM. If set to Feed it will increase or decrease the feed rate override from 1% to 200% of programmed G1 feed rate.

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## Section I: Plasma Defense and Water Level

### All Tables:

If you have a water table and purchased ShopSabre Plasma Defense with your plasma machine, you'll want to add it as a 3% to 5% mixture with the water in your table. To calculate the number of gallons you'll need, take the square inches of your water table times the height of your water level, and multiply the result by 0.0043. Since water level can change based on your preference, it's best to do this calculation.

For example, if your table has a water pan the size of 53" x 109" x 4.5", your total volume is  $53 \times 109 \times 4.5 \times 0.0043 = 111.8$  gallons. However, most of the time the water level will be between 0.5" and 1" below the top of the slats, which are themselves about 3". That puts the water volume at  $53 \times 109 \times 2.5 \times 0.0043 = 62$  gallons or less. This means approximately 2 to 3 gallons of Plasma Defense should be added before the water is filled. This could vary as high as 5 gallons if the table were filled much higher with water.

The water level will have an effect on cut quality. Generally speaking, as the water height increases, more smoke will be captured, but more dross will appear on the underside of the part being cut as the water tends to splash and cool the plate quickly. The reverse is also true, with lower water levels generating less dross but more smoke. As such, it is a preference determined by each customer individually based on what they experience.

### If you have a ShopMaster Table:

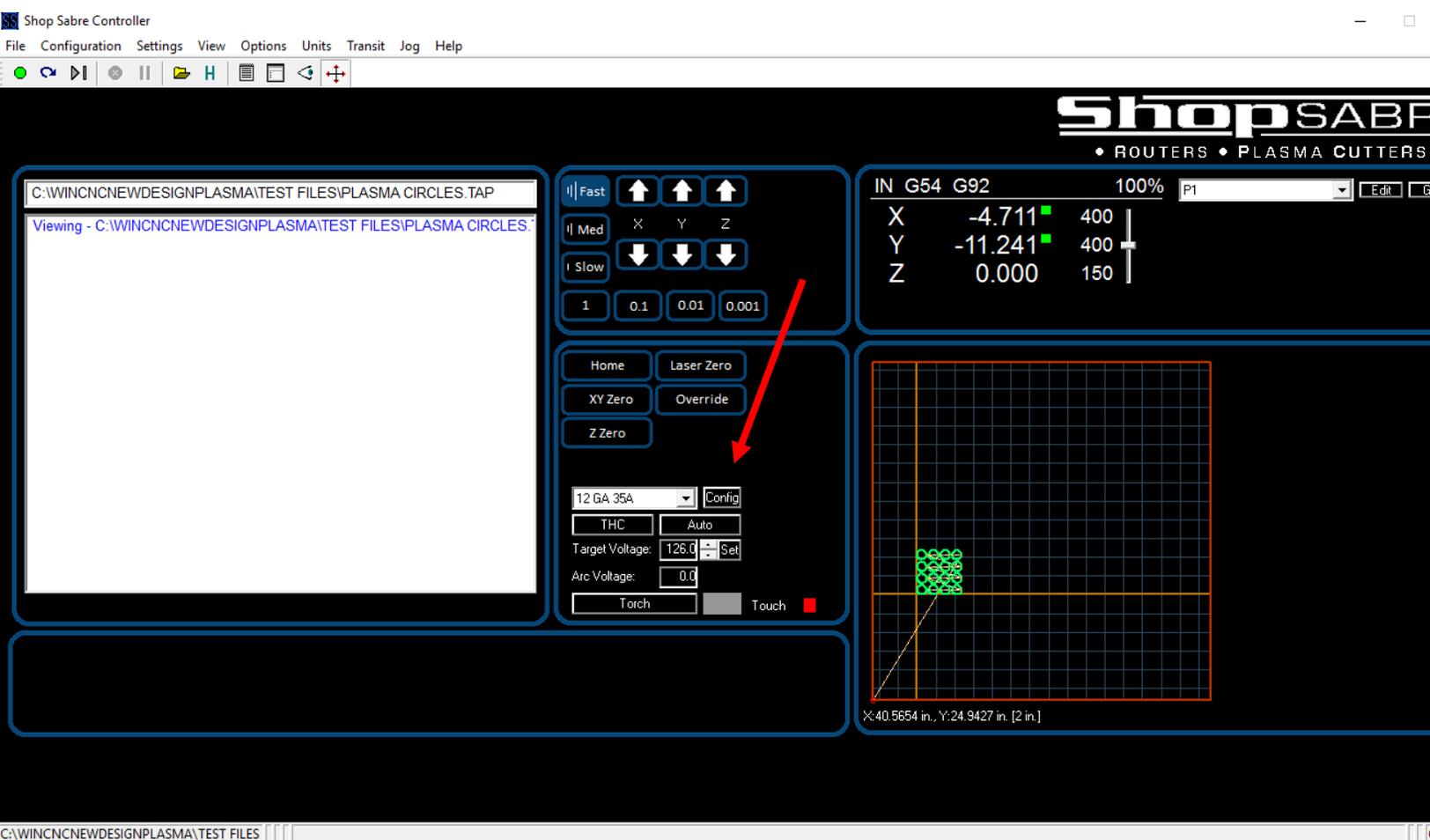
ShopMaster tables also contain an air ballast in the middle of the water tank. Due to the depth of the tank this allows the user to raise and lower the water level using compressed air. At the back of the machine is a pipe with a valve that feeds the ballast. When filling the water tank, fill until the holes at the bottom of the ballast tank are covered with water. Then pump water in until air bubbles come out of those holes. This is your maximum air level. Close the valve on the pipe and resume filling the water tank to the desired height. To lower the water, open the valve and allow air to escape from the tank. To raise the water level, pump air back in until bubbles appear.

