VERSION 10 CAD/CAM/CNC Tutorial

Tutorial Lesson List

Lesson 1 - Features, Installation, and Licensing

Lesson 2 - Drawing in CAD

Lesson 3 - Making a Toolpath in CAM

Lesson 4 - Using the Shape Library

Lesson 5 - Importing an Image

Lesson 6 - Fabrication Heads & Cut Charts

Lesson 7 - Advanced CAD/CAM Tools

Lesson 8 - More Advanced CAD Tools

Lesson 9 - Smart360™

Lesson 10 - Cutting a Part in CNC

Lesson 11 - Diagnostics and Help

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Lesson 1:
Features, Installation, and Licensing

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Application Features

Key:

New or improved in V10	Feature
Included	Y
Optional A-la-carte Feature	O
Not Included	N

Application Features	Std	Pro	Prem	V5	V6	V7	V8	V9	V10
Laser Pointer Software Only	O	O	O			X	X	X	X
Laser Pointer Software and Hardware	O	O	O			X	X	X	X
Feature -Based Processes	Y	Y	Y						X
Mill, Drill and Router Support	O	O	O				X	X	X
Plasma Support	Y	Y	Y	X	X	X	X	X	X
Basic Oxyfuel Support	Y	Y	Y	X	X	X	X	X	X
Enhanced Oxyfuel Support	N	Y	Y					X	X
Waterjet Support	N	O	O			X	X	X	X
Laser Cutting Support	N	O	O				X	X	X
Marker Support	N	Y	Y		X	X	X	X	X
Knife Cutting Support	N	O	O					X	X
Enhanced Drilling and Piercing	N	O	O					X	X
Laser Stitching Support (Included with Laser)	N	O	O					X	X
DXF Export	N	Y	Y		X	X	X	X	X
Printing Support for Part Number Labels, Nest Report and Nest (when licensed for the feature)	N	Y	Y				X	X	X
Advanced Text (Includes True Type Font Support w/o Exploding and Curved Text Around Any Shape	N	Y	Y		X	X	X	X	X
Part Shading	N	Y	Y			X	X	X	X
Animated Cutting Simulation	N	Y	Y			X	X	X	X
Customizable Cut Charts for Differing Materials and Thicknesses	Y	Y	Y			X	X	X	X
Customizable Lead-in, Lead-out Strategies	Y	Y	Y			X	X	X	X
Commonly Used Plate List	Y	Y	Y			X	X	X	X
Multiple Simultaneous Fabheads	N	O	O		X	X	X	X	X
HPR Auto-Gas Control	N	O	O				X	X	X
Kjellberg Smart Focus and Hi-Focus Auto Gas Support	N	O	O					X	X
Smart360	N	O	Y				X	X	X
Improved M-Code and Fab-Head Configuration	Y	Y	Y					X	X
Round Pipe Cutting with Rotary CNC	N	O	O				X	X	X
Rectangular Tube Cutting (add-on to Round Pipe)	N	O	O					X	X
Bevel Round Pipe Cutting with Dual-Rotary CNC	N	O	O					X	X

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CAD Features

Key:

	Feature
New or improved in V10	
Included	Y
Optional A-la-carte Feature	O
Not Included	N

CAD Features	Std	Pro	Prem	V5	V6	V7	V8	V9	V10
Shape Library	N	Y	Y		X	X	X	X	X
Fix Drawing Tool	N	Y	Y		X	X	X	X	X
Bridge Entities Tool	N	Y	Y		X	X	X	X	X
Shape Welding Tool	N	Y	Y		X	X	X	X	X
Measuring Tool	Y	Y	Y		X	X	X	X	X
Chamfer & Cornering Tool	Y	Y	Y		X	X	X	X	X
Part Shading	N	Y	Y			X	X	X	X
Free Form Stretching and Manipulation	Y	Y	Y			X	X	X	X
Layer Support	Y	Y	Y			X	X	X	X
Centerline Image Import	Y	Y	Y			X	X	X	X
Silhouette Image Import	Y	Y	Y	X	X	X	X	X	X
Multi Layer Color Image Import	N	Y	Y				X	X	X
DXF/DWG Import	Y	Y	Y	X	X	X	X	X	X
Arc Fitting	N	Y	Y			X	X	X	X

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Key:

New or improved in V10	Feature
Included	Y
Optional A-la-carte Feature	O
Not Included	N

CAM Features

CAM Features	Std	Pro	Prem	V5	V6	V7	V8	V9	V10
TrueShape Nesting	N	Y	Y		X	X	X	X	X
Automatic Kerf Compensation	Y	Y	Y	X	X	X	X	X	X
Import of parts from external files	N	Y	Y			X	X	X	X
Multi-Sheet and Fill Sheet TrueShape Nesting	N	Y	Y		X	X	X	X	X
Grid Nesting	Y	Y	Y	X	X	X	X	X	X
Corner Looping	N	Y	Y			X	X	X	X
Nesting Report + Part Numbers	N	O	Y			X	X	X	X
Graphical editing of Lead-in Lead-out location	Y	Y	Y			X	X	X	X
Tabbing	Y	Y	Y				X	X	X
Overburn Support	Y	Y	Y			X	X	X	X
Advanced Lead-in Lead-out Editing	N	Y	Y			X	X	X	X
Animated 3D Cutting Simulation	N	Y	Y			X	X	X	X
Assign Different Operations to Each Part	Y	Y	Y			X	X	X	X
Cut Sequencing	Y	Y	Y			X	X	X	X
Drag, Delete, Rotate, Copy parts on the nest	Y	Y	Y			X	X	X	X
Operation Sequencing	Y	Y	Y			X	X	X	X
Cutout or Part Mode	Y	Y	Y	X	X	X	X	X	X
Cutom views of Kerf Width, Cut Direction , Toolpath, Rapids and Part Geometry	Y	Y	Y			X	X	X	X
Advanced Small Hole Processing	N	Y	Y		X	X	X	X	X
Customizable Post Processor	Y	Y	Y	X	X	X	X	X	X
Collision Avoidance	N	O	Y				X	X	X
Multiple Tabs	N	Y	Y				X	X	X
Fill Nest with Common Part	N	Y	Y					X	X
Pattern Nesting	N	Y	Y						X
Common Line Grid Cutting	N	O	Y						X
Remnant Support	N	O	O						X
Free Cutting	N	Y	Y					X	X
Skeleton Cutting	N	Y	Y						X
Seperate Pierces From Cuts	N	Y	Y						X
Chain and Bridge Cutting	N	O	Y						X

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Key:

	Feature
New or improved in V10	
Included	Y
Optional A-la-carte Feature	O
Not Included	N

CNC Features

CNC Features	Std	Pro	Prem	V5	V6	V7	V8	V9	V10
THC Sfw and Hdw	O	O	O	X	X	X	X	X	X
Plasma Communications Sfw and Hdw (RS422 or RS485)	N	O	O			X	X	X	X
Advanced G-Code File Management	N	O	Y		X	X	X	X	X
Automatic Lead-In on Restart	N	Y	Y		X	X	X	X	X
Dynamic Ventilation	N	O	O		X	X	X	X	X
Dynamic THC On/Off	N	Y	Y			X	X	X	X
Jump to Line	Y	Y	Y	X	X	X	X	X	X
Dry Run	Y	Y	Y	X	X	X	X	X	X
Momentary Run	Y	Y	Y			X	X	X	X
Run File Forward and Backwards	Y	Y	Y			X	X	X	X
Motor Current Sensing	N	O	O				X	X	X
Workpiece Alignment (Included with laser pointer)	O	O	O		X	X	X	X	X
Rotary Axis Support	N	O	O			X	X	X	X
Kerf Crossing Detection	Y	Y	Y	X	X	X	X	X	X
Progress Meter	N	Y	Y		X	X	X	X	X
Move to Point in Viewport	N	Y	Y		X	X	X	X	X
Rip Cutting	N	Y	Y			X	X	X	X
THC Performance History Chart	Y	Y	Y			X	X	X	X
PowerMax Sync Cartridge Live Usage Statistics	N	O	O						X
Puddle Jumping	N	Y	Y						X
Smart Touch Off	N	Y	Y			X	X	X	X
Auto Tool Change Support	N	O	O					X	X

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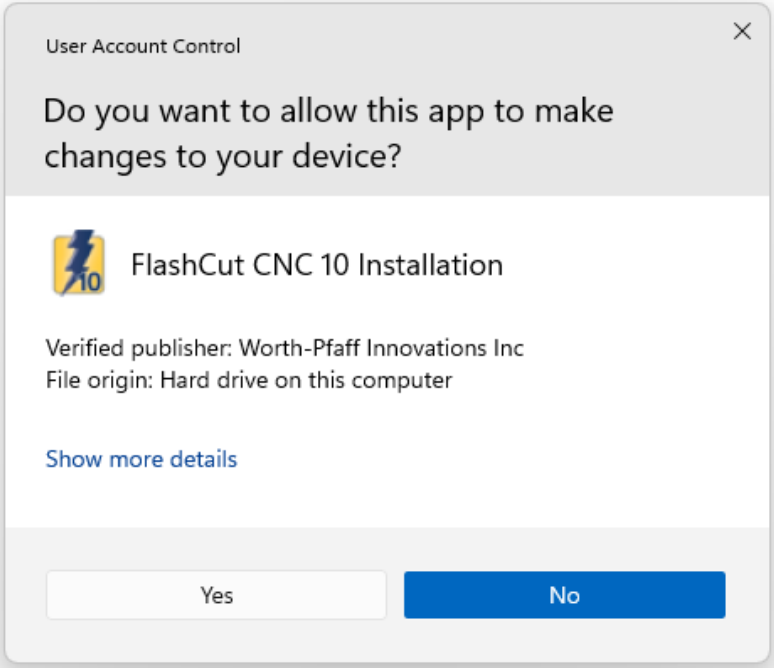
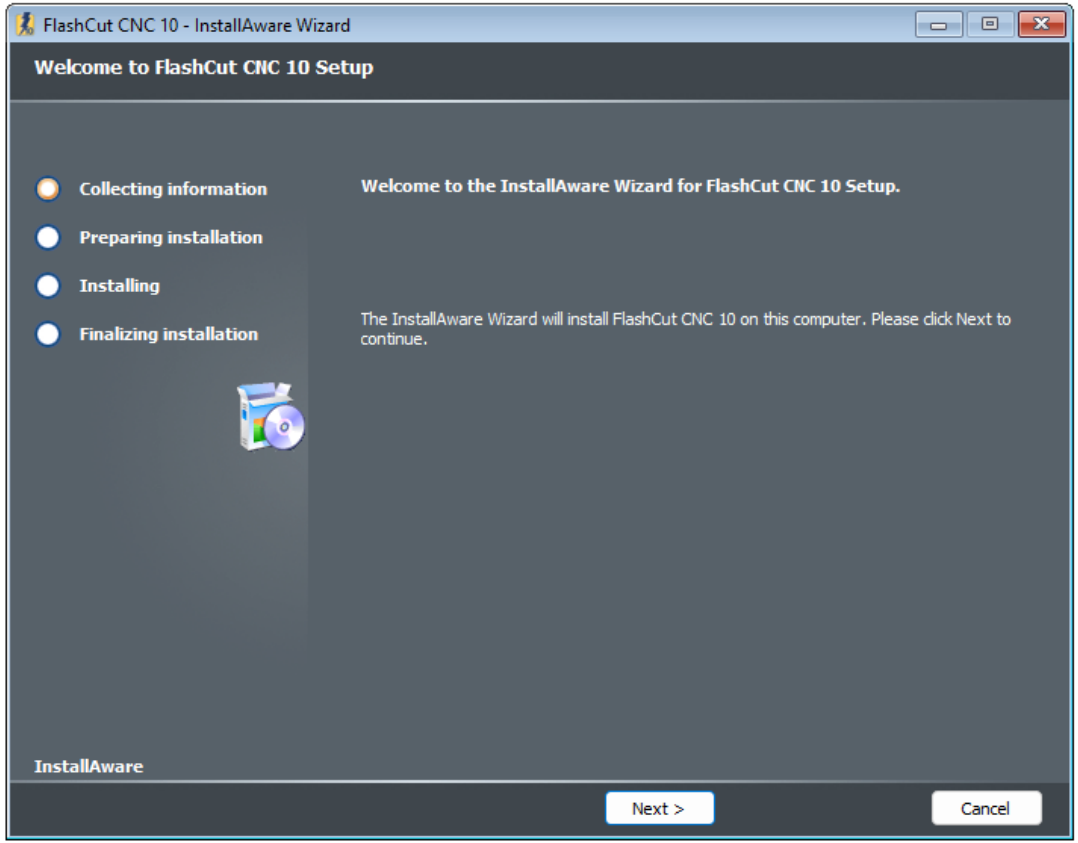
(*You will need 64-bit Windows 10 or newer to run the software)

Installation

1. Launch the FlashCut CNC Version 10 installer*
2. Choose *Yes* in the following



Installation



- If you have a previous version of V10, it will be automatically uninstalled.
- If you already have V5-V9, it will remain installed.
- If you have V5-V9, your setup files can be automatically converted to V10 on startup.

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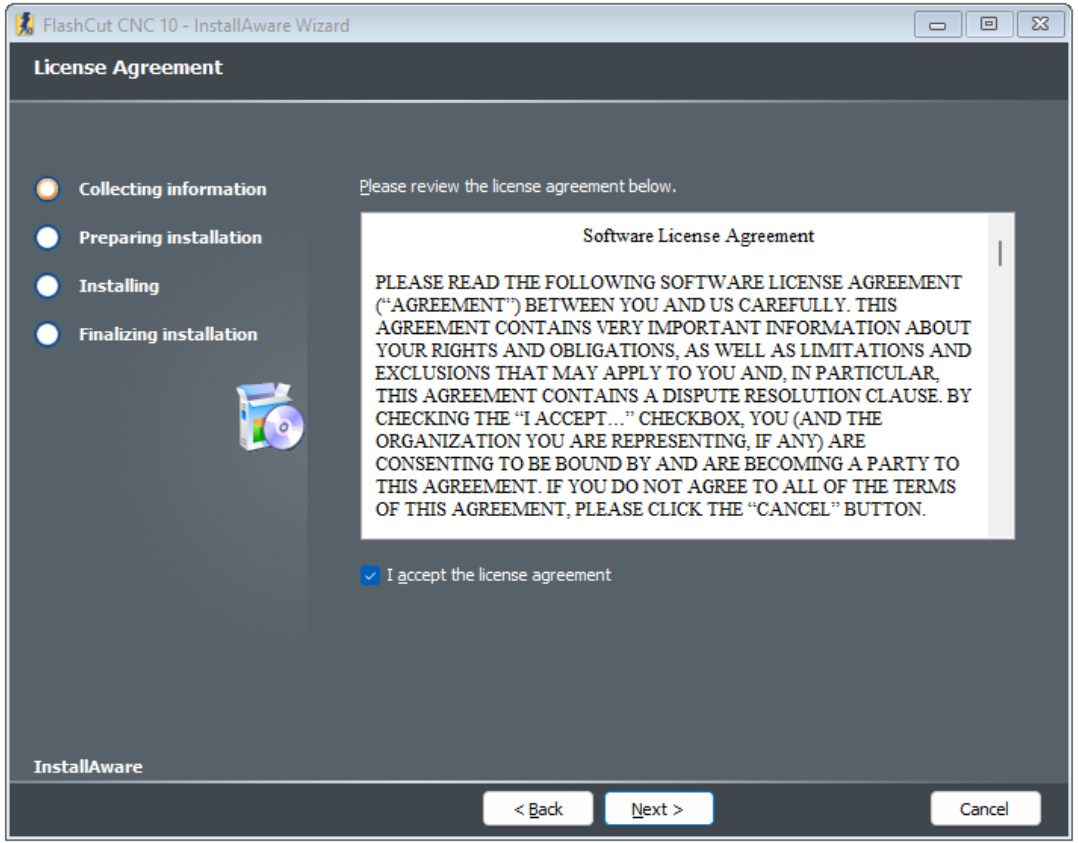
Installation



- Review the software license agreement and accept. Press next to continue the install.

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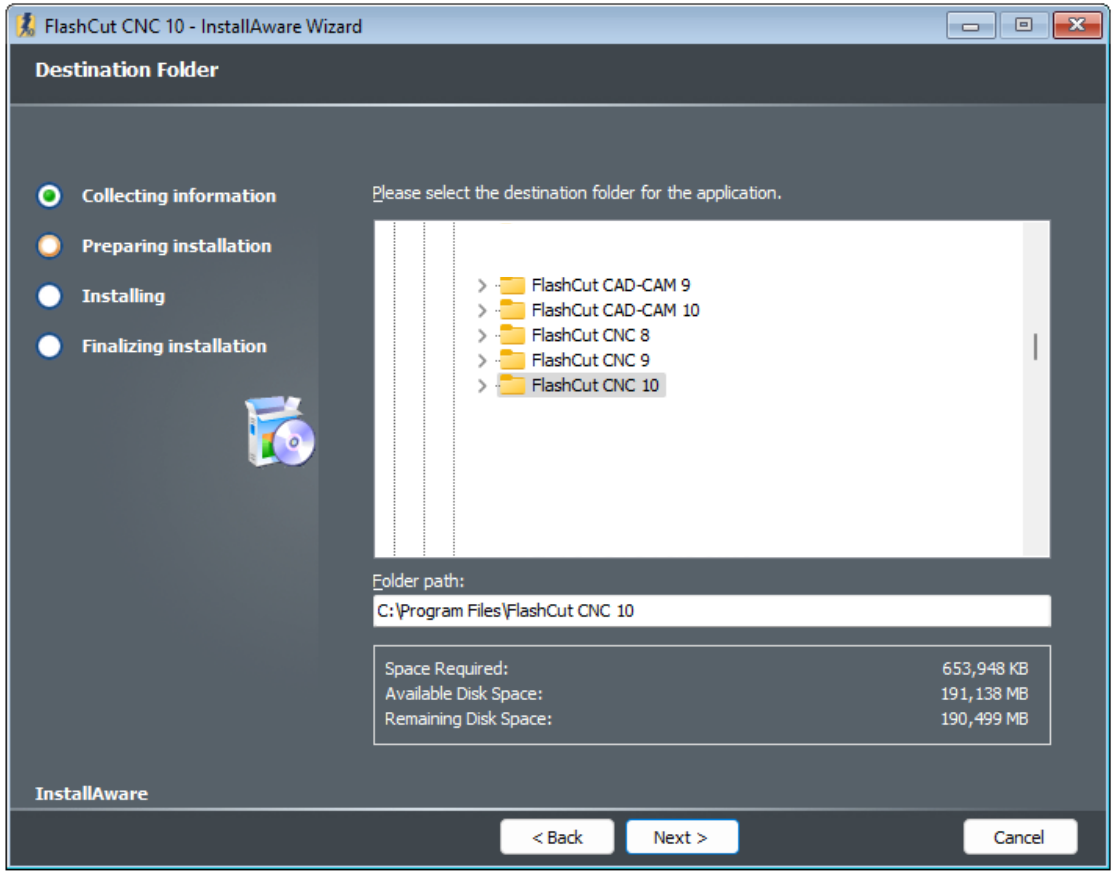
Installation



- Choose the folder location if different than the default and press next for the software to install.

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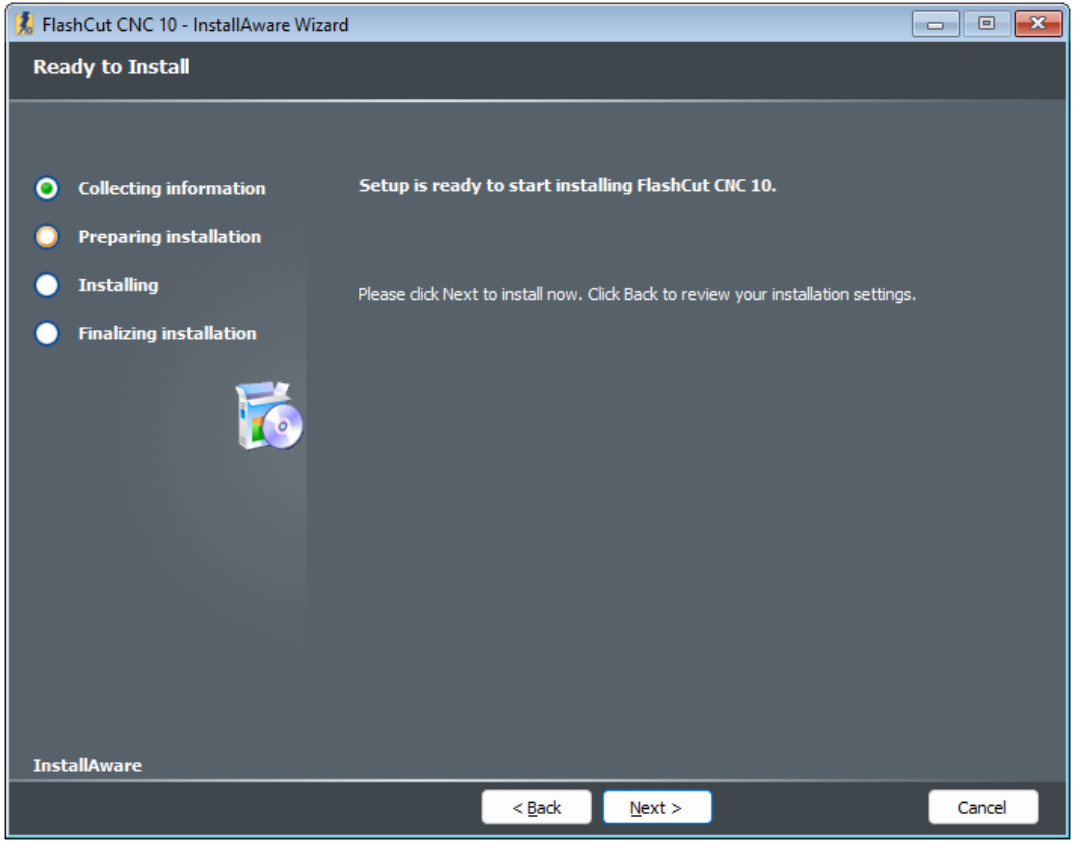
Installation



- Confirm the installation settings by pressing next and begin the install.

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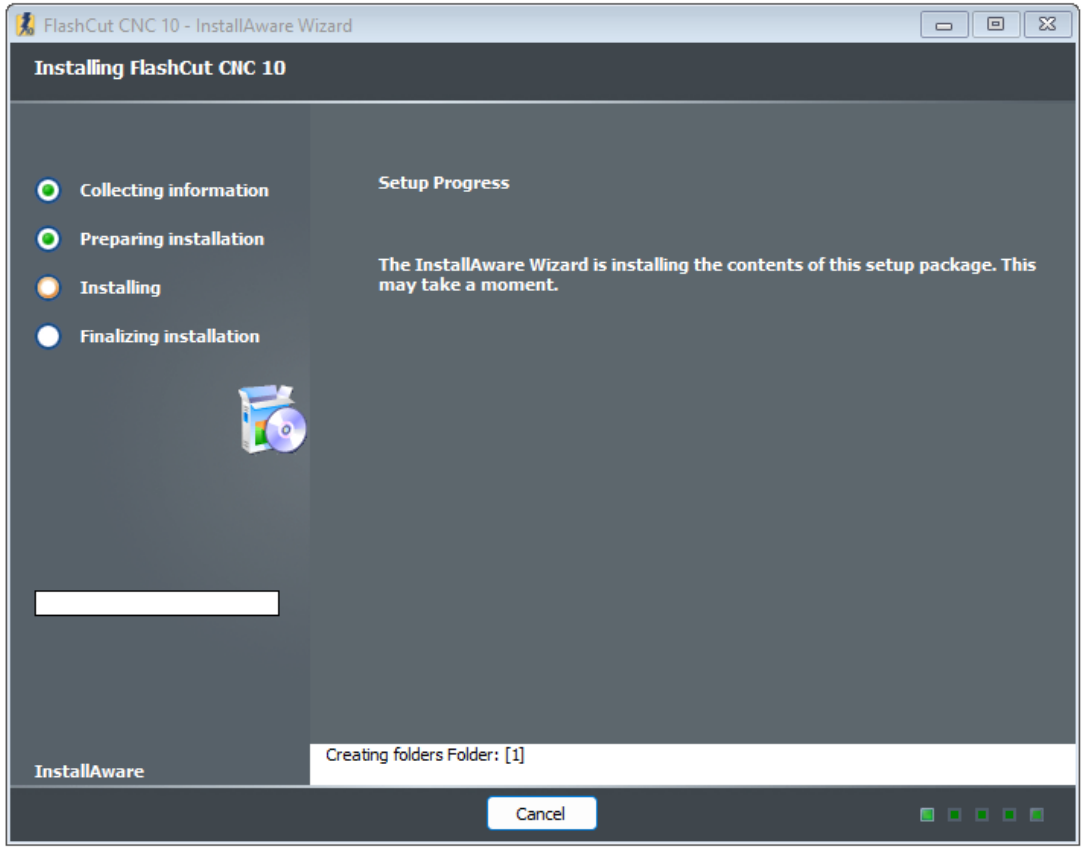
Installation



- Installation wizard automatically installs required components.

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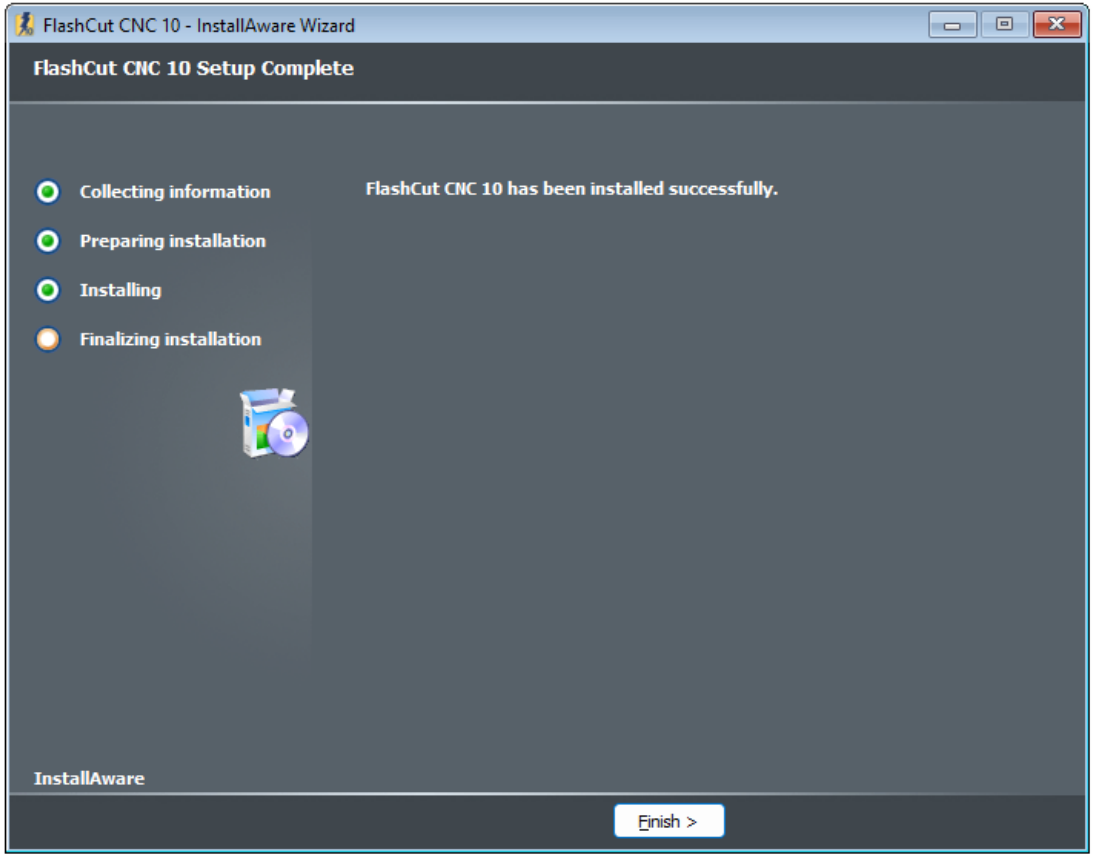
Installation



- The application is successfully installed.
- Launch the application to convert your V5-V9 setup files to V10.

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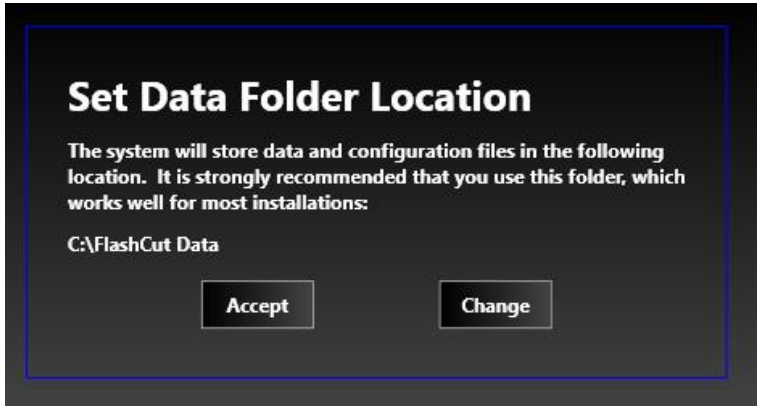
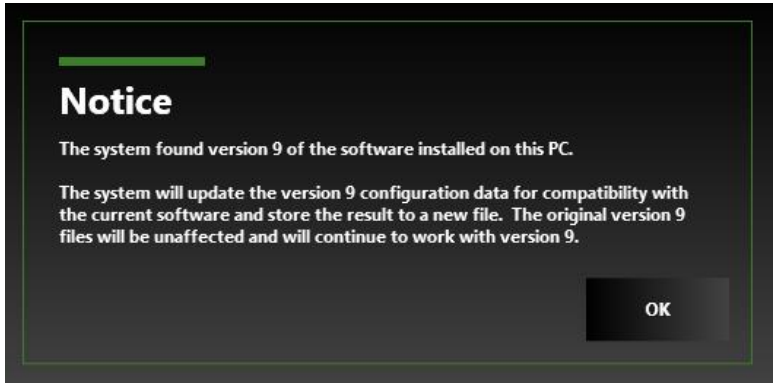
Installation





- Set a Data Folder Location (Default C:\FlashCut Data)
- If you have a previous version of the software installed the software will auto-detect the setup files and convert the previous setup files to the latest version.

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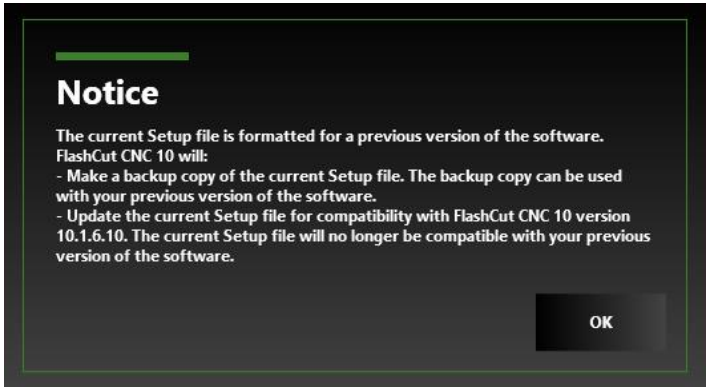
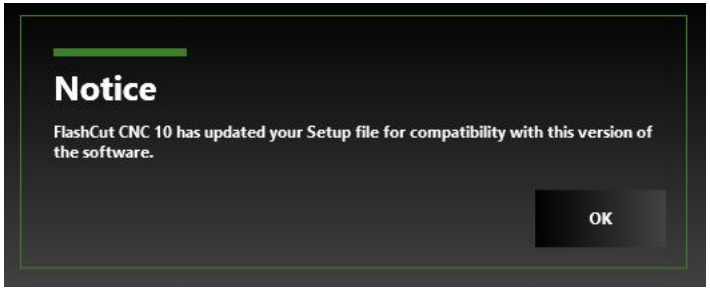
Installation





- V10 will make a backup of your previous versions setup file and attempt to convert it to a compatible version.
- If successful, you will be prompted with the following notice.

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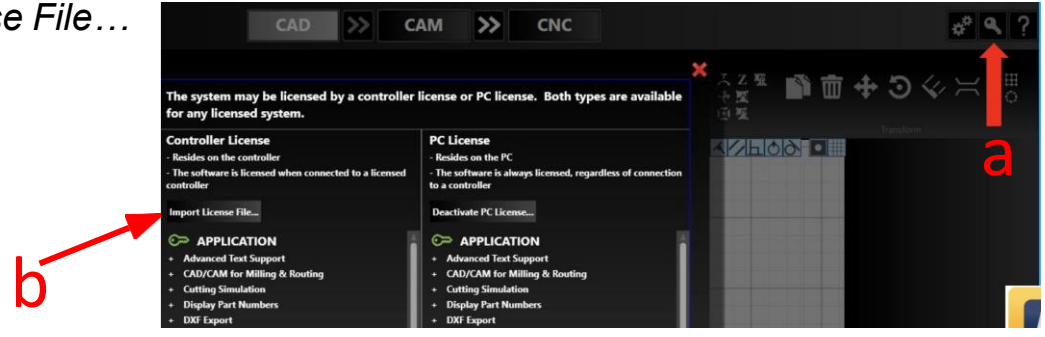
Licensing

1. Each system comes with two software licenses:
    - One license embedded in the controller for any PC that connects
    - One “software-only” license which can be activated on any PC— regardless of being connected to the controller
2. Either type of activated license will allow you to save CAD/CAM files, create G-Code, and send G-Code to the controller.
3. An unlicensed program will run in “Evaluation Mode”; this will allow the user to play with the CAD/CAM features and create G-Code of 25 lines or less, but will prevent saving files or generating more than 25 lines of G-Code.
4. To activate a “software-only” license , first go to the License window
    a. Click the key icon
    b. Locate the appropriate license in the pop-up menu by pressing Import *License File…*



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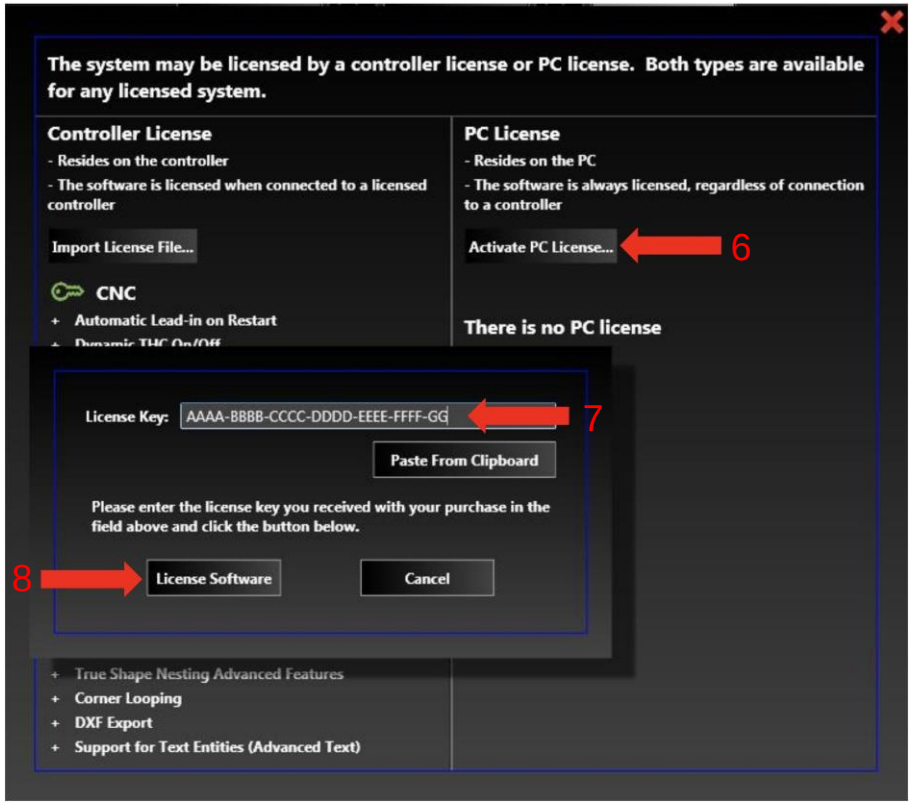
Activating PC License

5. Make sure you have an internet connection with the firewall off or with settings that will allow for an outside program to write to your hard disk

6. Press the Activate PC License button

7.Copy the License Key from the licensing email or back of controller and paste it in the License Key text box by typing or using the Paste From Clipboard option

8. Click the License Software button



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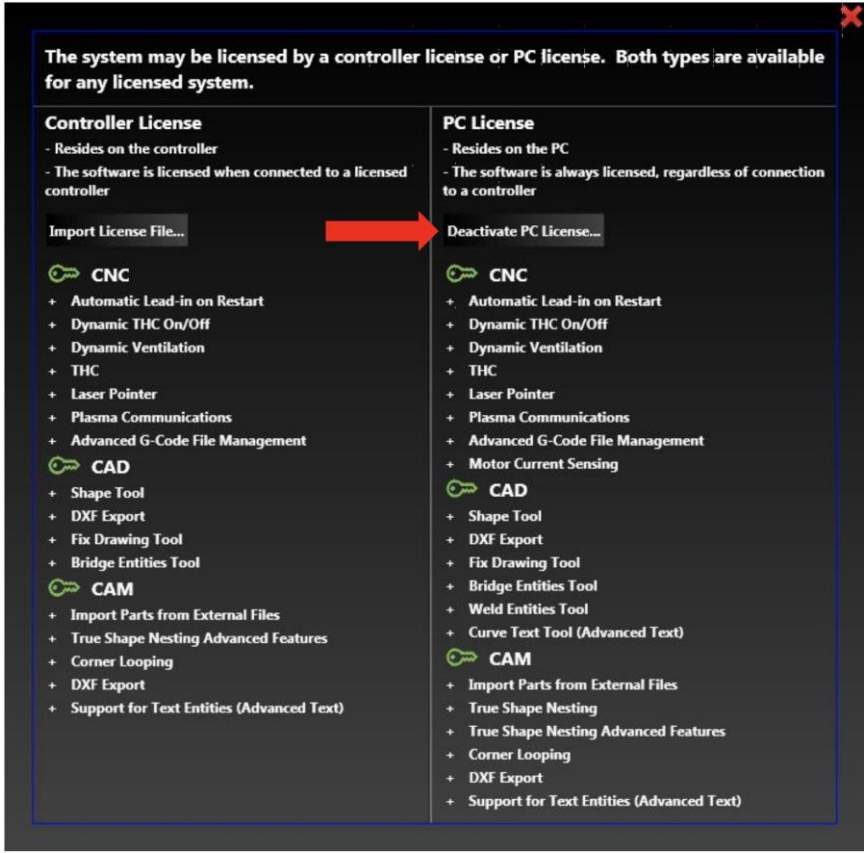
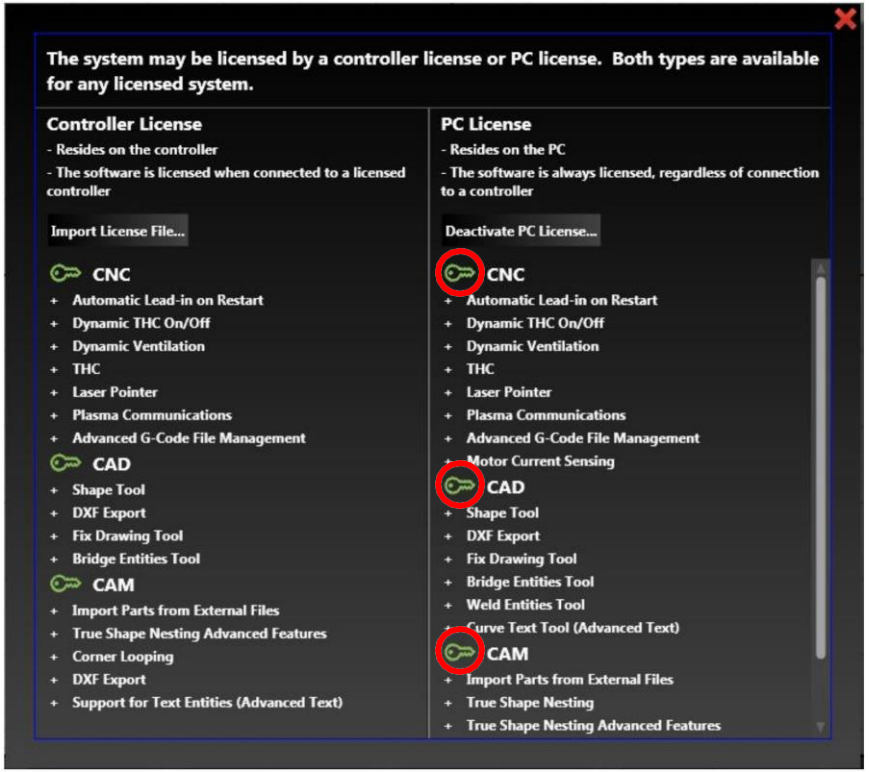
Activating PC License

- The features that you are licensed for are noted under a green key
- Each purchased license is good for one PC and one controller
- The PC license can be transferred to a new PC by first selecting the *Deactivate PC License* button on the original PC and then re-activating the license on a new PC using the same steps as above
- <u>You must have an internet connection on</u> <u>both PCs for this to work</u>



Activating PC License

- Once you have activated your license, you can now view the activated features listed on the license panel
- The green key indicates activated features in each section of the software.



