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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 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.

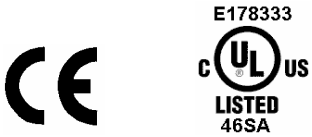
Avoid contact with electrical wires and cabling while power is on.

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

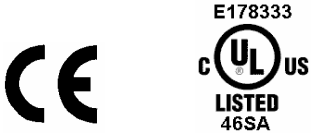



**Note:** This product has been designed and manufactured in accordance with CE and UL Safety Standards.

UL has successfully tested and listed the type " M" and "P" (with 10.4" display) 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

## Type "E" and "V" 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 "E" and "V" control products in accordance with the applicable U.S. and Canadian Safety Standards. File number E178333.

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-3738N1

## Type "B" Controls

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

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

Note: This product has not been safety tested for outdoor use.

# 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++® and the Microsoft Foundation Classes®, 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® 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*® on the front panel, without waiting for delivery, set-up, and alignment of templates. Or you can select any of 66 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++® and the Microsoft Foundation Classes®. The operating environment is completely compliant with the year 2000 dating.

## ShapeWizard®

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 S*oftMotion* 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 66 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

10.4" (264 mm) VGA Color DSTN LCD Display or optional Active Matrix TFT display. 15" TFT Touch Screen on some models.

40Gbyte (or higher) hard disk and 1.44Mbyte Floppy disk drive.

2.4 GHZ (or higher) Celeron ® Processor is available.

512 Mbytes of RAM.

Up to 64 lines of interface signals for cutting and motion logic (gas control, tracing system, markers, homing, etc.) depending on I/O configuration.

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

Surface mount printed circuit board technology.

Two axes optically isolated ±10VDC 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.

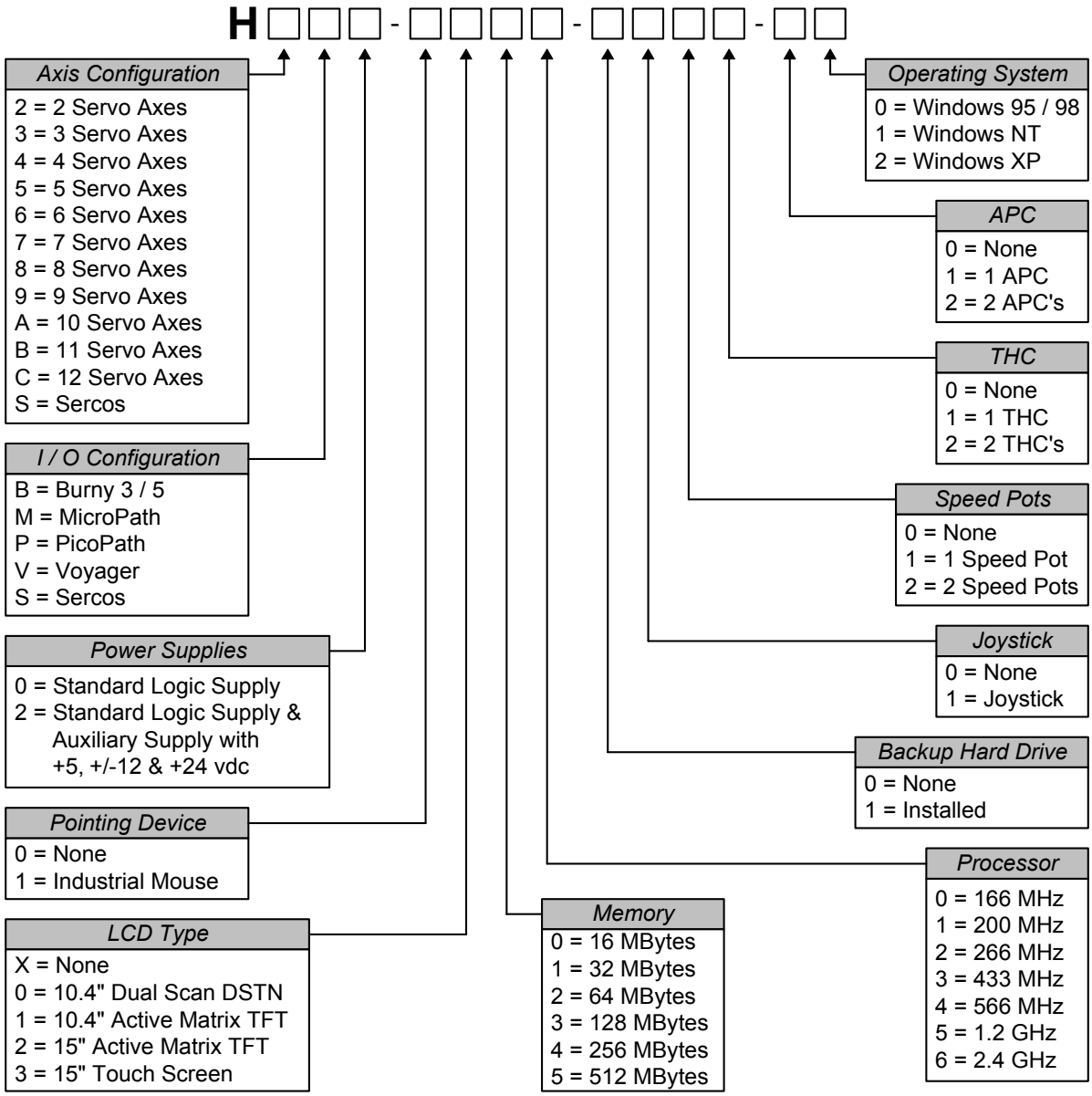
Universal power input (100-240 VAC; 47-63Hz).

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

The front panel keypad of the control is shown below. In the upper center is the Color LCD display. The power switch is located in the upper left-hand corner of the front panel. The power switch is illuminated when in the on position.

Located in the upper half of the control is the View Screen. The View Screen offers a simple to follow graphical interface for the operator to view all aspects of control operation such as machine setup, part file management, part programming and cutting operations.

Below the View Screen, there are several groups of push buttons or *keys* on the front panel. The eight keys located directly below the display and labeled with Soft-Keys act as programmable keys. The functions of these keys are shown in the display. This is supported directly on screen for units with touch screen displays. Softkeys 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.

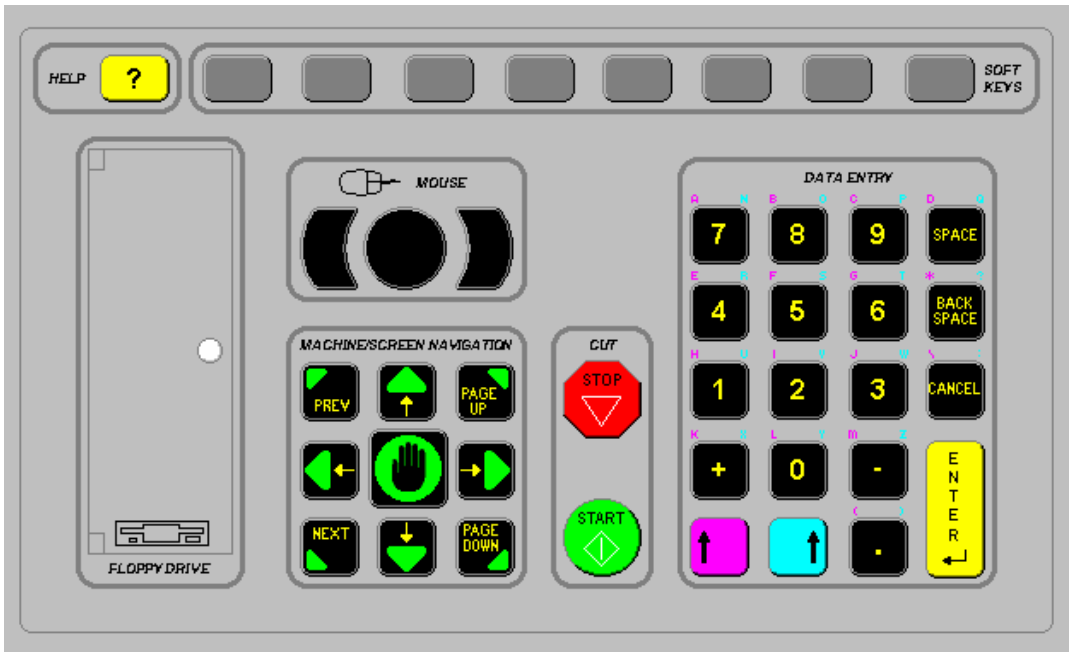
The yellow key labeled HELP is for on-line documentation and help. Simply press this key at any time and this document will be displayed.

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.

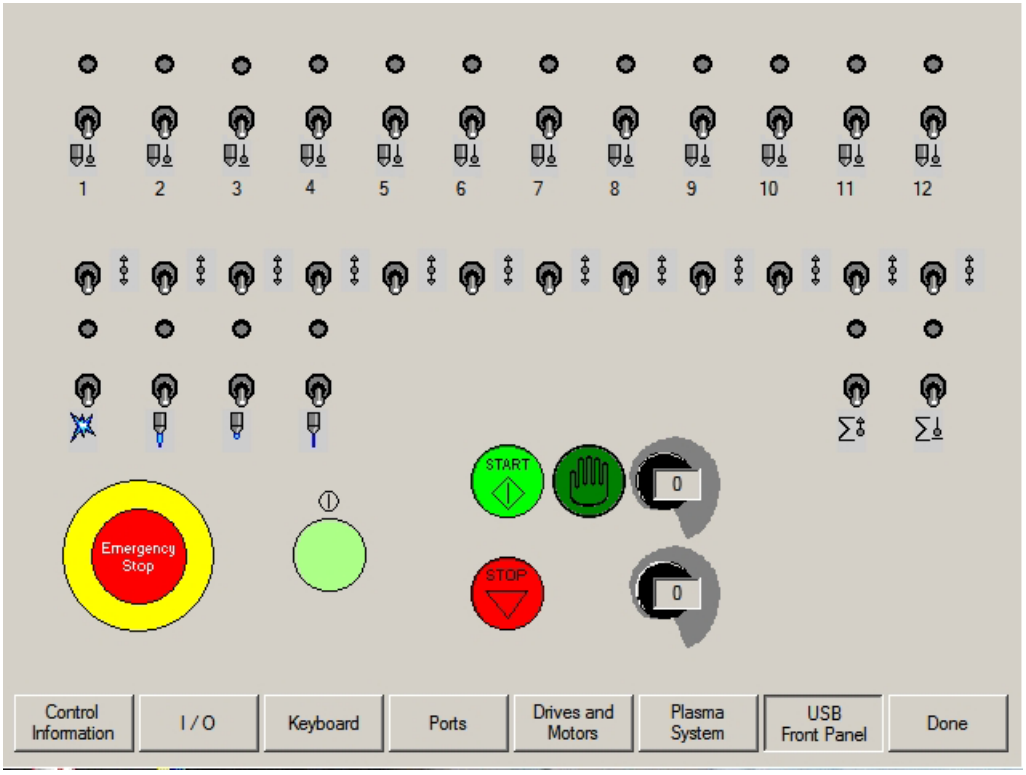
Behind the small door labeled *FLOPPY DRIVE* is the internal 3.5” 1.44Mbyte floppy disk drive. In addition, there is a small potentiometer behind this door to adjust the LCD brightness and contrast for dual scan displays. This potentiometer should only need to be set once, at the time of installation, unless the control is being operated in an extreme temperature environment.

**Front Panel**



### Optional PC Style Keyboard

### Optional USB Front Panel



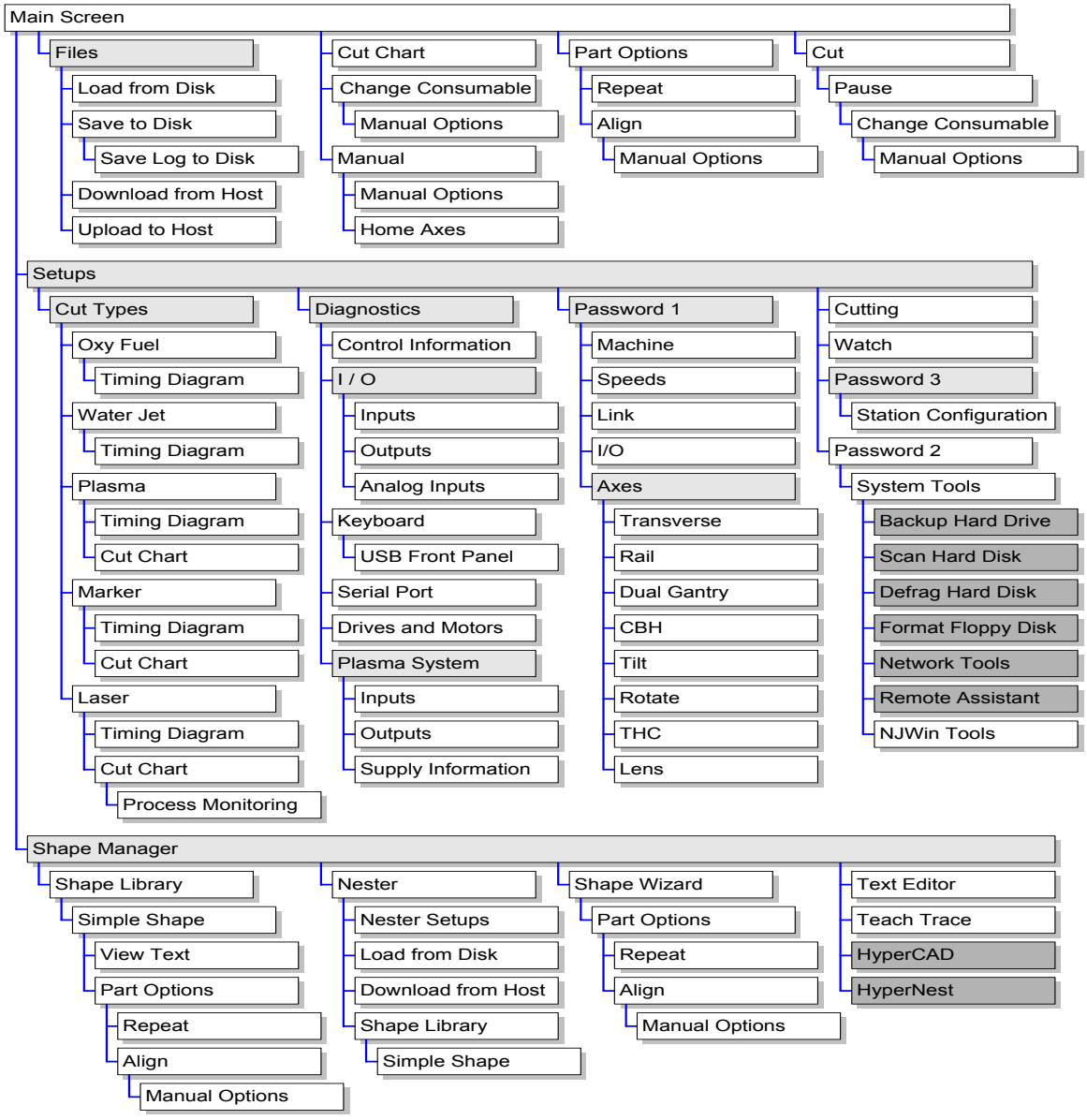
# Operation Summary

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 **DONE** and CANCEL keys have special functions in relation to the menu structure. The **DONE** 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

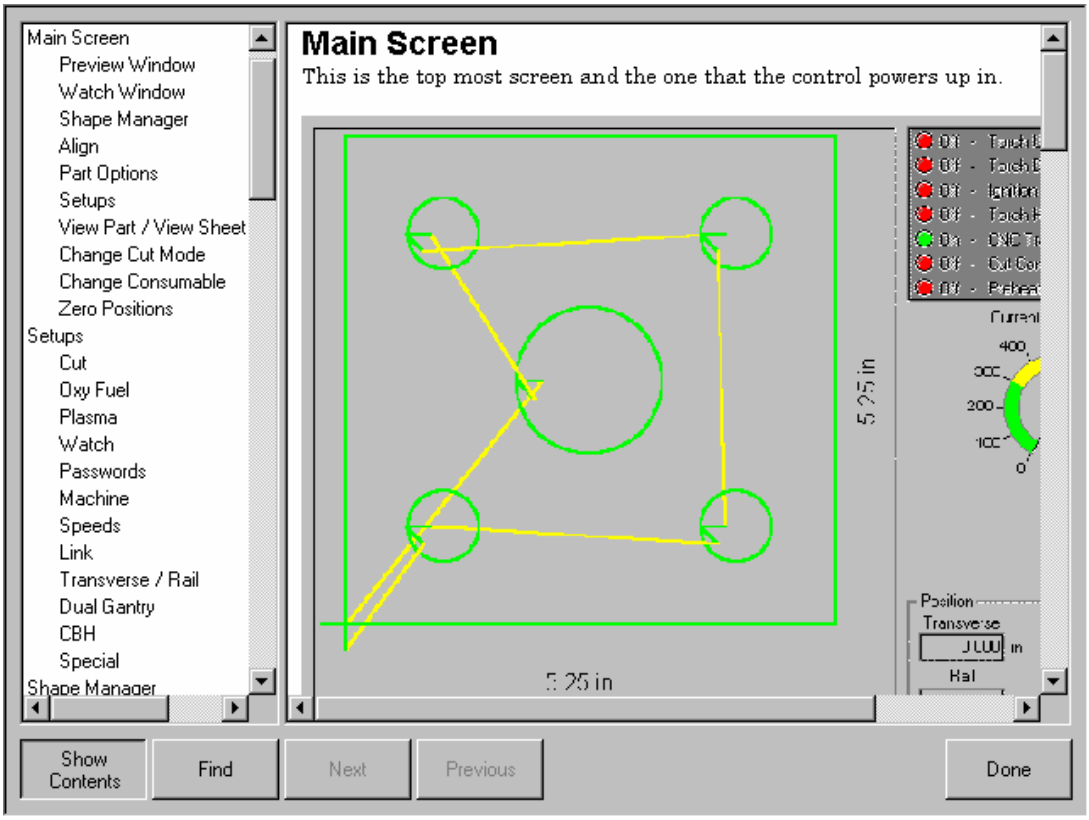


## Key & Menu Functions

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.

## Help Screen

This controller is equipped with an easy to follow help screen function. To access the internal help screens press the yellow softkey to the top left of the keypad. Help information for the screen currently being accessed will be displayed. Pressing the DONE softkey will exit the help screens and return you to the last control screen accessed.

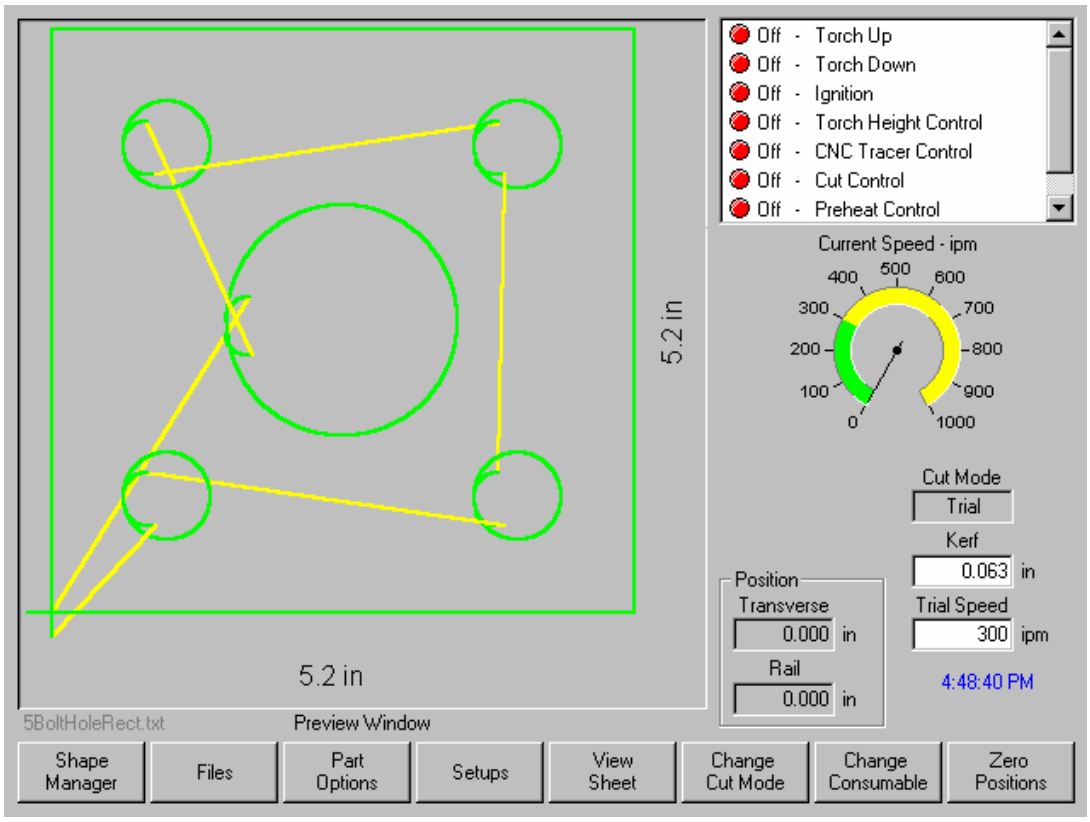



**Show Contents**
While at the help screen, the table of contents may be turned on and off by pressing the Show Contents softkey. Use the up/down arrow keys to select a subject and press enter to view. Press the previous/next key to move from the table of contents and the information screen and back. 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 one that the control powers up in.




**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 softkey 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.

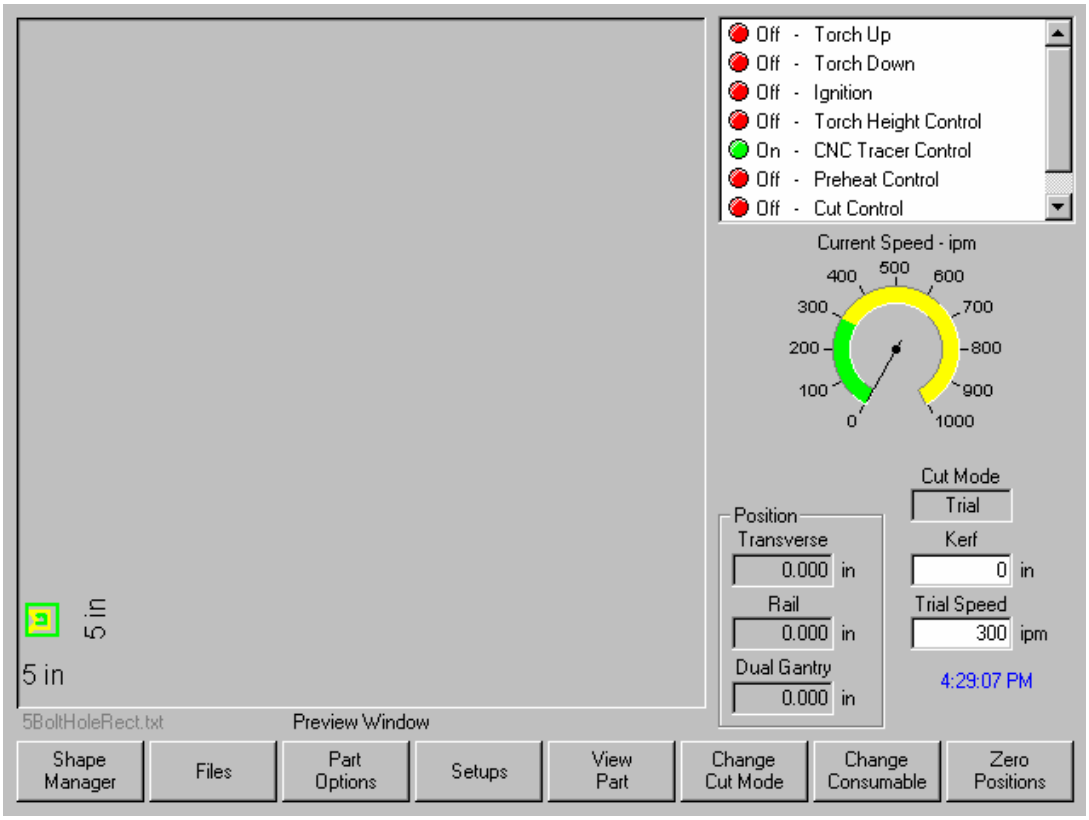
**Files**
This softkey takes you to the Files screen where you can load, save, download or upload part files.

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

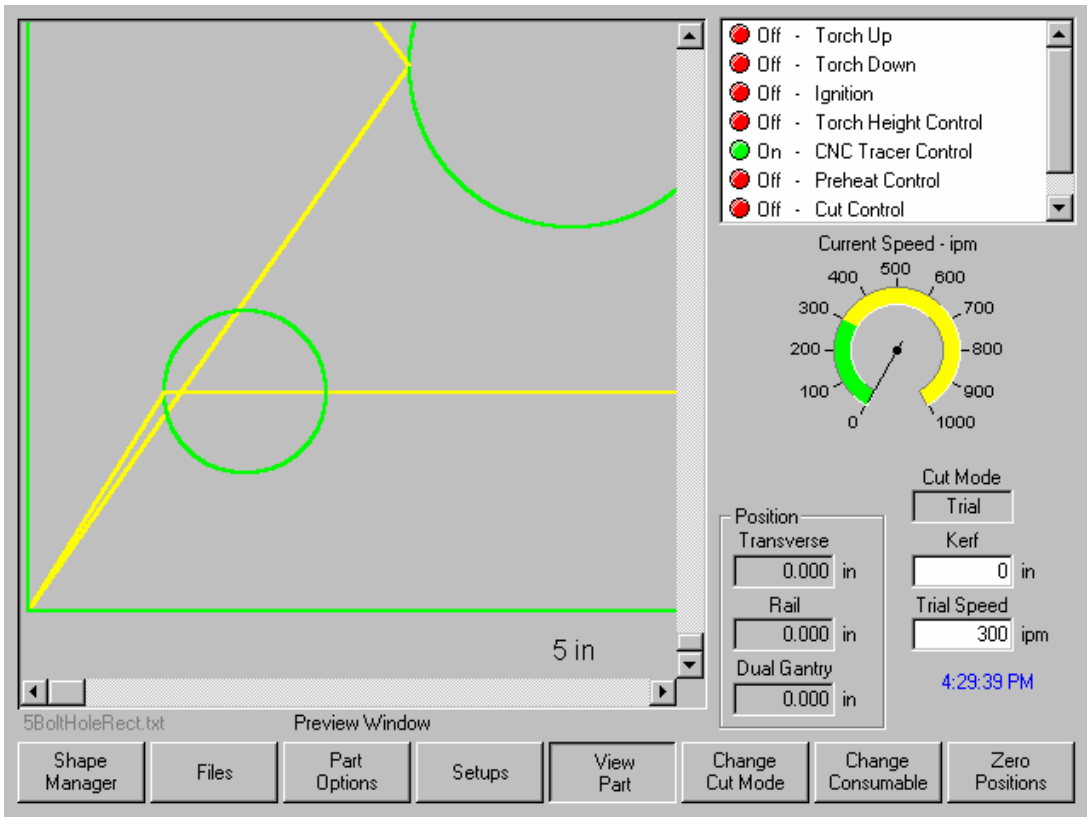
**Setups**
This softkey takes you to the setup screens.

**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 softkey, 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 and the control is not cutting, the view of the plate can be shifted horizontally and vertically by holding down a shift key and pressing the arrow keys. 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.

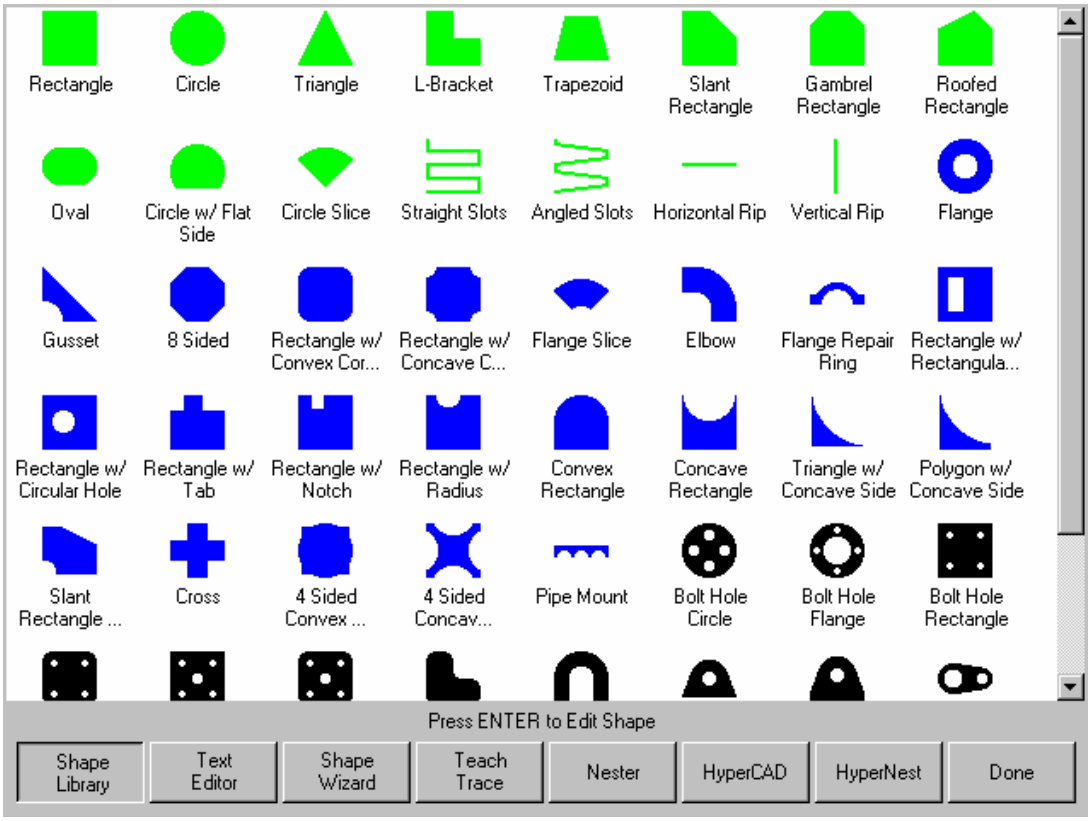
**Change Cut Mode**
Allows selection of Trial, Oxy Fuel, Plasma, Waterjet and Laser cutting modes, depending on the setup configuration. This softkey offers the selections of Automatic, Manual or Test Run for I/O type "B" configured controls.

**Change Consumable**
This softkey takes you to the Change Consumable screen.

**Zero Positions**
This softkey 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 53 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*® a graphical editor window. *ShapeWizard*® 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™ 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™. 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.

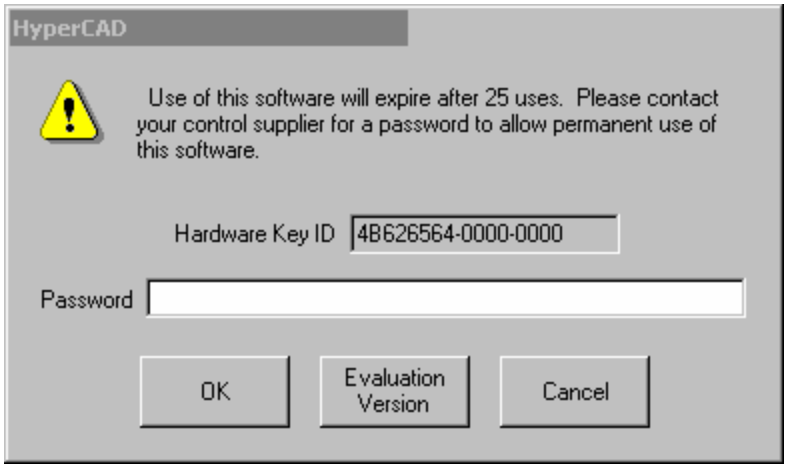
**HyperCAD**
The optional HyperCAD® feature is an easy to use 2D drawing application specifically designed for shape cutting. The software's powerful CAD utilities let users import DXF and CNC files or draw from scratch. Files can be converted to graphical parts for editing and saving or go directly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

**HyperNEST**
The optional HyperNEST® 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® greatly improves the output of any shape cutting operation.

**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.

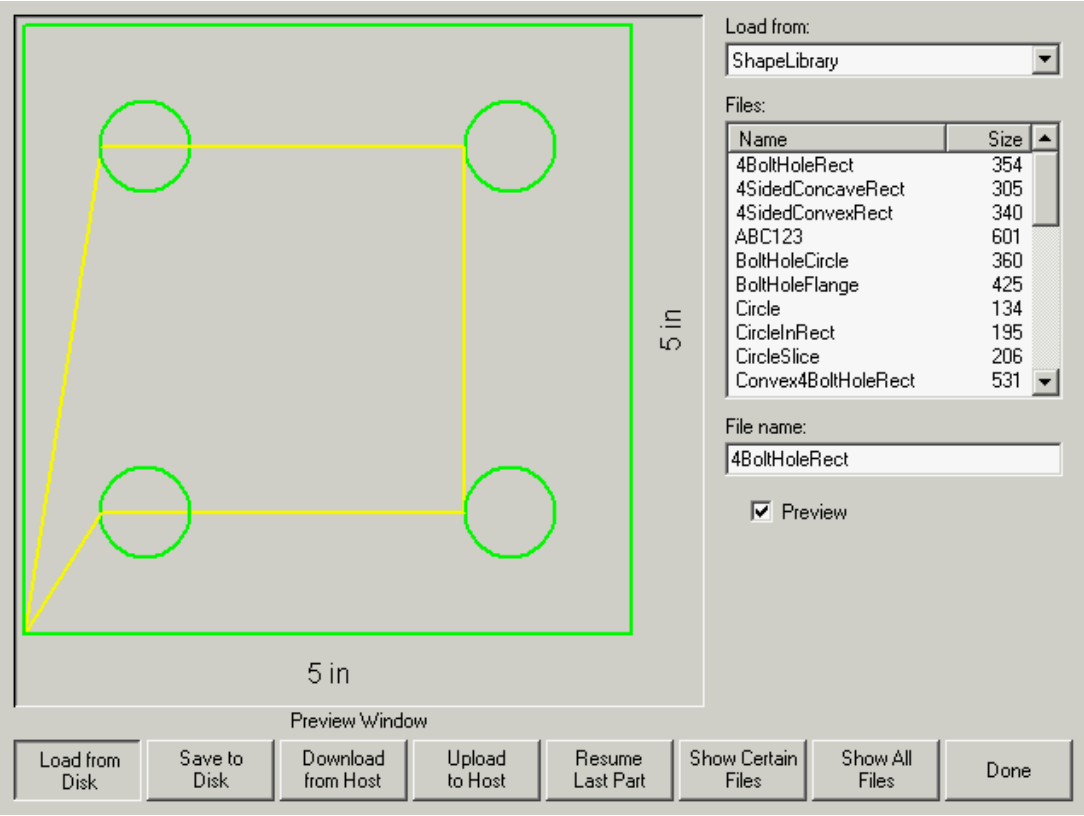
To launch the trial software, select the Evaluation Version.

Example:



# 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 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 softkey 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 softkey.

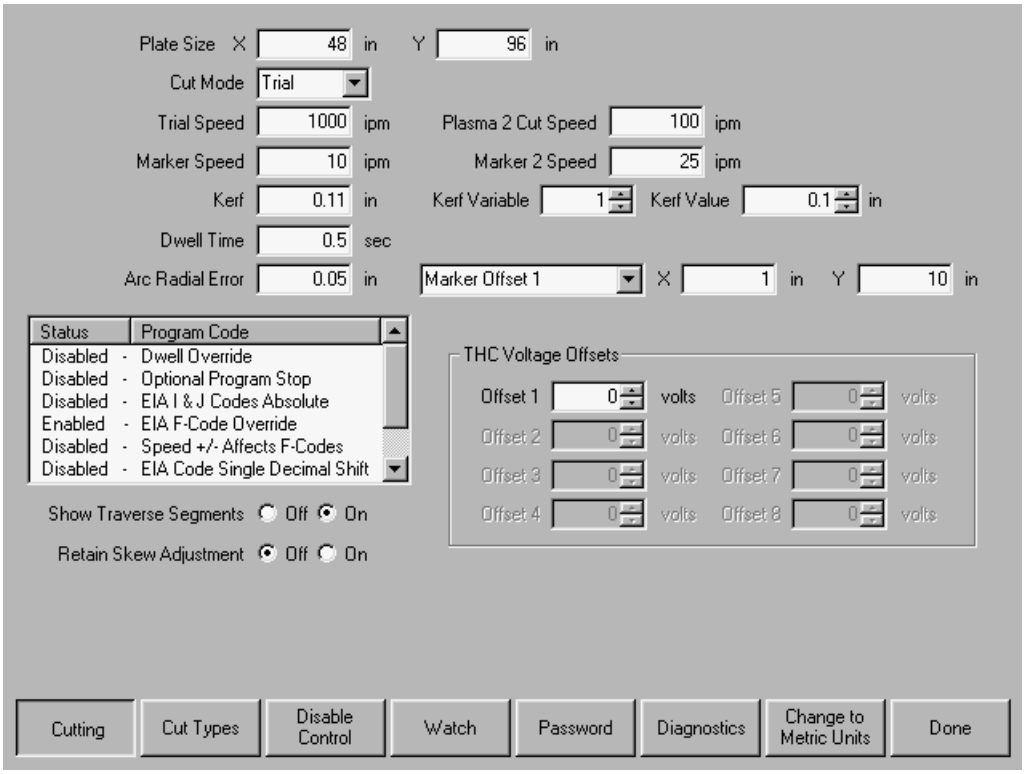
**Show Certain Files**
This softkey allows the operator to show only certain files from the selected directory. Both the asterisk and question mark may be used in defining the files to show. The asterisk is generated by holding down the left shift key and pressing the backspace key. The question mark is generated by holding down the right shift key and pressing the backspace key.

**Show All Files**
This softkey 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.




**Cutting**
Allows programming of the different cutting parameters EIA program types, dwell times, etc.

**Cut Types**
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 softkey 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.

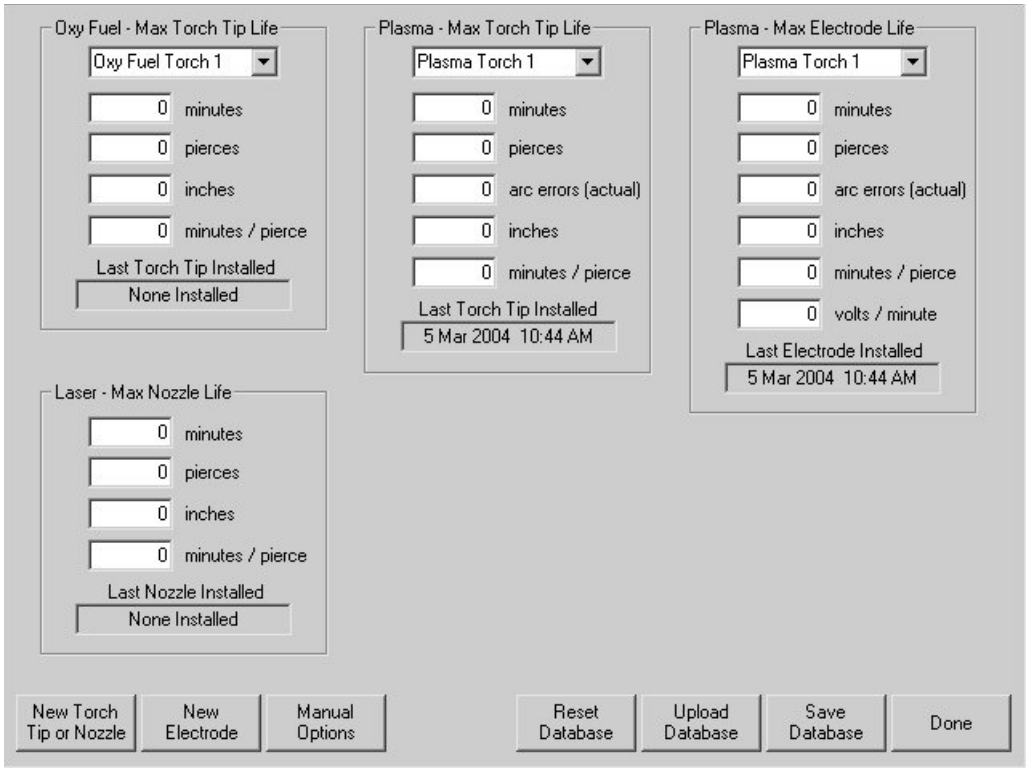
**Password**
Enter a password to get to the supervisor password protected setup menu.

**Diagnostic**
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 softkey 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 / millimeters 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.




**New Torch Tip**
This softkey records when a new Oxy Fuel or Plasma torch tip has been installed on the machine.

**New Electrode**
This softkey tells the control that a new electrode had been installed on the cutting machine.

**Reset Database**
This softkey is used to reset the database on the control to have no torch tip or electrode information.

**Setups**
Pressing the Setups softkey access the control setups for adjustment of the cut process.

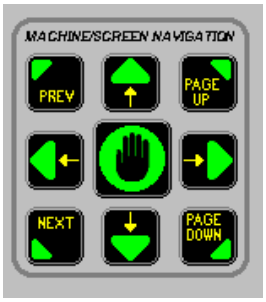
**Upload Database**
This softkey is used to upload the current database to a host computer running our link.

**Save Database**
This softkey is used to save the current database to the diskette.

## 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.

A purple or blue arrow at the left or right edge of the softkeys indicates that that more softkeys and features are available by pressing the corresponding shift key on the alpha-numeric keypad.



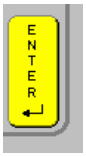

These keys activate jogging using the arrow keys when in the manual mode. Manual key functions (indicated in green) are available at the Manual, Pause and Align Screens. This keypad is also used for navigating through a multi-variable dialog box (indicated in yellow).

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.

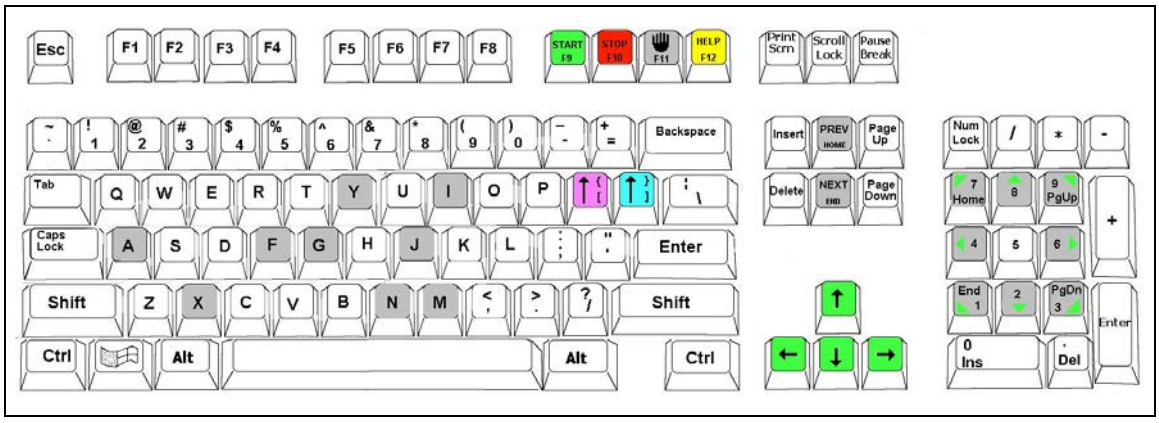

Deletes the current character in the data entry field and backs up one position in the field. Located above the Back Space key are the * and ? characters which are used as wild cards to search for files.


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.



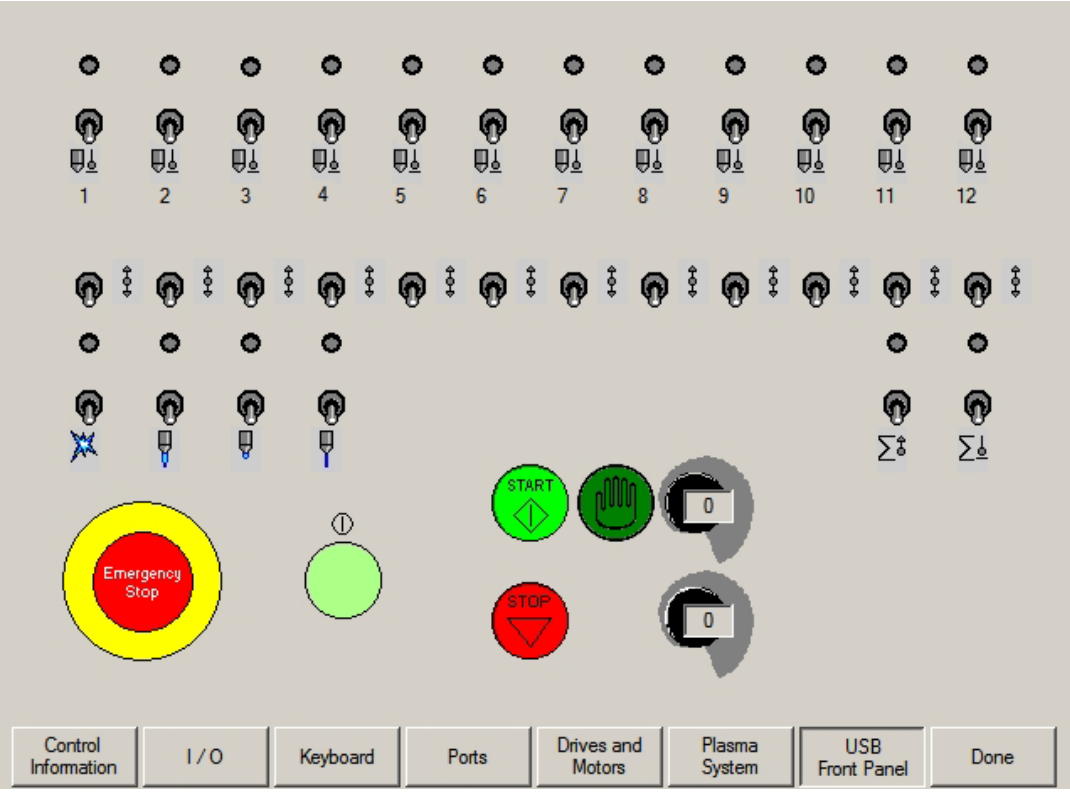

Causes the last number entered/toggled to be accepted. Located above the enter key are the < and > characters which are used for mapping network drives.

## Optional PC Keyboard Layout




**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




**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

# Section 3: Setups

## Cutting

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

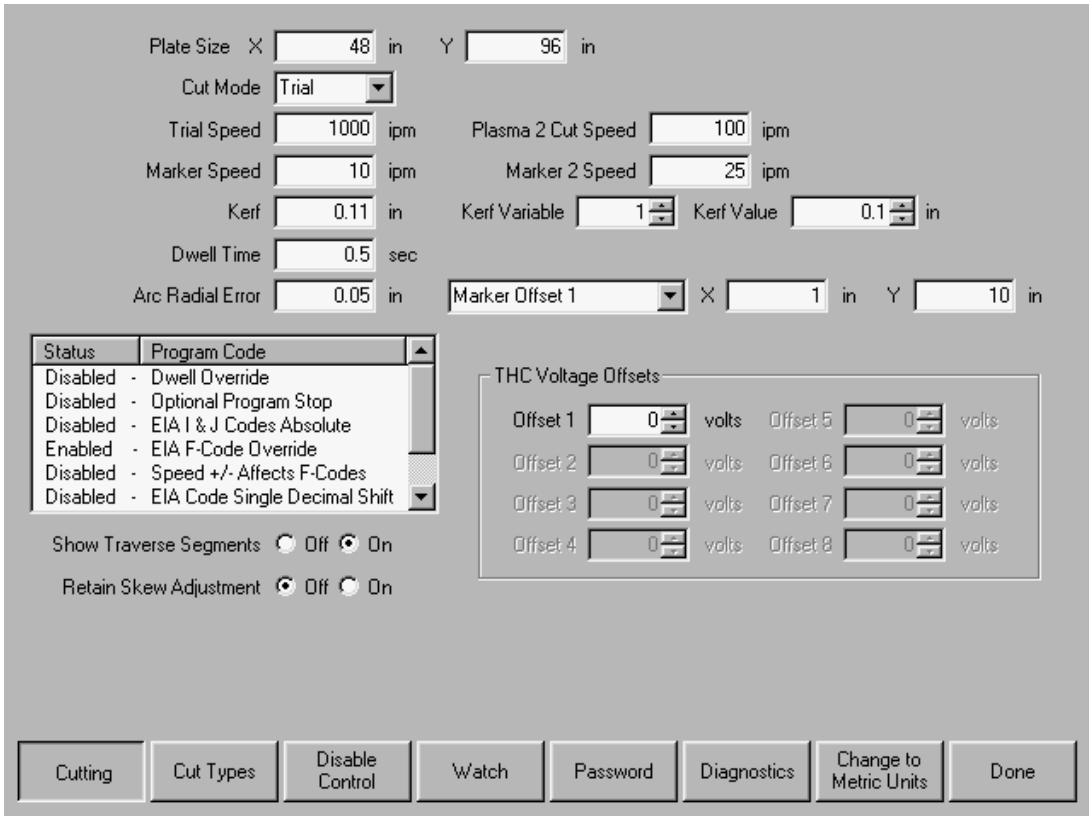



**Plate Size**
Specifies the dimensions of the current plate being cut. This dimension is used when loading a part to determine if it will fit on the plate. It is also used for viewing the part in Screen View.

**Cut Mode**
Specifies the current cut mode. Trial/Test mode allows the operator to dry-run the current part program without cutting. Press the left or right arrow keys to select the desired cut mode.

**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.

**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 softkey under the Part Options menu.

**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.

| ESSI CODE | Mapped EIA CODE | Description |
|---|---|---|
| 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 to 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.

**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.

**Kerf Variable / Kerf Offset**

The Kerf Variable / Kerf Offset 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.

Example: G43 D1 X0.06

*Kerf Variable Setting*

*Kerf Variable*
A number from 1-200 may be used

*Kerf Data*
The selected kerf value

**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.

**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.

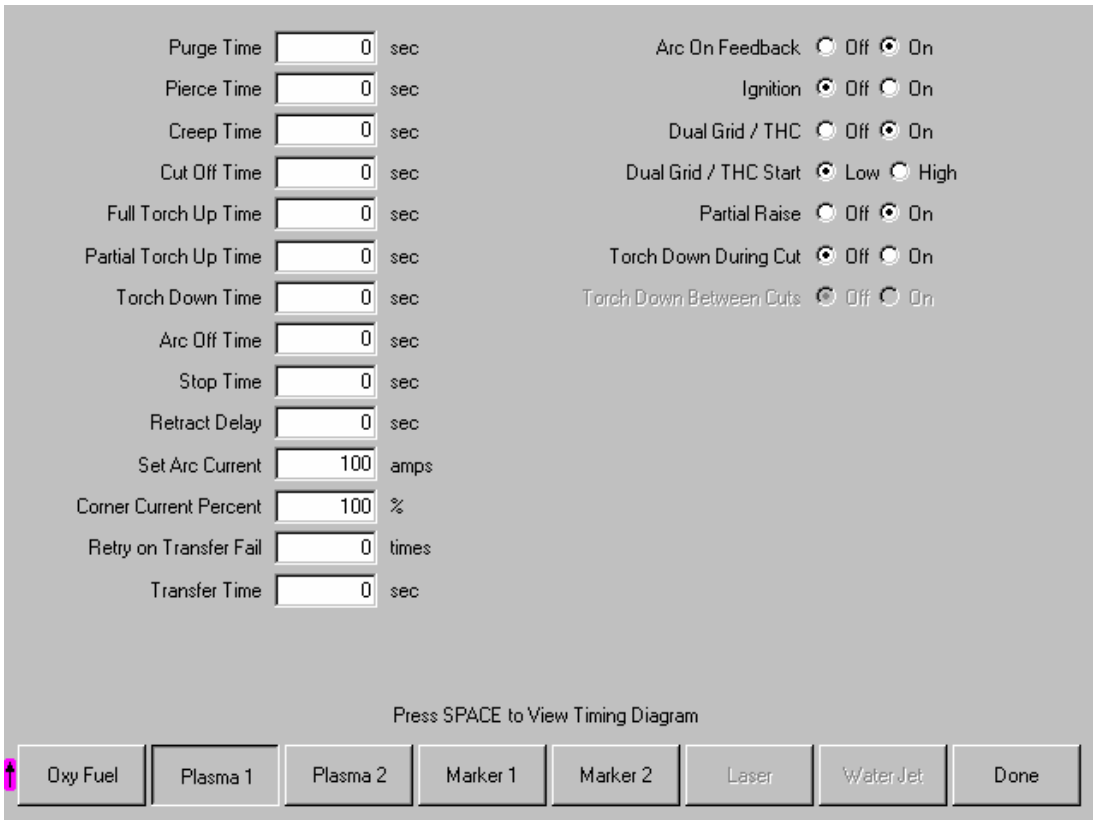
**Marker On Time** (Type "B" Configuration Only)
This parameter allows the operator to insert a time delay, which allows the marker to prepare for operation prior to the start of Marker motion.

**Marker Off Time** (Type "B" Configuration Only)
This parameter allows the operator to insert a time delay, which allows the marker to complete operation at the end of Marker motion.

## Cut Types

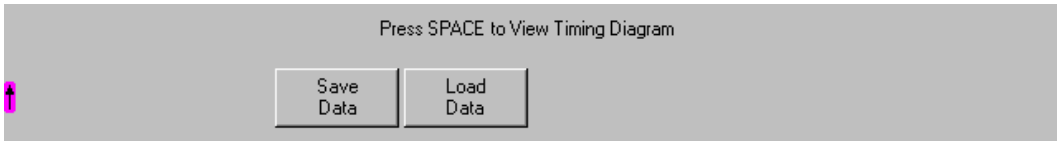
Your shape cutting control comes standard with several styles of built-in cut process logic which allows the cut process timing to be configured for optimum performance. Selection will vary due to control configuration.

Example:




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 space key 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. The Purple arrow at the left edge of the softkeys indicates additional softkeys are available. Pressing the shift key allows the Save Data and Load Data functions to be available.

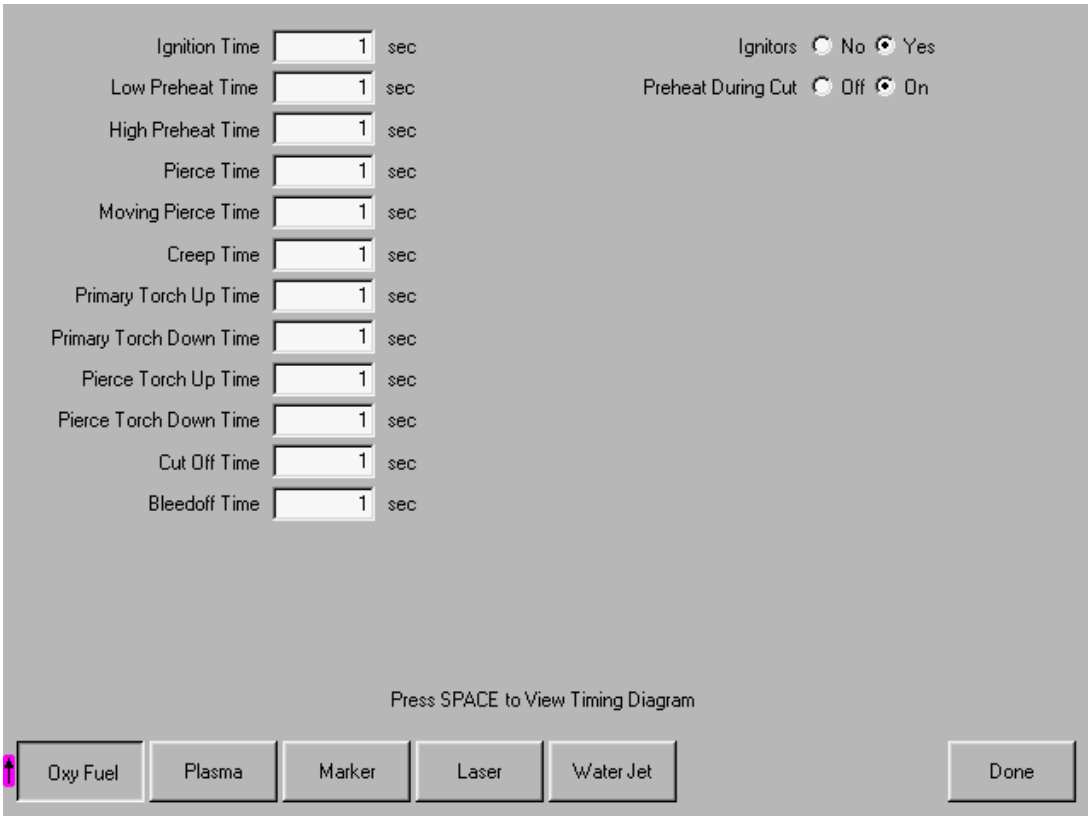


# Oxy Fuel

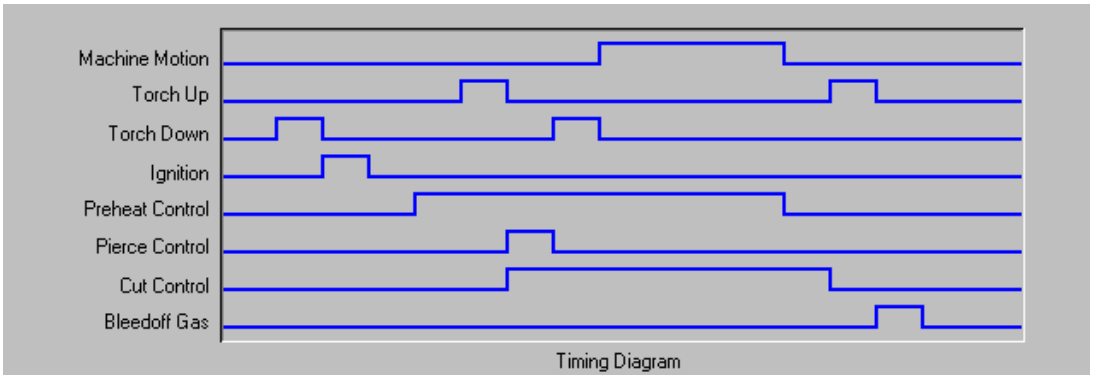
The control comes with the following built-in control logic for Oxy Fuel cutting. When Oxy Fuel is selected, the following parameters are available to customize the logic for the particular metal being cut. As these parameters are changed, the timing diagram below will change to show the new timing parameters.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

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

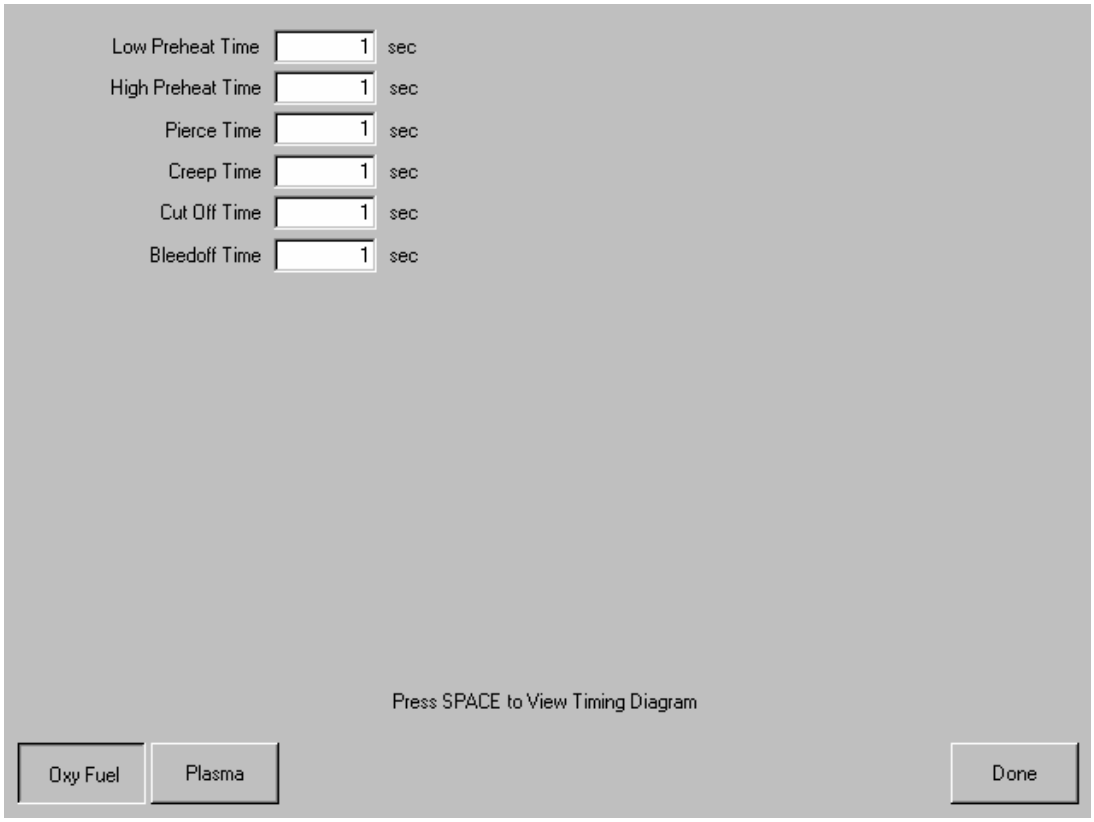
**I/O Configuration Type "M", "P" and "V"**




**I/O Configuration Type "M", "P" and "V"**
Press the Space Key to view the timing diagram from setups.

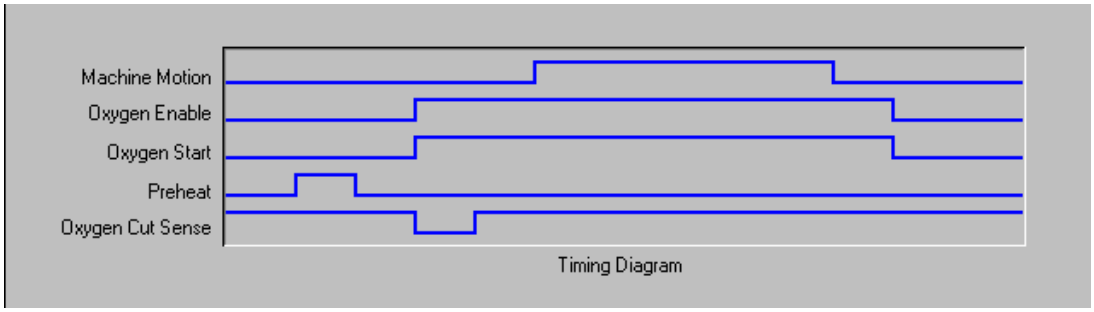


**I/O Configuration Type "B"**




**I/O Configuration Type "B"** (Timing Diagram)

Press the Space 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 softkeys 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.