## Chapter 3

- A. Setting Up Plate Configuration, [Page 46](#)
- B. Plasma Engraving Pen, [Page 51](#)
- C. Lubrication Information and Requirements, [Page 55](#)
- D. Frequently Asked Questions, [Page 56](#)
- E. Cut Quality, [Page 58](#)
- F. Understanding Basic G-Code, [Page 61](#)
- G. ShopSabre CNC Warranty, [Page 62](#)

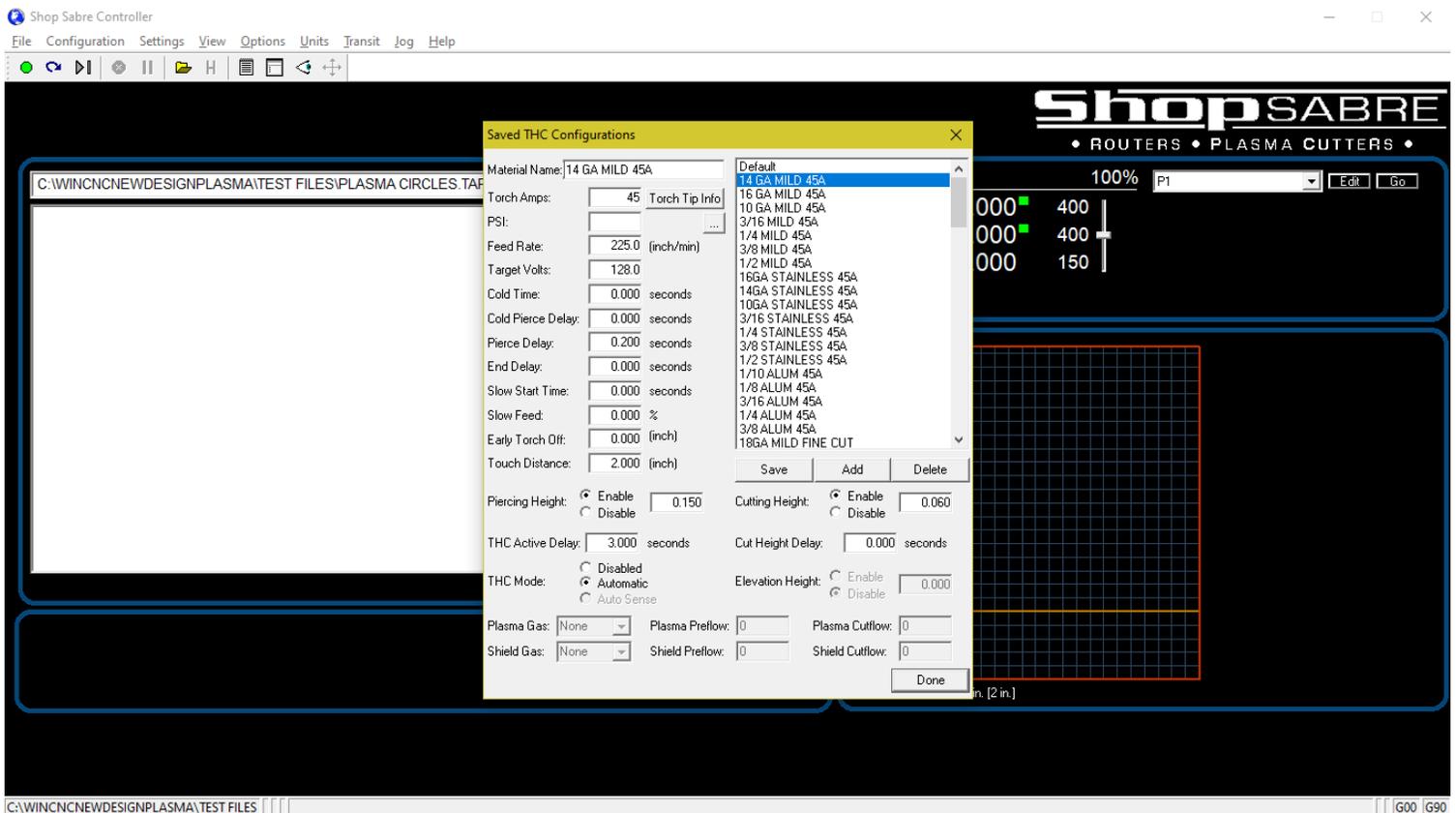
## Section A: Setting Up Plate Configuration

Your configuration screen is used to set the parameters of each plate thickness and type you plan to cut. To get to the Config screen, simply click on the "Config" button illustrated below.



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## View of Config Screen



In your config window you will input the values of the material you plan on cutting. If you look in your Hypertherm manual you will see charts for all material thickness and amperage ratings. You will use these numbers in your config screen to setup each cut file.

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Circled in **RED** below are the input boxes. Using your Hypertherm manual, match the corresponding input boxes with the information given in the manual. Remember when setting the Target Voltage, the higher you set the target voltage the higher off the plate the torch will be. If you do not have your Hypertherm manual, we have also loaded the information into your controller.

The screenshot displays the Shop Sabre Controller software interface. A dialog box titled "Saved THC Configurations" is open, showing a list of saved configurations and a set of input fields for a specific configuration. The input fields are circled in red. The background shows a control panel with a grid and various status indicators.

**Shop Sabre Controller**  
File Configuration Settings View Options Units Transit Log Help

**ShopSABRE**  
• ROUTERS • PLASMA CUTTERS •

100% P1 Edit Go

000 400  
000 400  
000 150

**Saved THC Configurations**

Material Name: 14 GA MILD 45A

Torch Amps: 45 Torch Tip Info

PSI:

Feed Rate: 225.0 (inch/min)

Target Volts: 128.0

Cold Time: 0.000 seconds

Cold Pierce Delay: 0.000 seconds

Pierce Delay: 0.200 seconds

End Delay: 0.000 seconds

Slow Start Time: 0.000 seconds

Slow Feed: 0.000 %

Early Torch Off: 0.000 (inch)

Touch Distance: 2.000 (inch)

Piercing Height:  Enable  Disable 0.150

THC Active Delay: 3.000 seconds

THC Mode:  Disabled  Automatic  Auto Sense

Plasma Gas: None Plasma Preflow: 0 Plasma Cutoff: 0

Shield Gas: None Shield Preflow: 0 Shield Cutoff: 0

Default

- 14 GA MILD 45A
- 16 GA MILD 45A
- 10 GA MILD 45A
- 3/16 MILD 45A
- 1/4 MILD 45A
- 3/8 MILD 45A
- 1/2 MILD 45A
- 16GA STAINLESS 45A
- 14GA STAINLESS 45A
- 10GA STAINLESS 45A
- 3/16 STAINLESS 45A
- 1/4 STAINLESS 45A
- 3/8 STAINLESS 45A
- 1/2 STAINLESS 45A
- 1/10 ALUM 45A
- 1/8 ALUM 45A
- 3/16 ALUM 45A
- 1/4 ALUM 45A
- 3/8 ALUM 45A
- 18GA MILD FINE CUT