Activating Controller License

1. To activate the controller license, you must do the following:
   a. Make sure your USB cable is connected and your controller is turned on
   b. Go to the CNC tab
   c. Hit the *Connect* button – which will turn green when connected successfully

2. Once you are connected to the controller, it is only necessary to do a “software only” license if the controller PC will not always be connected to the controller

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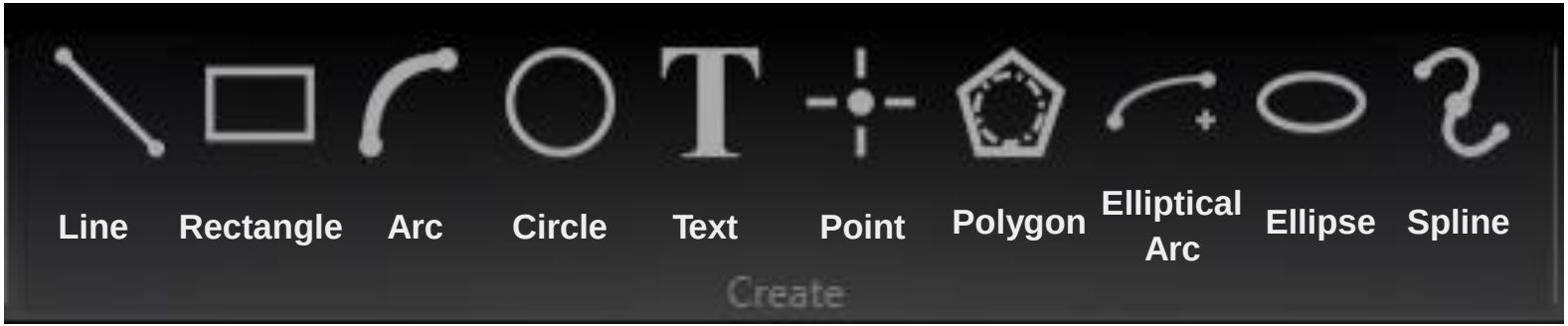
Lesson 2:
Drawing in CAD

Create Tools

Create tools toolbar location below

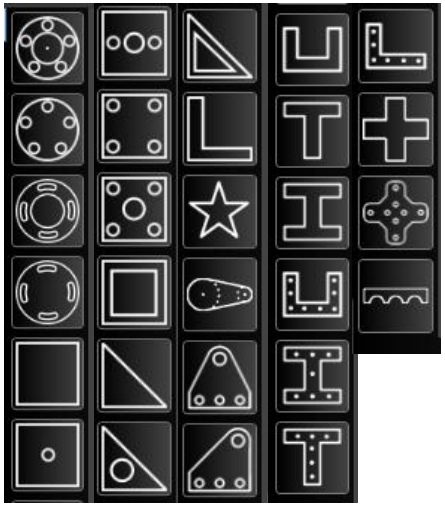
“Create” section labeled below



Shape Library

Shape Library tool location on toolbar

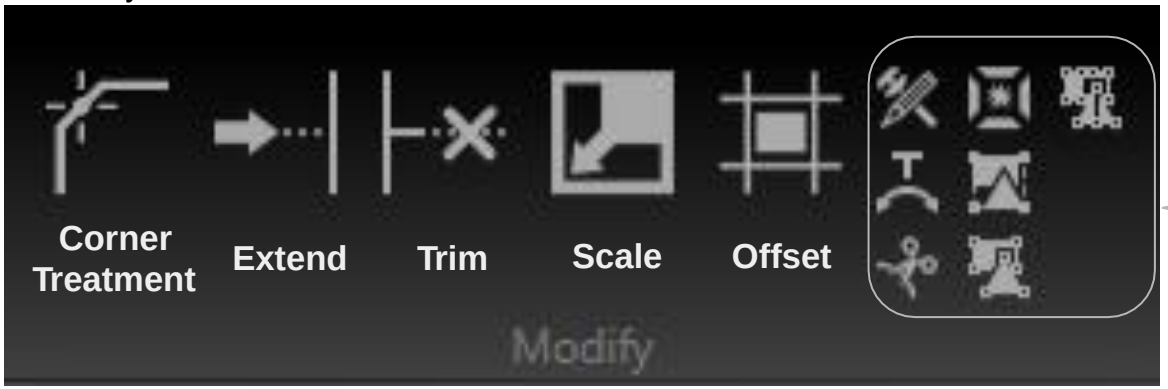
The Shape Library provides premade shapes you can manipulate and add to your drawing field



Modify Tools

Modify Tools section shown on toolbar below

"Modify" section labelled below



- Fix Drawing PRO
- Curved Text PRO
- Cut
- Explode
- Group
- Ungroup
- Ungroup All

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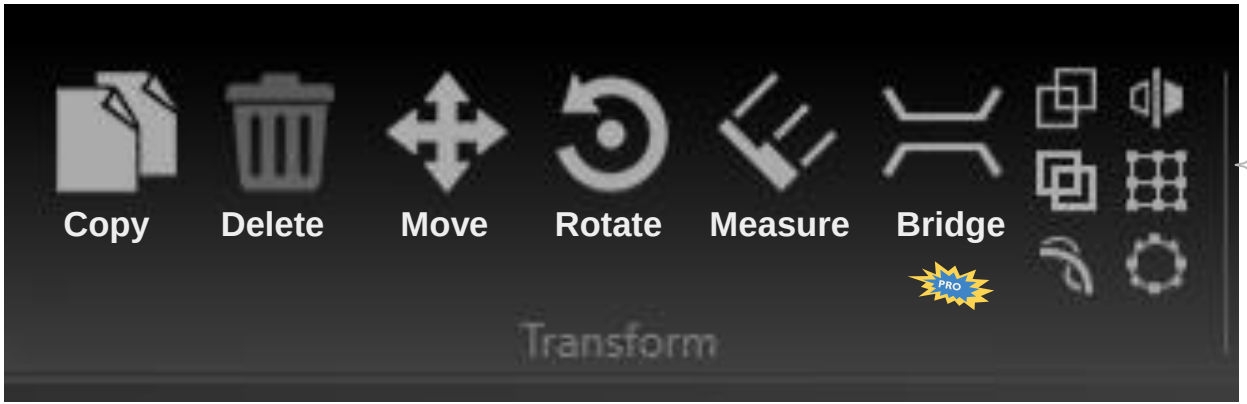
Transform Tools

Transform Tools section shown on toolbar below

"Transform" section labelled below



- Boolean Operations PRO
- Shape Welding PRO
- Arc Fitting PRO
- Mirror
- Linear Matrix
- Circular Matrix

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Toggle Snap and Palate Tools

Snap Tools:

- All Snaps Off
- Center
- Endpoint
- Grid
- Horizontal/ Vertical
- Intersection
- Midpoint
- Nearest
- Parallel
- Perpendicular
- Quadrant
- Tangent

Note: More than one type of snap can be active at one time.

Palate Tools:

- Part Shading On/Off
- Palate Grid On/Off

PRO

The snap tools affect how drawing tools interact with the background grid or with features already created. Clicking a snap tool toggles it on or off. Snap tools cause a feature or segment to lock on to the closest active snap location when the cursor is dragged nearby

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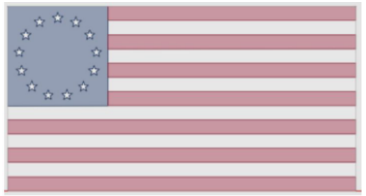
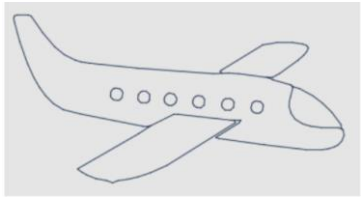
Importing Files

Bitmaps – BMP, DIB, JPG, JPEG, PNG, PBM, PGM, PPM, SR, RAS, TIFF, and TIF

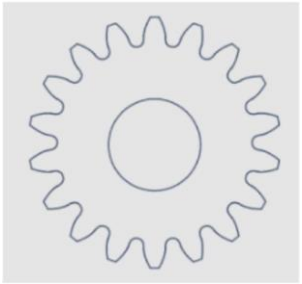


Color Image PRO



Centerline

Silhouette



DXF/DWG Drawings

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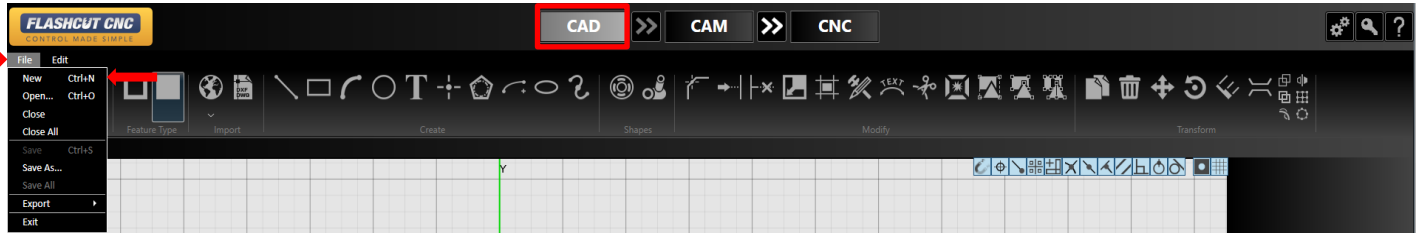
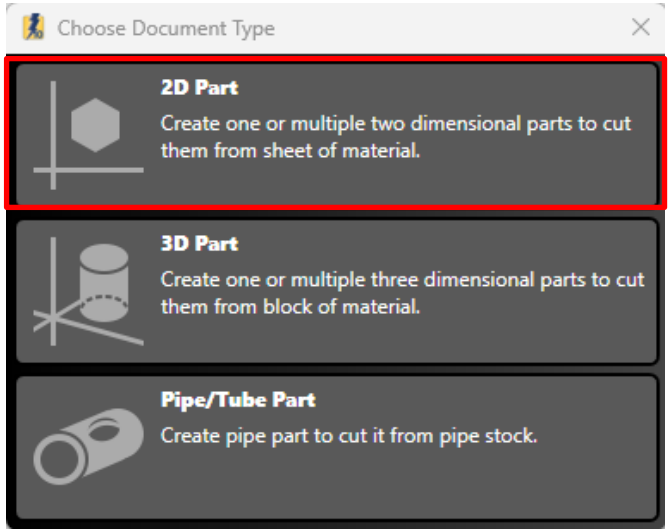
Making a Bracket

Start a new document by clicking on the *CAD* tab and selecting “File” → “New”



Note: A document type selection will pop up if you are licensed for more then one of the following:
2D CAD-CAM,
2.5/3D CAD-CAM,
Pipe/Tube CAD-CAM.

For this tutorial select 2D Part.



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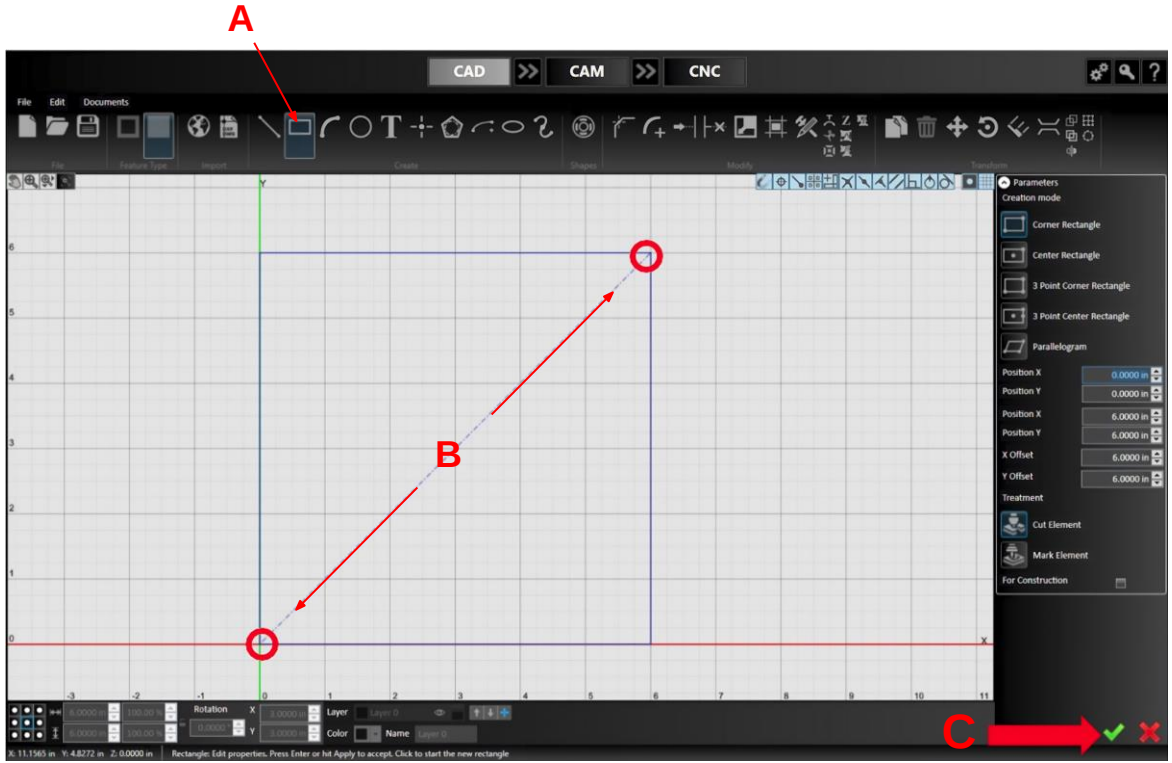
Making a Bracket



Step 1: Make a 6” by 6” Square.

A. Choose the *Rectangle* tool

B. Define the dimensions and placement by either clicking opposite corners with your mouse or setting the XY coordinates in the parameters panel

   a. Make sure the lower left corner of the square is located at (0,0)

C. Click the green check at the bottom of the parameters panel to “Check It In”

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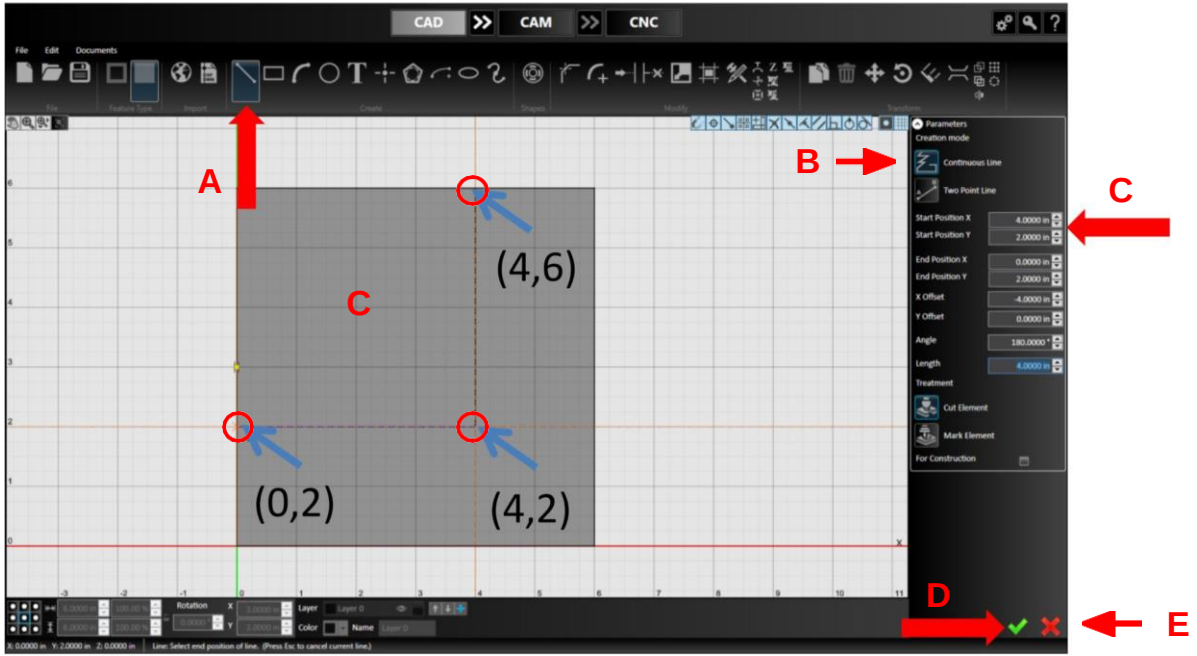
Making a Bracket

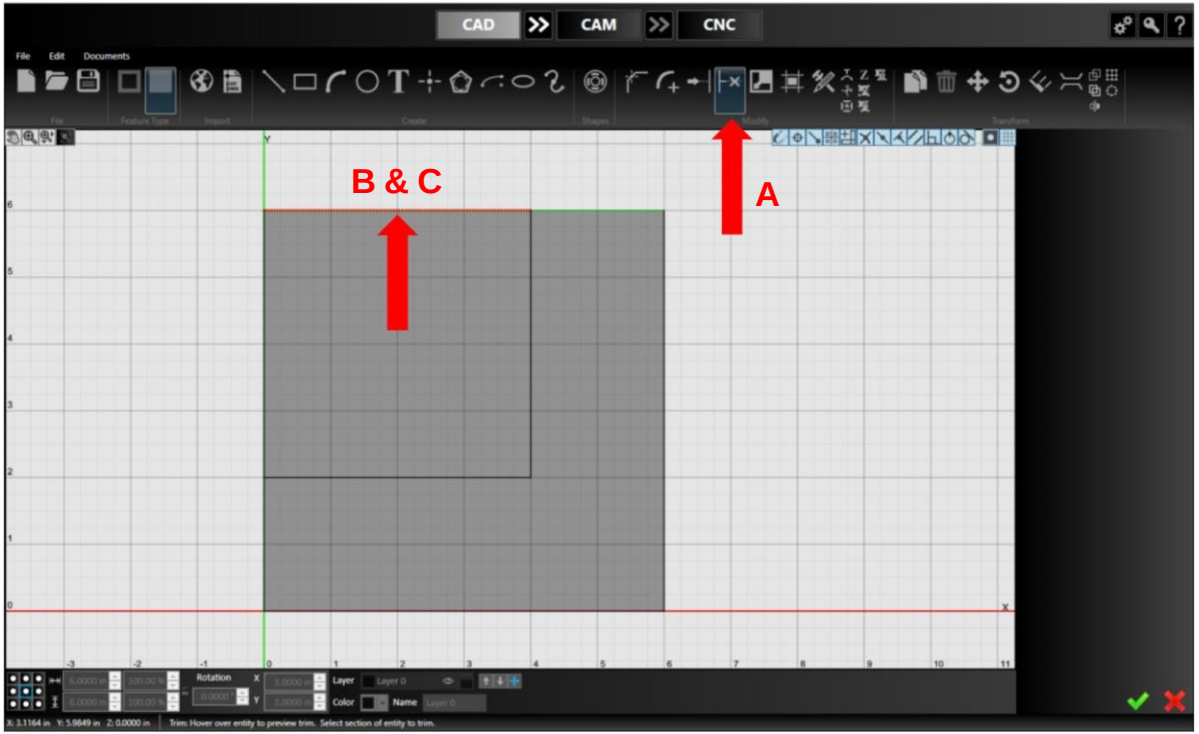


Step 2: Make a Polyline.

A. Choose the *Line* tool in the toolbar
B. Select *Continuous Line* in the parameters panel
C. Select the following three points with your mouse or by typing the XY coordinates: (4,6), (4,2), (0,2)
D. Click the green check to confirm your drawing
E. To end the polyline, click the red X or the *Esc* key

FLASHCUT CNC
CONTROL MADE SIMPLE

Making a Bracket



Step 3: Trim the Excess.

A. Select the *Trim* tool
B. Hover your mouse over the line segment you want to trim; it will turn red
    a. Note: the portion of the line segment that you will keep will turn green
C. Click the red segment to remove

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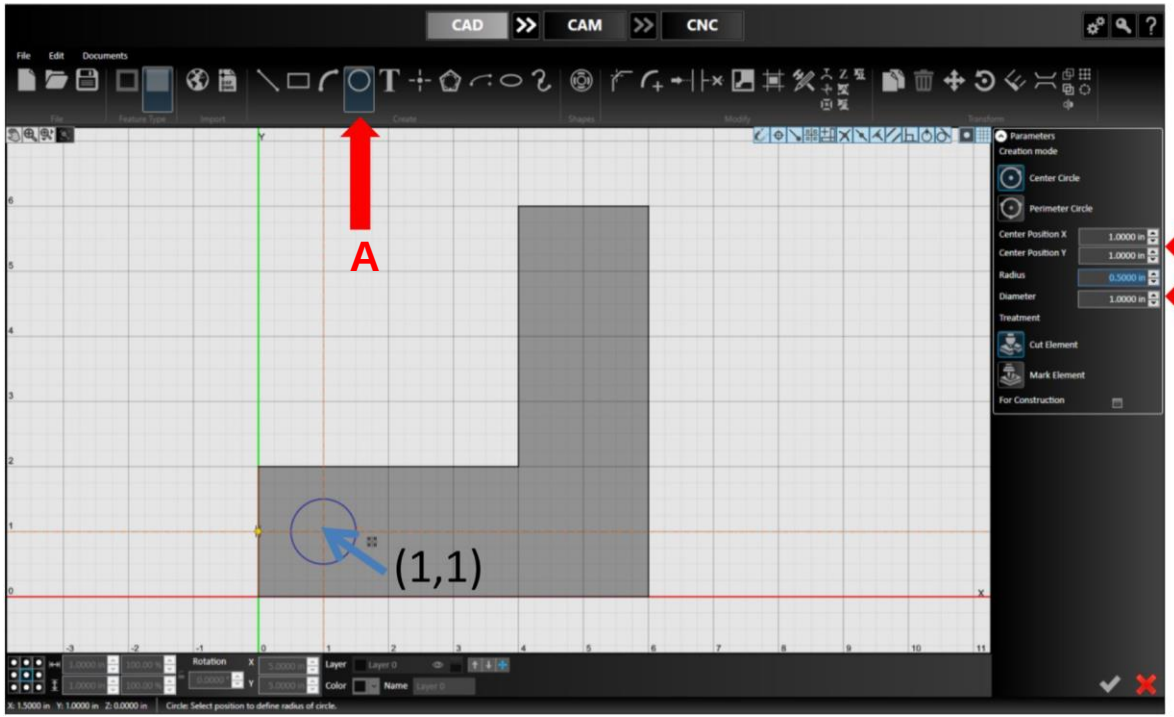
Making a Bracket



Step 4: Draw a Circle.

A. Select the *Circle* tool

B. Select the center point (1,1) with your mouse <u>or</u> type the XY coordinates in the parameter panel

C. Set the diameter to 1 with your mouse <u>or</u> enter the value into the parameter panel

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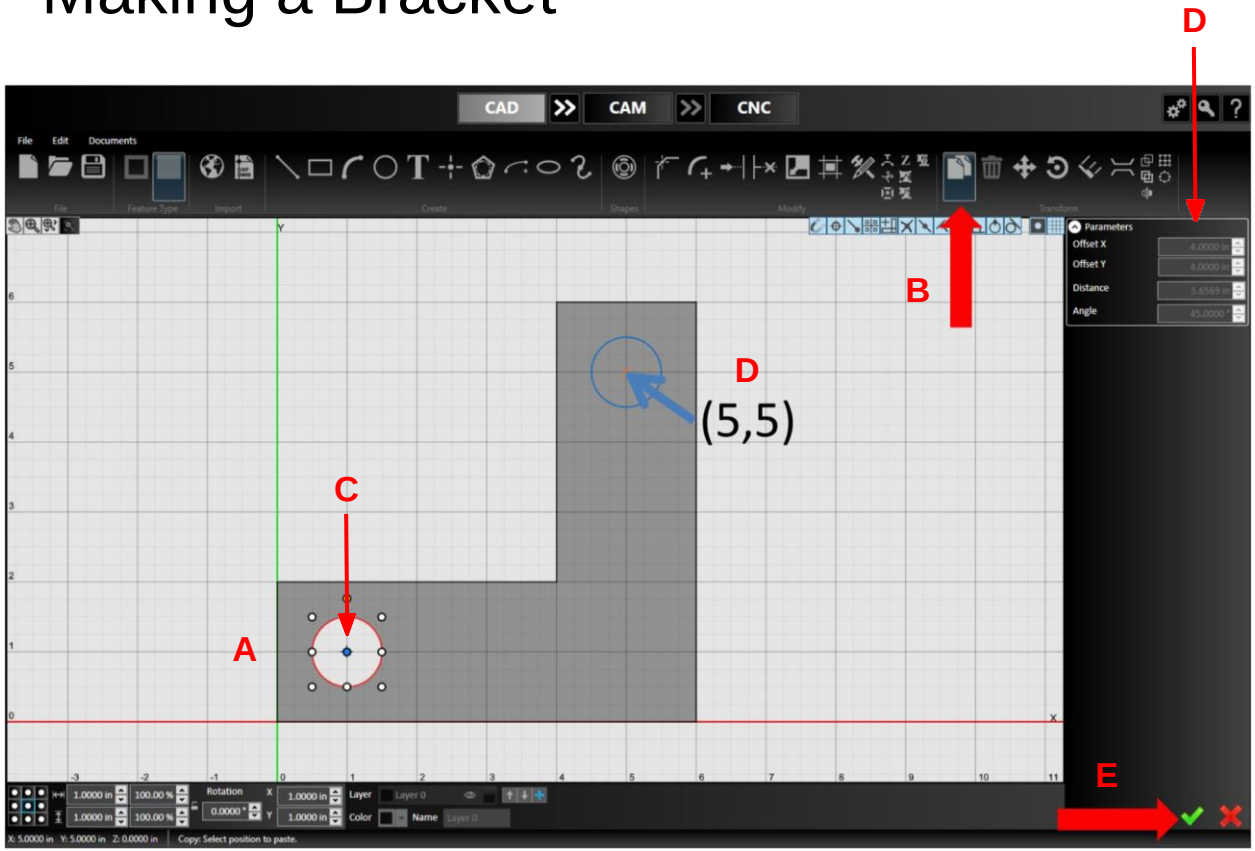
Making a Bracket



Step 5: Copy the Circle.

A. Select the existing circle; it will turn red

B. Select the *Copy* tool

C. Select the center of the existing circle as a reference point

D. Select the new center point at (5,5) with your mouse. The X/Y offset should read 4.00in in the parameters panel

E. Check it in

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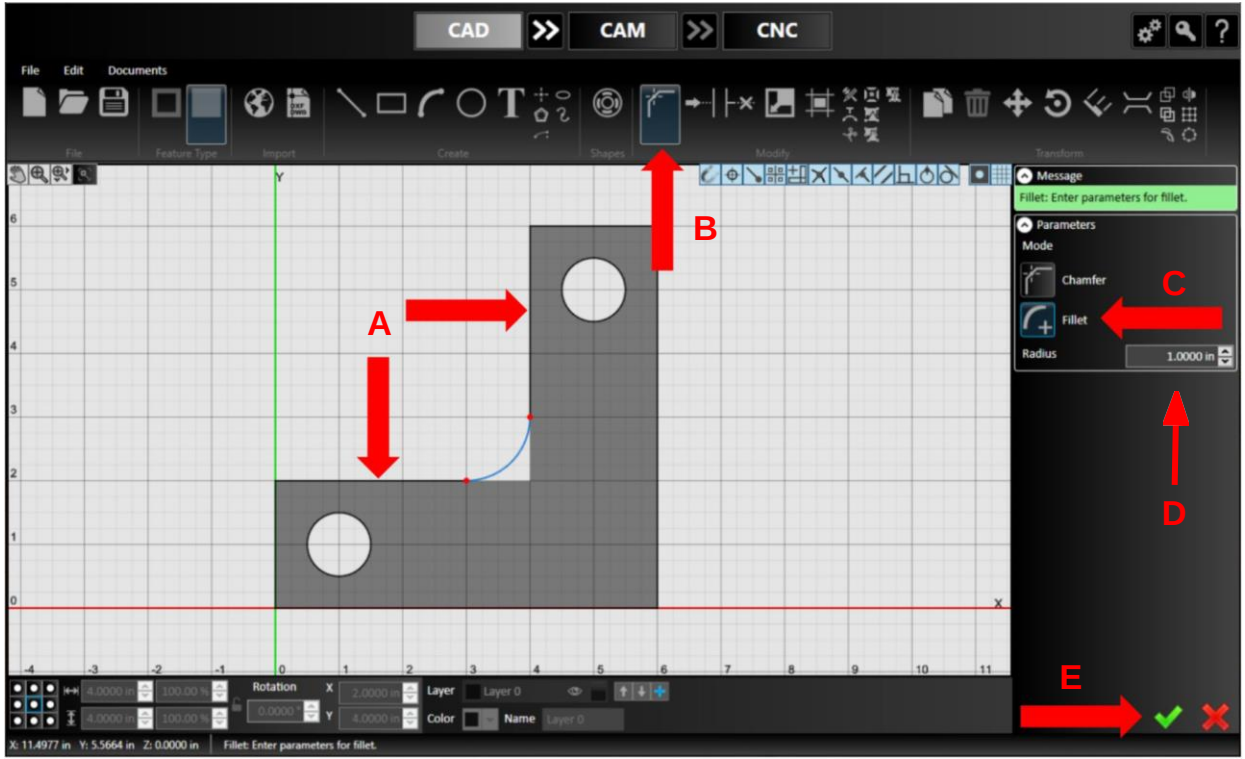
Making a Bracket



Step 6: Create a Fillet.

A. Select the inner corner or two adjacent lines to fillet; they will turn red
B. Choose the *Corner Treatment* tool in the toolbar
C. Select *Fillet* in the parameters panel
D. Adjust the radius by clicking and dragging w/ mouse or enter a radius of 1.0 in the parameters panel
E. Check it in

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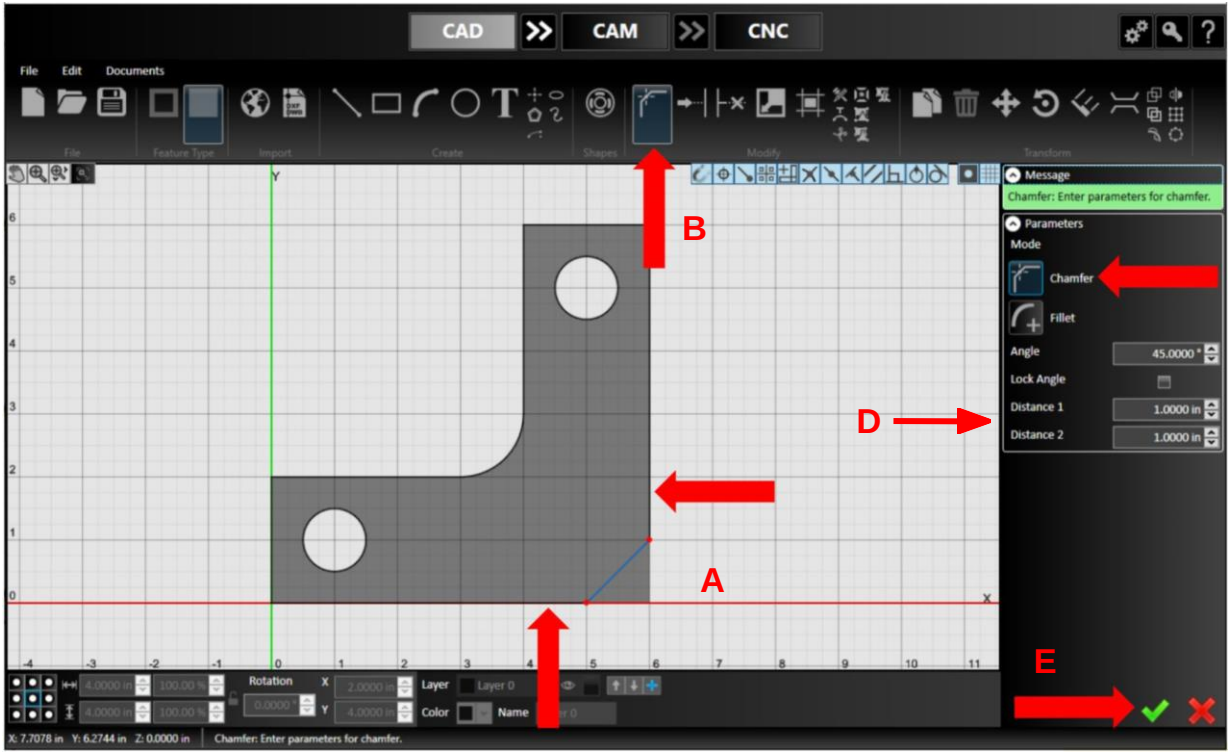
Making a Bracket



Step 7: Create a Chamfer.

A. Select the lower right corner <u>or</u> the two adjacent lines to chamfer; they will turn red

B. Choose the *Corner Treatment* tool again

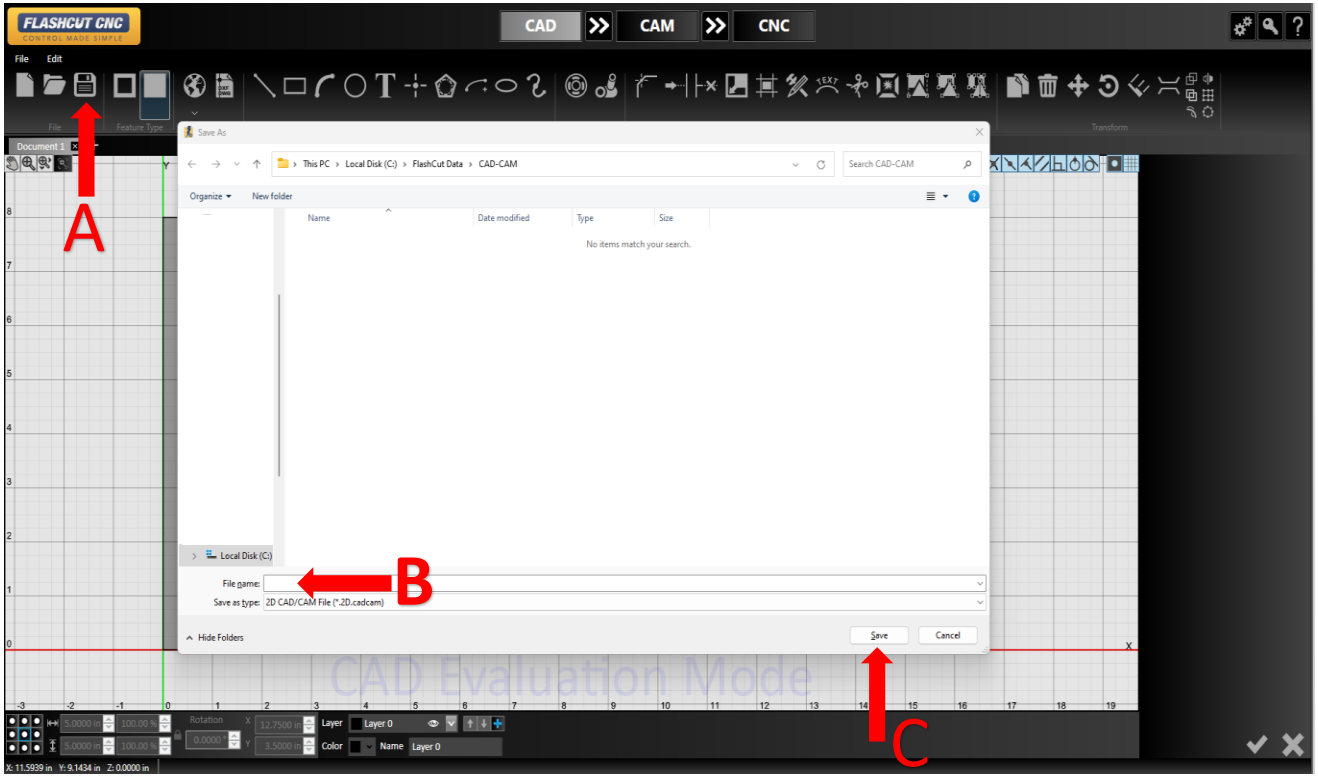
C. Select *Chamfer* in the parameters panel

D. Either drag to size <u>or</u> enter a length of 1.0 for Distance 1 & 2

E. Check it in

FLASHCUT CNC
CONTROL MADE SIMPLE

Making a Bracket



Step 8: Save the Drawing.

A. Select the *Save* icon <u>or</u> from the *File* menu choose *Save*

B. Name the file “Bracket” when prompted to do so

C. Hit the *Save* button

Note: CAD-CAM files get saved to **C:\FlashCut Data\CAD-CAM** by default.

