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Hypertherm®
Automation

HYPERTHERM SHAPE CUTTING CONTROL

OPERATOR AND INSTALLATION MANUAL

Software Version 8.0 for Touch Screen CNCs

July 2008

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Contents

Safety

Product Listings

MicroEdge and Voyager III

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

UL has successfully tested and listed these 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

Edge TI

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

UL has successfully tested and listed these products in accordance with the applicable U.S. and Canadian Safety Standards. File number E307226.

Additional markings:

1. Use minimum 75° C copper wire only.
2. Use copper conductors only.
3. Suitable for use on a circuit capable of delivering not more than 5000rms symmetrical amperes, 230 volts maximum.
4. Solid state motor overload protection is not provided on this device.
5. Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection provided by integral LISTED branch circuit protection fuse.

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

Please contact Hypertherm Automation for further safety listing information.

RECOGNIZE SAFETY INFORMATION

The symbols shown in this section are used to identify potential hazards. When you see a safety symbol in this manual or on your machine, understand the potential for personal injury, and follow the related instructions to avoid the hazard.

FOLLOW SAFETY INSTRUCTIONS

Read carefully all safety messages in this manual and safety labels on your machine.

- Keep the safety labels on your machine in good condition. Replace missing or damaged labels immediately.
- Learn how to operate the machine and how to use the controls properly. Do not let anyone operate it without instruction.
- Keep your machine in proper working condition. Unauthorized modifications to the machine may affect safety and machine service life.

DANGER WARNING CAUTION

A signal word DANGER or WARNING is used with a safety symbol. DANGER identifies the most serious hazards.

- DANGER and WARNING safety labels are located on your machine near specific hazards.
- WARNING safety messages precede related instructions in this manual that may result in injury or death if not followed correctly.
- CAUTION safety messages precede related instructions in this manual that may result in damage to equipment if not followed correctly.

CUTTING CAN CAUSE FIRE OR EXPLOSION

Fire Prevention

- Be sure the area is safe before doing any cutting. Keep a fire extinguisher nearby.
- Remove all flammables within 35 feet (10 m) of the cutting area.
- Quench hot metal or allow it to cool before handling or before letting it touch combustible materials.
- Never cut containers with potentially flammable materials inside – they must be emptied and properly cleaned first.
- Ventilate potentially flammable atmospheres before cutting.
- When cutting with oxygen as the plasma gas, an exhaust ventilation system is required.

Explosion Prevention

- Do not use the plasma system if explosive dust or vapors may be present.
- Do not cut pressurized cylinders, pipes, or any closed container.
- Do not cut containers that have held combustible materials.

WARNING

Explosion Hazard
Argon-Hydrogen and Methane

Hydrogen and methane are flammable gases that present an explosion hazard. Keep flames away from cylinders and hoses that contain methane or hydrogen mixtures. Keep flames and sparks away from the torch when using methane or argon-hydrogen plasma.

WARNING

Hydrogen Detonation with Aluminum Cutting

- When cutting aluminum underwater, or with the water touching the underside of the aluminum, free hydrogen gas may collect under the workpiece and detonate during plasma cutting operations.
- Install an aeration manifold on the floor of the water table to eliminate the possibility of hydrogen detonation. Refer to the Appendix section of this manual for aeration manifold details.


ELECTRIC SHOCK CAN KILL

Touching live electrical parts can cause a fatal shock or severe burn.

- Operating the plasma system completes an electrical circuit between the torch and the workpiece. The workpiece and anything touching the workpiece are part of the electrical circuit.
- Never touch the torch body, workpiece or the water in a water table when the plasma system is operating.

Electric Shock Prevention

All Hypertherm plasma systems use high voltage in the cutting process (200 to 400 VDC are common). Take the following precautions when operating this system:

- Wear insulated gloves and boots, and keep your body and clothing dry.
- Do not stand, sit or lie on – or touch – any wet surface when using the plasma system.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground. If you must work in or near a damp area, use extreme caution.
- Provide a disconnect switch close to the power supply with properly sized fuses. This switch allows the operator to turn off the power supply quickly in an emergency situation.
- When using a water table, be sure that it is correctly connected to earth ground.
- Install and ground this equipment according to the instruction manual and in accordance with national and local codes.
- Inspect the input power cord frequently for damage or cracking of the cover. Replace a damaged power cord immediately. **Bare wiring can kill.**
- Inspect and replace any worn or damaged torch leads.
- Do not pick up the workpiece, including the waste cutoff, while you cut. Leave the workpiece in place or on the workbench with the work cable attached during the cutting process.
- Before checking, cleaning or changing torch parts, disconnect the main power or unplug the power supply.
- Never bypass or shortcut the safety interlocks.
- Before removing any power supply or system enclosure cover, disconnect electrical input power. Wait 5 minutes after disconnecting the main power to allow capacitors to discharge.
- Never operate the plasma system unless the power supply covers are in place. Exposed power supply connections present a severe electrical hazard.
- When making input connections, attach proper grounding conductor first.
- Each Hypertherm plasma system is designed to be used only with specific Hypertherm torches. Do not substitute other torches which could overheat and present a safety hazard.

STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS

Use proper precautions when handling printed circuit boards.

- Store PC boards in anti-static containers.
- Wear a grounded wrist strap when handling PC boards.

TOXIC FUMES CAN CAUSE INJURY OR DEATH

The plasma arc by itself is the heat source used for cutting. Accordingly, although the plasma arc has not been identified as a source of toxic fumes, the material being cut can be a source of toxic fumes or gases that deplete oxygen.

Fumes produced vary depending on the metal that is cut. Metals that may release toxic fumes include, but are not limited to, stainless steel, carbon steel, zinc (galvanized), and copper.

In some cases, the metal may be coated with a substance that could release toxic fumes. Toxic coatings include, but are not limited to, lead (in some paints), cadmium (in some paints and fillers), and beryllium.

Gases produced by plasma cutting vary based on the material to be cut and the method of cutting, but may include ozone, oxides of nitrogen, hexavalent chromium, hydrogen, and other substances if such are contained in or released by the material being cut.

Caution should be taken to minimize exposure to fumes produced by any industrial process. Depending upon the chemical composition and concentration of the fumes (as well as other factors, such as ventilation), there may be a risk of physical illness, such as birth defects or cancer.

It is the responsibility of the equipment and site owner to test the air quality in the area where the equipment is used and to ensure that the air quality in the workplace meets all local and national standards and regulations.

The air quality level in any relevant workplace depends on site-specific variables such as:

- Table design (wet, dry, underwater).
- Material composition, surface finish, and composition of coatings.
- Volume of material removed.
- Duration of cutting or gouging.
- Size, air volume, ventilation and filtration of the work area.
- Personal protective equipment.
- Number of welding and cutting systems in operation.
- Other site processes that may produce fumes.

If the workplace must conform to national or local regulations, only monitoring or testing done at the site can determine whether the site is above or below allowable levels.

To reduce the risk of exposure to fumes:

- Remove all coatings and solvents from the metal before cutting.
- Use local exhaust ventilation to remove fumes from the air.
- Do not inhale fumes. Wear an air-supplied respirator when cutting any metal coated with, containing, or suspected to contain toxic elements.
- Assure that those using welding or cutting equipment, as well as air-supplied respiration devices, are qualified and trained in the proper use of such equipment.
- Never cut containers with potentially toxic materials inside. Empty and properly clean the container first.
- Monitor or test the air quality at the site as needed.
- Consult with a local expert to implement a site plan to ensure safe air quality.

A PLASMA ARC CAN CAUSE INJURY AND BURNS

Instant-On Torches
Plasma arc comes on immediately when the torch switch is activated.

The plasma arc will cut quickly through gloves and skin.
- Keep away from the torch tip.
- Do not hold metal near the cutting path.
- Never point the torch toward yourself or others.

ARC RAYS CAN BURN EYES AND SKIN

Eye Protection Plasma arc rays produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin.
- Use eye protection in accordance with applicable national or local codes.
- Wear eye protection (safety glasses or goggles with side shields, and a welding helmet) with appropriate lens shading to protect your eyes from the arc's ultraviolet and infrared rays.

Arc Current	Lens Shade AWS (USA)	Lens Shade ISO 4850
Up to 100 A	No. 8	No. 11
100-200 A	No. 10	No. 11-12
200-400 A	No. 12	No. 13
Over 400 A	No. 14	No. 14

Skin Protection Wear protective clothing to protect against burns caused by ultraviolet light, sparks and hot metal.
- Gauntlet gloves, safety shoes and hat.
- Flame-retardant clothing to cover all exposed areas.
- Cuffless trousers to prevent entry of sparks and slag.
- Remove any combustibles, such as a butane lighter or matches, from your pockets before cutting.

Cutting Area Prepare the cutting area to reduce reflection and transmission of ultraviolet light:
- Paint walls and other surfaces with dark colors to reduce reflection.
- Use protective screens or barriers to protect others from flash and glare.
- Warn others not to watch the arc. Use placards or signs.

GROUNDING SAFETY

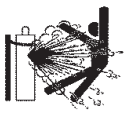
Work Cable Attach the work cable securely to the workpiece or the work table with good metal-to-metal contact. Do not connect it to the piece that will fall away when the cut is complete.

Work Table Connect the work table to an earth ground, in accordance with appropriate national or local electrical codes.

Input Power
- Be sure to connect the power cord ground wire to the ground in the disconnect box.
- If installation of the plasma system involves connecting the power cord to the power supply, be sure to connect the power cord ground wire properly.
- Place the power cord's ground wire on the stud first, then place any other ground wires on top of the power cord ground. Fasten the retaining nut tightly.
- Tighten all electrical connections to avoid excessive heating.

COMPRESSED GAS EQUIPMENT SAFETY

- Never lubricate cylinder valves or regulators with oil or grease.
- Use only correct gas cylinders, regulators, hoses and fittings designed for the specific application.
- Maintain all compressed gas equipment and associated parts in good condition.
- Label and color-code all gas hoses to identify the type of gas in each hose. Consult applicable national or local codes.



GAS CYLINDERS CAN EXPLODE IF DAMAGED

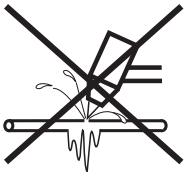
Gas cylinders contain gas under high pressure. If damaged, a cylinder can explode.

- Handle and use compressed gas cylinders in accordance with applicable national or local codes.
- Never use a cylinder that is not upright and secured in place.
- Keep the protective cap in place over valve except when the cylinder is in use or connected for use.
- Never allow electrical contact between the plasma arc and a cylinder.
- Never expose cylinders to excessive heat, sparks, slag or open flame.
- Never use a hammer, wrench or other tool to open a stuck cylinder valve.

NOISE CAN DAMAGE HEARING

Prolonged exposure to noise from cutting or gouging can damage hearing.

- Use approved ear protection when using plasma system.
- Warn others nearby about the noise hazard.



A PLASMA ARC CAN DAMAGE FROZEN PIPES

Frozen pipes may be damaged or can burst if you attempt to thaw them with a plasma torch.

PACEMAKER AND HEARING AID OPERATION

Pacemaker and hearing aid operation can be affected by magnetic fields from high currents.
Pacemaker and hearing aid wearers should consult a doctor before going near any plasma arc cutting and gouging operations.

To reduce magnetic field hazards:

- Keep both the work cable and the torch lead to one side, away from your body.
- Route the torch leads as close as possible to the work cable.
- Do not wrap or drape the torch lead or work cable around your body.
- Keep as far away from the power supply as possible.

ADDITIONAL SAFETY INFORMATION

1. ANSI Standard Z49.1, *Safety in Welding and Cutting,* American Welding Society, 550 LeJeune Road P.O. Box 351020, Miami, FL 33135
2. ANSI Standard Z49.2, *Fire Prevention in the Use of Cutting and Welding Processes,* American National Standards Institute 1430 Broadway, New York, NY 10018
3. ANSI Standard Z87.1, *Safe Practices for Occupation and Educational Eye and Face Protection,* American National Standards Institute, 1430 Broadway, New York, NY 10018
4. AWS F4.1, *Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances,* American Welding Society 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135
5. AWS F5.2, *Recommended Safe Practices for Plasma Arc Cutting,* American Welding Society 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135
6. CGA Pamphlet P-1, *Safe Handling of Compressed Gases in Cylinders,* Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202
7. CSA Standard W117.2, *Code for Safety in Welding and Cutting,* Canadian Standards Association Standard Sales 178 Rexdale Boulevard, Rexdale, Ontario M9W 1R3, Canada
8. NFPA Standard 51B, *Cutting and Welding Processes,* National Fire Protection Association 470 Atlantic Avenue, Boston, MA 02210
9. NFPA Standard 70–1978, *National Electrical Code,* National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210
10. OSHA, *Safety and Health Standards,* 29FR 1910 U.S. Government Printing Office, Washington, D.C. 20402

WARNING LABEL

This warning label is affixed to some power supplies. It is important that the operator and maintenance technician understand the intent of these warning symbols as described. The numbered text corresponds to the numbered boxes on the label.

1. Cutting sparks can cause explosion or fire.

1.1 Keep flammables away from cutting.

1.2 Keep a fire extinguisher nearby, and have a watchperson ready to use it.

1.3 Do not cut on any closed containers.

2. The plasma arc can cause injury and burns.

2.1 Turn off power before disassembling torch.

2.2 Do not hold the material near cutting path.

2.3 Wear complete body protection.

3. Electric shock from torch or wiring can kill. Protect yourself from electric shock.

3.1 Wear insulating gloves. Do not wear wet or damaged gloves.

3.2 Insulate yourself from work and ground.

3.3 Disconnect input plug or power before working on machine.

4. Breathing cutting fumes can be hazardous to your health.

4.1 Keep your head out of the fumes.

4.2 Use forced ventilation or local exhaust to remove the fumes.

4.3 Use ventilating fan to remove the fumes.

5. Arc rays can burn eyes and injure skin.

5.1 Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.

6. Become trained and read the instructions before working on the machine or cutting.

7. Do not remove or paint over (cover) warning labels.

Overview

The following sections highlight the features of the Hypertherm Automation CNC and version 8.0 of the Phoenix® software.

CutPro Wizard

The CutPro™ wizard is an interactive tool that simplifies the steps of cutting a part. The CutPro wizard helps you:

- Load a part program
- Select a cut process
- Align a plate and adjust for skew
- Set scrap clearance
- Select cut mode
- Start the cut directly from the wizard or by pressing the green Start button on the console

The wizard opens automatically from the Main screen after 10 seconds. Automatic activation can be disabled on the Special password setup screen. However, the wizard is always accessible by pressing the CutPro Wizard soft key on the Main screen.

Align Wizard

The Align™ wizard is an interactive tool that guides you through the process of aligning a plate and adjusting for a skewed plate. This wizard can be accessed from the CutPro Wizard or from the Align screen.

Remote Help

The Remote Help™ facility is an easy-to-use and reliable means of remotely connecting the Hypertherm Automation CNC to up to 15 users for:

- Observing an operator at the machine
- Reviewing settings and software configurations
- Transferring setup files, part programs, software updates, etc.
- Performing HPR diagnostics
- Training users

ShapeWizard

The *ShapeWizard*® tool allows you to graphically create simple part programs and store them on the internal hard disk present in the control.

Teach/Trace

If your system is 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 is 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 work file folders that can be stored on the internal hard disk drive.
- Punch or powder marker control with twelve programmable offsets.
- Choice of industry-standard EIA RS-274D or ISO 6582 ESSI part programming languages.

Manual Data Input (MDI)

- Full screen ASCII text editor.
- Allows writing, editing, and graphical review of part programs at the machine.

Communications Link

- Preview Mode allows machine operator to graphically review and select programs for download.
- Download part programs from CAD system, remote host computer, or other storage device via built-in RS-232C/ RS-422 port.
- Can accept EIA RS-274D or ESSI part programs.
- Baud Rates of up to 115K Baud. Communication baud rates of 230K are obtainable using the communication link software provided with the control.
- Optional network card for connecting directly to a PC Network for part file allocation.

Graphical program display

- Visually display any part program.
- Display of real-time position and I/O information.
- Display of actual cut path while cutting.

Built-in Parametric Shape Library

- Contains 68 commonly used shapes.
- Simple Graphical prompts for entering all part dimensions.

Teach/Trace

- Smart-arc and Smart-Line algorithms for optimum program size and contouring smoothness.
- Converts your existing optical tracer templates to EIA RS-274D programs, and stored on the internal hard disk drive.
- Automatic part closure detection.
- Allows multiple pierce points, lead-ins, lead-outs, and rapid traverse segments.
- Upload taught part programs to CAD system, remote host computer, or other storage device.
- Requires a separate optical tracer control system.

Performance Features

- Digital servo positioning control for any cutting machine. An optional SERCOS Interface allows expansion of motion axes and distributed I/O.
- Control dynamic accuracy of 0.002 inch (0.051 mm) with 1000 edge/inch encoders.
- Programmable cut speeds up to 3000 IPM (76,200 mmpm).
- Variable segment length look-ahead for optimum contouring performance.
- Automatic corner slowdown and torch height disable for clean, sharp corners.
- Speed Increase/Decrease buttons for optimizing machine cut speed.
- Automatic Plate and Corner Alignment corrects for skewed plates.
- Complete cut-loss recovery with backup and forward along path, off-path re-pierce and return-to-path, and move pattern functions.
- Rip Mode for straight-line cutting. Jog control cutting.
- Punch, powder or Plasma marker capability.
- Manual jog control with position read-out for positioning torches.
- 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 Water Jet interface with programmable abrasive output and pierce time.

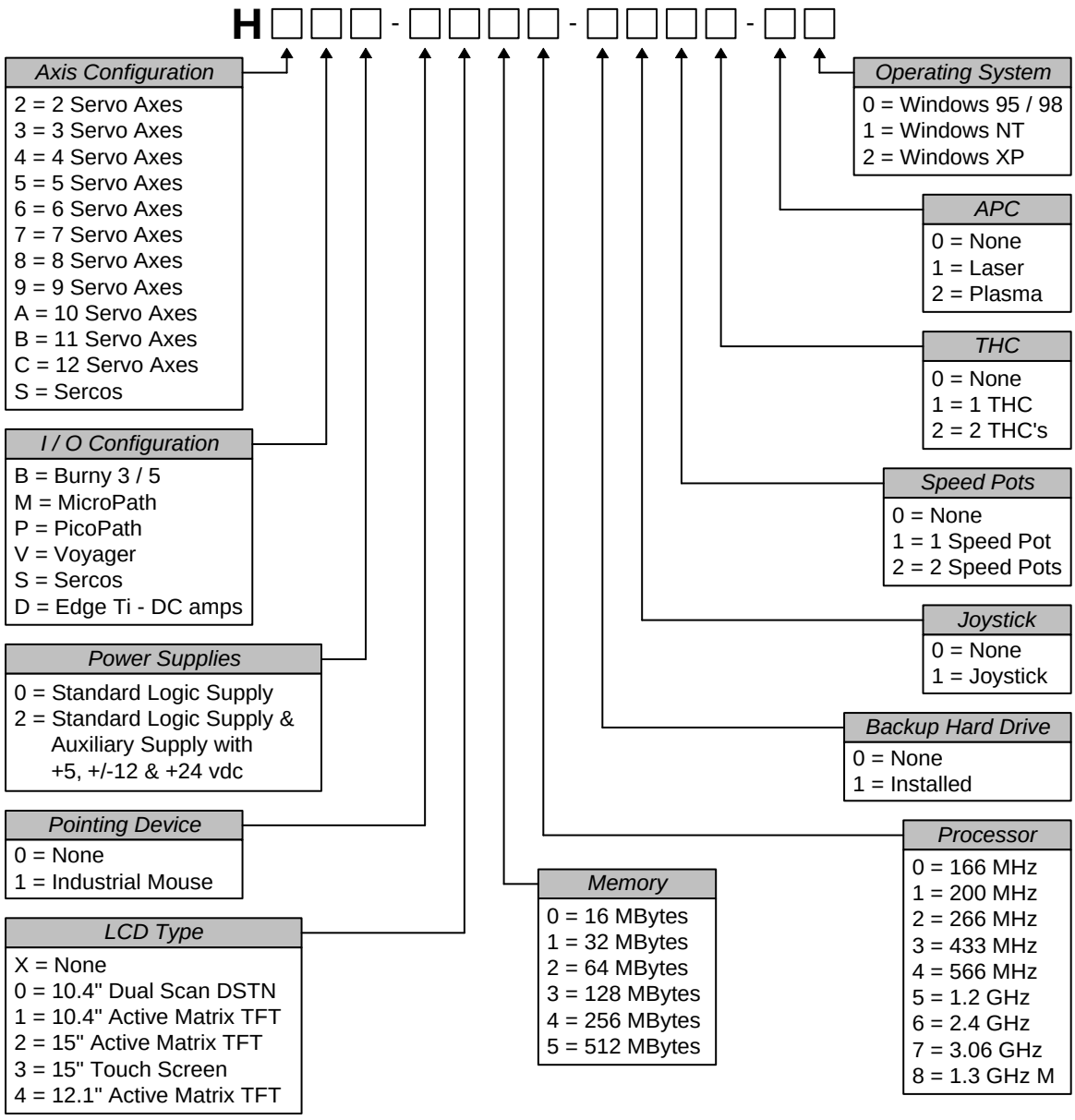
- Programmable servo gains, speeds, Watch Window, machine parameters, and communication parameters for flexible application.
- Interfaces easily to most optical tracing systems for integrated control.
- Complete built-in diagnostics for checkout and test.

Hardware Specifications

- 15” TFT Touch Screen with 1024 x 768 resolution.
- ≥60Gbyte hard disk
- ≥1.3 GHz Processor.
- 512 Mbytes of RAM.
- Up to 96 lines of interface signals for cutting and motion logic (gas control, tracing system, markers, homing, etc.) depending on I/O configuration. An optional SERCOS Interface™ allows expansion of I/O configuration.
- Industrial grade enclosure and keypad designed to minimize RFI/EMI interference.
- Surface mount printed circuit board technology.
- Two axes optically isolated ±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). Individual models may vary. Refer to machine interface information for details.
- Operating environment: 0 to 50°C (32 to 122°F); 95% relative humidity (non-condensing).
- An optional Chiller for Mariner style controls is available.

Model Numbering System

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



Front Panel Layout

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

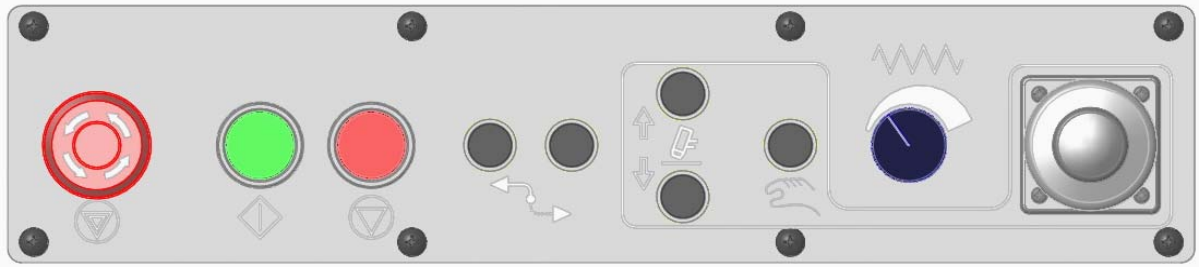
Power Switch

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

Touch Screen

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

Front Panel (selected models)



ICON Legend

 Emergency Stop

 Start

 Stop

 Forward and Backward on Path

 Torch Up / Down

 Manual

 Speed Pot (Manual Feedrate)

Front Panel Keypad (Voyager III model)

The yellow key labeled with a question mark (?) is for online 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 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 in the center of the keypad are for program start and stop.

The two keys to the right of the yellow help key are for Forward on Path and Backup on Path while in the Pause screen.

Key Functions

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

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

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

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

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

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

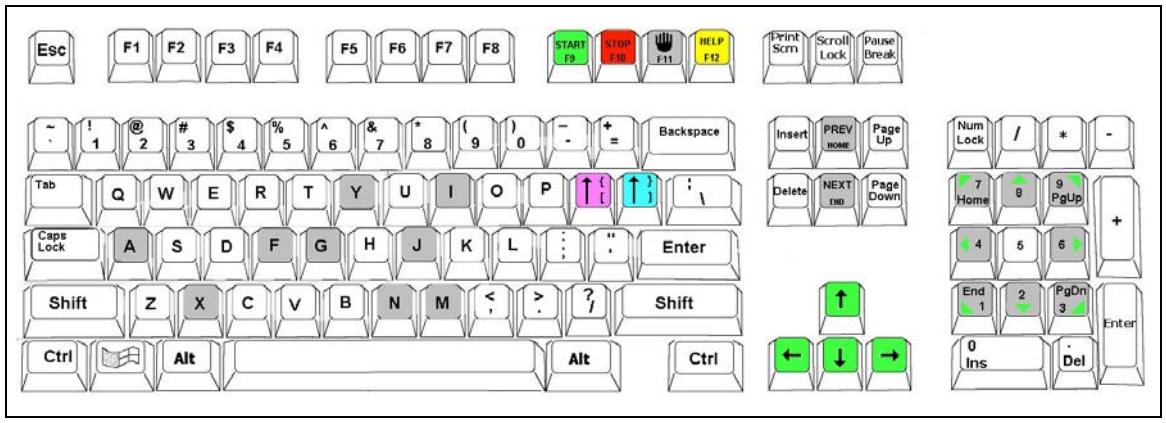
Deletes the current character in the data entry field and backs up one position in the field. Located above the Back Space key are the * and ? characters which are used as wild cards to search for files.

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

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

PC Keyboard Layout

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



Keyboard Functions

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

Function Key F9 is equivalent to the START key.

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

Function Key F11 is equivalent to the MANUAL MODE key.

Function Key F12 is equivalent to the HELP key.

Arrow direction keys are used for manual motion.

The HOME key is equivalent to the PREV field key.

The END key is equivalent to the NEXT field key.

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

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

The Esc key is equivalent to the CANCEL key.

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

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

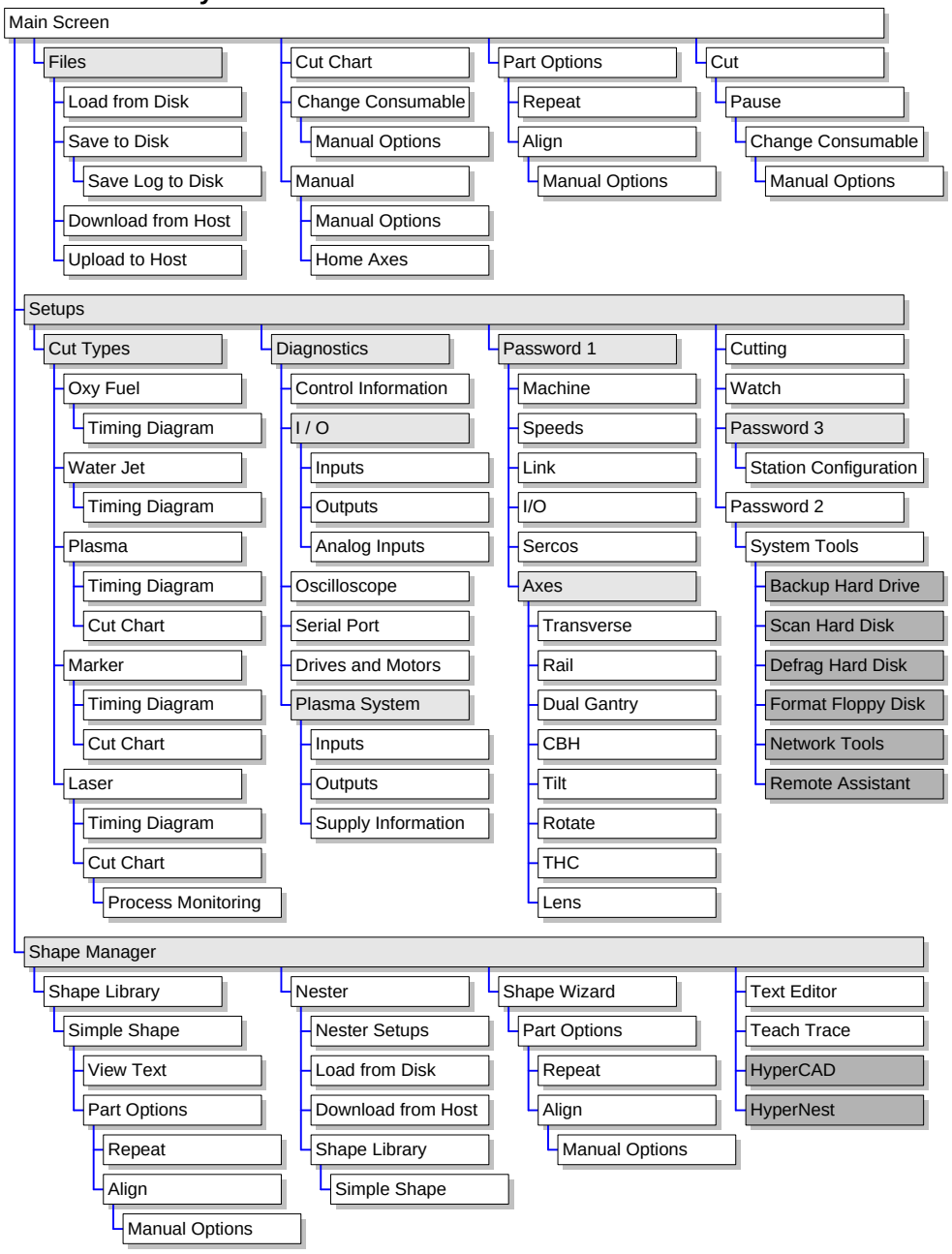
Operation Summary

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

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

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

Screen Hierarchy

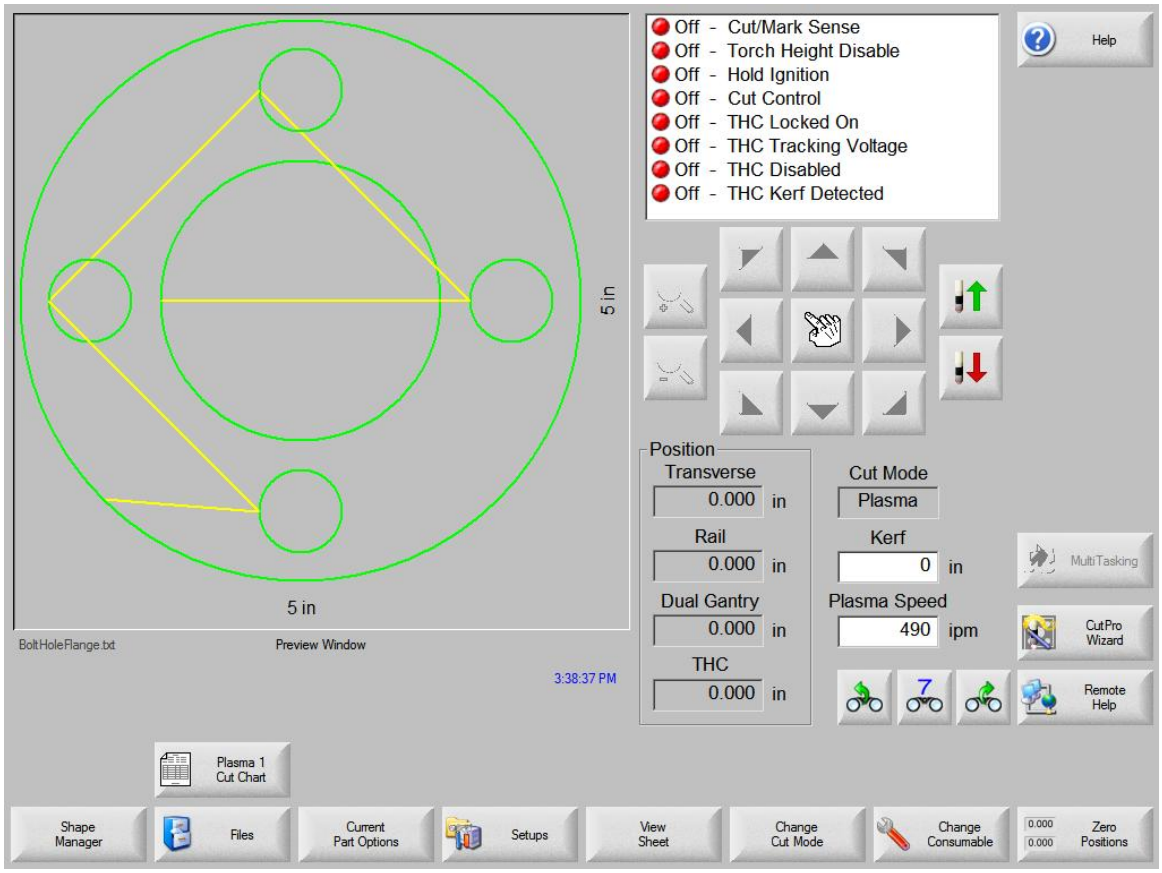


Key and Menu Functions

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

Screen Navigation

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

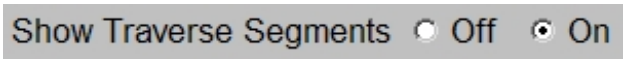


Soft keys to accept (OK) and reject (Cancel) changes.

The touch screen software interface allows direct key input on the screen through the use of check boxes, radio boxes, dropdown lists and data input.

Dropdown List
Press the arrow in the dropdown list to view options.

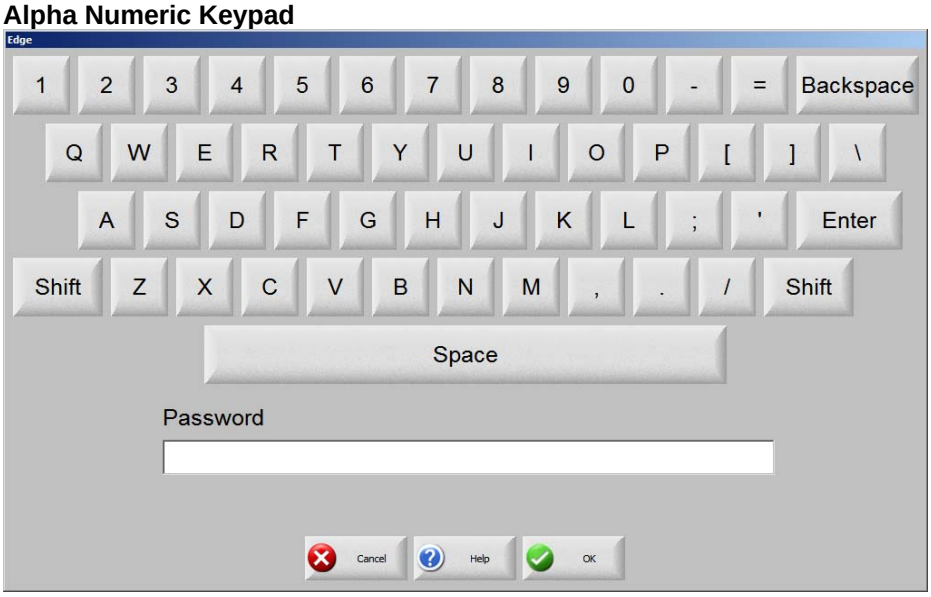
Radio Buttons
Press the round button to select the corresponding option.



Check Box
Press the square box to enable the corresponding option.

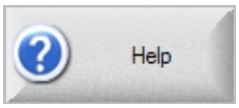
Data Input
Data input boxes automatically displays a numeric or alphanumeric keypad depending on data type. Double click on the field to enter data.

Alpha Numeric Keypad

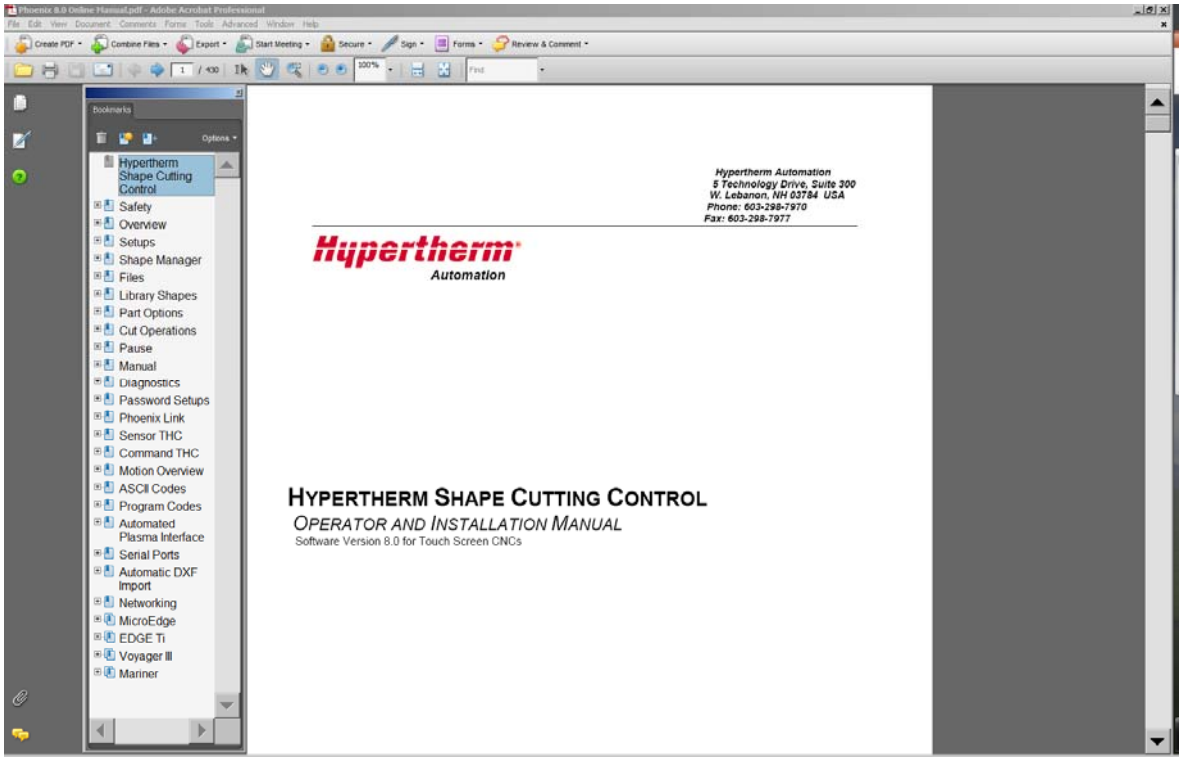


Numeric Keypad

Help Screen



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

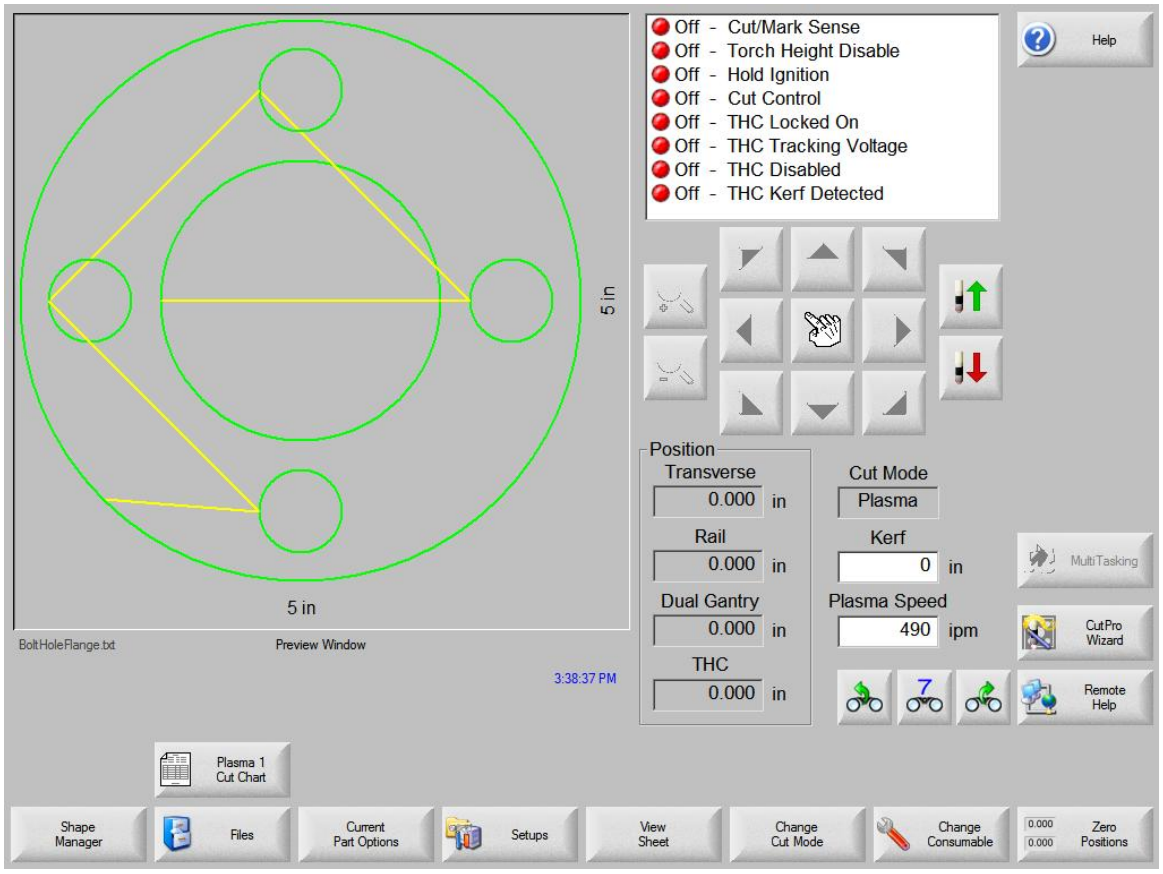


Show Bookmarks

Press the Show Bookmarks soft key on the Help screen to view the list of Help topics. Click on a topic for additional information.

Main Screen

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



Preview Window

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

Watch Window

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

Shape Manager

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

Files

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

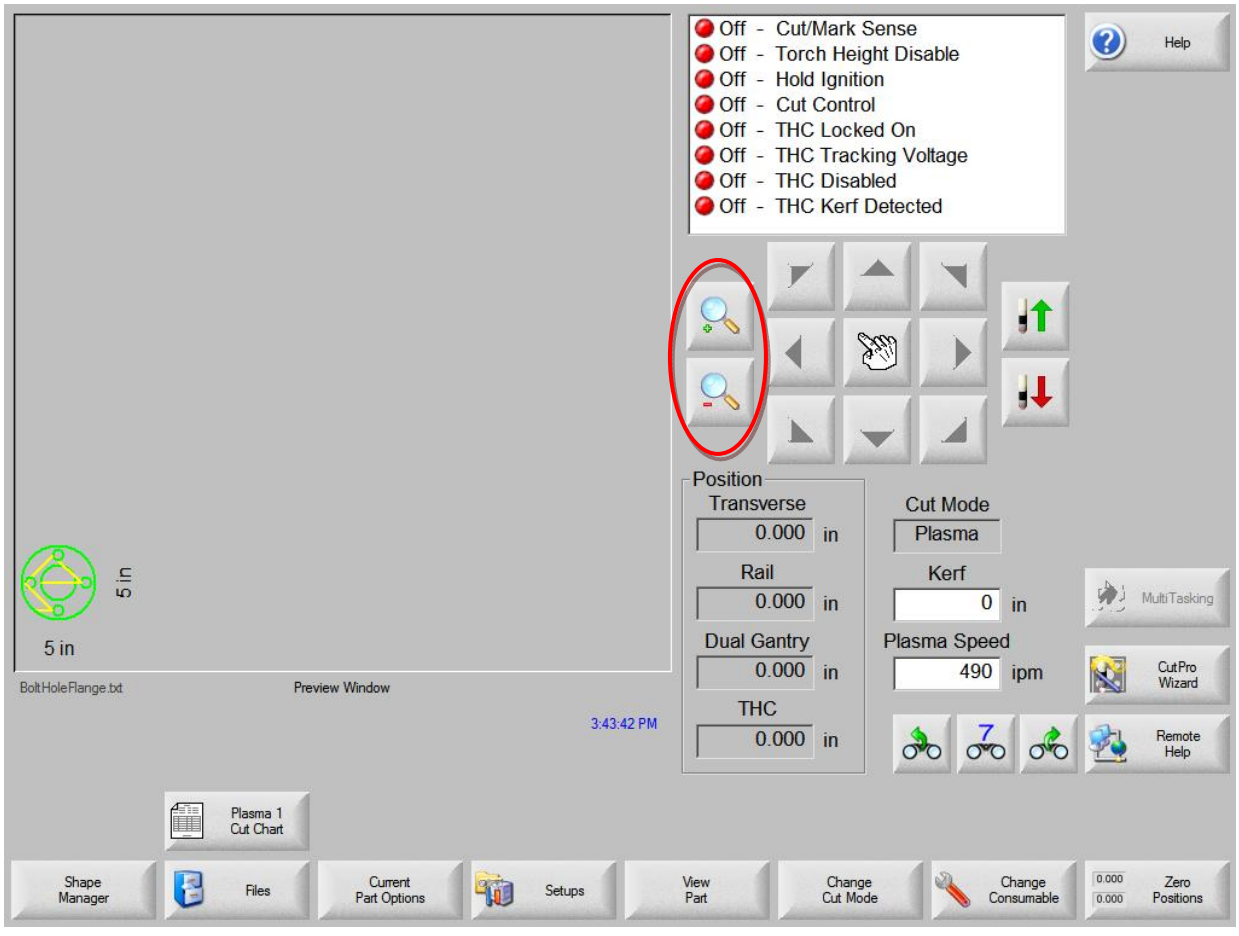
Part Options
This soft key takes you to the Part Options screen where the current part can be scaled, rotated, mirrored and/or repeated.

Setups
This soft key takes you to the setup screens.

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

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

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



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

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

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

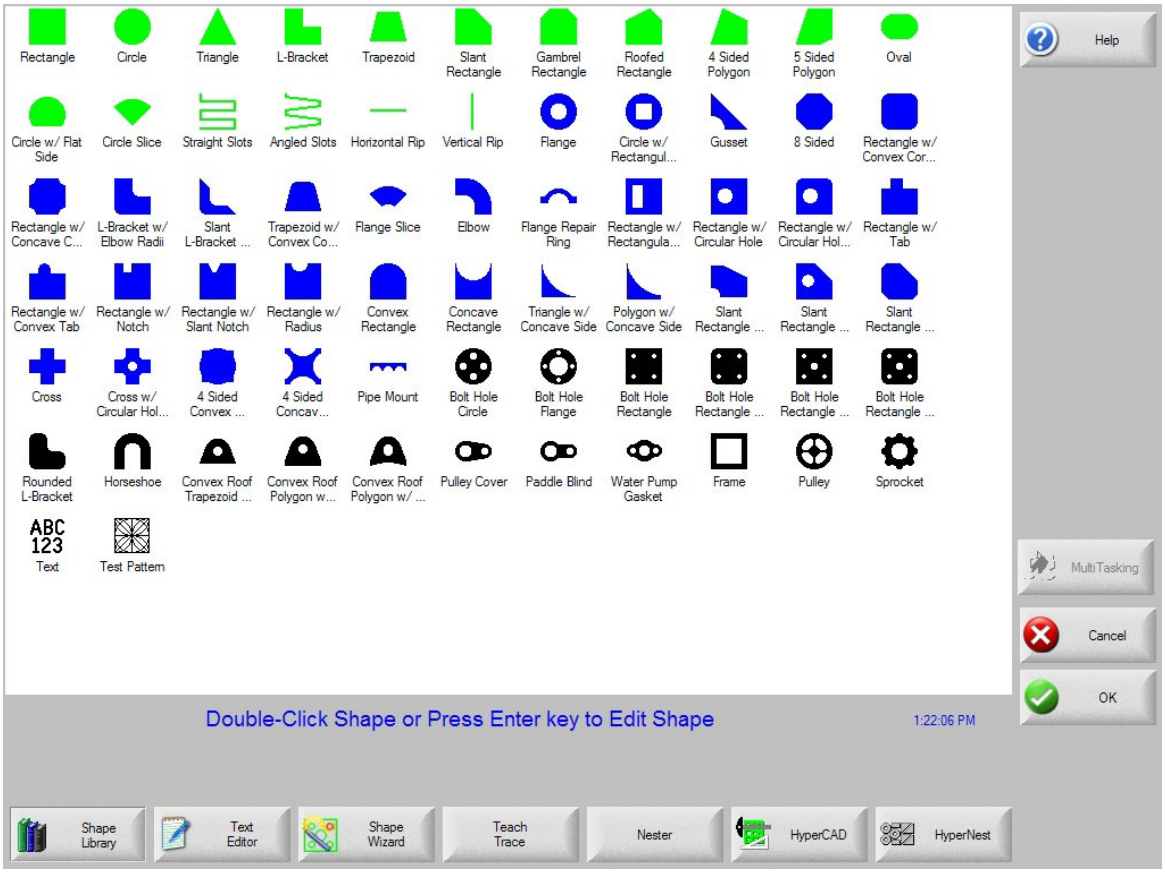
Change Cut Mode
Allows selection of trial, oxy fuel, plasma, water jet and laser cutting modes, depending on the setup configuration.

Change Consumable
This soft key takes you to the Change Consumable screen.

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

Shape Manager Screen

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



Shape Library

Displays the built-in library of 68 simple shapes.

Text Editor

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

Shape Wizard

Displays 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.

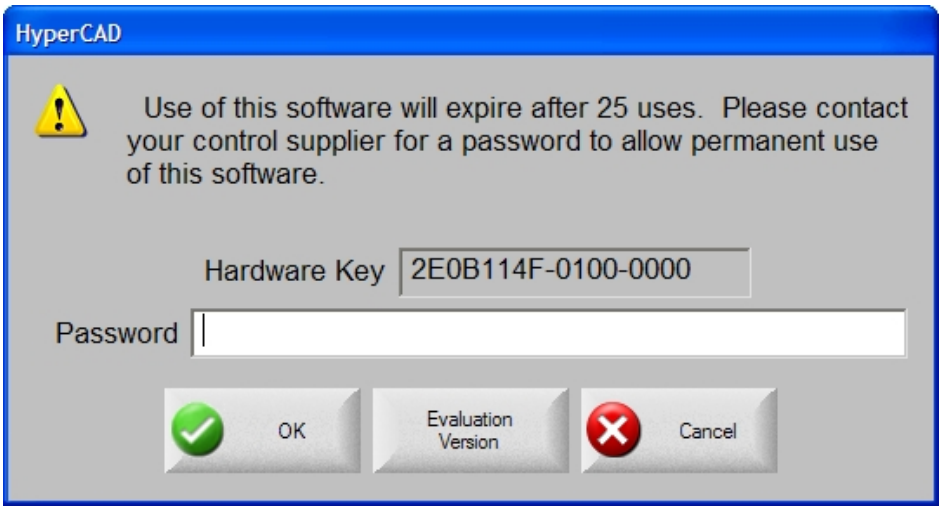
HyperNEST

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

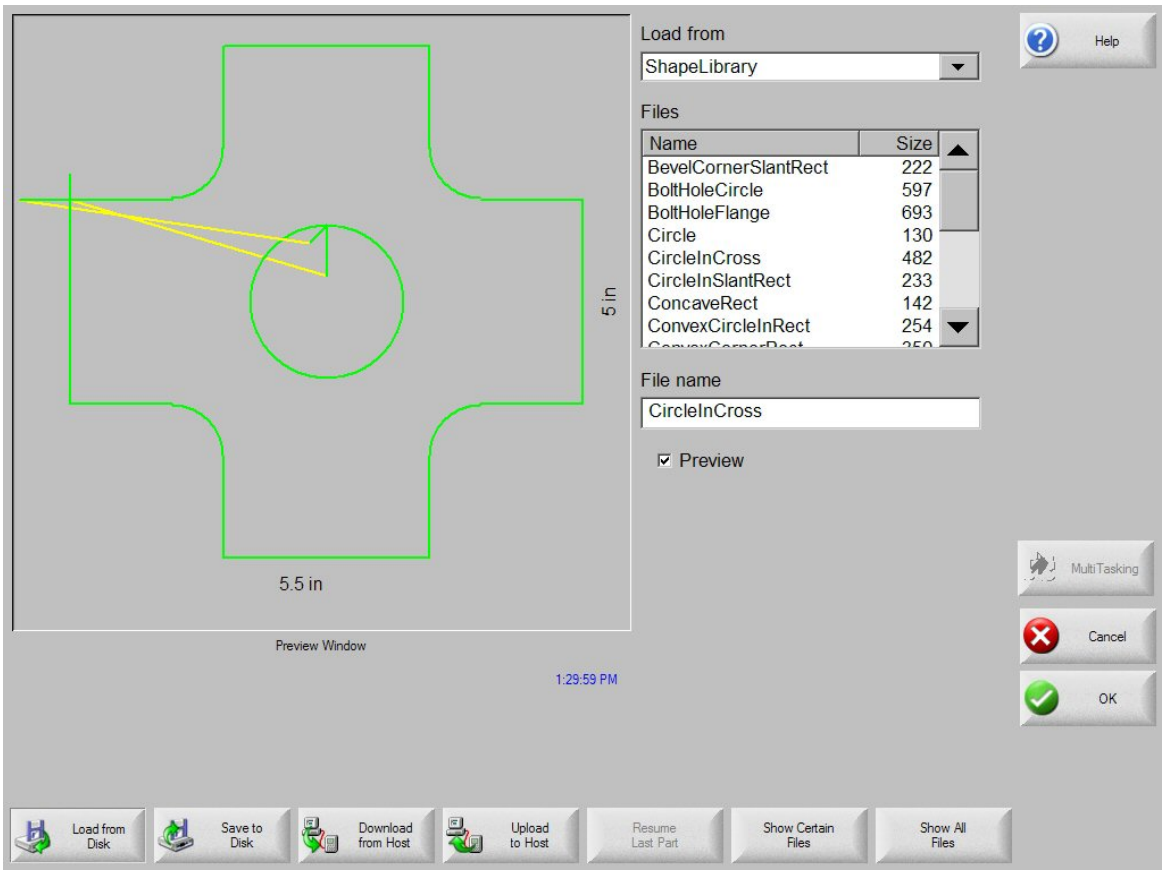
Trail version software will prompt the user with a notification of the number of "uses" left at each launch. To enable unlimited use, a password would be provided by the control vendor.

To launch the trial software, select the Evaluation Version.



Files

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



Load from Disk

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

Save to Disk

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

Download from Host

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

Upload to Host

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

Resume Last Part

The Resume Last Part soft key will be visible when the Rush Job Interrupt or Automated Power Loss Recovery feature is in use. These features allow the user to pause the current part program

and retain the part and current position information. This then allows the user to load and execute another part program and return to the original part using the Resume Last Part soft key.

Note: Controllers with SERCOS interface will save position information every minute to the hard drive. Some motion on path may be required for power or position loss recovery.

Show Certain Files

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

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

Show All Files

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

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

Setups Screen

The Setups Screen is used to configure the control.

Cutting

Allows programming of the different cutting parameters and dwell times.

Process

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

Disable Control

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

Watch

Allows programming of the user definable Watch Window.

Password

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

Diagnostics

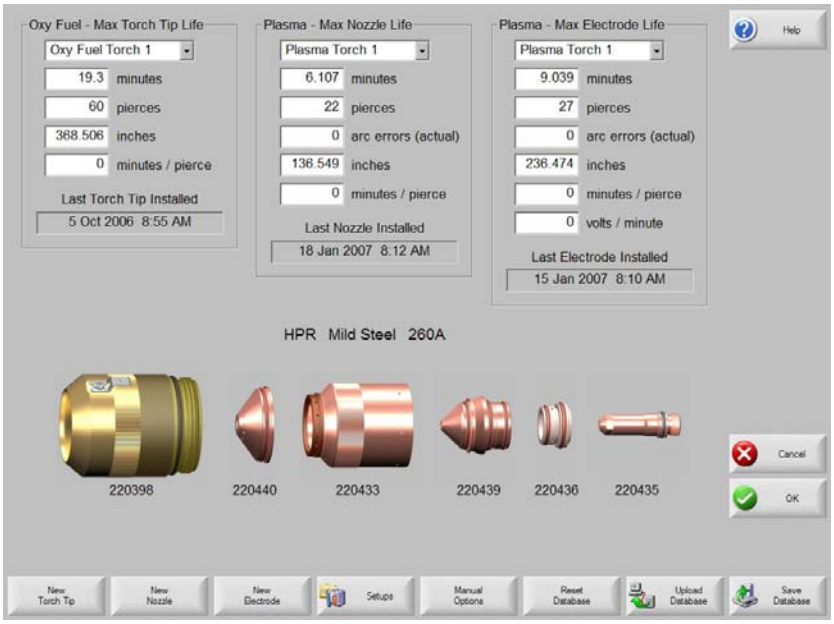
Opens the diagnostics menu.

Change to Metric Units/English Units

Changes all parameters over to metric units or English units.

Change Consumable

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



New Torch Tip

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

New Nozzle

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

New Electrode

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

Reset Database

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

Setups

Press this key to access the control setups for adjustment of the cut process.

Upload Database

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

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

Remote Help

Remote Help allows up to 15 computers or CNCs to be connected in a single internet session, in which local touch screen, mouse, and keyboard control, as well as screens, files, and chat information can be passed between all 15 members.

Remote Help insures system security by using a secure connection to the central SharedView service. If firewall protections require it, SharedView can also use secure https. In addition, only screen data is shared so viruses cannot be transmitted during sessions. However, if a session takes advantage of the Handouts feature to share files, virus protection software should be installed on the CNC.

Some applications for Remote Help are:

- Observe an operator using the machine
- Review settings and setups
- Transmit setup files, part programs, software updates, etc.
- Perform HPR diagnostics
- Train operators on new features
- Use a chat window to discuss features or issues

System Requirements for Remote Help:

- Phoenix Version 6.00.6, 7.50.3, 8.00.0, or higher
- Microsoft SharedView on the user CNC and OEM PC
- Internet connection to the CNC at the end-user site
- Internet connection at OEM remote helper site
- Microsoft SharedView on the user CNC and OEM PC

Install Shared View

To install SharedView on a CNC:

1. Press Remote Help.
2. Press Yes to indicate that you want Remote Help.
3. Press Yes to download SharedView.
4. On the Microsoft website, press the Shared View download field.
5. Press Run on the Free Download popup window.
6. Press Run on the Internet Explorer Security Warning popup.
7. Select Accept on the SharedView Service Agreement and press Next.
8. Remove all checks from the boxes on the SharedView setup window and press Install.
9. Press Finish after the setup is complete.
10. Close the Internet Explorer window after SharedView is intalled.

To install SharedView on a PC:

1. Enter the following URL in your browser's Address field: http://www.sharedview.com.
2. On the Microsoft website, press the Shared View download field.
3. Press Run on the Free Download popup window.
4. Press Run on the Internet Explorer Security Warning popup.
5. Select Accept on the SharedView Service Agreement and press Next.
6. Remove all checks from the boxes on the SharedView setup window and press Install.
7. Press Finish after the setup is complete.

Use Remote Help

Before you launch Remote Help, send an email to the remote helper to request a Remote Help session. Include the email address of all participants.

To use Remote Help from the console or PC:

Step	Operator	Remote Helper
1	At the CNC, press the Remote Help button on the Main screen. At a PC, launch SharedView using Windows.	
2	Click or press Yes on the message popup that asks if you need Remote Help	
3	Click or press Yes to use the on-screen keyboard. This is helpful for users at a CNC who have no keyboard.	
4		Insert your Windows Live ID email and password. Click Sign In. **Tip:** Set up a few hotmail email accounts to use with Remote Help.
5		Click on Start a new session.
6		Send the session name and the password to all participants (up to 15). Click Start.
7	Press or click Join a session.	
8	Enter the session name and password from the Remote Helper.	
9	When the session is created, click or press Join Now.	
10	Click Share.	
11	Click Share Entire Desktop to share the CNC with the Remote Helper.	

	Note: If a participant's CNC or PC does not have the latest version of SharedView, an upgrade message pops up and the user can upgrade.	
12		Click Request Control.
13	Click or press Allow on the message popup. **Note:** If the user clicks anywhere on the screen after this step, the Remote Helper loses control and must request it again.	
14	Click or press the message field at the top of the SharedView screen to enter text messages to other participants.	
15	To share files, click or press on Handouts and add or download a handout. **Note:** This is the only way a virus can be transmitted during a Remote Help session. Install virus protection on the CNC if you plan to transmit files using the Handouts feature.	
16		To end a session, click Close this session.

Notes:

- The remote helper is not allowed to perform control motion unless the control is in forced simulation mode or is a demo version of software running on a desktop. However, the remote helper can view motion that is controlled by the user.
- If a user loses the on-screen keyboard:
    1. Press Remote Help.
    2. Press Yes to use the same session.
    3. Press Yes to use the on-screen keyboard.

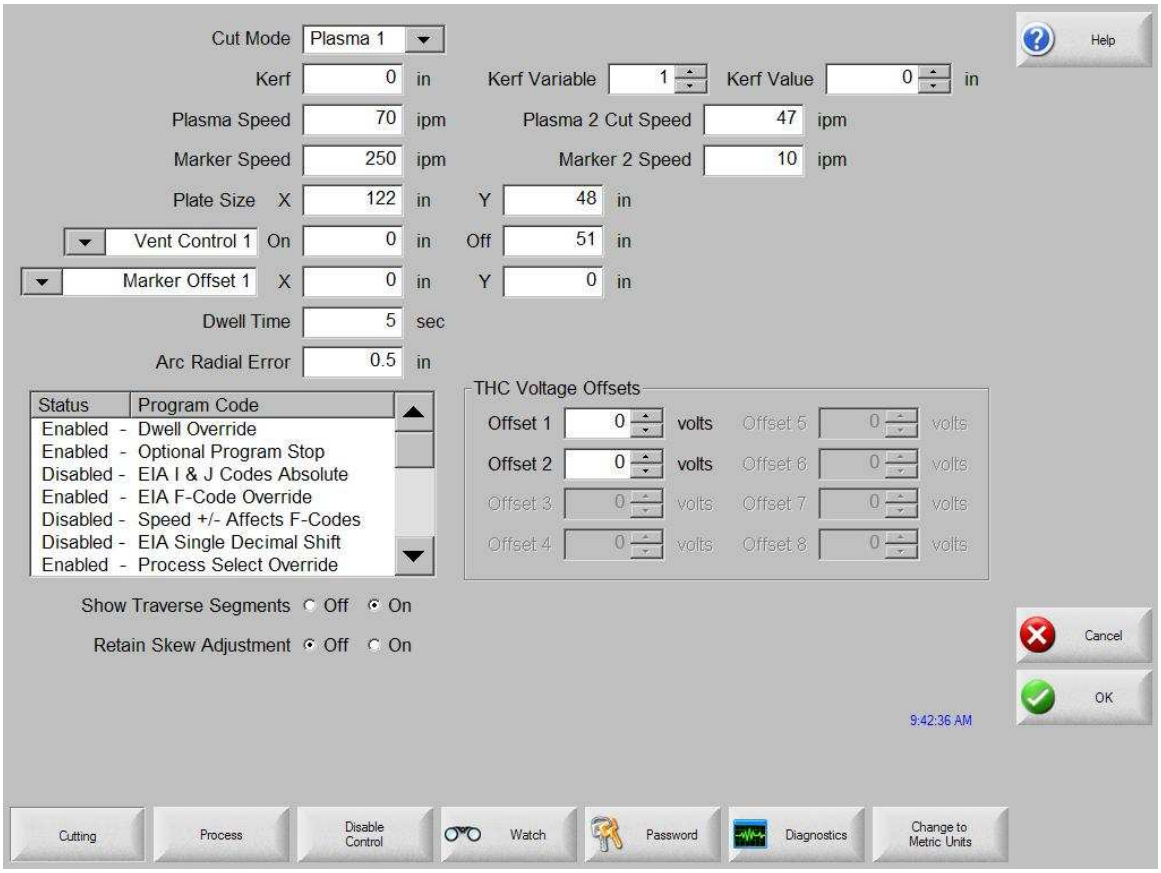
Setups

On the Setup screen, you make the selections that determine how you are going to cut.

Cutting

If you press the Cutting soft key, you can adjust the parameters for the cut mode you want to use. The available modes are:

- Trial (no cutting)
- Oxy-Fuel
- Plasma
- Laser
- Water jet

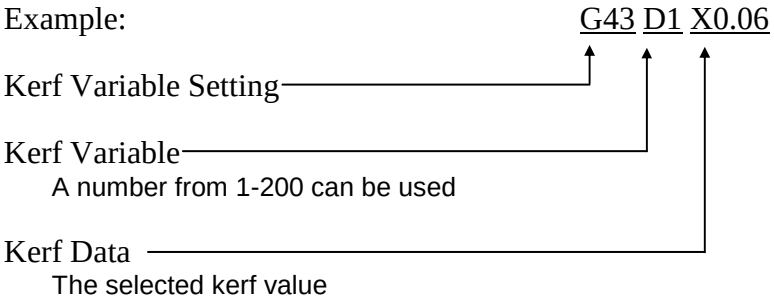


Cut Mode

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

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

Kerf Variable / Kerf Value
Creates a kerf variable table that assigns a variable to a Kerf value. Up to 200 variables can be entered to create a reference table.
This kerf variable can be used within a part program to define the kerf value and as torch parts wear, the kerf value changes. If the kerf variable value is updated as the consumable wears and changes, the new value will be called by the kerf variable command with all programs loaded that use the variable.
The EIA-274D part code for left kerf variable is the G43 code.



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

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

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

Vent Controls 1 - 50
Enter values for up to fifty programmable zones for fume extraction damper control. Based on the machine position, the vent control outputs to activate dampers at the selected zone for increased performance.

Marker Offsets 1 - 12
Enter values for up to twelve programmable marker offsets. The machine is offset by this amount at maximum speed when the appropriate marker code is detected.

Dwell Time
Specifies the amount of dwell (delay) that is 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 causes a three second dwell to be inserted at the current program block. A G04 with no X-code inserts 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 X *value* codes in an RS-274D program 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 are relative to the current block. In absolute mode, all offsets for X, Y, I and J are relative to an absolute reference point unless they are changed by using a G92 (set axis presets) program code.

EIA F-Code Override
When this parameter is enabled, embedded F-codes in an RS-274D program override any operator-entered cut speed.

Speed +/- Affects F-Codes
When this parameter is enabled, the control applies the speed increase/decrease percentage to all embedded F-codes that are 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 the 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 allows the part program to override the process select input.

Station Select Override
When enabled, this feature allows the part program to override the currently selected station select input.

Auto Torch Spacing Override
When enabled, this feature allows 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 turn off the "forced" G40 kerf disable if no G40 is used in the program by disabling the parameter.

G40 Used in Simple Shapes
This parameter is used with the Force Kerf Disable parameter to allow the G40 code that is normally inserted in to a simple shape from the shape library to be omitted by disabling the parameter.

Auto Start after APA
This parameter is used with the Automatic Plate Alignment feature to allow cutting to begin automatically after completion of the automatic plate alignment.

EIA Code 2 Decimal Shift
Some programming styles are structured so that the decimal point in the EIA positioning affecting part sizing is assumed. The EIA Code 2 Decimal Shift parameter allows the operator to select the location of the decimal point when translating parts by selecting

normal or single for correct translation. The selection should be set to Normal unless your part programs require two decimal shift to the right of the decimal point.

M17, M18 Used as Cut Codes

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

M76 Rotary Shortest Path

When enabled, this disables tilt and rotate software overtravels for dual tilt-style bevellers and allows the EIA-274D M76 Rotate go to Home command to select shortest path. When disabled it allows motion by longest path when homing. This is advantageous for some bevel head designs.

Stop on Single Arc Lost

If this setting is enabled, any cut sense input that is lost for longer than the arc off time during the cut pauses the part program or nest with a Cut Sense Lost message.

Show Traverse Segments

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

Retain Skew Adjustment

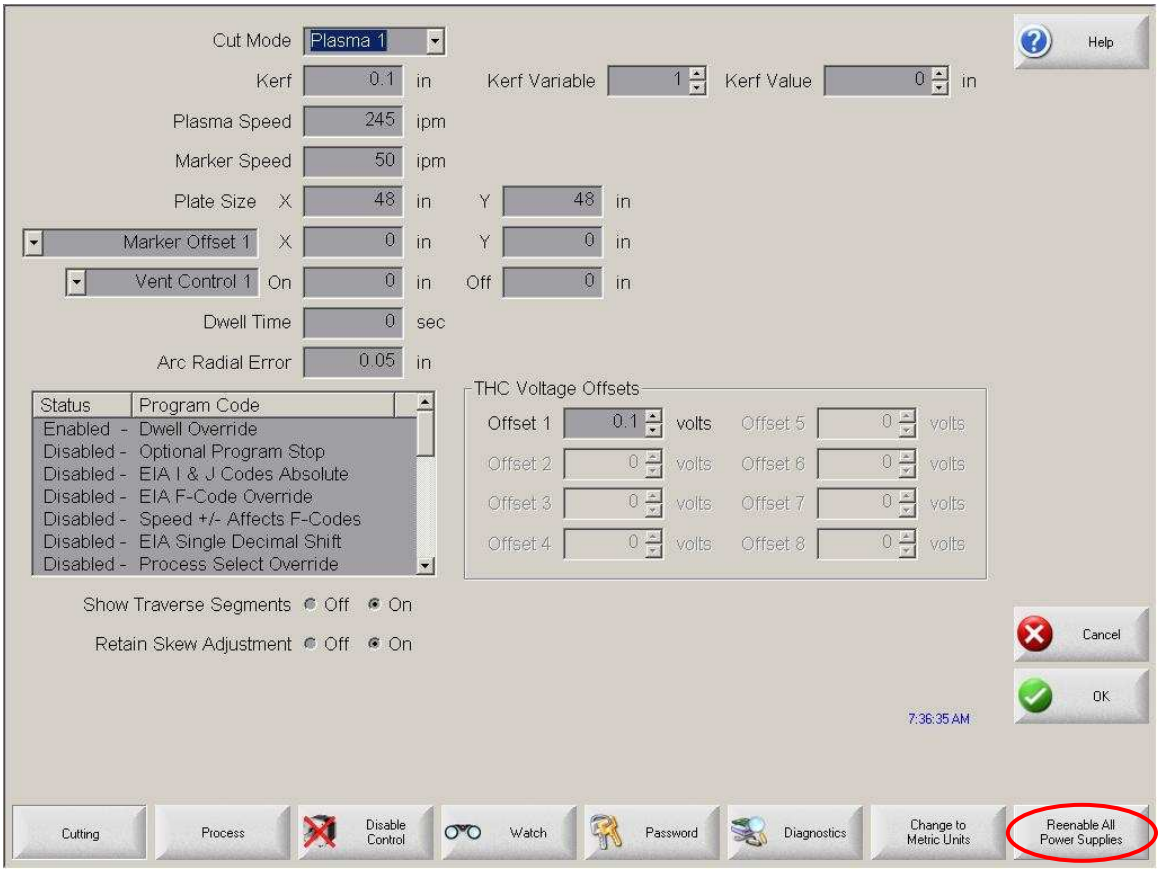
Retains the last calculated plate skew for all subsequent parts that are loaded. If disabled, any new part that is loaded will remove any previously calculated plate skew.

THC Voltage Offset

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

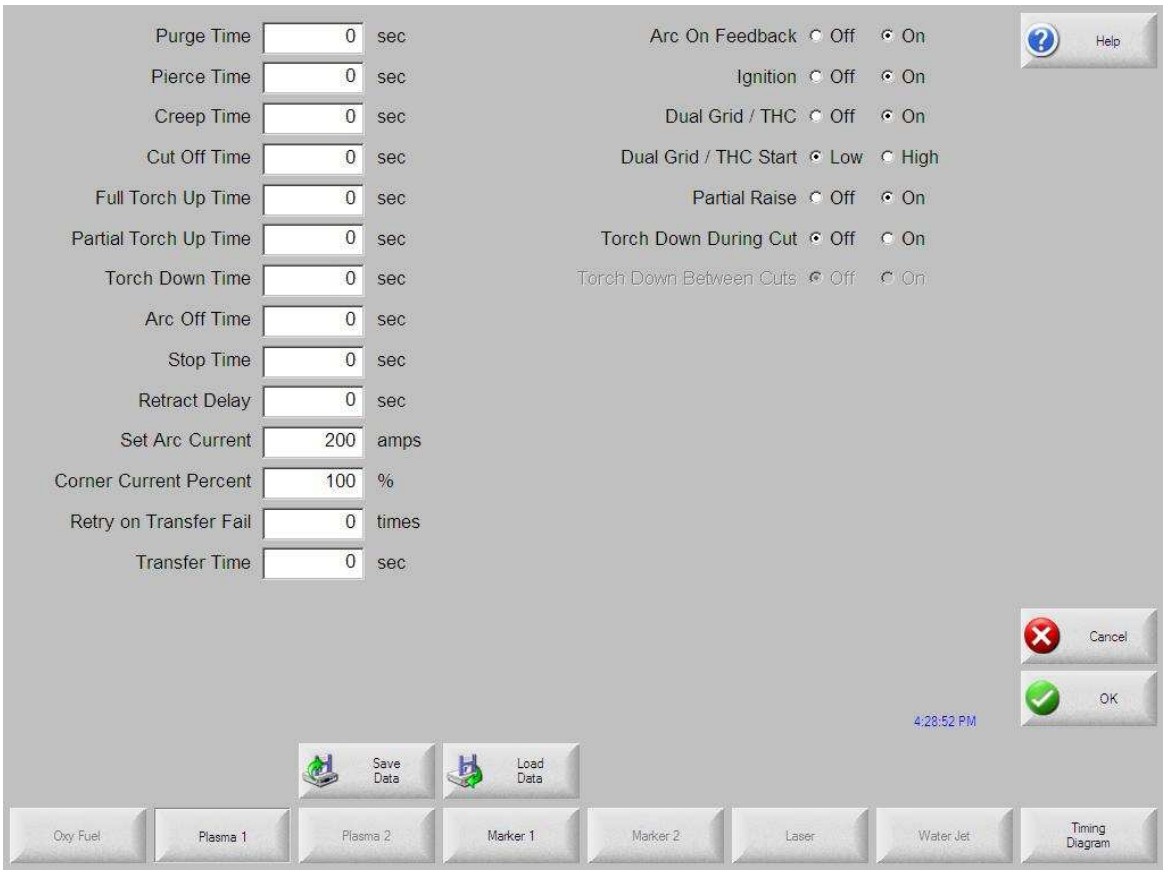
Reenable All Power Supplies

Press this soft key to re-enable any disabled HD4070 or HPR power supply with auto gas. This key is enabled only if a power supply has been disabled.



Process

Your CNC 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:



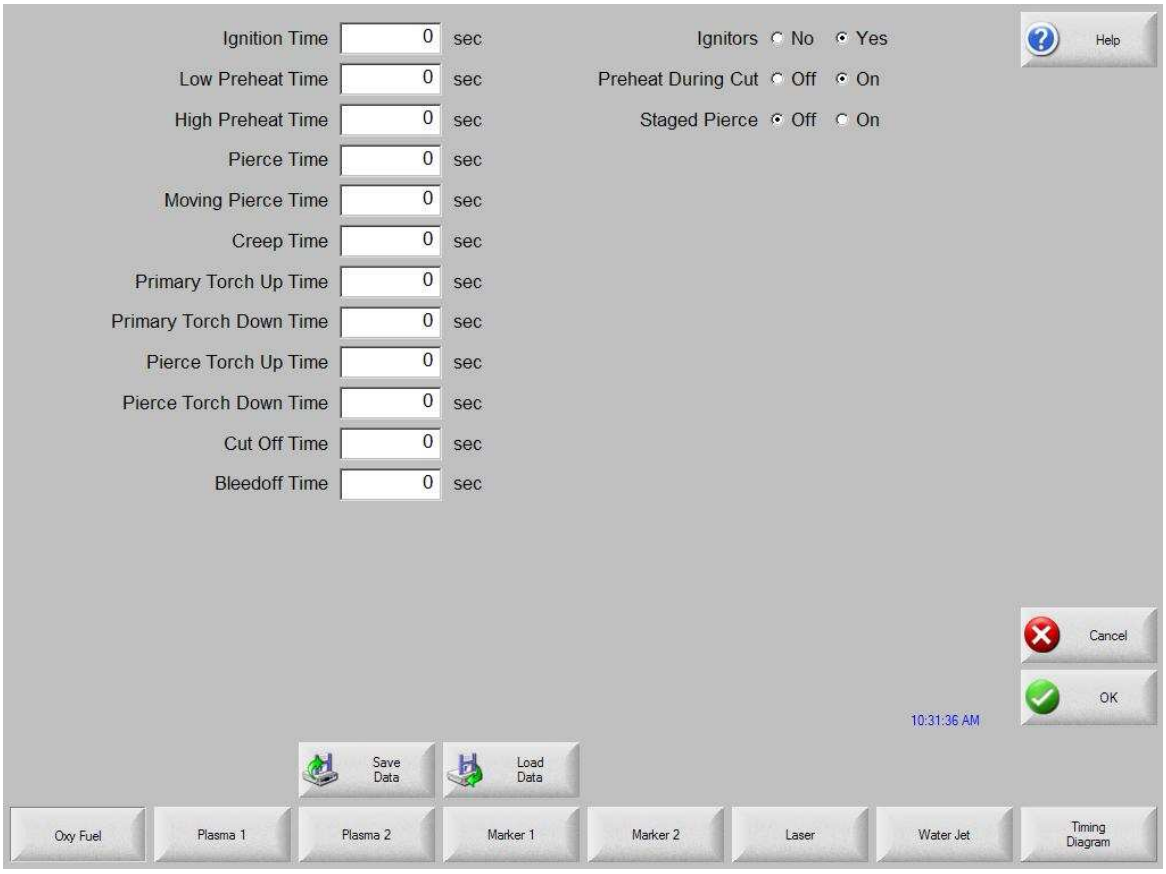
In the Plasma Cut Type example provided above, various process timing adjustments may be made to tune the process to the Plasma System and material being cut for the desired performance. Pressing the Timing Diagram soft key or the space key on a keyboard allows the user to view a graphical diagram of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

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

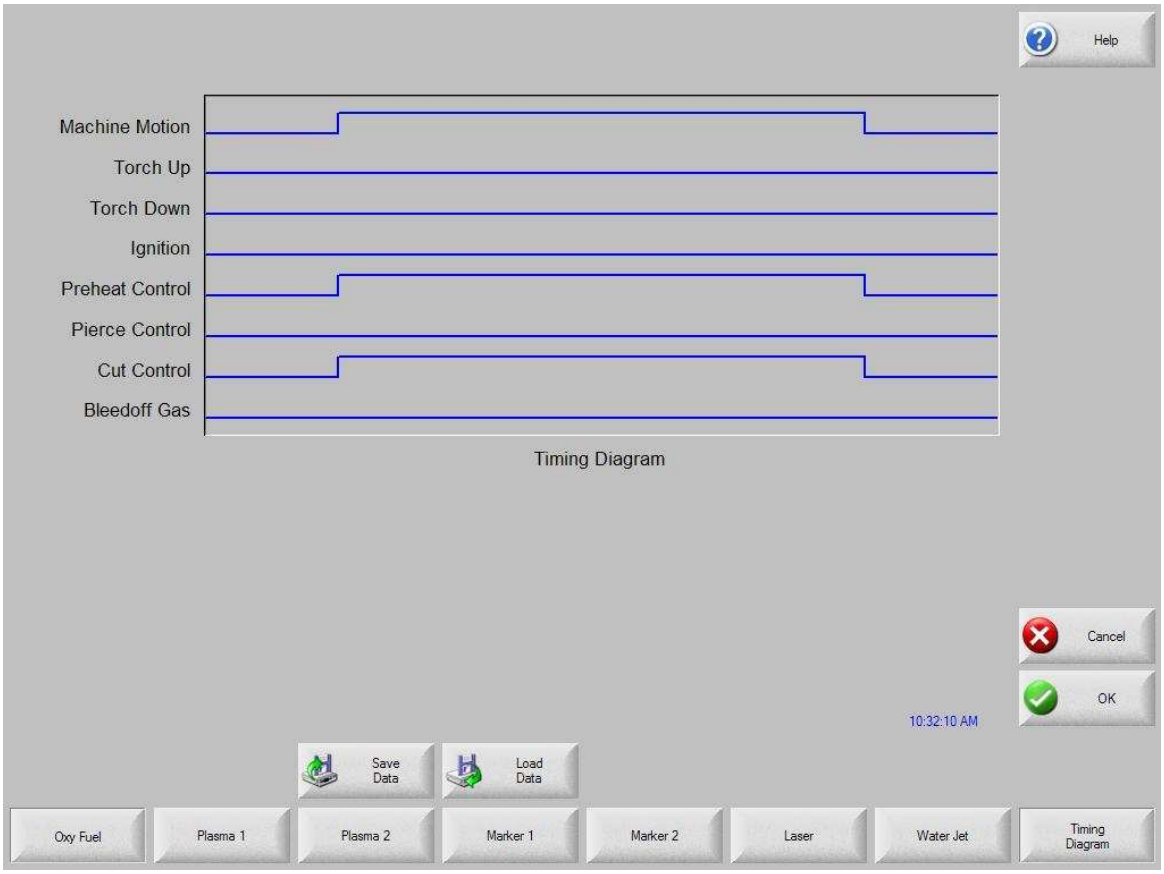
Oxy Fuel

The system supports configurations with both the Sensor OHC and other OHC lifters. In such a mixed configuration, stations must be defined and using stations selects, auto/all selects or manual selects. Although the system allows both types of OHC lifters, only one type can be used at a time.

The CNC 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 metal being cut. As these parameters are changed, the timing diagram below changes to show the new timing parameters. This screen is located under the Cut Types soft key in the Setups.
Note: Press the Start key twice to bypass all timers and begin the cut.



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



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

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

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

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

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

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

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

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

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

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

Pierce Torch Down Time
Specifies the amount of time used for torch lowering during piercing.

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

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

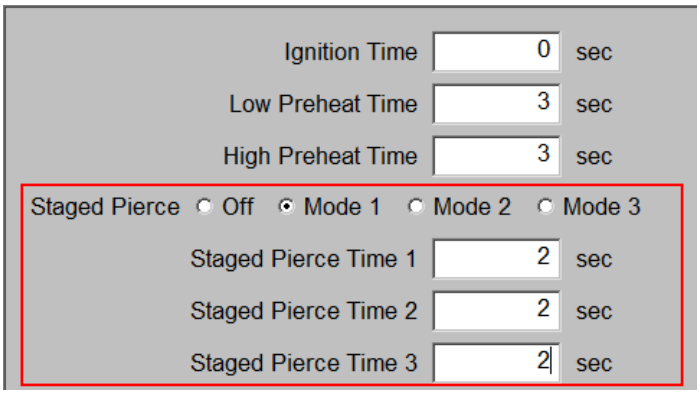
Igniters
When “No” is selected, this feature will turn the Preheat on between cut segments. This is to keep the torch lit for those cutting systems that do not have automatic torch igniters. For those cutting systems which have automatic torch igniters or that control the torch gases outside of the control,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

Preheat During Cut

Specifies whether the Preheat will be left on while cutting.

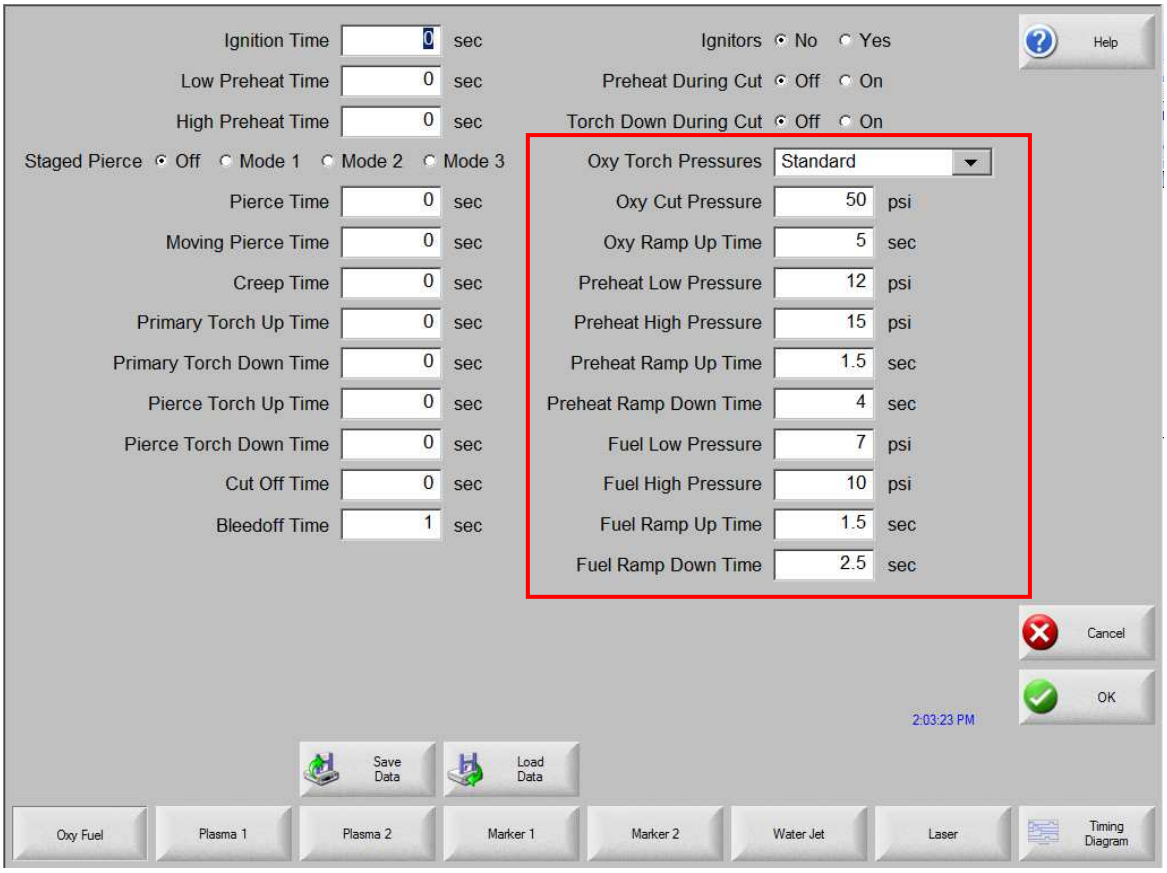
Staged Pierce

This unique feature works with selected outputs to perform the pierce in a staged progression of gas pressures.
To enable this setting, select one of the three modes and set the three staged pierce values:



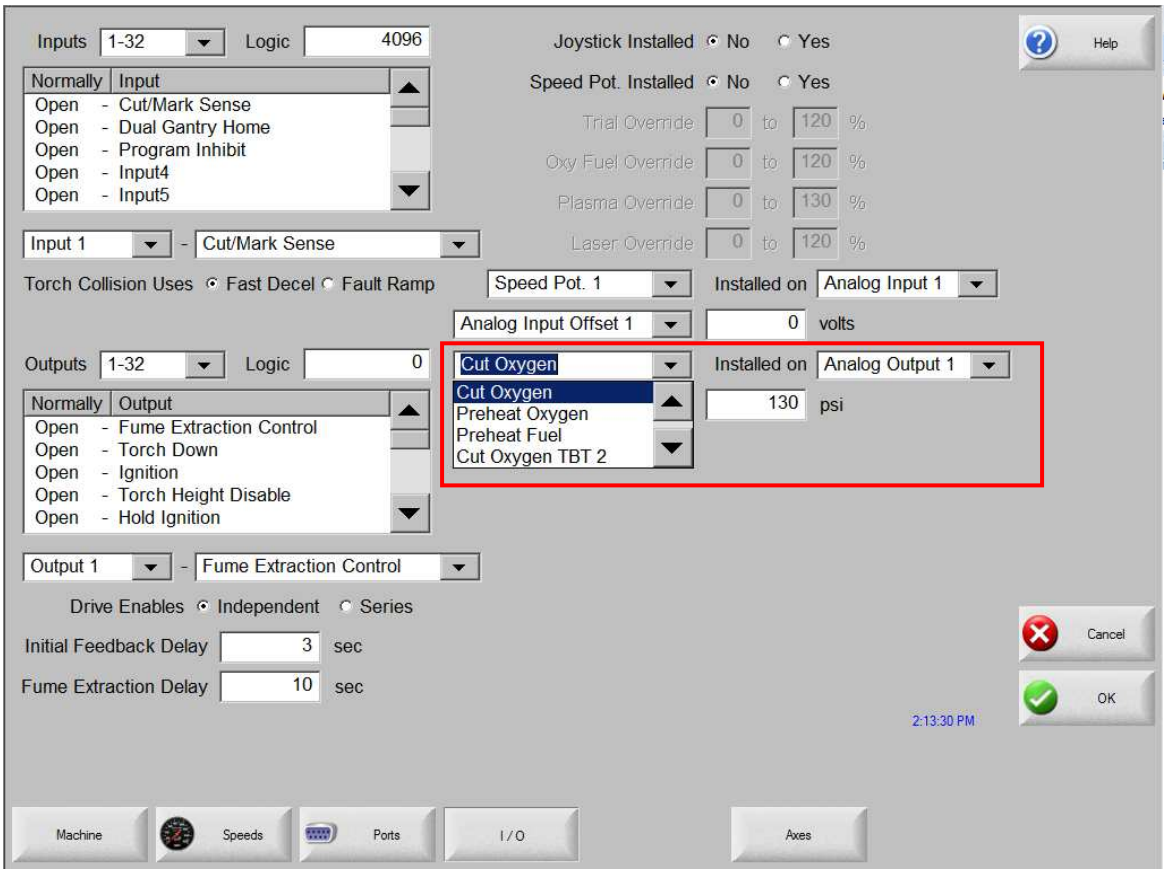
Controlling Oxy Fuel with Analog Outputs

You can select analog outputs on the I/O screen to control oxygen fuel pressures.



To select the analog signals that are used for oxygen valve pressure control:

1. On the Machine Setups password screen, press the I/O button.



2. Select each control and assign an analog output for it.
   The controls are listed in groups. All items in each group should be selected and matched with an analog output:
   - Cut Oxygen
   - Preheat Oxygen
   - Preheat Fuel

   - Cut Oxygen TBT 2
   - Preheat Oxygen TBT 2
   - Preheat Fuel TBT 2

   - Cut Oxygen TBT 3
   - Preheat Oxygen TBT 3
   - Preheat Fuel TBT 3

   - Preheat Oxygen TBPT
   - Preheat Fuel TBPT

3. When you finish selecting controls and assigning outputs, press or click OK. When you return to the Oxy Fuel screen, the parameters for the control you selected are added to the screen.
4. Edit the values for the parameters to meet the needs of your process.

Oxy Torch Pressures
Select the type of oxy fuel torch for the process.

Oxy Cut Pressure
Enter the pressure, in pounds per square inch, of the oxy fuel during cutting.

Oxy Ramp Up Time
Enter the time, in seconds, that the oxy fuel takes to reach cutting pressure.

Preheat Low Pressure
Enter the pressure, in pounds per square inch, of the oxy fuel at low pressure during preheat.

Preheat High Pressure
Enter the pressure, in pounds per square inch, of the oxy fuel at high pressure during preheat.

Preheat Pressure
Enter the preheat pressure, in pounds per square inch, for the triple bevel head.

Preheat Ramp Up Time
Enter the number of seconds that the process takes to move from low to high pressure during preheat.

Preheat Ramp Down Time
Enter the number of second that the process takes to move from high to low pressure during preheat.

Fuel Low Pressure
Enter the pressure, in pounds per square inch, of the oxy fuel at low pressure during cutting.

Fuel High Pressure
Enter the pressure, in pounds per square inch, of the oxy fuel at high pressure during cutting.

Fuel Pressure
Enter the fuel pressure, in pounds per square inch, for the triple bevel head.

Fuel Ramp Up Time

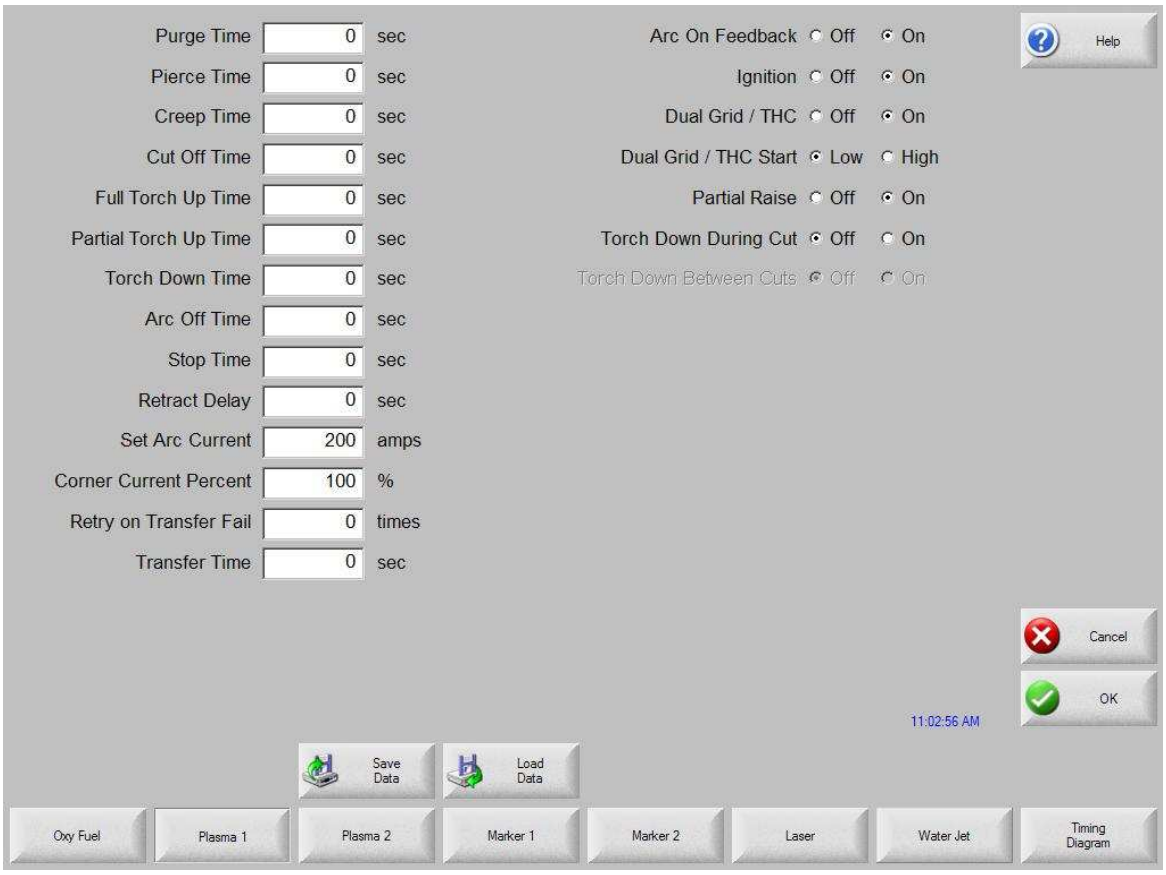
Enter the number of seconds that the process takes to move from low to high pressure during cutting.

Fuel Ramp Down Time

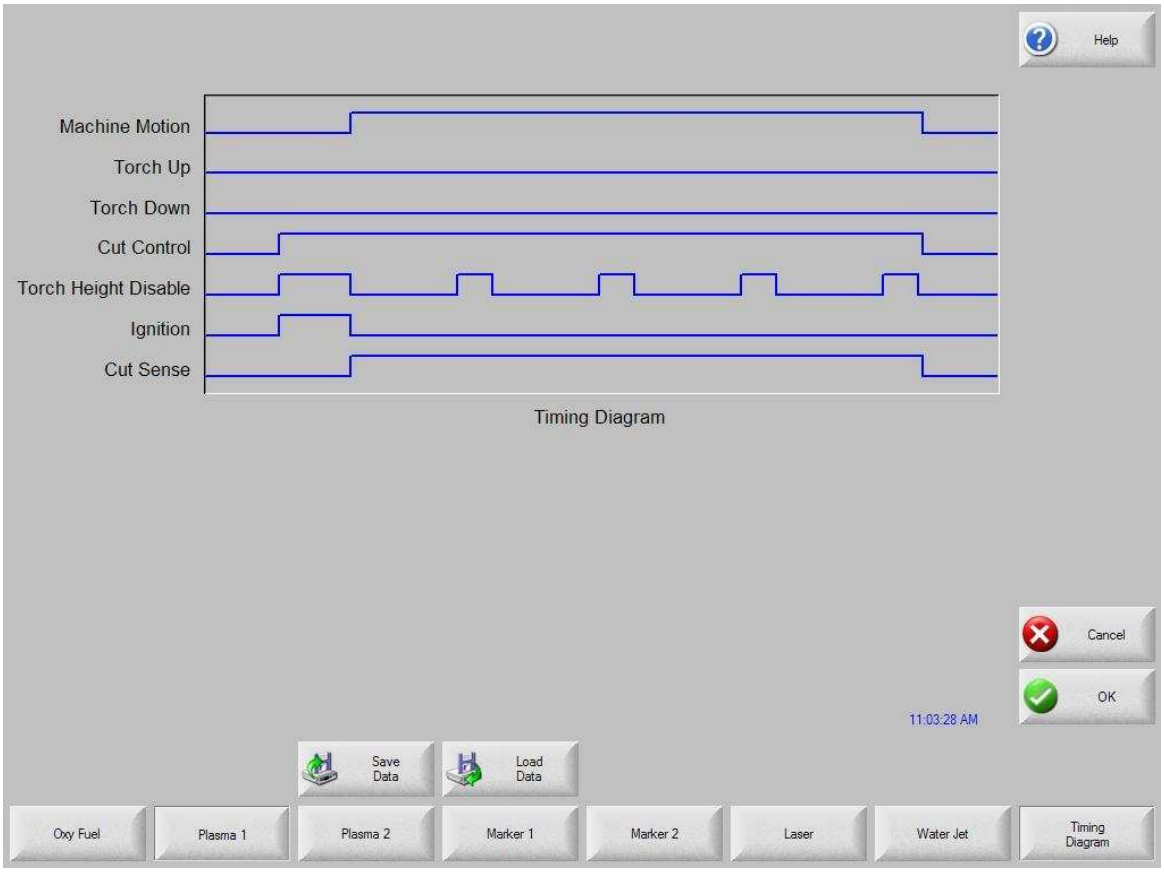
Enter the number of second that the process takes to move from high to low pressure during cutting.

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.



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



Purge Time

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

Pierce Time

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

Creep Time

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

Cut Off Time

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

delays of the cut gases that will maintain the cut arc and widen the cut path at the end of the cut segment.

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

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

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

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

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

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

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

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

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

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

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

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

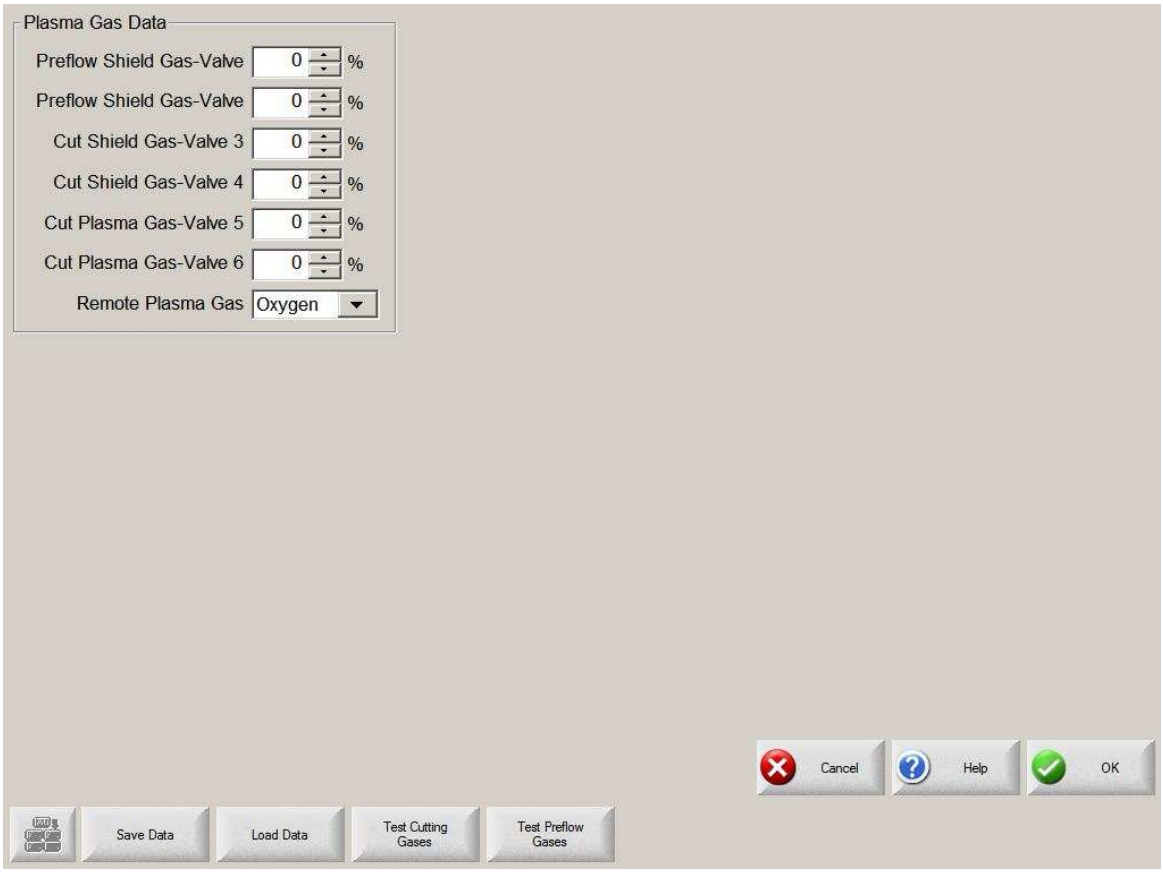
Torch Down During Cut
Turning on the Torch Down During Cut feature forces the torch down output to remain on throughout the cut process. This is advantageous for pneumatic style torch lifters that require a constant output.

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

HD3070 Auto Gas Interface

This section provides information on the Hypertherm HD3070® Auto Gas Interface. The Auto Gas screen is available from the Cut Types screen.

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



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

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

Save Data

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

Load Data

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

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

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

Test Cutting Gases

Pressing the Test Cutting Gases soft key allows the operator to test the HD3070 Cut Gases.

Test Preflow Gases

Pressing the Test Preflow Gases soft key 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)

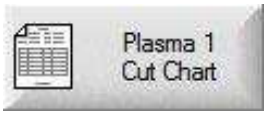
HD4070 and HPR Overview

The Mariner ™ and Voyager™ III controls offer the additional option of connecting directly to the Hypertherm HD4070 HyDefinition®, HPR130™ and HPR260™ 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.

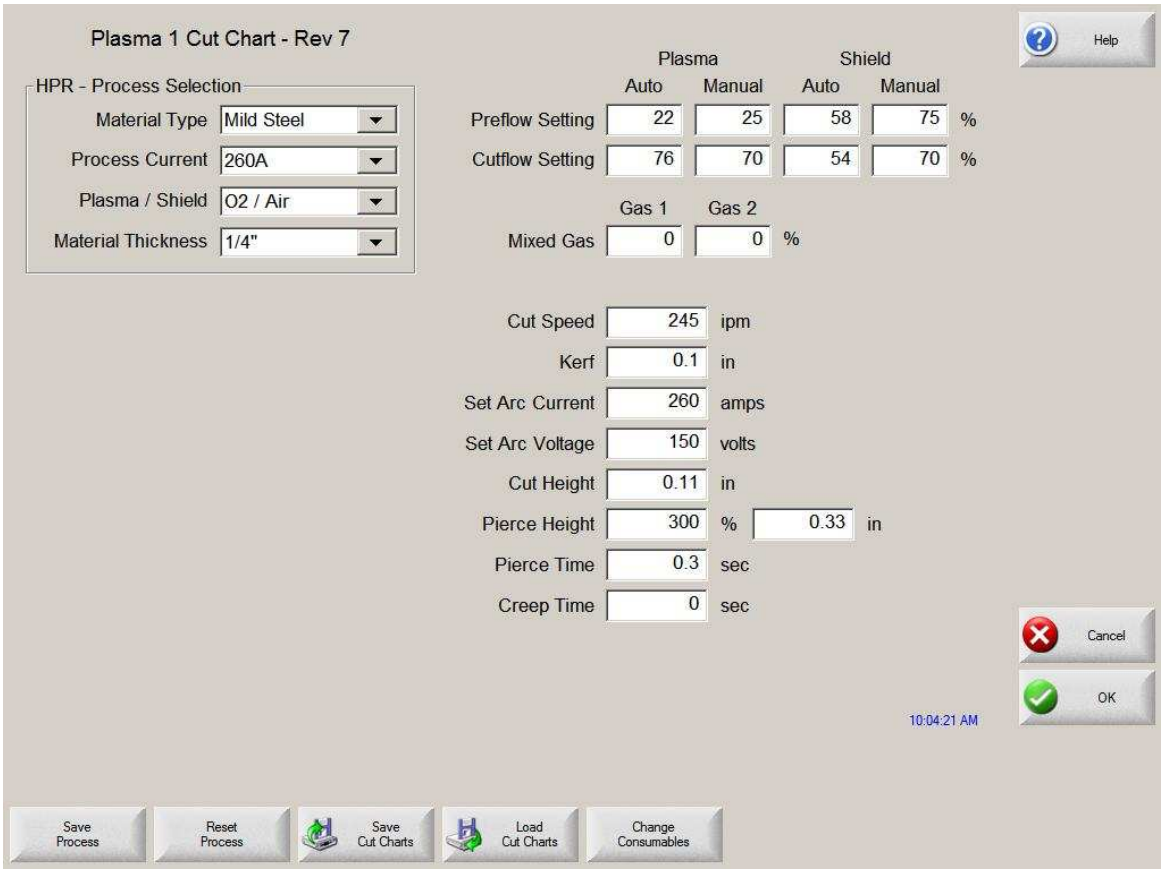
This database allows the user to select factory recommended settings or amend the database for personalized settings. The Cut Chart information may be saved or loaded via the hard drive or floppy drive. The Cut Chart files containing the factory recommended settings are available from Hypertherm.

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.



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 that is 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. This parameter allows the plasma torch to completely pierce the material before moving.

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

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

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

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

Examples of user and factory file names:
Mild Steel-HT4400-HD4070.usr
Mild Steel-HT4400-HD4070.fac

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

Factory text file names:

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

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

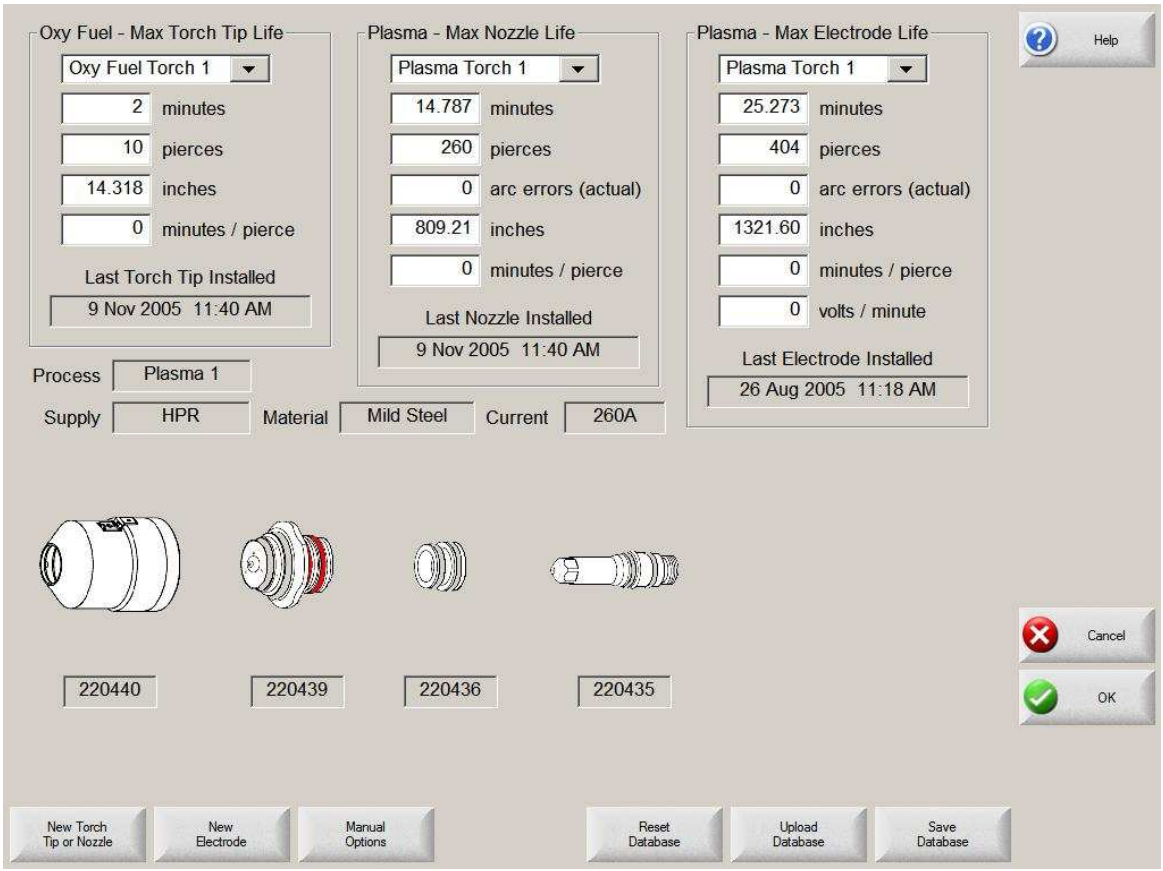
Test Preflow
Pressing the Test Preflow soft key performs the Test Preflow Gases feature at the Plasma supply.

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

Notes:
- Refer to the power supply operator's manual for complete information on the operation and setup of the plasma supply.
- A serial communication 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 can 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 power supply link feature has been enabled, consumable data information may be viewed at the Change Consumable screen.

FineLine Overview

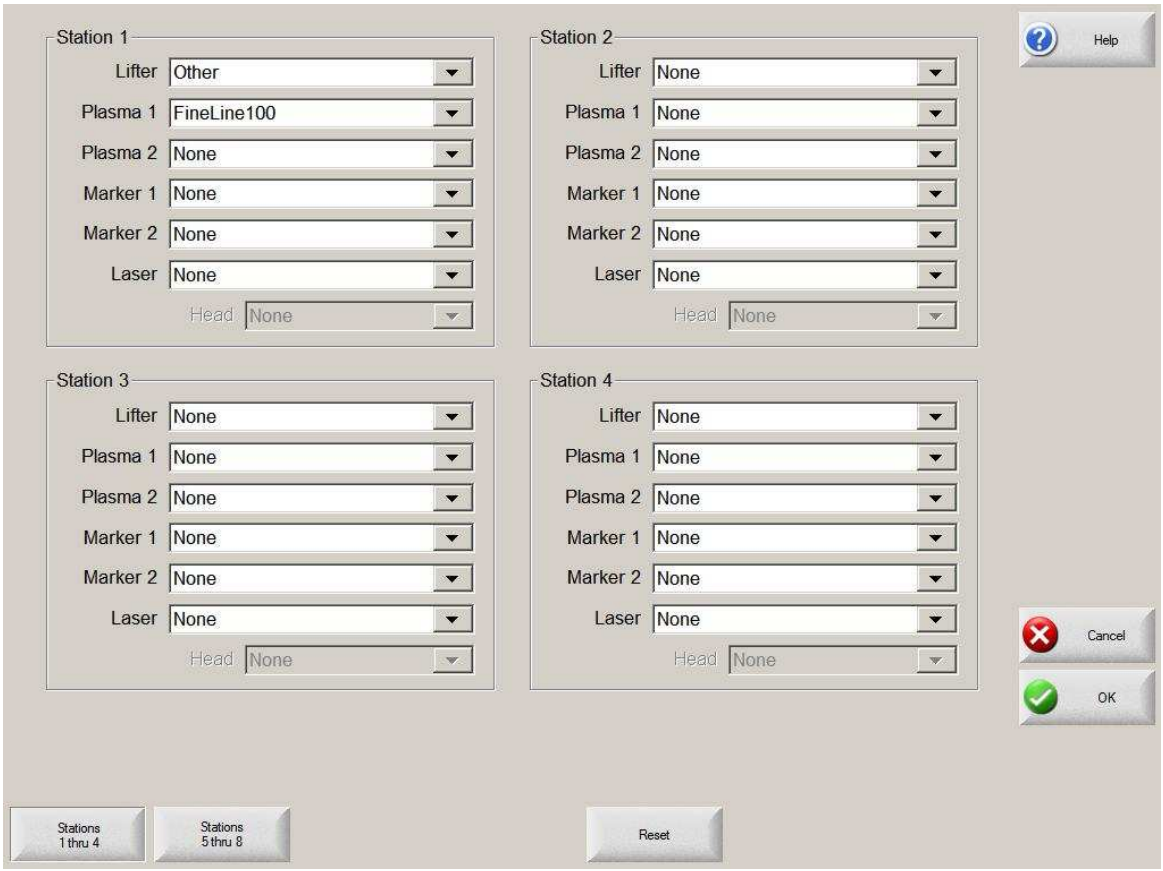
The “Type V” control offers the additional option of interfacing directly to InnerLogic’s FineLine Power Supply for setup via a user selected RS-422 serial port. This advanced feature transmits all necessary power supply settings from the control directly to the FineLine power supply configuring it for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

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

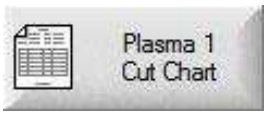
This database allows the user to select factory recommended settings or amend the database for personalized settings. The Cut Chart information may be saved or loaded via the hard drive or floppy drive. Specialized Cut Chart files containing the factory recommended settings are available from the control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

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

Station Configuration (example)

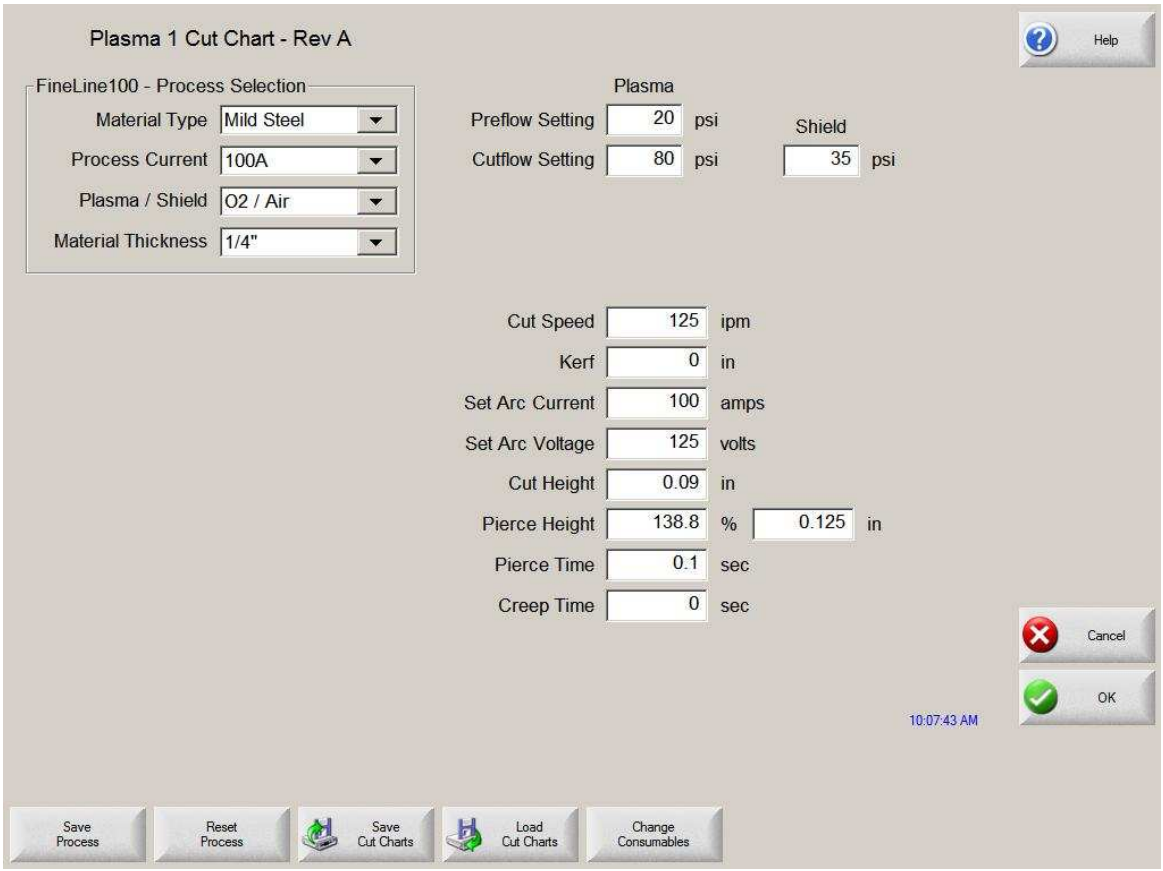


Access to the FineLine Cut Chart data is available from the Plasma Cut Types or Marker Cut Types screen using the shift key, as indicated below.



Note: Screen information will vary depending on THC selection.

Cut Chart



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 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. This parameter allows the plasma torch to completely pierce the material before moving.

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

Database Features

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

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

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

Examples of user and factory file names.

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

Load Cut Charts
Pressing the load Cut Charts soft key allows the user to the factory default database files which are supplied by Hypertherm as a user files (.usr) or factory files (.fac) from Diskette or USB memory stick.
It is recommended that the Database be updated through the control rather than the Power Supply if the serial communications link is enabled.

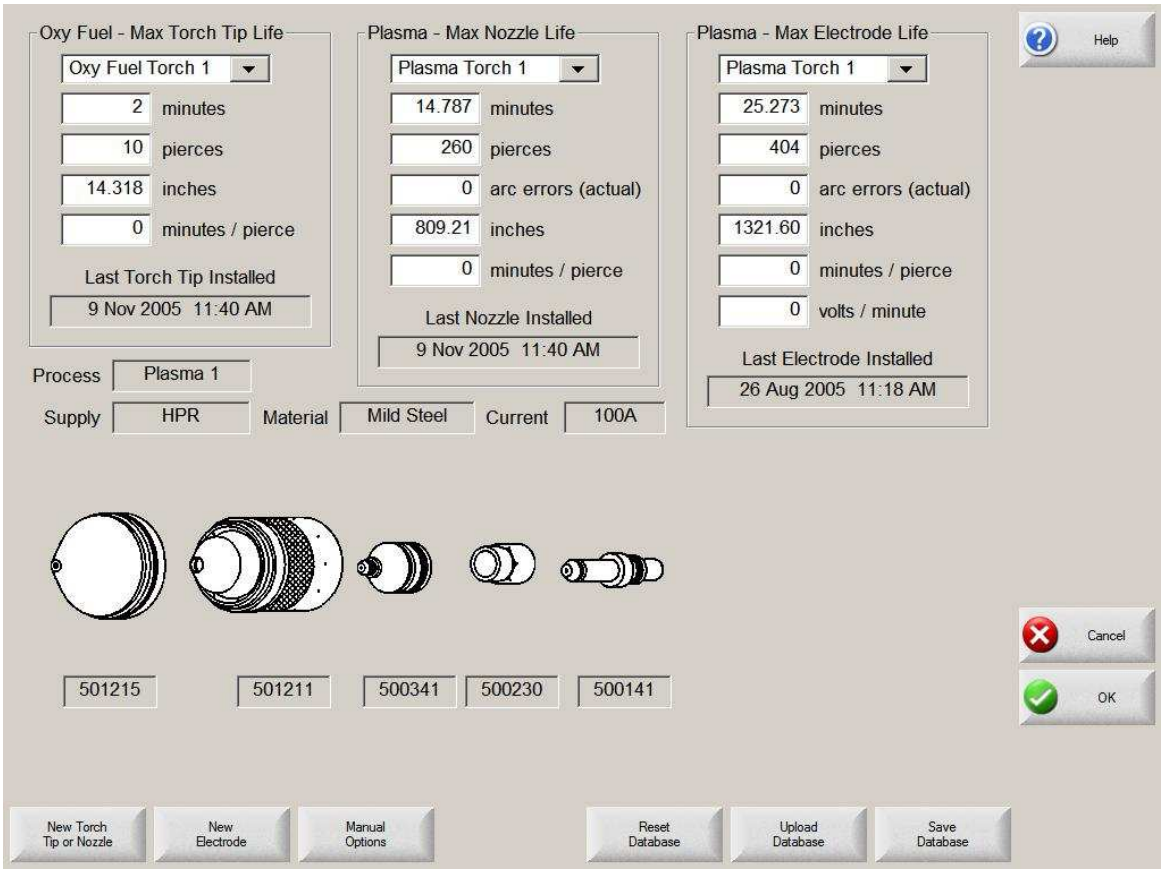
Test Preflow
Pressing the Test Preflow soft key performs the Test Preflow Gases feature at the HD4070 power supply.

Test Cutflow
Pressing the Test Cutflow soft key 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



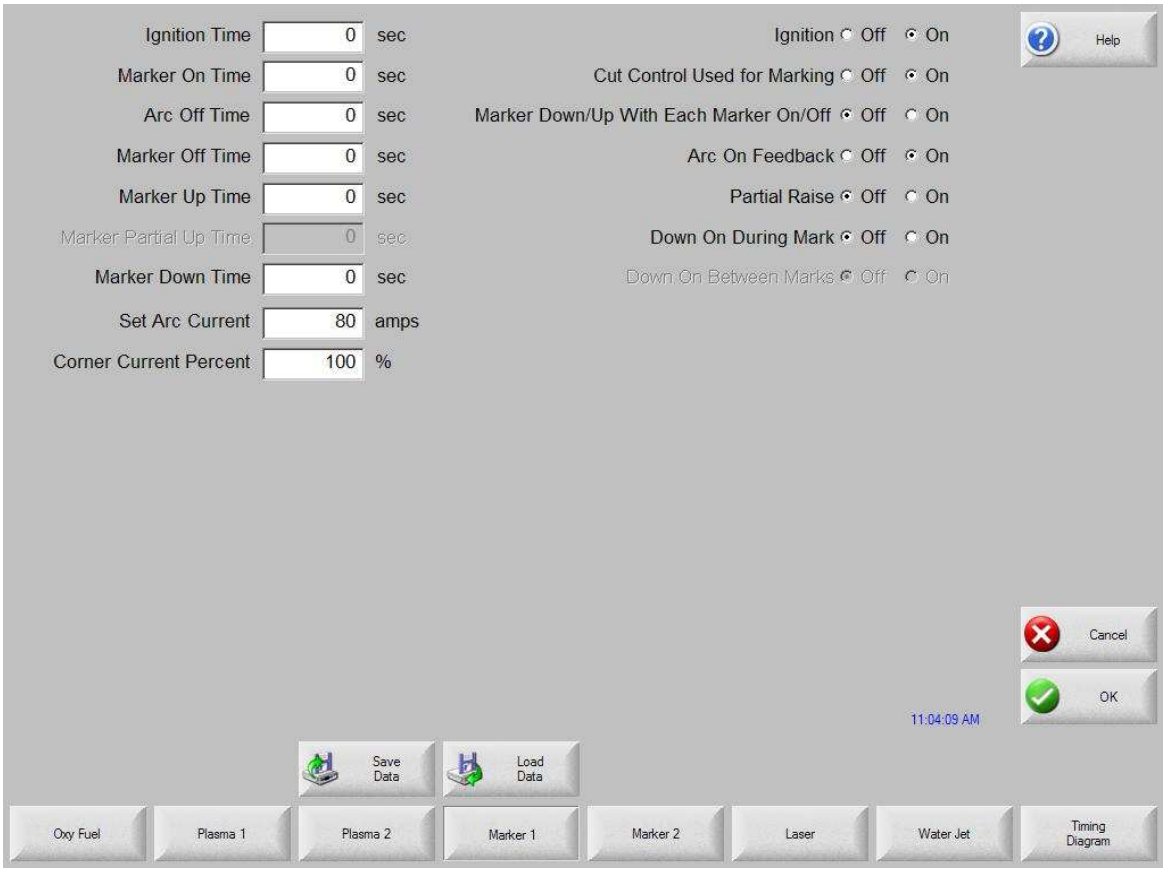
When the FineLine feature has been enabled, consumable data information may be viewed at the Change Consumable screen.

Marker

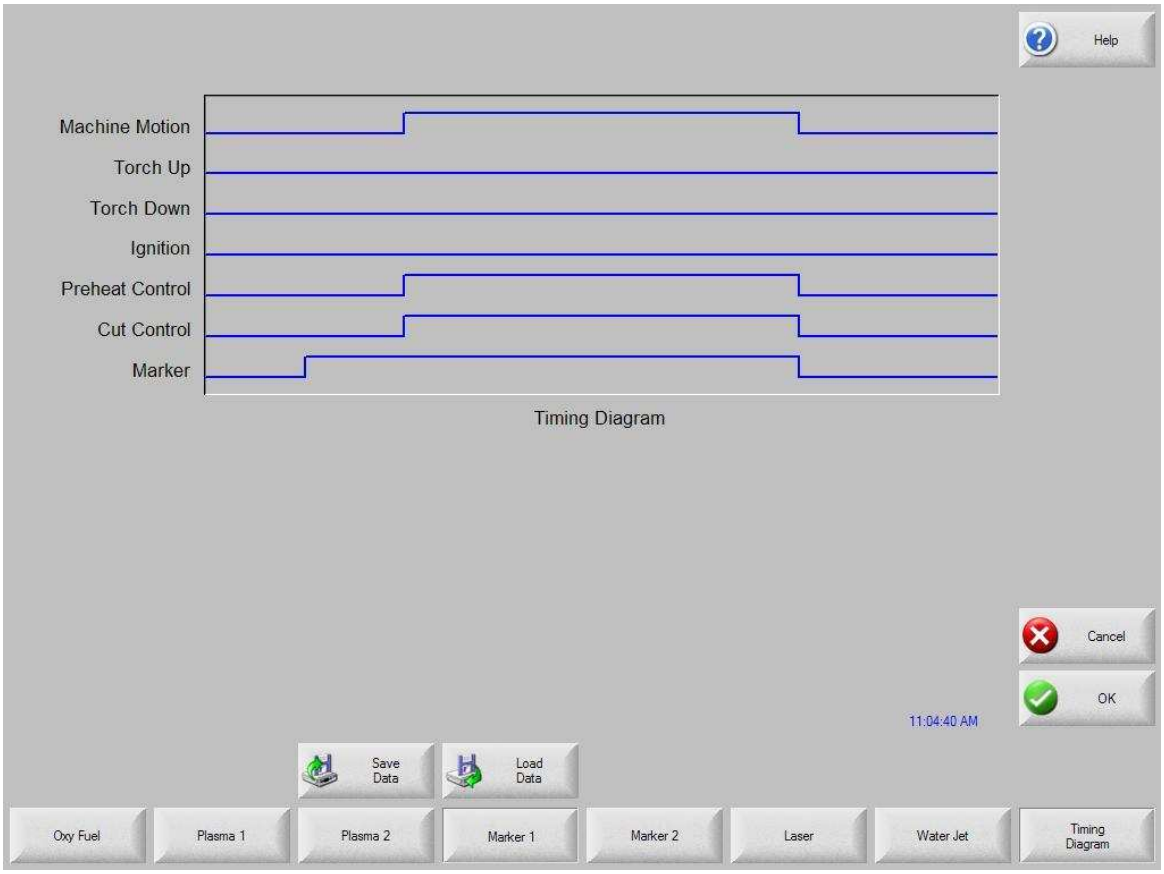
The control comes with the following built in marker control logic for marking. When marking is selected, the following parameters are available to customize the logic for the particular metal being marked. As these parameters are changed, the timing diagram below will change to show the new timing parameters.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

Marker Interface

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



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



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

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

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

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

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

Marker Down Time

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

Set Arc Current
The Set Arc Current feature allows the user to set the arc current at the Plasma Marking supply. This feature uses the "Set Current BCD" output from the control to activate the BCD inputs at the Plasma Marking supply. EIA RS-274D part program code G59 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
Turn on the Down On Between Marks feature to force the Torch Down Output to remain on while traversing between marking segments.
Note: Please refer to the Program Codes section of this guide for information on the Marker Font Generator feature.

Laser Overview

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

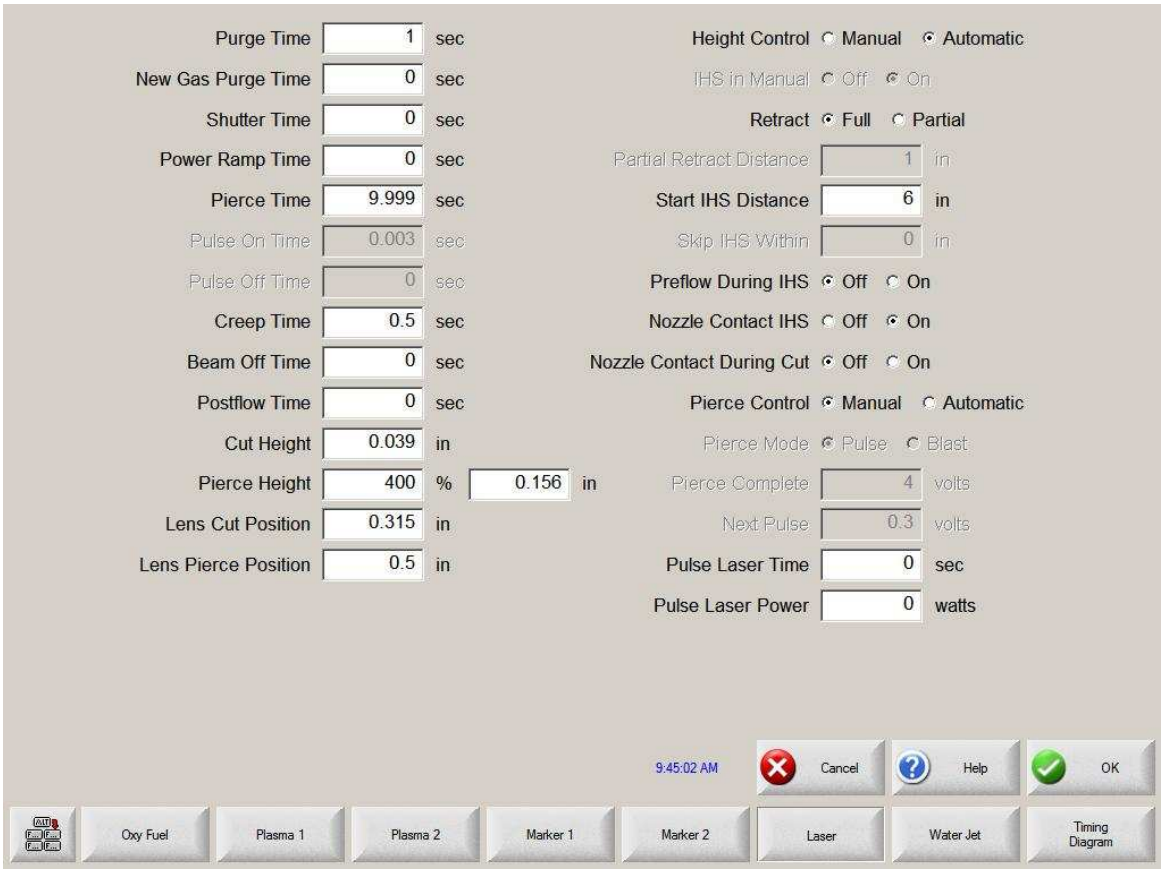
FAST Laser uses an innovative patent-pending design to create a dual flow zone allowing significantly higher oxygen assist gas pressures in the tightly defined cut zone established by the beam geometry, without the uncontrolled burning in the surrounding zone normally induced by increased assist gas 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 LH2125/2100 series is used on laser systems with 1.5" or 2.0" optics. The Hypertherm LH1575 head offers two different focal lengths: 5.0 and 7.5 inches for 1.5 inch optics.

Integrated with Hypertherm Automation's Mariner CNC, 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 Cut Types Screen

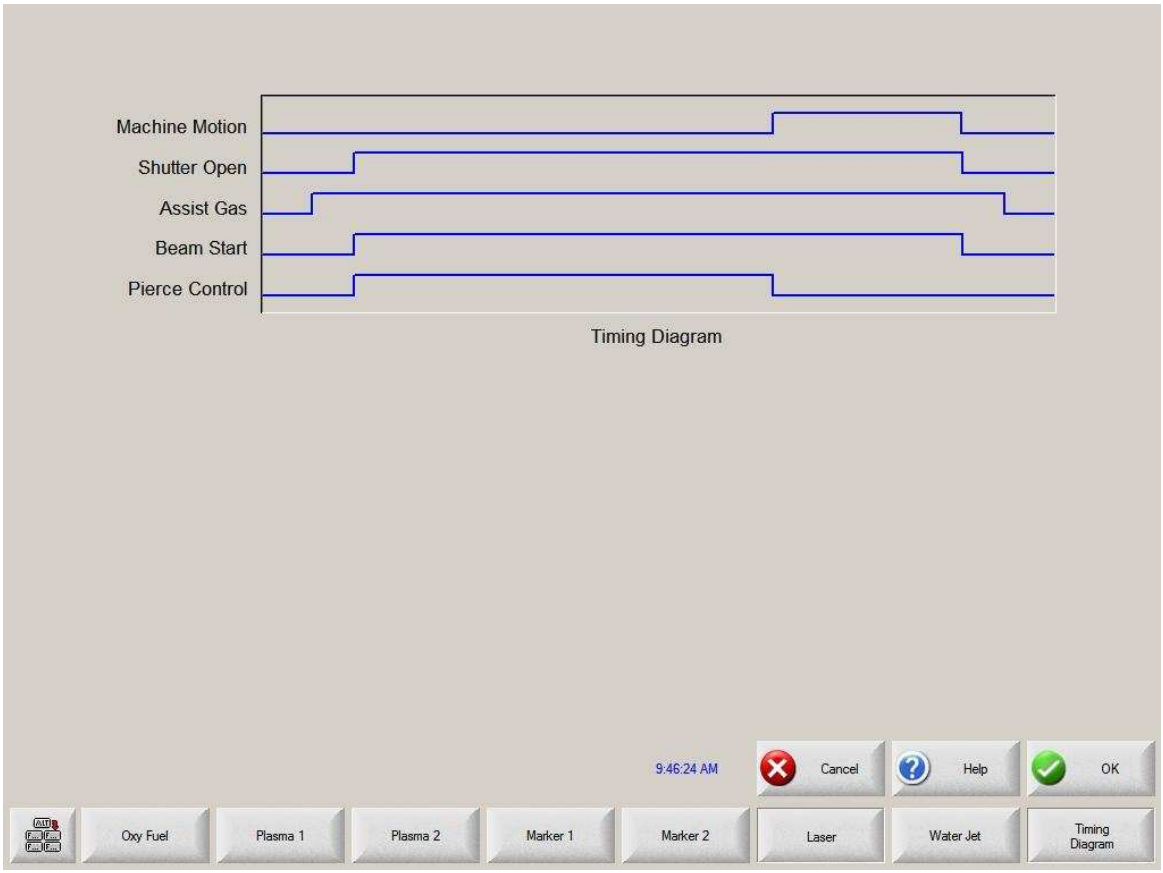


The Alt soft key at the left edge of the soft keys indicates additional soft keys are available. This allows for test lifter function to be available.

Test Lifter

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

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



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

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

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

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

Pierce Time
Specifies the time delay from when laser head completes lowering until motion is initiated at creep speed for cutting.
When Manual Pierce Control is selected, this is the total pierce time allowed.

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

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

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

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

Beam Off Time
The Beam Off Time parameter specifies the amount of time the beam output will be turned off prior to 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 Z axis lifter (THC1) in manual mode.

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

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

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

Preflow During IHS
Selecting ON will activate Preflow gases during the IHS cycle.

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

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

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

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

Pierce Complete

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

Next Pulse

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

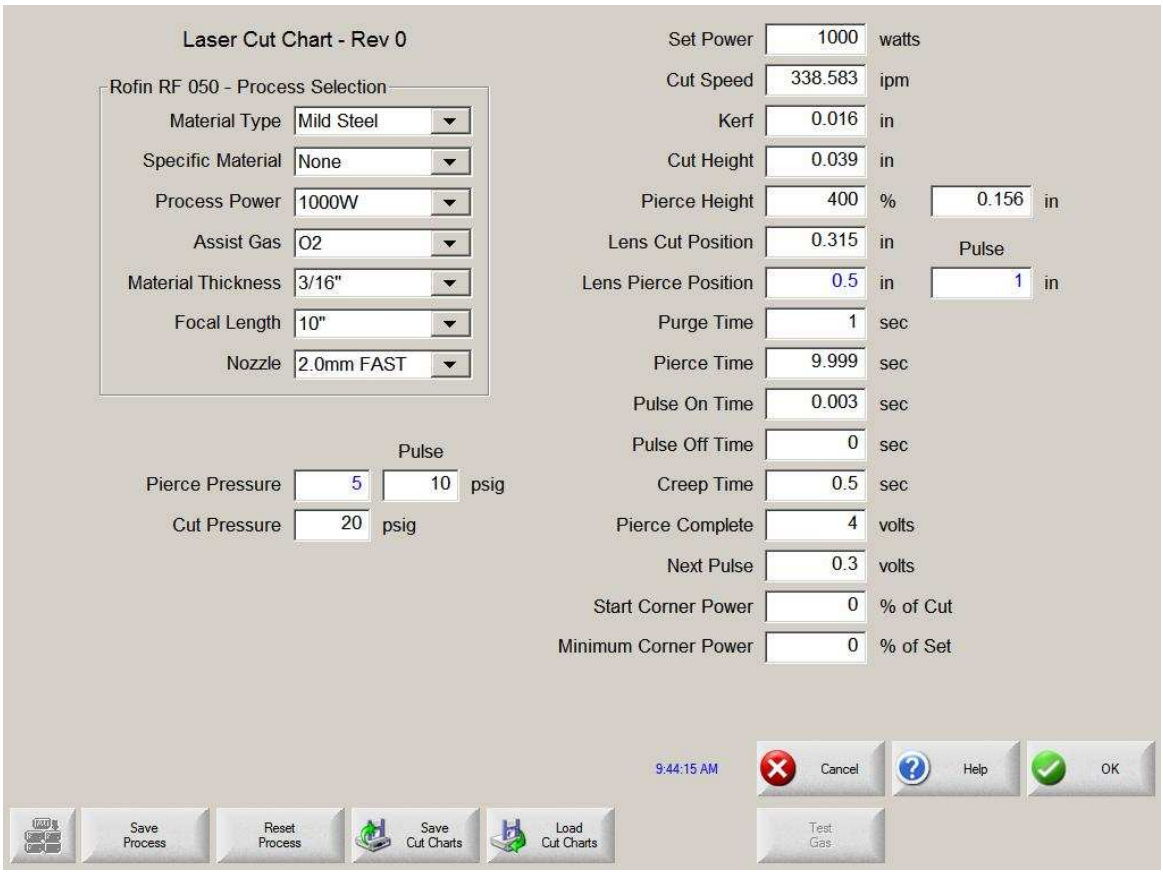
Cut Chart

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

Notes:

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

Laser Cut Chart Screen



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

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

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

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

Assist Gas
The appropriate Assist Gas for the desired process.

Material Thickness
The material thickness for the selected material type.

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

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

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

The following parameters 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 that will be applied to the current part program.

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

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

Lens Cut Position
Sets the focal lens position in the laser head for cutting.

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

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

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

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

When Manual Pierce Control is selected, this is the total pierce time allowed.
With Automatic Pierce Control is selected, this time is an additional delay after pierce is complete.

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

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

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

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

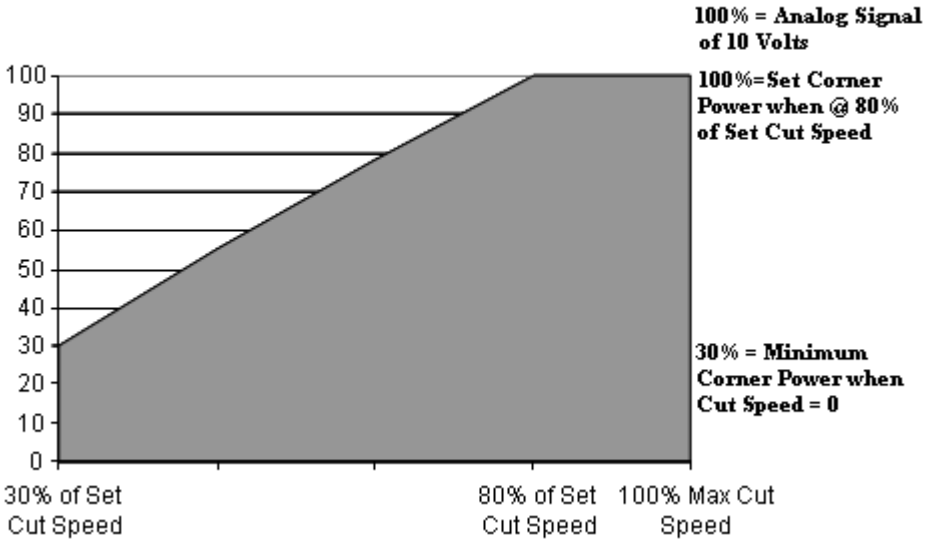
Next Pulse
Based on sensors in the laser head, the system can determine when the next pulse occurs. The Next Pulse will be delivered when the voltage drops below the Next Pulse setting.

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

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

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

Example of Corner Power Graph



Save Process
Press the Save Process soft key to save the current process settings to the hard drive and create a custom user database based on the eight process variables selected.

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

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

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

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

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

Height Control Manual/Automatic
Allows the user to select a manual or automatic height control for the laser head.

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

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

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

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

Preflow During IHS
Select ON to activate Preflow gas during the IHS cycle.