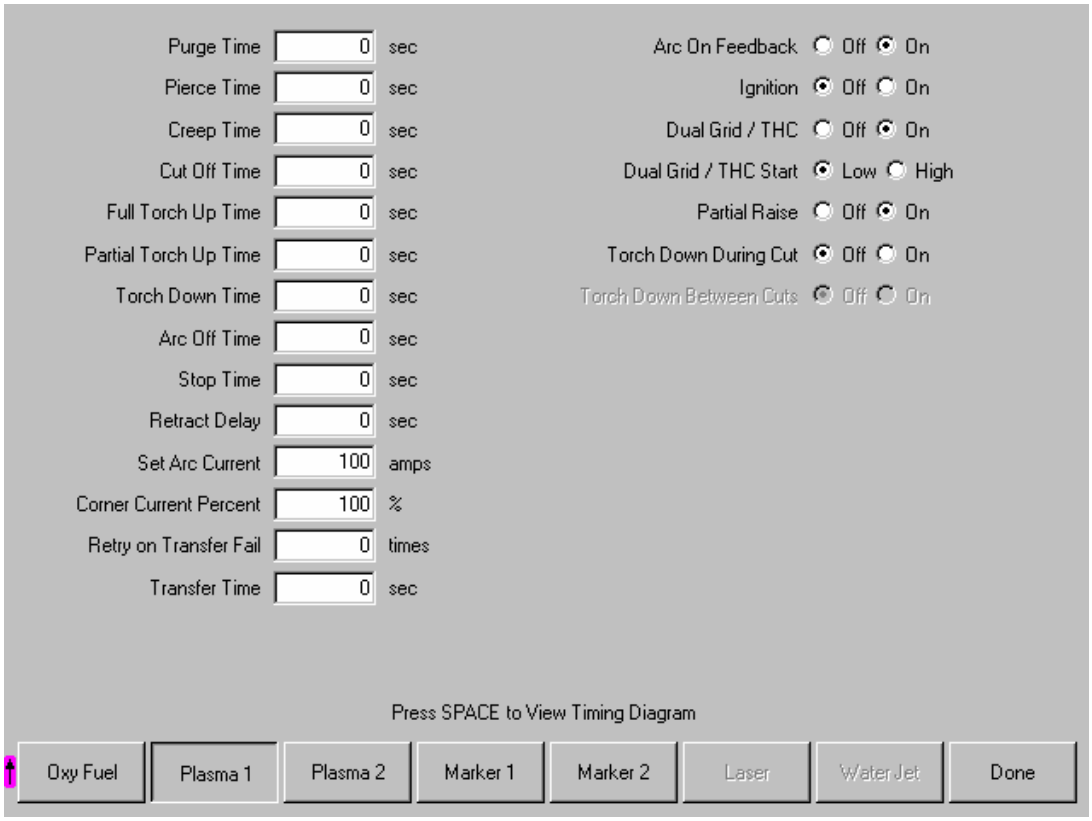
**Igniters**
When "No" is selected, this feature will turn the Preheat on between cut segments. This is to keep the torch light for those cutting systems that do not have automatic torch igniters. For those cutting systems which have automatic torch igniters or that control the torch gases outside of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

# Plasma

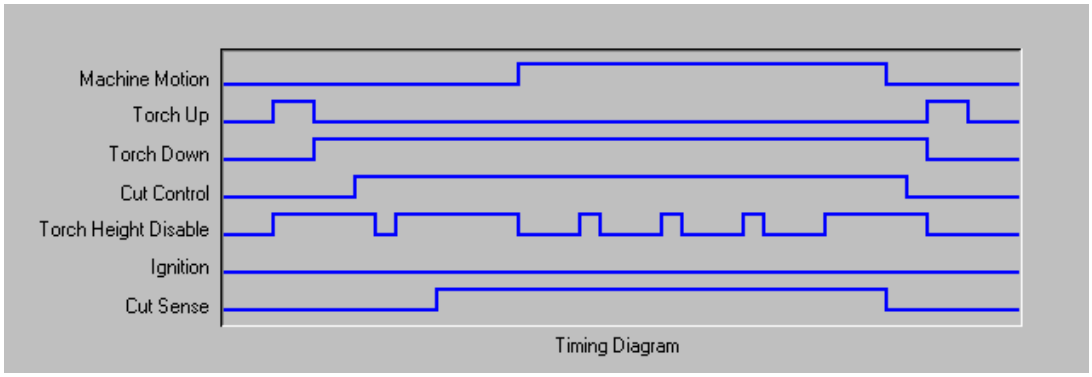
The control comes with the following built in control logic for Plasma cutting. When Plasma is selected, the following parameters are available to customize the logic for the particular metal being cut. As these parameters are changed, the timing diagram below will change to show the new timing parameters.

### I/O Configuration Type "M", "P" and "V"

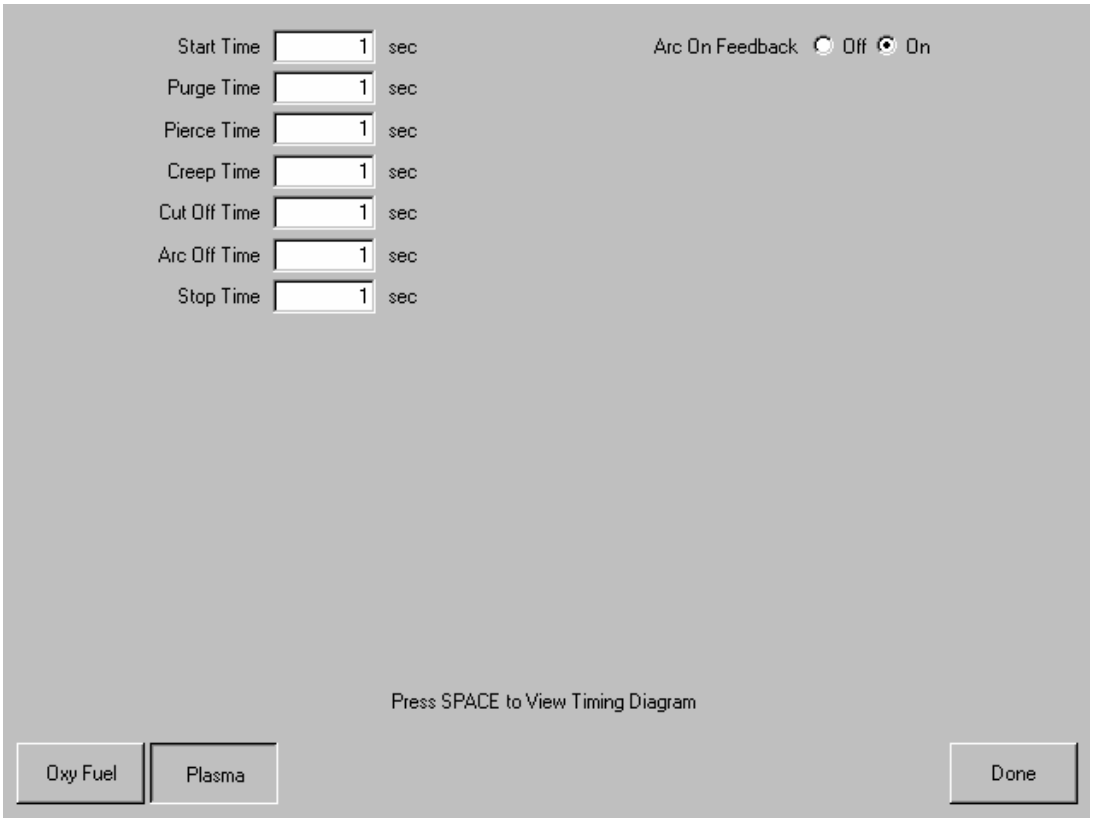



**I/O Configuration Type "M", "P" and "V"** (Timing Diagram)

Press the Space key to view the timing diagram from setups.

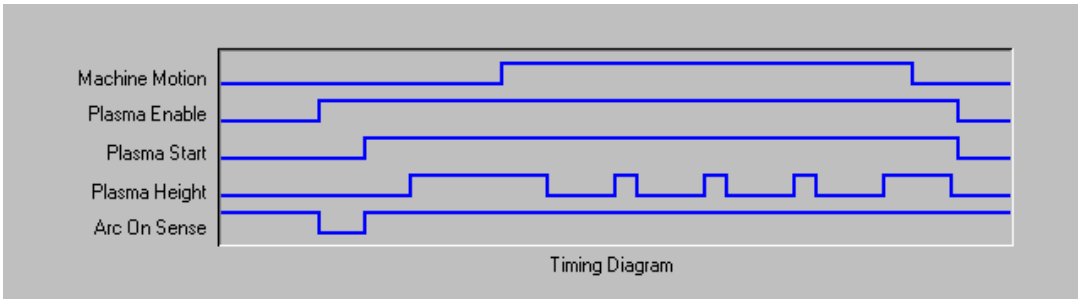


**I/O Configuration Type "B"**




**I/O Configuration Type "B"** (Timing Diagram)

Press the Space key to view the timing diagram from Setups.




**Start Time (Type "B" Configuration Only)**
The Start Time parameter is used to delay motion along the cut path when a tool is started or a tool is lowered.

**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 V*value* F*value* 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.

# 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 softkey in Setups.

**Note:** This screen feature is not available with type "B" configured controls.

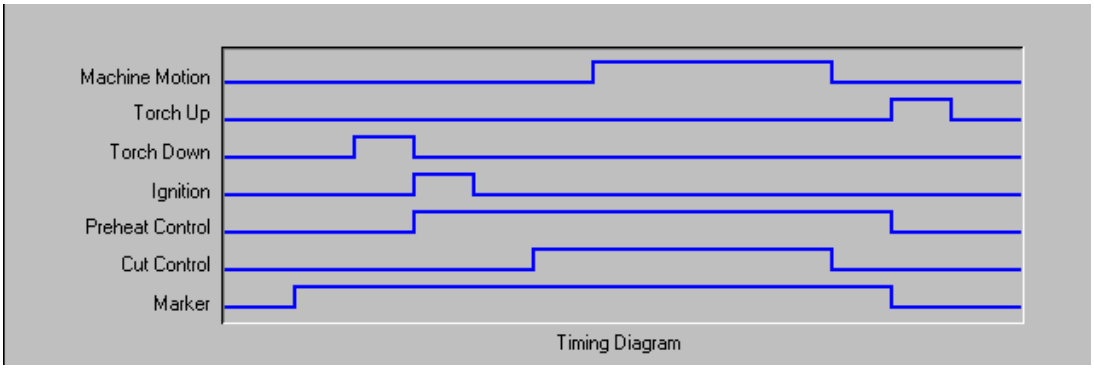
### Marker Interface

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.

**I/O Configuration Type "M", "P" and "V"** (Timing Diagram)

Press the Space 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 V*value* F*value* 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.

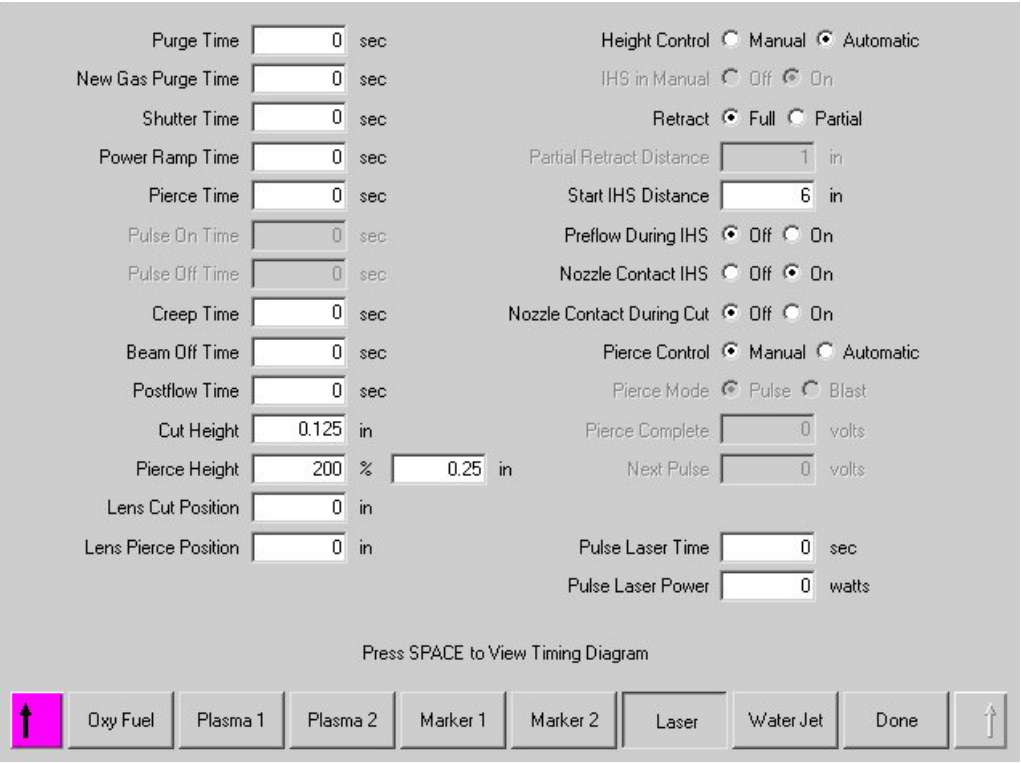
**Down On During Mark**
Turning on the Down On During Mark feature forces the torch down output to remain on throughout the Marking process. This is advantageous for pneumatic style torch lifters that require a constant output.

**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.

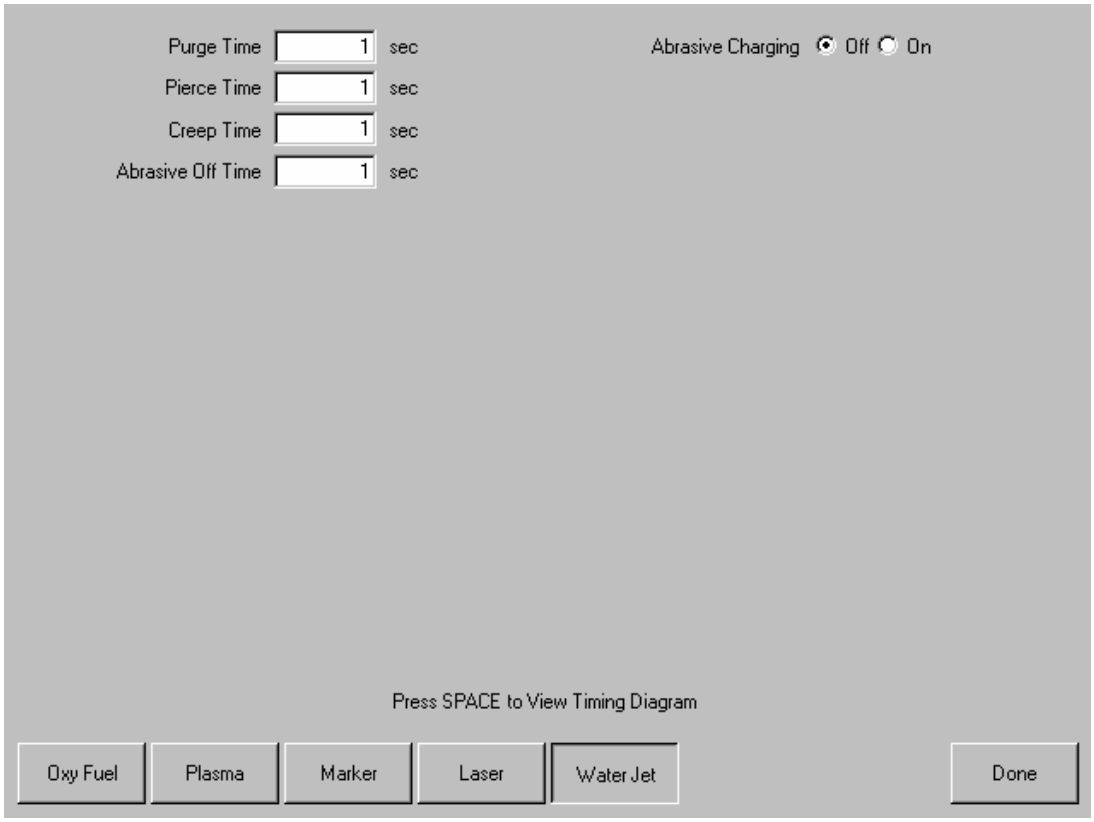
## Laser

I/O Configuration Type "V" only



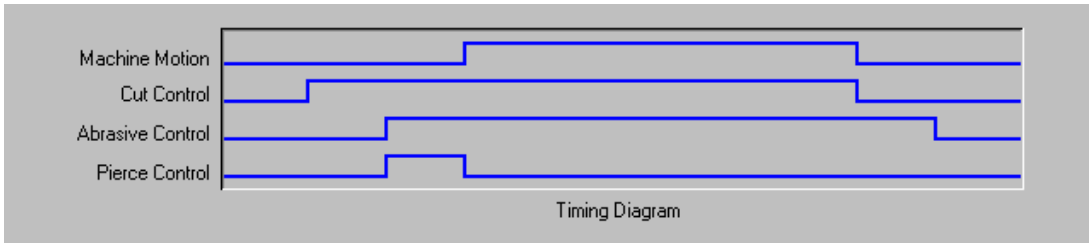

Refer to Appendix A: Mariner™ & Voyager II information.

## Water Jet




**I/O Configuration Type "M", "P" and "V"** (Timing Diagram)

Press the Space 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.

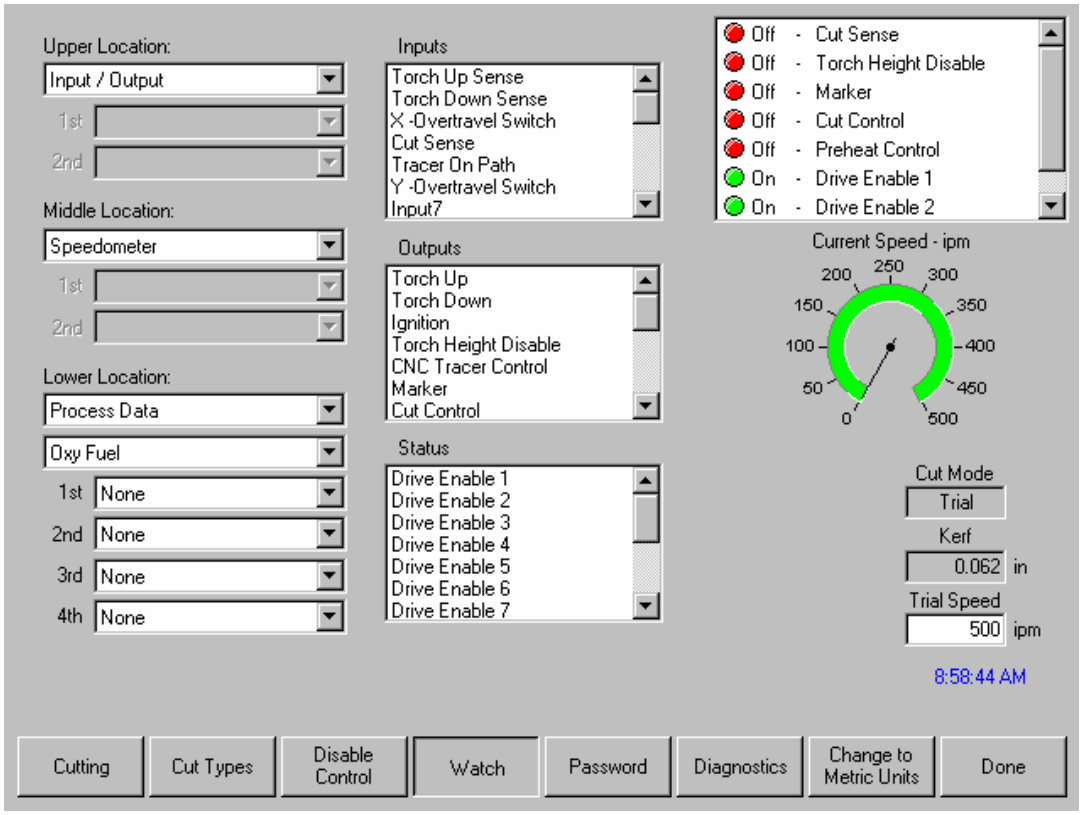
**Abrasive Off Time**
The Abrasive Off delay parameter species the amount of time the abrasive will remain on at the end of a cut.

**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, 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.

**Temperature**
Selecting to add the Temperature Widgit 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).

**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 HPR130™ autogas console. Up to four power supplies may be monitored. This is generally used for diagnostics only.

**Multiple Watch Windows**

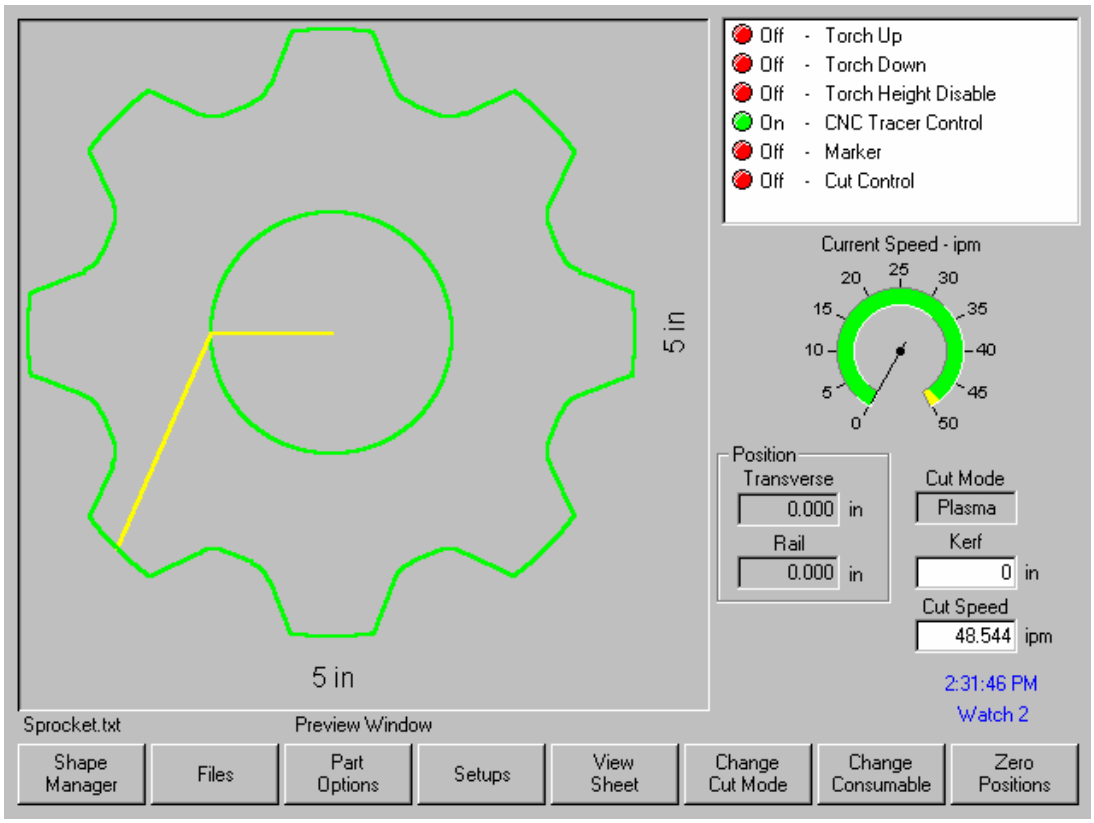
Up to ten different Watch windows may be configured on the control for quick selection and viewing of the Watch icons.

To configure different Watch windows for viewing, first access the Watch setup screen. Press and hold the Shift key ( Purple or Blue shift key ) followed by a number ( 0 – 9 ). As you press the Shift key the current Watch window number will be displayed in the lower right corner of the screen. Configure the Watch Window as desired.

To select a different Watch window, press and hold the Shift key followed by a number ( 0 – 9 ). Configure the next Watch window as desired. Continue this process until all desired Watch Windows have been configured.

To view the various Watch windows during operation, simply press and hold the shift key and the corresponding number and the desired Watch Window will then be displayed.

Example:

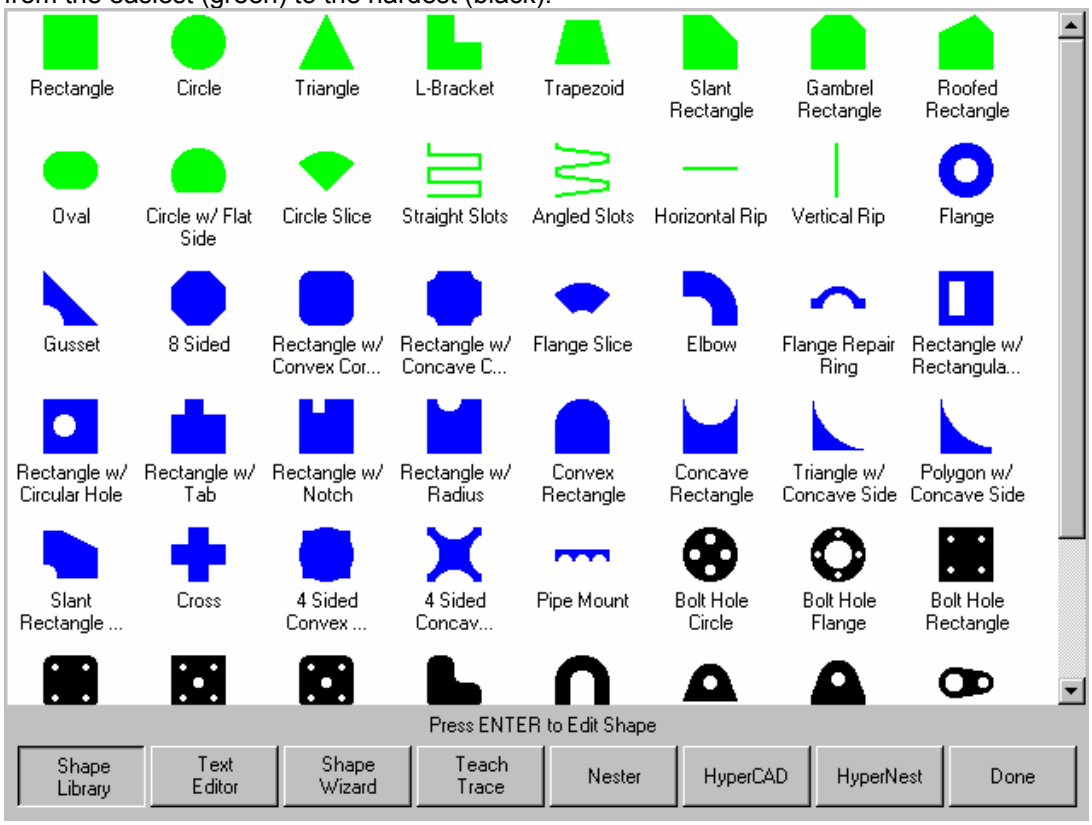


# Section 4: Shape Manager

## Shape Library

The control contains a built-in Shape Library with more than 53 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 53 shapes as shown below. The screen is defined in colors, from the easiest (green) to the hardest (black).

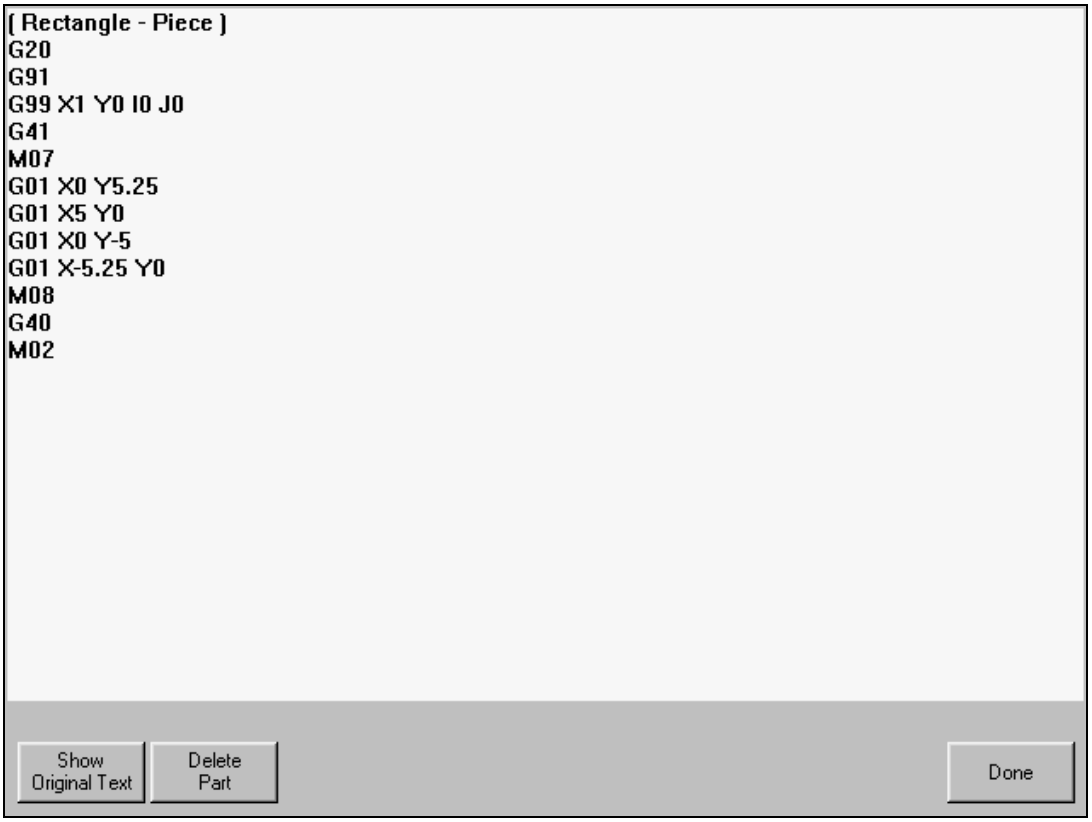



**Selecting a Simple Shape**
After pressing Shape Library from the Main Menu, the control display shows the Shape Library as shown above. At this time, simply use the arrow keys to navigate to the desired shape you wish to cut and press ENTER. If the selection is incorrect, press CANCEL and re-select the shape.

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. Done will save any changes to the current part in memory. If you want to save the changes to the hard drive, go to the Save to Disk screen. If you do not want to save any changes that were made, press Cancel on the keyboard.



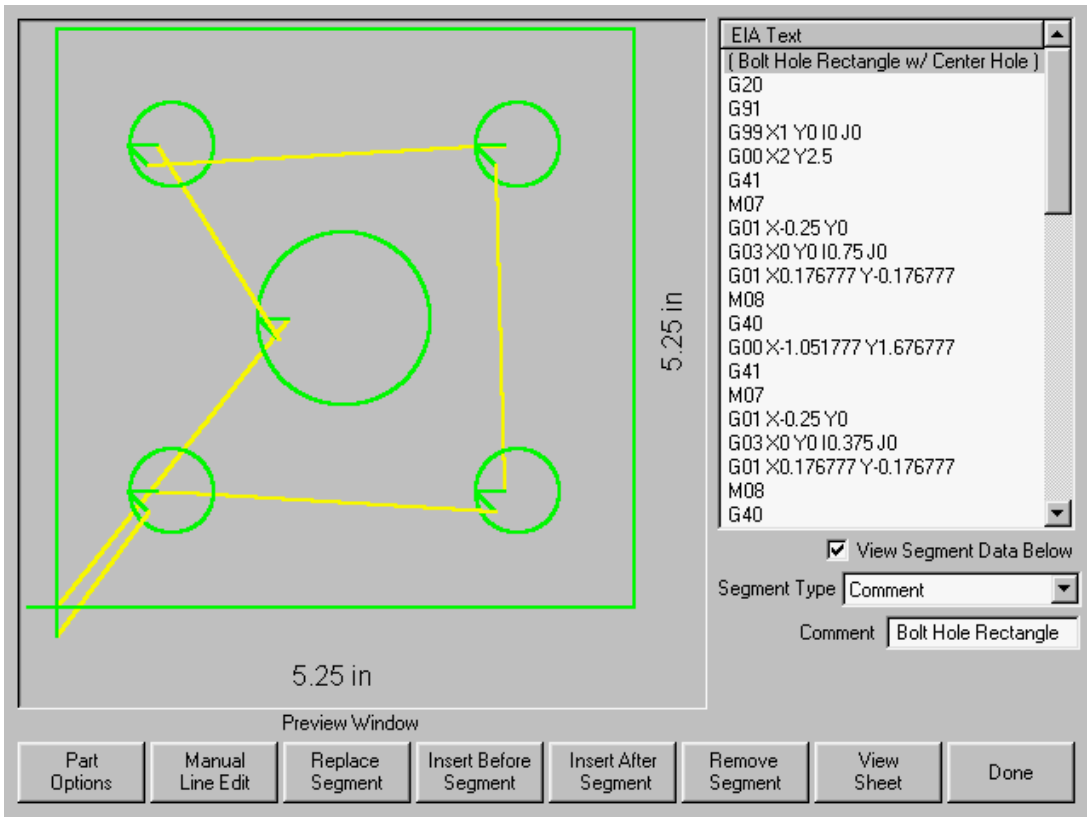

**Show Original Text**
Pressing the Show Original Text button allows the user to view and edit the part program in the original format in which it was written.

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

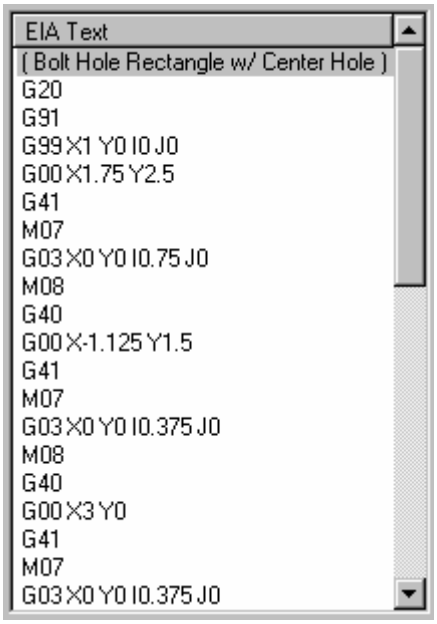
## Shape Wizard

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

*ShapeWizard*® 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*® is accessed from the Shape Library menu.

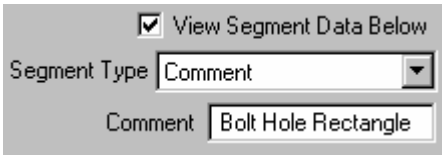



**Manual Line Edit**
Pressing Manual Line Edit allows editing the highlighted line in the Text Editor window. The ASCII text entered must be valid EIA RS-274D codes or an error message will result. Below is a Text Editor line as it appears immediately after the Manual Line Edit is pressed:




Simply typing right over the line can erase the highlighted text or the line can be edited using the left and right arrow keys.

**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:

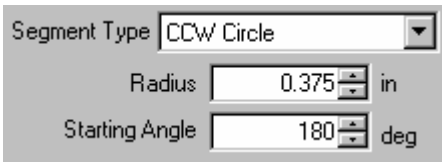



**Insert Before Segment**
Pressing this softkey causes the segment selected from the Segment Type window to be inserted before the segment highlighted in gray in the Text Editor window.

**Insert After Segment**
Pressing this softkey causes the segment selected from the Segment Type window to be inserted after the segment highlighted in gray in the Text Editor window.

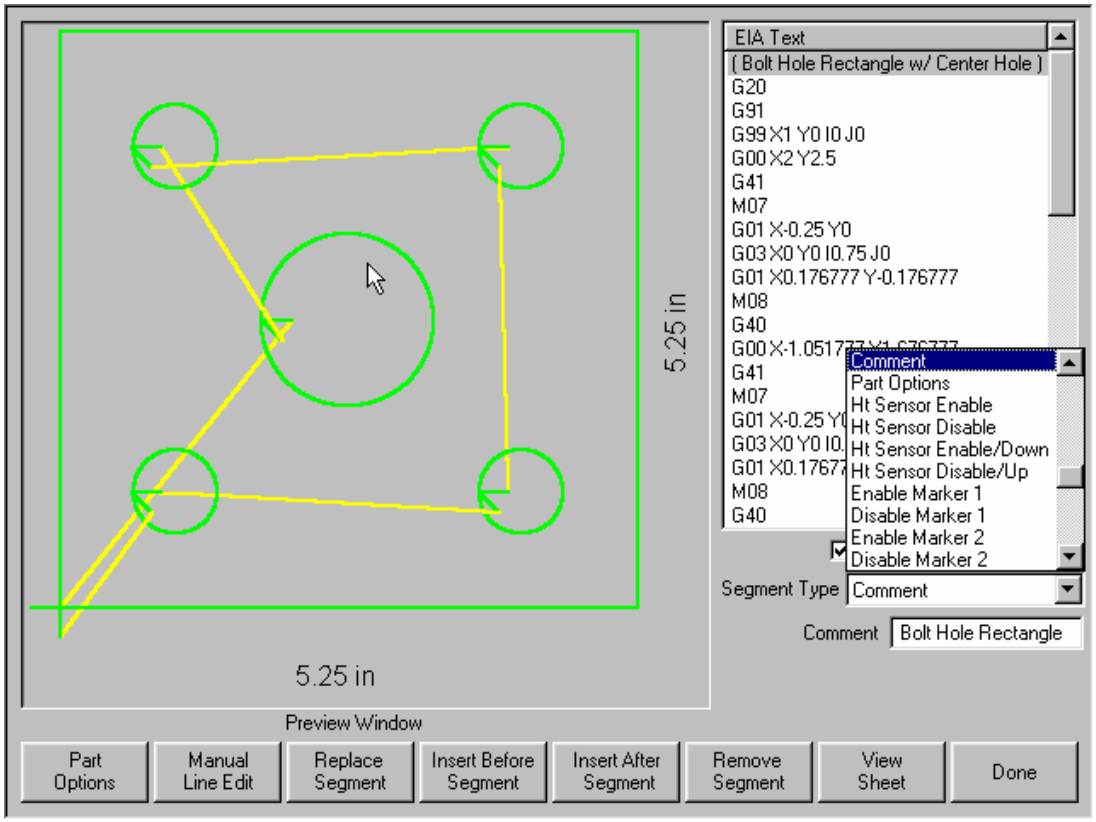
**Remove Segment**
The segment highlighted in gray or blue in the Text Editor window is removed from the part program when the Remove Segment softkey is pressed.

After the Manual Line Edit softkey has been pressed, the left and right arrow keys on the front panel can be used to move left and right within the line being edited in the Text Editor window. They also are used when entering segment parameters for new Segment Types such as:



While a text line is highlighted in blue, the Up and Down arrow keys are used to scroll vertically through the part program. With each press of one of these keys, a new segment is highlighted. In addition, the 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 Up and Down arrow keys are also used when the Segment Type pop-up window is highlighted to scroll vertically through the list of segments. The Segment Type pop-up window is pictured below:




The PAGE UP and PAGE DOWN keys can also be used wherever the Up and Down arrow keys are used. The only difference is that instead of moving up or down one line, PAGE UP and PAGE DOWN moves 20 lines at a time.

Pressing PREV and NEXT moves the edit focus to the next window. For example, when a user enters *ShapeWizard*, the first line in the Text Editor window is highlighted. If a new segment selection is desired, the user must press either PREV or NEXT until a selection in the Segment Type window is highlighted. Pressing NEXT again will cause the control to skip ahead and once again highlight a line in the Text Editor window. As a rule, NEXT always moves the selection flow ahead and PREV moves it backwards.

As soon as it becomes highlighted, the Segment Type window expands or pops-up. This allows the user to view a larger selection of segment types. See the picture above.

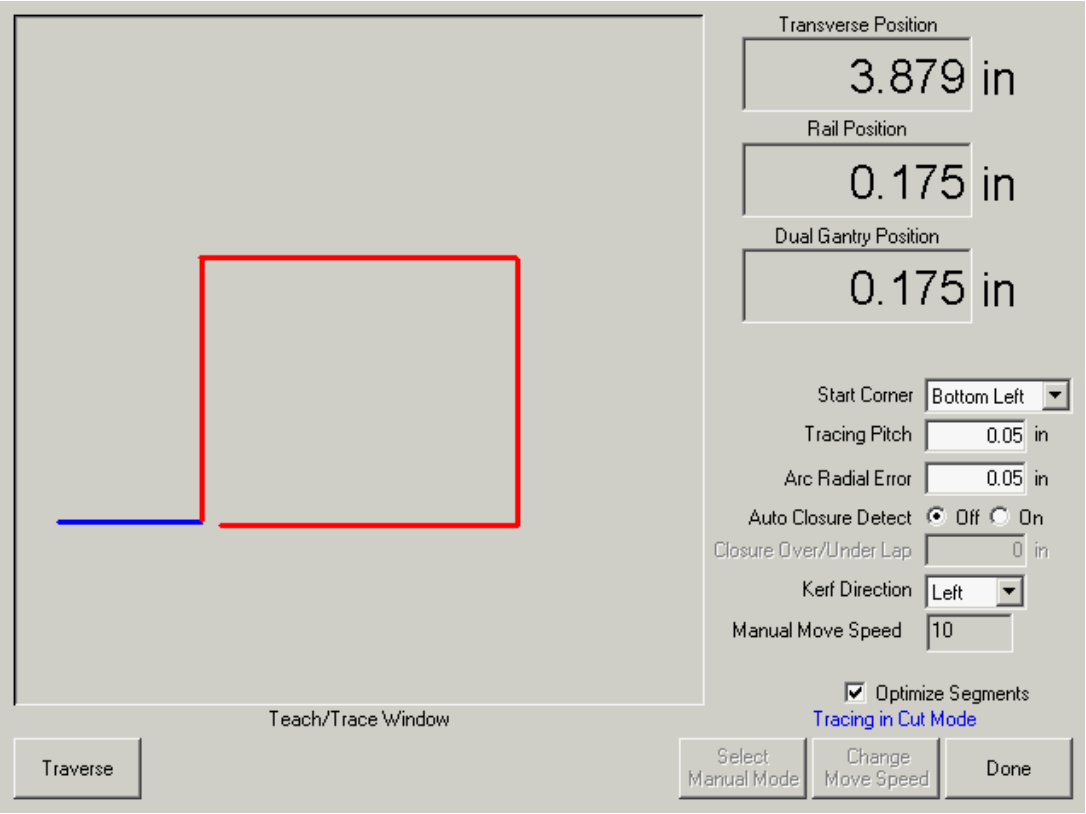
After a selection is made in the Segment Type window, pressing ENTER will cause the control to display up to three parameters associated with the segment selected. Not all segments have any parameters associated with them. For example, End Program does not need any additional parameters.

## 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.

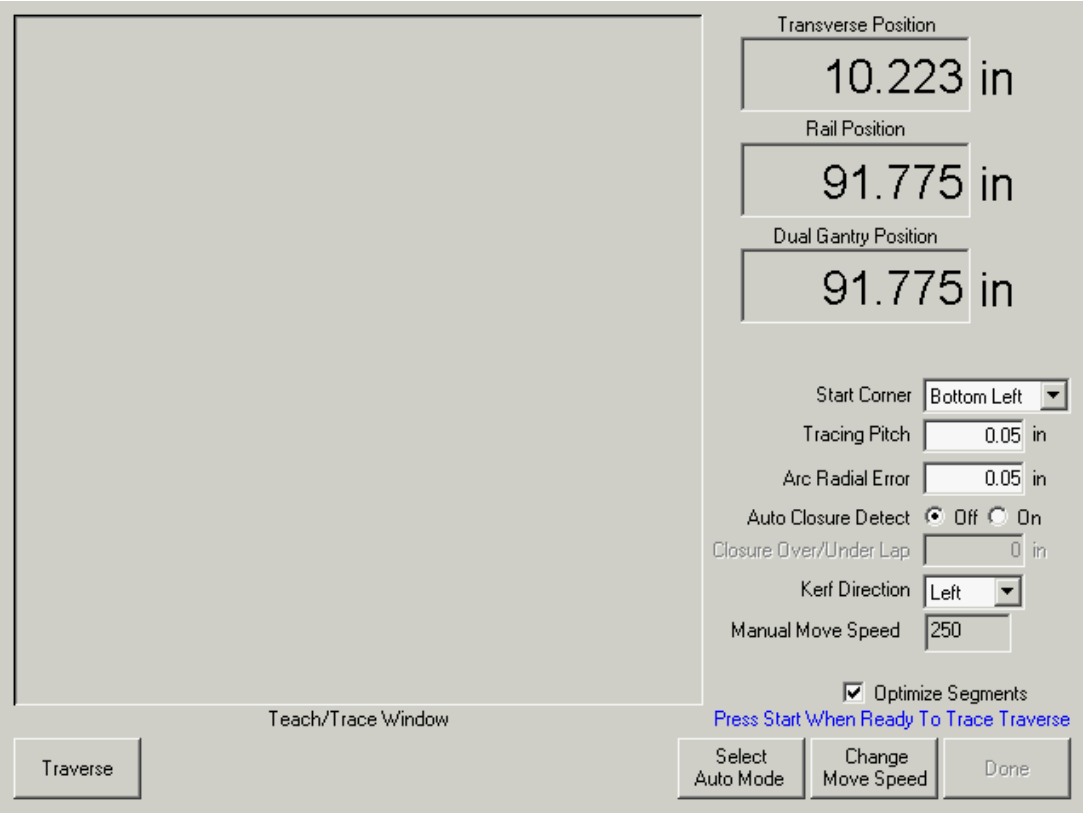
**Tracing a part**
To trace a part while at the Teach Trace screen, select Auto mode, then select traverse or pierce. You may switch between traverse and pierce during the tracing procedure. Position the optical sensor near the part drawing and press Start. Use the sensor positioning controls to direct 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 Done. 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.

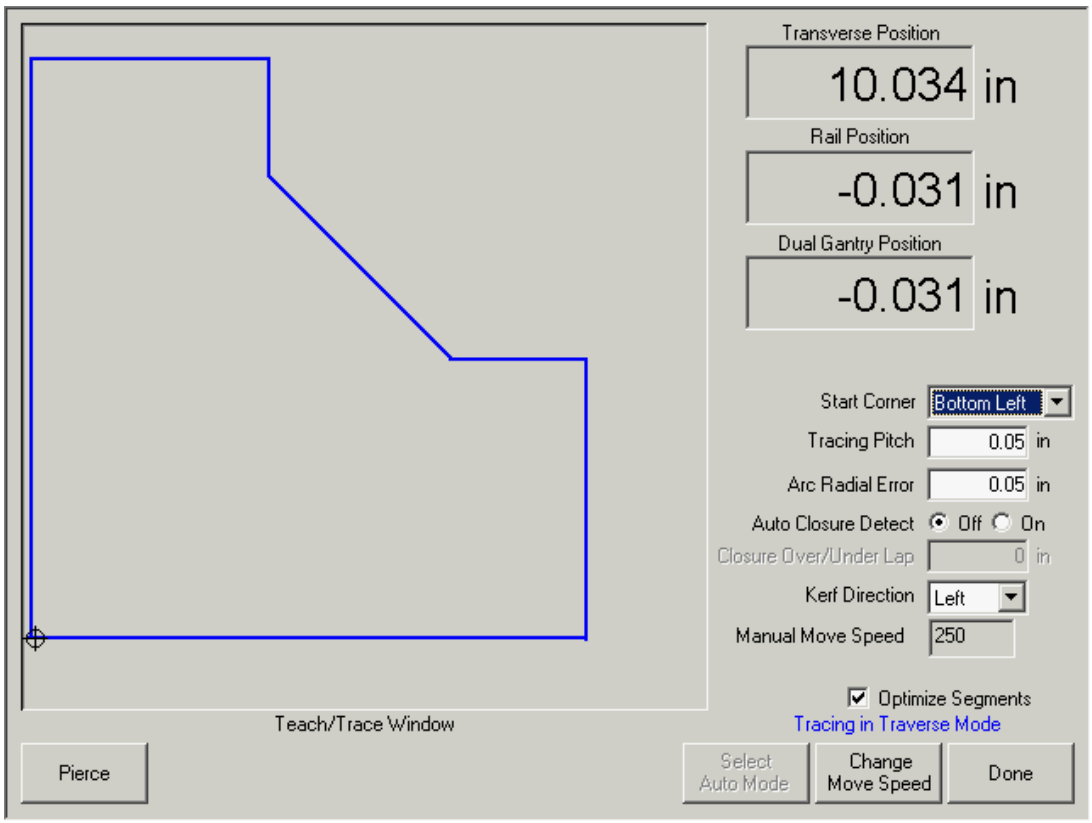
The user manually moves the torch (or a pointer) around the plate to define the outline of the material which remains. When the path is completed (it doesn't have to be a closed path), the operator presses the Done key and the recorded axis motions are written to a standard part program format with moves 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, 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 softkey 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.




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 Done 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.

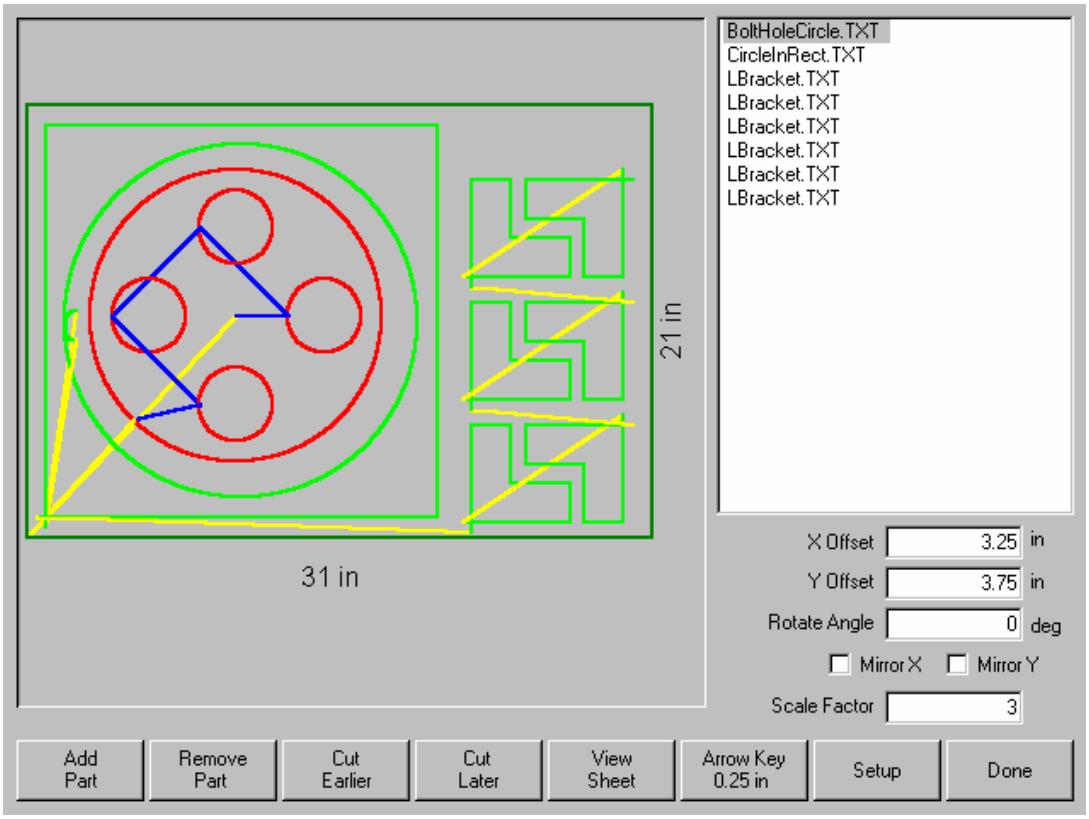
Additionally, an optional Automatic Nesting feature may be enabled to perform true shape, single station, automatic nesting. With its advanced Graphical User Interface, ease of use and advanced profile positioning algorithms, this Automatic Nesting feature can greatly improve the output of your shape 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 softkey accesses the screen, which allows the user to select a part program from a selected source.

**Remove Part**
This softkey is used to remove the selected part from the nest parts list.

**Cut Earlier**
Pressing the Cut Earlier softkey 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 softkey 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 softkey, 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.

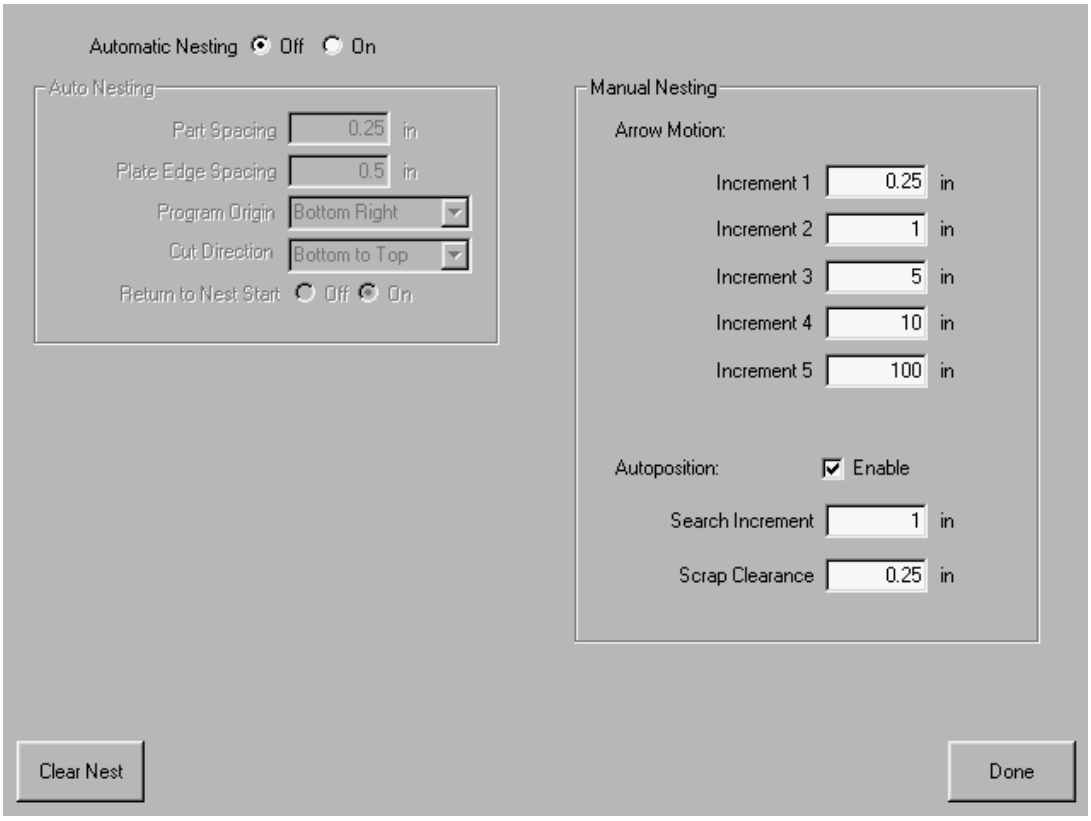
**Arrow Key ( Distance )**
The Arrow Key allows the user to select one of five different preset move distances when the arrow keys are pressed to locate parts in the nest. These five distances are definable and are selected in the Nester™ Setup screen.

**Setup**
Pressing the Setup softkey accesses the Nester™ Setup screen for configuring the variable parameters when using Nester™.

**Done**
The Done softkey is used to end the Nesting program, return to the Main Cut Screen and temporarily save the nested program as the current part. At this point, the part can be cut or saved to disk through the Shape Manager. Pressing the cancel key will return the user to the Main Cut Screen without saving the nested program.

## Nester™ Setup

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




**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.

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

**Done**
The Done softkey is used to end the nesting setup and return to the Nester™ main screen.

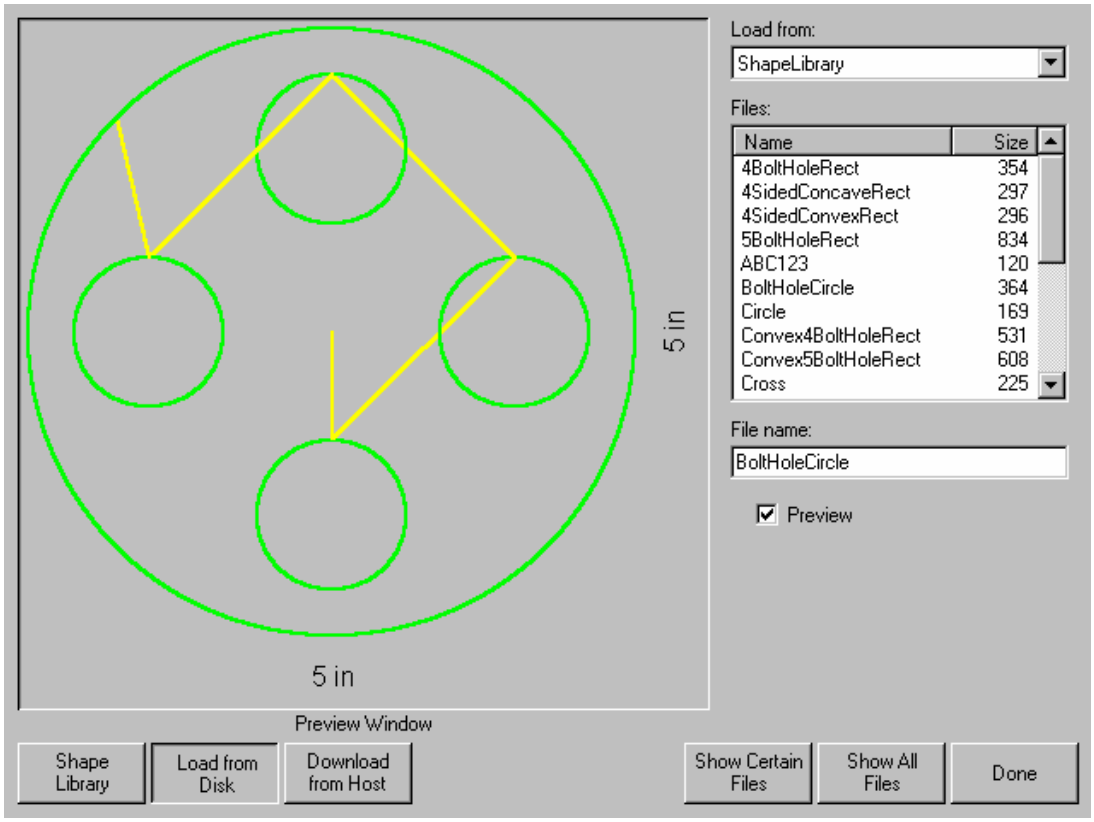
## Using Nester™

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.

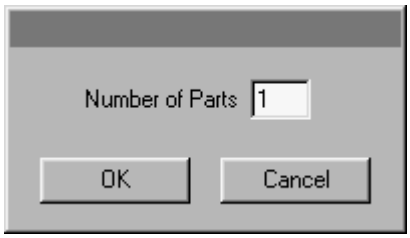
Press the Nester™ softkey from the Shape Manager screen then enter the Nester™ Setup Screen to configure the nesting software for use. Press Done to return to the Nester™ Main Screen to begin placing parts in the nest.

### Adding Parts

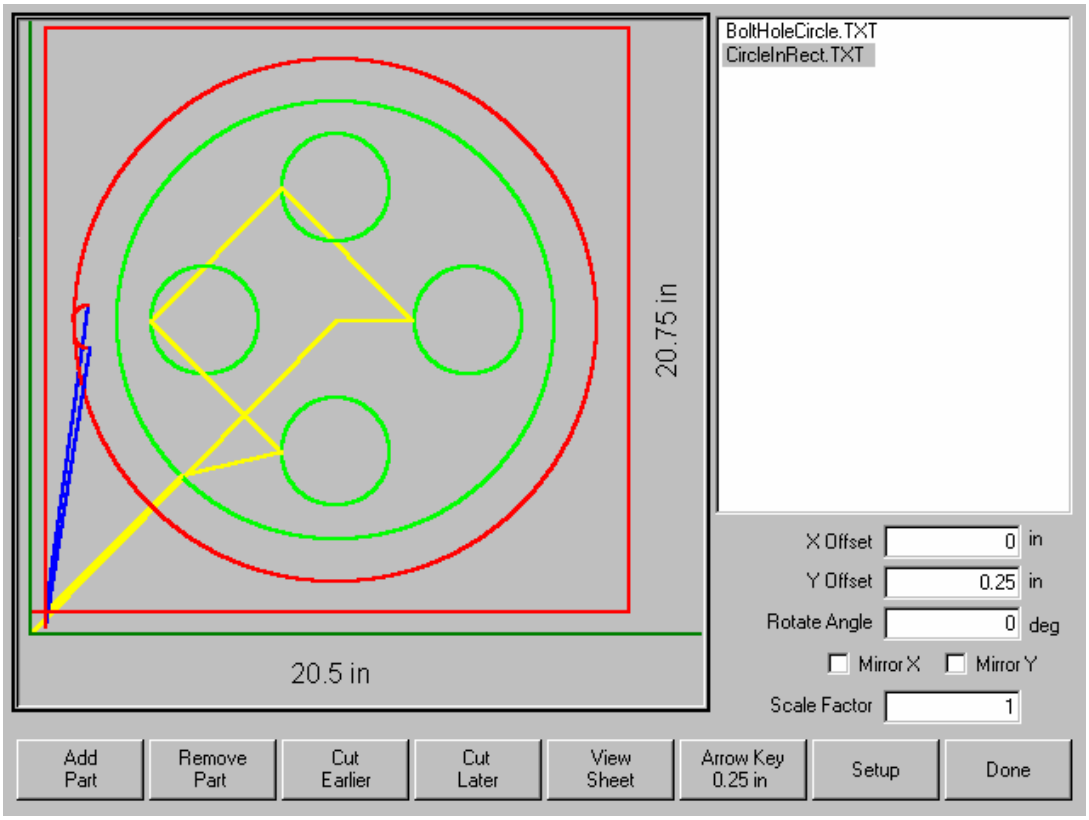
At the Nester™ Main Screen, press the Add Part softkey to add a new part to the nesting part list. The first screen viewed will allow the user to select a part from the Simple Shape Library, from a disk or from the host computer via link communications.




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



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 by using the Prev/Next keys and then using the Up/Down arrow keys to select. When the desired part file is highlighted, use the Prev/Next keys to move to the desired field to manually offset, rotate, mirror and scale the part.

