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***Hypertherm***

# Hypertherm Shape Cutting Control

## *Operator's Manual*

Software Version 7.00 for Touch Screen CNCs

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# Section 1: Safety

## Read This Manual

Read and understand this instructional manual, the cutting machine manuals, and your employer's safety practices. **Note:** This product is not designed to be field serviceable. Please return to an authorized repair center for any required service.

## Dangerous Machinery



Operation and maintenance of automated equipment involves potential hazards. Personnel should take precautions to avoid injury.

Injury and entanglement may occur if hands and limbs come in contact with moving machinery.

KEEP HANDS CLEAR of dangerous moving machinery. All control, including manual, can be effected using the touch screen, front panel keys or remote interface.

Loose fitting clothing or ties may become entangled in the machinery. These items should not be worn while operating or servicing the machine.

## High Voltages



Electric shock can kill. Be sure this equipment is safely installed in accordance with enclosed procedures and specifications.

Avoid contact with electrical wires and cabling while power is on.

This equipment should only be opened by trained service personnel.

Please refer to the appropriate appendix in the Installation Guide provided with your control for details on safety certification for that product.

## Product Listings

### Type “M” and “P” Controls



**Note:** This product has been designed and manufactured in accordance with CE and UL Safety Standards.

UL has successfully tested and listed the type “M” and “P” control products in accordance with the applicable U.S. and Canadian Safety Standards. File number E178333. Note: Suitable for pollution degree 2 environment only.

This appliance has been successfully tested and listed by CE under the following standards; EN 500081-2 1994, EN 61000-6-2 1999 and EN 55011:1998. Certificate number: Retlif R-3909N

# Section 2: Overview

## Introduction

This control is a multi-axis digital control system specifically designed for shape-cutting machines and is our latest effort in a long history of developing leading edge technology for the metal fabricating industry. At the forefront of our design efforts is a commitment *to ease-of-use*. Programmable soft-keys simplifies the front panel and put the most common functions at your fingertips. Developed around Microsoft Visual C++<sup>®</sup> and the Microsoft Foundation Classes<sup>®</sup>, this control brings a new generation of *man-machine-interfaces* to the most critical element in the shape cutting process, you, the user.

With the maturing of High Tolerance Plasma and the emergence of Laser into the area of shape cutting, you need a control that can accurately position the cutting device. *SoftMotion* brings the power and the accuracy of the Intel Pentium<sup>®</sup> microprocessor to your positioning table. With both a digital position loop and velocity loop running, you get smooth motion through the entire velocity range, and the comfort of knowing the cutting device is at the preprogrammed position. You can even verify this with a dynamic zoom function during cutting.

The control can be used with almost any two-dimensional shape-cutting table. Built-in logic is present for Plasma, Oxy-Fuel, Marking, Waterjet and Laser. Regardless of your application, we will make your shape cutting process more productive.

You can graphically key in part programs directly using *ShapeWizard*<sup>®</sup> on the front panel, without waiting for delivery, set-up, and alignment of templates. Or you can select any of 68 shapes from the parametric shape library. Using a host computer or CAD/CAM system, you can also download custom part programs easily. We even supply you at no-charge a communications package to tie the control to the rest of your management information. Whatever method is used, the control, with its advanced graphical user interface (GUI), shortens set-up time, speeds productivity and simplifies scheduling.

Our product is designed and developed around Microsoft Visual C++<sup>®</sup> and the Microsoft Foundation Classes<sup>®</sup>. The operating environment is completely compliant with the year 2000 dating.

## ShapeWizard<sup>®</sup>

Allows you to graphically create simple part programs and store them on the internal hard disk present in the control.

## Teach/Trace

If configured with a tracing head, you can use the control to digitize almost any pattern, store it on the internal hard disk, and further customize the program with *ShapeWizard*. The control has both smart-arc and smart-line translators to provide you with optimum program resolution.

## Shape Libraries

Graphically select the desired shape from the parts library. Then you simply add the dimensions you want, and the scaled part, with your entered dimensions, will be displayed. There is even a Help Icon to step you through the data entry.

## Program Upload and Download

Communication is an integral part of today's fabricating shop. All part programs that have been entered in the control can be uploaded to a remote computer or file server with an integrated RS-232C/ RS-422 communications link. CAD generated programs can be downloaded at baud rates of up to 115K baud and visually previewed on the color LCD display. Visual representation of part programs, along with full alpha-numeric file name support, gives you the flexibility to manage your data as you see fit. Use of the optional Network Card allows us to bring the latest in communication technology for increased speed and productivity to your shape cutting controller. Additionally, built-in Control monitoring features allow current operational status to be displayed at the host Link screen.

## SoftMotion

*SoftMotion*, a proprietary data buffer and interrupt structure that allows the control to generate all of its motion control algorithms from the main Pentium® Processor. This architecture allows *SoftMotion* to tightly couple the motion control and I/O logic to the operator interface.

## Cutting Options

Flexibility in your cutting operation is the key to success. The control comes standard with the following cutting functions to help you optimize material and plate usage. These functions work on any program. After selecting one of these functions, the new part will be graphically displayed.

### Mirror function

The mirror function can be used to create a mirror image of the part along either the X or Y-axis.

### Rotate function

The rotate function can be used to rotate the current part.

### Scale function

The scale function can be used to increase or decrease the current part by a programmed ratio.

### Repeat function

The repeat function duplicates the part shape in either a straight, staggered or nested grid patterns.

## Programming Features

English and Metric operation for worldwide use. Each axis can have its own encoder-to-unit edge rate.

Dynamic Kerf compensation with programmable kerf value.

Automatic Corner and Plate Alignment with programmable scrap clearance.

Shape Repeat with three grid patterns (straight, stagger, and nested) allows fast cutting of multiple pieces.

Part mirroring in both X and Y axes.

Part rotation.

Scaling allows quick part resizing to original size.

Virtually no limit to the number of program names or workfile folders that can be stored on the internal hard disk drive.

Punch or powder marker control with twelve programmable offsets.

Choice of industry-standard EIA RS-274D or ISO 6582 ESSI Part Programming Languages.

### Manual Data Input (MDI)

Full screen ASCII text editor.

Allows writing, editing, and graphical review of part programs at the machine.

### Communications Link

Preview Mode allows machine operator to graphically review and select programs for download.

Download part programs from CAD system, remote host computer, or other storage device via built-in RS-232C/ RS-422 port.

Can accept EIA RS-274D or ESSI part programs.

Baud Rates of up to 115K Baud. Communication baud rates of 230K are obtainable using the communication link software provided with the control.

Optional Network Card for connecting directly to a PC Network for part file allocation.

### Graphical program display

Visually display any part program.

Display of real-time position and I/O information.

Display of actual cut path while cutting.

**Built-in Parametric Shape Library**

Contains 68 commonly used shapes.

Simple Graphical prompts for entering all part dimensions.

**Teach/Trace**

Smart-arc and Smart-Line algorithms for optimum program size and contouring smoothness.

Converts your existing optical tracer templates to EIA RS-274D programs, and stored on the internal hard disk drive.

Automatic part closure detection.

Allows multiple pierce points, lead-ins, lead-outs, and rapid traverse segments.

Upload taught part programs to CAD system, remote host computer, or other storage device.

Requires a separate optical tracer control system.

**Performance Features**

Digital servo positioning control for any cutting machine. An optional SERCOS Interface™ allows expansion of motion axes and distributed I/O.

Control dynamic accuracy of 0.002 inch (0.051 mm) with 1000 edge/inch encoders.

Programmable cut speeds up to 3000 IPM (76,200 mmpm).

Variable segment length look ahead for optimum contouring performance.

Automatic corner slowdown and torch height disable for clean, sharp corners.

Speed Increase/Decrease buttons for optimizing machine cut speed.

Automatic Plate and Corner Alignment corrects for skewed plates.

Complete cut-loss recovery with backup and forward along path, off-path re-pierce and return-to-path, and move pattern functions.

Rip Mode for straight-line cutting. Jog control cutting.

Punch, powder or Plasma marker capability.

Manual jog control with position read-out for positioning torches.

Manual Nester™ and optional HyperNest® – CNC Automatic Nesting features for increased productivity and increased plate utilization.

Automated Torch Spacing feature to position torch station spacing automatically through the part program for standard and mirrored multi-torch cutting.

Rush Job Interrupt and Automated Power Loss Recovery features.



## Installation and Setup Features

Selectable axis orientation for compatibility with all cutting machines.

Built in oxy-fuel interface with programmable pre-heat time, ignition, and creep speed.

Built in plasma interface with programmable purge time, ignition time, arc-off delay time, and arc-transferred feedback.

Built in Laser interface with programmable shutter time, power ramp time and pierce time.

Built in Waterjet interface with programmable abrasive output and pierce time.

Programmable servo gains, speeds, Watch Window, machine parameters, and communication parameters for flexible application.

Interfaces easily to most optical tracing systems for integrated control.

Complete built-in diagnostics for checkout and test.

## Hardware Specifications

15" TFT Touch Screen with 1024 x 768 resolution.

≥60Gbyte hard disk

≥1.3 GHz Processor.

512 Mbytes of RAM.

Up to 96 lines of interface signals for cutting and motion logic (gas control, tracing system, markers, homing, etc.) depending on I/O configuration. An optional SERCOS Interface™ allows expansion of I/O configuration.

Industrial grade enclosure and keypad designed to minimize RFI/EMI interference.

Surface mount printed circuit board technology.

Two axes optically isolated  $\pm 10\text{VDC}$  drive outputs and incremental encoder inputs which are expandable to 6 axes of motion. Up to twelve axes of motion and 1024 I/O available with optional SERCOS Interface™. Optional axes available for dual gantry, dual transverse, contoured bevel head, two rotate, two tilt angle and eight Sensor™ THC applications..  
+5VDC single ended or differential encoder inputs.

Optically isolated serial ports with programmable baud rates to 115 K baud. Communication baud rates of 230K are obtainable using the communication link software provided with the control. Optional Network Card for connecting directly to a PC Network.

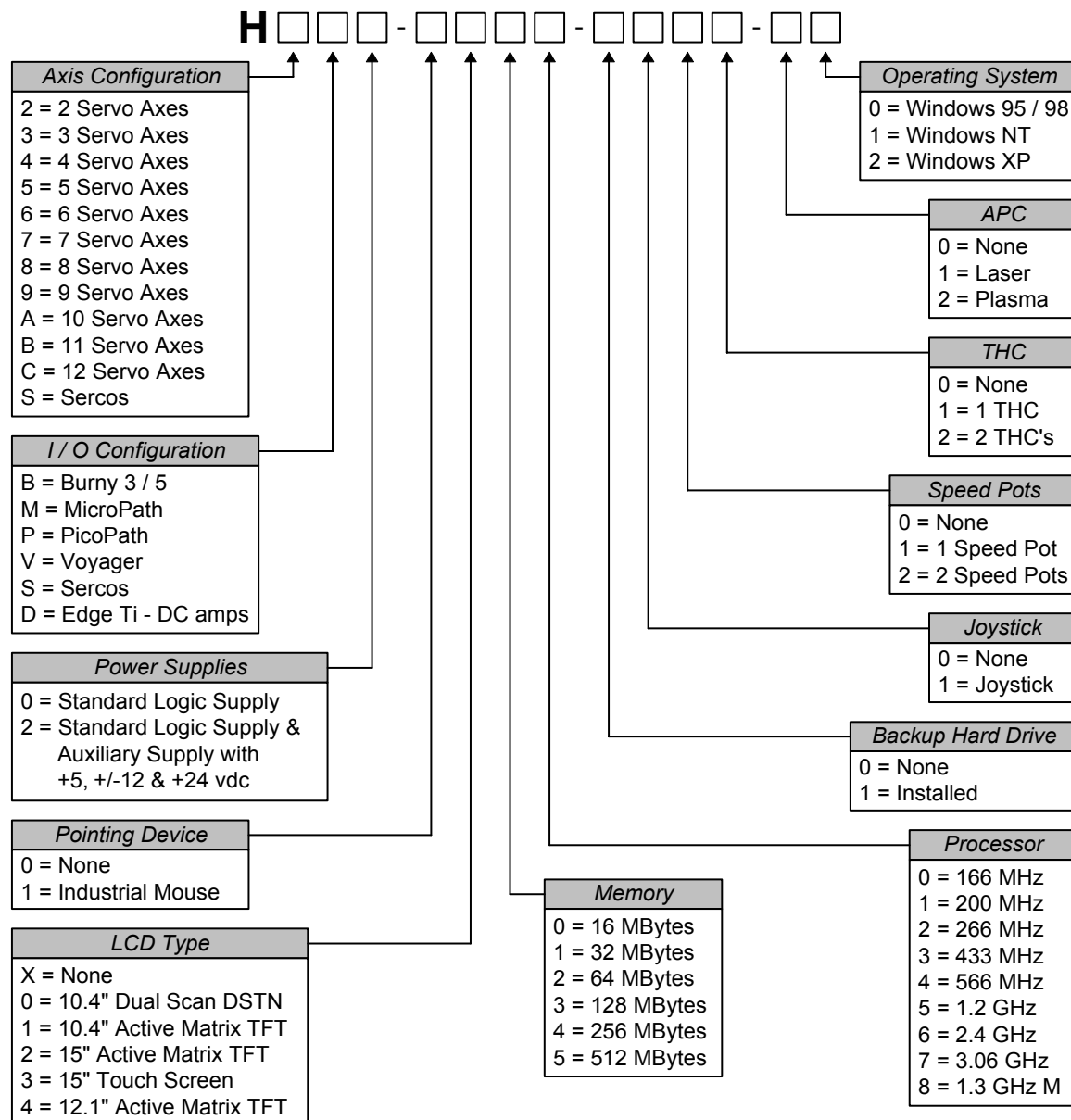
Universal power input (100-240 VAC; 47-63Hz). Individual models may vary. Refer to machine interface information for details.

Operating environment: 0 to 50°C (32 to 122°F); 95% relative humidity (non-condensing).

An optional Chiller for Mariner style controls is available.

## Model Numbering System

The control is available with the following hardware and software configurations. Features and control configuration options in software are based on the I/O configuration of the control. Generally, the information presented in this guide is based on the I/O configuration as outlined below. Please refer to your control I/O configuration for available features and product information. The specific configuration is determined by the Model Number, as shown below:



### Model Numbers

You may wish to record your Model Number in the space provided below.

Model Number Information	
Model Number:	
Serial Number:	

## Front Panel Layout

This software is designed specifically for 15" TFT Touch Screen operation with 1024 x 768 or higher resolution and is used on all CNC models. Individual man machine interface (MMI) and front panels may vary.

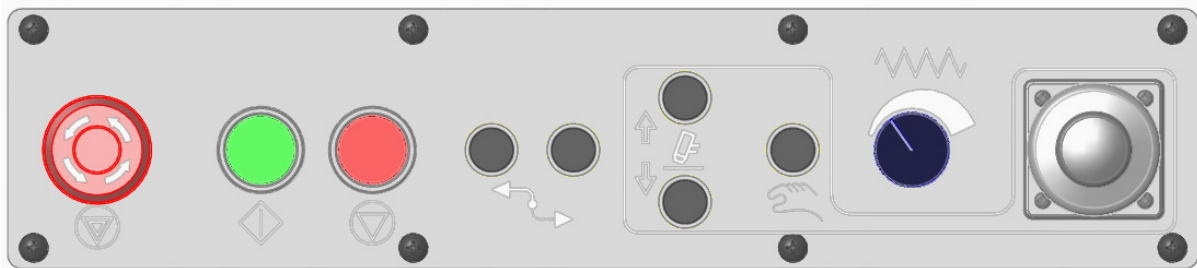
### Power Switch

Hypertherm Automation controls are equipped with a momentary contact power switch. Press briefly and release for controlled power on and power off the control. Pressing the power switch for 10 seconds will force a hard system shutdown of Windows and the control. Generally, a hard shutdown is not recommended.








### Touch Screen

The touch screen software interface allows direct key input on the screen through the use of check boxes, radial boxes, drop down selections and data input. Data input boxes will automatically display a numeric or alphanumeric keypad depending on data type.

### Front Panel (selected models)



### ICON Legend

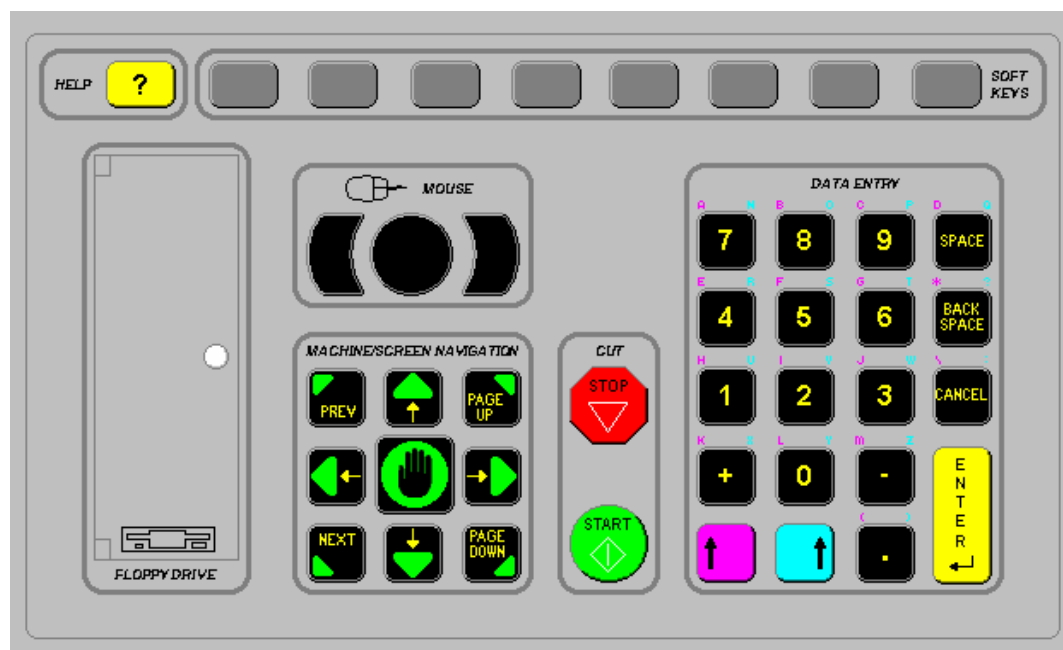
-  Emergency Stop
-  Start
-  Stop
-  Forward and Backward on Path
-  Torch Up / Down
-  Manual
-  Speed Pot (Manual Feedrate)

### Front Panel Keypad (selected models)

The yellow key labeled HELP is for on-line documentation and help. Simply press this key at any time and this document will be displayed.

The keys to the lower right of the front panel comprise the alpha numeric keypad, which is used for entering data. To the far left, under the label Machine/Screen Navigation, are keys which control manual motion and cursor location during data input. These include the MANUAL key (for Manual Mode jogs) and the eight arrow keys (for jog and cursor direction).

The two keys under the label CUT are for program start and stop.



### Key Functions



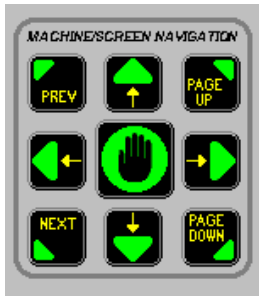
The alpha-numeric keypad is used to enter numeric data or text. To enter a number, simply press the key. To enter a word, press and hold the matching colored shift key (up arrow) while pressing the desired letter key. The + (plus) and - (minus) keys are used to add and delete features at selection and check boxes.



An alternate (ALT) soft key indicates that more soft keys and features are available by pressing this soft key on screen.



When the alternate soft key is displayed, the purple shift can also be used to view additional soft keys.



These keys activate jogging using the arrow keys when in the manual mode. Manual key functions (indicated in green) are available at the Manual, Pause and Align Screens. This keypad is also used for navigating through a multi-variable dialog box (indicated in yellow).

The Prev/Next buttons are used to move through the field boxes, Page Up/Down is used to scroll and the arrow keys are used to select items in a dialog box.



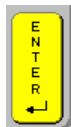
Pressing the space key inserts a space into the current data entry field. The space key is also used to toggle between fixed logic settings ( i.e. setups - preheat sense input open/closed ). The space key may also be used to add and delete features at selection and check boxes.



Deletes the current character in the data entry field and backs up one position in the field. Located above the Back Space key are the \* and ? characters which are used as wild cards to search for files.



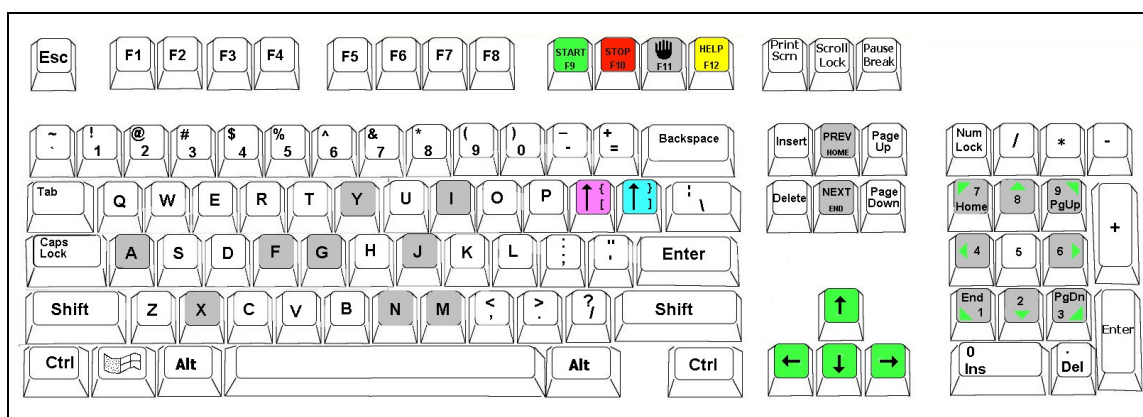
Can be pressed at any time (except during cut) to return to the previous menu without saving any changes. Located above the Cancel key are the \ and : characters which are used for mapping network drives.



Causes the last number entered/toggled to be accepted. Located above the enter key are the < and > characters which are used for mapping network drives.

## PC Keyboard Layout

Available as standard on selected models but may be added to all controls.



### Keyboard Functions

Function Keys F1-F8 are equivalent to the soft keys on the display screen.

Function Key F9 is equivalent to the START key.

Function Key F10 and Pause Key are equivalent to the STOP key.

Function Key F11 is equivalent to the MANUAL MODE key.

Function Key F12 is equivalent to the HELP key.

Arrow direction keys are used for manual motion.

The HOME key is equivalent to the PREV field key.

The END key is equivalent to the NEXT field key.

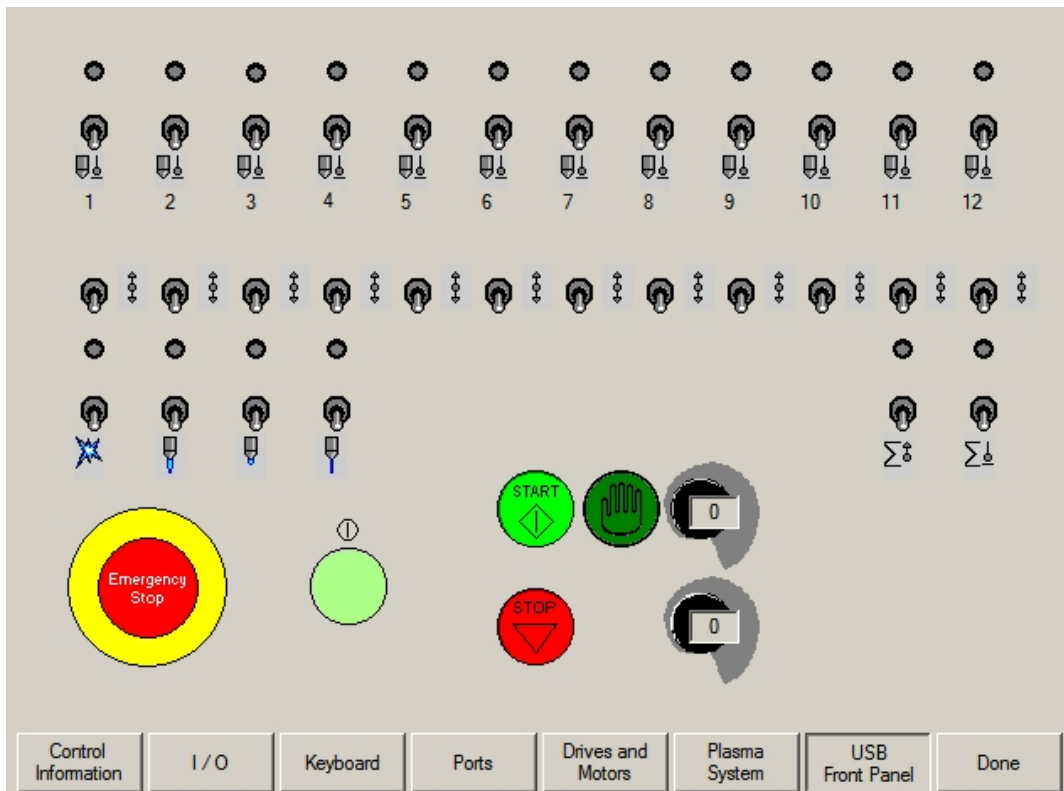
The [ key is equivalent to the purple arrow shift key.










The ] key is equivalent to the blue arrow shift key.

The Esc key is equivalent to the CANCEL key.

To exit the control software press Alt F4. Warning: This will terminate the current application.

To switch between applications press Alt Tab. Warning: The selected application window to be on top of the desktop and may cover or hide the control software application window.

**Optional USB Front Panel (selected models)****ICON Legend**

-  Single station torch selection. Upper switch position is automatic operation. Center switch position is OFF. Lower switch position is manual operation.
-  Manual Raise and Lower of selected station.
-  Manual ignition of torch.
-  Manual High Preheat.
-  Manual Low Preheat
-  Manual Cut Oxygen
-  All stations UP.
-  Automatic plate sensing (IHS) for pre-selected stations
-  Speed Pot

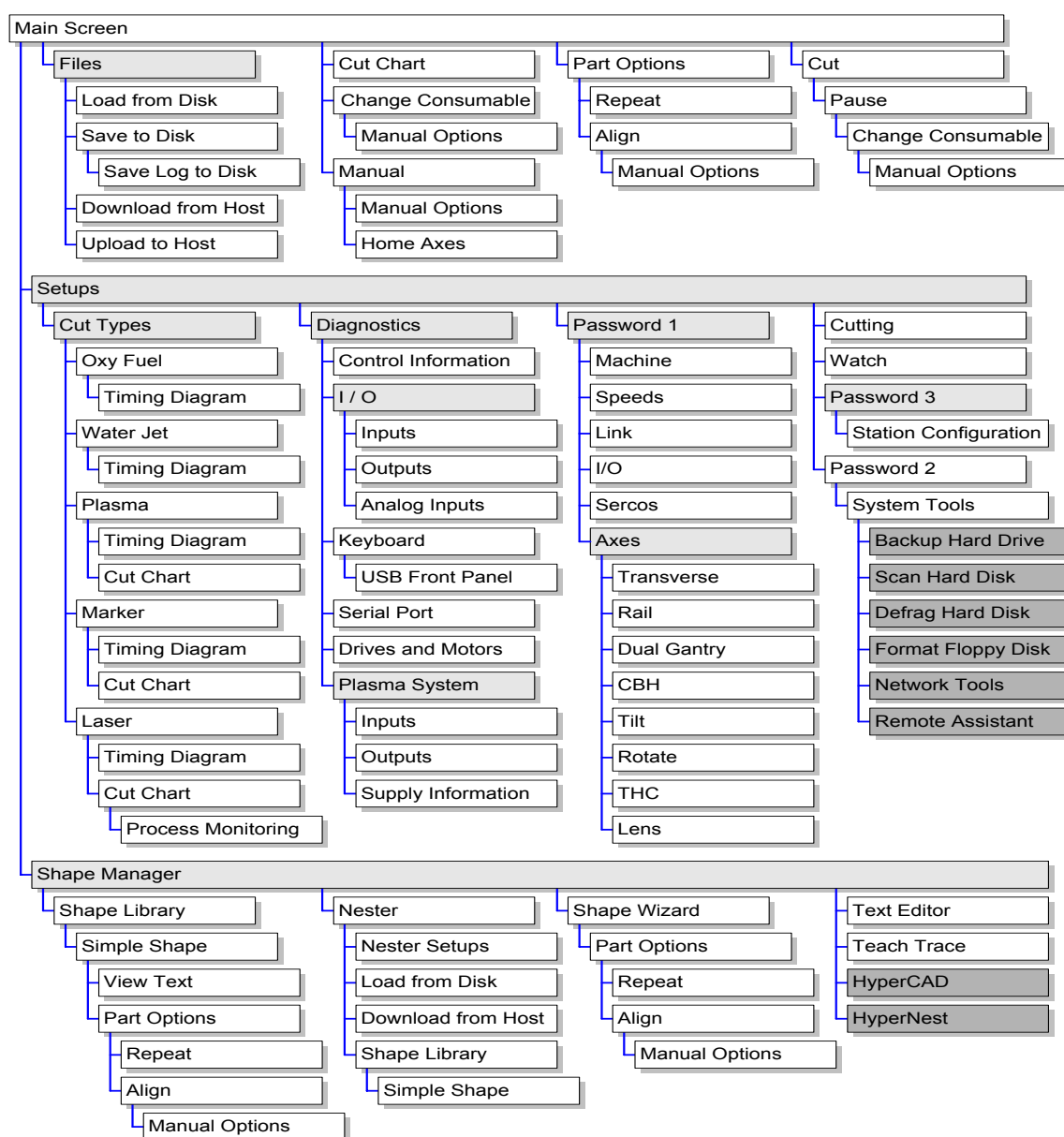
## Operation Summary

The programming and operation of the control is menu-driven. The following diagram shows the Screen Hierarchy for the menu structure.

The menu that appears in the display when the unit is first turned on is referred to throughout this manual as the Main Menu. All other menus and functions are accessed at some level under Main Menu, or else appear as part of a special operational sequence, such as when the cutting process is interrupted during the middle of a part.

The OK and CANCEL keys have special functions in relation to the menu structure. The OK soft key returns to the menu from which the present selection was entered and retains any changes that were made. The CANCEL key returns to the menu from which it was entered and deletes/discards any changes that were made. There are, however, some operations during which CANCEL is not active.

## Screen Hierarchy



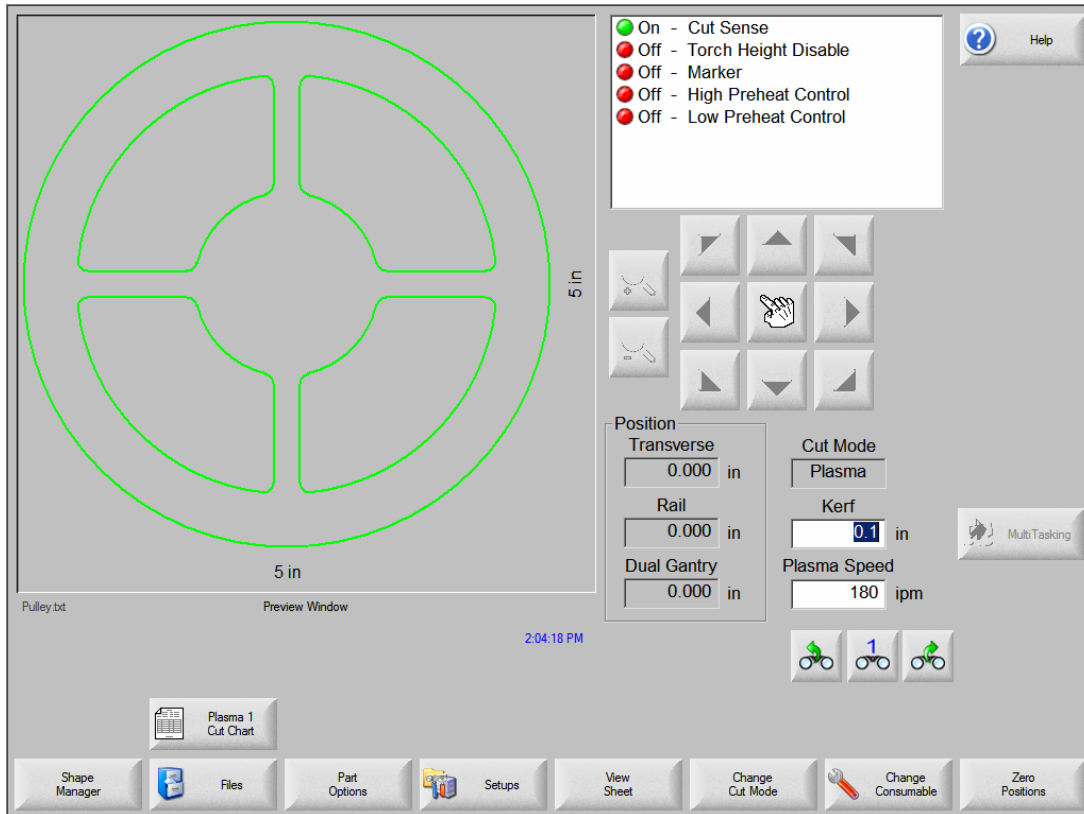


## Key & Menu Functions

The following is a short form description of all menu functions in the control. This is only a brief description of each function. Please consult the subsequent manual sections for more complete information on operational usage of specific keys. **Note:** Screens and features will vary depending on interface selection of Beginner, Intermediate or Advanced.

### Screen Navigation

The eight keys located directly at the bottom of the display act as programmable soft keys. Soft keys allow many different functions to be included without an excessive number of separate keys. It also provides complete flexibility for future software features and enhancements.



Soft keys to accept (OK) and reject (Cancel) changes.



An alternate (ALT) ICON at the left or right edge of the soft keys indicates that that more soft keys and features are available by pressing this softkey.



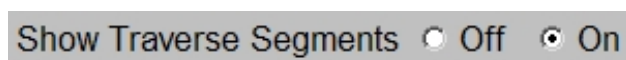
The touch screen software interface allows direct key input on the screen through the use of check boxes, radial boxes, drop down selections and data input.

**Pull Down Box (note arrow at left)**

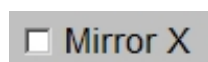
Press the arrow box to pull down and view selections.

**Radial Button**

Press the round box to select.

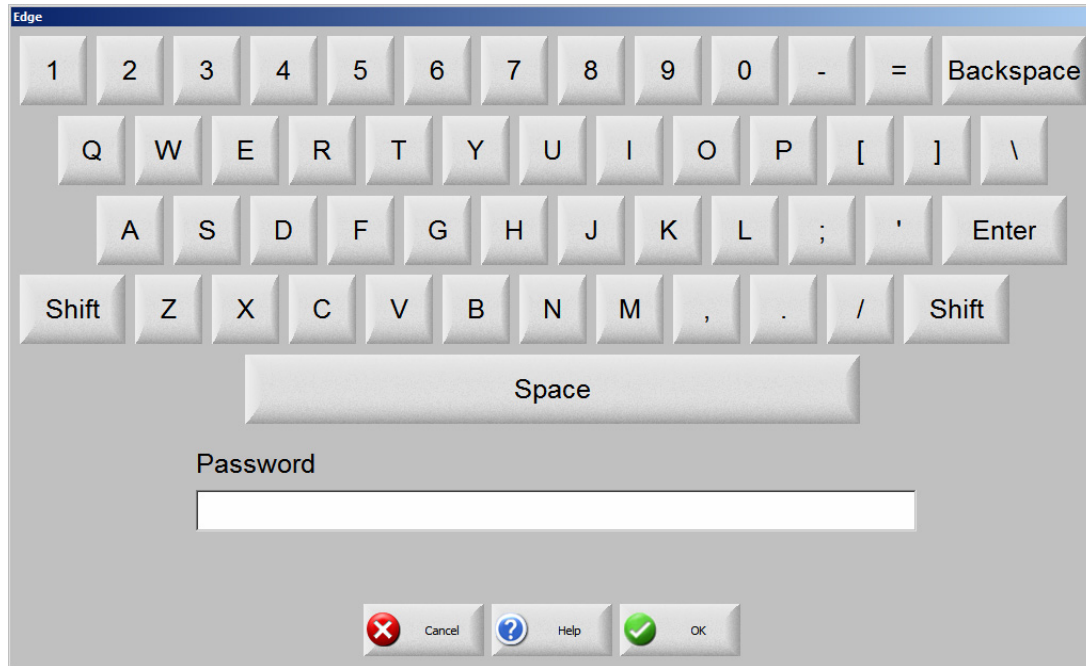
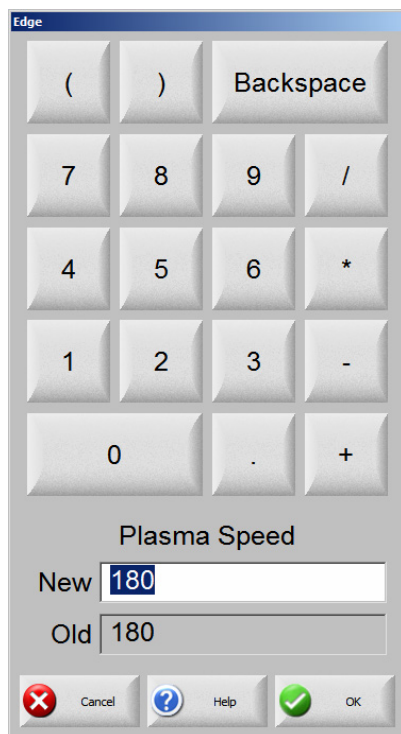
**Check Box**

Press the square box to enable.

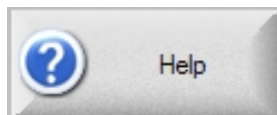


**Data Input**

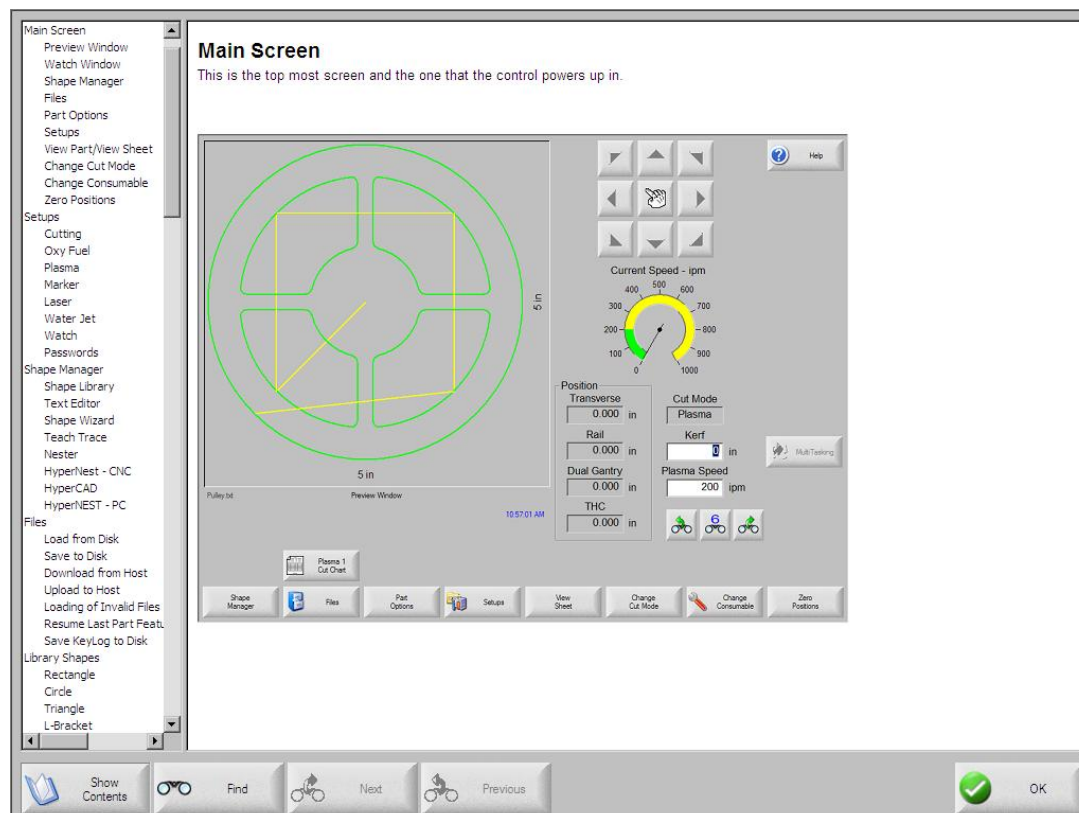
Data input boxes will automatically display a numeric or alphanumeric keypad depending on data type. Double click on the field to enter data.

**Alpha Numeric Keypad****Numeric Keypad**

## Help Screen



This controller is equipped with an easy to follow help screen function. To access the internal help screens press the Help soft key. Help information for the screen currently being accessed will be displayed. Pressing the OK soft key will exit the help screens and return you to the last control screen accessed.



### Show Contents

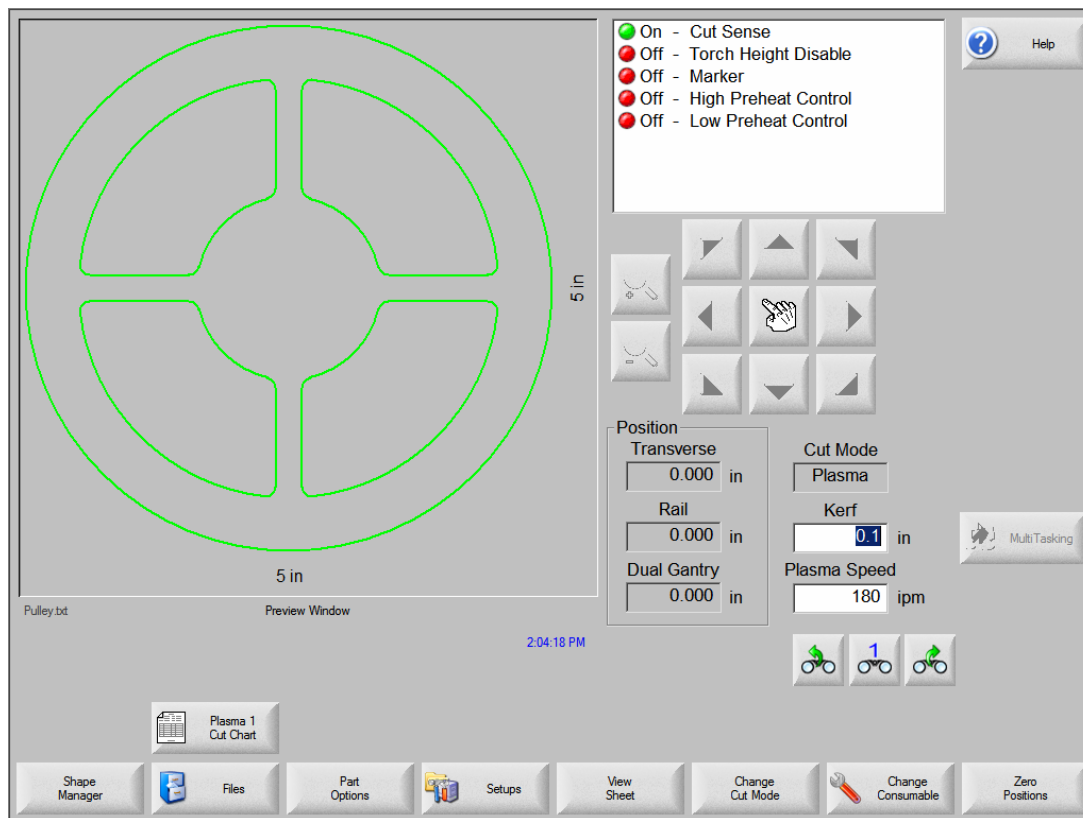
While at the help screen, the table of contents may be turned on and off by pressing the Show Contents soft key. Use the up/down arrow keys to select a subject and press enter to view. Press the previous/next key to move from the table of contents and the information screen and back. While at the information screen, the up/down arrow keys are used to scroll through the information on the selected topic.

### Find

The find feature will search for a requested topic within a selected information screen.

## Main Screen

This is the top most screen and the first available screen at power up.



## Preview Window

This window displays the current part in memory with the overall dimensions for that part.

## Watch Window

This is the right part of the screen where such things as the speedometer, positions, cut mode and time are displayed. This part of the screen is configurable through the setups. Up to 10 different Watch Windows are available for viewing during use.

## Shape Manager

This soft key takes you to the Shape Manager screen where you can load a simple shape, edit a part using the text editor or shape wizard or teach trace a part.

## Files

This soft key takes you to the Files screen where you can load, save, download or upload part files.

## Part Options

This soft key takes you to the Part Options screen where the current part can be scaled, rotated, mirrored and/or repeated.

## Setups

This soft key takes you to the setup screens.

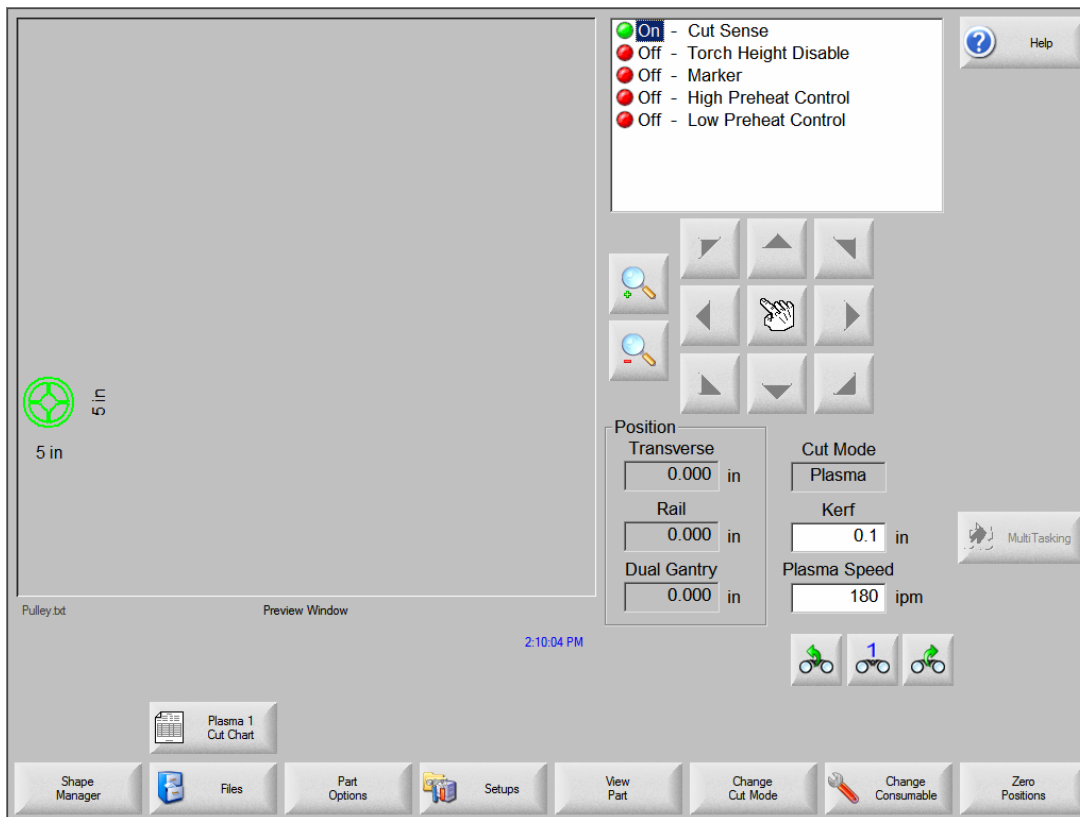
## View Part/View Sheet

View Part allows the viewing of the entire current part in the Preview Window.

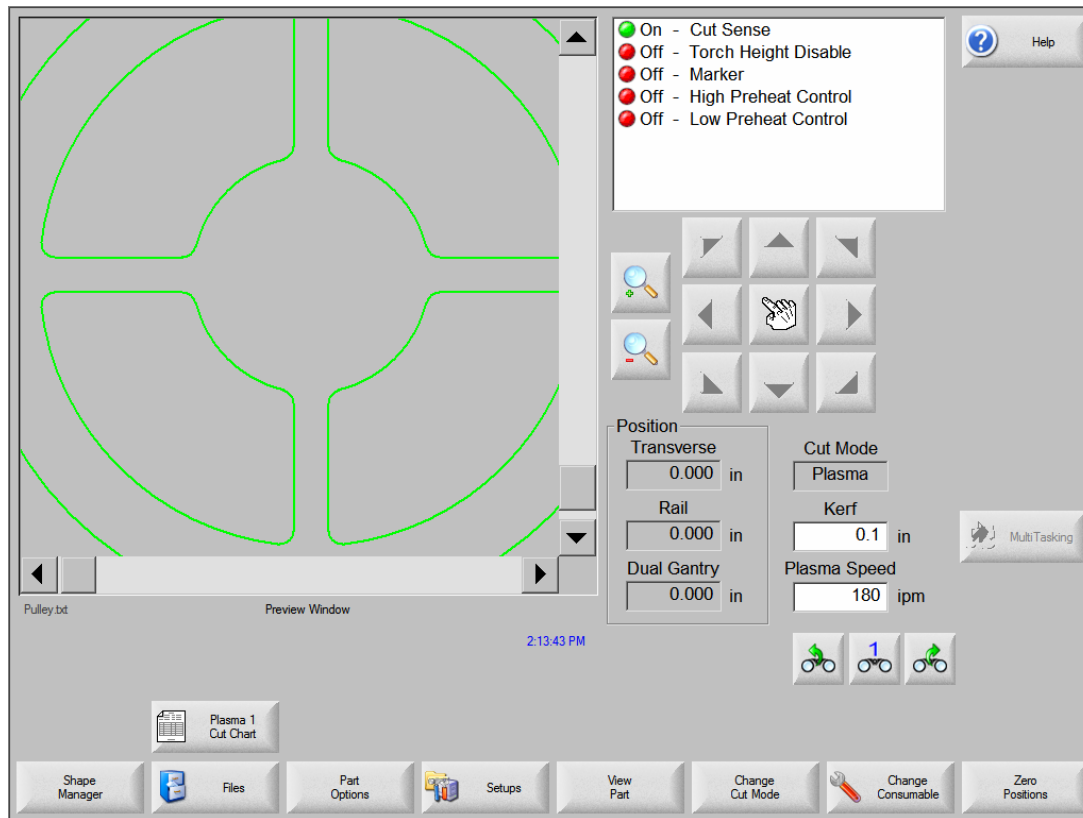
View Sheet allows the viewing of a part as it would appear on the plate. After pressing the View Sheet soft key, the display window zooms out to show the part in relationship to the entire plate.



Zoom +/- soft keys are available to change zoom level.



After zooming out, the display can be zoomed in again by pressing the + key, which causes horizontal and vertical scroll bars to be displayed. Pressing the - key will zoom back out.



While the scroll bars are displayed and the control is not cutting, the view of the plate can be shifted horizontally and vertically by pressing and moving the scroll bar or by holding down a shift key and pressing the arrow keys on the keypad. While the control is cutting, the view will automatically be shifted as the cut path reaches one of the edges of the view. This mode is useful in normal cutting to closely follow the cut-path while in zoom.

View Sheet is more useful when proper Plate Size values have been entered in Cutting Setups.

### Change Cut Mode

Allows selection of Trial, Oxy Fuel, Plasma, Waterjet and Laser cutting modes, depending on the setup configuration.

### Change Consumable

This soft key takes you to the Change Consumable screen.

### Zero Positions

This soft key zeros the current positions on the Transverse and Rail axes as well as the Dual Gantry axis if used.

## Shape Manager Screen

The Shape Manager screen is used to retrieve a part from the Shape Library and edit part files.



### Shape Library

Brings up the built-in library of 68 simple shapes.

### Text Editor

Enters the full screen ASCII text editor. The current part in memory is loaded, allowing direct editing of the selected part program.

### Shape Wizard

Enters into the *ShapeWizard*<sup>®</sup> a graphical editor window. *ShapeWizard*<sup>®</sup> allows direct editing of the selected part program using an easy to use graphical interface to view changes as they are made.

### Teach Trace

Enters the trace-teach menu, where with an *optional* tracing system, you can digitize a template.

### Nester

Nester<sup>™</sup> is a proprietary part nesting program which allows the operator to manually group or nest selected parts together as one part program to conserve raw materials and maximize machine utilization.

An *optional* Automatic Nesting feature is available as an add-on item to Nester<sup>™</sup>. This true shape, single station, automatic nesting package allows quick and simple nesting of profiles on to selected material sizes. This feature is offered as a limited use trial version. Please contact your control vendor for information on adding this feature.



**HyperCAD**

The optional HyperCAD<sup>®</sup> feature is an easy to use 2D drawing application specifically designed for shape cutting. The software's powerful CAD utilities let users import DXF and CNC files or draw from scratch. Files can be converted to graphical parts for editing and saving or go directly to cutting.

**HyperNEST**

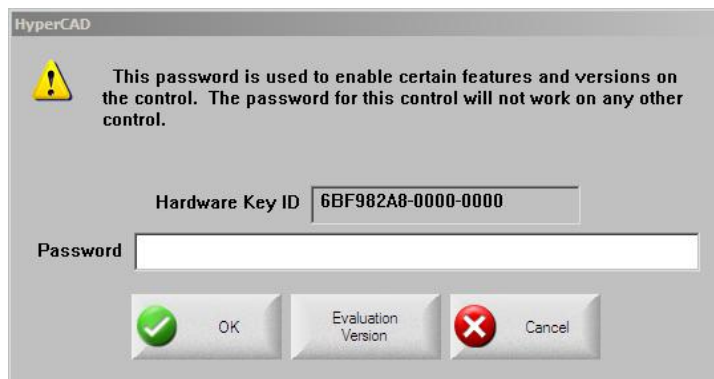
The optional HyperNEST<sup>®</sup> feature is a full featured, automatic true shape application designed to allow quick and simple nesting of profiles onto standard material sizes. With its advanced Graphical User Interface, HyperNEST<sup>®</sup> greatly improves the output of any shape cutting operation.

**Evaluation Timer**

Trial version software will prompt the user with a notification of the number of “uses” left at each launch. To enable unlimited use, a password would be provided by the control vendor.

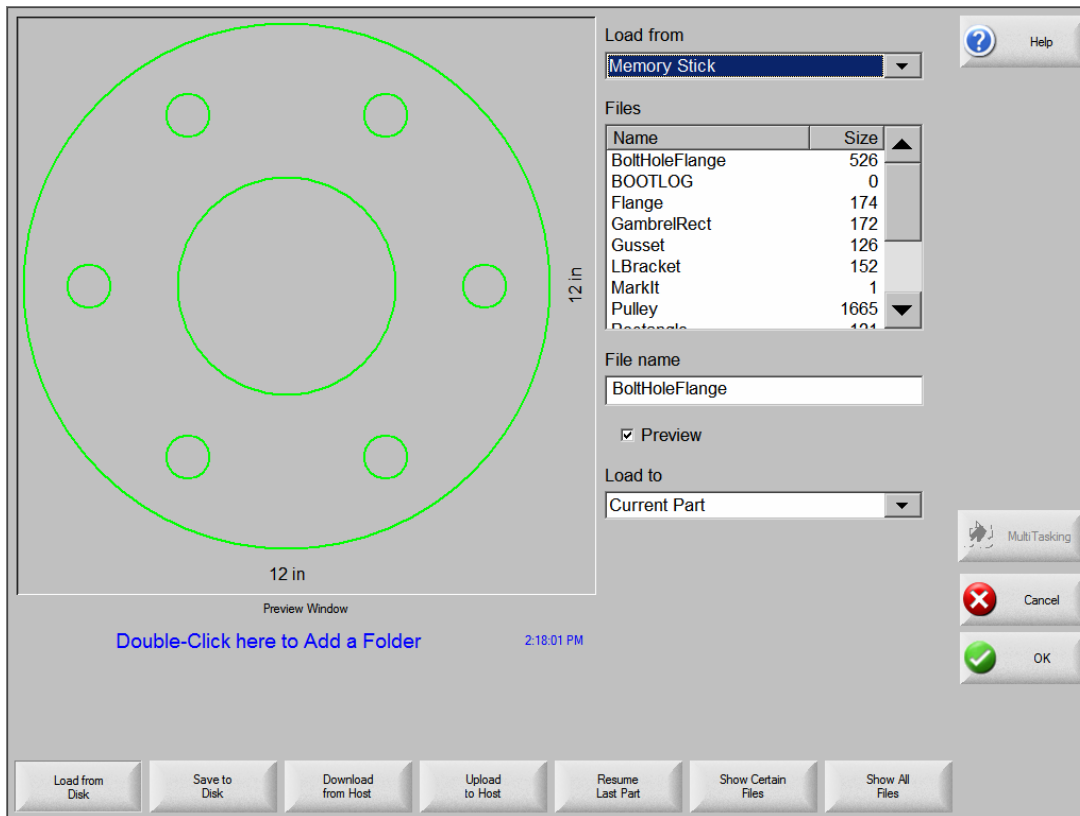
To launch the trial software, select the Evaluation Version.

Example:



## Files

From the Files screen the user may load or save parts on the control or an external location.



### Load from Disk

Allows programs to be loaded from the internal disk drives, USB memory stick or external mapped drives (network option) into working memory.

### Save to Disk

Allows the current program in memory to be saved to the internal disk drives or external mapped drives (network option). This also accesses the Save Key Logging File screen.

### Download from Host

Allows programs to be downloaded from a host computer to the internal disk drives over the selected RS-232C/ RS-422 serial port.

### Upload to Host

Allows programs from the internal disk drives to be uploaded to a host computer via the selected RS-232C/RS-422 serial port.

### Resume Last Part

The Resume Last Part soft key will be visible when the Rush Job Interrupt or Automated Power Loss Recovery feature is in use. These features allow the user to pause the current part program and retain the part and current position information. This then allows the user to load and execute another part program and return to the original part using the Resume Last Part soft key.

**Show Certain Files**

This soft key allows the operator to show only certain files from the selected directory. Both the asterisk and question mark may be used in defining the files to show.

Keypad operation: The asterisk is generated by holding down the left shift key and pressing the backspace key. The question mark is generated by holding down the right shift key and pressing the backspace key.

**Show All Files**

This soft key allows the operator to undo the Show Certain Files from above.

Note: An optional Network Card for connecting directly to a PC Network for part file allocation is available.

## Setups Screen

The Setups Screen is used to configure the control for use.

The Setups Screen is a graphical user interface for configuring a plasma cutting system. It features a top section with a 'Cut Mode' dropdown set to 'Plasma 1'. Below this are input fields for 'Kerf' (0 in), 'Kerf Variable' (1), and 'Kerf Value' (0 in). Speed settings include 'Plasma Speed' (200 ipm), 'Marker Speed' (400 ipm), and 'Marker 2 Speed' (10 ipm). Plate dimensions are set to 'Plate Size X' (48 in) and 'Y' (78 in). 'Vent Control 1' is set to 'On' with a value of 0 in, and 'Off' is set to 51 in. 'Marker Offset 1' is set to 'X' (0 in) and 'Y' (0 in). 'Dwell Time' is 5 sec, and 'Arc Radial Error' is 0.5 in. A status table is displayed below these settings:

Status	Program Code
Enabled	Dwell Override
Enabled	Optional Program Stop
Disabled	EIA I & J Codes Absolute
Enabled	EIA F-Code Override
Disabled	Speed +/- Affects F-Codes
Disabled	EIA Single Decimal Shift
Enabled	Process Select Override

Below the table are radio button options for 'Show Traverse Segments' (Off/On) and 'Retain Skew Adjustment' (Off/On). On the right, there are 'Help', 'Cancel', and 'OK' buttons. A timestamp '9:46:20 AM' is displayed. At the bottom, a row of soft keys includes 'Cutting', 'Process', 'Disable Control', 'Watch', 'Password', 'Diagnostics', and 'Change to Metric Units'.

### Cutting

Allows programming of the different cutting parameters and dwell times.

### Process

Enters the cut type menu, which allows editing of gas control sequencing variables for oxy-fuel and plasma cutting.

### Disable Control

Pressing the Disable Control soft key disables the motion command from the control to the drive system. While disabled, I/O points and encoder feedback are still active.

### Watch

Allows programming of the user definable Watch Window.

### Password

Enter a password to get to the supervisor password protected setup menu.

### Diagnostics

Enters the diagnostics menu.

### Change to Metric Units/English Units

Changes all parameters over to metric units or English units.

## Change Consumable

The Change Consumable Screen is used to track and record consumable life in a database. If the New Torch Tip or New Electrode soft key is pressed every time a torch tip or electrode is changed, the last information for the corresponding consumable will be added to a database. This database will show the date a consumable was changed and how long it lasted in minutes, pierces, inches / mm of travel and Arc Errors. Torch Tip and Electrode data can be recorded for up to twelve Oxy torches and up to eight plasma torches. A special feature allows the user to add an additional wear factor (in minutes) to compensate the database for the additional wear during piercing. Additionally, a Change Consumable Output will be activated when the specified limit has been reached. This output may be tied to an indicator lamp or alarm to prompt the operator to change the consumable.

The screenshot displays the 'Change Consumable' screen with three main sections for inputting consumable data:

- Oxy Fuel - Max Torch Tip Life:** Includes a dropdown for 'Oxy Fuel Torch 1' and input fields for 2 minutes, 10 pierces, 10 inches, and 0 minutes / pierce. The 'Last Torch Tip Installed' is recorded as 9 Nov 2005 11:40 AM.
- Plasma - Max Nozzle Life:** Includes a dropdown for 'Plasma Torch 1' and input fields for 14.787 minutes, 255 pierces, 0 arc errors (actual), 809.21 inches, and 0 minutes / pierce. The 'Last Nozzle Installed' is recorded as 9 Nov 2005 11:40 AM.
- Plasma - Max Electrode Life:** Includes a dropdown for 'Plasma Torch 1' and input fields for 25.076 minutes, 399 pierces, 0 arc errors (actual), 1283.58 inches, 0 minutes / pierce, and 0 volts / minute. The 'Last Electrode Installed' is recorded as 26 Aug 2005 11:18 AM.
- Laser - Max Nozzle Life:** Includes input fields for 2 minutes, 10 pierces, 10 inches, and 0 minutes / pierce. The 'Last Nozzle Installed' is recorded as 'None Installed'.

At the bottom of the screen, there are soft keys for 'New Torch Tip or Nozzle', 'New Electrode', 'Manual Options', 'Reset Database', 'Upload Database', and 'Save Database'. A 'Help' button is located in the top right corner, and 'Cancel' and 'OK' buttons are in the bottom right corner.

### New Torch Tip

This soft key records when a new Oxy Fuel or Plasma torch tip has been installed on the machine.

### New Electrode

This soft key tells the control that a new electrode had been installed on the cutting machine.

### Reset Database

This soft key is used to reset the database on the control to have no torch tip or electrode information.

### Setups

Pressing the Setups soft key accesses the control setups for adjustment of the cut process.

### Upload Database

This soft key is used to upload the current database to a host computer running our link.

### Save Database

This soft key is used to save the current database to the Diskette or USB memory stick.



# Section 3: Setups

## Cutting

When entering the Setup menu the operator can adjust the following run-time parameters for Trial Mode (no cutting), Oxy-Fuel, Plasma, Waterjet and Laser cutting.

The screenshot shows the 'Plasma 1' setup screen. At the top, 'Cut Mode' is set to 'Plasma 1'. Below this, 'Kerf' is 0 in, 'Kerf Variable' is 1, and 'Kerf Value' is 0 in. 'Plasma Speed' is 70 ipm, 'Plasma 2 Cut Speed' is 47 ipm, 'Marker Speed' is 250 ipm, and 'Marker 2 Speed' is 10 ipm. 'Plate Size' is X 122 in, Y 48 in. 'Vent Control 1' is On 0 in, Off 51 in. 'Marker Offset 1' is X 0 in, Y 0 in. 'Dwell Time' is 5 sec, and 'Arc Radial Error' is 0.5 in. A table of 'Status' and 'Program Code' is shown, with options like 'Dwell Override', 'Optional Program Stop', 'EIA I & J Codes Absolute', 'EIA F-Code Override', 'Speed +/- Affects F-Codes', 'EIA Single Decimal Shift', and 'Process Select Override'. 'THC Voltage Offsets' are set to 0 volts for all eight offsets. 'Show Traverse Segments' is Off, and 'Retain Skew Adjustment' is Off. The bottom of the screen has buttons for 'Cutting', 'Process', 'Disable Control', 'Watch', 'Password', 'Diagnostics', and 'Change to Metric Units'. The time '9:42:36 AM' is displayed.

### Cut Mode

Specifies the current cut mode. Trial mode allows the operator to dry-run the current part program without cutting.

