

The KNK Force with SCAL User Manual

<http://knkusa.com/>

February 1, 2018

Do **NOT** read this entire manual... unless you want to.

- Chapters 1 and 2 are very important in terms of setting up your Force to work with SCAL and learning the ins and outs of cutting.
- Chapters 3 – 10 are specific to SCAL and present every function in the software, many of which you may never need.
- Chapter 11 is for those owners wanting to perform print and cut applications.
- Chapter 12 covers the dual head feature and how to best use Force accessory tools.
- Chapter 13 covers the Force rotary tool.

It's not practical to print this entire manual because:

- It's a waste of paper and ink if you only ever need certain sections.
- The live links to videos, blog posts, products, etc. will not work.
- User manuals are updated from time to time (this current UM is based on SCAL 4.060).
- You cannot search on individual words.

Also:

- Having the *Table of Contents* continuously viewable makes navigation easier. It's also useful to know how to search for specific words or terms. Here is a link to a tutorial which covers how to do these two things: [How to Get the Most from your KNK UM](#).
- Note the green **Video** icons which link to videos related to the section in which they are located. These videos will enhance your learning.

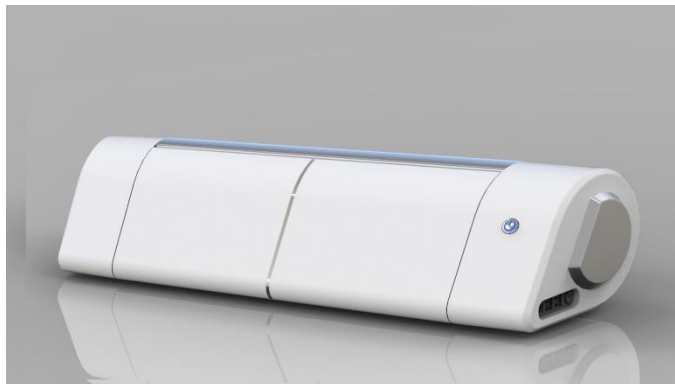


Table of Contents

1. INTRODUCTION.....	8
1.01 PLEASE READ!	8
1.02 SAFETY AND WARNINGS	8
1.03 WARRANTY	9
1.04 PARTS OF THE KNK FORCE	9
1.05 SUPPORT	10
1.06 SETTING UP SCAL WITH THE FORCE	10
1.06.1 Setting up the Cutting Mat.....	10
1.06.2 Selecting a Shape for Testing.....	12
1.06.3 Communication Test	12
1.06.4 Test Drawing: Origin Point Mode	13
2. KNK FORCE: CUTTING.....	15
2.01 WHAT YOU NEED TO UNDERSTAND ABOUT CUTTING	15
You Have To Make Mistakes	15
Begin with Easy Materials and Easy Shapes.....	15
Use the Correct Blade for the Material You Are Cutting	15
Set the Z Origin When Required	15
Understand the Cut Settings	16
Perform Test Cuts!	16
Record Your Successes.....	16
Keep the Cutting Mat Clean and Sticky	16
Know Where Your Images Will Cut.....	17
Don't Get Frustrated, Get Help!	17
2.02 CHOICES BEFORE CUTTING	17
2.02.1 Controlling What Shapes Will Cut.....	18
2.02.2 Controlling Where Shapes Will Cut.....	19
2.02.3 Selecting the Tool to be Used for Cutting	19
2.02.4 Determining the Cut Settings	20
2.03 CUT SETTINGS DETAILS.....	21
2.03.1 Tool and Replace Tool	21
2.03.2 Mult-Cut or Passes (P)	21
2.03.3 Cutting Depth (CD) / End Depth (ED)	22
2.03.4 Start Depth (SD).....	22
2.03.5 Up Speed (US).....	23
2.03.6 Cut Speed (CS).....	23
2.03.7 Plunge Speed (PS)	23
2.03.8 Lift Speed (LS)	23
2.03.9 Blade Offset (BO).....	23
2.03.10 Overcut.....	24
2.04 PRESETS	24
2.05 BLADE TENSION (BT)	25
2.06 PERFORMING A CUT WITH THE BLADE HOLDER.....	26
2.07 CALIBRATING THE FORCE'S SIZING RESOLUTION	28
2.07.1 Entering C3 Sizing Calibration into SCAL	28
2.07.2 Performing a Sizing Calibration.....	29
SETTINGS FORM FOR CUTTING MATERIALS ON THE KNK FORCE ¹	32
SUGGESTED CUT SETTINGS FOR VARIOUS MATERIALS ON THE KNK FORCE ¹	33
3. SCAL: INSTALLATION, PREFERENCES, AND WORKSPACE	41
3.01 INSTALLING SCAL	41
3.01.1 Selecting and Downloading the Software	41
3.01.2 Activating the Software	41
3.01.3 Installing the USB Driver	43
3.01.4 Installing Your Cutter.....	43
3.02 MAIN SCAL SCREEN.....	44
3.03 LANGUAGE PREFERENCE	45
3.04 UNITS PREFERENCE	45
3.05 CUSTOMIZING THE CUTTING MAT	45
3.05.1 Mat Size	45

3.05.2 Mat Orientation.....	46
3.05.3 Mat Grid.....	47
3.05.4 Workspace Alpha.....	48
3.05.5 Rulers.....	49
3.06 CUSTOMIZING THE WORKSPACE.....	49
3.07 SNAP TO.....	51
3.08 OTHER PREFERENCES.....	52
3.09 ZOOMING AND PANNING.....	53
3.09.1 Zooming.....	53
3.09.2 Panning.....	54
3.10 UNDO/REDO.....	54
3.10.1 Undo.....	54
3.10.2 Redo.....	54
3.11 PAGES.....	54
3.12 HELP RESOURCES.....	56
4. SCAL: HANDLING FILES AND ORGANIZING LAYERS.....	57
4.01 OPENING FILES.....	57
4.01.1 Opening a New File/Project.....	57
4.01.2 Opening an Existing SCUT File.....	57
4.02 SAVING SCAL FILES.....	58
4.03 USING THE LIBRARY.....	58
4.03.1 Shapes Tab.....	58
4.03.2 Fonts Tab.....	62
4.03.3 Projects Tab.....	63
4.04 LAYERS PANEL.....	64
4.04.1 Introduction to the Layers Panel.....	65
4.04.2 Parts of the Layers Panel.....	65
4.04.3 Creating Folders and Moving Layers.....	68
4.05 THE ESHAPE STORE.....	71
4.05.1 Importing from the eshape Store.....	71
4.05.2 Exporting to the eshape Store.....	73
4.06 IMPORTING OTHER FILE FORMATS.....	75
4.06.1 Importing Vector Files.....	75
4.06.2 Importing Raster Files.....	76
4.06.3 Importing Fonts.....	77
4.07 EXPORTING IN OTHER FILE FORMATS.....	77
4.07.1 Exporting in SVG Format.....	78
4.07.2 Exporting in JPG, PNG, BMP and TIFF Formats.....	78
4.07.3 Exporting in FCM Format.....	79
4.07.4 Exporting in PLT Format.....	79
4.07.5 Exporting to SCAL2.....	80
5. SCAL: MANIPULATING AND COLORING SHAPES.....	81
5.01 SELECTING.....	81
5.02.1 Basic Selection Handles.....	81
5.02.2 Advanced Selection Handles.....	82
5.02 DELETING.....	83
5.03 MOVING.....	83
5.04 RESIZING, SCALING, AUTO FIT.....	85
5.04.1 Resizing.....	85
5.04.2 Scaling.....	86
5.04.3 Auto Fit (PC only).....	87
5.05 ROTATING.....	88
5.06 SKEWING AND DISTORTING.....	89
5.06.1 Skewing.....	89
5.06.2 Distorting.....	90
5.07 MIRRORING AND FLIPPING.....	90
5.08 LOCKING AND UNLOCKING.....	91
5.09 HIDING AND SHOWING.....	92
5.10 GROUPING AND UNGROUPING.....	92
5.10.1 Group.....	92
5.10.2 Ungroup.....	93
5.11 BREAKING AND MERGING.....	93

5.11.1 Break Apart	94
5.11.2 Merge	94
5.12 ARRANGING (ORDERING) SHAPES	95
5.13 FILL & STROKE: FILL	97
5.13.1 No Fill	99
5.13.2 Color Fill	99
5.13.3 Pattern Fill	99
5.13.4 Gradient Fill	101
5.13.5 Opacity	103
5.14 FILL & STROKE: STROKE	104
5.15 DROPPER TOOL	108
5.16 CUTTING, COPYING, PASTING, DUPLICATING	109
5.16.1 Cutting to the Clipboard	109
5.16.2 Copying to the Clipboard	109
5.16.3 Pasting from the Clipboard	110
5.16.4 Duplicating - Duplicate	110
5.16.5 Quick Duplicate	111
5.17 ALIGNMENT	111
5.17.1 Align to Page	112
5.17.2 Align to Selection	113
5.18 DISTRIBUTE	114
5.18.1 Distribute to Page	114
5.18.2 Distribute to Selection	116
5.18.3 Distribute to Selection Below	118
6. SCAL: WORKING WITH TEXT	121
6.01 TEXT OPTIONS	121
6.02 SELECTING A FONT	121
6.02.1 Choosing a Font from the Font Menu	121
6.02.2 Choosing a Font via Font Preview	121
6.02.3 Temporarily Installing a Font	123
6.03 ADDING TEXT OPTIONS	124
6.04 FOUR MODES OF TEXT	125
6.04.1 Type Tool	125
6.04.2 Vertical Type Tool	125
6.04.3 Type on Path Tool	125
6.04.4 Type on Arch Tool	127
6.05 TEXT SETTINGS	128
6.06 OTHER TEXT EDITING	130
6.07 CREATING A CONNECTED LETTER TITLE	130
6.08 INCORPORATING SHAPES INTO A TITLE	131
6.09 WELDING TITLES IN IMAGINATIVE WAYS	132
6.10 STENCILING LETTERS	133
6.11 OPEN PATH FONTS (OPF)	134
6.12 KNOCKOUT	134
6.13 TITLE CRAWL	136
6.14 OTHER TEXT EFFECTS	137
7. SCAL: TRACING AND DRAWING	138
7.01 RASTER VERSUS VECTOR	138
7.02 FINDING EASY IMAGES TO TRACE	139
7.03 TRACE FUNCTION	140
7.03.1 Trace Settings	140
7.03.2 Monochrome Trace of a Colored Image: Effects of Contrast	143
7.03.3 Monochrome Trace of a Silhouette Image: Effects of Smooth	145
7.03.4 Monochrome Trace of a Detailed Image: Effects of Detail	146
7.03.5 Monochrome Trace of a Coloring Book Image: Single Line Threshold and Blackout	146
7.03.6 Monochrome Trace of a PNG File with a Transparent Background	147
7.03.7 Color Layers Trace	148
7.03.8 Single Color Trace	150
7.04 DRAW FUNCTIONS	154
7.04.1 The Draw Tool	154
7.04.2 Freehand Drawing	156
7.04.3 Brush Drawing	157

7.05 MANUAL TRACING OF AN IMPORTED IMAGE	157
7.05.1 Importing an Image for Manual Tracing	157
7.05.2 Manual Tracing Using the Draw Tool	158
7.05.3 Editing the Trace	159
7.05.4 Copy, Mirror and Weld to Complete Symmetrical Shapes	161
8. SCAL: EDITING	162
8.01 SIMPLIFY	162
8.02 SPLIT PATH	163
8.03 CLOSE PATH	165
8.04 JOIN PATHS	165
8.05 PATH OFFSET	166
8.06 ERASER	168
8.07 KNIFE AND CROP	169
8.07.1 Using Knife	169
8.07.2 Using Crop	170
8.08 WHICH CUTTING TOOL TO USE?	171
8.09 RULER	172
8.10 THE SHAPE TOOL - PATH AND NODE EDITING	174
8.10.1 Moving a Path	174
8.10.2 Reshaping a Path	175
8.10.3 Examples of Smoothing Curves	179
8.10.4 Applications for the Shape Tool	180
9. SCAL: DESIGNING	181
9.01 WHERE DO I START WITH LEARNING TO DESIGN?	181
9.02 PROJECT INFO	181
9.03 BASIC SHAPES	182
9.03.1 Rectangle	182
9.03.2 Rounded Rectangle	182
9.03.3 Circle and Oval	183
9.03.4 Triangle	183
9.03.5 Polygon	183
9.03.6 Star	183
9.03.7 Spiral	184
9.04 SHADOW LAYER	185
9.04.1 Shadow Layer Settings	185
9.05 BOOLEAN OPERATIONS	188
9.05.1 Union	188
9.05.2 Intersection	189
9.05.3 Exclude	190
9.05.4 Front Minus Back	191
9.05.5 Back Minus Front	192
9.06 DUPLICATE ROTATED	192
9.06.1 Duplicate Rotated Settings	192
9.06.2 Using Duplicate Rotated to Design a Wreath	194
9.06.3 Using Duplicate Rotated to Design a Frame	195
9.07 OBJECT ON PATH	195
9.07.1 Designing a Scalloped Oval	197
9.07.2 Warp a Shape to a Path	198
9.07.3 Remaining Settings	199
9.08 WRAPPER	200
9.09 LATTICE	202
9.10 RHINESTONES	206
9.10.1 Guidelines for Rhinestone Pattern Design	206
9.10.2 Rhinestone Outline	206
9.10.3 Rhinestone Fill	207
9.10.4 Editing Rhinestone Designs	208
9.10.5 Additional Tips on Rhinestone Designing	209
9.11 JIGSAW PUZZLE	211
9.12 3D ROTATE	214
9.13 3D EXTRUDE (SCAL PRO ONLY)	215
9.14 BARREL DISTORTION	216
9.15 BULGE	217

9.16 CANNED.....	219
9.17 WAVE	220
10. SCAL: OUTPUT	222
10.01 THE STYLE PANEL	222
10.02 PREVIEW	223
10.03 PRINTING	224
10.04 WEEDING (SCAL PRO ONLY)	226
10.05 TILING (SCAL PRO ONLY).....	228
10.06 CUT SETTINGS	230
10.06.1 Cut Window Settings.....	230
10.06.2 Cut by Color (SCAL PRO only)	235
10.06.3 Tiles (SCAL PRO only)	240
10.06.4 Extras (SCAL PRO only).....	241
10.07 CONTROLLING WHERE SHAPES WILL CUT	243
10.07.1 Overview	243
10.07.2 Origin Point.....	244
10.07.3 WYSIWYG.....	246
10.07.4 Center Point	249
10.08 PATH DETAILS AND REVERSE PATH.....	250
10.09 LINE FILL	251
10.10 PIERCE	252
11. KNK FORCE: PRINT AND CUT.....	254
11.01 WHAT IS A PRINT AND CUT (PNC)?	254
11.02 WHAT IS A PNC CALIBRATION?	255
11.03 CAMERA CALIBRATION PROCEDURE	255
11.03.1 What You Need for Calibrating	255
11.03.2 Preparing the Calibration File.....	255
11.03.3 Entering Settings and Printing.....	257
11.03.4 Setting the Registration Marks and Cutting	259
11.03.5 Adjusting the X and Y Camera Offsets	261
11.04 PREPARING AN ACTUAL PRINT AND CUT APPLICATION	262
11.05 AUTOMATIC PNC	262
11.06 PRINT AND CUT TIPS	266
12. KNK FORCE: DUAL HEAD APPLICATIONS.....	268
12.01 WHAT DUAL HEADS MEAN	268
12.02 CALIBRATING TWO TOOLS FOR ALIGNMENT.....	268
12.02.1 Locating the Dual Head Calibration	268
12.02.2 Setting Up a Dual Head File.....	269
12.02.3 Entering Settings.....	270
12.02.4 Adjusting the Tool Offset Values.....	271
12.03 GENERAL GUIDELINES WHEN USING ACCESSORY TOOLS	272
12.04 DRAWING WITH A PEN OR GLUE PEN	272
12.05 EMBOSSING AND SCORING.....	272
12.06 ENGRAVING	273
12.07 USING THE PUNCH TOOL	274
SETTINGS FORM FOR FORCE ACCESSORY TOOLS ¹	275
SUGGESTED SETTINGS FOR VARIOUS FORCE ACCESSORIES ¹	276
13. KNK FORCE: ROTARY TOOL.....	277
13.01 IMPORTANT SAFETY AND OPERATING CONSIDERATIONS	278
13.02 CONTENTS IN THE ROTARY TOOL KIT	278
13.03 SETTINGS FOR THE ROTARY TOOL.....	279
13.04 DETERMINING SETTINGS FOR CUTTING A NEW MATERIAL	280
13.04.1 Measure the Thickness of the Material	280
13.04.2 Surface Height.....	280
13.04.3 CD/ED Calculator.....	281
13.05 PEN TEST FOR VERIFYING CD/ED BEFORE CUTTING	282
13.06 ATTACHING A DRILL BIT TO THE ROTARY TOOL	284
13.07 ATTACHING THE ROTARY TOOL TO THE KNK FORCE	285

13.07.1 Attaching the Adaptor to the Blade Holder Seat	285
13.07.2 Inserting the Rotary Tool into the Adaptor	286
13.08 ENGRAVING	288
13.09 CUTTING	289
13.09.1 Things to Keep in Mind	289
13.09.2 Important Checklist Before You Cut!	289
13.10 DESIGN CONSIDERATIONS	289
SETTINGS FORM FOR FORCE ROTARY TOOL ¹	291
SUGGESTED ENGRAVING SETTINGS FOR FORCE ROTARY TOOL ¹	292
APPENDIX A SCAL: KEY BOARD SHORTCUTS	293
APPENDIX B KNK FORCE AND SCAL: TROUBLESHOOTING	299
B1 COMMUNICATING ISSUES	299
B2 OPERATING ISSUES	300
B3 CUTTING ISSUES	302
B4 SOFTWARE ISSUES	304
APPENDIX C SCAL: MAP AND REFERENCES	305
C1 SCREENSHOT OF SCAL SCREEN	305
C2 BARS	305
C2.1 Menu Bar	305
C2.2 Toolbar	306
C2.3 Pages Bar	306
C2.4 Status Bar	306
C3 PANELS	306
C3.1 Tools Panel	306
C3.2 Properties Panel	307
C4 PREFERENCES	307
C4.1 Preferences: General Tab	307
C4.2 Preferences: Edit Tab	308
APPENDIX D KNK FORCE: ADDITIONAL INFORMATION	310
D1 MORE ABOUT Z ORIGIN	310
D1.1 Why Do You Sometimes Set the Z Origin on the Mat versus the Material?	310
D1.2 How does Setting the Origin on the Mat Affect the Settings?	310
D2 CALCULATION OF DEPTHS IN MULTI-PASS APPLICATIONS	311
D3 MAT GUIDES	311
D4. TEST CUTTING A MATERIAL USING THE FORCE BLADE HOLDER	313
D5. TEST CUTTING A MATERIAL USING THE FORCE ROTARY TOOL	314

1. Introduction¹

1.01 Please Read!

Thank you for purchasing a KNK Force! Please read all of this section before using your new Force with Sure Cuts A Lot (SCAL).

- Because the Force must first be set up to communicate with C3 (the program residing on the computer inside of the Force), please read all of the first two chapters of the *KNK Force with C3 User Manual* (henceforth referred to as the *C3 User Manual*) here:

<http://www.iloveknk.com/support/knk-force-support-page>

- Write down the IP Address used to access C3 on your Force. You will need to enter this same IP Address into the Force **Cut Settings** window in SCAL.
- It is also important to install updates to C3 as some of them will contain firmware changes that can impact how the Force works with SCAL. Instructions for updating C3 are contained in *Section 4.03* of the *C3 User Manual*.
- Certain sections of the *C3 User Manual* have been repeated in this user manual for convenience or because they are important reminders. Feel free to skip certain sections:
 - ◇ If you have thoroughly read Chapters 1 and 2 in the *C3 User Manual*, you can move on to *Section 1.06* in this chapter. Please read that section and Chapter 2 before attempting to use the blade holder in your Force.
 - ◇ If you have already been using SCAL with your KNK Force, you can use this user manual as a reference book.

1.02 Safety and Warnings

Please be aware of the following safety guidelines when working with the KNK Force:

- **Pinch Points:** Keep hands, long hair, loose clothing, jewelry, etc. away from the moving parts.
- **Risk to Children and Pets:** Please supervise children around the Force, when it is in use. In particular, the rotary device can pose a danger to unsupervised children and pets.
- **Eye Protection:** When operating the rotary device, eye protection, such as safety glasses, is recommended.
- **Rotary Tool Instructions:** Please read *Chapter 13* before using the optional rotary tool.
- **Movement and Touching:** Do not move the KNK Force or touch any circuitry while it is plugged in.
- Additionally:
 - ◇ DO NOT touch or jam the plotter's track while it is operating. If the cutter is damaged, it is the owner's responsibility.
 - ◇ DO NOT shake the cutter while it is operating.
 - ◇ DO NOT cut any materials that have staples or other embellishments attached.
 - ◇ DO NOT touch the cutter with a magnet. It is safe, however, to cut magnetic materials, such as those used on refrigerators and car exteriors.
 - ◇ DO NOT allow small items to fall into the cutter.

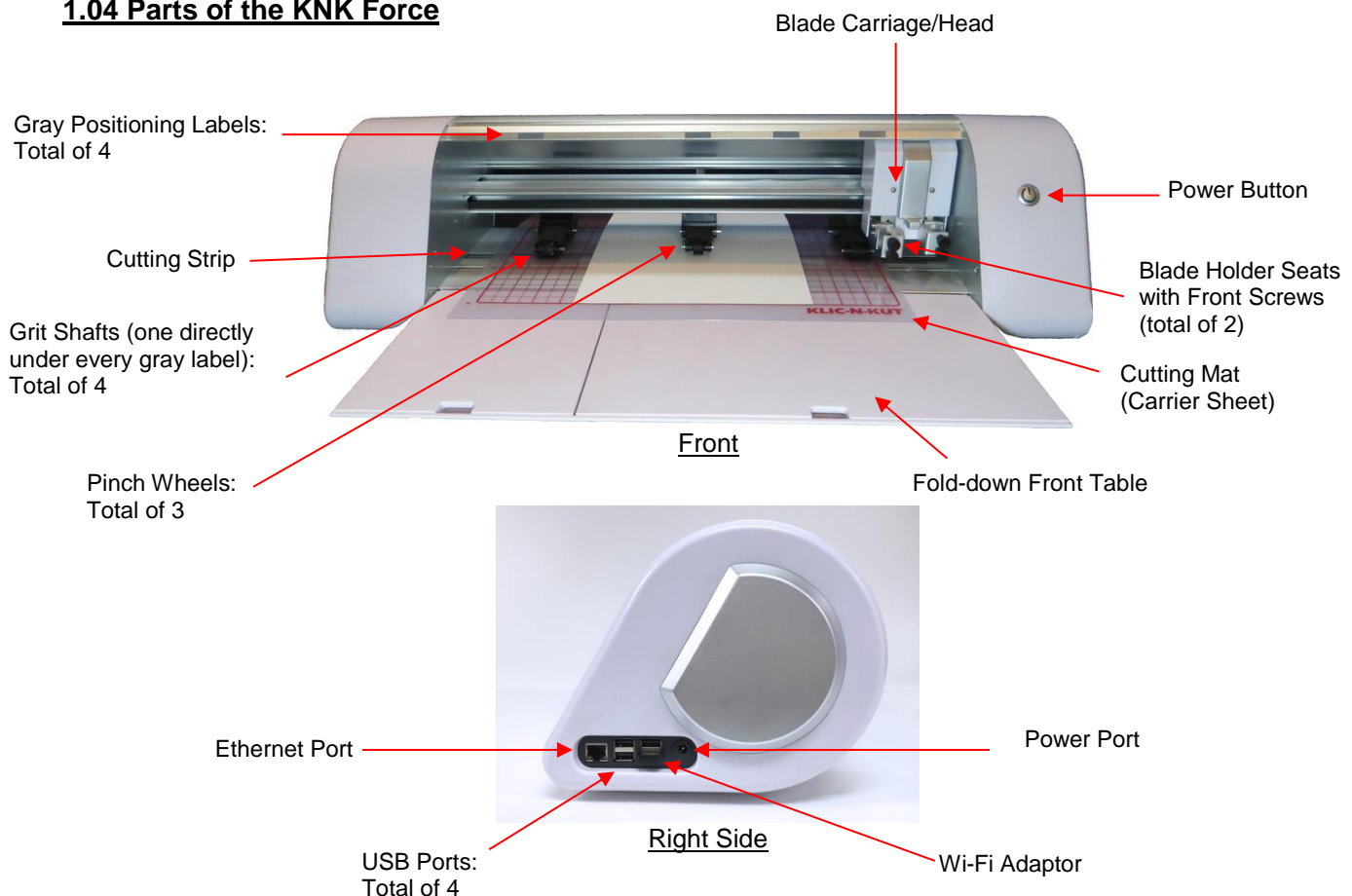
¹ © 2015, 2016, 2017 Accugraphic Sales, Inc., All Rights Reserved

- ◇ Transporting: When transporting the cutter, move the pinch wheel levers into the upward position or remove them from the Force by sliding to the far right side (as you face the front of the cutter). Remove the blade from the blade holder and cover the tip with the plastic cap. Also, remove items from the storage compartments inside the fold-down table.

1.03 Warranty

- **IMPORTANT!** If your KNK Force is damaged during shipment or appears to be defective, then your dealer should be notified as soon as possible. **If damages are reported later than three weeks after delivery**, then it will be the responsibility of the owner to ship the damaged cutter back to KNK USA for repair.
- The one year parts and labor warranty covers manufacturer's defects only and does not include normal wear and tear. If warranty work is required, the owner is responsible for shipping costs to and from KNK USA.
- KNK Force owners outside the USA should contact their dealer for procedures regarding warranty work or shipping damage.
- It is also recommended that you **retain the original box with packing materials** in case you ever need to ship your KNK Force.

1.04 Parts of the KNK Force



KNK USA Phone: 800-268-3672

Support Ticket: <http://knkusa.com/support/>

1.05 Support

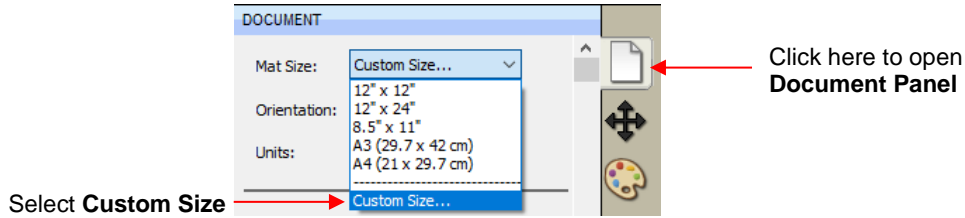
- If you run into difficulties with the operation of your KNK Force, turn off the power and look for a solution in this manual. *Appendix B* is a list of Troubleshooting FAQ's. If you continue to have technical questions or issues, please contact your KNK dealer as soon as possible.
- For any shipping issues, including delays or damages, please contact KNK USA (or your KNK distributor if you are outside the USA) as soon as possible so that appropriate action with the shipping company can be initiated.
- For any mechanical issues, please contact KNK USA.
- For more help in learning your Force, as well as sharing ideas and photos of projects with other owners, the following links are recommended:
 - ◇ Cutterpunk Web Site: <https://cutterpunk.com/knk-support/>
 - ◇ KNK Force Yahoo group: https://groups.yahoo.com/neo/groups/KNK_Force/
 - ◇ KNK Force Facebook group: <https://www.facebook.com/groups/KNKForce/>
 - ◇ For inspiration and tips on cutting specific materials: <http://teamknk.com/>
- For questions regarding Sure Cuts A Lot:
 - ◇ [SCAL Facebook Page](#)
 - ◇ [MTC and SCAL Facebook Group](#)
 - ◇ [SCAL Users Yahoo Group](#)
 - ◇ An online training program with over 4 hours of videos is available at this link: [Sure Cuts a Lot 4 Beginner Class](#).

1.06 Setting up SCAL with the Force

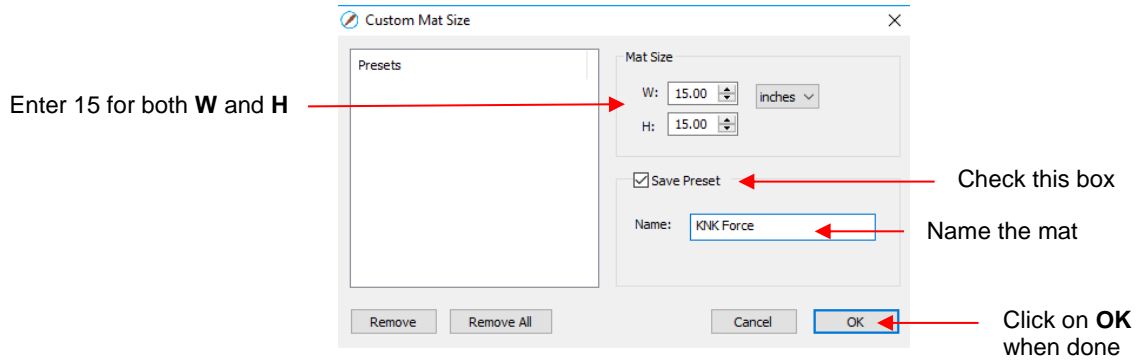
- This section is similar to *Section 2.06* of the *C3 User Manual* but will use SCAL instead of C3. Again, you must first have the Force communicating with C3 before attempting to use SCAL. Once you have an IP address assigned, you can then close C3 and not open it again unless you need to update the Force.
- If you have not yet installed SCAL, please go through *Section 3.01* to install SCAL and get the Force set up as your cutter. If you are testing SCAL, it is not necessary to register the software but the program will only work for 15 days and will make watermark cuts through your project.

1.06.1 Setting up the Cutting Mat

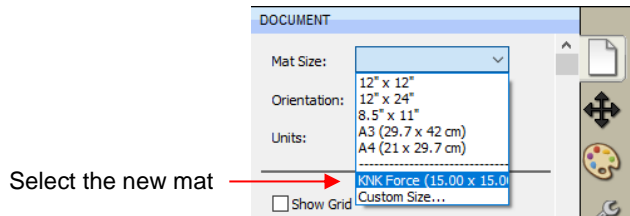
- Before testing, it is recommended that you set up an online virtual mat (henceforth referred to as **Cutting Mat** in the manual) to match your actual KNK Force mat:
 - ◇ Open the **Document Panel** by clicking the icon on the right side of the screen
 - ◇ From the **Mat Size** drop down menu, select **Custom Size**:



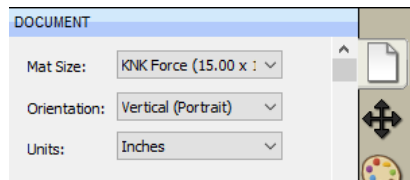
- ◇ A new window will open where you can set up the new mat and name it:



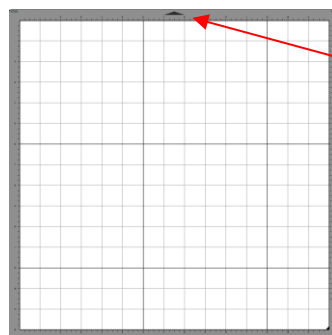
- ◇ After clicking on **OK**, the new mat can be selected from the list:



- For the initial test, it is recommended that **Portrait** mode be used so that your tests will match what is shown in the instructions. Later you can experiment with **Landscape** mode:




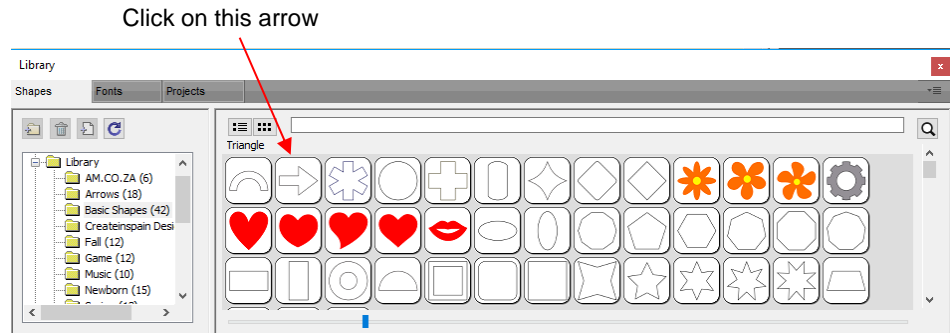
- Note the arrow at the top of the cutting mat. This indicates **Portrait** mode and how the mat will be inserted into the Force:



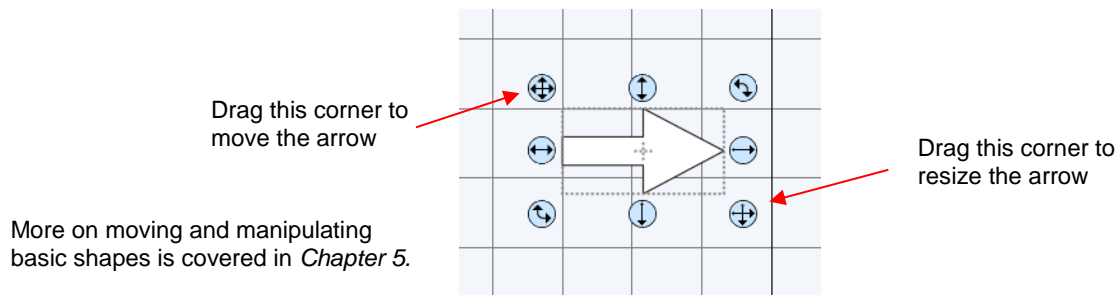
Indicates the direction the mat is fed into the cutter. In **Portrait** mode, the arrow will point up on the screen. In **Landscape** mode, the arrow will point to the left on the screen. More on the **Cutting Mat** is covered in *Section 3.05*.

1.06.2 Selecting a Shape for Testing

- If you closed the **Library**, click on this icon  at the top to reopen it. Click on the arrow thumbnail to add that shape to your screen. An arrow will help you better compare where a shape gets drawn versus how you see it on the screen:



- After clicking the arrow, you should see it on the screen. In this test, it doesn't matter where you place the arrow on the grid, as it will be drawn at the origin you set on the machine.



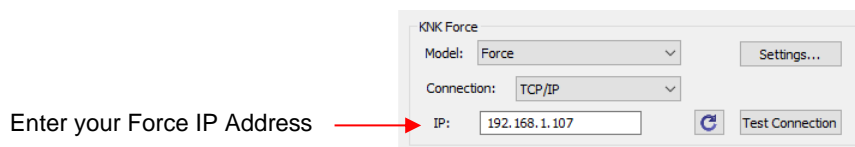
1.06.3 Communication Test

- In *Section 3.01.4*, you installed the KNK Force in SCAL. To now open the **Cut Settings** window, either:

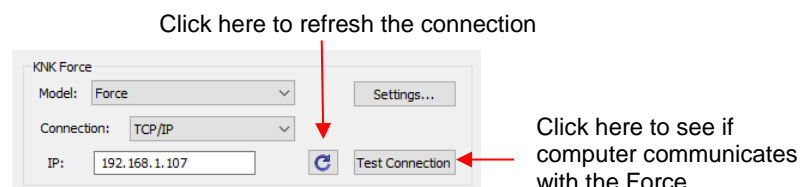
◇ Go to **Cutter> Cut with KNK Force**

- ◇ Click on the **Cutter** icon  on the **Toolbar** at the top

- The **Cut Settings** window will open:



- ◇ Under **Connection**, it should read TCP/IP. This is the connection needed for Wi-Fi.
- ◇ Under **IP**, enter the same **IP Address** you use when communicating to the Force in C3.
- ◇ Use the **Test Connection** button to verify that it works. If the test fails, click on the reload button to refresh the connection. Then try the test again:



- If the **Test Connection** still fails after reloading several times, please contact one of the available resources listed on the first page.

1.06.4 Test Drawing: Origin Point Mode

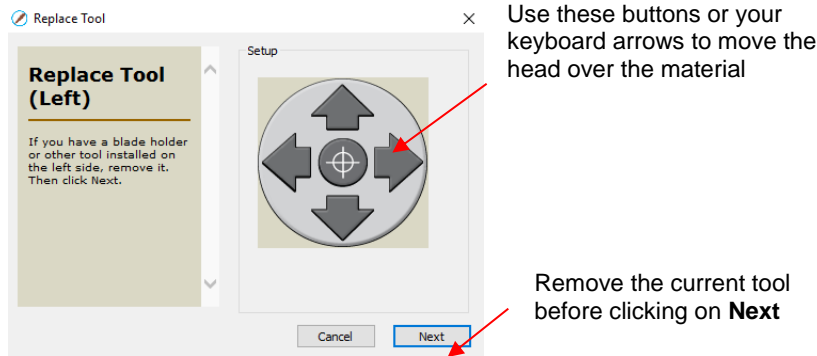
- It is important to learn where images will cut before you begin cutting. By using the test pen, you can experiment with settings and not risk cutting outside the material on the mat. Also, you can draw many times on a single sheet of paper whereas, if you are experimenting with the blade, you would need to be changing the paper more frequently.
- Note that if the test pen isn't working, you can insert any regular pen or marker directly into the grip on the Force.
- Make the following changes in the **Cut Settings** window:

The screenshot shows the KNK Force software interface. On the left is the 'Cut Settings' window, and on the right is a preview of the test drawing on a grid.

Annotations and Labels:

- Select Origin Point:** Points to the 'Origin Point' dropdown in the 'Cut Mode' section.
- Click here to set the Z origin:** Points to the 'Replace Tool' button.
- Select these settings. If using a marker, set the Cutting Depth to 2.** A bracket points to the 'Blade Offset', 'Overcut', 'Multi-Cut', 'Cutting depth', 'Up Speed', 'Plunge Speed', 'Cut Speed', and 'Lift Speed' settings.
- Click here to set the XY origin:** Points to the 'Set origin' button at the bottom.
- Click on Cut:** Points to the 'Cut' button at the bottom.
- Preview of arrow that will be cut at the origin:** Points to a white arrow in the drawing preview.

- ◇ Place your paper on the mat and insert the mat into the Force. **IMPORTANT:** It is assumed that you have gone through this same procedure in *Section 2.06* of the *C3 User Manual*. Here is a video to remind you of how to insert the mat and where to place the paper on the mat. [Video](#)
- ◇ Click on **Replace Tool** and follow the instructions:



- This process is essentially the same as how it is performed in C3 (refer to *Section 2.06.3* of the *C3 User Manual*).
 - The first step is to remove the current tool. At this point, you can also move the head to a new location such as over the paper. There are shortcut keys which can be used to move the head in larger or smaller increments as follows:
 - **Shift + arrow key:** move in a larger increment
 - **Ctrl + arrow key:** move in a smaller increment (on a Mac: **Command + arrow key**)
 - **Shift + Ctrl + arrow key:** move in the smallest increment possible (on a Mac: **Shift + Command + arrow key**)
 - Click on **Next** and the head will lower. **IMPORTANT:** you must NOT, at this point, use the buttons or keyboard arrows. The head will raise if you do this AND you will not be setting the correct **Z Origin**. At this second step, you must only insert the new tool (the test pen, in this case) and tighten, while the head is in the down position. Click on **Next** and the head will raise and return to the home origin.
- ◇ Set the **XY Origin** in the lower right corner of the paper:
 - Click on **Set origin** and use the buttons or keyboard arrows to move. This is essentially the same as how you set it in C3.
 - The same shortcut keys previously listed can be used to move in larger or smaller increments
 - Once the head is in position, click on **OK**.
- ◇ Use all of the same settings as shown in the prior **Cut Settings** screenshot (unless using a felt tip marker in which case a **Cutting Depth** of 2 should work). Then click on **Cut**.
- The arrow will be drawn to align with the origin you set on the paper with the test pen. If the pen doesn't draw, try increasing the **Cutting Depth** by 5 (or by 2 if using a marker).
- To draw again, return to the **Cut Settings** window and choose a different origin.
 - ◇ Practice moving the origin to different locations on the paper. The shape will always align with the location of this origin. This is how **Origin Point** mode works.
 - ◇ If you want the image to draw where you have it on the **Cutting Mat** in SCAL, then you need to switch to **WYSIWYG** mode.
 - ◇ Try using **Landscape** to see if that mode suits you better. The shapes will be rotated 90 degrees relative to how you see them on the screen.
 - ◇ Refer to *Sections 2.02.2* and *10.07* for more details on controlling where images will cut.

IMPORTANT: Please read *Sections 2.01- 2.06* before cutting!

2. KNK Force: Cutting

2.01 What You Need to Understand About Cutting

You Have To Make Mistakes

IMPORTANT: *The KNK Force is unlike any other blade-based cutter on the market! Please read all of Sections 2.01 – 2.06.*

- Successful owners are those who:
 - ◇ Have no fear of making mistakes
 - ◇ Have patience with those mistakes
 - ◇ Find out why they made those mistakes
 - ◇ Try again, based on new information
- It's from making mistakes that you learn more about the principles behind cutting. Once you get past the mistakes and have successful cuts, your confidence begins to soar and you'll be excited to broaden your range of projects!

Begin with Easy Materials and Easy Shapes

- You didn't begin your first driving lesson out on the freeway. You probably started driving on a farm or in a parking lot. Then you progressed to the neighborhood and other low-traffic streets. Then you began driving on major streets. Think of your cutting in the same way and don't start your first cuts with thick difficult materials or detailed cutting files! Instead, start cutting basic shapes and inexpensive materials, such as cardstock from Wal-Mart, or just scraps you have on hand. Work your way up to more difficult cuts after you master the easy ones.

Use the Correct Blade for the Material You Are Cutting

- Your KNK Force comes with a 45° blade (red cap) and a 60° blade (blue cap). An optional 30° blade (yellow cap) is also sold. Use the following as a guide for choosing the appropriate blade for the material you are cutting:
 - ◇ The 45° blade (red cap) should be used to cut vinyl, paper, cardstock, Dura-lar, Mylar, iron-on transfer, vellum
 - ◇ The 60° blade (blue cap) should be used to cut chipboard, Grungeboard, stiffened felt, craft foam, and some of the rhinestone template materials. **IMPORTANT!** This blade is very fragile!
 - ◇ The 30° fabric blade (yellow cap) should be used to cut all fabrics and felt. It's been reported that it also works well on cardstock that has been exposed to humidity.
- Refer to *Sections 2.02.3, 2.03.9, 2.03.10, and 2.05* for more information related to the KNK Force blades.

Set the Z Origin When Required

- The **Z Origin** is an important setting as it tells the cutter where the tip of the tool is located. This is initiated by clicking on **Replace Tool** in the **Cut Settings** window (refer back to *Section 1.06.4*). Also:
 - ◇ While you can set this origin on either the top of the mat or the top of the material, it is highly recommended that it is set with the tip of the tool on top of the mat when using the blade holder or piercing tool. Otherwise set the origin with the tip on top of the material.
 - ◇ The cut settings at the end of this chapter are all based on using the mat. If you choose to use the top of the material, you will need higher depth settings.
 - ◇ Insert the new tool at the correct time (not one step before nor one step after). Read the onscreen instructions to know at what point to insert the tool and tighten. Remember, if you need to move the

head to a different location, do so while the head is still in the up position (the first window of the **Replace Tool** process).

- ◇ If the mat is used for setting the **Z Origin** when cutting, it's not necessary to reset the origin when changing materials, as long as the blade holder remains positioned in the blade holder seat on the Force.

Understand the Cut Settings

- There are recommended settings for a wide range of materials at the end of this chapter. However, the quality of a cut can be affected by the newness of the blade, the condition of the mat, humidity (which adds moisture to many materials), and qualities of the material including color, texture, and consistency. Therefore, it's very important to know which setting(s) to adjust in order to improve a cut.
- In *Section 2.03* and *2.05*, the cut settings are presented in detail. At the end of this chapter are recommended settings. When adjusting settings, go up in small increments (~ 5 at a time). Under no circumstances attempt to use "extreme values" to see what will happen.

Perform Test Cuts!

- Test cuts are an important part of getting successful cuts every time you cut. Get into the habit of doing them because you certainly don't want to cut a huge project if the test cut indicates a test cut isn't clean. Saving scraps of each material you cut will provide you a way to test cut without taking up room on a new sheet of the material.
- The SCAL Library has lots of free shapes you can use for testing. One recommendation is to start with the *Ring* shape. After you pull up the test cut, you can easily check to see if the interior circle has cut too deeply. Once you have optimized the settings for the ring, try another more detailed shape, such as the asterisk. If you are cutting across the width of the material, also test a wide thin rectangle to make sure the cutting depth is sufficient for both sides.
- Go to *Appendix D4* for a flowchart procedure for test cutting with the Force blade holder. Print this flowchart and use it when troubleshooting a test cut. *Appendix D5* contains a similar procedure when using the rotary tool.

Record Your Successes

- As you begin to have successful cuts, take note of the settings used:
 - ◇ There is a blank form at the end of this chapter that you can print and use to record your cutting results. At the end of *Chapter 12* is a blank form for recording your results with the Force embosser, engraver, piercer and your own personal markers, glue pens, etc. At the end of *Chapter 13* is a blank form for recording results with the rotary tool.
 - ◇ There are suggested settings for a range of materials at the end of these same chapters. Use these as starting guides but remember that your results may vary based on the many factors which can affect cutting.
- You can also create new presets based on your successful cuts. Refer to *Section 2.04*.
- You can submit your successful settings by emailing them to smccauley45@cox.net
- You can view settings for various materials and accessories at this link:

Keep the Cutting Mat Clean and Sticky

- Materials like vinyl have a backing sheet that isn't penetrated during cutting. These backed materials do not need to be placed on the cutting mat if at least two pinch wheels can grip them during the cut. However, if a material doesn't have a backing sheet (and most do not), then the material must be stabilized by pressing onto a sticky mat for cutting.

- ◇ Always press your materials evenly to the mat. Think about using a brayer both before AND after cutting. Repressing the material after cutting can greatly aid in weeding the cut shapes from the waste.
- ◇ When necessary, tape thicker materials to the mat to keep them from slipping during the cut. But remember that taping the edges is not the same thing as making sure the entirety of the material is pressed to the mat.
- ◇ If you cut a range of materials, you might need more than one mat so that you can use stickier mats for certain materials (e.g. fabric, plastic) or mats with less adhesive for other materials (e.g. paper products).

Know Where Your Images Will Cut

- Practice with the test pen until you know, with 100% confidence, where your images will be drawn. This is important since you do not want to be guessing when you begin actually cutting with a blade. Refer to *Section 10.07* for screenshots and details on how the **Orientation** and **Cut Mode** options affect where shapes will cut.
- When using only one tool, mount it on the left side because the XY origin is always based on the left side even if you change the layer setting to cut on the right side.

Don't Get Frustrated, Get Help!

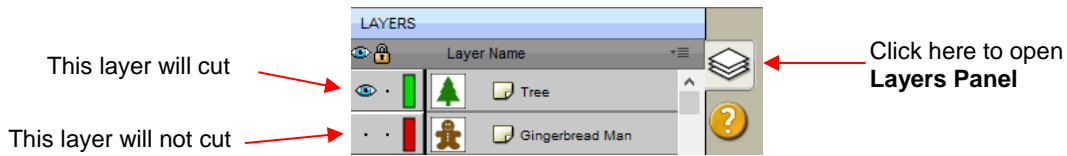
- Besides having your own KNK dealer as the first line of contact, there are many user forums, message boards, Yahoo groups, etc. where you can post questions and get answers from other users and KNK dealer. Utilize these resources! A recommended list was presented on the first page.
- Please follow a few “rules of etiquette” out of respect for those who are eager to assist. This saves both time and the posting of incorrect solutions. A few suggested guidelines:
 - ◇ List the cutter model, software, and which operating system is installed on your computer.
 - ◇ Describe the problem in detail:
 - A bad post would say, “My cutter is not cutting right.”
 - A better post would say, “I’m attempting to cut cardstock and I’m seeing a lot of tearing.”
 - The best post would say, “I’m attempting to cut 65 lb Recollections cardstock and I’m seeing a lot of tearing. My **Cutting Depth** is at 85, my **Blade Tension** is set to 2.5, and my **Cutting Speed** is at 20. I’m using the red capped blade.”
 - ◇ Post photos if possible. If the Force appears to be having a mechanical issue during cutting or not behaving in an expected manner, making a quick video is highly recommended.
 - ◇ Check back often. Nothing is more frustrating to someone helping than to never hear from the person again. Even if you get help somewhere else or you figure out the problem on your own, it is respectful to post back with the solution you found. This solution may help others in the future!

2.02 Choices Before Cutting

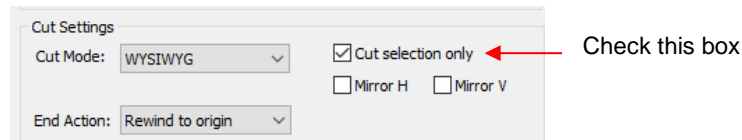
- There are a number of factors under your control for cutting:
 - ◇ What shapes to send to the cutter: *Section 2.02.1*
 - ◇ Where the shapes will be cut from the material: *Section 2.02.2*
 - ◇ What tool(s) will be used for cutting (or drawing, scoring, engraving, etc.): *Section 2.02.3*
 - ◇ What settings will be used: *Section 2.02.4*

2.02.1 Controlling What Shapes Will Cut

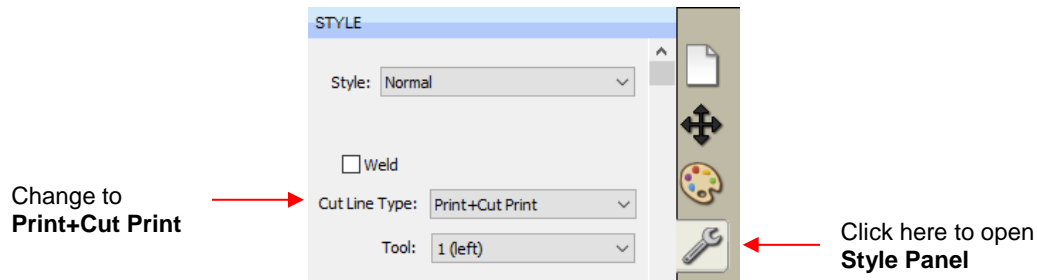
- There are four ways to control whether a shape will be cut or ignored:
 - Show/hide shapes on the **Layers Panel** (refer to *Sections 4.04* and *5.09*) – anything hidden will not be sent to the **Cut Settings** window. By clicking on the left side icon, a layer can be hidden. This is the most common way to control what shapes will cut.



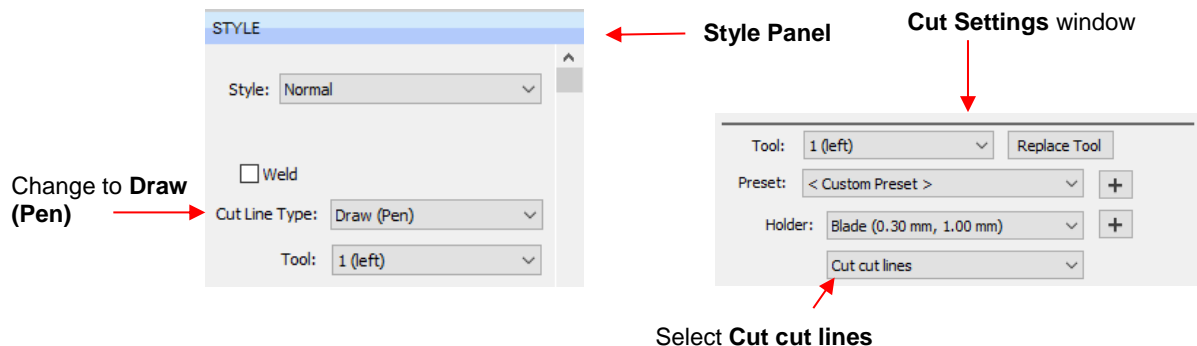
- Select/highlight which shapes you want to cut (refer to *Section 5.01*). Then, in the **Cut Settings** window, mark the option for only cutting those that are selected. This is useful if you have shapes you want to cut that are in the same folder with other shapes you do not want to cut. You still have the option to hide those other shapes, as in the prior option, but this could be quicker if there are a lot of shapes to turn off:



- For shapes you do not wish to cut, change the **Cut Line Type** (on the **Style Panel**) to **Print+Cut Print**. Those shapes can then only be printed and will not be sent to the **Cut Settings** window. This is typically used in **Print and Cut** applications (refer to *Sections 10.01* and *11.04*).

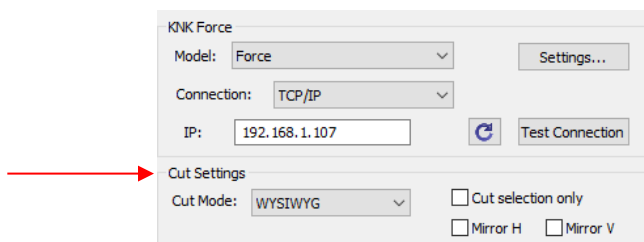


- For shapes you do not wish to cut, change the **Cut Line Type** (on the **Style Panel**) to **Draw (Pen)**. Those shapes will not be cut if you then have **Cut cut lines** selected in the **Cut Settings** window (refer to *Section 10.01*).



2.02.2 Controlling Where Shapes Will Cut

- In the **Cut Settings** window is a **Cut Mode** option:

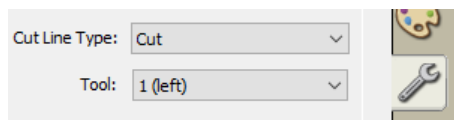


- This was briefly covered in *Section 1.06.3*. **Cut Mode** has two choices:
 - ◇ **WYSIWYG**: Cuts the shapes where they are positioned on the **Cutting Mat**. Refer to *Section 10.07.3*.
 - ◇ **Origin Point**: Moves the shapes to cut at the origin you have set on the cutter itself. Refer to *Section 10.07.2*.
- A third mode is called **Print+Cut** (aka **Print and Cut** or **PNC**):
 - ◇ This is the mode selected when you want to print images on your printer and then have the Force cut them out.
 - ◇ Three registration marks are printed, along with your images, from SCAL to your home or office printer. The printout is placed on the cutting mat. The camera on the Force is used to project an image at each mark and you will move an onscreen “+” icon to align with the registration mark in that projected image. The Force will then cut out your shapes based on triangulation. This is far more precise than **WYSIWYG** because it takes into account not only any misalignment of your printout on the mat, but also any errors in the printing. Most printers do not print images precisely in the location on the paper as they are located on the screen.
 - ◇ Note that raster images (.JPG, .BMP, .PNG etc.) will need to be traced first so that cut lines are created. Refer to *Section 7.03* for tutorials on how to do the tracing
 - ◇ Access to the **Print+Cut** mode is located in the bottom left corner of the **Cut Settings** window. Refer to *Chapter 11* for complete instructions on calibrating the camera and examples of PNC applications.

2.02.3 Selecting the Tool to be Used for Cutting

Blade Holder

- When using the blade holder, you will leave the **Cut Line Type** (on the **Style Panel**) set to **Cut**. Also, leave **Tool** set to **1 (left)**, as it is recommended that the blade holder always be installed on the left side:

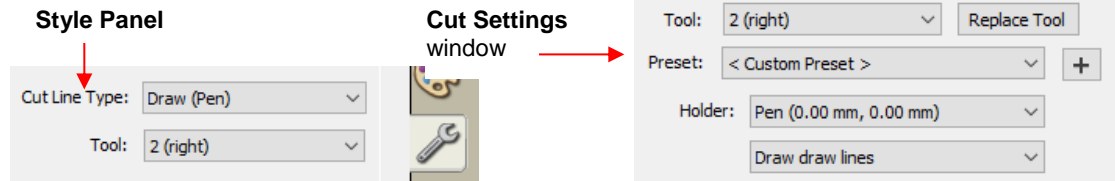


- You have a choice of three blade types to use in your Force blade holder, as was covered in *Section 2.0.1*. Based on the blade type, you will need to set a **Blade Offset** value for that type of blade (refer to *Section 2.03.9*). Based on the material you are cutting, you will also need to set a **Blade Tension** on the blade holder (refer to *Section 2.05*).

Pen (or Engraving Tool, Embossing Tool, Punch/Piercing Tool)

- When using a tool with no blade offset and no other tool, you can leave the **Cut Line Type** set to **Cut**, as with the blade holder. You will then change the **Blade Offset** and **Overcut** to 0, as you did in *Section 1.06.4*.

- If, however, you are using both the blade holder and a pen, then you will set the **Cut Line Type** to **Draw (Pen)** and change the **Tool** setting to **2 (right)**. Also, in the **Cut Settings** window, select **Pen** under **Holder** and also select **Draw draw lines**:



- When using both the pen and the blade holder (or other combination) of two tools, calibrations must be made to insure accurate alignment. This is covered in *Section 12.02*.

Rotary Tool

- Because the rotary tool is always mounted on the left side, the **Tool** setting will always be **1 (left)**. It also will need the **Blade Offset** and **Overcut** set to 0 in the **Cut Settings** window.
- IMPORTANT!*** Please read *Chapter 13* before using the rotary tool in your KNK Force.

2.02.4 Determining the Cut Settings

- In the lower half of the **Cut Settings** window, there are a number of settings which should be understood thoroughly, as you will be checking them before every cut. *Section 2.03* covers each setting in detail.
- The **Presets** provide very rough estimates of the settings to be used for about twenty materials. However, these presets do not include **Blade Tension**, which is as important as any of the other settings. Thus, it's recommended that the table at the end of this chapter be used for selecting settings.
- If you cannot find settings for your material, use the flow chart in *Appendix D4* to test cut your material and determine optimum settings.
- The following table summarizes the settings and shows the typical range you can expect to use. This table is only for cutting with the blade holder.

<u>Setting</u>	<u>Section to Read</u>	<u>Description</u>	<u>Typical Range (for Blade Cutting)</u>
Tool	2.03.1	Which side will be used for the blade or tool	1 (left) or 2 (right)
Multi-cut (aka Passes), P	2.03.2	Number of repeats to perform on a shape before moving to next shape	1 to 3
Start depth, SD	2.03.4	The target depth for the first pass in multipass applications	Ending Depth divided by Passes
Cutting depth / End depth, CD/ED	2.03.3	Maximum depth blade or tool will attempt to reach in Z direction. This depth is offset by Blade Tension setting.	1 to 200
Cutspeed, CS	2.03.6	How fast the blade or tool travels while in the down position	10-35
Up speed, US	2.03.5	How fast the blade or tool travels in the up position, moving from one location to another to begin cutting	20-40
Plunge speed, PS	2.03.7	How fast the blade or tool drops from the up position to the down position	20-40
Lift speed, LS	2.03.8	How fast the blade or tool rises from the down position to the up position	30-40
Blade offset, BO	2.03.9	Distance from the center of the blade shaft to the tip of the blade	0.25 - 0.75
Overcut	2.03.10	Additional distance for the blade to travel to insure cuts are closed	1.0 mm

2.03 Cut Settings Details

- Before presenting the individual settings, note that there is no force or pressure setting. Because of Z-axis control, the force is achieved using a combination of two settings: **Cutting Depth** or **Ending Depth** (see Section 2.03.3) and the **Blade Tension** setting on the blade holder itself (see Section 2.05).
- Also, because of Z axis control, you can have progressively increasing depths in multi-pass applications, as well as control the speed along the Z axis. Thus, there are new settings to learn and the remainder of this section covers each one. But remember that you'll want to check the settings table at the end of this chapter before trying out any cuts to make sure what you're using seems in line with the materials you're planning to cut.

2.03.1 Tool and Replace Tool

- Tool** has two choices: **1 (left)** or **2 (right)** which correspond to the two heads on the KNK Force. **Replace Tool** is used to set the **Z Origin** when loading a tool on the side that is selected:

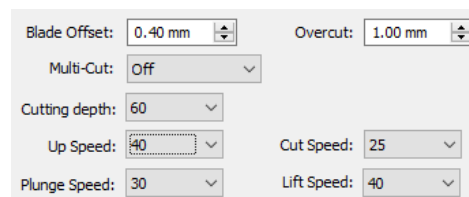


- All of the settings below **Tool** will be the ones applied for the tool on that side. In other words, leave **Tool** set to **1 (left)** and then enter all settings to be used by the left-side tool. When both heads will be used, after entering the left side settings, change **Tool** to **2 (right)** and then enter all settings to be used by the right-side tool. More about dual head applications is covered in *Chapter 12*.
- Similarly, when **Tool** is set to **1 (left)** then applying **Replace Tool** will allow you to insert a tool on the left side and set the **Z Origin**. When **Tool** is set to **2 (right)**, the applying **Replace Tool** will allow you to insert a tool on the right side and set the **Z Origin** on that side. Follow the instructions carefully so that the tool will be inserted at the correct step.

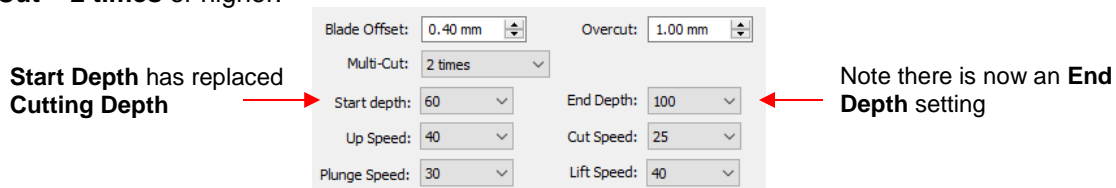
2.03.2 Multi-Cut or Passes (P)

- Depending on whether **Multi-Cut** is set to 1 or set to 2 or higher, the available settings in the window will be slightly different:

Multi-cut = Off:



Multi-Cut = 2 times or higher:



- This is an important setting in many applications because having the blade or tool work its way through a material can yield a higher quality result. The blade or tool will remain in the down position during the repeats, which is better than having the blade or tool start over after completing an entire project.

- Some examples where more than one pass is recommended:
 - ◇ Cutting thicker denser materials, such as chipboard, where multiple passes allows the blade to progressively “carve” through the material
 - ◇ Cutting fibrous materials, such as fabric, where two or more passes ensure that all of the fibers have been cleanly cut
 - ◇ Cutting intricate or detailed shapes, such as script titles, from certain materials, such as cardstock, where a single pass may leave certain spots not cleanly cut
 - ◇ Cutting rhinestone template material where a second pass results in much cleaner weeding of the cut circles
 - ◇ Cutting or engraving with the rotary tool to avoid over-stressing a bit and to achieve cleaner results

2.03.3 Cutting Depth (CD) / End Depth (ED)

- The depth settings are target locations on the Z Axis for the tool to attempt to reach based on the **Z Origin** being set to 0.
- The **Cutting Depth (CD)** only appears when **Multi-cut** is set to **Off**. When **Multi-cut** is **2 times** or higher, this same setting is called **End Depth (ED)**.
- This setting is important because it controls how deeply the blade will attempt to penetrate the material. If set too low, the material will not be completely cut. If set too high, the blade will cut through the material and into the cutting mat or the backing sheet of a material like vinyl. It will also then cause tearing of materials, such as paper and cardstock.
- While it would seem logical for this setting to simply be the thickness of the material, the resistance of the material (density), combined with the fact the blade is being pushed up due to an internal spring inside the Force blade holder, means that a higher setting is required.
- When using the rotary tool for cutting, the **CD/ED** is directly related to the thickness of the material, as well as the height where the **Z Origin** is set. More information on determining the **CD/ED** is presented in *Sections 13.04 – 13.05*.
- When engraving or embossing, the **CD/ED** is the depth to which you want the tool to penetrate the material.

2.03.4 Start Depth (SD)

- When using more than one pass, the **Start Depth (SD)** setting becomes available as shown in *Section 2.03.2*.
- This is the target depth for the first pass only. This setting can be the same as the **End Depth** or it can be smaller, which often makes sense when cutting thicker materials. Having Z-axis control, combined with the **Start Depth** and **End Depth** settings, allows the blade to work its way through thicker materials in stages versus the usual way cutters work (trying to cut all the way through the material right from the start).
- A good estimate for a **Start Depth** is to divide the **End Depth** by the **Multi-cut** setting. For example, if you determine that an **ED** of 100 is needed and you’re going to use a **Multi-cut** of 3, then set the **SD** to around 33.
- If three or more passes are selected and you have entered a separate **Start Depth** and **End Depth** then, after the first pass, each subsequent pass will have a progressively increasing target depth based on a linear calculation. Refer to *Appendix D2* for details on how the target depth for each pass is calculated.
- Recommended depth and pass settings are available for a range of materials and applications. These settings will be regularly updated as more testing is done. Refer to the table at the end of this chapter.
- ***IMPORTANT!*** With any recommended setting, you must still perform test cuts using small shapes or a portion of your project to make sure the settings are sufficient for a great cut. Many factors play into how well a material cuts including the dullness of the blade, the condition of the cutting mat, the material’s exposure to humidity, and slight differences in setting the tension on the blade holder.

2.03.5 Up Speed (US)

- The **Up Speed (US)** is how fast the blade or tool travels in the up position, moving from one location to another to begin cutting. The range of settings is from 1 to 40.
- For most cutting applications, this setting can be quite high, ~ 35 – 40. However, for some applications such as a print and cut (PNC), the setting should be lower, ~ 15 – 20, for maximum accuracy. Also, when using the rotary tool, which is a much heavier device than the blade holder, it is sensible to keep the **Up Speed** at a more conservative setting.

2.03.6 Cut Speed (CS)

- The **Cut Speed (CS)** is how fast the blade or tool travels while in the down position. On the Force, the setting ranges from 1 to 40, where a setting of 40 represents the maximum of 750 mm/sec.
- For small and/or intricate designs, slower speeds are better. A slow speed is 10 – 15. A really slow speed is less than 10. But when cutting larger or simpler designs with the blade, faster speeds should work fine, such as ~ 25 – 30. A speed over 35 is usually too fast for cutting but useful when using a marker or a pen.
- ***IMPORTANT!*** When using the optional rotary tool, too high of a cut speed can damage your cutter and/or rotary tool. Thus, when cutting most materials, the CS should be 10 or slower.

2.03.7 Plunge Speed (PS)

- The **Plunge Speed (PS)** is how fast the blade or tool drops from the up position to the down position. The range of settings is from 1 to 40.
- When cutting soft materials with a blade, the **Plunge Speed** can be set quite high, e.g. at 40. If you are cutting a dense material, such as thick chipboard, or any time you are using the blue capped blade, a lower **Plunge Speed**, such as 20, can help protect the blade from too strong of an initial impact with the material. If you are cutting a dense material, such as thick chipboard, or any time you are using the blue capped blade, a lower **Plunge Speed**, such as 20, can help protect the blade from too strong of an initial impact with the material. If you are cutting a dense material, such as thick chipboard, or any time you are using the blue capped blade, a lower **Plunge Speed**, such as 20, can help protect the blade from too strong of an initial impact with the material.
- ***IMPORTANT!*** When using the rotary tool, keep the **Plunge Speed** even lower (~ 5 – 10) so as to avoid damaging the tool upon contact with the material. It also allows time for the tool to cut down to a desired depth before starting along a path. Refer to *Section 13.03*.

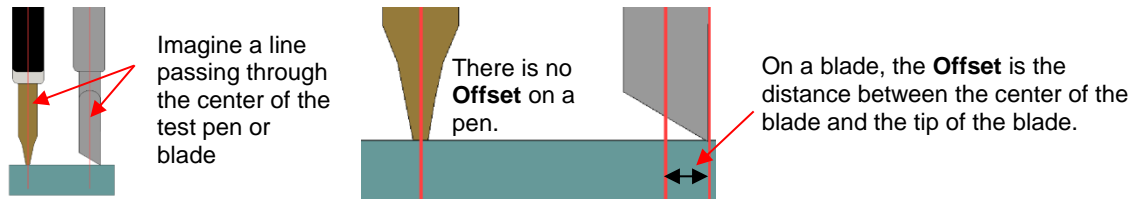
2.03.8 Lift Speed (LS)

- The **Lift Speed (LS)** is how fast the blade or tool rises from the down position to the up position. As with the other cut speed settings, the range is from 1 to 40.
- For light weight tools, such as the blade holder, embossing tool, pens, etc, this speed can be set high (~ 35 – 40). When using a heavy tool, such as the rotary tool, it's important to use a slow speed. Again, refer to *Section 13.03*.

2.03.9 Blade Offset (BO)

More Info

- **Blade Offset (BO)** is the horizontal distance from the center of the blade shaft to the tip of the blade. A pen, embosser, engraver, and rotary tool all have an offset of 0 because the tip is centered with the center of the pen/engraver/tool shaft. But a blade is different:



- If you set the **Blade Offset** to 0 when cutting with a blade, corners will be rounded. If it is set too high, bubbles will cut on sharp corners:



Offset is too low:
corners are rounded



Offset is too high:
bubbles appear at the corners

- Below are typical **Blade Offsets** for each of the three types of blades used in the Force blade holder.
 - ◇ Red capped blade: 0.25 mm
 - ◇ Blue capped blade: 0.35 mm
 - ◇ Yellow capped blade: 0.75 mm
- Any time you purchase new blades, refer to the packaging for the suggested **Blade Offset** for that particular blade. However, it's not unusual for blades to be slightly off-spec. Based on cutting a rectangle or square, increase or decrease the **Blade Offset** in increments of 0.1 or smaller.

2.03.10 Overcut

- Overcut** is related to **Blade Offset** in that it isn't needed when using a pen, embosser, engraver, and so forth, because the tips of those tools are aligned with the center of the tools themselves. However, leaving **Overcut** at 0 when using the blade holder will result in large shapes not quite closing:



Overcut is too low:
paths do not close

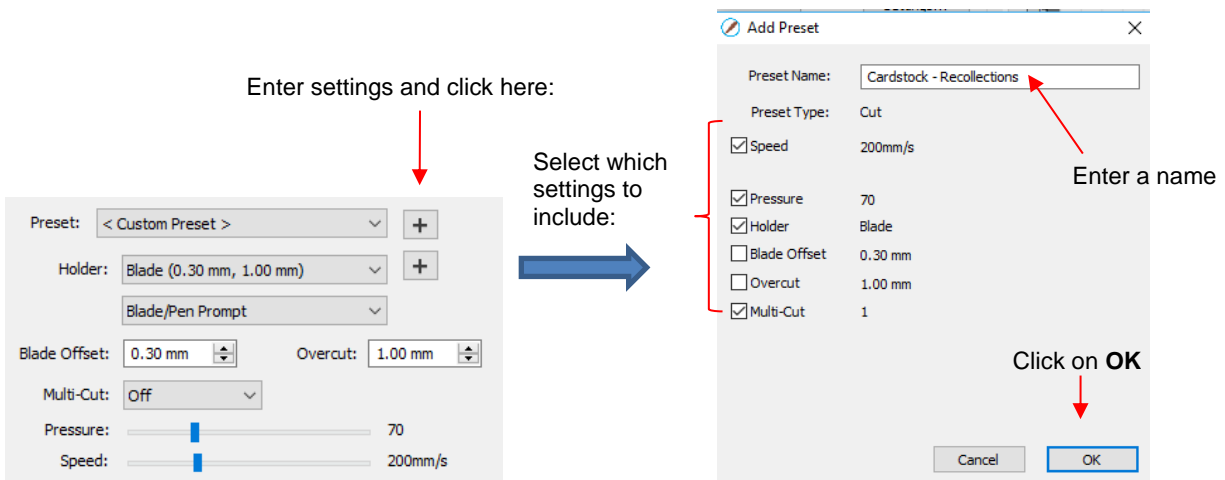
- In some cutting programs, **Overcut** is not a separate setting but rather automatically calculated and applied based on the **Blade Offset** entered. However, in SCAL, you enter an actual **Overcut** setting and should any time a blade is used.
- In general, the blade type doesn't greatly affect the **Overcut** required. Try using 1.00 mm. In the event you cut a large closed shape, like an 8" circle, you may find that you'll need to increase **Overcut** to 2.00 mm.

2.04 Presets

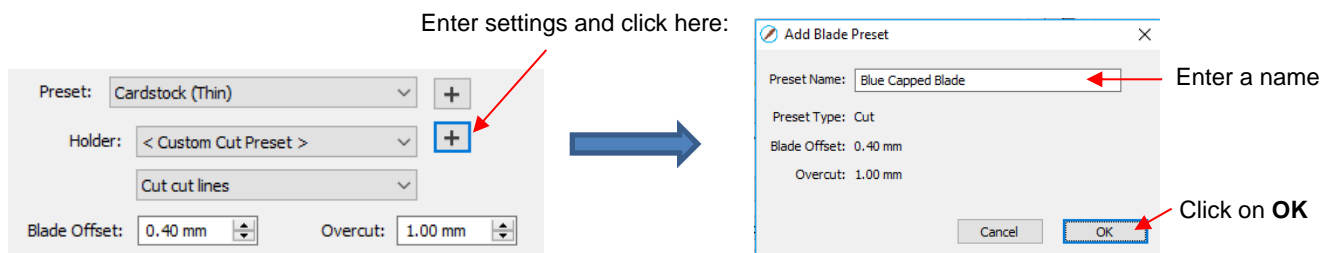
- SCAL has presets for about twenty materials. To select a preset, click on the dropdown menu and browse the list to find the material you are cutting.
- When selecting a preset, remember these should only be used as starting points for a test cut. There are many factors which can affect the force required, including sharpness of the blade, condition of the mat,

humidity, and intricacy of the design. It's also important to note the **Blade Tension**, which is set on the blade holder itself, is not included as a **Preset**. Refer to *Section 2.05*.

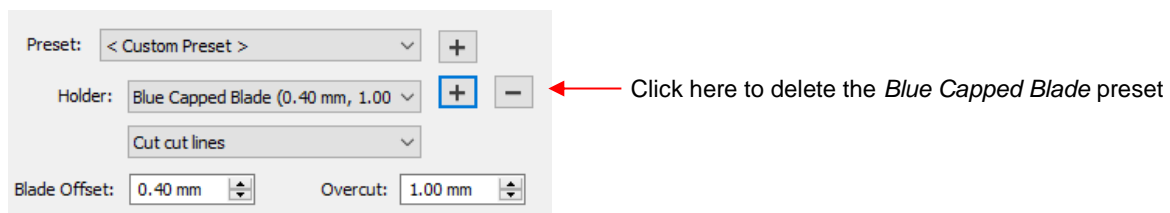
- SCAL also offers the ability to save your own presets. To do this, enter the settings you wish to save. Then click on the “+” to the right of **<Custom Preset>**:



- After clicking on **OK**, the new preset will be found at the bottom of the list.
- In a similar manner, you can also add other **Holders** to your list, which would typically be blades with other **Blade Offset** values. For example:



- To delete either type of preset that you personally added, select it from the menu and then a “–” button will appear. Clicking on that button will then remove it from the list:



2.05 Blade Tension (BT)

- Inside the KNK Force blade holder is a large spring that is compressed as you turn the top of the blade holder clockwise and loosened as you turn the top counter-clockwise. For very thin materials, such as vinyl and thin paper, you need the blade to be “floating” while cutting those materials, thus a very low tension is required. For thicker denser materials, like chipboard, you want a high tension so that more force is applied and the blade is held more rigidly.

- As covered in *Section 1.08.2* of the *C3 User Manual*, there is a measurable scale along the plunger. The scale goes from 1 to 6 where 1 is the lowest tension. In the recommended settings table, there are **Blade Tension** settings to use with various materials.
- When cutting materials that can use either blade, the 45 degree blade will need a slightly higher **Blade Tension** than the 60 degree blade, because of the extra contact with the material being cut.
- Materials that absorb moisture (such as cardstock, paper, fabric, and chipboard) may need more **Blade Tension** (and possibly more than one pass) if they have been exposed to humidity. One tip is to blow dry these materials before cutting or set inside a warm oven for about 15 minutes (preheat oven to its lower temperature and then turn off before putting your paper materials inside).

2.06 Performing a Cut with the Blade Holder

Video

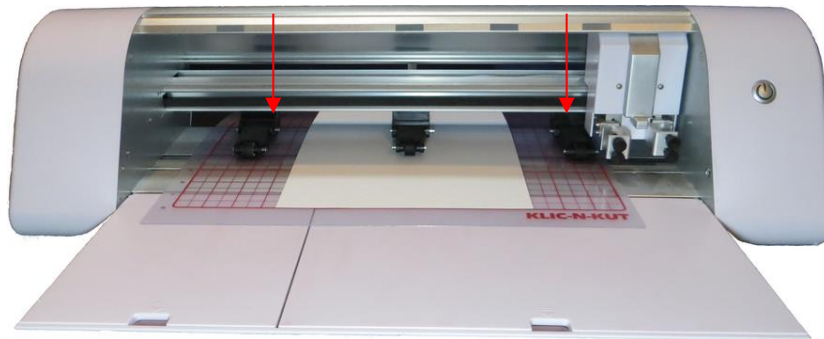
- (1) It's always a good idea to do a small test cut before cutting a large project. Select a shape from the **Library** in SCAL to use.
- (2) Press the material to a clean and sticky mat (unless a rolled material is being used):
 - ◇ Center the material between the two outer pinch wheels. Because of the Z Axis effect, the pressure from the pinch wheels can alter the CD/ED needed next to a pinch wheel. Thus, keeping the material away from a pinch wheel is important.
 - ◇ While using your hands to press down a material should work fine, a brayer helps provide a complete and even pressing.
 - ◇ Some materials may need more tackiness or less tackiness than others (refer to *Section 1.10* of the *C3 User Manual*).
 - ◇ Some material may require tape along the outside edges to prevent slippage. Be sure to still thoroughly press the entire surface to stabilize it completely.
- (3) Insert the mat (or rolled material) into the Force so that most of the mat (or rolled material) is behind the cutter:



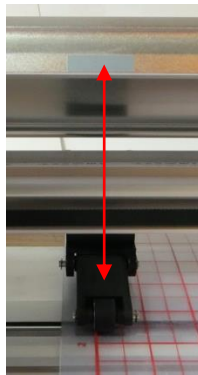
Only the lower part of the mat should be in the front of the cutter.

- (4) Arrange the mat so that the two outer pinch wheels are both over it.

Always use the far left and far right pinch wheels with the cutting mat.



- (5) Verify that the pinch wheels are aligned under the gray rectangles.



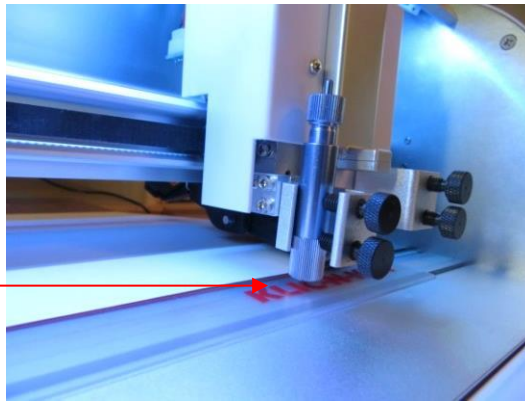
Wheels should be centered under the gray rectangles.

- (6) Set the **Blade Tension** on the blade holder based on the material to be cut. Refer to the table at the end of this chapter for recommended **Blade Tension** settings.



- (7) Go to the **Cut Settings** window and click on **Replace Tool** and follow the on-screen instructions. Set the **Z Origin** with the tip of the blade touching the top of the mat (or the top of the rolled material). Refer back, if necessary, to *Section 1.06.4*.

Z Origin is set with the
blade tip touching the mat.



- (8) Input all of the cut settings. Refer to the recommended settings at the end of this chapter.
- (9) Click on **Set origin**. Set the **XY origin** at the lower right corner of the material (or where you need the origin to be).
- (10) Click on **Cut**. After cutting, remove the cut shape and examine the mat for deep cut lines.
- (11) Use the flow chart in *Appendix D4* to adjust settings.
- (12) Repeat test cuts until satisfied with the cut settings.

2.07 Calibrating the Force's Sizing Resolution

- If you were to cut out any particular shape, for example, a 10" x 10" square (or use 250 mm x 250 mm), you might find that it actually measures 9-15/16" x 10-1/32". It will be very close to 10" x 10" but perhaps just slightly smaller or larger in either or both dimensions. Now this might be perfectly acceptable for the type of cutting you do. Therefore, it may not even be necessary to do this particular calibration. However, if you do want to make sure your shapes are cut precisely, the following procedure will allow you to calibrate your Force.
- ***IMPORTANT:*** This **Resolution** calibration is needed for accuracy in print and cut applications. Therefore, if you plan to do print and cuts, complete this calibration before performing the optic eye calibration in *Chapter 11*.

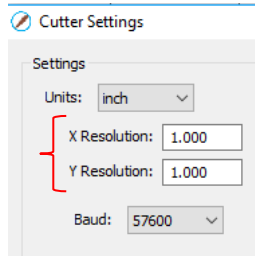
2.07.1 Entering C3 Sizing Calibration into SCAL

- If you have already performed the **Sizing Calibration** in C3, those same values can be entered into the **Cutter Settings** window in SCAL.
- For example, let's say these are the results you originally entered in C3 under **Settings>Basic Settings**:

Wheel resolution	Belt resolution
<input type="text" value="0.997"/>	<input type="text" value="1.0127"/>

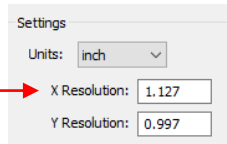
- Make a note of these values. Then go to **Cutter>Cutter Settings**. In the top left corner of that window you will see the calibration settings:

Calibration
settings



- To replace the defaults with the calibrations from C3:

Enter the **Belt**
resolution here.

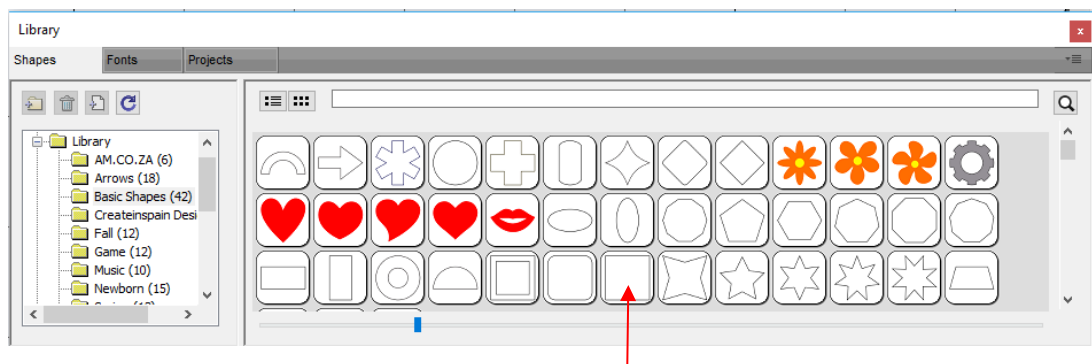


Enter the **Wheel**
resolution here.

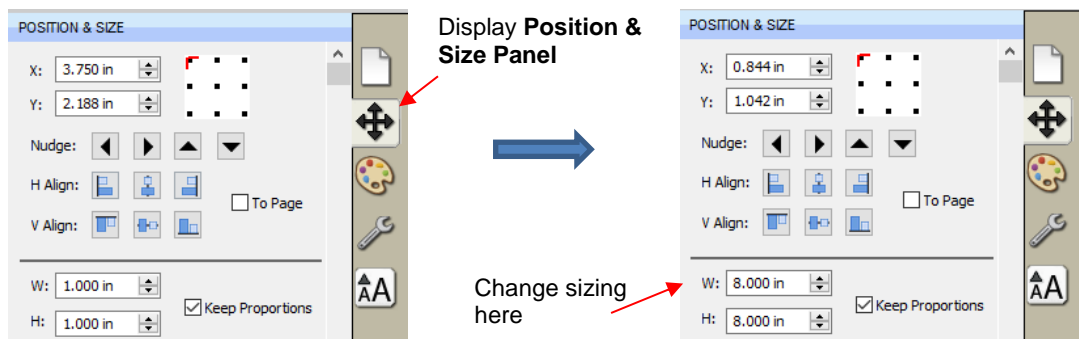
- After making changes, click on **Save** in the lower right corner of the **Cutter Settings** window.

2.07.2 Performing a Sizing Calibration

- Go to the **Library** and select the square shape:

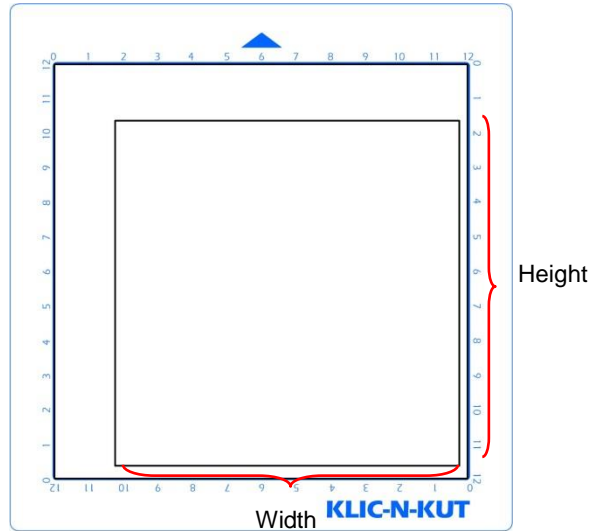


- Make sure you have selected the square and not the rounded square to the left of it because you will be measuring this square with a ruler after drawing it.
- To resize the square, select it and then click on the **Position & Size** icon to display that panel. The square will be 1" x 1" (or 25.4 mm x 25.4 mm). Change the size (**W** and **H**) to the largest size that will fit on the paper you have available. It is recommended that at least 10" x 10" (or ~ 250 mm x 250 mm) be used:

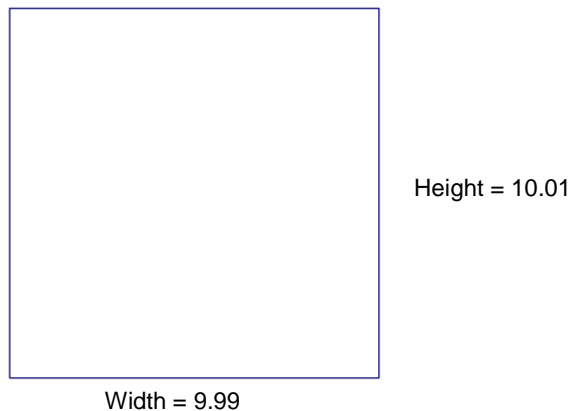


- Draw the square on your paper using the test pen or some other thin line pen. Then carefully measure the **Width** (the left-to-right length that drew) and the **Height** (the top-to-bottom length that drew):

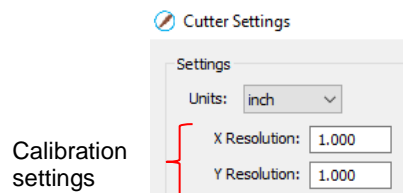
Feed the mat this direction
into the Force



- Because the Force is very accurate, only take note if the sides are slightly larger than 10" or slightly smaller than 10" because it will probably be so close that you cannot even measure how much larger or smaller than 10 inches it might be. Instead, let's say the **Height** is just the tiniest bit over 10". Mark that side as being 10.01". Let's say the **Width** is a tiny bit less than 10". Mark that side as 9.99". Now, if you feel you can measure accurately, with a ruler, then do so. But just estimating should work fine, too. (Note that if you are working with a metric ruler, you should be able to more accurately read the exact measurements). Write those measurements onto your sheet:



- Go to **Cutter>Cutter Settings**. In the top left corner of that window you will see the calibration settings:

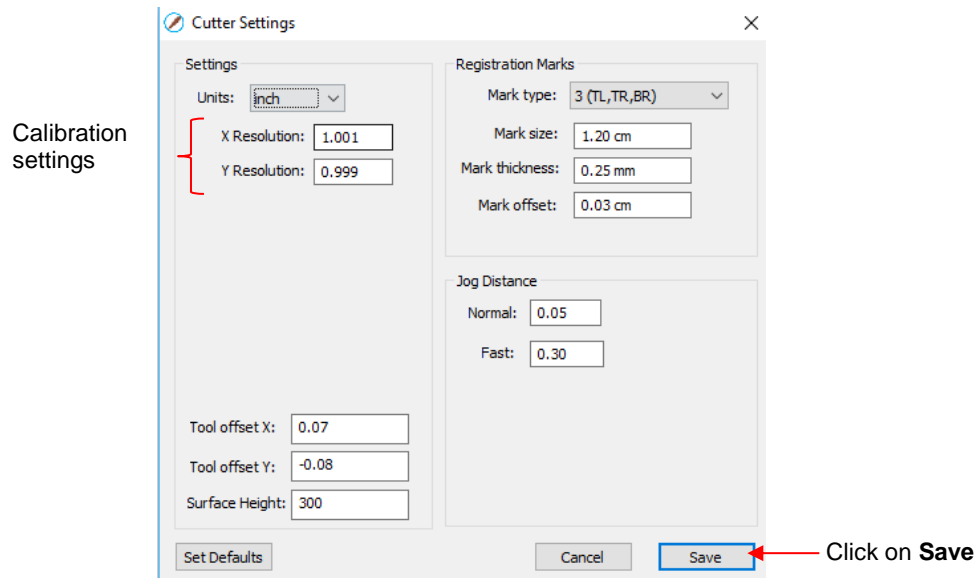


- Use a calculator to calculate the **X Resolution** and **Y Resolution** based on the measurements you obtained versus the size in SCAL. Note that it doesn't matter if you used **Portrait** or **Landscape** mode, the **X Resolution** is based on left-to-right (width) and the **Y Resolution** is based on top-to-bottom (height):

$$\begin{aligned} \text{New X Resolution} &= \text{Current X Resolution multiplied by the desired value divided by the actual value} \\ &= 1.0 * 10 / 9.98 \\ &= 1.001 \end{aligned}$$

$$\begin{aligned}\text{New Y Resolution} &= \text{Current Y Resolution multiplied by the desired value divided by the actual value} \\ &= 1.0 * 10.00 / 10.01 \\ &= 0.999\end{aligned}$$

- Enter those new values into the **Cutter Settings** window and click on **Save**:



- If, after testing again, you find that the sizing is still slightly off, then just repeat again. Note that in the calculations the second time, instead of using 1.00 for the **Current X Resolution** and/or **Y Resolution**, you will use whatever values you entered into the **Cutter Settings** window prior to drawing the square the second time.

Settings Form for Cutting Materials on the KNK Force¹

BT – Blade Tension; P – Passes; SD – Start Depth; CD/ED: Cut Depth/End Depth; CS – Cut Speed

[illegible]

¹ © 2015- 2018 Sandy McCauley, All Rights Reserved

Suggested Cut Settings for Various Materials on the KNK Force¹

These suggested settings are for initial test cut purposes. Other factors can influence settings such as dullness of the blade, condition of the mat, exposure to humidity, dye color, etc. Adjust settings, as needed.

BT – Blade Tension; P – Passes; SD – Start Depth; CD/ED: Cut Depth/End Depth; CS – Cut Speed

Unless otherwise noted under Comments - Up Speed = 40, Lift Speed = 40; Plunge Speed = 40; Blade Offset and Overcut = recommendations from *Sections 2.03.9 and 2.03.10*.

<u>Material</u>	<u>Color(s) Tested</u>	<u>Blade Type</u>	<u>BT</u>	<u>P</u>	<u>SD</u>	<u>CD / ED</u>	<u>CS</u>	<u>Other Comments</u>
Acetate - 5 mil Grafix	Clear	R	2	1		40	25	
Adhesive Foil - Cricut	Copper, Alum	R	1.5	1		25	25	
Aluminum 36 gauge	Aluminum	R	2.5	3	15	35	15	PS = 25; If not well adhered to mat, it will pick up the aluminum in corners
Art Paper - Borden & Riley #234 Paris Paper for Pens	White	R	2.5	1		90	25	Great paper for print & cuts
Balsa - 0.03" (0.75 mm)		B	1	2	25	50	15	Taped to an extra sticky mat; PS = 10
Balsa - 0.06" (1.5 mm)		B	1	3	20	75	10	Taped to an extra sticky mat; PS = 10
Balsa - 0.08" (2.0 mm)		B	1	5	15	100	10	Taped to an extra sticky mat; PS = 10
Candle Wax	Silver	R	1	1		12	15	Stockmar brand wax sheets, U.S. dealer is aToyGarden.com
Candle Wax - Rayher	Pale Green	R	0.5	1		20	15	Leave on backing sheet for cutting. Place in a freezer for 1 minute after cutting and before weeding
Candle Wax - Stockmar	Burgandy	R	0.5	1		35	15	Leave on backing sheet for cutting. Place in a freezer for 1 minute after cutting and before weeding
Cardstock - AC Textured 80lb	Hot Pink	R	2	2	70	70	25	Tendency to tear at corners, so 2 passes at ED 70 cleaner than 1 pass at higher CD
Cardstock - Bazzill Linen	Pink	R	2	2		80	25	
Cardstock - Bazzill Linen	Red	R	1.5	1		70	25	
Cardstock - Core'dinations Black Magic	Yellow	B	3.5	1		55	25	Painted" side down on mat. This prevents it from peeling at corners, since it is a very thin layer.
Cardstock - C&C Pastel Blush and Glitter Pastel Blush: 250 gsm		R	2	2		20	20	C&C: Create & Craft; sold in UK; cut with "good side" face down thus mirror images if needed; PS = 30
Cardstock - C&C Mirror Board: 250 gm	Gold mirror	R	2	1		60	20	C&C: Create & Craft; sold in UK

<u>Material</u>	<u>Color(s) Tested</u>	<u>Blade Type</u>	<u>BT</u>	<u>P</u>	<u>SD</u>	<u>CD / ED</u>	<u>CS</u>	<u>Other Comments</u>
Cardstock - C&C Pearlescent Bright Burst : 250 gsm	Dark pink and blue green	R	2	2		40	20	C&C: Create & Craft; sold in UK; cut with "good side" face down thus mirror images if needed; PS = 30
Cardstock - DCWV Metallic	Lavendar	R	3	1		90	25	
Cardstock - DCWV Patterned	Whimsical World	R	2	2	65	70	25	
Cardstock - Docräfts Solid Premium: 216 gm	Varied	R	2	1		86	20	Sold in UK
Cardstock - First Edition: 216 gm	Premium Dyed Textured	R	2	1		86	20	Sold in UK
Cardstock - Fotokarton: 300 gm (sold in Europe)	Yellow	R	2	2	50	100	15	PS of 20
Cardstock - Georgia Pacific - 110lb	White	R	2	1		60	25	
Cardstock - K&Company Designer Paper	Ancestry.com	R	2.5	2	80	80	30	
Cardstock - My Mind's Eye Designer	My Girl	R	2.5	1		90	25	
Cardstock - Neenah 65lb	White	R	2	1		60	25	
Cardstock - Neenah 80lb	Solar White; smooth	R	2	2	50	50	25	2 passes at a lower CD gave cleaner cutting than 1 pass at a higher CD.
Cardstock - Neenah Classic Linen 80 lb Cover 216 g/m2	Solar White	R	2	1		90	25	All time favourite paper, been using and cutting since early 1998 (by hand at first)
Cardstock - Neena Exact Index 90lb / 163 g/m2	White	R	2.5	1		65	25	http://amzn.to/1PLQo1Y
Cardstock - Papermania		R	2	2		45	25	Sold in UK
Cardstock - Paper Studio	White, heavy wt, #227041	R	1.5	2		50	25	
Cardstock - Prismatics 85lb	Bazzill Light nautical blue	R	2	1		90	25	
Cardstock - Recollections 65 lb	Black	R	2	1		60	25	
Cardstock - Recollections 65 lb - Shimmer	White Gold	R	2	2		20	40	
Cardstock - Recollections Printed Cardstock	Cupcake Cuties	R	2.5	1		90	25	
Cardstock - Stampin Up	Real Red	R	2.5	2	70	70	30	
Cardstock - Worldwin Cutmates	Candied Violets	R	2	1		60	25	

<u>Material</u>	<u>Color(s) Tested</u>	<u>Blade Type</u>	<u>BT</u>	<u>P</u>	<u>SD</u>	<u>CD / ED</u>	<u>CS</u>	<u>Other Comments</u>
Cardstock - Worldwin Doublemates 90lb	Brown, red	R	2	1		70	40	
Cardstock - Worldwin Doublemates 90lb	Gold	R	3	1		90	25	
Cardstock - Worldwin Smooth & Silky	Pistachio	R	2	2	50	50	25	2 passes at a lower CD gave cleaner cutting than 1 pass at a higher CD.
Cardstock - Worldwin Treasures	Heirloom Dark 90#	R	3	1		70	25	
Cardstock ~ 90 lb (unknown brand)	Blue, Black, both w/white backing	R	2.5	2	90	90	25	This paper is fantastic for popup cards, place cards, etc. any project that want to stand.
Cardstock - Worldwin Smooth & Silky	Light Pretty Pink	R	2.5	1		90	25	Start and stop points visible with PS at 40 and CD at 80. Dropped PS to 30 and increased CD to 90 made a perfect cut
Chipboard - 0.02" Cereal Box	Corn Chex Box	R	3	2	100	110	15	Printed side face down; taped to mat with blue painter's tape; Z axis origin set based on mat
Chipboard - 0.02" Cereal Box	Cracker box	B	2	1		120	15	Printed side face down; Z axis origin set based on mat
Chipboard - 0.02" Cereal Box	NesQuick Family Size	B	4	1		125	25	Printed side up
Chipboard - 0.02" White		B	3	2	130	170	20	White side down
Chipboard - 0.03"		B	2.5	2	120	140	25	Tried with the red blade, it required P=2 and BT= 4 and had rough outside corners. Blue blade cuts beautifully.
Chipboard - 0.055" - black		B	4	4	25	120	15	Cut relatively simple shapes with these settings.
Coated Cover: 18 pt Tango	White	R	1.5	3	60	180	25	PS = 20
Construction Paper - Creatology	Pink	R	1	1		35	20	
Construction Paper - Pacon Tru-Ray	Yellow	R	1	2	20	20	20	Did not cut as cleanly as the Creatology brand
Contact Paper	White	R	1	1		12	25	PS = 25
Craft Foam - 0.07"	Orange	B	1	1		40	25	Used a BO = 0.002 due to thickness of the material.
Craft Foam - Foamiran		R	2	1		50	20	
Craft Plastic 0.040" PET-G	Clear	B	4.5	5	85	125	25	
Double Sided Adhesive Sheets - Sookwang		R	2	2	5	5	25	Cuts through the white backing sheet and the adhesive, leaving the brown backing sheet intact.