To position the selected part, use the Prev/Next keys to highlight the view screen. 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 softkey. 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 softkeys displayed. When finished, press Done 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**

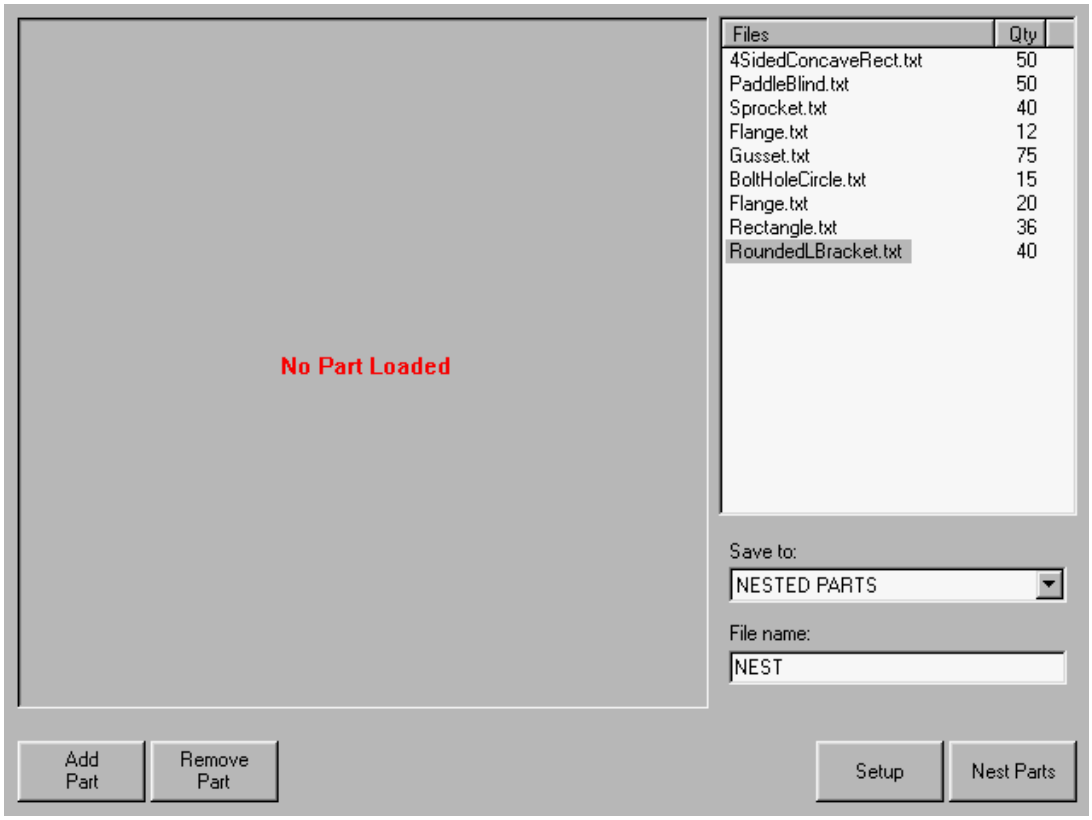
From the Main Cut screen, press the Files softkey to Save to Disk. From here the part can be saved to a hard disk folder on the control or a diskette. The nested parts file may be saved as a nest or a part. Saving as a nest will create a larger file, which will allow future modification of the nest through 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.

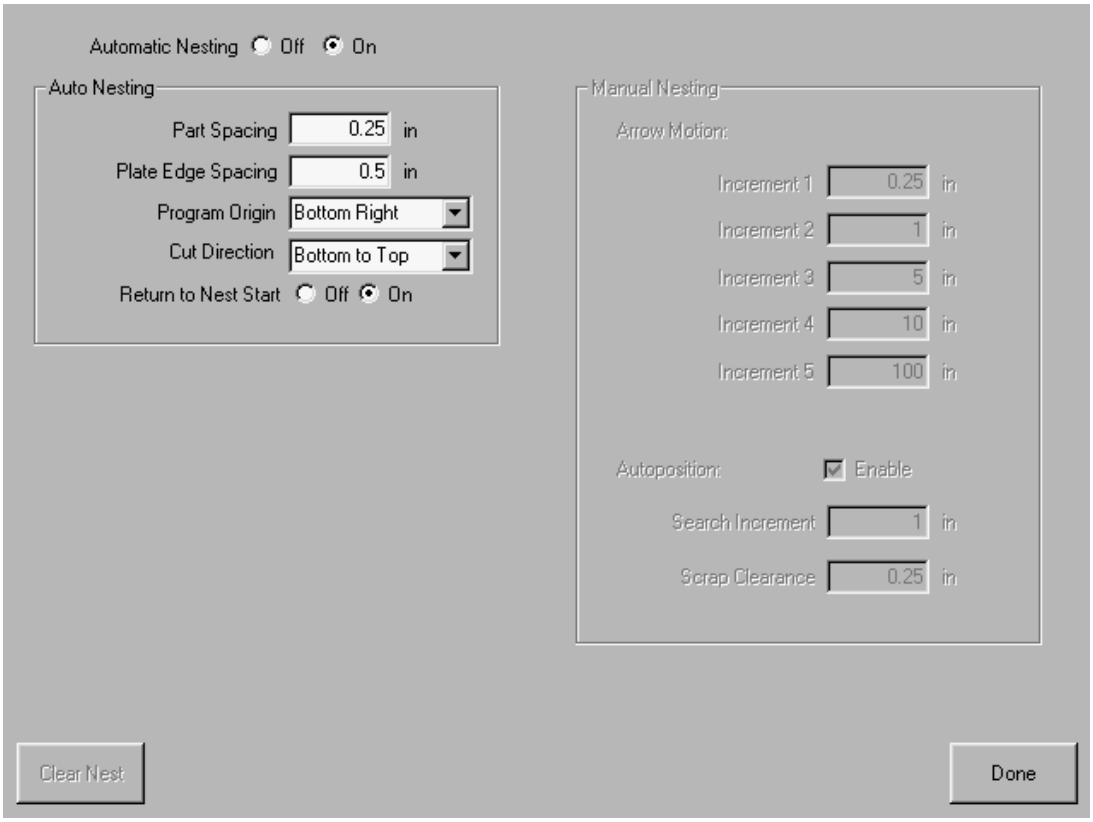
The upper right corner of the main screen displays the list part programs and quantities of parts to be automatically nested. In the lower right, locations to save the nested part program to a folder location and to assign a file name.




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 softkey accesses the following setup parameters and are 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 Automatic Nesting Parameter to ON 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.

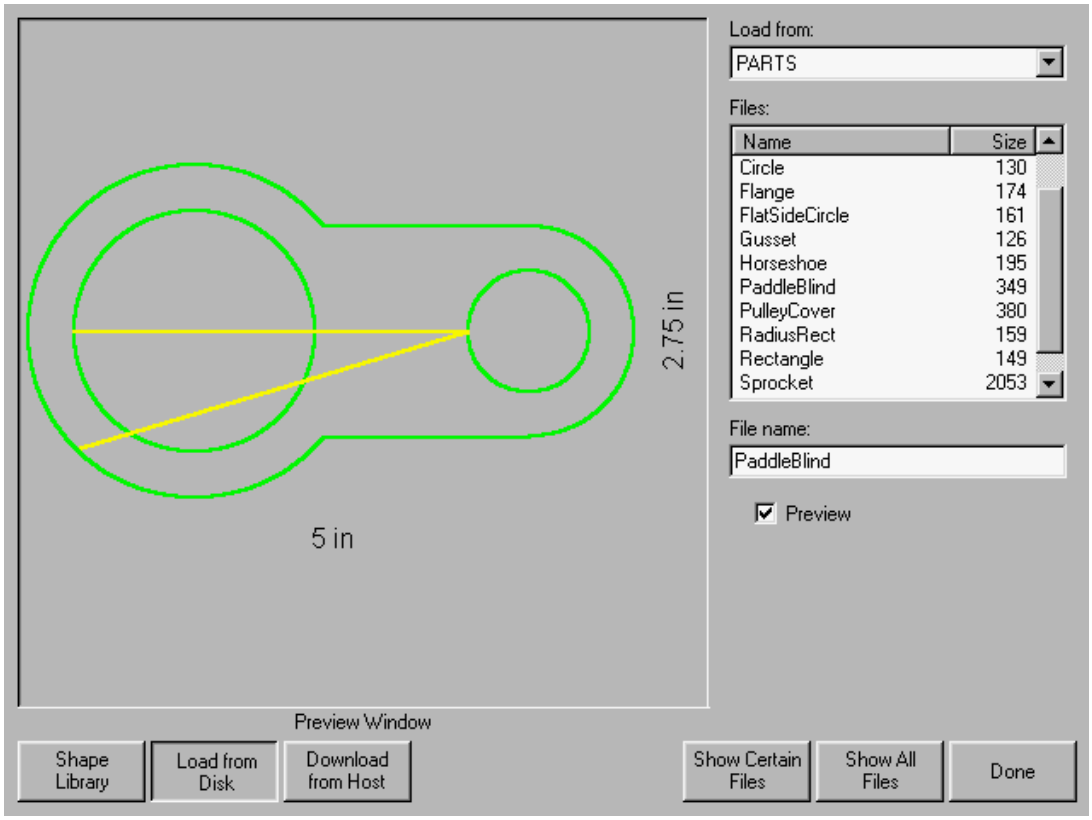
**Return to Nest Start**
When enabled, the Return to Nest Start feature will insert a traverse segment back to the start point at the end of the nest.

## Using HyperNest – CNC®

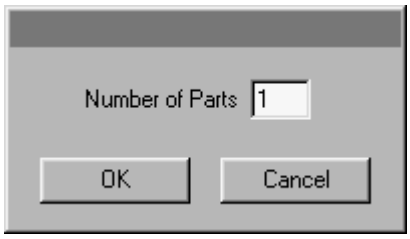
To begin, first select the plate size requirements for the nest at the Main Setup screen. Press the Nester™ softkey from the Shape Manager Screen then enter the Setup Screen to enable the Automatic Nesting software feature and configure the setup parameters for use. Press Done to return to the Main Screen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

**Adding Parts**

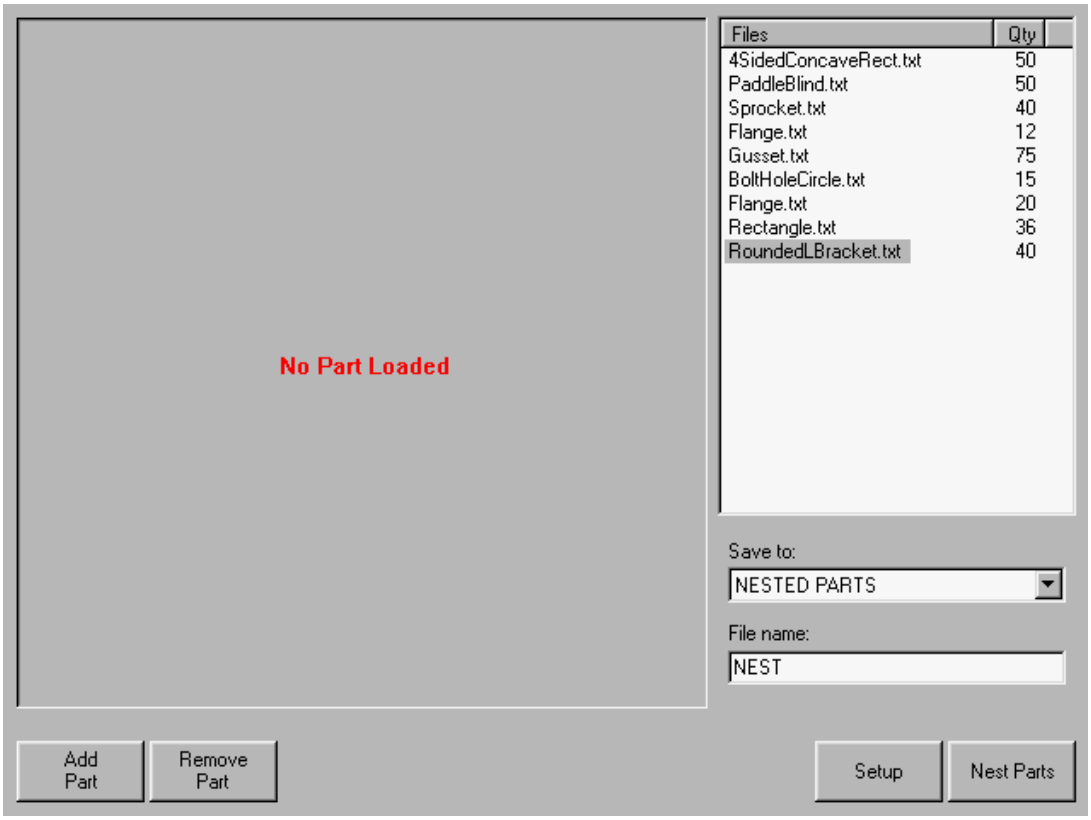
At the Main Screen, press the Add Part softkey to add a new part to the nesting part list. The Add Part screen will allow the user to select a part from the Simple Shape Library, from a disk or from the host computer via link communications.



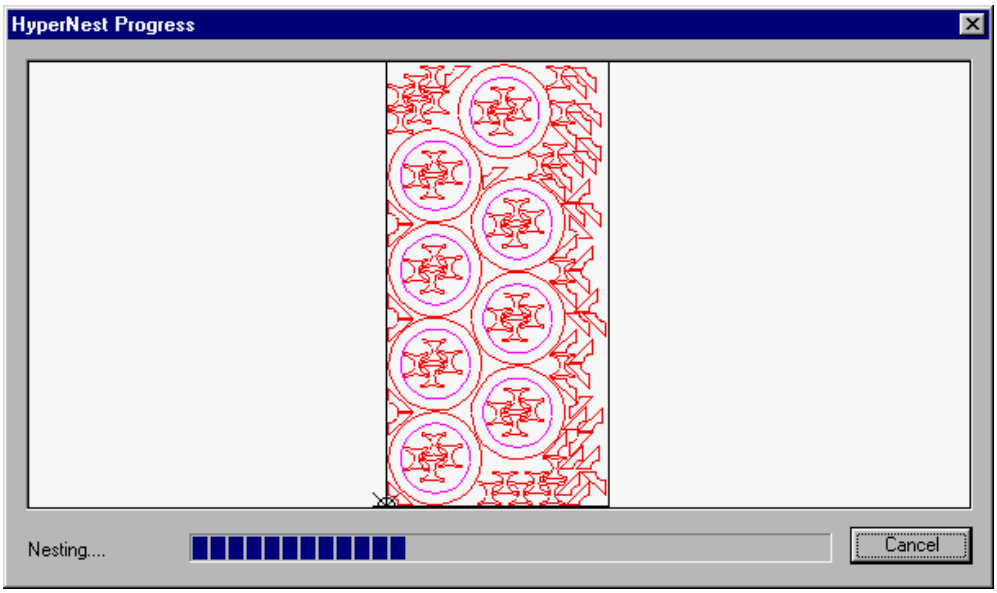

Once a part has been selected from the desired location, the user will be prompted to select the number of pieces desired.



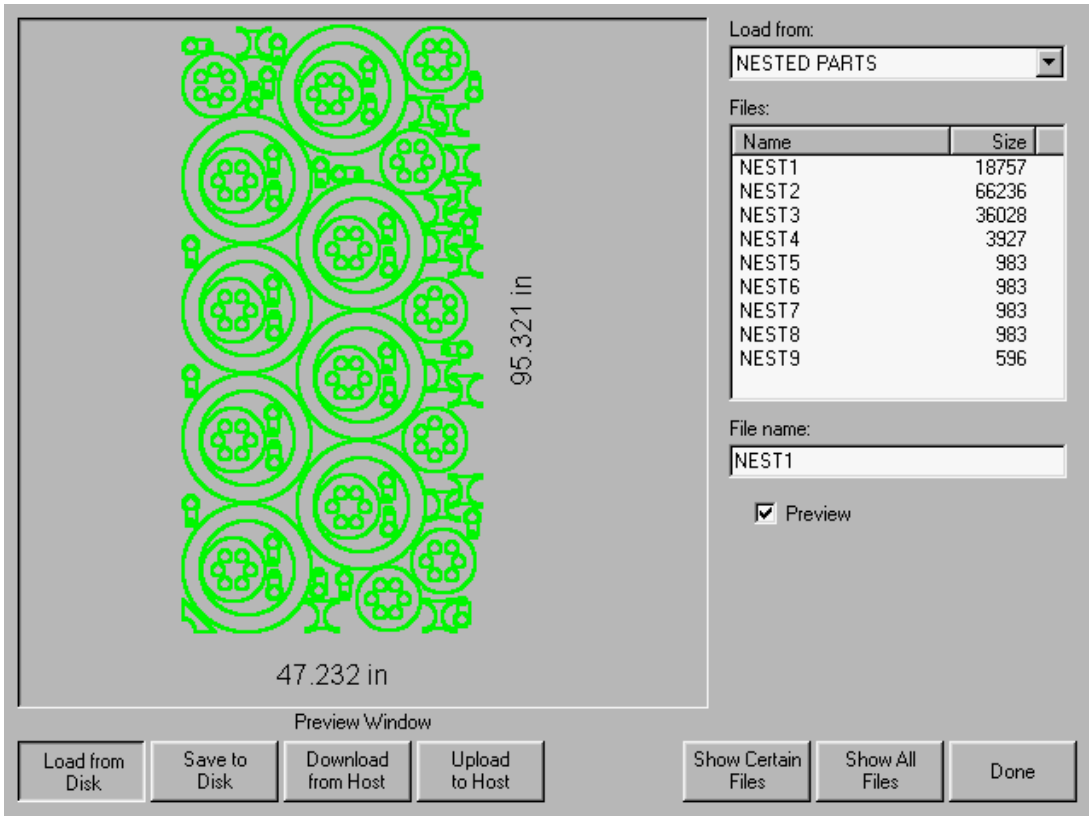
As new parts are added, the part file name and quantity will be displayed in the parts list window in the upper right corner of the screen in preparation for final placement during the Automatic Nesting process.




Select the desired file location and assign a file then press the Nest Parts softkey to begin the automatic nesting process. A progress window will be displayed during the nesting process.

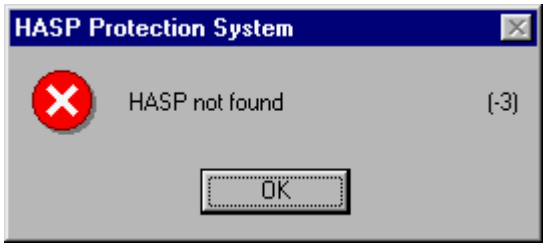


Note: The nest process progresses quickly and not all shapes may be visible on screen or other drawing anomalies may be noted during the nesting process.
In the event that more parts are selected than can fit on one plate, multiple plates or sheets (nested program) files will be generated and saved in 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.

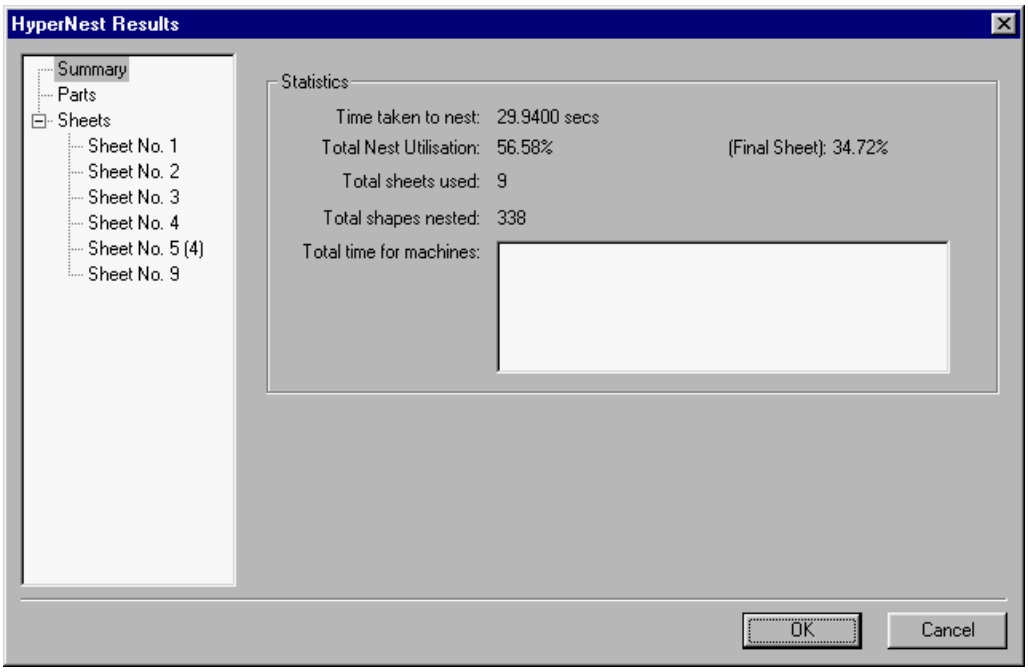



**Remove Part**
A part may be removed from the part files list by highlighting the selected part in the files list and pressing the Remove Part softkey prior to executing the nesting.

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

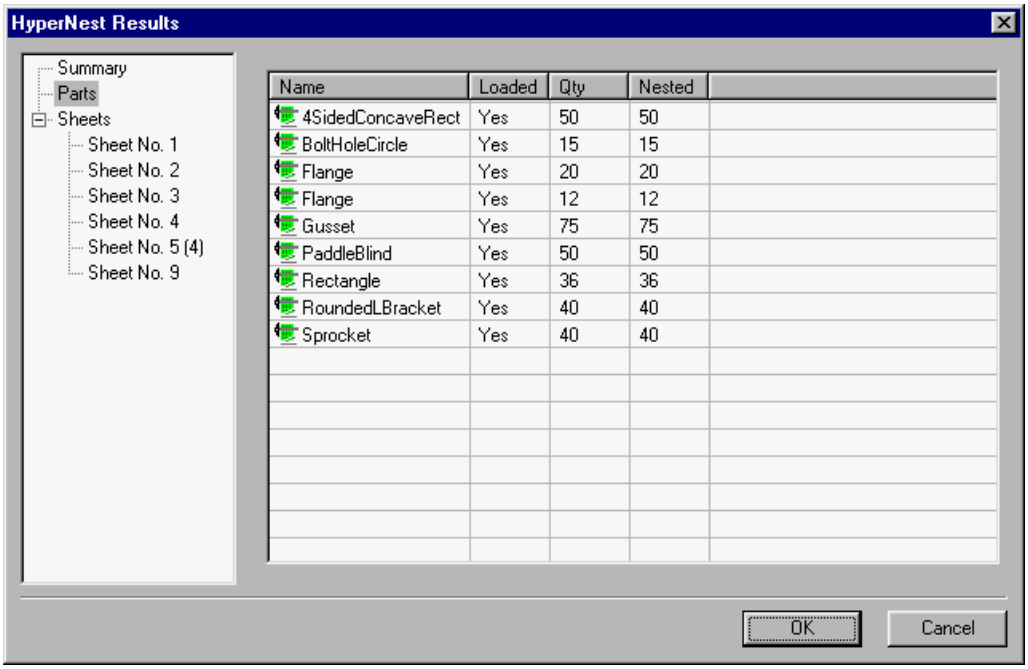


**Nest Summary**
Upon completion of the nest, the software will provide a summary of the Automatic Nesting process.

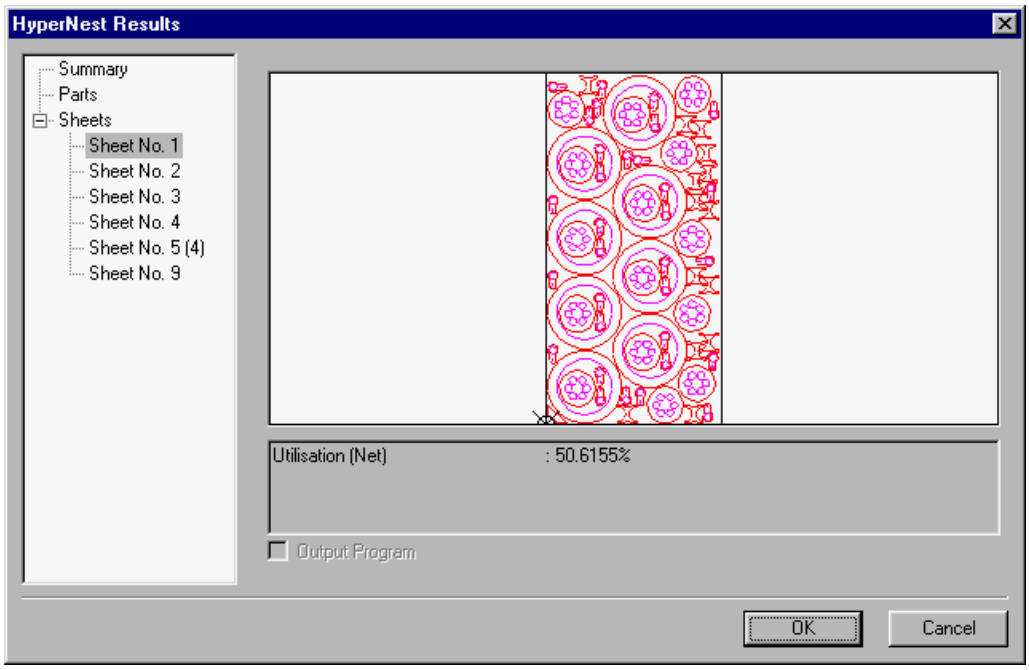



Statistical analysis of the process is provided for a number of sheets, time to execute nest, total nest utilization and total number of shapes nested.

Note: Sheets that are generated with the exact same part configuration will be listed as "Sheet No. # (total #). For the example above, the sheet number 5 thru 8 sheets are all the same and are listed as "Sheet No.5 (4)"



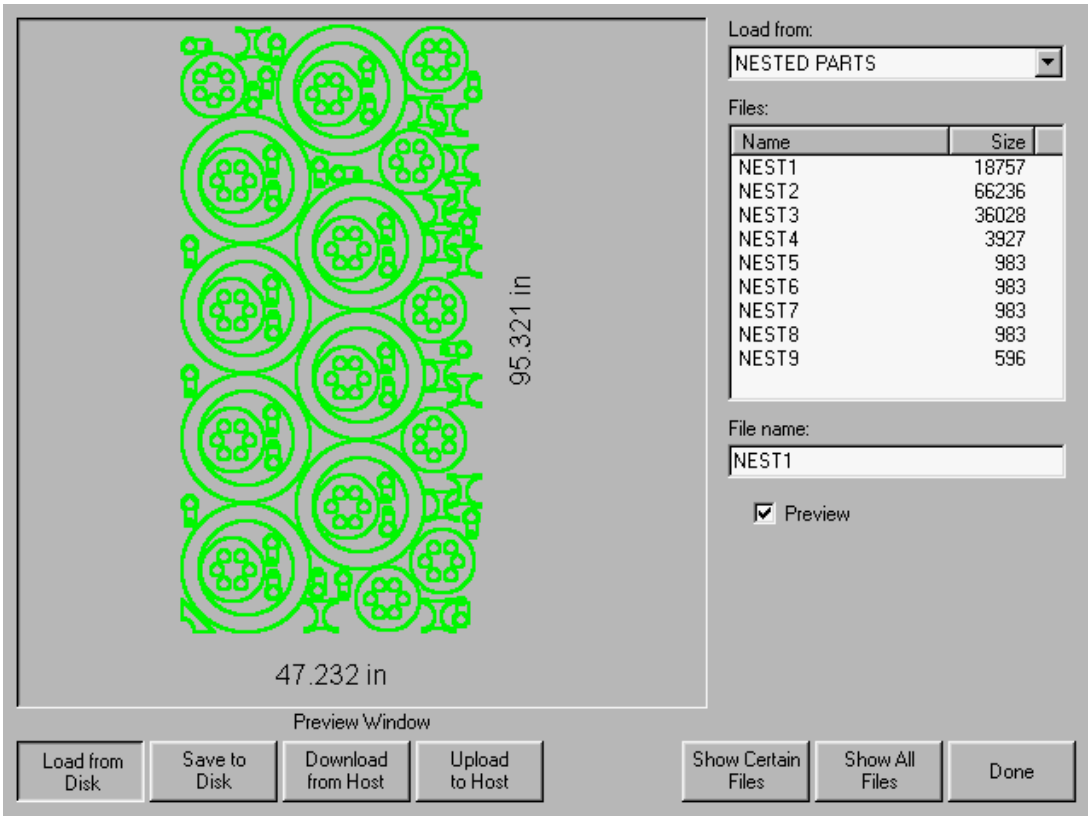

Pressing the down arrow key will allow you to view an analysis of the parts used.




Pressing the down arrow key again will allow you to view the individual sheets produced and a listing of the net utilization for the specific sheet.

Press Enter 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.

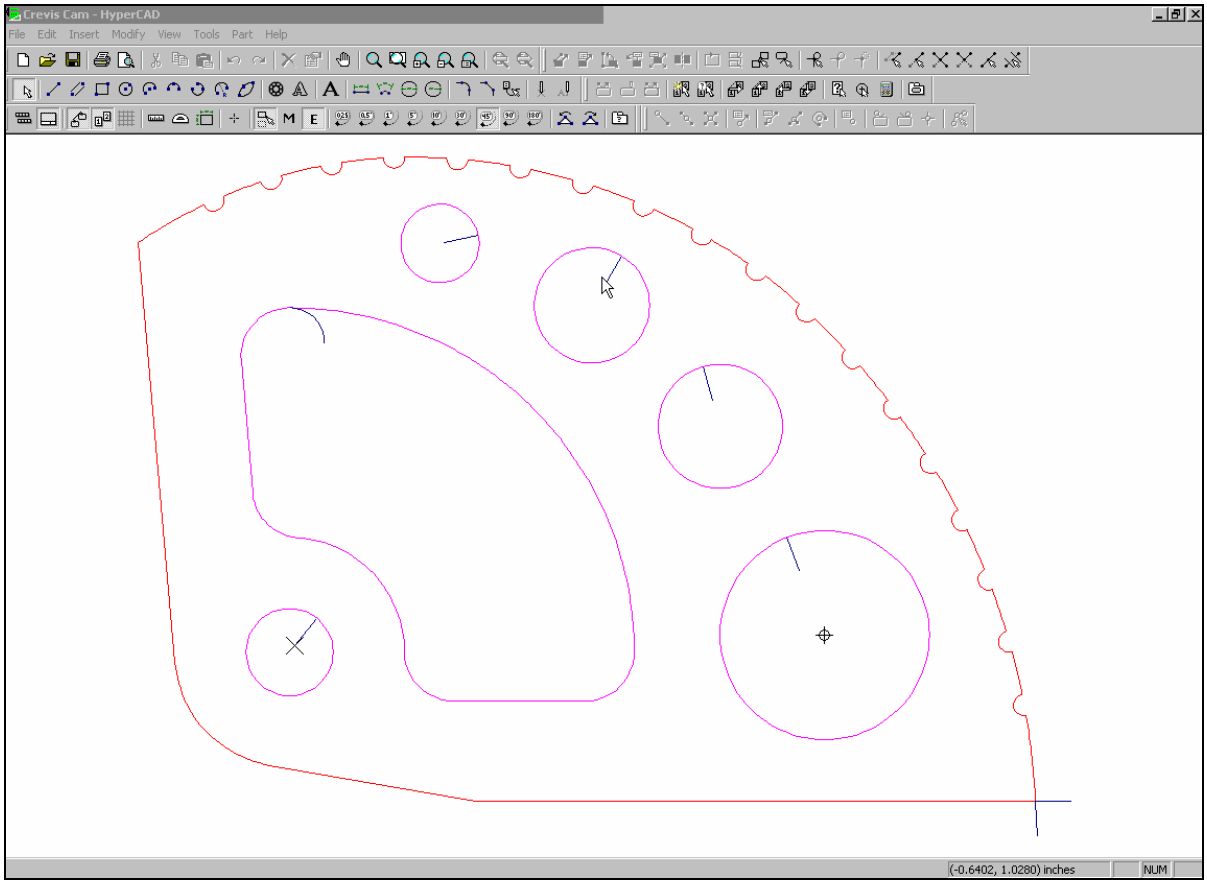
# HyperCAD®

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.

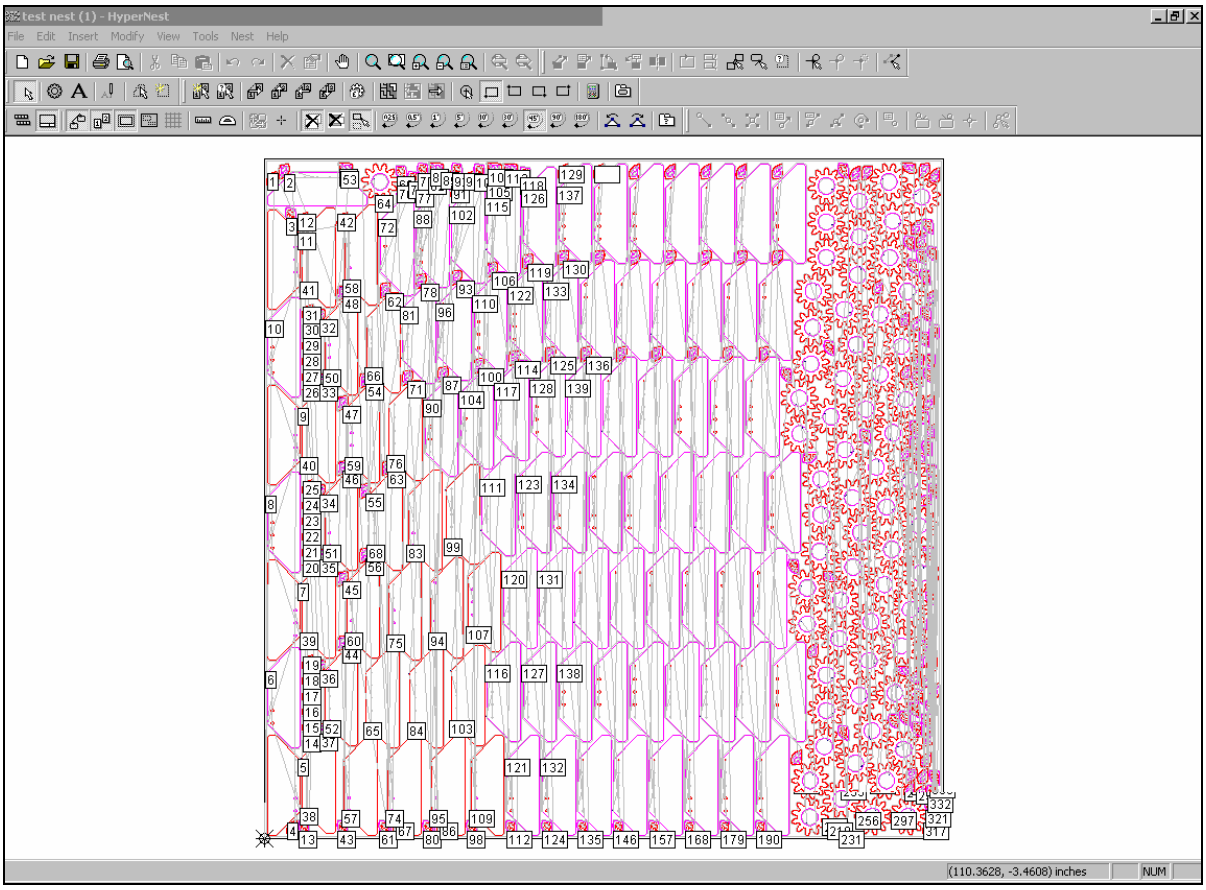
# HyperNEST®

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

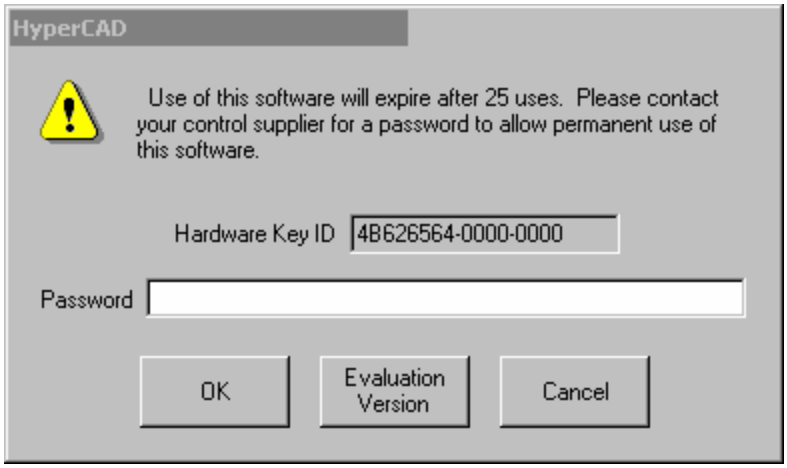



This feature is offered as a limited use trial version. Please contact your control vendor for information on enabling unlimited use of this feature. This package may be used on the CNC equipped with mouse and PC keyboard or offline on a PC.

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.

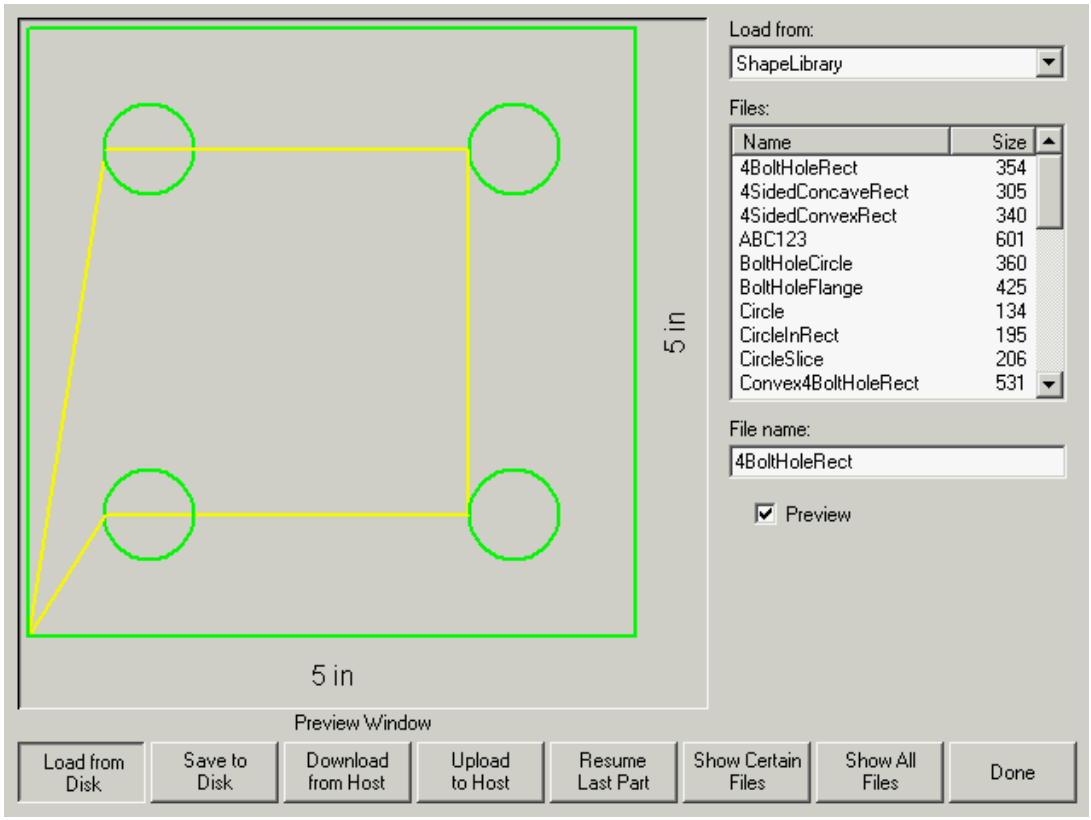
Example:



# Section 5: Files

## Load from Disk

The following screen is used to load a part from a diskette 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 or from a directory on the hard disk. 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.

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

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

**Load to**
The Load to list selects whether you load to the current part or to a directory on the hard disk. 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.

**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.

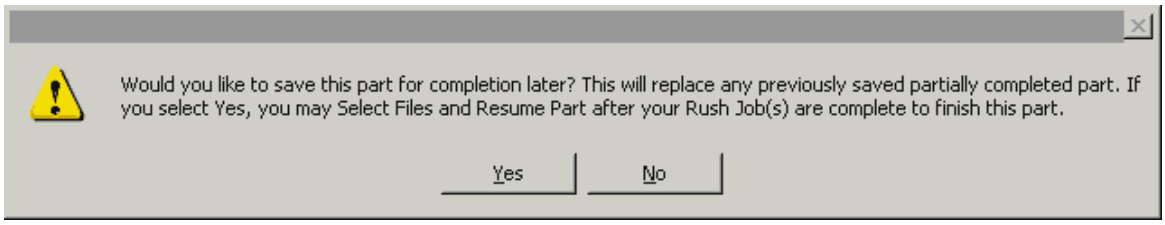
**Resume Last Part**
The Resume Last Part softkey will be visible when the Rush Job Interrupt or Automated Power Loss Recovery feature is in use. These features allow the user to pause the current part program and retain the part and current position information. This then allows the user to load and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

**Show Certain Files**
This softkey 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. To input the asterisk, 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.



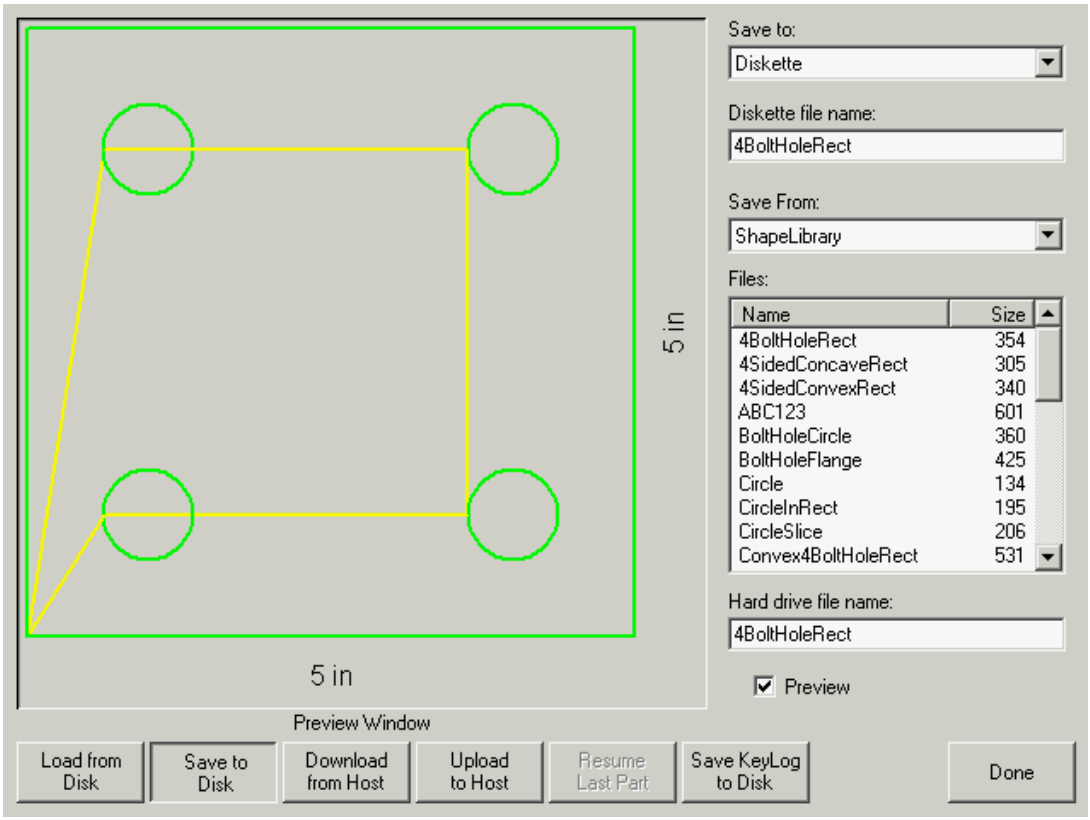

If the user selects YES, the Resume Last Part button will be viewable at the Files Screen. The user can then load and execute another part program and then return to the original part using the Resume Last Part softkey. The part program and position will be resumed.

**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 or the hard drive. Once all the parameters below are set, press ENTER on the keyboard to save the part.




**Save to**
The Save to list selects whether you save to the diskette or to a directory on the hard disk. 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 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 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 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 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 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

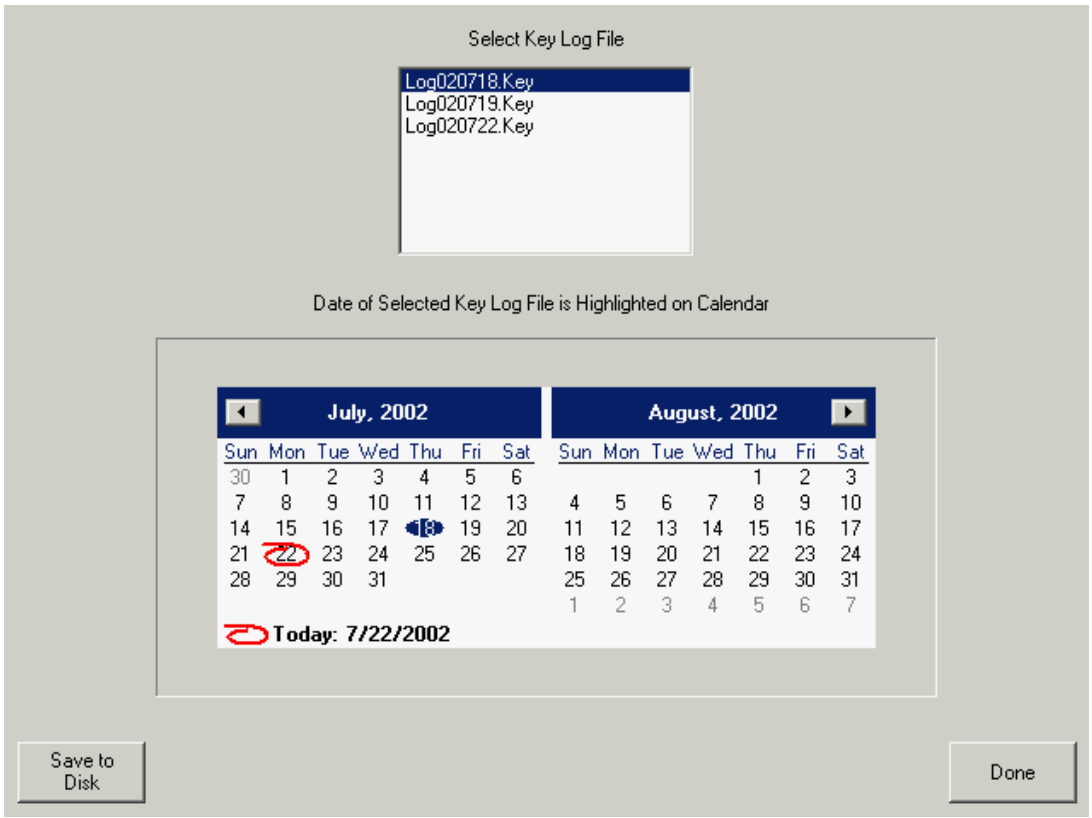
files. **Note:** This selection and Multiple file selection are only available if saving to the diskette from the hard drive.

**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 from the hard drive.

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

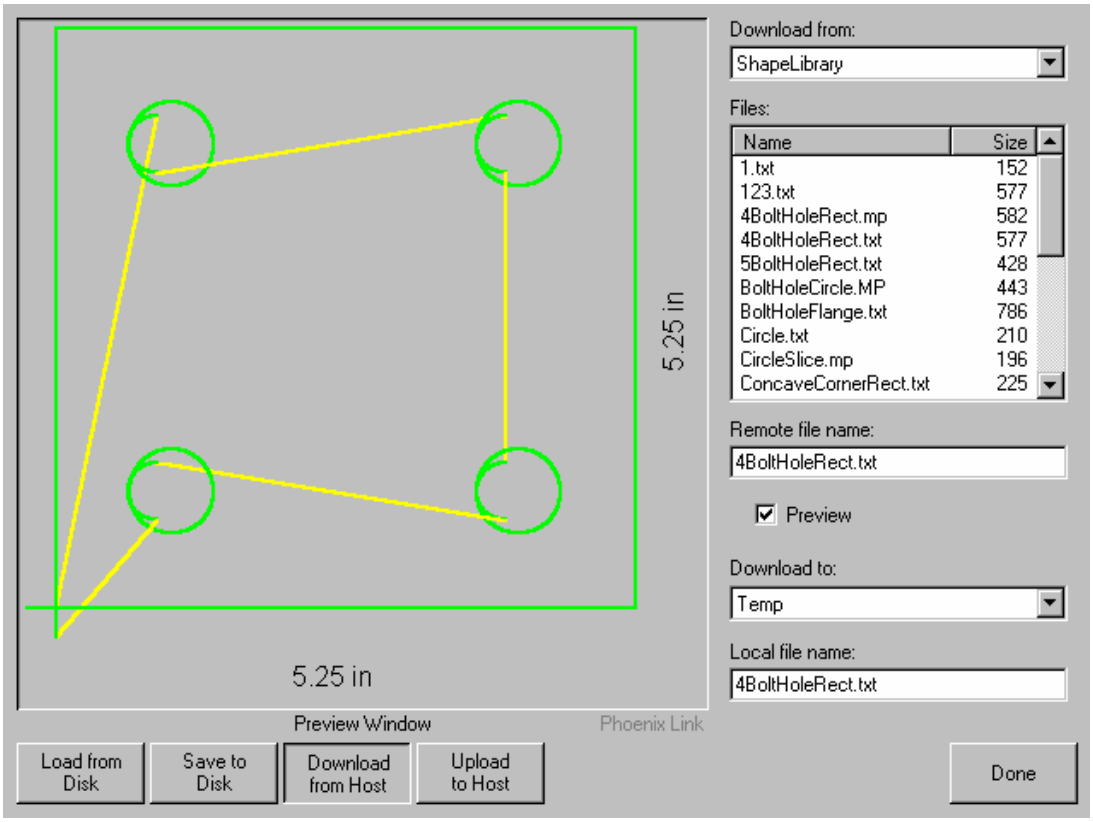
**Save KeyLog to Disk**
This feature is enabled when the Key Logging feature has been selected in setups.

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 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.

**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. 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.

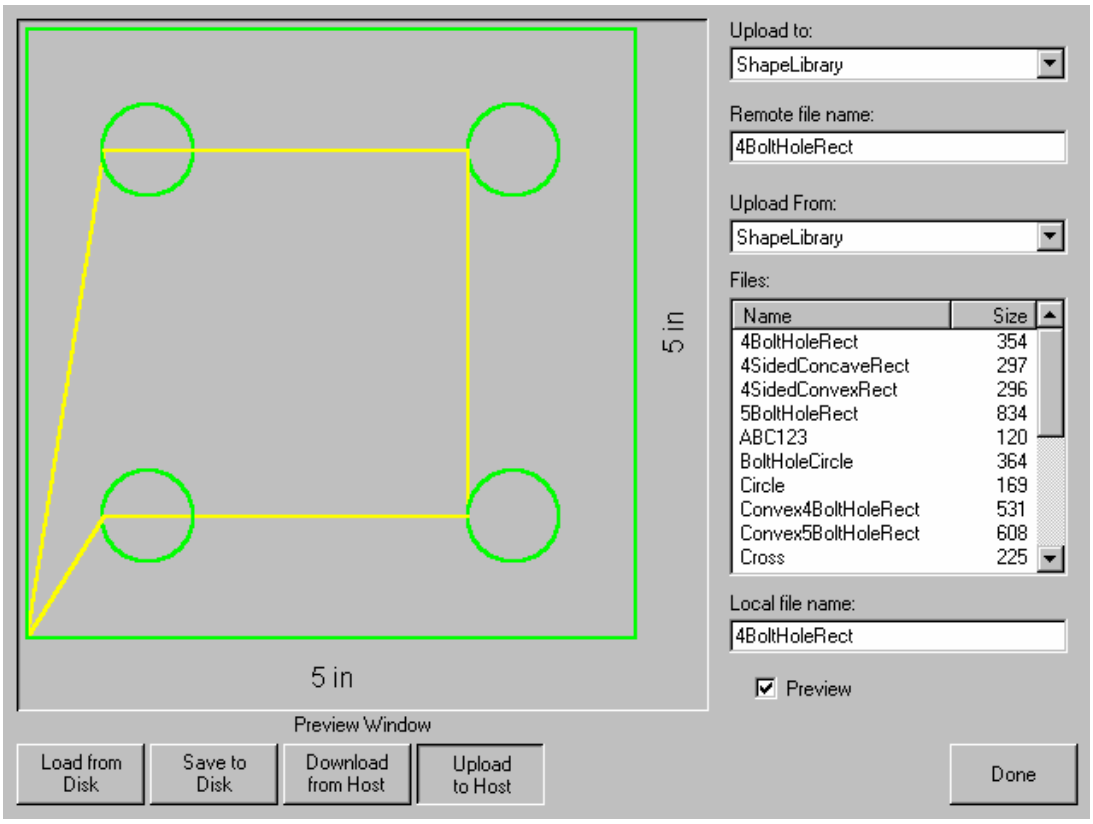
**Preview**
When checked, the Preview checkbox allows the file that is selected in the Files list box to be previewed. To check or uncheck the box, press the SPACE key on the keyboard when the Preview box has the focus.

**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. 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 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 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.

**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 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.

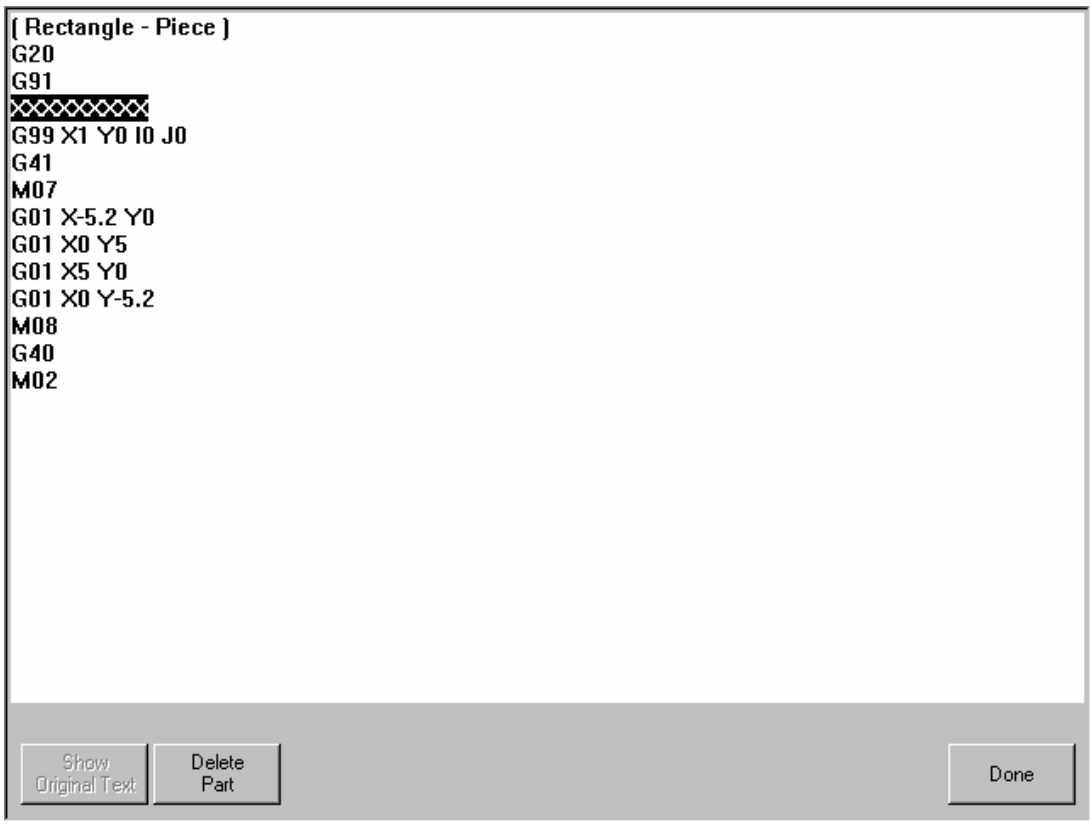
**Local file name**
The Local file name is the name of the local file that will be uploaded to the host computer.

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

## 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 bar.

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.

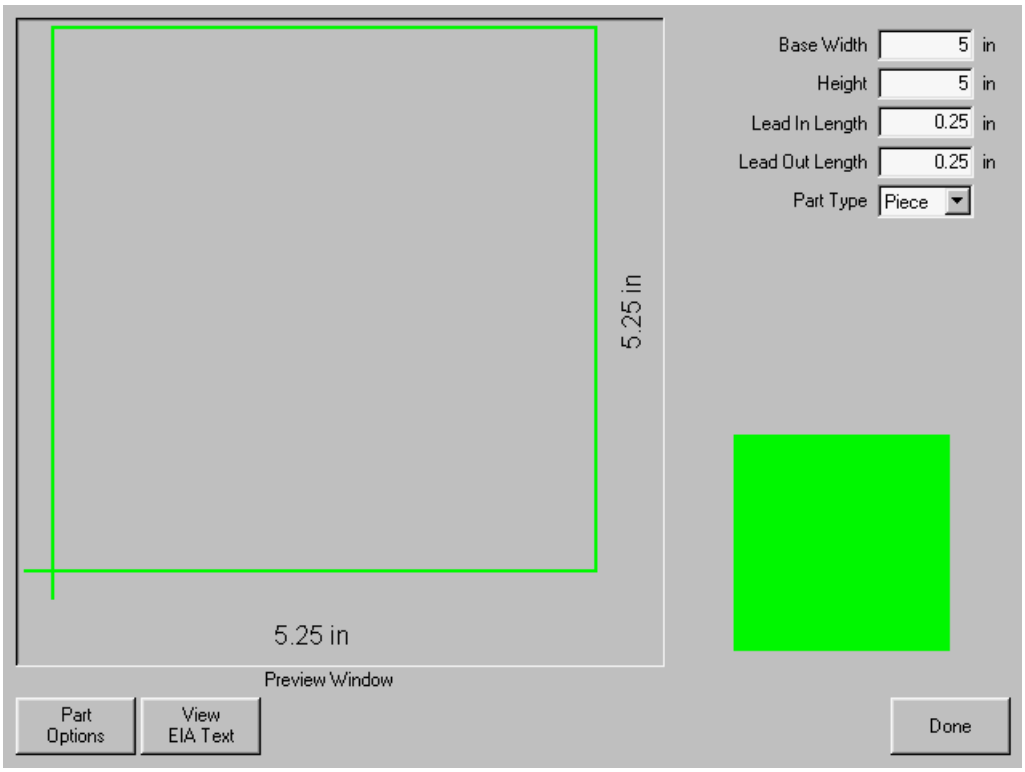
In some cases it is desirable to have an underburn length. For these conditions, simply enter a negative number for the Overburn length.

**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.

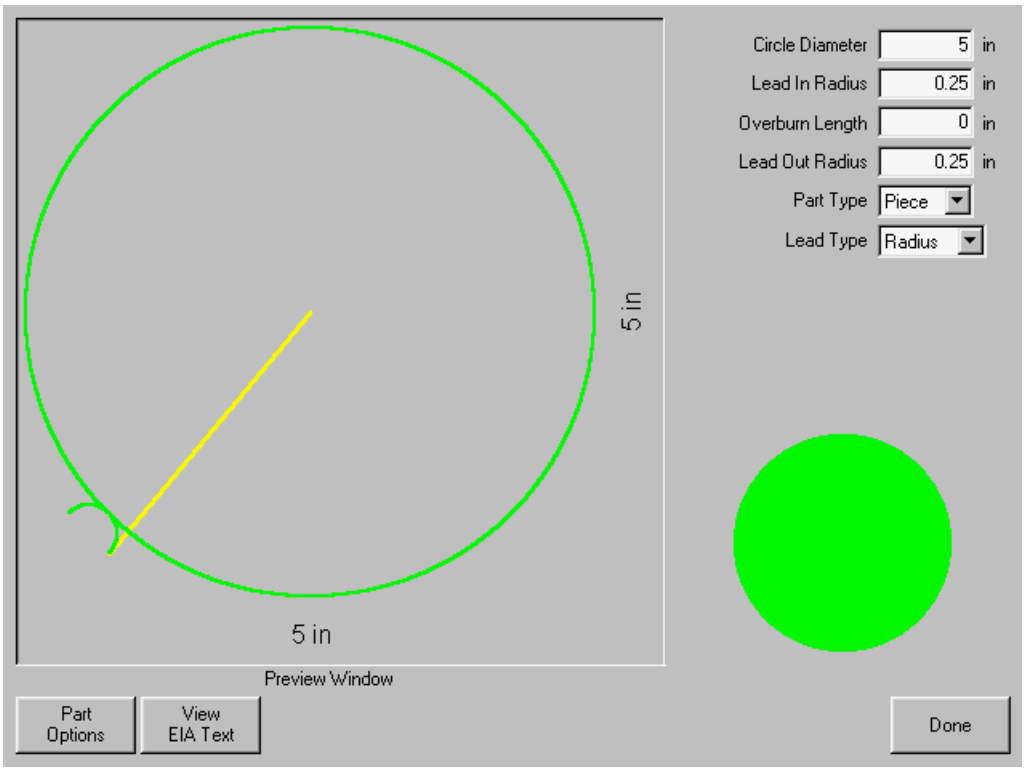
**Lead Type**
Depending on the shape selected, the style of the Lead in/ Lead out may be selected as Radius, Lock or Straight line. The Lock style Lead-in creates greater stability for the part and is only available if the Part Type is set to Piece. Lead-in selection is only available if the Part Type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

After the shape has been entered, press DONE to return to the Main Menu.