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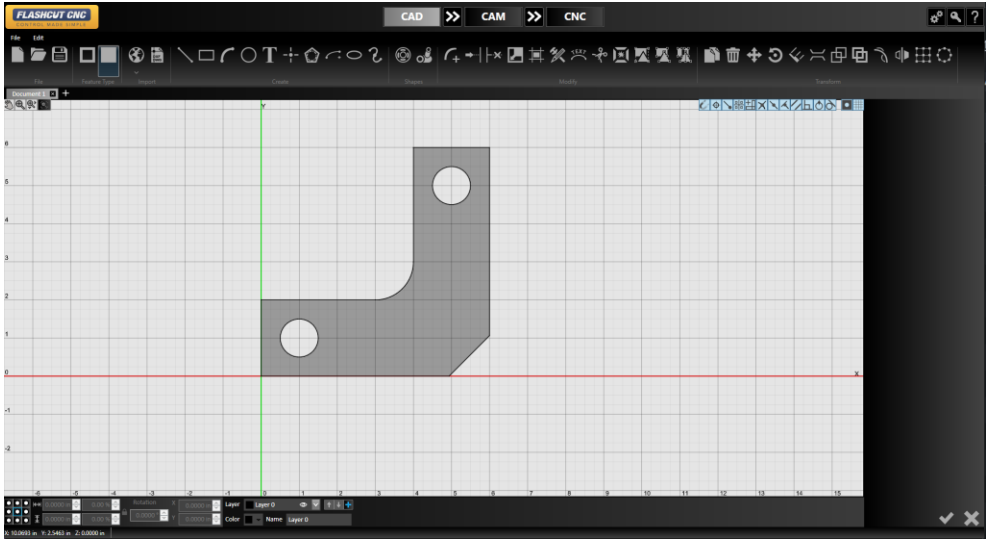
Lesson 3:
Making a Toolpath in CAM



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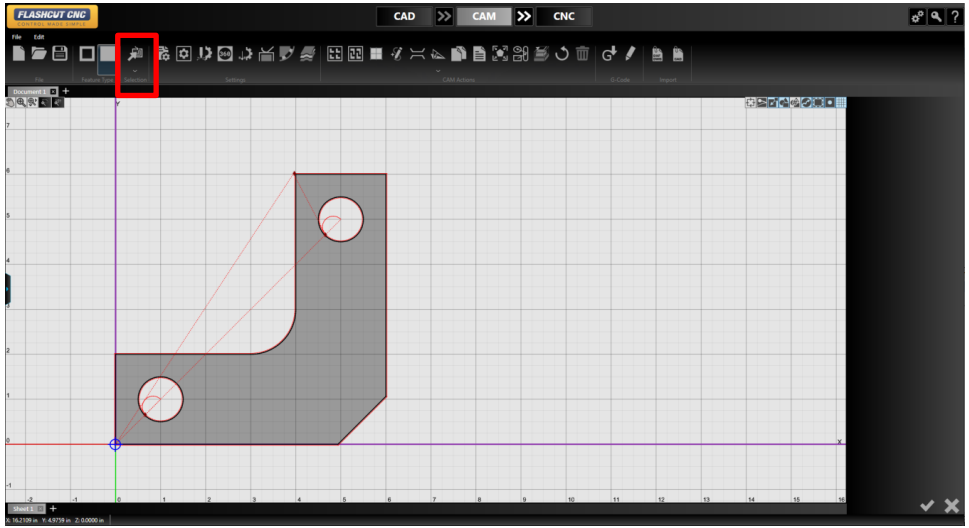
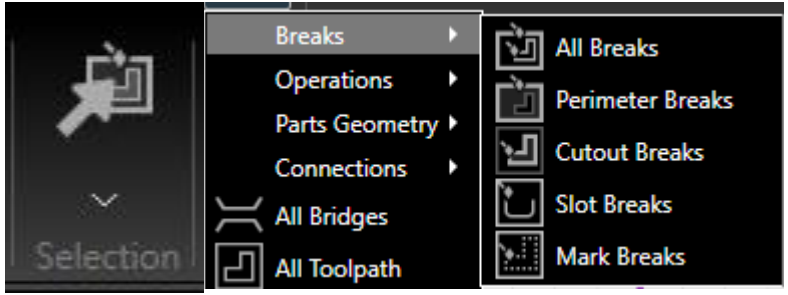
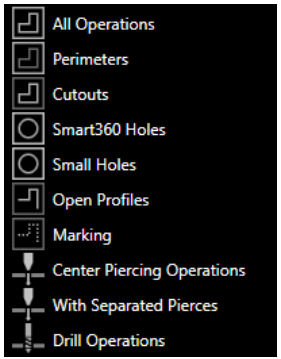
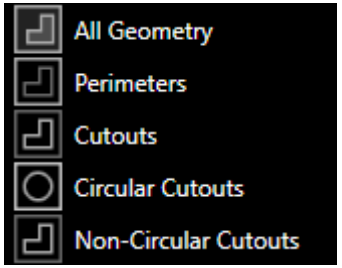
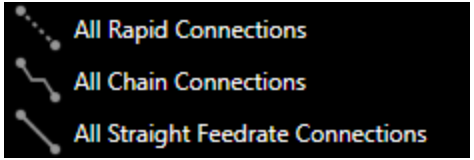
Using CAM: Selection Tool











- Used to select groups of entities:
  - Breaks – All; Perimeter; Cutouts, Slot, Marks
  - Operations – All; Perimeter; Cutouts; Smart360 Holes; Smart Holes; Open Profiles; Marking; Center Pierces; Separated Pierces; Drilling
  - Geometry – All; Perimeter; Cutouts; Circular Cutouts; Non-Circular Cutouts.
  - Connections – All Rapid; All Chain; All Straight.

Note: Ctrl-click will also add or subtract entities from the current selection

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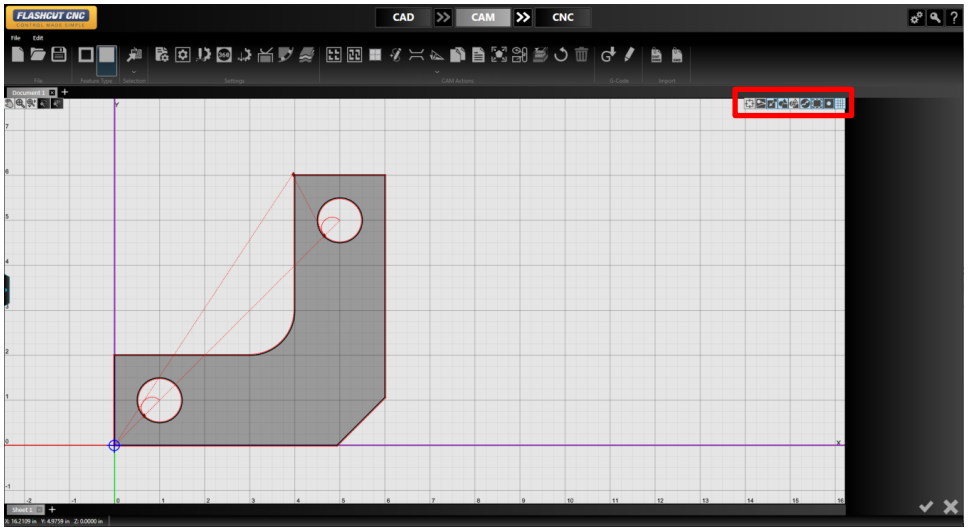
Using CAM: Display Options



Convenient way of displaying and hiding:

- *Cutting Direction*
- *Kerf Compensation*
- *Perimeter of Material*
- *Parts*
- *Part Numbers* OPT
- *Rapid Moves*
- *Toolpath*
- *Part Shading* PRO
- *Gridlines*

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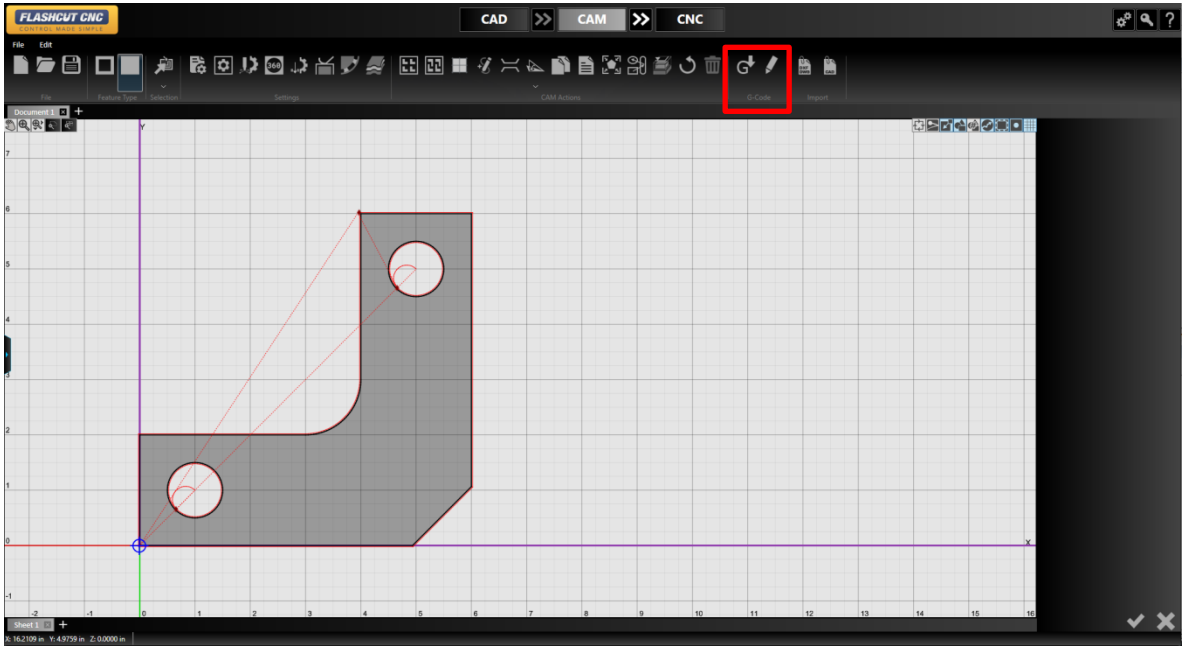
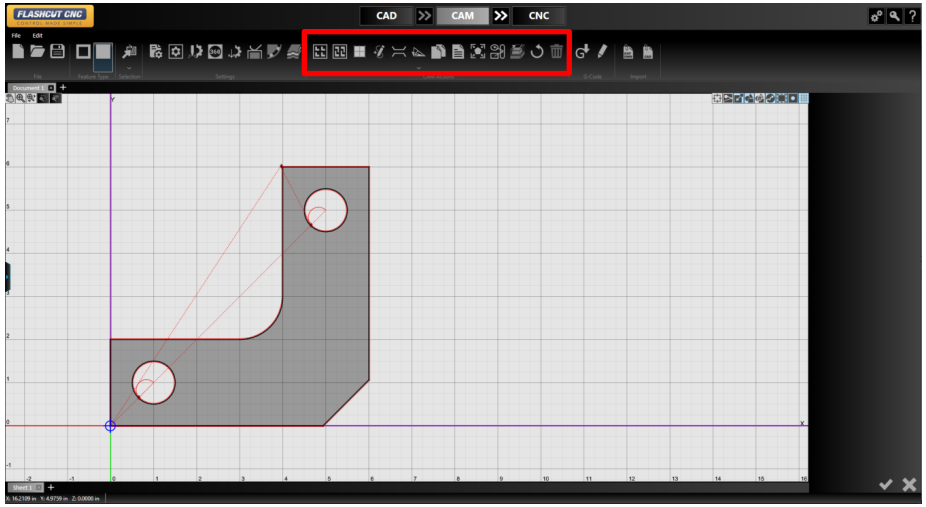
Using CAM: G-Code Generation



Use to *Generate* and *Edit* G-Code

Using CAM: CAM Actions



- *Grid Nesting*
- *True-Shape Nesting* PRO
- *Common Line Tool* OPT
- *Create a free path* PRO
- *Bridge tool* OPT
- *Layout Tool*
- *Multi Copy*
- *Nesting Report* OPT
- *Fit workpiece to the parts*
- *Connections Tool*
- *Cutting Simulation* PRO
- *Reset Tool Path*

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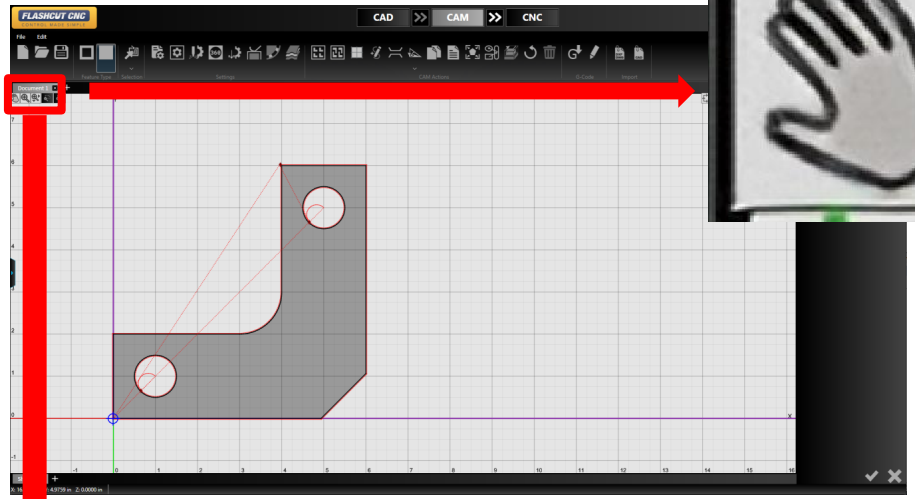
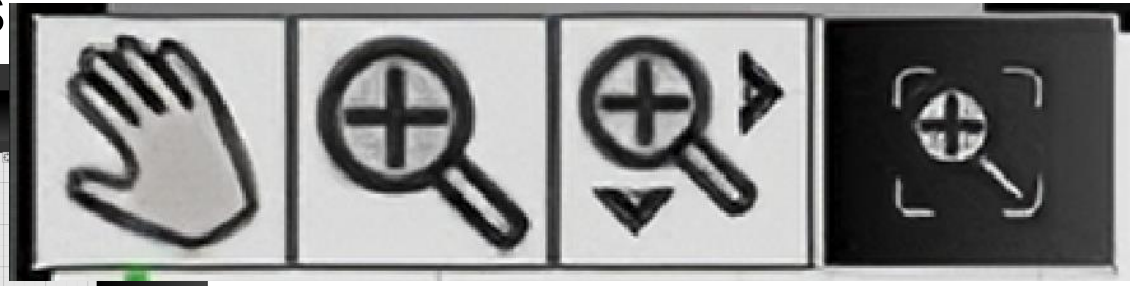
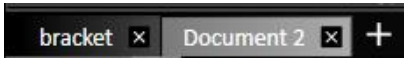
Using CAM: View Tools

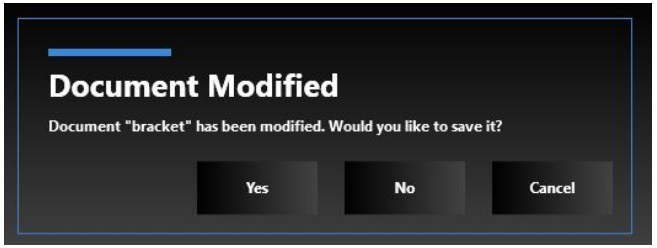




- *Pan*
- *Zoom*
- *Zoom Window*
- *Zoom Extents*



- Document Number / Name
  - Here you can switch between open CAD/CAM files or close your current project. You can create a new file by pressing the “+” next to your most recent open document.



Note: If you attempt to close a project that you have modified without saving a prompt will alert you to save before closing.

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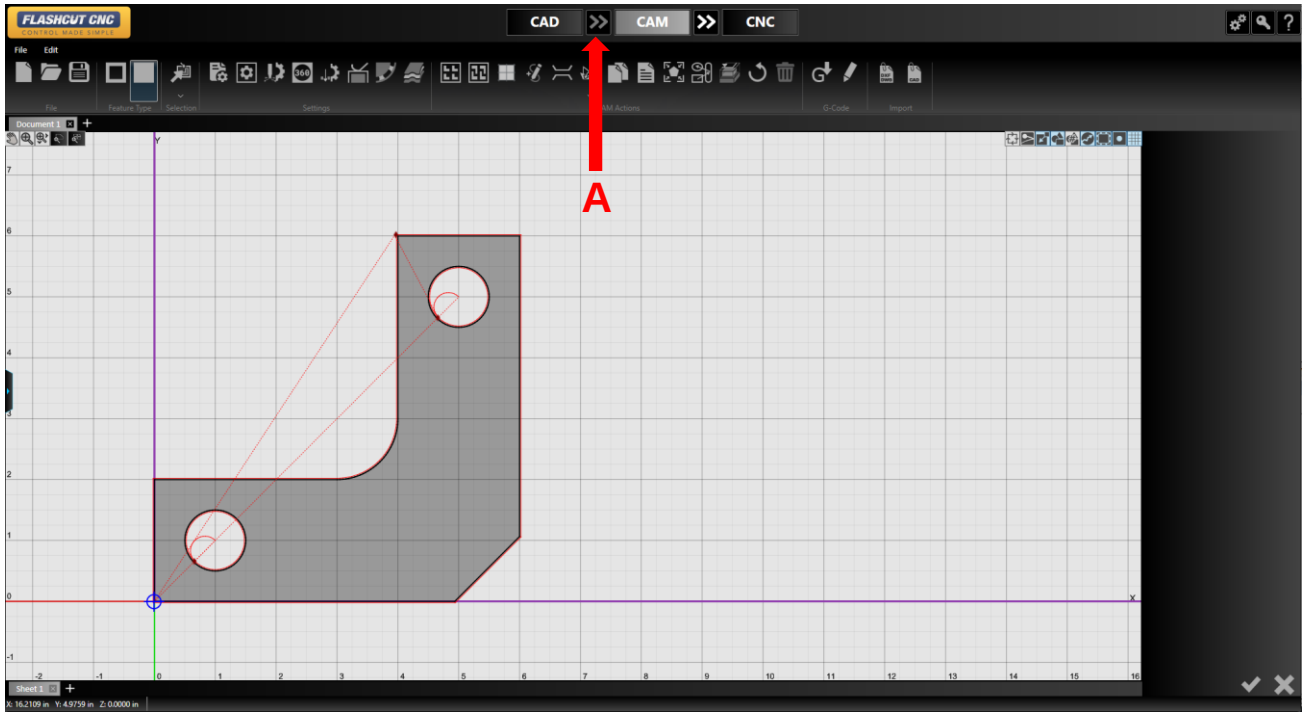
Making a Toolpath in CAM



Step 1: Transfer CAD Bracket Drawing to CAM.

A. Hit the double arrow button between *CAD* and *CAM*

   a. An initial toolpath will be generated with your default parameters

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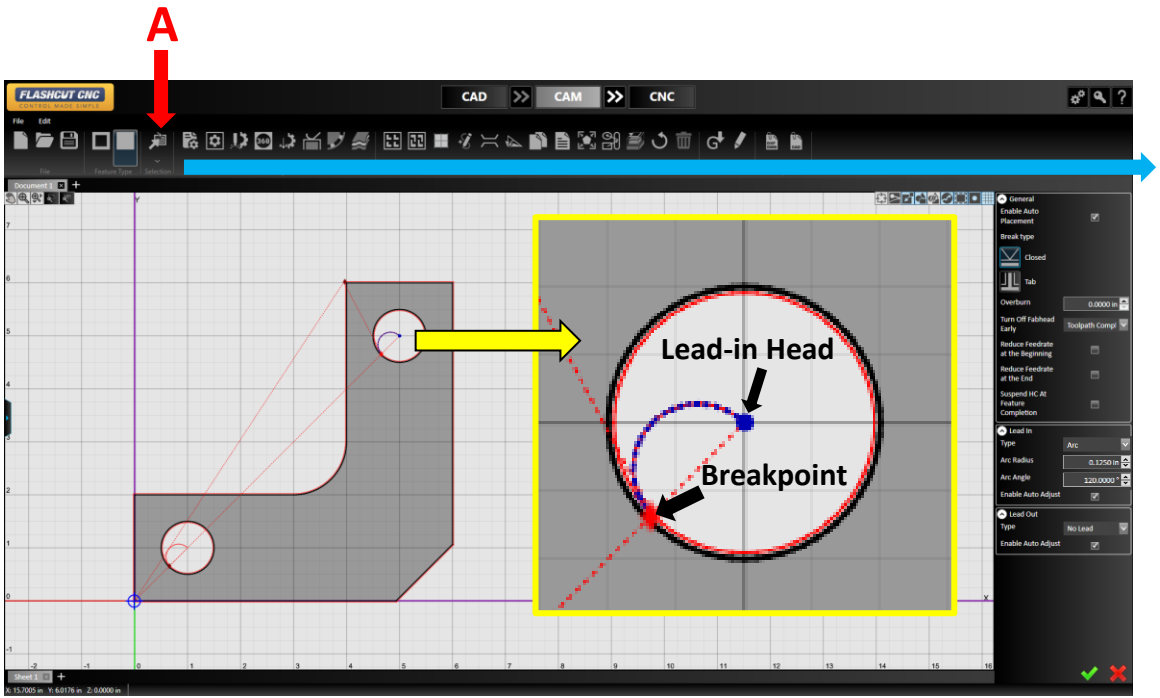
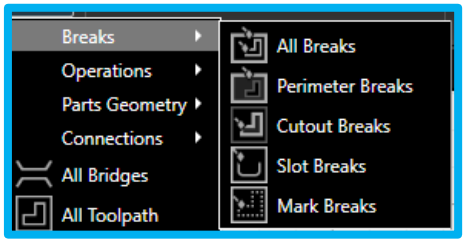
Making a Toolpath in CAM



Step 2: Setting Lead-Ins and Lead-Outs.

A. Click the *Selection* button; a drop down menu will appear
   a. Hover over the *Breaks* option and select *Cutout Breaks*
   b. The default cutouts can be changed in a different panel



Breaks Type Selections:

- **All Breaks**: Selects All Breakpoints.
- **Perimeter Breaks**: Selects breakpoints along the perimeter of the drawing.
- **Cutout Breaks**: Selects all Cutout Breakpoints.
- **Slot Breaks**: Selects Breakpoints of objects with open geometry.
- **Mark Breaks**: Selects all Marking Breakpoints.

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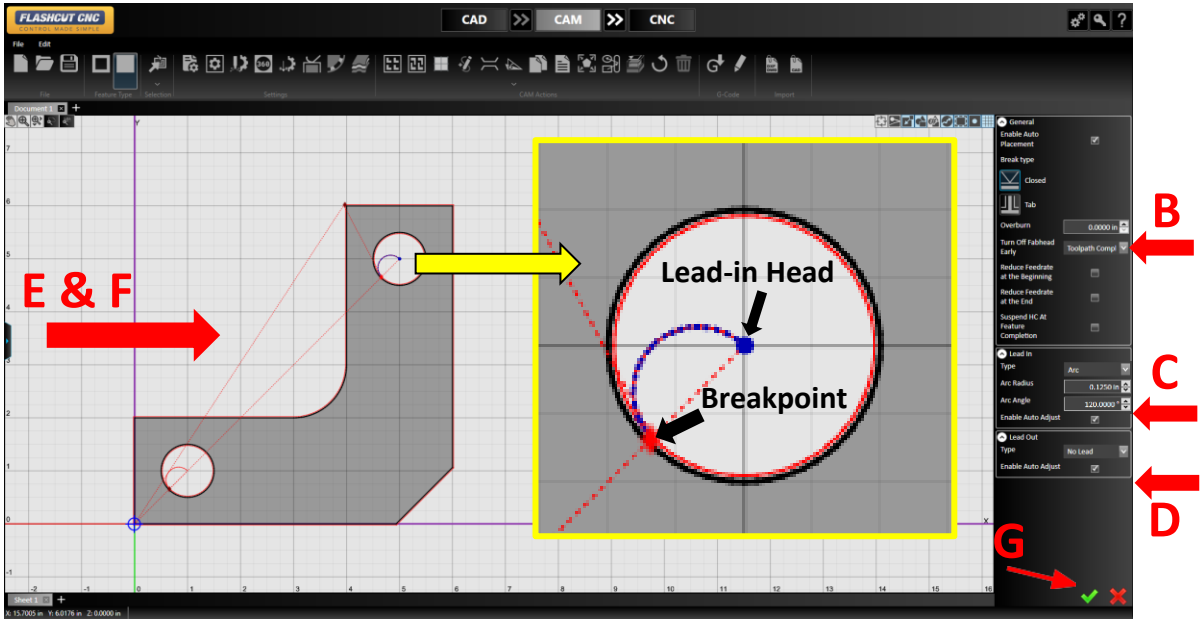
Making a Toolpath in CAM



Step 2: Setting Lead-Ins and Lead-Outs.

B. On the parameters panel, find the *General* section, and set *overburn* to 0
   a. *Overburn* can be used here, but for this tutorial this feature won't be used

C. In the *Lead-In* section, specify the following:
   a. *Type: Arc*
   b. *Radius*: 0.125
   c. *Angle*: 120

D. In the *Lead-Out* section, select *no lead-out*

E. With mouse, move lead-in to desired location by dragging the breakpoint

F. Dynamically adjust parameters by dragging the lead-in head

G. Check it in

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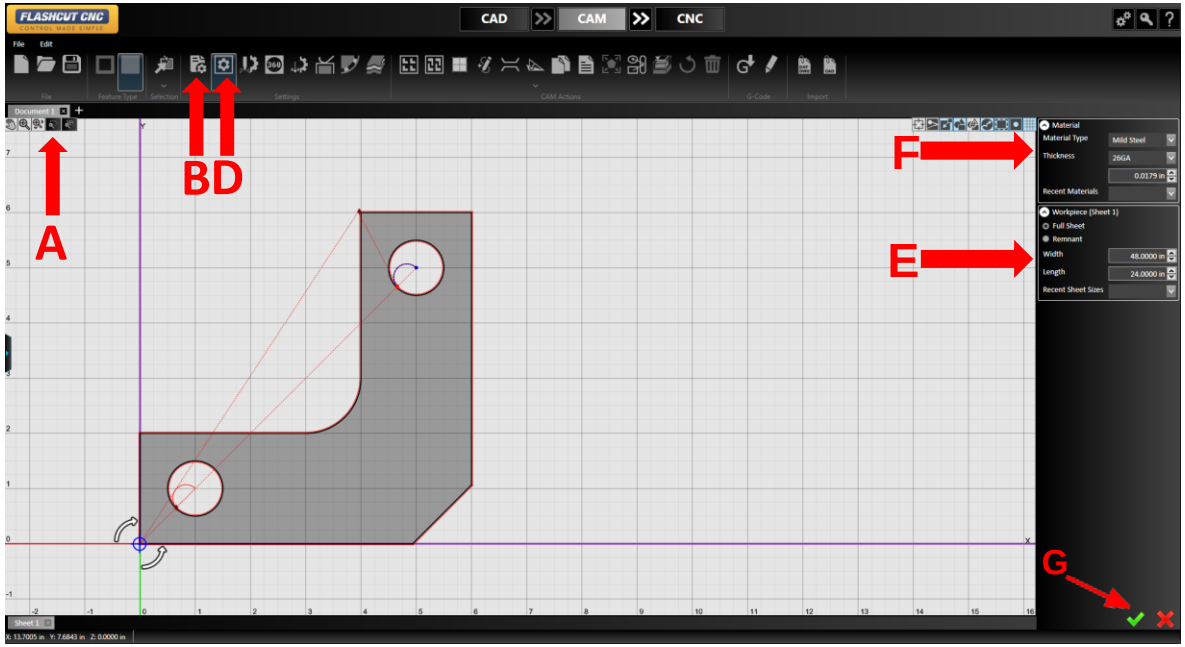
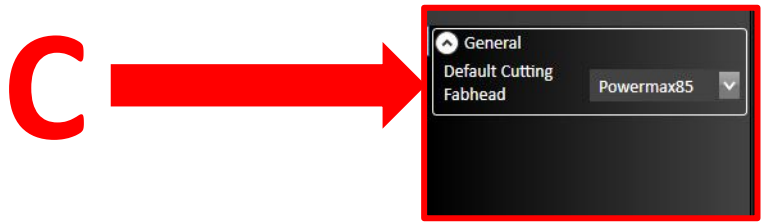
Making a Toolpath in CAM





Step 3: Setting Workpiece Dimensions.

A. Click the *Zoom to Workpiece Extents* button
   a. To refocus the display to only view the tool path of your parts. Click *Zoom Toolpath Extents*

B. Select *Project Settings* icon in the *CAM Actions* section on toolbar

C. In the parameters panel, make sure *Default Cutting Head* is correct. **(Only necessary if configured with more then one Fabhead)**
   a. Check it in

D. Select the *Material Settings Icon*

E. In the parameters panel, set *workpiece* dimensions to 48” wide x 24” long

F. Set *Material type* and properties

G. Check it in

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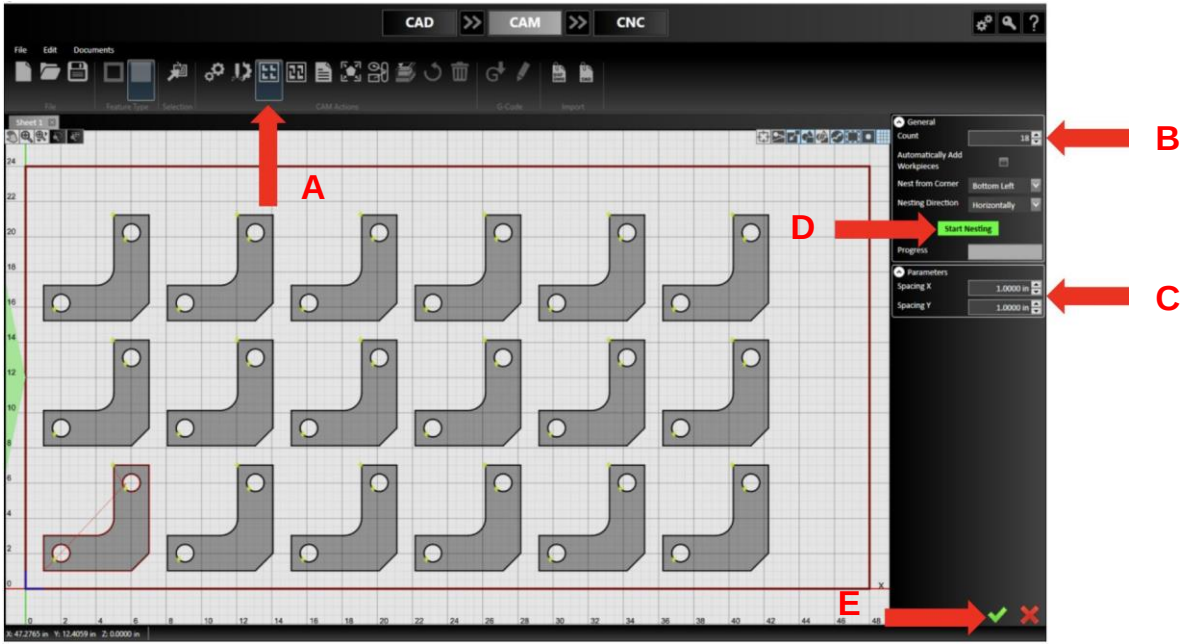
Making a Toolpath in CAM



Step 4: Grid Nesting.

A. Select the *Grid Nesting* button in the *CAM Actions* section

B. Set *Count* to 18

C. Set *Spacing X/Y* to 1.0

D. Click *Start Nesting*

E. Check it in

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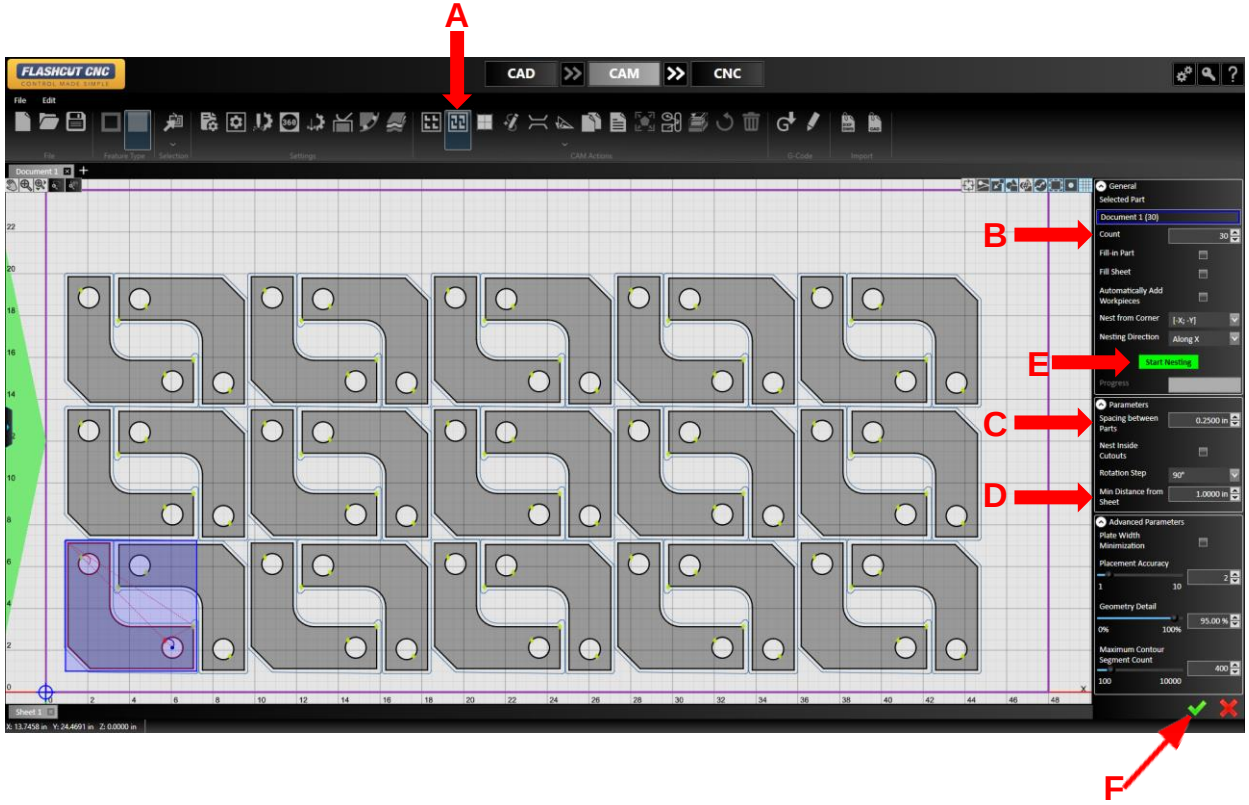
Making a Toolpath in CAM

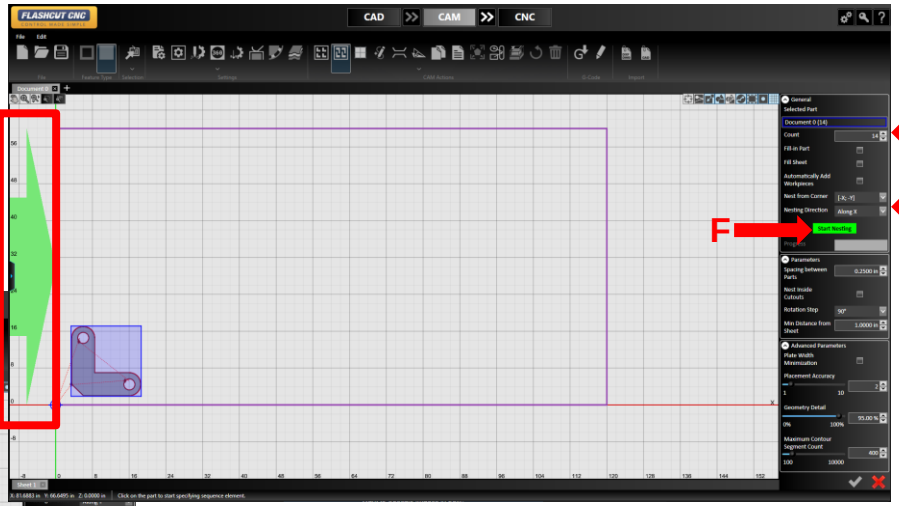


Step 5: TrueShape Nesting.

A. Select the *TrueShape Nesting* button in the *CAM Actions* section
B. Set *Count* to 30
C. In the *Parameters* section, set spacing to 0.25”
D. Set *Min Distance from Sheet* to 1”
E. Click *Start Nesting*
F. Check it in

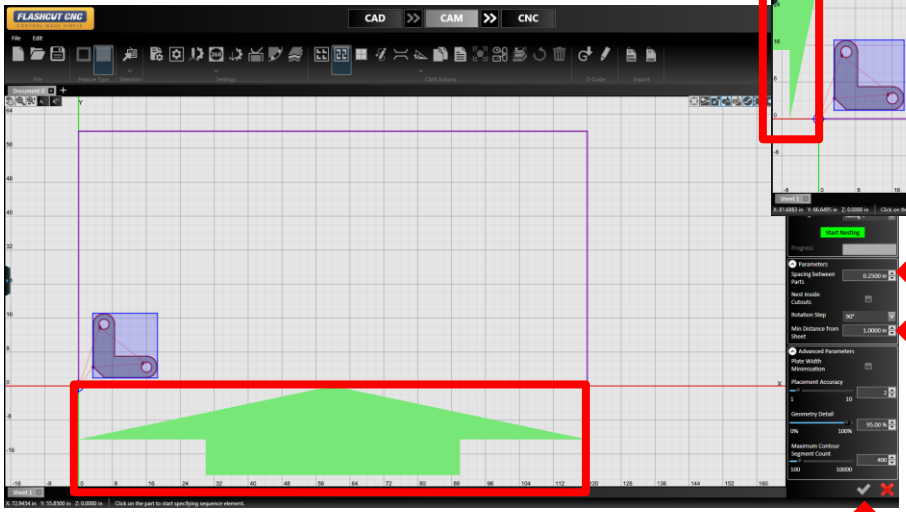
Making a Toolpath in CAM

Nesting Direction: Along X



Step 6: Nesting Direction.

A. Remain in *True-Shape Nesting*
B. Set *Count* to 14
C. In the *Parameters* section, set spacing to 0.25”
D. Set *Min Distance from Sheet* to 1”



Nesting Direction: Along Y

E. Locate the property *Nesting Direction* and experiment with each option
   a. Note how the direction determines the manner in which each piece fills the sheet, starting at the corner specified in *Nest from Corner*
F. Click *Start Nesting*
G. Check it in

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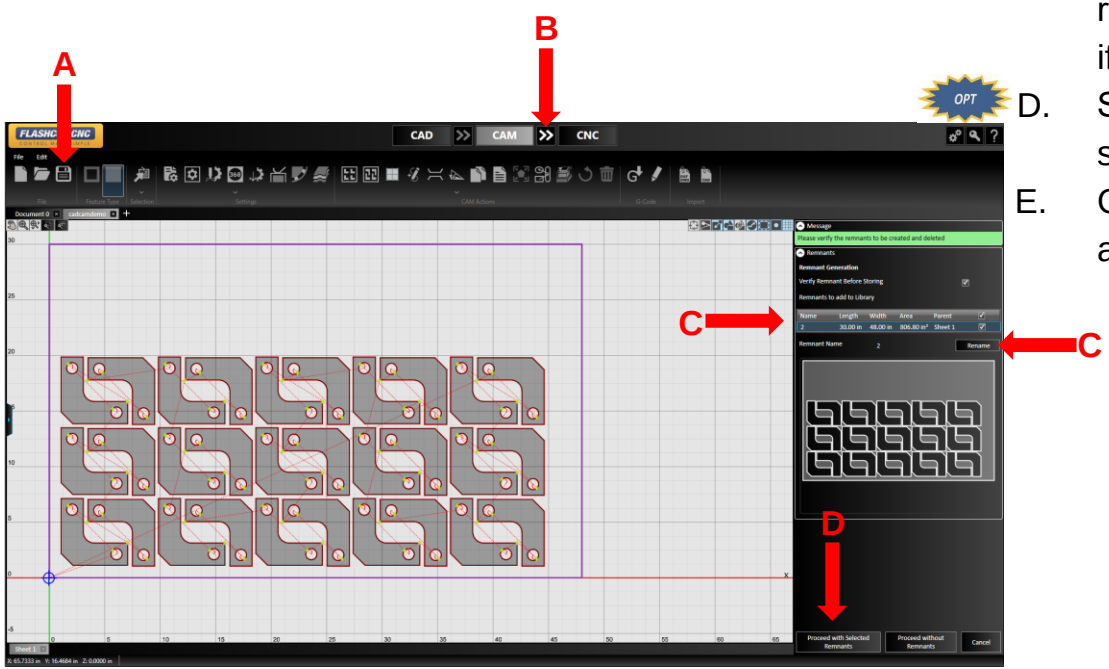
Making a Toolpath in CAM

Note: Remnant support feature is needed for steps C & D.



Step 6: Transform from CAD/CAM File to CNC.

A. Click *Save* icon to save CAD/CAM file
   a. Name the file if it has not been saved before

B. Hit the double arrow button between CAM and CNC

(Skip to E to proceed without remnant support)

OPT C. Remnants will be generated; Rename each remnant by selecting it and clicking “Rename” if desired.