<u>Material</u>	<u>Color(s) Tested</u>	<u>Blade Type</u>	<u>BT</u>	<u>P</u>	<u>SD</u>	<u>CD / ED</u>	<u>CS</u>	<u>Other Comments</u>
Double Sided Adhesive Sheets - Sookwang		R	2	2	5	25	25	Cuts through both top and bottom sheets and the adhesive.
Duck Tape	Mustache	R	2	1		70	25	
Dura-Lar - 5 mil	Mirrored on both sides	R	1	2	100	200	25	PS = 20
Fabric - Cotton (quilting)	White (Kona)	Y	2.5	2	10	10	25	
Fabric - Cork		F	1.5	2	50	100	20	PS = 20; Material available at embroiderygarden.com
Fabric - Denim		Y	3	2	15	15	25	Stonewash, medium weight, very sticky mat
Fabric - Twill		Y	2.5	2	15	15	25	
Felt - Stiffened		F	1	4	70	140	25	PS = 10
Foam Sheets - 1mm	CraftersSquare - Blue	R	2	2	50	70	25	
Foil	Your Story	R	2	1		20	25	Colored side down
Foil Board, Grafix Brand	Red, Blue, Green, Gold, Silver	R	2	1		90	30	color side up
Freezer Paper - Reynolds		R	1	1		7	25	mat sprayed with 404 ruler grip adhesive
Glitter Cardstock (chipboard wt) - Fabrique	Red	R	3	2	47	95	20	PS = 30 This is sold at Joann's and is 0.023" thick
Glitter Paper (chipboard wt)	American Crafts	R	5	2	70	90	20	PS = 20
Grungepaper, Tim Holtz Brand		R	2.5	2	40	50	25	With these settings - it slightly marked the mat but didn't cut it
HTV - Cricut Glitter Iron-On (on mat)	White	R	1.5	1		35	25	
HTV - Marea Premium	Black	R	1.5	1		30	25	Slight cut lines on backing but weeded easily
HTV - Premium Plus		R	1	1		20	25	
HTV - Siser EasyWeed direct from Roll	See Comments	R	2	1		10	40	Colors: Black, White, Orange, Dark Green, Navy Blue, Royal Blue, Red, Maroon, Gold
HTV - Siser EasyWeed on the mat	See Comments	R	2	1		3	40	Colors: Black, White, Orange, Dark Green, Navy Blue, Royal Blue, Red, Maroon, Gold
HTV-DecoSparkle	Spectrum	R	1	2	40	40	30	

<u>Material</u>	<u>Color(s) Tested</u>	<u>Blade Type</u>	<u>BT</u>	<u>P</u>	<u>SD</u>	<u>CD / ED</u>	<u>CS</u>	<u>Other Comments</u>
HTV-Glitterflex Ultra- on the mat	Silver	R	1.75	1		70	25	Cuts beautifully!
Iron-On Foil Sheets, Jean Trix; June Tailor Brand	Silver	R	3	1		60	25	Similar to HTV style but is suppose to be "cut through" the backing with scissors and then adhered; These settings "cut through"
Iron-On Glitter Sheets, Jean Trix; June Tailor Brand	Teal, Gold	R	4	2	160	180	30	Similar to HTV style but is suppose to be "cut through" the backing with scissors and then adhered; These settings "cut through"
Iron-On Hologram Sheets, Jean Trix; June Tailor Brand	Red, Silver	R	2.5	1		115	30	Similar to HTV style but is suppose to be "cut through" the backing with scissors and then adhered; These settings "cut through"
Labels - Avery Paper	White	R	2	1		18	25	
Laminator Pouch	Your Story	R	2	1		20	25	Not heated
Leather - artific.	White	Y	2.5	2	15	15	25	Cuts like butter!
Leather - 0.065" (1.6 mm)	Dk Brown	B	1.5	3	20	60	15	PS = 10; Applied Contact sheer liner on the back to protect the mat. The leather was purchased at Hobby Lobby
Magnet - 0.035"	Sticky backed	B	4	2	130	140	25	Magnet side up
Magnetic Vent Cover - 0.22mm	Home Depot	R	3	2	70	120	20	
Magnetic Vent Cover w/ chipboard - 0.66mm	Dollar Tree ("as seen on TV")	R	5	4	70	110	20	Black (magnetic) side down; PS = 20
Magnet - 1 mm - 0.04"	Sticky backed	B	4	3	90	140	20	
Metallic Film, Lightweight, Adhesive-backed - Grafix Brand	Gold, Silver	R	1	1		50	15	Very thin metallic film with card backing; this cuts film but not through the backing
Mylar - 0.005"		R	2.5	1		50	25	PS of 20
Mylar - 0.007"	Clear	R	3	2	75	75	30	Or use BT = 4, P = 1, SD = 90
Mylar - 0.0075 (from KNK USA)	Clear	R	4	2	80	80	30	
Mylar - 0.010" transparent	Clear	R	4.5	3	50	65	25	
Oil Board	Beige	R	2.5	2	90	90	25	Didn't cut through on single pass, cut again, and perfect!
Paper - Copy/Printer HP 20lb	White	R	1	1		18	25	
Paper - Copy/Printer Georgia Pacific 20lb	Red	R	1	1		70	40	

<u>Material</u>	<u>Color(s) Tested</u>	<u>Blade Type</u>	<u>BT</u>	<u>P</u>	<u>SD</u>	<u>CD / ED</u>	<u>CS</u>	<u>Other Comments</u>
Paper - Drawing - 70 lb	Extra white sulfite	R	2.5	1		20	23	
Paper - Patterned - heavy wt	Pads from Michaels	R	2	1		70	25	
Paper - Testors Decal Paper	White	R	1	1		18	25	
Paper - Tracing - Mead Academie	Transparent; 0.003"	R	1	1		35	25	Great substitute for cutting tissue paper
Photo Paper - HP 66lb		R	2	2		20	20	
Plastic File Folders		R	4	1		95	25	Requires an extra sticky mat to stabilize the plastic
Plastic File Folders - Staples 8 mil	Transparent purple	R	4	1		70	25	Requires an extra sticky mat to stabilize the plastic
Plastic Sheets, Clear-Lay Colors Translucent; Grafix Brand	Red, Blue, Green, Yellow	R	2	1		80	30	Package with Stained Glass and Clear-Lay Colors Translucent Plastic Sheets
Posterboard	Orange	B	2	1		95	25	Poster board can vary in thickness by quite a bit. Expect variations in settings and 2 passes will often be advisable.
Posterboard	Orange, red, black	R	1	2	30 - 55	60 - 110	25	Poster board can vary in both thickness and density. Start with conservative settings and move up until a clean cut is attained. May require even higher SD/ED.
Rhinestone- Hartco 425 -w/o the mat	Green	B	3	2	80	80	25	Cut clean; slight lines in sheet, weeded well when pressed to sticky mat.
Rhinestone-Hartco 425-on the mat	Green	B	3	2	50	50	25	Removed sheet before cutting - pressed sticky side to sticky mat. Weeded easily
Rhinestone-Rock It-on the mat	Blue	B	2	2	50	50	25	Removed sheet before cutting - pressed sticky side to sticky mat. Weeded easily
Rhinestone-Rock It-w/o the mat	Blue	B	3	2	60	60	25	Tiny lines in the backing sheet but circles were perfectly round and pattern weeded easily
Rubber-Fiber Gasket - 0.031"		B	4	3	50	160	25	
Shelf Liner: Con-Tact Quick Cover	Clear	R	1	1		10	20	Taped to mat as backing doesn't adhere well.
Shrink Film - Grafix - Sanded		R	4.5	1		50	23	
Shrinky Dink - Frost	Frost	R	2	2	45	55	40	
Stained Glass Plastic Sheets, Grafix .010" thick	Stained Glass	R	2	2	90	90	30	Package with Stained Glass and Clear-Lay Colors Translucent Plastic Sheets
Stamp Rubber - from Silhouette	Clear	B	1	1		15	15	Rubber placed on top of Silhouette stamp mat on top of Force mat

<u>Material</u>	<u>Color(s) Tested</u>	<u>Blade Type</u>	<u>BT</u>	<u>P</u>	<u>SD</u>	<u>CD / ED</u>	<u>CS</u>	<u>Other Comments</u>
Stencil Board		B	3.5	1		60	30	
Stencil Film, Blue - Grafix Brand; Heavyweight	Blue Film	R	3	2	80	80	20	
Sticky Flock - on the mat		B	2	2	40	40	25	Backing sheet off, pressed to mat
Styrene - 0.03" sign blank	Green and Pink	R	3.5	3	120	160	30	This cut through the media and let you then "press and pop" the cut out. It is from Hillman Group and sold at Lowes in sign blanks
Tyvek mailer	White	R	2	1		80	25	
Vellum	Translucent	R	2	1		20	25	
Vellum - .0025" - Helix Technical	Translucent	R	1	1		30	25	100% cotton
Vellum - 0.003" - Worldwind	Grape	R	2	1		20	25	
Vellum - 0.0035	Lt. Yellow	R	2	1		20	30	
Vellum - 0.004"	Teal	R	2	1		25	25	
Vellum - 0.004" - The Paper Company	Translucent	R	2	1		25	25	
Vellum - 0.006"	Translucent	R	3	1		45	25	
Vellum - Core'dinations 0.005"	Translucent	R	2	1		20	30	
Vinyl - 12 gauge 100% PVC	Clear	R	2	2	20	25	25	Purchased from Joann.com
Vinyl - 16 gauge 100% PVC	Clear	R	3	2	15	30	20	Purchased from Joann.com
Vinyl - Cricut (standard)	White, Red, Grey	R	1	1		15	25	
Vinyl - Decal - on the mat	Mactac red	R	1	1		20	25	
Vinyl - Decal - on the mat	Generic - Black	R	2	1		30	25	
Vinyl - Decal - w/o the mat	Mactac red	R	1	1		15	25	
Vinyl - Glitter	Cricut, gold	R	1	1		20	25	
Vinyl - Grafix Cling Vinyl	Clear	R	1	2	10	10	25	PS = 30

<u>Material</u>	<u>Color(s) Tested</u>	<u>Blade Type</u>	<u>BT</u>	<u>P</u>	<u>SD</u>	<u>CD / ED</u>	<u>CS</u>	<u>Other Comments</u>
Vinyl - Intermediate Cal - with the mat	Oracal 651 - see Comments	R	1	1		10	25	Scraps on the KNK Mat. Colors tested: White, Orange, Lt Green, Dark Green, Royal Blue, Black
Vinyl - Intermediate Cal- no mat - direct from the roll	Oracal 651 - see Comments	R	1	1		15	25	Direct from a roll. Colors tested: White, Orange, Lt Green, Dark Green, Royal Blue, Black
Vinyl - Metal Fx	Contact, silver	R	1	1		20	25	
Vinyl - Premium	Oracal 951	R	1	1		20	25	
Vinyl - Printable - on the mat	White	R	1	1		25	25	
Vinyl - Printable - w/o the mat	White	R	1	1		25	25	
Vinyl - Wall - on the mat	Oracal 631 - Green, Blue	R	1	1		15	25	
Vinyl - Wall - on the mat	Oracal 631 - Brown	R	2	1		20	25	
Vinyl - Wall - w/o the mat	Oracal 631 - Brown	R	2	1		18	25	
Vinyl - Wall - w/o the mat	Oracal 631 - Yellow	R	1	1		25	25	Cut intricate design very clean.
Wax Paper		R	0.5	1		30	20	
Wood Veneer - 0.015"	Oak, Walnut	R	1.5	5	50	250	25	PS = 10; Used 5 passes so that a higher speed could be used
[1] © 2015 - 2017 Accugraphic Sales, Inc., All Rights Reserved								

¹ © 2015, 2016, 2017,2018 Accugraphic Sales, Inc., All Rights Reserved

3. SCAL: Installation, Preferences, and Workspace

This chapter begins the Sure Cuts a Lot User Manual and is based on Version 4.069.

3.01 Installing SCAL

3.01.1 Selecting and Downloading the Software

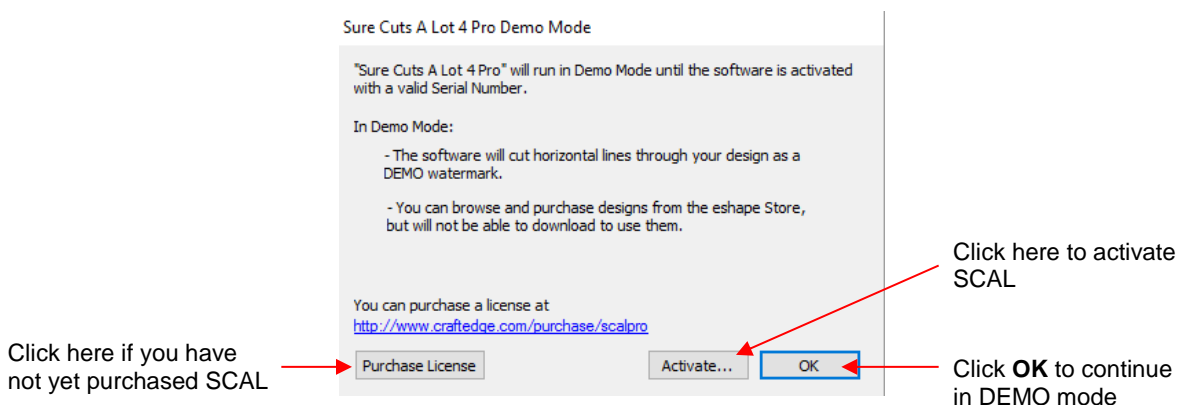
- *Sure Cuts A Lot 4* (SCAL) can be downloaded from the following link. Note that there are four choices - Mac or PC and then regular or PRO:

<http://www.craftedqe.com/download/download.html>

- The additional features in the PRO version are listed below:
 - ◇ Ability to cut longer than 72 inches
 - ◇ Weeding – add weeding boxes and internal lines
 - ◇ Tiling – splitting large designs into sections for cutting
 - ◇ Duplicate cutting – setting up a grid of repeats in the cutting window
 - ◇ Cut by color
 - ◇ End action options – where cutting head moves at the end of a cut
 - ◇ Color layer alignment
 - ◇ 3D extrude
 - ◇ Importing DXF, PLT
- Install the downloaded file and open SCAL. The software will run in DEMO mode until a registration is purchased. This mode will have the following limitations:
 - ◇ When cutting, horizontal lines will be added across the design
 - ◇ Digital shapes from the **eshape Store** cannot be downloaded
 - ◇ Exporting will add a DEMO watermark
- Note that the demo version of SCAL5 will expire after 15 days.

3.01.2 Activating the Software

- To convert the DEMO version into a registered version, click on **Activate** when opening the software and seeing this popup screen:



- **IMPORTANT:** Make sure the version of SCAL you installed matches the registration you purchased. You can verify this by going to **Help>About Sure Cuts a Lot**. If the wrong version is installed, uninstall this current version and download the correct one.
- After clicking on **Activate**, enter your name and the **Serial Number** you received after purchasing SCAL:

- If you do not have an Internet connection on this computer or the automatic activation fails, use the **Activate manually** option in the prior screenshot.

◇ The window will then pop up a **Site Code**:

◇ Next, go to the following link:

<http://www.craftedqe.com/activation/scal/>

- Enter your **Name**, **Serial Number** and the **Site Code**. Then click on **Generate Activation Code**:

- An **Activation Code** will be generated and it can be copied and pasted into the **Activate manually** screen.
- The purchased **Serial Number** can be registered on any two computers you own. If you want to register **SCAL** on a new computer:
 - ◇ Go to **Help>Deactivate** on the computer no longer needing SCAL and confirm you wish to deactivate.

◇ Go to the new computer and activate SCAL.

- If you need to activate your **Serial Number** on both a PC and a Mac, go to **Help>Support>Technical Support** and click on **Contact Support Team**.

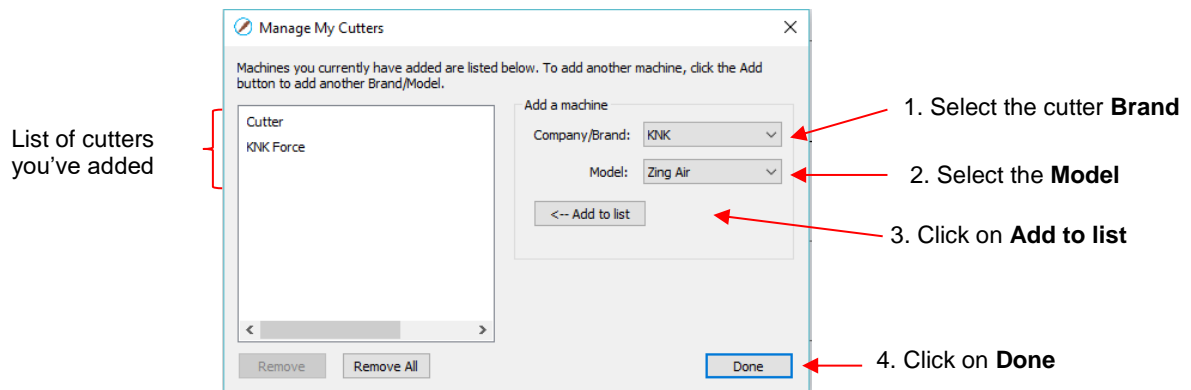
3.01.3 Installing the USB Driver

- If the cutter you are using connects via a USB cable, download and install the correct driver by going to **Help>Install Driver**. If you own a Klic-N-Kut, please go the following link to download the appropriate driver for your model:

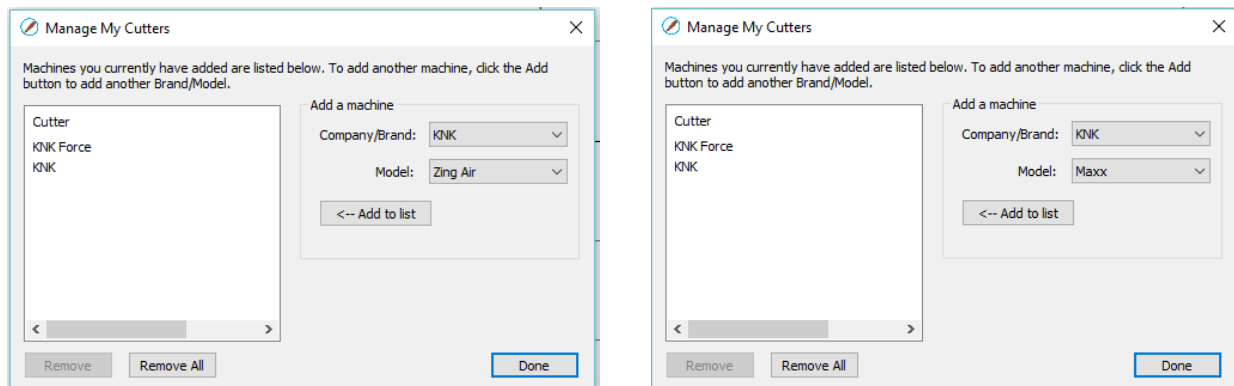
<http://knkusa.com/resources/>

3.01.4 Installing Your Cutter

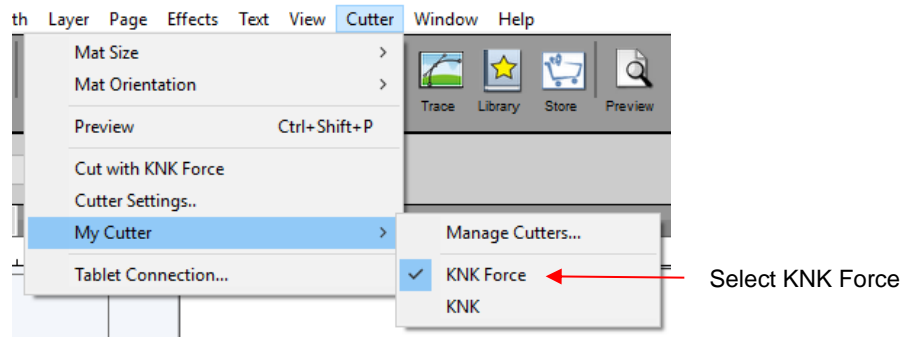
- Go to **Cutter>My Cutter>Manage Cutters** and the following window will open:



- As shown in the prior screenshot, select your cutter **Brand** and **Model** from the drop-down menus. Then click on **Add to list**. The cutter will then be added to the menu on the left side. Add all cutters you plan to use with SCAL.
- Note that with some brands, such as KNK, adding multiple models may not give separate listings. While KNK Force and the KNK Zing Orbit show up separately, selecting both Maxx and Zing Air from the model menu only displays once as KNK. Some models will need to be separately selected later in the **Cut Settings** window.

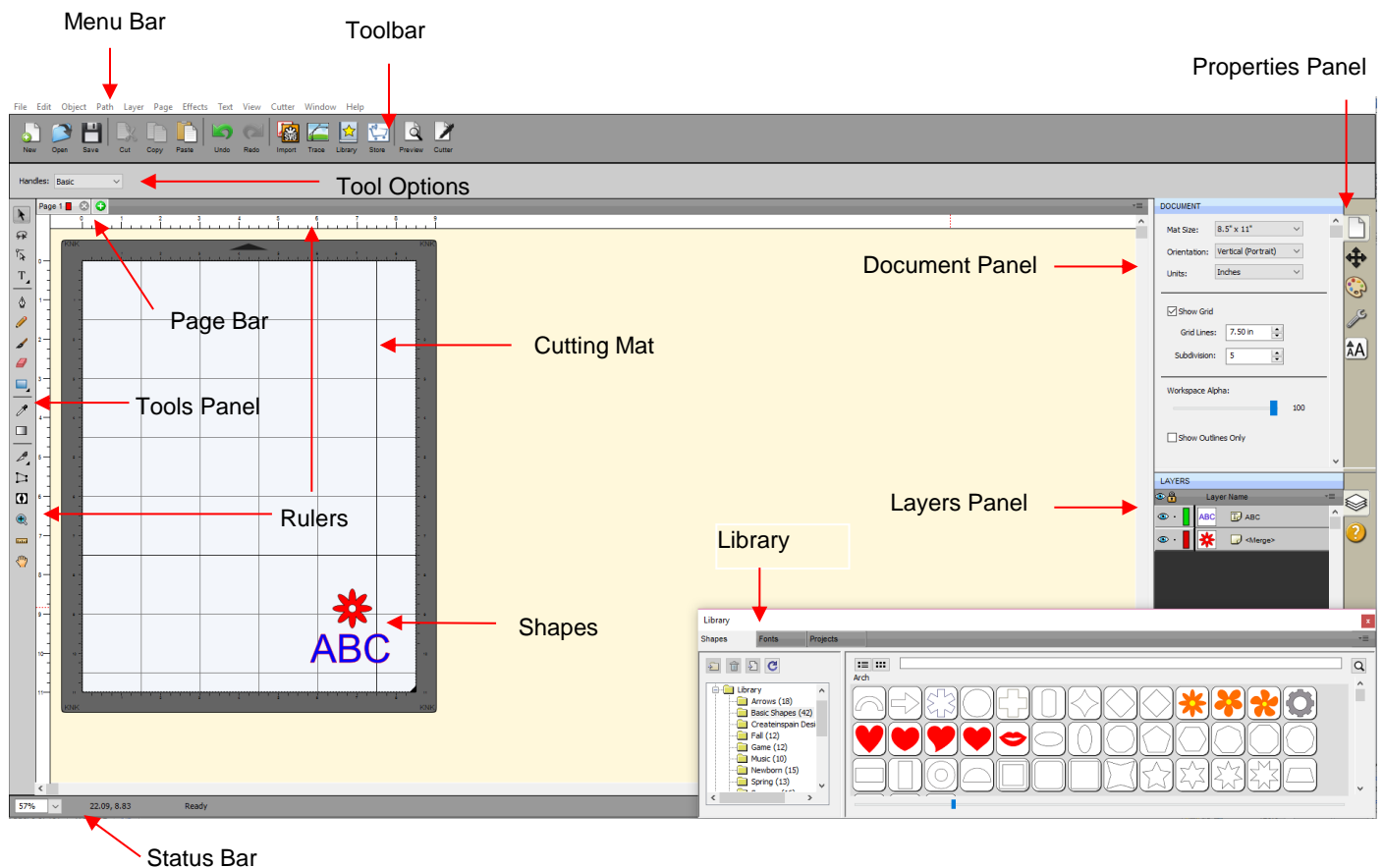


- Click on **Done** to save and close the window. Now, when you are ready to cut, the cutter you use will be selected by going to **Cutter>My Cutter** and picking which cutter you which to use:



3.02 Main SCAL Screen

- Below is a screen shot of the main screen in SCAL identifying various elements. Note the names of the items shown as they will be referenced throughout this user manual:



- Upon opening SCAL, another window will open which accesses SCAL's **eshape Store**. If you elect to no longer have it automatically open, you can also access it by going to **File>eshape Store** or clicking on its



icon on the **Toolbar**. More details are covered in *Section 4.05*.

- Hovering your mouse over most of the screen icons will pop up the icon's name and, in some cases, details about usage.
- In order to better remember where major elements are located, note that the term "bar" is used when components are laid out horizontally (such as the **Toolbar**) and the term "panel" is used when components are laid out vertically (such as the **Tools Panel**).

- Throughout this manual, **Cutting Mat** (capitalized and in bold type) refers to the on-screen simulation of the physical cutting mat, which will be written with lower case, normal type.
- **Shapes** are the objects or images that you will be adding to your projects. They can be created from scratch or imported from other sources, such as the **Library**, your computer, or the **eshape Store**. As you will see throughout sections of this user manual, you have many options and resources available to you.
- This manual also presents information by topics versus location on the screen. If you need to look up all of the functions on one particular element, for example the **Tool Panel**, refer to **Appendix C**.

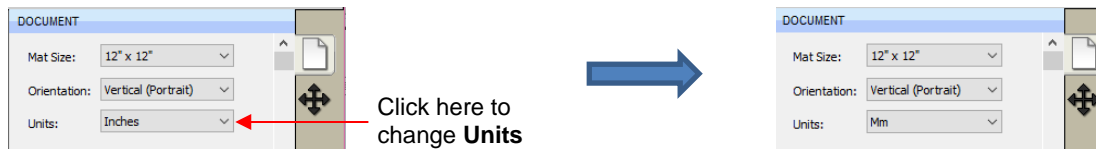
3.03 Language Preference

- Six other languages, besides English, are available. Go to **Help>Language** to change:



3.04 Units Preference

- By default, the unit setting is in inches. To switch to mm or cm, click on the drop-down menu next to **Units** on the **Documents Panel**:



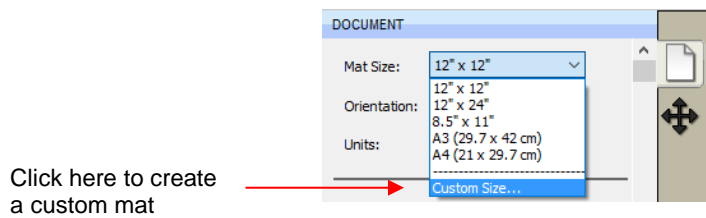
- The units can also be changed in either of the following locations:
 - ◇ Go to **View>Ruler Units**
 - ◇ Right-click on the screen and select **Ruler Units**

3.05 Customizing the Cutting Mat

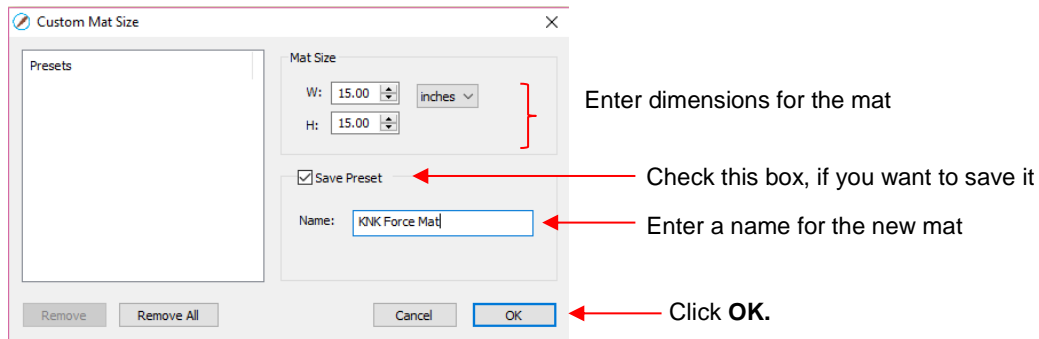
- The **Cutting Mat** serves as a design area for the software as well as to indicate, in some cutting modes, where the shapes will be cut.

3.05.1 Mat Size

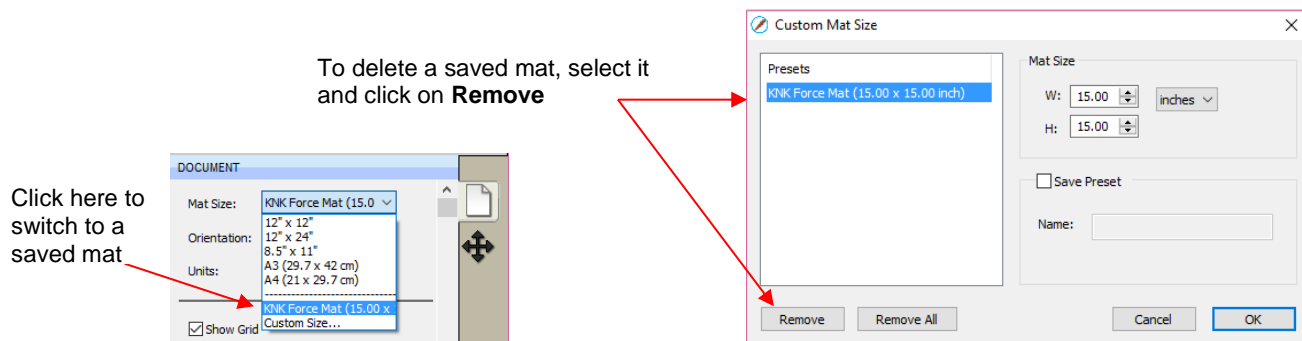
- There are three ways to access the **Cutting Mat** menu:
 - ◇ Click on the drop-down menu next to **Mat Size** on the **Documents Panel**
 - ◇ Right-click on the screen and select **Mat Size**
 - ◇ Go to **Cutter>Mat Size**
- There are five options for setting **Cutting Mat** dimensions under **Mat Size**. There is also the option to create a **Custom Size** for a mat:



- The following window will open where you can enter the dimensions of the mat and provide a name, if you wish to store it for future use:



- A saved mat will now appear at the bottom in the **Mat Size** menu and will be listed under **Presets** when you return to the **Custom Mat Size** window:

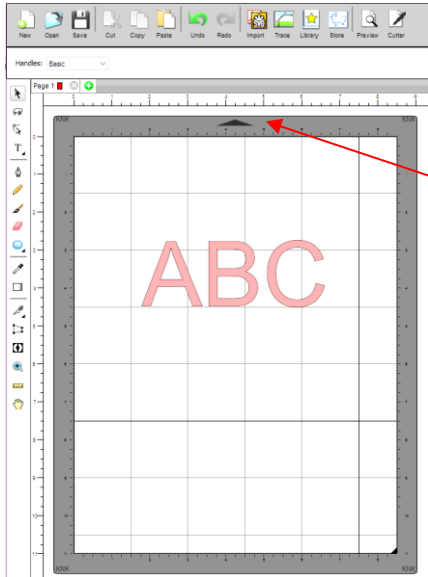


- To remove a custom **Cutting Mat** from the menu, go back to the **Custom Mat Size** window and select the mat under **Presets**. Click on **Remove**.

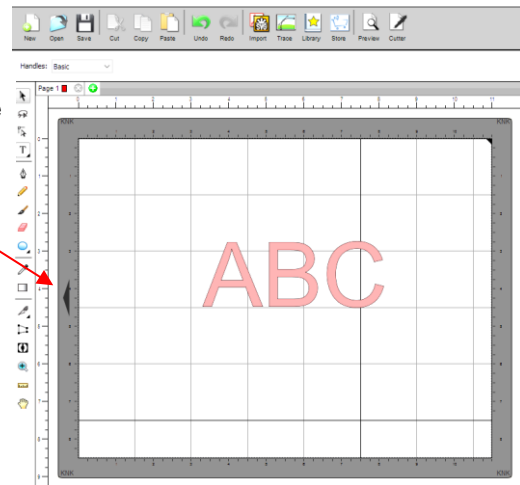
3.05.2 Mat Orientation

- A **Cutting Mat** can appear in either **Portrait** mode or **Landscape** mode with a triangle indicating the direction the mat will be fed into the cutter. To better illustrate this, a letter-size **Cutting Mat** is selected:

Portrait



Landscape

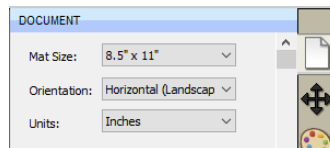


The black triangles show the direction the actual cutting mat should be fed into the cutter

- There are three ways to change the mat orientation:

- On the **Documents Panel** under **Mat Size**:

Select **Portrait** or **Landscape** here

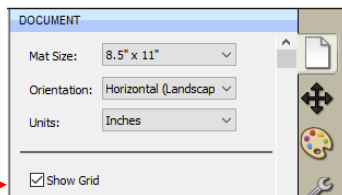


- Right-click on the screen and select **Mat Orientation**
- Go to **Cutter>Mat Orientation**

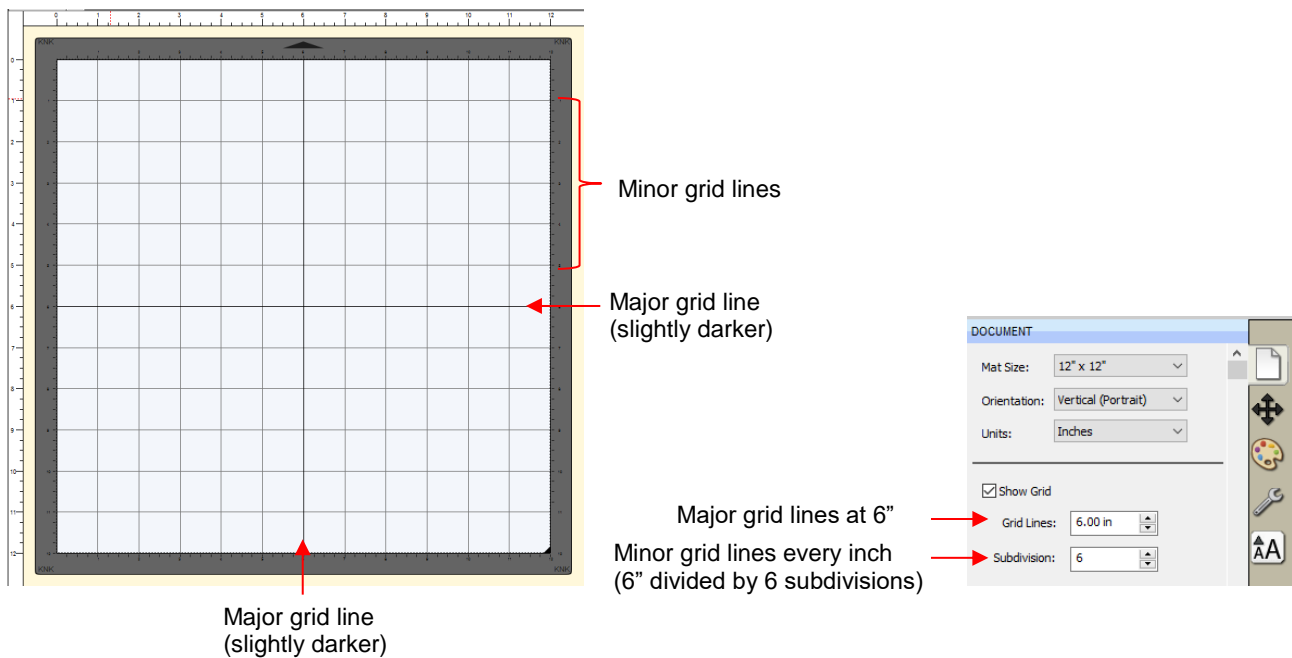
3.05.3 Mat Grid

- The mat grid can be toggled on or off by either of these two ways:
 - Go to **View>Show Grid**
 - Check or uncheck the **Show Grid** box on the **Documents Panel**:

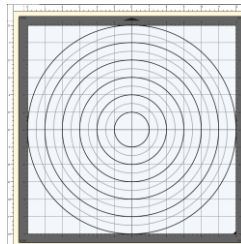
Check or uncheck



- The grid lines can also be customized. For example, with this 12" x 12" mat, major grid lines are set at 6" and then minor grid lines are set at 1" (by specifying 6 **Subdivisions** be used):

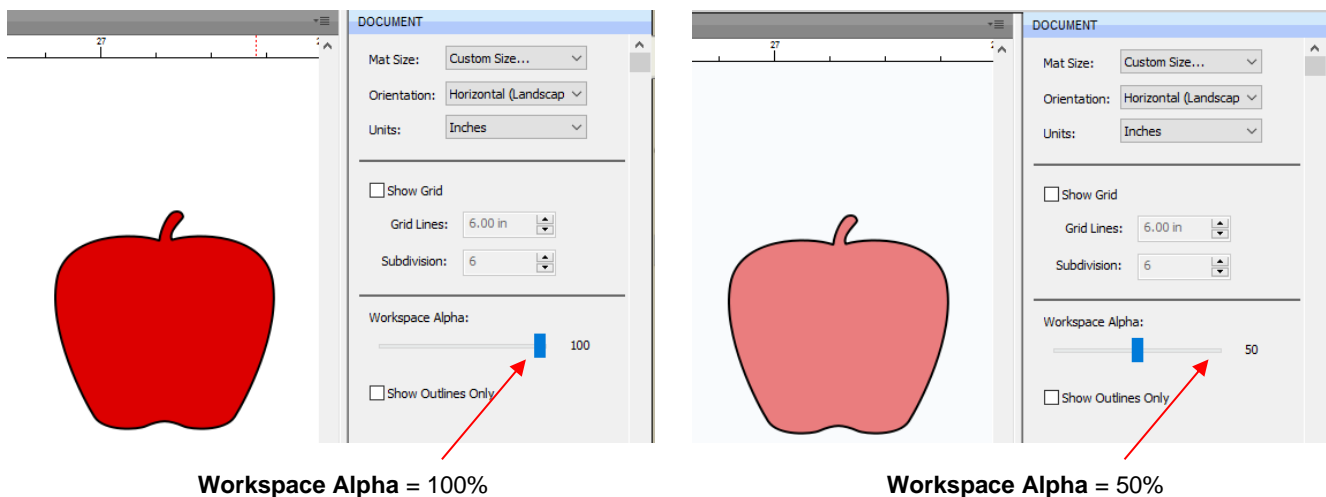


- A final grid option involves circular grid lines which can, as an example, be used for cake design. Go to **View>Show Mat Cake Circles:**



3.05.4 Workspace Alpha

- The **Workspace Alpha** setting is located on the **Document Panel** and affects the opacity of filled shapes on the **Cutting Mat**:



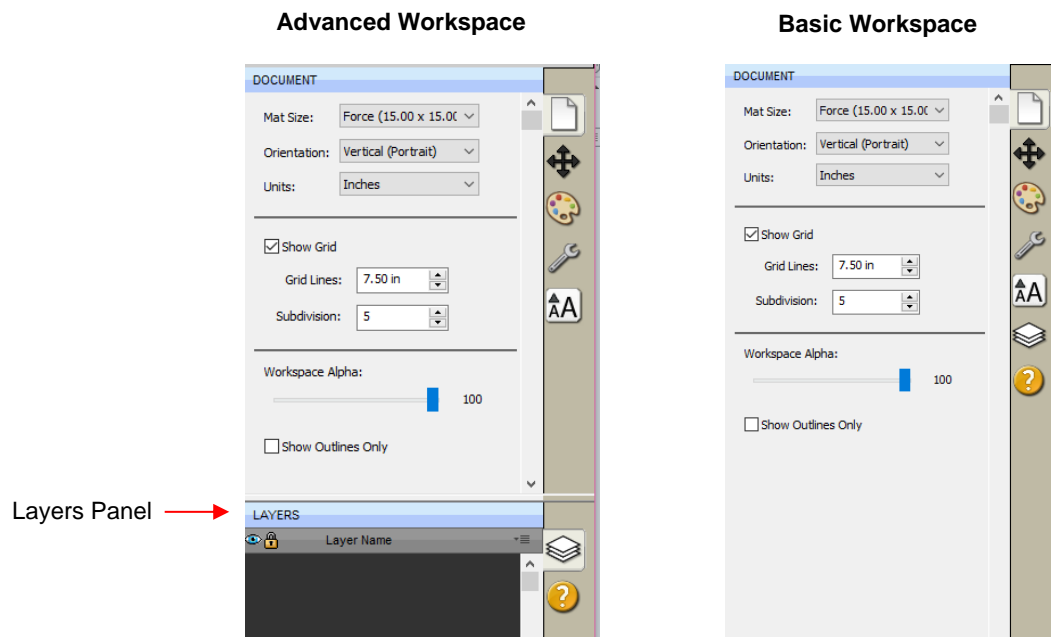
- You can also change the opacity of individual shapes versus all shapes. Refer to *Section 5.13.5*.

3.05.5 Rulers

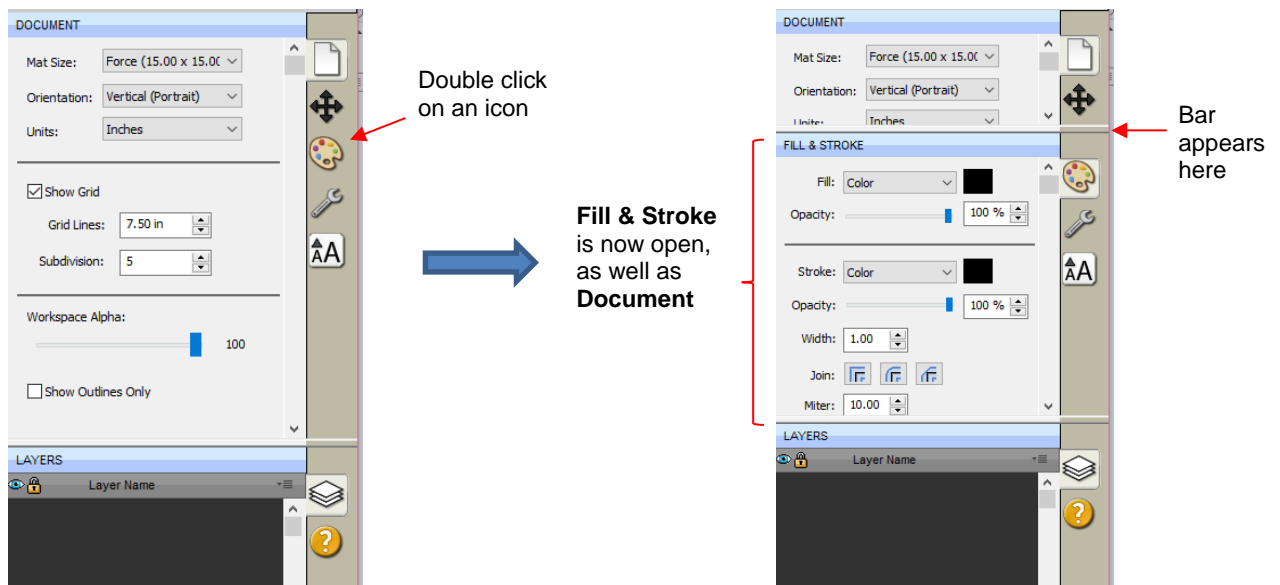
- The **Rulers** can be toggled on and off by right-clicking on the screen and selecting **Show Rulers**. Note that when hiding the rulers, click again on the screen for it to take effect.
- To change the units displayed on the **Rulers**, refer back to *Section 3.04*.

3.06 Customizing the Workspace

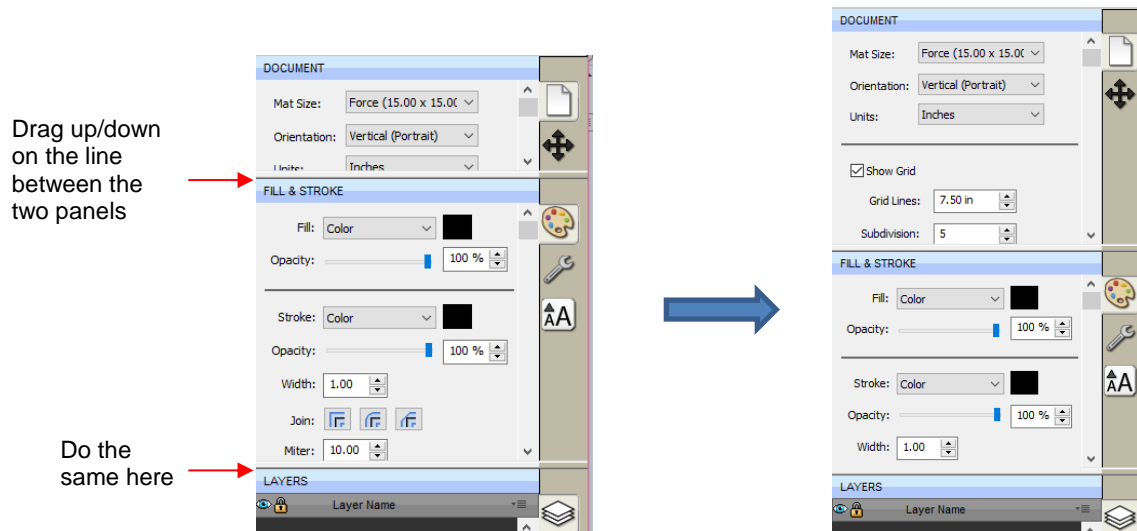
- In SCAL, the **Workspace** refers to the arrangement of windows on the **Properties Panel**. There are two versions already set up: **Basic** and **Advanced**. You can then make changes and name and save others, as desired.
- By default, the **Advanced Workspace** opens. To switch to **Basic**, go to **Window>Workspace>Basic**. The only difference between **Advanced** and **Basic** is the former has the **Layers Panel** open:



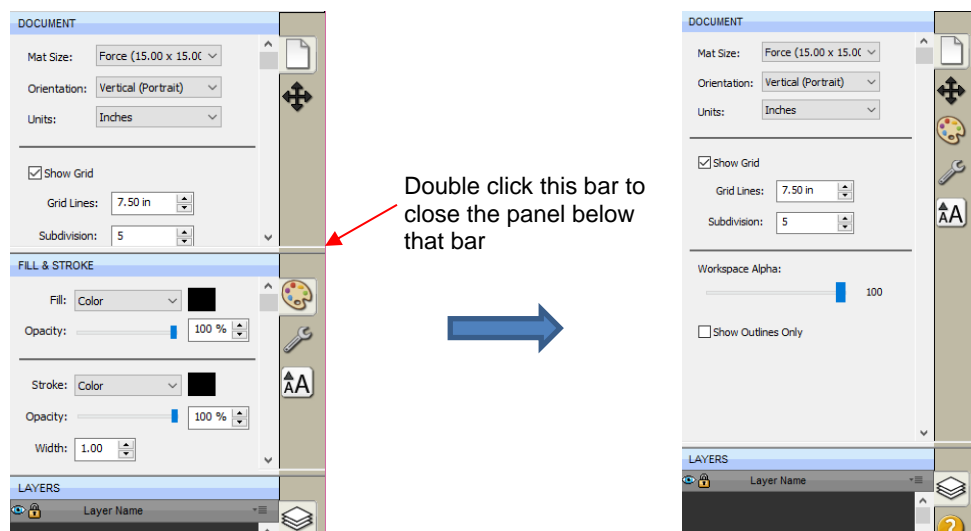
- To switch to other panels, click on the icons along the right side. If there's a particular panel you access often, then you can create a custom workspace. For example, let say you want the **Fill & Stroke Settings** panel to always be open. Double-click that icon and the **Properties Panel** will now have that panel open and separated:



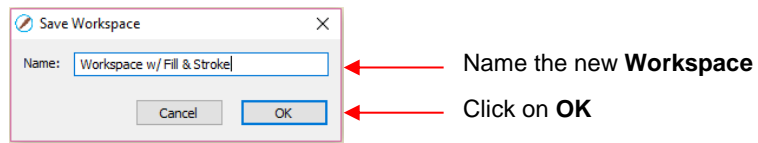
- These separate panels can also be resized by dragging them up or down:



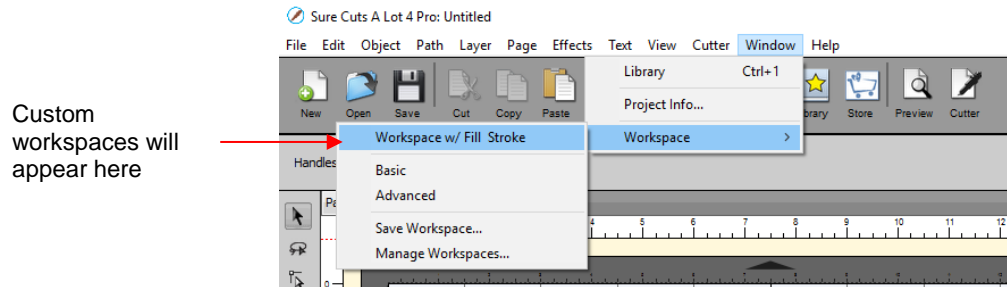
- To close a panel, double-click on the bar on the right side:



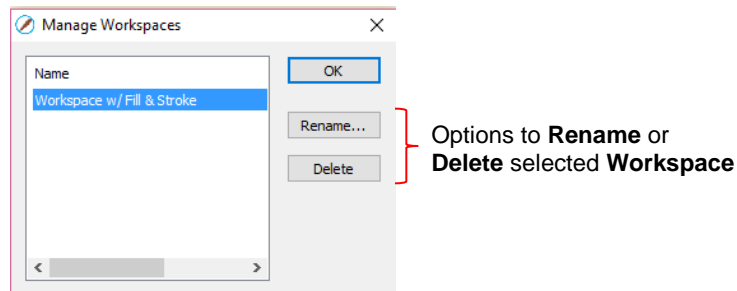
- To save workspace changes, go to **Window>Workspace>Save Workspace**. A window will open and you can name this new configuration:



- When you now go to **Window>Workspace**, the new workspace will appear at the top:



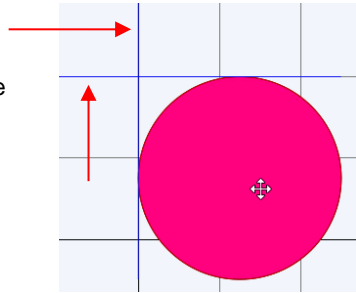
- To rename or delete a custom workspace, go to **Window>Workspace>Manage Workspaces** and a window will open with **Delete** and **Rename** options:



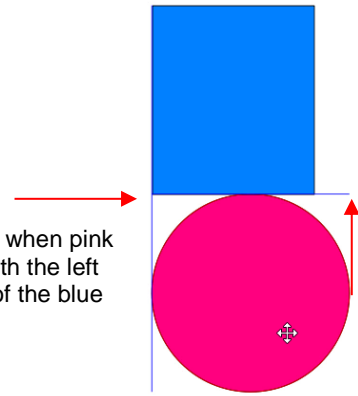
3.07 Snap To

- The **Snap To** option allows you to choose how shapes behave as they are being moved. Being able to snap to other objects or to the grid can help align shapes more easily when designing or editing a project.
- To access the **Snap To** options, go to **View>Snap To** and mark your preferences based on the following options:
 - ◇ **Grid**: selected shape will snap to the grid lines
 - ◇ **Objects (Bounds)**: selected shape will snap to other shapes' boundaries
 - ◇ **Objects (Centers)**: selected shape will snap to other shapes' centers
 - ◇ **Object (Sublayers)**: selected shape will also snap to shapes inside other shapes (child shapes)
- When you first access the **Snap To** menu, you will most likely see the last two grayed out. In order to access those options, make sure **Objects (Bounds)** is checked. Then you will be able to go back to the menu and change any of the options.
- When snapping to the grid, the grid can be showing or hidden.
- When a shape snaps to either the grid or to another shape, blue lines appear indicating the shape is aligned at that point. Here are two examples:

Grid lines turn blue when the pink circle snaps to them



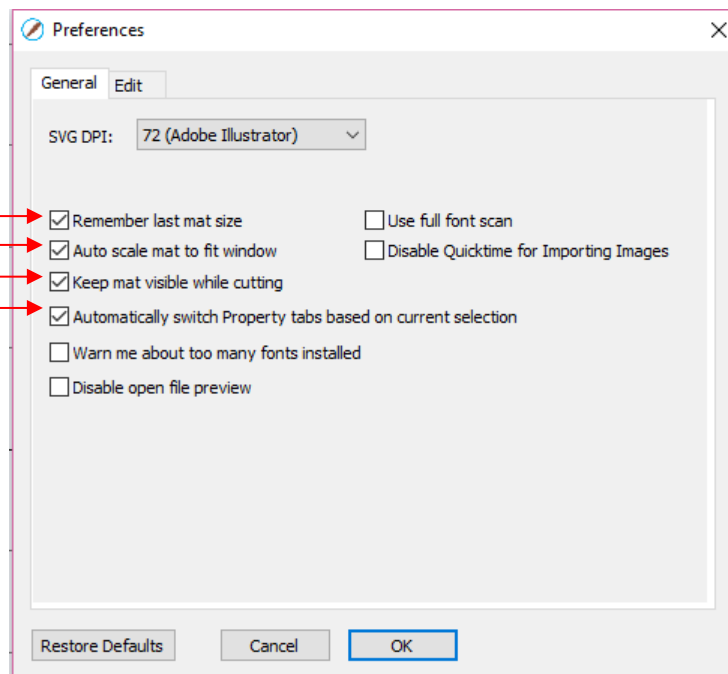
Blue lines appear when pink circle snaps to both the left side and bottom of the blue rectangle



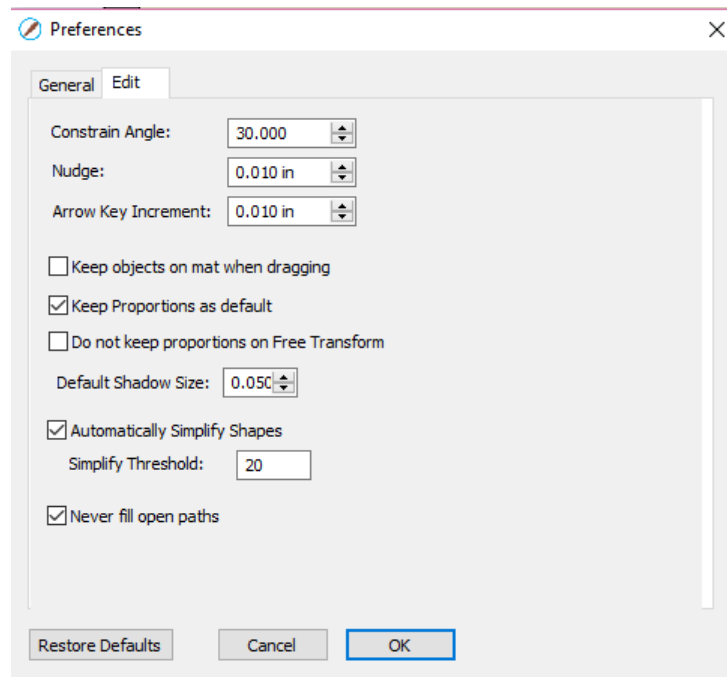
3.08 Other Preferences

- Under **Edit>Preferences** (or, on a Mac, press **Command + ,**), you will find a number of other options, some of which you will probably never need to change. Others will be covered in later sections, as they pertain to the function involved.
- For now, note the following preferences that do relate to the material covered so far. These should be self-explanatory based on their names:

Note these options related to the **Cutting Mat** and the **Properties Panel**



- If you click on the **Edit** tab, more preferences are listed. As with the preferences on the **General** tab, most will be covered in later sections of the manual:

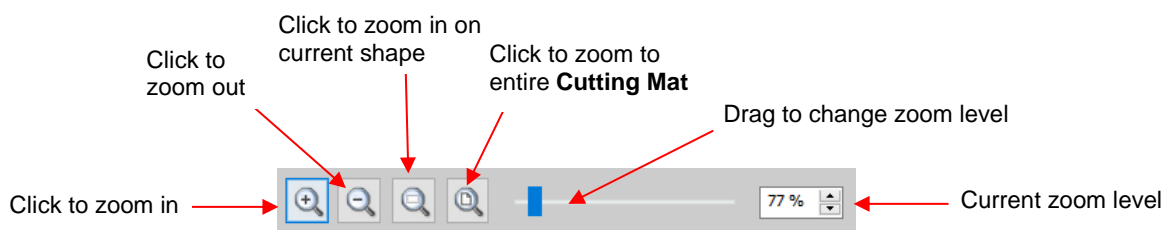


- For more details on these settings, go to *Appendix C4*.


3.09 Zooming and Panning

3.09.1 Zooming


- To zoom in and zoom out, use any of the following methods:
 - ◊ Hold down the **Alt** key (**Option** key on a Mac) while rolling the mouse wheel
 - ◊ Access the **Zoom** menu on the **Status Bar** in the lower left corner of the screen
 - ◊ Go to **View>Zoom In** or **View>Zoom Out**
 - ◊ Use the following shortcut keys/icons:
 - **Ctrl+ ++...** (hold **Ctrl** key (**Command** key on a Mac) and repeatedly click on **+** key): Zoom in
 - **Ctrl+ ---...** (hold **Ctrl** key (**Command** key on a Mac) and repeatedly click on **-** key): Zoom out
 - Right-click on the screen and select **Zoom In** or **Zoom Out**
 - Click the **Zoom in Tool** icon on the **Tools Panel** . Then use the icons in the **Tool Options** at the top:



- Note that while the **Zoom in Tool** is activated, you can also marquee-select an area of the screen to zoom to that location.
- To zoom in on a selected shape or shapes, use one of the following:
 - ◊ Click on the icon while the **Zoom in Tool** is activated (see prior screenshot)


- ◇ Use the shortcut (Mac only) **Option+ Shift+ =** (on a Mac only)
- ◇ Go to **View>Zoom Selection**
- To zoom to the **Cutting Mat**, use one of the following:
 - ◇ Click on the icon  while the **Zoom in Tool** is activated (see prior screenshot)
 - ◇ Use the shortcut **Ctrl+ F** (**Command + F** on a Mac)
 - ◇ Right click on the screen and select **Fit to Window**
 - ◇ Select **Fit to Window** from the **Zoom** menu on the **Status Bar**
- To change the zoom level so that a selected shape will be the same size on the screen as its actual size, go to **View>Actual Size**.

3.09.2 Panning


- To move the workspace up and down, roll the mouse wheel.
- To pan the workspace, use either of these methods:
 - ◇ Press and hold the **Spacebar** while dragging the left mouse button
 - ◇ Click the **Hand tool** icon on the **Tools Panel** . Then drag the left mouse button.

3.10 Undo/Redo

3.10.1 Undo

- As with most Windows applications, there is an **Undo** function to reverse the most recent steps performed. You can use any of the following to execute the **Undo** function:
 - ◇ Click on the **Undo** icon on the upper **Toolbar** 
 - ◇ Press **Ctrl+Z**
 - ◇ Go to **Edit>Undo**

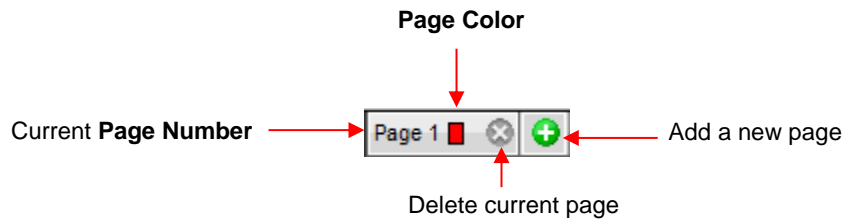
3.10.2 Redo


- As with most applications, there is also a **Redo** function in case you **Undo** too many steps or simply change your mind. You can use any of the following to execute the **Redo** function:
 - ◇ Click on the **Redo** icon on the upper **Toolbar** 
 - ◇ Press **Ctrl+Shift+Z**
 - ◇ Go to **Edit>Redo**

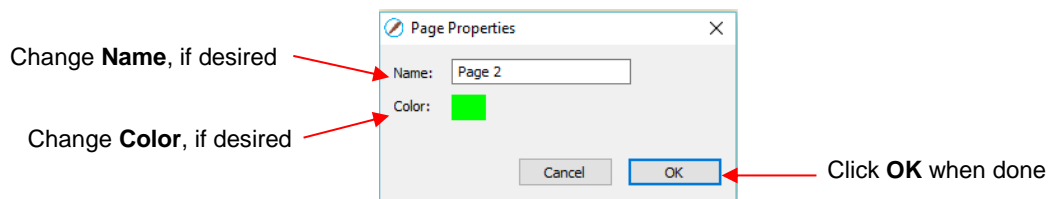
3.11 Pages

- The **Page Bar** allows you to add more pages to your current file/project. This can be convenient for organizing projects with many shapes and or layers.

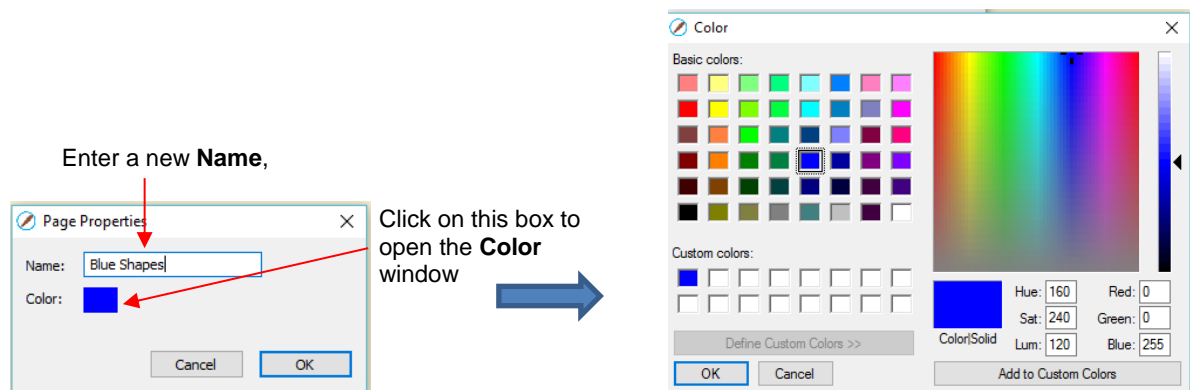
- The **Page Bar** is located just above the top **Ruler** and displays the current page, a color for quickly identifying pages, and icons for adding and deleting pages:



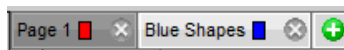
- To add a page, either go to **Page>Add Page** or click the green icon  on the **Page Bar** itself and the following window will open




- Either accept the default **Page** number as the new **Name** or provide your own. The same with color – you can click on the default color provided and select a new color from the **Color** window that opens. For example, you might want to have all of the blue shapes on their own page:




- After clicking on **OK**, the new page appears on the **Page Bar**:



- If you change your mind and want to edit the **Name** and/or **Color**, either go to **Page>Page Properties** or double-click on the **Page Name** and the same **Page Properties** window will open, allowing you to make changes.
- To switch between pages, click on the **Page** name or go to **Page** on the **Menu Bar** and the menu will have all pages listed.
- To delete a page, make sure it's selected and then either go to **Page>Delete Page** or click on the **Delete Page** icon . A window will open asking for confirmation.


3.12 Help Resources

- The following steps within SCAL will take you to help resources (note that some of these will require an Internet connection):
 - ◇ Go to **Help>Help** for access to a user guide
 - ◇ Click on the **Help Panel** icon  on the **Properties Panel** to open the user guide to a section based on the currently selected tool
 - ◇ Go to **Help>Forums** to access the SCAL user forum
 - ◇ Go to **Help>Online Video Tutorials** to access a page with links to both videos and written tutorials
 - ◇ Go to **Help>Support>Technical Support** for the following:
 - Contact the SCAL team
 - Retrieve your serial code
 - Download latest updates
 - Access the forum
 - Access tutorials
- Other online support groups for SCAL include:
 - ◇ [SCAL Facebook Page](#)
 - ◇ [MTC and SCAL Facebook Group](#)
 - ◇ [SCAL Users Yahoo Group](#)
- An online training program with over 4 hours of videos is available at this link: [Sure Cuts a Lot 4 Beginner Class](#).


4. SCAL: Handling Files and Organizing Layers

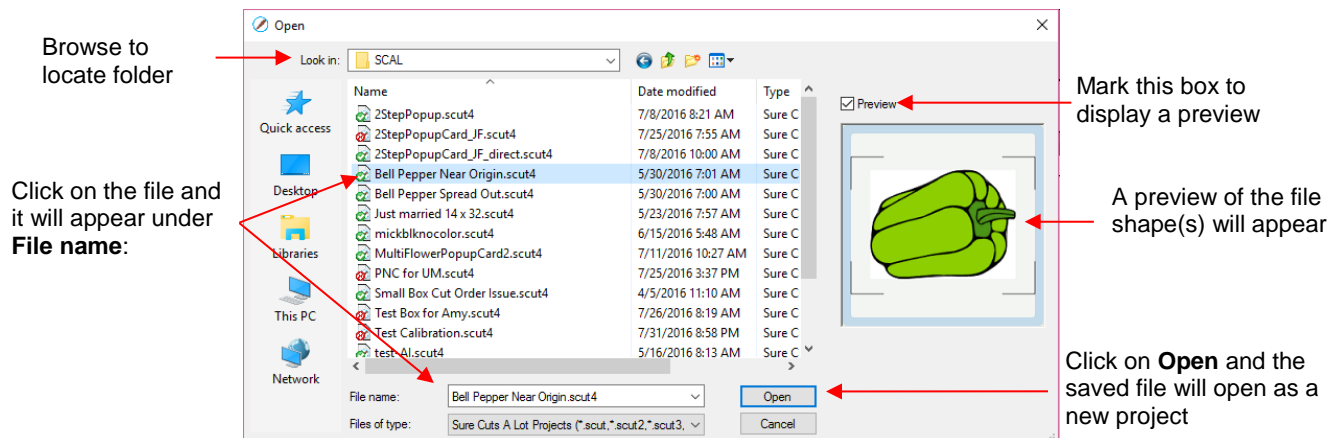
4.01 Opening Files

4.01.1 Opening a New File/Project

- When you launch SCAL, a new blank **Cutting Mat** will appear with a new blank project opened.
- To open a new file (start a new project), any of the following can be used:
 - ◇ Click on the **New Project** icon on the upper **Toolbar** 
 - ◇ Press **Ctrl+N**
 - ◇ Go to **File>New Project**
- Note that if any changes have been made to the existing project, a popup window will ask if you wish to save the changes that have been made. Refer to *Section 4.02*.
- If you wish to have more than one file open, you will need to open additional instances of SCAL.

4.01.2 Opening an Existing SCUT File

- An existing SCUTx file (where x is blank, 2, 3, or 4 indicating which SCAL version created it) can be opened in SCAL4 using any of the following:
 - ◇ Click on the **Open Project** icon on the upper **Toolbar** 
 - ◇ Press **Ctrl+O**
 - ◇ Go to **File>Open Project**
 - ◇ Go to **File>Recent Projects**, if the file is one of the last five you had open in SCAL
 - ◇ Double-click a SCUTx file in Windows Explorer or attached to an email
 - ◇ Drag and drop a SCUTx file onto the main screen of SCAL
 - ◇ Import from the **Library** (refer to *Section 4.03.3*)
- In the first three options above, a window will open where you can browse to locate the file you wish to open:



- In the case of opening a file from Windows Explorer, an email, or using a drag and drop method, the file will automatically open.
- Note that other file formats, besides SCUT can be imported into SCAL4. Refer to *Section 4.06*.

4.02 Saving SCAL Files

- A file can be saved in SCUT4 format using any of the following:

- ◇ Click on the **Save Project** icon on the upper **Toolbar**
- ◇ Press **Ctrl+S** (for save) or **Ctrl+Shift+S** (for save as)
- ◇ Go to **File>Save Project** or **File>Save Project As**



- If you've made changes and wish to save under a different file name, choose **File>Save As**. Name the file, choose a location, and click on **Save**.
- You can include notes about your file by going to **Window>Project Info**. This can be handy for your own future reference or for others using your files. Refer to *Section 9.02*.
- You can also export files in a host of other formats. Refer to *Section 4.08*.

4.03 Using the Library

- The SCAL **Library** provides a number of useful functions:

- ◇ It contains a collection of over 300 pre-installed shapes, organized into 16 subfolders
- ◇ It displays complete character sets for all fonts currently installed
- ◇ You can organize your own shapes and projects into separate folders and view thumbnails for selecting
- ◇ You can assign commonly-used shapes and projects to a **Favorites** folder for quicker access
- ◇ It provides access to designs and projects downloaded from the **eshape Store**

- The **Library** automatically opens every time you open SCAL. If you've closed it, the **Library** can be reopened by using one of the following:

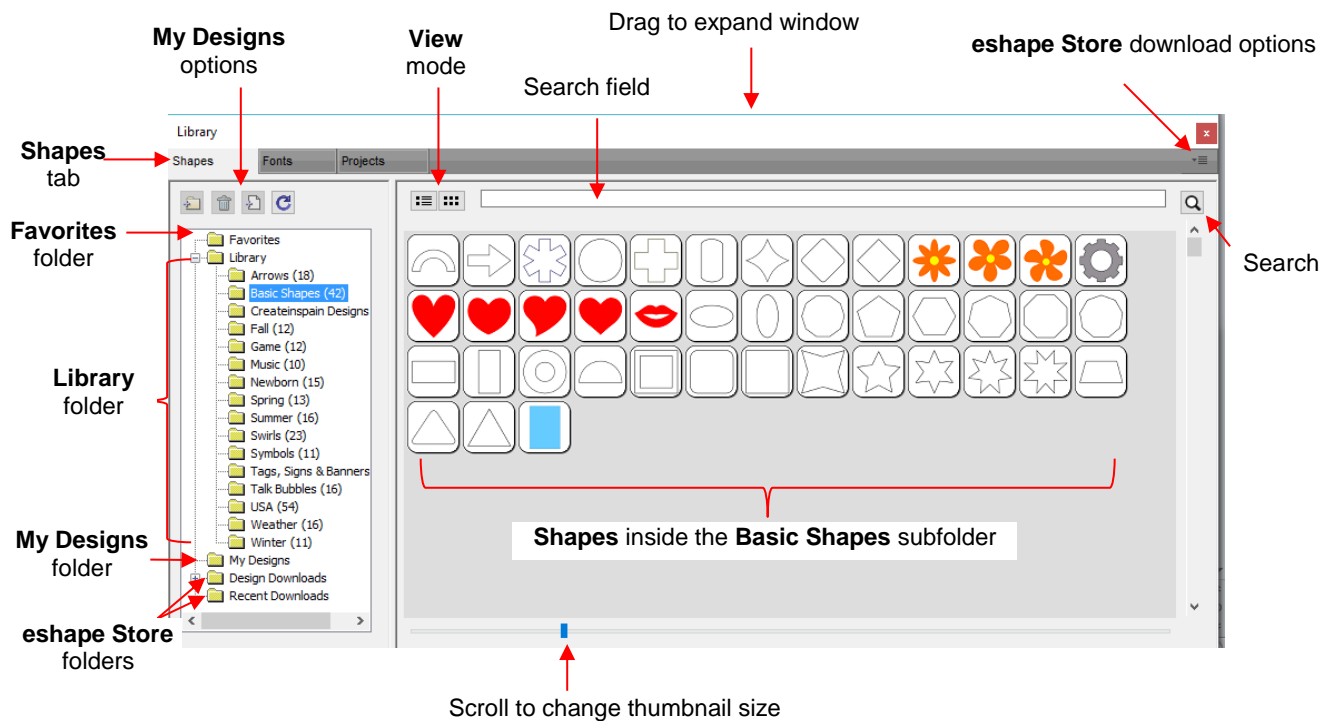
- ◇ Click on Library icon on the upper **Toolbar**
- ◇ Press **Ctrl+1**
- ◇ Go to **Window>Library**



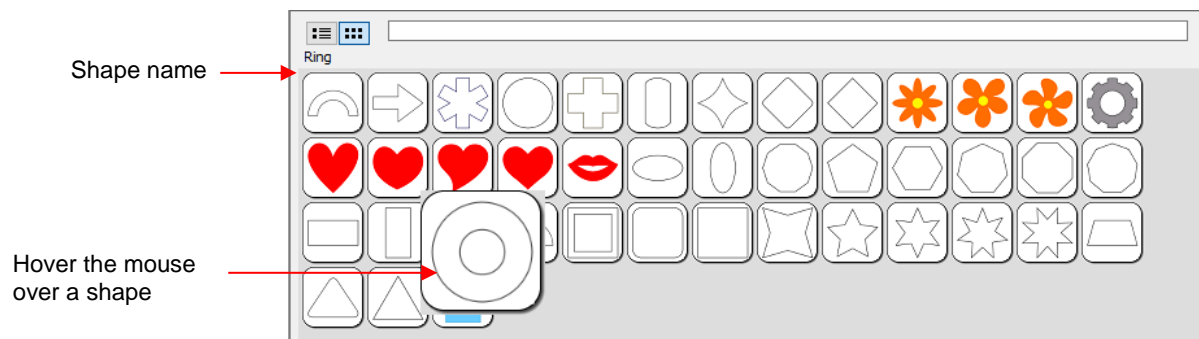
- The **Library** consists of three tabs: **Shapes**, **Fonts**, and **Projects**. Each is covered in the following subsections:

4.03.1 Shapes Tab

- When you first open the **Library**, the **Shapes** tab will be selected.
- In order to see all of the contents under this tab, drag the top of the window upwards until you see the following screenshot. Note the various parts of this window:

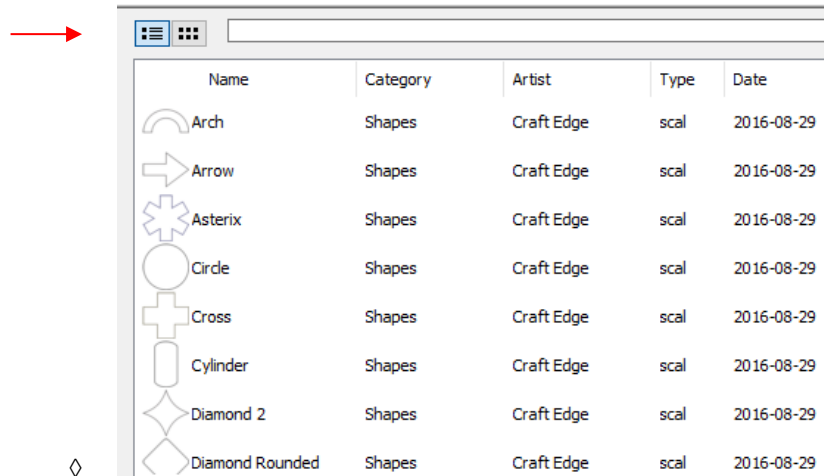


- On the left side you will see the **Library** folder which contains the included 300 shapes. The number in parentheses, after each subfolder, indicates how many shapes are assigned to that subfolder. **Basic Shapes**, as an example, has 42 assigned to it.
- Because the **Basic Shapes** subfolder is currently selected, thumbnails for all shapes contained in that subfolder are shown in the larger area on the right side. To add one of these shapes to the **Cutting Mat** either:
 - ◇ Click on the shape and it will be placed in a certain location on the **Cutting Mat**
 - ◇ Drag the shape to a desired location on the **Cutting Mat**
- To change subfolders or folders, click on the folder name on the left side and its contents will then appear on the right.
- A scroll bar at the bottom of the **Library** window can be used to make the thumbnails larger or smaller.
- As you hover over a shape, its thumbnail will get larger and its name will appear near the top:



- You can toggle between the thumbnail view and a list view using these icons at the top   :

Click here to
change to list view



- A search function enables you to see all of the shapes with a particular word in the name. For example, enter the word leaf and click on the search button:

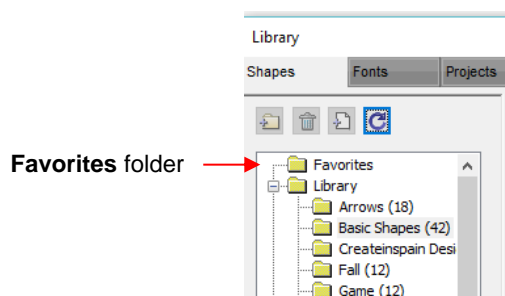
1. Enter search word

2. Click here or press **Enter** key

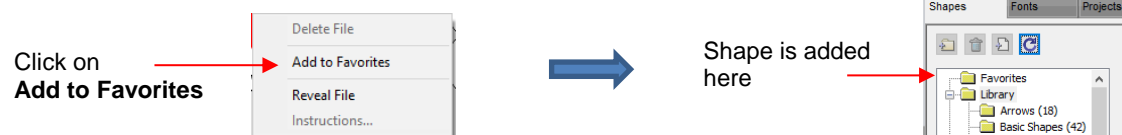
3. All shapes with the
search word in their
name will appear



- **Favorites:** Above the **Library** folder is a folder called **Favorites**:



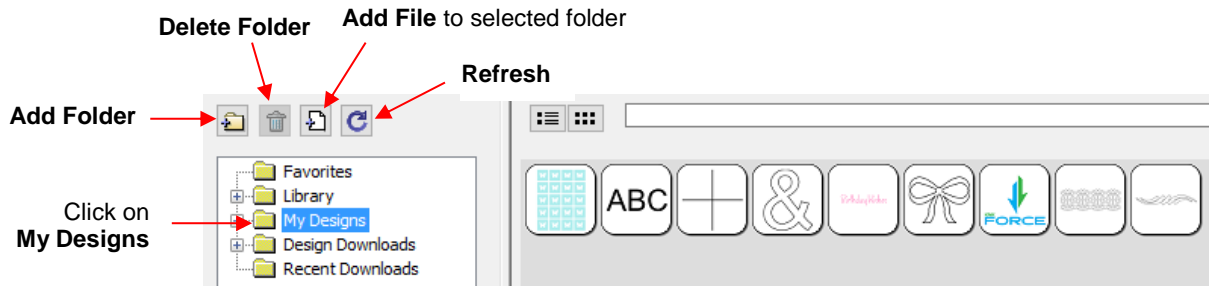
- ◇ The **Favorites** folder is for storing the shapes you access often. Locate the shape you want to add, right-click, and select **Add to Favorites** from the popup menu.




- ◇ This popup menu also has these options:
 - **Delete File** (only active in the **My Designs** folder)
 - **Reveal File** – opens the location on your computer where file is stored
 - **Instructions** – some files from the **eshape Store** may include instructions for the user

- **My Designs:** This folder is for storing your own SVG files for easy access.

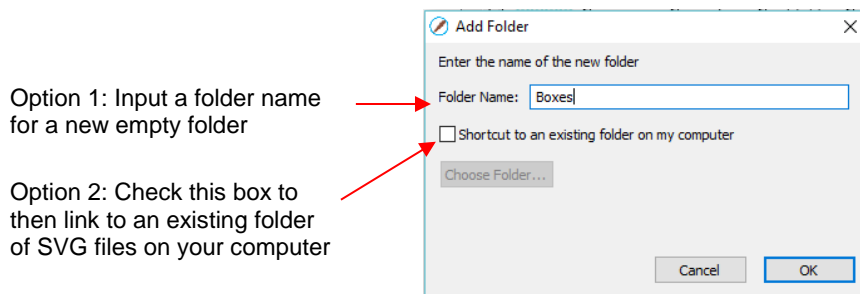
- ◇ Once you click on **My Designs**, the icons above the folder menu will become active:



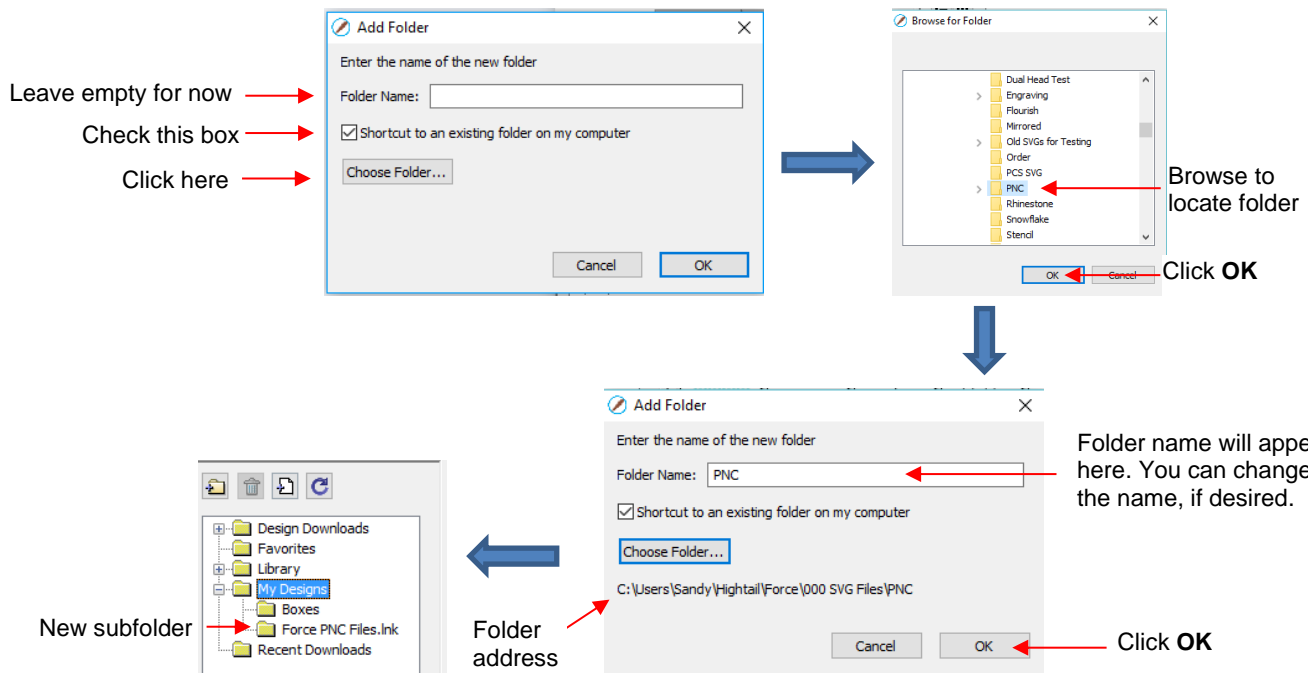
- ◇ Add subfolders: The shapes in the above screenshot have been added to **My Designs** but not into subfolders. To create subfolders for additional organizing:

- Click on the **Add Folder** icon 
- Right-click on **My Designs** and select **Add Folder** from the popup menu




- ◇ After choosing to add a folder, the following window opens where you have two options:

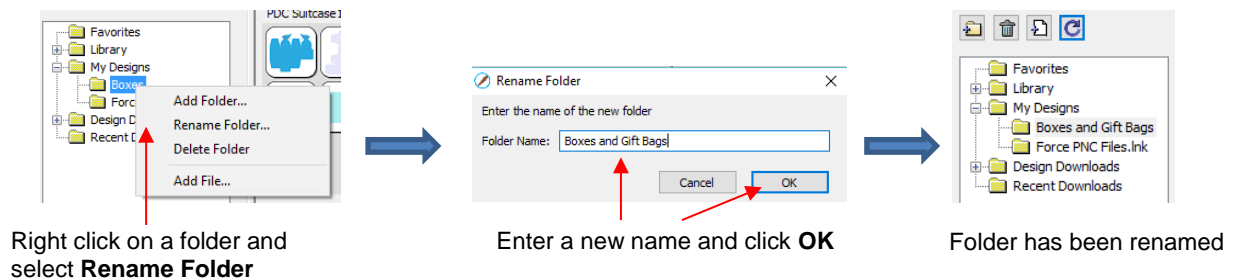



- ◇ If you select Option 2, the **Choose Folder** button will activate and clicking it will bring up this window where you can browse your computer to locate an existing folder of SVG files:



- ◇ Note that the **Folder Name** was changed to *Force PNC Files* before clicking on **OK**. The name will have a .lnk extension added indicating that it is linked to another folder on your computer.

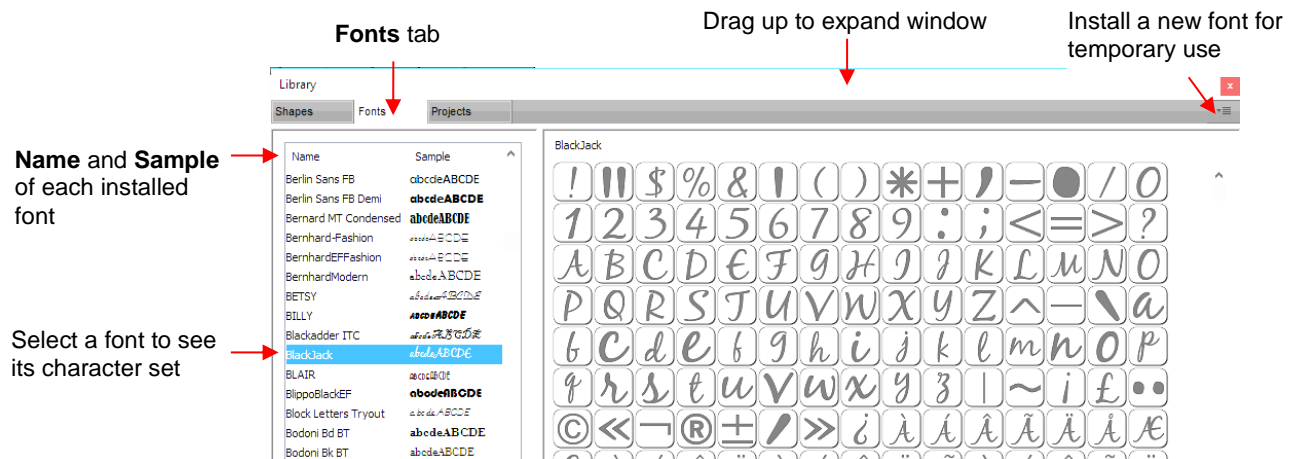
- ◇ To add files to a folder inside **My Designs**:
 - Select the folder and do either of the following:
 - Click on the **Add File** icon 
 - Right-click and select **Add File** from the popup menu
 - A window will open where you can then browse to find the SVG file to be added. You also have the option of selecting multiple files at once to import into that folder.
- ◇ To delete a file from a folder, right-click and select **Delete File** from the popup menu.
 - **IMPORTANT:** Note that deleting the file could also delete it from your computer unless it has been backed up elsewhere.
 - After deleting files, you will need to click on the **Refresh** icon  to update the thumbnail images.
- ◇ To delete a folder, select it and then do one of the following:
 - Click on the **Delete Folder** icon 
 - Right-click and select **Delete Folder** from the popup menu
- ◇ To rename a folder, right-click and select **Rename Folder** from the popup menu.




- **Design Downloads** and **Recent Downloads**: These two folders, along with the menu icon at the top right  are part of the **eshape Store** functions. These will be covered in *Section 4.05.1*.



4.03.2 Fonts Tab

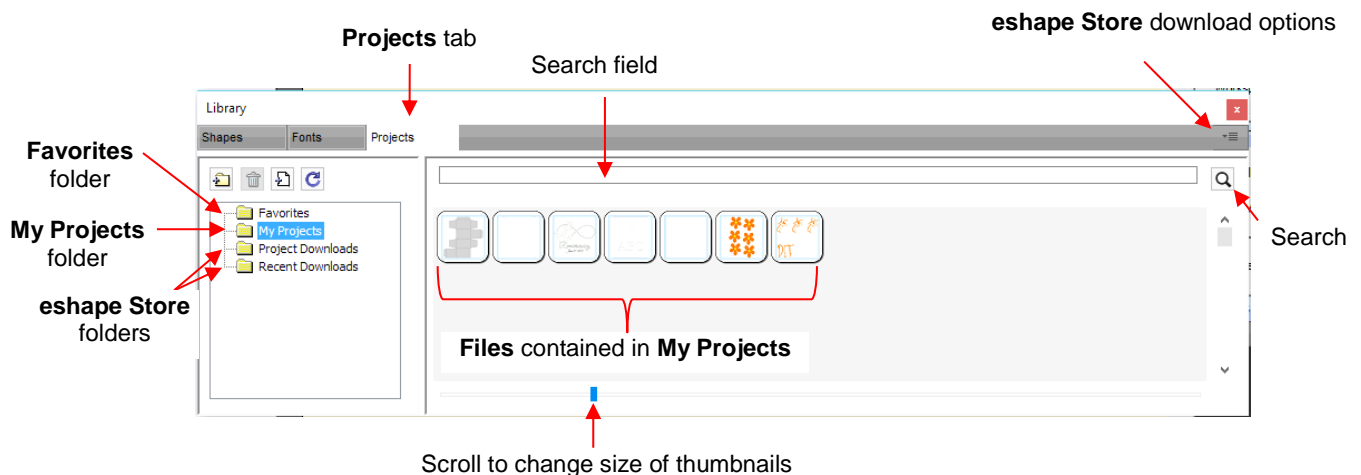
- The **Fonts** tab lists all of the currently installed fonts on your computer. Selecting any font in the list will show the entire character set on the right side of the window. It will also then make it the default font that will be used when adding text with any of the methods available in SCAL. Refer to *Section 6.03*.



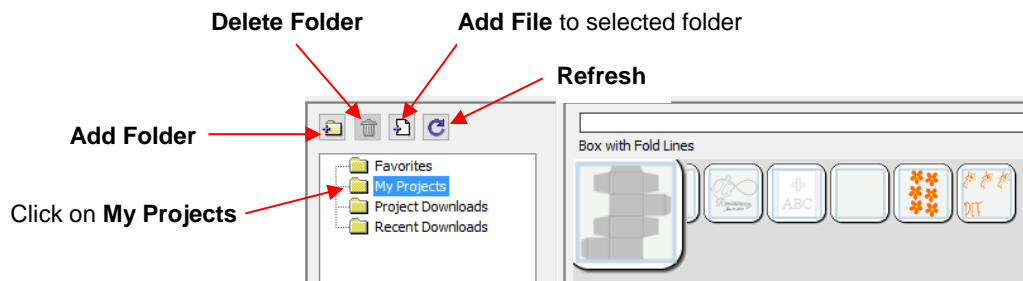
- Scroll the bar at the bottom to change the size of the lettering. To add a character to the **Cutting Mat**, left-click on it. While it is far quicker to type out text using the **Type** tool (again, refer to *Section 6.03*), this window is the best way to add special characters within a font or when using dingbat fonts.
- The menu icon  in the upper right corner can be used to temporarily add a font that's not installed on your computer. Click on it and then browse to the folder containing the font you wish to add. Again, refer to *Section 6.03* regarding temporary font usage.

4.03.3 Projects Tab


- The **Projects** tab is similar to the **Shapes** tab. Instead of .SVG files, however, it helps you organize and access your .SCUT files, also referred to as projects.
- As with the **Shapes** tab, there are no default categories or pre-added files. However, you will notice these other similar features:
 - ◇ **Favorites** folder – select any project, right-click, and select **Add to Favorites** from the popup menu
 - ◇ **My Projects** folder – virtually identical to **My Designs** folder (more information follows)
 - ◇ **Search** field and search icon  – for locating files with a particular word in the file name
 - ◇ **Project Downloads** and **Recent Downloads** folders and top right icon  : these pertain to **eshape Store**. Refer to *Section 4.05*.
 - ◇ Scroll bar to change the size of the thumbnails.
 - ◇ Hover over a thumbnail and it will get larger. The project name will appear below the **Search** field.



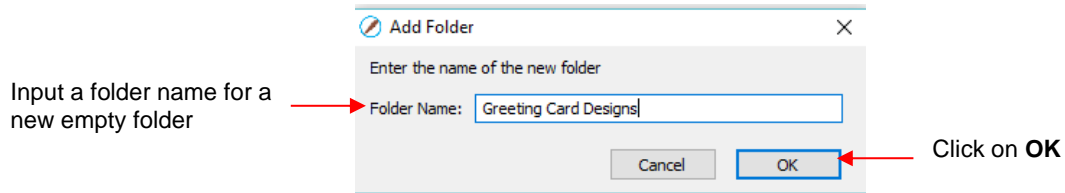
- **My Projects**: This is the main folder where you can organize your own projects for easy access.
 - ◇ Once you click on **My Projects**, the icons above the folder menu will become active:




- ◇ Add subfolders: The projects in the above screenshot have been added to **My Projects** but are not in subfolders. To create subfolders for additional organizing:

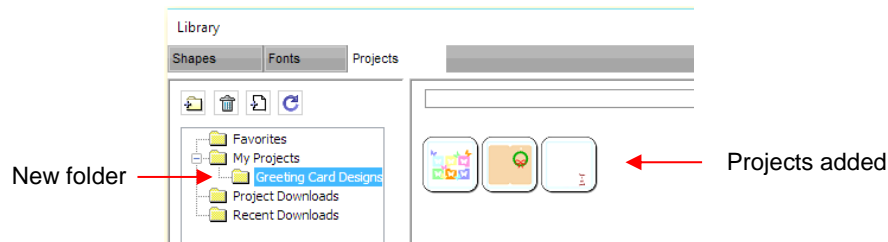
- Click on the **Add Folder** icon 
- Right-click on **My Projects** and select **Add Folder** from the popup menu



- ◇ After choosing to add a folder, the following window opens and you can name this folder:



- ◇ To add files to a folder inside **My Projects**:

- Select the folder and do either of the following:
 - Click on the **Add File** icon 
 - Right-click and select **Add File** from the popup menu
- A window will open where you can then browse to find the SCUT file to be added. You also have the option of selecting multiple files at once to import into that folder.
- After adding the files, the thumbnails for those projects will appear when the folder is selected:



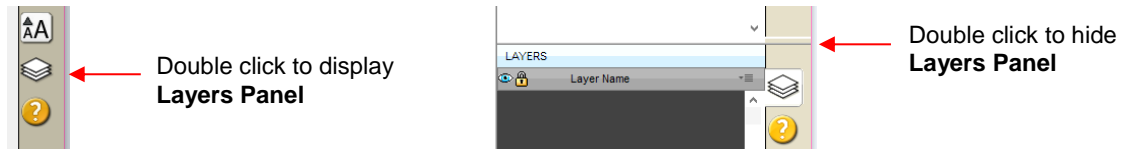
- ◇ To delete a file from a folder, right-click and select **Delete File** from the popup menu.
 - **IMPORTANT**: Note that deleting the file could also delete it from your computer unless it has been backed up elsewhere.
 - After deleting files, you will need to click on the **Refresh** icon  to update the thumbnail images.
- ◇ To delete a folder, select it and then do one of the following:
 - Click on the **Delete Folder** icon 
 - Right-click and select **Delete Folder** from the popup menu
- ◇ To rename a folder, right-click and select **Rename Folder** from the popup menu.

4.04 Layers Panel

Because of the importance of the **Layers Panel** in successfully using SCAL, it is being presented before the other file handling sections.