Save Add Delete

Done

C:\WINCNCNEWDESIGNPLASMA\TEST FILES\PLASMA CIRCLES.TAP

G00 G90

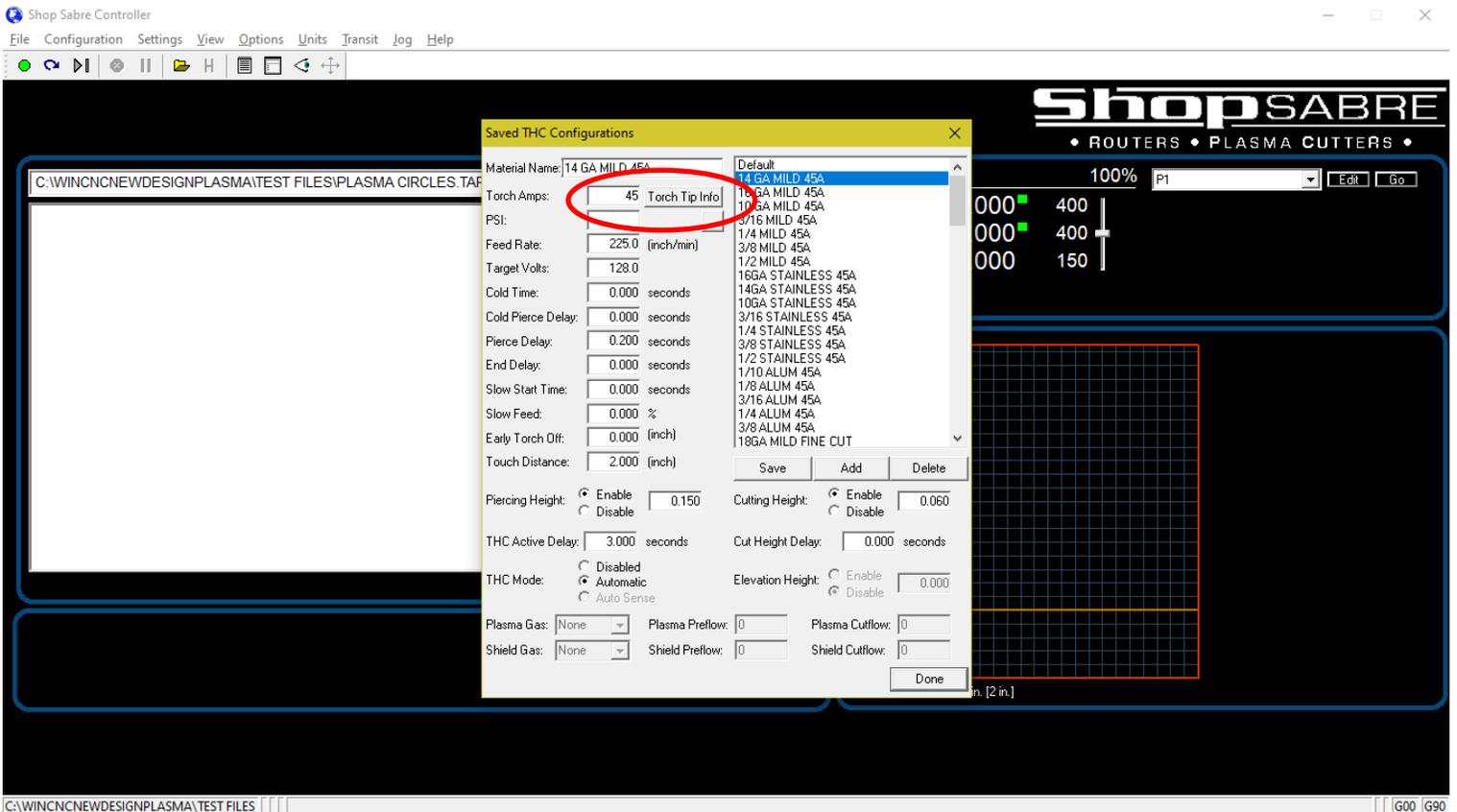
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To access the Hypertherm cutting information simply enter the amperage at which you wish to cut (input box circled in red) and click the button titled "Torch Tip Info" next to the amps input box. This will display the torch information.



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The picture below shows an example of the Hypertherm cutting information, accessed from the "Torch Tip Info" button.

**Torch Tip Information**

9 Cut Charts and Marking Charts

Mild Steel - 45 A - Air - Shielded

220817 220854 (220963 for ohmic sensing) 220941 220842 220857

Metric														
Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		Kerf Width					
mm	mm	mm	%	seconds	Cut Speed mm/min	Voltage volts	Cut Speed mm/min	Voltage volts	mm					
2	1.5	3.8	250	0.2	3560	128	7810	125	1.4					
3					3960	128	8590	127						
4					4360	128	9360	126						
6					1430	130	2110	127						
8					1020	133	1385	130						
10					780	136	920	134						
12					540	140	690	138						
16					310	146	400	141						
20					170	152	240	147						
25					110	157	145	154						
Edge Start														

English									
Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		Kerf Width
inches	inches	inches	%	seconds	Cut Speed in/min	Voltage volts	Cut Speed in/min	Voltage volts	inches
16 GA	0.06	0.15	250	0.1	249	128	320	124	0.053
14 GA					225	128	320	125	
10 GA					129	128	181	128	
3/16					85	129	122	127	
1/4					48	130	72	127	
3/8					33	136	38	133	
1/2					16	141	24	139	
5/8					13	146	16	141	
3/4					7	151	10	145	
7/8					6	154	7	151	
1					4	157	6	154	
Edge Start									