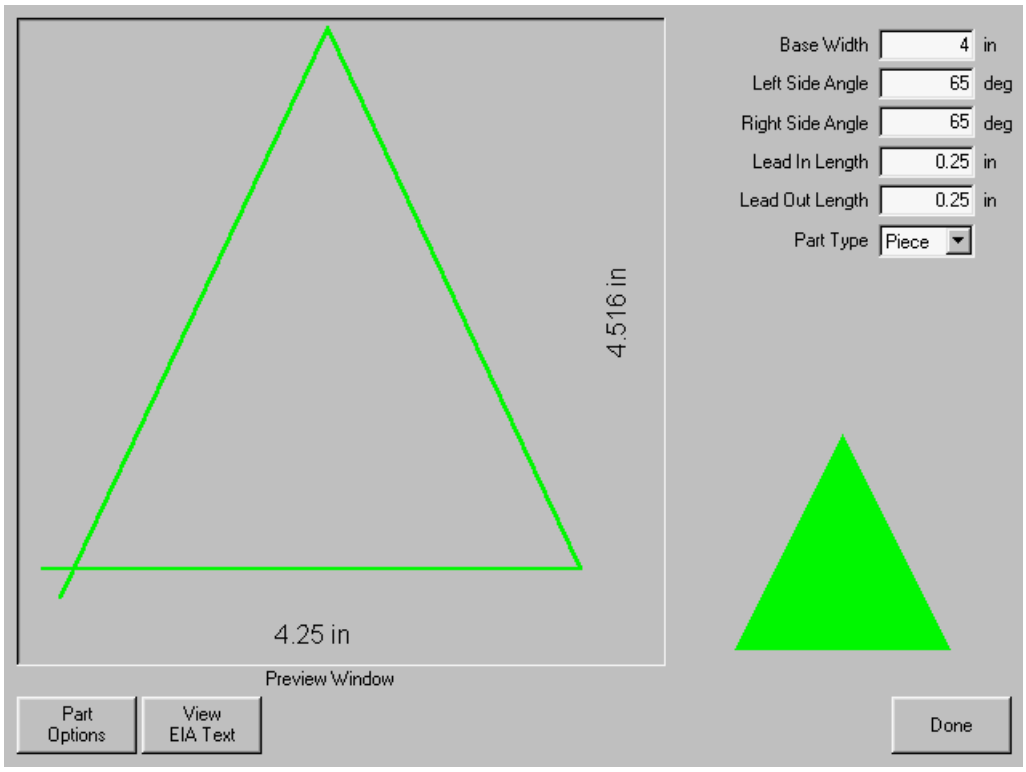
## Rectangle



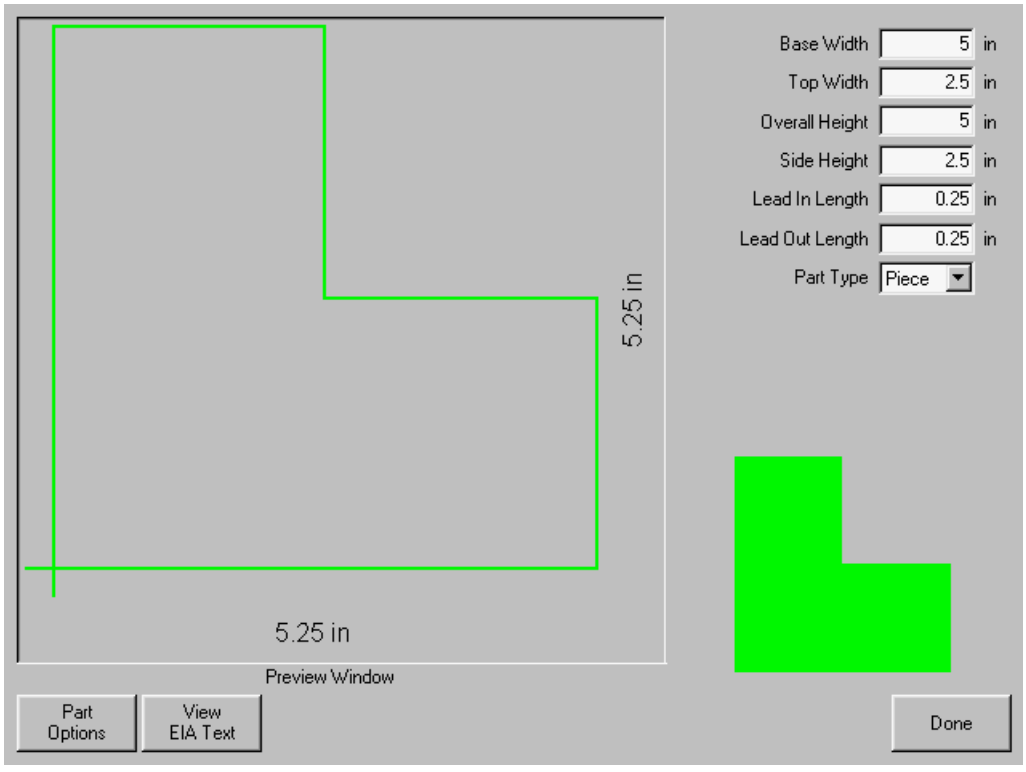

## Circle



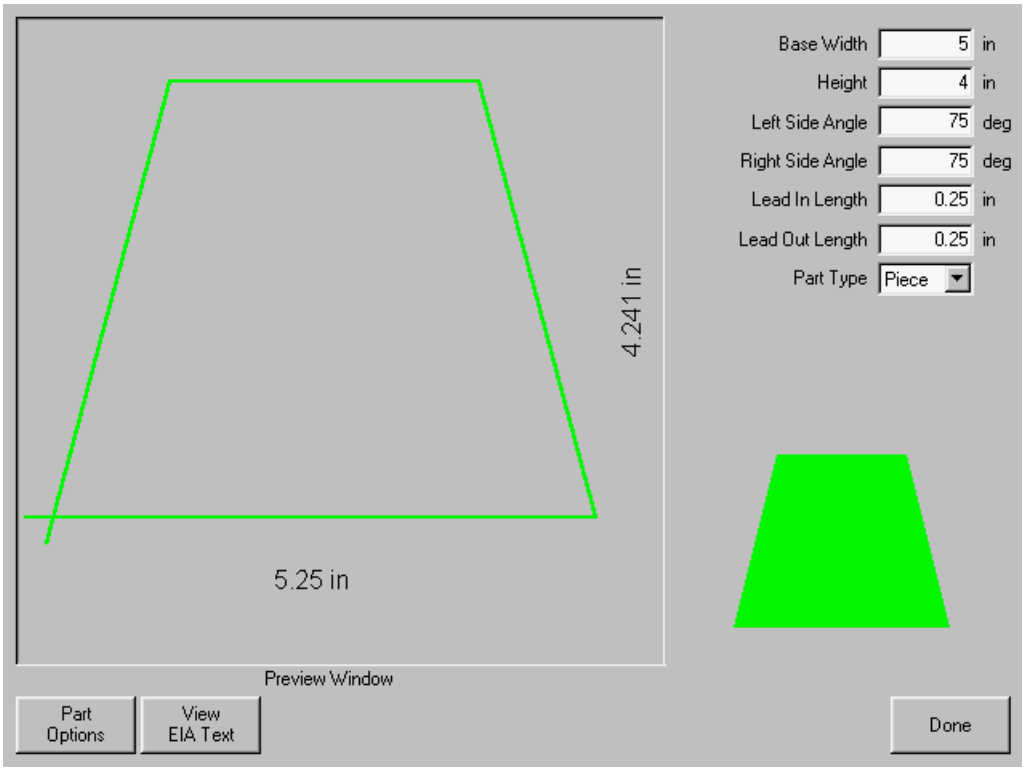
## Triangle



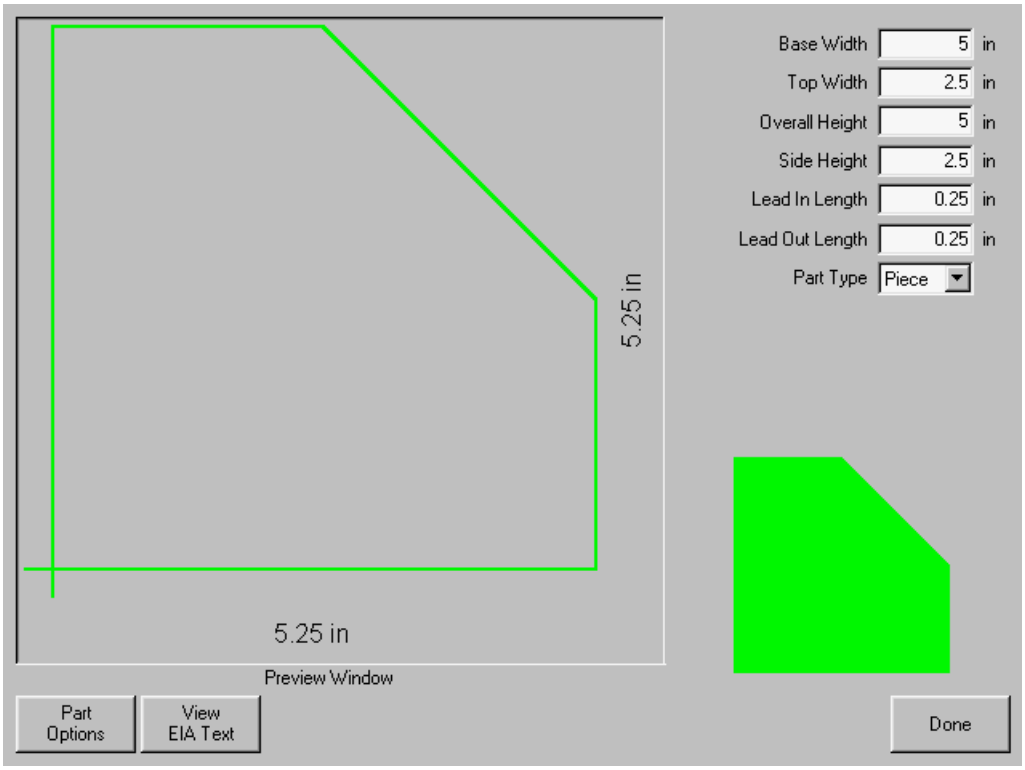

## L-Bracket



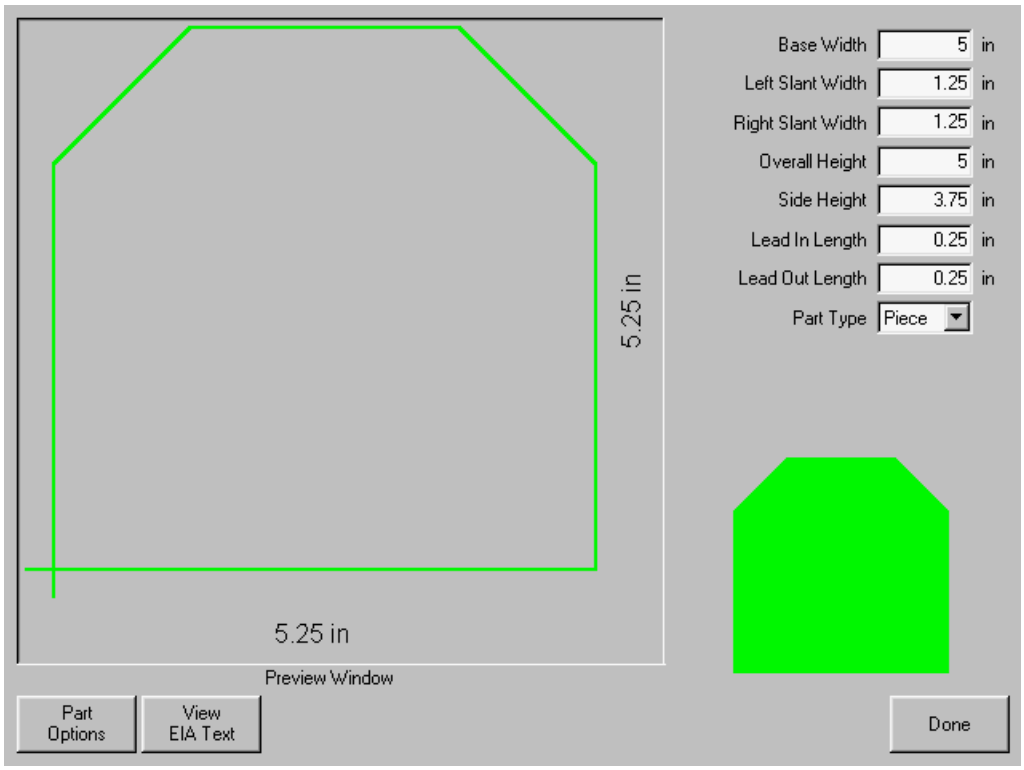
## Trapezoid



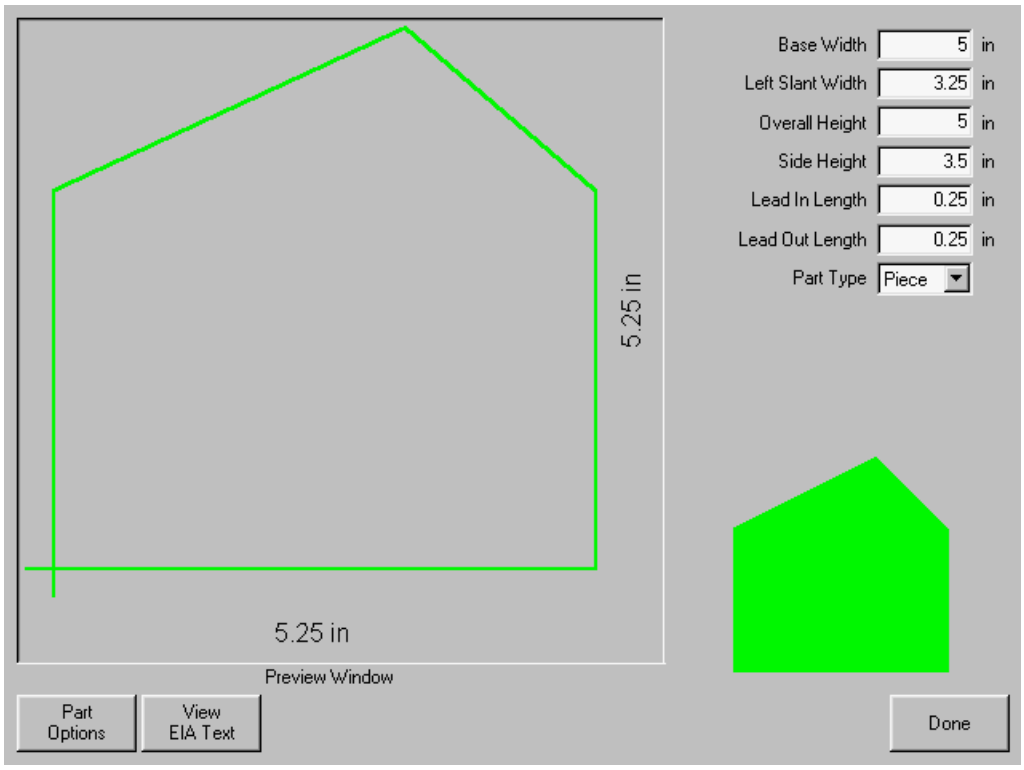

## Slant Rectangle



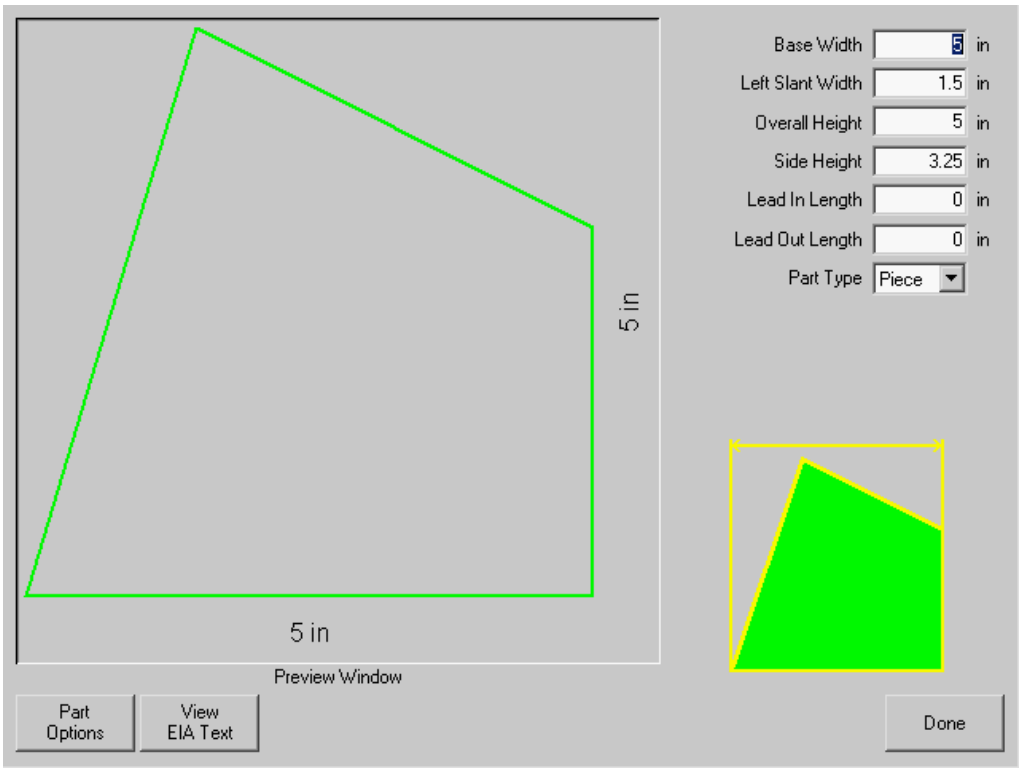
## Gambrel Rectangle



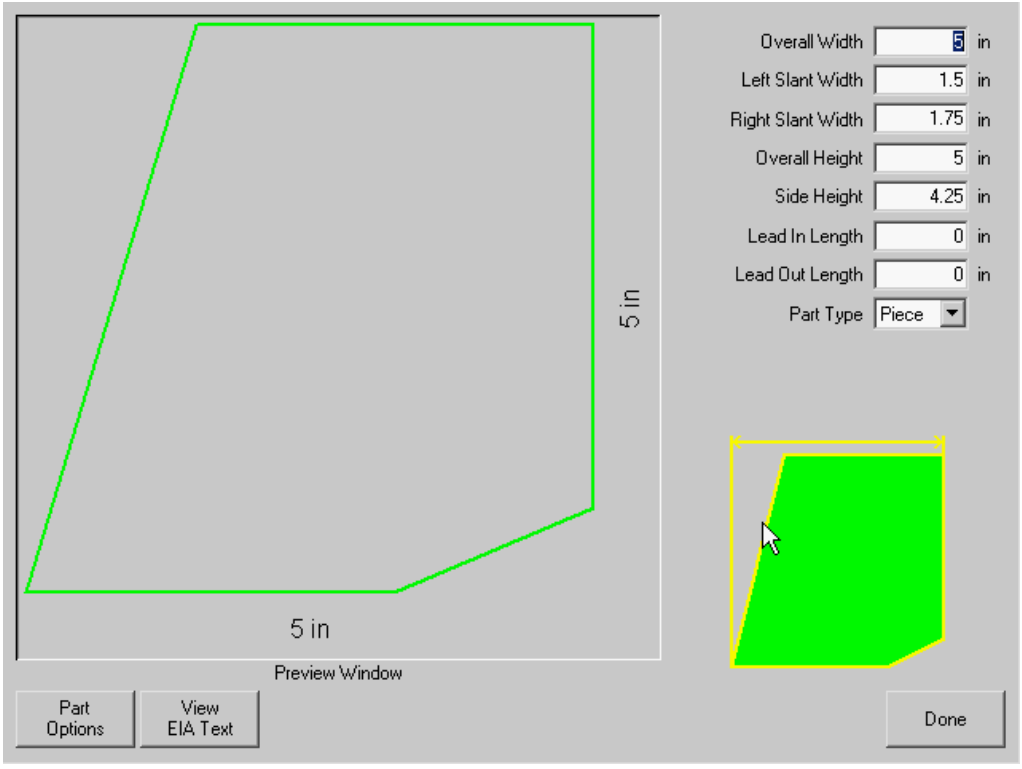

## Roofed Rectangle



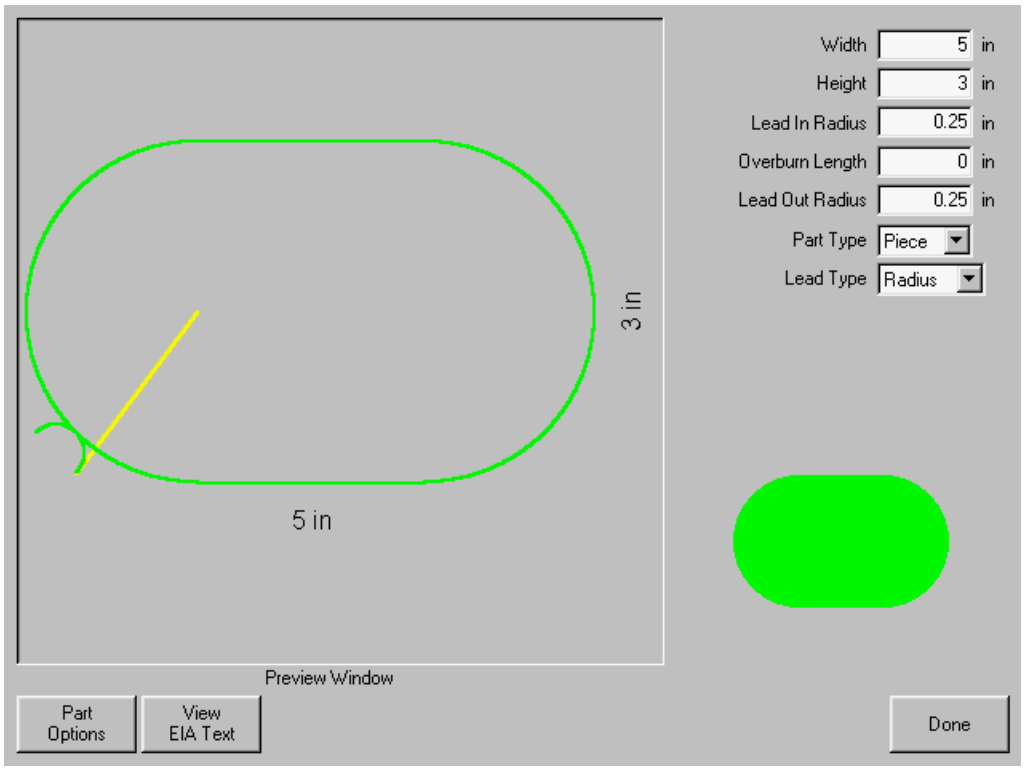
## 4 Sided Polygon



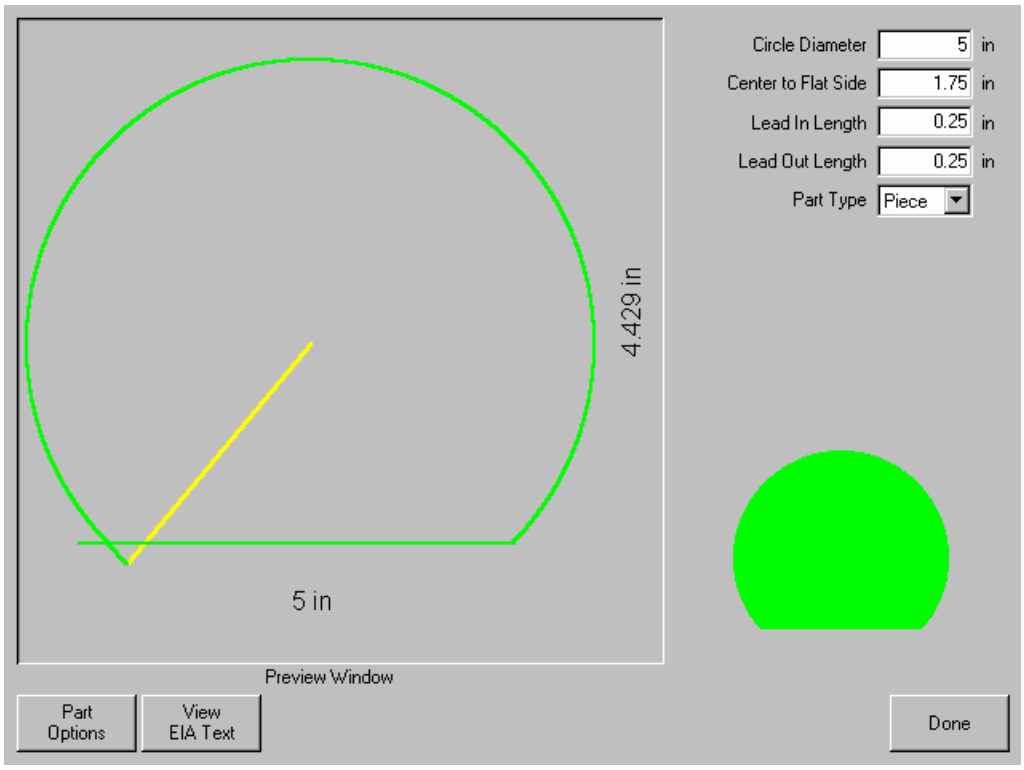

## 5 Sided Polygon



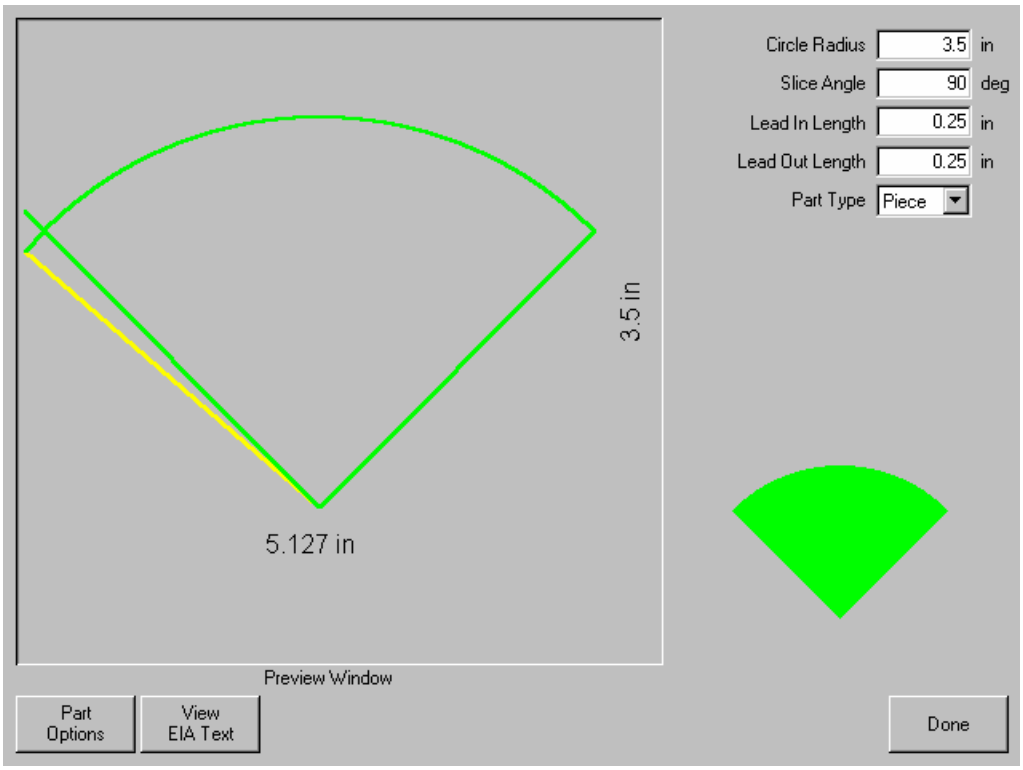
## Oval



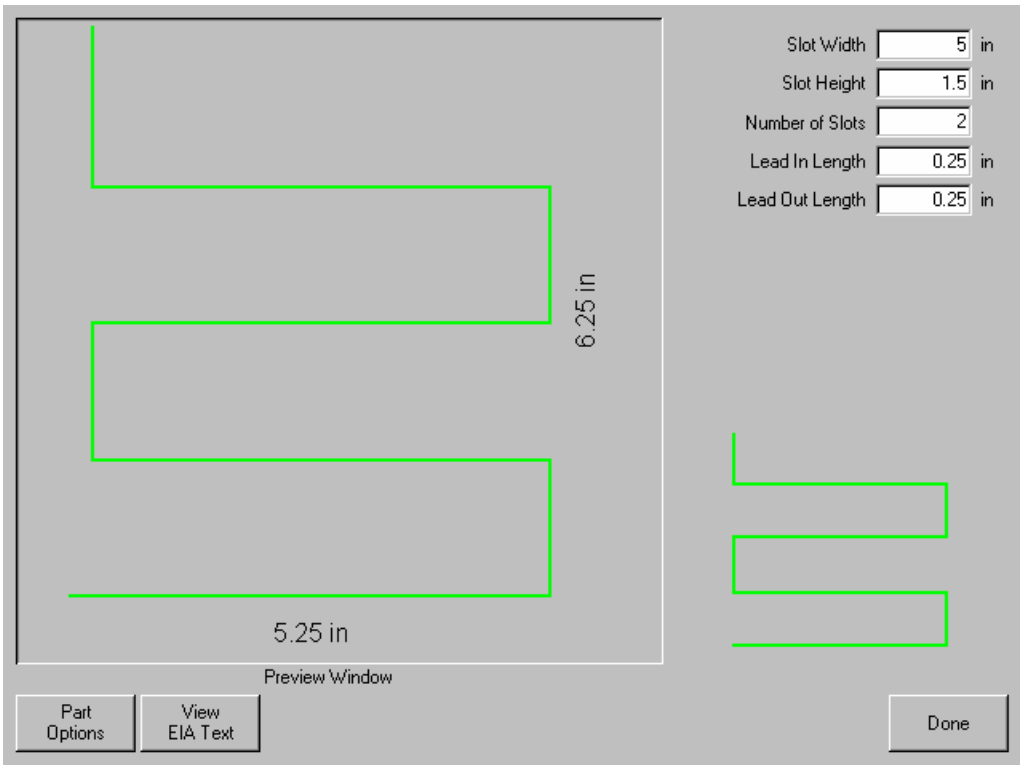

## Circle w/ Flat Side



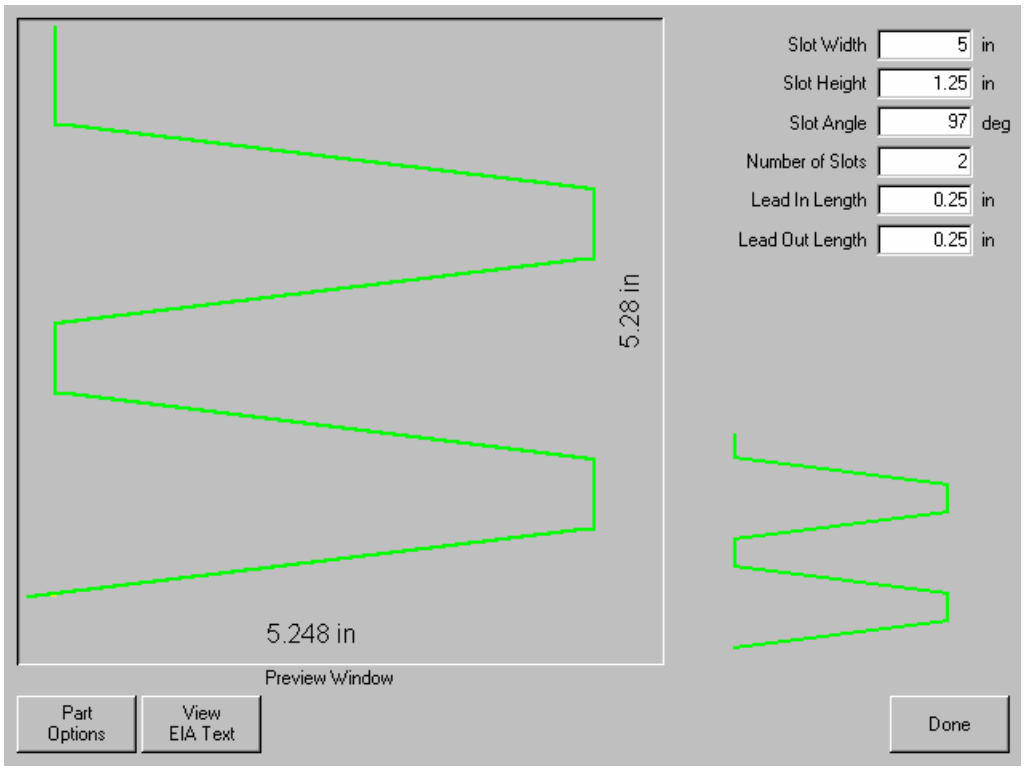
## Circle Slice



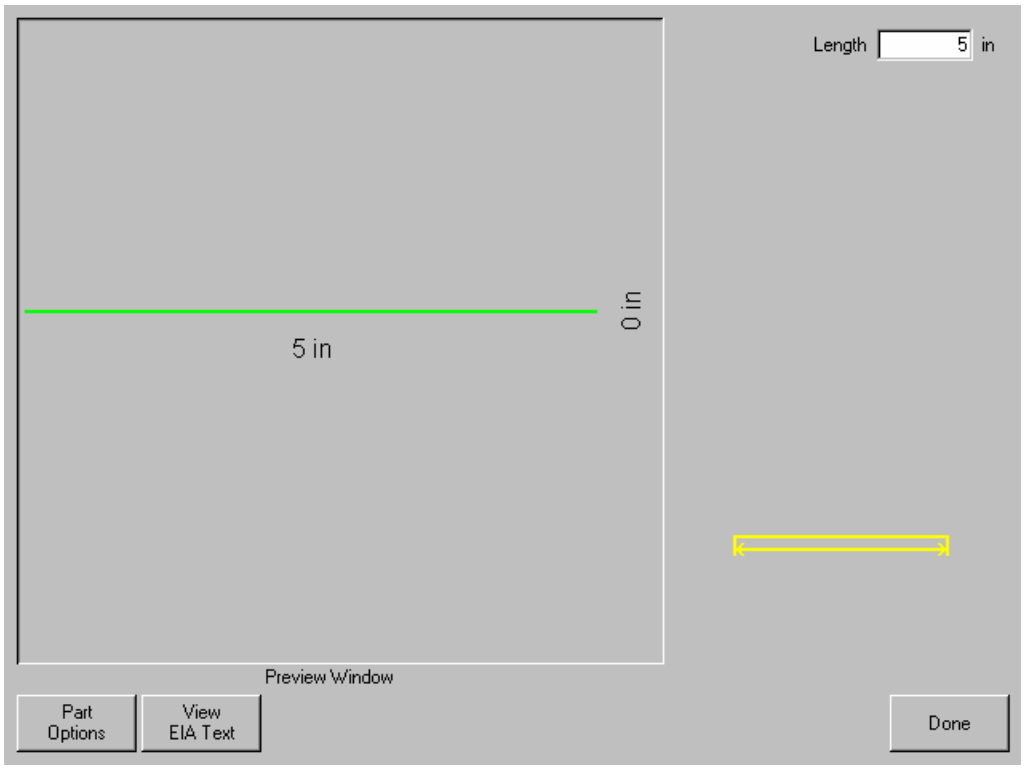

## Straight Slots



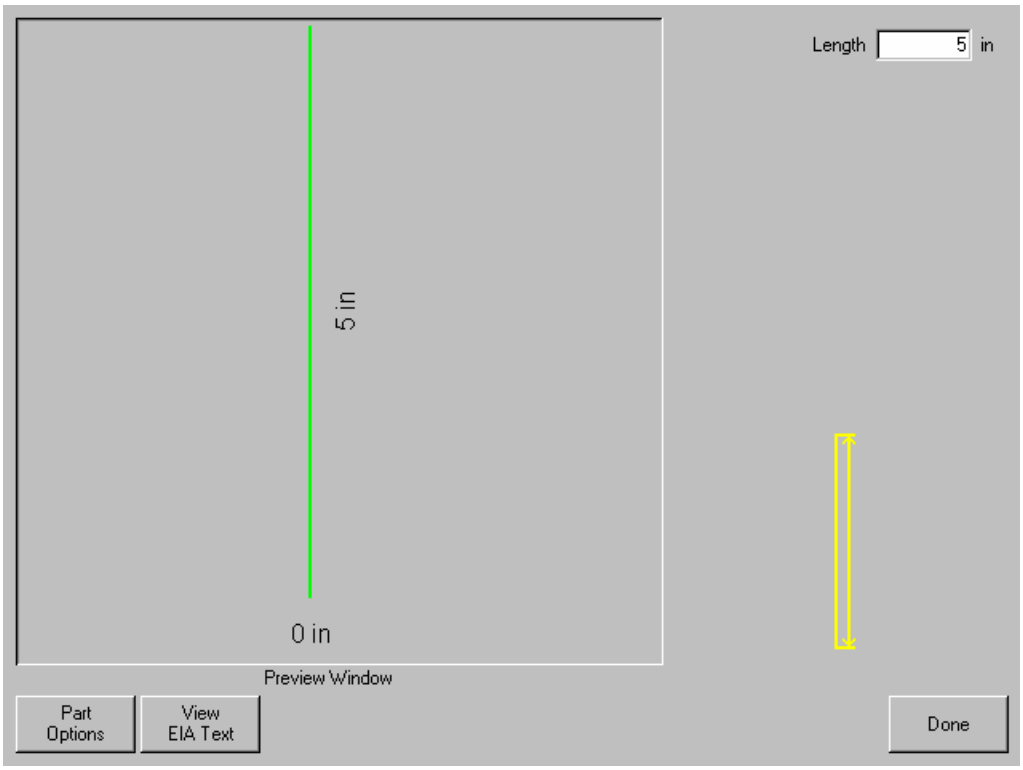
## Angled Slots



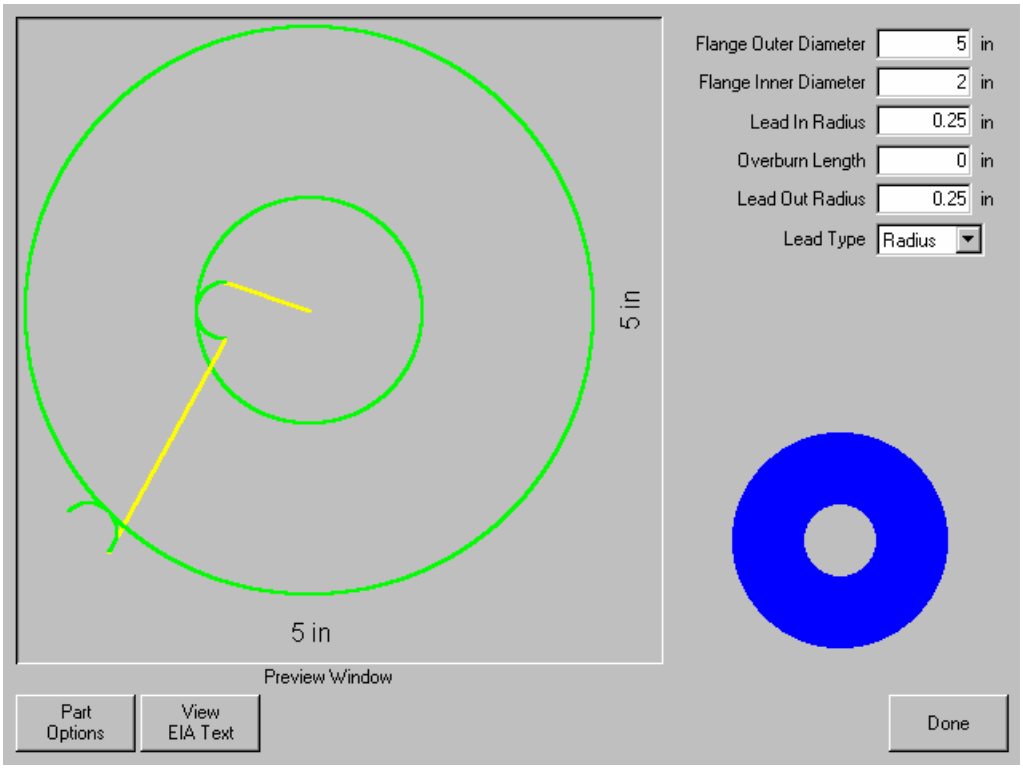

## Horizontal Rip



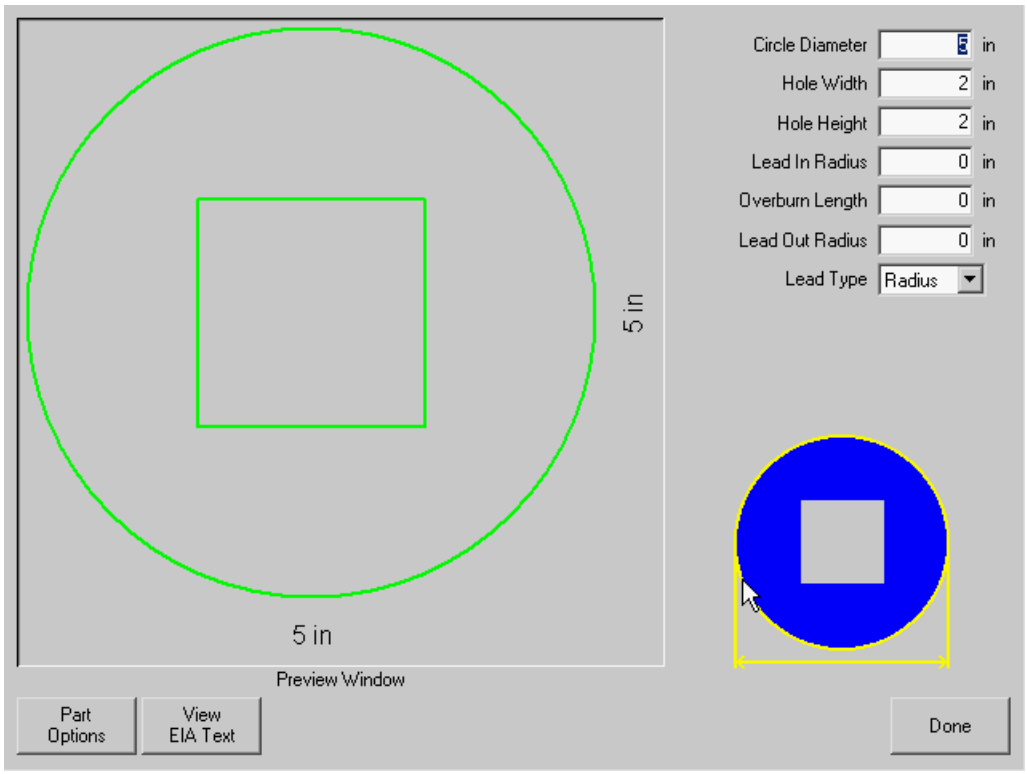
## Vertical Rip



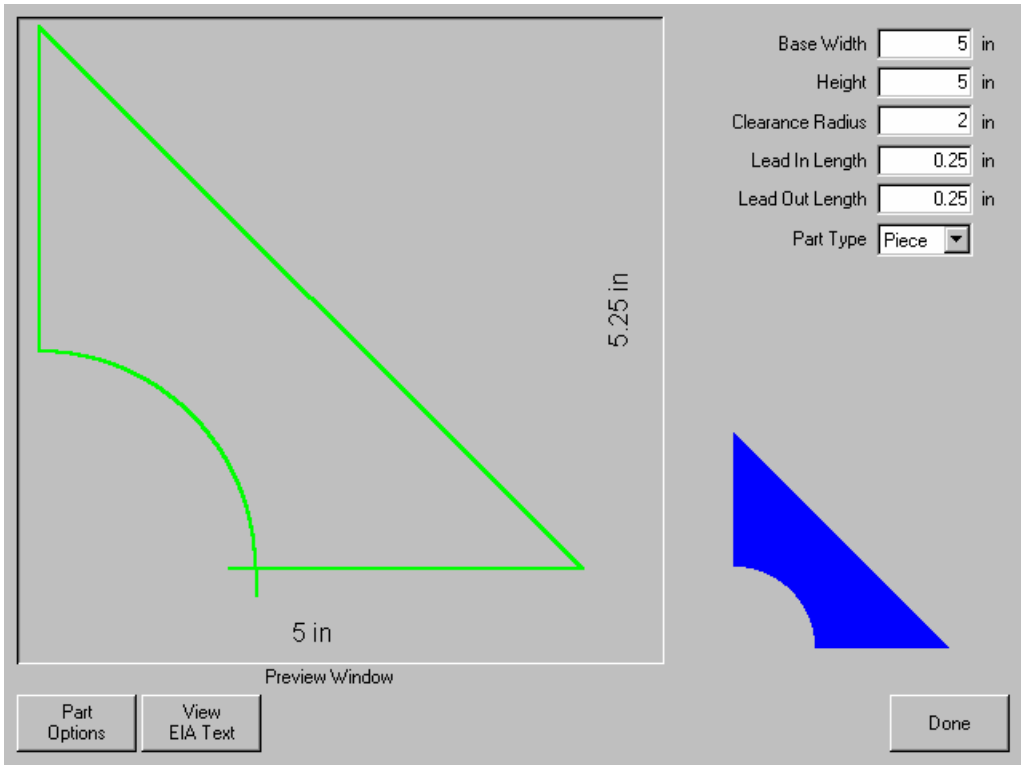

## Flange



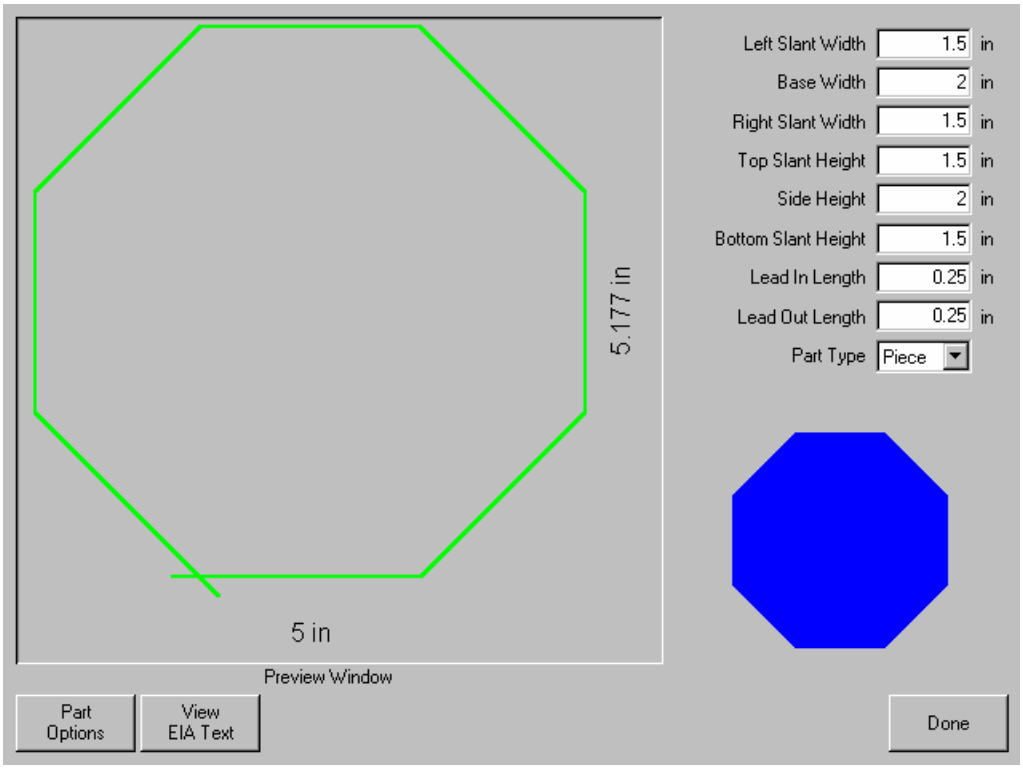
## Circle w/ Rectangular Hole



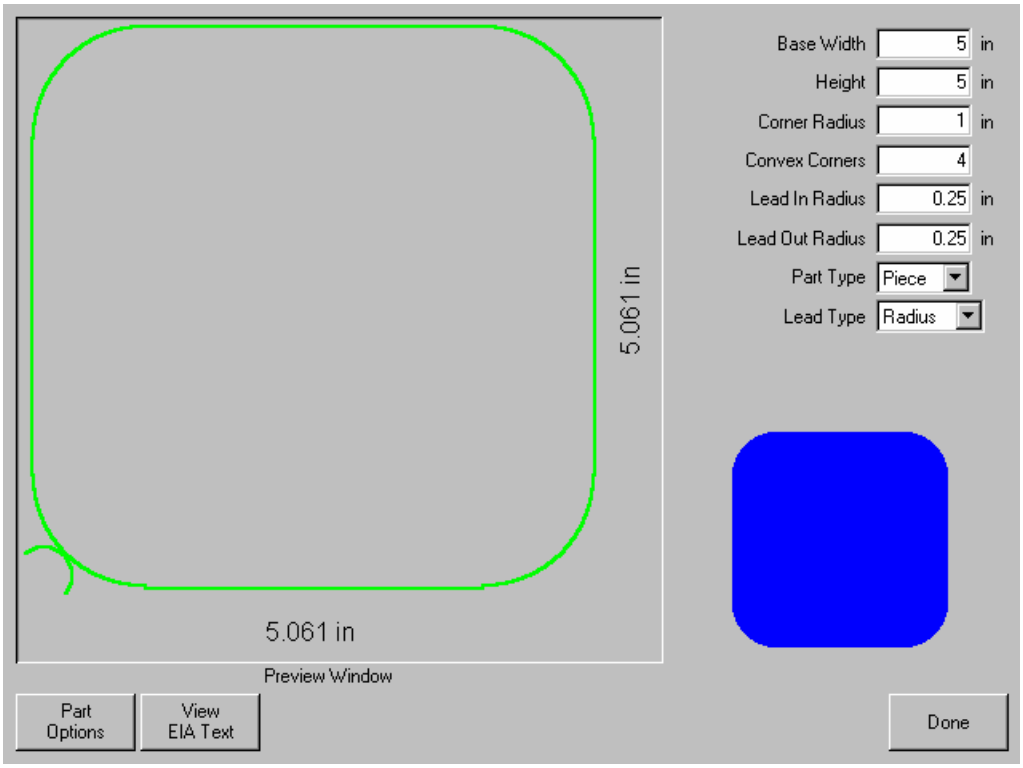

## Gusset



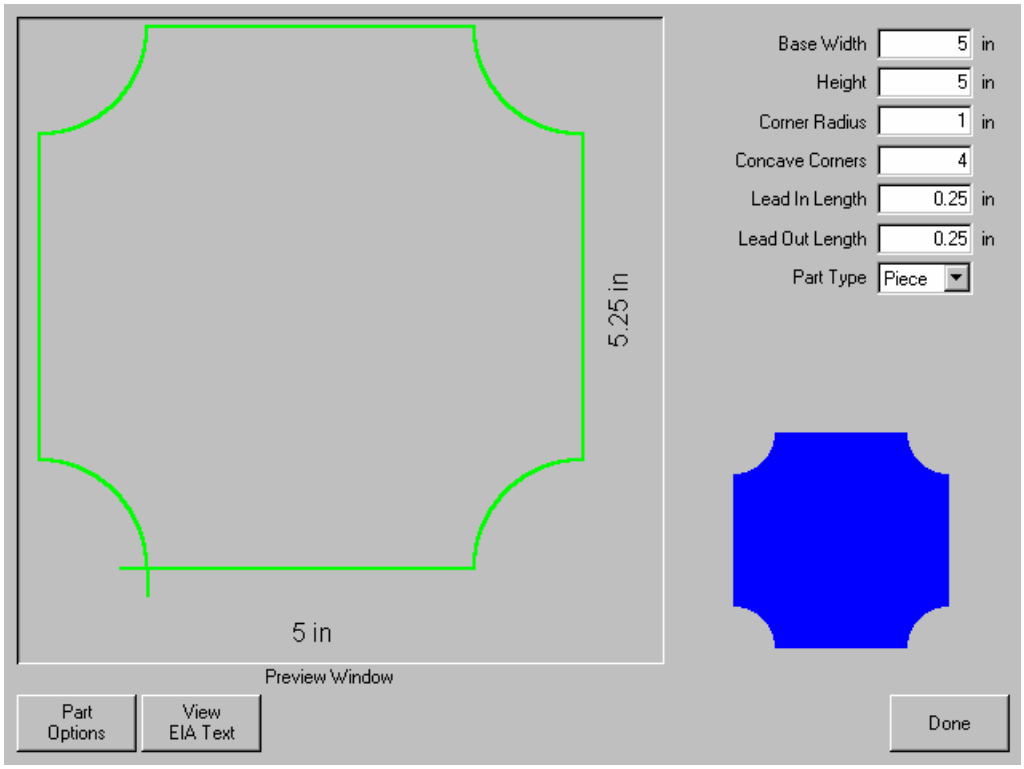
## 8 Sided



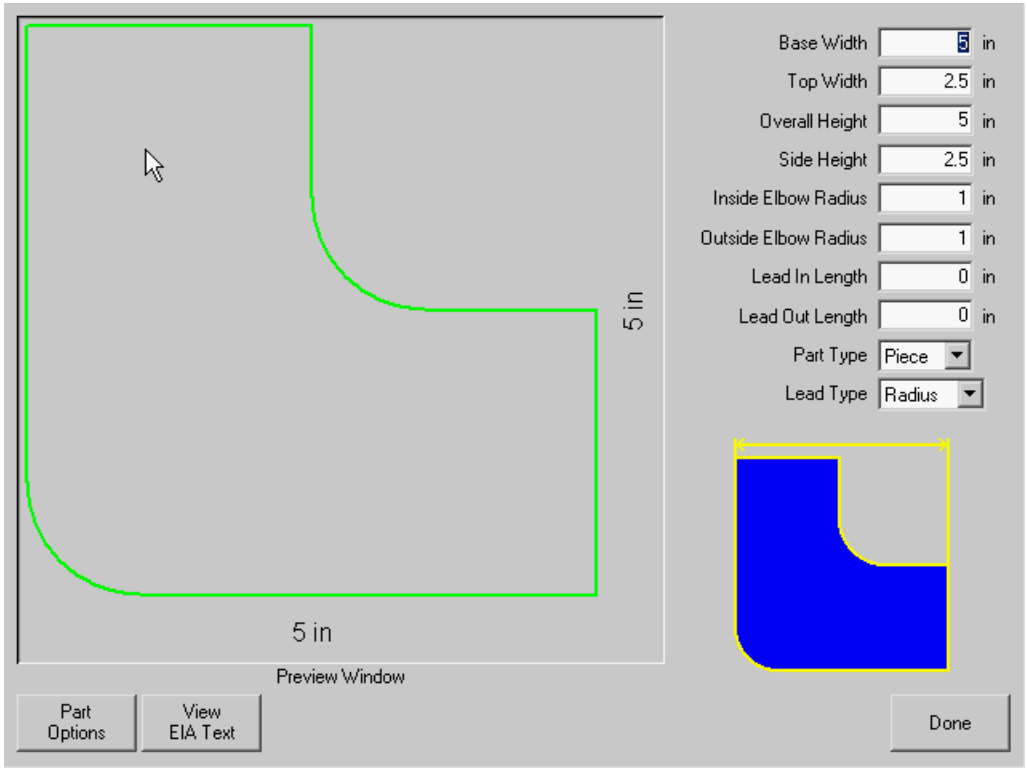

## Rectangle w/ Convex Corners



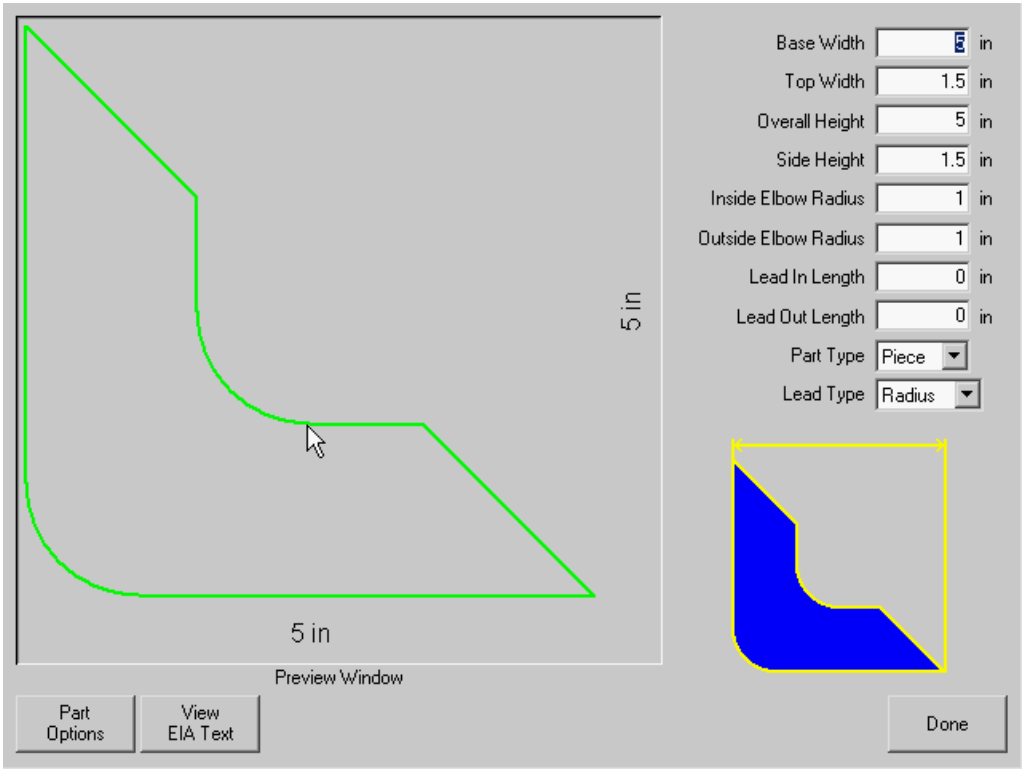
## Rectangle w/ Concave Corners



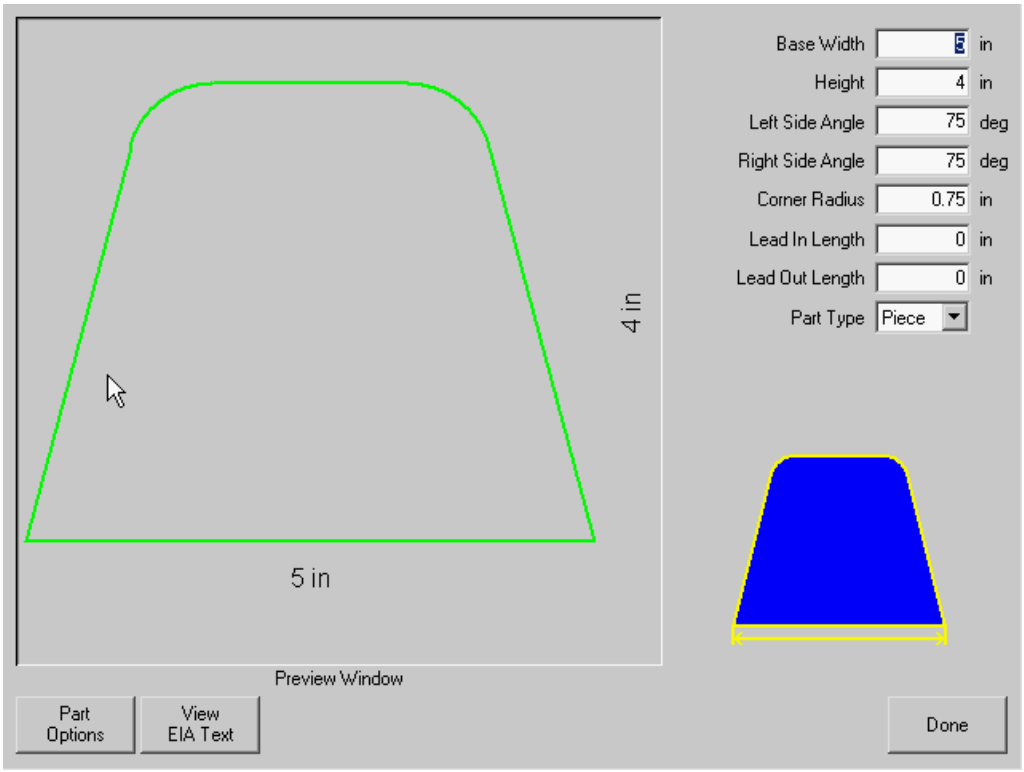

## L-Bracket w/ Elbow Radii



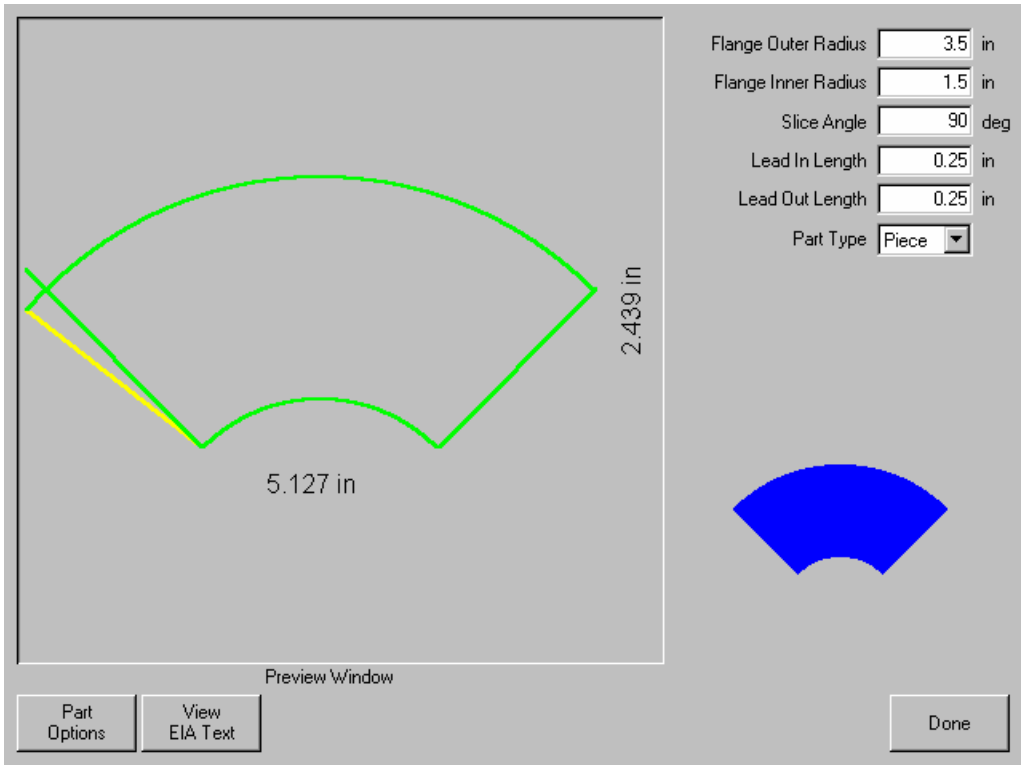
## Slant L-Bracket w/ Elbow Radii



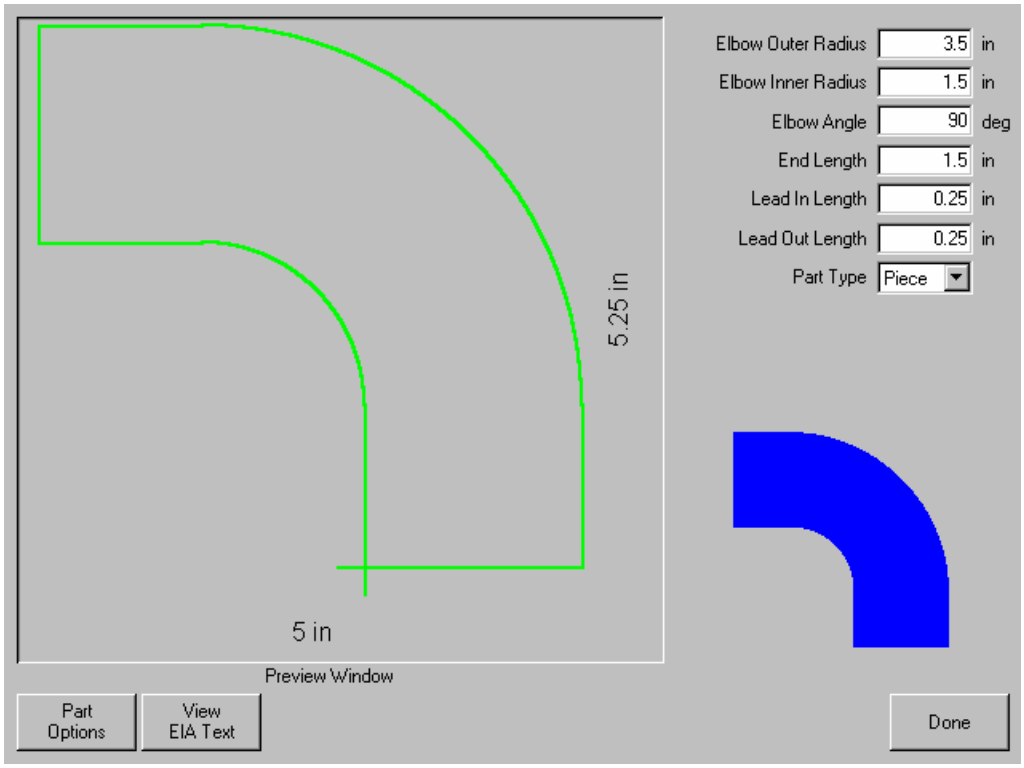

## Trapezoid w/ Convex Corners



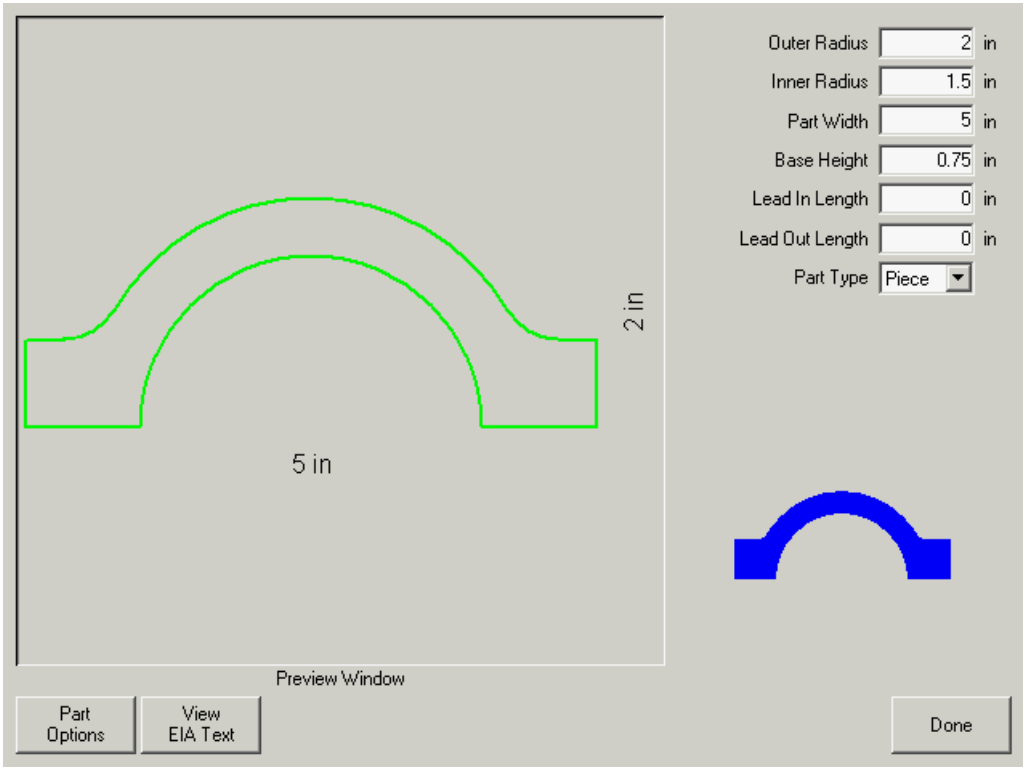
## Flange Slice



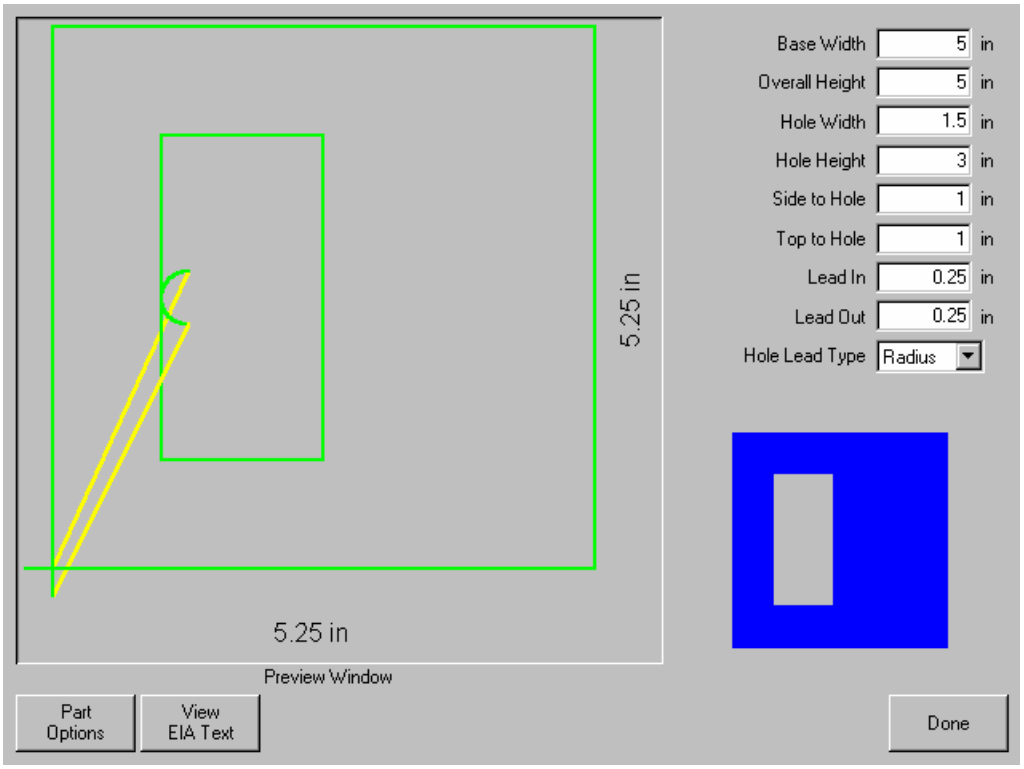

## Elbow



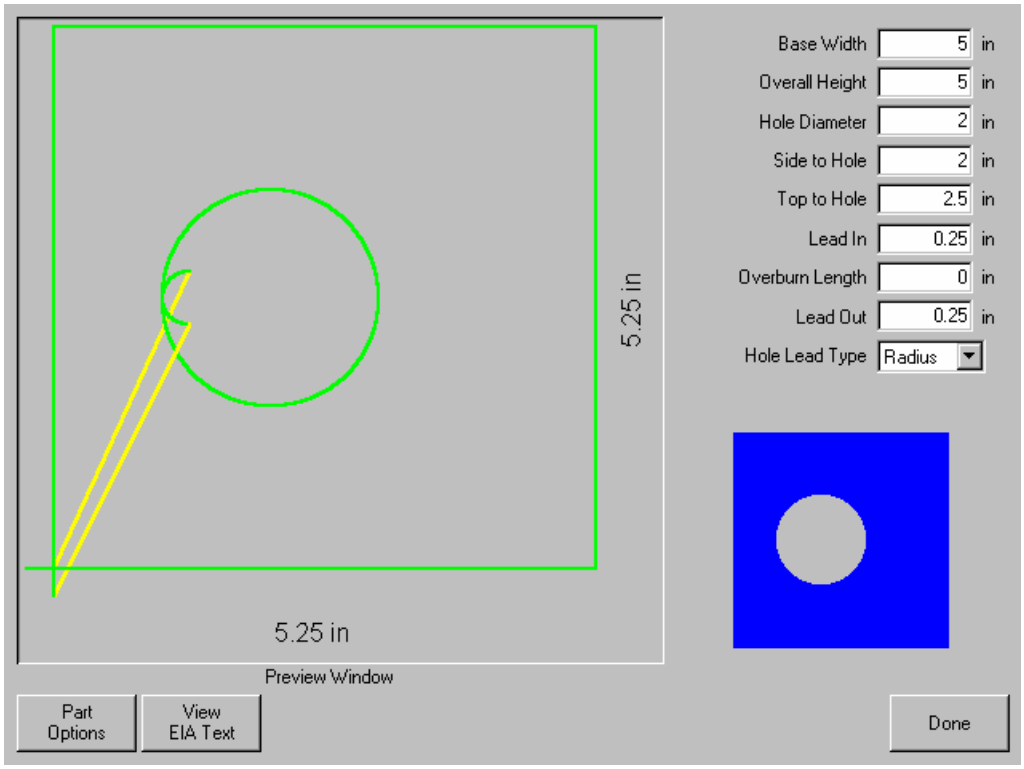
## Flange Repair Ring



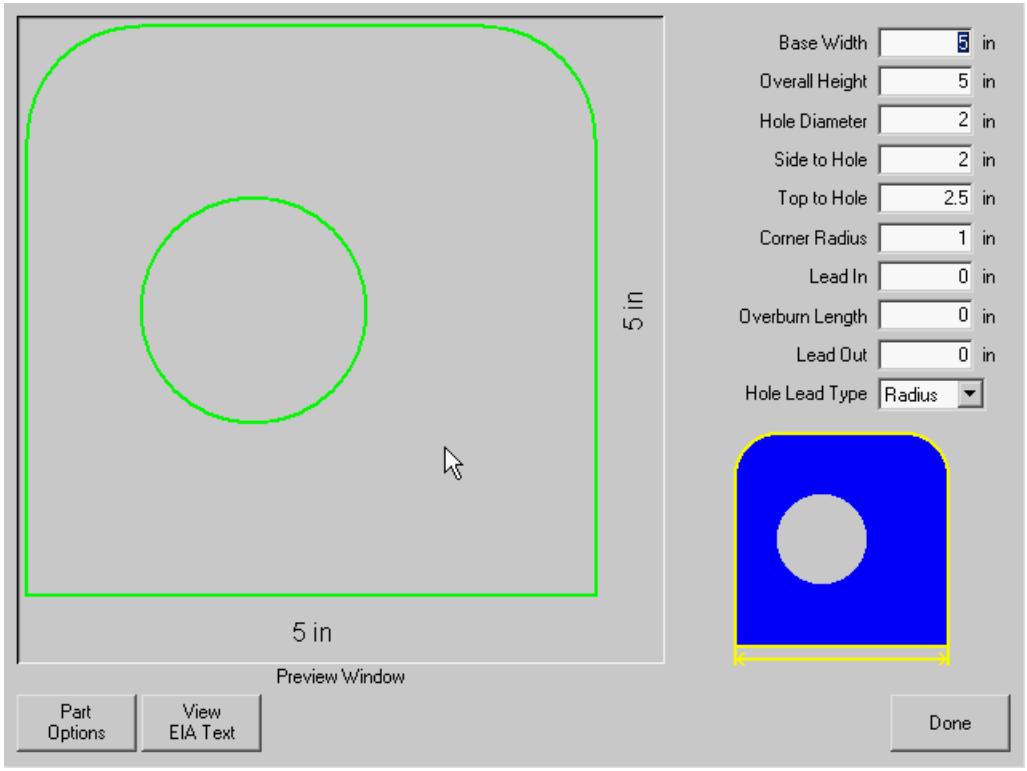

## Rectangle w/ Rectangular Hole



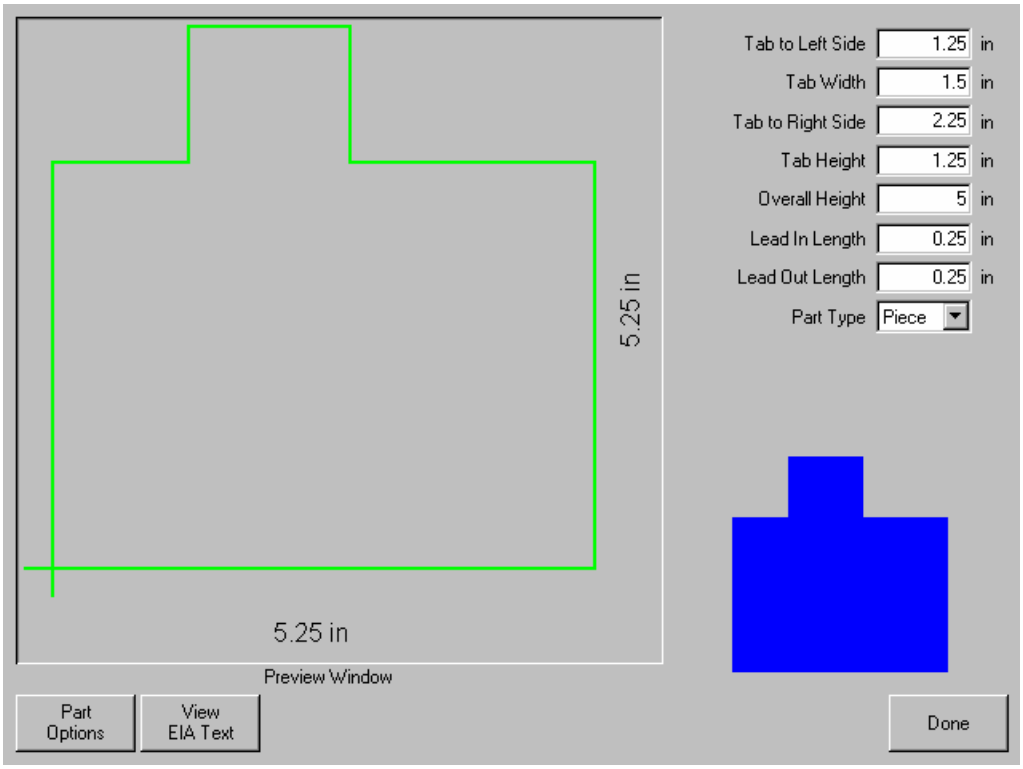
## Rectangle w/ Circular Hole



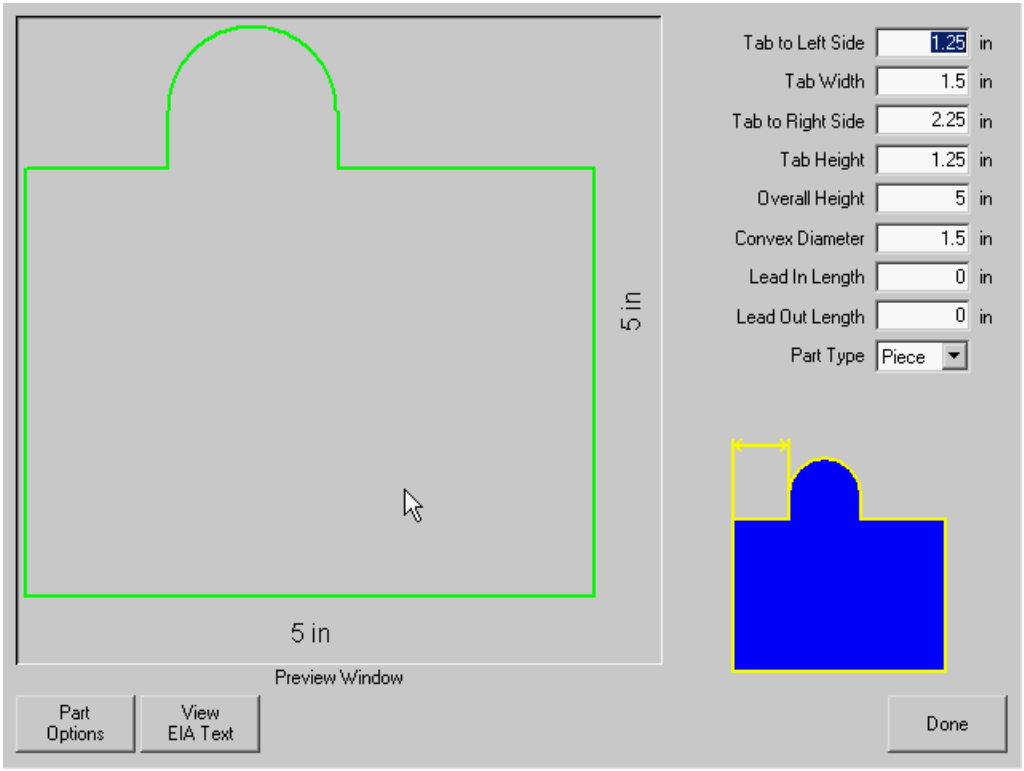

## Rectangle w/ Circular Hole and Convex Corners



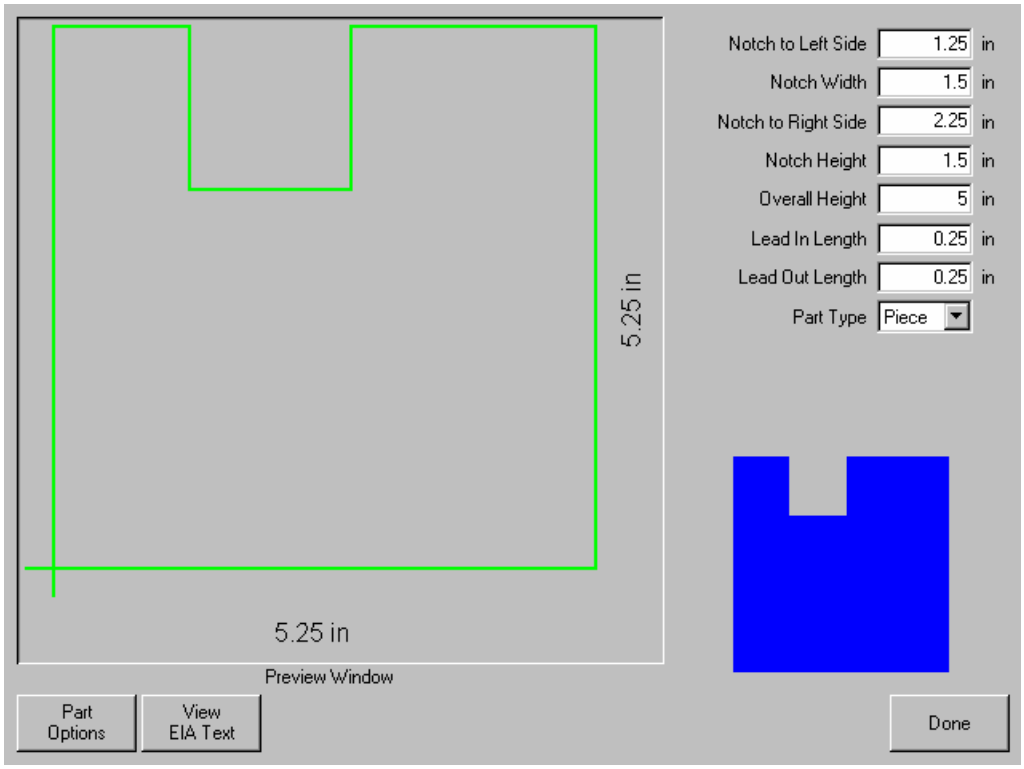
## Rectangle w/ Tab



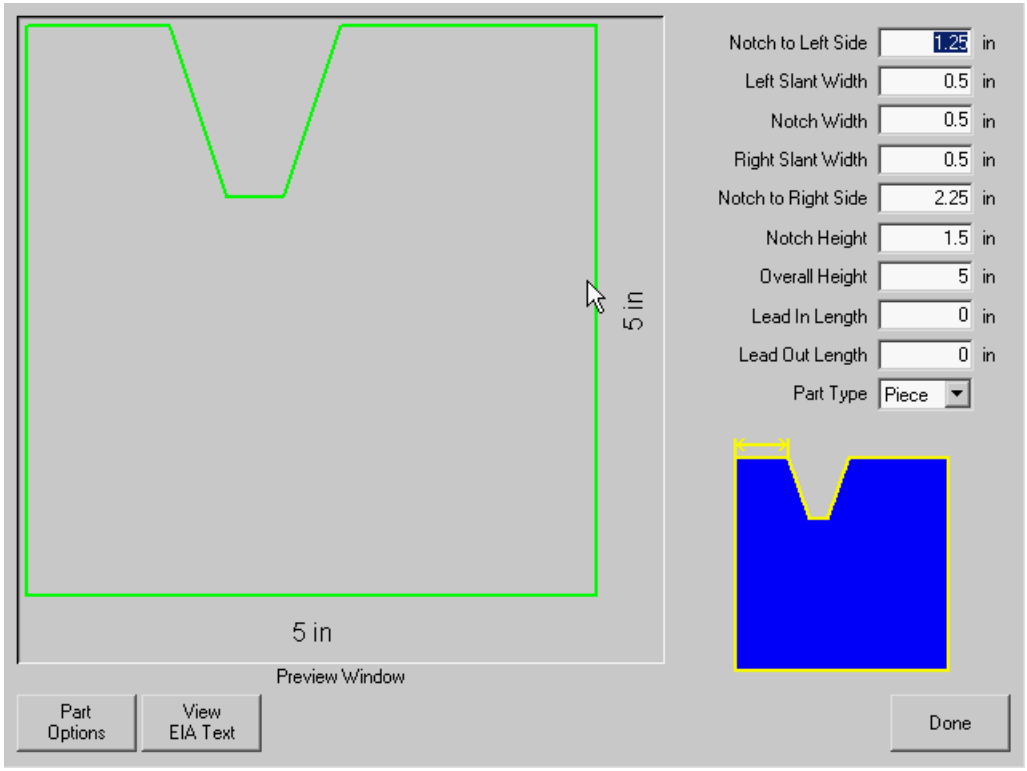

## Rectangle w/ Convex Tab



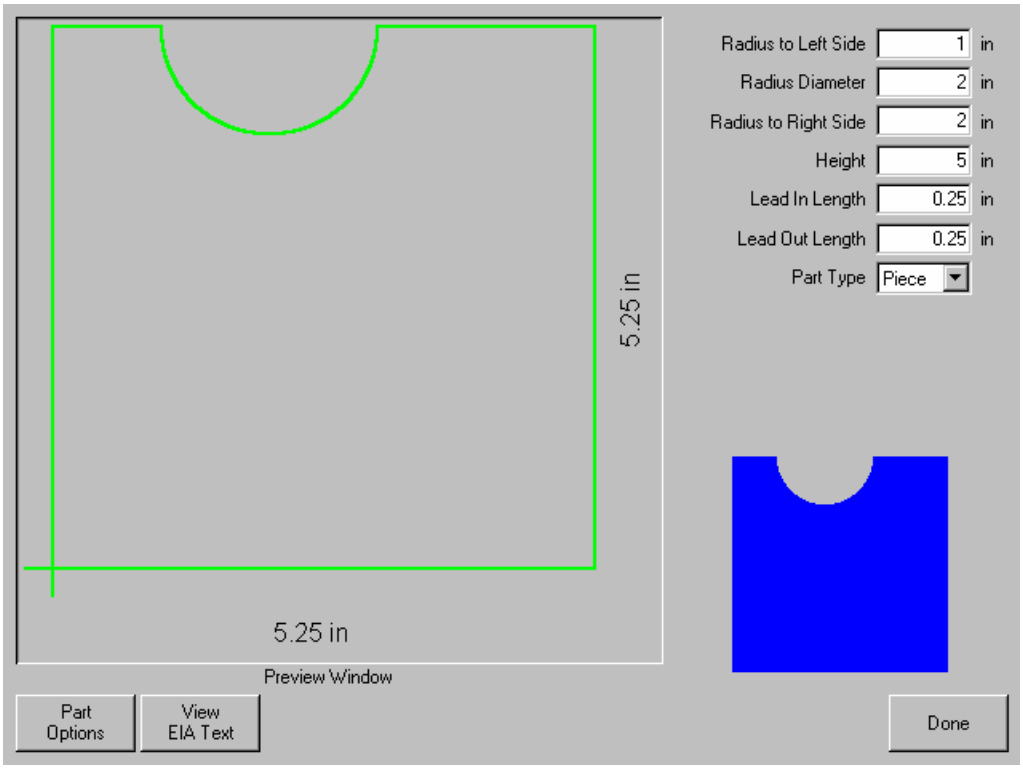
## Rectangle w/ Notch



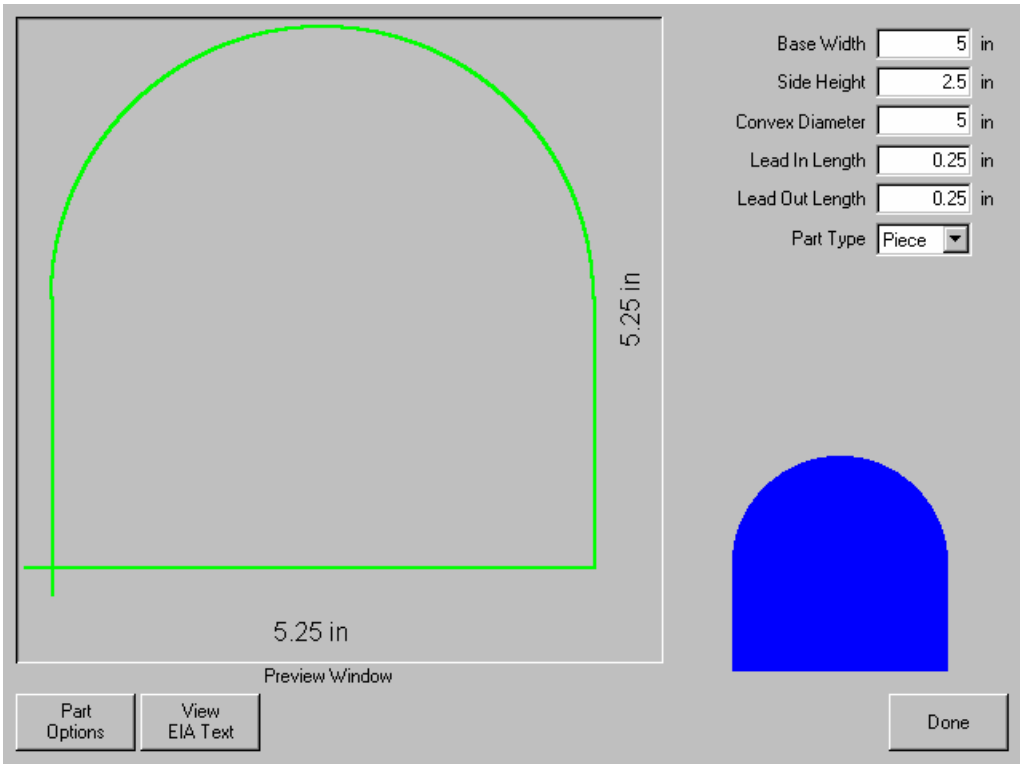

## Rectangle w/ Slant Notch



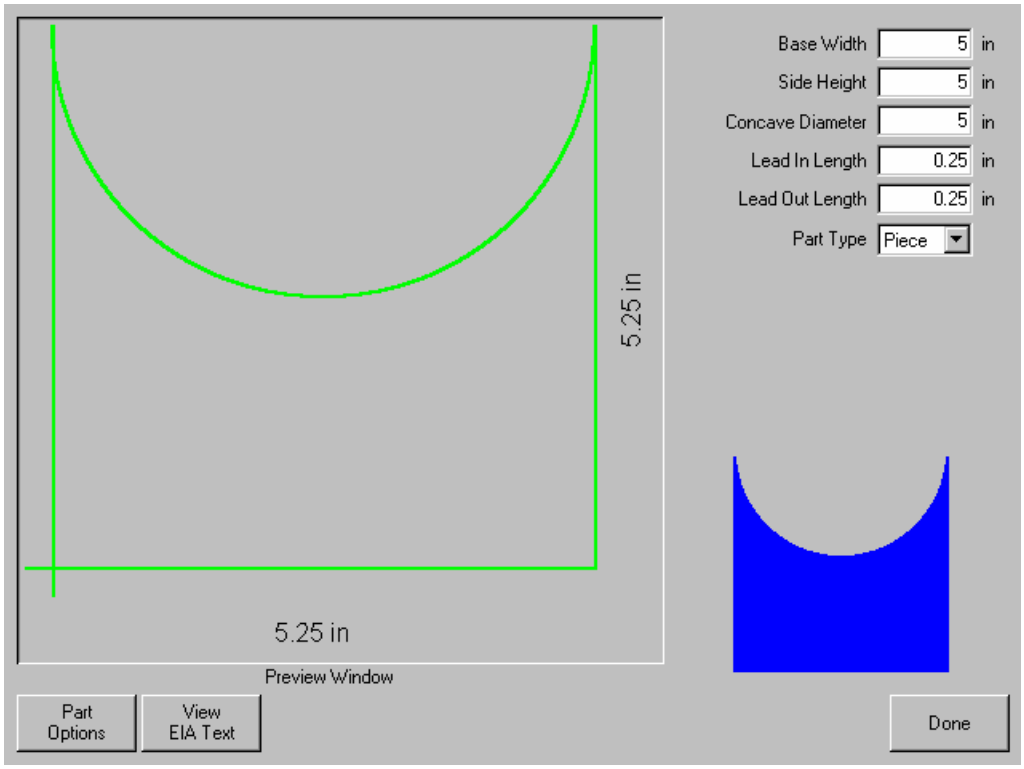
## Rectangle w/ Radius



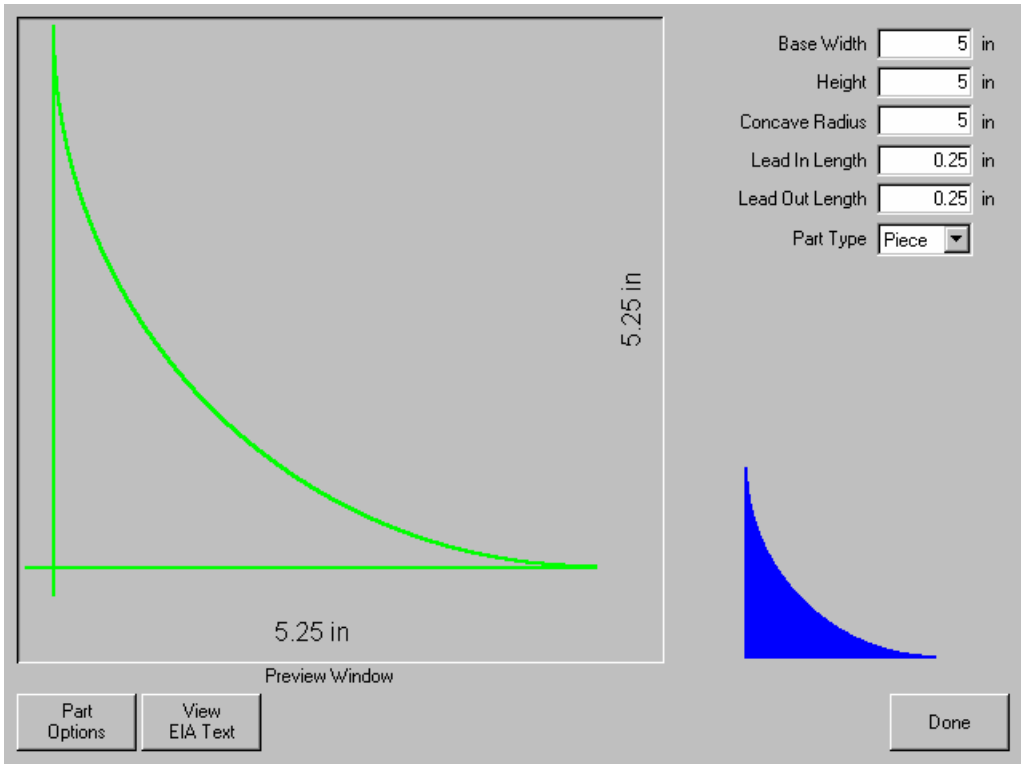

## Convex Rectangle



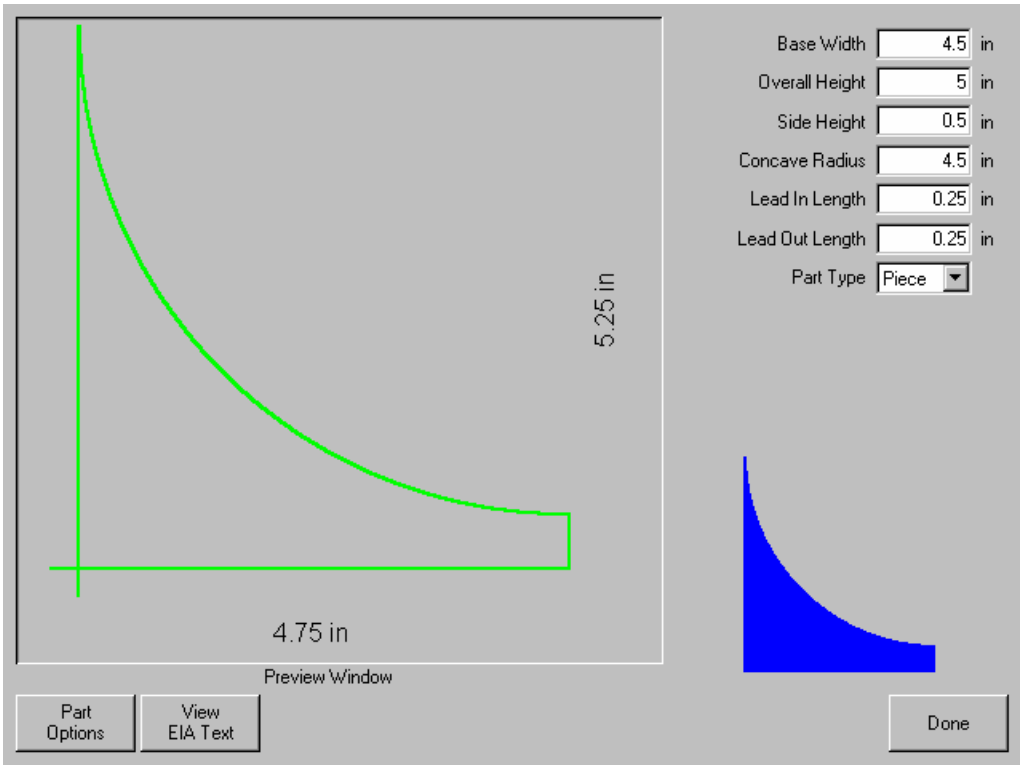
## Concave Rectangle



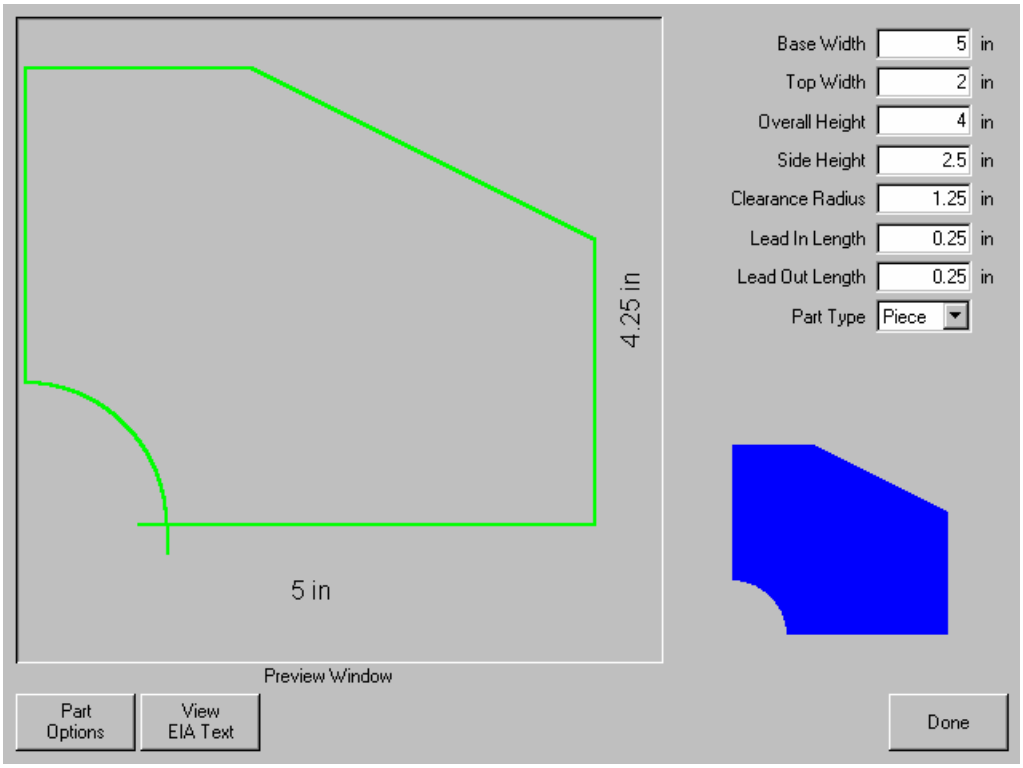

## Triangle w/ Concave Side



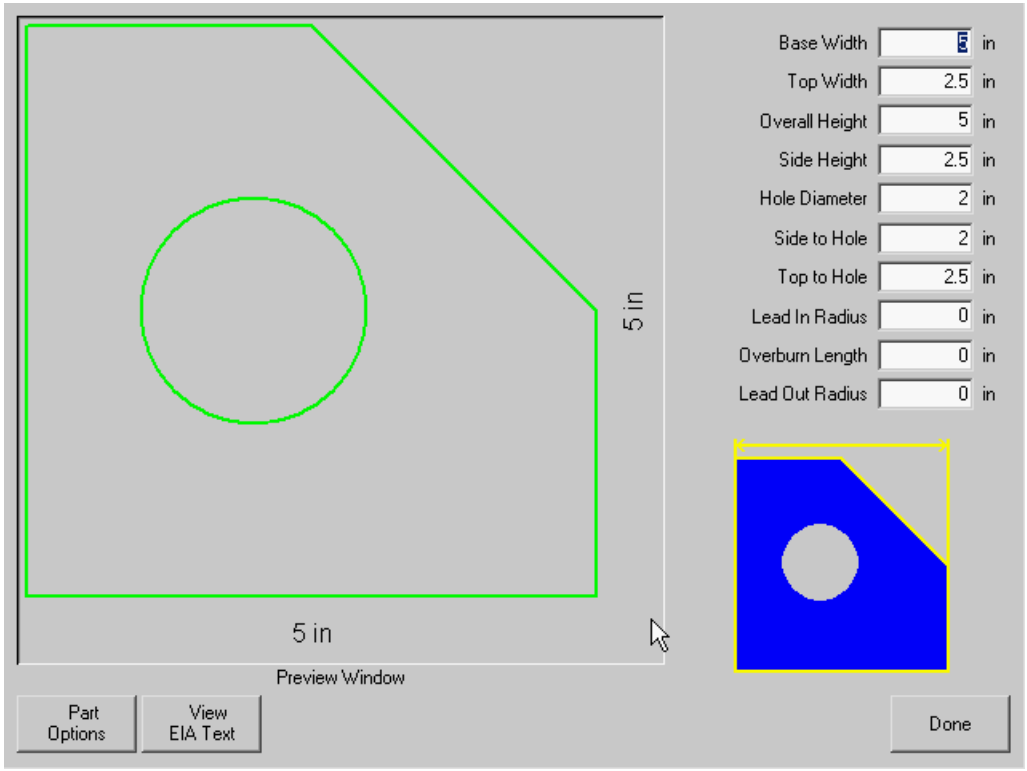
## Polygon w/ Concave Side



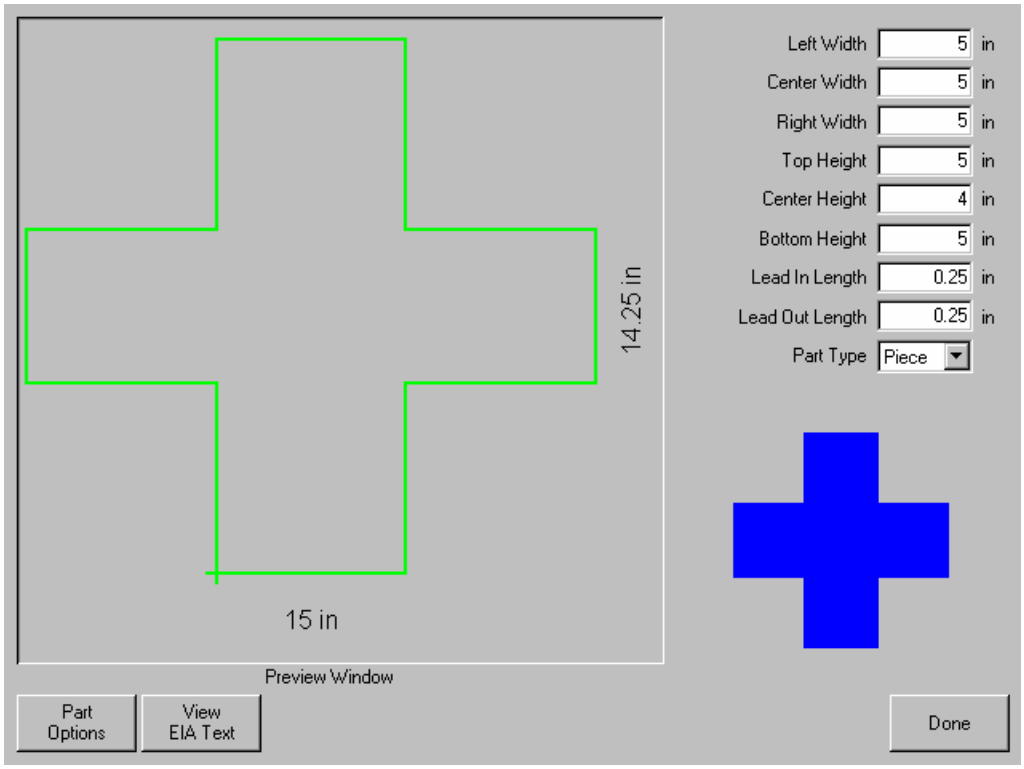

## Slant Rectangle with Radius



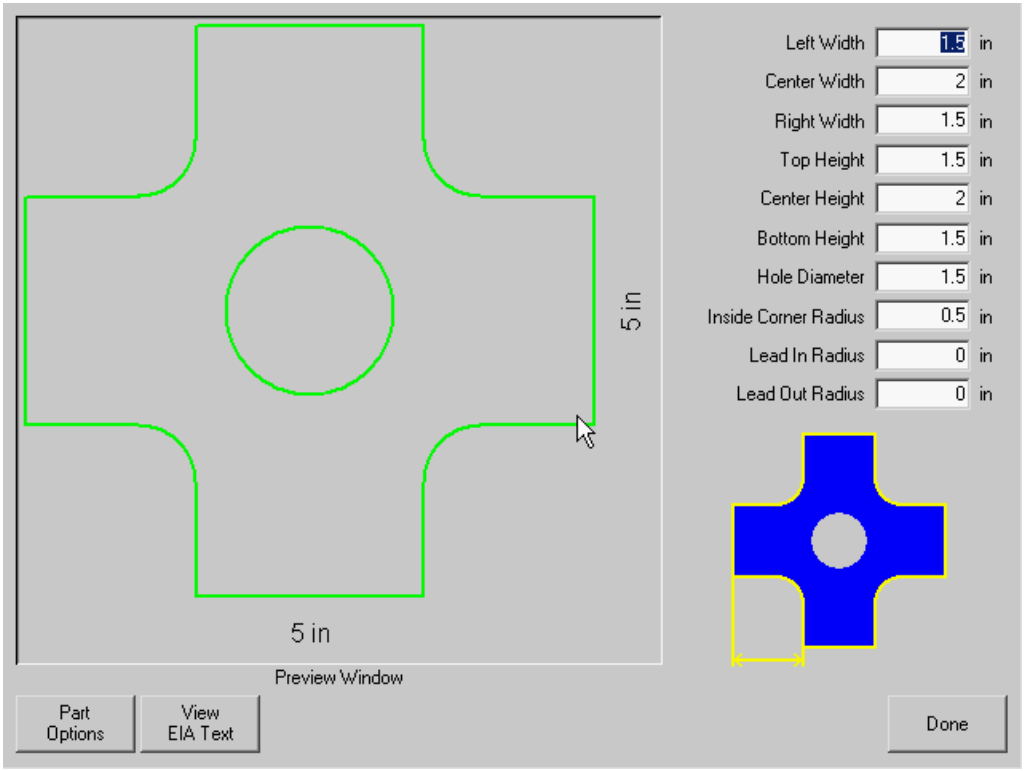
## Slant Rectangle with Circular Hole



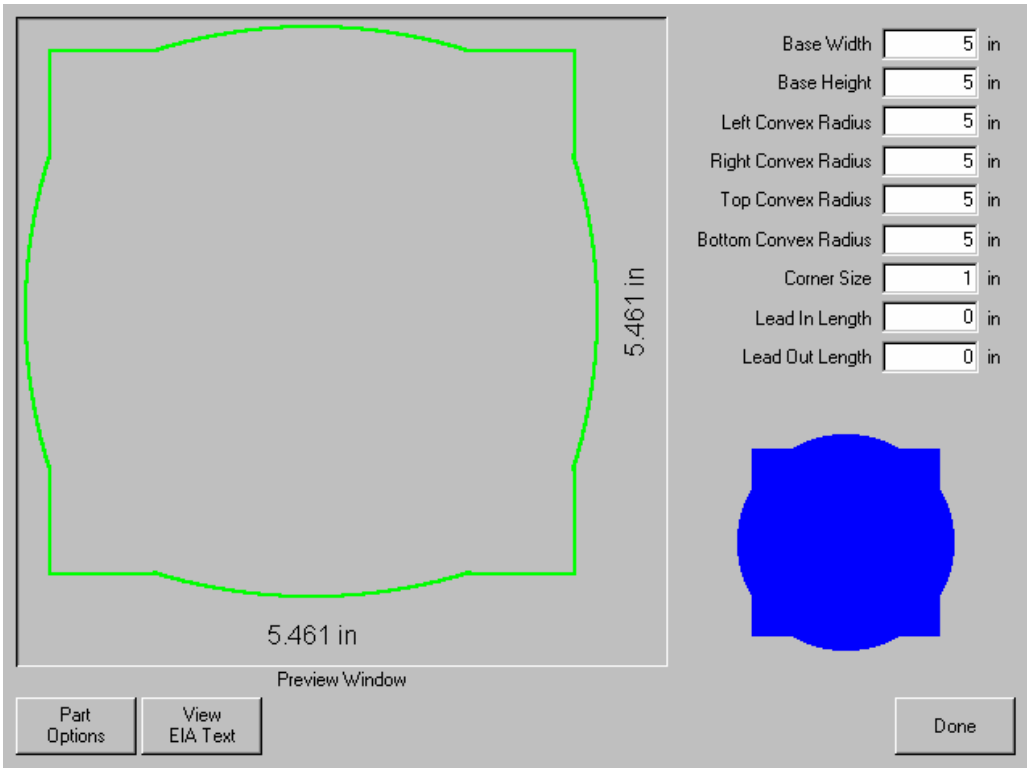

## Cross



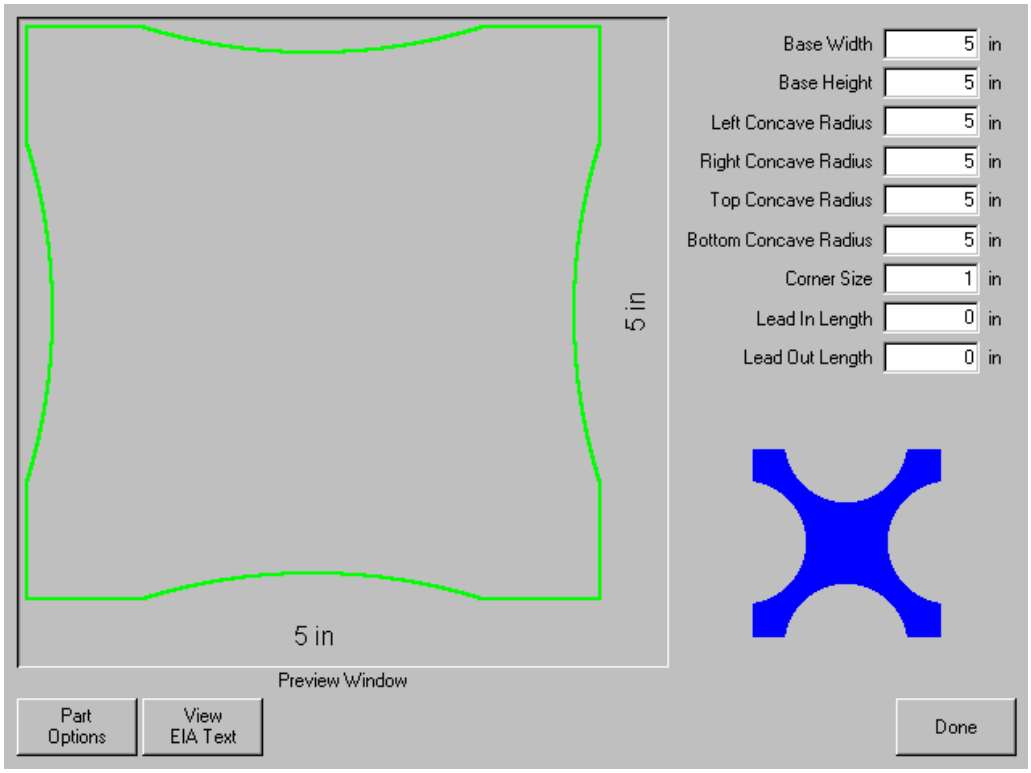
## Cross w/ circular Hole



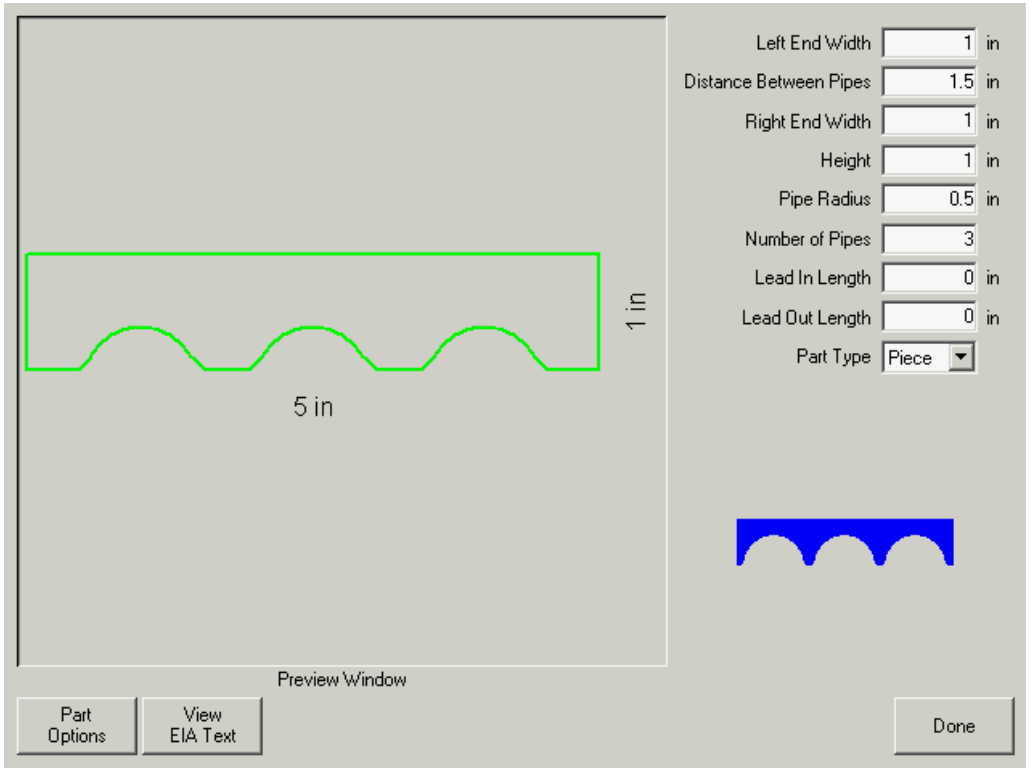

## 4 Sided Convex Rectangle



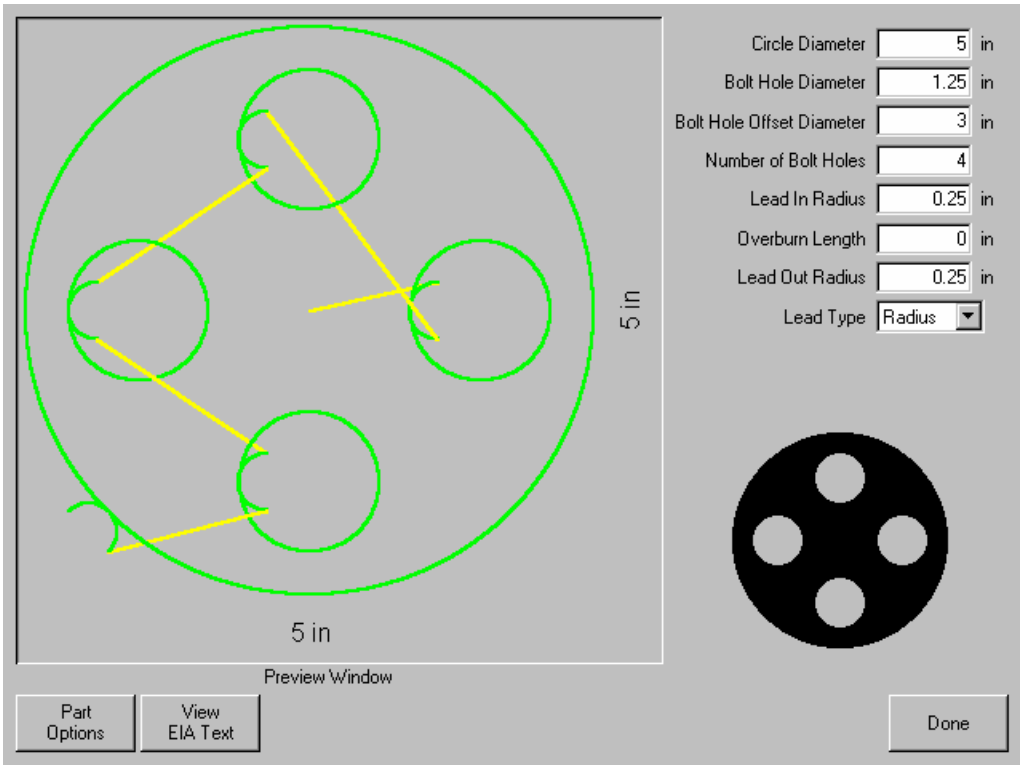