### Kerf

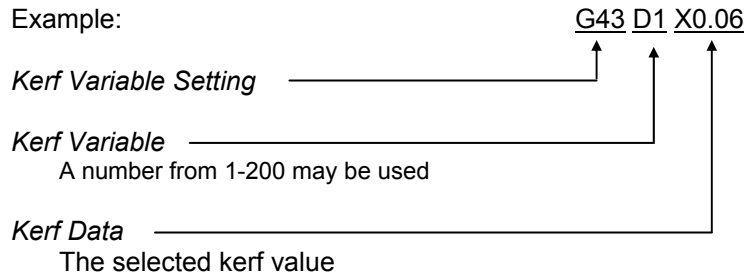
Specifies the amount of kerf (cutter compensation) that will be applied to the current part program. Care should be taken when selecting a kerf value as this parameter can cause invalid geometries to be generated. For example, adding a kerf of 0.5" to an arc with a radius of 0.25". After entering a kerf value, the kerf compensated cut path can be viewed by pressing the Kerf soft key under the Part Options menu.

### Kerf Variable / Kerf Value

The Kerf Variable / Kerf Value parameter is used to create a Kerf Variable table which assigns a reference number (variable) to a Kerf value. Up to 200 variables may be entered to create a reference table.

This Kerf Variable can then be used within a part program to define the kerf value when cutting. The advantage to this is that as torch parts wear, the kerf value changes. If the Kerf Variable value is updated as the consumable wears and changes, the new value will be called by the Kerf Variable command with all programs loaded that use the variable.

The EIA-274D part code for left kerf variable is the G43 code.



### **Trial/Cut Speed**

Specifies the speed for the current cut mode. These speeds are saved independently for trialing and cutting. Both speeds will be limited to the maximum machine speed. Cut and Trial speeds may be executed at the embedded F-code speed within a part program.

### **Marker 1 / Marker 2 Speed**

Specifies the speed for the selected Marker. These speeds are saved independently for each Marker and are executed through the marker tool selection within a part program. Marker 1 is activated by EIA RS-274D M09 and M10, or an ESSI 9 and 10. Marker 2 is activated by EIA RS-274D M013 and M14, or an ESSI 13 and 14.

### **Plate Size**

Specifies the dimensions of the current plate being cut. This dimension is used when loading a part to determine if it will fit on the plate. It is also used for viewing the part in Screen View.

### **Vent Controls 1 - 50**

Enter in values for up to fifty programmable zones for fume extraction damper control. Based on the machine position the vent control outputs to activate dampers at the selected zone for increased performance.

### **Marker Offsets 1 - 12**

Enter in values for up to twelve programmable marker offsets. The machine is offset by this amount at maximum speed when the appropriate marker code is detected.

### **Dwell Time**

Specifies the amount of dwell (delay) to be inserted into the current part program when an appropriate RS-274D program block is reached. This time can be overridden in the part program. For example in EIA programming a G04 X3 will cause a three second dwell to be inserted at the current program block. A G04 with no X-code will insert a dwell with the current Dwell Time parameter.

### **Arc Radial Error**

Specifies the arc error tolerance to be used when checking the current segment for dimensional accuracy. All ESSI or EIA programs are comprised of lines, arcs, and circles. Arc Radial Error is used to make sure that the starting and ending radial vectors are within tolerance to describe a valid geometry.



**Dwell Override**

When this parameter is enabled, embedded dwell G04 Xvalue codes in an RS-274D program will override the operator entered dwell time.

**Optional Program Stop**

Allows overriding of the optional program stop code M01 in the current part program. If enabled, an M01 code operates identically to M00. If disabled, the M01 code is ignored.

**EIA I & J Codes**

Selects Absolute or Incremental RS-274D programming mode. In Incremental mode, all offsets for X, Y, I and J relative to the current block. In absolute, mode all X, Y, I and J are relative to an absolute reference point unless changed by using a G92 program code.

**EIA F-Code Override**

When this parameter is enabled, embedded F-codes in an RS-274D program will override any operator entered Cut Speed.

**Speed +/- Affects F-Codes**

When this parameter is enabled, the control will apply the speed increase/decrease percentage to all embedded F-codes encountered in the part program

**EIA Decimal Shift**

Some programming styles are structured so that the decimal point in the EIA positioning affecting part sizing is assumed. The EIA decimal shift parameter allows the operator to select the location of the decimal point when translating parts by selecting normal or single for correct translation. The selection should be set to Normal unless your part programs have only a single digit to the right of the decimal point.

**Process Select Override**

When enabled, this feature will allow the part program to override the process select input.

**Station Select Override**

When enabled, this feature will allow the part program to override the currently selected station select input.

**Auto Torch Spacing Override**

When enabled, this feature will allow the part program to override the manually selected Torch Spacing inputs.

**G97 Loop Count Prompt**

When Enabled this feature will post a message on the screen to enter the number of loops or repeats to be selected when an EIA G97 code without a "T" value is encountered in the part program.

**ESAB Multi Torch Support**

When enabled this feature allows ESAB style ESSI part programs to map codes to specific station selects.

<u>ESSI CODE</u>	<u>Mapped EIA CODE</u>	<u>Description</u>
7	M37 T1	Select Station 1
8	M38 T1	Deselect Station 1
13	M37 T2	Select Station 2
14	M37 T2	Deselect Station 2
15	M37 T3	Select Station 3
16	M38 T3	Deselect Station 3

**Force G40 Kerf Disable**

In a part program Kerf is enabled and disabled using EIA G41/ G42 and G40 codes. Standard operation is to disable Kerf at the cut off even if the G40 Kerf Disable is not in a program. With this parameter, you can select to turn off the "forced" G40 Kerf Disable if no G40 is used in the program by setting the parameter to a "Disable" state.

**G40 Used in Simple Shapes**

Used in conjunction with the Force Kerf Disable parameter this allows the G40 code normally inserted in to a Simple Shape from the control Shape library to be omitted by setting the parameter to a "Disable" state.

**Auto Start after APA**

Used with the Automatic Plate Alignment feature, this allows the user to select to automatically begin cutting after completion of the Automatic Plate Alignment.

**EIA Code 2 Decimal Shift**

Some programming styles are structured so that the decimal point in the EIA positioning affecting part sizing is assumed. The EIA Code 2 Decimal Shift parameter allows the operator to select the location of the decimal point when translating parts by selecting normal or single for correct translation. The selection should be set to Normal unless your part programs require two decimal shift to the right of the decimal point.

**M17, M18 Used as Cut Codes**

This allows the EIA-274D M17 and M18 codes to be used for cut on and off commands when enabled.

**M76 Rotary Shortest Path**

When enabled, this allows the EIA-274D M76 Rotate go to Home command to select shortest path. When disabled it allows motion by longest path when homing. This is advantageous for some bevel head designs.

**Show Traverse Segments**

Allows traverse segment lines (displayed in yellow) to be turned OFF or ON during all part preview displays.

**Retain Skew Adjustment**

The Retain Skew Adjustment feature is used to retain the last calculated plate skew for all subsequent parts that are loaded. If disabled, any new part that is loaded will remove any previously calculated plate skew.

**THC Voltage Offset**

The THC Voltage Offset parameter is used to offset the individual Sensor THC™ Arc Voltages from the master set Arc Voltage. This allows the individual THCs to be adjusted to compensate for consumable wear and obtain optimum cut quality.

## Process

Your shape cutting control comes standard with several styles of built-in cut process logic which allows the cut process timing to be configured for optimum performance. Selection will vary due to control configuration.

Example:

The screenshot displays a software interface for configuring plasma cut parameters. It is organized into two main columns of settings. The left column contains time-based parameters in seconds (sec) and current/percentage values. The right column contains boolean (On/Off) settings for feedback and torch behavior. At the bottom, there are buttons for saving and loading data, and a row of softkeys for different cut types.

Parameter	Value	Unit
Purge Time	0	sec
Pierce Time	0	sec
Creep Time	0	sec
Cut Off Time	0	sec
Full Torch Up Time	0	sec
Partial Torch Up Time	0	sec
Torch Down Time	0	sec
Arc Off Time	0	sec
Stop Time	0	sec
Retract Delay	0	sec
Set Arc Current	200	amps
Corner Current Percent	100	%
Retry on Transfer Fail	0	times
Transfer Time	0	sec

Setting	Value
Arc On Feedback	Off
Ignition	Off
Dual Grid / THC	Off
Dual Grid / THC Start	Low
Partial Raise	Off
Torch Down During Cut	Off
Torch Down Between Cuts	Off

Buttons: Save Data, Load Data, Oxy Fuel, Plasma 1, Plasma 2, Marker 1, Marker 2, Laser, Water Jet, Timing Diagram. Status: 4:28:52 PM, Cancel, OK.

In the Plasma Cut Type example provided above, various process timing adjustments may be made to tune the process to the Plasma System and material being cut for the desired performance. Pressing the Timing Diagram softkey or the space key on a keyboard allows the user to view a graphical diagram of the process logic






Additionally, each cut type has the ability to save and load the process setups in a file on the hard drive or to a floppy Diskette or USB memory stick. Pressing the ALT key allows the Save Data and Load Data functions to be available.

## Oxy Fuel



The control comes with the following built-in control logic for Oxy Fuel cutting. When Oxy Fuel is selected, the following parameters are available to customize the logic for the particular metal being cut. As these parameters are changed, the timing diagram below will change to show the new timing parameters. This screen is located under the Cut Types soft key in the Setups.

Note: Pressing the Start key twice will bypass all timers and begin the cut.

Ignition Time	<input type="text" value="0"/>	sec	Ignitors	<input checked="" type="radio"/> No	<input type="radio"/> Yes	 Help
Low Preheat Time	<input type="text" value="0"/>	sec	Preheat During Cut	<input type="radio"/> Off	<input checked="" type="radio"/> On	
High Preheat Time	<input type="text" value="0"/>	sec	Staged Pierce	<input checked="" type="radio"/> Off	<input type="radio"/> On	
Pierce Time	<input type="text" value="0"/>	sec				
Moving Pierce Time	<input type="text" value="0"/>	sec				
Creep Time	<input type="text" value="0"/>	sec				
Primary Torch Up Time	<input type="text" value="0"/>	sec				
Primary Torch Down Time	<input type="text" value="0"/>	sec				
Pierce Torch Up Time	<input type="text" value="0"/>	sec				
Pierce Torch Down Time	<input type="text" value="0"/>	sec				
Cut Off Time	<input type="text" value="0"/>	sec				
Bleedoff Time	<input type="text" value="0"/>	sec				

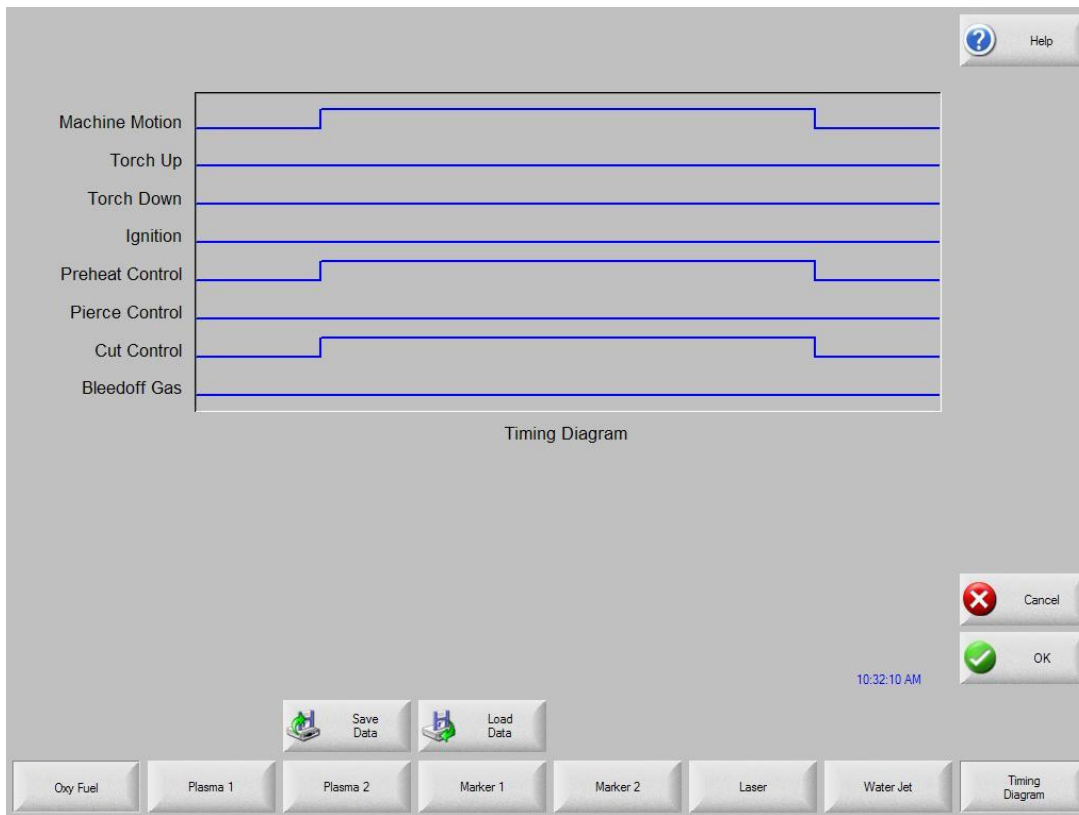
 Cancel  
 OK

10:31:36 AM

 Save Data  
 Load Data

Oxy Fuel Plasma 1 Plasma 2 Marker 1 Marker 2 Laser Water Jet Timing Diagram

Press the Timing Diagram soft key to view the timing diagram from setups.



### Ignition Time

Specifies the length of time that the oxy fuel igniter is held on at each ignition of the flame.

### Low Preheat

For those cutting systems that are equipped with a Low Preheat feature, this parameter allows the operator to input a timing delay to activate the Low Preheat output prior to the High Preheat.

### High Preheat

Specifies the length of time to wait at each pierce position for preheating the piece prior to piercing. During the run-time, the operator may use the SET, EXTEND, or RELEASE soft keys to customize the preheat length for the particular metal being cut.

### Pierce Time

Specifies the amount of delay after the cutting gas is turned on before lowering the torch to the cut position.

### Moving Pierce Time

The Moving Pierce Time parameter specifies the amount of time that the Pierce Output remains on while piercing with motion.

### Creep Time

Specifies the amount of time after piercing the part that the torch travels at Creep Speed. Creep Speed is determined by a setup parameter at the Speeds setup screen and is a percentage of the programmed cut speed. After the Creep Time is completed, the control accelerates to full cut speed. This parameter is helpful in allowing the operator to bring the cutting surface up to temperature and completely pierce the metal before cutting at full speed.

**Primary Torch Up Time**

Specifies the amount of time used for torch lift after completing each cut. This is normally used to provide torch head clearance and return the torch to its predefined rest position.

**Primary Torch Down Time**

Specifies the amount of time used to lower the torch at the beginning of each new cut. This is usually longer than the Pierce Torch Down Time as it involves lowering the torch from its predefined rest position.

**Pierce Torch Up Time**

Specifies the amount of time used for torch lift during piercing. This parameter is used to provide distance between the torch tip and metal surface for cutting.

**Pierce Torch Down Time**

Specifies the amount of time used for torch lowering during piercing.

**Cut Off Time**

The Cut Off delay parameter species the amount of time the cut on output will remain on at the end of a cut.

**Bleedoff Time**

Specifies the amount of time that the cut torch will pause to purge the oxygen at the end of a cut segment before traversing to the next cut segment.

**Igniters**

When "No" is selected, this feature will turn the Preheat on between cut segments. This is to keep the torch lit for those cutting systems that do not have automatic torch igniters. For those cutting systems which have automatic torch igniters or that control the torch gases outside of the control, set this parameter to "Yes". This tells the control not to turn on the Preheat between cut segments.

**Preheat During Cut**


Specifies whether the Preheat will be left on while cutting.


**Staged Pierce**


This unique feature works with selected outputs to perform the pierce in a staged progression of gas pressures.

## Plasma


The control comes with the following built in control logic for Plasma cutting. When Plasma is selected, the following parameters are available to customize the logic for the particular metal being cut. As these parameters are changed, the timing diagram below will change to show the new timing parameters.


Purge Time	<input type="text" value="0"/>	sec	Arc On Feedback	<input type="radio"/> Off	<input checked="" type="radio"/> On	 Help
Pierce Time	<input type="text" value="0"/>	sec	Ignition	<input type="radio"/> Off	<input checked="" type="radio"/> On	
Creep Time	<input type="text" value="0"/>	sec	Dual Grid / THC	<input type="radio"/> Off	<input checked="" type="radio"/> On	
Cut Off Time	<input type="text" value="0"/>	sec	Dual Grid / THC Start	<input checked="" type="radio"/> Low	<input type="radio"/> High	
Full Torch Up Time	<input type="text" value="0"/>	sec	Partial Raise	<input type="radio"/> Off	<input checked="" type="radio"/> On	
Partial Torch Up Time	<input type="text" value="0"/>	sec	Torch Down During Cut	<input checked="" type="radio"/> Off	<input type="radio"/> On	
Torch Down Time	<input type="text" value="0"/>	sec	Torch Down Between Cuts	<input type="radio"/> Off	<input checked="" type="radio"/> On	
Arc Off Time	<input type="text" value="0"/>	sec				
Stop Time	<input type="text" value="0"/>	sec				
Retract Delay	<input type="text" value="0"/>	sec				
Set Arc Current	<input type="text" value="200"/>	amps				
Corner Current Percent	<input type="text" value="100"/>	%				
Retry on Transfer Fail	<input type="text" value="0"/>	times				
Transfer Time	<input type="text" value="0"/>	sec				

 Cancel

 OK

11:02:56 AM

 Save Data

 Load Data

Oxy Fuel

Plasma 1

Plasma 2

Marker 1

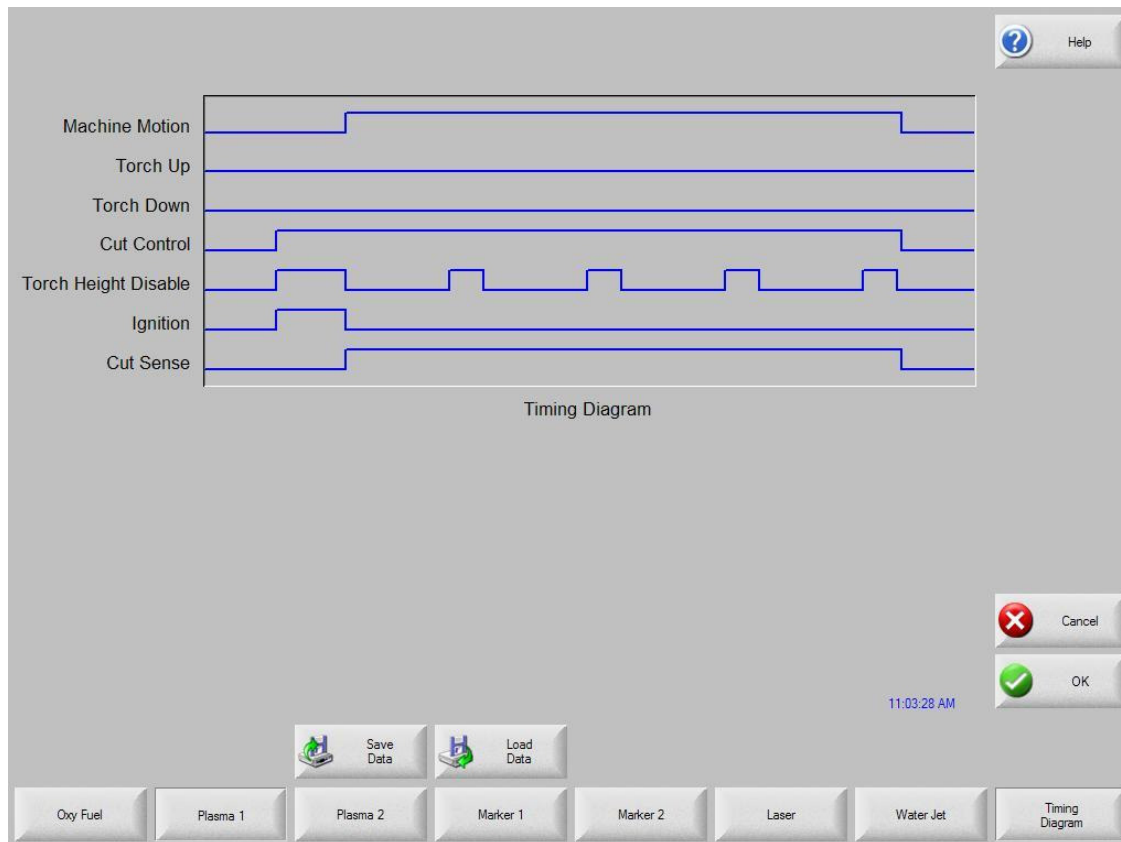
Marker 2

Laser

Water Jet

Timing Diagram

Press the Timing Diagram soft key to view the timing diagram from setups.



### Purge Time

Specifies the time delay from torch ignition until motion is enabled if Arc On Feedback is OFF. Purge Time should be set to zero if Arc On Feedback is ON.

### Pierce Time

Specifies the time delay from when the torch completes lowering until motion is initiated at Creep Speed. Used to allow the plasma torch to completely pierce the material before moving.

### Creep Time

Specifies the amount of time after piercing the part that the torch travels at Creep Speed. Creep Speed is determined by a setup parameter at the Speeds setup screen and is a percentage of the programmed cut speed. After the Creep Time is completed, the control accelerates to full cut speed.

### Cut Off Time

The Cut Off delay parameter species the amount of time the cut on output will remain on at the end of a cut. A negative Cut Off time up to one second may be used to terminate the cut output prior to the end of the cut segment. This is used to compensate for response delays of the cut gases that will maintain the cut arc and widen the cut path at the end of the cut segment.

### Full Torch Up Time

Specifies the length of time to raise the torch at the beginning and end of each cut to provide clearance over the cut pieces. If you are using an automatic height control system, set Torch Up Time to zero.



**Partial Torch Up Time**

Specifies the length of time for a partial raise of the torch at the beginning and end of each cut to provide clearance over the cut pieces. If you are using an automatic height control system, set Torch Up Time to zero. Note: The Partial Raise parameter must be enabled.

**Torch Down Time**

Specifies the length of time to lower the torch at the beginning of each cutting cycle. If you are using an automatic height control system, set Torch Down Time to zero.

**Arc Off Time**

Specifies the amount of delay to allow prior to indicating a lost cut signal. This can be useful in helping to minimize nuisance trips when traveling over previously cut paths in complex nested parts.

**Stop Time**

Specifies the amount of time that X/Y motion will pause at the end of a cut. This pause is advantageous for allowing the torch to completely raise and clear any cut irregularities before continuing to the next cut segment.

**Retract Delay**

Retract Delay specifies the amount of time X/Y and lifter motion will pause at the end of a cut. This allows the cut process to finish before lifting the torch and moving to the next pierce.

**Set Arc Current**

The Set Arc Current feature allows the user to set the arc current at the plasma supply. This feature uses the "Set Current BCD" output from the control to activate the BCD inputs at the plasma supply. The Set Arc Current parameter is also available for the HD4070® via the serial link. EIA RS-274D part program code G59 Vvalue Fvalue for setting current is supported.

**Corner Current Percent**

The Corner Current Percent feature allows the operator to select a reduced current setting to be executed when cutting corners to improve cut quality. This value is a percentage of the Set Current (above) and is active when the Torch Height Disable Output is on. The Corner Current parameter is also available for the HD4070® via the serial link.

**Retry Transfer Fail**

The Retry On Transfer Fail feature is used to specify the number of times the control will attempt to fire the torch in the event that the torch fails to ignite.

**Transfer Time**

The Transfer Time parameter specifies the amount of time used to attempt ignition of the torch. The ignition is confirmed by the Arc Sense Input (Arc on Feedback) to the control.

**Arc on Feedback**

Specifies whether an arc-on (also called Plasma Go, Current Sense, Arc Transferred) signal from the plasma system to the control is used. With Arc On Feedback ON, the control waits for Cut Sense input to activate before initiating machine motion.

**Ignition**

Enables use of the Ignition output for use in igniting the plasma torch. If your plasma system requires a separate ignition signal, toggle Ignition to ON. If not, leave Ignition OFF.

**Dual Grid/THC**

The Dual Grid parameter enables use of the Torch Height Disable output. This output is used to disable an automatic torch height sensor or reduce the plasma current in a switchable current plasma system when machine speed is less than Plasma Hi/Lo Speed.

**Dual Grid/THC Start**

If Dual Grid is ON, the start mode can be configured to start (HI) or (LOW) at ignition time. For switchable plasma systems, this usually means that in low mode the plasma system will only deliver 50% of the maximum output power.

**Partial Raise**

Enabling the Partial Raise feature will execute a tool raise at the end of the cut segment within a nest for the time specified in the Partial Up Time parameter. Full raise will be executed at the end of the final cut segment.

**Torch Down During Cut**

Turning on the Torch Down During Cut feature forces the torch down output to remain on throughout the cut process. This is advantageous for pneumatic style torch lifters that require a constant output.

**Torch Down Between Cuts**

Turning on the Torch Down Between Cuts feature forces the Torch Down Output to remain on while traversing between cut segments.

## HD3070® Auto Gas Interface

This section outlines information specific to Hypertherm's HD3070® Auto Gas Interface. The Auto Gas screen is available from the Cut Types screen.

**Note:** The Auto Gas feature must first be enabled at the Special Password screen and is designed for use with the **six** valve autogas console only

The screenshot shows the 'Plasma Gas Data' window. It contains six spinners for gas valve percentages, all set to 0%, and a dropdown menu for 'Remote Plasma Gas' set to 'Oxygen'. At the bottom, there are five soft keys: 'Save Data', 'Load Data', 'Test Cutting Gases', 'Test Preflow Gases', and a group of three buttons: 'Cancel', 'Help', and 'OK'.

Parameter	Value (%)
Preflow Shield Gas-Valve	0
Preflow Shield Gas-Valve	0
Cut Shield Gas-Valve 3	0
Cut Shield Gas-Valve 4	0
Cut Plasma Gas-Valve 5	0
Cut Plasma Gas-Valve 6	0
Remote Plasma Gas	Oxygen

The top of the Auto Gas screen lists the valve parameter settings for the HD3070®. Valve settings for the 3070® Auto Gas console are documented in the HD3070® manual. When the values are set, these become the current setting and the operator can choose to save the file to the diskette, USB memory stick or hard drive.

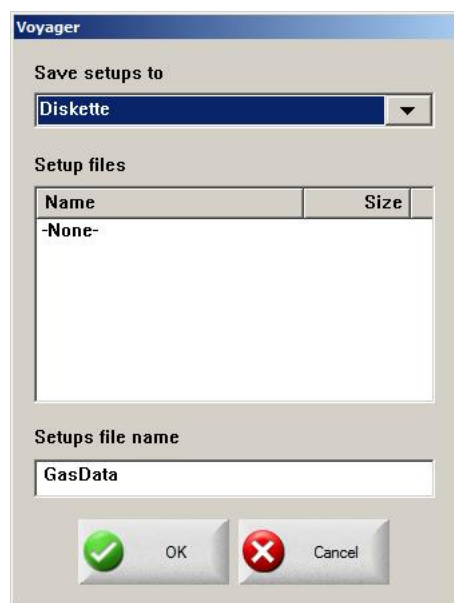
The settings at the supply are updated at control power up, whenever the settings are changed at this screen or through commands in a part program. Supply settings are also updated if power is lost and re-enabled at the power supply. There may be a brief delay as these power supply settings are communicated from the control to the power supply.

### Save Data

Pressing the Save Data soft key will allow the operator to save the current Auto Gas setting to diskette, USB memory stick or hard drive for future use.

### Load Data

Pressing the Load Data soft key will allow the operator to Load stored Auto Gas settings from diskette, USB memory stick or hard drive for use.



If you save the data, a file is created with G59 codes with the selected valve settings. Here is an example of the data file where all percentages are set to zero.

**G59 V65 B0**  
**G59 V66 B0**  
**G59 V67 B0**  
**G59 V68 B0**  
**G59 V69 B0**  
**G59 V70 B0**  
**G59 V71 B0**

### **Test Cutting Gases**

Pressing the Test Cutting Gases soft key allows the operator to test the HD3070<sup>®</sup> Cut Gases.

### **Test Preflow Gases**

Pressing the Test Preflow Gases soft key allows the operator to test the HD3070<sup>®</sup> Preflow Gases.

**HD3070® Auto Gas I/O**

The Interface to the HD3070® Auto Gas console is made through of Single Ended and BCD (Binary Coded Decimal) inputs. The BCD style of interface allows for exact settings by use of multiple inputs being active at any time. The active BCD inputs values are summed together to obtain the exact set point.

These I/O points are wired in the same fashion as our other Single Ended I/O points. The following I/O points are supplied for use of the HD3070® Auto Gas Console

**Inputs**

Gas Control Read Complete  
Gas Control Error

**Outputs**

Gas Control Write  
Remote Test Operate  
Remote Test Preflow  
Remote Air Plasma  
Remote H35/ N2 Plasma  
Remote O2 Plasma  
Gas Flow Set 1-100 (BCD)  
Valve Select 1-8 (BCD)

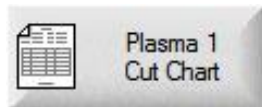
## HD4070<sup>®</sup> and HPR<sup>™</sup> Overview

The Mariner<sup>™</sup> and Voyager III<sup>™</sup> controls offer the additional option of interfacing directly to Hypertherm's HD4070<sup>®</sup> HyDefinition<sup>®</sup>, HPR130<sup>™</sup> and HPR260<sup>™</sup> Plasma Supplies for setup. This feature has the ability to improve power supply setup and operational accuracy while having the flexibility to fine tune the process specific to the operator's needs.

When using this advanced feature, all necessary power supply settings are transmitted from the control directly to the Plasma Supply configuring it for use via serial communications. The Plasma Supply setup is performed through the use of a Cut Chart (cut process parameter database) which is based on eight process variables. The combination of these eight process variables are tied to the settings for the cut process parameters (e.g. arc voltage, pierce delay, etc.) that are transmitted to the supply. For additional convenience, consumable part numbers for the Plasma supply are displayed at the Change Consumable screen.

This database allows the user to select factory recommended settings or amend the database for personalized settings. The Cut Chart information may be saved or loaded via the hard drive or floppy drive. The Cut Chart files containing the factory recommended settings are available from Hypertherm<sup>®</sup>.

Access to the Cut Chart data is available from the Plasma Cut Types or Marker Cut Types screen using the shift key, as indicated below. The Plasma Supply parameters must first be enabled in the password protected Station Configuration setups to allow the Cut Chart Information for the Plasma Supply to be available for use.



Note: Screen information will vary depending on THC selection.

## Cut Chart

**Plasma 1 Cut Chart - Rev 7**

HPR - Process Selection

Material Type:

Process Current:

Plasma / Shield:

Material Thickness:

	Plasma		Shield		
	Auto	Manual	Auto	Manual	
Preflow Setting	<input type="text" value="22"/>	<input type="text" value="25"/>	<input type="text" value="58"/>	<input type="text" value="75"/>	%
Cutflow Setting	<input type="text" value="76"/>	<input type="text" value="70"/>	<input type="text" value="54"/>	<input type="text" value="70"/>	%

Gas 1      Gas 2

Mixed Gas:   %

Cut Speed:  ipm

Kerf:  in

Set Arc Current:  amps

Set Arc Voltage:  volts

Cut Height:  in

Pierce Height:  %  in

Pierce Time:  sec

Creep Time:  sec

10:04:21 AM

Save Process    Reset Process    Save Cut Charts    Load Cut Charts    Change Consumables

Cancel    OK

The Cut Chart Database (cut process parameters) transmitted to the power supply is based on the following eight process variables.

### Material Type

The Material Type, such as Mild Steel, Stainless Steel or Aluminum, may be selected.

### Current Settings

The appropriate current setting for the material thickness and material type may be selected.

### Plasma / Shield Gases

The appropriate Plasma / Shield gases for the desired process may be selected.

### Material Thickness

The desired material thickness may be selected.

The following are the Cut Process parameters within the database which are used to configure the process. Appropriate parameter information is transmitted to the power supply.

**Cut Speed**

Specifies the speed for the selected process variables.

**Kerf**

Specifies the amount of kerf (cutter compensation) that will be applied to the current part program.

**Set Arc Voltage**

The operator may input the desired Arc Voltage for the material being cut.

**Cut Height**

The Cut Height setup parameter is used to select the desired cut distance from the plate.

**Pierce Height**

The Pierce Height setup parameter is used to select the desired Pierce Height. This may be entered as a multiplication factor that is calculated times the Cut Height or an actual Pierce Height distance.

**Preflow Setting**

The appropriate Plasma / Shield Preflow percentages for the desired process may be selected.

**Cutflow Settings**

The appropriate Plasma / Shield Cutflow percentages for the desired process may be selected.

**Preflow Time**

Specifies the amount of time the Preflow gases are on.

**Purge Time**

Specifies the time delay from torch ignition until motion is enabled.

**Pierce Time**

Specifies the time delay from when torch completes lowering until motion is initiated at Creep Speed. Used to allow the plasma torch to completely pierce the material before moving.

**Creep Time**

Specifies the amount of time after piercing the part that the torch travels at Creep Speed. Creep Speed is determined by a setup parameter at the Speeds setup screen and is a percentage of the programmed cut speed. After the Creep Time is completed, the control accelerates to full cut speed.



**Save Process**

Pressing the Save Process soft key allows the user to save the current process settings to the Hard drive creating a custom user database based on the eight process variables selected.

**Reset Process**

Pressing the Reset Process soft key allows the user to reset the current settings to factory recommend factory defaults based on the eight process variables selected.

**Save Cut Charts**

Pressing the Save Cut Charts soft key allows the user to save the current User and Factory databases to Diskette or USB memory stick. User files are designated with a .usr file extension and the factory files are designated with a .fac file extension

Examples of user and factory file names.

Mild Steel-HT4400-HD4070.usr  
Mild Steel-HT4400-HD4070.fac

**Load Cut Charts**

Pressing the load Cut Charts soft key allows the user to load the factory default database files which are supplied by Hypertherm in a Text file (.txt), user files (.usr) or factory files (.fac) from Diskette or USB memory stick.

Factory text file names.

Mild Steel Cut Chart Data	mschart.txt
Aluminum Cut Chart Data	alchart.txt
Stainless Steel Cut Chart Data	sschart.txt

It is recommended that the Database be updated through the control rather than the Power Supply if the serial communications link is enabled.

**Test Preflow**

Pressing the Test Preflow soft key performs the Test Preflow Gases feature at the Plasma supply.

**Test Outflow**

Pressing the Test Outflow soft key performs the Test Outflow Gases feature at the Plasma supply.

**Notes:**

- Please refer to the power supply operators manual for complete information on the operation and setup of the Plasma supply.
- A serial communications port for the Plasma supply must first be selected at the Port configuration screen to be enable the feature for use.
- The Plasma supply parameters must first be enabled in the password protected Station Configuration screen to allow the Cut Chart Information for the Plasma supply to be available for use.
- Power Supplies equipped with the Integrated Command® THC may be used with the control setups. The Command® THC must first be enabled for use in the password protected Station Configuration Screen.

## Change Consumable

Oxy Fuel - Max Torch Tip Life

Oxy Fuel Torch 1

2 minutes

10 pierces

14.318 inches

0 minutes / pierce

Last Torch Tip Installed

9 Nov 2005 11:40 AM

Plasma - Max Nozzle Life

Plasma Torch 1

14.787 minutes

260 pierces

0 arc errors (actual)

809.21 inches

0 minutes / pierce

Last Nozzle Installed

9 Nov 2005 11:40 AM

Plasma - Max Electrode Life

Plasma Torch 1

25.273 minutes

404 pierces

0 arc errors (actual)

1321.60 inches

0 minutes / pierce

0 volts / minute

Last Electrode Installed

26 Aug 2005 11:18 AM

Process Plasma 1

Supply HPR

Material Mild Steel

Current 260A

220440 220439 220436 220435

Cancel OK

New Torch Tip or Nozzle New Electrode Manual Options Reset Database Upload Database Save Database

When the power supply link feature has been enabled, consumable data information may be viewed at the Change Consumable screen.

## FineLine Overview

The “Type V” control offers the additional option of interfacing directly to InnerLogic’s FineLine Power Supply for setup via a user selected RS-422 serial port. This advanced feature transmits all necessary power supply settings from the control directly to the FineLine power supply configuring it for use.

The power supply setup is performed through the use of a Cut Chart (cut process parameter database) which is based on eight process variables. The combination of these eight process variables are tied to the settings for the cut process parameters (e.g. arc voltage, pierce delay, etc.) that are transmitted to the supply. For additional convenience, consumable part numbers for the FineLine are displayed at the Change Consumable screen.

This database allows the user to select factory recommended settings or amend the database for personalized settings. The Cut Chart information may be saved or loaded via the hard drive or floppy drive. Specialized Cut Chart files containing the factory recommended settings are available from the control vendor.

The Power Supply parameter must first be enabled in the password protected Station Configuration setups to allow the Cut Chart Information for the feature to be enabled for use. Once selected at the Station Configurations screen, the port must then be selected for communications on the Ports setup screen and the selected port must then be configured as RS-422. For more information on configuration of the port, refer to the Ports information section of this guide.

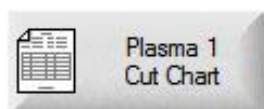
### Station Configuration (example)

The screenshot displays the 'Station Configuration' dialog box, which is used to configure settings for four stations. The dialog is organized into four panels, one for each station (Station 1, Station 2, Station 3, and Station 4). Each panel contains a list of components and their corresponding settings, all of which are currently set to 'None' except for Station 1's Lifter, which is set to 'Other'.

Station	Lifter	Plasma 1	Plasma 2	Marker 1	Marker 2	Laser	Head
Station 1	Other	FineLine100	None	None	None	None	None
Station 2	None	None	None	None	None	None	None
Station 3	None	None	None	None	None	None	None
Station 4	None	None	None	None	None	None	None

At the bottom of the dialog, there are buttons for 'Stations 1 thru 4', 'Stations 5 thru 8', and 'Reset'. On the right side, there are buttons for 'Help' (with a question mark icon), 'Cancel' (with a red X icon), and 'OK' (with a green checkmark icon).

Access to the FineLine Cut Chart data is available from the Plasma Cut Types or Marker Cut Types screen using the shift key, as indicated below.



Note: Screen information will vary depending on THC selection.

### Cut Chart

Plasma 1 Cut Chart - Rev A

Help

FineLine100 - Process Selection

Material Type: Mild Steel

Process Current: 100A

Plasma / Shield: O2 / Air

Material Thickness: 1/4"

Plasma

Preflow Setting: 20 psi

Cutflow Setting: 80 psi

Shield: 35 psi

Cut Speed: 125 ipm

Kerf: 0 in

Set Arc Current: 100 amps

Set Arc Voltage: 125 volts

Cut Height: 0.09 in

Pierce Height: 138.8 % 0.125 in

Pierce Time: 0.1 sec

Creep Time: 0 sec

Cancel

OK

10:07:43 AM

Save Process

Reset Process

Save Cut Charts

Load Cut Charts

Change Consumables

The Cut Chart Database (cut process parameters) transmitted to the power supply is based on the following eight process variables.

#### Material Type

The Material Type, such as Mild Steel, Stainless Steel or Aluminum, may be selected.

#### Current Settings

The appropriate current setting for the material thickness and material type may be selected.

#### Plasma / Shield Gases

The appropriate Plasma / Shield gases for the desired process may be selected.

#### Material Thickness

The desired material thickness may be selected.

The following are the Cut Process parameters within the database which are used to configure the power supply. Appropriate parameter information is transmitted to the power supply.

- 1) Material Type – Mild Steel, Stainless Steel, Aluminum, or Mild Steel (Cold Rolled).
- 2) Thickness
- 3) Set Current
- 4) Pierce Delay
- 5) Set Preflow Pressure
- 6) Set Plasma Gas type
- 7) Set Plasma Pressure
- 8) Set Shield Gas Type
- 9) Set Shield Pressure
- 10) Set Process (Cut/Mark)

The following items are stored in the Cut Chart Data file and will be automatically updated on the control.

**Cut Speed**

Specifies the speed for the selected process variables.

**Kerf**

Specifies the amount of kerf (cutter compensation) that will be applied to the current part program.

**Preflow Time**

Specifies the amount of time the Preflow gases are on.

**Purge Time**

Specifies the time delay from torch ignition until motion is enabled.

**Pierce Time**

Specifies the time delay from when torch completes lowering until motion is initiated at Creep Speed. Used to allow the plasma torch to completely pierce the material before moving.

**Creep Time**

Specifies the amount of time after piercing the part that the torch travels at Creep Speed. Creep Speed is determined by a setup parameter at the Speeds setup screen and is a percentage of the programmed cut speed. After the Creep Time is completed, the control accelerates to full cut speed.

## Database Features

### Save Process

Pressing the Save Process soft key allows the user to save the current process settings to the Hard drive creating a custom user database based on the eight process variables selected.

### Reset Process

Pressing the Reset Process soft key allows the user to reset the current settings to factory recommend factory defaults based on the eight process variables selected.

### Save Cut Charts

Pressing the Save Cut Charts soft key allows the user to save the current User and Factory databases to Diskette or USB memory stick. User files are designated with a .usr file extension and the factory files are designated with a .fac file extension

Examples of user and factory file names.

Mild Steel-Fineline200-Fineline200.usr  
Mild Steel- Fineline200-Fineline200.fac

### Load Cut Charts

Pressing the load Cut Charts soft key allows the user to the factory default database files which are supplied by Hypertherm as a user files (.usr) or factory files (.fac) from Diskette or USB memory stick.

It is recommended that the Database be updated through the control rather than the Power Supply if the serial communications link is enabled.

### Test Preflow

Pressing the Test Preflow soft key performs the Test Preflow Gases feature at the HD4070® Power supply.

### Test Outflow

Pressing the Test Outflow soft key performs the Test Outflow Gases feature at the HD4070® Power supply.

### Notes:

- Please refer to the power supply operators manual for complete information on the operation and setup of the FineLine Power Supply.
- The FineLine Power Supply parameters must first be enabled in the password protected Station Configuration Screen to allow the Cut Chart Information for the FineLine to be available for use.
- Serial communications for the FineLine Power supply are established on the user select communication port. The port must be configured for RS-422 operation.

**Change Consumable**

**Oxy Fuel - Max Torch Tip Life**

Oxy Fuel Torch 1

2 minutes

10 pierces

14.318 inches

0 minutes / pierce

Last Torch Tip Installed

9 Nov 2005 11:40 AM

**Plasma - Max Nozzle Life**

Plasma Torch 1

14.787 minutes

260 pierces

0 arc errors (actual)

809.21 inches

0 minutes / pierce

Last Nozzle Installed

9 Nov 2005 11:40 AM

**Plasma - Max Electrode Life**

Plasma Torch 1

25.273 minutes

404 pierces

0 arc errors (actual)

1321.60 inches

0 minutes / pierce

0 volts / minute

Last Electrode Installed

26 Aug 2005 11:18 AM

Process Plasma 1

Supply HPR

Material Mild Steel

Current 100A

501215 501211 500341 500230 500141

New Torch Tip or Nozzle New Electrode Manual Options Reset Database Upload Database Save Database

Cancel OK

When the FineLine feature has been enabled, consumable data information may be viewed at the Change Consumable screen.


## Marker



The control comes with the following built in marker control logic for marking. When marking is selected, the following parameters are available to customize the logic for the particular metal being marked. As these parameters are changed, the timing diagram below will change to show the new timing parameters. This screen is located under the Cut Types soft key in Setups.



### Marker Interface

The Marking feature from the control is operated through the use of existing I/O points for cutting torches on the control I/O connector. These I/O points may be switched from the cutting torch to the marking tool by use of an external relay(s) activated by the Marker Output or the Marker Output may be used to activate the marking tool.

Please refer to the Machine Interface section of this guide for exact I/O pinout information.

Ignition Time	<input type="text" value="0"/> sec	Ignition <input type="radio"/> Off <input checked="" type="radio"/> On	 Help
Marker On Time	<input type="text" value="0"/> sec	Cut Control Used for Marking <input type="radio"/> Off <input checked="" type="radio"/> On	
Arc Off Time	<input type="text" value="0"/> sec	Marker Down/Up With Each Marker On/Off <input type="radio"/> Off <input checked="" type="radio"/> On	
Marker Off Time	<input type="text" value="0"/> sec	Arc On Feedback <input type="radio"/> Off <input checked="" type="radio"/> On	
Marker Up Time	<input type="text" value="0"/> sec	Partial Raise <input type="radio"/> Off <input checked="" type="radio"/> On	
Marker Partial Up Time	<input type="text" value="0"/> sec	Down On During Mark <input type="radio"/> Off <input checked="" type="radio"/> On	
Marker Down Time	<input type="text" value="0"/> sec	Down On Between Marks <input type="radio"/> Off <input checked="" type="radio"/> On	
Set Arc Current	<input type="text" value="80"/> amps		
Corner Current Percent	<input type="text" value="100"/> %		

 Cancel  
 OK

 Save Data     Load Data

Oxy Fuel

Plasma 1

Plasma 2

Marker 1

Marker 2

Laser

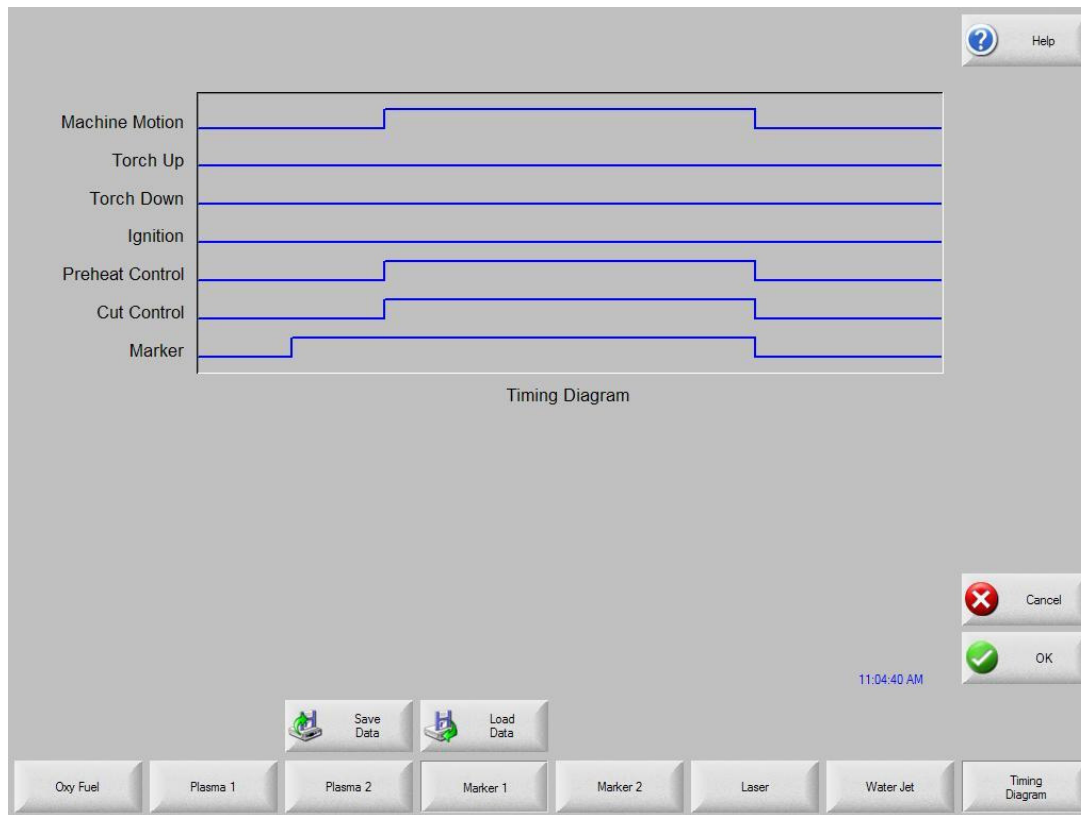
Water Jet

Timing Diagram

11:04:09 AM



Press the Timing Diagram soft key to view the timing diagram from setups.



### Ignition Time

(Ignition Output) Specifies the length of time that the ignition output is held on at each ignition point.

### Marker On Time

(Time Delay) This parameter allows the operator to insert a time delay, which allows the marker to prepare for operation prior to the start of Marker motion.

### Marker Off Time

(Time Delay) This parameter allows the operator to insert a time delay, which allows the marker to prepare for operation prior to the end of Marker motion.

### Marker Up Time

(Torch Up Output) Specifies the length of time to raise the marker at the beginning and end of each mark.

### Marker Partial Up Time

(Torch Up Output) Specifies the length of time for partial raise of the marker at the beginning and end of each mark. Note: The Partial Raise parameter must be enabled.

### Marker Down Time

(Torch Down Output) Specifies the length of time to lower the marker at the beginning of each marking cycle.

**Set Arc Current**

The Set Arc Current feature allows the user to set the arc current at the Plasma Marking supply. This feature uses the "Set Current BCD" output from the control to activate the BCD inputs at the Plasma Marking supply. EIA RS-274D part program code G59 *Vvalue Fvalue* for setting current is supported.

**Corner Current Percent**

The Corner Current Percent feature allows the operator to select a reduced current setting to be executed when cutting corners to improve marking quality. This value is a percentage of the Set Current (above) and is active when the Torch Height Disable Output is on.

**Ignition**

(Ignition Output Enable) The Ignition Off/On selection allows the operator to use the Ignition Output when marking if set to On.

**Cut Control Used for Marking**

This parameter is used to determine if the Cut Control output is to be used for activating the Marking tool. If set to no, the Marking Output would be used.

**Marker Down/Up With Each Marker On/Off**

The Marker Down/Up With Each Marker On/Off will command the send the appropriate Up/Down Output commands at each Mark On/ Off.

**Arc On Feedback**

Specifies whether an arc-on signal from a plasma marking system to the control is used. With Arc On Feedback ON, the control waits for Cut/Mark Sense input to activate before initiating machine motion.

**Partial Raise**

Enabling the Partial Raise feature will execute a tool raise at the end of the Mark within a nest for the time specified in the Partial Up Time parameter. Full raise will be executed at the end of the final Mark segment.

**Down On During Mark**

Turning on the Down On During Mark feature forces the torch down output to remain on throughout the Marking process. This is advantageous for pneumatic style torch lifters that require a constant output.

**Down On Between Marks**

Turning on the Down On Between Marks feature forces the Torch Down Output to remain on while traversing between marking segments.

**Note:** Please refer to the Program Codes section of this guide for information on the Marker Font Generator feature.

## Laser Overview

The Mariner™ Controls offers a unique Laser process screen directly integrates to Hypertherm's FAST Laser™ head. This feature has the ability to improve Laser setup and operational accuracy while having the flexibility to fine tune the process specific to the operator's needs.

FAST Laser™ (Flow Accelerated Screen Technology), utilizes an innovative patent-pending design to create a dual flow zone allowing significantly higher oxygen assist gas pressures in the tightly defined cut zone established by the beam geometry, without the uncontrolled burning in the surrounding zone normally induced by increased assist gas pressures. This accelerated high-velocity oxygen flow along the beam path not only increases cut speed by fueling the exothermic reaction, but also reduces *sensitivity* to common plate fabricating conditions and variables, most notably plate chemistry and condition.

With this technology, Hypertherm has introduced a line of laser cutting heads that utilize the FAST Laser™ process to deliver up to a 20% increase in cut speed over standard CO<sub>2</sub> laser heads on plate steel while also significantly expanding the capacity and quality range of plate laser cutting systems. These combined benefits produce substantial gains in productivity and unattended operation potential for dedicated plate lasers (4 to 6 kW) – whether integrated or retrofitted – while also offering expanded capacity range and cost performance for shared-duty systems (2 to 3 kW). The Hypertherm LH2100 head offers two different focal lengths: 7.5 and 10.0 inches; the LH2125 adds a 12.5-inch focal length option for thicker plate. The Hypertherm LH2125/2100 series is used on laser systems with 1.5" or 2.0" optics. The Hypertherm LH1575 head offers two different focal lengths: 5.0 and 7.5 inches for 1.5 inch optics.

Integrated with Hypertherm Automation's Mariner™ CNC controller, on-board FAST Laser™ process intelligence coupled to process monitoring optics standard on LH-series cutting heads, achieves improved overall control of the cutting process with fewer system faults and reduced operator involvement. Dynamic Pierce Control senses and initiates each cut once the pierce is complete. These combined capabilities maximize uptime while minimizing total cycle time.

**Note: Refer to Laser Information provided with the FAST Laser™ head for proper operation.**

## LASER

### Laser Cut Types Screen

Purge Time	<input type="text" value="1"/>	sec	Height Control	<input type="radio"/> Manual	<input checked="" type="radio"/> Automatic
New Gas Purge Time	<input type="text" value="0"/>	sec	IHS in Manual	<input type="radio"/> Off	<input checked="" type="radio"/> On
Shutter Time	<input type="text" value="0"/>	sec	Retract	<input checked="" type="radio"/> Full	<input type="radio"/> Partial
Power Ramp Time	<input type="text" value="0"/>	sec	Partial Retract Distance	<input type="text" value="1"/>	in
Pierce Time	<input type="text" value="9.999"/>	sec	Start IHS Distance	<input type="text" value="6"/>	in
Pulse On Time	<input type="text" value="0.003"/>	sec	Skip IHS Within	<input type="text" value="0"/>	in
Pulse Off Time	<input type="text" value="0"/>	sec	Preflow During IHS	<input checked="" type="radio"/> Off	<input type="radio"/> On
Creep Time	<input type="text" value="0.5"/>	sec	Nozzle Contact IHS	<input type="radio"/> Off	<input checked="" type="radio"/> On
Beam Off Time	<input type="text" value="0"/>	sec	Nozzle Contact During Cut	<input checked="" type="radio"/> Off	<input type="radio"/> On
Postflow Time	<input type="text" value="0"/>	sec	Pierce Control	<input checked="" type="radio"/> Manual	<input type="radio"/> Automatic
Cut Height	<input type="text" value="0.039"/>	in	Pierce Mode	<input checked="" type="radio"/> Pulse	<input type="radio"/> Blast
Pierce Height	<input type="text" value="400"/>	%	Pierce Complete	<input type="text" value="4"/>	volts
Lens Cut Position	<input type="text" value="0.315"/>	in	Next Pulse	<input type="text" value="0.3"/>	volts
Lens Pierce Position	<input type="text" value="0.5"/>	in	Pulse Laser Time	<input type="text" value="0"/>	sec
			Pulse Laser Power	<input type="text" value="0"/>	watts

9:45:02 AM

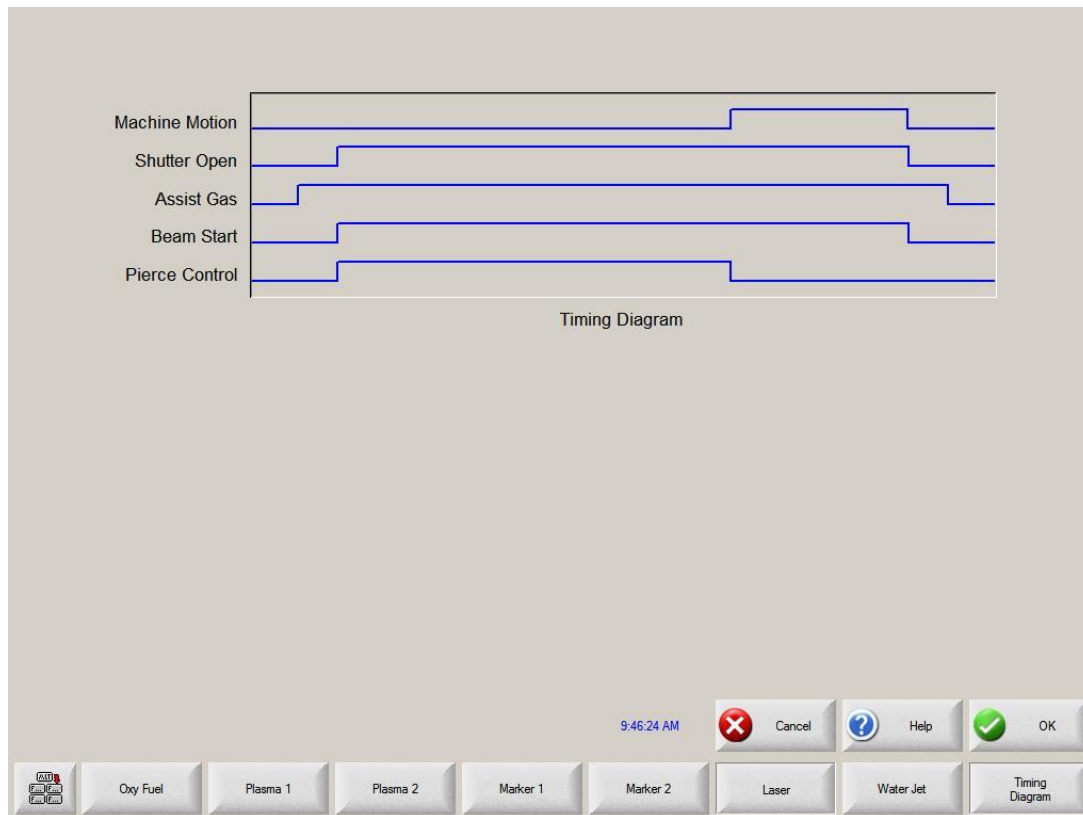
The Alt soft key at the left edge of the soft keys indicates additional soft keys are available. This allows for test lifter function to be available.

9:45:35 AM

### Test Lifter

Pressing the Test Lifter soft key will command the laser head THC1 lifter to lower to the plate, sense the plate and retract to the pierce height.

Press the Timing Diagram soft key to view the timing diagram from setups.



### Purge Time

Specifies the time delay for cutting gas purge before start of the laser cut motion is enabled.

### New Gas Purge Time

Specifies the Gas Purge Time for switching from one cutting gas to another cutting gas.

### Shutter Time

The Shutter Time parameter is used to specify the amount of time to open the shutter prior to the laser beam on.

### Power Ramp Time

The Power Ramp Time parameter is used to specify the amount of time to ramp up the laser power prior to the laser pierce.

### Pierce Time

Specifies the time delay from when laser head completes lowering until motion is initiated at creep speed for cutting.

When Manual Pierce Control is selected, this is the total pierce time allowed.

With Automatic Pierce Control is selected, this time is an additional delay after pierce is complete.

### Pulse On Time

When Automatic Pulse Mode is selected for pierce control the user can select Pulse On and Off Time to adjust duty cycle response of the sensor pulses from the laser cutting head.

**Pulse Off Time**

When Automatic Pulse Mode is selected for pierce control the user can select Pulse On and Off Time to adjust duty cycle response of the sensor pulses from the laser cutting head.

**Creep Time**

Specifies the amount of time after piercing the material that the laser head travels at Creep Speed for cutting. Creep Speed is determined by a setup parameter in the Speed Setup Screen and is a percentage of the programmed cut speed. After the Creep Time is completed, the control accelerates to full cut speed.

**Beam Off Time**

The Beam Off Time parameter specifies the amount of time the beam output will be turned off prior to the stop of motion. This feature can be used to tab parts for attachment to the skeleton.

**Postflow Time**

Specifies the amount of time that the cutting gas remains on after the cut is complete.

**Cut Height**

The Cut Height setup parameter is used to select the desired cut distance above the plate. This will set the initial cut height before the laser cut motion is activated. Cut Height is derived from the CHS signal and the calibration curve and represents cut distance from nozzle tip to the plate.

**Pierce Height**

The Pierce Height setup parameter is used to select the desired Pierce Height above the plate. This can be entered as a multiplication factor that is calculated times the Cut Height or an actual Pierce Height distance.

**Lens Cut Position**

Sets the focal lens position in the laser head for cutting.

**Lens Pierce Position**

Sets the focal lens pierce position in the laser head for cutting.

**Pulse Laser Time**

Sets the Laser Pulse Time duration for a one shot beam alignment.

**Pulse Laser Power**

Sets the Laser Pulse Power for a one shot beam alignment.

**Height Control Manual/Automatic**

Allows the user to either select a Manual or Automatic Height control for the laser head.

**IHS in Manual**

The IHS in Manual setup parameter allows the operator to select whether or not to use the Initial Height Sense feature when operating the Z axis lifter (THC1) in manual mode.

**Retract Full/Partial**

Selects the retract distance to be set at Full or Partial. In the Full retract mode, the laser head will retract to the Z-Axis Home position. In Partial retract mode, the laser head will retract to the set retract distance.

**Partial Retract Distance**

This setup parameter is used to select the THC 1 Retract Distance when configured for partial retract mode.

**Start IHS Distance**

The Start IHS Distance specifies the distance of travel for the THC 1 to move the laser head at high speed before switching to low speed and beginning Initial Height Sense. Caution should be taken when selecting this distance so that the laser head does not crash into the plate.

**Preflow During IHS**

Selecting ON will activate Preflow gases during the IHS cycle.

**Nozzle Contact IHS**

This parameter would be set to ON to select the THC 1 to use Contact Sense to detect the plate during the IHS cycle.

**Nozzle Contact During Cut**

Nozzle Contact During Cut allows the CNC to detect contact with the plate and generates a fault if this condition occurs.

**Pierce Control Manual/Automatic**

Allows the user to select Manual or Automatic Pierce control. Automatic control uses sensors in the Laser head to detect when the pierce is complete. Manual mode uses a preset pierce time and preset laser program. Automatic mode dynamically controls laser duty cycle.

**Pierce Mode Pulse/Blast**

When Automatic Pierce is selected the user can select to use a definable pulse output or a single Blast.

**Pierce Complete**

The Automatic Pierce monitors the voltage of sensors in the laser head and compares them to the value set by this parameter to detect the completion of the pierce.

**Next Pulse**

Based on sensors in the laser head, the system can determine when the next Laser Pulse is delivered during Automatic Pierce control. The voltage is derived from the feedback of the sensors in the laser cutting head.

**Cut Chart**

A cut chart database allows the user to select factory recommended settings or amend the database for personalized settings. The Cut Chart information can be saved or loaded via the hard drive, floppy drive or USB memory stick. The Cut Chart files contain the factory recommended settings that are available from Hypertherm®.

**Notes:**

- Please refer to the *FAST Laser™* operators manual for complete information on the operation and setup of the *FAST Laser™* head.
- The *FAST Laser™* Laser parameters must first be enabled in the password protected Station Configuration screen to allow use of the Cut Chart Information
- Specific Material, Process Power, Assist Gases, Material Thickness, Focal Length and Nozzle data fields allow new values to be added. Double click on the field to enter an new value or press the Plus key "+" to add or "-" to delete on the keypad.

## Laser Cut Chart Screen

**Laser Cut Chart - Rev 0**

Rofin RF 050 - Process Selection

Material Type: Mild Steel

Specific Material: None

Process Power: 1000W

Assist Gas: O2

Material Thickness: 3/16"

Focal Length: 10"

Nozzle: 2.0mm FAST

Pierce Pressure: 5 Pulse 10 psig

Cut Pressure: 20 psig

Set Power: 1000 watts

Cut Speed: 338.583 ipm

Kerf: 0.016 in

Cut Height: 0.039 in

Pierce Height: 400 % 0.156 in

Lens Cut Position: 0.315 in

Lens Pierce Position: 0.5 in Pulse 1 in

Purge Time: 1 sec

Pierce Time: 9.999 sec

Pulse On Time: 0.003 sec

Pulse Off Time: 0 sec

Creep Time: 0.5 sec

Pierce Complete: 4 volts

Next Pulse: 0.3 volts

Start Corner Power: 0 % of Cut

Minimum Corner Power: 0 % of Set

9:44:15 AM

Cancel Help OK

Save Process Reset Process Save Cut Charts Load Cut Charts Test Gas

The Cut Chart Database (cut process parameters) transmitted to configure the laser head are based on the following process variables. All values are user definable.

### Material Type

The Material Type, such as Mild Steel, Stainless Steel or Aluminum, may be selected.

### Specific Material

This is a user defined value to allow the user to create a custom database based on unique characteristics of the material type. Double click on the field or press the Plus key "+" to enter an new material name or "-" to delete on the keypad.

### Process Power

The appropriate process power (Wattage) for the material thickness and material type for the desired process.

### Assist Gas

The appropriate Assist Gas for the desired process.

### Material Thickness

The material thickness for the selected material type.

### Focal Length

Specific Focal Length lens that needs to be installed in the laser head for the desired process.

### Nozzle

Diameter and type of nozzle that needs to be installed for the desired process.



**Test Gas**

Pressing the Test Gas soft key performs the Test Gas feature of the cutting assist gas delivery system.

*The following are the Cut Process parameters within the database, which are then available to configure the specific process.*

**Set Power**

The Set Power parameter allows the user set the power (watts) to be used during the cut process. This value can be less than the process power.

**Cut Speed**

Specifies the Cut Speed for the selected material process.

**Kerf**

Specifies the amount of kerf (cutter compensation) that will be applied to the current part program.

**Cut Height**

The Cut Height setup parameter is used to select the desired cut distance from the nozzle tip to the plate. Cut Height is derived from the CHS signal and the calibration curve.

**Pierce Height**

The Pierce Height setup parameter is used to select the desired Pierce Height. This may be entered as a multiple factor that is calculated value of the Cut Height or an actual Pierce Height distance.

**Lens Cut Position**

Sets the focal lens position in the laser head for cutting.