4.04.1 Introduction to the Layers Panel

- The **Layers Panel** is used for the following:
 - ◇ Assigning or grouping shapes into separate layers to better organize a project
 - ◇ More easily applying changes to a group of shapes
 - ◇ Selecting one shape or a layer of shapes on the screen
 - ◇ Controlling what is sent to the cutter or printer
- The **Layers Panel** can be displayed by double-clicking its icon and hidden by double-clicking the small bar just above its icon:



Note that single clicking the icon will hide other panels, allowing the **Layers Panel** to fill the right column.

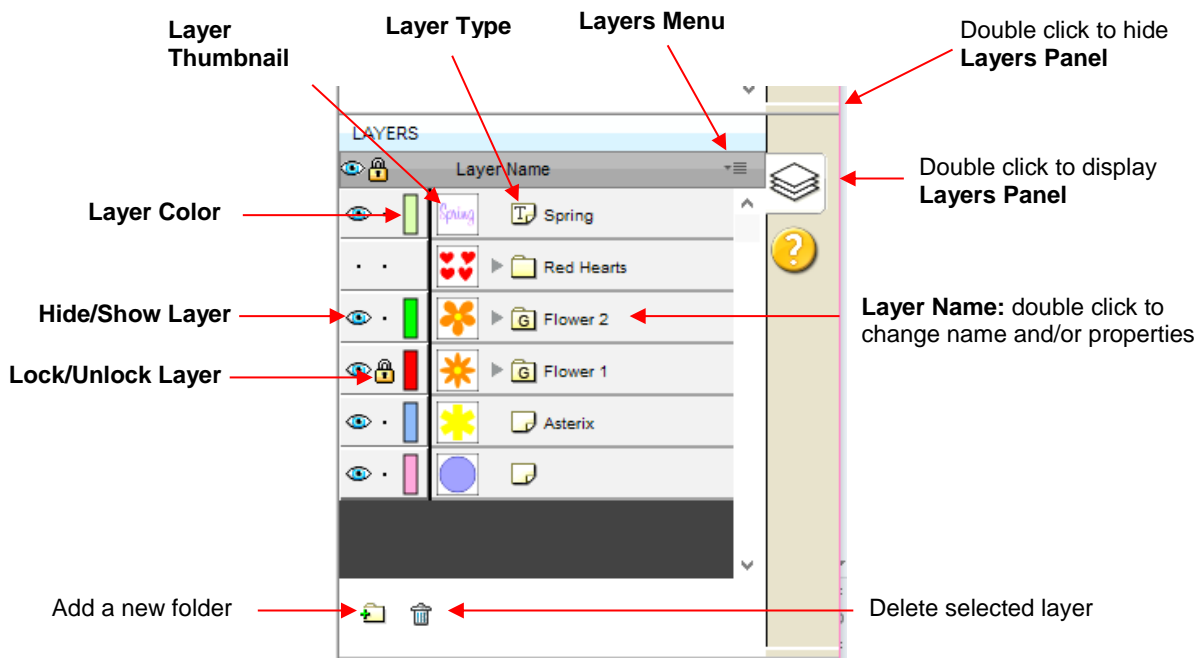
- You do not have to worry about adding shapes to the **Layers Panel**. They will automatically be assigned to new layers as you add them. You will want to learn how to move shapes to new layers or combine shapes into the same layer, depending on the circumstances. This is covered in *Section 4.04.3*.
- Here are a few examples of when shapes need to be on different layers:
 - ◇ Paper piecing or shadowed shape projects where some shapes will be cut from one color and other shapes from another color (or a number of other colors).
 - ◇ Fold-up projects (boxes, envelopes, popup cards, etc.) where the fold lines will need to have different settings and/or different tools used than your cut lines.
 - ◇ Rhinestone template projects where you need to cut two different templates, such as a fill that will be done in one color of rhinestones and an outline in another color.
- Other benefits of assigning shapes to specific layers include:
 - ◇ Ability to select, with one click of the mouse, all shapes assigned to a layer
 - ◇ Ability to hide or lock layers so that the shapes on that layer are not inadvertently selected, moved, resized, etc.
 - ◇ Ability to change the color, line style, and tool choice on all of the shapes assigned to a particular layer.

4.04.2 Parts of the Layers Panel

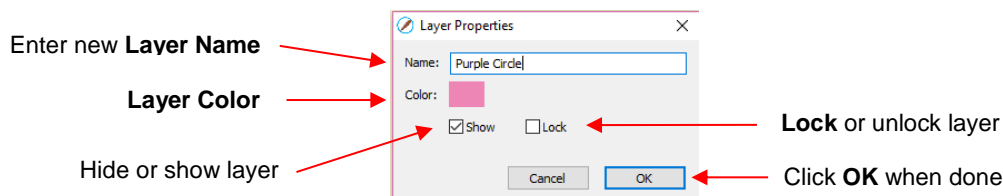
- The next few sections will use the following simple project to illustrate the **Layers Panel**:



- The following screenshot identifies the various icons on the **Layers Panel**:



- Layer Thumbnail:** Each layer has a thumbnail showing the shapes assigned to that layer. Click on that thumbnail and all shapes on that layer will be selected. If you wish to add the shapes from another layer to the section, hold the **Shift** key and click on the other thumbnail.
- Layer Type:** To the right of the **Layer Thumbnail** is the **Layer Type**, represented by one of four different icons:
 - ◇ Regular shape
 - ◇ Text shape which is still able to be edited as text, such as changing the font
 - ◇ Regular folder of individual shapes: When the folder is opened, by clicking the gray triangle, the icon changes and all layers or subfolders within are displayed.
 - ◇ Group folder where one or more of the shapes have been grouped together: When the folder is opened, by clicking the gray triangle, the icon changes and all layers or subfolders within are displayed.
- Layer Name:** In the prior **Layers Panel** screenshot, the last layer has no name. To add one, double-click that layer to open the **Layer Properties** window. Here you can change the name of that layer as well as some other settings. Note that the color assignment is for use on the Layers Panels only. It doesn't change the color of the shape assigned to that layer:



- Hiding layers, locking layers, and assigning layer colors can also be done on the **Layers Panel**:

- ◇ **Hide/Show Layer:** Click on the eye icon to hide that layer. The icon will be replaced with a dot as shown for the *Red Hearts* layer and the shapes on that layer will no longer be seen on the **Cutting**



Mat and will not be included when printing or cutting the project. Clicking on the dot icon will restore the layer to the **Cutting Mat**:


Layer Hidden:

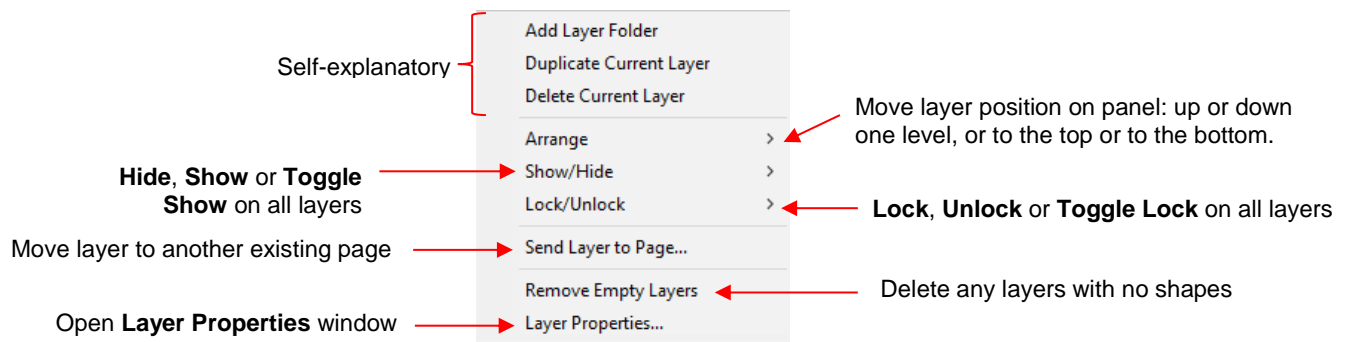




Layer Showing:

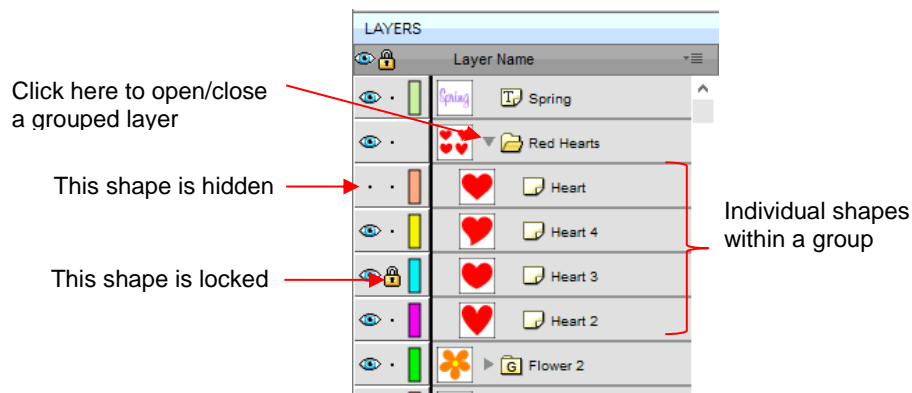


- ◇ **Lock/Unlock Layer:** Click on the dot to the right of the eye icon and the layer will become locked , such as shown for the *Flower 1* layer. The shapes on that layer will still be included in printing and in cutting, however cannot be selected on the **Cutting Mat**. This can be useful when shapes should not be inadvertently moved or if you are having problems selecting shapes nearby.
- ◇ **Layer Color:** Click on the current layer color icon  and a **Color** window will open where a different color can be assigned. Again, this is only for making layers easier to distinguish on the **Layers Panel** and doesn't change the **Fill** or **Stroke** color of the shapes themselves.

- **Layers Menu:** At the top of the **Layers Panel** is an icon for the **Layers Menu** . This menu is also available by clicking on **Layer** on the **Menu Bar** at the top of the screen. The following functions are available in this menu:





- Icons for adding a new layer  and deleting a selected layer  are also available at the bottom of the **Layers Panel**.
- Individual shapes within a group folder can also have individual properties changed. For example, let's say you have various shapes grouped together and you want to keep some locked and you want to hide others. Opening the grouped layer displays each thumbnail and the **Show/Hide** and **Lock/Unlock** icons can be individually changed. In this example, some basic shapes have been used for a clearer understanding:



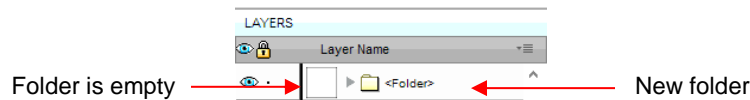
4.04.3 Creating Folders and Moving Layers

- As mentioned in *Section 4.04.1*, each new shape added to the **Cutting Mat** will initially be assigned to a new layer. This can quickly clutter the **Layers Panel**. The ability to combine shapes into folders and subfolders helps organize a project and make things easier for printing and/or cutting.

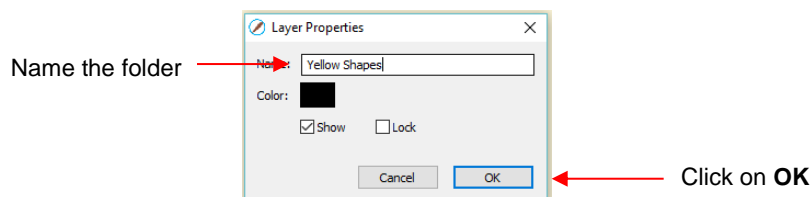
- There are three ways to create a new folder:

- ◇ Click on the **Add layer folder** icon  at the bottom of the **Layers Panel**
- ◇ Click on the **Layers Menu** icon  and select **Add Layer Folder**
- ◇ Go to **Layer>Add Layer Folder**

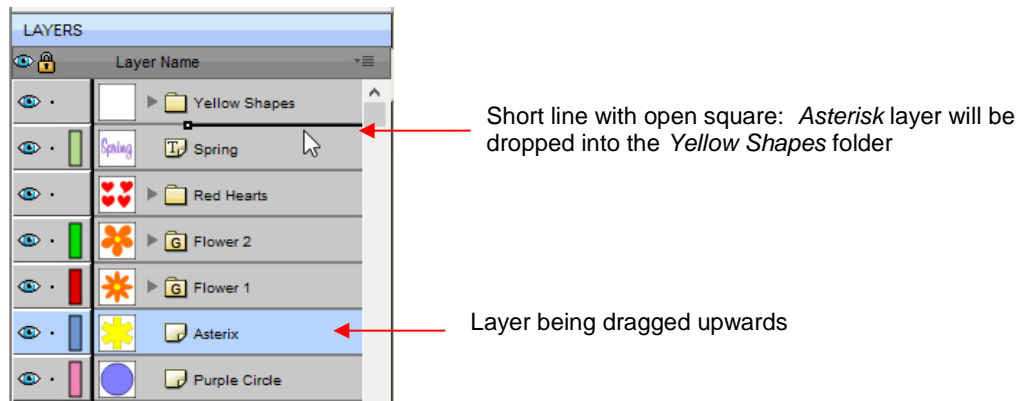
- When a new folder is added, it will appear at the top and look like this:



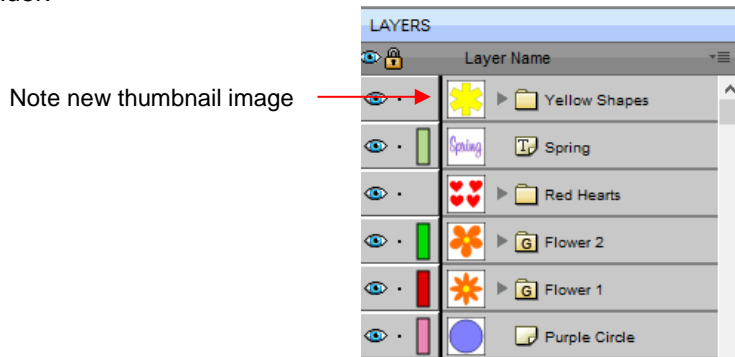
- Just as covered in the prior section, if you double-click on this new folder, you can rename it:



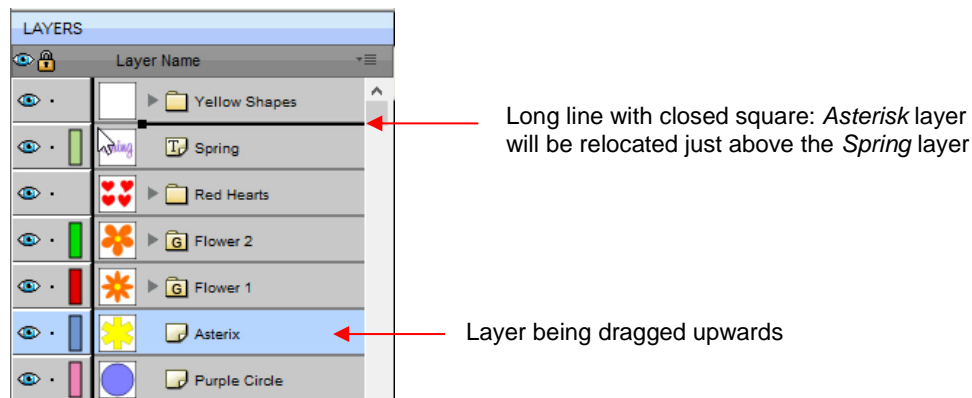
- In the prior section, it was also noted that layers can be re-ordered using the **Arrange** option in the **Layers Panel Options** menu. Alternatively, layers and folders can also be moved directly on the **Layers Panel** by dragging them up or down.
- There are two possible outcomes when dragging layers:
 - ◇ The layer is moved to a new location
 - ◇ The layer is moved into an existing folder
- The way to control where the layer “lands” is by moving it straight up and down or by dragging a little to the left while moving it up and down.
 - ◇ If you drag a layer without moving to the left, you will see a short line with an open square. This means it will be added to the folder directly above it:



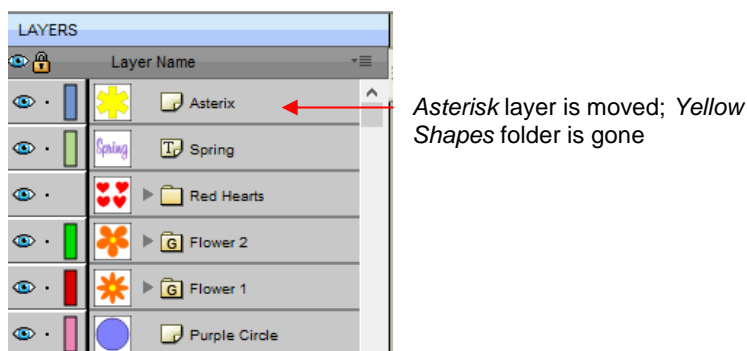
- ◇ Now the *Asterisk* layer is inside of the *Yellow Shapes* folder and can be seen in the thumbnail for that folder:



- ◇ If you drag a layer while moving it to the left, you will see a longer line with a closed black square. This means it will be added directly above that line:

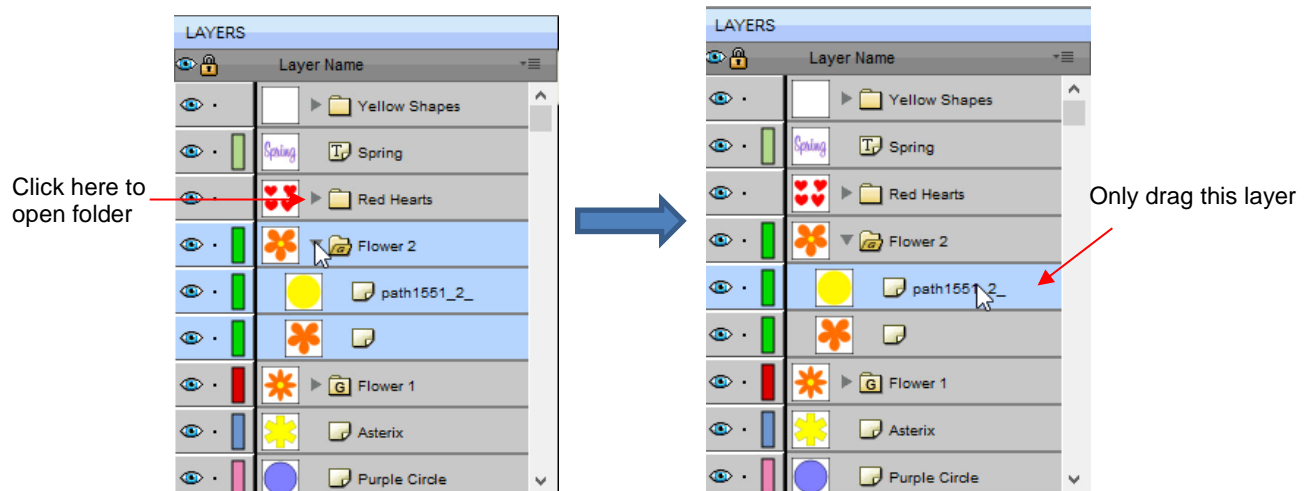


- ◇ **IMPORTANT:** Once you've created a new empty folder, like the *Yellow Shapes* folder, you cannot move that layer or other layers without the empty folder being deleted. So, in the case above, if the *Asterisk* layer had been simply relocated, the *Yellow Shapes* folder would then be gone:

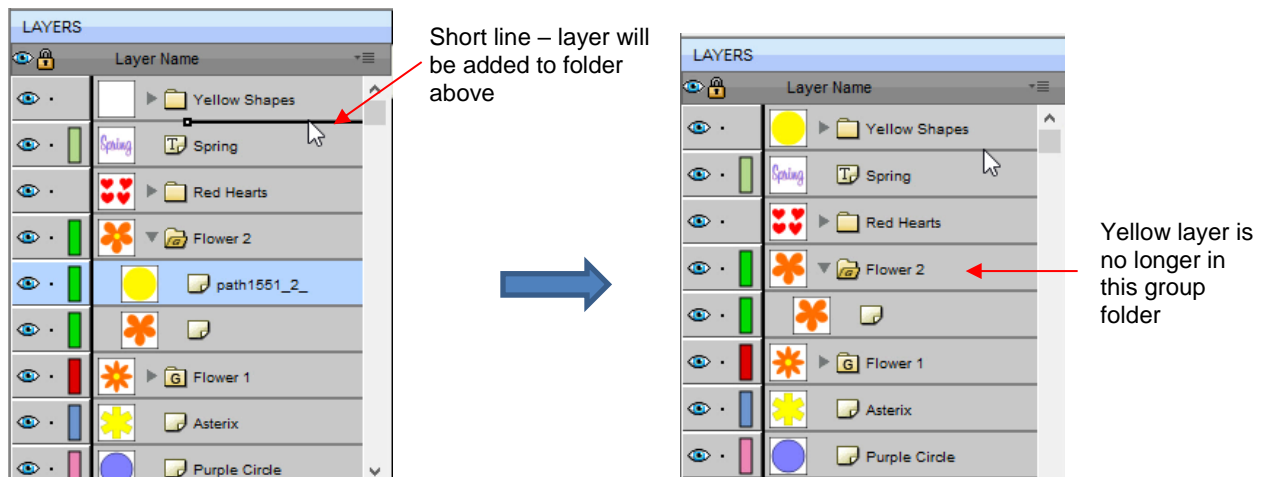


- Layers can also be moved out of an existing folder into other folders. In this example, the yellow centers of the flowers in the layers named *Flower 1* and *Flower 2*, can be similarly dragged and dropped into the *Yellow Shapes* folder:

◇ Open the *Flower 2* group folder and then make sure only the yellow layer is selected:



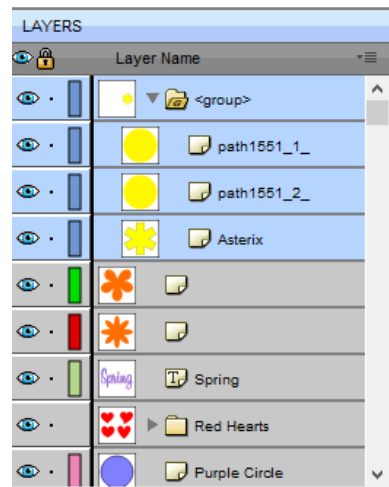
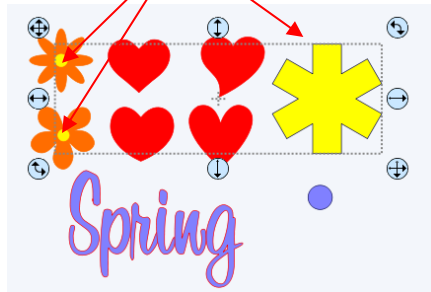
◇ Then drag the yellow layer up to the *Yellow Shapes*, again making sure only a short line is present. The yellow layer is then moved out of the *Flower 2* group:



◇ Repeat for the yellow shape inside the *Flower 1* folder.

- Note: This was just one way to achieve this goal. Another way would have been to ungroup the *Flower 1* and *Flower 2* layers. Then to select all of the yellow shapes on the **Cutting Mat** and go to **Object>Group**. A new group folder would be added to the **Layers Panel** with those shapes moved to it. Specific instructions on **Grouping** and **Ungrouping** are covered in *Section 5.10*.

All yellow shapes are selected and **Group** is applied.



New group folder contains these yellow shapes

4.05 The eshape Store

4.05.1 Importing from the eshape Store

- The **eshape Store** is an online shopping site linked within SCAL. Cutting files and fonts can be purchased through the store and downloaded into SCAL.
- To get started, access the **eshape Store** in any of the following ways:



◇ Click on the **eshape Store** icon on the **Toolbar**

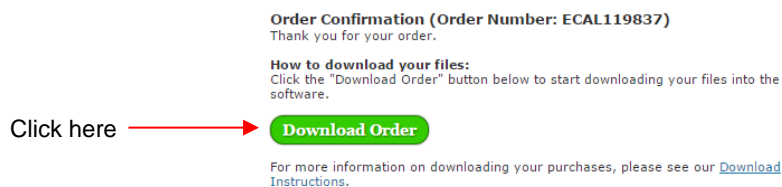
◇ Go to **File>eshape Store**

- The **eshape Store** window will open and you can either sign up for a free account or log in, if you have already registered:

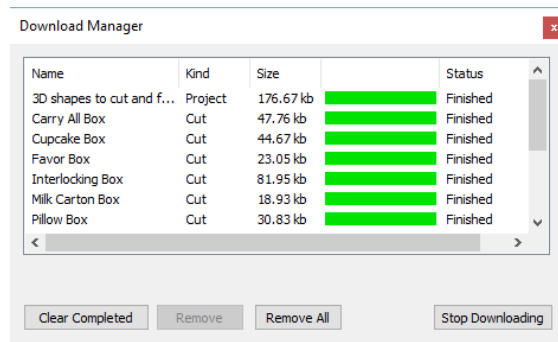


Sign in or Register

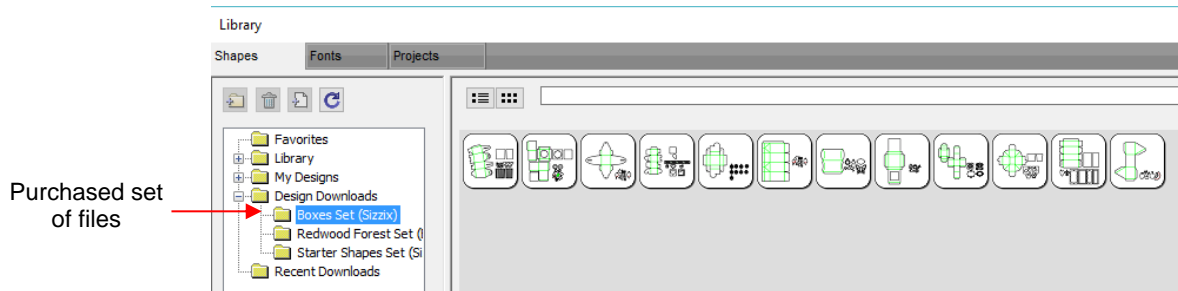
- Next, browse the site to find files of interest. After payment, the following screen shows your order number and a green **Download Order** button can be clicked to download the files you purchased:



- The following **Download Manager** window will open and the files you purchased will begin downloading:



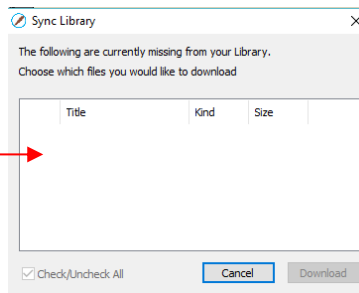
- Now open the **Library** to access the **eshape Store** files. Depending on the file type, the downloaded files will either appear on the **Shapes** tab, under **Design Downloads** or on the **Projects** tab, under **Project Downloads**:




- If you fail to download at the time of the purchase, your downloads can also be accessed in the following ways:

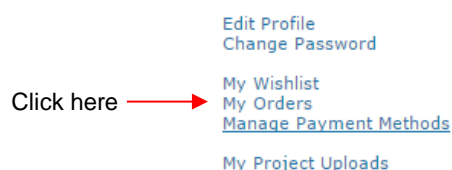
- ◇ Go to **File>Sync My Library**  and the following window will open:

If any files still need to be downloaded, they will be listed in this window for selection.



After selecting files, click on the **Download** button.

- ◇ Click on the top right icon  in the **Library** window and select **Sync Library**. The same window will open and you can select any files not already downloaded.
- ◇ At the **eshape Store**:
 - Log in and click on **My Account** at the top.
 - Then click on **My Orders**:



- Select a time period for the order and click on **Show Orders**. Then click on the **Download** icon:

My Account : My Orders

Select time period → Order Date: Last 30 days ▾ Choose if you want to search particular dates

Click here → Show Orders

You have 4 orders placed between: 7/30/2016 - 8/29/2016

Viewing 1 - 4 of 4

Click here to download entire order → Download Order Files

Download Instructions

Boxes Set
Price: \$9.99
Download

Carry All Box
Price: \$0.00
Download

Or click here to download individual products within an order

4.05.2 Exporting to the eshape Store

- To freely share your own SCAL creations, go to **File>Share Project**. The following window will open:

Start with Info tab

Instructions

Share Project

Info Images Instructions

Title: Rhinestone Baseball

Cut Type: Regular Cut ▾

Category: Sports ▾

Keywords: Baseball Rhinestone

Description: Rhinestone baseball sized at 3.6" x 3.6". The circles are 3.5 mm with a spacing of ~ 0.5 mm.

Hi, sandymc

Not You? Sign in

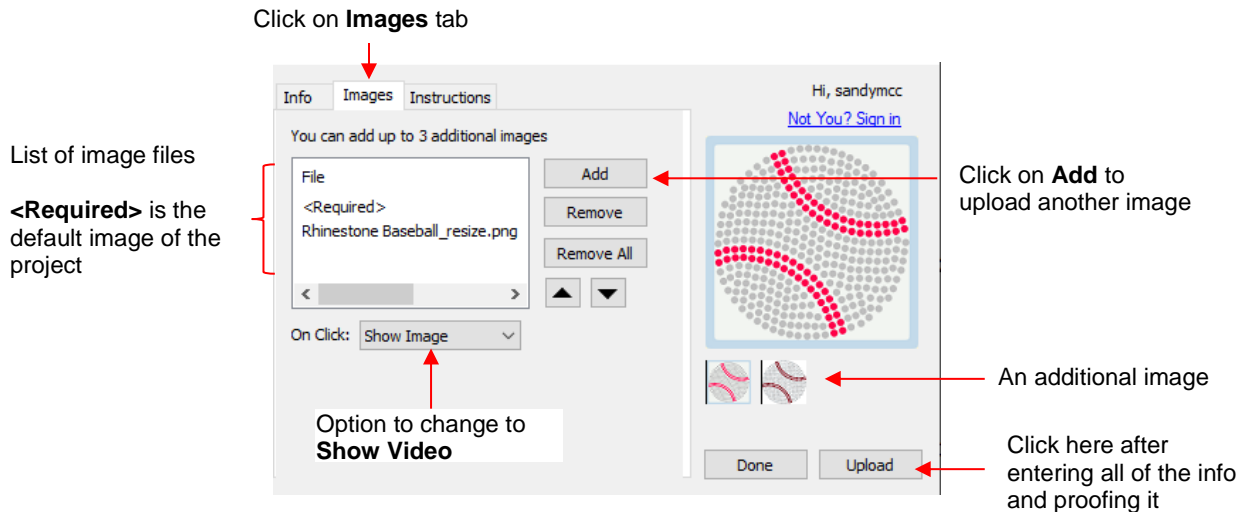
One of the project images

Click here after entering info on all three tabs and proofing it

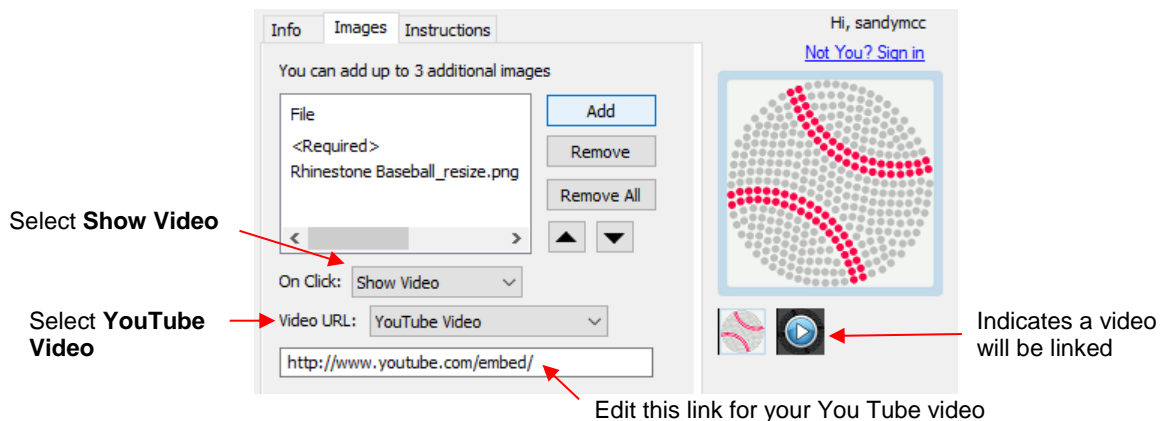
Done Upload

Save current settings

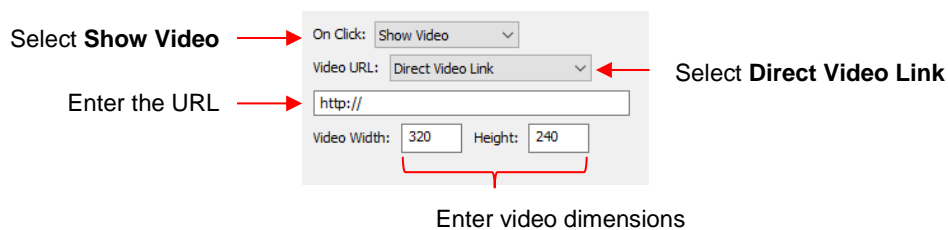
- There are instructions on the left-hand side. **Important:** Make sure all of the following settings have been completed before clicking on **Upload**:
 - ◇ **Title:** Provide a descriptive name for your project.
 - ◇ **Cut Type:** Select from the following:
 - **Regular Cut:** typical cutting projects
 - **Print2Cut:** print and cut projects
 - **Doodle:** projects drawn with a pen rather than cut with a blade
 - ◇ **Category:** Select from a long menu of choices. Review carefully to make sure the best choice is selected.
 - ◇ **Keywords:** Enter keywords based on what other SCAL owners might use to locate a file like yours.
 - ◇ **Description:** Enter information about the file that will help an owner know if it's what they might want or need.
- After completing the settings on the **Info** tab, click on the **Images** tab:



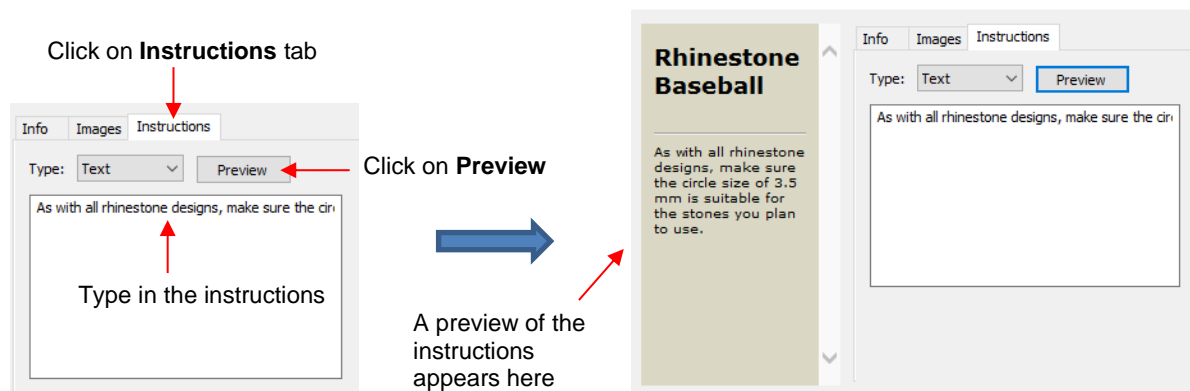
- ◇ Additional images can be uploaded, such as the rhinestone simulation version shown. Other examples where more images are appropriate might include final versions of finished greeting cards, fold-up boxes, and detailed paper-piecing projects.
- ◇ **On Click:** the default indicates **Show Image**. For videos, change this to **Show Video** from the menu.
 - If you have a YouTube video associated with your project, choose **YouTube** video and the window changes to include the start of an embedded YouTube video link:



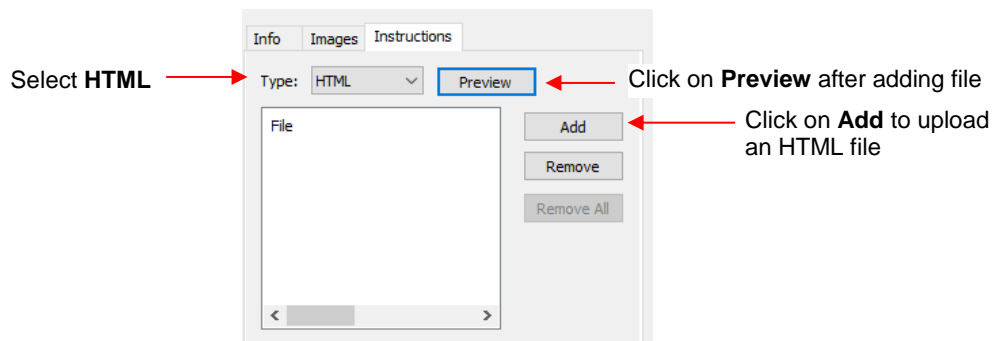
- Alternatively, you can link to an MP4 video located elsewhere:



- Finally, click on the **Instructions** tab and enter any instructions for the project. You have two options:
 - ◇ Type the instructions directly:



- ◇ Import an HTML formatted file by clicking on **Add** and then selecting the file:



- Once the desired choices and information are added for your file, check it all one last time. Then go back to the **Info** tab and click on **Upload**. Note that clicking on **Done** will save this information with your file for uploading at a later time.
- After clicking on **Upload**, a progress window will open indicating your file is being sent to the **eshape Store**. A final **Upload Finished** window will open and notify you that the uploaded file will be reviewed for approval before being available.

4.06 Importing Other File Formats

4.06.1 Importing Vector Files

- The following vector formats can be imported into SCAL:
 - ◇ SVG: common export format for vector programs, thus popular format used for sharing files on blogs and selling files in online design sites
 - ◇ SCUT4: format used to save projects in SCAL4
 - ◇ SCAL: format used by **eshape Store**
 - ◇ PDF: While a PDF can be created from a raster image, a vector image, or both, only the vector parts of a PDF will import into SCAL.
 - ◇ AI (Adobe Illustrator): common format due to the popularity of Adobe Illustrator
 - ◇ EPS: another common export format for many vector programs
 - ◇ FCM: format used by the Brother ScanNCut machines
 - ◇ GSD: format created by RoboMaster, RoboMaster Pro and Wishblade Advance. This format was used with the Craft Robos, Wishblade, and original Silhouette cutter.

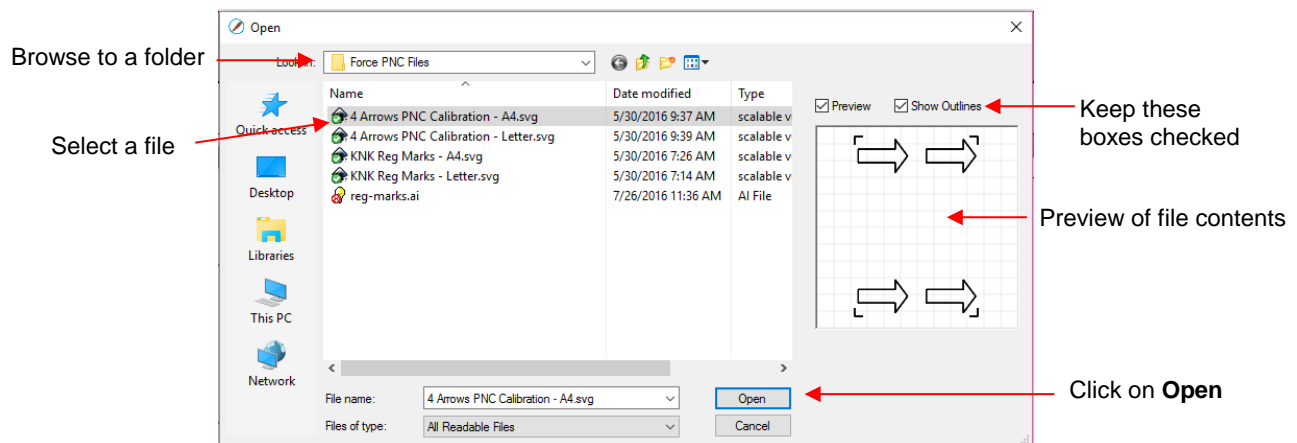
- ◇ PLT (SCAL PRO version only): developed by HP for their plotters, the PLT file evolved into a standard format used by early vinyl cutters
- ◇ DXF (SCAL PRO version only): common format exported by CAD programs
- ◇ WPC: format used in programs developed by Sign Max, which include WinPC Sign, Funtime, Pazzles Inspiration, and Gazelle.

- There are two ways to open the import window:

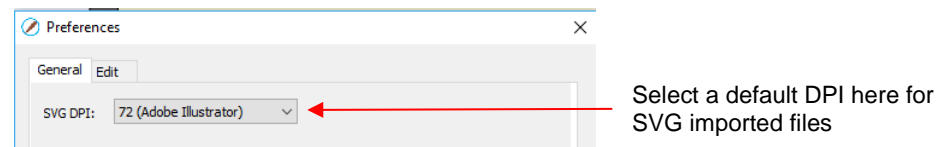
- ◇ Click on the **Import** icon on the upper **Toolbar**
- ◇ Go to **File>Import**



- Either choice will open the following window where you can browse to locate the file you need. Note there are options to see a **Preview** and **Show Outlines**:



- You can also drag and drop any of the file formats directly onto the SCAL screen to import that file.
- If the file is in SVG format, it can also be imported via the **Library**. Refer to *Section 4.03.1*. Also, SVG files vary in size depending on the program which exported them. Thus, always check the imported size before cutting your project. If you are regularly importing SVG files from one of the following programs: Adobe Illustrator, Inkscape, Corel Draw, or you know the DPI used by the exporting program, you can set it under **Edit>Preferences** (on a Mac, press **Command + ,**) so that you will not need rescale the file:



- PDF files can contain multiple pages. If this is the case with a PDF file you wish to import, note the following:
 - ◇ Use Adobe Reader or some other PDF browser to locate which page you wish to import
 - ◇ After selecting the PDF file to import, a second window will open where you can select which page you want to import. Note that if there are many pages, there will be a delay in opening the **Preview** window and you may wish to uncheck that box.
 - ◇ Only vector shapes in a PDF will be imported. Raster shapes will be ignored.

4.06.2 Importing Raster Files

- There are several ways to import a raster file (JPG, BMP, GIF, PNG) depending on the intended purpose for that file:

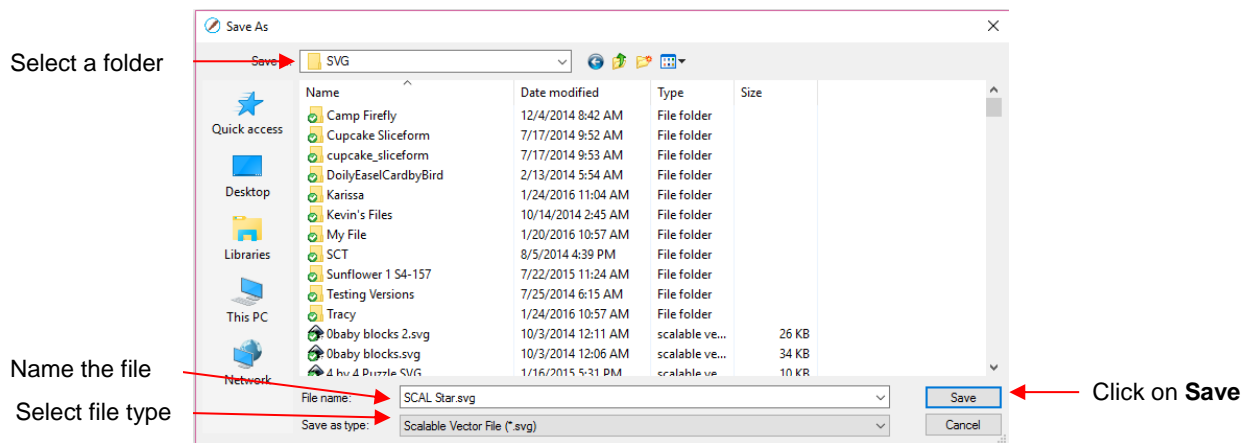
- ◇ **File>Import:** will import PNG files with a transparent background, simultaneously adding a vector cut line along the transparent border. This is very useful for PNC applications. This is the only raster format that will work using this method.
- ◇ **File>Place Image:** will import JPG, BMP, GIF, and PNG files for the purpose of printing or manually tracing in the event the auto-tracing function doesn't adequately perform due to the image quality. It's also another way to load an image for the **Trace Image** window. Refer to *Section 7.03*.
- ◇ **Trace:** will import and auto-trace JPG, BMP, GIF and PNG files. Various options and settings can be applied to obtain the desired results. Refer to *Section 7.03*.

4.06.3 Importing Fonts

- SCAL will display and utilize all fonts currently installed on your computer. You can also open non-installed fonts for temporary use. The formats supported include TTF, OTF, and OPF (open path / single line fonts). For more details, refer to *Section 6.02*.

4.07 Exporting in Other File Formats

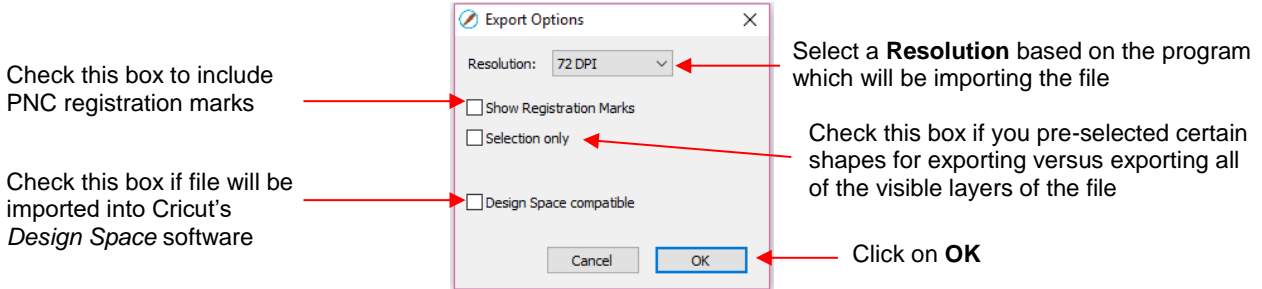
- Besides saving as a .SCUT4 file, you can also export in the following formats: SVG, JPG, BMP, PNG, TIFF, FCM, and PLT. Only SVG, FCM and PLT are vector formats. The others are raster.
- If there are only certain shapes in the file that you want to export, you have two options:
 - ◇ Select those particular shapes before exporting and then mark a box called **Selection only** in the export window.
 - ◇ Place those shapes on one or more separate layers and hide them on the **Layers Panel**. Refer to *Sections 4.04.2 and 5.09*.
- To export a file, use either of the following options:
 - ◇ Go to **File>Export**
 - ◇ Press **Ctrl+Shift+E**
- The following window will open where you can name the file, select the file format, and the location for saving:



- Depending on the type of file selected, an export window will open. The following subsections will cover these types in more detail.

4.07.1 Exporting in SVG Format

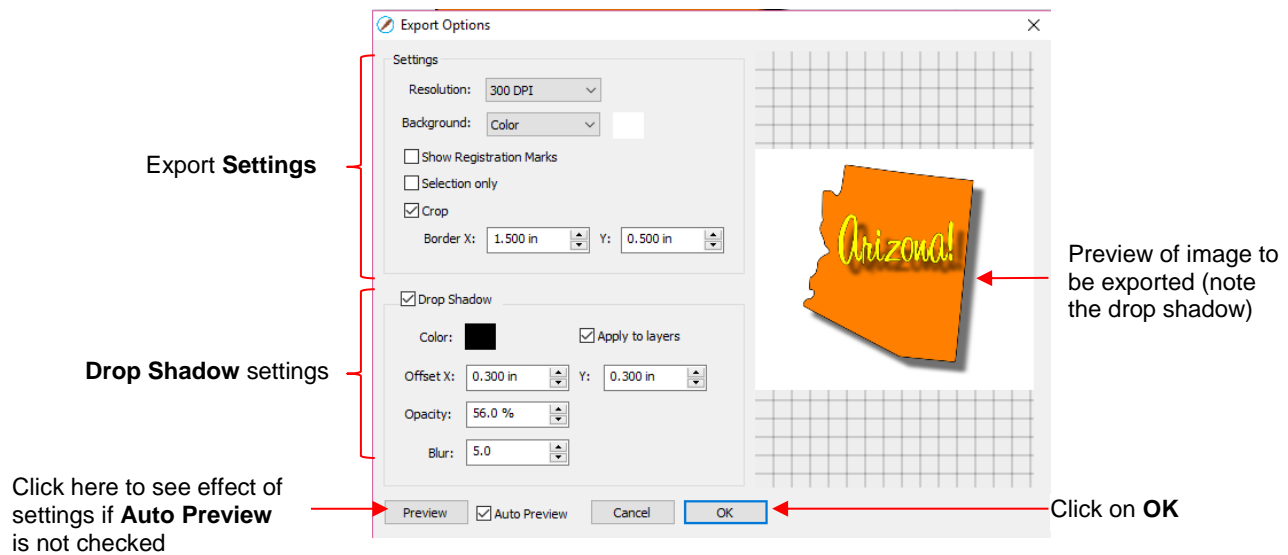
- The **SVG Export Options** are shown in the following screenshot:



- The **Resolution** setting affects the dimensions of the shapes upon importing into another program:
 - ◇ For example, Adobe Illustrator uses 72, Inkscape uses 90, and Corel Draw uses 96. Unless you know the intended program's **DPI**, leave it at 72.
 - ◇ If the project is designed with specific dimensions affecting the final result, such as an envelope for a card, include a separate *Read Me* text file noting the dimensions of the project in SCAL so that the imported SVG can be resized accordingly.
- The **Selection Only** setting was mentioned earlier as the option to mark when specific shapes have been selected for export versus exporting all of the shapes in the file.

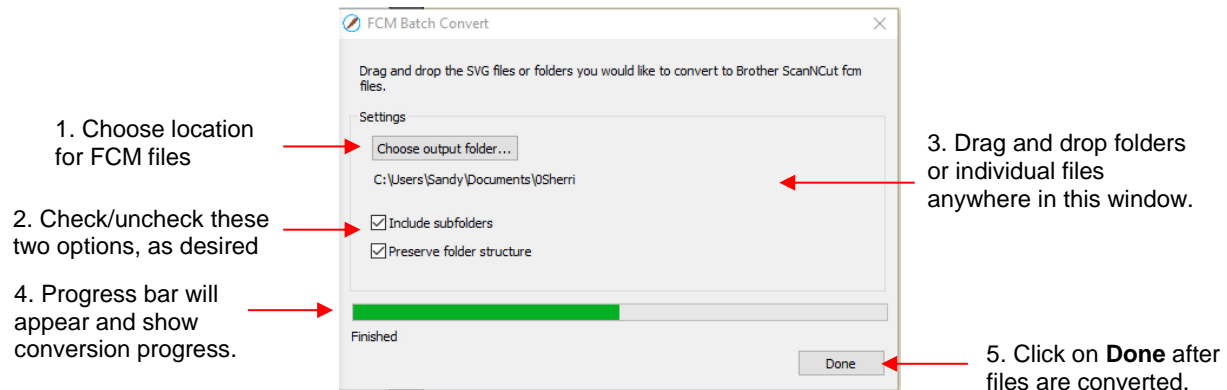
4.07.2 Exporting in JPG, PNG, BMP and TIFF Formats

- There are various reasons why you might want to export your file as a raster. For example:
 - ◇ The image is going to be posted on a web site or blog
 - ◇ The image will be shared with a friend or a customer
 - ◇ You wish to use the image in a digital scrapbooking program
 - ◇ You want to print a PNC project from a printer without SCAL installed
- If you choose any of the raster export formats, the same window will open offering options for:
 - ◇ **Resolution:** if the image will be printed, you usually choose 200 or 300
 - ◇ **Background:** choose a color or, with PNG export, you can also choose transparent
 - ◇ **Show Registration Marks:** option to print with the registration marks that will be used for a PNC application
 - ◇ **Selection only:** when specific shapes have been selected for export versus exporting all of the shapes in the file
 - ◇ **Crop:** increase or decrease the background border around the exported image
 - ◇ **Drop Shadow:** add a shadow effect to the image
- The following screenshot shows an example of an export in a raster format:



4.07.3 Exporting in FCM Format

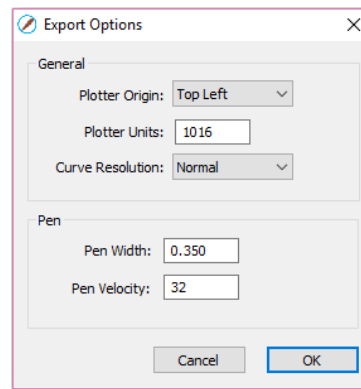
- The FCM format is used by the Brother ScanNCut models. There is no secondary window with export settings. After clicking on **Save**, the .FCM file will be located in the folder you chose in the **Save As** window.
- There is also a batch SVG-to-FCM converter available in SCAL. Go to **File>FCM Batch Convert** and the following window will open. Note that you have the option to convert entire folders of SVG files at one time:



4.07.4 Exporting in PLT Format

- PLT files were originally developed for HP plotters. They are also used by some of the cutters outside of the hobby world. The **Export Options** for PLT are as follows:

Because PLT files are usually sent directly to the plotter or cutter, the settings are specific to the device. Thus, these settings will need to be determined based on that intended device.



4.07.5 Exporting to SCAL2

- If you still use SCAL2, you can send a file from SCAL4 to SCAL2 by going to **File>Send to> Sure Cuts A Lot 2**. You will need both versions of SCAL open at the time.

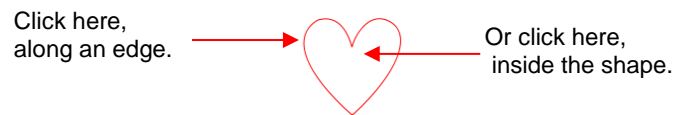
5. SCAL: Manipulating and Coloring Shapes

This chapter covers all of the ways to modify shapes. Note that while the singular term “shape” will be repeatedly used when describing various functions, it also refers to a selection of shapes. For example, resizing a selection of three shapes uses the same menu functions or mouse movement as a single shape.

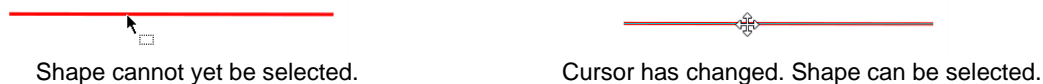
5.01 Selecting

- To select a shape, make sure the **Selection Tool** is indented on the **Tools Panel** . Then:

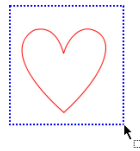
- ◇ Click anywhere on the shape (along an edge or inside a closed shape):



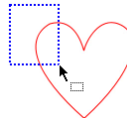
- ◇ Note that the cursor will change once the shape can be selected. For example, when selecting a line, wait for the cursor to change before clicking:



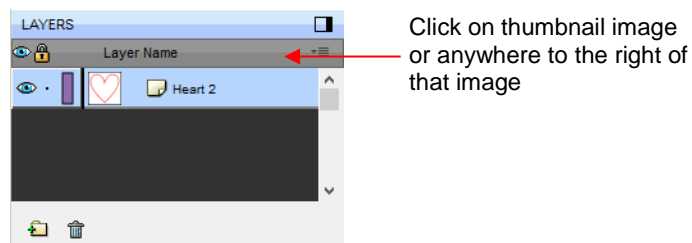
- ◇ Another way to select: drag the mouse to enclose the entire shape (aka marquee-select).



- ◇ A third way: hold the **Shift** key and marquee-select just a portion of the shape.

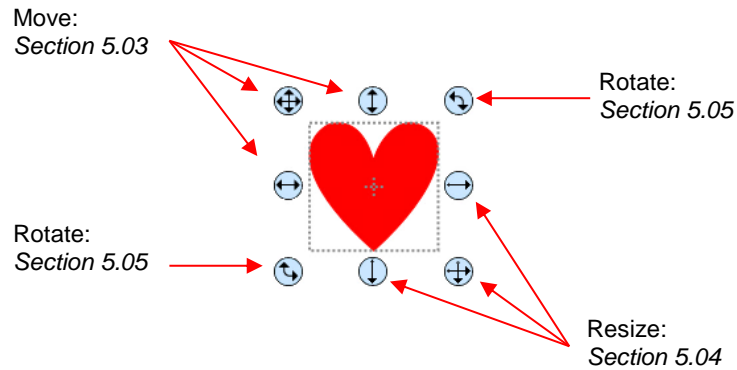


- ◇ A fourth way: click on the layer which contains this shape:



5.02.1 Basic Selection Handles

- Once selected, a shape will have 8 handles surrounding it. The functions of these handles are covered in other sections as indicated:

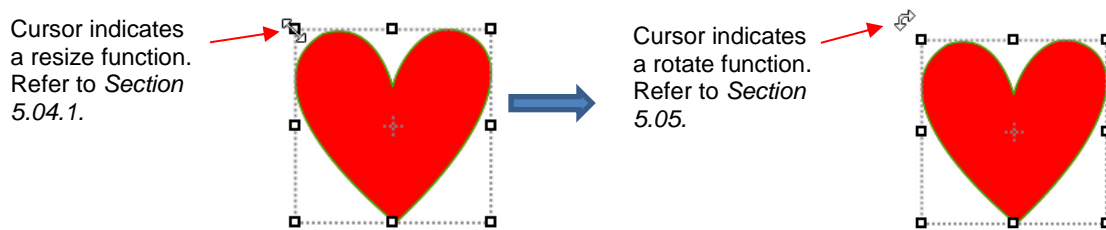


5.02.2 Advanced Selection Handles

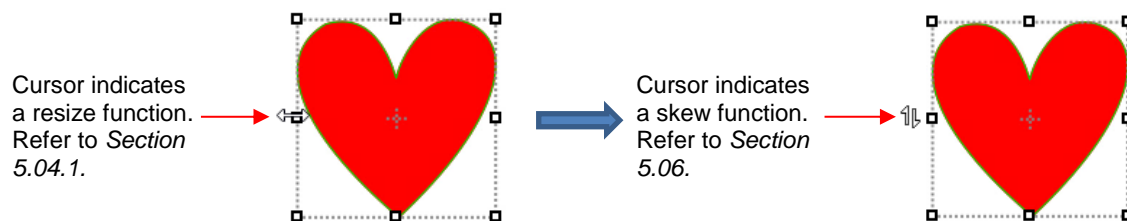
- While in the **Selection Tool** mode, the **Tool Options** bar indicates a setting called **Handles**. The drop-down menu offers another option called **Advanced**:




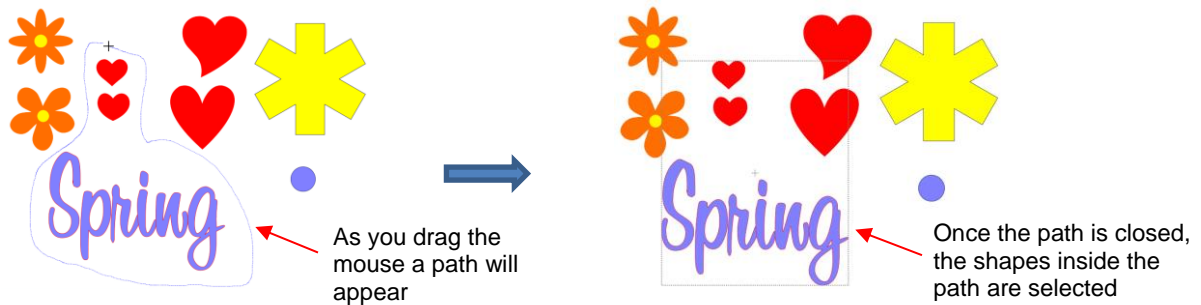
- In **Advanced** mode, a selected shape will appear with six identical handles. However, each handle now has two functions, depending on whether the mouse hovers directly over the handle or is moved slightly away from the handle:



- All four corner handles offer the same resizing and rotating functions. The middle handles along the four sides offer resizing and skewing:




- There are several ways to select more than one shape:
 - ◇ Select the first shape and hold down the **Shift** key while clicking on additional shapes.
 - ◇ Drag the mouse (marquee-select) to encompass the shapes. Always make sure you start clearly outside the boundaries of the images you want to select.
 - ◇ If all of the shapes are on the same layer, click on the thumbnail for that layer. Refer to [Section 4.04.2](#).
 - ◇ Use the **Lasso Selection** tool on the **Tools Panel** . Freely drag the mouse around the shapes you want to include in the selection:




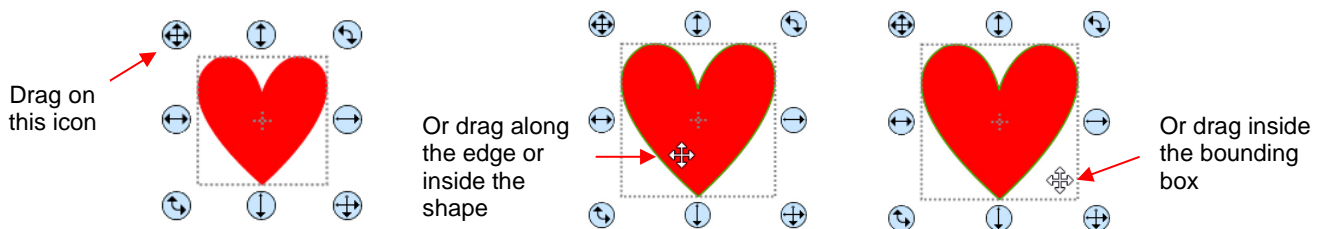
- If you wish to select all of the shapes on the screen, there are several options:
 - ◇ Press **Ctrl+A**
 - ◇ Right-click on the screen and choose **Select All** from the menu
 - ◇ Go to **Edit>Select All**
- To unselect all shapes, use one of the following ways:
 - ◇ “Click away” – click anywhere else on the screen and the shapes will be de-selected
 - ◇ Press **Ctrl+Shift+A**
 - ◇ Go to **Edit>Deselect All**

5.02 Deleting

- To delete a selected shape, use any of the following options:
 - ◇ Press the **Delete** key on the keyboard
 - ◇ Right-click on the screen and choose **Delete** from the menu
 - ◇ If the shape is on its own layer, click on the **Delete Layer** icon: 
- To delete all of the shapes in the current project:
 - ◇ Use one of the methods from *Section 5.01* to select all shapes
 - ◇ Then delete using any of the prior options listed for deleting a selected shape
- You can also delete a layer of shapes at one time from the **Layers Panel**. Refer to *Section 4.04.2*.

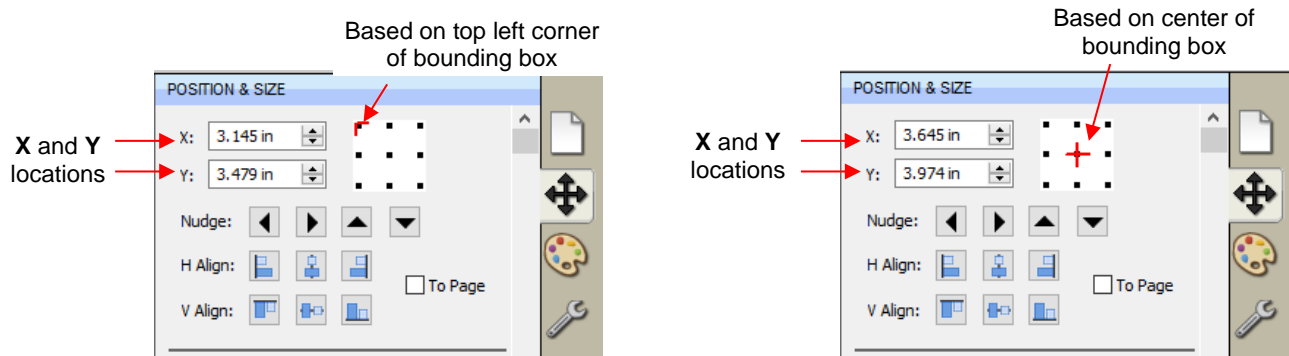
5.03 Moving

- To move a selected shape, hold down the left mouse button on the upper left corner icon or anywhere within the shape and drag to another location. Note that if you see this cursor , the shape can be moved:

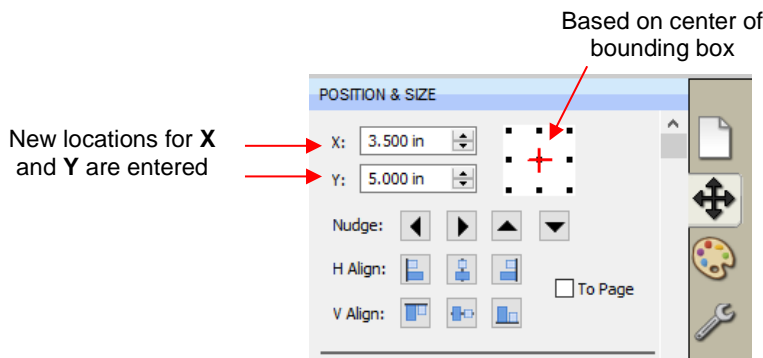


- To move a shape and maintain horizontal or vertical alignment, hold the **Shift** key while dragging or use the arrow keys on your keyboard.

- With a shape selected, the **Position & Size Settings on the Properties Panel** indicate the exact location of the bounding box around a selected shape. Note that this location is how far the shape is from the top left corner of the grid on the mat and the red mark indicates which part of the bounding box is being referenced. For example:



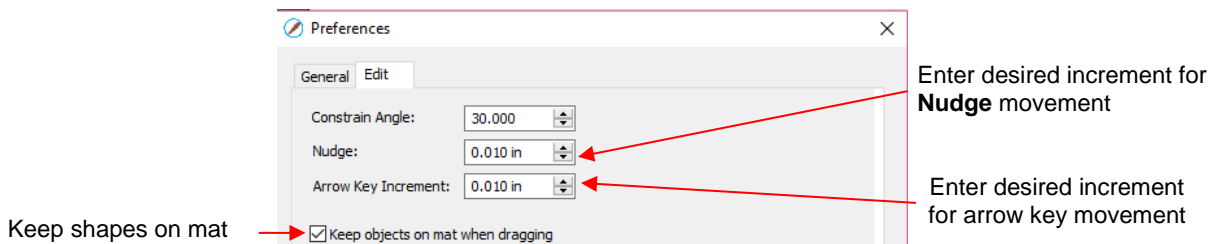
- You can enter new values into either or both of the **X:** and **Y:** windows to move the shape to a new location:



- The **Nudge** icons, which are just below the **X** and **Y** entries, can also be used to move a selected shape. These move in the same increments as the keyboard arrows:

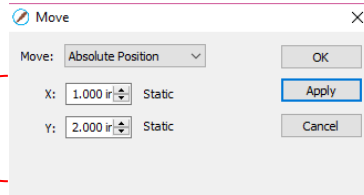


- The increment size for both the keyboard moves and the **Nudge** moves can be changed by going to **Edit>Preferences** and then selecting the **Edit** tab. This window also offers the option to force shapes to remain within the boundaries of the **Cutting Mat** while being moved with the mouse:

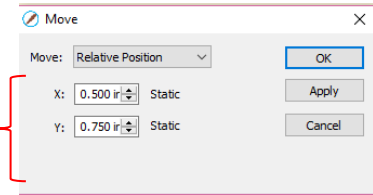


- There is also a **Move** function available which can be accessed these two ways:
 - ◇ Right-click on a selected shape and go to **Transform>Move**
 - ◇ Go to **Object>Transform>Move**
- This **Move** windows provides two moving options:
 - ◇ Move the shape to a specific position on the **Cutting Mat** (called **Absolute Position**)
 - ◇ Move the shape a certain distance from its current location (called **Relative Position**)

Absolution Position:
where to place the
shape on the mat

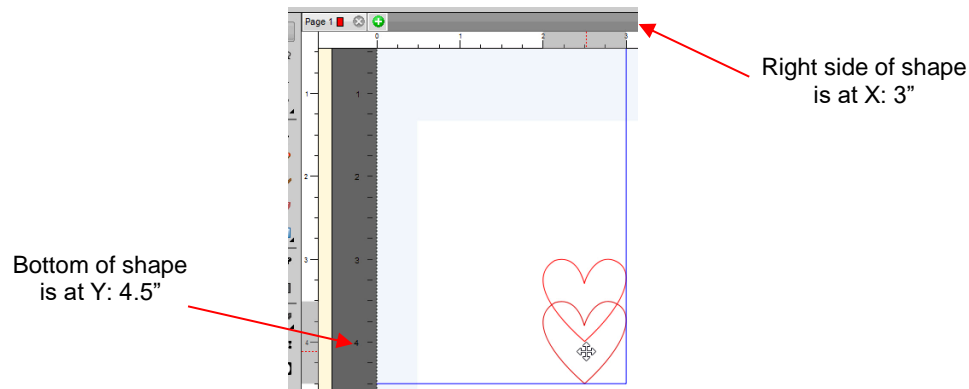


Relative Position:
how far to move the
shape in both an X
and Y direction



◇ **Important:** After applying a move in the **Move** window, click on **OK** and then re-enter the window if you need to make subsequent move.

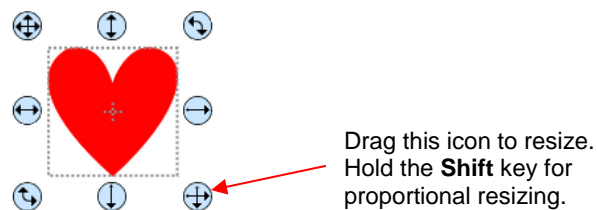
- You can also use the **Rulers** to estimate a new location for moving shapes. Blue lines will appear when the shape is aligned with a major marking, such as shown below:



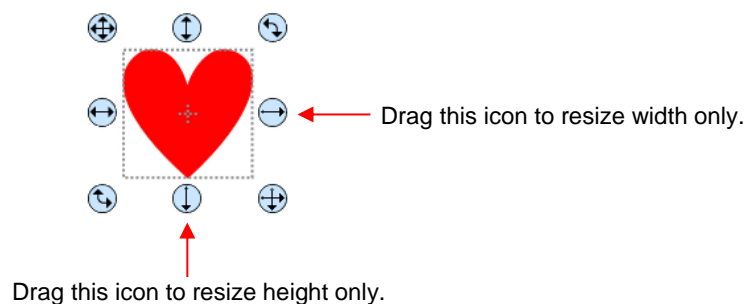
5.04 Resizing, Scaling, Auto Fit

5.04.1 Resizing

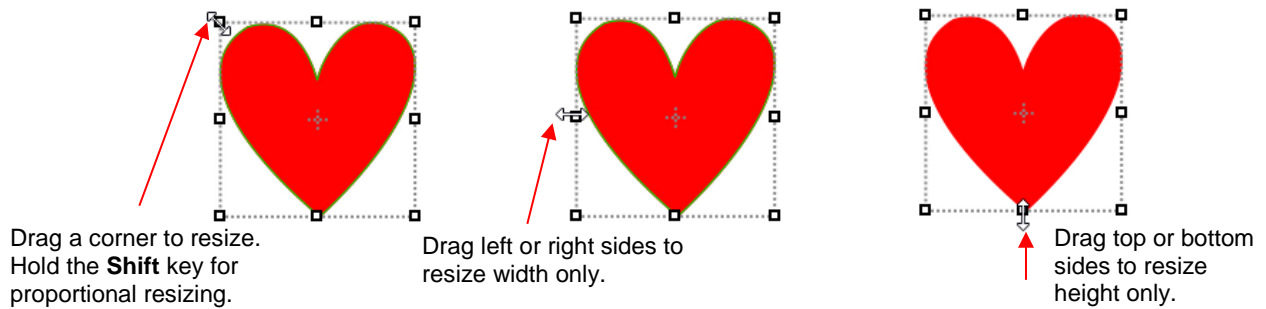
- With the shape selected, use your mouse to drag the lower right corner of the shape to freely resize. If you want to keep the width and height proportional, hold the **Shift** key down before dragging that icon:



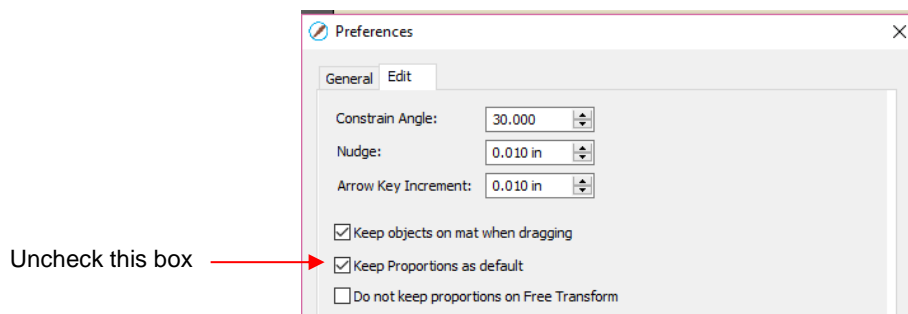
- To resize only the width or the height, drag the middle right or the middle bottom icons, respectively:



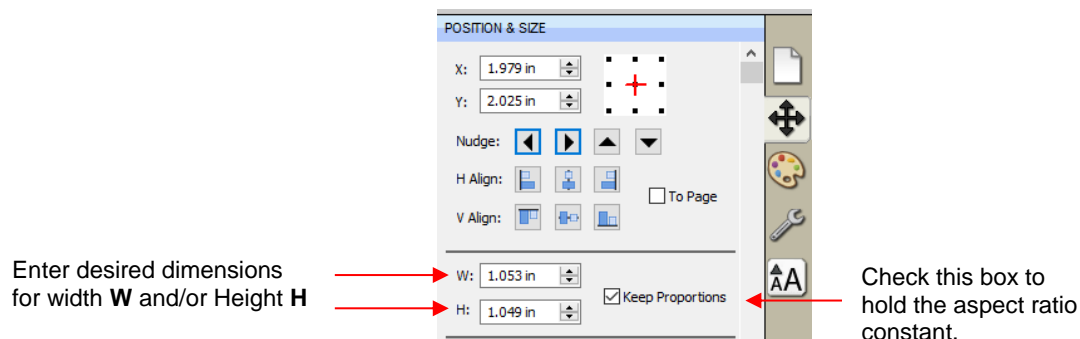
- If the **Handles** are in **Advance** mode, then drag a corner or a side when the cursor is directly over the handle. Again, holding the **Shift** key will resize height and width proportionately:



- If you prefer that proportional sizing be the default, thus not requiring the pressing of the **Shift** key, go to **Edit>Preferences** and click on the **Edit** tab. Uncheck the box shown below:

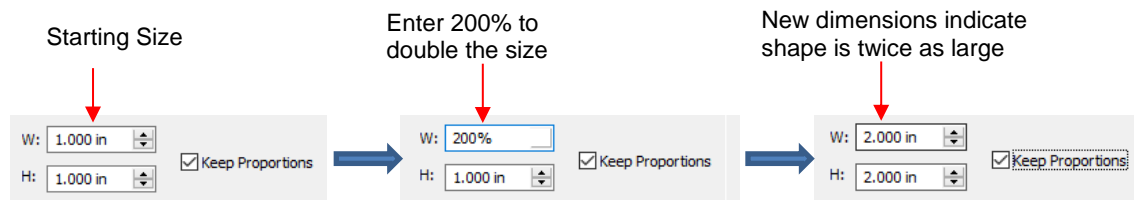


- Important:** Unchecking this box does not then affect shapes created using the **Shapes** tool on the **Tools Panel**. You will need to hold the **Shift** key to maintain proportions when resizing by dragging the lower right corner.
- If you need to make the shape an exact size, then enter the dimension in the **W** or **H** box on the **Position & Size Panel**. Check the **Keep Proportions** option if you want to hold the aspect ratio constant:



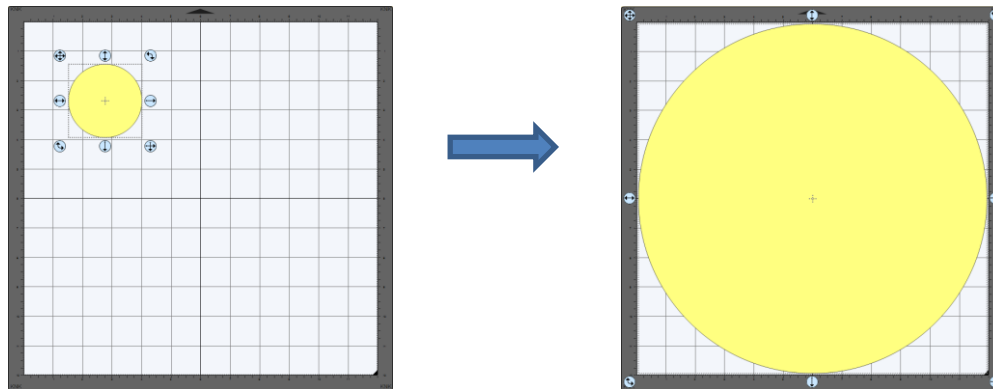
5.04.2 Scaling

- The **Scale** function can be accessed using either of these ways:
 - ◇ Right-click the selected shape and go to **Transform>Scale**
 - ◇ Go to **Object>Transform>Scale**
- Percentages can also be used in the dimension settings to scale. For example, if you want to double the size of a shape, you can enter 200%:

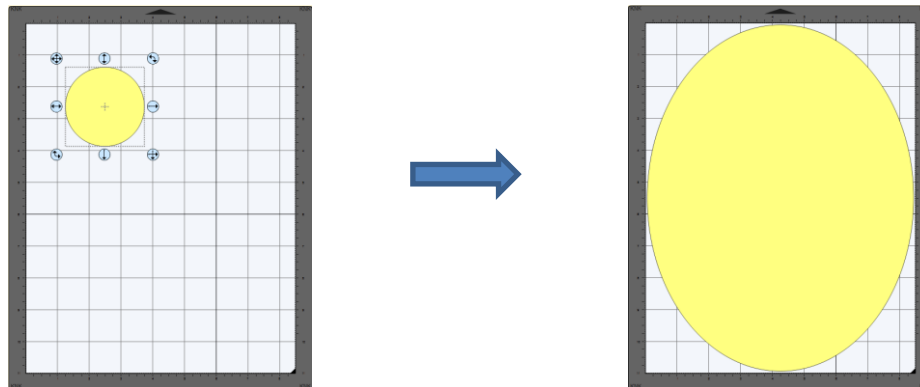


5.04.3 Auto Fit (PC only)

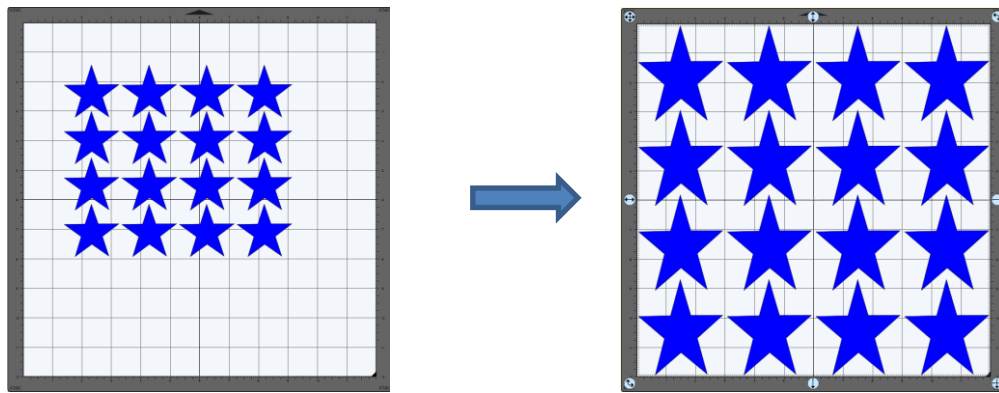
- The **Auto Fit** function will resize a shape or selection of shapes to fit the boundaries of the **Cutting Mat** with a slight (1/16") margin. It is accessed by going to **Object>Transform>Auto Fit**.
- Example: Select a circle on a 12" x 12" **Cutting Mat** and go to **Object>Transform>Auto Fit**:



- ◇ The new size of the circle is 11.875" x 11.875".
- ◇ If the circle is placed on a 15" x 15" mat, then it resizes to 14.85" x 14.875". However, if the circle is placed on letter size mat (8.5" x 11"), then it becomes an oval:

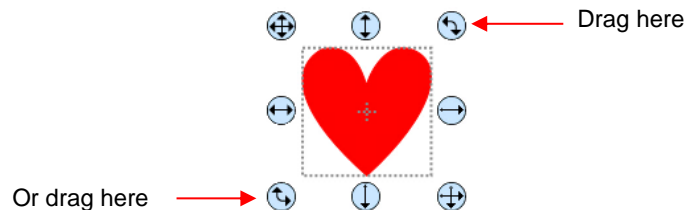


- A practical example might be something like this: You have one 12 x 12 sheet of cardstock and you want to cut out 16 stars for a party decoration and you want those stars as large as possible. Rather than having to "do the math", you can create a grid of stars (refer to *Section 5.16.4*) and then use the **Auto Fit** function to resize them for the cut:

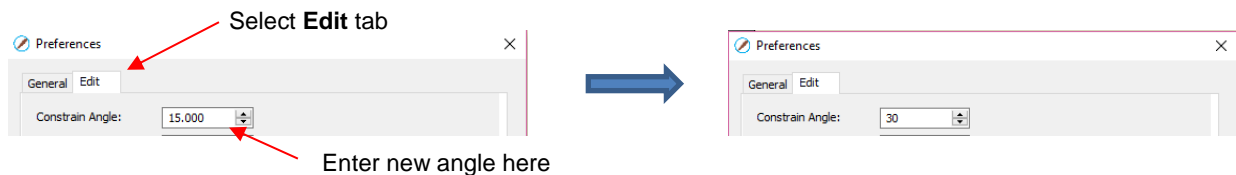


5.05 Rotating

- With the **Handles** set to **Basic** mode and the shape selected, dragging the top right icon will freely rotate the shape:



- ◇ Holding the **Shift** key, while rotating, will rotate the shape in 15° increments. However, if you need to rotate in increments other than 15°, go to **Edit>Preferences**, click on the **Edit** tab, and change the **Constrain Angle** to the desired increment (from 1 to 180°). Click on **OK** to save the change:

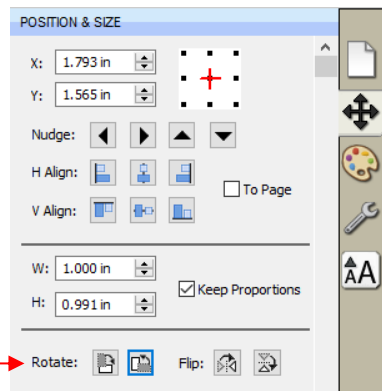


- ◇ The **Status Bar** at the bottom of the screen will indicate the current degree of rotation:

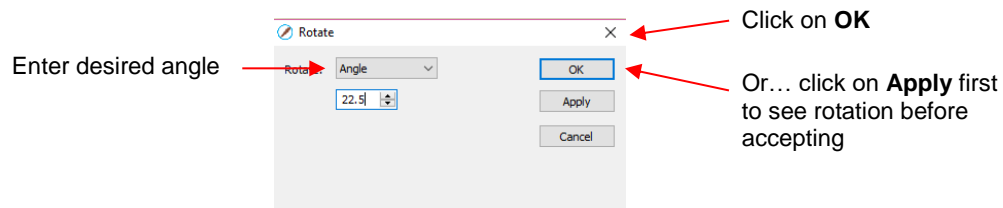


- ◇ Note: the **Status Bar** will continue to show the last degree of rotation until another shape is selected and rotated.
- A selected shape can be rotated exactly 45° clockwise or counter-clockwise, by clicking the **Rotate** icons on the **Position & Size Panel**:

Click the **Rotate** icons for a 45° rotation.



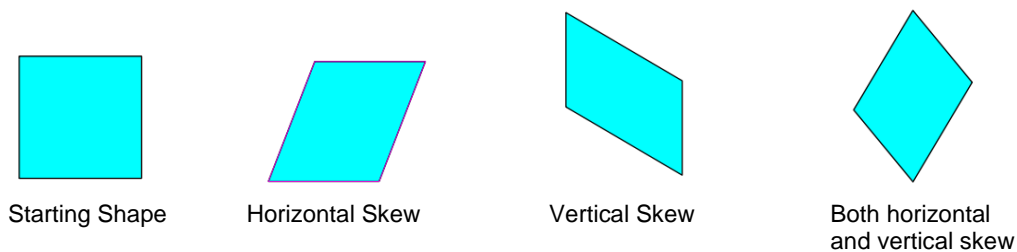
- To rotate a specific angle, open the **Rotate** window in either of two ways:
 - ◇ Right-click on a selected shape and go to **Transform>Rotate**
 - ◇ Go to **Object>Transform>Rotate**
- Enter the desired angle:



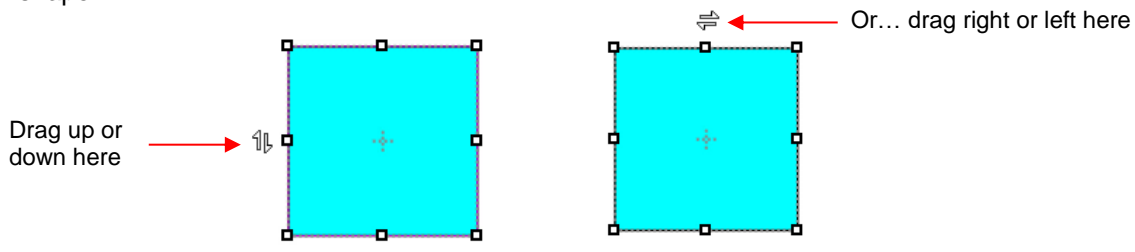
5.06 Skewing and Distorting

5.06.1 Skewing

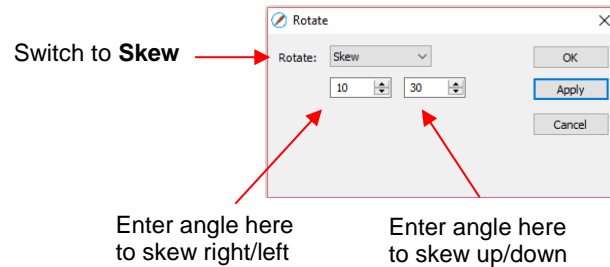
- Shapes can be skewed either horizontally or vertically:




- There are two ways to skew a shape:
 - ◇ With the shape selected and **Advanced** selected on the **Tool Options**, rest your mouse slightly outside of a handle in the middle of a side. The skew mode cursor will appear and it can be dragged to skew the shape:

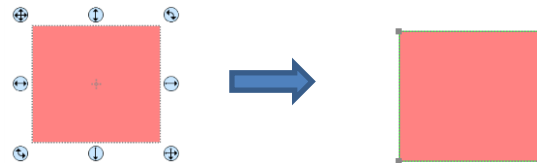


- ◇ With the shape selected, open the **Rotate** window by using one of these two methods:
 - Right-click and select **Transform>Rotate**
 - Go to **Object>Transform>Rotate**
- ◇ Then switch from **Angle** to **Skew** and enter a skew angle:

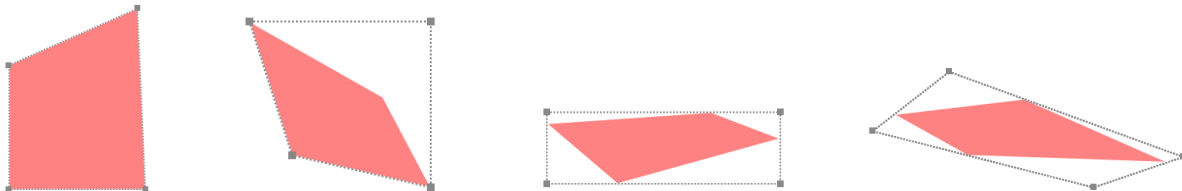


5.06.2 Distorting

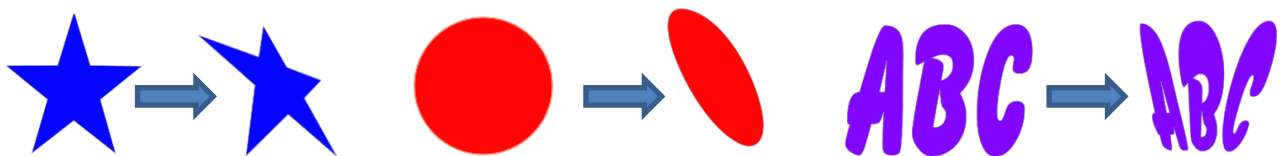
- The **Distort** tool is the 5th icon  from the bottom on the **Tools Panel**. Select a shape and then click on the icon. The four corners of the bounding box will display small boxes:



- The shape can now be distorted in countless ways by dragging any of the corners :

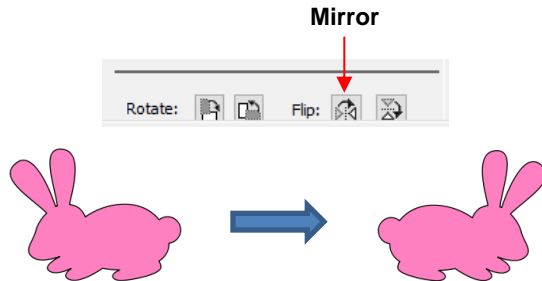


- Of course, the shape doesn't have to be rectangular. The **Distort** tool can be applied to anything:

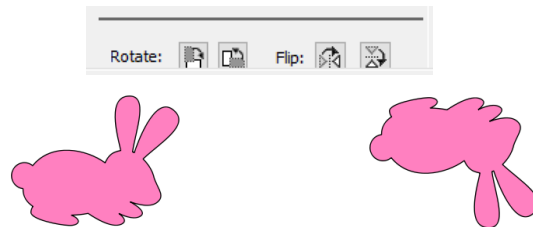


5.07 Mirroring and Flipping





- To horizontally mirror a shape, select it and then use one of the following:
 - ◇ Right-click on the screen and select **Transform> Flip Horizontal (Mirror)**
 - ◇ Go to **Object>Transform> Flip Horizontal (Mirror)**
 - ◇ Click on the **Mirror** icon, next to **Flip**, on the **Position & Size Panel**:



- To vertically flip a shape, select it and then use one of the following:
 - ◇ Right-click on the screen and select **Transform> Flip Vertical**
 - ◇ Go to **Object>Transform>Flip Vertical**
 - ◇ Click on the **Flip** icon on the **Position & Size Panel**:








5.08 Locking and Unlocking

- Locking a shape is normally done to prevent accidental selection and movement of that shape.
- To lock a selected shape, use any of the following options:
 - ◇ Right-click and select **Lock** from the menu
 - ◇ Go to **Object>Lock**
 - ◇ Press **Ctrl+Alt+L**
 - ◇ Locate the shape on the **Layers Panel** and click on the unlock icon  or double-click and check the **Lock** option.
- To lock all shapes:
 - ◇ Right-click and choose **Select All**, then right-click and choose **Lock**
 - ◇ Click on the **Layers Menu** icon  and select **Lock/Unlock>Lock All Layers**
- To unlock a single shape or a folder of shapes, locate the shape or folder on the **Layers Panel** and click on the **Lock** icon  or double-click and uncheck the **Lock** option.
- To unlock all locked shapes, use any of the following options:
 - ◇ Right-click on a selected unlocked shape and select **Unlock All** from the menu
 - ◇ Go to **Object>Unlock All**
 - ◇ Press **Ctrl+Shift+Alt+L**
 - ◇ Click on the **Layers Menu** icon  and select **Lock/Unlock>Unlock All Layers**

- To toggle the lock/unlock status of all layers on the **Layers Panel**, click on the **Layers Menu** icon  and select **Lock/Unlock>Toggle All Layers**

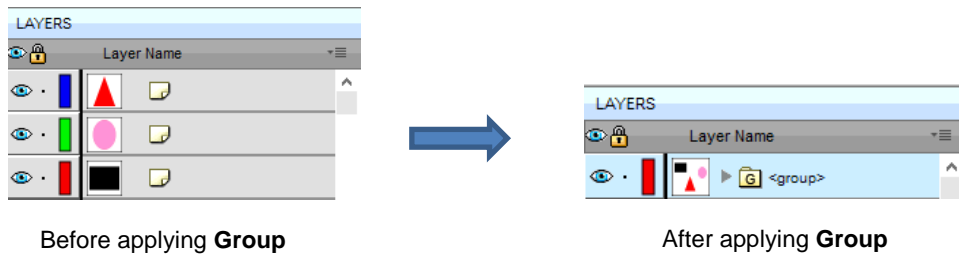
5.09 Hiding and Showing

- To hide a selected shape, use either of the following options:
 - ◇ Right-click and select **Hide** from the menu
 - ◇ Go to **Object>Hide**
 - ◇ Locate the shape on the **Layers Panel** and click on the hide icon  or double-click and uncheck the **Show** option.
- To hide all shapes:
 - ◇ Right-click and choose **Select All**, then right-click and choose **Hide**
 - ◇ Click on the **Layers Menu** icon  and select **Show/Hide>Hide All Layers**
- To unhide a single shape or a folder of shapes, locate the shape or folder on the **Layers Panel** and click on the unhide icon  or double-click and check the **Show** option.
- To unhide all hidden shapes, use any of the following options:
 - ◇ Right-click on a selected unhidden shape and select **Show All** from the menu
 - ◇ Go to **Object>Show All**
 - ◇ Select any shape (including a hidden one) on the **Layers Panel**, right-click and select **Show All** from the menu.
 - ◇ Click on the **Layers Menu** icon  and select **Show/Hide>Show All Layers**
- To toggle the hide/unhide status of all layers on the **Layers Panel**, click on the **Layers Menu** icon  and select **Show/Hide>Toggle All Layers**

5.10 Grouping and Ungrouping

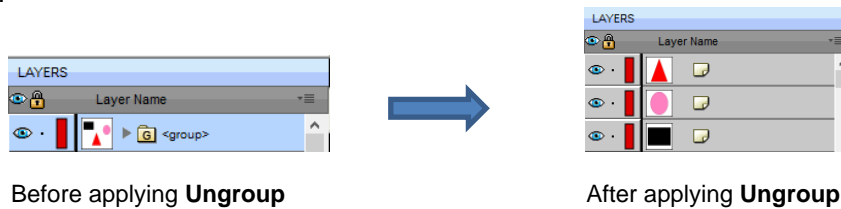
5.10.1 Group

- The **Group** function is used to combine shapes into a new folder on the **Layers Panel** so that they can be more easily moved, resized, rotated, etc.
- After selecting two or more shapes, the **Group** function can be applied in any of the following ways:
 - ◇ Right-click and select **Group** from the popup menu
 - ◇ Go to **Object>Group**
 - ◇ Press **Ctrl+G**
- The following example shows three shapes before and after grouping:



5.10.2 Ungroup

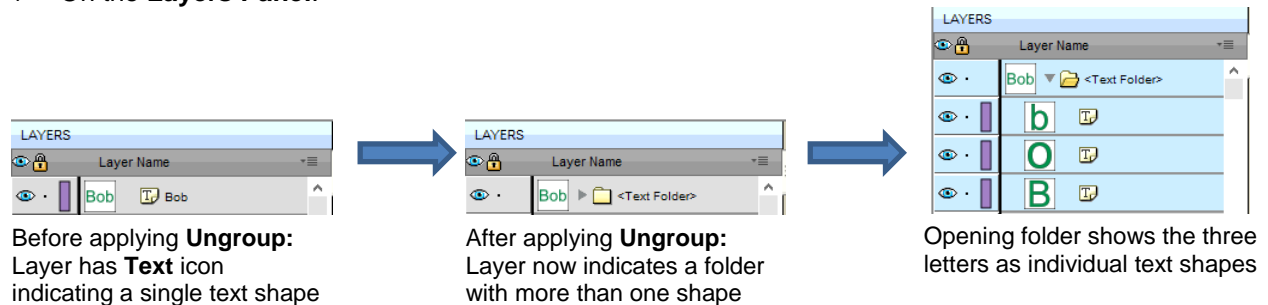
- The **Ungroup** function is used to separate a grouped layer of shapes into individual layers.
- After selecting a group, the **Ungroup** function can be applied in any of the following ways:
 - ◇ Right-click and select **Ungroup** from the popup menu
 - ◇ Go to **Object>Ungroup**
 - ◇ Press **Ctrl+Shift+G**
- The following screenshot shows the same grouped folder from the prior example both before and after ungrouping:



- Another example shows what happens when you ungroup a word. The individual letters of the word can now be selected:



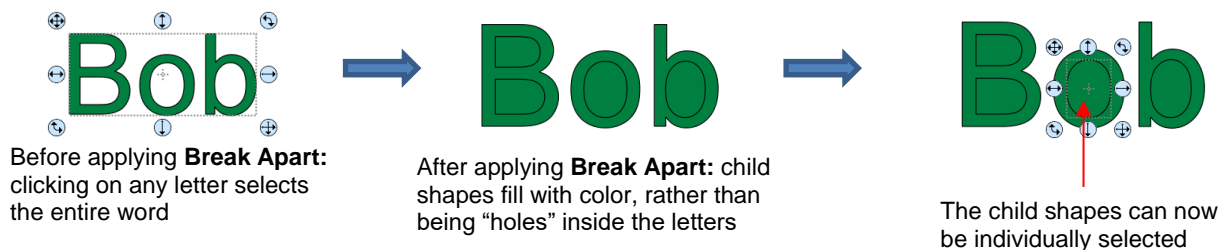
- ◇ On the **Layers Panel**:



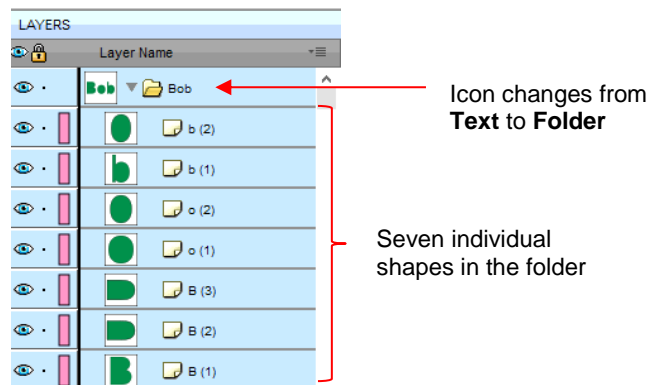
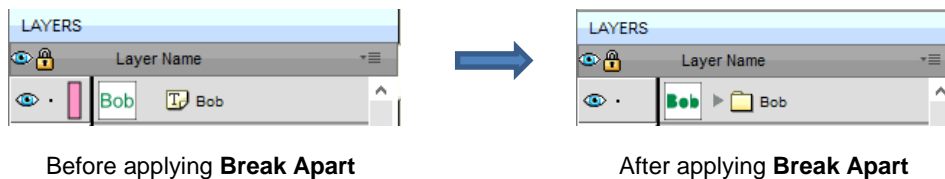
5.11 Breaking and Merging

5.11.1 Break Apart

- The **Break Apart** function goes one step further than **Ungrouping**. It is used to separate a combined shape into the individual parts that make up that shape.
- After selecting a combined shape, the **Break Apart** function can be applied in any of the following ways:
 - ◇ Right-click and select **Break Apart** from the popup menu
 - ◇ Go to **Object>Break Apart**
 - ◇ Press **Ctrl+B**
- The following screenshot shows **Break Apart** being applied to the same word “Bob” to separate the internal closed paths (also called child shapes) from the external paths (also called parent shapes):



- ◇ On the **Layers Panel**:



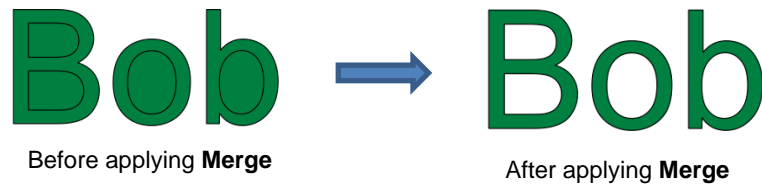
- Once you apply **Break Apart**, you have complete editing control over each individual shape within a design. But be careful! It's also easy to inadvertently move an individual shape (especially the tiny ones) and you can risk messing up the design. Thus, only use **Break Apart** when needed and then, more importantly, know how to rejoin your shapes, which is covered in the next section.