## 4 Sided Concave Rectangle



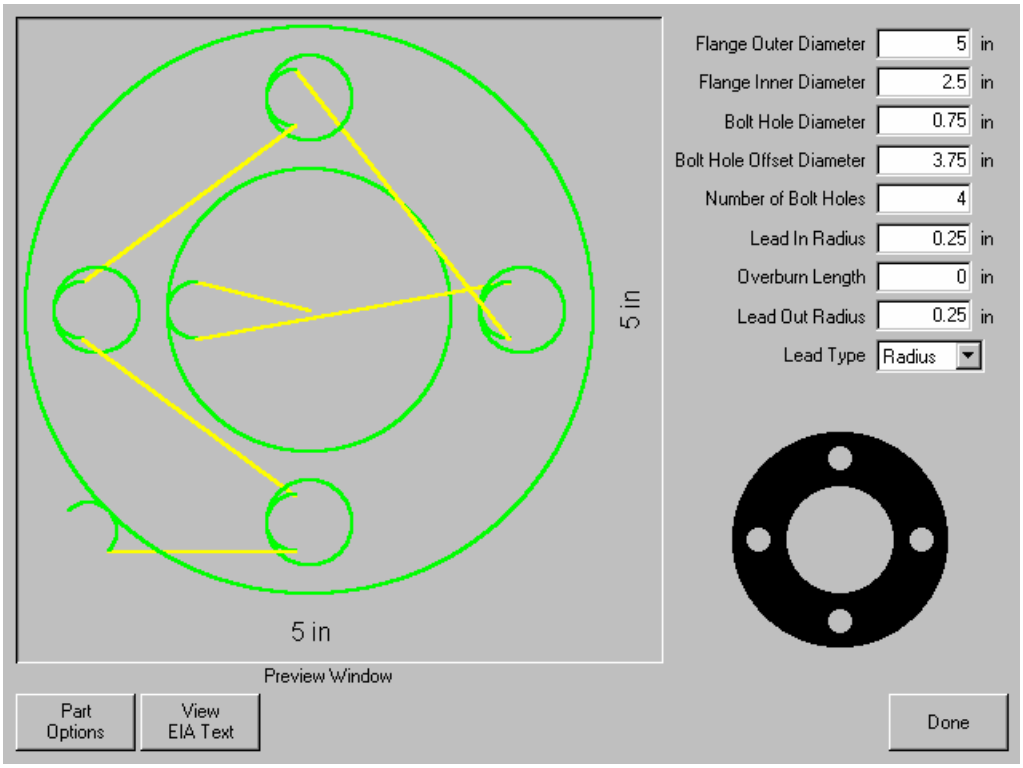

## Pipe Mount



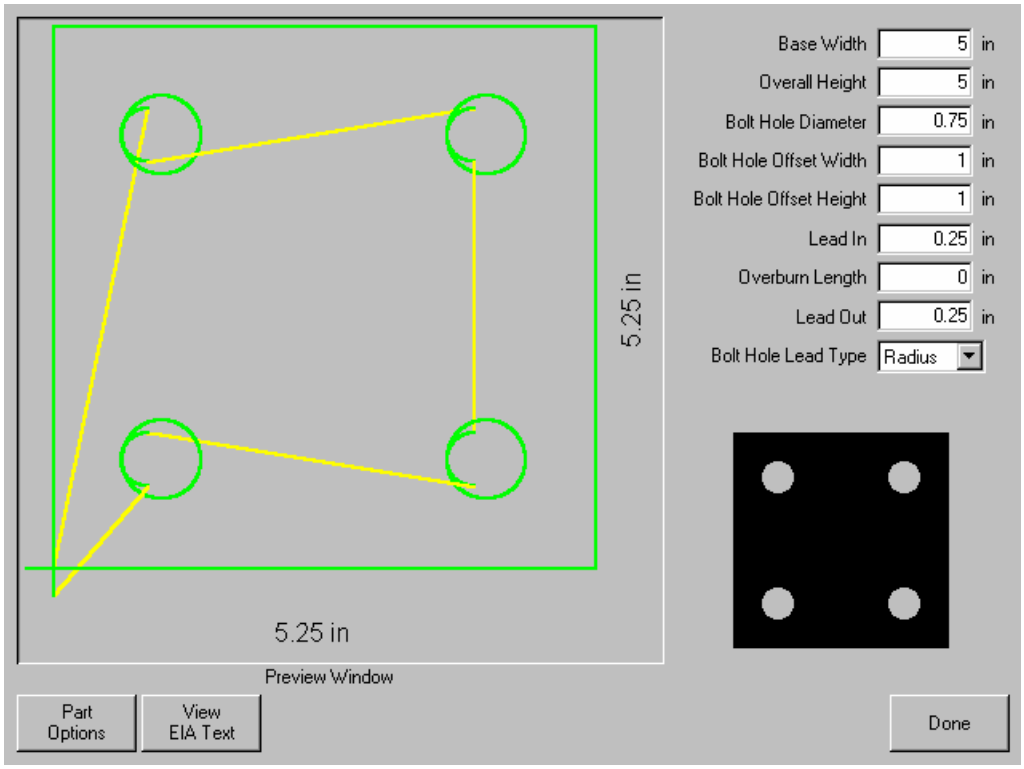
## Bolt Hole Circle



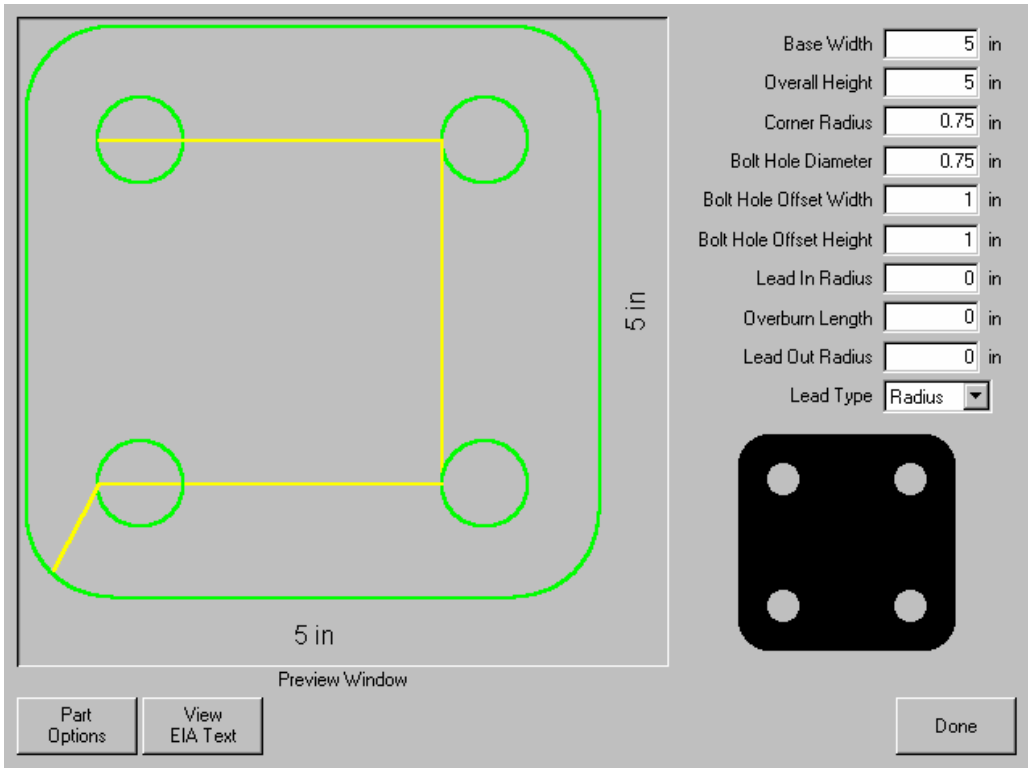

## Bolt Hole Flange



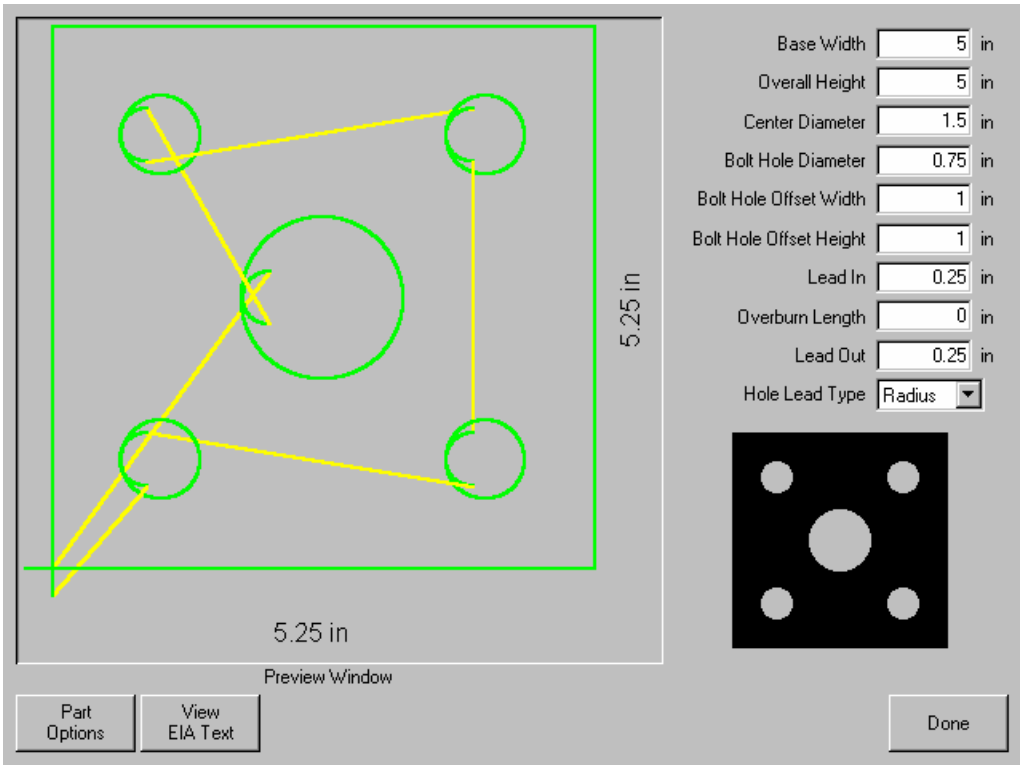
## Bolt Hole Rectangle



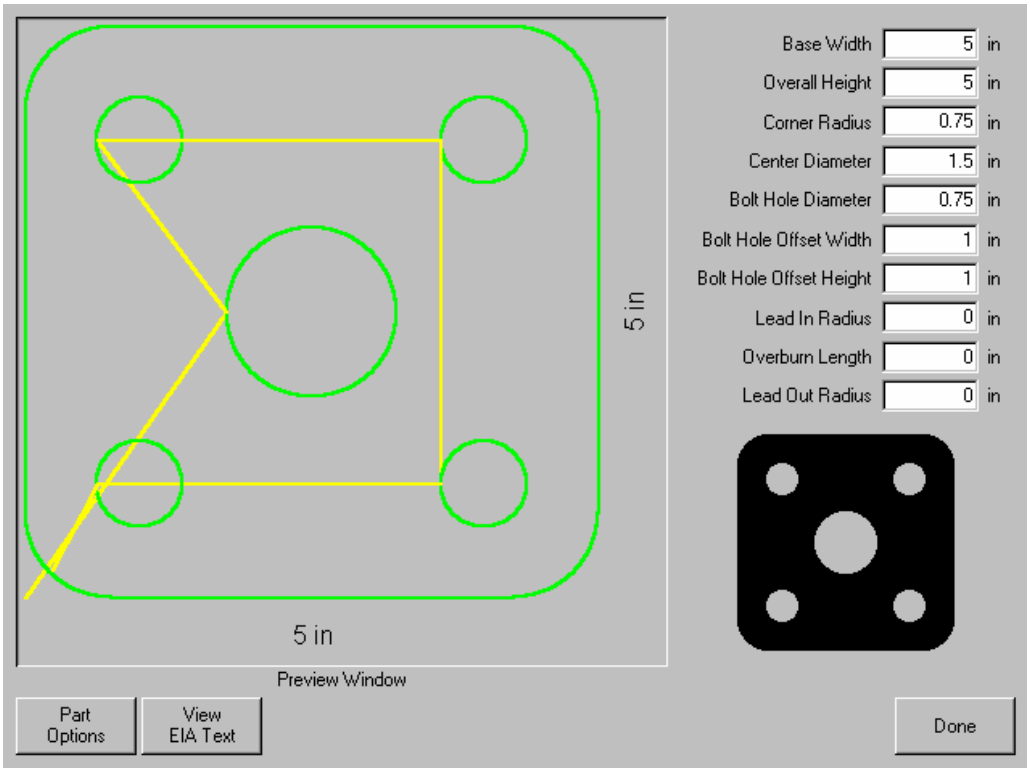

## Bolt Hole Rectangle w/ Convex Corners



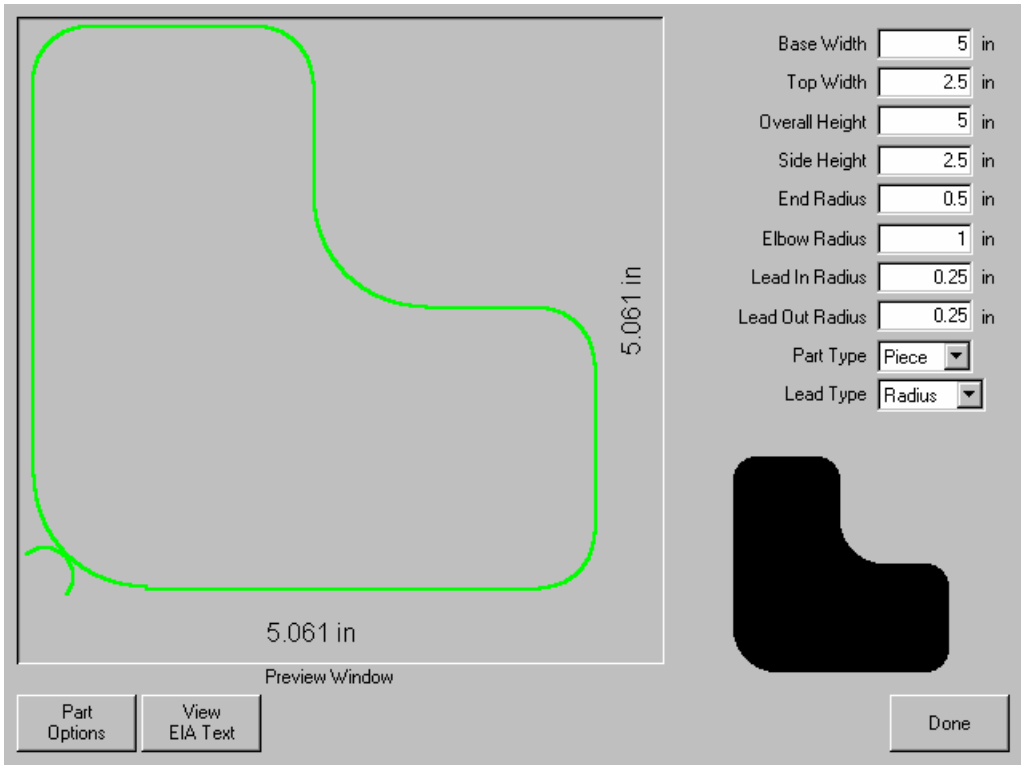
## Bolt Hole Rectangle w/ Center Hole



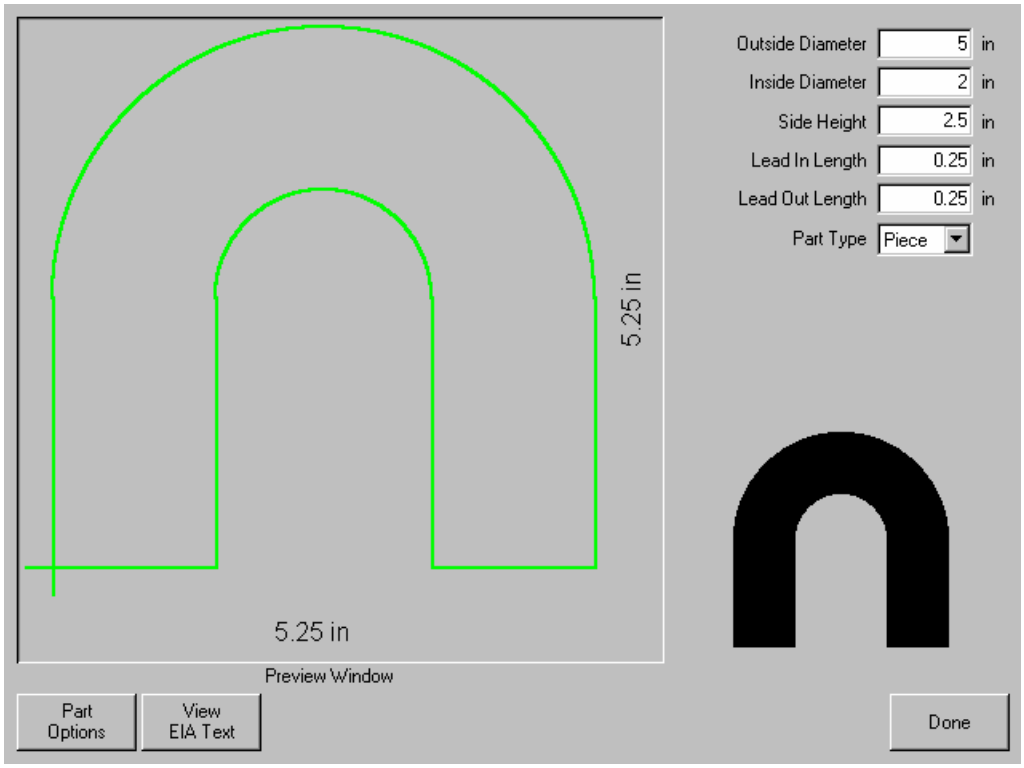

## Bolt Hole Rectangle w/ Center Hole and Convex Corners



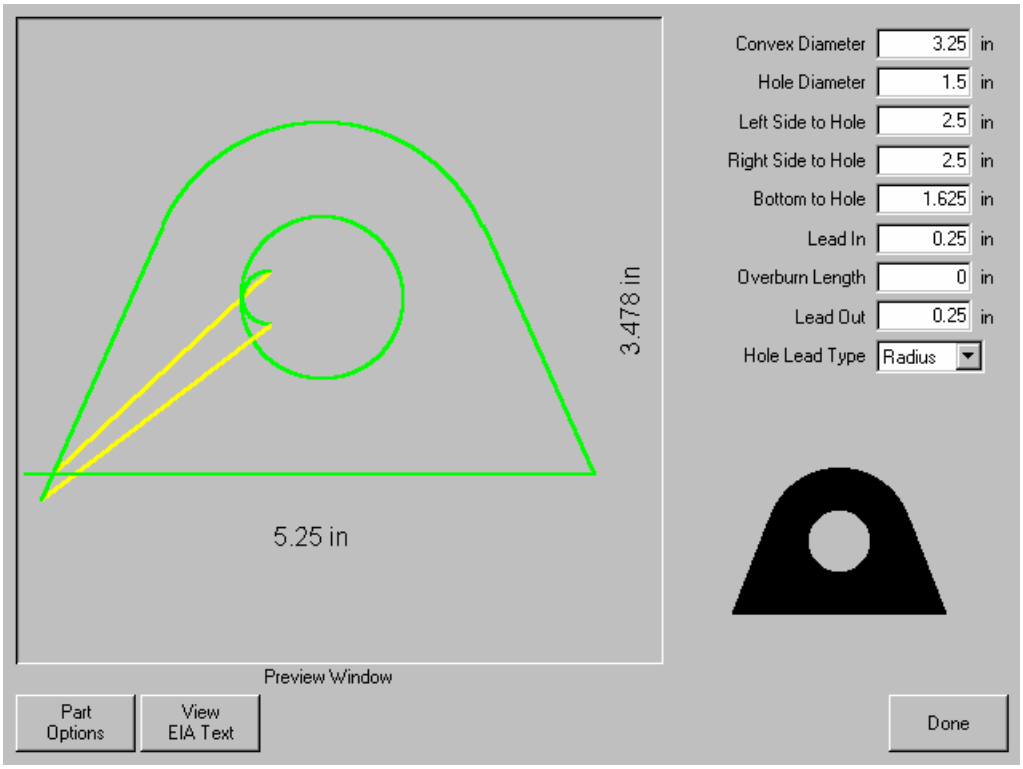
## Rounded L-Bracket



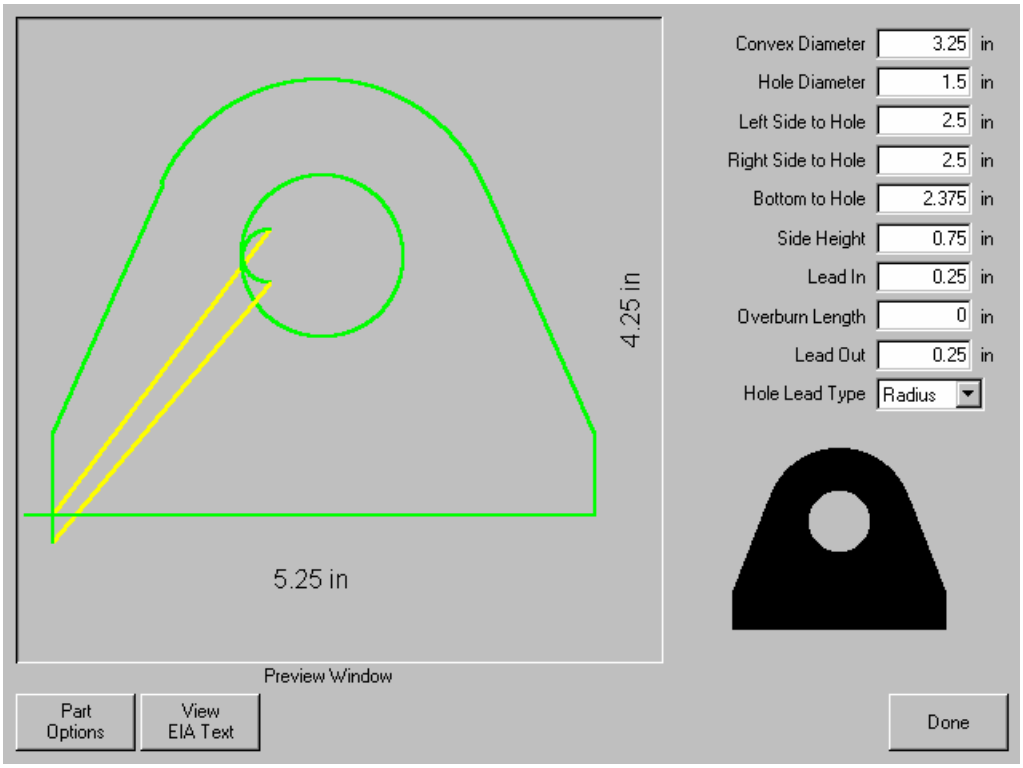

## Horseshoe



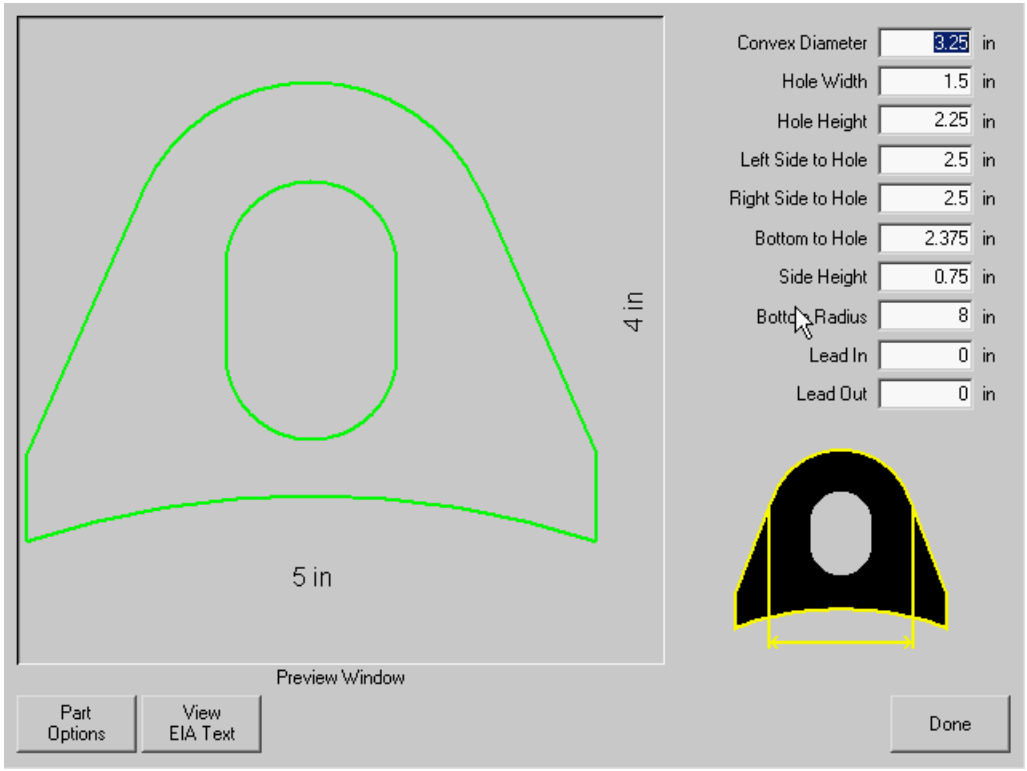
## Convex Roof Trapezoid w/ Hole



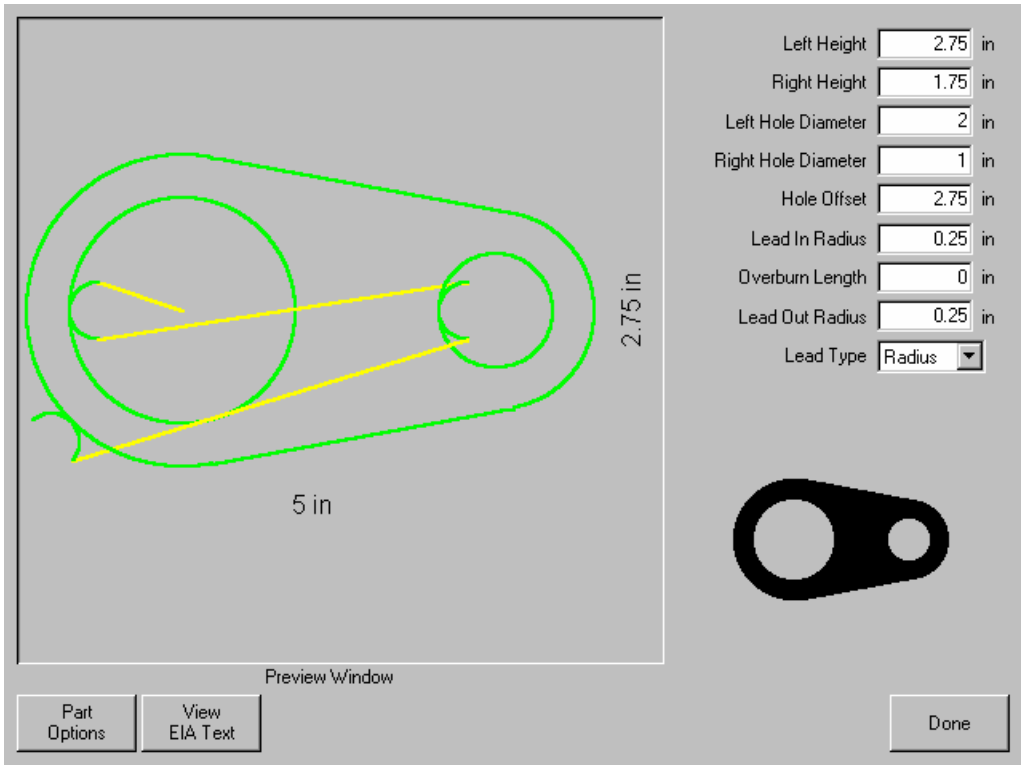

## Convex Roof Polygon w/ Hole



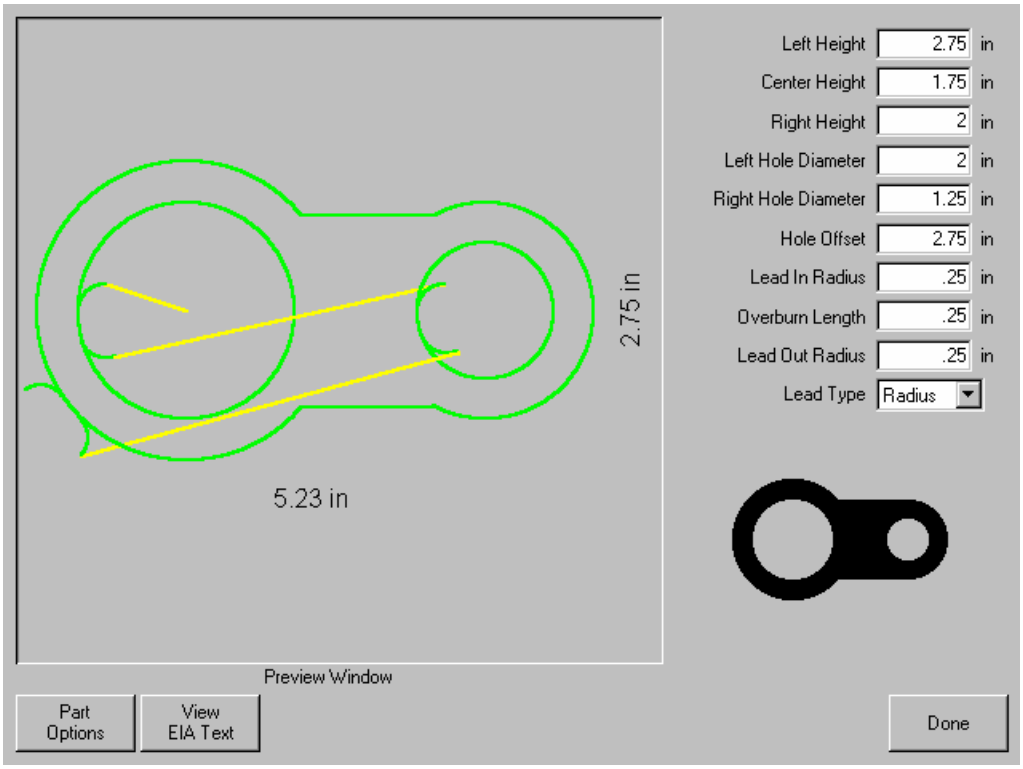
## Convex Roof Polygon w/ Oval Hole and Concave Bottom



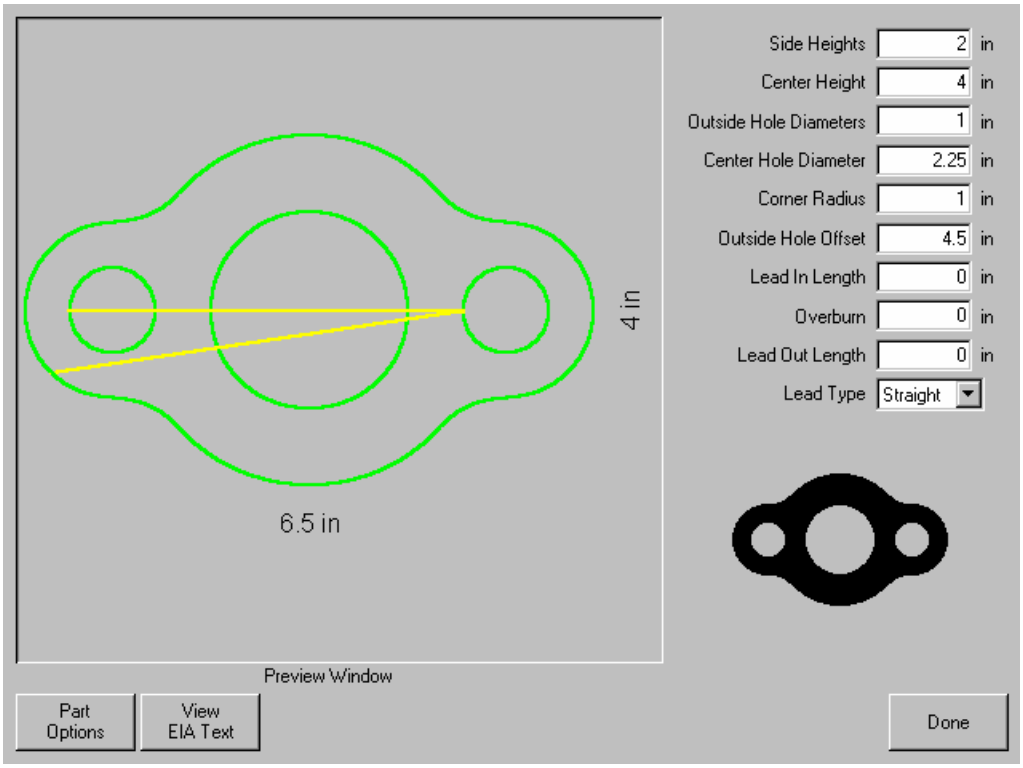

## Pulley Cover



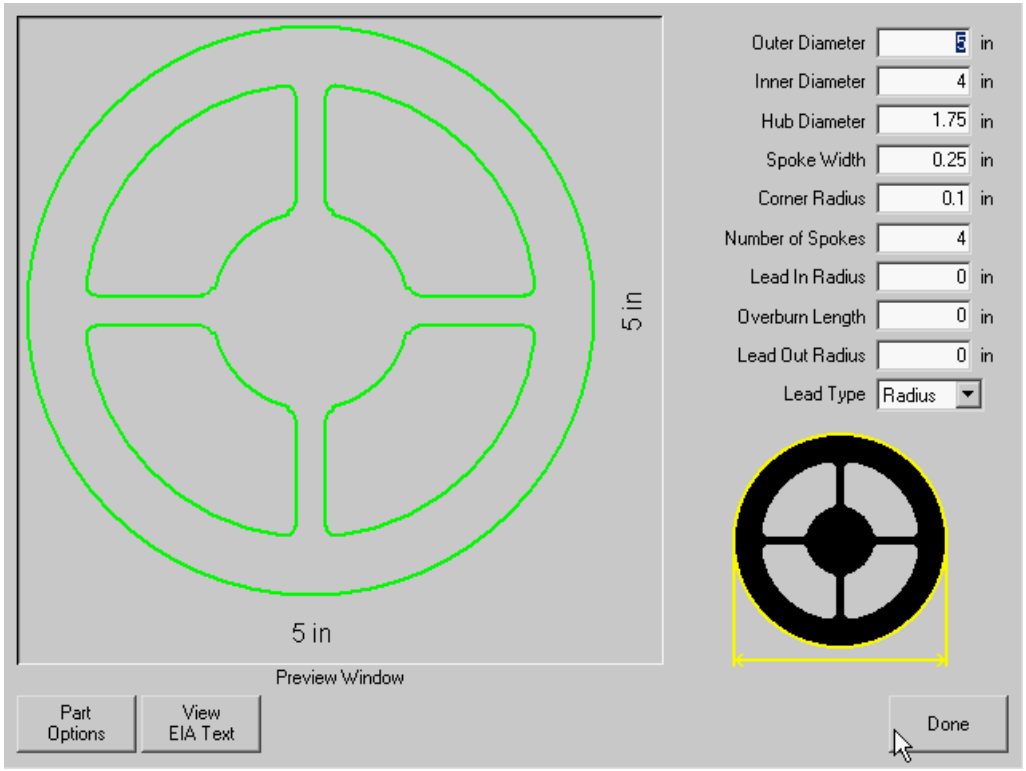
## Paddle Blind



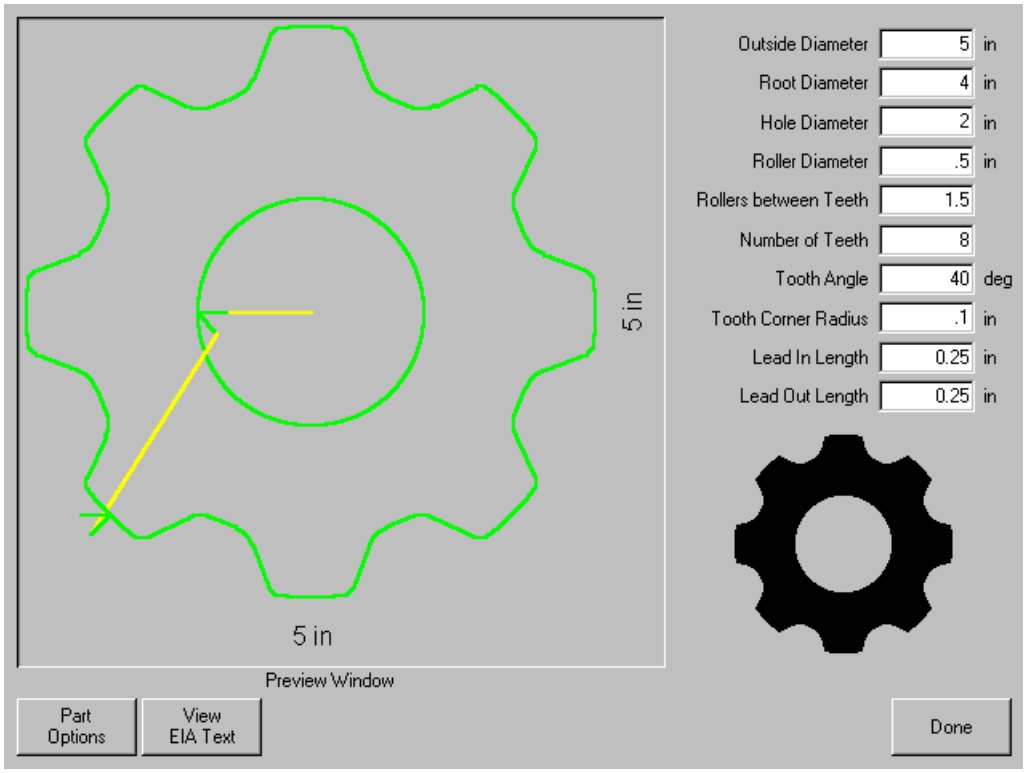

## Water Pump Gasket



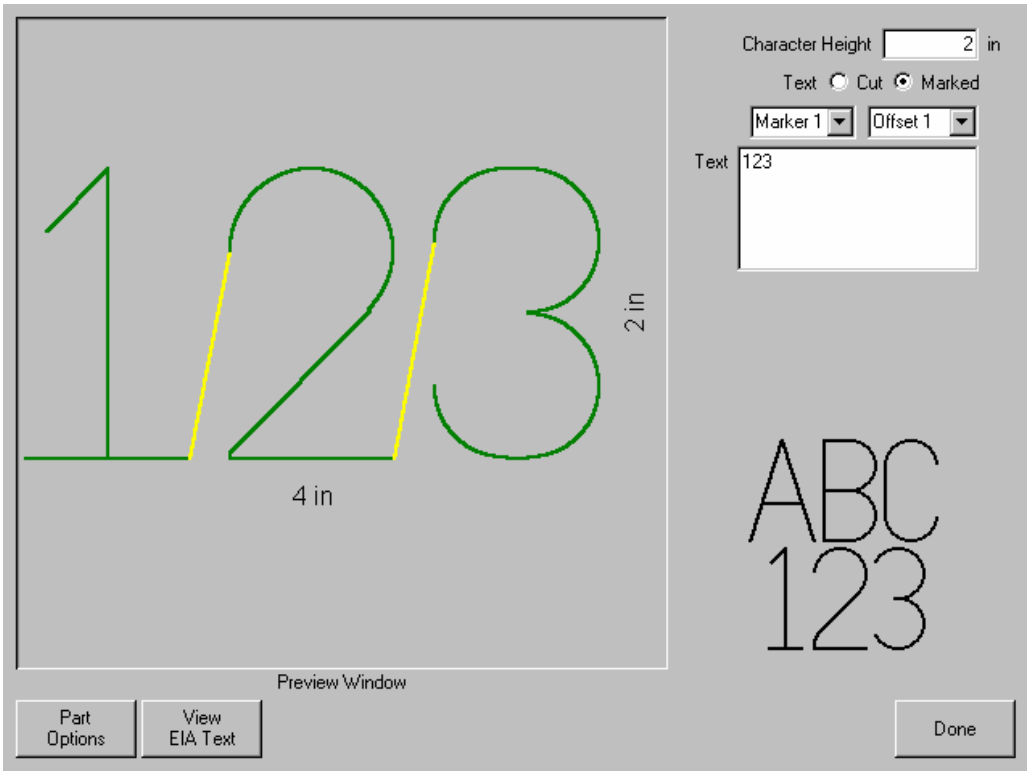
## Pulley



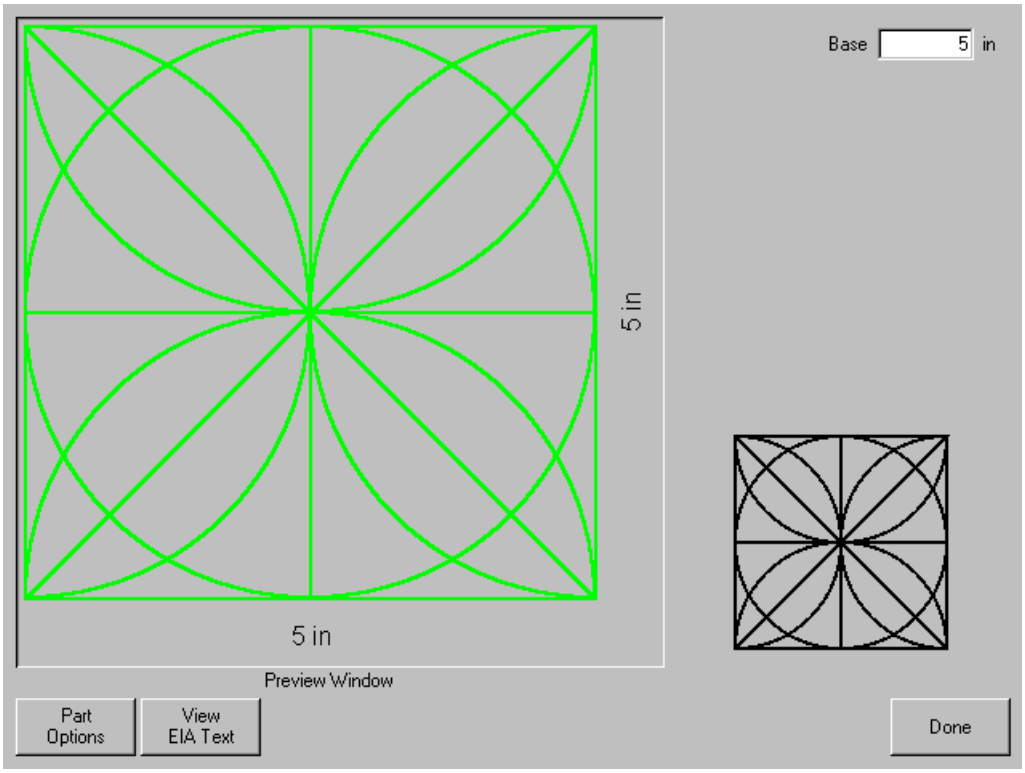

## Sprocket



## Text

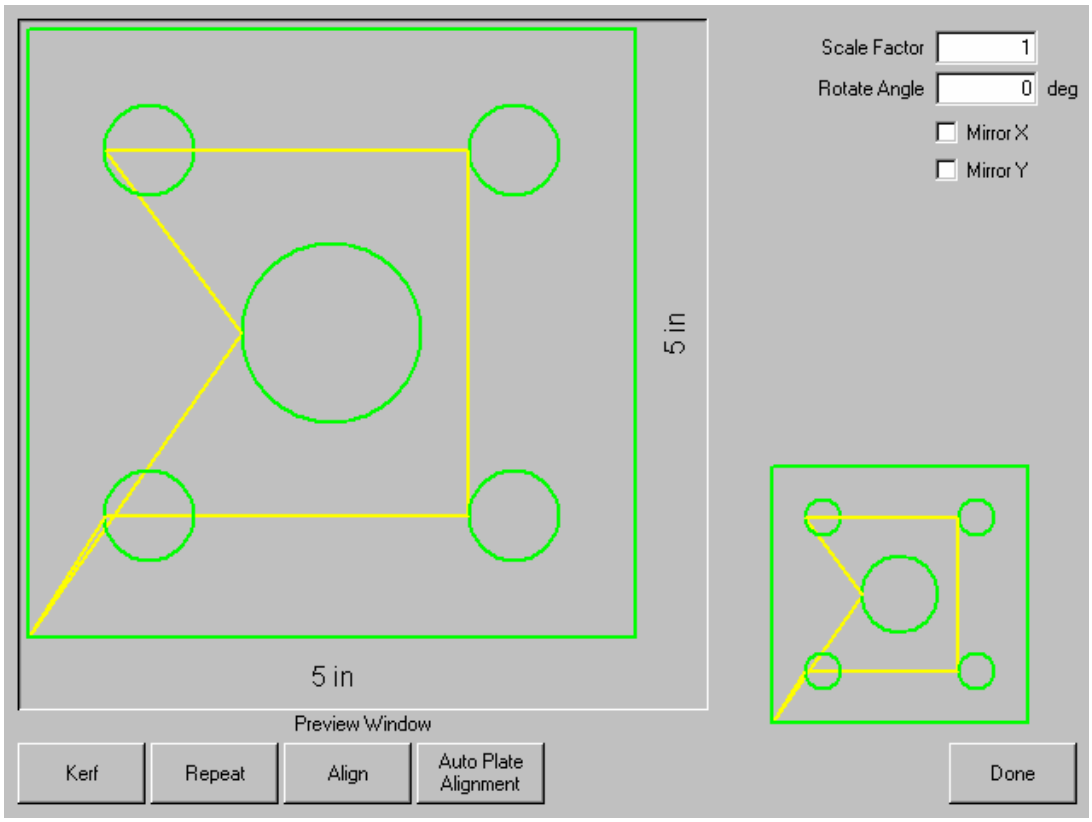



## Test Pattern



# Section 7: Part Options

There are a number of options available under the Part Options softkey. 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.



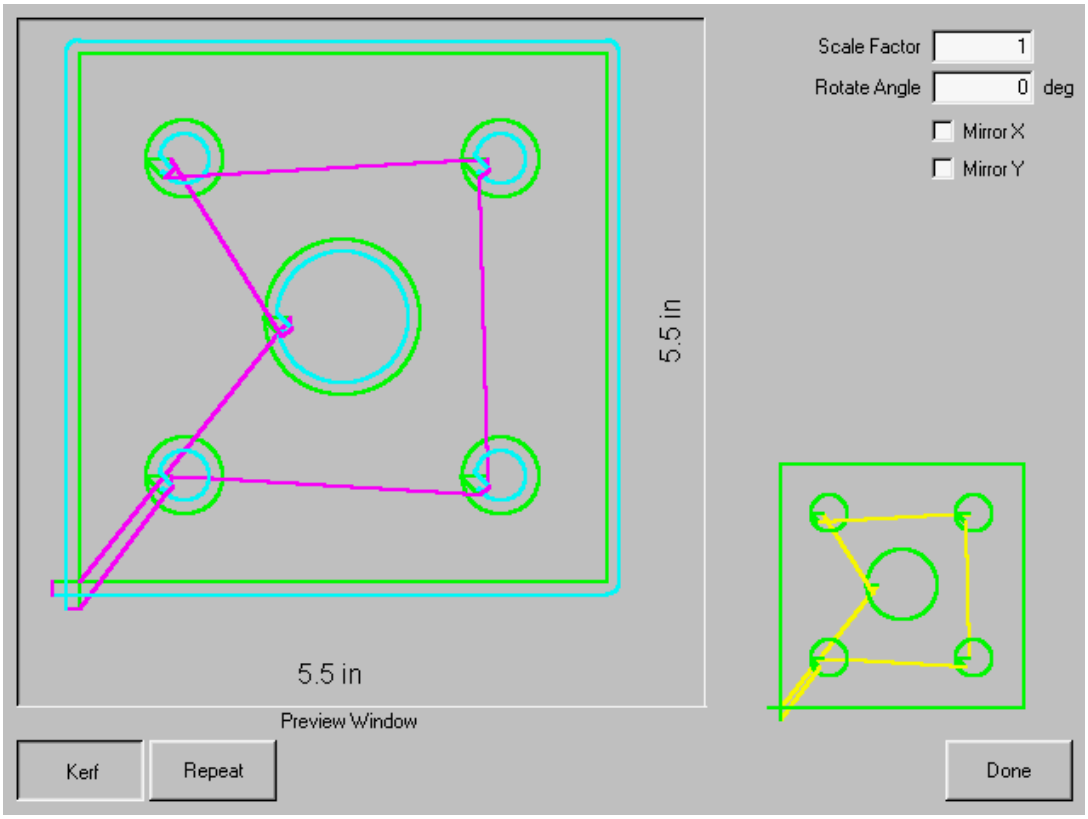

**Scale Factor**
Allows the operator to scale the current part in memory by a programmed factor. After a new scale factor has been entered, the part will be redrawn and its overall dimensions shown. Scale factor must be greater than zero.

**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.

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.

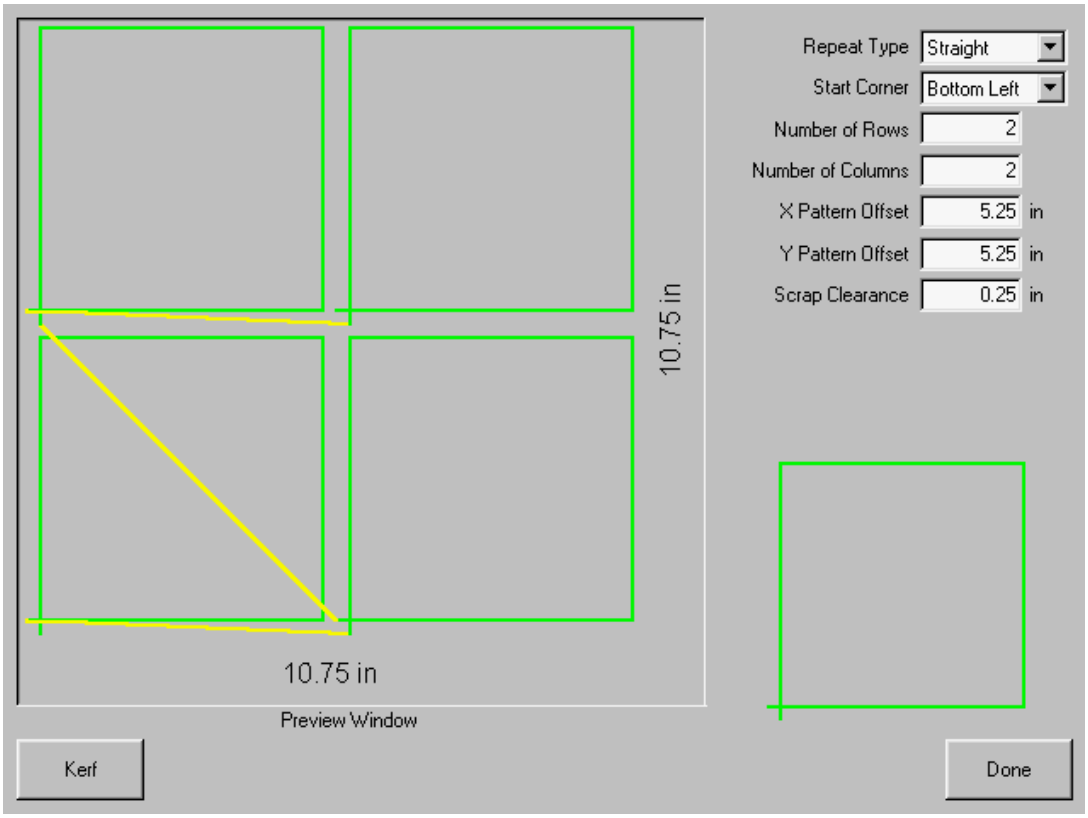
**Kerf**
Pressing the Kerf softkey will graphically show the kerf cut path in a light blue color. This can be extremely valuable in visually seeing the Kerf path prior to cutting. Pressing the button again turns the Kerf part graphics off.



## 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.

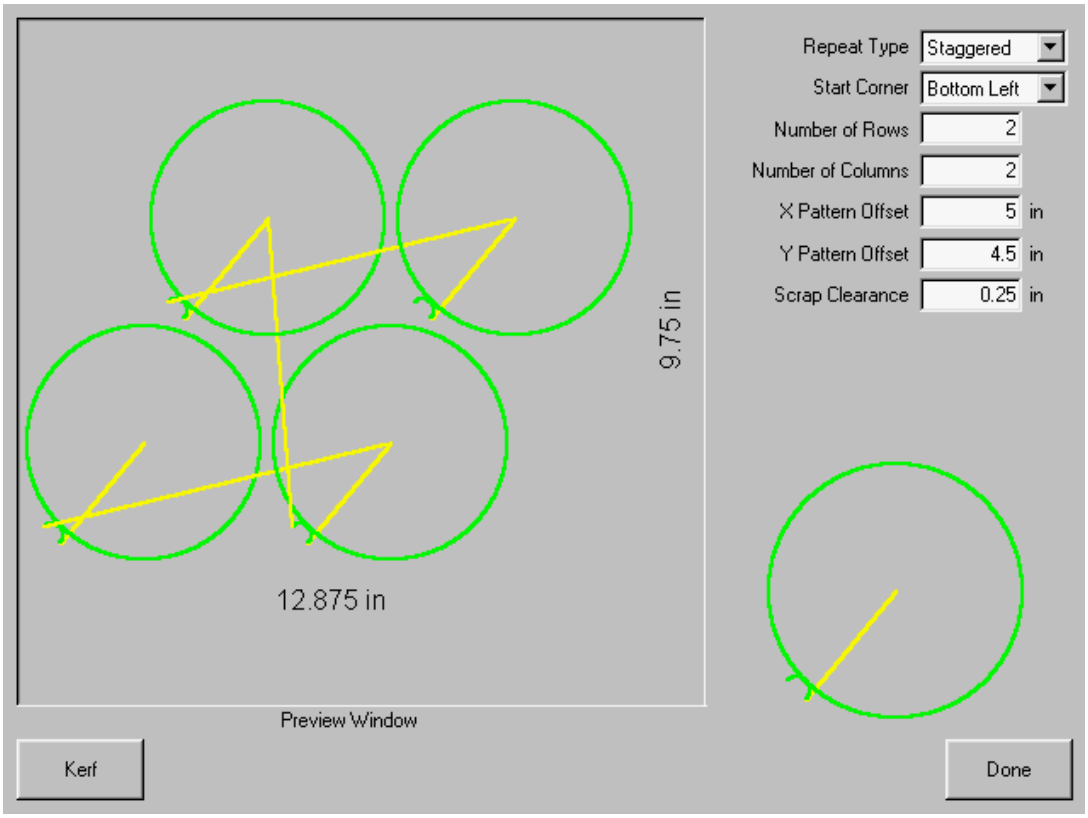
**Number of Columns**
Program the number of columns.

**X Pattern Offset/Y Pattern Offset**
The control automatically calculates the pattern offset based on the dimension of the current part in memory.

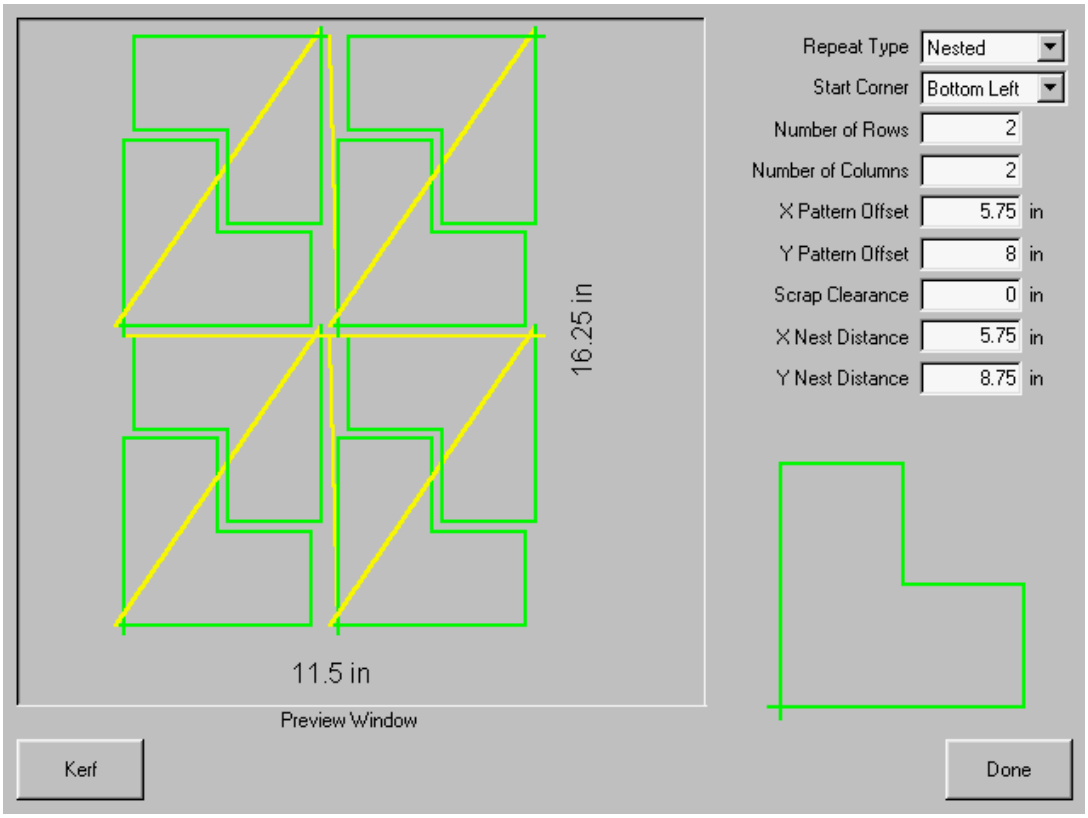
**Scrap Clearance**
Allows the user to insert scrap clearance between parts in the grid pattern. The same value is used for X and Y dimensions.

**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.

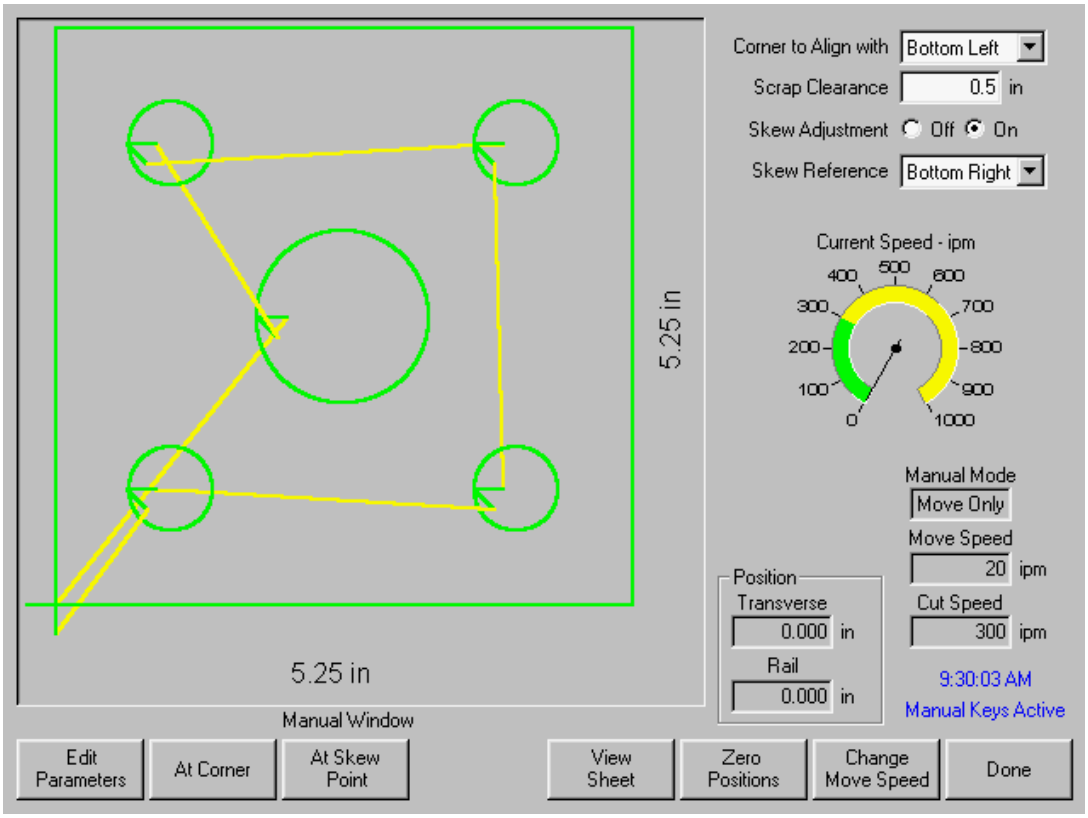
Part Alignment is used to position a part or nest of parts, on to a squared plate so that it will fit on to the plate. This is commonly with parts that have an internal pierce point such as a flange.

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 by pressing the Edit Parameters softkey. After the alignment parameters have been entered, press the Edit parameters softkey again to continue the alignment.