**Lens Pierce Position**

Sets the focal lens pierce position in the laser head for cutting.

**Resonator On Time**

During automated power up this allows a specific time for the resonator to power up.

**Purge Time**

Specifies the time delay from switching from one cutting gas type to another cutting gas type.

**Pierce Time**

Specifies the time delay from when laser head completes lowering until motion is initiated at creep speed for cutting.

When Manual Pierce Control is selected, this is the total pierce time allowed.

With Automatic Pierce Control is selected, this time is an additional delay after pierce is complete.

**Pulse On Time**

When Automatic Pulse Mode is selected for pierce control the user can select Pulse on time to adjust the pulse.

### Pulse Off Time

When Automatic Pulse Mode is selected for pierce control the user can select Pulse on and off time to adjust the pulse. The Off Time starts when the sensor signal falls below the next pulse threshold.

### Creep Time

Specifies the period after pierce complete that the laser head travels at Creep Speed. Creep Speed is determined by a setup parameter in the Speeds setup screen and is a percentage of the programmed cut speed. After Creep Time is complete, the control accelerates to full cut speed.

### Pierce Complete

The Automatic Pierce monitors voltage of sensors in the laser head to detect completion of the pierce. This is used in conjunction with Pulse On Time, Pulse Off Time and next pulse.

### Next Pulse

Based on sensors in the laser head, the system can determine when the next pulse occurs. The Next Pulse will be delivered when the voltage drops below the Next Pulse setting.

### Start Corner Power

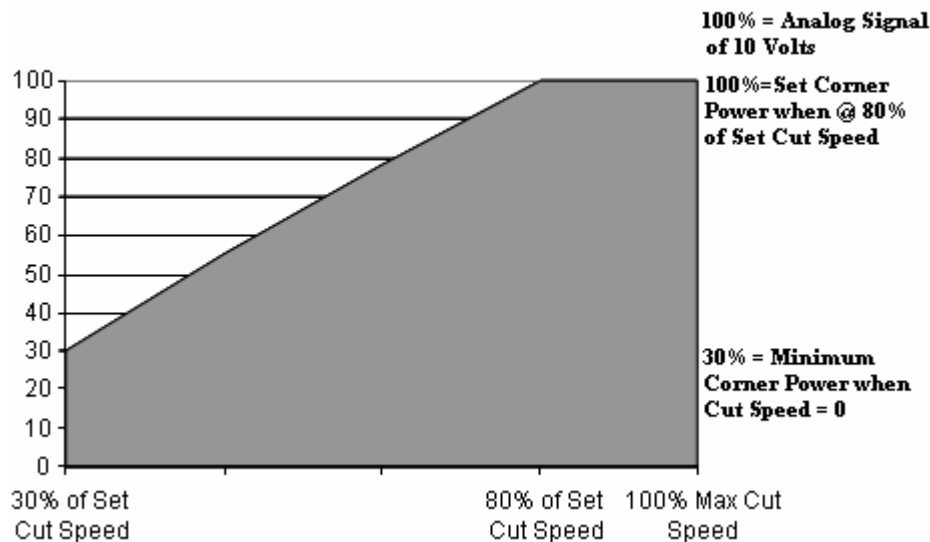
The Start Corner Power allows the user to define a speed where the corner power analog signal will be used to start to decrease laser power. This is defined as a percentage of cut speed.

See Corner Power graph, where the example shows this set to 80%.

### Minimum Corner Power

This parameter defines the minimum laser resonator power to switch when the cut speed reduces to zero in a corner. This is defined as a percentage of selected power (watts). See Corner Power graph, where the example shows 30%.

**EXAMPLE of Corner Power Graph**



**Save Process**

Pressing the Save Process soft key allows the user to save the current process settings to the Hard drive creating a custom user database based on the eight process variables selected.

**Rest Process**

Pressing the Reset Process soft key allows the user to reset the current settings to factory recommend factory defaults based on the eight process variables selected.

**Save Cut Charts**

Pressing the Save Cut Charts soft key allows the user to save the current User and Factory databases to Diskette or USB memory stick. User files are designated with a .usr file extension and the factory files are designated with a .fac file extension

**Load Cut Charts**

Pressing the load Cut Charts soft key allows the user to the factory default database files which are supplied by Hypertherm in a Text file (.txt), user files (.usr) or factory files (.fac) from Diskette or USB memory stick.

**Pulse Laser Time**

Sets the Laser Pulse Time duration for a one shot beam alignment.

**Pulse Laser Power**

Sets the Laser Pulse Power for a one shot beam alignment.

**Height Control Manual/Automatic**

Allows the user to either select a Manual or Automatic Height control for the laser head.

**IHS in Manual**

The IHS in Manual setup parameter allows the operator to select whether or not to use the Initial Height Sense feature when operating the Z axis lifter (THC1) in manual mode.

**Retract Full/Partial**

Selects the retract distance to be set at Full or Partial. In the Full retract mode, the laser head will retract to the Z-Axis Home position. In Partial retract mode, the laser head will retract to the set retract distance.

**Partial Retract Distance**

This setup parameter is used to select the THC Retract Distance when configured for partial retract mode.

**Start IHS Distance**

The Start IHS Distance specifies the distance of travel for the THC to move the laser head at high speed before switching to low speed and beginning Initial Height Sense. Caution should be taken when selecting this distance so that the laser head does not crash into the plate.

**Preflow During IHS**

Selecting ON will activate Preflow gas during the IHS cycle.

**Nozzle Contact IHS**

This parameter would be set to ON to select the THC to use Contact Sense to detect the plate during the IHS cycle.

**Nozzle Contact During Cut**

Nozzle Contact During Cut allows the CNC to detect contact with the plate and fault.

**Pierce Control Manual/Automatic**

Allows the user to select Manual or Automatic Pierce control. Automatic control uses sensors in the Laser head to detect when the pierce is complete

**Pierce Mode Pulse/Blast**

When Automatic Pierce is selected the user can select to use a definable pulse output or a single Blast.

**Pierce Complete**

The Automatic Pierce monitors voltage of sensors in the laser head to detect completion of the pierce.

**Next Pulse**

Based on sensors in the laser head, the system can determine when the next Pulse Pierce occurs during Automatic Pierce control. The voltage is derived from the feedback of the sensors.

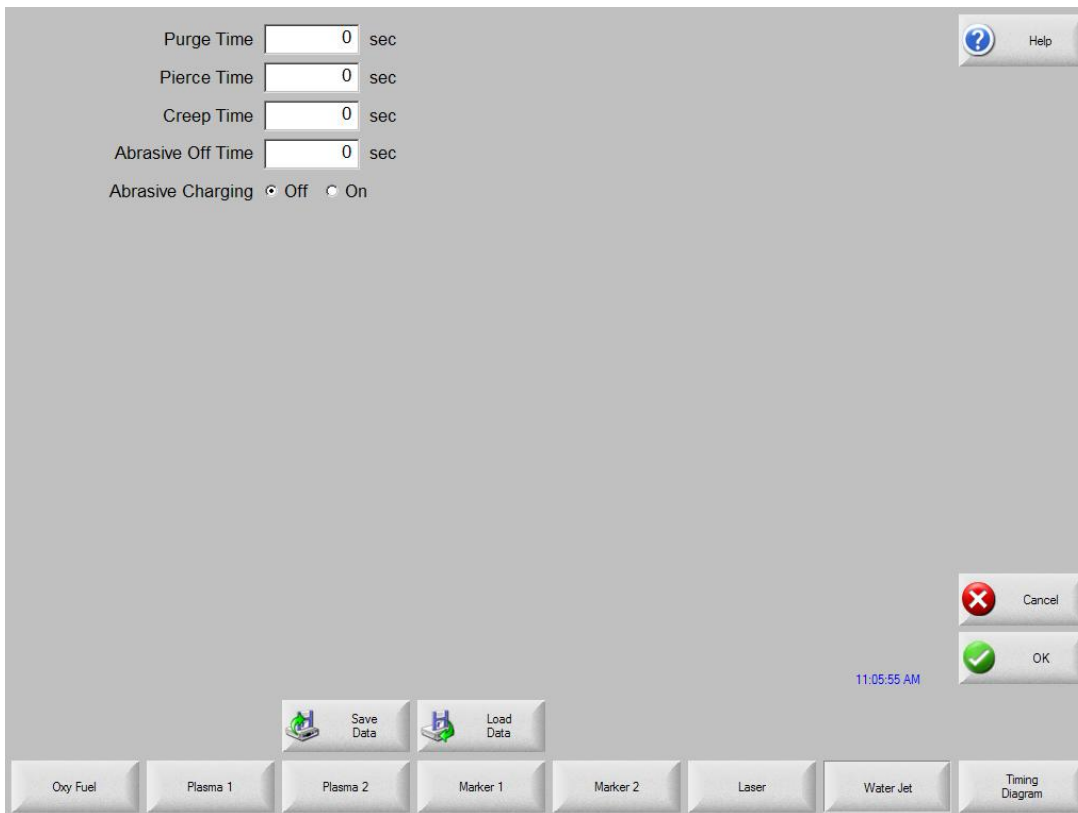
**Cut Chart**

A cut chart database allows the user to select factory recommended settings or amend the database for personalized settings. The Cut Chart information can be saved or loaded via the hard drive, floppy drive or USB memory stick. The Cut Chart files contain the factory recommended settings that are available from Hypertherm®.

**Notes:**

- Please refer to the *FAST Laser™* operators manual for complete information on the operation and setup of the *FAST Laser™* head.
- The *FAST Laser™* Laser parameters must first be enabled in the password protected Station Configuration screen to allow use of the Cut Chart Information
- Specific Material, Process Power, Assist Gases, Material Thickness, Focal Length and Nozzle data fields allow new values to be added. Double click on the field to enter an new value or press the Plus key "+" to add or "-" to delete on the keypad.

## Water Jet



The image shows a software interface for configuring a Water Jet. It features a grey background with several input fields and buttons. In the top left, there are four text boxes labeled 'Purge Time', 'Pierce Time', 'Creep Time', and 'Abrasive Off Time', each followed by a numeric input field set to '0' and the unit 'sec'. Below these is a radio button group for 'Abrasive Charging' with 'Off' selected. In the top right corner is a 'Help' button with a question mark icon. In the bottom right corner are 'Cancel' (with a red X icon) and 'OK' (with a green checkmark icon) buttons, with the time '11:05:55 AM' displayed above them. At the bottom center are two buttons labeled 'Save Data' and 'Load Data', each with a floppy disk icon. Along the bottom edge is a row of eight soft key buttons: 'Oxy Fuel', 'Plasma 1', 'Plasma 2', 'Marker 1', 'Marker 2', 'Laser', 'Water Jet', and 'Timing Diagram'.

Purge Time  sec

Pierce Time  sec

Creep Time  sec

Abrasive Off Time  sec

Abrasive Charging ☒ Off ☐ On

Help

Cancel

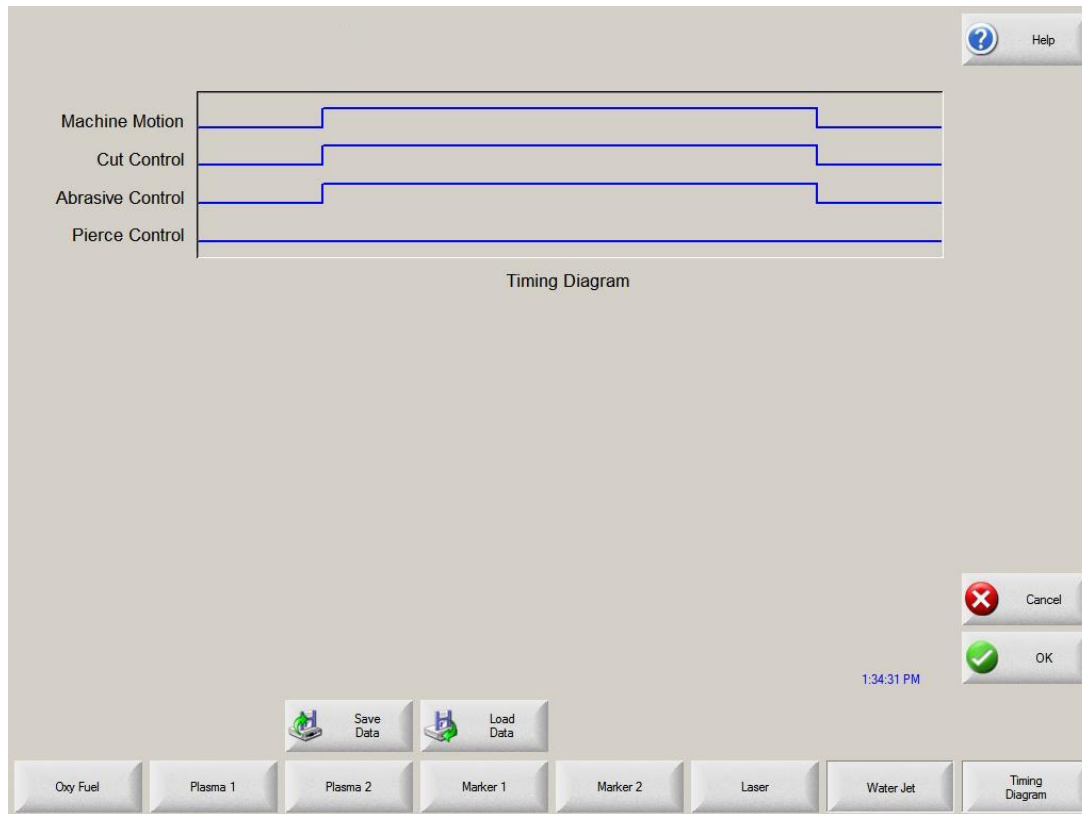
OK

11:05:55 AM

Save Data Load Data

Oxy Fuel Plasma 1 Plasma 2 Marker 1 Marker 2 Laser Water Jet Timing Diagram

Press the Timing Diagram soft key to view the timing diagram from setups.



### Purge Time

Specifies the time delay from torch ignition until motion is enabled.

### Pierce Time

Specifies the time delay from when cutting tool completes lowering until motion is initiated at Creep Speed. Used to allow the cutting tool to completely pierce the material before moving.

### Creep Time

Specifies the amount of time after piercing the part that the torch travels at Creep Speed. Creep Speed is determined by a setup parameter at the Speeds setup screen and is a percentage of the programmed cut speed. After the Creep Time is completed, the control accelerates to full cut speed.

### Abrasive Off Time

The Abrasive Off delay parameter species the amount of time the abrasive will remain on at the end of a cut.

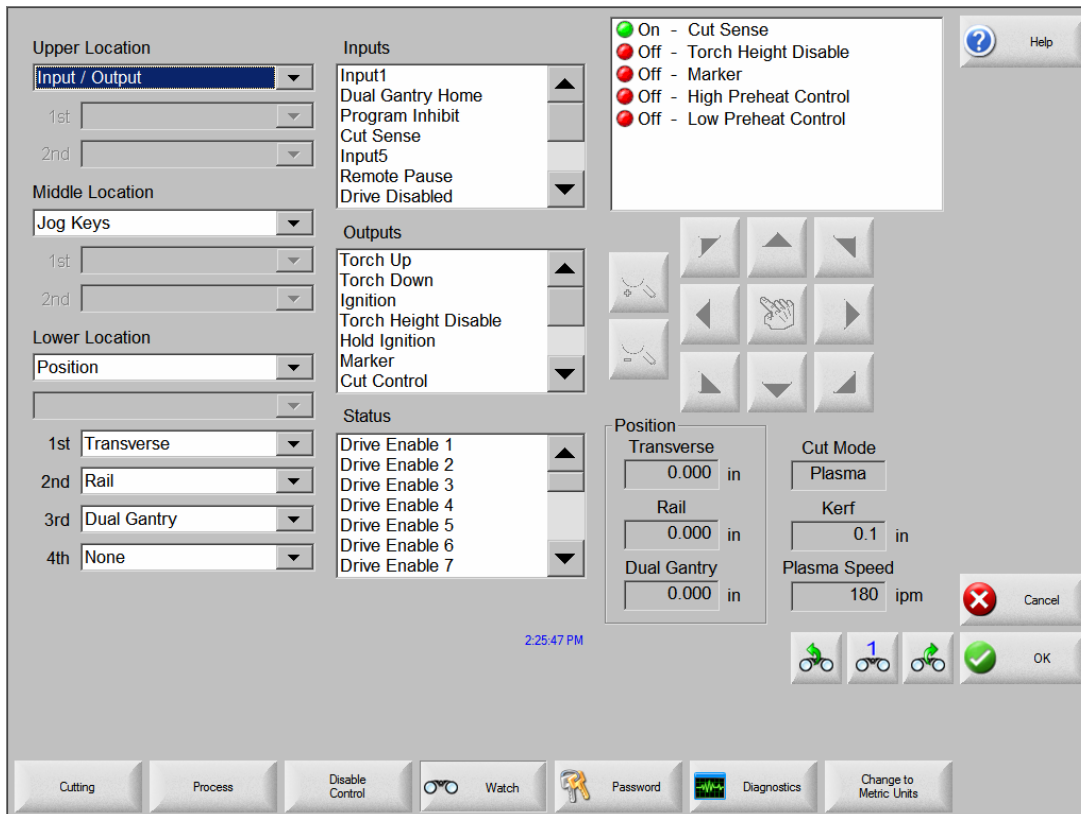
### Abrasive Charging

When selected, the Abrasive Charging feature will charge or fill the abrasive into the cutting system for use while cutting.

## Watch

The control comes with a unique function for watching critical process related parameters during cutting. The Watch window allows the operator to customize a certain portion of the screen to display functions that are critical for your particular cutting operation. Whether it is Current Speed, Position, I/O status, or torch consumable life, you now have the flexibility to display the information that you want to see.

As these parameters are turned ON or OFF, the Watch window will be updated with the new graphical widget. Widget is a GUI programmer's term for defining icons which graphically display information.



Several options are available to personalize the Watch window and not all options can be viewed at one time. The options are grouped into two sizes of widgets or icons. Large widgets may be placed into the upper position at the top of the Watch window or in the middle of the Watch window. Small widgets are positioned in the lower left corner of the Watch Window next to the cut information and clock. The cut information and clock at the lower right may not be edited.

Selections in the Watch window will change slightly based on the control I/O configuration and machine option selections that have been enabled.

The Watch positions will allow for the following selections.

### None

Selecting None will leave the selected position blank.

**Input/Output**

Allows current state of selected Input, Outputs or Status information to be displayed during cutting. This can be especially useful in debugging gas control sequencing problems. To add or delete a desired Input, Output or Status point to the Input/Output list box, Double click the desired item or highlight the desired item and + (add) or – (delete) keys on the alpha-numeric keypad.

**Position**

Allows the position for the selected axis to be displayed. Only two axes may be displayed at the Upper or Middle locations. The Lower location will allow up to four axes to be displayed.

**Following Error**

Allows the Following Error to be displayed. Following Error is the distance between the position the control has calculated and the actual position of the torch. A large Following Error may indicate that the cut speed selected may be beyond the capability of the cutting system. Only two axes may be displayed at the Upper or Middle locations. The Lower location will allow up to four axes to be displayed.

**Command Voltage**

Allows the user to view directional motion command voltage being sent to the amplifier for velocity type drives. This displayed voltage also equates to current being commanded for motion in current type drives. Peak voltage can be displayed for a specified amount of time.

**Temperature**

Selecting to add the Temperature information to the Watch window will display the current temperature inside the control in Fahrenheit or Celsius (selected at the Special Setups screen).

**Note:** Specific control hardware required.

**Speedometer**

Allows cut speed, maximum machine speed and current machine speed to be graphically displayed while cutting.

**Oxy Fuel Torch Tip**

Allows the selected oxy fuel torch tip (1- 12) consumable life to be graphically displayed while cutting. This is especially useful in helping to determine when the torch tip should be replaced and keeping track of torch tip data for statistical process control (SPC).

**Plasma Torch Tip**

Allows the selected plasma torch tip (1- 8) consumable life to be graphically displayed while cutting. This is especially useful in helping to determine when the torch tip should be replaced and keeping track of torch tip data for statistical process control (SPC).

**Plasma Electrode**

Allows the selected plasma electrode (1- 8) consumable life to be graphically displayed while cutting. This is especially useful in helping to determine when the electrode should be replaced and keeping track of electrode data for statistical process control (SPC).

**Jog Keys**

Selecting the jog keys option allows a directional keypad to be added to the watch window for manual motion directly from the touch screen. The operator can press the hand ICON in the middle of the navigation pad to enable manual mode. Select the desired move speed and press the corresponding arrow for manual motion in the desired direction.

**Process Data**

The Process Data option allows the user to view up to four selected items for a selected cut or marking process. Process timers and status items for Oxy Fuel, Plasma, Marker, Waterjet and Laser



may be selected. Note: The process data will only be displayed during the current cut process.  
 Example: Plasma 1 process parameters will only be displayed in the Watch window at the main cut screen while cutting in Plasma 1 Mode.

### Laser Nozzle

Laser Nozzle consumable life to be graphically displayed while cutting. This is especially useful in helping to determine when the nozzle should be replaced and keeping track of nozzle data for statistical process control (SPC).

### HPR Power Supply

Allows the user to view status for inputs, outputs and gas pressures for the HPR autogas console. Up to four power supplies may be monitored. This is generally used for service diagnostics only.

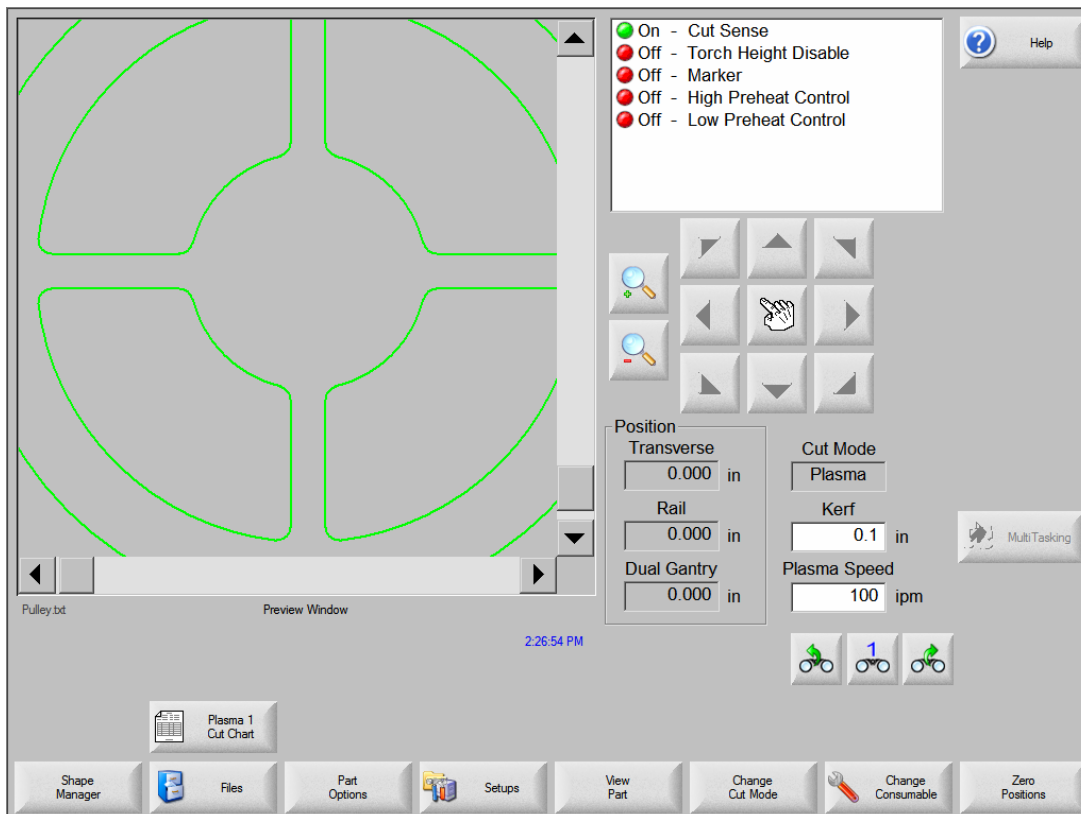
### Multiple Watch Windows

Up to ten different Watch windows may be configured on the control for quick selection and viewing of the Watch icons.



To configure different Watch windows for viewing, first access the Watch setup screen. Press the number ICON to enter a number or the Left/Right arrows to move up and down through the selections. The different Watch windows can be selected and viewed during operation using the same selection process.

Example:





# Section 4: Shape Manager

## Shape Library

The control contains a built-in Shape Library with more than 68 commonly used shapes. These shapes are *parametric*. Parametric shapes are shapes that are not fixed in size or geometry.

The Shape Library consists of more than 68 shapes as shown below. The screen is defined in colors, from the easiest (green) to the hardest (black).



### Selecting a Simple Shape

After pressing Shape Library from the Main Menu, the control display shows the Shape Library as shown above. Double click the desired shape you wish to cut and press OK. If the selection is incorrect, press CANCEL and re-select the shape.

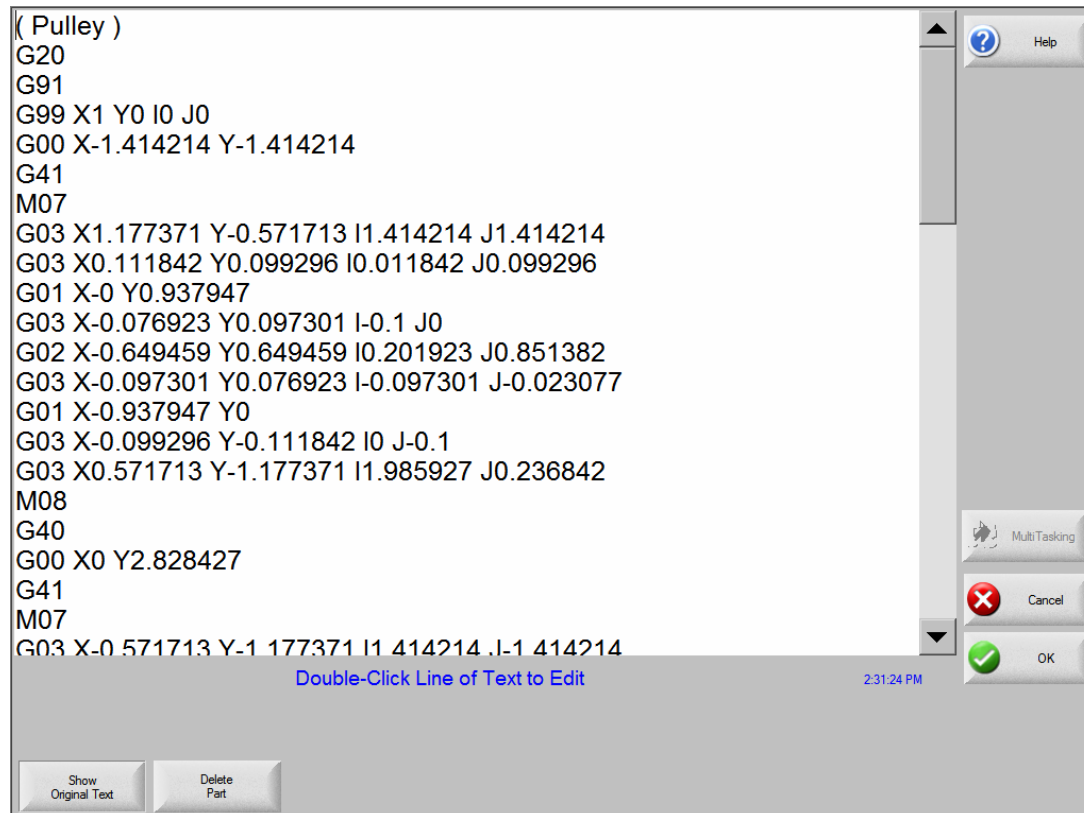
Keypad operation: Use the arrow keys to navigate to the desired shape you wish to cut and press ENTER.

At this point, the shape is displayed with the default parameters, or the parameters from the last edit session of this shape. Detailed information on the available shapes can be found in the following section.

## Text Editor

This screen is for manually inputting or editing of a part program in either ESSI or EIA format. The current part that is in memory will be displayed upon entering this screen. The OK soft key will save any changes to the current part in memory. If you want to save the changes to the hard drive, go to the Files Save to Disk screen. If you do not want to save any changes that were made, press Cancel on the keyboard.

Changes can be made by pressing on the desired line of code. An alphanumeric keypad will be displayed to initiate changes.



### Show Original Text

Pressing the Show Original Text button allows the user to view and edit the part program in the original format in which it was written.

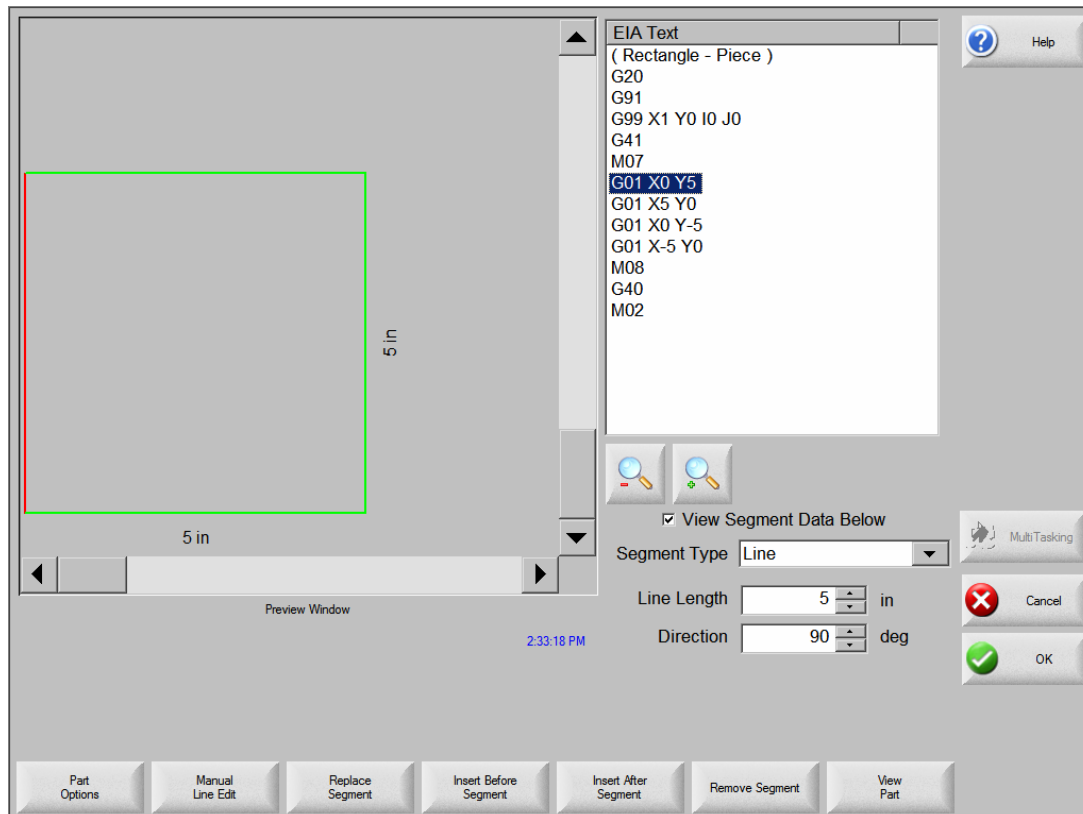
### Delete Part

The Delete Part button will delete the current part from the Text Editor so that a new part can be constructed.

## Shape Wizard

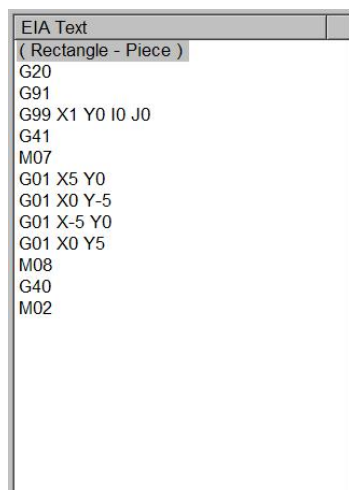
*ShapeWizard*<sup>®</sup>, a proprietary graphical part editor, provides a user-friendly, graphical method of editing part programs.

*ShapeWizard*<sup>®</sup> allows a user to graphically view not only the segment that is being edited, but also any changes that are made, when they happen. EIA RS-274D codes can be inserted directly as ASCII text into a part program or, alternatively, segments can be created by specifying phrases in the user's native language as a step-by-step process. EIA RS-274D codes need not be known. *ShapeWizard*<sup>®</sup> is accessed from the Shape Library menu.



### Manual Line Edit

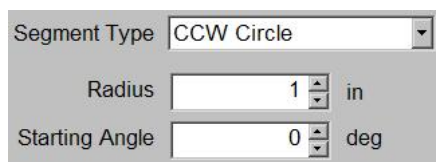
Pressing Manual Line Edit allows editing the highlighted line in the Text Editor window. The ASCII text entered must be valid EIA RS-274D codes or an error message will result. The alphanumeric keypad will be displayed for line edits. Below is a Text Editor line as it appears immediately after the Manual Line Edit is pressed:



Simply typing right over the line can erase the highlighted text.

While a text line is highlighted in blue, a new segment type can be selected and inserted into the program using soft keys. Additionally, a graphic representation of the part program in the Preview window is updated so that the corresponding segment is highlighted in red or blue, depending on whether it is a cut segment or a traverse.

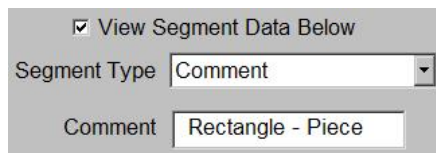
The Segment Type pop-up window is pictured below:



Parameters associated with the segment type will also be displayed and can be edited.

### Replace Segment

Replaces the segment highlighted in gray in the Text Editor window with the segment selected from the Segment Type window as pictured below:



### Insert Before Segment

Pressing this soft key causes the segment selected from the Segment Type window to be inserted before the segment highlighted in gray in the Text Editor window.

### Insert After Segment

Pressing this soft key causes the segment selected from the Segment Type window to be inserted after the segment highlighted in gray in the Text Editor window.

### Remove Segment

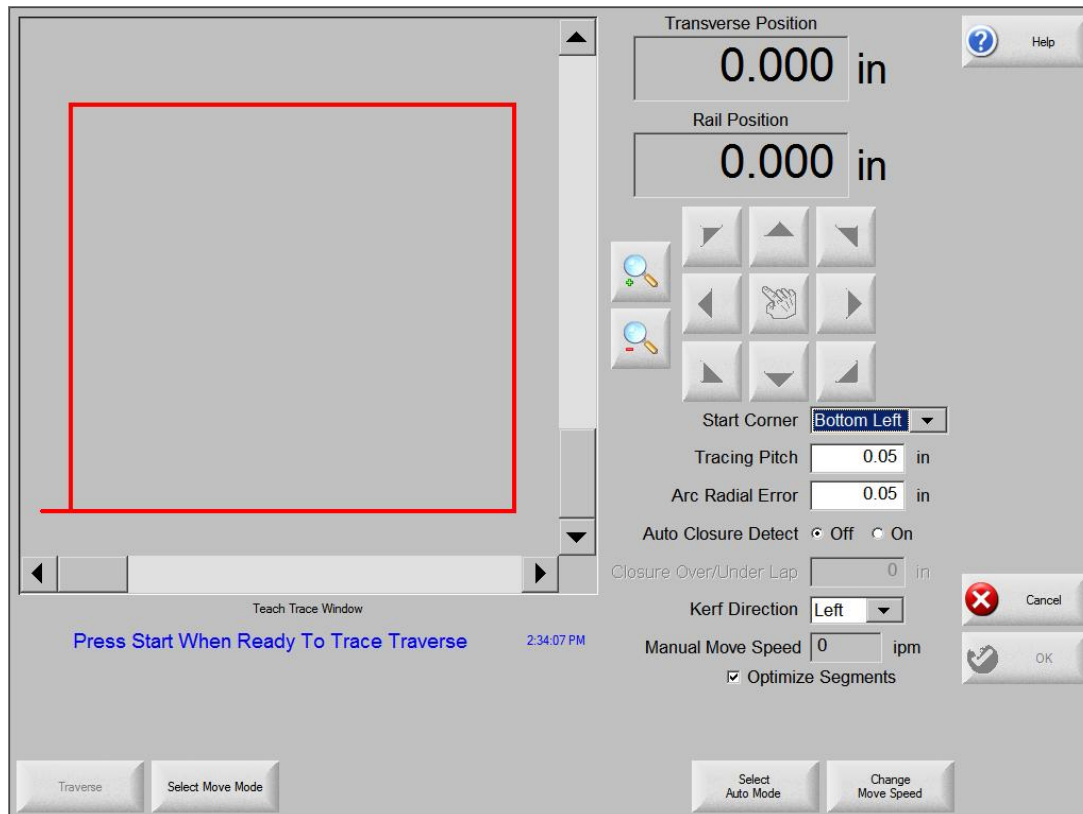
The segment highlighted in gray or blue in the Text Editor window is removed from the part program when the Remove Segment soft key is pressed.

## Teach Trace

The Teach Trace function of the control allows parts to be taught rather than programmed. The position information from the taught part will remain as a part program that can be saved to disk for future use.

The Teach Trace algorithms present in the control can recognize both arcs and lines. This will reduce the overall memory required to store these parts and will improve the smoothness of the cut. The taught part in memory is in EIA format and can be cut, saved or manipulated using any of the part options.

The Teach Trace function must be used in conjunction with an optional stand-alone optical tracing system.



### Start Corner

The Start Corner setup parameter allows the user to select where the taught part will begin for proper viewing on the screen.

### Tracing Pitch

This determines how precisely to learn a part. The Tracing Pitch can be adjusted to trade off resolution versus size of the taught part. This value does not affect the actual position resolution of the part.

A good starting point for most tracing systems is 0.01”.

**Arc Radial Error**

Specifies the arc error tolerance to be used when checking the current segment for dimensional accuracy. All ESSI or EIA programs are comprised of lines, arcs and circles. Arc Radial Error is used to ensure that the starting and ending radial vectors are within tolerance to describe a valid geometry.

**Auto Closure Detect**

This parameter is used to allow the control to detect that it has returned to the starting point. With this feature ON, the control stops the motion of the tracer when the part is complete allowing a lead-out to be programmed.

**Closure Over/Under Lap**

By specifying a positive value for this parameter, the control does not stop the tracer until it has gone past the start point by the amount of this parameter. By specifying a negative value, the tracer stops as soon as the tracing head position is within this parameter's distance of the starting point. This is only available if the Auto Closure Detect is ON.

**Kerf Direction**

Selects the desired kerf for cut segments.

**Traverse/Pierce**

Switches between the traverse and cut segments of the part as it is taught.

**Tracing a part**

To trace a part while at the Teach Trace screen, select Auto mode, then select traverse or pierce. You may switch between traverse and pierce during the tracing procedure. Position the optical sensor near the part drawing and press Start. Use the sensor positioning controls to direct the sensor towards the part. Once the sensor has located the part, the tracing system will follow the part outline until completion. When completed, press OK. The part file can now be cut, saved or edited.

Please refer to the instructions provided with your Optical tracing system for further details.



### Plate Remnant Trace

The Teach /Trace feature also supports the ability to trace in the outline of a plate remnant for use by a part programmer to create new nests of parts to be cut on the remnant.

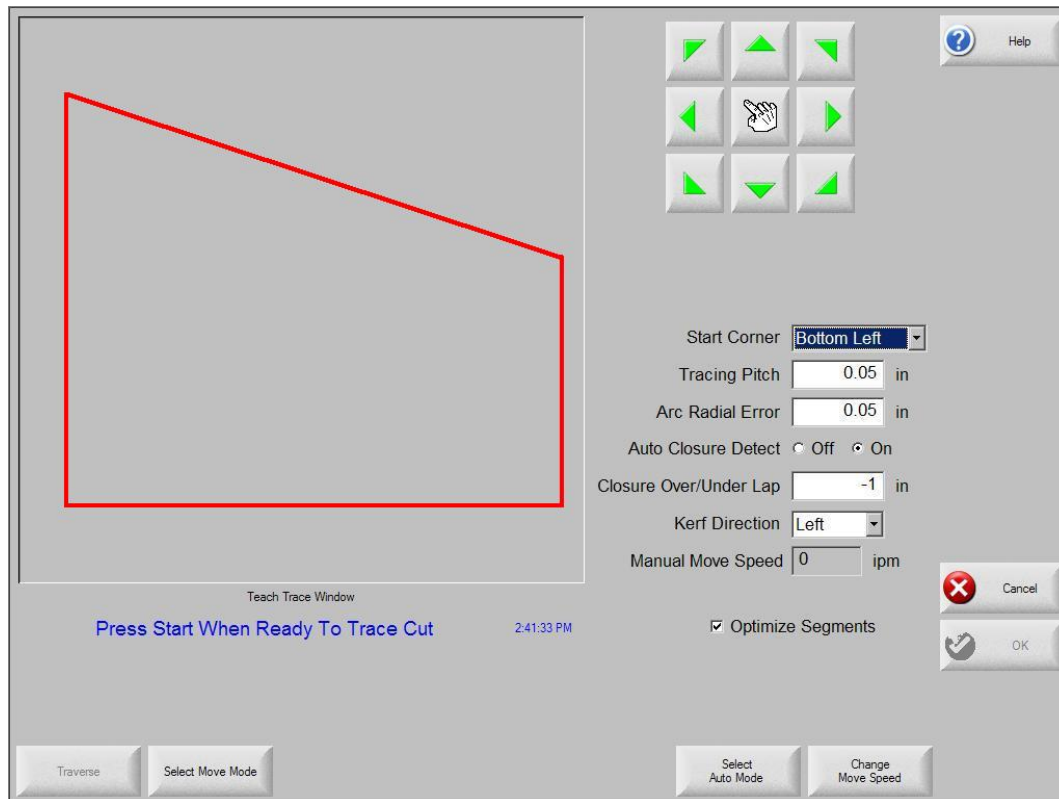
The user manually moves the torch (or a pointer) around the plate to define the outline of the material which remains. When the path is completed (it doesn't have to be a closed path), the operator presses the OK key and the recorded axis motions are written to a standard part program format with moves recorded as incremental routing moves. The movements will also display on the control's screen in the same manner as displayed during manual motion commands.

Once recorded, the part program can be uploaded via the serial link, or written to the floppy disk or USB memory, so that the programming department can use it to update their database to reflect the remaining material.



When first opened the system defaults to the automatic Teach/Trace mode which is used in conjunction with an optical head for program generation. In order to use the manual function, simply select the soft key to choose manual mode.

This will place the control in the manual control mode and also enables the Change Move Speed button to alter the manual move speed. Pressing the Change Move Speed button repeatedly will cycle through the programmed manual jog rate settings.



The operator should position the pointer or torch to the plate location where recording of the path is to begin. Once at the start point, press the “Start” button to begin recording positions. The manual motion buttons may now be used to trace out an arbitrary contour which defines the remaining plate area. When finished, press the OK soft key to record the motions to the “current” part program.

The program may now be saved to the disk, or uploaded in the normal manner.

## Nester™

Nester™ is a proprietary part nesting program, which allows the operator to manually group or nest selected parts together as one part program to conserve raw materials and maximize machine utilization. This nesting program is designed to maximize the control features of graphical user interface, simplified keypad operation and advanced communications software to provide quick, simple and logical programming.

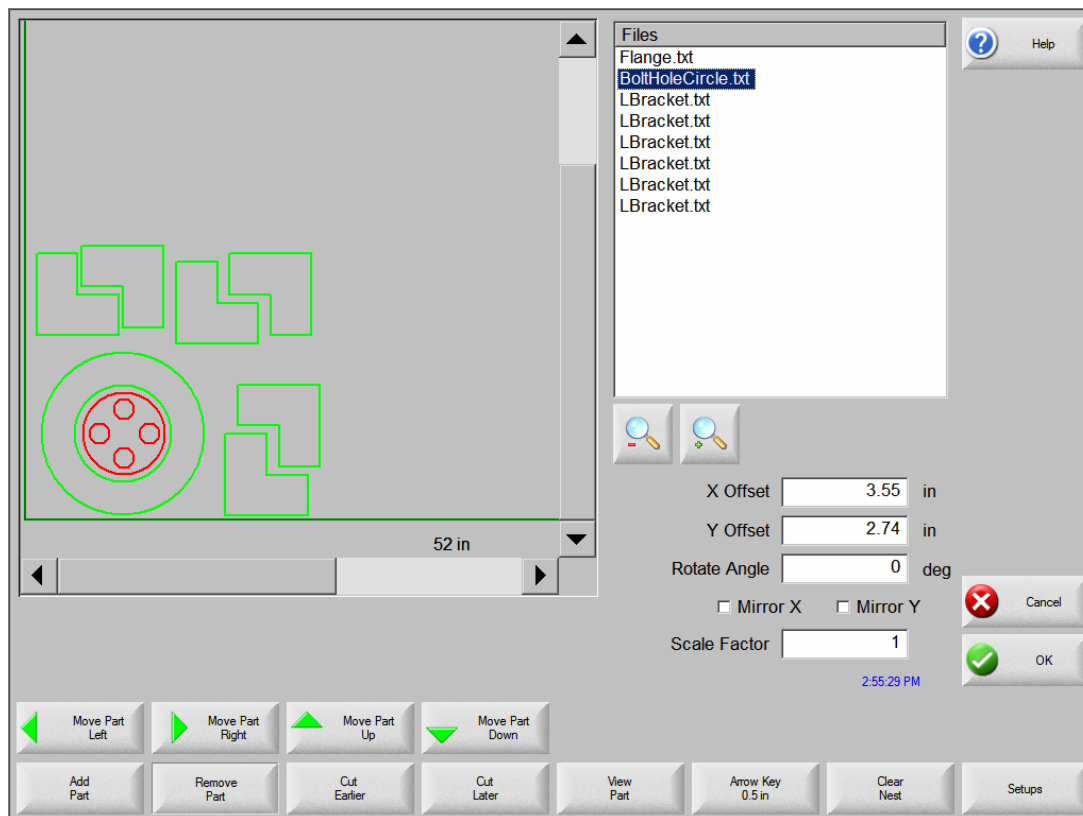
Additionally, an optional Automatic Nesting feature may be enabled to perform true shape, single station, automatic nesting. With its advanced Graphical User Interface, ease of use and advanced profile positioning algorithms, this Automatic Nesting feature can greatly improve the output of your shape cutting operation by reducing overall process time and increasing plate utilization. Please contact your control vendor for details on enabling this Automatic Nesting feature.

## Manual Nesting

### Main Screen Layout

The main viewing area is the largest area of the screen and is located in the upper left corner. The edge of the plate is displayed in dark green. The plate size displayed is based on plate information that has been selected at the main setup screen.

The upper right corner of the main screen displays the part program list for the nest in order of cut sequence. In the lower right, part position and orientation information for the selected part program is displayed and can be manipulated for use as new parts are added.



**Add Part**

Pressing the Add Part soft key accesses the screen, which allows the user to select a part program from a selected source.

**Remove Part**

This soft key is used to remove the selected part from the nest parts list.

**Cut Earlier**

Pressing the Cut Earlier soft key will move the selected part program to an earlier position in the part cut list. The sequence in which the parts are cut are changed, but not the selected part location in the nest.

**Cut Later**

Pressing the Cut Later soft key will move the selected part program to a later position in the part cut list. The sequence in which the parts are cut are changed, but not the selected part location in the nest.

**View Sheet / View Part**

View Sheet allows the viewing of a part as it would appear on the plate. After pressing the View Sheet soft key, the display window zooms out to show the part in relationship to the entire plate.

After zooming out, the display can be zoomed in again by pressing the + key, which causes horizontal and vertical scroll bars to be displayed. Pressing the - key will zoom back out.

More information on use of this feature is provided in the Manual cutting section.

**Arrow Key (Distance)**

The Arrow Key allows the user to select one of five different preset move distances when the arrow keys are pressed to locate parts in the nest. These five distances are definable and are selected in the Nester™ Setup screen.

**Clear Nest**

Clear Nest will delete all the parts located in the nested parts list from temporary memory.

**Setup**

Pressing the Setup soft key accesses the Nester™ Setup screen for configuring the variable parameters when using Nester™.

## Nester™ Setup

The following Setup parameters are used to configure the manual nesting process for use.

Nesting ☒ Manual ☐ Automatic

Arrow Increment 1  in

Arrow Increment 2  in

Arrow Increment 3  in

Arrow Increment 4  in

Arrow Increment 5  in

☒ Auto-Position

Search Increment  in

Scrap Clearance  in

Part Spacing  in

Plate Edge Spacing  in

Program Origin

Cut Direction

Return to Nest Start ☐ Off ☐ On

Help

MultiTasking

Cancel

OK

11:50:30 AM

### Arrow Motion

At this screen, the user can select different move increment dimensions. These dimensions are used as move distance references when the control arrow keys are pressed to place parts in position on the plate.

### Autoposition

Autoposition is an automated feature of the Nester™ software to search for the next available location to place a part that is being added to the nested part list. Autoposition compares the overall block dimensions of the selected part and searches for the next available block on the plate that is large enough to accommodate the part being loaded. Values can be input for the Search Increment and Scrap Clearance parameters that are used when searching for the next available part location.

Autoposition will not allow parts to be placed on top of other parts or inside other parts. This feature is enabled or disabled by using the space key at the enable box.

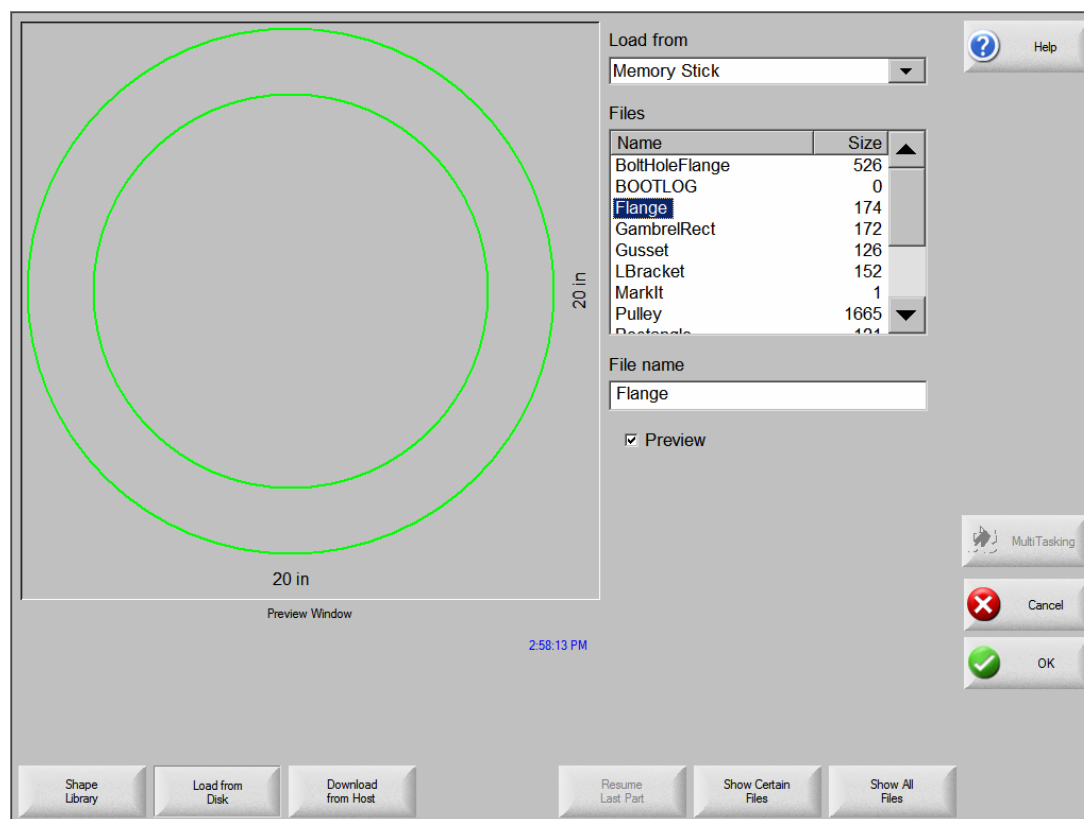
## Using Nester™

To begin, first select the plate size requirements for the nest at the Main Setup screen. This information is used to display the plate size and plate orientation at the main view screen to place parts on the plate. The plate information is retained with the nested part program when saved.

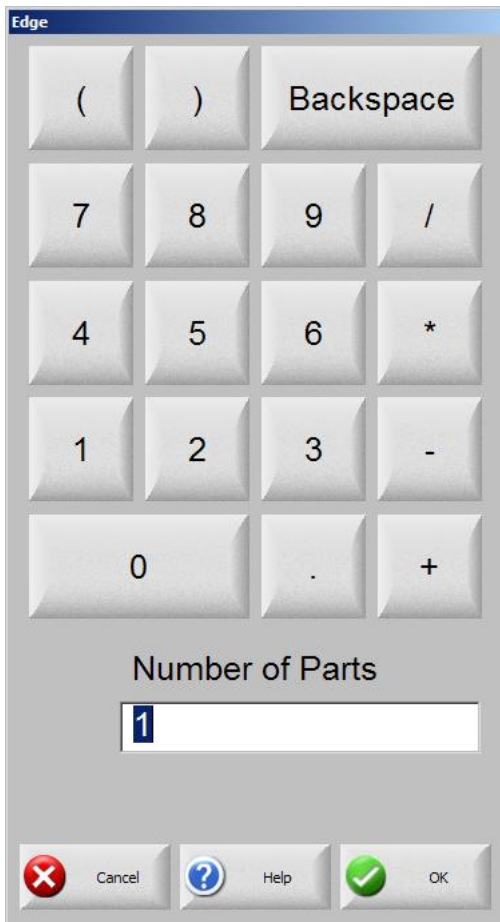
Press the Nester™ soft key from the Shape Manager screen then enter the Nester™ Setup Screen to configure the nesting software for use. Press OK to return to the Nester™ Main Screen to begin placing parts in the nest.

## Adding Parts

At the Nester™ Main Screen, press the Add Part soft key to add a new part to the nesting part list. The first screen viewed will allow the user to select a part from the Simple Shape Library, from a disk or from the host computer via link communications.



Once a part has been selected from either location, the user will be prompted to select the number of pieces desired.



The image shows a software dialog box titled "Edge". It features a numeric keypad with buttons for parentheses, Backspace, digits 0-9, and mathematical operators. Below the keypad is a text input field labeled "Number of Parts" containing the value "1". At the bottom are three buttons: "Cancel" (with a red X icon), "Help" (with a blue question mark icon), and "OK" (with a green checkmark icon).

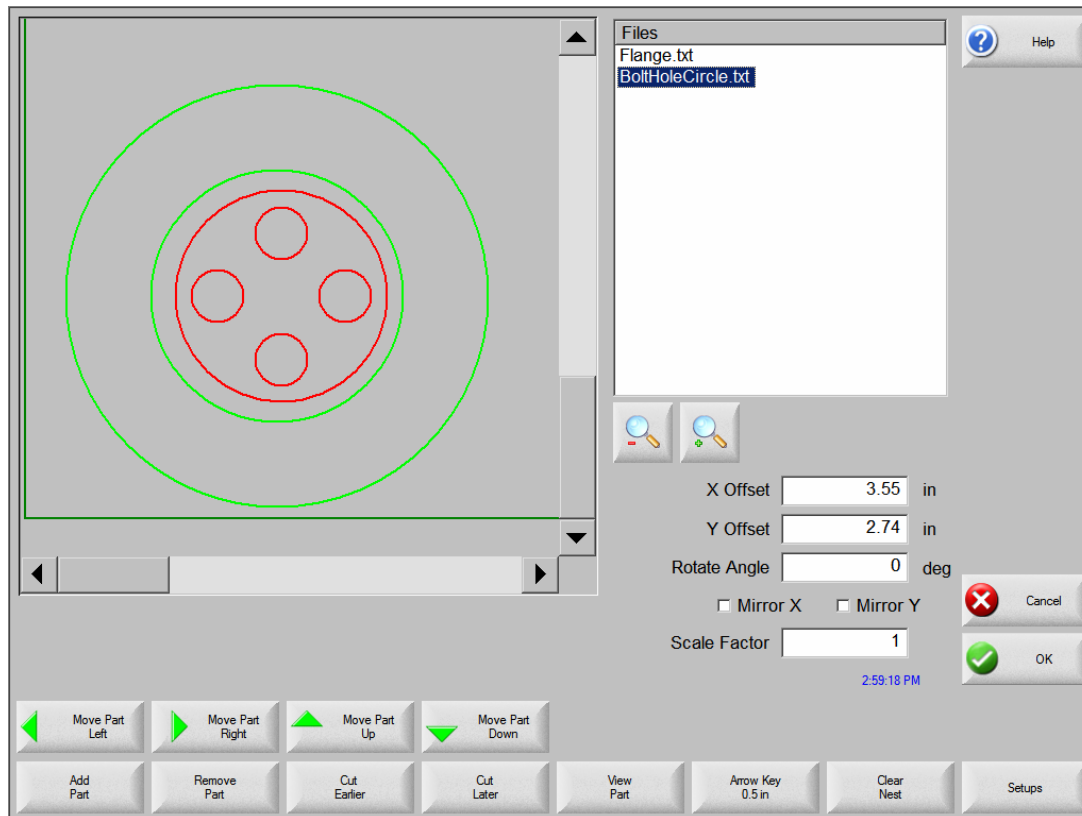
(	)	Backspace	
7	8	9	/
4	5	6	*
1	2	3	-
0		.	+

Number of Parts

1

Cancel Help OK

As new parts are added, they will be displayed on the selected plate in preparation for final placement.



At this screen, the part can be oriented, scaled and moved to final position. This is done by moving to the Nester™ Part List and highlighting the file name. Then select the desired field to manually offset, rotate, mirror and scale the part.

To position the selected part, use the manual direction keys. The view screen will be outlined by a bold blue border indicating that the arrow keys are active. Pressing the arrow keys will allow movement of the part to the desired location on the plate. Each time the arrow keys are pressed, the selected part will move in the direction of the arrow by the increment set by the Arrow Key distance soft key. By use of the arrow distance key, arrow keys and zooming in the view field, exact placement of the desired part may be obtained.

Additional parts may be added to the nest in the same fashion as described above. To customize your nest, you may decide to delete parts or add parts to the list and change the order in which they are cut by use of the soft keys displayed. When finished, press OK to return to the Main Cut screen and begin cutting the nest. The part nest is currently saved as a temporary file until another part is loaded.

### **Saving a Nest**

From the Main Cut screen, press the Files soft key to Save to Disk. From here the part can be saved to a hard disk folder on the control, Diskette or USB memory stick. The nested parts file may be saved as a nest or a part. Saving as a nest using the save as Nester File feature, will create a larger file which will allow future modification of the nest through Nester™. Nested parts saved as a part file cannot be modified.



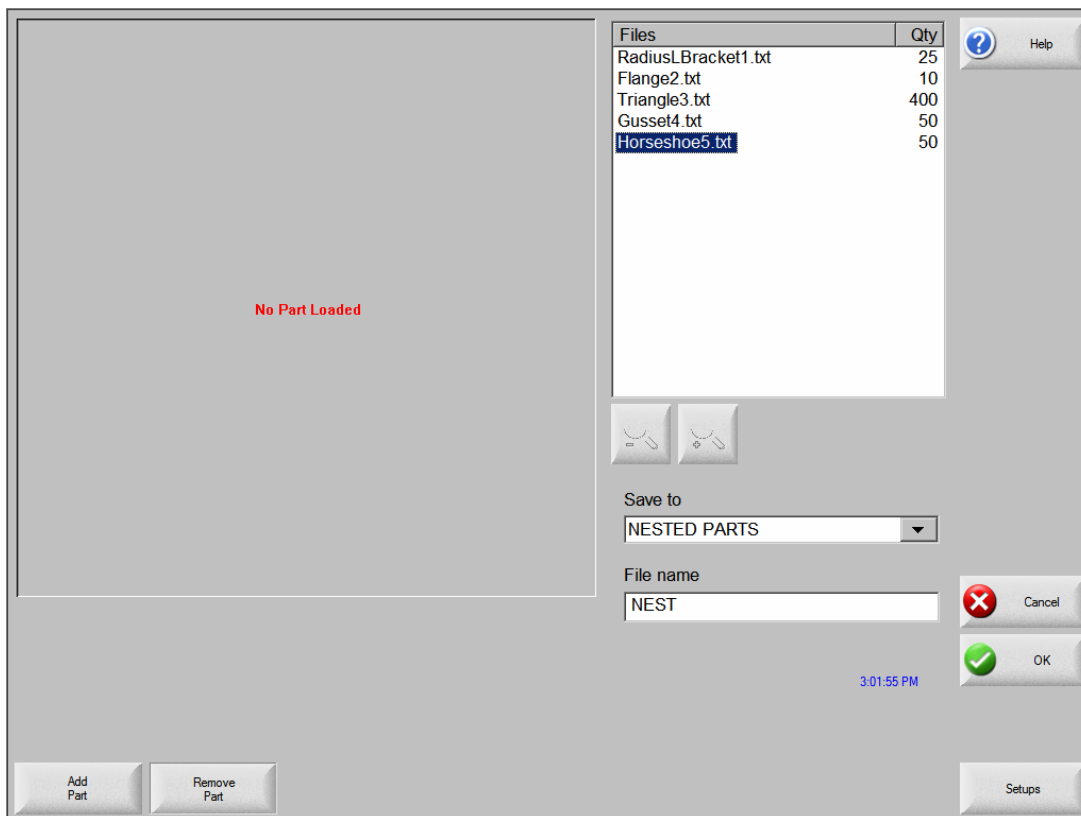
## HyperNest – CNC® Automatic Nesting Software

Optional *HyperNest® - CNC* feature - This true shape, single station, automatic nesting package allows quick and simple nesting of profiles on to selected material sizes. With its advanced Graphical User Interface, ease of use and advanced profile positioning algorithms, *HyperNest® - CNC* can greatly improve the output of your shape cutting operation by reducing overall process time and increasing plate utilization.

### Main Screen Layout

The main viewing area is the largest area of the screen and is located in the upper left corner and is used to preview manual nests. During an automatic nest, this area will remain blank. The plate size used during Automatic nesting is based on plate information that has been selected at the main setup screen.

The upper right corner of the main screen displays the list of part programs and quantities of parts to be automatically nested. In the lower right, there locations to save the nested part program to a folder location and to assign a file name.



**Note:** This software feature is protected both by a software enable and a hardware key (dongle) installed on the control.

## Automatic Nesting Setup

Pressing the Setup soft key accesses the following setup parameters and can be used to configure the automatic nesting process for use. Note: If this feature is not available (greyed out), the feature has not been enabled on your controller. Please contact your control vendor for details on how to enable the Automatic Nesting feature.

### Automatic Nesting

Switching the Nesting Parameter to Automatic enables the feature for use.

### Part Spacing

The Part Spacing feature sets the spacing between parts during the Automatic Nesting process.

### Plate Edge Spacing

This parameter allows the user to set spacing around the edge of the plate to be used during the Automatic Nesting process.

### Program Origin

The Program Origin (nest start location) may be set to lower left, upper left, bottom left or bottom right.

### Cut Direction

Cut Direction allows to user to select the direction the parts will be placed in during the Automatic Nesting process. Options are: Left or Right, Right to Left, Top to Bottom and Bottom to Top.

### Return to Nest Start

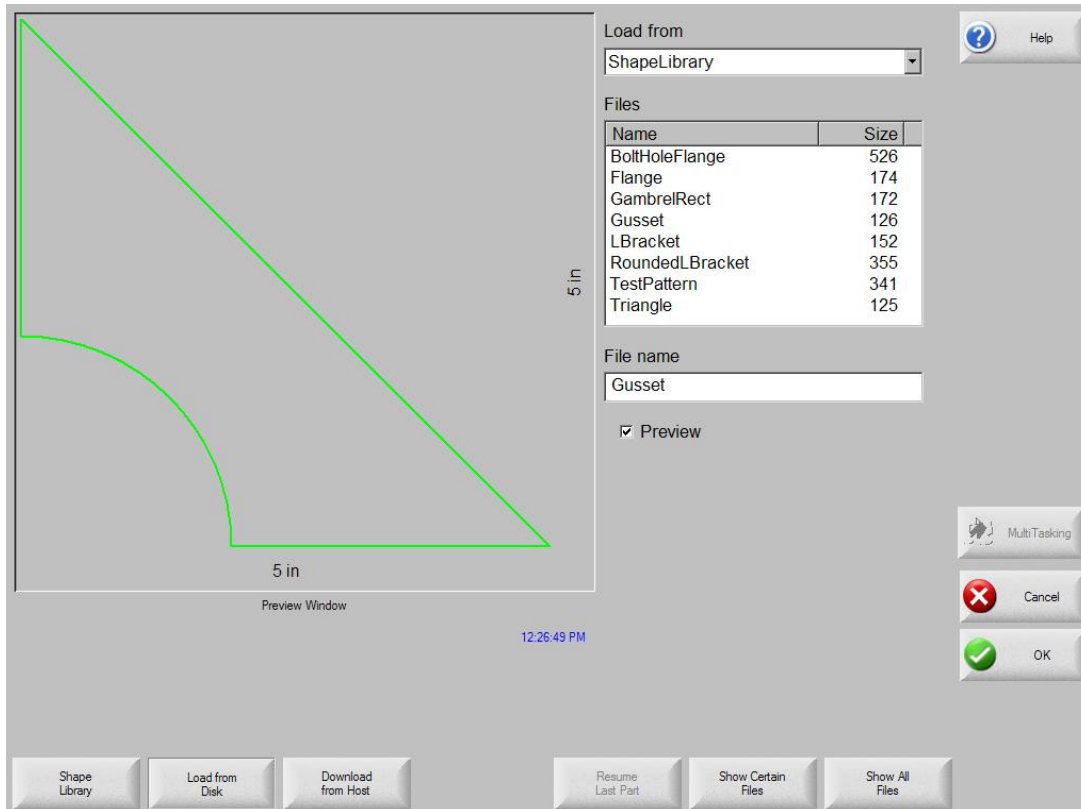
When enabled, the Return to Nest Start feature will insert a traverse segment back to the start point at the end of the nest.