OPT D. Select “Proceed with Selected Remnants” to save your remnants for later projects

E. G-Code will be generated for the toolpath in CAM and the CNC panel will automatically open

Note: If you click the CNC button, the CNC panel will open, but it will not load the G-Code for the current toolpath in CAM

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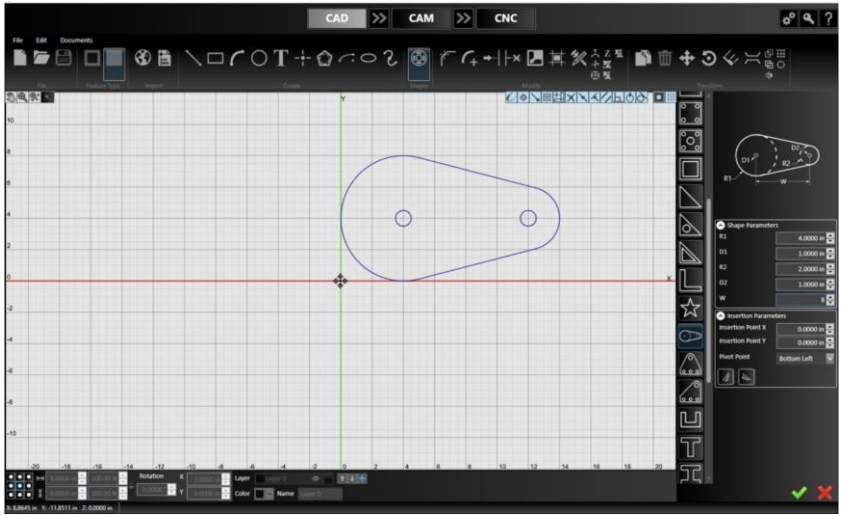
PRO

Lesson 4:
Shape Library



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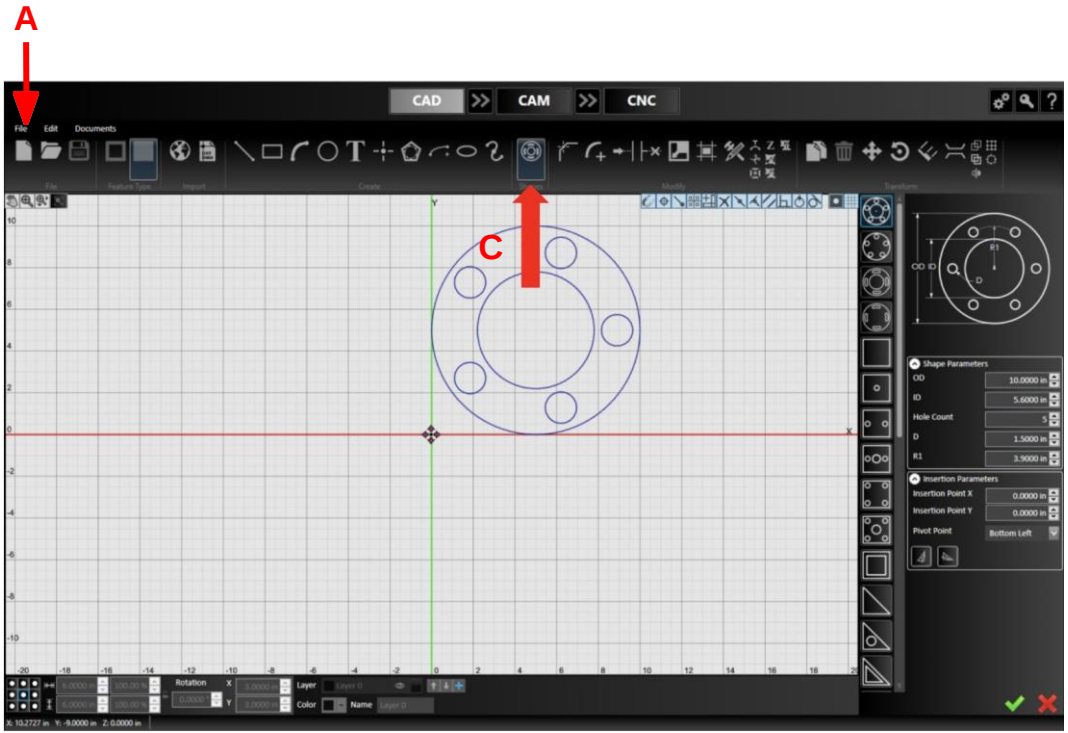
Exploring Shape Library



Step 1: Open a New File

A. Click the *New File* icon or select *New* from the *File* menu

B. Choose *2D* for the file type

C. Select the *Shape Tool*

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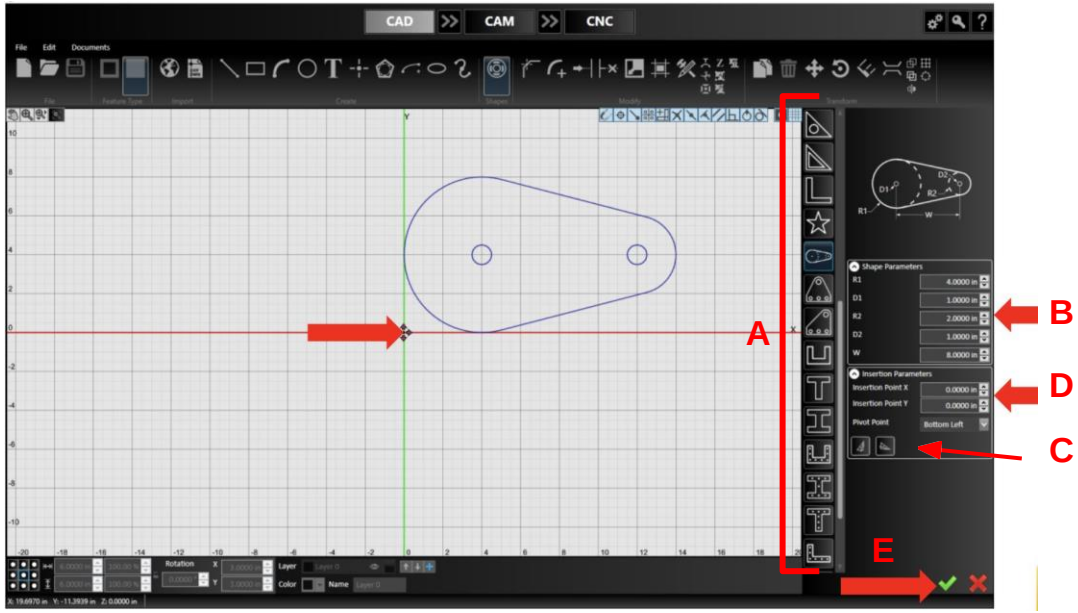
Exploring Shape Library

Note: Once completed shape is created, they can then be edited using any of the drawing tools.



Step 2: Customize a Shape

A. Scroll through the given shapes and choose one
B. Edit the shape properties in the parameters panel
C. Choose a *Pivot Point* location
D. Drag the shape with your mouse or type the XY coordinates into the boxes labelled *Insertion Point X/Y* to specify the shape's location
E. Check it in

FLASHCUT CNC
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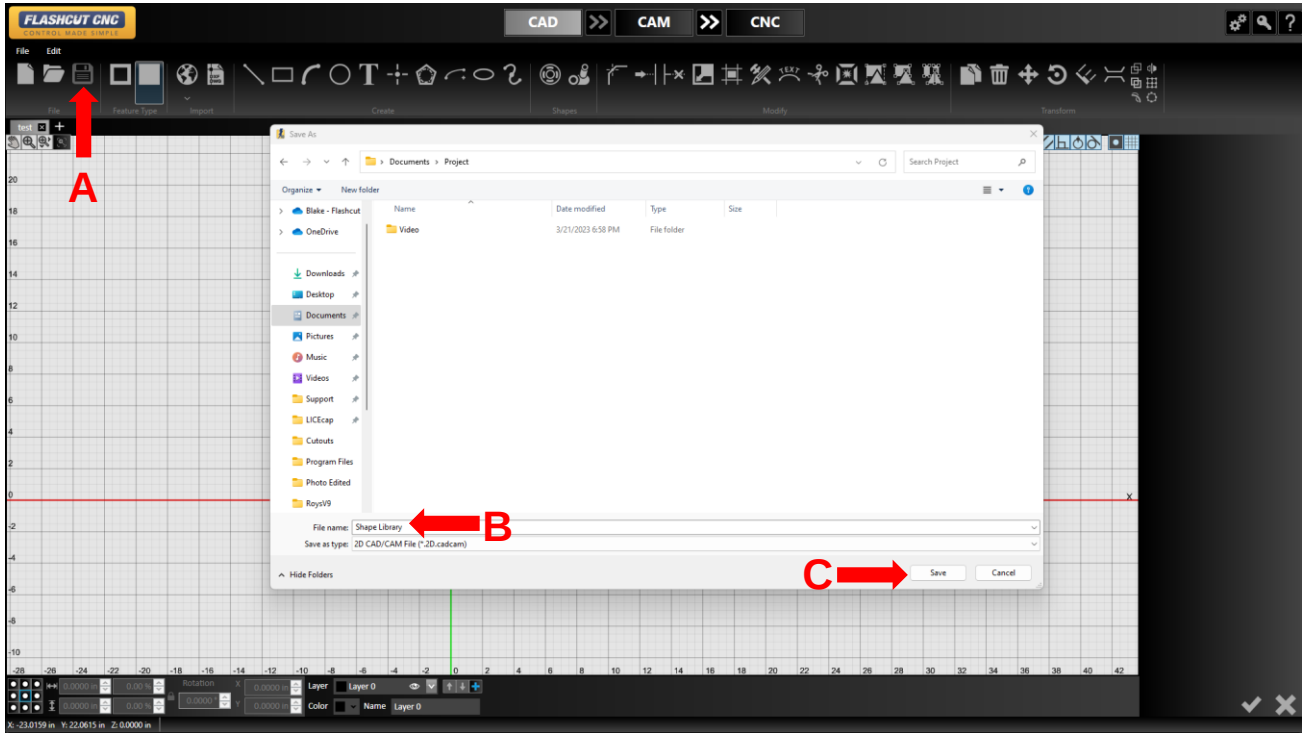
Exploring Shape Library



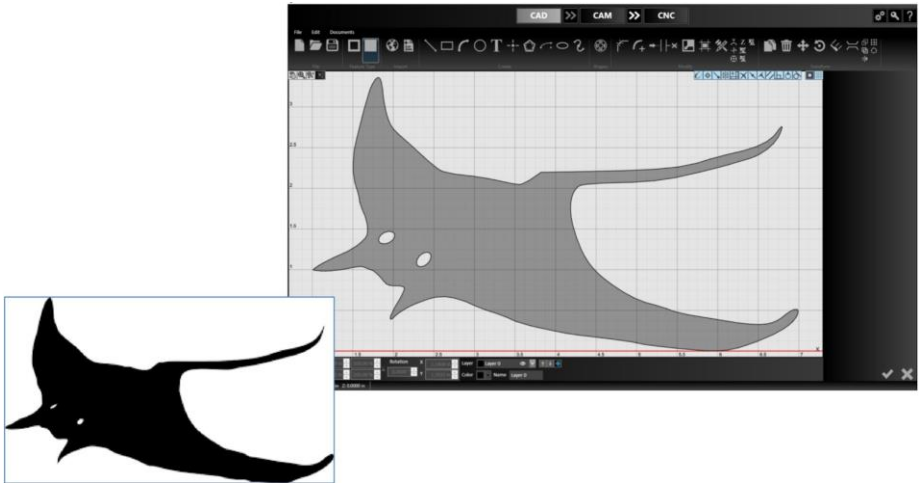
Step 3: Save the Drawing

A. Select the *Save* icon or from the *File* menu click *Save*

B. Name the file after your customized shape

C. Hit the *Save* button

Lesson 5:
Image Import



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Importing Silhouette Images

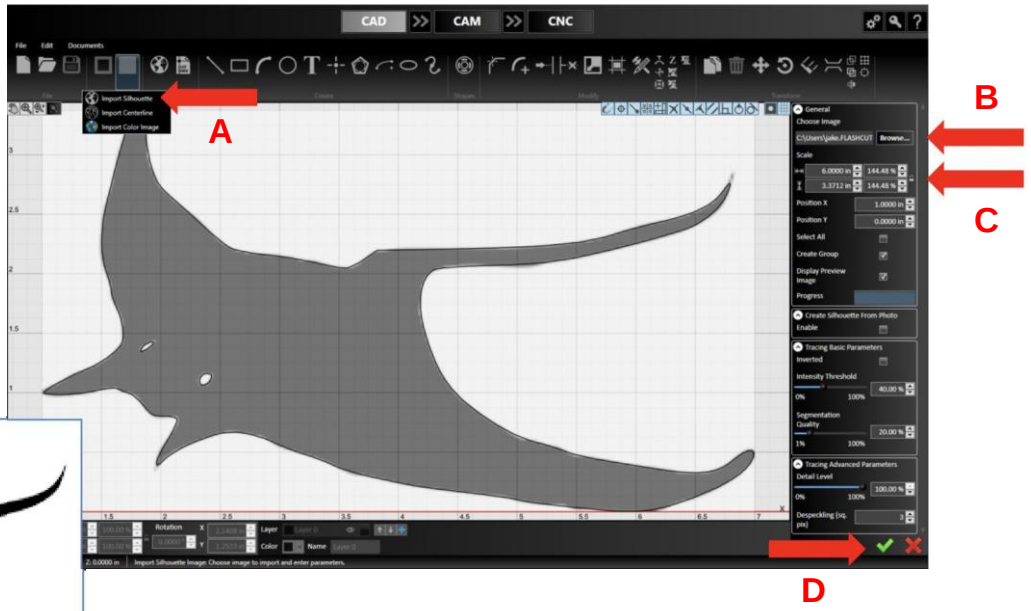
Step 1: Convert to Geometry

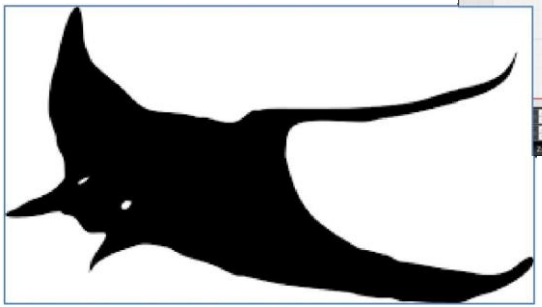
A. Choose the *Import Silhouette* icon from the *Image Import* dropdown

B. Browse to an image file (See page 27 for acceptable file types and example of silhouette image)

C. Alter the properties in the parameters panel to your liking

D. Check it in





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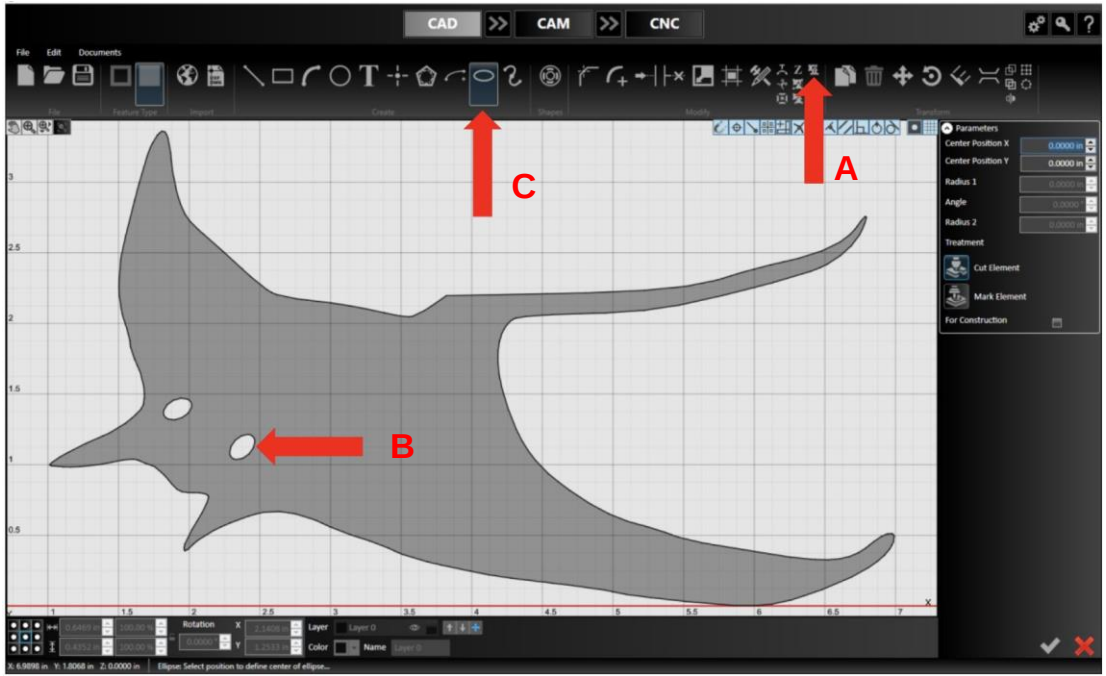
Importing Silhouette Images



Step 2: Edit the Geometry

A. Click the *Ungroup* button in the toolbar and select your image
   a. This will make the shape editable as individual line segments
   b. Use alt+click on any line segment to “chain select” an entire feature

A. Delete the eyes

B. Choose the *Ellipse Tool* and replace the eyes with ellipses

FLASHCUT CNC
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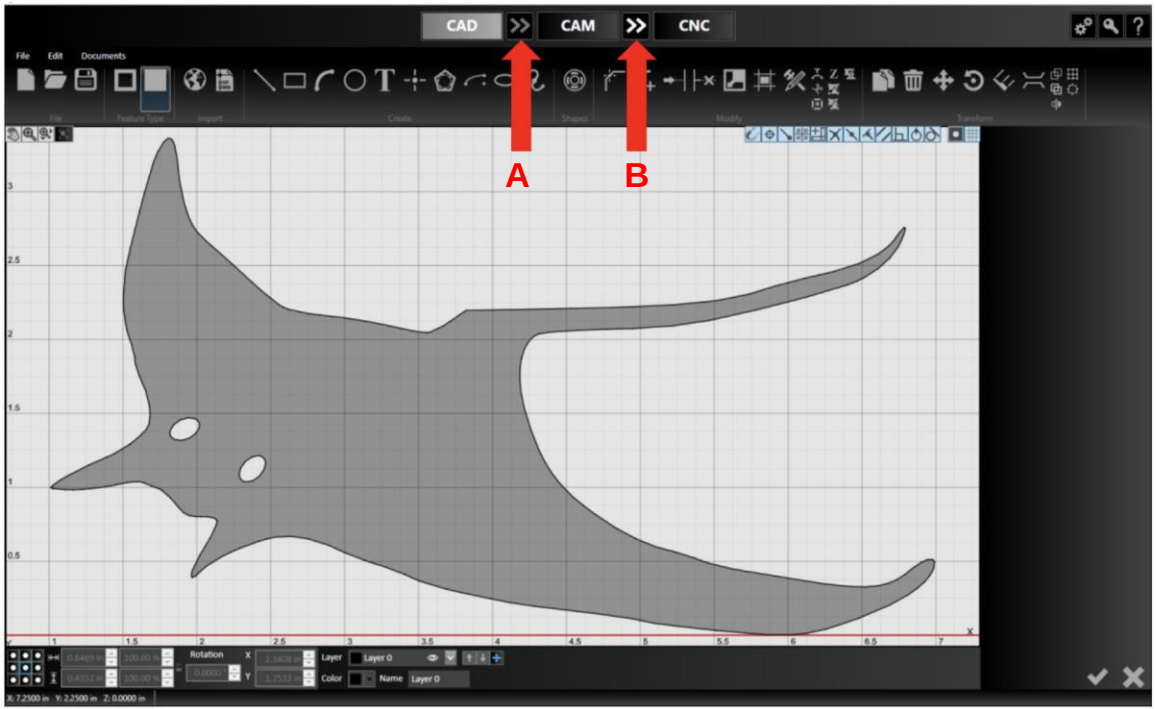
Importing Silhouette Images



Step 3: Create the Toolpath

A. Hit the double arrows between CAD and CAM to push the drawing to CAM and automatically create a tool path

B. Hit the double arrows icon between CAM and CNC to generate G-Code and send it to the CNC module

FLASHCUT CNC
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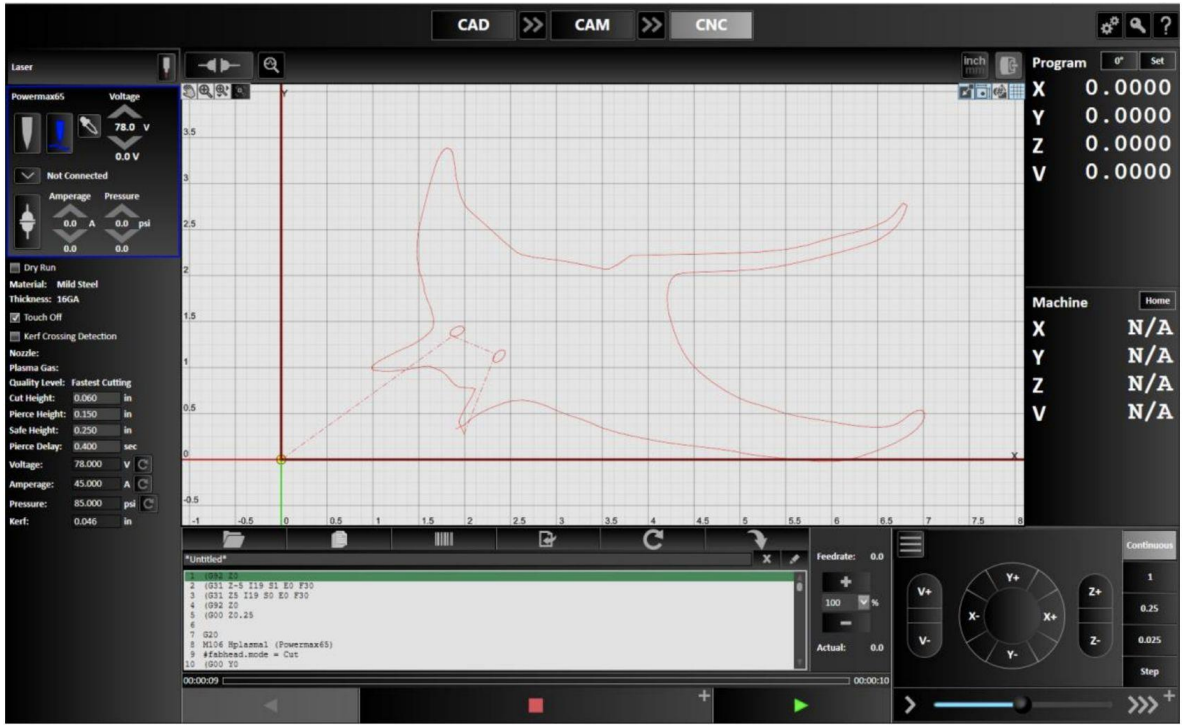
Importing Silhouette Images



Step 4: Cut the Parts in CNC

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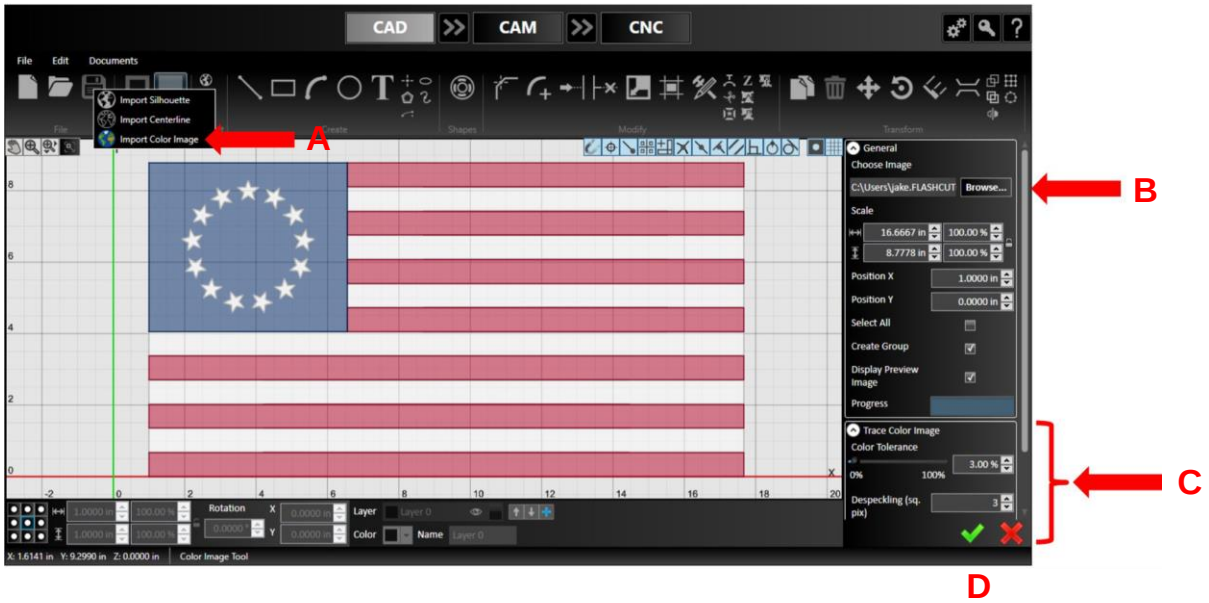
Importing Color Images



Step 1: Convert to Geometry

A. Choose the *Import Color Image* icon from the *Image Import* dropdown

B. Browse to an image file (see page 27 of this tutorial for acceptable file types, and example of silhouette image)
   a. Images with strong contrast work best

C. Alter the properties in the parameters panel to your liking

D. Check it in

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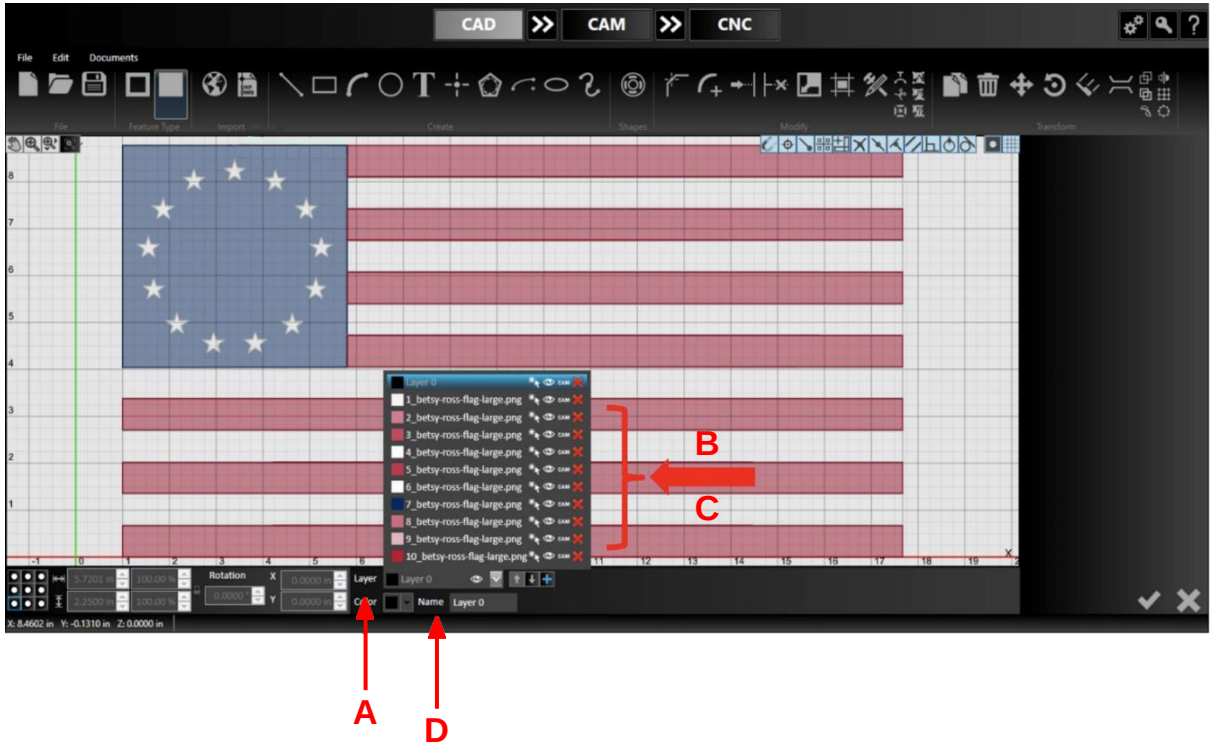
Importing Color Images



Step 2: Organize Layers

A. Click on the *Layer Tool* at the bar on the bottom of the screen

B. Click on the visibility icon of each layer to determine what geometry is associate with each layer

C. Delete the layers that are not necessary

D. Click on an individual layer and rename it by typing in the name field

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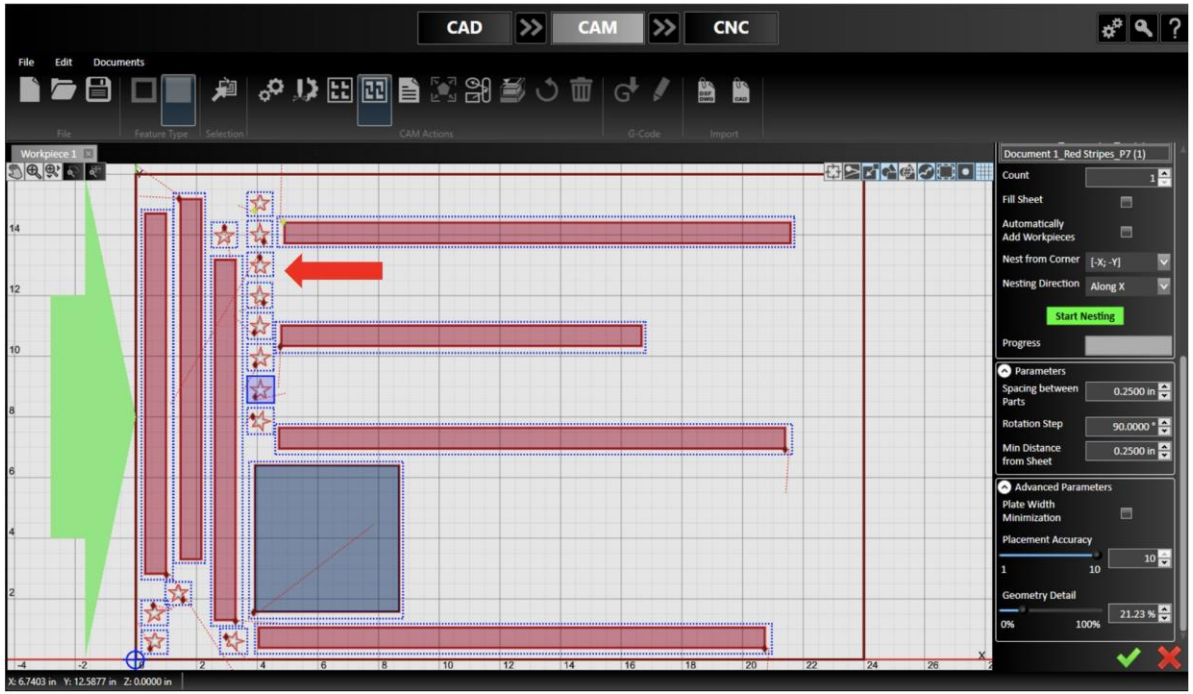
Importing Color Images



Step 3: Nest the Parts

A. Go to CAM
B. Follow the steps previously executed for *True Shape Nesting*
    a. Notice how the stars fill the sheet as individual parts, which may not be desirable

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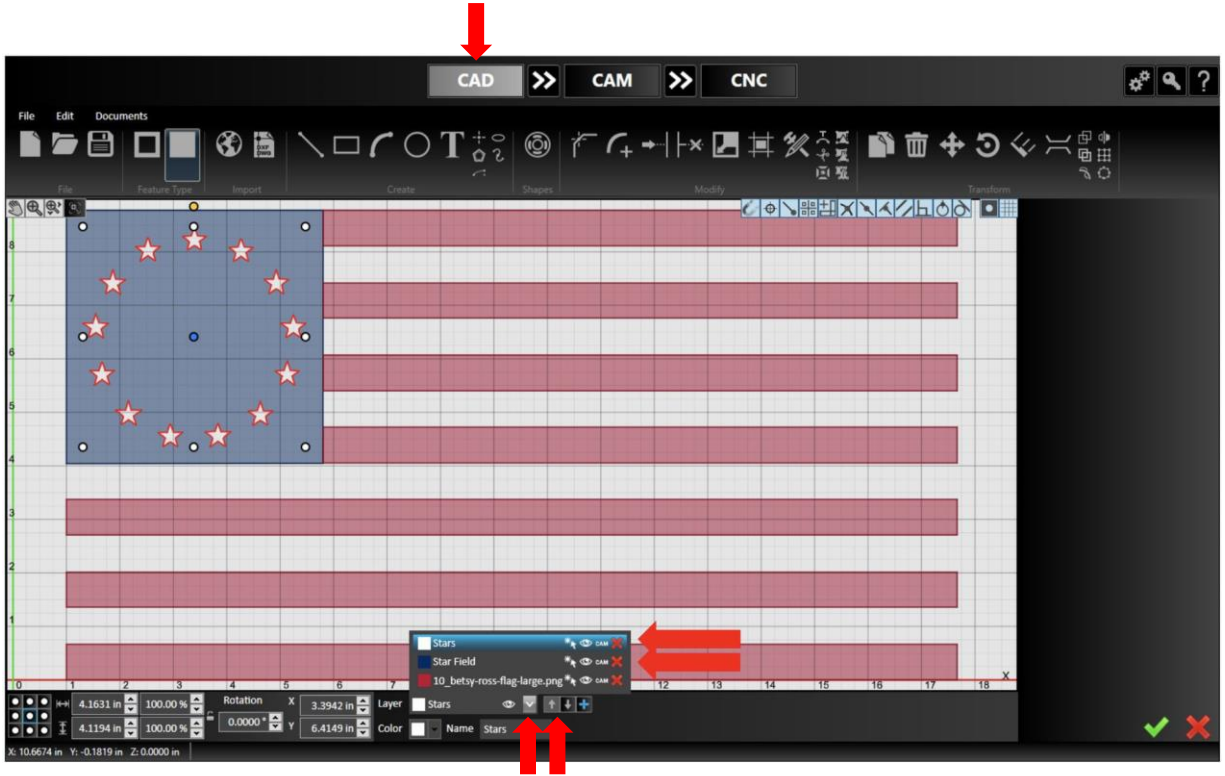
Importing Color Images



Step 4: Combine Layers

A. Return to CAD

B. Select the White “Stars” layer by selecting it in the dropdown or using the up and down arrows
   - The white star layer should be highlighted

C. In the layer tool, choose the blue star field layer; this will place the highlighted geometry (in this case, the stars) in the blue star field layer
   a. The stars are now cutouts of the blue layer

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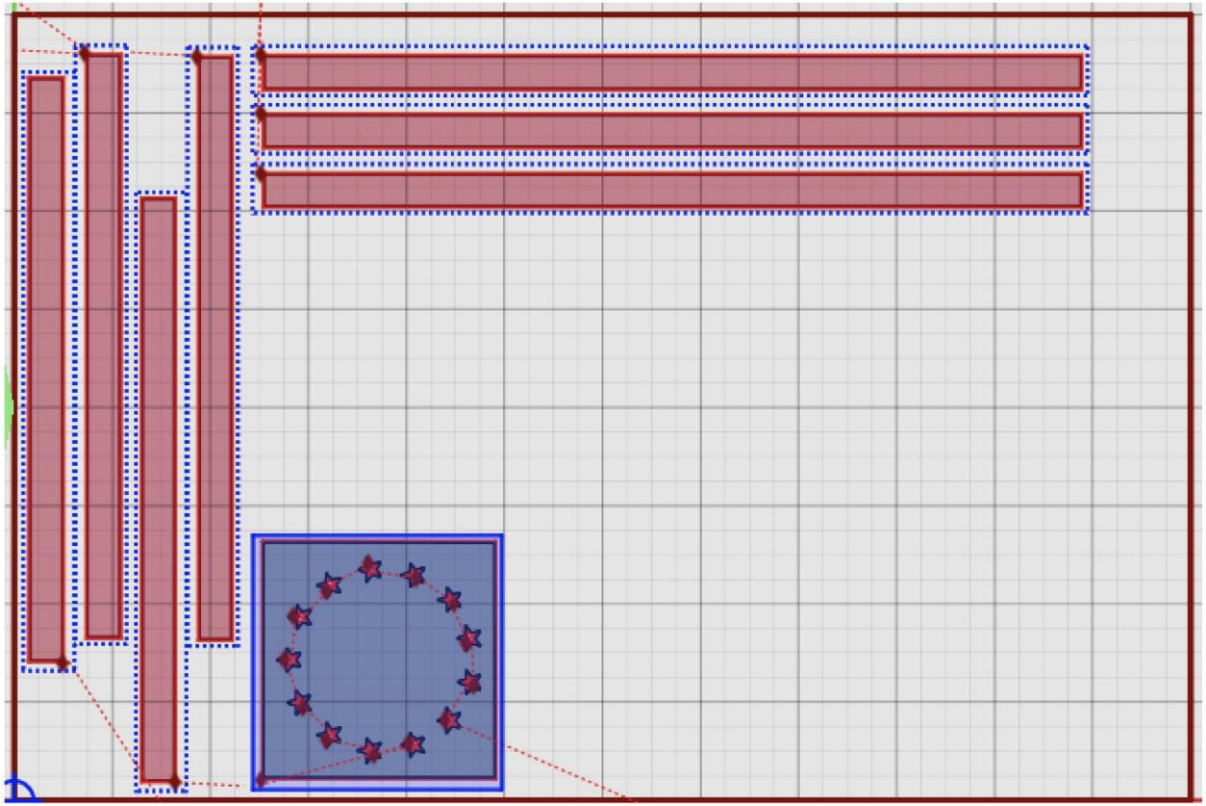
Importing Color Images



Step 5: Nest the Parts Again

A. Go to CAM
B. Follow the steps previously executed for *Nesting*
   a. Notice how the stars are no longer individual parts, but instead are cutouts in the star field layer

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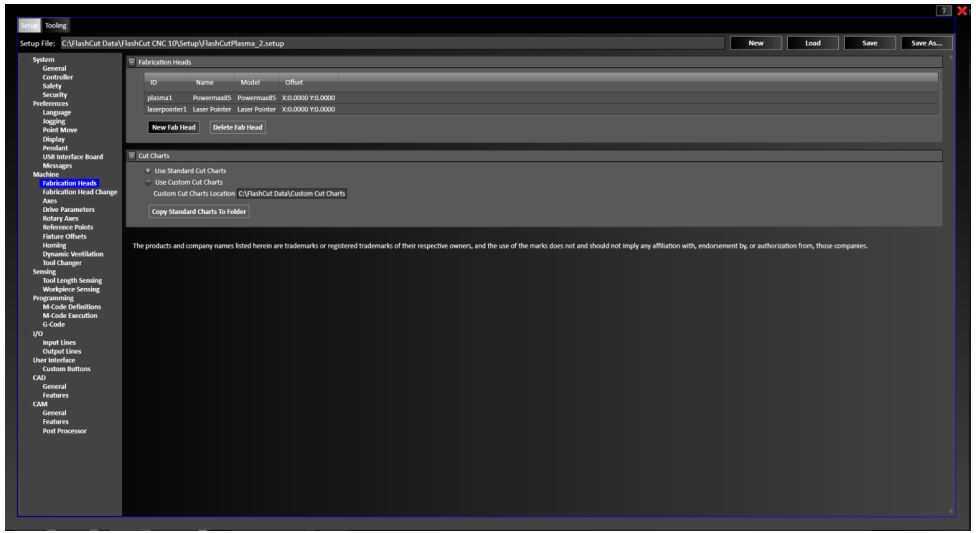
Lesson 6:
Fabrication Heads & Cut Charts



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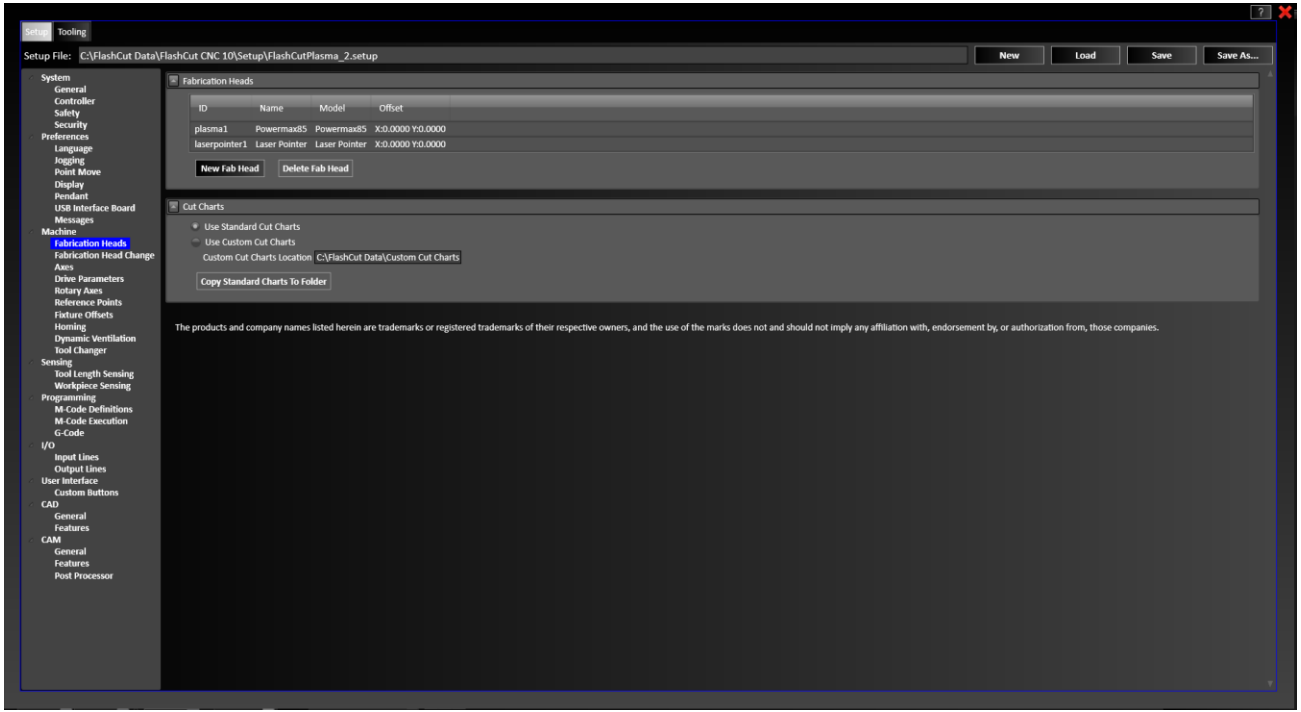
Adding a Fab Head



- Fabrication Heads are the actual cutting heads on your machine
- Plasma, Water Jet, Oxy Fuel, Router, Marker, Laser, and/or Laser Pointer*
- Some types of fab heads have associated Cut Charts with cutting parameters such as feedrate, kerf width, and cut height which vary for a given type and thickness of material

Note: Mill/Drill/Router, Waterjet, Knife, and Laser Support are a la carte features.