Gas flow rate - slpm / scfh

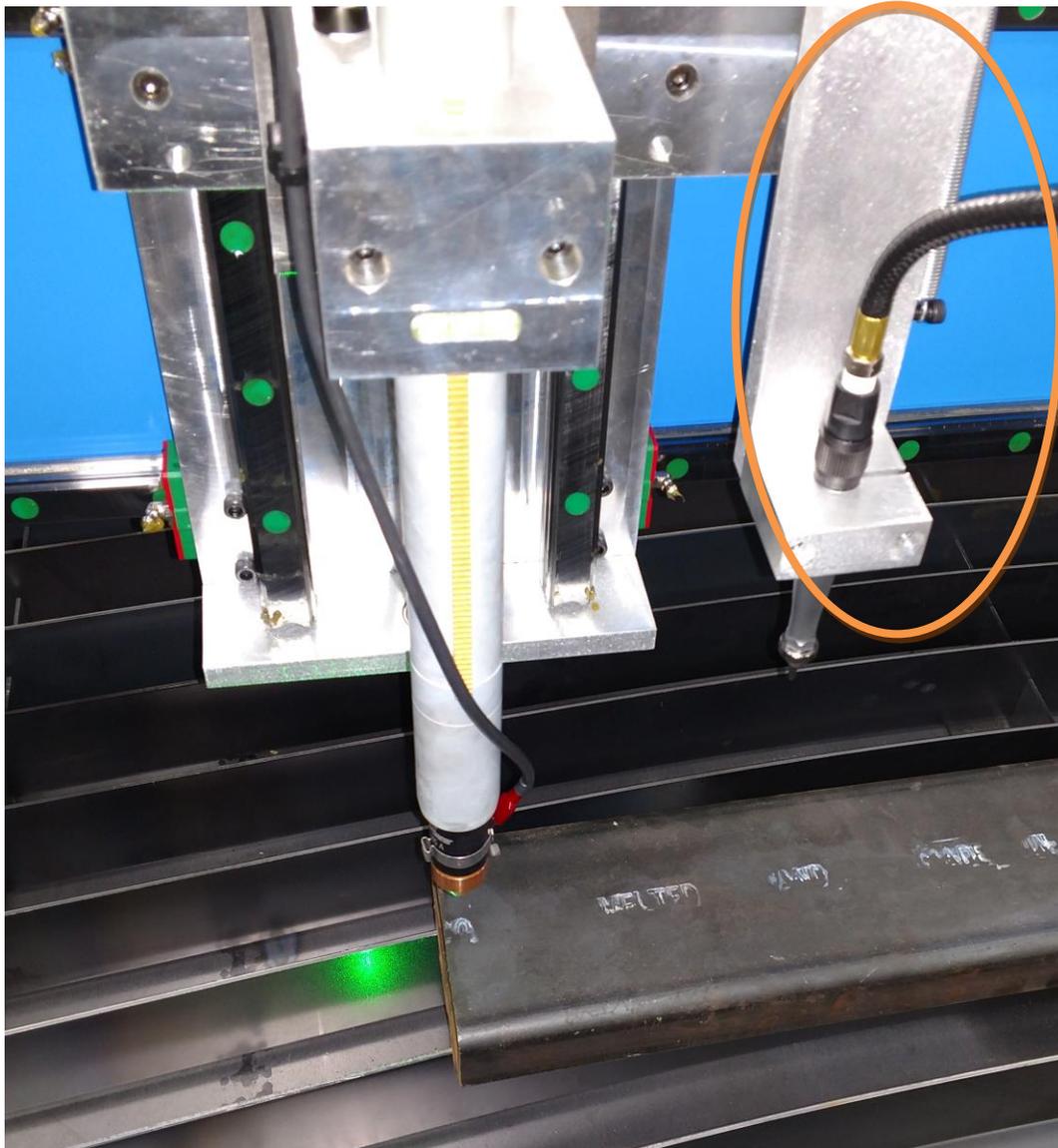
151 / 320	Hot (outflow)
184 / 390	Cold (preflow)

124 809240 Operator Manual Powermax 45 XP G00 G90

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## Section B: Plasma Engraving Pen

The engraving pen is used for writing or marking plates of steel before being cut out with the plasma cutter. The next couple pages will walk you through the process of using your marking pen. Below is a picture of an engraving pen on our ShopSabre SideKick model. If you ordered a combo unit or a ShopMaster the pen will look the same. The plasma torch must be installed for the engraver pen to work.

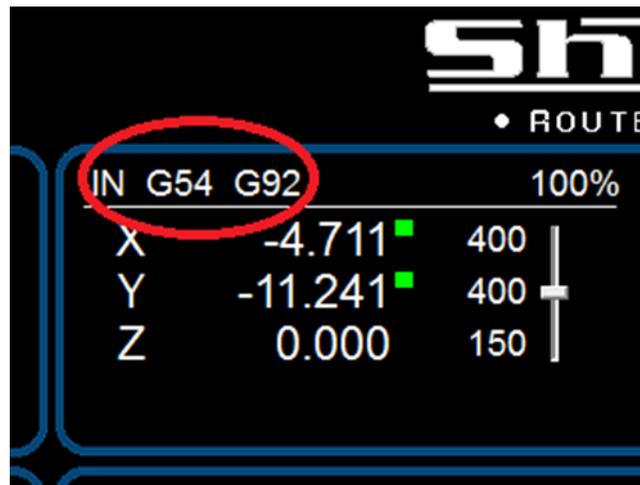


SideKick CNC plasma with the attached Engraving Pen

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These next steps will walk you through how to set a working zero for the engraving pen, opening an engraving file and running the program.

To set a machine zero, refer to those sections earlier in the manual. Check to make sure you are in G54 mode before setting the zero. If not, type in “G54” in the command bar and hit enter. We want to set this zero with the torch (or laser sight) before using the engraver.



Note: When you set an XY zero with the torch (or your laser sight), make sure you are in G54 mode. If you are in G55 mode the machine is expecting the zero to be set with the engraver, which is more difficult. If you abort during an engraving program it may leave the machine in G55 and you will want to manually type in G54 to return to torch mode.