## Using HyperNest – CNC®

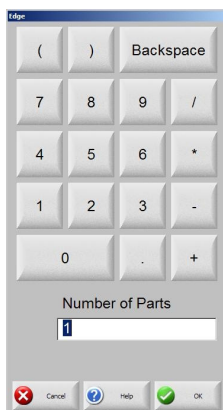
To begin, first select the plate size requirements for the nest at the Main Setup screen. Press the Nester™ soft key from the Shape Manager Screen then enter the Setup Screen to enable the Automatic Nesting software feature and configure the setup parameters for use. Press OK to return to the Main Screen and begin placing parts in the nest.

### Adding Parts

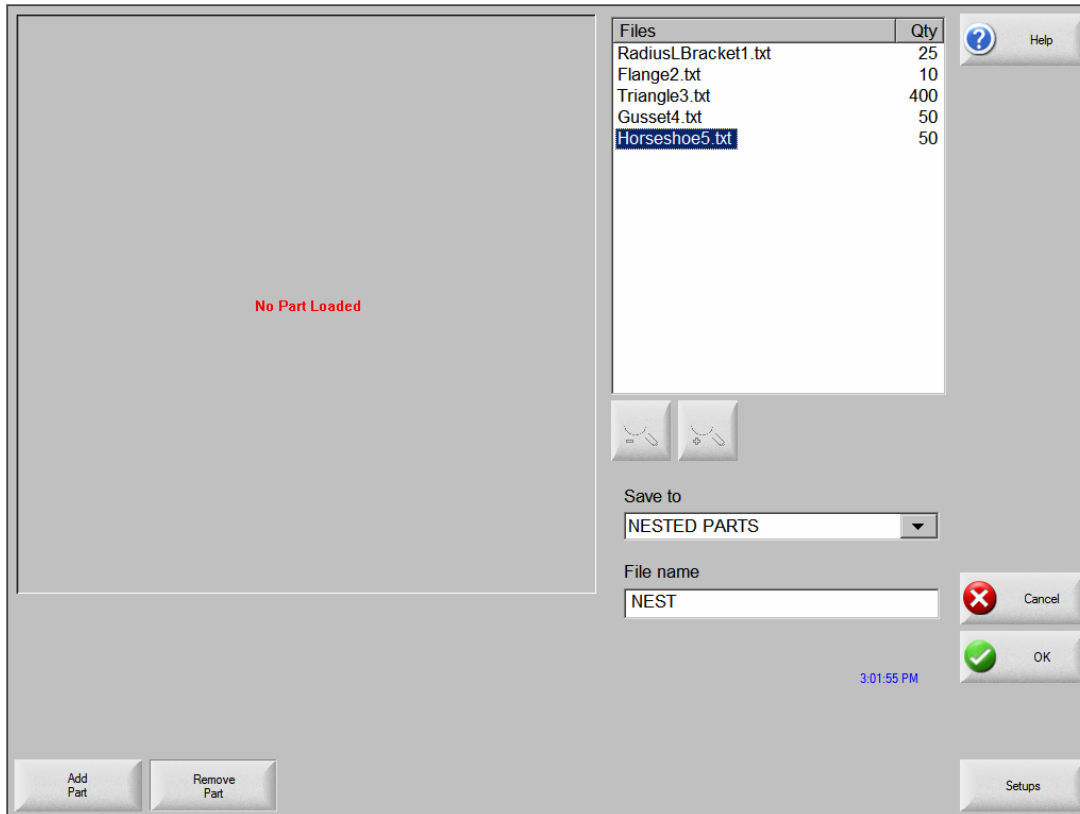
At the Main Screen, press the Add Part soft key to add a new part to the nesting part list. The Add Part screen will allow the user to select a part from the Simple Shape Library, from a disk or from the host computer via link communications.



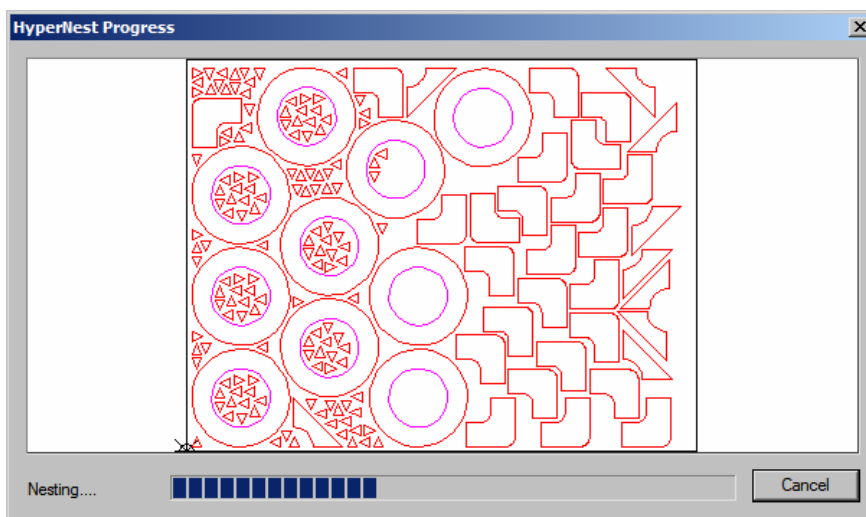
Once a part has been selected from the desired location, the user will be prompted to select the number of pieces desired.



As new parts are added, the part file name and quantity will be displayed in the parts list window in the upper right corner of the screen in preparation for final placement during the Automatic Nesting process.

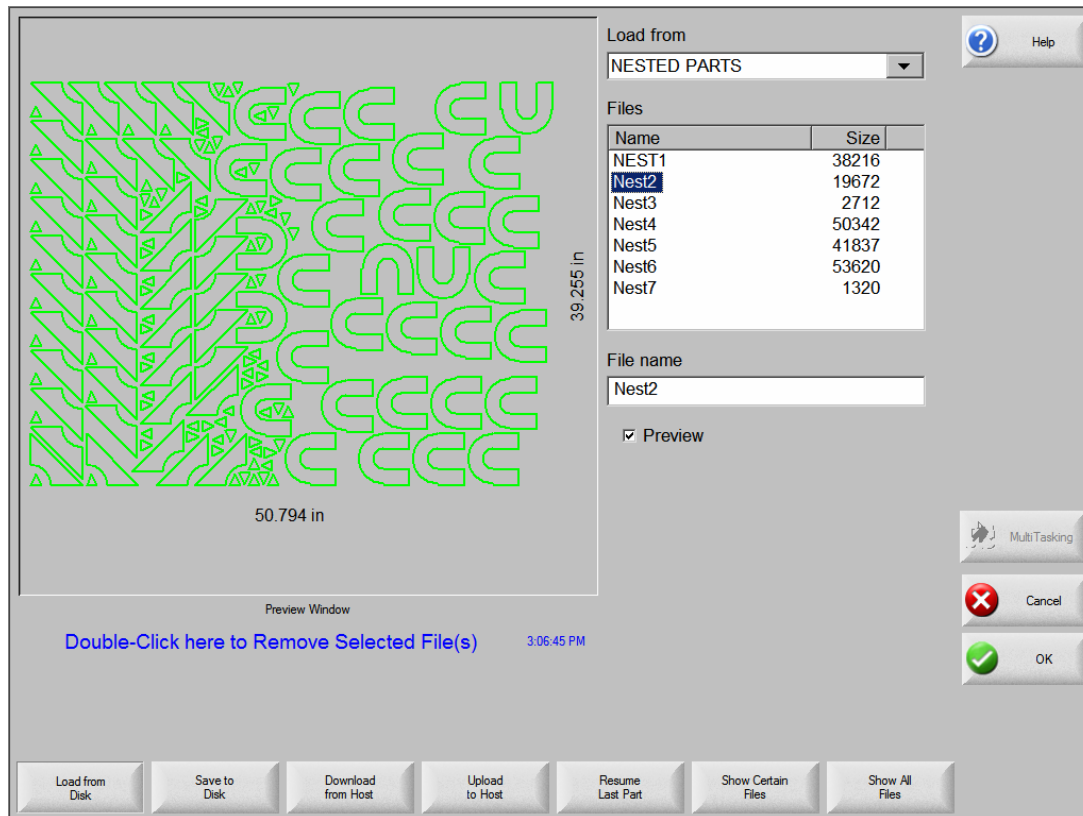


Select the desired file location and assign a file name, then press the OK soft key to begin the automatic nesting process. A progress window will be displayed during the nesting process.



Note: The nest process progresses quickly and not all shapes may be visible on screen or other drawing anomalies may be noted during the nesting process.

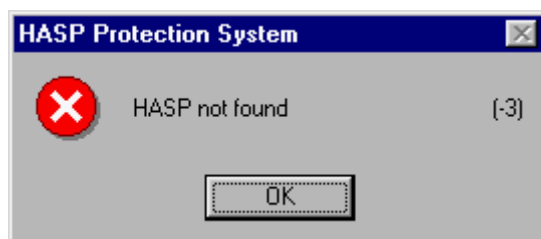
In the event that more parts are selected than can fit on one plate, multiple plates or sheets (nested program) files will be generated and saved in the selected folder with the selected file name, but a numeric suffix will be added. Example: saving the part file as Nest may generate multiple part files named NEST1.txt, NEST2.txt, NEST3.txt, etc.



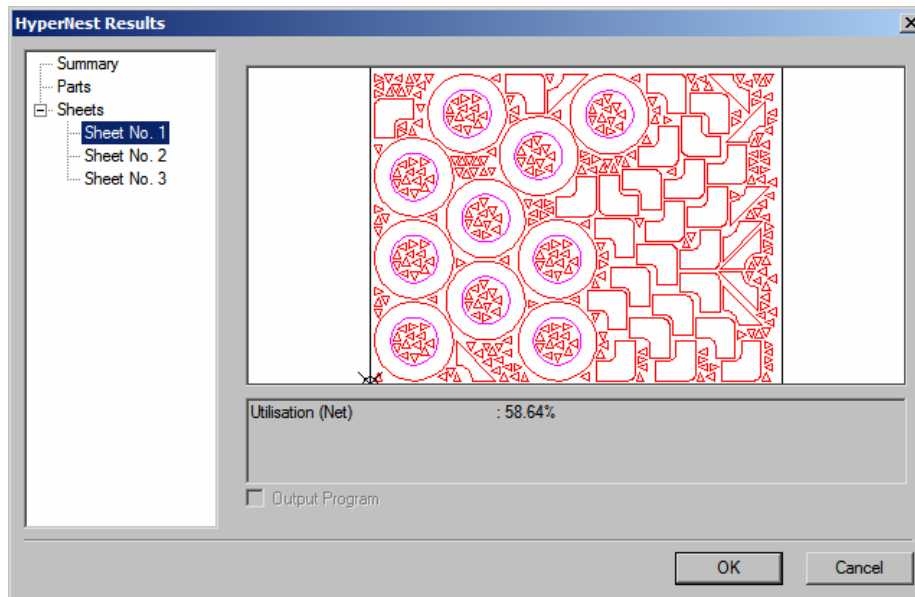
### Remove Part

A part may be removed from the part files list by highlighting the selected part in the files list and pressing the Remove Part soft key prior to executing the nesting.

**Note:** The software feature on the control is protected by a hardware key or dongle. If the hardware key has been removed from the control, the following message will appear when the Nest Parts soft key has been pressed.

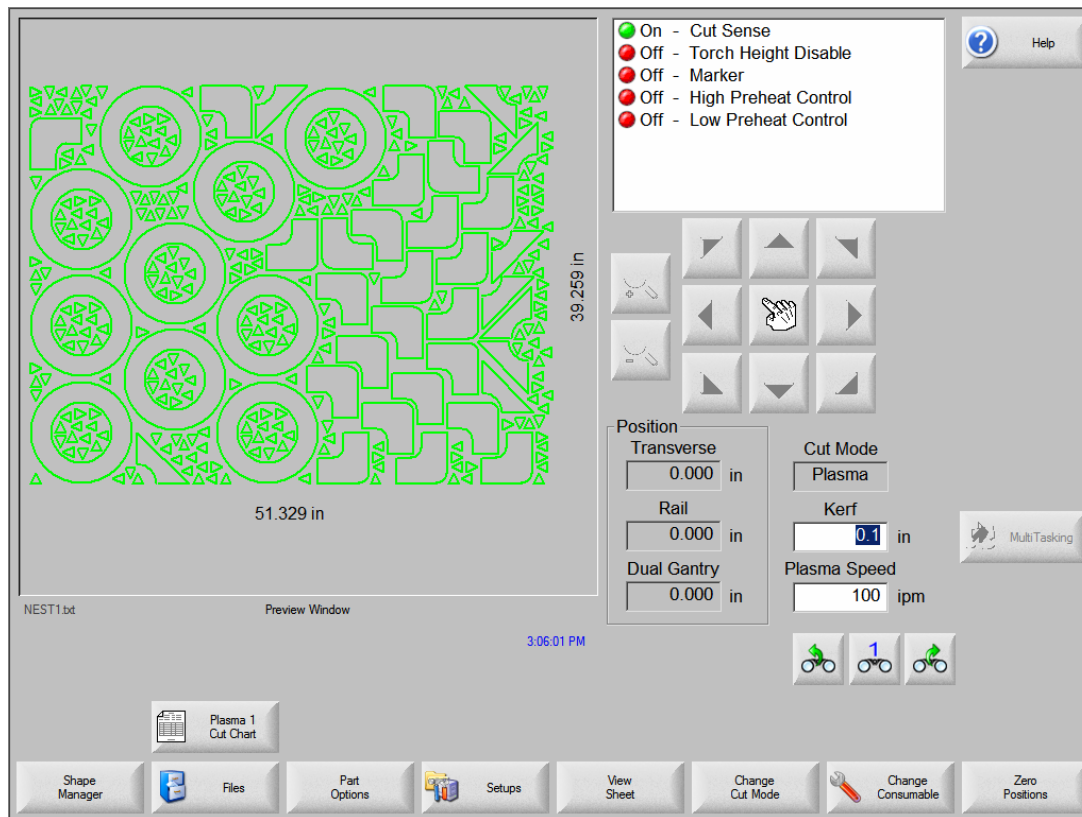






Press OK to accept the nest and have the first sheet become the current part. Press the Cancel key to reject the nest and return to the main nesting screen to add or remove parts from the nest.

## Main Screen View of Nest



**Note:** Parts with open loops or other invalid geometries may not be able to be automatically nested. It may be possible to manually nest parts which have been rejected by the Automatic Nesting function.



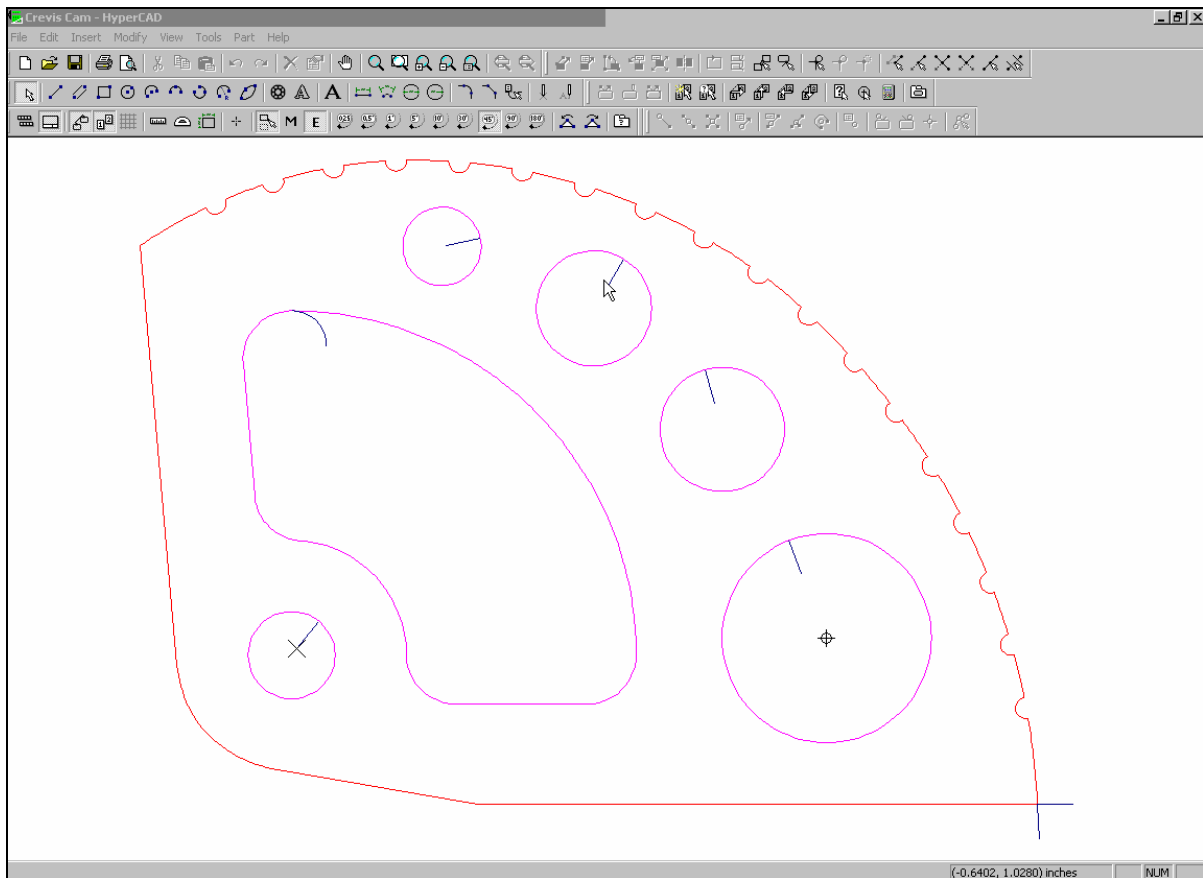
## HyperCAD®

HyperCAD® is an easy to use 2D drawing application specifically designed for shape cutting. The software's powerful CAD utilities let users import DXF and CNC files or draw from scratch. Files can be converted to graphical parts for editing and saving or go directly to cutting.

This simple CAD/CAM application lets you move easily from drawing to cutting.

### HyperCAD® Features

- English or Metric Units
- Part / Sheet viewing capabilities
- Scaling, mirroring or rotating of parts
- Repeating and copying of shapes
- Moving / modifying of lead-ins and lead-outs
- Add-on of chamfers, fillets and notches
- On-screen, full-part cutting simulation
- Built in Help functions



This feature is offered as a limited use trial version. Please contact your control vendor for information on enabling unlimited use of this feature. This package may be used on the CNC equipped with mouse and PC keyboard or offline on a PC.

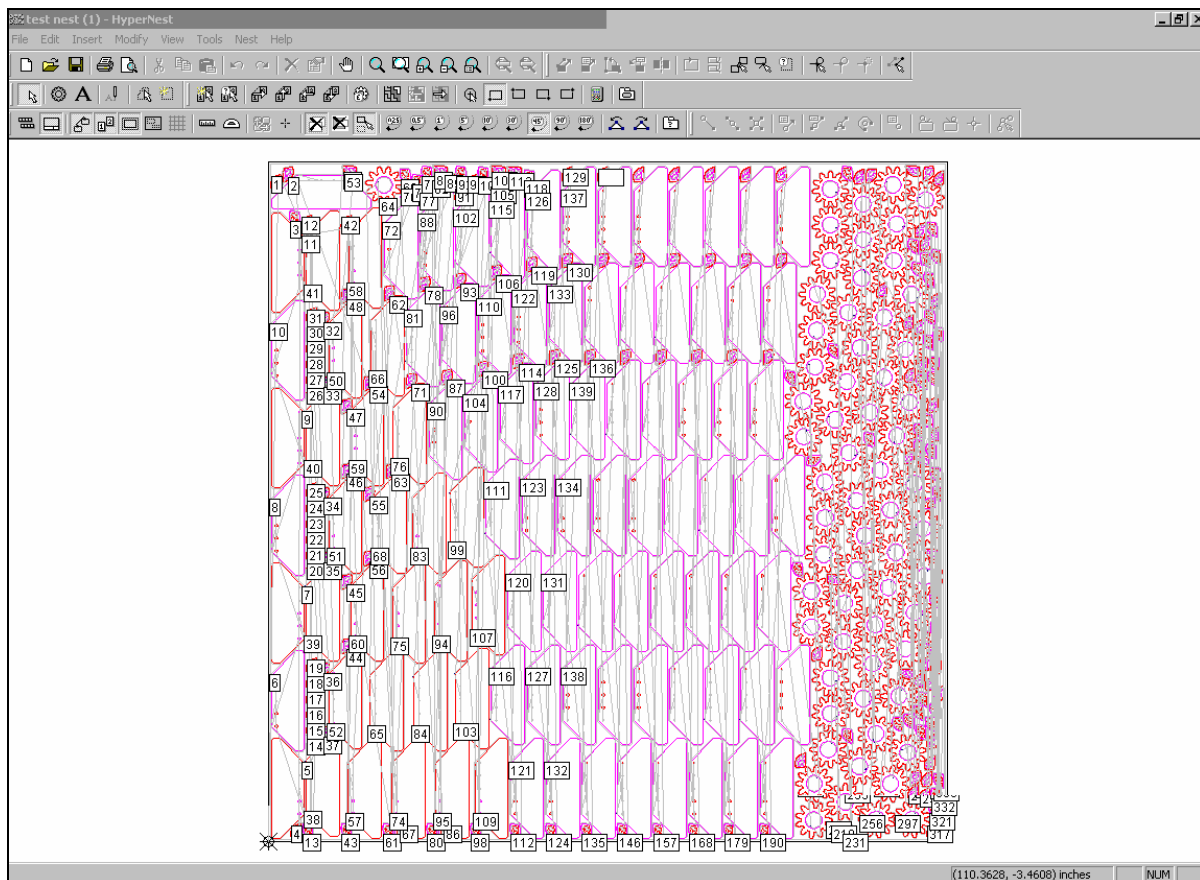
## HyperNEST®

HyperNEST® is a full featured, automatic true shape application designed to allow quick and simple nesting of profiles onto standard material sizes. With its advanced Graphical User Interface, HyperNEST® greatly improves the output of any shape cutting operation.

### HyperNEST® Features

HyperNEST® also lets mechanized end users achieve:

- Multi-torch nesting with a variable number of torches
- Bridging and chain cutting for common line cutting
- Extending consumable life
- "Move, drag and drop" manual interactive nesting
- Viewing and modifying of multiple sheets at the same time
- Multiple nesting scenarios for optimizing plate use and process cutting time
- Use of Wild Card parts to optimize plate utilization
- Automatic off-cut generation
- Built in Help functions



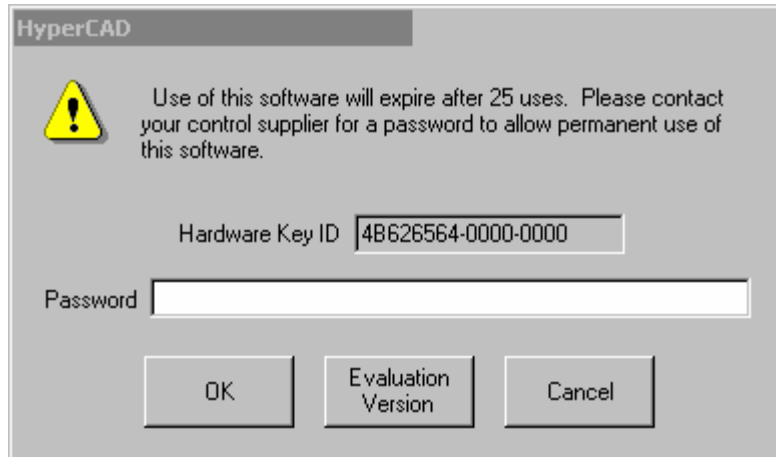
This feature is offered as a limited use trial version. Please contact your control vendor for information on enabling unlimited use of this feature. This package may be used on the CNC equipped with mouse and PC keyboard or offline on a PC.

### Evaluation Timer

Trail version software will prompt the user with a notification of the number of “uses” left at each launch. To enable unlimited use, a password would be provided by the control vendor.

To launch the trial software, select the Evaluation Version.

Example:

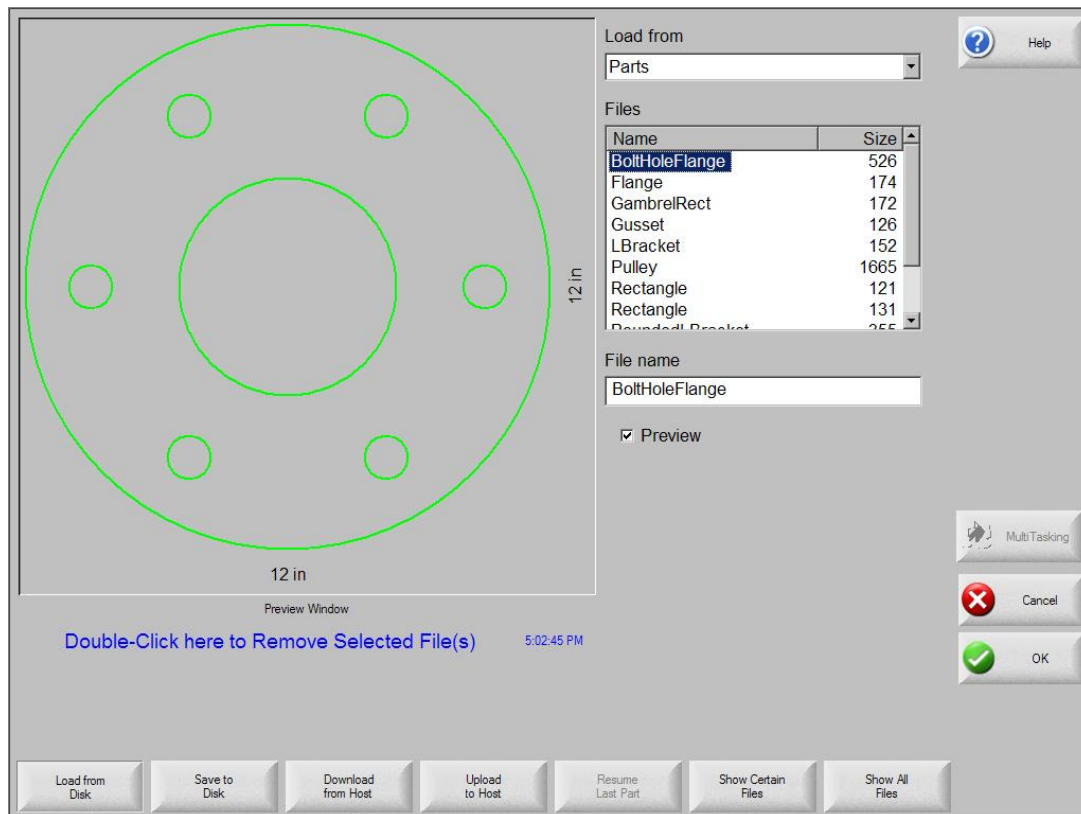




# Section 5: Files

## Load from Disk

The following screen is used to load a part from a diskette, USB memory stick or the hard drive. Once all the parameters below are set, press ENTER on the keyboard to load the part.



### Load from

The Load from list selects whether you load from the diskette, USB memory stick or from a directory on the hard disk. To add or remove a directory, double click on the touch screen where indicated.

Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add or remove new directory use the + or – key.

### Files

The Files list box is a list of all the files that are in the Load from directory that can be loaded from the disk.

Keypad operation: To scroll through different files, use the ↑, ↓, PAGE UP and PAGE DOWN keys on the keyboard. To remove a file, use the - key on the keyboard. To select multiple files to load, highlight the first file selection, then use the ↑ and ↓ keys while pressing the shift key to highlight the remaining files. **Note:** Multiple file selection is only available if loading from the Diskette or USB memory stick to the hard drive.

**File name/Diskette file name**

The File name /Diskette file name is the name of the file to load from disk/diskette/memory stick. To remove a file, highlight the file name and double click on the touch screen where indicated.

Keypad operation: To remove using a keyboard, use the – key.

**Preview**

When checked, the Preview checkbox allows the file that is selected in the Files list box to be previewed.

**Load to**

The Load to list selects whether you load to the current part or to a directory on the hard disk. To add or remove a directory, double click on the touch screen where indicated.

Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add a new directory, use the + key on the keyboard. To remove a directory, use the - key on the keyboard.

**Note:** This selection is only available if loading from the Diskette or USB memory stick.

**Hard drive file name**

The Hard drive file name is the name that you are giving the file you are loading on the hard drive.

**Note:** This selection is only available if loading from the Diskette or USB memory stick.

**Resume Last Part**

The Resume Last Part soft key will be visible when the Rush Job Interrupt or Automated Power Loss Recovery feature is in use. These features allow the user to pause the current part program and retain the part and current position information. This then allows the user to load and execute another part program and return to the original part using the Resume Last Part soft key.

**Show Certain Files**

This soft key allows the operator to search the selected folder for specific part files by using wildcard type search tools. Both the asterisk (\*) and question mark (?) can be used.

Keypad operation: To input the asterisk when using a keyboard, press the left shift key (purple) and the backspace key. To input the question mark, press the right shift key (blue) and the backspace key.

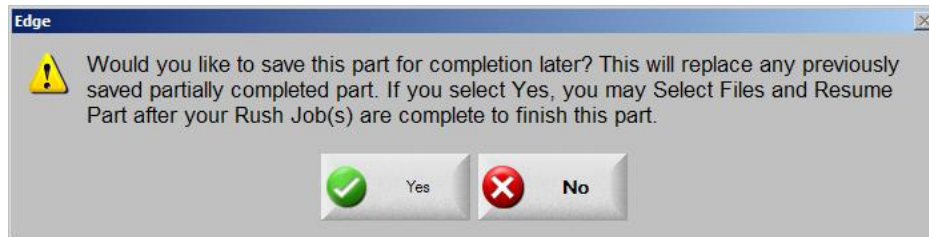
**Show All Files**

This will allow the operator to switch from the selected “certain files” to viewing all files with the predetermined file extensions.

## Resume Last Part Features

### Rush Job Interrupt

Rush Job Interrupt allows the user to pause the current part program and retain the part and current position information. When at the Pause screen, press the Cancel key. A prompt will appear on screen to ask the user if they wish to save the part information for later use.



If the user selects YES, the Resume Last Part button will be viewable at the Files Screen. The user can then load and execute another part program and later return to the original part using the Resume Last Part soft key. The part program and position will be resumed.

### Automated Power Loss Recovery

The Automated Power loss recovery uses the Resume Last Part feature similar to the Rush Job Interrupt. However, the Machine must be "Homed" to ensure proper positioning prior to resuming the part.

This feature may also be used in the event of an "Overtravel" or similar fault.

## Save to Disk

The following screen is used to save a part to a diskette, USB memory stick or the hard drive. Once all the parameters below are set, press OK to save the part.

Save to: Diskette

Diskette file: Nest1

Save From: NESTED PARTS

Name	Size
Nest1	13929
Nest2	15851
Nest3	19960
Nest4	50342
Nest5	41837
Nest6	53620
Nest7	1320

Hard drive file name: Nest1

☒ Preview

Double-Click here to Remove Selected File(s) 5:03:25 PM

Buttons: Load from Disk, Save to Disk, Download from Host, Upload to Host, Resume Last Part, Save Log to Disk

### Save to

The Save to list selects whether you save to the diskette, USB memory or to a directory on the hard disk. To add or remove a directory, double click on the touch screen where indicated.

Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add a new directory, use the + key on the keyboard. To remove a directory, use the - key on the keyboard.

### File name/Diskette file name

The File name /Diskette file name is the name that you are giving the file you are loading on the disk.

### Save Original Text

Selecting the Save Original Text option will save the part to disk in its original programming format.

**Note:** This selection is not available if saving to the Diskette or USB memory stick from the hard drive.

### Save from

The Save from list selects whether you save from the current part or from a directory on the hard disk. To add or remove a directory, double click on the touch screen where indicated.

Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add a new directory, use the + key on the keyboard. To remove a directory, use the - key on the keyboard.

**Note:** This selection is only available if saving to the Diskette or USB memory stick from the hard drive.



**Files**

The Files list box is a list of all the files that are in the Load from directory that can be loaded from the disk. To remove a file, double click on the touch screen where indicated.

Keypad operation: To scroll through different files, use the ↑, ↓, PAGE UP and PAGE DOWN keys on the keyboard. To remove a file, use the - key on the keyboard. To select multiple files to load, highlight the first file selection, then use the ↑ and ↓ keys while pressing the shift key to highlight the remaining files. **Note:** This selection and Multiple file selection are only available if saving to the Diskette or USB memory stick from the hard drive.

**Hard drive file name**

The Hard drive file name is the name that you are giving to the file loading on the hard drive. **Note:** This selection is only available if saving to the Diskette or USB memory stick from the hard drive.

**Preview**

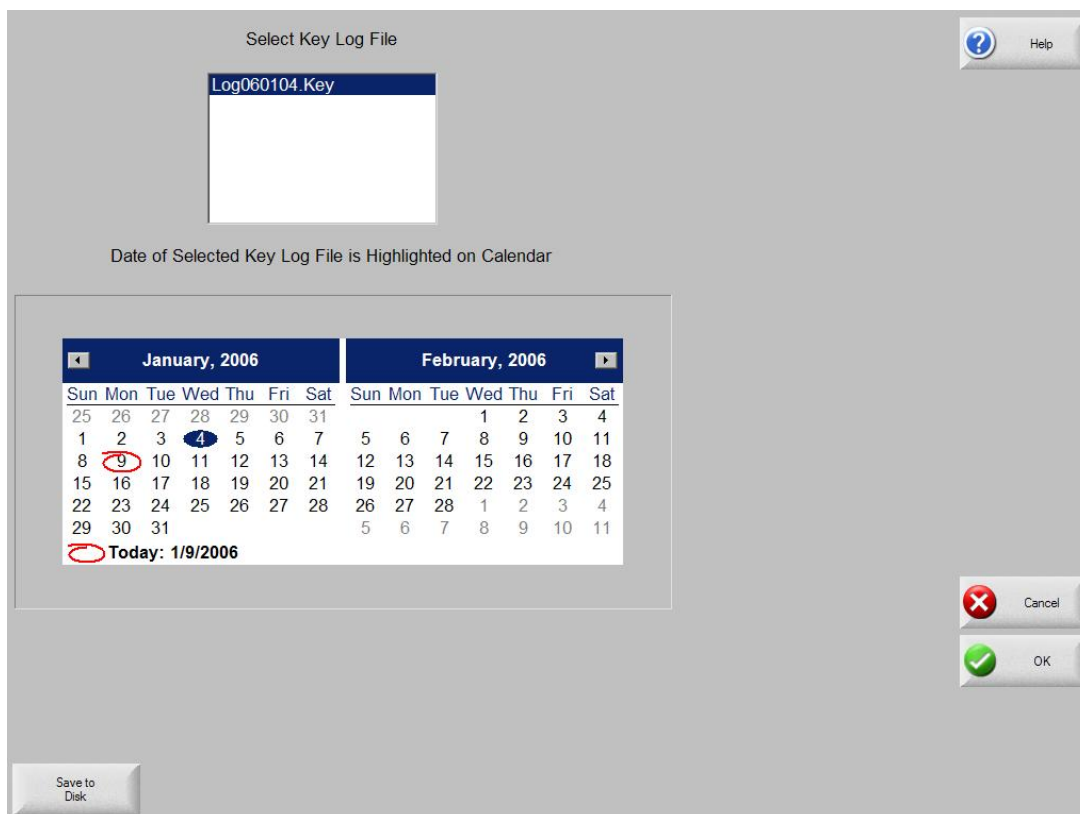
When checked, the Preview checkbox allows the file that is selected in the Files listbox to be previewed.

Keypad operation: To check or uncheck the box, press the SPACE key on the keyboard when the Preview box has the focus. **Note:** This selection is only available if saving to the Diskette or USB memory stick from the hard drive.

### Save KeyLog to Disk

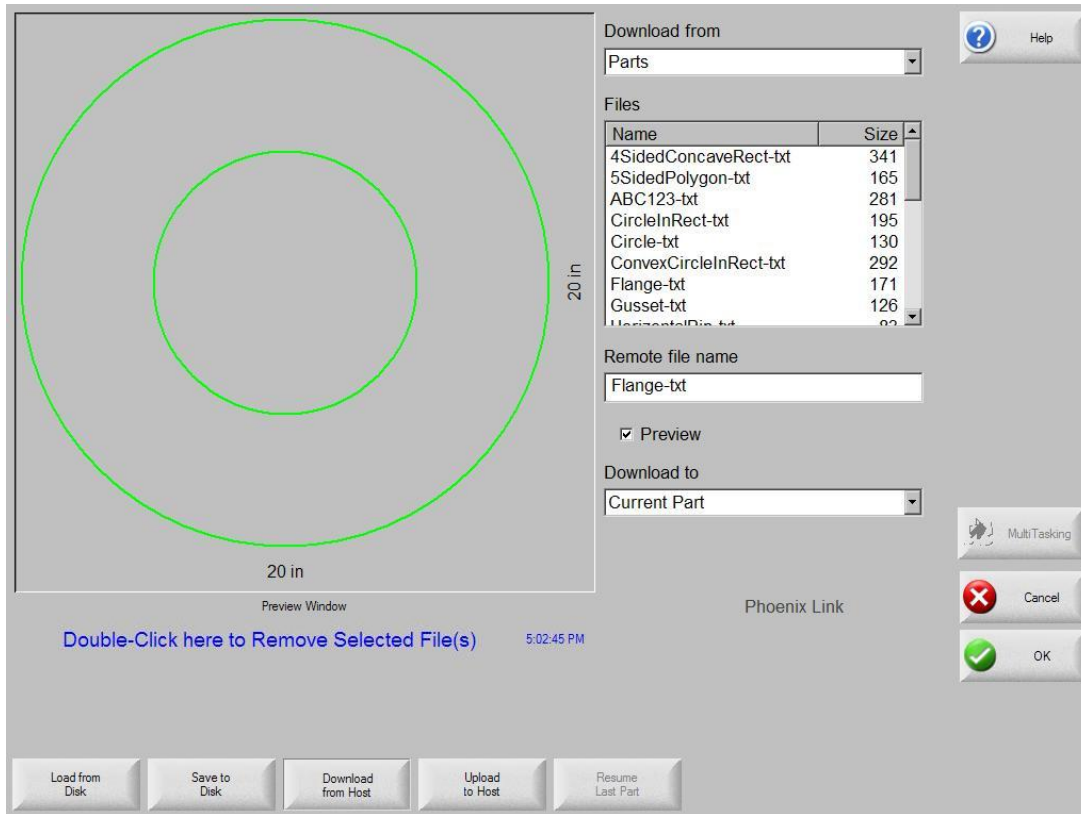
This feature is enabled when the Key Logging feature has been selected in setups.

The Key Logging feature is used as a troubleshooting diagnostic tool to record key presses made at the control during operation. When enabled, all key presses and application faults will be saved to a daily log file that may be sent to the control manufacturer for evaluation.



## Download from Host

The following screen is used to download a part from a host computer. Once all the parameters below are set, press ENTER on the keyboard to start the download.



### Download from

The Download from list selects which directory on the host computer you want to download from. To add or remove a directory, double click on the touch screen where indicated.

Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add or remove new directory use the + or – key.

### Files

The Files list box contains a list of all the files in the Download from directory that can be downloaded from the host computer.

Keypad operation: To scroll through different files, use the ↑, ↓, PAGE UP and PAGE DOWN keys on the keyboard. To remove a file, use the - key on the keyboard. To select multiple files to download, highlight the first file selection, then use the ↑ and ↓ keys while pressing the shift key to highlight the remaining files.

### Remote file name

The Remote file name is the name of the remote file that will be downloaded from the host computer.

**Preview**

When checked, the Preview checkbox allows the file that is selected in the Files list box to be previewed. To check or uncheck the box, press the SPACE key on the keyboard when the Preview box has the focus.

**Download to**

The Download to list selects whether you download to the current part in memory or to a directory on the local hard disk. If you select one of the local directories, the following field is available: Local file name.

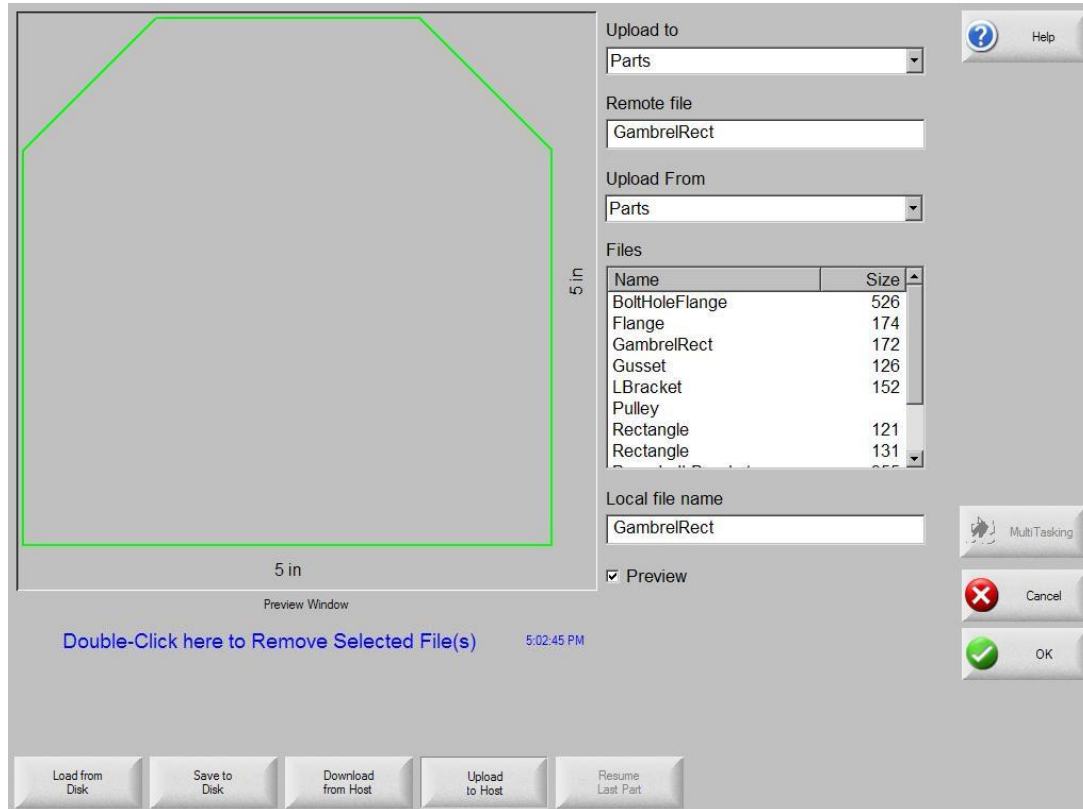
Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add a new directory, use the + key on the keyboard. To remove a directory, use the - key on the keyboard.

**Local file name**

The Local file name is the user defined file name assigned to the file that is being downloading to the hard drive.

## Upload to Host

The following screen is used to upload a part to a host computer. Once all the parameters below are set, press ENTER on the keyboard to start the upload.



### Upload to

The Upload to list selects which directory on the host computer that you want to upload to. To add or remove a directory, double click on the touch screen where indicated.

Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add a new directory, use the + key on the keyboard. To remove a directory, use the - key on the keyboard.

### Remote file name

The Remote file name is the name you want the file that you are uploading to have on the host computer.

### Upload from

The Upload from list selects whether you upload the current part in memory or from a directory on the local hard disk. If you select one of the local directories, the following fields are available: Files, Local file name and Preview. To add or remove a directory, double click on the touch screen where indicated.

Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add a new directory, use the + key on the keyboard. To remove a directory, use the - key on the keyboard.

**Note:** This selection is only available if saving to the Diskette or USB memory stick from the hard drive.

**Files**

The Files list box contains a list of all the files that are in the Upload from directory that can be uploaded to the host computer. To remove a file, double click on the touch screen where indicated.

Keypad operation: To scroll through different files, use the ↑, ↓, PAGE UP and PAGE DOWN keys on the keyboard. To remove a file, use the - key on the keyboard. To select multiple files to upload, highlight the first file selection, then use the ↑ and ↓ keys while pressing the shift key to highlight the remaining files.

**Local file name**

The Local file name is the name of the local file that will be uploaded to the host computer.

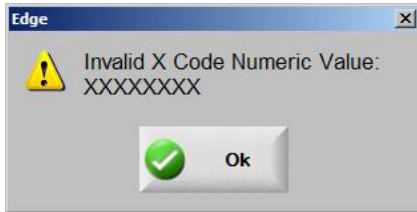
**Preview**

When checked, the Preview checkbox allows the file that is selected in the Files list box to be previewed.

Keypad operation: To check or uncheck the box, press the SPACE key on the keyboard when the Preview box has the focus.

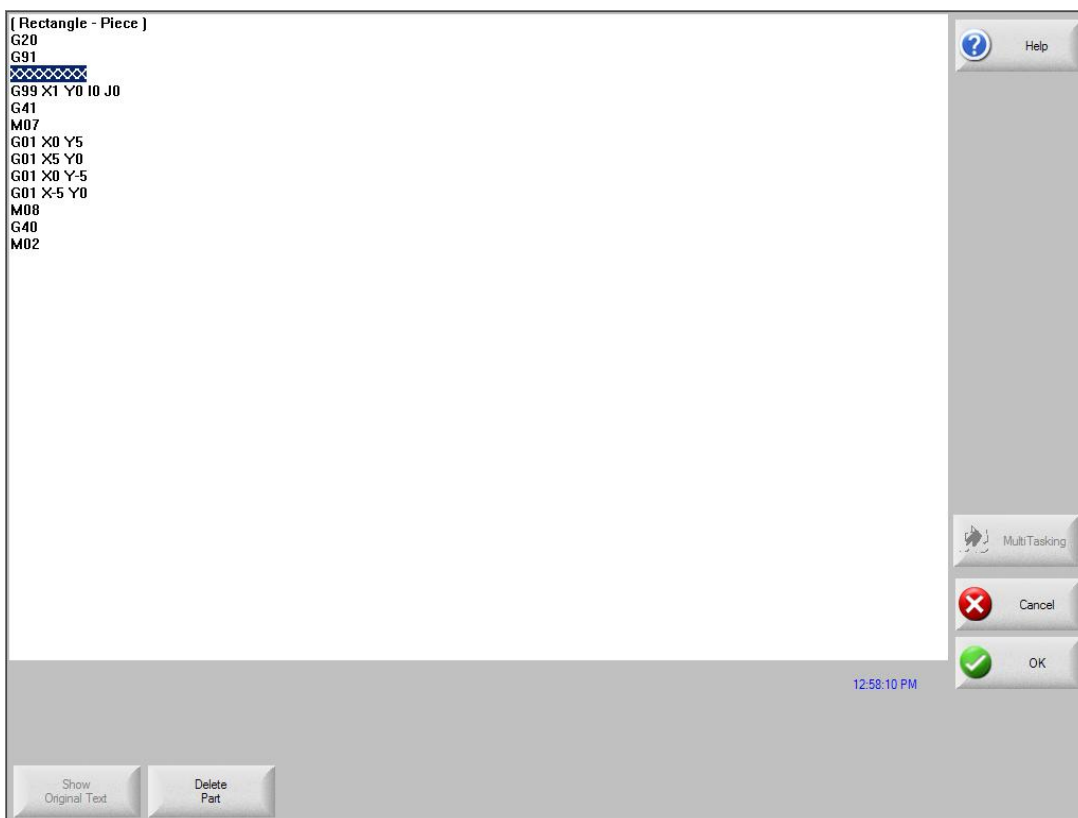
## Loading Of Invalid Files

While loading the desired part file, the control will check the part for proper geometry and other similar errors. If a part is loaded in which an error is detected, a message will be posted on screen to indicate the error.



If the part is attempted to be loaded, the control will display the invalid line of code from the text editor.

**Example:** In the following example, the line of code "XXXXXXX" is invalid and has been highlighted for easy detection. The part file may be corrected using the text editor. After the invalid code has been corrected, the control will attempt to translate the part file and will indicate any additional invalid codes.







# Section 6: Library Shapes

## Shape Manager Simple Shapes

Double click on the shape to edit for use.



## Library Shape Setup

Enter in the desired dimensions to obtain the part you require. There will be a small Help icon in the lower right hand corner of the display to indicate which parameter the control is looking for. The current parameter being entered will be highlighted with a yellow arrow.

While you are entering in parameters, the control is performing some general checks for proper geometries. Should the control encounter a set of parameters that do not make sense, a warning message will be displayed and the parameters in conflict will be highlighted in red. **Note:** It is not possible to check for all improper geometries and it may still be possible to enter in a part that does not make geometric sense.

As you are entering dimensional parameters, the control is automatically drawing your new shape with the entered values. This is extremely useful in providing a visual check of the shape that has been entered.

## Lead-In, Lead-Out

Enter the appropriate value to ensure proper piercing (Lead-in) and gas bleed-off (Lead-out) to obtain optimum cut quality.

The location for the lead-in and lead-out is fixed, but can be changed by using the ShapeWizard and then saving the new shape to disk. *Note:* the Rectangle simple shape has the ability to select the location for the lead-in and lead-out by pressing the SPACE key. Pressing the SPACE key will move the lead-in and lead-out to the next available location.

**Overburn Length**

Overburn is used for parts that contain a circular element. Overburn specifies arc length that the torch will travel past the circle closure point. The dimension entered is the chord length of the overburn-arc.

In some cases it is desirable to have an underburn length. For these conditions, simply enter a negative number for the Overburn length.

**Part Type**

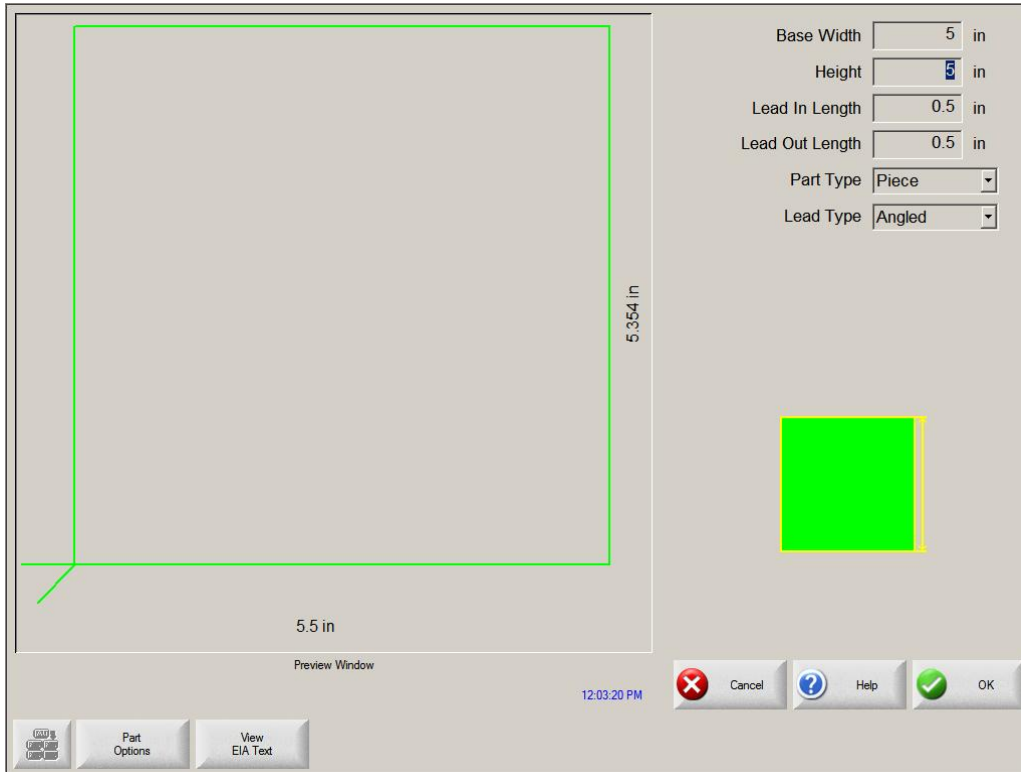
Selects whether you want to cut the part as a separate Piece or a Hole in a larger part. Chain cut options are available for simple shapes that have external cut paths.

**Lead Type**

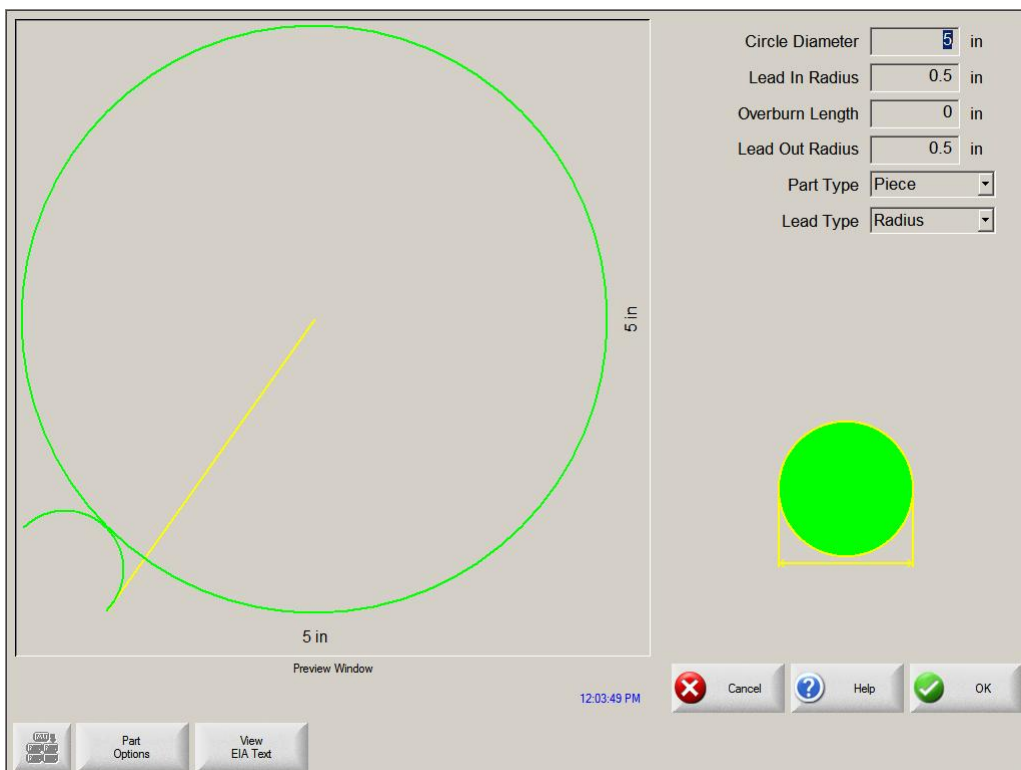
Depending on the shape selected, the style of the Lead in/ Lead out may be selected as Radius, Lock or Straight line. The Lock style Lead-in creates greater stability for the part and is only available if the Part Type is set to Piece. Lead-in selection is only available if the Part Type is set to Piece or Hole.

*Note:* Some shapes will offer drop down fields to increase options with additional parameters.

## Rectangle

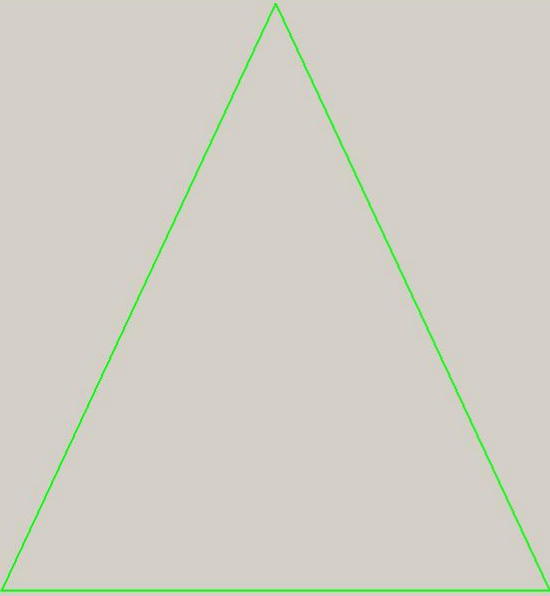


## Circle



## Triangle

Preview Window



4 in

4.289 in

Base Width  in


Left Side Angle  deg

Right Side Angle  deg

Lead In Length  in

Lead Out Length  in

Part Type



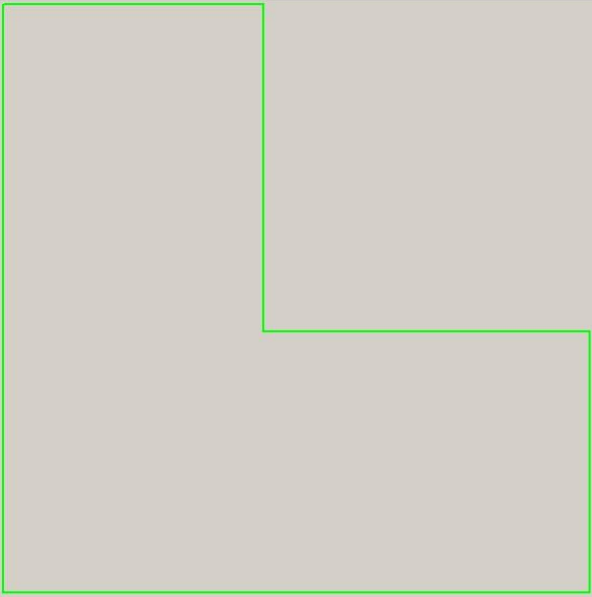
12:04:11 PM

Cancel Help OK

Part Options View EIA Text

## L-Bracket

Preview Window



2.25 in

2.25 in

Base Width  in

Top Width  in

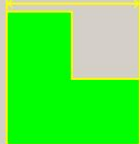
Overall Height  in

Side Height  in

Lead In Length  in

Lead Out Length  in

Part Type

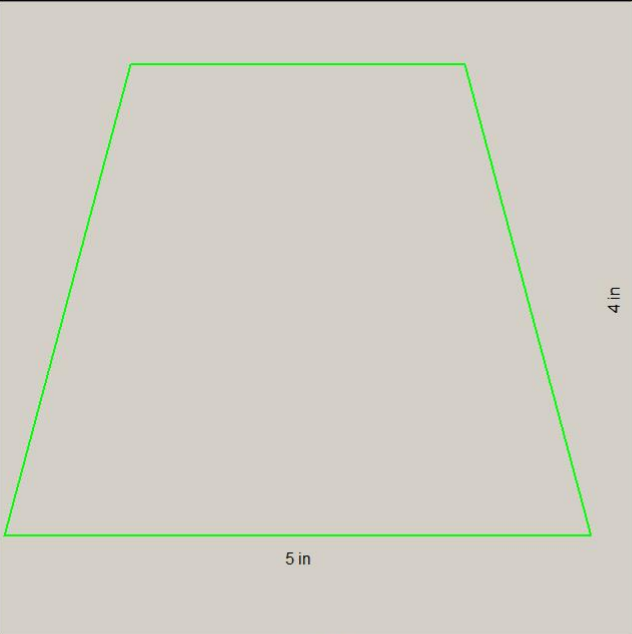


12:04:32 PM

Cancel Help OK

Part Options View EIA Text

## Trapezoid



5 in

4 in

Preview Window

12:04:55 PM

Base Width  in

Height  in

Left Side Angle  deg

Right Side Angle  deg

Lead In Length  in

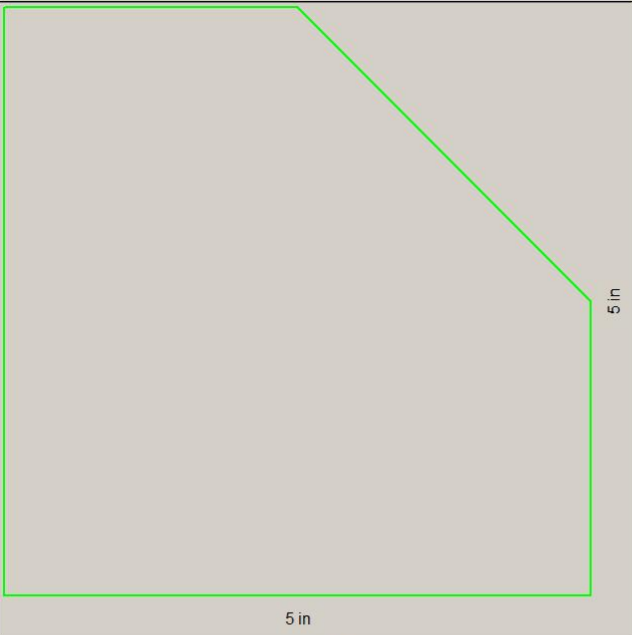
Lead Out Length  in

Part Type

Cancel Help OK

Part Options View EIA Text

## Slant Rectangle



5 in

5 in

Preview Window

12:05:22 PM

Base Width  in

Top Width  in

Overall Height  in

Side Height  in

Lead In Length  in

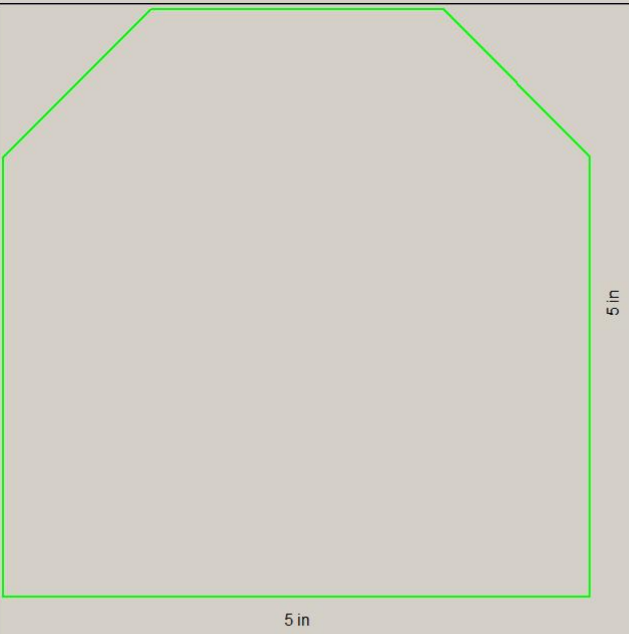
Lead Out Length  in

Part Type

Cancel Help OK

Part Options View EIA Text

## Gambrel Rectangle



A diagram of a Gambrel Rectangle (octagon) with a base width of 5 in and an overall height of 5 in. The top corners are cut off at a 45-degree angle, with a slant width of 1.25 in on each side. The side height is 3.75 in. The diagram is shown in a preview window with a green outline.

Base Width  in  
Left Slant Width  in  
Right Slant Width  in  
Overall Height  in  
Side Height  in  
Lead In Length  in  
Lead Out Length  in  
Part Type

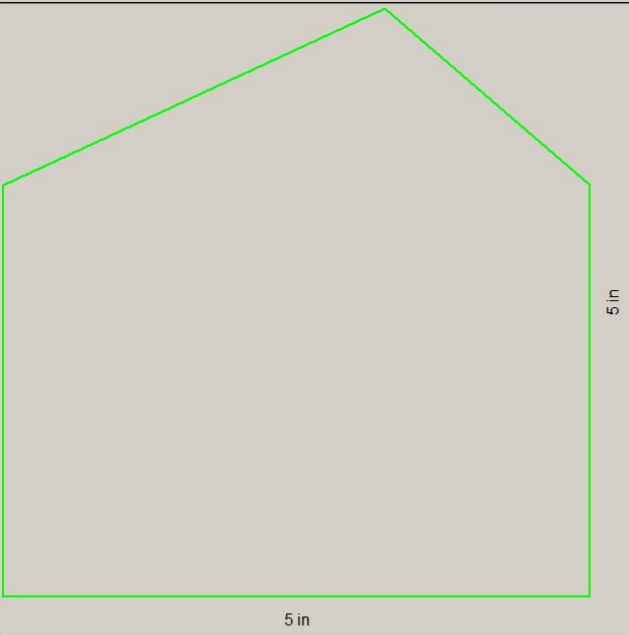
Preview Window

12:05:57 PM

Cancel Help OK

Part Options View EIA Text

## Roofed Rectangle



A diagram of a Roofed Rectangle with a base width of 5 in and an overall height of 5 in. The top corners are cut off at a 45-degree angle, with a slant width of 3.25 in on each side. The side height is 3.5 in. The diagram is shown in a preview window with a green outline.