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

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

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

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

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

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

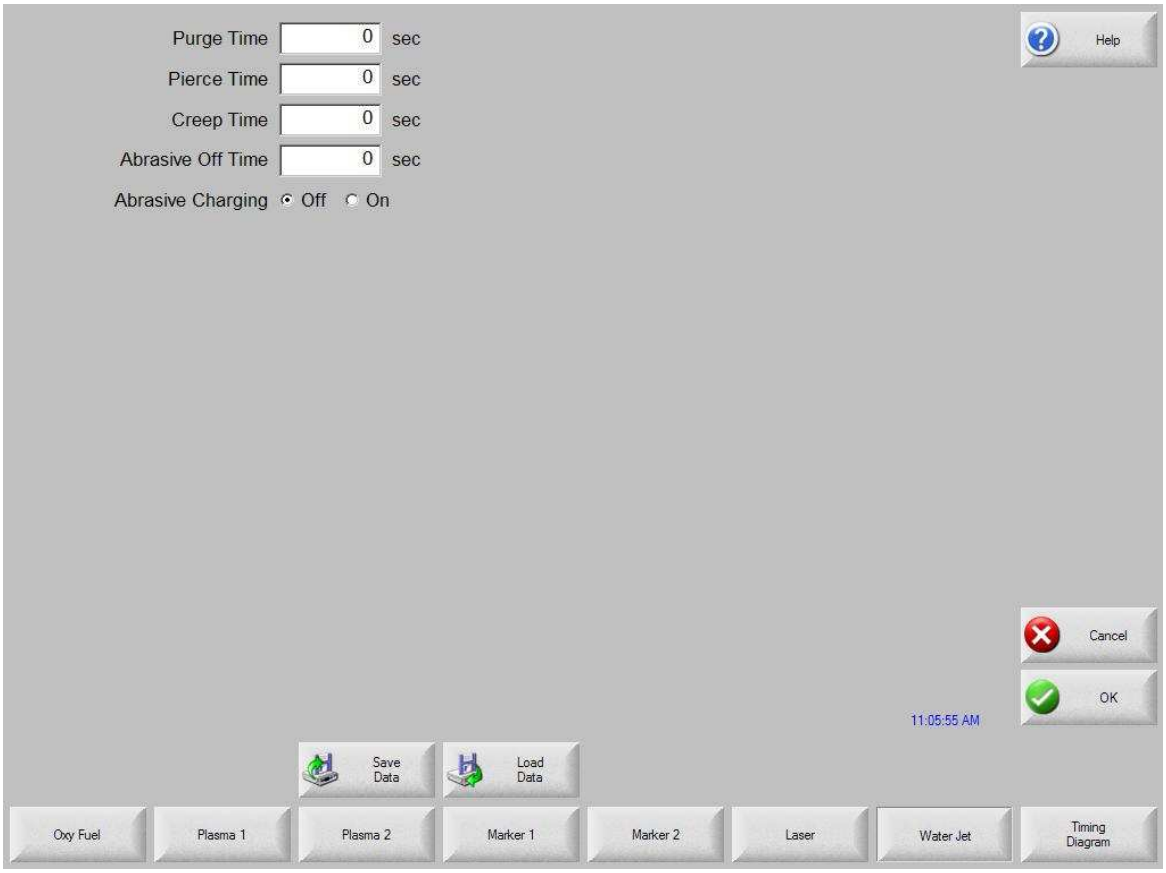
Cut Chart

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

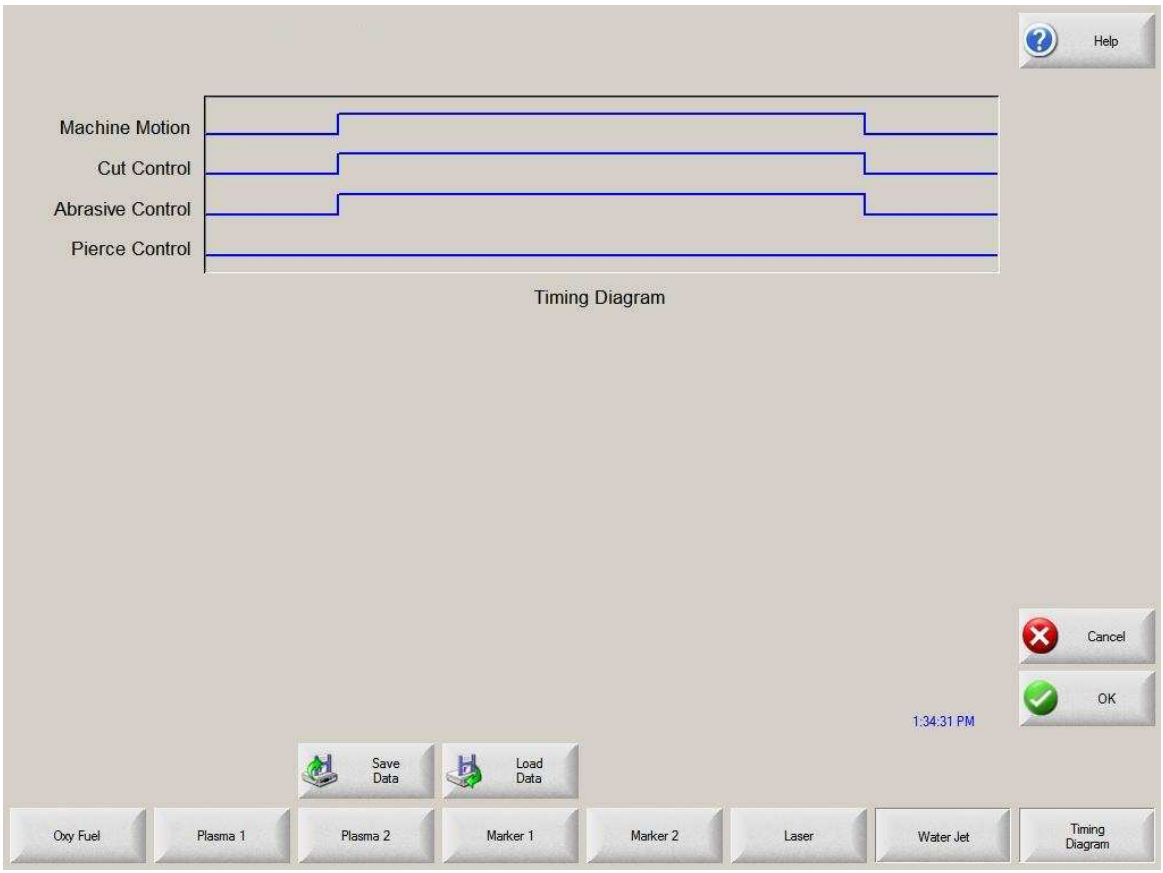
Notes:

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

Water Jet



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



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

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

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

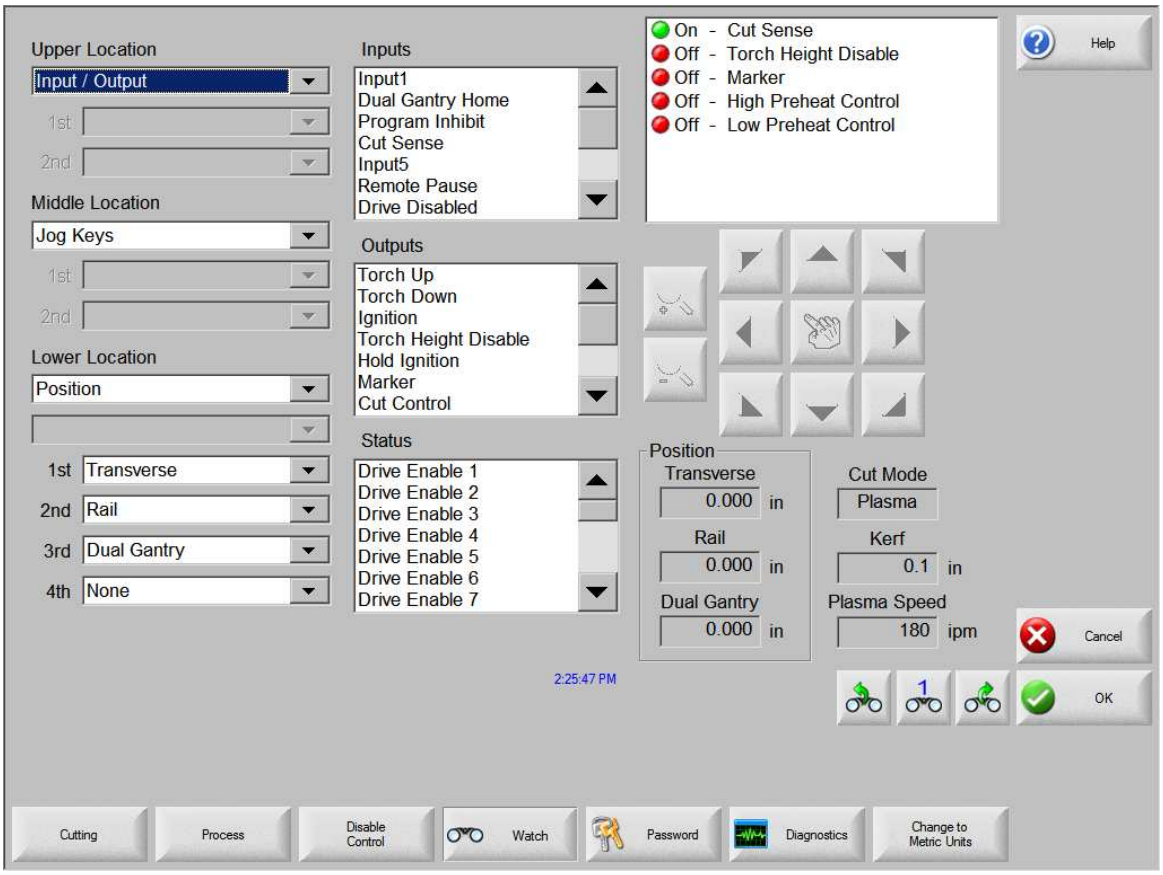
Abrasive Off Time
The Abrasive Off delay parameter species the amount of time the abrasive will remain on at the end of a cut.

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

Watch

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

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



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

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

None
Selecting None leaves the selected position blank.

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

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

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

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

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

Note: Specific control hardware is required.

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

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

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

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

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

Process Data
The Process Data option allows the user to view up to four selected items for a selected cut or marking process. Process timers and status items for Oxy Fuel, Plasma, Marker, Water jet and Laser may be selected. Note: The process data will only be displayed during the current cut process. Example: Plasma 1 process parameters will only be displayed in the Watch window at the main cut screen while cutting in Plasma 1 Mode.

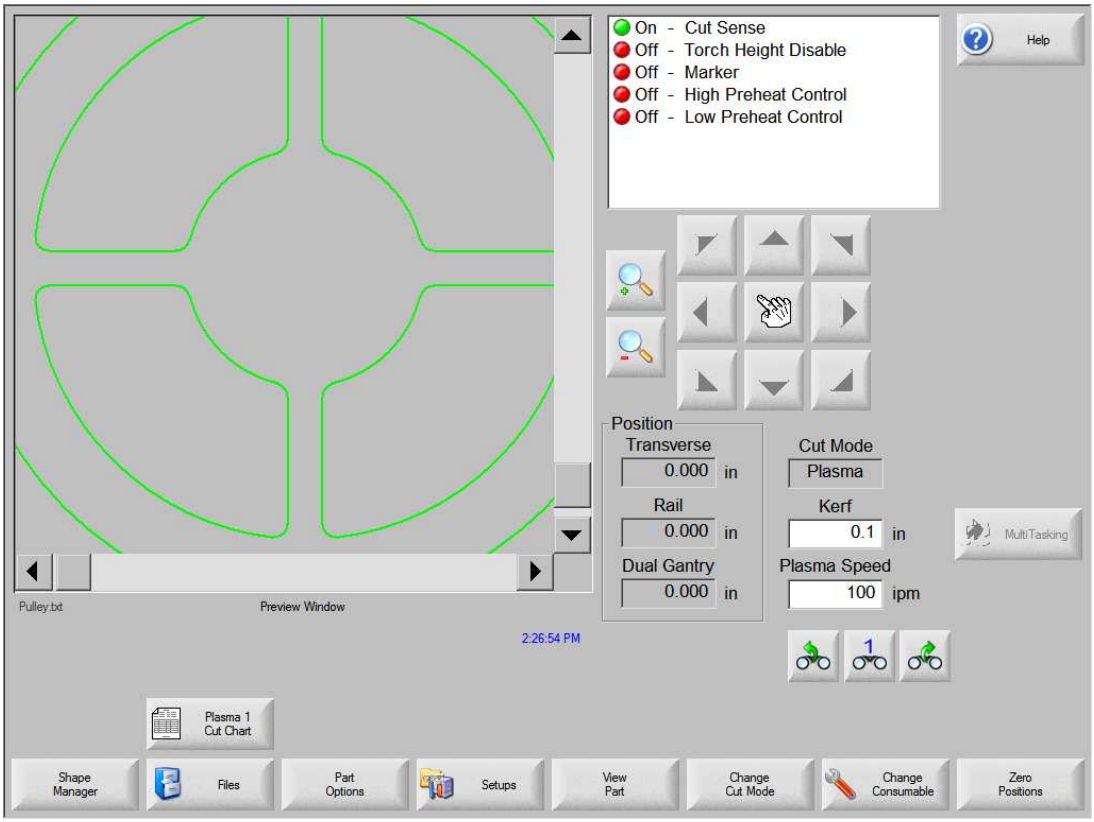
Laser Nozzle
Laser Nozzle consumable life to be graphically displayed while cutting. This is especially useful in helping to determine when the nozzle should be replaced and keeping track of nozzle data for statistical process control (SPC).

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

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

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

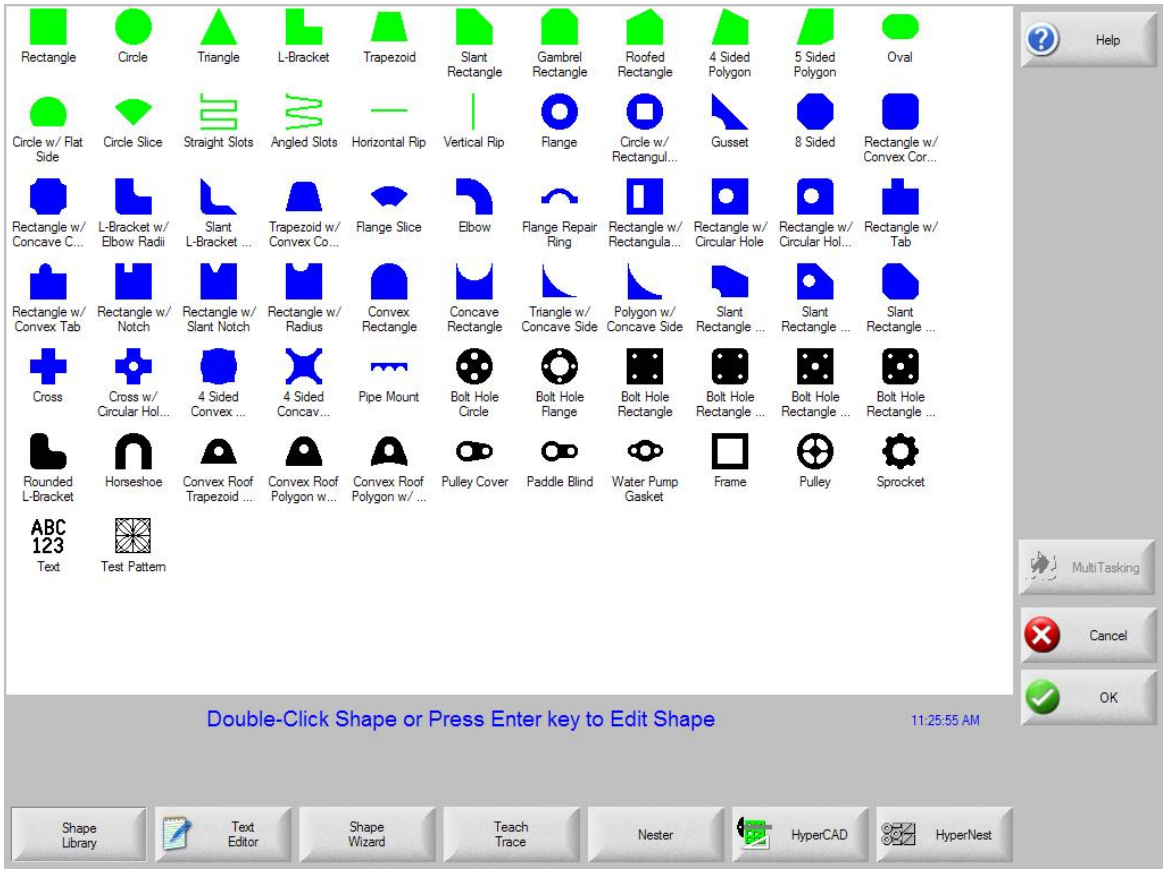
Example


On - Cut Sense
Off - Torch Height Disable
Off - Marker
Off - High Preheat Control
Off - Low Preheat Control
Help
Position
Transverse
0.000 in
Rail
0.000 in
Dual Gantry
0.000 in
Cut Mode
Plasma
Kerf
0.1 in
Plasma Speed
100 ipm
MultiTasking
Pulley.txt
Preview Window
2:26:54 PM
1
Plasma 1 Cut Chart
Shape Manager
Files
Part Options
Setups
View Part
Change Cut Mode
Change Consumable
Zero Positions

Shape Manager

Shape Library

The CNC contains a built-in Shape Library with more than 68 commonly used shapes. These shapes are *parametric*. Parametric shapes are shapes whose size or geometry you can edit. The shapes in the library are color-coded from easiest (green) to hardest (black).



To select a simple shape:

1. On the Main screen, press Shape Library
2. Double click a shape.
3. Press OK.
4. If the selection is incorrect, press Cancel and select the shape again.

Keypad operation:

1. Use the arrow keys to navigate to a shape.
2. Press Enter.

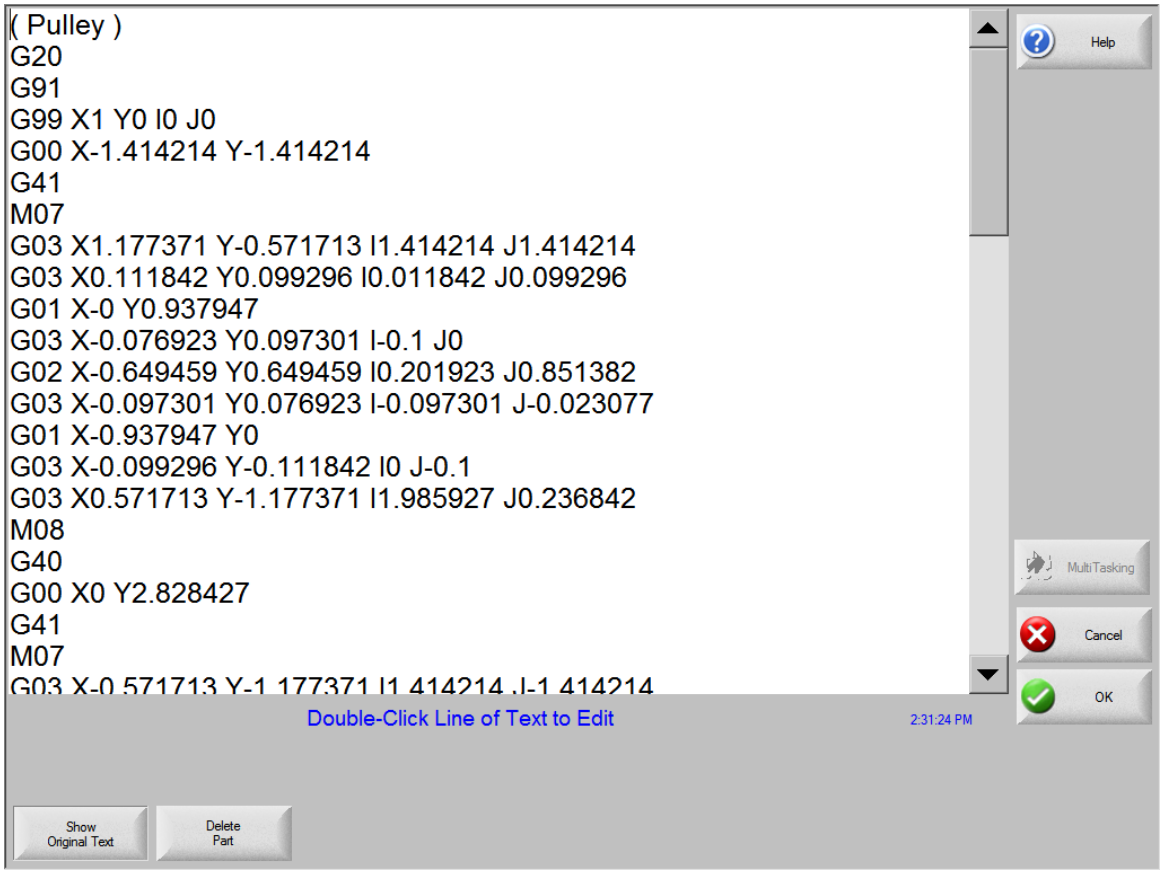
The shape is displayed with the default parameters or the parameters from the last time this shape was edited. For more information on the available shapes, see Files.

Text Editor

The text editor screen allows you to write or edit a part program in either ESSI or EIA format. The current part that is in memory is displayed when this screen opens.

The OK soft key saves changes to the current part in memory. If you want to save the changes to the hard drive, go to the Files Save to Disk screen.

If you do not want to save any changes that were made, press Cancel on the keyboard. Changes can be made by pressing on the desired line of code. An alphanumeric keypad will be displayed to initiate changes.



Show Original Text

Allows you to view and edit the part program in its original format.

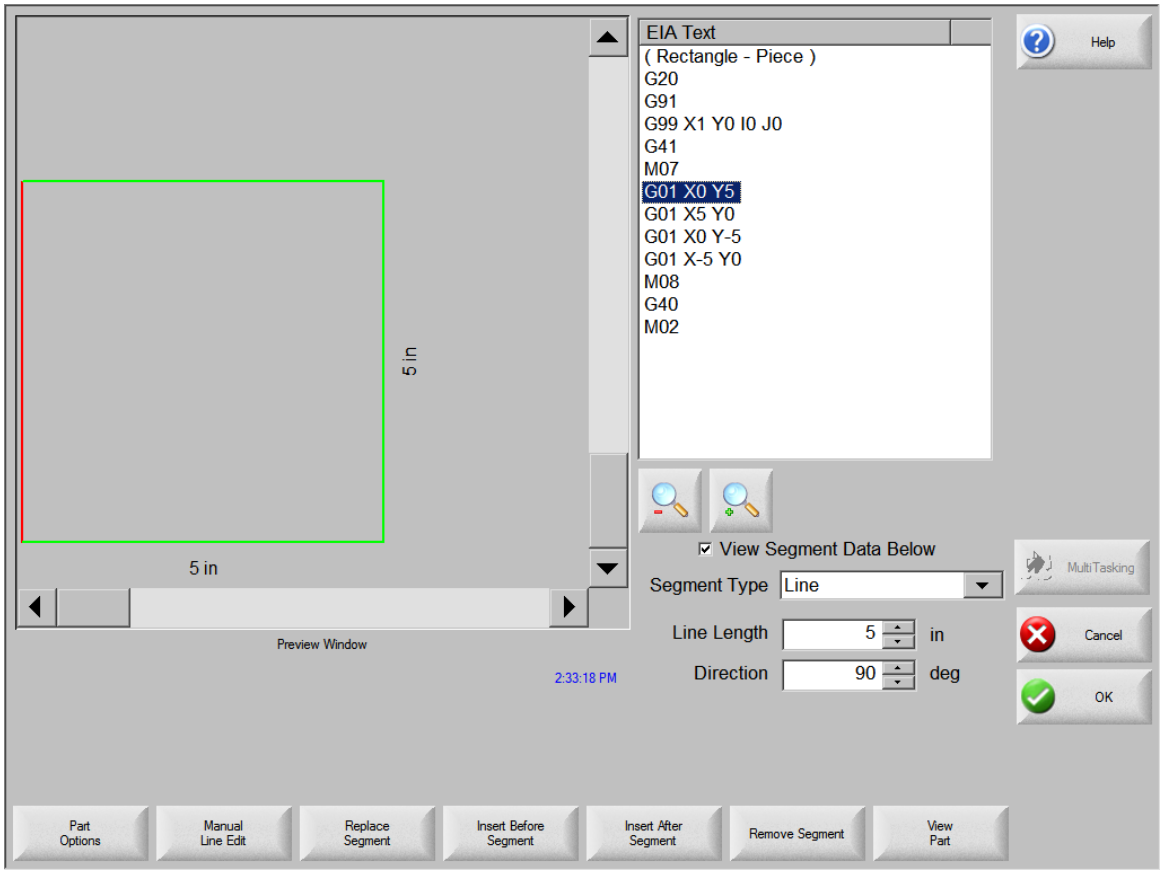
Delete Part

Deletes the current part from the Text Editor so that a new part can be constructed.

Shape Wizard

ShapeWizard® is a proprietary graphical part editor that provides a user-friendly, graphical interface for editing part programs.

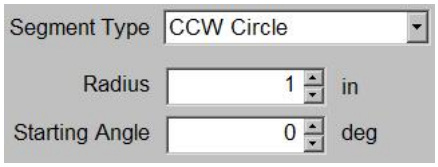
You can view not only the segment that is being edited, but other changes that are made, as well. You can add EIA RS-274D codes to a part program in the EIA Text window as ASCII text. If you don't know EIA RS-274D codes, you can create segments specifying phrases in your native language.



Manual Line Edit

Press Manual Line Edit to edit a line of text in the EIA Text window. The ASCII text that you enter must be a valid EIA RS-274D code or an error message will display. The alphanumeric keypad is displayed for line edits.

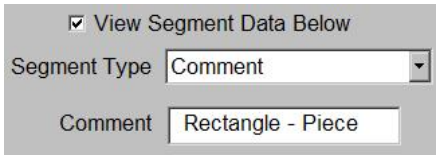
Type over a line to erase the highlighted text.
While a text line is highlighted in blue, you can use the Segment Type field and related fields to change the segment type and insert it into the program.



As you edit a line of code, the picture of the part in the Preview window is updated. The corresponding segment is highlighted in red or blue to indicate that it is a cut segment or a traverse.

Replace Segment

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



Insert Before Segment

Inserts 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

Inserts the segment selected from the Segment Type window after the segment highlighted in gray in the Text Editor window.

Remove Segment

Deletes the segment that is highlighted in gray or blue in the EIA Text window from the part program.

Teach Trace

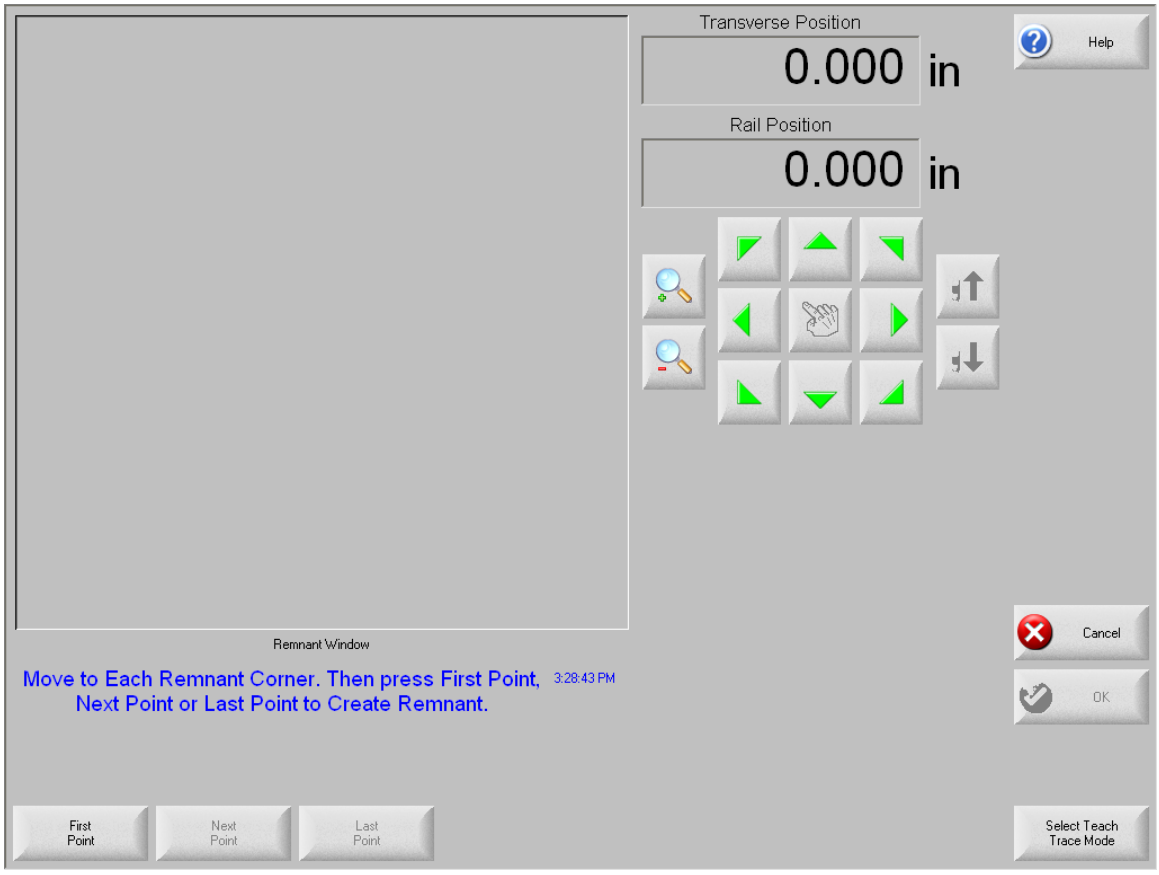
The Teach Trace function of the CNC allows parts and remnants to be traced rather than programmed. The position information from the traced part remains as a part program that can be saved to disk.

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

Teach Trace has two modes, Remnant Trace and Teach Trace. The screen opens in Remnant Trace mode. Press the Select Teach Trace Mode soft key to use Teach Trace.

Remnant Trace Mode

In Remnant Trace mode, you can trace the outline of a plate remnant and save it as a file so that it can be used later and nests of parts can be cut from the remnant.

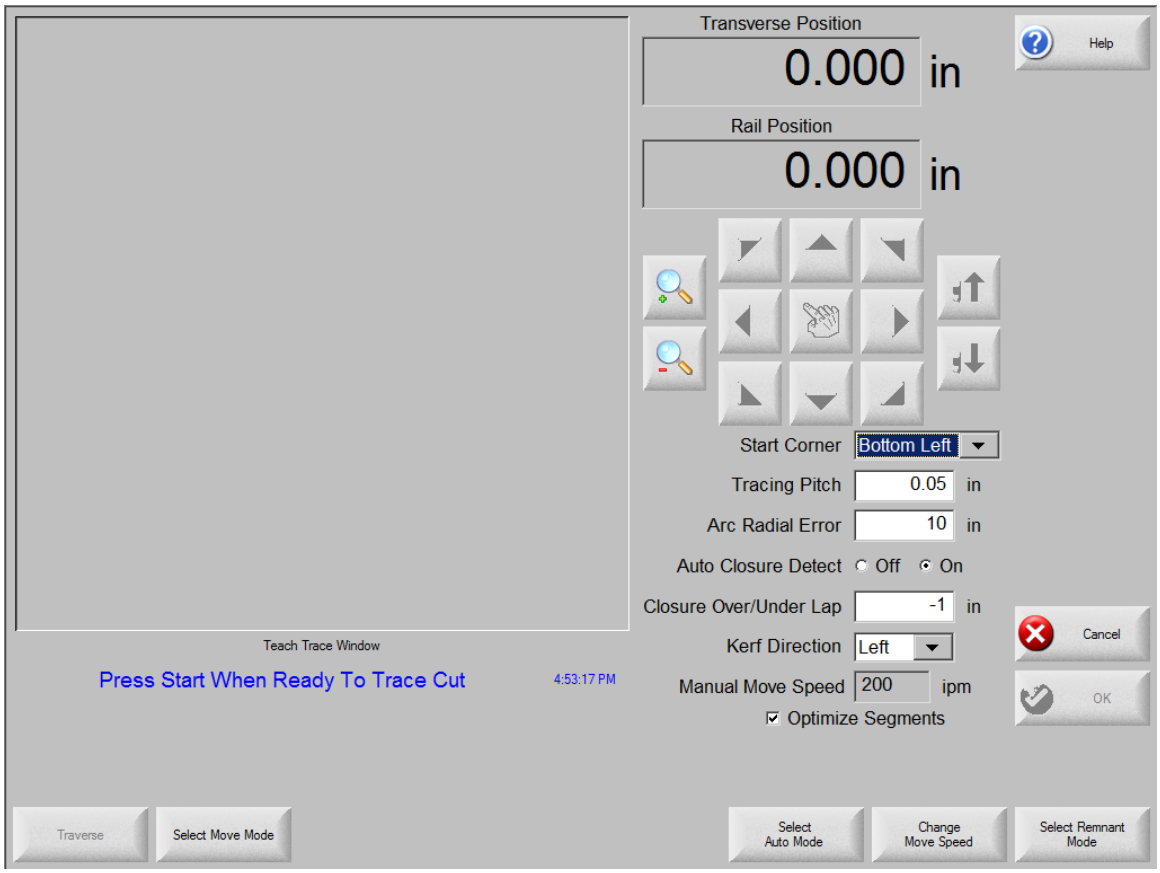


To trace a remnant:

1. On the TeachTrace screen, press the Select Remnant Mode soft key.
2. Jog to the point on the Remnant window where you want the trace to begin. Use the joystick or jog keys to move the torch over the plate.

3. Press or click First Point.
4. Jog to the next point and press or click Next Point.
   Repeat this step until you have traced all but the final point.
5. When the pointer is over the last point you need to trace, press or click Last Point.
   Trace Remnant draws a line between this point and the first point to close the remnant.
6. Press or click OK to let TeachTrace create the remnant.
   TeachTrace connects the last point to the first point automatically and returns to the Preview Window.
7. Press or click Files then Save to Disk.
8. Select a folder for the new remnant file from the Save to dropdown list.
   It is helpful to create a folder named Remnant to hold your remnant files.
9. Enter a file name in the File Name field.
10. Press or click OK.

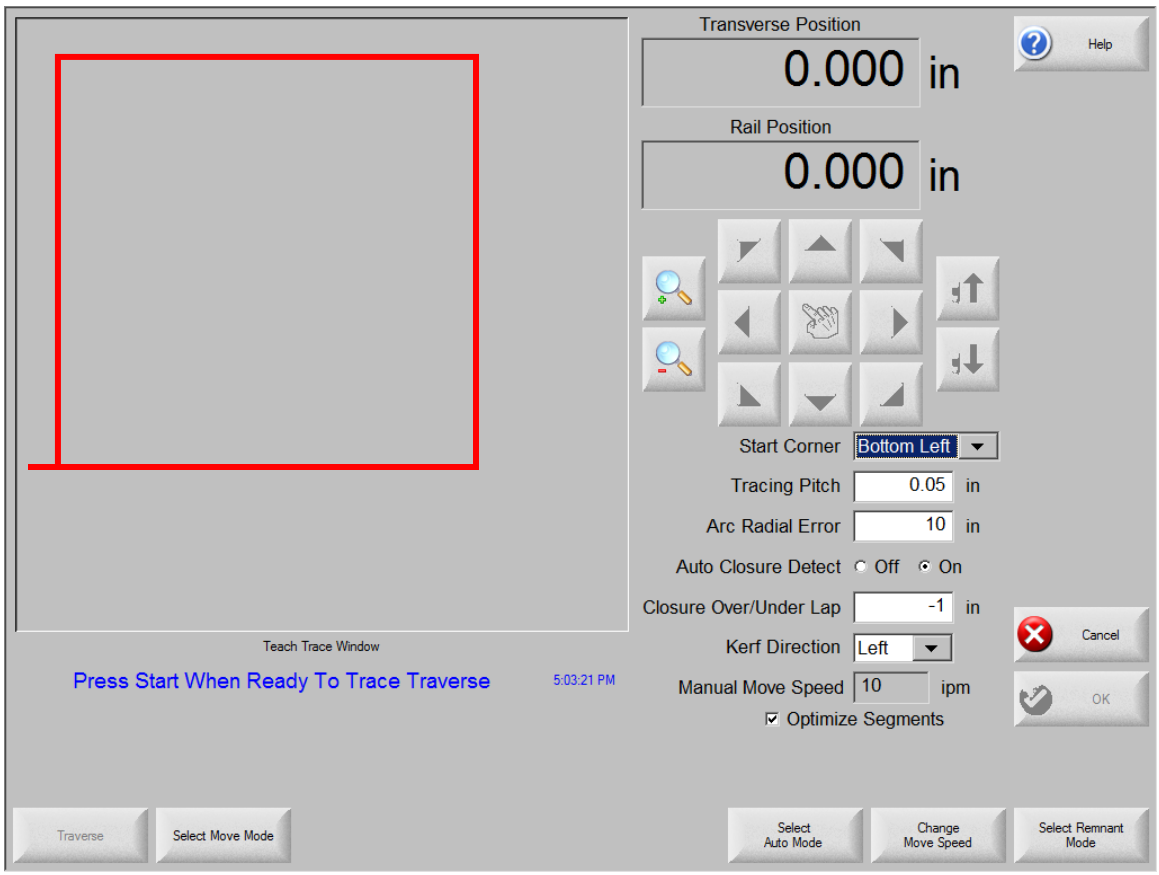
Teach Trace Mode



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

To use the manual function, press Select Manual Mode, which also enables the Change Move Speed button so you can change the manual move speed. Press the Change Move Speed button repeatedly to cycle through the programmed manual jog rate settings.


Help
Start Corner
Bottom Left
Tracing Pitch
0.05
in
Arc Radial Error
0.05
in
Auto Closure Detect
Off
On
Closure Over/Under Lap
-1
in
Kerf Direction
Left
Manual Move Speed
0
ipm
Cancel
OK
Teach Trace Window
Press Start When Ready To Trace Cut
2:41:33 PM
Optimize Segments
Traverse
Select Move Mode
Select Auto Mode
Change Move Speed



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 CNC to detect that it has returned to the starting point. With this feature ON, the CNC 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 CNC 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 kerf for cut segments.

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

Select Auto/Manual Mode
Use this button to change trace modes. If you select manual mode, you can also use the Change Move Speed button to change the trace speed.

Change Move Speed
Press this button to change the trace speed in manual mode.

Select Remnant Mode
Press this button to use remnant mode to create remnants.

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

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

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.

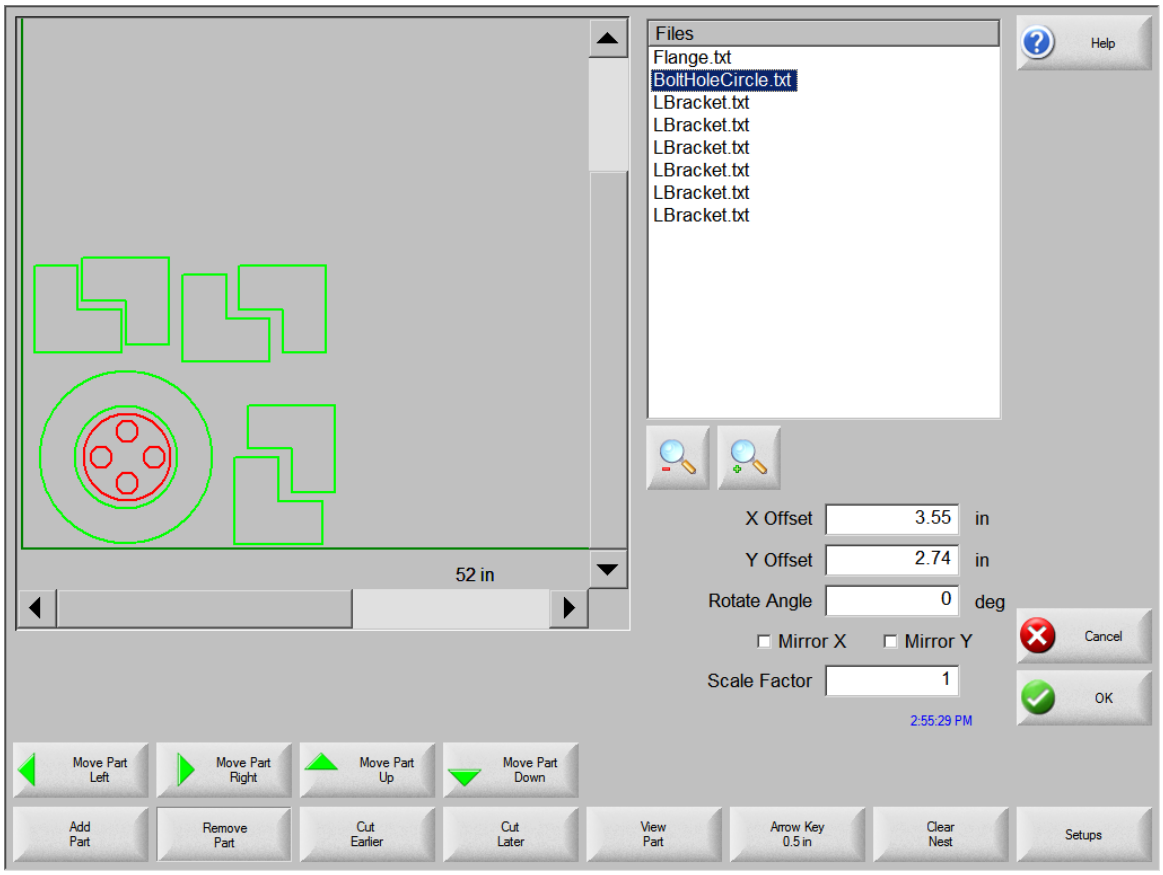
Additionally, an optional Automatic Nesting feature may be enabled to perform true shape, single station, automatic nesting. With its advanced Graphical User Interface, ease of use and advanced profile positioning algorithms, this Automatic Nesting feature can greatly improve the output of your shape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

Manual Nesting

Main Screen Layout

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

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



Add Part

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

Remove Part

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

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

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

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

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

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

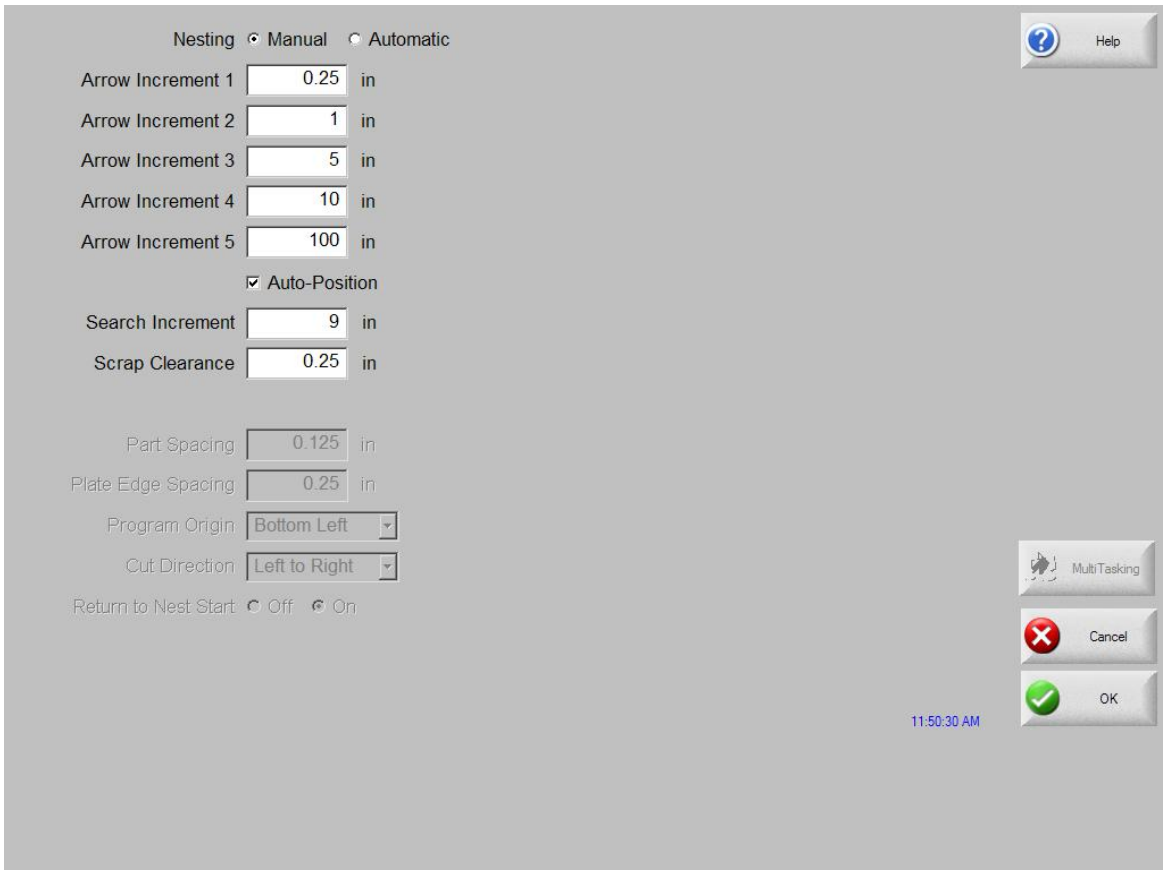
Arrow Key (Distance)
The Arrow Key allows the user to select one of five different preset move distances when the arrow keys are pressed to locate parts in the nest. These five distances are definable and are selected in the Nester setup screen.

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

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

Nester Setup

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



Arrow Motion

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

Autoposition

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

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

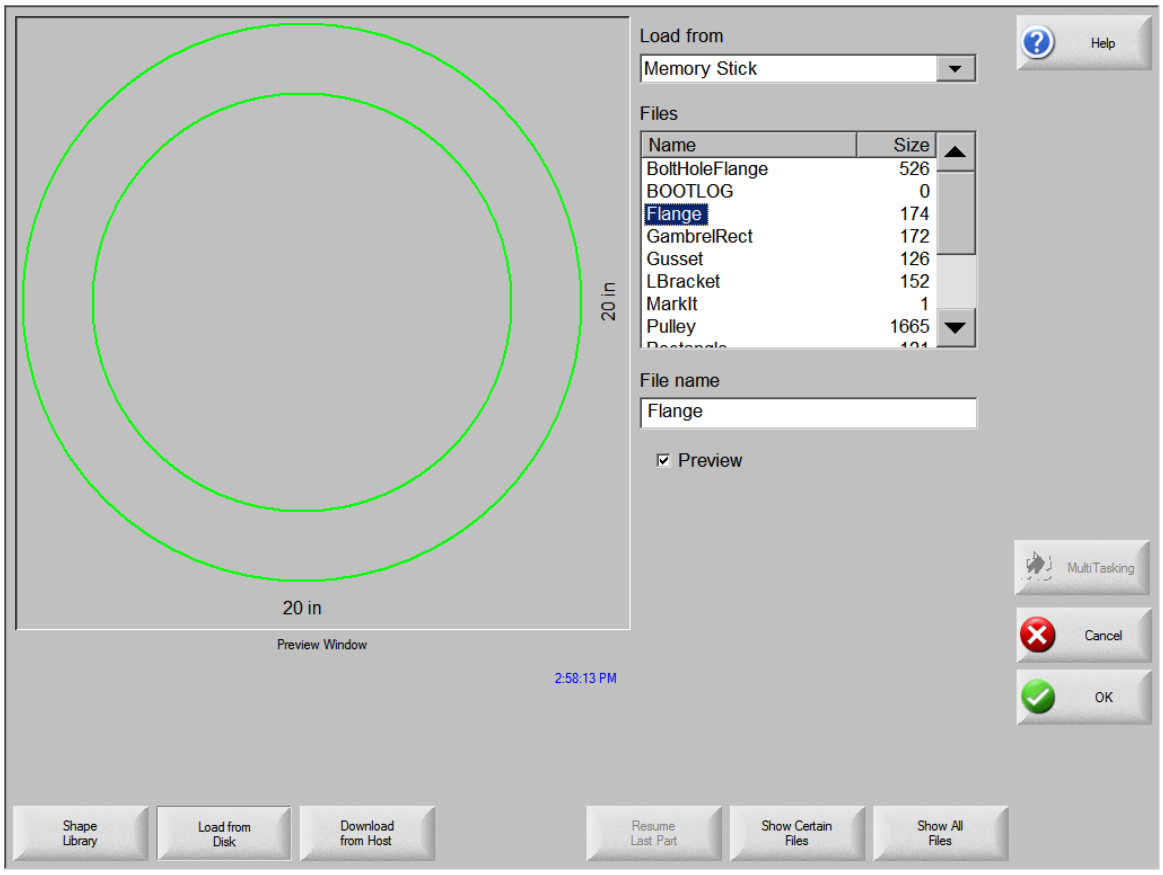
Using Nester

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

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

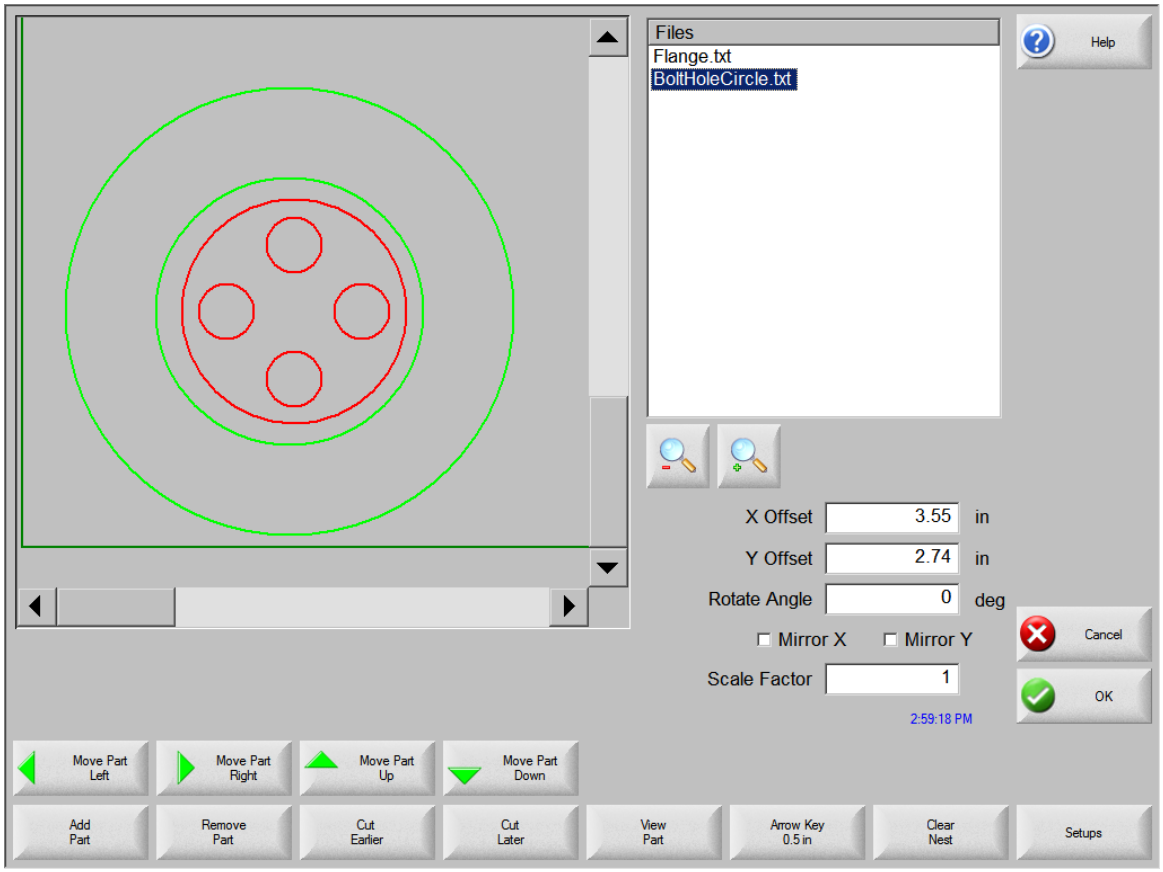
Adding Parts

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



After 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 are displayed on the selected plate in preparation for final placement.



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

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

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

Saving a Nest

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

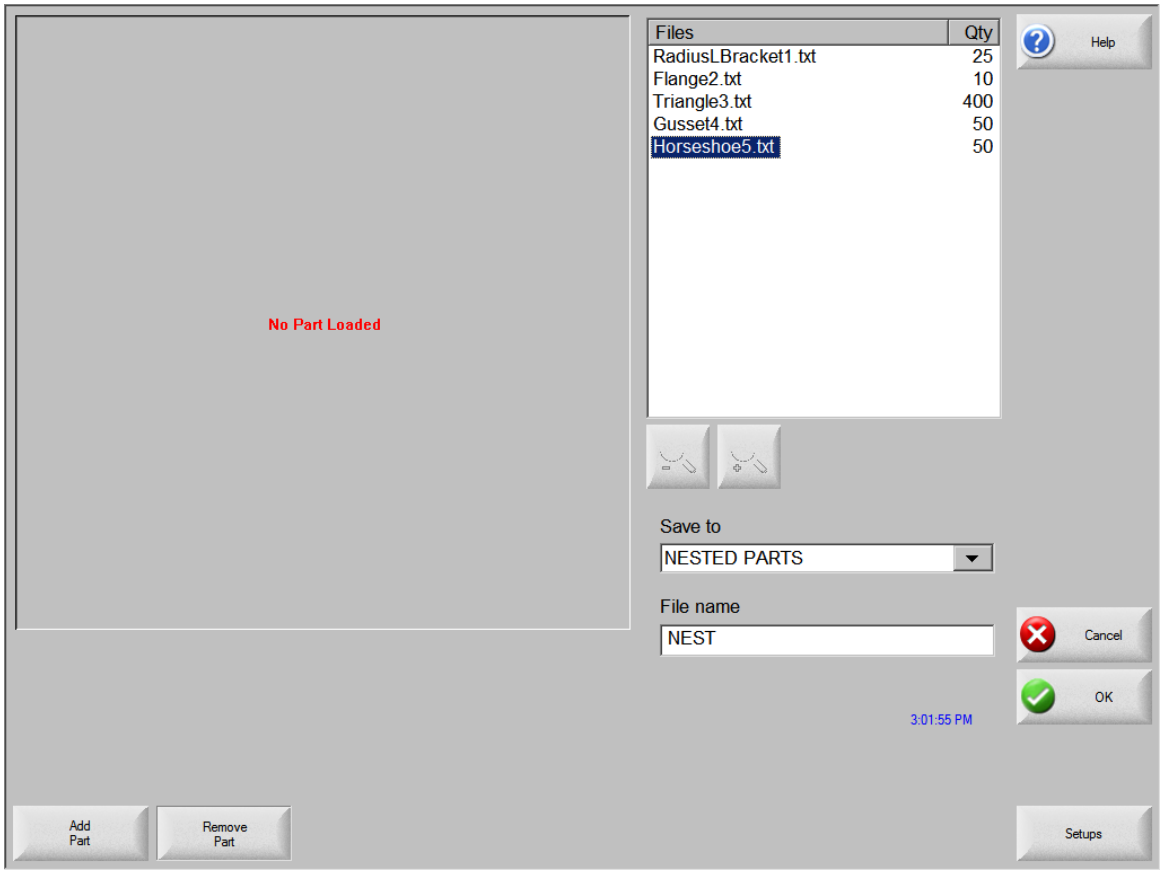
HyperNest – CNC Automatic Nesting Software

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

Main Screen Layout

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

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



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

Automatic Nesting Setup

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

Automatic Nesting

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

Part Spacing

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

Plate Edge Spacing

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

Program Origin

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

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

Nest Direction
Select the direction in which nests are placed in the automatic nesting process.

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.

Use Remnant
If remnants are created and saved for future use, select On to use one of these remnants for automatic nesting.

Generate and Cut Offcut
Select On to generate offcuts for standard, rectangular nests.
If this feature is enabled, offcuts are created when 30% or more of the sheet remains after nesting. The offcut is cut after a pause at the end of the nest on the last nested rectangular sheet.

M65 Auto Reload
Select On to allow new sheets to be reloaded automatically.

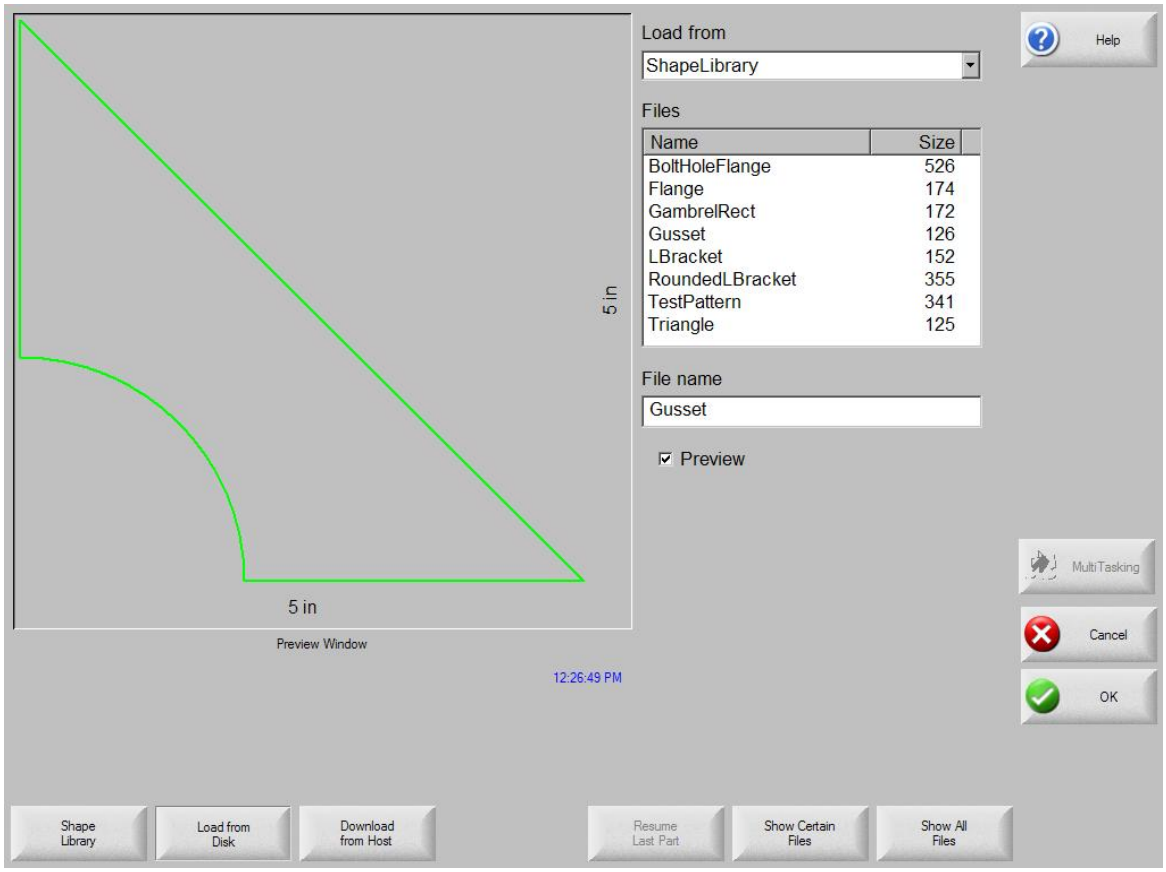
When this feature is selected, there is a pause at the end of each sheet until the operator presses Start to Resume. Then, a new sheet automatically loads and runs. Auto reload works with standard, rectangular nests only.

Using HyperNest – CNC

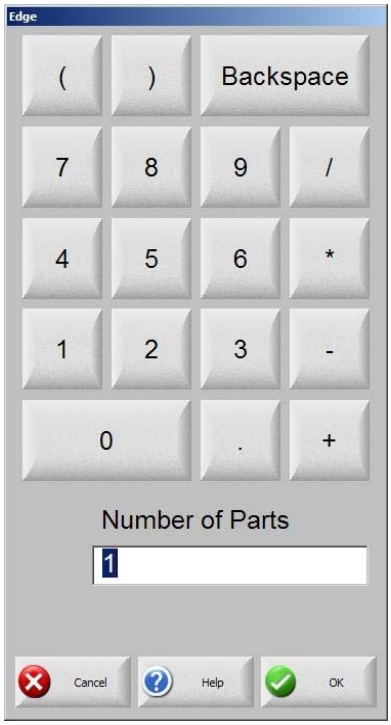
To begin, first select the plate size requirements for the nest at the Main Setup screen. Press the Nester soft key from the Shape Manager Screen then enter the Setup Screen to enable the Automatic Nesting software feature and configure the setup parameters for use. Press OK to return to the Main Screen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

Adding Parts

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

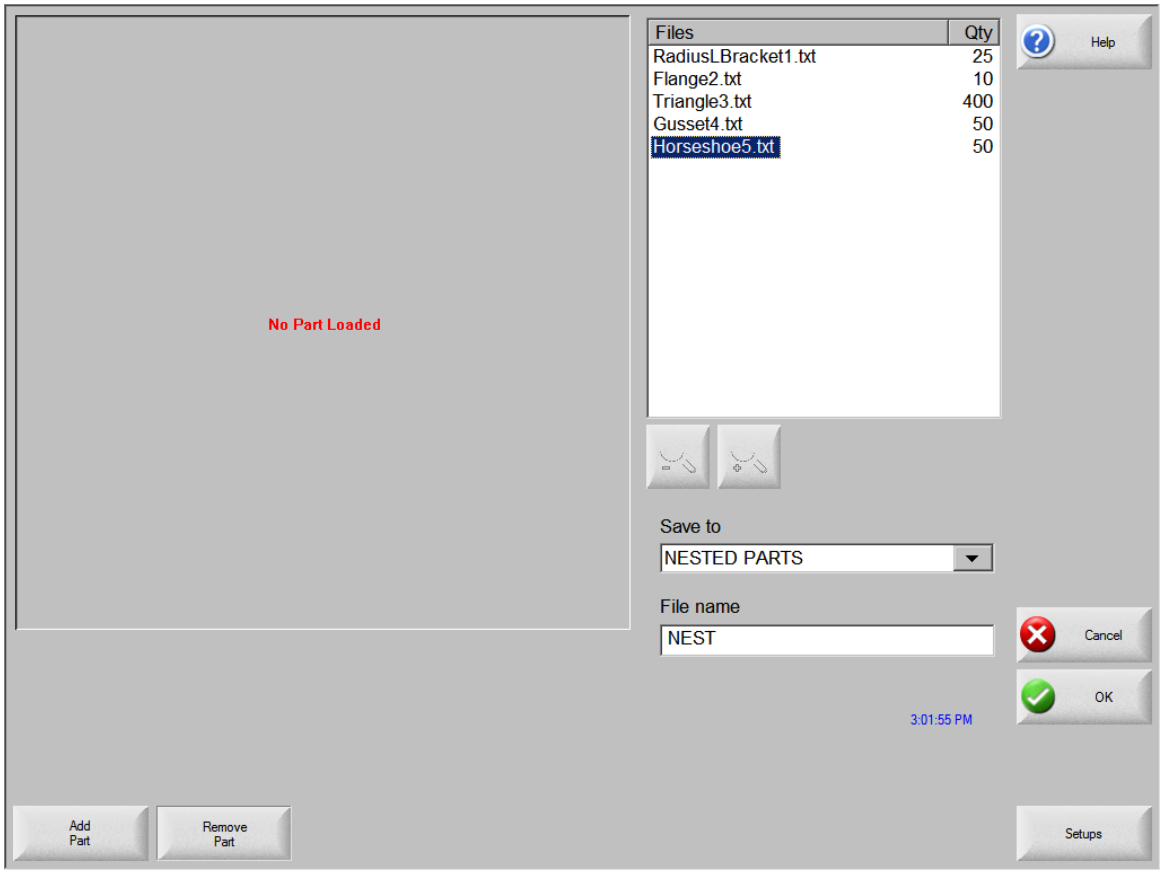


After a part has been selected from the desired location, the user is prompted to select the number of pieces to be included in the nest.

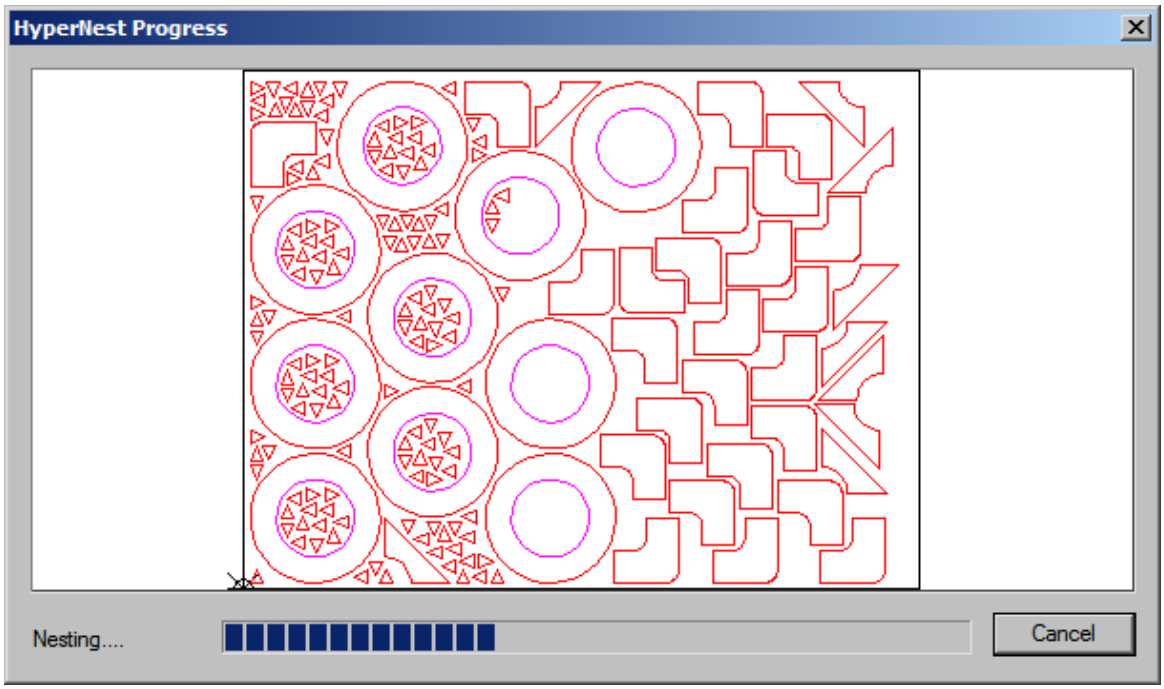


After the number of parts is selected, a popup window displays to allow you to select whether the selected part will be mirrored in the nest, for greater efficiency, or used as a wildcard part. Wildcard parts "fill in" a sheet on which the nest occupies at least 75% of the sheet.

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

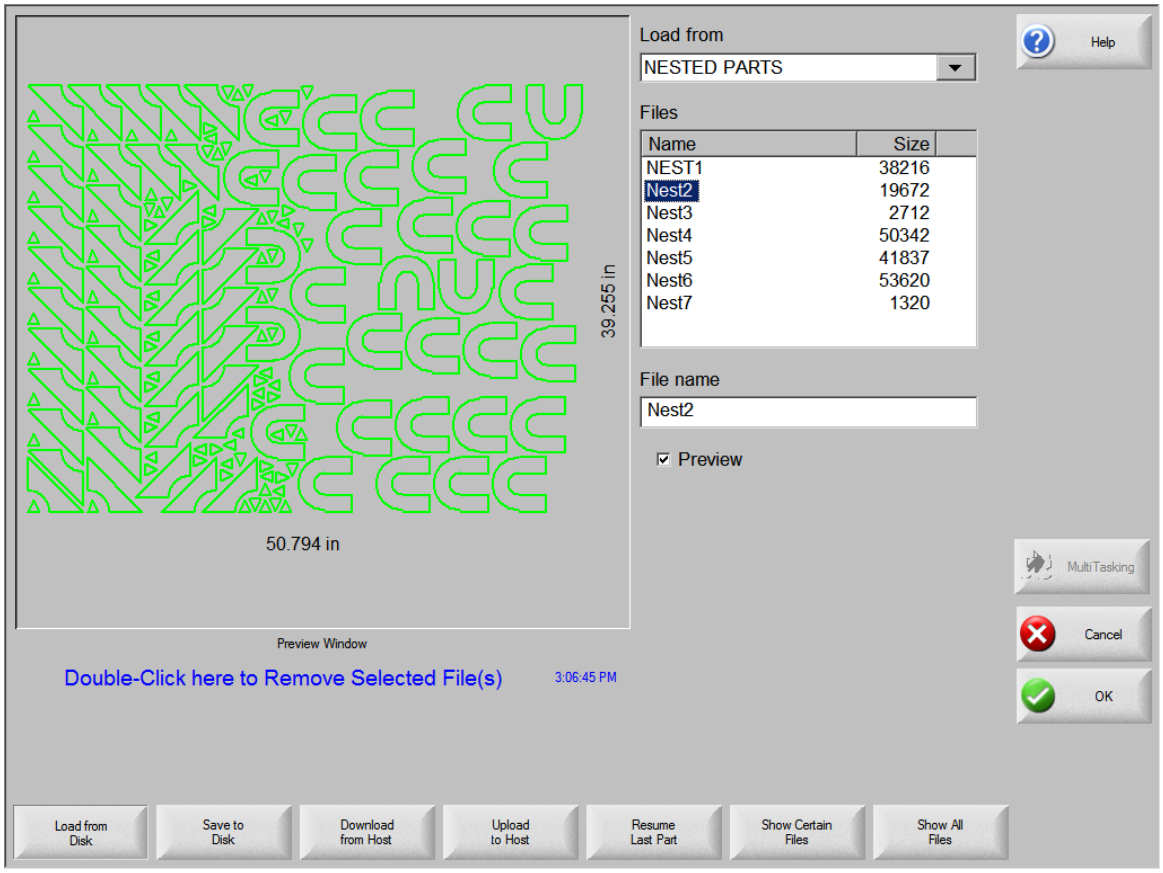


Select the desired file location and assign a file name, then press the OK soft key to begin the automatic nesting process. A progress window will be displayed during the nesting process.



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

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



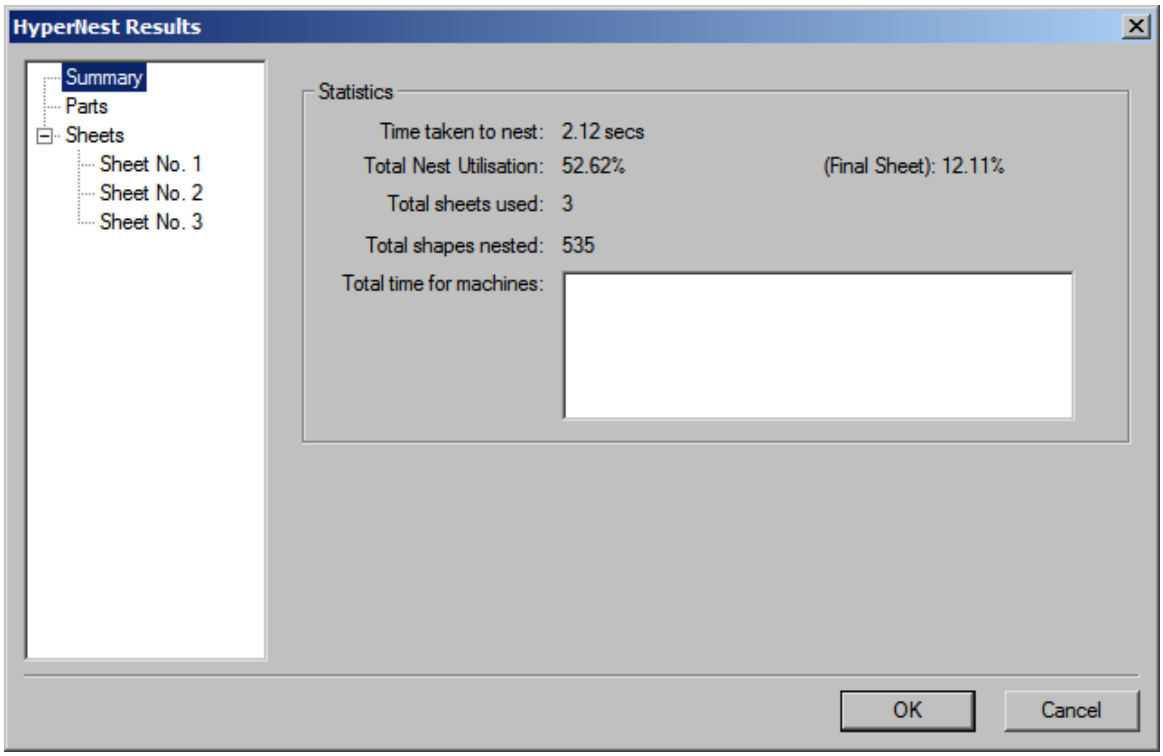
Remove Part

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

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

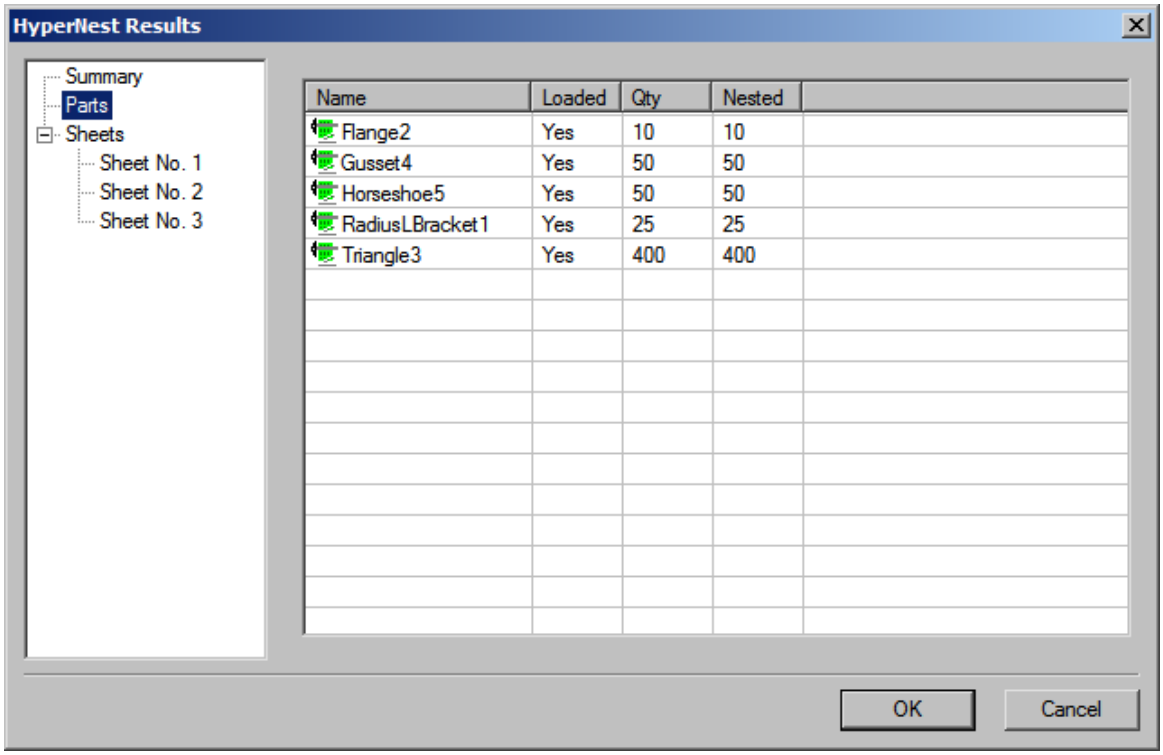
Nest Summary

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

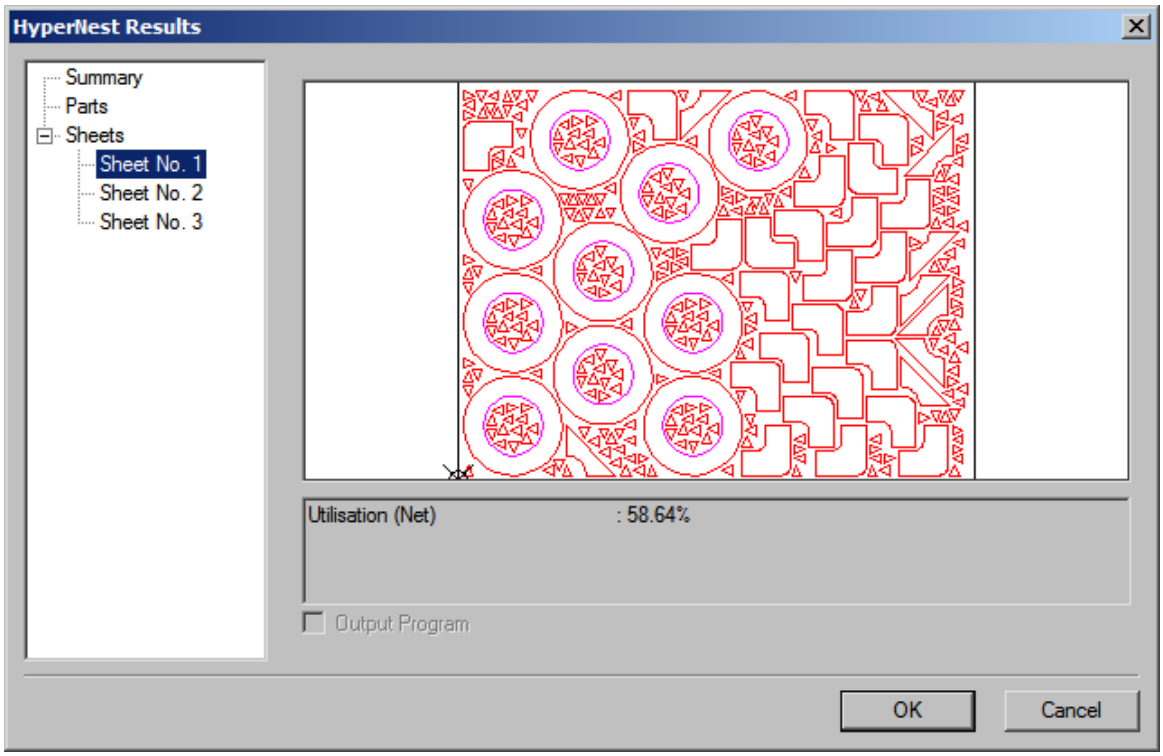


Statistical analysis of the process is provided for the number of sheets, time to execute nest, total nest utilization and total number of shapes nested.

Note: Sheets that are generated with the exact same part configuration will be listed as "Sheet No. # (total #)".

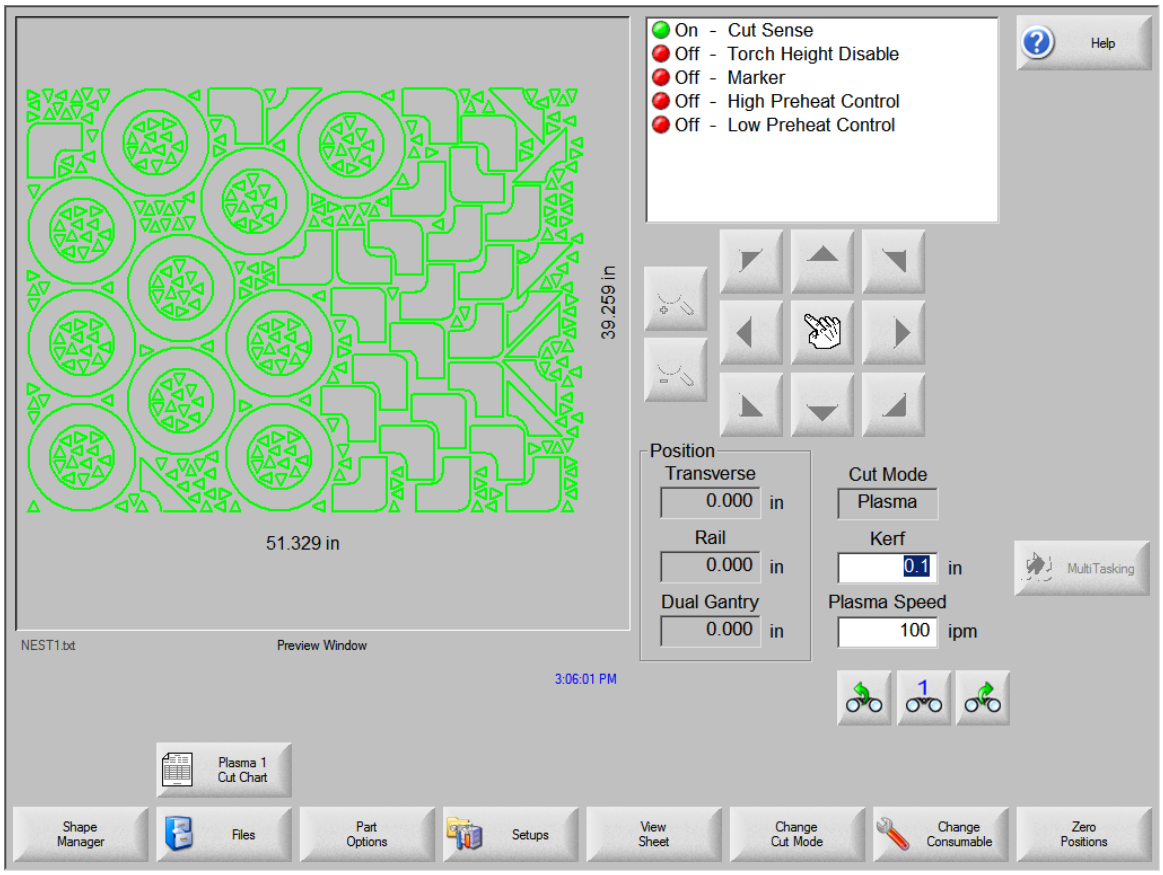


Scrolling down will allow you to view an analysis of the parts used and to view the individual sheets produced and a listing of the net utilization for the specific sheet.



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

Main Screen View of Nest



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

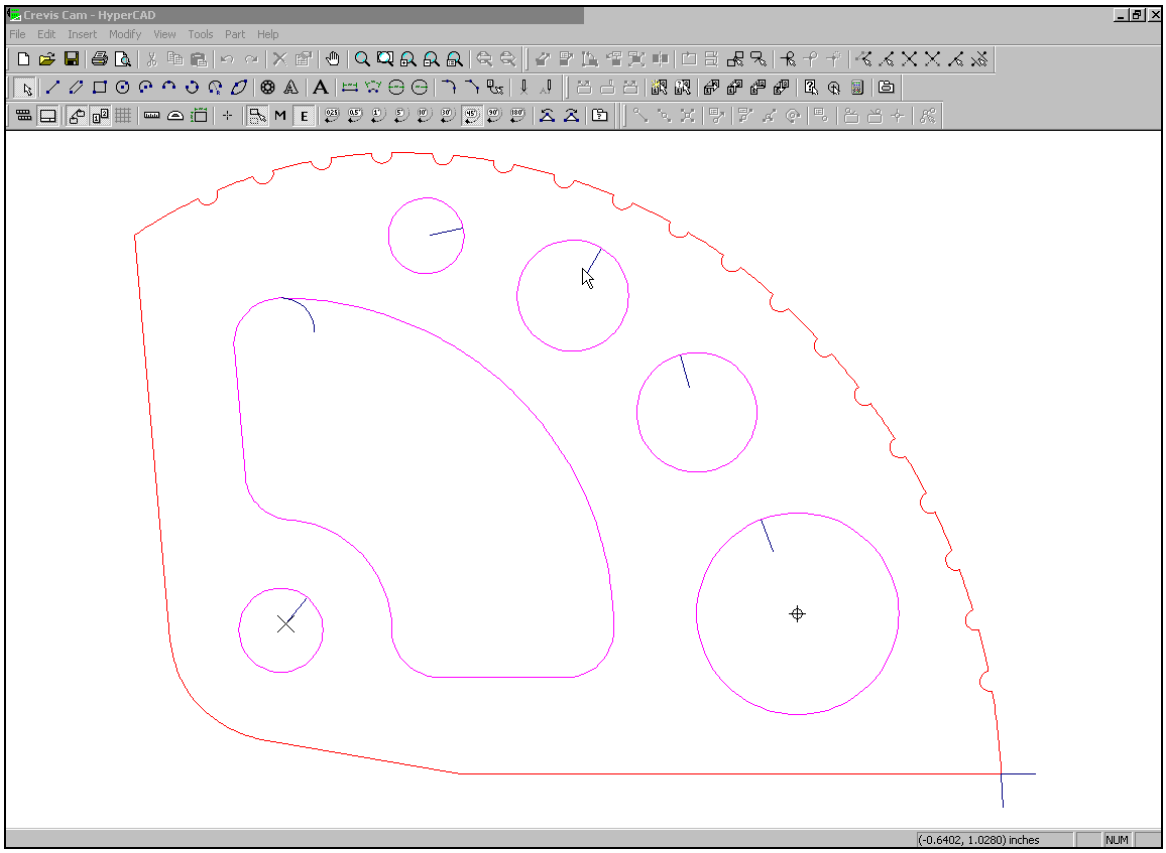
HyperCAD

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

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

HyperCAD Features

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



This feature is offered as a limited use trial version. Contact your CNC 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.

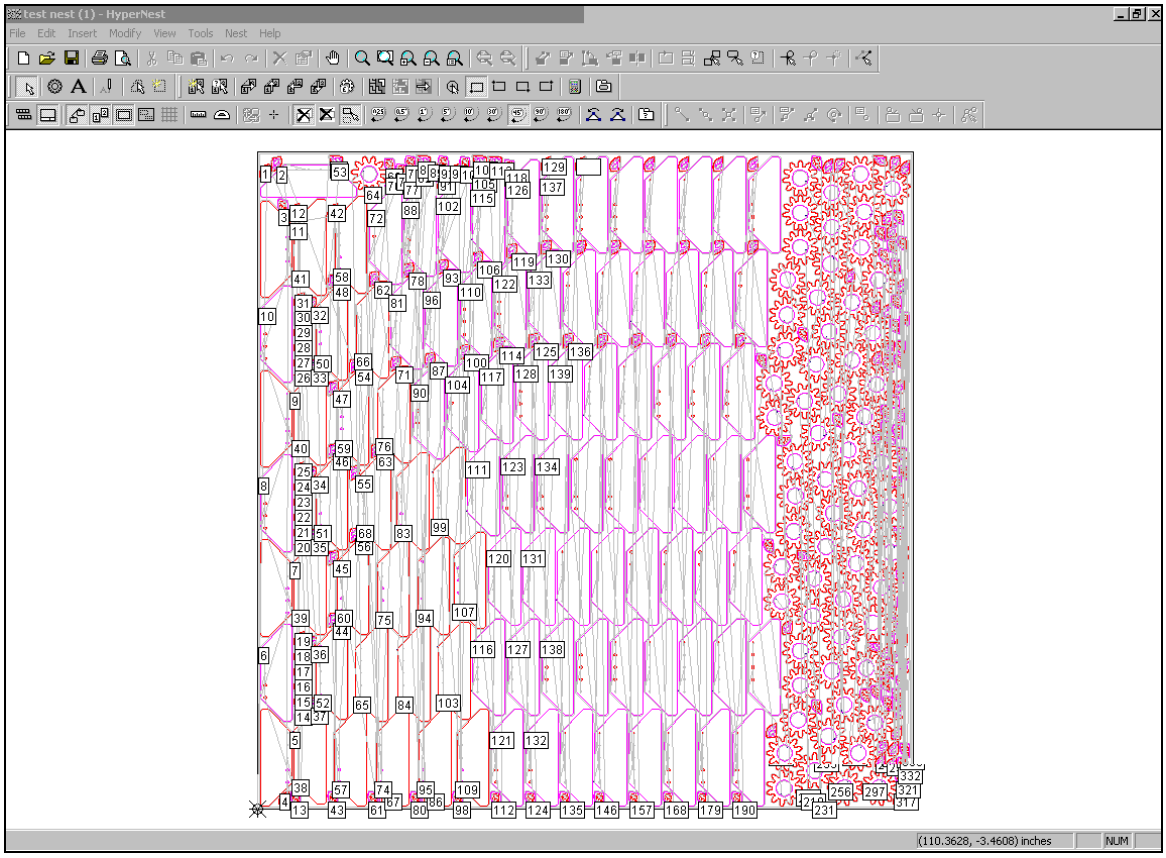
HyperNEST

HyperNEST is a full featured, automatic true shape application designed to allow quick and simple nesting of profiles onto standard material sizes. The HyperNEST graphical user interface 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



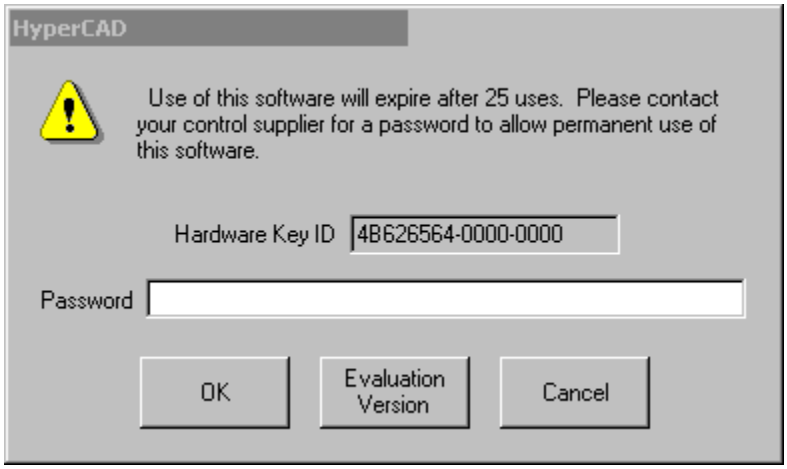
This feature is offered as a limited use trial version. Contact your CNC vendor for information on enabling unlimited use of this feature. This package may be used on the CNC equipped with mouse and PC keyboard or offline on a PC.

Evaluation Timer

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

To launch the trial software, select the Evaluation Version.

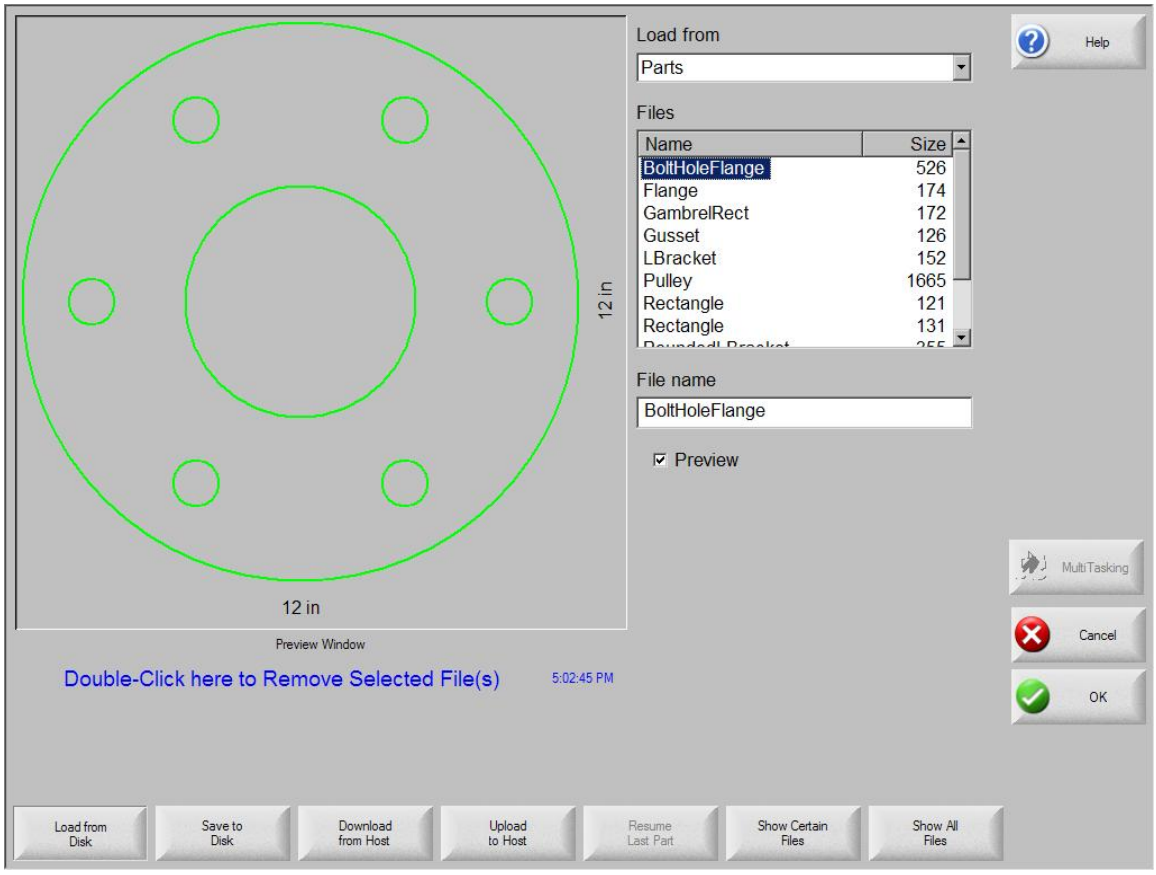
Example



Files

Load from Disk

The following screen is used to load a part from a diskette, USB memory stick, or the hard drive.



Load from

Select the source from which you load a part: diskette, USB memory stick, or a directory on the hard disk. To add or remove a directory, double-click on the touch screen where indicated.

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

Files

Lists the files that are in the directory you selected in the Load from field. Press the name of the files that you want to load.

Keypad operation: To scroll through different files, use the ↑, ↓, Page Up and Page Down keys on the keyboard. To remove a file, use the - key on the keyboard. To select

multiple files to load, highlight the first file selection, then use the ↑ and ↓ keys while pressing the shift key to highlight the remaining files.
Note: You can only select multiple files if you are loading them from a diskette or USB memory stick to the hard drive.

File name/Diskette file name

Displays the name of the file you selected. To remove a file, highlight the file name and double-click on the touch screen where indicated.

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

Preview

Check this box to preview the files you selected in the Preview Window.

Load to

Select the destination for the part; either load the part for cutting or save it in a directory on the hard disk. To add or remove a directory, double-click on the touch screen where indicated.

Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add a new directory, use the + key on the keyboard. To remove a directory, use the - key on the keyboard.
Note: This selection is only available if you are loading the part from the diskette or USB memory stick.

Hard drive file name

Enter the name for the file that you are loading on the hard drive.
Note: This selection is only available if you are loading the part from the diskette or USB memory stick.

Resume Last Part

Displays 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. The user can load and execute another part program and return to the original part using the Resume Last Part soft key.

Show Certain Files

Allows the operator to search the selected folder for specific part files by using wildcard searches with both the asterisk (*) and question mark (?).

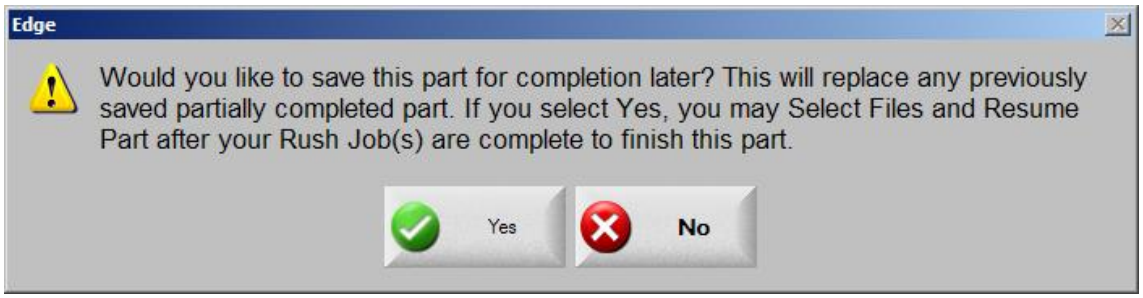
Keypad operation: To input the asterisk when using a keyboard, press the left shift key (purple) and the backspace key. To input the question mark, press the right shift key (blue) and the backspace key.

Show All Files
Allows the operator to switch from viewing the selected files to viewing all files with the predetermined file extensions.

After all the parameters are set, press Enter on the keyboard to load the part.

Resume Last Part Features

Rush Job Interrupt
Allows you to pause the current part program and retain the part and current position information. At the Pause screen, press the Cancel key. A message window offers you the opportunity to save the part information to use later.

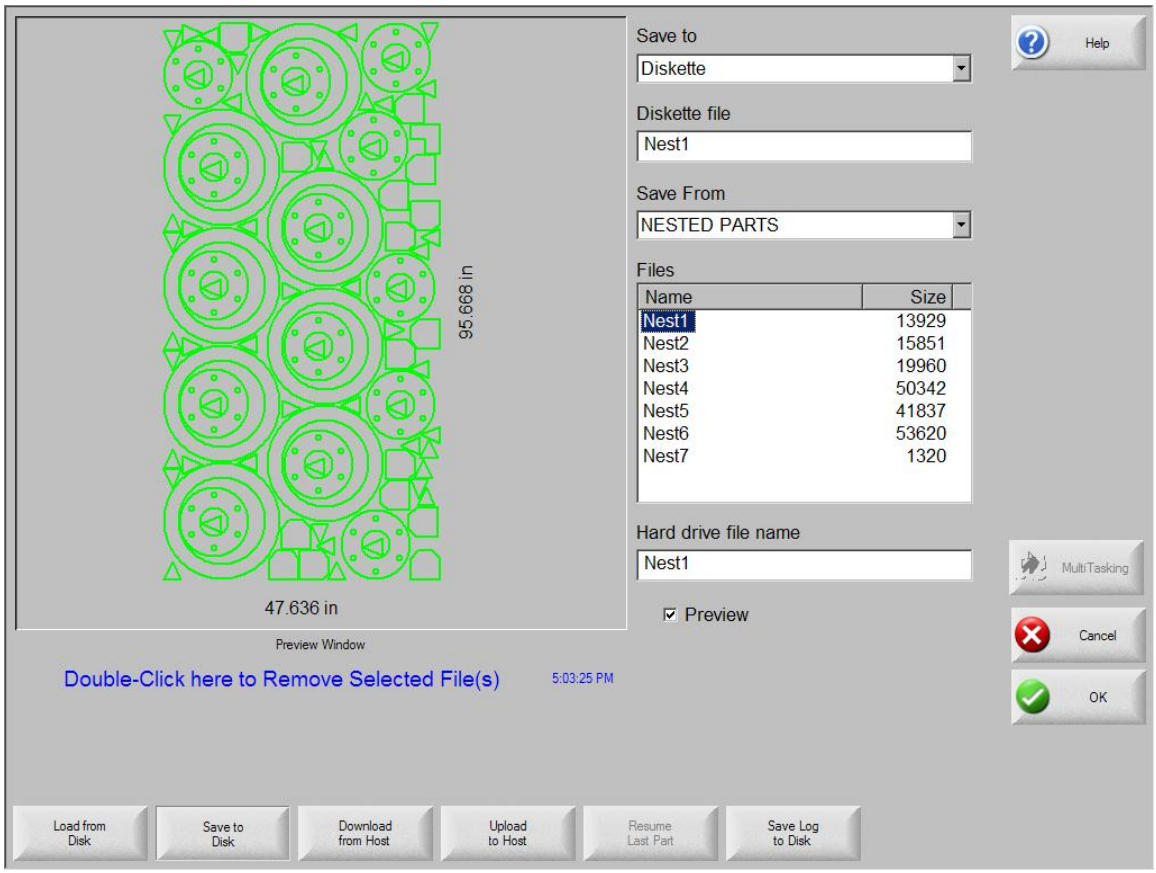


If the user selects YES, the Resume Last Part button will be viewable at the Files Screen. The user can load and execute another part program and then press the Resume Last Part soft key to return to the original part and resume cutting.

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 before it can resume cutting the part.
You can also use this feature if there is an overtravel, or similar fault.

Save to Disk

This screen is used to save a part to a diskette, USB memory stick, or the hard drive.



Save to

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

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

File name/Diskette file

Enter the file name that you are giving the file you are loading on the disk.
If you select the Save Original Text option, the system will save the part to the disk in its original programming format.
Note: This selection is not available if you are saving the file to the diskette or USB memory stick from the hard drive.

Save From

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

Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add a new directory, use the + key on the keyboard. To remove a directory, use the - key on the keyboard.
Note: This selection is only available if saving to the Diskette or USB memory stick from the hard drive.

Files
Select one or more part files from the list of all the files that are in the Load from directory that can be loaded from the disk. To remove a file, double-click on the touch screen where indicated.

Keypad operation: To scroll through different files, use the ↑, ↓**,** PAGE UP and PAGE DOWN keys on the keyboard. To remove a file, use the - key on the keyboard. To select multiple files, 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 you are saving files to the diskette or USB memory stick from the hard drive.

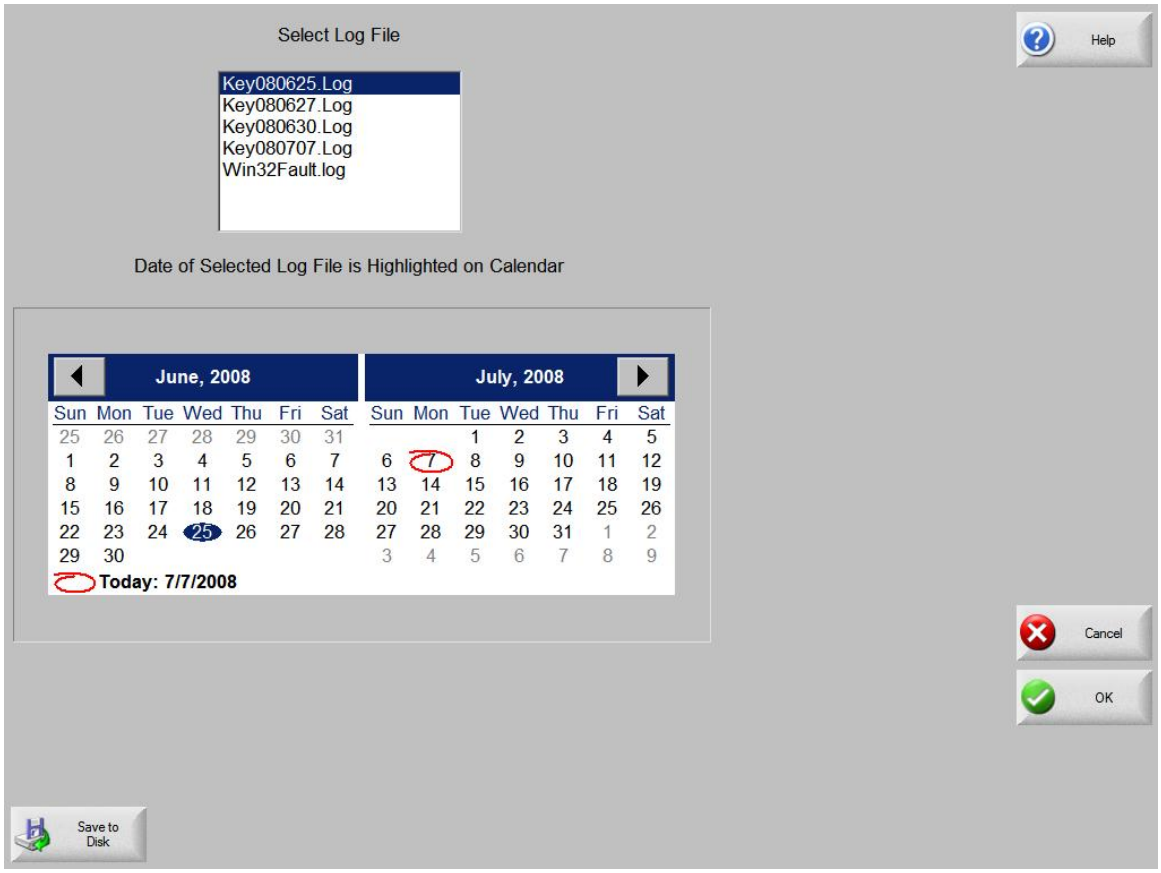
Hard drive file name
Enter the name that you are giving to the file if you are loading it on the hard drive.
Note: This selection is only available if you are saving files to the diskette or USB memory stick from the hard drive.

Preview
Check this box to preview the file that is selected in the Files listbox.

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

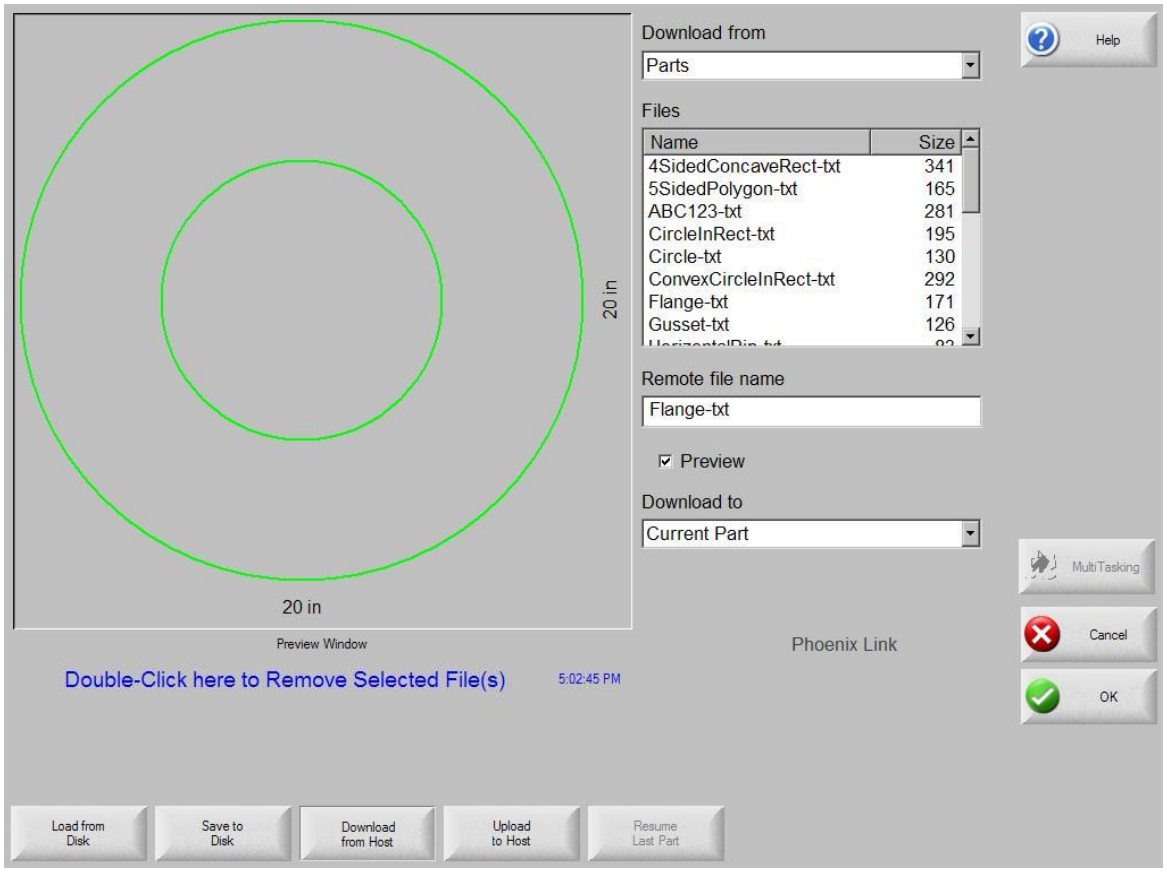
After you have made all your selections and entries, press OK to save the part.

Save Log to Disk
This feature is enabled when Key Logging is selected in setups.
The Key Logging feature is used as a diagnostic tool to record key presses that are made at the control during operation. When this feature is enabled, all key presses and application faults are saved in a daily log file that can be sent to the control manufacturer for evaluation.


Select Log File
Key080625.Log
Key080627.Log
Key080630.Log
Key080707.Log
Win32Fault.log
Date of Selected Log File is Highlighted on Calendar
June, 2008
Sun Mon Tue Wed Thu Fri Sat
25 26 27 28 29 30 31
1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30
Today: 7/7/2008
July, 2008
Sun Mon Tue Wed Thu Fri Sat
1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31 1 2
3 4 5 6 7 8 9
Help
Cancel
OK
Save to Disk

Download from Host

The following screen is where you download a part from a host computer. After all the parameters below are set, press Enter on the keyboard to start the download.



Download from

Selects the directory on the host computer from which you want to download a part. To add or remove a directory, double-click on the touch screen where indicated.

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

Files

Lists the files in the download from directory that can be downloaded from the host computer.

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

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

Preview
Check this box to preview the file that you selected in the Files list box. To check or uncheck the box, press the SPACE key on the keyboard when the Preview box has the focus.

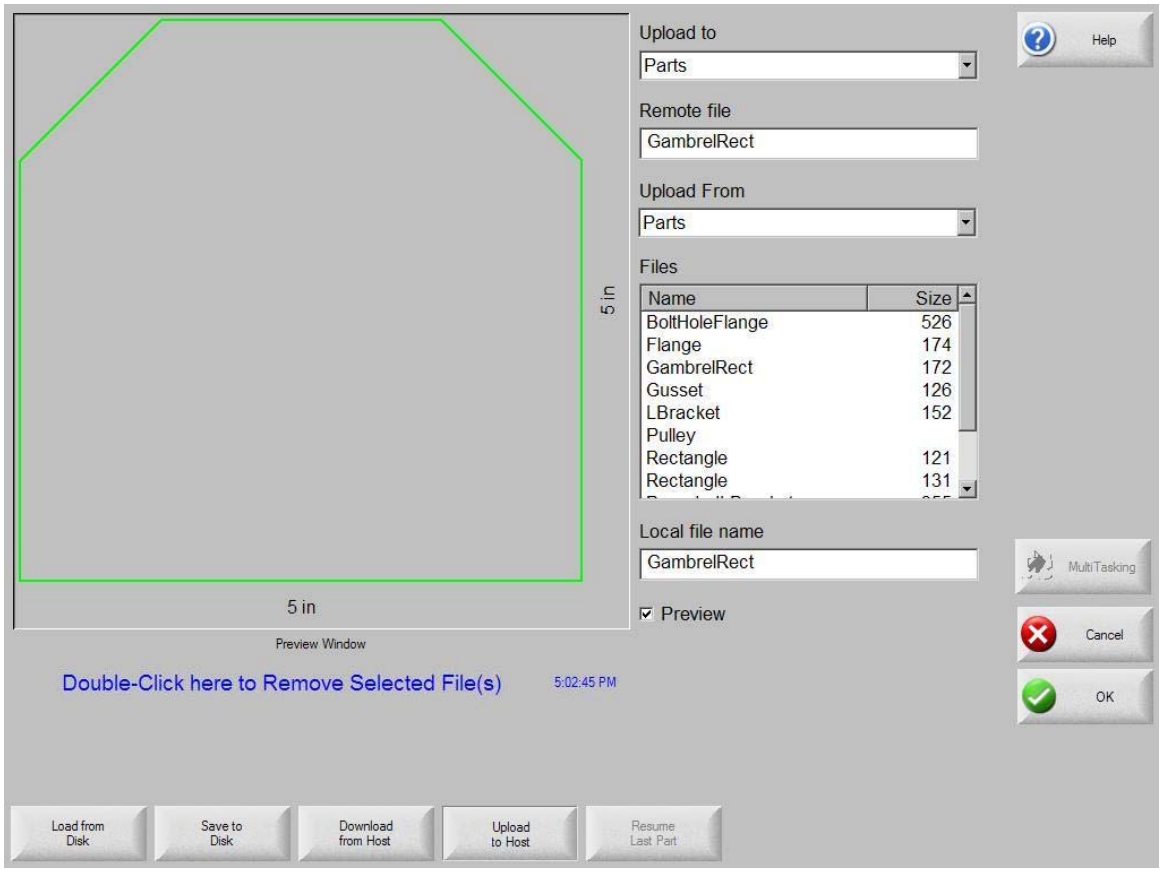
Download to
Selects you want to download the part -- to the current part in memory or to a directory on the local hard disk. If you select one of the local directories, the Local file name field displays.

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

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

Upload to Host

Use this screen to upload a part to a host computer. After all the parameters are set, press Enter on the keyboard to start the upload.



Upload to

Select the directory on the host computer to which you want to upload a file. To add or remove a directory, double-click on the touch screen where indicated.

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

Remote file name

Enter the name of the file that you are uploading to the host computer.

Upload from

Select 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 Files, Local file name and Preview fields display. To add or remove a directory, double-click on the touch screen where indicated.

Keypad operation: To select a different directory, use the ↑ and ↓ keys on the keyboard. To add a new directory, use the + key on the keyboard. To remove a directory, use the - key on the keyboard.
Note: This selection is only available if you are saving a file to the diskette or USB memory stick from the hard drive.

Files
Lists all the files in the upload from directory that can be uploaded to the host computer. To remove a file, double-click on the touch screen where indicated.

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

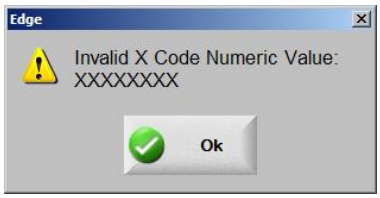
Local file name
The name of the local file that will be uploaded to the host computer.

Preview
If you check this box, you can preview the file you selected in the Preview window.

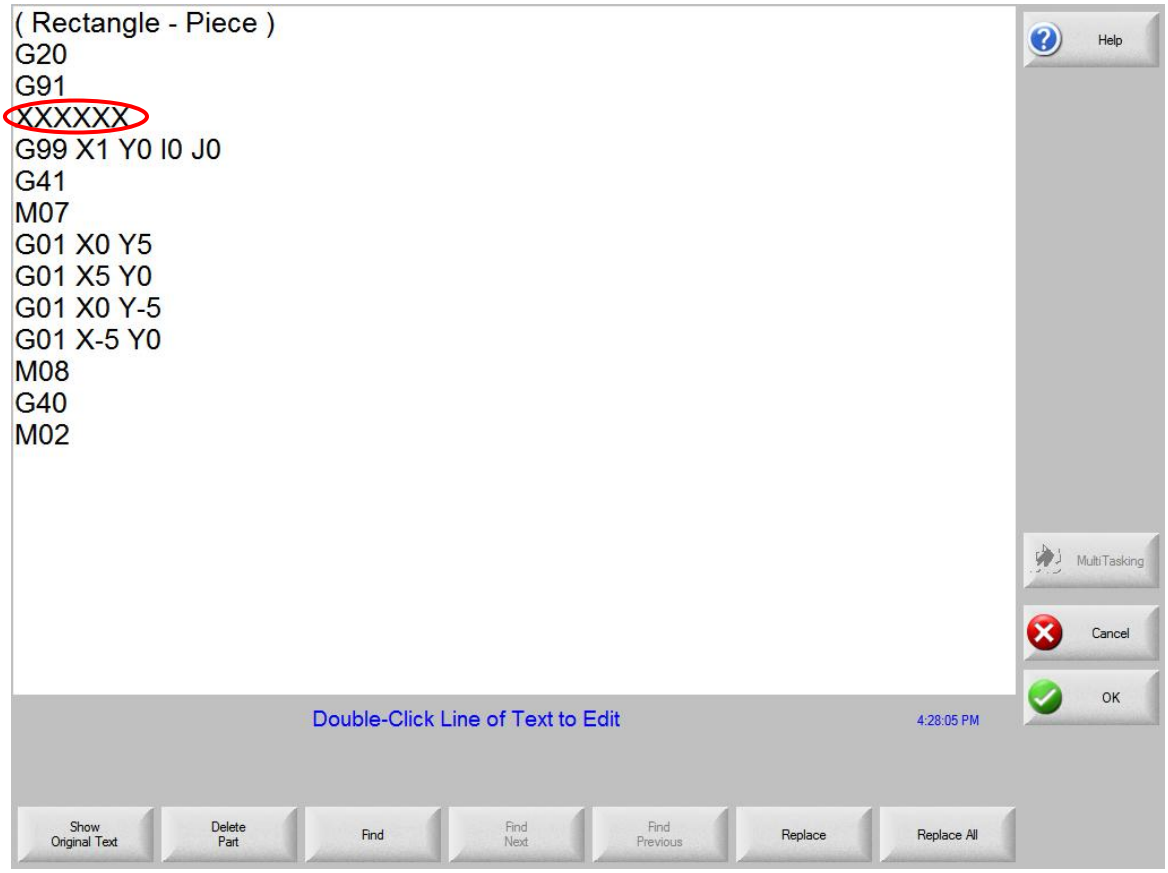
Keypad operation: To check or uncheck the box, press the SPACE key on the keyboard when the Preview box has the focus.

Loading Invalid Files

While loading the desired part file, the control will check the part for proper geometry and other errors. If an error is detected, a message is displayed:



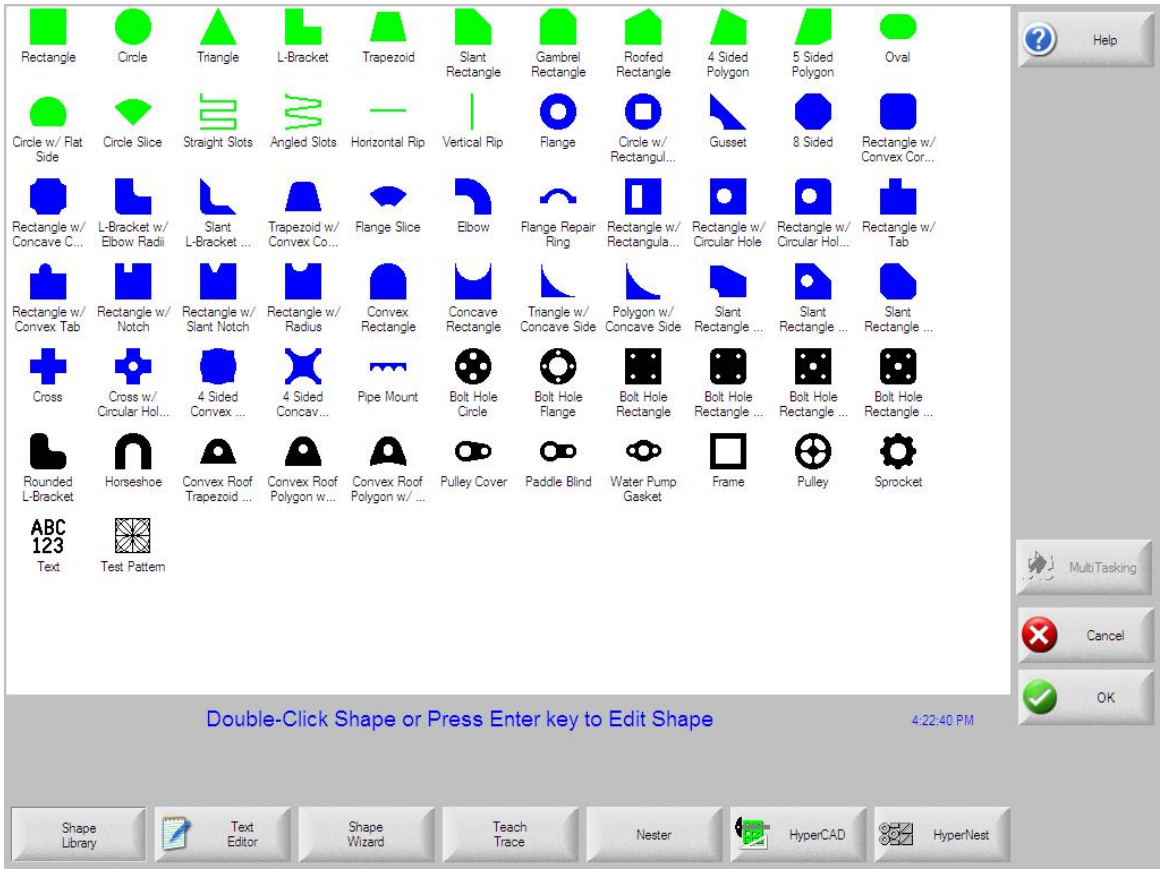
If the system attempts to load the part, the control highlights the invalid line of code from the text editor.
For example, in the following sample code, the line of code “XXXXXXXX” is invalid and has been circled for easy detection. Correct the file using the text editor. After the invalid code is corrected, the control will attempt to translate the part file and will indicate additional invalid codes.


(Rectangle - Piece)
G20
G91
XXXXXX
G99 X1 Y0 I0 J0
G41
M07
G01 X0 Y5
G01 X5 Y0
G01 X0 Y-5
G01 X-5 Y0
M08
G40
M02
Help
MultiTasking
Cancel
OK
Double-Click Line of Text to Edit
4:28:05 PM
Show Original Text
Delete Part
Find
Find Next
Find Previous
Replace
Replace All

Files

Library Shapes

Double-click on a shape to edit it.



Library Shape Setup

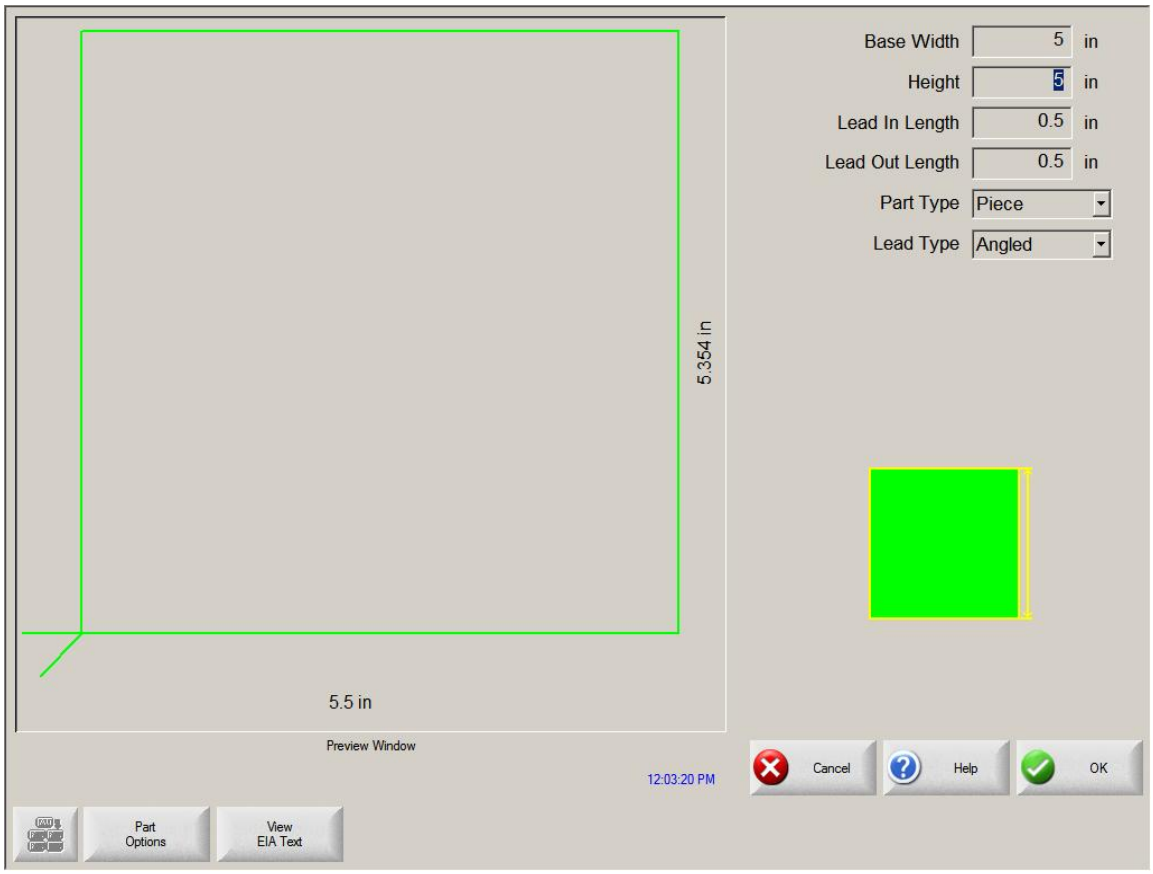
On the screen for the shape you select, enter the correct dimensions to create the part you require. There is a small Help icon in the lower right hand corner of the display to indicate which parameter the control is looking for. The current parameter is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Rectangle



Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Height
Enter the height of the part.

Lead-In/Lead-Out Length
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.

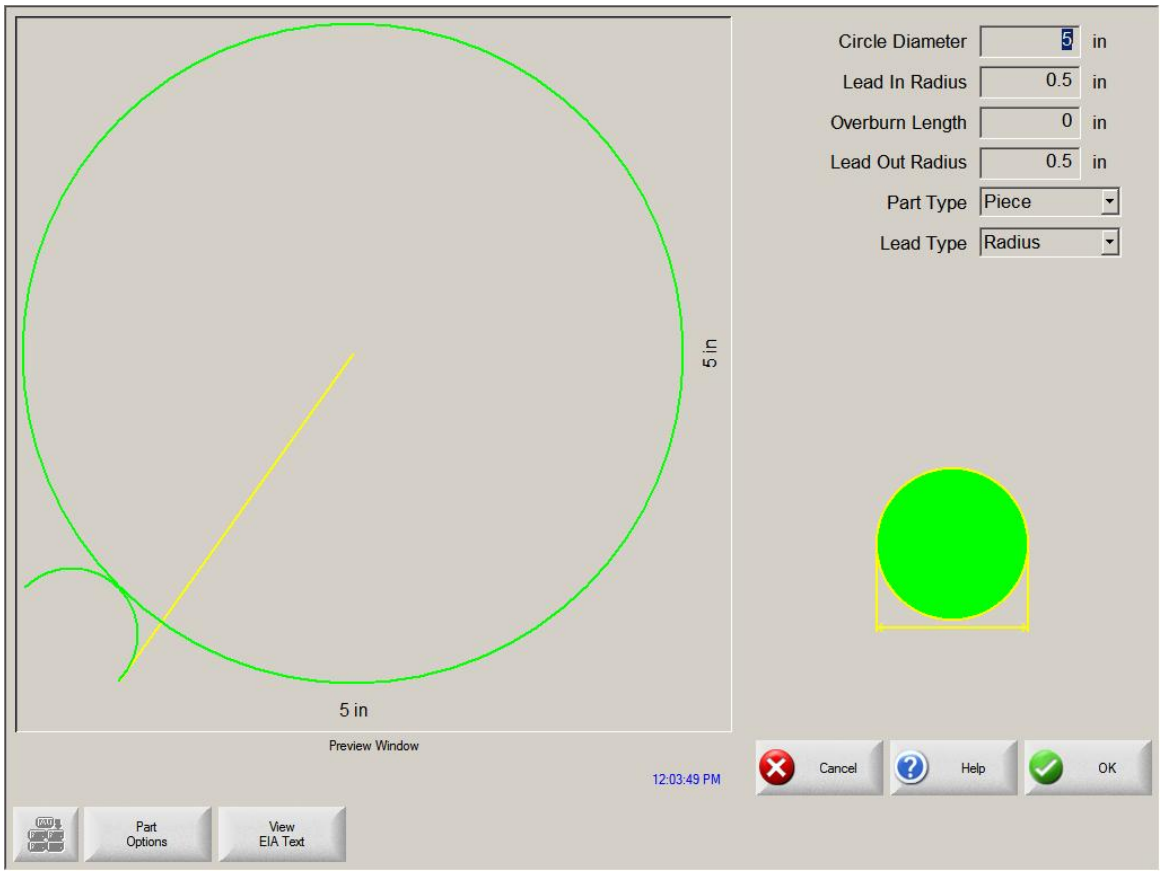
Note: the Rectangle simple shape has the ability to select the location for the lead-in and lead-out by pressing the Space key. Press the Space key to move the lead-in and lead-out to the next available location.

Part Type
Indicate 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 you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Circle



Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Circle Diameter
Enter the diameter of the part.

Lead-In Radius

Overburn Length
Parts that contain a circular element user overburn. Overburn specifies the 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, enter a negative number for the overburn length.

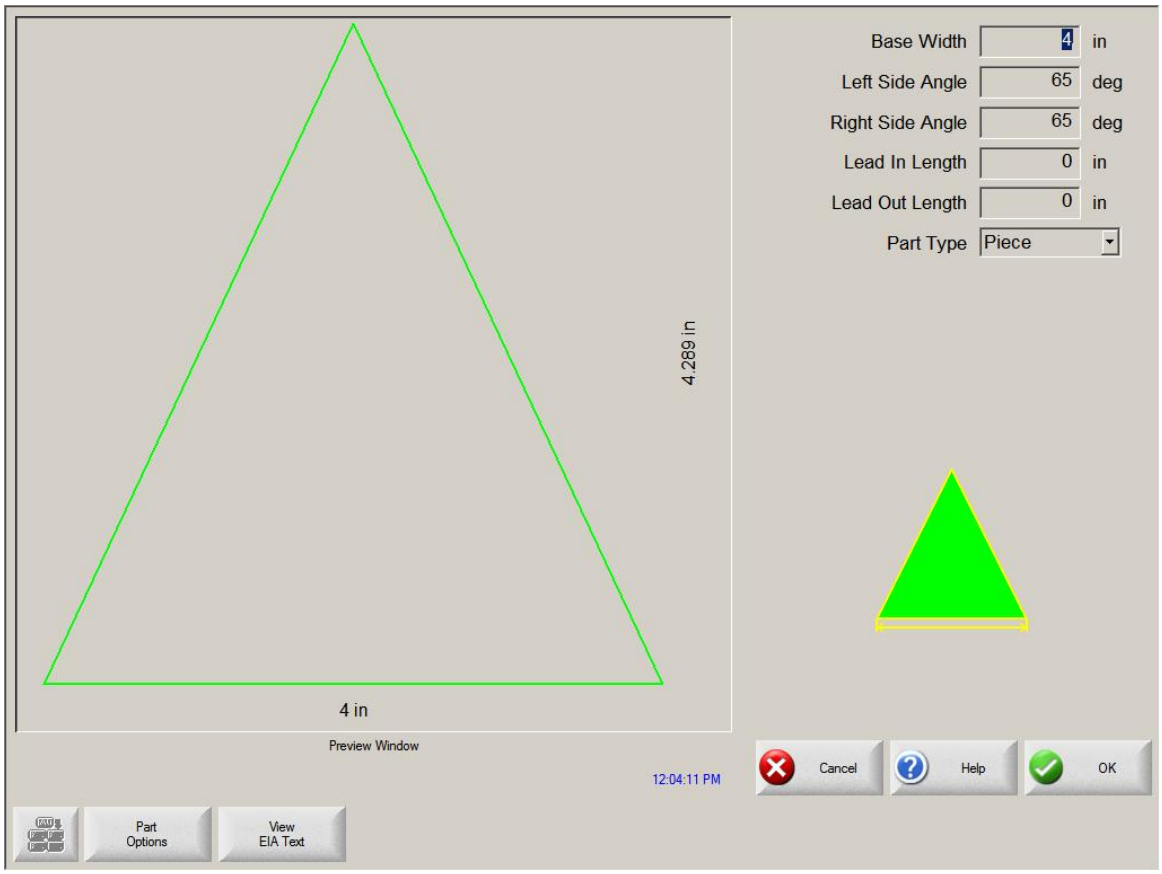
Lead Out Radius

Part Type
Indicate 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 you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Triangle



Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

BaseWidth
Enter the width of the base of the part.

Left Side Angle
Enter the number of degrees for the angle on the left side of the part.

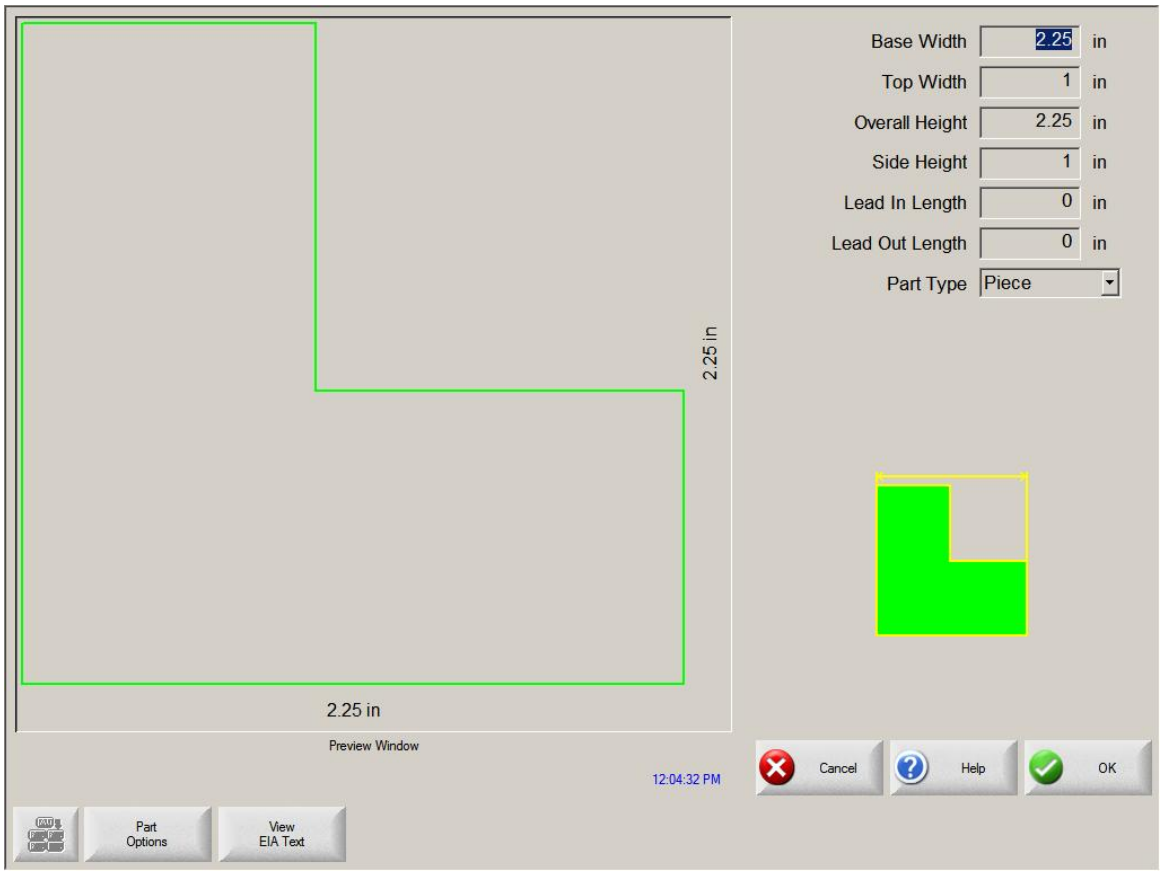
Right Side Angle
Enter the number of degrees for the angle on the right side of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

L-Bracket



Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Top Width
Enter the width of the top of the part.

Overall Height
Enter the height of the part from the base to the top.

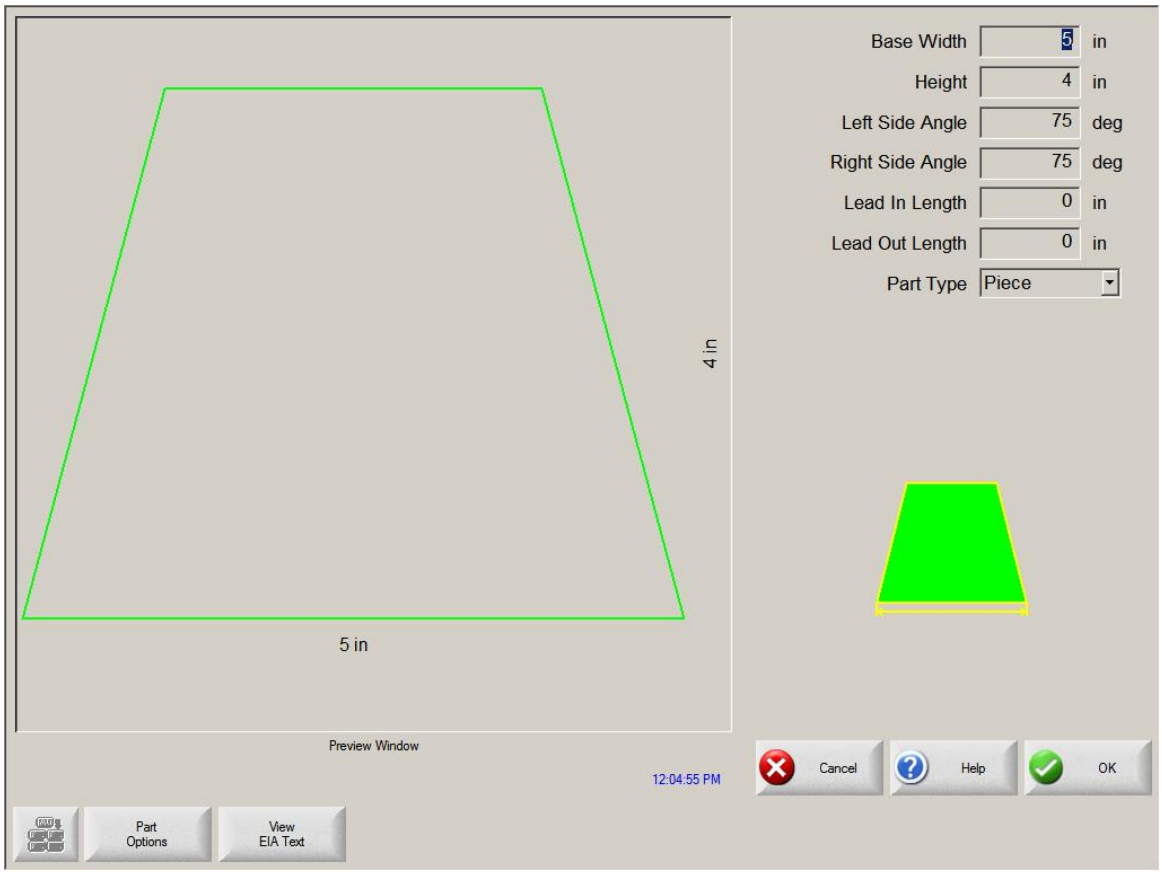
Side Height
Enter the height of the shortest side of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Trapezoid



Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Height
Enter the height of the part.

Left Side Angle
Enter the number of degrees for the left side angle of the part.

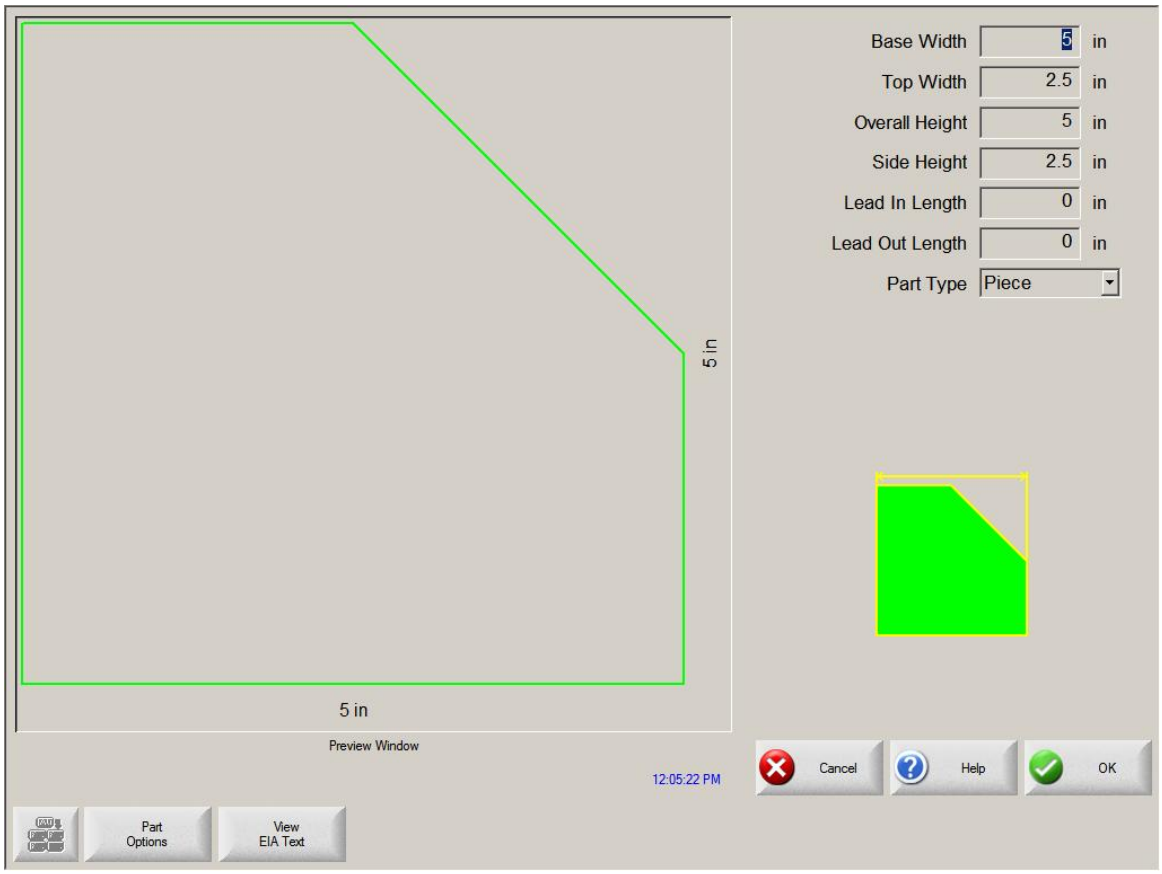
Right Side Angle
Enter the number of degrees for the right side angle of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Slant Rectangle



Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Top Width
Enter the width of the top of the part.

Overall Height
Enter the height of the part from the base to the top.