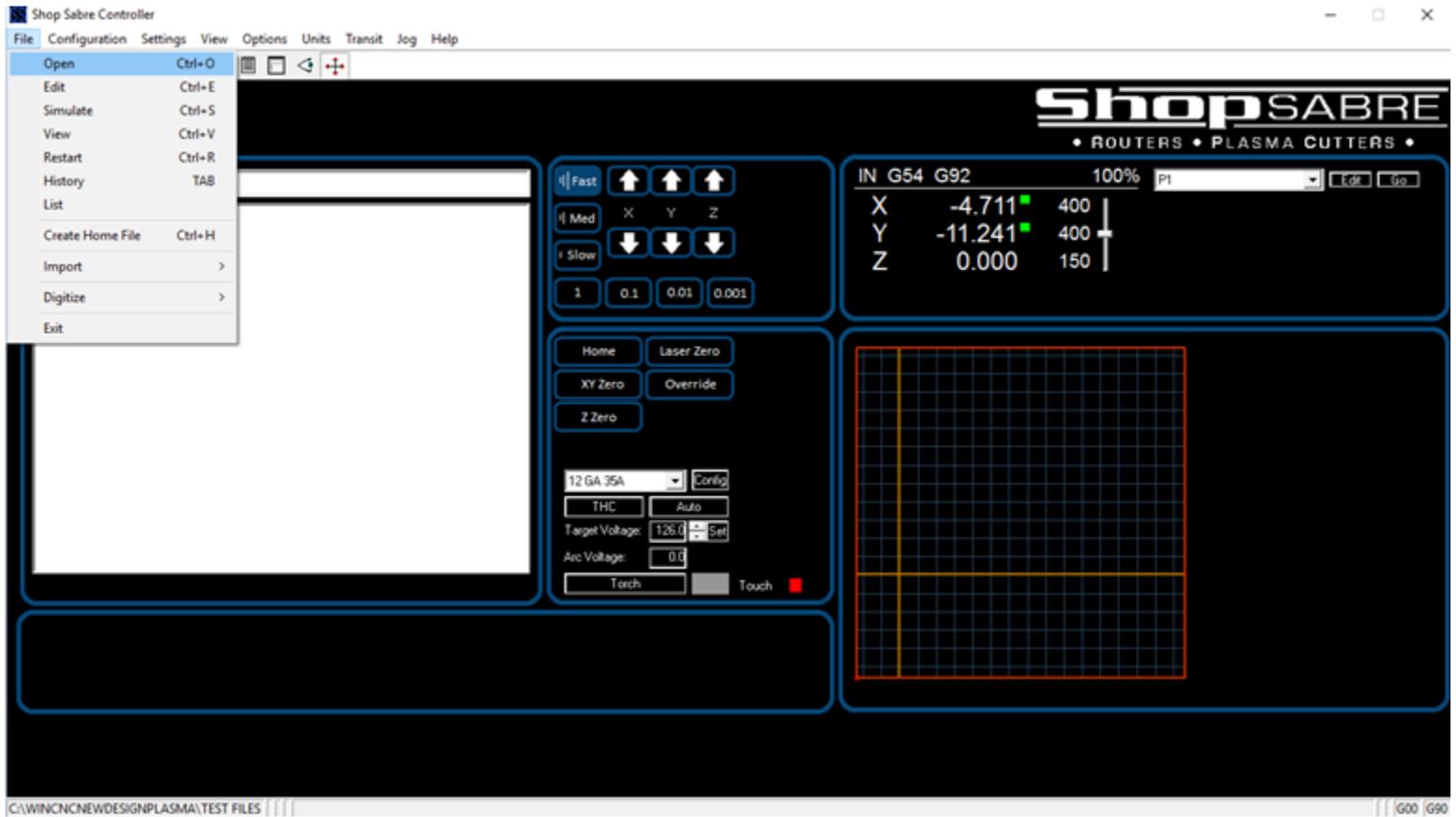
You are ready to run your engraver program. The end of this section describes how to create an engraver file. If you need help with this process, please call our tech support.

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On your WinCNC screen in the upper left corner, single click the File menu, and scroll down to the Open button.



After clicking the open button find the designated file, scroll over and single click, opening it in the input bar on your WinCNC controller screen.

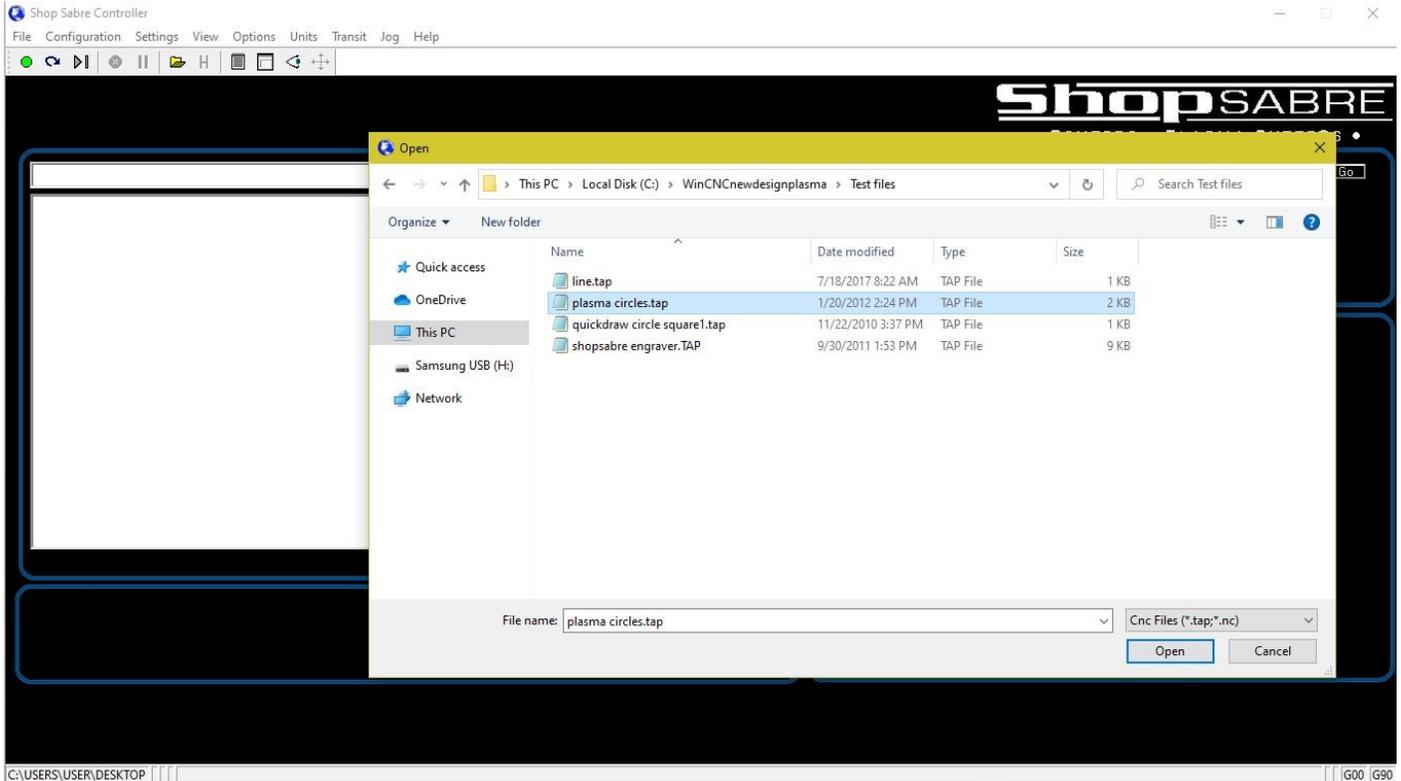
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Locate the file you plan on using for the engraving pen. Mouse over the file and single click. This will put the file in the input bar on the WINCNC control screen.



Your machine is now ready to run the program. To run the program, you can either click the green button on your WinCNC control screen or simply press Enter on your keyboard. Please refer back to Chapter 2 for a list of quick keys. The plasma torch will proceed to do a touch on the material, lift up and proceed to turn on the pen.