FLASHCUT CNC
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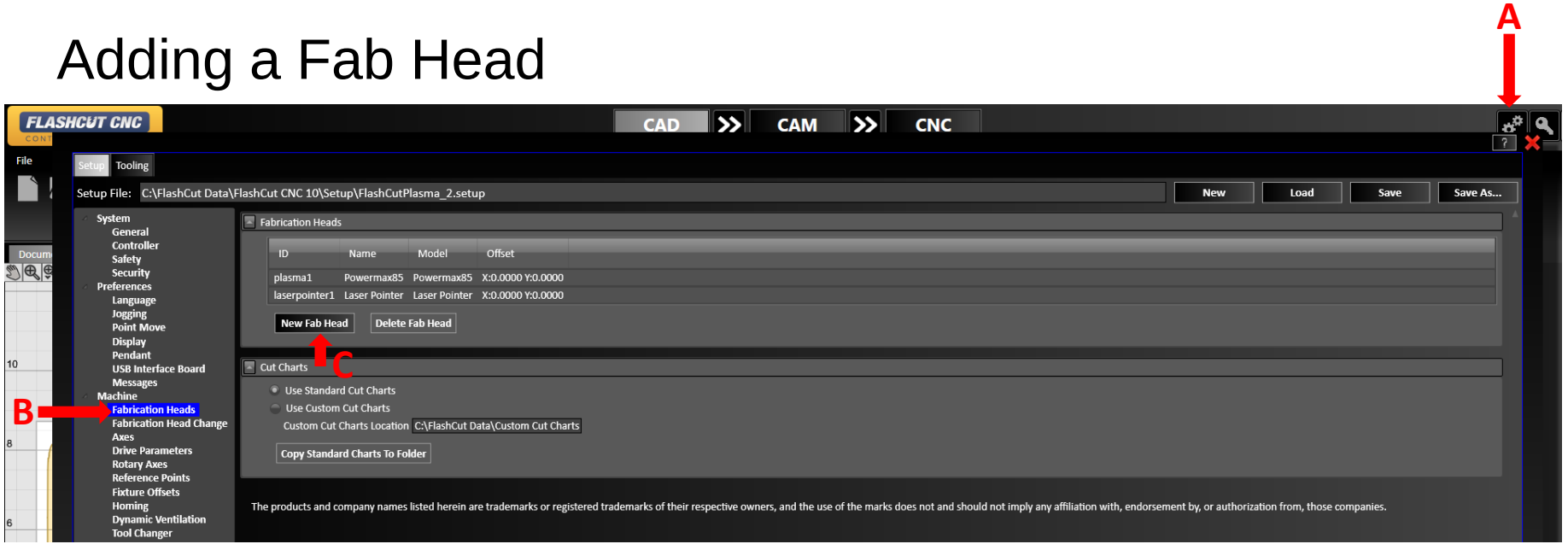
Adding a Fab Head



A. Click the *Configuration* icon (double gears) located at the top right corner of the window
   a. The Configuration Screen will pop up

B. Go to the *Fabrication Heads* section

C. Select a *New Fab Head*

FLASHCUT CNC
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Adding a Plasma Fab Head

A. Choose the *Type, SubType*, and *Model* from the dropdown menus; *ID* and *Name* will be automatically populated, but you can edit these if necessary

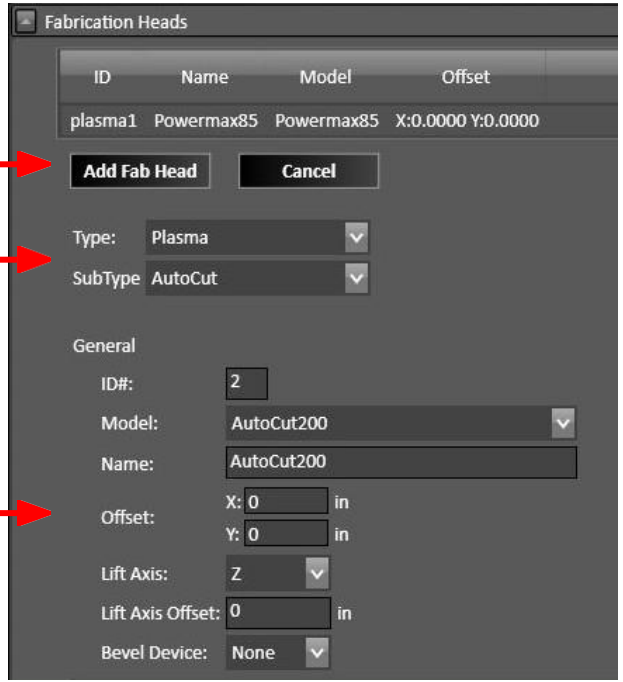
B. Set X/Y *Offset* if you have more than one fab head

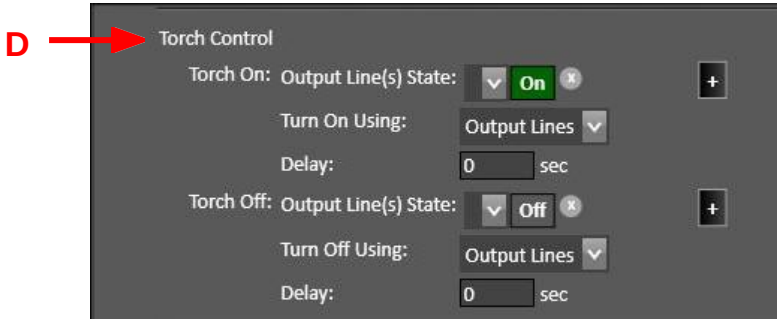
C. Select RS-232/485 and a COM Port if you have direct communication to set the torch's current and pressure

D. The *Output Lines* macros for turning the *Torch On* and *Off are Automatically generated*

E. Hit the *Add Fab Head* button to finalize your fab head changes

F. *Save* the Setup file





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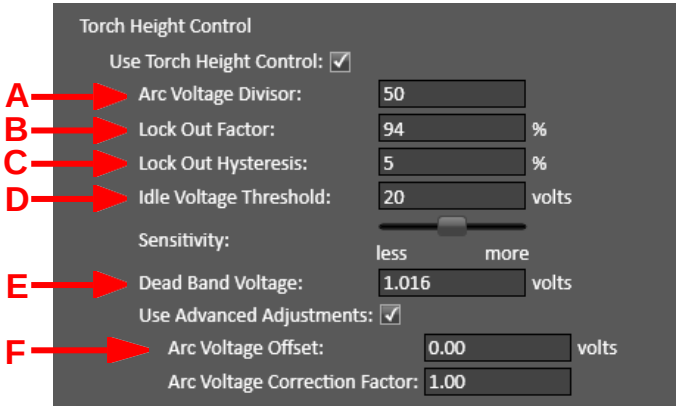
WARNING: Adjusting these fields outside of the recommended procedure can produce undesired effects. It is important that the calibration is used to accurately measure incoming voltage and not to compensate for outdated cut charts, poor gas quality, incorrect voltage divisors values, or other common voltage problems. **(Refer to page 29 in the User's Guide for more help)**

Adding a Plasma Fab Head (THC)



If you have *Torch Height Control*, check the box and fill in the parameters:

A. *Arc Voltage Divisor* – This must match the exact voltage divider setting in your torch. For THC to work properly: (**Maximum Raw Voltage ÷ Arc Voltage Divisor**) must be < 6V

B. *Lock Out Factor* – After a feedrate lockout, THC will suspend to prevent unwanted diving when the XY velocity of the torch is below this percentage of the feedrate

C. *Lock Out Hysteresis* – THC will resume when the XY velocity goes above: (***Lock Out Factor + Lock Out Hysteresis***) **** Programmed Feedrate***

D. *Idle Voltage Threshold* – Arc voltage is hidden when below this value to prevent displaying errant feedback at idle. Does not affect machine behavior

E. *Sensitivity & Deadband Voltage* – This is a factor that determines how quickly the THC acts towards voltage fluctuation. This number can vary from 0.09V-1.94V, smaller values being more sensitive ~1V is recommended for most systems

F. ***Arc Voltage Offset & Correction Factor* -*** Most plasma systems do not need to use this. However, some systems may need configurable voltage adjustments to correct for inaccuracy of the measured arc voltage that may be caused by the plasma torch lead length and other factors

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Adding a Plasma Fab Head (Sensing)

Sensing will allow the torch to find the surface of the plate

A. Choose the sensing *Direction* and *Feedrate*

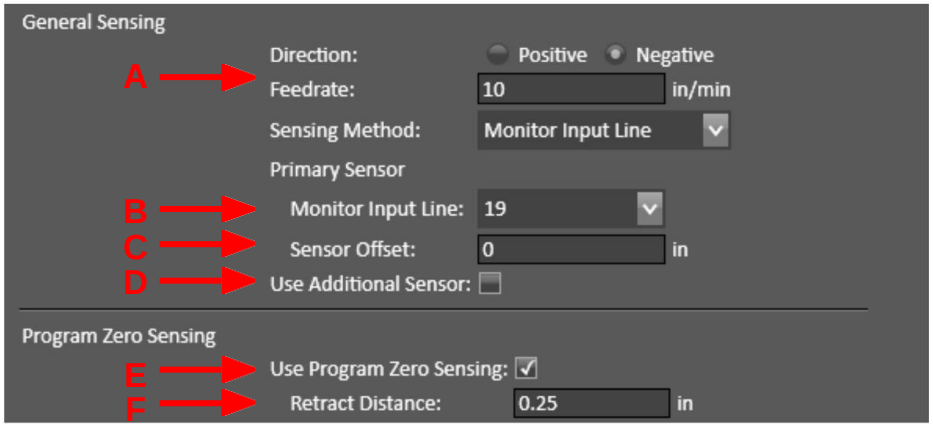
B. Choose the *Monitor Input Line* for the *Primary Sensor*, typically an Ohmic sensor

C. *Sensor Offset* is the extra distance that the Z axis travels between zero and tripping the sensor

D. *Use Additional Sensor* enables a backup switch in case the primary touch off method fails; this is typically a mechanical switch or proximity sensor

E. *Program Zero Sensing* enables the torch to set program zero at the sheet

F. *Retract Distance* is amount that the torch will raise after sensing



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Adding a Plasma Fab Head (Cont.)

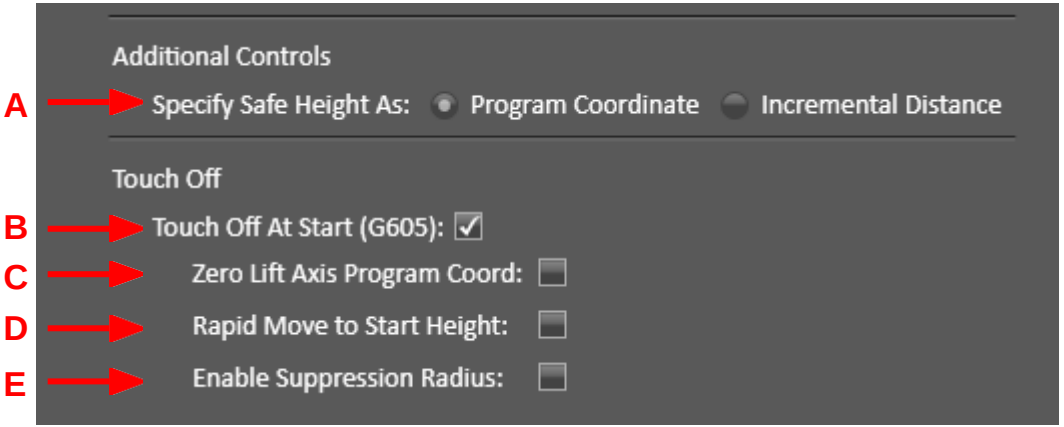
A. *Safe Height* will raise the torch to a specified height after every cut
   a. It is recommended this height be in Program Coordinates (Incremental Distance is also available)

B. *Touch Off* enables the option to causes the torch to sense the plate before every cut

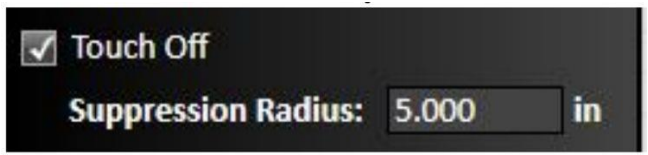
C. If *Zero Life Axis Program Coord* is enabled, each tough off will also zero the Z axis program coordinate

D. *Rapid Move to Start Height* will cause the Z axis to rapid down to a specified height before slowing to sensing federate and beginning the sensing procedure while touching off

E. If *Enable Suppression Radius* is checked, the torch will skip all touch off procedures within a specified radius of the previous touch off location



Note: The radius is specified in the CNC panel at run time.



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Advanced Plasma Control

Cut leadin when returning to toolpath (found under *Cutting* when customizing a new fab head) – Designed for recovering from a lost torch using the following steps:

A. Use Momentary/Step mode by clicking the '+' icon on the feedhold button and then “Run Step g-code” and “Run Momentary g-code” buttons to move to the point where the cut stopped
   a. *Dry Run* mode can be toggled in CNC on the left panel but is not needed
B. Jog off of the toolpath to a point that will be off the finished part
C. Disable *Dry Run* mode and start the program from that point
D. The system will use that point as a temporary pierce position and then cut a lead-in to the last feedhold position on the part
E. The program will proceed normally from that point

Run Step g-code

Run Momentary g-code

Jump To Line Tool

Jog Controls

Dry Run Mode

Momentary/Step Mode

FLASHCUT CNC
CONTROL MADE SIMPLE

Cut Charts

A. Many of the Plasma and Oxy Fuel fab heads have pre-loaded cut charts with manufacturer-recommended cut parameters

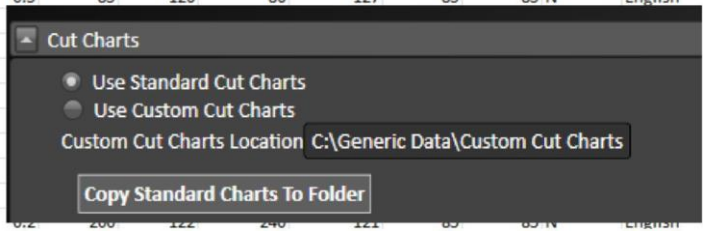
B. You can use the Standard Cut Charts for the fab head manufacturer's recommended settings

C. If you choose the Custom Cut Chart option, then you must also hit the "*Copy Standard cut charts to Folder*" to store copies of the charts as CSV files at the specified location

D. Any value in these cut charts can be edited using a spreadsheet program such as Excel

E. Feedrates and pierce times for waterjet are calculated from a formula embedded in the software

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	NozzleModel	MaterialType	Thickness	KerfWidth	CutHeight	Pierce Height	Pierce Delay	BestFeedrate	BestVoltage	Production Feedrate	Production Voltage	Current	Pressure	EdgeStart	Units
2	85A Shielded	Mild Steel	0.1345	0.068	0.06	0.15	0	250	122	336	121	85	85	N	English
3	85A Shielded	Mild Steel	0.1875	0.071	0.06	0.15	0.2	185	123	220	123	85	85	N	English
4	85A Shielded	Mild Steel	0.25	0.073	0.06	0.15	0.5	130	123	160	126	85	85	N	English
5	85A Shielded	Mild Steel	0.375	0.078	0.06	0.15	0.5	85	126	86	127	85	85	N	English
6	85A Shielded	Mild Steel	0.5	0.09	0.06	0.18									
7	85A Shielded	Mild Steel	0.625	0.095	0.06	0.18									
8	85A Shielded	Mild Steel	0.75	0.1	0.06	0.24									
9	85A Shielded	Mild Steel	0.875	0.105	0.06	0.06									
10	85A Shielded	Mild Steel	1	0.11	0.06	0.06									
11	85A Shielded	Mild Steel	1.125	0.115	0.06	0.06									
12	85A Shielded	Mild Steel	1.25	0.12	0.06	0.06									
13	85A Shielded	Stainless Steel	0.1406	0.068	0.06	0.15									
14	85A Shielded	Stainless Steel	0.1875	0.071	0.06	0.15									



FLASHCUT CNC
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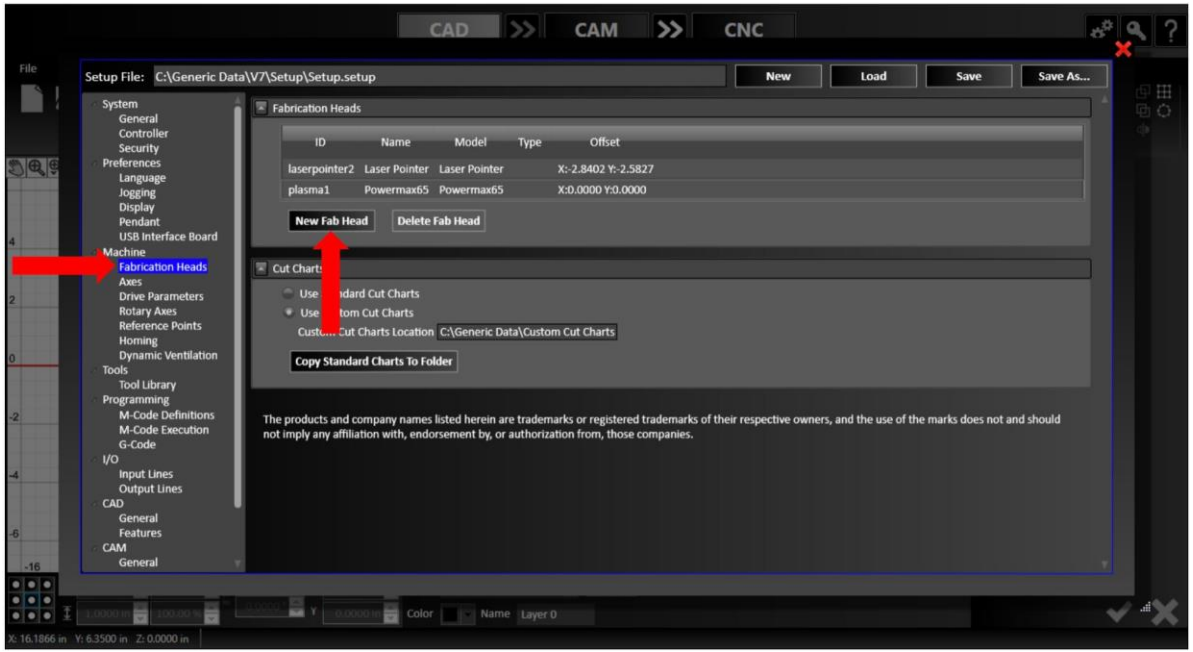
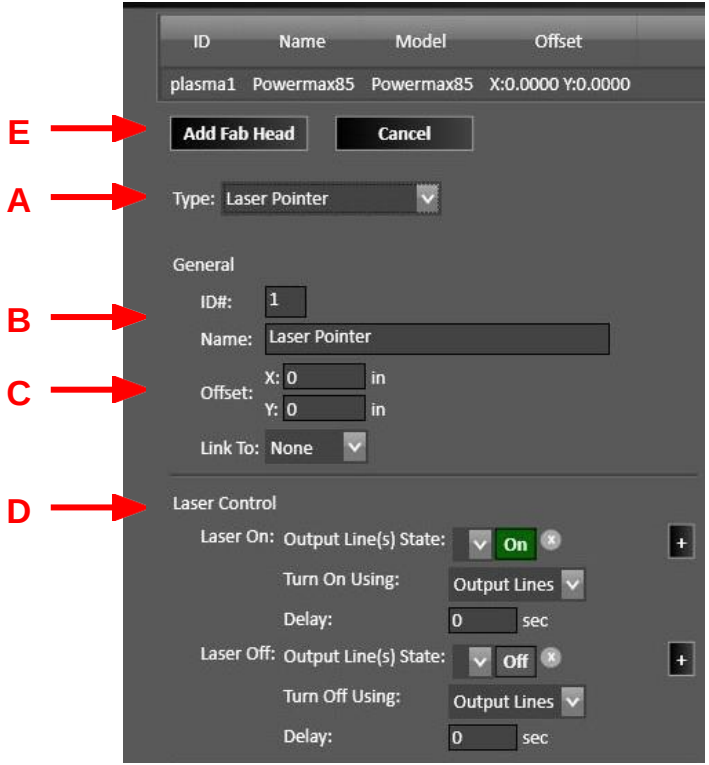
Adding a Laser Pointer

A. Go to *Fabrication Heads* in the Configuration Screen and select *New Fab Head*



Adding a Laser Pointer



A. Choose the Type *Laser Pointer*

B. *ID* and *Name* will be automatically populated

C. Set X/Y *Offset* as the distance from the center of the laser pointer to the center of the main fab head

D. Fill in the proper *Output Lines* for turning the *Laser Pointer On* and *Off* as well as the correct macros for Automatic Execution Mode

E. Hit the *Add Fab Head* button to finalize your fab head changes

F. *Save* the Setup file

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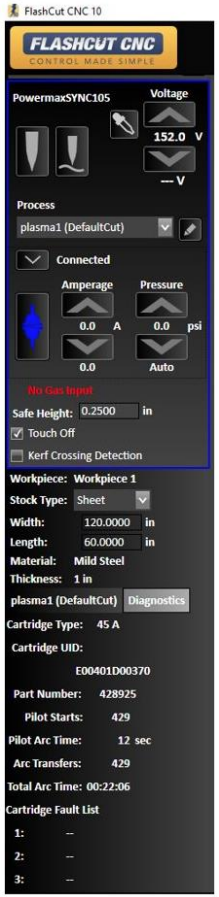
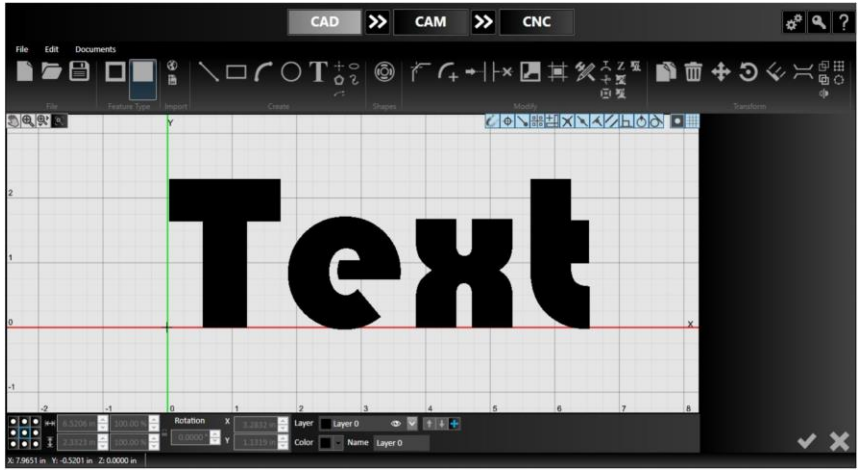
Powermax SYNC Cartridges & Support



- Available as an a-la-carte feature
- Reduce operator training and troubleshooting time with fewer consumable parts to manage and replace
- FlashCut GUI has continuous communications with Sync via RS-485 to track the life of each consumable including Pilot Starts, Pilot Arc Time, Arc Transfers, and Total Arc Time
- Adjust Amperage and Pressure through GUI
- Error code deciphering and tracking per consumable

PRO

Lesson 7:
Advanced CAD/CAM Tools



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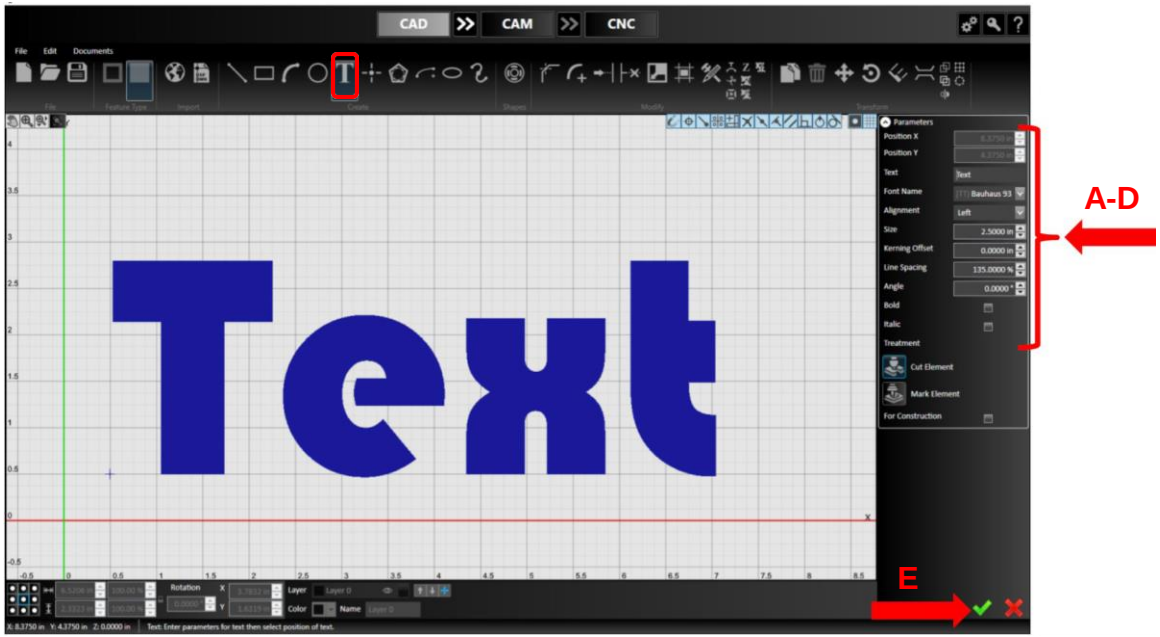
Using the *Text* Tool

A. Choose starting point with your mouse or type the X/Y Positions
B. Type the text you want
C. Choose a font; once you choose an initial font, you can use the up/down arrows to scroll through and view other fonts
    a. Flashcut uses any True-type font installed on your PC. We also install a single line font (SLF1) for your convenience
D. Adjust the size, kerning, line spacing, angle, bold, and italic options
E. Check it in



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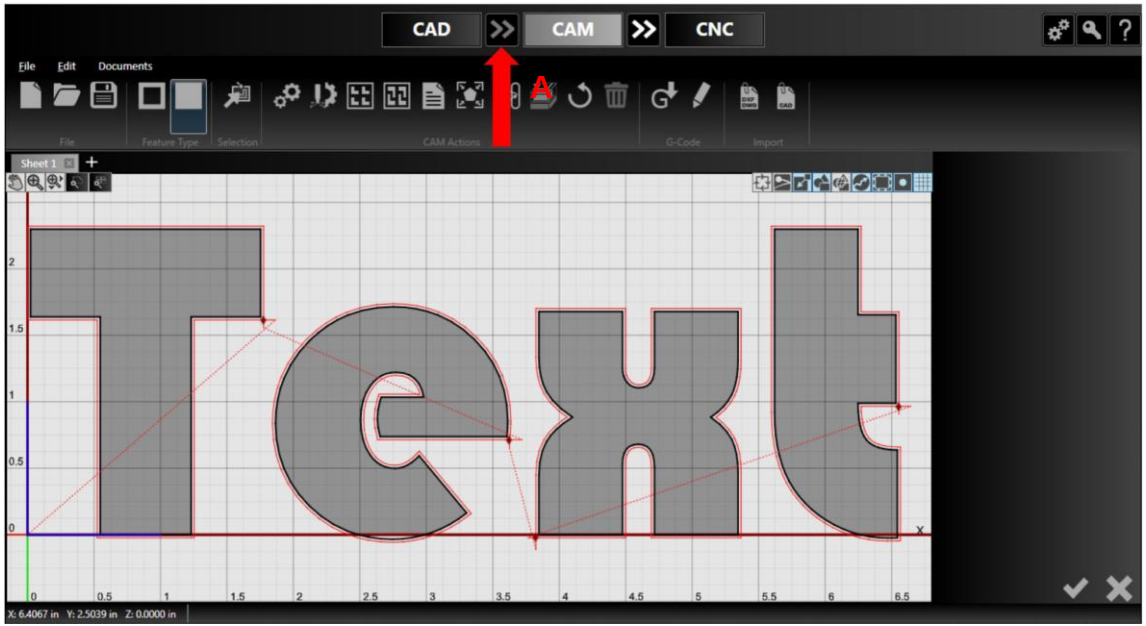
Using Advanced Text Toolpath

A. Go to the CAM mode by selecting the double arrows
B. Note that the toolpath is created without the need to explode the text (unless you need to modify the geometry of the text, such as adding bridges)
C. You can move and change the lead-in of each letter, which will be retained even if another letter in the word is edited



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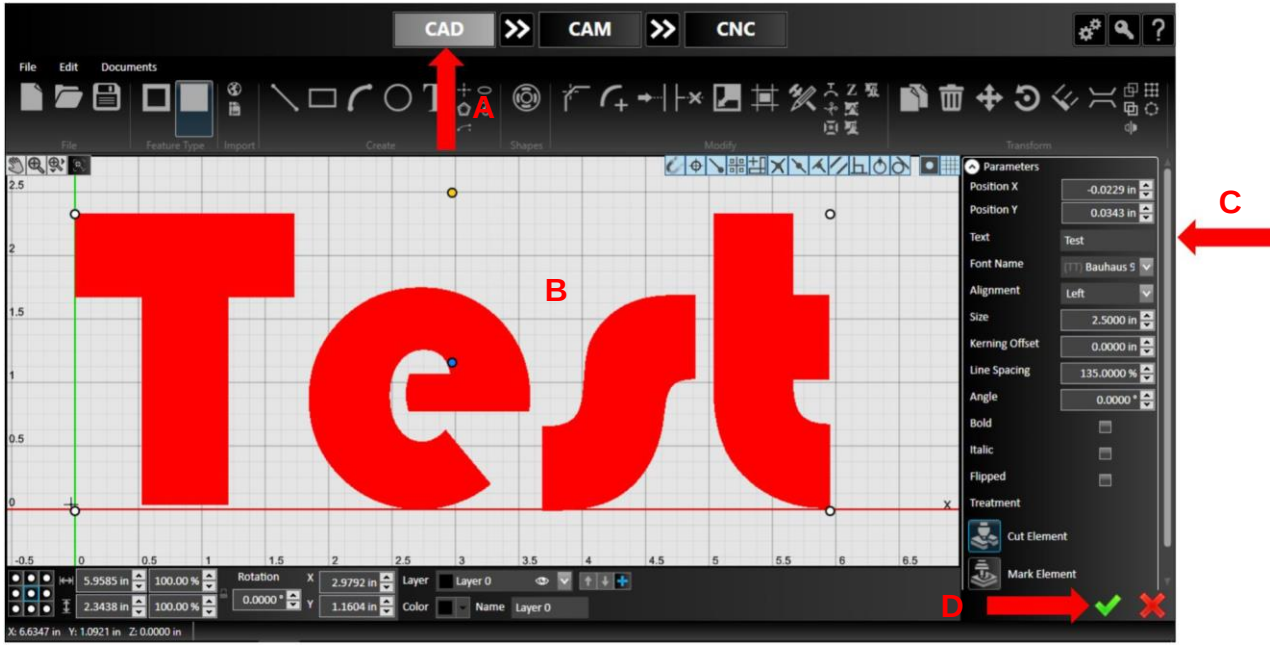
Editing Text Without Explode



A. Return to the CAD module
B. Click on the text to open the object's parameters panel for editing, even after generating a tool path
C. Change one letter in the word you typed
D. Check in any changes

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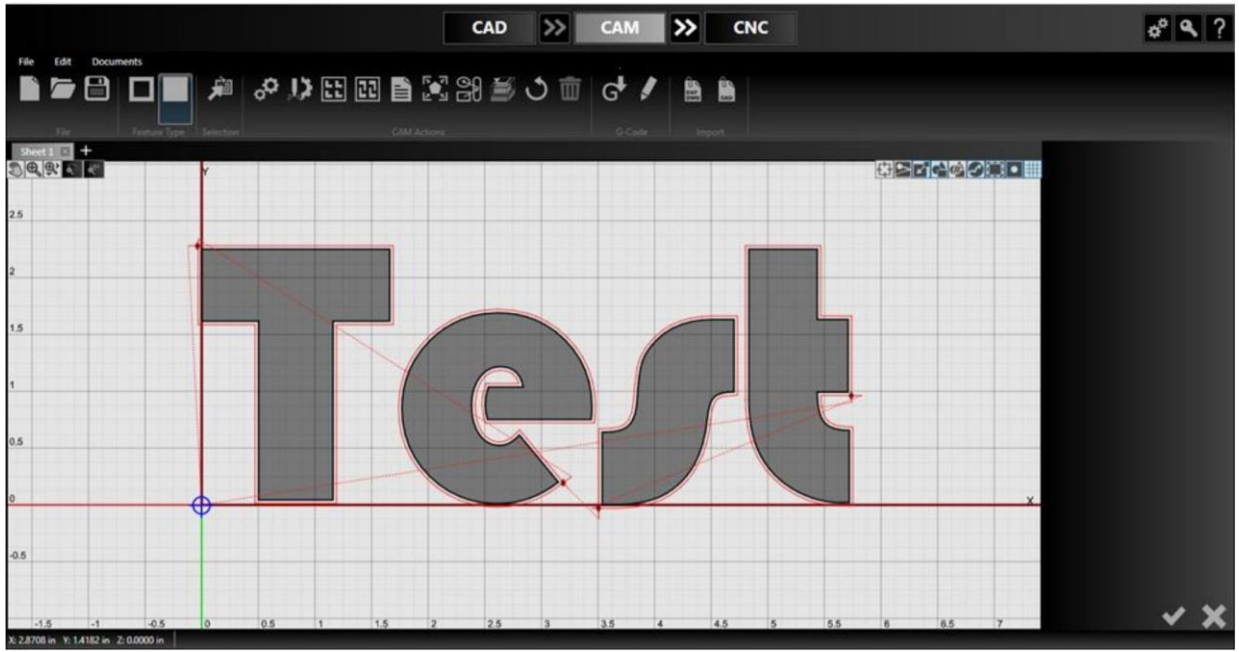
Toolpath of New Text



A. Go to the CAM module
   a. Notice how the toolpath regenerated with the new text from the font without having to explode the font

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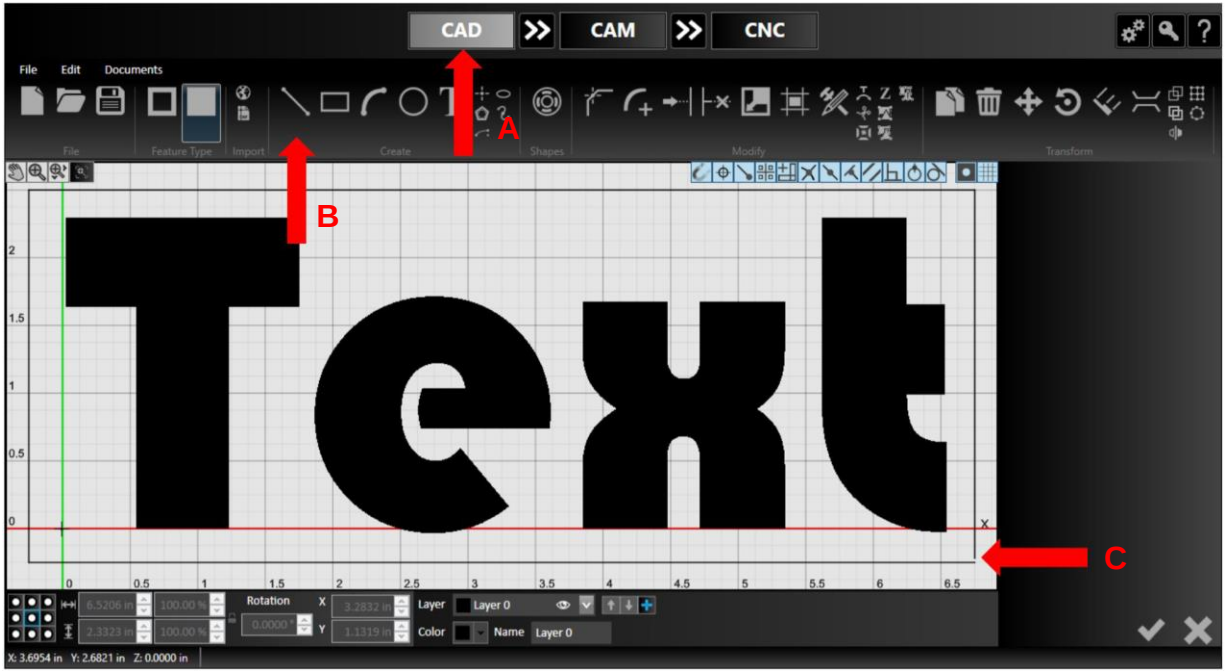
Using the *Fix* Tool



A. Go back to CAD
B. Click *Line Tool*
C. Draw box around the text, but leave the last line disconnected from the first; this is easier to do if you deactivate all of the snapping tools