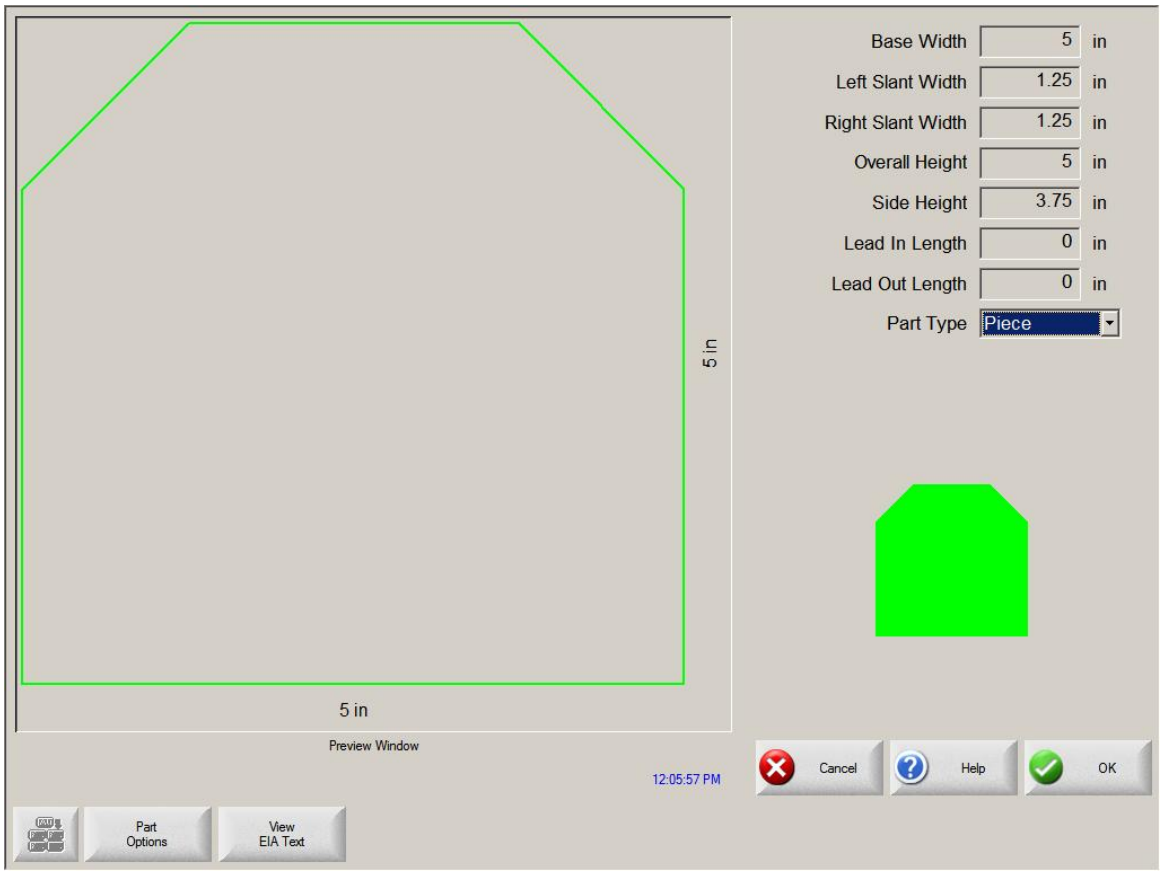
Side Height
Enter the height of the shortest side of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Gambrel Rectangle



Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Left Slant Width
Enter the width (measured horizontally) of the left, slanted side of the part.

Right Slant Width
Enter the width (measured horizontally) of the right, slanted side of the part.

Overall Height
Enter the height of the part from the base to the top.

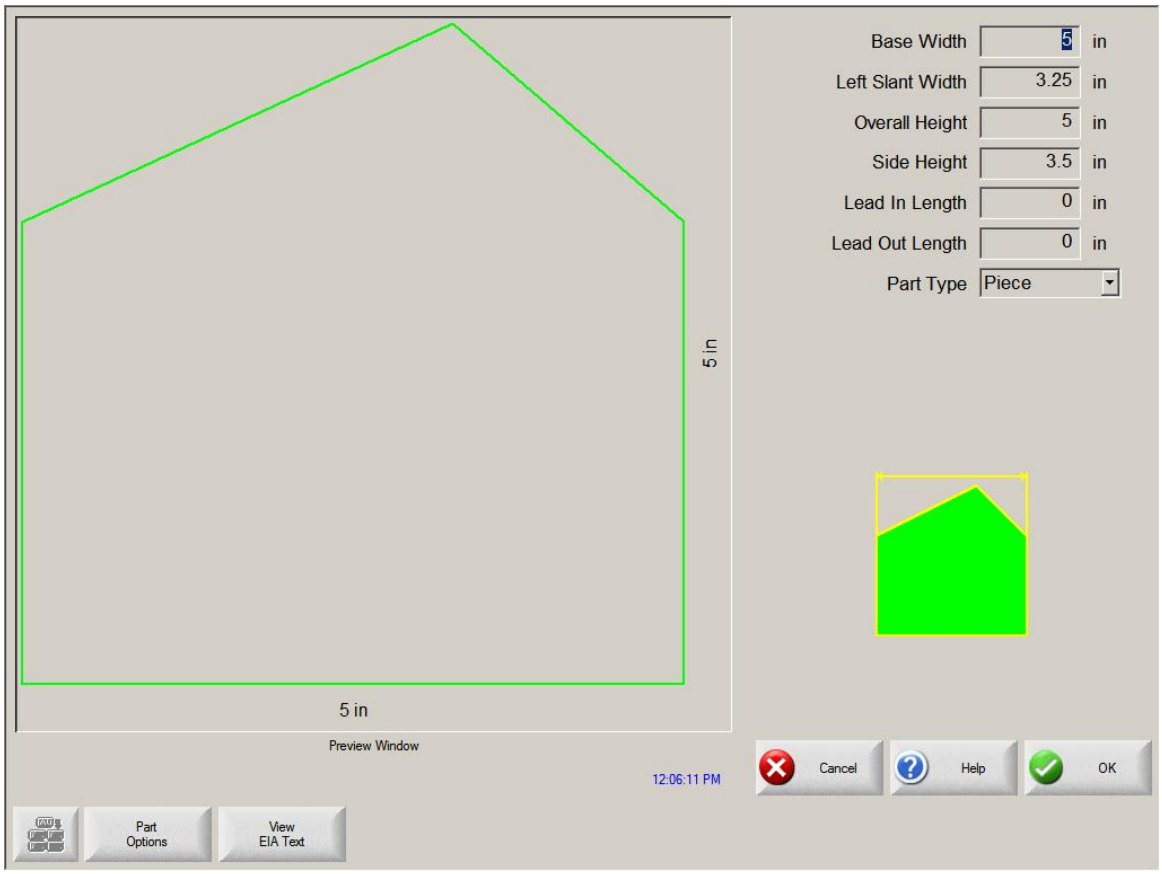
Side Height
Enter the height of the sides of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Roofed Rectangle



Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Left Slant Width
Enter the width (measured horizontally) of the left, slanted side of the part.

Overall Height
Enter the height of the part from the base to the point at the top.

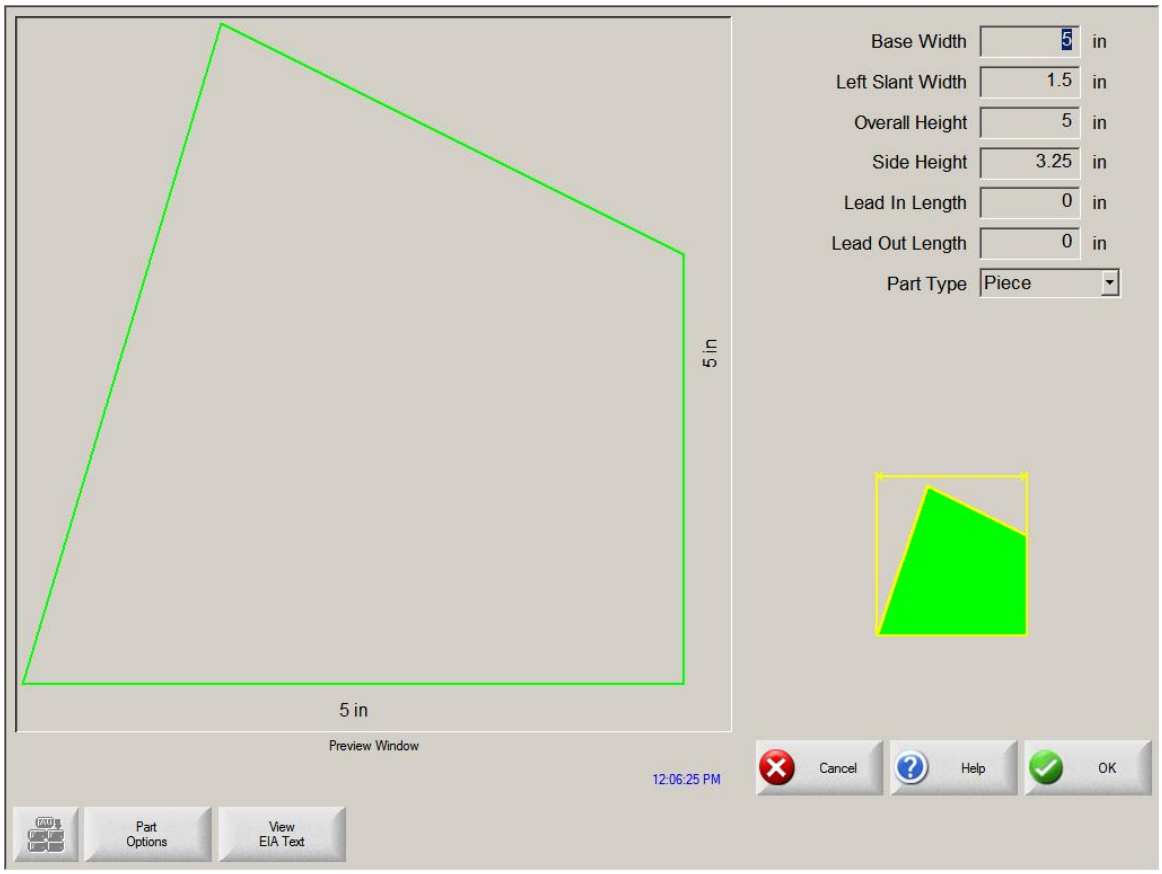
Side Height
Enter the height of the sides of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

4-Sided Polygon



Library Shape Setup

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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Left Slant Width
Enter the width (measured horizontally) of the left, slanted side of the part.

Overall Height
Enter the height of the part from the base to the point at the top.

Side Height
Enter the height of the sides of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

5-Sided Polygon

Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Overall Width
Enter the width of the part.

Left Slant Width
Enter the width of the slant (measured horizontally) of the left side of the part.

Right Slant Width
Enter the width of the slant (measured horizontally) of the right side of the part.

Overall Height
Enter the height of the part, from base to top.

Side Height
Enter the height of the right side of the part.

Lead In Radius
Enter the radius of the lead-in arc.

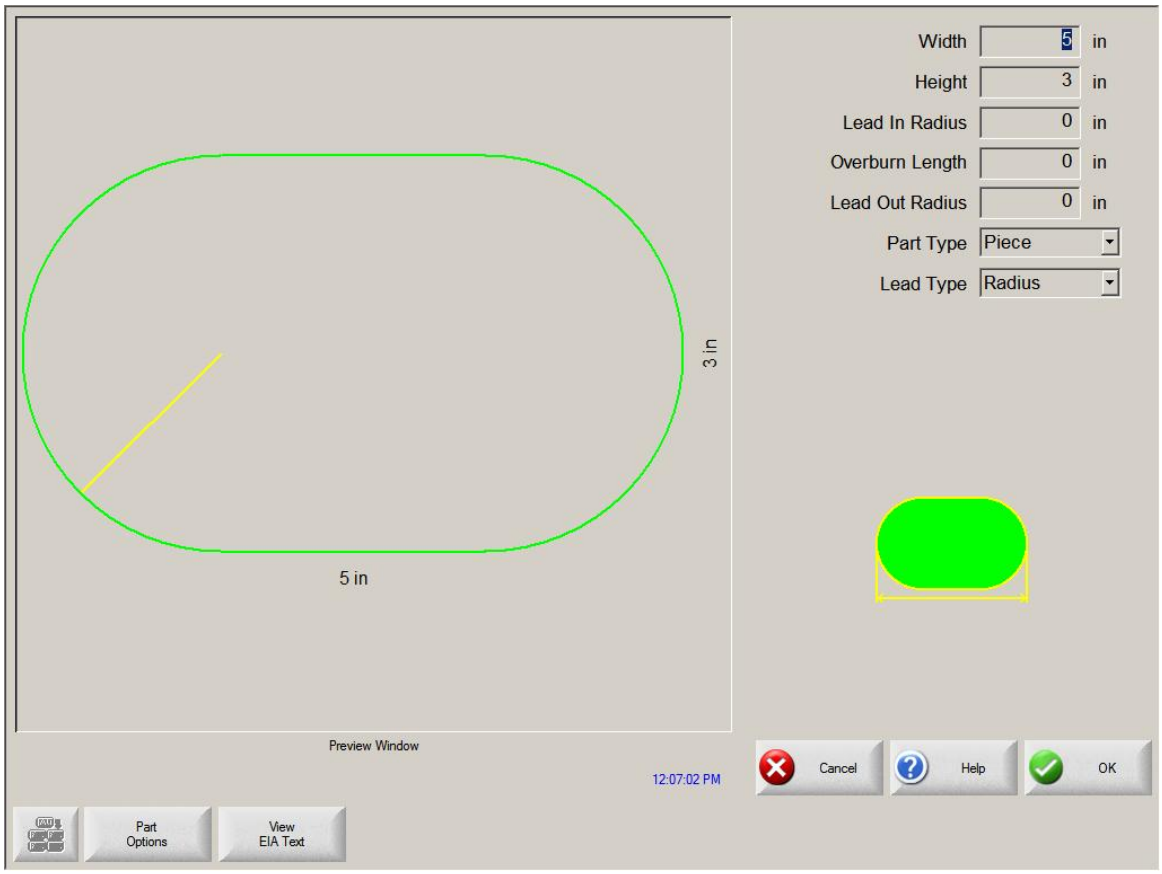
Lead Out Radius
Enter the radius of the lead-out arc.

Part Type
Indicate 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 you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Oval



Library Shape Setup

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While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Width
Enter the width of the part.

Height
Enter the height of the part.

Lead In Radius
Enter the radius of the lead-in arc.

Overburn Length
Parts that contain a circular element user overburn. Overburn specifies the 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, enter a negative number for the overburn length.

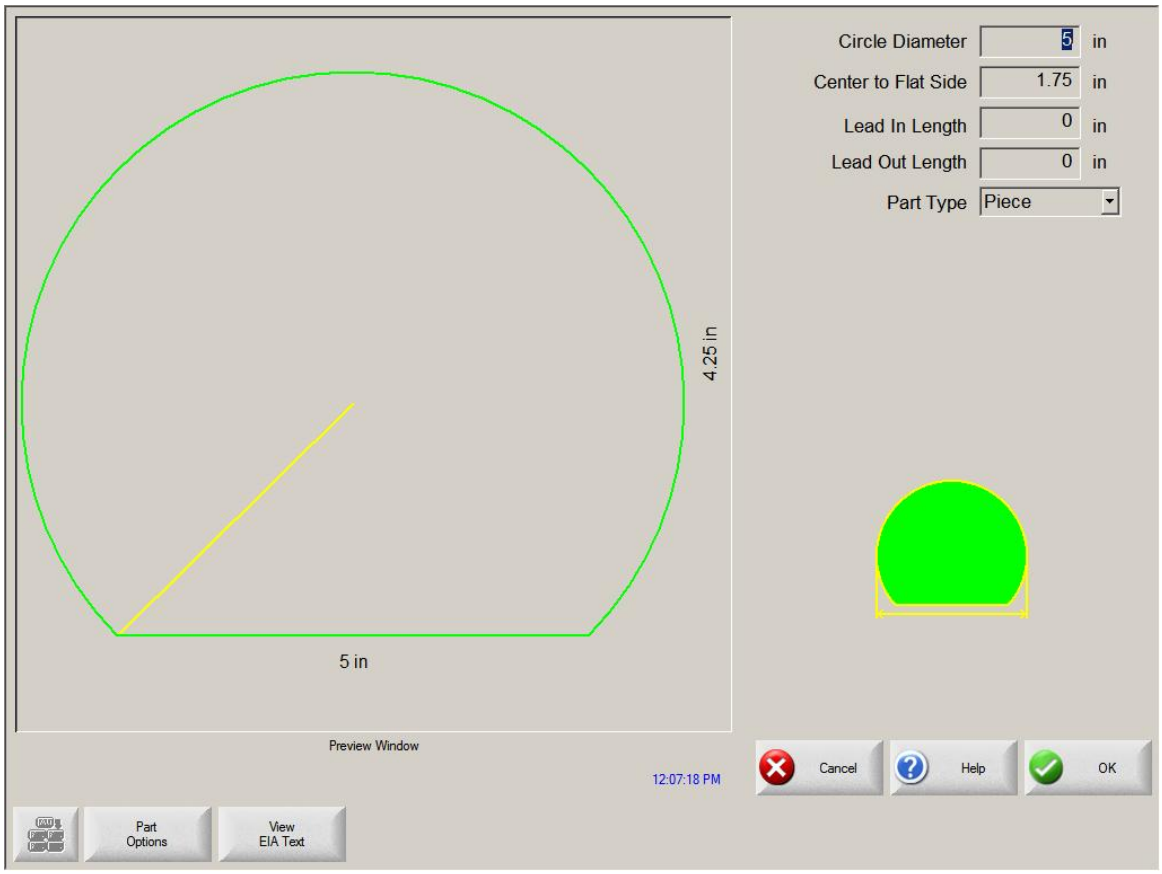
Lead Out Radius
Enter the radius of the lead-out arc.

Part Type
Indicate 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 you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Circle with Flat Side



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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Circle Diameter
Enter the length of the diameter of the part.

Center to Flat Side
Enter the distance from the center to the flat side of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Circle Slice

Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

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

Circle Radius
Enter the radius (straight side) of the part.

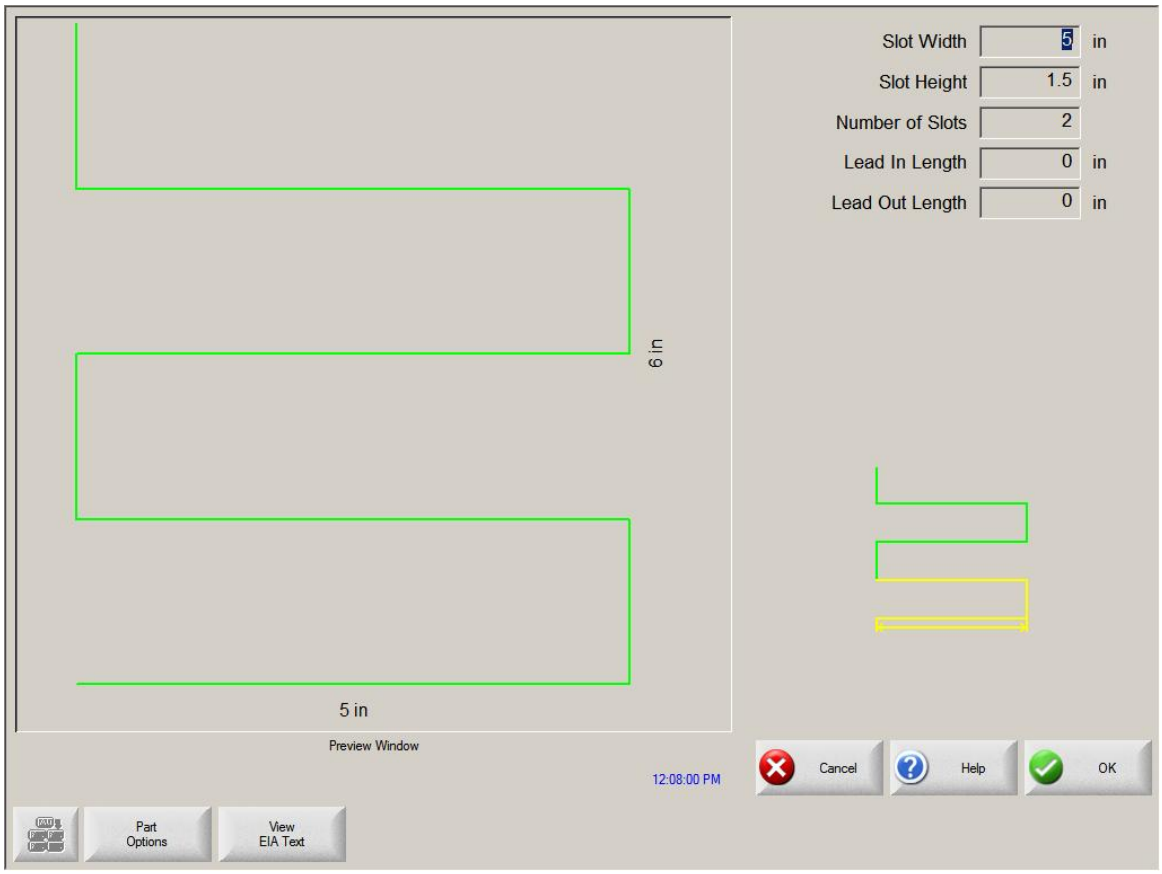
Slice Angle
Enter the number of degrees of the angle of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Straight Slots



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

Slot Width
Enter the width of the slots.

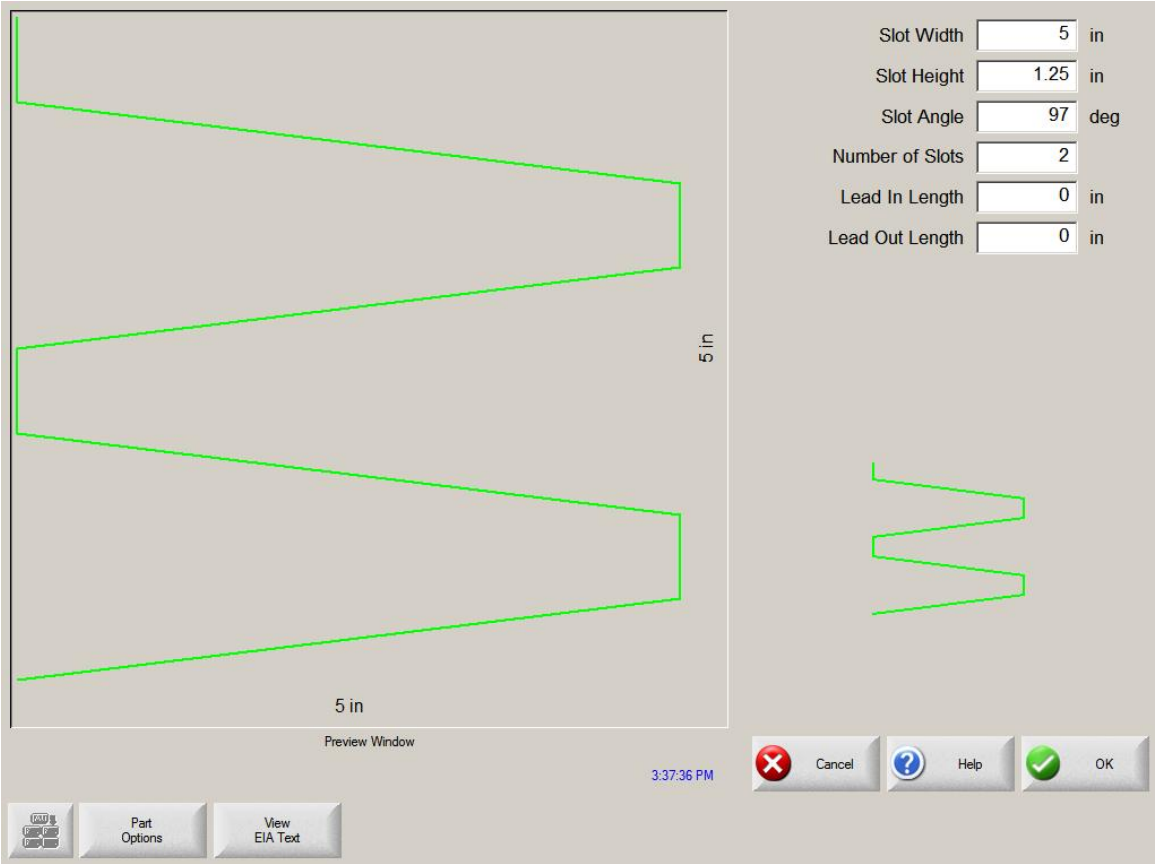
Slot Height
Enter the height of the slots.

Number of Slots
Enter the number of slots in the part.

Lead-In/Lead-Out Length
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.

Angled Slots



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

Slot Width
Enter the width of the slots.

Slot Height
Enter the height of the slots.

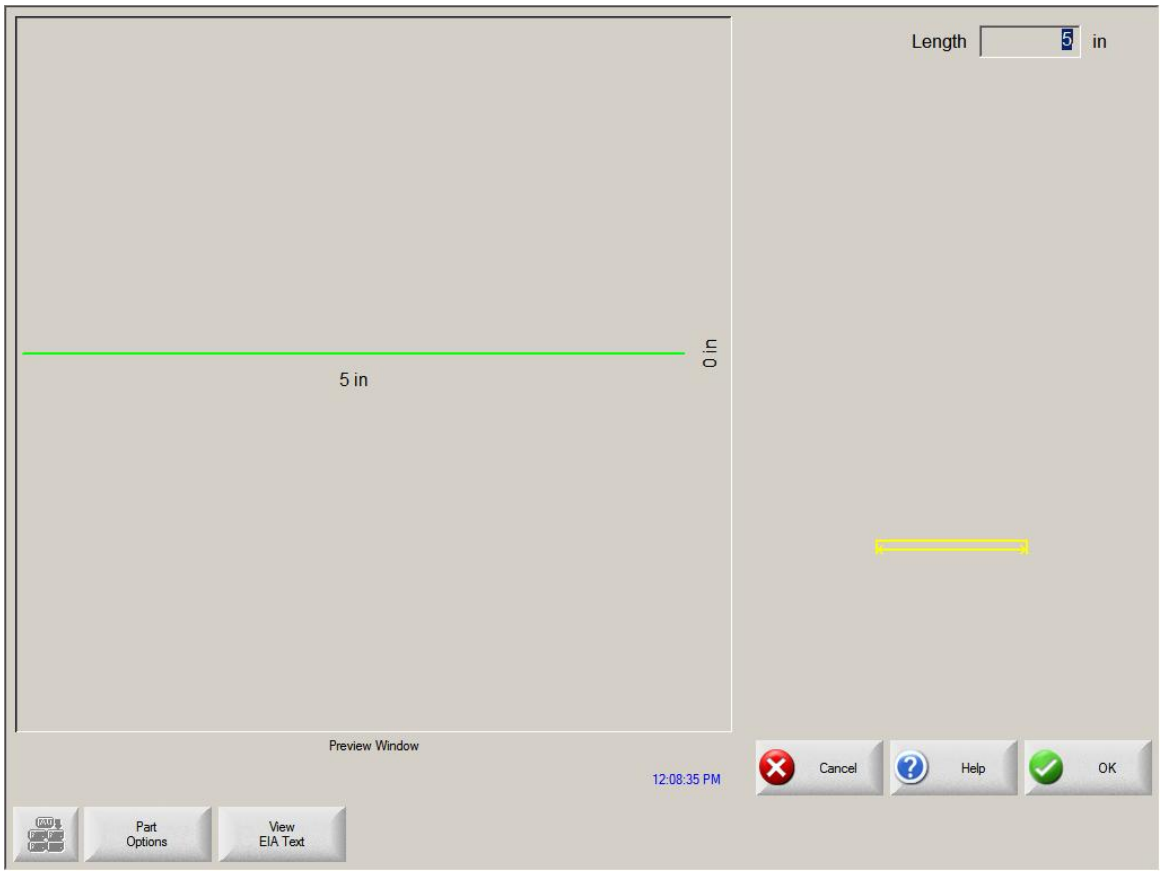
Slot Angle
Enter the number of degrees for the angles at the end of each slot.

Number of Slots
Enter the number of slots in the part.

Lead-In/Lead-Out Length
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.

Horizontal Rip



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

Length

Enter the length of the horizontal rip.

Vertical Rip

Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

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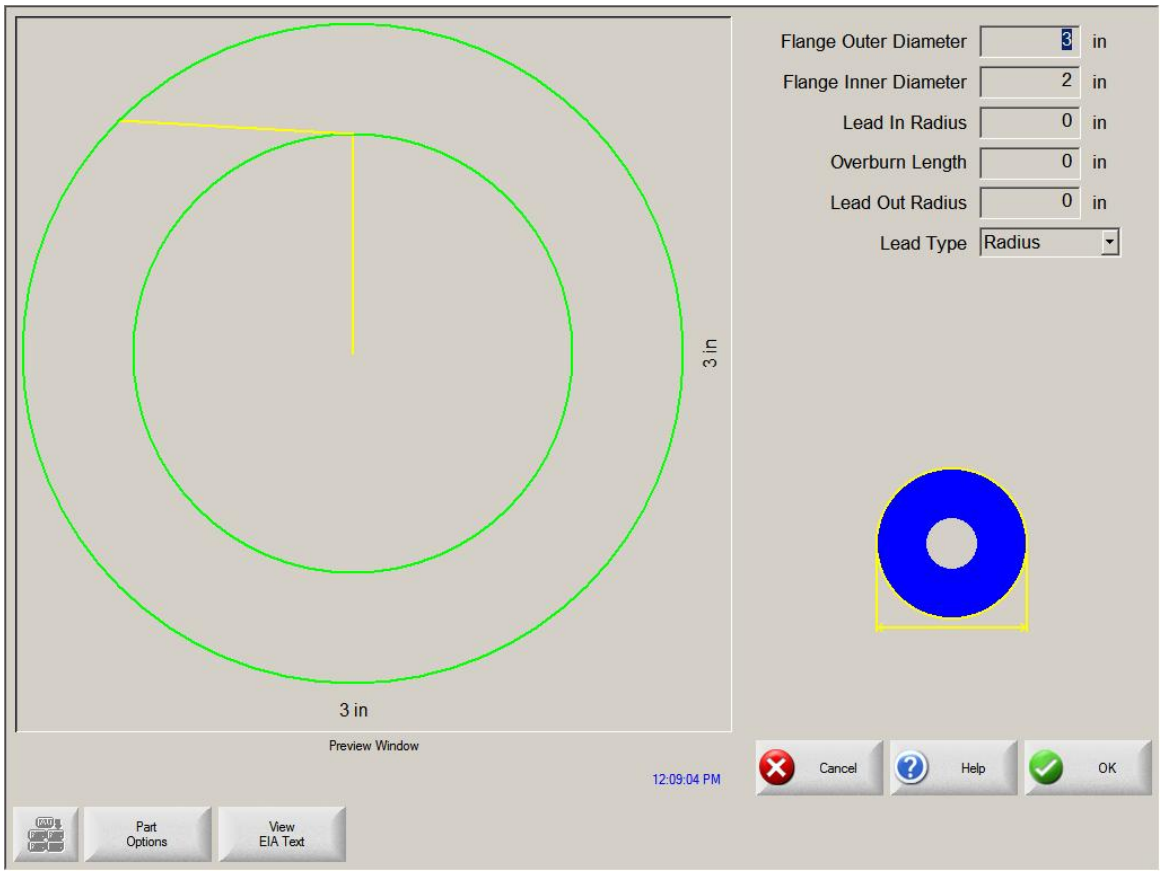
Length

Enter the length of the vertical rip.

Flange



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

Flange Outer Diameter
Enter the diameter of the outer edge of the part.

Flange Inner Diameter
Enter the diameter of the inner edge of the part.

Lead In Radius
Enter the radius of the lead-in arc.

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

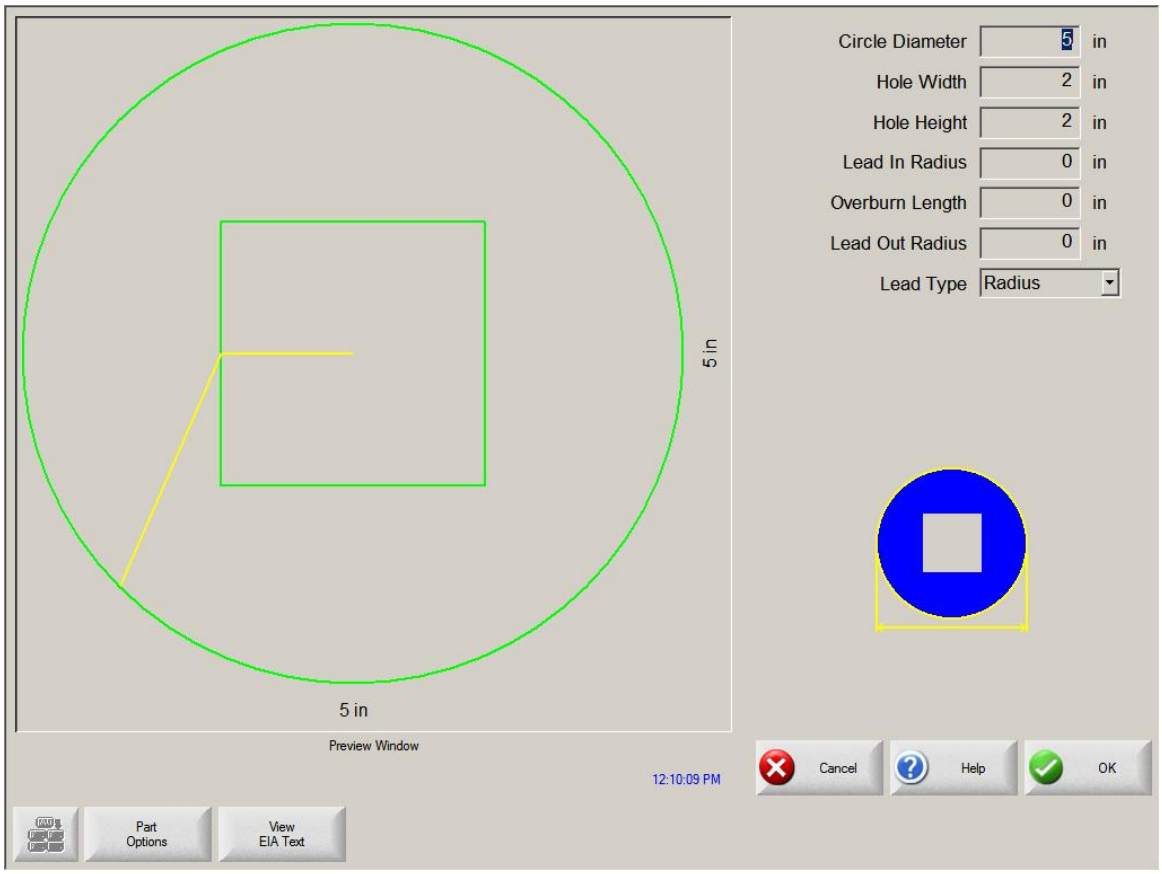
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Circle with Rectangular Hole



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

Circle Diameter
Enter the diameter of the outer circle.

Hole Width
Enter the width of the rectangular hole.

Hole Height
Enter the height of the rectangular hole.

Lead In Radius
Enter the radius of the lead-in arc.

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

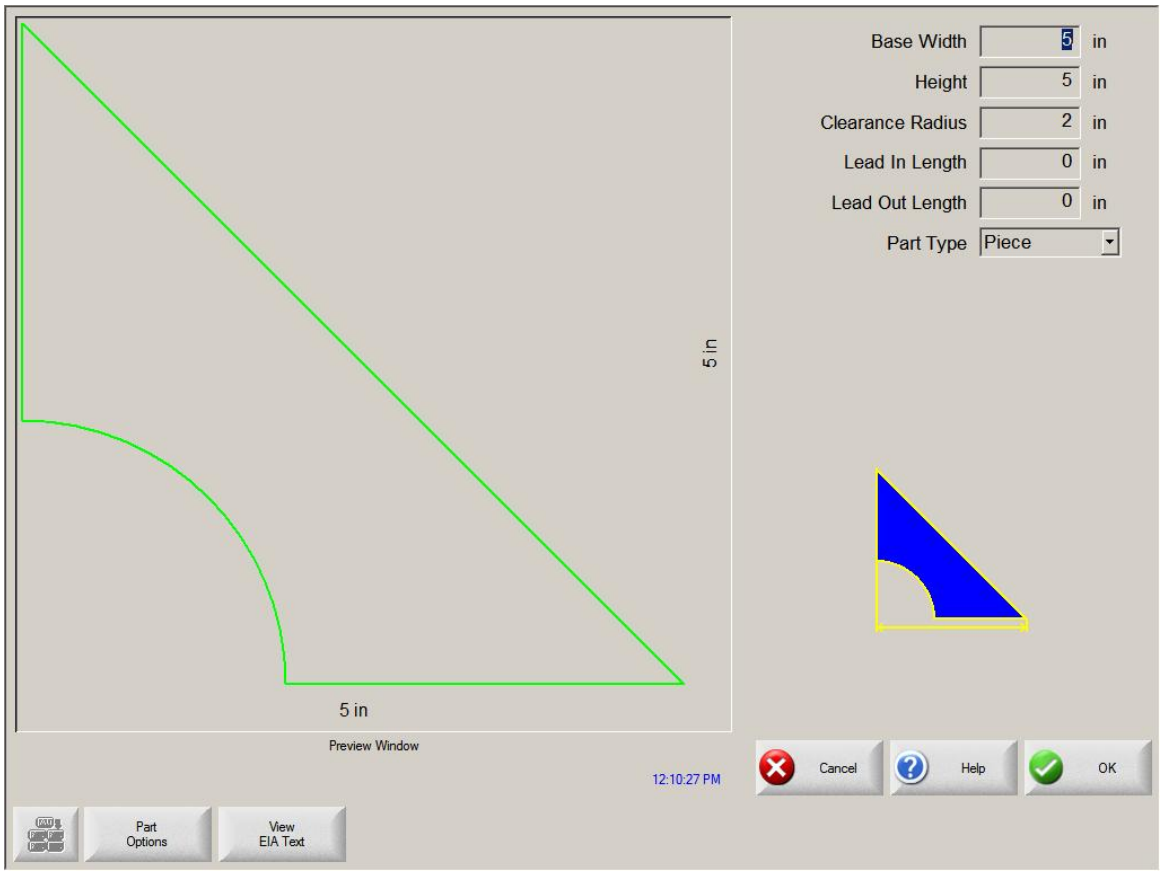
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Gusset



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

Base Width
Enter the width of the base of the part.

Height
Enter the height of the part.

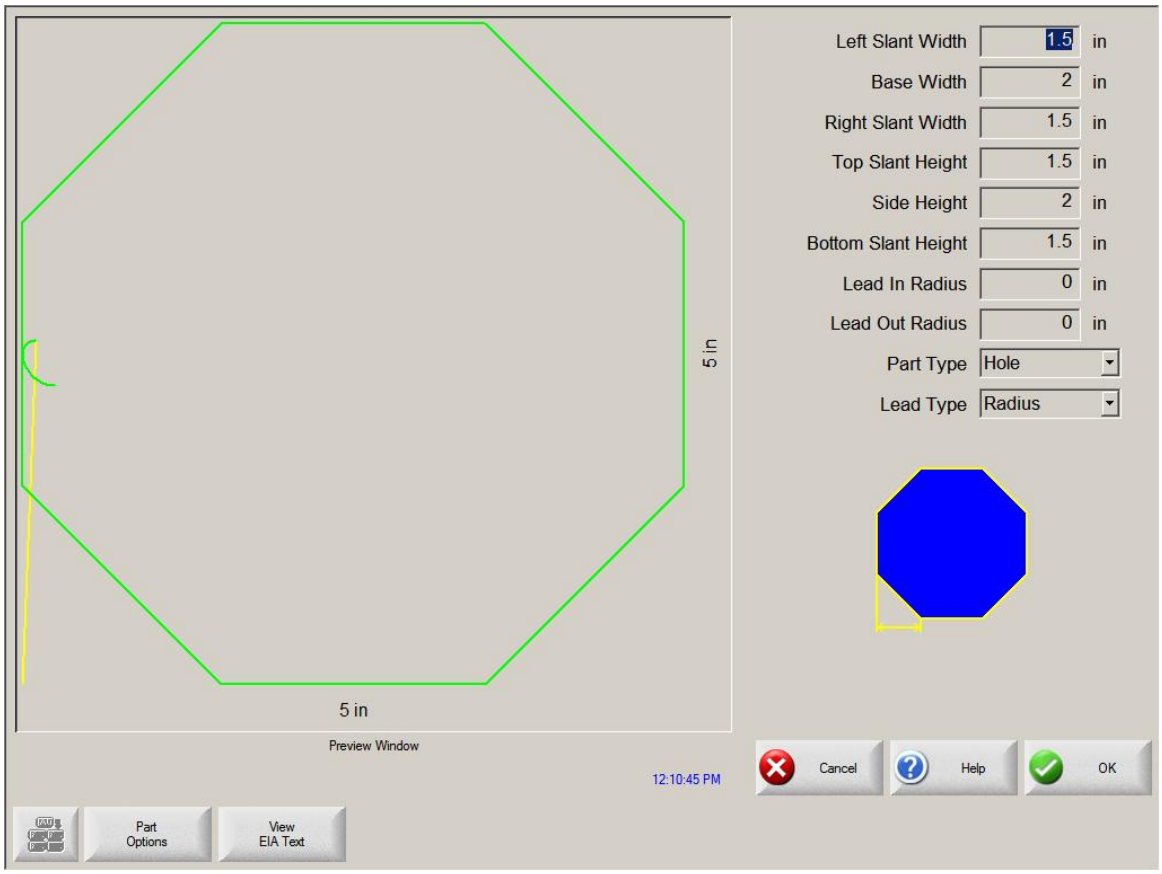
Clearance Radius
Enter the length of the radius of the clearance curve.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

8-Sided



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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Left Slant Width
Enter the width of the side that slants to the left.

Base Width
Enter the width of the base of the part.

Right Slant Width
Enter the width of the side that slants to the right.

Top Slant Height
Enter the height of the slanted sides on the top of the part.

Side Height
Enter the length of each side.

Bottom Slant Height
Enter the height of the slanted sides on the bottom of the part.

Lead In Radius
Enter the radius of the lead-in arc.

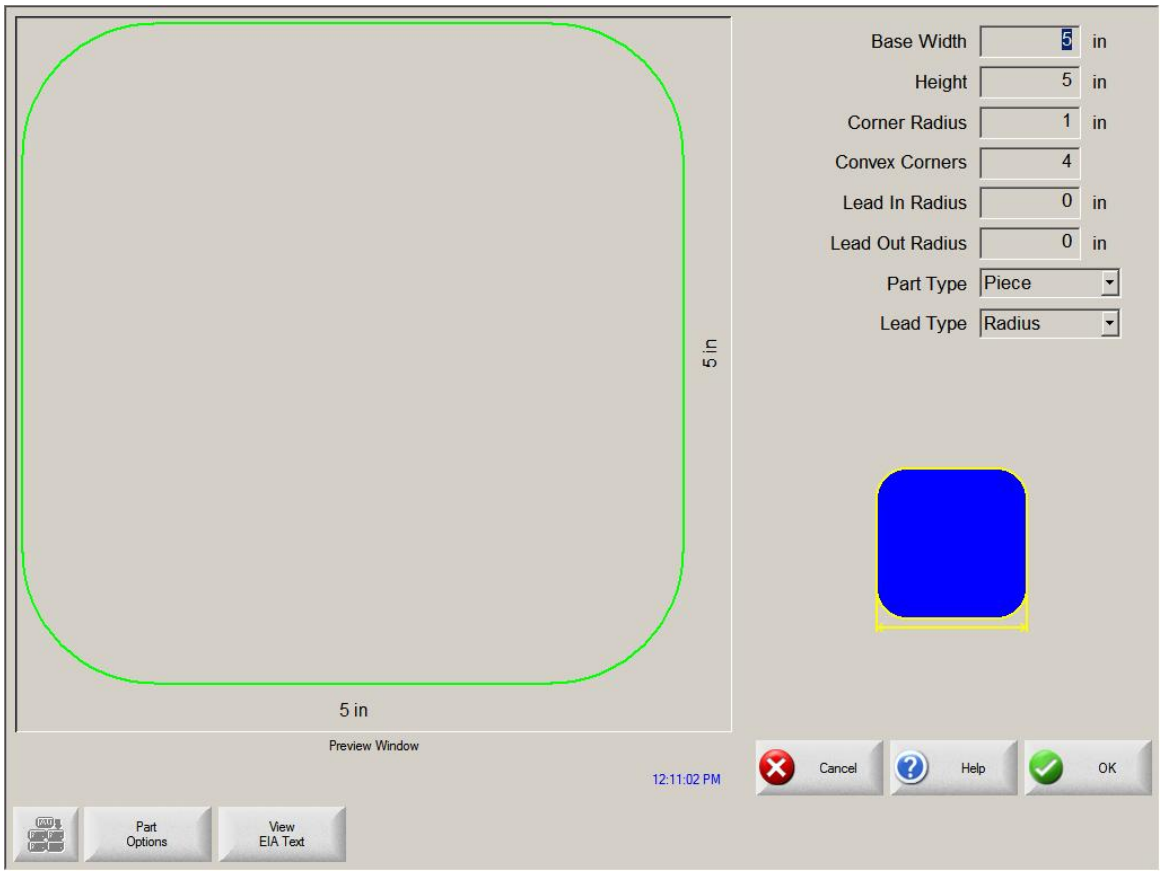
Lead Out Radius
Enter the radius of the lead-out arc.

Part Type
Indicate 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 you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Rectangle with Convex Corners



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

Base Width
Enter the width of the base of the part.

Height
Enter the height of the part.

Corner Radius
Enter the length of the radius of the curve in the convex corners.

Convex Corners
Enter the number of convex corners on the part.

Lead In Radius
Enter the radius of the lead-in arc.

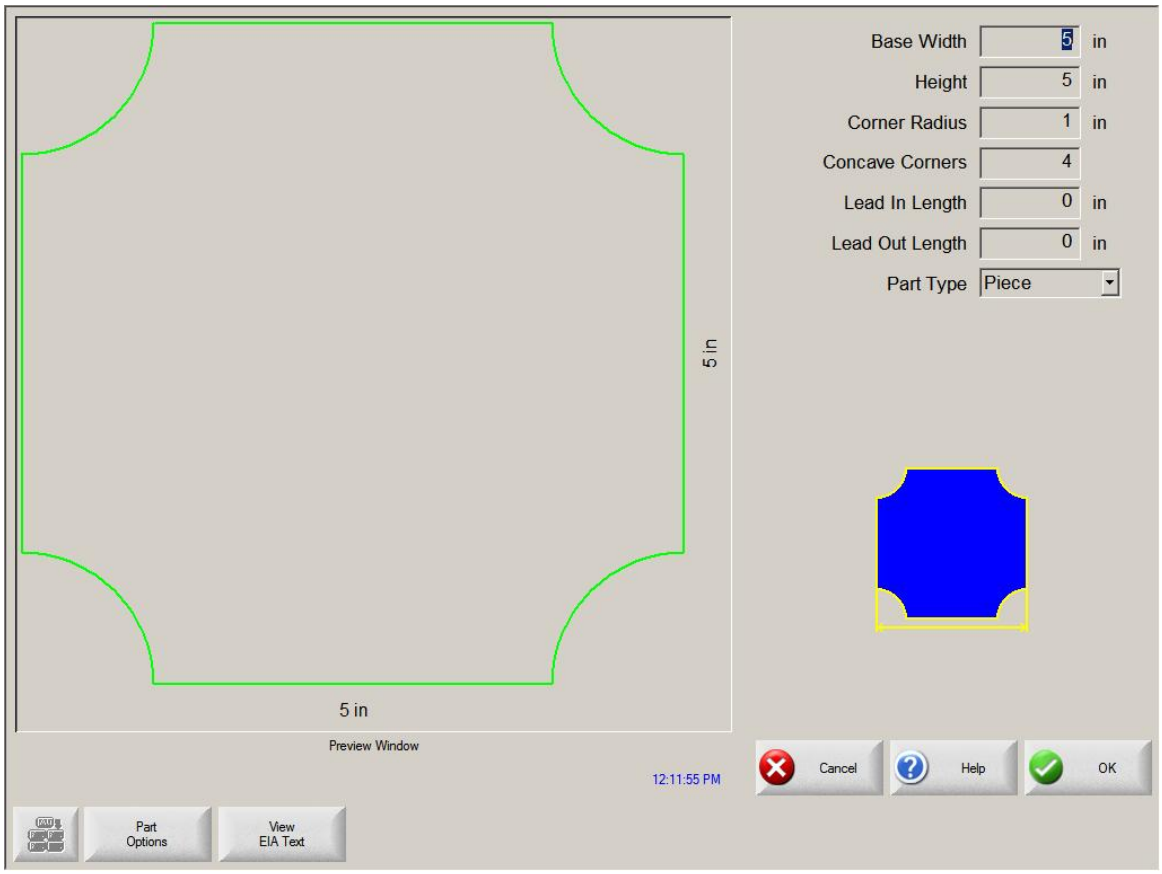
Lead Out Radius
Enter the radius of the lead-out arc.

Part Type
Indicate 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 you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Rectangle with Concave Corners



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

Base Width
Enter the width of the base of the part.

Height
Enter the height of the part.

Corner Radius
Enter the length of the radius of the curve in the concave corners.

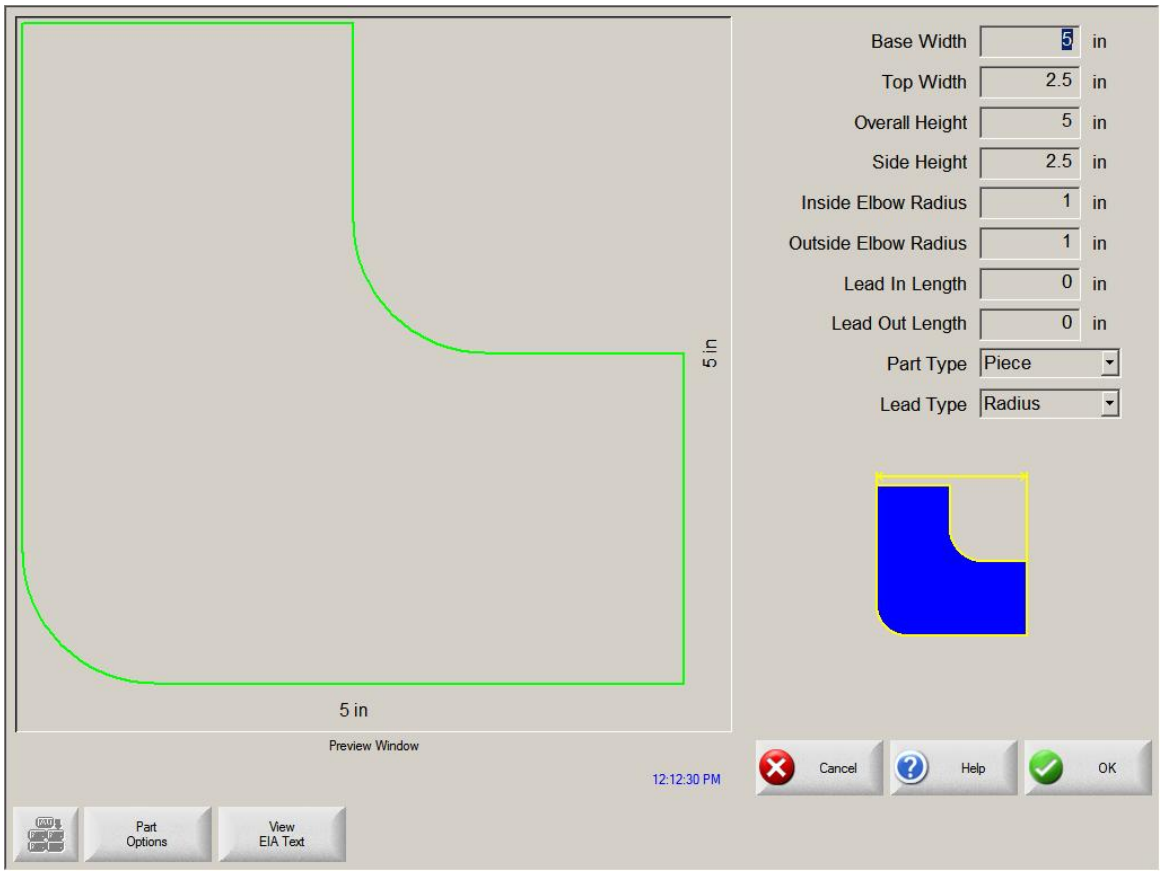
Convex Corners
Enter the number of convex corners for the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

L-Bracket with Elbow Radii



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

Base Width
Enter the width of the base of the part.

Top Width
Enter the width of the top of the part.

Overall Height
Enter the height of the part, from base to top.

Side Height
Enter the height of the right side of the part.

Inside Elbow Radius
Enter the radius of the inside curve of the part.

Outside Elbow Radius
Enter the radius of the outer curve of the part.

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

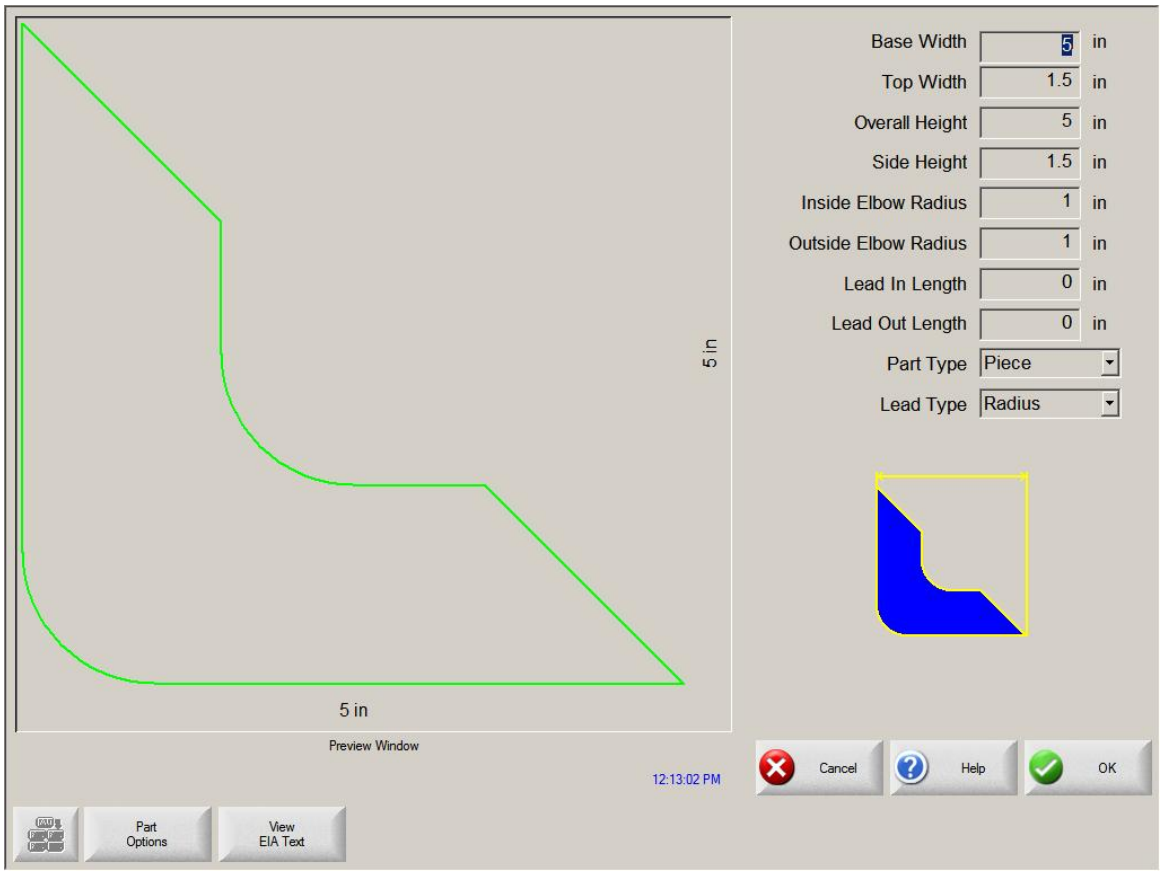
The location for the lead-in and lead-out is fixed, but can be changed by using the ShapeWizard and then saving the new shape to disk.

Part Type
Indicate 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 you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Slant L-Bracket with Elbow Radii



Library Shape Setup

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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Top Width
Enter the width of the top of the part.

Overall Height
Enter the height of the part from base to top.

Side Height
Enter the height of the short side of the part.

Inside Elbow Radius
Enter the radius of the inside curve of the part.

Outside Elbow Radius
Enter the radius of the outer curve of the part.

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

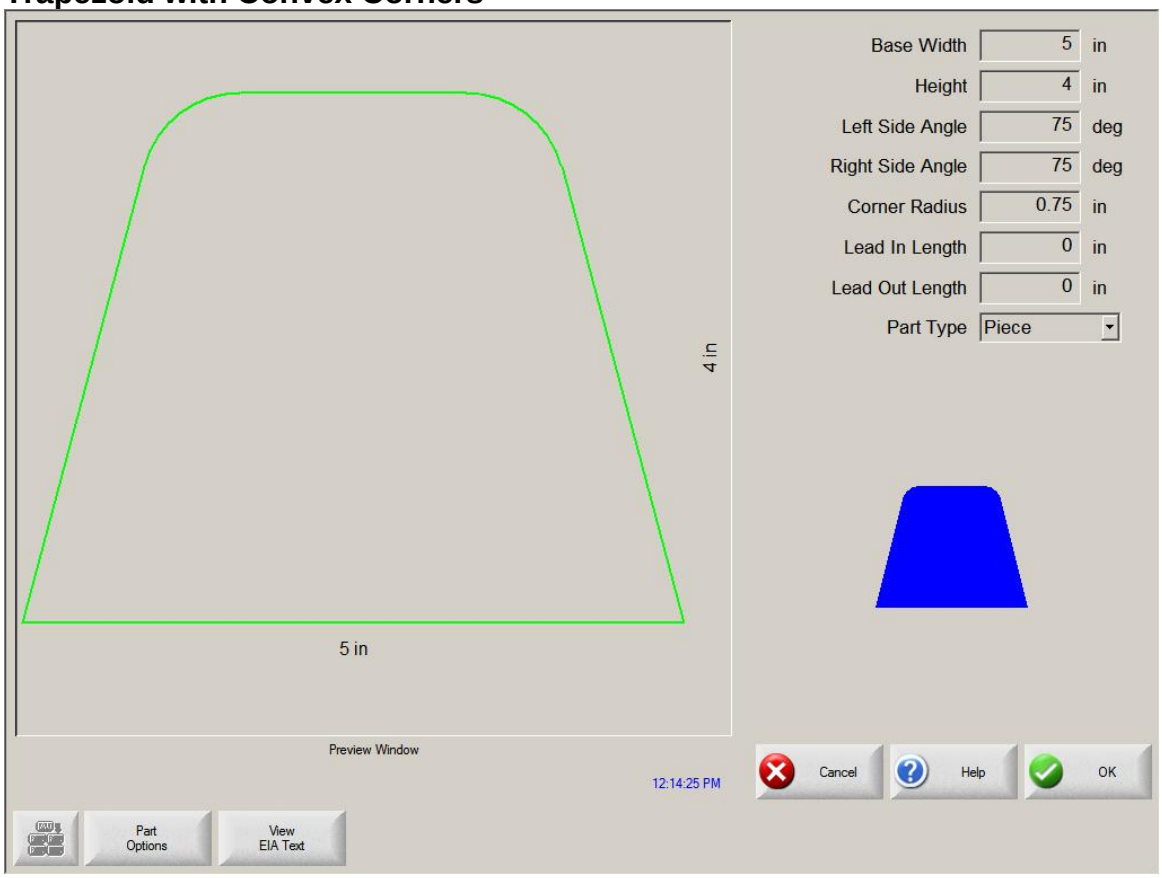
The location for the lead-in and lead-out is fixed, but can be changed by using the ShapeWizard and then saving the new shape to disk.

Part Type
Indicate 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 you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Trapezoid with Convex Corners



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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Height
Enter the height of the part.

Left Side Angle
Enter the number of degrees for the angle on the left side of the part.

Right Side Angle
Enter the number of degrees for the angle on the right side of the part.

Corner Radius
Enter the radius of the curve in the convex corners of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Flange Slice

Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Flange Outer Radius
Enter the radius of the outside curved edge of the part.

Flange Inner Radius
Enter the radius of the inside curved edge of the part.

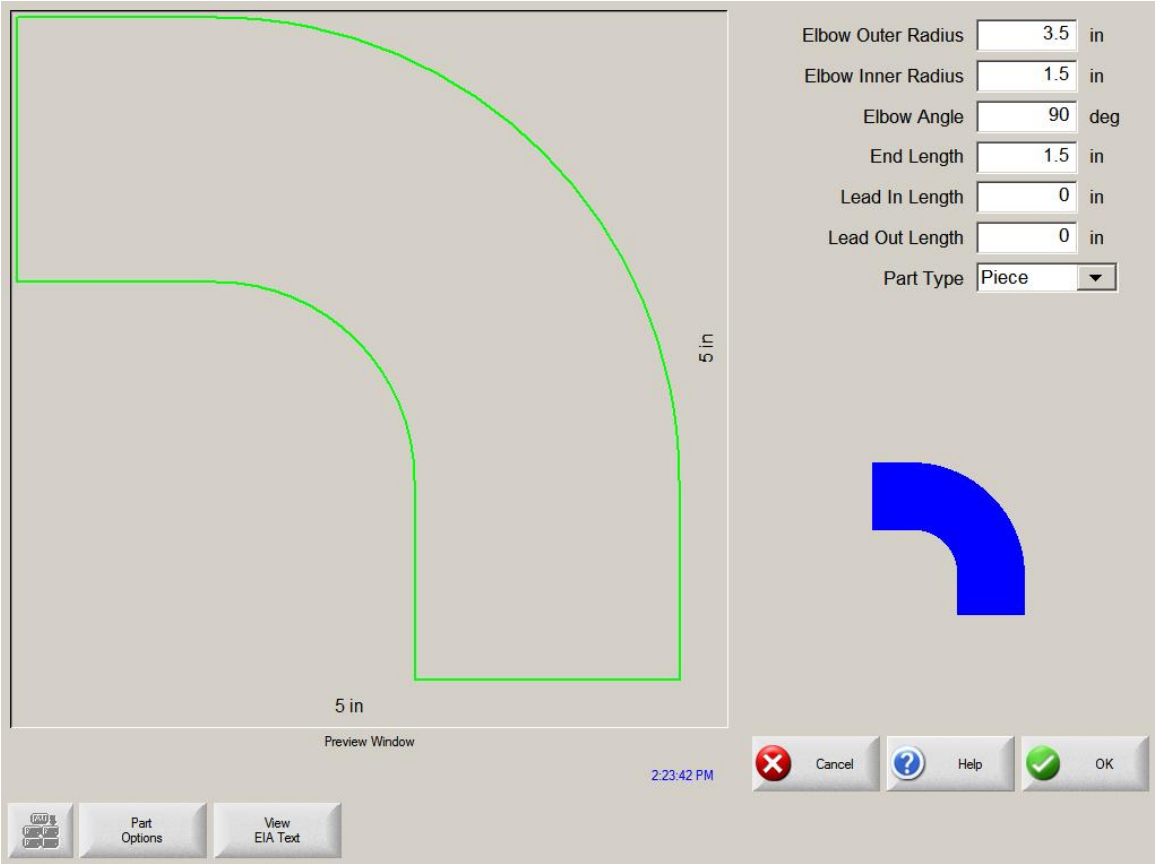
Slice Angle
Enter the angle of the straight sides of the part

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Elbow



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While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Elbow Outer Radius
Enter the radius of the outer edge of the part.

Elbow Inner Radius
Enter the radius of the inner edge of the part.

Elbow Angle
Enter the number of degrees of the angle formed by the straight edges of the part.

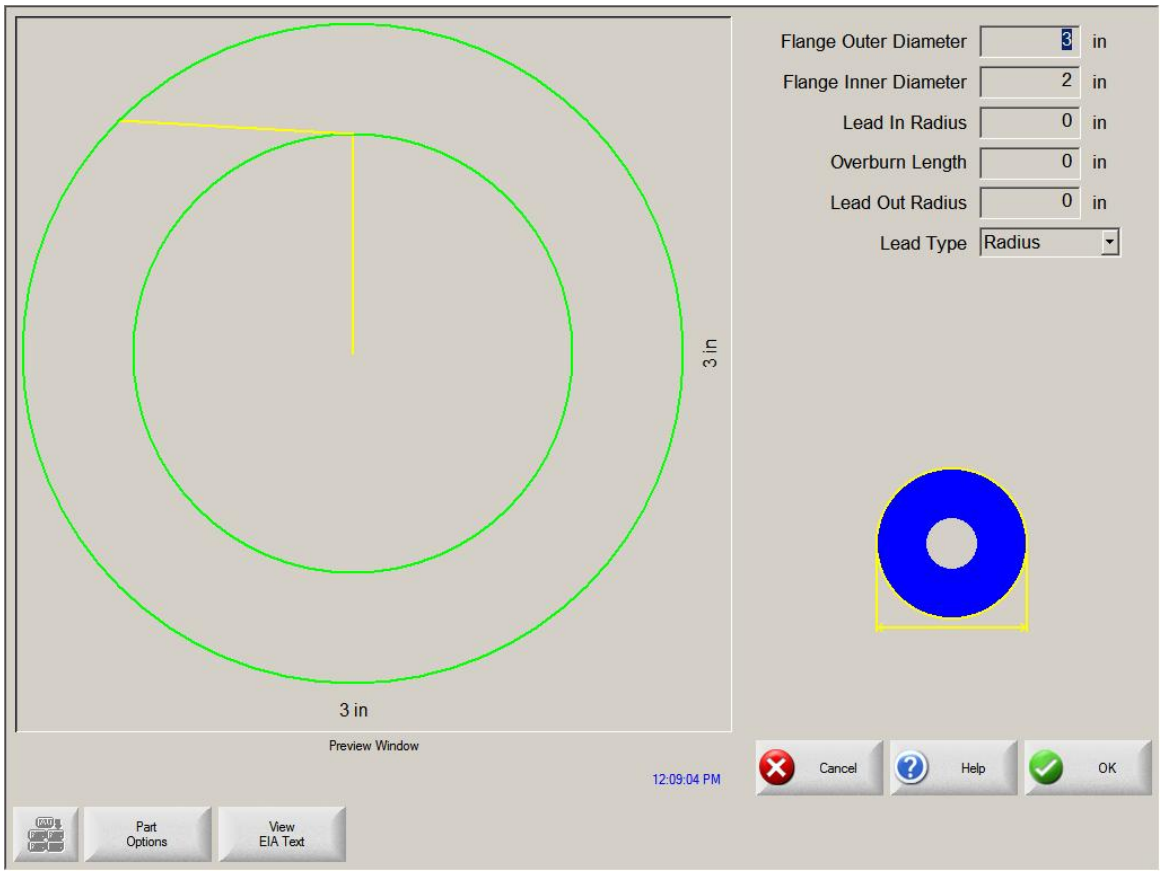
End Length
Enter the length of the ends of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Flange Repair Ring



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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Flange Outer Diameter
Enter the length of the diameter of the outer, circular edge of the part.

Flange Inner Diameter
Enter the length of the diameter of the inner hole within the part.

Lead In Radius
Enter the radius of the lead-in arc.

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

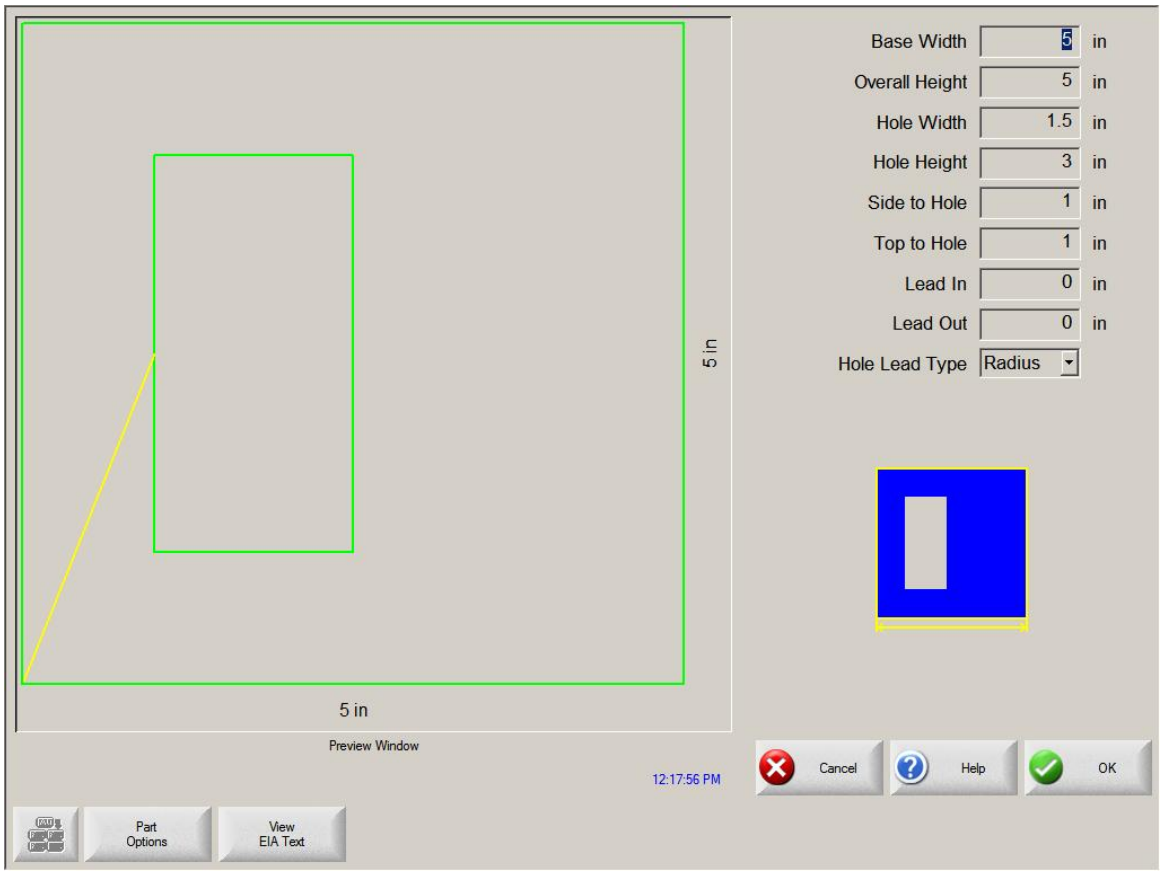
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Rectangle with Rectangular Hole



Library Shape Setup

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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Overall Height
Enter the height of the part from base to top.

Hole Width
Enter the width of the hole within the part.

Hole Height
Enter the height of the hole within the part.

Side to Hole
Enter the distance between the left edges of the part and the hole within it.

Top to Hole
Enter the distance between the top of the part and the top of the hole within it.

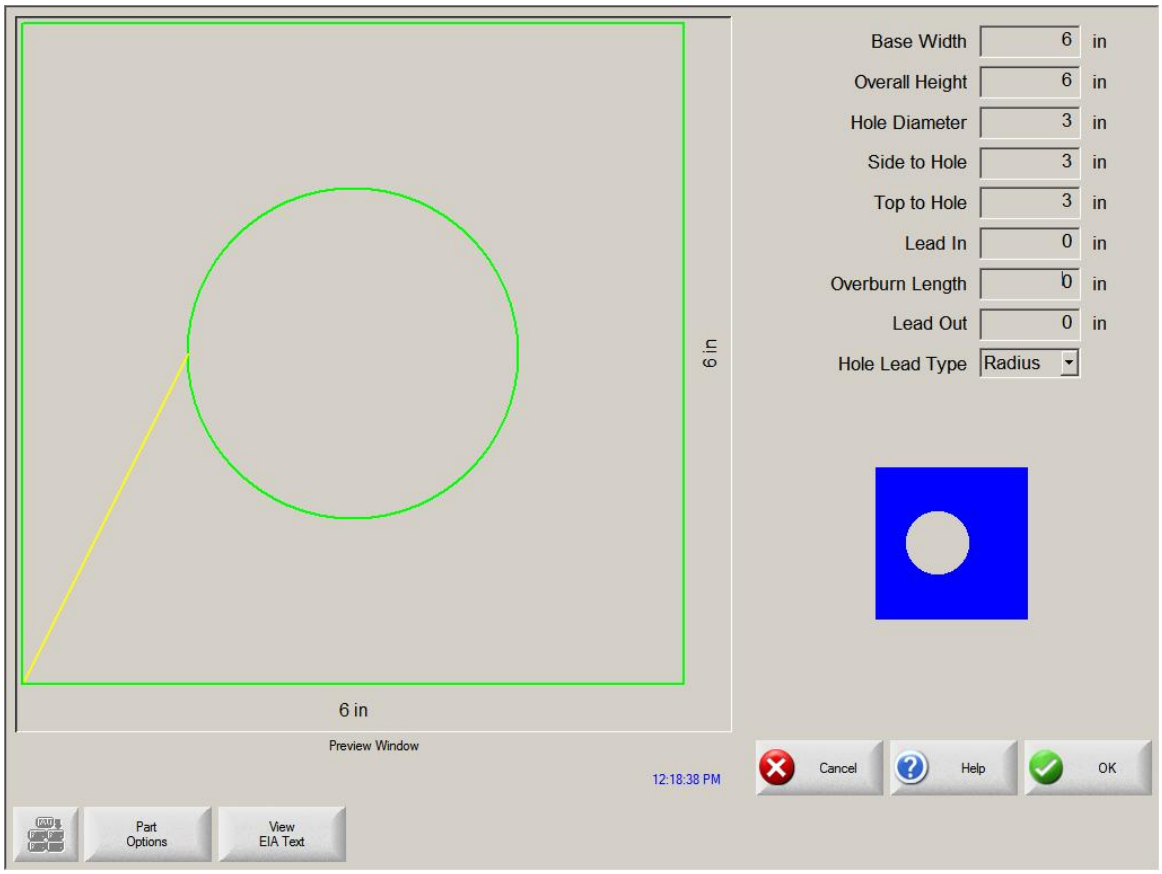
Lead-In/Lead-Out
Enter the appropriate value to ensure proper piercing (lead-in) and gas bleed-off (lead-out) to obtain optimum cut quality.

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.

Hole Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Rectangle with Circular Hole



Library Shape Setup

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

Base Width
Enter the width of the base of the part.

Overall Height
Enter the height of the part from base to top.

Hole Diameter
Enter the diameter of the hole within the part.

Side to Hole
Enter the distance from the left side of the part to the center of the hole within it.

Top to Hole
Enter the distance from the top of the part to the center of the hole within it.

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.

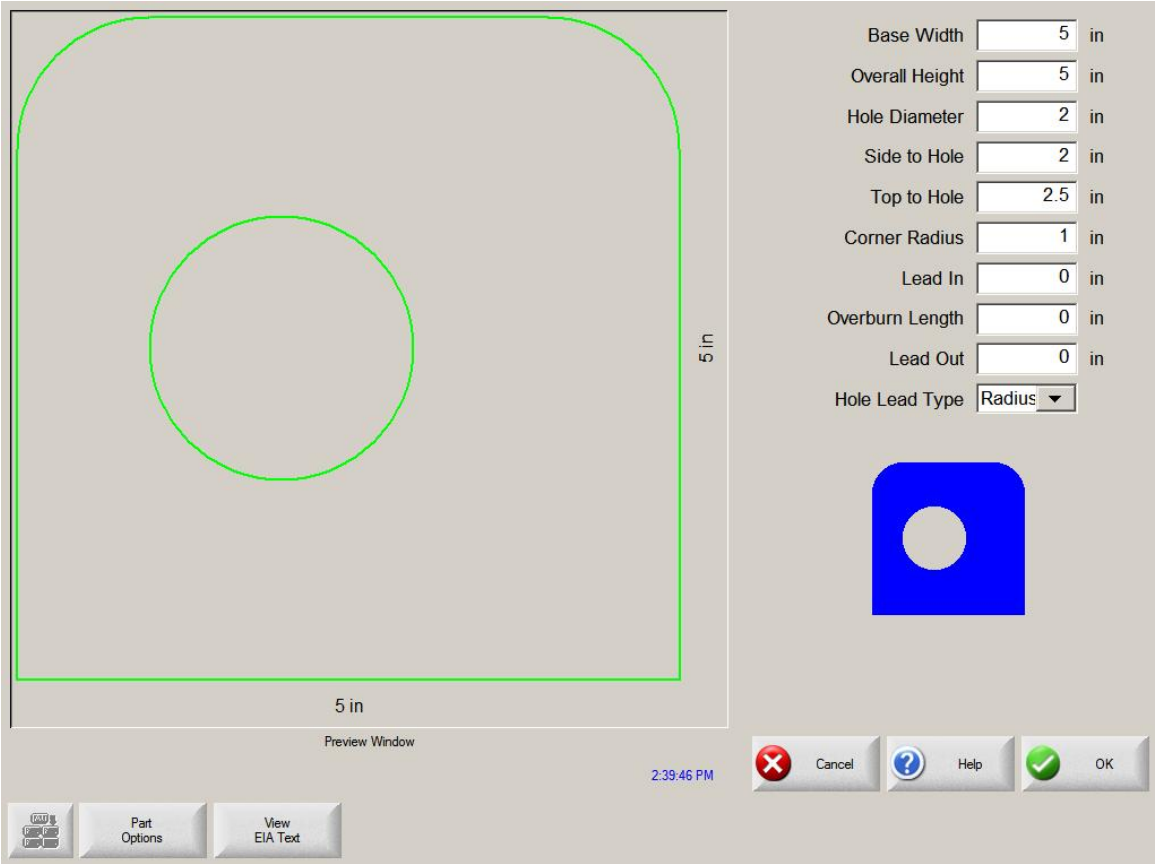
Overburn Length
Parts that contain a circular element user overburn. Overburn specifies the arc length that the torch will travel past the circle closure point. The dimension entered is the chord length of the overburn-arc.

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

Hole Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Rectangle with Circular Hole and Convex Corners



Library Shape Setup

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

Base Width
Enter the width of the base of the part.

Overall Height
Enter the height of the part from the base to the top.

Hole Diameter
Enter the diameter of the hole within the part.

Side to Hole
Enter the distance between the left side of the part and the center of the hole within it.

Top to Hole
Enter the distance between the top of the part and the center of the hole within it.

Corner Radius
Enter the length of the radius of the convex corners.

Lead-In/Lead-Out Length
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.

Overburn Length
Parts that contain a circular element user overburn. Overburn specifies the 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, enter a negative number for the overburn length.

Hole Lead Type
Depending on the shape you select, the style of the lead in/ lead out can 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.

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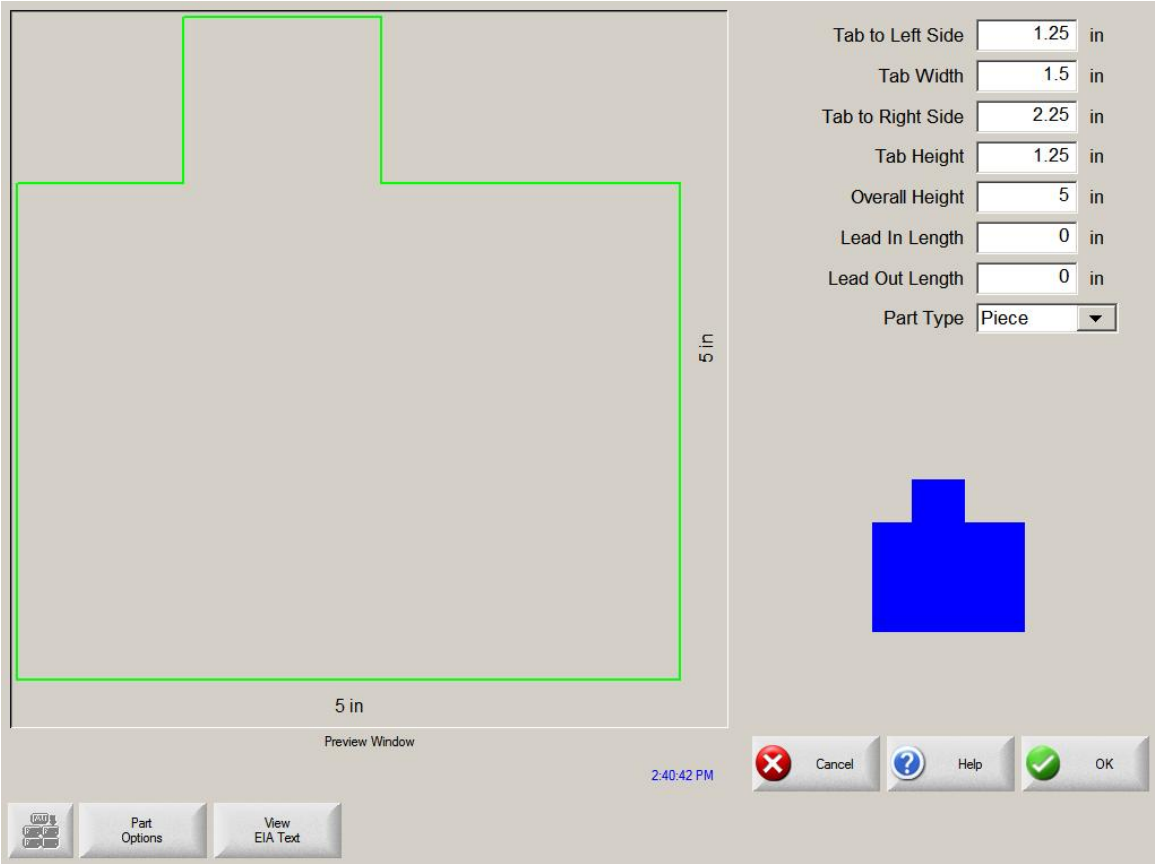
Rectangle with Tab



Library Shape Setup

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

Tab to Left Side
Enter the distance between the left side of the part and the left side of the tab.

Tab Width
Enter the width of the tab.

Tab to Right Side
Enter the distance between the right side of the part and the right side of the tab.

Tab Height
Enter the height of the tab.

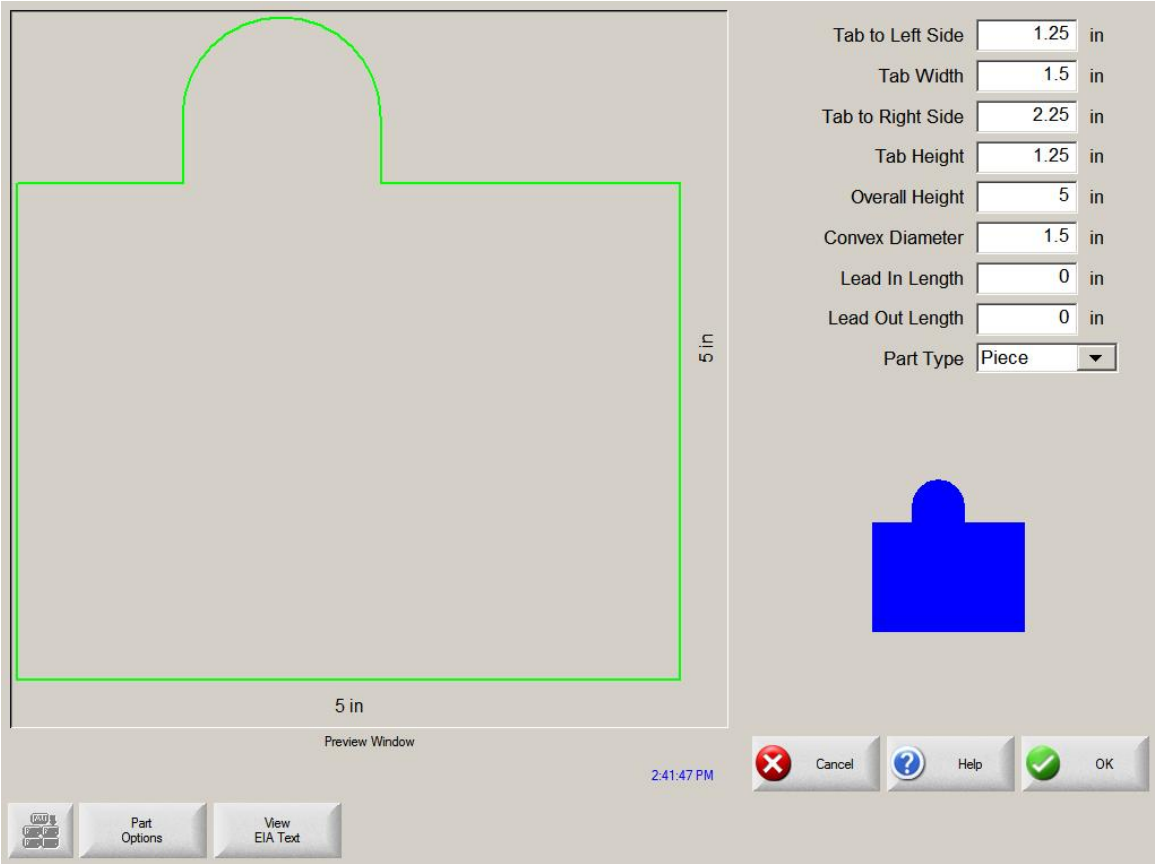
Overall Heigth
Enter the height of the part from the base to the top of the tab.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Rectangle with Convex Tab



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

Tab to Left Side
Enter the distance between the left side of the part and the left side of the tab.

Tab Width
Enter the width of the tab.

Tab to Right Side
Enter the distance between the right side of the part and the right side of the tab.

Tab Height
Enter the height of the tab.

Overall Heigth
Enter the height of the part from the base to the top of the tab.

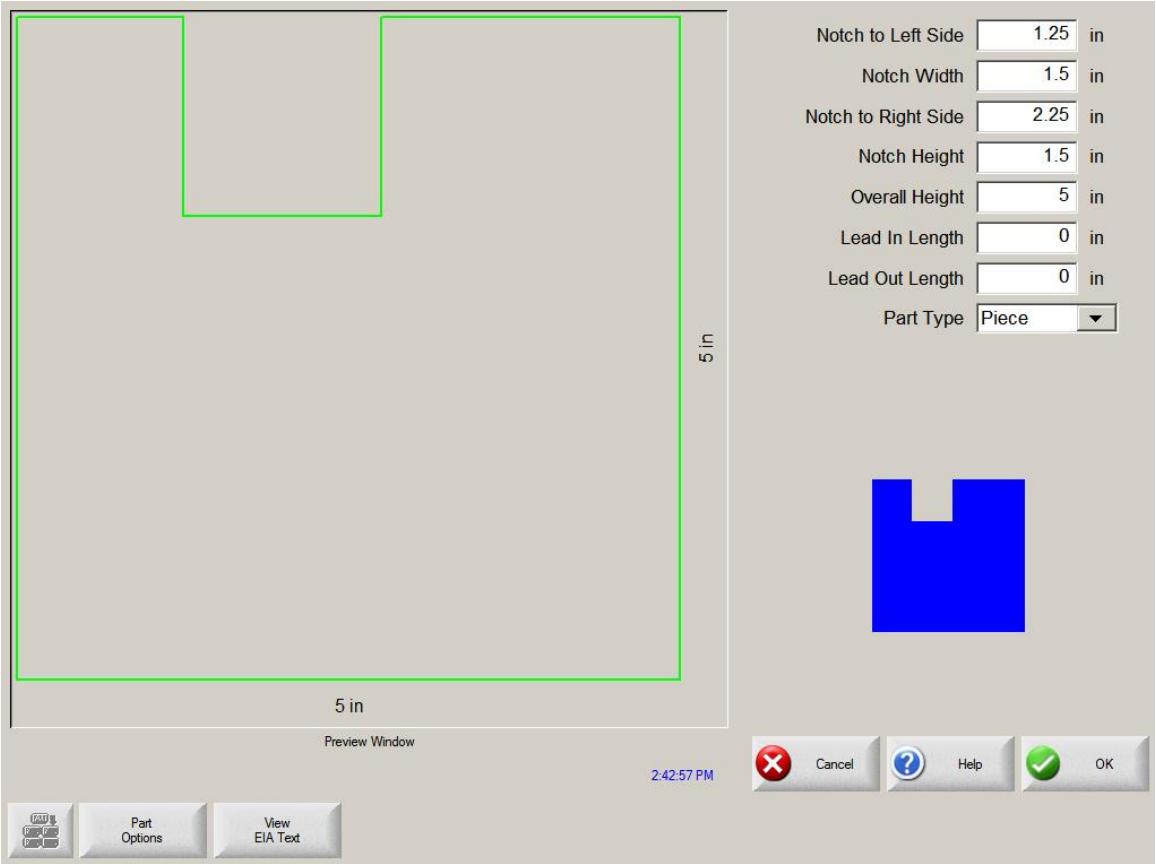
Convex Diameter
Enter the diameter of the convex curve of the tab.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Rectangle with Notch



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

Notch to Left Side
Enter the distance between the left sides of the part and the notch.

Notch Width
Enter the width of the notch.

Notch to Right Side
Enter the distance between the right sides of the notch and the part.

Notch Height
Enter the height of the notch.

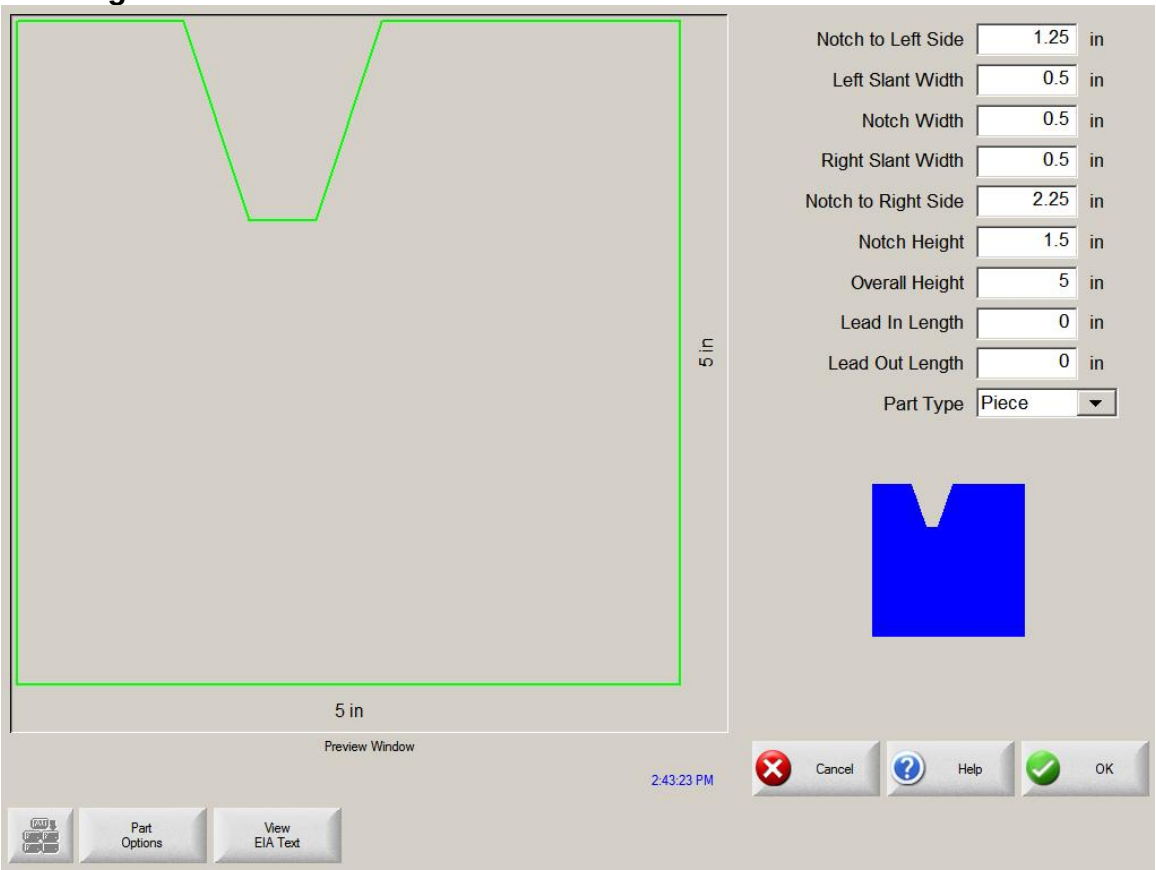
Overall Height
Enter the height of the part from base to top.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Rectangle with Slant Notch



Library Shape Setup

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

Notch to Left Side
Enter the distance between the left sides of the part and the notch.

Left Slant Width
Enter the width of the left slant in the notch.

Notch Width
Enter the width of the notch.

Right Slant Width
Enter the width of the right slant in the notch.

Notch to Right Side
Enter the distance between the right sides of the notch and the part.

Notch Height
Enter the height of the notch.

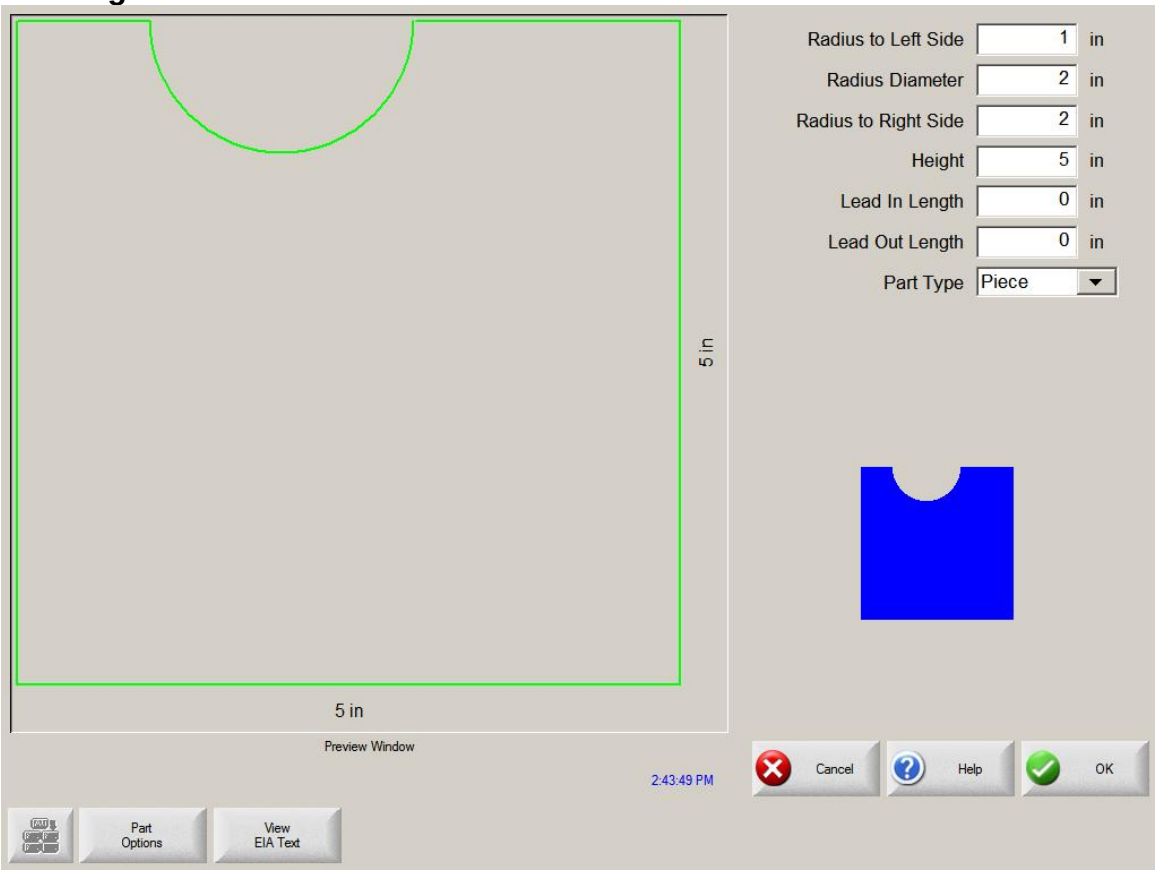
Overall Height
Enter the height of the part from base to top.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Rectangle with Radius Notch



Library Shape Setup

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

Radius to Left Side
Enter the distance between the left sides of the part and the radius.

Radius Diameter
Enter the diameter of the radius.

Radius to Right Side
Enter the distance between the right sides of the part and the radius.

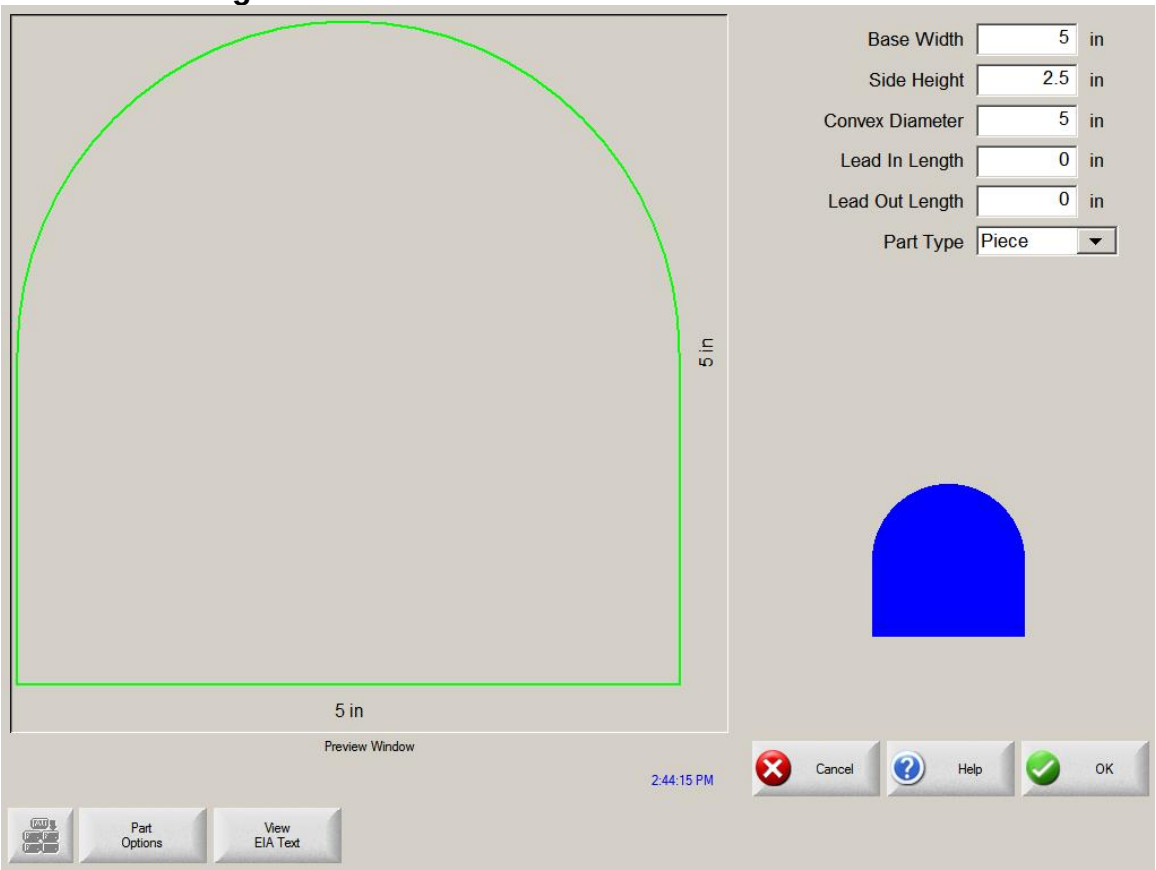
Height
Enter the height of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Convex Rectangle



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

Base Width
Enter the width of the base of the part.

Side Height
Enter the height of the rectangular portion of the part.

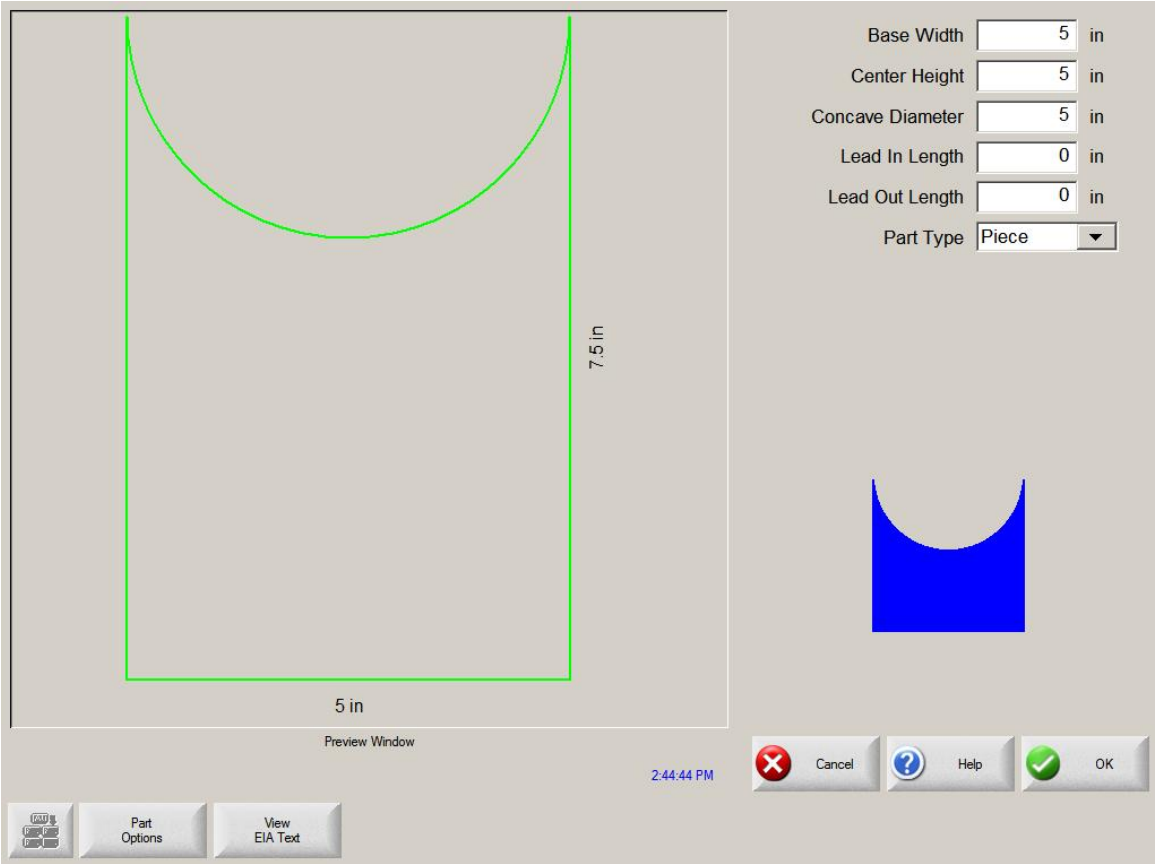
Convex Diameter
Enter the diameter of the convex portion of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Concave Rectangle



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

Base Width
Enter the width of the base of the part.

Center Height
Enter the height of the part between the base and the lowest point of the concave side.

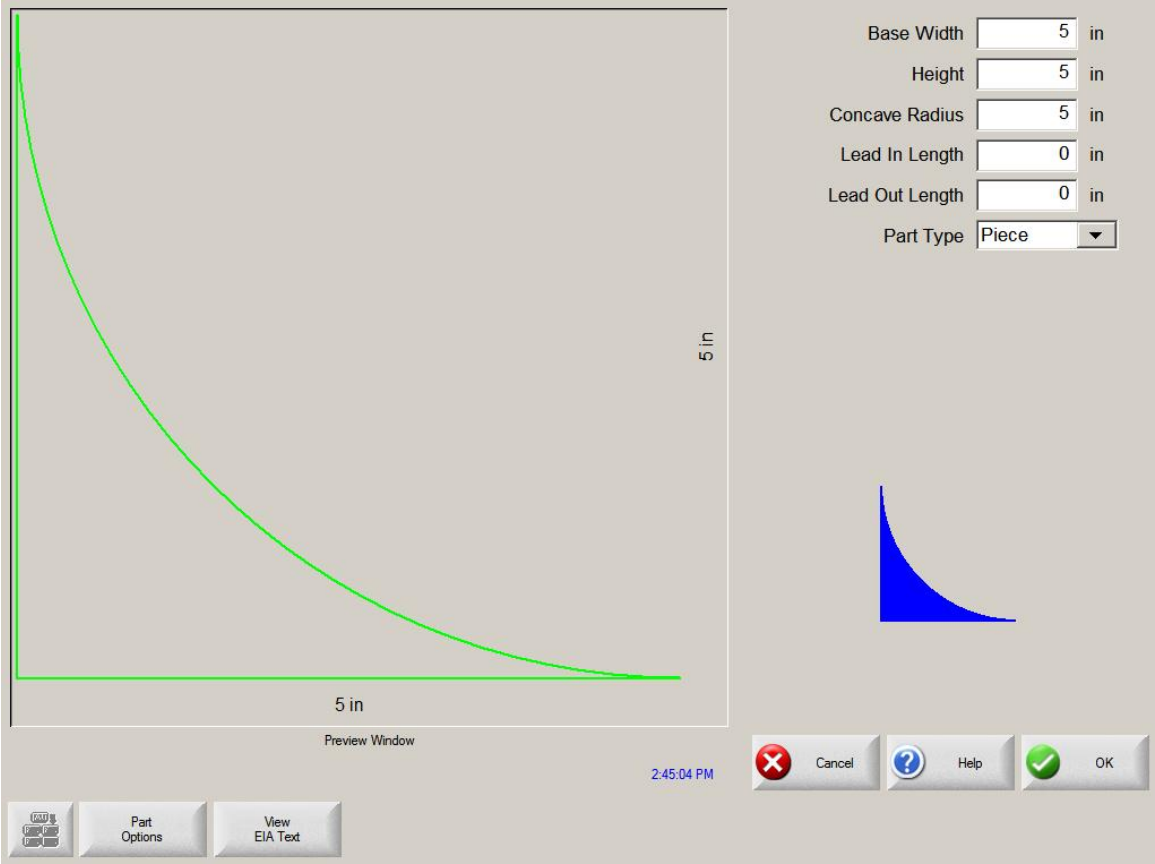
Concave Diameter
Enter the diameter of the concave portion of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Triangle with Concave Side



Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Height
Enter the height of the part.

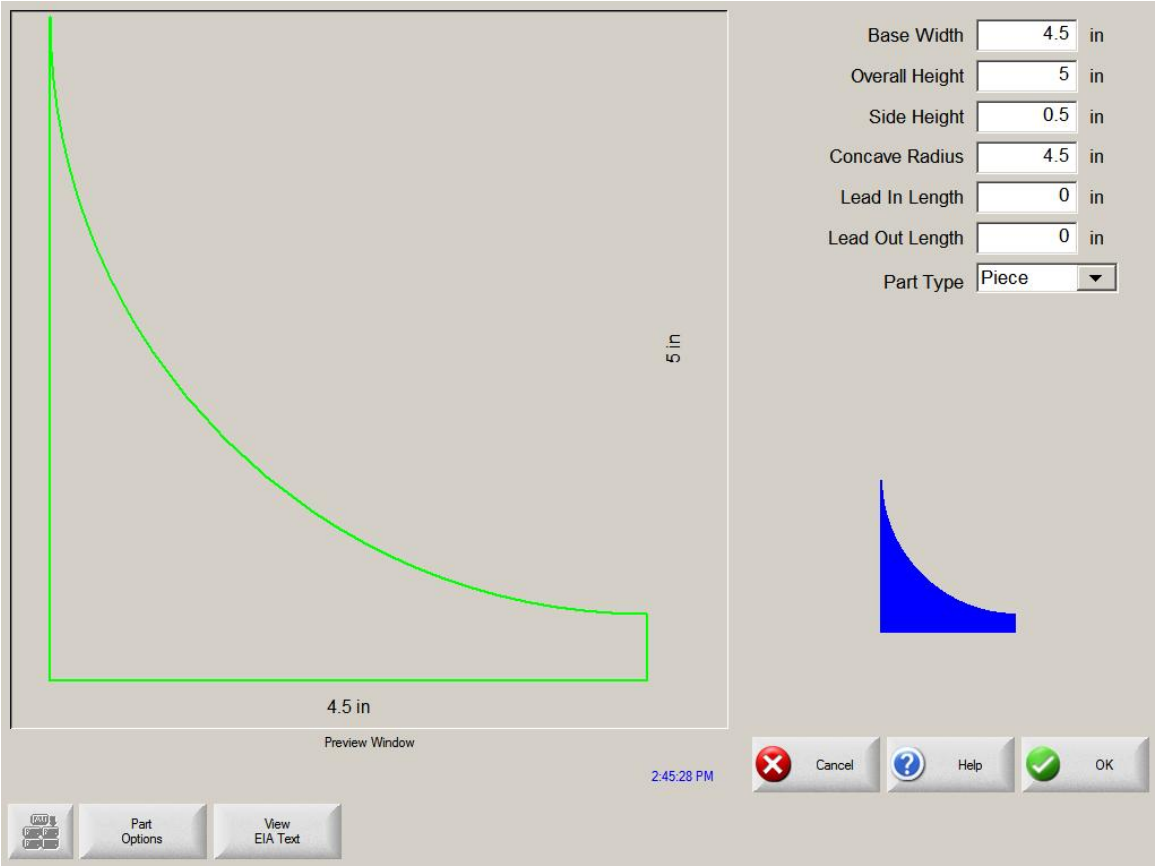
Concave Radius
Enter the length of the radius of the concave portion of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Polygon with Concave Side



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

Base Width
Enter the width of the base of the part.

Overall Height
Enter the height of the part from the base to the top.

Side Height
Enter the height of the right side of the part.

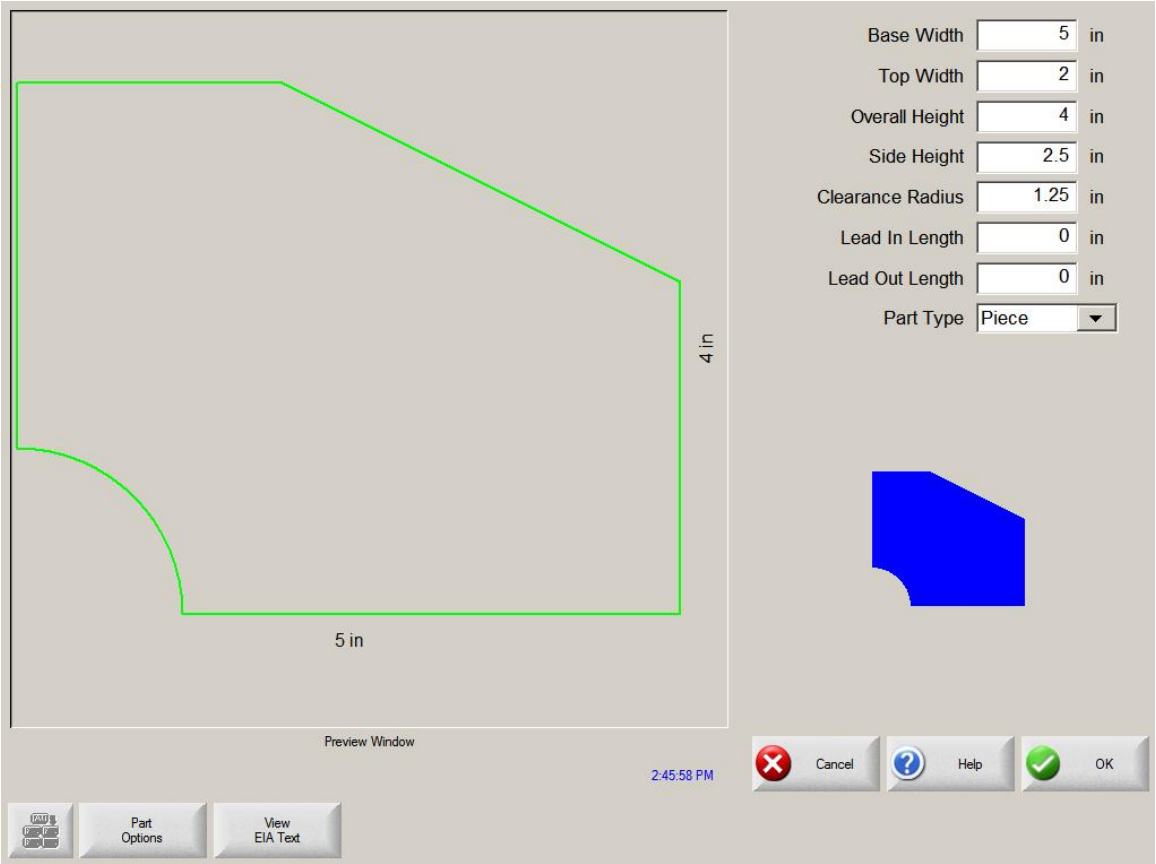
Concave Radius
Enter the radius of the concave portion of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Slant Rectangle with Radius



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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Top Width
Enter the width of the top of the part.

Overall Height
Enter the height of the part from the base to the top.

Side Height
Enter the height of the right side of the part. The height of the side must be less than the overall height of the part.

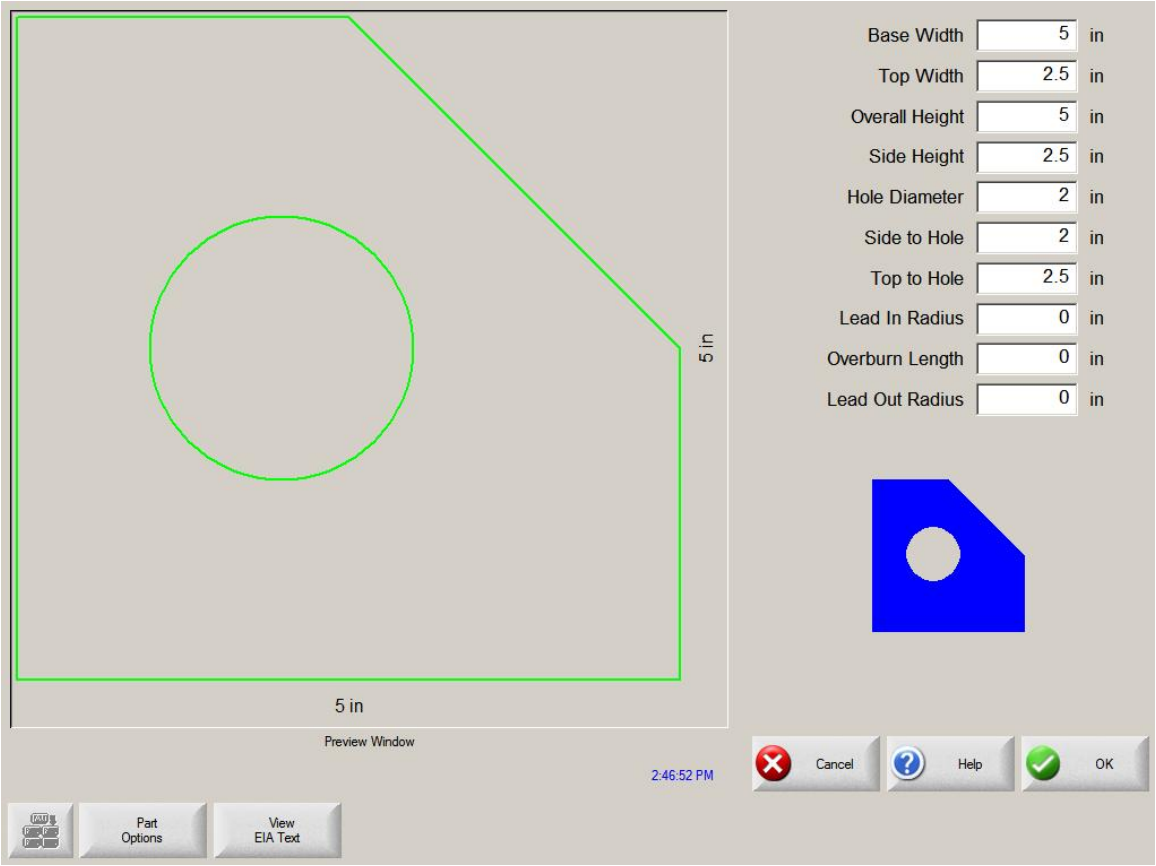
Clearance Radius
Enter the length of the radius of the clearance curve.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Slant Rectangle with Circular Hole



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

Base Width
Enter the width of the base of the part.

Top Width
Enter the width of the top of the part.

Overall Height
Enter the height of the part from the base to the top.

Side Height
Enter the height of the right side of the part. The height of the side must be less than the overall height of the part.

Hole Diameter
Enter the diameter of the hole within the part.

Side to Hole
Enter the distance from the left side of the part to the center of the circle within it.

Top to Hole
Enter the distance from the top of the part to the center of the circle within it.

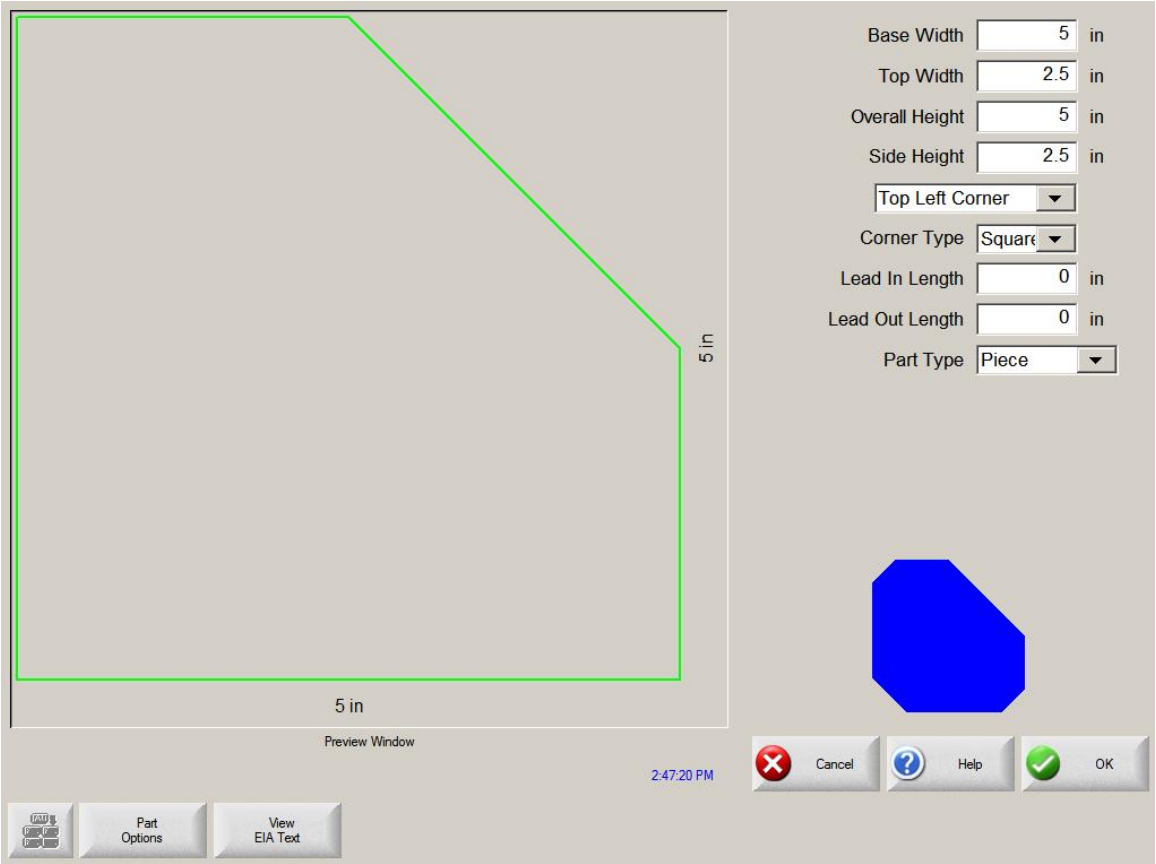
Lead In Radius
Enter the radius of the lead-in arc.

Overburn Length
Parts that contain a circular element user overburn. Overburn specifies the 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, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Slant Rectangle with Beveled Corners



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

Base Width
Enter the width of the base of the part.

Top Width
Enter the width of the top of the part.

Overall Height
Enter the height of the part from the base to the top.

Side Height
Enter the height of the right side of the part. The height of this side must be less than the height of the left side.

Corner Selection
Use the dropdown list to select a corner of the part. Use the remaining fields to specify the style of that corner. Repeat your selections for up to three corners.

Corner Type
Use the dropdown list to select a square or bevel corner.

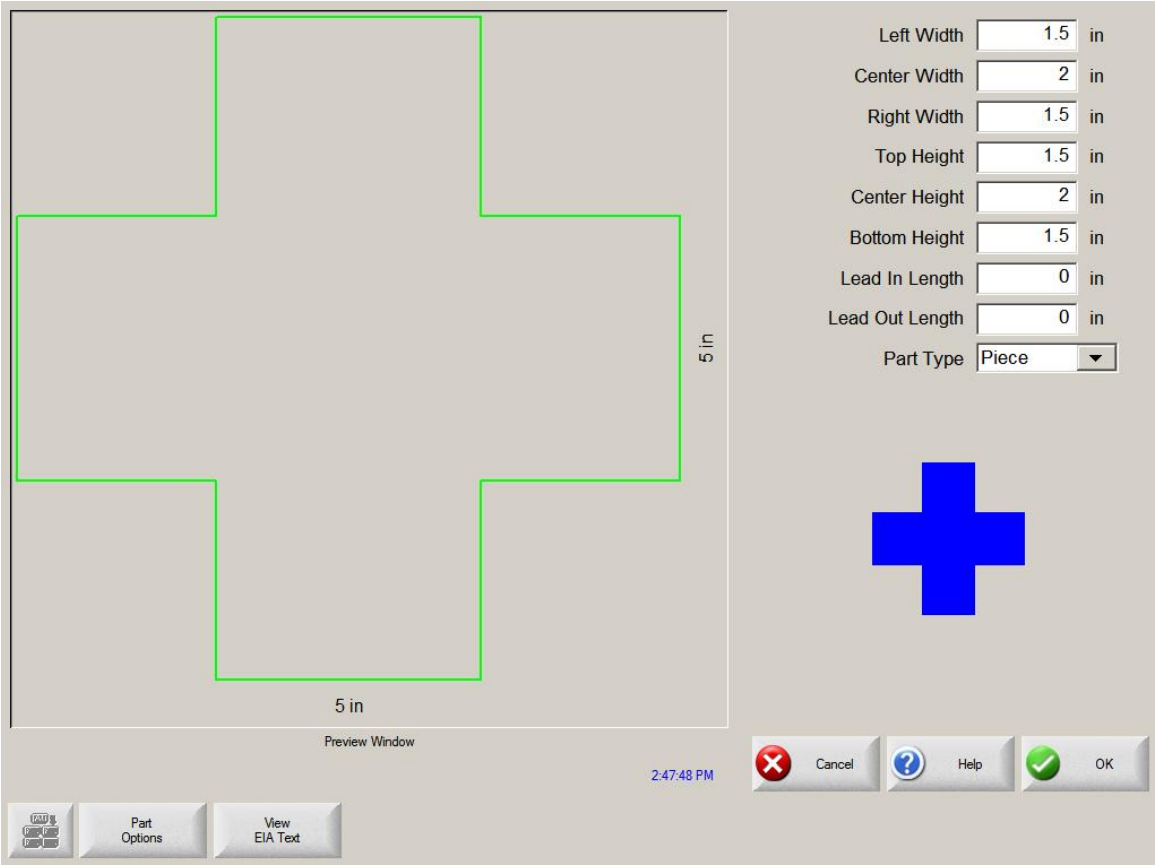
If you select a bevel corner, use the Corner Width and Corner Height fields to enter the dimensions of the bevel.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Cross



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

Left Width
Enter the width of the left side of the part.

Center Width
Enter the width of the center of the part.

Right Width
Enter the width of the right side of the part.

Top Height
Enter the height of the top of the part.

Center Height
Enter the height of the central portion of the part.

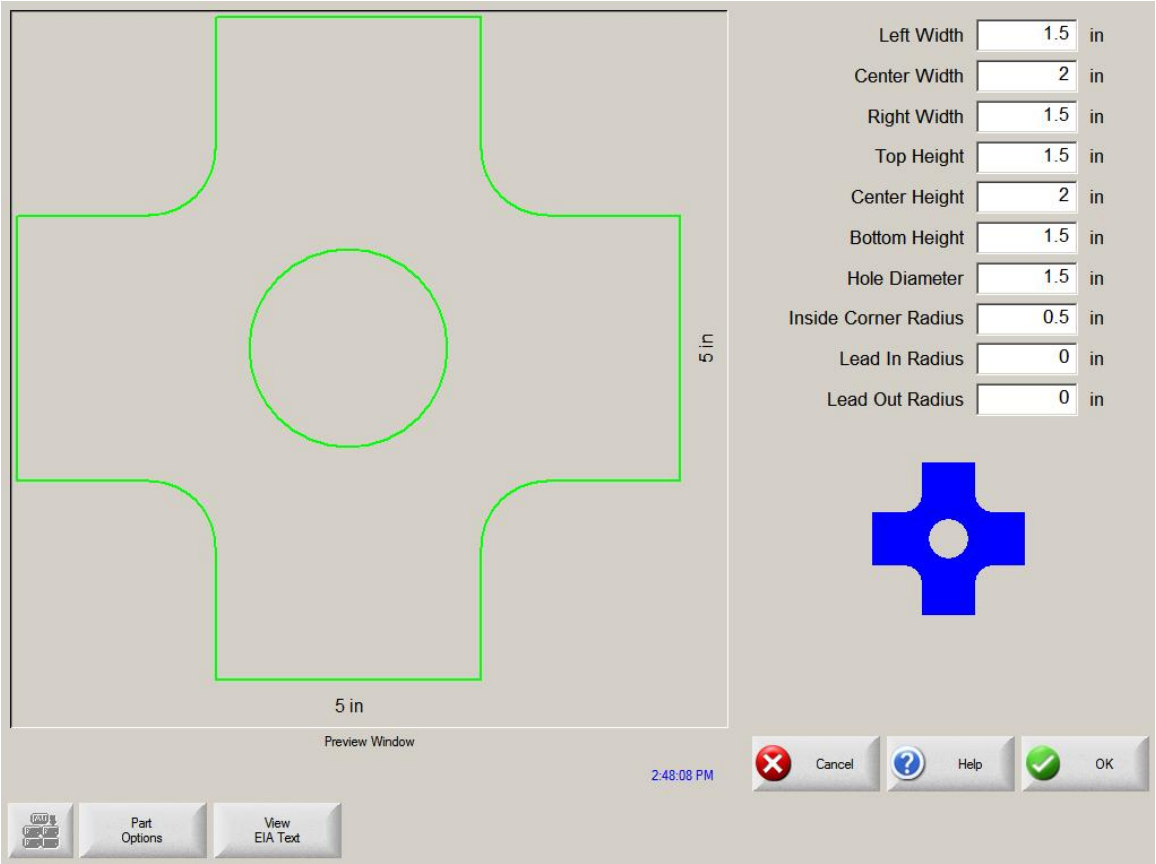
Bottom Height
Enter the height of the bottom portion of the part

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Cross with Circular Hole and Concave Inside Corners



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

Left Width
Enter the width of the left side of the part.

Center Width
Enter the width of the center of the part.

Right Width
Enter the width of the right side of the part.

Top Height
Enter the height of the top of the part.

Center Height
Enter the height of the central portion of the part.

Bottom Height
Enter the height of the bottom portion of the part

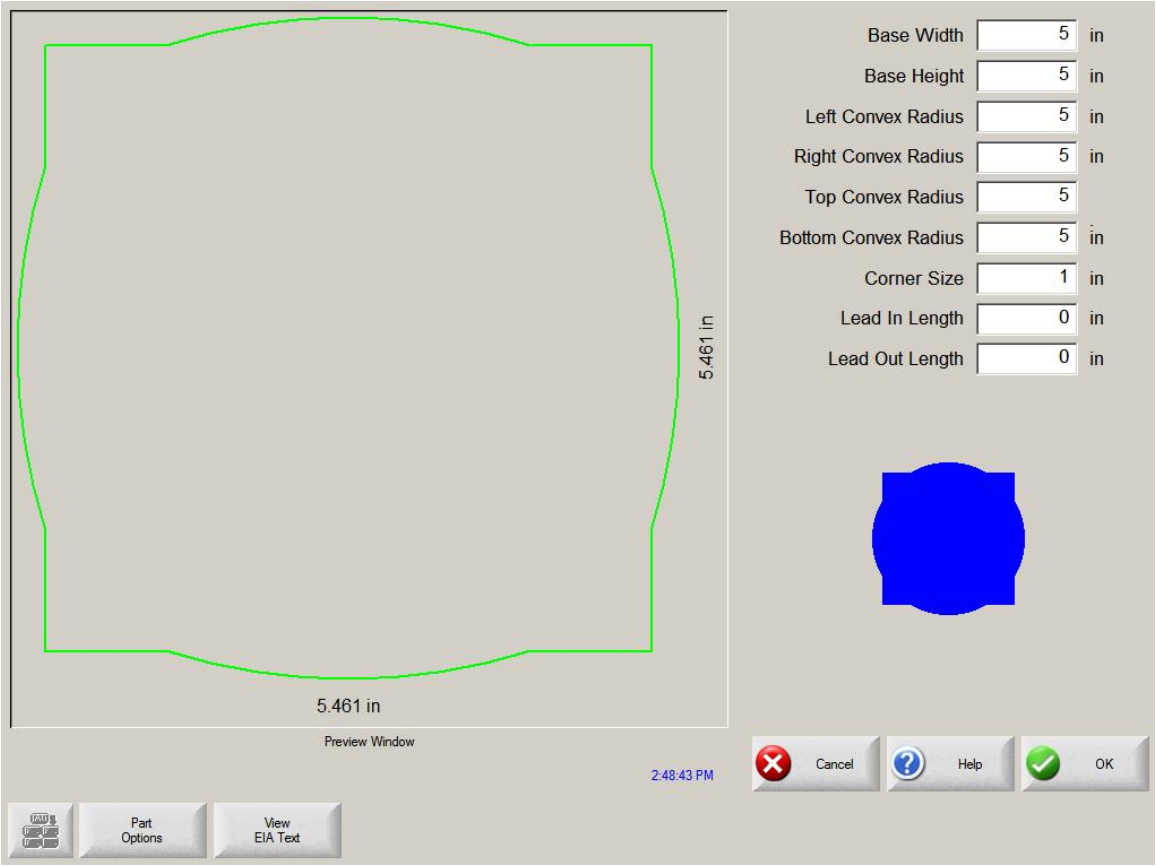
Hole Diameter
Enter the length of the diameter of the hole within the part.

Inside Corner Radius
Enter the length of the radius of the curve on the inside of the corner.

Lead In Radius
Enter the radius of the lead-in arc.

Lead Out Radius
Enter the radius of the lead-out arc.

4 Sided Convex Rectangle



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

Base Width
Enter the width of the rectangular base of the part.

Base Height
Enter the height of the rectangular portion of the part.

Left Convex Radius
Enter the length of the radius of the left convex side of the part.

Right Convex Radius
Enter the length of the radius of the right convex side of the part.

Top Convex Radius
Enter the length of the radius of the top convex side of the part.

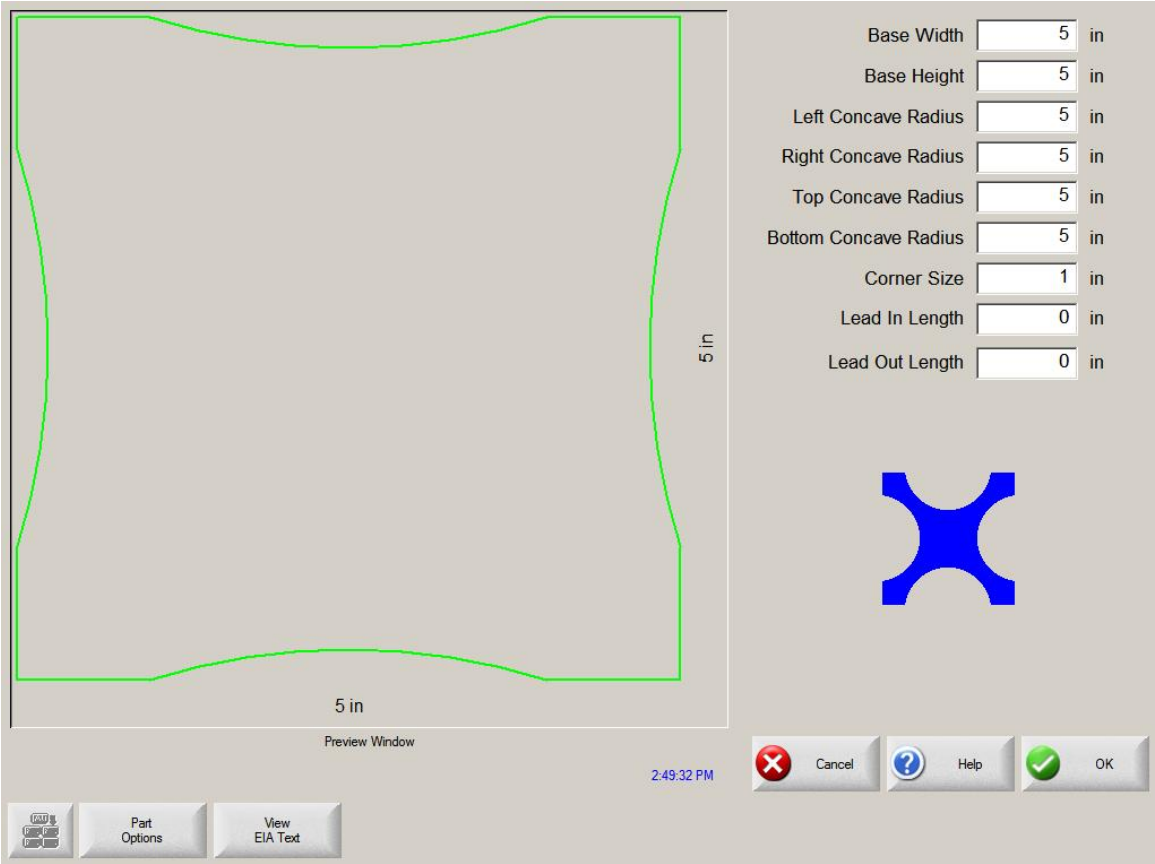
Bottom Convex Radius
Enter the length of the radius of the right convex side of the part.

Corner Size
Enter the length and height of the corners of the part.

Lead-In/Lead-Out Length
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.

4 Sided Concave Rectangle



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

Base Width
Enter the width of the base of the part.

Base Height
Enter the height of the part from the base to the top.

Left Concave Radius
Enter the length of the radius of the left concave side of the part.

Right Concave Radius
Enter the length of the radius of the right concave side of the part.

Top Concave Radius
Enter the length of the radius of the top concave side of the part.

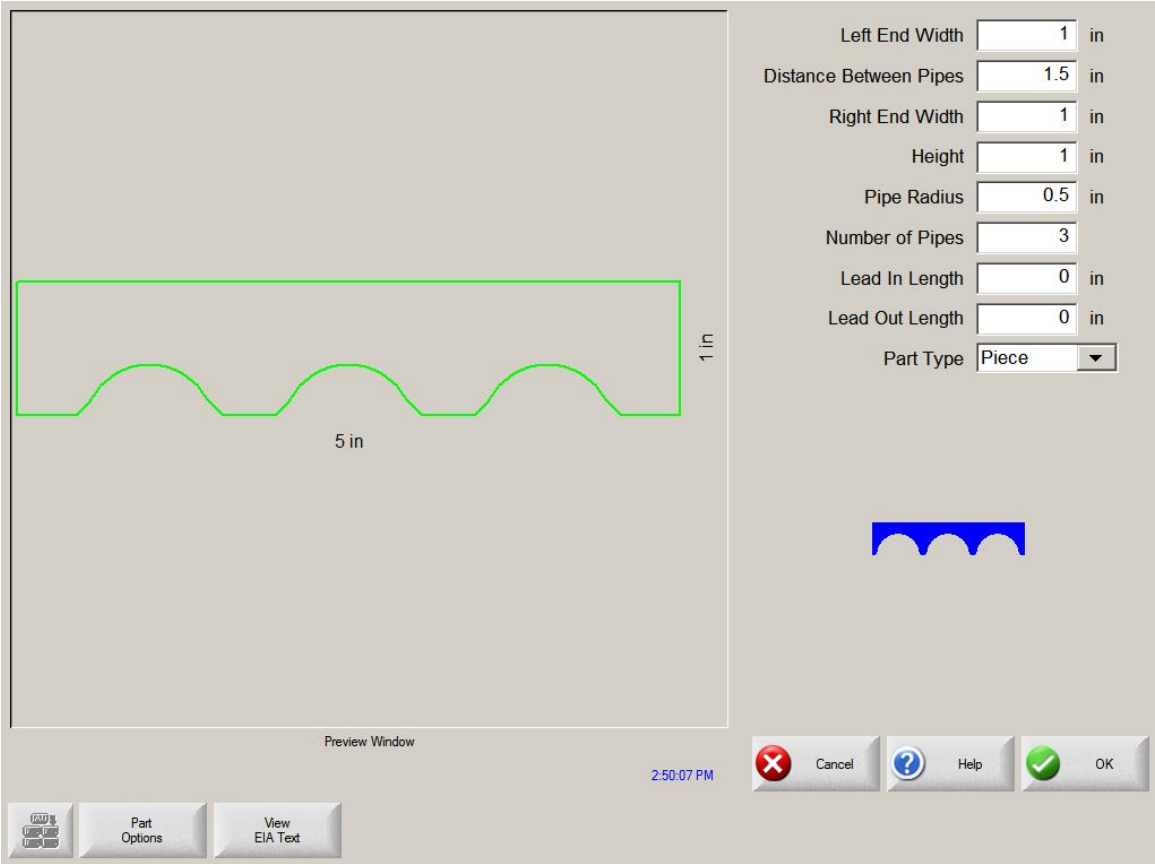
Bottom Concave Radius
Enter the length of the radius of the bottom concave side of the part.

Corner Size
Enter the length and height of the corners of the part.

Lead-In/Lead-Out Length
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.

Pipe Mount



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

Left End Width
Enter the distance between the left side and the center of the left pipe.

Distance Between Pipes
Enter the distance between the center of the pipes.

Right End Width
Enter the distance between the right side and the center of the right pipe.

Height
Enter the height of the part.

Pipe Radius
Enter the radius (measured vertically) of the pipes.

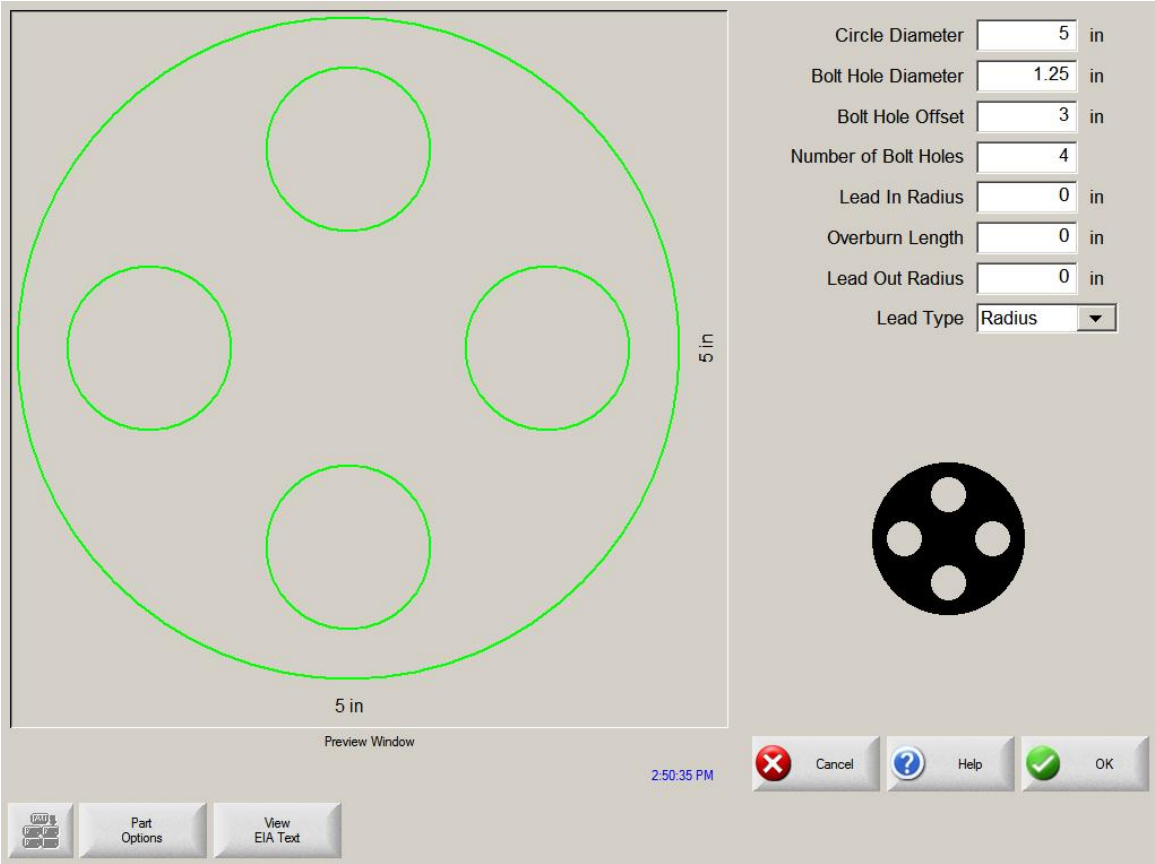
Number of Pipes
Enter the number of pipes in the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Bolt Hole Circle



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

Circle Diameter
Enter the length of the diameter of the part.

Bolt Hole Diameter
Enter the length of the diameter of the bolt holes.

Bolt Hole Offset
Enter the distance between the centers of the bolt holes .

Number of Bolt Holes
Enter the number of bolt holes within the part.

Lead In Radius
Enter the radius of the lead-in arc.

