Operator Station Instructions

Safety Instructions

	⚠ **READ THE INSTRUCTIONS** • Completely read these instructions before assembling, using or maintaining this CNC Table. • Keep these instructions for future reference.
	⚠ **DANGER – SPARKS CAN CAUSE A FIRE OR EXPLOSION!** • Plasma cutting produces sparks which can fly a long distance at high speeds, igniting flammable or explosive vapors and/or materials. Keep flammable materials a minimum of 6′ (1.8m) away from the edge of your Plasma Table. • Do *not* use the Plasma Cutter in the vicinity of flammable or explosive vapors.
	⚠ **WARNING – FIRE RISK!** • Heat and sparks from plasma cutting can easily start a fire. Do *not* allow the Plasma Table to work unsupervised. • Always disengage the Plasma Table and Plasma Cutter from your electrical power supply before leaving them unattended for long periods of time. • Always have a fire extinguisher close by while plasma cutting.
	⚠ **WARNING – ELECTRIC SHOCK RISK!** • Incorrect use of Plasma Cutter could cause electric shock, injury or death! • *Don't* touch the workpiece or Water Table while in use. Only the Operator Station should be touched while the Table is in use. • The electrode, workpiece, and Water Table are all electrically 'live' when the Plasma Cutter is powered on. Do not allow these 'live' parts to touch bare skin or wet clothing. • Disconnect the Plasma Cutter from its power supply before assembling, disassembling, or performing maintenance on the torch and/or when changing out the tips and electrodes. • Be sure that the workpiece is correctly supported and grounded before starting a plasma cutting process.
 	⚠ **WARNING – PINCH AND CRUSH RISK!** • This Plasma Table is a heavy construction weighing 330lbs and has several bulky, heavy pieces that can cause serious injury if they are dropped. • We strongly recommend that you get the help of at least one other capable person during the assembly of this Plasma Table. • Avoid pinching your hands while handling parts during the assembly. We strongly recommend that you use a pair of thick well-fitted work gloves. • We strongly recommend that you wear approved safety shoes when uncrating, building and using the Plasma Table.

	**⚠ WARNING – ELECTROMAGNETIC FIELDS CAN BE A HEALTH RISK!** • The electromagnetic field which is produced while plasma cutting can interfere with various electrical and electronic devices, such as a cardiac pacemaker. Anyone who uses such devices should speak with their doctor before attempting any plasma cutting operation. • Exposure to electromagnetic fields that are generated while plasma cutting might have other health impacts which are unknown.
 	**⚠ WARNING – INJURY RISK!** • Use on an even, level, solid floor only. The Plasma Table, when fully loaded, will be more than 500+lbs. *Do not* use it on an inclined floor. • Wear protective work gloves when handling metal. It might be sharp and it will be extremely hot when it is cut. Allow enough time for it to cool before handling. • The plasma cutting torch lead, ground lead and Plasma Table cables are a tripping hazard. Dress cables with cable ties where possible, use care when moving around the table and always make sure to be well-balanced.
	**⚠ WARNING – INHALATION RISK!** • Gasses, vapors, and fumes produced during plasma cutting are dangerous. Do not breathe in the fumes that are caused by plasma cutting. Make sure workspace ventilation is sufficient. • Use an OSHA-accepted respirator when you are plasma cutting. • Use great care when plasma cutting coated metals (e.g. galvanized, lead-based paints, cadmium-plated and powder-coated).
	**⚠ CAUTION – ARC RAYS CAN HARM EYES AND PRODUCE BURNS!** • Arc rays cause intense ultraviolet radiation which could burn exposed skin and inflict eye damage. Use a shield with a suitable filter (#5 at the minimum) to protect your eyes from sparks and rays from the arc when plasma cutting or when watching it (see ANSI Z49.1 and Z87.1 for the safety standards). • Pressurized air discharge can eject metal particles, dirt and debris at high velocity. Always wear ANSI approved eye protection when operating the Plasma Table. • Use suitable clothing (long pants, long sleeves, close-toed shoes, and gloves) made from durable, flame-resistant material to protect skin. • If other people or pets are around plasma cutting, use welding screens to protect these bystanders from sparks and arc rays.
	**⚠ CAUTION – INJURY RISK!** • Plasma cutting can cause intense noise. Wear proper hearing protection while using the Plasma Cutter.
	**⚠ BE AWARE** • *Don't* pick up from the gantry or gantry mounts. It will damage the gantry. • Dispose of any Plasma Table fluid and waste solely as directed by your local laws and regulations.

Table of Contents

Glossary

Arc Voltage: The voltage of the arc between the electrode and the material that is being cut. It is used to control the torch height. A higher arc voltage means a larger gap between torch and workpiece while a lower arc voltage means a smaller gap.

CAM: Computer-Aided Machining. Software that controls machine tools for manufacturing workpieces. It takes a drawing file and changes it into a machine path which can be post-processed into a G-code file for CNC use.

CCW: Counter-Clockwise. Meaning the direction of rotation.

CNC: Computer Numerical Control. Meaning an automated machine which is mainly controlled by a computer.

Cut Speed: The horizontal travel speed of the torch head while cutting.

CW: Clockwise. Meaning the direction of rotation.

Dross: The plasma cutting slag that is left behind after a cut. It builds up at the bottom of the cut. It is usually knocked or ground off as needed.

Electrode: A consumable on the plasma torch head which produces the plasma arc.

Euro Connector: A single connector for the plasma torch which contains all the connectors needed to run it (airline, trigger, pilot arc, etc.).

Gantry: X-Axis and Y-Axis travel assembly which allows the torch head to move around the plate. Made up of aluminum tracks with a stepper motor-driven linear actuator.

G-Code: The programming language which CNC machines use. Usually, movement commands start with a ‘G’. This is why it’s called G-Code. In the case of miscellaneous commands, which typically relate to torch control, the commands start with ‘M’ instead of ‘G’.

Hand Torch: A torch designed to be held in your hand. It will have a torch trigger. It can still be used on a CNC Plasma Table but is not designed for it.

IHS: Initial Height Setting. It is set by the THC and determines the height of the plasma torch above the material before the pierce begins.

Kerf: The width of the cut caused by the plasma torch. The width changes, subject to the material, torch height, cutting amperage, consumable wear, and tip diameter.

LCD: Liquid Crystal Display. A form of digital display (e.g. on the Operator Station).

Lead-In and Lead-Out: The paths that extend before and after the chosen cut path.

Machine Torch: A torch which is designed to be used on a CNC plasma table. It will not include a torch trigger. Also called a CNC Torch.

Main Cut Screen: The screen that is displayed on the Operator Station when the CNC table is activated, once you clear the Logo Screen.

Operator Station: The primary control unit for the CNC Plasma Table. It directs all cutting actions.

Pierce: An action of the plasma torch when beginning a cut on the workpiece.

Post Processor: It uses a path created by CAM Software and changes it into a G-Code file that the machine can understand.

Retaining Cap: A consumable of the plasma torch which holds all other consumables in place.

Slats: These are the metal supports in the Water Table where the material sits.

Stepper Motor: A type of motor generally used on CNC machines. It has distinct positions, known as steps, which provide accurate, completely controlled movements.

Swirl Ring: A consumable of the plasma torch which controls the swirling action of the air around the electrode.

THC: Torch Height Controller. During a cut will keep the proper distance between the torch and the material.

Tip: A consumable of the plasma torch which focuses the plasma arc down to an appropriate size.

Torch: This is the tool which takes the power supplied by the plasma cutter and uses it to cut metal. It does this by creating an exceptionally hot plasma stream which travels to the metal and melts it on contact.

Water Table: A method of controlling the dust and fumes from the cutting process. It is a large pan which contains a layer of water and plasma cutting fluid that decreases the fumes.

X-Axis: The plane of left-right movement of the torch on the CNC Plasma Table. The movement is controlled through the X-Axis Gantry.

Y-Axis: The plane of front-back movement of the torch on the CNC Plasma Table. The movement is controlled through the Y-Axis Gantry.

Z-Axis: The plane of up-down movement of the torch on the CNC Plasma Table. The movement is controlled through the THC.

Zero Point: The point of origin for all movements in a cut program.

Quick Guide to Basic Operation of the CNC Controller

Figure A

The Physical Controls

The Operator Station has a 7" LCD screen. The power switch and the emergency stop button will control power to the Operator Station. Pressing the emergency stop cuts power right away, stopping cutting and movement. You must rotate the emergency stop button CW to bring back power. The main control groups for the Operator Station are displayed in Figure A.

1) LCD screen: It is used to observe and navigate operations.
2) Number and Letter Keypad: Primarily used for entering settings and naming files. SHIFT switches the letter/number combo to the alternative character. You will need to press SHIFT again each time you need to switch to an alternative character.
3) Quick Access: These keys are used to quickly access selected settings without needing to go through the settings menus.
4) Arrow Keys: The arrows will manually move the plasma torch's position and are used to navigate the menu. The Torch Height Motor is manually used by the S↓(lower) and S↑(higher) keys. You can change torch cutting speed with the F↓(decrease) and F↑(increase) keys. A single tap will adjust it by a factor of one. Holding it for several seconds will adjust it by factors of ten.
5) Manual Controls for Cutting Functions. Because this table is set up as a CNC Plasma Table, only the PIERCE and OFF keys are used for manual processes.
6) The Main Function Keys: They are used to access and exit menus and change settings quickly. The keys' functions are displayed along the bottom of the LCD screen. Key F7 and ↵, are usually used to confirm changes or to choose to continue. ESC is used to exit a screen. Pressing ESC several times will bring you back to the main screen. Function options vary depending on what menu you are using.
7) Machine Start/Stop Controls: To start a program press I followed by ↵ to confirm. Stop by pressing 0 and continue by pressing I. Important Note: It will not ask for confirmation before starting to continue a cut.
8) USB Connection: This is for importing and exporting files through a USB drive. The arrow key on the left of the port is used for software updates.