5.11.2 Merge

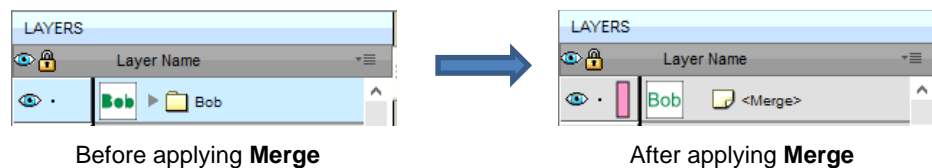
- The **Merge** function is used to combine individual paths, curves, and lines into a single shape. This is basically the opposite function to **Break Apart**.
- After selecting two or more shapes, the **Merge** function can be accessed in either of the following ways:
 - ◇ Go to **Object>Merge**

◇ Press **Ctrl+Shift+B**

- If the **Merge** function is applied to the prior “Bob” example, after having **Break Apart** applied, the word will now become all one shape again. Separated child paths no longer exist and even the individual letters can no longer be selected:



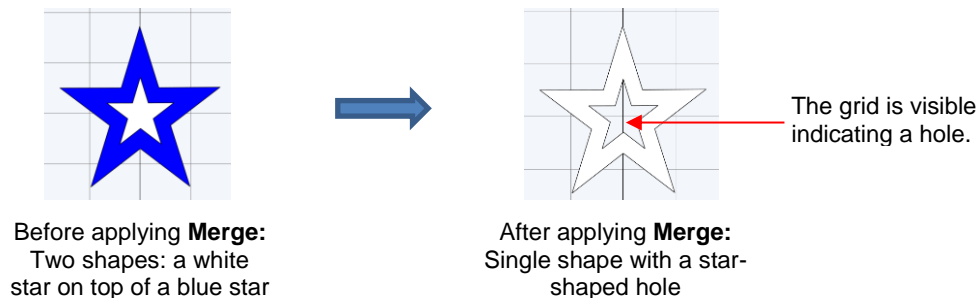
On the **Layers Panel**, this is what will appear:



- Note that if you apply **Merge** to shapes of different colors, they will all become one color because a merged shape is regarded as a single shape, even if the parts being merged do not touch:

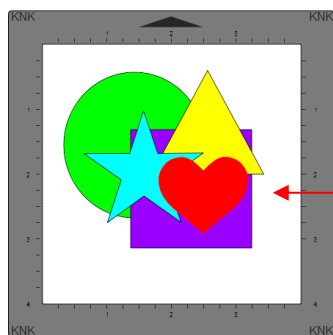


- ◇ A child shape that is merged with a parent shape essentially becomes a hole in that shape. This can be proven by having the grid showing when merging:

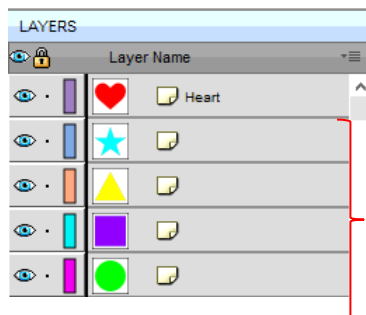


5.12 Arranging (Ordering) Shapes


- The shape order affects the visual appearance on the **Cutting Mat**. A shape that is above or on top of another shape will appear above it on the **Layers Panel**.
- The following example shows four overlapping shapes and how they appear on the **Layers Panel**:

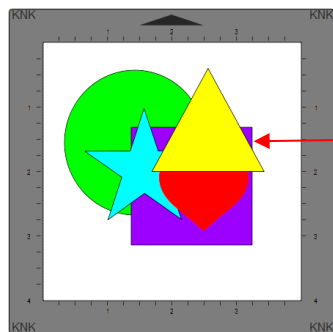


From top to bottom:
red heart
blue star
yellow triangle
purple square
green circle



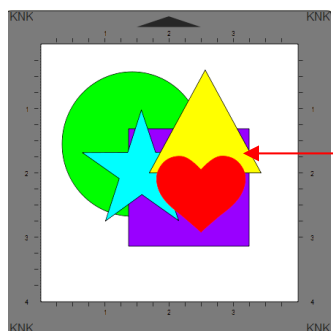
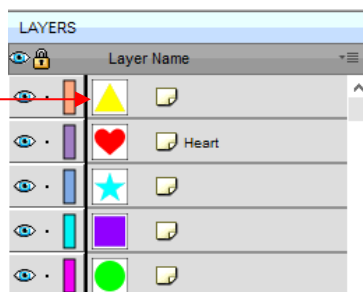
The order of the 5 shapes on the **Layers Panel** matches the overlap on the **Cutting Mat**

- In *Section 4.04.3*, moving layers was presented and could be used here to change the order of the shapes. However, another way to reorder these shapes is to select one and then access the **Arrange** functions using one of the following:
 - Go to **Object>Arrange**
 - Right-click and select **Arrange** from the popup menu
 - Click on the **Layers Menu** icon  and select **Arrange**
- Four options will then appear:
 - Bring to Front** (or **Layer to Top**): Move selection to the very top
 - Bring Forward** (or **Raise Layer**): Move selection up one level
 - Send Backward** (or **Lower Layer**): Move selection down one level
 - Send to Back** (or **Layer to Bottom**): Move selection to the very bottom
- In the above example, the yellow triangle is selected and each option shows what would have changed if it had been applied:



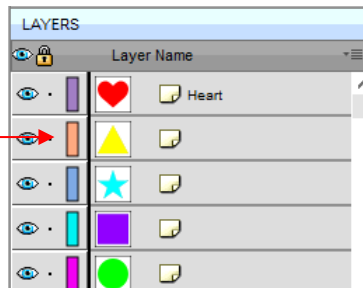
Bring to Front

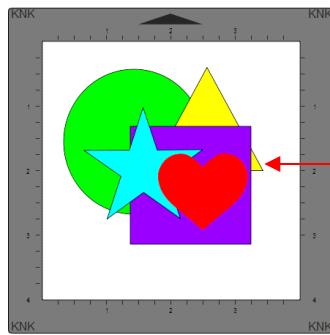
Triangle moves to the top



Bring Forward

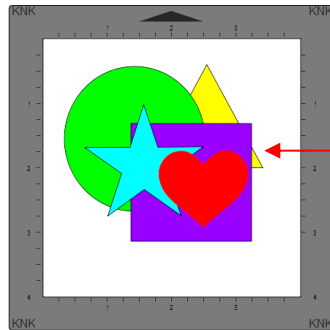
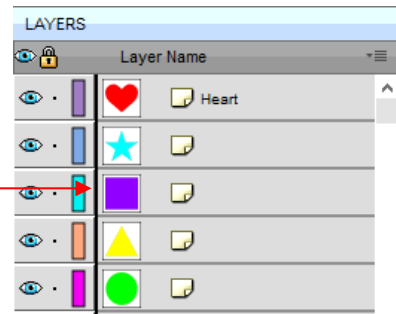
Triangle moves above blue star but is still below red heart





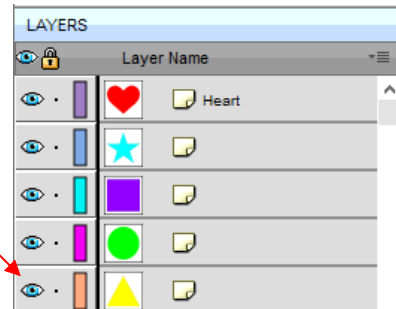
Send Backward

Triangle moves below purple square but is still above green circle



Send to Back

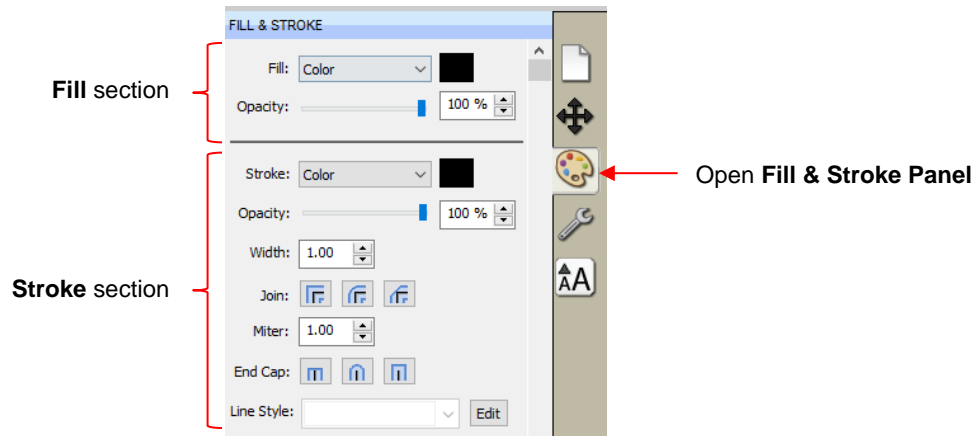
Triangle moves to the bottom



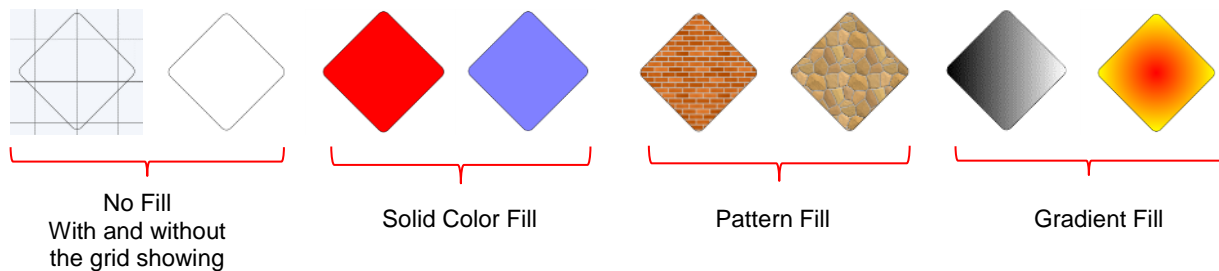
- It is worth noting that if any of the other layers had been locked or hidden, the movement of the triangle would have been the same. In other words, if the red heart had been hidden and/or locked, the triangle would still have ended up above it using **Bring to Front**.
- There are also shortcut keys (Windows version only) for these four **Arrange** functions:
 - ◇ Bring to Front - **Ctrl+Shift+Up**
 - ◇ Bring Forward - **Ctrl+Up**
 - ◇ Send Backward - **Ctrl+Shift+Down**
 - ◇ Send to Back - **Ctrl+Shift+Down**

5.13 Fill & Stroke: Fill

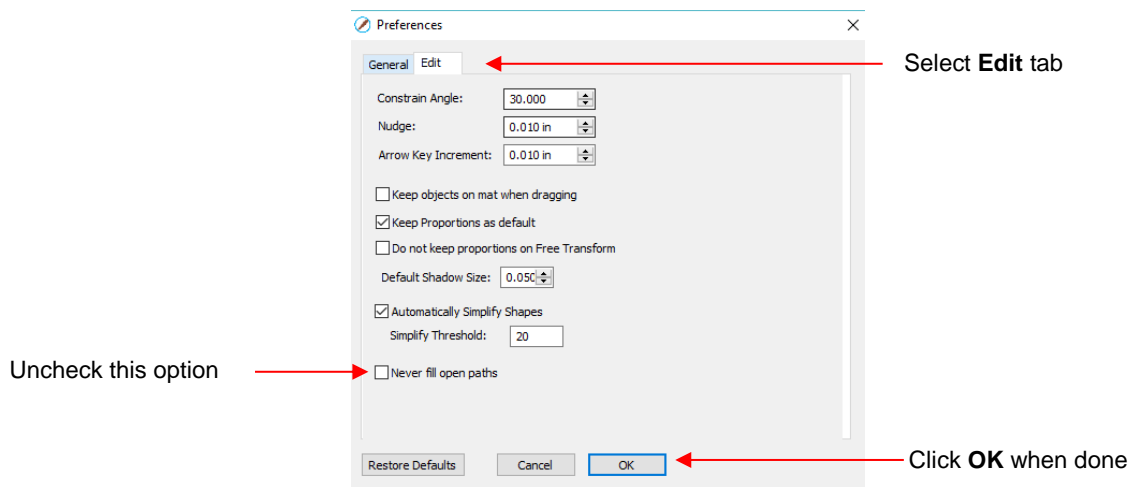
- The **Fill & Stroke Panel** provides options for changing how a shape or open path appears on the screen and, in the case of **Line Style** (solid versus dashed), how it cuts. This can be helpful in designing a project and also in print and cut applications.
- To open this panel, click on the **Fill & Stroke** icon on the **Properties Panel**:



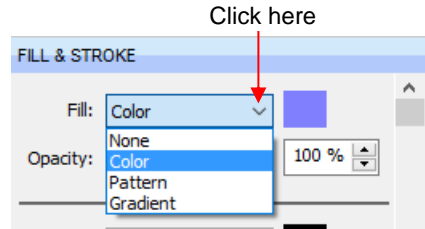
- Shapes can be filled with nothing, a solid color, a pattern or a gradient:



- By default, only closed shapes can display a fill. However, you can opt to have open shapes filled by going to **Edit>Preferences**, clicking on the **Edit** tab, and then unchecking the box next to **Never fill open paths**.

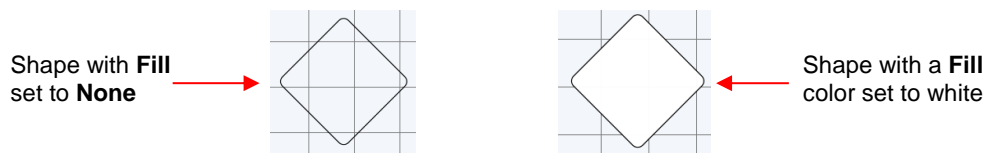


- To select a type of **Fill**, click on the drop-down menu and select from the four options:



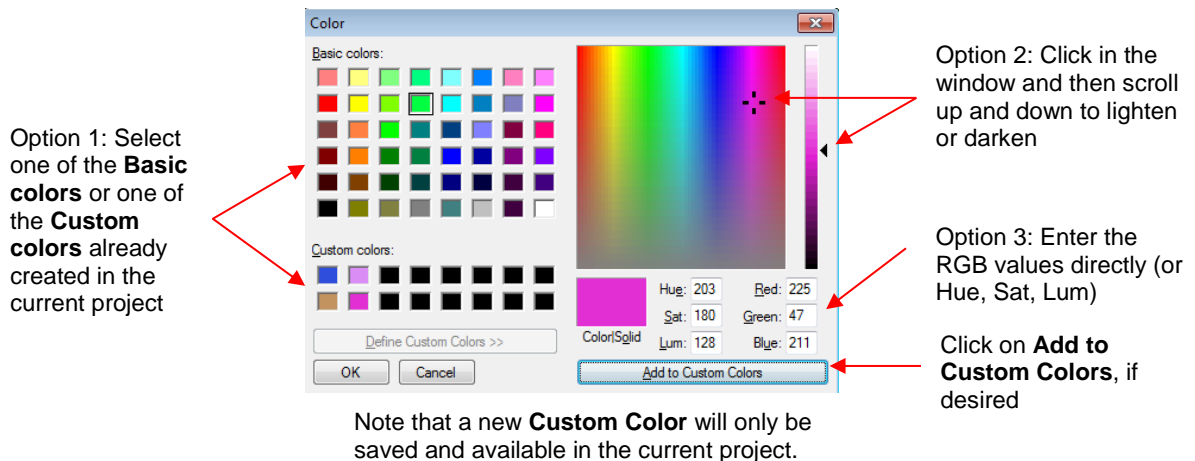
5.13.1 No Fill

- From the **Fill** menu, select **None** and shape will be empty. Note that this is not the same as having a white fill. When **None** is selected, the grid will show through the shape if the **Show Grid** option (on the **Document Panel**) is turned on:



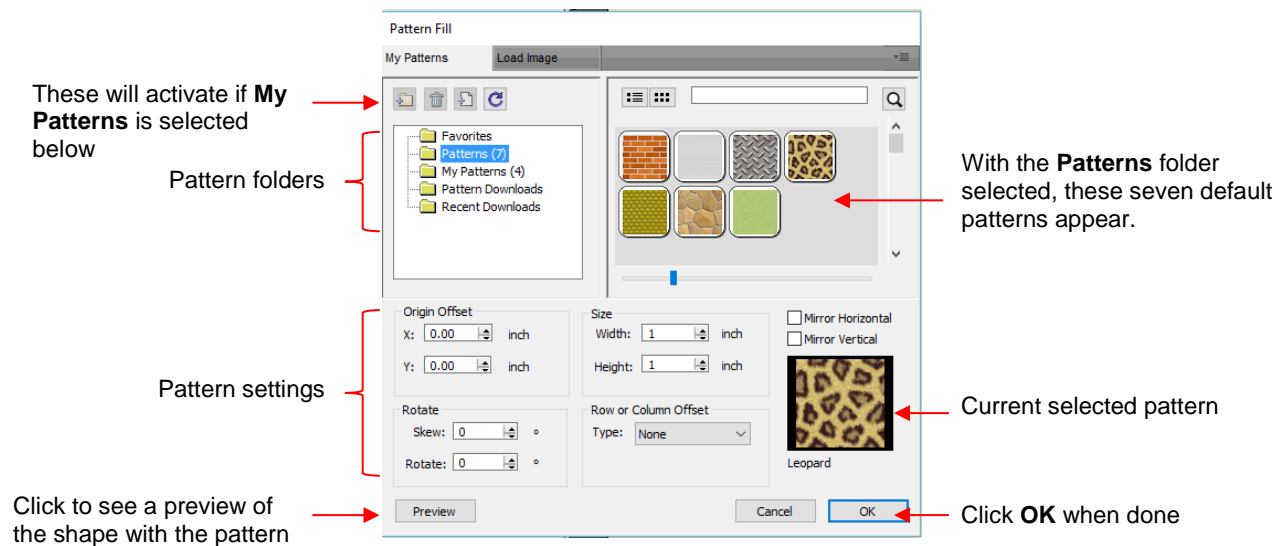
5.13.2 Color Fill

- From the **Fill** menu, select **Color** and then click on the color box to the right to open the following window where you will have the option to select a basic color or create your custom color:

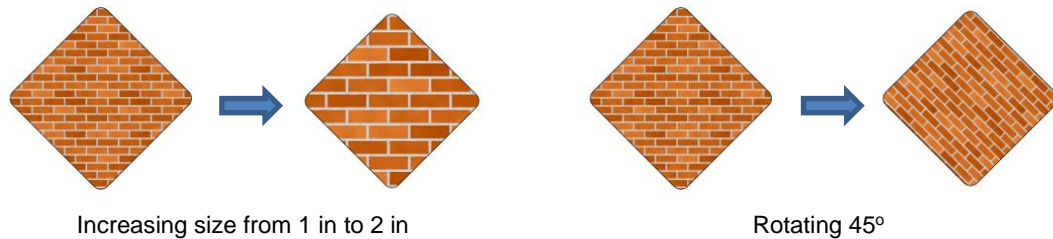


5.13.3 Pattern Fill

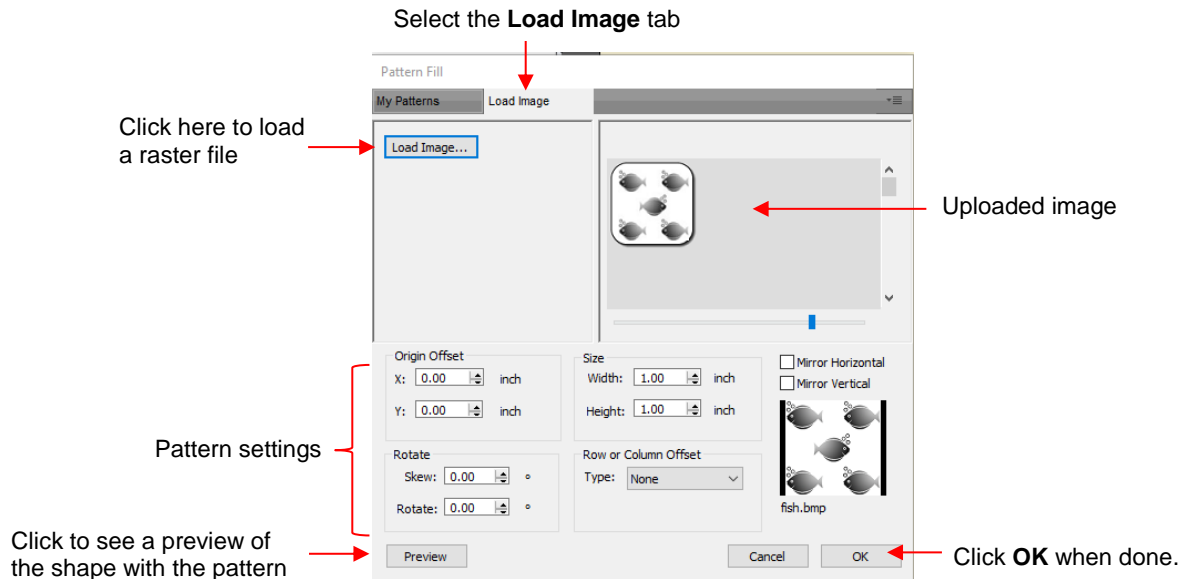
- From the **Fill** menu, select **Pattern** and then click on the color box to the right to open the following window where a pattern can be selected:



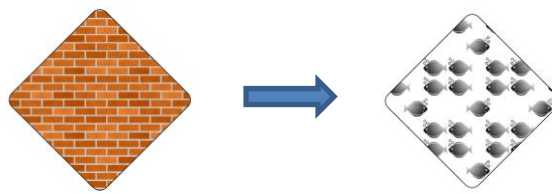
- Many of the functions in the **Pattern Fill** window are identical to those under the **Shapes** tab in the **Library**. Refer to *Section 4.03.1* for directions on searching, adding new folders, adding new files, adding to **Favorites**, etc.
- When adding your own patterns under **My Patterns**, select common raster file formats (e.g. BMP, PNG, JPG).
- The pattern settings can be used to modify how the pattern appears in the filled shape, for example:



- The other tab, **Load image**, can be used to load a raster file to use as a pattern, if you do not wish to save it under **My Patterns**. It has pattern settings, as well:

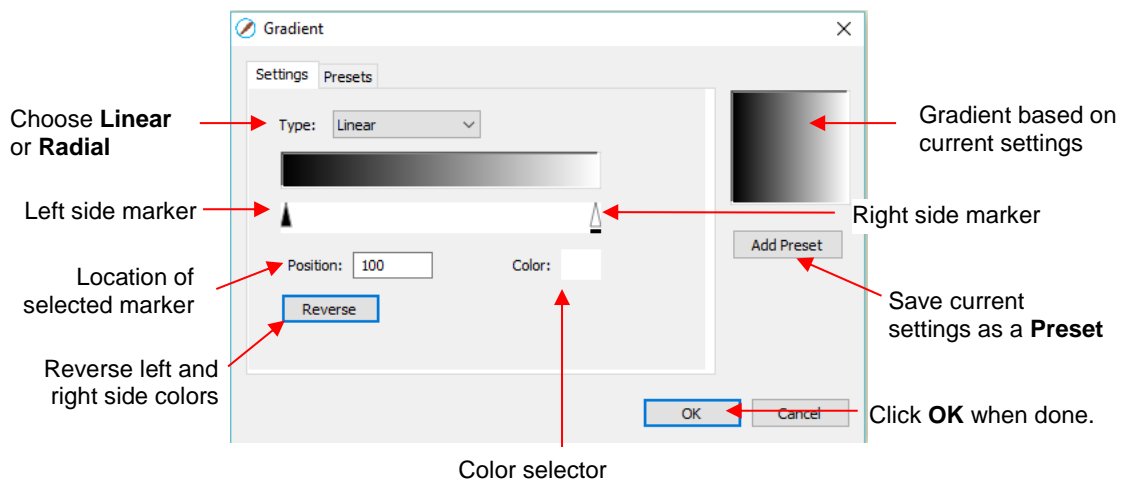


- The selected shape now fills with the uploaded image:

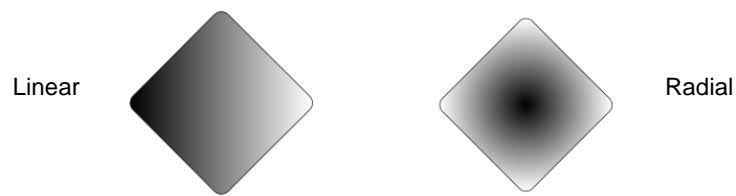


5.13.4 Gradient Fill

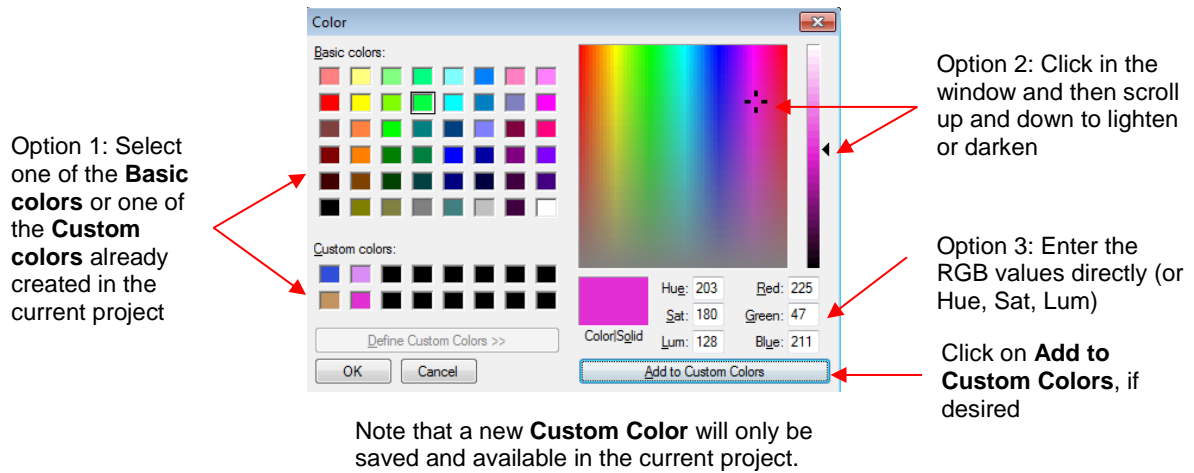
- From the **Fill** menu, select **Gradient** and then click on the color box to the right to open the following window where a gradient can be designed:



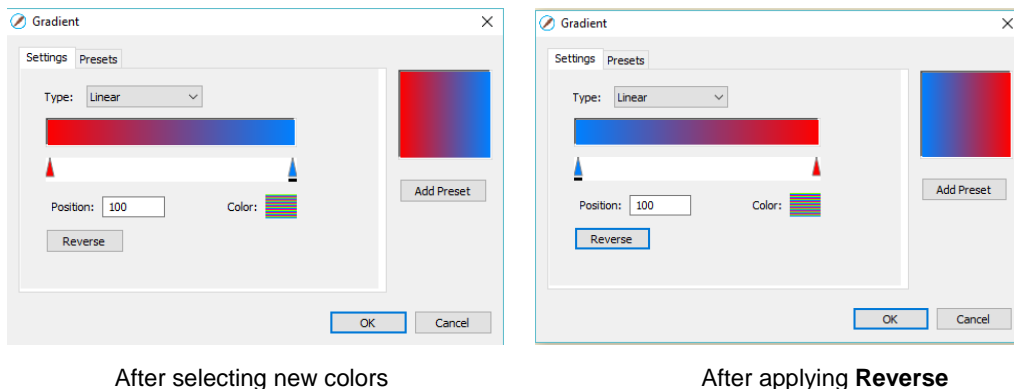
- **Type:** Choose **Linear** for a left-to-right gradient. Choose **Radial** for a center outwards gradient:



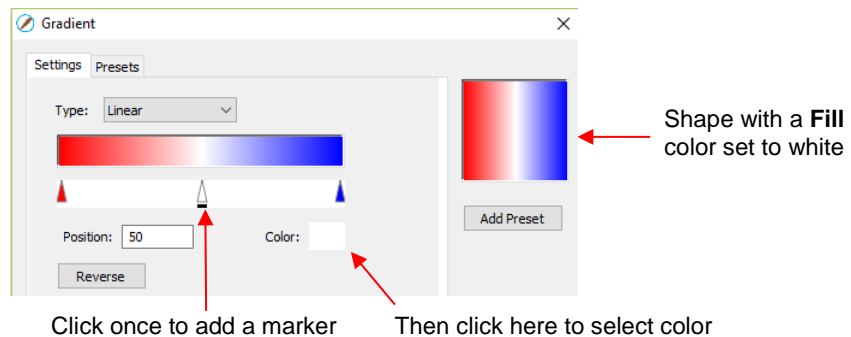
- ◇ To change colors, click on one of the markers, then click on the color selector box and choose a color from the **Color** window. Repeat for the other marker. As with other color selections, you can choose a base color or create a custom color:




- ◇ After selecting new colors, the thumbnail image will update. Note that clicking on **Reverse** will switch the two chosen colors:



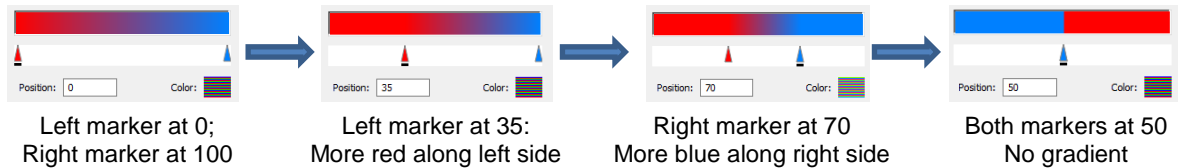
- ◇ More markers can be added by clicking on the **Position Bar** and then clicking on the **Color** selector. For example, white could have been added to the middle:




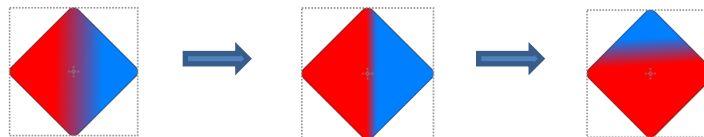
- ◇ If you inadvertently add a marker or decide you don't want one or more of the new ones, drag the marker downward and it will be removed.
- ◇ **Position:** The **Position** value is a location from 0 to 100 and applies to whichever marker is selected.

Note the little black line under a selected marker .

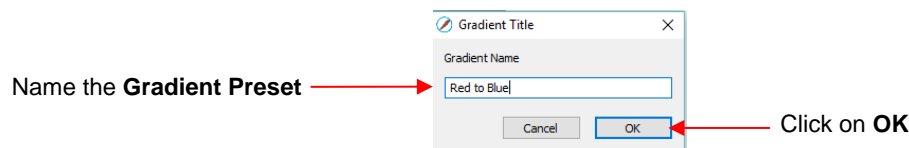
- ◇ Changing the **Position** moves the marker and resets where the gradient begins on that side. You can also manually slide the markers to change the **Position**, as well. Returning to the two-color example:



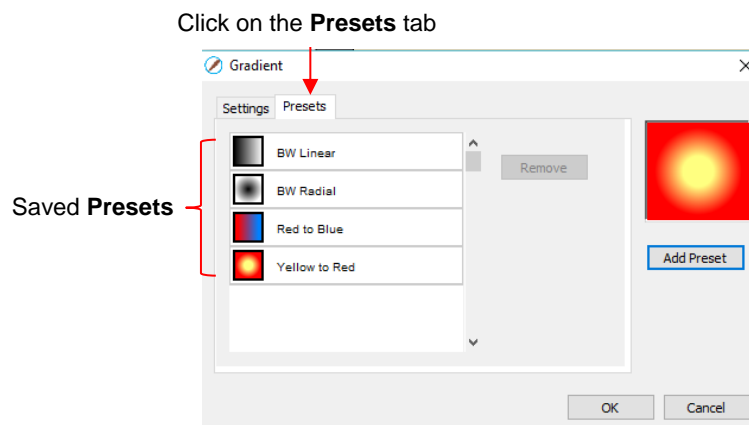
- ◇ The **Position** can also be changed after the shape is filled and the **Gradient** window is closed. On the **Tools Panel** is a **Gradient** tool . After selecting the shape, click on the **Gradient** icon and then drag the mouse across the shape to change the **Positions** and even rotate the gradient:



- ◇ If you want to save a particular gradient for future applications, click on **Add Preset** and a window will open where you can name this **Preset**:

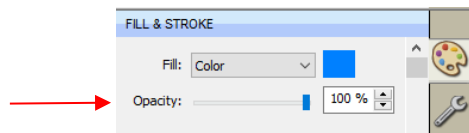


- ◇ To access your saved **Gradient Presets**, click on the **Presets** tab and the menu will appear:



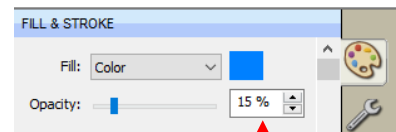
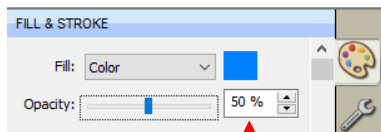
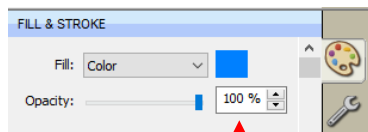
5.13.5 Opacity

- Just below the **Fill** setting is **Opacity**:

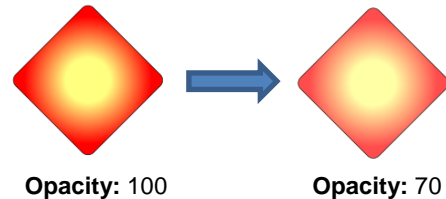
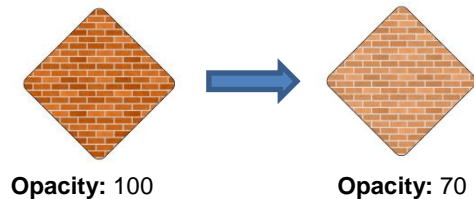


- Decreasing the **Opacity** setting will make a shape more transparent. This can be used for changing the appearance for printing or for revealing shapes that are completely or just partially hidden by other shapes.

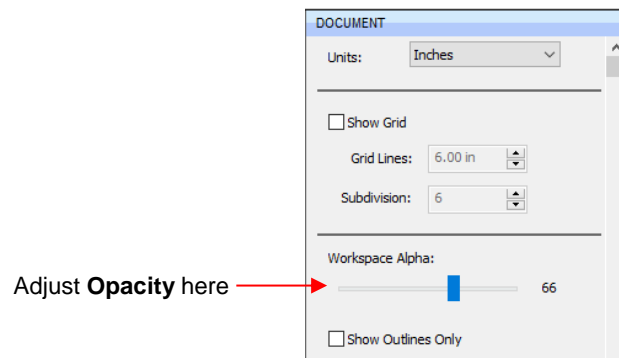
◇ In the following example, the **Opacity** is decreased on the blue circle, allowing the blocked portion of the red square to be seen:



◇ Lowering the **Opacity** can be applied to shapes filled with **Patterns** and **Gradients**, as well:

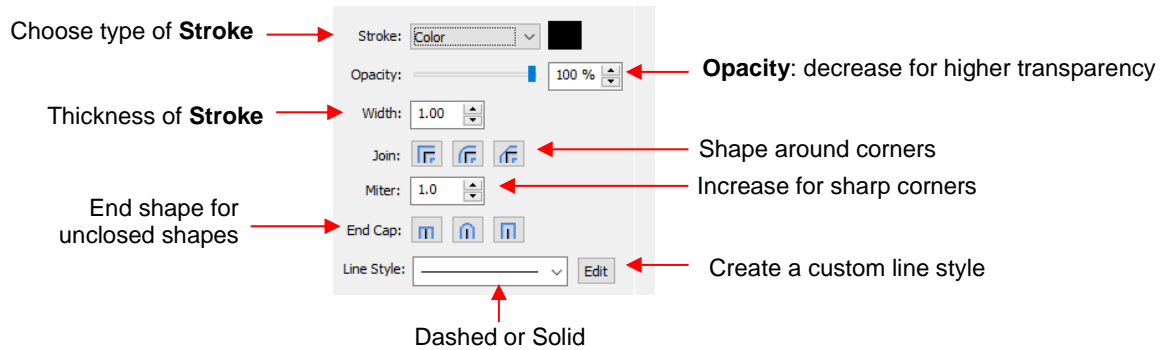


◇ If you want to decrease the **Opacity** for all shapes, the **Workspace Alpha** setting on the **Documents Panel** can be reduced from 100% to the desired level:



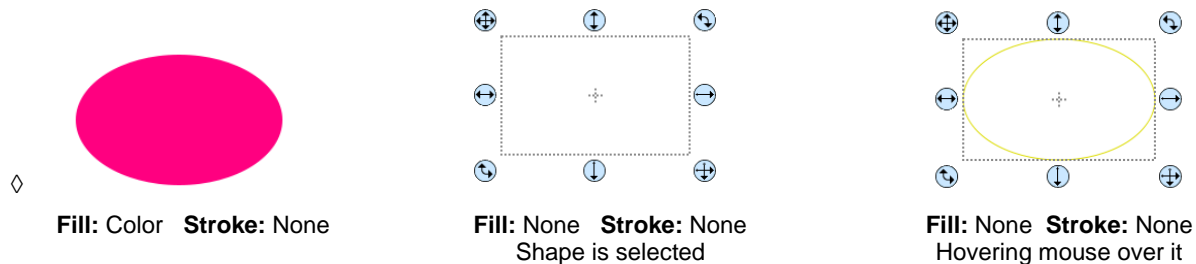
5.14 Fill & Stroke: Stroke

- The **Stroke** settings are located below the **Fill** settings on the **File & Stroke Panel**. Note the following:



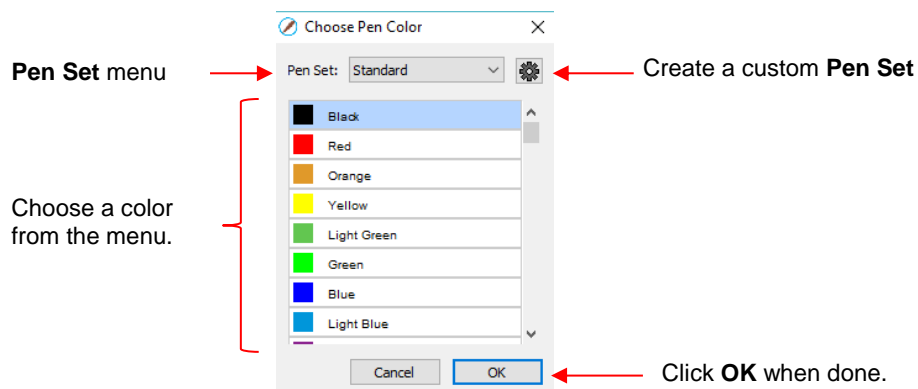
- **Stroke**: All shapes have a **Stroke** assignment using one of the following choices:

- ◇ **None**: The shape will not have an outline. Note that if you also choose **None** for the **Fill**, then you will not be able to see the shape at all unless you hover the mouse over it:

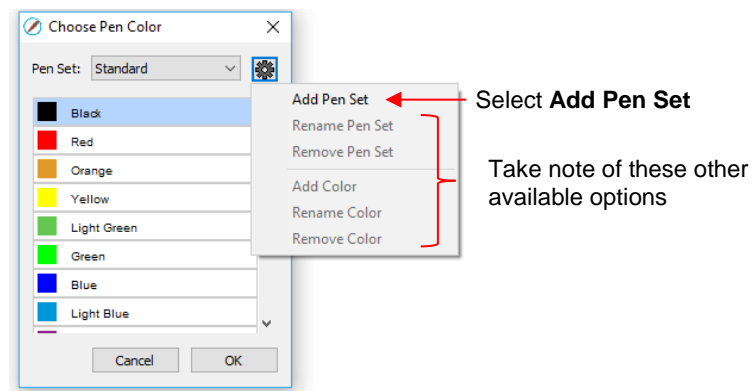


- ◇ **Color**: Once **Color** is selected, click on the box to the right and the **Color** window will open. This is the same window that opened when **Color** was selected under **Fill**. As with other color selections, you can choose a base color or create a custom color.
- ◇ **Pen Color**: Choose this if you are recoloring lines based on selecting actual pens or other tools to switch out during the cut.

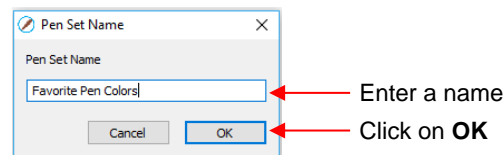
- When you choose **Pen Color** and then click on the box to the right, the **Choose Pen Color** window opens:



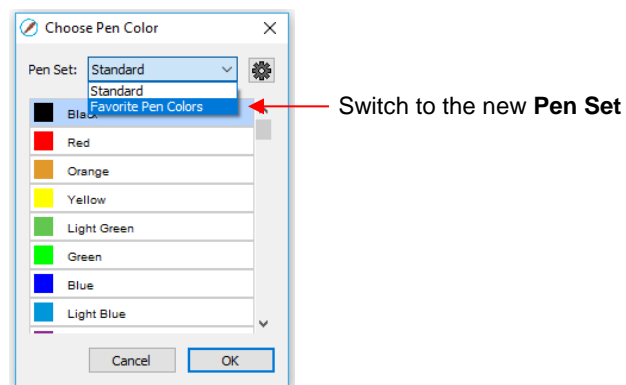
- Select the desired color from the menu and click **OK**. You also have the option to create your own custom **Pen Set** by clicking on the small icon in the upper right corner [Gear icon]. The following menu appears and you can then select **Add Pen Set**:




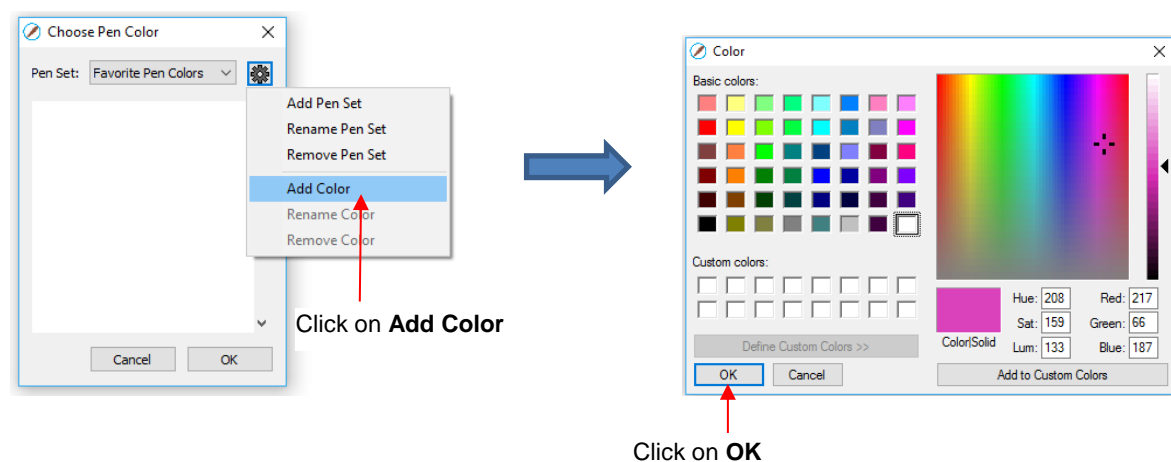
- Next, name the pen set:



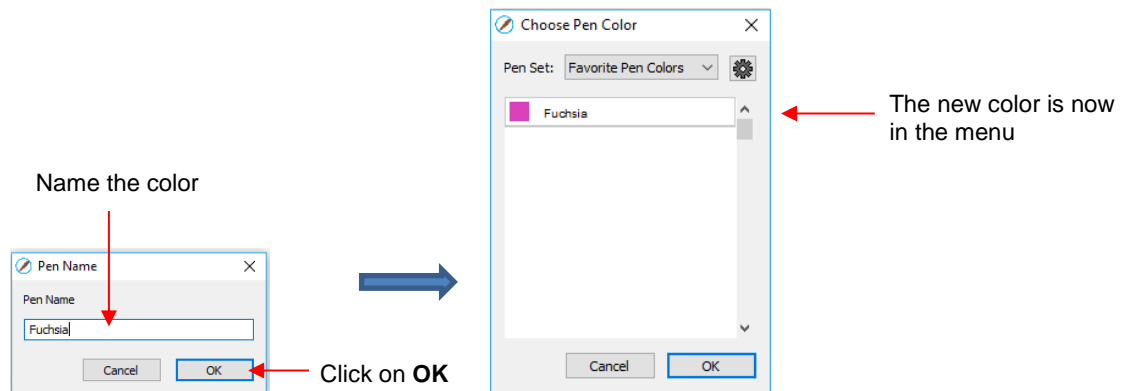
- In the **Pen Set** menu, you can now select the new **Pen Set Name**:



- Again, click on the small icon in the upper right corner  and you can begin adding pen colors with their respective RGB color values or just scroll to create colors you like:



- After clicking on **OK**, you will be prompted to name this color and then it will show up in the menu:



- In the same menu where you can add new colors, are options to **Remove Color** or **Rename Color**. Before you can use these options, you will need to close and reopen SCAL.

- **Opacity:** Decreasing the **Opacity** setting will make the **Stroke** color more transparent. It's not particularly noticeable until you increase the **Stroke Width**, thus examples will be shown in the next bullet.
- **Width:** Increasing the **Width** will make the **Stroke** thicker. The units are in pixels thus the same values give the same results whether your SCAL **Units** are set to inches, cm, or mm.



Stroke Width: 1
Opacity: 100%



Stroke Width: 10
Opacity: 100%




Stroke Width: 20
Opacity: 100%




Stroke Width: 20
Opacity: 50%

- ◇ **IMPORTANT:** The **Stroke Width** does not affect how a shape or line is cut or drawn. It's only used for display and printing purposes.

- **Join** consists of three options which affect how sharp corners are handled:

- ◇ **Miter**  : Corners are sharp but will become beveled at low values of **Miter**

- ◇ **Round**  : Corners are rounded off.

- ◇ **Bevel**  : Corners are clipped at a 45° angle.

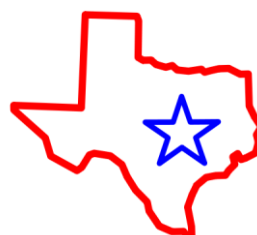
- Just as with **Opacity**, there's not a strong visual difference if the **Stroke Width** is small. Thus, to illustrate **Join**, a **Stroke Width** of 20 will be used:



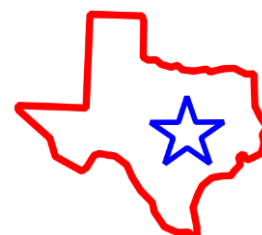
Join: Miter
Miter: 1.0
Slightly beveled



Join: Miter
Miter: 3.5
Sharp corners






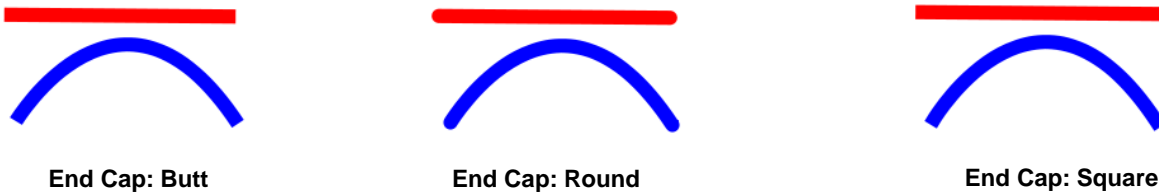
Join: Round



Join: Bevel

- **End Caps:** Unclosed shapes, such as lines and arcs, can have the **Stroke** shape on the ends changed, similar to the **Join** setting. The choices are:

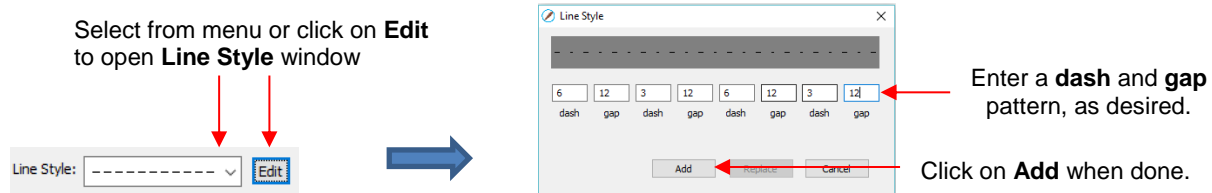
- ◇ **Butt** : The end is squared off, aligned with the actual end of the path
- ◇ **Round** : The end is rounded.
- ◇ **Square** : The end is squared off and extends beyond the actual end based on the **Stroke Width**.



- To better illustrate the difference between **Butt** and **Square**, the original line is shown in a close up:




- **Line Style:** The **Line Style** can be either solid or dashed. If dashed is selected, then one of the default patterns can be selected or you can specify the dash length and spacing desired by clicking on **Edit**:



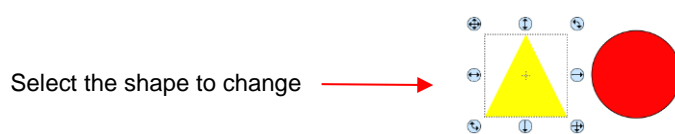
- ◇ The **Line Style** selected will be displayed on the screen and will be cut or drawn with that style by the cutter. Again, the **Stroke Width**, however, is ignored by the cutter.

5.15 Dropper Tool

- Shapes can also have the **Fill**, **Stroke** or both changed based on the settings for another shape. This is accomplished using the **Dropper** tool  on the **Tools Panel**.

- To use this function:

- ◇ Select the shape to be recolored. In this example, it will be a yellow triangle with no **Stroke**:



- ◇ Click on the **Dropper** tool icon and choose a setting from the **Tool Options**:



- ◇ Finally, click on the shape that has the color property you wish to use. In this case it's the red circle with the black **Stroke**. The selected triangle is recolored to match.



Move the mouse over the shape that has the desired color(s)

After clicking on the circle, the triangle **Fill** color is now red and the **Stroke** color is now black

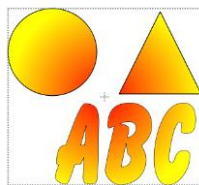
- Note that other properties, such as **Stroke Width** or **Opacity**, will not be copied onto the selected shape. On the other hand, if the **Fill** is a pattern or gradient, it will be copied. You can also fill multiple shapes at once:



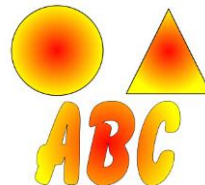
A selection of three shapes will be recolored with the fill gradient in the diamond on the right

All three shapes are filled at once

- Note, however, that the three shapes were treated as one object when filling with the gradient. A different result is obtained if each shape had been filled separately:



All three shapes recolored at once



Shapes recolored individually

5.16 Cutting, Copying, Pasting, Duplicating

5.16.1 Cutting to the Clipboard

- To cut shapes to the clipboard (copy to the clipboard and delete from the **Cutting Mat**), first select the shape or shapes and then use any of the following:

- ◇ Click on the **Cut** icon located on the upper **Toolbar**
- ◇ Right-click on the screen and select **Cut**
- ◇ Press **Ctrl+X**
- ◇ Go to **Edit>Cut**



5.16.2 Copying to the Clipboard

- To copy shapes to the clipboard, first select the shape or shapes and then use any of the following:

- ◇ Click on the **Copy** icon located on the upper **Toolbar**
- ◇ Right-click on the screen and select **Copy**
- ◇ Press **Ctrl+C**
- ◇ Go to **Edit>Copy**



- To make multiple copies, refer to the **Duplicate** function described later in this section.

5.16.3 Pasting from the Clipboard

- There are three **Paste** functions in SCAL:
 - ◇ **Paste:** pastes the shape offset slightly (0.25") from the original
 - ◇ **Paste in Place:** pastes the shape in exactly the same location as the original
 - ◇ **Paste (Auto Fill):** pastes enough copies to auto-fill the **Cutting Mat**

- To **Paste** shapes from the clipboard, use any of the following:

- ◇ Click on the icon located on the upper **Toolbar**
- ◇ Right-click on the screen and select **Paste**
- ◇ Press **Ctrl+V**
- ◇ Go to **Edit>Paste**



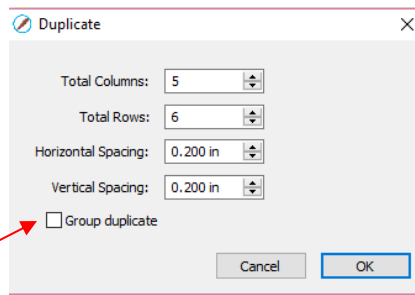
- To **Paste in Place** shapes from the clipboard, use any of the following:
 - ◇ Right-click on the screen and select **Paste in Place** (without any shapes selected)
 - ◇ Press **Ctrl+Shift+V**
 - ◇ Go to **Edit>Paste in Place**
- To **Paste (Auto Fill):** use either of the following:
 - ◇ Press **Ctrl+Shift+Alt+V**
 - ◇ Go to **Edit>Paste (Auto Fill)**

5.16.4 Duplicating - Duplicate

- The **Duplicate** function allows you to make multiple copies of a shape aligned in rows and/or columns, with the spacing you desire. To access **Duplicate**, first select the shape(s) and then use either of the following:
 - ◇ Press **Ctrl+D**
 - ◇ Go to **Object>Duplicate**
- To fill your grid with images, move the selected shape(s) to the top left corner of the gridded part of the **Cutting Mat**. With the shape(s) still selected, use **Ctrl-D** (or **Object>Duplicate**) to open the **Duplicate** window. As you begin clicking on **Total Columns** and **Total Rows**, the mat will fill with the shapes. Change the **Spacing**, as needed, to better fit the duplicates. Click on **OK** to accept:

Increase **Rows** and **Columns** to fill **Cutting Mat** and change **Spacing**, as desired or as needed.

Option to group all of the shapes



Click on **OK** to accept

- To create a single row of repeats, set the **Rows** value to 1. For a single column of repeats, set the **Columns** value to 1. To overlap the repeats, enter a negative number under **Spacing**. Refer to *Section 9.03.1* for a tutorial on how this function can be used to create a border.
- There is also a **Duplicate Rotated** function to arrange the duplicates in a circular formation. Because this is more typically used for design purposes, it is covered in *Section 9.06*.

5.16.5 Quick Duplicate

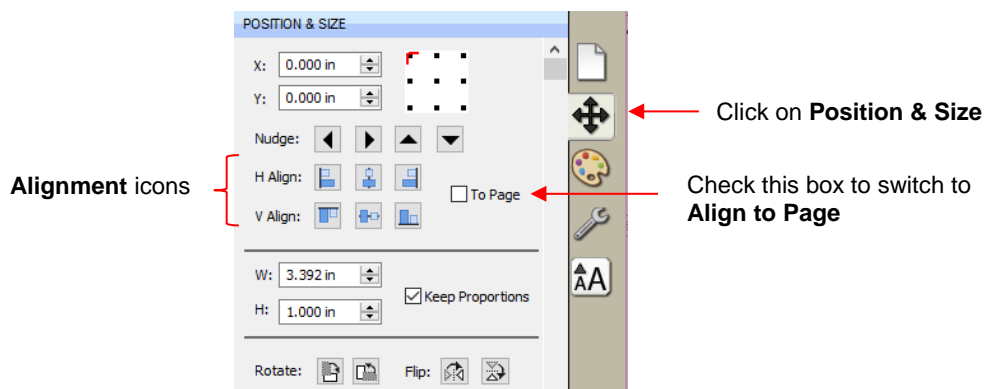
- A quick way to make a single copy of a shape is to hold the **Alt** key while dragging the shape. The original will be left behind and new copy will be moved with the mouse.
- You can also hold the **Alt** key and left-click on a shape and it will duplicate that shape leaving the copy on top of the original.

5.17 Alignment

- There are fourteen functions used to align shapes, seven of them with respect to the **Cutting Mat** (referred to as **Page**) and another seven with respect to one another (referred to as **Selection**). After selecting two or more shapes, these functions can be accessed using either of the following:

◇ Go to **Object>Alignment**

◇ Click on an alignment icon from the **Position & Size** window on the **Properties Panel**:

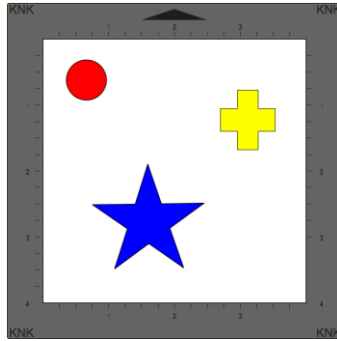


Alignment icons

Click on **Position & Size**

Check this box to switch to **Align to Page**




- The following three shapes, in their current relative positions, will be used to illustrate what happens when each alignment function is applied. Note that a small custom mat was created to facilitate screenshots:

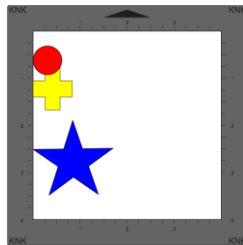


5.17.1 Align to Page

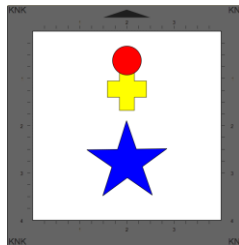
- Make sure the alignment mode is set to **Align to Page**. To do this, either:
 - ◇ Go to **Object>Alignment** and make sure **Align to Page** is checked
 - ◇ Check the **To Page** option on the **Position & Size** panel

- With the shapes selected, the horizontal alignment options are:

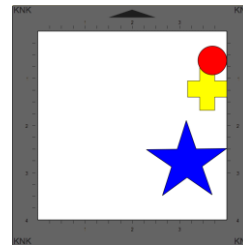
- ◇ **Align Left** aligns shapes along the left side of the **Cutting Mat**. 
- ◇ **Align Horizontal Center** aligns shapes through the center of the **Cutting Mat**. 
- ◇ **Align Right** aligns shapes along the right side of the right side of the **Cutting Mat**. 



Align Left






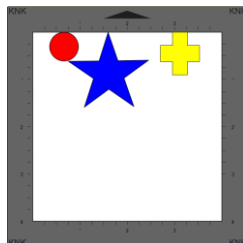
Align Horizontal
Center



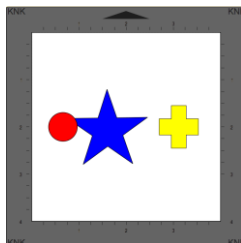
Align Right

- With the shapes selected, the vertical alignment options are:

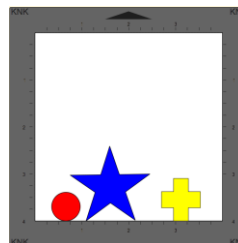
- ◇ **Align Top** aligns shapes along the top side of the **Cutting Mat**. 
- ◇ **Align Vertical Center** aligns shapes through the center of the **Cutting Mat**. 
- ◇ **Align Bottom** aligns shapes along the bottom side of the **Cutting Mat**. 



Align Top



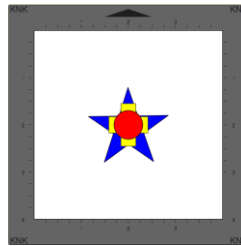
Align Vertical
Center



Align Bottom

- To center all three shapes in the middle of the **Cutting Mat**, use either:

- ◇ A combination of **Align Horizontal Center** and **Align Vertical Center**:
- ◇ Go to **Object>Alignment>Align Centers**

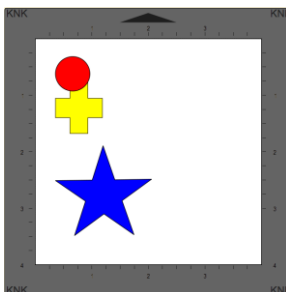


Align Centers

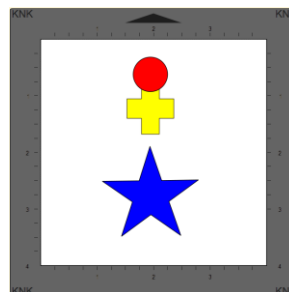
5.17.2 Align to Selection

- First, make sure the alignment mode is set to **Align to Selection**. This is done by either making sure the **To Page** option is not checked on the **Position & Size** panel or by going to **Object>Alignment** and making sure **Align to Selection** is checked.
- With the shapes selected, the horizontal alignment options are:

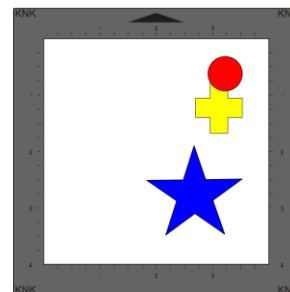
- ◇ **Align Left** aligns shapes along the left side of the leftmost shape of the group.
- ◇ **Align Horizontal Center** aligns shapes to a vertical axis through the center.
- ◇ **Align Right** aligns shapes along the right side of the rightmost shape of the group.



Align Left



Align Horizontal Center

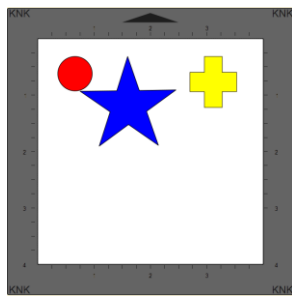


Align Right

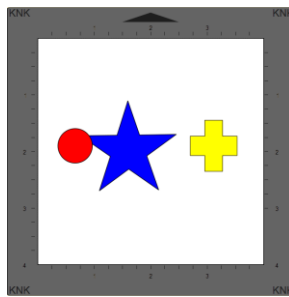
- With the shapes selected, the vertical alignment options are:

- ◇ **Align Top** aligns shapes along the top side of the uppermost shape of the group.
- ◇ **Align Vertical Center** aligns shapes to a horizontal axis through the center.
- ◇ **Align Bottom** aligns shapes along the bottom side of the bottommost shape of the group.

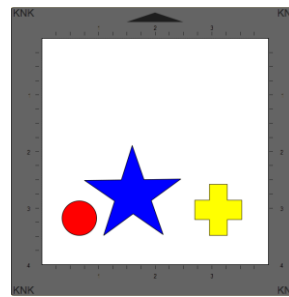




Align Top



Align Vertical Center



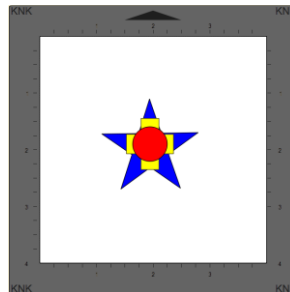
Align Bottom

- To center all three shapes use either:

◇ A combination of **Align Horizontal Center** and **Align Vertical Center**:



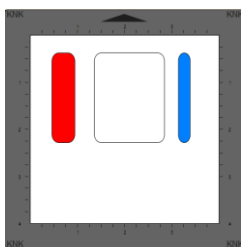
◇ Go to **Object>Alignment>Align Centers**



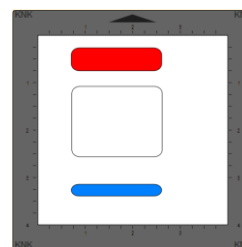
Align Centers

5.18 Distribute

- The **Distribute** function rearranges the spacing between shapes. Similar to the **Alignment** function, you can **Distribute to Page (Cutting Mat)** or you can **Distribute to Selection** (selected shapes). There's also a third, called **Distribute to Selection Below**, which distributes based on whatever shape is positioned at the lowest level on the **Layers Panel** and its difference in size relative to the outermost shape in the opposite direction of the distribute option (and yes, this is confusing, but will be explained in *Section 5.18.3*)
- After selecting the shapes, these functions can be accessed by going to **Object>Distribute**.
- The following three shapes, in their current relative positions, will be used to illustrate what happens with each distribute function when **Distribute to Selection** or **Distribute to Page** is applied. Note that a small custom mat was created to facilitate screenshots:



Will be used for
horizontal distribute
examples



Will be used for
vertical distribute
examples

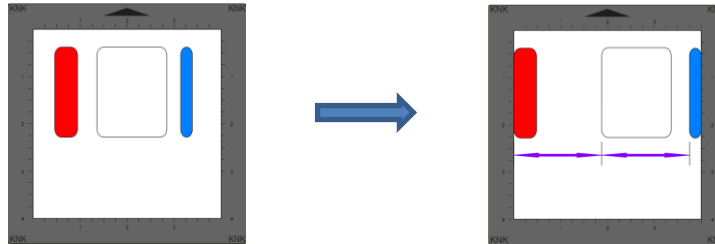
5.18.1 Distribute to Page

- Select the shapes and go to **Object>Distribute** and then make sure the **Distribute to Page** option is checked. In this mode, the two outermost shapes will align with the **Cutting Mat** and then other shapes will

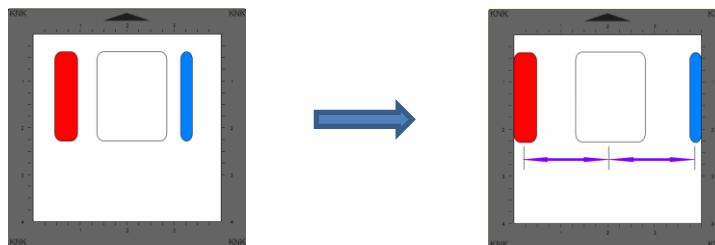
be evenly spaced from one side of the mat to the other, according to which additional option is chosen. All options, with screenshots, are presented. The purple arrows indicate equal spacing.

- With the shapes selected, the horizontal distribute options are:

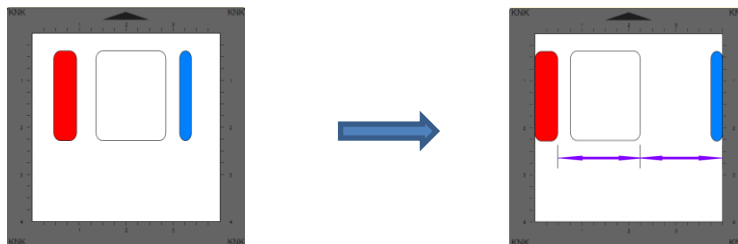
◇ **Distribute Left:** spaces shapes so that the left sides of each shape are the same distance apart:



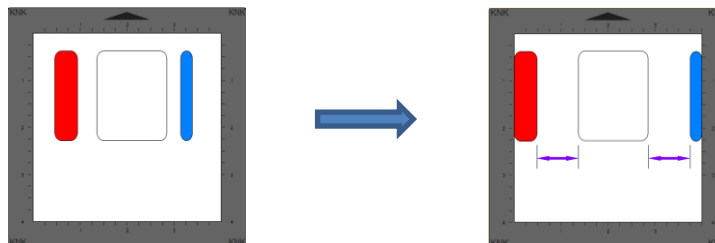
◇ **Distribute Center Horizontally:** spaces shapes so that the centers of each shape are the same distance apart:



◇ **Distribute Right:** spaces shapes so that the right sides of each shape are the same distance apart:

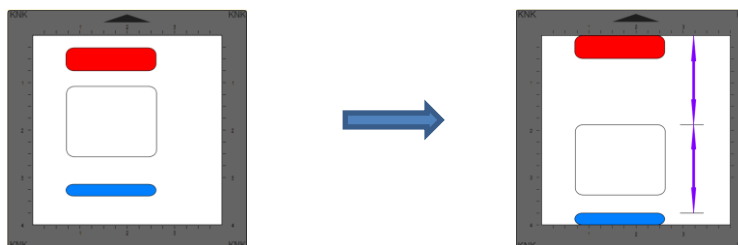


◇ **Distribute Space Horizontally:** spaces shapes so that the gaps between the shapes are the same.

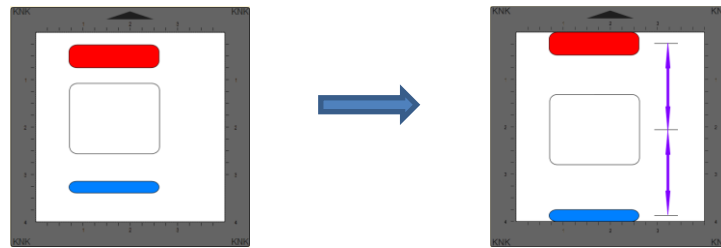


- With the shapes selected, the vertical distribute options are:

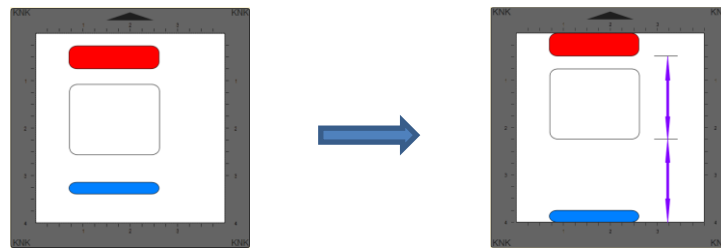
◇ **Distribute Top:** spaces shapes so that the top sides of each shape are the same distance apart:



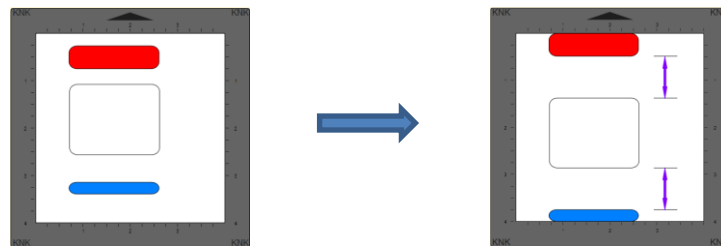
- ◇ **Distribute Center Vertically:** spaces shapes so that the centers of each shape are the same distance apart:



- ◇ **Distribute Bottom:** spaces shapes so that the bottom sides of each shape are the same distance apart:

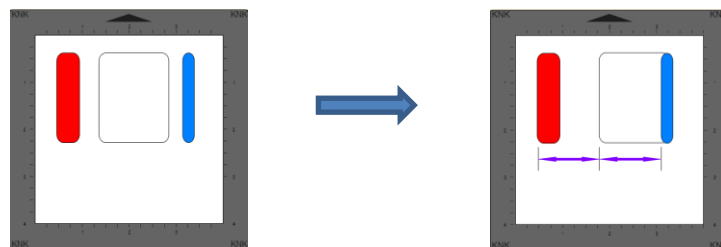


- ◇ **Distribute Space Vertically:** spaces shapes so that the gaps between the shapes are the same.

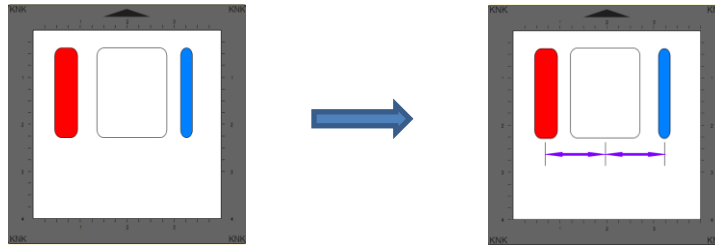


5.18.2 Distribute to Selection

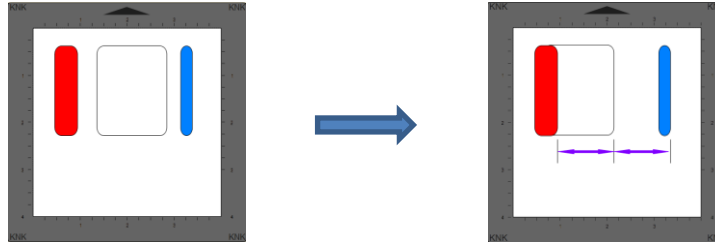
- Select the shapes and go to **Object>Distribute** and then make sure **Distribute to Selection** is checked. In this mode, the two outermost shapes will remain in position and then other shapes will be evenly spaced, according to which additional option is chosen. All options, with screenshots, are presented. Again, the purple arrows indicate equal spacing.
- With the shapes selected, the horizontal distribute options are:
 - ◇ **Distribute Left:** spaces shapes so that the left sides of each shape are the same distance apart:



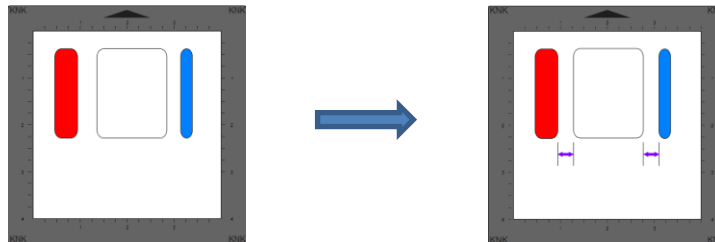
- ◇ **Distribute Center Horizontally:** spaces shapes so that the centers of each shape are the same distance apart:



- ◇ **Distribute Right:** spaces shapes so that the right sides of each shape are the same distance apart:

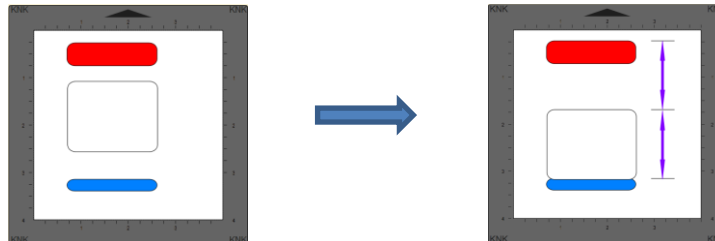


- ◇ **Distribute Space Horizontally:** spaces shapes so that the gaps between the shapes are the same.

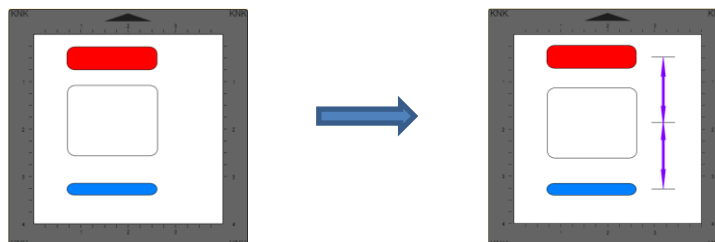


- With the shapes selected, the vertical distribute options are:

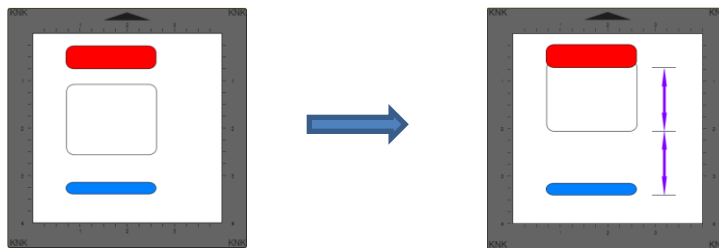
- ◇ **Distribute Top:** spaces shapes so that the top sides of each shape are the same distance apart:



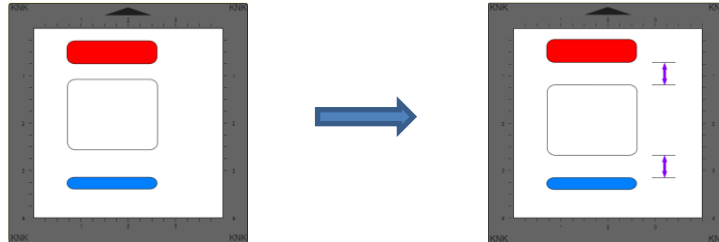
- ◇ **Distribute Center Vertically:** spaces shapes so that the centers of each shape are the same distance apart:



- ◇ **Distribute Bottom:** spaces shapes so that the bottom sides of each shape are the same distance apart:

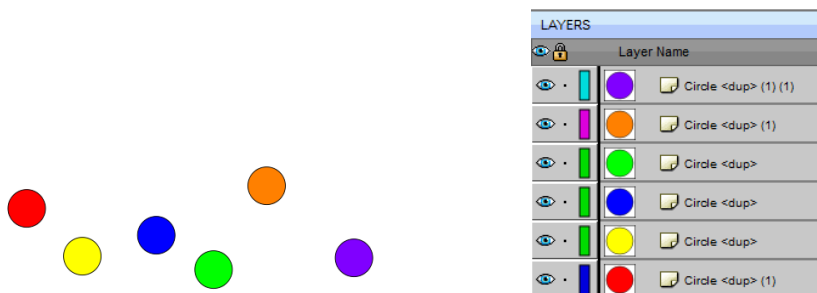


- ◇ **Distribute Space Vertically:** spaces shapes so that the gaps between the shapes are the same.

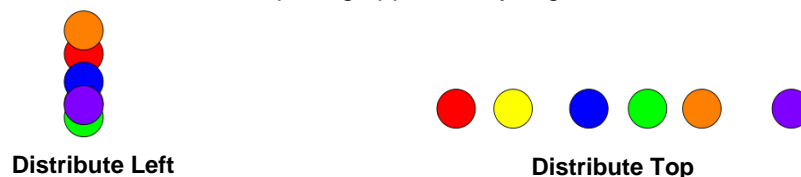


5.18.3 Distribute to Selection Below

- This function is, hands down, the strangest function I have encountered in 10 years of writing technical manuals. I have no practical applications to share and the developer hasn't responded to my request for assistance. Thus, I can only explain what happens when you apply it. Maybe one of our readers will figure out a great use for it and share with me so that I can add it to this section.
- Given a selection of shapes, applying one of the **Distribute to Selection Below** options will space the shapes based on the difference in size between the bottommost shape of the selection and then the shape that is the furthest away in the opposite direction to the distribute option.
- As an example, here is a random scattering of 1" circles. The red one is the bottommost of the selection, as shown on the **Layers Panel**:

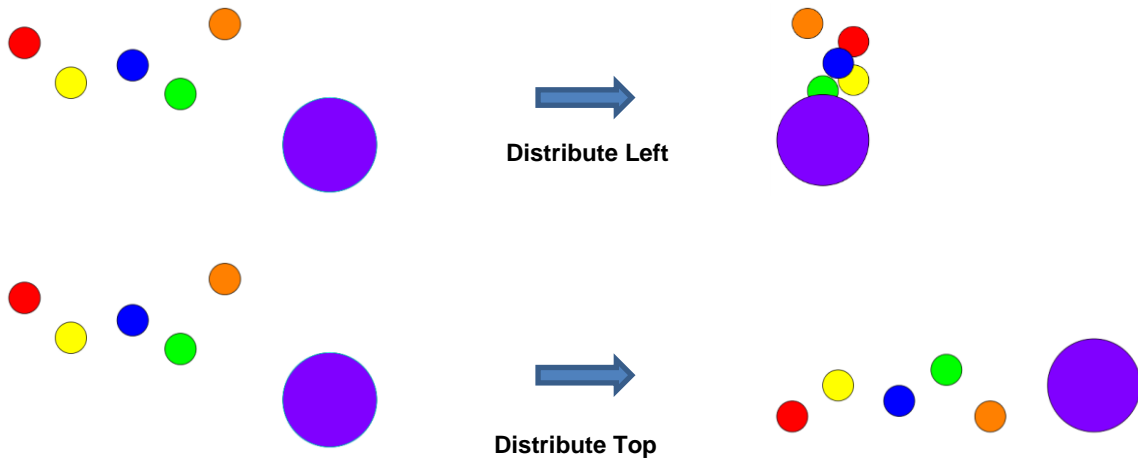


- ◇ Applying **Distribute Left** will move all of the circles to align with the left side of the red one. Applying **Distribute Top** will move all of the circles to align with the top side of the red one. Because the circles are all the same size, there is no spacing applied, only alignment:



- ◇ **Distribute Left:** Note that the up/down Y locations remain the same for all of the circles.
- ◇ **Distribute Top:** The left/right X locations remain the same for all of the circles.

- Now, let's make the purple circle that's both furthest to the right and furthest towards the bottom equal to 3" in size instead of just 1" and then apply the same **Distribute** options:



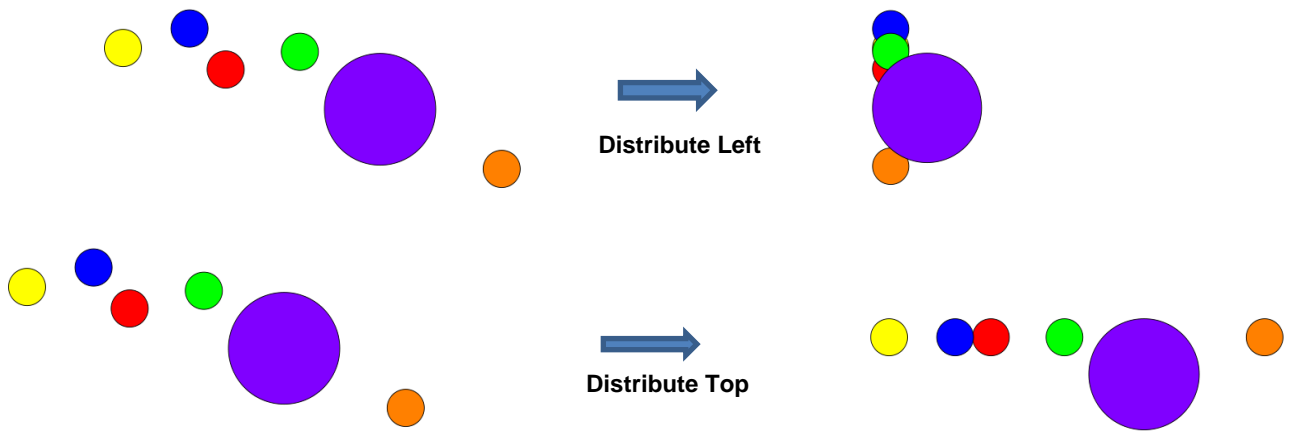
- ◇ **Distribute Left:** The new location for the 3" purple circle is now 2" to the left of the 1" red circle, which was, again, the bottommost shape. The 2" is a result of subtracting 1" from 3". The locations of the other circles are an equal spacing of that 2 inches, however note that one of the circles, the yellow one, is aligned with the red one and starts the distribution:

Location of Left Side	
Red	5"
Yellow	5"
Blue	4.5"
Green	4.0"
Orange	3.5"
Purple	3.0"

- ◇ **Distribute Top:** The same kind of new arrangement happened in this case as well, only in a vertical way. The red circle is still in the same location, but the top of the purple circle is now 2" higher than the red one and the other circles are evenly distributed, with the orange one first aligning with the red one:

Location of Top Side	
Red	3"
Orange	3"
Blue	2.5"
Yellow	2.0"
Green	1.5"
Purple	1.0"


- Now, this distribution happened because the purple circle was both larger than the red one AND it was the outermost circle in both of the opposite directions. In other words, when applying **Distribute Left**, the purple circle was the rightmost shape. When applying **Distribute Top**, the purple circle was the bottommost shape.
- If another one of the 1" circles had been the outermost, then both of those **Distribute** options would have yielded the same alignment when all of the circles were the same size. Note also that the bottommost red circle doesn't have to be on the far left or on the top. It can be located anywhere but the other circles will be moved to align with it:



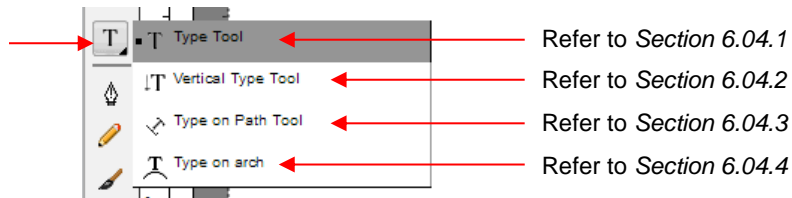
- At this time, no further details will be presented. However, if a practical application comes to light, I will be happy to include it.

6. SCAL: Working with Text

6.01 Text Options


- There are four modes for adding text to the **Cutting Mat**:
 - ◇ **Type Tool**: normal left to right typing of text
 - ◇ **Vertical Type Tool**: vertical aligned lettering
 - ◇ **Type on Path Tool**: text is aligned along the path of your choosing
 - ◇ **Type on arch**: text is arranged in a circular pattern
- To select a mode, hold down the mouse button on the **Type Tool** icon  on the **Tools Panel**. The screenshot below indicates where to go for further instructions on using that text mode:

Click and hold left
mouse button here:



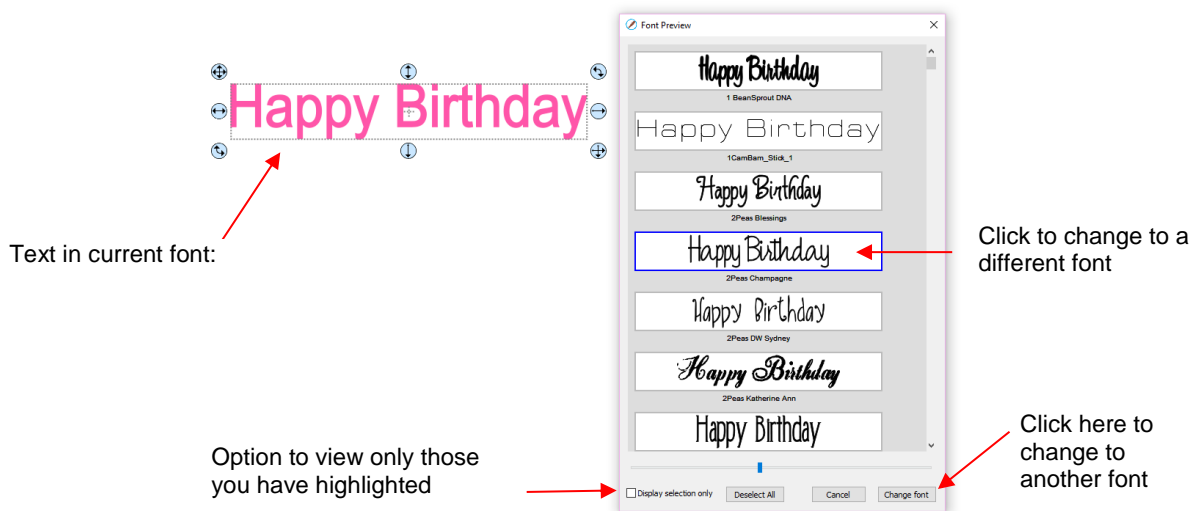
6.02 Selecting a Font

6.02.1 Choosing a Font from the Font Menu

- There are three places to select the font:
 - ◇ Click the **Text Settings** icon  on the **Properties Panel** to open the **Text Panel**. Select from the **Font** drop-down menu.
 - ◇ Go to **Text>Font**
 - ◇ Click on the **Fonts** tab in the **Library** (refer to *Section 4.03.2*).
- If you are looking for a particular font in any of those three menus, type the first letter of the font name and you will be taken to the fonts that begin with that letter.

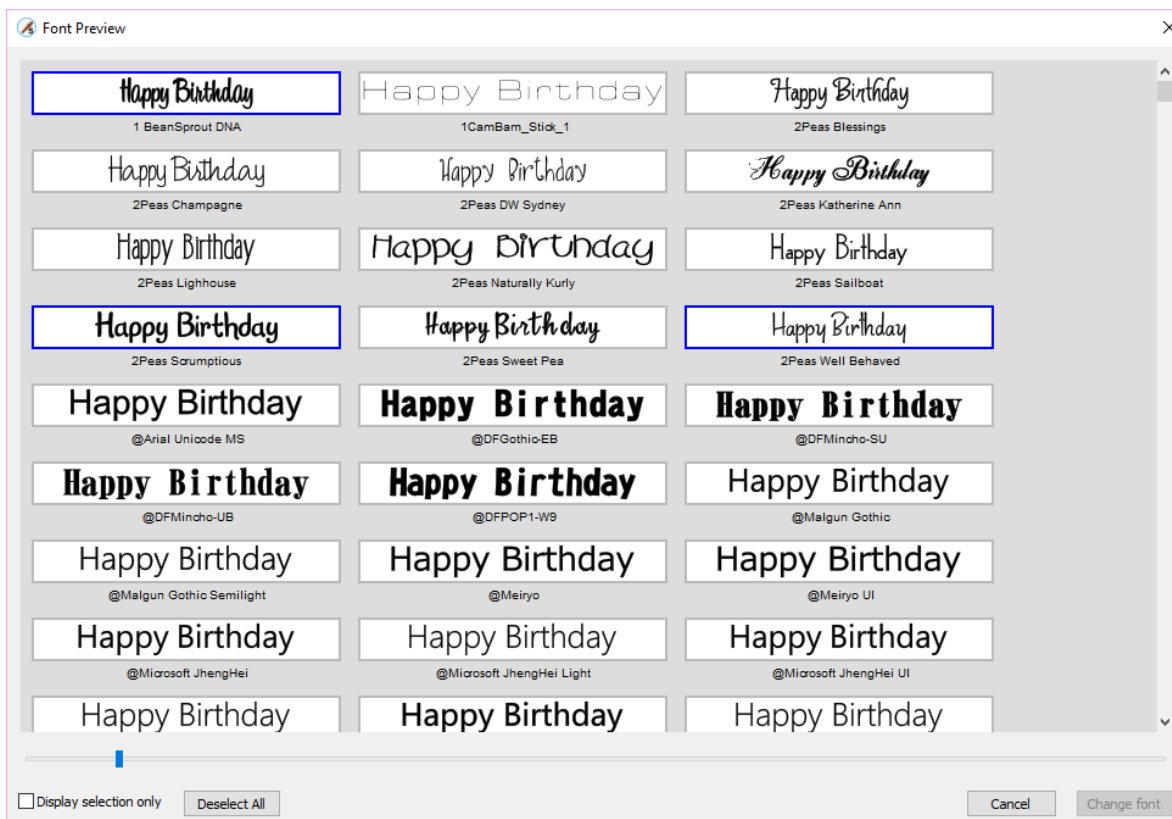
6.02.2 Choosing a Font via Font Preview

- To view the text you're using in different fonts, first type out the text using the instructions in *Sections 6.03 and 6.04*. Then select the text and go to **Text>Font Preview**. There you can scroll through all of the fonts currently installed in SCAL to view others you might prefer:

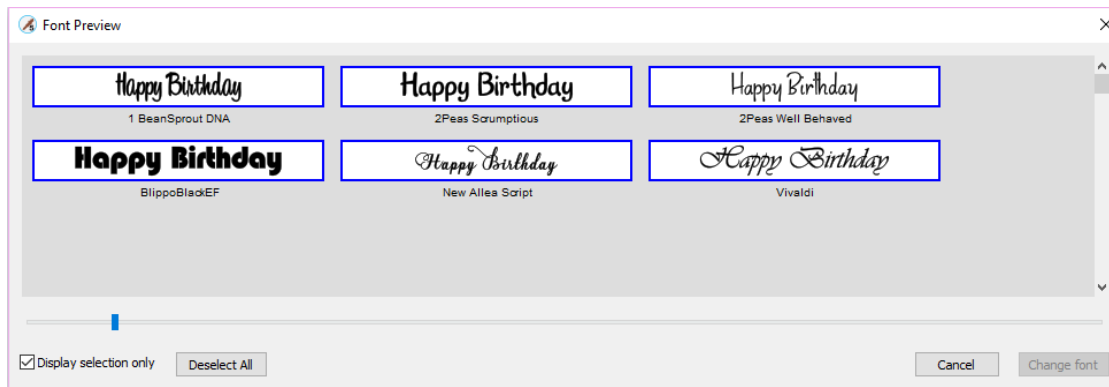


- You can expand this window and decrease the size of the fonts by scrolling the size bar to view more samples. Also, you can highlight those of interest and then click **Display selection only** to more easily decide which ones you might like to use:

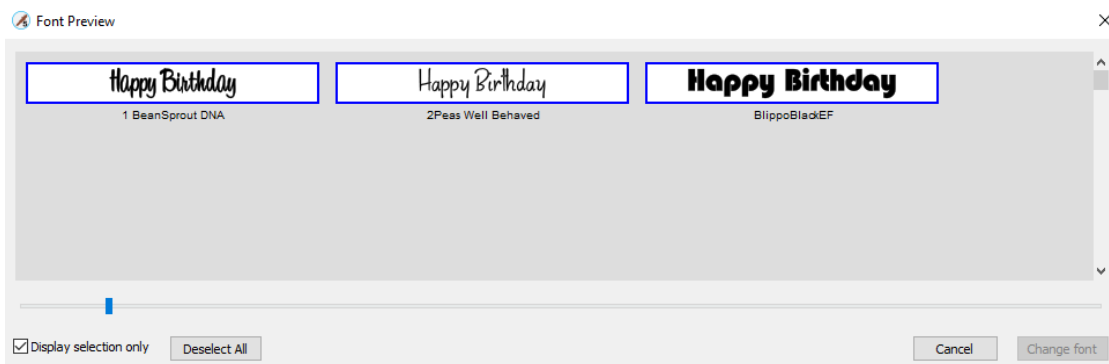
◇ Expand the window and highlight those you want to further compare:



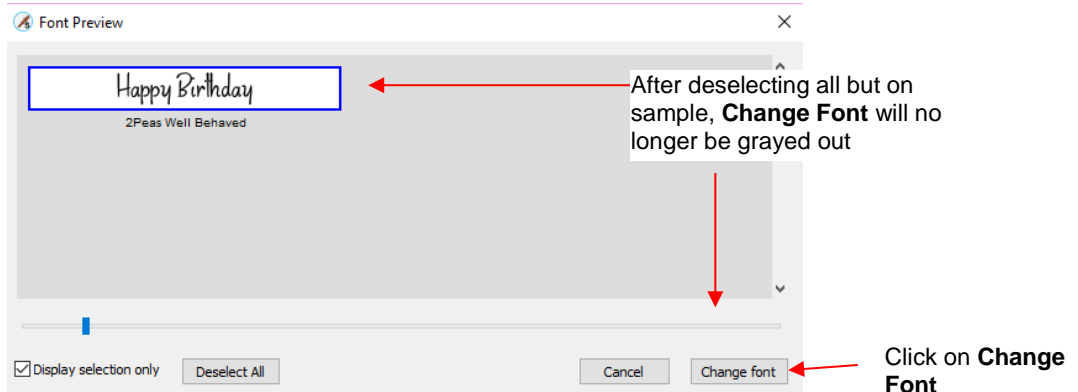
- ◇ After scrolling through fonts and highlighting only those of further interest, click on **Display selected only**:



- ◇ At this point, as you left click any sample, it will be removed from the display, allowing you to refine your selection:



- ◇ Once you are down to a single sample, you can then click on **Change Font**:




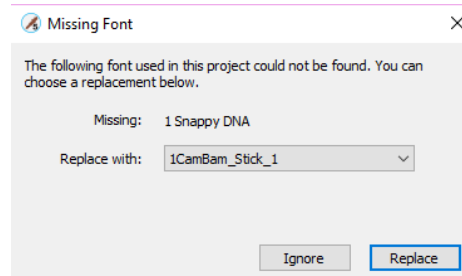
- ◇ The text will now be changed to the new font:

Happy Birthday

6.02.3 Temporarily Installing a Font



- If you want to load a new font that's not already installed on your computer, go to **Text>Load Font File**. Browse to locate the font file (including .TTF, .OTF, or .OPF) of your choosing and click on **Open**. This font will now be available until SCAL is closed. The **Library** also offers this feature. Refer to *Section 4.06.2*.