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

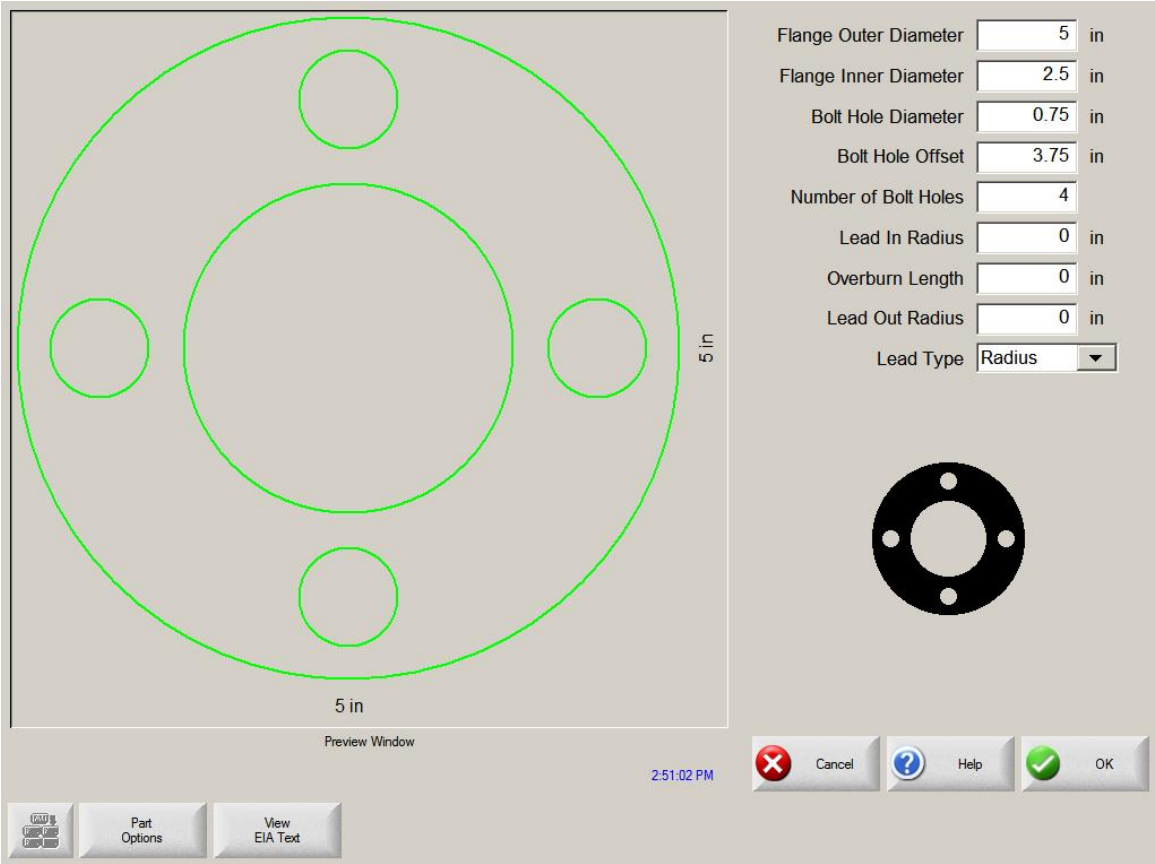
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Bolt Hole Flange



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

Flange Outer Diameter
Enter the length of the diameter of the outer edge of the part.

Flange Inner Diameter
Enter the length of the diameter of the circle at the center of the part.

Bolt Hole Diameter
Enter the length of the diameter of the bolt holes.

Bolt Hole Offset
Enter the distance between the centers of the bolt holes .

Number of Bolt Holes
Enter the number of bolt holes within the part.

Lead In Radius
Enter the radius of the lead-in arc.

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

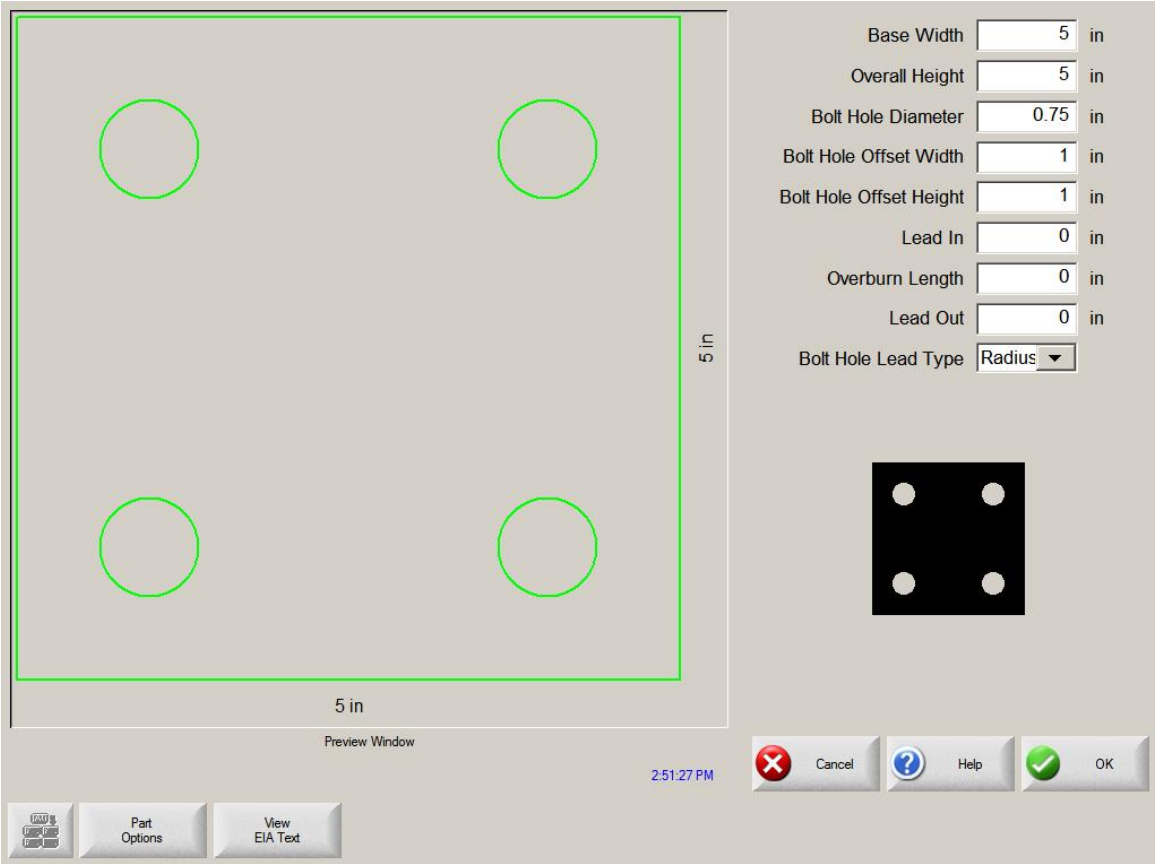
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Bolt Hole Rectangle



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

Base Width
Enter the width of the base of the part.

Overall Height
Enter the height of the part from the base to the top.

Bolt Hole Diameter
Enter the length of the diameter of the bolt holes.

Bolt Hole Offset Width
Enter the distance between the center of the bolt holes and the side of the part.

Bolt Hole Offset Height
Enter the distance between the center of the bolt holes and the top or bottom of the part.

Lead In

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

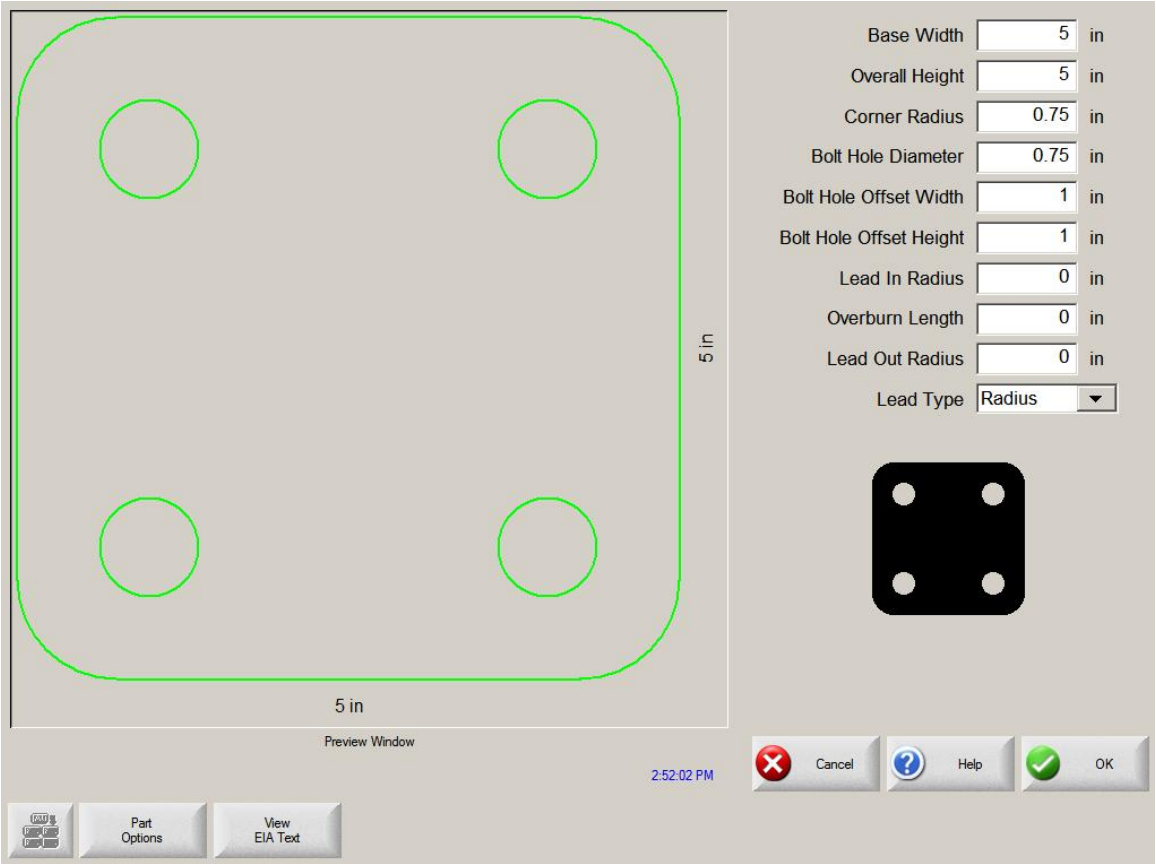
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out

Bolt Hole Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Bolt Hole Rectangle with Convex Corners



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

Base Width
Enter the width of the base of the part.

Overall Hieght
Enter the height of the part from the base to the top.

Corner Radius
Enter the length of the radius of the convex corners.

Bolt Hole Diameter
Enter the length of the diameter of the bolt holes.

Bolt Hole Offset Width
Enter the distance between the center of the bolt holes and the side of the part.

Bolt Hole Offset Height
Enter the distance between the center of the bolt holes and the top or bottom of the part.

Lead In Radius
Enter the radius of the lead-in arc.

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

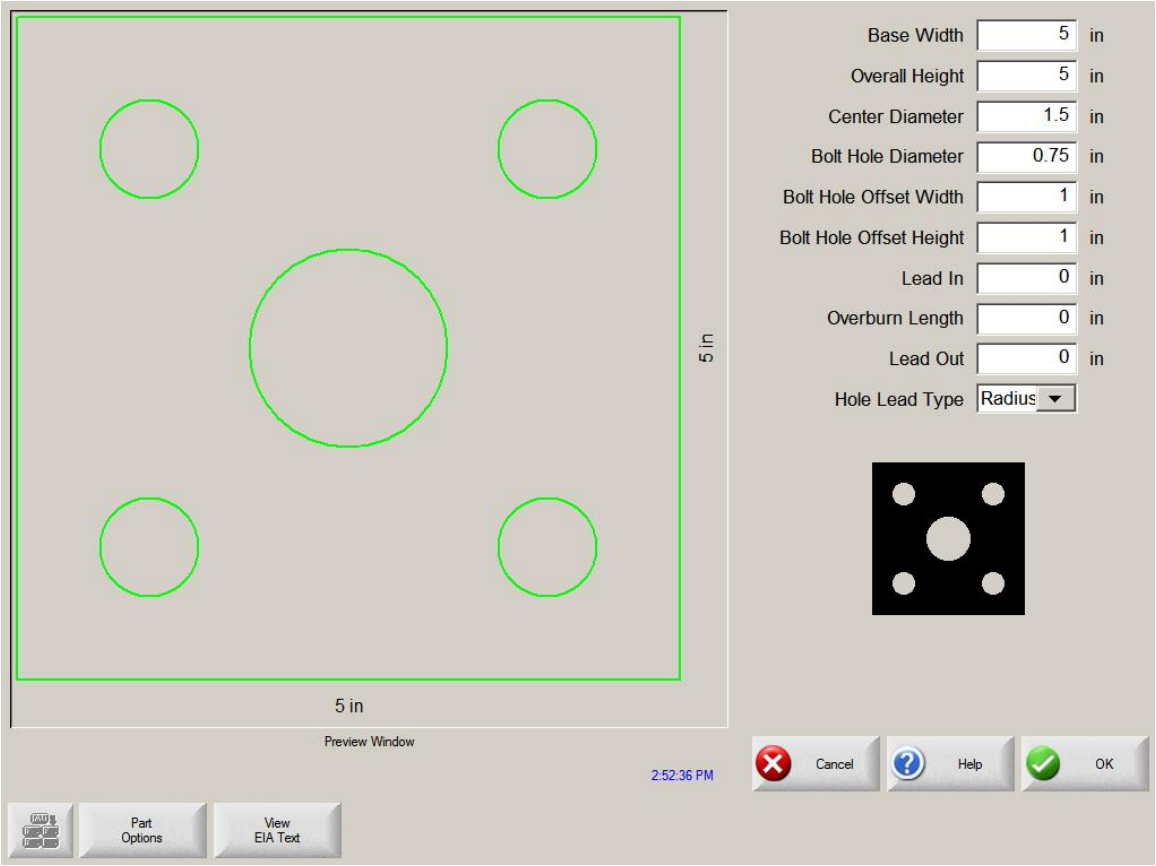
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Bolt Hole Rectangle with Center Hole



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

Base Width
Enter the width of the base of the part.

Overall Height
Enter the height of the part from the base to the top.

Center Diameter
Enter the length of the diameter of the central hole.

Bolt Hole Diameter
Enter the length of the diameter of the bolt holes.

Bolt Hole Offset Width
Enter the distance between the center of the bolt holes and the side of the part.

Bolt Hole Offset Height
Enter the distance between the center of the bolt holes and the top or bottom of the part.

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.

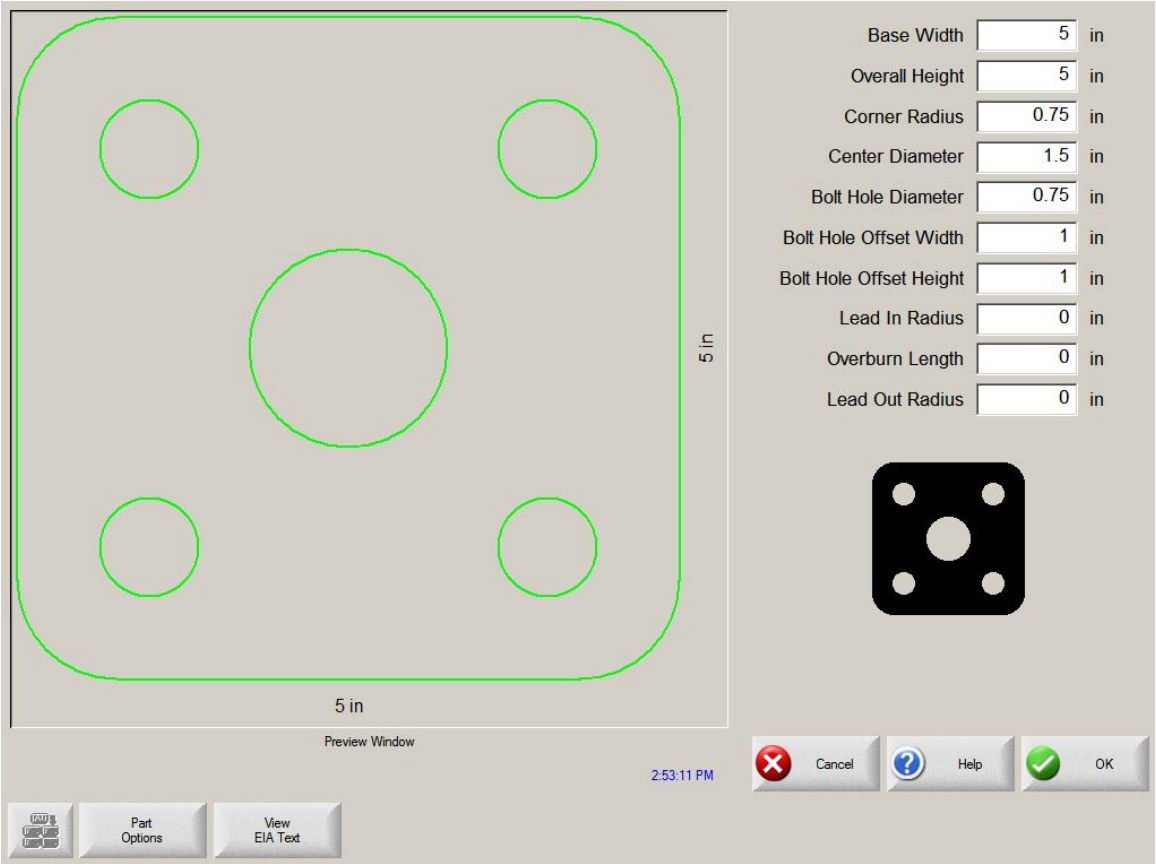
Overburn Length
Parts that contain a circular element user overburn. Overburn specifies the arc length that the torch will travel past the circle closure point. The dimension entered is the chord length of the overburn-arc.

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

Hole Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Bolt Hole Rectangle with Center Hole and Convex Corners



Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

While you are entering parameters, the control is performing some general checks for proper geometries. If the control finds a set of parameters that conflict, a warning message is displayed and the parameters in conflict are highlighted in red.

Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Overall Height
Enter the height of the part from the base to the top.

Corner Radius
Enter the radius of the convex corners.

Center Diameter
Enter the diameter of the central hole.

Bolt Hole Diameter
Enter the diameter of the bolt holes.

Bolt Hole Offset Width
Enter the distance between the center of the bolt holes and the side of the part.

Bolt Hole Offset Height
Enter the distance between the center of the bolt holes and the top or bottom of the part.

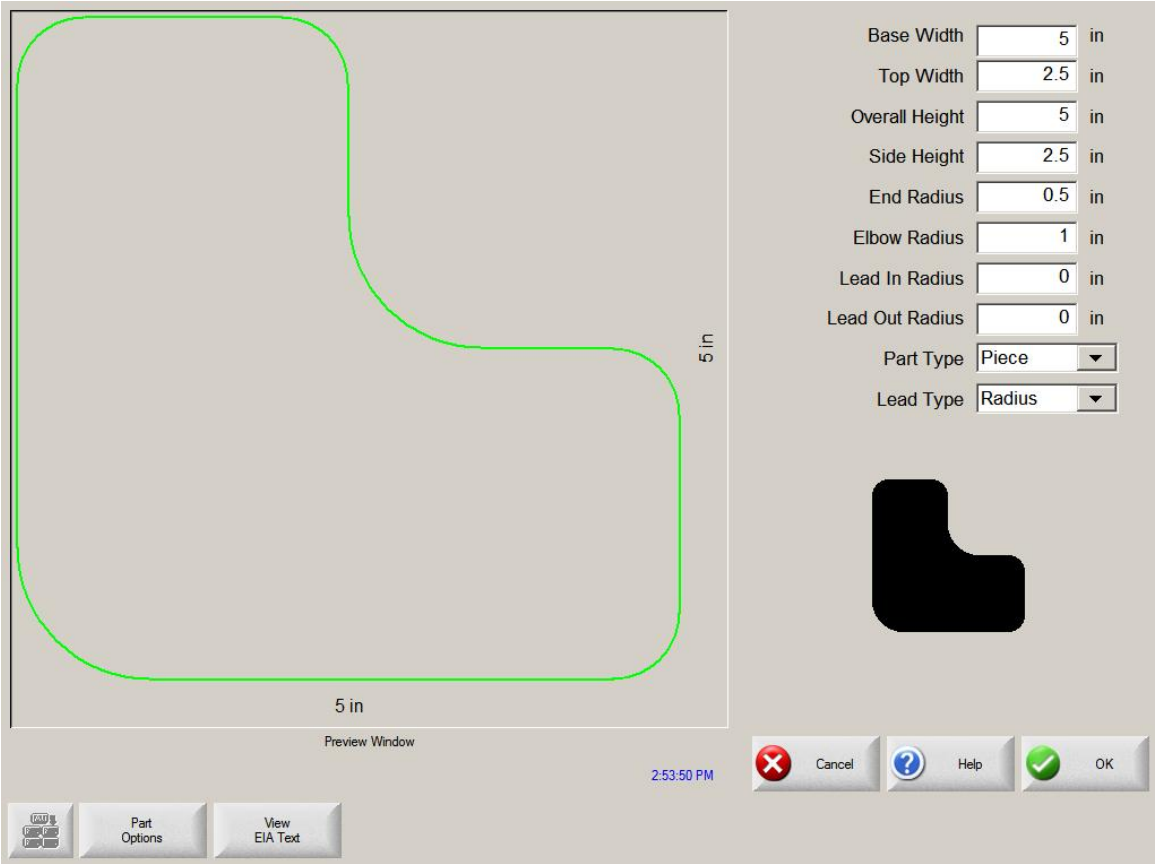
Lead In Radius
Enter the radius of the lead-in arc.

Overburn Length
Parts that contain a circular element user overburn. Overburn specifies the 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, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Rounded L-Bracket



Library Shape Setup

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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Top Width
Enter the width of the top of the part.

Overall Height
Enter the height of the part from the base to the top.

Side Height
Enter the height of the right side.

End Radius
Enter the length of the radius of the curve at the corners of the part.

Elbow Radius
Enter the length of the radius of the curve at the elbow of the part.

Lead In Radius
Enter the radius of the lead-in arc.

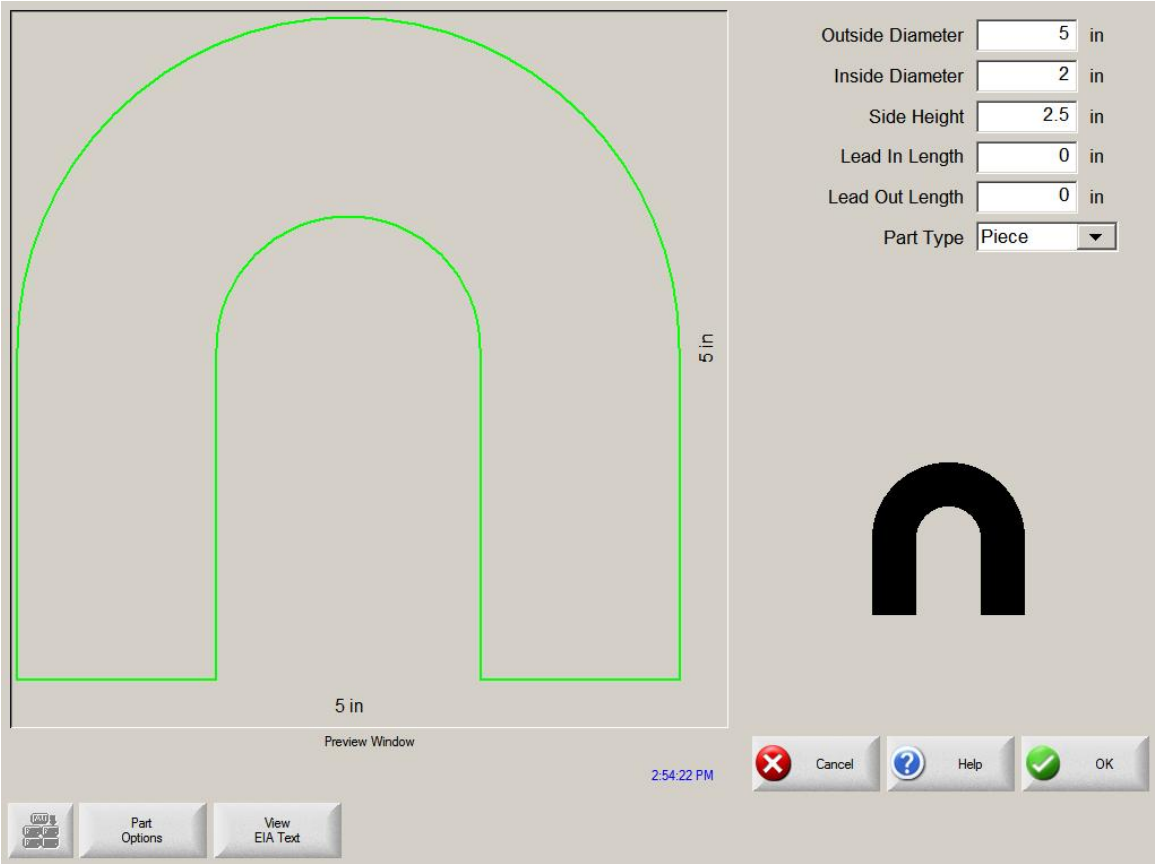
Lead Out Radius
Enter the radius of the lead-out arc.

Part Type
Indicate 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 you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Horseshoe



Library Shape Setup

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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Outside Diameter
Enter the diameter of the outside curved portion of the part.

Inside Diameter
Enter the diameter of the inside curved portion of the part.

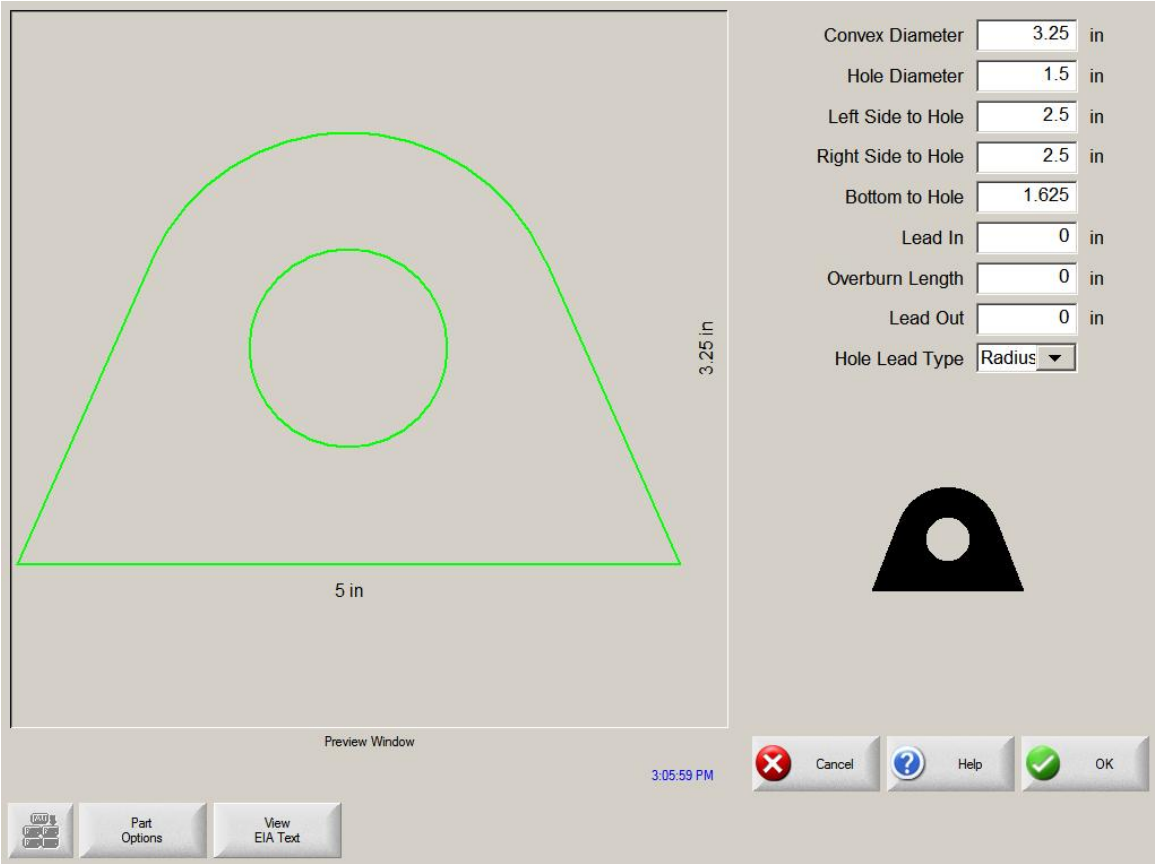
Side Height
Enter the height of the straight sides of the part.

Lead-In/Lead-Out Length
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.

Part Type
Indicate 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.

Convex Roof Trapezoid with Hole



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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Convex Diameter
Enter the diameter of the convex portion of the part.

Hole Diameter
Enter the diameter of the hole within the part.

Left Side to Hole
Enter the distance between the left corner of the base to the center of the circle.

Right Side to Hole
Enter the distance between the right corner of the base to the center of the circle.

Bottom to Hole
Enter the distance between the base and the center of the circle.

Lead-In/Lead-Out Length
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.

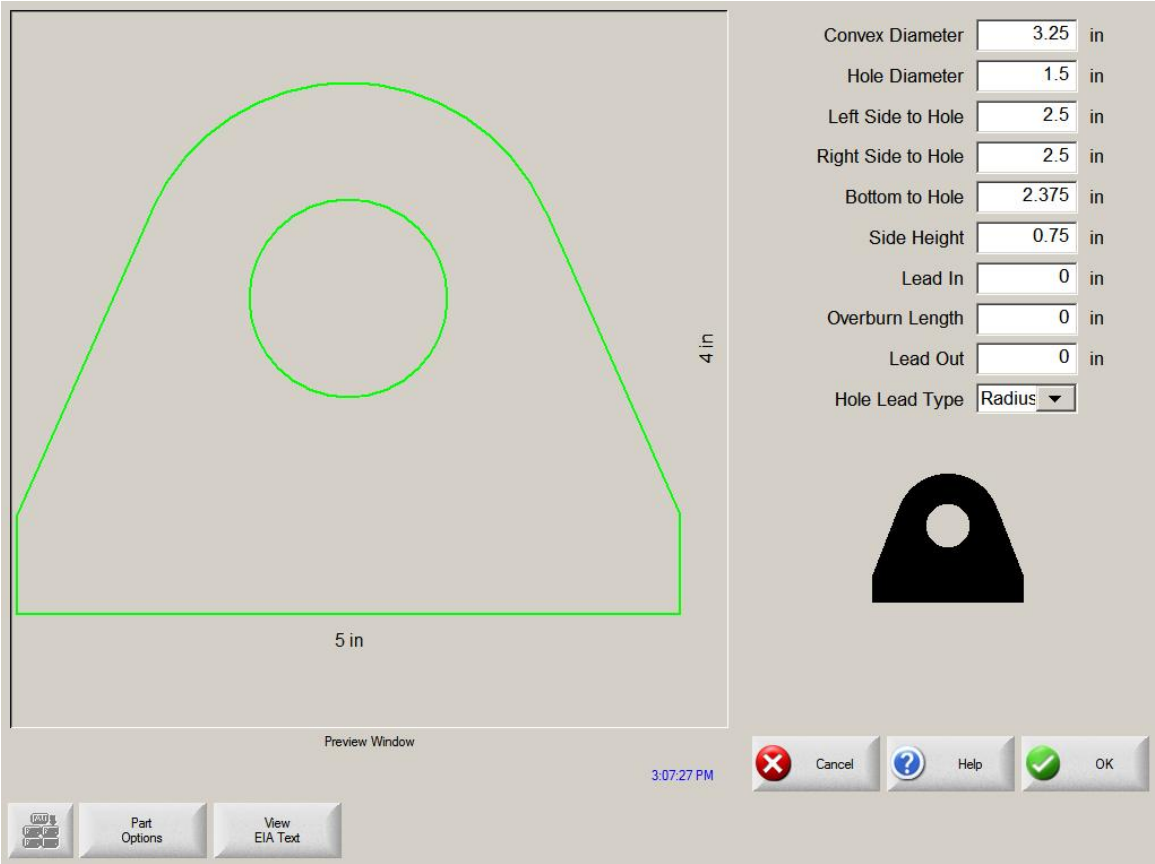
Overburn Length
Parts that contain a circular element user overburn. Overburn specifies the arc length that the torch will travel past the circle closure point. The dimension entered is the chord length of the overburn-arc.

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

Hole Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Convex Roof Polygon with Hole



Library Shape Setup

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

Convex Diameter
Enter the diameter of the convex portion of the part.

Hole Diameter
Enter the diameter of the hole within the part.

Left Side to Hole
Enter the distance between the left corner of the base to the center of the circle.

Right Side to Hole
Enter the distance between the right corner of the base to the center of the circle.

Bottom to Hole
Enter the distance between the base and the center of the circle.

Side Height
Enter the height of the straight sides of the part.

Lead-In/Lead-Out Length
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.

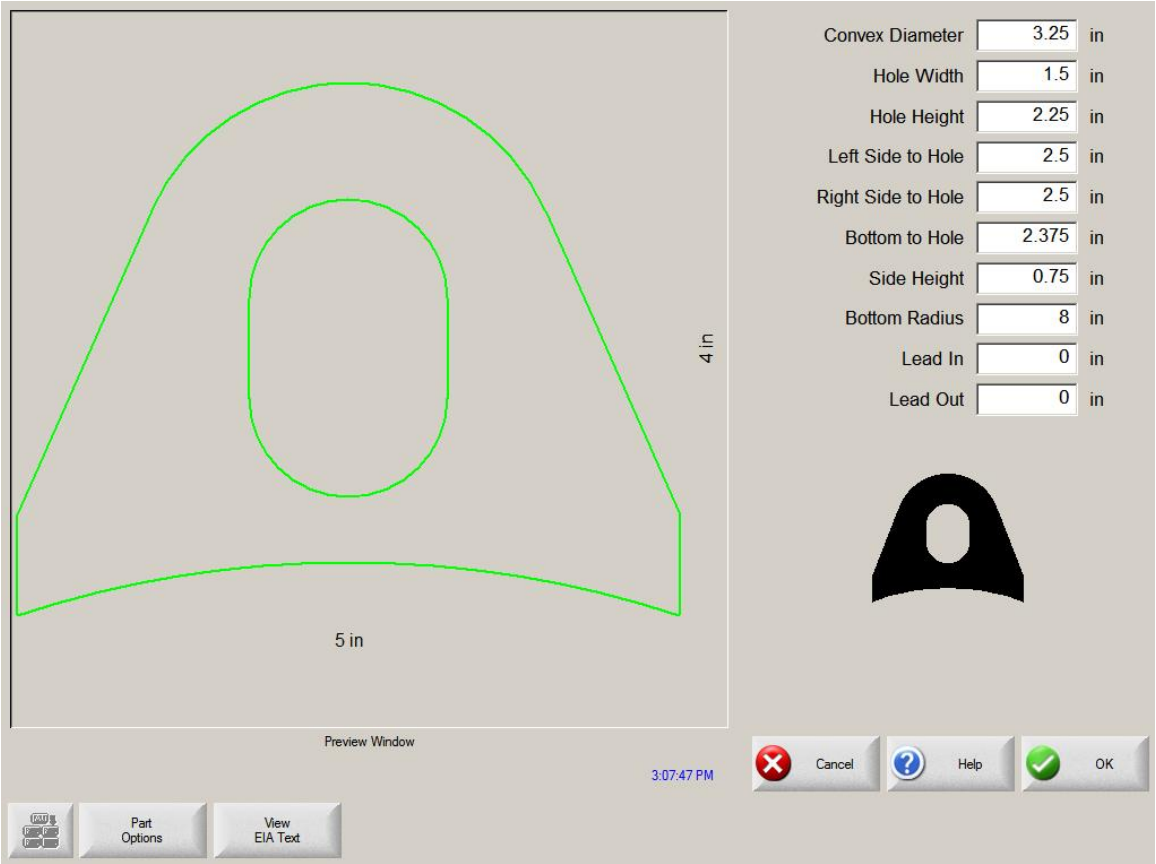
Overburn Length
Parts that contain a circular element user overburn. Overburn specifies the arc length that the torch will travel past the circle closure point. The dimension entered is the chord length of the overburn-arc.

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

Hole Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Convex Roof Polygon with Oval Hole and Concave Bottom



Library Shape Setup

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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Convex Diameter
Enter the diameter of the convex portion of the part.

Hole Width
Enter the width of the hole within the part.

Hole Height
Enter the height of the hole within the part.

Left Side to Hole
Enter the distance between the left corner of the base to the center of the hole.

Right Side to Hole
Enter the distance between the right corner of the base to the center of the hole.

Bottom to Hole
Enter the distance between the base and the center of the hole.

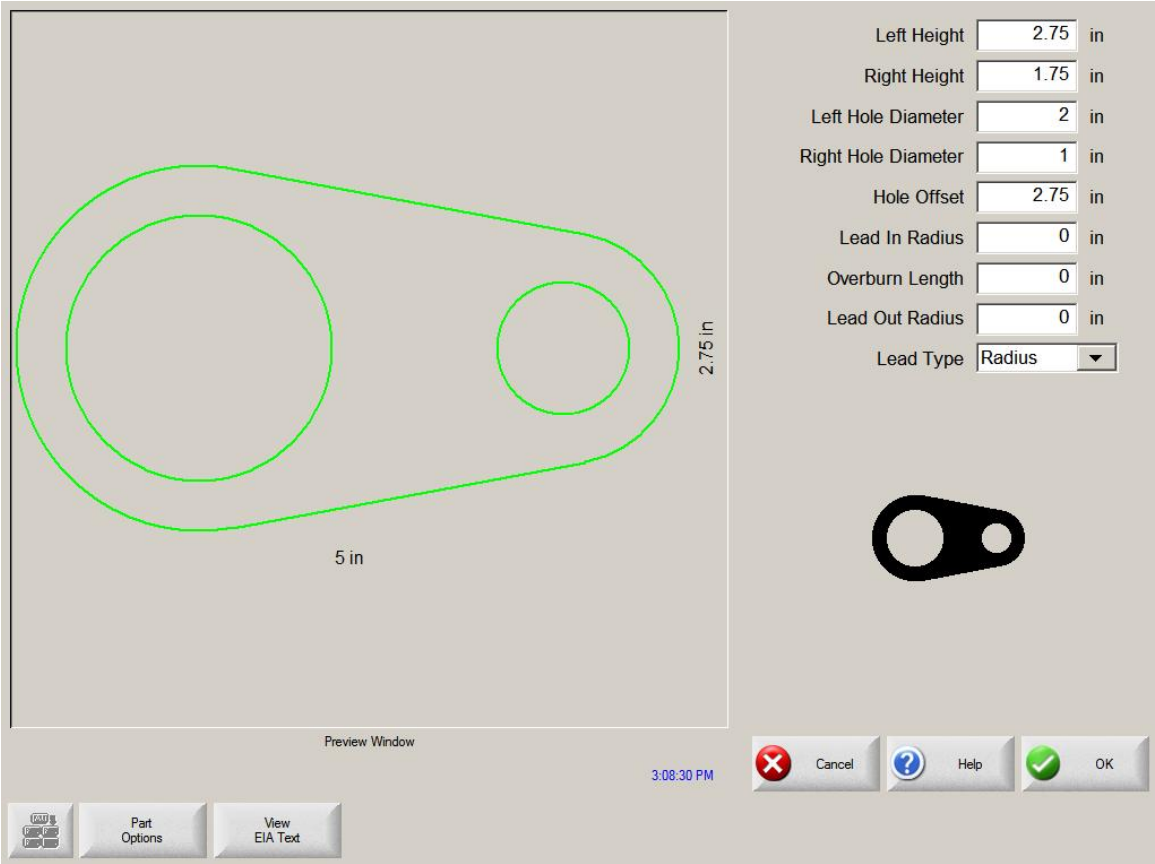
Side Height
Enter the height of the straight sides of the part.

Bottom Radius
Enter the radius of the curve on the bottom of the part.

Lead-In/Lead-Out Length
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.

Pulley Cover



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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Left Height
Enter the diameter of the outside, left edge.

Right Height
Enter the diameter of the outside, right edge.

Left Hole Diameter
Enter the diameter of the left hole within the part.

Right Hole Diameter
Enter the diameter of the right hole within the part.

Hole Offset
Enter the distance between the centers of the two holes.

Lead In Radius
Enter the radius of the lead-in arc.

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

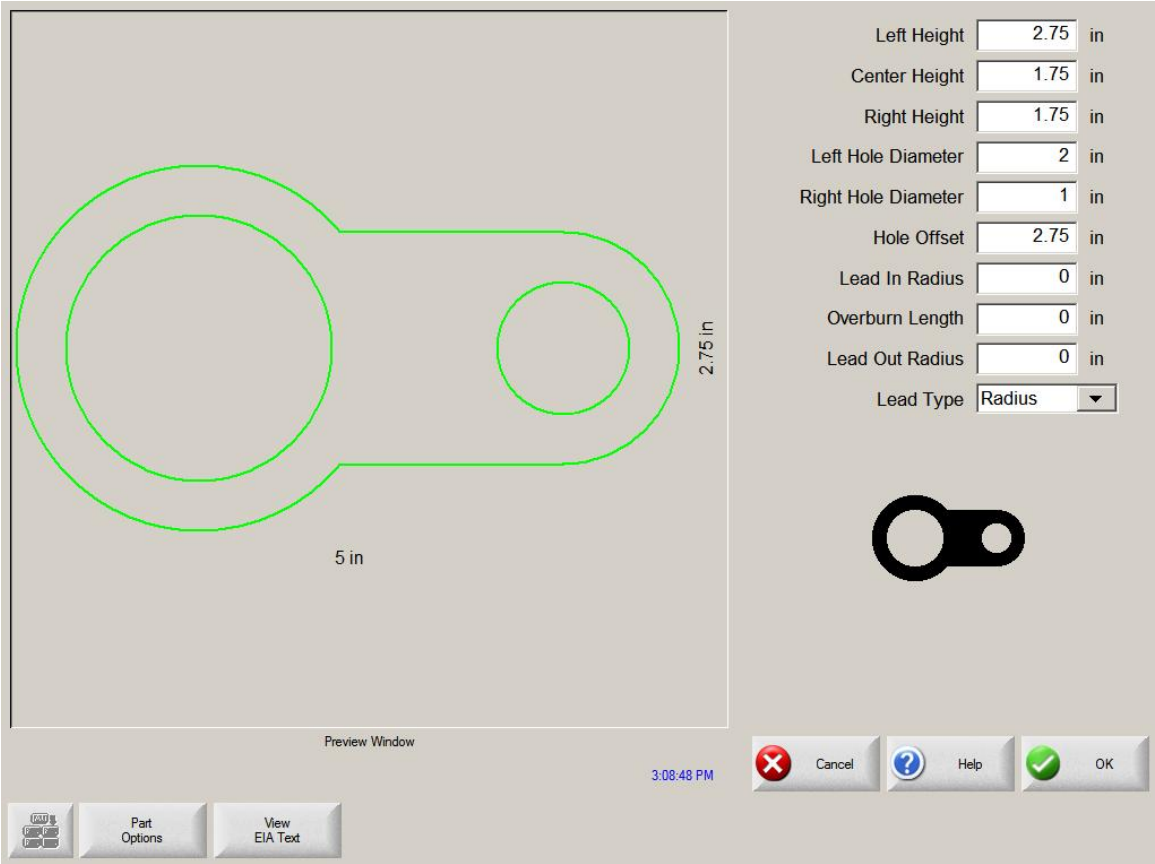
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Paddle Blind



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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Left Height
Enter the diameter of the outside, left edge.

Center Height
Enter the height of the center of the part.

Right Height
Enter the diameter of the outside, right edge.

Left Hole Diameter
Enter the diameter of the left hole within the part.

Right Hole Diameter
Enter the diameter of the right hole within the part.

Hole Offset
Enter the distance between the centers of the two holes.

Lead In Radius
Enter the radius of the lead-in arc.

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

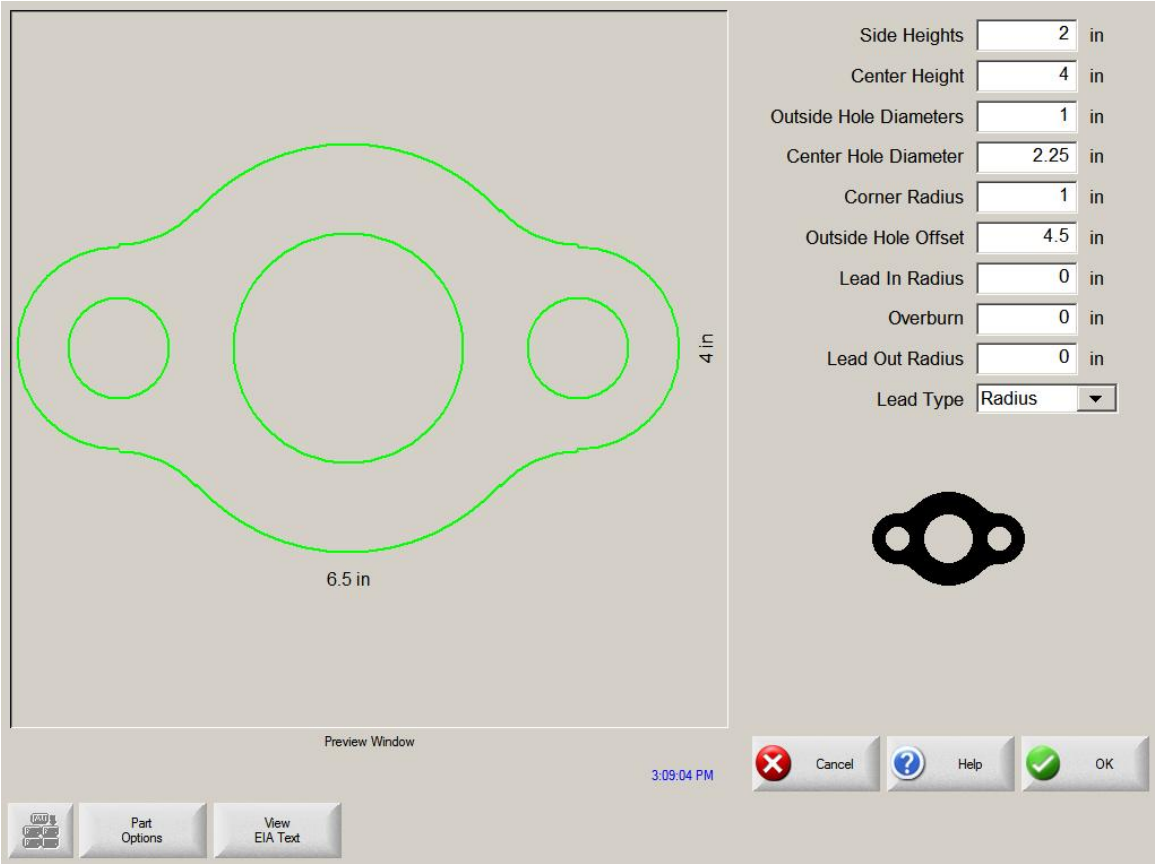
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Water Pump Gasket



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

Side Heights
Enter the diameter of the outside edges of the sides of the part.

Center Height
Enter the diameter of the outside, center edge of the part.

Outside Hole diameters
Enter the diameters of the outside holes within the part.

Center Hole Diameter
Enter the diameter of the center hole.

Corner Radius
Enter the radius of the curve in the corners of the part.

Outside Hole Offset
Enter the distance between the centers of the outside holes.

Lead In Radius
Enter the radius of the lead-in arc.

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

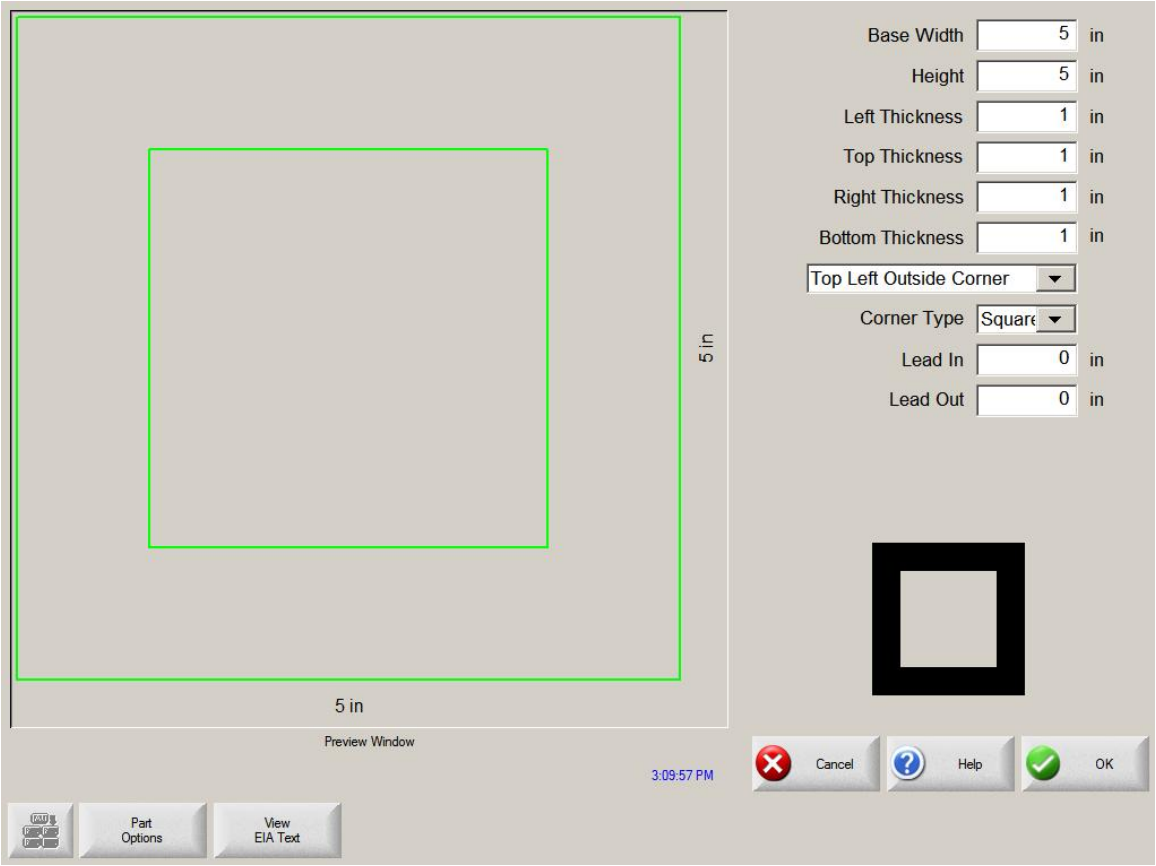
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Frame



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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Base Width
Enter the width of the base of the part.

Height
Enter the height of the part.

Left Thickness
Enter the distance between the inner and outer edges on the left side of the part.

Top Thickness
Enter the distance between the inner and outer edges on the top of the part.

Right Thickness
Enter the distance between the inner and outer edges on the right side of the part.

Bottom Thickness
Enter the distance between the inner and outer edges on the bottom of the part.

Corner Selection
Use the dropdown list to select a corner of the part. Use the remaining fields to specify the style of that corner. Repeat your selections for up to three corners.

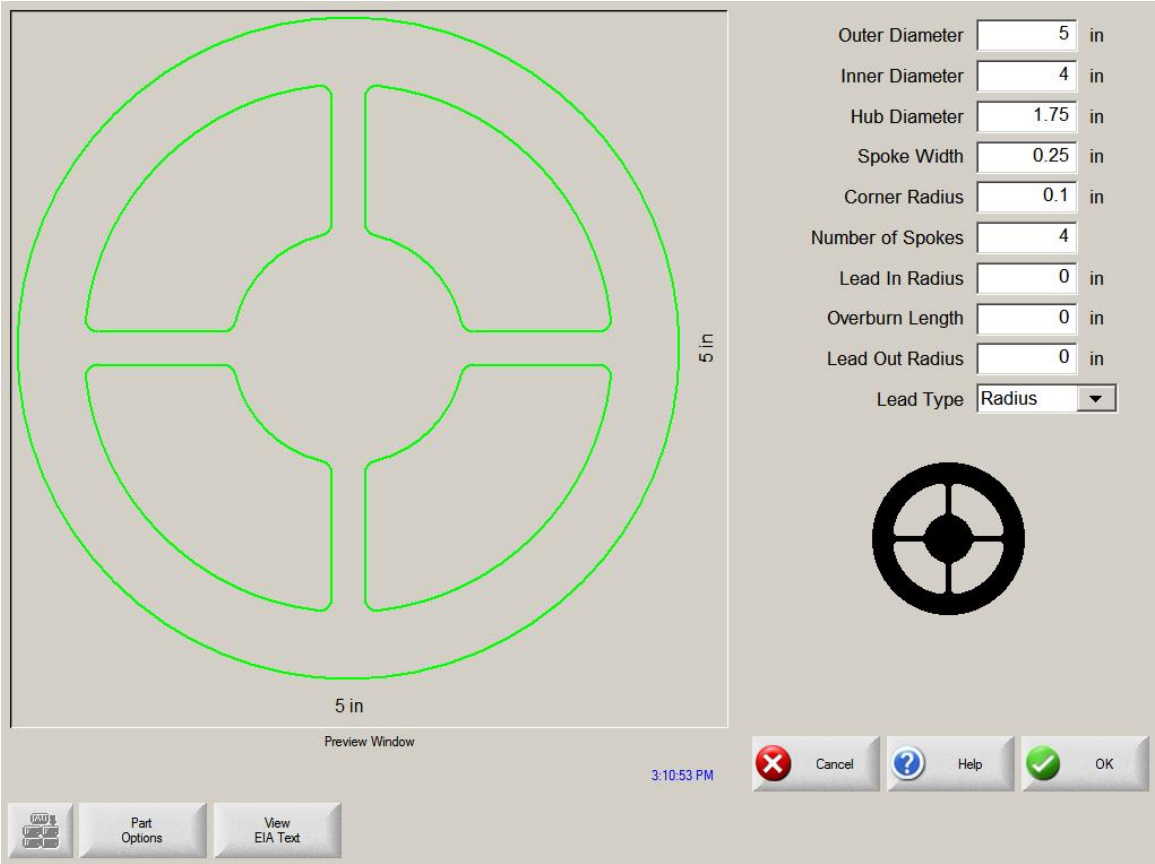
Corner Type
Use the dropdown list to select a square, bevel, or round corner.

- If you select a bevel corner, use the Corner Width and Corner Height fields to enter the dimensions of the bevel.
- If you select a round corner, use the Corner Radius field to enter the radius of the corner.

Lead-In/Lead-Out Length
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.

Pulley



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

Outer Diameter
Enter the diameter of the outside edge of the part.

Inner Diameter
Enter the diameter of the inside edge of the part.

Hub Diameter
Enter the diameter of the hub in the center of the part.

Spoke Width
Enter the width of the spokes of the part.

Corner Radius
Enter the radius of the curve in the corners of the part.

Number of Spokes
Enter the number of spokes in the part.

Lead In Radius
Enter the radius of the lead-in arc.

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

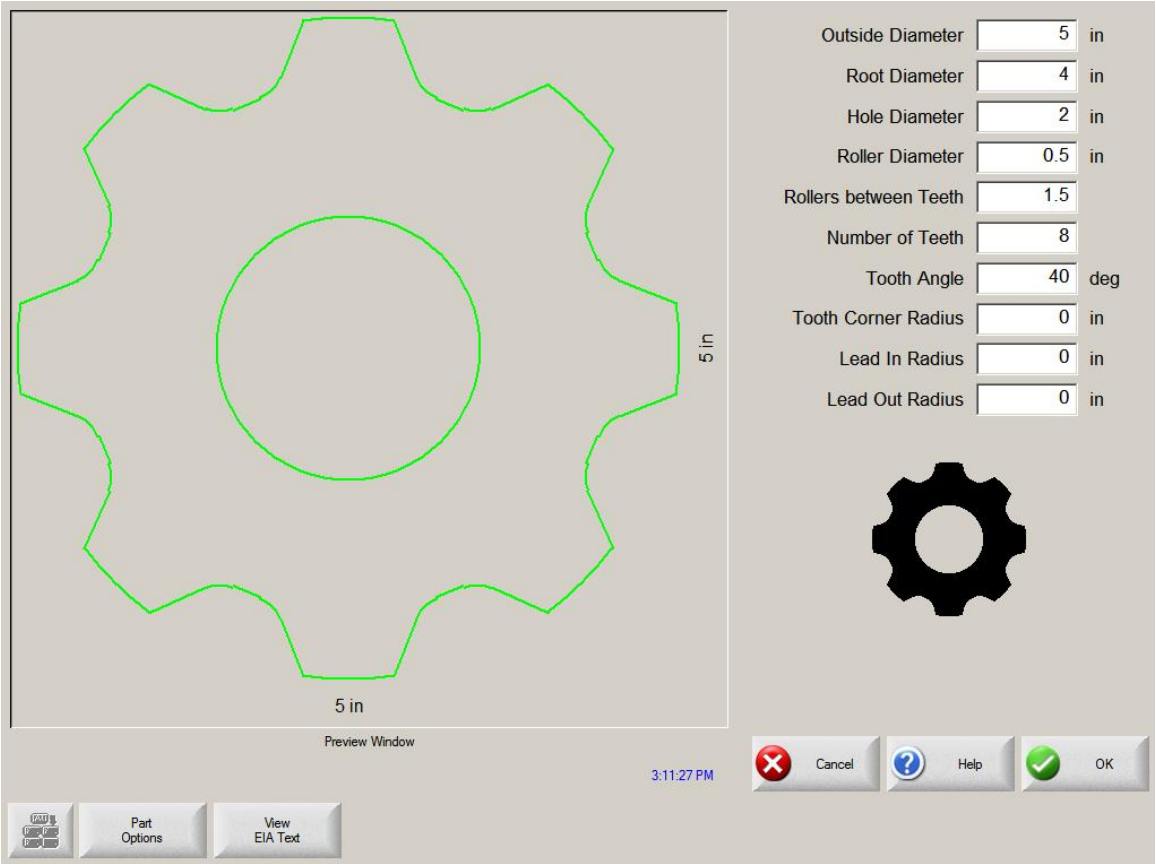
In some cases it is desirable to have an underburn length. For these conditions, enter a negative number for the overburn length.

Lead Out Radius
Enter the radius of the lead-out arc.

Lead Type
Depending on the shape you select, the style of the lead in/ lead out can be selected as radius, lock or straight line. The lock style lead-in creates greater stability for the part and is only available if the part type is set to piece. Lead-in selection is only available if the part type is set to piece or hole.

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

Sprocket



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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

Outside Diameter
Enter the diameter of the outside edges of the teeth on the sprocket.

Root Diameter
Enter the diameter of the part at the root of the curves between the teeth of the sprocket.

Hole Diameter
Enter the diameter of the hole in the center of the part.

Roller Diameter
Enter the diameter of the roller that defines the curve at the corners of the roots of the tooth.

Rollers between Teeth
Enter the number of rollers that fit between the root corners of the teeth.

Number of Teeth
Enter the number of teeth on the sprocket.

Tooth Angle
Enter the number of degrees of the angle of the straight side of the tooth.

Tooth Corner Radius
Enter the radius of the curve at the corner of the teeth.

Lead In Radius
Enter the radius of the lead-in arc.

Lead Out Radius
Enter the radius of the lead-out arc.

Text

Library Shape Setup

Enter the correct dimensions to create the part you require. There is 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 is highlighted with a yellow arrow.

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Note: The system does not check for all incorrect geometries and it is possible to enter a part that does not make geometric sense.

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

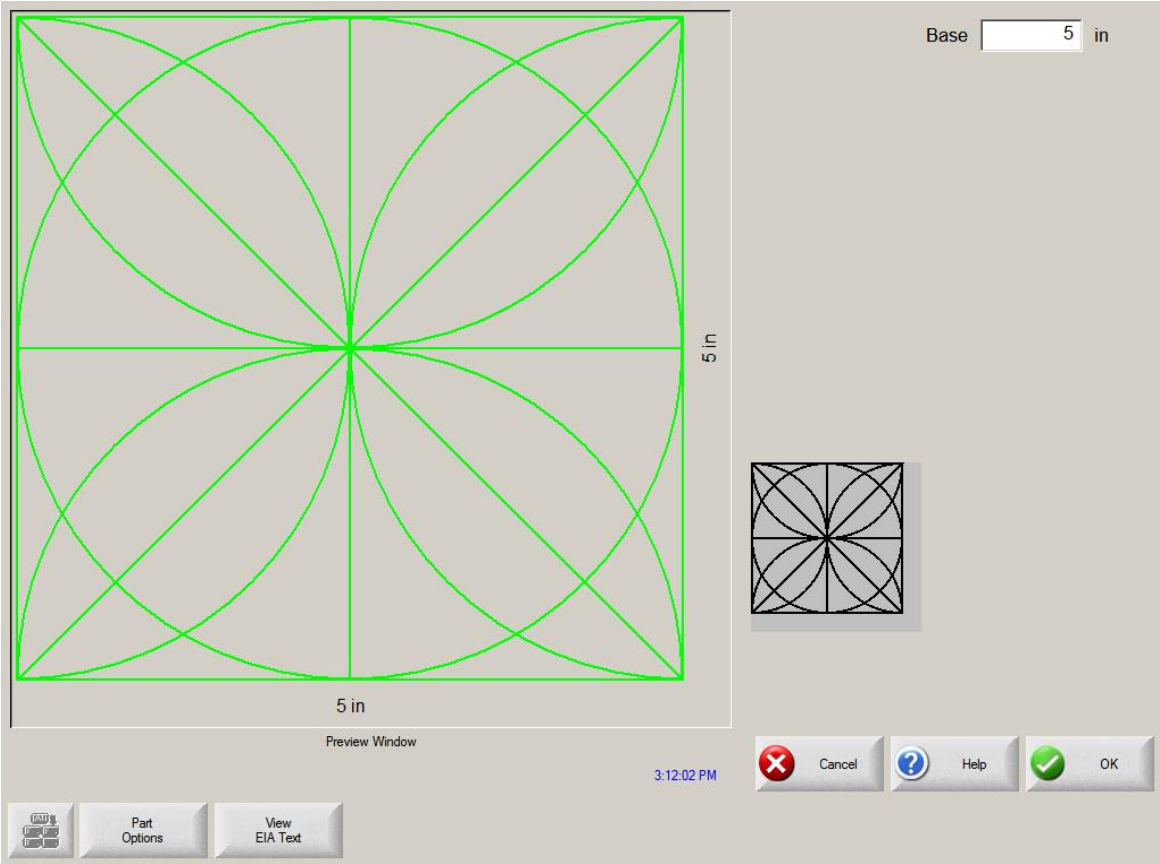
Character Height
Enter the height of the characters in the text.

Text
Use the radio buttons to select whether the text will be cut or marked.

If you select Marked, use the dropdown lists to select the marker and the offset.

Text
Enter the text you want to cut or mark.

Test Pattern



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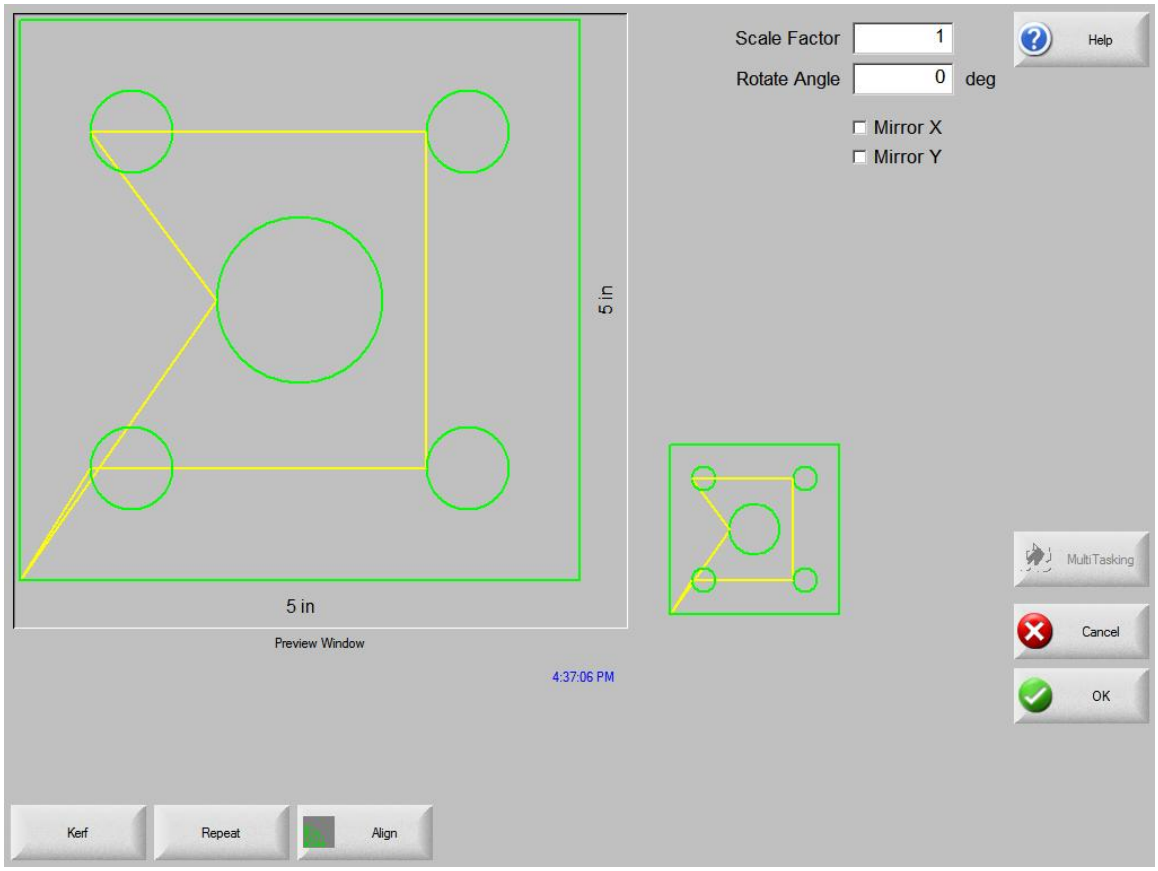
As you enter dimensional parameters, the control automatically draws the new shape with the values you enter. This is extremely useful in providing a visual check of the shape that has been entered.

Base

Enter the width of the base of the part.

Part Options

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



Scale Factor

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

Rotate Angle

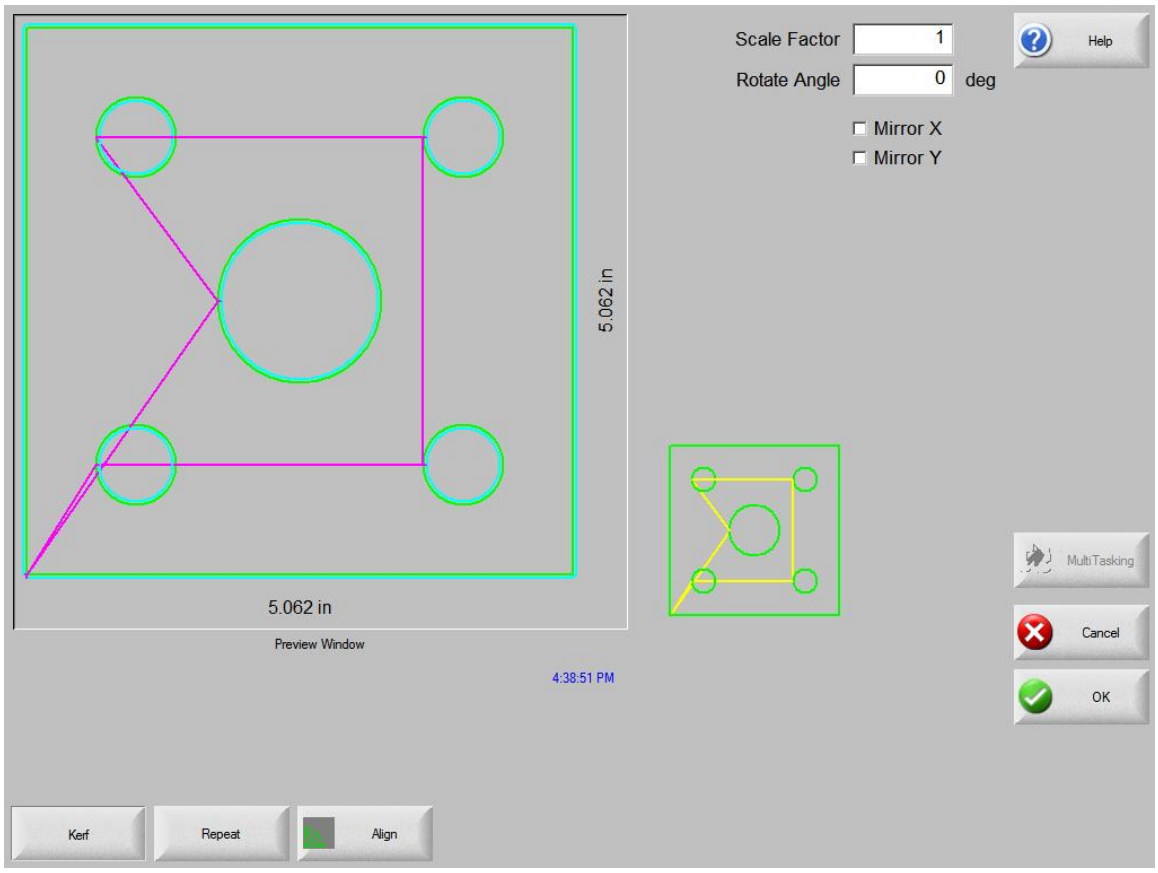
Allows the operator to rotate the current part in memory by a programmed value. After a new rotate angle has been entered, the new part is displayed in the Preview window. The rotate angle can be any positive or negative angle.

Mirror X/Mirror Y

These checkboxes make the X or Y dimensions negative. The result is a mirror image of the current part in memory.
For keypad operation, press the Next or Enter key to toggle to the X or Y field. When the cursor is on the field, press the Space key to enter a checkmark in the current highlighted field.

Kerf

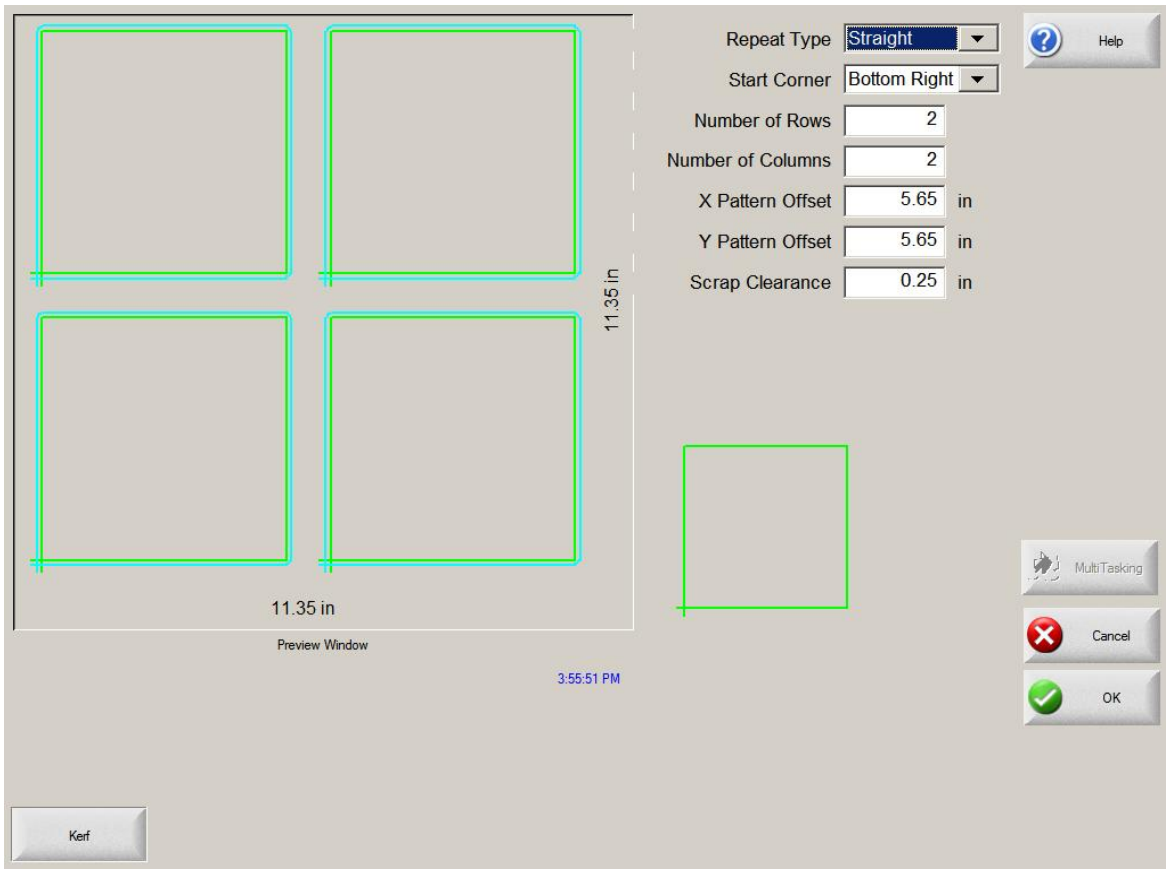
Press the Kerf soft key to show the kerf path in light blue. This helps you see the Kerf path before cutting. Press the button again to turn the Kerf part graphics off.



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

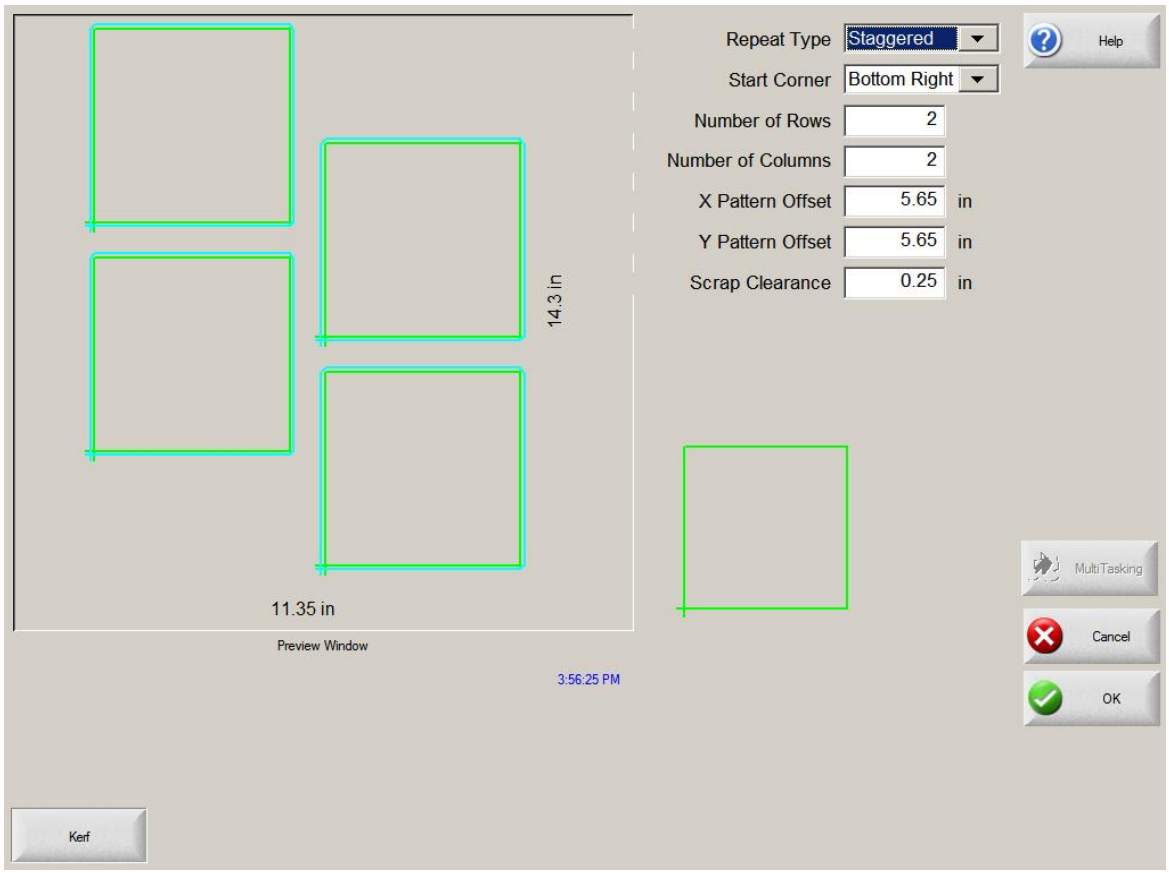
Program the number of columns.

X Pattern Offset/Y Pattern Offset

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

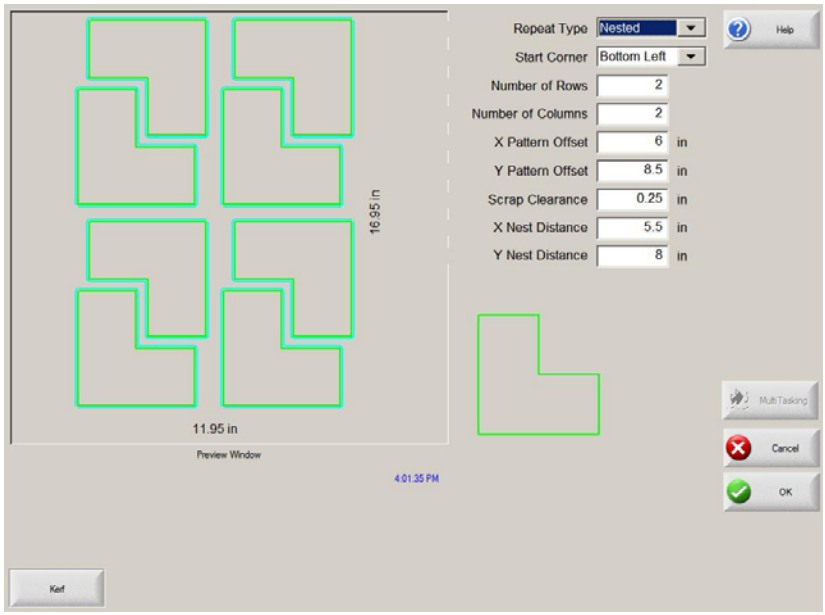
Scrap Clearance
Allows the user to insert scrap clearance between parts in the grid pattern. The same value is used for X and Y dimensions.

Staggered Repeat



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.

Nested Repeat



Pattern Offsets

This is an automated feature that calculates the minimum spacing required between repeated parts. The spacing 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 allows the part to be repeated without overlapping.

You can use this pre-calculated value or select new values manually. If you enter new pattern offset values, the control automatically draws the new group pattern with the new values.

Nest Distance

This is an automated feature that calculates the minimum spacing required between nested parts. The spacing 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 allows the part to be repeated without overlapping.

You can choose to use this pre-calculated value or select new values manually. As you enter new offset values, the control automatically draws the new nested pattern with the new values.

Tip: If you change Nest Distance values manually, start with a simple nest (1 column x 1 row) and perform adjustments based on the display. As the nest distance values are adjusted, the pattern displayed on screen is updated. When the Nest Distance is what you want, increase the nest size to a 2-column, 2-row nest. Then the X and Y pattern offsets can be adjusted in the same fashion. When the desired nest spacing has been reached, increase the nest size as needed to the maximum size that the plate allows.

Align

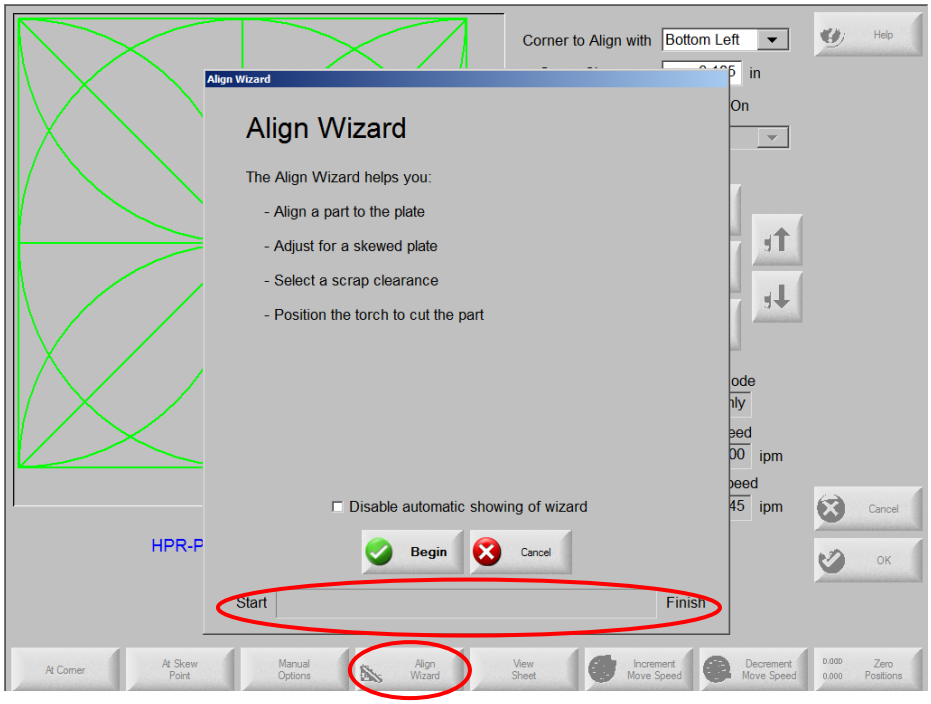
This screen allows you to:

- Launch the Align wizard.
- Align the current part to one of the four corners of the plate. This is common with parts that have an internal pierce point such as a flange.
- Accommodate skewed plates when aligning the part. This is commonly used with a nest of parts that has a small margin of error for placement of the nest on the plate.

Align Wizard

The Align wizard automates the sequence of operations to enter coordinates for a skewed plate on the table and to align parts to a skewed or aligned plate.

The Align wizard opens automatically from the Align screen or you can press the Align Wizard soft key on the Align window.



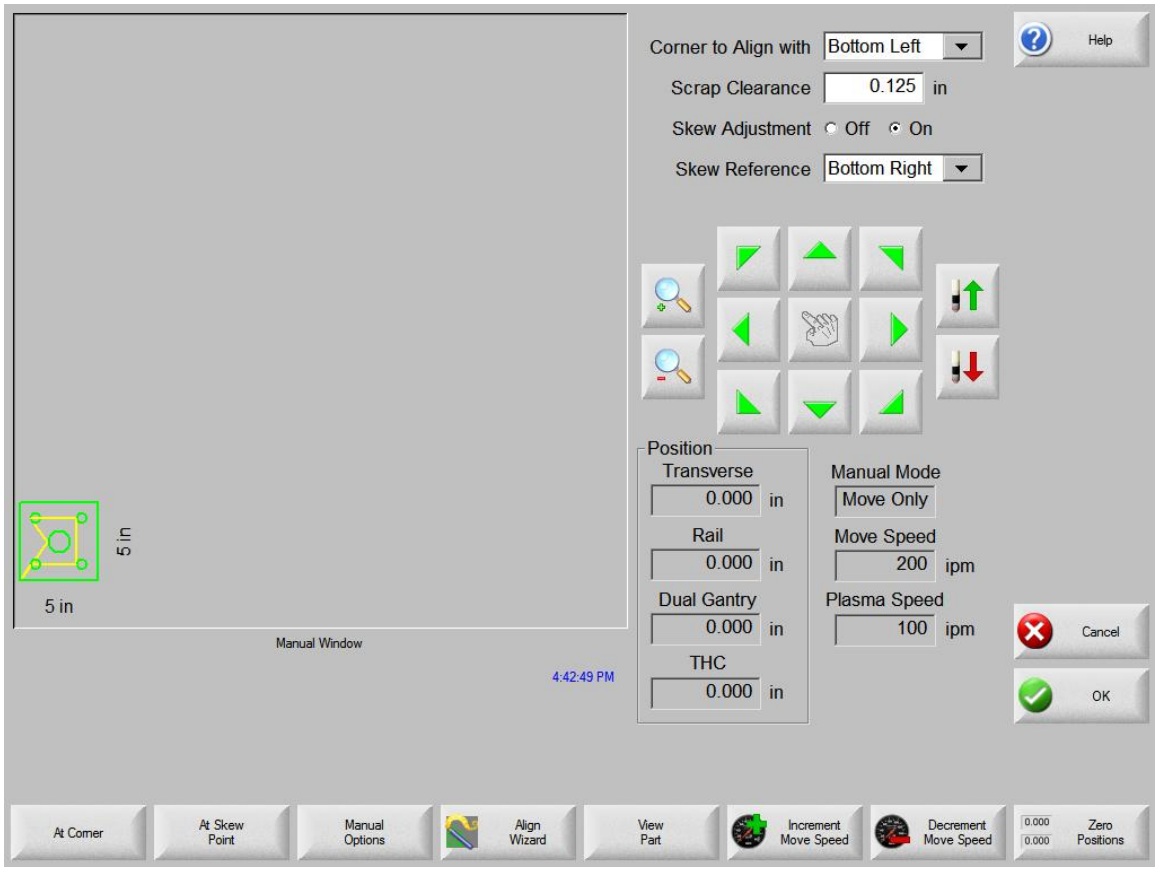
As you work with the Align wizard, it keeps track of your progress and displays it at the bottom of the wizard window in the progress bar.

You can choose to use the torch or a laser pointer to align the plate. If you choose the laser pointer, you must have a marker offset value of at least 1 entered for Marker Offset 10, 11, or 12 on the Setups screen.

Manual Part Alignment

To align a part manually on the plate:

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



Corner to Align with

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

Scrap Clearance

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

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

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

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

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

Automatic Plate Alignment (APA)

The Automatic Plate Alignment (APA) feature detects the edges of a rectangular plate and calculates the degree of skew to align a part on the plate. Two types of APA sequences are available:

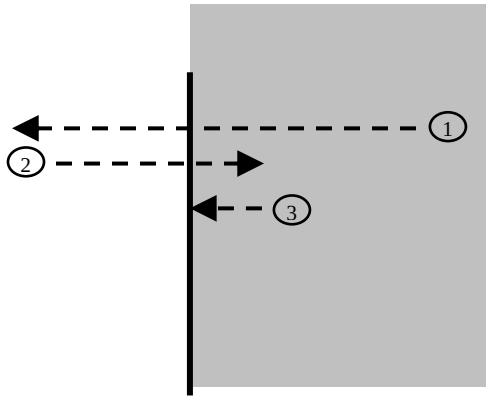
- **Five-point alignment** is the default type of APA and detects plate alignment, skew, and size.
- **Three-point alignment** detects plate alignment and skew.

Notes about APA:
- The APA sensors must be assigned in I/O setups. The logic states must be set so that the input is active when the sensor is over the plate.
- The sensor moves fast to the outward edge of the plate until the sensor detects the edge and switches to OFF. For accuracy, motion reverses until the sensor is activated again and switches to ON. See Sensing Sequence.
- If User Defined is selected as the Manual Offset value on the Manual Options screen, an X/Y tool offset value from the Setup screen is required to compensate for the distance between the master torch and the APA sensor.
- Scrap clearance, if required, is entered on the Align screen. In addition, Corner to Align With on the Align screen sets the start corner location of the program.
- If your machine requires homing, this function should be performed before APA.
- Some sensors may detect the table slats as an extension of the plate. If this is a problem in your application, configure 2 sensors. The first sensor to detect the edge of the plate (switch to OFF) is used for all plate detection at that location.
- An appropriate X/Y offset for the two sensors is recommended to minimize the potential that booth sensors would the slats as an extension of the plate. The distance between the first and second sensor is programmed in tool offset #11 on the Setup screen.
- Sensing radius should be programmed according to the radius of the sensor. If dual sensors are used, the radius applies to both sensors.

- You can insert program codes into the part program to automatically configure 3-part APA for that part. See Part Code.

Sensing Sequence

1. The sensor moves off the plate at high speed (status = OFF).
2. The sensor returns to the plate at medium speed (status = ON).
3. The sensor moves off the plate at slow speed (status = OFF). The edge of the plate is detected and recorded.



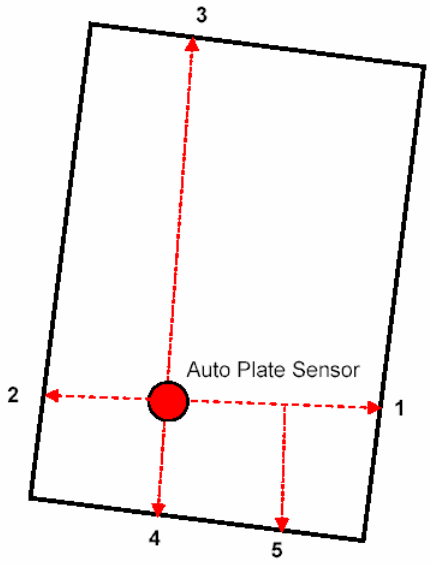
Five-Point Alignment

5-point alignment uses 5 reference points to calculate skew and plate size. The CNC commands the Sensor PHC to move around the plate in search of the edge at 5 points. After the 5 reference points have been detected, the CNC positions the torch in the correct location to start the part program with the calculated skew.

To start 5-point alignment:

1. Position the Plate Sensor above the plate manually. The Auto Plate Align Sensor Input should be ACTIVE.
2. Select Part Options > Align. Verify that the correct corner has been selected. Edit parameters for Skew alignment.
3. Press the Automatic Plate Align soft key on the Part Options screen.

The sensor moves across the plate to detect the reference edges of the plate. Each position is recorded as one of the reference points. Motion continues until all 5 points are detected.



After the sensor detects all 5 reference points, the CNC positions the sensor or the torch at the starting point of the part program.

The values for Scrap Clearance and Start Corner on the Align screen contribute to the calculation of the final position for the alignment and the start point of the part program. The APA function also enters the values for the dimensions of the plate in the appropriate fields in the Setup screen.

The part program can be executed automatically at the end of the alignment if Auto Start after APA is enabled on the process Setup screen or it can wait for the start of the cycle.

Three Point Alignment

During a 3-point alignment, the CNC commands motion of the sensor around the plate and searches for the edges of the plate at 3 reference points After the sensor detects the 3 reference points, the CNC positions the sensor or the torch at the starting point of the part program with the calculated alignment and skew.

Program Code

To configure APA within a part program, you must add EIA program codes to the beginning for the part program. The parameters remain in effect until they are changed or the CNC is restarted.

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

G66D100B300C30

- G66 = 3-point alignment command
- D*value* = Distance between two plate edge reference points
- B*value* = Rapid feed rate for distance (D) motion

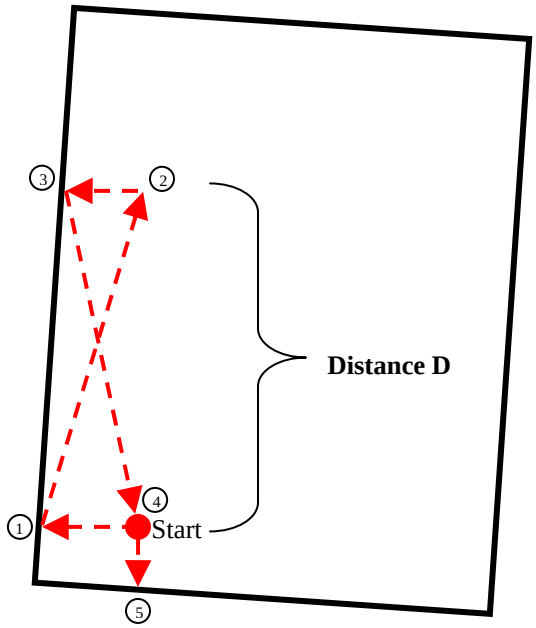
- C*value* = Slow feed rate for the distance to the edge

Motion Path

The following drawing shows a typical edge detection sequence for APA with the following selections on the Align screen:

- Corner to Align: Lower left
- Skew Point: Upper left

Change the values for these fields to specify a different starting point and sequence.



To start the 3-point alignment:

1. Load a part program with the appropriate program codes included at the beginning of the program. See Program Code.
2. Position the plate sensor above the plate manually. The Auto Plate Align Sensor Input should be ACTIVE.
3. Select Part Options > Align. Verify that the correct corner has been selected. Edit parameters for Skew alignment.
4. Press Auto Plate Alignment.

The sensor moves across the plate to detect the reference edges of the plate. Each position is recorded as one of the reference points. Motion continues until all 3 points are detected.

After the sensor detects all 3 reference points, the CNC positions the sensor or the torch at the starting point of the part program.

The values for Scrap Clearance and Start Corner on the Align screen contribute to the calculation of the final position for the alignment and the start point of the part program.

The APA function also enters the values for the dimensions of the plate in the appropriate fields in the Setup screen.

The part program can be executed automatically at the end of the alignment, or it can wait for the start of the cycle, as specified in Program Code selection list on the Setup screen.

Cut Operations

CutPro Wizard

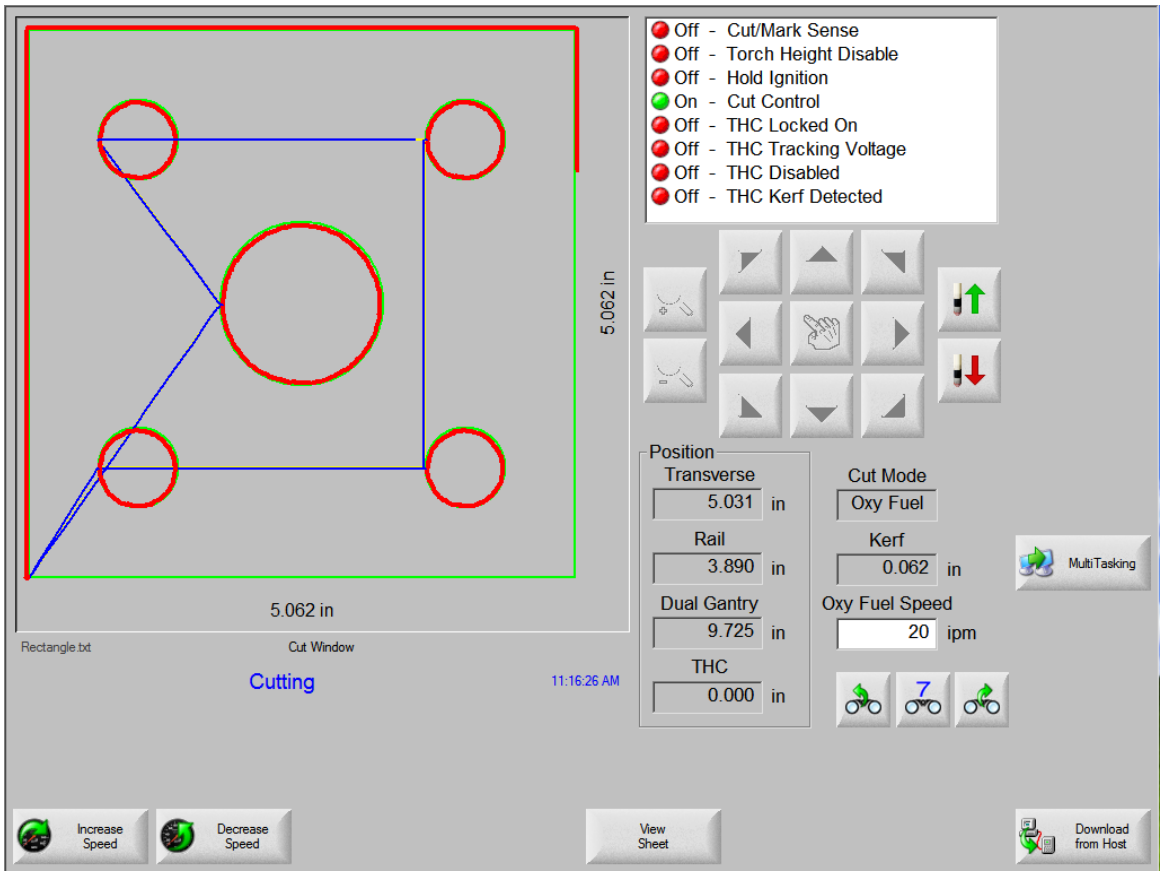
The CutPro wizard automates the sequence of choices and selections that you must make before you begin cutting parts. If you have parts, nests, and cutting processes stored on your system, you can use the CutPro wizard to simplify cutting operations.

The CutPro wizard also helps you to align parts and handle plate skew with the Align wizard. For more information on the Align wizard, see the Part Options chapter.

The CutPro wizard opens automatically from the Main screen or you can press the CutPro Wizard soft key on the Main screen. As you work with the CutPro wizard, it keeps track of your progress and displays it at the bottom of the wizard window in the progress bar.

Cutting in Manual Mode

After you verify that the cut mode, cut speed and Kerf values are set correctly, press the Start key on the Main or Manual window to cut a part. The following window is displayed:



To cut the part, verify 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 on the front panel. This starts cutting in the selected Cut Mode.

To preview the path, press the Change Cut Mode soft key until Trial appears in the Cut Mode window. Press the Start key to have the cutting device follow the cut path without cutting. Motion is performed at the programmed speed.

Press the Stop key on the front panel to stop a cut. The machine decelerates to a smooth stop along the cut path. If the cutting process was on when you pressed the Stop key, 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.
In sheet view, the control automatically scrolls to keep the cut location centered within the view screen. This feature is useful during normal cutting to zoom in and follow the cut-path.

View Sheet is useful when proper plate size values have been entered in Cutting setups and when the machine has been homed. If you attempt to view large parts with a fully zoomed screen, the part may not be fully drawn on the screen before the next view

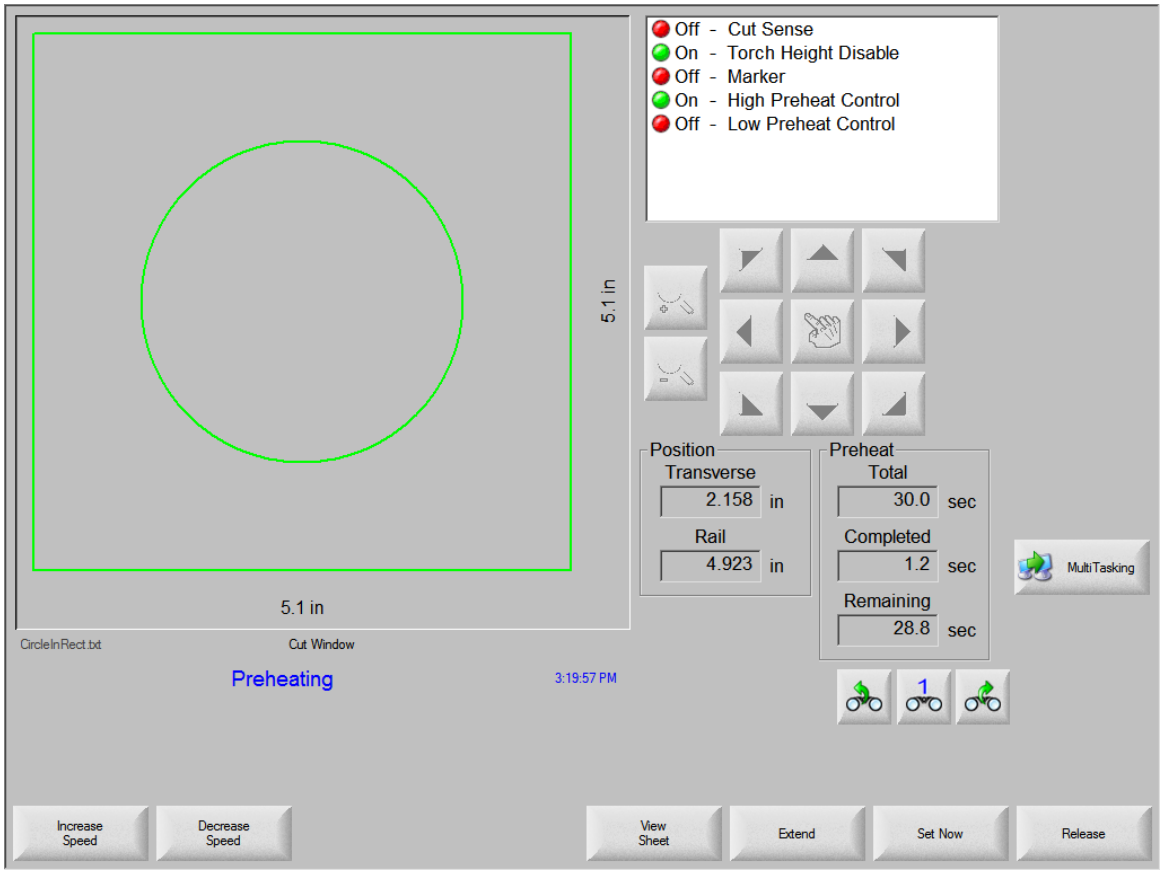
location displays and the screen may flash. Zoom out to correct this and view a larger area.

Speed Increase
Increases the current cut speed by 3%.

Speed Decrease
Decreases the current cut speed by 3%.
Note: Double click the speed field to enter a new speed value.
Keyboard operation: To change the current cut speed while cutting a part, press the Enter key once to highlight the current cut speed, enter the new cut speed, and press Enter again.

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

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



The Preheat times, Total, Completed and Remaining, are shown to a tenth of a second.

When you activate the Cut Sense input, the Preheat delay time cycle ends. The time at the point of activation becomes the new Preheat time for subsequent cuts. Three soft keys are also displayed which can be used to modify the Preheat cycle in progress.

Press the Start key twice to bypass the Preheat and Pierce Time Delays and begin the cut in the Oxy Fuel cut mode.

The function of these keys is explained below:

Extend
Extends the Preheat timer until it is stopped with either the Set-Now or Release soft key.

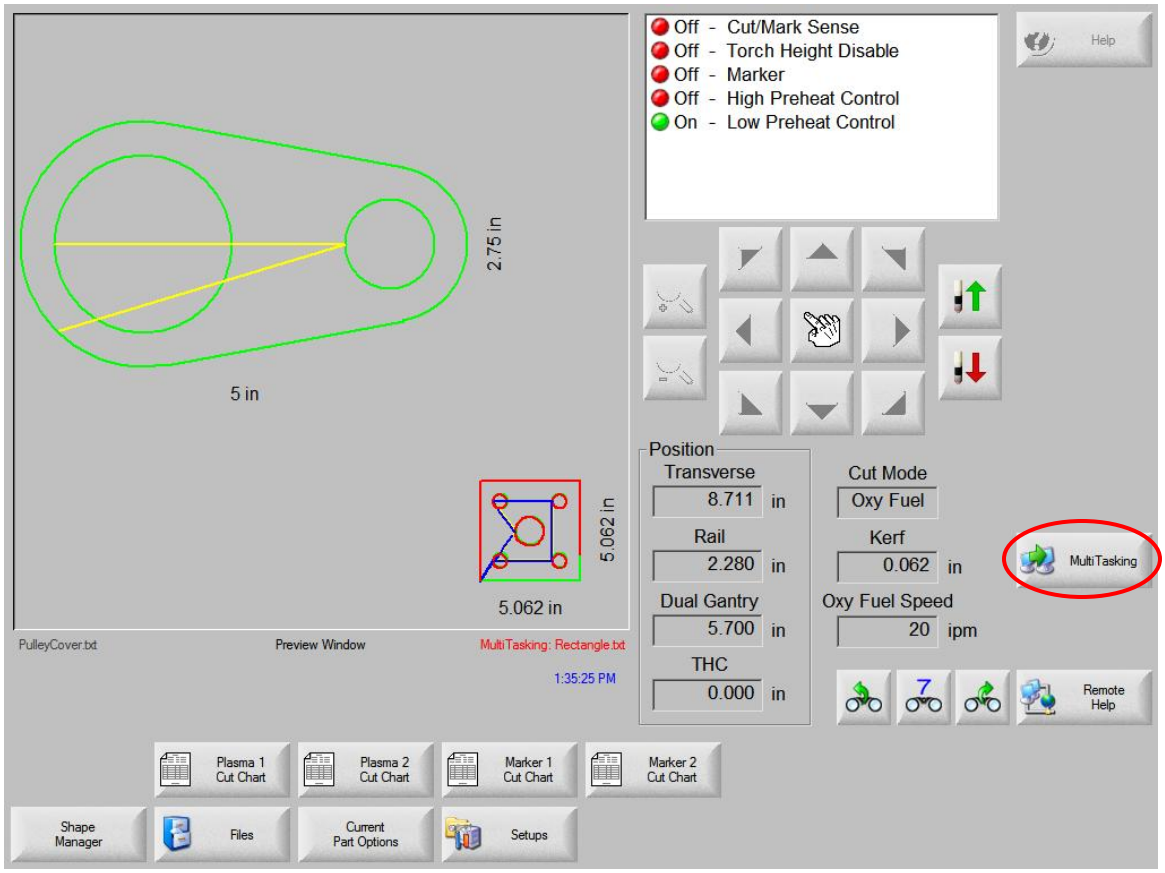
Set Now
Ends the selected delay timer and saves the new set time. Use the Set Now soft key with the Extend soft key to modify the preset Preheat time.

Release
Ends the selected delay timer, but does not modify the original delay time.

Multitasking

Multitasking allows you to load and configure a new part program while another part program is cutting. This feature is only available in advanced operation mode.

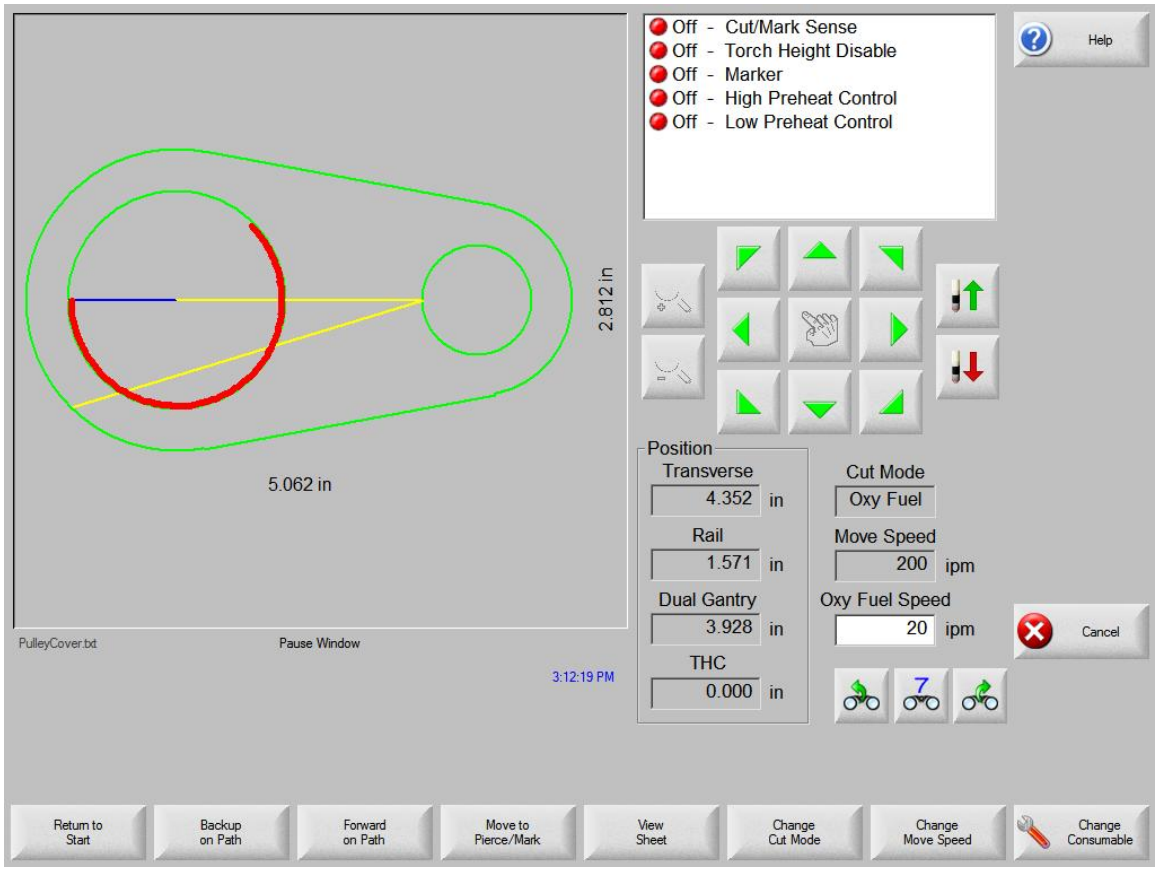
To begin, press the multitasking soft key. The current part program displays in the lower right corner of the Preview Window. The new program displays in the main view area.



Press the multitasking soft key to switch between programs.

Pause

If the cut process fails, the CNC has full-featured recovery capabilities.
The Cut Loss Recovery features of the CNC are available from the Pause screen which displays when the operator presses Stop or if cut sense is lost.



Press the Cancel key while the Pause screen is displayed to cancel 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 used after a cut loss, all information about the current position of the cutting device on the path is lost.

Backup and Forward on Path

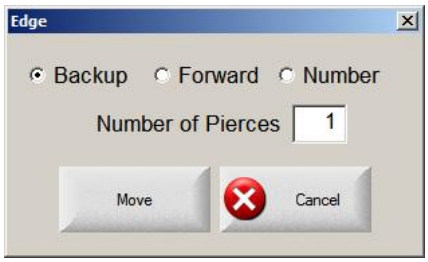
Use these two soft keys to move backward and forward along the cut path at the selected move speed to locate the pierce restart point. Press the Start key to resume the cut at the programmed cut speed. In addition to all segments of a standard part, the Backup and Forward on Path functions allow full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

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

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

Move to Pierce/Mark

Press the Move to Pierce/Mark soft key to move directly to any pierce point.



Enter the information for the pierce point and press Enter. The cutting device moves directly to the selected pierce point.

Change Cut Mode

Alternates the restart mode between Cut and Trial. This allows the operator to move through the part partially as a trial cut and partially as an actual cut.

Change Move Speed

Cycles through the four move speeds that are available. The four move speeds are the Maximum Machine Speed, High Jog Speed, Medium Jog Speed and Low Jog Speed from the Speeds setups.

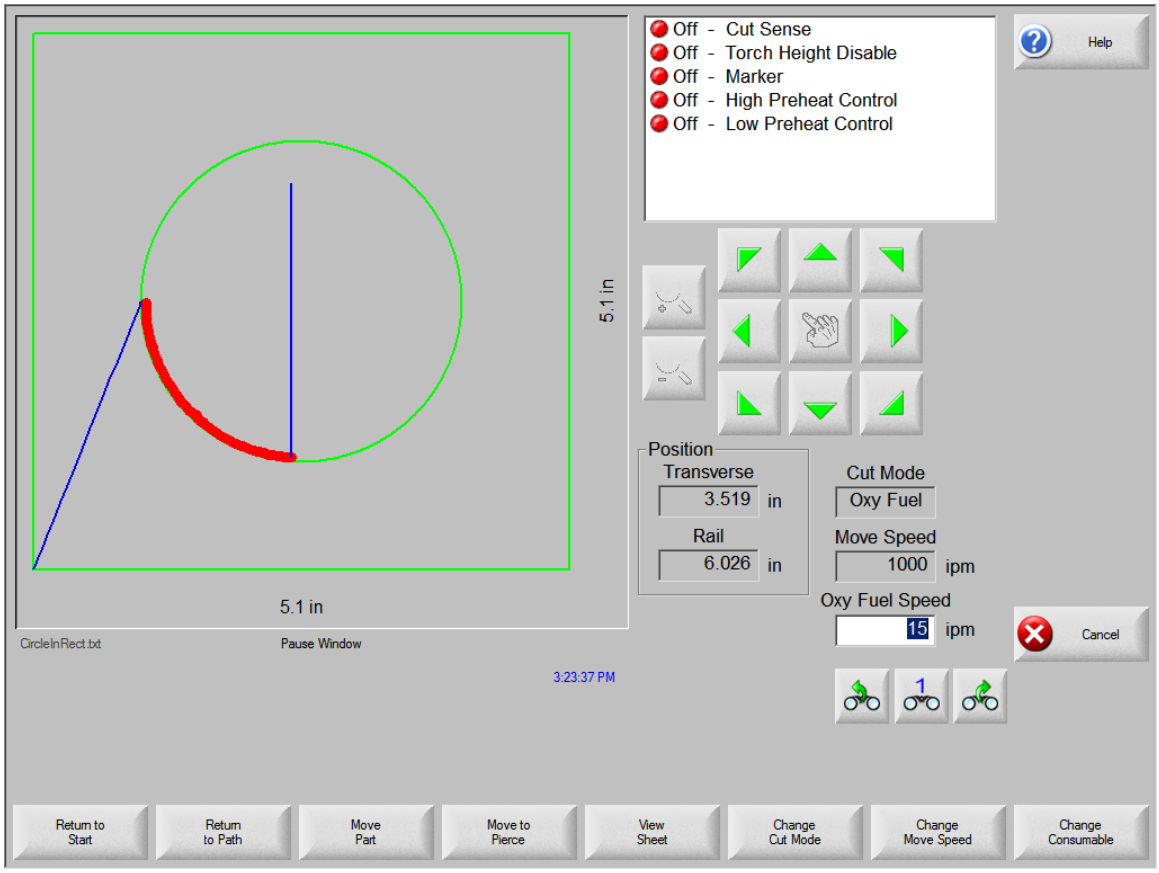
Change Consumable

Opens the Change Consumable screen.

On-Path Restart

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

While the Pause Window is displays, the manual arrow keys are fully functional so you can move the cutting device. This allows you to move the machine in any direction (not necessarily along the path) to inspect the partially cut piece. Once the cutting device is moved off the cut path, the Off-path Pause Window displays.



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

Return to Path

Press the Return to Path soft key in the Off-path Pause window to return the cutting device to the point on the cut path from which it was jogged away. This feature is useful for inspecting or replacing components after 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 cutting can resume.

Move Part

Moves the entire part on the plate. The point along the cut path to which the cutting device moves becomes the current position of the cutting device. The On-path Pause window displays again because the cutting device is on path.

Off-Path Restart

Press the Start key from the Off-path Pause window, to construct a lead-in from the off-path point back to the original part.

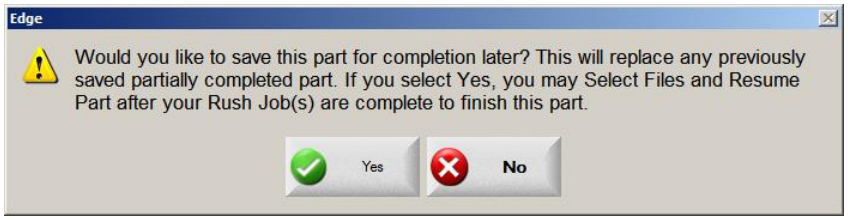
In a cut loss situation, the operator can use the Backup on Path key in the On-path Pause window menu to position the cutting device on the cut path where the cut was lost. The

operator can then use the manual arrow keys to jog the cutting device off path to a suitable pierce point.

Press Start at this point to cut a new lead-in 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

Allows the user to pause the current part program and retain the part and current position information. On the Pause screen, press the Cancel key. A prompt displays on screen to allow the user the option to save the part information for later use.

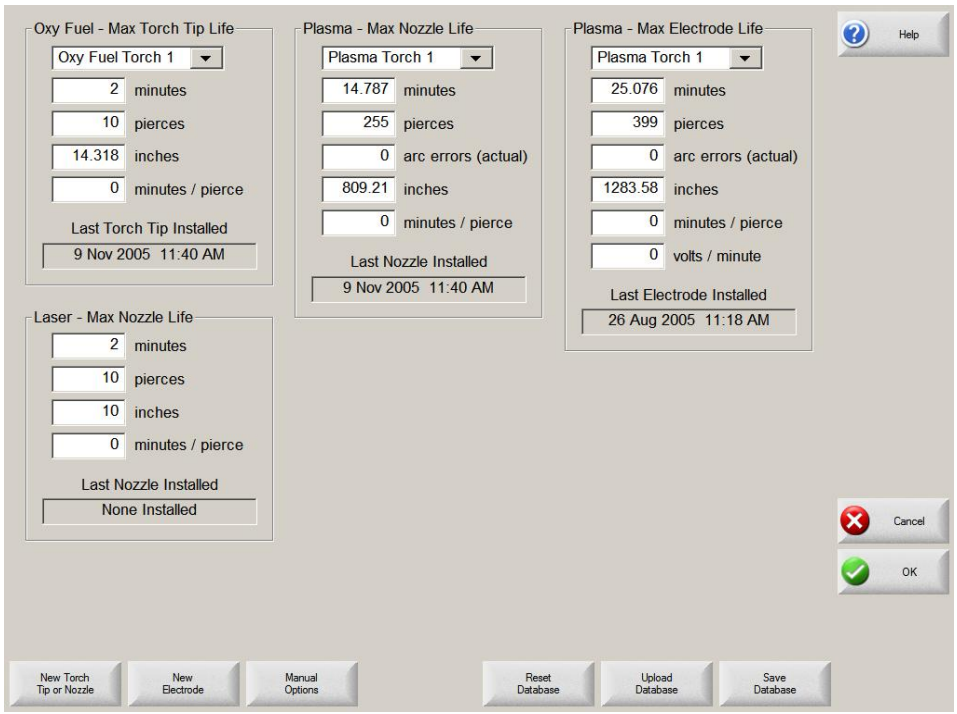


If you select Yes, the Resume Last Part button displays on the Files Screen. You can load and execute another part program and then return to the original part using the Resume Last Part soft key. The part program and position resumes.

Change Consumable

This screen tracks consumable life data for statistical analysis. In addition, the feature can prompt the operator that a consumable has reached its expected life 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 consumable and avoid a consumable failure that can affect 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 soft key is pressed every time a torch tip or electrode is changed, the last information for the corresponding consumable will be added to a database. This database shows 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 torch tip or electrode to be updated. The value of the tracking information is reset to zero and starts counting up as you cut in the selected mode. The “Installed on” date for the selected consumable is updated and the current values for the selected consumable are recorded, with the date, in a database that can be saved to disk.

The database is saved in CSV (comma separated value) format on the CNC and can be downloaded for use with standard database software programs for productivity and cost analysis. In addition, this data may also be viewed in the Watch Window during cutting.

The consumable information that is updated (Oxy torch 1-12 / Plasma torch 1-8) is determined by the “Station Select 1-20” inputs.

In the previous example, Plasma Torch #1 torch tip has a limit of 5000 minutes of operation. After 5000 minutes, the Change Consumable output becomes active and is indicated with a lamp or audible alarm. The intent is to set the limits at an expected life value of the consumable so that the operator is reminded to change the consumable when it has reached its expected life.

The data collected on the consumable life automatically updates to the new highest value. In the previous example, the new maximum value could extend above 5000 minutes when the new value is reached so the value would increase to 5001 and continue. This auto update feature can be disabled in the password protected Special Setups screen.

Minutes
The estimated life in time that the torch tip or electrode lasts. This value increases to the maximum life achieved or a maximum value can be entered.

Pierces
The estimated life in pierces that the torch tip or electrode lasts. This value increases to the maximum life achieved or a maximum value can be entered.

Inches/millimeters
The estimated life in distance that the torch tip or electrode lasts. This value increases to the maximum life achieved or a maximum value can be entered.

Minutes per Pierce
Piercing causes additional wear on the consumables. This parameter allows the user to enter a value which is added to the overall minutes value for each pierce, providing a more accurate representation of overall consumable wear.

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

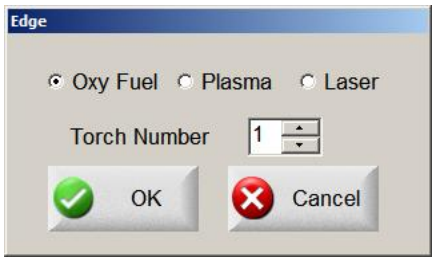
Volts per Minute
The Volts per Minute parameter allows the user to enter a value that is used to change the cut Arc Voltage, based on the number of minutes that have elapsed while cutting in Plasma mode. This value adjusts the Voltage offset value.

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



New Electrode
Press the New Electrode soft key to select which Electrode has been replaced and to update the database.

Setups
Press the Setups soft key to access the control setups and adjust the cutting process.

Reset Database
Resets the values in the database on the control and clears the torch tip or electrode information after uploading or saving the database.

Upload Database
Uploads the current database to a host computer running our link.

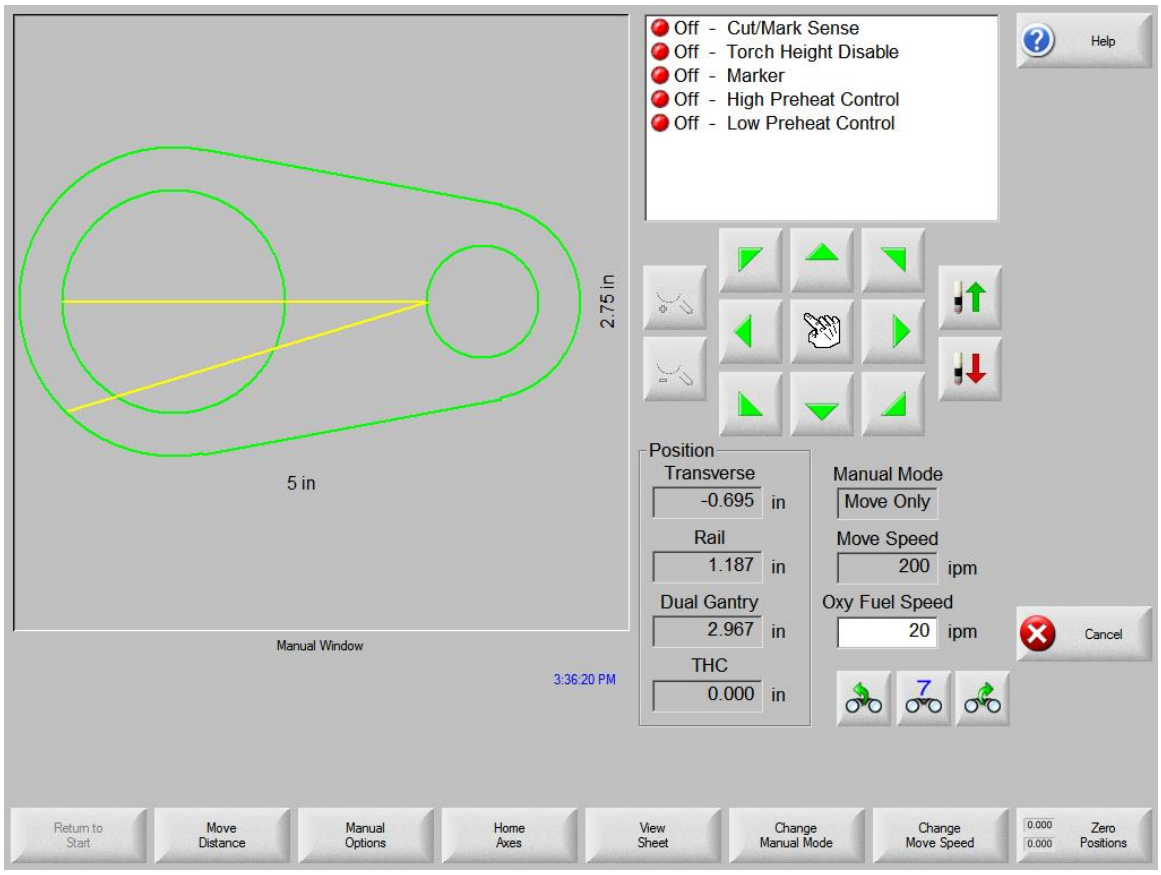
Save Database
Saves the current database to the diskette or USB memory stick.

Pause

Manual

The manual key is indicated by the hand icon.

Press the manual key on the screen to view the following screen. The directional jog keys are active when they are green.



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

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

If the latched manual key feature is enabled in the control setups, press the manual key a second time to allow motion to continue without holding down the arrow key. This

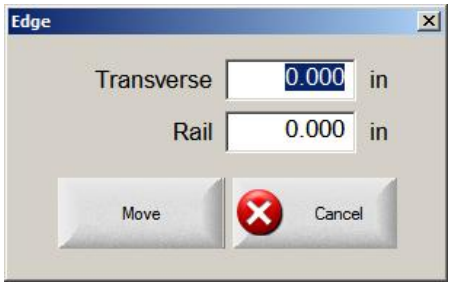
feature is available for the manual direction keys in the Manual, Align and Pause screens. When this feature is activated, the dialog “Latched Manual Keys On” will be displayed in red at the bottom right corner of the part window. Motion can be paused by use of the Stop, Cancel or an arrow key. The latched manual key feature can be turned off by pressing the manual key again.

Return to Start

Whenever the Manual window is opened, the transverse and rail positions at that point are saved. After rip cutting or other manual operations, it may be necessary to return to this "start" position. Press the Return to Start soft key to generate motion in the transverse and rail axes from the machine’s current position to the position that was saved when the Manual window opened.

Move Distance

When Move Only is displayed in the Manual Mode window, the second soft key from the left changes to Move Distance. The Move Distance soft key allows you to perform moves over exact distances. After you press Move Distance, the control prompts you for traverse and rail distance values for the machine’s motion. Enter the appropriate values and press ENTER. The cutting device moves the distance you entered in a straight line without executing any cut logic.



Values are entered the same way as described in the previous Cut Distance paragraphs. As with any automatic motion, you may press STOP on the front panel at any time to bring the machine smoothly to a stop before the programmed motion is complete.

Cut Distance

When Rip Cut mode is selected in the Manual Mode window, the second soft key from the left changes to Cut Distance. This soft key allows you to make rip cuts of an exact length. After you press Cut Distance, the control prompts you for traverse and rail distance values for machine motion. Enter the appropriate values and press ENTER. After the cutting device executes the cut logic sequence, it moves the distance you entered in a straight line.

If you enter incorrect values, press the CANCEL key at any time. After motion has begun, press STOP on the front panel to bring the machine smoothly to a stop before the programmed motion is complete.
Rip Cut mode is useful for making a cut along a specified linear path. Motion stops and cutting action ceases when the new position is reached or when the STOP key is pressed. If you do not know the exact distance, enter a distance longer than needed in the right direction, and then press STOP to end the cut.

Manual Options

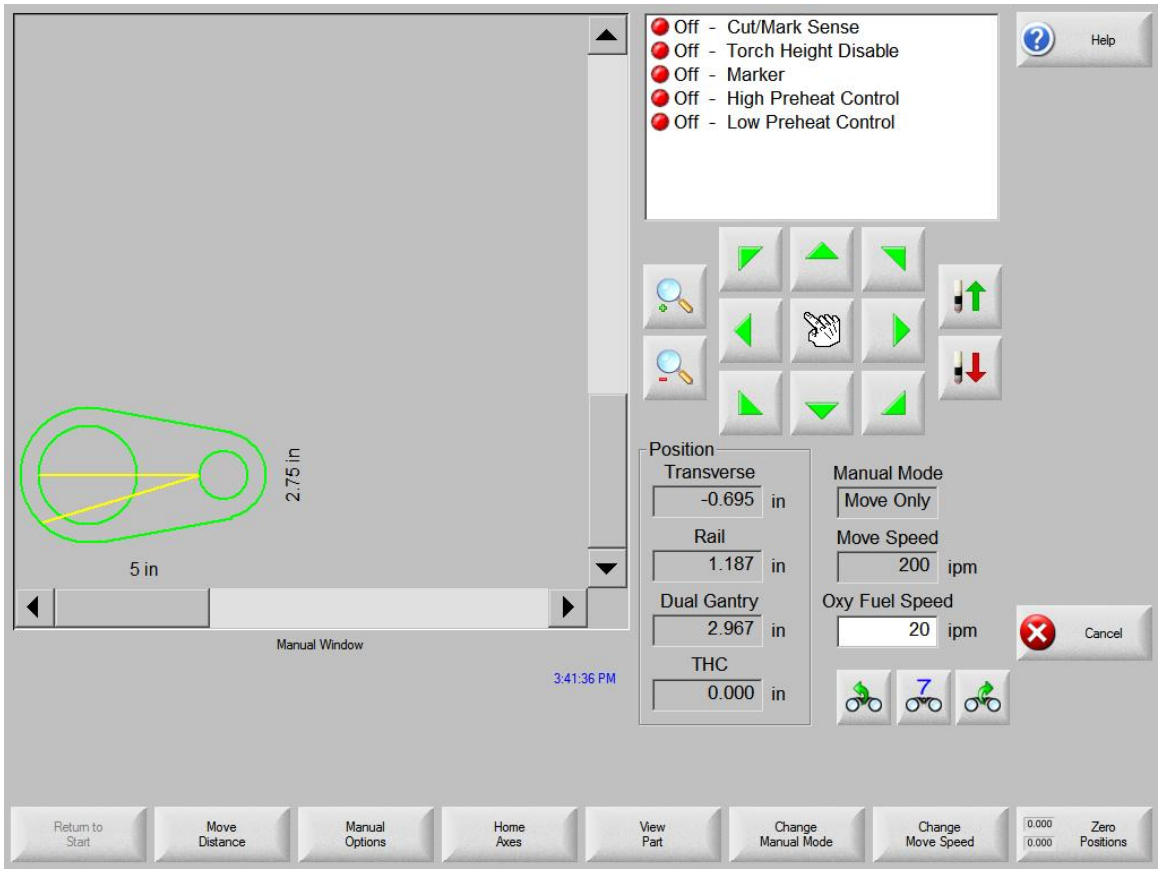
Press the Manual Options soft key to access the Manual Options screen.

Home Axes

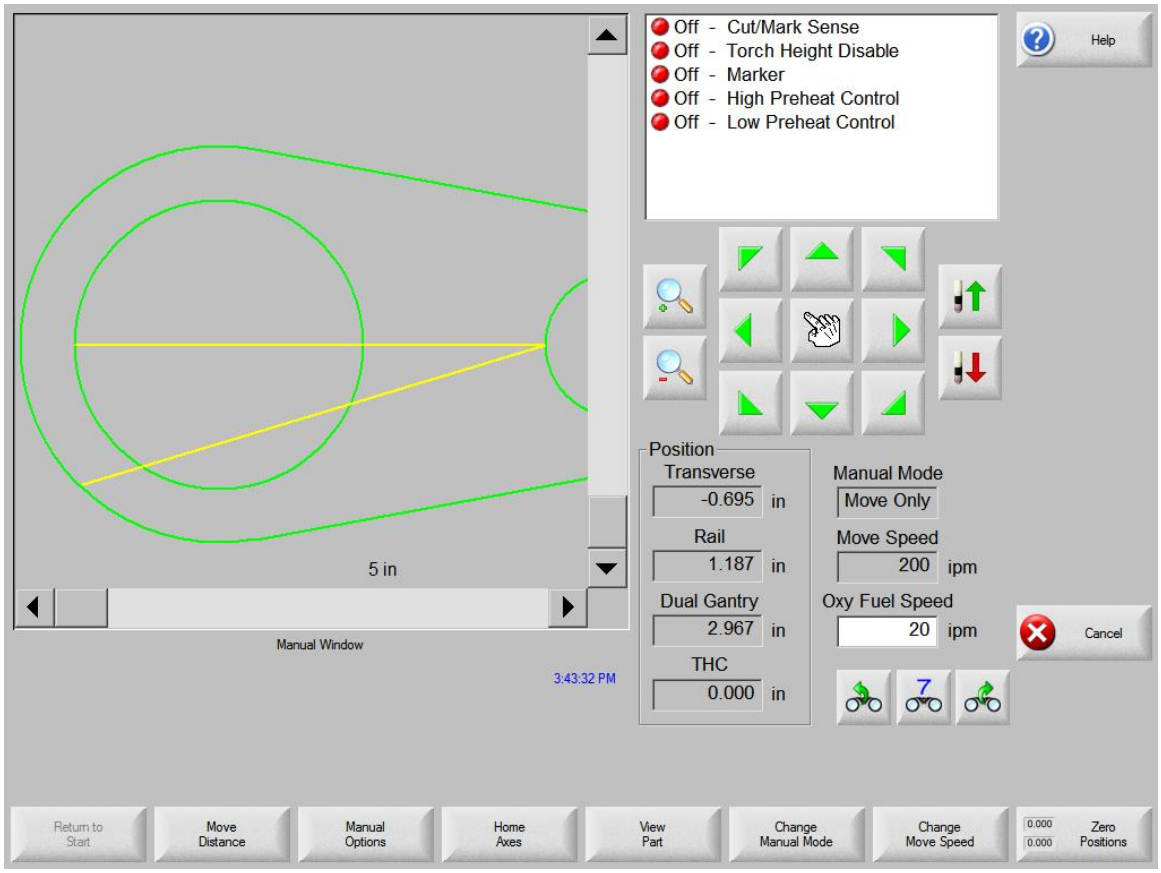
Press the Home Axes soft key to access the Homes Axes screen.

View Sheet/View Part

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



After the display zooms out, you can zoom in again by pressing the + key, which adds horizontal and vertical scroll bars. Press the - key to zoom out again.



While the scroll bars are displayed, you can hold down the scroll bar and move it to adjust the view of the machine horizontally and vertically. This mode is useful in normal cutting to closely follow the cut path while in zoom.

While cutting in sheet view, the control automatically scrolls to keep the cut location centered within the view screen. This feature is useful in normal cutting to 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 already been homed. If you are viewing large parts being cut with the display fully zoomed, the system may not be able to draw the part on screen before it has to move to the next view location. In this case, the view screen may flash but you can correct this by zooming out to a larger view area.

Change Manual Mode

This soft key alternates the control Manual Mode between Move Only and Rip Cut.

If you press this soft key the second soft key from the left to changes function from Move Distance to Cut Distance. Rip Cutting is described in more detail below.

Change Move Speed

This soft key toggles through the four Move Speeds: maximum machine speed, high jog speed, medium jog speed and low jog speed from the Speeds setups.

Zero Positions

Press this soft key to return all axes positions to 0 (zero).

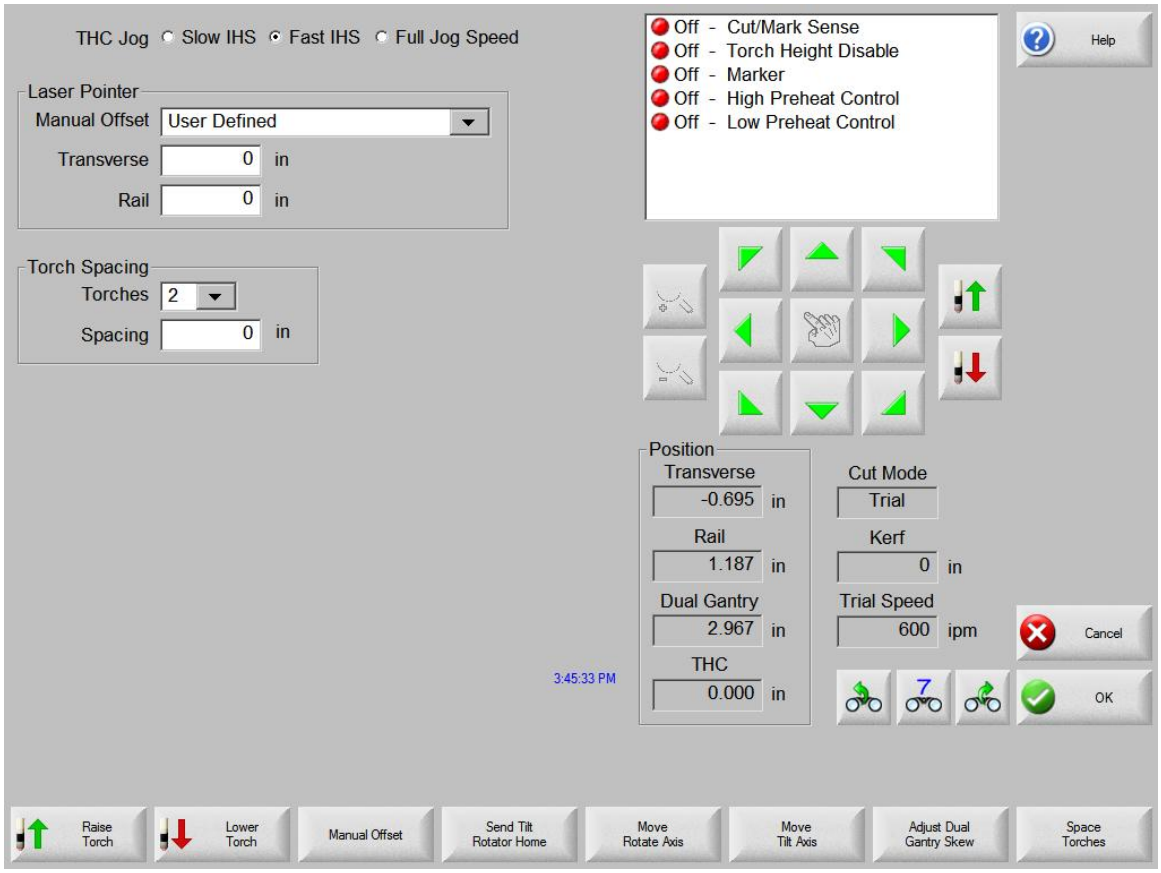
Rip Cutting

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

To initiate a Rip Cut:

1. Verify that the correct cut-mode (Oxy or Plasma) has been selected.
2. Verify that the proper cut speed is displayed in the Cut Speed window (editable in Rip Cut mode).
3. 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.
4. Use the arrow keys to change direction.
5. Press Stop, Cancel, or Manual to stop the operation of the cutting device.

Manual Options



Raise Torch

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

Lower Torch

Lowers the cutting torch while the soft key is pressed or until the torch down sense input is activated. If the torch down output has been enabled to stay on during the cut in plasma setups, press the Lower Torch soft key to keep the torch in the down position until the Lower Torch soft key is depressed a second time.

Manual Offset

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

You can select the following offsets:

- User Defined – Uses the selected X / Y Offset distance.
- Laser pointer to Plasma 1 – Offset 10

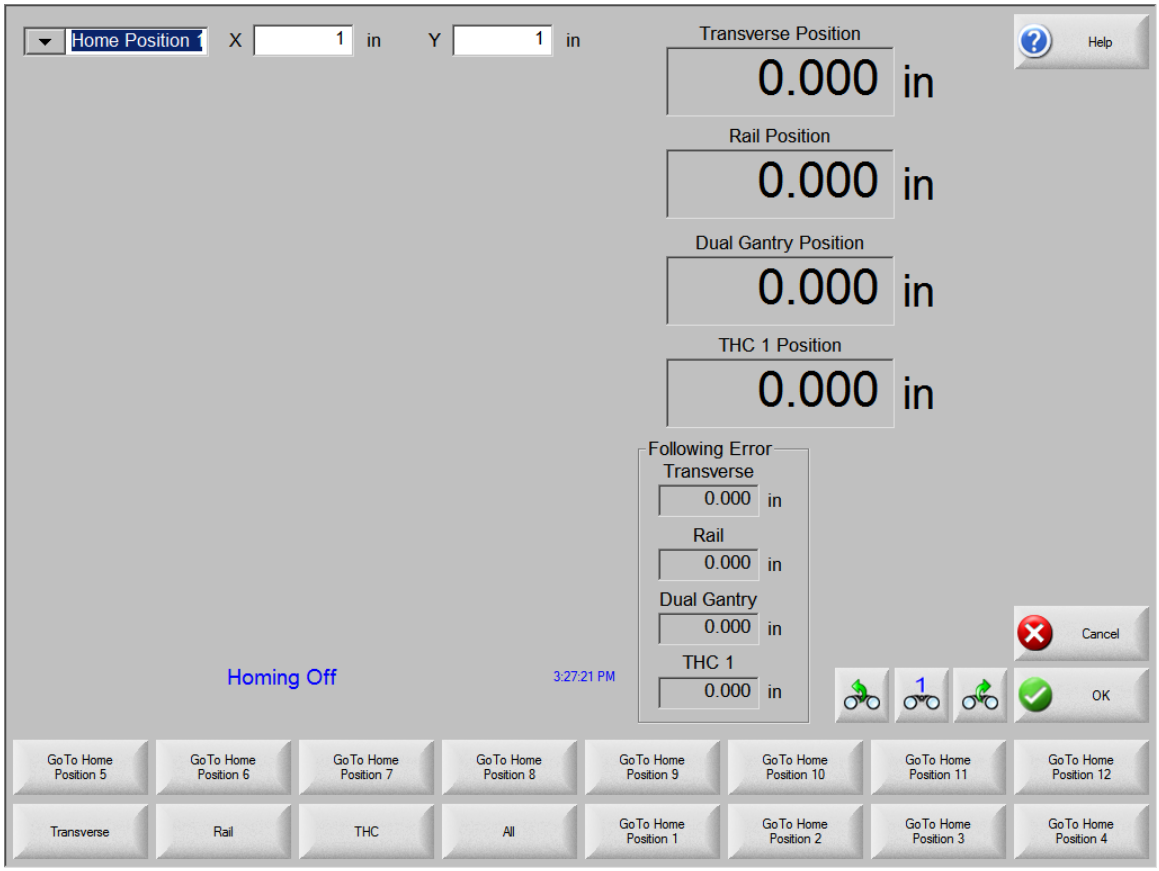
- Laser pointer to Plasma 2 – Offset 11
- Laser pointer to Oxy Fuel – Offset 12

Adjust Dual Gantry Skew

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

Home Axes

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



The home feature sets 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 moves the axis toward the home switches at the fast home speed until the switches have been activated. After the switches have been activated, motion stops and 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 and provides an absolute reference point for future motion commands.

Transverse

Press the Transverse soft key to initiate the automated homing procedure. This procedure generally produces machine motion in the transverse axis, depending on the homing parameters set in the Setups.

Rail

Press the Rail soft key to initiate the automated homing procedure. This procedure generally produces machine motion in the Rail axis, depending on the homing parameters set in the Setups.

CBH

Press the CBH soft key to initiate the automated homing procedure. This procedure generally produces machine motion in the CBH axis, depending on the homing parameters set in the Setups.

THC

Press the THC soft key to initiate the automated homing procedure for the Sensor THC. This procedure generally produces machine motion in the THC axis, depending on the homing parameters set in the Setups.

Tilt

Press the Tilt soft key to initiate the automated homing procedure for the Tilt Axis.

Rotate

Press the Rotate soft key to initiate the automated homing procedure for the Rotate Axis. **Note:** If Tilt and Rotate Axes are enabled, the following window will appear and allow access to the Tilt/ Rotate or other axes.

Select Yes to access Homing for the Tilt and Rotate Axes. Select No to access the Homing functions for the other axes,

All

Press the All soft key to initiate the automated homing procedure. This procedure generally produces machine motion in one or more axes, depending on the homing parameters set in the Setups.