Any file can be changed into an engraving file by opening the file in notepad or by using the edit in the control screen. Once you have the file open in notepad you will need to go to the Edit menu and down to Replace. You are going to "Replace All" for the following commands one at a time:

M65 to M3

M61 to z0

M62 to z1

M66 to G54

Add an M5 at the end of the file

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## Section C: Lubrication Information and Requirements

For long-term use of a linear motion system under normal conditions, good lubrication is a must. If lubricant is not used, rolling parts wear quickly, and the service life of the system is shortened considerably.

To simplify the lubrication requirements, we stock the proper grease, grease guns, and fittings available for purchase. The kit includes three large grease tubes, a grease gun with flexible hose, and a needle fitting for all grease points. Give us a call at 800-493-6021 to learn more.

There are generally 7-12 grease points for the linear bearings (one for each bearing block): four on the Y axis, four on the gantry X axis, and four that are on the Z axis vertically. We recommend that for every 40 - 60 hours of operation all blocks be greased. The blocks take about one to three pumps on the grease gun.

If you have ball screws, those axes have ball nuts with grease zerks on them. To grease the Z nut, you will find a slot at the top in the back, through which you will see the Z zerk when the machine is homed. The X axis nut (on a double-tube machine only) is found on the gantry between the two X tubes. Run each axis to distribute the grease. All ball screws should be greased every 40-60 hours of operation depending on the speed and size of the average job you run. If you notice that the machine seems to be running rough increase your greasing schedule. It is possible, however, to over-grease the bearings which can also cause rough movements and cuts.



When greasing your machine, you must use the recommended grease SL-3310 and proper needle tip as shown in picture to the left. Using a non-needle tip may cause damage to the bearings which will not be covered under warranty.

Do not use a standard grease fitting. The needle fitting to use is ATD-5016.

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## Section D: Frequently Asked Questions

**Q: The machine is telling me “G28 required”**

A: The machine needs to be homed before other operations can commence. If it gives this error after pressing the “home” button, it means there is another error. Pressing an arrow key on the keyboard to tell the machine to jog will often bring up the true error.

**Q: The machine is telling me “Emergency Stop” when I try to jog or home it.**

A: Make sure the emergency stop button is not pressed in. If it is, twist it to release. If it is already released, check to see that both 37-pin connectors are in their appropriate ports (i.e., the port labeled “Blue Port” on the control box is going to the colored blue port on the back of the computer, and same for the black port.). If they are not, replace them in the correct locations. If they are please contact tech support.

**Q: My torch goes down to touch off but does not lift up**

A: This can be one of two problems. If the pierce height is set to 0 or disabled in the config screen, set this to the appropriate number as found in your Hypertherm manual and enable it. Refer to the section on the config screen earlier in this manual. The other possibility is that the torch is not low enough in the holder, or that it is not sensing the touch before triggering a servo offline. Check that the wire is connected and not damaged and that the torch is low enough in the holder for it to physically reach down to touch the plate before reaching the limit of its downward travel. If these are all correct, contact tech support.

**Q: The machine stopped and gave a “Soft limit exceeded y+” or another axis or direction (x-, x+, y-, z+)**

A: The controller software has calculated that the next move will take it beyond the cutting limits of the machine and has stopped itself to prevent damage. With an X or Y error, this typically means either the XY zero point needs to be moved or that the drawing is too large for the table (or both). Previewing the drawing in the preview window will often show it outside of the red box, indicating it is outside of the table’s cutting area. A “Z+” error generally indicates that some other problem occurred. Scrolling up in the g-code history will often show the first error that prompted the Z+ error.

**Q: The machine is running my part in the air but the torch never came down to fire**

A: EnRoute setup was not completed correctly. If the cncctrl.ini file was not moved to the C:\Windows folder it will have this exact behavior. Complete the EnRoute setup earlier in this manual and re-output your file.

**Q: The torch touches off the material but does not fire**

A: There is either an error on the Hypertherm screen (i.e., 0-XX, where XX is a number, or an orange light may be flashing) or the “plasma” wire is not attached between the control box to the back of the plasma unit. The list of error codes is in the Hypertherm manual. If you need help, contact tech support.

**Q: The parts are previewing correctly on the control screen but are cutting incorrectly or are misaligned when the machine is finished cutting**

A: The servo motors are very susceptible to electrical interference from the plasma cutter. If there are coils or loops of wire, or if there are wires sitting near the plasma unit itself there can be cross-talk that feeds back to the control box and causes motors to move out of position. Try to spread these wires out to remove any coils or loops, especially in the torch and ground leads coming from the plasma cutter. If you need help with this process, contact our tech support team.

## Section E: Cut Quality

Modern air plasma power supplies and torches like Hypertherm are capable of producing good quality cuts at higher speeds than other cutting devices like water jets, lasers, and oxy-acetylene torches. However, it is important to note that they are not laser cutters in terms of edge/finish quality and there are many factors the operator needs to be aware of to produce good cut quality.

The operator must be aware that a plasma torch uses an electric arc to turn compressed air (or other gasses) into a high-temperature plasma. This arc will **ALWAYS** drag behind the torch during motion. Looking at the sides of a part after a cut, the lag lines will be visible. Part of the feel for operating a plasma is about the angle and shape those lag lines are creating. Be aware that there is a “good” side to a cut - as the torch runs down the table away from the home position the right side is considered good and is typically cleaner than the left side. Cutting clockwise versus counterclockwise (climb vs conventional) will give different results depending on whether it is an inside or outside cut. We recommend leaving EnRoute on climb cutting.