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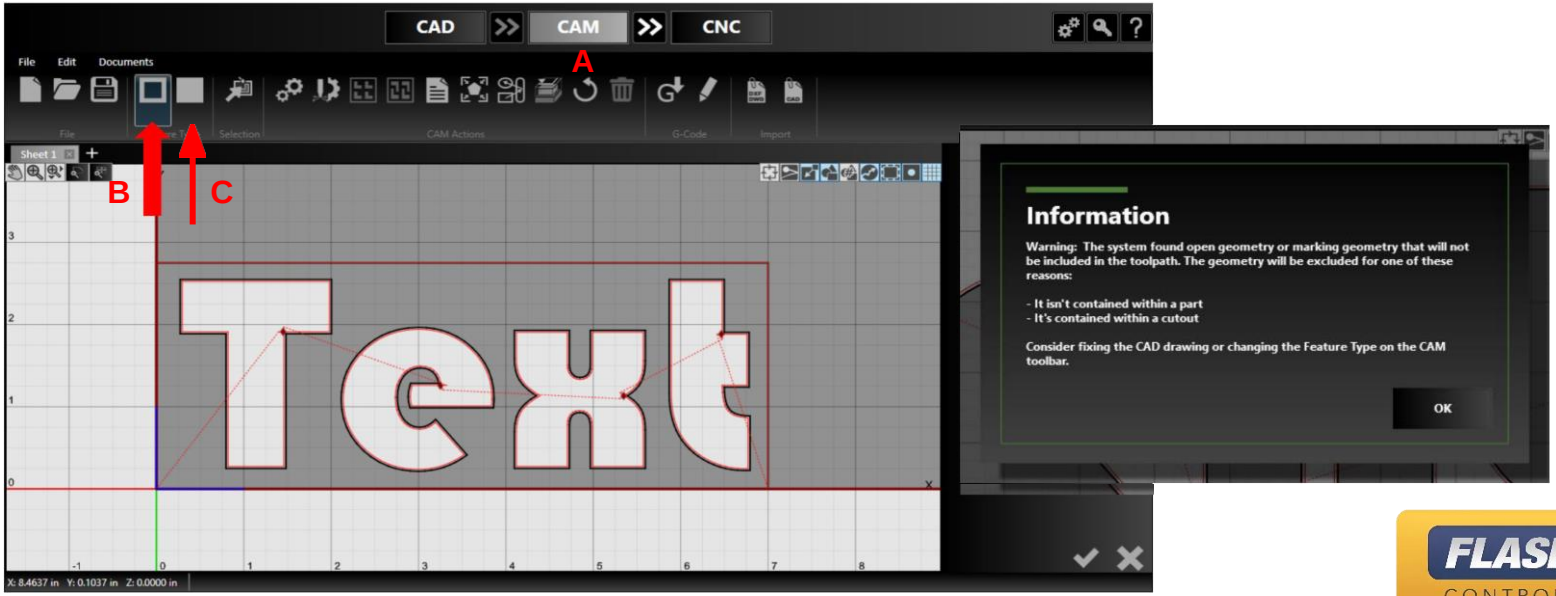
Create the Toolpath

A. Go to the CAM module by hitting the double arrows
B. The toolpath for the rectangle did not appear because it is not a closed entity
C. If you choose the *Make Top Level Features a Cutout* button, the rectangle will appear but the text will become a cutout and not a part
D. Switch back to *Make the Top Level a Part* feature type



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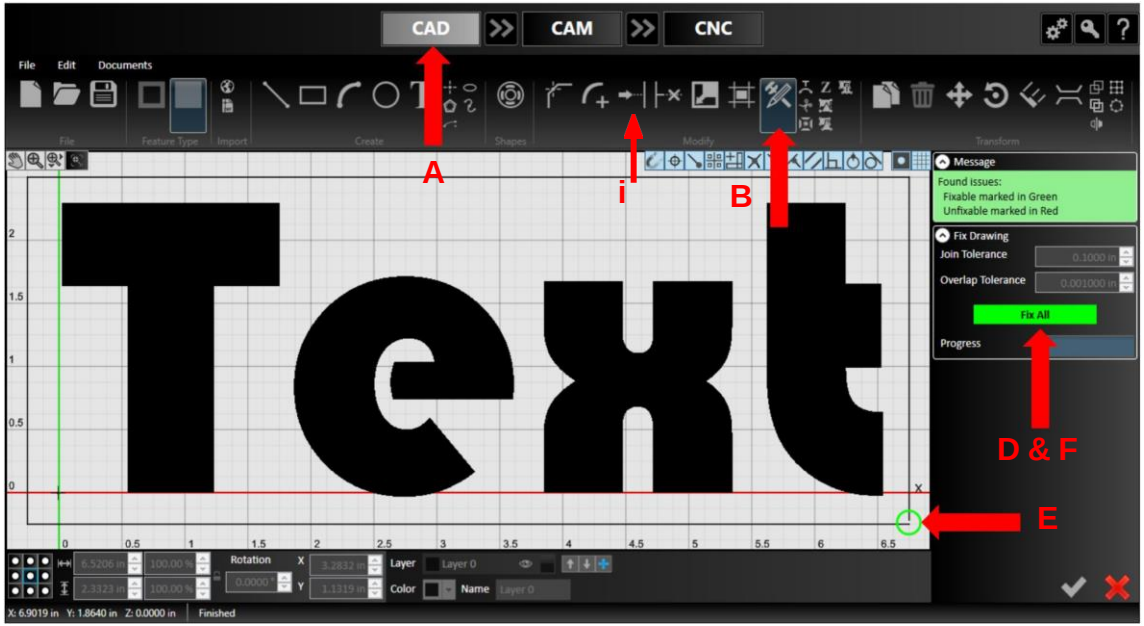
“Fix” the Rectangle



A. Go back to the CAD tab
B. Click the *Fix Drawing* tool (Shift + F)
C. Choose a tolerance larger than any of your drawing errors
D. Hit the *Search Issues* button
E. Any issues found will be noted with a green circle; any issues that cannot be fixed automatically will be noted with a red circle
F. You can either choose the *Fix All* button to automatically fix the issue of fix them manually
    i. (Optional) to fix them manually select the “Extend” Tool and move your curse near the open line segment

FLASHCUT CNC
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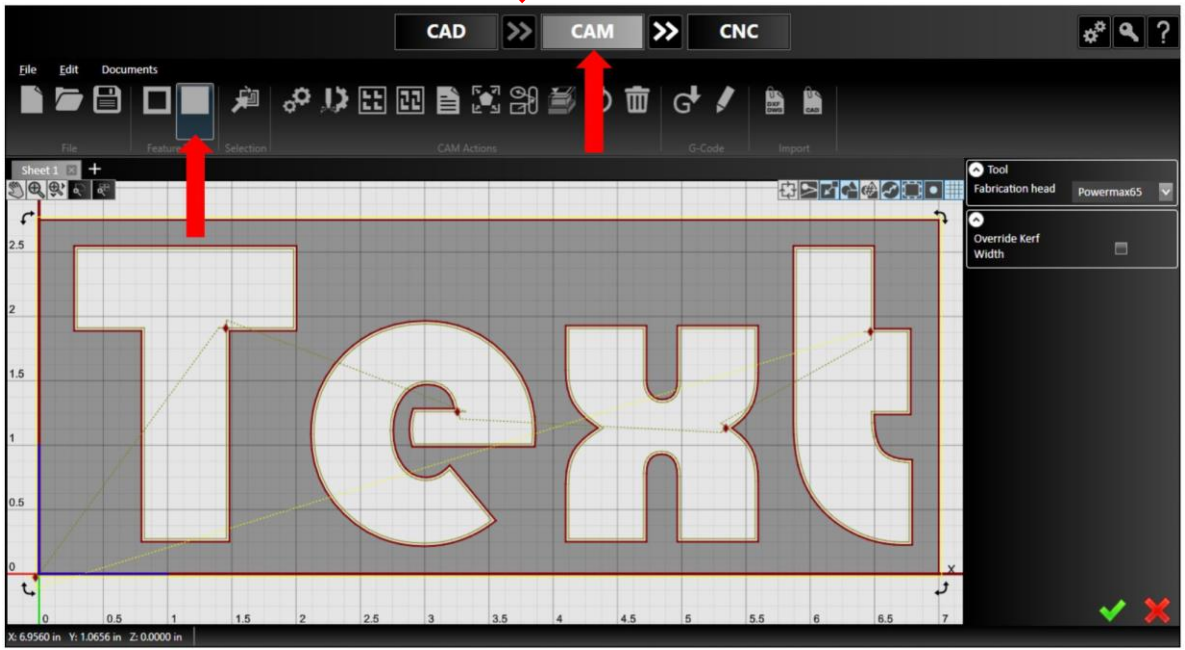
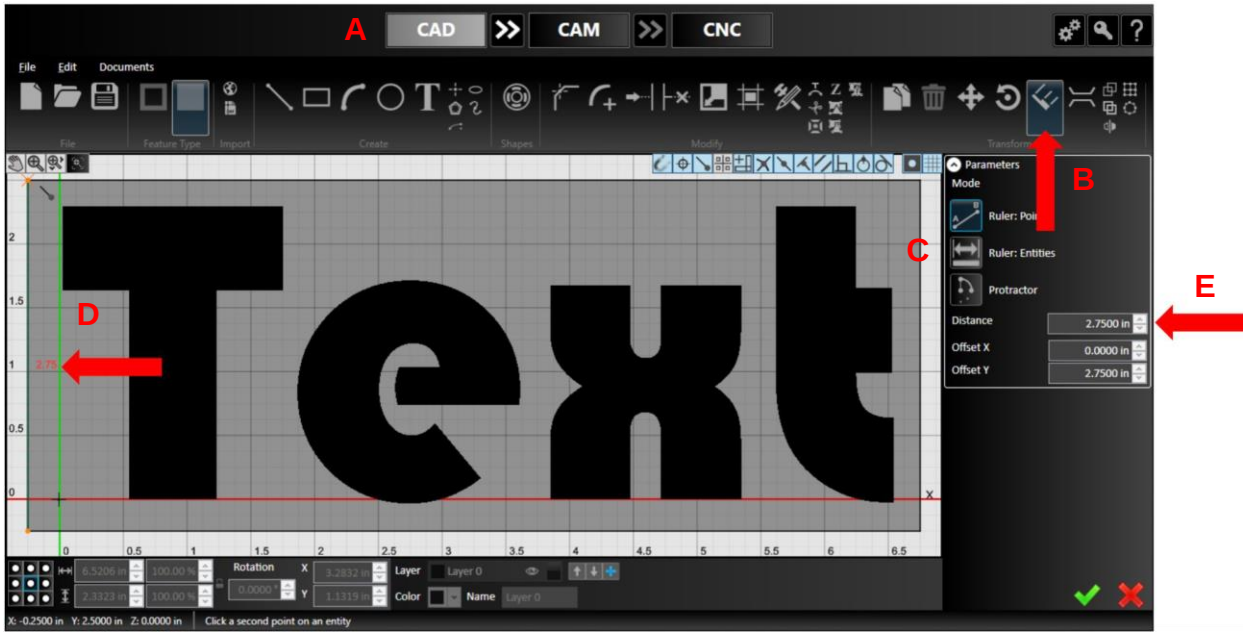
Create the Toolpath



A. Go to CAM by clicking on the name or double arrows
   a. Note that the “fixed” rectangle now appears no matter which feature type the top level feature is.

Using the *Measure* Tool



A. Go to CAD
B. Click *Measure Entities with Ruler* tool
C. Select the mode you want: *Points*, *Entities*, or *Protractor*
D. Select the portion of the drawing you want to measure
E. The corresponding dimensions will appear in the right side as well as on the drawing

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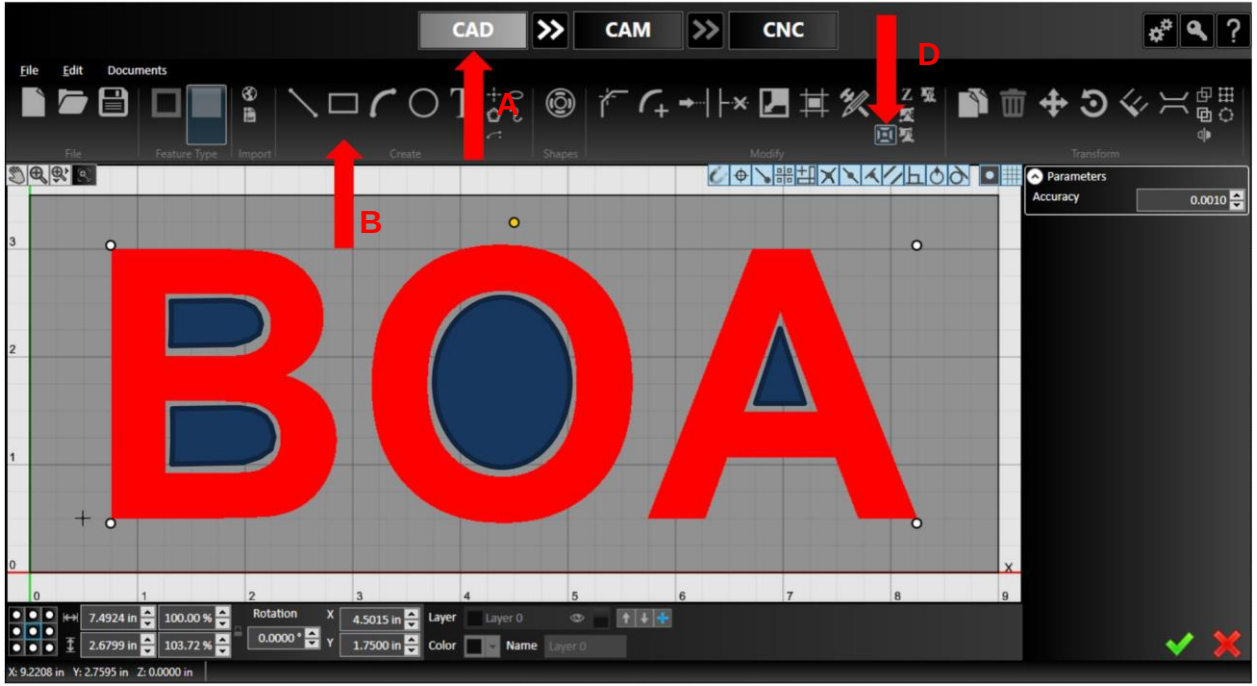
Using Bridges



A. Go to CAD
B. Draw the text “BOA” surrounded by a rectangle
C. If you cut this, the centers (shaded in blue for illustration) would fall out
D. Select the text and use the *Explode* button so that it becomes line segments

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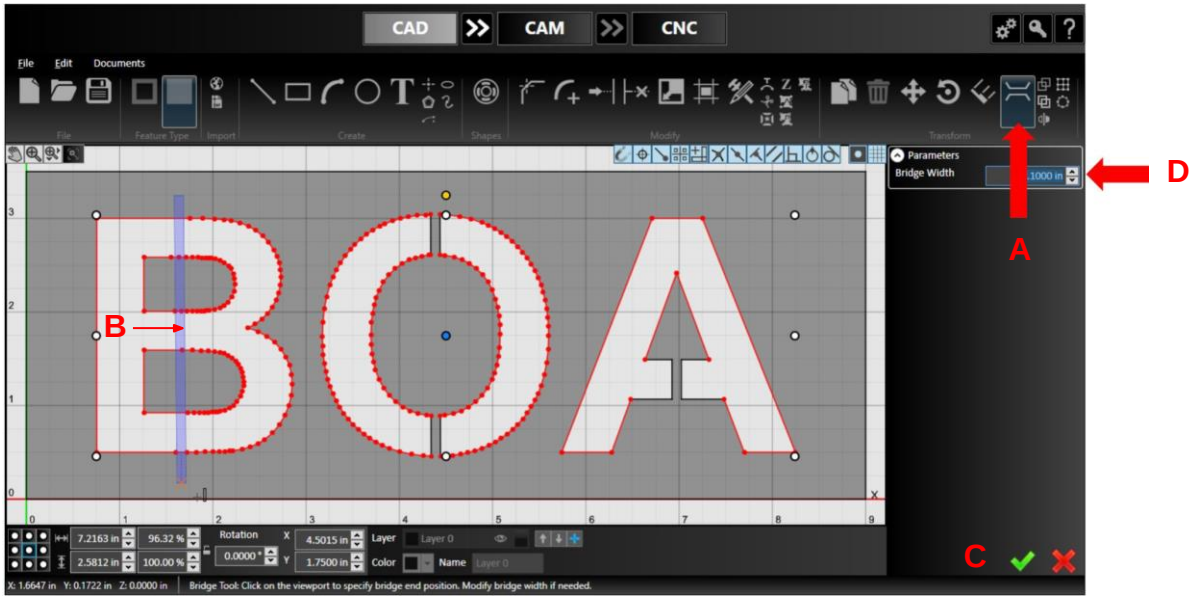
Using the *Bridge* Tool



A. Choose the *Bridge* tool
B. Draw bridges to join the interior of the letters to the surrounding box
C. Finalize each bridge by hitting the green *Check* or starting a new bridge
D. You can set the width of each bridge individually and you can move the bridge with your mouse before it is finalized

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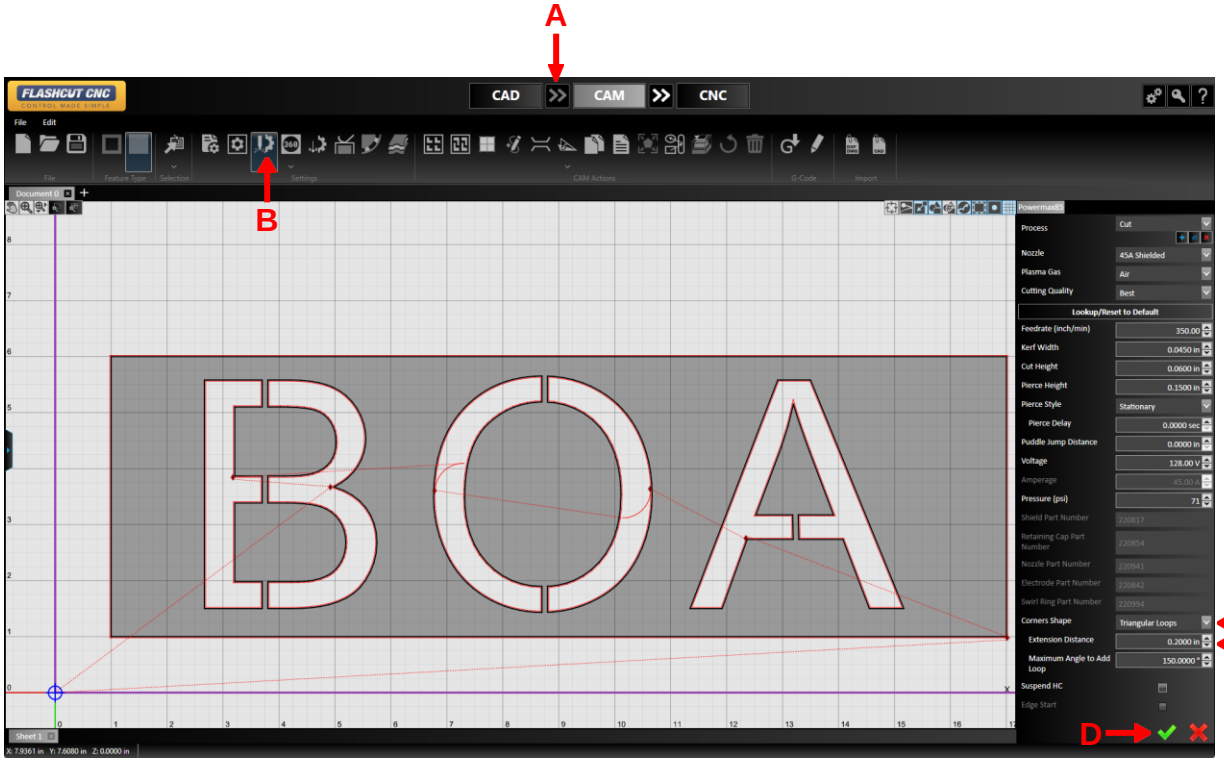
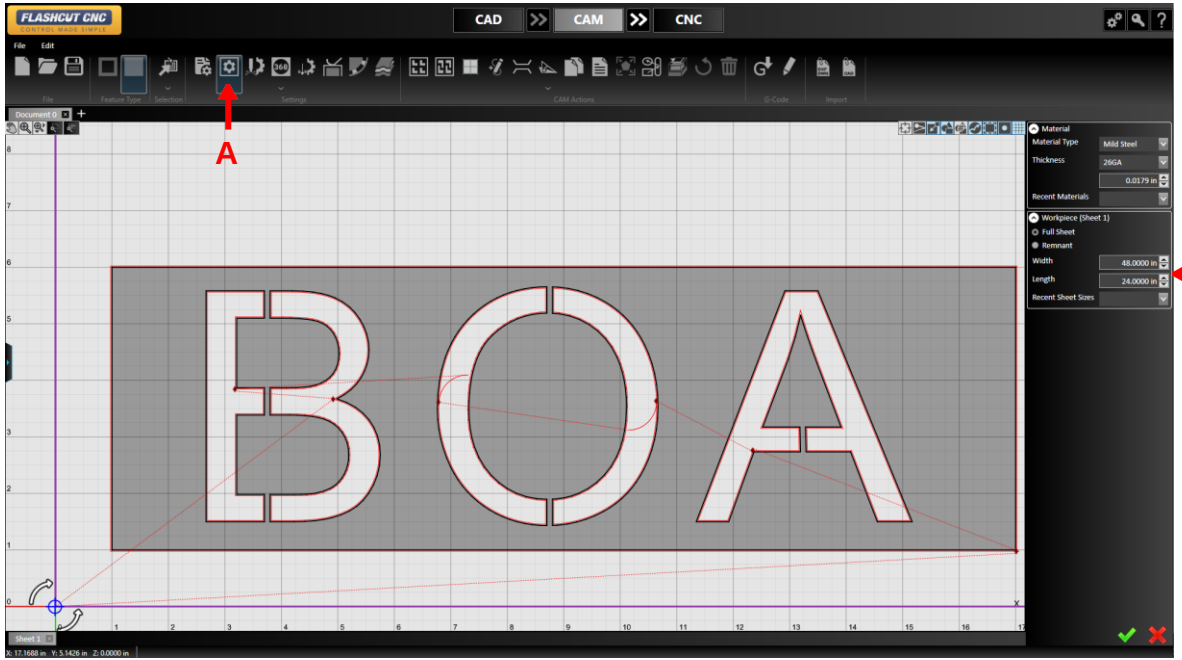
Create Corner Loops



Corner looping minimizes dross on sharp, exterior corners

A. Hit the double arrow to go to CAM mode
B. Go to *Plasma Settings* and set Corners to Round or Triangular Loops
C. Set the Corner Extension Distance; for example 0.15 in
D. Hit the green *Check* and save the CAD/CAM file

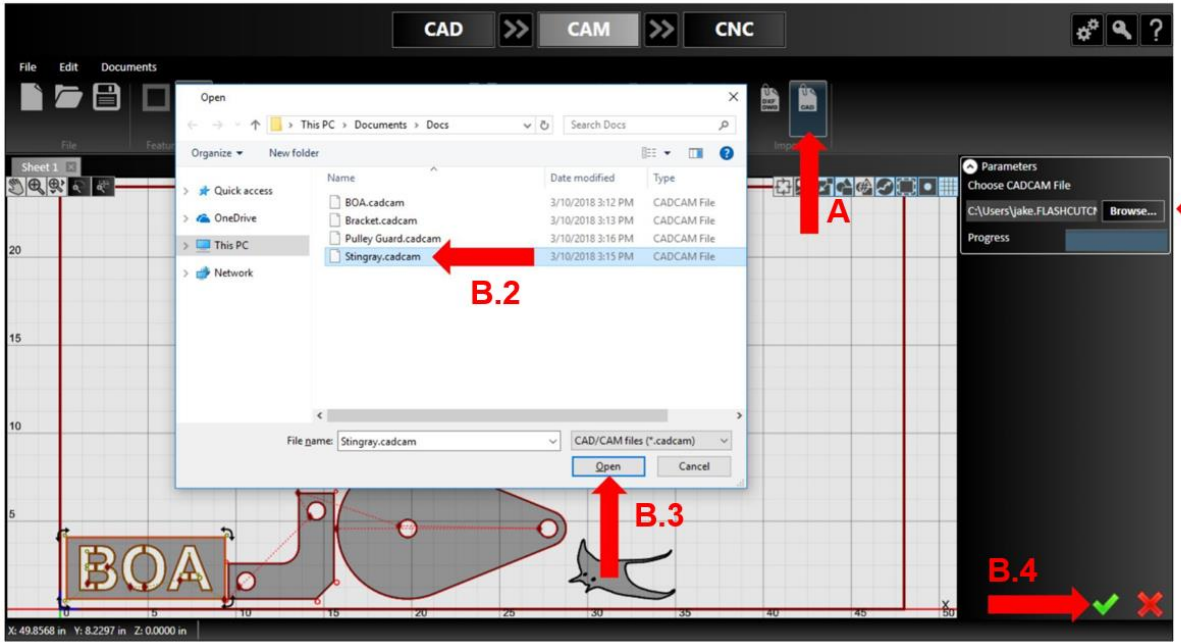
Nesting Multiple Files



You are not restricted to only nesting the parts in a given CAD/CAM file; you can reference external CADCAM and DXF files as well

A. Select the *Material Settings* icon
B. Specify the size and material properties of the sheet you will be cutting; in this example, we will use a 48” x 24” mild steel plate

Nesting Multiple Files



To reference an external CADCAM file while in CAM:

A. Choose the *Import External Files* icon

B. Choose the file(s) that you want to import and then hit the green *Check.* Simultaneously Import multiple files from the same directory by selecting them all at once

In this case, we are nesting all the files made in the different lessons

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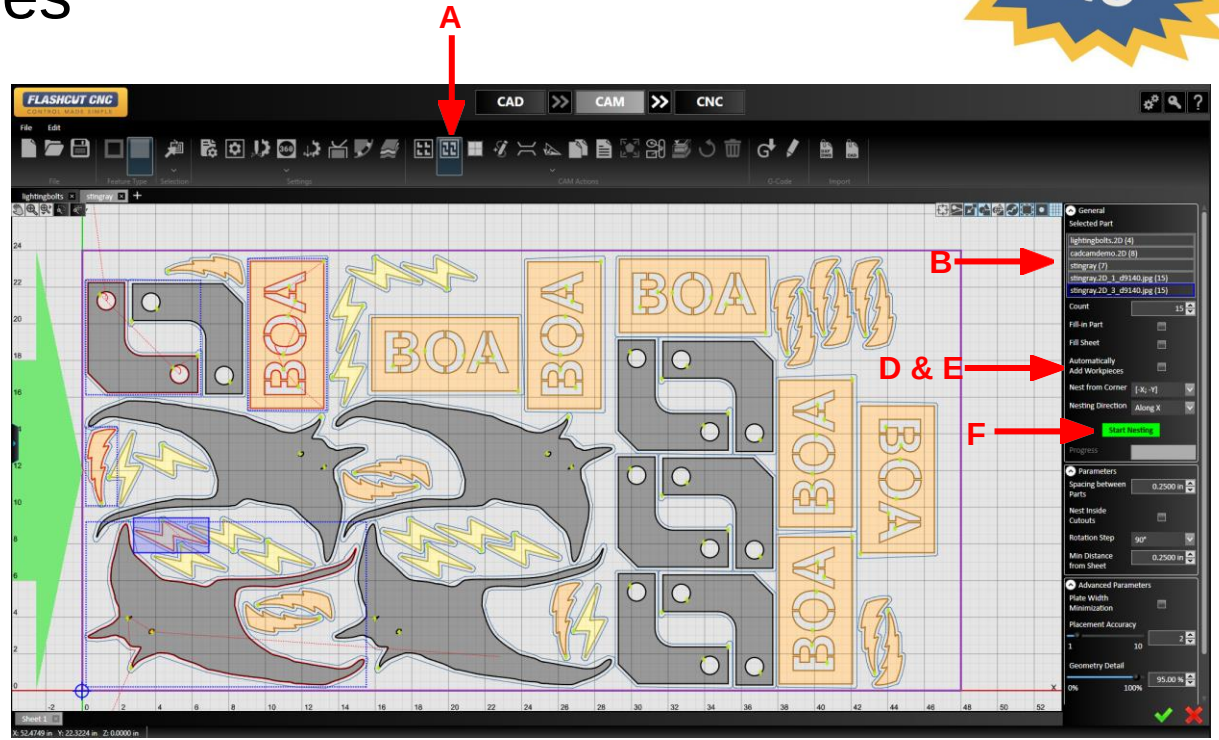
Nesting Multiple Files

A. Select the *True-Shape Nesting* icon
B. On the right will be a list of the parts to nest; click on each name and change each count
C. Note that the named parts gets highlighted in blue when name is clicked
D. Check *Automatically Add Workpieces* if you need more than one sheet
E. Fill in the other options such as Nesting direction, Minimum distances, etc
F. When you are ready, hit the *Start Nesting* button; complex nests will take longer



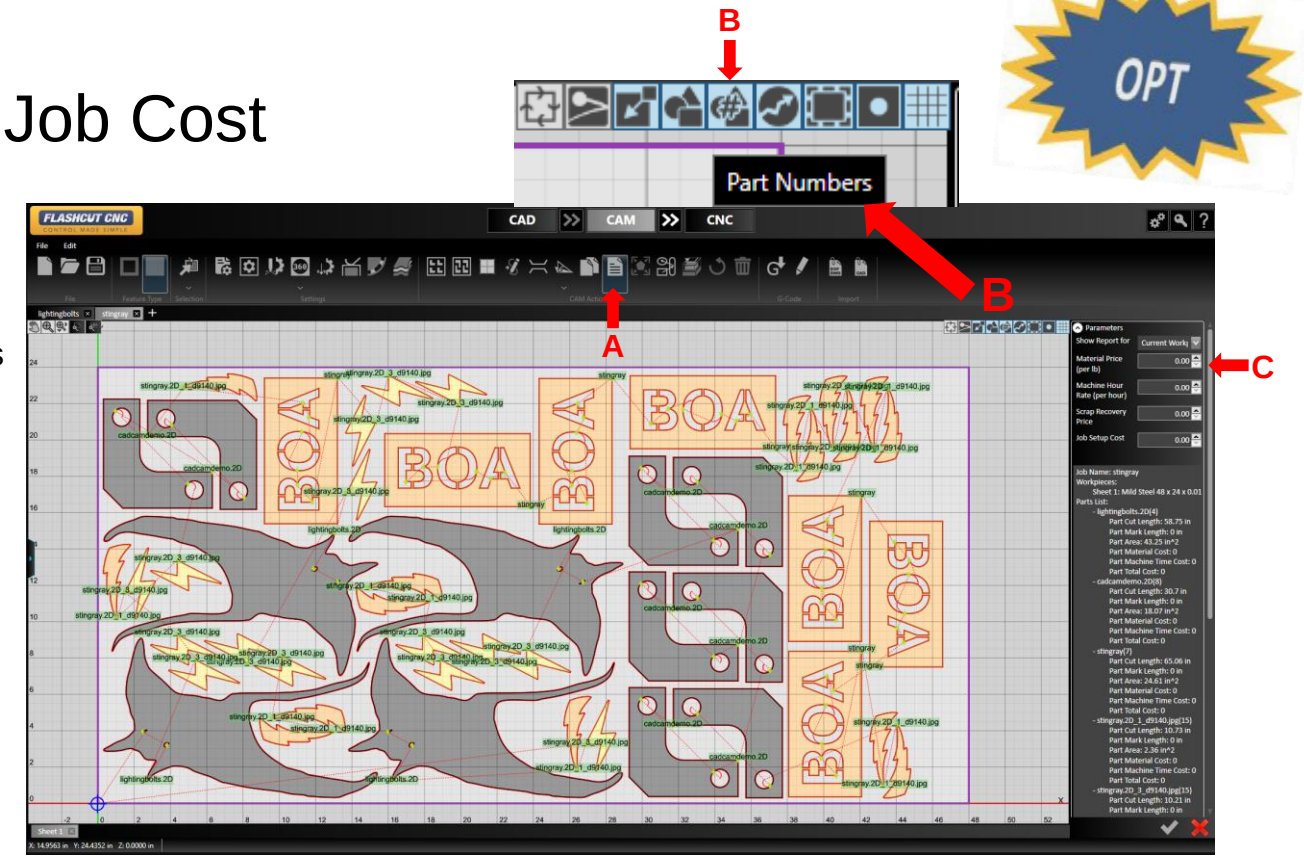
Nesting Report & Job Cost

A. Click on the *Nesting Report* tool to open information about the nest
   a. Information includes number and type of parts and material efficiency

B. Toggle the *Part Numbers* CAM view to see an overlay of the name of each part in the nest

C. Adjust the "**Material Price**", "**Machine Hour Rate**", "**Scrap Recovery Price**", and "**Job Setup Cost**" to receive more accurate job cost estimates

D. This report can be printed by clicking the corresponding button at the bottom of the parameters panel



Note: You will need to scroll to the bottom of the nesting report to access the "Save and Edit" & "Print…" Buttons.

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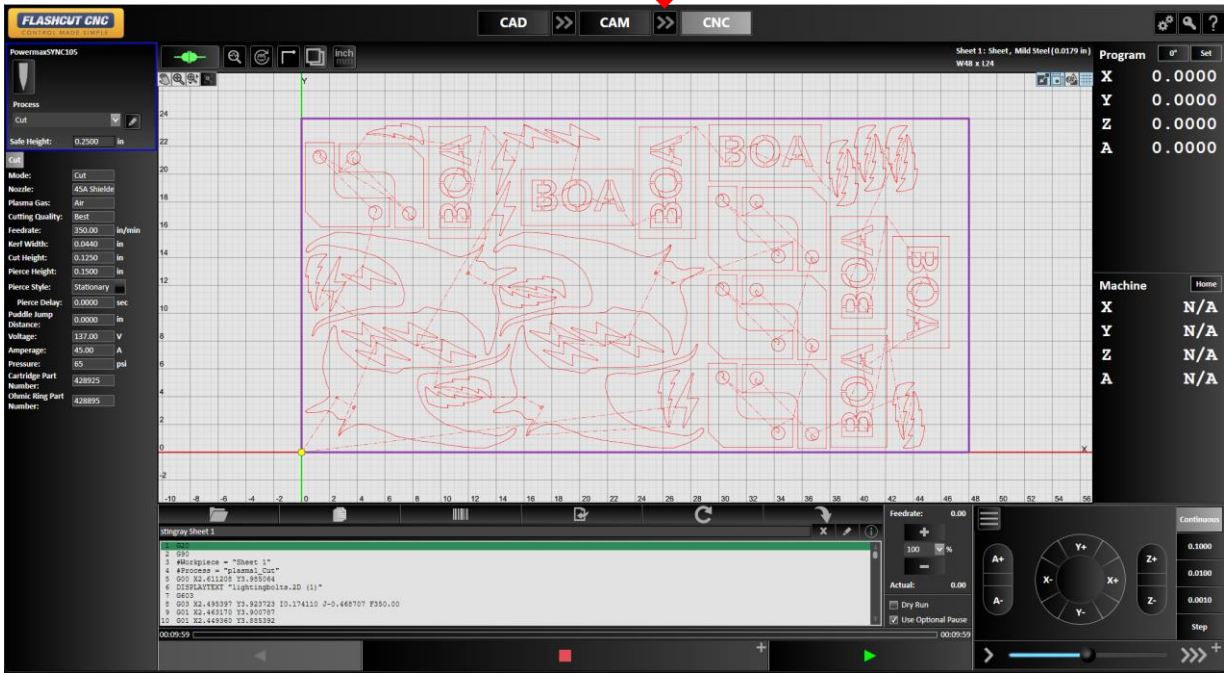
Send Nest to CNC



A. Select the sheet that you want to cut
B. Select the double arrow between CAM and CNC

The G-Code of the nested toolpath will be sent automatically to CNC

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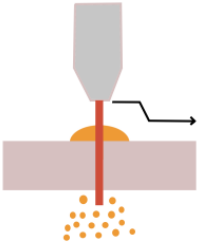
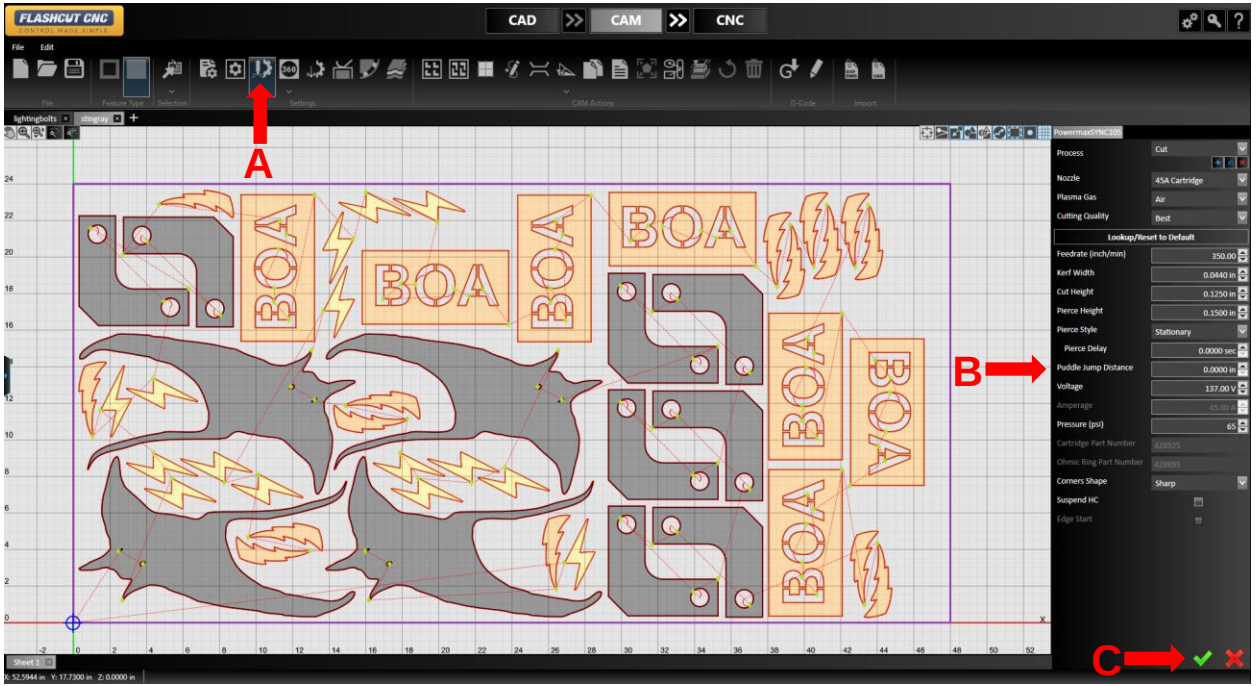
Puddle Jumping



- Used to hold pierce height over molten puddles when cutting thick material.
- Goes down to cut height after puddle jump distance is cleared.