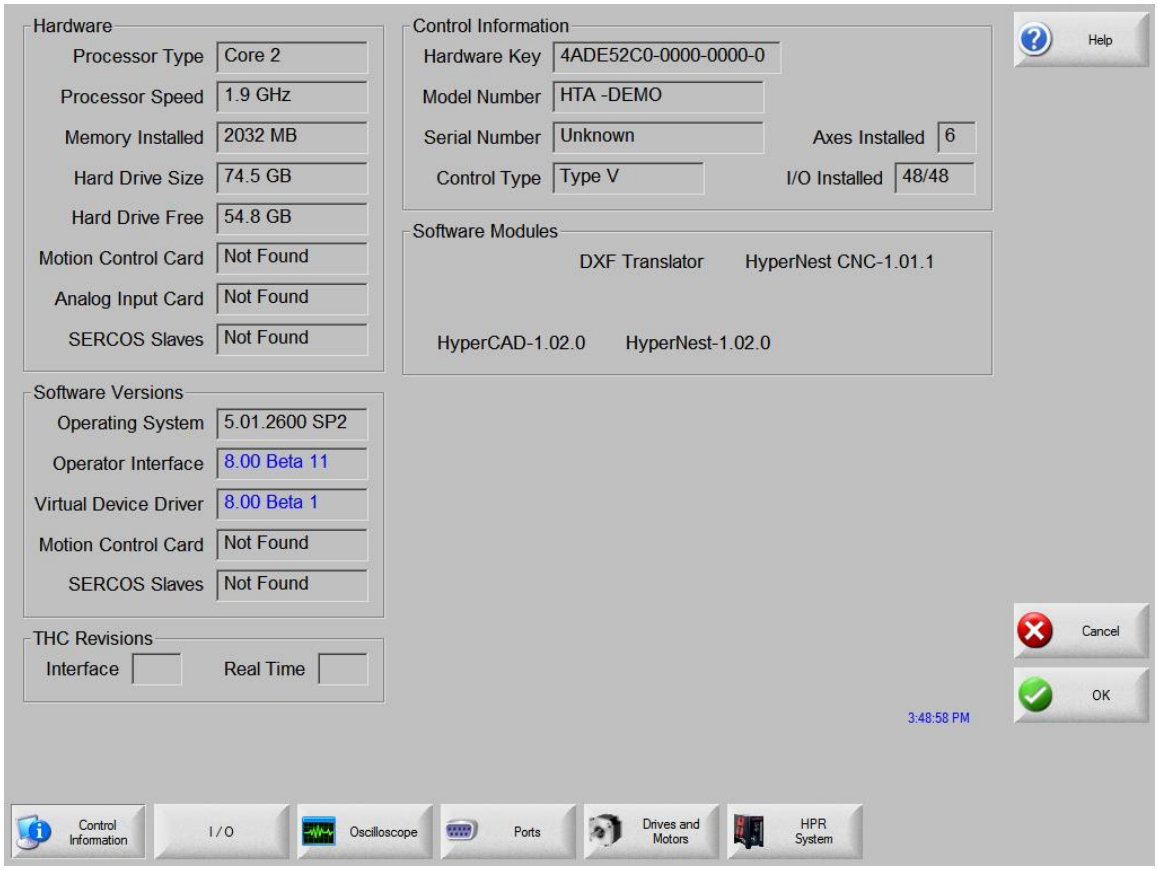
Go To Home Position

Press one of the four Go To Home Position soft keys to move the transverse and rail axes to the predefined position set in the corresponding edit window. The Go To Positions are absolute and require that an automated home procedure already be executed.

Diagnostics

Control Information

This screen displays the current software versions and hardware configuration of the control. You must provide this information if you contact the factory for support. A typical control information screen is shown below.



Hardware

The Hardware section shows the current hardware configuration which includes the Processor Type, Processor Speed, Memory Installed, Hard Drive Size, Hard Drive Free Space and Motion Control Card revision.

Software Versions

The Software Versions section shows the current version of the Control's Operating System, Operator Interface (software version), Virtual Device Driver and the Motion Control Card software.

Control Information
The control Information section displays the Hardware Key number, the control model number, serial number, control I/O type, axes enabled and I/O enabled.

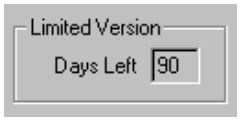
Software Modules
The Software Modules information displays the optional software features which have been loaded or have been enabled for use, such as DXF Translator, McAfee VirusScan Software, or NJWIN font Viewer.

Voltage
System Voltages at the motherboard are displayed for motherboards equipped with this monitoring feature.

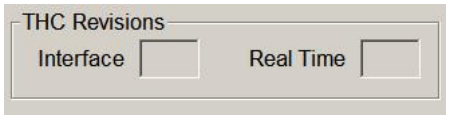
Temperature
Temperature at the motherboard is displayed for motherboards equipped with this monitoring feature.

Fans
Fan speeds at the motherboard are displayed for motherboards equipped with this monitoring feature.

Limited Version
The Limited Version information is displayed if the control is operating on a trial version of the software. The version of software is available for 90 days and can enabled for permanent use with a password available from the control vendor.



THC Revision
The current Command THC Interface and Real Time Revision Levels are displayed at the Control Information screen when enabled.



System Diagnostics
Press the System Diagnostics soft key to access the touch screen calibration utility for tuning touch screen response.

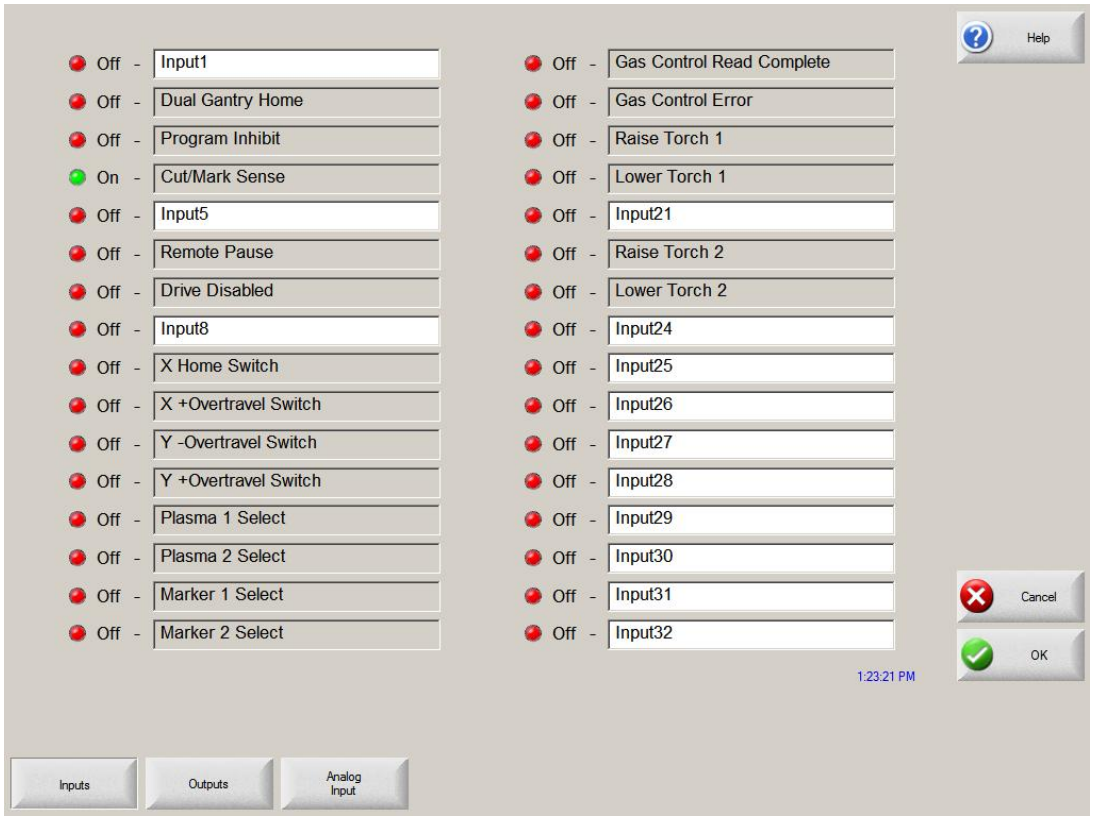
I/O

Inputs

This test continuously monitors and displays the state of all of the optically-isolated discrete inputs in the control. The current state of each input, On or Off, is displayed next to the input name.

You can change the name of inputs that are displayed with a white background. To change the input name, use the Previous/Next arrow key to highlight the input and type the new input name. The input can be connected to the control and used as commanded in the part program. For example, the EIA W7 S1 code pauses the program and waits for input 7 to become active.

A password is required to view this screen.



Note: The number and name of the inputs depends on the control software and hardware configurations.

Outputs

This test allows the activation of all optically-isolated discrete outputs in the control. To change the state of an output, select it with the PREV and NEXT keys and press the SPACE key. The current state of each output, On or Off, is displayed next to the output name. Below is an output screen with all of the outputs Off.

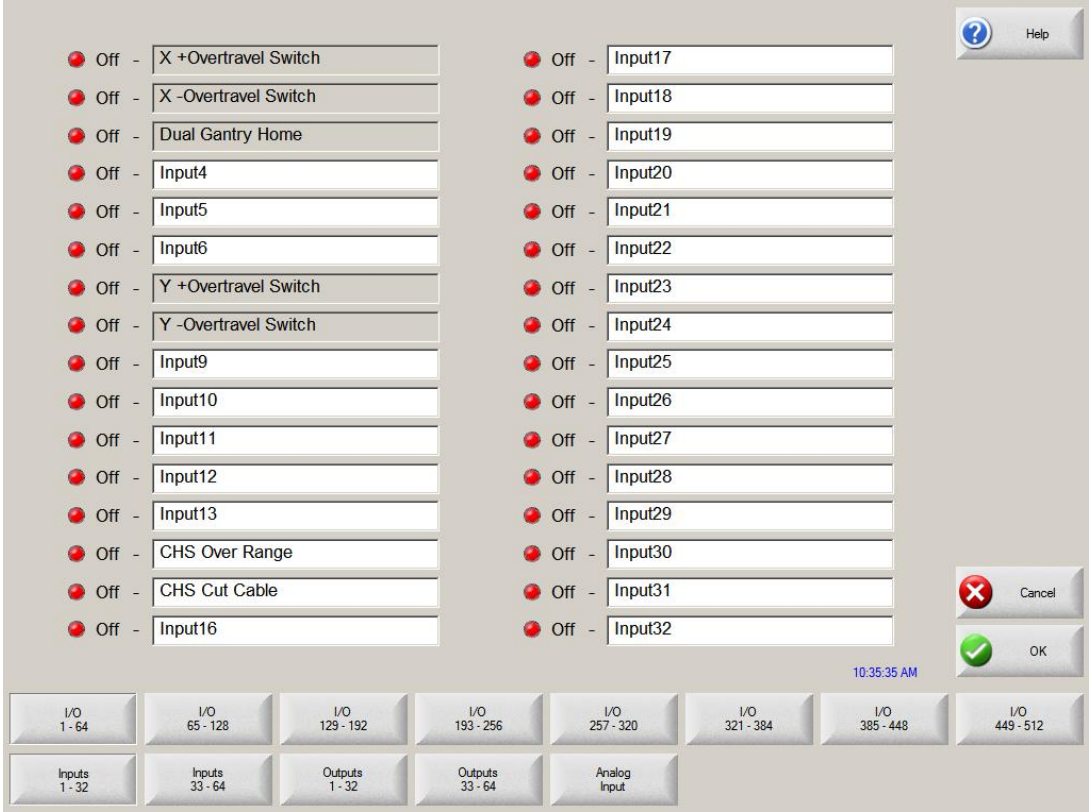
Warning: When you activate the control's outputs manually, the machine, torch and marker can move and the cutting device can activate.

You can change the name of outputs that are displayed with a white background. To change the output name, use the Previous/Next arrow key to highlight an output and type the new output name. The output can be connected to the control and used as commanded in the part program. For example, the EIA M22 and M23 code will turn on and off output 12.

Note: The number and name of the outputs depends on the control software and hardware configurations.

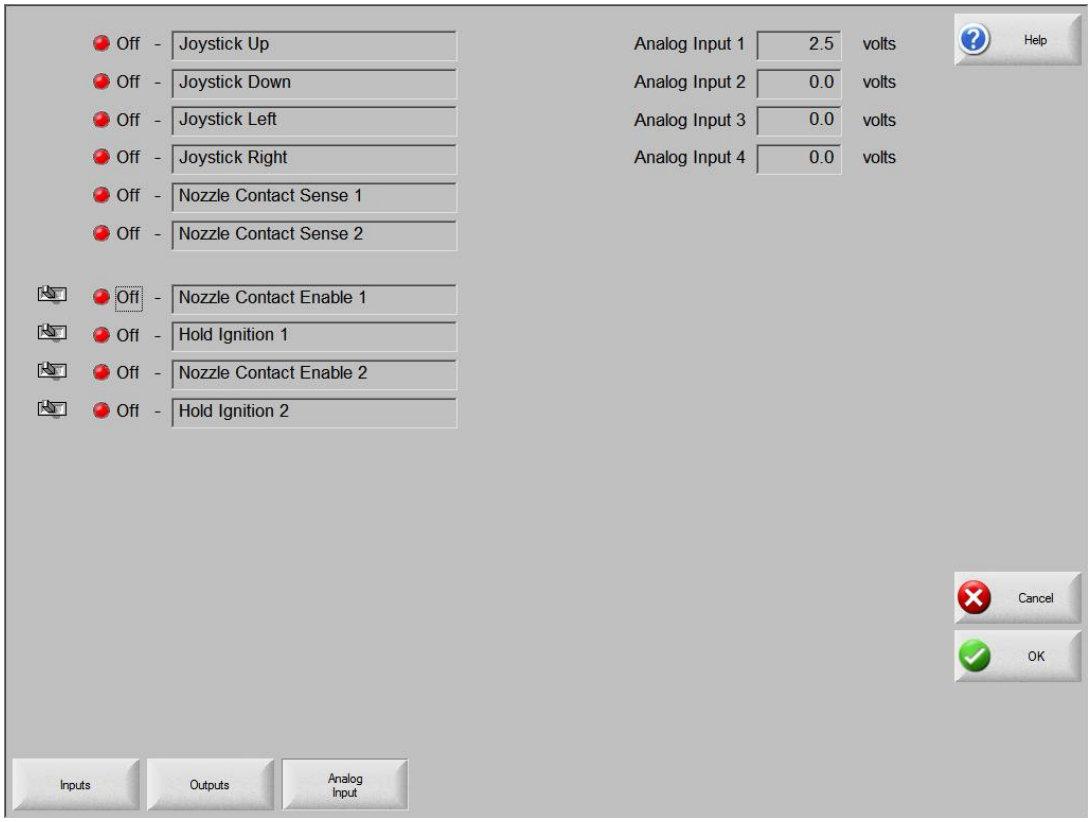
Expanded I/O

For controls equpped with more than 64 I/O, a series of selection softkeys are available to access the required inputs, ouputs and analog I/O.



Note: The optional USB Front Panel I/O is not accessible from the I/O Diagnostics screen. Functionality for the USB Front Panel can be tested through the Keyboard Diagnostics.

Analog Input Diagnostics



Note: The appearance of the View screen depends on the type of Analog Input Card that is installed.

Inputs

The Analog Input Card required to operate the optional Joy Stick and Speed Pots is equipped with six low voltage inputs that are optically isolated and can operate at 24 – 120 VAC/DC. The first four inputs are used for the optional joystick feature. Inputs five and six are used to support THC One and THC Two Nozzle Contact Sense respectively. The Input Logic for these inputs is normally open.

Analog Inputs

The Analog Input values shown in the upper right hand of the screen are the voltages coming into the analog card. Analog Inputs 1 and 2 are used for THC 1 and 2. Analog inputs 3 and 4 are used for optional external speed pots.

Serial Port

This diagnostic screen allows you to test the control serial ports. To perform the test, install the appropriate jumper or jumpers. If the serial port you are testing is configured for RS-232, jump pin 2 to pin 3. If you are testing a serial port that is configured for RS-422, jump pin 2 to pin 3 and pin 4 to pin 7. Select the appropriate serial port to test and press the Test Port soft key to initiate the test.

If the serial port is functioning properly, the text in the Send window will appear in the Received window. If the serial port is not functioning properly, a Communications Time Out message will appear below the Received window. If the serial port test fails, the control may be defective and the factory should be consulted for further instructions. Below is a serial port test screen with a successful test.

Port

Select the port that you want to test.

Test

Select a single or continuous signal to send for testing.

Send window

Contains the text that will be transmitted during the serial port test.

Received window

Displays the text that is received during the serial port test. If the test is successful, the text in the Send and Received windows is the same.

Test Port

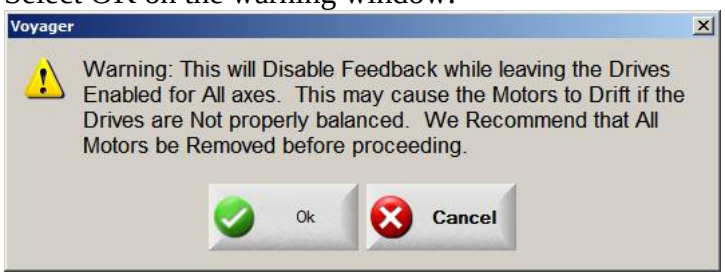
The soft key that initiates the serial port test on the selected port.

Drives and Motors

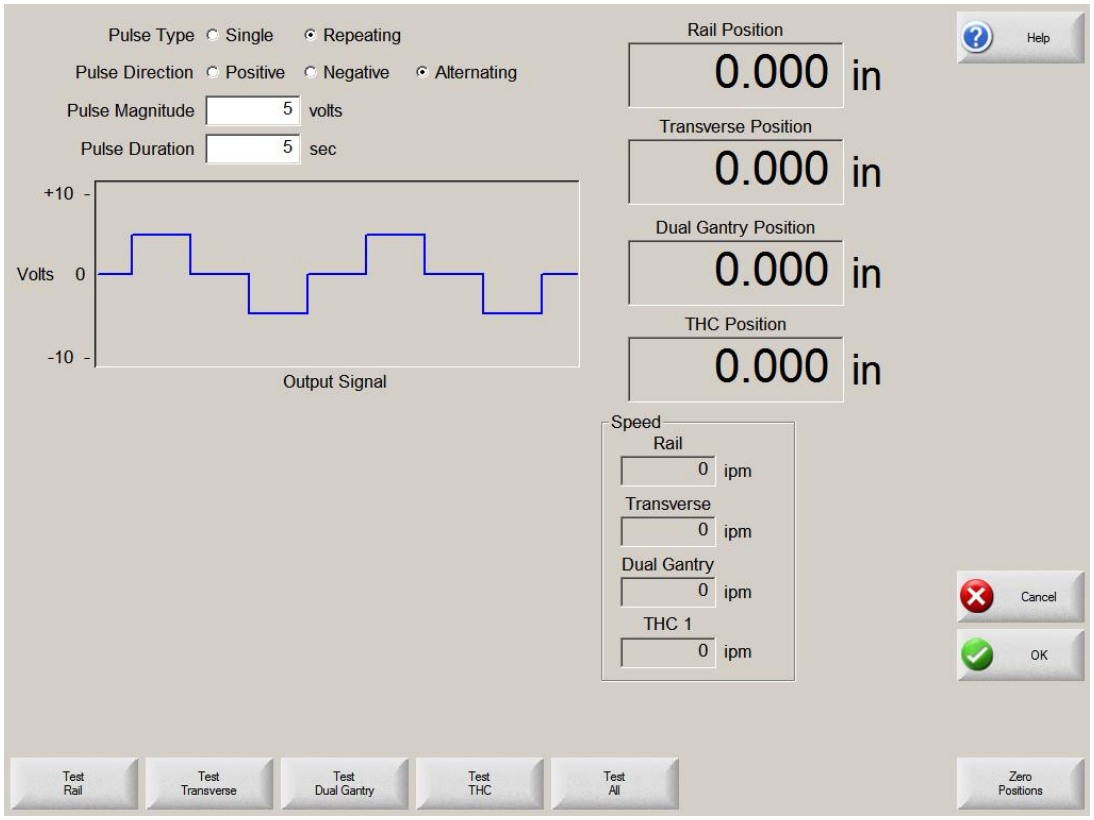
The Drives and Motors diagnostic screen allows a technician to send a direct signal to the drive amplifiers for testing, without enabling the servo loop.

Warning! Use extreme caution when you send direct signals to the drive amplifiers. Unexpected motion on the cutting table can occur.

Select OK on the warning window:



Enter the machine password to view the Drives and Motors screen:



Pulse Type
Select the kind of pulse, single or repeated, that is sent to the drive amplifier. If you select a repeated pulse, the signal continues until the Test soft key for that axis is pressed again.

Pulse Direction
Selects the direction of the pulse; positive, negative or alternating, that is sent to the drive amplifier.

Pulse Magnitude
Sets the voltage of the signal that is sent to the drive amplifier.

Pulse Duration
Sets the amount of time for each segment of the signal that is sent to the drive amplifier.

Test Transverse/Rail/Dual Gantry/CBH
The Test buttons send the selected output signal to the appropriate drive amplifier. If a repeating signal has been selected, any combination of available test buttons can be used for the test. The output signal is sent to the drive amplifier until the output soft key has been pressed a second time to end the test.

Test All
Sends the selected output signal to all drive amplifiers.

Speed
The Speed window displays the current speed for each axis.

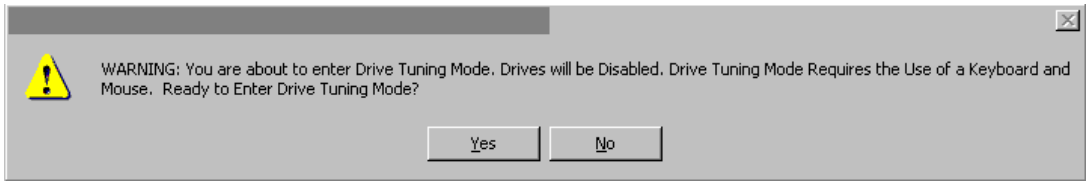
Note: When more than four axes are selected, the user must select which group of axes will be tested on the Drives and Motors Diagnostic screen:

SERCOS Drives and Motors

The SERCOS Interface allows the user to expand the number of axes available for use. Motion commands are sent to the drives is over a serial link using diagnostic software provided by the Drive vendor.

Warning! Use extreme caution when you send direct signals to the drive amplifiers. Unexpected motion on the cutting table can occur.

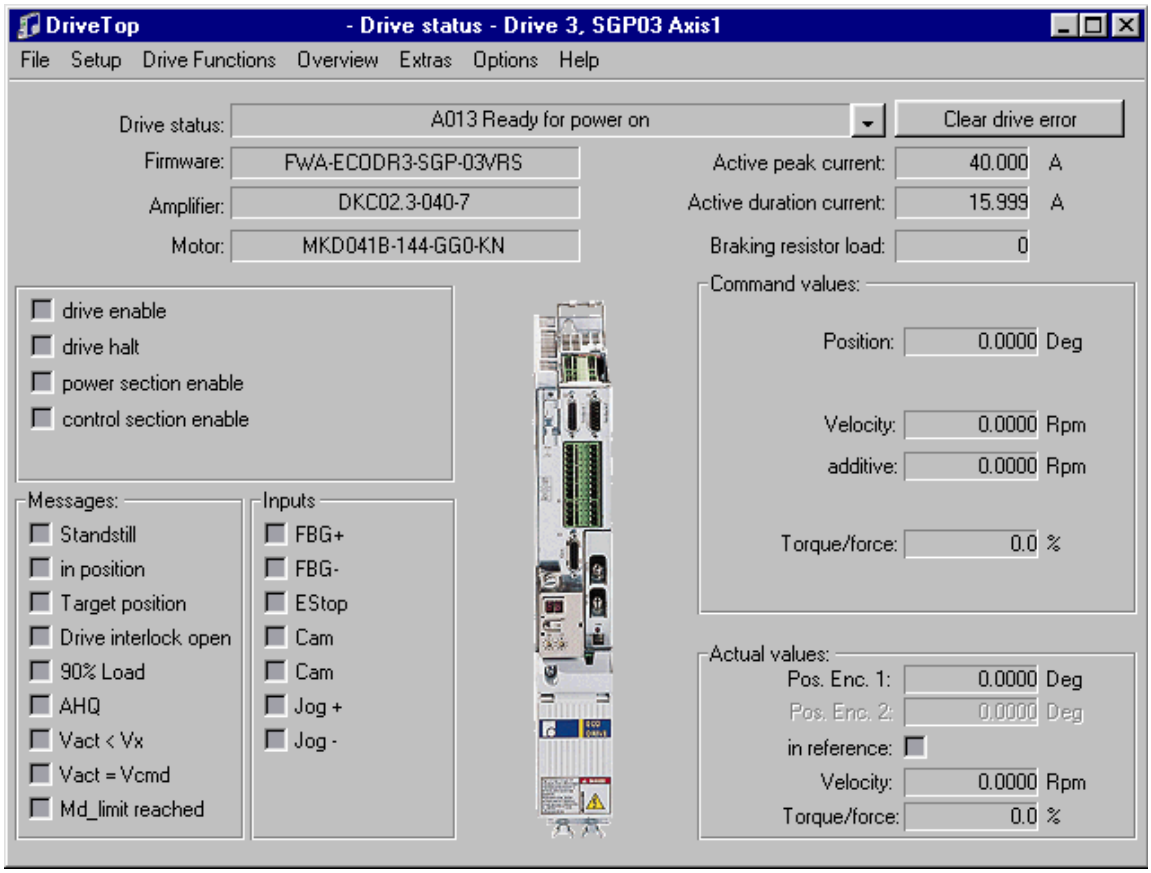
Press Yes on the following warning message window:



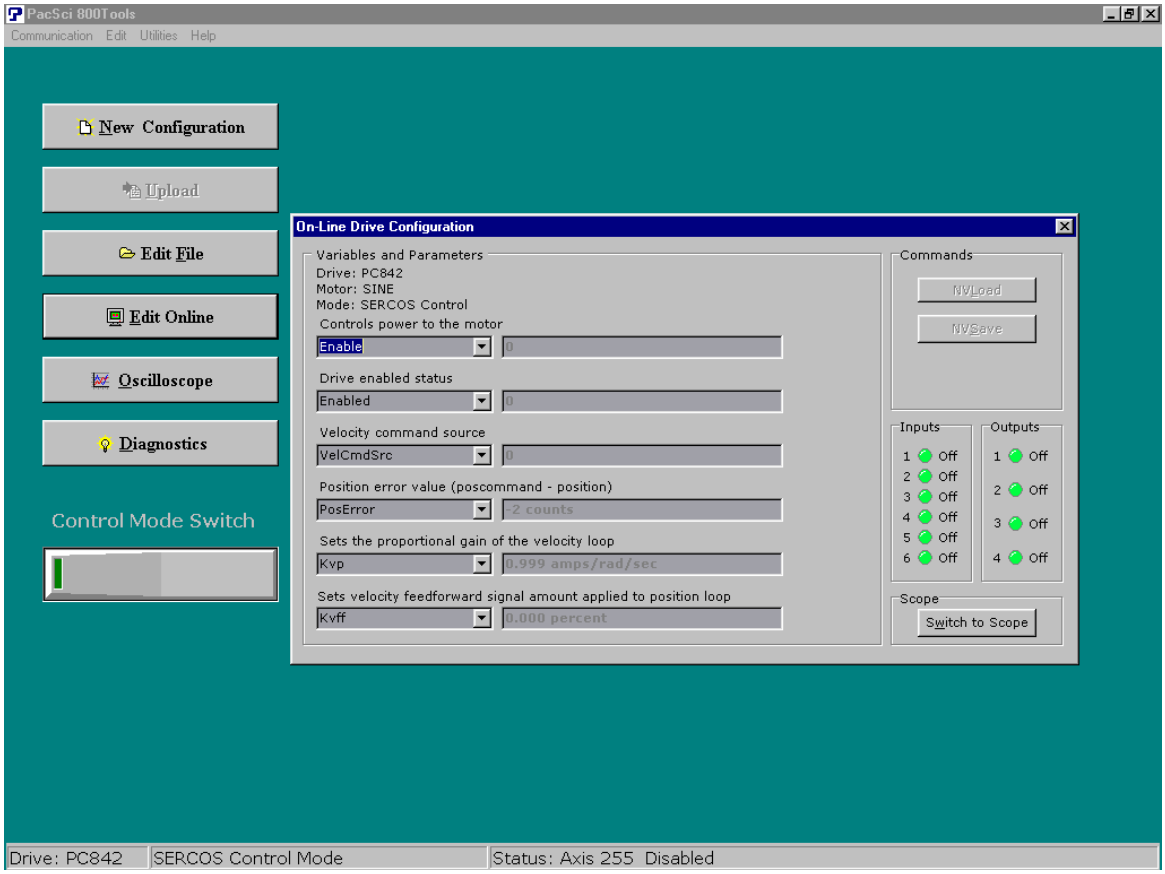
When the Drive and Motors Diagnostics screen displays, the appropriate drive communications software is launched for the drive that you selected. Refer to information supplied by the drive vendor on how to use the drive setup software for the drive that you selected. The following sections provide some examples of drive setup and tuning software.

Note: Screen resolution may temporarily change during the use of these utilities.

DriveTop from Indramat



PacSci 800Tools from Pacific Scientific



Error Messages

The control displays error messages when programming, machine, or internal errors are detected. A list of the common error messages are explained below in the following sections.

SERCOS Errors

A number of different errors can be posted from the SERCOS Interface for both motor and I/O performance. The error messages are specific to the drive and I/O modules in use. Refer to information supplied by the drive and I/O hardware supplier for the appropriate actions.

SERCOS Ring Not Running

This error indicates that communication with the SERCOS ring has been lost. Generally, this is caused by a fault condition on the ring. Check SERCOS hardware and cycle power.

No Part Loaded

This message displays if the control does not contain a valid part program in memory. To clear this error message, load a valid part program from either the Shape Library, hard drive, diskette USB memory, or from a host system.

Part Larger than Plate

This message displays if the part program that has been loaded is larger than the plate size information in Setups. The operator can ignore the message and continue the cut or return to Setups to correct the plate size.

Kerf too Large, Arc/Line has Disappeared. Abort Cut?

This message displays if the kerf size selected is too large and will affect the shape of the part. The operator can continue to cut the part, abort the cut to review the kerf that was selected, or abort the cut to review the part program for errors. If the operator chooses to continue cutting the part program that prompted this error, unexpected results can result.

Cut Sense Lost

This message displays if the Arc ON Feedback setup parameter is enabled and the Cut Sense input is deactivated by the plasma unit while cutting. When this condition occurs, the control displays the Pause screen. The operator can then use the Cut Recovery feature to finish cutting the piece.

Communications Time Out

This message displays if the host system does not respond within the time set in the Link Time Out field for either a Host Upload or Download.

To correct this problem:
- Increase the Link Time Out setup parameter.
- Check the communications setup parameters on the host system and the control.

Host Not Responding
This message displays if communication to the Host system is lost after initial communication has been established.

To correct this problem:
- Re-establish communications to the host by exiting and re-entering the Upload or Download to Host screens.
- Review the communications setup parameters on the Host system and the control.

Scale Factor must be between .001 and 1000
This message displays if a value less than .001 or greater than 1000 is entered for a Scaling Factor.

To correct this problem, enter a value between .001 and 1000 for the Scaling Factor.

Radius at Arc Beginning and Radius at Arc End are not within the Arc Radial Error Tolerance
This message displays if the radius beginning-arc and the radius-ending arc of a part program are not within the Arc Radial Error setup parameter in the Main Setup screen.

To correct this problem:
- Increase the Arc Radial Error Tolerance setup parameter.
- Correct the part program itself.

Transverse Position Error Exceeded
This message displays if the current Transverse position error exceeds the Servo Error Tolerance Setup parameter in the machine setups screen. This message also displays if the position feedback loops are not operating properly, or the machine is being commanded to move or accelerate faster than it is able.

Generally, this error is displayed if the setting for Incremental or Absolute EIA I and J codes is set to the wrong state for the active part program. To correct this problem:

- Increase the Servo Error Tolerance Setup parameter in the machine setups screen.
- Re-tune the system.
- Decrease the Maximum machine speed setup or acceleration rate setup parameters.

Rail Position Error Exceeded

This message displays if the current Rail position error exceeds the Servo Error Tolerance Setup parameter in the machine setups screen. It can also appear if the position feedback loops are not operating properly or if the machine is being commanded to move or accelerate faster than it is able.

This error generally indicates a servo drive or motor problem. To correct this problem:

- Check for fault indications on the servo drives.
- Increase the Servo Error Tolerance Setup parameter in the machine setups screen.
- Re-tune the system.
- Decrease the maximum machine speed setup or acceleration rate setup parameters.

Dual Gantry Position Error Exceeded

This message displays if the current Dual Gantry position error exceeds the Servo Error Tolerance Setup parameter in the machine setups screen. It also may appear if the position feedback loops are not operating properly or the machine is being commanded to move or accelerate faster than it is able.

This error generally indicates a servo drive or motor problem. To correct this problem:

- Check for fault indications on the servo drives.
- Increase the Servo Error Tolerance Setup parameter in the machine setups screen.
- Re-tune the system.
- Decrease the Maximum machine speed setup or the acceleration rate setup parameters.

Transverse Positive Hardware Overtravel Reached

This message displays if the control detects a positive limit switch in the Transverse axis. This can also occur if the limit switch input is set for the wrong polarity or the limit switch wiring is not properly connected.

This error generally indicates a servo drive or motor problem. First check for fault indications on the servo drives. If the Transverse axis tripped the positive limit switch, use Manual mode to jog the Transverse axis away from the limit switch.

Rail Positive Hardware Overtravel Reached

This message displays if the control detects a positive limit switch in the Rail axis. This can also occur if the limit switch input is set for the wrong polarity or the limit switch wiring is not properly connected.

If the Rail axis tripped the positive limit switch, use Manual mode to jog the Rail axis away from the limit switch.

Transverse Negative Hardware Overtravel Reached

This message displays if the control detects a negative limit switch in the Transverse axis. This can also occur if the limit switch input is set for the wrong polarity or the limit switch wiring is not properly connected.

If the Transverse axis tripped the negative limit switch, use Manual mode to jog the Transverse axis away from the limit switch.

Rail Negative Hardware Overtravel Reached

This message displays if the control detects a negative limit switch in the Rail axis. This can also occur if the limit switch input is set for the wrong polarity or the limit switch wiring is not properly connected.

If the Rail axis tripped the negative limit switch, use Manual mode to jog the Rail axis away from the limit switch.

Transverse Positive Software Overtravel Reached

This message displays if the Transverse axis position is greater than the Maximum Travel Limit setup parameter for the Transverse axis.

If this occurs, use Manual mode to jog the Transverse axis to a position within the Travel Limit setup parameters.

Rail Positive Software Overtravel Reached

This message displays if the Rail axis position is greater than the Maximum Travel Limit setup parameter for the Rail axis.

If this occurs, use Manual mode to jog the Rail axis to a position within the Travel Limit setup parameters.

Transverse Negative Software Overtravel Reached

This message displays if the Transverse axis position is less than the Minimum Travel Limit setup parameter for the Transverse axis.

If this occurs, use Manual mode to jog the Transverse axis to a position within the Travel Limit setup parameters.

Rail Negative Software Overtravel Reached

This message displays if the Rail axis position is less than the Minimum Travel Limit setup parameter for the Rail axis.

If this occurs, use Manual mode to jog the Rail axis to a position within the Travel Limit setup parameters.

Dual Gantry Skew Error Exceeded

This message displays when the control has detected a position error fault between the two drive axes on the dual gantry. It also may appear if the position feedback loops are

not operating properly, or the machine is being commanded to move or accelerate faster than it is capable.

To correct this problem:

- Increase the Skew Error Tolerance Setup parameter in the machine setups screen.
- Re-tune the system.
- Decrease the maximum machine speed or the acceleration rate setup parameters.

Need Station Selection

This message displays if the input for a station or process has not been activated. Example: When cutting in Plasma mode, a Plasma 1 or Plasma 2 input may be required to execute the selected Plasma cut process.

Buffer Time Out

This message displays if there is an instance where the motion buffer is full and cannot record the data being saved. This error allows the operator to stop the motion, back up on path to the last pierce and start over without a position error. This error should be reported to the control vendor.

CNC Time Out

This is a general error that may appear if there is an instance when any buffer is full and cannot record the data being saved. This error allows the operator to stop the motion, back up on path to the last pierce and start over. This error should be reported to the control vendor.

Unable to Find HASP

The HASP is a hardware protection key (dongle) that enables the software. If the HASP is not installed, the control will not work. If this message appears and the hardware key is in place, contact your control vendor for assistance.

Norton Ghost Utility

If a disaster occurs and prevents the control from operating, the Norton Ghost™ Utility is available on specified controls to replace core system files and re-enable operation of the control. Norton Ghost must be installed on the control hard drive with an appropriate ghost image file.

The Norton Ghost Utility works by allowing you to retrieve an image file from the drive D: partition of the hard drive to replace all data on drive C: The Ghost Image can be a factory default or custom user created image files.

Note: All current information on Drive C: will be lost. You should create a unique user image after table configuration which includes all the important table settings.

This feature may be executed from the System Tools screen or through use of a Ghost image utility. This tool is available from the control supplier and transmitted over the Internet.

- Create Utility from E-mail -- To create a Norton Ghost tool utility from the compressed software sent via the Internet:
- USP Memory --Instructions to download USB format tools and files are available to create a bootable USB device. Specific batch files to run the utility are included.
- Diskette -- The file sent by the Internet will be an auto-executable file which will place the required files onto a diskette to be used at the control.

To copy the executable file to a diskette:
1. Place a blank diskette into your PC.
2. Double click on the recovery EXE file.
   A message box displays.
3. Click on the “Create Floppy” button to copy the files.
   The EXE will copy the new files to the floppy disk to take to the control.

Create a Ghost Recovery File

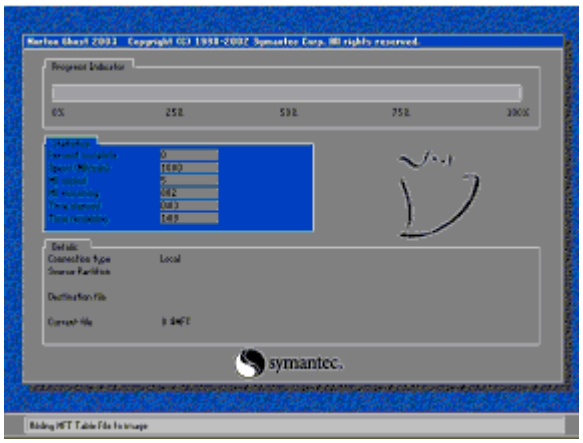
To create a Custom Image File:
1. Place the Norton Diskette or USB memory device into the control.
2. Turn the control on. Norton Ghost displays:

```
Starting PC DOS.......
.
.
.
Select 1 to make a New Backup Image or 2 to restore
existing [1,2]
```

3. Press 1 to create a new back up image.
   You can create up to three custom images. They are created as “newest” to “oldest”

image and are automatically assigned. The “original” ghost image is the factory default and cannot be over written.
Back up begins automatically:

```
--------------Backing Up Drive, Please Wait ---------------
```



The following Message appears when the backup is complete:

```
---- Back Up Complete, Please Remove Disk and Reboot -----
```

4. Remove the diskette or USB memory device.
5. Turn the control off and then on.
   You may need to reload table setups and software updates if the image is not current.

Retrieve an Image File

To retrieve an image file:
1. Place the Norton Diskette or USB memory device into the control.
2. Turn the control on.
   Norton Ghost displays:

```
Starting PC DOS.......
.
.
.
Select 1 to make a New Backup Image or 2 to restore
existing [1,2]
```

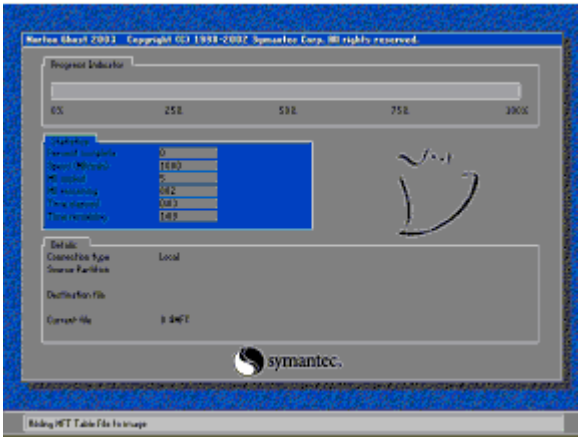
3. Press 2 to retrieve the back up image.
   You can create up to three custom images. They are created as newest to oldest image. The original ghost image is the factory default. The next message allows the user to select which version to use when restoring:

```
1. Newest.gho
2. Older.gho
3. Oldest.gho
4. Original.gho

Select the Number of the Image to restore from the
choices above [1,2,3.4 ]
```

4. Press the number for the image that you want to retrieve.

```
--------------------Restoring, Please Wait ----------------
```



Norton Ghost launches and displays messages to indicate the progress of the restore. The following message displays when the restore is complete:

```
--------------------End Restoring, Please Remove Disk and Reboot ----------------------
```

Remove the diskette or USB memory device. Turn the control Off and then On. Table setups and software updates may need to be reloaded if the image is not current.

Password Setups

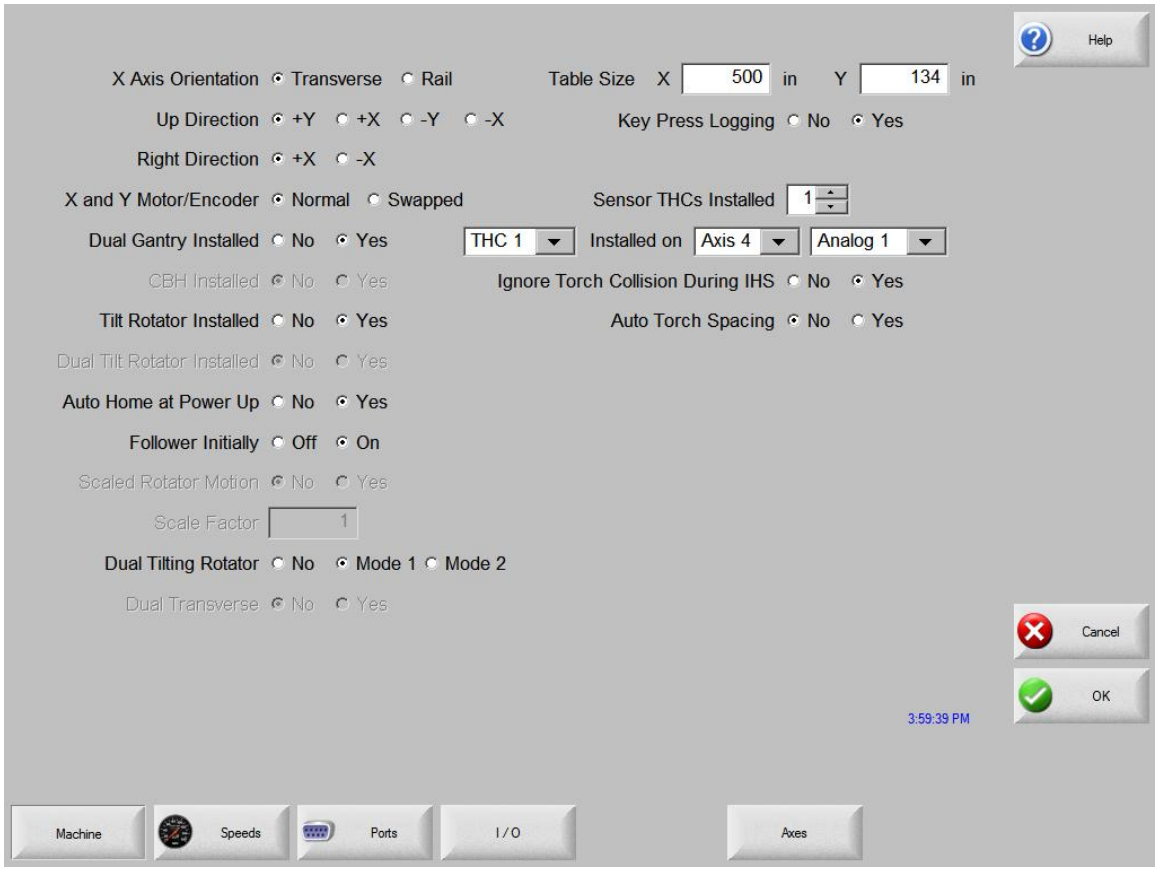
The following setup screens are only available with the supervisory passwords. This prevents unauthorized personnel from entering these screens.

 **Warning!** Only trained service personnel should have access to these passwords. Incorrect settings can cause machine damage.

The 2865 password allows you to view the machine, speeds, link and axes setups without making changes. This password is useful for verifying setups without the danger of accidentally changing them or revealing the supervisory password to an unauthorized user.

 **Note:** After the CNC is installed on the cutting table or setup parameters are changed, save the current setup file to both the hard drive and a floppy disk for future reference.

Machine



X Axis Orientation
Specifies the X axis as the transverse or rail axis. The default setting is Transverse. This parameter should be set before cutting the part.

Up Direction
Defines the machine motion when the ↑ arrow key is pressed during manual mode.

Right Direction
Defines the machine motion when the → arrow key is pressed during manual mode.

Dual Gantry Installed
Select Yes to enable the dual gantry axis and allow configuration of that axis.

CBH Installed
Select Yes to enable the contour bevel head axis and allow configuration of that axis.

X and Y Motor/Encoder
Select Swapped to swap the X and Y Axis encoder signals internally. This feature simplifies the installation of systems with alternative wiring configurations.

Auto Torch Spacing
Select Yes to enable the automatic torch spacing feature. This feature uses embedded part program codes and dedicated outputs to control individual torch stations to set spacing and clamping of direct and mirrored cutting. Refer to the Auto Torch Spacing information for additional information.

Tilt Rotator Installed
Enables use of the Tilt Rotator feature. Tilt Rotator is a unique rotational cutting tool that combines a rotational axis with a tilt (bevel) axis that performs for compound cutting.

Note: The Tilt Rotator feature executes the tilt-angle motion over the length of the line segment.

Dual-Tilt Rotator Installed
This parameter enables use of a second tilt rotator feature. A second transverse axis is enabled and allows individual, parallel, and mirror cutting.

Auto Home at Power Up
Determines if the contour bevel head (CBH) and tilt or rotate axes automatically go into the homing routine when the CNC powers up.

Follower Initially
Determines whether the CBH and rotate features are always enabled after power up or are enabled through the part program.

Dual Tilting Rotator Mode
Defines the tilt rotator to use two tilt axes rather than a rotation axis and tilt axis for rotational bevel cutting. The Tilt Rotator Installed must be selected for this feature.

Key Press Logging
Records key press and other related information in a daily log file. This log is intended for use by Service Technicians when a fault occurs to help review events before the fault occurs. When logging is enabled, the log file is saved to the hard drive so it can be retrieved by transfer to a floppy diskette or USB memory. Usually this parameter is set to NO.

Table Size
Enter a value for the active cutting area for the X and Y axis. These values limit the plate size parameter in the cutting setup screen to the maximum size of the table.

THCs Installed
Defines the total number of Sensor THC axes assigned for operation at the control.

THC Installed On Axis / Analog
Defines the THC axis. Select the THC, which axis it is installed on, and the analog input to use (arc voltage feedback).

Note: Refer to the Station Configuration and Sensor THC sections of this guide for additional information on the setup and use of the Sensor THC.

Ignore Torch Collision During IHS
Allows the system to ignore input about a torch collision during the initial height sense cycle. This may be helpful for some THC mechanics.

Command THCs Installed
Enables the Command THC serial link. For more information on this feature, refer to the Command THC section of this guide. Shown in Type P mode only.

SERCOS

The SERCOS interface requires configuration to establish communications for motion and I/O.

The following drives are supported and are preferred:

Indramat/Bosch
- IndraDrive Mi
- IndraDrive C basic drive
- IndraDrive C basic drive with MA1 option
- IndraDrive C advanced drive
- IndraDrive C advanced drive with MA1 option

Kollmorgen
ServoStar 300

The following drives are also supported:

Indramat/Bosch
IndraDrive M Double Drive (I/O on drives is not supported)
EcoDrive 03
EcoDrive Cs

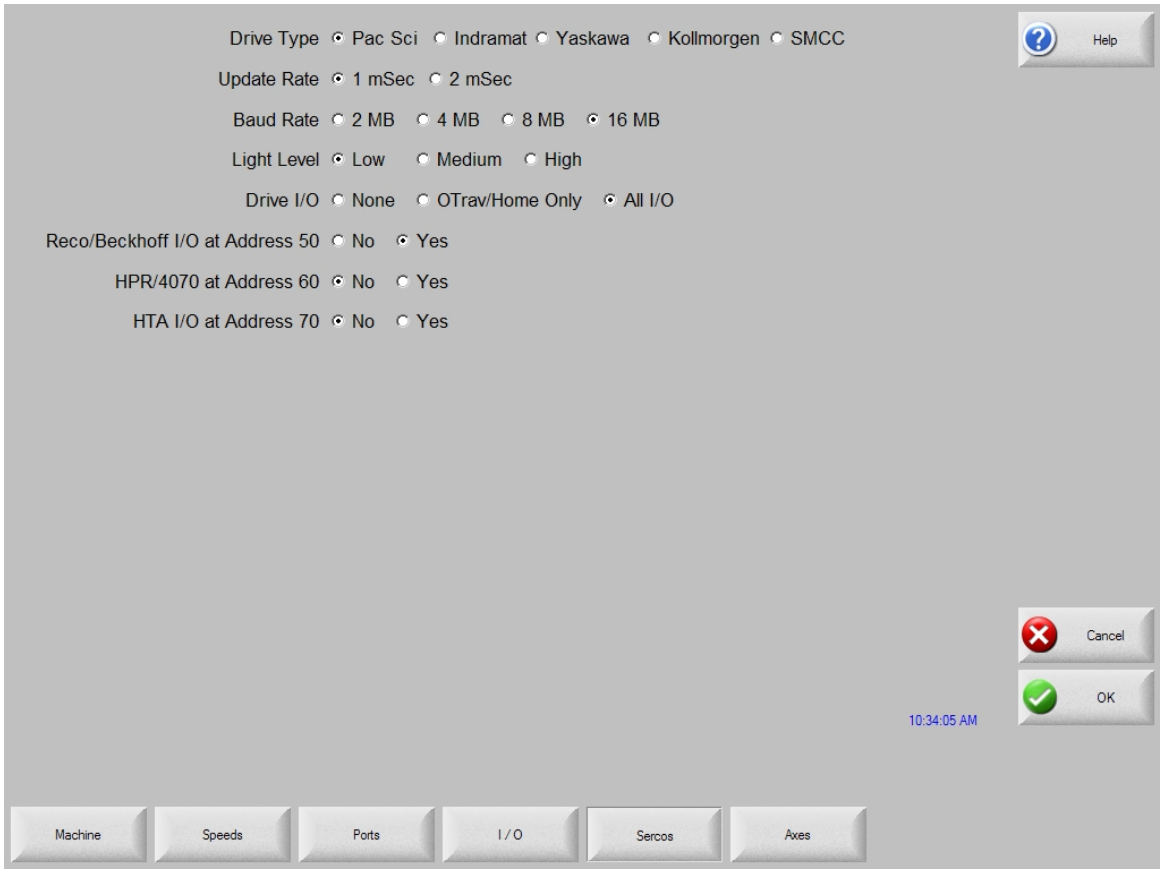
Kollmorgen/Danaher
ServoStar 600
SSCD

Yaskawa
Sigma II with TRIO SERCOS adapter

PacSci
PC840 Series

The SERCOS I/O modules that are supported include:
- 1 Reco Inline SERCOS node
- 1 Reco 02.2 SERCOS node
- 1 Beckhoff SERCOS node
- 1 Hypertherm Automation I/O SERCOS node

Note: A single Hypertherm Automation I/O node can be configured with either 1 Reco or 1 Beckhoff node. No more than one Reco or Beckhoff I/O node can be enabled.



Drive Type
Select the manufacturer of the SERCOS style drive. This makes the proper operation and tuning parameters and software available.

Update Rate
Select the motion and I/O update rate for the SERCOS ring. One millisecond is recommended but the actual value depends on the capabilities of the hardware being used.

Baud Rate
Select the communication rate for the SERCOS ring. This is determined by the type of drive and I/O being used.

Light Level
Adjust the intensity of the light pulses used on the fiber optic ring. This feature compensates for diminished signal due to issues such as ring distance.

Drive I/O
Select the I/O options that are supported on the drive amplifier; None, Overtravel and Home Switches, or All I/O.

Note: The drive I/O populates the general purpose I/O (both analog and digital) in order from the lowest SERCOS drive axis to the highest SERCOS drive axis. All I/O is the default setting for the SMCC interface.

RECO/Beckoff I/O at Address 50

Select Yes if the Indramat RECO or Bechkoff I/O module is being used to expand the total number of I/O on the fiber optic ring.

Note: The RECO I/O will populate the general purpose I/O (both analog and digital) following all drive I/O.

HPR/4070 at address 60

Select Yes if the optional SERCOS interface for HPR/4070 is being used.

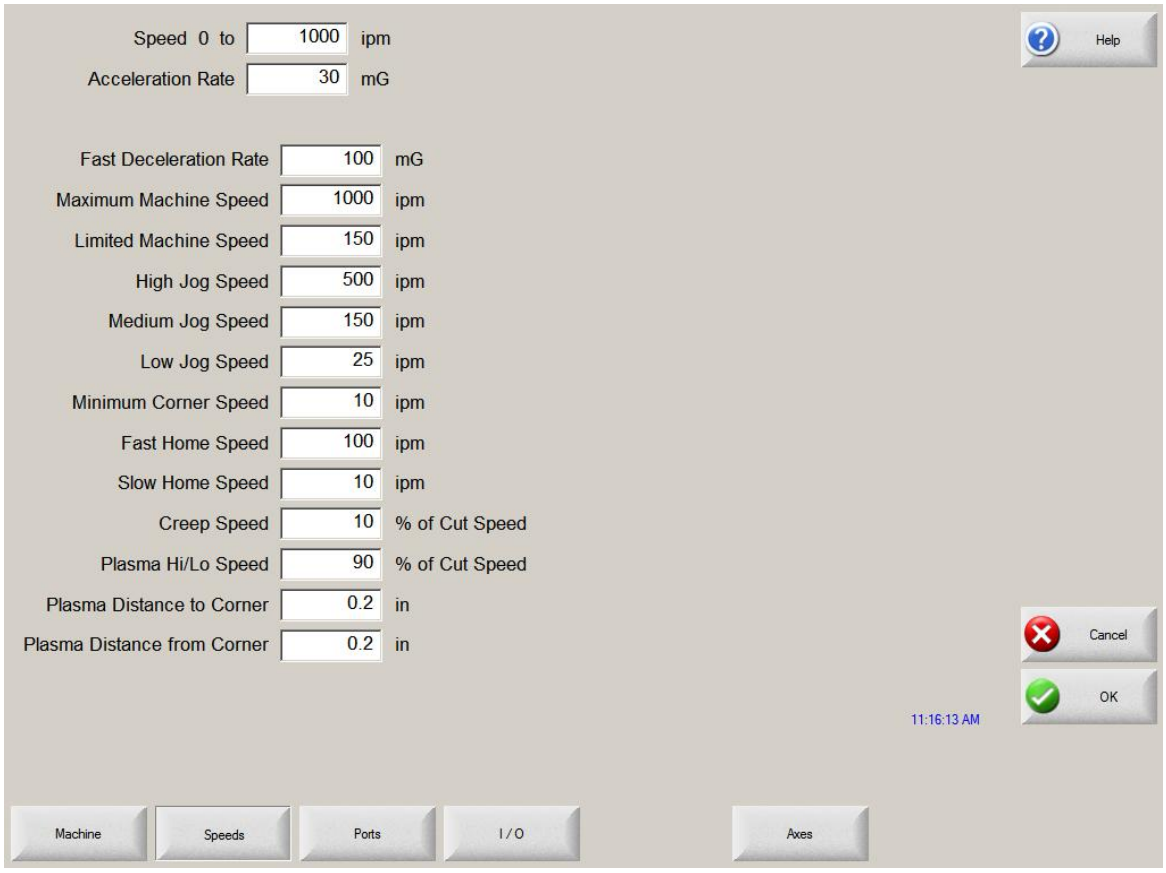
HTA I/O at Address 70

Select Yes if the optional Hypertherm SERCOS interface card is being used.

Speeds

The Speeds setup screen is where you set the machine speeds for the operating modes.

The CNC is capable of operating over a wide range of speeds, depending on the drives, motors, gearboxes and mechanics of the system.



Speed 0 To

Specifies speed ranges and customizes the acceleration rates for these speeds. When a speed range that is lower than the maximum speed is entered, a new range at the maximum machine speed setting is created. You can set a maximum of 5 speed ranges.

To reduce the number of Speed To ranges, enter the maximum speed in the highest range and the additional range fields will be removed from the screen.

Acceleration Rate

Determine both the acceleration and deceleration rate for all motion.

All mechanical systems have different acceleration and deceleration rates to move the cutting device smoothly. The higher the acceleration rate, the quicker the machine will get up to speed. The lower the acceleration rate the smoother the machine will position the cutting device.

Enter a value in milliGs for the desired acceleration rate. One milliG is approximately 0.384 inches per second^2. A recommended, initial value for this field is 10 mGs.

Fast Stop Deceleration Rate

This parameter is activated by the Fast Stop or Torch Collision Input and specifies in milliGs how quickly the system will stop when the Fast Stop Input is active. Generally, this value is much higher than the acceleration rate.

One milliG is approximately 0.384 inches per second^2.

Maximum Machine Speed

Enter the maximum value at which the system is capable of contouring. This parameter is used to limit the range of all subsequent speed entries. In addition, it is used to scale the speedometer in the Watch window during runtime operation.

The maximum speed at which the CNC can contour can be calculated with the following equation.

Maximum Contouring Rate (IPM) =

$$\frac{60 \text{ seconds}}{\text{minute}} \Theta \frac{1 \text{ Inch}}{\text{User edges}} \Theta \frac{100{,}000 \text{ edges}}{\text{second}}$$

For example: the CNC could command a cutting machine with 4000 edges per inch resolution at 1,500 IPM.

Limited Machine Speed

Defines maximum machine speed when the Limited Speed Input is active. This is commonly used to set a reduced machine speed for increased safety during machine testing or maintenance.

High Jog Speed

Defines the high speed for manual motion.

Medium Jog Speed

Defines the medium speed for manual motion.

Low Jog Speed

Defines the low speed for manual motion.

Minimum Corner Speed
Defines the minimum speed to use when negotiating corners. The CNC has centripetal velocity and acceleration contouring algorithms which provide optimal cut quality for most cut operations. In some situations, a minimum corner speed prevents over-burning at corners. In normal operations, this parameter should be set to zero.

Fast Home Speed
Defines the speed that the CNC uses during the first phase of the homing sequence. During the first phase, the cutting device moves toward the home limit switches at the fast rate.

Slow Home Speed
Defines the speed that the CNC uses during the second phase of the homing sequence. During the second phase, the cutting device moves off the home limit switch and proceeds to the marker pulse. When the CNC detects the marker pulse, it decelerates to a stop and performs a small move in the opposite direction to the marker pulse.

Creep Speed Percentage
Defines what percentage of the machine cut speed will be used when creeping. Generally, creep speed is 25% of the cut speed.

Plasma Hi/Lo Speed Percentage
Specifies the percentage of the Cut Speed at which the CNC activates the Torch Height Disable output. The plasma system uses this output to switch from low to high current or to disable the height control.

Note: The Dual Grid/THC feature must be enabled at the Plasma Setups Screen.

Plasma Distance To Corner
Specifies the distance before turning a corner at which the plasma system should switch from high current to low current and disable the automated height sensor. Distance to Corner is active whenever the speed drops below the Plasma Hi/Lo Percentage, or segments intersect at an angle greater than the tangent angle.

Note: The Dual Grid/THC feature must be enabled at the Plasma Setups Screen.

Plasma Distance From Corner
Specifies the distance after turning a corner at which the plasma system should enable the Automated Height Sensor. Distance from Corner is active whenever the speed drops below the Plasma Hi/Lo Percentage, or segments intersect at an angle greater than the tangent angle.

Note: The Dual Grid/THC feature must first be enabled at the Plasma Setups Screen.

For additional details on how the Torch Height Disable feature of this CNC operates, please refer to the Cutting Section of this guide.

CBH Speed Setups

The CBH speed setup parameters display only if they have been enabled.

CBH Acceleration Rate

Specifies the acceleration rate for smooth and stable movement of the contoured bevel head. The higher the acceleration rate, the quicker the CBH will get up to speed. The lower the acceleration rate, the smoother the machine will position the cutting device. Values are entered in revolutions/second^2.

Maximum CBH Speed

Specifies the maximum speed for the CBH rotation in revolutions/minute.

CBH High Jog / Home Speed

Specifies the manual CBH jog and fast Home speed.

CBH Low Jog / Home Speed

Specifies the CBH slow home speed.

THC Speed Setups

The THC speed setup parameters display only if they have been enabled.

THC Acceleration Rate

Specifies the acceleration rate for smooth and stable movement of the Sensor THC. The higher the acceleration rate, the quicker the THC will get up to speed. The lower the acceleration rate, the smoother the machine will position the cutting device. Values are entered in milliGs.

Maximum THC Speed

Specifies the maximum speed for the Sensor THC in inches / minute.

THC Jog Speed

Specifies the THC jog speed.

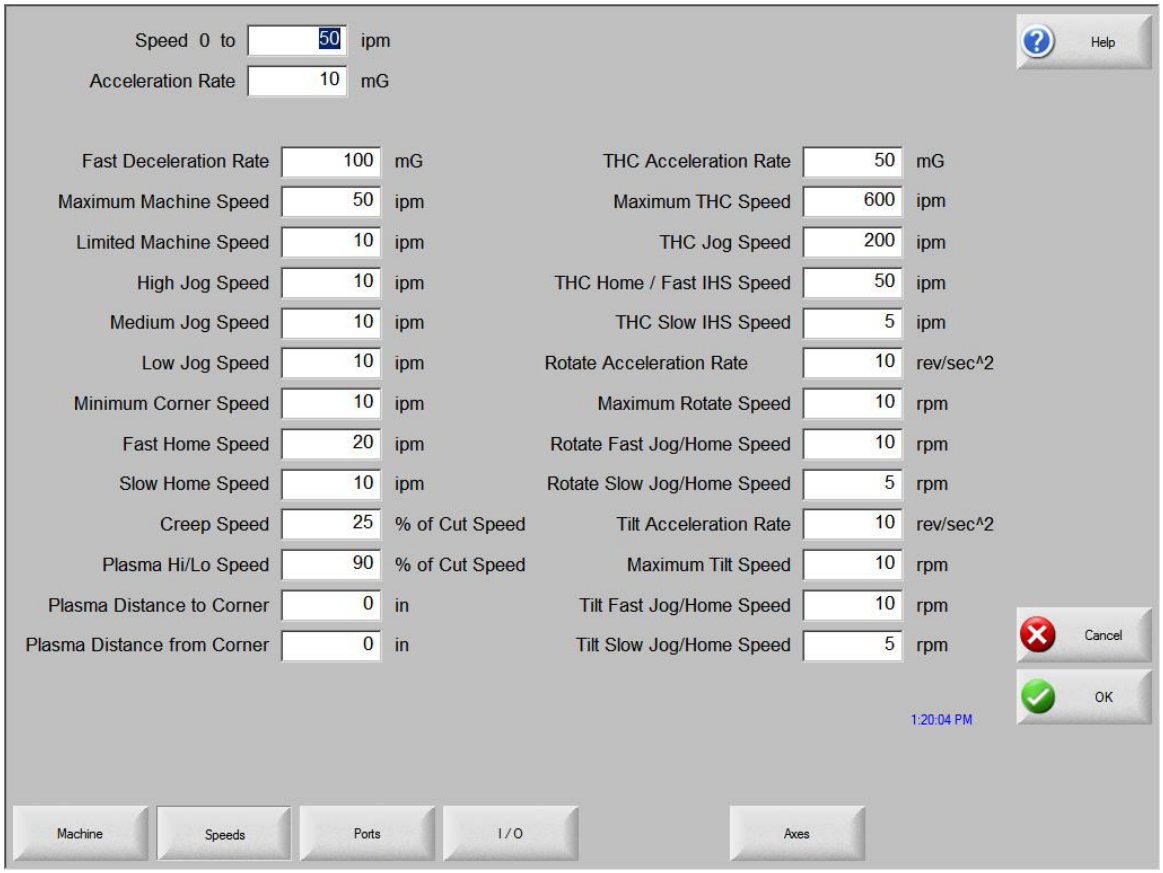
THC Home/Fast IHS Speed

Specifies the speed that is used to home the torch at the top of the slide and to move the torch from the selected IHS height towards the plate, looking for the surface of the plate.

THC Slow IHS Speed

Specifies the speed that is used to retract the torch after the plate has been sensed. The torch retracts at this speed until contact sense is lost. This determines the exact distance to the plate regardless of any flexing of the plate. A very low speed is recommended for optimal accuracy.

The following Speeds setup parameters are available when Tilt Rotator has been enabled.



Rotate Acceleration Rate

Specifies the acceleration rate for smooth and stable movement of the contoured bevel head. The higher the acceleration rate, the quicker the Rotate Axis gets up to speed. The lower the acceleration rate, the smoother the machine will position the cutting device. Values are entered in revolutions/second^2.

Maximum Rotate Speed

Specifies the maximum speed for the Rotate Axis rotation in revolutions/minute.

Rotate High Jog Speed

Specifies the high speed for the rotate axis jog.

Rotate Low Jog Speed

Specifies the low speed for the rotate axis jog.

Tilt Acceleration Rate

Specifies the acceleration rate for smooth and stable movement of the contoured bevel head. The higher the acceleration rate, the quicker the tilt axis gets up to speed. The lower the acceleration rate, the smoother the machine positions the cutting device. Values are entered in revolutions/second^2.

Maximum Tilt Speed
Specifies the maximum speed for the tilt axis, in revolutions/minute.

Tilt High Jog Speed
Specifies the high speed for tilt axis jog.

Tilt Low Jog Speed
Specifies the low speed for tilt axis jog.

Torch Height Disable

The Torch Height Disable feature is used to activate the Torch Height Disable output and freeze, or disable, the automatic adjustment of the automated torch height control system to prevent diving or crashing of the torch in corners.

Note: The Dual Grid/THC feature must first be enabled in the Plasma Setups screen.

The CNC activates the Torch Height Disable output based on the values of the following parameters:
- Plasma Hi/Lo % of Cut Speed
- Plasma Distance to Corner
- Plasma Distance from Corner

When any one of these conditions is met, the Torch Height Disable feature is implemented. The definition of a corner is based on the tangent angle in the special password screen and the value of the Plasma Hi/Lo speed.

Tangent Angle
Specifies the degree of the tangent angle for motion control. Segments within a part that intersect at angles greater than the selected tangent angle will decelerate to zero or the minimum corner speed.

Segments within a part that intersect at angles less than or equal to the selected tangent angle do not decelerate unless the next segment is a speed-limited arc.

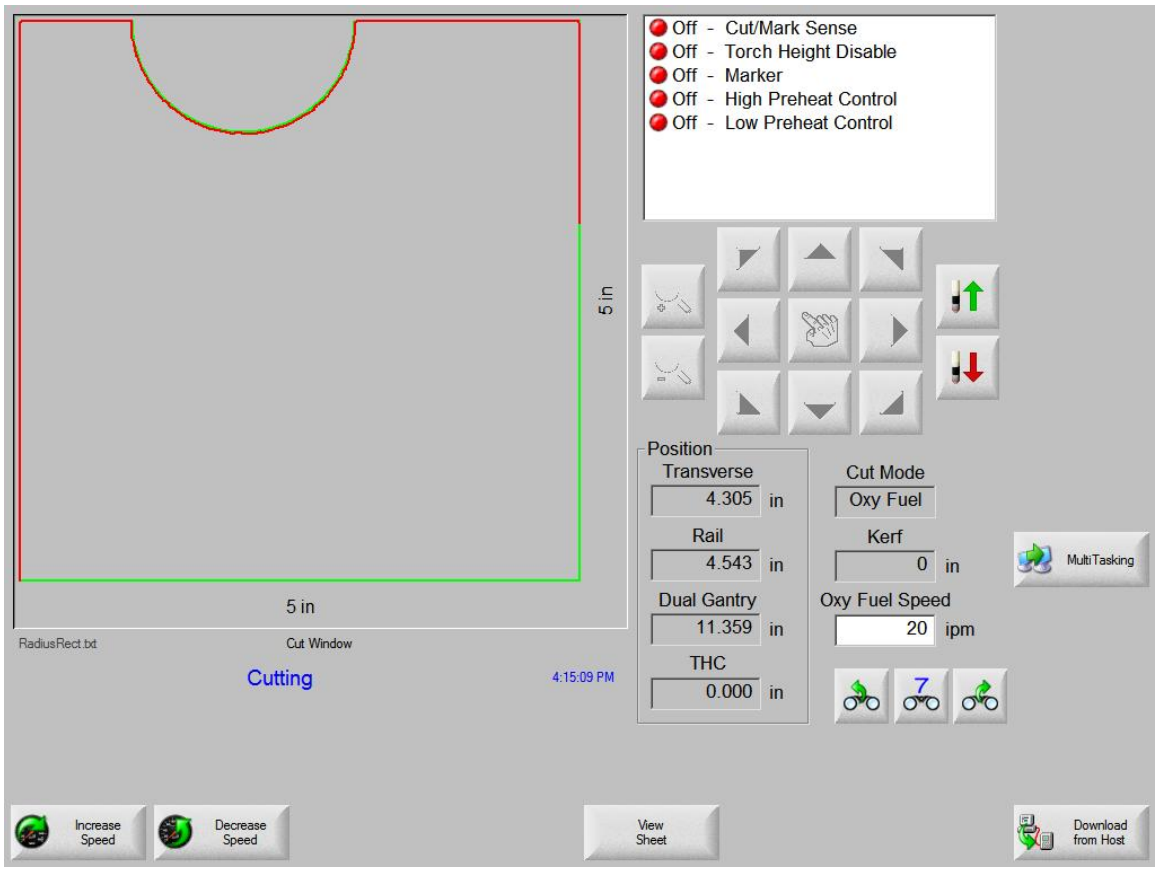
Plasma Hi/Lo Speed Percentage
Specifies the percentage of the cut speed below which the CNC will activate the Torch Height Disable output. The plasma system can use this output to switch from low to high current or to disable the height control.

Plasma Distance To Corner
Specifies the distance before turning a corner at which the plasma system should switch from low current to high current or disable the Automated Height Sensor. Distance to Corner is active when the speed drops below the Plasma Hi/Lo Percentage, or when segments intersect at an angle greater than the tangent angle.

Plasma Distance From Corner

Specifies the distance after turning a corner at which the plasma system should enable the Automated Height Sensor. Distance from Corner is active whenever the speed drops below the Plasma Hi/Lo Percentage, or segments intersect at an angle greater than the tangent angle.

Example:
In the following illustration, the Torch Height Disable output is activated based on the values of the setup parameters.



Plasma Hi/Lo Percentage Value 90%
Distance to Corner Value .5 inches
Distance from Corner Value .5 inches
Tangent Angle Value 20 Degrees

For these values, the Torch Height Disable output is active 0.5 inch before and 0.5 inch after each 90 degree corner. The THD output is also activated as the torch accelerates away from the pierce and through the arc because the speed is below the Plasma Hi/Lo value. Finally, because the arc intersects at greater than the 20-degree tangent angle, the THD output is activated for 0.5 inches before and after the beginning of the arc, and is activated for 0.5 inches before and after the end of the arc.

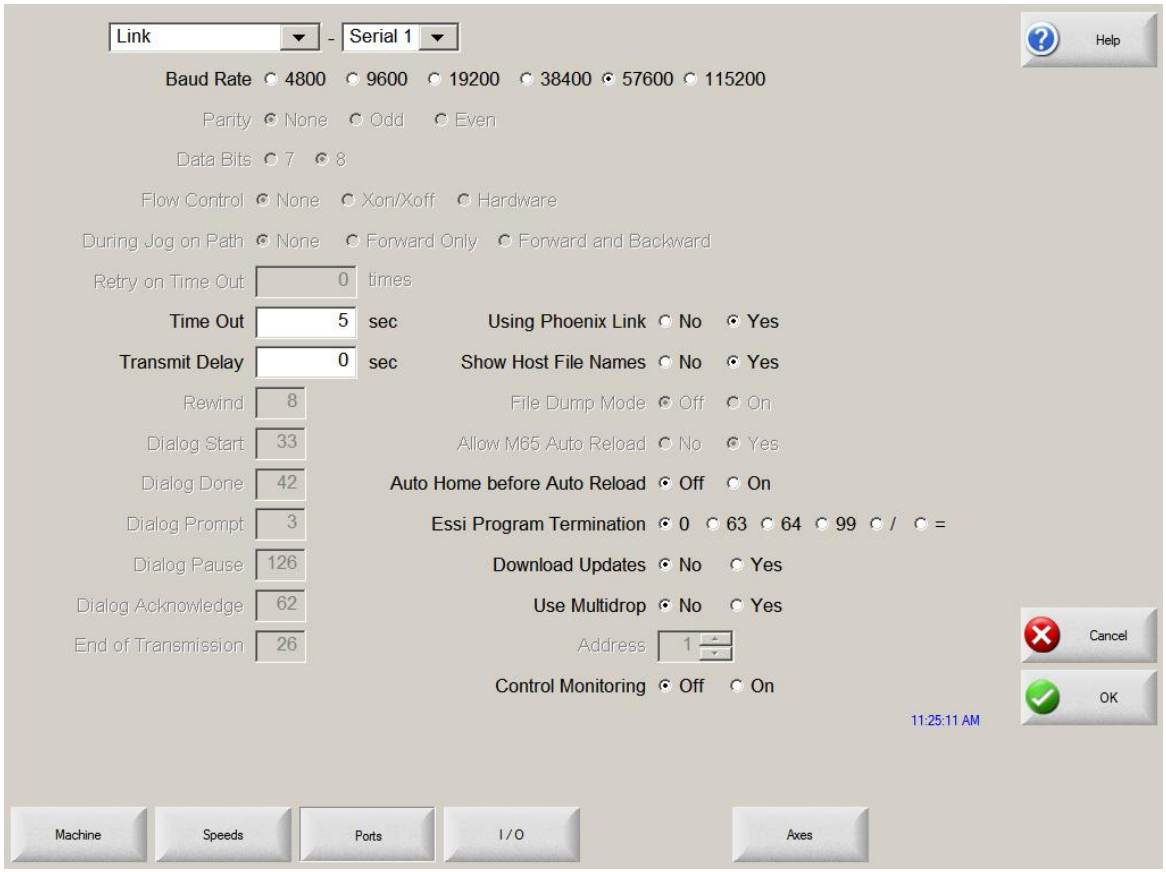
Ports

The CNC comes standard with two RS-232C serial ports, which can be converted to an RS-422 configuration. For more information about how to change the serial ports to the RS-422 configuration, refer to Serial Port Connections. This port has been specially designed with opto-isolation and filtering to minimize EMI/RFI noise problems that are common in many cutting operations. Parameters are enabled and disabled depending on port feature selections.

The CNC can be configured to use the communication link provided on the CNC or the user can enter information to create a custom communication link on the Link screen to communicate with a host computer. Information on how to access the Phoenix software is provided later in this section.

A maximum of eight ports can be configured for use in software. Hardware provided with your CNC may support a lower number of communication ports.

The following parameters are available to help configure the serial ports for your specific communications package and selected communication features.



Port Designation
Specifies which serial port is configured for link use with the following remote communication settings. Select Link, Messaging, HD4070, FineLine or Command THC (type"V" controls).

Baud Rate
Specifies the baud rate for the remote communication link. The available baud rates are shown. The CNC also incorporates a unique compression utility that allows the effective baud rate to be doubled. For example, for links configured to run at 9600 baud, the effective rate is 19.2K baud.

Note: For serial messaging communication speeds from 1200 baud to 115200 baud are available. See Serial Messaging in the Program Code section for more information.

Parity
Specifies the parity for the remote communication link.

Data Bits
Specifies the number of data bits the remote link is using. This value is 8 for the link software included with the control.

Time Out Delay
Specifies the amount of time the CNC waits before it displays a communications error if it is not be able to establish a link with a remote device.

Transmit Delay
Specifies the amount of delay the CNC inserts between each character that is transmitted over the serial port. Some communication links require a small delay to avoid missing characters that have been sent to them. This parameter should normally be set to 0.

The following parameters allow the user to create a custom communication link on the CNC by entering the ASCII code equivalent to the character or symbol used by the host computer for dialog start. For example: The ASCII Decimal Code 33 is equal to the **!** symbol.

Rewind
This field is only enabled when Link File Dump Mode has been enabled. Enter the ASCII code equivalent to the character or symbol used by the host computer for tape rewind at the host tape drive system. Enter 0 to eliminate the rewind command.

Dialog Start
Enter the ASCII code equivalent to the character or symbol used by the host computer for dialog start.

Dialog Done
Enter the ASCII code equivalent to the character or symbol used by the host computer for dialog done.

Dialog Prompt
Enter the ASCII code equivalent to the character or symbol used by the host computer for dialog prompt.

Dialog Pause
Enter the ASCII code equivalent to the character or symbol used by the host computer for dialog pause.

Dialog Acknowledge
Enter the ASCII code equivalent to the character or symbol used by the host computer for dialog acknowledgement.

End of Transmission
Enter the ASCII code equivalent to the character or symbol used by the host computer for dialog acknowledge.

Using Phoenix Link
Select Yes if you are using the Phoenix Communication link program that is supplied on the control. The CNC automatically enters the appropriate ASCII codes to the communication link dialog parameters listed previously.

Show Host File Names
Select whether File Names are shown on the Download from Host screen. This is a time-saving feature for operators who have very large part folders at the host computer and know the exact file name of the part program they want to load. The Using Phoenix Link parameter must be set to ON to enable this feature.

File Dump Mode
Select On to configure the link communication protocol to communicate with link programs that operate in File Dump Mode. This allows the CNC to accept part programs as a single uninterrupted stream of information as with a tape reader style link.

Allow M65 Auto Reload
Available when a generic link communication has been enabled and allows you to select whether the EIA M65 code is used as an auto-reload code or is ignored.

Auto Home before Auto Reload
Automatically homes the machine before the next auto reload (EIA M65 code), either serial link, USB memory or from diskette, is executed

ESSI Program Termination
This parameter allows the operator to tell the CNC which ESSI code (0,63, 64 99, / or =) is used as machine stop.

Download Updates
Allows the operator to download CNC software updates through the link communication to the host PC. To use this feature, the "Using Phoenix Link" parameter must be set to YES. The new update file must be placed in the same folder location as the Link software. When the Update Software soft key is pressed on the Special Password screen, the CNC searches for the new software update through the link rather than the floppy drive.

Use Multi Drop
Allows the CNC to work with the Phoenix Link software multi-drop feature. The multi-drop feature allows the Phoenix Link software to communicate with multiple controls to one communications port at the host PC. Up to eight controls can be supported with the multi-drop feature.

Note: The "Using Phoenix Link" parameter must be set to Yes to enable this feature. In addition, specific hardware (serial communication board Rev C or higher) may be required to support this feature. Please contact your CNC supplier for more details.

Address
Defines the CNC identification address for the multi-drop communication feature. The Phoenix Link software uses this address at the host PC to know which CNC it is communicating with.

Control Monitoring
Allows the user to view CNC status at the host PC. Status for file name, position, cut mode and cut information is displayed. This feature is only available with the Phoenix Link communication software. Refer to the Phoenix Link section for additional information.

The following additional parameters are available when Serial Messaging has been enabled. See Serial Messaging in the Program Code section of this guide for more information.

Flow control
Select None, Xon/Xoff or Hardware.

During Jog on Path
Select whether the CNC sends messages when jogging Forward or Backward on Path while at the Pause screen.

Note: All messaging stops when the Stop Key has been pressed or when the Remote Pause input becomes active.

Note: The Message Type 21 is not executed for Backup on Path.

Retry on Time Out

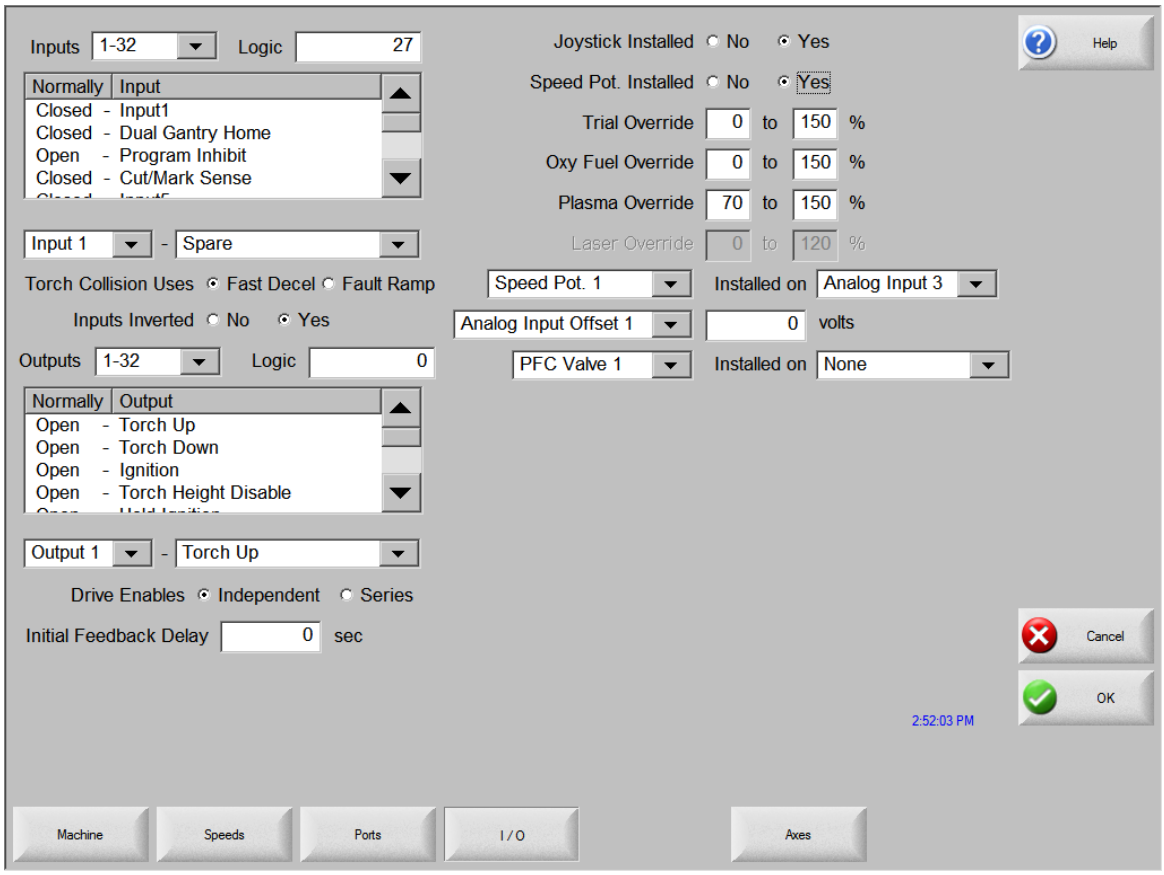
Select the number of times the system automatically retries Message Type 22. After the system tries to send the message this many times it displays “Message Error” to indicate that the external device does not respond.

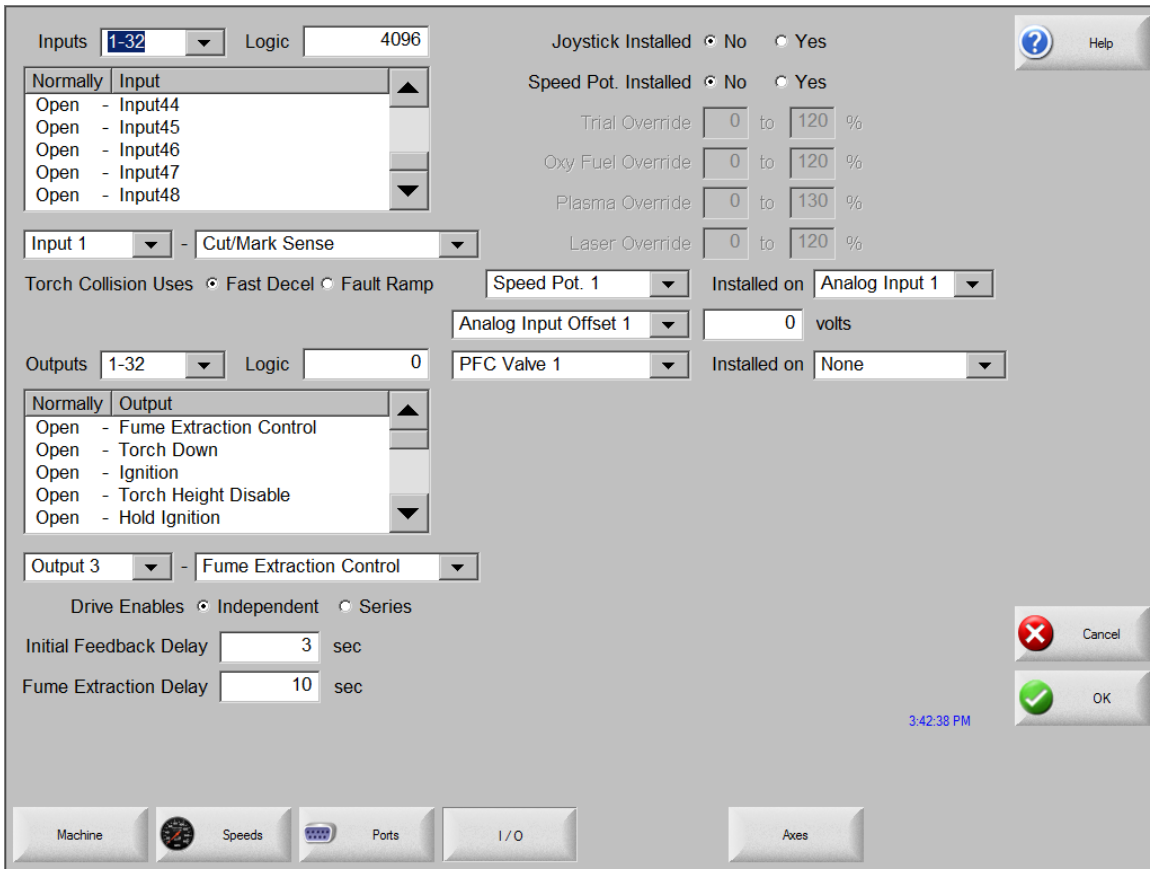
Time Out

This value is used for Message Type 22 if there is no time-out value used in the command string of the program code. Refer to the Delay Time / Time Out information for more information.

I/O

Press the I/O soft key to configure the inputs and outputs for the shape cutting table.





Expanded I/O

Available when more than 64 I/O have been selected. A drop-down box is available to assign I/O in the higher I/O ranges.

Note: When the optional USB front panel is used, the top 128 I/O are assigned to USB I/O to support the front panel

Input Logic

The CNC comes standard with up to 32 discrete inputs. Used as a mask to determine whether an input is treated as a normally open or closed contact. Entering a numerical value here sets all the Inputs to a predefined set of logic states for all of the inputs.

With Input Logic set to zero (0), an active input is displayed with a green lamp in the input diagnostic screen.

Logic Selection Box

Determines whether the logic state for each input is normally open or closed. To select the logic state for an input, select the desired input and press the space key.

Input Selection
Defines which inputs are used by the CNC and their physical location on the CNC interface. All controls are shipped with the default selection of inputs and interface locations for the selected control interface (I/O) configuration.

Torch Collision Uses
Determines the type of response that is used when the Torch Collision input is active. You can select to use a Fast Stop Decel value or the Fault Ramp time that has been selected for the individual axis.

Inputs Inverted
Defines which inputs are used by the CNC and their physical location on the CNC interface. All controls are shipped with the default selection of inputs and interface locations for the selected control interface (I/O) configuration.

Drive Enables
Determines how the CNC responds to drive faults. If you select Series, all axes must complete their individual fault ramp times before the drives are disabled. If you select Independent, each drive is disabled as soon as its axis fault ramp time is finished.

Initial Feedback Delay
Allows the initial feedback from the drive system to be held off after initial power up. This allows the drive system to become fully enabled before it enables the position loop.

Fume Extraction Delay
Enter the number of seconds after the end of a cut part program that the fume exhaust remains on.

Speed Pot and Joystick Overview

Through the use of single-ended inputs to an optional analog input card installed in the control, your CNC can be configured to support an external joystick or two speed potentiometers.

Note: These features are not available for all CNC types and optional CNC hardware may be required.

- The external joystick is used as a directional command signal when it is in manual motion.
- The optional speed potentiometer can be used to adjust the current motion speed.
- These features must first be enabled at the password-protected I/O screen.

Joystick Installed
Select Yes to enable the optional external joystick. This parameter is not available for all CNC types and optional CNC hardware is required.

Speed Pot Installed
Select Yes to enable the optional external speed potentiometer. This parameter is not available for all CNC types and optional CNC hardware is required.

Plasma Override %
Sets the minimum and maximum range for adjustment of the plasma speed potentiometer based on a percentage of the set cut speed. The speed potentiometer feature must be enabled to use this parameter.

Oxy Fuel Override %
Sets the minimum and maximum range for adjustment of the oxy fuel speed potentiometer based on a percentage of the set cut speed. The speed potentiometer feature must be enabled.

Trial Override %
Sets the minimum and maximum range for adjustment of the trial speed potentiometer based on a percentage of the set trial speed. The speed potentiometer feature must be enabled.

Speed Pot Installed On
Assigns speed potentiometer inputs to the desired Analog Input if a dedicated speed potentiometer input is not available on the analog input card.

Analog Offset 1- 12
Corrects for any imbalance or zeroes the incoming analog voltage to the analog input card

Note: To calibrate the analog inputs, jumper the two pins specific to the input together and view the incoming voltage on the Diagnostics Analog I/O screen. The incoming voltage should be 0. If any voltage is displayed at the diagnostic screen, an offset voltage equal to the incoming voltage being read can be entered here to make the incoming voltage 0. Refer to the installation instructions later in this section for more details.

Input Definitions

Input	Definition
Spare	Activated through the part program. If a spare input is located in the part program, the CNC pauses the process until the input state is detected. The spare inputs can be implemented with specific EIA “O” and “M” codes that indicate the input number and function. Refer to Appendix A for a complete description of these commands.
Torch Up Sense	Indicates that the torch is in the full up position.
Torch Down Sense	Indicates that the torch is in the full down position.
Preheat Sense	Indicates that the preheat input from the torch is active.
Cut Sense	Indicates that the plasma arc has transferred to the work piece. If the Arc On Feedback setup parameter is ON, machine motion begins at the activation of this input. Type “M” and “P” controls.
Tracer on Path	Used with the Teach Trace feature and indicates that the tracing system has detected the template line.
Drive Disabled	Causes the CNC to stop all motion and generate a fault message. Position information is lost.
Remote Pause	Stops all CNC motion and displays the Pause screen. No motion is allowed until this input is deactivated.
Remote Start	Begins the selected program cycle as if the Start button on the CNC had been pressed.
Program Inhibit	Forces the CNC to command the motion output to a zero (0) speed. This is generally used as a dwell to pause motion during a tool change or as a pause from a PLC interface.
Raise/ Lower Torch	Operates multiple Sensor THCs when multiple Sensor THCs are commanded by the CNC as separate axes. The Torch Raise and Torch Lower commands can be issued with soft keys or through these external inputs to the control. Type V control.
Station Select Input	Indicates which Sensor THCs is active when multiple Sensor THCs are commanded by the CNC as separate axes. Also tracks consumable data for the specified plasma or oxy torch.

	Stations 1-8 are designated for plasma; stations 9-20 are designated for oxy fuel. Type V control.
X Home Switch	Indicates that the machine has traveled to its X axis home position. If the X axis Use Home Limit Switch parameter is set to YES and a homing function is performed, the X axis moves in the specified home direction at the fast home speed until the input is activated. The X axis then decelerates to a stop and moves in the opposite direction at the slow home speed until the switch is deactivated. After the switch is deactivated, the X axis decelerates to a stop or, if the Use Marker Pulse parameter is set to YES, continues until the encoder marker pulse is detected.
Y Home Switch	Indicates that the machine has traveled to its Y axis home position. If the Y axis Use Home Limit Switch parameter is set to Yes and a homing function is performed, the Y axis moves in the specified home direction at the fast home speed until the input is activated. The Y axis then decelerates to a stop and moves in the opposite direction at the slow home speed until the switch is deactivated. After the switch is deactivated, the Y axis decelerates to a stop or, if the Use Marker Pulse parameter is set to Yes, continues until the encoder marker pulse is detected.
Z Home Switch	Indicates that the machine has traveled to its Z axis home position. If the Z axis Use Home Limit Switch parameter is set to Yes and a homing function is performed, the Z axis moves in the specified home direction at the fast home speed until the input is activated. The Z axis then decelerates to a stop and moves in the opposite direction at the slow home speed until the switch is deactivated. After the switch is deactivated, the Z axis decelerates to a stop or, if the Use Marker Pulse parameter is set to Yes, continues until the encoder marker pulse is detected.
Y Overtravel Switch	Indicates that the machine has traveled into its full positive travel of a Y axis. If hardware overtravels are enabled and this input is activated, the CNC stops all motion and generates a fault message. Motion is not re-enabled until the switch is deactivated.
X Overtravel Switch	Indicates that the machine has traveled into its full positive travel of a X axis. If hardware overtravels are enabled and this input is activated, the CNC stops all motion and generates a

	fault message. Motion is not re-enabled until the switch is deactivated.
Limit Switch	Indicates that the machine has traveled into its full positive travel of an axis. If hardware over travels are enabled and this input is activated, the CNC stops all motion and generates a fault message. Motion is not re-enabled until the switch is deactivated. (Type “M” configuration only)
Ready to Fire PS 1-4	Ensures that all HD4070 power supplies have completed each individual Initial Height Sense and are ready for use. The torch ignition is held off by the Hold Ignition Input to the power supply from the control. This input is exclusive to the HD4070 multiple power supply configuration.
Raise /Lower 4070 1-2	Used as a manual raise/lower command to the selected HD4070 integrated THC through the CNC serial power supply communication link. This input is exclusive to the HD4070 multiple power supply configuration.
X +Overtravel Switch	Indicates that the machine has traveled to its full positive travel on the X axis. If hardware over travels are enabled and this input is activated, the CNC stops all motion, generates a fault message and only allows manual motion in the X axis negative direction.
X –Overtravel Switch	Indicates that the machine has traveled to its full negative travel on the X axis. If hardware overtravels are enabled and this input is activated, the CNC stops all motion, generates a fault message and only allows manual motion in the X axis positive direction.
Y +Overtravel Switch	Indicates that the machine has traveled to its full positive travel on the Y axis. If hardware overtravels are enabled and this input is activated, the CNC stops all motion, generates a fault message and only allows manual motion in the Y axis negative direction.
Y –Overtravel Switch	Indicates that the machine has traveled to its full negative travel on the Y axis. If hardware overtravels are enabled and this input is activated, the CNC stops all motion, generates a fault message and only allows manual motion in the Y axis positive direction.

Power Supply OK	Used for the optional Automated Process Controller (APC). It confirms a ready condition from the plasma power supply before beginning the cut process.
Fast Stop	Used as an urgent stop input command to the control. When the Fast Stop input becomes active, the CNC decelerates motion using a special Fast Stop Decel parameter, and forces the operator to the Pause Screen. One second after the input becomes active, the Drive Enable output from the CNC turns off and disables motion. Position information and I/O points are maintained while the input is active. This allows the operator to recover the last position after the input has been cleared. **Note:** The Fast Stop Decel parameter is located on the password protected Speeds setup screen.
Torch Collision	Used on torch systems with breakaway mounts. If a torch makes contact with the plate or an obstacle that causes the breakaway mount to release, an input for the mount is sent to the CNC indicating that a torch collision has occurred. The operator is forced to the Pause screen. While the input is active, the Cut output is turned off and manual motion is enabled, allowing the operator to raise, lower and move the torch position to clear the fault. **Note:** Position information, motion command, and I/O points are maintained and allow the operator to return to the cut path and resume cutting. This feature uses the Fast Stop Deceleration rate. Manual raise inputs can be used.
Joystick (Direction)	Command manual motion (up, down, left, and right) when using an external joystick.
Fume Extraction Sense	If selected, this input confirms that an external Fume Extraction system on the cutting table is operational before beginning the cut. An option to override is displayed if the input has not been satisfied at the time of the cut.
Cut/Mark Sense 1& 2	Verifies that the plasma torch or marker tool has established the arc for the selected process. This indicates to the CNC that motion can begin. (Type “V” controls).
THC Cut Sense	Verifies that the plasma torch or marker tool has established the arc for the selected Sensor THC and indicates to the CNC that motion can begin. (Type “V” controls).

Plasma Select 1 & 2	Select which Plasma process logic is used by the control. These inputs are generally run by external switches. (Type "V" controls).
Marker Select 1 & 2	Select which Marker process logic is used by the control. These inputs are generally run by external switches. (Type "V" controls).
Sensor THC Enable	Indicates which Sensor THCs are active when multiple Sensor THCs are commanded by the CNC as separate axes. This input is now supported by the Station Select input.
THC Homing to Limit	The THC Enable Input is used during Sensor THC Homing as the Current Limit input if the Home to Hard Stop Current Limited option is selected.
Nozzle Contact Sense	Used during Sensor THC IHS to detect the location of the cut surface. This input is returned to the CNC through the external voltage divider card.
THC Homing to Switch	The Nozzle Contact Sense Input is used during Sensor THC Homing as the Home Switch input, if the Home to Switch option is selected.
THC Automatic	Used as an external input to switch the Sensor THC between automatic and manual operation.
Speed Limit Input	Limits the machine speed for safety during machine testing and maintenance. When this input is active, motion is limited to the user-defined Limited Machine Speed selected in the password protected Speeds screen
Tilt +/– Overtravel Switch	Indicates that the machine has traveled to its full positive travel in the Tilt axis. If hardware overtravels are enabled and this input is activated, the CNC stops all motion, generates a fault message and only allows manual motion in the Tilt axis opposite direction. The Tilt Overtravel Input is also used for homing the tilt axis.
Tilt +/–	Used for manual jog commands for the tilt axis.
Tilt Home Feature	Uses the Tilt Overtravel Switch input to indicate that the machine has traveled to its tilt axis home position. When the Tilt axis is homed, it moves in the specified home direction at the Fast Home Speed until the input is activated. The tilt axis decelerates to a stop and moves in the opposite direction at the

	Slow Home Speed until the switch is deactivated. See also Tilt Overtravel Switch.
Rotate +/–	Used for manual jog commands for the rotate axis.
Rotate Home Switch	Indicates that the machine has traveled to its rotate axis home position. When the rotate axis is homed, it moves in the specified home direction at the Fast Home Speed until the input is activated. The rotate axis decelerates to a stop, moves in the opposite direction at the Slow Home Speed until the switch is deactivated.
Pierce Complete	Used for the laser cut process to confirm that the pierce is complete.
Gas Control Read Comp.	Used as part of the HD3070 Automatic Gas Console communication to confirm that communication is complete.
Gas Control Error	Used as part of the HD3070 Automatic Gas Console communications to indicate an error from the Auto Gas Console.
Enable Oxy Fuel 1-12	Used for tracking consumable data for the specified oxy torch. This input is now supported by the Station Select input.
Enable Plasma 1-8	Used for tracking consumable data for the specified plasma torch. This input is supported by the Station Select input.
Arc Error Counter 1-8	Used as part of consumable data tracking, this input triggers a counter on the Change Consumable Screen. A Plasma Enable Input must be mapped to enable this input.
Test Lifter	Performs a test IHS function with a Sensor THC.

Output Logic

The CNC comes standard with up to 32 discrete outputs. The Output Logic parameter is used as a mask to determine whether or not the output is to be treated as a normally open contact or as a normally closed contact.

Logic Selection Box

The Logic Selection Box allows the user to select the Logic state for each input to be either normally open or normally closed. The logic state for the inputs can be switched by selecting the desired Output and pressing the space key.

Output Selection

The Output Selection box feature is used to define which inputs will be used by the control, and their physical location on the control interface. All controls are shipped with

the default selection of Outputs and interface locations for the selected control Interface (I/O) configuration.

Output Definitions

Output	Description
Spare	Activated through the part program. If a spare output is located in the part program, the CNC turns on the output as directed. The Spare outputs can be implemented with specific EIA "W" and "M" codes that indicate the output number and function. Refer to Appendix A for a complete description of these commands.
Torch Up	Raises the cutting torch. It is activated for the "Primary Torch Up Time" and the "Pierce Torch Up Time" in oxy fuel mode. It is activated for the "Torch Up Time" in plasma mode.
Torch Down	Lowers the cutting torch. It is activated for the "Primary Torch Down Time" and the "Pierce Torch Down Time" in oxy fuel mode. It is activated for the "Torch Down Time" in plasma mode.
Ignition Control	Turns on the igniters in oxy fuel mode or ignites the plasma system in plasma mode.
Torch Height Disable /Dual Grid Control	Disables the automatic torch height controller in plasma mode. It is activated whenever the current axis position is within the "Plasma Distance To Corner" or the "Plasma Distance From Corner" parameters while cutting a part. It is also active whenever the current cutting speed drops below the result of (Programmed Cut Speed x (Plasma High/Lo Speed/100)). This output also reduces the plasma current in a switchable current plasma system when the machine speed is less than the Plasma Hi/Lo speed percentage.
Reduce Current	Used with the HD4070 to switch the plasma to low current mode.
CNC/Tracer	Controls a CNC relay. The CNC relay determines whether the control, tracing system, or joystick is commanding the amplifiers. This output is always active unless the CNC is off, in Teach Trace mode, or is disabled.
Marker / Marker Enable	Activates an external marking device. It can only be activated by the appropriate "M" code in the part program.

	Refer to Appendix A for a complete description of appropriate “M” code commands.
Cut Control	Enables the cutting oxygen in oxy fuel mode or starts the plasma system in plasma mode. This output can also be used to activate a marking device.
Low Preheat Control	Enables the low preheat gas when cutting in oxy fuel mode. It is activated for the “Low Preheat Time” when initiating a cut.
Preheat Control	Enables the high preheat gas when cutting in oxy fuel mode. It is activated for the “High Preheat Time” when initiating a cut.
Key Press Indicator	Activated whenever a key is pressed on the control.
Motion Indicator	Activated whenever the CNC is commanding machine motion.
Plasma Select	Activated whenever the CNC is in the Plasma cutting mode.
Bleed Off Gas	Used by the oxy fuel cut logic to send an output to the oxy torch to purge gases at the end of a cut. This output is on for the duration of the Bleed Off time selected in setups.
Pierce Control	Used by the plasma and oxy fuel cut logic to send an output to the torch during the pierce. This output is on for the duration of the Pierce Time selected in setups.
Turn ON / Off Supply	Used by the Optional APC to turn on or off the plasma supply through the control.
N2 Select	Used by the Optional APC to enable the use of nitrogen while cutting.
Drive Enable	Used to enable the drives during normal functions and to disable the drives during fault conditions.
Fume Extraction Control	Enables fume extraction and the Initial Feedback Delay and Fume Extraction Delay fields.
Shutter Open	Used exclusively with the laser cut logic to open the laser shutter for use.

Assist Gas	Used exclusively with the laser cut logic to activate the assist gas.
Digital Beam	Used exclusively with the laser cut logic to activate the digital beam.
Laser Start	Used exclusively with the laser cut logic to activate the laser system.
Abrasive Control	Used exclusively with water jet cut logic and activates the abrasive control, adding abrasive to the cut stream while cutting, or for charging the abrasive prior to cutting.
Plasma Enables	Used for external logic. The appropriate output(s) is on during plasma cutting, based on the Plasma Select inputs.
Marker Enables	Used for external logic. The appropriate output(s) is on during marking, based on the Marker Select inputs.
Nozzle Contact Enable	Active during Sensor THC IHS. This input is tied back to the CNC through the external voltage divider card. This output can also be used to switch an external drive system to low output mode (if equipped) during IHS for stall force plate sensing.
Hold Ignition	Is part of the Sensor THC operation to hold ignition of the external Plasma Supply. This output can be tied back to the CNC through the external voltage divider card or direct to the power supply depending on configuration.
Gas Flow Set 1 – 100	Used as part of the HD3070 automatic gas console communications (BCD) to set gas flow rates.
Valve Select 1 – 8	Used as part of the HD3070 automatic gas console communications to select the appropriate valves for operation.
Gas Control Write	Used as part of the HD3070 automatic gas console communications to configure the unit for operation.
Remote Test Operate	Used as part of the HD3070 automatic gas console communications to initiate the remote test.
Remote Test Preflow	Used as part of the HD3070 automatic gas console communications to test operation of preflow gases.

Remote Air Plasma	Used as part of the HD3070 automatic gas console communications to signal the Air Plasma output.
Remote H35/ N2 Plasma	Used as part of the HD3070 automatic gas console communications to signal the H35/N2 output.
Remote O2 Plasma	Used as part of the HD3070 automatic gas console communications to signal the O2 Output.
Change Consumable	Activates when a consumable data value on the Change Consumable Screen has reached its preset maximum. Generally, this output is tied to an external indicator light or audible alarm to prompt the system operator to change the appropriate consumable. The affected consumable data must be reset on the Change Consumable Screen to clear the output.
Current Set BCD	Sets the current at the plasma power supply or marker supply. These outputs are tied to the BCD inputs. Combinations of the current values are used to attain the desired current set point.
Marker Control	Activates the marker tool during the marking process. Traditionally, the marker tool is activated through the combination of Marker Enable and Cut Control outputs. All the noted options are available and can be configured on the Marker Setup screen for the desired process timing and operational results.
Program Running	Active any time the CNC is operating within a part program.
Station Enable 1-20	Activates any function specific to a torch station and are controlled through M37T and M38T codes within a part program. Typically, these codes generally enable a torch station for use. Stations Usually, stations 1-8 are configured with plasma and stations 9-20 are configured with oxy fuel or other types of fuel. However, plasma can only be configured on stations 1-8.
Station Lock 1-19	Are part of the Automated Torch Spacing feature. The station lock locks the unused torch station to the gantry or beam when the torch is not in use.

Station Clamp 1-19	Used as part of the Automated Torch Spacing feature. The Station Clamp is used to clamp the selected torch station to the transverse axis for standard cutting.
Station Mirror 1-19	Used as part of the Automated Torch Spacing feature. The station mirror is used to clamp the selected torch station to the transverse axis for mirrored cutting.
Auto OHC 1-20	Instructs the Sensor OHC to operate the specified station in automatic mode

Axes – Transverse or Rail

The following screen is identical for both the traverse and rail setup screens.

The CNC comes with both an advanced position and velocity servo loop. The following parameters are available to help configure the servo loops for your specific drive and mechanical system.

Speed 0 To

This parameter allows the technician to input selected speed ranges to customize the gains for the various speeds selected.

Note: These speed parameters are directly tied to the Speed To field for the acceleration rates previously noted on the Speeds setup screen. Changing these speed parameters replaces the Speed To values entered at the Speeds setup screen.

Proportional Gain

Proportional gain correlates to elastic stiffness in the control loop. Increase the proportional gain to increase the static stiffness, but decrease the response of the servo loop.

Under a proportional loop control, the drive system applies a restoring torque to the motor in proportion to the position error of the axis.

If proportional gain too high, the system and axis become unstable. During cutting, the torch can overshoot the path. This is also called a “hot” control loop.

If proportional gain too low, the system response is not precise. This can be seen in the test pattern when the outside corners become rounded and not all the circle segments meet in the center.

Integral Gain

Integral gain improves the positioning accuracy of the control loop. Integral gain can be used to compensate for static friction or gravity. Excessive integral gain can result in system instability.

For most shape cutting machines, this parameter should be set to zero (0).

Derivative Gain

Derivative gain helps to minimize sudden changes in velocity. The higher the derivative gain, the slower the response time to the control loop. For most velocity loop drives, this parameter is set to zero (0).

Feedforward Gain

Feedforward gain can be used to drive the following error to zero during machine motion. In all digital control loops there is a finite amount of error that is introduced by the velocity command. Increasing feedforward gain can reduce this introduced error.

Velocity Gain

When you use a current loop amplifier, you can use the internal velocity loop in the CNC to provide dampening without an external tachometer.

Use of the internal velocity loop with a current loop amplifier can result in higher static stiffness, smoother machine motion, and less overshoot.

Servo Error Tolerance

Allows the user to program the amount of servo loop following error to be allowed prior to display an error message. The parameter is limited to a maximum value of five inches.

Encoder Counts per inch

Enter a value that is the number of encoder edges per inch of machine travel. It is possible to enter fractional encoder units and the CNC will keep track of these fractions automatically. Encoder counts per inch are equal to the resolution of the encoder, multiplied by the encoder revolutions per inch or mm (based on the machine drive gearing).

For example: The resolution of a 4X – 1000 line encoder counts both edges (lines) of channel A and channel B to equal 4 counts per line multiplied by the 1000 lines per revolution would equal 4000 counts per revolution. If the encoder revolutions per inch to travel are 1:1, we would have 4000 encoder counts per inch of travel.

Encoder Counts/ Inch = 4 Counts/ Line x 1000 Lines/ Rev x 1 Rev/ Inch = 4000

Fault Ramp Time
This parameter sets the motion deceleration time after a fault occurs. At the end of "Fault Ramp Time, The drives will be disabled.

Drive Type
This parameter is used to tell the CNC what type of control loop to run. If you are running an external velocity loop drive (indicated by having an integrated tachometer in the motor), select Velocity. If you are running in torque mode (no tachometer), select Current.

DAC Polarity
This parameter allows changing of the analog output polarity to establish proper control loop feedback without any wiring changes.

Encoder Polarity
This parameter allows changing of the encoder input polarity to establish proper counting for positive machine motion without any wiring changes.

Encoder Decode Mode
Currently, the CNC only supports 4X encoder decode mode. This has been done to increase positional accuracy.

Use Hardware Overtravels
Select whether or not the cutting machine will be using Hardware Overtravels. If Hardware Overtravels are used, the CNC will disable feedback and display an error message if the inputs become active. It is recommended that Hardware Overtravels be installed.

Backlash Compensation
The Backlash Compensation parameter is used to offset or compensate for any backlash in the mechanics of the drive system.

Home
The Home parameter is used to activate use of the Home feature. Depending on control I/O configuration, the table may be Homed to either a designated Home Switch or an Overtravel Switch.

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 CNC 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.

Absolute Home Position
Defines the position of the axis when the Home Limit Switch or Marker Pulse is detected.

Home Offset Distance
Allows the user to set an offset distance from the Home Limit Switch.

Home Switch Normally
If a Home Limit Switch is used, the user is prompted for switch polarity.

Home Direction
Determines which direction the axes will travel during phase one of the homing sequence.

Use Marker Pulse
When enabled, the absolute home position will be assigned at the instant the marker pulse is detected. It is recommended that the Marker Pulse be used for optimal homing repeatability.

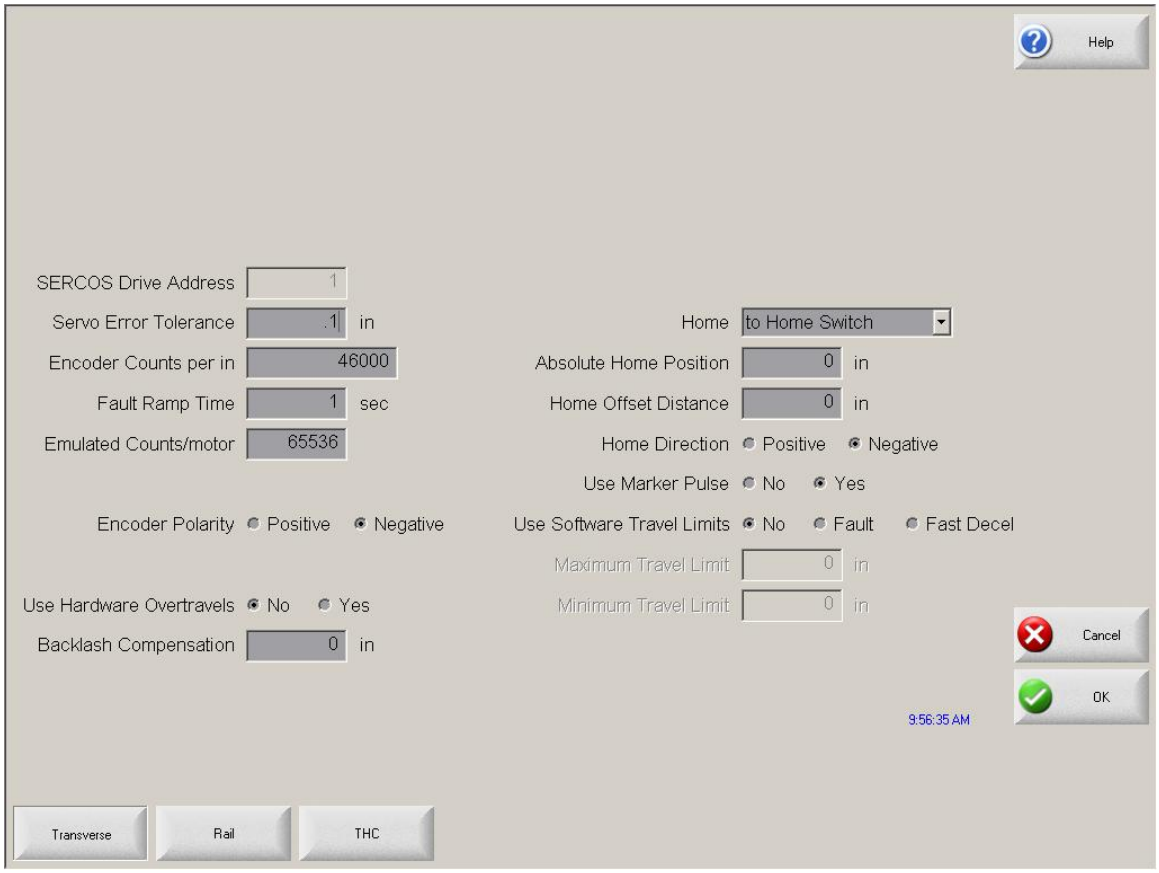
Use Software Travel Limits
The CNC is capable of running with software Overtravel limit switches based on position. When enabled, this feature allows the user to select the fault logic of fault or Fast Decel when active. Fault operates as hardware switches with immediate fault. Fast Decel uses the fast Decel value to ramp down motion.

Maximum Travel Limit
If Software Overtravels are enabled, the user is prompted for the maximum travel of the cutting machine.

Minimum Travel Limit
If Software Overtravels are enabled, the user is prompted for the minimum travel of the cutting machine.

Axes -- SERCOS

The SERCOS Interface controls the position loop from the amplifier. As a result, limited information for motion is required in the CNC setups. Tuning is performed through serial port diagnostic software available at the Drives & Motors Diagnostic screen.



The following is a listing of the unique SERCOS parameters. Note: parameters will apply to all SERCOS axes.

SERCOS Drive Address

Each Drive Axes is automatically assigned a Drive Address at the CNC. The appropriate drive amplifier will be coded with the matching Drive Address to provide control motion to the correct amplifier / motor on the SERCOS ring.

Note: The drives may be physically located in any order on the ring.

Emulated Encoder Counts/ motor rev

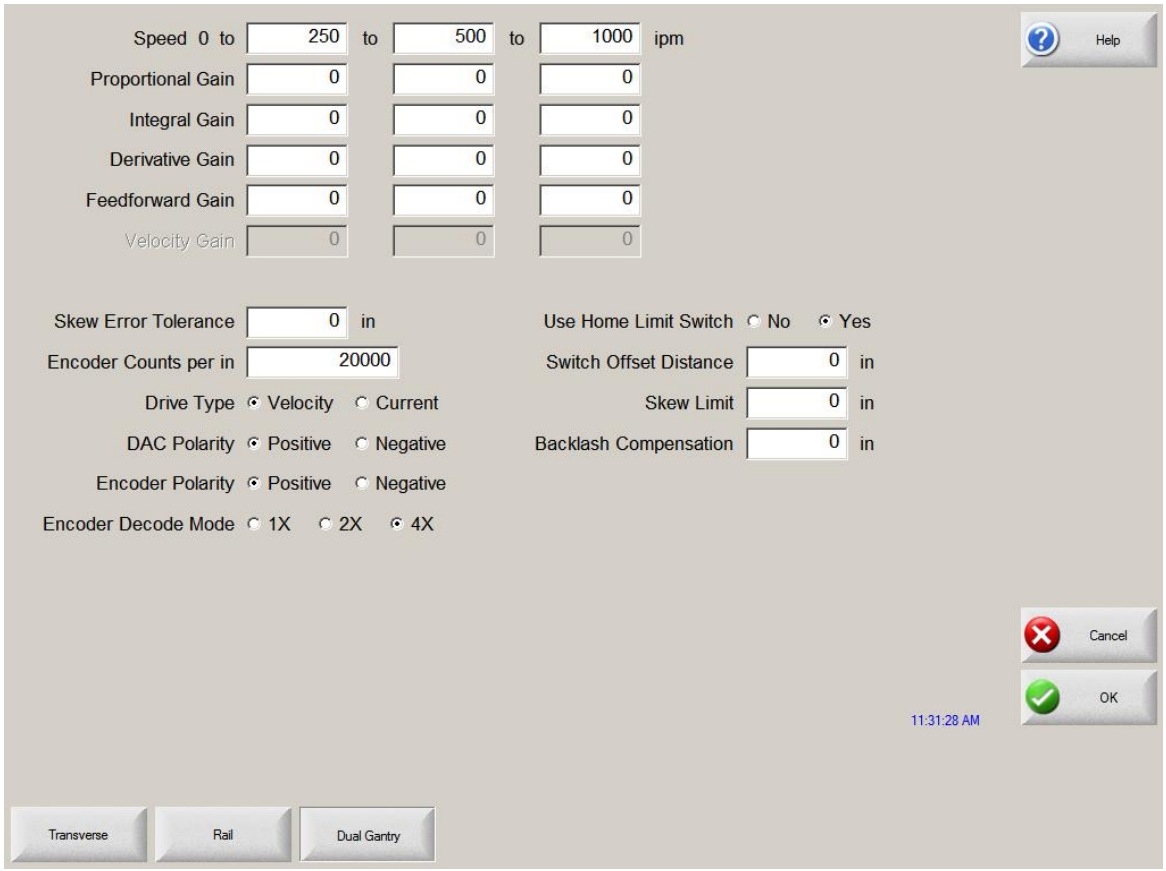
This parameter allows the user to adjust the number of counts per motor rev that the drive generates over the SERCOS ring, to adjust resolution. This parameter is available for Pac Sci drives only. Other drive types allow the emulated Counts /motor rev parameter to be set up in the drive tuning software.

Axes -- Dual Gantry

The following setup screen is available if the CNC is configured for a Dual Gantry Axis.

The Dual Gantry Axis is commanded as a separate axis on the control that mirrors the output of the main Rail Axis. Additionally, performance of the Dual Gantry Axis is compared to the main Rail Axis and additional output command is given to keep the axis in position.

The definitions for the setup parameters are the same as for the Transverse/Rail Axes. However, the number of selections are reduced as features for overtravels and homing do not apply.



Speed 0 To

This parameter allows the technician to input selected speed ranges to customize the gains for the various speeds selected.

Note: These speed parameters are directly tied to the Speed To field for the acceleration rates previously noted on the Speeds setup screen. Changing these speed parameters will replace the Speed To values entered at the Speeds setup screen.

Proportional Gain

Proportional Gain correlates to Elastic Stiffness in the control loop. Increasing the proportional gain increases the static stiffness, but decreases response of the servo loop.

Under proportional loop control the drive system will apply a restoring torque to the motor in proportion the position error of the axis.

With a Proportional Gain too high, the system will be unstable which will result in overshoots, and a generally “nervous” and shaky axis. This is also referred to as a “hot” control loop.

With a proportional gain too low, the system will respond in a loose or sloppy manner. This can be seen in the test pattern when the outside corners become rounded and the circle segments do not all meet in the center.

Integral Gain

Integral Gain improves the positioning accuracy of the control loop. Integral gain can be used to compensate for static friction or gravity. Excessive Integral Gain can result in system instability.

For most shape cutting machines this parameter should be set to zero (0).

Derivative Gain

Derivative Gain helps to dampen out sudden changes in velocity. The higher the derivative gain, the slower the response time to the control loop.

For most velocity loop drives this parameter will be set to zero (0).

Feedforward Gain

Feedforward Gain can be used to drive the following error to zero during machine motion. In all digital control loops there is a finite amount of error that is introduced by the velocity command. Increasing Feedforward Gain can reduce this introduced error.

Velocity Gain

When using a current loop amplifier, the internal velocity loop in the CNC can be used to provide dampening without an external tachometer.

Using the internal velocity loop with a current loop amplifier can result in higher static stiffness, smoother machine motion, and less overshoot.

Skew Error Tolerance

If the Dual Gantry Axis is installed, the user will be prompted for Skew Error Tolerance. This is the amount of position error allowed between the master and slave gantry drive axes prior to an error message being displayed.

Encoder Counts per inch
Enter a value that is the number of encoder edges per inch of machine travel. It is possible to enter fractional encoder units and the CNC will keep track of these fractions automatically. Encoder Counts per inch are equal to the resolution of the encoder, multiplied by the encoder revolutions per inch (based on the machine drive gearing).

For example, the resolution of a 4X – 1000 line encoder counts both edges (lines) of channel A and channel B to equal 4 counts per line multiplied by the 1000 lines per revolution would equal 4000 counts per revolution. If the encoder revolutions per inch to travel is 1:1, we would have 4000 encoder counts per inch of travel.

Encoder Counts/Inch = 4 Counts/Line x 1000 Lines/Rev x 1 Rev/Inch = 4000

Note: This value should match the value used for the Rail for proper operation.

Drive Type
This parameter is used to tell the CNC what type of control loop to run. If you are running an external velocity loop drive (indicated by having an integrated tachometer in the motor), select Velocity. If you are running in torque mode (no tachometer), select Current.

DAC Polarity
This parameter allows changing of the analog output polarity to establish proper control loop feedback without any wiring changes.

Encoder Polarity
This parameter allows changing of the encoder input polarity to establish proper counting for positive machine motion without any wiring changes.

Encoder Decode Mode
Currently the CNC only supports 4X encoder decode mode. This has been done to increase positional accuracy.

Use Home Limit Switch
Selecting “Yes” will enable the Home feature for the Dual Gantry Axis. Note: The Z Home Switch must first be defined and mapped to an input location in the I/O screen to enable this feature.

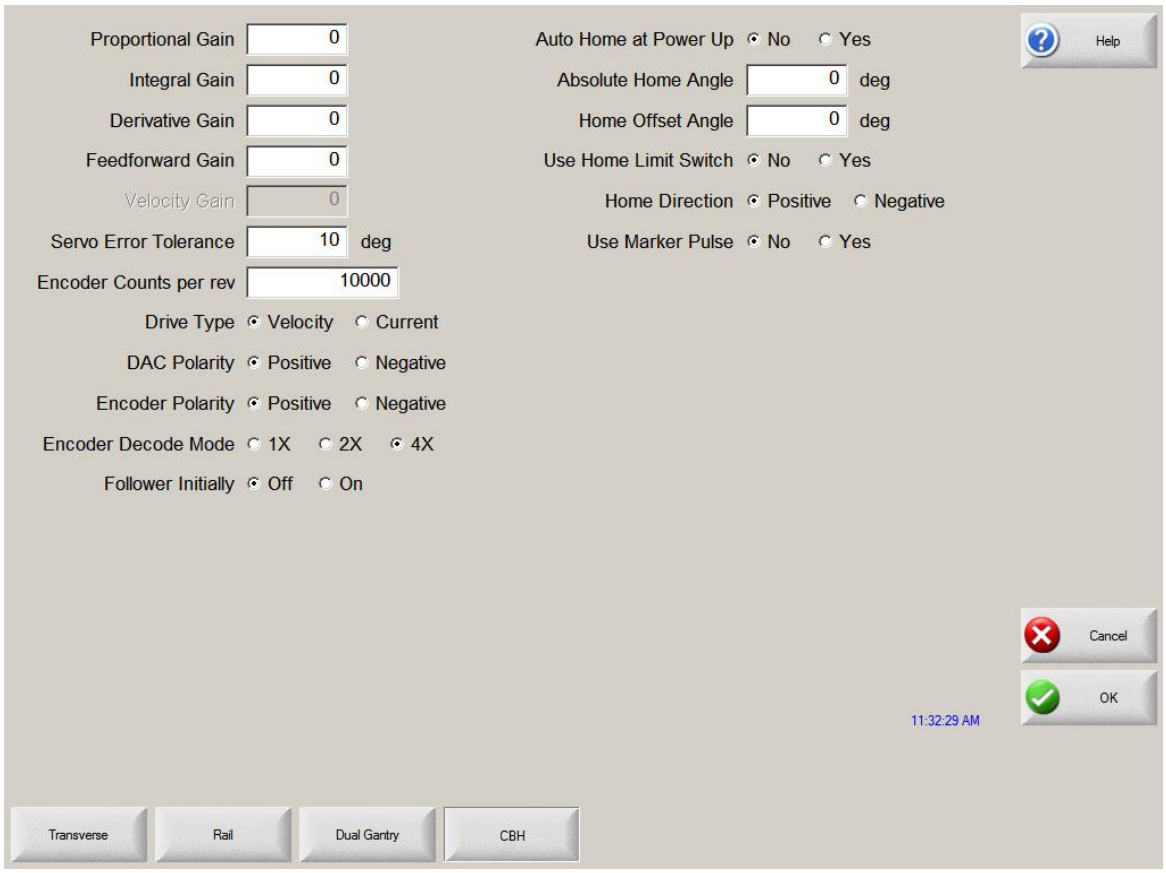
Switch Offset Distance
The Switch Offset Distance is used to specify any physical position offset between the Dual Gantry and Rail Home Switch positions. This allows the CNC to very accurately position the two axes for operation and remove any skew of the gantry.

Backlash Compensation
The Backlash Compensation parameter is used to offset or compensate for any backlash in the mechanics of the drive system.

Axes -- CBH

The following setup screen is available if the CNC is configured for a Contour Bevel Head.

The definitions for the setup parameters are the same as for the Transverse/Rail Axes, with the exception of Absolute Home Angle and Home Offset Angle. These two setup parameters serve the same basic function as previously described but are measured in degrees of rotation rather than inches or millimeters. However, the number of selections are reduced as these parameters are not used with a Contour Bevel Head.



Proportional Gain

Proportional Gain correlates to Elastic Stiffness in the control loop. Increasing the proportional gain increases the static stiffness, but decreases response of the servo loop.

Under proportional loop control, the drive system will apply a restoring torque to the motor in proportion the position error of the axis.

With a Proportional Gain too high, the system will be unstable which will result in overshoots and a generally “nervous” and shaky axis. This is also referred to as a “hot” control loop.

With a proportional gain too low, the system will respond in a loose or sloppy manner. This can be seen in the test pattern when the outside corners become rounded and the circle segments do not all meet in the center.

Integral Gain

Integral Gain improves the positioning accuracy of the control loop. Integral Gain can be used to compensate for static friction or gravity. Excessive Integral Gain can result in system instability.

For most shape cutting machines, this parameter should be set to zero (0).

Derivative Gain

Derivative Gain helps to dampen out sudden changes in velocity. The higher the Derivative Gain, the slower the response time to the control loop.

For most velocity loop drives, this parameter will be set to zero (0).

Feedforward Gain

Feedforward Gain can be used to drive the following error to zero during machine motion. In all digital control loops there is a finite amount of error that is introduced by the velocity command. Increasing Feedforward Gain can reduce this introduced error.

Velocity Gain

When using a current loop amplifier, the internal velocity loop in the CNC can be used to provide dampening without an external tachometer.

Using the internal velocity loop with a current loop amplifier can result in higher static stiffness, smoother machine motion, and less overshoot.

Servo Error Tolerance

Allows the user to program the amount of servo loop Following Error to be allowed prior to display an error message. The parameter is limited to a maximum value of 90 degrees.

Encoder Counts per rev

Enter a value that is the number of encoder edges per revolution of the Contour Bevel Head axis. It is possible to enter fractional encoder units and the CNC will keep track of these fractions automatically. Encoder Counts per rev are equal to the resolution of the encoder multiplied by the encoder revolutions per rev.

For example: The Resolution of a 4X – 1000 line encoder counts both edges (lines) of channel A and channel B to equal 4 counts per line time multiplied by the 1000 lines per revolution would equal 4000 counts per revolution.

Encoder Counts/Rev = 4 Counts/Line x 1000 Lines/Rev = 4000

Drive Type

This parameter is used to tell the CNC what type of control loop to run. If you are running an external velocity loop drive (indicated by having an integrated tachometer in the motor), select Velocity. If you are running in torque mode (no tachometer), select Current.

DAC Polarity
This parameter allows changing of the analog output polarity to establish proper control loop feedback without any wiring changes.

Encoder Polarity
This parameter allows changing of the encoder input polarity to establish proper counting for positive machine motion without any wiring changes.

Encoder Decode Mode
Currently the CNC only supports 4X encoder decode mode. This has been done to increase positional accuracy.

Follower Initially
This parameter is used to determine if the CBH axis will be On when the CNC is first powered up.

Auto Home At Power Up
Determines if the Contour Bevel Head will automatically go into the homing routine upon powering up the control.

Absolute Home Angle
Defines the position of the axis when the home limit switch or marker pulse is detected.

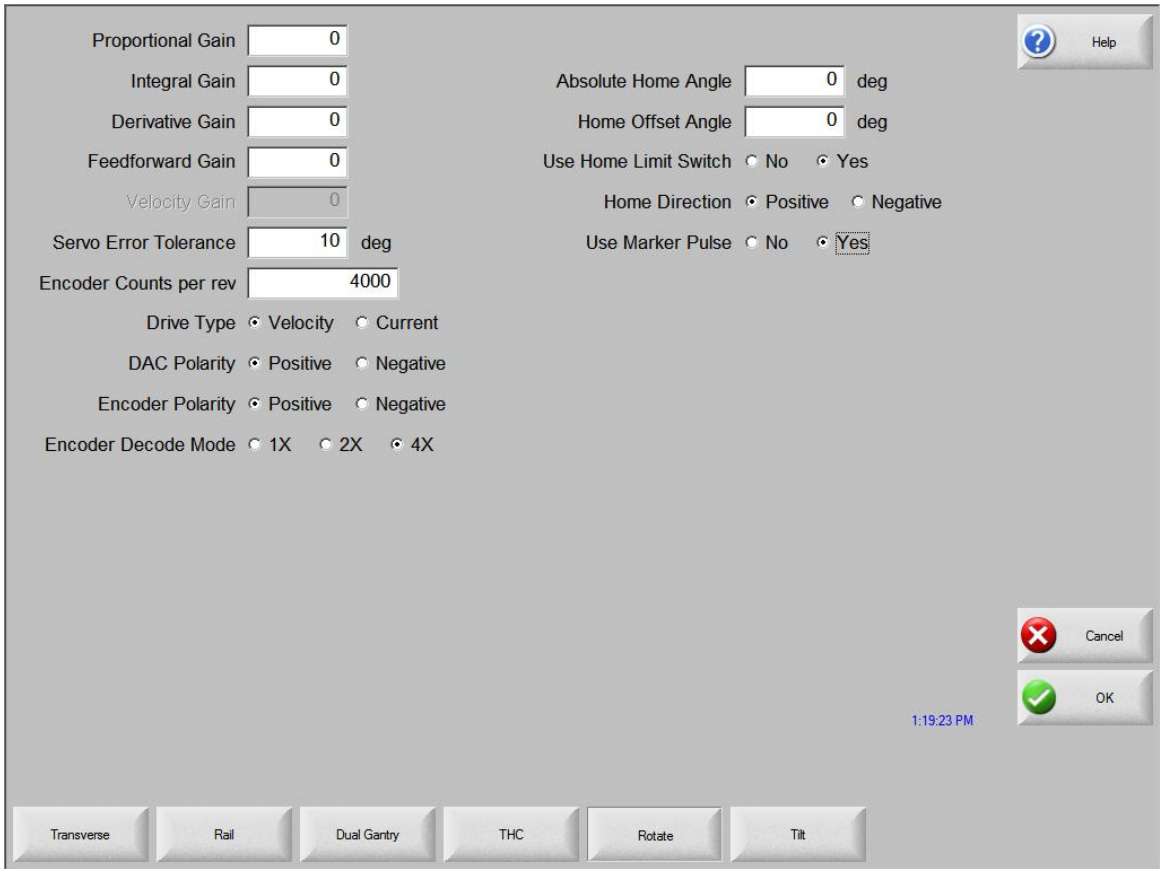
Home Offset Angle
Allows the user to set an offset angle from the home limit switch.

Use Home Limit Switch
Tells the CNC to look for a home limit switch during phase one of the homing sequence.

Home Direction
Determines which direction the axes will travel during phase one of the homing sequence.

Use Marker Pulse
When enabled, the absolute home position will be assigned at the instant the marker pulse is detected. It is recommended that the marker pulse be used for optimal homing repeatability.

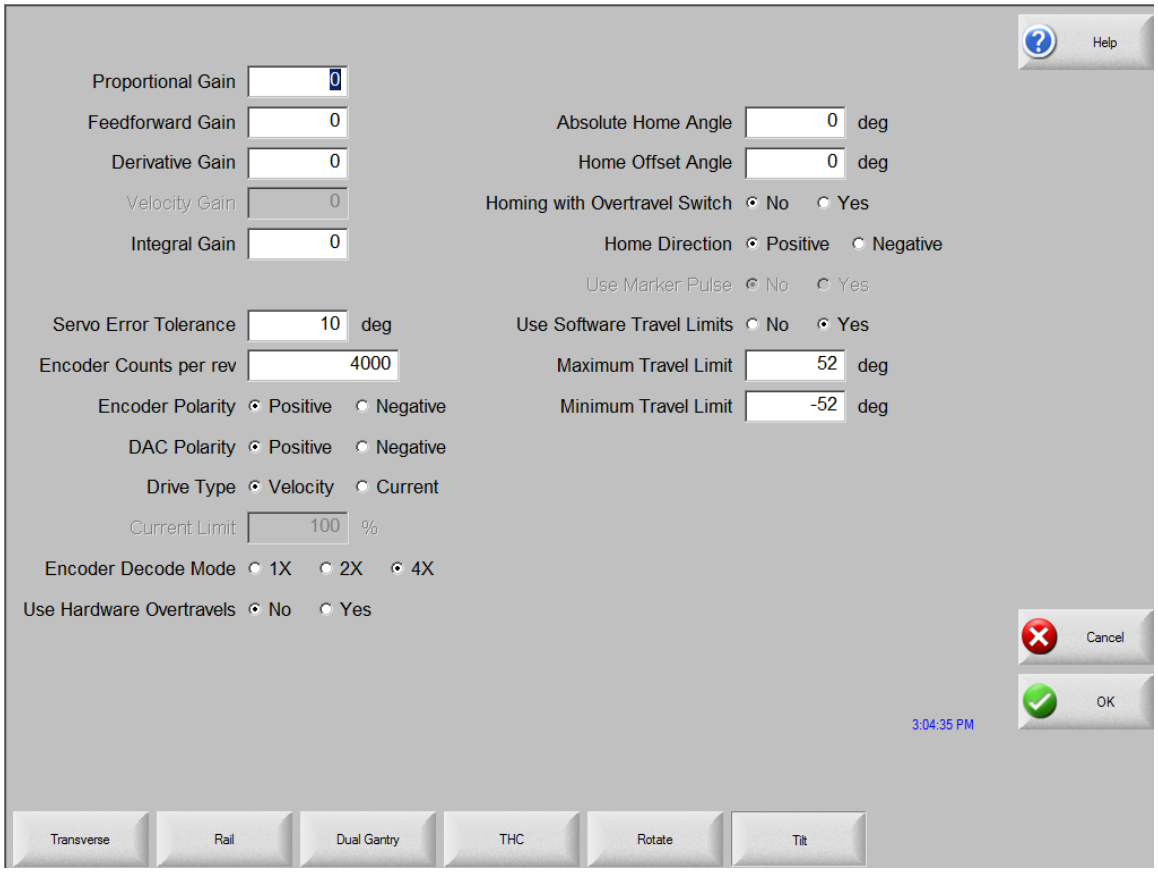
Axes -- Rotate



Absolute Home Angle
Defines the position of the axis when the home limit switch or marker pulse is detected.

Home Offset Angle
Allows the user to set an offset angle from the home limit switch.

Axes -- Tilt



Absolute Home Angle
Defines the position of the axis when the home limit switch or marker pulse is detected.

Home Offset Angle
Allows the user to set an offset angle from the home limit switch.

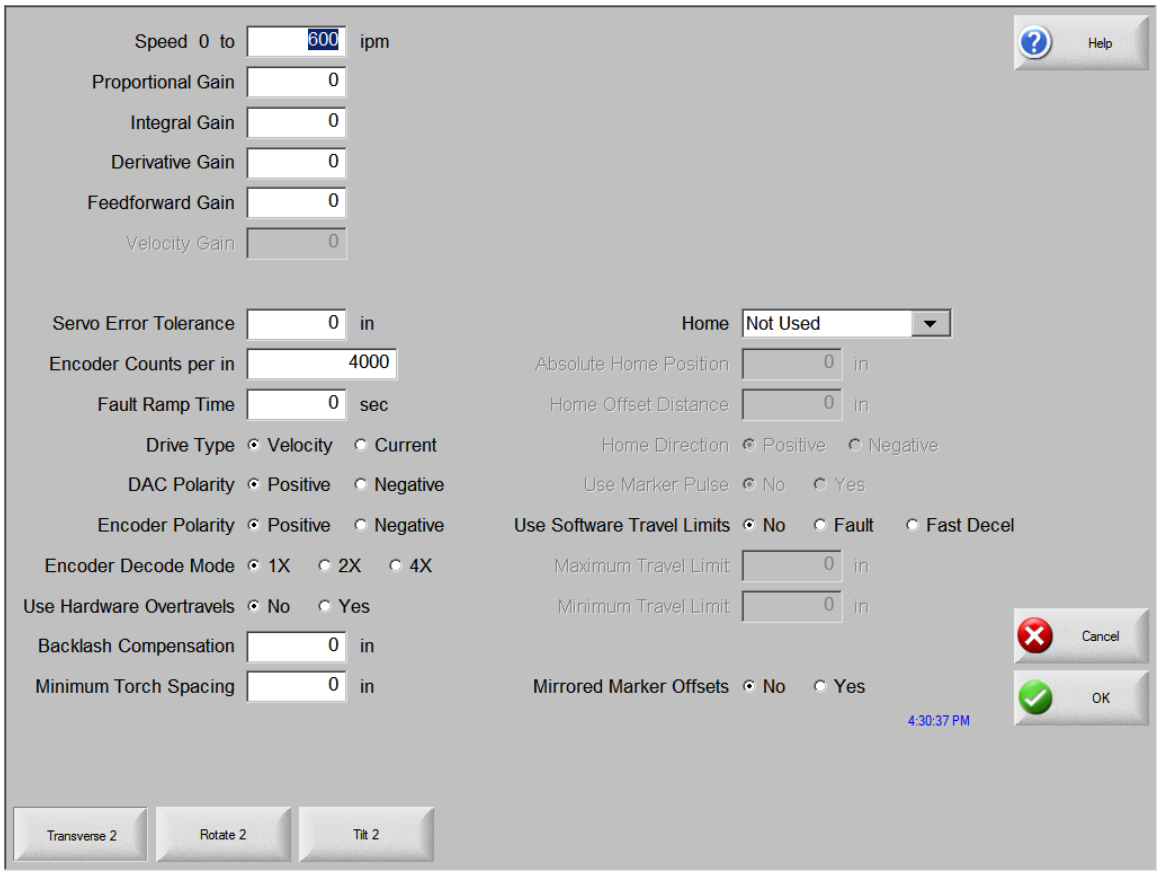
Note: Homing to a limit switch uses the Tilt Overtravel Switch (+/ –) input.

Homing with Overtravel Switch
The Home with overtravel switch parameter is used to activate use of the Home feature and uses the Overtravel Switch as its reference.

The Home feature is used to set a known absolute physical position location for the tilt axis.

Axes -- Transverse 2

The transverse 2 axis is only available when a second bevel head has been enabled.



Minimum Torch Spacing

Sets the minimum distance that is allowed between the transverse 1 and transverse 2 axes.

Mirrored Marker Offsets

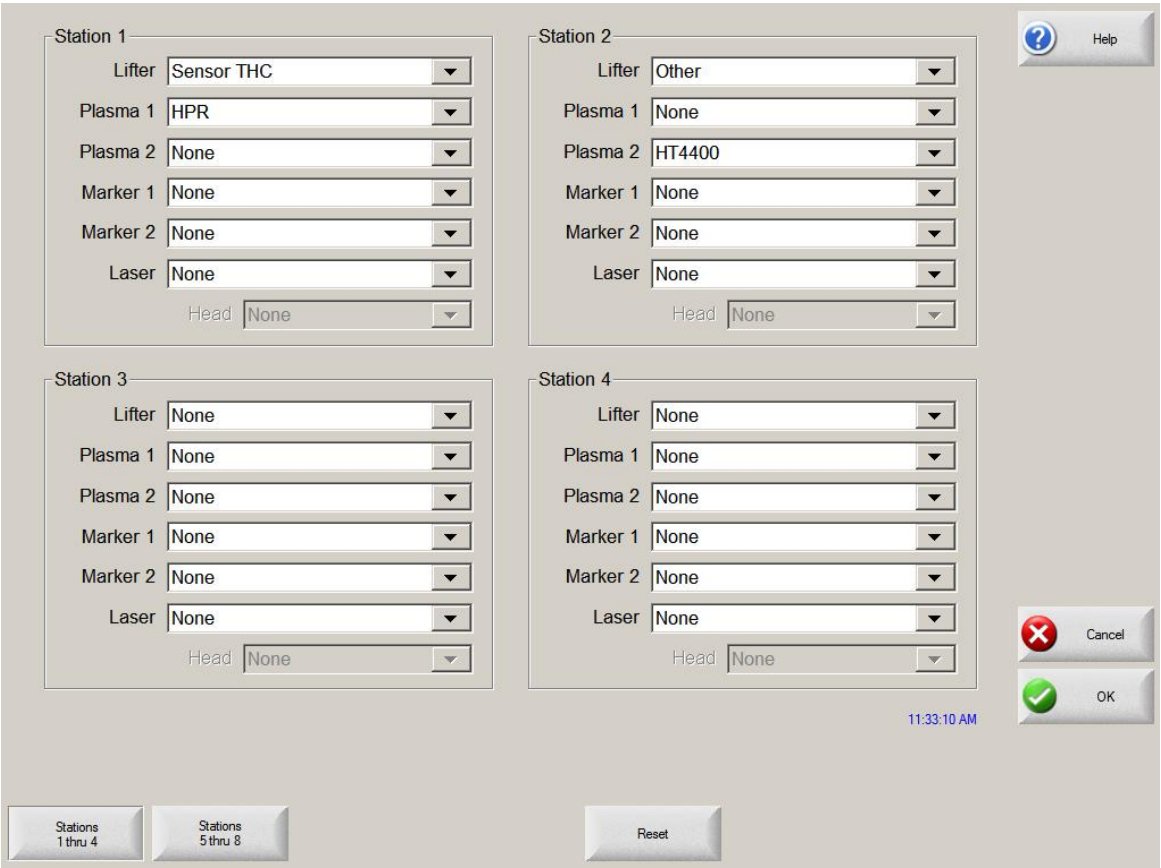
Allows preset tool offsets to be performed as mirrored motion for the transverse 2 axis.