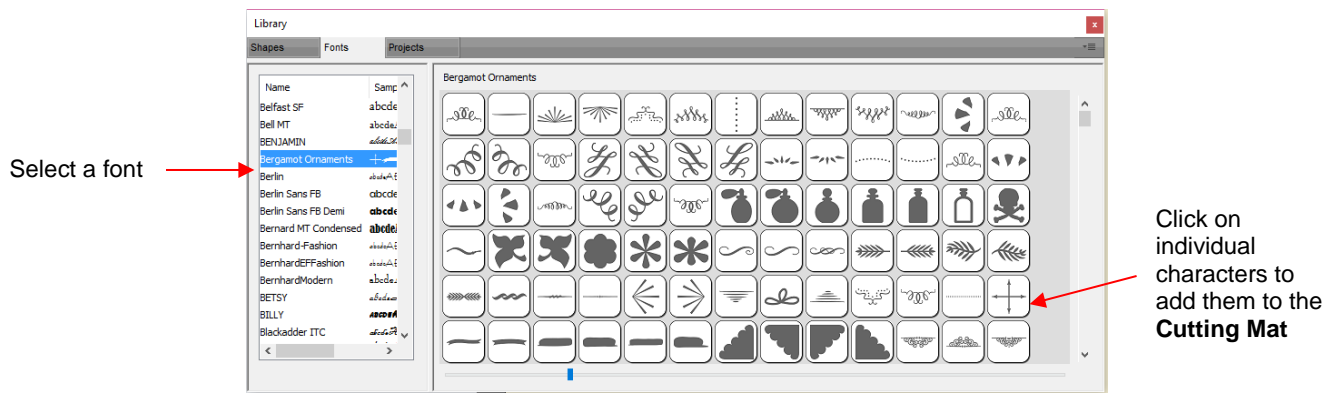
- If you want to load a new font that's not already installed on your computer, there are two ways:
 - ◊ Go to **Text>Load Font File**
 - ◊ Open the **Library**, click on the **Fonts** tab, and then click on the **Menu** icon 
- Any font file with a format of .TTF, .OTF, or .OPF) can be opened and will be available until SCAL is closed.
- When you open a font file for temporary use, that font will be uninstalled upon closing SCAL. If you have saved that file without first converting the text, the next time the file is reopened, you will receive the following message:



- ◊ Two options are provided:
 - **Ignore:** The text with the missing font will be converted to an outline (no longer editable as a text object)
 - **Replace:** The text will be replaced with the font shown or another font you select from the drop-down menu
- ◊ If you have no plans to edit the text, then you can avoid the message by converting text before saving the file. To do this, select the text and apply one of the following:
 - Go to **Text>Convert Text to Outlines**
 - Go to **Path>Object to Path**
 - Right-click and select **Path>Object to Path**

6.03 Adding Text Options



- There are three ways to add text to the **Cutting Mat**:
 - ◊ Click on the **Type Tool** icon  on the **Tools Panel**, click anywhere on the **Cutting Mat**, and begin typing. This is the easiest method when adding ordinary text.
 - ◊ Copy and paste text from another application, such as from Word, Excel, or from an email, onto the **Cutting Mat**. Before pasting, click on the **Type Tool** icon  on the **Tools Panel**
 - ◊ Click on the **Fonts** tab in the **Library** and click on characters shown in the character map. This is the easiest method when using dingbat fonts:



6.04 Four Modes of Text



6.04.1 Type Tool

Jay Max
McCauley McCauley

- Hold down the mouse button on the **Type Tool** icon  on the **Tools Panel** and select the top choice: **Type Tool**.
- Click anywhere on the **Cutting Mat** and begin typing. Note that:
 - ◇ Pressing the **Enter** key will move the cursor to a new line and you can continue typing
 - ◇ Clicking elsewhere on the **Cutting Mat** will allow you to begin adding new text at that location
 - ◇ When done, either press the Esc key or click on the Select icon  on the Tools Panel

6.04.2 Vertical Type Tool

J M
a a
y x

- Hold down the mouse button on the **Type Tool** icon  on the **Tools Panel** and select the second choice: **Vertical Type Tool**.
- Click anywhere on the **Cutting Mat** and begin typing. Note that:
 - ◇ Clicking elsewhere on the **Cutting Mat** will allow you to begin adding new text at that location
 - ◇ When done, either press the **Esc** key or click on the **Select** icon  on the **Tools Panel**

6.04.3 Type on Path Tool




- Determine which shape you want to use for the path. In the prior screen shot, ovals, spiral and a rectangle were used. But it could have been a square, triangle, or any other shape, even a curve path:

Happy New Year to one and all!

- To use this function:

◇ Add the shape to the **Cutting Mat**.

◇ Hold down the mouse button on the **Type Tool** icon  on the **Tools Panel** and select the third choice: **Type on Path Tool**.


◇ Click on or inside the shape and begin typing. In the **Tools Options**, a setting appears which allows you to move the start point for the text further along the path. Otherwise it will start at the leftmost side:

Start Offset: 0.000 in

Happy New Year!

Start Offset: 0.50 in

Happy New Year!

◇ When done, either press the **Esc** key or click on the **Select** icon  on the **Tools Panel**. Note that if you no longer need the path for your project, go to **Text>Convert Text to Outlines** and the path will be deleted.

Happy New Year!

- If you want the text on the inside of the shape:

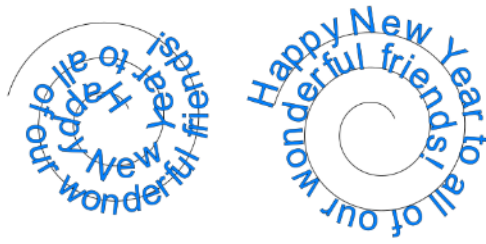
◇ First apply **Path>Reverse Path** to the shape. Then type the text:

Happy New Year!

◇ Again, use **Text>Convert Text to Outlines** to delete the path:

Happy New Year!

- In a similar manner, using **Reverse Path** can change how text is applied along a spiral:




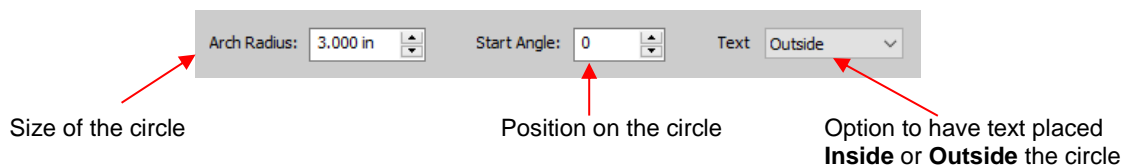
- ◇ After applying **Text>Convert Text to Outlines**:



6.04.4 Type on Arch Tool

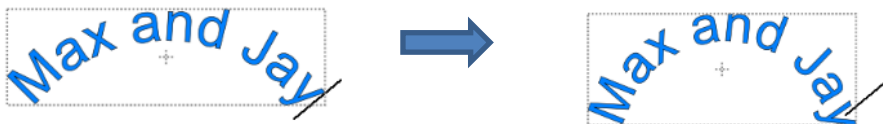
Max and Jay

- With this function, text is typed as if it were following an imaginary circle.
- Hold down the mouse button on the **Type Tool** icon  on the **Tools Panel** and select the last choice: **Type on arch**.
- Click anywhere on the **Cutting Mat** and begin typing. In the **Tools Options**, three settings will appear allowing you to customize the results:



- For example:

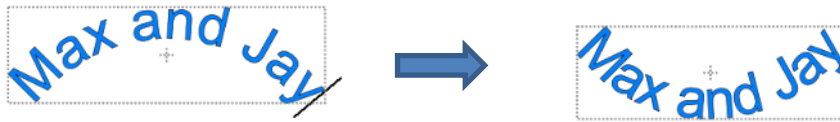
Decreasing the **Arch Radius** from 1.0 to 2.0:



Changing the **Start Angle** from 0 to 180:





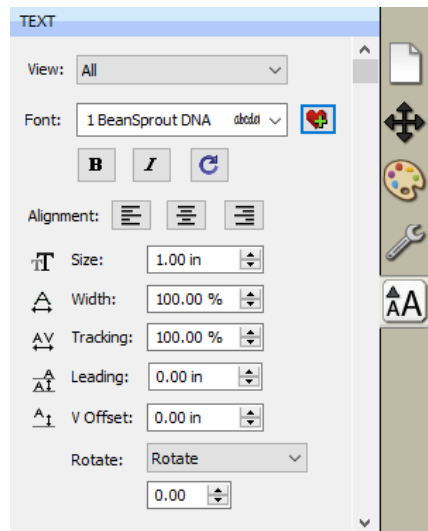
Changing **Text** from **Outside** to **Inside**:




- When done, either press the **Esc** key or click on the **Select** icon  on the **Tools Panel**.

6.05 Text Settings

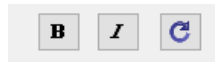
- The **Text Settings** window offers an array of settings related to the creation and editing of text:
 - Before typing text, make changes in this window so that they will be in place when text is then typed.
 - For existing text, drag your mouse to highlight the letters and then change settings to be applied. For example, a different font, different size, wider spacing, etc. (Note that in order to highlight text, you need to first click on the **Type Tool** icon  on the **Tools Panel**.)
- To open, click on the **Text Settings** icon  on the **Properties Panel** to open the **Text Panel**:



Click here to open
Text Panel

- The following is a list of these settings and how to apply them. Note that if the text is already typed, you can highlight all or only a portion of the text for the change.
 - ◇ **View:** Controls which fonts show in the menu under **Font**:
 - **All:** Displays all installed fonts plus any that have been temporarily installed during this session of SCAL
 - **Favorites:** Displays all fonts you have assigned as a **Favorite** in the **Library**
 - **This Project:** Displays all fonts currently used since starting this particular project during this session
 - ◇ **Font:** Menu of fonts which can be used for new or existing text. Note that you can also add to your **Favorites** list by selecting a font and then clicking on the  icon to the right.

◇ **Bold Italic Reload:**



- **IMPORTANT:** Some fonts will change significantly if the **Bold** option is selected. The same is true of the **Italic** option. Make sure these icons are not indented/blue unless you are confident you want to use either or both of them.
- **Reload** is only needed if you have separately installed new fonts on your computer since opening the current SCAL session.

◇ **Alignment:** Standard text justify options: Left Align, Center Align, and Right Align



- ◇ **Size:** Approximate height of lettering based on an ascender and descender. For example, if text is set to 1.0 inches, then the height of the word “Baby” would be ~ 1.0.” However, the “B” typed by itself might only be 0.7” in height because there is no descender, such as the letter “y”.
- ◇ **Width:** Increasing the width will widen the letters leaving the height unchanged. Note that letter spacing will not be altered, thus the letters may end up overlapping unless Tracking is increased, as well.
- ◇ **Tracking:** This is the spacing between letters. Increasing will spread letters apart while decreasing will force them closer together and can result in overlapping:

KNK Force KNK Force KNK Force

Tracking: 100% Tracking: 120% Tracking: 80%

◇ **Leading:** Changes the spacing between lines of text:

KNK Force KNK Force

& Zing Orbit & Zing Orbit

Leading: 0 inches Leading: 0.2 inches

- ◇ **V Offset:** Raises or lowers a line of text or, more commonly, can be used to raise and lower individually selected letters:

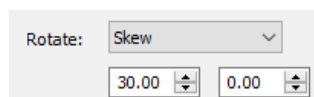
KNK Force & Zing Orbit

- ◇ **Rotate:** Rotates a line of text or can be applied to individual letters:

KNK Force & Zing Orbit

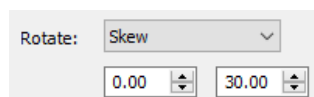
- ◇ **Skew:** In the same menu with **Rotate** is the **Skew** option which can also be applied to a line of text or to individual letters. There are two settings: one for X axis skew and one for Y axis skew:

- **X Axis Skew** set to 30:



KNK Zing Orbit

- **Y Axis Skew** set to 30:



KNK Zing Orbit

6.06 Other Text Editing

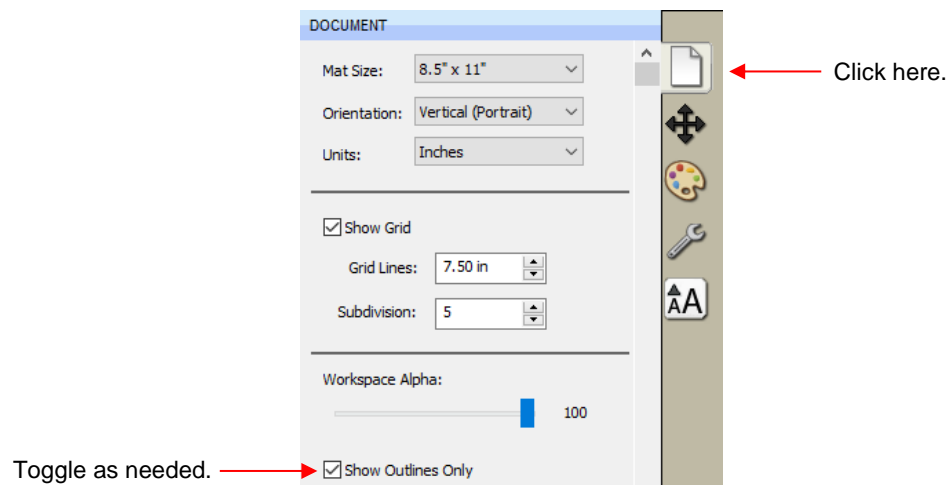
- **Ungroup:** To split a selection of text into individual letters, apply the **Ungroup** function using one of the following ways:
 - ◇ Right-click and select **Ungroup** from the popup menu
 - ◇ Go to **Object>Ungroup**
 - ◇ Apply **Ctrl+Shift+G**
- **Break:** To break a selection of text into individual paths, apply the **Break Apart** function using one of the following ways:
 - ◇ Right-click and select **Break Apart** from the popup menu
 - ◇ Go to **Object>Break Apart**
 - ◇ Apply **Ctrl+B**
- For more information on **Ungroup** and **Break Apart**, refer to *Sections 5.10.2* and *5.11.1*.

6.07 Creating a Connected Letter Title

- Using the instructions from *Section 6.04.1*, type the letters of your title:

Happy Anniversary

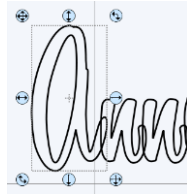
- Because you will be working with the letters individually, select the title and apply **Ungroup** (*Section 6.06*).
- With the letters split, you can select one or more and use the left and right arrow keys to change the spacing between letters, overlapping as desired. It is advisable to zoom in on the text to get a more accurate view of the actual positioning of the letters. You may also want to check the text both with and without **Show Outlines Only** option turned on (which can be changed on the **Document Panel**):



- Also, you should turn off **Snap to Grid** so that you can more freely move letters. This is located under **View>Snap To**.

- Begin overlapping the letters. It's usually advisable to move letters either by using the arrow keys on the keyboard or by using the left center icon:

Drag this icon so that letter can only move horizontally.



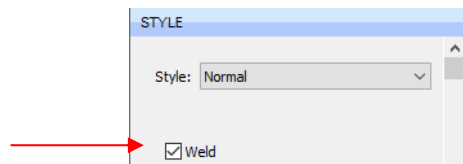
- Continue arranging letters as desired. Remember that you can customize freely to get the desired look. For example, in this font called 1 Bean Sprout DNA, the vowels tend to be a bit oversized compared to other characters in the font. Thus, the uppercase "A" can be sized smaller to better match the other letters:



- When you are satisfied with the overlap, select all of the letters and go to **Path>Union**. The overlap will be removed:



- Alternatively, if you do not want to make the weld permanent, you can select the shapes and mark the weld option on the **Style Panel**:



- To create an outline/shadow for titles and other shapes or if you need to thicken a font that turns out to be too thin for cutting, refer to *Section 9.04*.

6.08 Incorporating Shapes into a Title

- A quick way to incorporate a shape into a welded title is to use any of thousands of dingbat fonts available from the Internet for free or even check the SCAL **Library** for a shape. In this example, a script font is being used for the title and a turkey, found in the **Library** under the *Fall* folder, will be used for the shape.
- Using the steps in *Section 6.04.1*, create the title:

Happy Thanksgiving

- Select the title and go to **Object>Ungroup**. Then move the "Thanksgiving" part to the right to add some spacing for the turkey. In this example, other parts were also moved so that all letters in "Happy" and all letters in "Thanksgiving" overlap.

Happy Thanksgiving

- In the **Library**, locate the turkey shape and click on it to add to the **Cutting Mat**. Resize and arrange to overlap with the lettering:



- Go to **Path>Union** or press **Ctrl+Shift+U** to remove the overlap:



- Note that dingbat fonts and **Library** shapes are not the only shapes that can be welded to letters. Any shape imported or created within SCAL can be used!

6.09 Welding Titles in Imaginative Ways

- Some fonts simply do not work well with the traditional overlapping of the letters to be welded into one piece for cutting. For example, let's take an extreme case with Arial font and the name, "Billy". Note what happens when you overlap the letters in this particular font:

Billy

Type the letters



Bily

Overlap the letters



Bty

Weld the letters – undesirable result

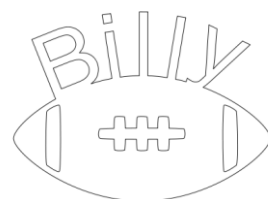
- Most crafters will start looking for a different font... one with ligatures (extenders) that easily connect the letters to one another. However, many fonts with ligatures are script fonts and may not convey the desired look. Instead, look for objects that can be used to connect the letters. A basic thin rectangle is an easy solution. Just align it along the bottom of the letters and weld:

Billy



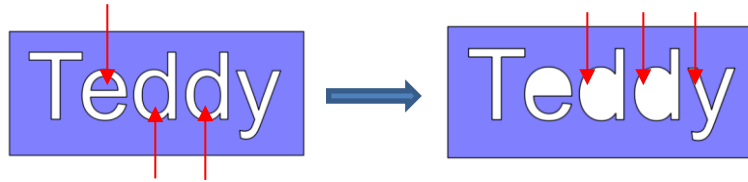
Billy

- However, the objects to use as a base do not have to be so basic. Look for objects that will tie into a theme. Here are just a few examples:



6.10 Stenciling Letters

- When creating a stencil, you keep the “waste” or “negative” of a cut. When using regular fonts, such as Arial, some of the letters, such as a “B”, “a”, and “e”, will not work because they have interior paths called child shapes. Those child shapes are not connected to the waste portion of the material and will be lost from the stencil as shown below. The red arrows indicate the child shapes inside parent shapes for the letters “B”, “a”, and “e”:



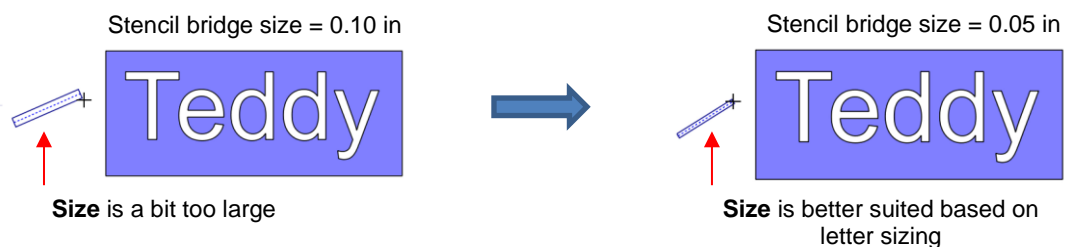
After cutting and lifting the stencil from the mat, the interior parts of the “e” and the “d”’s will be cut away.

- To avoid this, a procedure called stenciling can be used to connect the area outside of the letters to the child shapes, essentially eliminating them. There is a feature on the **Tools Panel** called the **Stencil Bridge** which can be used to connect the interior parts to the surrounding area.
- Before using this function, select the text and go to **Object>Ungroup**. Failure to do this can cause distortion of other letters as the stencil function is applied. Then click on the **Stencil Bridge** icon

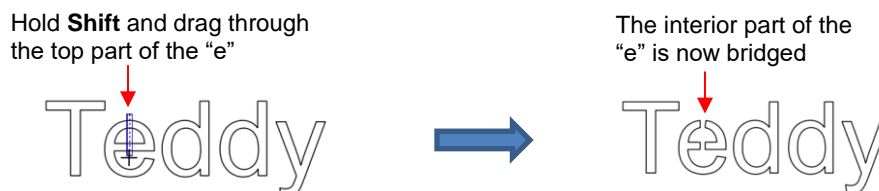
- Zoom in close on the lettering so that you’ll be able to see exactly where you need to connect. Click on the **Stencil Bridge** icon and, in the **Tools Options** at the top, a setting for the width or thickness of the bridge can be set:



- The **Size** you enter will normally relate to the height and style of the lettering you are stenciling. In this example, the name “Teddy” was typed at a height of ~1 inch. The **Stencil bridge size** is set at 0.10, but it could be smaller or larger depending on your personal preference. Before applying, you can drag the mouse in an empty area of the screen to see the size that will be used and adjust accordingly:



- Before applying, hide the outside rectangle, so that it’s not affected. You can now drag the mouse across a letter to create a bridge. Hold down the **Shift** key, while dragging, and the bridge will be either perfectly vertical or perfectly horizontal:



- Repeat the process with the other letters containing child shapes:

Teddy

- Note that just one part of the letter could have been bridged instead of both the top and the bottom:

Teddy

- Unhide the rectangle and the stencil is ready to cut:

Teddy



Completed stencil

6.11 Open Path Fonts (OPF)

- Besides TTF and OTF, a third type of font, Open Path Font (.OPF) can also be opened in SCAL. This font consists of single lines/curves only. Here's a comparison to help you understand the difference:



TTF version



OPF version of the same font

- These fonts are useful when using a pen or engraving tool in your cutter or for designing single line rhinestone titles:

Open Path Font

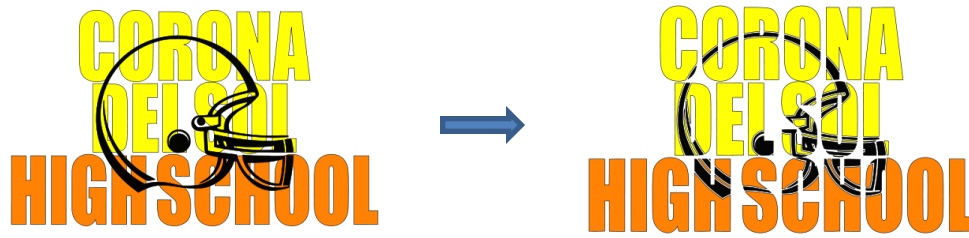
- Currently, this font type only works in a few applications like SCAL and does not install into Windows or on a Mac O/S for use in programs such as Word.
- To try out using Open Path Fonts, there are some free ones to download here:

<http://www.iloveknk.com/Support/Software/Open-Path-Fonts/>

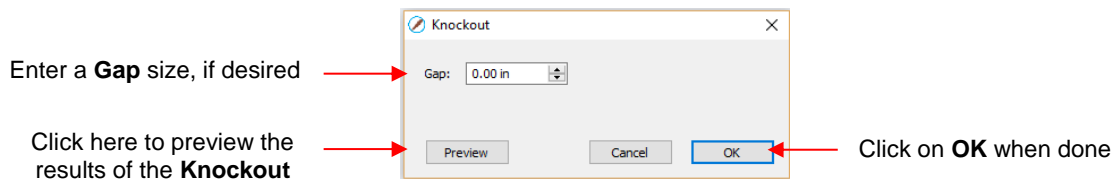
- Because these are open path, they may not appear on the **Cutting Mat** when you first add them. You will need to select a **Stroke** color on the **Fill & Stroke Panel**. Refer to *Section 5.14*.
- You can purchase Open Path Fonts (also called Thin Fonts) from www.letteringdelights.com and from www.onlinefonts.com to use in SCAL. Note that these also come with the TTF equivalents, which are not actual single lines and curves, but are still very thin.

6.12 Knockout

- The **Knockout** function involves overlaying one image on top of another and then merging the two so that the overlap between the two images is, essentially, cut out and replaced with that part of the top image. This is a popular design technique for HTV (heat transfer vinyl) applications so a typical high school design is used as an example:



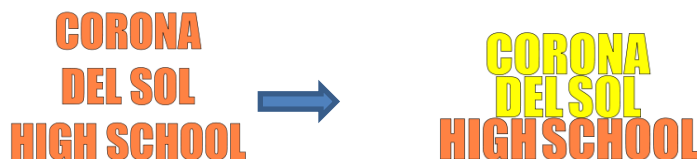
- To open the **Knockout** function window, select two or more shapes and go to **Effects>Knockout**:



- The **Gap** will create an offset between the top image and the bottom image. This is not only pleasing to the eye but also makes alignment of two layers of HTV easier to manage. Here's an example showing how the gap affects the overall appearance:



- IMPORTANT!** When you click on **Preview**, it will take a few seconds or longer for the image to update. Be patient. Also, in cases where you have multiple images on top, such as the hearts in the prior screenshot, it is recommended that those shapes be joined first using **Object>Merge**.
- When preparing text, you want as little “white space” as possible. Thus, here are some guidelines:
 - ◇ Select a thick dark font. In the examples in this section, *Impact* was used.
 - ◇ After creating the text, move rows of letters together until they almost touch.
 - ◇ Reduce spacing between words, but make sure the text is still readable.
 - ◇ The text does not need to be all one shape. Thus, you can recolor parts of it if you wish.



- When aligning the top image over the lettering, note that anything extending outside of the image or over white areas will be deleted. Thus, size the image accordingly:



Top image extends beyond the edges of the lettering



Much of the image is lost



Image is sized smaller so that most of the helmet is over the lettering



Better result

- Note that the **Knockout** function isn't just for text. It can be used on any vector shapes. Because it is so popular with lettering, its presentation in this chapter seemed appropriate.

6.13 Title Crawl

- Title Crawl** distorts text (or any shape) so that it appears to be stretching towards you or away from you:

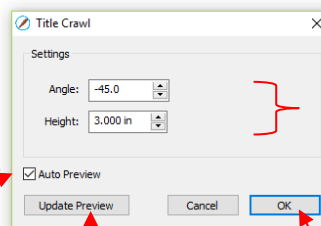


- To apply **Title Crawl**, select the text and go to **Effects>Title Crawl**. The following window opens

Preview



Check this box to have the preview update with changes



Click here to manually update the preview

Click on **OK** when done

Adjust these according to the information that follows

- ◇ **Angle:** As the **Angle** setting is increased, the top of the title will rotate towards you. Decreasing the **Angle** setting will rotate away:



Angle: -45
Height: 3.0



Angle: -25
Height: 3.0



Angle: -145
Height: 3.0

- ◇ **Height:** This setting works in an opposite manner to how one would expect. Increasing **Height** will make the text less rotated whereas decreasing it will make the text more rotated:

TEAM KKK

Angle: -45
Height: 3.0

TEAM KKK

Angle: -25
Height: 6.0

TEAM KKK

Angle: -145
Height: 2.0

- Multiple lines of text can have **Title Crawl** applied to create the famous Star Wars “in a galaxy far far away” effect:

*Five years ago
KNK USA selected
designers to present
three new projects every
week to inspire and educate
customers on using their KKK
cutters. Visit www.teamknk.com*

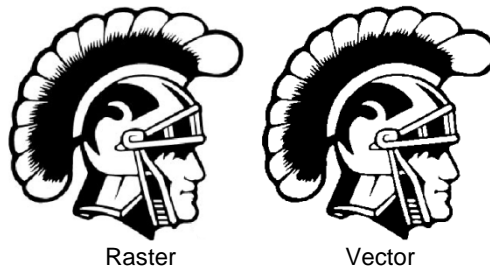
6.14 Other Text Effects

SCAL offers many other design functions to customize text for your projects. Refer to *Sections 9.12 – 9.17* for more ideas.

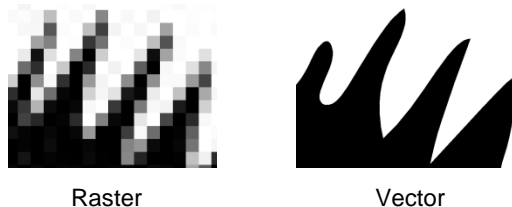
7. SCAL: Tracing and Drawing

7.01 Raster versus Vector

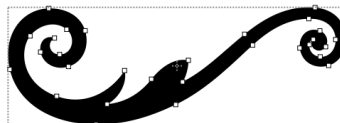
- All graphics are either raster or vector and there is no third type. While you can often tell by the file format, even that isn't always a good way to know for certain. For example, a PDF file can be made from either raster images or vector images and some PDF's will contain both types.
- You may not be able to tell, at first glance, whether an image is a raster or a vector. For example, this screen shot shows the same image in both formats:



- Most everyone today has a digital camera and, at the very least, has heard the term “mega-pixel.” A pixel is a square that is black, white, or colored. Photographs are made up of millions of these pixels to create the image you see. If you zoom in close enough on any raster image, you can see these tiny pixels. But when you zoom in close on the same area in the vector version, you will instead see lines and curves, not squares/pixels:



- A vector image isn't made up of pixels. Instead, a vector is like a connect-the-dot puzzle in which little dots (called nodes or points) are connected to each other with paths (either straight lines or curves). Digital die cutters need those paths so that they can communicate to the cutter where the blade should travel in order to cut what you want... kind of like a road map. In SCAL, the nodes look like this:



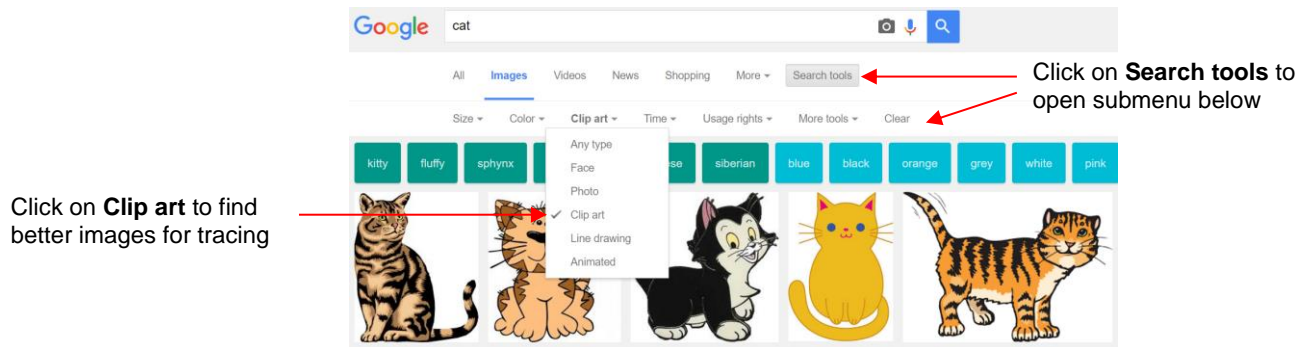
- As mentioned earlier, you can often tell whether a file is a raster or a vector based on the file format. Here are some guidelines:

Raster: BMP, JPG, GIF, PNG Vector: AI, EPS, DXF, SVG Either: PDF, sometimes EPS & WMF

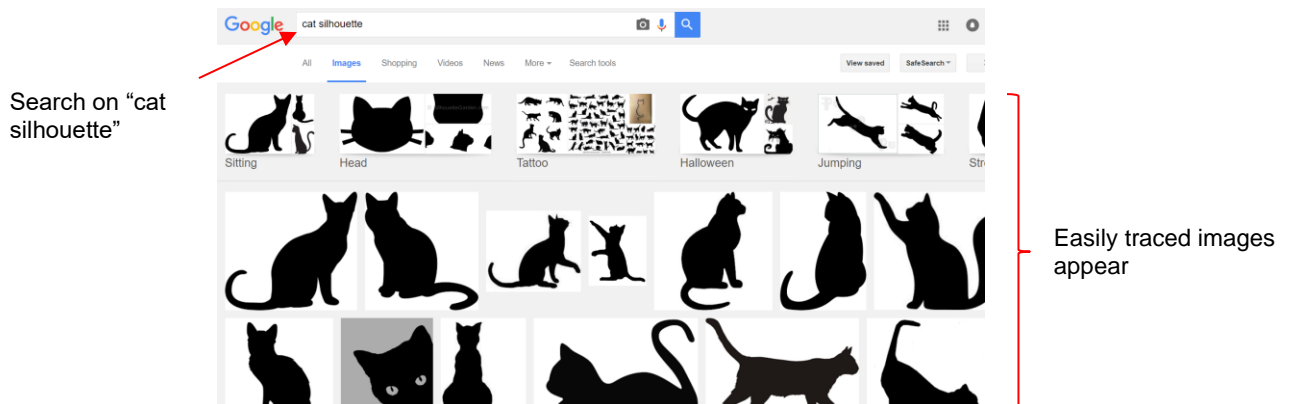
- To convert a raster into a vector, SCAL offers both an automatic and a manual trace function. Because the automatic **Trace** feature in SCAL is so fast and powerful, it is always worth trying it first. The only situation in which it may not be able to provide the results you need are (1) the image is very tiny or has a very poor resolution or (2) the image has poor contrast between one part and the next. For example, imagine a brown dog lying on brown carpet. How would the software know what part is the dog and what part is the carpet? Thus, you may need to manually trace some images, so both functions are covered, in detail, in this chapter.

7.02 Finding Easy Images to Trace

- What qualifies as an easy image? The obvious answer is “an image which gives you the results you want!” But those who are new to the vectorizing process do not always realize which images are going to be easy and which ones are not. Note that you shouldn’t be discouraged from trying to trace anything. But when you are learning the process, working with easier images will make the learning stage go smoother. So here are a few guidelines in selecting images:
 - ◇ Black and white images are easier to vectorize than colored images
 - ◇ Colored images with flat colors are easier to trace than those with variegated colors
 - ◇ Large, high resolution images are easier to trace than tiny, low resolution images
 - ◇ Images with tiny details will be more difficult to trace than simpler images with fewer details
 - ◇ Photographs are usually the most difficult to trace, especially when some of the colors blend (such as the brown dog on the brown carpet, mentioned earlier).
- For your own personal use, there are many images that can be found on the Internet. Use [Google Images](#) to search and find images based on keywords. Google Images also has filters at the top of the window (under **Search Tools**) to limit your search to black and white, as well as to clipart or line drawings. For example, after searching on the word cat, one can limit the images in this way:



- Adding the word “*Silhouette*” in a search, will also produce images that are typically very easy to auto-trace:




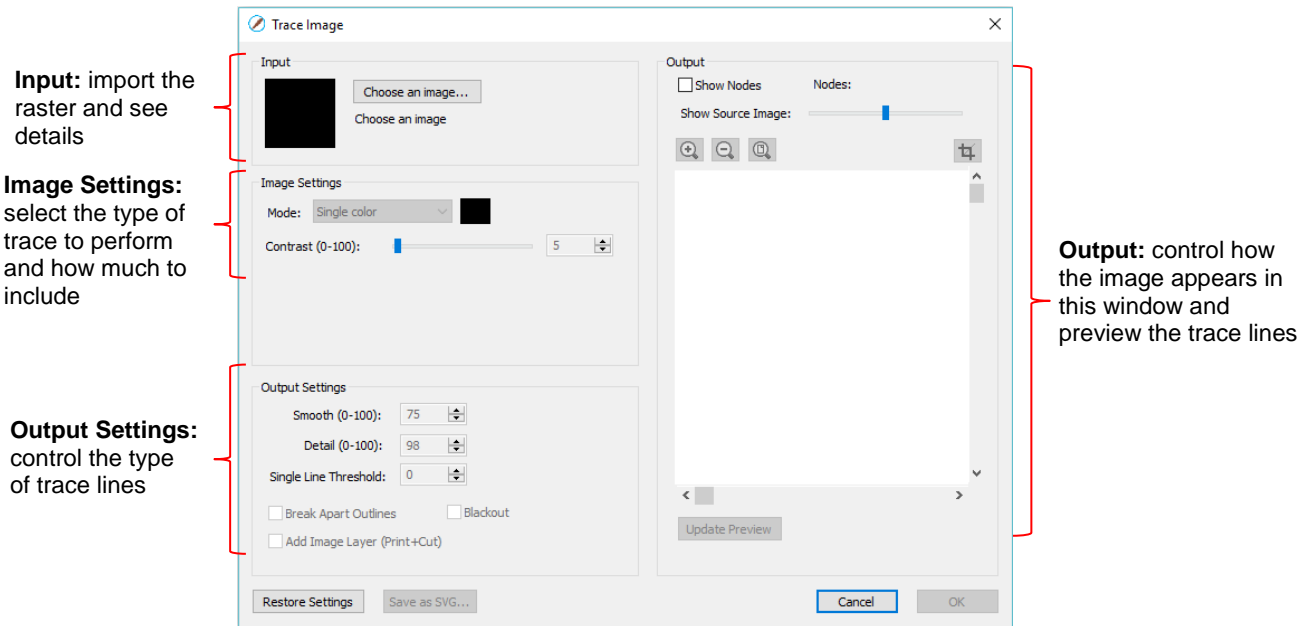
- When you find an image you want to trace, click on it first to bring up a larger version. Then right-click and select **Save image as** from the popup menu. Note: If you use a browser other than Chrome, the popup menu may have slightly different wording for saving a file.
- **IMPORTANT!** Before tracing any Internet images, be sure to check the *Terms of Use* at the site hosting the image.

7.03 Trace Function

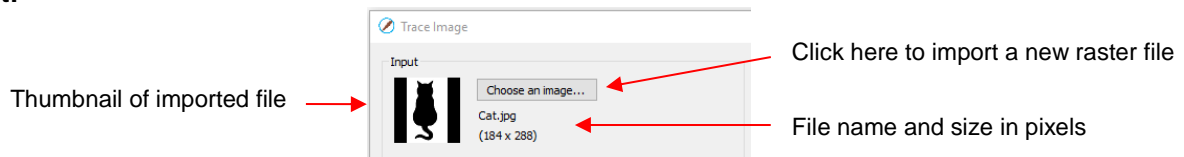
Images used in this tutorial can be downloaded at: <http://iloveknk.com/Images/>

7.03.1 Trace Settings

- To begin the tracing process, open the **Trace Image** window using one of the following ways:
 - Click on the **Trace** icon on the **Toolbar** 
 - Go to **File>Trace Image**
 - Press **Ctrl+Shift+T**
- There are five sections to the **Trace Image** window: **Input**, **Image Settings**, **Output Settings**, **Output**, and then the bottom bar. Note the location of each section and its main purpose. More details about each section follows:



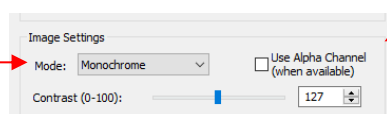
- Input:**



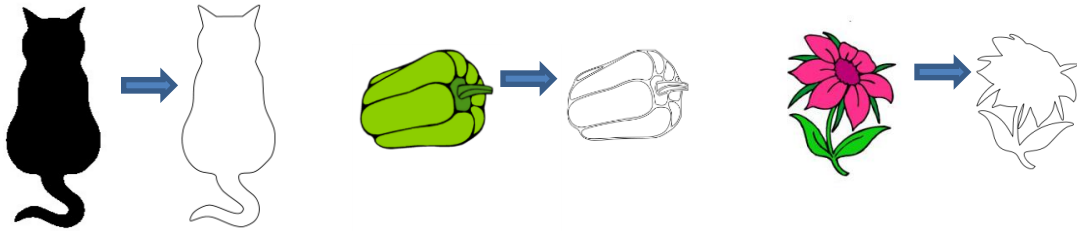
- Alternatively, before opening the **Trace Image** window, you can import the raster file using **File>Place Image**. Then, with the image selected, open the **Trace Image** window and this image will be loaded and ready for changes to trace settings.

- Image Settings:**

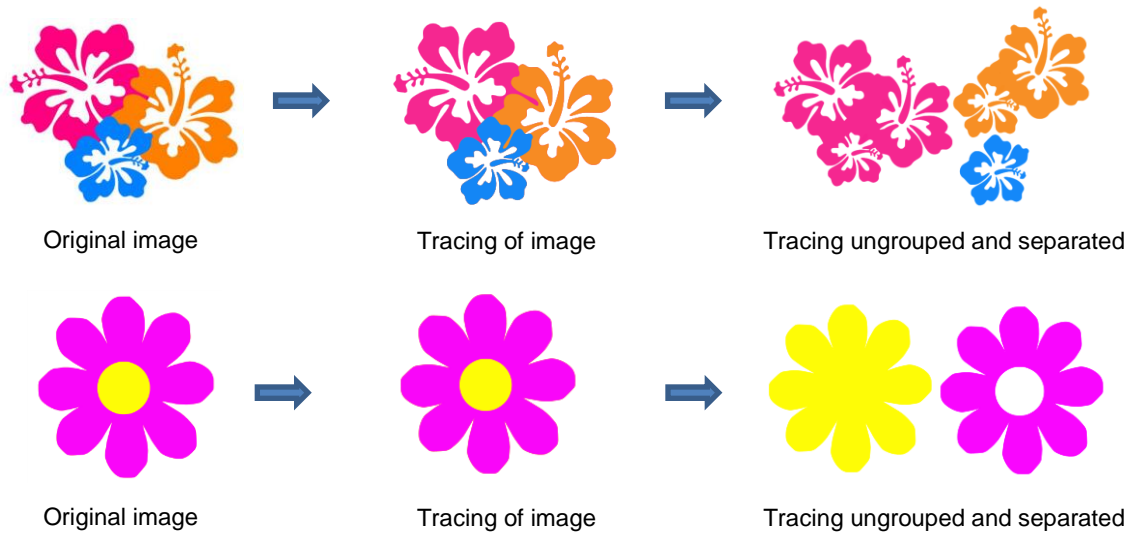
Choose from three modes:
Monochrome, **Color Layers**, or **Single Color**



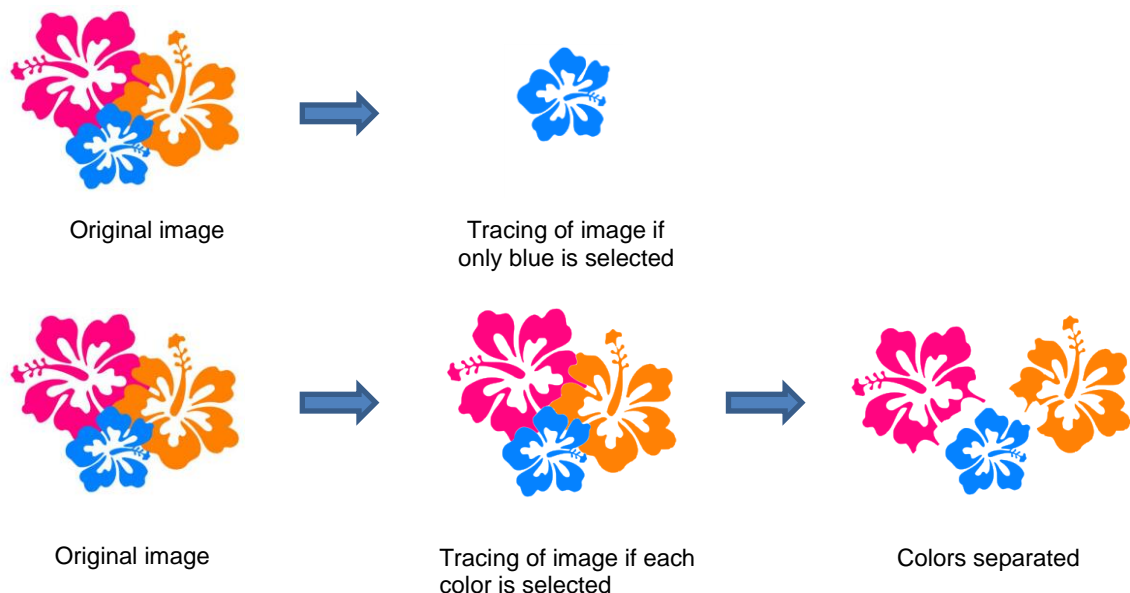
- The **Mode** you choose is determined by the desired outcome / project application, as follows:
 - Monochrome:** choose this mode when you only need a black and white trace of the image:



- **Color Layers:** choose this mode for multi-color images where you need separate colors, such as for a paper piecing or layered vinyl project and you want under-layers to use for alignment. Two examples follow which illustrate what is produced when **Color Layers** is chosen:



- **Single Color:** choose this mode when you want to single out a certain color to be traced or when the multi-color image needs to have colors traced exactly as displayed. This would be a typical choice for an HTV application where you do not want layers of material to overlap. The same examples are used again to demonstrate the difference:





Original image



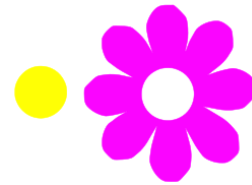
Tracing of image if only pink is selected



Original image



Tracing of image if each color is selected



Colors separated

- ◇ Check the **Use Alpha Channel** box if the imported file is a PNG file with a transparent background. The transparent background is easily identified by the trace program requiring very little adjustment to other settings.
- ◇ **Contrast** controls the level of color differentiation included in the trace: lower will include less, higher will include more.

• Output Settings:

Sharp or smooth curves →

Prevent double line tracing →

Apply **Break Apart** when multiple paths are traced →

Output Settings

Smooth (0-100):

Detail (0-100):

Single Line Threshold:

☐ Break Apart Outlines ☐ Blackout

☐ Add Image Layer (Print+Cut)

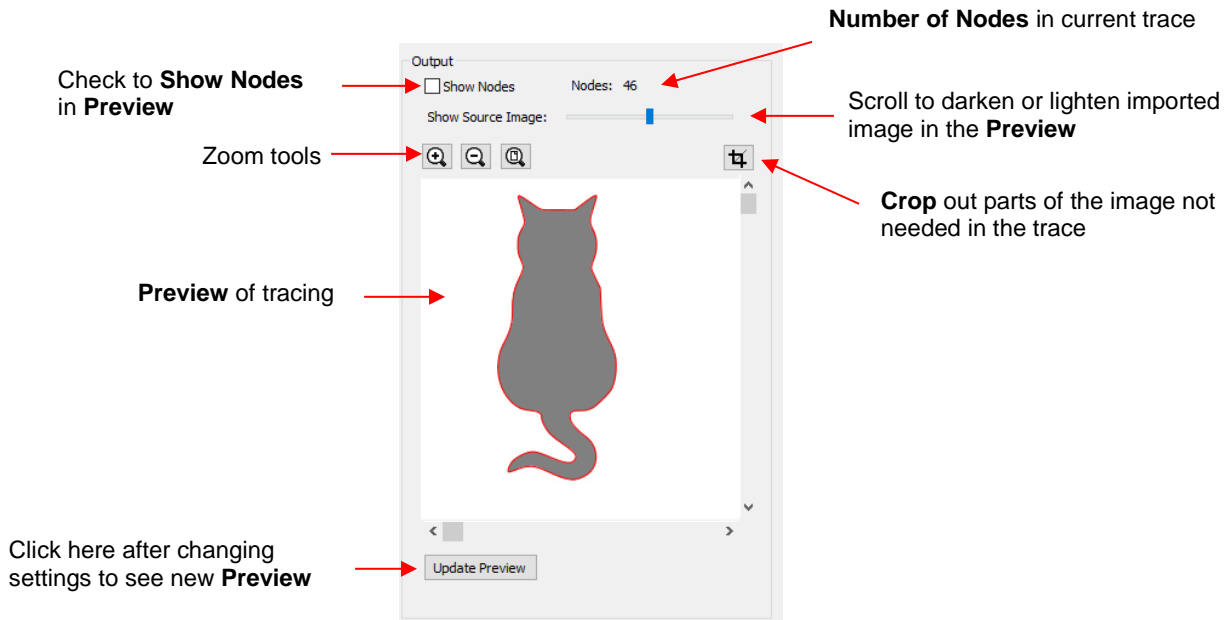
Use to filter out small specks

Use to remove child shapes

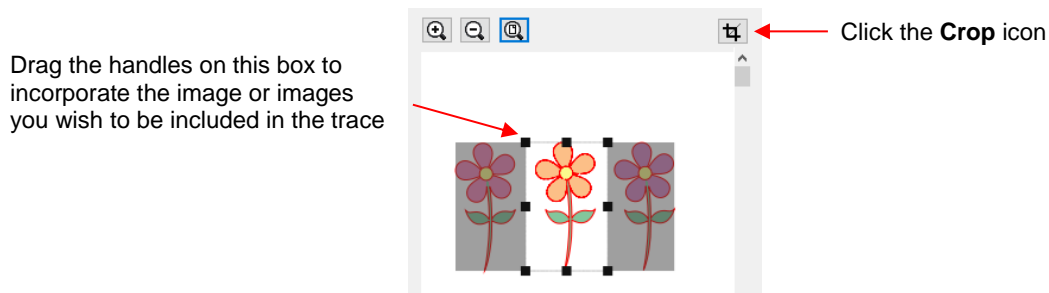
Include the original image

- ◇ **Smooth:** Adjust according to type of image. For example, decrease (make sharper) if tracing a shape with sharp corners like an envelope template. Increase (make smoother) if tracing a shape with soft curves, like a teddy bear. Refer to *Section 7.03.3*.
- ◇ **Detail:** If tiny undesired shapes appear, decrease to filter those shapes out.
- ◇ **Single Line Threshold:** When tracing coloring book images (image with black outlines), use to convert those double lines to single lines.
- ◇ **Break Apart Outlines:** Checking the **Break Apart Outlines** box will save a step if different parts of the tracing need to be edited separately or placed on separate layers.
- ◇ **Blackout:** Check this box so that internal shapes (child shapes) are not included in the tracing.
- ◇ **Add Image Layer:** Check this box if a copy of the imported image will be needed, such as for a print and cut application. The result will be two layers grouped: one will be labeled "Print" and the other layer will be labeled "Cut."

- **Output:**

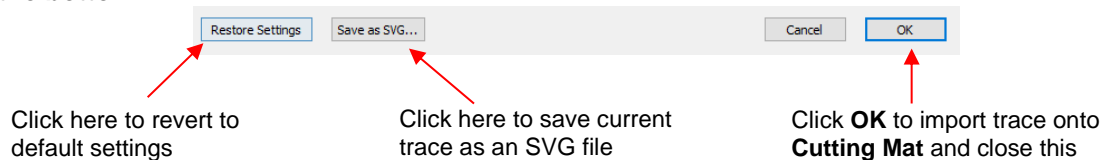


- ◇ None of the settings in the **Output** section affect the final result, with the exception of the **Crop** function. The other settings only affect the **Preview** so adjust as desired.
- ◇ When you click on the **Crop** icon, a rectangle will appear that can be resized to fit around the desired part of the image. This is useful when there are multiple images in a raster file and you only want to trace some of them. For example:



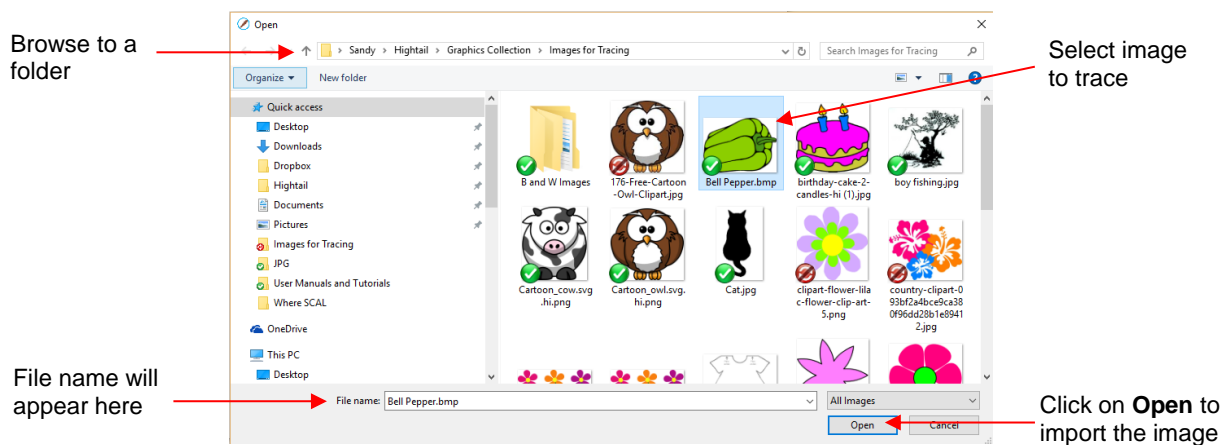
- ◇ Note that the red lines in and around shapes in the **Preview** window indicate the actual trace lines as a result of current settings

- **At the bottom:**

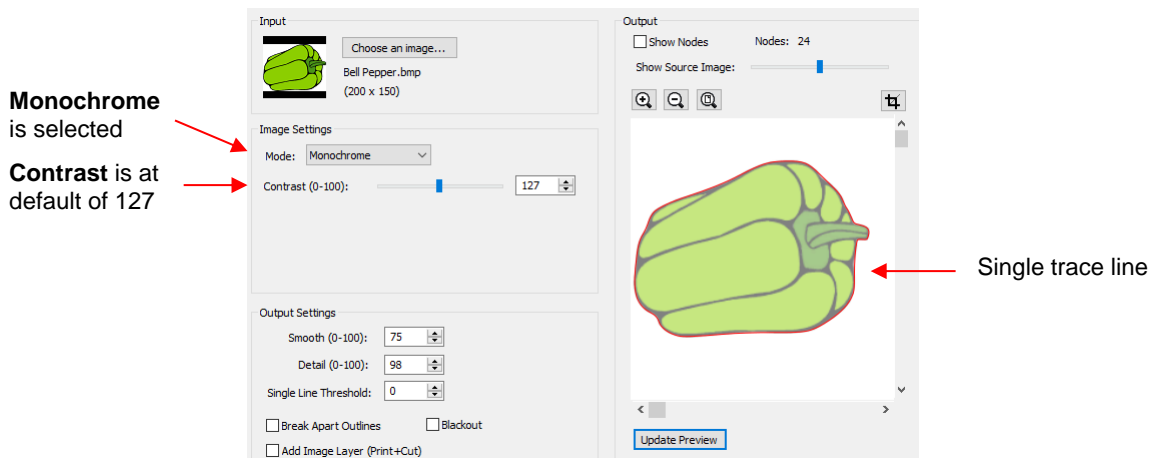


7.03.2 Monochrome Trace of a Colored Image: Effects of Contrast

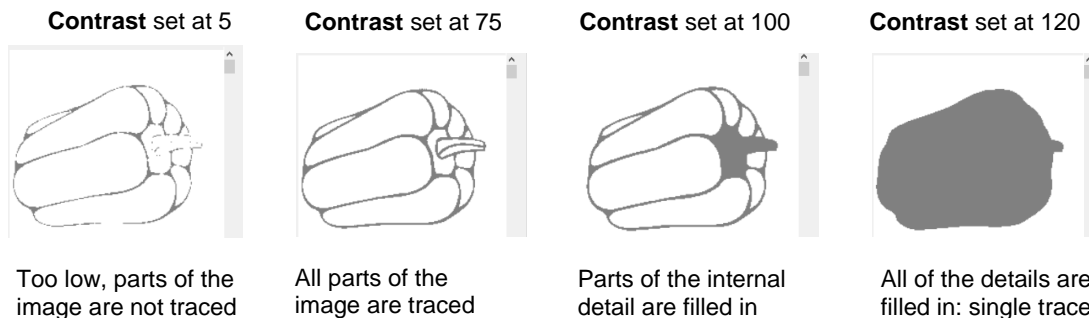
- Start by clicking on **Choose an image** in the **Input** section and then browse to locate the raster file you wish to trace:



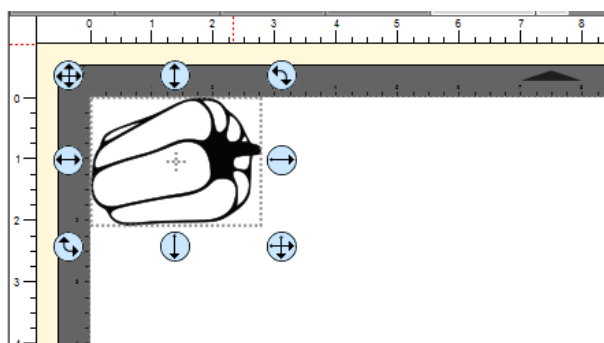
- In this example, a bell pepper image is imported for tracing and the **Preview** indicates a single trace path around the image:



- Let's experiment with the **Contrast** setting to fully understand how it works on an image of this type. Note that as you drag the **Contrast** scroll bar, the original image disappears so that you only see the trace lines:

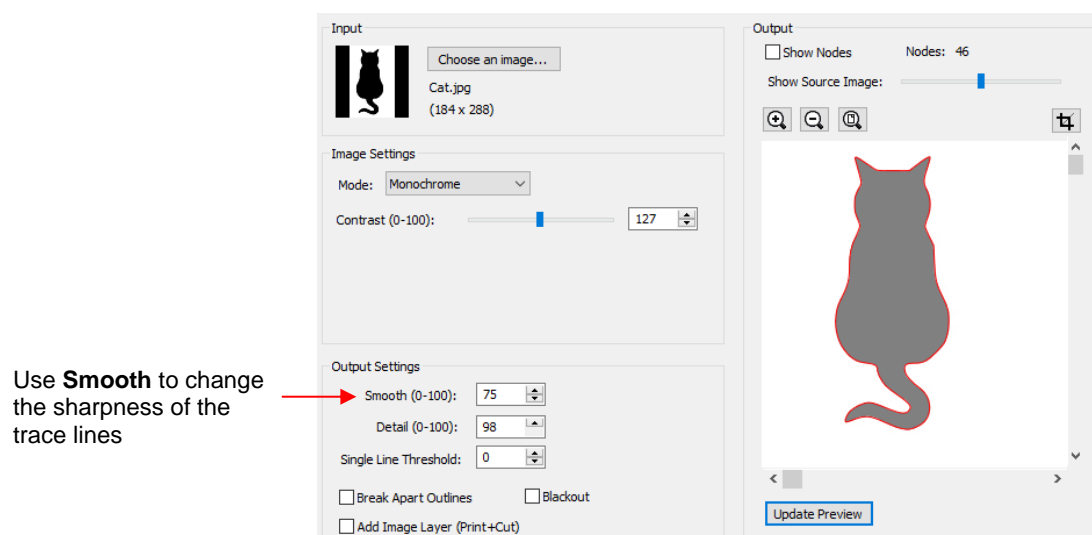


- Thus, for any given image, scroll the **Contrast** setting to see the effects and determine which version best suits your project needs. Once satisfied, click on **OK** and the image will appear in the top left corner of the **Cutting Mat**, ready to be resized and cut out:

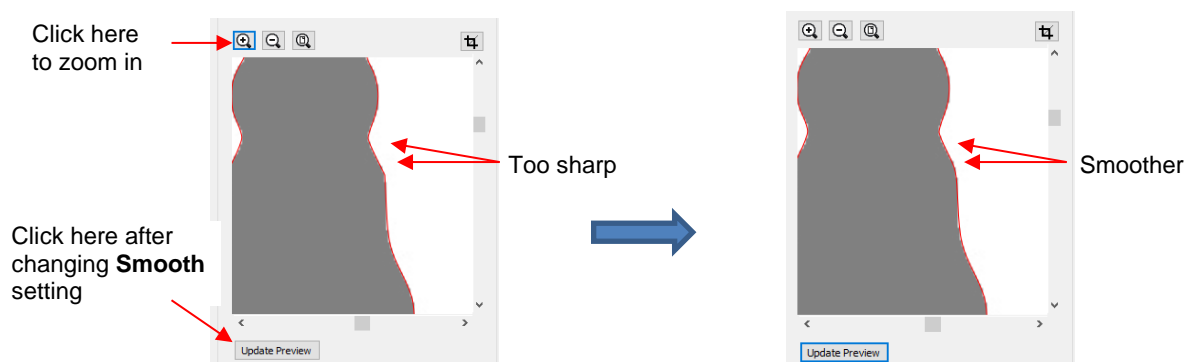


7.03.3 Monochrome Trace of a Silhouette Image: Effects of Smooth

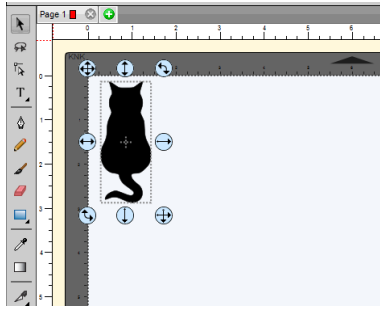
- As mentioned at the end of *Section 7.02*, silhouette images typically offer an easy trace. In this next example, a silhouette cat image is imported into the **Trace Image** window. Because this is a silhouette image, **Monochrome** mode is chosen and the image appears to have traced very well. However, upon a closer look at the right side of the cat, it appears that the neck area is a bit sharp:



- To soften the outline of the cat, zoom in on that area and then increase the **Smooth** setting until a desired result is obtained. In the following screenshot, the **Smooth** setting is increased from 75 to 85. Remember to click on **Update Preview** after every adjustment to settings:

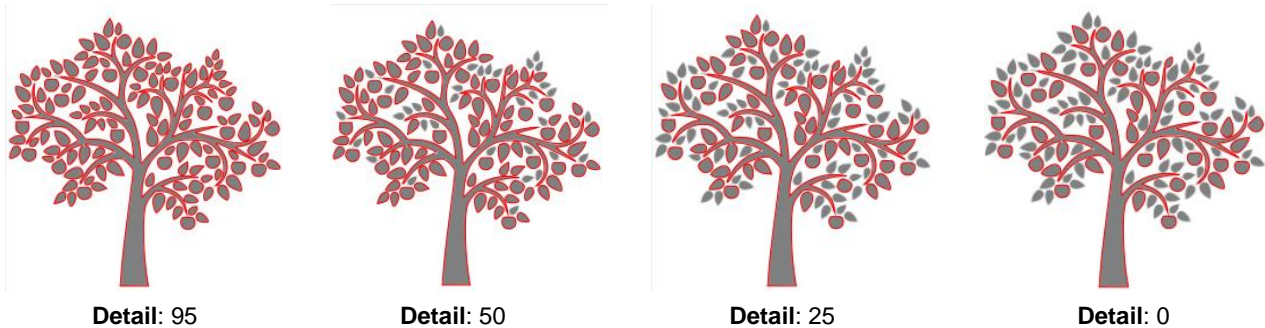


- After clicking on **OK**, the cat shape appears on the **Cutting Mat** and is ready to be sized and cut:



7.03.4 Monochrome Trace of a Detailed Image: Effects of Detail

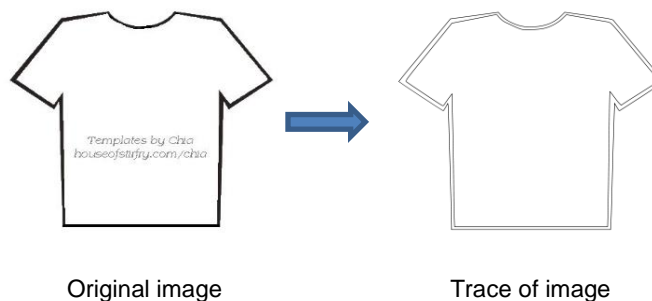
- The **Detail** setting can be used to filter out small shapes. Sometimes these shapes are just random pixels that show up from, say, a dirty scanner bed. Other times they are shapes that make up the design but will be too small to cut and are not needed.
- Before showing examples of the **Detail** effect, note that there will be times when some small shapes might be needed but not all of them. In those situations, it's best to include them and then they can be edited out using other tools in SCAL.
- The following tree image is imported into the **Trace Image** window. You have decided that not all of the leaves needed. The **Detail** setting can be lowered to filter out some of the smaller ones:



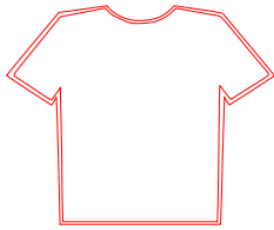
- As shown in the prior screenshot, decreasing **Detail** will remove small shapes. However, even at 0, there are still shapes of a certain size that will be included in the trace. Again, there are editing tools that can be used in case more of the small shapes need to be removed. Refer to *Section 8.06*.

7.03.5 Monochrome Trace of a Coloring Book Image: Single Line Threshold and Blackout

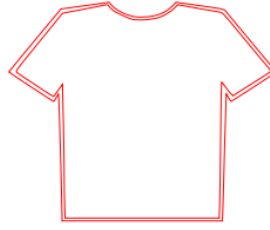
- The **Single Line Threshold** setting is useful when the imported image had a black border around it and you do not want a double line trace. For example, if the following T-shirt image is traced using default settings, two trace lines result: one line is following the outside of the black border while the other line is following the inside of the black border:



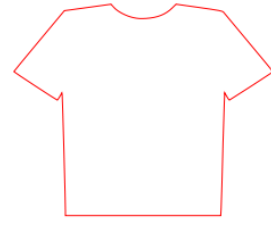
- To have only one trace line, increase the **Single Line Threshold** setting until there is only a single line showing in the **Preview** window:



Single Line Threshold = 0
double line

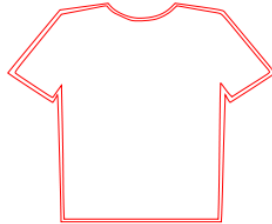


Single Line Threshold = 5
double line

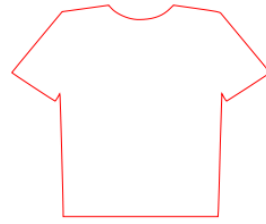


Single Line Threshold = 10
single line

- ◇ Because the T-shirt image is a simple closed shape, the **Blackout** option could have been used instead of **Single Line Threshold**:

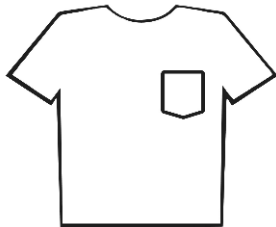


With **Blackout** unchecked

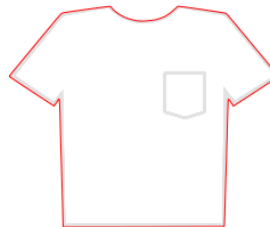


With **Blackout** checked

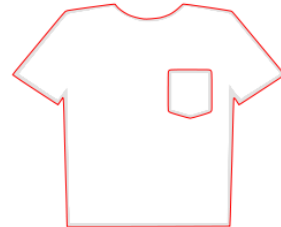
- ◇ However, if the T-shirt had internal details, such as a pocket, then **Blackout** could not be used as the entire pocket would have been ignored. In this situation, **Single Line Threshold** is the better choice:



Original image



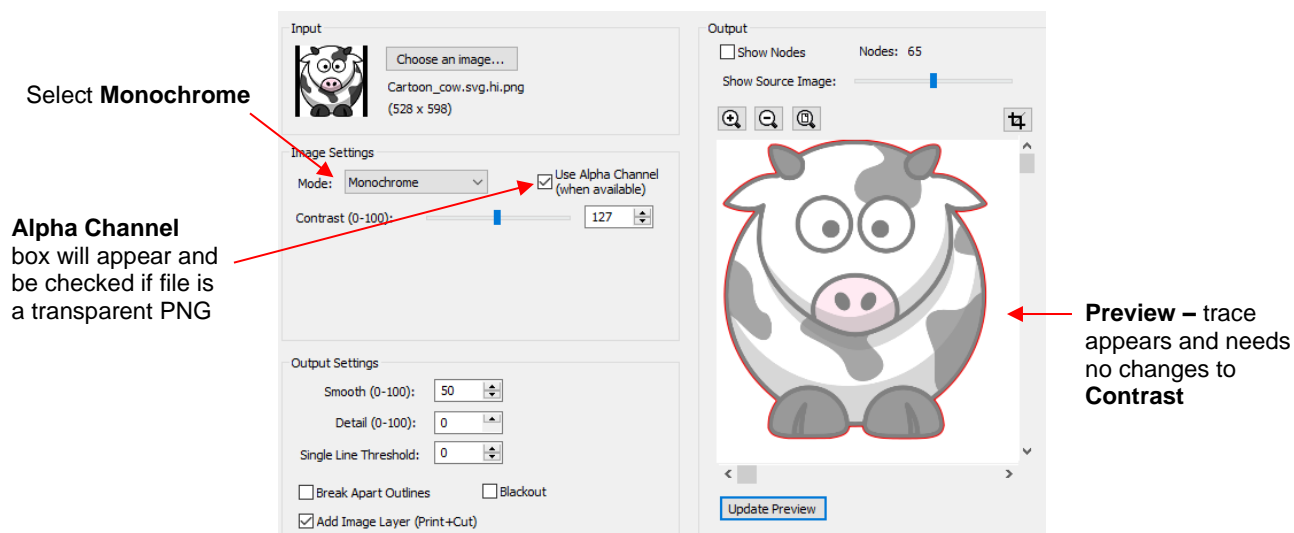
Preview of trace with
Blackout checked



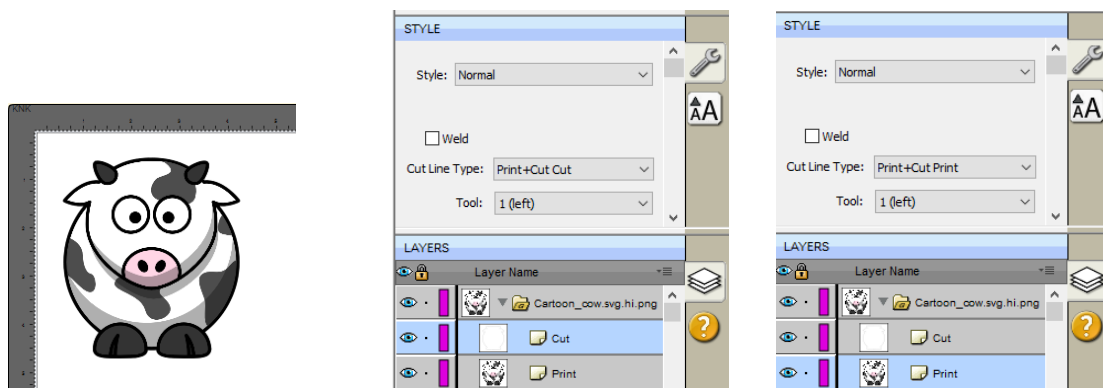
Preview of trace with
Single Line Threshold
increased

7.03.6 Monochrome Trace of a PNG File with a Transparent Background

- PNG files with a transparent background are the easiest files to trace because the software can readily identify where the invisible background starts and ends. Furthermore, when you load a PNG file into the **Trace Image** window, an option will pop up if a transparent background is identified:



- Regarding a few of the relevant **Settings**:
 - ◇ **Contrast**: It shouldn't be necessary to adjust this setting because of the transparent background
 - ◇ **Smooth**: In some cases, it might be necessary to decrease **Smooth** to get a tighter fit for a print and cut application. Alternatively, you can also create an **Inset** after the trace, when needed. Refer to the **Inset Offset** option in *Section 8.05*.
 - ◇ **Blackout**: apply if there are internal cut lines that are not needed
 - ◇ **Add Image Layer (Print + Cut)**: Mark this box if you want a second layer with the original image.
- If the **Add Image Layer** option is marked, after clicking on **OK**, the image will appear on the **Cutting Mat** and the **Layers Panel** will indicate which layer is the **Print** and which is the **Cut**. Note that on the **Style Panel**, the **Cut** layer will be designated as **Print+Cut Cut** and the **Print** layer will be designated at **Print+Cut Print**. This means that the **Cut** layer will not be printed and the **Print** layer will not be cut:



- For more information on the **Style Panel**, refer to *Section 10.01*.

7.03.7 Color Layers Trace

- As mentioned in *Section 7.03.1*, **Color Layers** might be a good mode to choose for a paper piecing or layered vinyl project if you want under-layers present. In this section, a flower that has two shades of pink and two shades of green is chosen:



- After loading the image and then selecting **Color layers**, the window will update to show new settings:

Select **Color layers**

Scroll to select number of colors to identify

Colors identified

Scroll to the left to better see the cut lines in the **Preview**

Preview

Click here after every change

- The **Max Colors** setting shows the current number of identified colors. Below that are icons of these colors. Note that white (or whatever has been used for the background color of the graphic, will also be included in the count. If you do not see those color samples, click on **Color layers** a second time.
- Depending on the image and what you want in your final trace, the **Max Colors** can be increased or decreased. Because this image has two shades of pink and two shades of green, those can be added to the count:

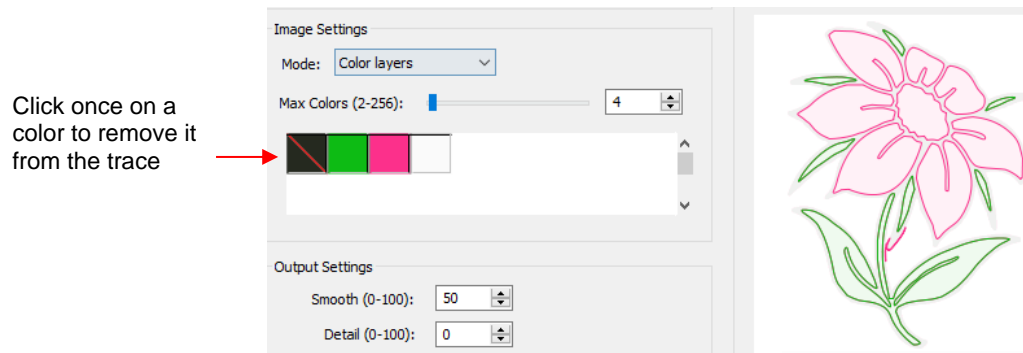
Max Colors increased to 6

- After accepting **OK** in both cases, the layers are ungrouped and compared:

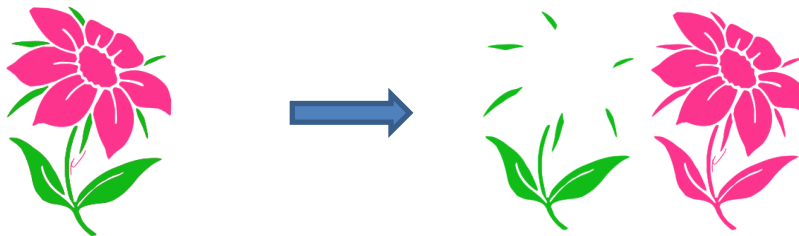




- You can also turn off colors by clicking on them. For example, if you do now want the black background traced:



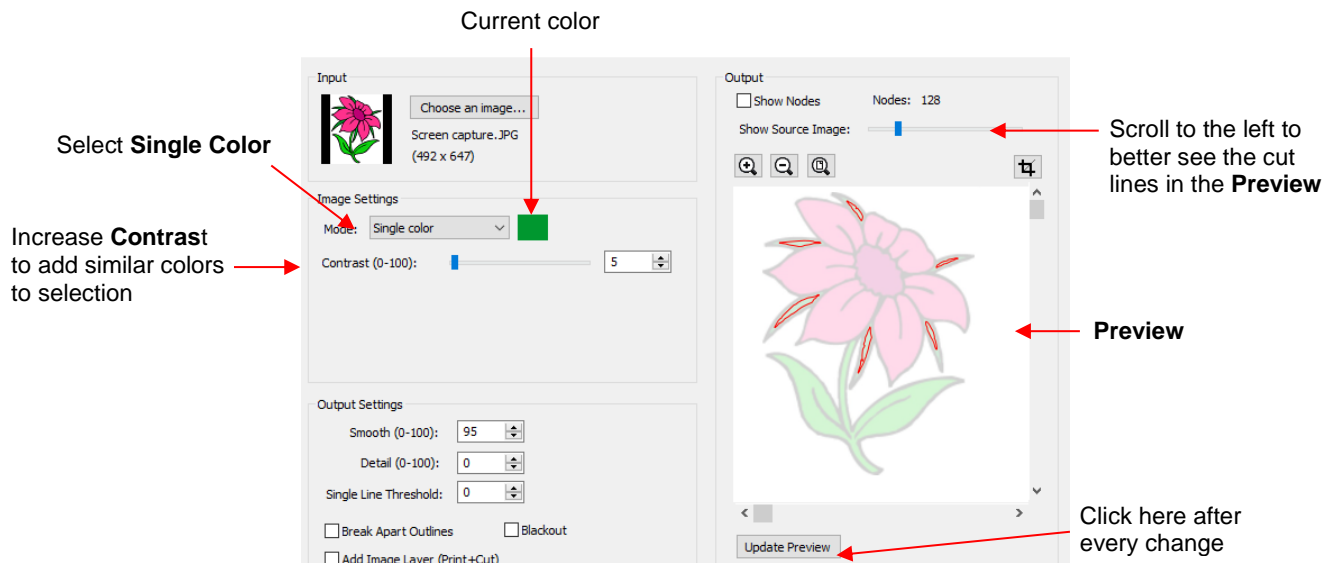
- The result is this:



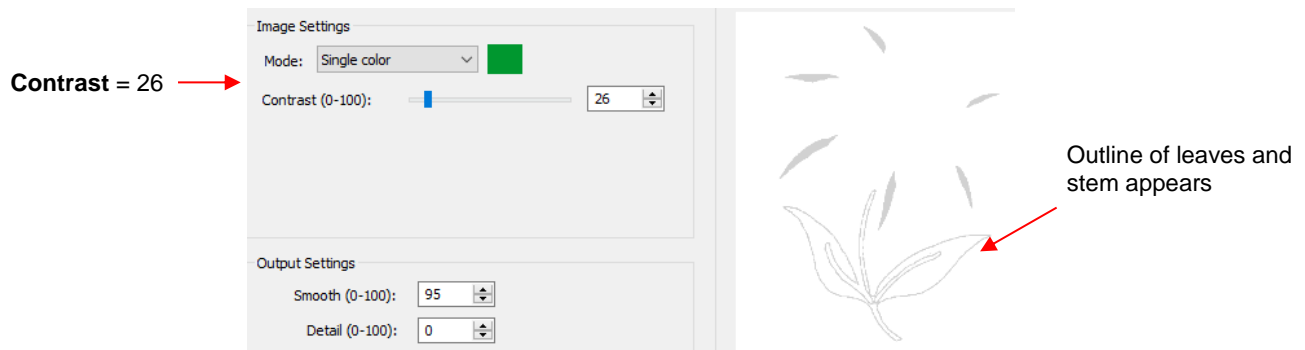
- In simple designs, **Color Layers** can be quick and easy to implement. Realistically, in cases like this image just covered, it might not be easy to layer these detailed cuts perfectly. Thus, the **Single Color** option will more likely be used in most cases.

7.03.8 Single Color Trace

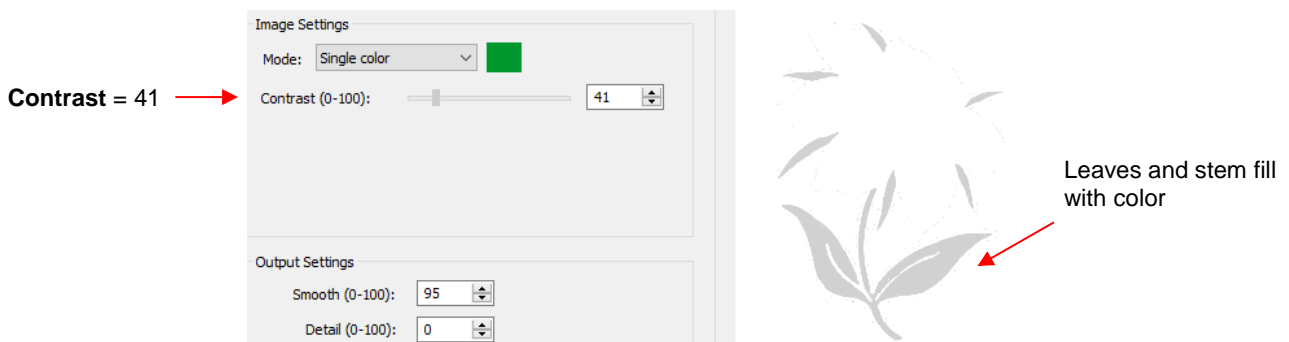
- With the **Single Color** option, each desired color is selected and traced individually. The advantage is that only the visible part of each color is traced. The disadvantage is that you must reload the image and perform a trace for each color desired.
- Again, the same flower image that was used in the prior section will be opened into the **Trace** window. When **Single Color** is selected from the drop-down menu, the window will update to show new settings:



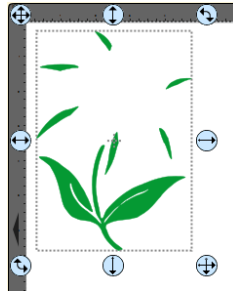
- In the screenshot, the initial color identified was a shade of green. In the **Preview**, you can see how many parts of the flower were included as being in the range of that shade.
 - If you want to add more of the green parts of the flower, then increase the **Contrast**. As you hold down the left mouse button and scroll, the image will turn gray so that you can more clearly see what is being added.
- ◇ With a **Contrast** of 26, the outline of the flower stem and leaf appear:



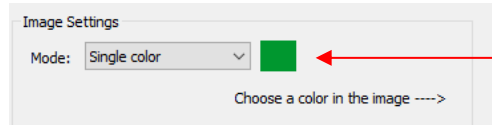
- ◇ With a **Contrast** of 41, the leaves and stem fill:



- Once you are satisfied, click on **OK** to import that green layer onto the **Cutting Mat**:

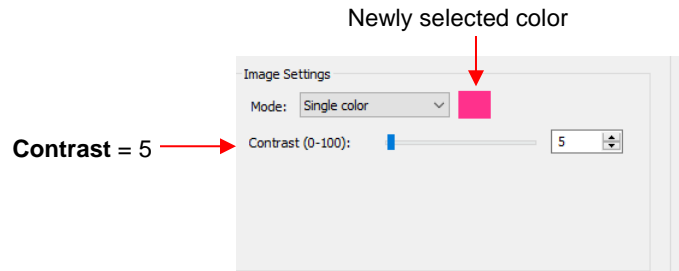


- Now, reopen the **Trace** window, reload the same image and then click on the color box next to **Single Color**. A message will pop up indicating you are to click on another color on the **Preview**:



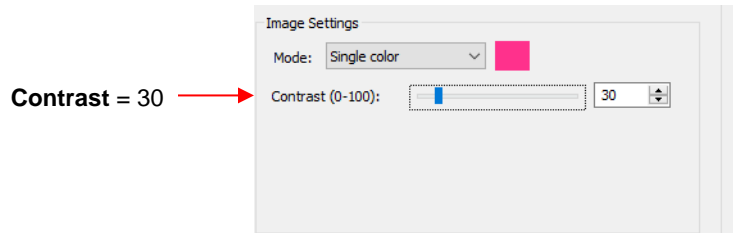
Click on this box

- One of the petals is clicked and the color box turns to that color. The **Preview** shows how much of the image is now included at the current **Contrast** of 5:



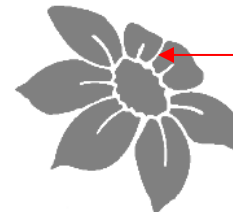
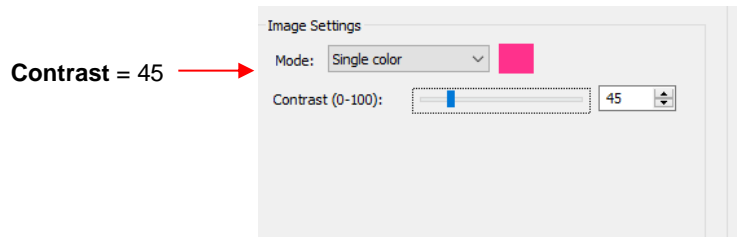
These petals are included in this color

- The process is then repeated whereby the **Contrast** is increased. At a value of 30 more of the same petals are filled out, thus it is recommended to always tweak the **Contrast** some:



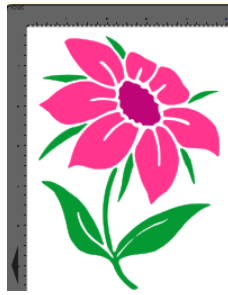
The petals fill out a bit more at a higher **Contrast**

- If the **Contrast** is increased even higher, the center part of the flower gets added. Just as in the case of using **Color Layers**, this is optional.



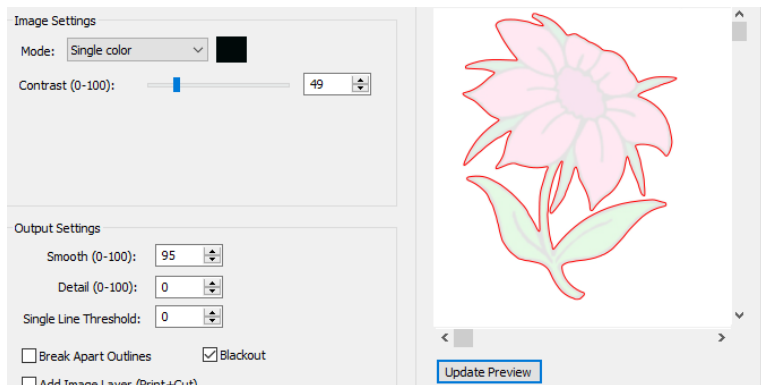
The center of the flower is now added

- After deciding on the **Contrast** for pink, click on **OK**. Now, let's assume that you did the petals and center in two parts and you are now at this point:

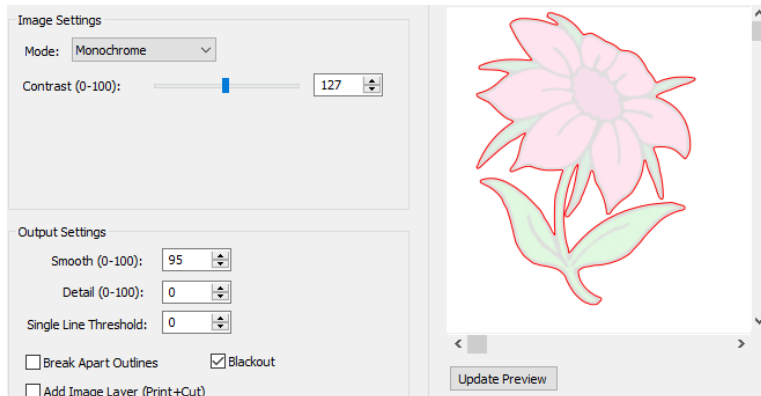


- You now have several options for completing the trace which involves adding a final outline/shadow layer to the flower:

◇ Option 1: Continue to use **Single Color**, click on the part of the image that is black, mark the **Blackout** option:



◇ Option 2: Switch to **Monochrome** mode, mark the **Blackout** option:




◇ Option 3: Forgo using the **Trace** window. Select the layers traced so far and use the **Shadow Layer** function to add a black outline. Details of this procedure are covered in *Section 9.04*.

- The final results, using the three options, are virtually identical:



7.04 Draw Functions

7.04.1 The Draw Tool

- The **Draw Tool** is accessed by clicking on the 5th icon  on the **Tools Panel**. This tool is used to draw straight lines and Bézier curves. It can be a bit tricky to master but just like with many good things - practice makes perfect!

Drawing Straight Lines

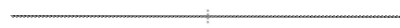
- To draw a single straight line, use your mouse to click once where you want to start the line and click again where you want to end the line. Then immediately press **Esc** or the **Enter** key:



Left click once to begin.



Move cursor to where you want to finish the line.

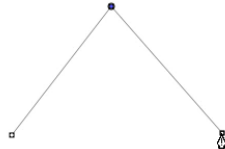


To stop drawing, press **Esc** or the **Enter** key

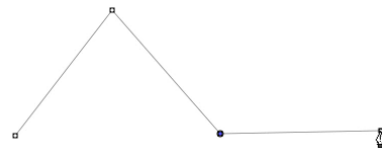
- If you wish to continue drawing a path of connected lines, keep left-clicking each time you need to change directions. Each click produces a node:



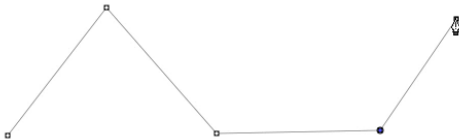
Left click to start and left click at a 2nd location



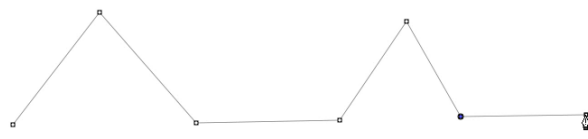
Move to a 3rd location and left click again.



Move to a 4th location and left click again.

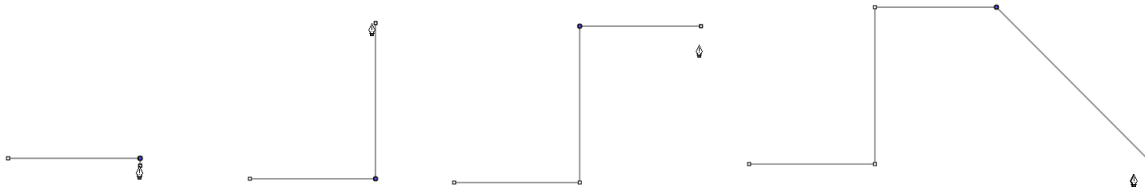


Move to a 5th location and left click again.



Continue clicking until you are ready to end. Click **Esc** or the press the **Enter** key.

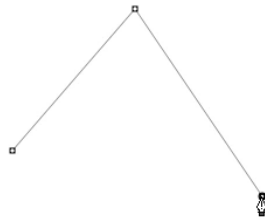
- If you want to draw perfectly vertical lines, perfectly horizontal lines, or lines at a 45° angle, hold the **Shift** key while clicking:



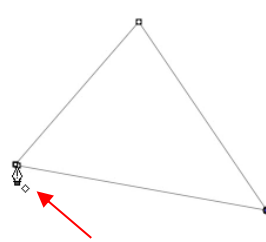
- If are drawing a closed path then, just as the mouse cursor approaches the starting node, a small diamond will appear next to the cursor and you can click one last time to end the process. The shape will automatically join the first and last nodes and fill with color, provided a **Fill** color is assigned:



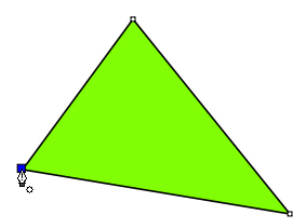
Left click to start and then left click at a 2nd location



Move to a 3rd location and left click again



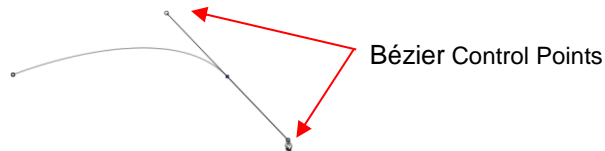
As you approach the start, watch for the cursor change.



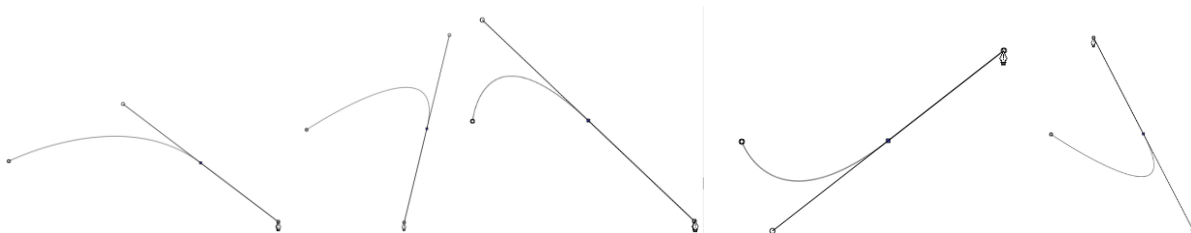
Left click and the shape will close and fill with color

Drawing Bézier Curves

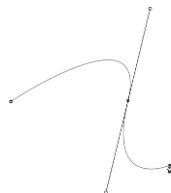
- Drawing curves is a bit more difficult. The key is to take it one step at a time, practice the technique a lot, and remember that you can later correct your curves using the **Shape Tool** (refer to *Section 8.10*).
- To draw a curve, use your mouse to left-click once where you want to begin the curve. Then, instead of left-clicking, hold the left mouse button down and begin dragging the mouse. Continue holding the left button and notice a second line appears with two circles at either end. These are called Bézier control points:



- As you drag the mouse, you'll see that you have full control over how long this line will be, as well as where the control points are positioned. Remember to just keep pressing the left mouse button. Experiment with longer and shorter control lines, as well as rotating the line to bend the curve in a range of different ways:



- When you are satisfied with the curve, you have two choices at this point:
 - ◇ Release the left mouse button, move the mouse to a new spot, left-click, and you'll begin creating a new curve connected to the prior curve:

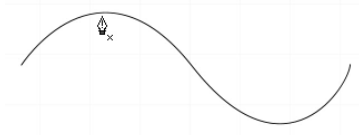


- ◇ Release the left mouse button and press the **Esc** key or press the **Enter** key to stop the drawing process:

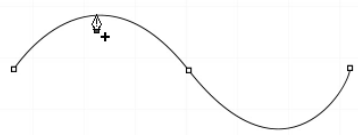


Adding and Deleting Nodes

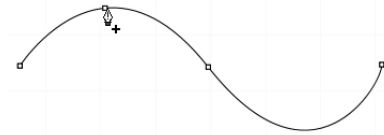
- Zoom in on the curve, select it, and then click on the **Draw Tool** icon.
- To add a node, move the cursor next to the path and watch for the cursor to change. With the cursor right on the path, left-click to add a node:



Note the cursor has a small x next to it as it approaches the curve

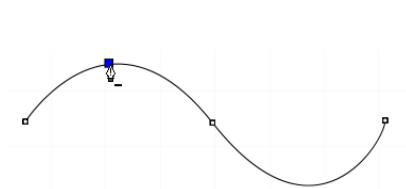


After cursor changes, left click once and a node is added

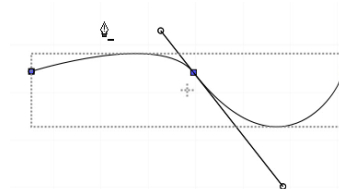


New node has been added

- To delete a node, move the cursor over an existing node until the cursor changes and you can see the node turn blue. Left-click once to delete that node:




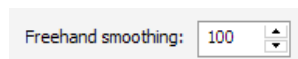
Once the cursor changes and the node turns blue, left click



The node is deleted and the curve will change accordingly

7.04.2 Freehand Drawing

- The **Freehand** tool is accessed by clicking on the 6th icon  on the **Tools Panel**. This tool is used to freely draw thin lines with your mouse or, better yet, a graphics tablet.
- In the **Tool Options**, there is a setting called **Freehand smoothing**. Increase that setting if you want the software to reduce “shakiness” as much as possible:



- The two extremes for the **Freehand smoothing** setting clearly demonstrate the difference:



smoothing: 0



smoothing: 100

- When drawing closed shapes, the shape will remain an open path regardless of how precise you attempt to be in returning to the start. To close the shape, select it and go to **Path>Close Path**:




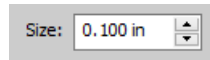
Freehand tree



After applying **Path>Close Path** and selecting a **Fill** color

7.04.3 Brush Drawing

- The **Brush** tool is accessed by clicking on the 7th icon  on the **Tools Panel**. It is used to freehand draw thick lines. As with the **Freehand** tool, using a stylus with a graphics tablet will provide the most control.
- In the **Tool Options** is a **Size** setting for the thickness of the **Brush** tool:



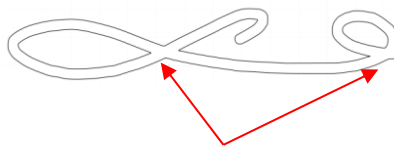
- Select the **Size** you desire and freehand draw:



- One fun application is to use the **Brush** tool to easily add circles to a design. Select the **Size** and then just left-click without dragging the mouse. For example, the tree drawn with the **Freehand** tool in the prior section is now decorated:



- Note that if a path drawn with the **Brush** tool crosses itself, the overlap will be removed:



Overlaps automatically removed

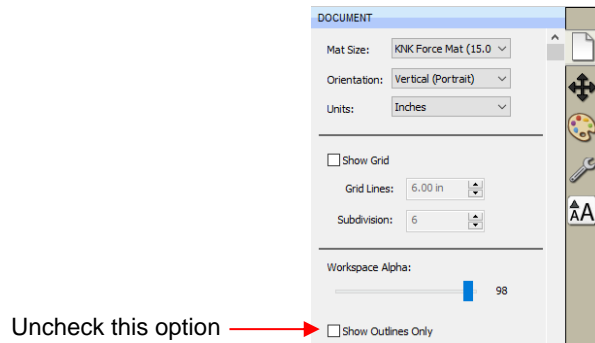
7.05 Manual Tracing of an Imported Image

- Sometimes the quality of an image will fail to yield a good auto-trace. It could be that the image is too small or too detailed. If the image is important to you, then manually tracing offers another option for conversion to a vector cut line.
- The easiest way to manually trace a raster graphic is using the **Draw Tool** presented in **Section 7.04.1**. However, instead of trying to create the Bézier curves as you go, it's faster and easier to simply and quickly click, click, click around the image placing a node wherever the path changes directions. Then you can go back and manually move nodes and drag curves to fit the original image. This process is presented in the next few subsections.