Begin Cutting a Library Shape

1) Confirm that the table has been set up correctly. Refer to Assembly and Basic Setup before you begin (See assembly manual).
2) Confirm that the material is grounded.
3) Confirm that the table and cutter are activated and properly powered.
4) Confirm that the plasma cutter's air pressure regulator is set to a minimum of 60 psi while air is flowing.
5) On seeing the Halo logo screen press any key to move on to the main cut screen.
6) At the main cut screen, press key F1 to enter the shape library. Use the black arrow keys to change your selection and then use F6 to select the shape.
7) Enter the dimensions you need. Each dimension will be shown on the part below the dimension input area. The units will be in millimeters (See Figure B).
8) Lead In and Out are used to help smooth the cut where it starts and finishes cutting. This will depend on part size. Greater lead in makes for smoother entry cuts with thicker materials.
9) When finished with dimensions, press F7. Press G to shift modes until 'Plasma' is displayed.
10) Before you start the operation, look at a Cut Speed chart. and confirm that your settings will work for the material you are cutting. If not, change them by using the F4 key for settings. Then use the F1, F4, and F6 keys, for the Speed, Plasma, and THC settings. Double click on F7 to save your settings. ESC will bring you back to the main cut screen.
11) Also, check quick access settings on main cut screen. See *Main Cut Screen* (p.11: #7 & 8).
12) With your machine set up, adjust the plasma torch to the chosen starting point by using the arrow keys. Press F7 for manual movement controls mode and then press F3 to zero it. Pressing F7 will run a frame around the part letting you know if there is enough space or not. For more info see *How to Use Demo Mode* (p.8).
13) If torch path needs adjusting, move the torch, zero it again, and repeat frame test.
14) When you are ready to cut, press the Start key followed by the ↵ key to initiate the cut. The torch will move to the start point, level the torch, and start the arc.
15) The cut can be paused at any time by pressing the Stop key and can then be restarted by pressing the Start key.
16) If you stop and manually adjust the torch, it will list a few options for returning the torch to the cut path, once you press Start. Usually, for the best cut continuity 'return only' should be used. With the torch returned, press Start again to continue the cut. For more detail see *Main Cut Screen During Cutting* (p.22).
17) To exit the cut, press ESC and then ↵.

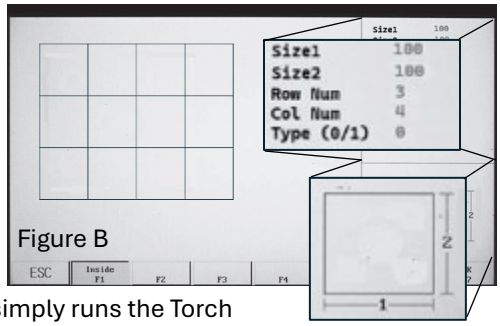


Figure B

How to Use Demo Mode

1) There are three ways to run a demo on the CNC Table: There is the dedicated Demo Mode, Demo during cutting, and Frame in manual movement.
2) Option one is the dedicated Demo Mode. It can be accessed on the Main Cut Screen by pressing the G key. It simply runs the Torch through the cut path or to a selected point without initiating the plasma cutter or THC.
3) Option two is a demo method that can be used for quick access while you're cutting. You can stop the cut while it's in progress and then press F2 to run the demo, then stop it and restart your cut.
4) Option three is Frame, which can be accessed through the F7 manual movement key and then pressing F7 Frame. This will have the Torch move around the perimeter of the cut extremes in a rectangular pattern. It lets you see if the cut will likely interfere with objects, any existing cut outs, and the table limits. When you run the machine, we strongly recommend you run the Frame function before every cut, to avoid wastage or other issues.

Recovering a Failed or Incomplete Cut

If the cut doesn't complete, you can take the steps below to rerun the cut segment. They can also be used if a setting needs to change before you continue the cut, since some settings can't be changed during a cut. Be aware that restarting a cut mid-segment won't be as smooth as a continuous cut. For the best results make sure to stop the machine between cuts.

If You Notice an Incomplete Cut Before the Program Completes

1) If you notice an incomplete cut, press the red Stop key. The F1 key will serve as a back function to run the G-code segments in reverse. Pressing this key will cause the Torch to return to the start point of its last cut.
2) Return to a point before the incomplete section and press F2, if needed, to run the torch forward without cutting and then stop where the failure starts. You can use F↓ to slow the movement speed to help with precise alignment.
3) Press the green Start key to continue the cut

If You Notice an Incomplete Cut After the Program Completes

1) If you notice an incomplete cut after the program is done, move the Torch back to the start point (0, 0). After a program completes, the machine will usually prompt you by asking if you would like to return to start. *Don't* re-zero.
2) Press the G key to switch into Demo Mode. Press Start and ↵. Press the red Stop button a few millimeters before the incomplete area.
3) Press the G key again to switch back to Plasma Mode. Press Start.

Changing the Settings During a Cut

1) To change the settings during a cut, you use the same general idea but press F3 and ↵ to bring the Torch back to the zero point of the file and exit. Make your changes to settings and do not re-zero the table.
2) Switch over to Demo Mode and run the program to the point where you stopped the program. Switch back to Plasma Mode to resume cutting.

Converting an Image or PDF File to a DXF File for Cutting in Autodesk® Fusion 360®

1) To cut an image or PDF file, you must first convert it to a DXF or SVG file that Fusion 360 can open and create a cut path with it.
2) This can be done at no cost through a website like https://convertio.co/ which is able to translate a variety of file types to a DXF or SVG drawing.
3) When you convert an image, if it will not convert your file to a DXF/SVG as you wanted, it might be useful to make the colors neutral, increase the contrast, or even edit certain aspects out by using a photo editor. Irrelevant line segments can also be removed after your conversion using Fusion 360.
4) On convertio.co, pick your file you need to convert, and then select DXF or SVG on the drop-down menu to the right of your file name.
5) Press the Convert button and then download your new DXF/SVG file.
6) Once in Fusion 360 go to 'Open from my computer…' and locate your converted DXF/SVG file.
7) At this point, follow the steps in the next section: *Creating and Cutting a G-Code File with Autodesk Fusion 360* (p.10).

Creating a G-Code File with Autodesk Fusion 360 and Importing It

1) Open Autodesk Fusion 360.
2) Once you create a sketch, it is recommended to extrude the design in the way you want it cut out (extruded distance does not matter). It will provide a visual aid.
3) Use the Change Workspace drop-down menu on the main toolbar to change from the current workspace to the 'manufacture' workspace.
4) Switch to the Fabrication tab on the main toolbar.
5) Select Setup. Select New Setup. Click on the lower left-corner of the part to select the zero point.
6) In the cutting box, select the 2D Profile tool. The 2D Profile window will open and default to the Tool tab.
7) Select your preferred plasma tool in the Tool tab. The Tool window will open.
    - To create a tool, locate the local library in the Libraries box and then press the *Create new tool for waterjet, laser, and plasma cutting* icon, located in the top right of the window.
    - Switch the type to Plasma cutter in the Cutter tab and verify that the unit is millimeters.
    - Set kerf width to the desired amount. The kerf width is usually 0.5mm - 1.5mm, but for the best dimensional accuracy, measure the kerf width yourself.
    - Press OK to finish. The tool is now always available in the local library.
8) Click the face that will be cut out in the Geometry tab.
9) Machine path tolerance can be adjusted in the Passes tab. For the best cut quality you should usually set Sideways Compensation to Left. Compensation Type directs if the kerf width will be controlled by the Cutting Control System 'In control' or by Fusion 360 'In Computer'.
    - Allowing Fusion 360 to adjust for designs with small, intricate features is strongly advised. The CNC Operator Station can't calculate compensation pathing for small, intricate features and defaults to zero kerf. If you use Fusion 360 to compensate, check that kerf width in the Cutting Control System is set to zero.
10) Lead-In & Lead-Out and cut entry & exit positions can be changed in the Linking tab.
11) Press OK button when done. If no errors appear then the toolpath has been successfully created.
    - In the Actions box, select Simulate to view the toolpath in motion. The path of the Plasma Torch can be adjusted with the control arrows in the bottom center of the window.
12) To convert the path to G-Code for your Halo Plasma Table, select Post Process in the Actions box. It will make the G-Code for the selected toolpath(s). Press the Post button and save it where you want.
    - When running Post Process for your first time, download the Halo Post Processor Fusion 360 file from the Halo webpage. In the Configuration Folder box select the folder where post configuration was downloaded. In the Post Configuration box, the Halo Post Processor Fusion 360 may be selected. The default output folder can be changed.
13) Transfer the file that you saved into a USB stick and plug it into the CNC machine.
14) With the USB stick inserted, a part can be imported. Starting at the Main Cut Screen, press F2 to enter the file menu and then press F2 again to go to the USB stick.
15) The USB stick's files can be viewed using the arrow keys, ↵ and ESC.
16) Once the correct file is chosen, press ↵ to open it.
17) You can save a file to the machine's storage by pressing F5 when the file is selected in your USB menu.

Advanced Operations of the CNC Controller

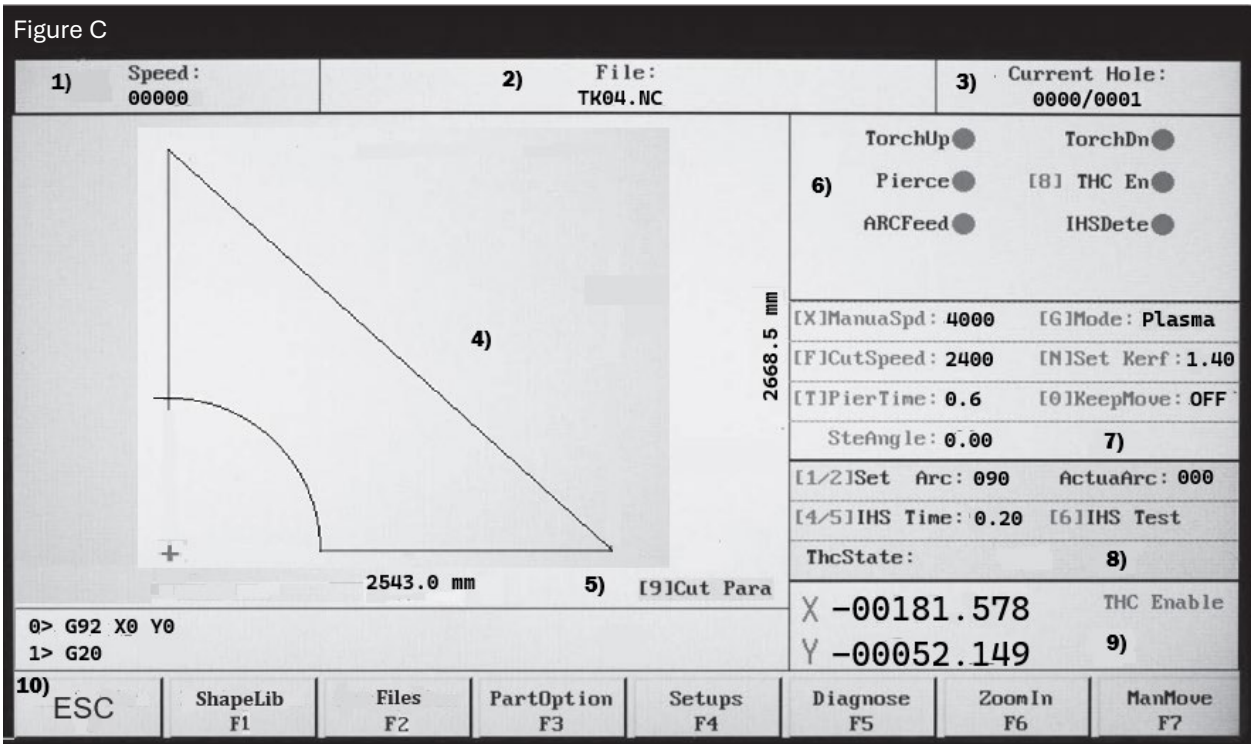
Main Cut Screen

When you power on the plasma table, it will take a few seconds to activate. Once the Halo logo appears you can press any key to continue.