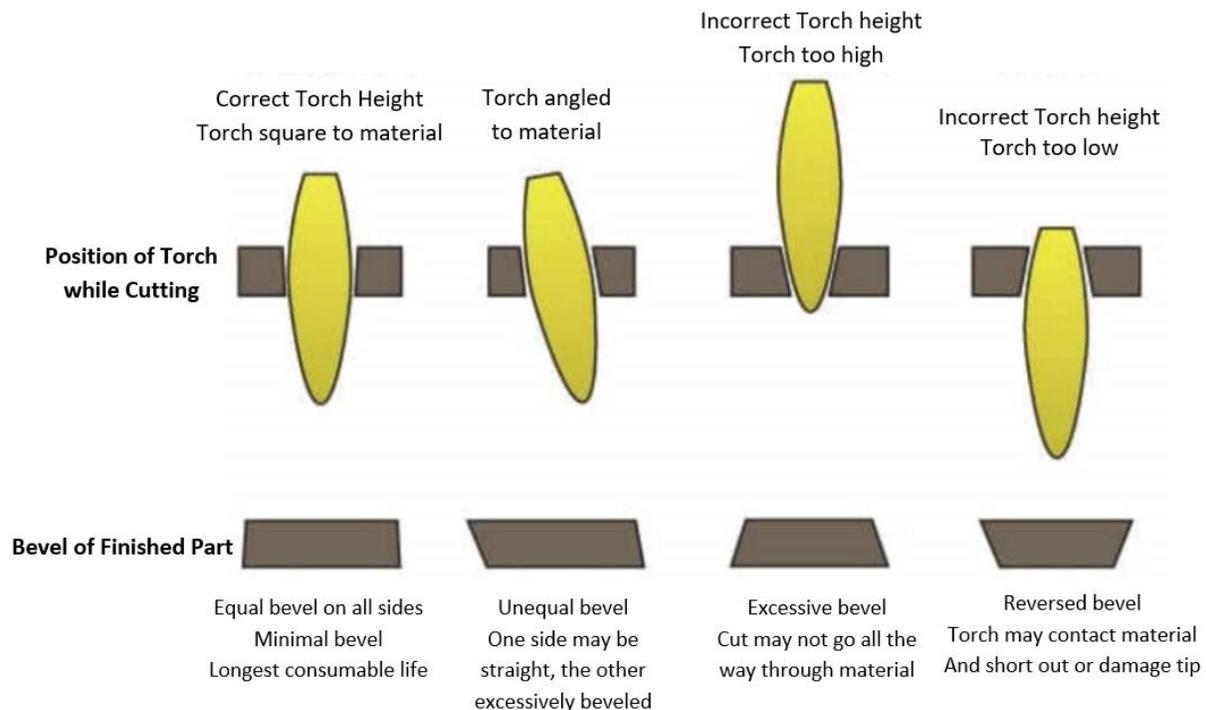
### HOLE SIZES

This arc drag is the reason it is very difficult to get small holes to come out clean – the arc would rather jump across a small hole than follow in a circular motion underneath the torch. Typically, the smallest hole that can ever be clean with an air plasma is a 1:1 ratio with material thickness ( $\frac{1}{2}$ ” thick material has a bare minimum hole size of  $\frac{1}{2}$ ” diameter) with a  $\frac{1}{4}$ ” diameter as a bare minimum for anything smaller than  $\frac{1}{4}$ ” thickness. Hypertherm suggests a minimum of 2:1 with thickness ( $\frac{1}{2}$ ” material need a 1” diameter) to have consistently good hole cuts.

## BEVEL/TAPER

There are several different types of bevel or taper that all have different sources. A plasma cutter creates a roughly diamond-shaped beam of heated plasma below the tip of the torch. This shape means that it is impossible to consistently create parts with 0° taper. However, modern plasma cutters can get close. Hypertherm states that on the "good" side of the torch will give 1-3° or more at best for an air plasma and the "bad" side will be 3-8° or more. This means over the height of a ½" thick material the bottom of the cut (kerf size) will be on average 0.026" smaller than the top on each side of the cut. For a hole that is 0.5" diameter on top of 0.5" thick material, the bottom would therefore actually be 0.45" diameter or smaller rather than 0.5". This is considered normal and best quality for non- "hi definition" plasma cutters.

Below is a chart that shows different types of bevel and what causes it. Keep in mind, these are just some of the possible causes.



Slowing down the movement of the torch *could* potentially eliminate some bevel at the cost of worse cut quality (excessive dross, blown-out material on the bottom of the part) as well as torch collisions with the plate, lower consumable lifespan, and more.

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## DROSS

As the plasma stream cuts away material, molten metal is generally blown away across the plate or down into the table. Some of it may stick to the metal on the top or bottom of the plate. This dross will always be present with air plasma. It is possible to minimize it, but the cutting process will inevitably leave some and is just inherent to the nature of plasma cutters.

There are different types of dross: Low-speed, High-speed, and Top spatter.

**Low speed dross** tends to look like thick globs or balls of metal on the bottom of the part. The only fix is to increase the feed rate or (possibly) increase the cutting height or target voltage to move the cutter away from the part. Cutting farther away or faster will both put less heat into the part per unit distance, removing material less quickly per inch and giving the arc something to grab ahold of and cut. Be wary of bevel forming due to the torch not being at the appropriate cutting height.

**High speed dross** tends to be small hard beads on the bottom and often requires a lot of grinding to remove. The fix here is the opposite of low speed dross – cutting slower or closer to the plate. As above, be wary of changing the height out of the ideal range and creating bevel.

**Top Spatter** can have to do with cutting height, speed, or bad consumables and will tend to be a noticeable spray along the top of the part.

## SHAKING/WOBBLING CUTS

Generally, this is indicating one of a few things:

- a) One of the Y-axis motors has gone offline and the other is dragging it. Cycling power on the control box and rehomeing the machine should restore this motor. If it happens frequently it could be related either to a bearing problem or electrical noise causing the machine to lose position
- b) The material is very thin and shaking due to the force of the air pressure from the torch
- c) Consumables are bad and the arc is dancing around trying to find the easiest path to ground. Nozzles and swirl rings that are worn out will often cause the air to not swirl properly and will deviate from the normal column of air.

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## Section F: Understanding Basic G-Code

This section is not a comprehensive list of g-codes or specifically how to code files. It’s simply a set of basic, common g-codes that your files will often contain. All spaces are ignored by the controller.

G0	Indicates a rapid move to a location (I.e, G0 X15 Y37 moves to those coordinates at rapid speed)
G1	Indicates a move at the specified feed rate which is usually indicated on the same line or an earlier line
G2 or G3	A smooth arc motion either clockwise or counterclockwise
G53	Calls for a rapid movement using absolute coordinates. The coordinates with G53 are based on the machine’s home location rather than a working zero.
G54, G55, G56, G57	An X or Y direction offset (or both). If your machine has multiple cutting heads, each one will have a position specified by one of these offset numbers. While setting an XY zero with one cutting head, make sure to be in the proper offset. For instance, if you have both a torch and an engraver, the engraver will be on a G55 and the torch on a G54.
G90	Sets the controller to absolute coordinate moves. Nearly every G-code file should begin with this. All subsequent G0, G1, G2 and G3 moves will be based on your XYZ zero point. (I.e., X2 moves it to 2 inches from 0. Another X2 would not move at all since it’s already at X2)
G91	Sets the controller to relative coordinate moves. All subsequent moves will be based on the current position of the spindle. (I.e., X2 moves 2 inches to the right of its current location. Another X2 moves 2 inches to the right again).
G92	Clears all working zeros
G92 X#Y#Z#	Sets a working zero that is # distance from the spindle’s current location. (I.e., G92 X0Y0 will set the current location as X0Y0, where G92 X5 will set the X zero to be 5 inches to the left of the current position and not change the Y zero)
M63	Calls for the torch to touch off the plate and lift to pierce height.
M61	Calls for the torch to touch off the plate, lift to pierce height, and pierce.
M62	Turns off torch
M3	Turns the engraver on
M5	Turns all engraver off
G4x#	A G4 by itself will pause indefinitely while it waits for the user to hit the enter key. G4x# will pause for # seconds. For example, the warmup macro will do a G4x600, which pauses for 600 seconds (10 minutes).
F###	This is important for when working with engraver files, but the config screen should be used for all plasma cut files.  Sets the feed rate for all G1, G2, and G3 moves. Can be used at the end of a movement line (G1 X10 Y5 F100) or on a line by itself, before any G1 lines, calling out which axes to set (F350XY). XY feed speeds must be set separately from Z feed speeds. Using an F# on the end of a line with a X Y & Z movement will only set the feed rate for the Z axis.