Station Configuration

This password protected screen for the Voyager III and Mariner controls is used to configure a plasma, marker or laser torch station for use. This provides a single location to assign the tool, process, and lifter selections for the station. You can configure up to eight stations for the plasma 1 & 2 and marker 1 & 2 process selections.

The “4532” password allows you to view the Station configuration screen and verify setups but does not allow changes.

You can also use this station configuration screen to enable the serial link for the Command THC, as well as serial communication for the HD4070 and HPR130 plasma systems.



You can use codes within a part program to select the stations that are used. These station codes enable a THC station and are used in conjunction with the process selection codes to configure the cut or mark process.

When a station selection code is executed through program codes, the corresponding station select output is active.

Stations 1-4 or 5-8
The Stations 1-4 or Stations 5-8 soft keys access the corresponding stations for configuration.

Reset
Resets or clears all station setup parameters to None.

Part Program Support
Enable a station for use. Place station and process selection codes before the cut or mark.

Station Selects
You can select or cancel stations (lifters or THCs) using an EIA-274D program code with the following format.

Code	Description
M19 T*value*	Cancel all station selections
M37 T*value*	Select station 1-20 (Tvalue)
M38 T*value*	Cancel station 1-20 (Tvalue)

You can override these station selection program codes by selecting THC inputs to the control. The feature to override the part program must be enabled at the Cutting Setup screen.

Process Selects
Make process selections with an EIA-274D program code in the following format:

Example: **M36 T*value***

M Code

Valve Identity

T1 = Plasma Process 1
T2 = Plasma Process 2
T3 = Marker Process 1
T4 = Marker Process 2
T5 = Laser Process

Station Configuration Variables
The following options are available for station configuration:

Lifter
None
Sensor THC
Command THC (with serial link)
HD4070 integrated THC 1 or 2 (used only with the HD4070 power supply)
Other (any standalone lifter station)

Power Supplies

None	HD4070 Torch 1or 2	Powermax series
Max100/ 100D	HT4001	FineLine 100
Max200	HT4100	FineLine 200
HT2000	HT4400	Other (any other plasma system)
HD3070	HPR130	

Marker

None
ArcWriter
FineLine 100 & 200
HD4070 Torch 1or 2
HPR130
Other (any standalone marker)

Laser

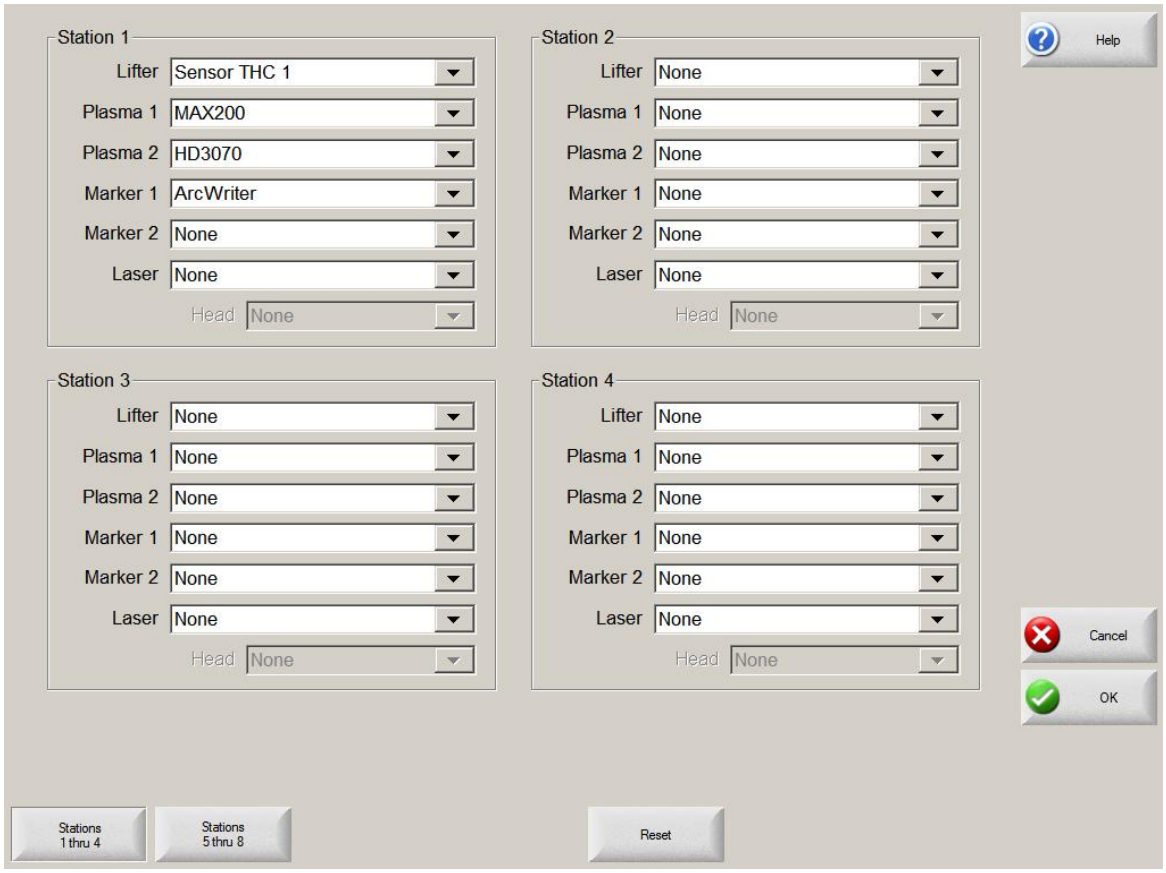
Rofin RF 40 & 50
Rofin DC 35
Rofin TR 60
Other

Set the Station Select Override feature in Cutting Setups to Disabled to override station selections with manual inputs.

Set the Process Select Override feature in Cutting Setups to Disabled to override process selections with manual inputs.

Overview

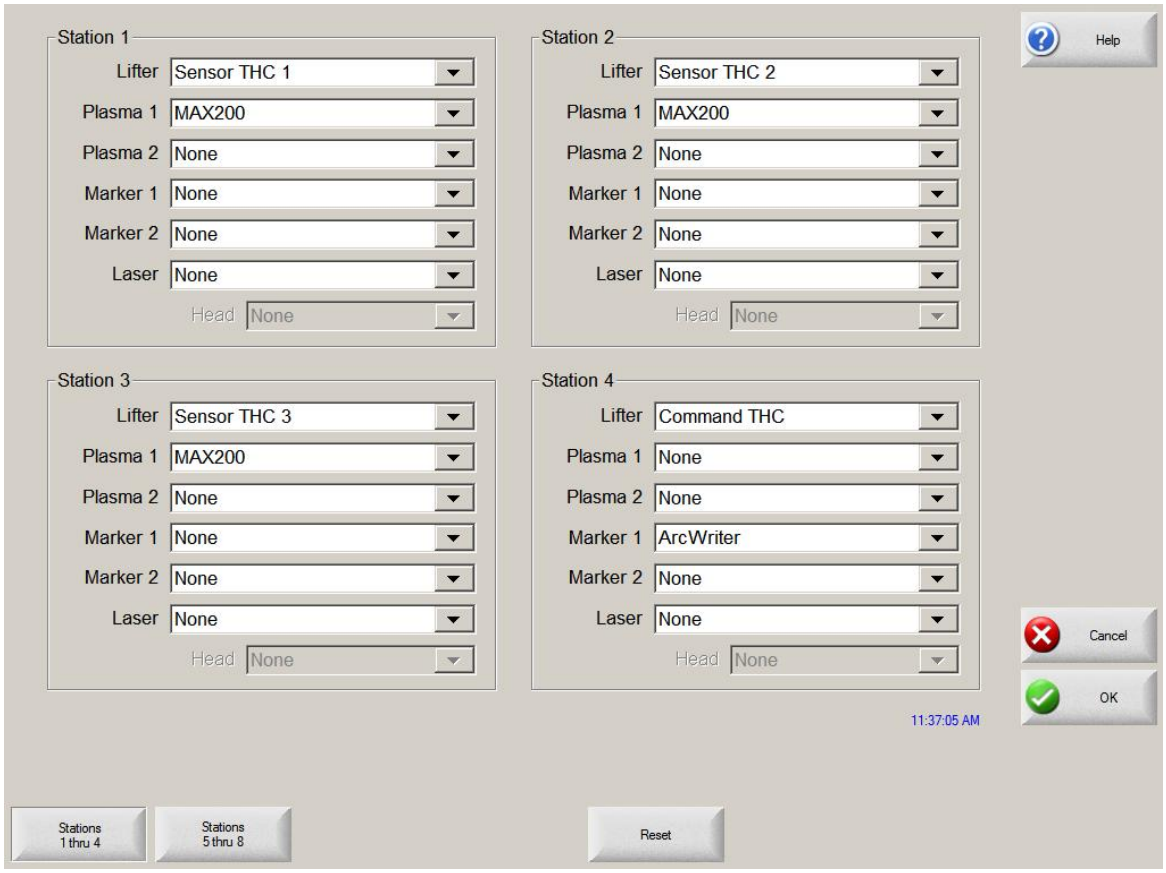
1. Press the Stations 1-4 or Station 5-8 soft key to access a station.
2. Select the appropriate lifter station from the list of available lifter types.
3. Select the appropriate tool (plasma power supply or marker tool) the station from the list of available tools in the Plasma and Marker Process fields. The tool selection should reflect the actual tools in use for that individual lifter. The Station can be configured so that all four plasma and marker processes operate on one station or are distributed throughout all 8 stations.
4. If necessary, use the Reset soft key to reset or clear all station setup parameters setting the values to None.



The selections you make for the four processes, THC designations, and certain power supplies can limit the overall configuration.

For example, if you selected a Sensor THC for Station 1 and a MAX200 for plasma process 1, you cannot select another power supply type for plasma process 1. However, you can select a MAX200 for plasma process 1 at other stations if you select a Sensor THC.

Password Setups



Support for Command THC

Selecting a Command THC as the lifter for a process enables the serial link to be assigned for a single Command THC.

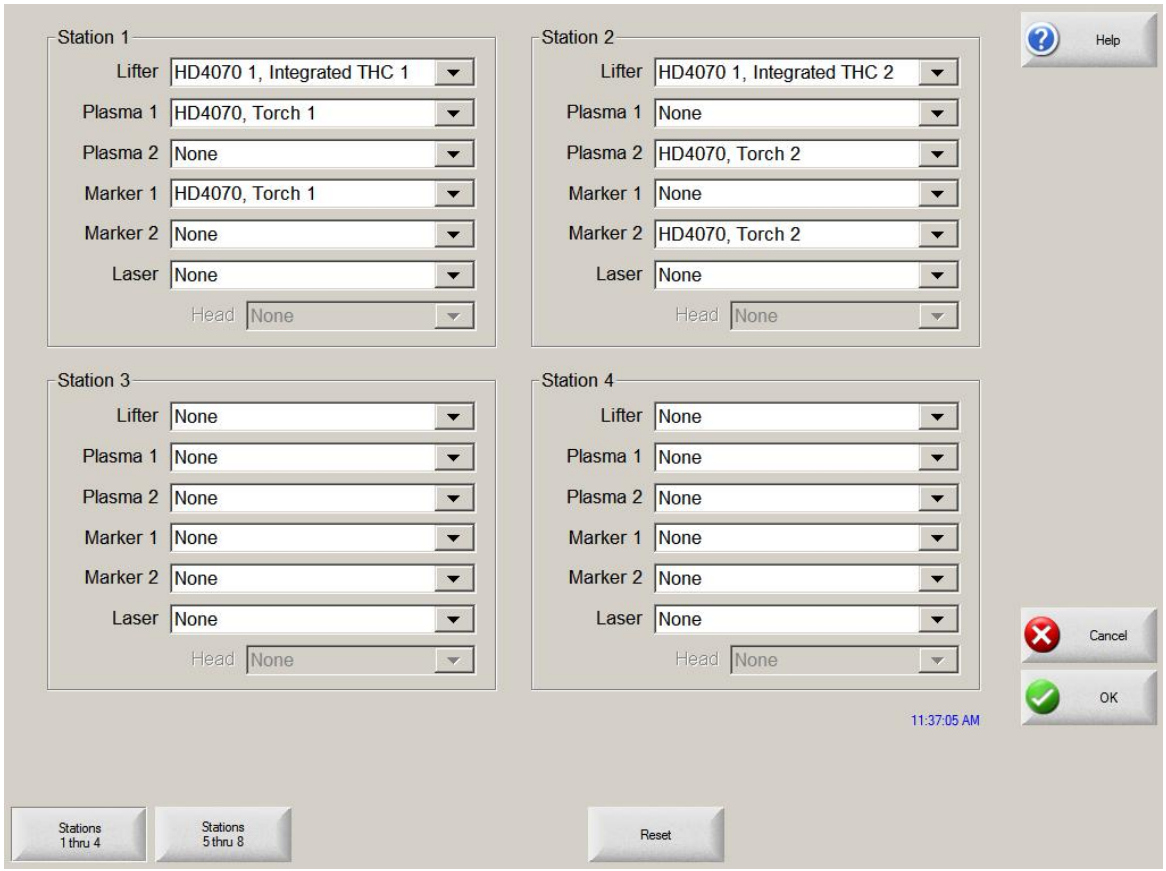
Note: The actual serial port must be assigned on the Ports setup screen. This also configures the selected Plasma or Marker Cut Types screen to display the Command THC features. If a Command THC has been selected for a station but does not use the serial communication to the control, the lifter type should be set to Other.

Refer to the Command THC section for additional information on the operation of the Command THC.

Support for HD4070

The HD4070 feature establishes the Serial Link HD4070 Power Supply communication link and configures the selected Plasma or Marker Cut Types screen to display the HD4070 features. A single HD4070 must be assigned to Stations 1 and 2. A second, multi-dropped HD4070 can be assigned on stations 3 and 4.

Each HD4070 can use two integrated Command THCs. These are controlled by the HD4070 and have designated station locations.

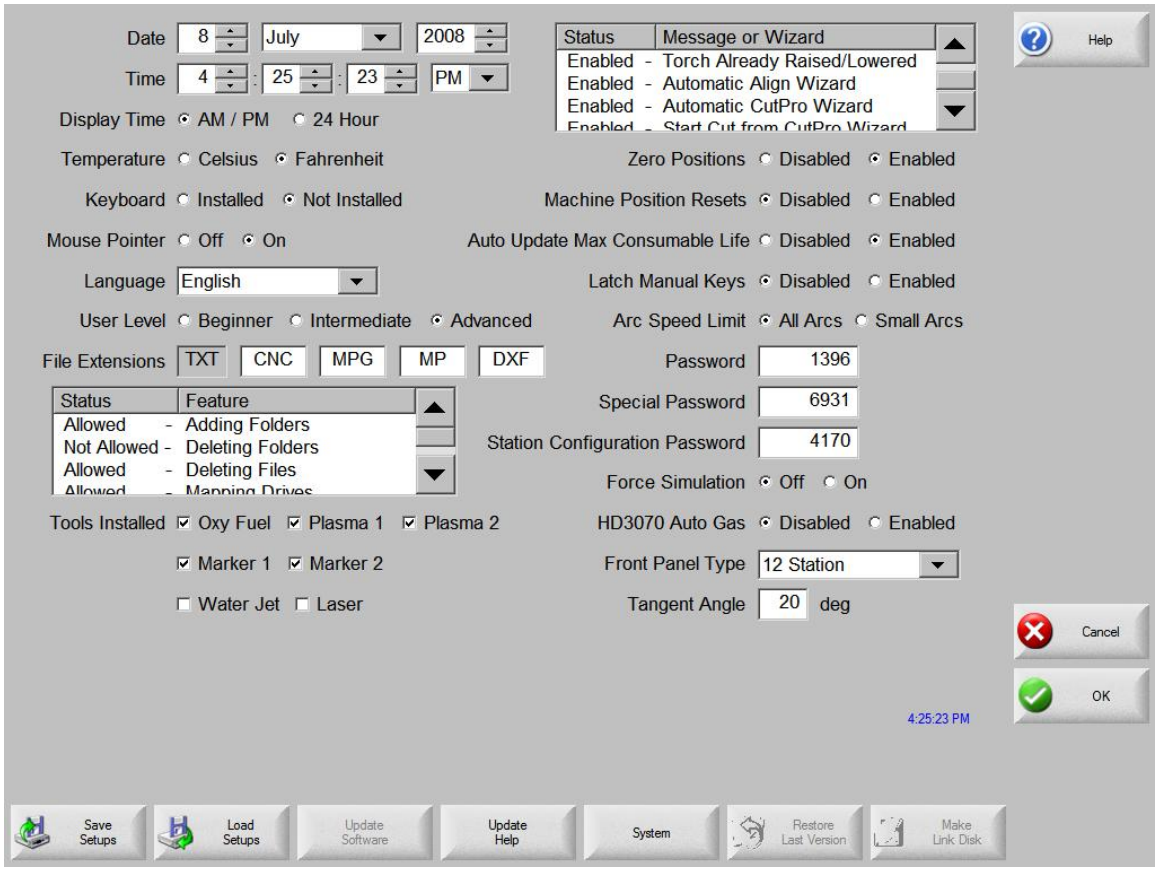


In the previous example, you can see that the Cutting and Marking with the HD4070 Integrated Torch 1 is limited to Plasma 1 and Maker 1 on Station 1. Additionally, the cutting and marking with HD4070 Integrated Torch 2 is limited to Plasma 2 and Maker 2 on Station 2. These stations can be configured for Cut or Mark or both. A second multi-dropped HD4070 can also be assigned on stations 3 and 4.

Support for FineLine 100 / 200

You can configure serial communications to the Inner Logic FineLine 100 and FineLine 200 for use with selected THCs.

Special



Date
Enter the current date.

Time
Enter the current time. This is the time that is displayed on the main screen.

Display Time
Select whether the display time is shown in either AM/PM format or 24-hour clock format.

Mouse Pointer
Select On to use an external mouse or touch screen.

Keyboard
Select Not Installed to use the on-screen keypad. Select Installed to use an external keyboard.

User Level
Select the user experience level. The level you select determines view screens and the features that are available. For example, the intermediate level provides a larger preview area and an ALT soft key to access additional screens.

Motion Cursor
Select the style of the Motion Cursor.

File Extensions
Enter the file extensions of the part files that will be accepted at the control.

Adding Folders
Select whether the CNC operator can add folders from the parts directory on the CNC or the host computer.

Deleting Folders
Select whether the CNC operator can delete folders from the parts directory on the CNC or the host computer.

Deleting Files
Select whether the CNC operator can delete folders from the parts directory on the CNC or the host computer.

Mapping Drives
Select whether the CNC operator can map to external drives from the CNC through the optional network.

Configuring Watch
Select whether the CNC operator can change the items in the Watch Window.

Adding Processes
Select whether the user can add new processes to the laser cut charts when enabled.

Removing Processes
Select whether the user can remove processes to the laser cut charts when enabled.

Force Simulation
Select On to put the CNC into simulation mode. This mode disables motion but maintains CNC operation and I/O feedback.

Temperature
Select whether the internal CNC temperature is displayed in Fahrenheit or Celsius in the Watch Window.

Note: This setting is not available on all CNC types and optional CNC hardware is required.

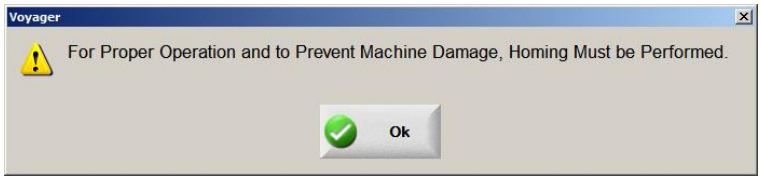
Tools Installed
Selects or limits the cut modes available to the CNC operator.

Message Enables
The following pull down box is used to enable and disable system messages. To change the status of a message, highlight the selected message and press the Space key.

Ready to Start Cutting Message
When enabled, the Ready Message feature will display a ready message when the Start button is pressed.

Kerf Too Large Warning Message
Disables the Kerf Too Large warning message. This message notifies the user that a conflict between the cut paths and the current Kerf value for a part has been detected and that some detail could be lost when the part is cut.

Homing Must Be Performed Message
Prompts the operator to home the selected axis before motion begins. The selected axis must have homing enabled on the axes setup screen.



Values Have been Changed Message
Displays as a confirmation when changes to values on the current configuration screen are detected. This ensures that changes are not made in error when exiting the screen.

Home Torch Height Control Message
Prompts the operator to home the Sensor THC axis at power up and before motion begins.

Ready to Final Align Message
Appears as part of the skew alignment function and displays just before final motion to position the tool begins.

Part Larger than Plate Message
Displays when the dimensions of the part that have been loaded exceed the selected plate dimensions.

Cut Chart Data Has Changed Message
Displays as a confirmation when changes to the values on the current Cut Chart screen are detected. This ensures that changes are not made in error when exiting the screen.

Save Part for Rush Job
Enables or disables the Resume Part prompt for Rush Job Interrupt.

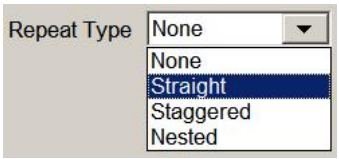
Automatic Align Wizard
Enables or disables the automatic availability of the alignment wizard on the Align screen.

Automatic Cut Wizard
Enables or disables the automatic availability of the Cut Pro wizard on the Main screen. If availability of the wizard is enabled, it appears 10 seconds after the Main screen is opened.

Start Cut from Cut Wizard
Allows or prevents cutting to start directly from the Cut Pro Wizard. If this is disabled, the operator must use the Start button on the console to begin the cut.

Latched Manual Keys
Enables or disables the Latched Manual Key feature which allows the manual motion keys to remain on with a single key press.

Auto Drop Down
When this option is enabled, all options are displayed in a drop-down list.



Zero Positions
Determines whether the CNC operator has the ability to zero positions. When disabled, the zero positions soft key is grayed out and is unavailable to the operator.

Auto Size App.
Changes the size of the application software to full screen display (when it is enabled) or the standard size of 640x480.

Language
Allows the user to select the language that is displayed on the CNC from the available languages stored on the control. Languages can be added to the CNC by performing the standard software update with a language-specific update file. Some languages also require the installation of a font viewer to properly display characters. To change to a different language, select the desired language and press the OK soft key. You must restart the CNC for the new language to be displayed.

Tangent Angle
Sets the degree of the tangent angle for motion control. Segments within a part that intersect at angles greater than the selected tangent angle decelerate to zero or to the minimum corner speed. Segments within a part that intersect at angles less than or equal to the selected tangent angle, do not decelerate unless the next segment is a speed-limited arc.

Password
Allows the user to enter a new password for machine setups. Numbers or letters can be used.

Special Password
Allows the user to enter a new password for special setups. Numbers or letters can be used.

Station Configuration Password
Allows the user to enter a new password for Station Configuration setups. Numbers or letters can be used.

Auto Update Max Consumable Life
If this feature is enabled, it tracks the consumable life values beyond the user-defined set point and assigns that maximum value as the new set point. If this feature is disabled, the user-defined set point for maximum consumable life is not updated.

Machine Position Resets
If this setting is enabled, it resets the absolute machine position when the Zero Positions soft key is pressed. Only the current incremental motion (part) position is reset to zero. Position information based on homing is not lost.

Arc Speed Limit Check
Allows the user to turn off the Speed Limit Check that is performed by *SoftMotion* for arcs larger than 10". This compensates for abrupt motion commands caused by non-tangent line arc segments and smoothes out motion.

HD3070 Auto Gas
When enabled, this setting allows the CNC to communicate with the auto gas console for the HD3070 and gives access to the related setup parameters.

Front Panel
Defines the use of an optional 12-station or 6-station operator console.

Save Setups
Press the Save Setups button to save the current CNC setting to the floppy disk or hard drive. A window displays to select the drive and enter a file name.

 **Note:** After installation of the CNC on the cutting table or if any setup parameters are changed, it is important to save the current setup file to both the hard drive and floppy disk for future reference.

Load Setups
Press Load Setups to load the selected control setting from the floppy drive or hard drive on to the control. A window displays where you can select the drive and enter the file name.

Update Software
Press the Update Software button to update the CNC operating software from a floppy disk.

Update Help
Press the Update Help button to update the CNC help files from a floppy disk.

System Tools
Press the System Tools button to access core Windows features for system performance. Features include Update Registry, Scan Hard Disk, Defrag Hard Disk and Format Disk. System Tools also accesses features for virus scanning and adding special fonts for some languages.

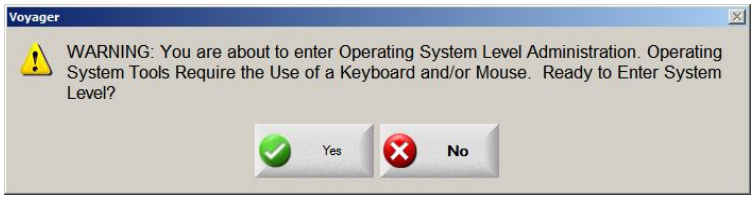
Restore Last Version
Restores the CNC to the previous version of system software.

Make Link Disk
The CNC is shipped with proprietary communication link software for communication with a host computer. Press this soft key to transfer the link software to a floppy disk so it can be loaded onto a host computer. A text file is included with the software to instruct the user on setup and use of the link.

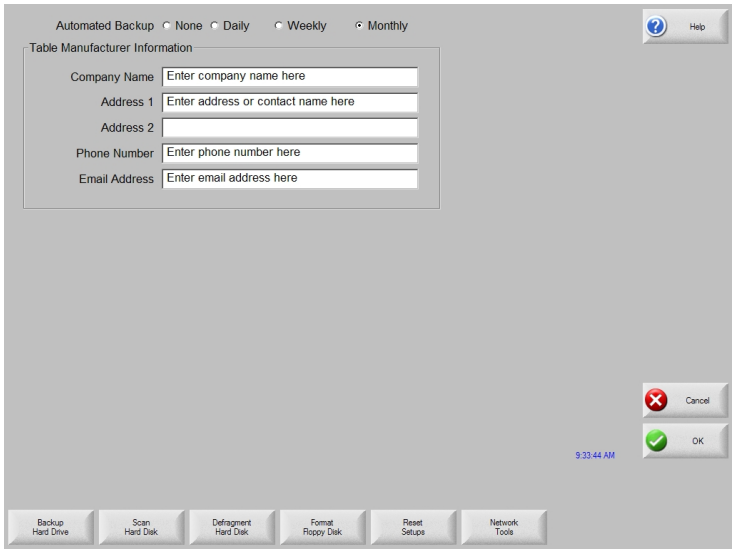
System Tools – Windows XP

Note: The CNC Systems Tools require operational knowledge of the Windows XP operating system and should only be performed by qualified personnel.

Note: A reminder is posted on the screen when entering the Systems Tools that a mouse and keyboard are required for proper operation. The mouse and keyboard should be connected to the CNC before entering the System Tools.



System Tools



Automated Backup

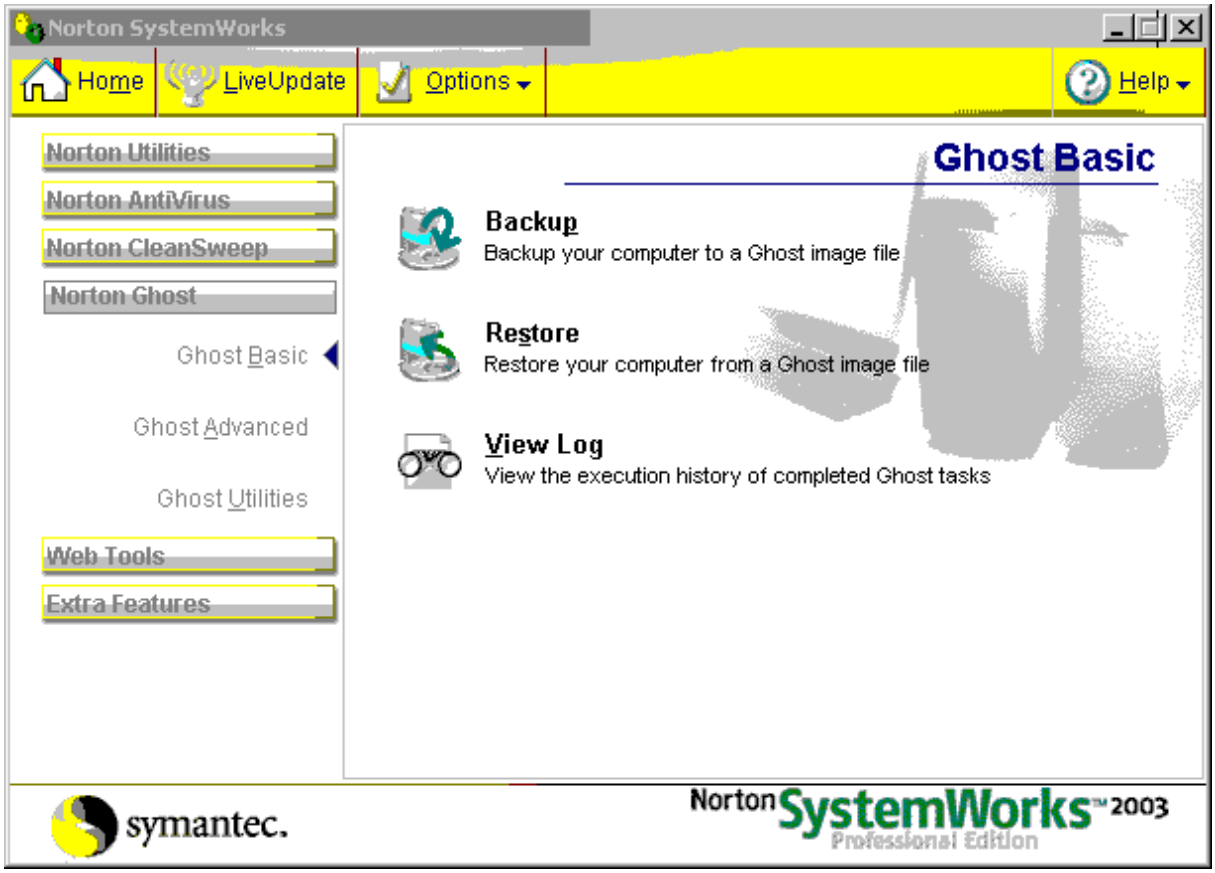
Select the frequency of the automatic reminder for the backup of information on the main hard drive. At the selected time, the system displays a prompt to back up the system when you turn it on.

Table Manufacturer Information

Enter the contact information for the cutting table manufacturer. This information is displayed when Remote Help starts up so this information should be the contact information for users of Remote Help.

Backup Hard Drive

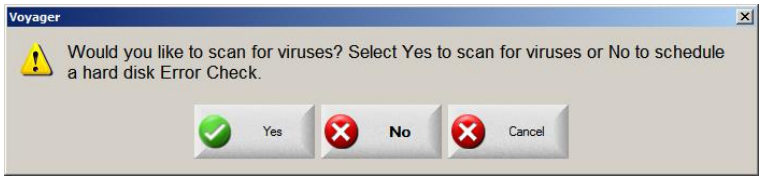
Press the Backup Hard Drive soft key to save the contents of the main hard drive to a specified location on the CNC hard drive or mapped location using the Norton Ghost Utility.



Note: After using Norton Ghost, all files on Drive C: will be replaced. CNC setups must be reloaded.

Scan Hard Disk

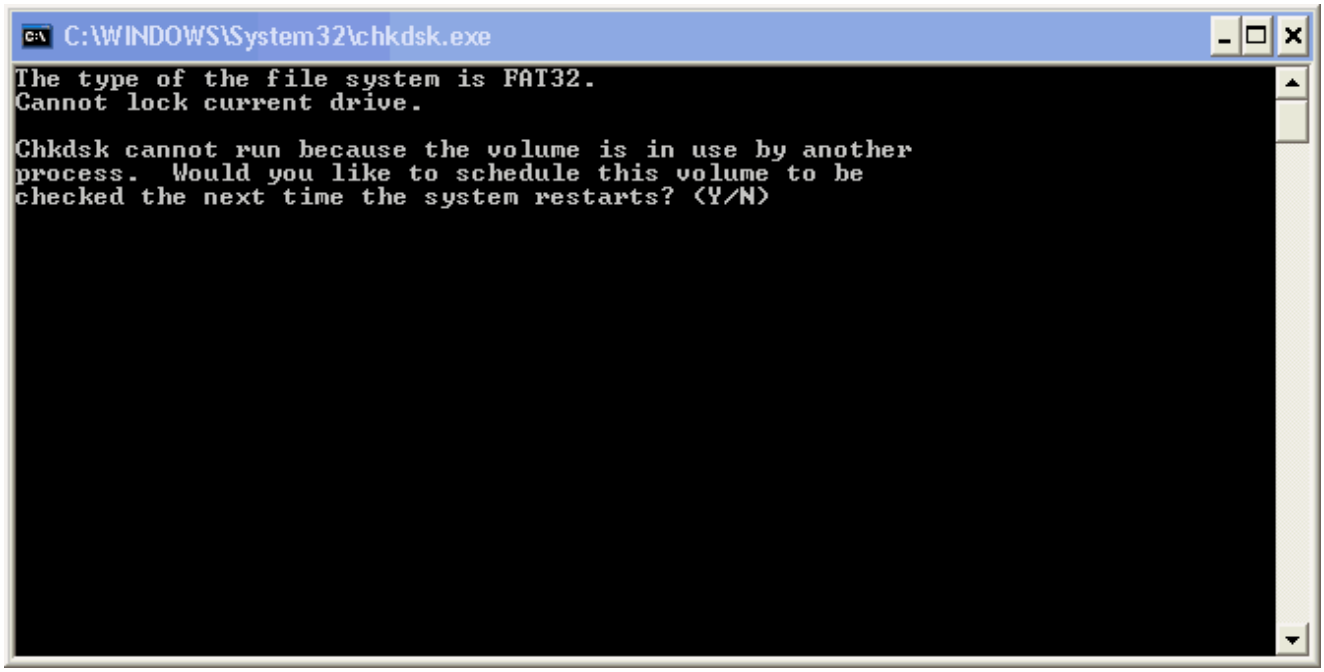
Press the Scan Hard Disk soft key to scan the hard drive for viruses or disk errors using Norton antivirus software.



Select Yes to scan the hard drive for viruses using Norton anti-virus software.

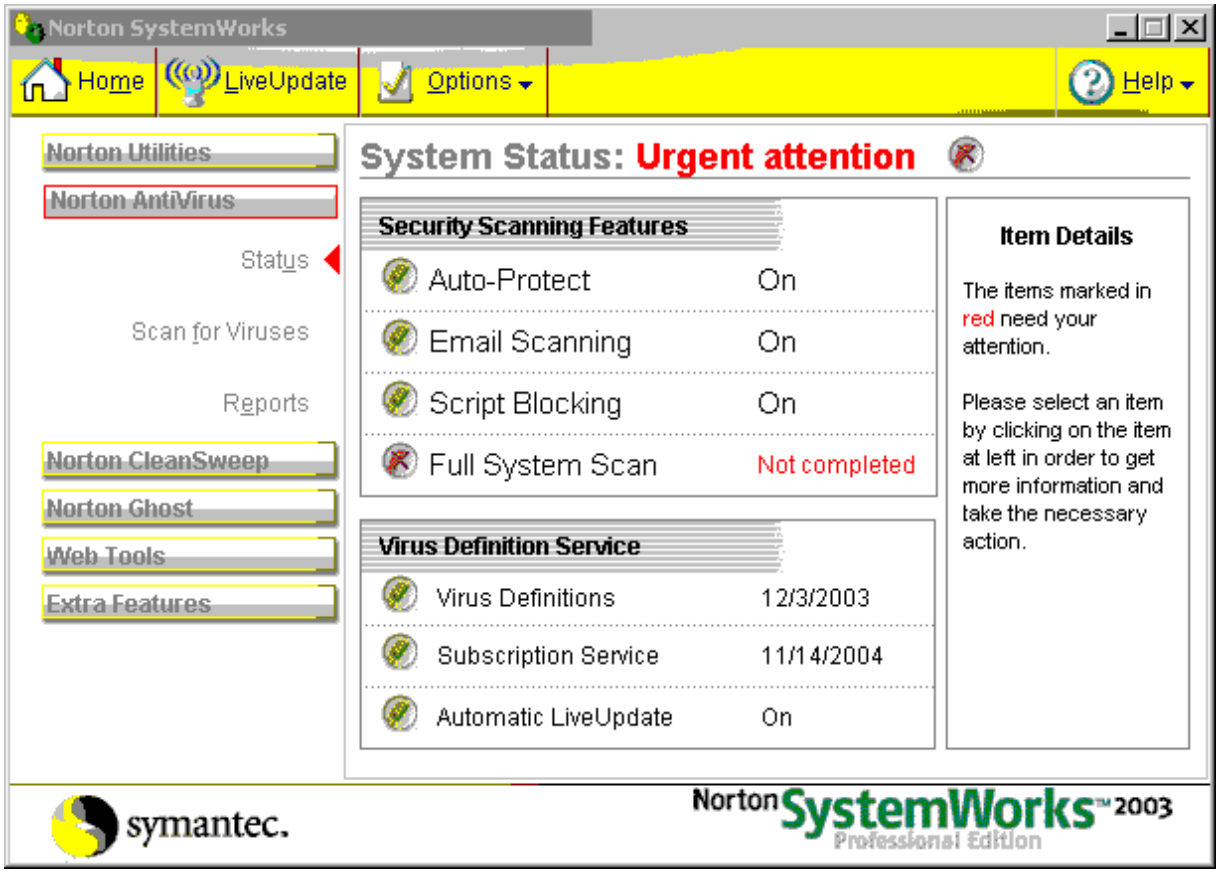
Select No to scan the hard drive for errors and correct them using the Windows XP CHKDSK (check disk) utility. This task should be performed approximately every three months depending on the number of files loaded to and removed from the control.

The Check Disk (CHKDSK) function cannot operate while the CNC software is in operation. You will be prompted to press "Y" (for yes) to check the disk the next time that the CNC boots up.



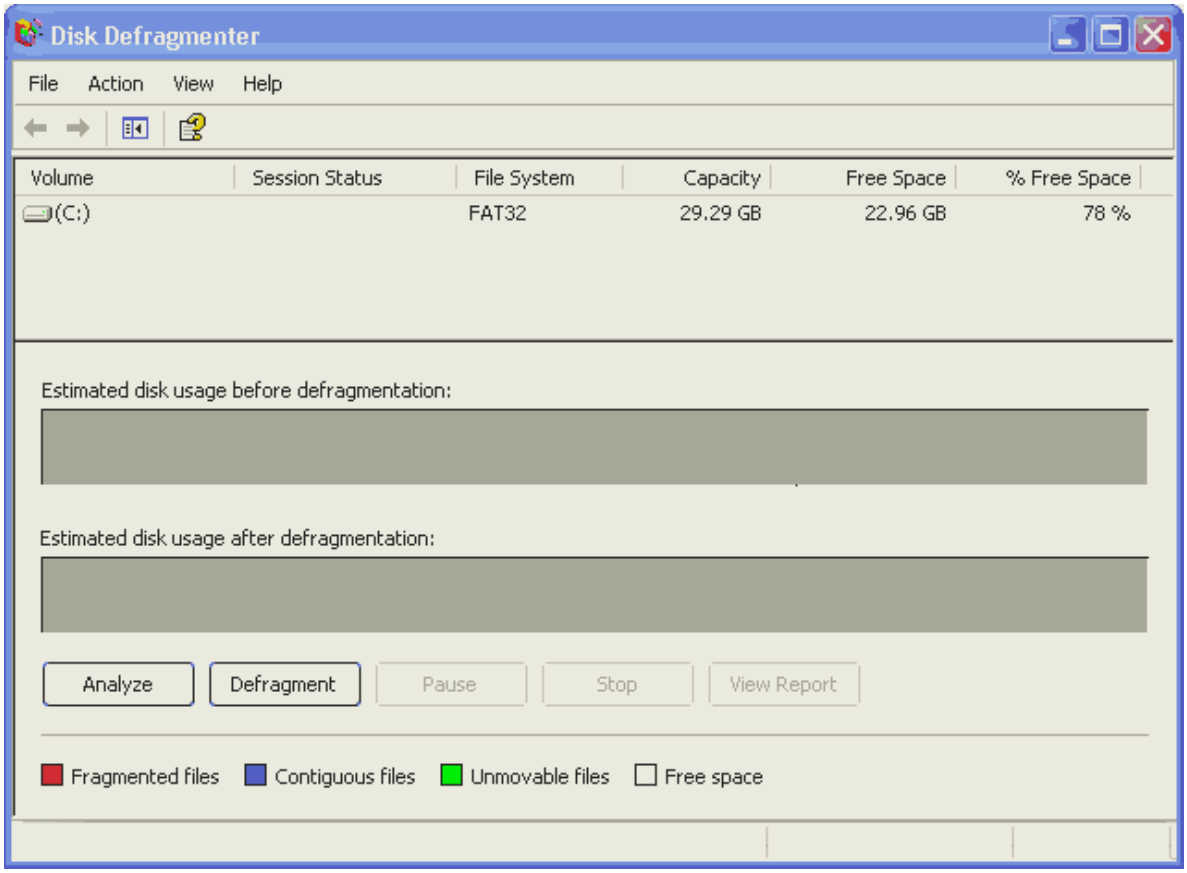
Antivirus

The AntiVirus feature allows you to search files that are loaded on the CNC for known viruses. Contact your CNC vendor to obtain the anti-virus software for your control.



Defragment Hard Disk

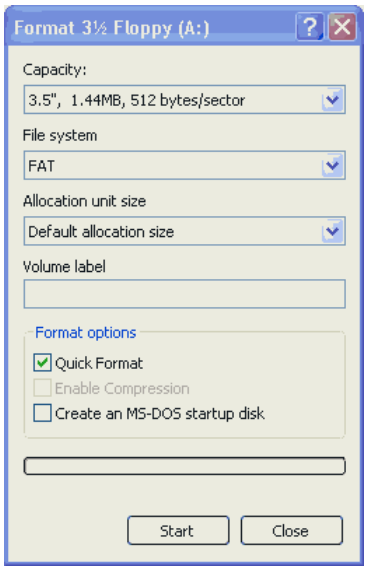
Scans the CNC hard disk for file locations and rearranges them for optimum performance. This task should be performed approximately every three months.



Format Floppy Disk

Formats a floppy disk if the CNC has difficulty reading a floppy disk formatted by a computer.

Important: Formatting the diskette will remove any files that are stored on the diskette.



Reset Setups

Deletes the current setup file and reloads default values. A new setup file can then be loaded on the CNC through the Special Password screen.

If the CNC supplier has installed a customized setup file that contains information specific to the cutting table, the soft key is renamed Restore Setups. This custom setup file is the default setup file and if you press the Restore Setup soft key, the custom setup file is restored.

Network Tools

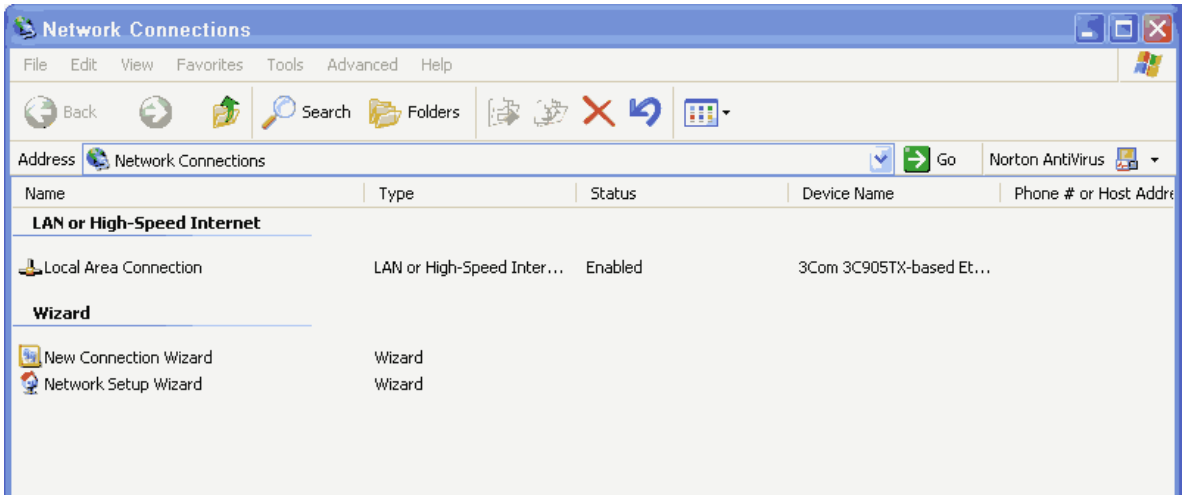
Network tools allow the CNC to be incorporated directly into an office PC Network for part allocation. This feature is available on the control's Windows XP operating system and requires a factory supplied network card to be installed. Contact your CNC vendor for additional details on adding this feature.

The optional networking feature is supported for:

- Window NT servers
- Window NT workgroups
- Window 98 workgroups

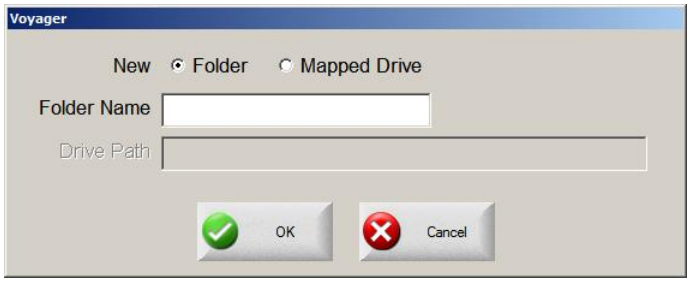
Note: The Network Tools require operational knowledge of the Windows XP operating system and should only be performed by qualified personnel.

Press the Network Tools soft key on the System screen to access the Windows XP Network Connection utility.



To Map the CNC for loading files

Enables the Mapped Network Drive feature on the special password screen. On the Files screen, double click on the load from file location or press the + key then enter a drive location.



The control automatically logs on to the system at boot up.

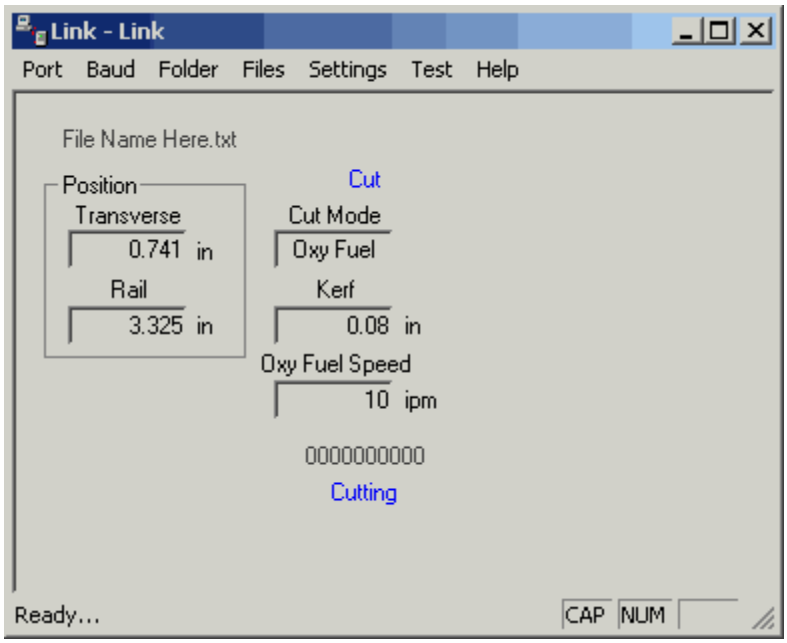
Phoenix Link

Overview

The Phoenix Link communication software is communication software on the CNC for transmission of part and consumable database files between the CNC and the host computer. The program uses a 2X compression feature that allows the communication system to operate at speeds up to 230 K baud.

Phoenix Link

When the Phoenix Link communication software is operating, the following window displays at the host computer for configuration. After the software is running, the window can be minimized.



Port

Allows you to select the communication port on the host computer.

Baud

Allows you to select the baud rate for communication on the host computer. The minimum baud rate is 9600 bps; the maximum baud rate is 115,200 bps.

Folder

Allows you to change the path of the Master folder (in the Parts folder). Subfolders and the part files within this folder are viewed at the CNC.

Files
Allows you to indicate which file extensions are acceptable for part program files that are downloaded by the link software and viewed at the CNC.

Settings
Allows you to configure the link to allow the Auto Reload (M65) feature to be enabled and recognized during communication. In addition, you can also select and configure communication with multiple CNCs using Multi-Drop.

Test
Tests the operation of the communication port. To test, simply connect the send and receive signals on the selected communication port by inserting a paper clip and click on the port to test. The status of the test is displayed in the lower left corner of the window.

Help
Displays the current version of the link software.

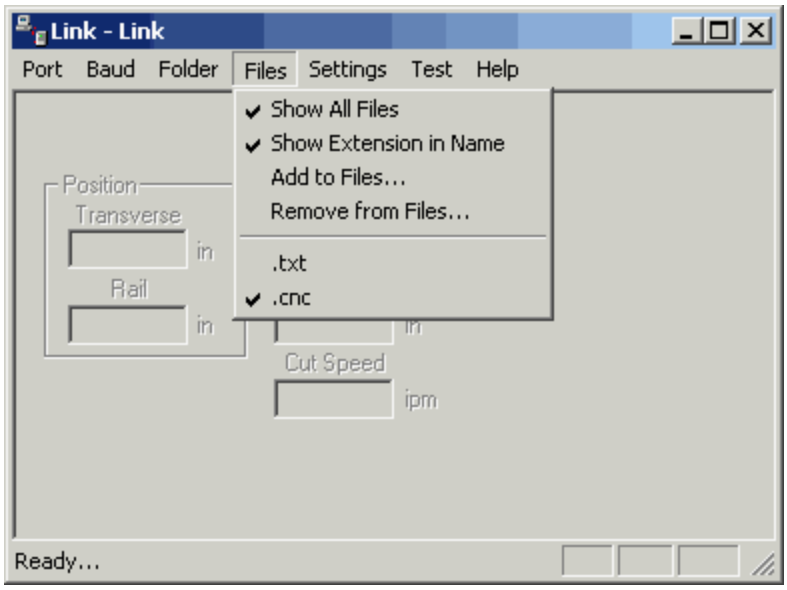
Files

The Files setup parameter allows you to indicate which file extensions are acceptable for part program files that are downloaded by the link software and viewed at the CNC.

After a file has been saved on the CNC, it is assigned the .txt file extension.

Important: Take care when downloading files. Part programs with the same name, but different file extensions, are overwritten during multiple file downloads. A warning is displayed at the control before a file is overwritten.

The list of acceptable part program types is listed in the lower half of the of the Files option box. A checkmark (√) before the file extension indicates which selected file type will be displayed at the control. Note that the checkmark (√) in the file extension listing also indicates the file extension that is placed on a part program when uploading a file to the host.



The following options are available to define what part programs can be viewed at the control.

Show All Files

Allows all file types in the selected parts folder to be viewed at the control. A checkmark (√) before this feature indicates that it has been enabled.

Show Extension in Name

Allows the user to view the file extension as part of the file name at the CNC. For the file name *Job123.CNC*, the control displays *Job123_CNC* in the filename location of the download screen. The control displays *Job 123* if this feature is not enabled. This feature is helpful if multiple files that have the same file name but different file extensions are being used. A checkmark (√) before this feature indicates that it has been enabled.

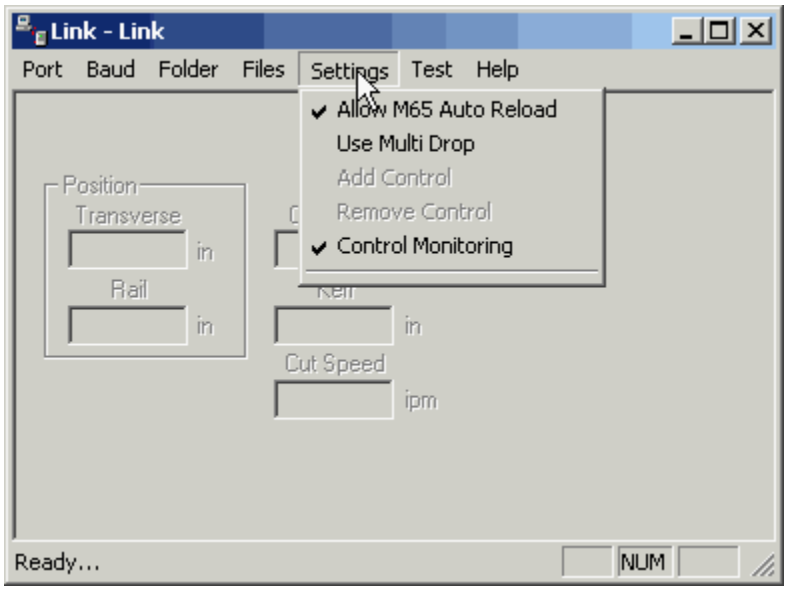
Add to Files

Allows the user to add to the list of acceptable part program types to be viewed at the CNC. Up to four file types (extensions) can be added to the default .txt extension. A checkmark (√) before a file extension indicates which file extension will be added to any part file that is uploaded to the host.

Remove from Files

Allows the user to remove file extensions from the list of acceptable part program types.

Settings



Allow M65 Auto Reload

Select this option to allow part programs to be partitioned into smaller part programs separated by the M65 code. During the download, the CNC downloads the individual sections of the part program and allows the operator to execute that section of the part. When that section of the program has been completed, the next section of the program is automatically downloaded for execution. The downloads continue until an end-of-program (M02) code is detected.

Use Multi Drop

Allows the link to be configured for communication with multiple CNCs through one communication port on the host PC. Up to eight controls can be supported with the Multi-Drop feature.

Note: The Using Phoenix Link parameter must be set to Yes at the control to enable this feature. In addition, specific hardware for the control (serial communication board Rev D or higher) and host PC may be required to support this feature. Contact your control supplier for more details.

Add Control

Adds a new control to the list of controls to communicate with. The corresponding control number must be assigned to the new control in the link set-up screen.

Remove Control

Removes a control from the list of controls with which the host PC communicates.

Control Monitoring

Allows you to view control status at the host PC. Status for file name, position, cut mode and cut information is displayed. This feature is only available with the Phoenix Link communication software.

Installation

The list below outlines the step-by-step procedure for the communication setup of the control and installation of the Phoenix Link communication software:

Minimum System Requirements

Processor:	Pentium 100MHZ
Hard Drive Space	0.5 MB
Memory:	4MB
Display:	VGA
Floppy Drive:	3.5”
Operating System:	MS Windows 95, 98, NT, 2000, ME or XP
Serial Port:	One RS-232 or RS422 serial port will be required per control.

Software

1. At the CNC, access the Special Password screen.
2. Insert a diskette or USB memory device into the floppy drive or USB port.
3. Press the Make Link Disk soft key. Three files are transferred to the memory device:
   Link.exe
   Setup.exe
   Readme.txt

   The Setup file creates a Link folder on the root directory of the host PC and copies the Link software into it. The Readme file contains additional information about the installation and setup of the Link software on the host computer.

4. When the light goes out on the floppy drive, transfer the floppy disk to the host computer and place the disk into the floppy (A) drive.
5. Click the Windows Start button and select Run.
6. Enter *A:\Setup.bat* in the Open field and click OK.

   The setup file expands the files and creates a Link folder on the root directory. The Link.exe file is copied to this folder.

   N**ote**: The Link software must be located and run on the PC that is connected to the communication cable coming from the control.
7. Click the Windows Start button and click Run.
8. Enter *A:\Link\Link.exe* in the Open field and click OK.
   After the link software has been launched, two other files are created. A Link.ini file,

which contains the Link software configuration information, and a Parts folder, which is the default Master parts folder.

9. Create a shortcut to the Link.exe file on the desktop of the host PC..
10. At the host computer, create one or more folders in the Parts directory. Copy any part programs that will be accessed by the control in these folders.

    For example, to add the folders Workfile 1 and Workfile 2 to the parts directory, the hierarchy of the files would resemble the following structure:

    Path C:\Link\Parts\Workfile 1 and C:\Link\Parts\Workfile 2

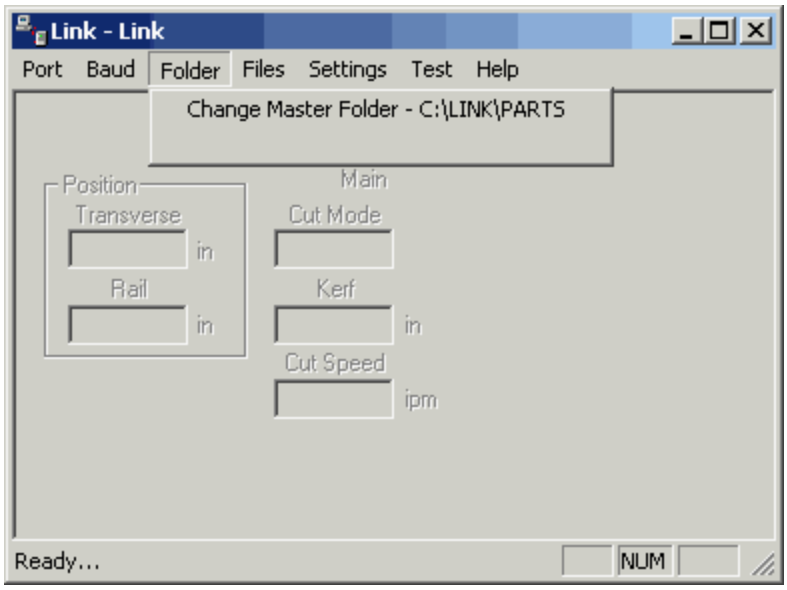
    Any part programs that will be viewed at and downloaded to the control should be placed here. Only the sub folders Workfile 1 and Workfile 2 and the program files located within them are viewed at the control.

Change Master Folder

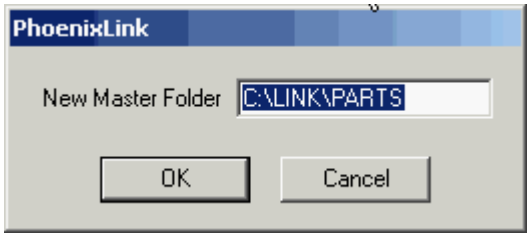
If the host computer currently has existing part programs and folders, the Link software can be configured to operate with the current folder names. This master part program folder can be located on the host PC or on another PC that is networked to the host PC.

Note: The Link software must be located and run on the PC that is connected to the communication cable coming from the control. This is accomplished by configuring the Link software through the Change Master Folder feature to point the link to the folder that contains the required part programs.

Launch the Link software at the host computer to view the Link window.



Select Files > Change Master Folder.

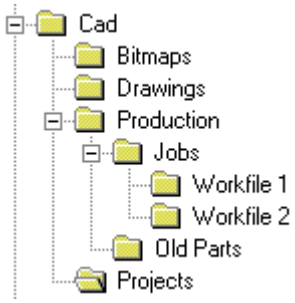


To change the master file from the current folder, enter the selected path in the New Master Folder field and click OK.

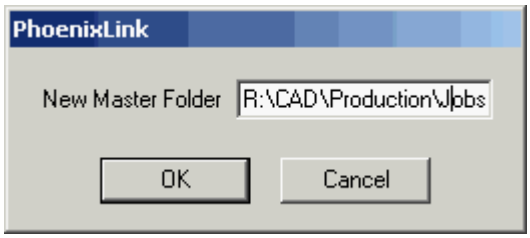
Use the same procedure to select a master folder on a network.

For example, if the folders that contain the part programs are currently located in a folder named Jobs that is located on the PC named R drive, the Link.exe could be configured with the Change Master folder option to access these files.

Example path: R:\Cad\Production\Jobs



Again, start by launching the Link Software at the host computer. Select Files\Change Master Folder.



The Master file may now be changed from the current folder to the selected "Jobs" folder by typing in the path R:\Cad\Production\Jobs. Select OK to accept the change.

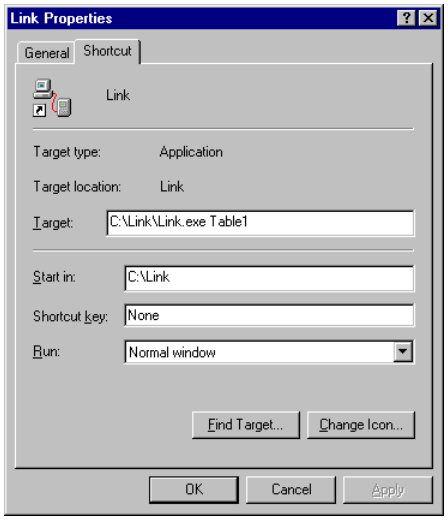
The final step to setup the Link software is to configure the Link software for Port, Baud, Files and Settings to match those being used at the control. It is recommended that a shortcut to the Link.exe be placed on the desktop of the host PC for ease of use.

Operating Multiple Links

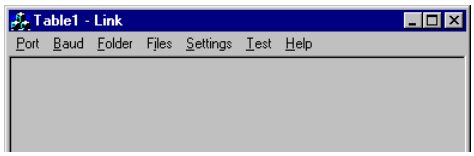
To connect more than one control to the host PC without the use of the Multi-Drop feature, you can install Link software specifically for each control. Each version of Link that operates requires its own, dedicated communication port on the host PC.

1. Create individual folders for each cutting table.
2. Copy the Link.exe file into each folder.
3. Create a shortcut for each Link.exe on the desktop.
4. Right-click on each shortcut to open the shortcut properties dialog box.
5. Add to each shortcut the target command line information to indicate with which table the Link will be communicating.

In the target command line example below, *Table1* has been added to the end of the command line to indicate the Link will be specific to communications with Table 1.



This “table” information, added to the Target command line, is added to the title bar of the Link window. The Link can now be launched from the shortcut and configured specifically for this “table”. When the Link is closed, a “Table1.ini” with the specific Link setup file will be saved in the folder.



Continue to configure each additional Link for communication to each control. The separate Link files can be configured to point to the same or different master parts folders.

Hardware

To set up communication, place the control next to the host computer and connect them with a short communication cable. After communication is successfully established, the control can be moved to the cutting table and connected to the host computer with the appropriate cable or short-distance modem system.

1. Configure the selected RS232/RS422 serial port on the control for operation, as described in the Serial Port information of this guide.
2. Test the control’s communication port in the Diagnostic Screen to confirm proper operation of the serial port. Directions for testing of the serial port are described in the Diagnostic section of this guide.
3. Enter the control’s Link setup screen to select the use of the desired communication port, select the baud rate and select to use Phoenix Link. Start at the lowest baud rate and increase it until the maximum is achieved. If you select a baud rate that is too high characters or information can be lost and error messages will be displayed.
4. Enter the control’s Special Password screen to add the file extension of the part programs that are being used to the current list of acceptable file extensions.
5. Load and configure the Link software at the host computer as described in the Software section.
6. Test the host computer’s selected serial port with the “Test Port” feature of the Link software as outlined in the Phoenix Link software overview.
7. Connect the control to the host computer’s selected communications port with the appropriate cable or modem system.

Operating Phoenix Link

The Phoenix Link software must be running on the host computer to communicate with your CNC.

1. Start the Link software at the host PC from the desktop shortcut or select the Windows Start Button, then select Run.
2. From the opening prompt, enter C:\Link\Parts\Link.exe (or the appropriate path to the Link.exe) and click OK.
   The Phoenix Link window appears. The Link software window can be minimized during operation.
3. At the CNC, press the Files soft key and select to Upload or Download to Host. As the control is connecting to the host computer, a status display in blue text for the communication can be viewed in the lower right corner of the screen.
4. The control will initialize the port, open the port, and try to contact the host. If this attempt at communication fails, an error message is displayed in red. If the attempt is successful, the control downloads the available folder and part file names to be viewed on screen.

   Note: If you select No in the Show Host File Names field at the control, only folder names can be viewed.

Common Errors

The following list describes common errors that you can encounter when you install a communication system.

- The port selected at the host computer has already been assigned to another software program.
- The host and control have been configured to different setup values.
- The cable has been connected to the incorrect port or software has been configured to the incorrect port.
- The selected modem or cabling system being used has swapped the transit and received signals, causing a communications failure.
- Trying to transmit over too long a cable without a modem or using incorrect wire for the distance being traveled.
- Trying to communicate at too high a baud rate for the modem system selected.
- The correct file extension has not been entered at the control’s Special Password screen, preventing part programs from being displayed at the control.

Error Messages

The following list provides descriptions of common error messages and possible causes.

Unable to Open Port (control)

The selected communications port could not be opened. The wrong port has been selected or the communications port has failed.

Unable to Open Port (host)

The selected communications port could not be opened. The wrong port has been selected, the communications port has failed or another software application is using the port.

Unable to Initialize Port

The selected communications port could not be initialized. The wrong port has been selected, the communications port has failed or another software application is using the port.

Port Failed

The Port Failed error message is displayed if the communications port test has failed for the selected port. There could be a failure of the communications port or a fault in the test wire connection that is incorrectly connected to the proper send and receive pins location.

Host Not Responding

This message is displayed if the communication port has successfully opened the port but has failed to establish communication with the Link software. There could be a fault with the cable connection, cable configuration, or the host computer's communications port.

Communication Failed

This message is displayed if, after establishing communication with the host, an expected message from the host is not correct.

Communications Time Out

This message is displayed if the specified amount of time allowed for a response from the host computer expires. This amount of time is configured in the Link setup screen. There could be a fault in the cable connection, cable configuration, or the host computer's communications port.

Checksum Error

This message is displayed at the control after a part has been uploaded or downloaded if the checksum calculated by the host and the control do not match. The checksum calculation is performed by adding the numeric values of the ASCII codes that are used. Possible reasons for this error are incorrect cabling or transmission at a speed that is too high for the selected communications system.

Warning: The Master Folder Selected does not Contain any Folders

This error message is displayed at the host computer if the selected master folder does not contain any subfolders. You can choose to add subfolders if they do not exist. If subfolders do exist, the path to the master folder may be incorrect.

For additional assistance in trouble shooting the Phoenix Link in the event of a failure, contact your control vendor.

Sensor THC

Overview

Sensor THC (Torch Height Control) system is designed for use with your shape cutting control. Sensor THC utilizes the most current technology available to provide superior plasma cut performance.

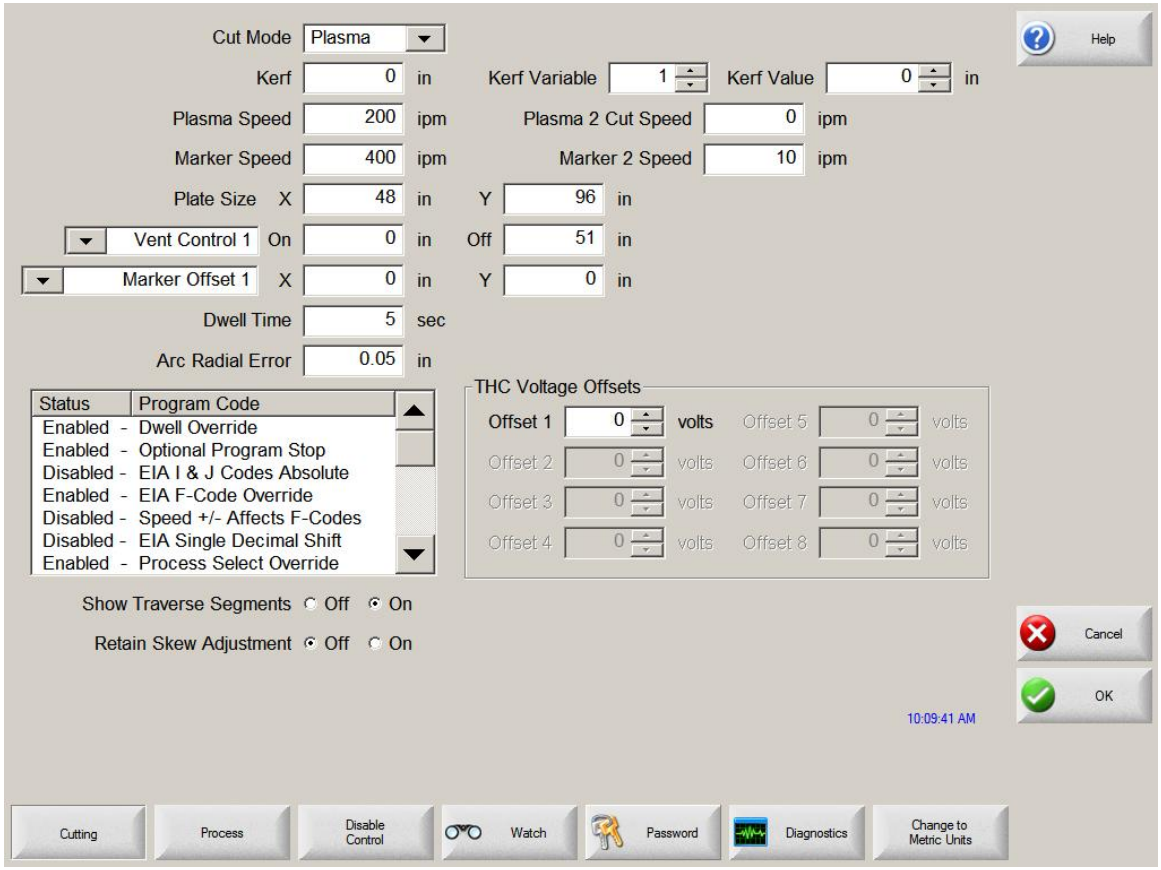
During the plasma cut process, variations in the distance between the torch tip and the cut material affect the cutting arc voltage and ultimately, the quality of the cut. An automated torch height control maintains the appropriate cut height for the set arc voltage to obtain the optimum cut quality 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 includes 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 is 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 restored to the original value. This value is then compared to the value of the Set Arc Voltage field. If the values are different, the control will raise or lower the torch on the slide to correct the cut voltage. This Appendix will highlight the features which are unique to the Sensor THC.

For operation, this feature must first be enabled in the password machine setups. Setup parameters specific to the cut process and the THC axis will then be available for configuration.

 **Warning!** Installation, Setup and Calibration should only be performed by trained service personnel. Extreme care should be used when installing this product.

Cut Setups

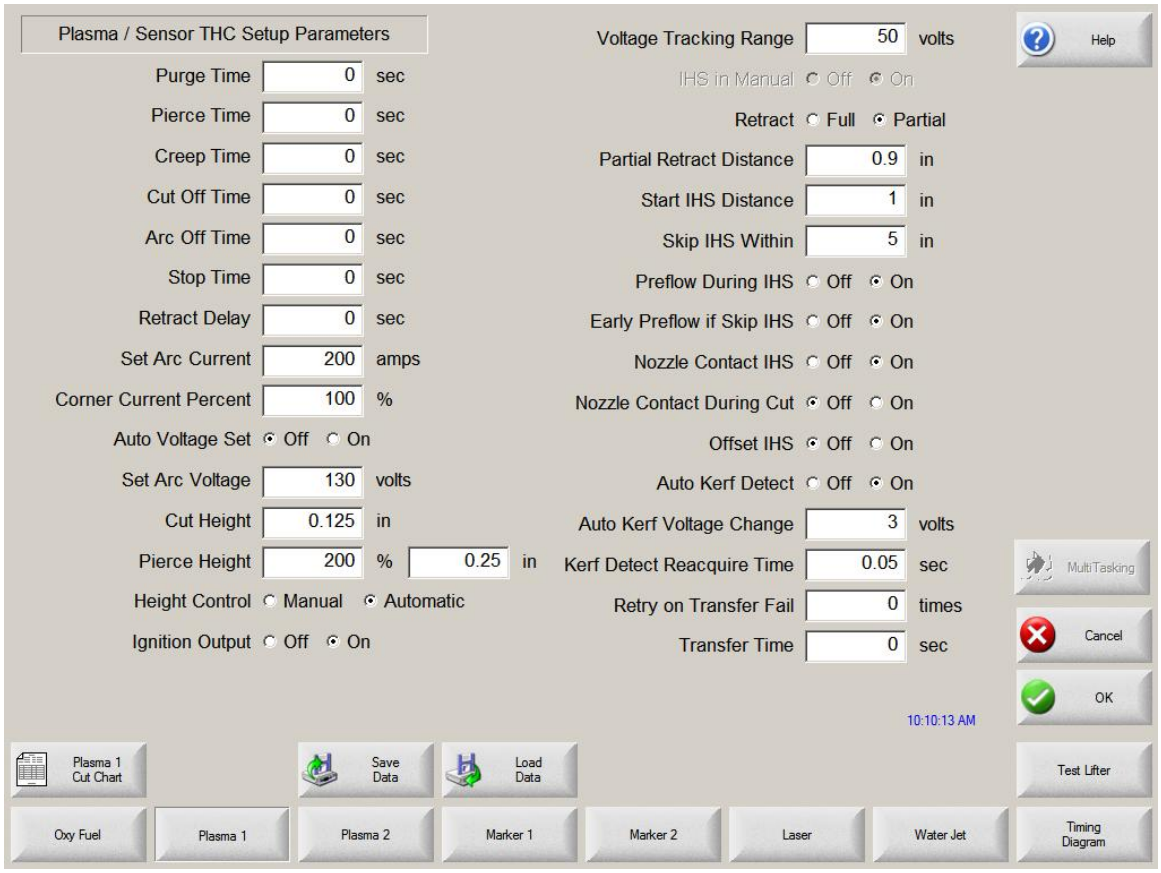


THC Voltage Offset

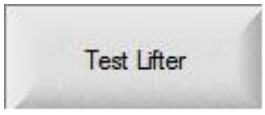
Offsets the individual Sensor THC arc voltages from the master set arc voltage. This allows the individual THCs to be adjusted to compensate for consumable wear and obtain optimum cut quality.

Note: The THC Voltage Offset parameter can be automatically adjusted using the Volts per Minute parameter of the Change Consumable screen. Refer to Change Consumables for additional details.

Plasma Setups



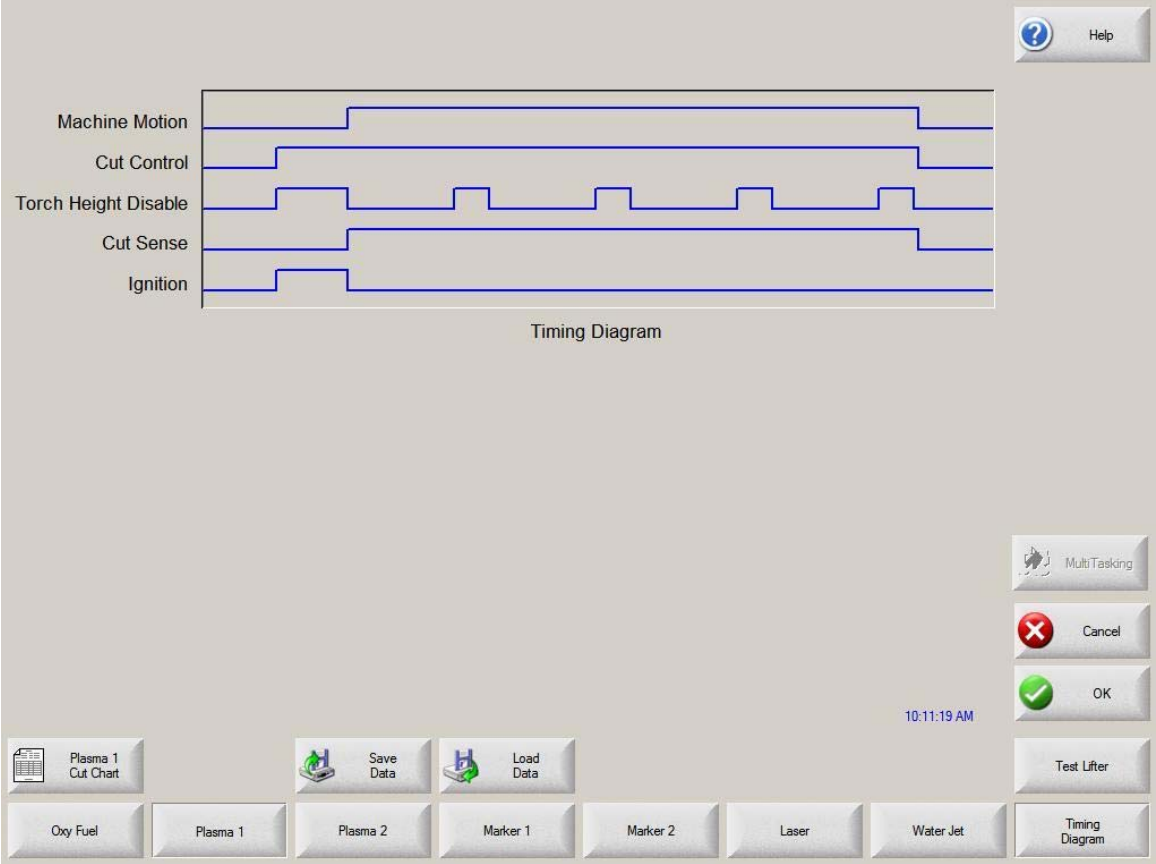
The test lifter soft key allows you to test the IHS function.



Test Lifter

Press the Test Lifter soft key to command the torch lifter to descend to the plate, sense the plate, and retract to the pierce height.

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



Retract Delay
Specifies the delay between the cut off and the torch retract.

Auto Voltage Set
Samples the Arc Voltage that is generated when cutting at a specific cut height. The Arc Voltage value relative to the manual cut height sample is used when cutting the part instead of a predetermined Arc Voltage.

Set Arc Voltage
The Arc Voltage to use for the material being cut.

Cut Height
Selects the cut height from the plate. This sets the initial cut height before arc voltage control is activated when the system is operating in automatic mode.

Pierce Height
Selects the pierce height. This can be entered as a percentage of the cut height or as an actual distance.

Voltage Control

Allows the operator to select whether the Sensor THC operates in manual or automatic mode. Manual mode disables the torch height control and allows the torch to cut at the specified cut height and voltage. Automatic mode allows the THC to command the torch up and down to maintain the voltage at the specified arc voltage set point.

Ignition Output
Enables the use of the ignition output to ignite the plasma torch. If your plasma system requires a separate ignition signal, select On. If not, leave Ignition Off.

Voltage Tracking Range
Specifies the allowable variation in arc voltage from the set point. If the arc voltage goes above or below this allowable range, the system faults and pauses cutting.

IHS in Manual
Allows the operator to select whether to use initial height sensing when operating the Sensor THC in manual mode.

Retract Full/Partial
Allows the retract distance to be set at full or partial. During a full retract, the torch retracts to the home position. During a partial retract, the torch retracts to the set retract distance.

Partial Retract Distance
Selects the THC retract distance for a partial retract.

Start IHS Distance
Specifies the distance that the THC travels to move the torch at high speed before switching to low speed and beginning initial height sense. Take care to select a distance that allows the torch to clear the plate.

Skip IHS Within
Disables initial height sense at pierce points if IHS falls within the selected distance. This setting increases cutting productivity. The distance is measured from the end point of the cut segment to the next pierce point.

Preflow During IHS
Select On to activate preflow during the IHS cycle.

Early Preflow if Skip IHS
Select On to activate preflow during the traverse before the pierce if skip IHS is enabled.

Nozzle Contact IHS
Select On to require the Sensor THC to use contact sense to detect the plate during the IHS cycle. Use this parameter when cutting light gauge material to prevent plate deflection.

Nozzle Contact During Cut
Select On to require the Sensor THC to use the contact sense input to detect the plate contact during cut and pause operations.

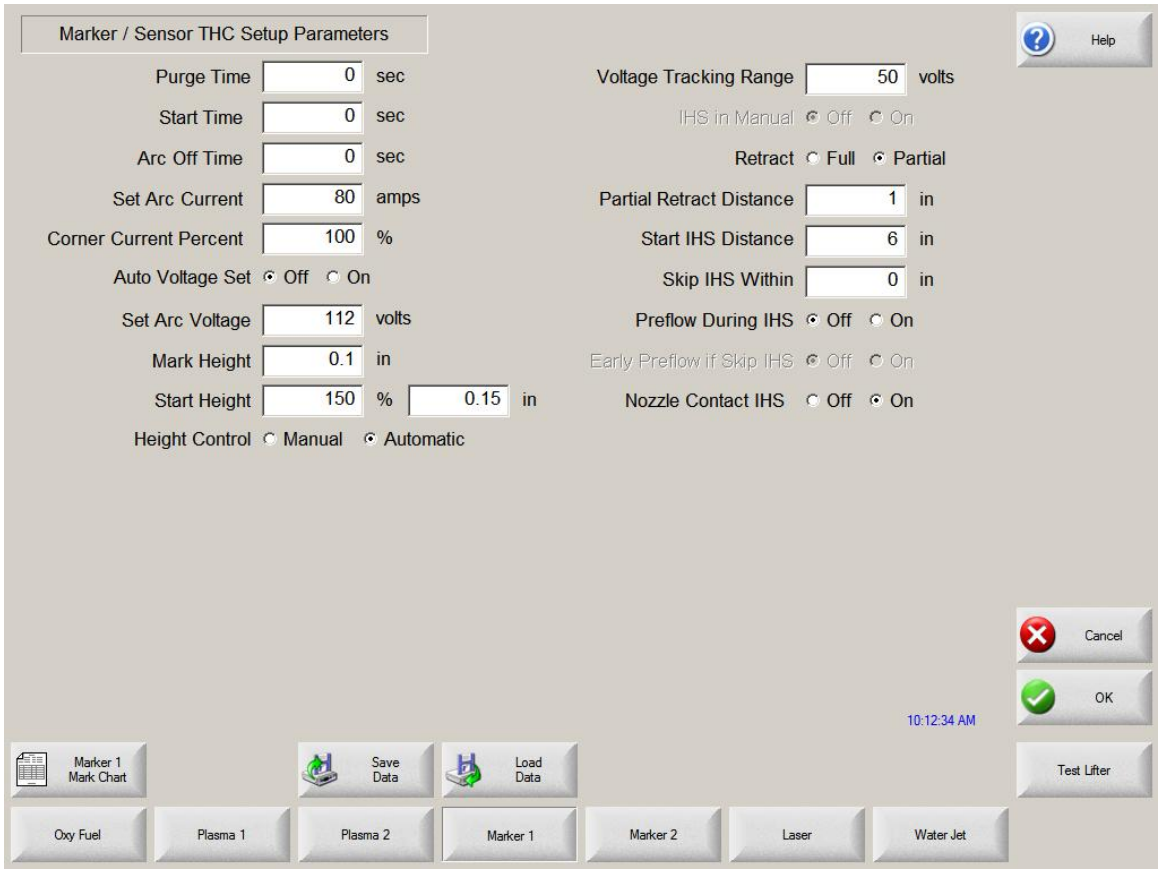
Offset IHS
Activates a remote probe for plate detection and initial height sense. If this feature is enabled, the control system executes the Tool Offset 9 or Marker Offset 9. The plasma torch moves the distance of the offset, performs the IHS and then returns the torch to the pierce location at each commanded pierce or cut on. The Z axis parameter is used to adjust for height differences between the torch and the probe.

Auto Kerf Detect
Reduces the possibility of the torch diving into the plate. When Yes is selected, the THC detects sudden changes in arc voltage when crossing a kerf path and freezes the height motion of the THC.

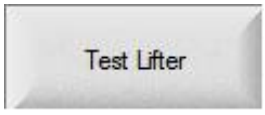
Auto Kerf Voltage Change
Sets the change in voltage that disables the THC when the torch passes over a previous cut. This setting prevents the torch from diving and requires that the Auto Voltage Lock On parameter be active.

Kerf Detect Reacquire Time
Determines the amount of time after a change in voltage is detected that the CNC disables THC height motion.

Marker Setups



The test lifter soft key is available to test the IHS function.



Test Lifter

Press the Test Lifter soft key to command the torch lifter to descend to the plate, sense the plate, and retract to the pierce height.

Purge Time

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

Start Time

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

Sample Voltage
If this parameter is enabled, it samples the Arc Voltage that is recorded when cutting at a specified cut height. The value of this sample arc voltage is used to cut the part instead of a predetermined arc voltage.

Set Arc Voltage
Records the arc voltage for the material being cut.

Mark Height
Sets the cut distance from the plate. This value sets the initial cut height before arc voltage control is activated when operating in automatic mode.

Start Height
Sets the start height for the cut. This can be entered as a percentage of the start height or as an actual start height distance.

Voltage Control
Allows the operator to select the Sensor THC to operate in manual or automatic mode. Manual mode disables the torch height control and allows the torch to cut at the specified cut height and voltage. Automatic mode allows the THC to command the torch up and down to maintain the voltage at the specified arc voltage set point.

Voltage Tracking Range
Sets the allowable variation in arc voltage from the set point. If the arc voltage exceeds this range, the system faults and pauses cutting.

IHS in Manual
Allows the operator to select whether to use the initial height sense when the Sensor THC is in manual mode.

Retract Full/Partial
Selects the retract distance. If Full is selected, the torch retracts to the home position. If Partial is selected, the torch retracts to the distance set in the Partial Retract Distance field.

Partial Retract Distance
Sets the distance that the THC retracts when partial retract is selected.

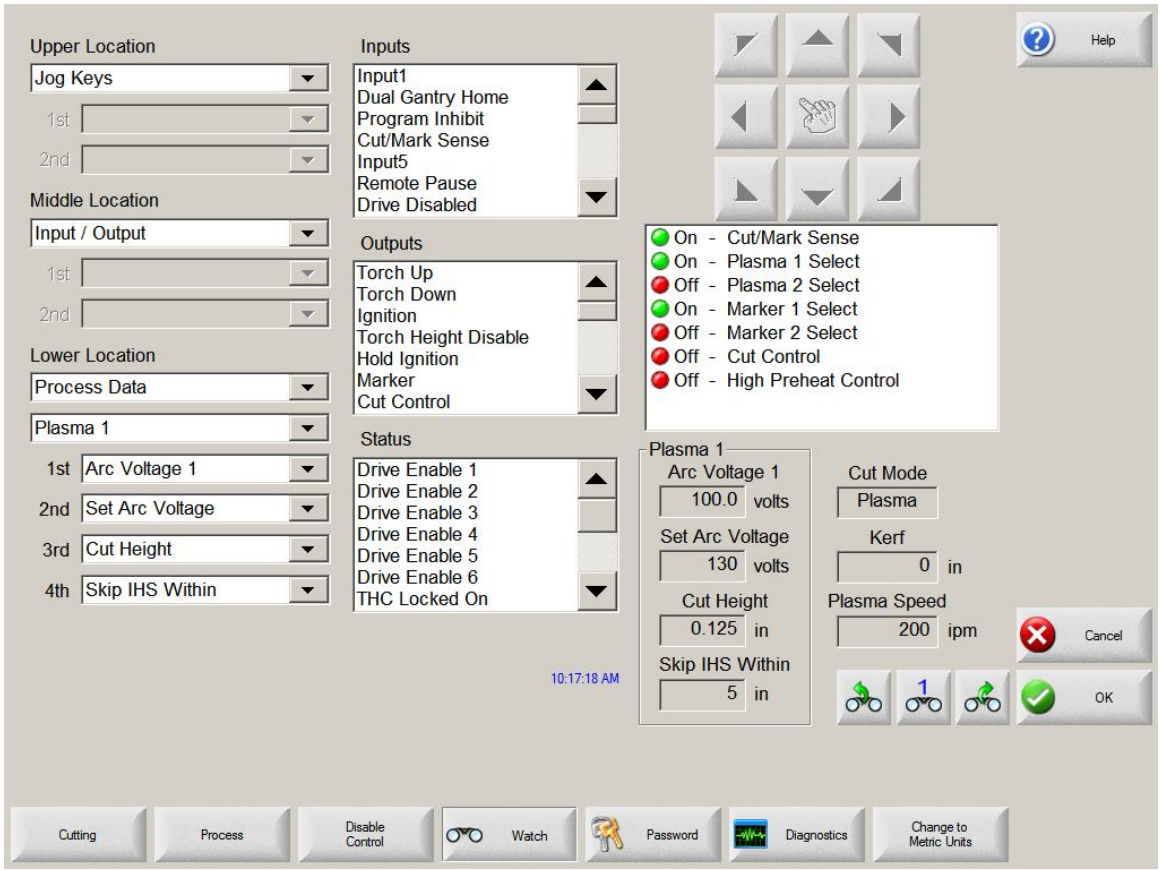
Start IHS Distance
Specifies the distance that the THC moves the torch at high speed before switching to low speed and beginning initial height sense. Take care to select a distance that allows the torch to clear the plate.

Skip IHS Within
Disables initial height sense at pierce points if IHS falls within the selected distance. This setting increases cutting productivity. The distance is measured from the end point of the cut segment to the next pierce point.

Preflow During IHS
Select On to activate preflow during the IHS cycle.

Nozzle Contact IHS
Select On to require the Sensor THC to use contact sense to detect the plate during the IHS cycle. Use this parameter when cutting light gauge material to prevent plate deflection.

Process Watch



Input/Output
In addition to the standard I/O options, the Watch window can be configured to include the status of the voltage tracking for the Sensor THC. This indicates when the automated voltage tracking has “locked on” and is adjusting the torch height based on voltage.

Position

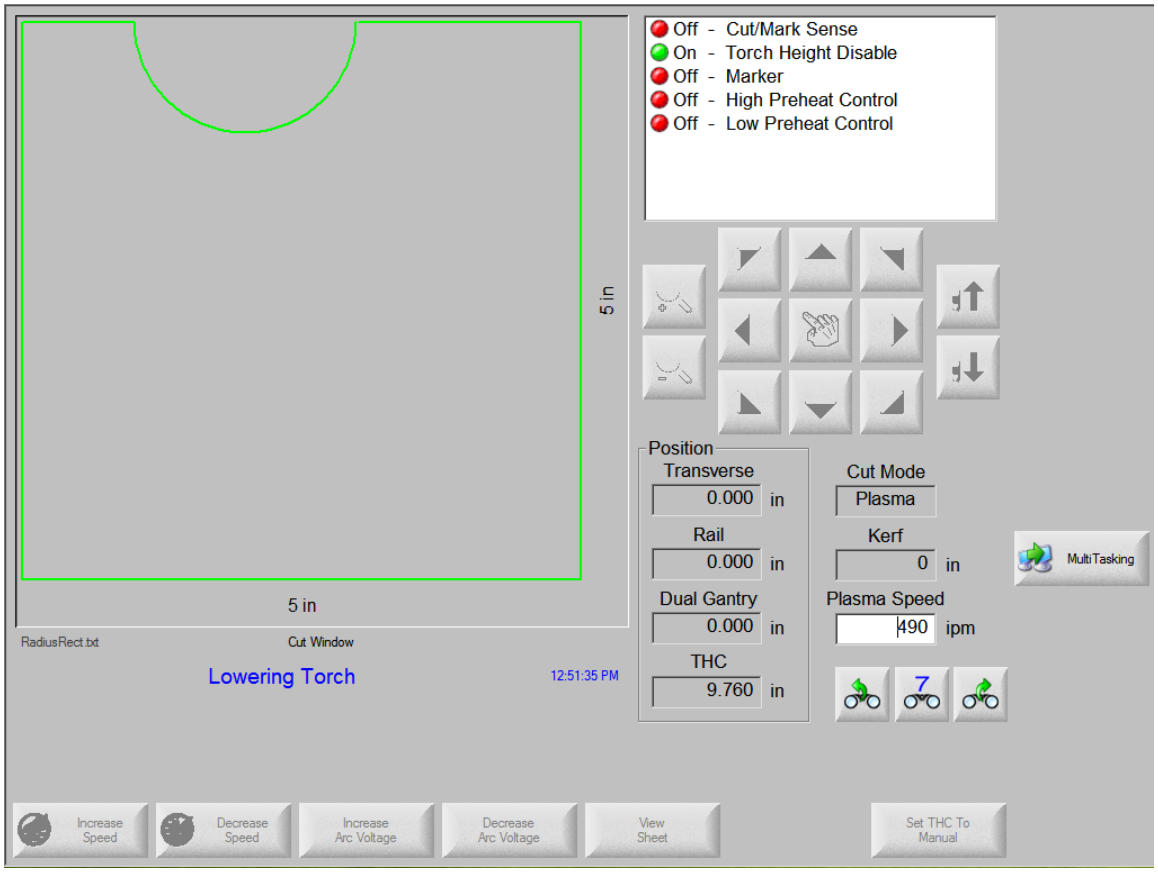
The Sensor THC is operated as a separate axis on the CNC. Position information for the THC axis can be displayed in the Watch window.

Plasma Process

Information critical to the THC operation may be added to the Lower Location. This information includes Arc Voltage, the Set Arc Voltage, Cut Height and Pierce Delay. Values for the Set Arc Voltage, Cut Height and Pierce Delay can be adjusted on the main cut screen to customize the cut process.

Main Cut Screen

Automatic THC Mode



When the Sensor THC is cutting in automatic mode, three soft keys are available on the main cut screen that allow the operator to manually increase and decrease arc voltage for the cut and to switch to manual mode.

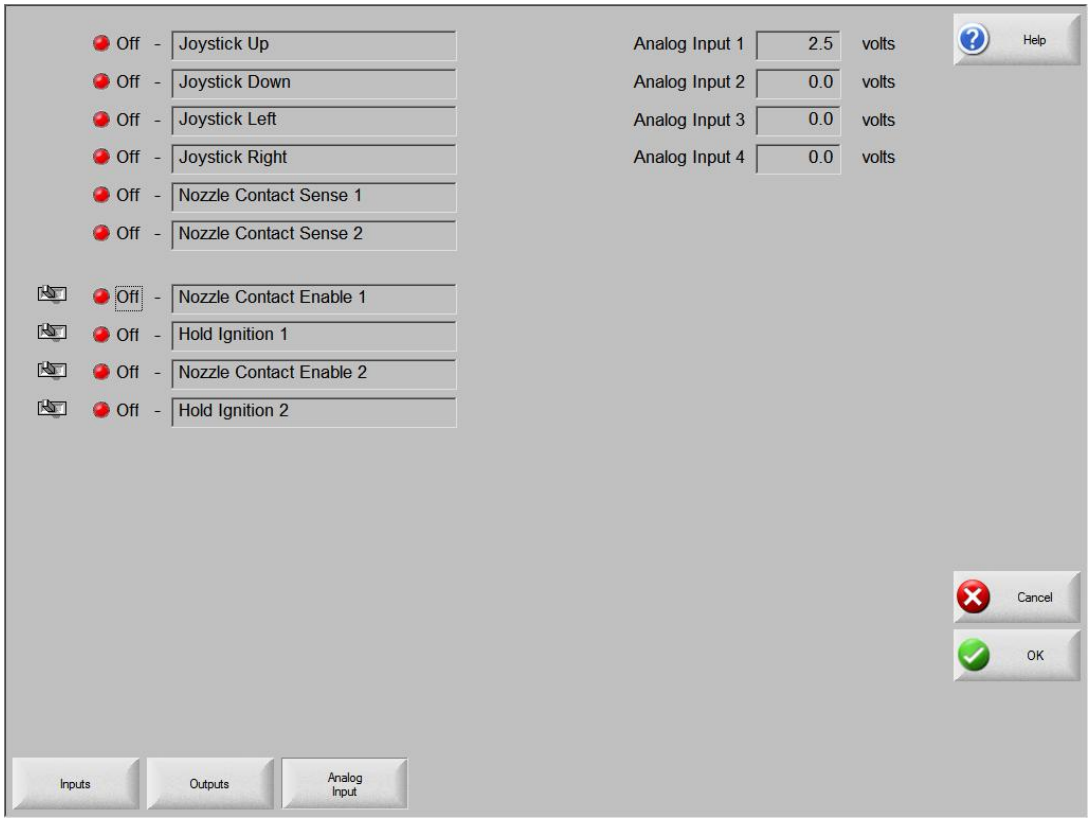
When the Sensor THC is cutting in manual mode, three soft keys are available on the main cut screen that allow the operator to manually raise and lower the manual cut height and to switch to automatic mode.

Sensor THC Setups

Analog Input

The Sensor THC requires that additional inputs, outputs and analog voltage be transmitted to the CNC to monitor the process. These signals are transmitted to the CNC through an analog input card that is installed in the CNC. In addition to THC operations, this analog input card can also be used for operation of an optional joystick and external speed pots.

Note: The appearance of the view screens varies depending upon the analog input card that has been installed.



Inputs / Outputs

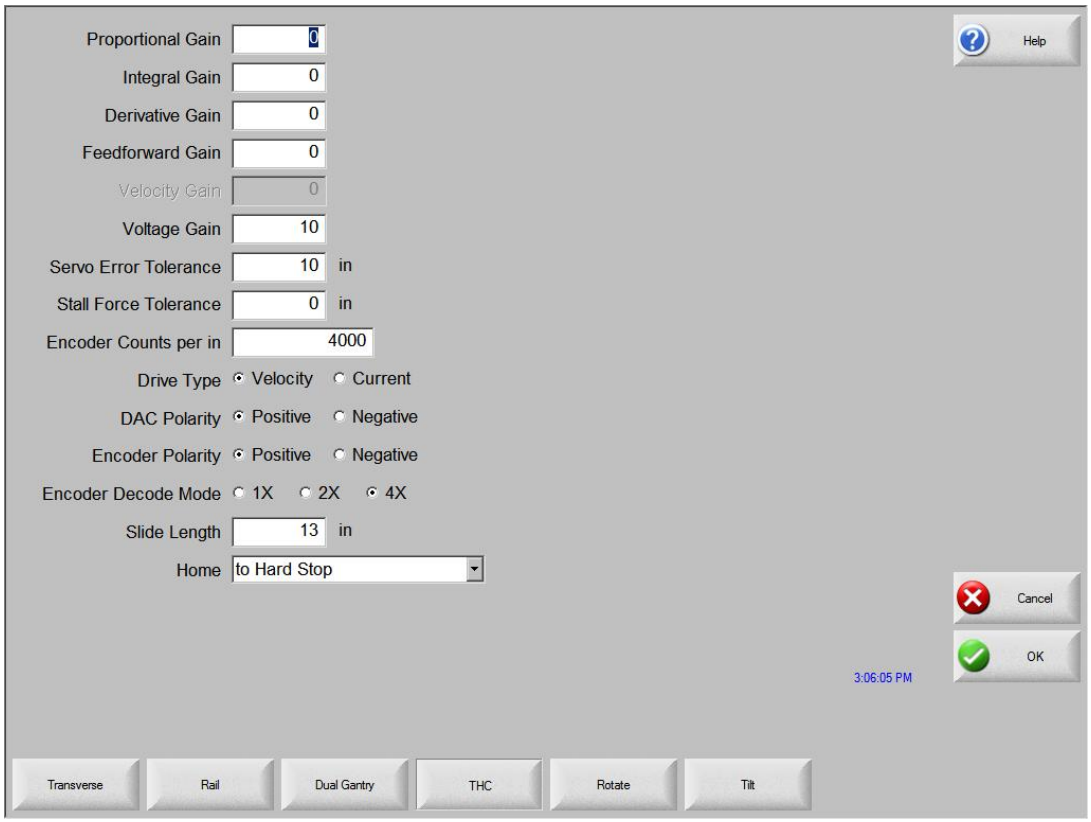
Single-ended inputs and outputs located on the analog input card are displayed.

Analog Inputs

The analog input values shown in the upper right of the screen are the actual voltages coming into the analog card. Analog inputs that are assigned to the THC axis and the analog input for the THC are visible here.

Sensor THC Axis Setups

The THC Axis screen is designed specifically for use with the Sensor THC.



Note: For proper operation, Sensor THC encoder counts should be approximately 20, 000 counts/ inch.

Stall Force Tolerance

The Stall Force Parameter allows the user to select the amount of Following Error (inches / mm) to be used as the motion limit when Homing or performing manual IHS / plate sensing. Example: If the value is set to .1 inches, the THC Axis will continue to move the axis until .1 inches of following error has been reached. This will indicate the Plate location during IHS and will indicate the top of the slide during homing.

Slide Length

This parameter is used to specify the overall motion length of the Slide mechanism being used for the THC. This information is used to set the travel limits of the slide after homing.

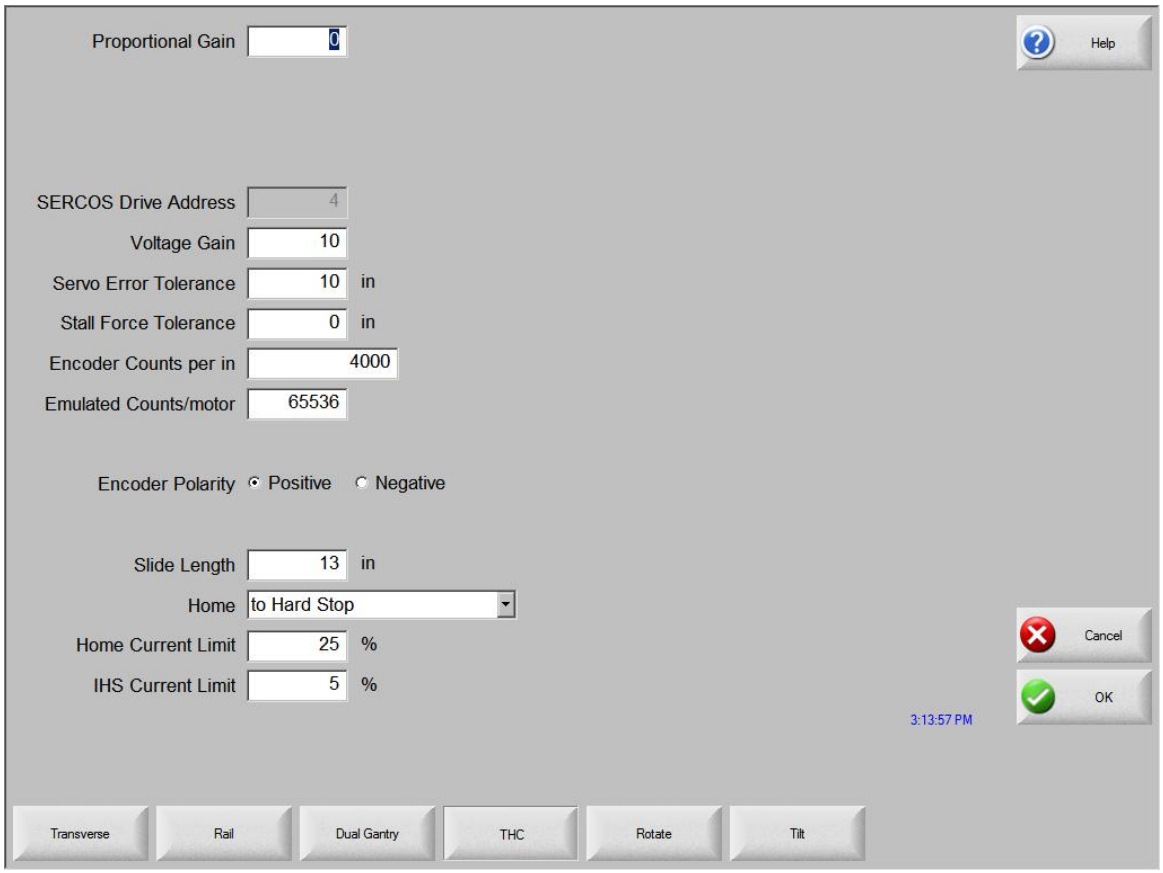
Home

The Home parameter is used to activate use of the Home feature for the THC Axis. Depending on the Slide mechanism used, the THC may be Homed to Hard Stop, Hard Stop w/ Current Limit or Home Switch.

Note:
If the “Home to Hard Stop Current Limited” option is selected, the CNC Nozzle Contact Enable Output should be connected to the Current Limit Input of the amplifier to reduce torque during homing.

The CNC Nozzle Contact Sense Input is used during Sensor THC Homing as the Home Switch Input if the “Home to Switch” option is selected.

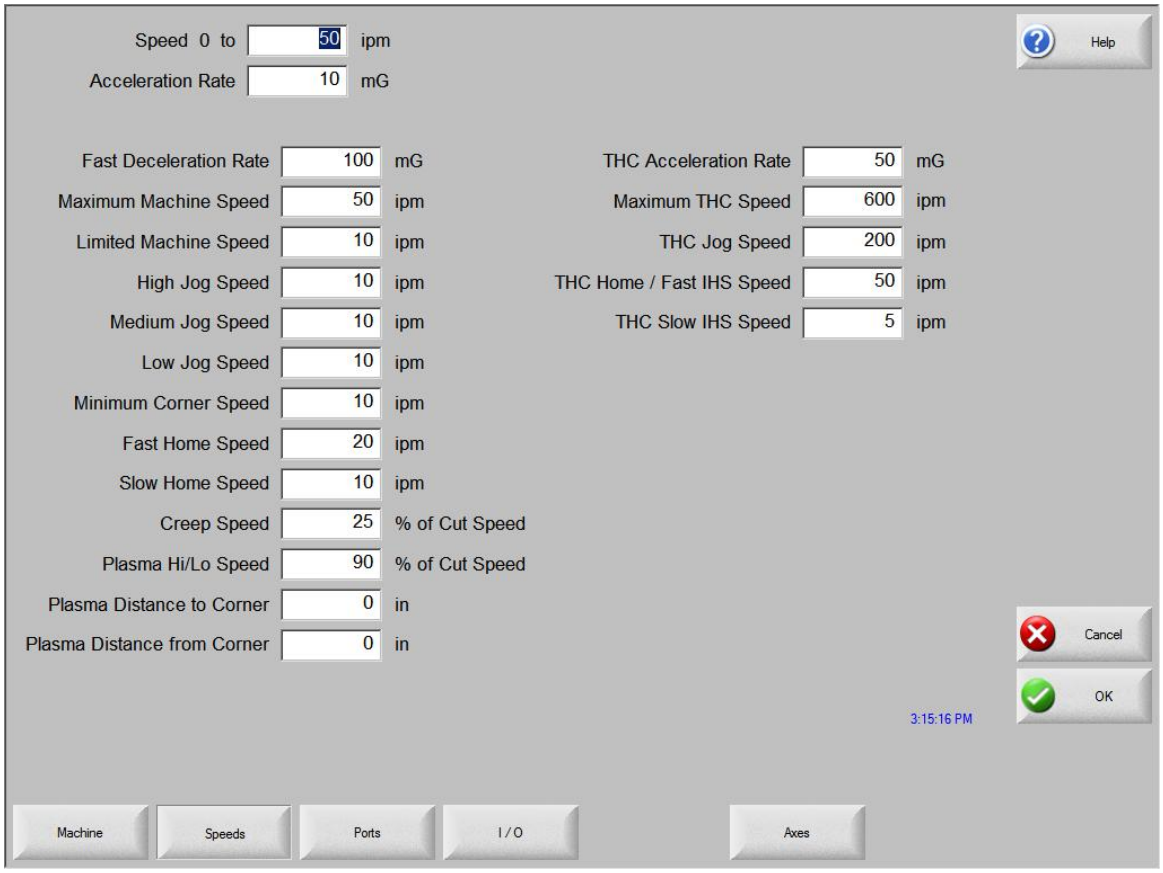
SERCOS Sensor THC Axis



Home/ IHS Current Limit

The Home / IHS Current limit parameter allows the user to select a percentage of current limit to be used during homing and IHS functions.

THC Speeds



THC Acceleration Rate

This parameter allows the operator to set the acceleration rate for smooth and stable movement of the Sensor Torch Height Control. The higher the acceleration rate, the quicker the THC will get up to speed. The lower the acceleration rate, the smoother the machine will position the cutting device. Values are entered in milliGs.

Maximum THC Speed

Enter the maximum speed for the Sensor THC movement in inches/millimeters per minute.

THC Jog Speed

Enter a value for the desired THC jog speed.

THC Home/Fast IHS Speed

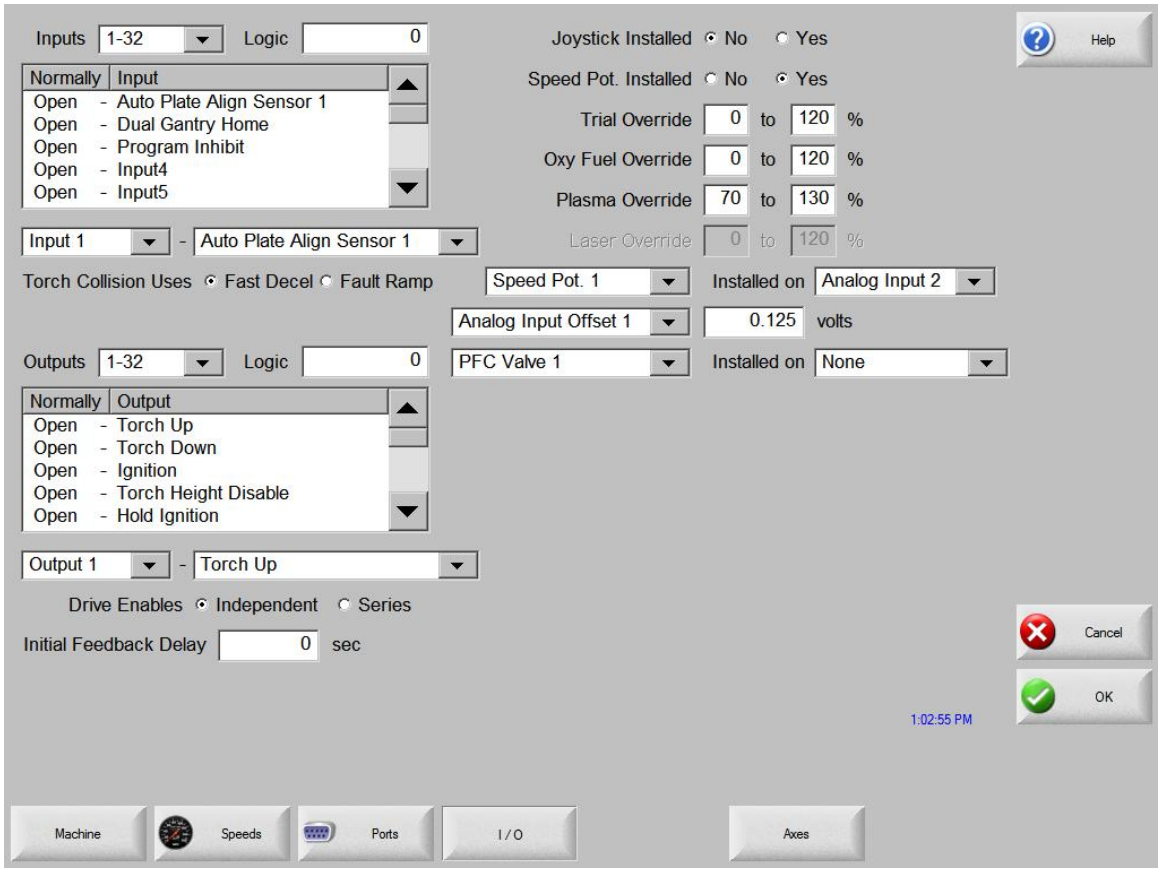
The THC Home/Fast IHS Speed entered here is used to home the torch at the top of the slide and to quickly maneuver the torch from the selected IHS height to the plate.

THC Slow IHS Speed

The THC IHS Speed is used to retract the torch after the plate has been sensed. The torch will retract at this speed until the contact sense is lost. This determines the exact distance to the plate, regardless of any flexing of the plate. A very small speed is recommended for optimal accuracy.

Note: Due to the quick response time of the Sensor THC, generally there is no need for a value to be entered at the "Distance to Corner" parameter to lock or "freeze" the position of the torch. It is, however, suggested that a value be entered for the "Distance from Corner" to stabilize the torch during acceleration.

THC I/O



Analog Offset 1 - 12

The Analog Offsets 1 through 12 are used to correct for any imbalance or "zero" the incoming analog voltage to the Analog Input Card. Analog inputs are assigned to the THC Axis and the Analog Offsets for the appropriate THC Analog input may be adjusted here.

To calibrate the Analog Inputs, jumper the two pins specific to the input together and view the incoming voltage at the Diagnostics Analog I/O screen. The incoming voltage should be zero. If any voltage is displayed at the diagnostic screen, an Offset Voltage

equal to the incoming voltage being read can be entered here to “zero” the incoming voltage. Please refer to the installation instructions later in this section for more details.

Sensor THC Part Program Support

Sensor THC offers the ability to configure THC setup parameters through part program codes.

The following parameters are available for use using EIA-274D G59 codes:

- Arc Voltage
- Pierce / Start Time
- Pierce/ Start Height Factor
- Cut / Mark Height

Setup is obtained using the following format.

Example: G59 V601 F*value*

Misc. G Code

Variable Identity

V600 = Plasma 1 Arc Voltage
V601 = Plasma 1 Pierce Time
V602 = Plasma 1 Pierce Height Factor – User units
V603 = Plasma 1 Cut Height
V604
V625 = Plasma 2 Arc Voltage
V626 = Plasma 2 Pierce Time
V627 = Plasma 2 Pierce Height Factor
V628 = Plasma 2 Cut Height
V629
V650 = Marker 1 Arc Voltage
V651 = Marker 1 Start Time
V652 = Marker 1 Start Height Factor
V653 = Marker 1 Mark Height

V675 = Marker 2 Arc Voltage
V676 = Marker 2 Start Time
V677 = Marker 2 Start Height Factor
V678 = Marker 2 Mark Height

Variable Value

The selected value for the variable

Installation and THC Interface

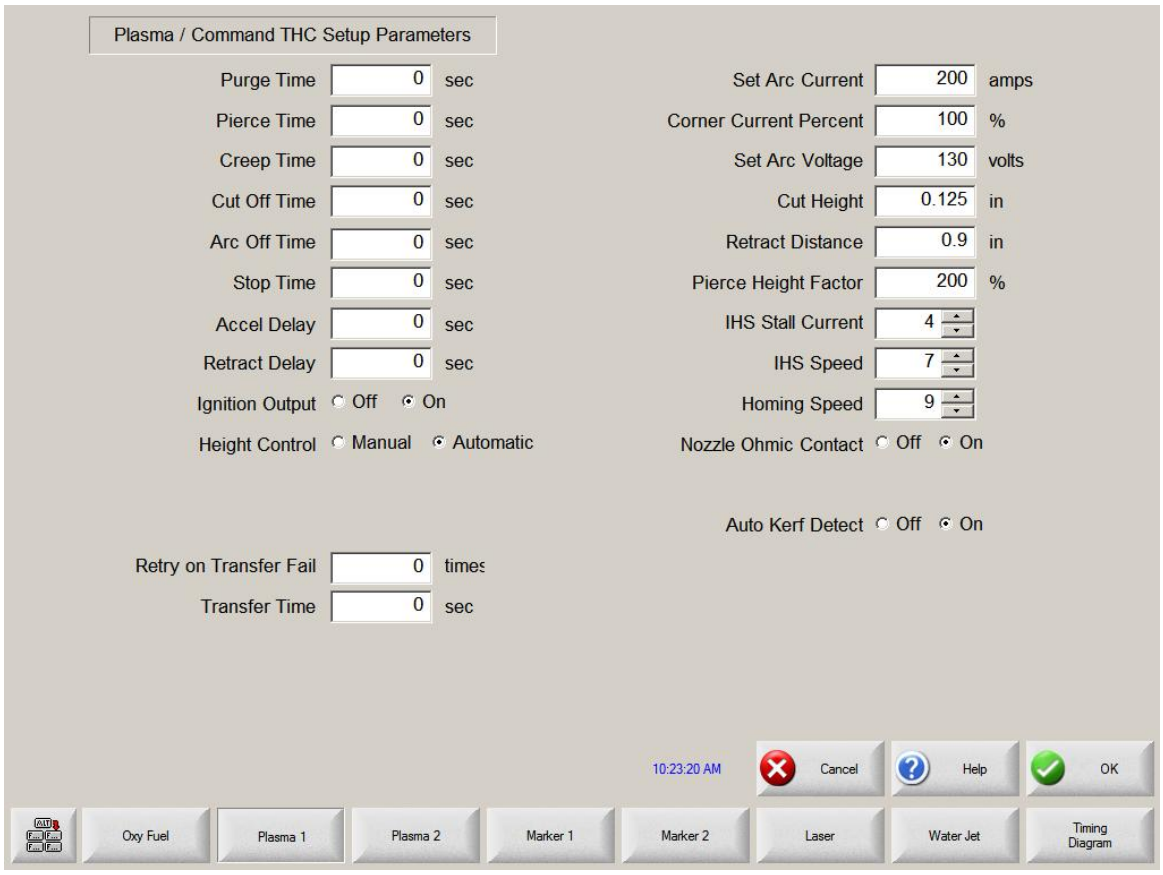
The Sensor THC is supported through various hardware configurations to offer single and multiple Sensor THC operation. Please refer to your exact CNC hardware configuration when installing the Sensor THC.

 **Warning!** Due to potentially high voltages, extreme care should be taken when working inside the plasma power supply. Work should only be performed by trained service personnel. Please refer to Power Supply manufacturer instructions.

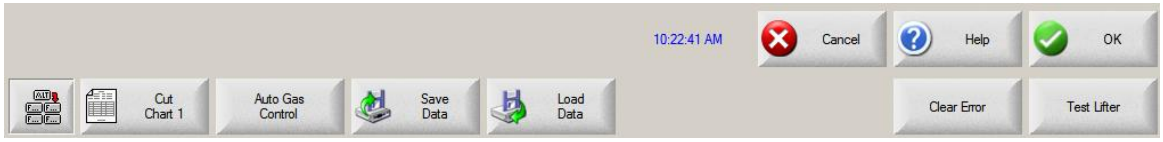
Sensor THC

Command THC

The Command THC from Hypertherm is an automated Torch Height Control system that adjusts the distance between the plasma torch and the work surface to provide improved cut quality. After the Command TCH is set up using the password-protected parameters, you can set up operational parameters for the Command THC on the Plasma Setups Screen. For additional information on the use of the Command THC, refer to the operating instructions provided with the Command THC system.



Additional soft keys:



Clear Error

The Clear Error soft key allows you to clear an error at the Command THC control box. After the soft key is pressed, a message will be posted on the control displaying a description of the error.

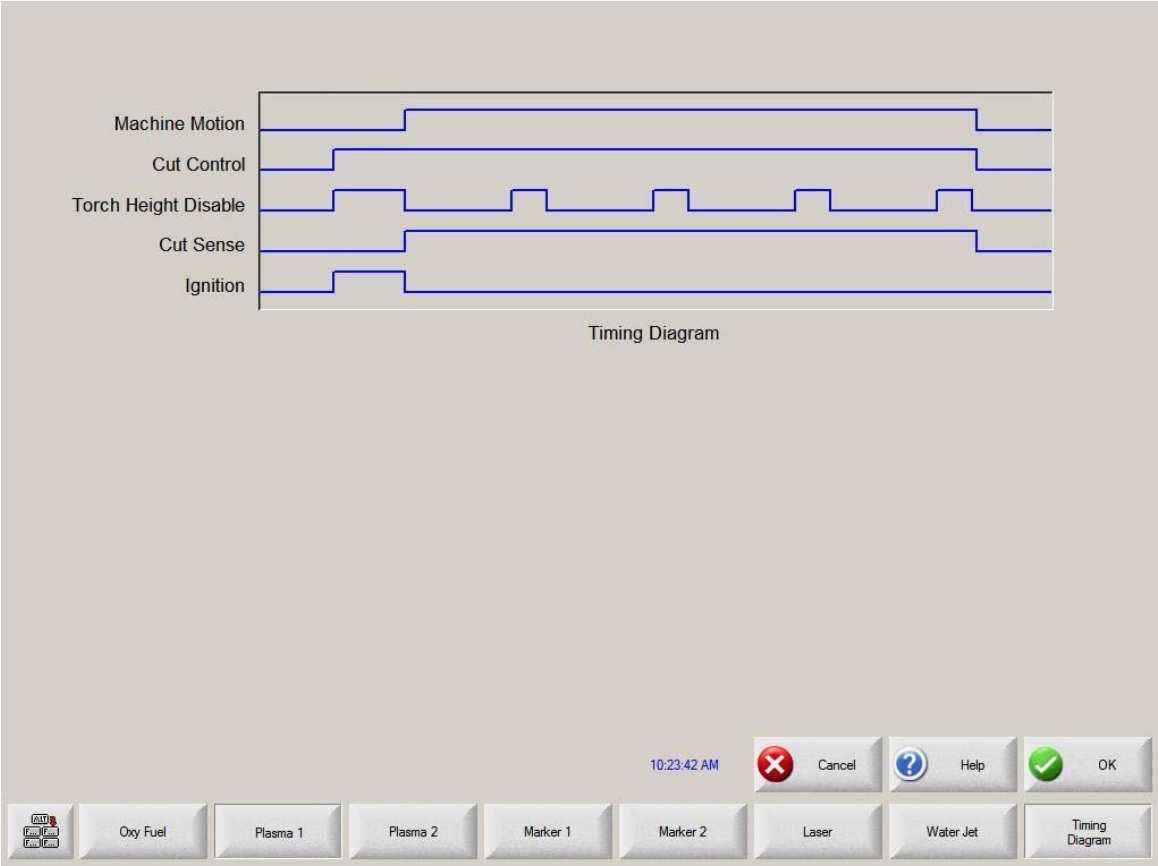
Test Cycle ON/OFF

Press the Test Cycle ON/ OFF soft key to operate the Command THC in Test mode. In Test mode, the Command THC completes the cycle without firing the torch.

Test Lifter

Press the Test Lifter soft key to command the torch lifter to lower to the plate, sense the plate and retract to its pierce height.

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



Purge Time

Specifies the time delay from torch ignition until motion is enabled, if the value for Arc On Feedback is Off.

Enter 0 (zero) for the Purge Time if the value for Arc On Feedback is On.

Pierce Time

Specifies the delay between the time that the torch is fully lowered until motion is initiated at Creep Speed. This value allows the plasma torch to pierce the material completely before moving.

Creep Time

Specifies the amount of time that the torch travels at creep speed after piercing the material. Creep Speed is a percentage of the programmed cut speed and is determined by a setup parameter on the Speed Setup Screen. After Creep Time has elapsed, the control accelerates to full cut speed.

Arc Off Time

Specifies the amount of time to wait before indicating a lost cut signal. This delay helps minimize nuisance trips when the torch travels over previously cut paths in complex nested layouts.

Stop Time

Specifies the amount of time that motion pauses at the end of a cut. This pause allows the torch to raise completely and clear cut irregularities before advancing to the next cut segment.

Accel Delay

Delays the activation of the Automatic Voltage Control so the cutting table can 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 delay between the end of the cut signal and retracting the torch.

Ignition

Enables the Ignition output to ignite the plasma torch. If your plasma system requires a separate ignition signal, select ON. If your system does not require a separate ignition signal, select OFF.

Voltage Control

Allows the operator to select manual or automatic mode for the Command THC. Manual mode disables the torch height control and allows 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 a specified set point.

Retract Full/Partial

Selects a full or partial retract distance for the torch. In the Full retract mode, the torch retracts to the Home position. In Partial retract mode, the torch retracts to the set retract distance.

Retry On Transfer Fail

Specifies the number of times the control attempts to fire the torch if the torch fails to ignite.

Transfer Time

Specifies the amount of time to attempt ignition of the torch. The ignition is confirmed by the Arc Sense Input (Arc on Feedback) to the control.

Set Arc Current

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 and supports EIA RS-274D part program code G59 V*value* F*value* for setting current.

Corner Current Percent

Allows the operator to improve cut quality at corners by selecting a reduced current setting for cutting corners. This value is a percentage of the Set Current (above) and is active when the Torch Height Disable Output is on.

Set Arc Voltage

Selects the desired Arc Voltage for the material being cut.

Cut Height

Selects the desired cut distance from the plate and sets the initial cut height before Arc Voltage control is activated.

Retract Distance

Selects the THC Retract Distance when partial retract mode is configured.

Pierce Height Factor

Is a factor that is multiplied by the Cut Height value to set the pierce height distance.

IHS 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 1 and 10. The limited stall force is always used if nozzle ohmic sense is turned off.

IHS Speed

Sets the lifter downward speed during the IHS cycle. This is a relative factor between 1 and 10.

Homing Speed

Determines the retract or homing speed. This is a relative factor between 1 and 10.

Nozzle Ohmic Contact

Select ON for the Command THC when using Ohmic Contact Sense to detect the plate during the IHS cycle.

Preflow During IHS

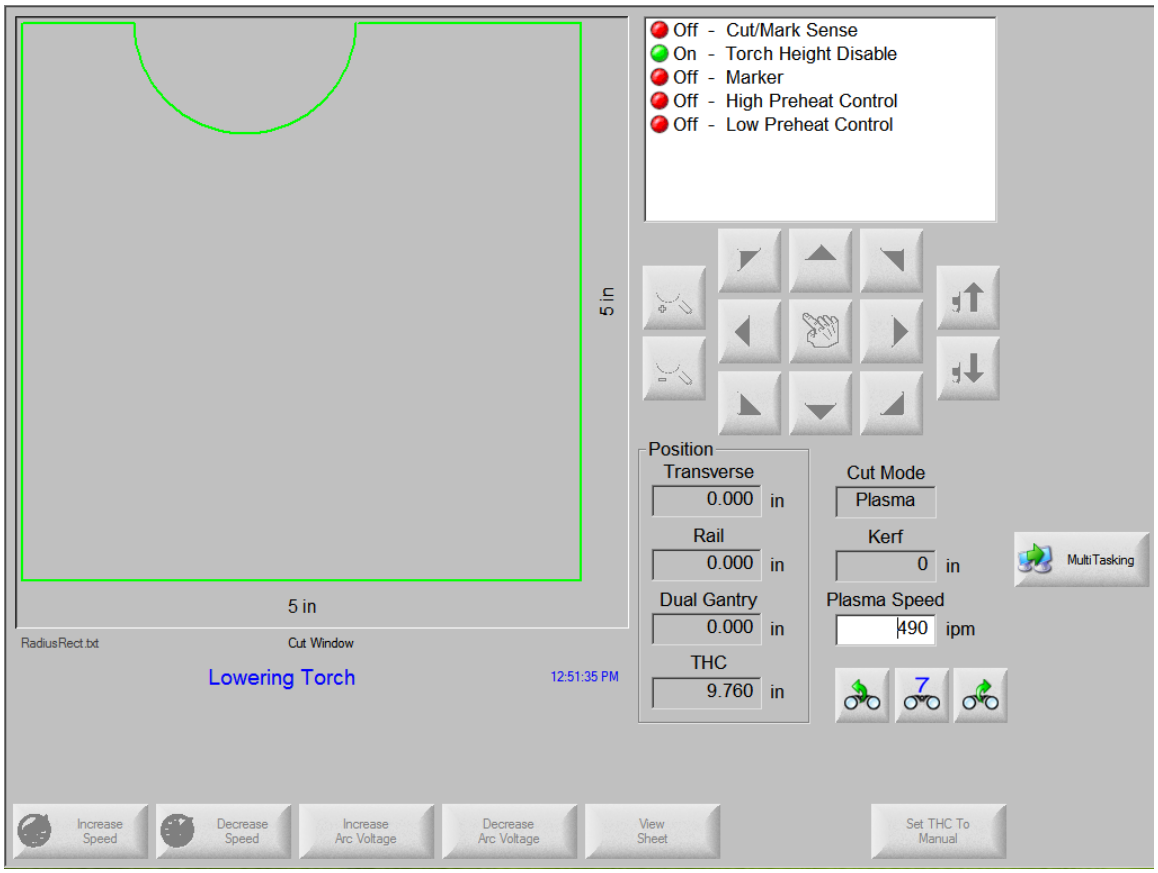
Select ON to activate preflow during the IHS cycle.

Auto Kerf Detect

Select ON to reduce the possibility of the torch diving into the plate. When this feature is enabled, the THC detects sudden changes in arc voltage when it crosses a kerf path and freezes the THC.

Main Cut Screen

Automatic THC Mode



Increase/Decrease Arc Voltage

These two soft keys, display on the main cut screen while the Command THC is operating in automatic mode,. These soft keys allow you to increase and decrease the Arc Voltage for the cut.

Extend

Press this soft key during the pierce cycle to extend the pierce timer until it is stopped either by the Set-Now or Release soft key.

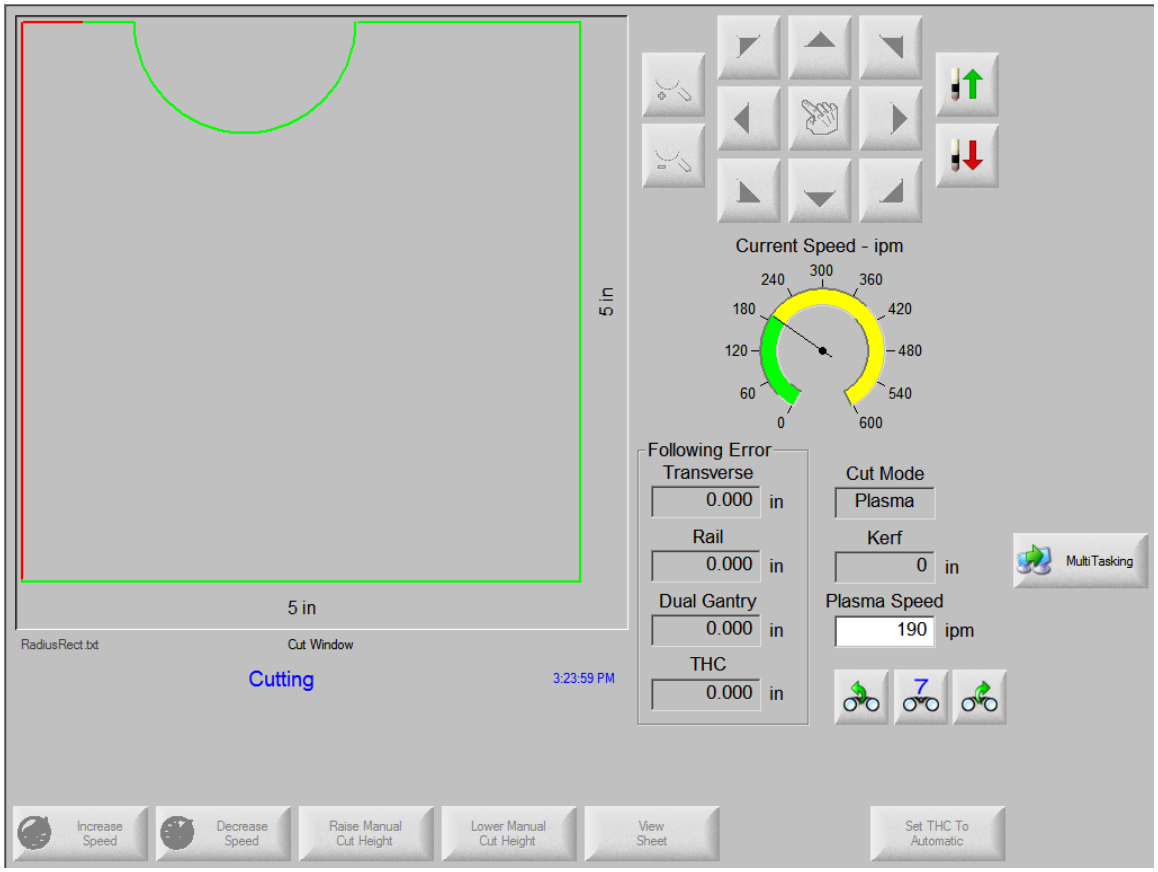
Set Now

Press the Set Now soft key to end the pierce cycle and save the new pierce time. The Set Now soft key is often used in with the Extend soft key to modify the preset pierce time.

Release

Press the Release soft key to end a pierce cycle without modifying the original pierce time. The original pierce time is saved for the remaining pierces.

Manual THC Mode



Raise/Lower Torch

These two soft keys, display on the main cut screen while the Command THC is operating in Manual mode. These soft keys allow you to raise and lower the torch for the cut.

Extend

Press this soft key during the pierce cycle to extend the pierce timer. To stop the timer, press either the Set-Now or Release soft key.

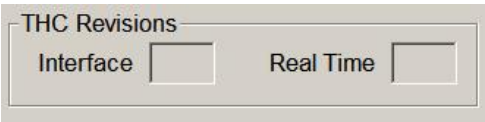
Set Now

Press the Set Now soft key to end the pierce cycle and save the new pierce time. The Set Now soft key operates with the Extend soft key to modify the preset pierce time.

Release

Press the Release soft key to end a pierce cycle but keep the original pierce time.

Diagnostics



The current Command THC Interface and Real Time Revision Levels are displayed at the Control Information screen when enabled.

Machine Interface

Warning! Configure the port for RS-422 operation before connecting to the Command THC. The Command THC Link must first be enabled in Machine Setups for Type “P” controls and at the Station configuration for type “V” controls. Refer to the Serial Port section of this guide for additional information on configuring the serial port for RS-422 communication.

Port Designation

Serial communication for the Command THC is automatically set to the serial port which is not selected for serial communications. For example, if Serial Port 1 is designated for use as the link to the host PC for downloading part programs, HD4070 communications are established on Serial Port 2.

Type “V” control may select the serial port designation at the Ports configuration screen.

RS-422 Connections to Command THC with 25-pin D-type connector

Command THC		Control	
Signal Name	**DB-9 Pin**	**Signal Name**	**DB-9 Pin**
RxD -	1	TxD -	2
TxD -	2	RxD -	3
RxD +	20	TxD +	4
TxD +	21	RxD +	7

For improved noise immunity, cable shields for communication should be tied to ground. Ferrite bead with several wraps on the cable may also be used.

Motion Overview

This section provides an introduction to motion theory.

Note: System tuning should be performed by a qualified service technician. Improper tuning can cause personal injury or damage to the system.

Outline of Information

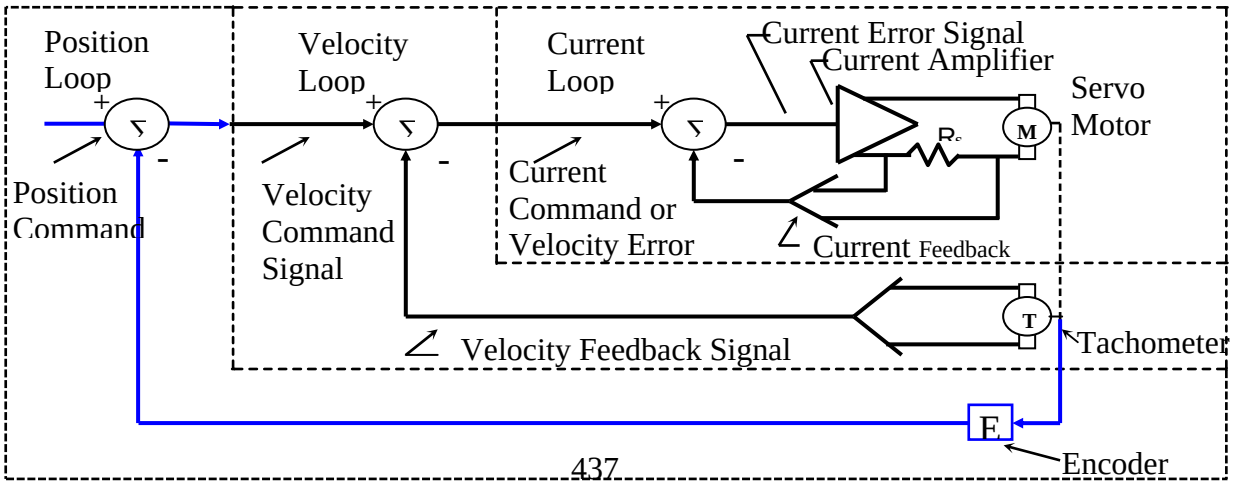
1. Closed loop servo control
2. Encoders
3. Following error
4. Position and servo error
5. Edge per inch parameter
6. Gain
7. Recommended tuning procedures

Closed Loop Servo Control

A servo system is the means of accurately controlling electrical motors to create force. The motor output is connected to a gear system to translate the rotational force of the motor into linear motion. In addition, this gear system modifies the strength and speed of the motion.

Closed loop servo control is the continuous process of monitoring position, or velocity commands, or both compared to actual position and velocity and adjusting the output accordingly. A servo system without feedback devices and automatic adjustment capabilities is called an open loop servo control.

The drawing below outlines a typical velocity and position loop system. The most important aspect for motion control is the position loop. The process starts with the motion control providing a motion command (voltage) to the motor to move at a specific speed to a position. Position is tracked during the motion by means of a feedback device, or encoder, that provides both directional and distance information. Based on this feedback, the control adjusts its motion command, or voltage, to the motor to ensure that the motor is accurately positioned on the designated motion path at the correct speed.

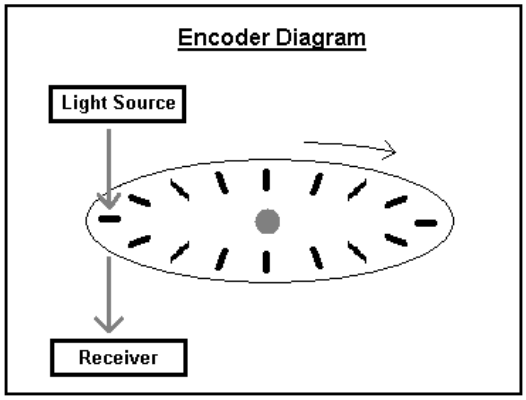


Typical Velocity and Position Loop System

The motion command starts as digital output within the control and is converted to a +/- 10 Vdc analog output for use by the motors. This conversion of the motion command within the control is referred to as the digital to analog converter (DAC) output and is performed by the motion control card. After the analog output leaves the control, it travels to a drive amplifier that increases the voltage output to the motor and creates motion. Also, there is usually a linear relationship between the voltage sent and the machine speed. For example, if 10 volts is the maximum machine speed, 5 volts is half maximum machine speed. Additionally, the polarity of the output (DAC polarity +/-) to the amplifier dictates the direction of the motor rotation. In most applications and in the following application description, the feedback device is an encoder.

Encoders

An encoder is a feedback device that provides signal pulses as the motor turns. The diagram at the right illustrates the basic concept of an encoder. Although this does not represent all encoder feedback device technology, this illustration provides a visual aid to help understand the process.

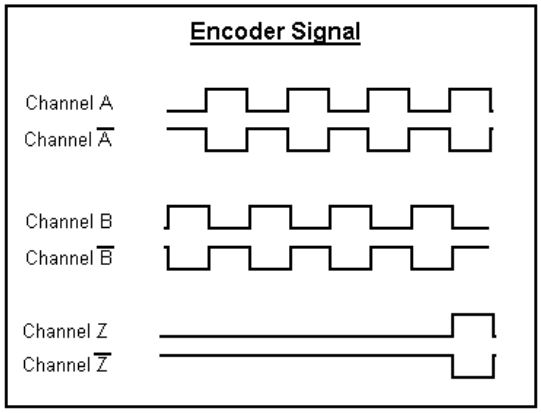


The illustration shows a disk with small holes cut out along the outer edge. The light source projects a beam of light downward through the holes in the disk. As the disk turns on the end of the motor shaft, the light passes through the disk and creates pulses. The receiver below the disk picks up the light pulses and sends that feedback to the control.

There is a direct relationship between the rotation of the motor shaft, the encoder light pulses, and the distance of the motion. Therefore, the control is able to calculate distance by counting the encoder pulses it receives, which closes the position loop. This relationship, shown as a simplified formula is:

encoder pulses x motor revs = distance

The encoder generates a square wave signal as illustrated in the Encoder Signal diagram to the right. Most encoders provide two main signals, A and B, and the complements, A/ and B/. These signals are also referred to as channels. The compliment channels are not always used but if they are used, they can provide increased noise immunity. The rotational direction, or encoder polarity, can be determined by the signal that is received, either ABABA or BABAB.



The channel Z signal is produced only once a revolution and is called the *marker pulse*. This marker pulse is quite often used for accuracy in homing routines.

The pulses are called *counts*. The holes in the disk are also called *lines*. The pulses that the receiver picks up may actually be the beginning and end of each pulse for a line on both channels (A&B) so that the receiver picks up four pulses for each line. This is called a 4x mode encoder. Thus, a 1000 line encoder in 4x mode would produce 4000 counts for each revolution of the motor. The more counts an encoder produces, the more accurate the motion is.

Following Error

Following error or servo error is the distance between the position that the control commands and the actual position of motion. Some following error is normal because the resistance of the load prevents the response of the motor to reach the ideal command of the system. This latent response is similar to driving a car away from a stop light. It takes time for the engine to produce the force that is required to move the weight of the car to the desired speed. Following error for each axis can be selected to be viewed in the Watch Window / Status Window of the control. This is a quick reference tool for monitoring the performance of the actual machine motion as compared to the control command.

The important consideration for X/Y coordinate motion is that the response for the X and Y motion is similar. If the response is dissimilar, poor results for commanded motion will result. An example of a dissimilar tuned response would be that when a circular motion is commanded, an oval or elliptical motion will result as one axis out performs the other.

Position and Servo Error

A position, or servo, error occurs when the distance between the ideal motion position and the actual motion position exceeds a pre-defined servo error tolerance value. A position error indicates that the response from the motion command was not executed, was executed too slowly or was executed incorrectly. The Servo Error Tolerance is a user definable value within the control and is usually set to a value twice the following error during normal operation. This allows the system to operate without nuisance faults caused by temporary resistance to the motion, such as dirt on motion rails or temporary tension from motor cabling.

Note: It is important to remember that in the closed position loop, the output command adjusts to maintain speed and positioning. Thus, a loss of encoder feedback causes the control to send its maximum motion command to the motor so the motor "runs away" without control. Conversely, if the motor fails to turn while feedback is enabled, a position error results and the command output stops when the fault occurs.