Base Width  in  
Left Slant Width  in  
Overall Height  in  
Side Height  in  
Lead In Length  in  
Lead Out Length  in  
Part Type

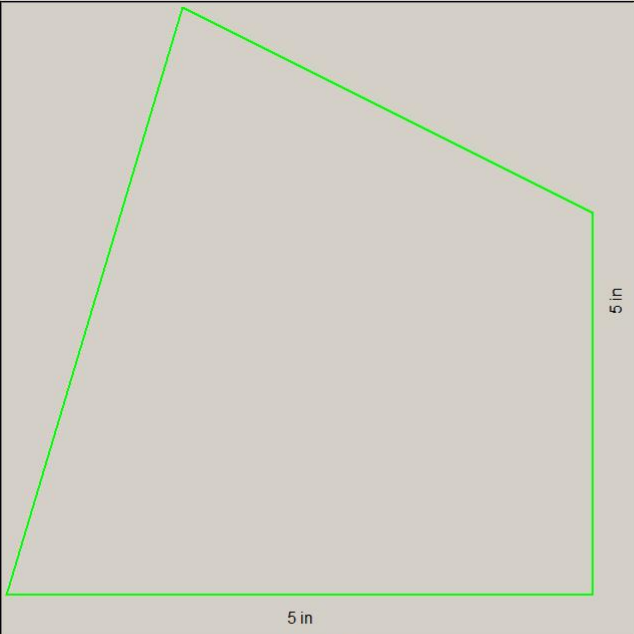
Preview Window

12:06:11 PM

Cancel Help OK

Part Options View EIA Text

4 Sided Polygon



5 in

5 in

Preview Window

Base Width  in

Left Slant Width  in

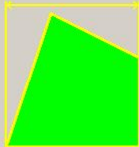
Overall Height  in

Side Height  in

Lead In Length  in

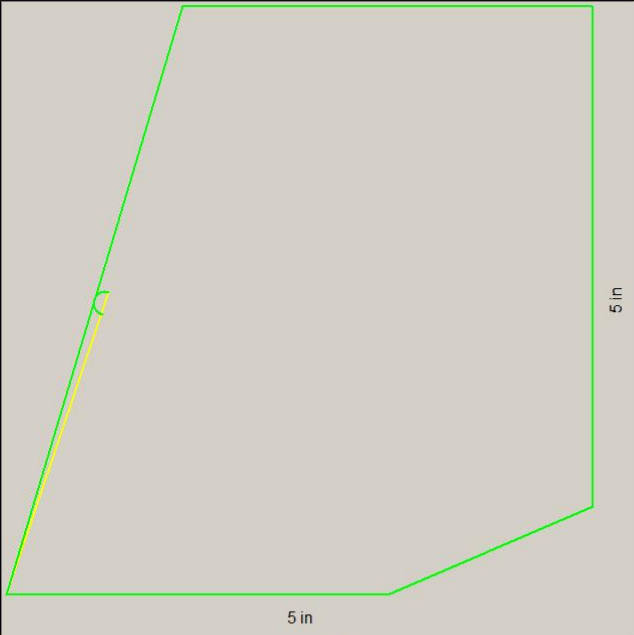
Lead Out Length  in

Part Type



12:06:25 PM

5 Sided Polygon



5 in

5 in

Preview Window

Overall Width  in

Left Slant Width  in

Right Slant Width  in

Overall Height  in

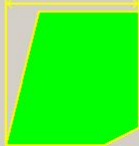
Side Height  in

Lead In Radius  in

Lead Out Radius  in

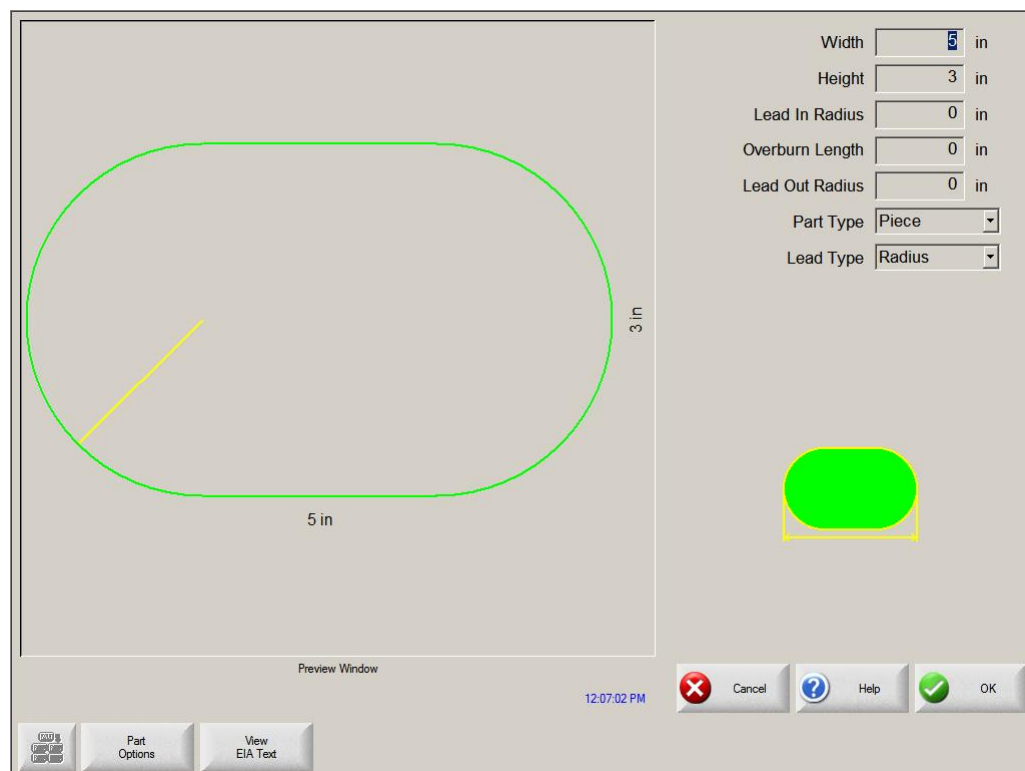
Part Type

Lead Type



12:06:47 PM

## Oval



The interface for creating an oval part. The main preview window shows a green oval with a width of 5 in and a height of 3 in. A yellow leader line points to the center. To the right, the parameter list includes:

- Width: 5 in
- Height: 3 in
- Lead In Radius: 0 in
- Overburn Length: 0 in
- Lead Out Radius: 0 in
- Part Type: Piece
- Lead Type: Radius

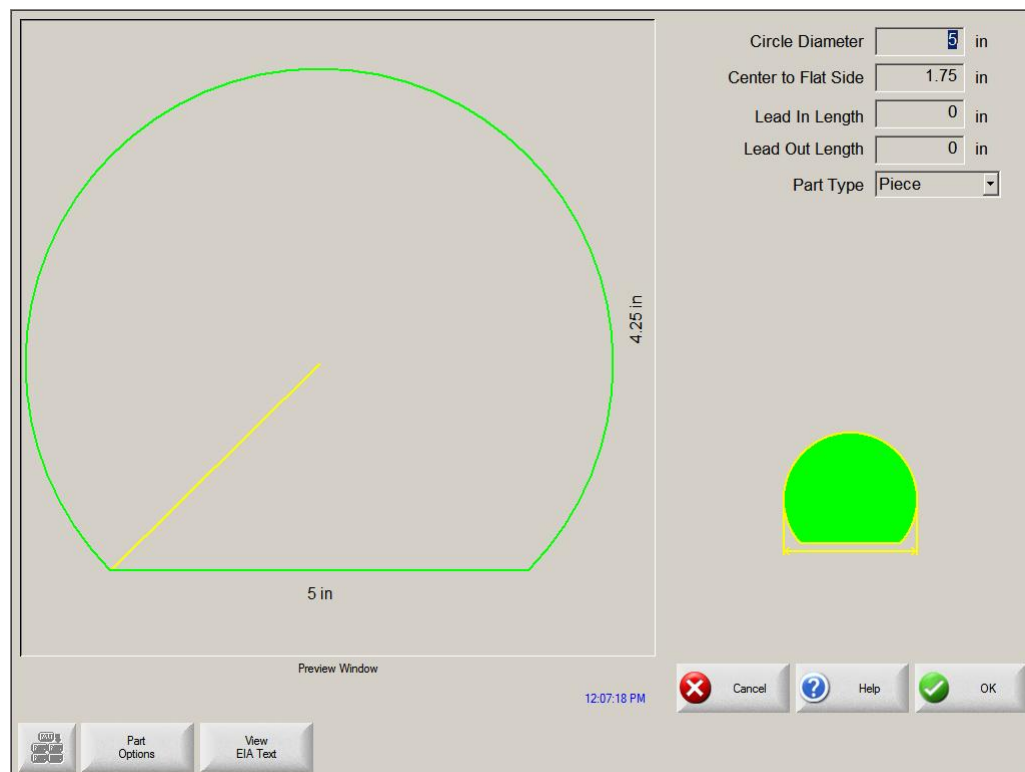
Below the parameters is a small green oval icon. At the bottom, there are buttons for 'Part Options', 'View EIA Text', 'Cancel', 'Help', and 'OK'. The timestamp '12:07:02 PM' is displayed.

Preview Window

12:07:02 PM

Part Options View EIA Text Cancel Help OK

## Circle w/ Flat Side



The interface for creating a circle with a flat side. The main preview window shows a green circle with a diameter of 5 in and a flat side of 4.25 in. A yellow leader line points to the center. To the right, the parameter list includes:

- Circle Diameter: 5 in
- Center to Flat Side: 1.75 in
- Lead In Length: 0 in
- Lead Out Length: 0 in
- Part Type: Piece

Below the parameters is a small green circle icon with a flat side. At the bottom, there are buttons for 'Part Options', 'View EIA Text', 'Cancel', 'Help', and 'OK'. The timestamp '12:07:18 PM' is displayed.

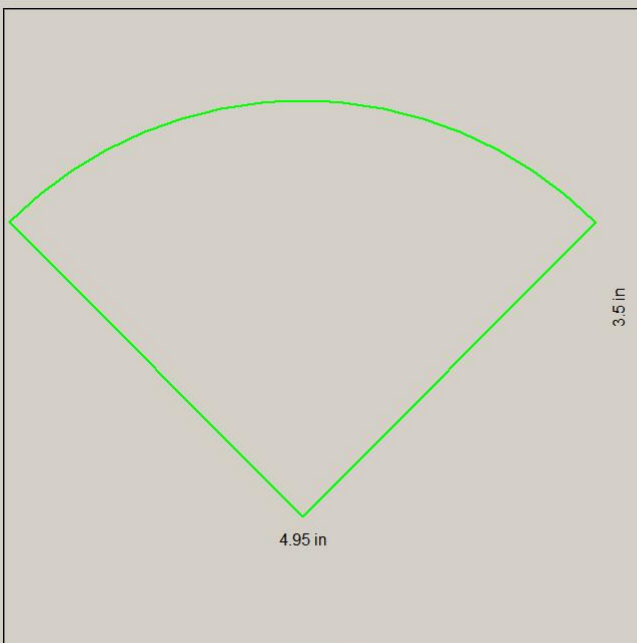
Preview Window

12:07:18 PM

Part Options View EIA Text Cancel Help OK



Circle Slice



4.95 in

3.5 in

Preview Window

Circle Radius  in

Slice Angle  deg

Lead In Length  in

Lead Out Length  in

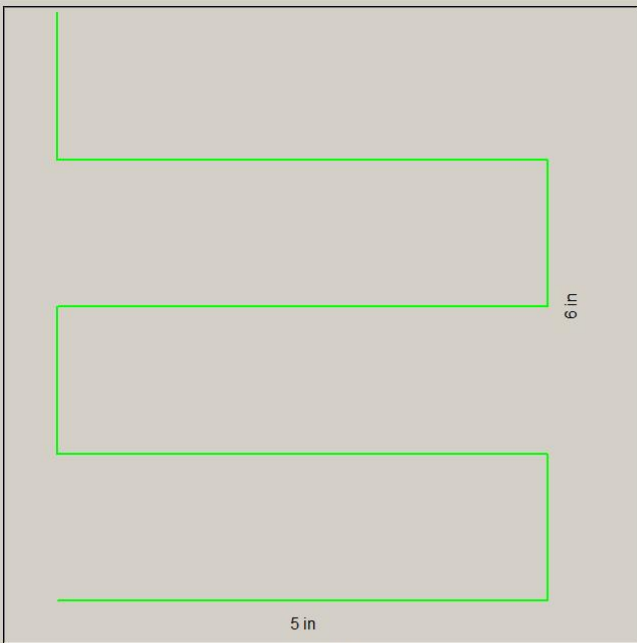
Part Type



12:07:47 PM

Cancel Help OK

Straight Slots



5 in

6 in

Preview Window

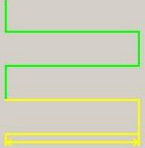
Slot Width  in

Slot Height  in

Number of Slots

Lead In Length  in

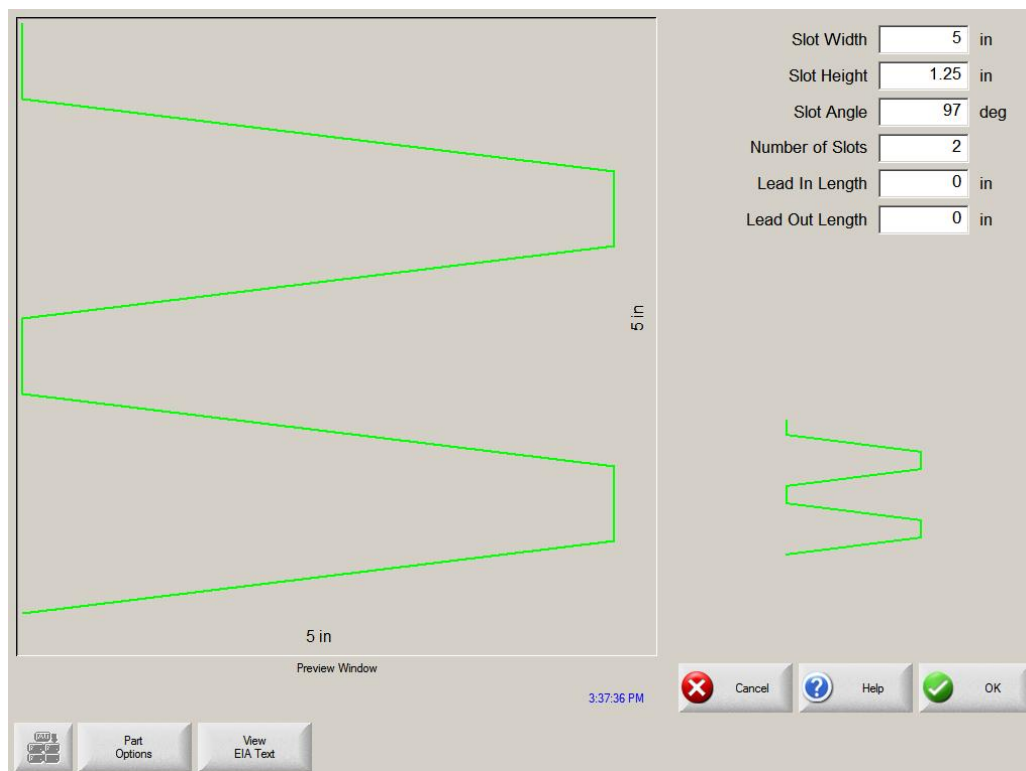
Lead Out Length  in



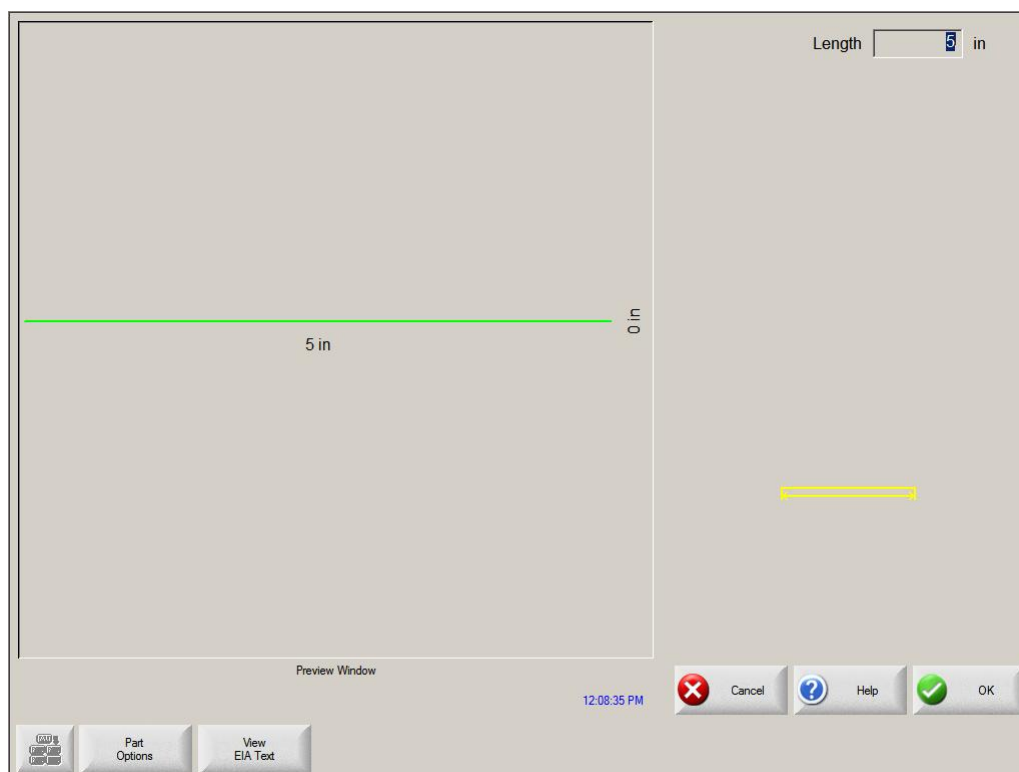
12:08:00 PM

Cancel Help OK

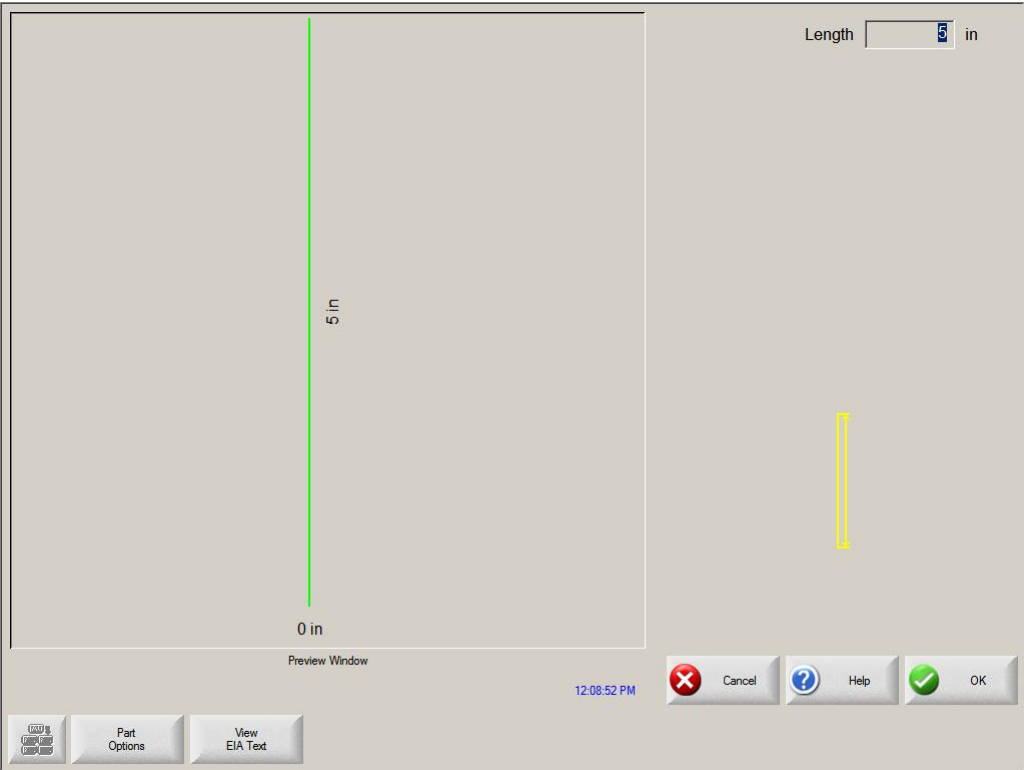
## Angled Slots



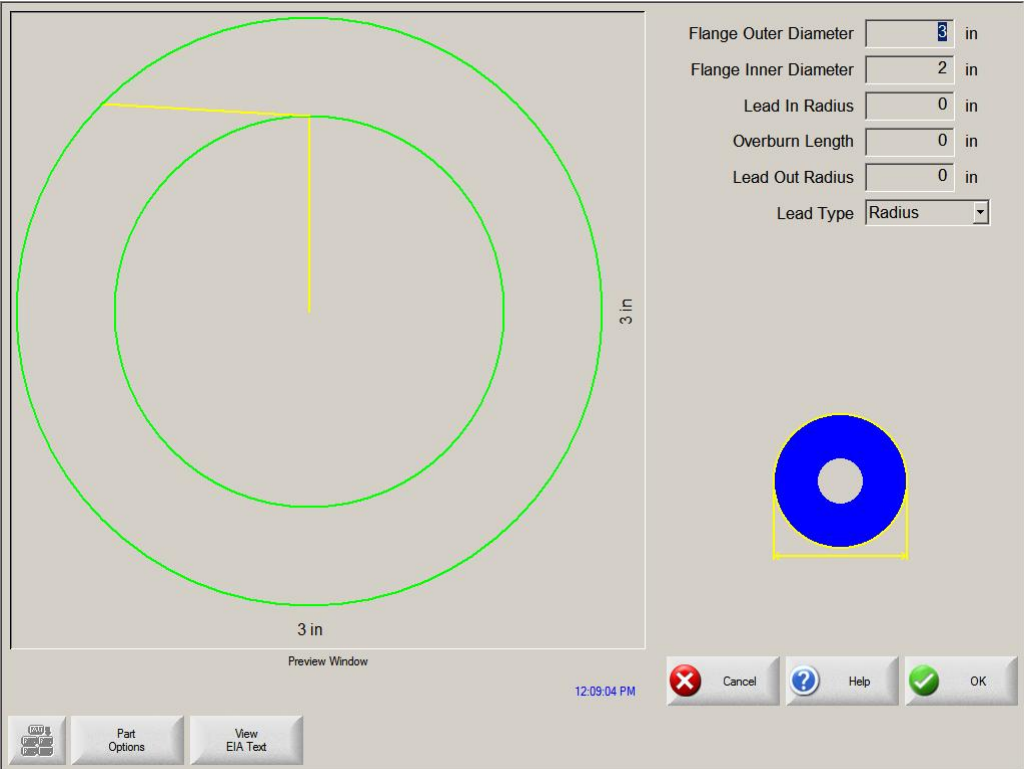
## Horizontal Rip



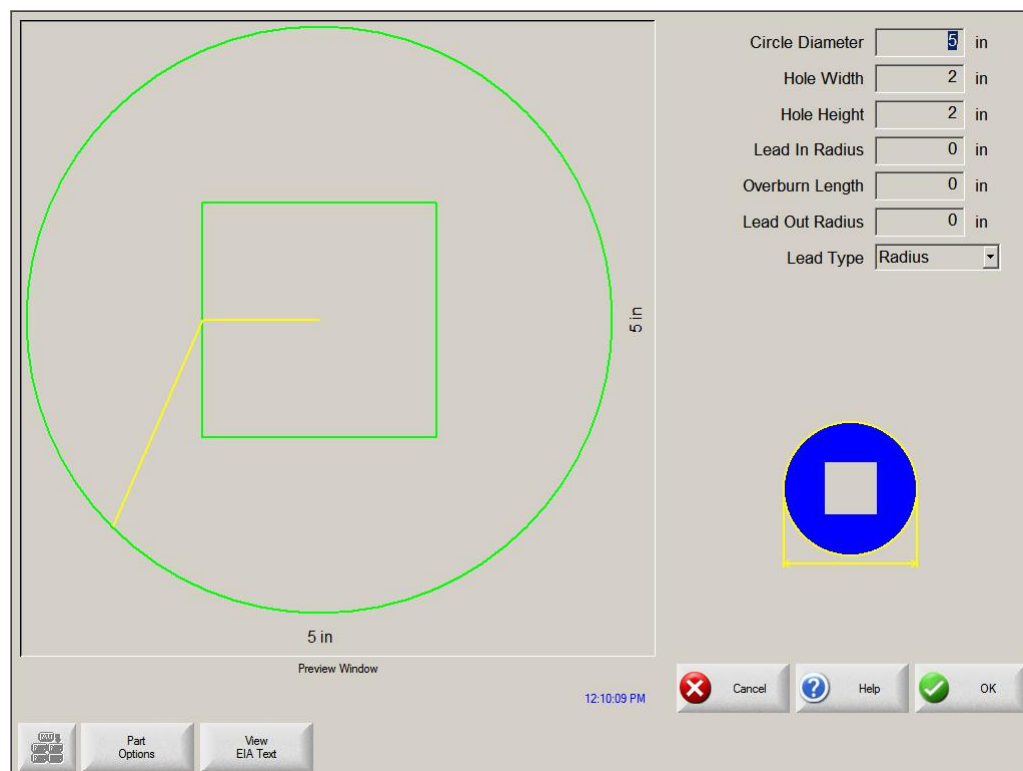
Vertical Rip



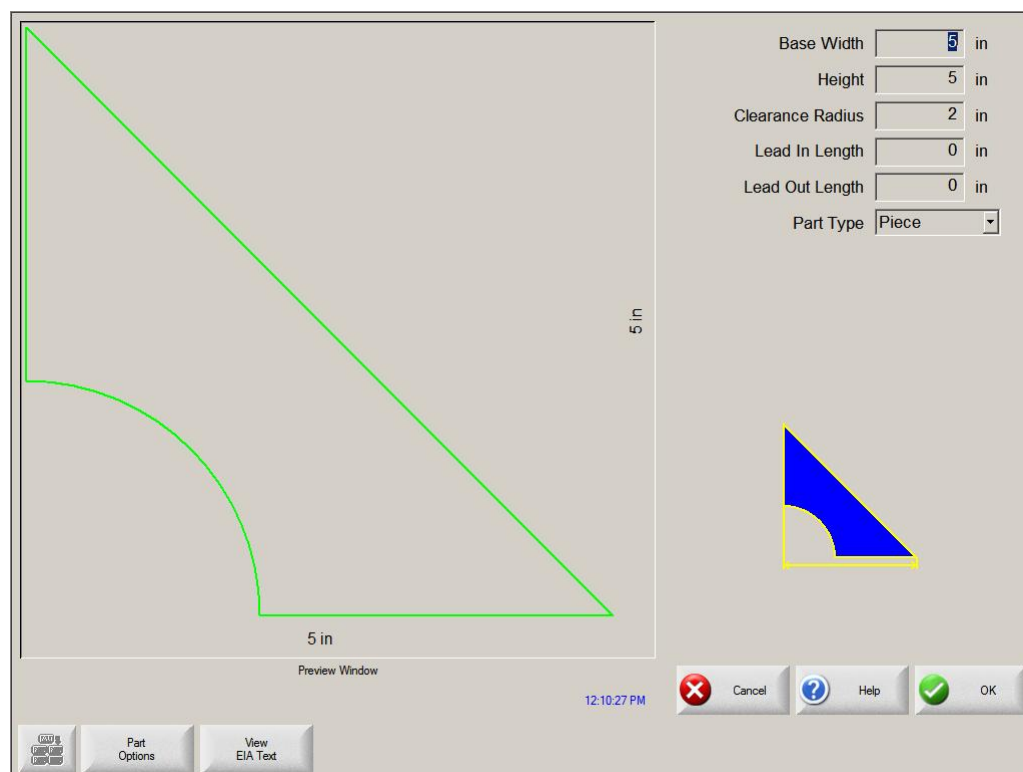
Flange



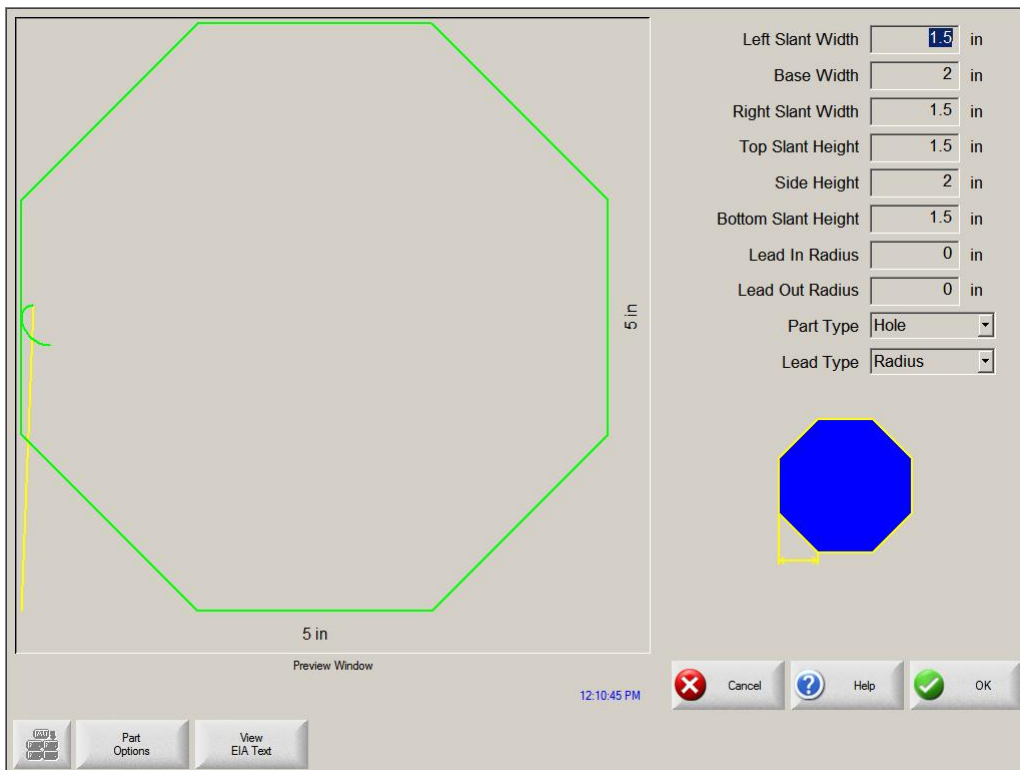
## Circle w/ Rectangular Hole



## Gusset



## 8 Sided



Preview Window

5 in

5 in

Left Slant Width  in

Base Width  in

Right Slant Width  in

Top Slant Height  in

Side Height  in

Bottom Slant Height  in

Lead In Radius  in

Lead Out Radius  in

Part Type

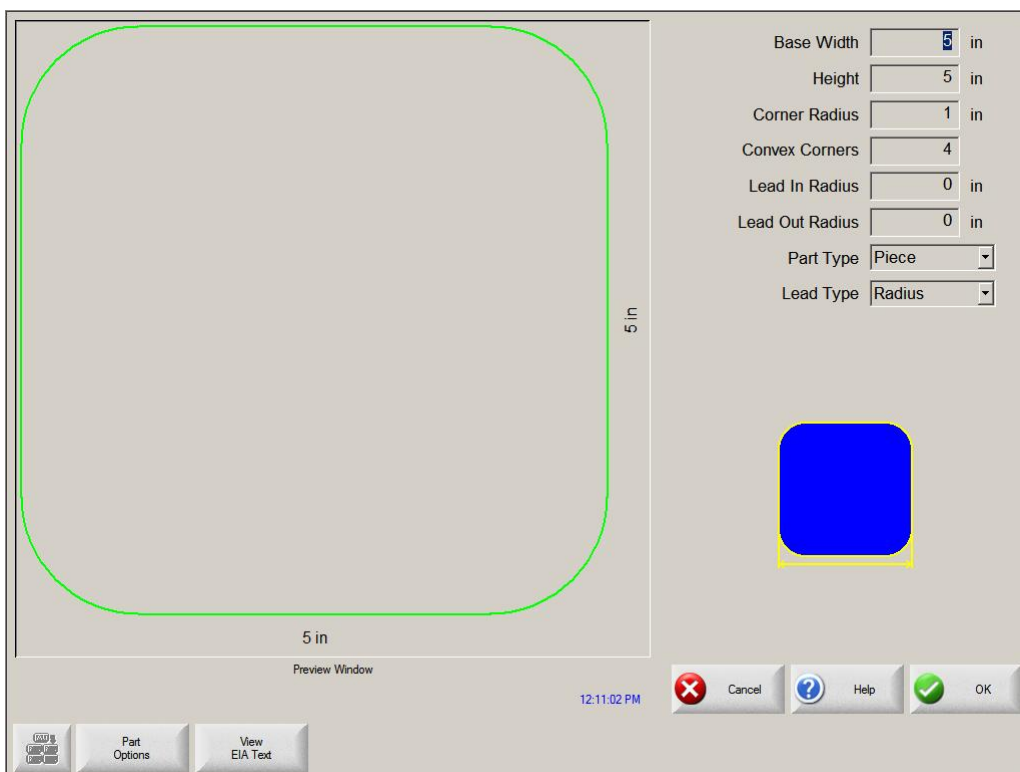
Lead Type

12:10:45 PM

Cancel Help OK

Part Options View EIA Text

## Rectangle w/ Convex Corners



Preview Window

5 in

5 in

Base Width  in

Height  in

Corner Radius  in

Convex Corners

Lead In Radius  in

Lead Out Radius  in

Part Type

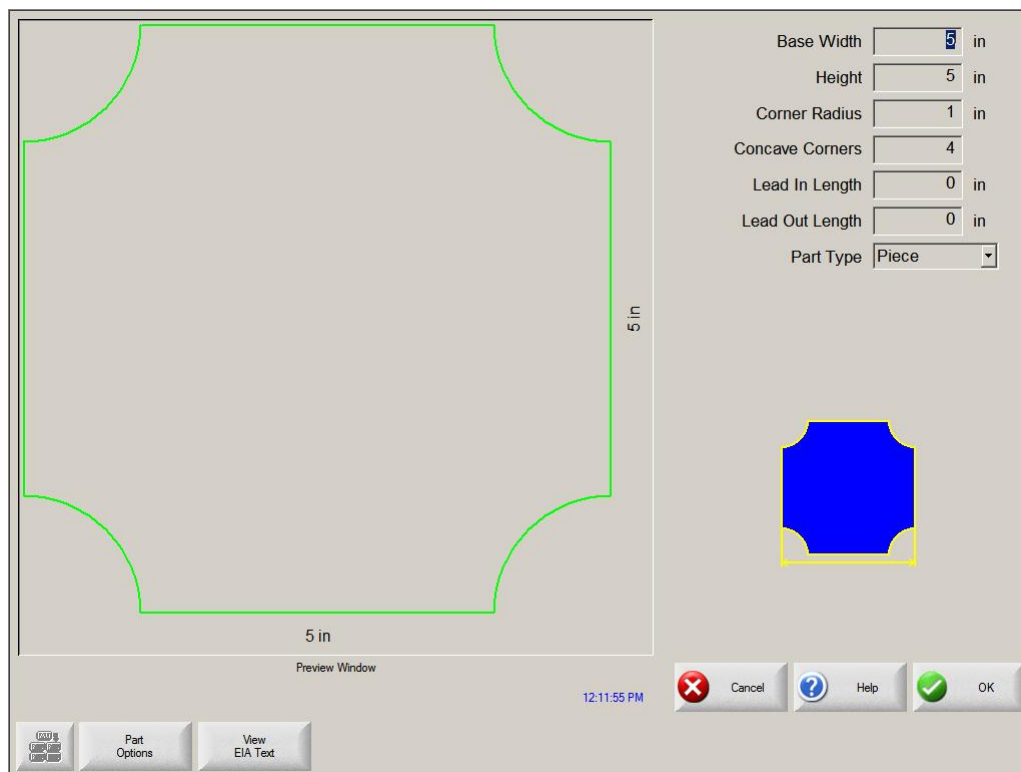
Lead Type

12:11:02 PM

Cancel Help OK

Part Options View EIA Text

## Rectangle w/ Concave Corners



Base Width  in

Height  in

Corner Radius  in

Concave Corners

Lead In Length  in

Lead Out Length  in

Part Type

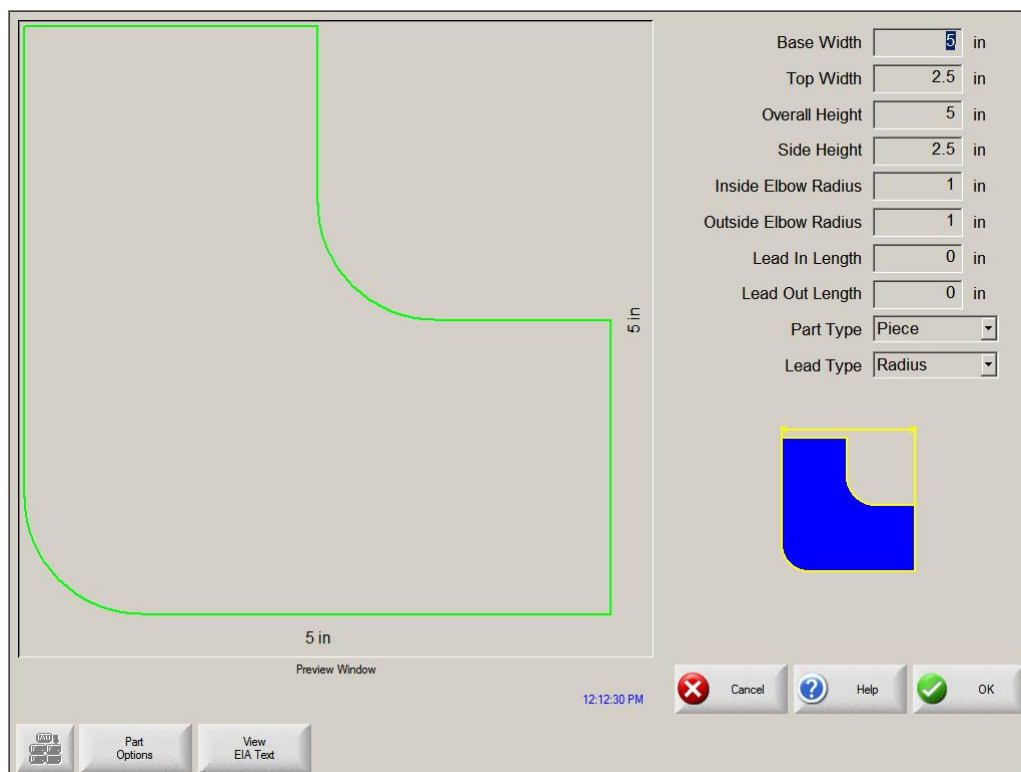
Preview Window

12:11:55 PM

Cancel Help OK

Part Options View EIA Text

## L-Bracket w/ Elbow Radii



Base Width  in

Top Width  in

Overall Height  in

Side Height  in

Inside Elbow Radius  in

Outside Elbow Radius  in

Lead In Length  in

Lead Out Length  in

Part Type

Lead Type

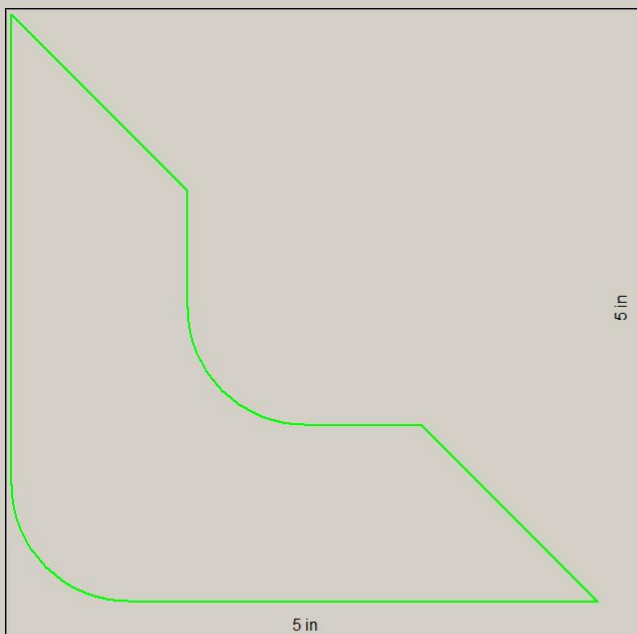
Preview Window

12:12:30 PM

Cancel Help OK

Part Options View EIA Text

## Slant L-Bracket w/ Elbow Radii



5 in

5 in

Preview Window

12:13:02 PM

Base Width  in

Top Width  in

Overall Height  in

Side Height  in

Inside Elbow Radius  in


Outside Elbow Radius  in




Lead In Length  in


Lead Out Length  in

Part Type

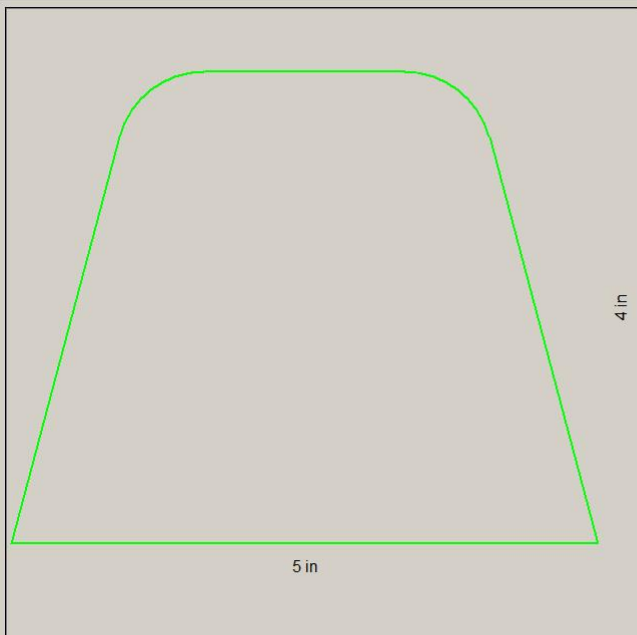
Lead Type



 Cancel  Help  OK

 Part Options View EIA Text

## Trapezoid w/ Convex Corners



4 in

5 in

Preview Window

12:14:25 PM

Base Width  in

Height  in

Left Side Angle  deg


Right Side Angle  deg




Corner Radius  in


Lead In Length  in

Lead Out Length  in

Part Type



 Cancel  Help  OK

 Part Options View EIA Text

## Flange Slice

Preview Window

2:19:46 PM

Flange Outer Radius  in

Flange Inner Radius  in

Slice Angle  deg

Lead In Length  in

Lead Out Length  in

Part Type

4.95 in

2.439 in

Part Options View EIA Text

Cancel Help OK

A green line diagram of a flange slice. It is a sector of an annulus with an outer radius of 3.5 in and an inner radius of 1.5 in. The slice angle is 90 degrees. The lead-in and lead-out lengths are both 0 in. The dimensions 4.95 in and 2.439 in are shown on the diagram.A blue 3D model of a flange slice, showing its curved shape and thickness.

## Elbow

Preview Window

2:23:42 PM

Elbow Outer Radius  in

Elbow Inner Radius  in

Elbow Angle  deg

End Length  in

Lead In Length  in

Lead Out Length  in

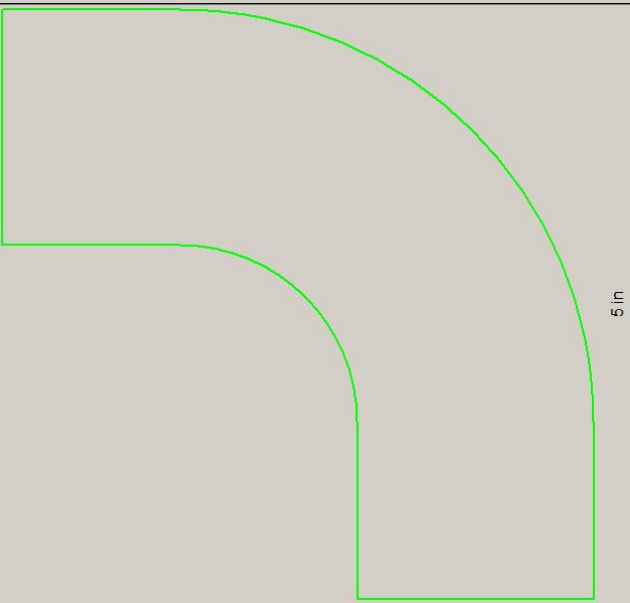

Part Type

5 in

5 in

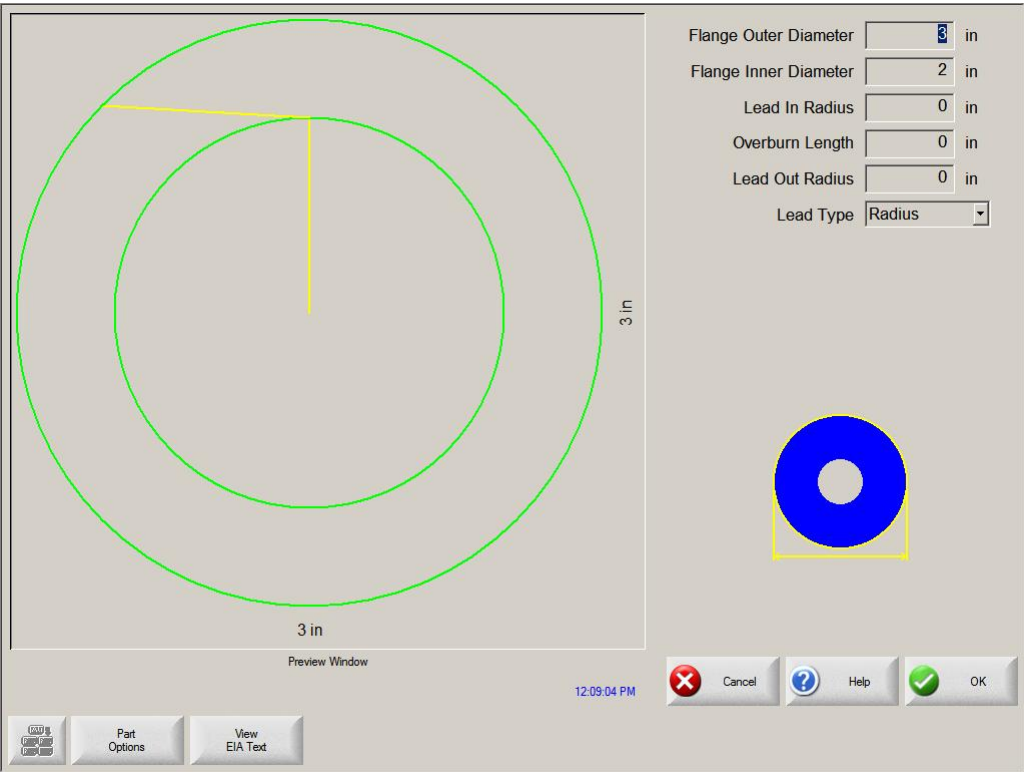
Part Options View EIA Text

Cancel Help OK

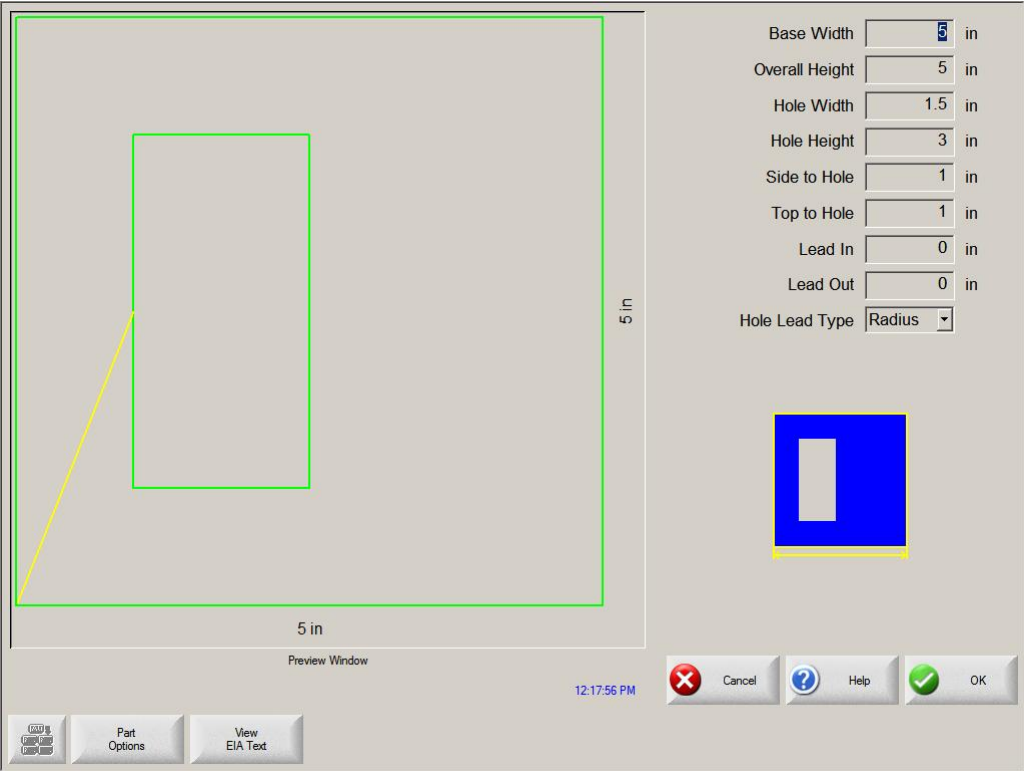
A green line diagram of an elbow. It is a 90-degree bend with an outer radius of 3.5 in and an inner radius of 1.5 in. The end length is 1.5 in. The lead-in and lead-out lengths are both 0 in. The dimensions 5 in and 5 in are shown on the diagram.A blue 3D model of an elbow, showing its curved shape and thickness.



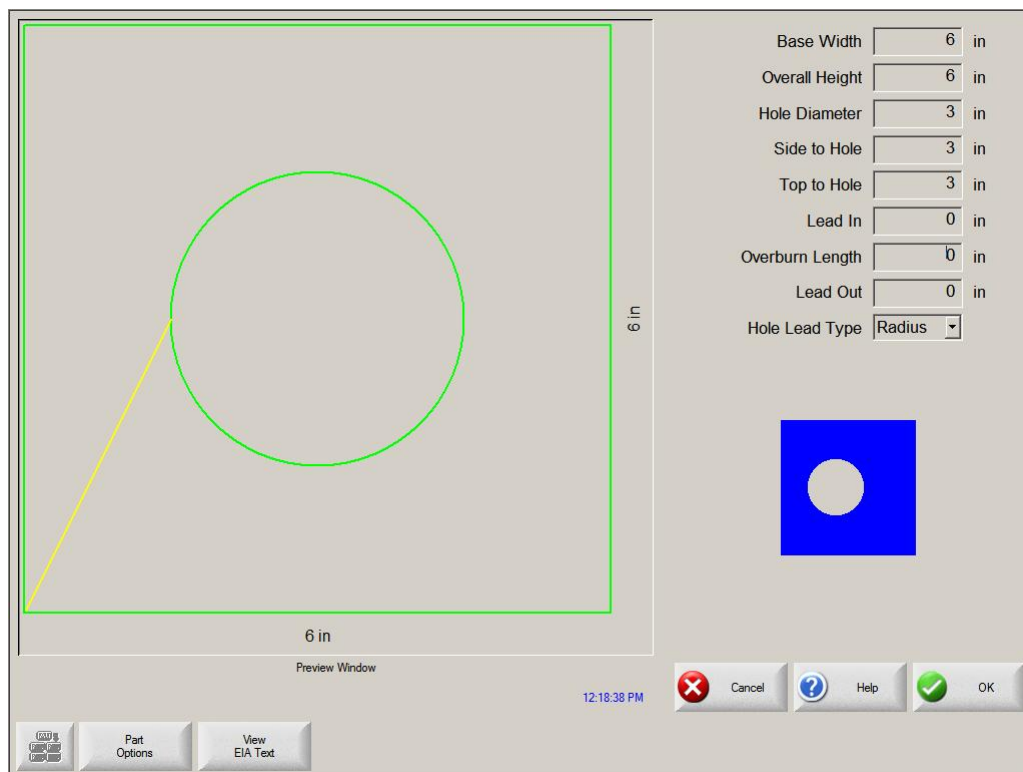
Flange Repair Ring



Rectangle w/ Rectangular Hole



## Rectangle w/ Circular Hole



Base Width  in

Overall Height  in

Hole Diameter  in

Side to Hole  in

Top to Hole  in

Lead In  in

Overburn Length  in

Lead Out  in

Hole Lead Type

6 in

6 in

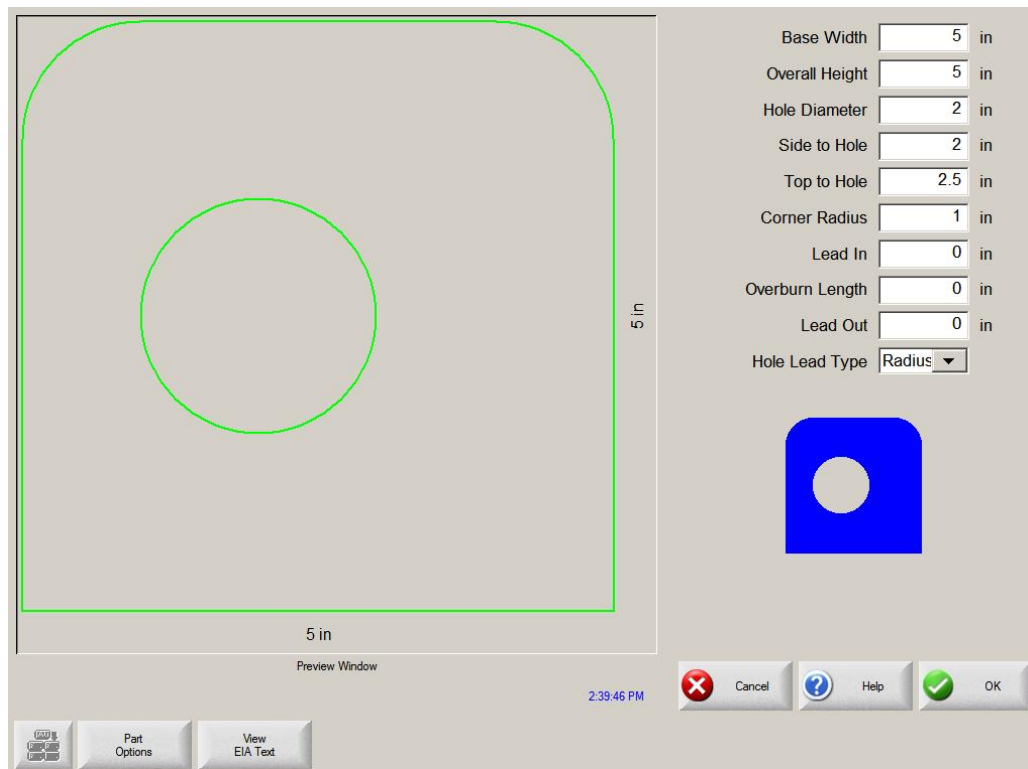
Preview Window

12:18:38 PM

Cancel Help OK

Part Options View EIA Text

## Rectangle w/ Circular Hole and Convex Corners



Base Width  in

Overall Height  in

Hole Diameter  in

Side to Hole  in

Top to Hole  in

Corner Radius  in

Lead In  in

Overburn Length  in

Lead Out  in

Hole Lead Type

5 in

5 in

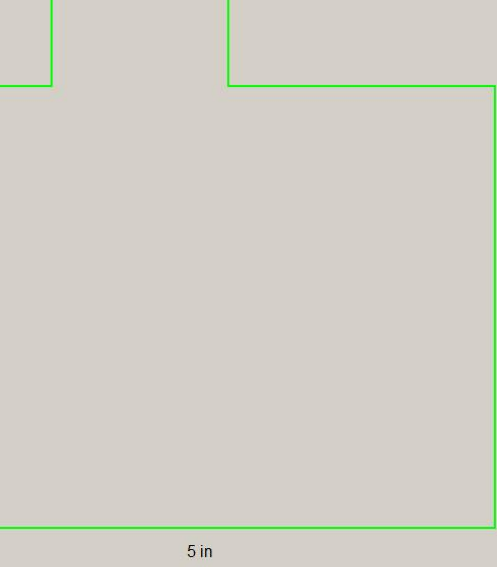
Preview Window

2:39:46 PM

Cancel Help OK

Part Options View EIA Text

## Rectangle w/ Tab



5 in

5 in

Tab to Left Side  in

Tab Width  in

Tab to Right Side  in

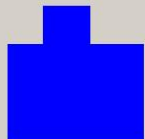
Tab Height  in

Overall Height  in

Lead In Length  in

Lead Out Length  in

Part Type  ▼




Preview Window

2:40:42 PM

Part Options View EIA Text

Cancel Help OK

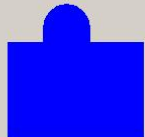
## Rectangle w/ Convex Tab



5 in

5 in


Tab to Left Side	1.25	in
Tab Width	1.5	in
Tab to Right Side	2.25	in
Tab Height	1.25	in
Overall Height	5	in
Convex Diameter	1.5	in
Lead In Length	0	in
Lead Out Length	0	in
Part Type	Piece	<span>▼</span>




Preview Window

2:41:47 PM

✖ Cancel
ℹ Help
✔ OK

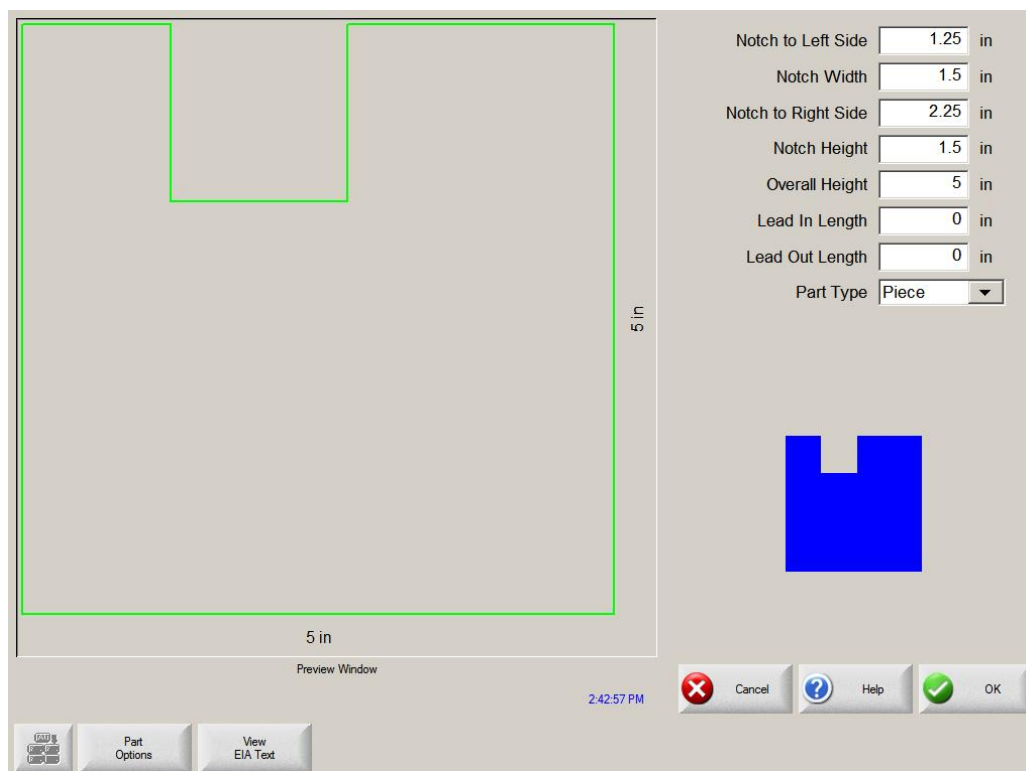


Part Options



View EIA Text

## Rectangle w/ Notch



Notch to Left Side  in

Notch Width  in

Notch to Right Side  in

Notch Height  in

Overall Height  in

Lead In Length  in

Lead Out Length  in

Part Type

5 in

5 in

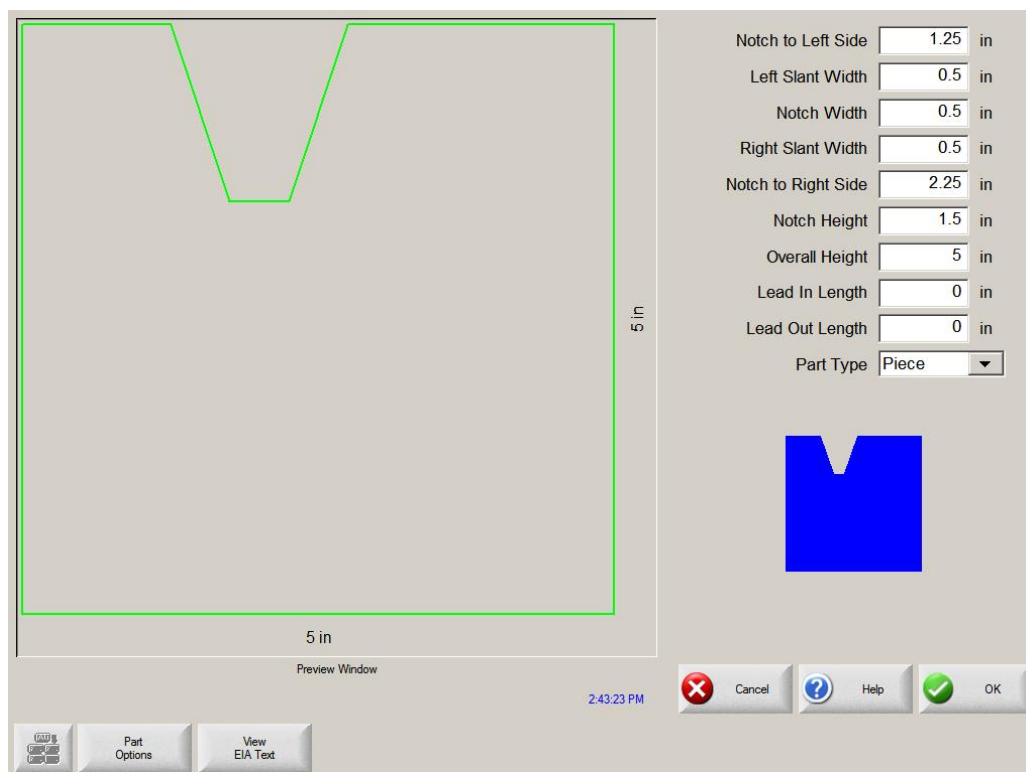
Preview Window

2:42:57 PM

Cancel Help OK

Part Options View EIA Text

## Rectangle w/ Slant Notch



Notch to Left Side  in

Left Slant Width  in

Notch Width  in

Right Slant Width  in

Notch to Right Side  in

Notch Height  in

Overall Height  in

Lead In Length  in

Lead Out Length  in

Part Type

5 in

5 in

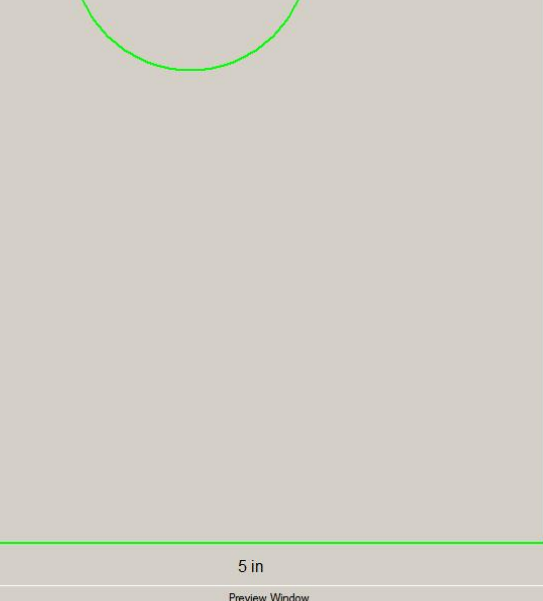
Preview Window

2:43:23 PM

Cancel Help OK


Part Options View EIA Text


## Rectangle w/ Radius Notch




	Radius to Left Side	<input type="text" value="1"/>	in
	Radius Diameter	<input type="text" value="2"/>	in
	Radius to Right Side	<input type="text" value="2"/>	in
	Height	<input type="text" value="5"/>	in
	Lead In Length	<input type="text" value="0"/>	in
	Lead Out Length	<input type="text" value="0"/>	in
	Part Type	<input type="text" value="Piece"/> ▼	

Preview Window


2:43:49 PM





 Cancel
  Help
  OK

## Convex Rectangle



5 in

5 in

Base Width  in


Side Height  in


Convex Diameter  in


Lead In Length  in

Lead Out Length  in

Part Type Piece ▼







Preview Window

2:44:15 PM

Part Options

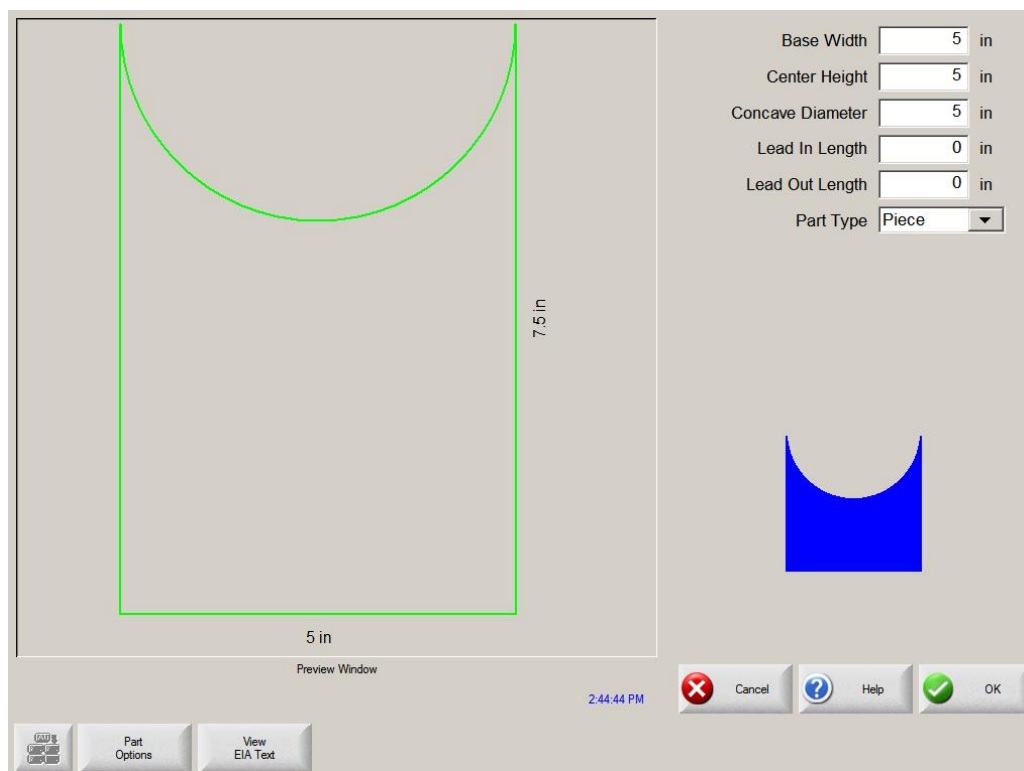
View EIA Text

Cancel

Help

OK

## Concave Rectangle



The interface for creating a Concave Rectangle. It features a large preview window on the left showing a green outline of a rectangle with a concave top. The base width is labeled as 5 in and the height as 7.5 in. To the right of the preview window is a panel with input fields for various parameters. Below these fields is a small blue 3D model of the part. At the bottom of the interface are buttons for 'Part Options', 'View EIA Text', 'Cancel', 'Help', and 'OK', along with a timestamp of 2:44:44 PM.