2. Move the torch to the first corner location ("Corner to Align with").
3. Press the "At Corner" softkey.
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" softkey.
7. Press the Done softkey. 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.

**Edit Parameters**
Press this softkey to enable or disable the editing of the parameters for aligning the part.

**At Corner**
Press this softkey when at the corner of the plate you want to align the part in.

**At Skew Point**
Press this softkey 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.

This feature uses a five point reference scheme for skew 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 must first be assigned in I/O setups. The logic state must be set so that the input is active when over the plate.

2) Similar to the Homing function, Motion to move to the outward edges of the plate is executed at a fast peed until the Sensor switches to an of state indicating the edge of the plate. For accuracy, motion will then reverse at a slow speed ( 10 ipm / 250 mmpm ) until the sensor is then activated again. That position is recorded as the reference point. Motion to move to the edges of the plate will be executed at the selected Manual Move Speed. Four speeds are available, Maximum Machine speed, High Jog, Med Jog and Low Jog.

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.

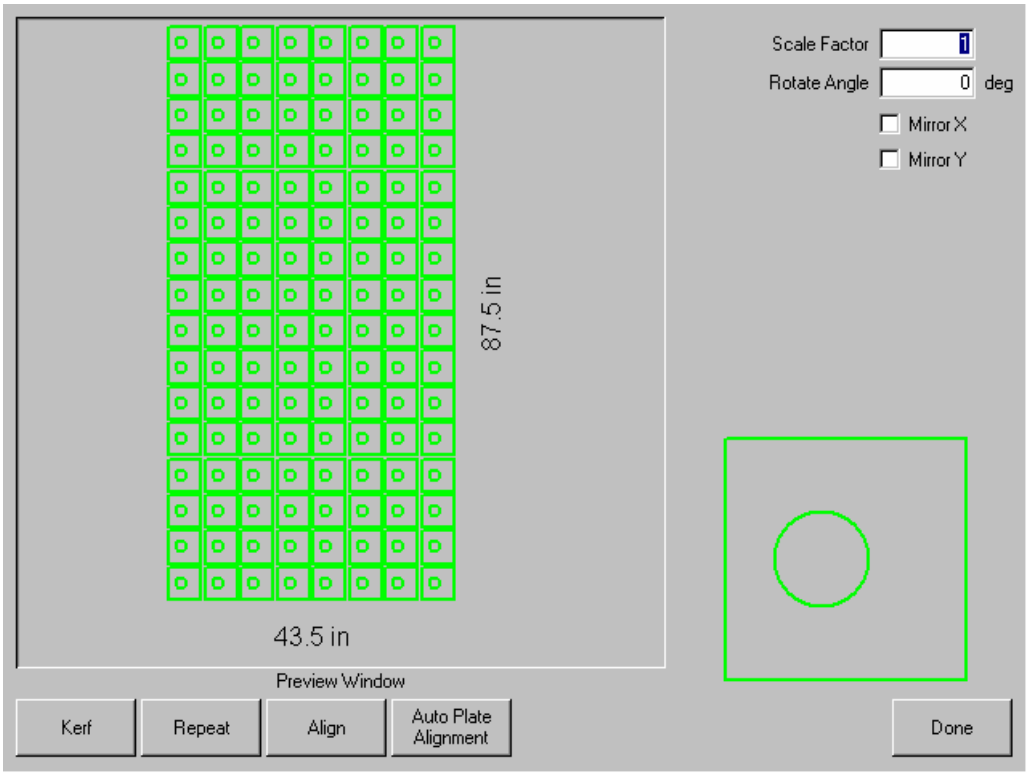
4) Scrap clearance, if required, would be entered at the align screen. Additionally, Corner to Align with on the align screen will set the start corner location of the program.

5) If your machine requires "Homing", the Homing function should be performed at some point prior to operation.

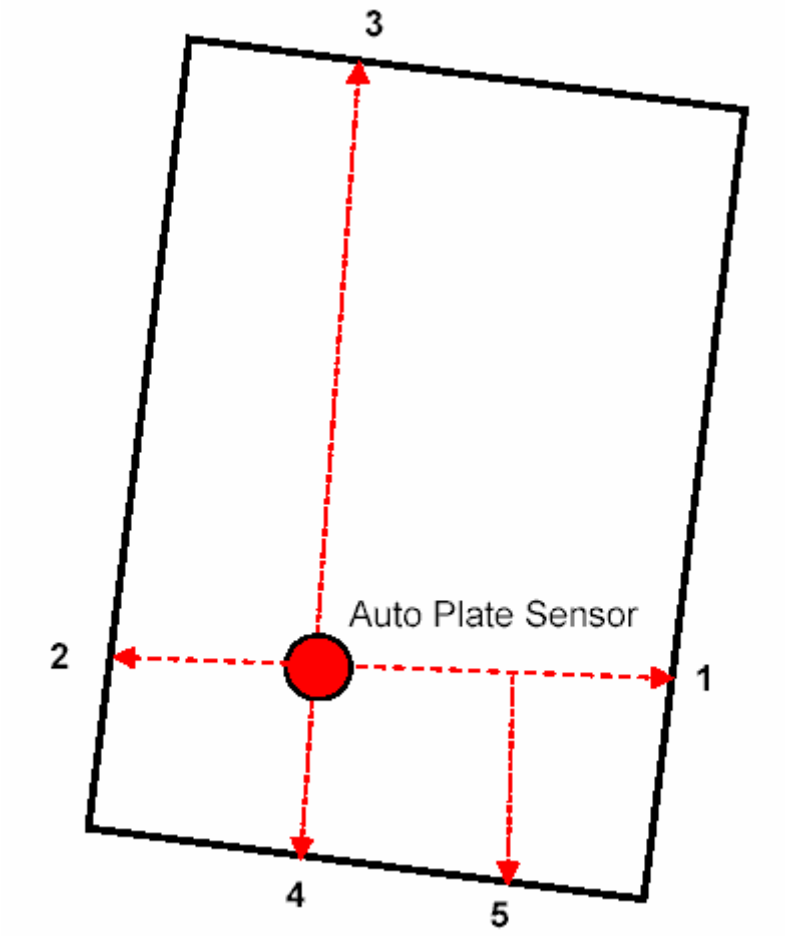
**Instructions**

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 Softkey 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 slow speed until the sensor again becomes active. This position is recorded as the respective reference point. Motion continues until all five points are detected.

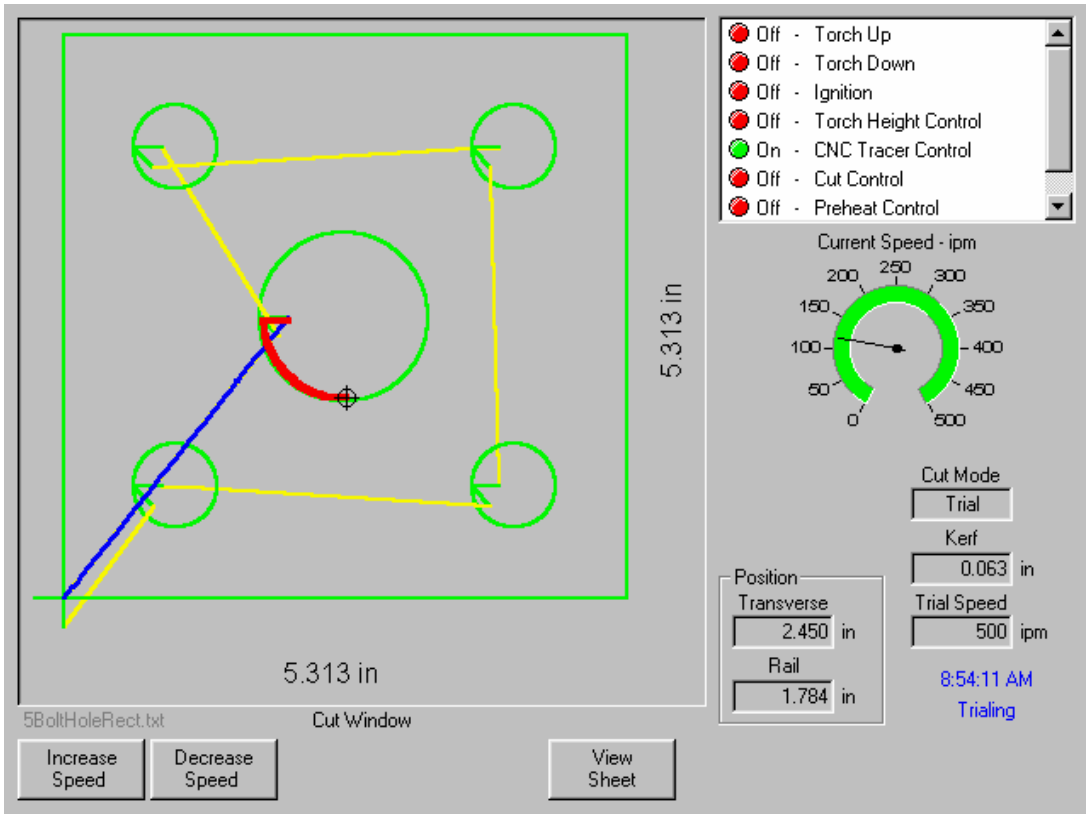



4) Upon completion of detection the five reference points, the control will then position the Plate Sensor (if no tool offset used) or the torch (if a tool offset is used) to the start point of the part program. Scrap Clearance ( from the Align screen ) and Start Corner ( from the Align screen ) will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

# 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:

## I/O Configuration Type “M”, “P” and “V”




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. Type “B” configured controls will offer the selection of Test Run, Manual and Automatic.

To preview the path, press the Change Cut Mode softkey until Trial or Test Run 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, or 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.

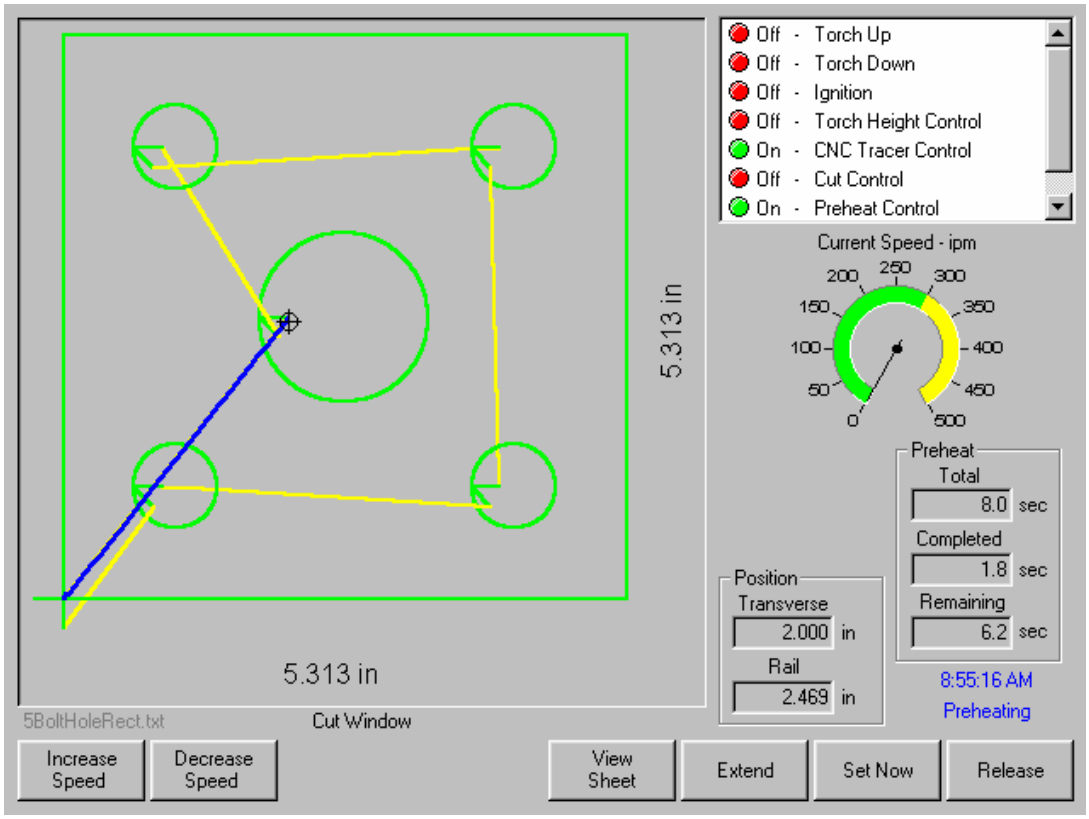
**Speed Increase**
Pressing the Speed Increase softkey increases the current cut speed by 3%.