Encoder Counts and Maximum Machine Speed

Remembering that the position loop uses the pulses or counts from the encoder to calculate distance, it is important to determine how many encoder pulses are equal to a specific distance of machine motion. The control uses the encoder counts per inch/mm value as the constant to calculate distance and speed.

The encoder counts per inch/mm is a calculation based on the number of pulses generated by the encoder for one revolution of the motor and how much distance is traveled from that motor motion through the gearing being used. The following formula illustrates this relationship:

counts/line x counts/rev x 1 rev/inch = encoder counts/inch

For example, the resolution of a 4X – 1000 line encoder counts both edges (lines) of channel A and channel B to equal 4 counts per line multiplied by the 1000 lines per revolution equaling 4000 counts per revolution. If the encoder revolutions per inch of travel are 1:1, we would have 4000 encoder counts per inch of travel.

4 counts/line x 1000 lines/rev x 1 rev/inch = 4000 encoder counts/inch

Determining Maximum Machine Speed

The following formula is used to establish the proper value for determining maximum machine speed.

max RPM of the motor x of inches of travel per revolution = maximum machine speed in inches per minute.

For example:

4000 RPM Motors x .125 inches per rev = 500 inches per minute

Note: Through test or calculation it is determined that the table moves 1/8 inches per revolution of the encoder.

With the maximum speed, encoder counts per inch, DAC and encoder polarities determined and entered into control setups, a simple test of machine motion can be made in the control Drive Diagnostics screen. This test should be made with the motors disengaged for safety. This is a basic motion test of the system and does not use gain terms or the position loop for motion. Refer to the Speeds information in this guide for more information on this feature.

Gain

Proportional Gain

In a feedback control system, the error term is acted on by the control system and it alters the output. Proportional gain is amplification of the error term. In a closed loop control system, this is proportional to the error signal. Thus, the output is proportional gain multiplied by error.

In most systems, proportional gain is the primary tuning parameter for improving the response of the position loop.

Integral Gain

Proportional gain cannot completely eliminate error. The system can become unstable if only proportional gain is used to eliminate error in a system. When the response of a system is satisfactory, but steady state error is excessive, the error can be further reduced by increasing system gain only for long term accumulations of error over time. Integral gain is sometimes used to compensate for static load disturbances like torque loading, gravity bias, and offset.

Note: Integral gain can cause instability in a system because it has a more instant effect at the beginning of a move profile. Therefore, it is rarely used for velocity drives. However, integral gain can provide improved response with current drives. Only small adjustments to integral gain should be made if indications of steady state error exist. In almost all applications, this value is set to zero. Use the feed forward gain for closing following error that occurs during a move profile.

Derivative Gain

Derivative gain responds to the rate of change of the signal and can produce corrections before the error term becomes large, therefore it is useful in improving the transient response of a system. Since it opposes change in the controlled output, it can produce a stabilizing effect by damping a tendency toward oscillation. This is the reason we promote tuning by following error to the maximum Proportional Gain then setting

Derivative Gain at 10% of Proportional Gain as a rule of thumb. Do not overdo Derivative Gain as it can have a detrimental effect on the overall response of the system.

Feed Forward

Feed forward "pushes" the commanded output ahead to reduce or eliminate the difference between the actual position and the commanded position during motion, called dynamic following error. Feed forward corrects for a "lag" in the system and has an effect similar to proportional gain. Do not make large increases in feed forward gain because it can cause positive following error and excessive overshoot.

Velocity Gain

When using a current loop amplifier, the internal velocity loop in the control can provide dampening without an external tachometer.

Using the internal velocity loop with a current loop amplifier can result in higher static stiffness, smoother machine motion, and less overshoot.

Recommended Tuning Procedures for Hypertherm Automation Motion Controls

Using the information previously provided as a core understanding of the position loop process, we can now look at tuning motion for the desired motion performance. Due to potential safety hazards and the potential possibility for machine damage from incorrect tuning, it is recommended that this operation be performed by trained and experienced personnel.

Prior to performing motion tuning, values for DAC Polarity, Encoder Polarity and maximum machine speed should be calculated and entered into control setups. Servo Error Tolerance for the axes should be set to maximum (5 inch max for X/Y motion).

Initially, it is recommended that basic tuning start with the motors disengaged from the machine to allow the user to confirm controlled motion and response of the motion axes. An initial Acceleration Rate of 10 Mg's can be used to begin the motion tuning. It is important to remember that after the motors are engaged to the machine for motion, the load requirements for each axis will change requiring additional tuning. Additionally, if the acceleration rate is increased after the initial tuning, additional adjustments to Gain tuning may be required for proper machine motion.

Procedure for Velocity Type Drives

We recommend tuning the system by performing manual moves at a slow speed with all gains set to zero with the exception of Proportional Gain. Proportional Gain should start with a small value of 10. Engage the motors to the machine frame and beginning raising the Proportional Gain to allow movement. If the axes start to vibrate or oscillate, this indicates the selected gain value is too high and should be lowered. It may also require de-tuning the response of the Drive amplifier.

Now that you have some basic control of the system, set up the Watch Window to display Position and Following Error for the selected Axes. Load and automatically "Trial" the Test Pattern simple shape from the shape library. You will be able to follow the response of the system by watching the performance of the Motor /Encoder feedback and its ability to maintain path on the control preview screen.

Systematically increase Proportional Gain until it has little or no effect on the following error or until instability becomes noticeable. Then reduce Proportional Gain to eliminate instability. Derivative Gain may be used to provide a dampening effect. For a Velocity Loop Servo Drive, Integral Gain should be set to zero. After tuning for the best response, increase Feed Forward Gain systematically to further reduce following error if necessary. It is not required that you eliminate following error but it is wise to ensure that Following Error for each axis is similar. Please Note: Feed Forward Gain will reduce steady state following error, but may cause overshoot.

It is important to note that some following error is desirable, following error terms should be nearly the same from one axis to another, and the polarity of the following error term must be the same as the direction of travel.

Finally, check the system tuning by placing a pen on the system. "Draw" the test pattern provided in the simple shape library and observe the cornering capability, arc/ circle contouring and the ability to position at the center crossings. When troubleshooting tuning issues, varying the size and trial speed can often provide valuable information through observations of the pen tracing.

After the system has been successfully tuned, adjust the Servo Error Tolerance to equal twice the normal Following Error for the axes (note: This is a common approach to setting the Servo Error Tolerance but is up to the discretion of the service agent) . This is allows the system to operate without nuisance faults caused by temporary resistance to the motion, such as dirt on motion rails or temporary tension from motor cabling, etc.

Procedure for Current Type Drives

Similar to tuning for Velocity Type Drives, the recommended tuning procedure focuses on response of the motion. The process begins with low initial values that are increased to get a desired response. If the axes start to vibrate or oscillate, this indicates the selected gain value is too high and should be lowered. It is recommended that basic tuning start with the motors disengaged from the machine to allow the user to confirm controlled motion and response of the motion axes. Motors can then be engaged to fine tune for desired performance.

Set up the Watch Window to display Position and Following Error for the selected Axes. Load and automatically "Trial" the Test Pattern simple shape from the shape library. You will be able to follow the response of the system by watching the performance of the Motor /Encoder feedback and its ability to maintain path on the control preview screen.

Systematically increase the Velocity Gain until it has little or no effect on the following error or until instability becomes noticeable. Proportional Gain would then be used to increase the “stiffness” of response. Integral Gain can be used to improve the steady state performance. Derivative Gain may then be used to provide a dampening effect.

After tuning for the best response, increase Feed Forward Gain systematically to further reduce following error if necessary. It is not required that you eliminate following error but it is wise to ensure that Following Error for each axis is similar. Please Note: Feed Forward Gain will reduce steady state following error, but may cause overshoot.

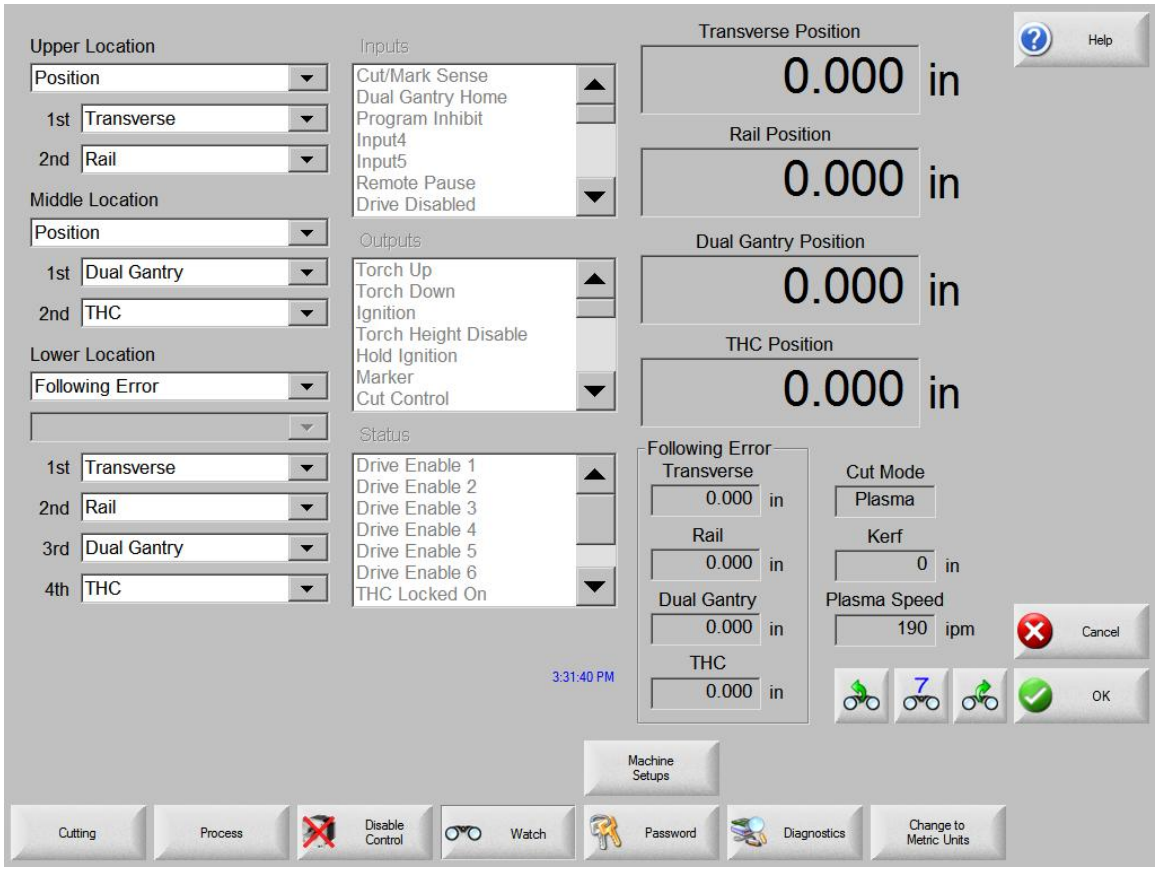
It is important to note that some following error is desirable, following error terms should be nearly the same from one axis to another, and the polarity of the following error term must be the same as the direction of travel.

Finally, check the system tuning by placing a pen on the system. “Draw” the test pattern provided in the simple shape library and observe the cornering capability, arc/ circle contouring and the ability to position at the center crossings. When troubleshooting tuning issues, varying the size and trial speed can often provide valuable information through observations of the pen tracing.

After the system has been successfully tuned, adjust the Servo Error Tolerance to equal twice the normal Following Error for the axes (note: This is a common approach to setting the Servo Error Tolerance but is up to the discretion of the service agent) . This is allows the system to operate without nuisance faults caused by temporary resistance to the motion, such as dirt on motion rails or temporary tension from motor cabling, etc.

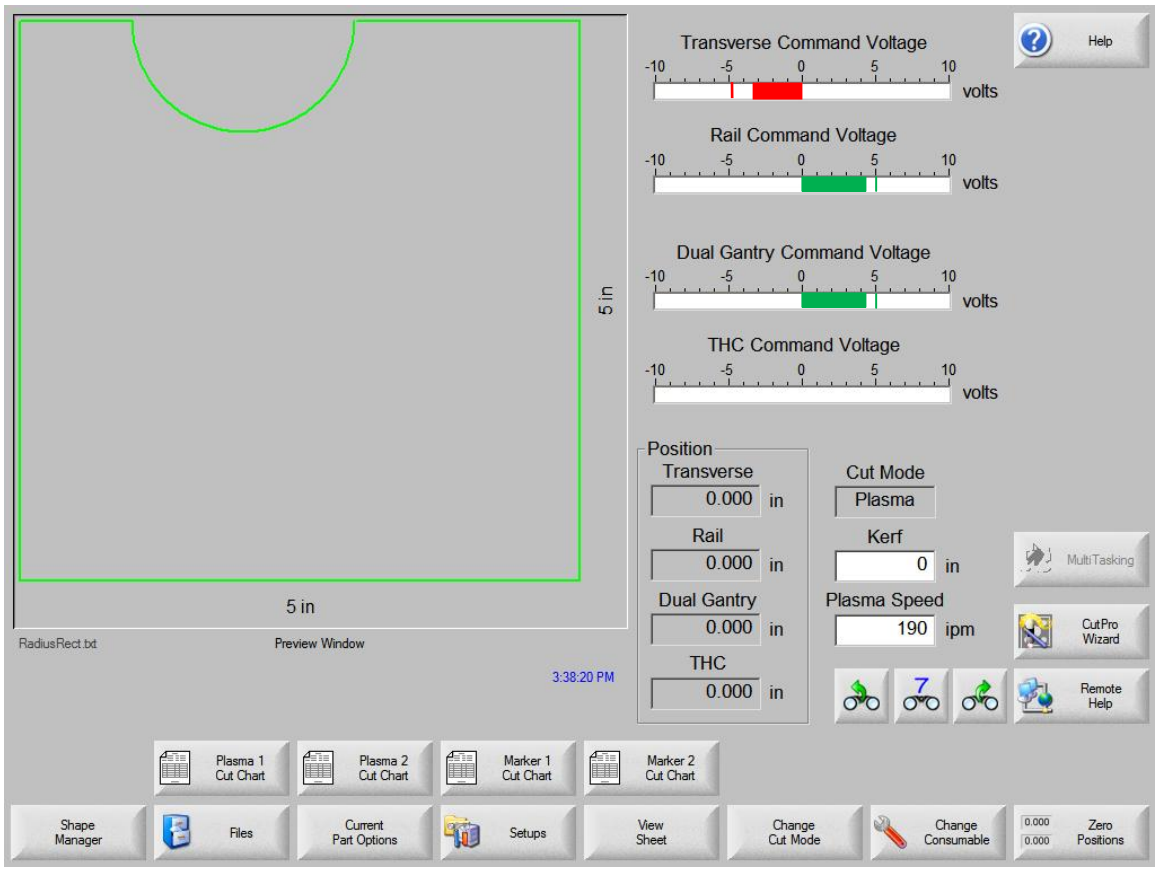
Motion Tuning Watch Windows

Position and Following Error may be displayed.



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

Motion Overview

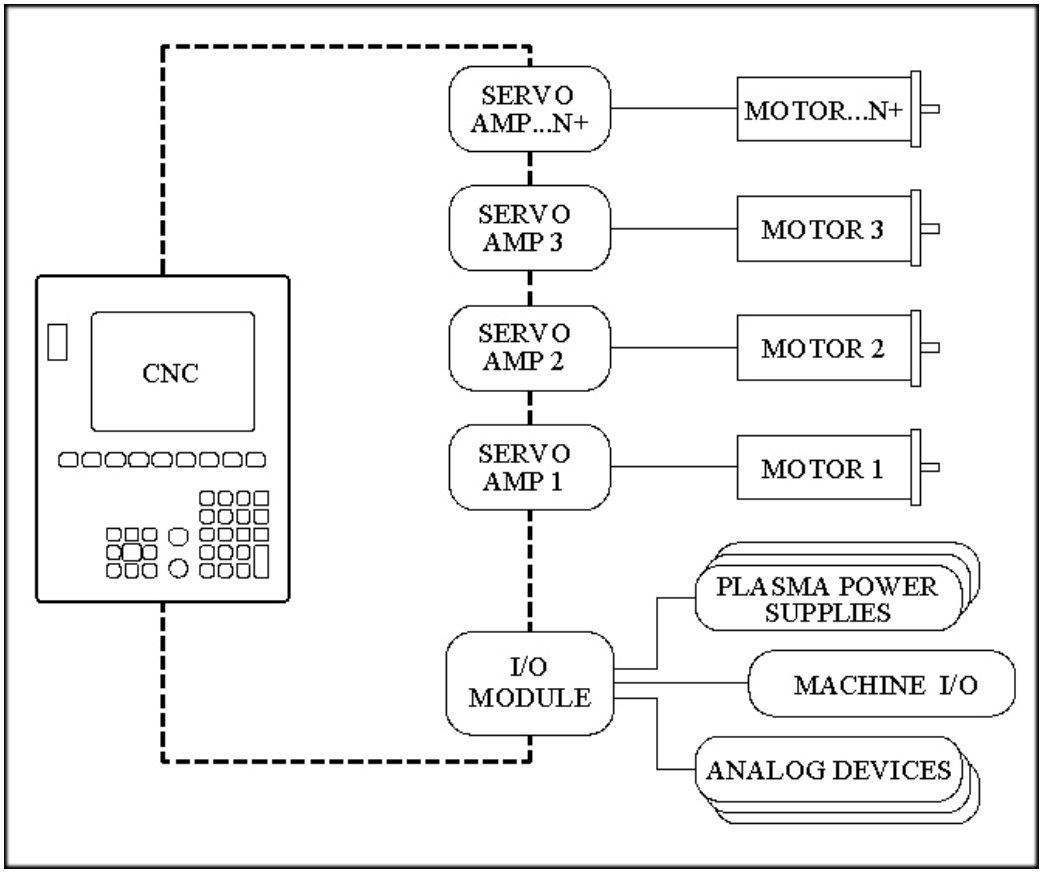


SERCOS Interface Overview

The acronym “SERCOS” refers to **SE**rial **R**eal time **CO**mmunication **S**ystem servo drive interface. This approach to communication with the drive amplifiers is performed through use of a fiber optic ring and replaces the traditional +/- 10VDC analog output motion control card with a new fiber optic driver card. Motion commands from the amplifier to the motor are the same as in a traditional servo loop.

SERCOS has been widely accepted and is approved by International standard (IEC 61491 in 1995) and European standard (EN 61491 in 1998).

Due to the expandable nature of the SERCOS interface, Mariner can support up to 12 axes of motion currently available in control software. Additional I/O modules may be added to expand the total number of digital and analog I/O.



The SERCOS Drive Interface has a number of unique advantages.

1. Reduced CNC - machine interface wiring by use of a single fiber optic connector.
2. Fast 32 bit communications between the drive and CNC.
3. Improved noise immunity due to the fiber optic communication.
4. Long fiber optic cable lengths supported.

5. SERCOS is an open standard that is cross vendor compatible.

For more information on SERCOS, contact SERCOS North America at http://www.sercos.com/

ASCII Codes

This appendix provides the 128 ASCII codes (American Standard Code for Information Interchange) as defined by ANSI (American National Standards Institute) Standard X3.4-1977.

Control Codes

Hex	Dec	Character	Name	Description
00	0	^ @	NUL	Null
01	1	^A	SOH	Start of Header
02	2	^B	STX	Start of Text
03	3	^C	ETX	End of Text
04	4	^D	EOT	End of Transmission
05	5	^E	ENQ	Enquiry
06	6	^F	ACK	Acknowledge
07	7	^G	BEL	Bell
08	8	^H	BS	Backspace
09	9	^I	HT	Horizontal Tab
0A	10	^J	LF	Line Feed
0B	11	^K	VT	Vertical Tab
0C	12	^L	FF	Form Feed
0D	13	^M	CR	Carriage Return
0E	14	^N	SO	Shift Out
0F	15	^O	SI	Shift In
10	16	^P	DLE	Data Link Escape
11	17	^Q	DCI	Device Control 1
12	18	^R	DC2	Device Control 2
13	19	^S	DC3	Device Control 3
14	20	^T	DC4	Device Control 4
15	21	^U	NAK	Negative Acknowledge
16	22	^V	SYN	Synchronous Idle
17	23	^W	ETB	End Transmission Block
18	24	^X	CAN	Cancel
19	25	^Y	EM	End of Medium
1A	26	^Z	Sub	Substitute
1B	27	^[	ESC	Escape
1C	28	^\	FS	File Separator
1D	29	^]	GS	Group Separator
1E	30	^^	RS	Record Separator
1F	31	^_	US	Unit Separator
20	32		SP	Space

All Codes

Hex	Dec	Symbol	Hex	Dec	Symbol	Hex	Dec	Symbol
00	0	^ @	2B	43	+	56	86	V
01	1	^A	2C	44	,	57	87	W
02	2	^B	2D	45	-	58	88	X
03	3	^C	2E	46	.	59	89	Y
04	4	^D	2F	47	/	5A	90	Z
05	5	^E	30	48	0	5B	91	[
06	6	^F	31	49	1	5C	92	\
07	7	^G	32	50	2	5D	93	]
08	8	^H	33	51	3	5E	94	^
09	9	^I	34	52	4	5F	95	_
0A	10	^J	35	53	5	60	96	`
0B	11	^K	36	54	6	61	97	a
0C	12	^L	37	55	7	62	98	b
0D	13	^M	38	56	8	63	99	c
0E	14	^N	39	57	9	64	100	d
0F	15	^O	3A	58	:	65	101	e
10	16	^P	3B	59	;	66	102	f
11	17	^Q	3C	60	<	67	103	g
12	18	^R	3D	61	=	68	104	h
13	19	^S	3E	62	>	69	105	i
14	20	^T	3F	63	?	6A	106	j
15	21	^U	40	64	@	6B	107	k
16	22	^V	41	65	A	6C	108	l
17	23	^W	42	66	B	6D	109	m
18	24	^X	43	67	C	6E	110	n
19	25	^Y	44	68	D	6D	111	o
1A	26	^Z	45	69	E	70	112	p
1B	27	^[	46	70	F	71	113	q
1C	28	^\	47	71	G	72	114	r
1D	29	^]	48	72	H	73	115	s
1E	30	^^	49	73	I	74	116	t
1F	31	^_	4A	74	J	75	117	u
20	32		4B	75	K	76	118	v
21	33	!	4C	76	L	77	119	w
22	34	“	4D	77	M	78	120	x
23	35	#	4E	78	N	79	121	y
24	36	$	4F	79	O	7A	122	z
25	37	%	50	80	P	7B	123	{
26	38	&	51	81	Q	7C	124	|
27	39	‘	52	82	R	7D	125	}
28	40	(	53	83	S	7E	126	~
29	41	)	54	84	T	7F	127	←
2A	42	‘	55	85	U			

Program Codes

EIA RS-274D

The control supports EIA RS-274D part programs. An EIA RS-274D program lists the sequence of lines, arcs, speeds, kerf and I/O functions that are used to create a part. While the user is free to program in EIA using the standard text editor, it is recommended that the *ShapeWizard*® Graphical Programming environment be used instead.

Following is a list of the EIA codes that are directly supported, mapped, or currently unsupported by the control. Mapped EIA codes are automatically converted upon program load into directly supported EIA codes. Unsupported EIA codes are ignored. All other EIA codes generate an error.

Directly Supported EIA Codes

EIA CODE	DESCRIPTION
F*value*	Machine Speed (if Speed Override enabled)
N*value*	Line Number
(*text)*	Comments
X*value*	X Axis Endpoint or other Data
Y*value*	Y Axis Endpoint or other Data
I*value*	I Axis Integrand or Part Option Data
J*value*	J Axis Integrand or Part Option Data
O*value* S*value*	Output (1-64), State (0-Off or 1-On)
W*value* S*value*	Wait for Input (1-64), State (0-Off or 1-On)
G00	Rapid Traverse Linear Interpolation
G00 A*value*	Sets Tilt angle – A is the angle value in degrees
G00 XY*val* A*val*	Performs Linear Interpolation of Tilt angle along line segment.
G01 A*value* F*value*	Sets Tilt angle value in degrees with a speed command in RPM
G00 Xn Yn	Traverse command where n = value to move the desired axes a distance.
G00 Zx.xx Tx	Index Sensor™ THC height “Z” distance for torch “T”. Manual mode only.
G00 Cxx	Move to rotate “C” position
G01 Cxx Fxx	Move to rotate “C” position with Speed “F” command in RPM
G00 C180-	Rotate Axis offset 180 degrees will continue to rotate in the proper direction
G00 C-180-	Rotate Axis offset -180 degrees will continue to rotate in the proper direction
G01 C180- Fxx	Rotate Axis offset 180 degrees with speed
G01 C-180- Fxx	Rotate Axis offset -180 degrees with speed
G01	Linear Interpolation (at Cut Speed)
G02	Clockwise Circular Interpolation
G03	Counterclockwise Circular Interpolation
G04	Preset Dwell (uses Setup Dwell Time)
G04 X*value*	Program Dwell in Seconds

G08 X*value*	Repeat Subroutine X Times
G20	Select English Units (inches)
G21	Select Metric Units (mm)
G40	Disable Kerf Compensation
G41	Enable Left Kerf Compensation
G42	Enable Right Kerf Compensation
G43 X*value*	Kerf Value
G41 D1-200	Enables Left Kerf using a Kerf Table variable
G42 D1-200	Enables Right Kerf using a Kerf Table variable
G43 D1-200	Sets the current Kerf value via the Kerf Table using prior set Left / Right Kerf
G59 D1-200Xvalue	Sets Kerf table variable from 1-200
G59 V*value* F*value*	Sets the Plasma Supply current through Outputs or Serial Link for Vprocess (504,514,524,534) at Fcurrent value V504 – Current Setting Plasma 1 V514 – Current Setting Plasma 2 V524 – Current Setting Marker 1 V534 – Current Setting Marker 2
G66 D*val* B*val* C*val*	Auto Align 3 Point Method with Long Offset Distance, Fast Speed, Slow Speed values respectively
G82	Oxy-Fuel Cut Mode
G83	Oxy-Fuel Cut Mode Contour Bevel Head
G84	Plasma Cut Mode
G85	Plasma Cut Mode Contour Bevel Head
G90	Absolute Programming Mode
G91	Incremental Programming Mode
G92	Set Axis Presets
G97	Program Repeat Pointer
G97 T*value*	Program Repeat Pointer. Executes the repeat T times
G98	Repeat at G97, or start of program if no G97
G99	Part Options
M00	Program Stop
M01	Optional Program Stop (uses Setup Parameter)
M02	End of Program
M07	Cutting Device On
M08 Txx.xx	Cutting Device Off (Temporary Optional Time Delay from –1 to 99.99 seconds)
M09	Enable Marker 1
M10	Disable Marker 1
M11	Marker Offset 1 On
M12	Marker Offset 1 Off
M13	Enable Marker 2
M14	Disable Marker 2
M15	Cut On
M16	Cut Off

M17	Oxy Gas On
M18	Oxy Gas Off
M19	Cancel All Stations
M26	Station Select On
M27	Station Select Off
M28	CBH / Rotator(s) Disable
M29	CBH / Rotator(s) Enable
M30	End of Program (same as M02)
M31	Reset Functions (Cut Off, Marker Off, Kerf Off)
M32	Unclamp / Unlock All Stations
M32 T*value*	Unclamp / Unlock ‘T” Station, where T = 1 through 19
M33	Unclamp / Lock All Stations
M34	Clamp / Unlock All Stations
M34 T*value*	Clamp / Unlock ‘T” Station, where T = 1 through 19
M35	Clamp / Unlock All Stations Mirror
M35 T*value*	Clamp / Unlock Mirror “T” Station, where T = 1 through 19
M36 T*value*	Process Select “T” where T value selects the process 1 – Plasma 1 2 – Plasma 2 3 – Marker 1 4 – Marker 2 5 – Laser
M37 T*value (1-20)*	Select Station “T” where T = 1 through 20
M38 T*value (1-20)*	Deselect Station “T” where T = 1 through 20
M40	Start of Subroutine
M40 X*value*	Start of Subroutine. Executes the repeat X times
M41	End of Subroutine
M48	Speed Override Enable
M49	Speed Override Disable
M50	Height Sensor Disable
M51 Txx.xx	Height Sensor Enable (Temporary Optional Time Delay in seconds before Enable)
M52	Height Sensor Disable and Raise Torch
M53	Height Sensor Enable and Lower Torch
M63	User Defined 1 On
M64	User Defined 1 Off
M54	User Defined 2 On
M55	User Defined 2 Off
M56	User Defined 3 On
M57	User Defined 3 Off
M58	User Defined 4 Off
M59	User Defined 5 On
M65	End of Program (same as M02) or Auto Reload
M72	Marker Offset 2 Off
M73	Marker Offset 2 On
M75	A Axis/Tilt Go to Home Command - Rapid Index

M76	C Axis/Rotate Go to Home Command - Rapid Index
M77	Go to Home position Y Axis
M78	Go to Home position X Axis
M79 T*value (1-4)*	Go To Home Position (1-4)
M90	Aligns CBH / Rotator to Tangent angle of next cut segment
M90-	Align rotator negative, when not using shortest path motion
M274	Marker Offset 3 Off
M275	Marker Offset 3 On
M276	Marker Offset 4 Off
M277	Marker Offset 4 On
M278	Marker Offset 5 Off
M279	Marker Offset 5 On
M280	Marker Offset 6 Off
M281	Marker Offset 6 On
M282	Marker Offset 7 Off
M283	Marker Offset 7 On
M284	Marker Offset 8 Off
M285	Marker Offset 8 On
M286	Marker Offset 9 Off
M287	Marker Offset 9 On
M288	Marker Offset 10 Off
M289	Marker Offset 10 On
M290	Marker Offset 11 Off
M291	Marker Offset 11 On
M292	Marker Offset 12 On
M293	Marker Offset 12 On
M301	Assigns the current X/Y position to Home Position 1
M302	Assigns the current X/Y position to Home Position 2
M303	Assigns the current X/Y position to Home Position 3
M304	Assigns the current X/Y position to Home Position 4
M305	Assigns the current X/Y position to Home Position 5
M306	Assigns the current X/Y position to Home Position 6
M307	Assigns the current X/Y position to Home Position 7
M308	Assigns the current X/Y position to Home Position 8
M309	Assigns the current X/Y position to Home Position 9
M310	Assigns the current X/Y position to Home Position 10
M311	Assigns the current X/Y position to Home Position 11
M312	Assigns the current X/Y position to Home Position 12

Mapped EIA Codes

EIA CODE	DESCRIPTION	MAPPED TO
G04 F*value*	Program Dwell	G04 X*value*
G05	Set Axis Presets	G92
G21	Linear Interpolation (at cut speed)	G01
G22	CW Circular Interpolation	G02
G23	CCW Circular Interpolation	G03
G41 K*value*	Left Kerf with Value	G41 with Kerf Value
G42 K*value*	Right Kerf with Value	G42 with Kerf Value
G97 T*Value*	Subroutine Loop	G08 X*value* and M40
G45	Lead In to Kerfed Part	G01, G02, or G03
G70	Select English Units	G20
G71	Select Metric Units	G21
G98	End of Subroutine Loop	M41
M03	Cutting Device On/Off	M07 (Oxy Fuel) or M08 as appropriate
M04	Cutting Device On	M07
M05	Cutting Device Off	M08 (Oxy Fuel)
M06	Cutting Device Off	M08
M06	Enable Marker 2	M13
M07	Disable Marker 1 or 2	M10 or M14 as appropriate
M08	Enable Marker 1	M09
M09	Disable Marker 1 or 2	M10 or M14 as appropriate
M10	Enable Marker 2	M13
M14	Height Sensor Disable	M50
M15	Height Sensor Enable	M51
M20	Cutting Device On/Off	M07 or M08 as appropriate (Plasma)
M21	Cutting Device On/Off	M07 or M08 as appropriate (Plasma)
M20	Output 9 On	O9 S1
M21	Output 9 Off	O9 S0
M22	Output 12 On	O12 S1
M23	Output 12 Off	O12 S0
M24	Wait for Input 7 On	W7 S1
M25	Wait for Input 8 On	W8 S1
M25	CBH Enable	M29
M26	Wait for Input 7 Off	W7 S0
M26	CBH Disable	M28
M27	Wait for Input 8 Off	W8 S0
M67, M02	Kerf Left	G41
M68, M03	Kerf Right	G42
M69, M04	Kerf Off	G40
M65, M70	Cutting Device On	M07
M66, M71, M73	Cutting Device Off	M08
M70	Marker Offset 1 Off	M12
M71	Marker Offset 1 On	M11
M70T01	Marker Offset 1 Off	M12

M71T01	Marker Offset 1 On	M11
M70T02	Marker Offset 2 Off	M72
M71T02	Marker Offset 2 On	M73
M70T03	Marker Offset 3 Off	M274
M71T03	Marker Offset 3 On	M275
M70T04	Marker Offset 4 Off	M276
M71T04	Marker Offset 4 On	M277
M70T05	Marker Offset 5 Off	M278
M71T05	Marker Offset 5 On	M279
M70T06	Marker Offset 6 Off	M280
M71T06	Marker Offset 6 On	M281
M70T07	Marker Offset 7 Off	M282
M71T07	Marker Offset 7 On	M283
M70T08	Marker Offset 8 Off	M284
M71T08	Marker Offset 8 On	M285
M98	End Comment	)
M99	Start Comment	(
M221	No Mirror, No Rotate	G99 X1 Y0 I0 J0
M222	Mirror Y, No Rotate	G99 X1 Y0 I0 J1
M223	Mirror X and Y	G99 X1 Y0 I1 J1
M224	Mirror X, No Rotate	G99 X1 Y0 I1 J0
M225	Mirror X/Y on -45 Deg	G99 X1 Y270 I1 J0
M226	Rotate 90 Deg CCW	G99 X1 Y90 I0 J0
M227	Mirror X/Y on +45 Deg	G99 X1 Y270 I0 J1
M228	Rotate 90 Deg CW	G99 X1 Y270 I0 J0
M245	Output 1 On	O1 S1
M246	Output 1 Off	O1 S0
M247	Output 2 On	O2 S1
M248	Output 2 Off	O2 S0
M249	Output 3 On	O3 S1
M250	Output 3 Off	O3 S0
M251	Output 4 On	O4 S1
M252	Output 4 Off	O4 S0
M253	Wait for Input 1 On	W1 S1
M254	Wait for Input 1 Off	W1 S0
M255	Wait for Input 2 On	W2 S1
M256	Wait for Input 2 Off	W2 S0
M257	Wait for Input 3 On	W3 S1
M258	Wait for Input 3 Off	W3 S0
M259	Wait for Input 4 On	W4 S1
M260	Wait for Input 4 Off	W4 S0

Unsupported EIA Codes

EIA CODE	DESCRIPTION
G30	Mirror Off
G46	Table 0 Select
G94	Feed per minute
G95	Feed per rev
G99	Freestanding G99
G103 Q*name*	Stop Current Program/ Load New Program
G201	Incremental Line In2
G202	Incremental CW Arc In2
G203	Incremental CCW Arc In2
G211	Incremental Line In3
G212	Incremental CW Arc In3
G213	Incremental CCW Arc In3
G221	Absolute Line In2
G222	Absolute CW Arc In2
G223	Absolute CCW Arc In2
G231	Absolute Line In3
G232	Absolute CW Arc In3
G233	Absolute CCW Arc In3
G240	Programmable Kerf
G247	Table 1 Select
G248	Table 2 Select
G249	Table 3 Select
G250	Table 4 Select
G276	Internal Variable Load
G277	External Variable Load
G278	X Axis Home
G279	Y Axis Home
G280	X Home Return
G281	Y Home Return
M66	PLC Control Code
M75	Ignored if not using CBH, Tilt Rotator(s)
M76	Ignored if not using CBH, Tilt Rotator(s)
M210	X Sign Toggle
M211	Y Sign Toggle
M212	X and Y Swap and Toggle
M231	Aux. State Reset
M261	Aux. Torch Master On
M262	Aux. Torch Master Off

The unsupported EIA codes previously noted are ignored when read. Some of these codes may be supported in the future. Any EIA codes that are not listed above will result in a translator error upon loading the EIA program. Known EIA codes that will not be accepted include, but are not limited to:

P*value*	Program Number
D*value*	Indexed Kerf Operations
V*value*	Internal Variable Load

EIA Comments

Comments may be placed into the part program to be displayed on screen and viewed by the operator. The comment line must first be preceded by a program stop command (EIA M00 code or ESSI 0 code).

EIA Example:

M00 – Pauses Program
(Comment) – Text to be displayed

ESSI

The control supports ESSI part programs as defined by the International Standards Organization in ISO 6582. An ESSI program lists the sequence of Lines, Arcs, Speeds, Kerf and I/O Functions used to create a part. While the user is free to program in ESSI using a standard text editor, it is recommended that the *ShapeWizard*® Graphical Programming environment be used instead.

While the user is free to download ESSI programs to the control, it is important to note that all Part Programs will be internally converted to EIA for execution in the control. Following is a list of the ESSI codes that are mapped into the control, or currently unsupported by the control. Mapped ESSI codes are automatically converted upon program load into directly supported EIA codes. Unsupported ESSI codes are ignored. All other ESSI codes will generate an error.

Mapped ESSI Codes

ESSI CODE	DESCRIPTION	MAPPED TO EIA
%	Start of Program	Not Used-Automatic
+/-*value*…	Line or Arc	G00, G01, G02 or G03 as appropriate
0	End Program or Stop	M02 or M00 (if 64 is End Program)
3	Start Comment	(
4	End Comment	)
5	Enable Rapid Traverse	Not Used-Automatic
6	Disable Rapid Traverse	Not Used-Automatic
7	Cutting Device On	M07
8	Cutting Device Off	M08
9	Enable Marker 1	M09
10	Disable Marker 1	M10
11	Marker Offset 1 On	M11
12	Marker Offset 1 Off	M12
11+1	Marker Offset 1 On	M11
12+1	Marker Offset 1 Off	M12
11+2	Marker Offset 2 On	M73
12+2	Marker Offset 2 Off	M72
11+3	Marker Offset 3 On	M275
12+3	Marker Offset 3 Off	M274
11+4	Marker Offset 4 On	M277
12+4	Marker Offset 4 Off	M276
11+5	Marker Offset 5 On	M279
12+5	Marker Offset 5 Off	M278
11+6	Marker Offset 6 On	M281
12+6	Marker Offset 6 Off	M280
11+7	Marker Offset 7 On	M283
12+7	Marker Offset 7 Off	M282
11+8	Marker Offset 8 On	M285
12+8	Marker Offset 8 Off	M284
13	Enable Marker 2	M13

14	Disable Marker 2	M14
15	Marker Offset 2 On	M73
16	Marker Offset 2 Off	M72
21	No Mirror, No Rotate	G99 X1 Y0 I0 J0
22	Mirror Y, No Rotate	G99 X1 Y0 I0 J1
23	Mirror X and Y	G99 X1 Y0 I1 J1
24	Mirror X, No Rotate	G99 X1 Y0 I1 J0
25	Mirror X/Y on -45 Deg	G99 X1 Y270 I1 J0
26	Rotate 90 Deg CCW	G99 X1 Y90 I0 J0
27	Mirror X/Y on +45 Deg	G99 X1 Y270 I0 J1
28	Rotate 90 Deg CW	G99 X1 Y270 I0 J0
29	Enable Left Kerf Comp	G41
30	Enable Right Kerf Comp	G42
38	Disable Kerf	G40
39+*value*	Machine Speed	F*value*
40+*value*	Programmable Kerf	G43 X*value*
41	Preset Dwell	G04
41+*value*	Program Dwell in mSec	G04 X*value*
45	Ht Sensor Enable/Lower	M53
46	Ht Sensor Disable/Raise	M52
47	Ht Sensor Enable	M51
48	Ht Sensor Disable	M50
51	CBH Enable	M29
52	CBH Disable	M28
53	Cutting Device On	M07
54	Cutting Device Off	M08
63	Reset Functions	M31
64	End Program	M02
65	End of Program/ Reload	M65
67	Ht Sensor Disable	M50
68	Ht Sensor Enable	M51
70	Select English Units (in)	G20
71	Select Metric Units (mm)	G21
79+1	Go To Home Position 1	M79 T1
79+2	Go To Home Position 2	M79 T2
79+3	Go To Home Position 3	M79 T3
79+4	Go To Home Position 4	M79 T4
81	Incremental Mode	G91
82	Absolute Mode	G90
83	Set Axis Presets	G92
90	End of Program	M02
97	Program Repeat Pointer	G97
97+*value*	Subroutine Loop	M40 X*value*
98	Repeat at 97, Subroutine loop or start of program if no 97	G97, G98 or M41 as appropriate
99	End of Program	M02

245	Output 1 On	O1 S1
246	Output 1 Off	O1 S0
247	Output 2 On	O2 S1
248	Output 2 Off	O2 S0
249	Output 3 On	O3 S1
250	Output 3 Off	O3 S0
251	Output 4 On	O4 S1
252	Output 4 Off	O4 S0
253	Wait for Input 1 On	W1 S1
254	Wait for Input 1 Off	W1 S0
255	Wait for Input 2 On	W2 S1
256	Wait for Input 2 Off	W2 S0
257	Wait for Input 3 On	W3 S1
258	Wait for Input 3 Off	W3 S0
259	Wait for Input 4 On	W4 S1
260	Wait for Input 4 Off	W4 S0
282	Marker Offset 3 On	M275
283	Marker Offset 3 Off	M274
284	Marker Offset 4 On	M277
285	Marker Offset 4 Off	M276
286	Marker Offset 5 On	M279
287	Marker Offset 5 Off	M278
288	Marker Offset 6 On	M281
289	Marker Offset 6 Off	M280
290	Marker Offset 7 On	M283
291	Marker Offset 7 Off	M282
292	Marker Offset 8 On	M285
293	Marker Offset 8 Off	M284

Unsupported ESSI Codes

ESSI CODE	DESCRIPTION
103+Name	Stop Current Program/ Load New Program
237	X Sign Toggle
238	Y Sign Toggle
239	X and Y Swap and Toggle
266	Table 1 Select
267	Table 2 Select
268	Table 3 Select
269	Table 4 Select
276	Internal Variable Load
277	External Variable Load
278	X Axis Home
279	Y Axis Home
280	X Home Return
281	Y Home Return

The unsupported ESSI codes above are ignored when read. Some of these codes may be supported in the future. Any ESSI codes that are not listed above will result in a translator error upon loading the ESSI program.

ESSI Comments

Comments may be placed in to the part program to be displayed on screen and viewed by the operator. The comment line must first be preceded by a program stop command (EIA M00 code or ESSI 0 code).

ESSI Example:

0 – Pauses Program
3 – Start Comment
Comment – Text to be displayed
4 – End Comment

Advanced Feature Codes

Kerf Table

CODE	DESCRIPTION
G59 D1-200Xvalue	Sets kerf table variable from 1-200
G41 D1-200	Enables Left Kerf using a Kerf Table variable
G42 D1-200	Enables Right Kerf using a Kerf Table variable
G43 D1-200	Changes current kerf value via Kerf Table using previously set Left or Right kerf

Tilt / Rotator Part Codes

CODE	DESCRIPTION
G00 A*value*	Sets Tilt angle as a preparatory command – A is the angle value in degrees
G00 XY*value* A*value*	Performs Linear Interpolation of Tilt angle along line segment.
G00 A*value* F*value*	Sets Tilt angle – Angle value in degrees with a speed command in RPM
M28	Disables Follower
M29	Enables Follower
M90	Preparatory Cmd - Aligns Rotator to Tangent angle of next cut segment
M90-	Align rotator when not using shortest path motion
M75	A axis/Tilt Goto Home Cmd - Rapid Index
G00 Cxx	Move to rotate “C” position
G01 Cxx Fxx	Move to rotate “C” position with Speed “F” command
G00 C180-	Rotate Axis align 180 degrees will continue to rotate in the proper direction
G00 C-180-	Rotate Axis align -180 degrees will continue to rotate in the proper direction
G01 C180- Fxx	Rotate Axis align 180 degrees with speed
G01 C-180- Fxx	Rotate Axis align -180 degrees with speed

Automatic Torch Spacing Program Codes

CODE	DESCRIPTION
M32	Unclamp / Unlock All Stations
M33	Unclamp / Lock All Stations
M34	Clamp / Unlock All Stations
M34T*value*	Clamp / Unlock ‘T” Station, where T = 1 through 19
M35	Clamp / Unlock All Stations Mirror
M35T*value*	Clamp / Unlock Mirror “T” Station, where T = 1 through 19
M77	Go to Home position Y Axis
M78	Go to Home position X Axis

Station Selects

Stations (Lifter / THCs) may be selected and de-selected using a EIA-274D program code with the following format.

CODE	DESCRIPTION
M19 T*value*	Cancel All Station Selections
M37 T*value*	Select Station 1-20 (Tvalue)
M38 T*value*	De-Select Station 1-20 (Tvalue)

Additionally, these Station Select program codes may be overridden using the user selected THC inputs to the control. The feature to override the part program must be enabled at the Cutting Setup screen.

Process Selects

Process Selections may be selected using a EIA-274D program code with the following format.

Example: M36 T*value*

Misc. M Code — M36

Valve Identity — T*value*

- T1 = Plasma Process 1
- T2 = Plasma Process 2
- T3 = Marker Process 1
- T4 = Marker Process 2
- T5 = Laser Process

Station Configuration Variables

The following options are available for the station configuration

Lifter

None
Sensor THC
Command THC (w/ Serial Link)
HD4070 Integrated THC 1 or 2 (used only with the HD4070 power supply)
Other (any stand alone Lifter Station)

Power Supplies

None	HD4070 Torch 1or 2	Powermax series
Max100/ 100D	HT4001	FineLine 100
Max200	HT4100	FineLine 200
HT2000	HT4400	Other (any other Plasma system)
HD3070	HPR130	

Marker

None	ArcWriter	FineLine 100 & 200
HD4070 Torch 1or 2	HPR130	Other (any stand alone Marker)

Laser
Rofin RF 40 & 50 Rofin DC 35 Rofin TR 60 Other

Automatic Torch Spacing

The automatic torch spacing feature uses codes within the part program, and designated outputs, to perform precise positioning of individual torch stations for multi-torch cutting processes.

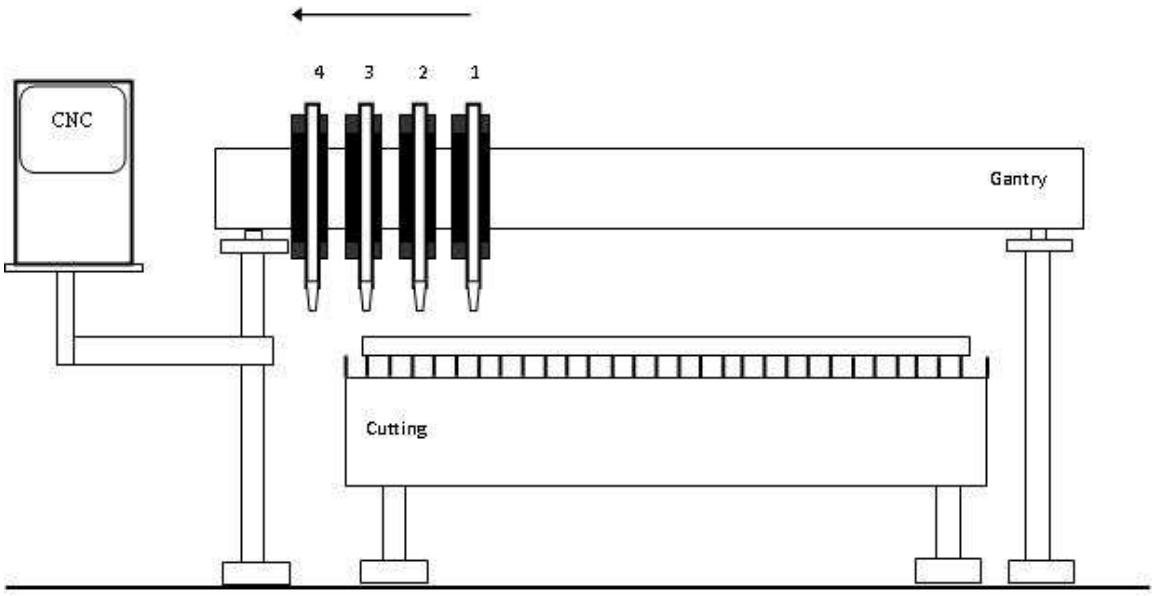
This feature must be enabled in Machine Setups. The Auto Torch Spacing Override feature in Cutting Setups must also be enabled.

In this process, the primary torch station has a fixed mount to the transverse axis and the other secondary torch stations have the ability to clamp to the mechanics of the transverse axis during use or lock to the gantry or beam when not in use.

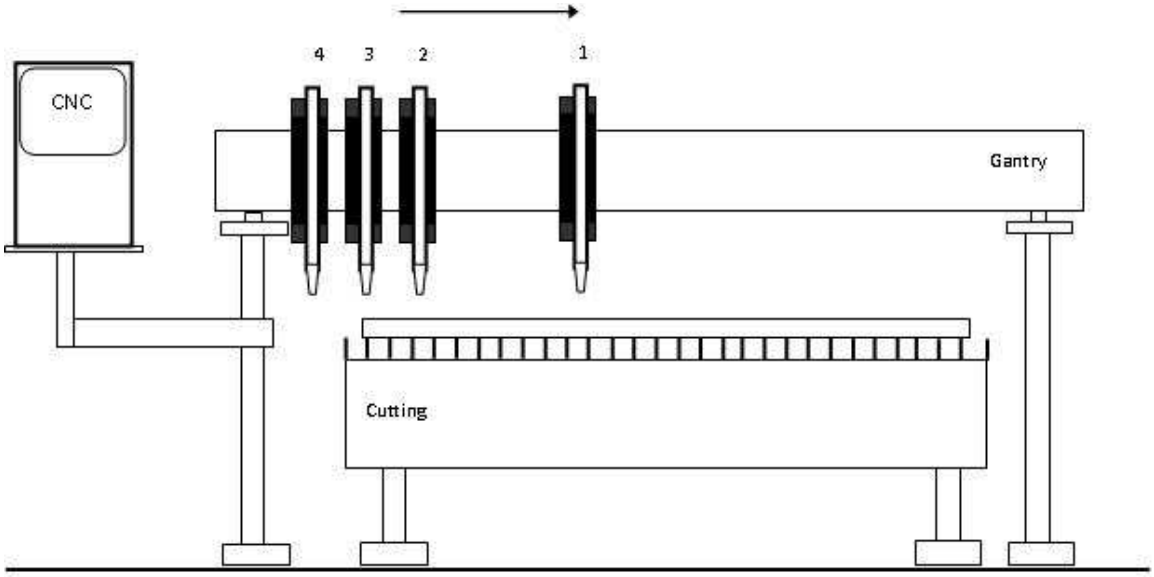
For the example, in the following illustration, Torch 1 is the primary station and Torch 2-4 are the secondary stations.

Typical use is as follows:

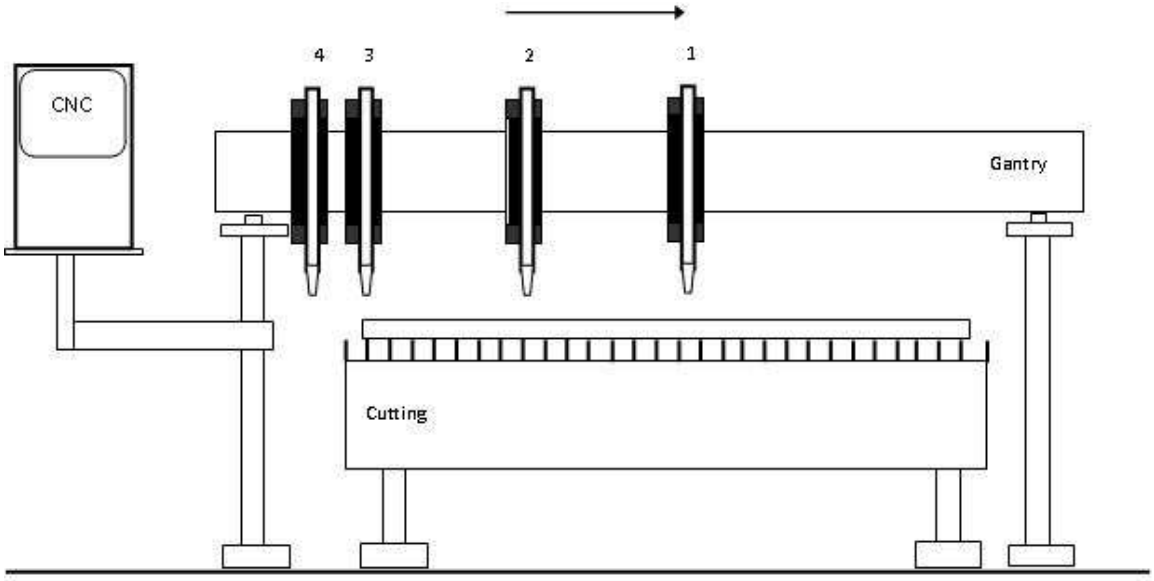
1) Unclamp and unlock all stations (except the first which is fixed and slides the others)
2) Go to Home Command on Transverse Axis (M77 or M78 depending on orientation)



3) Clamp and Unlock all carriages and G00 index inward on transverse (optional command - may used to space all stations away from edge / OT switch of machine)
4) Lock and Unclamp all and G00 index to space first station (remember-first station has no clamping/locking on board)



5) Unlock and Clamp next station and G00 index to space the next station.



6) Repeat Step 5 until as many stations as needed are spaced.

Note: Homing also automatically includes the commands necessary to push the stations to the side and lock / clamp them whenever the transverse is homed, if Auto Torch Spacing is

enabled. Unclamp/ Clamp and Unlock / lock commands execute a one second delay before moving.

Automatic Torch Spacing Program Codes

Code	Description
M32	Unclamp / Unlock All Stations
M33	Unclamp / Lock All Stations
M34	Clamp / Unlock All Stations
M34T*value*	Clamp / Unlock 'T" Station, where T = 1 through 19
M35	Clamp / Unlock All Stations Mirror
M35T*value*	Clamp / Unlock Mirror "T" Station, where T = 1 through 19
M77	Go to Home position Y Axis
M78	Go to Home position X Axis
G00 Xn Yn	Traverse command where n = value to move the desired axes a distance.

Automatic Torch Spacing I/O

Station Lock 1-19	The Station lock is used to Lock the unused torch station to the gantry or beam when not in use.
Station Clamp 1-19	The Station Clamp is used to Clamp the selected torch station to the transverse axis for standard cutting.
Station Mirror 1-19	Station Clamp is used to Clamp the selected torch station to the transverse axis for mirrored cutting.

Example Part Program

Transverse axis defined as X axis
Three station cut of 20 inch vertical rip.

CODE	DESCRIPTION
G70	English Units
G91	Incremental Mode
G99 X1 Y0 I0 J0	Axes Preset zero Scaling
M32	Unclamp / Unlock All Stations
M78	Home X Axis (move all stations to Home position)
M34	Clamp All / Unlock All
G00X2Y0	Traverse X axis 2 inches (to move off edge/ switch)
M33	Unclamp All / Lock All
G00X10Y0	Traverse X axis 10 inches (to set 10 inch space – station 1)
M34 T1	Clamp Station 1 / Unlock Station 1
G00X10Y0	Traverse X axis 10 inches (to set 10 inch space– station 2)
M34 T2	Clamp Station 2 / Unlock Station 2
G41	Left Kerf
M07	Cut On
G01 X0 Y20	Line segment (Y axis 20 inches)
M08	Cut Off
G40	Kerf Off

M02 End of Program

Sensor THC Part Program Support

Sensor THC allows you to configure THC setup parameters through part program codes.

The following parameters are available for use using EIA-274D G59 codes:

- Arc Voltage
- Pierce / Start Time
- Pierce/ Start Height Factor
- Cut / Mark Height
- Transfer Height Factor

Setup is obtained using the following format:

Example: G59 V601 F*value*

Misc. G Code

Variable Identity

V600 = Plasma 1 Arc Voltage
V601 = Plasma 1 Pierce Time
V602 = Plasma 1 Pierce Height Factor
V603 = Plasma 1 Cut Height
V604 = Plasma 1 Transfer Height Factor
V605 = Plasma 1 Cut Height Delay
V606 = Plasma 1 Kerf Detect Reaquire Time

V625 = Plasma 2 Arc Voltage
V626 = Plasma 2 Pierce Time
V627 = Plasma 2 Pierce Height Factor
V628 = Plasma 2 Cut Height
V629 = Plasma 2 Transfer Height Factor
V630 = Plasma 2 Cut Height Delay
V631 = Plasma 2 Kerf Detect Reaquire Time

V650 = Marker 1 Arc Voltage
V651 = Marker 1 Start Time
V652 = Marker 1 Start Height Factor
V653 = Marker 1 Mark Height

V675 = Marker 2 Arc Voltage
V676 = Marker 2 Start Time
V677 = Marker 2 Start Height Factor
V678 = Marker 2 Mark Height

Variable Value

The selected value for the variable

THC Index code

G00 Zx.xx Tx Index Sensor THC height “Z” distance for torch “T”. Manual mode only.

Subparts

Subparts allow the user to call and execute a separate part file within a part program using a simple line of text.

To configure a subroutine part for use, the user must first create a folder on the CNC hard drive named “SUBPARTS”. To create a folder on the hard drive, select Load From Disk. With the folder location highlighted, press the + key to create a new folder.

Save the desired part program in the SUBPARTS folder.

To execute the part, insert a line of code at the desire location within the part with the following format.

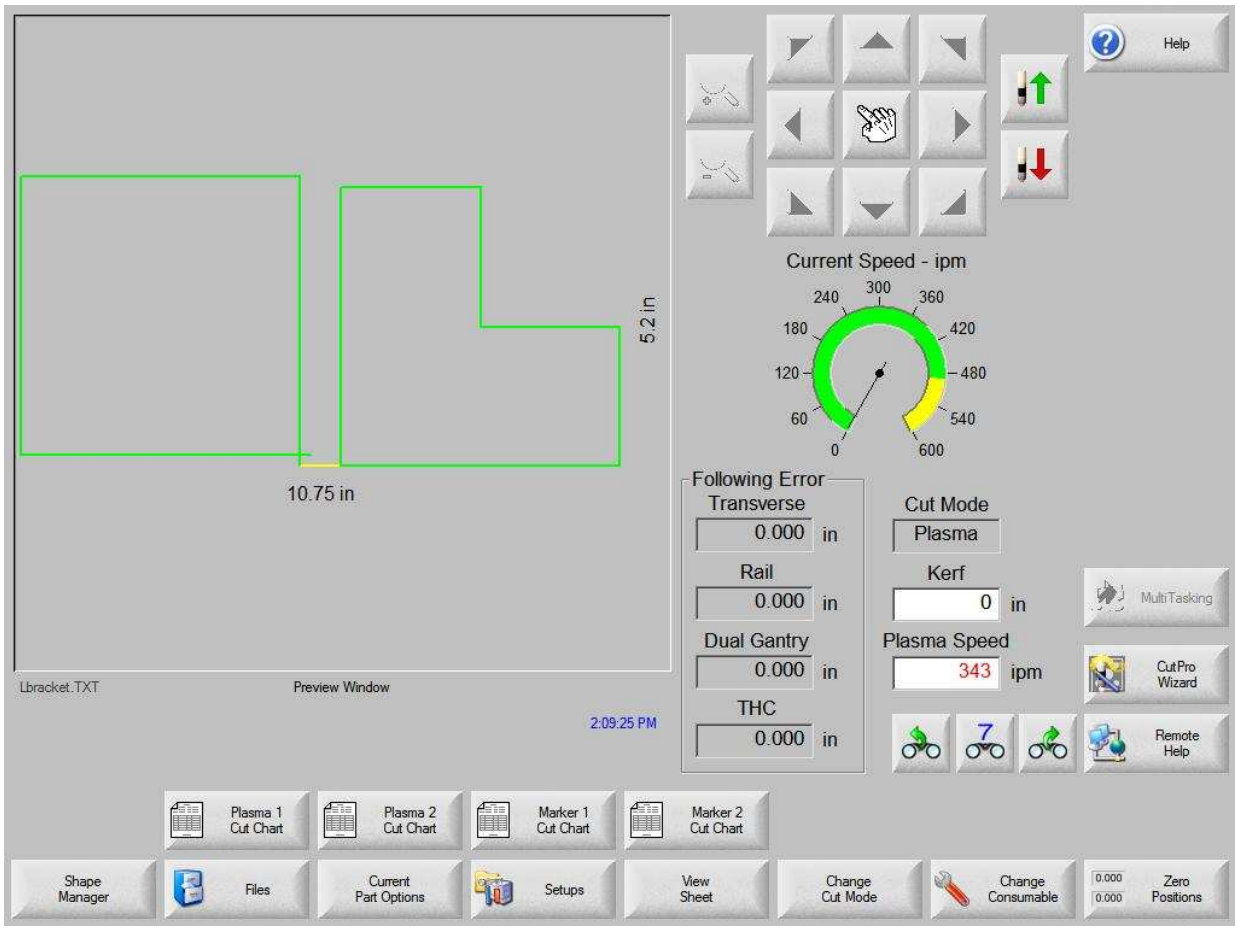
PFILENAME

Start the line of code with the letter P to indicate that a Sub Part is to be executed, followed by the filename for the desired part program.

For example, to execute subpart L-Bracket after completing a simple 5” x 5” square with a programmed traverse, the part program would look something like the following example:

```
(Rectangle - Piece)
G20
G91
G99 X1 Y0 I0 J0
G41
M07
G01 X-5.2 Y0
G01 X0 Y5
G01 X5 Y0
G01 X0 Y-5.2
M08
G00 X.75 Y0
PL-BRACKET
G40
M02
```

When executed, this program would be represented as the original part plus the additional subpart, including the programmed traverse.



Note: Subparts can also contain subparts. After being translated by the CNC, the final text of the part will contain the complete text of the original part and subpart.

Marker Font Generator

The Marker Font Generator feature can be used to label or identify parts with a marking device before cutting. This is accomplished by use of a simple command string within the part program code to call existing text characters (fonts) and execute marking of the selected text.

The program code uses a specific format and is structured to provide information to be used when marking. Information on the font source location, scale factor, angle, marker tool, tool offset and text are entered as information blocks in the command string. Each section or information block in the command string is separated by a space. The format of this command code is outlined as follows:

Note: If a value is not present for a specific information block, the default values will be used. The default values are:

Font (F):	Internal	**Angle (A):**	0°	**Offset (O):**	#1
Scale (S):	One	**Marker (M):**	#1		

Example of a simple command string: **<F2 S1 A45 M2 O2 <TEST 123>**

< The program command must begin with the "**<**" symbol to indicate the Marker Font Generator feature is being used.

F The first block of information is the Font Source location. The "F" indicates "Font" and is followed by a digit to indicate the location. Number 1 indicates the internal font in the control software, number 2 indicates to use a font located on the control hard drive, and number 3 indicates to source the font to be used from diskette or USB memory. If no font is found at the selected location, the default internal font will be used. For the example given, the font location would be from the hard drive.

S The second information block determines the scale of the text. The "S" is used to indicate "Scale" and is followed by a digit to indicate a numeric scale factor. For the example given, the Scale factor would be two or twice as large as the original font dimensions.

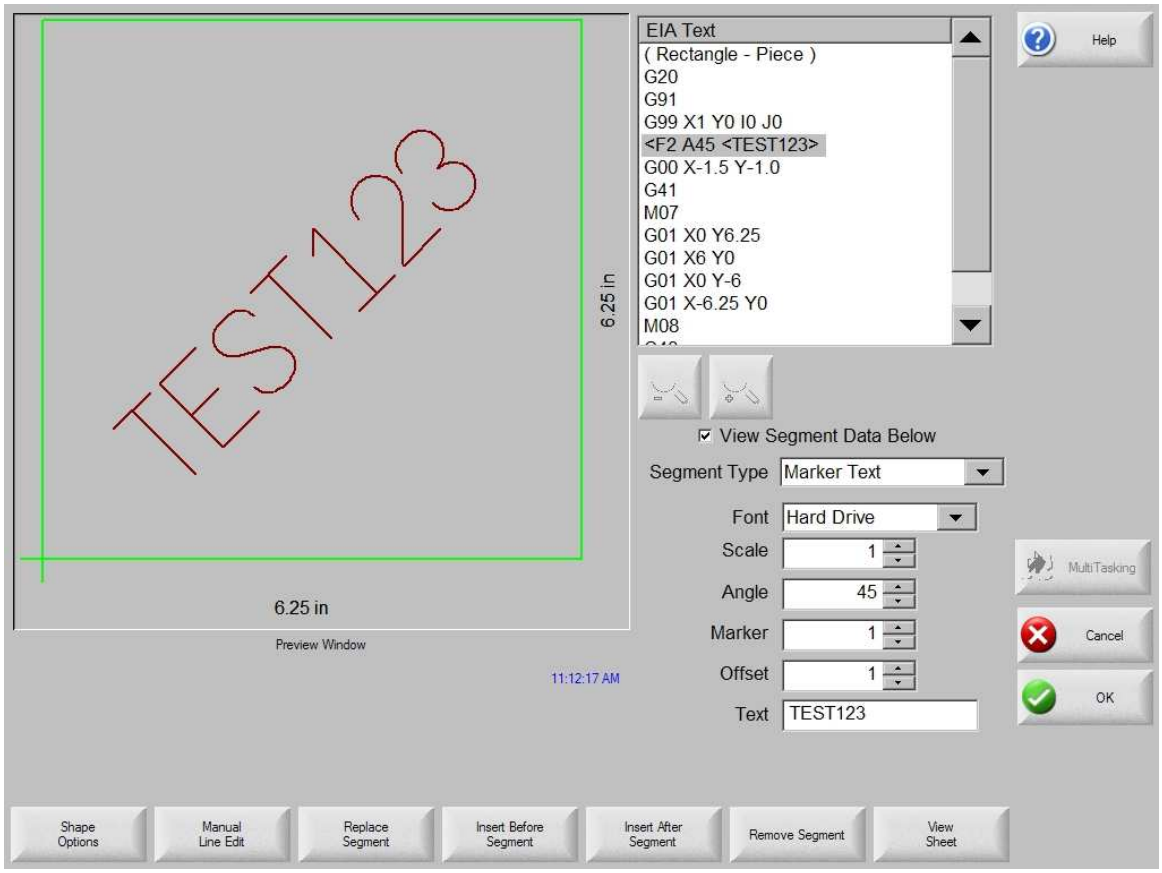
A The third information block determines the angle of the text. The "A" is used to indicate "Angle" and is followed by a numeric value for the degree of angle. For the example given, the angle would be 45°.

M The fourth information block determines the Marker Tool to be used. The "M" is used to indicate "Marker" followed by the number of the Marker Tool (Marker Enable Output) to be used. Up to two marker enables are supported.

O The fifth information block determines which tool Offset to be used. The "O" indicates offset followed by a number indicating one of the nine different tool offsets previously configured in control setups is to be used. The example shown indicates that tool offset number two should be used.

< > The final information block is used to specify the marker text to be executed. The text must be enclosed in the "<" and ">" marks to be valid and understood as the selected text. For the example given, the marker text executed would be "TEST 123"

Translated by the control, the example command string given above would generate the Marker Text "TEST 123" onto the plate as shown here in Shape Wizard.



To improve the ease of use for the part program designer and control operator, the marker font generator always inserts a traverse segment to return to the original start point at the beginning of the marking text.

Internal Fonts

The internal fonts located within the control software are 1" high and are limited to characters available on the control keypad. Alphabetical characters are limited to upper case letters only.

External Fonts

External fonts can be loaded from a floppy disk or from the control hard drive. When the CNC generates the text, the CNC searches for part files to correspond to the selected character. The part file names must be based on their ASCII numeric equivalent and have a .txt file extension.

For example, for the marker text "Ab 12", the control searches for the following files to generate the text:

Text	ASCII No.	File Name
Capital A	65	Ascii65.txt
Lower case b	98	Ascii98.txt
Space	32	Ascii32.txt
No 1	49	Ascii49.txt
No 2	50	Ascii50.txt

Refer to the ASCII Codes section of this guide for additional ASCII code information.
Font programs may be saved on the control hard drive by creating a folder labeled “Fonts” using the “Save to Disk” feature and saving the font programs within this folder. Remember, if a corresponding part file to text requested is not found at the selected source location, the internal font file will be used.

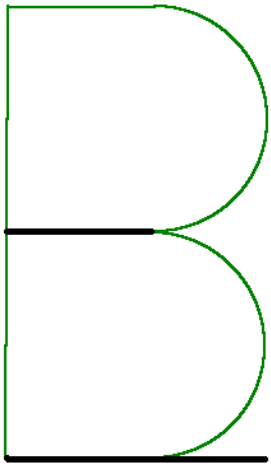
Custom Fonts

As previously noted, customer-selected custom fonts can be used when using the marker font generator. To construct these font files, certain guidelines should be adhered to.

1. Programming format must be EIA
2. Only M09 and M10 maybe used to enable and disable the marker.
3. Only G00, G01, G02 and G03 codes may be used.
4. The program must end in an M02.
5. The proper file name must be assigned to the font program.
6. The font program must begin in the lower left and end in the lower right.
7. Font programs should have the consistent dimensional limits (i.e. 1’ high, etc.).

Example: The letter “B” – File Name Ascii66.txt

```
M09
G01 X0 Y1
G01 X0.321429 Y0
G02 X0 Y-0.5 I0 J-0.25
G01 X-0.321429 Y0
M10
G00 X0.321429 Y0
M09
G02 X0 Y-0.5 I0 J-0.25
G01 X-0.321429 Y0
M10
G00 X0.571 Y0
M02
```



The darker lines in the drawing represent the Traverse segment and the lighter lines represent the Marking lines. You can see by this illustration that at the end of the font program, a traverse is used to continue motion to the bottom right corner.

Note: The Burny 3/5 style of programming for the Marker Font Generator feature is also supported for the default internal font source.

Serial Messaging

The Serial Messaging feature may be used to pass commands embedded within a part program through a selected serial port to an external device. Both RS-232 and RS-422 are supported. TCP/ IP protocol is not supported at this time. There are 2 Serial Messaging ports available.

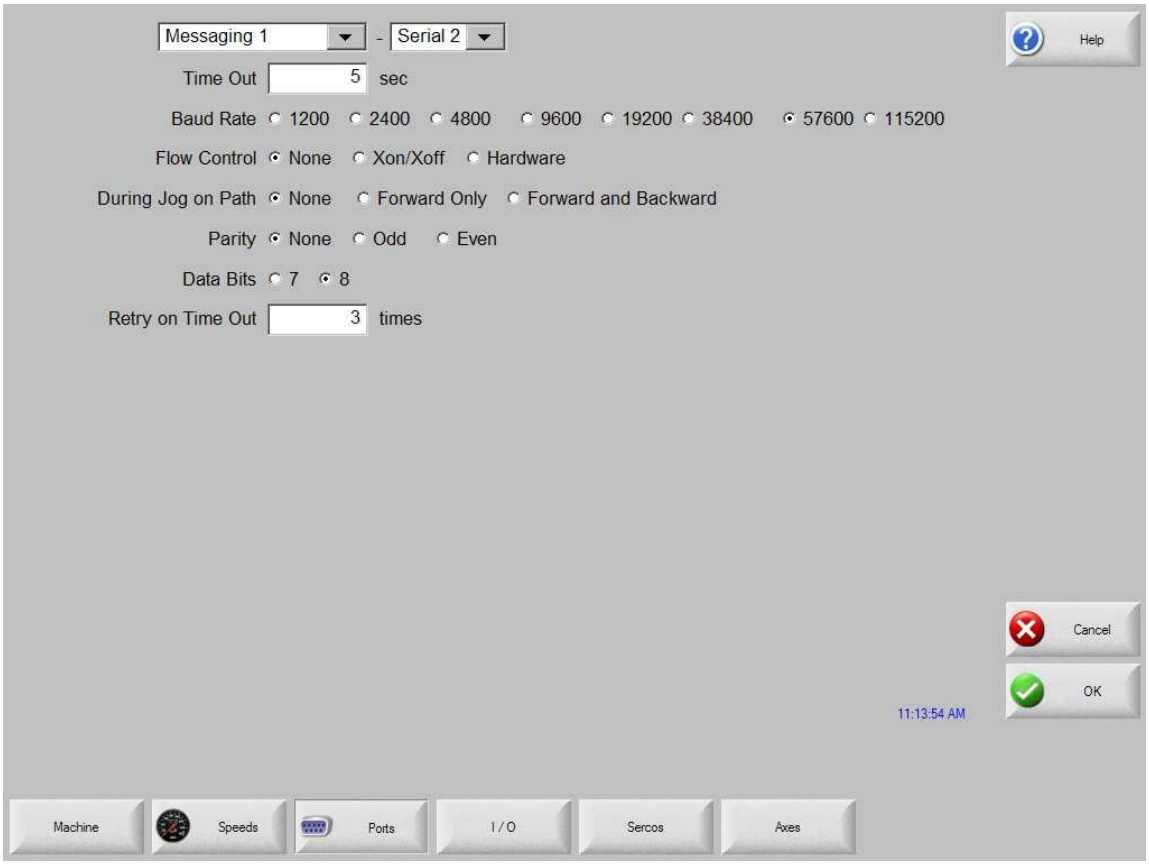
Overview

Serial Messaging has a fairly basic communication protocol that has three simple formats to send ASCII codes as command strings. During the messaging function, a status indicator for "Message Transmit", "Message Delay" or "Message Verify" will be displayed in the Watch window.

Options

1. While the selected message is sent to the external device, the part program will be temporarily suspended. After completion of the transmission, the part program will then automatically resume. No acknowledgement from the external device is required. An additional Time Delay may also be added.
2. A message is sent concurrent to execution of the part program and no delay is encountered. No acknowledge is required. No Delay Time is allowed.
3. The message is sent with a suspension of the program during transmission as in option one, but an Acknowledge from the external device (ACK) is required before the part program can continue. A Non-Acknowledge (NAK) response from the external device will prompt a retransmit of the message from the control. An optional Time Out value may be added to the program code. If no Time Out code is used in the program code the Default time out value at the Ports setup screen will be used. Additionally, an optional automatic retry feature may be enabled at the Ports setup screen.

To enable use of this feature, assign Messaging to the selected port(s) at the Ports setup screen.



After enabling Messaging, the flow control parameters to communicate with the external device will then need to be selected. The user may also select how messaging is handled for the

The following parameters must be configured. Hardware and flow control configuration information must match the external device.

Baud Rate
Select a communication speed from 1200 Baud to 115200 Baud

Parity
Select None, Odd or Even.

Data Bits
Select 7 or 8 Data Bits.

Flow Control
Select to use None, Xon/Xoff or Hardware.

During Jog on Path
The user may select whether messages will be sent when jogging Forward or Backward on Path while at the Pause screen. Note: All messaging will stop when the Stop Key has been pressed or the Remote Pause input becomes active.

Note: The Message Type 21 will transmit the message concurrent to the associated motion segment during "Backup on Path".

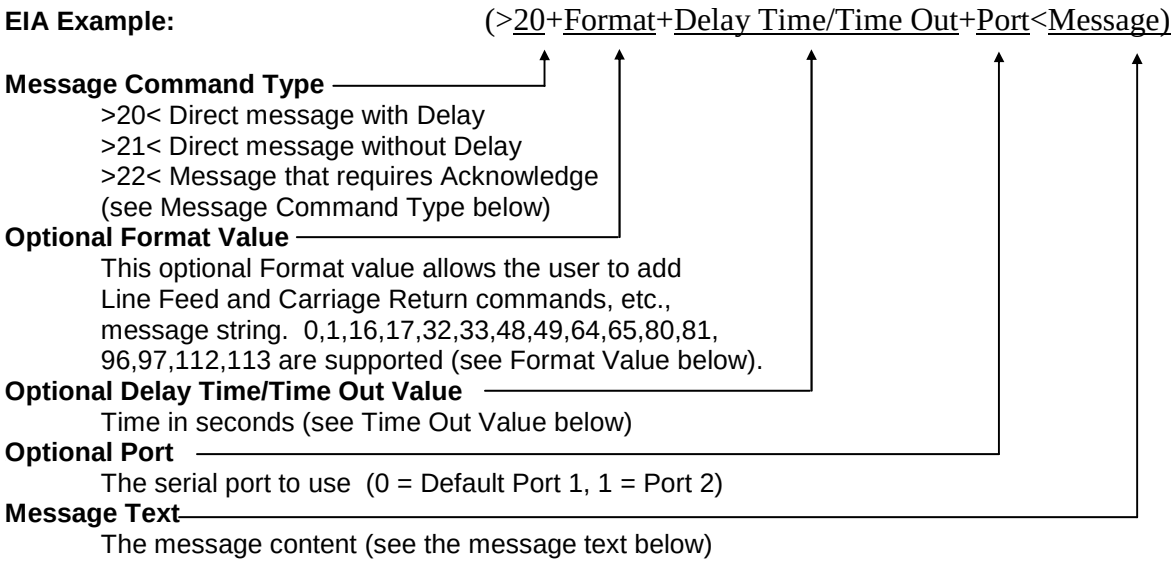
Retry on Time Out
For the Message Type 22 (which requires an acknowledgement from the external device after the message) an automatic retransmit of the message may be sent. The user may select the number of retries allowed before faulting from a lack of response from the external device. The fault prompt "Message Error" will be displayed when in a Time Out condition.

Time Out
The Time Out value may be used for the Message Type 22 (which requires an acknowledgement from the external device after the message) if there is no Time Out value used in the command string of the program code. Refer to the Delay Time / Time Out information for more information.

Programming Code
The ASCII message string follows a unique program message format. Each command begins with a ">" character and ends with a "<" character. These characters are used as delimiters to frame the command (Message Type, Optional Format and Optional Delay Time/ Time Out) instructions for the message.

Message Information

The format of this command code is outlined as follows:



Note: Message format is always within comment characters and the command portion of the program code is between the ">" Character and the "<" Character.

ESSI Example:	EIA Example:
3	(>20,1,1,0<Message)
>20,1,1,0<Message	
4	

See below for Format, Delay and Port settings information.

Note: For the example provided, the plus sign (+) character was used as delimiter between fields for the command instruction. In addition to the plus sign (+), the hyphen (**-**), comma (**,**) or space may be used as delimiters.

Example:

Using spaces, the EIA command would look like this: (>20 Format Timeout Port<Message Text)

Message Command Type

>20< This command delays the part program until all bytes have been transmitted, then optionally waits the Delay Time, if specified.

>21< A message is sent concurrent to execution of the part program and no delay is encountered. No acknowledge is required.

>22< The message is sent with a suspension of the program during transmission as in option one, but an Acknowledge from the external device (ACK = Hexadecimal 06) is required before the part program can continue. A nonacknowledge (NAK = Hexadecimal 15)

response from the external device will prompt a retransmit of the message from the control.

An optional Time Out value may be added to the program code. If no Time Out code is used in the program code the Default time out value at the Ports setup screen will be used. Additionally, an optional automatic retry feature may be enabled at the Ports setup screen.

With the automatic retry feature the message will automatically be retransmitted if no response is detected. The retry is executed after the Time Out value has elapsed. The number of retries can be defined on the Ports configuration screen.

Optional Format Value

Specialty characters for the format may be sent in addition to command string.

Specialty Characters Supported

HEX	Name	Description
01	SOH	Start of Header
02	STX	Start of Text
03	ETX	End of Text
04	EOT	End of Transmission
0A	LF	Line Feed
0D	CR	Carriage Return
	BCC	“Exclusive Or” Check Byte

Note: Checksum is always an 'Exclusive OR' of the Data ONLY as it does not include any of the 'Format' chars including the CR/LF option.

Optional Format Character Assignments

VALUE	ASSIGNMENT
0	No Special assignment(must be used in the format location if a Delay or Port is required but no Format options are required). Append a Carriage Return (<CR> = Hex value OD) and a Line Feed (<LF> = Hex Value0A)
16	Append an "Exclusive OR" (<BCC>) to the end of the message.
17	Appends a combination of 16 and 1.
32	Encloses the message with Start of Text (<STX> = Hex Value 02) and End of Text (<ETX> = Hex Value 03). The <ETX> follows the message and the optional <CR><LF>> append codes but precedes the Check Byte <BCC>.
33	Appends a combination of 1 and 32.
48	Appends a combination of 16 and 32.
49	Appends a combination of 1, 16 and 32.
64	Append a Start of Header (<SOH> = Hex value 01) and a End of Transmission (<EOT> = Hex Value04) to the Message.
65	Appends a combination of 1and 64.
80	Appends a combination of 16 and 64.
81	Appends a combination of 1, 16 and 64.
96	Appends a combination of 32 and 64.
97	Appends a combination of 1, 32, and 64.
112	Appends a combination of 16, 32 and 64.
113	Appends a combination of 1, 16, 32 and 64.

Optional Delay Time/Time Out Value

The Delay Value will issue a delay in seconds at the end of the message for Message Type 20.

No delay is supported for Message Type 21.

This value also works as a Time Out value for Message Type 22. An error will be displayed if the message is not acknowledged (ACK Hexadecimal 06) within the specified time. If no Time Out Delay is defined in the command, the Time Out parameter on the Ports screen will be used.

The value is in a 3.2 format where a value of 5 is equal to 5.00 seconds. Accepted limits for the value is range of 0.00 to 999.99 seconds.

If there is no delay, but the optional port below is being selected, then 0 is required to be entered in the optional delay location.

Optional Port

The Optional Port setting selects which Messaging Port to use. The default messaging port to use is Port 1 if this parameter is omitted. If the optional port is used, 0 = Messaging Port 1 and 1 = Messaging Port 2.

Message Text Content

Up to 300 data characters in each command string may be sent. The Command characters (information between and including the ">" and "<" signs) are included in this maximum.

Printable and Non- Printing ASCII codes can be used in the message string. Refer to the ASCII Code appendix of this manual for more information on ASCII codes and the Hexadecimal value.

Non-printing characters are supported by use of a two-character command and can send a Binary Code in the Range from 0-255. Double byte character to support combinations will affect the maximum length count with each pair reducing the maximum data characters by 1. Refer to the Non-printing Character information later in this section for information on these values.

Non – Printing Characters

Non Printing Characters are supported through use of a pair of two printing codes to equal the non-printing code. This pair of characters is retained in the program code but sent as single 8-bit code when transmitted.

There are three types of character pairs and each performs a different operation based on the first character of the pair. This produces a single modified character for transmission.

Character Options

1. The "&" two-character pair clears the 0x40 bit from the 2nd character code value.
2. The "!" two-character pair clears the 0x40 bit and sets the 0x80 bit set in the 2nd character code.
3. The "$" two-character pair clears the 0xC0 bit in the 2nd character.

To transmit the single character with a value 0x01, use the two character sequence "&A". This converts the "A" value of 0x41 to 0x01 by clearing the 0x40 bit. To transmit 0x81, use "!A" or to transmit)xC1 use "$A".

Exceptions / Additions

As the "&", "!" and "$" are used as key indicators for the Non-print characters, there is a special format used when these characters are used as a print character in the message text. Simply use the character twice. "&&" = "&"

The ESSI style part program uses several unique characters which requires special two character codes to be used. For example, the message code "&K" in the part program will transmit the code value of 0x2B which is the ASCII code for the plus sign (+). In order to send the + character the code "&K" must be used.

The following are unique codes used in WORD ADDRESS and ESSI programs

CODE	CODE VALUE	DESCRIPTION
&’	0x20=space	At end of ESSI program
&h	0x28 = “(“	To transmit “(” from WORD ADDRESS program
&i	0x29 = “)“	To transmit “)” from WORD ADDRESS program
&?	0x7F = DEL	Non-printable DELETE code
&K	0x2B = “+”	To transmit “+” from ESSI program

Non Printing Character Table

ASCII codes less than Hexadecimal 20

Code	Hex	Code	Hex	Code	Hex	Code	Hex
&@	00	&H	08	&P	10	&X	18
&A	01	&I	09	&Q	11	&Y	19
&B	02	&J	0A	&R	12	&Z	1A
&C	03	&K	0B	&S	13	&[	1B
&D	04	&L	0C	&T	14	&\	1C
&E	05	&M	0D	&U	15	&]	1D
&F	06	&N	0E	&V	16	&^	1E
&G	07	&O	0F	&W	17	&_	1F

8 bit character codes greater than Hexadecimal 80

Code	Hex	Code	Hex	Code	Hex	Code	Hex
!@	80	!H	88	!P	90	!X	98
!A	81	!I	89	!Q	91	!Y	99
!B	82	!J	8A	!R	92	!Z	9A
!C	83	!K	8B	!S	93	![	9B
!D	84	!L	8C	!T	94	!\	9C
!E	85	!M	8D	!U	95	!]	9D
!F	86	!N	8E	!V	96	!^	9E
!G	87	!O	8F	!W	97	!_	9D
!`	A0	!h	A8	!p	B0	!x	B8
!a	A1	!I	A9	!q	B1	!y	B9
!b	A2	!j	AA	!r	B2	!z	BA
!c	A3	!k	AB	!s	B3	!;	BB
!d	A4	!l	AC	!t	B4	!<	BC
!e	A5	!m	AD	!u	B5	!=	BD
!f	A6	!n	AE	!v	B6	!>	BE
!g	A7	!o	AF	!w	B7	!?	BF
$@	C0	$H	C8	$P	D0	$X	D8
$A	C1	$I	C9	$Q	D1	$Y	DD
$B	C2	$J	CA	$R	D2	$Z	DA
$C	C3	$K	CB	$S	D3	$[	DB

$D	C4	$L	CC	$T	D4	$\	DC
$E	C5	$M	CD	$U	D5	$]	DD
$F	C6	$N	CE	$V	D6	$^	DE
$G	C7	$O	CF	$W	D7	$_	DF
$`	E0	$h	E8	$p	F0	$x	F8
$a	E1	$I	E9	$q	F1	$y	F9
$b	E2	$j	EA	$r	F2	$z	FA
$c	E3	$k	EB	$s	F3	$;	FB
$d	E4	$l	EC	$t	F4	$<	FC
$e	E5	$m	ED	$u	F5	$=	FD
$f	E6	$n	EE	$v	F6	$>	FE
$g	E7	$o	EF	$w	F7	$?	FF

Program Codes

Automated Plasma Interface

The following information outlines features relates to automated plasma supply functions and diagnostics. These systems require communication between the CNC and the relevant plasma power supply.

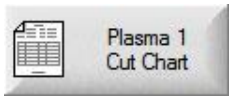
HPR and HD4070 Interface

Hypertherm Automation controls offer the additional option of interfacing directly to a Hypertherm HPR and HD4070 HyDefinition Power Supplies for setup. Note: MicroEdge and Edge II controls can be operated in Voyager mode to add this feature. This feature has the ability to improve the ease of 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.

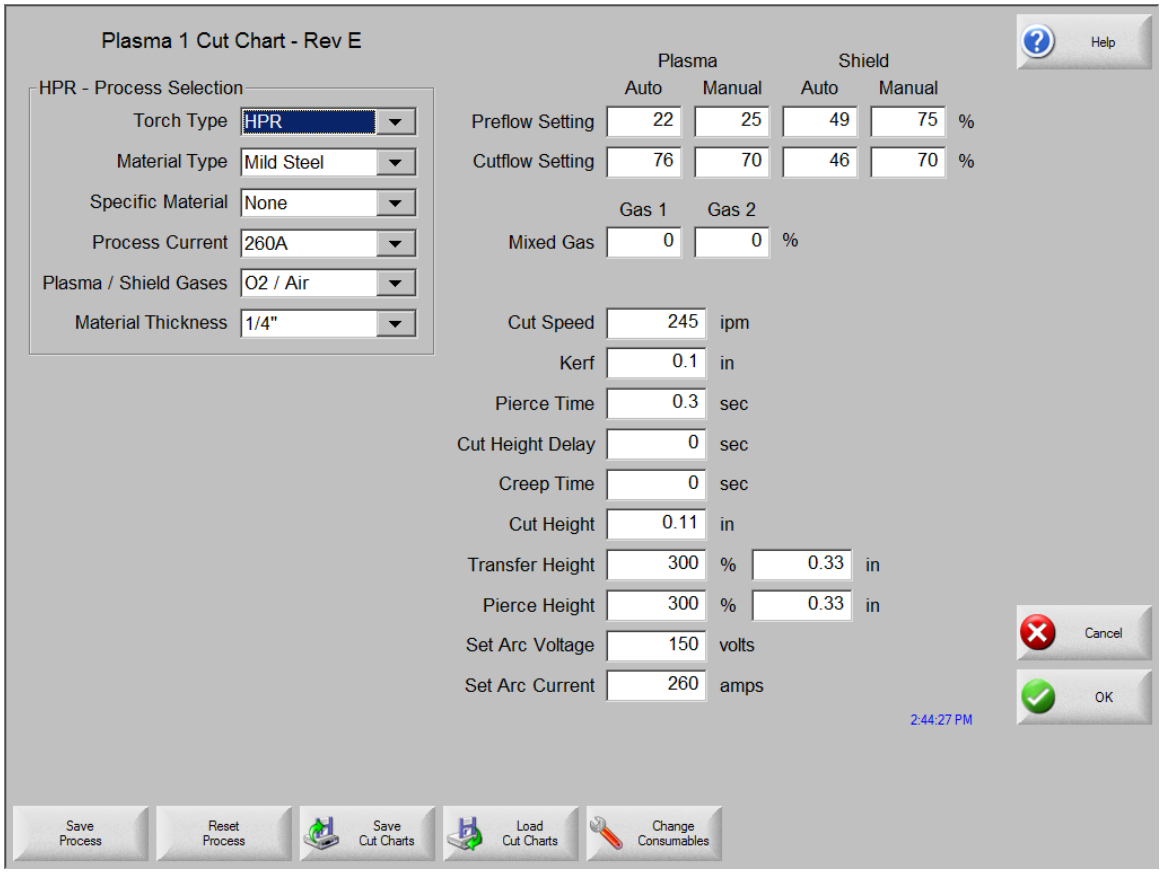
This database allows the user to select factory recommended settings or amend the database for personalized settings. The Cut Chart information may be saved or loaded via the hard drive or floppy drive. The Cut Chart files containing the factory recommended settings are available from Hypertherm.

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.



Note: Screen information will vary depending on the THC that is selected.

Cut Charts



The Cut Chart Database contains the cut process parameters that the CNC transmits to the power supply. Each cut chart is based on the following process variables:

- Torch type
- Material type
- Specific material
- Process current
- Plasma/shield Gas
- Material thickness

Depending on the power supply that you have selected, there may be other basic parameters, as well.

The default cut charts that are loaded into the system at the factory, provide values for all remaining parameters for the cut chart and these are displayed on the right of the Cut Chart screen. You can edit the values for these parameters and save them in an edited cut chart. The default cut charts are distinguished by their .fac file extension. Files that you or other users edit have a .usr file extension.

Torch Type

Select a torch for your power supply.

Material Type
Select the type of material for this cut chart; mild steel, stainless steel, or aluminum.

Specific Material
Select a custom database from the dropdown list.

You can also use this field to create or modify a custom database of characteristics of the material type. For more information, see Custom Cut Charts.

Process Current
Enter the appropriate current setting for the material thickness and material type that you selected.

Plasma / Shield Gases
Select the appropriate plasma and shield gases for the process.

Material Thickness
Select the thickness of the material.

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.

Preflow Setting
Select the appropriate plasma and shield preflow percentages for the process.

Cutflow Setting
Select the appropriate plasma and shield cutflow percentages for the process.

Cut Speed
Specifies the speed for the selected process variables.

Kerf
Specifies the amount of kerf that is applied to the current part program.

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.

Cut Height Delay
Specifies, in seconds, the delay between moving from pierce height to cut height while X and Y motion advances.

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 Height
Specifies the height of the torch from the plate during cutting.

Transfer Height
Species the height of the torch from the plate during transfers. Transfer height allows for a higher pierce height by initiating the transfer at a lower height than moving to pierce height, away from pierce dross. This value can be entered as a percentage of the cut height or as an actual transfer height distance.

Pierce Height
Specifies the height of the torch during pierces. This value can be entered as a percentage of the cut height or an actual pierce height distance.

Set Arc Voltage
Enter the arc voltage for the material that has been selected.

Set Arc Current
Enter the number of amps for the material that has been selected. This field is not supported on all plasma supplies.

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.

Save Process
Press the Save Process soft key to save the current process settings to the hard drive and create a custom user database based on the process variables selected.

Reset Process
Press the Reset Process soft key to reset the current settings to factory recommend factory defaults based on the process variables selected.

Save Cut Charts
Press the Save Cut Charts soft key to save the current user and factory databases to a diskette or USB memory stick. The default, factory files have a .fac file extension. Files that can be edited have a .usr file extension.

Examples of default and user-edited file names.

Mild Steel-HT4400-HD4070.fac

Mild Steel-HT4400-HD4070.usr

Load Cut Charts

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

Factory text file names.

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

The database should be updated through the control rather than the Power Supply if the serial communications link is enabled.

Test Preflow

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

Test Cutflow

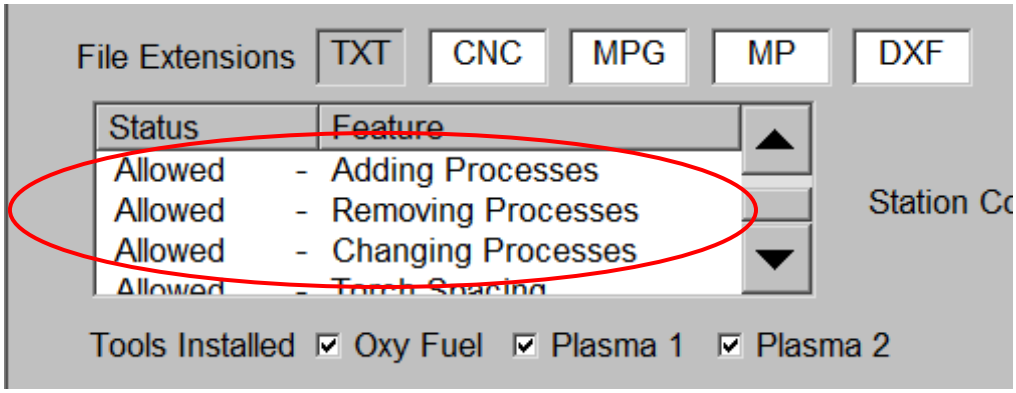
Pressing the Test Cutflow soft key performs the Test Cutflow Gases feature at the Plasma supply.

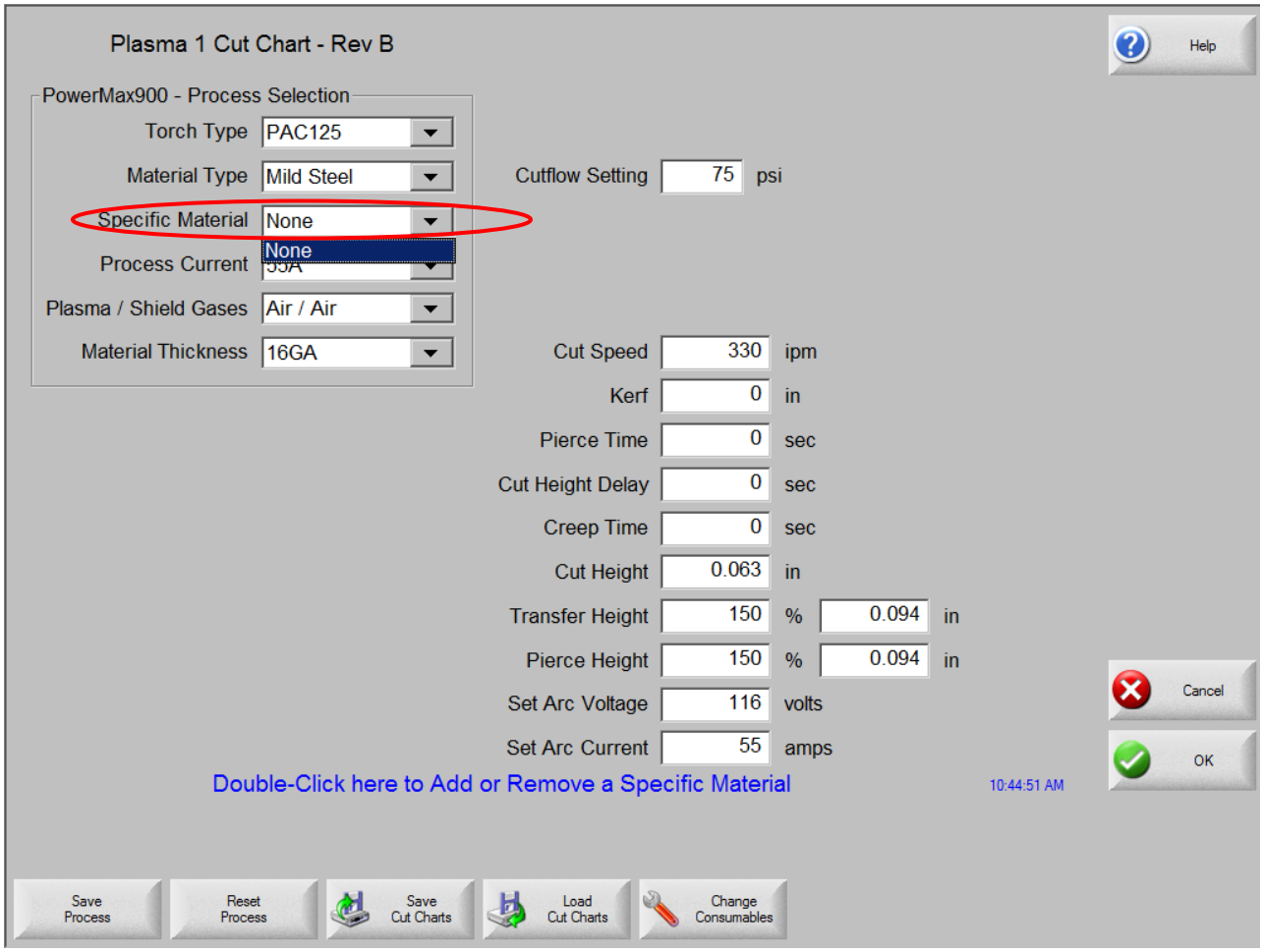
Notes:

- Refer to the power supply operator's 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 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.
- 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.

Custom Cut Charts

Custom cut charts are enabled on the Special password screen. In the Status/Feature table, select Allow for Adding Processes, Removing Processes, and Changing Processes.





To create a custom cut chart:

1. Select an existing entry in the Specific Material dropdown list to copy as the basis for your new cut chart. To simplify the process, select an entry that is similar to the cut chart you want to create.

None is the factory default value for this parameter. If it is the only option, no custom cut charts have been created.

2. Double-click on the message in blue at the bottom of the screen.
3. Press or click Add on the message popup.
4. Enter the name of the new specific material on the online keyboard and press or click OK.

The name that you enter appears in the Specific Material dropdown list. All other values are copied to this new custom chart from the original cut chart that you selected.

5. To add a value in the Process Current dropdown list, open the list and double click on the message in blue at the bottom of the screen.
    a. Press or click Add on the message popup.
    b. Enter the new value on the online keyboard and press or click OK.

    To remove a process current as an option in the custom cut chart, select it from the dropdown list, and double click on the message in blue at the bottom of the screen.

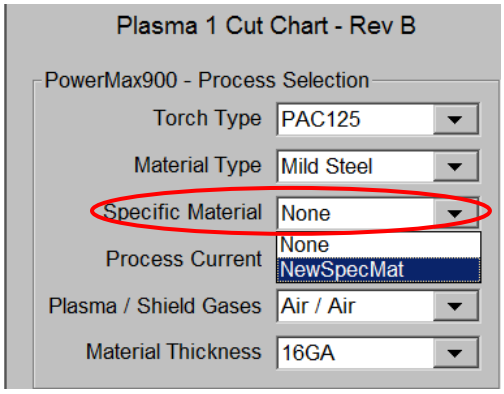
    a. Press or click Remove on the message popup.
    b. Press or click Yes to confirm the removal.
6. To add a pair of process/shield gasses, open the list and double click on the message in blue at the bottom of the screen.
    a. Press or click Add on the message popup.
    b. Select the new plasma/shield pair from the dropdown list and press or click OK.

    To remove a pair of plasma/shield gasses as an option in the custom cut chart, select it from the dropdown list, and double click on the message in blue at the bottom of the screen.

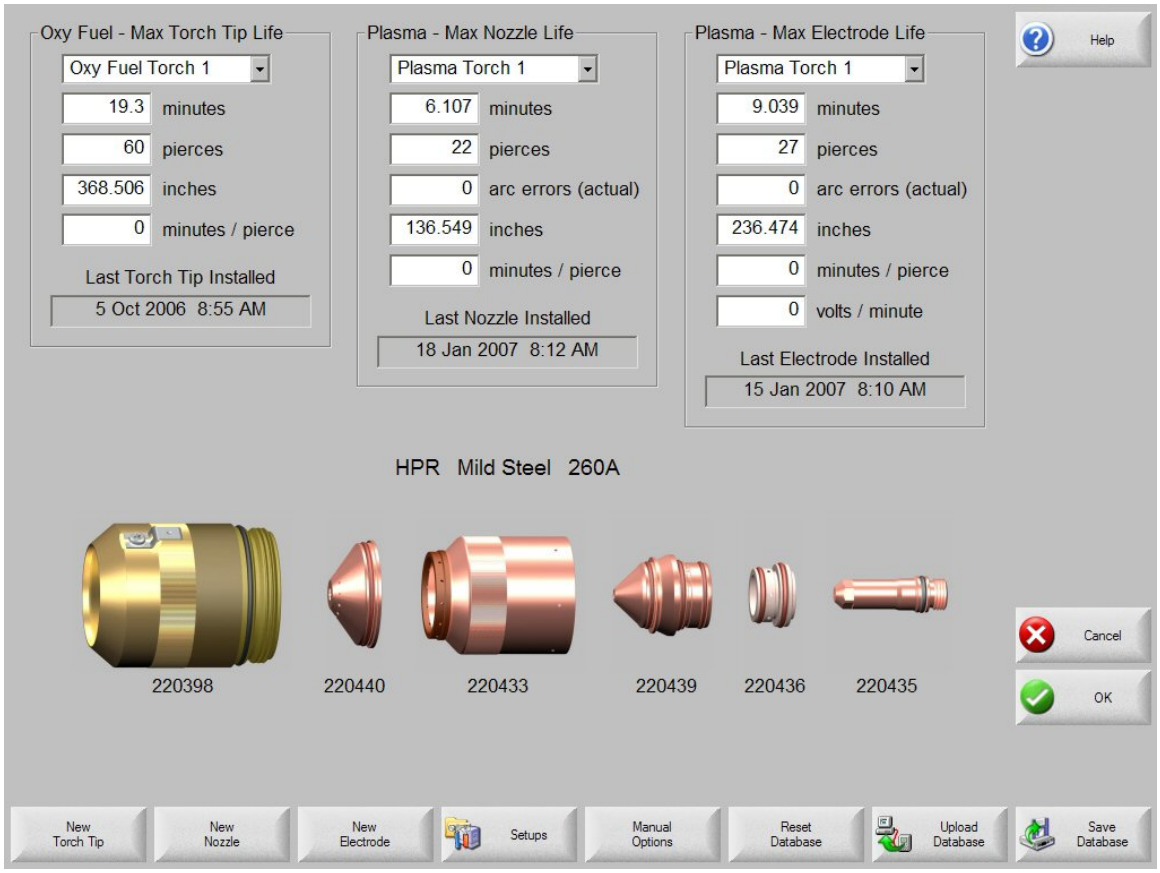
a. Press or click Remove on the message popup.
b. Press or click Yes to confirm the removal.

7. To add a material thickness, open the list and double click on the message in blue at the bottom of the screen.
   a. Press or click Add on the message popup.
   b. Select the new thickness from the dropdown list and press or click OK.

   To remove a thickness as an option in the custom cut chart, select it from the dropdown list, and double click on the message in blue at the bottom of the screen.
   a. Press or click Remove on the message popup.
   b. Press or click Yes to confirm the removal.
8. Change the remaining values on the right of the screen as necessary to accommodate the process changes you just made for the custom cut chart.
9. To save the new, custom cut chart, press or click Save Cut Chart.
   Press or click Yes on the next two confirmation message popups.
10. To use a custom cut chart, select it from the Special Material dropdown list on the Cut Chart screen or in the CutPro wizard:



Change Consumable



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

I/O and Diagnostics

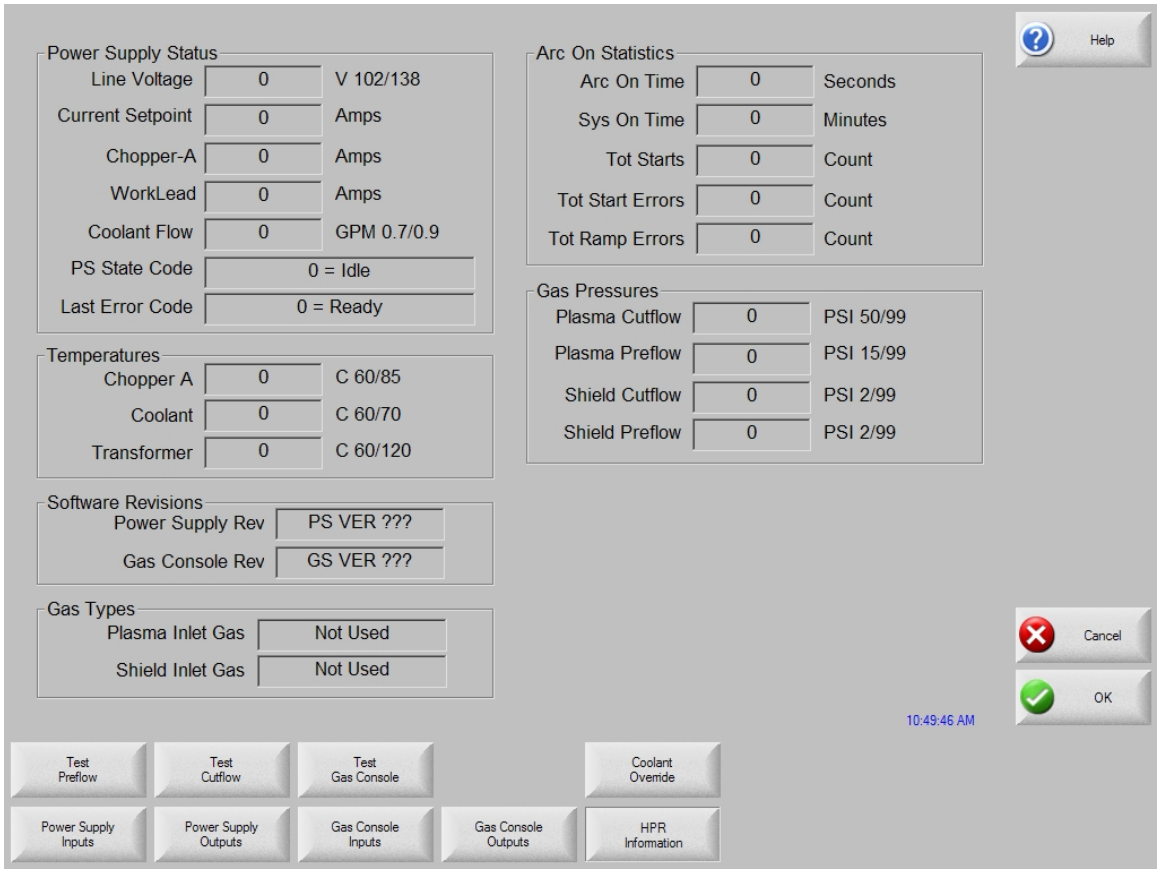
Power supply I/O and remote diagnostics screens are accessed through the standard Diagnostic screen after serial link communications has been established. Status for the supply Software Revisions, Gas Pressure, Usage, I/O and Remote tools will be available.

Information

Status items for the supply are available at the Information Screen.

HD4070 Diagnostics

HPR Diagnostics



Test Preflow

Press the Test Preflow soft key to perform the Test Preflow Gases feature at the power supply. This feature is used to set the inlet gas pressures under normal flow conditions to the recommended level.

Test Cutflow

Press the Test Cutflow soft key to perform the Test Cutflow Gases feature at the power supply. This feature is used to set the inlet gas pressures under normal flow conditions to the recommended level.

Test HPR Gas Console

This feature provides automated test features for the HPR AutoGas console. Please contact an authorized service agent for use of these tests.

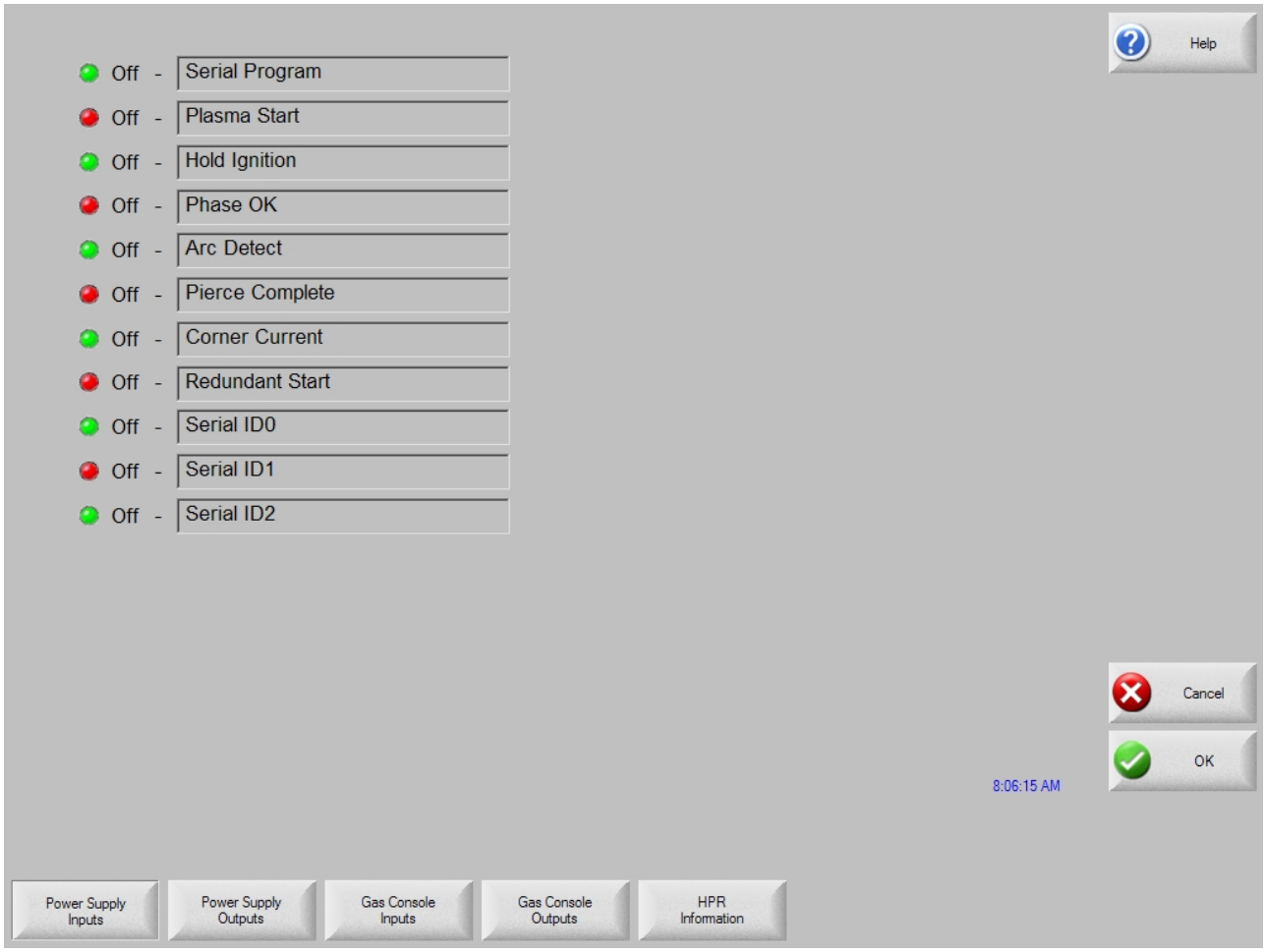
Coolant Override

Pressing the Coolant Override soft key allows to user to override a coolant error and to test the coolant pump. This is useful to bypass the error and purge the coolant line of air bubbles at initial power up.

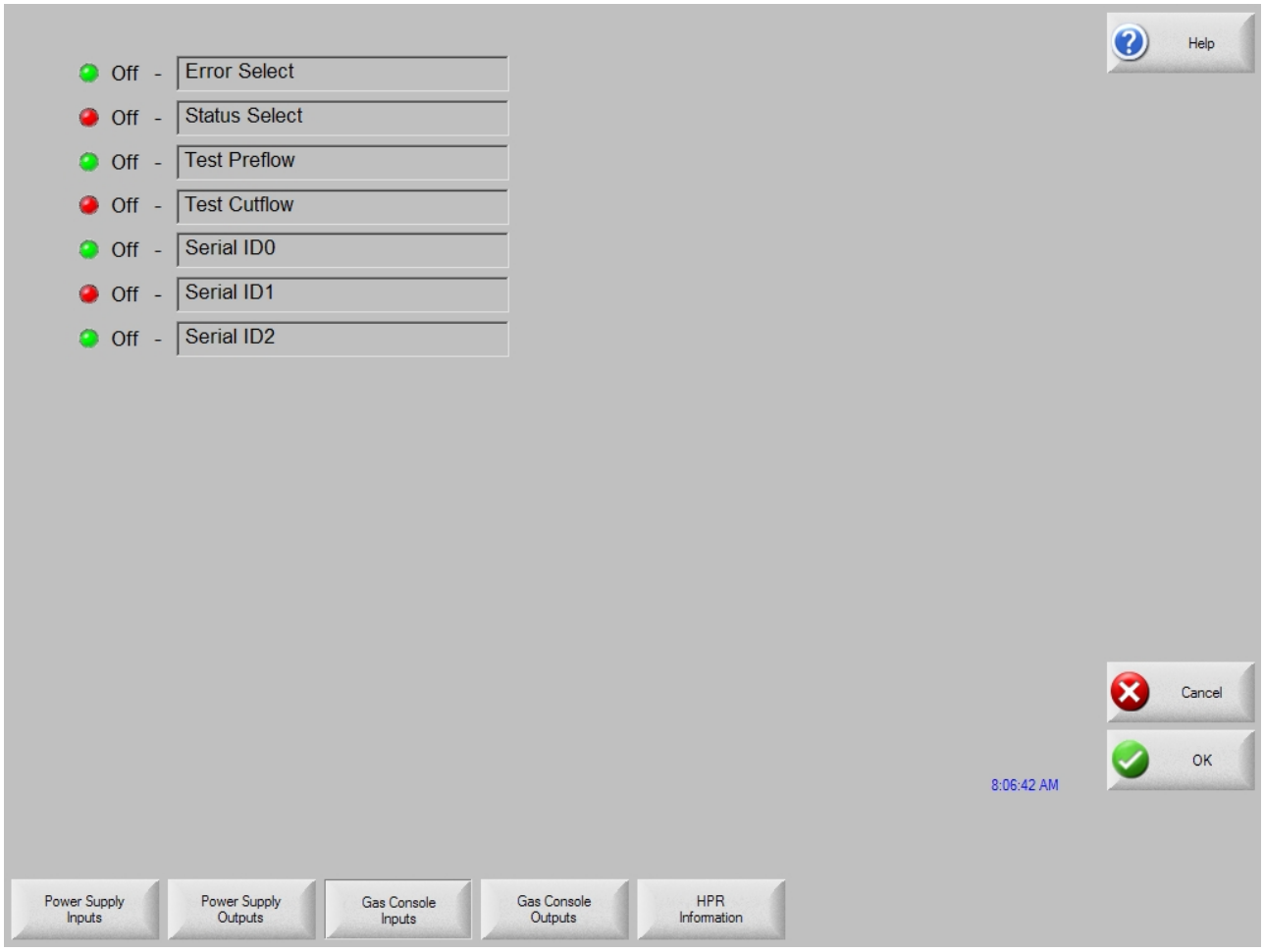
Update Software

Pressing the Update Software soft key will initiate the process of the Software Update at the power supply. Step by step instructions will be displayed on screen to guide the user through the process.

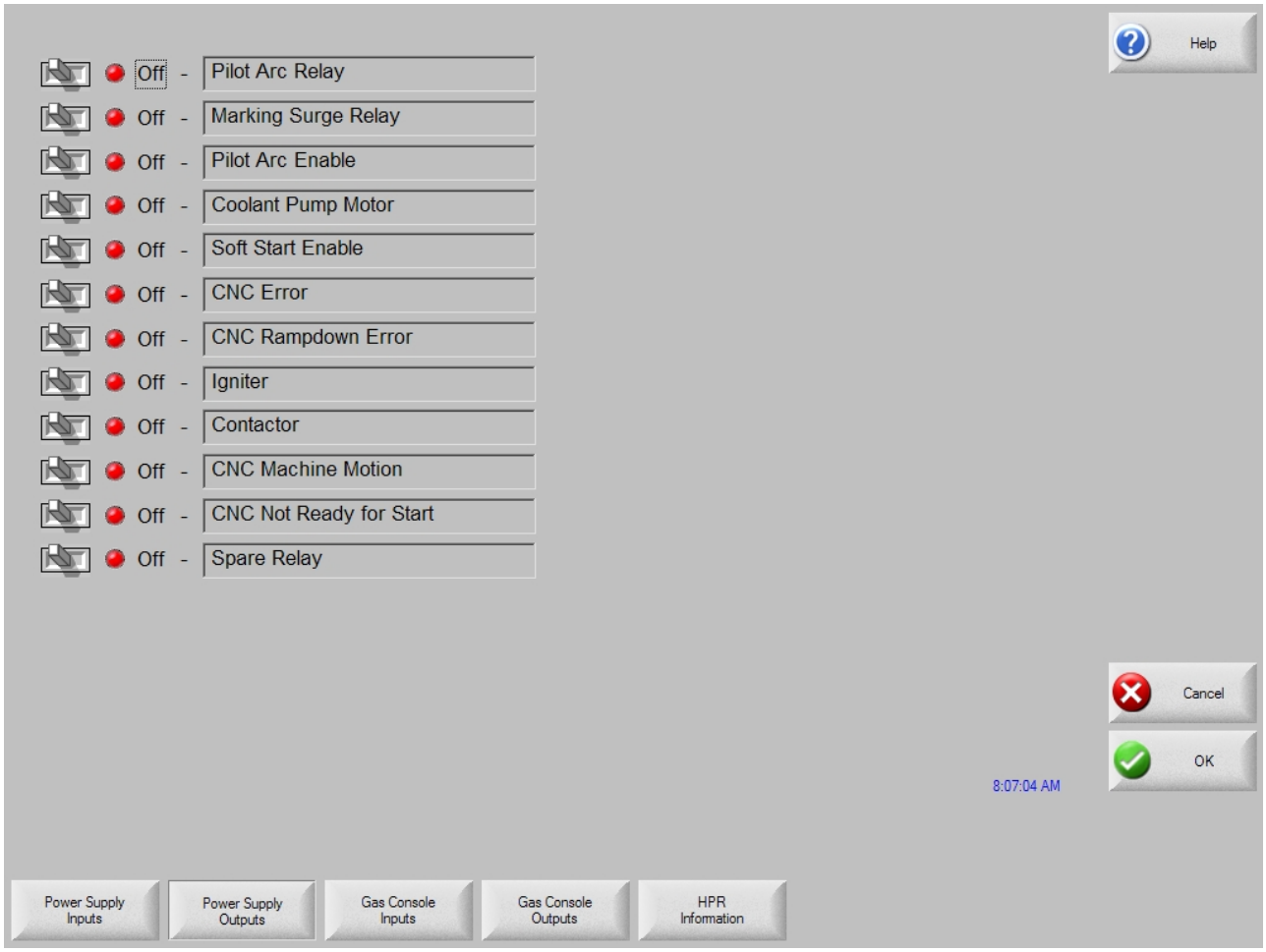
Inputs


Help
Off - Serial Program
Off - Plasma Start
Off - Hold Ignition
Off - Phase OK
Off - Arc Detect
Off - Pierce Complete
Off - Corner Current
Off - Redundant Start
Off - Serial ID0
Off - Serial ID1
Off - Serial ID2
Cancel
OK
8:06:15 AM
Power Supply Inputs
Power Supply Outputs
Gas Console Inputs
Gas Console Outputs
HPR Information

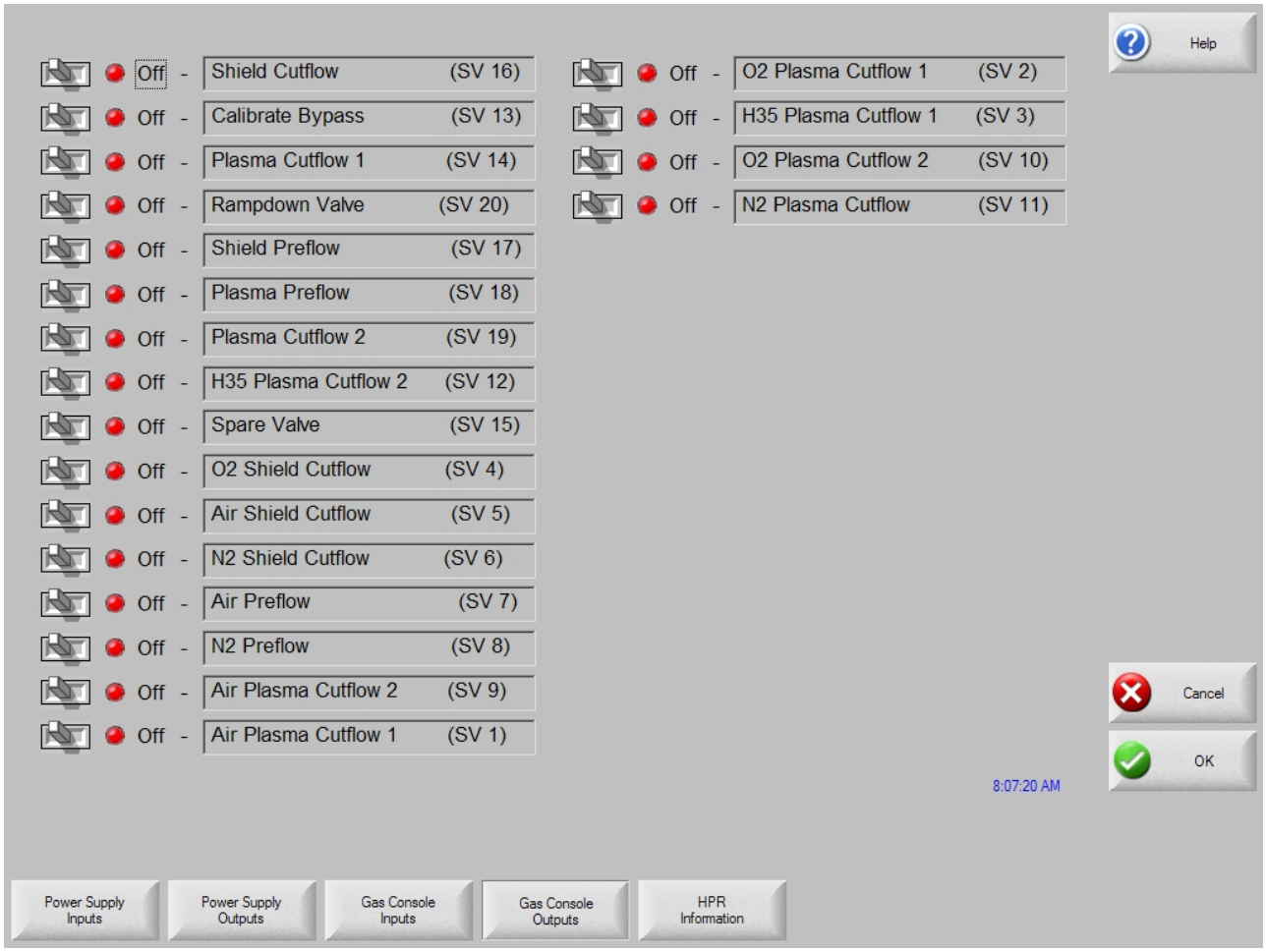
Inputs


Help
Off - Error Select
Off - Status Select
Off - Test Preflow
Off - Test Cutflow
Off - Serial ID0
Off - Serial ID1
Off - Serial ID2
Cancel
OK
8:06:42 AM
Power Supply Inputs
Power Supply Outputs
Gas Console Inputs
Gas Console Outputs
HPR Information

Outputs


Help
Off - Pilot Arc Relay
Off - Marking Surge Relay
Off - Pilot Arc Enable
Off - Coolant Pump Motor
Off - Soft Start Enable
Off - CNC Error
Off - CNC Rampdown Error
Off - Igniter
Off - Contactor
Off - CNC Machine Motion
Off - CNC Not Ready for Start
Off - Spare Relay
Cancel
OK
8:07:04 AM
Power Supply Inputs
Power Supply Outputs
Gas Console Inputs
Gas Console Outputs
HPR Information

Outputs



Note: Similar to the standard Output Diagnostic screen, the output screen shows the current status of the listed supply outputs. Note: Outputs for the supply cannot be activated through the diagnostic screen.

Serial Communication Interface

RS-422C Connections to HPR CNC Interface

Control (male)		Supply (male)	
Signal Name	**DB-9 Pin**	**Signal Name**	**DB-37 Pin**
TxD-	2	RxD-	1
RxD-	3	TxD-	2
TxD+	4	RxD+	20
RxD+	7	TxD+	21

RS-422C Connections to HD4070 CNC Interface

Control (male)		Supply (male)	
Signal Name	**DB-9 Pin**	**Signal Name**	**DB-37 Pin**
TxD-	2	RxD-	2
RxD-	3	TxD-	1
TxD+	4	RxD+	21
RxD+	7	TxD+	20

Multiple Supplies

The Serial Communication Link supported by the CNC can also be extended to multiple power supplies.

This unique feature is implemented through the use of the serial link and I/O points. It is assumed that the all systems are configured similarly and will be used simultaneously. If any of the selected power supplies has a fault, the fault must be cleared before the cut can begin.

Specific hardware and software versions for both the control and the power supply are required. Please refer to the power supply manual for additional information on operation and installation.

Inputs and Outputs

Raise 1-4 and Lower 1-4

The Raise / Lower inputs will be used to control the Integrated Command THC lifters on multi-dropped supplies for the selected process.

Note: When using this feature with the Sensor THCs rather than the Integrated Command THCs, the Sensor THC Torch Raise and Torch Lower commands for the selected process may be made through the software soft keys or through the use of these external inputs to the control.

Cut Sense 1-4

THC Cut Sense Input (arc on feedback) is used to verify that the plasma torch or marker tool has established the arc for the selected torch. This indicates to the control that motion can begin.

Ready to Fire PS 1-4

This signal is an output from each supply and is used in multiple plasma systems. It notifies the CNC that the THC has completed the IHS cycle and Preflow is complete. This indicates that the torch is ready to fire. On the supply this signal is used along with the CNC Plasma Sync Input. The CNC Hold Ignition output is connected to the supply “CNC Plasma Sync” inputs. When all configured supplies return active “Ready to Fire” signals, the “Hold Ignition” signals are removed.

Hold Ignition

The Hold Ignition Output is used to delay ignition of the external plasma supply and allow the individual supplies to complete Preflow and IHS before torch ignition. For this application, the Hold Ignition would be tied to the Plasma Sync Inputs for multi-dropped supplies.

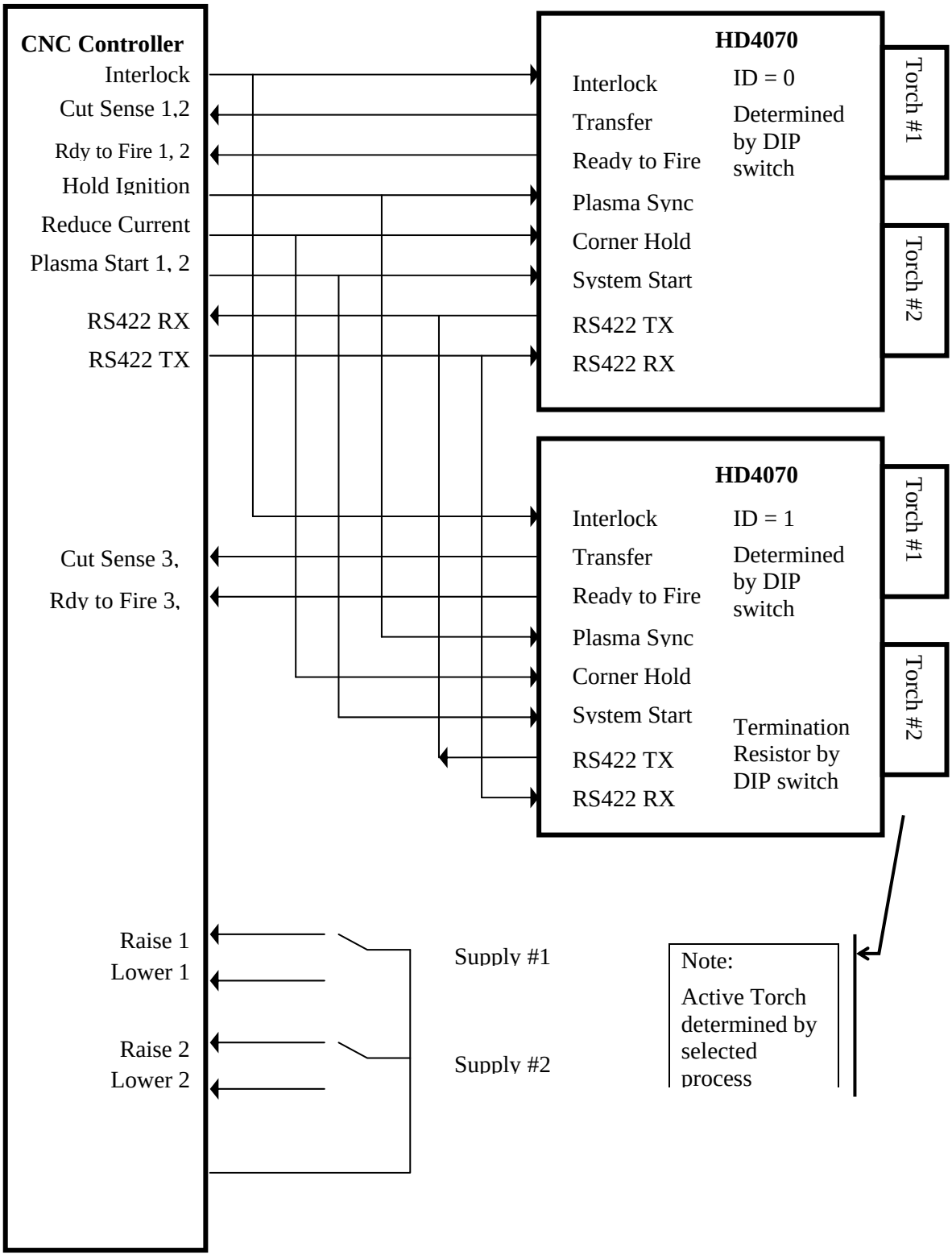
Reduce Current

Used with the supply to switch the plasma to low current mode. This signal is functionally different from the Torch Height Disable Output in that it is not active during the initial torch ignition, pierce, and accelerate to speed after Plasma Start. For this application, the Reduced Current output would be tied to the Corner Hold Inputs for multi-dropped power supplies.

The Corner Current Parameter located on the Plasma Setup Screen, is a user defined value for setting the percentage of the corner current.

Note: Proper multi-drop operation requires a Rev C or higher breakout board in the HD4070, as well as Rev K or higher control software in the HD4070.

RS-422 Multidrop Interface to Multiple power supplies



HPR and HD4070 Part Program Support

The same Cut Chart data which is used at the Cut Chart setup screen may also be used within a part program to configure the power supply for use. This code is used to select the set point for each variable.

It is not necessary to have a line of code for each Cut Chart variable within a part program. Only those variables which are changing need be inserted into the part program (e.g. Material Thickness or Material Type).

Part program codes for the power supply should be grouped together at the beginning of the program. The three variables which may be set through the part program are Material Type, Current Setting and Material Thickness.

Cut parameters for the power supply may be configured using the EIA-274D G59 code with the following format.

Example: G59 V503 F5

Misc. G Code

Variable Identity

V503 – Material Type Plasma 1
V513 – Material Type Plasma 2
V523 – Material Type Marker 1
V533 – Material Type Marker 2

V504 – Current Setting Plasma 1
V514 – Current Setting Plasma 2
V524 – Current Setting Marker 1
V534 – Current Setting Marker 2

V507 – Material Thickness Plasma 1
V517 – Material Thickness Plasma 2
V527 – Material Thickness Marker 1
V537 – Material Thickness Marker 2

Variable Value

V503, V513, V523, V533 – Material Type

Add .0*x* for Specific Material *x* (for example: V503 F1 .01 for mild steel, specific material 1)

1 = Mild Steel

2 = Stainless Steel

3 = Aluminum

V504, V514, V524, 534 – Current Setting

7 = 7A	70 = 70A
10 = 10A	80 = 80A
15 = 15A	100 = 100A
18 = 18A	130 = 130A
30 = 30A	200 = 200A
45 = 45A	

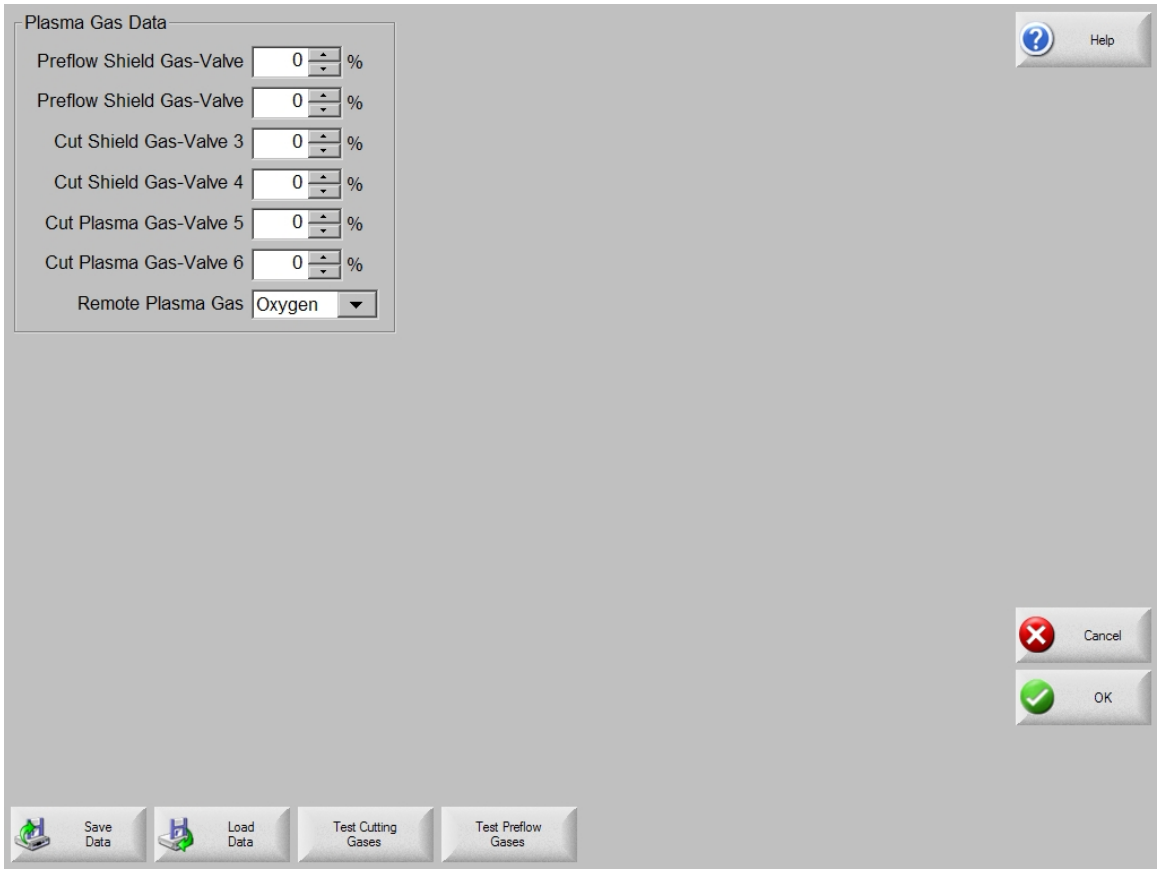
V507, 517, 527, 537 – Material Thickness

EIA Number	Gauge and Fraction	Decimal	Metric
1	None	None	None
2 or 3	28GA	0.015”	0.35mm
4 or 5	27GA	0.016”	0.4mm
6 or 7	26GA	0.018”	0.5mm
8 or 9	24GA	0.024”	0.6mm
10 or 11	22GA	0.030”	0.8mm
12 or 13	20GA	0.036”	0.9mm
14	19GA	0.040”	1mm
15 or 16	18GA	0.048”	1.2mm
17 or 18	16GA	0.060”	1.5mm
19	1/16”	0.063”	1.6mm
20 or 21	14GA	0.075”	2mm
47	13GA	0.090”	2.2mm
22	3/32”	0.094”	2.4mm
23 or 24	12GA	0.105”	2.5mm
48	11GA	0.120”	3mm
25	1/8”	0.125”	3.2mm
26 or 27	10GA	0.135”	3.5mm
49	9GA	0.150”	3.8mm
52	8GA	0.164”	4mm
50	7GA	0.180”	4.5mm
28	3/16”	0.188”	4.8mm
53	6GA	0.194”	5mm
51	5GA	0.210”	5.5mm
29	1/4”	0.25”	6mm
30	5/16”	0.313”	8mm
31	3/8”	0.375”	10mm
32	7/16”	0.438”	11mm
33	1/2”	0.5”	12mm
34	9/16”	0.563”	14mm
35	5/8”	0.625”	15mm
36	3/4”	0.75”	20mm
37	7/8”	0.875”	22mm
38	1”	1”	25mm
39	1 1/8”	1.125”	30mm
40	1 1/4”	1.25”	32mm
41	1 3/8”	1.375”	35mm
42	1 1/2”	1.5”	38mm
54	1 5/8”	1.625”	40mm
43	1 3/4”	1.75”	45mm
55	1 7/8”	1.875”	48mm
44	2”	2”	50mm
56	2 1/8”	2.125”	55mm
45	2 1/4”	2.25”	60mm
46	2 1/2”	2.5”	65mm

HD3070 Auto Gas Interface

This section outlines information specific to the Hypertherm HD3070 auto gas interface. The Auto Gas screen is available from the Cut Types screen.

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



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

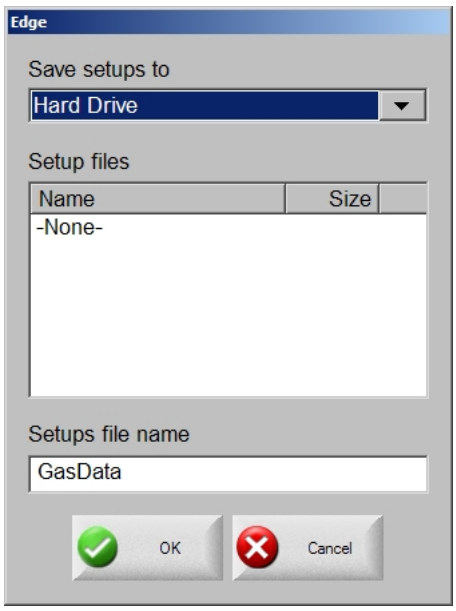
The settings at the supply are updated at control power up, whenever the settings are changed at this screen or through commands in a part program. Supply settings are also updated if power is lost and re-enabled at the power supply. There may be a brief delay as these power supply settings are communicated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

Save Data

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

Load Data

Press the Load Data soft key to allow the operator to Load stored autogases setting from diskette, USB memory or hard drive.



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

G59 V65 B0

G59 V66 B0

G59 V67 B0

G59 V68 B0

G59 V69 B0

G59 V70 B0

G59 V71 B0

Test Cutting Gases

Pressing the Test Cutting Gases soft key allows the operator to test the HD3070 Cut Gases.

Test Preflow Gases

Pressing the Test Preflow Gases soft key 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 use 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 input 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 with 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)

HD3070 Part Program Support

The same valve setting data which is used at the Auto Gas setup screen may also be used within a part program to configure the HD3070 for use. This code is used to select the valve and indicate the valve set point.

Using a EIA-274D G59 code with the following format.

Example: G59 V65 B5

Misc. G Code

Valve Identity

V65 = Preflow Shield Gas - Valve 1
V66 = Preflow Shield Gas - Valve 2
V67 = Cut Shield Gas - Valve 3
V68 = Cut Shield Gas - Valve 4
V69 = Cut Plasma Gas - Valve 5
V70 = Cut Plasma Gas - Valve 6
V71 = Remote Plasma Gas Type

Valve Value

For Valves V65 – V70

A whole integer is used to set the desired percentage value.

For Valve 71

0 = Oxygen

1 = H35/N2

2 = Air

For the example given, the part program code (G59 V65 B5) would set the Autogas Preflow Shield Gas valve to 5%. Multiple G59 codes can be used to set and adjust the all desired valves.