Base Width  in

Center Height  in

Concave Diameter  in

Lead In Length  in

Lead Out Length  in

Part Type

5 in

7.5 in

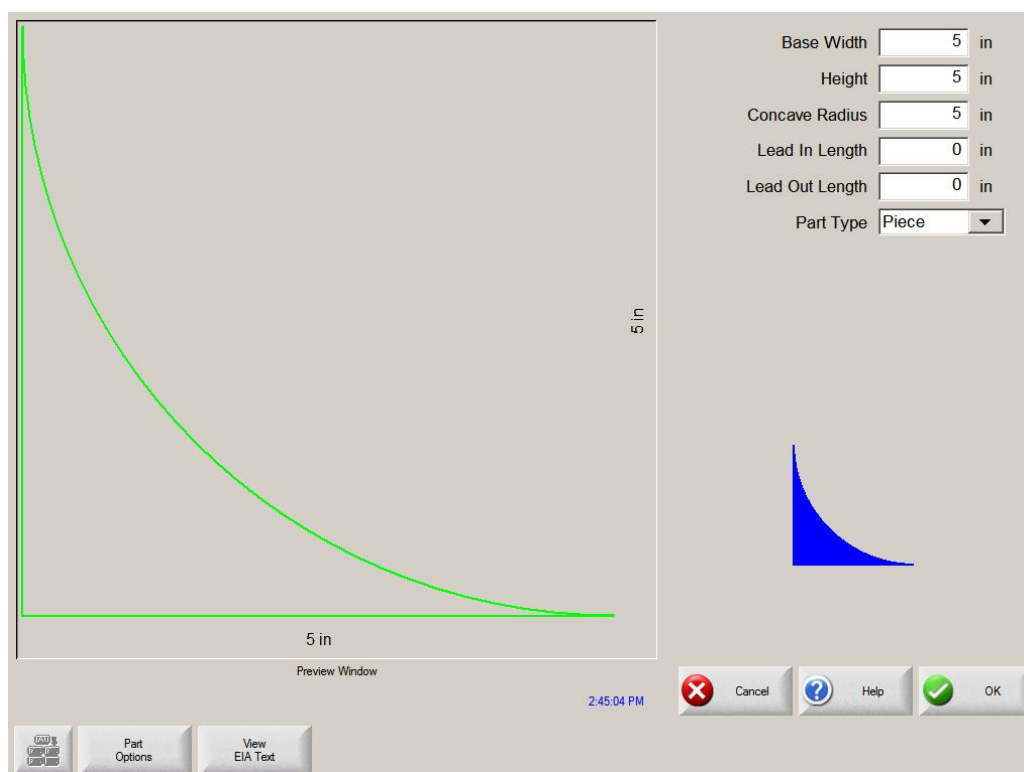
Preview Window

2:44:44 PM

Part Options View EIA Text

Cancel Help OK

## Triangle w/ Concave Side



The interface for creating a Triangle with a Concave Side. It features a large preview window on the left showing a green outline of a right-angled triangle with a concave hypotenuse. The base width is labeled as 5 in and the height as 5 in. To the right of the preview window is a panel with input fields for various parameters. Below these fields is a small blue 3D model of the part. At the bottom of the interface are buttons for 'Part Options', 'View EIA Text', 'Cancel', 'Help', and 'OK', along with a timestamp of 2:45:04 PM.

Base Width  in

Height  in

Concave Radius  in

Lead In Length  in

Lead Out Length  in

Part Type

5 in

5 in

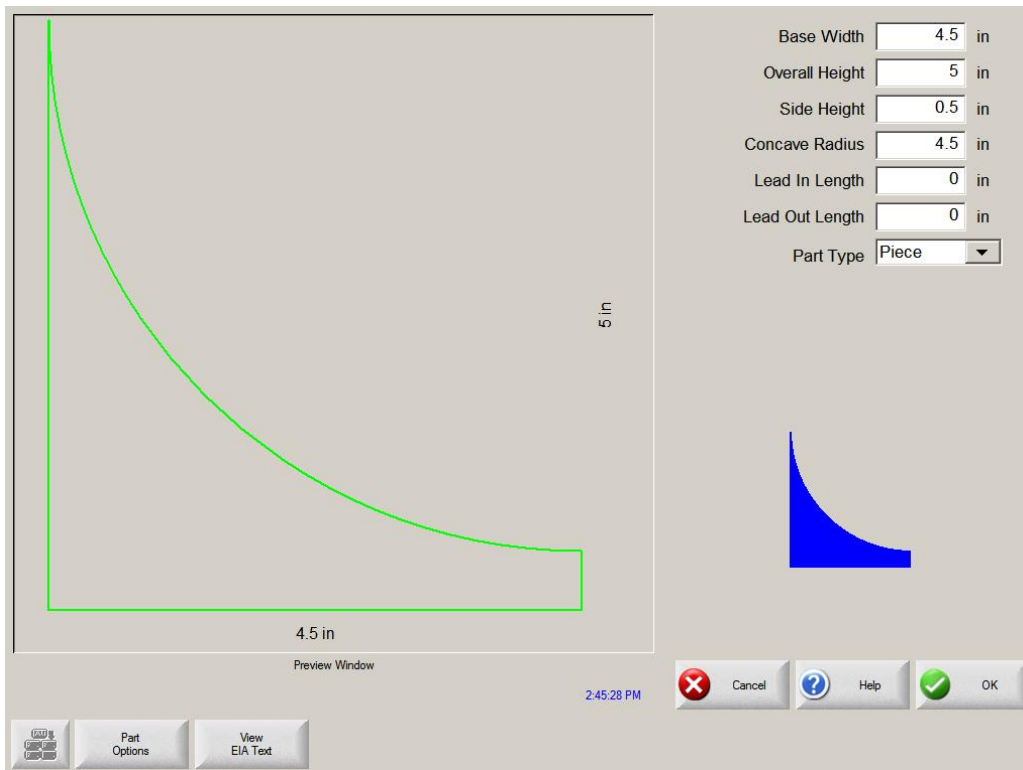
Preview Window

2:45:04 PM

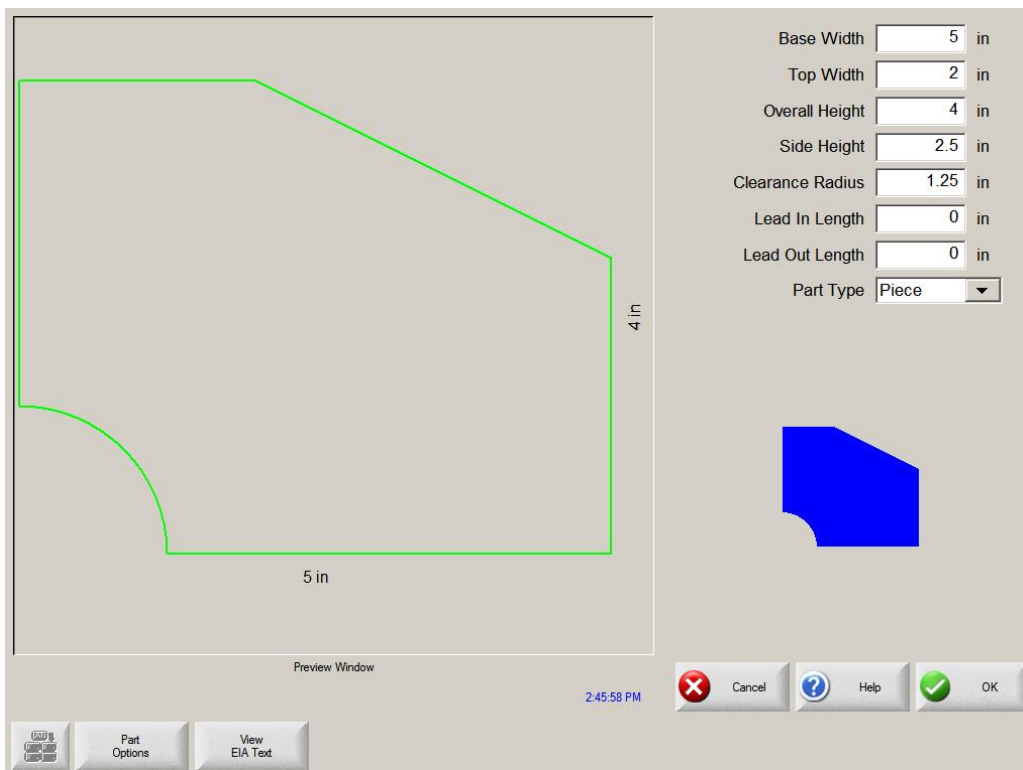
Part Options View EIA Text

Cancel Help OK

## Polygon w/ Concave Side



## Slant Rectangle with Radius



## Slant Rectangle with Circular Hole

Base Width  in

Top Width  in

Overall Height  in

Side Height  in

Hole Diameter  in

Side to Hole  in

Top to Hole  in

Lead In Radius  in

Overburn Length  in

Lead Out Radius  in

Preview Window

2:46:52 PM

Cancel Help OK

Part Options View EIA Text

## Slant Rectangle w/ Beveled Corners

Base Width  in

Top Width  in

Overall Height  in

Side Height  in

Top Left Corner

Corner Type

Lead In Length  in

Lead Out Length  in

Part Type

Preview Window

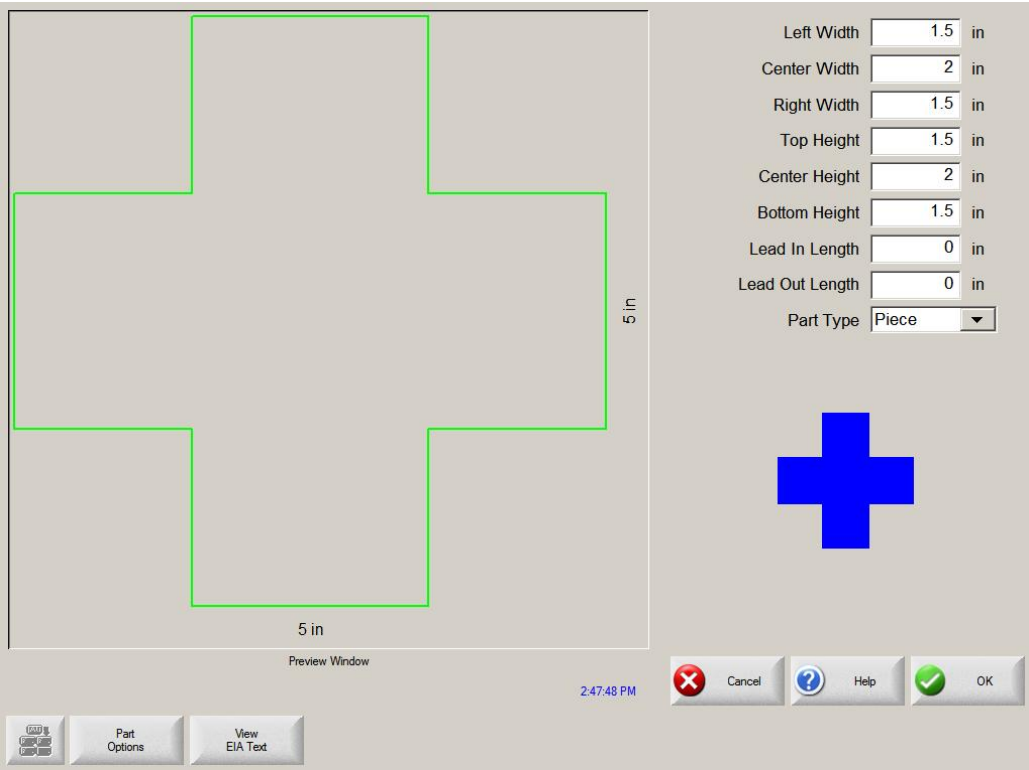
2:47:20 PM

Cancel Help OK

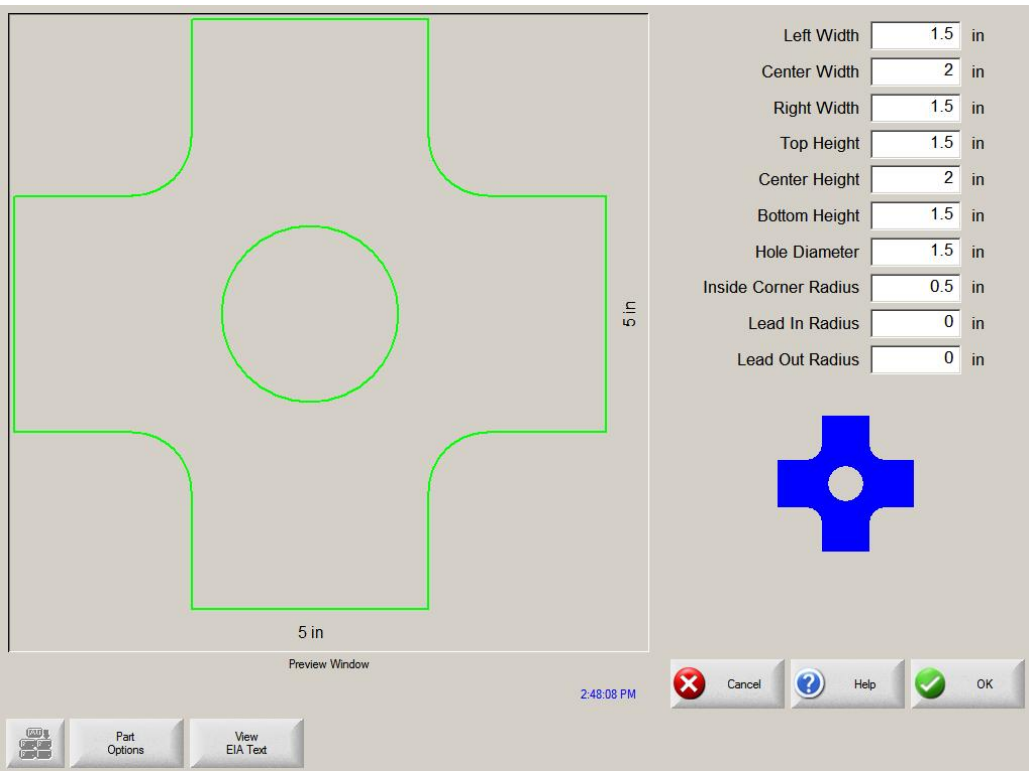
Part Options View EIA Text



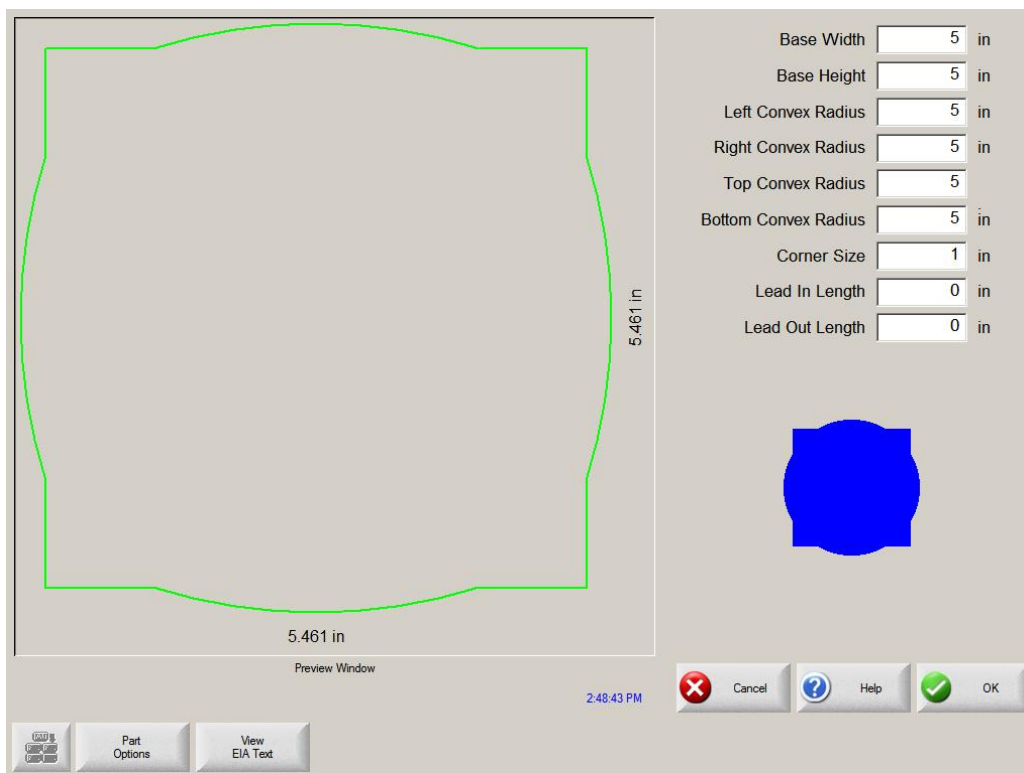
Cross



Cross w/ Circular Hole and Concave Inside Corners



## 4 Sided Convex Rectangle



The dialog box for a 4-sided convex rectangle features a preview window on the left and a parameter control panel on the right. The preview window shows a rectangle with outward-curving sides, with dimensions of 5.461 in by 5.461 in. The parameter panel includes input fields for Base Width (5 in), Base Height (5 in), Left Convex Radius (5 in), Right Convex Radius (5 in), Top Convex Radius (5 in), Bottom Convex Radius (5 in), Corner Size (1 in), Lead In Length (0 in), and Lead Out Length (0 in). A small blue icon of the shape is shown below the parameters. At the bottom are buttons for Part Options, View EIA Text, and Cancel, Help, OK.

Base Width  in

Base Height  in

Left Convex Radius  in

Right Convex Radius  in

Top Convex Radius  in

Bottom Convex Radius  in

Corner Size  in

Lead In Length  in

Lead Out Length  in

5.461 in

5.461 in

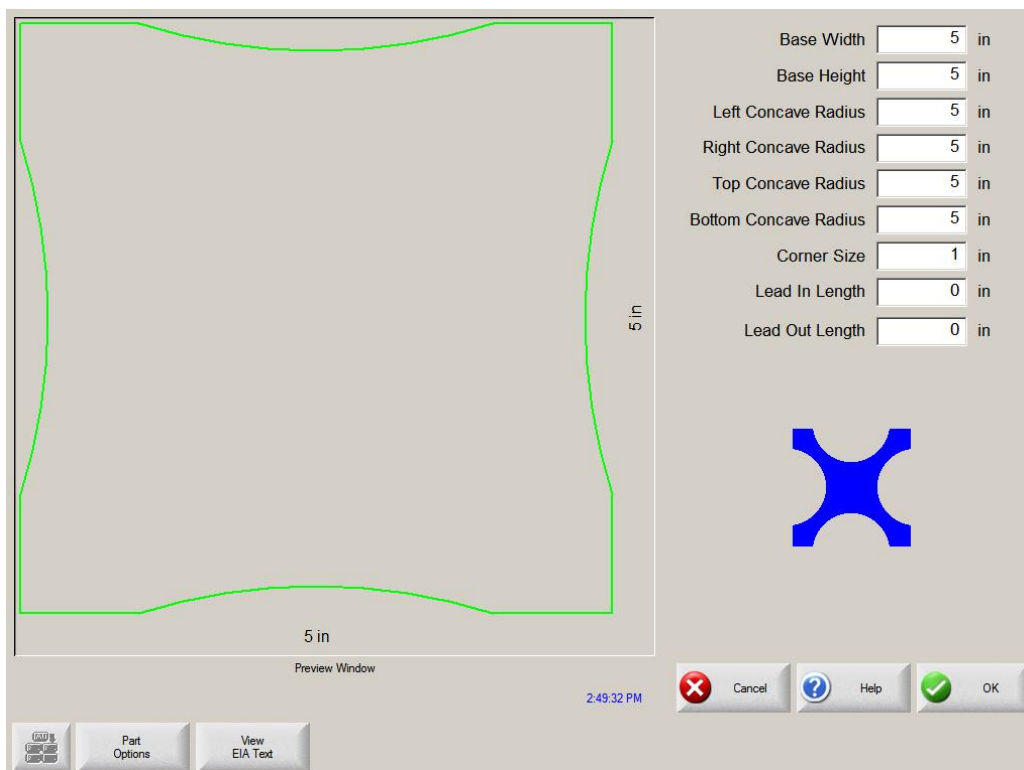
Preview Window

2:48:43 PM

Cancel Help OK

Part Options View EIA Text

## 4 Sided Concave Rectangle



The dialog box for a 4-sided concave rectangle features a preview window on the left and a parameter control panel on the right. The preview window shows a rectangle with inward-curving sides, with dimensions of 5 in by 5 in. The parameter panel includes input fields for Base Width (5 in), Base Height (5 in), Left Concave Radius (5 in), Right Concave Radius (5 in), Top Concave Radius (5 in), Bottom Concave Radius (5 in), Corner Size (1 in), Lead In Length (0 in), and Lead Out Length (0 in). A small blue icon of the shape is shown below the parameters. At the bottom are buttons for Part Options, View EIA Text, and Cancel, Help, OK.

Base Width  in

Base Height  in

Left Concave Radius  in

Right Concave Radius  in

Top Concave Radius  in

Bottom Concave Radius  in

Corner Size  in

Lead In Length  in

Lead Out Length  in

5 in

5 in

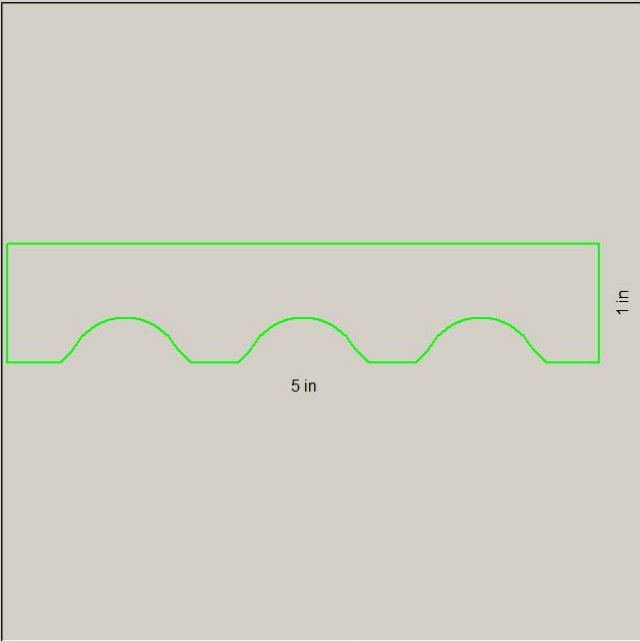
Preview Window

2:49:32 PM

Cancel Help OK

Part Options View EIA Text

Pipe Mount



5 in

1 in

Preview Window

Left End Width  in

Distance Between Pipes  in

Right End Width  in

Height  in


Pipe Radius  in


Number of Pipes  in

Lead In Length  in

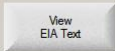
Lead Out Length  in

Part Type






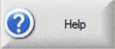
Part Options



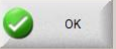
View EIA Text



Cancel



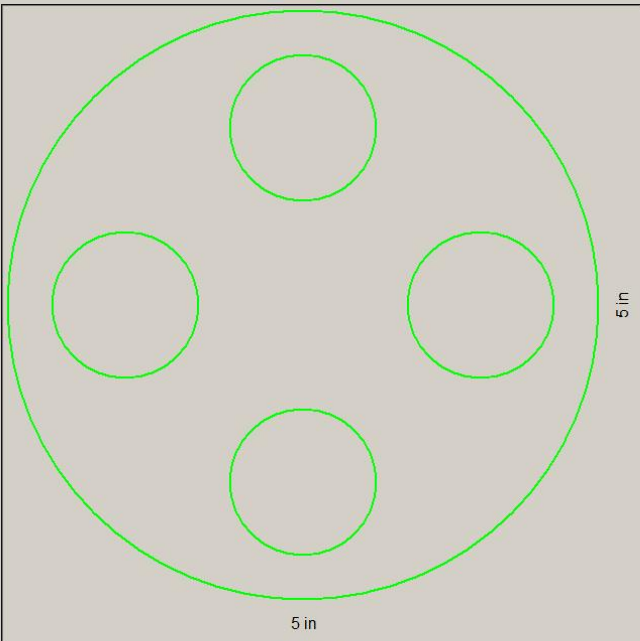
Help



OK

2:50:07 PM

Bolt Hole Circle



5 in

5 in

Preview Window

Circle Diameter  in

Bolt Hole Diameter  in

Bolt Hole Offset  in

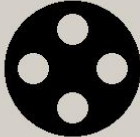
Number of Bolt Holes  in


Lead In Radius  in

Overburn Length  in


Lead Out Radius  in

Lead Type






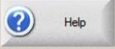
Part Options



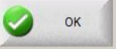
View EIA Text



Cancel



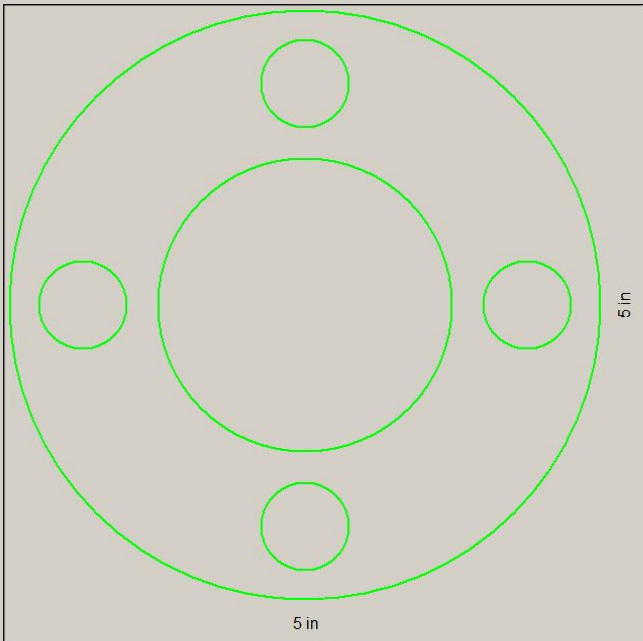
Help



OK

2:50:35 PM

## Bolt Hole Flange



Preview Window

5 in

5 in

2:51:02 PM

Part Options View EIA Text

Cancel Help OK

Flange Outer Diameter  in

Flange Inner Diameter  in

Bolt Hole Diameter  in

Bolt Hole Offset  in


Number of Bolt Holes

Lead In Radius  in

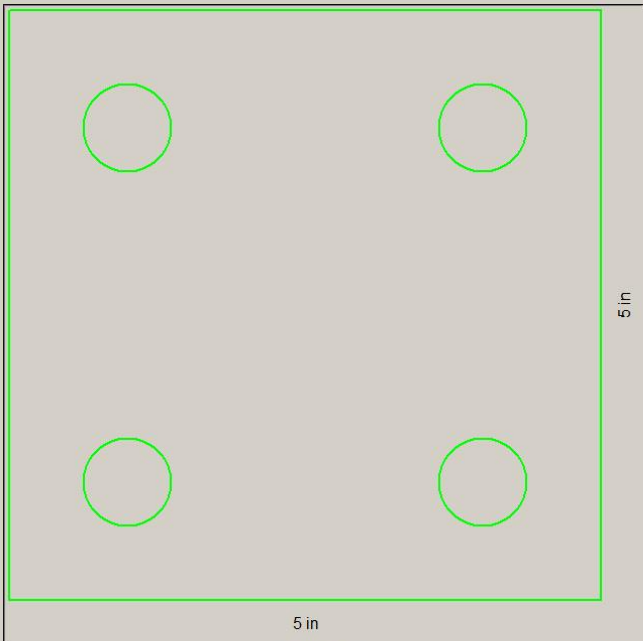
Overburn Length  in

Lead Out Radius  in

Lead Type



## Bolt Hole Rectangle



Preview Window

5 in

5 in

2:51:27 PM

Part Options View EIA Text

Cancel Help OK

Base Width  in

Overall Height  in

Bolt Hole Diameter  in

Bolt Hole Offset Width  in

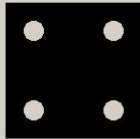
Bolt Hole Offset Height  in

Lead In  in

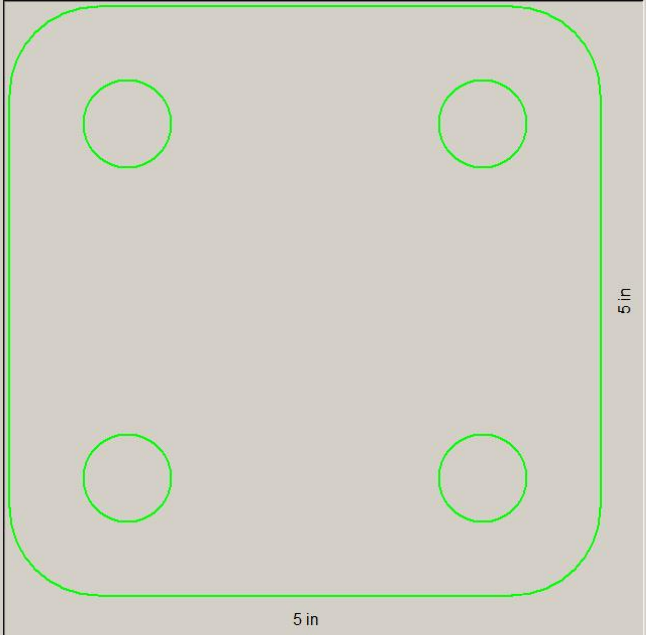
Overburn Length  in

Lead Out  in

Bolt Hole Lead Type



## Bolt Hole Rectangle w/ Convex Corners



Base Width  in

Overall Height  in

Corner Radius  in

Bolt Hole Diameter  in

Bolt Hole Offset Width  in

Bolt Hole Offset Height  in

Lead In Radius  in

Overburn Length  in

Lead Out Radius  in

Lead Type

5 in

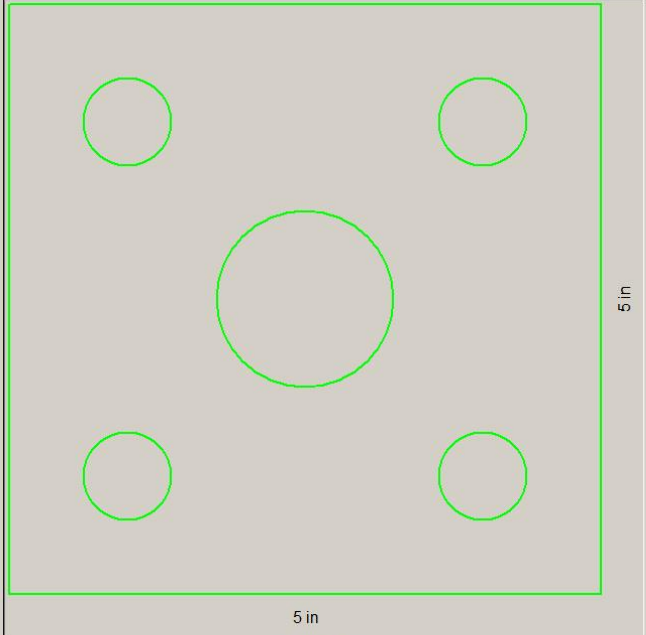
Preview Window

2:52:02 PM

Cancel Help OK

Part Options View EIA Text

## Bolt Hole Rectangle w/ Center Hole



Base Width  in

Overall Height  in

Center Diameter  in

Bolt Hole Diameter  in

Bolt Hole Offset Width  in

Bolt Hole Offset Height  in

Lead In  in

Overburn Length  in

Lead Out  in

Hole Lead Type

5 in

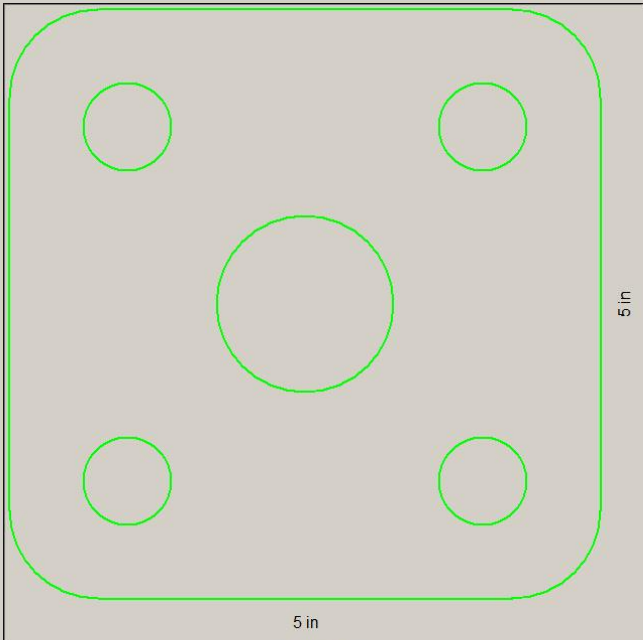
Preview Window

2:52:36 PM

Cancel Help OK

Part Options View EIA Text

## Bolt Hole Rectangle w/ Center Hole and Convex Corners



5 in

5 in

Preview Window

2:53:11 PM

Base Width  in

Overall Height  in

Corner Radius  in

Center Diameter  in

Bolt Hole Diameter  in


Bolt Hole Offset Width  in




Bolt Hole Offset Height  in



Lead In Radius  in

Overburn Length  in

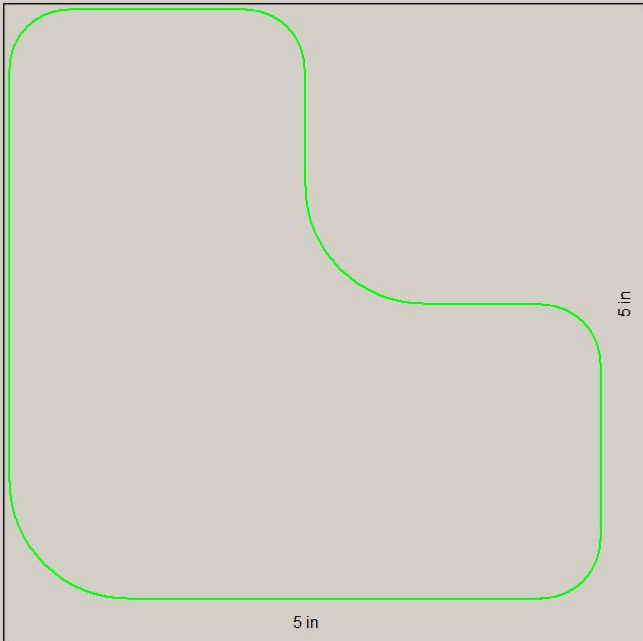
Lead Out Radius  in



 Cancel  Help  OK

 Part Options  View EIA Text

## Rounded L-Bracket



5 in

5 in

Preview Window

2:53:50 PM

Base Width  in

Top Width  in

Overall Height  in

Side Height  in

End Radius  in


Elbow Radius  in




Lead In Radius  in



Lead Out Radius  in

Part Type

Lead Type



 Cancel  Help  OK

 Part Options  View EIA Text

## Horseshoe

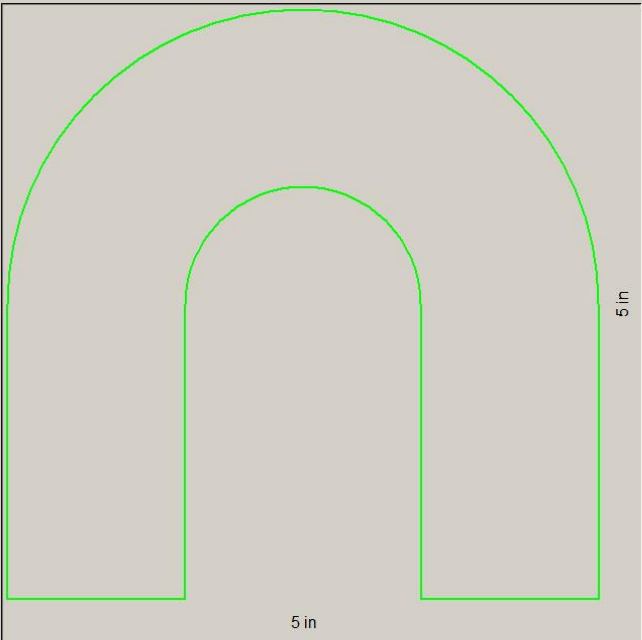


Diagram of a Horseshoe shape. The shape is defined by a semi-circular top with an outside diameter of 5 in and an inside diameter of 2 in. The side height is 2.5 in. The lead in and lead out lengths are 0 in. The part type is set to Piece.

Preview Window

2:54:22 PM

Buttons: Cancel, Help, OK

Buttons: Part Options, View EIA Text

Outside Diameter	5	in
Inside Diameter	2	in
Side Height	2.5	in
Lead In Length	0	in
Lead Out Length	0	in
Part Type	Piece	

## Convex Roof Trapezoid w/ Hole



Diagram of a Convex Roof Trapezoid w/ Hole shape. The shape is defined by a convex top with a convex diameter of 3.25 in and a hole diameter of 1.5 in. The left side to hole is 2.5 in, the right side to hole is 2.5 in, and the bottom to hole is 1.625 in. The lead in and lead out lengths are 0 in. The overburn length is 0 in. The hole lead type is set to Radius.

Preview Window

3:05:59 PM

Buttons: Cancel, Help, OK

Buttons: Part Options, View EIA Text

Convex Diameter	3.25	in
Hole Diameter	1.5	in
Left Side to Hole	2.5	in
Right Side to Hole	2.5	in
Bottom to Hole	1.625	
Lead In	0	in
Overburn Length	0	in
Lead Out	0	in
Hole Lead Type	Radius	



## Convex Roof Polygon w/ Hole

Convex Diameter  in

Hole Diameter  in

Left Side to Hole  in

Right Side to Hole  in

Bottom to Hole  in

Side Height  in

Lead In  in

Overburn Length  in

Lead Out  in

Hole Lead Type

Preview Window

3:07:27 PM

Part Options View EIA Text

Cancel Help OK

## Convex Roof Polygon w/ Oval Hole and Concave Bottom

Convex Diameter  in

Hole Width  in

Hole Height  in

Left Side to Hole  in

Right Side to Hole  in

Bottom to Hole  in

Side Height  in

Bottom Radius  in

Lead In  in

Lead Out  in

Preview Window

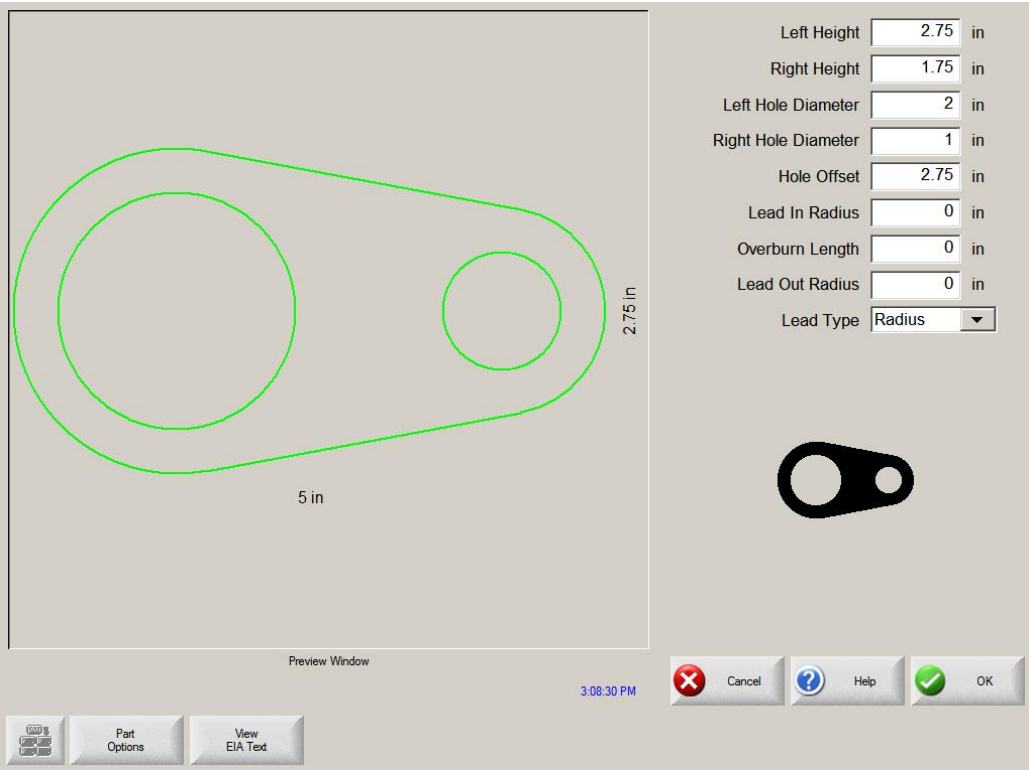
3:07:47 PM

Part Options View EIA Text

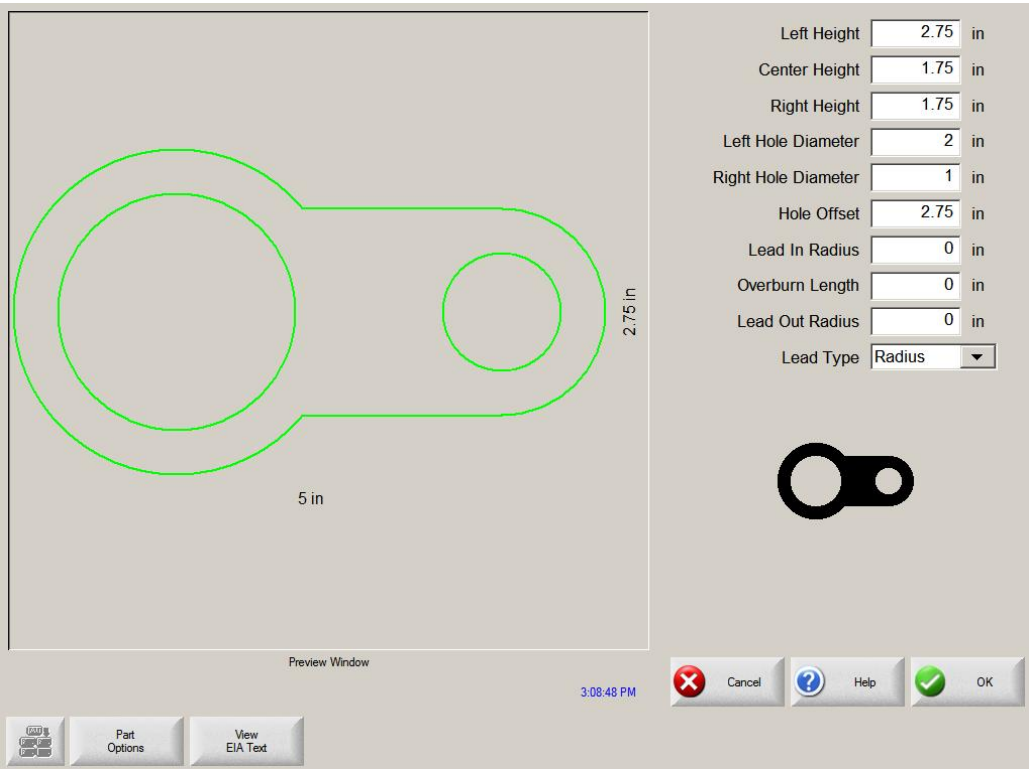
Cancel Help OK



Pulley Cover



Paddle Blind



## Water Pump Gasket

Preview Window

6.5 in

4 in

Side Heights  in

Center Height  in

Outside Hole Diameters  in

Center Hole Diameter  in

Corner Radius  in

Outside Hole Offset  in

Lead In Radius  in

Overburn  in

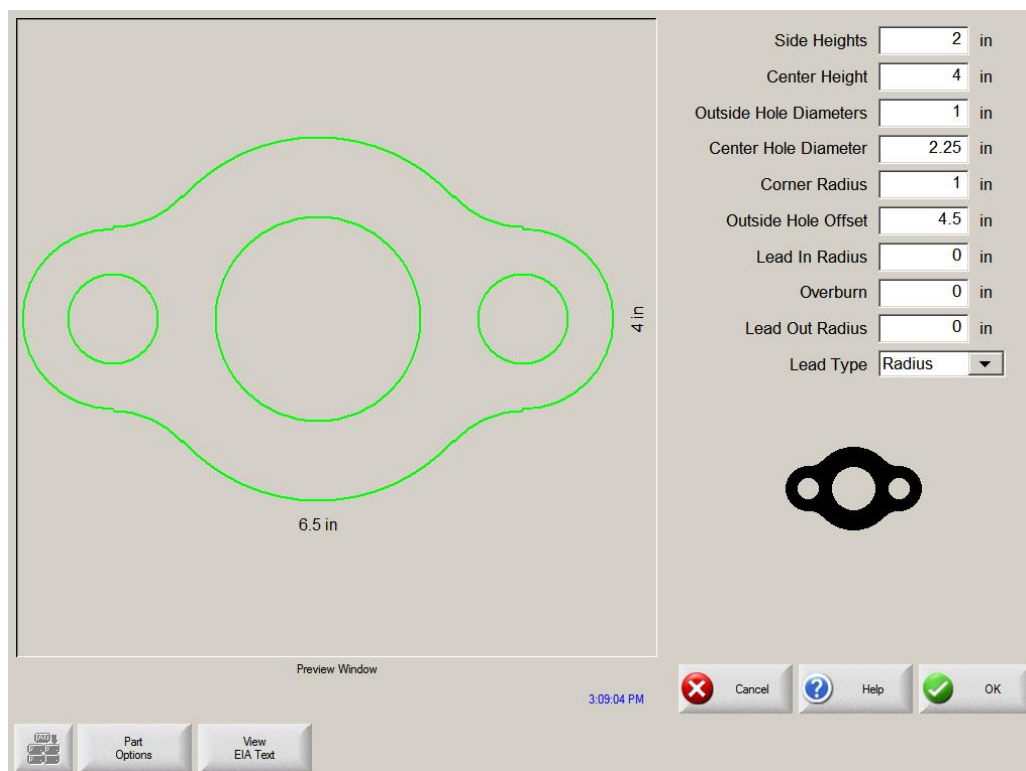
Lead Out Radius  in

Lead Type

3:09:04 PM

Cancel Help OK

Part Options View EIA Text



## Frame

Preview Window

5 in

5 in

Base Width  in

Height  in

Left Thickness  in

Top Thickness  in

Right Thickness  in

Bottom Thickness  in

Top Left Outside Corner

Corner Type

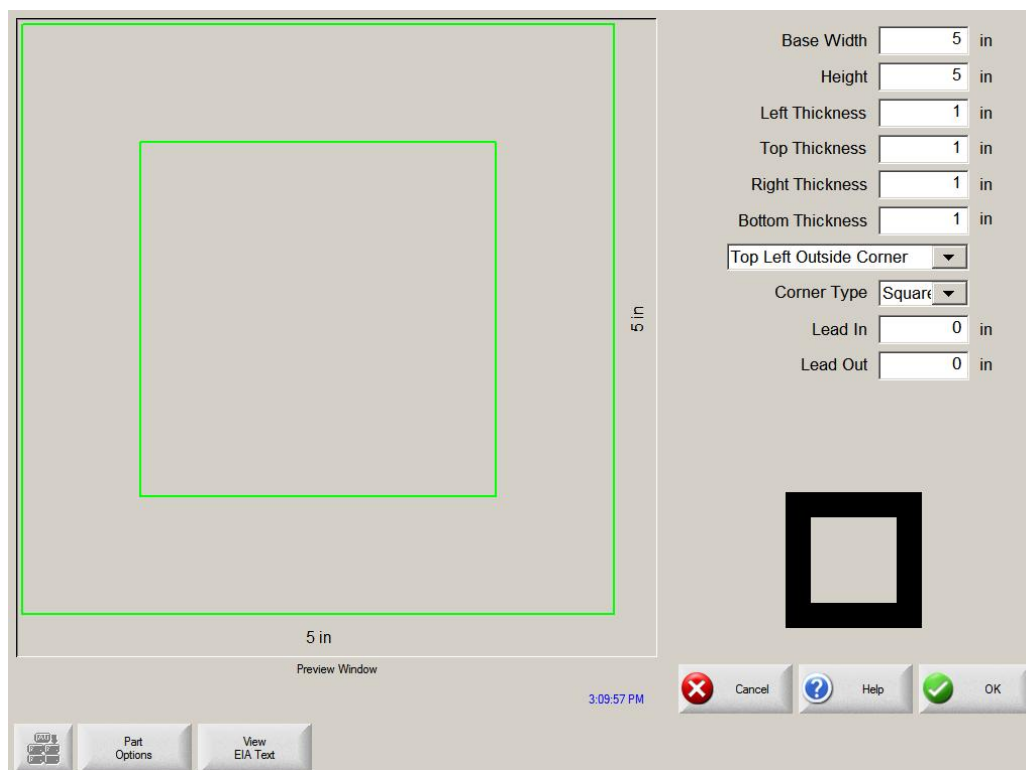
Lead In  in

Lead Out  in

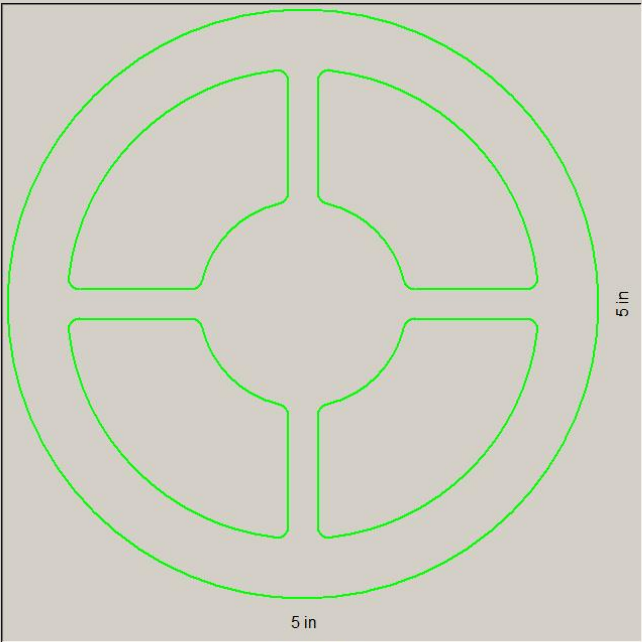
3:09:57 PM

Cancel Help OK

Part Options View EIA Text



Pulley



5 in

5 in

Preview Window

Outer Diameter  in

Inner Diameter  in

Hub Diameter  in

Spoke Width  in

Corner Radius  in


Number of Spokes

Lead In Radius  in




Overburn Length  in



Lead Out Radius  in

Lead Type

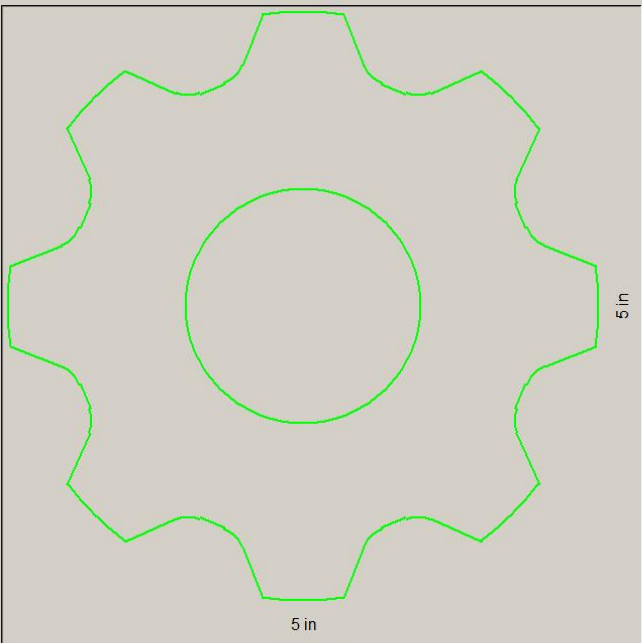


3:10:53 PM

 Cancel  Help  OK

 Part Options  View EIA Text

Sprocket



5 in

5 in

Preview Window

Outside Diameter  in

Root Diameter  in

Hole Diameter  in

Roller Diameter  in

Rollers between Teeth


Number of Teeth

Tooth Angle  deg




Tooth Corner Radius  in



Lead In Radius  in

Lead Out Radius  in



3:11:27 PM

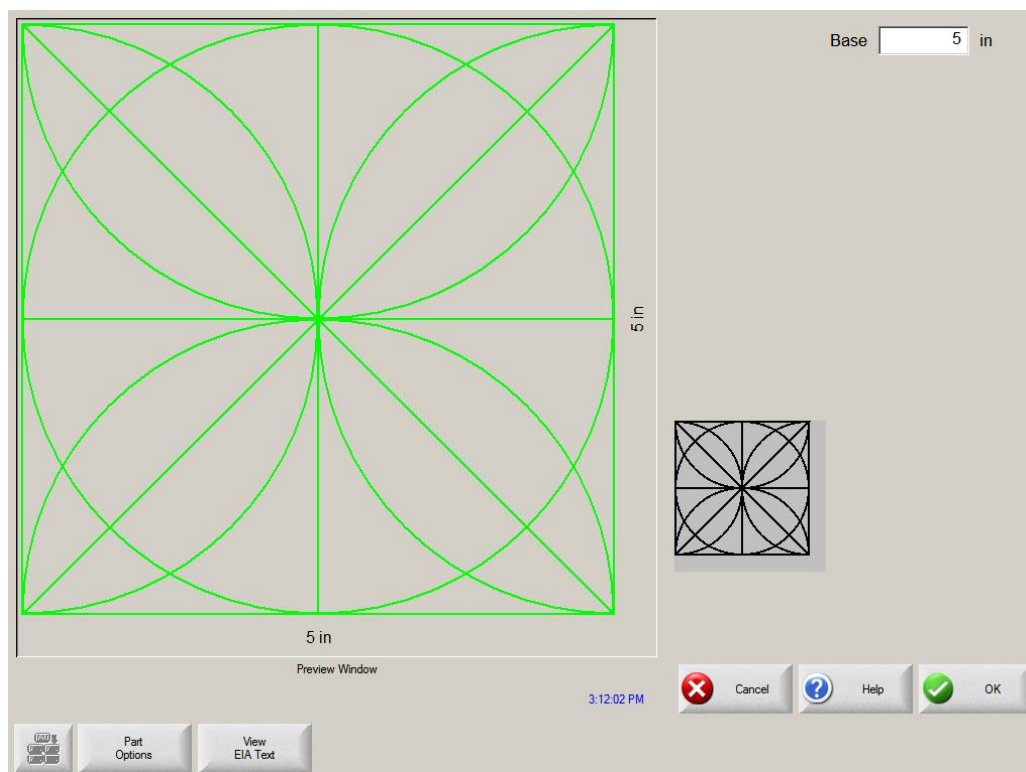
 Cancel  Help  OK

 Part Options  View EIA Text

## Text

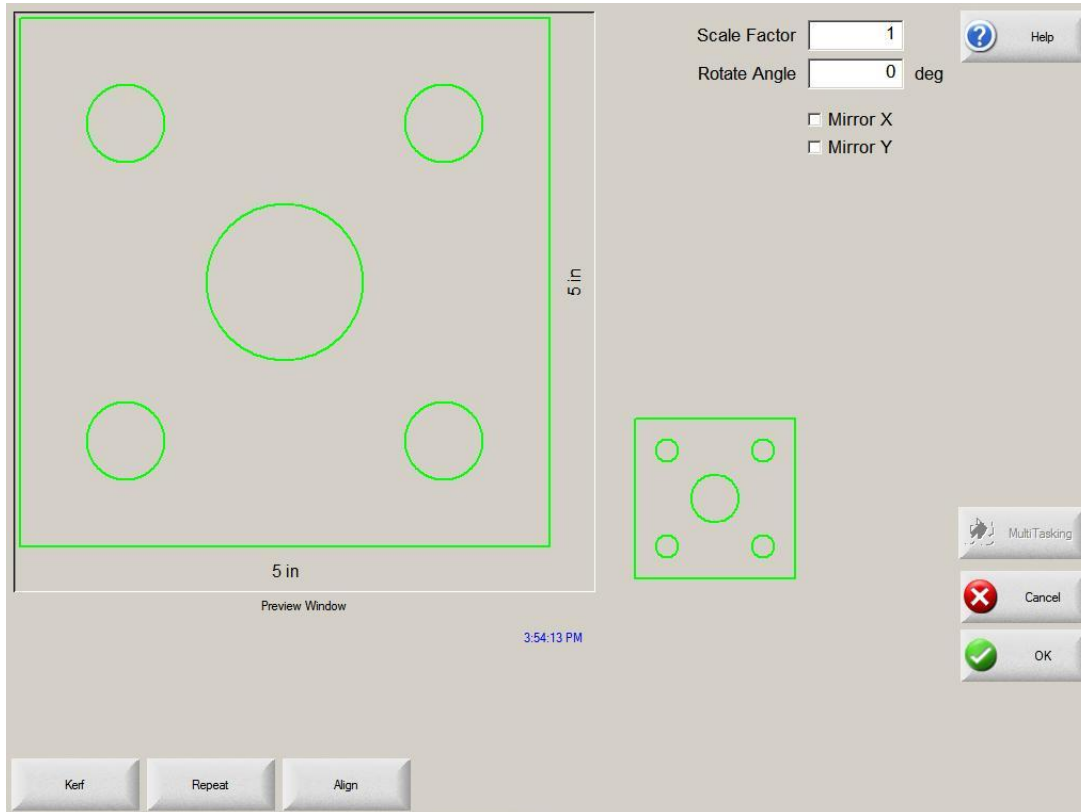


## Test Pattern



## Section 7: Part Options

There are a number of options available under the Part Options soft key. These options can be used to customize the current part loaded into working memory. All options will display the effects of the changes in the Preview Window.



### Scale Factor

Allows the operator to scale the current part in memory by a programmed factor. After a new scale factor has been entered, the part will be redrawn and its overall dimensions shown. Scale factor must be greater than zero.

### Rotate Angle

Allows the operator to rotate the current part in memory by a programmed value. After a new rotate angle has been entered, the new part will be displayed in the Preview window. Rotate angle can be any positive or negative angle.

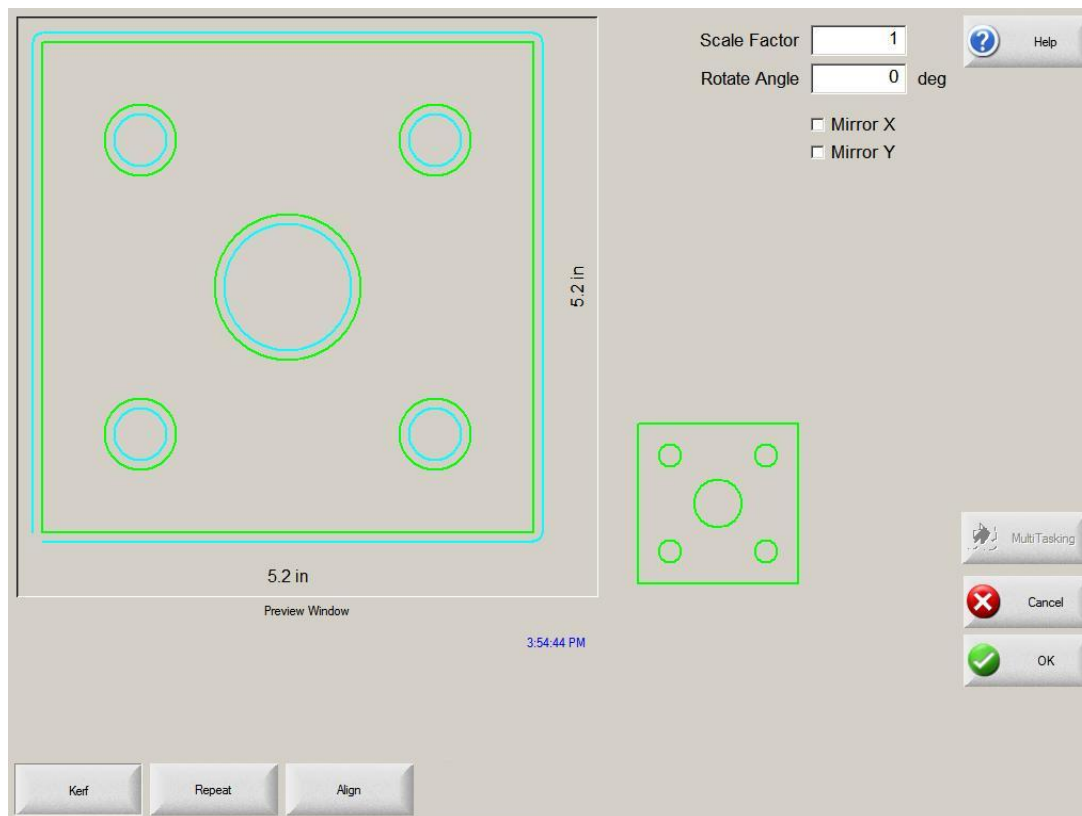
### Mirror X/Mirror Y

These checkboxes allow the X and/ or Y dimensions to be negated. The result will be a mirror image of the current part in memory.

Keypad operation: Press the NEXT or ENTER key to toggle to the X or Y field. Once on the field, the SPACE key will place a checkmark in the current highlighted field.