**Speed Decrease**
Pressing the Speed Decrease softkey decreases the current cut speed by 3%.

**Note:** 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 softkey. The Repeats softkey is shared with the Extend softkey 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 softkeys 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.

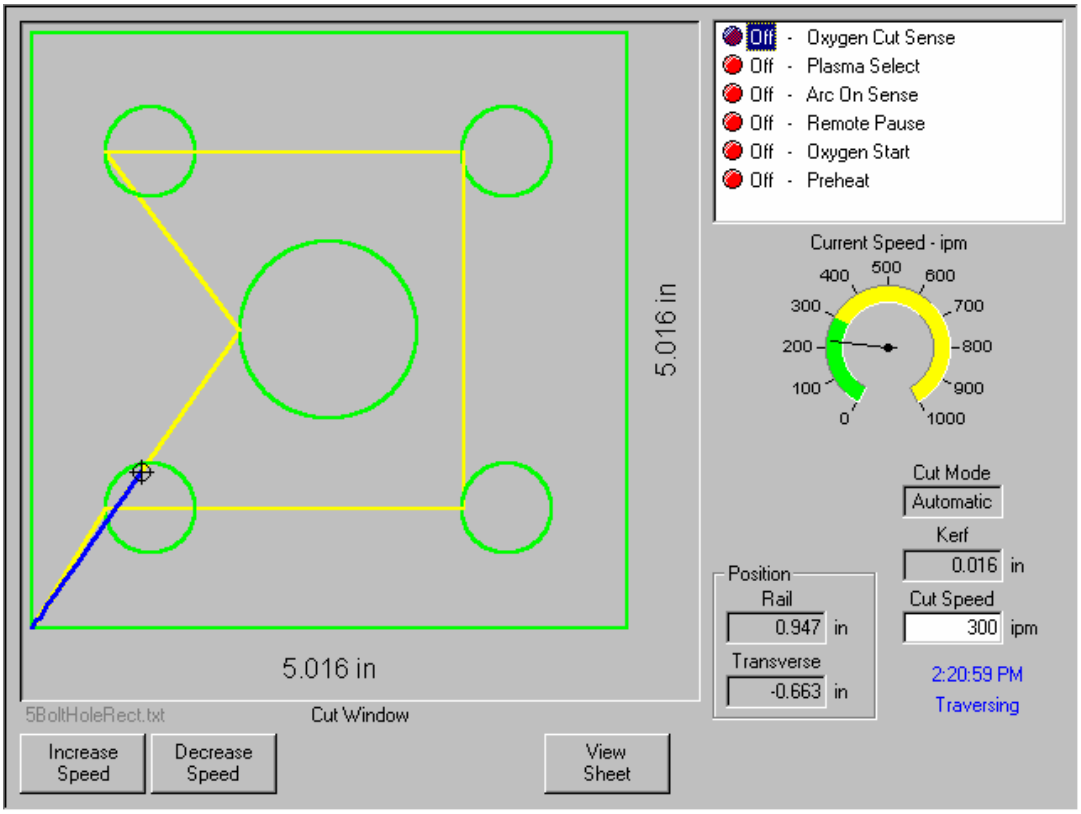
The function of these keys is explained below:

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

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

**Release**
A Release softkey 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.

## I/O Configuration Type "B"




For type "B" configured controls, the operator may choose between three cut modes.

**Automatic**
Cutting in Automatic mode allows the part to be cut with all preheat and cutting processes to be performed by the control.

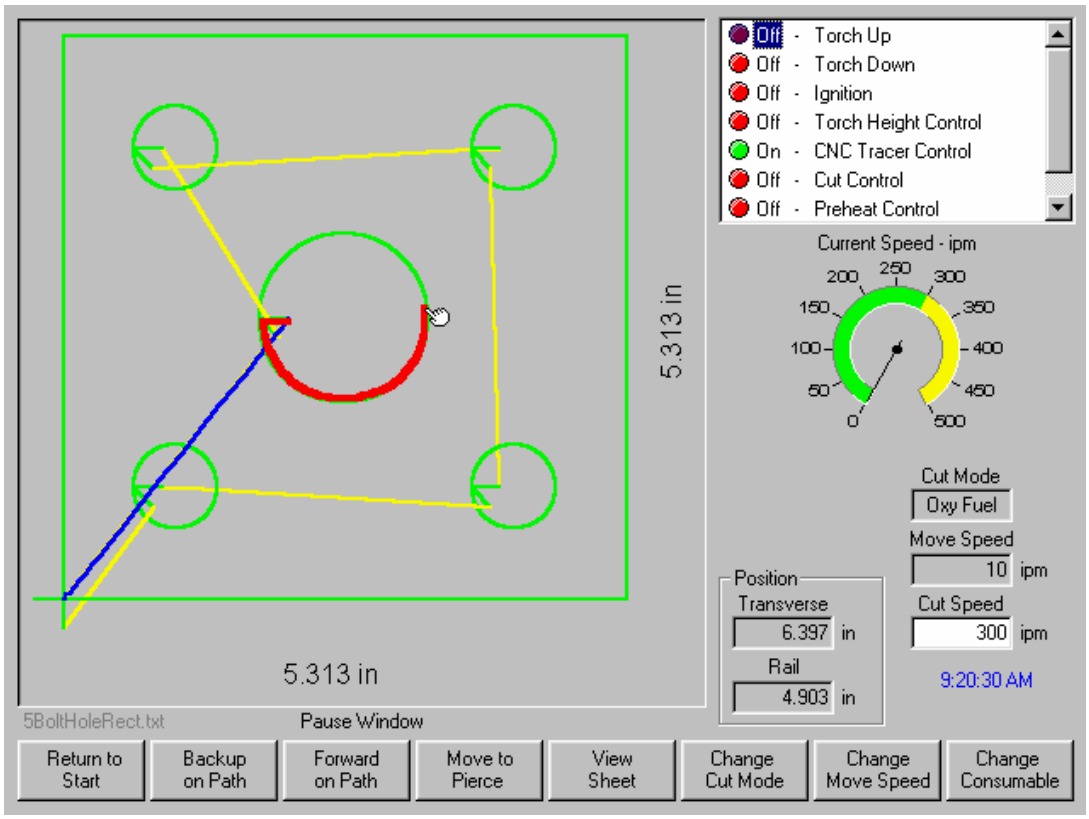
**Manual**
Cutting in Manual mode allows the part to be cut with the operator manually preheating and starting the cut process using the machine's cutting controls.

**Test Run**
When Test Run is selected, the cutting machine will move through the motions of the part selected without cutting.

# 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.

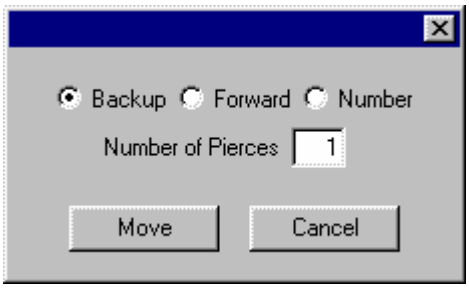
**Return to Start**
Allows the operator to return to the initial starting point of the part. **Note:** If the Return to Start function is utilized after a cut loss, all information about the current position of the cutting device on the path will be lost.

**Backup and Forward on Path**
Use these two softkeys 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 softkey in the Pause window. The corresponding speed is displayed in the Move Speed window.

**Move to Pierce**
Pressing the Move to Pierce softkey 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 softkey changes the restart mode from Cut to Trial/Test or from Trial/Test to Cut. This allows the operator to move through the part partially as a Cut and partially as an actual Cut.

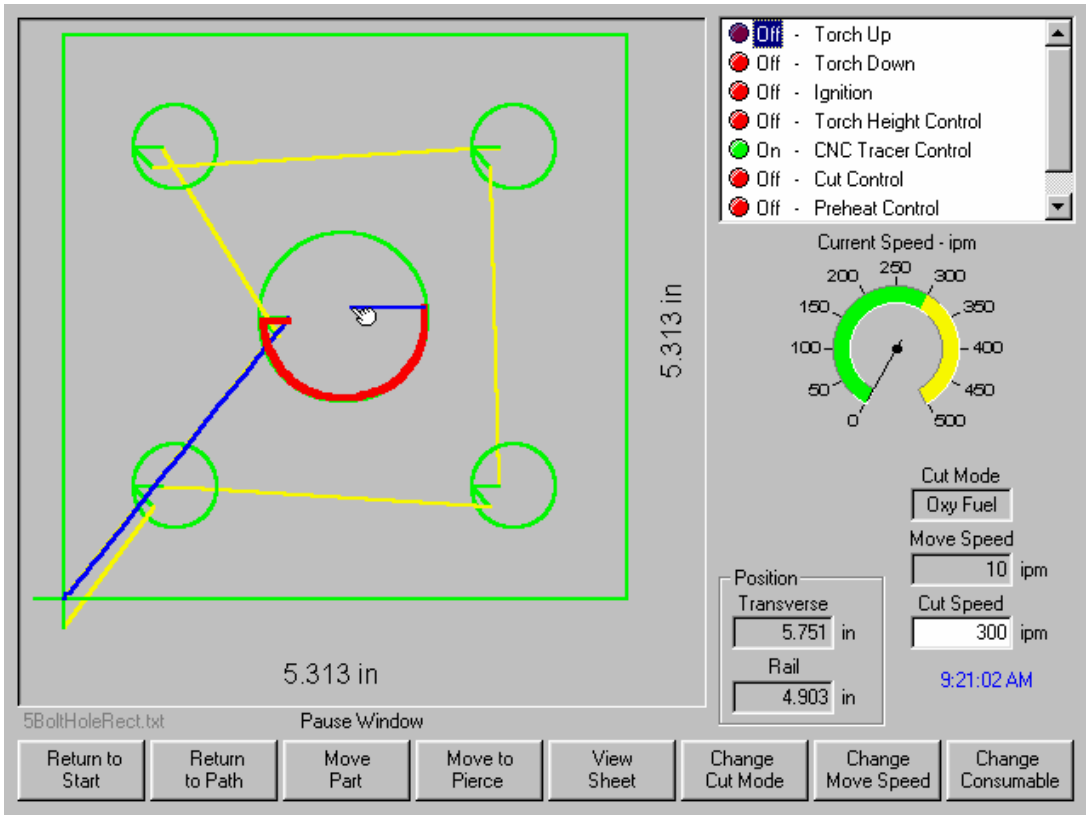
Type "B" configured units will switch between Test Run, Manual and Automatic.

**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.

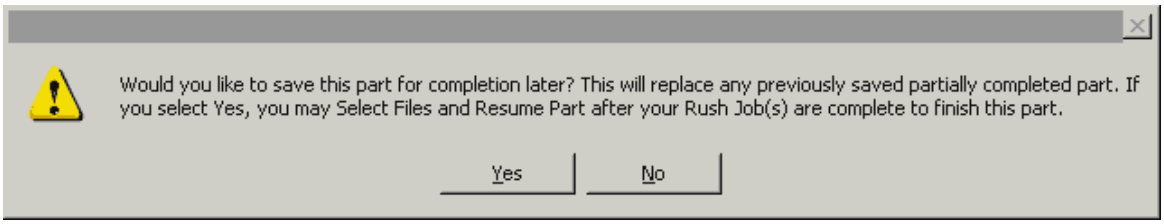
**Return to Path**
Pressing the Return to Path softkey in the Off-path Pause window returns the cutting device to the point on the cut path from which it was jogged away. Most useful for inspecting or replacing cutting device components after a cut loss and then returning to the cut loss point. When 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 softkey 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.

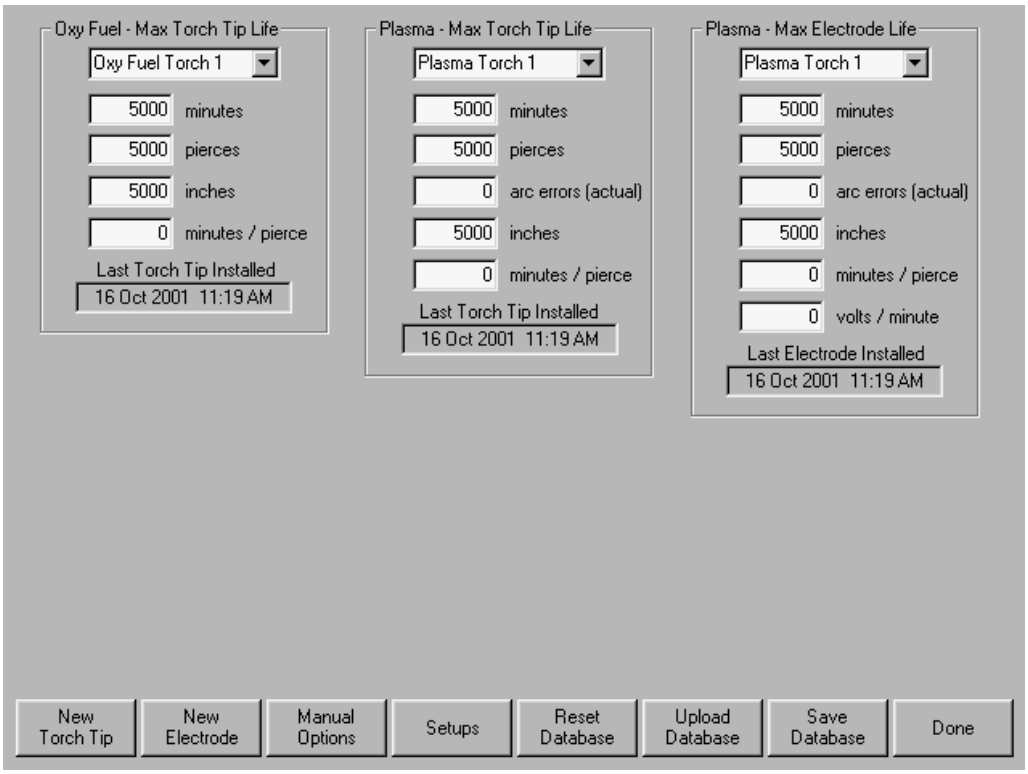



If the user selects YES, the Resume Last Part button will be viewable at the Files Screen. The user can then load and execute another part program and then return to the original part using the Resume Last Part softkey. The part program and position will be resumed.

## 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.



**Overview**
If the New Torch Tip or New Electrode softkey 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 and 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.

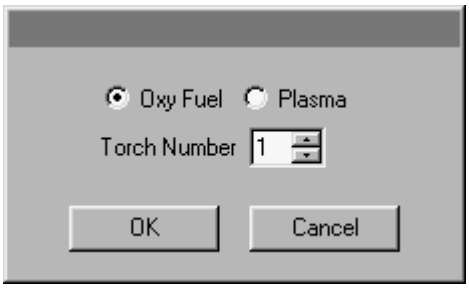
Note: These inputs are only available when the “Enable Plasma” input has been defined.

**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.

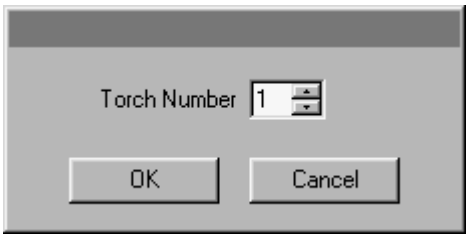
**Last Torch Tip Installed**
Displays the date and time when the selected tip was installed.

**Last Electrode Installed**
Displays the date and time when the selected electrode was installed.

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




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




**Setups**
Pressing the Setups softkey accesses the control setups for adjustment of the cut process.

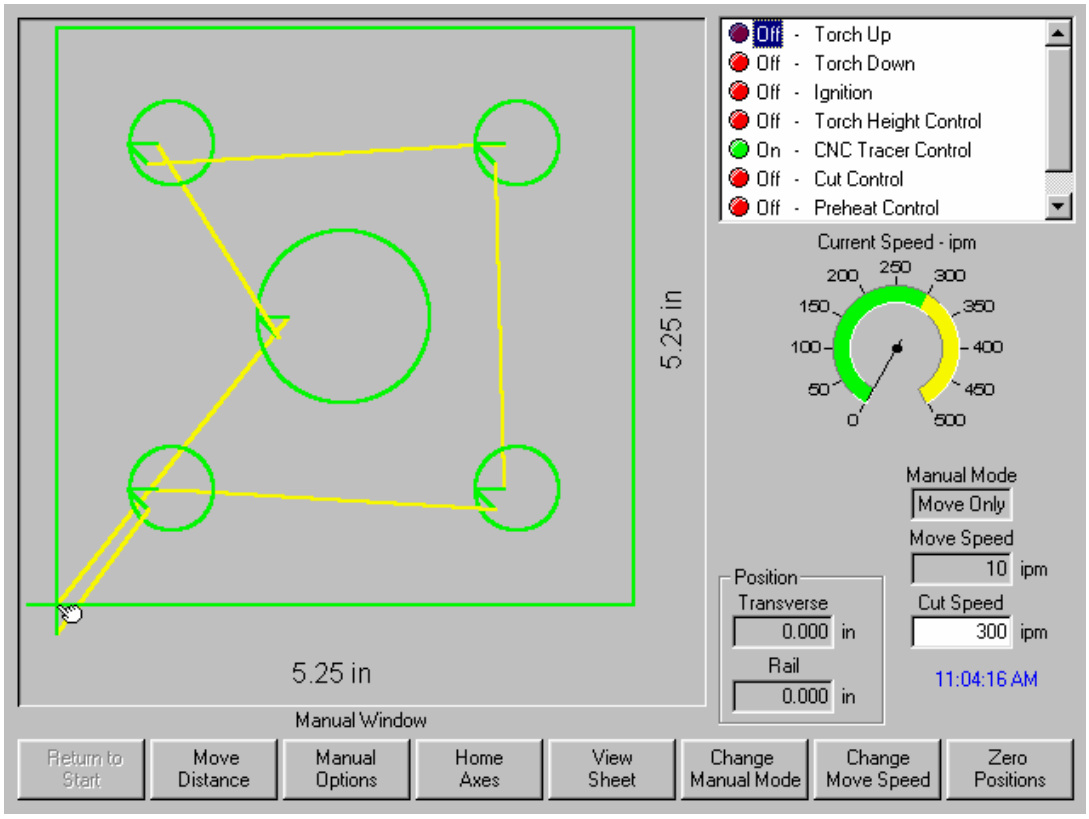
**Reset Database**
This softkey is used to reset the values in the database on the control, clearing the torch tip or electrode information after uploading or saving the database.

**Upload Database**
This softkey is used to upload the current database to a host computer running our link.

**Save Database**
This softkey is used to save the current database to the diskette.

# Section 10: Manual

After pressing the Manual key from the Main screen or Shape Library, the following screen is displayed.



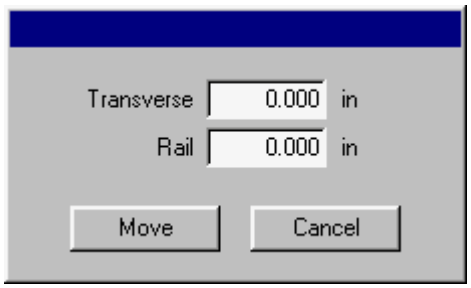

Whenever the manual keys are active, the cursor icon in the graphics display window will be in the shape of a tiny hand.

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 softkey 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.

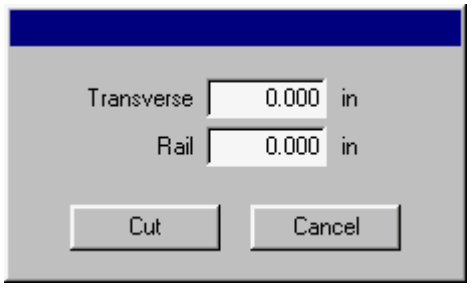
**Move Distance**
When Move Only is displayed in the Manual Mode window, the second softkey from the left changes to Move Distance, allowing manual moves of an exact distance to be performed. After pressing Move Distance, the control prompts the operator for Traverse and Rail distance values for machine 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 softkey 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.



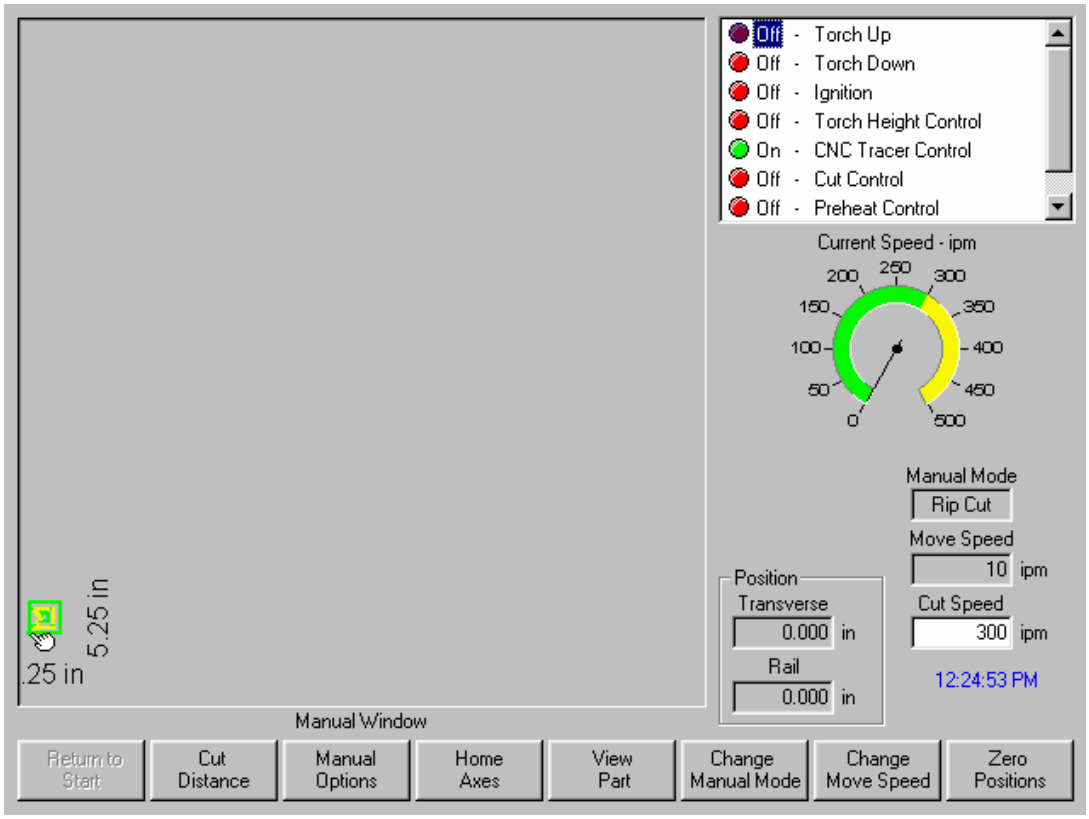

If you enter incorrect values, press the PREV or NEXT keys to highlight the incorrect field, then re-enter the value. To exit without causing motion, press the PREV or NEXT keys until the Cancel button is highlighted, then press ENTER or just press the CANCEL key at any time. After motion has begun, 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.

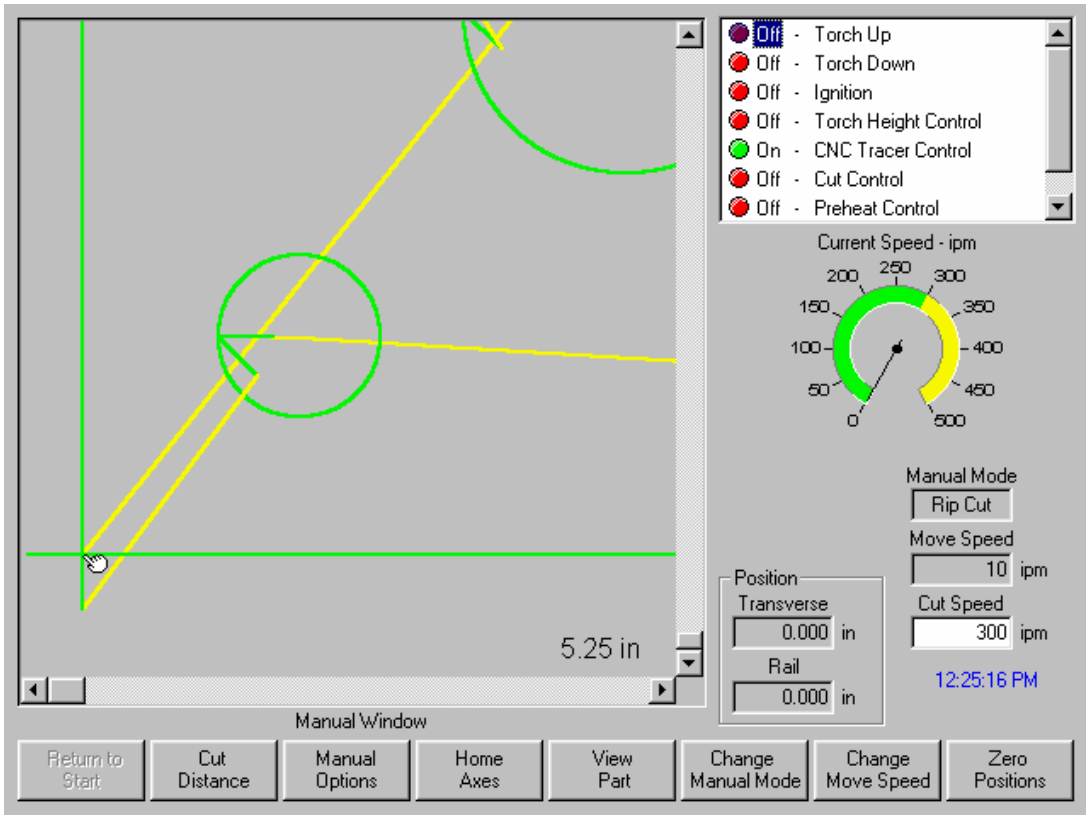
**Manual Options**
Pressing the Manual Options softkey accesses the Manual Options screen.

**Home Axes**
Pressing the Manual Options softkey 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 softkey, 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 a shift key and pressing the arrow keys. 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 softkey changes the control Manual Mode from Move Only to Rip Cut and vice versa. Pressing this softkey also causes the second softkey from the left to change function from Move Distance to Cut Distance. Rip Cutting is described in more detail below.

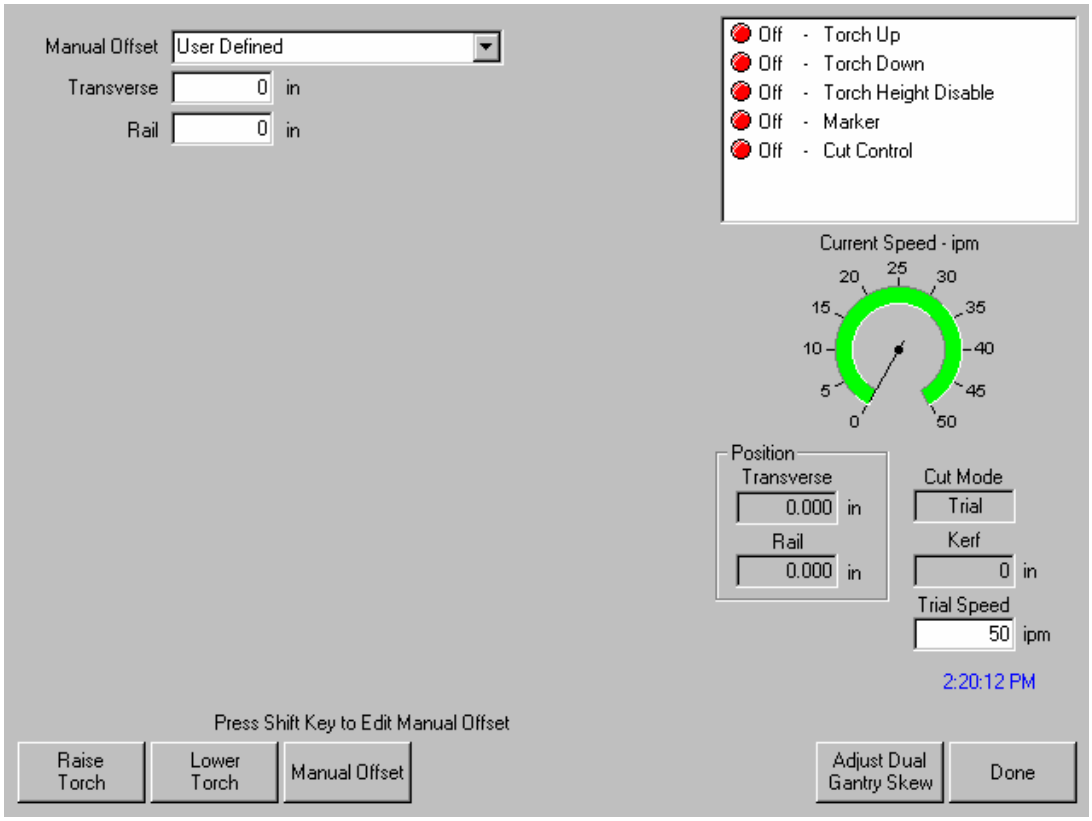
**Change Move Speed**
Is used to toggle through the four Move Speeds available. The four Move Speeds are the Maximum Machine Speed, High Jog Speed, Medium Jog Speed and Low Jog Speed from the Speeds setups.

**Zero Positions**
Pressing this softkey 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




**Raise Torch**
Raises the cutting torch while the softkey is pressed or until the Torch Up sense input is activated.

**Lower Torch**
Lowers the cutting torch while the softkey 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 softkey will keep the torch in the down position until the Lower Torch softkey 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:

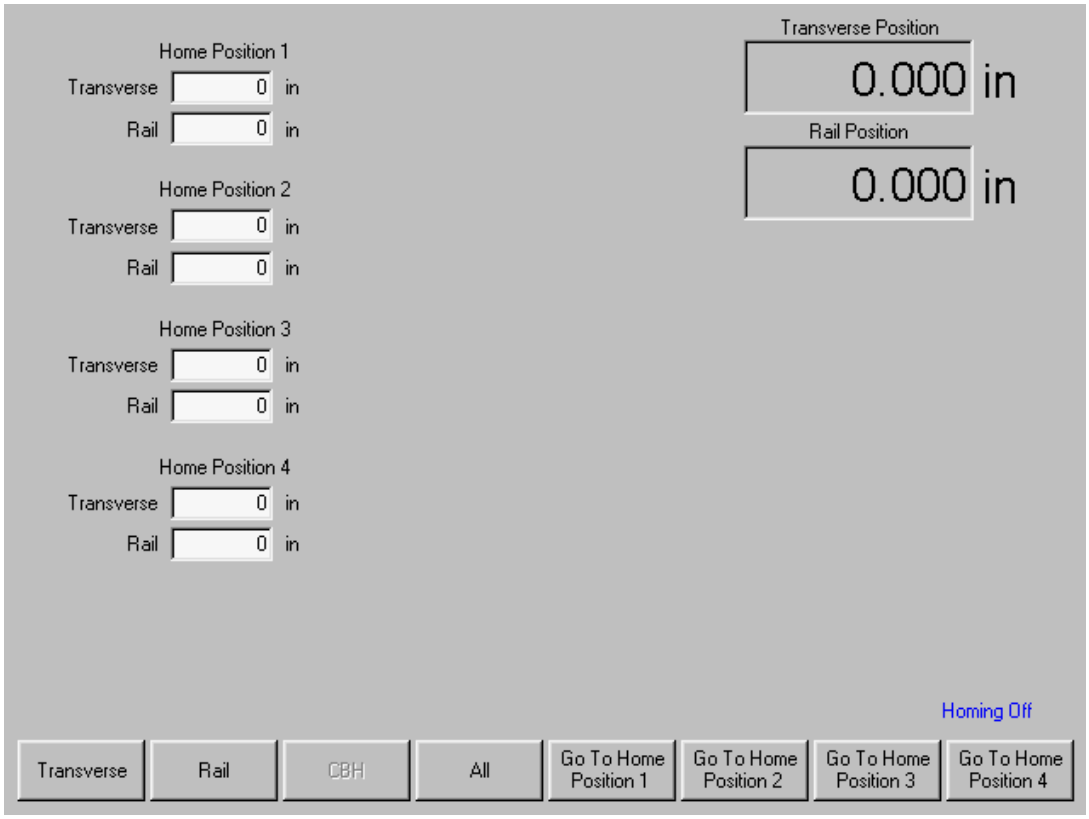
User Defined – Uses the selected X / Y Offset distance.
Laser pointer to Plasma 1 – Offset 10
Laser pointer to Plasma 2 – Offset 11
Laser pointer to Oxy Fuel – Offset 12

Press the purple or blue shift keys to edit the Manual Offset Parameters.

**Adjust Dual Gantry Skew**
Allows the operator to manually realign the Dual Gantry Axis using the directional 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 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 softkey 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 softkey 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.

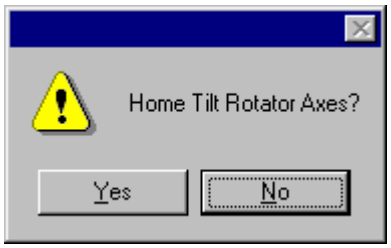
**CBH**
Pressing the CBH softkey causes the automated homing procedure to be executed. This procedure generally produces machine motion in the CBH axis, depending on the homing parameters set in the Setups.

**THC**
Pressing the THC softkey 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 softkey causes the automated homing procedure for the Tilt Axis to be executed.

**Rotate**
Pressing the Rotate softkey 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 softkey 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 softkeys 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.

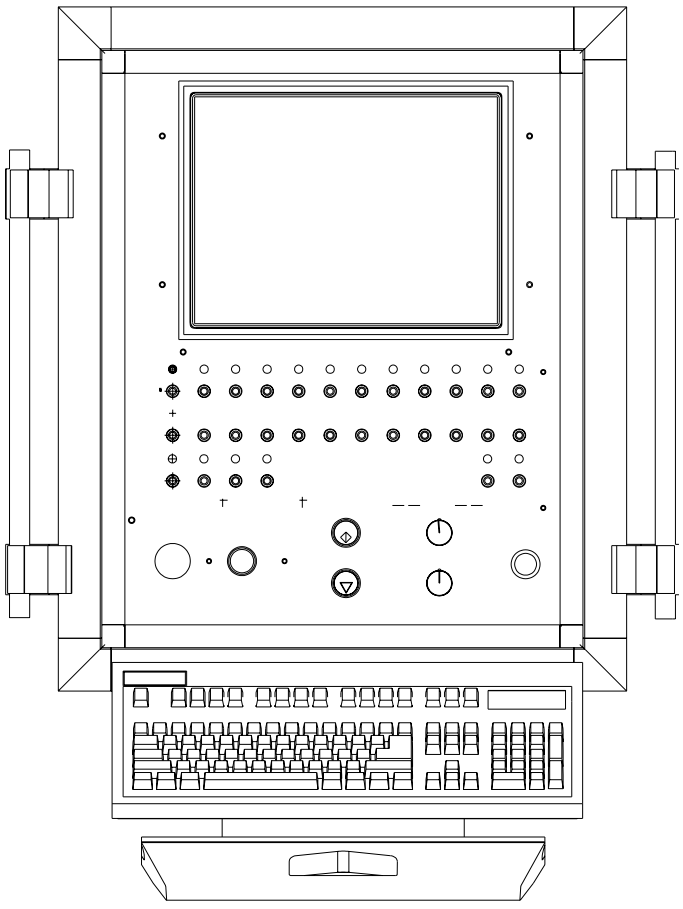
# Appendix A: Mariner™ & Voyager II™

The Voyager II™ and Mariner™ are Hypertherm's premier PC-based CNC Controls for the metal cutting industry utilizing our proprietary Graphical User Interface (GUI) and *SoftMotion*™ Technology. These products set the standard for operational features, ease of use and increased productivity in the shape cutting industry.

This Appendix is intended to note additional product features, highlight modified view screens and to familiarize the operator with the screen structure for these controls. Many view screens will change only slightly and this section will only reference the new features for that view screen. ***Note:*** The controls have the ability to control several cutting processes. View screens which simply duplicate the set up parameters or features for the additional process, have not been included.

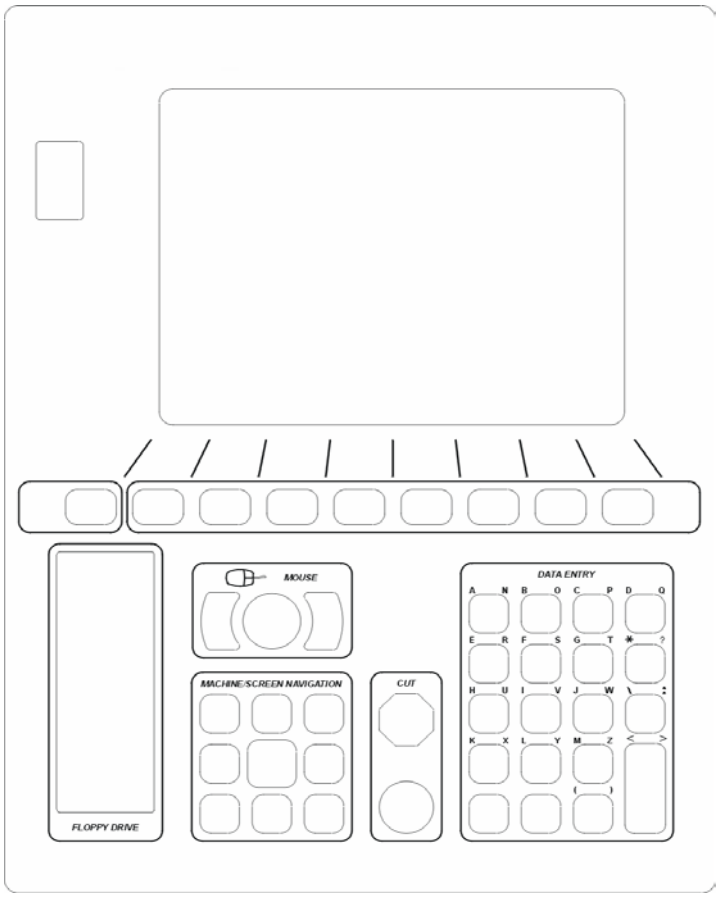
## Mariner™ Overview

Mariner ™ offers motion control operation of up to 12 axes with 1024 I/O signals with SERCOS™ Interface, providing a high degree of flexibility in operation and table configurations. This control system supports Multiple Sensor™ Torch Height Controls, Tilt / Rotate, Dual tilt / Rotate and Dual Transverse motion axes along with direct communication to Hypertherm's HD3070® HyDefinition® Autogas Console, HD4070® HyDefinition® and HPR 130™ Plasma systems. A unique Laser process screen directly integrates to Hypertherm's *FAST*Laser head. This product uses type "v" software.

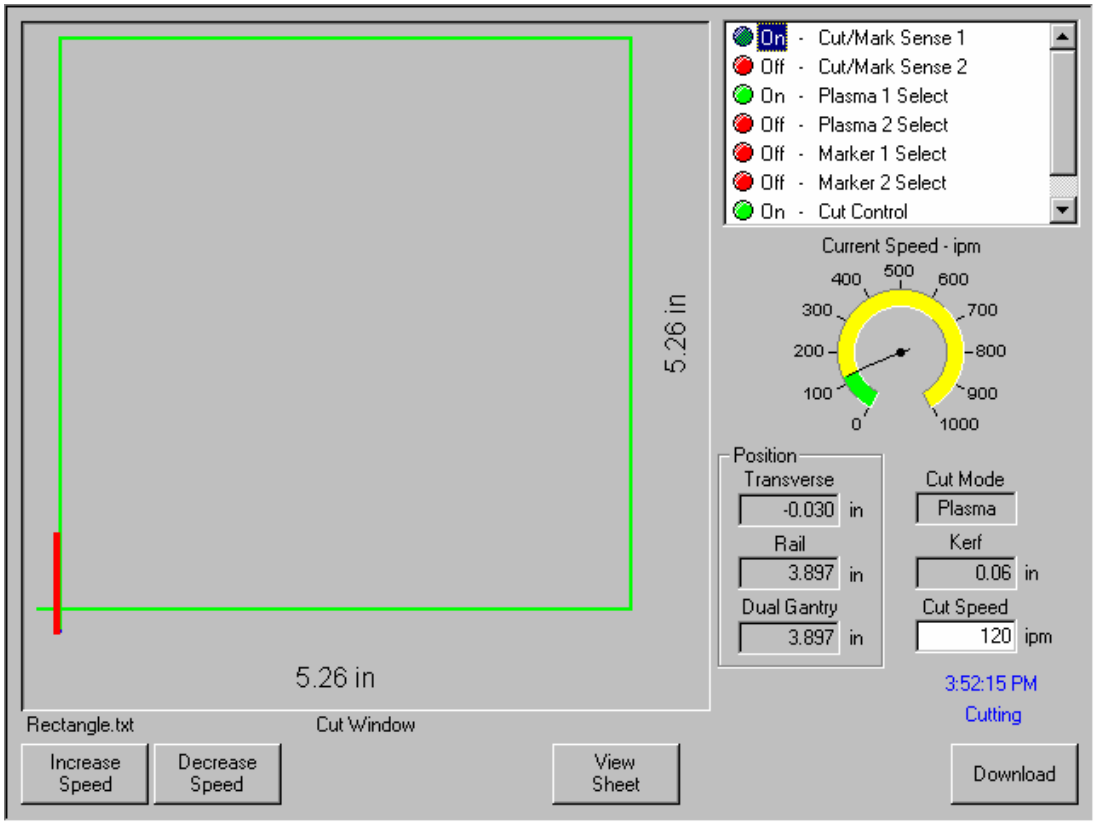


## Voyager II™ Overview

Voyager II™ offers motion control operation of up to six axes with 64 I/O signals, providing a high degree of flexibility in operation and table configurations. This control system supports Multiple Sensor™ Torch Height Controls, Tilt / Rotate axes and direct communication to Hypertherm's HD3070® HyDefinition® Autogas Console, HD4070® HyDefinition® and HPR 130™ Plasma systems.



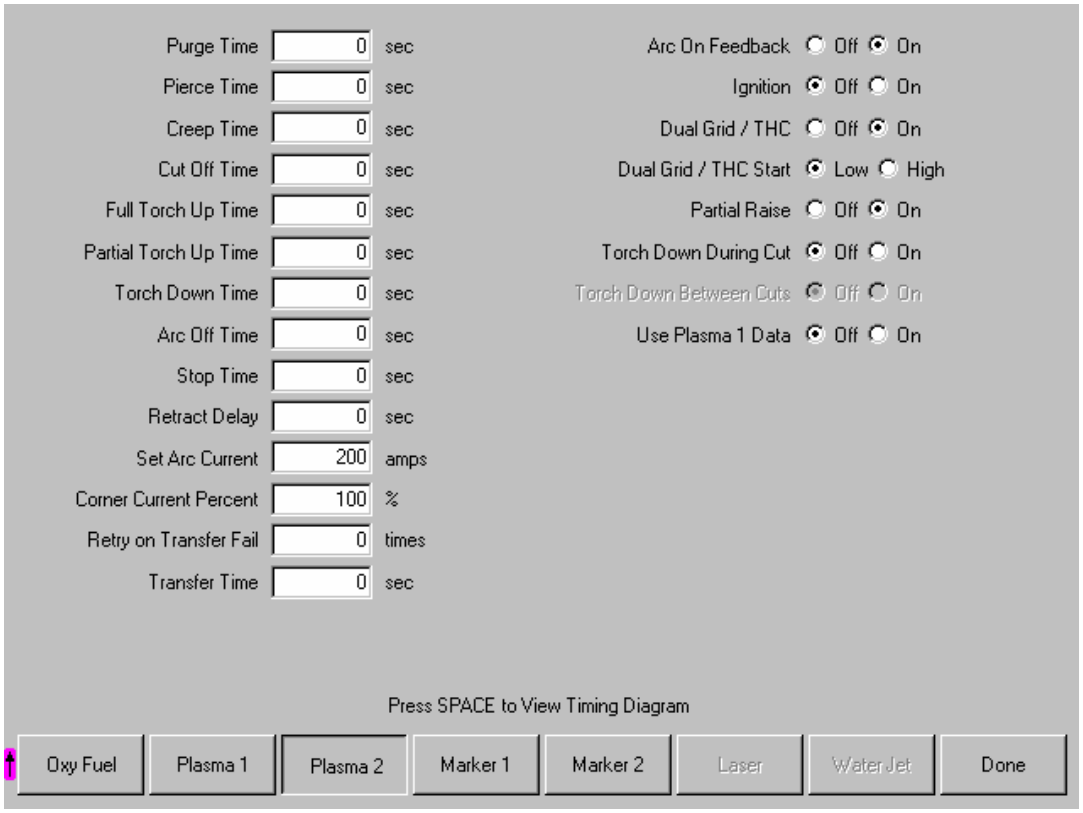
## Cutting




As previously mentioned, the Mariner™ and Voyager II™ Shape cutting controls support multiple Cut and Marker processes. This allows the control to support different Plasma and Marker systems with very different timing within a single part program. To select which process is to be used by the control, a Plasma or Marker Select input is required. Please refer to the I/O information in this Appendix for additional information on the Plasma Select and Marker Select Inputs.

# Setups

## Cut Types




The Cut types setup screen is similar to those previously outlined in this guide with the exception that the Mariner ™and Voyager II™ Controls offer multiple Plasma and Marker process screens.

**Use Plasma 1 Data**
The Use Plasma 1 Data setup parameter is used to force all Plasma 2 process setup parameters to use the Plasma 1 process timing data. This allows simple modification to both Plasma setup screens when both Plasma systems being used are similar and require the same process timing.

**Use Marker 1 Data**
The Use Marker 1 Data setup parameter is used to force all Marker 2 process setup parameters to use the Marker 1 process timing data. This allows simple modification to both Marker setup screens when both Marker systems being used are similar and require the same process timing.

## 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 power supply 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.

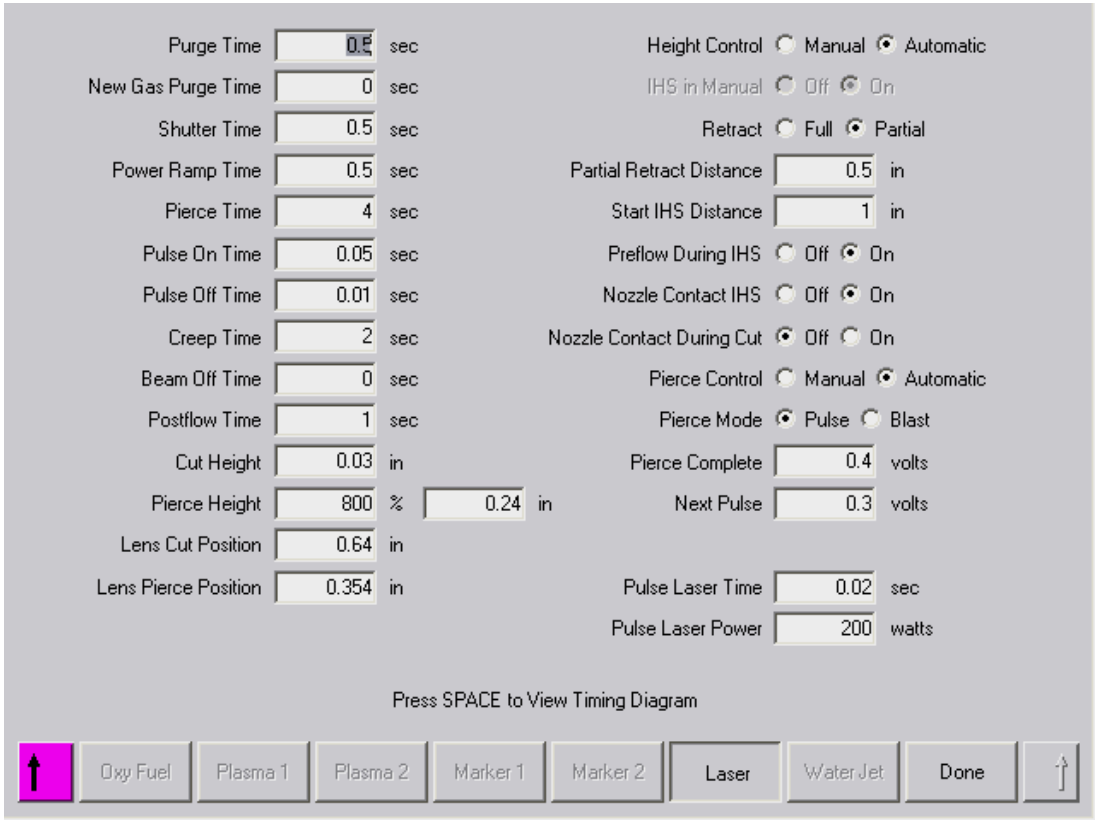
With this technology, Hypertherm has introduced a line of laser cutting heads that utilize the *FAST* Laser™ process to deliver up to a 20% increase in cut speed over standard $CO_2$ laser heads on plate steel while also significantly expanding the capacity and quality range of plate laser cutting systems. 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 LH21XX 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 only 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

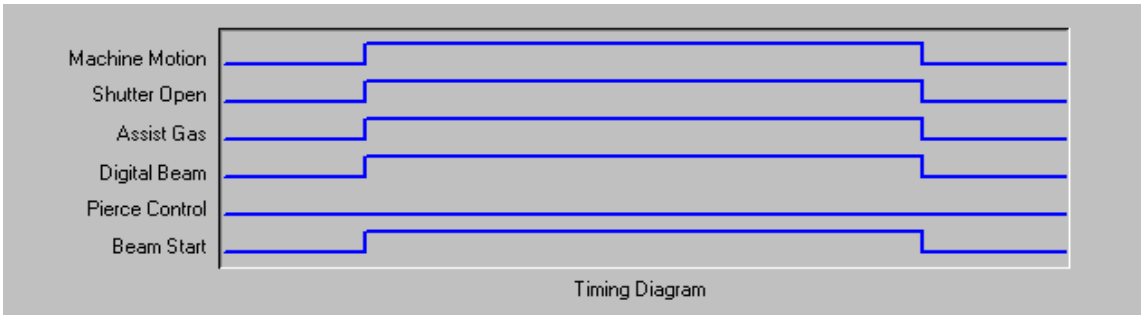
### Laser Cut Types Screen




The Purple arrow at the left edge of the softkeys indicates additional softkeys are available. Pressing the shift key or the Opening Square Bracket Key " [ " on the keyboard, this allows for test lifter function to be available.


**Test Lifter**
Pressing the Test Lifter softkey or "F8" will command the laser head THC1 lifter to lower to the plate, sense the plate and retract to the pierce height.

Press the Space 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 he 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 Sensor THC (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 gases 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 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.

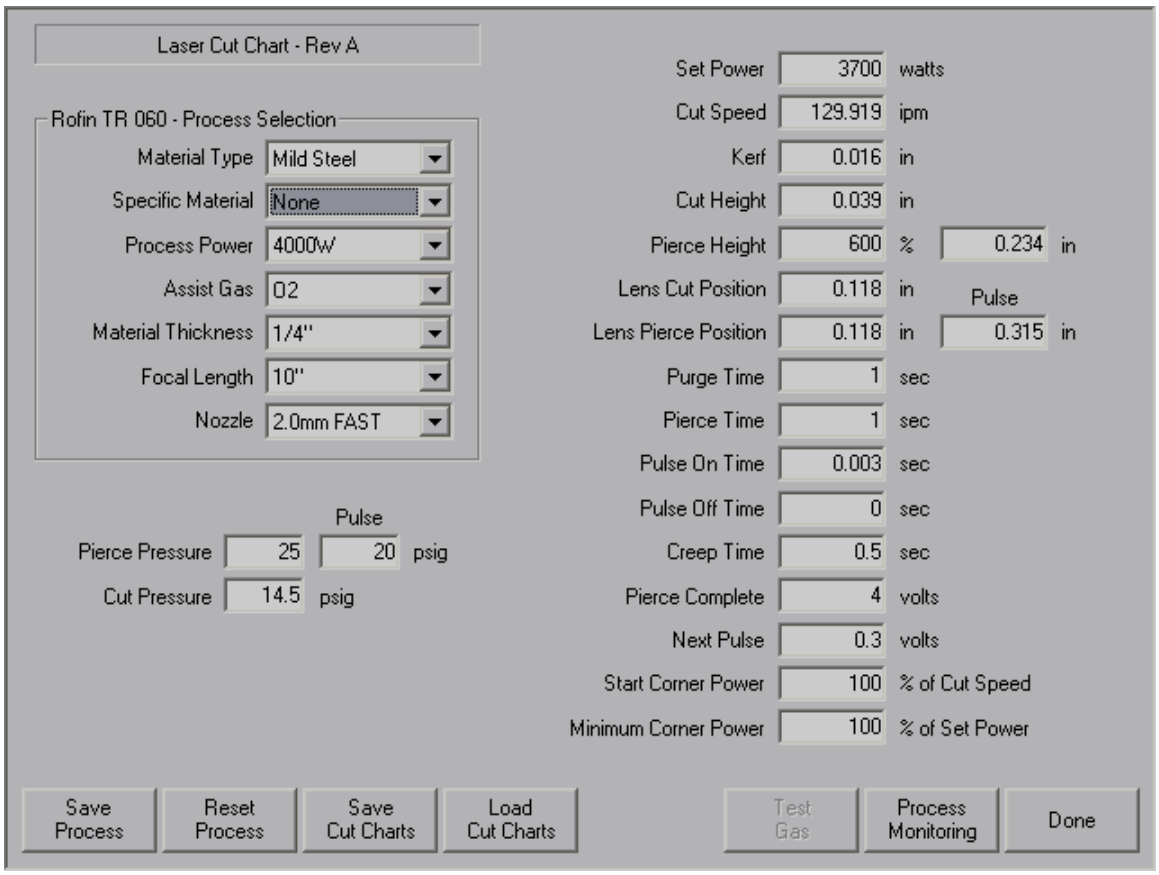
**Next Pulse**
Based on sensors in the laser head, the system can determine when the next Laser Pulse is delivered during Automatic Pierce control. The voltage is derived from the feedback of the sensors in the laser cutting head.

**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. Pressing the Plus key “+” to enter an new values or names; or the Minus key “-“ to delete undesired values or names

One access method to the Cut Chart data is available from the Cut Types screen by pressing the shift key which is the “ [ “ Key “opening-square-bracket” on the keyboard or purple key and “F1” together. Another access method to the Cut Charts data is available from the Main Cutting Screen. Press the shift key which is the “ [ “ and “F6” together.

## Laser Cut Chart Screen.




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. Press the Plus key "+" to enter an new material name or "-" to delete.

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

**Assist Gases**
The appropriate Assist Gases 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 softkey 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.

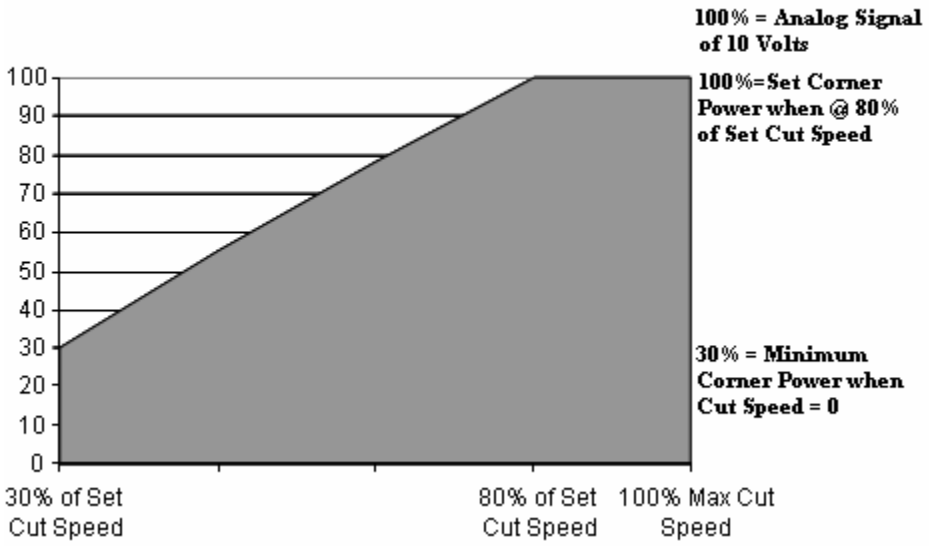
**Pierce Complete**
The Automatic Pierce monitors voltage of sensors in the laser head to detect completion of the pierce. This is used in conjunction with Pulse On Time, Pulse Off Time and next pulse.

**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.

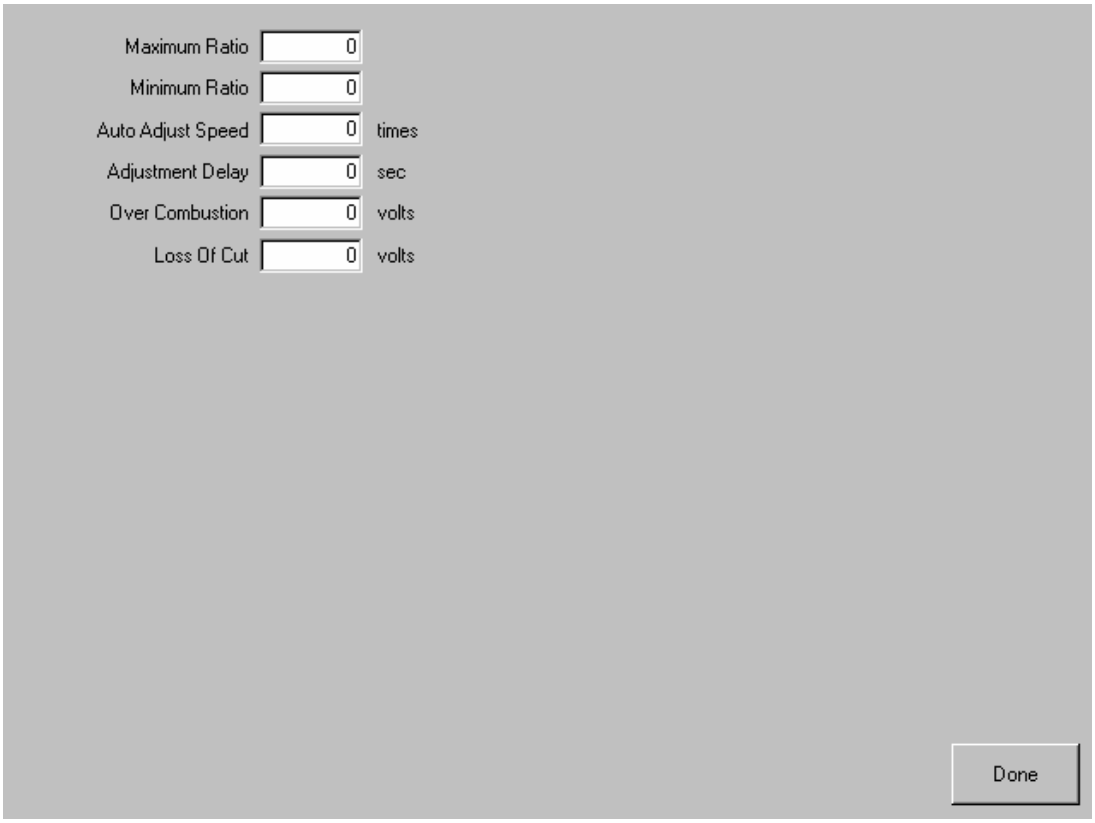
**Start Corner Power**
The Start Corner Power allows the user to define a speed where the corner power analog signal will be used to start to decrease laser power. This is defined as a percentage of cut speed. See Corner Power graph, where the example shows this set to 80%.

**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**



**Laser Process Monitoring**




**Maximum Ratio**
The Automated Process monitoring uses sensors within the laser head to make adjustments based on the ratio of the feedback from laser head sensors. The user sets the maximum and minimum values for operation.

**Minimum Ratio**
The Automated Process monitoring uses sensors within the laser head and makes adjustments based on the ratio of the feedback from these sensors. The user sets the maximum and minimum values for operation.

**Auto Adjust Speed**
The Automated Process Monitoring controls the adjustments for speed of the operation. The user selects how many times the Auto Adjust Speed process can automatically adjust.

**Adjustment Delay**
This sets the value for delays between process adjustments.

**Over Combustion**
This sets the value for detection of over combustion based on voltage from the laser head sensors.

**Loss of Cut**
This sets the value for detection of over combustion based on voltage from the laser head sensors.

**Save Data**
Pressing the Save Data softkey 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.

**Process Defaults**
Pressing the Process Defaults softkey allows the user to reset the current settings to factory recommend factory defaults based on the eight process variables selected.

**Save Database**
Pressing the Save Database softkey allows the user to save the current User and Factory databases to diskette. User files are designated with a .usr file extension and the factory files are designated with a .fac file extension

**Load Database**
Pressing the load Database softkey 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.

**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 Sensor THC (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 gases 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.

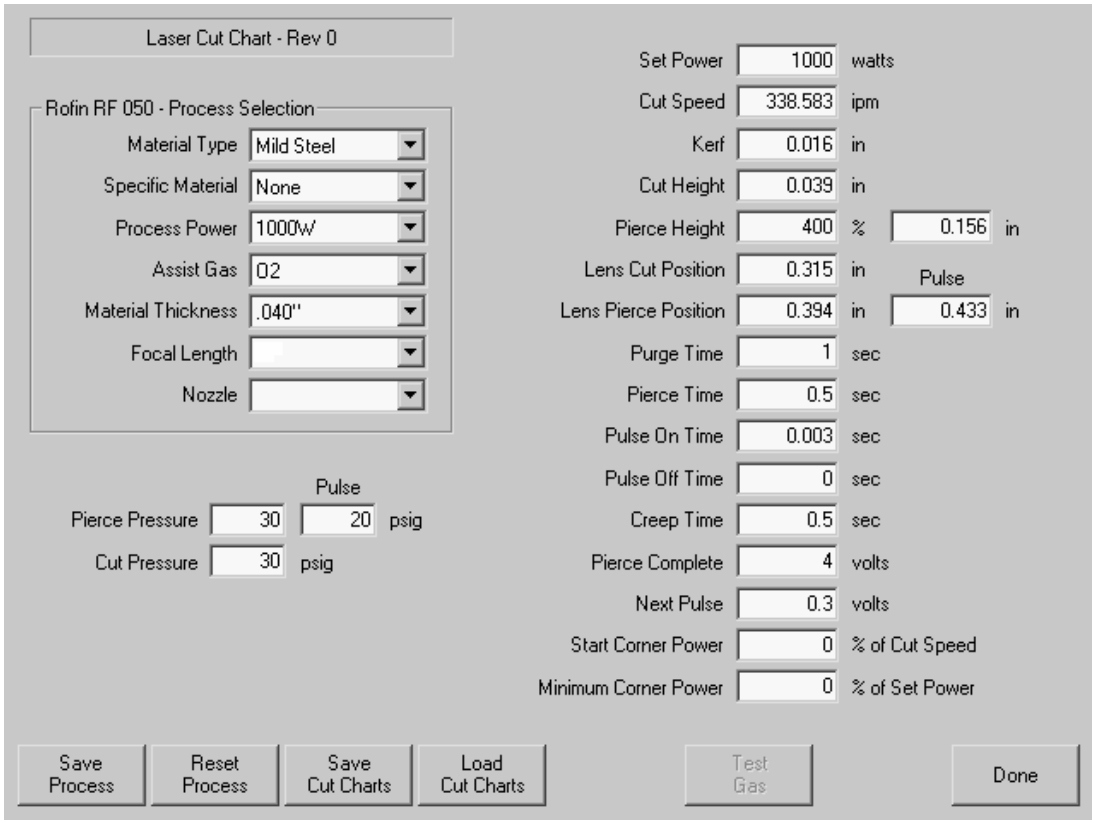
**Cut Chart**
A cut chart database allows the user to select factory recommended settings or amend the database for personalized settings. The Cut Chart information can be saved or loaded via the hard drive, floppy drive or USB memory stick. The Cut Chart files contain the factory recommended settings 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. Pressing the Plus key “+” to enter an new values or names; or the Minus key “-“ to delete undesired values or names

One access method to the Cut Chart data is available from the Cut Types screen by pressing the shift key which is the “ [ “ Key “opening-square-bracket” on the keyboard or purple key and “F1” together. Another access method to the Cut Charts data is available from the Main Cutting Screen. Press the shift key which is the “ [ “ and “F6” together.