To Enable Puddle Jumping:

A. Select the "*Fabhead Settings*" icon

B. Set the *Puddle jump distance* to your desired amount

C. Confirm the changes

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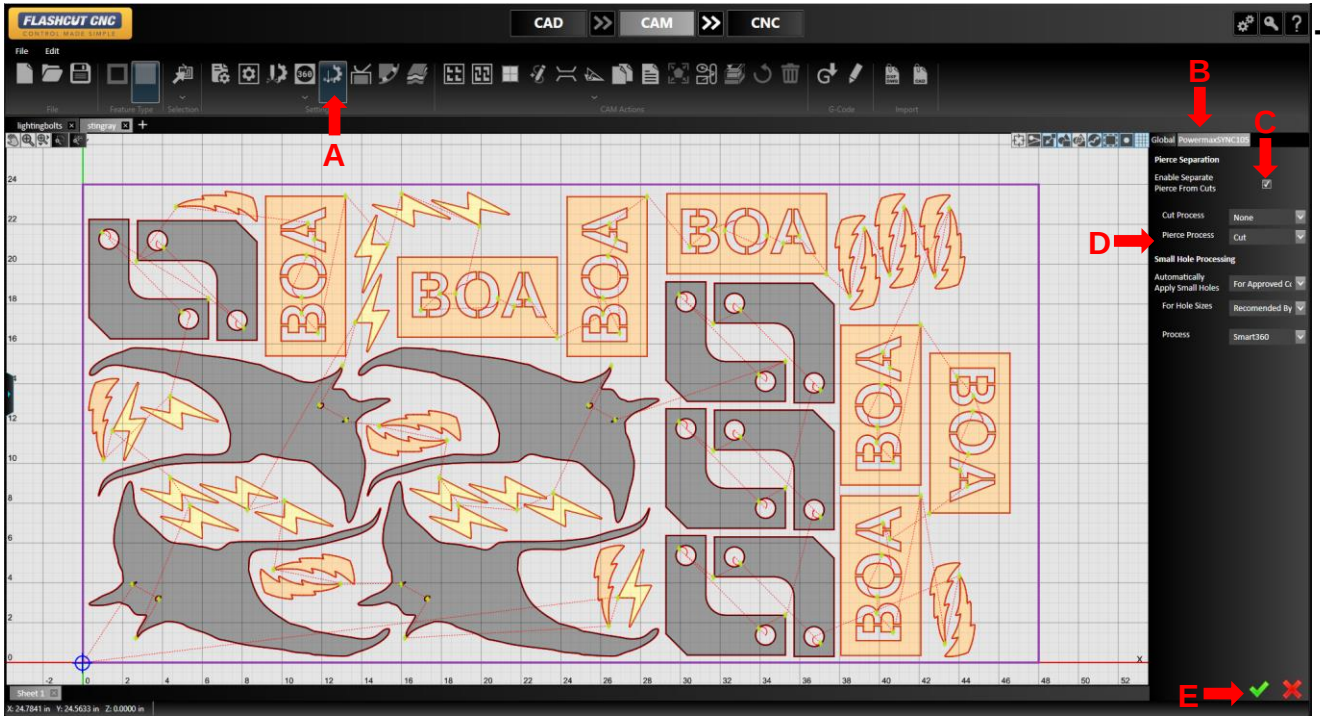
Separate Pierces and Cuts

- Separate operations so all pierces can be done before profiling
- Allows for operator to remove topside dross from pierces before profiling



To Separate Pierces and Cuts:

A. Select the "*Automatic Operation Creation*" Tool
B. Select your desired fabhead
C. Check "Enable Separate Pierces From Cuts"
D. Select your desired cut process for each
E. Confirm the changes

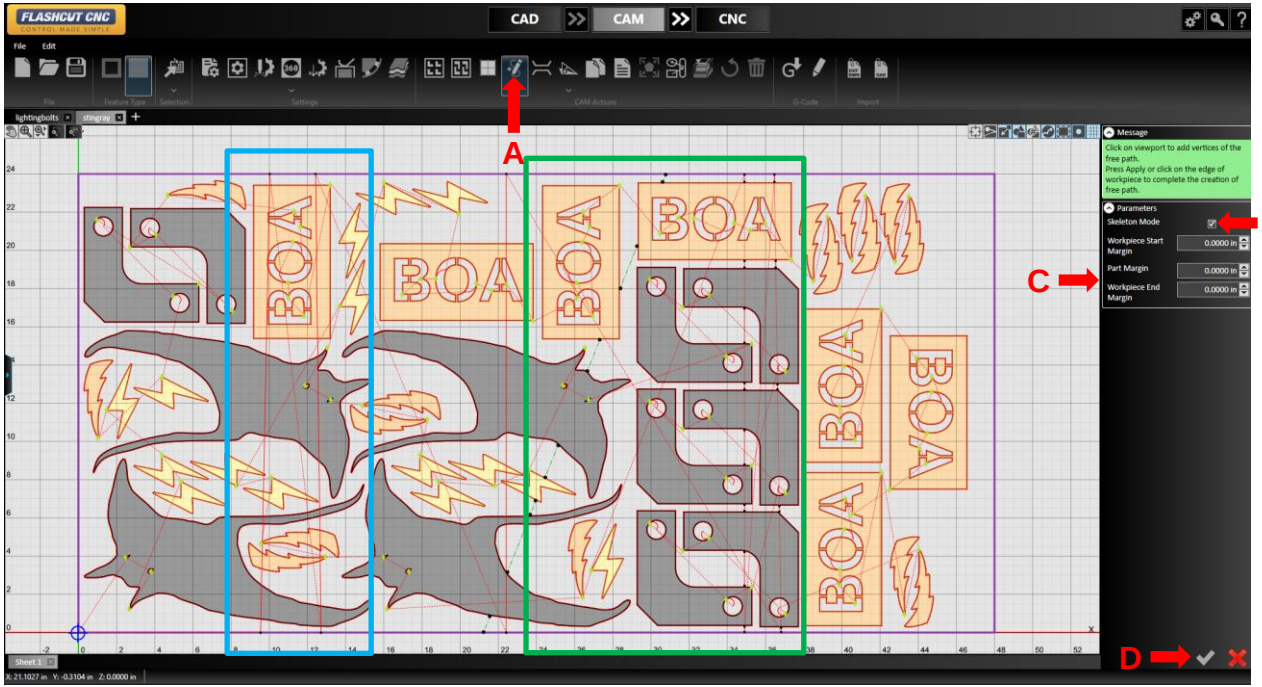
Free Cut Tool & Skeleton Mode

Free Cut

Allows the user to add cuts to the existing toolpaths on the drawing. Click to add vertices of the cut, similar to the Line tool in CAD.

Skeleton Mode

When selected, allows the user to define areas where cuts cannot be made, in relation to either the boundaries of the workpiece or any existing parts on the workpiece.



To Enable Skeleton Mode

A. Click the *Free Cut* Icon located in the CAM Action section
B. Check *Skeleton Mode* box
C. Configure the *Workpiece* start and end margins
D. Confirm your settings

- Skeleton Cut effortlessly cut scrap material into manageable pieces
- Automatically recognizes parts and cutouts so it only cuts through the scrap remnant
- *Free Cut* creates a toolpath regardless of the parts

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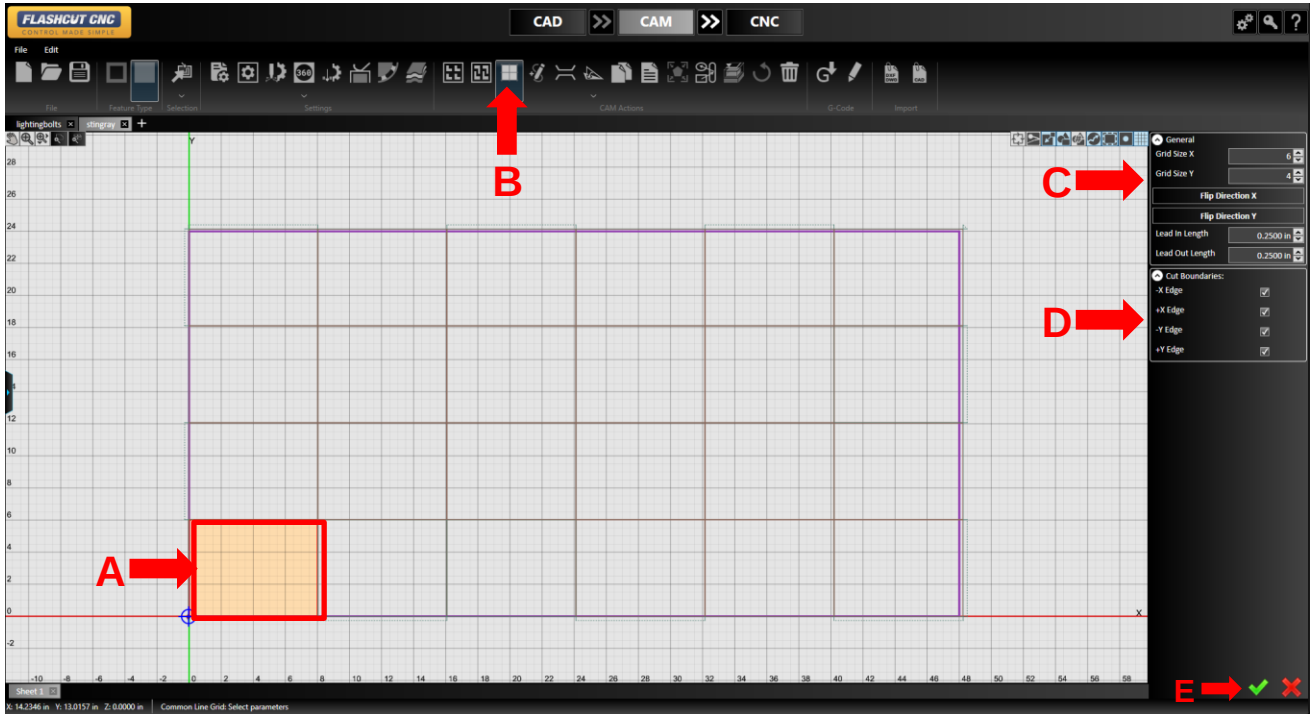
Common Line Cutting

Creates a set of identical parts based on a single part where the edges of each part are cut using a grid of common parallel lines. The part to be replicated must have parallel sides (e.g., rectangles).

OPT



To Use Common Line Cutting:

A. Select the part you wish to replicate
B. Click the *Common Line* tool
C. Configure Grid Size and Lead in/out
D. Select the Cut Boundaries for the edge of your sheet
E. Confirm your settings

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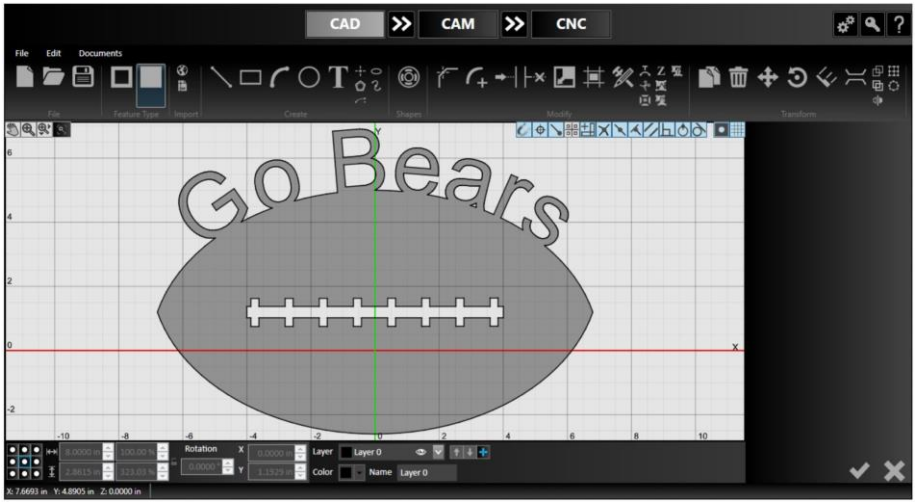
Lesson 8:
More Advanced CAD Tools



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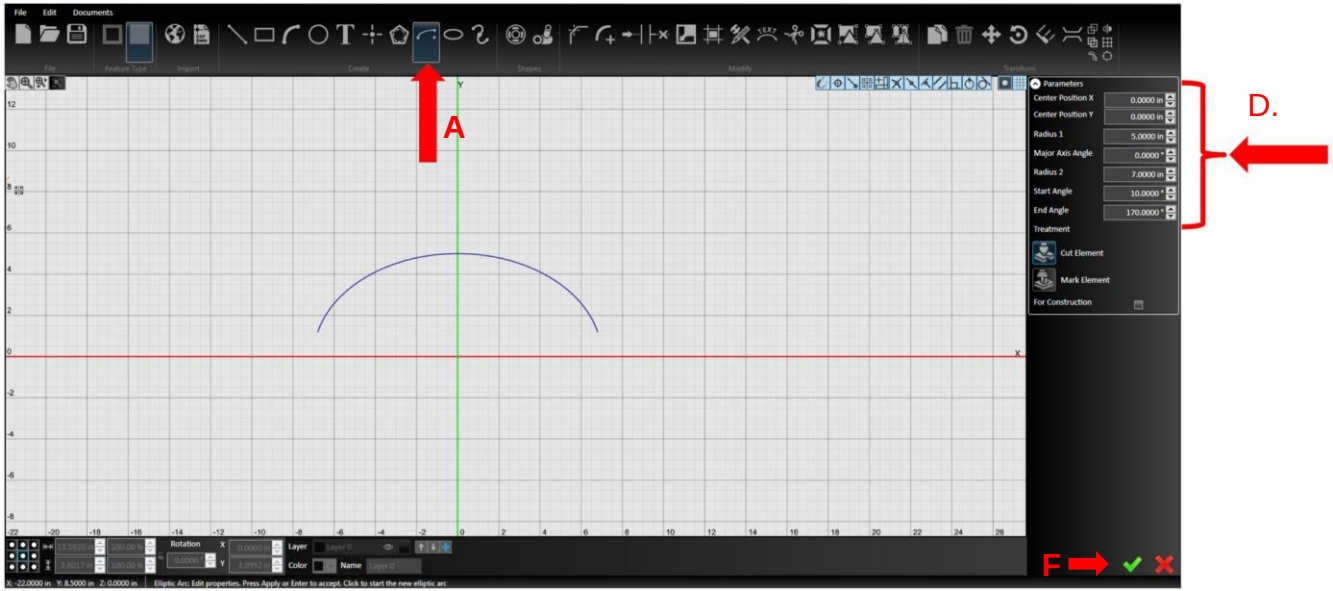
Elliptical Arc



A. In CAD, choose the *Elliptical Arc* tool
B. Chose the center point for the full ellipse with your mouse or by typing on the parameters panel
C. Choose the major and minor radii of the ellipse
D. Choose the start angle and end angle with your mouse or by typing on the right
E. Draw the upper arc only
F. Hit the green *Check*

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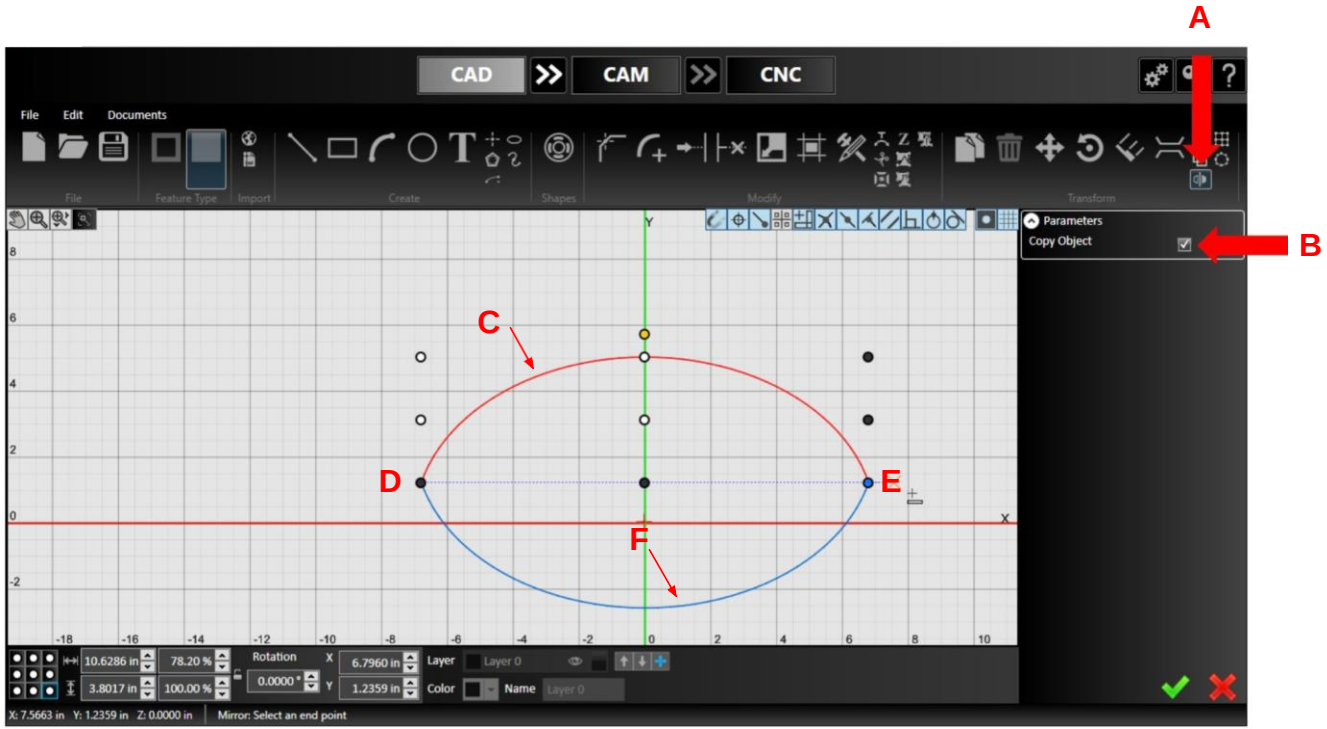
Mirroring



A. Select the *Mirror* tool
B. Check the *Copy Object* box – otherwise, the original copy will be removed
C. Select the elliptical arc to mirror and right click to accept
D. Select the left end of the elliptical arc as one endpoint of the mirror line
E. Select the other endpoint of the mirror line; while you select, the mirror line is dotted
F. The mirrored object will now appear

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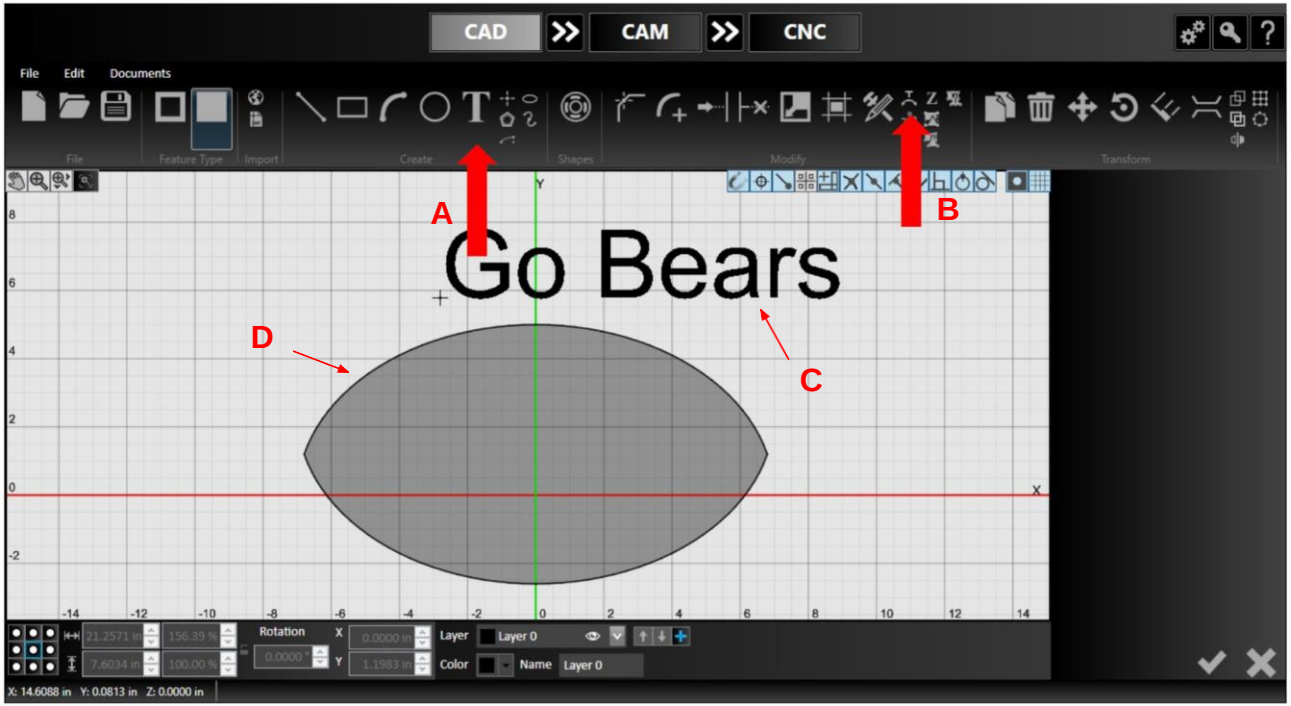
Curved Text



A. Use the *Text* tool to type the text to curve in any font and size

B. Select the *Curved Text* tool

C. Select the text that you want to curve then right click to confirm

D. Select the curve that you want the text to follow and right click to confirm

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Curved Text

A. Adjust the parameters to flip the text; determine the alignment and offset

In this case, we want the bottom of the text to be just below the top of the curve

B. Use the arrows next to the text to move the text along the curve

Note: You can still edit the text in the text editor

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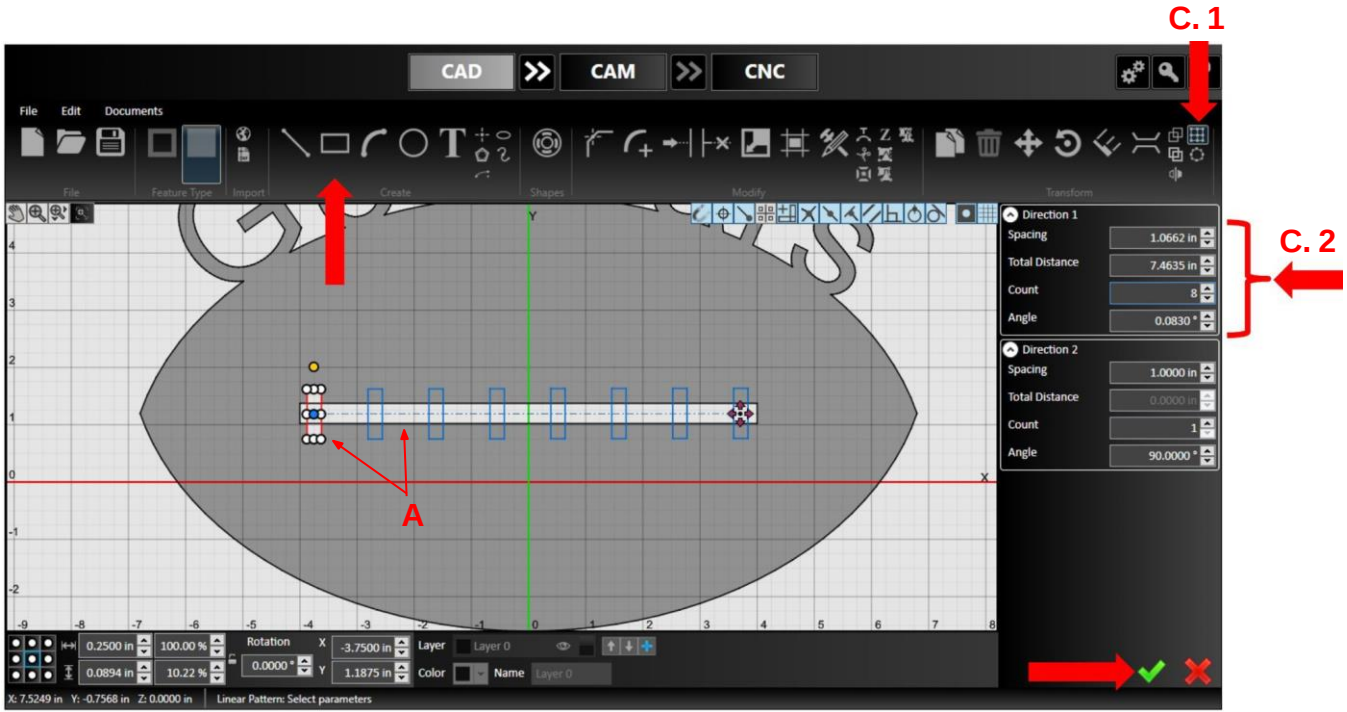
Shape Welding

A. Explode the text into geometry by selecting the text and hitting the *Explode* button
   a. Once the text is exploded, it cannot be edited

B. Select all of the geometry that you want to weld together; in this case, it's all of the geometry, so you can use ctrl+A or drag over the part to select everything

C. Choose the *Weld Selected Entities* tool to weld everything into one part

Linear Pattern



A. Draw a long horizontal rectangle and a short vertical rectangle on the left (see red rectangle in image)

B. Select the red rectangle by alt+clicking any of its sides

C. Click the *Linear Pattern* tool and enter the spacing and count parameters

Note: There is also a *Circular Pattern* tool

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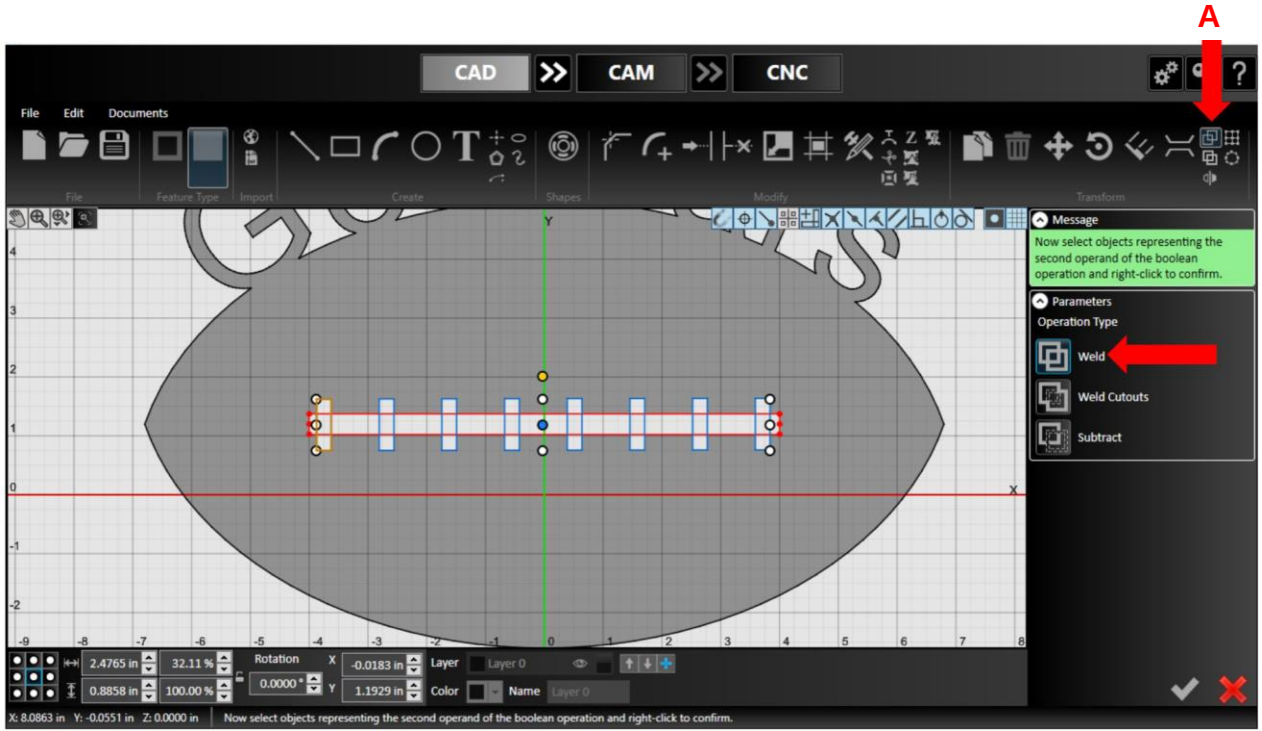
Welding and Boolean Operations



A. Select the *Weld Entities* tool to weld the objects together once you are happy with the lace pattern

Note: The *Boolean Operations* tool allows you to do welding and other operations such as subtracting entities and welding cutouts

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Create the Toolpath

A. Hit the double arrow button to automatically create a toolpath

B. Hit the next double arrow icon to generate a G-Code and send it to the CNC panel

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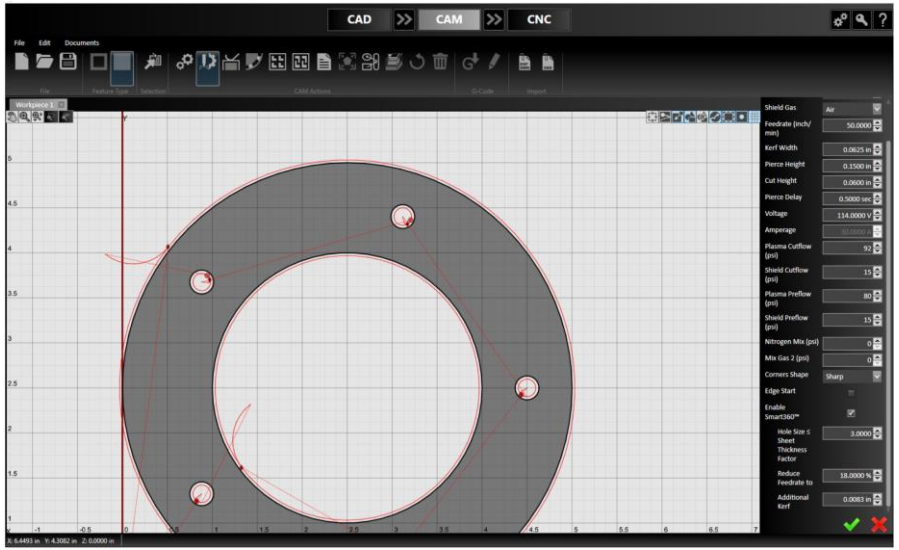
Lesson 9:
Smart360™



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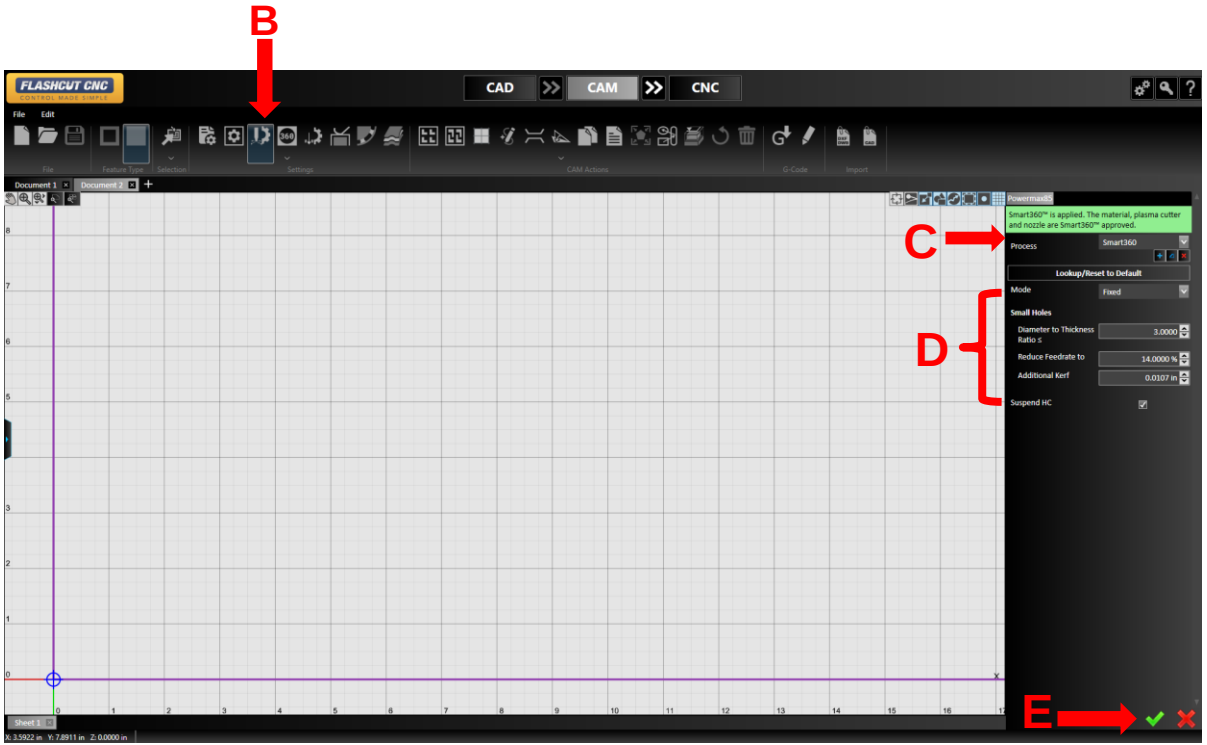
Enable and Configure Parameters



A. Make sure you have a compatible torch configured
B. Open *Plasma Settings*
C. Under the “Process” drop down, Select “Smart360”
D. Configure the feedrate reduction factor and other process parameters
E. Apply the changes

Note: If the selected parameters are compatible, an Additional Kerf value will be generated.
Otherwise, the user can enter a value based on experience

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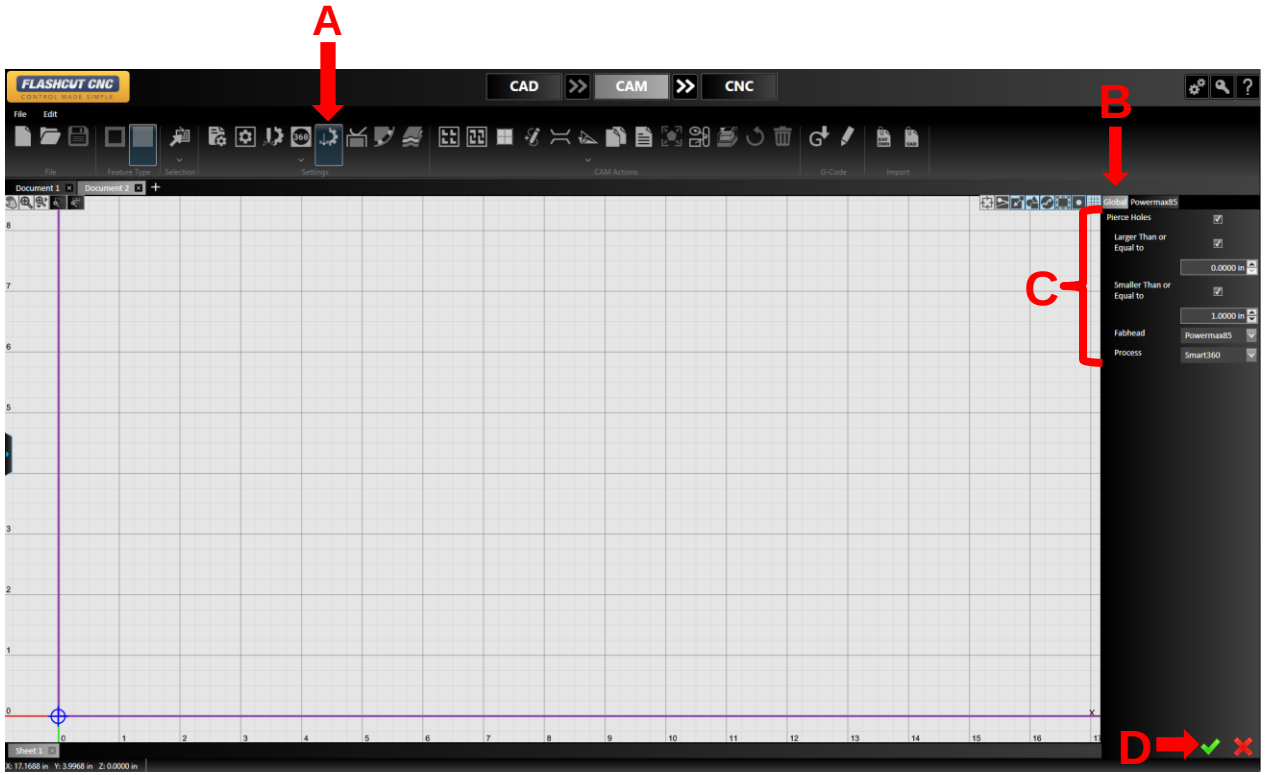
Enable and Configure Parameters



A. Select the *Automatic Operation Creation* tool
B. Select the “Global” tab
C. Enable Pierce Holes, configure desired hole size range, and select “Smart360” for the process
D. Apply the changes

All holes within the range of the specified size will now be pierced using the “Smart360” Process.