**Kerf**

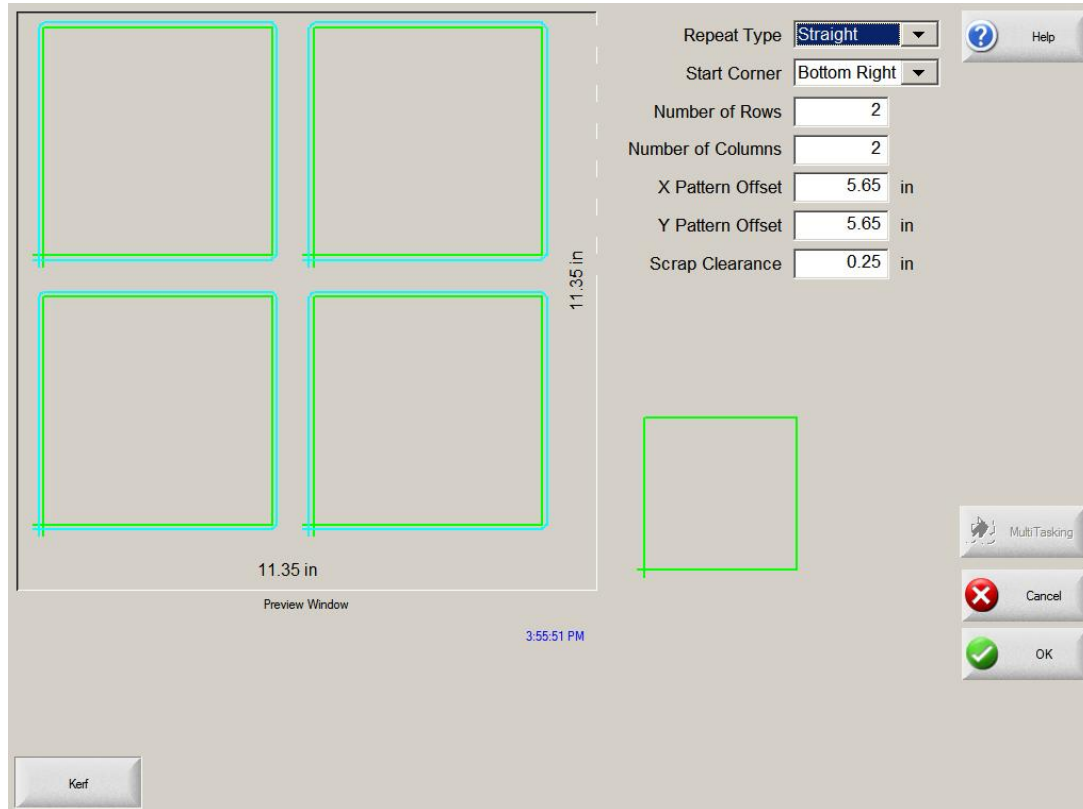
Pressing the Kerf soft key will graphically show the kerf cut path in a light blue color. This can be extremely valuable in visually seeing the Kerf path prior to cutting. Pressing the button again turns the Kerf part graphics off.



## Repeat

The control has three built-in automatic repeat types: Straight, Staggered, and Nested.

### Straight Repeat



### Repeat Type

Allows the user to select which type of the three repeats to use: Straight, Staggered or Nested

### Start Corner

Allows the user to select which corner of the plate from which to start the shape repeat.

### Number of Rows

Program the number of rows to cut.

### Number of Columns

Program the number of columns.

### X Pattern Offset/Y Pattern Offset

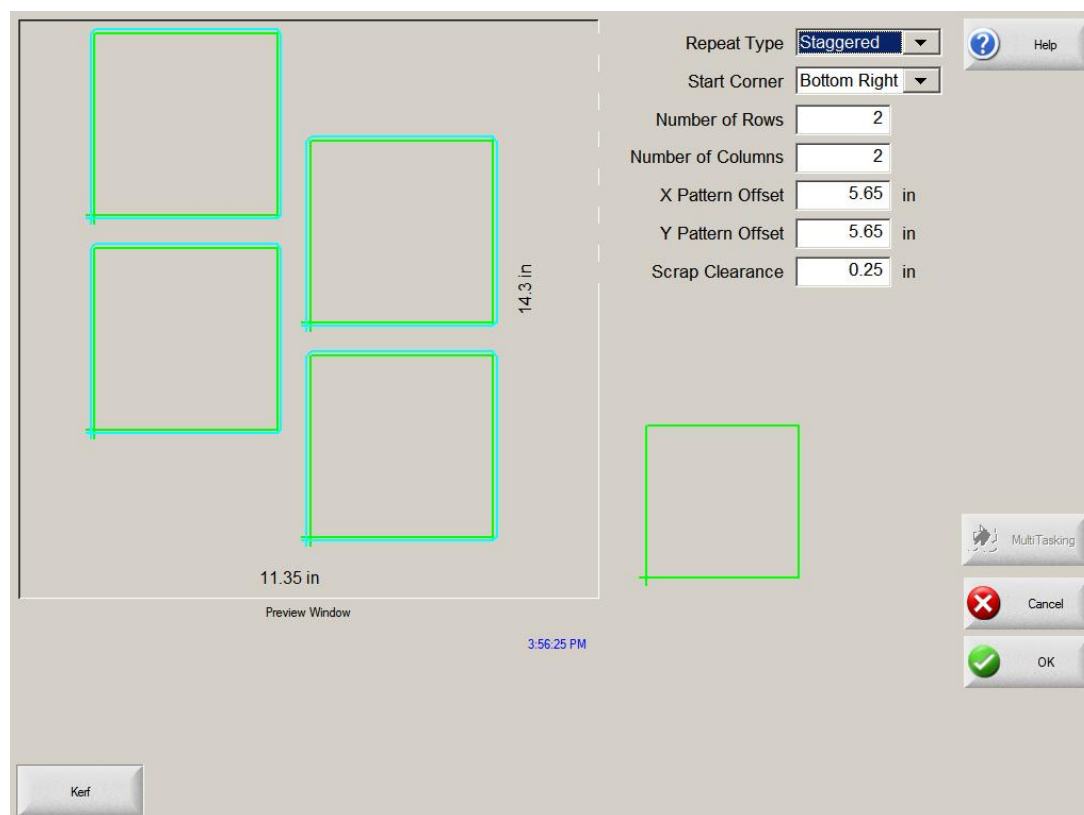
The control automatically calculates the pattern offset based on the dimension of the current part in memory.

**Scrap Clearance**

Allows the user to insert scrap clearance between parts in the grid pattern. The same value is used for X and Y dimensions.

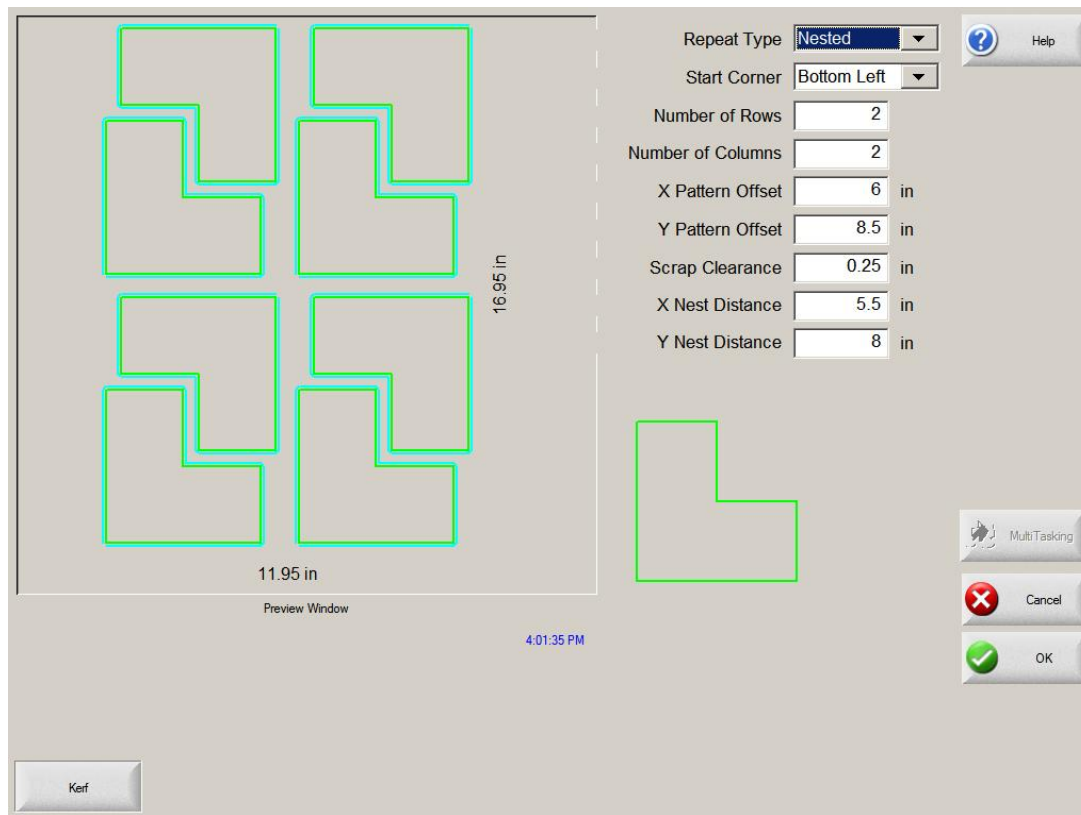
**X Nest Distance/Y Nest Distance**

The control automatically calculates the nest offset based on the dimension of the current part in memory. This parameter is only available for the Nested type of repeat.

**Staggered Repeat**



## Nested Repeat



### Pattern Offsets

The control has an automated feature that calculates the minimum spacing required between repeated parts. This is based on the size of the part (including Lead in and Lead out), the Kerf value and scrap clearance. This calculated spacing is not always optimum but will allow the part to be repeated without overlapping.

The user may choose to use this pre-calculated value or select to manually select new values. As you are entering new pattern offset values, the control will automatically draw the new group pattern with the entered values. This is extremely useful in providing a visual check of the nest as it is entered.

### Nest Distance

The control has an automated feature that calculates the minimum spacing required between nested parts. This is based on the size of the part (including Lead in and Lead out), the Kerf value and scrap clearance. This calculated spacing is not always optimum but will allow the part to be repeated without overlapping.

The user may choose to use this pre-calculated value or choose to manually select new values. As you are entering new nest pattern offset values, the control will automatically draw the new nested pattern with the entered values. This is extremely useful in providing a visual check of the nest as it is entered.

Generally, when manually changing the Nest Distance values, it is easiest to start with a simple nest (1 column x 1 row) and perform adjustments based on the graphic display. As the nest Distance values are adjusted, the pattern displayed on screen will be updated. When the desired Nest Distance has been obtained, increase the nest size to a two column, two row nest. The X and Y

pattern offsets can then be adjusted in the same fashion. When the desired nest spacing has been reached, the nest size can be increased to the required volume up to the maximum plate potential.

## Align

This screen is used to align the current part in memory into one of the four corners of the plate for cutting. This function also allows for skewed plates to be taken into account when aligning the part.

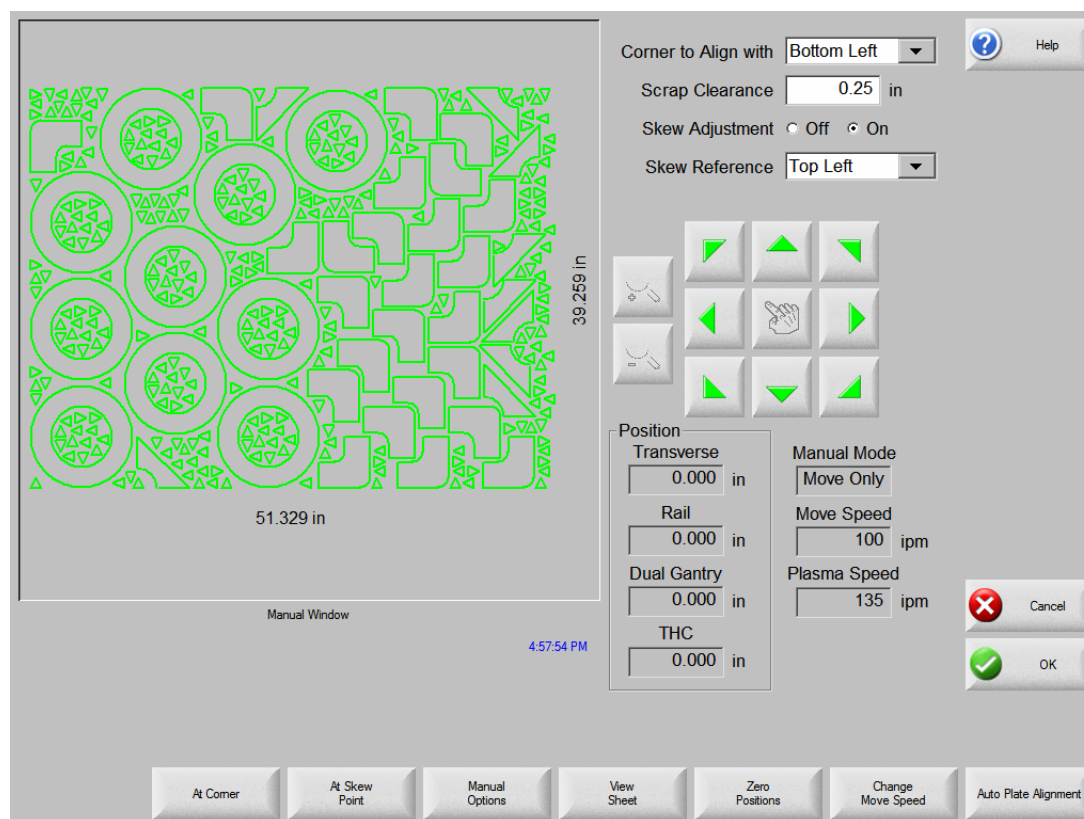
Part Alignment is used to position a part or nest of parts, on to a squared plate so that it will fit on to the plate. This is commonly with parts that have an internal pierce point such as a flange.

Skew Alignment is used to position a part or nest of parts, on to a skewed or angled plate so that it will fit accurately onto the plate without going over the edges. This is commonly used with a nest of parts which has little margin of error for placement of the nest on to the plate.

### Instructions for use

To Align a part to the plate, follow these steps:

1. Set parameters to those needed for aligning your part in the upper right corner of the screen.
2. Move the torch to the first corner location ("Corner to Align with") using the jog keys.
3. Press the "At Corner" soft key.
4. If performing a Part Alignment, go to step 7. If performing a Skew Alignment, go to step 5.
5. Move the torch to a point along the edge of the plate towards the selected "Skew Reference".
6. Press the "At Skew Point" soft key.
7. Press the OK soft key. The machine will move to the start point for the part and return to the Main screen ready for cutting.



**Corner to Align with**

Selects the corner of the plate to align the part in.

**Scrap Clearance**

This is the amount of clearance between the edge of the plate and the part the control will add in when moving to the start point of the part.

**Skew Adjustment**

This determines if the control will adjust for plate skew when performing the align function.

**Skew Reference**

This is the skew reference corner which you will move towards and mark a point along the edge. This is only available if Skew Adjustment is On.

**At Corner**

Press this soft key when at the corner of the plate you want to align the part in.

**At Skew Point**

Press this soft key when at the edge of the plate for skew adjustment. This is only available if Skew Adjustment is On.

## Automatic Plate Alignment (APA)

The Automatic Plate Align (APA) feature is a fully automated function to detect the edges of a rectangular plate and calculate the degree of skew for aligning a part program to the plate. Both five point and three point align sequences are available for use

### Five Point Align

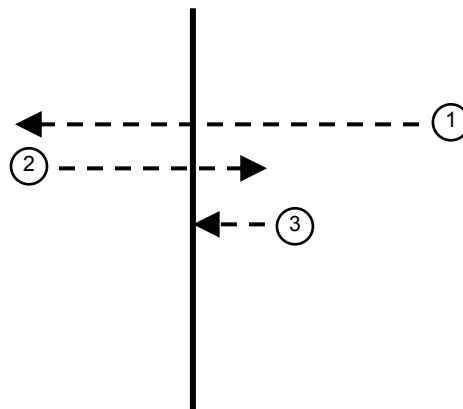
This feature uses a five point reference scheme for skew and plate size calculations. When executed, the controller commands motion of the sensor around the plate searching for the edges at five specific reference points. After the five reference points have been detected, the control will position the torch in the proper location to start the part program with the calculated skew.

### Set Up/ Notes:

- 1) The Auto Plate Align Sensor(s) must first be assigned in I/O setups. The logic state(s) must be set so that the input is active when over the plate.
- 2) The predetermined motion path will move to the outward edges of the plate in five locations and is executed at a fast peed until the Sensor switches to an off state indicating the edge of the plate. For accuracy, motion will then reverse until the sensor is then activated again. Please refer to Sensing Sequence below.
- 3) The Manual Options "User Defined" Manual Offset value will be used if a X/Y tool offset is required to compensate for the distance between the master torch and the APA Sensor.
- 4) Scrap clearance, if required, would be entered at the align screen. Additionally, Corner to Align with on the align screen will set the start corner location of the program.
- 5) If your machine requires "Homing", the Homing function should be performed at some point prior to operation.
- 6) Sensor radius should be programmed to the "sensing" radius of the sensor. If dual sensors are used the radius applies to both sensors.
- 7) For dual sensors, the distance between the first and second sensor should be programmed in tool offset #11.

### Typical Sensing Sequence

- 1) Motion will move at high traverse speed or 650ipm / 1600mm/m (whichever is slower).
- 2) Motion will move back onto the plate at medium traverse speed.
- 3) Motion will move off the plate at slow traverse speed. Edge of the plate will be detected and recorded.

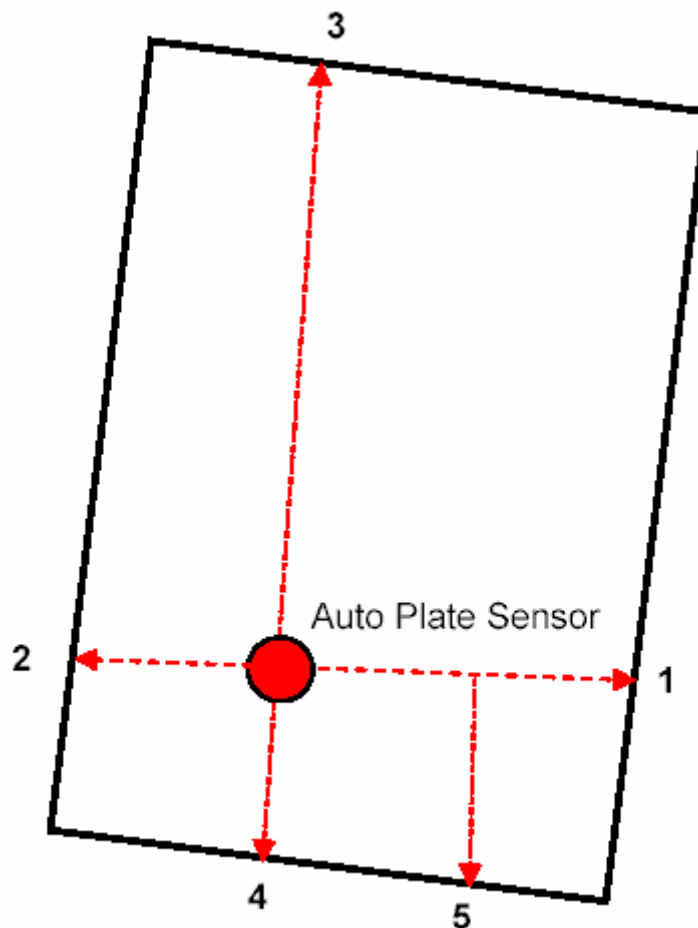


**Instructions**

- 1) To start the Automatic Plate Alignment function, manually position the Plate Sensor above the plate. At this point the Auto Plate Align Sensor Input should be active.
- 2) Press the Automatic Plate Align Soft key at the Part Options screen.



- 3) A motion sequence will then be executed to detect the right, left, top, bottom and bottom right skew reference edges of the plate. In each case, the control will move to the outward edge of the plate until the sensor detects the edge of the plate (off state). The control will then reverse motion at a med speed until the sensor again becomes active then moves off at a slow speed. This position is recorded as the respective reference point. Motion continues until all five points are detected.



- 4) Upon completing detection of the five reference points, the control will then position the Plate Sensor (if no tool offset used) or the torch (if a tool offset is used) to the start point of the part program. Scrap Clearance (from the Align screen) and Start Corner (from the Align screen) will also be executed in the final position move, and will set the plate size to the detected dimension.

### Three Point Align

When executed, the controller commands motion of the sensor around the plate searching for the edges at three specific reference points on a square plate based on motion commands within the part program. After the three reference points have been detected, the control will position the torch in the proper location to start the part program with the calculated skew. Traverse distance and speeds are defined in the program code to improve the speed and accuracy of the process.

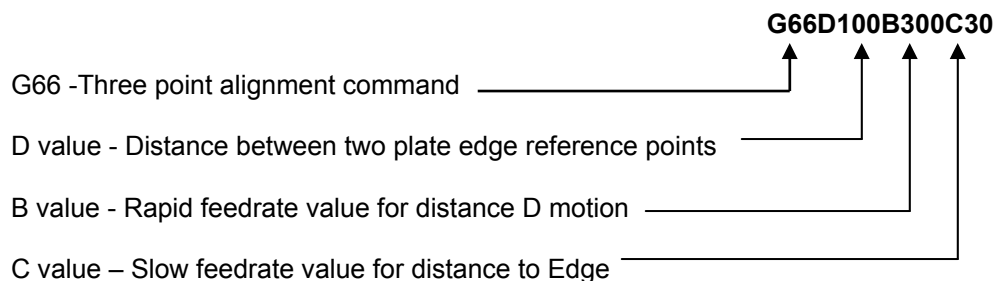
#### Set Up/ Notes:

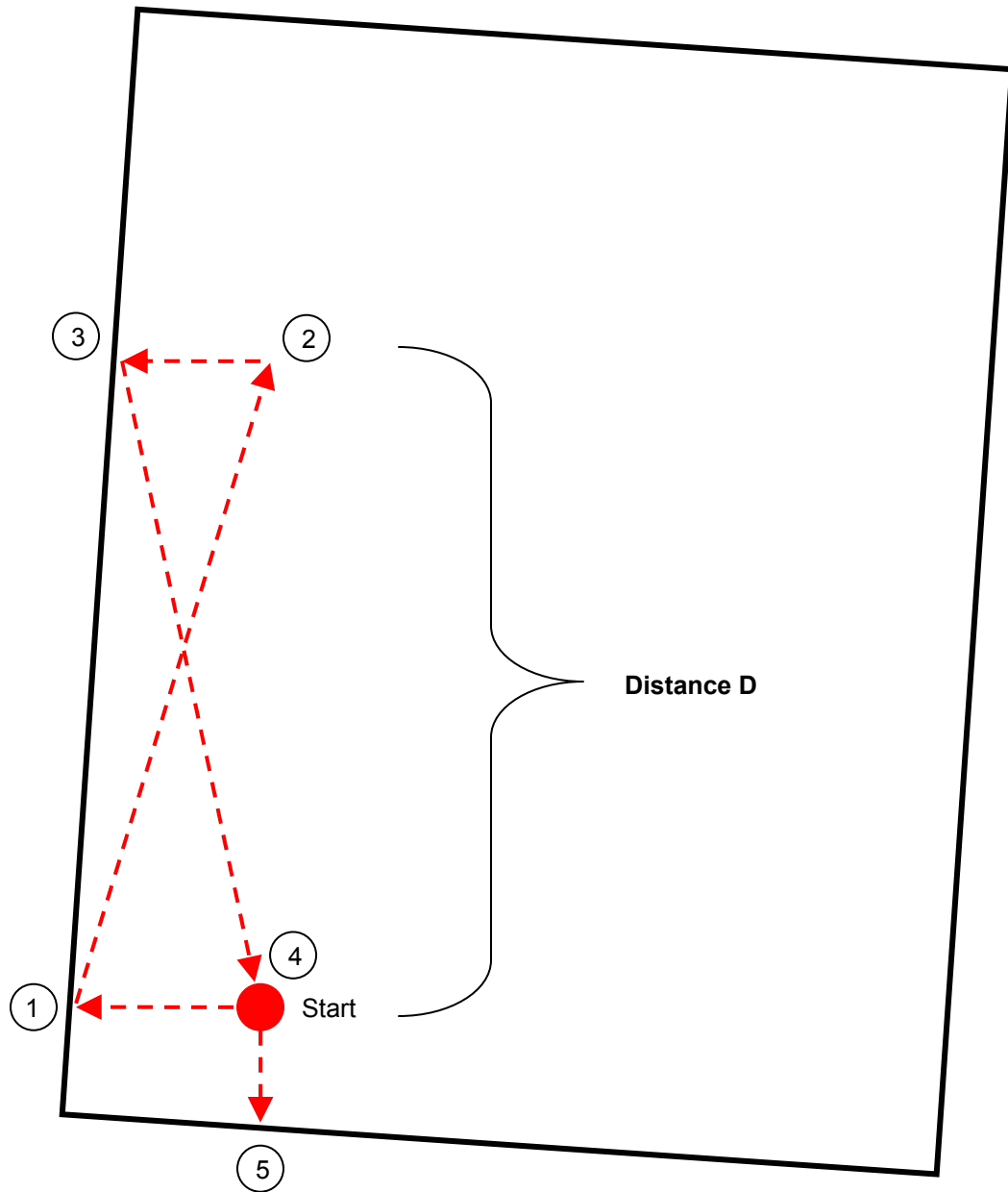
- 1) The Auto Plate Align Sensor(s) must first be assigned in I/O setups. The logic state must be set so that the input(s) are active when over the plate.
- 2) The 3 point align feature must be enabled in Machine Setup and assign Sensor radius for accuracy.
- 3) The Manual Options "User Defined" Manual Offset value will be used if a X/Y tool offset is required to compensate for the distance between the master torch and the APA Sensor.
- 4) Scrap clearance, if required, would be entered at the Align screen. Additionally, Corner to Align With and Skew Point parameters on the Align screen will set the start corner location of the program and sequence for edge detection.
- 5) If your machine requires "Homing", the Homing function should be performed at some point prior to operation.
- 6) Insert program codes into the part program.

### Program Code

The EIA program code should be placed at the start of the part program. The parameters will be effective until changed or restart.

Three point alignment distance and speeds can be defined with the following EIA format program code.



**Motion Path**

This drawing shows a typical edge detection sequence for the Automatic Align feature with Corner selected as lower left and Skew point selected as upper left on the Align screen. Alternate start points and sequence and may be used by selecting different Corner to Align and Skew Point parameters.

**Instructions**

- 1) To begin the auto-align, load the desired part program with the appropriate program codes included at the beginning of the program.
- 2) To start the Automatic Plate Alignment function, manually position the Plate Sensor above the plate. At this point the Auto Plate Align Sensor Input should be active.
- 3) Go to PART OPTIONS/ ALIGN. Verify that the correct corner has been selected. Edit parameters for Skew alignment.
- 4) Press the Auto Plate Alignment button.



The machine will perform the alignment as previously shown.

Upon completing detection of the three reference points, the control will then position the Plate Sensor (if no tool offset used) or the torch (if a tool offset is used) to the start point of the part program. Scrap Clearance (from the Align screen) and Start Corner (from the Align screen) will also be executed in the final position move.

The part program may be automatically executed at the end of the alignment, or it may wait for cycle start, as selected in the Setup screen.

**Dual Sensor Note:**

Some sensors may detect the table slats as an extension of the plate during the plate edge detection cycle. For this reason, use of dual sensors is highly recommended.

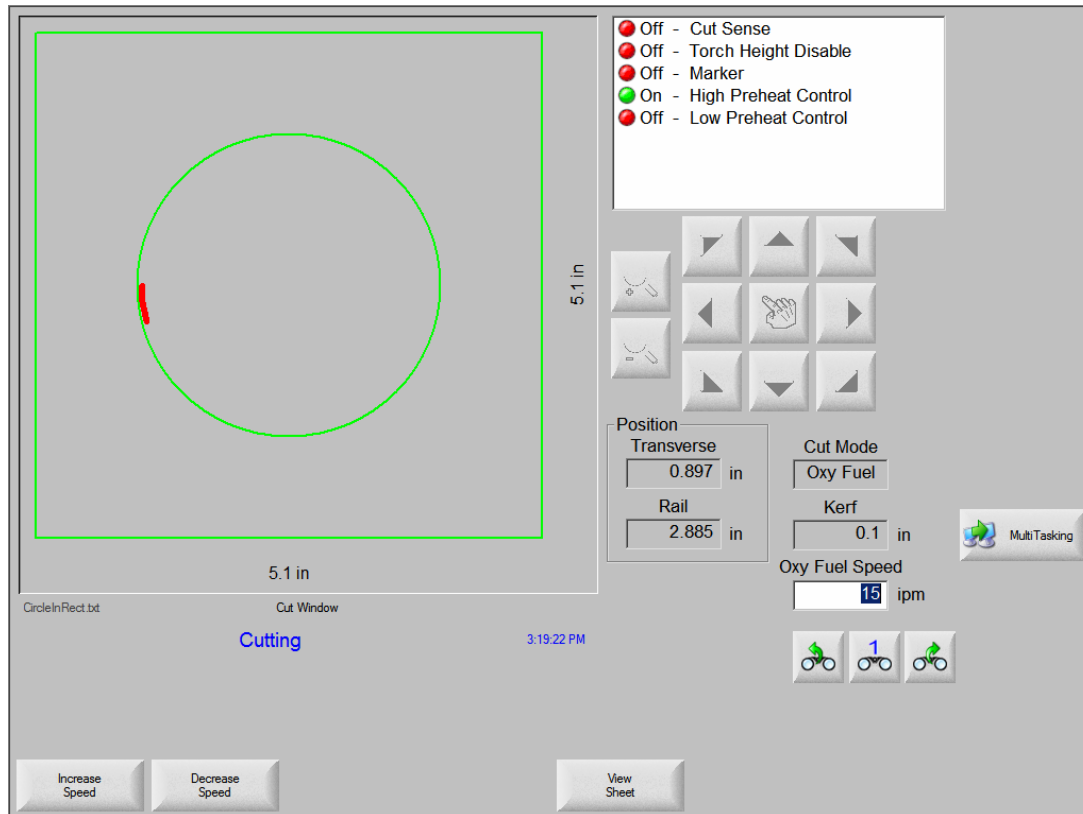
Sensor radius should be programmed to the "sensing" radius of the sensor. If dual sensors are used the radius applies to both sensors. When a second sensor is used, the first sensor to detect "no plate" will be used for all plate detection at that location.

An appropriate X/Y offset for the two sensors is recommended to minimize the potential that both sensors would pick up a false plate detection from the slats. The sensor offset distance should be programmed in tool offset #11.



## Section 8: Cutting

After determining that the cut mode, cut speed and Kerf values are all set correctly, a part can be cut by pressing the START key from the Main window or Manual window. The following window is displayed:



To cut the part, make sure that the Cut Mode is set to the selected cut type and that the Kerf and Cut Speed settings are correct, then press the START key. This initiates cutting in the selected Cut Mode.

To preview the path, press the Change Cut Mode soft key until Trial appears in the Cut Mode window. Pressing the START key causes the cutting device to follow the cut path, but cutting is not activated. Motion is performed at the programmed Speed.

You may stop a cut, at any time, by pressing the STOP key on the front panel. The machine decelerates to a smooth stop along the cut path. If the cutting process was on when the STOP key was pressed, it is de-activated according to the programmed cut logic.

During a cut, the Watch window displays information about the part being cut, such as the current cut speed, current axes positions and path position.

While cutting in sheet view, the control will automatically scroll to keep the cut location centered within the view screen. This feature is useful in normal cutting to closely follow the cut-path while zoomed in.

View Sheet is more useful when proper Plate Size values have been entered in Cutting setups and when the machine has been previously homed. Viewing of large parts when fully zoomed during a

cut may not allow the part to be fully drawn on screen before moving onto the next view location. This may appear as a flashing view screen and may be corrected by zooming out to get a larger view area.

**Speed Increase**

Pressing the Speed Increase soft key increases the current cut speed by 3%.

**Speed Decrease**

Pressing the Speed Decrease soft key decreases the current cut speed by 3%.

Note: The user can also double click the speed field to enter a new speed value

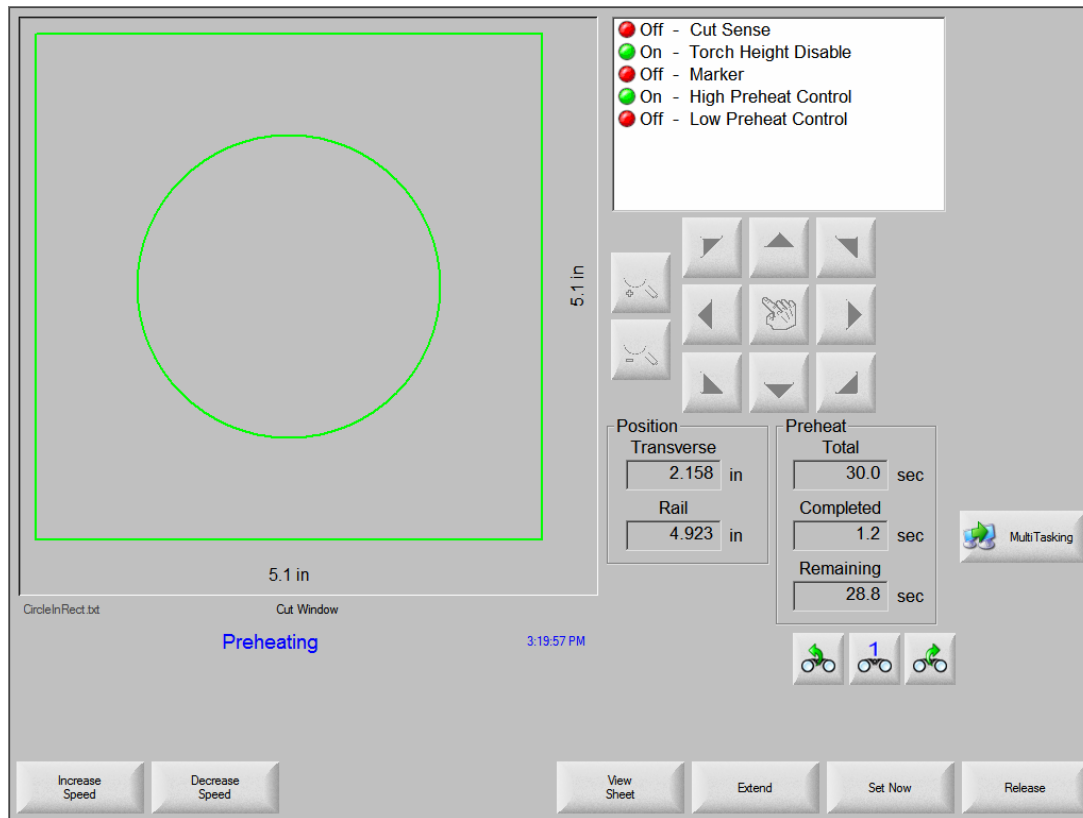
Keyboard operation: To change the current cut speed while cutting a part, press the Enter key once to highlight the current cut speed, enter in the desired cut speed and press Enter to accept.

**Repeats**

If a Shape Repeat option has been enabled, you can also see the number of rows and columns remaining to be cut by pressing the Repeats soft key. The Repeats soft key is shared with the Extend soft key which is only active during initiation of the cut sequence.

**Cut Delay Timers**

Cut Delay Timers that define the timing logic for the cut are available for both Oxy-Fuel and Plasma at the Cut Types setup screen. When in cut mode, the control displays the preset delays as executed in the lower right corner of the screen. For certain delay times such as Preheat and Pierce, a continuously updated countdown timer which shows the preset time and time remaining is also displayed. An example of the Preheat Timer is illustrated below:



The Preheat times, Total, Completed and Remaining, are shown to a tenth of a second. Activating the Cut Sense input will terminate the Preheat delay time cycle and the time at the point of activation will become the new Preheat time for subsequent cuts. Three soft keys are also displayed which may be used to modify the Preheat cycle in progress. Pressing the Start key twice will bypass the Preheat and Pierce Time Delays and begin the cut for the Oxy Fuel cut mode.

The function of these keys is explained below:

### Extend

When pressed, this soft key extends the Preheat timer until it is stopped, either by a Set-Now or Release soft key press.

### Set Now

Pressing the Set Now soft key terminates the selected delay timer and saves the new set time. The Set Now soft key is often used in conjunction with the Extend soft key to modify the preset Preheat time.

### Release

A Release soft key press will terminate the selected delay timer, but will not modify the original delay time. The original delay time is retained for any remaining pierces.

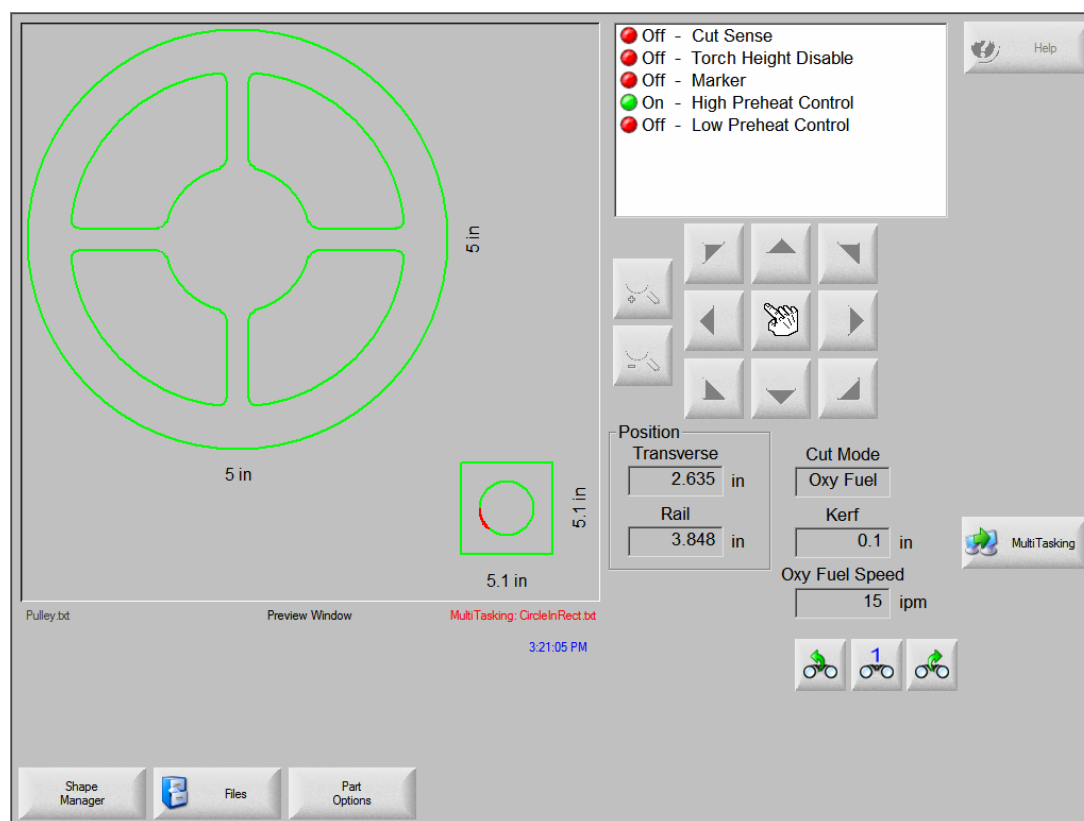
## Multitasking

The multitasking feature allows the user to load and configure a new part program while in the middle of cutting executing current part program. This feature is only available in advanced operation mode.

This feature is only available in Advanced mode. To begin, press the multitasking soft key on screen.



At this time the current part program will be displayed in the lower right corner of the Preview Window. Any new program will be shown in large format in main view area.

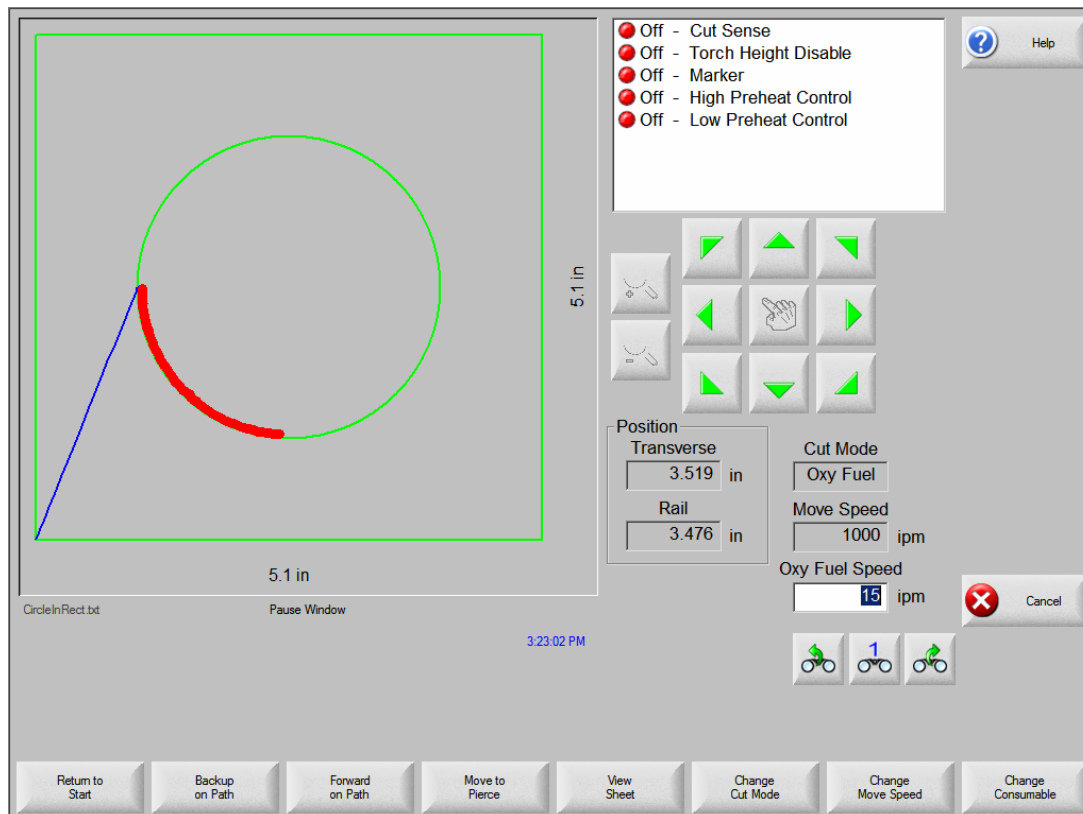


Pressing the multitasking soft key allows the user to switch between the programs.

## Section 9: Pause

For those unavoidable times when the cut process fails, the control has full-featured Cut Loss Recovery capabilities.

The Cut Loss Recovery features of the control are available from the Pause screen, which is reached whenever STOP is pressed or if Cut Sense is lost. The Pause screen appears below.



Pressing the CANCEL key while the Pause screen is displayed aborts the current part.

### Return to Start

Allows the operator to return to the initial starting point of the part. **Note:** If the Return to Start function is utilized after a cut loss, all information about the current position of the cutting device on the path will be lost.

### Backup and Forward on Path

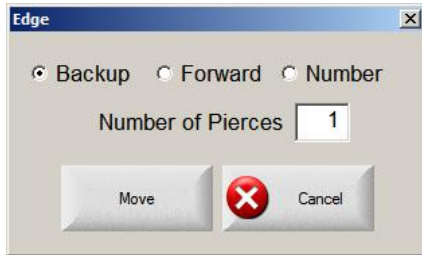
Use these two soft keys to move backwards and to move forward along the cut path at the selected Move Speed to locate the desired pierce restart point. Then press the START key to resume the cut at the programmed cut speed. In addition to all segments of a standard part, the Backup and Forward on Path functions allow full movement through all sections of Shape Repeat part as well.

Like the Manual Mode functions, Backup and Forward on Path use the currently selected Move Speed. The different speeds allow moving rapidly along the path, or precisely positioning the cutting device.

When a cut loss occurs, the initial backup and forward speed is the one that was used last. To toggle between the move speeds, press the Change Move Speed soft key in the Pause window. The corresponding speed is displayed in the Move Speed window.

### Move to Pierce

Pressing the Move to Pierce soft key allows the operator to directly move to any pierce point.



Enter the information for the desired pierce point and press ENTER. The cutting device will move directly to the selected pierce point.

### Change Cut Mode

The Change Cut Mode soft key changes the restart mode from Cut to Trial or from Trial to Cut. This allows the operator to move through the part partially as a Cut and partially as an actual Cut.

### Change Move Speed

Is used to toggle through the four Move Speeds available. The four Move Speeds are the Maximum Machine Speed, High Jog Speed, Medium Jog Speed and Low Jog Speed from the Speeds setups.

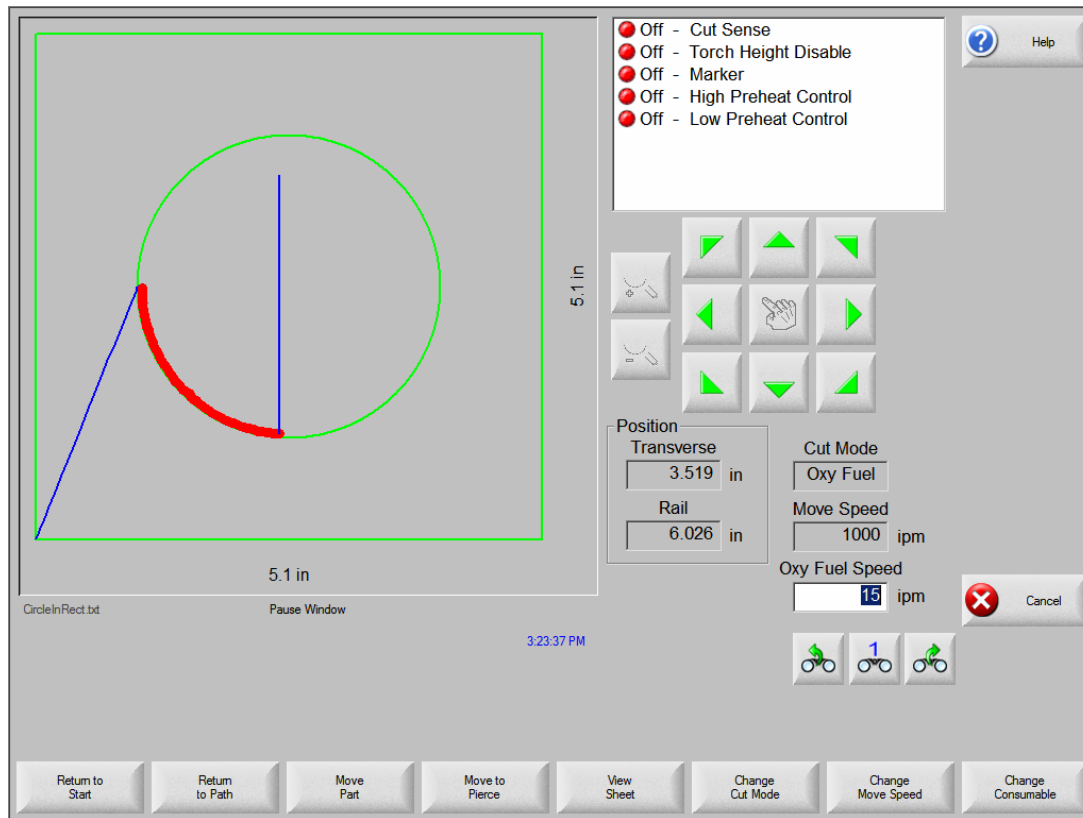
### Change Consumable

Takes you to the Change Consumable screen.

### On-Path Restart

To restart the cut at the pierce point selected using On-Path Backup, press the START key. The cut speed and the cut mode are the same as they were prior to when the motion was paused, unless the values have been edited in the Watch window.

While the Pause Window is displayed, the Manual arrow keys are fully functional to move the cutting device around. This allows the machine to be moved in any direction (not necessarily along the path) to inspect the partially cut piece. Once the cutting device is moved off the cut path, a different window is displayed. The Off-path Pause Window is shown below:



The differences between the On-path Pause Window and the Off-path Pause window are outlined below.

### Return to Path

Pressing the Return to Path soft key in the Off-path Pause window returns the cutting device to the point on the cut path from which it was jogged away. Most useful for inspecting or replacing cutting device components after a cut loss and then returning to the cut loss point. When the cutting device is back on the cut path, the On-path Pause Window is restored and the cut may be resumed.

### Move Part

When the Move Part soft key is pressed, the entire part is shifted on the plate. The point along the cut path to which the cutting device was moved becomes the new current position of the cutting device. The On-path Pause window is then re-displayed since the cutting device is now back on path.

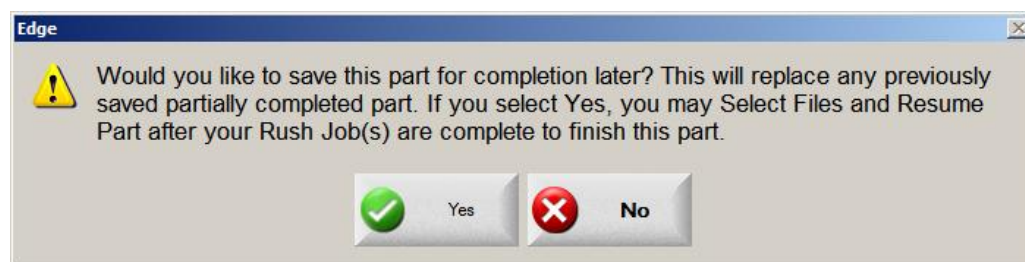
### Off-Path Restart

By pressing the START key from the Off-path Pause window, a lead-in is constructed from the off-path point back to the original part.

In a cut loss situation, the operator would use the Backup on Path key in the On-path Pause window menu to position the cutting device on the cut path where the cut was lost. The operator would then use the Manual arrow keys to jog the cutting device off path to a suitable pierce point. Pressing START at this point causes a new lead-in to be cut from the off-path pierce point to the point along the path from which the cutting device was jogged away. When the cutting device is back on path, it continues along the path to cut the remainder of the part.

### Rush Job Interrupt

Rush Job Interrupt allows the user to pause the current part program and retain the part and current position information. When at the Pause screen, press the Cancel key. A prompt will appear on screen to ask the user if they wish to save the part information for later use.



If the user selects YES, the Resume Last Part button will be viewable at the Files Screen. The user can then load and execute another part program and then return to the original part using the Resume Last Part soft key. The part program and position will be resumed.

### Change Consumable

This screen is used to keep track of consumable life data for statistical analysis. Additionally, the feature may be used to prompt the operator that a consumable has reached its expected life cycle by using an output from the control to activate an indicator such as an indicator lamp or audible alarm. This feature allows the operator to change the appropriate consumable and avoid a consumable failure that may effect cut quality or damage the torch.

Note: This Change Consumable feature can only track consumable life data and offer features related to that data. The control cannot detect consumable condition or failures.

The image shows the "Change Consumable" screen with four panels for different torch types. Each panel has input fields for various life metrics and a "Last Installed" timestamp.

Oxy Fuel - Max Torch Tip Life	Plasma - Max Nozzle Life	Plasma - Max Electrode Life	Laser - Max Nozzle Life
Torch: Oxy Fuel Torch 1	Torch: Plasma Torch 1	Torch: Plasma Torch 1	Torch: Laser
2 minutes	14.787 minutes	25.076 minutes	2 minutes
10 pierces	255 pierces	399 pierces	10 pierces
14.318 inches	0 arc errors (actual)	0 arc errors (actual)	10 inches
0 minutes / pierce	809.21 inches	1283.58 inches	0 minutes / pierce
Last Torch Tip Installed: 9 Nov 2005 11:40 AM	0 minutes / pierce	0 minutes / pierce	Last Nozzle Installed: None Installed
	Last Nozzle Installed: 9 Nov 2005 11:40 AM	0 volts / minute	
		Last Electrode Installed: 26 Aug 2005 11:18 AM	

At the bottom of the screen, there are buttons for "New Torch Tip or Nozzle", "New Electrode", "Manual Options", "Reset Database", "Upload Database", and "Save Database". On the right side, there are "Cancel" and "OK" buttons.



**Overview**

If the New Torch Tip or New Electrode soft key is pressed every time a torch tip or electrode is changed, the last information for the corresponding consumable will be added to a database. This database will show the date a consumable was changed and how long it lasted in minutes, pierces, inches and millimeters.

To reset the current consumable value press the New Tip/New Electrode button. Select the desired Torch Tip or Electrode to be updated. The value of the tracking information will be reset to zero and will start counting up as you cut in the selected mode. The "Installed on" date for the selected consumable will be updated and the current values for the selected consumable will be recorded with the date in a database that can be saved to disk.

The database is saved in CSV (Comma Separated Value) format at the control and may be downloaded for use with standard database software programs for productivity and cost analysis. Additionally, this data may also be viewed in the Watch window during cutting.

Which consumable information is updated (Oxy torch 1-12 / Plasma torch 1-8) is determined by the "Station Select 1-20" inputs.

For the example given above Plasma Torch #1 torch tip has a limit of 5000 minutes of operation. After 5000 minutes have been performed on Torch #1, the Change Consumable output will become active. Generally, this output is tied to an indicator lamp or audible alarm. The intent is to set the limits at an expected life value of the consumable so that the operator will be reminded to change the consumable when it has reached its expected life.

The data collected on the consumable life will automatically update to the new highest value. For the example above, the new maximum value could extend above 5000 minutes as the new value is attained (e.g. the value would increment to 5001 and continue to count). This auto update feature may be disabled in the password protected Special Setups screen.

**Minutes**

This is the estimated life in time that the torch tip or electrode will last. This value will increase to the maximum life achieved or a maximum value may be entered

**Pierces**

This is the estimated life in pierces that the torch tip or electrode will last. This value will increase to the maximum life achieved or a maximum value may be entered

**Inches/millimeters**

This is the estimated life in distance that the torch tip or electrode will last. This value will increase to the maximum life achieved or a maximum value may be entered

**Minutes per Pierce**

Generally, the process of piercing the plate causes additional wear to the consumable life. This parameter allows the user to enter a value which will be added to the overall Minutes value for each pierce, providing a more accurate representation of overall consumable wear.

**Arc Errors**

Actual Arc Errors may be tracked using the Arc Error Input to the control from the Plasma supply. The power supply indicates an Arc Error when the Plasma Arc did not achieve a long-life ramp down. The Arc Error input to the control is through the HD4070® Serial Communications or through the discrete "Arc Error" Input.

**Volts per Minute**

The Volts per Minute parameter allows the user to input a value that will be used to change the cut Arc Voltage based on the number of minutes that have elapsed while cutting in Plasma mode. This value will adjust the Voltage offset value. Note: This feature is only available for systems configured with the Sensor™ THC.

**Last Torch Tip Installed**

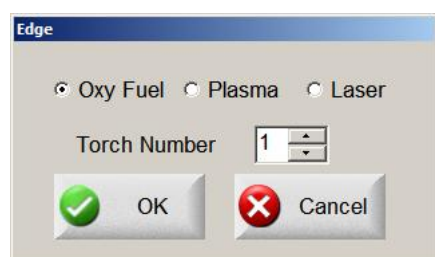
Displays the date and time when the selected tip was installed.

**Last Electrode Installed**

Displays the date and time when the selected electrode was installed.

**New Torch Tip**

Pressing the New Torch Tip soft key allows the operator to select which Torch Tip has been replaced and to update the database.

**New Electrode**

Pressing the New Electrode soft key allows the operator to select which Electrode has been replaced and to update the database.

**Setups**

Pressing the Setups soft key accesses the control setups for adjustment of the cut process.

**Reset Database**

This soft key is used to reset the values in the database on the control, clearing the torch tip or electrode information after uploading or saving the database.

**Upload Database**

This soft key is used to upload the current database to a host computer running our link.

**Save Database**

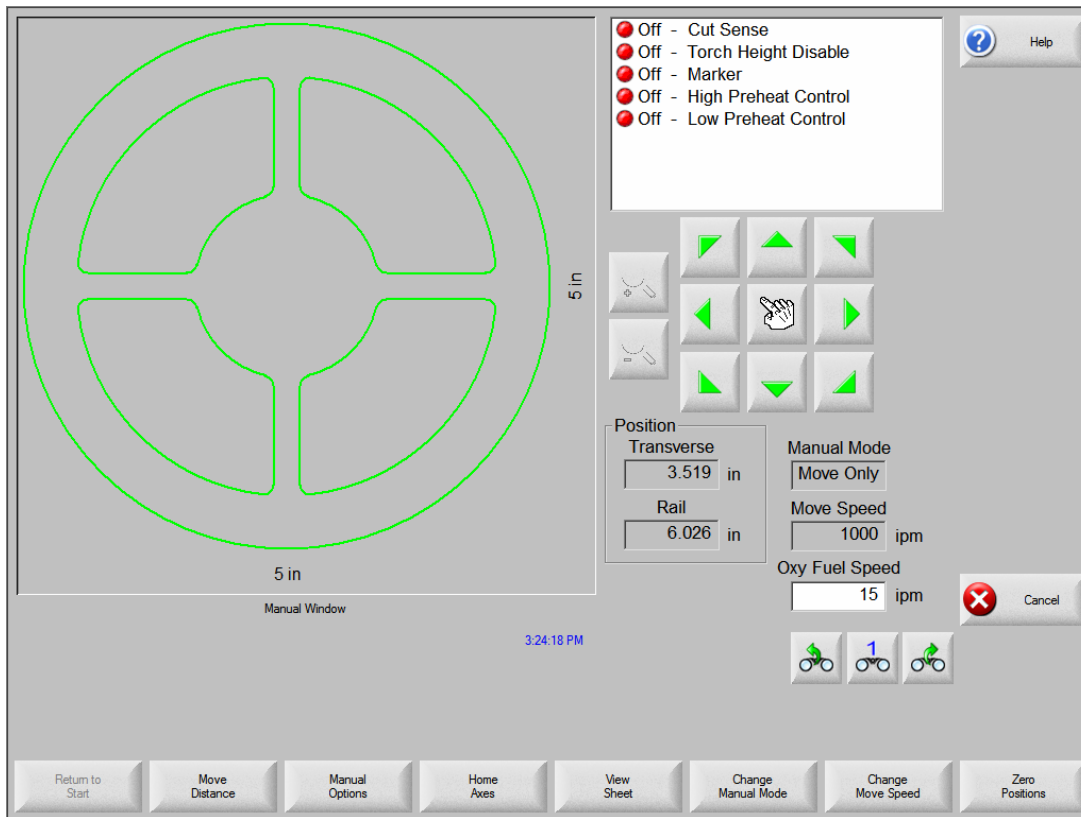
This soft key is used to save the current database to the Diskette or USB memory stick

# Section 10: Manual

The manual key is indicated by the “hand” icon.



After pressing the Manual key on screen, the following screen is displayed. The directional jog keys will be active when shown in green.



Whenever the manual keys are active, the cursor icon in the graphics display window will be in the shape of a tiny hand.

From the Manual window, the machine can be moved manually in one of eight directions using the arrow keys. The dual-purpose arrow keys are press on/release off. The cutting device moves as long as the key is held down. When the key is released, it comes to a smooth stop.

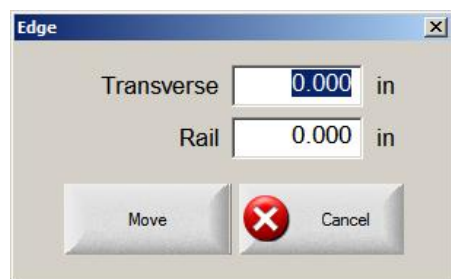
If the Latched Manual Key feature is enabled in the control setups, pressing the manual key a second time will allow motion to continue without holding down the arrow key. This feature is available for the manual direction keys in the Manual, Align and Pause screens. When this feature is activated, the dialog “Latched Manual Keys On” will be displayed in red at the bottom right corner of the part window. Motion can be paused by use of the Stop, Cancel or an arrow key. The Latched Manual Key feature can be turned off by pressing the manual key again.

**Return to Start**

Whenever the Manual window is entered, the Transverse and Rail positions at that point are saved. After rip cutting or other manual operations it may be desirable to return to this "start" position. Pressing the Return to Start soft key will generate motion in the Transverse and Rail axes from the machine's current position to the position saved at entry into the Manual window.

**Move Distance**

When Move Only is displayed in the Manual Mode window, the second soft key from the left changes to Move Distance, allowing manual moves of an exact distance to be performed. After pressing Move Distance, the control prompts the operator for Traverse and Rail distance values for machine motion. Enter the desired values and press ENTER. The cutting device then moves the entered distance in a straight line without executing any cut logic.

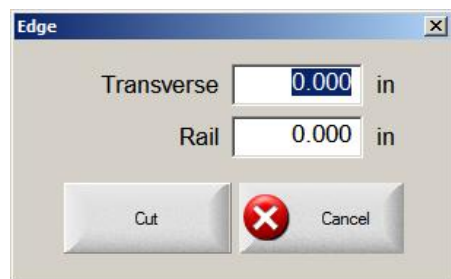


Values are entered the same way as described in the Cut Distance paragraphs above.

As with any automatic motion, you may press STOP on the front panel at any time to bring the machine smoothly to a stop before the programmed motion is complete.

**Cut Distance**

When Rip Cut mode is selected in the Manual Mode window, the second soft key from the left changes to Cut Distance, allowing rip cuts of an exact distance to be performed. After pressing Cut Distance, the control prompts the operator for Traverse and Rail distance values for machine motion. Enter the desired values and press ENTER. After executing the cut logic sequence, the cutting device then moves the entered distance in a straight line.



If you enter incorrect values, press the CANCEL key at any time. After motion has begun, press STOP on the front panel to bring the machine smoothly to a stop before the programmed motion is complete.

Rip Cut mode is useful for making a cut along a specified linear path. Motion stops and cutting action ceases either when the new position is reached or when the STOP key is pressed. If an exact distance is not known, enter a distance longer than needed in the right direction, and then press STOP to abort the cut.

**Manual Options**

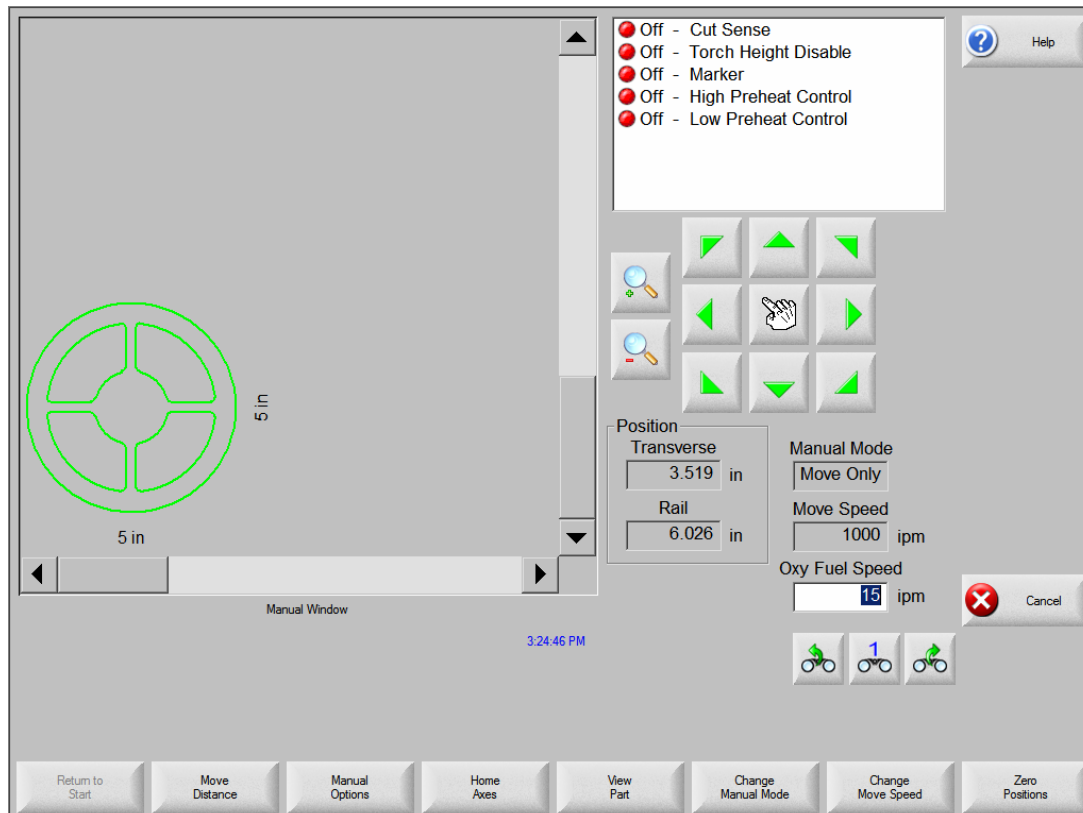
Pressing the Manual Options soft key accesses the Manual Options screen.