**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 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®.

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




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. Press the Plus key "+" to enter an new material name or "-" to delete.

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

**Assist Gases**
The appropriate Assist Gases for the desired process.

**Material Thickness**
The desired material thickness for the selected process.

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

**Nozzle**
Diameter of the nozzle that needs to be installed for the desired process.

***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.

**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 plate.

**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 Lens Cut Position distance.

**Lens Pierce Position**
Sets the Lens Pierce Position distance.

**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 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.

**Pulse On Time**
When Automatic Pulse Mode is selected for pierce control the user can select Pulse on and off 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.

**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.

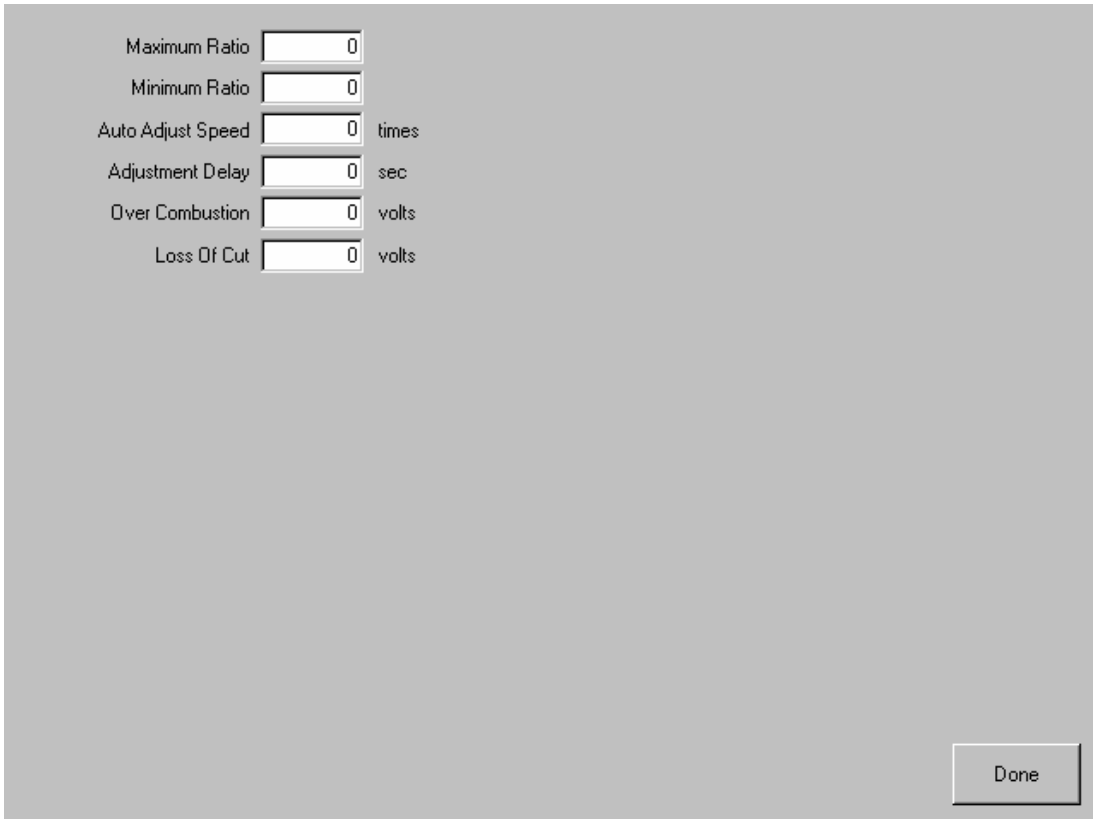
**Pierce Complete**
The Automatic Pierce monitors voltage of sensors in the laser head to detect completion of the pierce.

**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 corner for power switching. This is defined as a percentage of cut speed.

**Minimum Corner Power**
This allows the laser resonator to switch to a low power mode in corners. This is defined as a percentage of selected power (watts ).

**Laser Process Monitoring**



**Maximum Ratio**
The Automated Process monitoring uses sensors within the laser head to make adjustments based on the ratio of the feedback from laser head sensors. The user sets the maximum and minimum values for operation.

**Minimum Ratio**
The Automated Process monitoring uses sensors within the laser head and makes adjustments based on the ratio of the feedback from these sensors. The user sets the maximum and minimum values for operation.

**Auto Adjust Speed**
The Automated Process Monitoring controls the adjustments for speed of the operation. The user selects how many times the Auto Adjust Speed process can automatically adjust.

**Adjustment Delay**
This sets the value for delays between process adjustments.

**Over Combustion**
This sets the value for detection of over combustion based on voltage from the laser head sensors.

**Loss of Cut**
This sets the value for detection of over combustion based on voltage from the laser head sensors.

**Save Data**
Pressing the Save Data softkey 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.

**Process Defaults**
Pressing the Process Defaults softkey allows the user to reset the current settings to factory recommend factory defaults based on the eight process variables selected.

**Save Database**
Pressing the Save Database softkey allows the user to save the current User and Factory databases to diskette. User files are designated with a .usr file extension and the factory files are designated with a .fac file extension

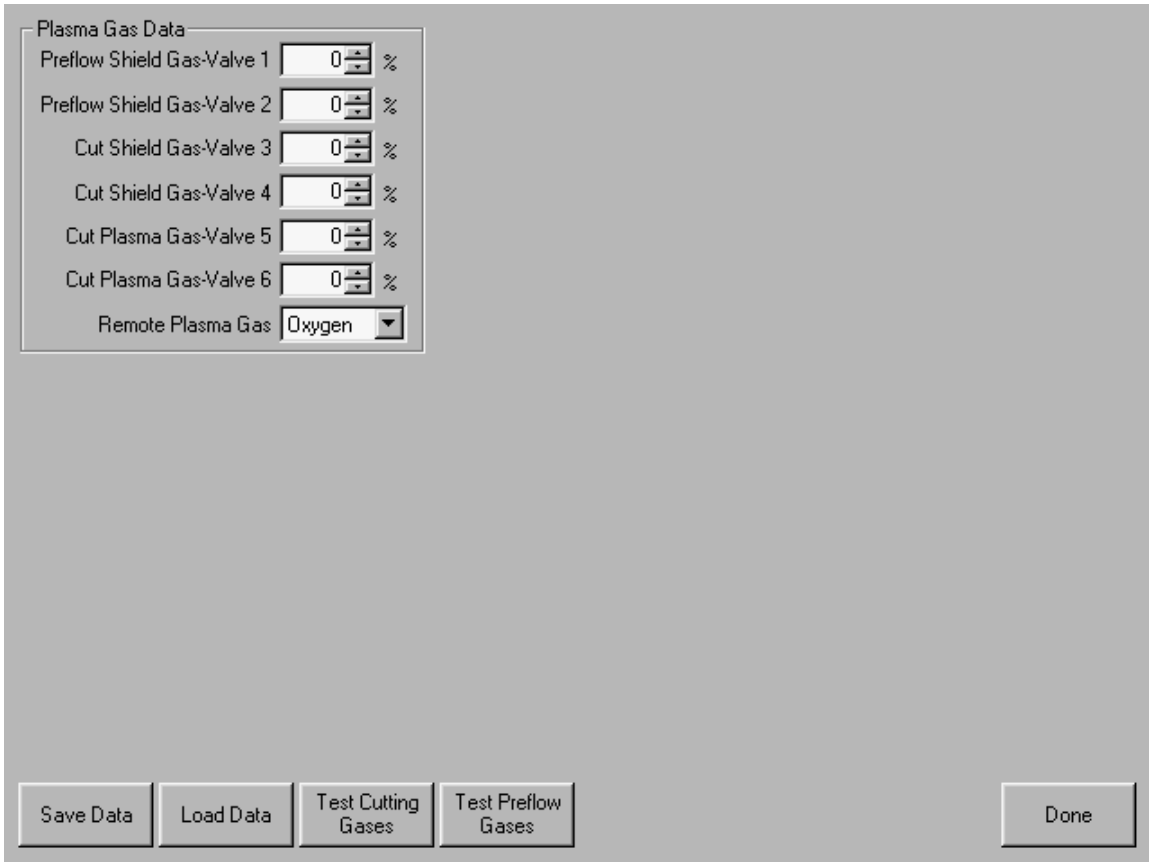
**Load Database**
Pressing the load Database softkey allows the user to the factory default database files which are supplied by Hypertherm in a Text file ( .txt ), user files ( .usr ) or factory files ( .fac ) from diskette.

**Test Gas**
Pressing the Test Gas softkey performs the Test Gases feature at the Laser supply.

## 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.

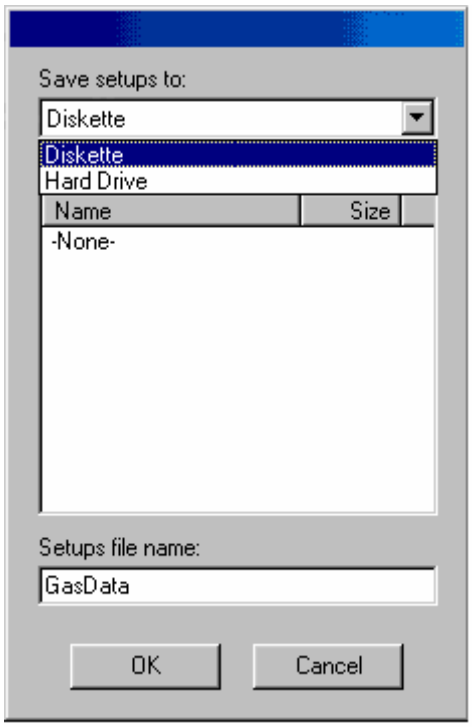



The top of the Auto Gas screen lists the valve parameter settings for the HD3070®. Valve settings for the 3070® Auto Gas console are documented in the HD3070® manual. When the values are set, these become the current setting and the operator can choose to save the file to the diskette or hard drive.

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 softkey will allow the operator to save the current Auto Gas setting to diskette or hard drive for future use.

**Load Data**
Pressing the Load Data softkey will allow the operator to Load stored Auto Gas settings from diskette 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 softkey allows the operator to test the HD3070® Cut Gases.

**Test Preflow Gases**
Pressing the Test Preflow Gases softkey allows the operator to test the HD3070® 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® and HPR130™ Overview

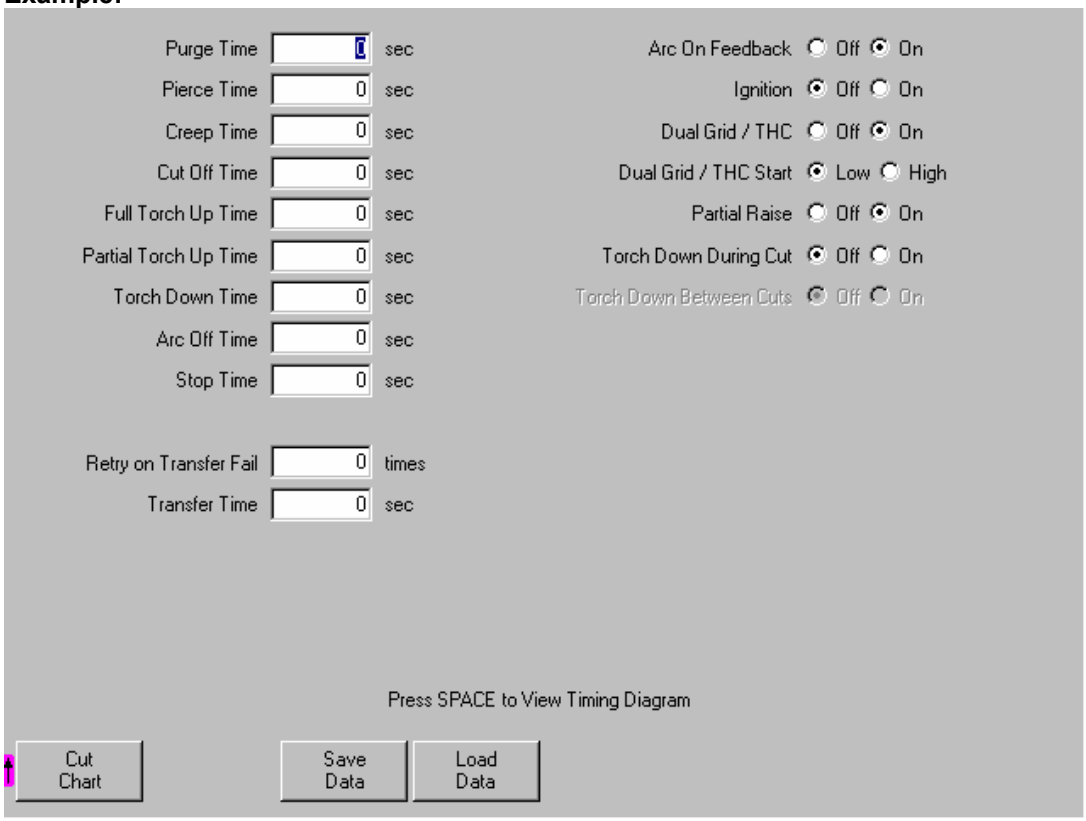
The Mariner ™ and Voyager II™ controls offer the additional option of interfacing directly to Hypertherm's HD4070® HyDefinition® and HPR130™ Plasma Supplies for setup. This feature has the ability to improve power supply setup and operational accuracy while having the flexibility to fine tune the process 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®.

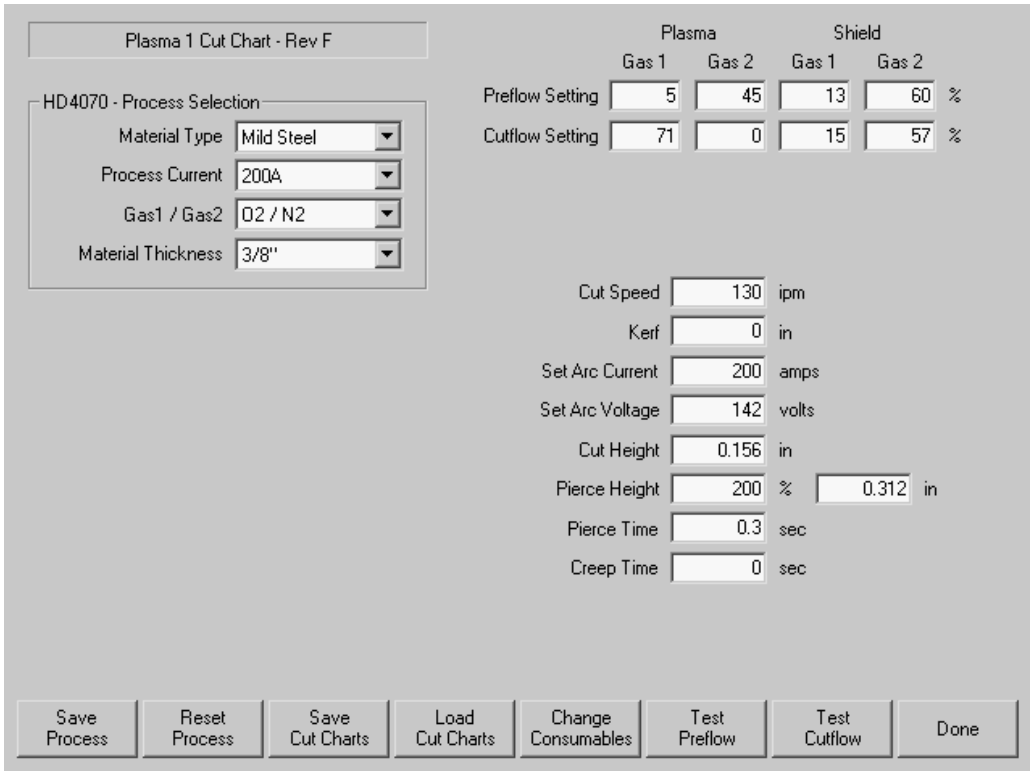
Access to the Cut Chart data is available from the Plasma Cut Types or Marker Cut Types screen using the shift key, as indicated below. The Plasma Supply parameters must first be enabled in the password protected Station Configuration setups to allow the Cut Chart Information for the Plasma Supply to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

**Example:**




Note: Screen information will vary depending on THC selection.

**Cut Chart**




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 Data**
Pressing the Save Data softkey 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.

**Process Defaults**
Pressing the Process Defaults softkey allows the user to reset the current settings to factory recommend factory defaults based on the eight process variables selected.

**Save Database**
Pressing the Save Database softkey allows the user to save the current User and Factory databases to diskette. 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 Database**
Pressing the load Database softkey 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.

Factory text file names.

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

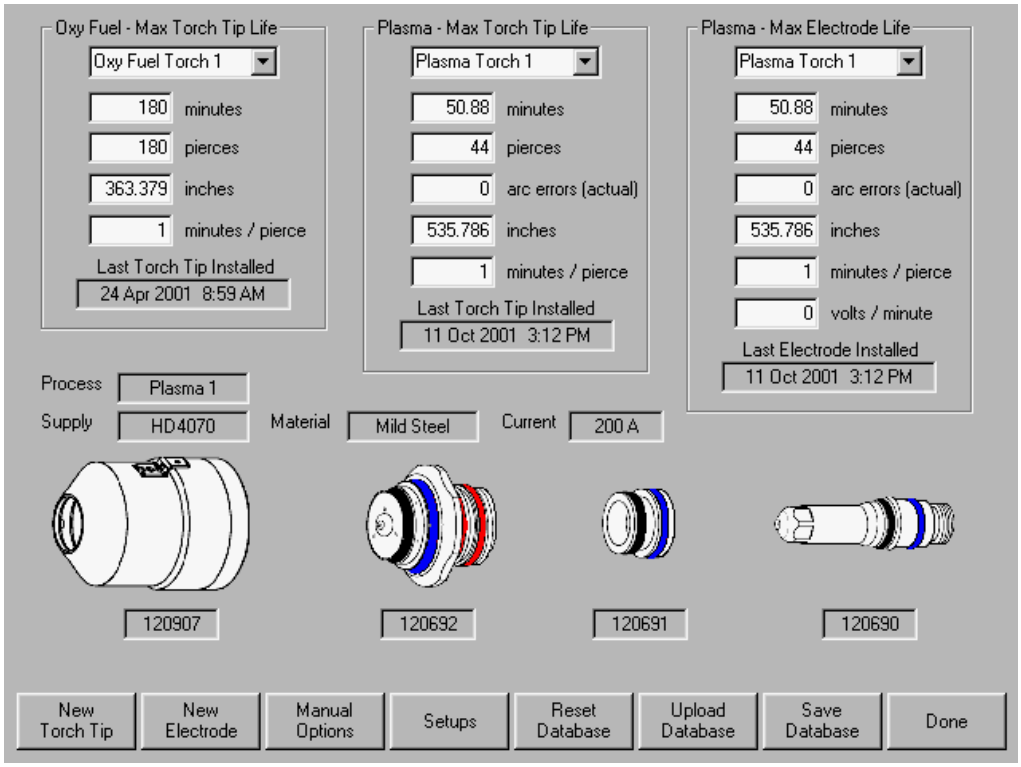
It is recommended that the Database be updated through the control rather than the Power Supply if the serial communications link is enabled.

**Test Preflow**
Pressing the Test Preflow softkey performs the Test Preflow Gases feature at the Plasma supply.

**Test Cutflow**
Pressing the Test Cutflow softkey performs the Test Cutflow 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




When the HD4070® feature has been enabled, consumable data information may be viewed at the Change Consumable screen.

## FineLine Overview

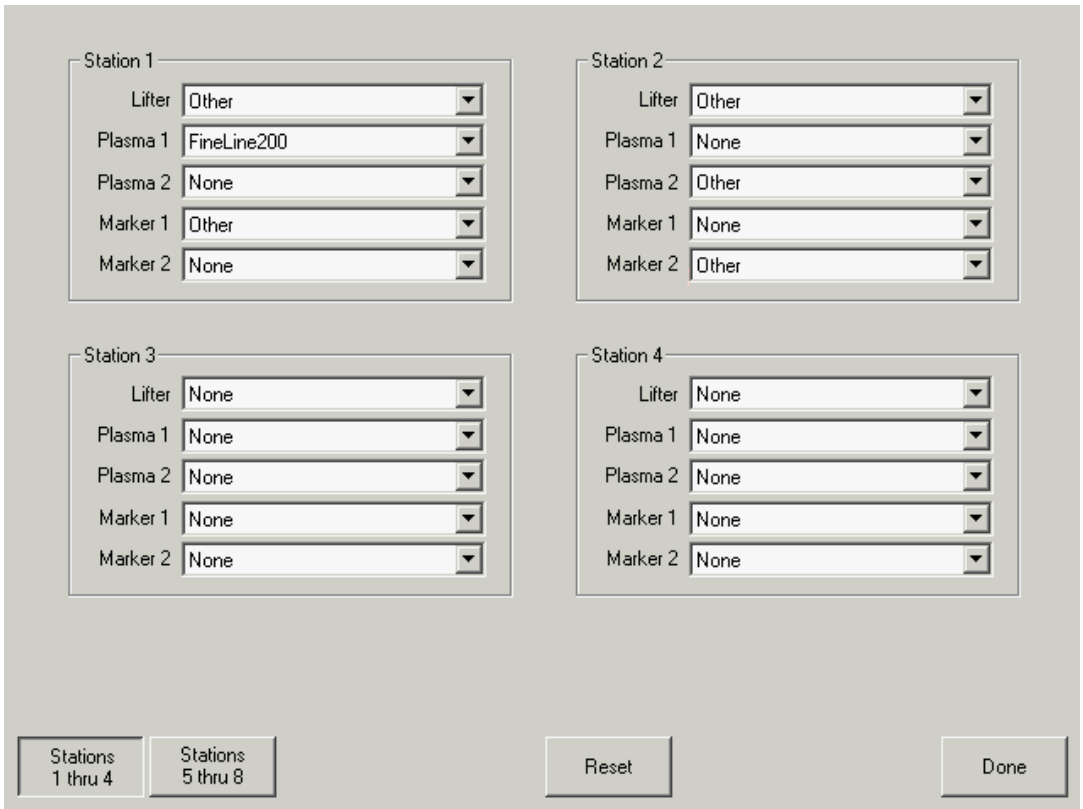
The "Type V" control offers the additional option of interfacing directly to InnerLogic's FineLine Power Supply for setup via a user selected RS-422 serial port. This advanced feature transmits all necessary power supply settings from the control directly to the FineLine power supply configuring it for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

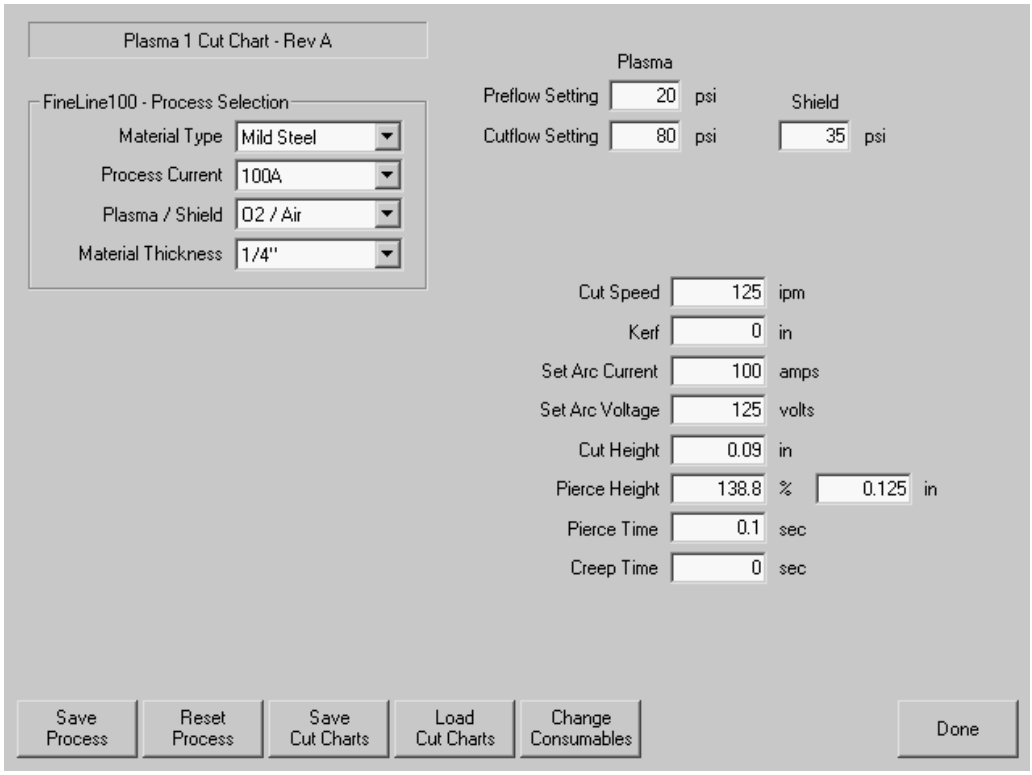


Access to the FineLine Cut Chart data is available from the Plasma Cut Types or Marker Cut Types screen using the shift key, as indicated below.

**Example:**


Note: Screen information will vary depending on THC selection.

**Cut Chart**




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 Data**
Pressing the Save Data softkey 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.

**Process Defaults**
Pressing the Process Defaults softkey allows the user to reset the current settings to factory recommend factory defaults based on the eight process variables selected.

**Save Database**
Pressing the Save Database softkey allows the user to save the current User and Factory databases to diskette. 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 Database**
Pressing the load Database softkey 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.

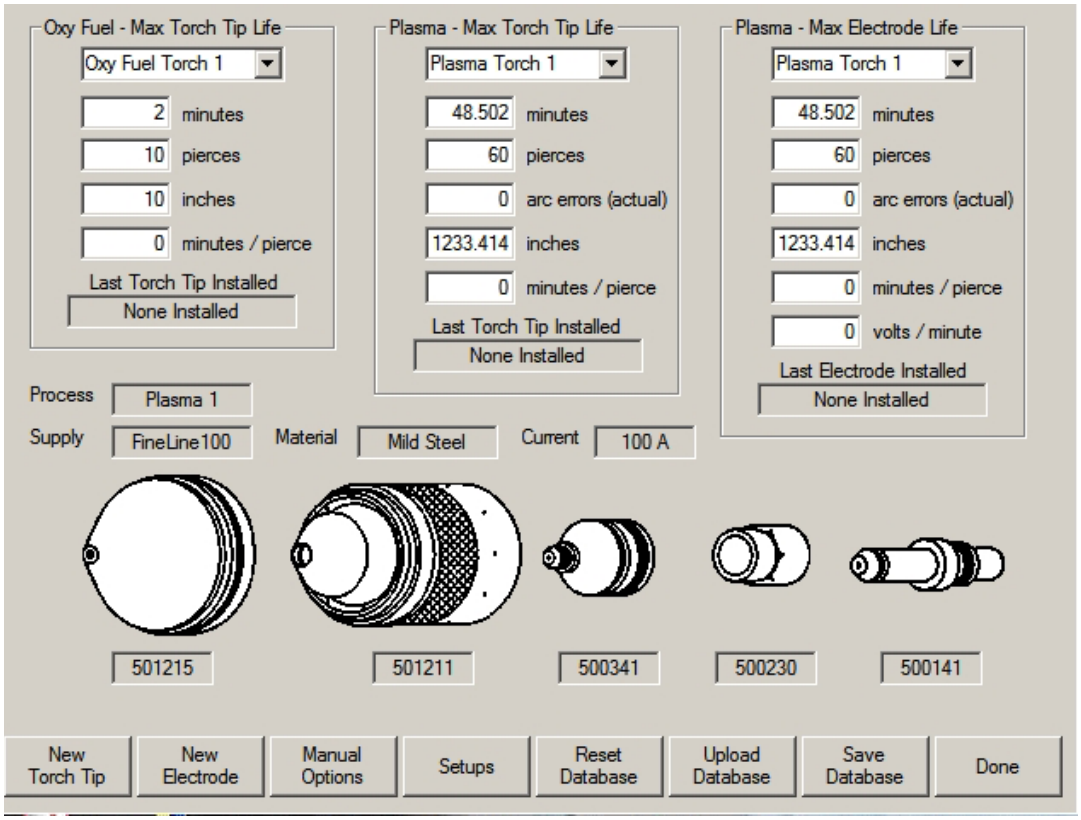
It is recommended that the Database be updated through the control rather than the Power Supply if the serial communications link is enabled.

**Test Preflow**
Pressing the Test Preflow softkey performs the Test Preflow Gases feature at the HD4070® Power supply.

**Test Cutflow**
Pressing the Test Cutflow softkey performs the Test Cutflow 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**




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

# Appendix B: 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.

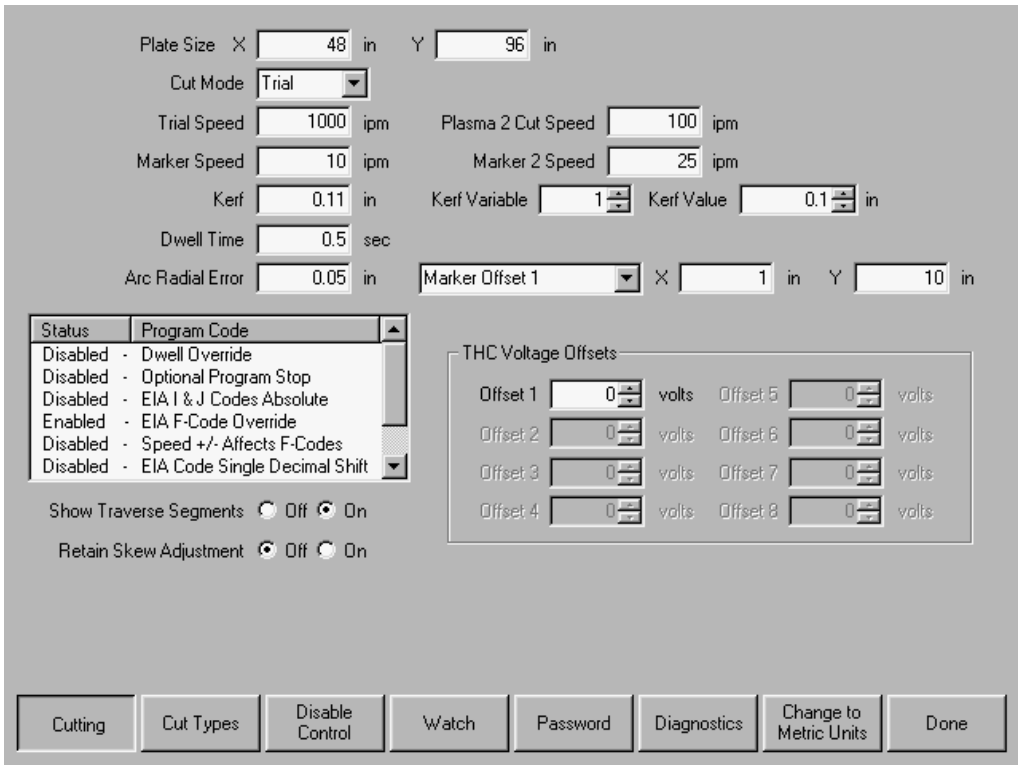
During the plasma cut process, variations in the distance between the torch tip and the cut material will affect the cutting arc voltage and ultimately, the quality of the cut. Through use of an automated torch height control to maintain the appropriate cut height for the set arc voltage, we are able 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$^{th}$ 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. Note: This feature is not available on control systems with the Type “B” or “M” interface 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

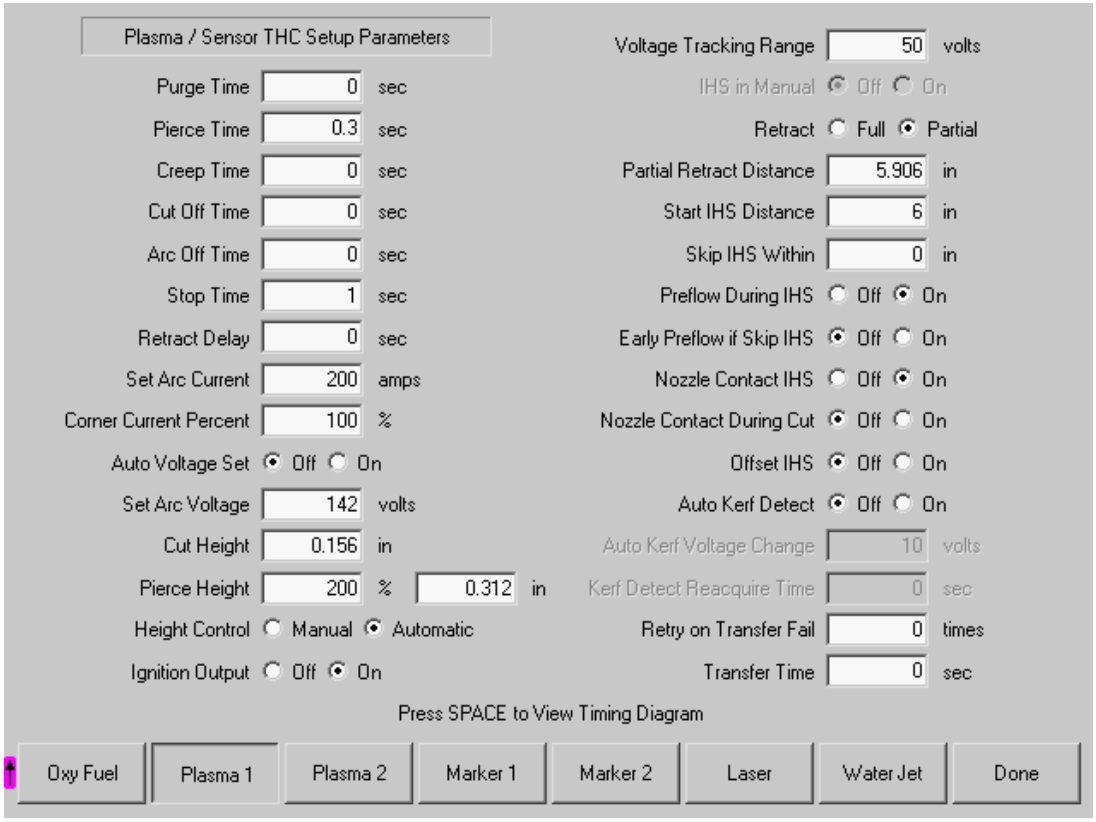



**THC Voltage Offset**
The THC Voltage Offset Parameter is used to offset the individual Sensor THC™ Arc Voltages from the master set Arc Voltage. This allows the individual THCs to be adjusted to compensate for consumable wear and obtain optimum cut quality.

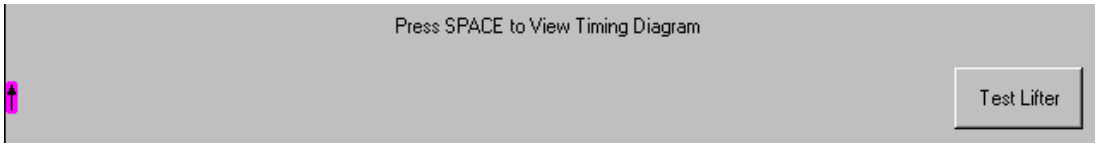
Note: The THC Voltage Offset parameter may be automatically adjusted using the Volts per Minute parameter of the Change Consumable feature. Please refer to the Change Consumable information in this guide for additional details.

# Plasma Setups

### I/O Configuration Type “P” and “V”



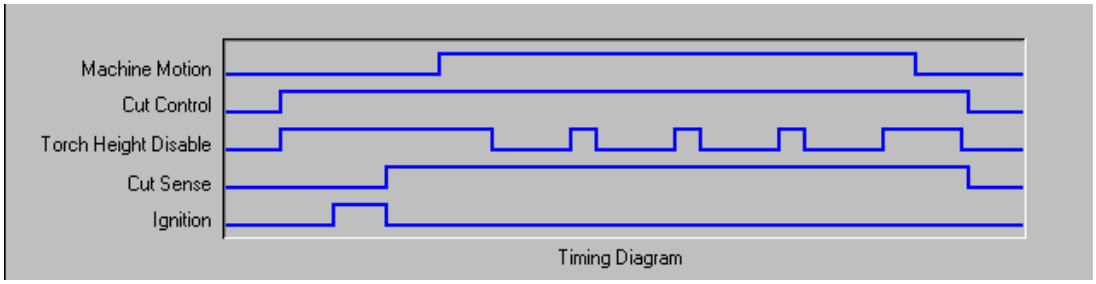

The Purple arrow at the left edge of the softkeys indicates additional softkeys are available. Pressing the shift key allows the test lifter function to be available.




**Test Lifter**
Pressing the Test Lifter softkey will command the torch lifter to lower to the plate, sense the plate and retract to the pierce height

**I/O Configuration Type "P" and "V"** (Timing Diagram)

Press the Space 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 setpoint.

**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.

**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.

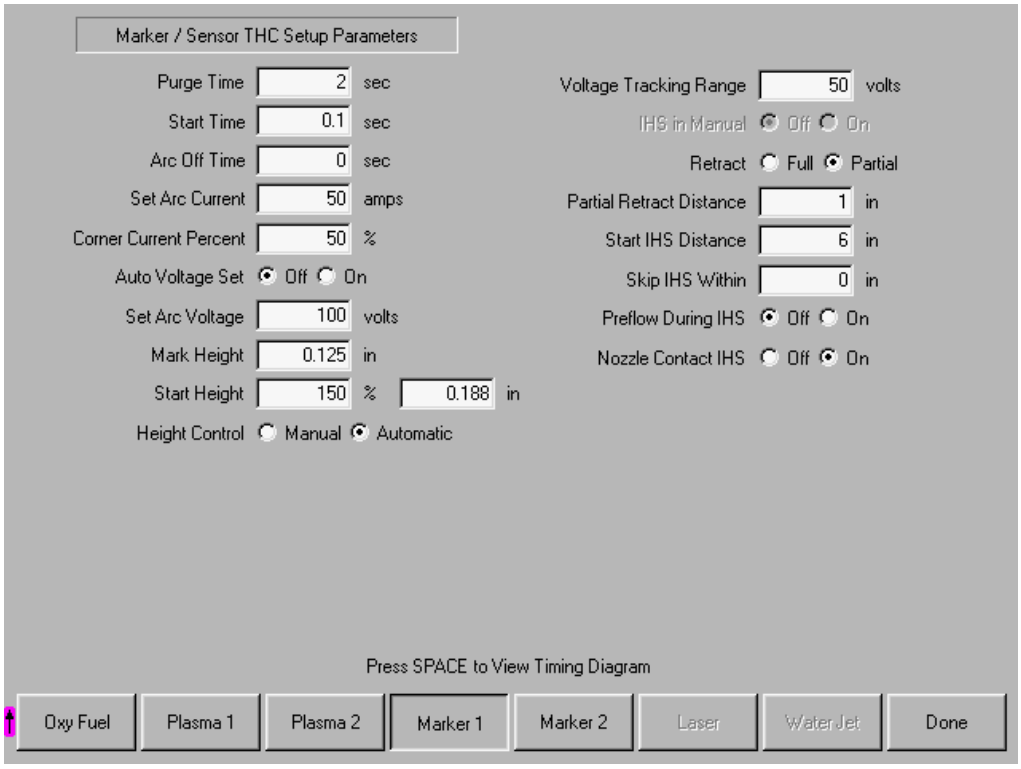
**Auto Kerf Voltage Change**
The Auto Kerf feature of the Sensor THC will detect a voltage change when the torch passes over a previous cut and will disable the THC to prevent the torch from diving. This setup parameter is used to specify the allowable variation from the voltage setpoint at which the 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.

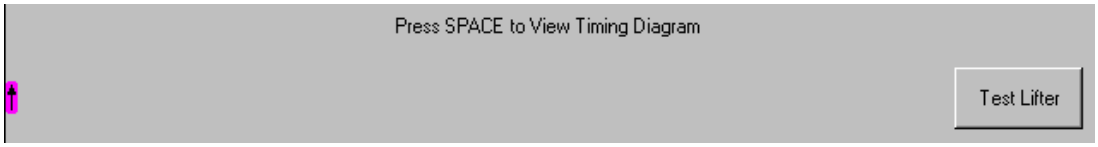
**Note:** Depending on the performance of the plasma system being used, a creep time may be required to allow for ramp up of the cut voltage after the pierce.

## Marker Setups

**I/O Configuration Type "P" and "V"**




The Purple arrow at the left edge of the softkeys indicates additional softkeys are available. Pressing the shift key allows the test lifter function to be available.




**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.

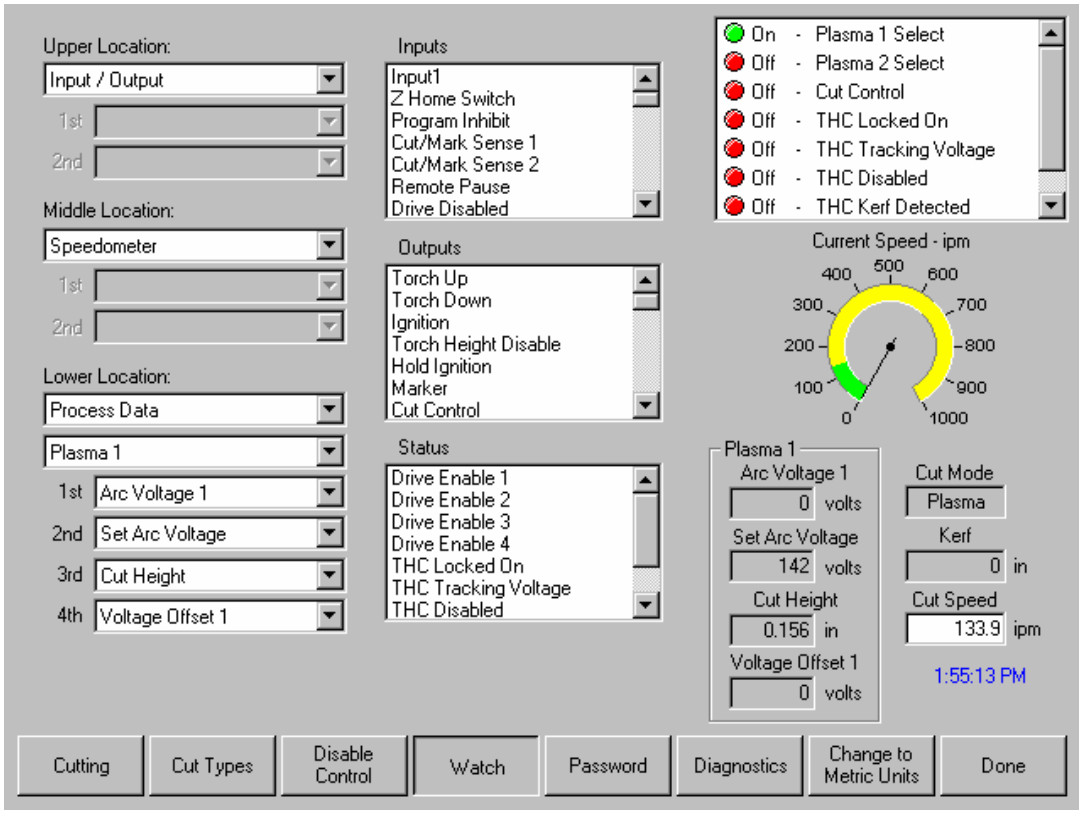
**Start IHS Distance**
The Start IHS Distance specifies the distance of travel for the THC to move the torch at high speed before switching to low speed and beginning Initial Height Sense. Caution should be taken when selecting this distance so that the torch does not crash into the plate.

**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



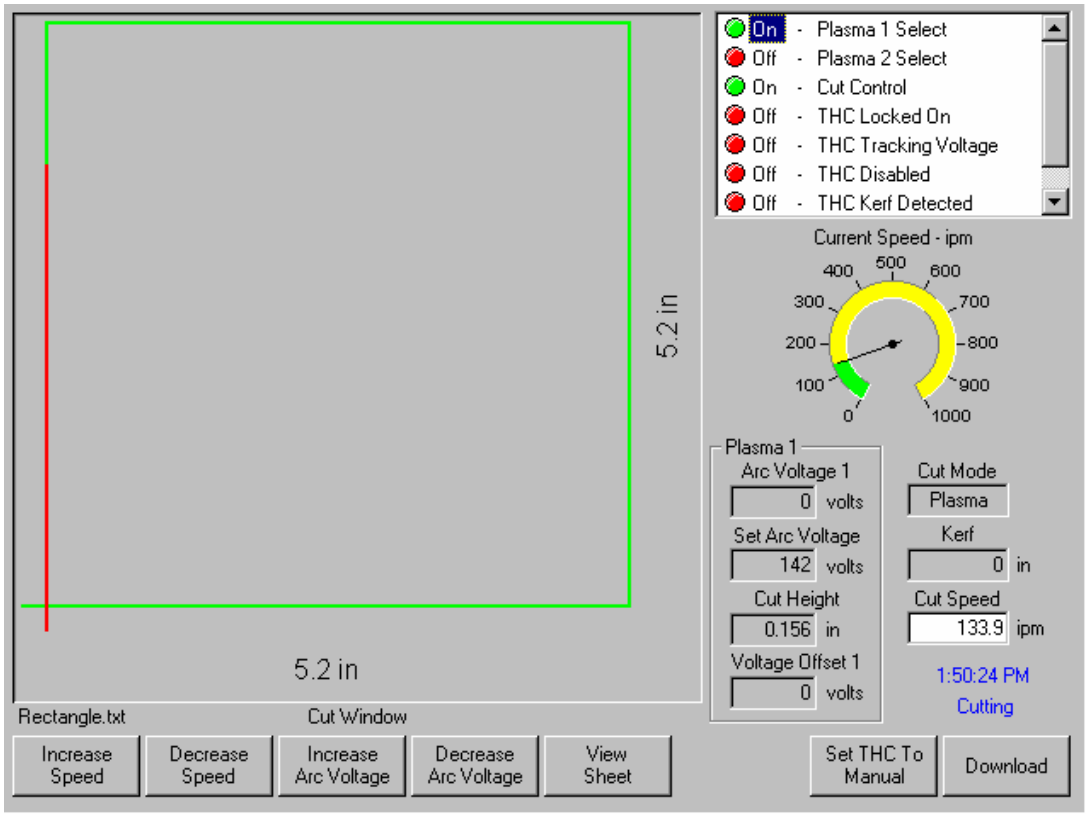

**Input/Output**
In addition to the standard I/O options, the Watch window may be configured to include the status of the voltage tracking for the Sensor™ THC. This will indicate when the automated voltage tracking has “Locked On” and is adjusting the torch height based on voltage.

**Position**
The Sensor™ THC is operated on the control as a separate axis on the control. Position information for the THC axis may be to position information 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 maybe adjusted at the main screen to customize the cut process.

# Main Cut Screen

### Automatic THC Mode

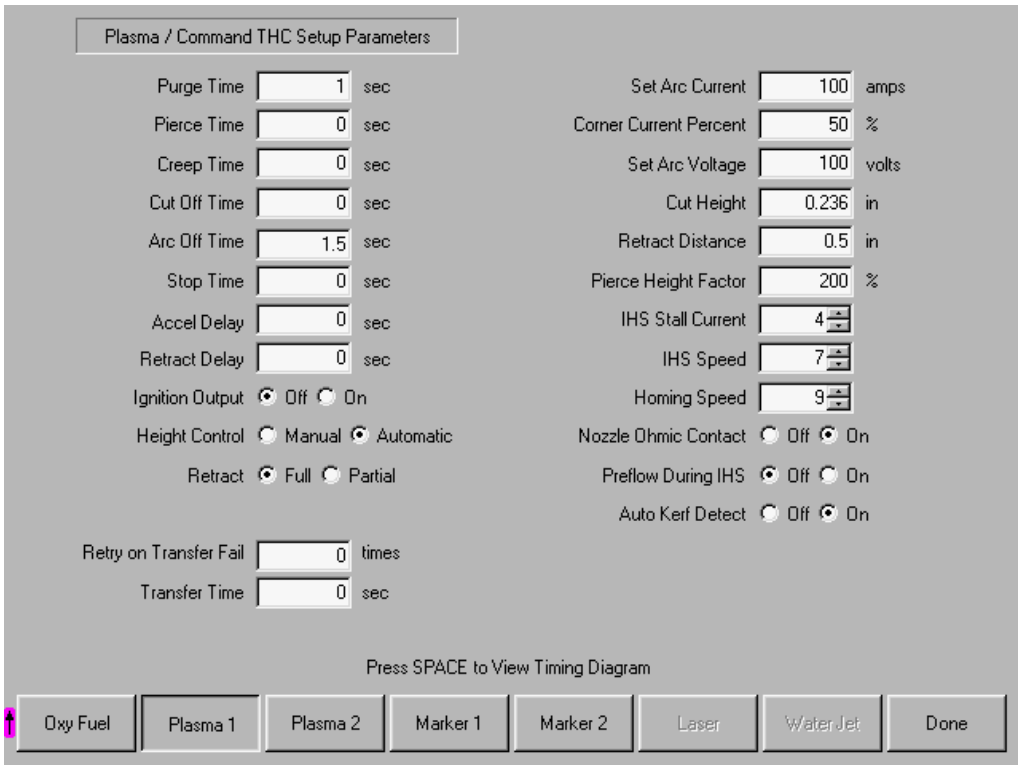



While at the main cut screen, when cutting with the Sensor™ THC in Automatic mode, three new softkeys will become available to manually increase and decrease the Arc Voltage for the cut and to switch to Manual mode.

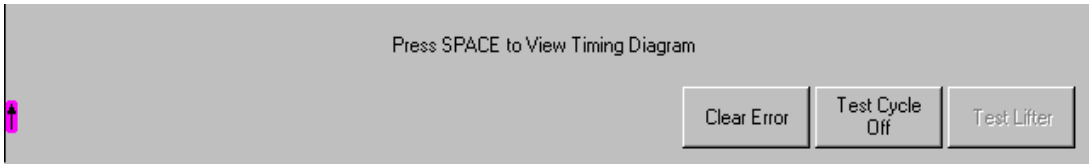
While at the main cut screen, when cutting with the Sensor™ THC in Manual mode, three new softkeys will become available to manually raise and lower the Manual Cut Height and to switch to Automatic mode.

# Appendix C: 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.




The Purple arrow at the left edge of the softkeys indicates additional softkeys are available. Pressing the shift key allows the test lifter function to be available.



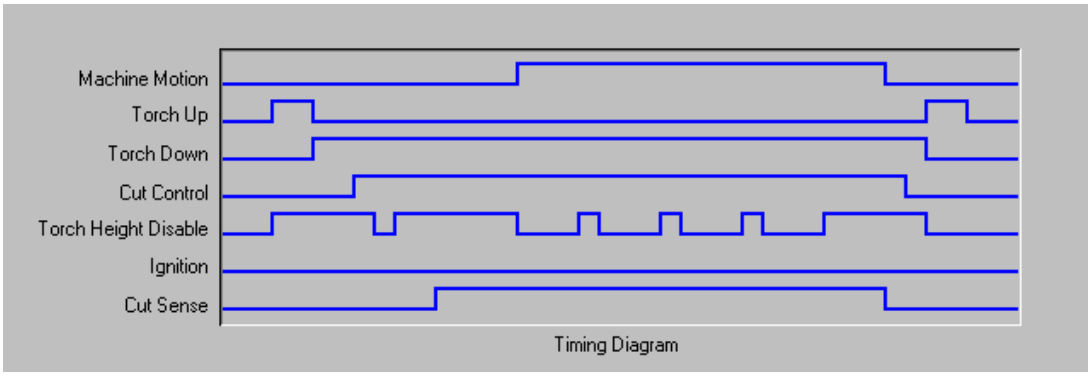

**Clear Error**
The Clear Error softkey allows the user to clear an error at the Command® THC control box. After the softkey has been pressed, a message will be posted on the control displaying a description of the error.

**Test Cycle ON/OFF**
Pressing the Test Cycle ON/ OFF softkey allows the operator to select to operate the Command® THC in Test mode. In Test mode, the Command® THC will complete the cycle without firing the torch.

**Test Lifter**
Pressing the Test Lifter softkey will command the torch lifter to lower to the plate, sense the plate and retract to its pierce height.

**I/O Configuration Type "M", "P" and "V"** (Timing Diagram)

Press the Space 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 25% 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 V*value* F*value* 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).

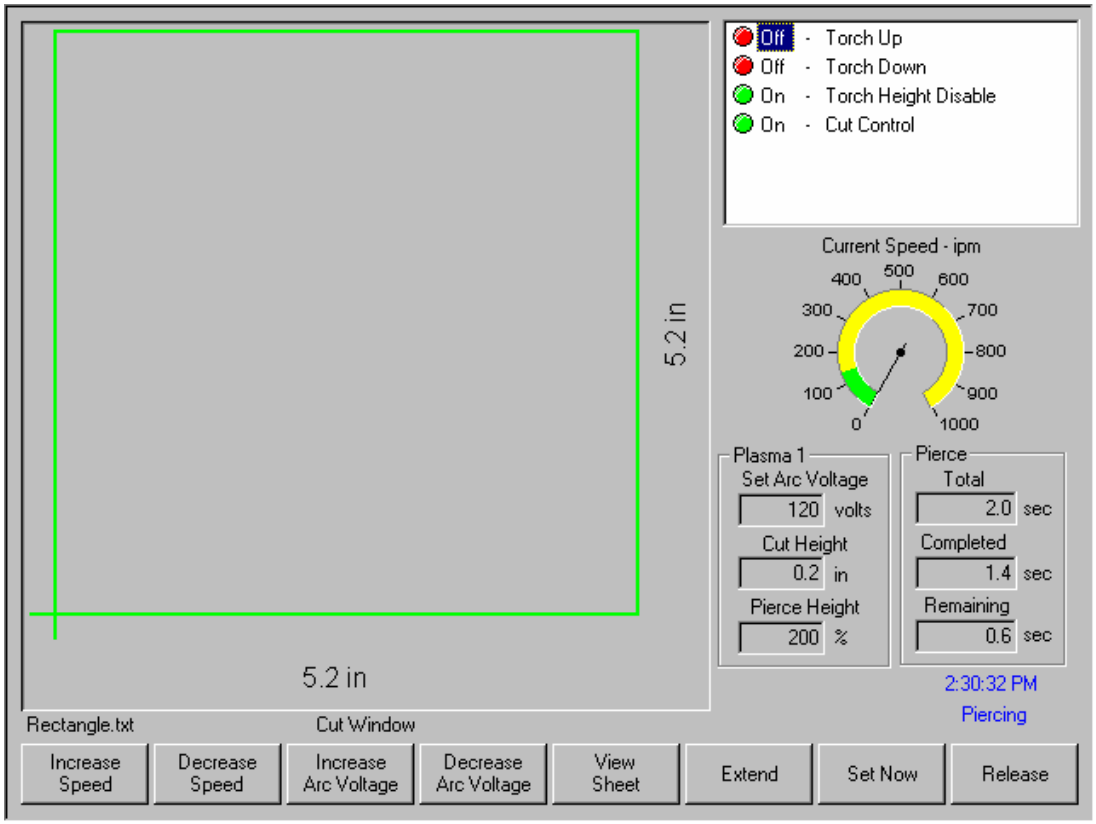
**Nozzle Ohmic Contact**
This parameter would be set to on if the Command® THC when using Ohmic Contact Sense to detect the plate during the IHS cycle.

**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



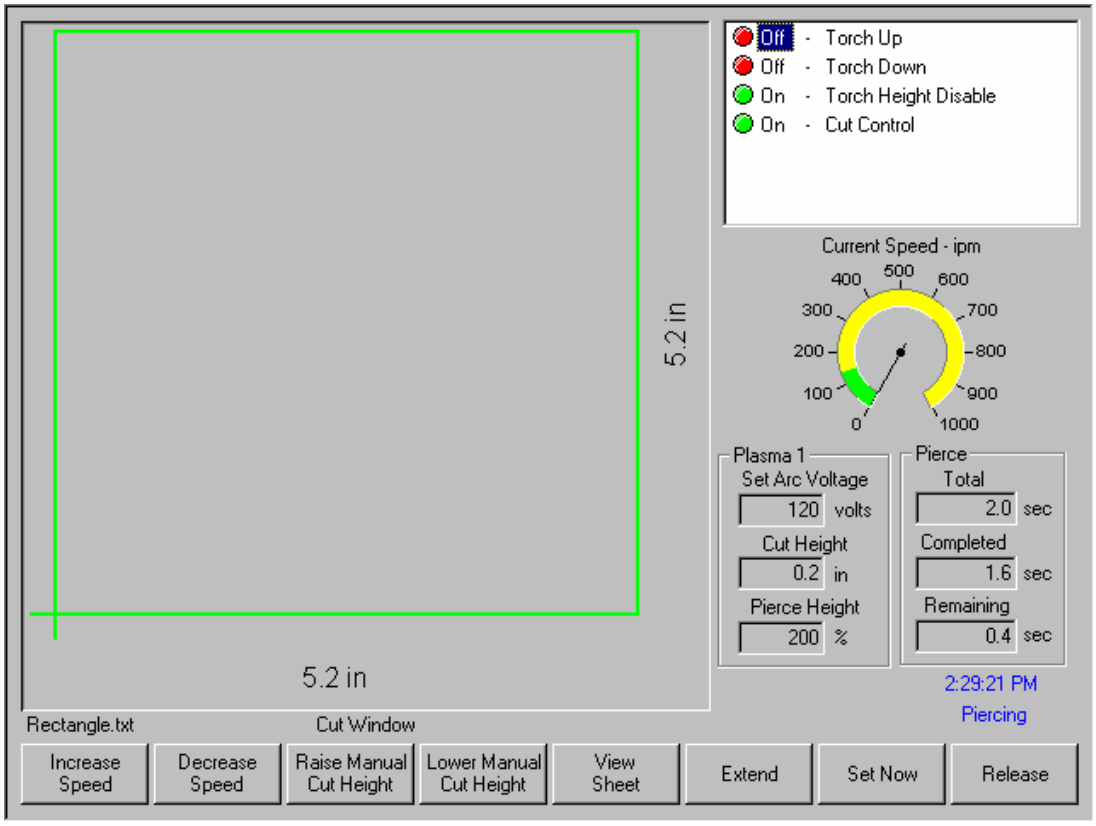

While at the main cut screen, when cutting with the Command® THC in Automatic mode, two new softkeys will become available to manually increase and decrease the Arc Voltage for the cut.

**Extend**
When pressed during the pierce cycle, this softkey extends the pierce timer until it is stopped either by a Set-Now or Release softkey press.

**Set Now**
Pressing the Set Now softkey terminates the pierce cycle and saves the new pierce time. The Set Now softkey is often used in conjunction with the Extend softkey to modify the preset pierce time.

**Release**
A Release softkey 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**



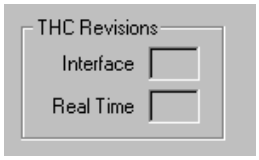

While at the main cut screen, when cutting with the Command® THC in Manual mode, two new softkeys will become available to manually raise and lower the torch cut height.

**Extend**
When pressed during the pierce cycle, this softkey extends the pierce timer until it is stopped either by a Set-Now or Release softkey press.

**Set Now**
Pressing the Set Now softkey terminates the pierce cycle and saves the new pierce time. The Set Now softkey is often used in conjunction with the Extend softkey to modify the preset pierce time.

**Release**
A Release softkey 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® THC Interface and Real Time Revision Levels will be displayed at the Control Information screen when enabled.

# Appendix D: Optional DXF Translator

## DXF Translator Overview

The optional 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.

**DXF Support**
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.

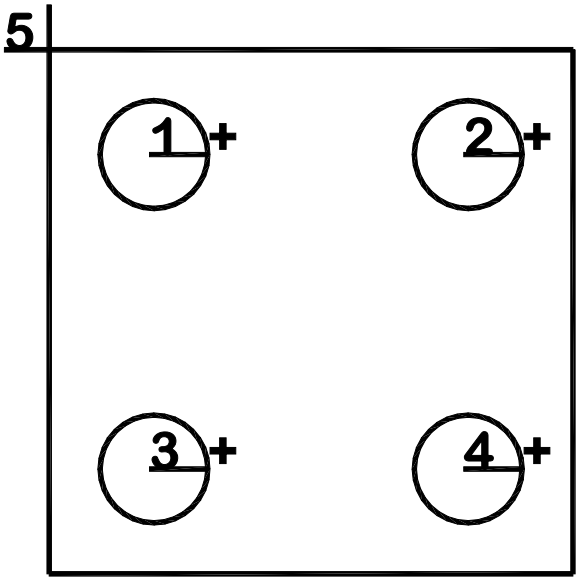
**Text Commands**
1 Used to indicate the first pierce point (subsequent pierce points proceed in numerical order)
+ Indicates a Counter-Clockwise circle
- Indicates a Clockwise circle

**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.

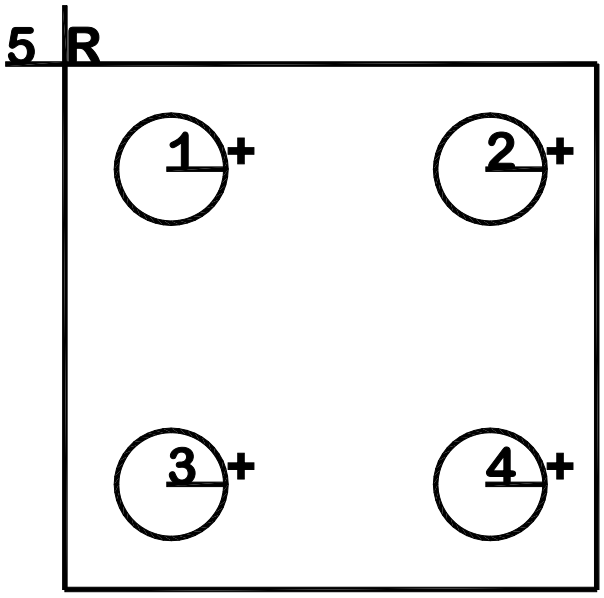
The following is a basic Bolt Hole Rectangle with the Lead-in and Lead-out for the rectangle as part of the top and side line segments. The numbers indicate the order of the pierces and the "+" sign indicates a Counter-Clockwise rotation for the circles.

**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.