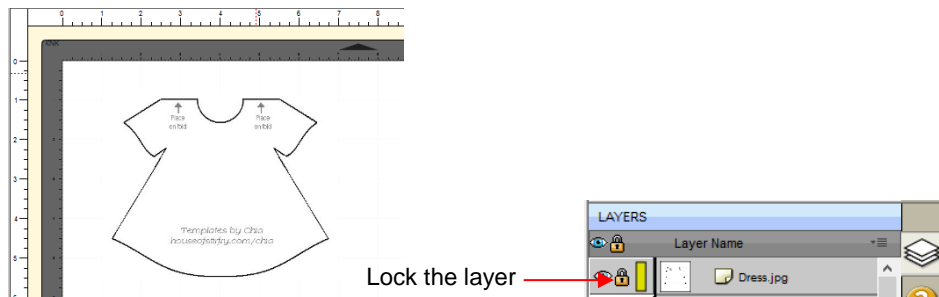
7.05.1 Importing an Image for Manual Tracing

- Since you won't be trying to auto-trace the raster image, use **File>Place Image** to import it onto the **Cutting Mat**. In this tutorial, the *Dress.jpg* file shared at the link in *Section 7.03* will be used.
- While this dress could easily be auto-traced, it provides a great example of how the **Draw Tool** can be used to fit a shape such as this. So, it will be used for the manual tracing example.

- In order to see the image, make sure **Show Outlines Only** is not checked on the **Document Panel**:

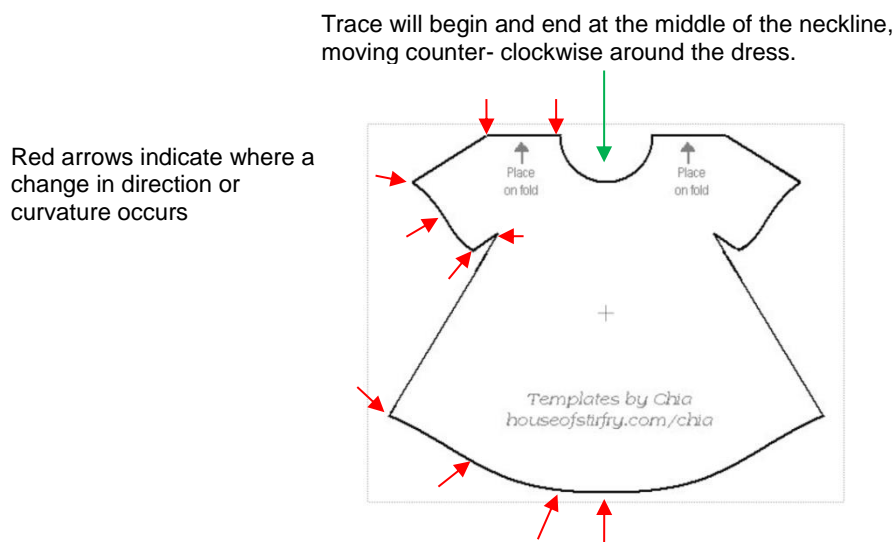


- To avoid inadvertently selecting the image while tracing, lock that layer on the **Layers Bar**:



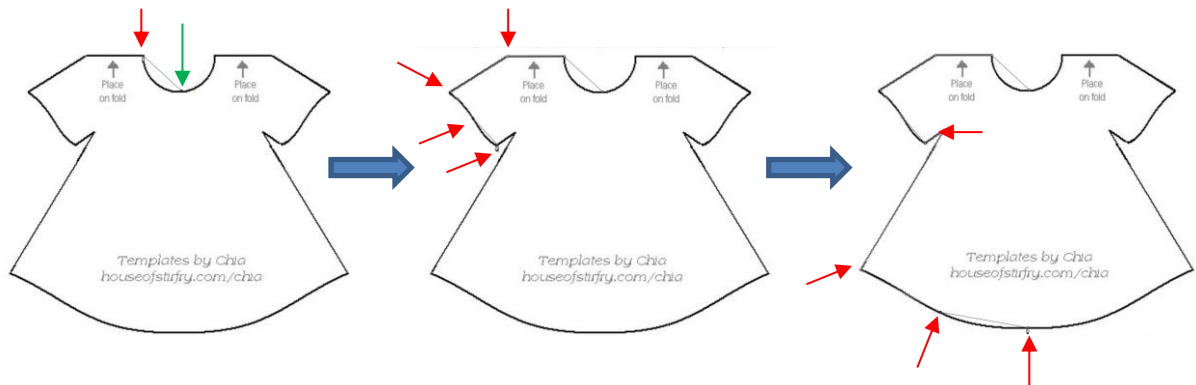
7.05.2 Manual Tracing Using the Draw Tool

- Make sure you have read *Section 7.04.1* to learn how to comfortably and successfully use the **Draw Tool**.
- Now, the best method for tracing a symmetrical image is to only trace one half. Then you can make a copy of it, mirror the copy, and weld the two together to create a perfectly symmetrical shape. This is what will be done in this case because the dress is symmetrical.
- Before beginning the trace, visually note how many changes in curves and straight lines exist. This will help you understand where to click as you work around the image. But don't overthink it. Remember that you can add nodes, delete nodes and move nodes during the editing process:

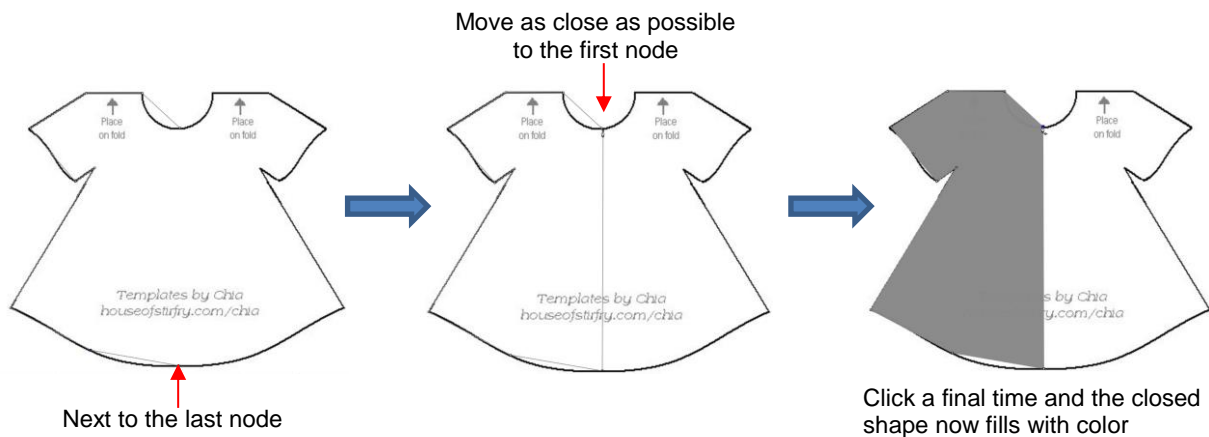


- The process is as follows:


- ◇ Zoom in as close as possible, but make sure the entire image can still be seen. Click on the **Draw Tool** icon.
- ◇ Left-click once in the middle of the neckline (see green arrow below). Then click at each point where the curve changes. A series of straight line segments will be made, one right after another:



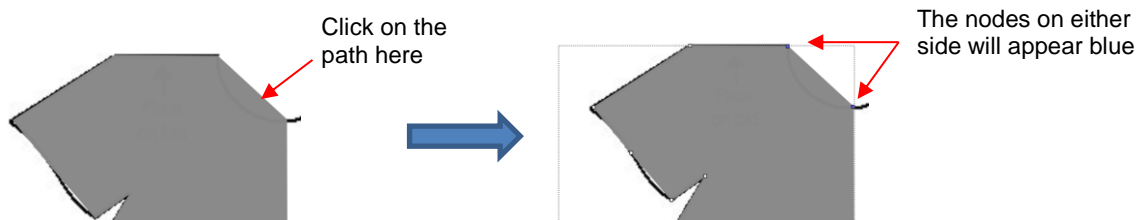
- ◇ Once you've reached the next to the last node, click as close as possible on the first node and the shape will close and fill with color (based on the color currently assigned on the **Fill & Stroke Panel**):



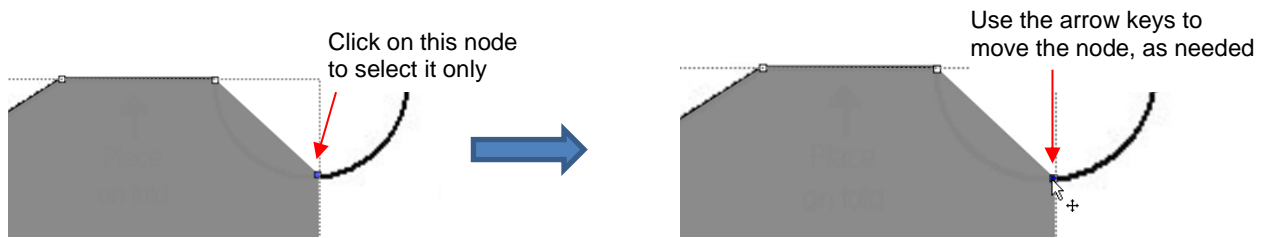
7.05.3 Editing the Trace

- The next step is to move nodes and convert any straight lines into curves, as needed. This is done using the **Shape Tool**  which is the 3rd icon on the **Tools Panel**. Note that more details about using the **Shape Tool** will be presented in *Section 8.10*. For now, only a portion of this function's capability is needed.
- Using the **Shape Tool** will take a bit of patience and attention. But following the steps exactly as presented should yield successful results:

- ◇ With the **Shape Tool** selected, click on the neckline path. The two nodes on either side will be blue:



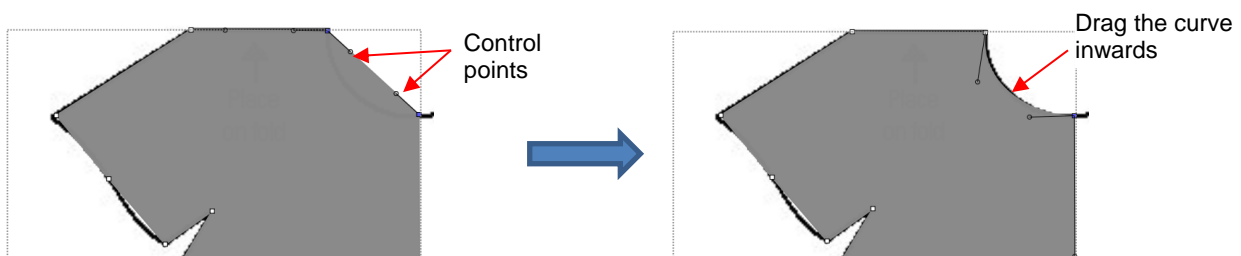
- ◇ If you need to move either node, click on the node to be moved and the other node will turn white. Be very precise in clicking as it is easy to miss the node. If that happens, you will need to click the path again to show the nodes.
- ◇ Once you have the single node highlighted in blue, you can now move the blue node by using the arrow keys on your keyboard:



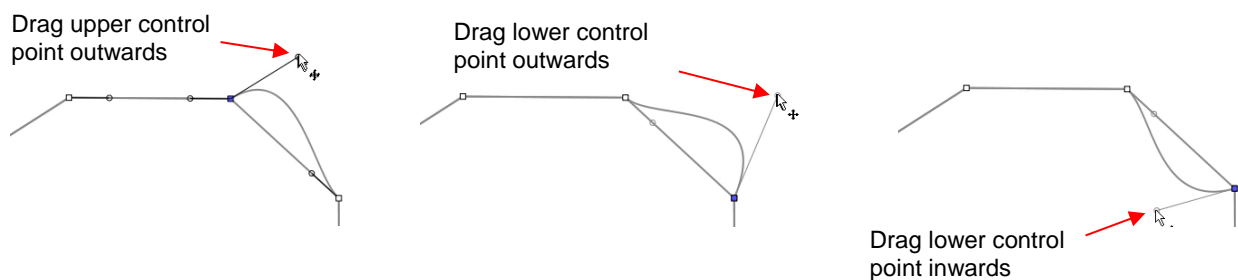
- ◇ Next, click on the second icon on the **Tool Options**:




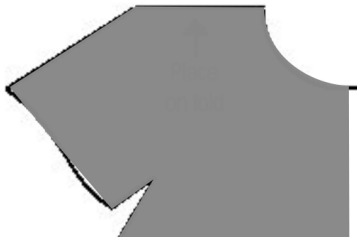
- ◇ Then click again on the neckline path and you will see Bézier control points. This means you can now drag the middle of the path inwards to form the neckline:



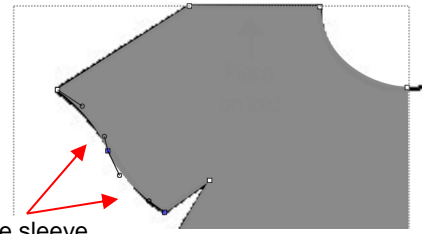
- ◇ Alternatively, the Bézier control points can also be dragged. This is useful if the curve isn't symmetrical. Here are a few examples of how that curve could be altered:



- ◇ Just like with nodes, when selecting a Bézier control point, you need to click precisely on the little circle. If you inadvertently see all of the nodes disappear, just click on the path again.
- ◇ Once the neckline is curved, go over to the sleeve and repeat the process for both parts of the sleeve since one side curves inwards and the other side curves outwards. Again, click on the path, click on the 2nd icon on the **Tool Options** , click on the path again and then drag the curve:



Before editing




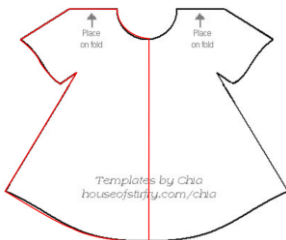
Both parts of the sleeve are reshaped

- ◇ Repeat on the bottom of the dress. The shape you traced should now fit the original image. If it's not a perfect fit, don't worry about it! No one will ever know. 😊

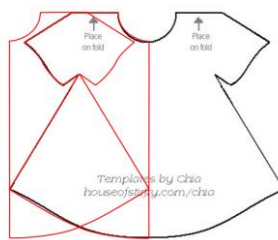


7.05.4 Copy, Mirror and Weld to Complete Symmetrical Shapes

- The final step to complete the dress involves making a mirror image copy and then welding it to the original.
 - ◇ Select the dress and do a **Copy** and **Paste** or you can hold the **Alt** key and click once on the dress to make a copy of the image on top of the original.
 - ◇ With the image still selected, click the **Mirror** icon  on the **Position & Size Panel**.
 - ◇ Move the copy to the right until it slightly overlaps the original. In the following screenshots, **Fill** has been turned off and a thick red **Stroke** applied to better illustrate:



Original trace

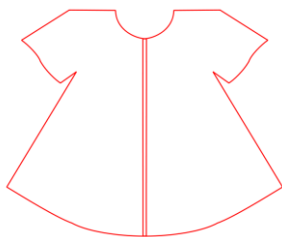


Copy made and Mirror applied

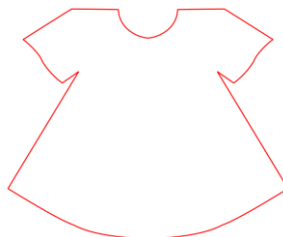


Copy is moved to the right side

- The original image is no longer needed. The trace and the copy are welded using **Path>Union**. Fill is then applied to complete the trace:



Imported raster is removed



Apply **Path>Union**



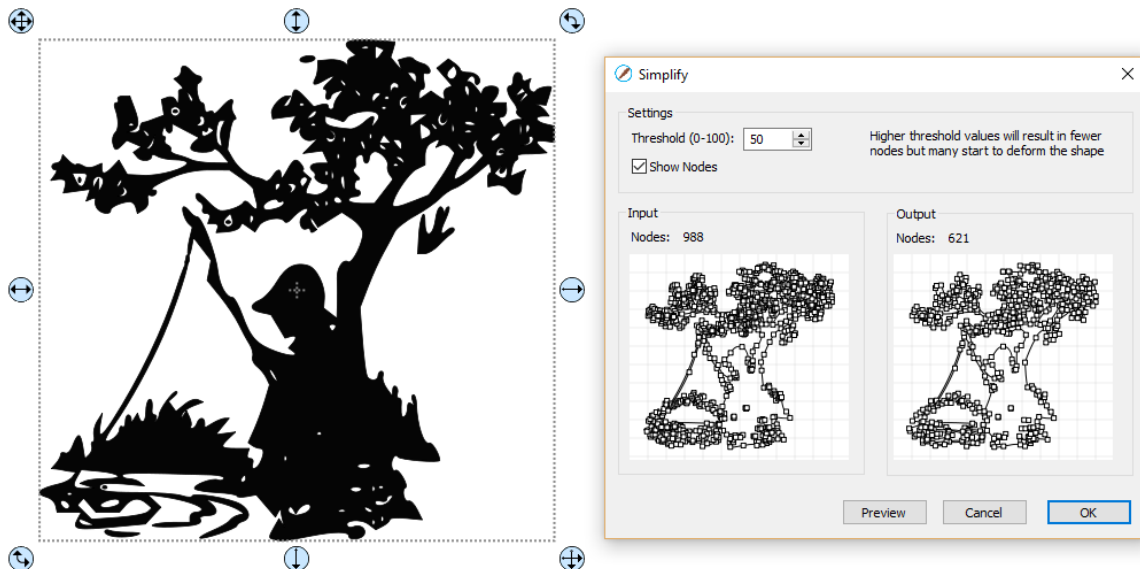
Turn on **Fill** and select a new color

8. SCAL: Editing

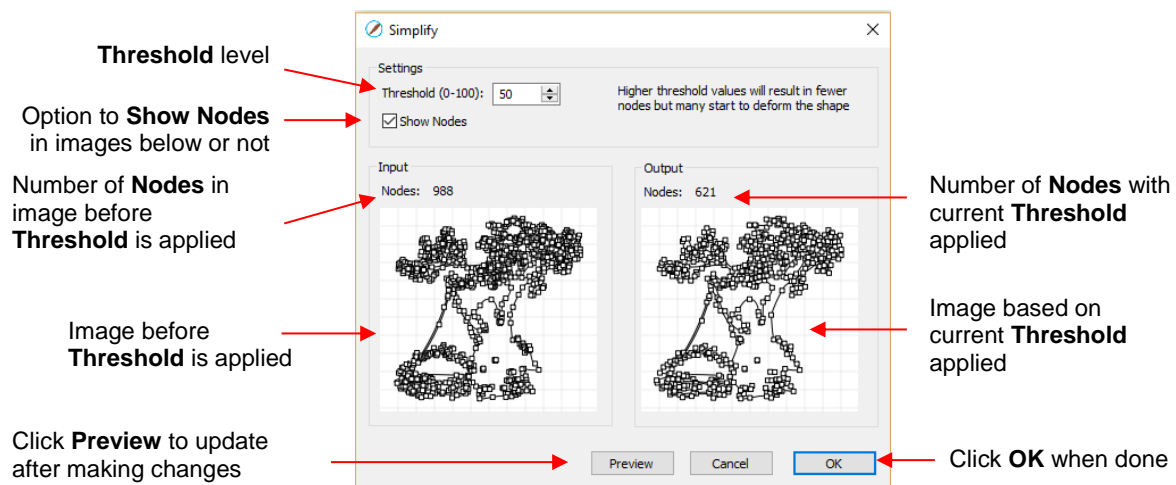
This chapter covers functions that are used to modify shapes in SCAL as well as prepare shapes for cutting. For functions used in designing, refer to *Chapter 9*.

8.01 Simplify

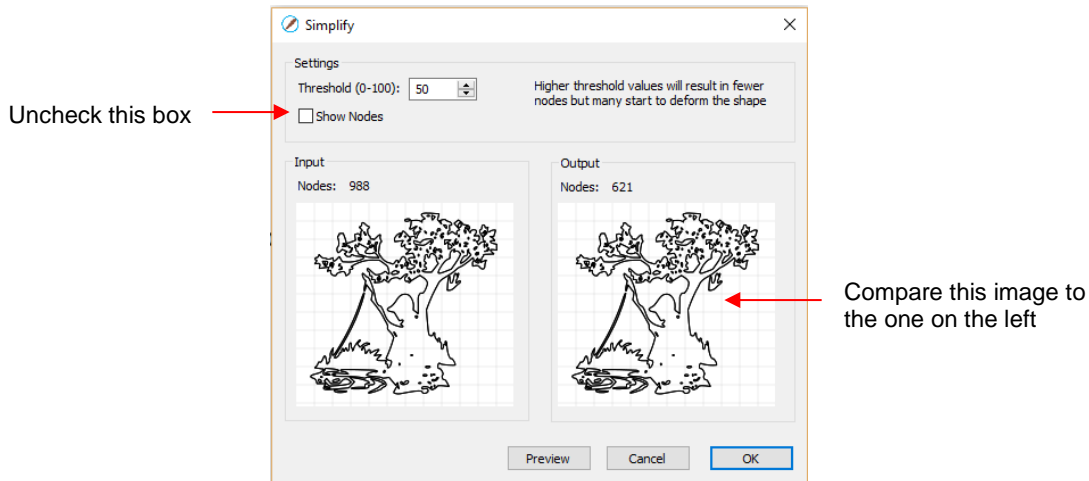
- The purpose of the **Simplify** function is to reduce the number of nodes. This can be important when cutting small vector shapes in which clustering of nodes in tight locations can sometimes lead to poor cutting.
- There are two ways to open the **Simplify** window after selecting a shape:
 - ◇ Right-click and select **Path>Simplify**
 - ◇ Go to **Path>Simplify**



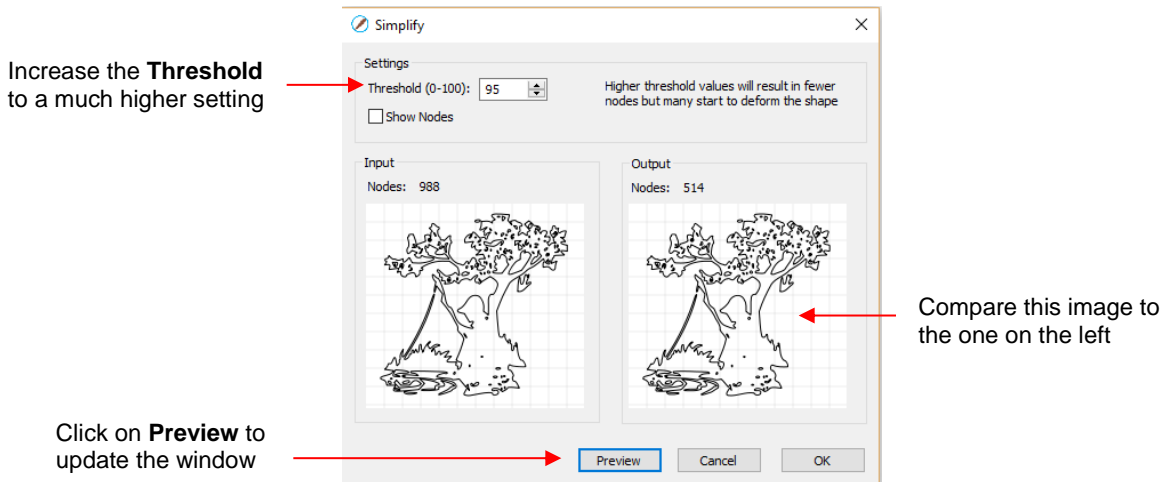
- The **Simplify** window shows the nodes of the selected image in two side-by-side windows: an **Input** and an **Output**, along with the number of **Nodes** in each one. That count is based on the current **Threshold** setting:




- To see the effect of **Threshold**, uncheck the **Show Nodes** box. Make sure the shapes haven't become distorted as a result of applying the current **Threshold** setting:



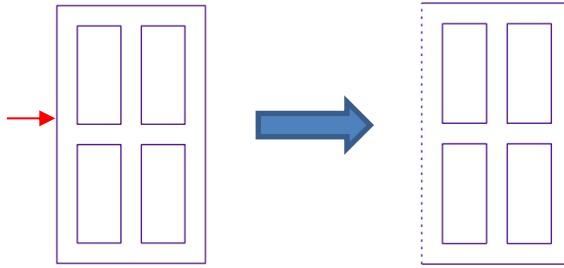
- Try increasing the **Threshold** setting to reduce more nodes. In general, you should be able to use a high **Threshold** without compromising the image:



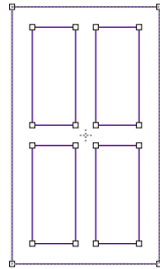
8.02 Split Path

- The **Split Path** function allows you to delete the path between any two adjacent nodes. First you must select two nodes using the **Shape Tool**  on the **Tools Panel**. Then you can access **Split Path** using either of the following:
 - ◇ Right-click and select **Path>Split Path**
 - ◇ Go to **Path>Split Path**
- The following door shape will be used as an example to show the steps. The goal is to change the left side of the door from a solid cut line to a dashed outline:

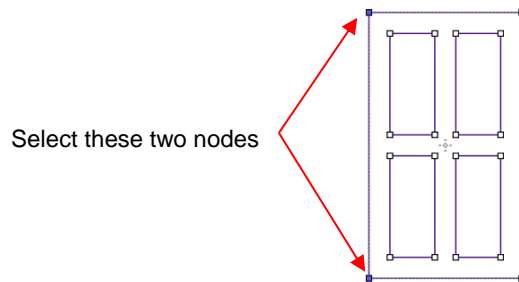
The left side of this paneled door will be separated and made dashed so that the door can be folded to open instead of being cut out




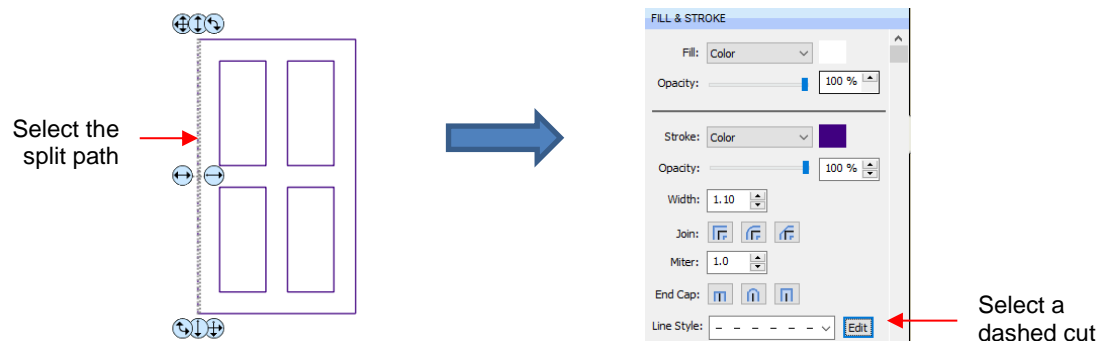
- ◇ Select the shape and click on the **Shape Tool** icon  on the **Tools Panel**. The nodes will appear on the shape:



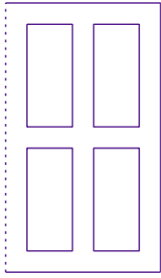
- ◇ Drag your mouse to marquee-select the two nodes on the left side of the window:



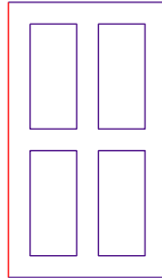
- ◇ Break that path by going to **Path>Split Path**. Then click on the **Select** icon . Now you can separately select that left side line and change to a dashed cut on the **Fill & Stroke Panel**:



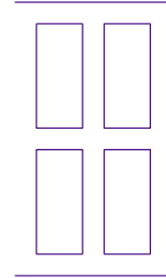
- ◇ The left side of the window will now cut dashed. Alternatively, the left side could have been left solid and scored with an embosser in the cutter or the left side could have been deleted and the fold made by hand:



Left side will cut dashed



Left side will be scored separately



Left side won't cut at all

8.03 Close Path

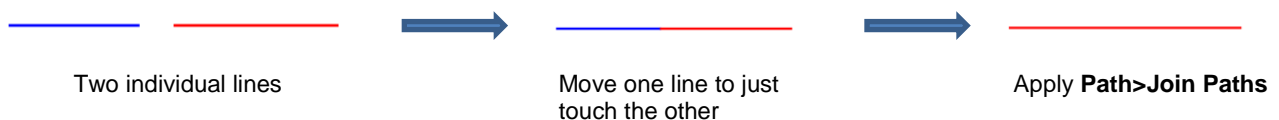
- The **Close Path** function can be applied to any open shape, other than a straight line, to join the start and ending nodes with a straight line:



- To apply **Close Path**, select an open shape and use either of the following:
 - ◇ Go to **Path>Close Path**
 - ◇ Right-click and select **Path>Close Path**
- The path will then fill with whatever **Fill** property is currently assigned to that shape.

8.04 Join Paths

- Join Paths** will connect two nodes from two different open paths if those nodes are in very close proximity to one another.
- To access **Join Paths**, select the two open shapes and go to **Path>Join Paths**:

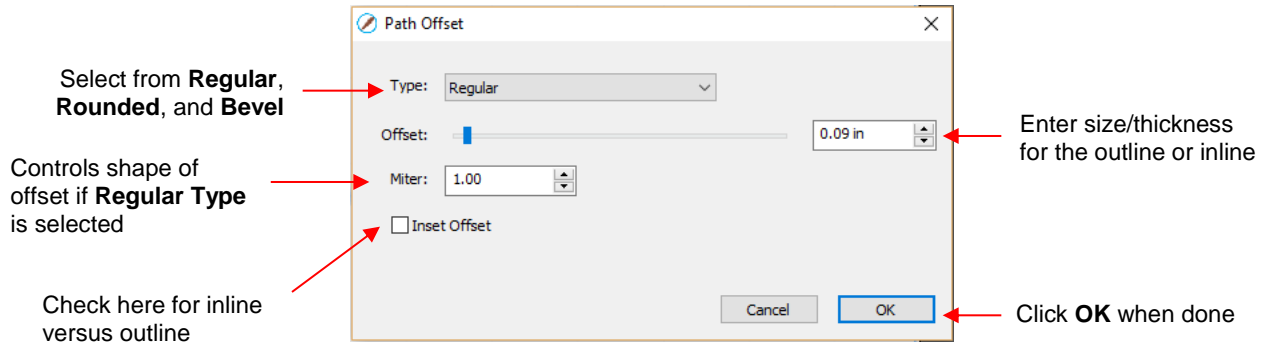


- If you are joining several lines at once, such as these four lines to create a box, then all four lines can be selected at one time and be joined. However, for the new shape to be an actual closed shape, you must then apply **Path>Close Path**:

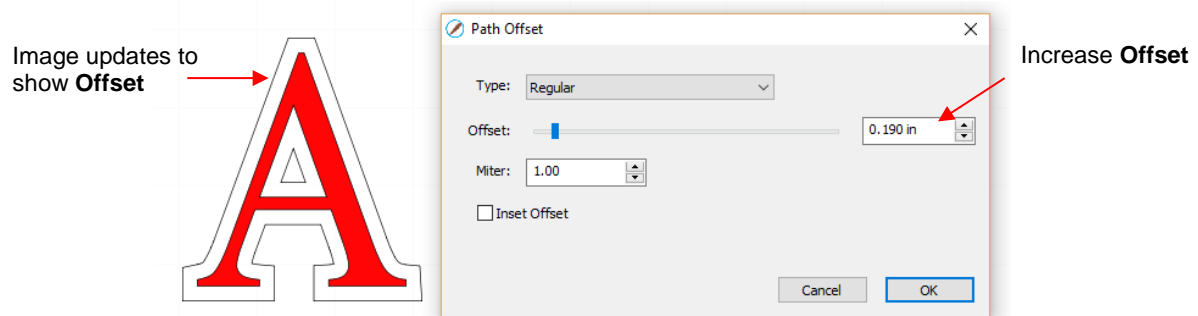


8.05 Path Offset

- **Path Offset** creates an outline or inline of a shape and will delete the original upon clicking on **OK**. Note that if you want the original, either make a backup copy or use the **Shadow Layer** function presented in *Section 9.04*.
- To access **Path Offset**, select the shape and go to **Path>Path Offset**:



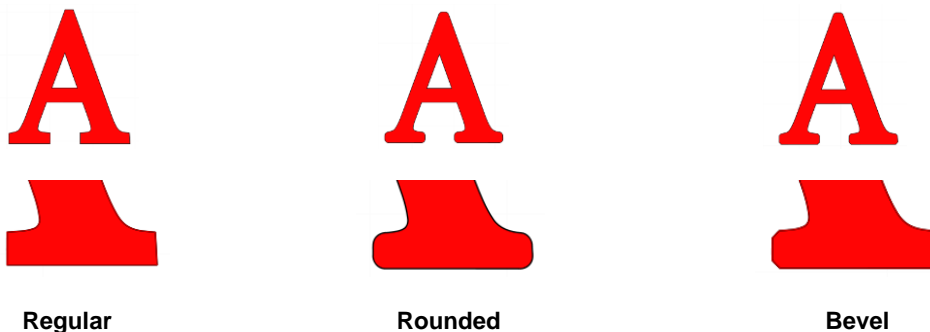
- As you increase the **Offset**, you will begin to see the outline form on your selected shape:



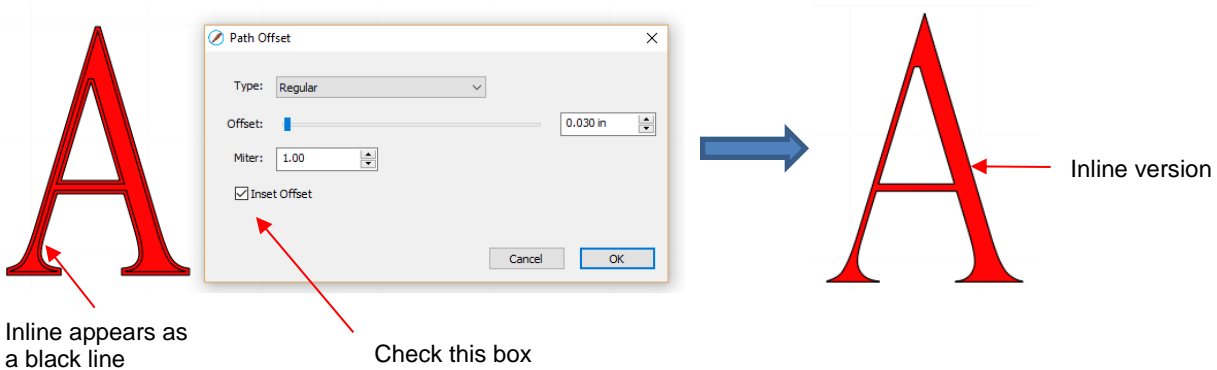
- After clicking on **OK**, the **Offset** will fill with the same color and the original will be deleted:



- **Type** controls the style or shape of the offset at the corners. There are three choices:



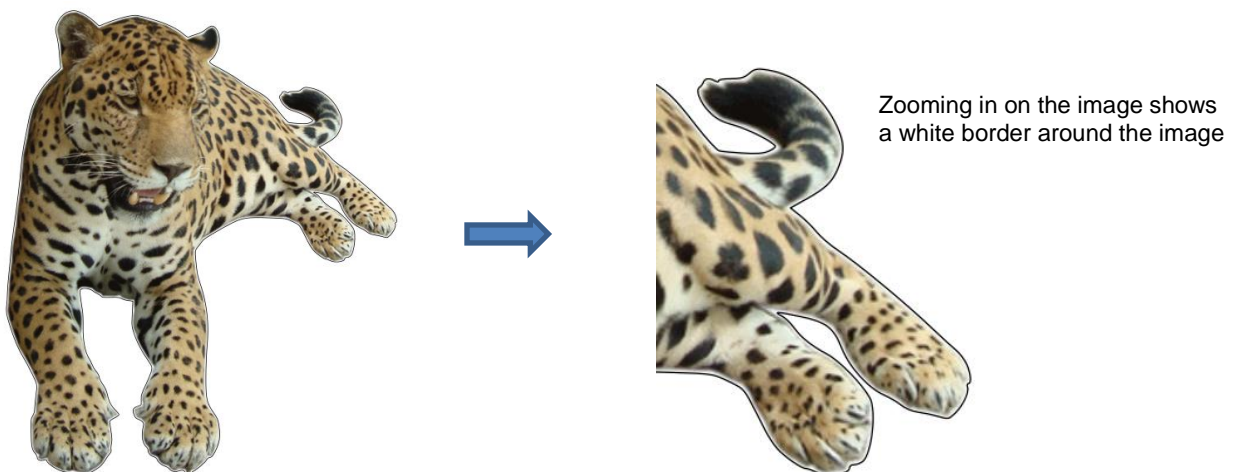
- Note that the first choice, **Regular**, also has a **Miter** setting which should work in the same way as **Miter** affects the **Stroke** (refer to *Section 5.14*). However, at this time, it appears that the **Miter** setting is not working.
- Checking the **Inset Offset** box creates an inline instead of an outline:



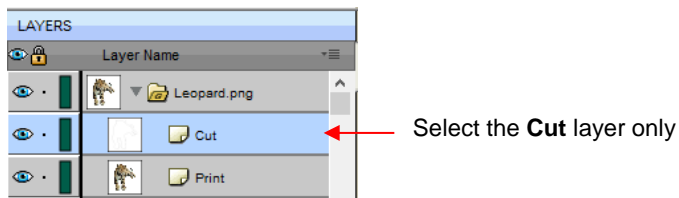
- A practical example of using **Path Offset** is when you have a font that is too thin to cut at the size you need. Applying a very small **Offset** can make the difference in whether or not text can be cut at certain small sizes. In the case below, the 1" lettering was offset by only 0.005":



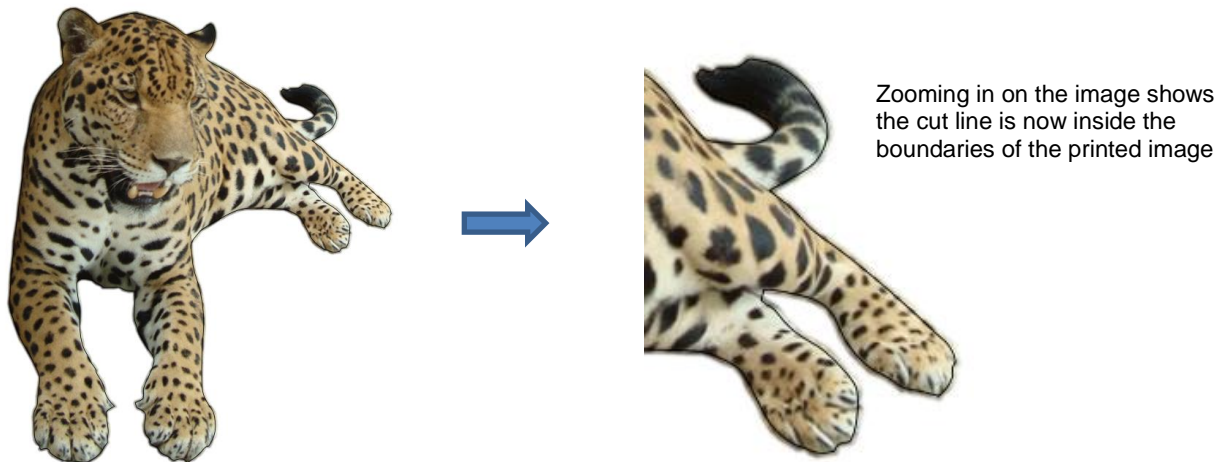
- A second practical example showing the use of **Inset Offset**, is the following print and cut application. A PNG with a transparent background was traced using the **Trace** function. However, based on the location of the cut line, relative to the printed image, there will be small amount of white surrounding the image:



◇ Select the **Cut** layer only on the **Layers Panel**:

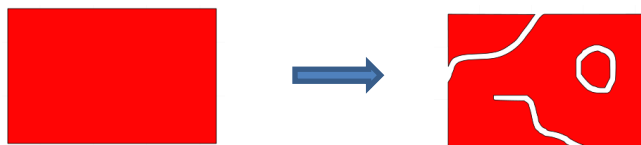


- ◇ Open the **Path Offset** window. Set the **Offset** to a small size, such as 0.03". Be sure to mark the box for **Inset Offset**. The result is a cut line which will eliminate that white border around the image:

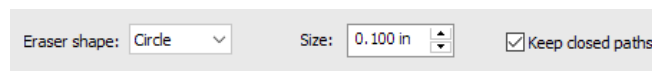


8.06 Eraser

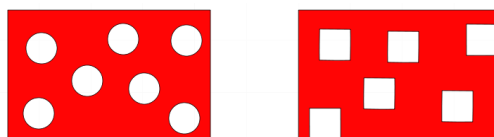
- The **Eraser** is the 8th icon  on the **Tools Panel**. Use this tool to erase parts of a shape by dragging your mouse across the shape:



- The **Tool Options** for the **Eraser** include the following:





- ◇ **Eraser Shape:** Choose either **Circle** or **Square**:

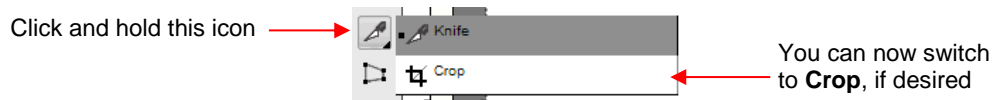


- ◇ **Size:** select a thickness for the erasure. Scroll up and down or enter a specific size.
- ◇ **Keep closed paths:** Mark this option if you bisect a shape and you want the two resulting shapes to be closed. Otherwise you end up with two open shapes:



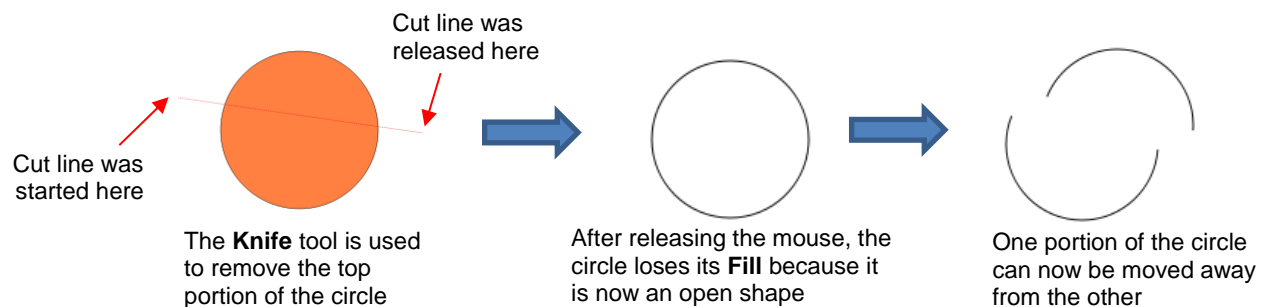
8.07 Knife and Crop

- The **Knife** tool can be accessed by clicking this icon  on the **Tools Panel**. Note the tiny triangle in the icon, indicating there are other options available. The **Crop** tool  can be accessed by holding down the left mouse button on this icon and then selecting **Crop** from the popup menu.



8.07.1 Using Knife

- The **Knife** tool always makes a straight line cut. Starting outside the shape, click and hold the left mouse button and drag across the shape at the desired location for the cut. When you release the mouse button the cut will be applied and one shape can be moved away from the other:



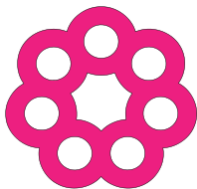
- There are four ways to control the angle of the cut:
 - ◇ Click and hold the left mouse button – you can freely drag the red cut line to cut at any angle (as shown in the screenshot)
 - ◇ Hold the **Shift** key and click and hold the left mouse button and drag left or right: the red cut line will be perfectly horizontal
 - ◇ Hold the **Shift** key and click and hold the left mouse button and drag up or down: the red cut line will be perfectly vertical
 - ◇ Hold the **Shift** key and click and hold the left mouse button and drag diagonally: the red cut line will be at exactly 45°
- If you wish to close the cut shapes, select them and either:

- ◇ Go to **Path>Close Path**
- ◇ Right-click and select **Path>Close Path**

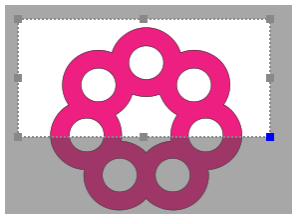


8.07.2 Using Crop

- With the **Crop** tool, you drag the mouse to marquee-select an area to be retained. Then you press the **Enter** key to complete the crop. Everything outside of the selected area will be deleted:



The top part of this shape will be cropped

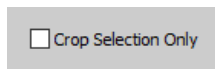


Marquee-select the area to be retained

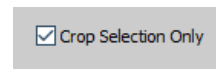


After pressing the **Enter** key

- There are two options when using the **Crop** tool based on a setting on the **Options Bar**:

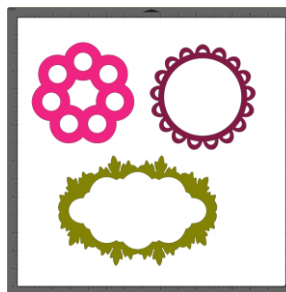


IMPORTANT: If left unchecked, only the marquee-selected part of the shape will be retained. The rest of that shape and every other shape on the page will be deleted, even those that might be hidden or locked!

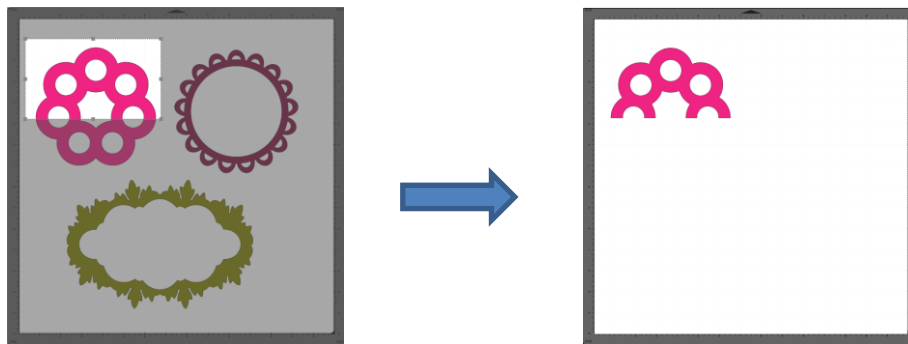


If checked, the marquee-selected part of the selected shape will be retained, as well as all other shapes on the page.

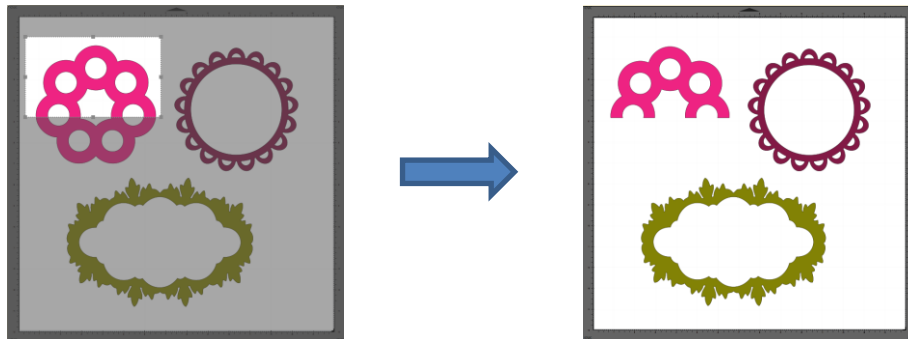
- Here is an example to show what would happen in both cases. The file has three shapes and the top right shape will be cropped just as in the prior screenshot:



- ◇ With the **Crop Selection Only** box not checked, the other shapes are deleted as well as the lower half of the pink doily:



- ◇ With the **Crop Selection Only** box checked, the shape is selected first and then only the bottom half is deleted:



8.08 Which Cutting Tool to Use?

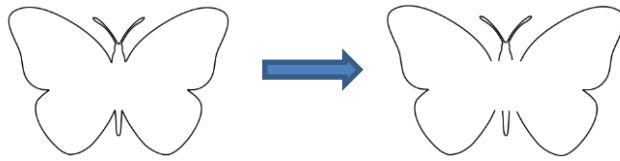
- Having so many cutting functions to use can make it difficult to know which one to use in a particular instance. Experience will be your best guide, as well as testing them out. But a summary of the functions is presented in this section and this may prove to be helpful when selecting which tool to try first.
- The following table summarizes the capabilities of the various options for cutting shapes. Note that **Boolean Join** has also been added but isn't covered until *Section 9.05* because it is more often used for designing than for editing.

	Can make straight line cuts	Can force horizontal, vertical cuts	Can force diagonal cuts	Can do freehand cuts	Can change thickness of the cut	Can cut using square or circle shapes	Can cut using any shape	Can cut with open shapes remaining	Can cut with closed shapes remaining
Eraser				✓	✓	✓		✓	✓
Knife	✓	✓	✓					✓	
Crop	✓	✓			✓				✓
Split								✓	
Boolean Join	✓	✓	✓		✓	✓	✓		✓

- Here are a few samples to show which functions would be the best choices for making the cut:

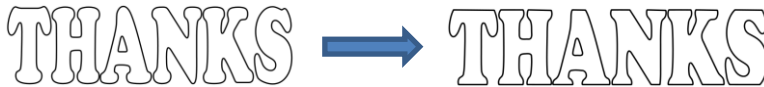


Knife
or
Split:



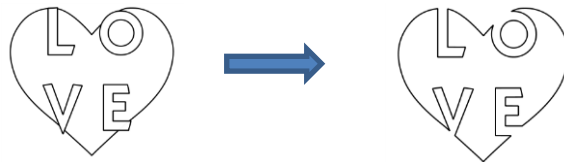
Cut up the butterfly without closing the shapes. Used for projects where the shapes are folded along one side instead of cut out

Crop



Slice off the top and bottom of a word. Used for a popup card.


Boolean
Join:

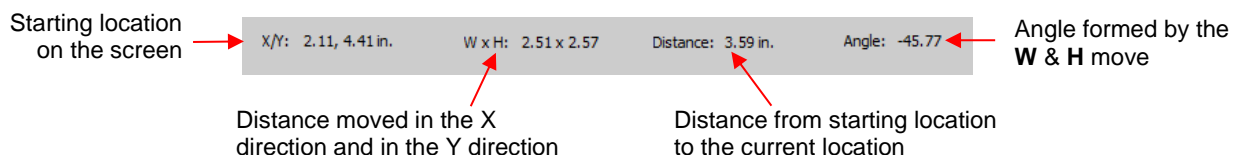


Cut a shape with any other shape or shapes

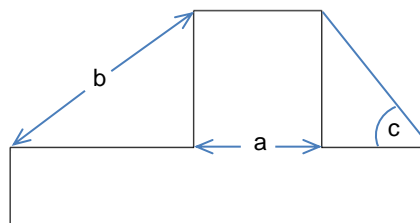
- **Knife** and **Split** have the same effect. **Split** is a bit more limiting because there needs to be nodes present in the location where the cut will occur. It might be useful if you are already in the **Shape Tool** mode where you can then select the nodes and apply the **Split**. Otherwise, **Knife** is probably the easier tool to use.

8.09 Ruler

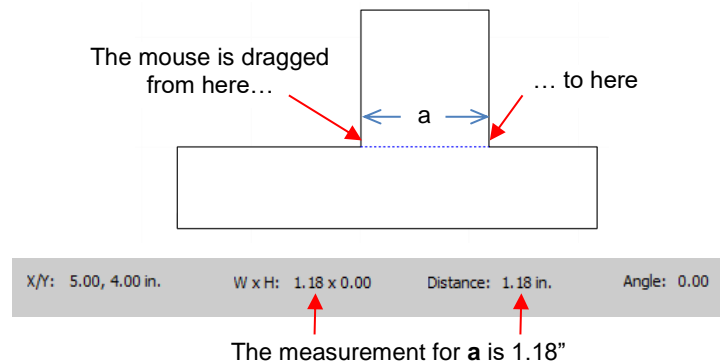
- The **Ruler** function allows you to measure the distance and angle between any two points on the screen. It is accessed by clicking on the second icon from the bottom  on the **Tools Panel**.
- No shapes need to be preselected. Just hold down the left mouse button at any location and then drag the mouse to a new location. The **Tool Options** provide the following information:



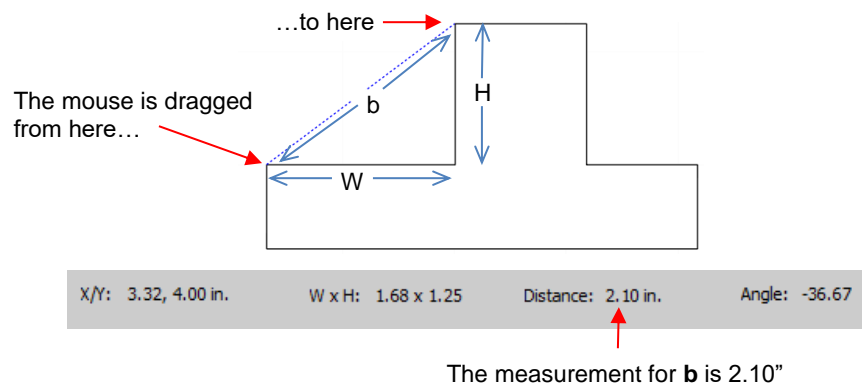
- To better illustrate these variables, the following shape will be used and the various measurements will be determined using the **Ruler**:



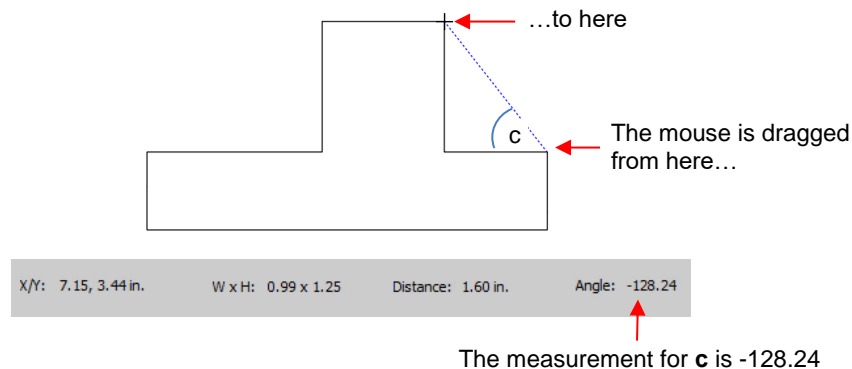
- ◇ **X/Y:** This is the starting position on the screen and will match the X/Y grid location on the **Cutting Mat**. You can extend beyond the boundaries of the mat, if needed.
- ◇ **W x H:** Indicates how far the mouse has been dragged away from the starting point. Note that as the mouse is dragged, a blue dotted line will appear. In this example, when measuring for the distance “a”, the **H** should be zero since it's a vertical measurement only. In fact, making sure **H** is 0 is one way to make sure the **W** is the correct measurement needed:



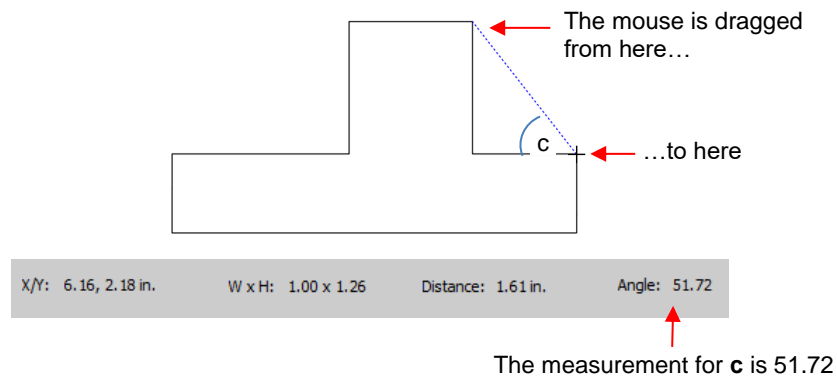
- ◇ **Distance:** This is the actual measurement between the starting location and the ending location. In the prior measurement, **W** is the same as **Distance** because the measurement was a horizontal one. But measuring the length of "**b**" is not:




- ◇ **Angle:** This is the angle of the **Distance** line relative to the X axis.
- In the first measurement of "**a**", the angle was 0 because it was a horizontal line. On the other hand, if the mouse had been dragged from the right side to the left side instead of the other way around, the angle would have read 180.
 - If the measurement had been vertical, then the **Angle** would have read 90 if measured from the top to the bottom. It would have read -90 if measured from the bottom to the top.
 - In the example being used, the angle "**c**" is measured to be -128.24:



- Obviously, "**c**" is an acute angle so -128.24 doesn't represent the actual angle shown in the screenshot. To get the true value, you subtract -128.24 from 180 (degrees in a straight line) to get 51.76 degrees.
- However, the other way to get "**c**" without having to do a calculation is to drag from the other direction:

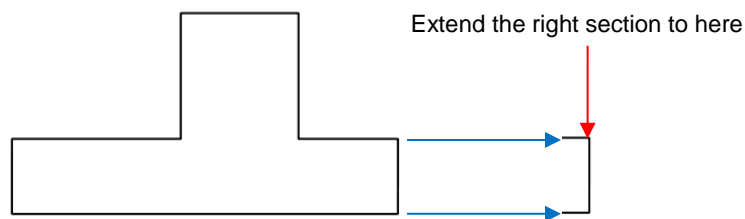


8.10 The Shape Tool - Path and Node Editing

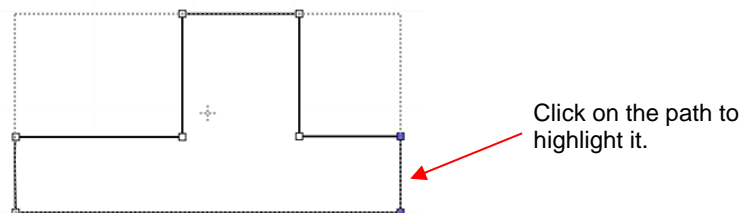
- Path editing involves moving paths as well as reshaping them. This topic was first introduced in *Section 7.05* where you were shown how to draw with the **Draw Tool** and then curve a straight-line path. If you haven't read *Section 7.05*, please do so before proceeding with the rest of this section.
- To use the **Shape Tool**, click on the third icon  on the **Tools Panel** and then click on a shape. You should see the nodes which currently define that shape. If you do not see any nodes, then:
 - ◇ The shape is grouped with one or more other shapes. Go to **Object>Ungroup** and then try again.
 - ◇ The shape is still in text mode. To convert, return to **Select** mode. Select the letters and go to **Object>Break Apart** and then marquee-select all and go to **Object>Merge**.
- Path editing involves dragging a path or dragging **Bezier** control points to reshape them. Node editing involves moving nodes and changing the type of node to then form desired curves.
- The most likely mistake you'll make while learning path and node editing is failing to zoom in close enough so that you can click precisely on paths and nodes. Keep that in mind while experimenting.

8.10.1 Moving a Path

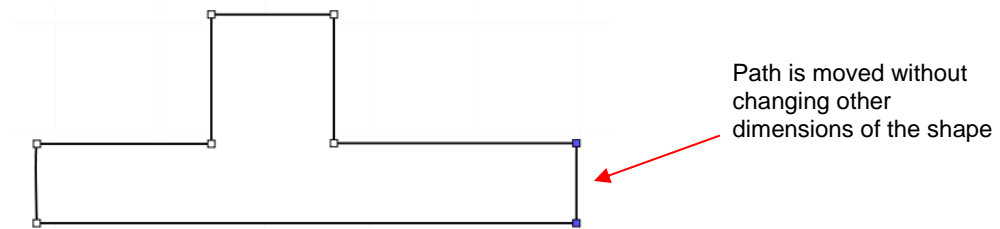
- Sometimes a path needs to be extended without resizing the rest of the shape. For example: let's say you need to extend the right section of this shape by a few inches:



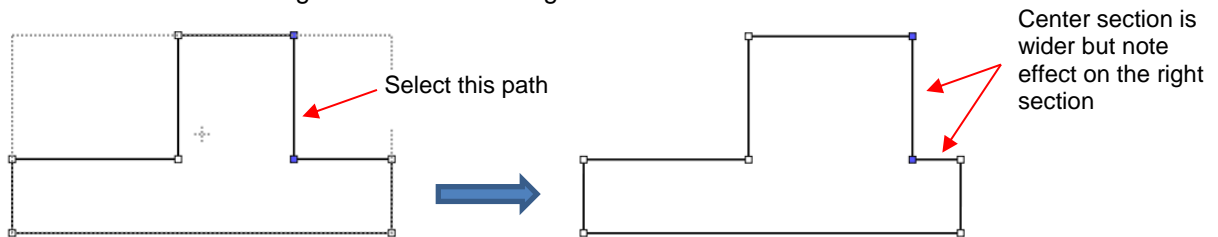
- ◇ Select the **Shape Tool**  on the **Tools Panel** and then click on that path:



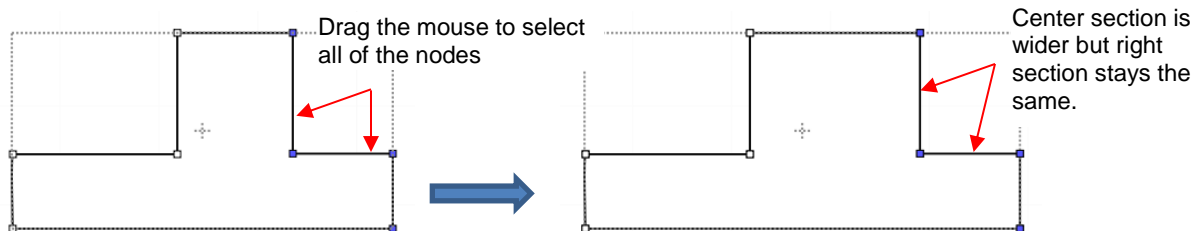
- ◇ You can now use the arrow keys on your keyboard to move that path. Holding the **Shift** key while clicking on an arrow key will move it in larger increments:



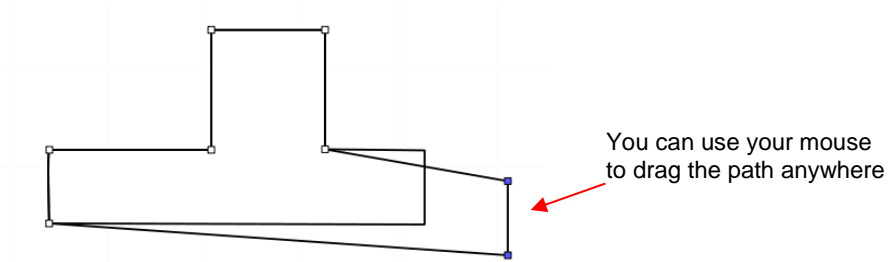
- ◇ If instead, the center section had been widened by selecting the path on its right side, then that would have resulted in shortening the section to the right of it:



- ◇ Thus, to maintain the dimensions of the right section, both paths need to be moved at the same time. To do this, marquee-select the nodes as shown and then move with the keyboard arrow:



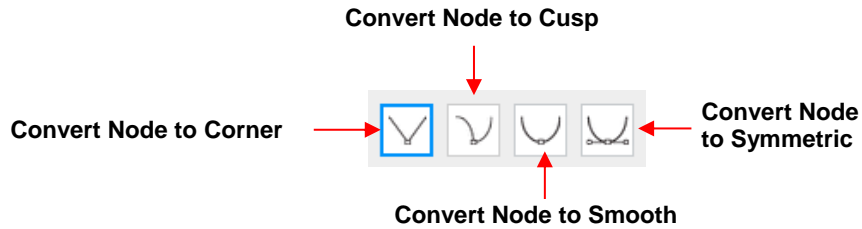
- If the shape is made up of straight line segments, versus curves, you can also drag the segments with your mouse instead of using the keyboard arrows. Note that it can be a bit tricky getting the cursor in the perfect spot to start dragging. However, you won't have the same control if you wish to keep the paths perfectly horizontal or vertical:




- One practical example of moving paths is in the resizing of boxes and envelopes where you need the overall dimensions of the final project to be different but you do not want to change the size/thickness of the flaps.

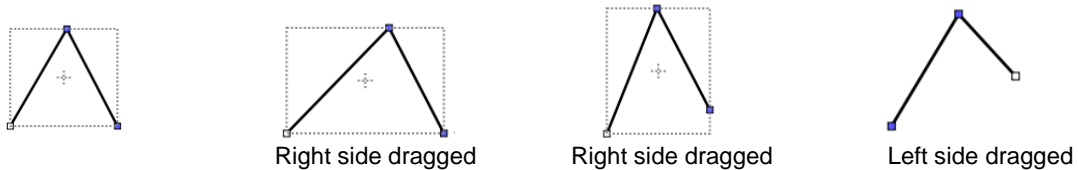
8.10.2 Reshaping a Path


- With the **Shape Tool** selected, you'll observe four icons in the **Tool Options**. The purpose of each option is to convert one or more selected nodes to that type of node:

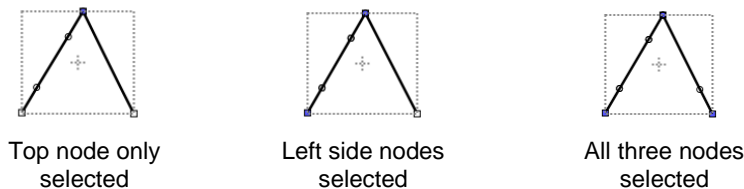


- One or more nodes are highlighted and then the appropriate icon selected. These same four functions can also be accessed by right-clicking and selecting **Path>Convert Node to**.
- To illustrate each one of these options, a simple path with a sharp corner will be used. This shape is already in **Corner Node** mode. To change to a different mode (in the examples that follow the first one), the top node is selected and then the option is clicked from the **Tool Options** or using the right-click and **Path>Convert Node to** menu option.

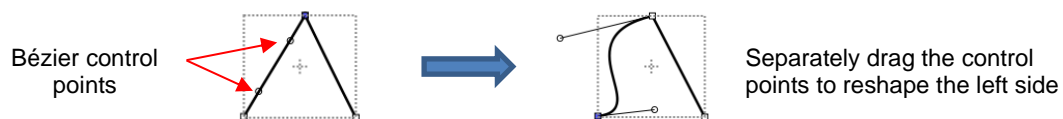
- ◇  **Corner Nodes:** These are the nodes that make up straight-line shapes such as rectangles, squares, triangles, stars, etc. Once selected, the shape will appear as below and either path can be moved as was demonstrated in the prior *Section 8.10.1*.



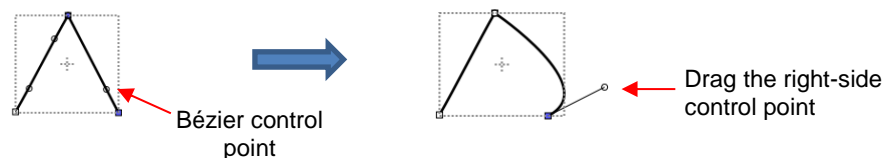
- ◇  **Cusp Nodes:** In this mode the Bézier control points appear and can be moved independently. First note how the paths appear when in this mode, depending on how many of the adjacent nodes are selected:




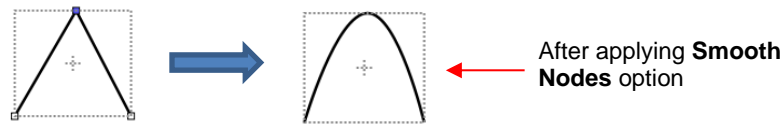
- The dots along the path are Bézier control points which are not linked to one another. You can freely drag either or both to create curves:



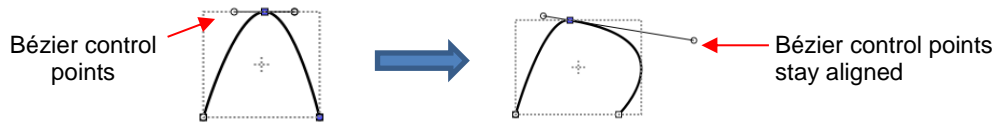
- In the case where there is a single Bézier control point on the right side, you can again drag the control point to create a curve:



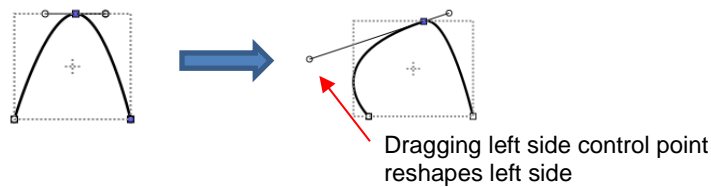
- ◇  **Smooth Nodes:** In this mode the Bézier control points always stay in a straight line. Notice that when you convert to **Smooth Nodes**, the shape immediately forms a curve:




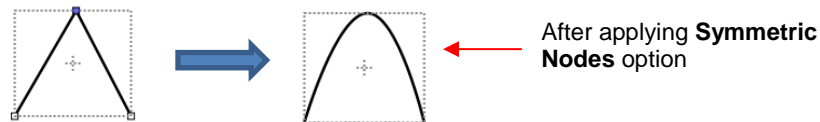
- When the newly formed shape is selected again, the Bézier control points appear in a straight line. If you move one, the other will move as well, in order to maintain that straight line:



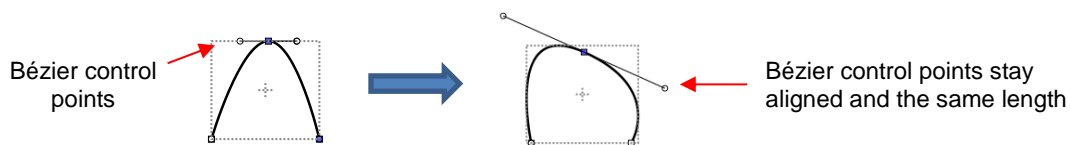
- The left side Bézier control point controls the curve on the left side. Thus, if it had been moved instead this would have resulted:



- ◇  **Symmetric Nodes:** In this mode the Bézier control points not only stay in a straight line, they also stay the same length. As with **Smooth Nodes**, when you convert to **Symmetric Nodes**, the shape immediately forms a curve:

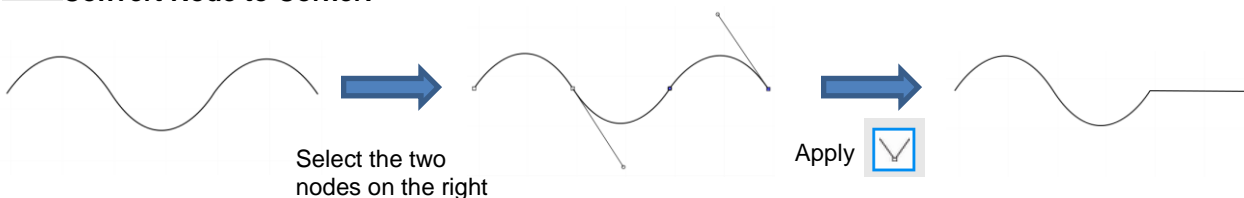


- When the newly formed shape is selected again, the Bézier control points appear in a straight line and the image appears the same as with **Smooth Node** status. However, when you now move one control point, the other will not only maintain that straight line, but also the same length. And the curves on both sides of the selected node will change:



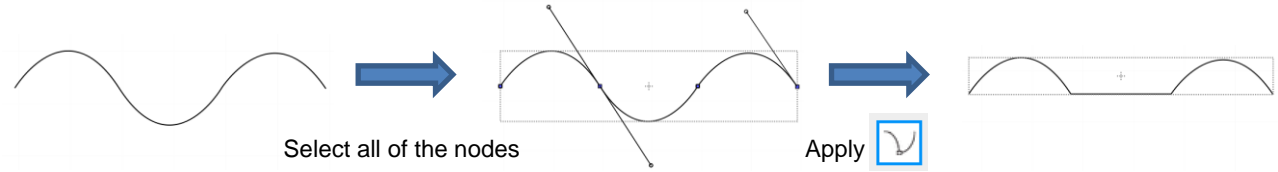
- To further illustrate these options, marquee-select a group of nodes to select more than one path and then click on whichever option you want to apply. The following examples show what occurs when the first two options are applied to curves and the last two options are applied to straight lines:

Convert Node to Corner:

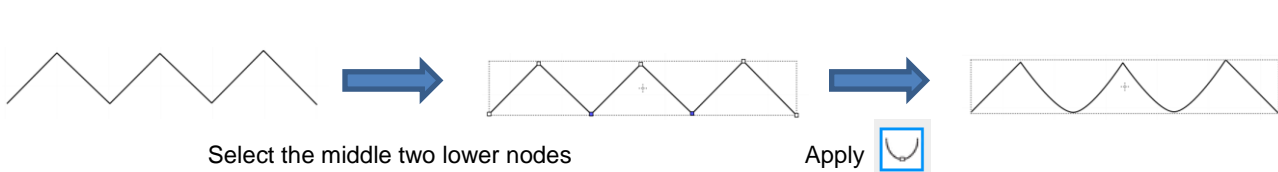




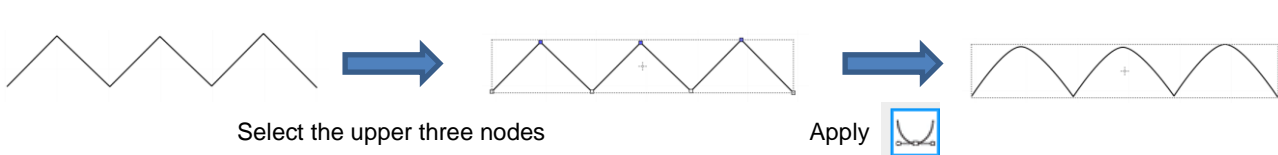
Convert Node to Cusp:



Convert Node to Smooth:

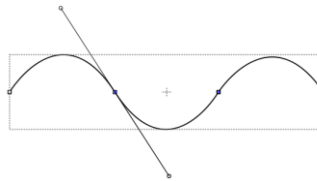


Convert Node to Symmetric:

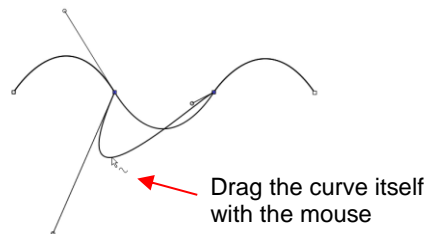


- As was shown in *Section 7.05.3*, you can also drag the path itself to reshape it, if one of the nodes has been converted to **Cusp**, **Smooth**, or **Symmetric**. For example:

- ◇ The following curve has the lower path selected and the option marked:

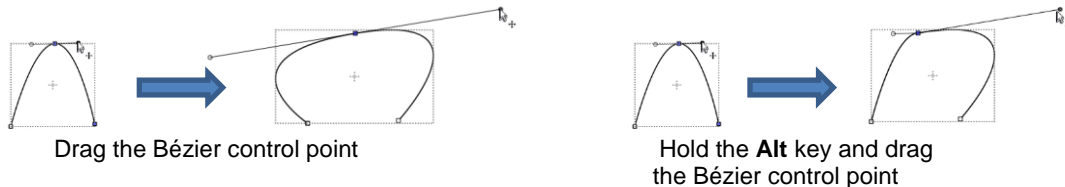


- ◇ The path can now be dragged with the mouse:



- You will recall that when a node is in either **Smooth** or **Symmetric** mode, adjusting one Bézier control point will automatically affect the other one and the curves on either side will change. To avoid this, hold the **Alt** key while dragging the control point and the other control point will remain in place:

- ◇ For example, with the following **Smooth** node shape, the same change is made with and without holding the **Alt** key during the adjustment:




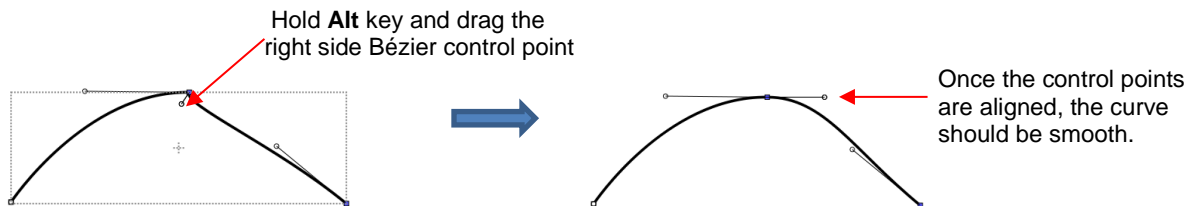
8.10.3 Examples of Smoothing Curves


- The last method shown in the prior section can be used to correct kinks in what should be a smooth curve.

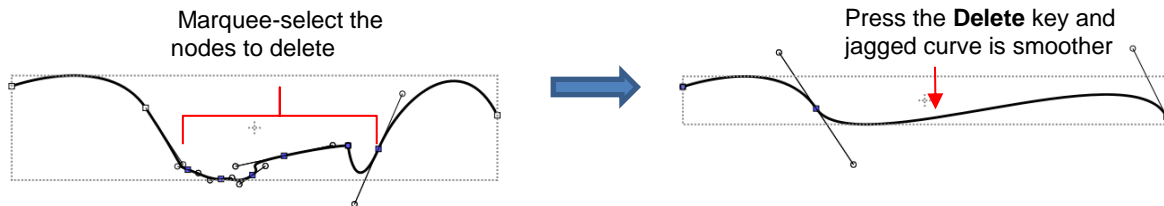
◇ For example, let's say you want to make the following shape have a nice smooth curve:



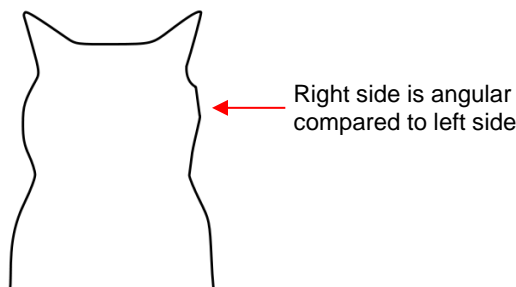
- ◇ Using the **Shape Tool**, click on the curve to reveal the node. Then click on the third icon , if needed, so that option will be highlighted. Hold the **Alt** key and drag the Bezier control point that's closest to the curve needing adjustment until the two control points are in a straight line:



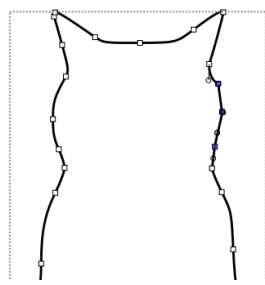
- In *Section 7.04.1*, you were shown how to add or delete nodes while in the **Draw Tool**  mode. Any time you want to add nodes to an existing path, you will need to be in this mode. However, you can delete nodes while in the **Shape Tool** mode. Select a node or marquee-select a group of nodes and press the **Delete** key on your keyboard:



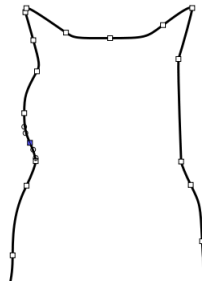
- Based on such a drastic change, it's worth noting that deleting smaller numbers of nodes at a time is usually advisable to avoid losing the original structure of the shape.
- ◇ As a practical example, here is a traced image of a cat. Note the right side of the cat's head is not smooth and rounded like the left side:



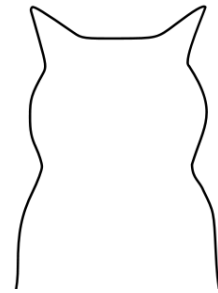
- Using the **Shape Tool**, the nodes causing the angular shape are marquee-selected and deleted. Then the path is reshaped:



Shape Tool shows nodes causing angular shape



After deleting the nodes, the right side is flat



After reshaping the line into a curve

8.10.4 Applications for the Shape Tool

- It's not always obvious when the **Shape Tool** might be needed. Here are a few examples to keep in mind:
 - ◇ Editing of pixel traced images: Sometimes a pixel trace will appear to be perfect until, for example, you use it for a print and cut and discover that some of the paths are slightly outside the printed areas of the original image:



Trace line doesn't follow shape here.



A node can be added or the Bezier curve can be reshaped.



- ◇ Manual tracing: As shown in *Section 7.05*, one of the quickest ways to manually trace a raster image is to use the **Draw Tool** and simply click/click/click around the image and then use the **Shape Tool** to create curves and move nodes to more closely align with the original image.
- ◇ Improving a cut: If you have problems with a particular location on a cut shape, examine the nodes in that location. You may find a cluster of nodes or a sharp cusp. Delete those excess nodes, reform the path, and then retest the cut.
- ◇ Modifying poorly designed files: Sometimes you will pick up free files that don't quite cut the way you expected. Examples are often fold-up templates where corners and fold lines do not quite meet. Having the ability to move paths and nodes can correct these kinds of files and provide cleaner and more professional end products.

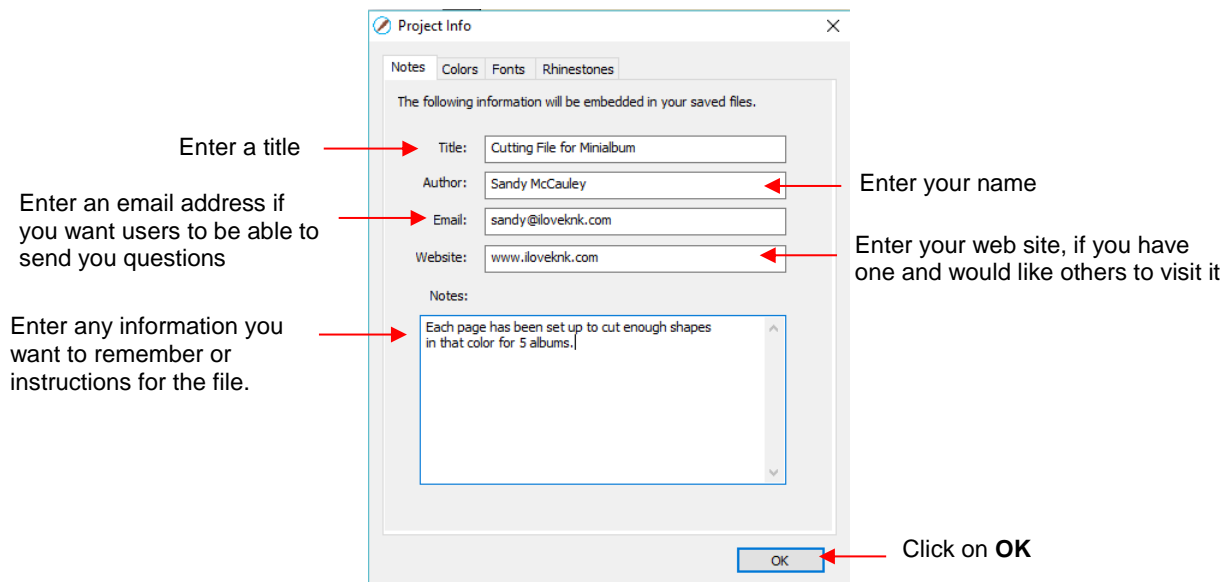
9. SCAL: Designing

9.01 Where Do I Start with Learning to Design?

- SCAL offers some excellent easy-to-use designing tools to assist you in creating whatever you can imagine. The best way to learn these tools is to focus on only one at a time and play with settings. You aren't going to break anything in the software by experimenting and you never know what you might discover!

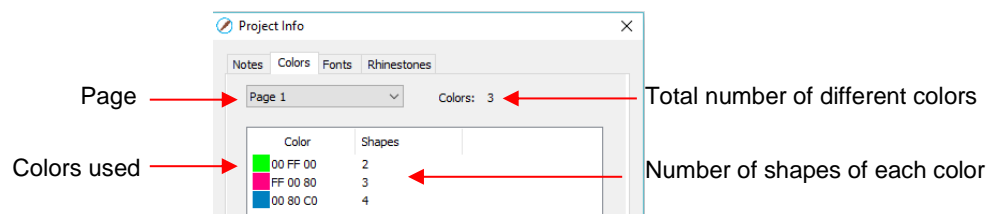
9.02 Project Info

- Before getting started on the fun and amazing design capability of SCAL, it's worth noting a feature that allows you to add your name and some other details to your file. This can save you time later when you're not remembering some of the original details and also help others with whom you share your files. Using this feature is, of course, entirely optional.
- To open the **Project Info** window, go to **Window>Project Info**. The following example shows some of the optional information you can add in this window that will be saved with your actual project:

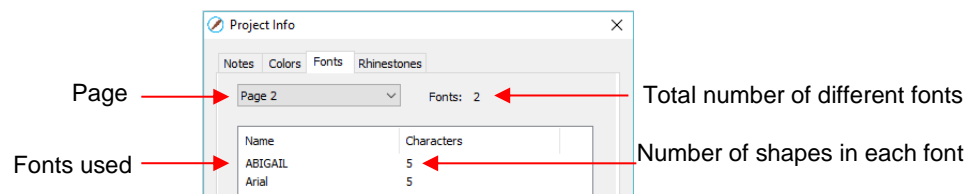


- Note the other tabs in this window: **Colors**, **Fonts**, and **Rhinstones**. These do not require your input. Instead, they automatically track, by **Page**, those elements that are currently present in the file. For example:

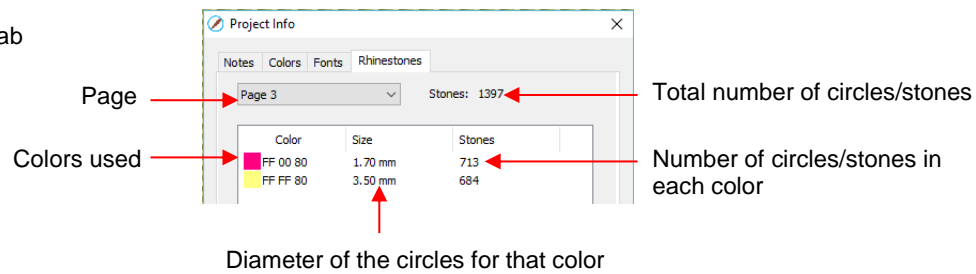
Colors Tab



Fonts Tab




Rhinestones Tab



- Note: When changing tabs, such as from **Colors** to **Fonts**, always take note of the **Page** number. It will not automatically update to the page you were just checking. Thus, if you are on *Page 2* when on the **Colors** tab, you may discover you're on *Page 1* on the **Fonts** tab. Simply change to the page you need from the dropdown menu.

9.03 Basic Shapes

- The **Tools Panel** has access to the following basic shapes: **Rectangle**, **Rounded Rectangle**, **Circle**, **Triangle**, **Polygon**, **Star**, and **Spiral**. Some of these have customizing functions which will appear on the **Tool Options** bar and will be detailed in the following subsections.
- To access these various shapes, hold down the left mouse button on the **Rectangle** icon  on the **Tools Panel** and then select the desired shape from the popup menu.
- Once a different shape is selected, that shape's icon will then replace the **Rectangle** icon.

9.03.1 Rectangle

- After selecting the **Rectangle** shape, drag the left mouse button to form a rectangle.
- Holding the **Shift** key while dragging the mouse will constrict the proportions, resulting in a square:



Freely dragging mouse



Holding **Shift** key

9.03.2 Rounded Rectangle

- After selecting the **Rounded Rectangle** shape, drag the left mouse button to form a rectangle with rounded corners.
- Holding the **Shift** key while dragging the mouse will constrict the proportions, resulting in a rounded square:

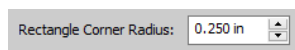


Freely dragging mouse



Holding **Shift** key

- In the **Tool Options**, a setting will appear. This can be used to control the roundness of the corners:





Radius: 0.10



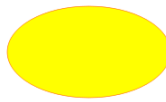
Radius: 0.25



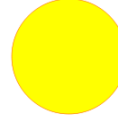
Radius: 0.75

9.03.3 Circle and Oval

- After selecting the **Circle** shape, drag the left mouse button to form an oval.
- Holding the **Shift** key while dragging the mouse will constrict the proportions, resulting in a circle:



Freely dragging mouse



Holding **Shift** key

9.03.4 Triangle

- After selecting the **Triangle** shape, drag the left mouse button to form a triangle.
- Holding the **Shift** key while dragging the mouse will constrict the proportions, resulting in a triangle with equal height and width:



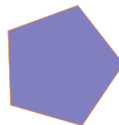
Freely dragging mouse



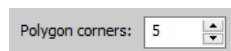
Holding **Shift** key

9.03.5 Polygon

- After selecting the **Polygon** shape, drag the left mouse button to form a polygon:



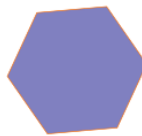
- In the **Tool Options**, a **Polygon corners** setting will appear:



- ◊ This can be used to change the number of sides on the polygon. For example:



Polygon corners: 3



Polygon corners: 6



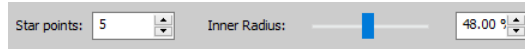
Polygon corners: 10

9.03.6 Star

- After selecting the **Star** shape, drag the left mouse button to form a star:



- In the **Tool Options**, two settings will appear:



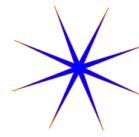
- ◊ The **Star points** setting can be used to change the number of points on the star. The **Inner radius** setting can be used to change the angle of the inner points:



5 Points
Radius: 38%



4 Points,
Radius: 47%



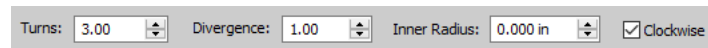
8 Points
Radius: 10%

9.03.7 Spiral

- After selecting the **Spiral** shape, drag the left mouse button to form a spiral:



- In the **Tool Options**, four settings will appear:



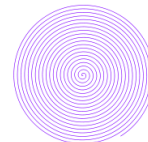
- ◊ **Turns:** Number of rotations around the center:



Turns: 3



Turns: 6



Turns: 20

- ◊ **Divergence:** Tightness of the spiral: larger = looser; smaller = tighter:



Divergence: 1



Divergence: 3

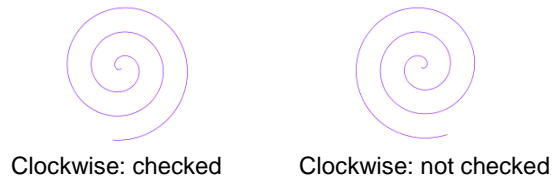


Divergence: 0.5

- ◊ **Inner Radius:** Starting point of the spiral

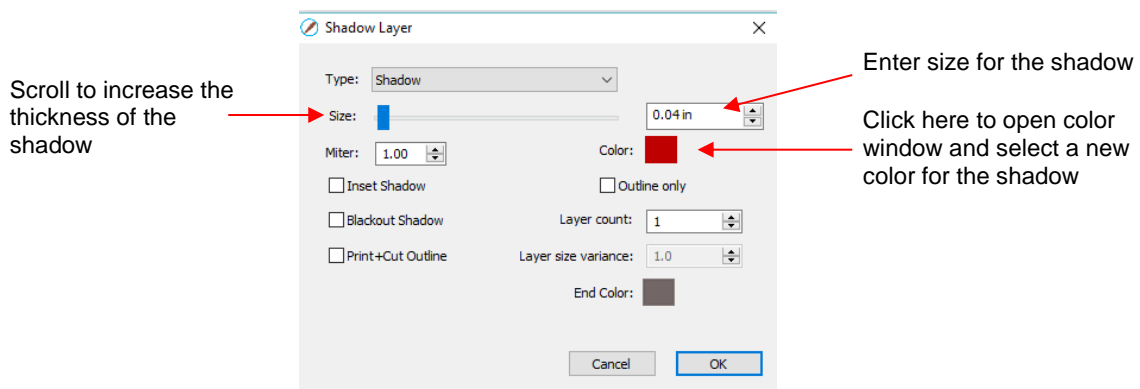


- ◇ **Clockwise:** Whether spiral rotates clockwise or counter-clockwise from center:



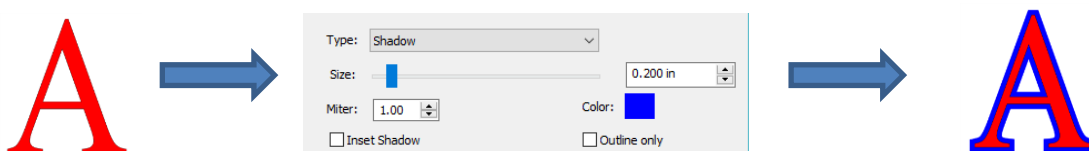
9.04 Shadow Layer

- The **Shadow Layer** function allows you to create an outline or an inline of any shape including, of course, text. After selecting a shape, you can access the function in either of two ways:
 - ◇ Go to **Effects>Shadow Layer (Contour Cut)**
 - ◇ Right-click and select **Appearance>Add Shadow Layer**
- The following window will open:

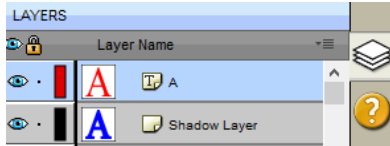


9.04.1 Shadow Layer Settings

- Size** changes the thickness of the shadow layer. You can either scroll the **Size** bar or type in a size in the input window to the right.
- Color** refers to the color of the shadow. Clicking on the color box opens the color window where a new color can be selected.
- As an example, an uppercase Times New Roman “A” is used. After increasing the **Size** and changing the **Color** to blue, the following result is obtained:



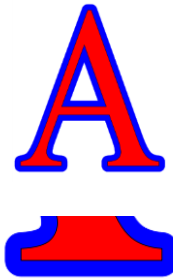
- ◇ The **Layers Panel** shows the addition of a new **Shadow Layer**:



- **Type** controls the style or shape of the shadow at the corners. There are three choices:



Shadow



Shadow (Rounded)



Shadow (Straight)

- ◇ Note that the first choice, **Shadow**, also has a **Miter** setting which should work in the same way as **Miter** affects the **Stroke** (refer to *Section 5.14*). However, at this time, it appears that the **Miter** setting is not working.

- **Inset Shadow** is the opposite of **Shadow** – instead of creating a contour that is larger than the original shape, a contour is created that is smaller and fits inside the original shape.