**Home Axes**

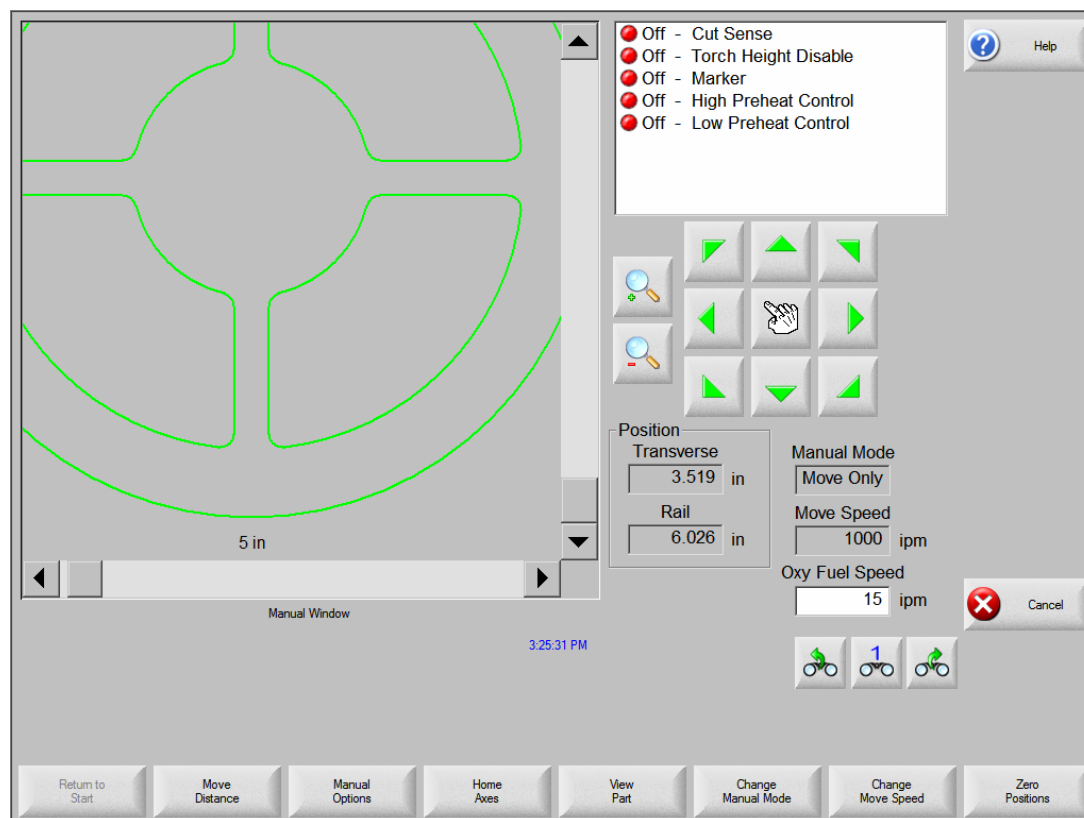
Pressing the Manual Options soft key accesses the Homes Axes screen.

**View Sheet/View Part**

View Sheet allows the viewing of a part as it would appear on the plate. After pressing the View Sheet soft key, the display window zooms out to show the part in relationship to the entire plate.



After zooming out, the display can be zoomed in again by pressing the + key, which causes horizontal and vertical scroll bars to be displayed. Pressing the - key will zoom back out.



While the scroll bars are displayed, the view of the machine can be shifted horizontally and vertically by holding down the scroll bar and moving in the desired direction. This mode is useful in normal cutting to closely follow the cut path while in zoom.

While cutting in sheet view, the control will automatically scroll to keep the cut location centered within the view screen. This feature is useful in normal cutting to closely follow the cut-path while zoomed in.

View Sheet is more useful when proper Plate Size values have been entered in Cutting setups and when the machine has been previously homed. Viewing of large parts when fully zoomed during a cut may not allow the part to be fully drawn on screen before moving onto the next view location. This may appear as a flashing view screen and may be corrected by zooming out to get a larger view area.

### Change Manual Mode

This soft key changes the control Manual Mode from Move Only to Rip Cut and vice versa. Pressing this soft key also causes the second soft key from the left to change function from Move Distance to Cut Distance. Rip Cutting is described in more detail below.

### Change Move Speed

Is used to toggle through the four Move Speeds available. The four Move Speeds are the Maximum Machine Speed, High Jog Speed, Medium Jog Speed and Low Jog Speed from the Speeds setups.

### Zero Positions

Pressing this soft key zeroes all axes positions.

### Rip Cutting

When the Manual Mode window displays Rip Cut, the arrow keys can then be used to initiate a cut sequence and machine motion in the direction chosen.

To initiate a Rip Cut, first ensure that the proper cut-mode (Oxy or Plasma) was previously selected. Next, make sure that the proper cut speed is displayed in the Cut Speed window (editable in Rip Cut mode) and then press the arrow key corresponding to the desired start direction for the cut. The cutting sequence proceeds even after the key is released; however, machine motion is generated **only as long as an arrow key is held down**, unless the latched manual key feature has been enabled. Use the various arrow keys to change direction and the cutting device will continue to operate until the Stop, Cancel or Manual Key is pressed.

## Manual Options

The screenshot displays the Manual Mode window with the following elements:

- Speed Selection:** Radio buttons for **THC Jog**, **Slow IHS**, **Fast IHS**, and **Full Jog Speed**.
- Manual Offset:** A dropdown menu currently set to **User Defined**.
- Position Inputs:**
  - Transverse:** 0 in
  - Rail:** 0 in
- Control Pad:** A 3x3 grid of directional arrow keys (Up, Down, Left, Right, Center) and two keys with torch icons.
- Status List:** A list of system status indicators, all currently **Off**:
  - Off - Cut Sense
  - Off - Torch Height Disable
  - Off - Marker
  - Off - High Preheat Control
  - Off - Low Preheat Control
- Position Display:**
  - Transverse:** 3.519 in
  - Rail:** 6.026 in
- Cut Mode:** A dropdown menu set to **Oxy Fuel**.
- Kerf:** 0.1 in
- Oxy Fuel Speed:** 15 ipm
- Buttons:**
  - Cancel:** A button with a red 'X' icon.
  - OK:** A button with a green checkmark icon.
  - Manual Key:** A button with a blue '1' icon.
  - Stop:** A button with a green circular arrow icon.
- Bottom Bar:**
  - Raise Torch:** A button with an upward arrow icon.
  - Lower Torch:** A button with a downward arrow icon.
  - Manual Offset:** A button with a circular arrow icon.
  - Adjust Dual Gantry Skew:** A button with a double-headed arrow icon.
- Timestamp:** 3:26:42 PM
- Help:** A button with a question mark icon.

### Raise Torch

Raises the cutting torch while the soft key is pressed or until the Torch Up sense input is activated.

### Lower Torch

Lowere the cutting torch while the soft key is pressed or until the Torch Down sense input is activated. If the Torch Down Output has been enabled to stay on during the cut in Plasma setups, pressing the Lower Torch soft key will keep the torch in the down position until the Lower Torch soft key is depressed a second time.

**Manual Offset**

Manual Offset is useful for cutting tables that have a laser alignment tool attached and allows you to use your laser alignment tool for aligning a part to a plate. The offset will stay in place until it is turned off from this screen or a part is cut in either Oxy-Fuel or Plasma cut mode.

The user may select the following offsets:

- User Defined – Uses the selected X / Y Offset distance.
- Laser pointer to Plasma 1 – Offset 10
- Laser pointer to Plasma 2 – Offset 11
- Laser pointer to Oxy Fuel – Offset 12

**Adjust Dual Gantry Skew**

Allows the operator to manually realign the Dual Gantry Axis using the directional manual jog (arrow ↑ and ↓) keys.



## Home Axes

From the Home screen, each axis or all axes can be "homed". In addition, the Transverse and Rail axes can be sent to one of four programmed alternate home positions.

The screenshot displays the 'Home' screen of a control system. At the top, there are input fields for 'Home Position 1' (set to 1), 'X' (set to 1 in), and 'Y' (set to 1 in). Below these are four large position displays, each showing '0.000 in': 'Transverse Position', 'Rail Position', 'Dual Gantry Position', and 'THC 1 Position'. A 'Following Error' window is open, showing similar '0.000 in' values for Transverse, Rail, Dual Gantry, and THC 1. The status 'Homing Off' is displayed in blue text, along with the time '3:27:21 PM'. At the bottom, there is a grid of buttons: 'GoTo Home Position 5' through 'GoTo Home Position 12' in the top row, and 'Transverse', 'Rail', 'THC', 'All', 'GoTo Home Position 1', 'GoTo Home Position 2', 'GoTo Home Position 3', and 'GoTo Home Position 4' in the bottom row. A 'Cancel' button with a red 'X' and an 'OK' button with a green checkmark are also present.

The Home feature is used to set a known absolute physical position location on the cutting table that is used for referencing future manual "Go to Home" and other motion commands. This is generally performed through activation of a home switch positioned on the appropriate axis giving it a known physical location.

When the Homing Command is entered at the control, the control will move the axis towards the Home Switches at the Fast Home Speed until the switches have been activated. Once the switches have been activated, motion stops and then the axis moves in the opposite direction off switch at the Slow Home Speed. The moment that the switch is deactivated, the position is recorded at the control providing an absolute reference point for future motion commands.

### Transverse

Pressing the Transverse soft key causes the automated homing procedure to be executed. This procedure generally produces machine motion in the Transverse axis, depending on the homing parameters set in the Setups.

### Rail

Pressing the Rail soft key causes the automated homing procedure to be executed. This procedure generally produces machine motion in the Rail axis, depending on the homing parameters set in the Setups.

**CBH**

Pressing the CBH soft key causes the automated homing procedure to be executed. This procedure generally produces machine motion in the CBH axis, depending on the homing parameters set in the Setups.

**THC**

Pressing the THC soft key causes the automated homing procedure for the Sensor™ THC to be executed. This procedure generally produces machine motion in the THC axis, depending on the homing parameters set in the Setups.

**Tilt**

Pressing the Tilt soft key causes the automated homing procedure for the Tilt Axis to be executed.

**Rotate**

Pressing the Rotate soft key causes the automated homing procedure for the Rotate Axis to be executed.

Note: If Tilt and Rotate Axes are enabled, the following window will appear to allow access to the Tilt/ Rotate or other axes.



Selecting "Yes" will access Homing for the Tilt and Rotate Axes. Selecting "No" will access the Homing functions for the other axes,

**All**

Pressing the All soft key causes the automated homing procedure to be executed. This procedure generally produces machine motion in one or more axes, depending on the homing parameters set in the Setups.

**Go To Home Position**

Pressing one of the four Go To Home Position soft keys causes the Transverse and Rail axes to move to the predefined position set in the corresponding edit window. The Go To Positions are absolute and require that an automated home procedure be executed previously.

# Appendix A: Sensor™ THC

## Sensor™ Torch Height Control Overview

Sensor™ THC is a proprietary Automated Torch Height Control system that is designed specifically for use with your shape cutting control. Sensor™ THC utilizes the most current technology available to provide superior plasma cut performance with unmatched ease of use.

During the plasma cut process, variations in the distance between the torch tip and the cut material will affect the cutting arc voltage and ultimately, the quality of the cut. Through use of an automated torch height control to maintain the appropriate cut height for the set arc voltage, we are able to obtain the optimum cut quality regardless of variations in plate positioning.

Sensor™ THC is operated as a separate closed loop servo axis on the control and has several setup parameters available to customize the system for optimal performance and individual requirements. The THC system is made up of four parts: the control, the analog input card mounted in the control, the voltage divider card and the mechanical slide with a motor to operate the slide. The voltage divider card, which would be mounted in the plasma power supply, monitors the arc voltage of the cutting process at the torch then transmits  $1/40^{\text{th}}$  of this voltage to the analog input card in the control where it is multiplied up to the original value. This value is then compared to the selected Set Arc Voltage. If the values are different, the control will raise or lower the torch on the slide to correct the cut voltage. This Appendix will highlight the features which are unique to the Sensor™ THC.

For operation, this feature must first be enabled in the password machine setups. Setup parameters specific to the cut process and the THC axis will then be available for configuration.



**Warning!** Installation, Setup and Calibration should only be performed by trained service personnel. Extreme care should be used when installing this product.

## Cut Setups

Cut Mode: **Plasma**  
 Kerf: **0** in    Kerf Variable: **1**    Kerf Value: **0** in  
 Plasma Speed: **200** ipm    Plasma 2 Cut Speed: **0** ipm  
 Marker Speed: **400** ipm    Marker 2 Speed: **10** ipm  
 Plate Size: X **48** in    Y **96** in  
 Vent Control 1: On **0** in    Off **51** in  
 Marker Offset 1: X **0** in    Y **0** in  
 Dwell Time: **5** sec  
 Arc Radial Error: **0.05** in

Status	Program Code
Enabled	- Dwell Override
Enabled	- Optional Program Stop
Disabled	- EIA I & J Codes Absolute
Enabled	- EIA F-Code Override
Disabled	- Speed +/- Affects F-Codes
Disabled	- EIA Single Decimal Shift
Enabled	- Process Select Override

Show Traverse Segments: ☐ Off ☒ On  
 Retain Skew Adjustment: ☒ Off ☐ On

THC Voltage Offsets:  
 Offset 1: **0** volts    Offset 5: **0** volts  
 Offset 2: **0** volts    Offset 6: **0** volts  
 Offset 3: **0** volts    Offset 7: **0** volts  
 Offset 4: **0** volts    Offset 8: **0** volts

10:09:41 AM

Cutting    Process    Disable Control    Watch    Password    Diagnostics    Change to Metric Units

### THC Voltage Offset

The THC Voltage Offset Parameter is used to offset the individual Sensor THC™ Arc Voltages from the master set Arc Voltage. This allows the individual THCs to be adjusted to compensate for consumable wear and obtain optimum cut quality.

Note: The THC Voltage Offset parameter may be automatically adjusted using the Volts per Minute parameter of the Change Consumable feature. Please refer to the Change Consumable information in this guide for additional details.

## Plasma Setups

Plasma / Sensor THC Setup Parameters		Voltage Tracking Range <input type="text" value="50"/> volts		Help	
Purge Time	<input type="text" value="0"/> sec	IHS in Manual	<input type="radio"/> Off <input checked="" type="radio"/> On		
Pierce Time	<input type="text" value="0"/> sec	Retract	<input type="radio"/> Full <input checked="" type="radio"/> Partial		
Creep Time	<input type="text" value="0"/> sec	Partial Retract Distance	<input type="text" value="0.9"/> in		
Cut Off Time	<input type="text" value="0"/> sec	Start IHS Distance	<input type="text" value="1"/> in		
Arc Off Time	<input type="text" value="0"/> sec	Skip IHS Within	<input type="text" value="5"/> in		
Stop Time	<input type="text" value="0"/> sec	Preflow During IHS	<input type="radio"/> Off <input checked="" type="radio"/> On		
Retract Delay	<input type="text" value="0"/> sec	Early Preflow if Skip IHS	<input type="radio"/> Off <input checked="" type="radio"/> On		
Set Arc Current	<input type="text" value="200"/> amps	Nozzle Contact IHS	<input type="radio"/> Off <input checked="" type="radio"/> On		
Corner Current Percent	<input type="text" value="100"/> %	Nozzle Contact During Cut	<input checked="" type="radio"/> Off <input type="radio"/> On		
Auto Voltage Set	<input checked="" type="radio"/> Off <input type="radio"/> On	Offset IHS	<input checked="" type="radio"/> Off <input type="radio"/> On		
Set Arc Voltage	<input type="text" value="130"/> volts	Auto Kerf Detect	<input type="radio"/> Off <input checked="" type="radio"/> On		
Cut Height	<input type="text" value="0.125"/> in	Auto Kerf Voltage Change	<input type="text" value="3"/> volts		
Pierce Height	<input type="text" value="200"/> % <input type="text" value="0.25"/> in	Kerf Detect Reacquire Time	<input type="text" value="0.05"/> sec	MultiTasking	
Height Control	<input type="radio"/> Manual <input checked="" type="radio"/> Automatic	Retry on Transfer Fail	<input type="text" value="0"/> times	Cancel	
Ignition Output	<input type="radio"/> Off <input checked="" type="radio"/> On	Transfer Time	<input type="text" value="0"/> sec	OK	
				10:10:13 AM	
Plasma 1 Cut Chart		Save Data		Load Data	
Oxy Fuel	Plasma 1	Plasma 2	Marker 1	Marker 2	Laser
			Water Jet		
Timing Diagram					
Test Lifter					

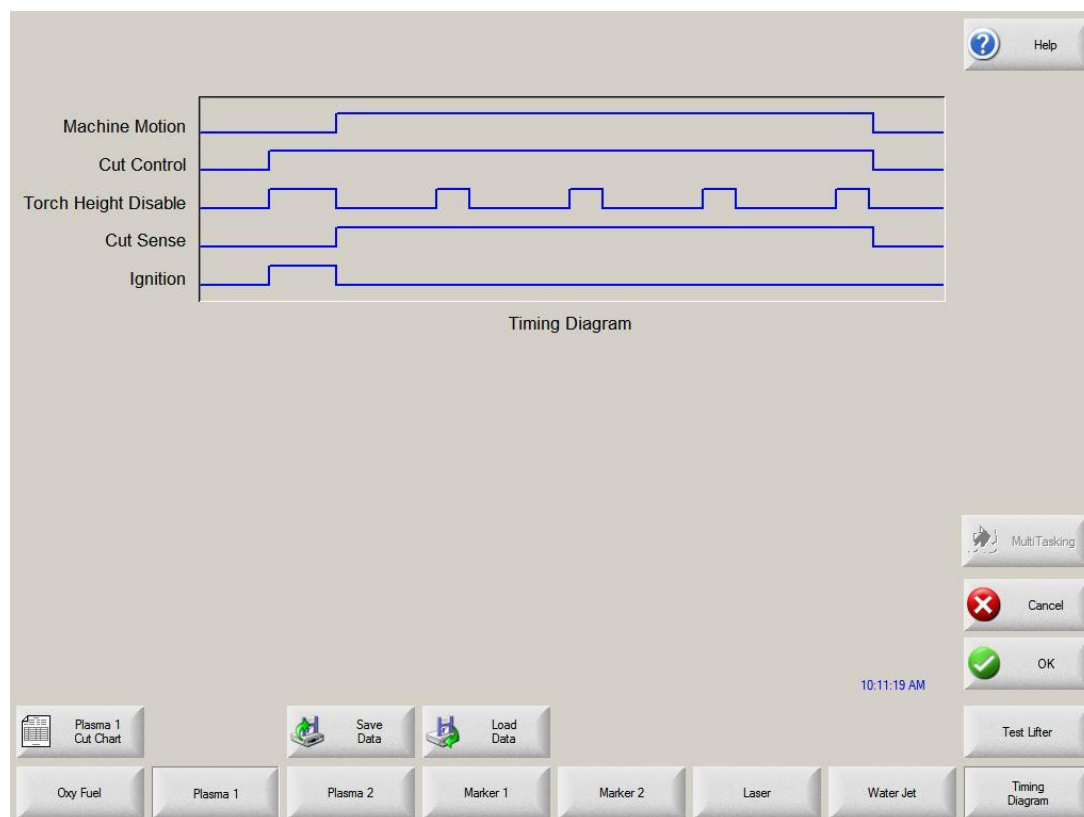
Test lifter soft key will be available to test the IHS function.



### Test Lifter

Pressing the Test Lifter soft key will command the torch lifter to lower to the plate, sense the plate and retract to the pierce height

Press the Timing Diagram soft key to view the timing diagram from setups.



### Retract Delay

The Retract Delay Parameter is used to specify the amount of time delay that the used between the cut off and the torch retract.

### Auto Voltage Set

When enabled, the Auto Voltage Set feature is used to sample the Arc Voltage being generated when cutting at a specific cut height. Then the Arc Voltage value relative to the manual cut height sample will be used when cutting the part instead of a predetermined Arc Voltage.

### Set Arc Voltage

The operator may input the desired Arc Voltage for the material being cut.

### Cut Height

The Cut Height setup parameter is used to select the desired cut distance from the plate. This will set the initial cut height before arc voltage control is activated when operating in automatic mode.

### Pierce Height

The Pierce Height setup parameter is used to select the desired Pierce Height. This may be entered as a multiplication factor that is calculated times the Cut Height or an actual Pierce Height distance.

### Voltage Control

This setup parameter allows the operator to select the Sensor THC to operate in Manual or Automatic mode. Manual mode will disable the torch height control, allowing the torch to cut at the specified cut height and voltage. Automatic mode allows the THC to command the torch up and down to maintain the voltage at the specified arc voltage set point.

**Ignition Output**

Enables use of the Ignition Output for use in igniting the plasma torch. If your plasma system requires a separate ignition signal, toggle Ignition to ON. If not, leave Ignition OFF.

**Voltage Tracking Range**

The Voltage Tracking Range parameter specifies the allowable variation in arc voltage from the setpoint. If the arc voltage should go above or fall below this allowable range, the system will fault and pause cutting.

**IHS in Manual**

The IHS in Manual setup parameter allows the operator to select whether or not to use the Initial Height Sense feature when operating the Sensor THC in manual mode.

**Retract Full/Partial**

Selects the retract distance to be set at Full or Partial. In the Full retract mode, the torch will retract to the Home position. In Partial retract mode, the torch will retract to the set retract distance.

**Partial Retract Distance**

This setup parameter is used to select the THC Retract Distance when configured for partial retract mode.

**Start IHS Distance**

The Start IHS Distance specifies the distance of travel for the THC to move the torch at high speed before switching to low speed and beginning Initial Height Sense. Caution should be taken when selecting this distance so that the torch does not crash into the plate.

**Skip IHS Within**

The Skip IHS Within feature is used to disable Initial Height Sense at pierce points if it falls within the selected distance to increase cutting productivity. The distance is measured from the end point of the cut segment to the next pierce point. If this distance falls within the selected Skip IHS Within distance, no IHS will take place.

**Preflow During IHS**

Selecting ON will activate Preflow during the IHS cycle.

**Early Preflow if Skip IHS**

Selecting ON will activate Preflow during the traverse prior to the pierce while the skip IHS feature is used.

**Nozzle Contact IHS**

This parameter would be set to ON to select the Sensor THC to use Contact Sense to detect the plate during the IHS cycle. It is recommended that Nozzle Contact Initial Height Sense be used when cutting light gauge material to prevent plate deflection.

**Nozzle Contact During Cut**

This parameter would be set to ON to select the Sensor THC to use the Contact Sense input to detect the plate contact during cutting and pause operation.

**Offset IHS**

The Offset IHS feature is used to activate a remote probe for plate detection and Initial Height Sense. With this feature enabled, the control system will execute the Tool / Marker Offset number nine. This will move the Plasma cutting torch the distance of the offset, perform the IHS and then return the Plasma torch to the pierce location at each commanded pierce / cut on. The Z axis parameter is used to adjust for height differences between the torch and the probe.

▼	Marker Offset 9	X	1	in	Y	1	in	Z	0	in
---	-----------------	---	---	----	---	---	----	---	---	----

**Auto Kerf Detect**

The Auto Kerf Detect feature reduces the possibility of the torch diving into the plate. When enabled, the THC will detect sudden changes in arc voltage when crossing a Kerf path and will freeze motion of the THC.

**Auto Kerf Voltage Change**

The Auto Kerf feature of the Sensor THC will detect a voltage change when the torch passes over a previous cut and will disable the THC to prevent the torch from diving. This setup parameter is used to specify the allowable variation from the voltage setpoint at which the THC will detect the voltage change and disable the THC.

**Kerf Detect Reacquire Time**

The Kerf Detect Reacquire Time determines the time limit at which the control will force the THC to adjust the THC height to meet the voltage setpoint if the Automatic Voltage Lock On has not been established after a Kerf crossing.

**Note:** Depending on the performance of the plasma system being used, a creep time may be required to allow for ramp up of the cut voltage after the pierce.



## Marker Setups

**Marker / Sensor THC Setup Parameters**

Purge Time  sec

Start Time  sec

Arc Off Time  sec

Set Arc Current  amps

Corner Current Percent  %

Auto Voltage Set ☒ Off ☐ On

Set Arc Voltage  volts

Mark Height  in

Start Height  %  in

Height Control ☐ Manual ☒ Automatic

Voltage Tracking Range  volts

IHS in Manual ☒ Off ☐ On

Retract ☐ Full ☒ Partial

Partial Retract Distance  in

Start IHS Distance  in

Skip IHS Within  in

Preflow During IHS ☒ Off ☐ On

Early Preflow if Skip IHS ☒ Off ☐ On

Nozzle Contact IHS ☐ Off ☒ On

10:12:34 AM

Marker 1 Mark Chart Save Data Load Data

Oxy Fuel Plasma 1 Plasma 2 Marker 1 Marker 2 Laser Water Jet

Cancel OK Test Lifter

Test lifter soft key will be available to test the IHS function.



### Test Lifter

Pressing the Test Lifter soft key will command the torch lifter to lower to the plate, sense the plate and retract to the pierce height

### Purge Time

Specifies the time delay from torch ignition until motion is enabled.

### Start Time

Specifies the time delay from when torch completes lowering until motion is initiated at Creep Speed. Used to allow the Marker to completely transfer to the material before moving.

### Sample Voltage

When enabled, the Sample Voltage feature is used to sample the Arc Voltage being recorded when cutting at a specific cut height, then that Arc Voltage value will be used when cutting the part instead of a predetermined Arc Voltage.

### Set Arc Voltage

The operator may input the desired Arc Voltage for the material being cut.

**Mark Height**

The Mark Height setup parameter is used to select the desired cut distance from the plate. This will set the initial cut height before arc voltage control is activated when operating in automatic mode.

**Start Height**

The Start Height setup parameter is used to select the desired Start Height. This may be entered as a multiplication factor that is calculated times the Start Height or an actual Start Height distance.

**Voltage Control**

This setup parameter allows the operator to select the Sensor THC to operate in Manual or Automatic mode. Manual mode will disable the torch height control, allowing the torch to cut at the specified cut height and voltage. Automatic mode allows the THC to command the torch up and down to maintain the voltage at the specified arc voltage setpoint.

**Voltage Tracking Range**

The Voltage Tracking Range parameter specifies the allowable variation in arc voltage from the setpoint. If the arc voltage should go above or fall below this allowable range, the system will fault and pause cutting.

**IHS in Manual**

The IHS in Manual setup parameter allows the operator to select whether or not to use the Initial Height Sense feature when operating the Sensor THC in manual mode.

**Retract Full/Partial**

Selects the retract distance to be set at Full or Partial. In the Full retract mode, the torch will retract to the Home position. In Partial retract mode, the torch will retract to the set retract distance.

**Partial Retract Distance**

This setup parameter is used to select the THC Retract Distance when configured for partial retract mode.

**Start IHS Distance**

The Start IHS Distance specifies the distance of travel for the THC to move the torch at high speed before switching to low speed and beginning Initial Height Sense. Caution should be taken when selecting this distance so that the torch does not crash into the plate.

**Skip IHS Within**

To increase cutting productivity, the Skip IHS Within feature is used to disable Initial Height Sense at pierce points if it falls within the selected distance. The distance is measured from the end point of the cut segment to the next pierce point. If this distance falls within the selected Skip IHS Within distance, no IHS will take place.

**Preflow During IHS**

Selecting ON will activate Preflow during the IHS cycle.

**Nozzle Contact IHS**

This parameter would be set to ON to select the Sensor THC to use Contact Sense to detect the plate during the IHS cycle. It is recommended that Nozzle Contact Initial Height Sense be used when cutting light gauge material to prevent plate deflection.

## Process Watch

The screenshot displays the 'Process Watch' control interface. It features a top navigation bar with buttons for 'Cutting', 'Process', 'Disable Control', 'Watch', 'Password', 'Diagnostics', and 'Change to Metric Units'. The main area is organized into several functional sections:

- Upper Location:** Includes a 'Jog Keys' dropdown and two input fields labeled '1st' and '2nd'.
- Middle Location:** Includes an 'Input / Output' dropdown and two input fields labeled '1st' and '2nd'.
- Lower Location:** Includes a 'Process Data' dropdown, a 'Plasma 1' dropdown, and four input fields labeled '1st' through '4th' with values like 'Arc Voltage 1', 'Set Arc Voltage', 'Cut Height', and 'Skip IHS Within'.
- Inputs:** A list of input signals including 'Input1', 'Dual Gantry Home', 'Program Inhibit', 'Cut/Mark Sense', 'Input5', 'Remote Pause', and 'Drive Disabled'.
- Outputs:** A list of output signals including 'Torch Up', 'Torch Down', 'Ignition', 'Torch Height Disable', 'Hold Ignition', 'Marker', and 'Cut Control'.
- Status:** A list of status signals including 'Drive Enable 1' through 'Drive Enable 6' and 'THC Locked On'.
- Plasma 1:** A section for plasma parameters including 'Arc Voltage 1' (100.0 volts), 'Set Arc Voltage' (130 volts), 'Cut Height' (0.125 in), and 'Skip IHS Within' (5 in).
- Status List:** A list of status indicators with green/red circles and text: 'On - Cut/Mark Sense', 'On - Plasma 1 Select', 'Off - Plasma 2 Select', 'On - Marker 1 Select', 'Off - Marker 2 Select', 'Off - Cut Control', and 'Off - High Preheat Control'.
- Bottom Bar:** Contains buttons for 'Cutting', 'Process', 'Disable Control', 'Watch', 'Password', 'Diagnostics', and 'Change to Metric Units'.

A timestamp '10:17:18 AM' is displayed in the center of the interface.

### Input/Output

In addition to the standard I/O options, the Watch window may be configured to include the status of the voltage tracking for the Sensor™ THC. This will indicate when the automated voltage tracking has “Locked On” and is adjusting the torch height based on voltage.

### Position

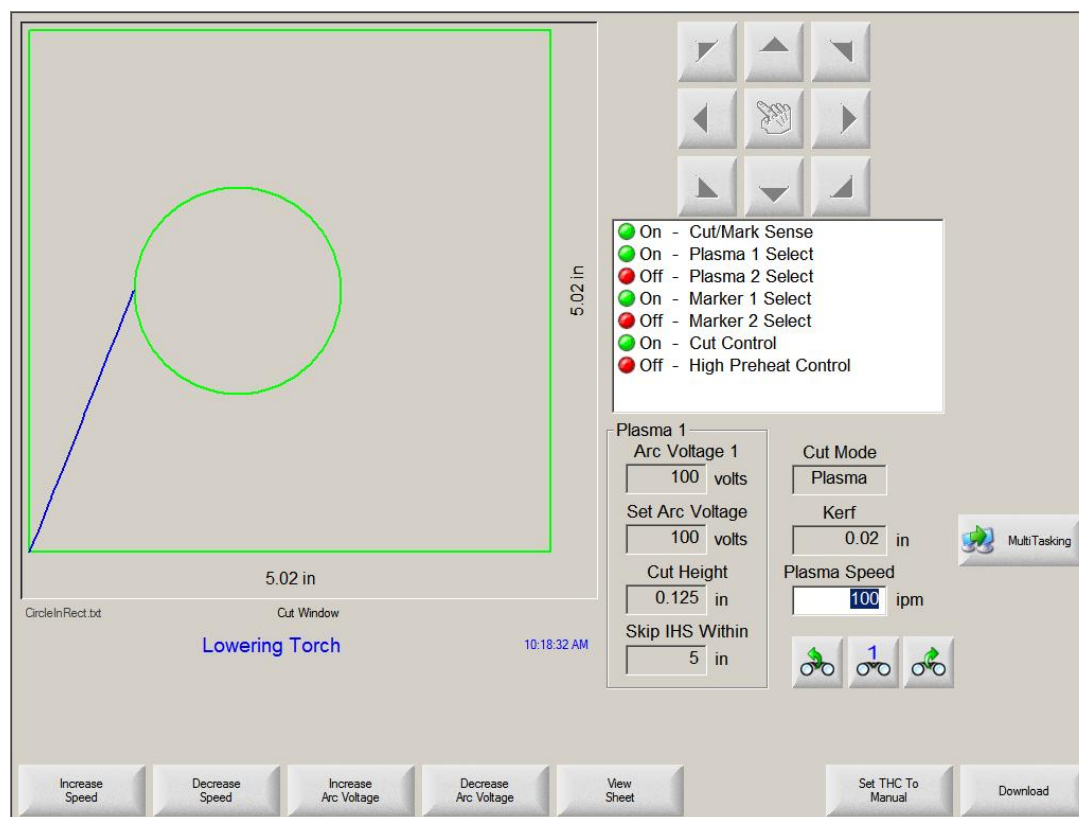
The Sensor™ THC is operated as a separate axis on the control. Position information for the THC axis may be displayed in the Watch window.

### Plasma Process

Information critical to the THC operation may be added to the Lower Location. This information includes the Actual Arc Voltage, the Set Arc Voltage, Initial Cut Height and Pierce Delay. Values for the Set Arc Voltage, Initial Cut Height and Pierce Delay may be adjusted at the main screen to customize the cut process.

## Main Cut Screen

### Automatic THC Mode



While at the main cut screen, when cutting with the Sensor™ THC in Automatic mode, three new soft keys will become available to manually increase and decrease the Arc Voltage for the cut and to switch to Manual mode.

While at the main cut screen, when cutting with the Sensor™ THC in Manual mode, three new soft keys will become available to manually raise and lower the Manual Cut Height and to switch to Automatic mode

## Appendix B: Command® THC

The Command® THC from Hypertherm® is an automated Torch Height Control system which adjusts the distance between the Plasma torch and the work surface for improved cut quality. Once enabled in password protected setups, operational parameters for the Command® THC may be configured at the Plasma Setups Screen for use. For additional information on the use of the Command® THC, please refer to the operating instructions provided with the THC system.

Plasma / Command THC Setup Parameters

Purge Time	<input type="text" value="0"/> sec	Set Arc Current	<input type="text" value="200"/> amps
Pierce Time	<input type="text" value="0"/> sec	Corner Current Percent	<input type="text" value="100"/> %
Creep Time	<input type="text" value="0"/> sec	Set Arc Voltage	<input type="text" value="130"/> volts
Cut Off Time	<input type="text" value="0"/> sec	Cut Height	<input type="text" value="0.125"/> in
Arc Off Time	<input type="text" value="0"/> sec	Retract Distance	<input type="text" value="0.9"/> in
Stop Time	<input type="text" value="0"/> sec	Pierce Height Factor	<input type="text" value="200"/> %
Accel Delay	<input type="text" value="0"/> sec	IHS Stall Current	<input type="text" value="4"/> <small>amps</small>
Retract Delay	<input type="text" value="0"/> sec	IHS Speed	<input type="text" value="7"/> <small>inches/min</small>
Ignition Output	<input type="radio"/> Off <input checked="" type="radio"/> On	Homing Speed	<input type="text" value="9"/> <small>inches/min</small>
Height Control	<input type="radio"/> Manual <input checked="" type="radio"/> Automatic	Nozzle Ohmic Contact	<input type="radio"/> Off <input checked="" type="radio"/> On
		Auto Kerf Detect	<input type="radio"/> Off <input checked="" type="radio"/> On
Retry on Transfer Fail	<input type="text" value="0"/> times		
Transfer Time	<input type="text" value="0"/> sec		

10:23:20 AM

Cancel Help OK

Oxy Fuel Plasma 1 Plasma 2 Marker 1 Marker 2 Laser Water Jet Timing Diagram

### Additional soft keys

10:22:41 AM

Cancel Help OK

Auto Gas Control Save Data Load Data

Clear Error Test Lifter

### Clear Error

The Clear Error soft key allows the user to clear an error at the Command® THC control box. After the soft key has been pressed, a message will be posted on the control displaying a description of the error.

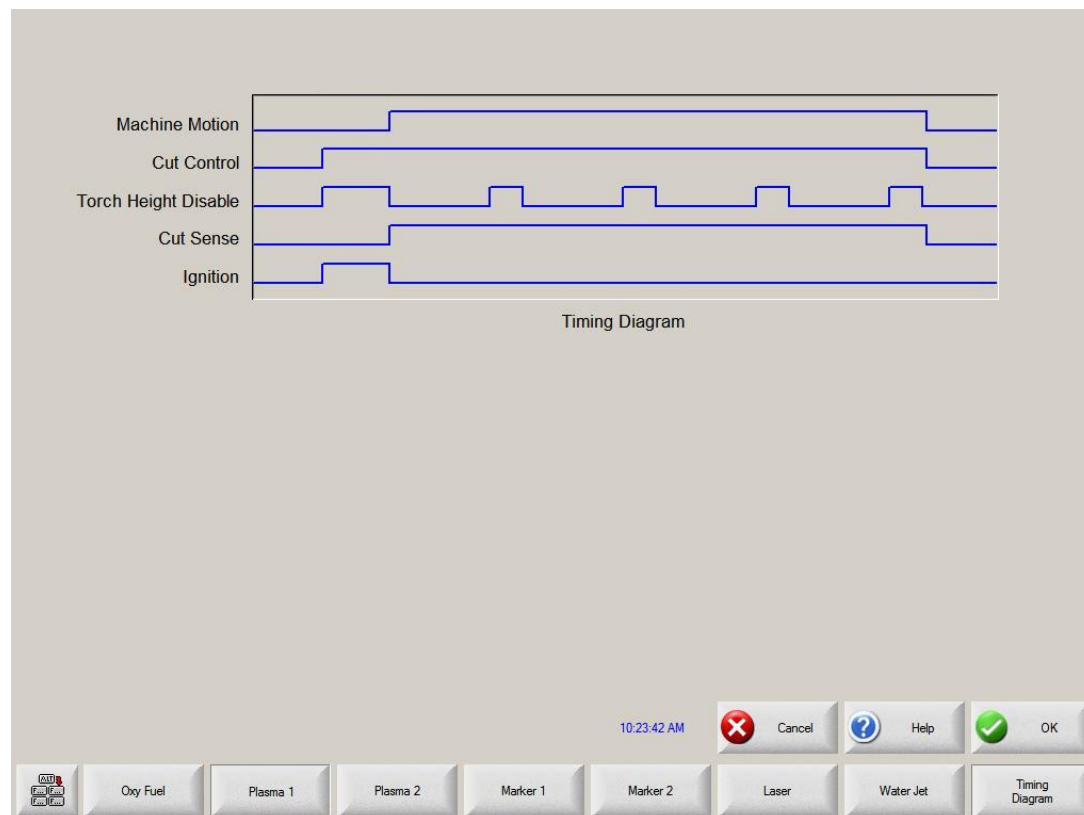
### Test Cycle ON/OFF

Pressing the Test Cycle ON/ OFF soft key allows the operator to select to operate the Command<sup>®</sup> THC in Test mode. In Test mode, the Command<sup>®</sup> THC will complete the cycle without firing the torch.

### Test Lifter

Pressing the Test Lifter soft key will command the torch lifter to lower to the plate, sense the plate and retract to its pierce height.

Press the Timing Diagram soft key to view the timing diagram from setups.



### Purge Time

Specifies the time delay from torch ignition until motion is enabled if Arc On Feedback is OFF. Purge time should be set to Zero if Arc On Feedback is ON.

### Pierce Time

Specifies the time delay from when torch completes lowering until motion is initiated at Creep Speed. Used to allow the plasma torch to completely pierce the material before moving.

### Creep Time

Specifies the amount of time after piercing the part that the torch travels at creep speed. Creep Speed is determined by a setup parameter in the Speed Setup Screen and is a percentage of the programmed cut speed. After this time, the control accelerates to full cut speed.

**Arc Off Time**

Specifies the amount of delay to allow prior to indicating a lost cut signal. This can be useful in helping to minimize nuisance trips when traveling over previously cut paths in complex nested parts.

**Stop Time**

Specifies the amount of time that motion will pause at the end of a cut. This pause is advantageous for allowing the torch to completely raise and clear cut irregularities before continuing on to the next cut segment.

**Accel Delay**

The Accel Delay parameter delays the activation of the Automatic Voltage Control to allow for the cutting table to reach a steady cutting speed. This parameter should be set as low as possible without allowing the torch to dive excessively at the beginning of a cut.

**Retract Delay Time**

Specifies the time delay at the end of the cut signal will pause prior to retracting the torch.

**Ignition**

Enables use of the Ignition output for use in igniting the plasma torch. If your plasma system requires a separate ignition signal, toggle Ignition to ON. If not, leave Ignition OFF.

**Voltage Control**

This setup parameter allows the operator to select the Command® THC to operate in Manual or Automatic mode. Manual mode will disable the torch height control allowing the torch to cut at the specified cut height and voltage. Automatic mode allows the THC to command the torch up and down to maintain the voltage at the specified setpoint.

**Retract Full/Partial**

Selects the retract distance to be set at Full or Partial. In the Full retract mode, the torch will retract to the Home position. In Partial retract mode, the torch will retract to the set retract distance.

**Retry On Transfer Fail**

The Retry On Transfer Fail feature is used to specify the number of times the control will attempt to fire the torch in the event that the torch fails to ignite.

**Transfer Time**

The Transfer Time parameter specifies the amount of time used to attempt ignition of the torch. The ignition is confirmed by the Arc Sense Input (Arc on Feedback) to the control.

**Set Arc Current**

The Set Arc Current feature allows the user to set the arc current at the plasma supply. This feature uses the "Set Current BCD" output from the control to activate the BCD inputs at the plasma supply. EIA RS-274D part program code G59 Vvalue Fvalue for setting current is supported.

**Corner Current Percent**

The Corner Current Percent feature allows the operator to select a reduced current setting to be executed when cutting corners to improve cut quality. This value is a percentage of the Set Current (above) and is active when the Torch Height Disable Output is on.

**Set Arc Voltage**

The operator may input the desired Arc Voltage for the material being cut.

**Cut Height**

The Cut Height setup parameter is used to select the desired cut distance from the plate. This will set the initial cut height before Arc Voltage control is activated.

**Retract Distance**

This setup parameter is used to select the THC Retract Distance when configured for partial retract mode.

**Pierce Height Factor**

The Pierce Height Factor setup parameter is a multiplication factor that is calculated times the Cut Height to set the pierce height distance.

**IHS Stall Current**

The Initial Height Sense Stall Current sets the lifter downward force to detect when the torch makes contact with the plate during the IHS cycle. This is a relative factor between one (minimum) and ten (maximum). The limited stall force is always used if nozzle ohmic sense is turned off.

**IHS Speed**

The Initial Height Sense Speed sets the lifter downward speed during the IHS cycle. This is a relative factor between one (minimum) and ten (maximum).

**Homing Speed**

This setup parameter determines the retract or homing speed. This is a relative factor between one (minimum) and ten (maximum).

**Nozzle Ohmic Contact**

This parameter would be set to on if the Command<sup>®</sup> THC when using Ohmic Contact Sense to detect the plate during the IHS cycle.

**Preflow During IHS**

Selecting ON, will activate preflow during the IHS cycle.

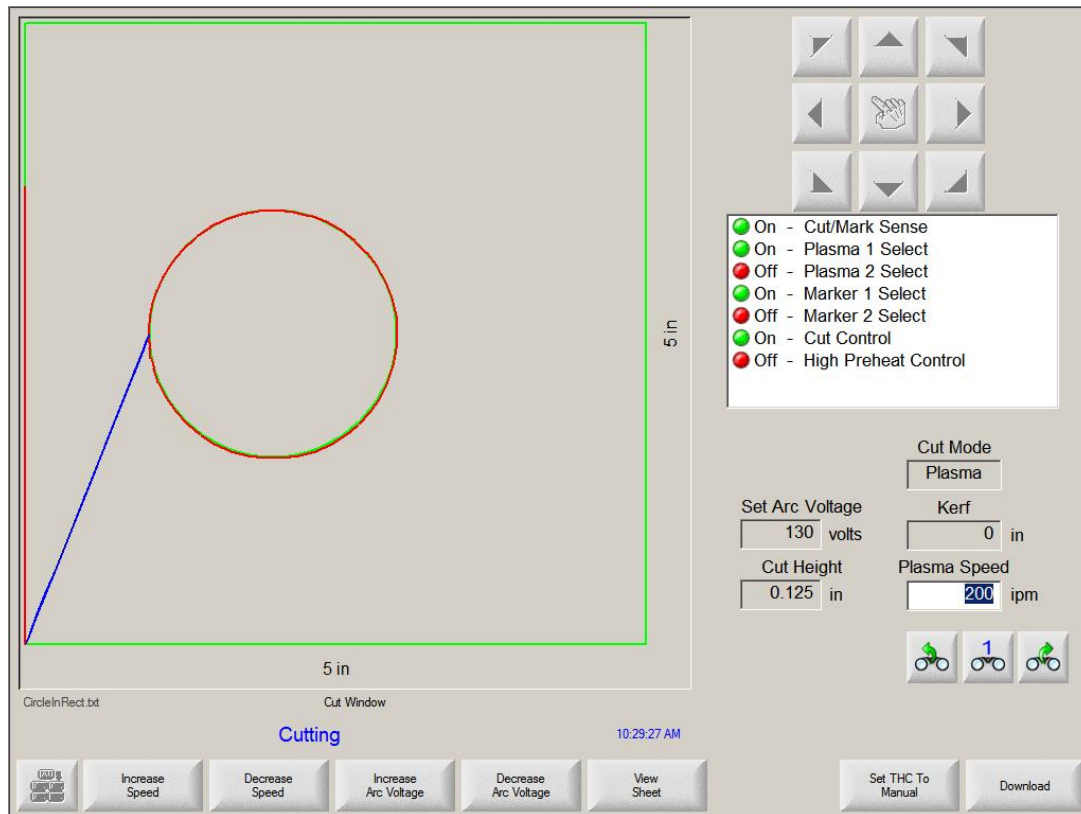
**Auto Kerf Detect**

The Auto Kerf Detect feature reduces the possibility of the torch diving into the plate. When enabled, the THC will detect sudden changes in arc voltage when crossing a kerf path and will freeze the THC.



## Main Cut Screen

### Automatic THC Mode



While at the main cut screen, when cutting with the Command® THC in Automatic mode, two new soft keys will become available to manually increase and decrease the Arc Voltage for the cut.

### Extend

When pressed during the pierce cycle, this soft key extends the pierce timer until it is stopped either by a Set-Now or Release soft key press.

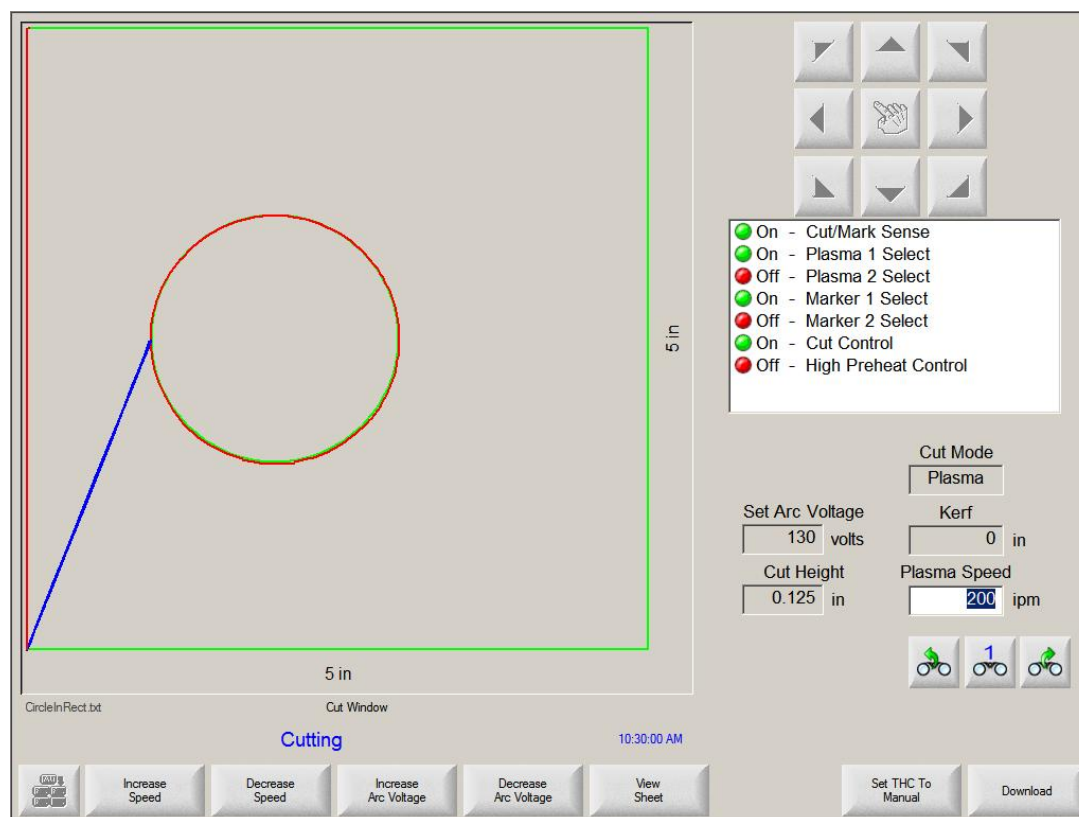
### Set Now

Pressing the Set Now soft key terminates the pierce cycle and saves the new pierce time. The Set Now soft key is often used in conjunction with the Extend soft key to modify the preset pierce time.

### Release

A Release soft key press will terminate a pierce cycle, but will not modify the original pierce time. The original pierce time is retained for any remaining pierces.

## Manual THC Mode



While at the main cut screen, when cutting with the Command<sup>®</sup> THC in Manual mode, two new soft keys will become available to manually raise and lower the torch cut height.

### Extend

When pressed during the pierce cycle, this soft key extends the pierce timer until it is stopped either by a Set-Now or Release soft key press.

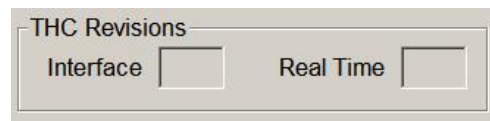
### Set Now

Pressing the Set Now soft key terminates the pierce cycle and saves the new pierce time. The Set Now soft key is often used in conjunction with the Extend soft key to modify the preset pierce time.

### Release

A Release soft key press will terminate a pierce cycle, but will not modify the original pierce time. The original pierce time is retained for any remaining pierces.

## Diagnostics



The current Command<sup>®</sup> THC Interface and Real Time Revision Levels will be displayed at the Control Information screen when enabled.

# Appendix C: Automatic DXF Import

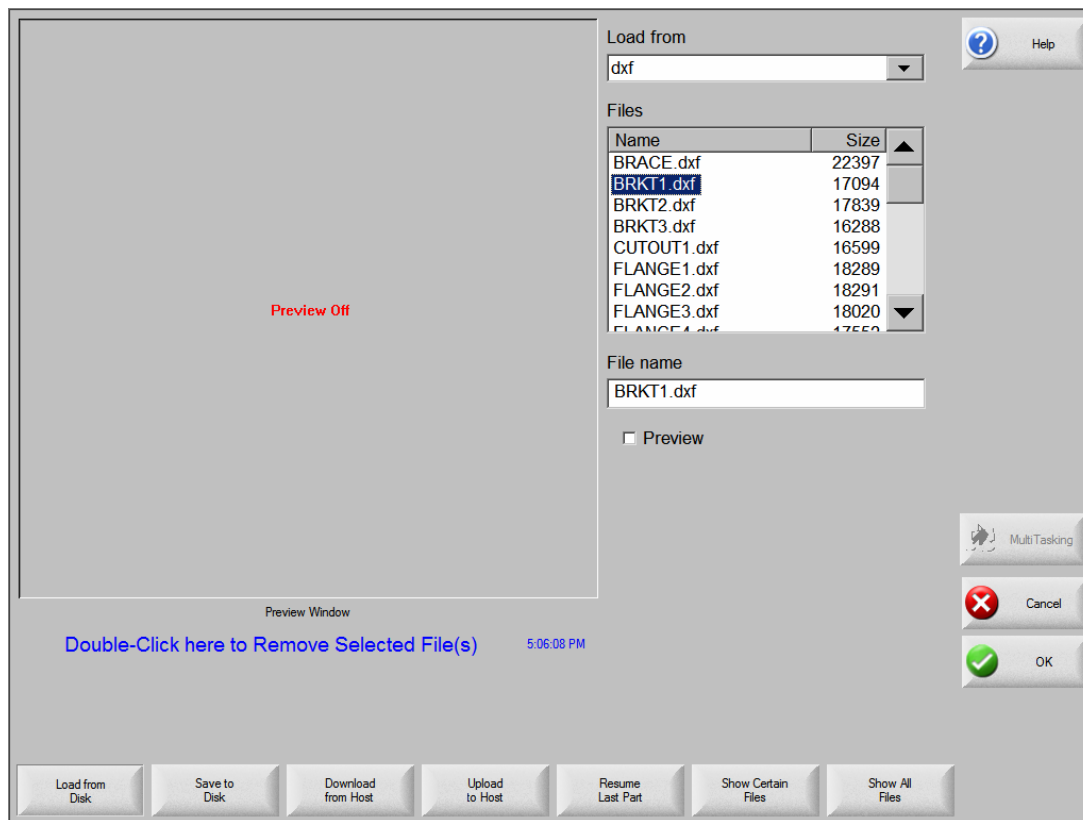
## DXF Import Overview

Hypertherm Automation controls offer two styles of automated DXF import. The first DXF feature allows the CAD designer to prepare the DXF file with a specific format that includes the location of pierces, pierce order and direction. When loaded into the control an EIA format part program will be created for use at the control.

Also offered is a fully automatic DXF import feature that allows the control operator to select lead style and length. The CNC Auto DXF software will automatically place the lead in and lead out based on the operator selections and create an EIA format part program ready for use and the CNC.

### Loading DXF Files

To load a DXF file, access the Files Load screen and select the source location and file.



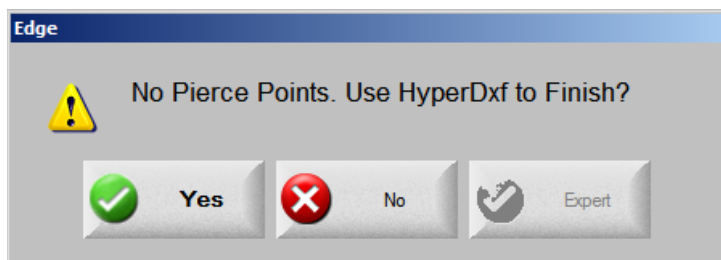
If the file has been formatted following the rules for prepared files including the lead in and direction, the control will detect this and translate the file for use. See Prepared DXF files.

If the file contains no pierce or lead in /out information, the user will be prompted through use of the auto import feature. See Raw DXF files

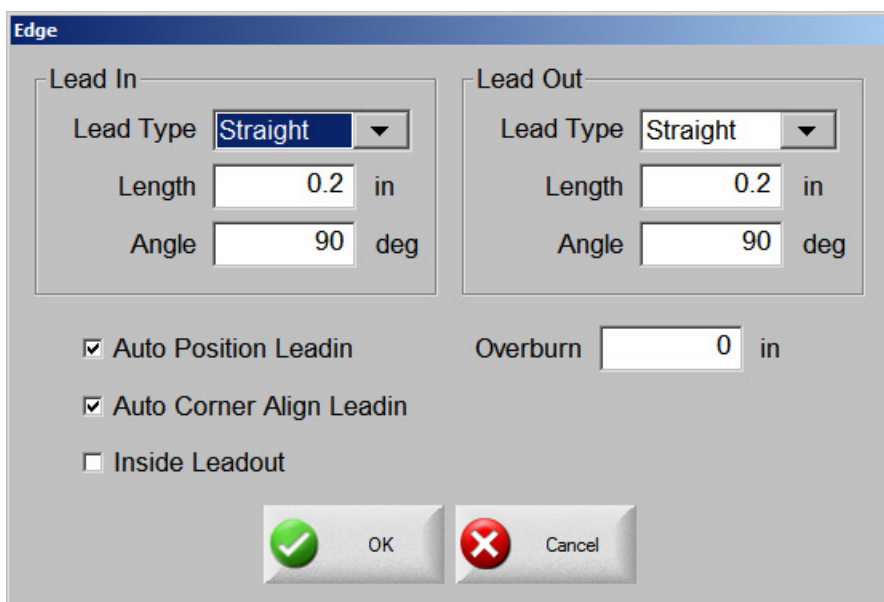
**Note:** To load DXF files the DXF extension must first be added to the Special Setups screen.

## Raw DXF Files

If the DXF file is detected as having no pierce information, the operator will be given the option to use a Hyper DXF fully automated translation tool to import the file and add lead in and lead out information.



If the user selects YES, a configuration screen will be displayed to define lead in/ lead out format.



### Lead Type

The user may select a Straight or Radius lead in or lead out.

### Length / Radius

The lead in or lead out length or radius may be selected.

### Angle

Angle in degrees for lead in or lead out may be selected.

### Auto Position Lead In

When selected, the software will attempt to find a suitable corner to position the lead in.

### Auto Corner Align Lead In

When selected, the software will attempt to find a suitable corner to position the lead in.

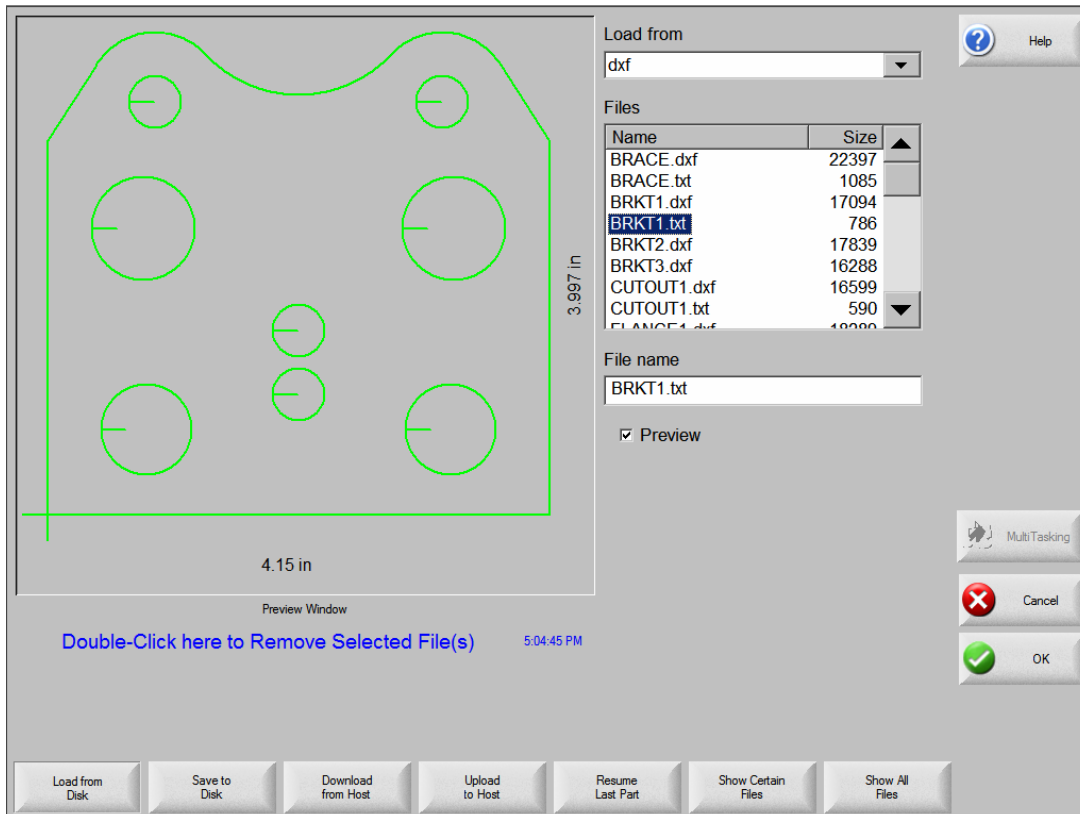
**Inside Lead Out**

This selection allows the user to select if lead out is used on both internal and external cuts. When not selected lead outs will be added to external cuts only.

**Overburn**

Overburn will provide a continued overlapping cut in the lead in/ lead out area of a hole.

After import, an EIA part program with a .txt extension will be created and placed in the source folder. Note the BRKT1.dxf and BRKT1.txt in the following example.



## Prepared DXF Files

The DXF Translator software is designed to allow the control to load and translate into an EIA format part program a DXF style drawing created in Autocad™ or Autocad LT™. For the control to load and understand the CAD file, certain guidelines must be adhered to when creating the drawing. The Optional DXF Translation feature is enabled through a password provided by your control supplier.

### Drawing Format

There should be nothing on the Cut Layer except Lines, Arcs, Circles and Text commands. Do not put dimensions or notes on the same Layer as Cut data.

Elliptical segments, Squares and Polylines are not supported. They should be sectioned into short arcs or line segments. You can use the ACAD EXPLODE command to convert POLYLINES into segments.

The end angles of two arcs from any intersection point are not allowed to be within the same quadrant.

Text commands determine Cut Sequence, and determine path through multi-segment Intersections. Text commands are placed on the drawing with the Text feature of your CAD program. Size of the text is not important. Location of the text is extremely important. A Left Justified position for the text must be used. Text commands must be "SNAPPED" to the appropriate intersection or pierce points.

Text commands are used to indicate Pierce Points and Cut Direction. Note that the directional commands should ONLY be used when more than one exit path exists at an intersection of segments to determine the direction of the next line segment.

### Text Commands

- 1 Used to indicate the first pierce point (subsequent pierce points proceed in numerical order)
- + Indicates a Counter-Clockwise circle
- Indicates a Clockwise circle

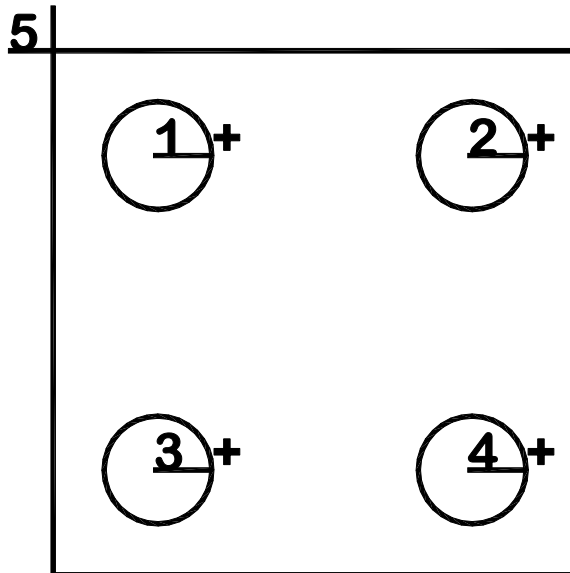
**Directional Commands**

R Indicates the next segment's direction (if Line) or ending angle (if arc) is 350° to 10°  
RU Indicates the next segment's direction (if Line) or ending angle (if arc) is 0° to 45°  
UR Indicates the next segment's direction (if Line) or ending angle (if arc) is 45° to 90°  
U Indicates the next segment's direction (if Line) or ending angle (if arc) is 80° to 100°  
UL Indicates the next segment's direction (if Line) or ending angle (if arc) is 90° to 135°  
LU Indicates the next segment's direction (if Line) or ending angle (if arc) is 135° to 180°  
L Indicates the next segment's direction (if Line) or ending angle (if arc) is 170° to 190°  
LD Indicates the next segment's direction (if Line) or ending angle (if arc) is 180° to 225°  
DL Indicates the next segment's direction (if Line) or ending angle (if arc) is 225° to 270°  
D Indicates the next segment's direction (if Line) or ending angle (if arc) is 260° to 280°  
DR Indicates the next segment's direction (if Line) or ending angle (if arc) is 270° to 315°  
RD Indicates the next segment's direction (if Line) or ending angle (if arc) is 315° to 360°

Traverses are automatically determined between pierce points and need not be entered on the CAD drawing.

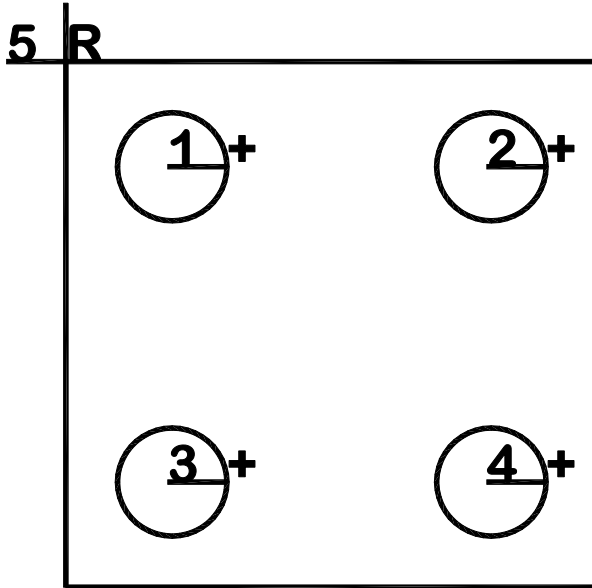
The following is a basic Bolt Hole Rectangle with the Lead-in and Lead-out for the rectangle as part of the top and side line segments. The numbers indicate the order of the pierces and the "+" sign indicates a Counter-Clockwise rotation for the circles.

**Example:**



If the Lead-in and Lead-out were made up as additional line segments added to the top and side line segments, additional text would be required to indicate which direction the next line segment should take as part of the part program.

**Example:**



In this example, the Letter "R" has been snapped to the intersection of the four line segments to indicate that the next line segment after Lead-in (pierce 5) would be the segment which is located at 350 to 10 degrees and then to the other connected segments on the square. After the left side (vertical) cut segment has been executed, no additional text is required to indicate which line should be cut. Since the Lead-in and the first cut segment have already been executed the Lead-out segment would be the only segment left available.

**Comments:**

- There should be nothing on the Cut Layer except Lines, Arcs, Circles and Text / Directional commands.
- Line segments must be connected to complete the cut path.
- If multiple line segments or arcs need to be repeated, each line segment should be drawn rather than copied and pasted.
- Features for Marking are not available at this time.
- No Traverse lines are required. All lines in the CAD drawing are assumed to be cut lines.
- Left Kerf is assumed.





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