The first screen to appear after the logo will be the Main Cut Screen.

You can return to the Main Cut Screen by pressing ESC as many times as needed.

Figure C



Main Cut Screen Details (See Figure C)

1) The current torch speed (mm/min).
2) The current file you are viewing.
3) How many pierces you have made, out of how many you will do in this file.
4) Part preview. Your zero point and current torch position are indicated with red crosshairs. A red dotted line will indicate torch travel. The overall part dimensions are shown at the bottom and right sides of the window.
5) Quick access chart for cut parameters. Input your preferred settings for future use.
6) Mode specific index. Shows in plasma cutting mode. Press 8 when not cutting to quickly enable or disable the automatic THC.
7) Quick reference chart for Operator Station display. Manual speed, controller mode, cut speed, pierce time, kerf, movement mode and steel plate angle.
8) Quick reference chart for THC settings. Set arc voltage target, actual arc voltage, IHS set time, IHS test and THC state.
9) Torch head coordinates compared to the zero point. Display for THC enable or disable.
10) The menu for what the function keys will open.

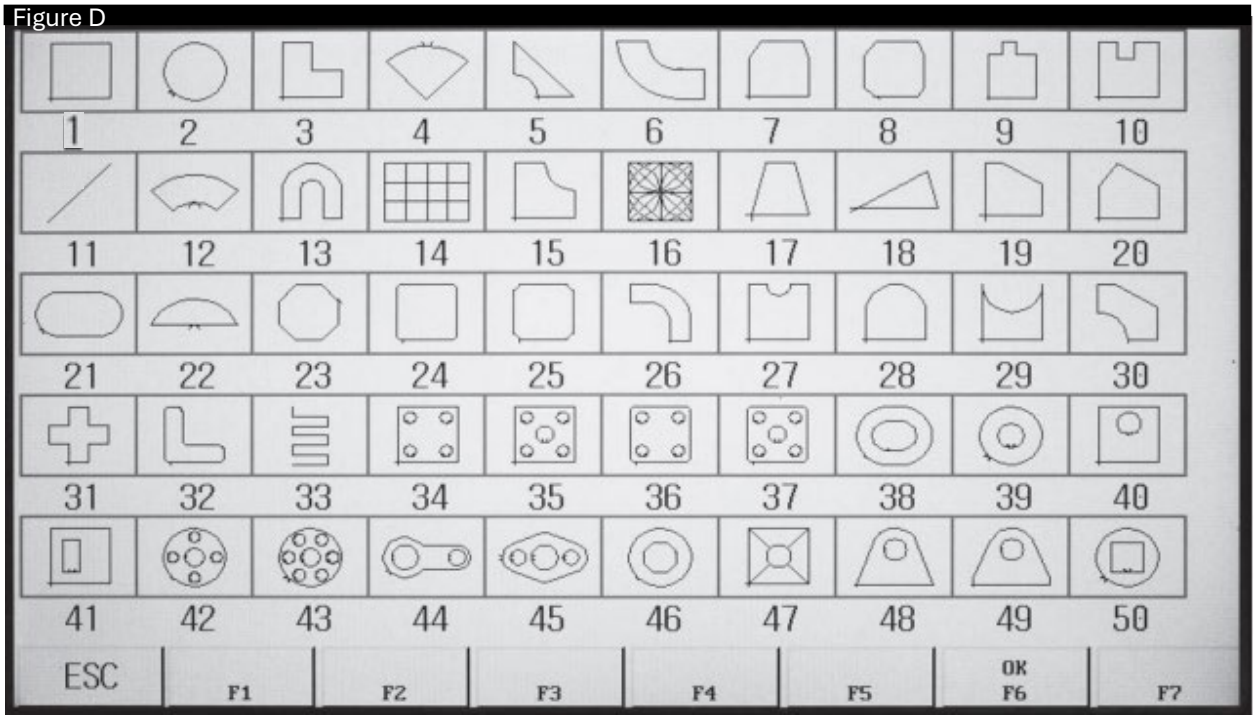
Main Cut Screen Details ctd.

You can quickly change your settings by pressing the correct quick access key. They are indicated on the display with numbers or letters in square brackets. For example, [G] will switch you between Plasma Mode and Demo Mode.

Navigating within the settings window can be done with arrow keys. You can then use the number pad to enter the correct numbers.

Shape Library

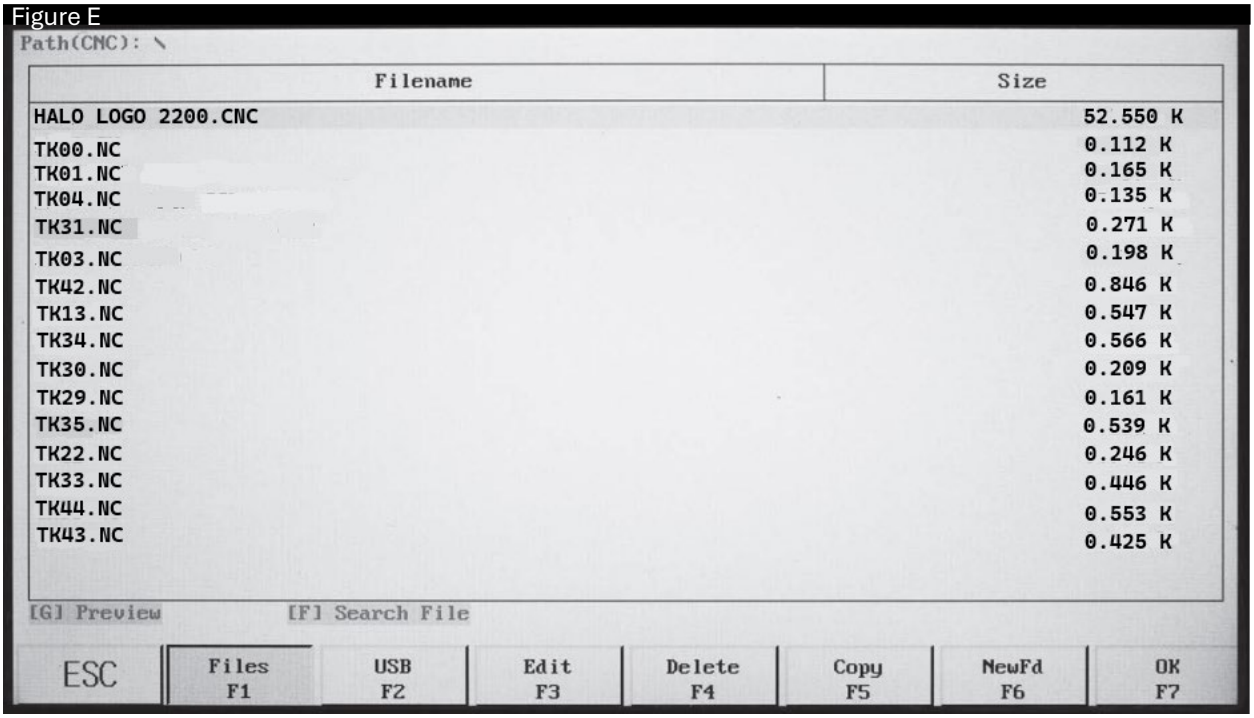
Figure D



1) Press F1 on the Main Cut Screen to enter the shape library (See Figure D). You can select preloaded shapes on this screen by using the arrow keys.
2) Press ↵ or F6 on the selected part to open a screen that allows you to adjust its dimensions. The machine units are measured in millimeters.
3) A good lead-in or lead-out helps assure a smooth cut at entry and exit points. More lead-in is generally better, up to about 5mm or 0.2". Lead-out is less critical and does not need to be as long.
4) Once dimensions are entered, open shape in the main cut screen by pressing F7.
5) The F1 and F2 keys allow you to switch between inside and outside lead cuts (where available). For example, inside would be used to cut out a circle without damaging the inside piece and outside would be used to cut a hole in a piece without damaging the outside of it.