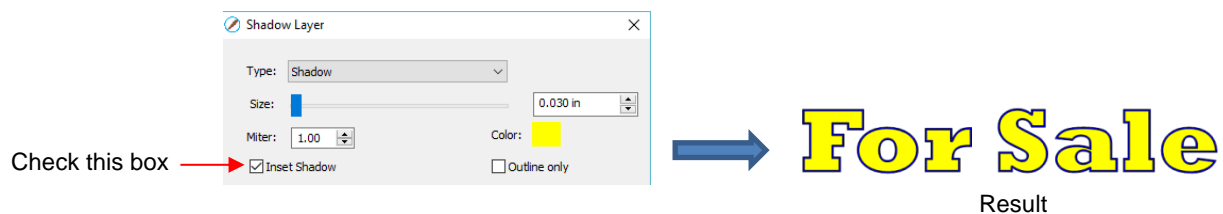
- ◇ For example, let's say you are going to create a two-color vinyl sign that says "For Sale":

For Sale

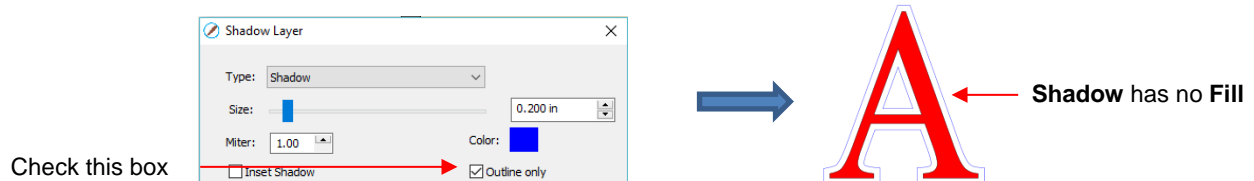
- ◇ If a normal **Shadow** is used to create the second layer, the letters will automatically be welded because of their proximity to one another. This may not be suitable for your application:

For Sale

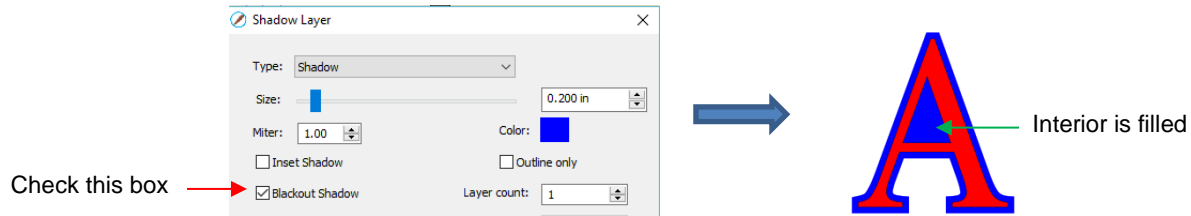
- ◇ Instead, create an **Inset Shadow** by checking the **Inset Shadow** option:



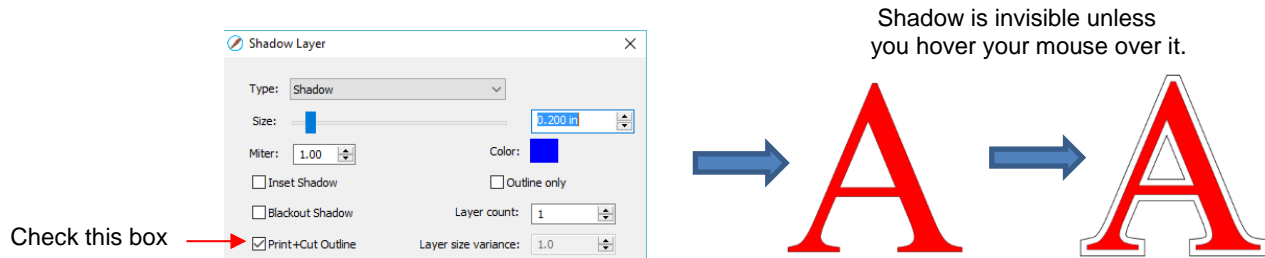
- **Outline only** can be checked to set the **Fill** on the shadow to **None**. The **Stroke** color will be whatever is indicated next to **Color**:



- **Blackout Shadow** can be used to remove any interior shadow lines, leaving only a single outset:



- **Print +Cut Outline** creates a shadow with a **Fill** and **Stroke** both set to **None**. The shadow will be invisible unless you hover the mouse over the shadow:



◇ Two print-and-cut examples for this function are:

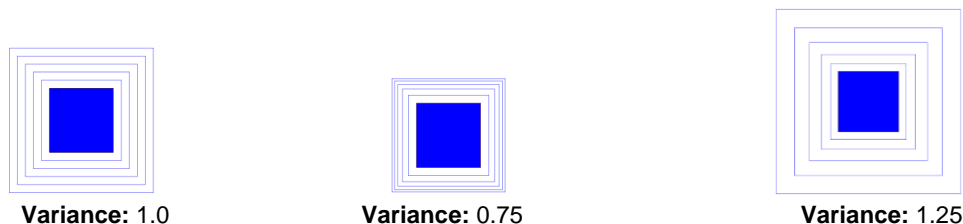
- Add a contour cut around a printed shape
- Cut just inside the boundaries of a printed image (in this case you also use the **Inset Shadow** option)

- **Layer** settings: There are three additional settings in the **Shadow Layer** window used to create multiple shadows on a shape:

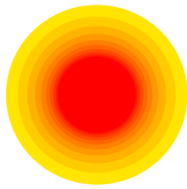
◇ **Layer count:** Total number of shadow layers to be created

◇ **Layer size variance:** If left at 1.0, the increasing thickness of each layer will be based on the original **Size** of the first shadow. If less than 1, the increasing thickness of each layer will be progressively smaller than the prior, based on the variance. If greater than 1, the increasing thickness of each layer will be progressively larger based on the variance.

- For example, a square is used where the original shadow **Size** is 0.25 and the **Layer count** is set to 5. **Outline only** mode is also chosen so that the individual layers are easier to see. Note the different results when **Layer size variance** is set 1, 0.75 and 1.25:



◇ **End color:** If the **End color** is chosen to be different from the original **Color**, a gradual transition between the two colors will be created. This can be used to create some beautiful designs for a print and cut:

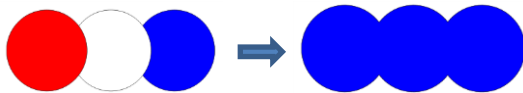


9.05 Boolean Operations

- Under **Path** on the **Menu Bar**, there are five Boolean operations that are very useful when designing cutting files. This section illustrates how each works and provides a practical example for each one.

9.05.1 Union

- The **Union** operation, also commonly called welding, removes the overlap between two or more selected shapes. The color of the new shape will be that of the bottom-most shape:

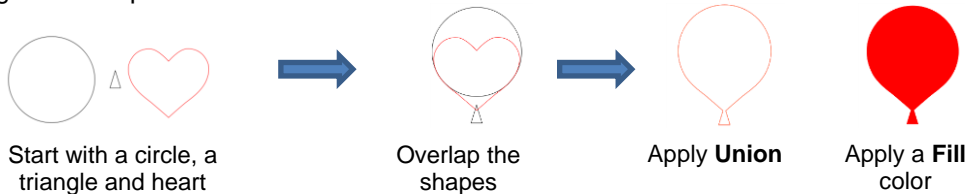


With a **Fill** color: before and after **Union**



With no **Fill**: before and after **Union**

- To apply this operation, select two or more shapes and use one of the following:
 - ◇ Go to **Path>Union**
 - ◇ Press **Alt+U**
 - ◇ Right-click and select **Path>Union**
- Sections 6.07 – 6.09* showed several examples of the **Union** operation applied to text. Here's an example using basic shapes and the **Union** function to create a balloon:



Start with a circle, a triangle and heart

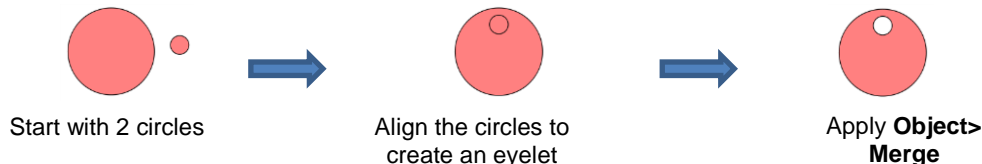
Overlap the shapes

Apply **Union**

Apply a **Fill** color

- In this next example, a scalloped border will be designed:

- ◇ Start with two circles that will be used to create an eyelet circle:

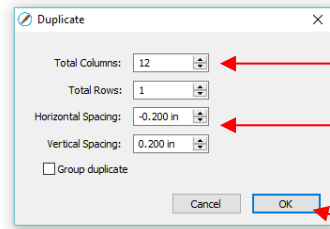
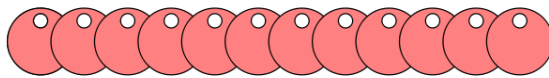


Start with 2 circles

Align the circles to create an eyelet

Apply **Object>Merge**

- ◇ Select this new shape and use **Object>Duplicate** to open the **Duplicate** window:



Increase **Total Columns**

Use a negative **Horizontal Spacing** to overlap the shapes.

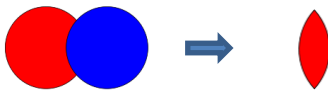
Click on **OK**

- ◇ Add a long rectangle and align with the pattern of circles. Apply the **Union** function:



9.05.2 Intersection

- The **Intersection** operation is the opposite of the **Union** operation. Instead of removing overlap, the overlap is what remains. The color of the new shape will be that of the bottom shape:



With a **Fill** color: before and after **Intersection**

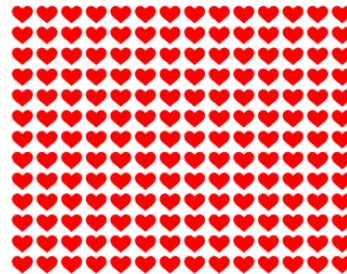


With no **Fill**: before and after **Intersection**

- To apply this operation, select two shapes and use one of the following:
 - ◇ Go to **Path>Intersection**
 - ◇ Right-click and select **Path>Intersection**
- One example involves filling a shape with a pattern:
 - ◇ This pattern was designed by using the **Duplicate** function to create a grid of hearts. Then, by applying **Object>Merge** on the hearts, it is now a single shape:

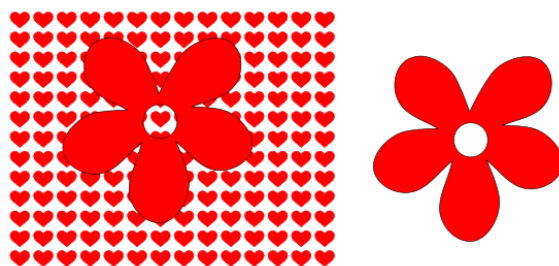


A heart from the **Library's Basic Shapes** folder



After using **Duplicate** and then **Merge**

- ◇ Arrange the shape to be filled (in this case, a flower) over the pattern. Also, set aside a copy of the flower shape to use later as a border.



- ◇ Select the pattern and flower and apply **Path>Intersection**:

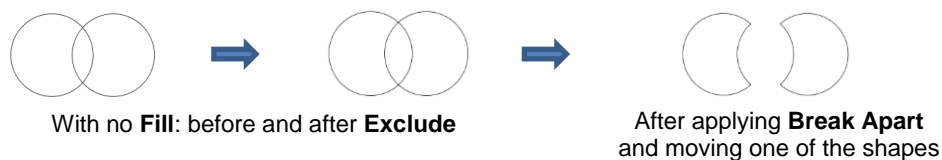
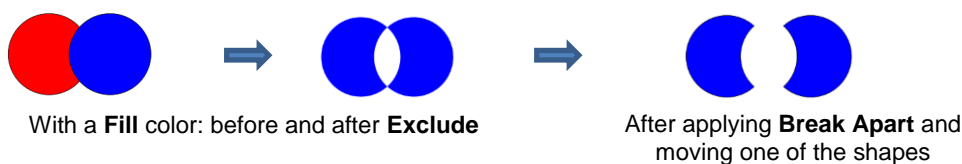


- ◇ Recolor the spare flower with a white **Fill** and a red **Stroke**. Then center the pattern with the spare flower. Perfect for a print and cut!



9.05.3 Exclude

- The **Exclude** operation subtracts the intersection of two shapes from both of the shapes. The color of the new shapes will be that of the upper shape.



- To apply this operation, select two shapes and use one of the following:
 - ◇ Go to **Path>Exclude**
 - ◇ Right-click and select **Path>Exclude**
- After applying, use **Object>Break Apart** if you need to move one shape away from the other.
- As an example, use the heart-filled flower from the prior section as a cut design on the front of a greeting card:
 - ◇ Start with a rounded rectangle as the card base (refer to *Section 9.03.2*):



- ◇ Add the pattern from *Section 9.05.2*, without the spare flower shape. Arrange the pattern so that it will cut from the front of the card:

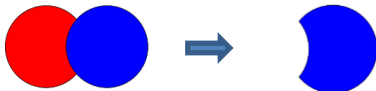


- ◇ Select the card and pattern and apply **Path>Exclude**:

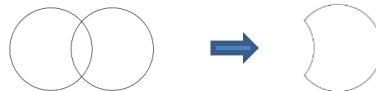


9.05.4 Front Minus Back

- The **Front Minus Back** operation subtracts the intersection of two shapes from the front (or upper) shape, leaving only that front shape:



With a **Fill** color: before and after **Front Minus Back**



With no **Fill**: before and after **Front Minus Back**

- To apply this operation, select two shapes and use one of the following:
 - ◇ Go to **Path>Front Minus Back**
 - ◇ Right-click and select **Front Minus Back**
- An example involves adding the word HELLO to the card designed in *Section 9.05.3*.
 - ◇ Select a font and type out the letters. Add a rectangle so that the tops and the bottoms of the letters will just overlap the rectangle:



- ◇ Select the rectangle and the lettering and apply **Path>Front Minus Back**:



or when filled with color:



- ◇ Arrange the greeting on the front of the card designed in *Section 9.05.3*. Select both and apply either **Object>Merge** or **Path>Exclude** so that all internal shapes are cut before the outside card base:

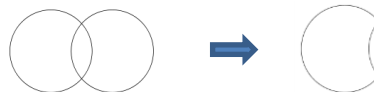


9.05.5 Back Minus Front

- The **Back Minus Front** operation is the opposite of **Front Minus Back**. It subtracts the intersection of two shapes from the back (or bottom) shape, leaving only that back shape:



With a **Fill** color: before and after **Back Minus Front**



With no **Fill**: before and after **Back Minus Front**

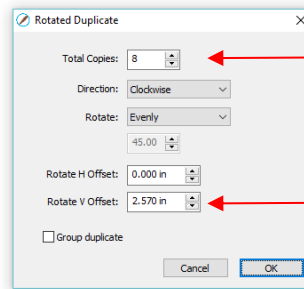
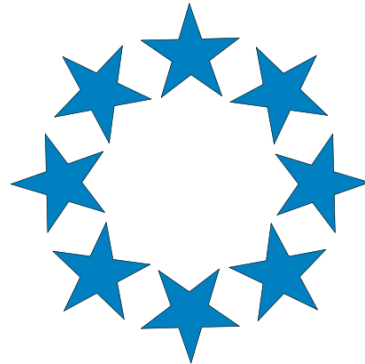
- To apply this operation, select two shapes and use one of the following
 - ◇ Go to **Path>Back Minus Front**
 - ◇ Right-click and select **Back Minus Front**
- Any examples for **Back Minus Front** are essentially the same as for **Front Minus Back**. When choosing which to use, just check the screen and think about which one you need to remain. Alternatively, just try one and, if it's the wrong choice, use **Undo** to back up one step and then pick the other. ☺

9.06 Duplicate Rotated

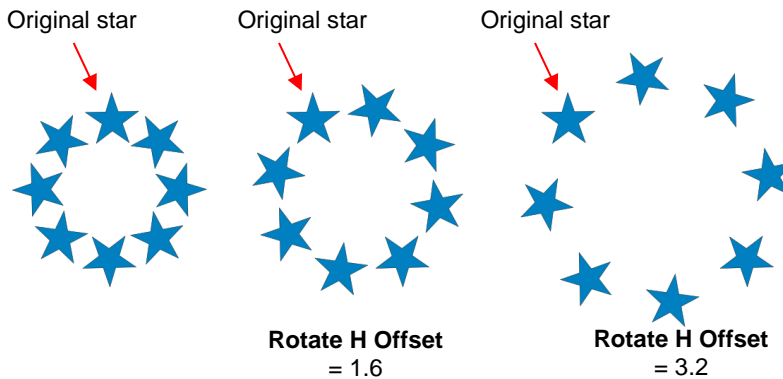
Video

9.06.1 Duplicate Rotated Settings

- The **Duplicate Rotated** function allows you to make duplicates arranged in a circle or partial circle pattern.
- To access **Duplicate Rotated**, first select the shape(s) and then use either of the following:
 - ◇ Go to **Object>Duplicate Rotated**
 - ◇ Press **Ctrl+Shift+D**
- To illustrate how this works, start with a small shape. Select it and then activate the **Duplicate Rotated** function using either of the methods just mentioned. The following window opens:



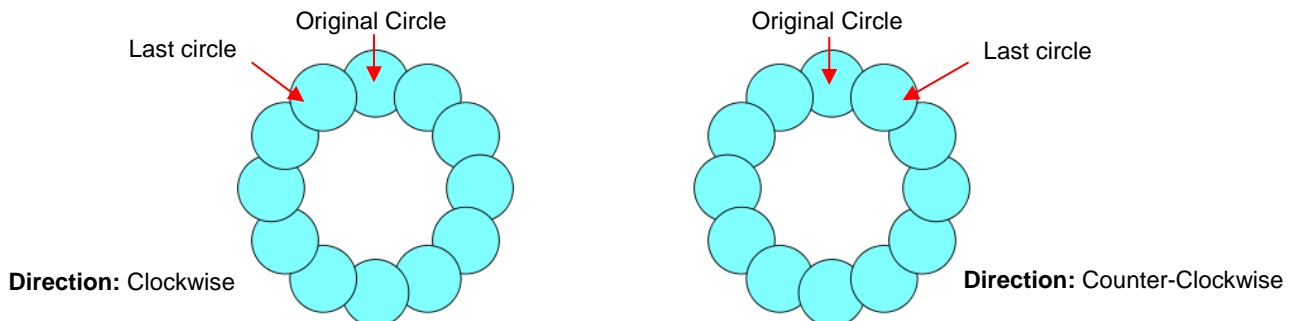
- ◇ Start by increasing the number of copies. If the shapes are overlapping too much, increase **Rotate V Offset** which is the distance from the center. Increasing the **Rotate H Offset** setting shifts the center of rotation toward the right:



- ◇ Because the stars must spread out in order to keep the original in its same position, one can then decrease the **Rotate V Offset** at the same time as increasing the **Rotate H Offset**, if you need to spread the shapes but keep the design in the current display area of SCAL.

- The **Direction** setting changes the order of the duplicates around the circle.

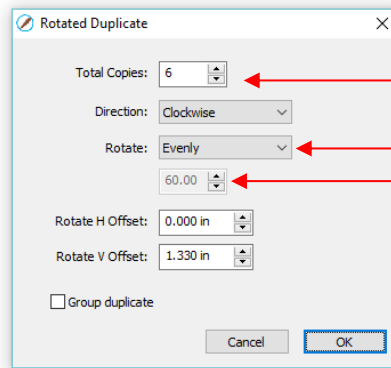
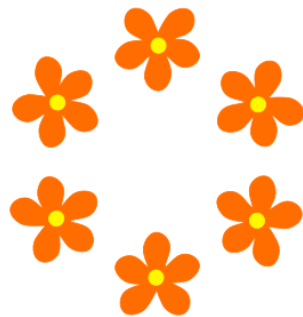
- ◇ With clockwise selected, the order of the shapes follows a clockwise progression so that the last copy is just to the left of the original at the top. The opposite is true if counter-clockwise is selected:



- ◇ Does it matter which **Direction** is used? Most likely, only if you need it for display purposes.

- **Rotate** has two options: **Evenly** and **Custom**. With **Evenly** selected, the copies are distributed evenly in a full 360° circle. But let's say you want a semi-circle of shapes:

- ◇ First, create a circle pattern using the desired number of shapes. Note that the greyed-out box below **Rotate** is changing as you add more shapes:

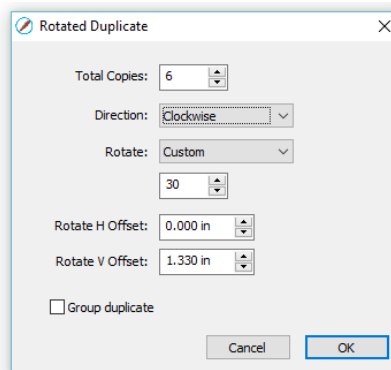


Set the desired total

Start with **Evenly**

Note this value

- ◇ Change the **Rotate** to **Custom** and then, because you want a semi-circle of shapes, divide that value by 2. Thus, in this example, it will be changed to 30:



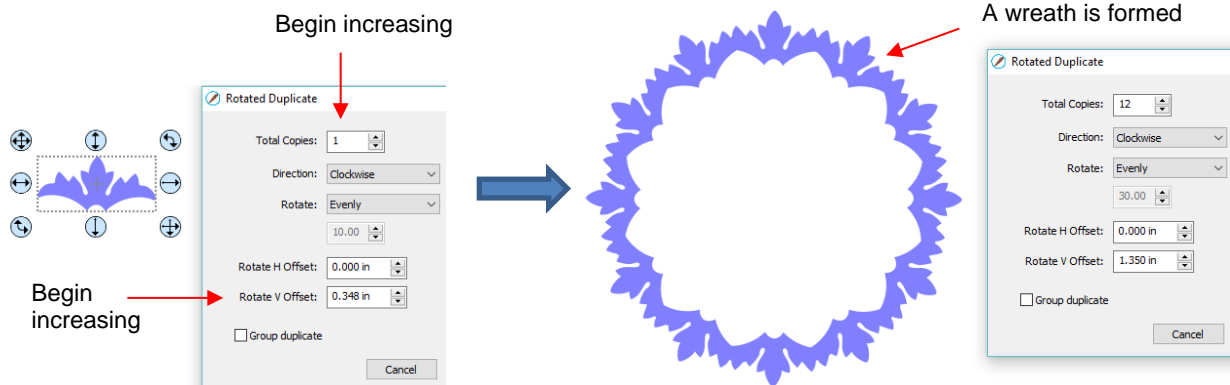
- ◇ If you want the shapes to be grouped, mark the **Group duplicate** box. Otherwise leave it unchecked.

9.06.2 Using Duplicate Rotated to Design a Wreath

- Begin with a desired shape. In this example, a shape from the **Library's Swirls** folder will be used.



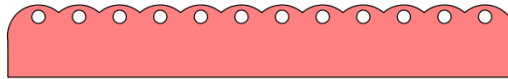
- Select and go to **Object>Duplicate Rotated**. Begin increasing **Total Copies** and the **Rotate V Offset** until a desired overlapping pattern is obtained:



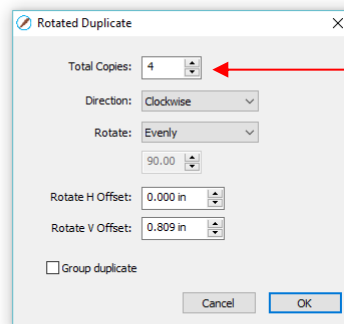
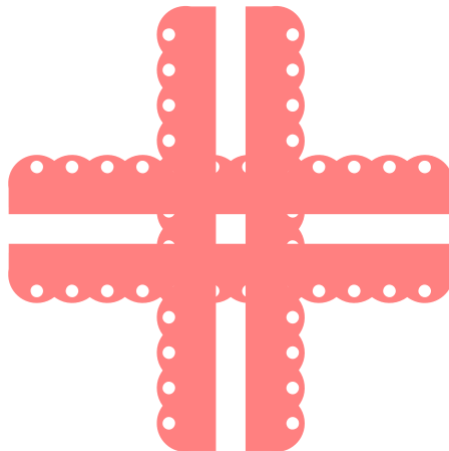
- After creating the pattern, go to **Path>Union** to remove the overlap and the shape is ready to cut.

9.06.3 Using Duplicate Rotated to Design a Frame

- In *Section 9.05.1*, the **Duplicate** and **Union** functions were used to create this scalloped border:

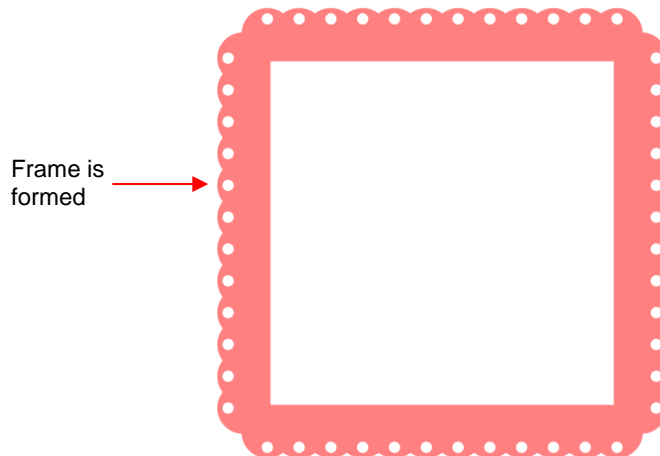


- Select the shape, go to **Object>Duplicate Rotated**, and enter 4 for **Total Copies**:

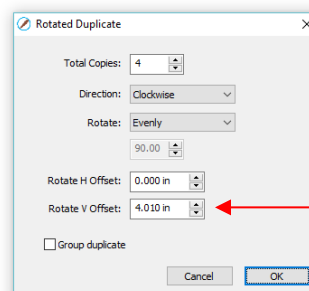


Set **Total Copies** to 4

- Begin increasing the **Offsets** until the four corners overlap evenly:



Frame is formed



Increase **V Offset** until the four corners look perfect

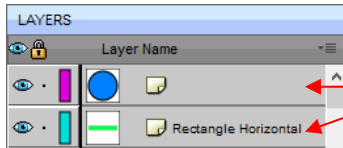
- Click on **OK** and then apply **Path>Union**.

9.07 Object on Path

- The **Object on Path** function can be used to align repeats of a shape along the path of another shape:

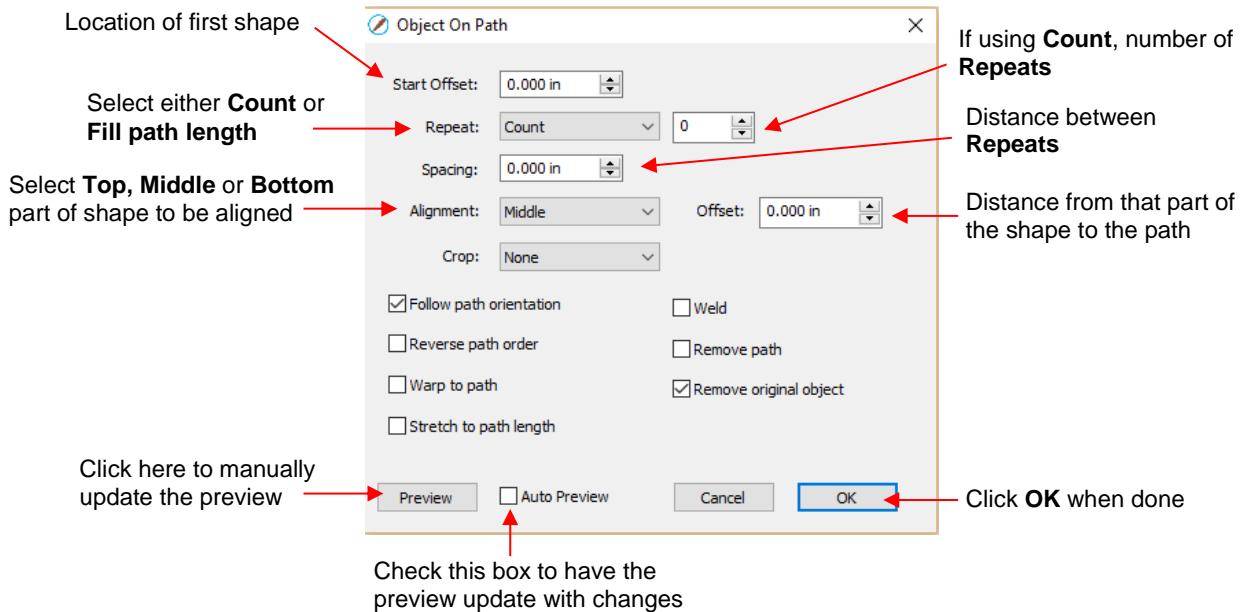


- IMPORTANT:** Before applying the function, check the **Layers Panel** to make sure the shape to be repeated is on a higher layer than the path:

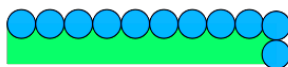


Shape to be repeated should be above the path shape

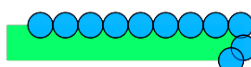
- To open the **Object on Path** window, select both the path and the shape to be repeated and go to **Effects>Object on Path**. Because there are so many settings in this window, only about half will be explained at this point:



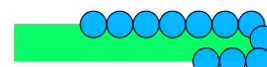
- ◇ **Start Offset:** This is the distance from the left side of the path to the location of the first shape:



Start Offset = 0

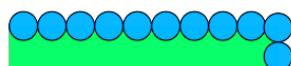


Start Offset = 0.5"

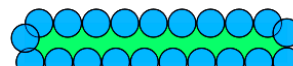


Start Offset = 1.5"

- ◇ **Repeat:** Choose **Count** if you want to specify how many copies to place along the path. Choose **Fill Path length** if you want the program to automatically fill in the number of repeats that will fill the path using the **spacing** you enter:

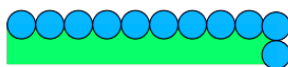


Repeats: Count 10

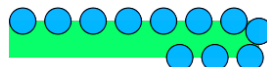


Repeats: Fill path length

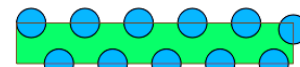
- ◇ **Spacing:** Enter the desired spacing between repeats:



Spacing = 0

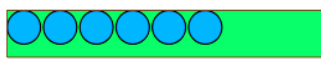


Spacing = 0.2"

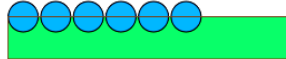


Spacing = 0.5"

- ◇ **Alignment:** This refers to the object being repeated. Choose **Top** to have the top of the shape aligned along the path. Choose **Bottom** to have the bottom of the shape aligned along the path. Choose **Middle** to have the center of the shape aligned along the path:



Alignment: Top

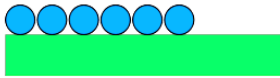


Alignment: Middle



Alignment: Bottom

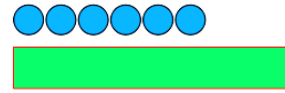
- ◇ **Offset:** This is how far from the path the repeats will be positioned. For example, if you choose **Bottom** for **Alignment** and then 0.15" or 0.25" for **Offset**, then the top of the shapes will be 0.15" or 0.25" above the path:



Offset = 0



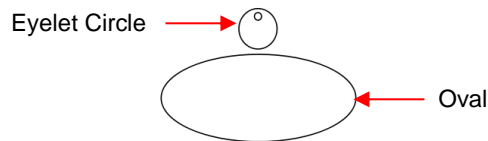
Offset = 0.15"



Offset = 0.25"

9.07.1 Designing a Scalloped Oval

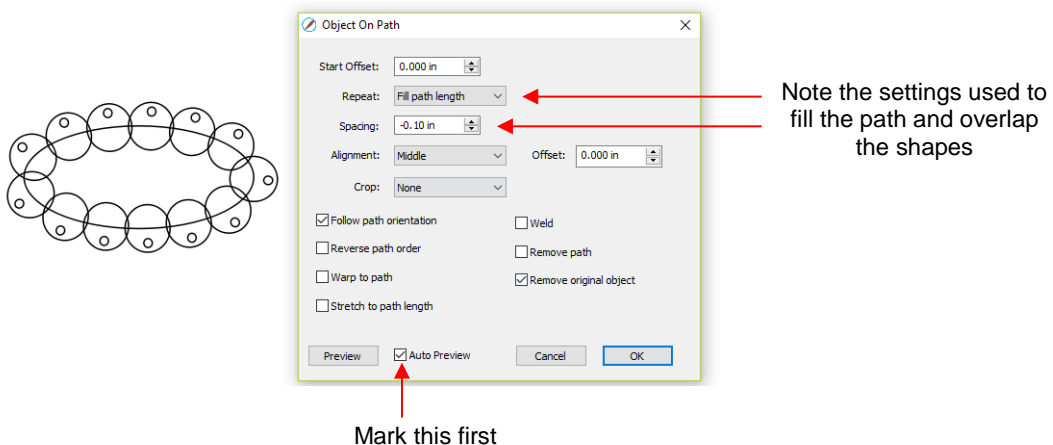
- Create an eyelet circle as described in *Section 9.05.1*. Add an oval from the **Library's Basic Shapes** and resize both shapes as shown in the following screenshot:



- Before using the **Object on Path** function, make sure the eyelet shape is above the oval path on the **Layers Panel**:

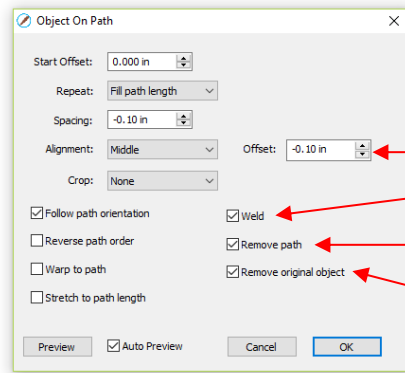
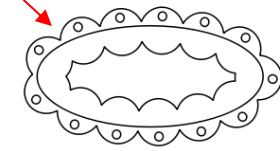


- Select the shapes and open the **Object on Path** window using **Effects>Object on Path**. Begin by marking the **Auto Preview** option so that all changes will be immediately reflected. Then choose **Fill path length** so the shapes will be distributed over the entire path. Set the **Spacing** to a negative number so that the shapes will overlap:



- Next the **Offset** is decreased to soften the scallop. Also a few new settings are noted as shown and described below:

Lowering the **Offset** makes the scallop less acute



Lower the **Offset**

Removes overlap

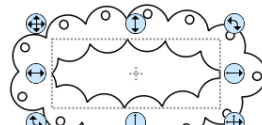
Removes original path

Removes original shape

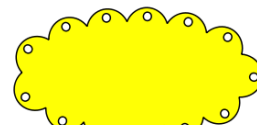
- ◇ **Weld:** Mark this box if you want the shapes welded together, as shown in the screenshot.
- ◇ **Remove path:** Choose if you will no longer need the path shape (in this case, the oval)
- ◇ **Remove original object:** Choose if you will no longer need the original shape (in this case, the eyelet circle)
- Click on **OK** and the scalloped oval is mostly complete. To remove the internal scallop, apply **Object>Break Apart**. Carefully select the internal scallop shape and delete. Then marquee-select the remaining scallop border with eyelet circles and apply **Object>Merge**:



After clicking on **OK**



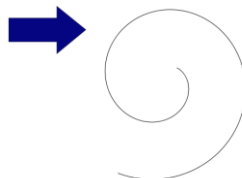
After applying **Break Apart**, select inner scallop



After deleting inner scallop, apply **Merge** and a **Fill**

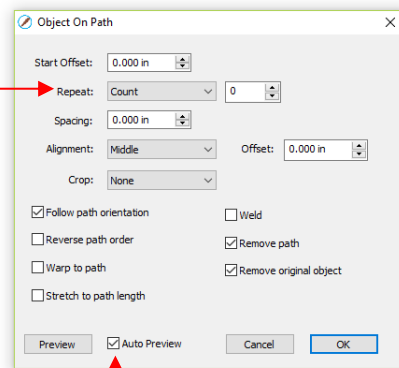
9.07.2 Warp a Shape to a Path

- The **Object on Path** function can also be used to stretch a shape to fit a path. For example, let's start with an arrow (from the **Library's Arrows**) and a spiral (refer to *Section 9.03.7*):

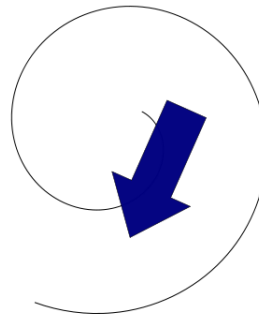


- Verify that the arrow is above the spiral on the **Layers Panel**. Then select both and go to **Effects>Object on Path**. Note that since there is only one shape involved, **Repeat** is left at **Count** and set to 0:

Repeat is set to **Count**
but the number of
repeats is set at 0

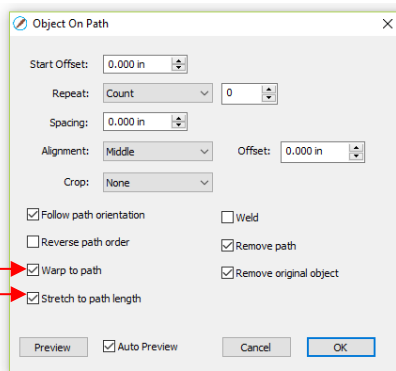


Mark this first



Original arrow appears
positioned at start of
spiral

- Next, two new settings are applied:

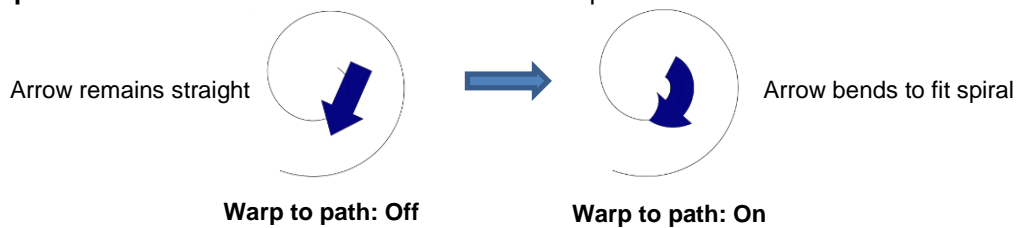


Mark these two
options

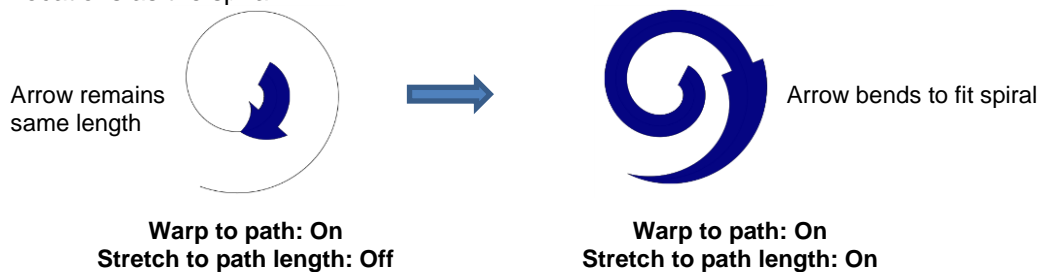


Arrow is now curved and
stretched to fit the spiral

- ◇ **Warp to path:** causes the arrow to bend/curve to fit the spiral:



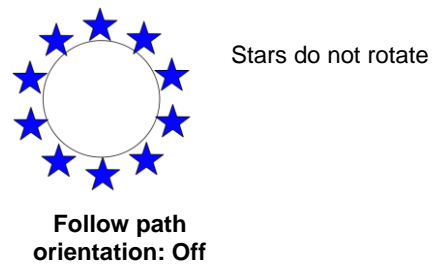
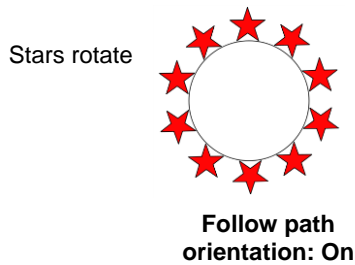
- ◇ **Stretch to path length:** causes the arrow to be elongated so that it starts and ends at the same locations as the spiral:



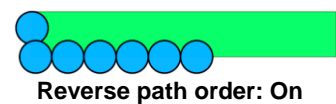
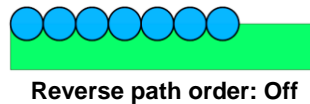
9.07.3 Remaining Settings

- The two remaining settings in the **Object On Path** window are:

- ◇ **Follow path orientation:** With this setting turned on, the repeats will rotate so that they stay aligned with the path. With the setting turned off, the shapes never rotate:



- ◇ **Reverse path order:** Changes the direction the shapes are applied. With **Reverse path order** turned off, the shapes are applied clockwise around the path. With **Reverse path order** selected, the shapes are applied counter-clockwise:

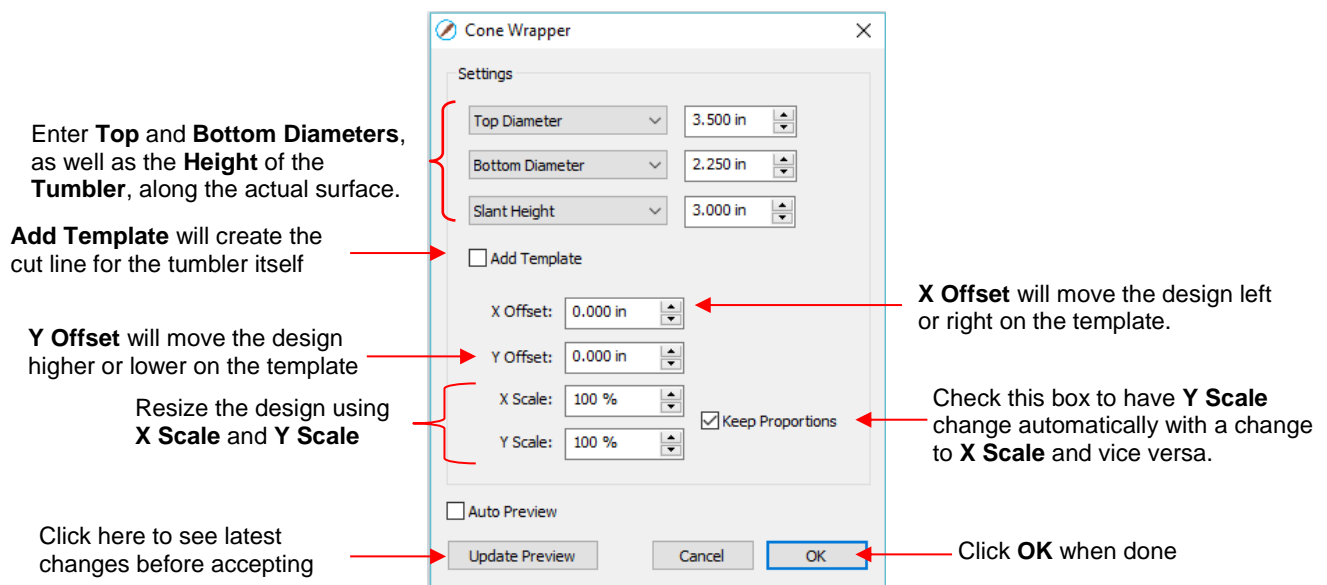


9.08 Wrapper

- The **Wrapper** feature can be used for shaping designs to fit around conical shapes in which the top is a different diameter than the bottom. Some typical applications include tumblers and cupcake wrappers.
- This function can be accessed by selecting one or more shapes and going to **Effects>Wrapper**. For this example, the following design was created with the intention of having it applied to a small cup:



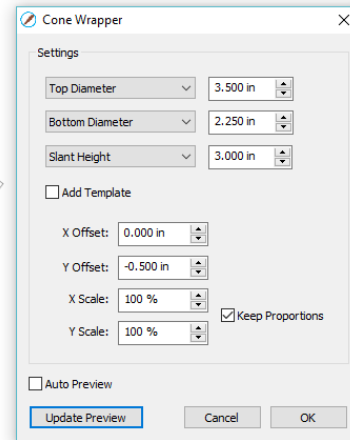
- Select the design and go to **Effects>Wrapper**. The following window will open:



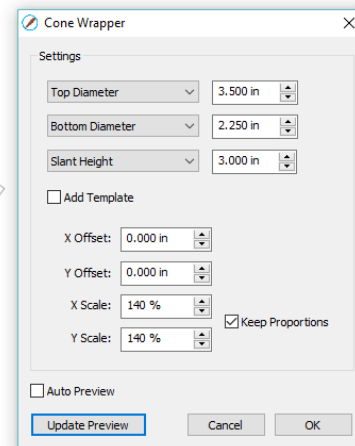
- ◇ Measure the cup: **Top Diameter**, **Bottom Diameter** and along the side from bottom to top (**Slant Height**). Enter those as shown in the screenshot. Alternatively, you can measure the radius or the circumference, as well as use the vertical height versus the horizontal height. These other choices are in the drop-down menus.
- ◇ Once these measurements are entered, click on **Update Preview** to see how the design will fit on the cup. Note the design will be displayed in outline mode while working in this window:



- ◇ The template is the outside pattern based on the cup's dimensions. If you plan to cut that template, then check the box next to **Add Template**. Otherwise, it won't be on the **Cutting Mat** after you click on **OK**.
- ◇ Adjust the **X Offset** and/or **Y Offset** to move the design, if needed. For example, making **Y Offset** negative moves the design higher up on the template:



- ◇ Adjust the **X Scale** and/or **Y Scale** to resize the design, if needed. If you want to scale proportionately, mark the **Keep Proportions** box:



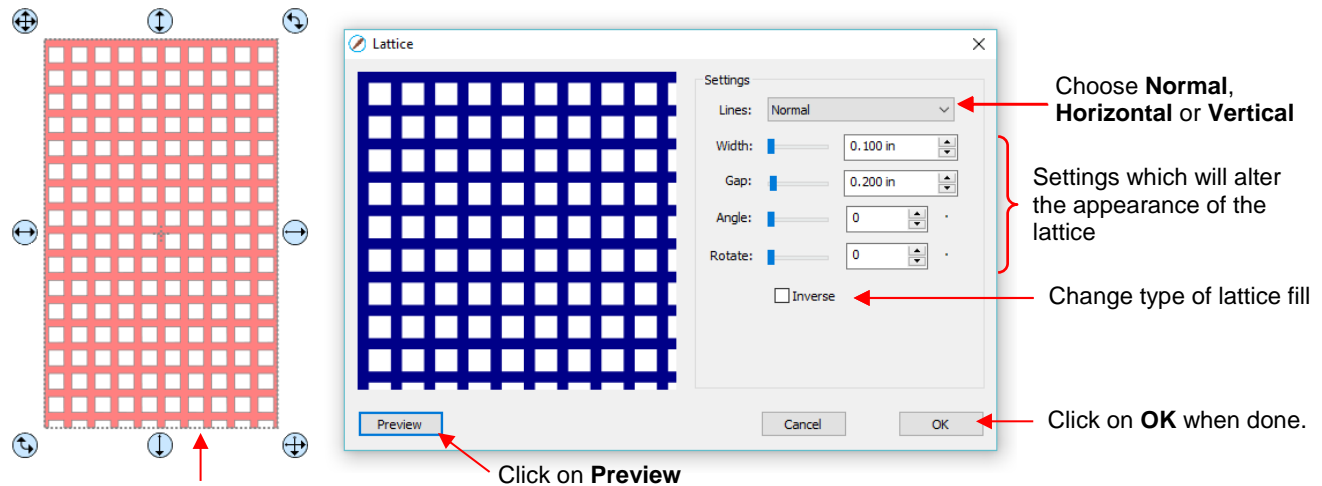
- ◇ Remember to click on **Update Preview** after each change in the settings. **Auto Preview** doesn't currently work.
- After clicking on **OK**, the fill color returns to the design and the project is ready for completion:



9.09 Lattice

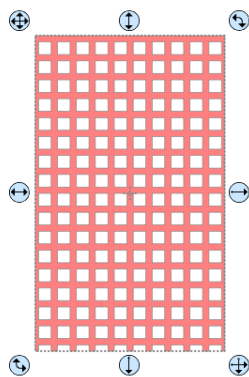
- The **Lattice** feature can be used to create a lattice design within a shape or as part of the shape itself. To access this feature, select one or more shapes and then use either of the following:
 - ◇ Go to **Effects>Lattice**
 - ◇ Right-click and select **Appearance>Lattice**

- In this example, a rectangle is used to show the effects of the settings in the **Lattice** window:

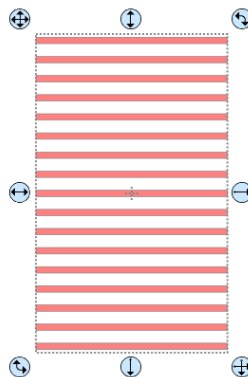


After clicking on **Preview**, selected shape will display lattice based on current settings

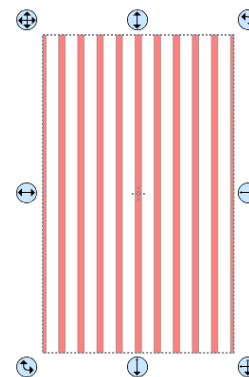
- ◇ **Lines:** Besides the traditional crisscross pattern, you can also choose to only have horizontal lines or only have vertical lines:



Lines: Normal

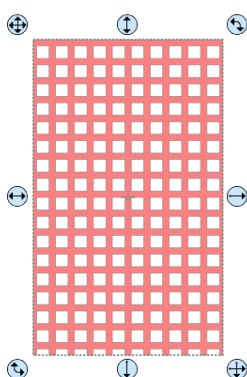


Lines: Horizontal Only

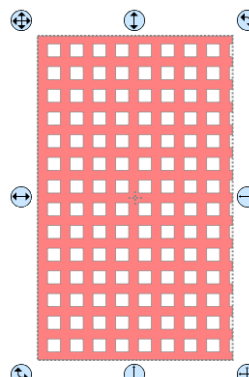


Lines: Vertical Only

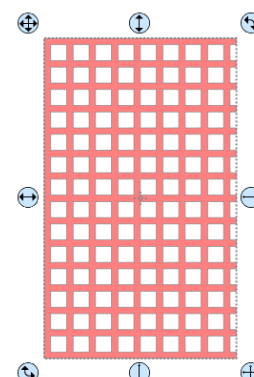
- ◇ Change **Width** and **Gap** to produce desired appearance. Remember that if the lattice pattern is too small, it might be difficult to cut:



Width: 0.1 in
Gap: 0.2 in

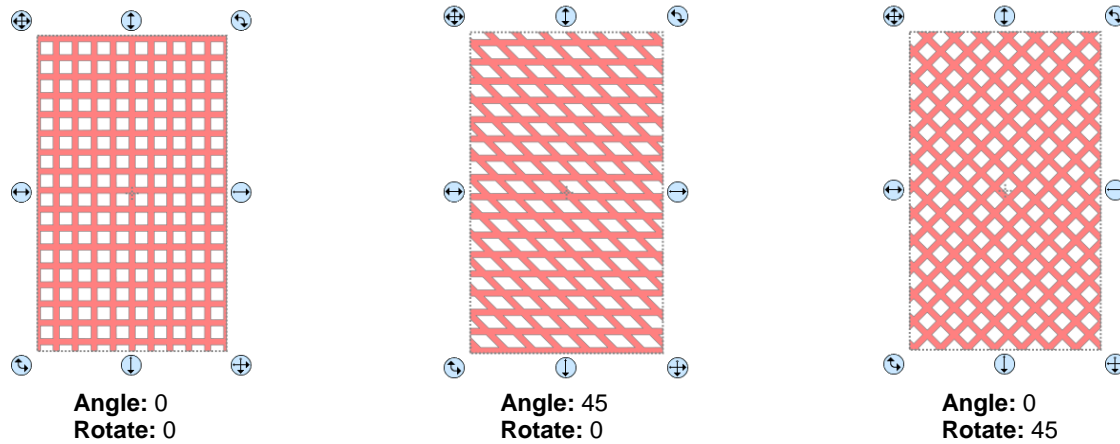


Width: 0.15 in
Gap: 0.2 in

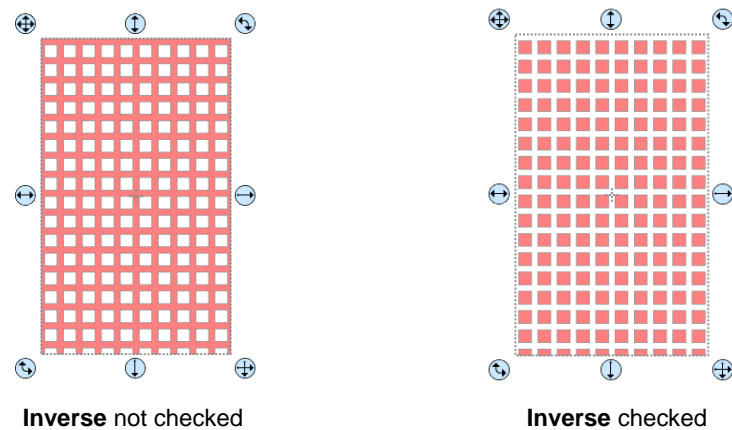


Width: 0.1 in
Gap: 0.25 in

- ◇ The **Angle** setting will skew the lattice shape while the **Rotate** setting will simply rotate the overall pattern:

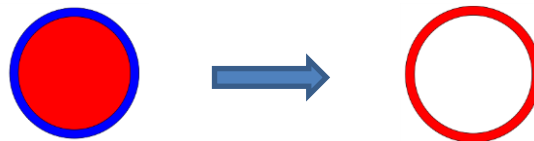


- ◇ **Inverse** is used to create a kind of negative lattice (an example will follow later in this section):

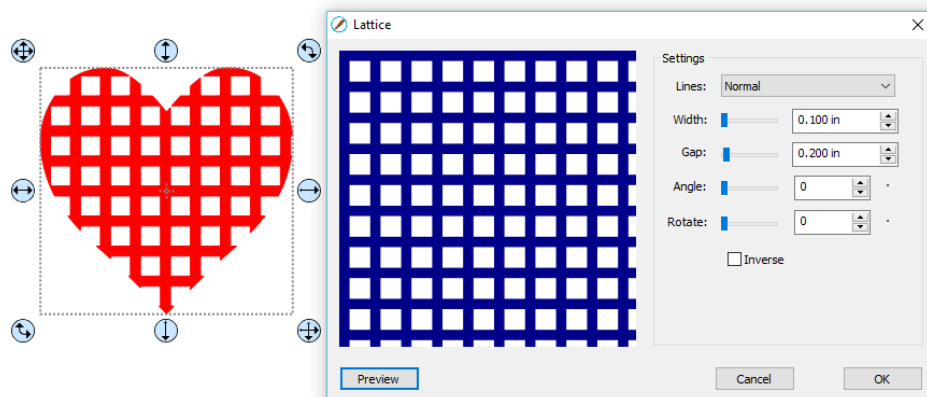


- An example of when **Inverse** would not be checked is when you want to attach/weld a latticed shape to something else. In the following example, a latticed heart is attached to the center of a ring:

- ◇ A ring is created by applying **Object>Merge** to two centered circles:



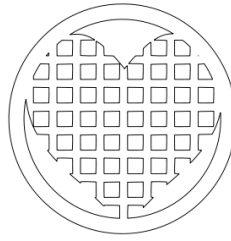
- ◇ Select a heart shape from the **Library** and apply **Effects>Lattice**:



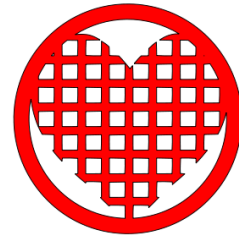
- ◇ Align the latticed heart in the center of the ring and weld using **Path>Union**:



Remove **Fill** from ring
to make overlap easier
to see



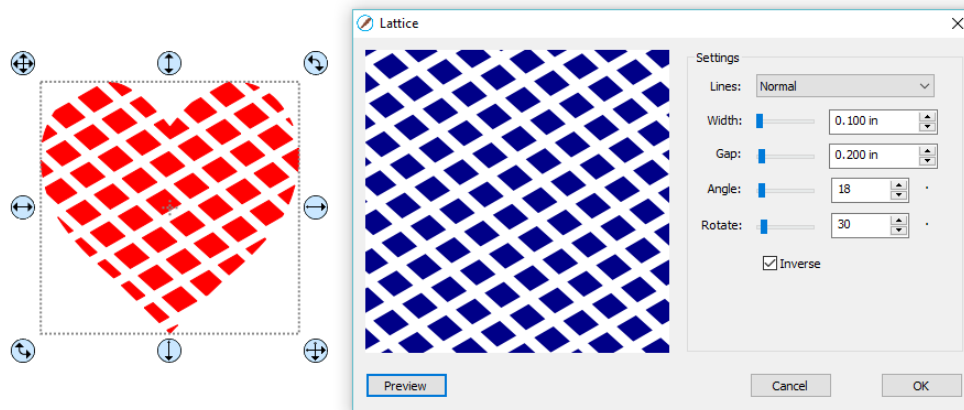
After applying
Path>Union



Set **Fill** to red again

- An example of when **Inverse** would be checked is when you want a lattice aperture cut from the front of a greeting card:

- ◇ Using the same heart as above, make sure **Inverse** is selected:



- ◇ Arrange the latticed heart over a base greeting card:



- ◇ Select all and go to **Object>Merge**. The card is complete:



- If you have a shape that has the **Lattice** effect applied and want to remove it (even after the file has been saved and re-opened), select the shape and go to **Object>Remove Effects**.

9.10 Rhinestones

- SCAL's **Rhinestones** feature provides both outlining and horizontal fill of shapes with the size of circles needed for your rhinestones and the desired spacing. After selecting a shape, the feature can be accessed in either of the following ways:
 - ◇ Go to **Effects>Rhinestones**
 - ◇ Right-click and select **Appearance>Rhinestones**

9.10.1 Guidelines for Rhinestone Pattern Design

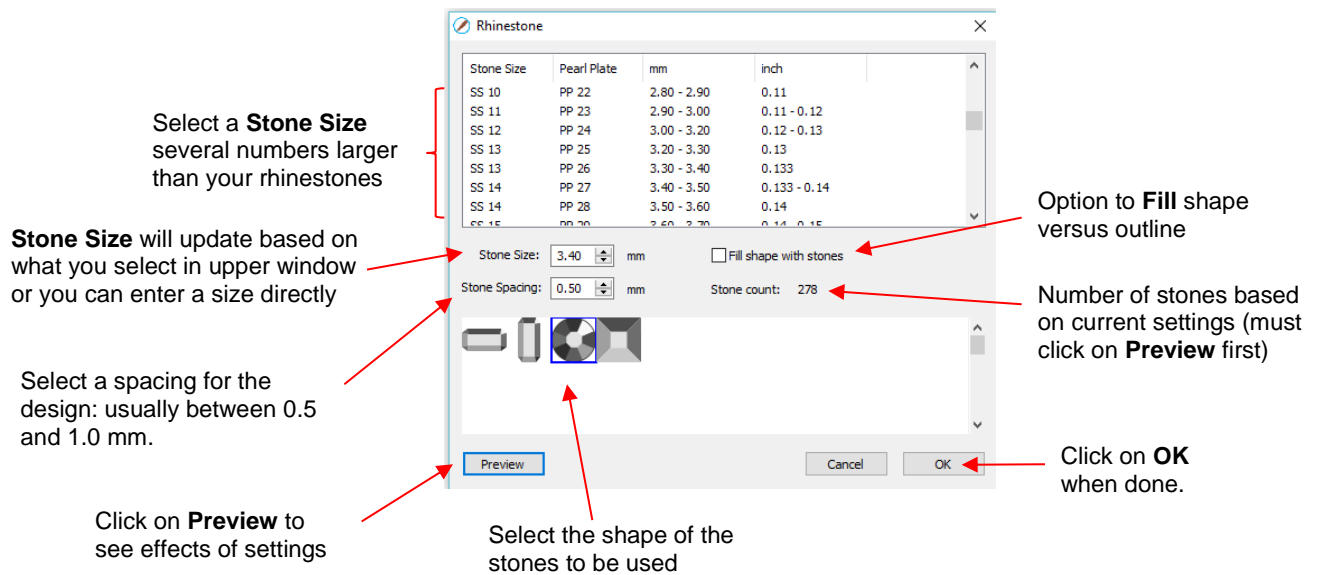
- There are some very specific guidelines to follow when designing a rhinestone pattern:
 - ◇ In general, you want to size the shape before applying the rhinestone circles. If you later want to resize the design, SCAL does have the ability to regenerate the rhinestone pattern, maintaining the original selected stone size and spacing. But in order to have a good sense of how the design is going to appear on your garment and to make sure lettering is readable, you want to design close to the target size.
 - ◇ **IMPORTANT:** Always make a backup copy of your design before entering the **Rhinestone** window because the original design will be replaced with the new rhinestone pattern. You might later want to use that same original design but apply a different size rhinestone or create a shadow layer from it, or some other change.
 - ◇ The circle size selected will need to be larger than the stone size you purchase. As a general rule, select a size three numbers larger than your stones. Thus, if you purchased SS10 stones, then in the rhinestone design window, you would select SS13 stones. This larger size will allow the SS10 stones to more easily brush into the holes, saving a lot of time and tedium.
 - ◇ When selecting a font to use, be leery of "fancy fonts." You want the lettering to be readable after it is converted to circles. When in doubt, have someone who doesn't know the words you've used attempt to read the rhinestone design on your monitor. If they cannot decipher your words, then try a more basic font.

9.10.2 Rhinestone Outline

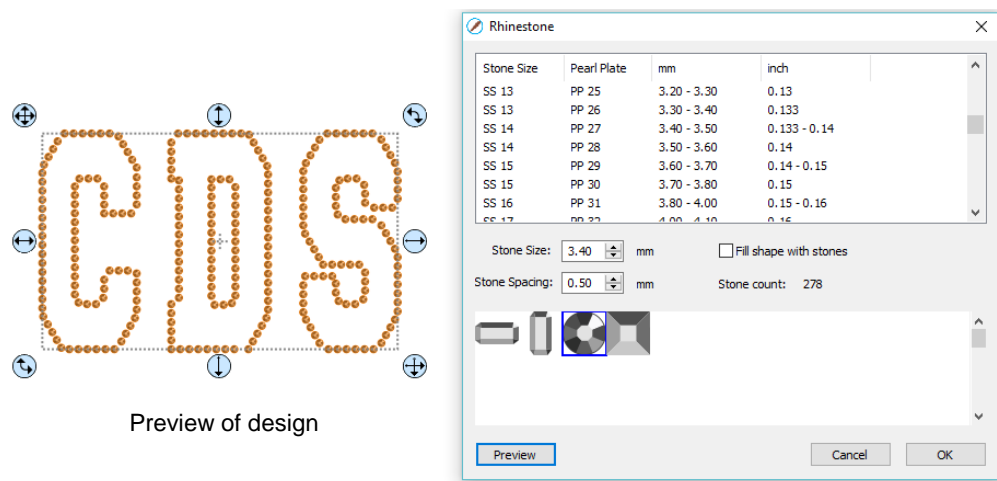
- In this example, the initials from a high school will be outlined. As mentioned previously, the first step is to size the width and height of the design. Make sure there is enough space between the letters so that the circles will not overlap. Also, you may want to resize the lettering vertically, leaving the width the same. This will better fill a T-shirt, allow more circles to be applied, and will improve the readability of the design:



- To apply a rhinestone outline, first make a backup copy of the shape. Then select the shape and go to **Effects>Rhinestones**:



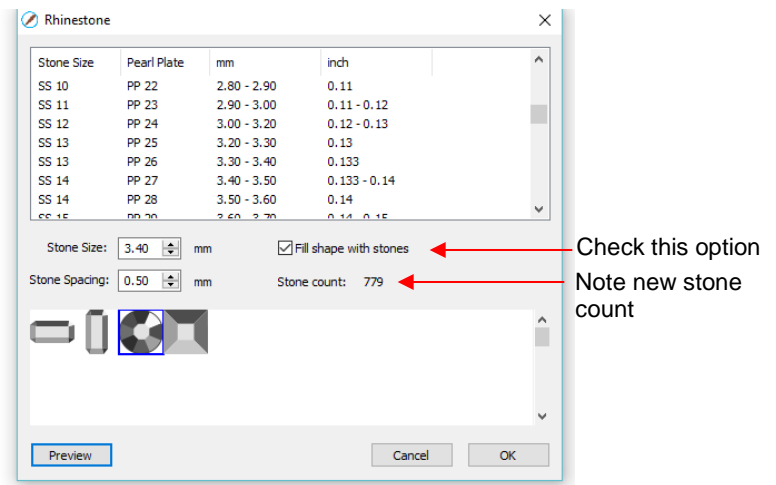
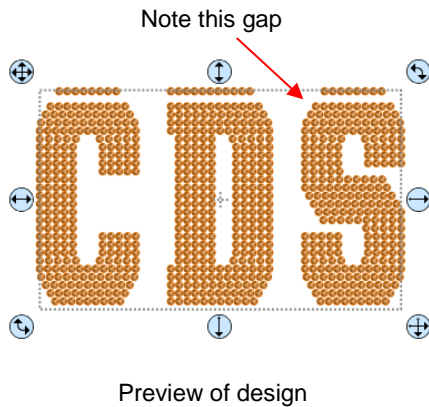
- After inputting the initial settings, click on **Preview** and your selected design will be outlined with simulated stones:



- During the editing process, the simulation will be lost. If you want to restore it, record your current settings before clicking on **OK**. For guidelines on editing, refer to *Section 9.10.4*.

9.10.3 Rhinestone Fill

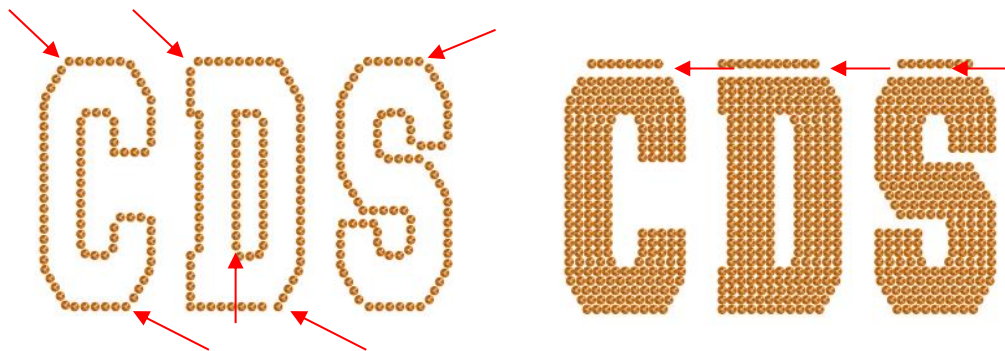
- Another option in the **Rhinestone** window is **Fill shape with stones**. Instead of outlining the shape, the image will be filled with circles in horizontal rows. In our prior example, the same letters will now appear like this:



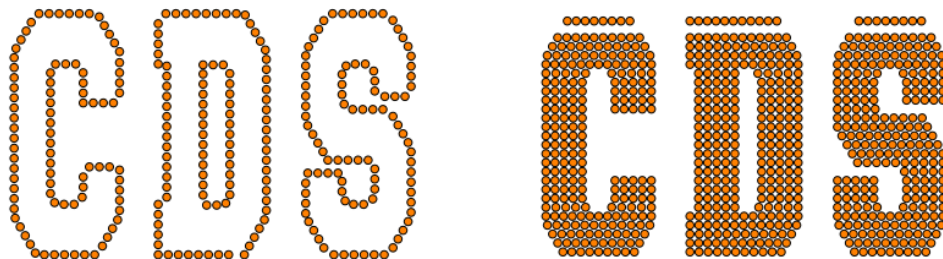
- The gap in the design is one of the inconsistencies that will sometimes occur with automatic fill algorithms. Thus, all rhinestone designs will need some editing as covered in *Section 9.10.4*. If you wish to restore the simulation after editing, be sure to record the settings you used before clicking on **OK**.
- Also, note the increase in the number of stones as a result of switching to a line fill. Rhinestones are typically sold by the gross and 1 gross equals ~ 144 stones. Thus, this design would require over 5 gross of stones compared to just under 2 gross for the outline version.


9.10.4 Editing Rhinestone Designs

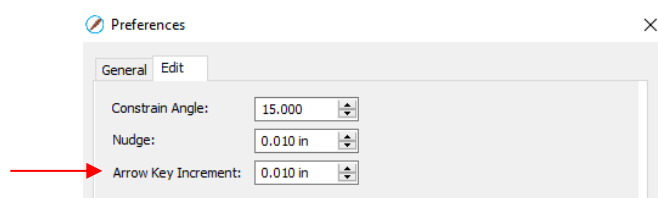
- Before editing, make a backup of the design created by the **Rhinestone** function. As was mentioned earlier you can resize rhinestone designs but if certain editing has occurred, you might or might not get the results you want after editing.
- Rhinestone designs typically will need “tweaking” which involves adding, deleting, moving, or re-spacing circles. Looking at the two designs created in the prior two subsections reveals some needed edits as indicated by the red arrows:



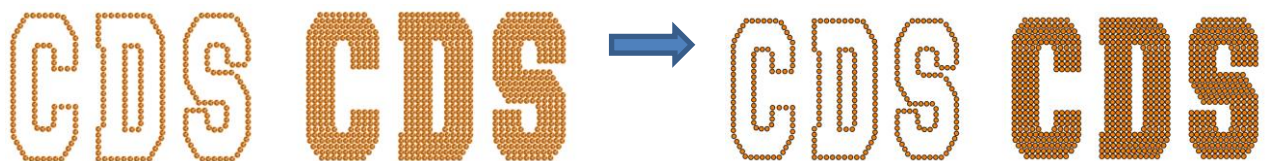
- The first step is to break the design so that individual circles can be moved. Select the pattern and apply **Object>Break Apart** or **Ctrl-B**. The simulation will vanish but this will be remedied:



- To restore the simulation, select the design and reopen the **Rhinestone** window. Enter the same original settings just used, including selecting the same stone again. Click on **OK** and the simulation will return. But you will now be able to individually select stones and move them or delete them.
- The following list shows the most common functions applied when editing rhinestone designs:
 - ◇ Use the **Zoom** functions (*Section 3.09*) to move in close for easier selection of individual or small groups of circles
 - ◇ Use the **Lasso Selection** tool  (*Section 5.01*) to more easily select a group of circles
 - ◇ To quickly add a circle, select one and then hold the **Alt** key while dragging a copy to its new location
 - ◇ To delete multiple circles, hold the **Delete** key while clicking on individual circles
 - ◇ Use the arrow keys on your keyboard to move a circle or row of circles in smaller increments. It's advisable to change the increment to 0.01" (0.25 mm) by going to **Edit>Preferences** (or, on a Mac, press **Command + ,**). Then click on the **Edit** tab and change the **Arrow Key Increment**, as shown here:

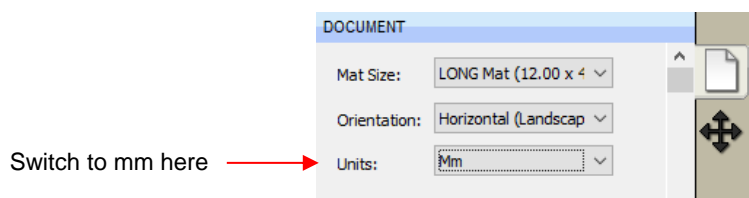


- ◇ To realign a row or column of circles, use the alignment functions covered in *Section 5.17.2*
- ◇ To respace a row or column of circles, use the spacing functions covered in *Section 5.18.2*
- Sometimes the circles you want to re-space equally may fall closer to a 45° angle versus vertically or horizontally. Select your entire design and rotate until the line of circles is closer to vertical or horizontal. Re-space the circles and then rotate back into place.
- After editing the design, you may wish to group the design to avoid inadvertently moving one or more stones out of place. To do that select the design and go to **Object>Group** or apply **Ctrl+G**.
- If you have a shape that has a **Rhinestone** effect applied and want to remove it (even after the file has been saved and re-opened), select the shape and go to **Object>Remove Effects**.

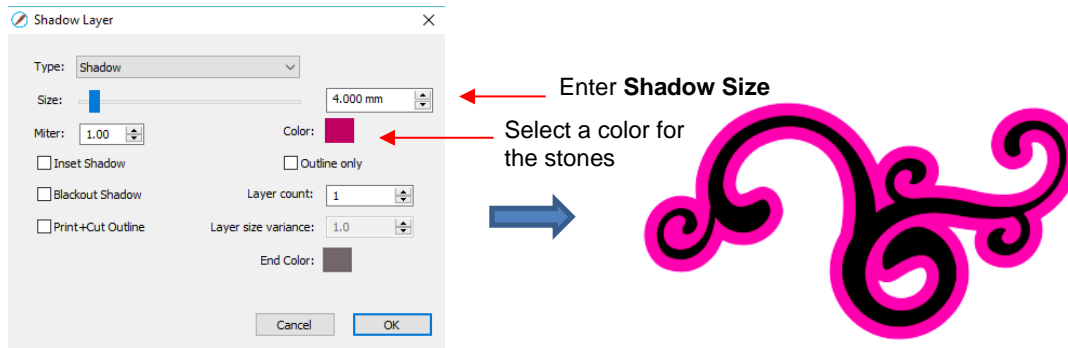


9.10.5 Additional Tips on Rhinestone Designing

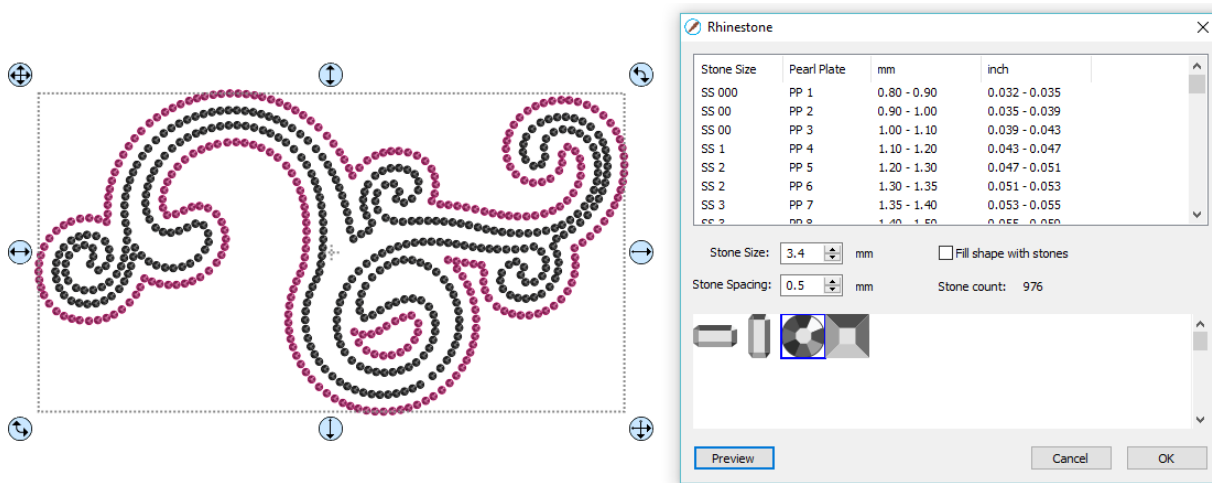
- If you want to outline your design, then create the outline first using the **Shadow Layer** function (*Section 9.04*). Choose a **Shadow Size** at least the size of the circles plus the spacing. Otherwise, the stones will overlap. Since rhinestone design programs work in metric, it's easier if you temporarily change the units in SCAL to mm. This setting is on the **Document Panel**:



- For the following example, a swirl design from the **Library** is added to the **Cutting Mat** and sized for a T-shirt. The same settings for SS 10 stones will be used - the circles will be 3.4 mm in diameter and the spacing will be 0.5 mm. Thus, the **Shadow Size** needs to be at least 3.9 mm. So, just to be safe, a **Shadow Size** of 4.0 mm will be entered:



- Next, select the design and the shadow and make a backup copy. Then go to the **Rhinestone** window. Since the same settings will be used for both the original design and the outline, both can have the rhinestone effect applied in the same step:

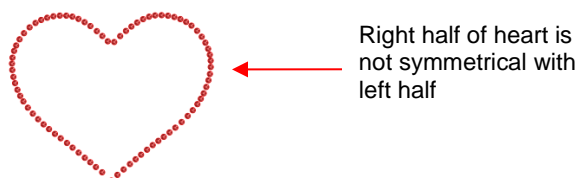


- After some minor tweaking the design is complete and ready to cut:

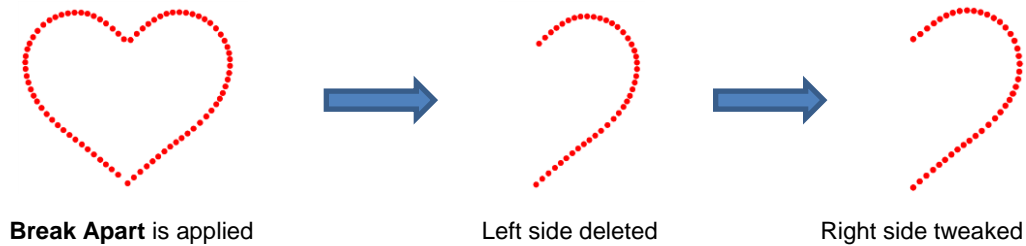


- With symmetrical rhinestone designs, consider using the following process to perfect your design:

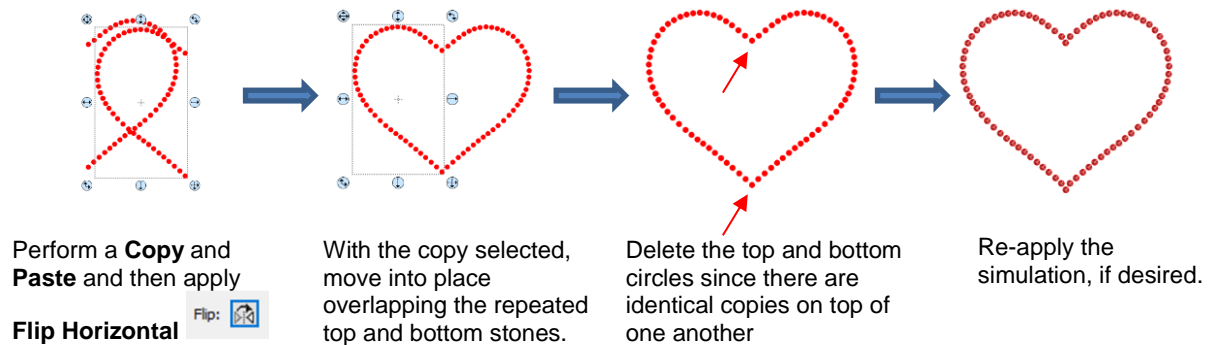
◇ This heart outline is clearly not symmetrical:



- ◇ Apply **Object>Break Apart** to the design. Then decide which half is closer to perfect and delete the other half. Then tweak the remaining half:



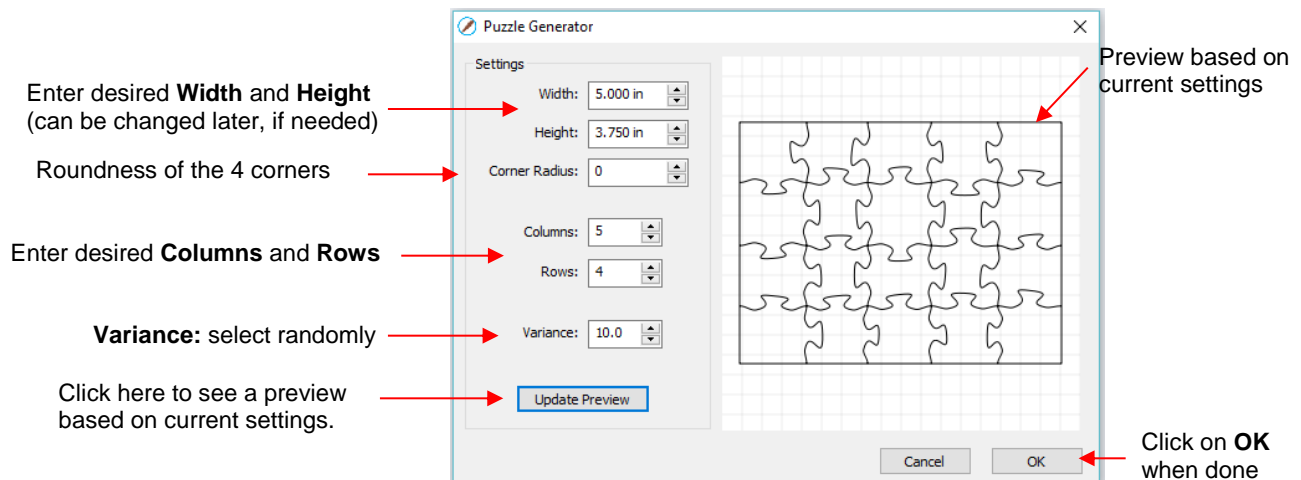
- ◇ Select the tweaked design and then perform the following steps shown:



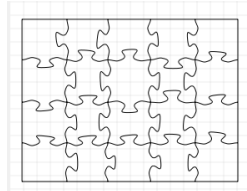
- A final tip: If you plan to do a lot of rhinestone applications, create and cut a template with small patterns (~15 – 20 circles) in different sizes so that you can test brush your rhinestones to find out the optimum size to use when designing. A difference of just 0.1 or 0.2 mm can affect how easily the stones will brush into a pattern right side up. If the size is too small, the stone will tend to not fall in. If the size is too large, then the ones that land right side up will tend to get flipped over by the brush. Also, stones can vary slightly in size from one manufacturer to the next and also from one color to the next. Further, the size of the cut holes can vary slightly from one template material to the next.

9.11 Jigsaw Puzzle

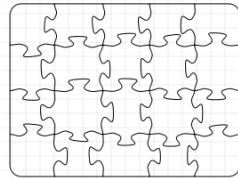
- The **Jigsaw Puzzle** feature will generate a rectangular jigsaw pattern with a number of options from which to choose. To open the window, go to **Effects>Puzzle Generator**:



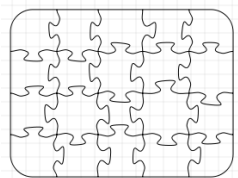
- ◇ **Width and Height:** If you plan to apply this puzzle over a specific image, you may want to choose dimensions that correspond to your image. For example, let's assume you have a photo that is 5" x 3.75" and plan to make a print and cut jigsaw puzzle. Enter those dimensions into the **Puzzle Generator**, as shown in the prior screenshot.
- ◇ **Corner Radius:** With a setting of 0, the corners of the rectangle are 90°. If you want rounded corners, increase this setting:



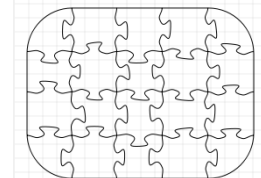
Corner Radius = 0



Corner Radius = 0.25

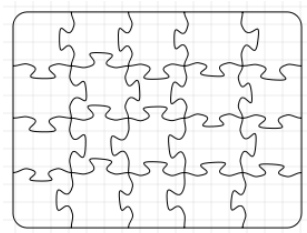


Corner Radius = 0.5

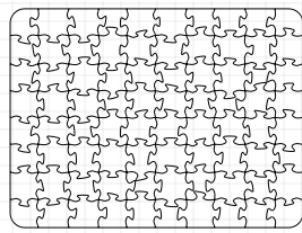


Corner Radius = 1.0

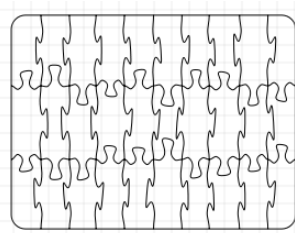
- ◇ **Columns and Rows:** To keep the shapes from becoming too distorted, make the number of **Columns** and **Rows** similar to the dimensions. If you want more pieces, then increase the number of **Columns** and **Rows** proportionately. For example, instead of having 5 **Columns** and 4 **Rows**, double the number to 10 **Columns** and 8 **Rows**. But don't use, for example, 10 **Columns** and 3 **Rows** with these dimensions:



5 Columns, 4 Rows



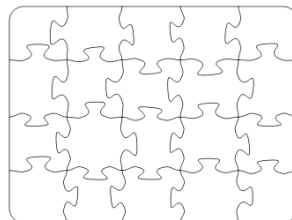
10 Columns, 8 Rows



10 Columns, 3 Rows

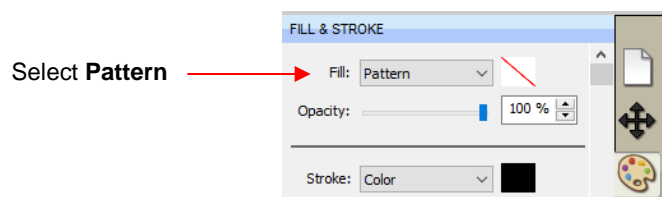
- ◇ **Variance:** This setting can be used to make sure one puzzle is not identical to the next, if all other settings are the same.

- When you are satisfied with the appearance of your puzzle pieces, click on **OK** and the puzzle will be on the **Cutting Mat**:



- For a print and cut application:

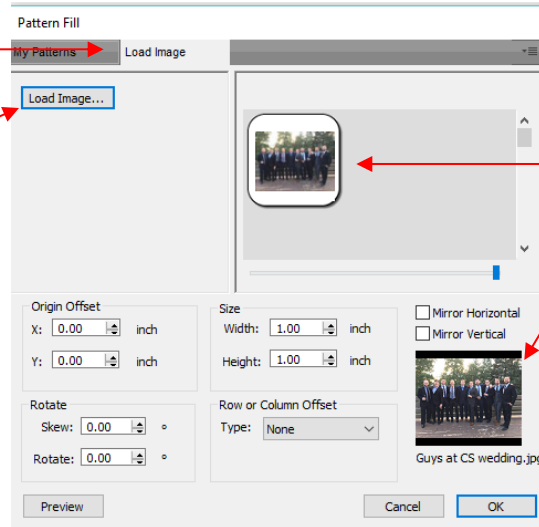
- ◇ Select the shape and, on the **Fill & Stroke Panel**, select **Pattern** from the **Fill** menu:



- ◇ The **Pattern Fill** window will open. Click on the **Load Image** tab and then click on the **Load Image** button to browse and find the image you want to use. It will then appear on the right side and can be selected:

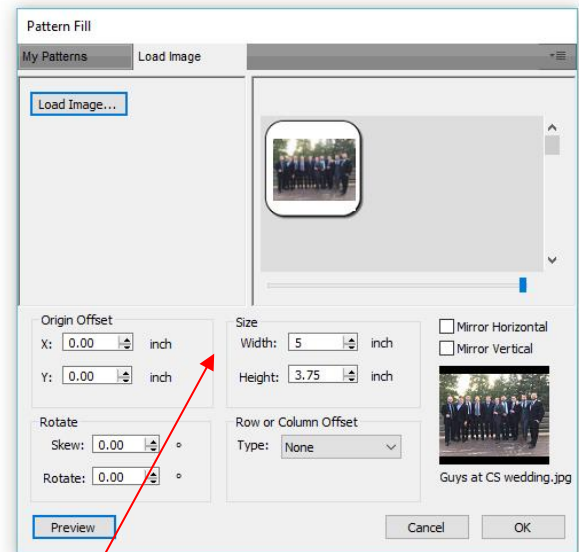
Select **Load Image** tab

Click on **Load Image** and browse to find file



Click on image and it will appear below

- ◇ Enter the same **Size (Width and Height)** used when the jigsaw pattern was created and then click on **Preview**:



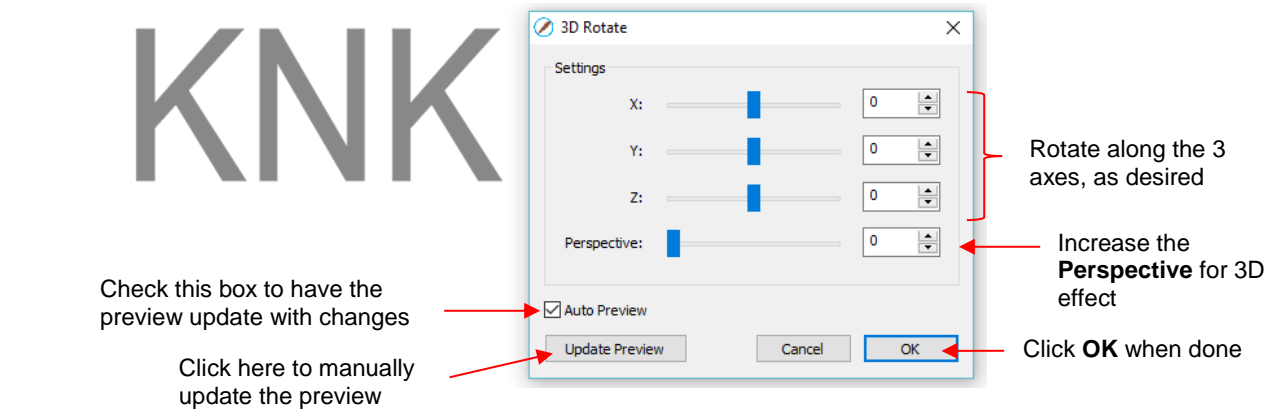
Enter same dimensions as were used in the **Generate Puzzle** window

- ◇ Click on **OK** and the jigsaw puzzle is ready for a print and cut application:

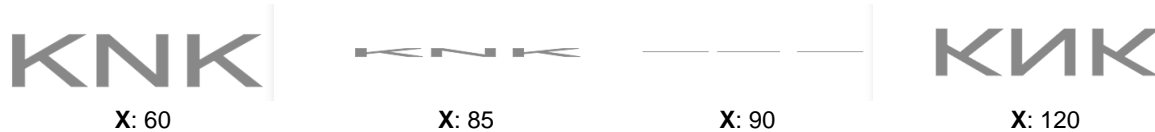


9.12 3D Rotate

- The **3D Rotate** function is used to rotate a shape along the X, Y, and/or Z axis. To access this function, select a shape and go to **Effects>3D Rotate**. In the following example, text will be used to show the effects of the settings:



◇ X Axis Rotation:



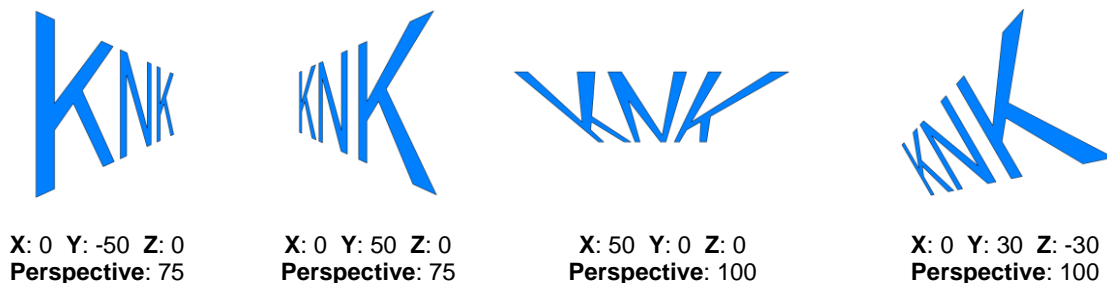
◇ Y Axis Rotation:



◇ Z Axis Rotation:

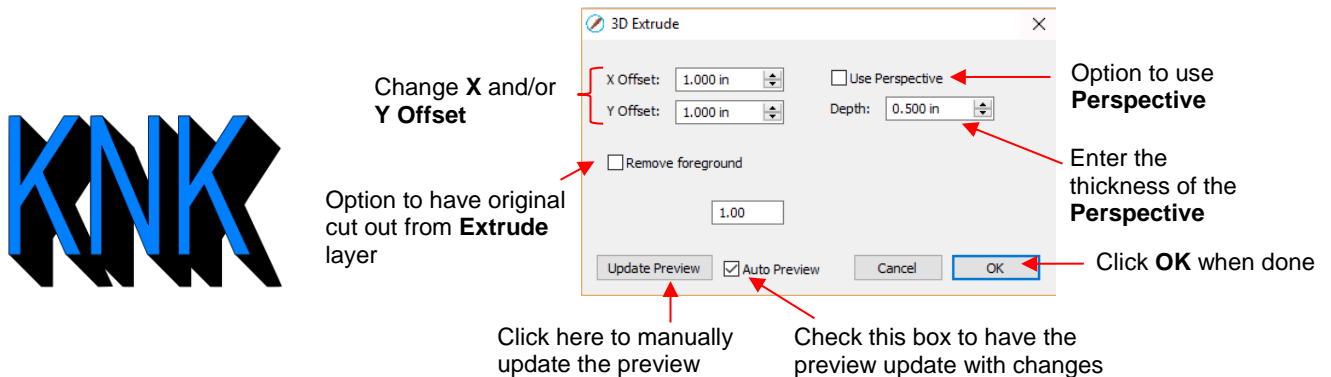


- ◇ **Perspective:** This is where the fun begins. Combining this setting with another rotation provides the 3D illusion. Here are examples:

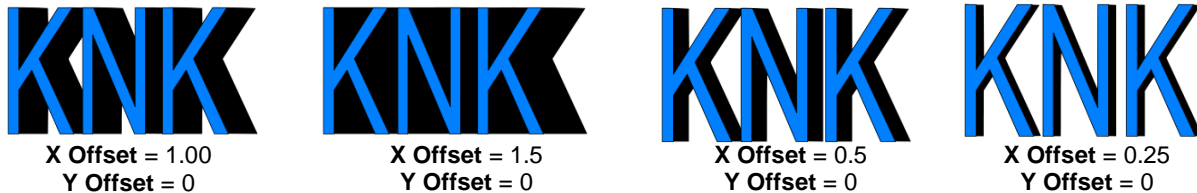


9.13 3D Extrude (SCAL PRO only)

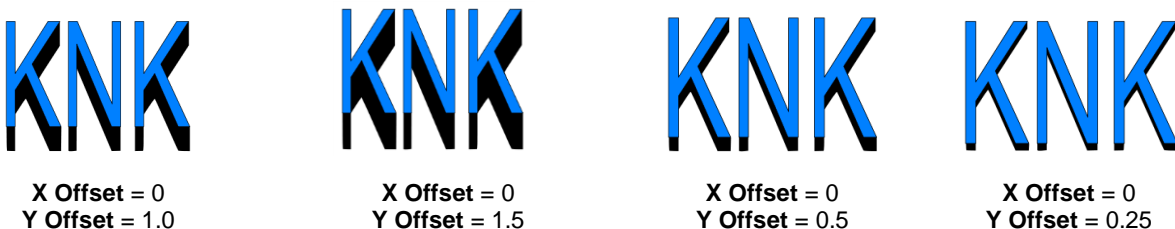
- The **3D Extrude** is used to create a cast or 3D shadow. To access this function, select a shape and go to **Effects>3D Extrude**. In the following example, text will be used to show the effects of the settings:



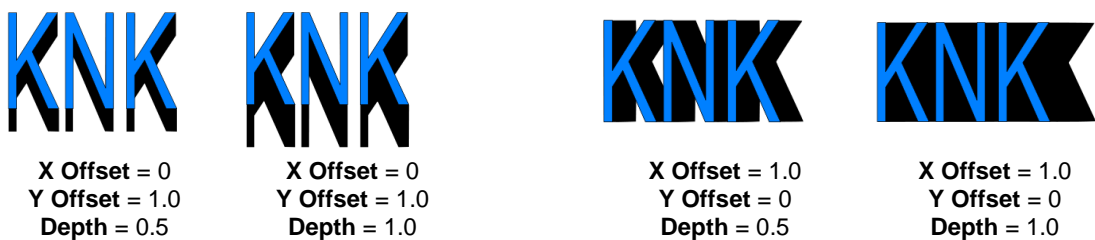
- ◇ **X Offset:** Increasing **X Offset** will extend the shadow to the right while decreasing it will retract the shadow towards the left. Note that **Y Offset** has been set to 0:



- ◇ **Y Offset:** Increasing **Y Offset** will extend the shadow downwards while decreasing it will retract the shadow towards the top. Note that **X Offset** has been set to 0:



- ◇ **Depth:** Adds the actual 3D effect by increasing the extension of the shadow:

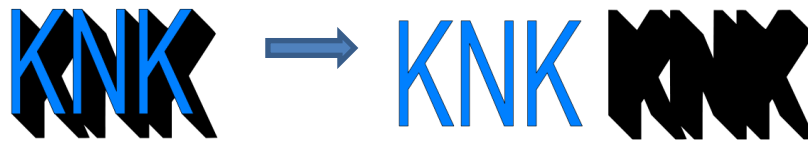


- ◇ **Use Perspective** provides a vanishing point effect:

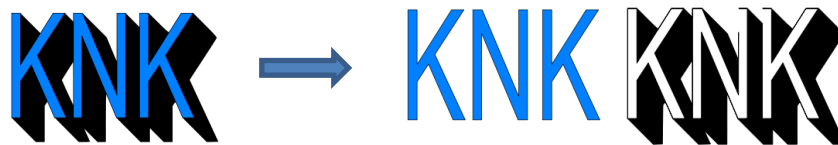


◇ **Remove foreground:**

- With this option off, when you separate the shape from the shadow, you see that the shadow is filled beneath the original. In other words, in a paper piecing or layered vinyl project, the original shape would need to be aligned over the top of the 3D shadow:

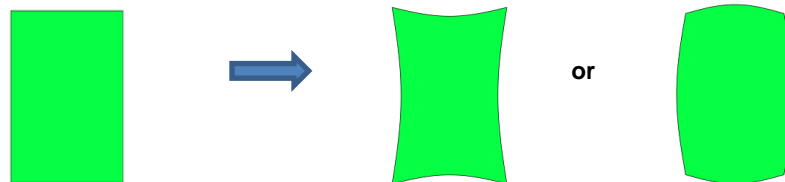


- With **Remove foreground** checked, the original shape will be cut away from the shadow. This would be the typical choice when layering HTV where some kinds cannot be pressed on top of each other (such as glitter HTV):

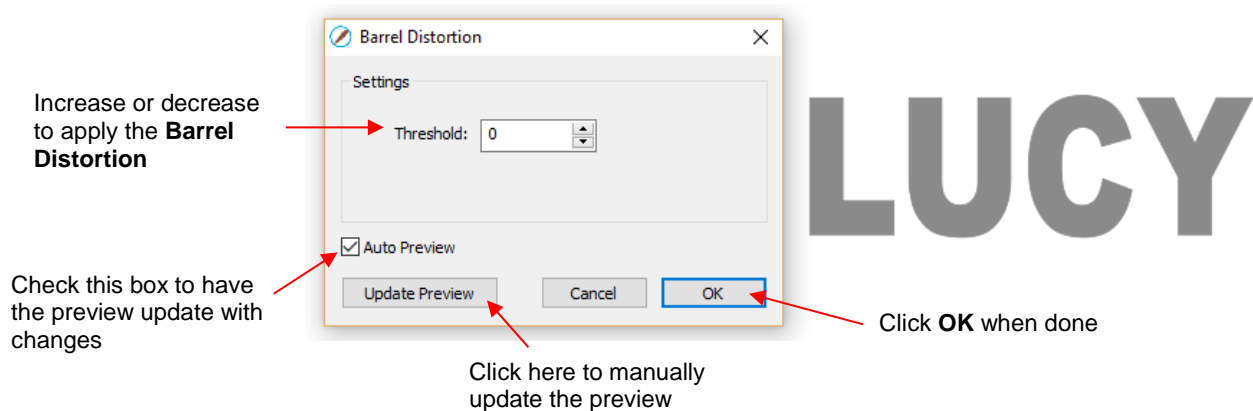


9.14 Barrel Distortion

- The **Barrel Distortion** feature will warp a shape by narrowing or thickening the middle part of the shape:



- In the following example, text will again be used to show the effects of the settings. To open the **Barrel Distortion** window, select the text and go to **Effects>Barrel Distortion**:



- As you increase the **Threshold**, you will see a narrowing of the shape in the middle:



- As you decrease the **Threshold**, you will see a thickening of the shape in the middle:

LUCY

Threshold = -10

LUCY

Threshold = -20

LUCY

Threshold = -40

9.15 Bulge

- The **Bulge** feature allows you to apply various expanding or shrinking distortions to a shape. These distortions can be applied to the top side of the shape, the bottom side, or both. They can be applied to the left side, the right side, or both. And the distortions can be expanding on both sides, shrinking on both sides, or a combination.
- To open the **Bulge** window, select the shape and go to **Effects>Bulge**:

Choose from **Separately**, **Together**, or **Opposite**

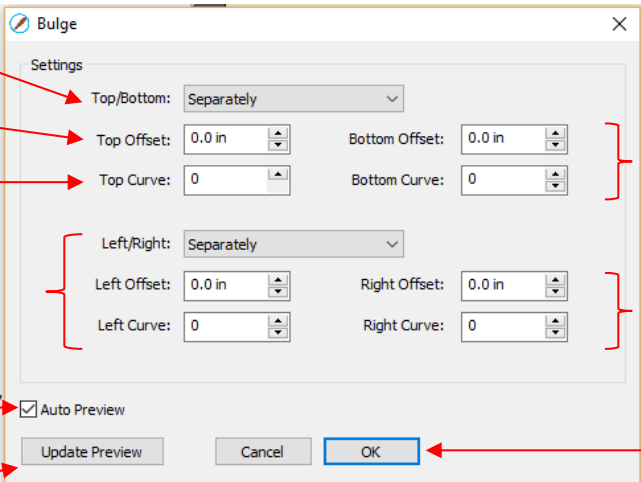
Increase to round up, decrease to curve down

Add more customization to the effect of the bulge

Same settings as above, but applied to the **Left** and **Right** sides instead of **Top** and **Bottom**

Check this box to have the preview update with changes

Click here to manually update the preview



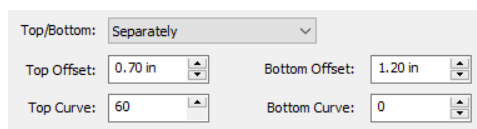
Bottom side settings

Right side settings

Click **OK** when done

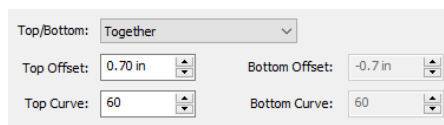
- In the top portion of the window are settings for applying **Bulge** to the top or bottom of a shape. The **Top/Bottom** setting allows you to choose if you want to apply the settings in one of three ways:

◇ **Separately:** The **Offset** and **Curve** settings can be different for the top versus the bottom



LUCY

◇ **Together:** The **Offset** and **Curve** settings will be applied equally to both the top and the bottom. In this case the **Bottom Offset** and **Bottom Curve** settings will be grayed out.