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## Section G: ShopSabre Warranty

Numerically Automated Cutting Systems/DBA ShopSabre CNC Limited Warranty applies to the original purchaser in that the SELLER'S SOLE OBLIGATION AND EXCLUSIVE REMEDY, as permitted by law, any warranty and/or condition implied by law, product will be free from defects in material and workmanship for a period of one year from delivery date on mechanical components and on electronics.

Subsystems manufactured by other firms but integrated into Numerically Automated Cutting Systems/DBA ShopSabre CNC systems are covered by the original manufacturer's warranty. Numerically Automated Cutting Systems/DBA ShopSabre CNC assumes no liability for the content of such manufacturer's warranties or product literature.

The liability of Numerically Automated Cutting Systems/DBA ShopSabre CNC under valid warranty claims is limited to repair or replacement of defective components at Numerically Automated Cutting Systems/DBA ShopSabre CNC discretion. In no way or any circumstance does this warranty cover or extend to incidental costs, loss of time, loss of revenues, and/or consequential damages.

Warranty does not cover customer caused damages; damages due to misuse, negligence or accident and/or installation and internal adjustments or modifications other than those stated in the “Installation and Operation” sections of operation manuals or without the express permission of Numerically Automated Cutting Systems/DBA ShopSabre CNC.

Onsite warranty service is available, labor and parts costs are covered. Travel costs including hotel and meals are the customer's responsibility and are charged at time of scheduling.

### RETURNS AND ADJUSTMENTS

Equipment incorrectly ordered is subject to a 35% restocking charge. Merchandise that has been abused, mistreated, or shows signs of wear will not be accepted for return or credit. **No returns on Software (whether purchased or provided with a machine), whole machine units, custom or special orders. It is the customer's responsibility and risk to determine the suitability of a machine assembly or option to fit the needs or function required. No returns will be considered/accepted after 30 days.**

Numerically Automated Cutting Systems/DBA ShopSabre CNC will ship replacement/warranty parts via standard ground transportation. Expedited or overnight services are available at an additional cost.

Any product, component, or assembly returned for Any Reason shall be sent insured prepaid via the means of transportation specified by Numerically Automated Cutting Systems/DBA ShopSabre CNC. In all cases, Numerically Automated Cutting Systems/DBA ShopSabre CNC has sole responsibility for determining the cause and nature of failure, and Numerically Automated Cutting Systems/DBA ShopSabre CNC determination and any remedies with regard there to shall be final in all cases.

Warranty parts/components not returned within 5 business days will be charged in full to client. Outstanding balances may result in cancellation of further warranty and/or support until balance is cleared.

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## **SHIPPING DAMAGE**

All shipping damage must be reported to **the shipping company** at the time of delivery and noted on paperwork before signing. If damage is discovered after the driver has left, you must contact the shipping company and file a report for the damages found. In both events, notify ShopSabre as soon as possible. We will try to assist you with a claim. The claim is between the customer and the shipping company. All replacement parts will be billed to the customer and the shipping company will reimburse the customer directly for the parts. In the event that a ShopSabre technician is required, they will be billed at \$65 per hour plus travel expenses for each technician required.

## **EXCLUDED PRODUCTS**

All laser optical components are specifically excluded from warranty.

All Consumables are specifically excluded from warranty.

All Software is specifically excluded from warranty.

## **WATER-COOLED AND AIR-OPERATED PRODUCTS**

Numerically Automated Cutting Systems/DBA ShopSabre CNC does not warrant any of its water-cooled or air operated products against contingent or subsequent damage resulting from negligence in providing the required water-cooling or air pressure or from unexpected events which cause the required water-cooling or air pressure to be interrupted during operation of the equipment or from unacceptable water quality or air quality/volume/pressure. Warranty does NOT cover damages due to moisture in air operated items- ShopSabre does recommend use of appropriate air contamination removal.

## **TERMS**

All payments are due 50% at the time of order and the final balance including shipping and handling prior to shipment whether for complete systems, subsystems, accessories, or parts orders. Numerically Operated Cutting Systems/DBA ShopSabre CNC will not extend credit.

## **SALES TAX**

State Sales Tax will appear on all shipments to states in which ShopSabre CNC has economic nexus, unless a signed official state tax exemption certificate is furnished to Numerically Automated Cutting Systems/DBA ShopSabre CNC at time of purchase. ALL purchasers are responsible for payment of sales/use tax to their own state or local jurisdiction where applicable. Governing Law: The State of Minnesota is the jurisdiction and the governing law.

## **SHIPPING/INSTALLATION**

All Shipping will be facilitated through ShopSabre’s broker unless otherwise stated. Customer will be responsible for unloading and installation of equipment. All Machines will require proper equipment for unloading specified in user manual. ShopSabre will not provide unloading services unless otherwise stated in writing at the time of order. ShopSabre will use best judgment when choosing the delivery method. ShopSabre is not responsible for freight delays related to the chosen carrier, weather, or acts of God. If you require special delivery needs you must let ShopSabre know in writing prior to shipping. Extra costs may result from special shipping requirements and will not be covered by any promotions, sales, or discounts. ShopSabre is not responsible/liable for damages, losses, injury, or failures related to unloading the equipment or installation of the equipment. Customers choosing to pick-up their own equipment must do so within 48 hours of completion or storage fees may apply. Customers picking up must provide flat trailer with no sides. Customers picking up will be responsible for providing necessary straps, tarps, and protection against damages. ShopSabre will not extend liability for customer pick-up and will not be responsible for damages related to travel.

ShopSabre will not be responsible for equipment that is improperly installed. All Utilities should be installed to local code and inspected for safety by a professional prior to powering up. ShopSabre does not extend liability for improper utility installation.

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#### **DISCLAIMER**

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