Files

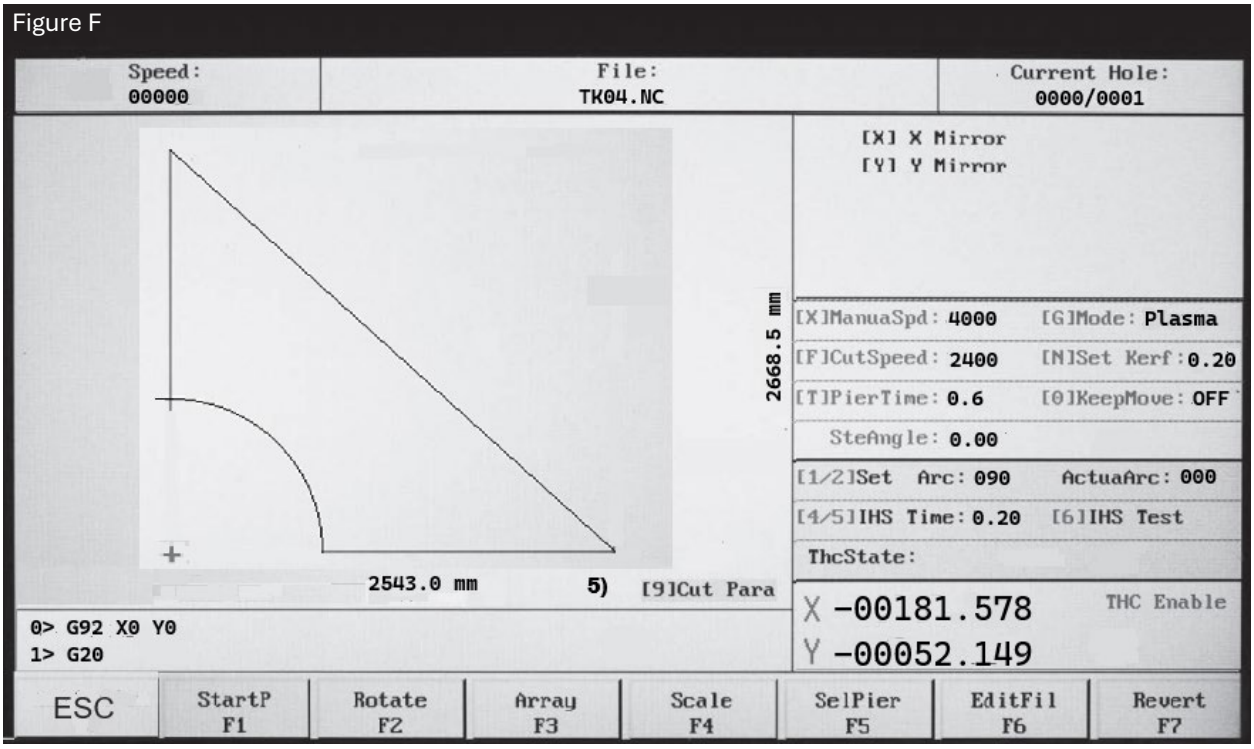
Figure E



1) Press F2 on the Main Cut Screen to open the file browser (where the machine stores G-code), or a USB drive (See Figure E). Files can be searched, copied, deleted, edited, previewed, renamed and saved there. It supports a maximum USB drive size of 16GB. The USB drive must be formatted to the FAT or FAT32 file system.
2) Use the arrow and ↵ keys to explore the file directory.
3) Press F7 or ↵ on a G-code file to open it from the USB Drive. Do not remove the USB Drive before you are finished using the part or save the part first.

Part Option

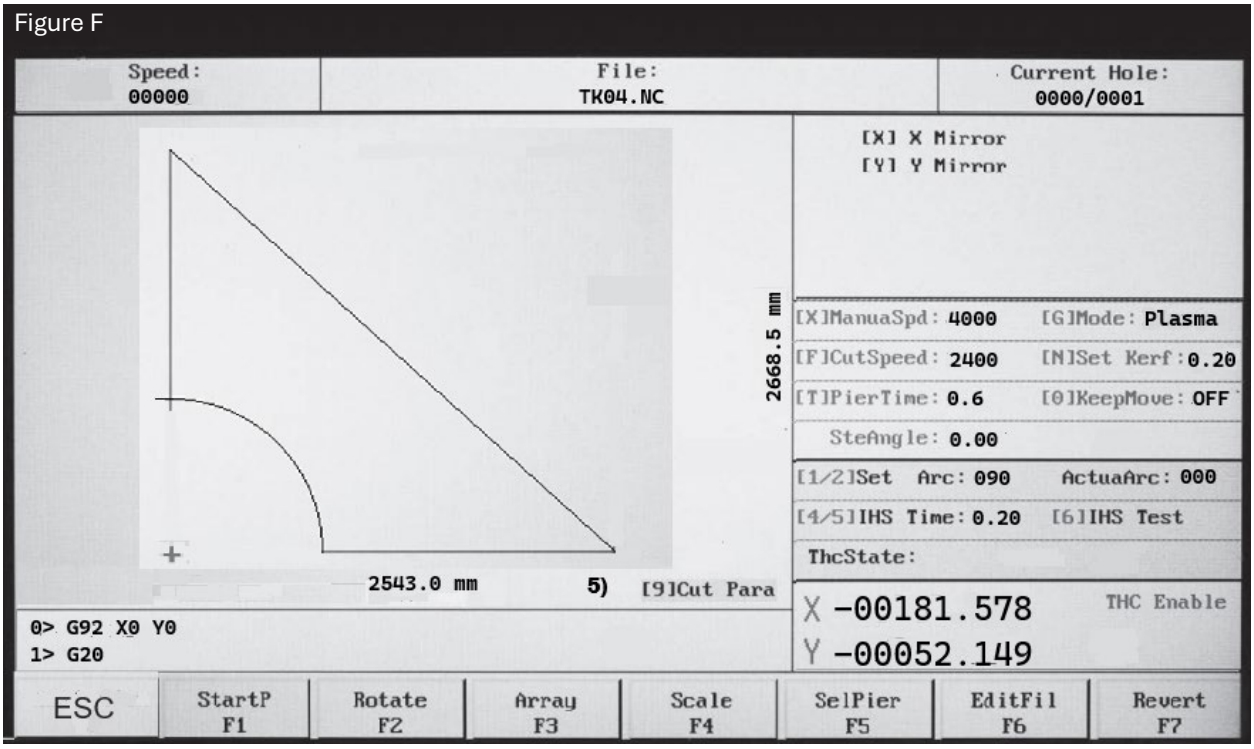
Figure F



1) Press F3 on the Main Cut Screen to open the part modification menu (See Figure F). Any changes that are made in this menu can be reversed with the ESC key.
2) F1 may be used to move the cut's zero point to top-left, top-right, bottom-right, bottom-left, and center positions.
3) F2 can be used to change the cut angle.
    - *Rotate Part* - The user can rotate the positioning of the cut path by 360° CW or CCW. It is the most standard and intuitive choice for part rotation.
    - *Rotate Steel Plate* - It opens a separate menu where you can press F3 to enter the angle of the plate that has been loaded. The result is the same but is framed through a different perspective.
4) F3 will open array nesting. The options are summarized below. When nesting parts, the computer automatically spaces the 'frame' view for each part 10mm apart. In some cases, this may still be too close, and you will have to increase the distance. Press the ESC key to cancel or F1 to create the array.
    - *Rows* - The number of horizontal rows for the array, from top to bottom.
    - *Columns* - The number of vertical columns for the array, from left to right.
    - *Row Distance* - The distance between rows. 10mm spacing is standard.
    - *Col Distance* - The distance between columns. 10mm spacing is standard.
    - *Alt Order (1/0)* - Changes the cutting order of the array. Option '0' will cut from left to right, bottom to top, and will start on the left side of every row. Option '1' will snake through the rows, eliminating the travel time needed for restarting on the left. It cuts down on run time for larger arrays.
    - *Stag Array (1/0)* - Setting to '1' removes one part from every other row and staggers the columns to allow tighter nesting with certain shapes, like circles. '0' is the standard and makes a straight array.

Part Option ctd.

Figure F



5) F4 is used to change the size of the part, with 1.00 being the current size of it. For example, to scale a part up 33%, input 1.33. To reduce size to 78%, enter 0.78.
6) F5 is for choosing to start with a specific pierce in the code. It can be useful for recovering a failed cut or if you want to skip over certain sections without making a new G-code file. For example, to skip to the fourth pierce enter '4' and press the F1 key. The cut will start from the fourth pierce.
7) F6 allows you to view and manually edit the G-code file that you have loaded.
8) F7 reverses changes to the part.
9) [X] switches to a mirror image of the part along the X-Axis, and [Y] does the same thing along the Y-Axis.
10) Press the ESC key to save your changes and return to the Main Cut Screen.

Setups

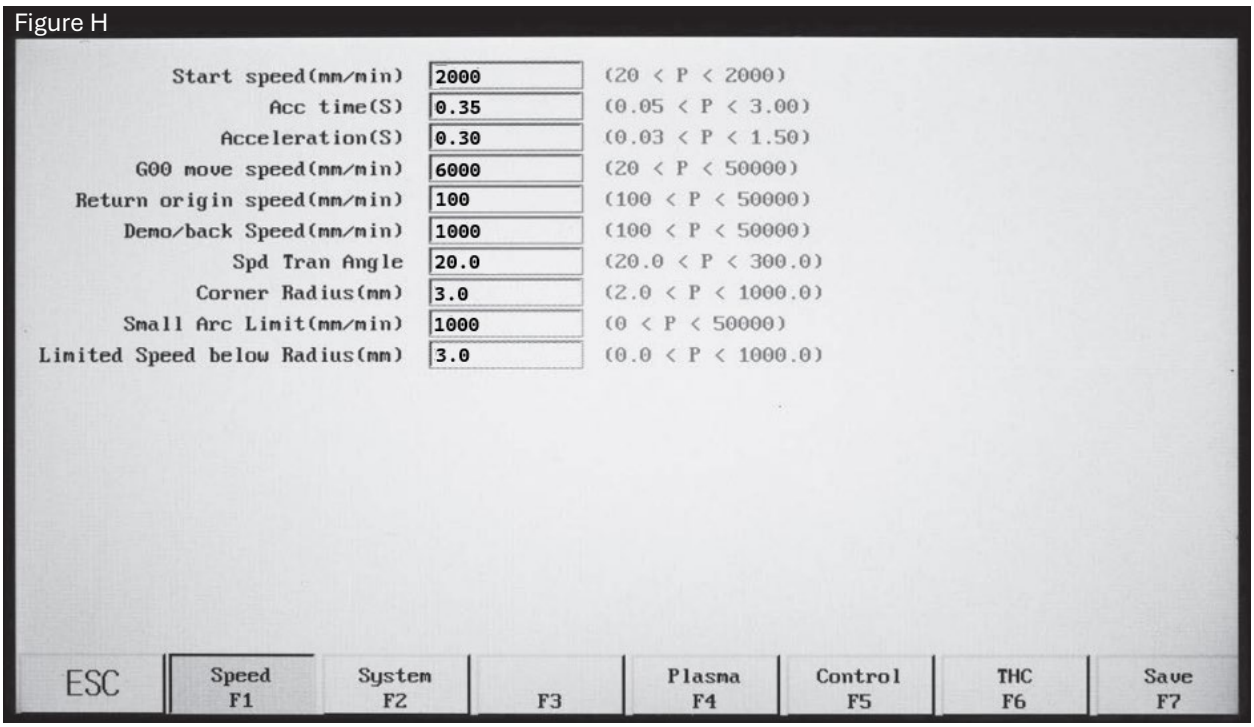
F4 opens a machine settings menu (See Figure G), where you can find more detailed choices. The screen is just a list of options along the Main Function Keys.