FineLine Overview

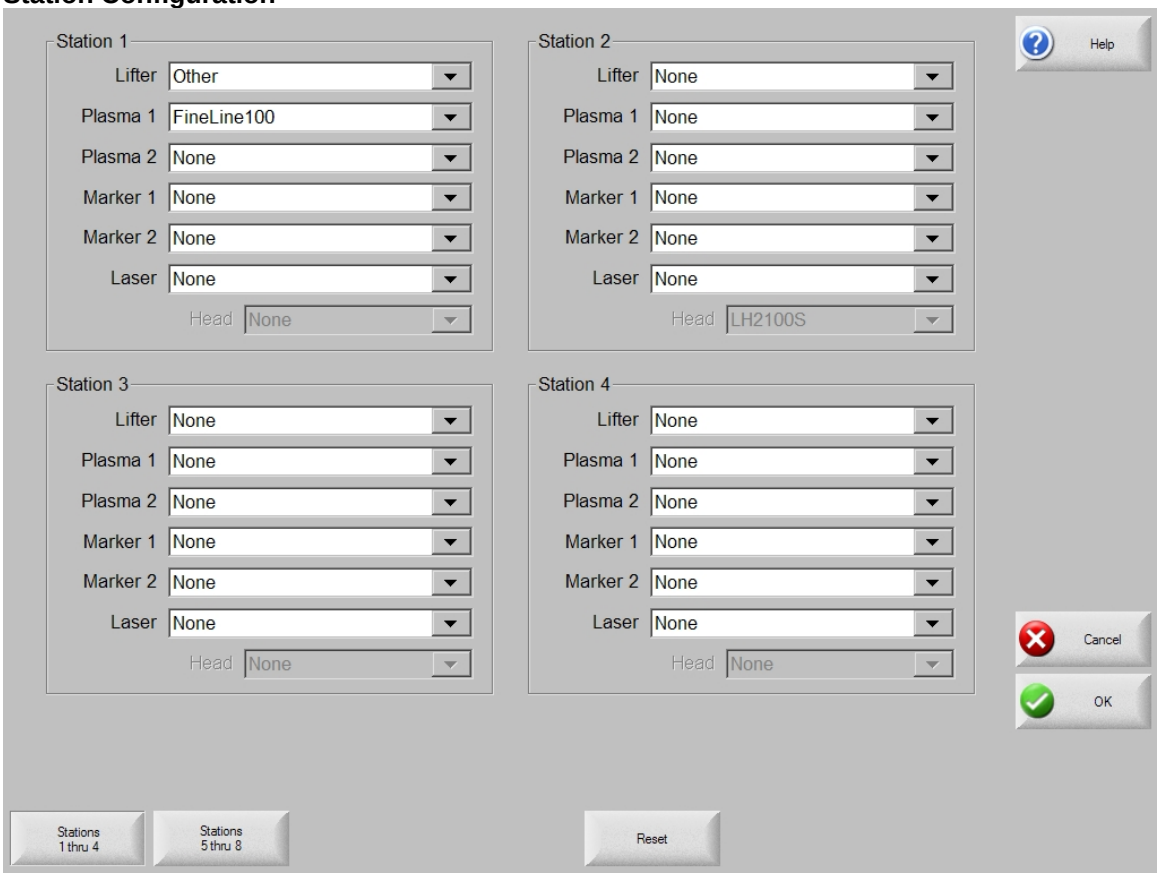
Hypertherm Automation controls offer the additional option of interfacing directly to INNERLOGIC's FineLine Power Supply for setup via a user selected RS-422 serial port. This advanced feature transmits all necessary power supply settings from the control directly to the FineLine power supply configuring 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.

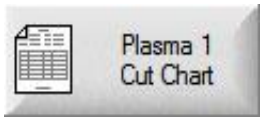
This database allows the user to select factory recommended settings or amend the database for personalized settings. The Cut Chart information may be saved or loaded via the hard drive or floppy drive. Specialized Cut Chart files containing the factory recommended settings are available from the control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

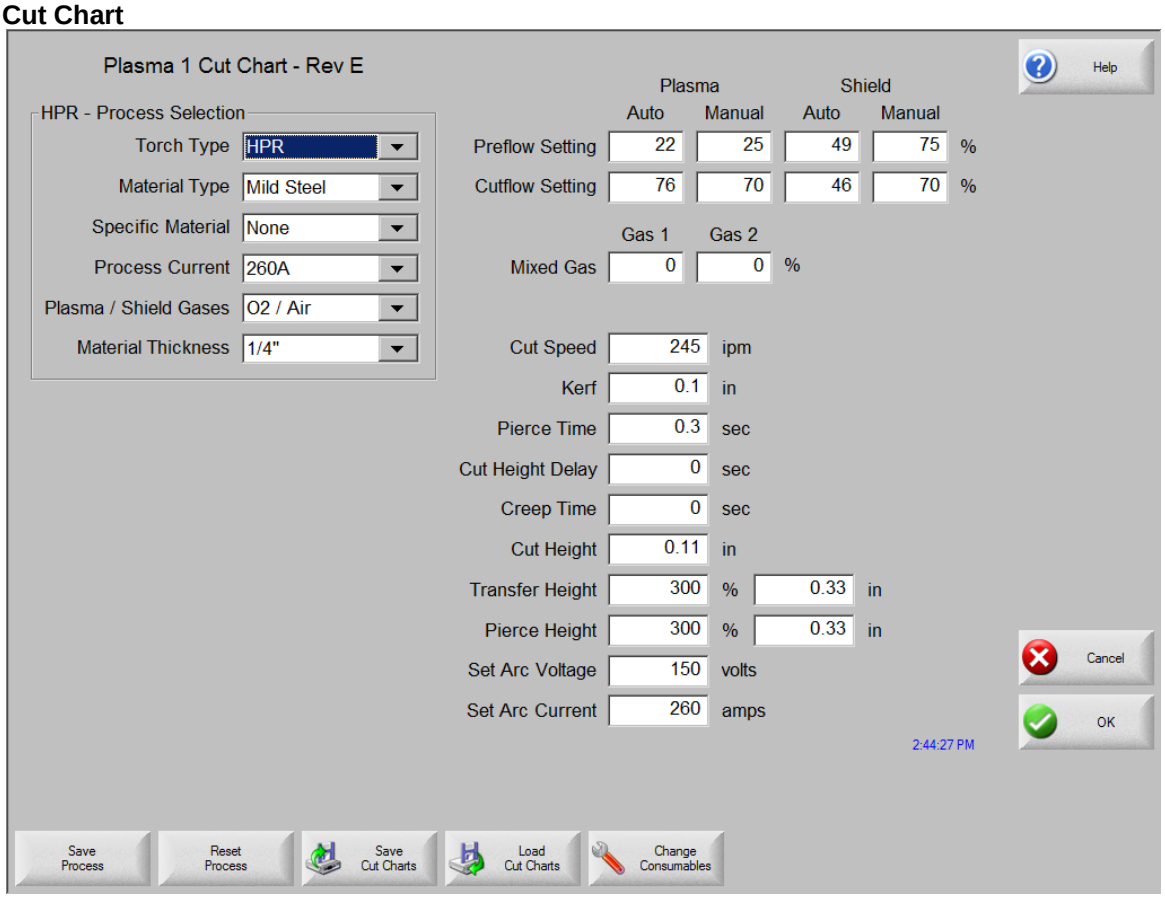


Access to the FineLine Cut Chart data is available from the Plasma Cut Types or Marker Cut Types screen using the shift key, as indicated below.



Note: Screen information will vary depending on THC selection.

Cut Chart



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.

Specific Material

A custom database from the dropdown list may be selected. The factory default is None.

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.

- Material Type – Mild Steel, Stainless Steel, Aluminum, or Mild Steel (Cold Rolled).
- Thickness
- Set Current
- Pierce Delay
- Set Preflow Pressure
- Set Plasma Gas type
- Set Plasma Pressure
- Set Shield Gas Type
- Set Shield Pressure
- Set Process (Cut/Mark)

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

Cut Speed
Specifies the speed for the selected process variables.

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

Preflow Time
Specifies the amount of time the Preflow gases are on.

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

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

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

Database Features

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

Reset Process

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

Save Cut Charts

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

Examples of user and factory file names.

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

Load Cut Charts

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

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

Test Preflow

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

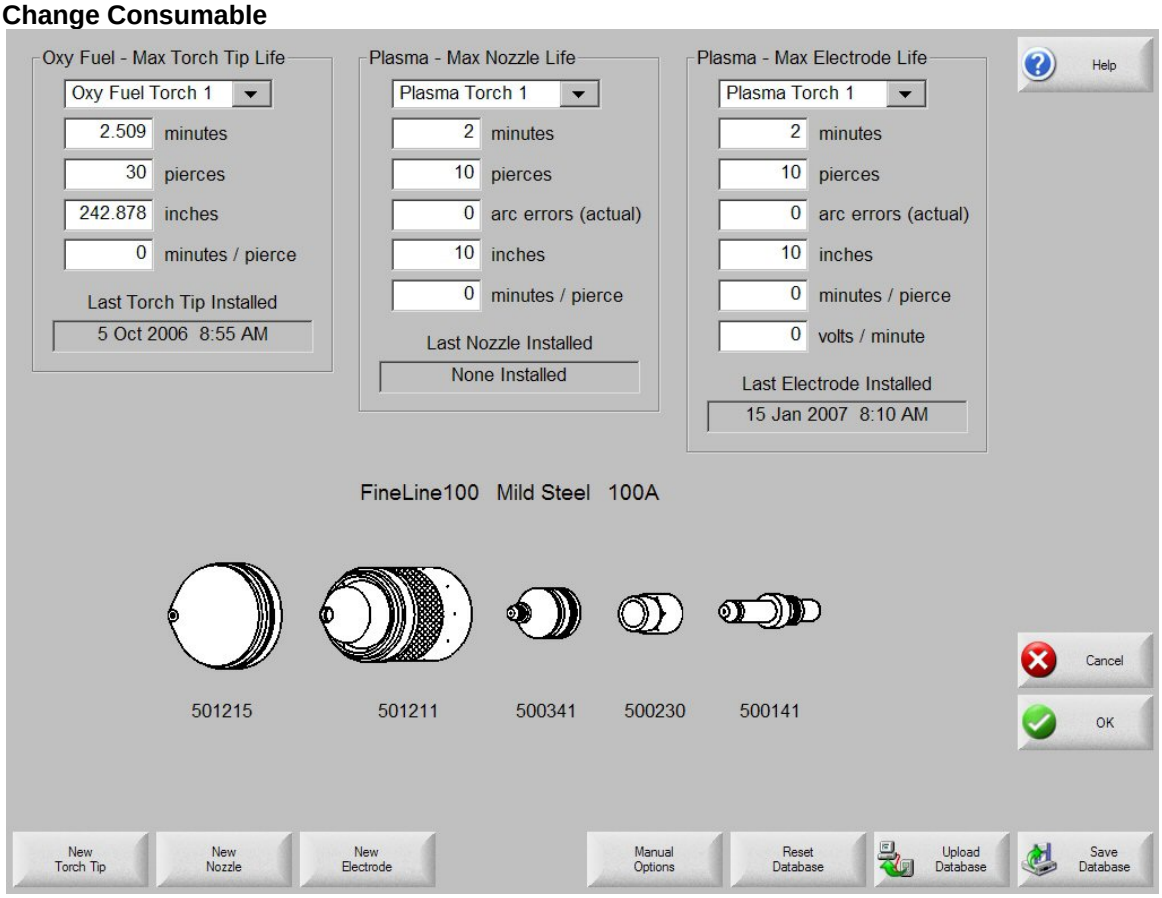
Test Cutflow

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

Notes:

- Refer to the power supply operator's 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.

FineLine Part Program Support

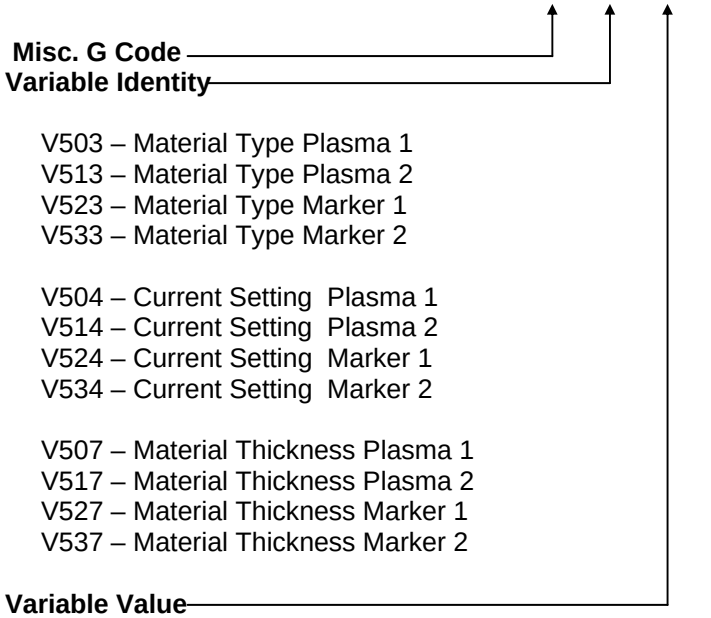
The same Cut Chart data which is used at the Cut Chart setup screen may also be used within a part program to configure the FineLine for use. This code is used to select the set point for each variable.

It is not necessary to have a line of code for each Cut Chart variable within a part program. Only those variables which are changing need be inserted into the part program (e.g. Material Thickness or Material Type).

Part program codes for the FineLine should be grouped together at the beginning of the program. The three variables which may be set through the part program are Material Type, Current Setting and Material Thickness.

Cut parameters for the FineLine may be configured using an EIA-274D G59 code with the following format.

Example: G59 V503 F5



V503 – Material Type Plasma 1
V513 – Material Type Plasma 2
V523 – Material Type Marker 1
V533 – Material Type Marker 2

V504 – Current Setting Plasma 1
V514 – Current Setting Plasma 2
V524 – Current Setting Marker 1
V534 – Current Setting Marker 2

V507 – Material Thickness Plasma 1
V517 – Material Thickness Plasma 2
V527 – Material Thickness Marker 1
V537 – Material Thickness Marker 2

V503, V513, V523, V533 – Material Type

Add .0*x* for Specific Material *x* (for example: V503 F1 .01 for mild steel, specific material 1)

1 = Mild Steel

2 = Stainless Steel

3 = Aluminum

V504, V514, V524, 534 – Current Setting

8 = 8A	50 = 50A
9 = 9A	70 = 70A
10 = 10A	100 = 100A
30 = 30A	200 = 200A

V507, 517, 527, 537 – Material Thickness

EIA Number	Gauge and Fraction	Decimal	Metric
1	None	None	None
2 or 3	28GA	0.015”	0.35mm
4 or 5	27GA	0.016”	0.4mm
6 or 7	26GA	0.018”	0.5mm
8 or 9	24GA	0.024”	0.6mm
10 or 11	22GA	0.030”	0.8mm
12 or 13	20GA	0.036”	0.9mm
14	19GA	0.040”	1mm
15 or 16	18GA	0.048”	1.2mm
17 or 18	16GA	0.060”	1.5mm
19	1/16”	0.063”	1.6mm
20 or 21	14GA	0.075”	2mm
47	13GA	0.090”	2.2mm
22	3/32”	0.094”	2.4mm
23 or 24	12GA	0.105”	2.5mm
48	11GA	0.120”	3mm
25	1/8”	0.125”	3.2mm
26 or 27	10GA	0.135”	3.5mm
49	9GA	0.150”	3.8mm
52	8GA	0.164”	4mm
50	7GA	0.180”	4.5mm
28	3/16”	0.188”	4.8mm
53	6GA	0.194”	5mm
51	5GA	0.210”	5.5mm
29	1/4”	0.25”	6mm
30	5/16”	0.313”	8mm
31	3/8”	0.375”	10mm
32	7/16”	0.438”	11mm
33	1/2”	0.5”	12mm
34	9/16”	0.563”	14mm
35	5/8”	0.625”	15mm
36	3/4”	0.75”	20mm
37	7/8”	0.875”	22mm
38	1”	1”	25mm
39	1 1/8”	1.125”	30mm
40	1 1/4”	1.25”	32mm
41	1 3/8”	1.375”	35mm
42	1 1/2”	1.5”	38mm
54	1 5/8”	1.625”	40mm
43	1 3/4”	1.75”	45mm
55	1 7/8”	1.875”	48mm
44	2”	2”	50mm
56	2 1/8”	2.125”	55mm
45	2 1/4”	2.25”	60mm
46	2 1/2”	2.5”	65mm

Serial Ports

Both of the serial ports that are provided are shipped in the RS-232C wiring configuration. To change either port to an RS-422 configuration, you must change a jumper setting on the Serial Isolation Board that is inside the CNC on the back panel. Find the appropriate jumper for the desired port at the bottom of the board and move the jumper from the RS-232C position to the RS-422 position. These positions are clearly marked on the board.

 **Warning!** Configure the port for RS-422 operation before connecting RS-422 compatible devises.

The serial ports in the CNC are specifically designed to operate with a standard nine-pin serial port connector. Specifications for these ports are as follows:

Channel Type	Optically Isolated RS-232C or RS-422.
Information Code	ASCII
Baud Rate	User-selectable up to 115.2K baud.
Number of Start Bits	1
Number or Stop Bits	1
Word Length	User selectable 7 or 8 bits.
Parity	User-selectable None, Even or Odd.
Data Synchronization	XON (Control-Q) / XOFF (Control-S).
Time Out	User-selectable in one-second increments.
Transmit Delay	User-selectable in one one/hundredths of a second increments.
Rear Panel Connector	IBM-PC/AT compatible 9-pin D-type female.

Control RS-232C DB-9 Pinout

Pin	Signal Name	Description
1	Shield	Chassis ground
2	TxD	Transmit data to external device
3	RxD	Receive data from external device
4		No connection
5	Common	Ground
6		No connection
7		No connection
8		No connection
9		No Connection

RS-232C Connections to Host PC with 9-pin D-type connector

Host PC		Control	
Signal Name	**DB-9 Pin**	**Signal Name**	**DB-9 Pin**
Shield	1	Shield	1
RxD	2	TxD	2
TxD	3	RxD	3
Common	5	Common	5

RS-232C Connections to Host PC with 25-pin D-type connector

Host PC		Control	
Signal Name	**DB-25 Pin**	**Signal Name**	**DB-9 Pin**
Shield	1	Shield	N/C
RxD	3	TxD	2
TxD	2	RxD	3
Common	7	Common	5

Automatic DXF Import

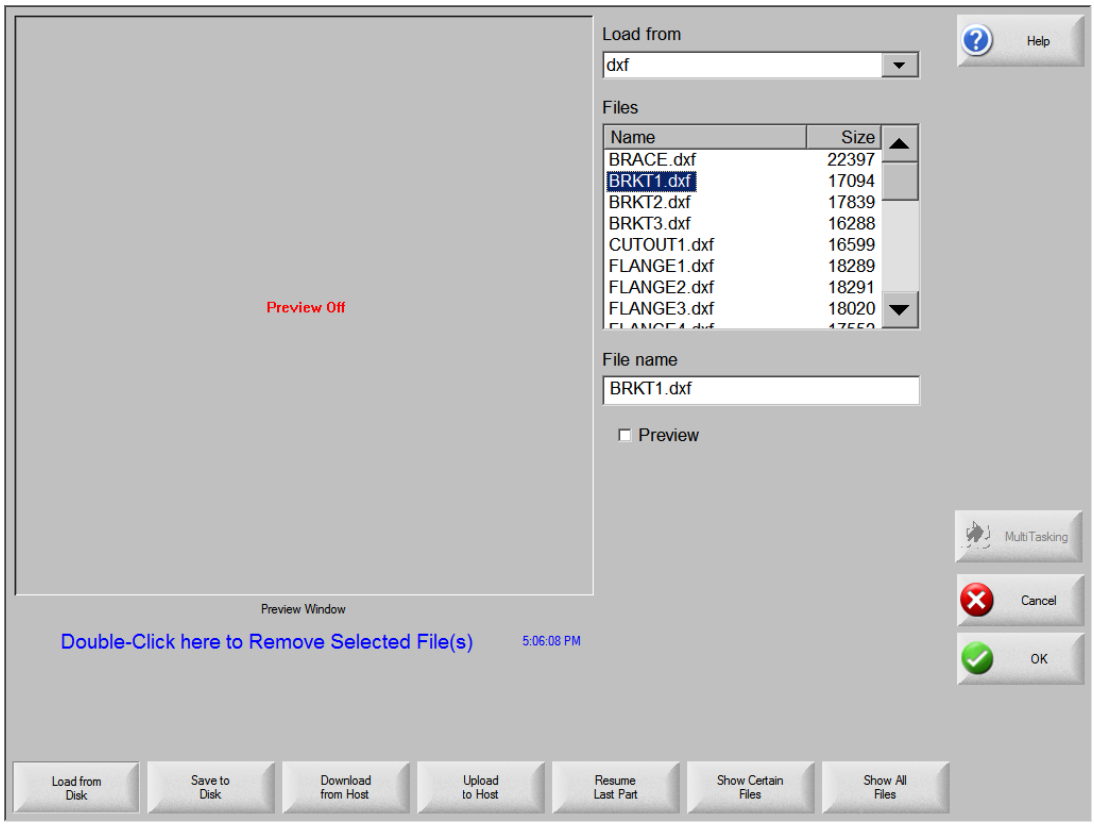
Overview

Hypertherm Automation controls offer two styles of automated DXF import. The first DXF feature allows the CAD designer to prepare a DXF file that includes the location of pierces, pierce order and direction. When this file is loaded into the control, an EIA format part program will be created for use at the control.

The second type of DXF file is a fully automatic DXF import feature that allows the control operator to select lead style and length. The CNC Auto DXF software automatically places the lead-in and lead-out based on the operator selections and creates an EIA format part program ready for use and the CNC.

Load DXF Files

To load a DXF file, access the Files Load screen and select the source location and file.



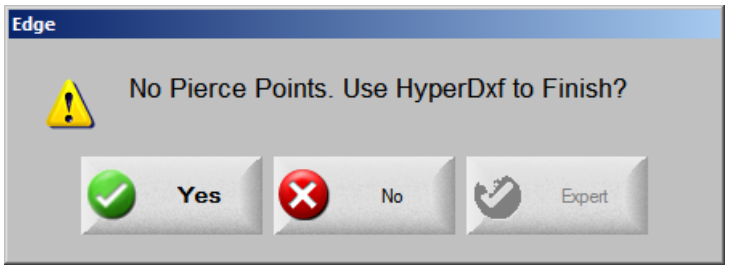
If the file includes the lead-in and direction, the control detects this and translates the file for use. For more information, see Prepared DXF Files.

If the file contains no pierce or lead-in /lead-out information, the HyperDxf utility prompts the user for this information. For more information, see Raw DXF Files.

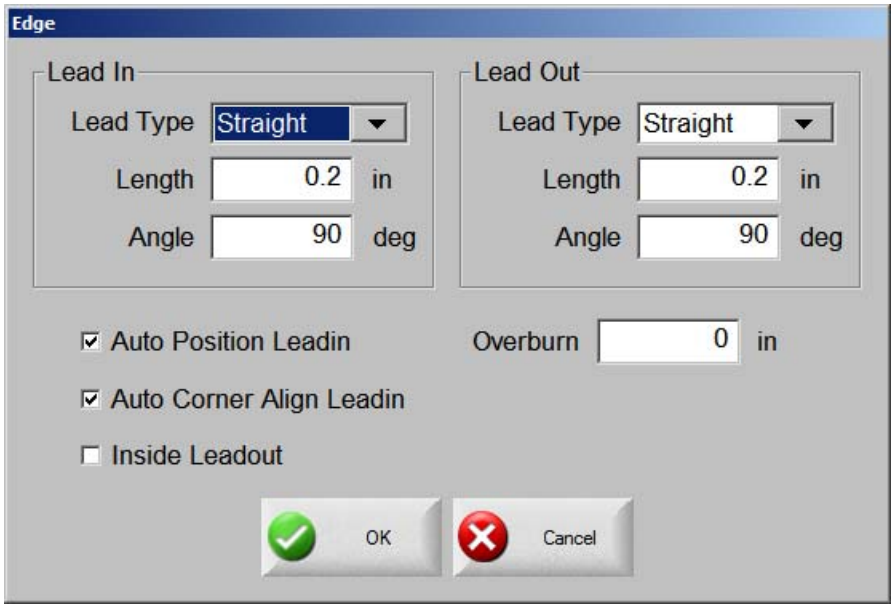
Note: To load DXF files the DXF extension must first be added to the Special Setups screen.

Raw DXF Files

If the control does not detect pierce information in the DXF file, the operator has the option to use the Hyper DXF translation utility to import the file and add - and lead-out information.



If the user selects YES, a configuration screen displays fields to define the lead-in/ lead-out format.



Lead Type

Select a Straight or Radius lead-in or lead-out.

Length / Radius

Select the lead-in or lead-out length or radius.

Angle

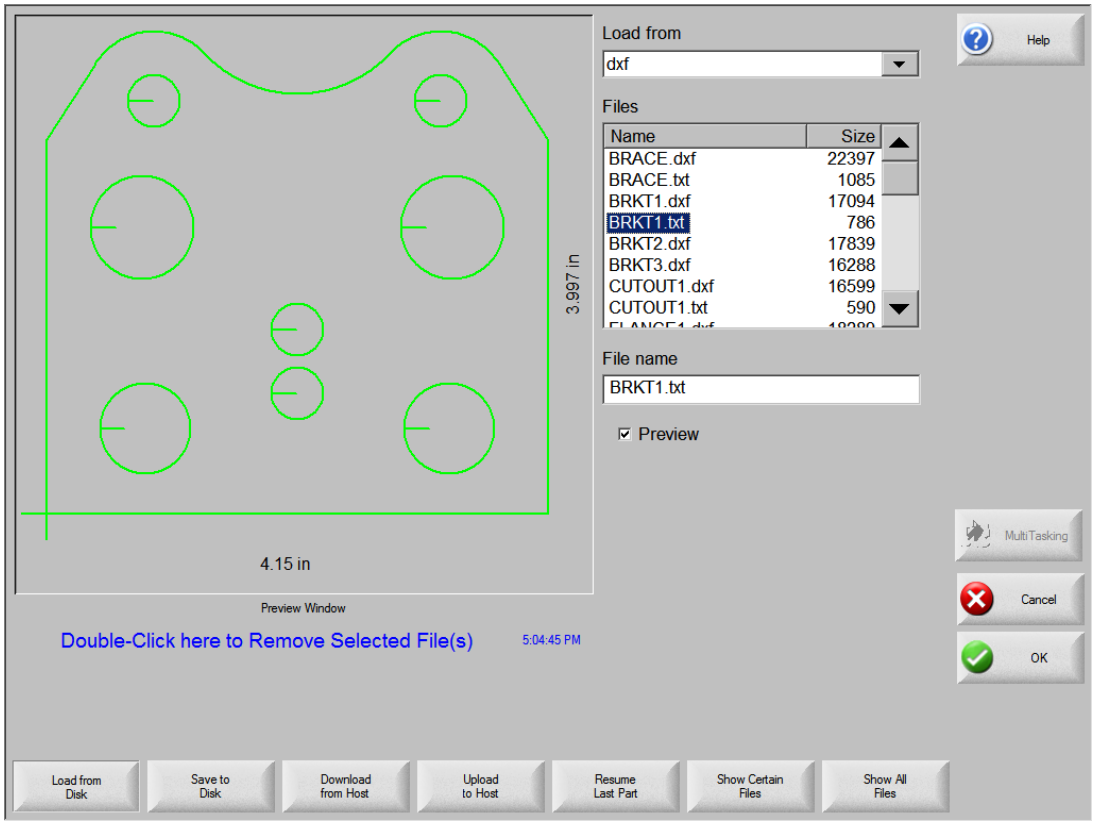
Select angle in degrees for lead-in or lead-out.

Auto Position Lead-in
If this box is checked, the software attempts to find a suitable corner for the lead-in.

Auto Corner Align Lead-in
If this box is checked, the software attempts to find a suitable corner for the lead-in.

Inside Lead-out
If this box is checked, a lead-out is used on both internal and external cuts. If the box is not checked, lead-outs are added to external cuts only.

Overburn
Overburn provides an overlapping cut in the lead-in/ lead-out area of a hole.
After import, an EIA part program with a .txt extension is created and placed in the source folder. Note the BRKT1.dxf and BRKT1.txt in the following example.



Prepared DXF Files

The DXF Translator software allows the control to load and translate a DXF style drawing created in Autocad ® or Autocad LT® into an EIA part program. Certain guidelines must be observed when creating the CAD drawing to allow the control to load and understand the file. The optional DXF translation utility is enabled through a password provided by your control supplier.

Drawing Format

There should be nothing on the cut layer except lines, arcs, circles and text commands. Do not put dimensions or notes on the same layer as cut data.

Elliptical segments, squares and polylines are not supported. Divide these elements 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 cannot be within the same quadrant.

Text commands determine cut sequence, and determine the path through multi-segment intersections. Text commands are placed on the drawing with the text feature of your CAD program. The size of the text is not important. However, the location of the text is extremely important. Text must be left justified and text commands must be "snapped to the appropriate intersection or pierce points.

Text commands indicate pierce points and cut direction. Note that the directional commands should only be used to determine the direction of the next line segment when more than one exit path exists at an intersection of segments.

Text Commands

1 Indicates the first pierce point (subsequent pierce points follow in numerical order)
\+ Indicates a Counter-Clockwise circle
\- Indicates a Clockwise circle

Directional Commands

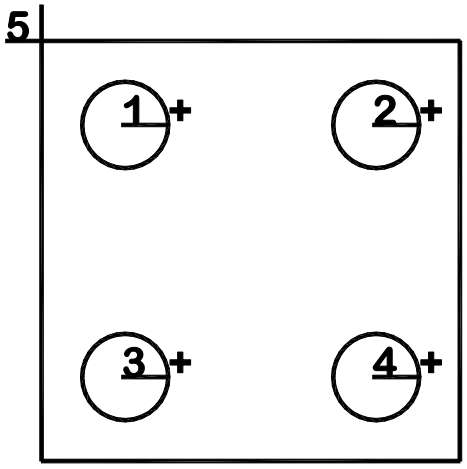
The following commands indicate the next segment's direction, if it is a line, or the ending angle, if it is an arc, if the angle is:

R 350° to 10°
RU 0° to 45°
UR 45° to 90°
U 80° to 100°
UL 90° to 135°
LU 135° to 180°
L 170° to 190°
LD 180° to 225°

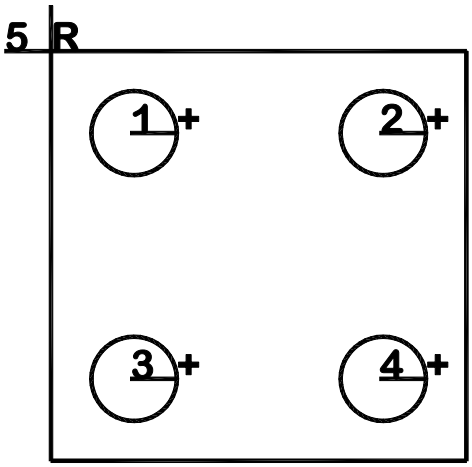
DL 225° to 270°
D 260° to 280°
DR 270° to 315°
RD 315° to 360°

Traverses are automatically determined between pierce points and do not need to be entered on the CAD drawing.

The following example 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.



If the lead-in and lead-out are created as additional line segments added to the top and side line segments, additional text is required to indicate which direction the next line segment should take as part of the part program, as shown in the following diagram:



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) segment has been cut, no additional text is required to indicate which line should be cut. The Lead-out segment is the only segment left to cut because the lead-in and the first segment have already been cut.

Notes:

- 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.
- No traverse lines are required. All lines in the CAD drawing are assumed to be cut lines.
- Left kerf is assumed.

Networking

This chapter describes how to connect a CNC to a local area network and some of the issues that can arise due to that connection. There are many different network configurations, so you may need to consult a network technician.

Network Operating System

 **Note:** The Network functions involve operational knowledge of Windows® XP operating system and should only be performed by qualified personnel.

The Hypertherm Automation CNCs are designed to work with Microsoft domain- or workgroup-based networks. These instructions assume a domain-based network. If you are connecting to a workgroup, refer to Attaching to a Workgroup at the end of this chapter.

In each case, the CNC uses the local administrator account on the CNC. Local logon is required because the system must have administrative rights on the CNC. You can map network connections to a share on the host network using the user name provided by the network administrator. If the network mapping is set to be re-established on power-up when it is created, it will automatically be set up when the CNC is turned on.

Do not create user accounts on the CNC or try to have the CNC log in directly to your network domain. The new user accounts create performance issues on the CNC. Use the local administrator account and map your network drive as described in this chapter.

Configuring the Network Interface Card

To include the CNC on the network, you must attach a keyboard and mouse to the CNC so you can configure the network interface card (NIC).

Notes:

- If a NIC is set up to use a DHCP server, but is not connected to a DHCP server, it can cause startup delays and other problems.
- Only one NIC should be active on the CNC and be connected to the shared LAN.

Before you begin, you need to know:

- Whether you will be using a DHCP server on the network.

  Note: The use of a DHCP server is recommended because it ensures that the TCP/IP settings are correct.

  If you are not using a DHCP Server, what are the TCP/IP network settings?

- IP address: _____
- Subnet mask: _____
- Default gateway: _____
- Preferred DNS server _____
- Alternate DNS server _____

For more information about configuring TCP/IP settings, see Hardware Considerations.

- Will the controller be part of a Windows domain or workgroup?
- What is the name of the domain or workgroup?
- Has the operator's user name and password been added to the server?

Connecting the CNC to a Network

To attach the CNC to the network:

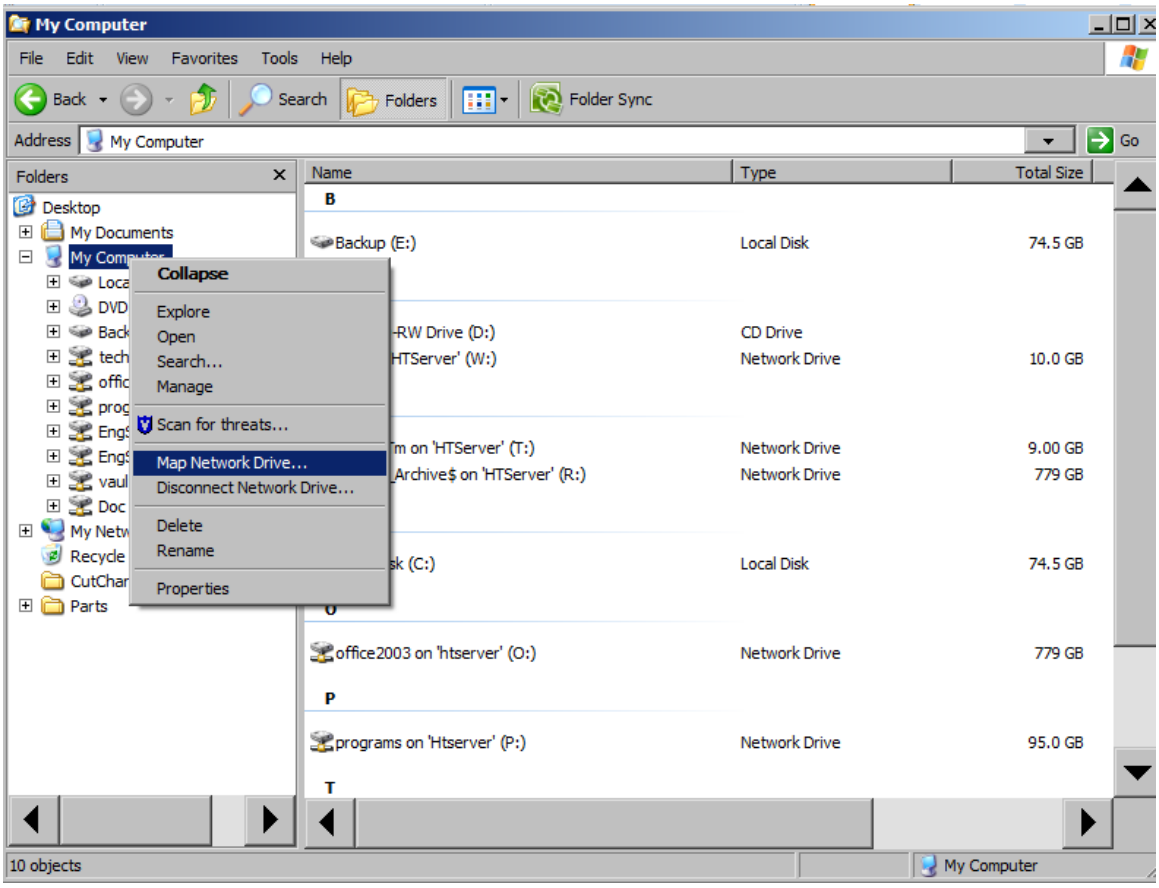
1. Create a user account on your network file server (Windows Server). You will need to set up:
   a. The user name, for example: *operator*.
   b. The password for the new user name, for example: *1234*
2. Attach the keyboard and mouse to the controller, and plug the fiber optic card into the fiber-to-copper converter box, if the fiber connection is to be used.
3. Connect the LAN cable to the network connector on the converter box or to the CNC, as appropriate.
4. Turn on the power to the CNC.
   The CNC will power up and be connected to the network. You will be logged into the CNC as the administrator. This is not the same as being an administrator on the LAN. At this point the CNC is attached to the network and has an address but is not logged into the LAN.

Mapping a Connection to a Network Share

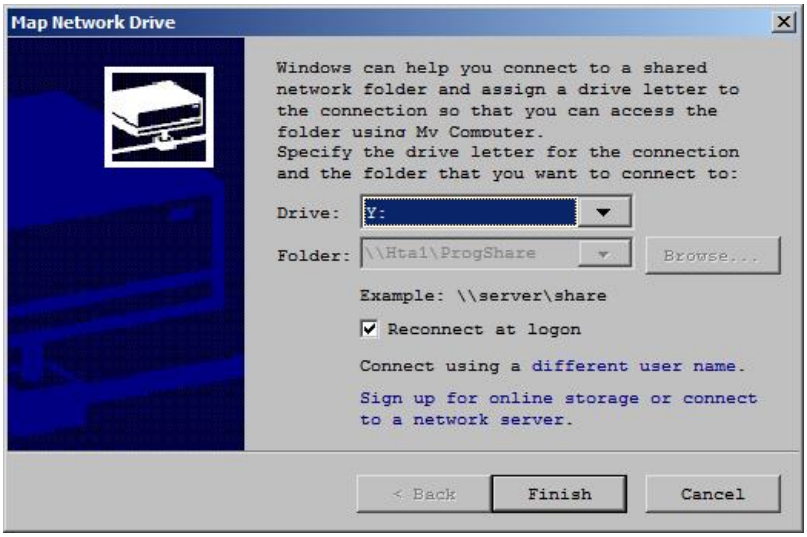
Note that the following procedure requires that the PC you are mapping be logged into the LAN

To map to a network share:

1. Press ALT+F4 to return to the Windows desktop.
2. From the Start menu select Windows Explorer.
3. Right-click on My Computer.



4. Select Map Network Drive.
5. Select a letter for the drive from the Drive dropdown list.

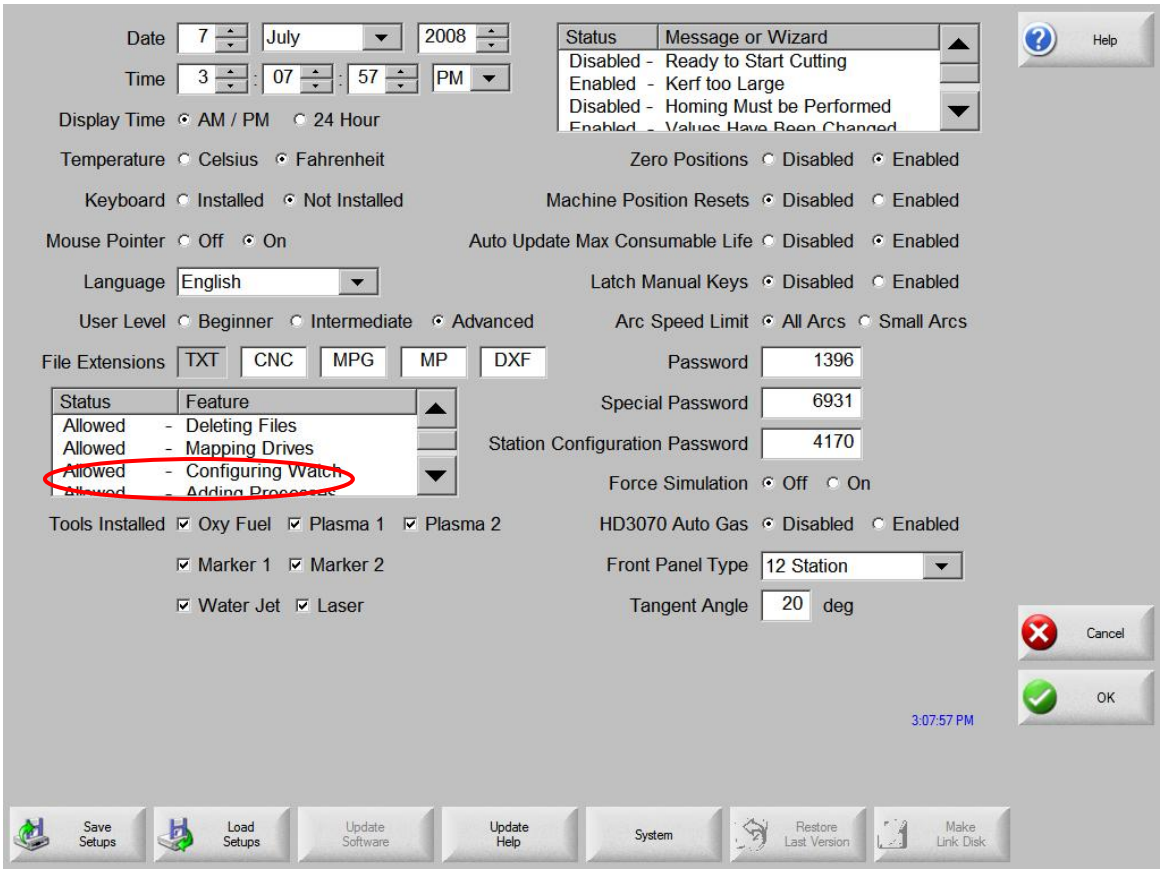


6. Enter a path to the network share in the Folder field.
7. Select Reconnect at logon.

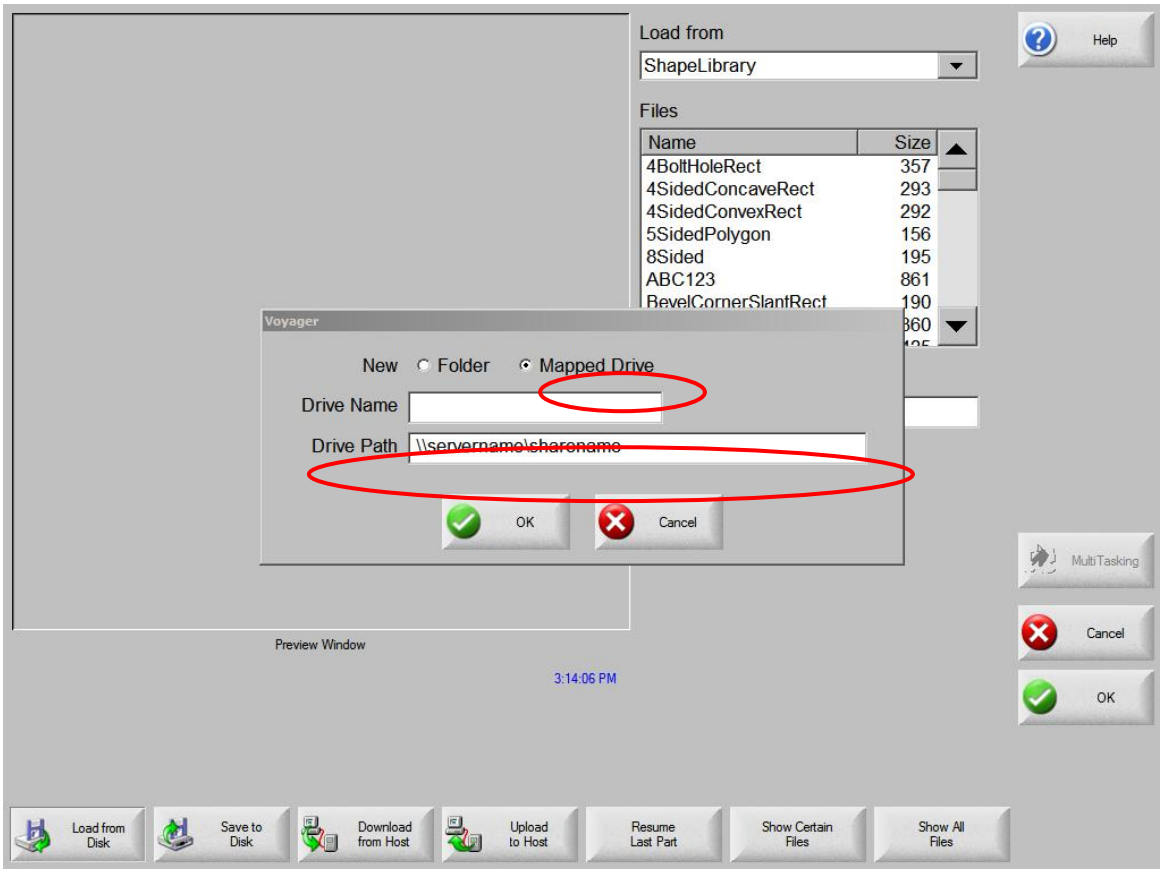
8. Click Finish.
   You may see a prompt for the user name and password for your network server. If you are in a domain system, enter it with your user name in the User name field (*domain\username*).

To access the share from the CNC software, press the Files soft key on the Main screen to map the drive.

Note: Mapping must be enabled in the Phoenix software on the Special password setup screen.



Use UNC format to perform the mapping.



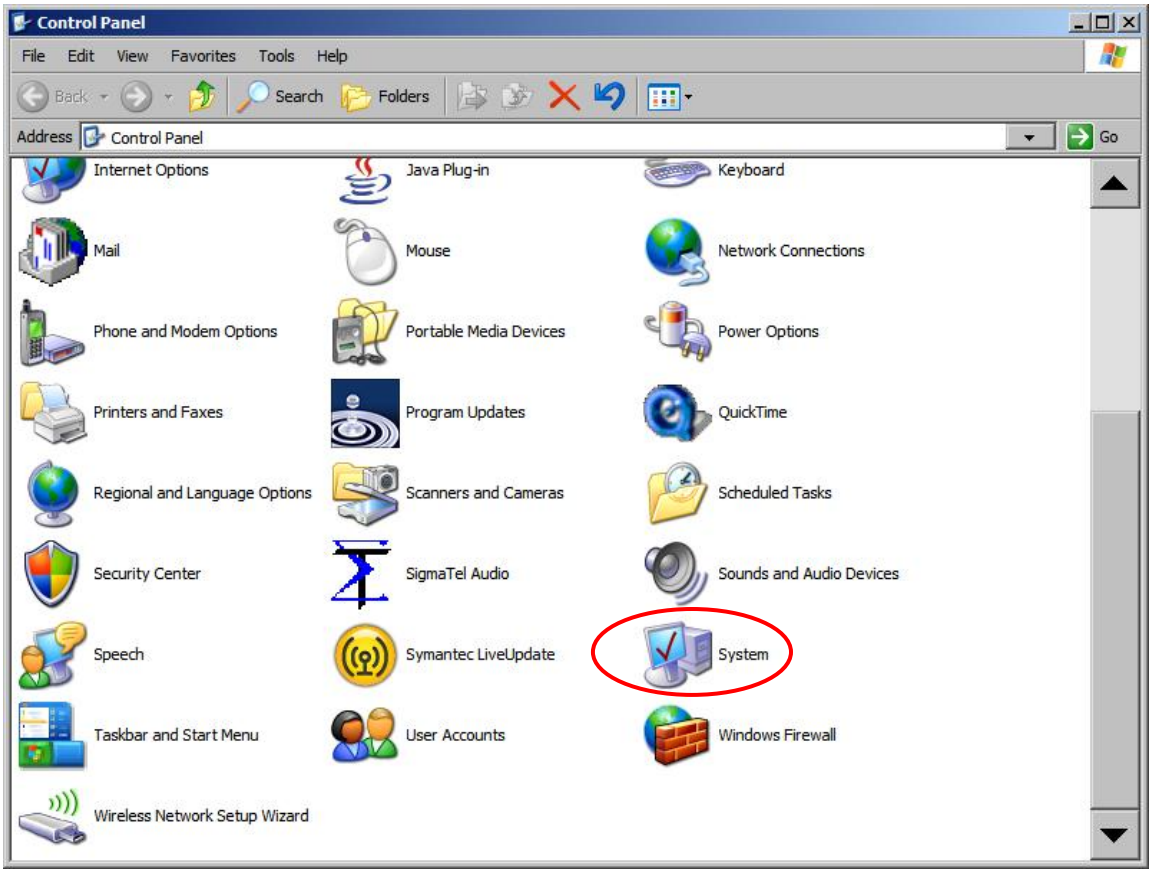
9. Click OK.

Connecting the CNC to a Workgroup

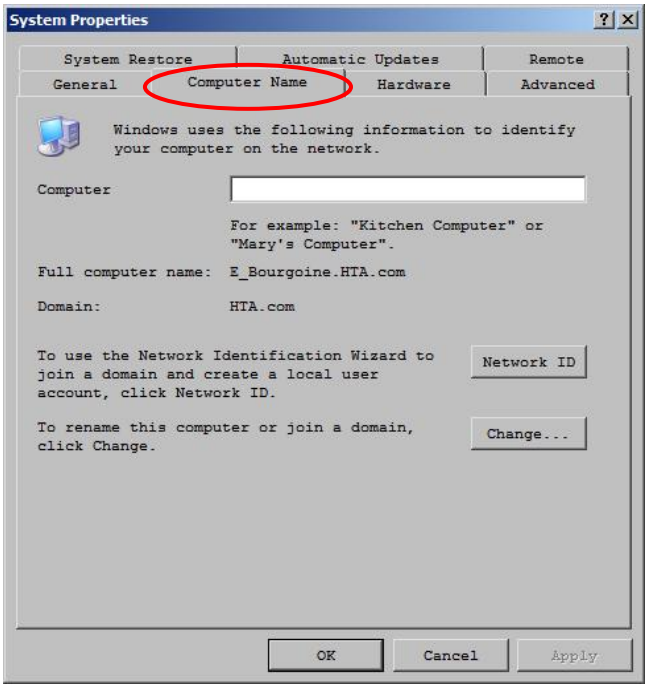
The CNC is set up as a member of a workgroup. If you are going to connect the CNC to a workgroup, the name of the workgroup must be changed to the name of the workgroup on the computer that shares files with the CNC.

To connect to a workgroup:

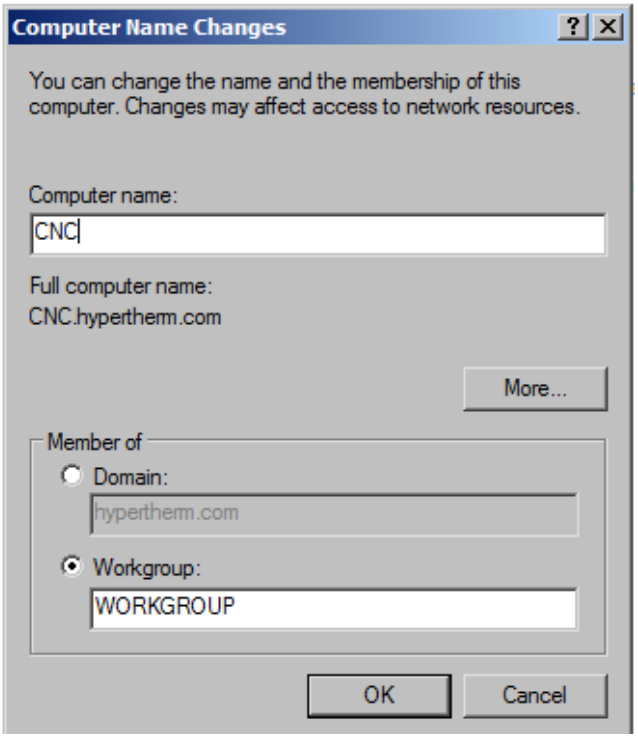
1. Connect a keyboard and mouse to the CNC.
2. Press Alt + F4 to return to the Windows desktop.
3. Select Start > Settings > Control Panel.
4. Double-click on the System icon.



5. Select the Computer Name tab.



6. Click Change.
7. Enter the name of your CNC in the Computer name field.
8. In the Member of group box, select Workgroup.
9. Enter the workgroup name of the computer with which you share files.

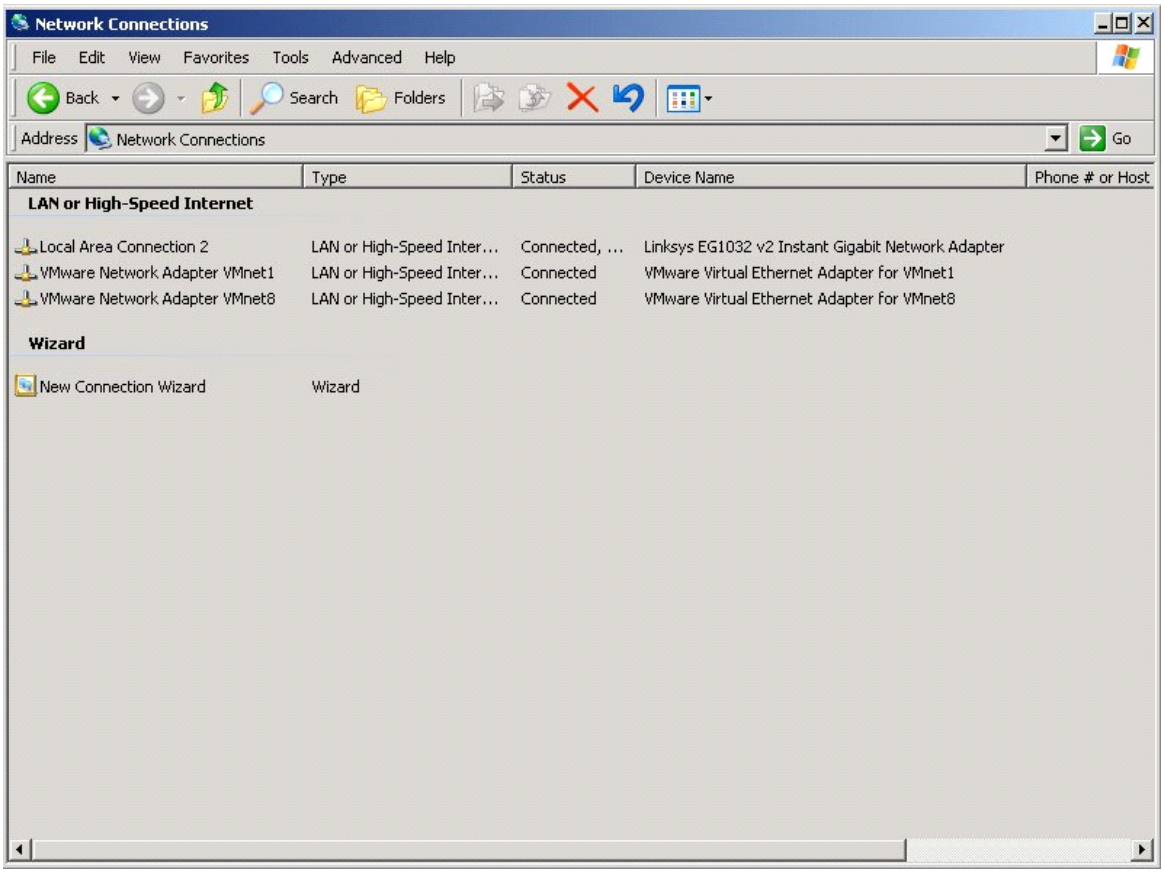


Use the procedure in Mapping a Connection to a Network Share to map to the shared directory on the PC.

Hardware Considerations

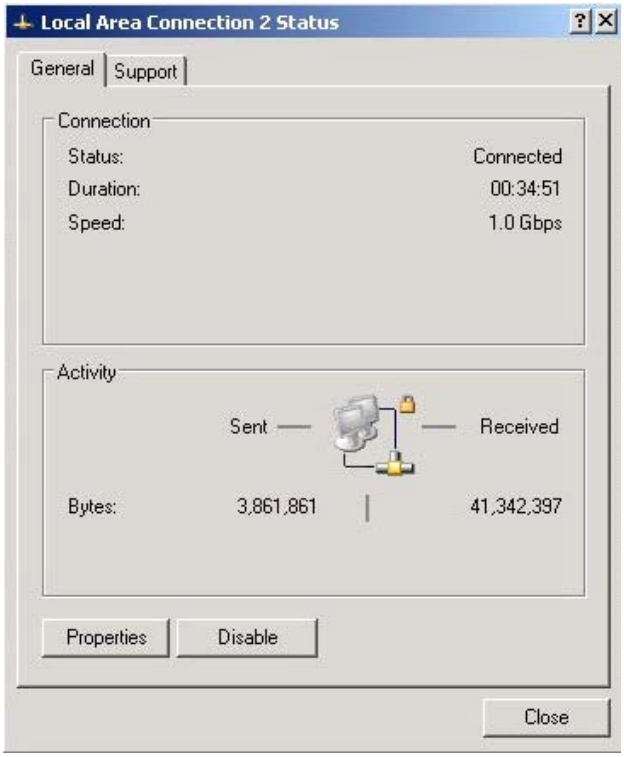
If you are using a Hypertherm Automation CNC with the networking option included, it may be shipped with a fiber optic network card installed. The operating system is set up to use DHCP to obtain the required TCP/IP address. This setup allows the CNC to obtain all the necessary network settings automatically when it is turned on and eliminates the need for a network administrator to keep manual records of assigned IP addresses and insures that the address, net mask, DNS server, and gateway addresses are automatically set to be compatible with your network.

If your network does not support DHCP, it will be necessary to go into the network setting screen and change the TCP/IP settings by hand on the network settings screen to make the CNC compatible with the network. To make these changes here involve attaching a keyboard and mouse to the CNC and accessing the Windows XP network setup parameters.

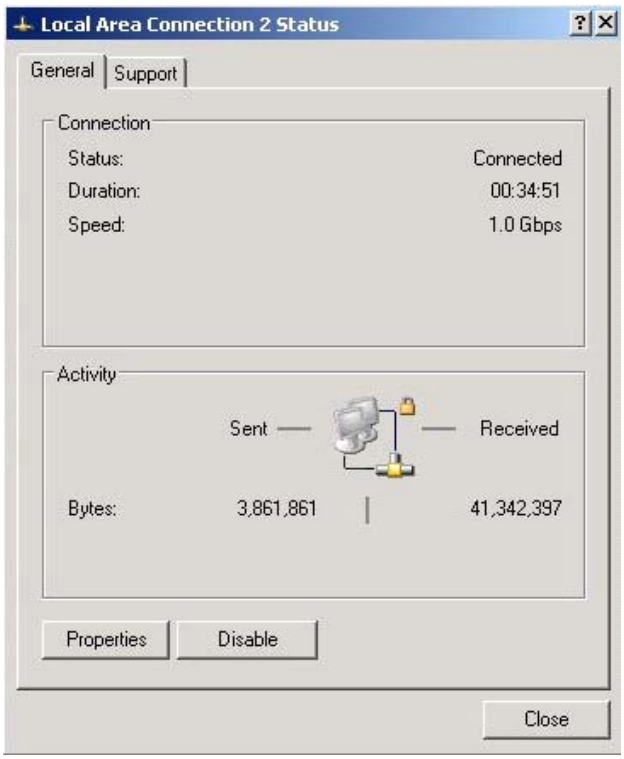


1. Double-click on any network adapters that are not being used.
   The Local Area Connection 2 Status window opens.

2. Click Disable to prevent Windows from trying to service these unused adapters.

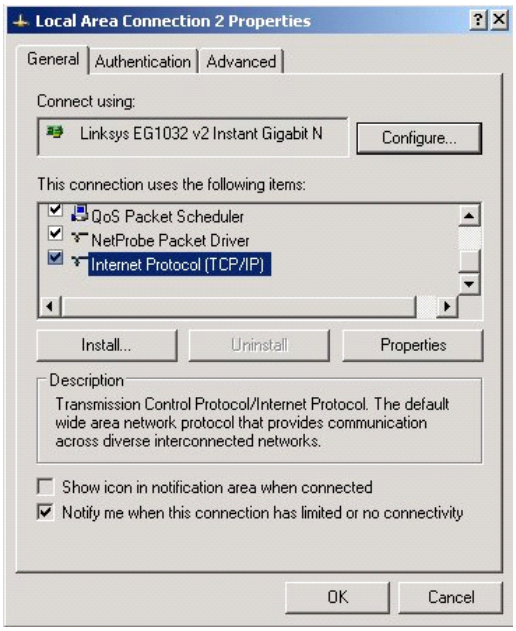


3. Click Close.
4. After you have disabled all the adapters that are not being used, double-click the network adapter that is being used.

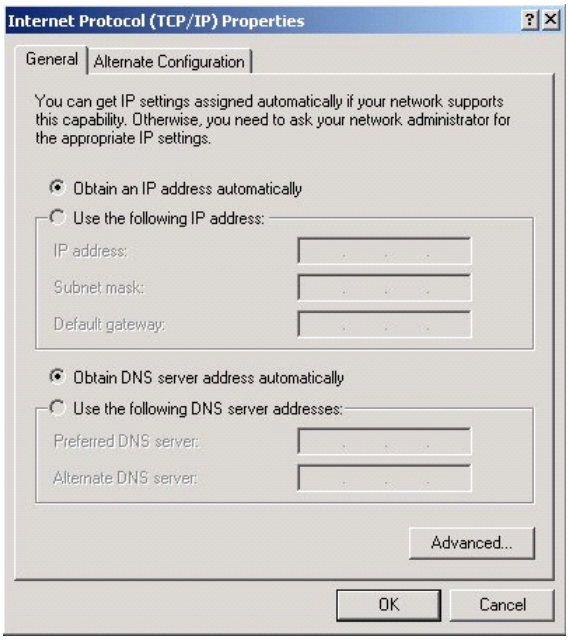


5. Click Properties.

   The Connection Properties screen for the adapter you selected displays the features for its network connection.



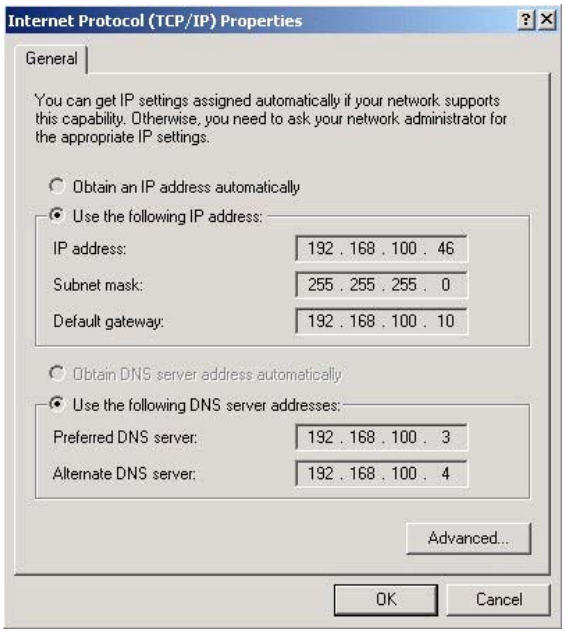
6. Select Internet Protocol (TCP/IP).
7. Click Properties.



8. To use DHCP, leave the default settings.

   If a DHCP server is not available, enter the TCP/IP address information in the IP address, Subnet mask, and Default gateway fields. Note that you must provide a valid IP address that has not been used elsewhere in the network.

   In addition, enter the appropriate DNS server address information in the Preferred DNS server and Alternate DNS server fields.



9. Click OK.

10. Verify that only one network card is active.
11. Reboot the system.

MicroEdge

Overview

The *MicroEDGE*™ PC based motion control from Hypertherm Automation is specifically for the metal cutting industry. This control package provides a unique combination of flexible table configurations, expandable features and an unparalleled ease of use.

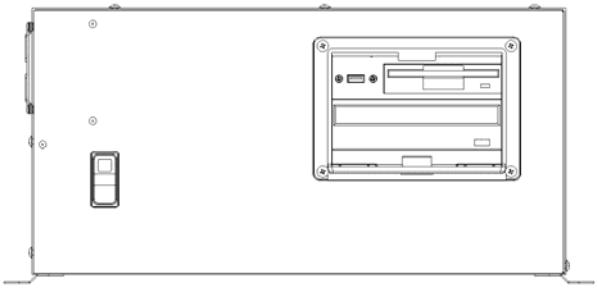
MicroEDGE utilizes our proprietary Graphical User Interface (GUI) and *SoftMotion* Technology with motion control operation of up to four axes with 24 I/O signals.

This product offers a unique approach to the motion control market by allowing custom configuration the final package by adding a PC style Monitor, Keyboard and Mouse.

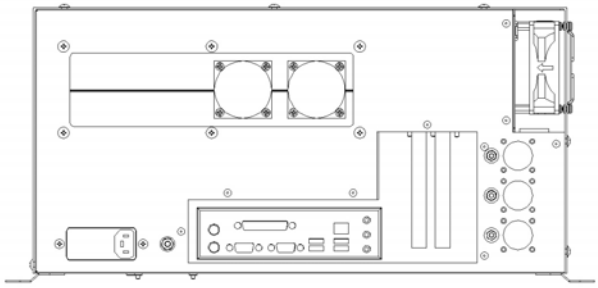
Additional features such as Joystick, Speed Pots, Integrated Sensor THC, networking, CAD/CAM Software, Nesting Software provide unlimited combinations of options for increased productivity.

Operation and maintenance of automated equipment involves potential hazards. Personnel should take precautions to avoid injury. This equipment should only be opened by trained service personnel.

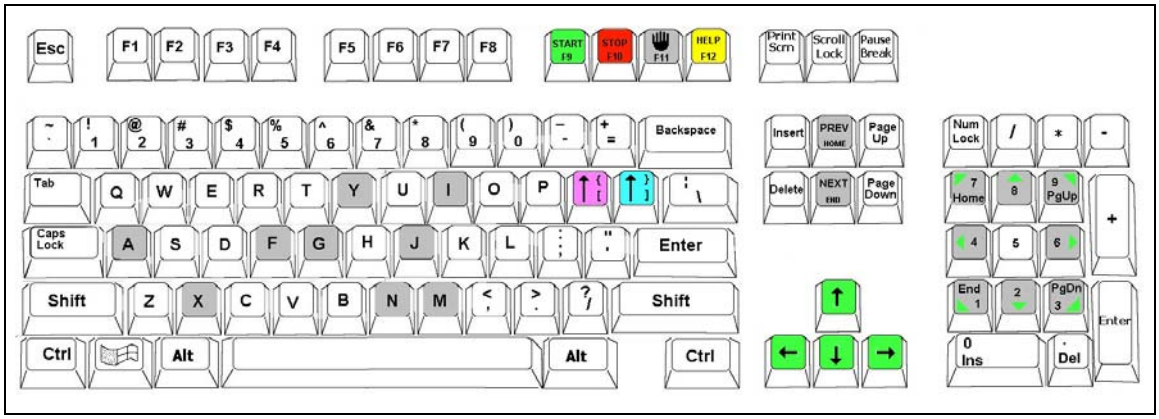
MicroEDGE™



Rear View



Keyboard Layout



Typical 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.
To switch between applications press Alt Tab.

A color coded key cap sticker set is provided to allow easy reference to the keys used by the control software.

System Requirements

Monitor Requirements (CRT or LCD)
Standard VGA capable 1240 x780 analog monitors or better with 15 pin High Density D-sub connector. Touch screen displays are also supported.

Keyboard Requirements
Standard 101/ 104 Key PS/2 or USB Compatible Keyboard

Optional Mouse Requirements
PS/2 or USB Compatible Mouse

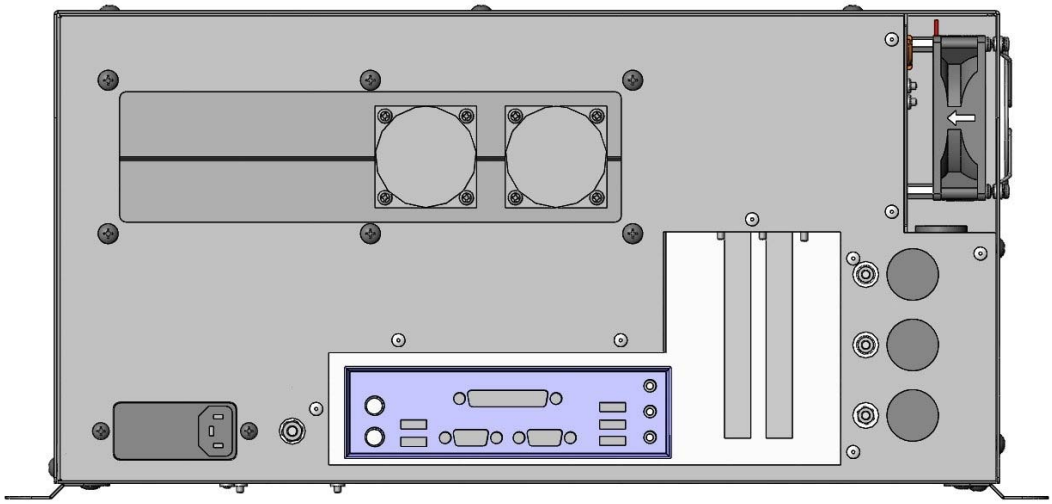
THC, Joystick & Speedpots

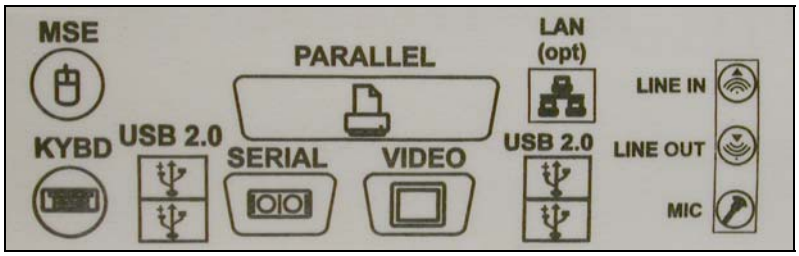
Optional features for two Sensor THC, one Joystick and two Speedpots are offered.

Note: Use of some monitors and other devices may require loading of a device driver for operation. Many standard device drivers are located in the C:\CABS or C:\CABS\I386 folders.

Machine Interface

The MicroEDGE shape cutting control is an extremely versatile product offering up to four configurable axes of motion, configurable I/O locations and a convenient table interface for ease of installation. The control features may also be expanded through use of optional analog and network interface cards.





The rear panel of the control has several cable connectors to connect the control to power, I/O and communication ports. These connectors are clearly labeled as to their function.

AC Input

The AC power cable is inserted into the AC power connector and plugged into a standard 3-way 110 or 220 volt outlet. The control has a universal AC input power module that allows the user to plug into either voltage without changing additional jumpers. In addition, the AC Power connector contains an integral fuse receptacle and line filter.

A remote communications link can be connected to one of the two serial ports and an external ground (PE) lug for earth grounding of the unit is also provided.

Serial Port

Please refer to the Ports Information section of the Installation Guide for additional information on configuration of Serial ports for communication. Note: Serial ports for the MicroEDGE are not optically isolated. Appropriate grounding or after market port isolator or protocol converter to add optical isolation is recommended.

I/O Configuration

The cables that connect the control to the cutting machine are attached to the I/O (Input/Output), and the DRIVE/ENCODER connectors. For the purposes of this guide Single Ended I/O is referred to as Type “P” configuration.

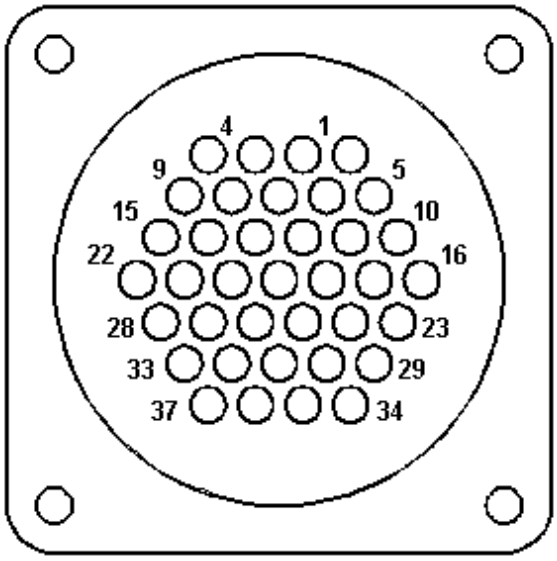
The information provided here is the basic information for connection of the shape cutting control to the cutting table. Each machine interface will vary slightly based on the cutting table configuration and features. Additionally, I/O pinout information may vary slightly based on the configuration of the selected I/O and their locations. Changes to the I/O configuration may be made in the password protected I/O screen. All controls are shipped with the default selection of Inputs and interface locations for the selected control Interface (I/O) configuration. Installation and service should only be performed by a qualified service technician.

I/O Connector

The I/O connector is a standard sex circular CPC connector from AMP. This connector was specifically chosen for its rugged industrial design and its metal insulation characteristics for EMI/RFI noise immunity.

In the single ended I/O scheme, a ground is provided on the I/O pin. The advantage to single ended I/O is that it takes one pin for each point versus two for the double-ended I/O scheme, thus increasing the total number of I/O points available to the user.

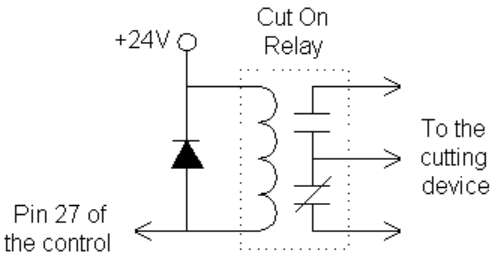
I/O Mating Connector
Connector AMP #208470-1
Backshell AMP #208945-8
Sockets (16-18 ga) AMP #66101-3
Sockets (20-24 ga) AMP #66105-3



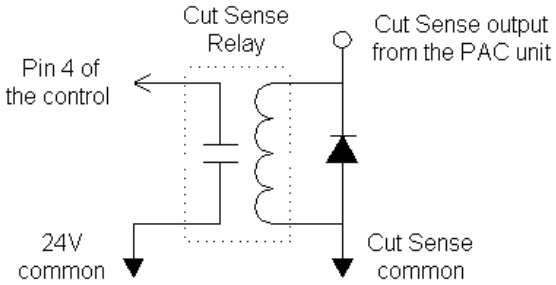
I/O Interface

Connecting single ended I/O to the control. These examples assume a +24V power supply has been connected across pins 34 and 36 of the control, or that the optional internal +24V power supply has been installed.

Output tied to external Cut On

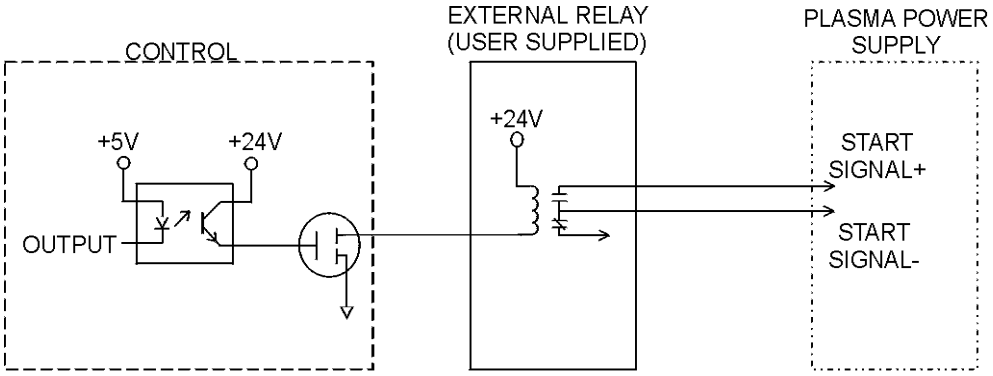


Input tied to Cut Sense Relay

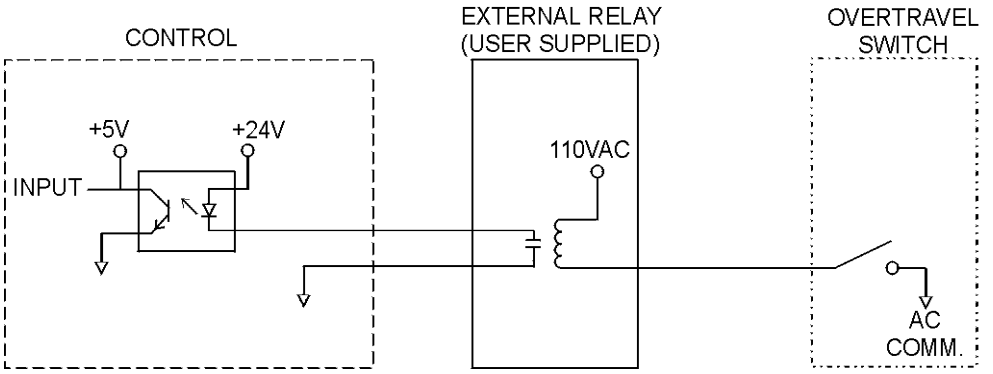


Examples of possible circuits

Output



Input



Single Ended I/O Pinout

The Single Ended I/O offers 12 outputs which are rated at 24VDC for up to 1-amp loads and 12 inputs rated for 24VDC.

Pin	I/O	Description
1	Input 1	Torch Up Sense
2	Input 2	Torch Down Sense
3	Input 3	Preheat Sense or X -Overtravel Switch
4	Input 4	Cut Sense
5	Input 5	Tracer on Path or Z Home Switch
6	Input 6	Spare or Y -Overtravel Switch
7	Input 7	Spare
8	Input 8	Spare or Remote Pause
9	Input 9	X Home Switch
10	Input 10	X Overtravel Switch or X +Overtravel Switch
11	Input 11	Y Home Switch
12	Input 12	Y Overtravel Switch or Y +Overtravel Switch
13	N/C	No Connection
14	+24 VDC	+ I/O Power Supply
15	+24 VDC	+ I/O Power Supply
16	N/C	No Connection
17	24V Common	I/O Power Supply Common
18	24V Common	I/O Power Supply Common
19	N/C	No Connection
20	N/C	No Connection
21	Output 1	Torch Up
22	Output 2	Torch Down
23	Output 3	Ignition Control
24	Output 4	Torch Height Disable/Dual Grid Control
25	Output 5	CNC/Tracer
26	Output 6	Marker Enable
27	Output 7	Cut Control
28	Output 8	Spare
29	Output 9	Spare or Low Preheat
30	Output 10	Preheat Control
31	Output 11	Key Press Indicator or Motion Indicator
32	Output 12	Spare or Plasma Select
33	I/O Shield	Chassis Ground
34	+24 VDC	+I/O Power Supply
35	+24 VDC	+I/O Power Supply
36	24 V Common	I/O Power Supply Common
37	24 V Common	I/O Power Supply Common

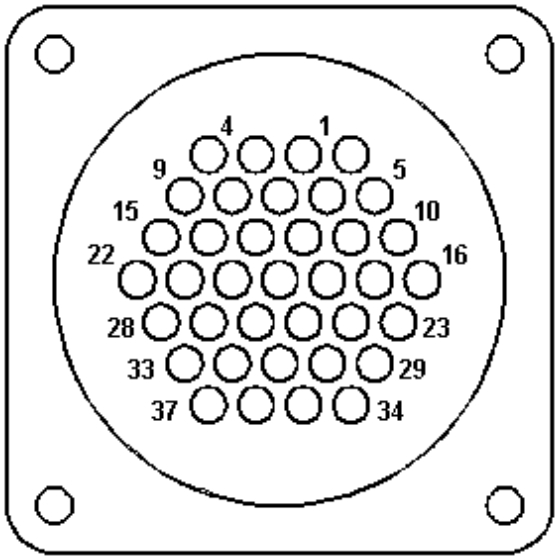
Drive/Encoder Connector

The Drive/Encoder connector is a reverse sex circular CPC connector from AMP. This connector was specifically chosen for its rugged industrial design and its metal insulation characteristics for EMI/RFI noise immunity.

NOTE: For optimum noise immunity, cable shields may be tied externally to the control enclosure or to the metal AMP connectors.

Drive/Encoder Mating Connector and Cable

Connector AMP #208472-1
Backshell AMP #208945-8
Pins (16-18 ga) AMP #66099-3
Pins (20-24 ga) AMP #66103-3
Cabling: Use Belden # 9504 or equivalent for encoder signals
Cabling: Use Belden # 9501 or equivalent for drive signals



Axes Assignments

Axes	Axes Assignment
1 (X)	Transverse or Rail
2 (Y)	Transverse or Rail
3 (Z)	Dual Gantry, CBH, Rotate or THC
4 (W)	CBH, Tilt or THC

Drive/Encoder Pinout

Pin	Description
2	Encoder Power Supply Input (+5V or +12V*)
3	Encoder Power Supply Common
7	Encoder Power Supply Shield
8	

*__NOTE__: For Rev A + B MCC's +12V Encoders require a switch to be set on the interface board.

X Axis	Y Axis	Description
4	1	Encoder Power Output
8	6	Encoder Power Common
9	5	Encoder Channel A input
14	11	Encoder Channel /A Input
15	10	Encoder Channel B Input
21	17	Encoder Channel /B Input
22	16	Encoder Channel Z Input
28	23	Encoder Channel /Z Input
13	12	Encoder Shields
24	26	Drive Enable In (relay contact)
25	27	Drive Enable Out (relay contact)
37	34	Drive Power Input (+12 or +15)
33	29	Servo Output (± 10V)
32	30	Drive Power Common
36	35	Drive Power Input (-12 or –15)
20	18	Servo Output Common
19	31	Drive/Servo Shield

Drive/Encoder Pinout (For 3 and 4 Axes units)

Pin	Description
2	Encoder Power Supply Input (+5V or +12V)
3	Encoder Power Supply Common
7	Encoder Power Supply Shield

Z Axis	W Axis	Description
4	1	Encoder Power Output
8	6	Encoder Power Common
9	5	Encoder Channel A input
14	11	Encoder Channel /A Input
15	10	Encoder Channel B Input
21	17	Encoder Channel /B Input
22	16	Encoder Channel Z Input
28	23	Encoder Channel /Z Input
13	12	Encoder Shields
24	26	Drive Enable In (relay contact)
25	27	Drive Enable Out (relay contact)

37	34	Drive Power Input (+12 or +15)
33	29	Servo Output (± 10V)
32	30	Drive Power Common
36	35	Drive Power Input (-12 or –15)
20	18	Servo Output Common
19	31	Drive/Servo Shield

THC and Joystick Interface

MicroEdge has dedicated connectors for THC 1, THC and Joystick / Speedpots.

Series 1 PCI Analog Card

Note: The Analog Card will be designated as PCI-AIC Rev A in the Control Information Diagnostic screen.

Board Marking PCI Analog 1 Part # PCBS-0074

THC 1

Pin #	Designation	Description
1	Common	Common
2	Input 5 +	Nozzle Contact Sense + (Relay Contact)
3	Input 5 –	Nozzle Contact Sense - (Relay Contact)
4	Output 1 +	Nozzle Contact Enable + (Relay Contact)
5	Output 1 –	Nozzle Contact Enable - (Relay Contact)
6	Analog Input 1 +	THC +
7	Analog Input 1 –	THC –
8	Output 2 +	Hold Ignition (Relay Contact)
9	Output 2 –	Hold Ignition (Relay Contact)
Ground Stud		Shield

Mating Connector

Connector AMP #206708-1
Backshell AMP #206966-1
Sockets (20-24 ga) AMP #66105-3
Cabling: Use Belden # 9504 or equivalent

THC 2

Pin #	Designation	Description
1	Common	Common
2	Input 6 +	Nozzle Contact Sense + (Relay Contact)
3	Input 6 –	Nozzle Contact Sense – (Relay Contact)
4	Output 3 +	Nozzle Contact Enable + (Relay Contact)
5	Output 3 –	Nozzle Contact Enable – (Relay Contact)
6	Analog Input 2 +	THC +
7	Analog Input 2 –	THC –
8	Output 4 +	Hold Ignition (Relay Contact)
9	Output 4 –	Hold Ignition (Relay Contact)
	Ground Stud	Shield

Mating Connector

Connector AMP #206708-1
Backshell AMP #206966-1
Sockets (20-24 ga) AMP #66105-3
Cabling: Use Belden # 9504 or equivalent

Joystick

Pin #	Designation	Description
1	Input 1	Joystick UP
2	Input 2	Joystick DWN
3	Input 3	Joystick LT
4	Input 4	Joystick RT
5	Common	Common
6	Analog Input 3 +	Speed Pot 1
7	Analog Input 3 –	Speed Pot 1
8	Analog Input 4 +	Speed Pot 2
9	Analog Input 4 –	Speed Pot 2
	Ground Stud	Shield

Note: Joystick inputs are activated by passing the Common signal (pin 5) to the desired input.
Analog inputs for the speedpots are rated at 0 - +10VDC

Mating Connector

Connector AMP #206708-1
Backshell AMP #206966-1
Sockets (20-24 ga) AMP #66105-3
Cabling: Use Belden # 9504 or equivalent

THC and Joystick Cable Grounding

Cable shields should be tied to the external PE studs for optimum noise immunity.

Sensor THC

This section refers to following hardware configuration. *Note*: The Analog Card will be designated as Rev 0 in the Control Information Diagnostic screen.

Series 1 PCI Analog Card (Board Marking PCBS-0073)	Part # PCBS-0074
Series 3 Voltage Divider Card	Part # PCBS-0061

Instructions

If the voltage divider card has not been installed in the plasma power supply, mount the card in an accessible location away from high electrical noise areas. Wire the VDC to the appropriate signal inside the power supply as outlined in the following pinout information

Voltage Divider Card Pinout (Series 3)

Divider PCB - 2C Connector J1

Pin #	Description
1	85 -265 VAC Power Input (47-63Hz)
2	285 -265 VAC Neutral Input

Mating Connector

2C Phoenix Connector – Phoenix Part # 1840366

Divider PCB - 8C Connector J2 To Control

Pin #	Description
1	+24 VDC Common
2	+24 VDC
3	Nozzle Contact Sense
4	Nozzle Contact Enable
5	+24 VDC Common
6	Analog Out +
7	Analog Out –
8	E Ground

Mating Connector

8C Phoenix Connector – Phoenix Part # 1803633

Divider PCB - 5C Connector J3 to Power Supply / Table

Pin Number	Description
1	Ground (Chassis Ground)
2	Electrode (Plasma DC –)
3	Work (Plasma DC +)
4	NC
5	Shield (Nozzle Contact)

Mating Connector

Terminal Connections

Control & Cable Pinout for Sensor THC

I/O Configuration Type "P"

Note: A 9C Amp connector is provided on the back of the control (I/O Type "P") for interfacing.

Control 9C Analog Pin #	Description	Divider J2 Pin #
1	24V Common	1
2	Nozzle Contact Sense +	2
3	Nozzle Contact Sense –	3
4	Nozzle Contact Enable +	4
5	Nozzle Contact Enable –	5
6	Analog +	6
7	Analog –	7
8	Hold Ignition +	N/A (direct to power supply)*
9	Hold Ignition –	N/A (direct to power supply)*
Ground Stud	Shield	No Connection

Analog Mating Connector

Connector AMP # 206708-1
Backshell AMP #206966-1
Sockets #66105-3 (20-24 ga)

VDC Mating Connector

8C Phoenix Connector – Phoenix Part # 1803633

Cable

Belden #9505 or equivalent

* **Note**: It is recommended that the Hold Ignition input be wired to the Power Supply through an external relay for noise immunity. Please refer to Instructions from the supply manufacturer for details on connection to the Hold Ignition Input.

Calibration

Series 1 Analog Card

Note: The Series 1 Analog Card will be designated as Rev 0 in the Control Information Diagnostic screen.

Board Marking PC-012-1098 Rev. B Part # PCBS-0010-B

After the voltage divider card and control cabling have been connected, the system is ready to be calibrated for use.

Analog Offset: To adjust the Analog Offset, place a jumper on the Analog In signals on the Analog input card or at the 9C connection for the Analog Input Card located at the back of the control. The analog input voltage would then be viewed at the I/O Diagnostics screen to read any incoming voltage for the THC. If any voltage is displayed at the diagnostic screen, an Offset Voltage equal to the incoming voltage being read can be entered at the Password protected Analog I/O screen to correct for any imbalance and "zero" the incoming voltage

Example: If an incoming Analog Input Voltage is reading .1 volts, simply enter .1 at the Analog Offset and correct the imbalance.

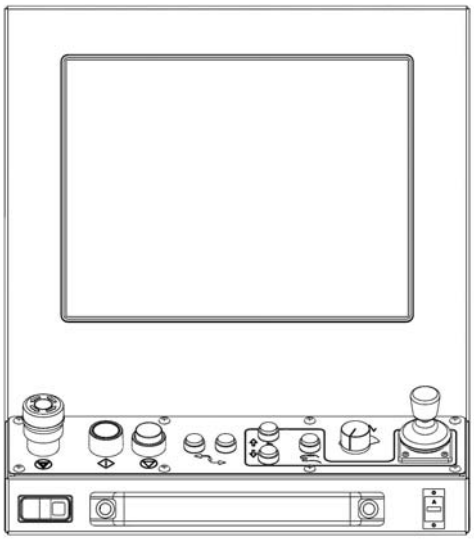
Edge Ti

Overview

The Edge Ti shape cutting control is an extremely versatile product offering up to four configurable axes of motion, built-in Servo Amplifiers and configurable I/O. Use of built in relay contacts for I/O increases interface options and minimizes external interface components.

Hypertherm Automation PC based CNC controls for the shape cutting industry utilize our proprietary Graphical User Interface (GUI), and *SoftMotion* Technology to increase productivity, reduce operational costs while providing unsurpassed operational flexibility. The control features may be further expanded through use of integrated Sensor™ THC interface and networking

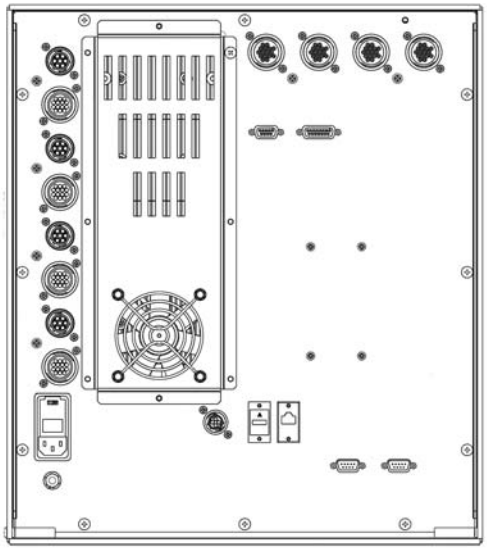
Edge Ti™



Touch Screen

The 15” display used in the Edge Ti is a patented IntelliTouch Surface Wave technology which provides precise drift free touch accuracy and unsurpassed clarity. Pure glass construction with tiny transducers on the back of the touch screen preserves color purity and works even if scratched. There is no known wear out mechanism as there are no layers, coatings or moving parts. IntelliTouch technology has been tested by the supplier for more than 50 million touches in one location without failure.

Rear View



THC, Joystick & Speedpots

Features for Joystick and Speedpots are offered as standard. Optional features for integrated Sensor THC are available.

Note: Use of some devices such as USB memory devices may require loading of a device driver for operation. Many standard device drivers are located in the C:\CABS or D:\CABS\I386 folders.

Operation and maintenance of automated equipment involves potential hazards. Personnel should take precautions to avoid injury. This equipment should only be opened by trained service personnel.

Machine Interface

The information provided here is the basic information for connection of the shape cutting control to the cutting table. Each machine interface will vary slightly based on the cutting table configuration and features. Additionally, I/O pinout information may vary slightly based on the configuration of the selected I/O and their locations. Changes to the I/O configuration may be made in the password protected I/O screen. All controls are shipped with a default selection of Inputs and interface locations for the selected control Interface (I/O) configuration. Installation and service should only be performed by a qualified service technician.

The rear panel of the control has several cable connectors to connect the control to power, I/O and communication ports. These connectors are clearly labeled as to their function.

AC Input

The AC power cable is inserted into the AC power connector and plugged into a standard 3-way 115 or 230 volt outlet. The AC Power connector contains an integral fuse module and line filter. AC input power can be selected by the user by changing position of the fuse module so that the selected voltage is displayed.

WARNING! Ensure proper orientation of fuse module for input power before applying power to the CNC. Component damage could occur with incorrect voltage setting.

Recommended AC Fuses

Different fuse ratings are recommended based on incoming voltage selected.

Voltage Input: 120Vac uses 8 amp (slow blow) Littlefuse part #313008
Voltage Input: 220Vac uses 5 amp (slow blow) Littlefuse part #313005
Size: ¼" x 1¼" or 5mm x 20MM fuse can be used

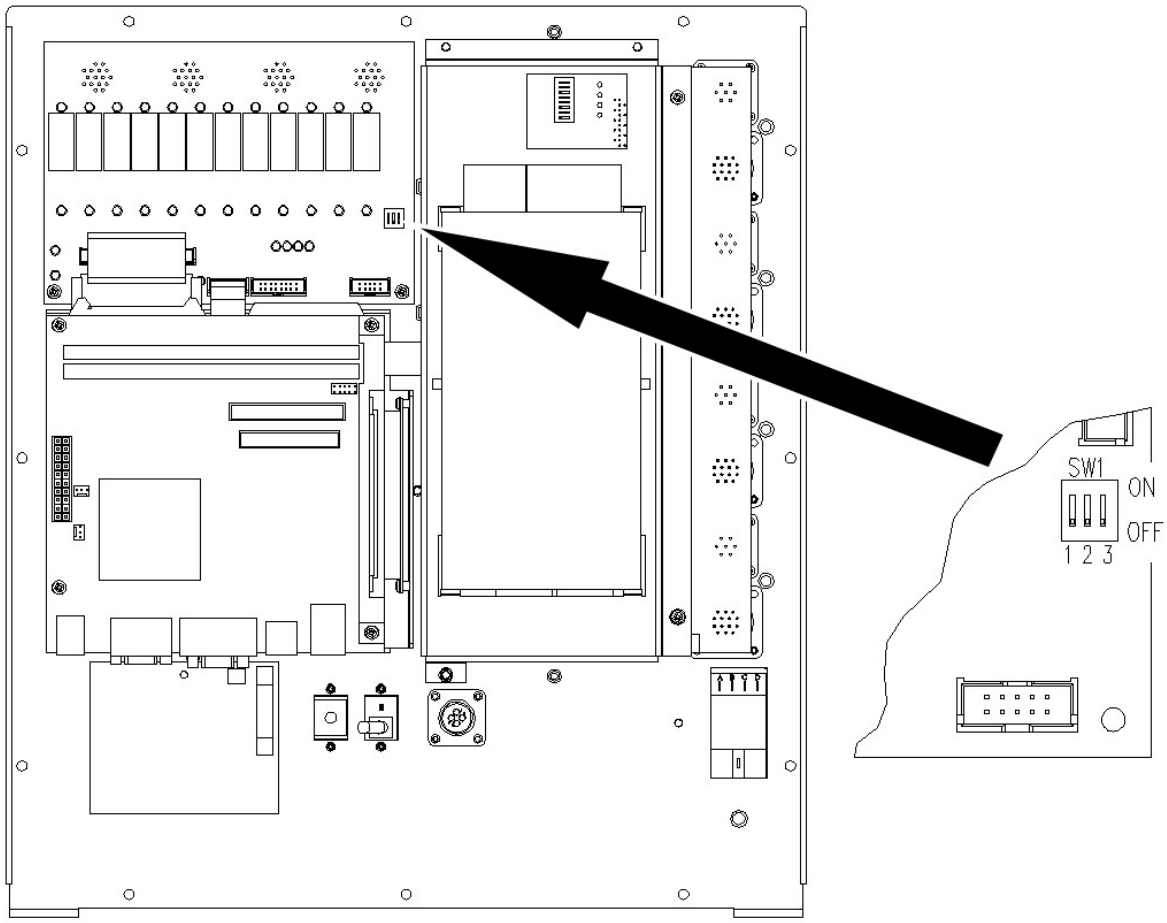
Serial Port

Please refer to the Ports Information section of the Installation Guide for additional information on configuration of Serial ports for communication.

A remote communications link can be connected to one of the two serial ports and an external ground (PE) lug for earth grounding of the unit is also provided.

I/O Configuration

The Edge – Ti provides several options for I/O interfacing with built in circuitry providing interface flexibility and reducing the need for external components. Inputs are through optoisolators and outputs are through relays. Contacts for both normally closed and normally open outputs are available for use.



Input Mode

Note that the inputs have two different modes that are selectable using DIP switch SW1-3. When this switch is OFF the inputs are in the sourced input mode and an external voltage source of between 12V and 24V is required to activate each input.

When DIP switch SW1-3 is ON, the inputs are all in the dry contact mode and require an external switch to common to activate the inputs. The logic states sensed by the CNC are reversed between the two input modes.

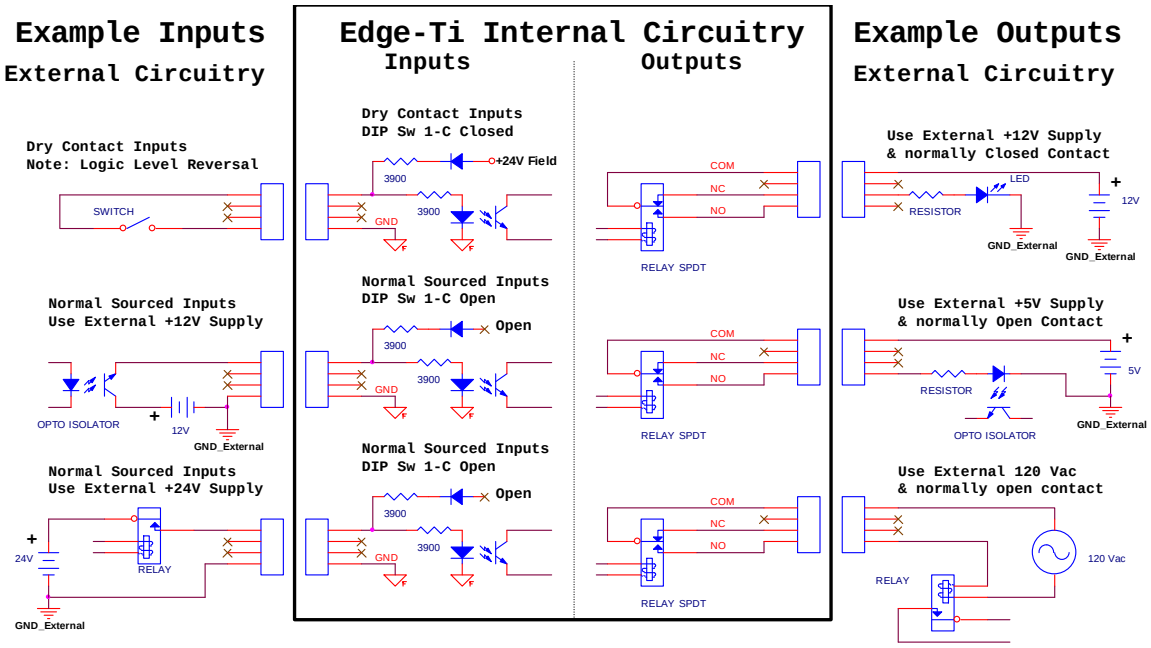
In a sourced input circuit, an inactive input will produce a logic low and an active input will produce logic high. In dry contact mode these logic levels are reversed with an inactive input producing logic high and an active input producing a logic low.

Switch SW1-3

Input Mode	SW1-3
Dry Contact	Off
12Vdc or 24Vdc Sourced	On

I/O Interface

The following illustration shows the details of connecting the I/O to common circuitry. All outputs are relay contacts rated at 1 AMP 250VAC maximum



 ***WARNING!*** Do not exceed 24Vdc or 10mA into any optoisolator input. Use care to observe the correct signal polarities or damage may occur! Do not exceed 250 Vac or 1 Amp through any relay output.

I/O Pinout

Three inputs and three outputs are provided per connector

Connector I/O 1-3

Pin#	Signal
1	OUT1 Common
2	OUT1 Normally Closed
3	OUT1 Normally Open
4	OUT2 Common
5	OUT2 Normally Closed
6	OUT2 Normally Open
7	OUT3 Common
8	OUT3 Normally Closed
9	OUT3 Normally Open
10	IN1
11	IN1 Common
12	IN2
13	IN2 Common
14	IN3
15	IN3 Common
16	Cable Shield

Connector I/O 4-6

Pin#	Signal
1	OUT4 Common
2	OUT4 Normally Closed
3	OUT4 Normally Open
4	OUT5 Common
5	OUT5 Normally Closed
6	OUT5 Normally Open
7	OUT6 Common
8	OUT6 Normally Closed
9	OUT6 Normally Open
10	IN4
11	IN4 Common
12	IN5
13	IN5 Common
14	IN6
15	IN6 Common
16	Cable Shield

Connector I/O 7-9

Pin#	Signal
1	OUT7 Common
2	OUT7 Normally Closed
3	OUT7 Normally Open
4	OUT8 Common
5	OUT8 Normally Closed
6	OUT8 Normally Open
7	OUT9 Common
8	OUT9 Normally Closed
9	OUT9 Normally Open
10	IN7
11	IN7 Common
12	IN8
limit input)	
13	IN8 Common
14	IN9
limit input)	
15	IN9 Common
16	Cable Shield

Connector I/O 10-12

Pin#	Signal
1	OUT10 Common
2	OUT10 Normally Closed
3	OUT10 Normally Open
4	OUT11 Common
5	OUT11 Normally Closed
6	OUT11 Normally Open
7	OUT12 Common
8	OUT12 Normally Closed
9	OUT12 Normally Open
10	IN10
11	IN10 Common
12	IN11 (shared w/ lifter Lower
13	IN11 Common
14	IN12 (shared w/ lifter Upper
15	IN12 Common
16	Cable Shield

Shared Inputs

Note that general inputs #11 and #12 are shared with the Lifter Interface Limit Switch inputs. These inputs can only be used as general purpose inputs if they are **NOT** used by the Lifter limit switches.

If you are using the Lifter Interface and limit switches are connected to these inputs you must set DIP switches SW1-1 and SW1-2 to ON and you should not connect to inputs #11 and #12. Note that the standard Hypertherm Lifter does not use limit switches and the DIP switches SW1-1 & SW1-2 should be OFF so that inputs #11 and #12 can be used.

Switch SW1-1 and SW1-2

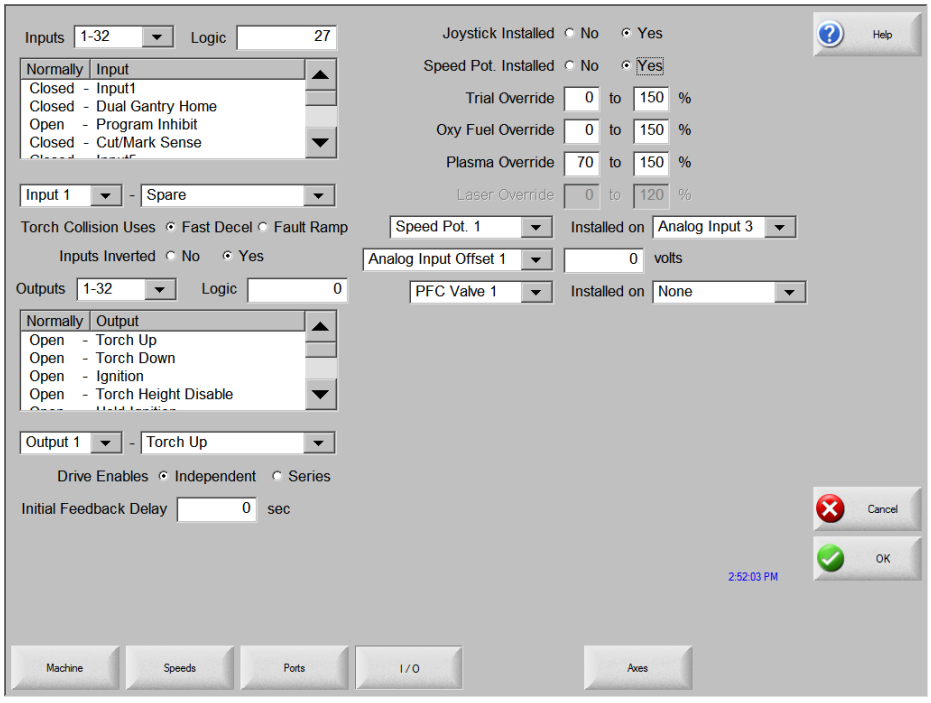
Input Mode	SW1-1	SW1-2
Lifter Limit Switch Enabled	On	On
Lifter Limit Switch Disabled	Off	Off

I/O Mating Connector

The I/O connector is a standard sex circular CPC connector from AMP
Connector AMP 16C #206037-1
Backshell AMP #206070-1
Sockets 20-24AWG AMP #66105-3

I/O Setup Screen

The I/O setup screen is used to define inputs, outputs and their logic state.



Note: The input logic for the first twelve I/O would need to be inverted for Dry Contact Mode Inputs so that logic state is shown correctly for operational mode. An Inputs Inverted parameter has been provided for this purpose.

Front Panel I/O
Edge TI has dedicated I/O for operation of front panel switches. NOTE: For proper operation, these inputs should not be reassigned.

Input #	Description
24	Front Panel Start
25	Front Panel Stop
26	Front Panel Forward on Path
27	Front Panel Forward on Path
28	Raise Torch 1
29	Lower Torch 1
30	Front Panel Manual
31	Front Panel E-Stop

Lifter Interface

Edge Ti offers the option of an integrated Torch Height Control. The lifter interface connector is provided for this use. Lower Limit, Upper Limit and Breakaway inputs are sinking inputs to Field Common. Please refer to Sensor™ PHC manual for additional information.

Lifter Pinout (9 Pin Dsub)

Pin#	Description
1	Field +12VDC
2	Lower Limit (shared w/ general input 11)
3	Upper Limit (shared w/ general input 12)
4	Breakaway (Torch Collision)
5	Field Common
6	Field Common
7	Plate Contact -12Vdc
8	Plate Contact Sense
9	Plate Contact Common

Shared Inputs
Note that general inputs #11 and #12 are shared with the Lifter Interface Limit Switch inputs. These inputs can only be used as general purpose inputs if they are **NOT** used by the Lifter limit switches.

If you are using the Lifter Interface and limit switches are connected to these inputs you must, close DIP switches SW1-1 and SW1-2 and you should not connect to inputs #11 and #12. Note that the standard Hypertherm Lifter does not use limit switches and that

the DIP switches SW1-1 & SW1-2 should be left open so that inputs #11 and #12 can be used.

Switch SW1-1 and SW1-2

Input Mode	SW1-1	SW1-2
Lifter Limit Switch Enabled	On	On
Lifter Limit Switch Disabled	Off	Off

Mating Connector

Use Hypertherm cable CABL-0207 or recommended 9 Pin Dsub (or equivalent)

Connector AMP #205204-3
Backshell Northern Technology #C88000209
Pins AMP #1-66506-0
Cabling: Use Belden # 9540 or equivalent

Plasma Interface

A plasma interface is provided as standard for Edge TI. This feature is used in conjunction with a Plasma Interface Module to provide connections at the Plasma Supply. Inputs and outputs are dry contact mode. Arc voltage is assigned to Analog Input 5. Please refer to Sensor™ PHC manual for additional information.

Plasma Interface Pinout (15 Pin Dsub)

Pin#	Description
1	Field +12VDC
9	Field +12VDC
2	Plasma Start Output (Cut Control)
10	Plasma Start Output (Cut Control)
3	Hold Ignition Output +
11	Hold Ignition Output -
4	Transfer Input + (Cut Sense)
12	Transfer Input - (Cut Sense)
5	Field Common
6	Field Common
7	Field Common
13	Field Common
14	Field Common
15	Electrode Arc Voltage (–)
8	Work Arc Voltage (+)

Mating Connector

Use Hypertherm cable CABL-0208 or recommended 15 Pin Dsub (or equivalent).

Connector AMP #205206-1
Backshell Northern Technology #C88000207

Pins AMP #1-66506-0
Cabling: Use Belden # 9541

External Interlock

An external interlock is provided to remotely disable servo power.

Interlock Pinout

Pin#	Description
1	Interlock Relay Coil (24VDC)
2	GND
3	GND
4	+24VDC (50 milliamps maximum)

Additional Notes:

1. For Servo Drive Amplifiers to operate, Pin 1 must be connected to GND Pin 2, typically through a remote mushroom type switch. If no remote switch is to be used, connect pin 1 to pin 2 with a jumper or the servo drives will not power on.
2. 24VDC is provided for use to activate the digital inputs only in the case where sourced inputs are selected, it must not be used for any other auxiliary purpose.

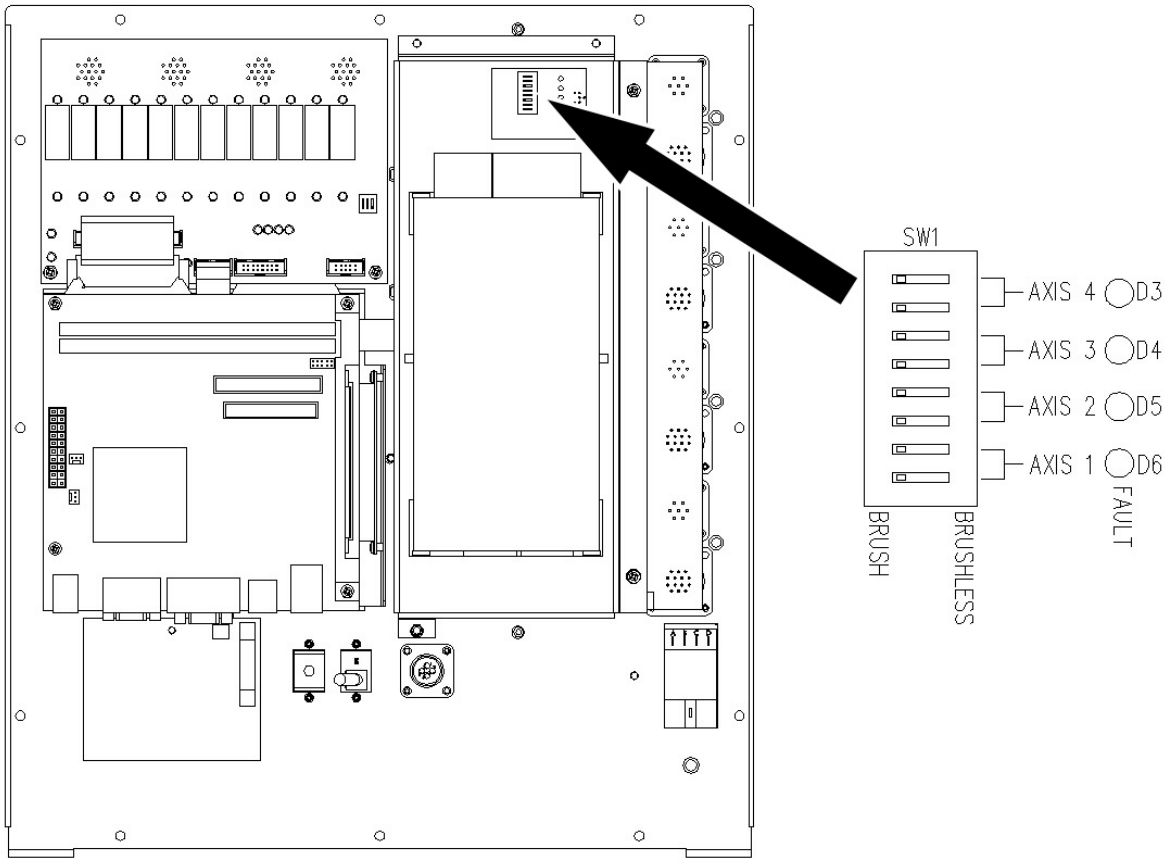
Mating Connector

Connector AMP #206060-1
Backshell AMP #206062-3
Sockets 20-24AWG AMP #66105-3

Motor Encoder Connections

Edge Ti supports DC brush and brushless motors. Switch SW1 on the drive interface can be used to select motor type being used. Please note the location and setting in the following illustration.

Drive Type selection on Axes Setup screen must be set to CURRENT mode.



Motor Requirements
250 Watts (each amplifier, 1,000 watts total)
70 VDC Bus
4 Amps Continuous, 6 Amps Peak (for 2 seconds)
+5VDC differential encoders
Brushless motors also require Hall Effect sensors phased at 120 degrees

Axes Assignments

Axes	Axes Assignment
1 (X)	Transverse or Rail
2 (Y)	Transverse or Rail
3 (Z)	Dual Gantry, CBH, or THC
4 (W)	CBH, or THC

Motor Power Pinout

Pin#	Description
1	Brushless Motor-A or Brush +
2	Brushless Motor-B or Brush -
3	Brushless Motor-C
4	Brake + (24VDC, 250ma max)
5	Brake -
6	Cable Shield
7	No Connect

Additional Notes:

1. Brake output is limited to 250ma total. This output is only used on the THC vertical axis.

Drive Motor Mating Connector

Connector AMP #211399-1
Backshell AMP #206966-1
Sockets 16-18AWG AMP #66101-3
Cabling: Use Belden # 9552 or equivalent for brushed motor signals
Cabling: Use Belden # 9553 or equivalent for brushless motor signals

Encoder Pinout:

1	Encoder +5V
2	Encoder GND
3	Encoder Channel A
4	Encoder Channel A/
5	Encoder Channel B
6	Encoder Channel B/
7	Encoder Channel Z
8	Encoder Channel Z/
9	+V Hall Out (6V @ 30MA max)
10	Hall GND
11	Hall - A
12	Hall - B
13	Hall - C
14	Cable Shield

Additional Notes:

1. Only 5 Volt encoders are supported.
2. Hall Sensors are used with Brushless motors only.
3. Inside the Edge Ti, dipswitches are used to select Brush or Brushless mode, 2 switches per axis. Can mix Brushed and Brushless if switches are set properly.

4. For optimum noise immunity, cable shields may be tied externally to the control enclosure.

Encoder Mating Connector

Connector AMP #206044-1
Backshell AMP #206070-1
Pins (20-14AWG) AMP #66103-3
Cabling: Use Belden # 9504 or equivalent for brushed motor signals
Cabling: Use Belden # 9507 or equivalent for brushless motor signals

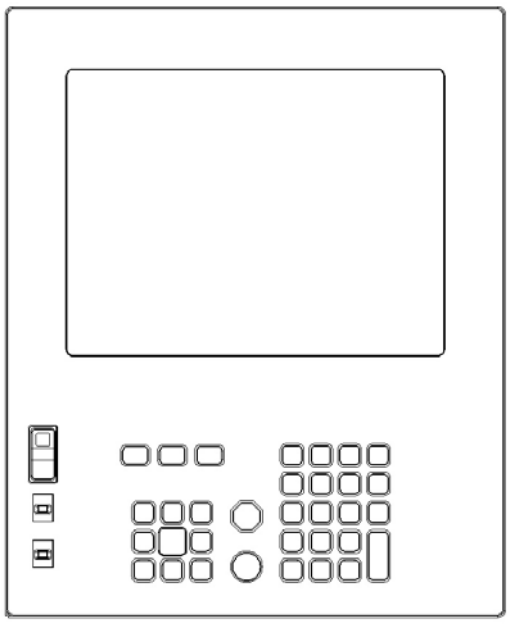
Reminder: Drive Type selection on Axes Setup screen must be set to CURRENT mode.

Voyager III

Overview

The Voyager III™ PC based CNC control for the metal cutting industry utilizes our proprietary Graphical User Interface (GUI) and *SoftMotion* Technology. Voyager III provides the user with increased performance and greater operational flexibility utilizing a 15" touch screen display, 2.4Ghz Intel processor, proprietary operational software and a unique SERCOS/Analog machine interface. Common applications for Voyager class controls include: bevel head systems, multiple Sensor Torch Height Controls and other advanced systems requiring more than four axes for machine interfacing.

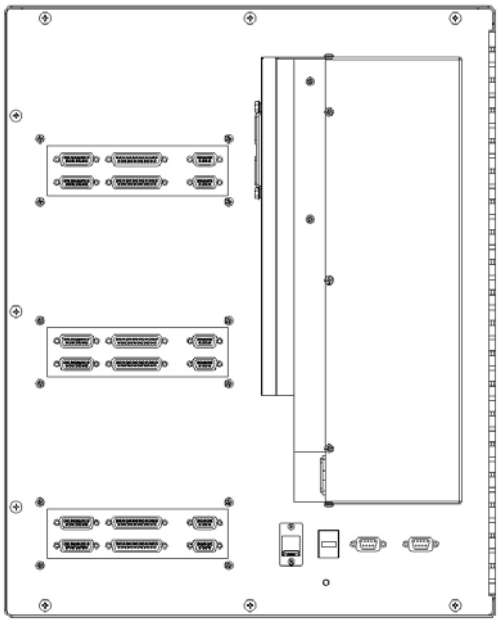
Voyager III™



Touch Screen

The 15" display used in the Voyager III is a patented IntelliTouch Surface Wave technology which provides precise drift free touch accuracy and unsurpassed clarity. Pure glass construction with tiny transducers on the back of the touch screen preserves color purity and works even if scratched. There is no known wear out mechanism as there are no layers, coatings or moving parts. IntelliTouch technology has been tested by the supplier for more than 50 million touches in one location without failure.

Rear View



THC, Joystick & Speedpots

Optional features for Sensor THC, Joystick and Speedpots are offered.

Note: Use of some devices such as USB memory devices may require loading of a device driver for operation. Many standard device drivers are located in the C:\CABS or

Voyager III incorporates a unique machine interface designed by Hypertherm Automation to convert SERCOS (Serial Real Time Communication) to a traditional analog interface. For those not familiar with SERCOS, it is a fiber optic communication ring for commanding motion and controlling I/O that is available from many drive suppliers.

This new interface approach allows Voyager III to offer three styles of machine interface, increasing system flexibility for wiring and features.

Interface options:

1) The standard configuration of Voyager III uses SERCOS internally but provides a traditional and familiar analog machine interface on the back of the CNC.

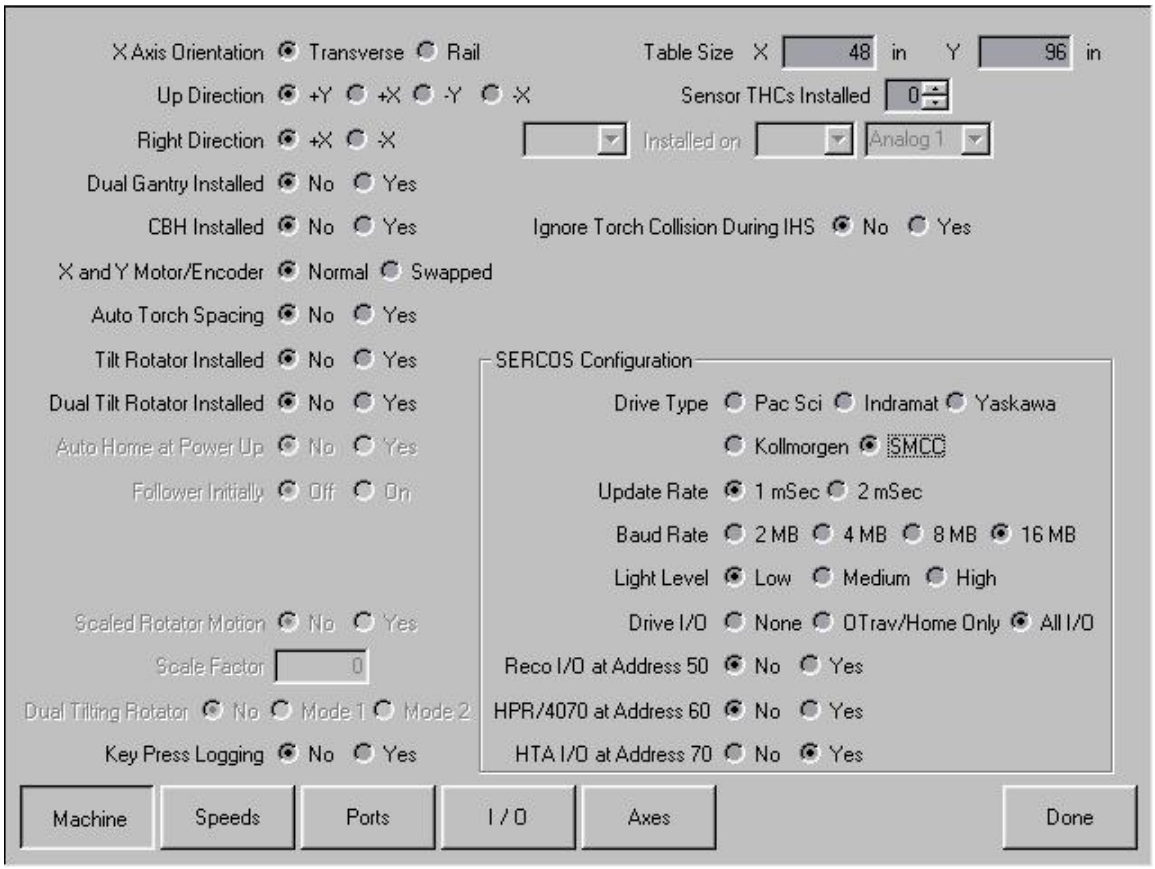
2) Standard SERCOS interface with a fiber optic cable connected to SERCOS amplifiers and I/O.

3) The new SERCOS to Analog conversion card (part # ASSY-0191) is mounted externally using fiber optic communications to the card. The card then provides a traditional analog interface output to motion amplifiers and I/O.

Each interface card offers two axes of motion, thirty-two (16/16) 24VDC positive logic inputs and outputs, plus two analog inputs for Speedpot and Sensor THCs.

The information contained in this section is intended to provide the basic information for connection of the Voyager III™ Shape Cutting Control to the cutting table. Each machine interface will vary slightly based on the cutting table configuration and features. Additionally, I/O pinout information may vary slightly based on the configuration of the selected I/O and their locations. Changes to the I/O configuration may be made in the password protected I/O screen. All controls are shipped with the default selection of Inputs and interface locations for the selected control Interface (I/O) configuration. Installation and service should only be performed by a qualified service technician. For more information regarding the I/O process definitions, please refer to the Setups section of this guide.

Setups



Drive Type

The manufacturer of the SERCOS style drive being used would be selected. This allows proper operation and tuning parameters to be available. SMCC is the default setting for Voyager III.

Update Rate

The update rate for the ring may be selected for motion and I/O. One millisecond is the default setting for Voyager III.

Baud Rate

Communication rate for the ring may be selected. 16 Mbaud is the default setting for Voyager III.

Light Level

The user has the ability to adjust the intensity of the light pulses used on the fiber optic ring. This feature is used to compensate for diminished signal due to issues such as ring distance. Low is the default setting for Voyager III

Drive I/O
The user may select to use I/O options directly supported on the Drive Amplifier. Options are None, Overtravel and Home Switches only or All I/O. Note: The Drive I/O will populate the general purpose I/O (both analog and digital) in order from the lowest SERCOS drive axis to the highest SERCOS drive axis. All I/O is the default setting for SMCC / Voyager III interface.

RECO I/O at Address 50
This parameter is set to Yes if the Indramat RECO I/O module is being used to expand the total number of I/O being used on the standard fiber optic ring. Note: The RECO I/O will populate the general purpose I/O (both analog and digital) following all drive I/O. The default setting for Voyager III is NO.

HTA I/O at Address 70
This parameter is set to Yes if one of the SERCOS to Analog cards is set to be used for I/O expansion.

Common Status Messages

Starting Up Drives on SERCOS Ring. Phase 1 -4
This is a status message to indicate the SERCOS ring power up and will advance through phases 1-4. Failure to reach phase 4 indicates a problem with power up. Cycle power to initiate SERCOS phase up again. If the system repeatedly fails to enable the SERCOS ring, contact your vendor for assistance.

SERCOS Ring not Running. Restart Ring?
This status message indicates the SERCOS ring is currently not running. You may see this when a command such as a motion command is requested but the RING was not enabled. Restart of the ring is recommended.

Updating SMCC software.....
After a control software update, the SERCOS to Analog card software may also be updated at restart of SERCOS ring. It is important not to interrupt this update sequence.

SERCOS Ring Not Running. Please Check Power, Status of LEDs on Drives and I/O Modules, Fiber Optic Ring Connections and SERCOS Baud Rate.
This status message indicates the SERCOS ring is not running after power up. It is recommended to check hardware and parameters then restart the ring by power cycle.

New Setups May Require Restarting SERCOS Ring to Take Effect. Restart SERCOS Ring?
When changes are made to system configuration that affect the SERCOS ring operation, you may be prompted to restart the ring. Restart of the ring is recommended.

SERCOS Drives Not Enabled and Ready. Please Check Drive are Enabled and Ready with No Errors.

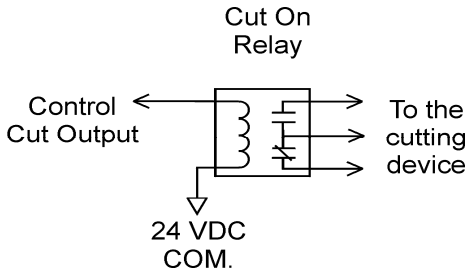
This status message indicates the SERCOS ring is not running due to a missing enable signal. First check that the Control Enable Disabled softkey is correct. The softkey should read DISABLE CONTROL. Then check status of ring hardware or external drives to ensure there are no errors displayed.

Machine Interface

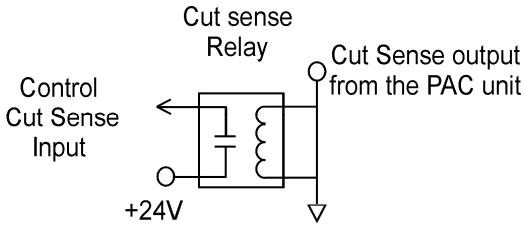
I/O Configuration Type "V" (Positive Logic Single Ended I/O)

Connecting single ended I/O to the control. The control provides +24V power on pins 22, 23 & 24 (+24 VDC) and pins 9, 10, 11 &12 (24 VDC Common) on the I/O connector.

Output tied to external Cut On

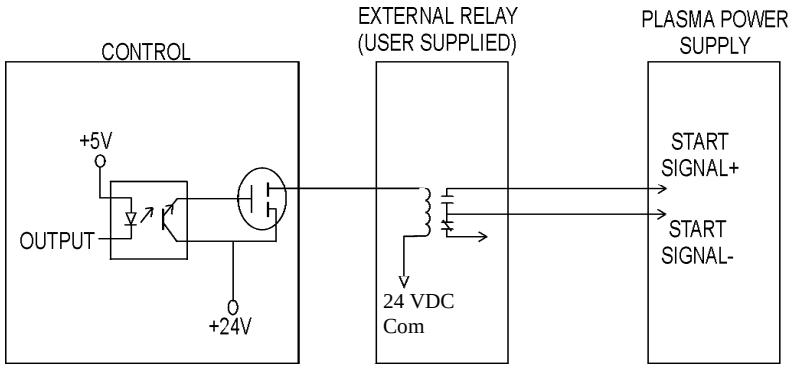


Input tied to Cut Sense Relay

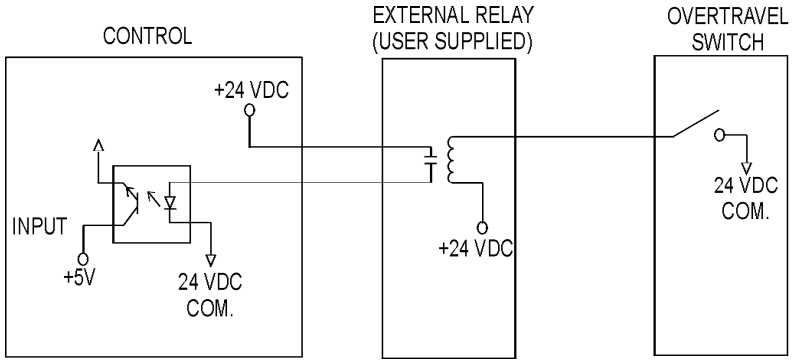


Examples of possible circuits

Output



Input



Single Ended I/O Pinout

The Single Ended I/O offers up to 48 outputs which are rated at 24VDC for up to 1-amp loads and 32 inputs rated for 24VDC as standard

I/O Connector

Pin	Description
1	Output 1
2	Output 2
3	Output 3
4	Output 4
5	Output 5
6	Output 6
7	Output 7
8	Output 8
9	+24 VDC Common
10	+24 VDC Common
11	+24 VDC Common
12	+24 VDC Common
13	Watchdog Contact
14	Input 1
15	Input 2
16	Input 3
17	Input 4
18	Input 5
19	Input 6
20	Input 7
21	Input 8
22	+24 VDC
23	+24 VDC
24	+24 VDC
25	Watchdog Contact

Note: Wiring pattern continues incrementally for I/O 9-16, 17- 24, 25-32, 33-40, 41-48

Mating Connector

Connector: 25C D-Sub Amp # 207464-2 or equivalent
Backshell: Amp #748676-3 or equivalent
Pins: Amp #5-66506-9 (20-24 AWG) or equivalent

Axes	Connector Location*	Axes Assignment
1	Axis 0	X- Transverse or Rail
2	Axis 1	Y- Transverse or Rail
3	Axis 2	Dual Gantry, CBH, Rotate or THC
4	Axis 3	CBH, Tilt or THC
5	Axis 4	Rotate or THC
6	Axis 5	Tilt or THC

Note: Markings on backdoor machine interface for Axes are zero based.

Drive/ Encoder Pinout

Pin	Description
1	Channel A Input
2	Channel B Input
3	Channel Z Input
4	Encoder Power Output (5 VDC supplied as standard)
5	Field Common
6	Servo Output (± 10V)
7	Drive Enable In (relay contact)
8	Field Common
9	Channel /A Input
10	Channel /B Input
11	Channel /Z Input
12	Field Common
13	Field Common
14	Servo Output Common
15	Drive Enable Out (relay contact)

 **Note: Cable Shields should be connected to chassis ground.**

Drive/ Encoder Input Mating Connector

Connector: 15C D-Sub Amp # 25206-3 or equivalent
Backshell: Amp #748676-2 or equivalent
Pins: Amp #5-66506-9 (20-24 AWG) or equivalent

Note: Wiring pattern continues for additional Axes

Analog Connection Pinout

Note on analog connector: For opertional flexibility, inputs and outputs have a shared logic and are provided in both positive logic (+24VDC) and negative logic (24VDC common).

In this application shared I/O means that a single I/O assignment is offered at three locations.

Example: Output 15 could be assigned as the I/O connector a Nozzle Contact Enable. Once assigned in software, this output signal would be available as:

- A positive logic output on second I/O connector Pin 20
- A positive logic output on analog connector Pin 7
- A negative logic output on analog connector Pin 8

Analog 1

Pin #	Designation	Description
1	Analog 1 +	Analog Input (0-10VDC)
2	Analog 1 -	Analog Common
3	+24VDC	
4	Duplicate Input 15	Positive logic shared input 15
5	Field Common	
6	Alternate Input 15	Negative logic shared input 15
7	Duplicate Output 15	Positive logic shared output 15
8	Alternate Output 15	Negative logic shared output 15
9	Field Common	

Note: Wiring pattern continues for Analog 2-6
Assignable shared I/O locations are 15, 16, 31, 32, 47, 48

Mating Connector

Connector: 9C D-Sub Amp # 205204-4 or equivalent
Backshell: Amp #748676-1 or equivalent
Pins: Amp #5-66506-9 (20-24 AWG) or equivalent

Sensor THC Interface

Analog 9C Pin #	Description	Divider J2 Pin #
5	24V Common	1
6	Nozzle Contact Sense	3
8	Nozzle Contact Enable	4
1	Analog In+	6
2	Analog In–	7
Chassis	Shield	No Connection

Mating Connector

Connector: 9C D-Sub Amp # 205204-4 or equivalent
Backshell: Amp #748676-1 or equivalent
Pins: Amp #5-66506-9 (20-24 AWG) or equivalent
Cable Belden #9505 or equivalent

Note: Wiring pattern continues for Analog 2-6

It is recommended that the Hold Ignition Input be wired to the Power Supply through an external relay from the I/O connector. Please refer to instructions from supply manufacturer for details on connection to the Hold Ignition Input.

Voltage Divider Card Pinout (Series 3)

Part # PBS-0061

Divider PCB - 2C Connector J1

Pin #	Description
1	85 -265 VAC Power Input (47-63Hz)
2	85 -265 VAC Neutral Input

Mating Connector

2C Phoenix Connector – Phoenix Part # 1840366

Divider PCB - 8C Connector J2 to Control Analog Connector

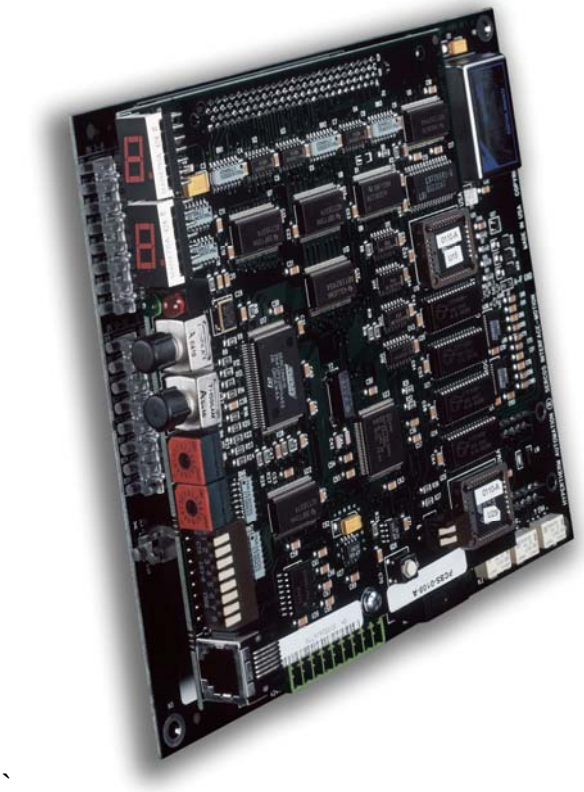
Pin #	Description
1	+24 VDC Common
3	Nozzle Contact Sense
4	Nozzle Contact Enable
6	Analog Out +
7	Analog Out –
8	E Ground

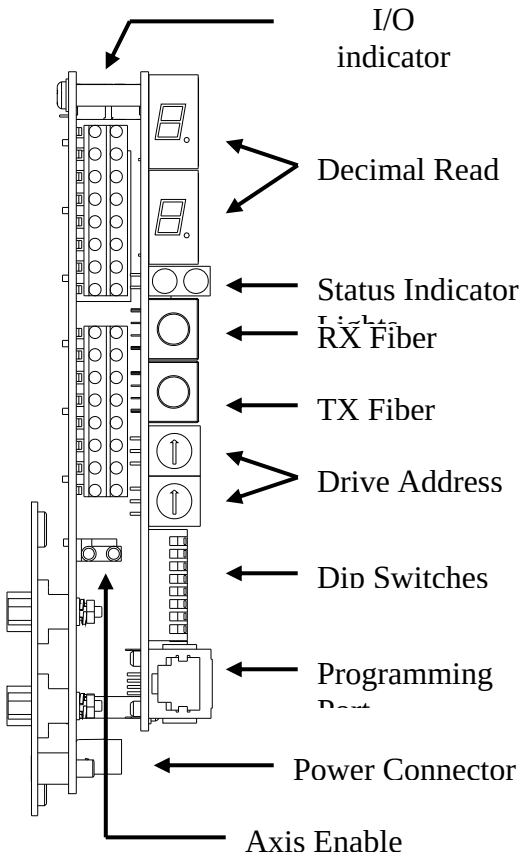
Mating Connector
8C Phoenix Connector – Phoenix Part # 1803633

Divider PCB - 5C Connector J3 to Plasma Supply / Table

Pin Number	Description
1	Ground (Chassis Ground)
2	Electrode (Plasma DC –)
3	Work (Plasma DC +)
4	NC
5	Shield (Nozzle Contact)

SERCOS to Analog Conversion Card





Decimal Read Out
The 7 segment display indicates SERCOS ring phases status 1-4. Additionally, the 2 decimal points in the 7 segment display indicate phase condition for the SERCOS ring and are on immediately after CNC boot up and reset. They remain on until the ring is successfully phased up to phase 4. After that the decimal points remain off even if the ring drops from phase 4. With this approach, if the SERCOS ring is not running, you can determine if the ring has ever made it to phase 4 during that power on cycle. This assumes the card has not been reset or lost power.

Status Indicator Lights
A Red and Green light are provided to indicate status of the SERCOS ring. Red indicates a Fault and Green indicates a RUN status.

Drive Address Rotary Hex Switches
Factory settings are as follows:
For Axes 1 and 2: SW1 = 0, SW2 = 1
For Axes 3 and 4: SW1 = 0, SW2 = 3
For Axes 5 and 6: SW1 = 0, SW2 = 5
For Axes 7 and 8: SW1 = 0, SW2 = 7
For Axes 9 and 10: SW1 = 0, SW2 = 9
For Axes 11 and 12: SW1 = 0, SW2 = B

Note: Markings on backdoor machine interface for Axes are zero based.

Address Rotary Hex Switches (for I/O only)
For I/O Expansion Interface (no Axes being used): SW1 = 7, SW2 = 0

Programming Port
This is for factory use only.

Dip Switch Settings

Fiber Optic Light Level:
Location SW3
Low Level (0-15 meters): 1 = OFF, 2 = OFF (Default setting)
Medium Level (15-30 meters): 1 = OFF, 2 = ON
High Level (30-45 meters): 1 = ON, 2 = OFF
Highest Level (>45 meters): 1 = ON, 2 = ON

Baud Rate:
Location SW3
16 MBAUD 3 = ON, 4 = ON (Default setting)
8 MBAUD 3 = ON, 4 = OFF
4 MBAUD 3 = OFF, 4 = ON
2 MBAUD 3 = OFF, 4 = OFF

Reserved:
Location SW3
5 = OFF, 6 = OFF, 7 = OFF, 8 = OFF

Flash Write Jumpers:
Location SW4
1 = ON, 2 = ON

Reset Button:
SW5 – Press to reset card

Error Codes:

E1 Display Code = "Voltage or Temperature Error Detected!"
Displayed if voltage or temperature sensors on Field Interface board indicate an error. Please check power supply, wiring and connections.

E2 Display Code = "Bad Checksum for SMCC Software!"
Displayed if checksum for SERCOS Slave Flash Program is not correct. Program needs to be reloaded using the Serial Port connection.

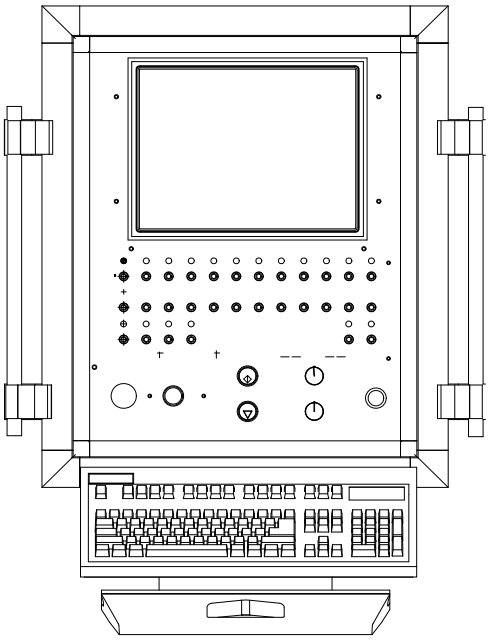
E3 Display Code = "Wrong Interface Board Detected for Selected SERCOS Address!"
Displayed if the selected SERCOS Slave Address/SERCOS Slave mode does not match the Field Interface functionality. For example, using an HPR Field Interface with a SERCOS Slave card set to Drive Address 1-12 is not possible, since these are axes SERCOS addresses only, not peripheral I/O SERCOS addresses.

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 Plasma systems. A unique Laser process screen directly integrates to Hypertherm's *FAST*Laser head. This product uses type "V" software.

Mariner™



Touch Screen

The 15" display used in the Mariner control is a patented IntelliTouch Surface Wave technology which provides precise drift free touch accuracy and unsurpassed clarity. Pure glass construction with tiny transducers on the back of the touch screen preserves color purity and works even if scratched. There is no known wear out mechanism as there are no layers, coatings or moving parts. IntelliTouch technology has been tested by the supplier for more than 50 million touches in one location without failure.

THC, Joystick and Speedpots

Features for Sensor THC, Joystick and Speedpots are provided as standard. Connection and operation information is provided in the Operators and Installation Guide provided with this product.

Note: Use of some devices such as USB memory devices may require loading of a device driver for operation. Many standard device drivers are located in the C:\CABS or D:\CABS\I386 folders.

The Mariner Shape Cutting Control is designed with all machine interface connections passing through the pedestal mount at the base of the enclosure. Motion and I/O are supported via the fiber optic communication ring of the SERCOS Interface.

The information contained in this section is intended to provide the basic information for connection of the Mariner Shape Cutting Control to the cutting table. Each machine interface will vary slightly based on the cutting table configuration and features.

AC Input Pinout

TB connector	Description
101	110VAC or 220VAC Input (Hot)
102	110VAC or 220VAC Input (Neutral)
	AC Power Ground

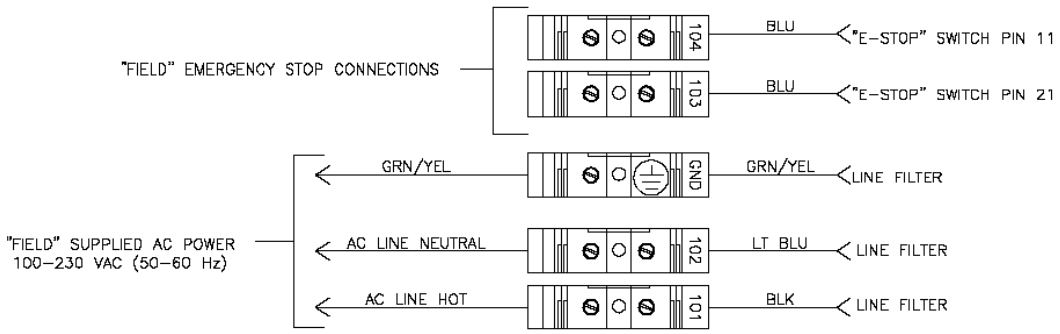
Recommended Wire
14 AWG or greater

E-Stop

The E-stop Switch provides normally open contacts rated at 20VAC/500mA minimum to 250VAC/6A maximum.

TB connector	Description
103	Contact Closure
104	Contact Closure

Diagram Location Din-02



SERCOS Motion and I/O

As noted previously, Motion and I/O are supported via the fiber optic communication ring of the SERCOS Interface. Digital and Analog I/O are supported.

Motion is controlled through address assignments for the axes. Inputs and Outputs work on a similar assignment in SERCOS and may be mapped at the I/O configuration screen.

Details for wiring the motion and /O are specific to the specific SERCOS hardware being used. Please refer to the appropriate supplier for interfacing information.

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