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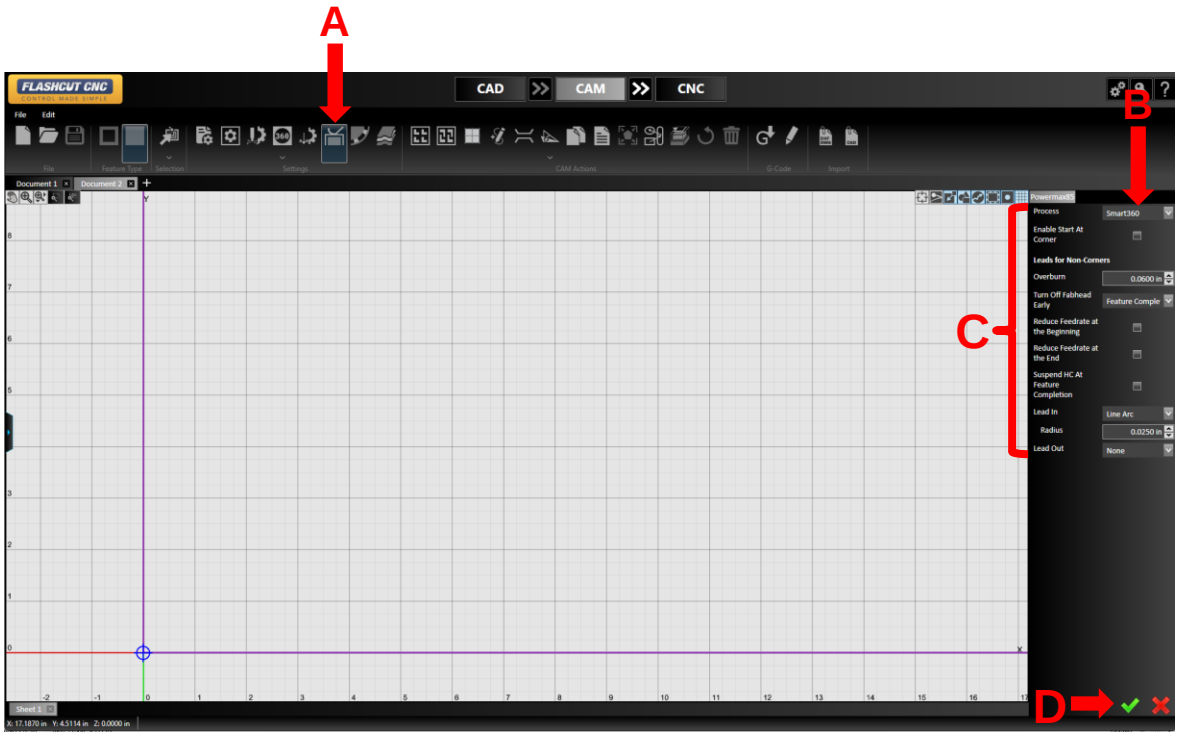
Modify Lead-In



A. Open the *Breaks tool* to change lead-in parameters

B. Under the “Process” drop down, Select “Smart360”

Each aspect of the Smart360™ lead-in is generated automatically

C. For advanced users, each parameter can be individually modified

D. Apply the changes

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Lesson 10:
Cutting a Part in CNC

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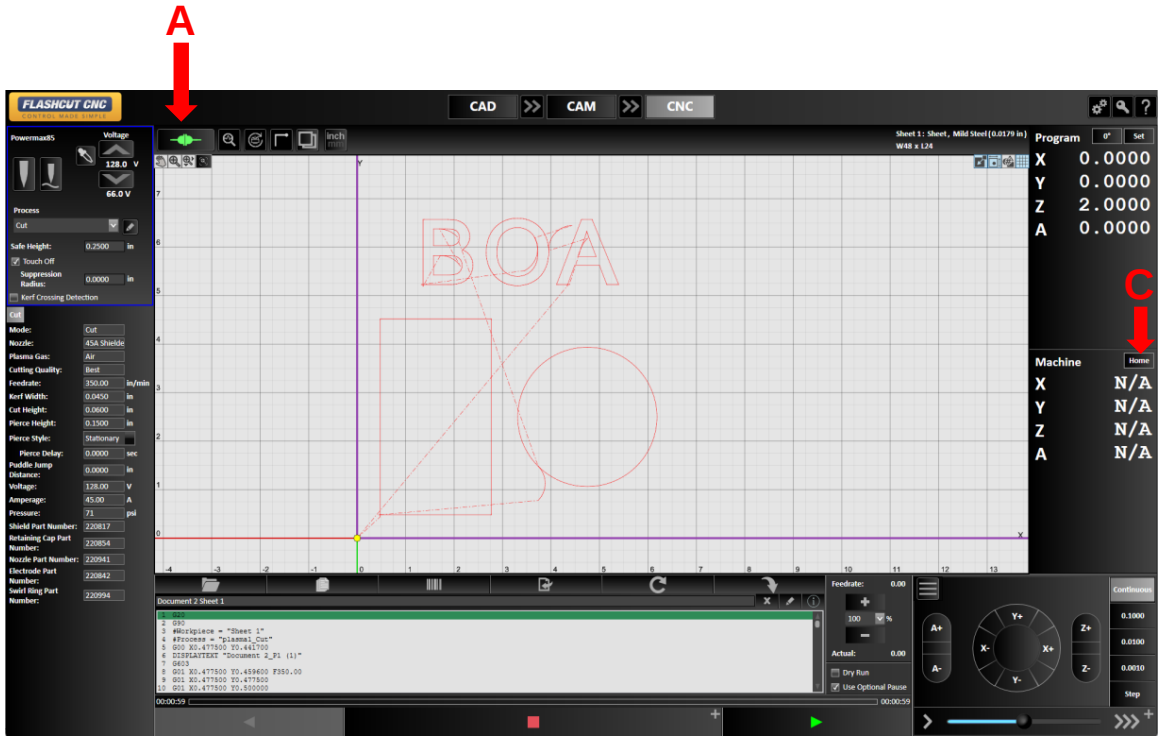
Connect to the Controller



A. Make sure the controller is connected by selecting the Connect button

B. Agree to the “Safety First” message when prompted and hit OK to upgrade the firmware if prompted

C. If you configured for homing, select the *Home All;* the machine will seek the switched on all axes and set all of the Machine Coordinates to 0

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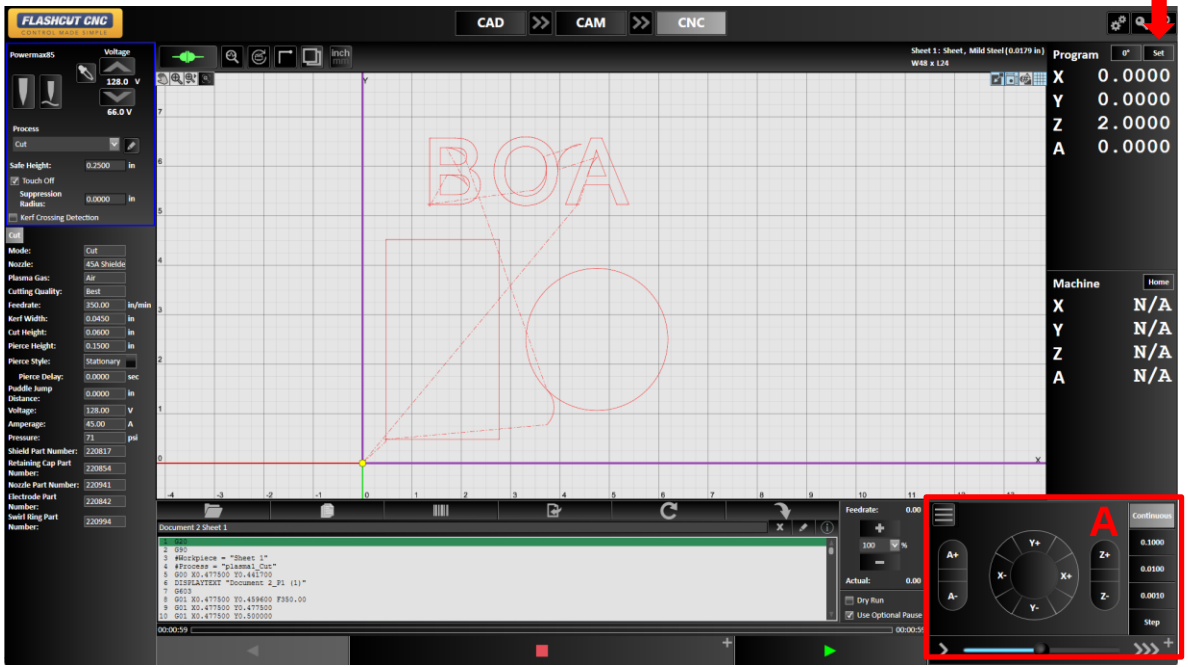
Set your Program to Zero



A. Jog to the zero point of your program by clicking on any of the jog buttons either in *Continuous* mode or any of the discrete distances; the slider bar determines speed

B. Set the X/Y Program Coordinates to zero with the *Set* button and *Zero X* and *Y*

C. If you have a sensor on your Z axis, set your Z axis coordinate by clicking *Set* and *Sense Z Zero;* if you don't have one, select *New*… under *Set* to set your coordinates

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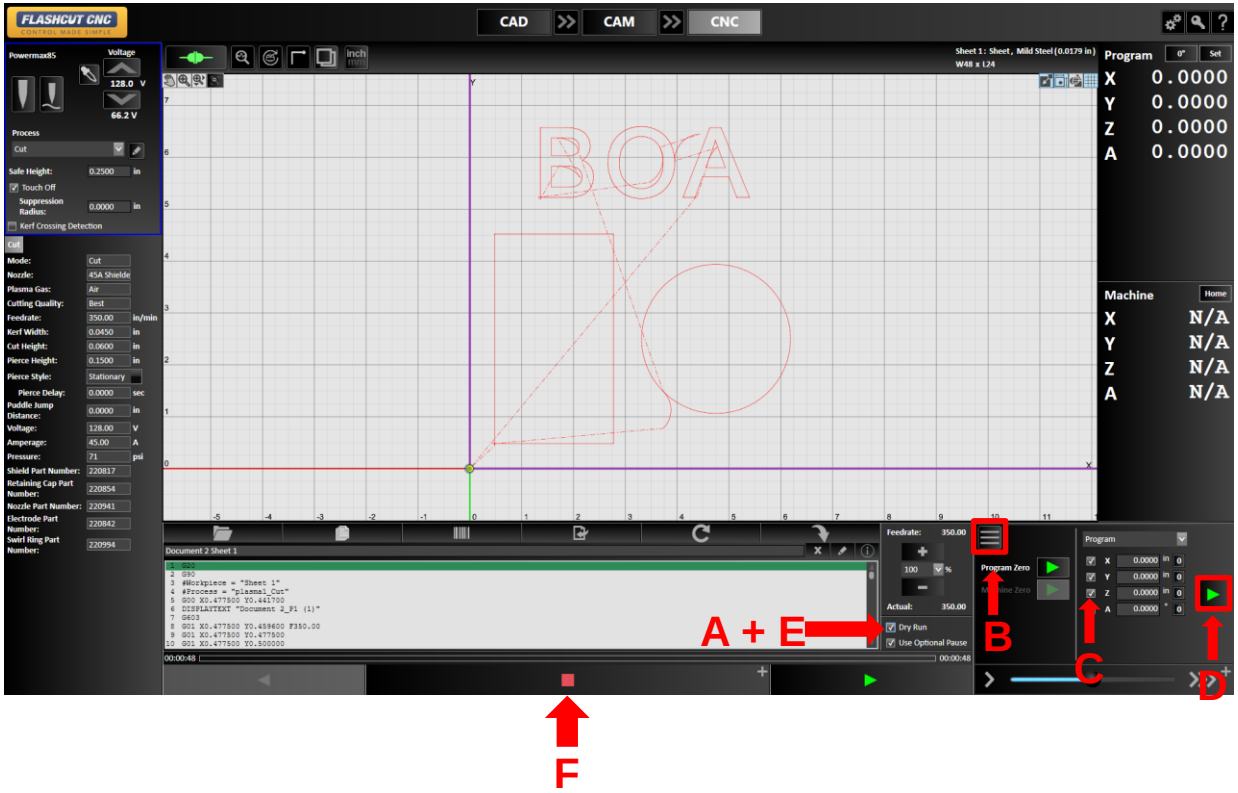
Cut the Part



A. Verify the toolpath by clicking *Dry Run* and then the green *Run G-Code* button

B. If everything looks good, you can move back to Program Zero by switching from "Jog Mode" to "Move to Point Mode" using the hamburger icon

C. Uncheck the Z axis (Lift Axis) while X and Y remain checked

D. Click the Green Arrow to do a point move to X0, Y0

E. To cut the part, uncheck *Dry Run* and select the green *Run G-Code* button

F. You can stop the program at any time by choosing the red *Feed Hold* button or pressing ANY key on the keyboard

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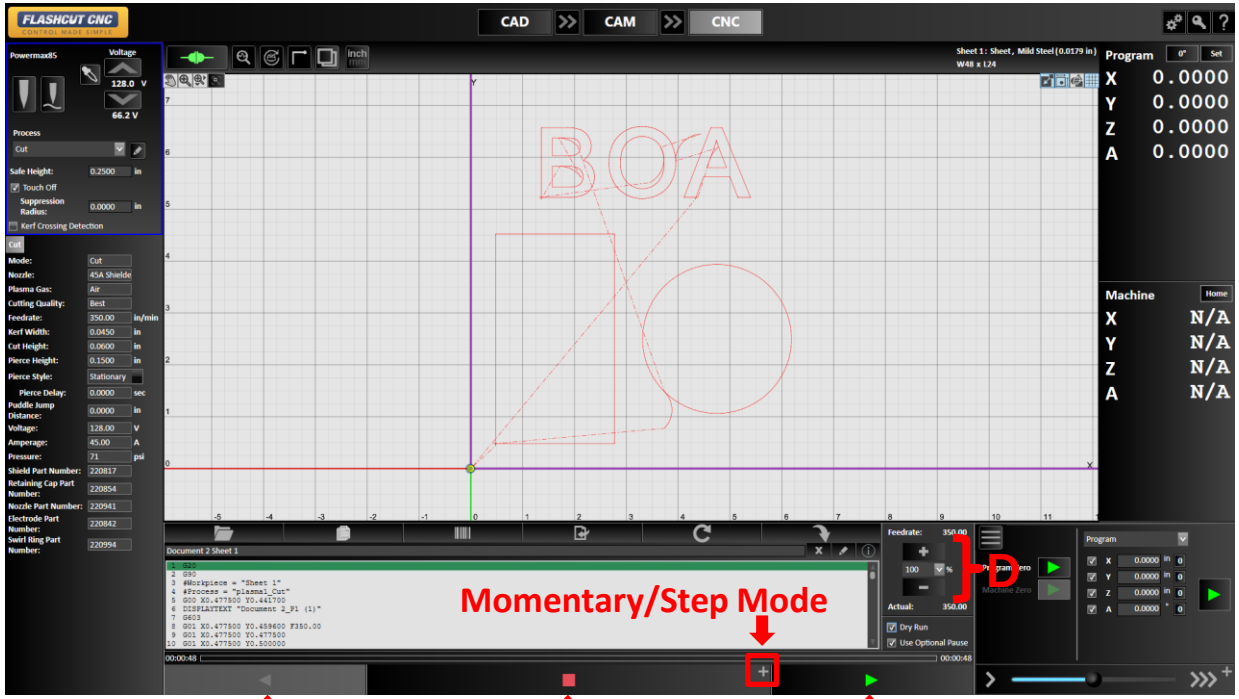
Program Flow Control



Run Momentary G-code: G-Code will run as long as button is depressed.

Run Step G-code: One line of G-Code will be executed.

A. The *Run G-Code* buttons runs the program forward and cuts the parts

B. The red *Feed Hold* button ramps down the motors and stops the program

C. The gray *Run G-Code in Reverse* button will run backwards, but won't cut

D. You can speed up or slow down the feedrate in real-time by hitting the + or - feedrate buttons

E. The gray + on the *Feed Hold* buttons opens **Momentary/Step Mode**. This displays two new ways to run the G-code

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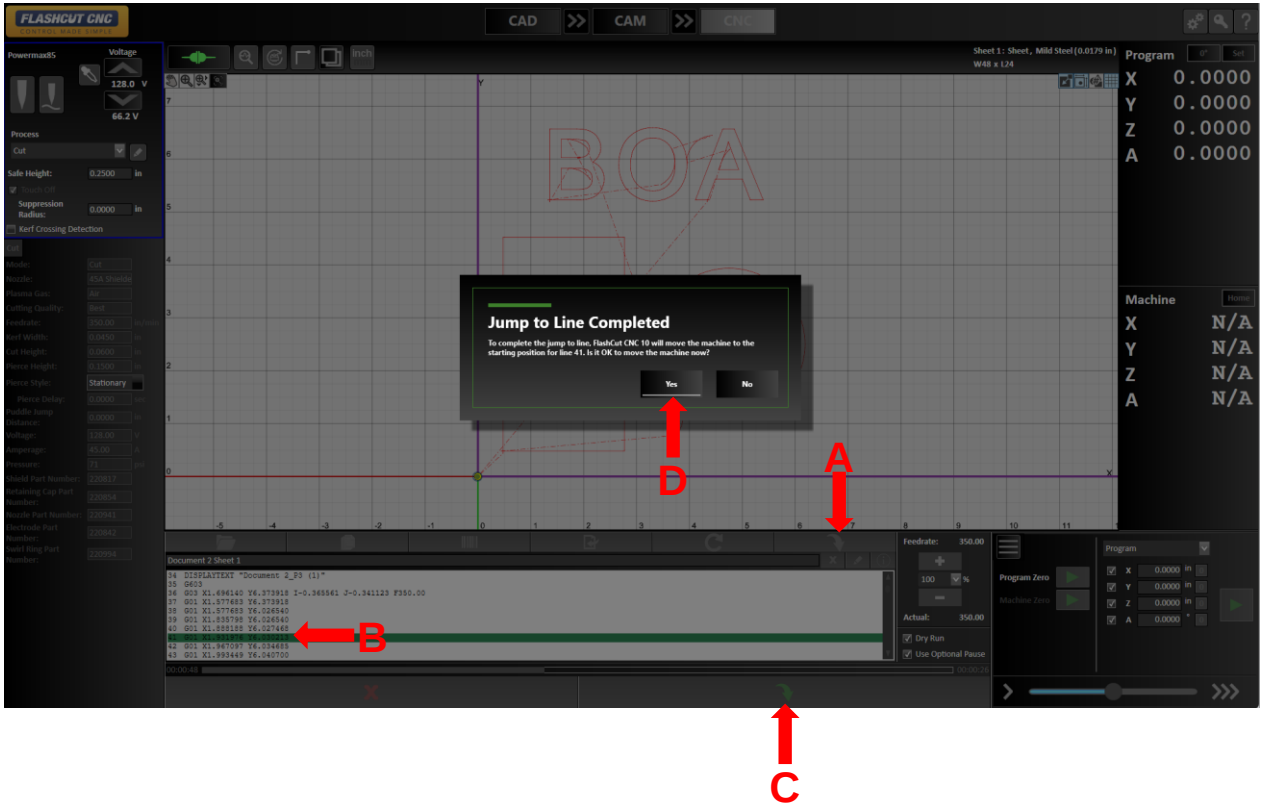
Jump to Line



A. Jump to any line of the program while idle by pressing the *Jump to Line* button

B. You can now select any line in the Program Listing Box or any command in the Viewport

C. Click the *Execute Jump To Line* button

D. A dialog will pop up verifying the Jump to Line was completed; choose *Yes* to move the machine to the beginning of the line

You can run the program forward or backwards using normal program flow control

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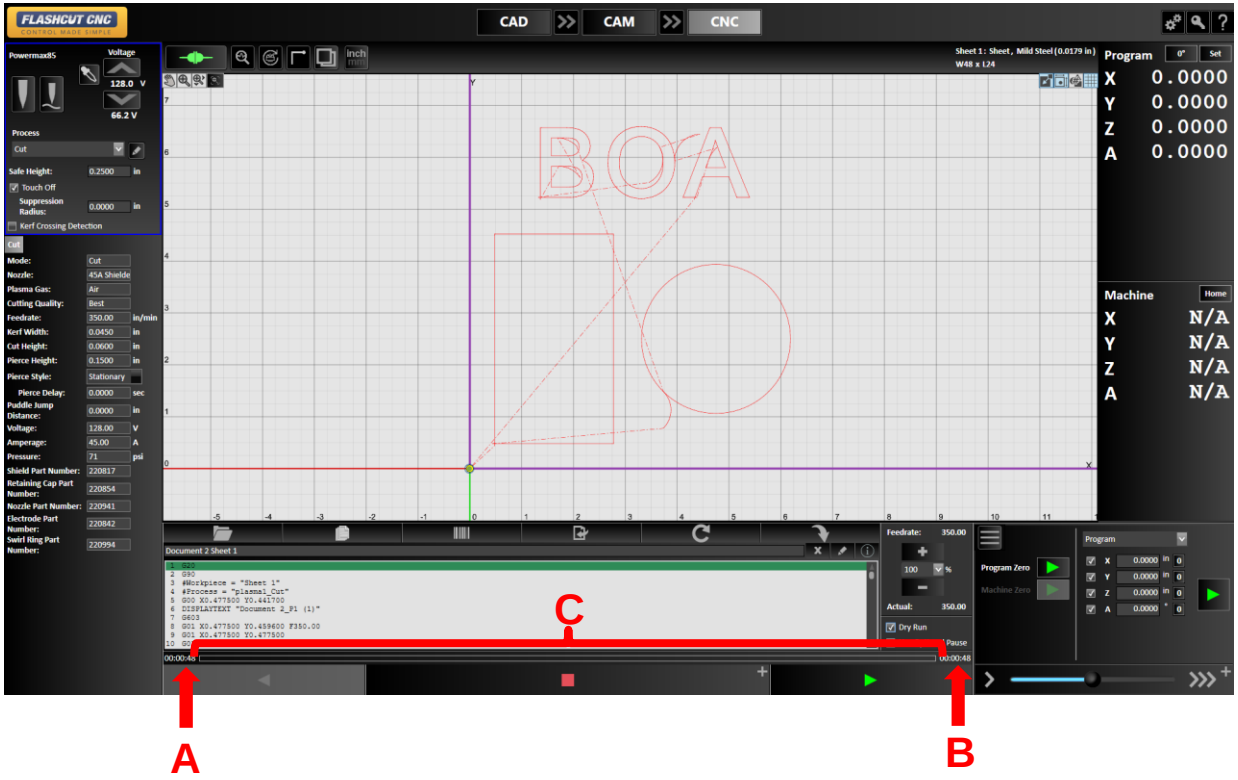
Progress Meter

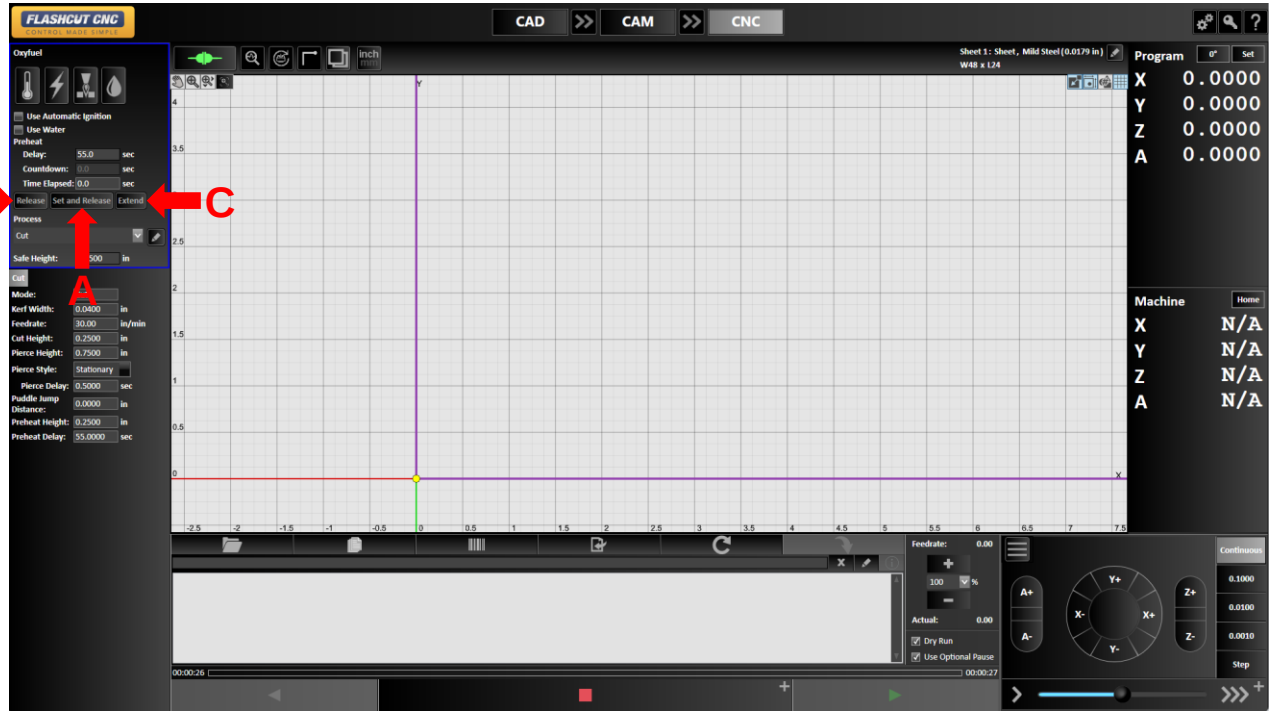


Automatically calculate program runtime

A. The value on the left shows total runtime
B. The value on the right shows time remaining
C. The meter fills as the program runs to visually indicate progress

If you do not have the Progress Meter configured, you need to do so in the G-Code page of the configuration

Advanced Oxy Fuel Control



Dynamically release oxy fuel during preheat process

A. Choose to overwrite the delay with the current time by clicking *Set and Release*
B. End the preheat process without changing the Delay by clicking Release
C. Allow the torch to remain preheating until released by clicking Extend

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Lesson 11:
Diagnostics & Help

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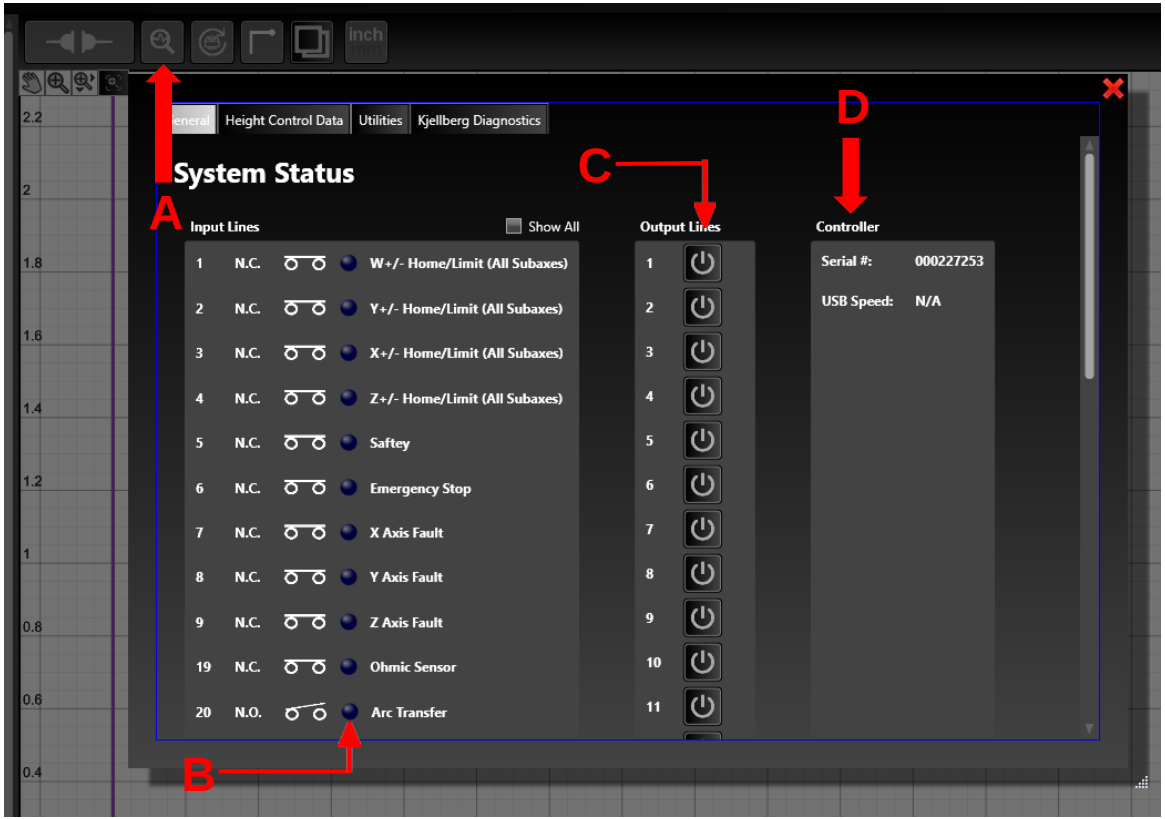
Diagnostics & Help



A. The *System Status* panel is accessible through the magnifying glass icon

B. Live status of *Input Lines* is shown by the switch icons and blue LEDs (only active if the software is connected to the controller)

C. Live status of the *Output Lines* are also available; turn any output on and off simply by clicking on its button

D. The serial number of the connected controller can be viewed in the right-most column

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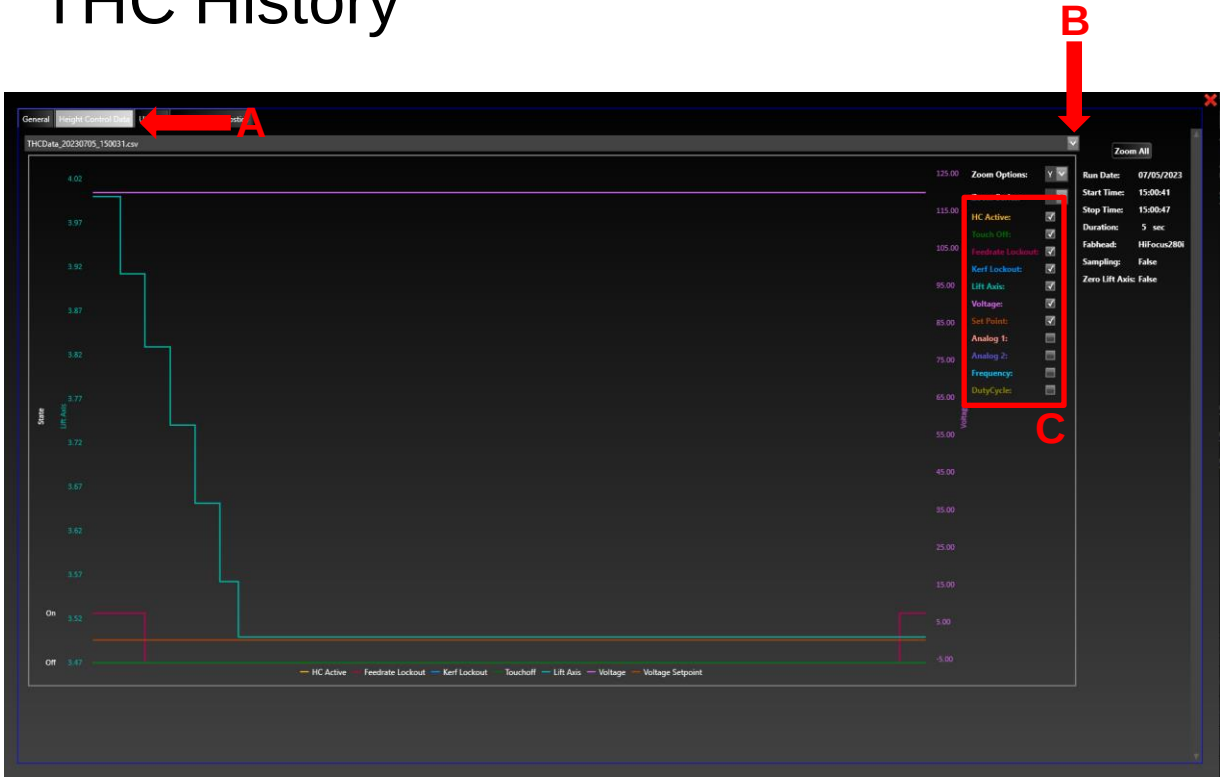
THC History



A. Click the *Height Control Data* tab to view recorded cut data

B. Data is organized by runs; all saved runs can be seen in the top dropdown

   a. The entire sheet will be saved or until Feedhold is asserted

C. The chart displays torch height; set-point and measured voltages; THC state; Kerf lockout and more. You can check and uncheck the values you want displayed in the legend

D. The scroll wheel can be used to zoom; right-click and drag will pan

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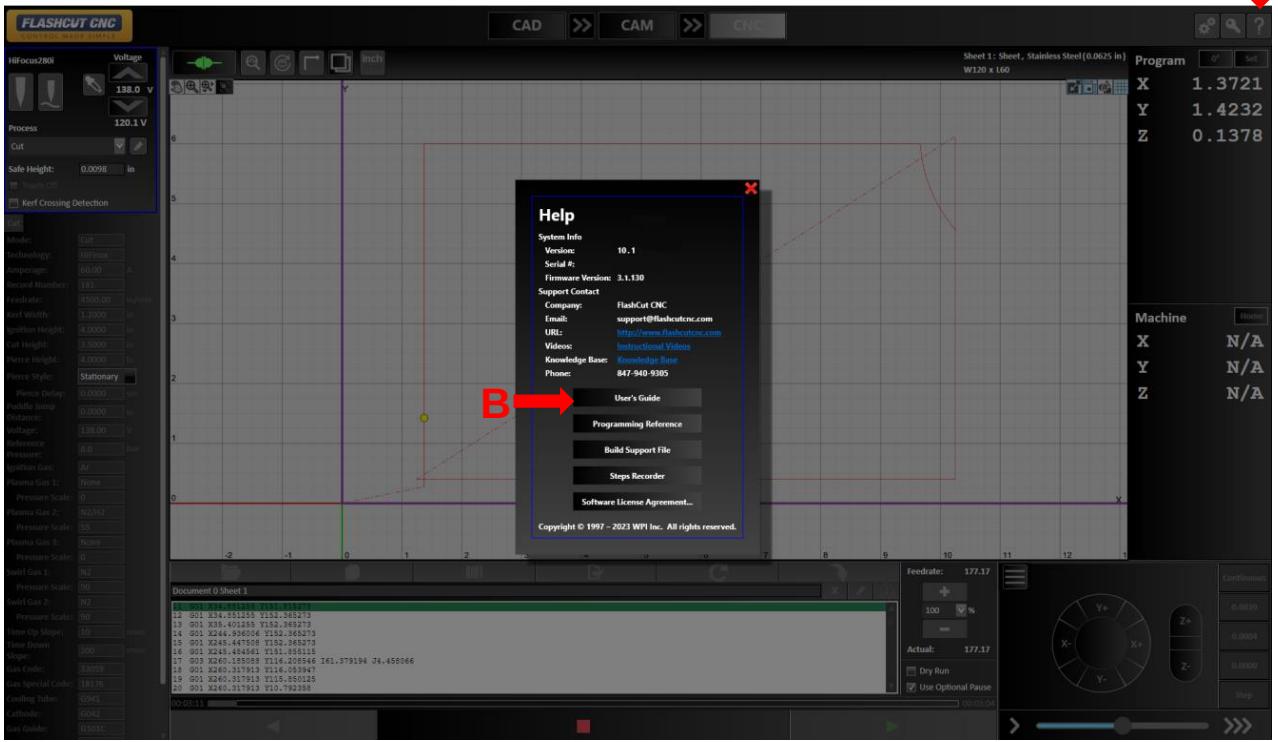
Help Screen and User's Guide



A. The *Help* screen can be accessed by clicking on the *?* button

This shows the serial number as well as current software and firmware versions

B. *Build Support File* will create a ZIP with configuration settings and a log of past commands; this can be emailed to our support staff for in-depth diagnostics

Any online manuals are available through the *Help* window in some versions

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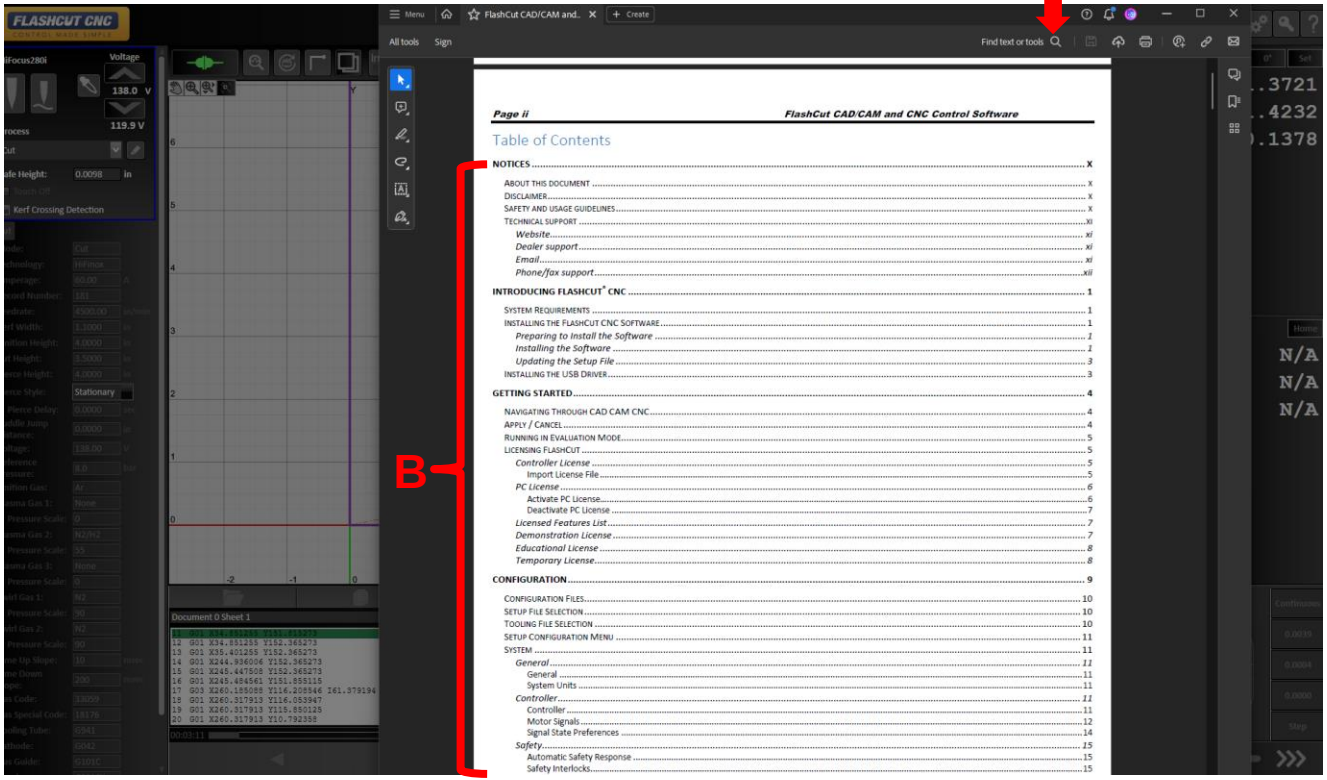
User's Guide



A. The User's Guide will launch on the computer's default PDF application

B. Clicking on any of the sections in the Table of Contents will bring the user to the chosen page

C. The Find function can be used to locate relevant information

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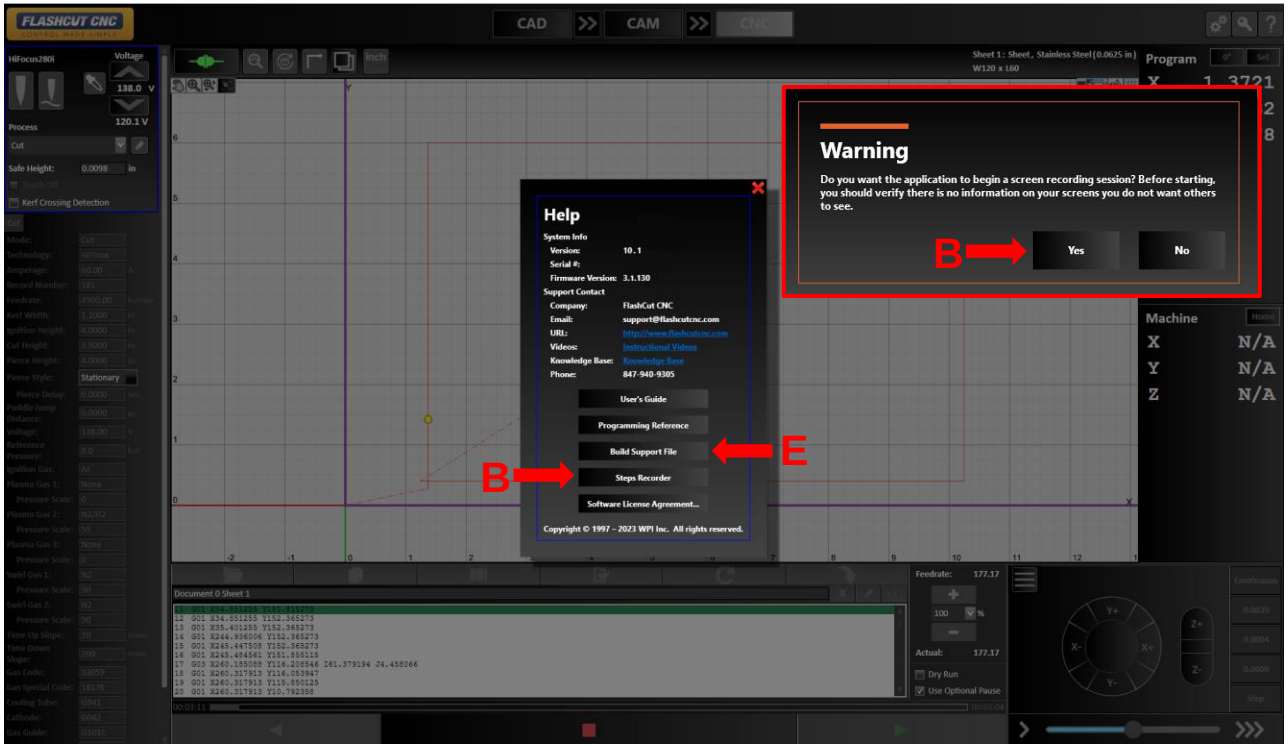
Step Recorder



Note: If you are encountering a problem or have questions about a particular procedure, you can utilize the Steps Recorder Feature. When you use this feature, a screen recording session will begin.

A. Return to the *Help* screen by clicking on the *?* Button

B. Click *Step Recorder,* a warning message will display, press *Yes*

C. When a screen recording session is in progress, a red square icon will appear in the upper right of the program window

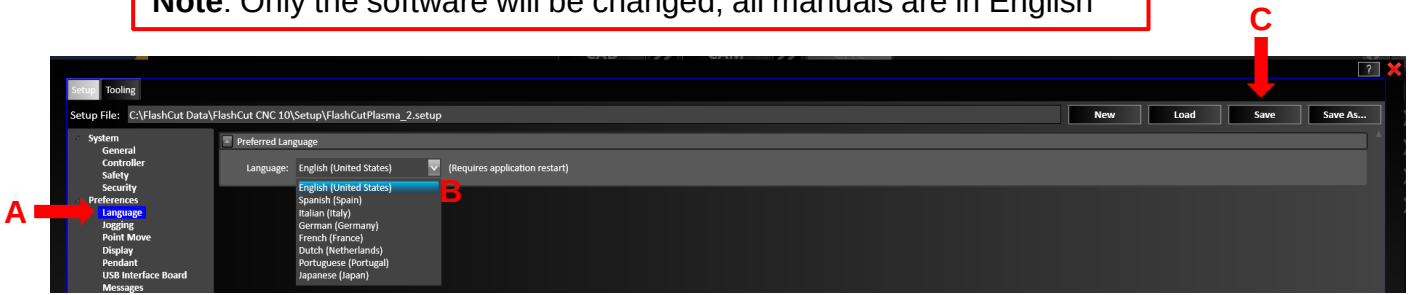
D. Press the Stop Recording button when you're done recording

E. Build a Support File, these steps will now be included in the support file

8 Languages Supported

A. To change a language go to Configuration and select *Language*
B. Choose the language you need from the drop down menu
C. You will need to save the configuration, exit, and re-enter the program for the language change to register

Note: Only the software will be changed; all manuals are in English



- English
- Spanish
- Italian
- French
- Portuguese
- German
- Japanese
- Dutch

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Contact Information

- Phone: (847) 940-9305
- Email:
  - support@flashcutcnc.com
  - sales@flashcutcnc.com
- Website: www.flashcutcnc.com
- Revised: 12/20/2023

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