Figure G

Once you select an option you can navigate using the arrow keys and use the number pad to enter values.

Press F1 to access **Speed** (See Figure H), which opens common settings used in all modes.

Figure H

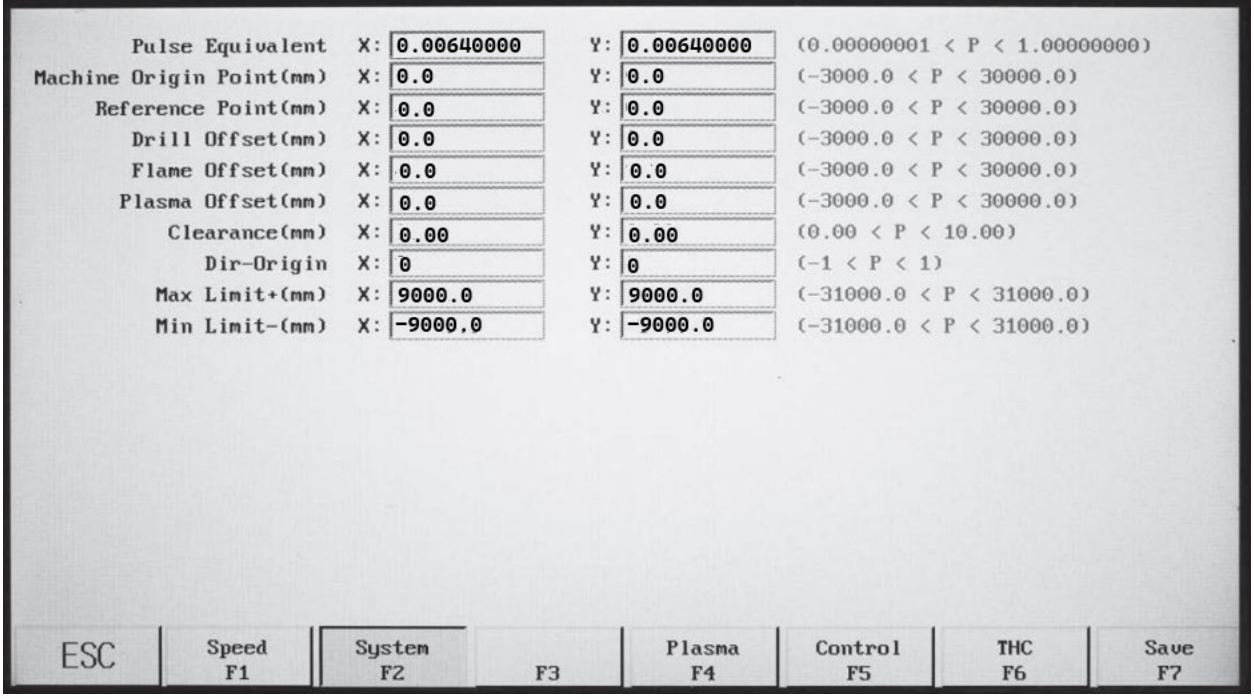


1) *Start speed (mm/min)* - Speed when movement starts. Can be used to gradually ramp up movement speed over the time defined in *Acc time (S)*. Useful for making precise manual movements easier and thicker materials.
2) *Acc time (S)* - Time period in which *Start speed* accelerates to the operating speed and then decelerates to zero.
3) *Acceleration (S)* - Changes speed at which stepper motors accelerate. It controls how abrupt sudden changes of direction, like corners, are. Small adjustments here can make a big difference. 0.3s is usually a good middle ground.
4) *G00 move speed (mm/min)* - Speed used when the table automatically moves the torch.
5) *Return origin speed (mm/min)* - Not used in this table configuration.
6) *Demo/back Speed (mm/min)* - Speed used when you are using the Back function or running the machine in demo mode.
7) *Spd Tran Angle* - Not used in this table configuration.
8) *Corner Radius (mm)* - Not used in this table configuration.
9) *Small Arc Limit (mm/min)* - Speed limit when cutting a radius lower than the size set in *Limited Speed below Radius*. It can improve the radius quality by slowing down the torch.
10) *Limited Speed below Radius (mm)* - Any radius equal to or lower than this value will decrease speed to the limit set in *Small Arc Limit* above.

Setups ctd.

Press F2 to access **System** (See Figure J), which can be used to change machine settings such as limits and stepper motor settings. We don't recommend changing these settings in this menu without directions from technician.

Figure J

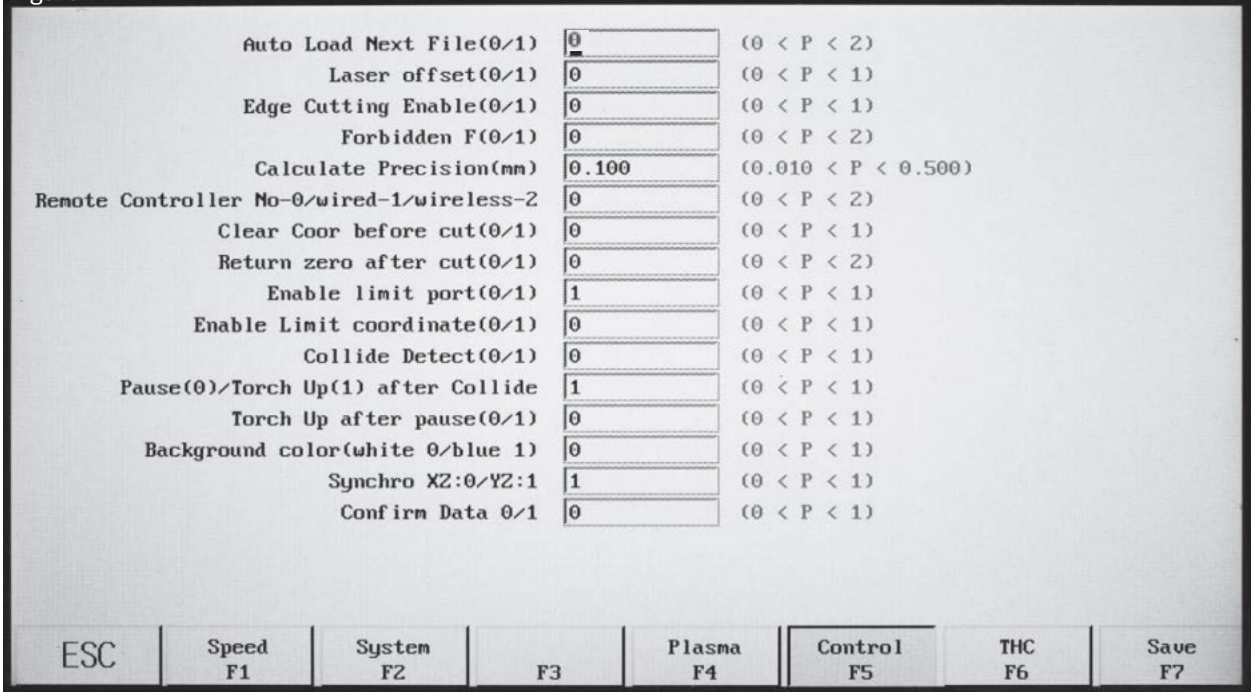


Press F5 to access **Control** (See Figure K). Has many systems setting variables pre-set in the factory.

Background color (white 0/blue 1) - Switches between white (standard) and blue background color.

Halo doesn't recommend changing other settings in this menu without direction from technicians.

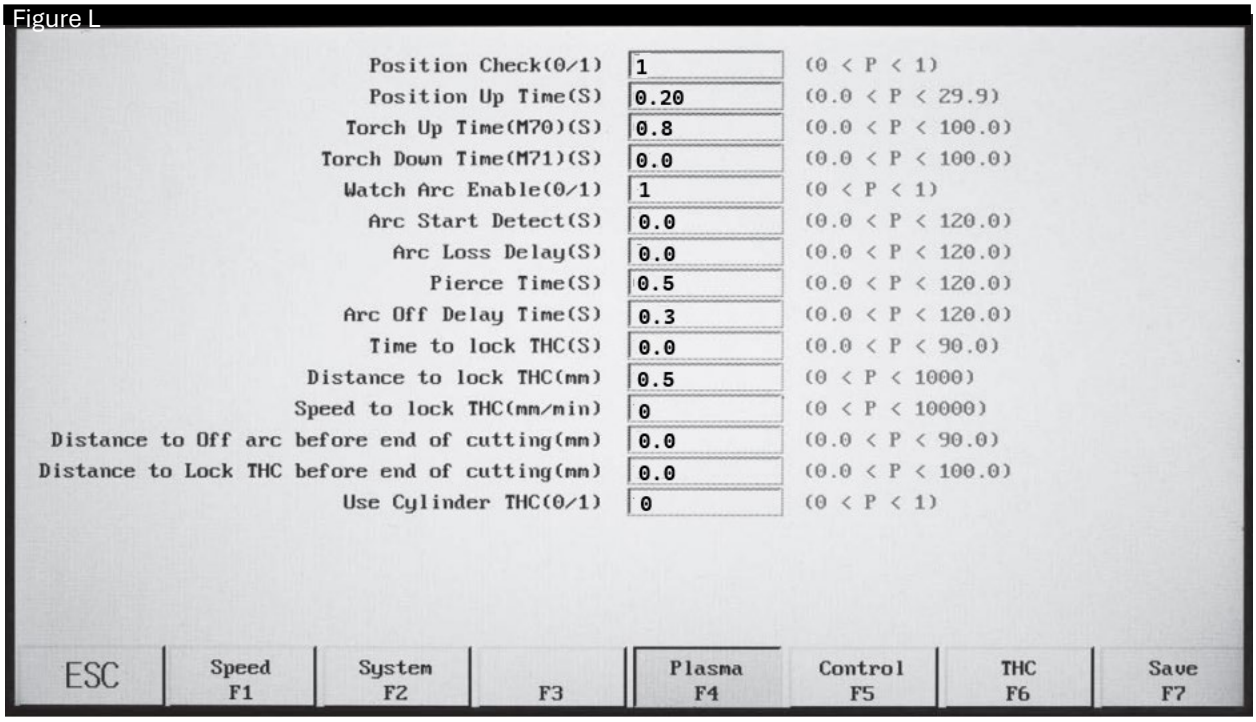
Figure K



Setups ctd.

Press F4 to access **Plasma** (See Figure L), which can be used to change plasma-specific settings.

Figure L

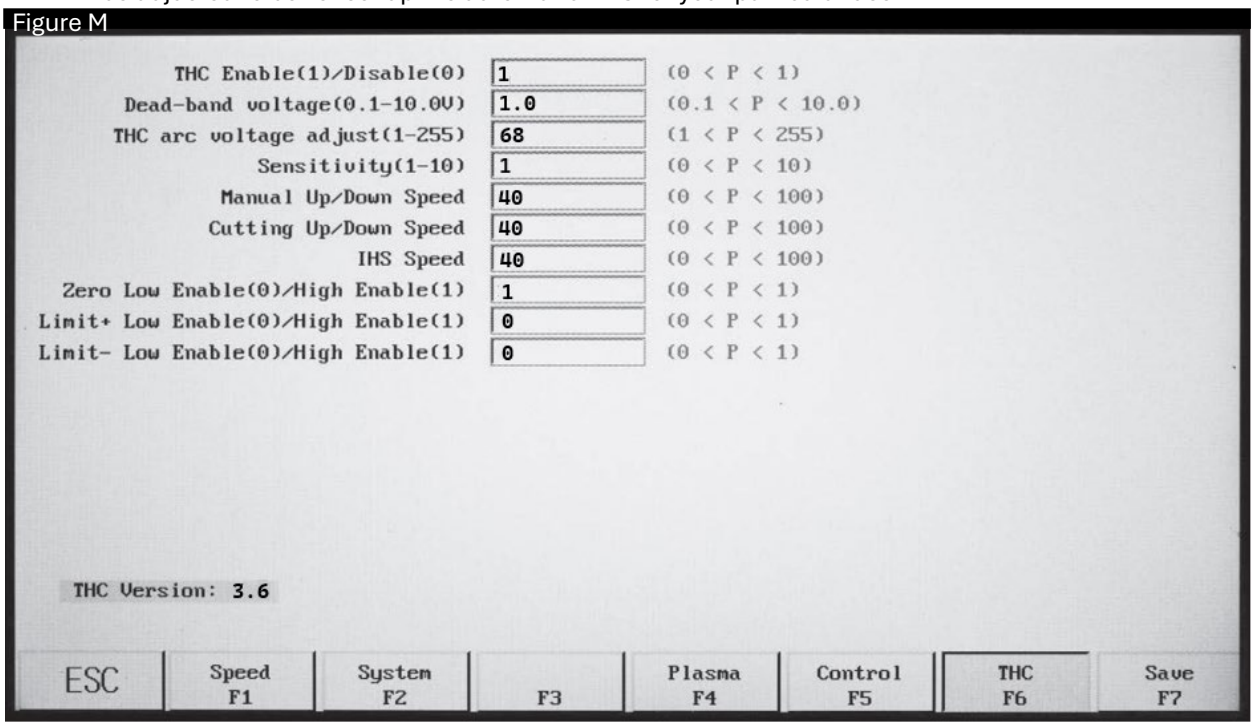


1) *Position Check (0/1)* - Enables or disables running the initial height program. Leave set to '1' to run the program before cutting if you want the torch to level itself.
2) *Position Up Time (S)* - The run-up time to the Initial Height Setting (in seconds). It can also be changed from the main cut screen using the '4' and '5' keys.
3) *Torch Up Time (M70)(S)* - The length of time (in seconds) the torch height motor will run upward at the beginning and end of the cut path. Set between zero and one second to save time.
4) *Torch Down Time (M71)(S)* - The length of additional time (in seconds) the torch will run down before starting a cut path. Set between zero and one second to save time.
5) *Watch Arc Enable (0/1)* - Set to '1' to monitor plasma arc by arc voltage; used in conjunction with the two settings that follow. When set to '0' the table won't stop if it fails to detect arc voltage.
6) *Arc Start Detect (S)* – Pause in arc detection as cut/pierce starts. If the table detects that the arc is lost after this set time, it will pause the cut and display an arc alarm. Normally left at zero.
7) *Arc Loss Delay (S)* - Arc loss detection delay. If the table detects that the arc is lost for longer than the set time, it will pause the cut and display an arc alarm. Normally left at zero.
8) *Pierce Time (S)* - The time after arc start that the Plasma Torch will hold stationary so that it can pierce the material before moving.
9) *Arc Off Delay Time (S)* – Pauses the table for a set time after plasma arc ends. It can space out the time between cuts on parts with many holes, or you can set to less than a second to save time.
10) *Time to lock THC (S)* - Time it locks the THC after cut start. Helpful for odd starts with large gaps, or on thick material which results in an unstable arc at the start of the cut.
11) *Distance to lock THC (mm)* - Distance from the end of the cut segment until the THC will be locked.
12) *Speed to lock THC (mm/min)* - If movement speed during cut is under this value, it locks torch height.
13) *Distance to Off arc before end of cutting (mm)* - Distance to end of cut until it turns off the arc.
14) *Distance to Lock THC before end of cutting (mm)* - Distance to end of cut until it locks torch height.
15) *Use Cylinder THC (0/1)* - Setting for non-standard height controller. Leave at '0' for this table.

Setups ctd.

Press F6 to access **THC** (See Figure M), which has all of the THC-specific settings. Some of these can be adjusted to better set up the automatic THC for your particular use.

Figure M



1) *THC Enable (1) / Disable (0)* - Enable or disable the automatic THC by pressing '1' or '0'.
2) *Dead-band voltage (0.1-10.0V)* - Adjustable dead zone for the THC. If actual arc voltage differs from the set arc voltage by more than this number, it automatically adjusts the torch height. Usually set to 1V.
3) *THC arc voltage adjust (1-255)* - Arc voltage ratio adjustment calculation number. *Do not adjust without consulting Halo*; adjusting can cause improper function. Standard is 64.
4) *Sensitivity (1-10)* – How reactive the torch height control is. Larger numbers make the torch adjust faster but can also cause a feedback loop where the torch is frequently and rapidly adjusting up and down. The default setting is 1.
5) *Manual Up/Down Speed* - Manual adjustment speed for the torch height. The default is 40.
6) *Cutting Up/Down Speed* - Automatic adjustment speed for the torch height. The default is 40.
7) *IHS Speed* - Speed of the torch when setting initial height. Keep at 40 for a good adjustability range of the start height.
8) *Zero Low Enable(0) / High Enable (1)* - Leave set to '1' to enable the torch height motor.
9) *Limit+ Low Enable(0) / High Enable (1)* - Not used in this table configuration. Leave set at '0'.
10) *Limit- Low Enable (0) / High Enable (1)* - Not used in this table configuration. Leave set at '0'.

Remember to save your changes by pressing the F7 key.

Diagnose

F5 opens a diagnostic menu (See Figure N) which you can use to monitor inputs and outputs.

Halo does not recommend changing any of the settings that are not described below unless specifically asked to by the Halo Techicians.

Figure N

You can set the date and language through this menu. Press F4 for **SysSet** and enter password '1928'.

Figure P

From there, press F3 for setting the date/time or F4 for setting the language (See Figure P).

Zoom In

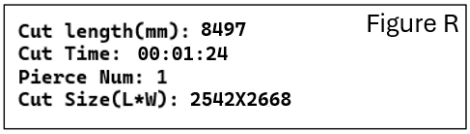
F6 opens the zoom menu (See Figure Q), which allows you to get a closer look at small features.

Figure Q

You can control the zoom level by pressing F5 to zoom in and F4 to zoom out. F6 will return you to the main cut screen.

F7 Info shows info about the cut file (See Figure R).

Figure R

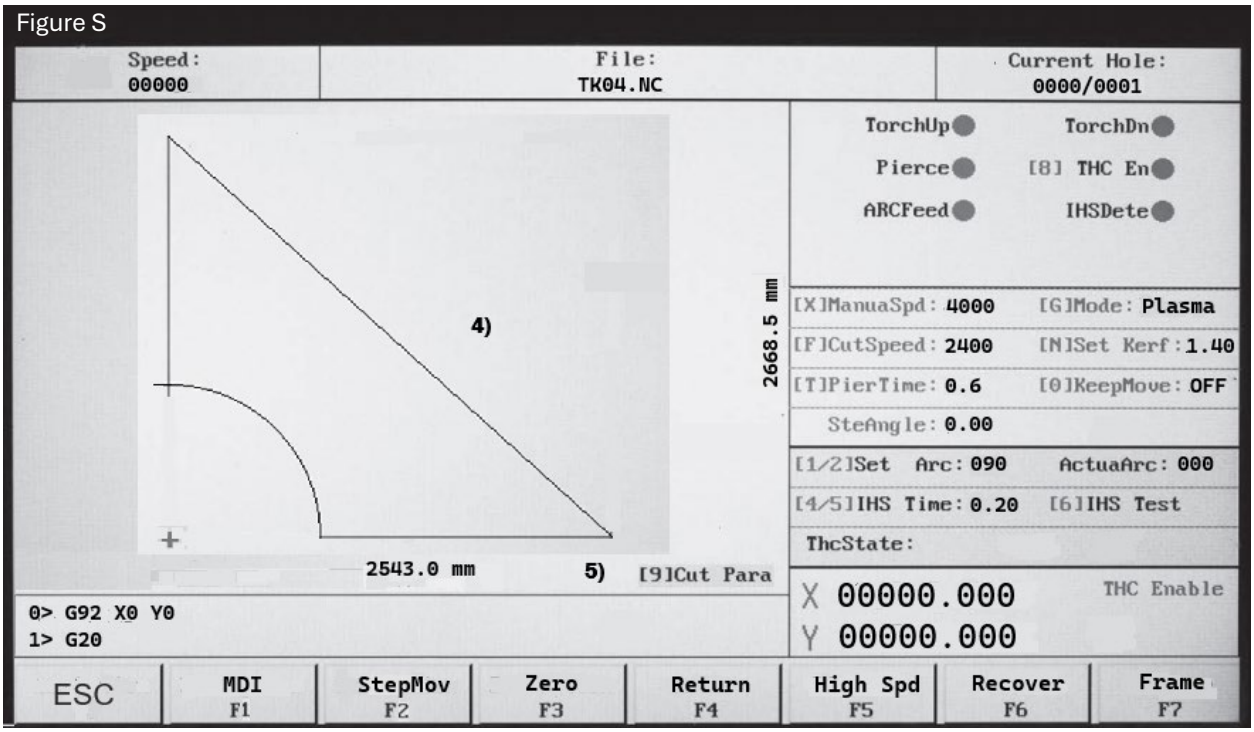


1) *Cut length (mm)* - The length in millimeters of cutting necessary to complete the cut file.
2) *Cut Time* - How long the cut file would take in hours, minutes and seconds.
3) *Pierce Num* – The number of individual pierces the cut file requires.
4) *Cut Size (L*W)* – The dimensions of the cut file to the rounded *down* to the nearest mm.

Manual Movement

F7 opens the manual movement menu (See Figure S), which can be used for cutting manually with the pierce key and to set alignment before making a cut. The options are detailed below.

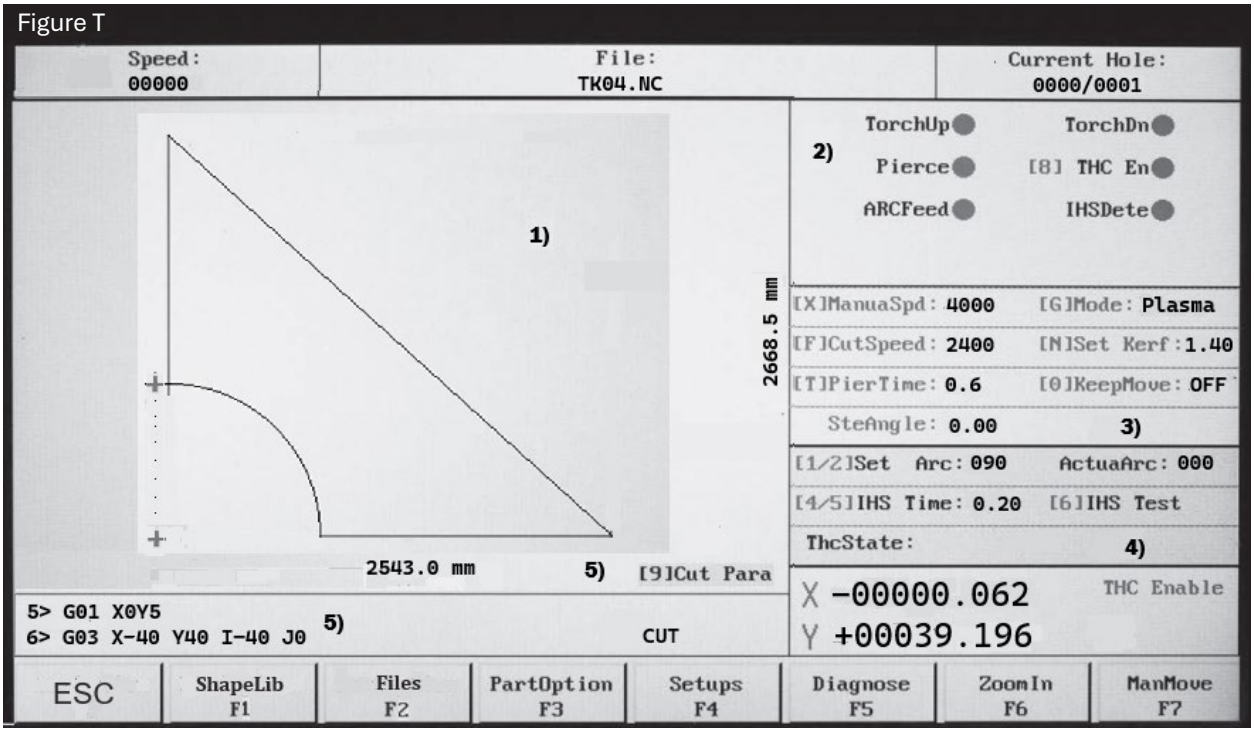
Figure S



1) *MDI (F1)* - Enter values (in mm) for X- and Y-Axes and the torch will move to match it. Negative numbers will move the torch left (X-Axis) and forward (Y-Axis). Positive numbers the reverse.
2) *StepMov (F2)* - This is step movement mode. Enter a value (in mm). Then press the appropriate arrow key. The torch will move in that direction for the entered value. This can be helpful for precisely aligning a plate.
3) *Zero (F3)* - This setting manually zeroes the coordinate system so that you can be sure you have the alignment you want. Simply position the torch in the location you want to set as your zero coordinate and then press F3. It will now treat that as your zero point.
4) *Return (F4)* - Used to return the torch to the zero point by selecting *Return to Reference*. Selecting *Return to Maction Machine Zero* will establish your current location as the new zero point.
5) *High Spd (F5)* - Used to switch between the three speed levels which have been defined in advance: High Speed, Mid Speed and Low Speed. Simply press F5 to switch between them.
6) *Recover (F6)* - This can restore the torch to a previous breakpoint or offset the cut file.
7) *Frame (F7)* - This has the torch run a rectangular perimeter at the maximum and minimum X and Y values in the cut file. It allows you to quickly and easily confirm that you have enough space on the sheet you are cutting, that it is in the correct place and that the cut won't take you past the limits of the axes.

Main Cut Screen During Cutting

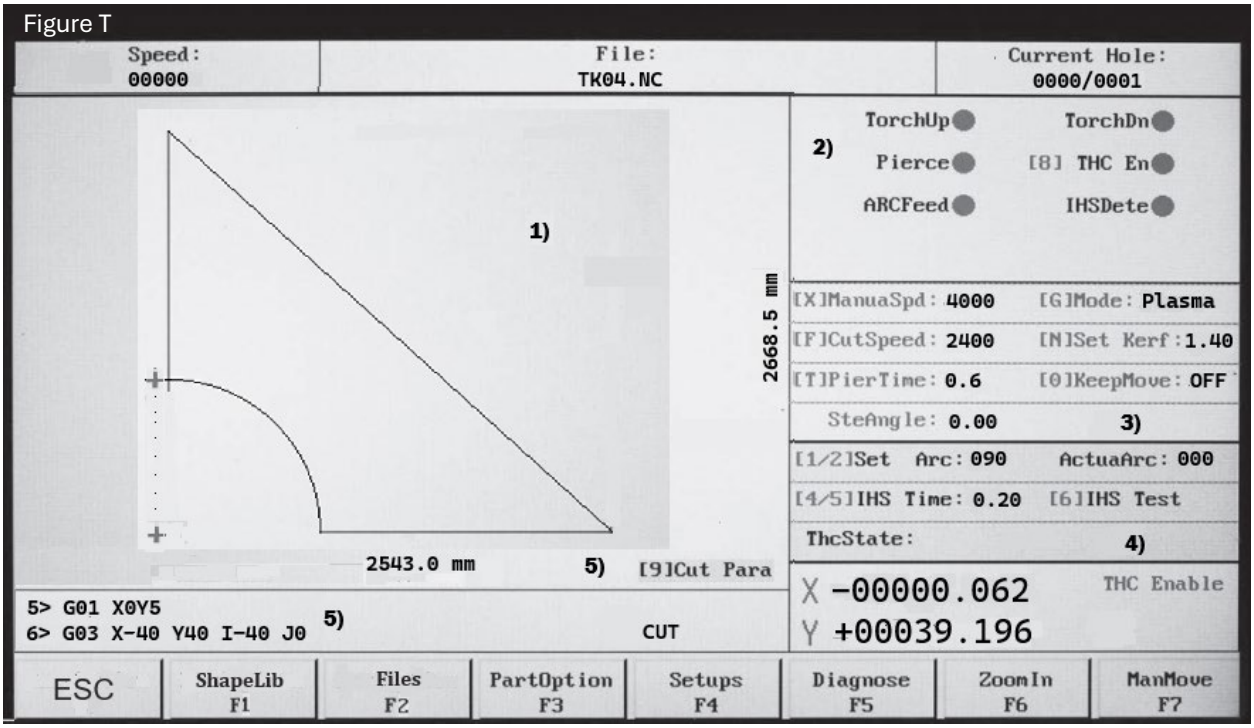
Figure T



1) The part view will be colored as the cut progresses. Any finished section is colored green. Lines of torch travel are red dotted. Red crosshairs are at current torch location and zero point. (See Figure T)
2) The THC sensors and program status. This is useful for troubleshooting. For example, let's say that the arc is breaking due to height. If the *THC En* indicator is red, it's likely breaking because the torch height has been locked because of one of the settings for plasma cutting.
    - *Torch Up* – Glows green to say that the torch height motor is shifting up.
    - *Pierce* - Glows green when the computer is triggering the plasma cutter.
    - *ARCFeed* - Glows green to say that arc voltage is being received.
    - Torch Down - Glows green to say that the torch height motor is shifting down.
    - *THC En* - Glows green to say that the automatic torch height control program is in progress. It glows red when disabled, which may tell you that the torch height control is fully disabled or has been locked by a setting.
    - *IHSDete* - Not used in this table configuration.
3) Quick access settings. They can be changed only when cutting is paused or not running.
    - *ManuaSpd* - Press [X] to change the speed when manually moving the torch (mm/min).
    - *CutSpeed* - Press [F] to set the standard speed the torch moves when cutting (mm/min).
    - *PierTime* - Press [T] to access pierce time setting. Pierce time is the time the torch is still at the start of a cut to allow the arc to completely pierce the material.
    - *SteAngle* - When using *Rotate steel plate*, it shows the currently set angle here. Rarely used.
    - *Mode* - Press [G] to switch between Plasma and Demo mode.
    - *Set Kerf* - Press [N] to enter kerf width (mm) for compensation to improve your part accuracy.
    - *KeepMove* - Pressing [0] switches keep moving mode on/off. For normal movement you need to hold the arrow key down to move the torch in a direction. Turning on KeepMove lets you click the movement direction, and the torch keeps moving in that direction until you press the key again or it hits a limit.

Main Cut Screen During Cutting ctd.

Figure T



4) Quick access settings for the THC (See Figure T).
   - *Set Arc* - The arc voltage that the THC targets when cutting and the torch height is not locked. Change by pressing key [1] to increase and key [2] to decrease.
   - *IHS Time* - The IHS in seconds. When the cut starts it will zero the torch height by touching the material, and then will run the motor upward for the set time to establish start height. Change by pressing key [4] to increase and key [5] to decrease.
   - *ThcState* – Tells you what the THC is doing now.
   - *ActuaArc* - Display of the actual arc voltage being measured by the CNC table. It will display 0 if there is no arc voltage or 255 if there is an input error.
   - *IHS Test* - Press 6 to run the IHS program without cutting so you can confirm visually that the starting height is correct.
5) Shows the live stream of G-Code on the left side. The top right displays any timer running and the countdown. The bottom right shows what the Operator Station is doing now.

A prompt window appears if you try to restart a cut while off the cut path. It will offer the following options for returning to the stop point:

- *Only Return* - Returns the torch to point on the part path where it stopped. Press the Start key to continue the cut.
- *Cutting Return* - Ignites the arc at torch's current location and cuts a straight path to last point on the part path where it stopped and continues the rest of the program as normal.
- *Offset Cutting* - Moves the point on the part path where it stopped to where the torch is now. Wherever the torch is, it shifts the system so that the last path point is moved to where the torch is and cutting will continue from there.

Choosing Machine Settings

Acceleration - The abruptness of the movement is mostly controlled by the *Acceleration* (p.16) setting. Increasing this may make for smoother movement at high speeds.

Amperage - For metals thicker than 1/16" (1.6mm), 40A+ output from your Plasma Cutter is ideal for max speed and is required for thicker materials. Thinner gauge steel can be cut with a lower amperage. Lower amperages allow you to put less heat into the workpiece, minimizing warpage. It also requires lower speeds, which can create a smoother cut; trying to maintain high speeds (like 3000mm/min) on a complicated cut file can potentially result in inaccurate cuts).

Arc Volts - The measured voltage drop across the arc, which is useful for controlling height. The THC attempts to keep the arc volts at Set Arc; the optimal range varies somewhat depending on the plasma cutter you are using.

Cut Speed - First locate a suitable speed for your material thickness from a Cut Speed chart. Depending on many factors, like the condition of consumables, amperage, and material quality, speed will need to be fine-tuned.

The best speed is as fast as possible while minimizing dross on the finished piece. Large, chunky dross says your speed is too low. Small, hard dross beads mean your speed is too fast. When cutting in the ideal speed range, it is normal for a narrow spray of sparks to shoot out over top the sheet and for the plasma spray out the bottom to lag slightly behind the torch position. It leaves a shallowly curved line on cut edges.

IHS Time - The IHS is defined by seconds of motor run time upwards. Ideally, the initial height is 1.5 to 2 times higher than the cutting height. With thicker material, good initial height is crucial because damage to consumables can happen when slag is shot back into the Plasma Torch.

Kerf - Kerf varies based on various factors, and even varies slightly while the table cuts. But it is usually close to your Plasma Torch's tip diameter. To get the most accurate kerf width, measure a cut piece with no kerf compensation applied and subtract the actual size from the set size. If both sides you measure have been cut, divide by two. Due to the nature of plasma cutting there will nearly always be a positive bevel which is clearest on thicker materials. This means, from top to bottom, inside features will slope smaller and outside features will slope larger.

Pierce Time - Improper pierce time may cause two issues: failure to penetrate, which results in a shower of spark and slag with a poor initial cut; or arc failure and sputtering at the beginning of a cut. Thicker material may need nearly a second of pierce time or more, while thin gauge might not need any. See a Cut Speed chart for a starting point based on your material thickness.

Too short of a pierce time means the plasma arc hasn't fully penetrated the material before it starts moving. This results in greater consumable wear, a shower of spark and slag across the table, and an improper cut. Ideal pierce time allows for full penetration of the material before movement occurs.

Too long of a pierce time will fully penetrate the material, resulting in a hole beneath the torch. The plasma cutter will struggle to maintain the arc because there isn't any material to conduct it. This results in sputtering as it switches between the pilot and cutting arc or may trigger an arc break alarm and pause the cut.

Radius Speed – You can use *Small Arc Limit* and *Limited Speed Below Radius* (p.16) to reduce tight radius speed. It doesn't have a large effect, but a slight reduction is ideal for good quality, chiefly at high cut speeds.

THC Lock Time - Time to lock THC (p.18) is the time the THC is locked after beginning a cut. On thick material it can improve initial stability of the arc, where extreme changes in arc voltage cause unstable automatic torch height control.

Upkeep

The customer should work to prevent dust and debris build up. Regular lubrication of racks, pinions, and guide rails will help to maintain smooth travel and avoid corrosion.

Consumables should be replaced whenever needed. The tip and electrode should always be changed out in pairs for best performance. When changing out consumables, always be careful not to discard the swirl ring. It often sticks to the tip and is sometimes discarded by mistake.

To drain the water table, remove the silicone plug in the drain bolt. This plug is simply pulled out from the top for draining. For larger plasma tables, there will be a plug in each section of the water table.

If sheets of metal are often being loaded onto the table or there is other equipment being used nearby, make sure to inspect the wiring harnesses regularly. Damaged wiring can cause improper or erratic performance and can be a fire hazard. Discontinue use immediately and contact Halo for replacement harnesses if you notice damaged wiring. Dressing the wiring harnesses can help to avoid damage, but double-checking is still needed.

Troubleshooting

USB Drive Undetected or Files Loading Incorrectly

1) *USB drive too large*. The maximum USB drive size the machine will support is 16GB.
2) *USB drive not formatted to the correct file system*. Reformat the USB to a FAT or FAT32 file system. It can be done on a Windows PC by right-clicking on the USB drive in File Explorer and selecting Format.
3) *USB driver file system corrupted*. Reformat as described in previous step. These systems can corrupt over time, especially when used for a CNC table and repeatedly connected and disconnected.

Poor Quality Cut

1) *Low air pressure to plasma unit*. Plasma cutter needs sufficient air pressure flowing to the torch. At least 60psi while the air is flowing is standard.
2) *Air leak at fittings, lines, hose or plasma cutter.* Shut down the plasma unit. Locate the leak and perform the appropriate repair.
3) *Moisture in the compressed air.* Drain your air compressor.
4) *Incorrect arc voltage*. For thin gauge metal Torch height should be between 0.11" (2mm) and 0.19" (5mm) above the workpiece during a cut.
5) *Consumables failed*. Check the condition of your consumables and replace as needed. If you have switched consumables just before the failure, ensure that all consumables are present and properly seated.
6) *Incorrect amperage*. Refer to a cut setting chart for ideal amperage for your metal thickness in CNC.

Poor Dimensional Accuracy

1) *Incorrect kerf.* Prior to cutting an important piece, run a test piece without kerf compensation. Measure kerf by subtracting the measured size from the set size and divide by two if you are measuring across two cut faces. Use this calculated kerf as the new kerf setting. Remember, CNC plasma cutting has discrepancies which make it difficult to get a better tolerance than ± 0.02" [0.5mm] continuously. In addition, there will always be some positive bevel. The thicker the material the more noticeable the bevel.
2) *CNC is improperly calibrated*. Contact Halo Tech: tech@halo-innovations.ca or 905-981-4256.

Plasma arc fails to start.

1) *No power*. Circuit breaker has tripped. Reset the circuit breaker.
2) *Improperly grounded workpiece*. Confirm that plasma cutter's ground clamp has a good, clean metal contact to the workpiece and that it is hooked up to the plasma cutter.
3) *Plasma Cutter overheated*. Check for overheat indicator or appropriate error code. Allow the plasma cutter to cool. Make sure the duty cycle was not exceeded.
4) *Consumables failed*. Check the condition of your consumables and replace as needed. If you have switched consumables just before the failure, ensure that all consumables are present and properly seated.
5) *Excessive torch height*. Lower Arc Voltage or the IHS.
6) *Incorrect mode*. The Operator Station must be in Plasma mode.
7) *Settings adjusted too far outside of normal parameters, making plasma cutting difficult*. Refer to pages 16-19 for safe default settings. If it is still not working, contact Halo Tech: tech@halo-innovations.ca or 905-981-4256.

Plasma arc is breaking repeatedly.

1) *Travelling too large a gap.* Adjust path so the Torch doesn't need to cross large gaps in the workpiece.
2) *Improperly grounded workpiece.* Confirm that plasma cutter's ground clamp has a good, clean metal contact to the workpiece and that it is hooked up to the plasma cutter.
3) *Arc Start Detect time is set too low.* Increase Arc Start Detect time (p.18) so there is enough time for the height to set and arc to fire.
4) *Consumables failed.* Check the condition of your consumables and replace as needed. If you have switched consumables just before the failure, ensure that all consumables are present and properly seated.
5) *Excessive torch height.* Lower Arc Voltage or the IHS.
6) *Locked torch height.* Check lock indicator *THC En* during the cut. If the Torch height is being locked (glowing red), verify that the THC is enabled or change the setting that is locking the height (eg. *Time to lock THC*, *Distance to lock THC* , and/or *Speed to lock THC* (p.18)).
7) *Settings too far outside of normal parameters, making plasma cutting difficult*. Refer to pages 16-19 for safe default settings. If it is still not working, contact Halo Tech: tech@halo-innovations.ca or 905-981-4256.

Operator Station does not power on.

1) *No power to the unit.* Check power source (120V, 60Hz and 5A) and the connection to the CNC table.
2) *Circuit breaker for power supply has tripped.* Reset the circuit breaker.
3) *Computer malfunction.* Contact Halo Tech: tech@halo-innovations.ca or 905-981-4256.

Limit Alarm Triggers Randomly

1) *Wiring failure.* Check the problem sensor for failed wiring.
2) *Debris buildup.* Ensure that the sensor has been cleaned of any debris buildup that could trigger it by mistake.