LUCY

◇ **Opposite:** The **Offset** and **Curve** settings will be applied opposite to one another on the top and the bottom. In this case, the **Bottom Offset** and **Bottom Curve** settings will again be grayed out.

Top/Bottom: Opposite

Top Offset: 0.70 in Bottom Offset: 0.7 in

Top Curve: 60 Bottom Curve: 60

LUCY

- The **Top Offset** rounds the top side of the shape up or down depending on whether a positive or negative value is applied. The **Bottom Offset** does the same, but applies it to the bottom side of the shape:

NIKKI

Top Offset = 1.0
Bottom Offset = 0

NIKKI

Top Offset = 2.0
Bottom Offset = 0

NIKKI

Top Offset = -0.5
Bottom Offset = 0

NIKKI

Top Offset = 0.0
Bottom Offset = 1.0

NIKKI

Top Offset = 0.0
Bottom Offset = 2.0

NIKKI

Top Offset = 0.0
Bottom Offset = -0.5

- The **Top Curve** setting will alter the roundness of the **Top Offset** to add even more customization to the **Bulge** effect. Likewise, the **Bottom Curve** setting does the same to the **Bottom Offset**:

TEDDY

Top Offset = 1.5
Top Curve = 0

TEDDY

Top Offset = 1.5
Top Curve = 50

TEDDY

Top Offset = 1.5
Top Curve = 90

TEDDY

Bottom Offset = 1.5
Bottom Curve = 0

TEDDY

Bottom Offset = 1.5
Bottom Curve = 50

TEDDY

Bottom Offset = 1.5
Bottom Curve = 90

- The **Left/Right** settings all work in the same manner, except they affect the shape horizontally versus vertically. Here are some examples similar to the prior **Top/Bottom** ones:

◇ **Left/Right:** choose from **Separately**, **Together**, or **Opposite**:

LEO

Separately

LEO

Together

LEO

Opposite

◇ Effect of **Left Offset** and **Right Offset**:

LEO

Left Offset = 1.0

LEO

Left Offset = -1.0

LEO

Right Offset = 1.0

- ◇ Effect of **Left Curve** and **Right Curve**:

LEO

Left Offset = 1.0
Left Curve = 50

LEO

Left Offset = 1.0
Left Curve = 90

LEO

Right Offset = 1.0
Right Curve = 75

- ◇ Or just have some fun with it:

FINN

FINN

FINN

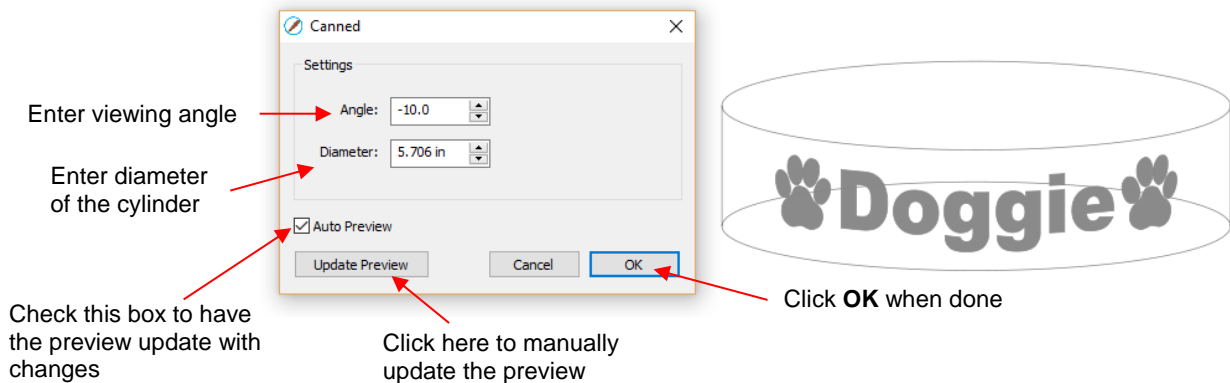
FINN

9.16 Canned

- The **Canned** effect will curve lettering as if it were wrapped around a cylinder (can) and viewed at an angle:

Doggie → **Doggie**

- To open the **Canned** window, select the shape and go to **Effects>Canned**:



- Decreasing the **Angle** setting (i.e. making the setting more negative) will increase the perspective and cause a greater roundness to the lettering.

Doggie

Angle = -10

Doggie

Angle = -45

Doggie

Angle = -90

- Increasing the **Angle** has the opposite effect. At an **Angle** of 0, the lettering is horizontal. A positive **Angle** setting results in curving the lettering in the other direction:



Angle = 0



Angle = 45



Angle = 90

- The **Diameter** of the cylinder can be increased or decreased, as well. A larger **Diameter**, applied at the same **Angle**, will lessen the roundness, while a smaller **Diameter** will increase it.



Angle = -30
Diameter = 5.0



Angle = -30
Diameter = 7.5



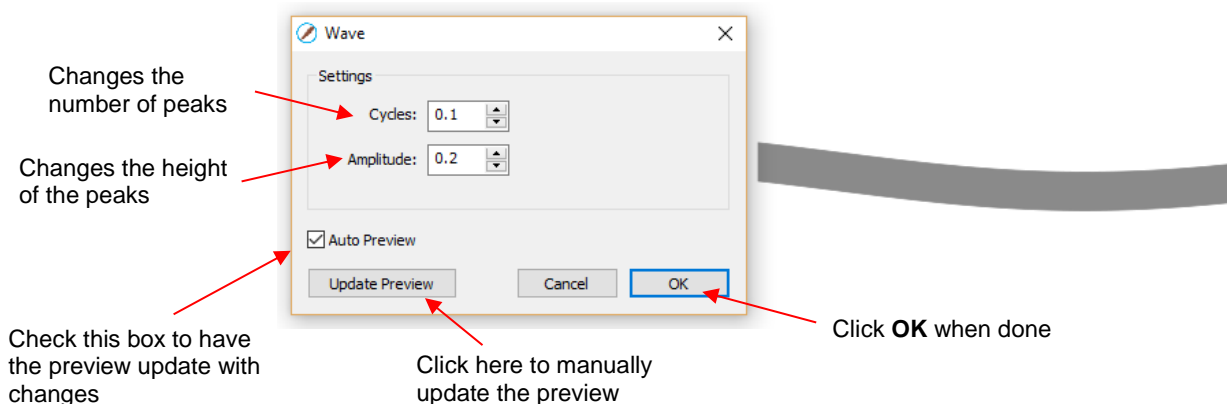
Angle = -30
Diameter = 3.5

9.17 Wave

- The **Wave** function will transform any shape into a wave:



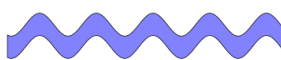
- To open the **Wave** window, select a shape and go to **Effects>Wave**:



- Increasing **Cycles** adds more peaks along the shape:



Cycles = 0.5

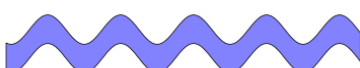


Cycles = 1.0

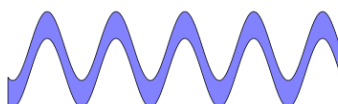


Cycles = 2.0

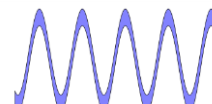
- Increasing **Amplitude** make the peaks higher:



Cycles = 1.0
Amplitude = 0.2



Cycles = 1.0
Amplitude = 0.5



Cycles = 1.0
Amplitude = 1.0

- The **Wave** function can be used on text to achieve this effect:

Twinkle Twinkle Little Star

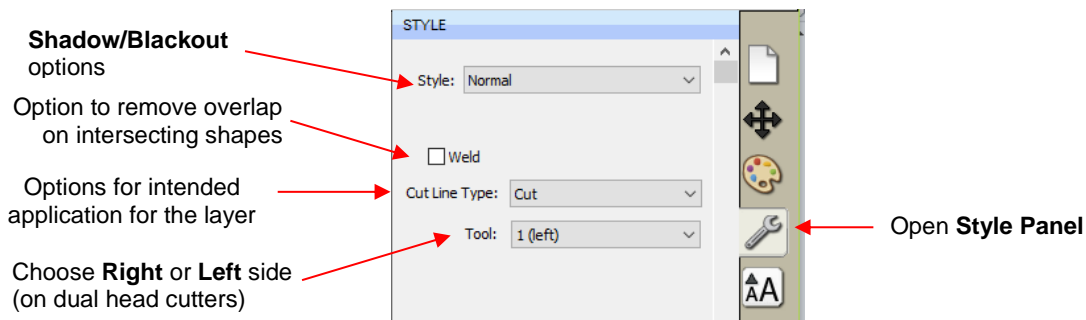


Twinkle Twinkle Little Star

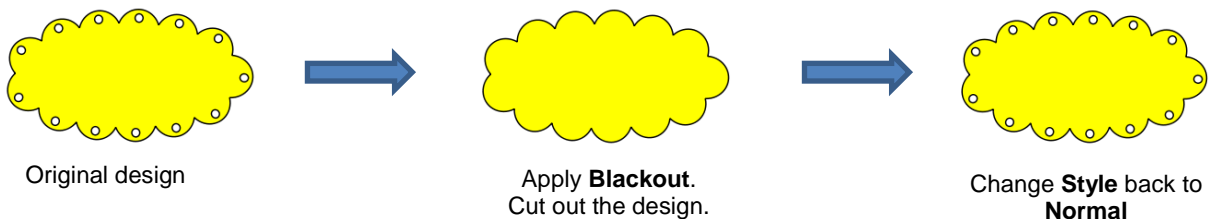
10. SCAL: Output


10.01 The Style Panel

- The **Style Panel** has various settings that are typically, but not necessarily, applied for the purpose of cutting and printing:
 - ◇ Set a contour cut (**Shadow**)
 - ◇ Remove any interior shapes (**Blackout**)
 - ◇ Apply a weld (**Union**) on any overlapping shapes (only applied during printing and/or cutting)
 - ◇ Assign an intended use for the layer (called **Cut Line Type**)
 - ◇ Assign a layer to a particular tool (for cutters with more than one head)
- To open this panel, click on the **Style** icon on the **Properties Panel**:

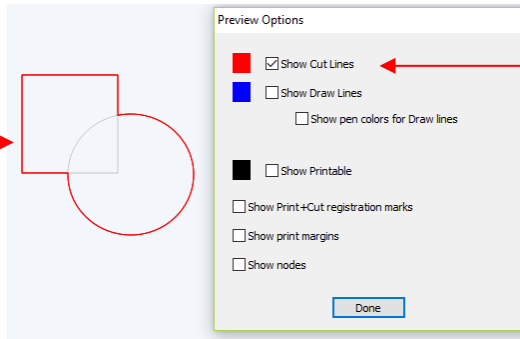


- **Style:** In this menu are various combinations of **Shadow** and **Blackout** applications. Refer to *Section 9.04* for instructions and examples. Note, however, that if you later change your mind and you haven't applied any subsequent changes (such as those in the **Path** menu), then re-selecting **Normal** from the **Style** drop-down menu will restore the original style.
 - ◇ For example, let's say you've applied **Blackout** to a shape and then cut it out. You can now select that same shape and return the style to **Normal**:



- **Weld:** This option applies the **Union** function (refer to *Section 9.05.1*) to any overlapping shapes.
 - ◇ Note that if the shapes are on different layers, the **Weld** option needs to be marked on each layer.
 - ◇ As mentioned before, settings in the **Style** window do not become permanent changes to the shapes on the **Cutting Mat**. However, you can verify the **Weld** effect by clicking on the **Preview** icon  on the **Toolbar** (for more details on **Preview**, refer to *Section 10.02*):


With **Weld** assigned to an overlapping square and circle, the shapes are welded for cutting

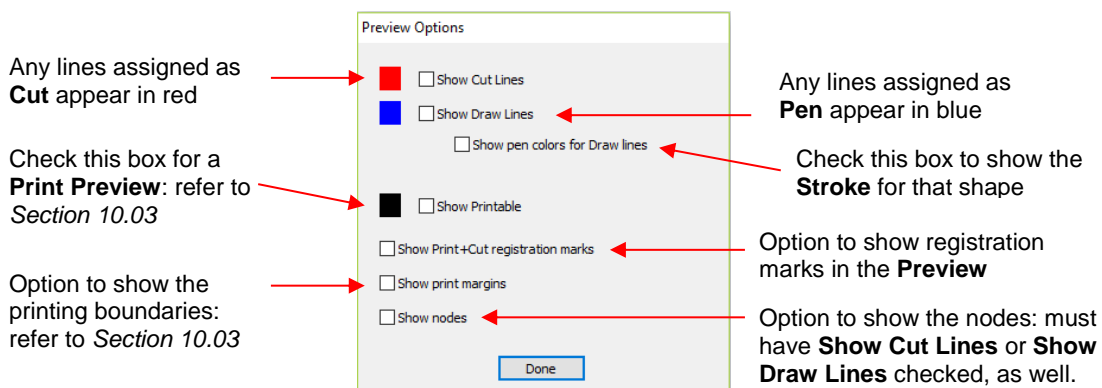


Red lines in the **Preview** window show what will actually cut.

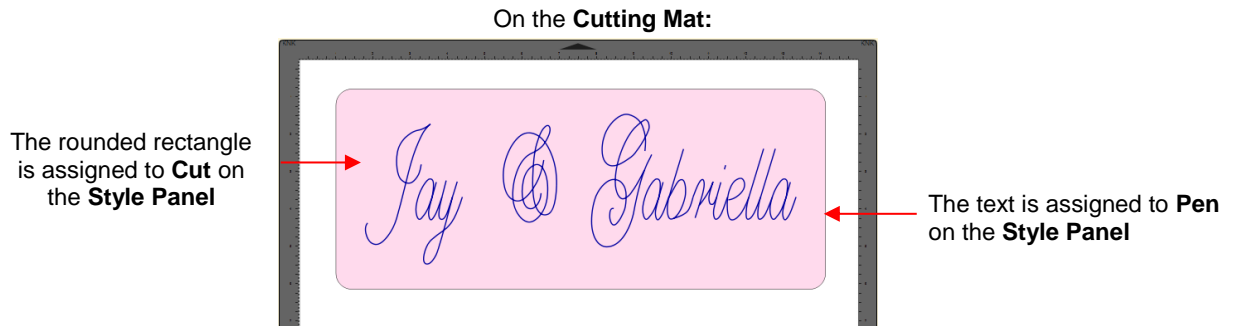
- **Cut Line Type:** There are five options in this menu:
 - ◇ **Cut:** choose this option for regular cutting. Because this is the default, you don't normally need to select it.
 - ◇ **Pen:** choose this option when using a pen, embosser, engraver, glue pen, rotary tool or other device that doesn't require a blade offset.
 - ◇ **Print+Cut Cut:** in print and cut applications, choose this option for the layer that will be cut.
 - ◇ **Print+Cut Print:** in print and cut applications, choose this option for the layer that will be printed only. It will not appear in the cut window.
 - ◇ **Color layer alignment** (Pro version only): in applications such as vinyl where several layers will be cut from different colors and aligned, choose this option for the layer that has registration shapes that need to be cut from every color along with that color's shapes. These registration shapes can then be used to layer the colors perfectly. Refer to the last part of *Section 10.06.2*.
- **Tool:** for cutters with more than one head, such as the KNK Force, choose if the layer should be executed by the left side or by the right side.

10.02 Preview

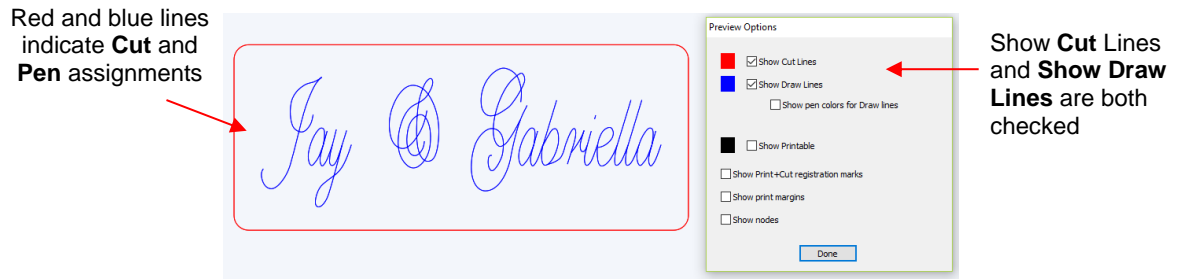
- To see what your cutter will cut or what your printer will print, click on the **Preview** icon  on the **Toolbar**. The following window will open. Note that settings applied on the **Style Panel** are reflected in the **Preview** window:



- The following example shows what would be seen in the **Preview** window compared to how it appears on the **Cutting Mat**:

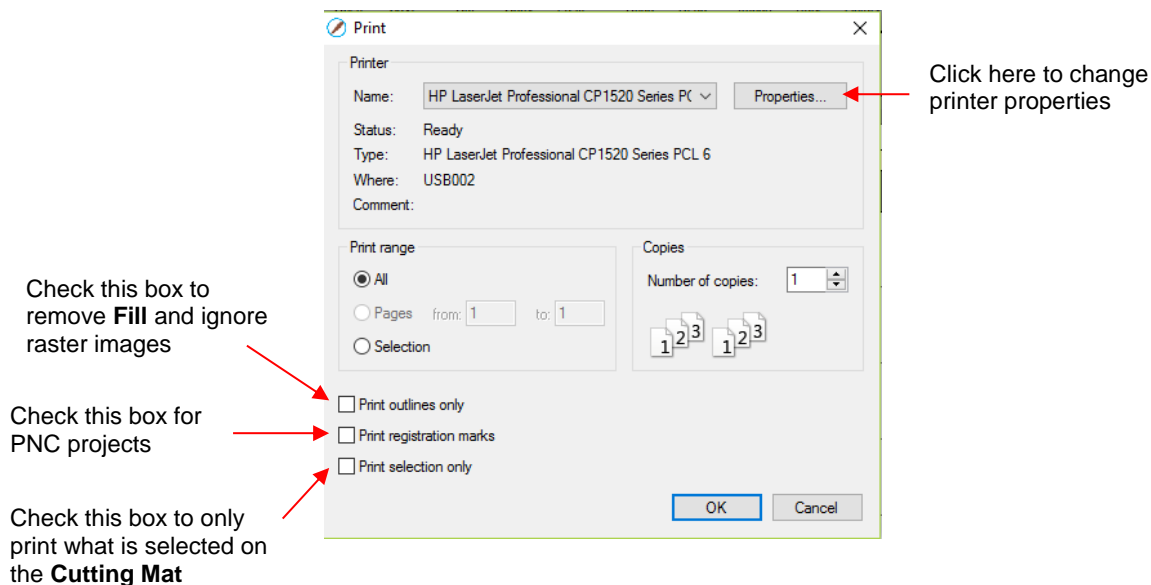


In the **Preview Options** window:



10.03 Printing

- To print from SCAL, go to **File>Print** or press **Ctrl+P**. The following window will open:



- To set up printer settings, click on the **Properties** button. (Note that you can also access your printer's properties by going to **File>Print Setup** and clicking on **Properties**.) The window which opens should be familiar to you and will not be covered in this user manual.
- Print outlines only:** Only vector shapes will be printed. Imported raster images (.JPG, .PNG, .BMP, etc.) will not appear. If you've applied a **Fill** to shapes including colors, gradients, or patterns, then those will not appear either.
- Print registration marks:** If your application is a print and cut, then you will want to check this option. Refer to *Chapter 11* for details on PNC calibration and how to set the properties for the registration marks.

- **Print selection only:** This is one way to control what is printed. You will need to select the shapes to be printed prior to entering the **Print** window. Alternatively, you can hide layers on the **Layers Panel** that you do not want printed.
- If your **Cutting Mat** is larger than the printout dimensions, then make sure the shapes are located in the upper left portion of the **Cutting Mat** or else any shapes outside of the printout boundary will be omitted or

cut off. To verify, click on the **Preview** icon  on the **Toolbar** and select **Show Print Margins**.

- ◇ For example, let's say you have a PNC application and your shapes are arranged like this on a 12" x 12" **Cutting Mat**:



- ◇ When you click on the **Preview** icon and mark **Show print margins**, you can see that a portion of the cow will not be printed:

This part of the cow will not be printed

Preview Options

☐ Show Cut Lines

☐ Show Draw Lines

☐ Show pen colors for Draw lines

☒ Show Printable

☐ Show Print+Cut registration marks

☒ Show print margins

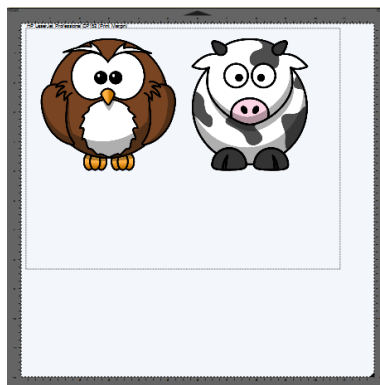
☐ Show nodes

Done

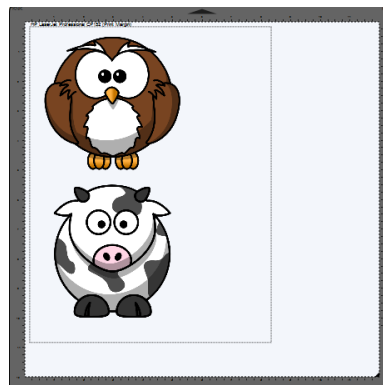
Check this box so that the original graphic appears

Check this box to see the boundaries of the printer

- ◇ You have two choices. You can either switch to **Landscape** printing under **File>Print Setup** or you can move the shape on the right to be below the left shape:



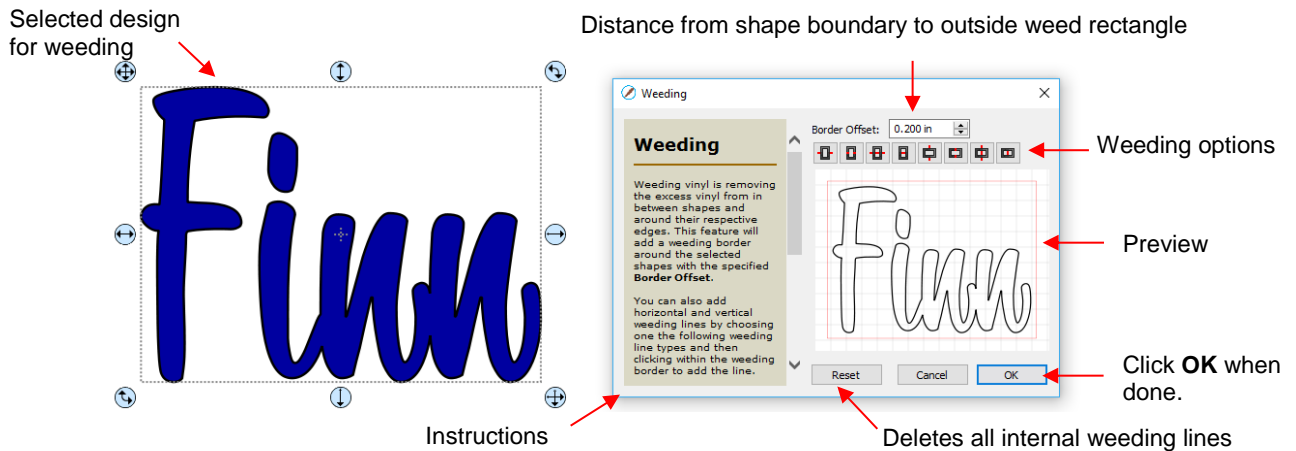
Option 1: Switch to **Landscape** under **File>Print Setup**



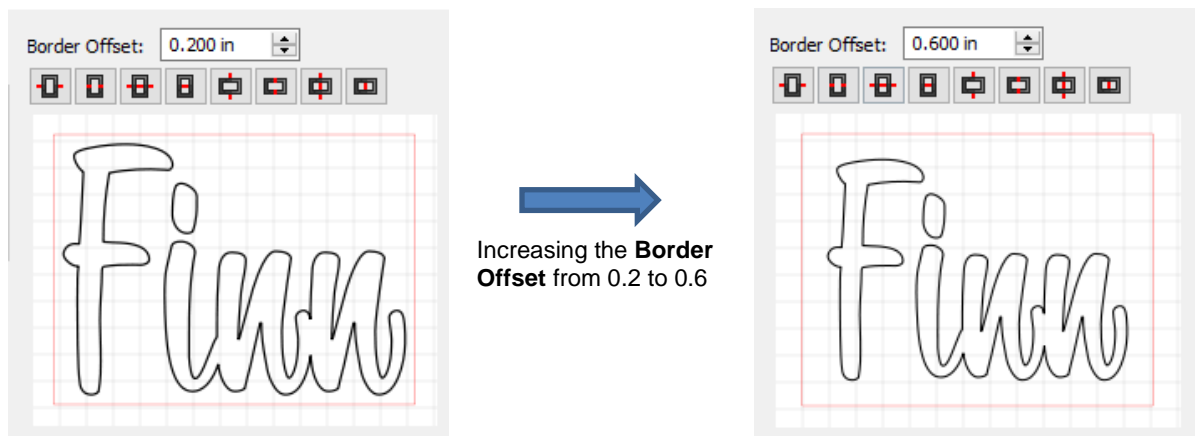
Option 2: Rearrange the shapes

10.04 Weeding (SCAL PRO only)

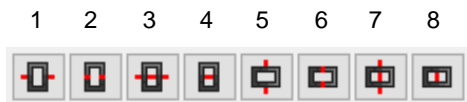
- Weeding is an important function for those who do vinyl applications. When removing the waste vinyl from around the cut shapes, it's very helpful to have extra cut lines. This way you don't end up trying to weed out large pieces at one time.
- To set up a weed, select the shapes and go to **Effects>Weeding**. The following window will open:



- ◇ **Border Offset:** Increase or decrease to set the spacing between the shapes and the outside weeding rectangle. The red line represents that outer cut. For example:

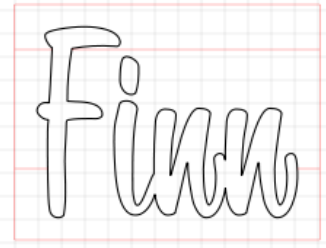


- ◇ **Border Options:** These icons can be used to add additional cut lines inside the outer weed border. Each icon in the following screenshot indicates where the lines will be added but a description and example are also shown. Note that once you select an option, you can click at the desired location on the preview image to add the cut line or lines:



- 1 or 5: Add horizontal or vertical weed cuts between shapes and outer weed border

1

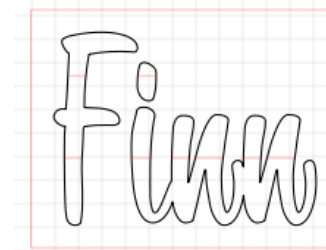


5

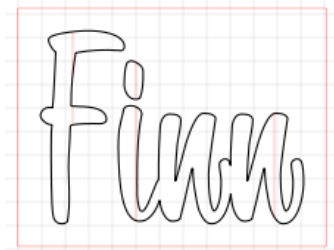


- 2 or 6: Add horizontal or vertical weed cuts inside the shapes (this is used for applications such as glass etching where the outside “waste vinyl” is actually kept and the shapes themselves are weeded out)

2

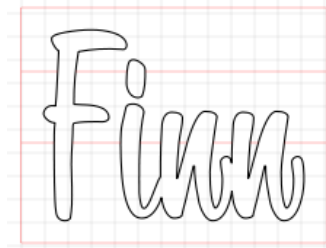


6



- 3 or 7: Add horizontal or vertical weed cuts in between shapes and outer weed border and also inside and between shapes

3

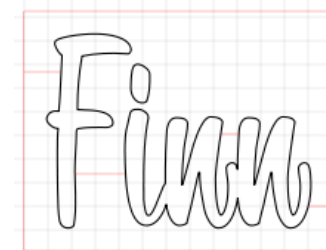


7

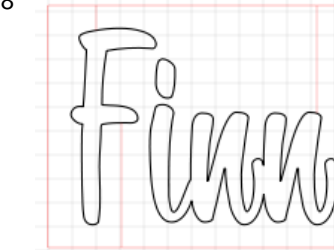


- 4 or 8: Add horizontal or vertical weed cuts anywhere you like

4

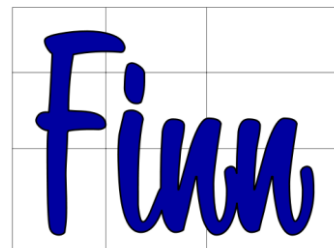


8

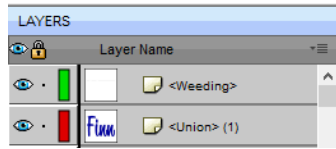


◇ **Reset:** At any point, you can click on **Reset** to remove any of the internal cut lines and begin again.

- Once you are satisfied with the weeding line, click on **OK**:



- On the **Layers Panel** you will observe a new layer called *Weeding*:

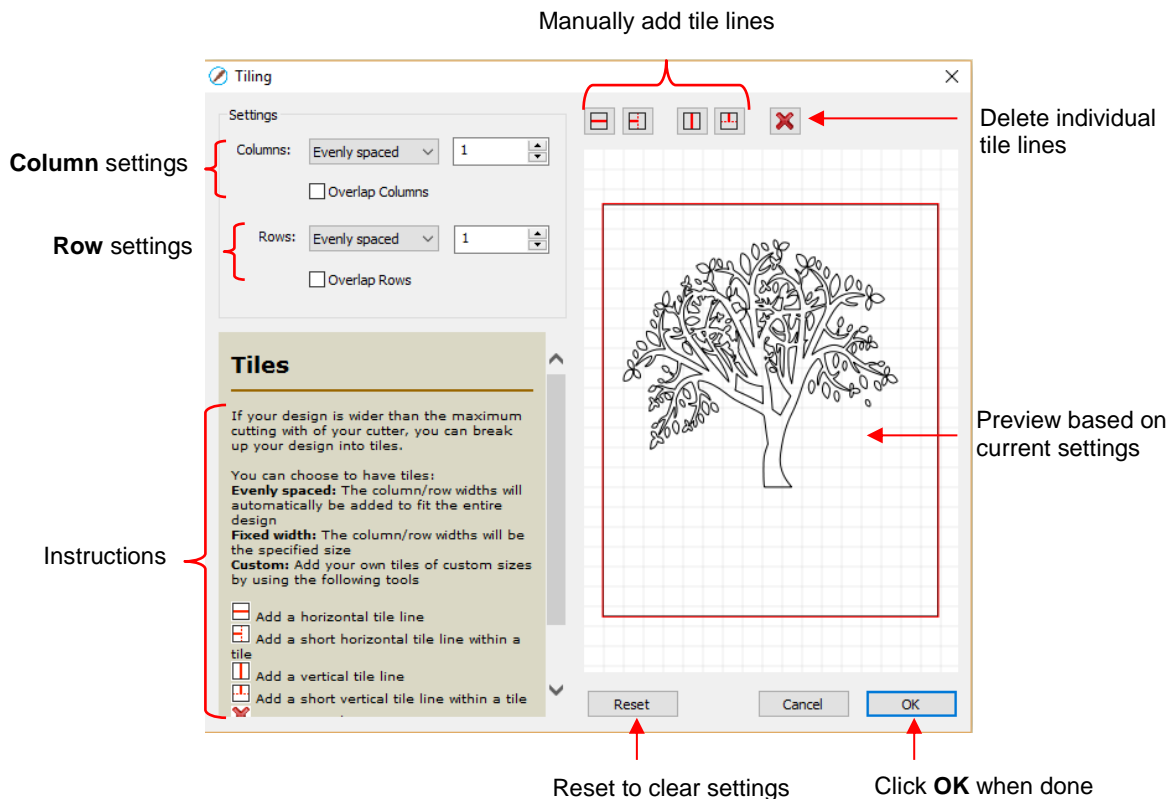


10.05 Tiling (SCAL PRO only)

- The **Tiling** function is used to split large designs into rectangular sections for cutting.
- In the following example, a design that is 40" wide and 36" tall cannot be cut on a cutter that only has a maximum 15" wide cutting range (such as the KNK Force or Zing Orbit):



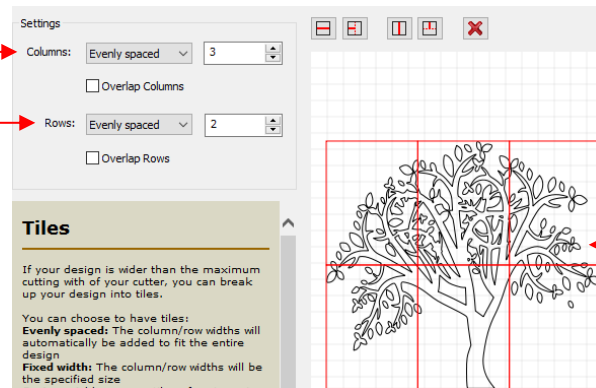
- To open the **Tiling** window, select the shape and go to **Effects>Tiling**:



◇ **Columns and Rows:** Under both of these you have the following choices:

- **Evenly spaced:** Enter a number and that many columns (or rows) are created, all the same width. For example, you could enter 3 columns and 2 rows:

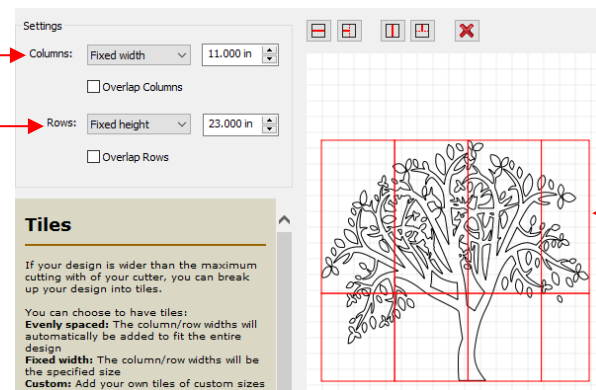
Select **Evenly spaced** and then 3 **Columns** and 2 **Rows**



Preview shows the project evenly split into 3 columns and 2 rows

- **Fixed width:** Enter a specific width for the columns. This is probably the most useful choice since you should know the dimensions of the material being used. For example, if you have 12" wide vinyl, then you will probably want the columns to be no wider than ~ 11" or, possibly, 11.5". Also, let's say your vinyl is in 24" long pieces:

Select **Fixed width-** 11" wide **Columns** and 23" long **Rows**

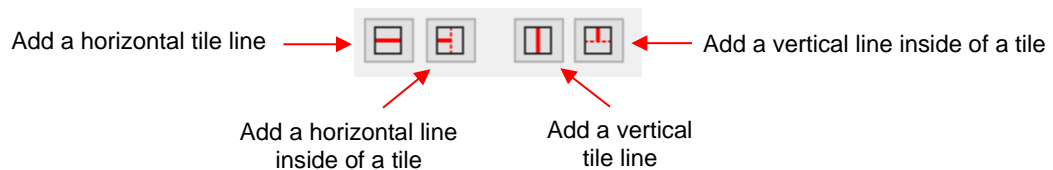


The design is 40" wide and 36" tall.

After creating three 11" wide columns, the remaining 7" in width is on the right side.

After creating one 23" row, the remaining 13" in height is at the bottom.

- **Custom:** Because the tiling line can sometimes fall into undesirable spots resulting in, for example, slivers or extremely tiny shapes, using **Custom** is another option. With it selected, you can then use the icons above the preview to add cut lines wherever you like:

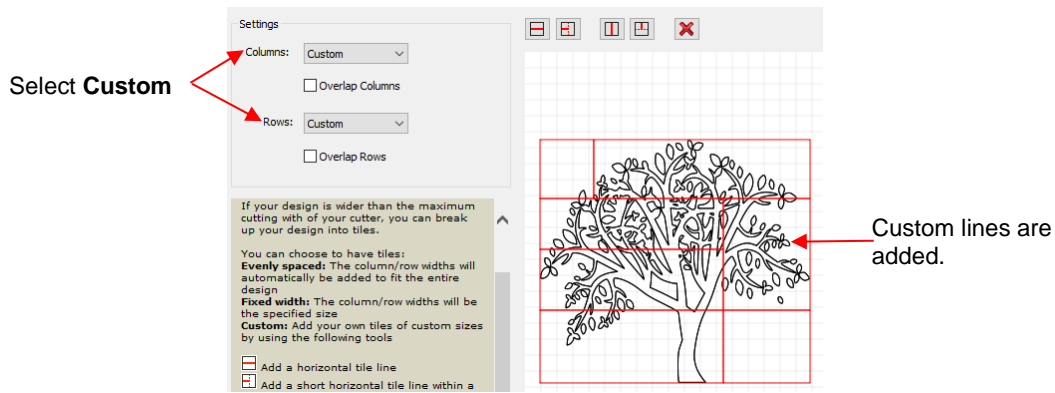



Add a horizontal tile line

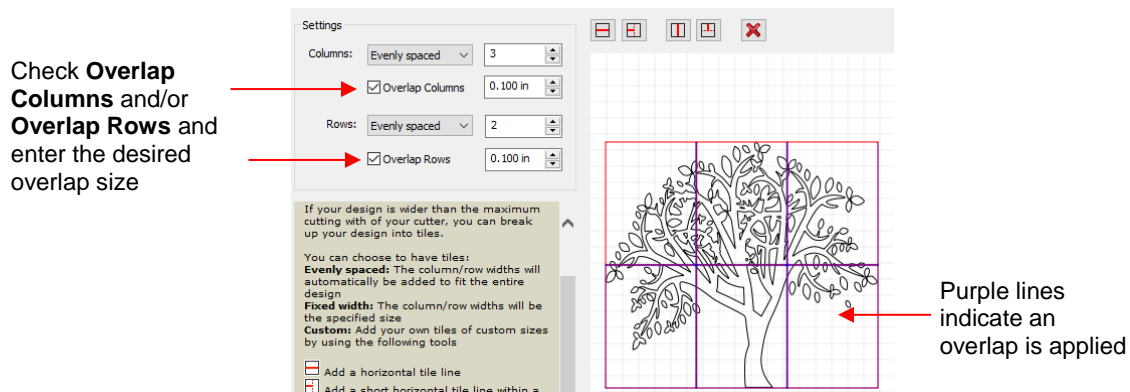
Add a vertical line inside of a tile

Add a horizontal line inside of a tile

Add a vertical tile line



- ◇ To delete any of the lines, click on the **Delete** icon  and then click on the line inside the **Preview** window.
- ◇ **Overlap Columns** and **Overlap Rows**: If you want an overlap created so that each tile slightly overlaps with an adjacent one, check the box and then enter the desired overlap:




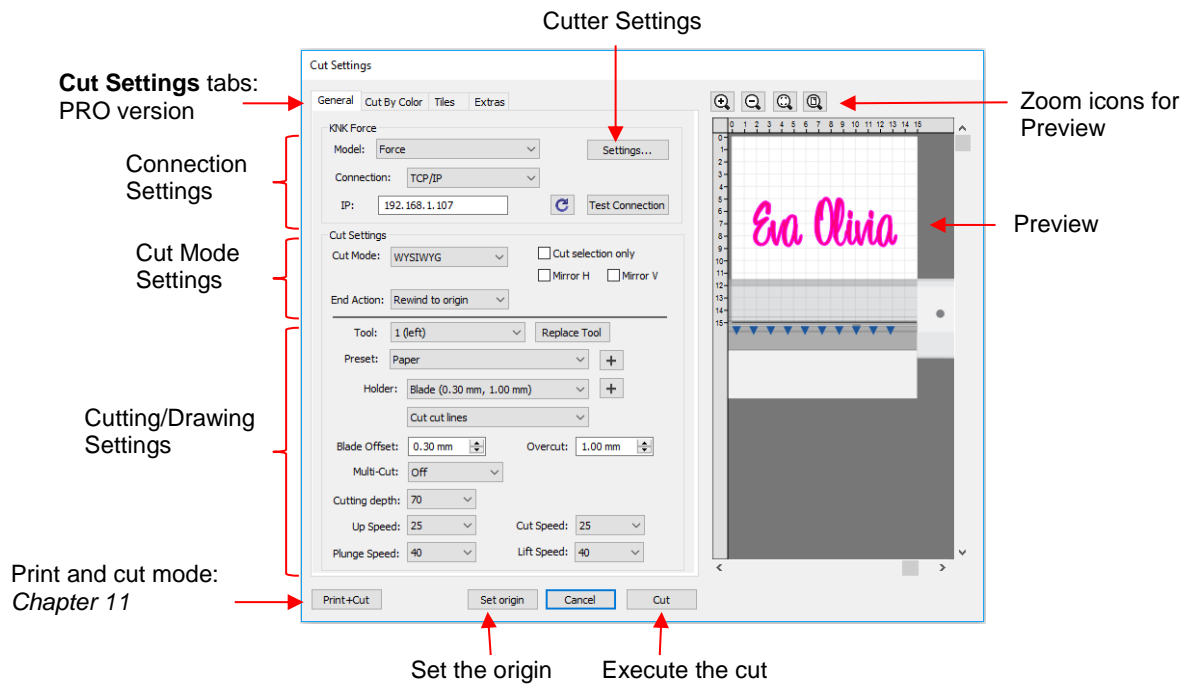
- After clicking on **OK**, you won't observe any changes on the **Cutting Mat** or on the **Layers Panel**. The results of the **Tiling** process will apply once you enter the cutting window. Refer to *Section 10.06.3*.

10.06 Cut Settings

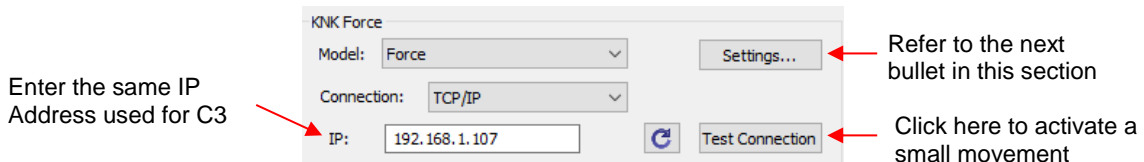
The cut settings will vary from one cutter to the next based on the brand and model of that cutter and its built-in functionality. For this reason, the information presented here will only apply to the brand and model of cutter presented in Chapters 1 and 2.

10.06.1 Cut Window Settings

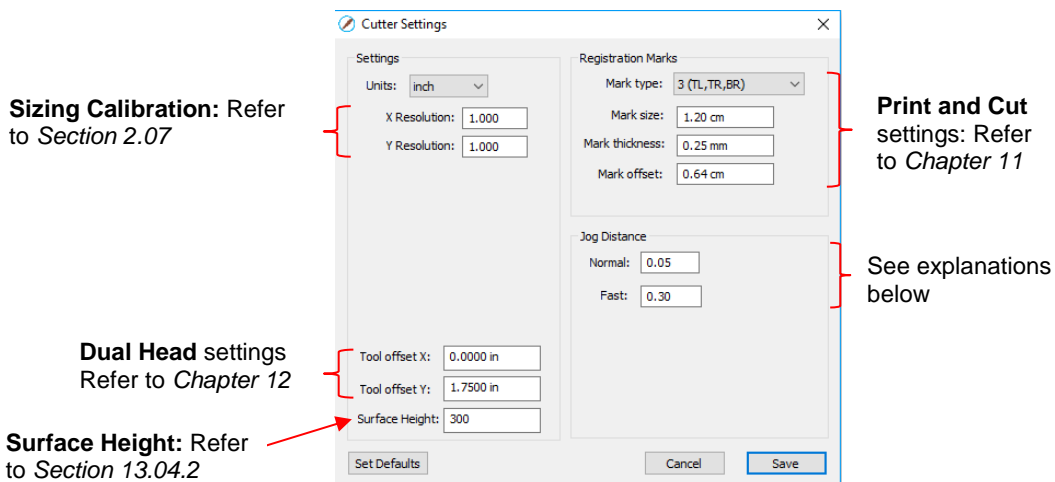
- When you are ready to execute a cut (or draw), the cut window can be opened using either of the following:
 - ◇ Click on the **Cutter** icon  on the **Toolbar**
 - ◇ Go to **Cutter>Cut With KNK Force** (or model you have added)
- The following window will open:



- ◇ **Cut Settings tabs:** The regular version of SCAL will only have the **General** tab. The PRO version has three additional tabs; **Cut by Color** (refer to *Section 10.06.2*), **Tiles** (refer to *Section 10.06.3*) and **Extras** (refer to *Section 10.06.4*).
- ◇ **Connection Settings:** Choose the model of cutter being used and connection settings. For the KNK Force this includes the IP address set up under C3.



- ◇ **Cutter Settings**, which can also be accessed by going to **Cutter>Cutter Settings**, opens a new window with additional settings relevant to that model. For the KNK Force:



- **Jog Distance:** The following settings apply when setting the origin or moving the Force camera or Maxx/Zing laser light:
 - **Normal:** the distance the head or mat moves with each arrow key increment
 - **Fast:** the distance the head or mat moves while holding **Shift** with each arrow key increment

◇ **Cut Settings:**

Choose either **WYSIWYG** or **Origin Point** (refer to Section 10.07)

PRO version: enter where head should go at end of cut

Check if only selected shapes should be cut

Check either or both if you wish to have shapes mirrored before cutting (on the KNK Force, these are reversed)

- **Cut Mode:** Refer to *Section 10.07* which covers controlling where shapes will cut.
- **End Action** (PRO version only): controls what happens at the conclusion of the cut. There are three choices:
 - **Rewind to origin:** default setting in which the head returns to the origin set before the cut began
 - **Advance Amount:** when this option is selected, the head moves to the end of the cut, over to the right side, and then advances the mat or rolled material forward based on a value you enter into a new window:

Select **Advance Amount** and a new input pops up

Enter distance to advance

- **Do Nothing:** the head stops at the location where it finished cutting
- **Cut selection only:** If you have pre-selected which shapes you want to cut, then mark this box.
- **Mirror H** and **Mirror V:** Options to check if you want the shapes mirrored for cutting. This is very handy when cutting HTV or embossing. In both cases, you will be flipping over the material once the cutting or embossing is complete.

◇ **Cutting/Drawing Settings:** As mentioned earlier, this section will vary considerably from one brand/model of cutter to the next:

Select **Tool** (1 or 2)

Select a **Preset** of suggested settings

Select type of tool

Change settings, as needed

Click here to change out a tool on the KNK Force

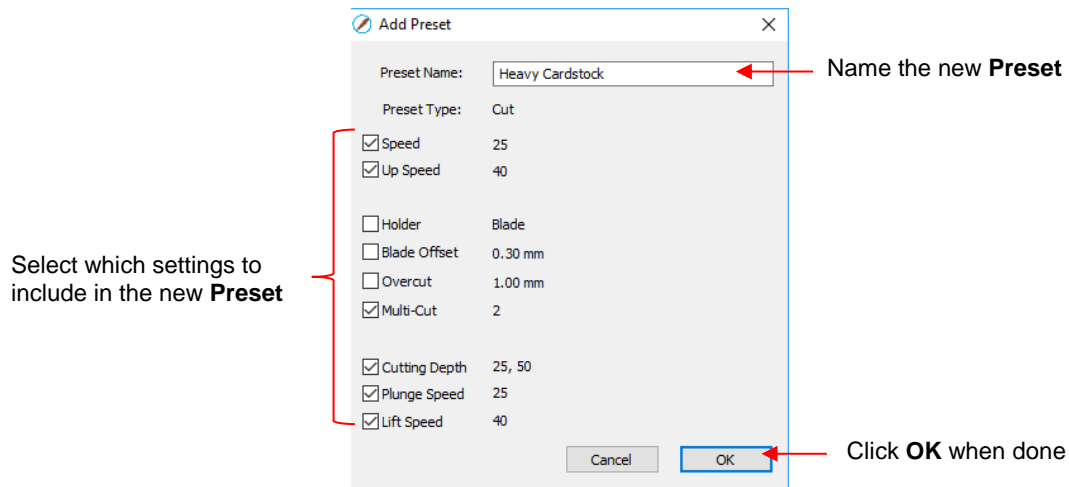
Add a new **Preset**


Add a new tool

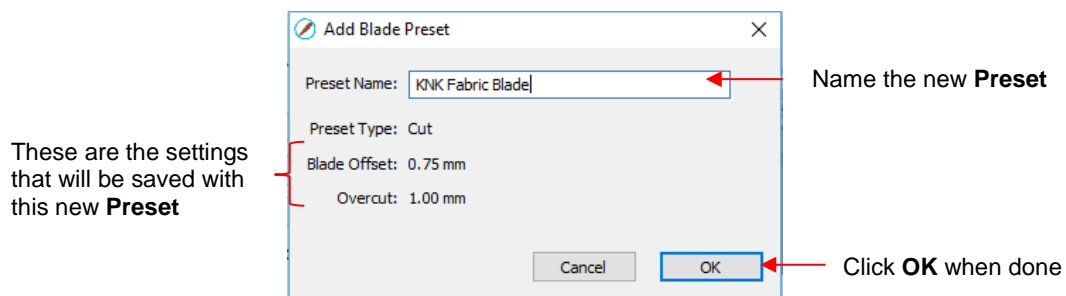
Select type of action

- First, select the **Tool** (left or right side) and then, if you like, select from the **Preset** menu, the material you will be cutting. Alternatively, make any changes to the settings for this material. If you

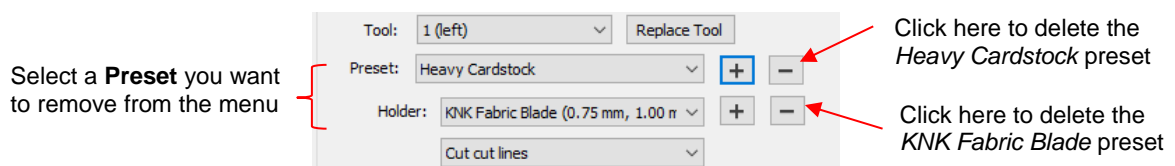
wish to save the new settings, click on the icon  to the right of **Preset** and the following window will open:



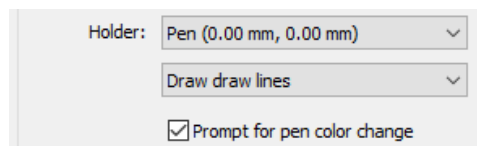
- Presets for the **Holder** are also available to select. If you wish to enter a new **Preset**, first make changes to the **Blade Offset** and **Overcut** settings. Then click on the icon  to the right of **Holder**. The following window will open:



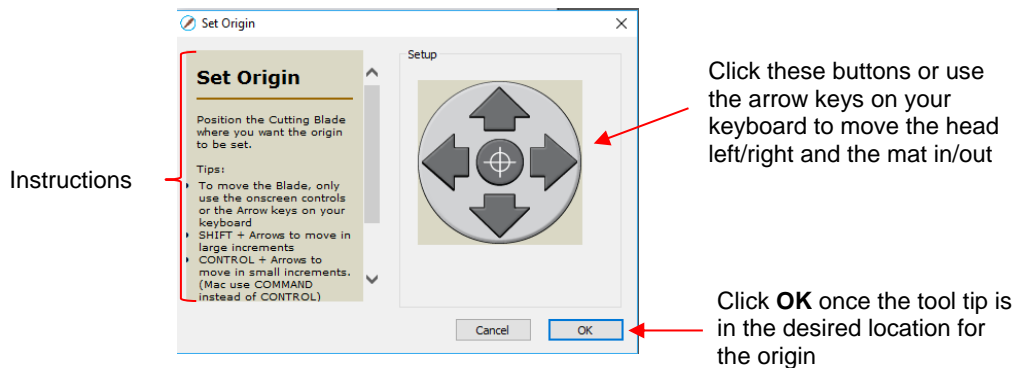
- If you need to delete any of the **Presets** you added yourself, select the **Preset** from the menu and then a delete option will be available for removing that **Preset**:



- If you select **Pen** under **Holder**, then an additional option called **Prompt for pen color change** will appear. Marking this setting will cause the cutter to pause between colors so that the tool can be changed out, if desired.



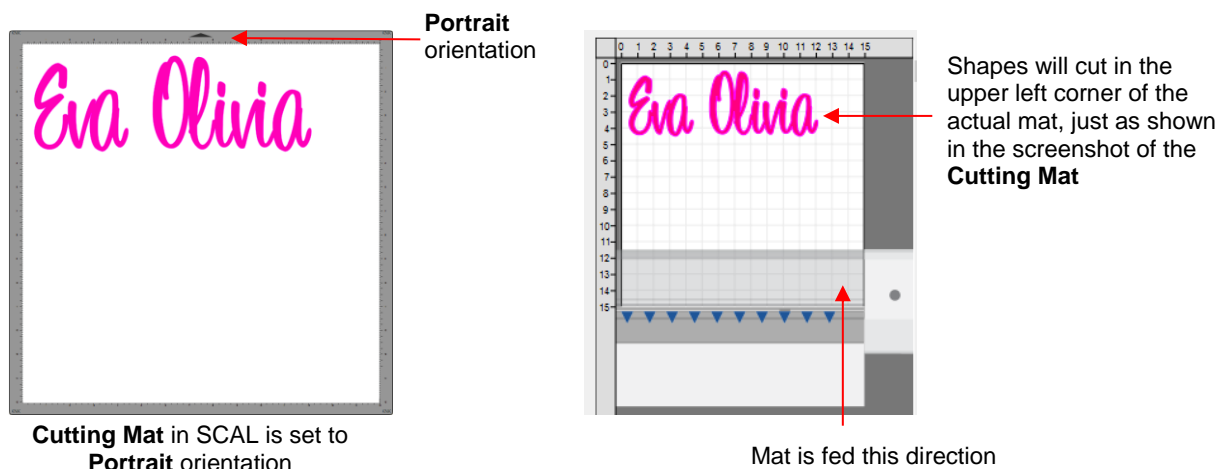
- Detailed instructions on utilizing both heads on the KNK Force are presented in *Chapter 12*.
- ◇ **Print+Cut:** Clicking on this button opens the **Print and Cut** window. Refer to *Chapter 11* for detailed instructions on calibrating the camera and performing print and cut applications.
- ◇ **Set Origin:** Click on this button to set the origin for cutting. The following window will open:



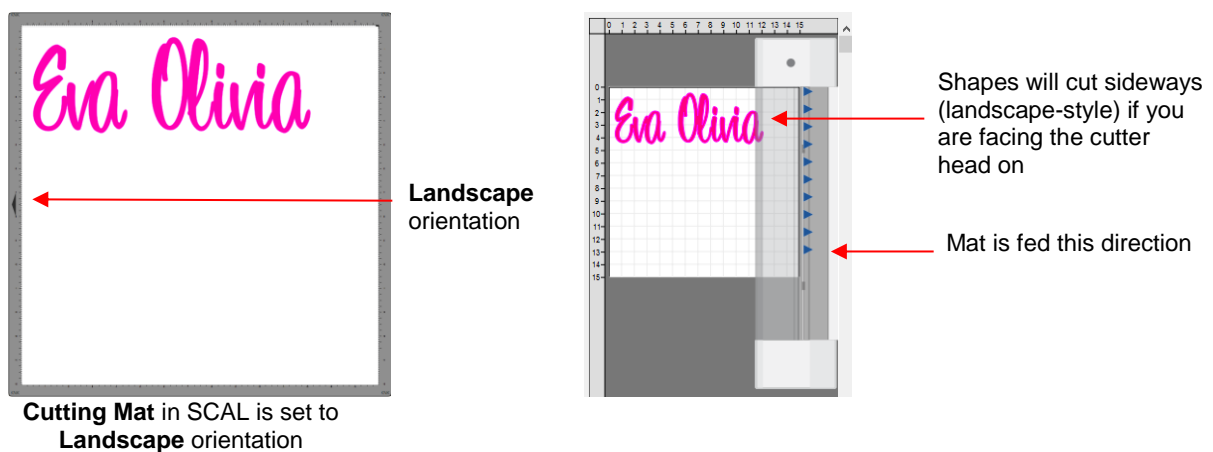
- In general, you always set the origin in the lower right corner of the material as was presented in *Section 1.06*. (Note: This may not be true with other brands of cutters.)

◇ **Preview:** The preview displays the shapes that will cut and their orientation plus location based on other settings.

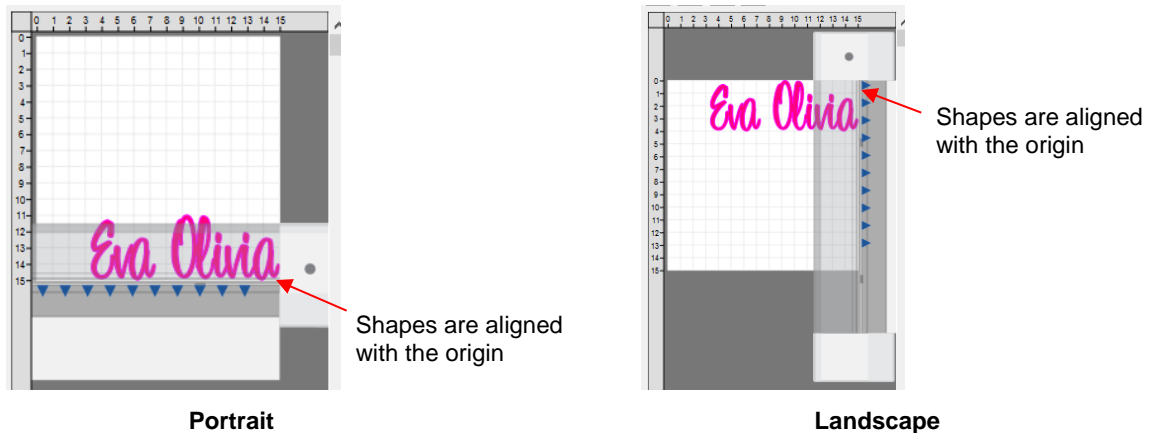
- For example, with a **Portrait** orientation and **WYSIWYG** cut mode, the **Preview** indicates the shapes will cut exactly in the same location and orientation as you see on the **Cutting Mat**:



- Using the same **WYSIWYG** cutting mode, but having the **Cutting Mat** orientation set as **Landscape**, the **Preview** changes indicating the shapes will be cut in a landscape position:



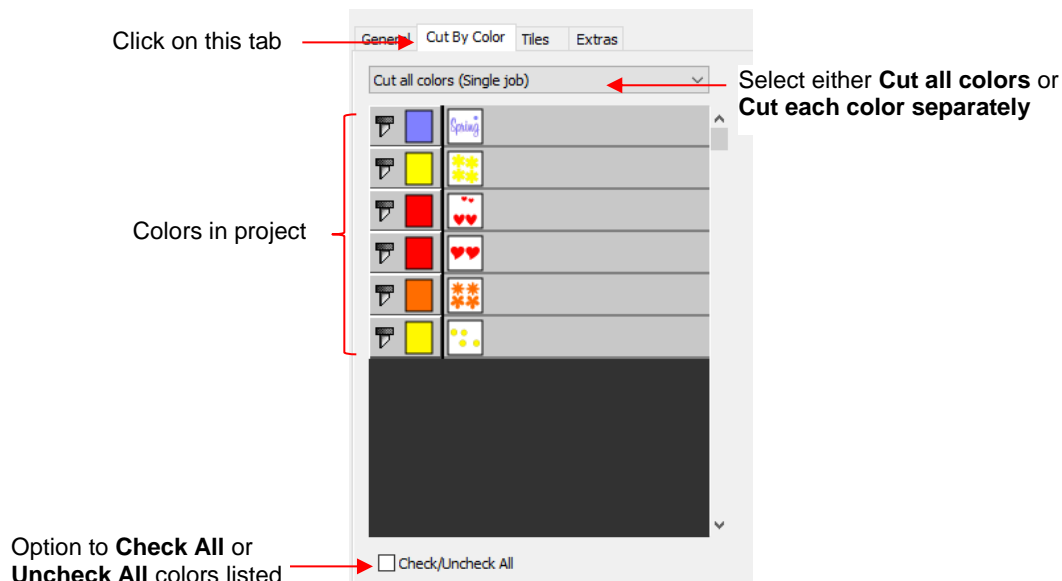
- In **Origin Point** mode, it doesn't matter where the shapes are located on the **Cutting Mat**, they will cut so as to align with the origin you set:



- Additional details on controlling where shapes are cut are presented in *Section 10.07*.

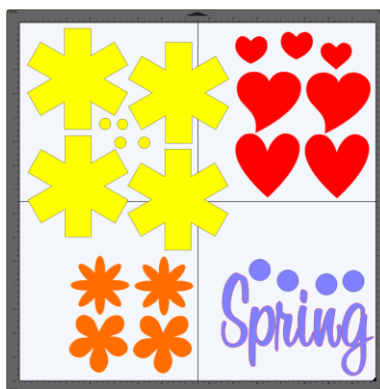
10.06.2 Cut by Color (SCAL PRO only)

- The **Cut by Color** function offers two capabilities:
 - ◇ Turn on and off colors to be cut without the need to show/hide layers on the **Layers Panel** or pre-select shapes to cut. In fact, you don't even need to ungroup mixed-color groups.
 - ◇ Cut all of the colors at once or have the cutter pause between colors, thus permitting the change out of materials
- To access **Cut by Color**, click on the **Cut by Color** tab in the **Cut Settings** window:



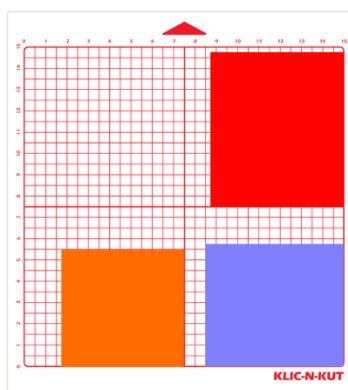
- **Cut all colors (Single job):** In this mode all of the colors marked in this window will be cut at one time.
 - ◇ As an example, here are some shapes laid out on the **Cutting Mat**. Note how the grid is set to divide the mat into four quadrants:


The shapes of each color have been arranged into quadrants on the **Cutting Mat**



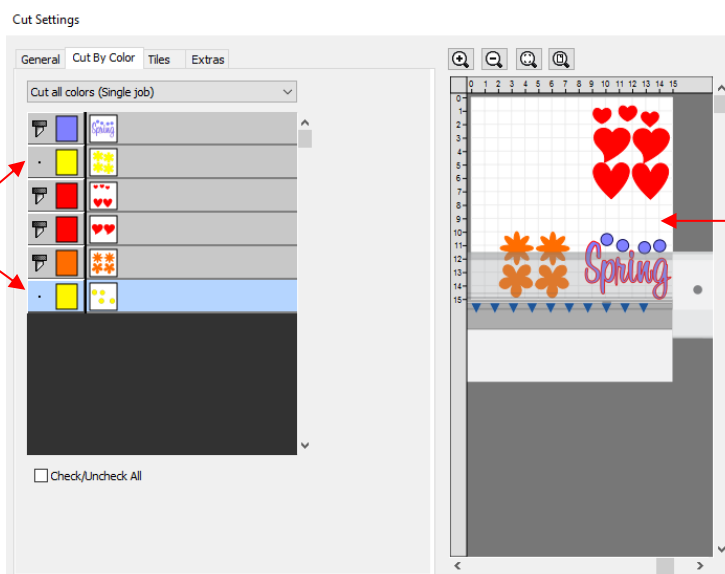
The **Cutting Mat** is divided into quadrants for easier placement of the scraps onto the actual cutting mat

- ◇ Let's say you also have scraps you want to use, however the yellow scrap you plan to use won't fit onto the mat with the other scraps. So, you want to cut lilac, red, and orange first. You place those colors into quadrants on the mat that match the layout on the **Cutting Mat** in SCAL:



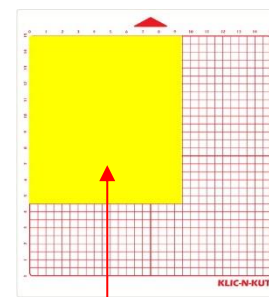
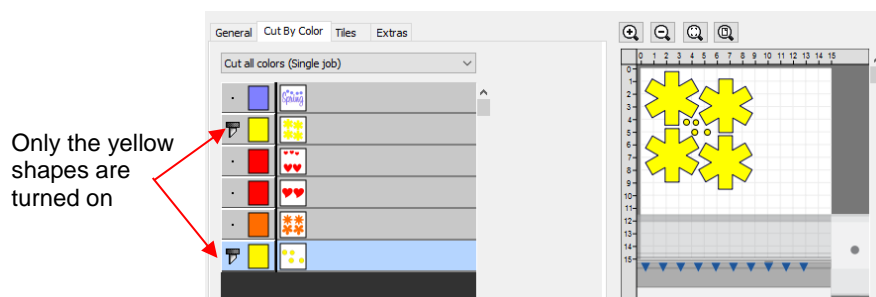
- ◇ In the **Cut Settings**, make sure **WYSIWYG** mode is selected and you have the other settings selected. Then select the **Cut by Colors** tab and click on the blade icon  next to the yellow shapes to hide those from cutting:

The yellow shapes are turned off



The **Preview** shows where the shapes will cut and shows that the yellow ones are excluded

- ◇ The cut is executed and the red, orange, and lilac shapes are cut. Then the same procedure can be used for the remaining yellow shapes:



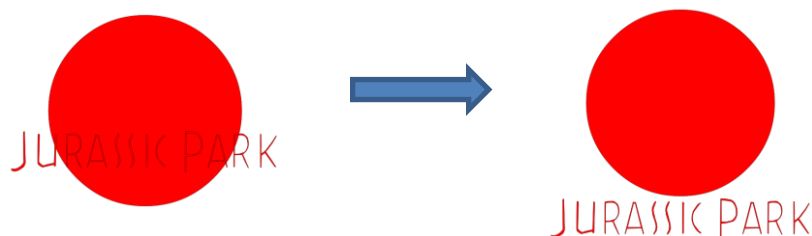
The yellow scrap is placed in the upper left corner of the mat to match the **Preview** window

- **Cut each color separately (Separate jobs):** In this mode you can also turn on or off colors for cutting. However, SCAL will prompt for each color before executing the cut.

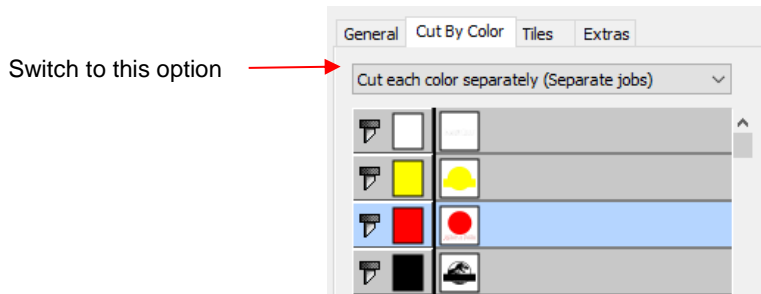
◇ As an example, here is a layered design to be cut from vinyl:



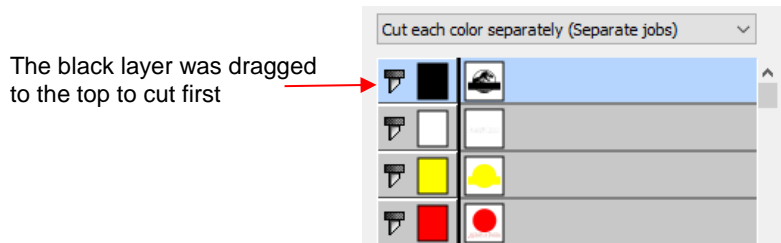
- ◇ Choosing the option to **Cut each color separately** is logical because:
 - The shapes are arranged on top of one another
 - The size is so large that the individual colors cannot be placed on the cutting mat to cut all at one time
- ◇ However, before sending the project to the cutter, take note of any colors that might have shapes that need to be moved. In this example, the thin red lettering "Jurassic Park" would cut through the background red circle, hence it needs to be moved away:



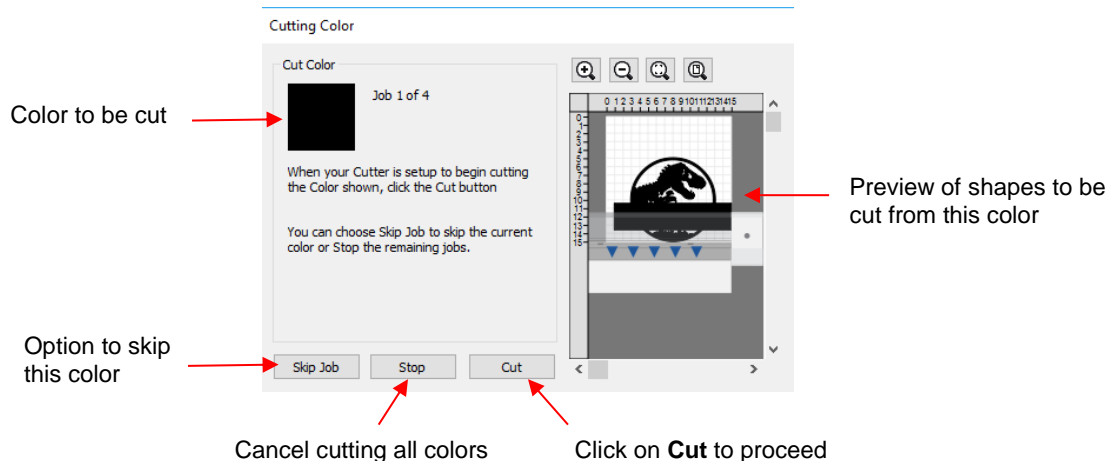
- ◇ In the **Cut Settings**, **Origin Point** should be chosen so that each color is moved to align with the origin and, thus, the material loaded each time in the same location. In the **Cut by Color** tab, the **Cut each color separately** option is chosen:



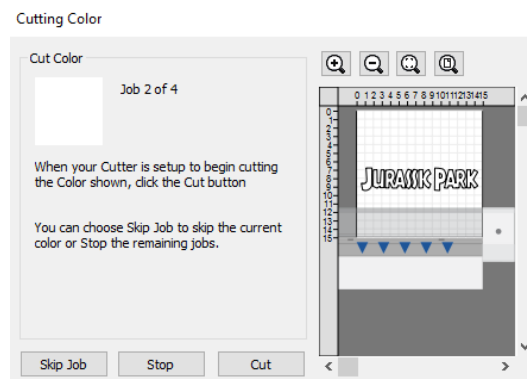
- ◇ Note that you can change the cut order by dragging the colors up or down the menu. For example, let say you already have black vinyl loaded into the cutter and the origin set to cut:



- ◇ Upon selecting **Cut**, the following window opens:



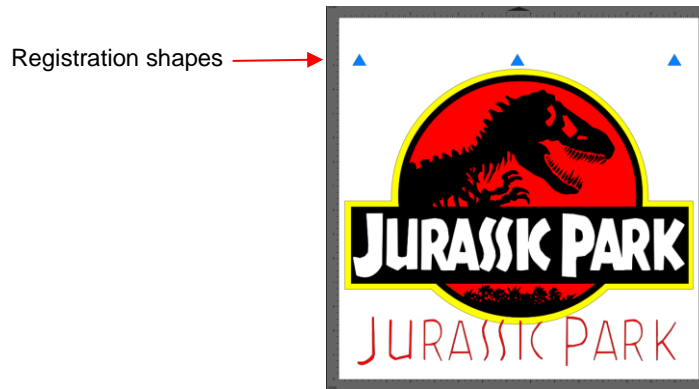
- ◇ If you decide not to cut this color, click on **Skip Job** and the next color in the menu will be selected. If you clicked on **Cut**, then the black shapes are cut out and then this same next color window will open:



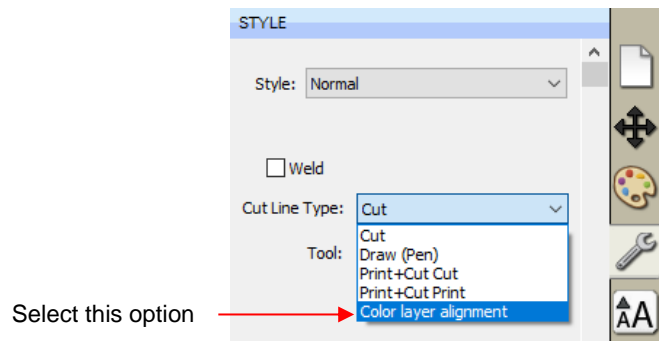
- ◇ And the process continues until all colors have been cut.

- In *Section 10.01*, **Color Layer Alignment** was mentioned as one of the options under **Cut Line Type** on the **Style Panel**. In applications, such as the one just presented, it can be tricky aligning the various colors after cutting. To make the job easier, small registration shapes can be added to the design and cut with every color so that they can then be lined up when layering color.

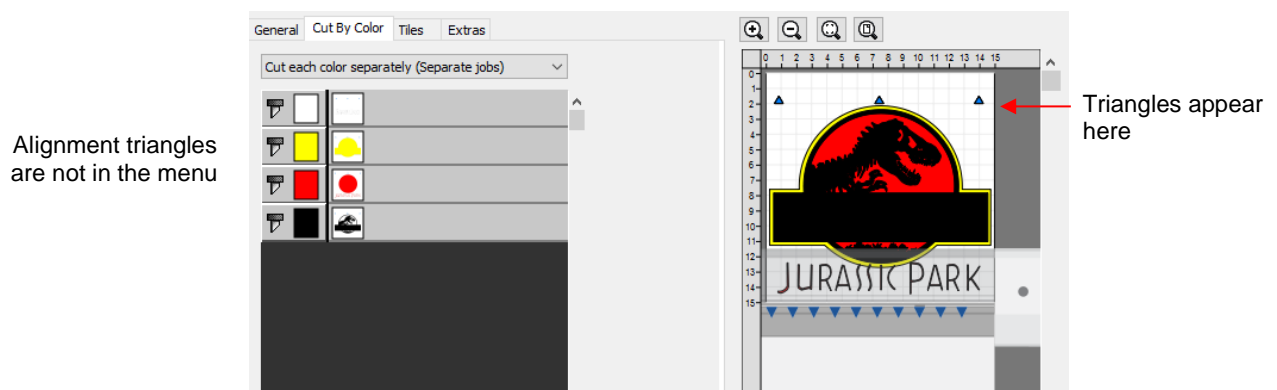
◇ In the *Jurassic Park* example, three small triangles are added and grouped to be on the same layer:



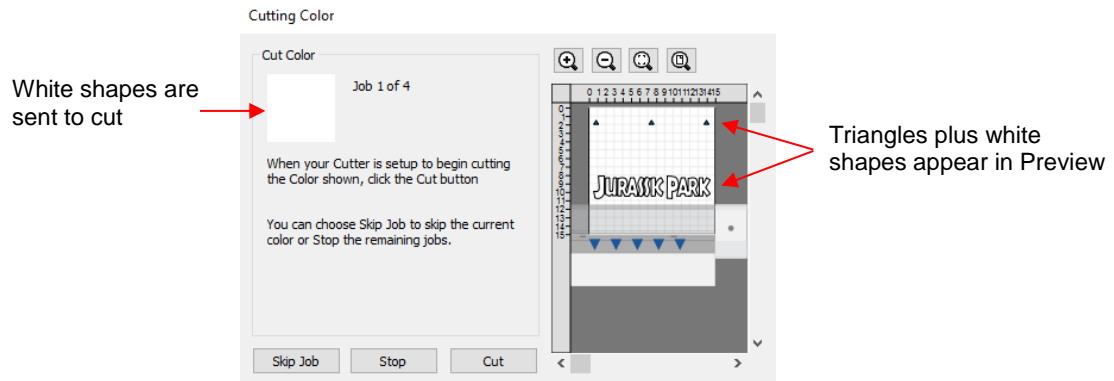
◇ The layer is selected and the **Cut Line Type** for this layer is changed to **Color Layer Alignment**:



◇ When the **Cut by Color** tab is then selected, the registration triangles are not in the menu. However they do appear in the **Preview**:

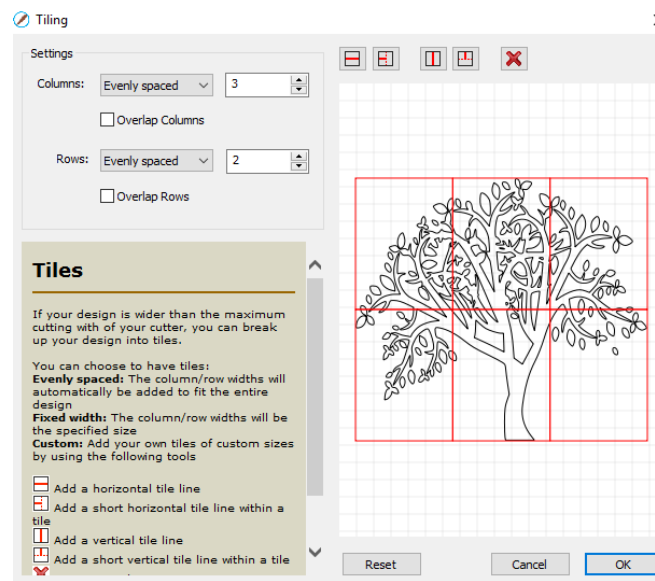


◇ Then, as each color window opens, the triangles will appear in the **Preview** for that color:

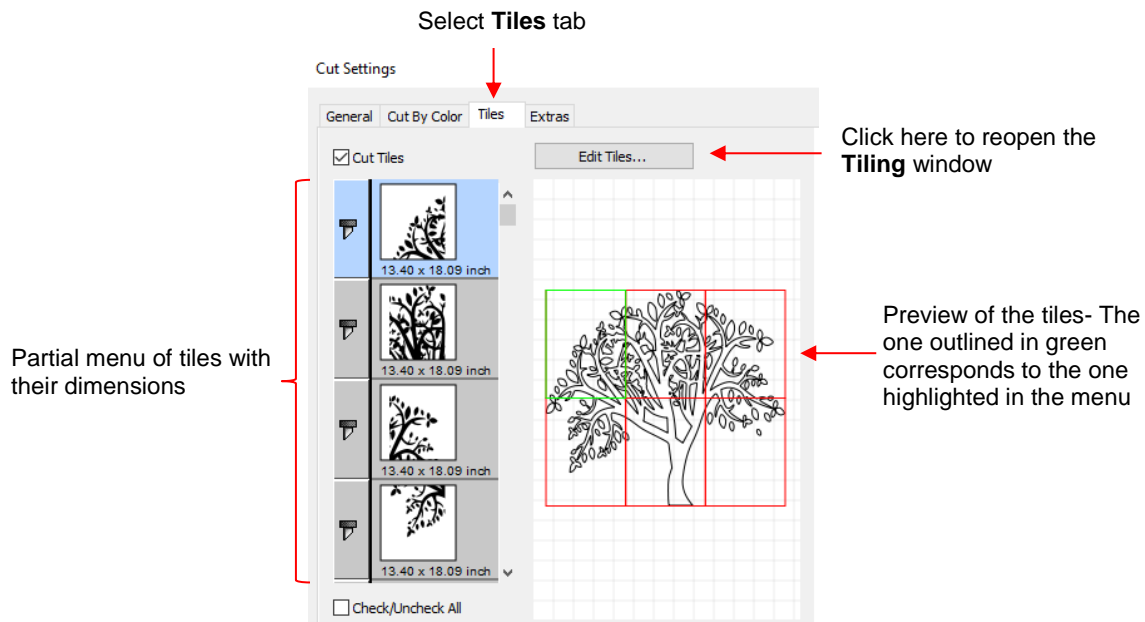



10.06.3 Tiles (SCAL PRO only)

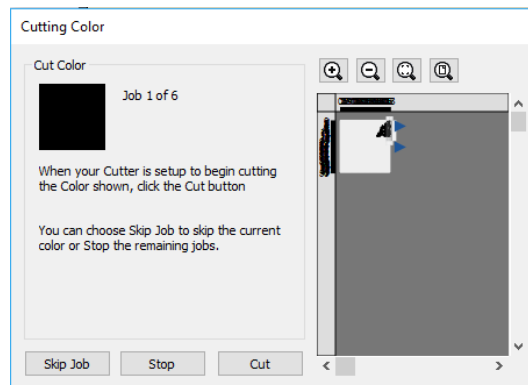
- In *Section 10.05*, you were shown how to use the **Tiling** function to split a design that is too large to cut based on the limits of your cutter:



- After clicking on **OK**, but before sending the design to cut, make the Cutting Mat dimensions fit the design. If any of the design extends beyond the boundaries of grid, those tiles will not cut.
- Open the **Cut Settings** window, click on the **Tiles** tab and check the box next to **Cut Tiles** to then open a menu showing the individual tiles with additional options:



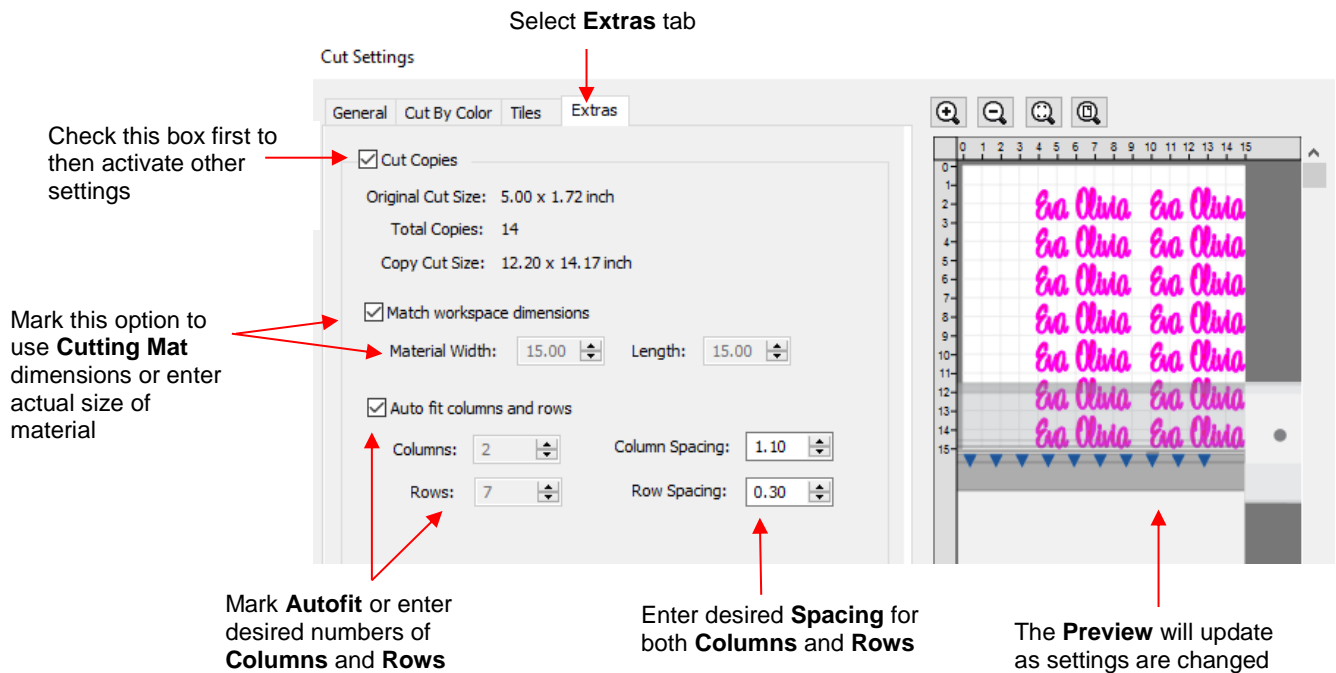
- ◇ **Cut Tiles:** Mark this option first so that the menu and preview appears.
- ◇ **Edit Tiles:** clicking this button will take you back to **Effects>Tiling** in case you need to edit the settings.
- ◇ As with **Cut by Color**, clicking on the blade icon  next to any tile will prevent that tile from cutting. You can also drag tiles up or down in the menu to change the cutting order.
- After you click on **Cut**, be patient. It can take a minute or more for a large and/or detailed design to be processed by the software. Eventually, a window will open showing the first tile to be cut:



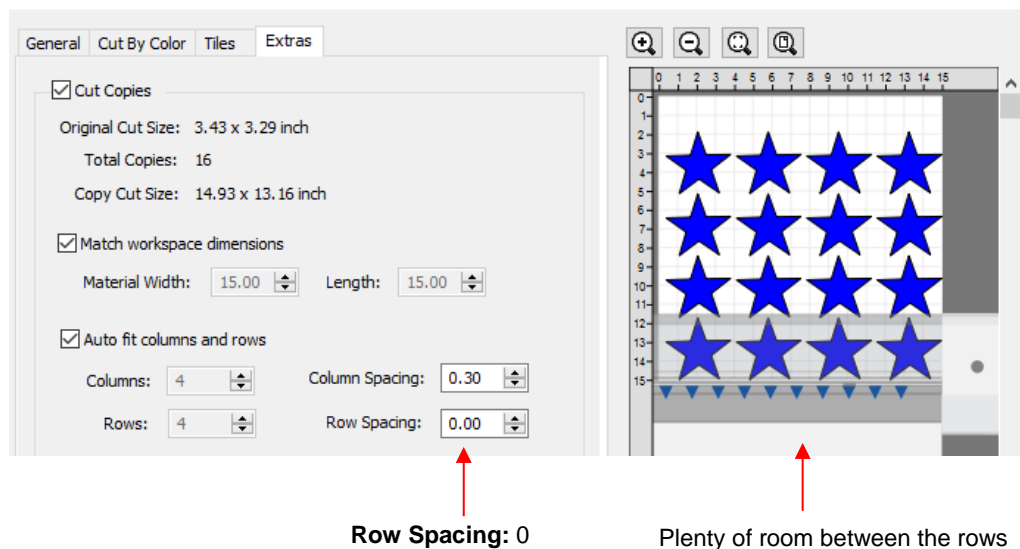
- ◇ Just as with **Cut by Color**, you can
 - Click on **Cut** to proceed with cutting that tile. After it is cut the next tile will be selected.
 - Click on **Skip Job** to skip cutting that tile and bring up the next tile
 - Click on **Stop** to cancel all cutting.

10.06.4 Extras (SCAL PRO only)

- The **Extras** feature allows you to duplicate shapes for cutting, without having to set it up on the **Cutting Mat**. To use this feature, click on the **Extras** tab in the **Cut Settings** window



- ◇ **Cut Copies:** Mark this option first so that other settings become editable
- ◇ **Match workspace dimensions:** If your material is the same size as the **Cutting Mat**, then mark this option. Otherwise, enter the **Width** and **Length** of the material to be used. Pay attention to the **Preview** window to make sure you have the orientation correct to match how the material is placed on the cutting mat.
- ◇ **Auto fit columns and rows:** Mark this option if you want as many duplicates as possible cut from the material. Otherwise, enter the desired number of **Columns** and **Rows** to match the number of copies needed.
- ◇ **Spacing:** Adjust the spacing as desired. In general, shapes can be quite close together when cutting from thinner materials, such as vinyl and cardstock. In some cases, such as with a star, you can even use 0 for the **Row Spacing**, since the bottom of the shape is not close to the top of the shape in the row below it:



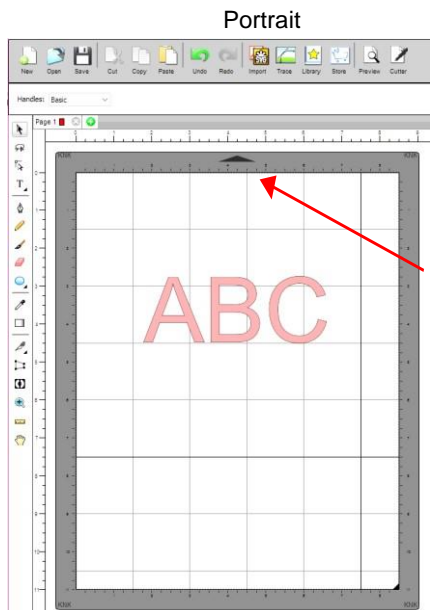
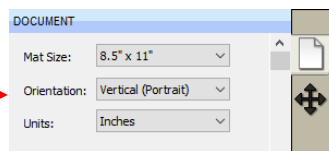
- Make sure you have all of the cut settings made under the **General** tab of the **Cut Settings** window. Once you click on **Cut**, all of the duplicates will be cut out and it appears that using **Cancel**, in the current version of SCAL, will not abort the cut.

10.07 Controlling Where Shapes Will Cut

10.07.1 Overview

- There are two **Orientations** for cutting:
 - ◇ **Portrait** – Shapes will cut in the same orientation you see on the **Cutting Mat**
 - ◇ **Landscape** – Shapes will cut 90° clockwise to the orientation you see on the **Cutting Mat**
- There are 3 available **Cut Modes** when cutting to the KNK Force:
 - ◇ **WYSIWYG** – Shapes will cut relative to their position on the virtual Cutting Mat
 - ◇ **Origin Point** – Shapes will cut to align with the origin set before cutting
 - ◇ **Print and Cut** – Shapes will cut based on aligning the camera with printed registration marks (refer to *Chapter 11*)
- The **Orientation** is set on the **Document Panel**:

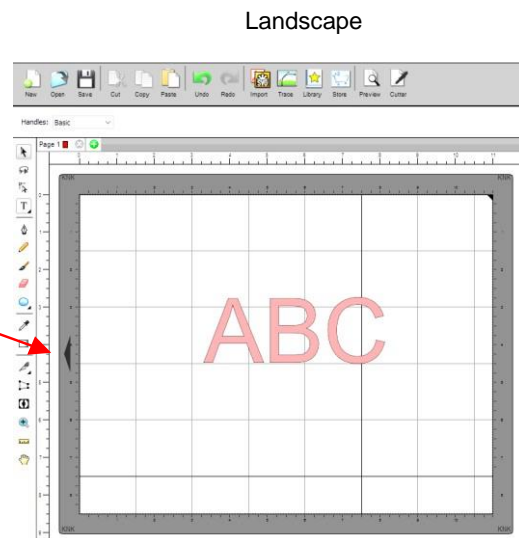
Select either **Vertical (Portrait)** or **Horizontal (Landscape)**



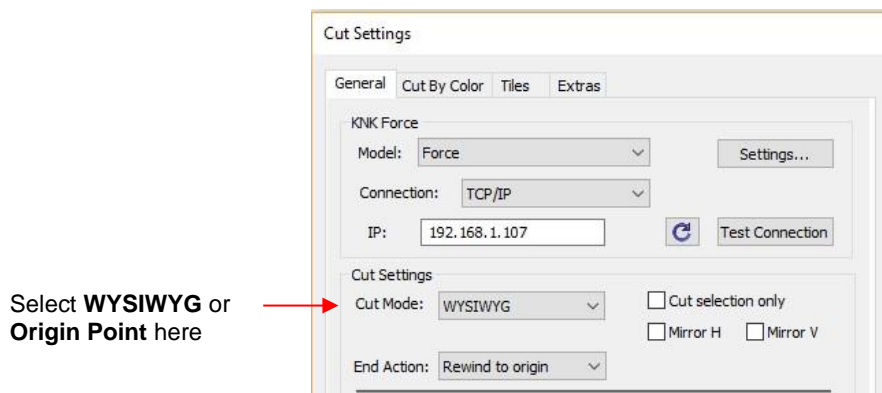
into the

Portrait

Landscape

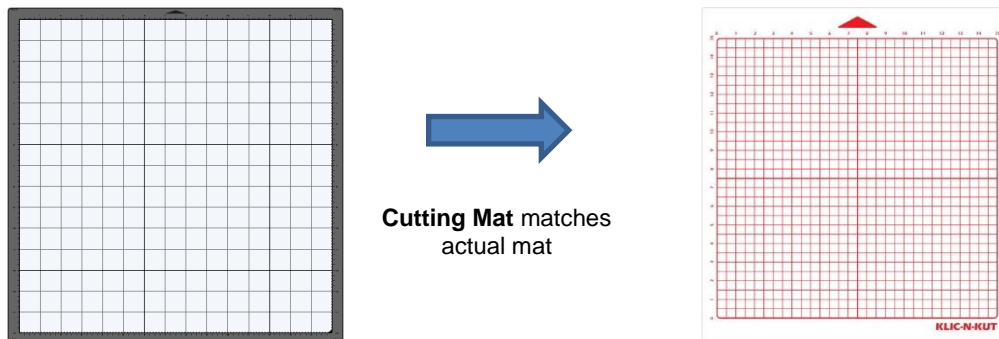


- The choice between **Portrait** and **Landscape** is a personal one – use whichever one makes the most sense to you. For long projects, such as for large vinyl cuts, **Landscape** is usually chosen because the project displays better on the computer monitor. However, you still have the option to use **Portrait**, if desired.
- The **Cut Mode** is set in the **Cut Settings** window:

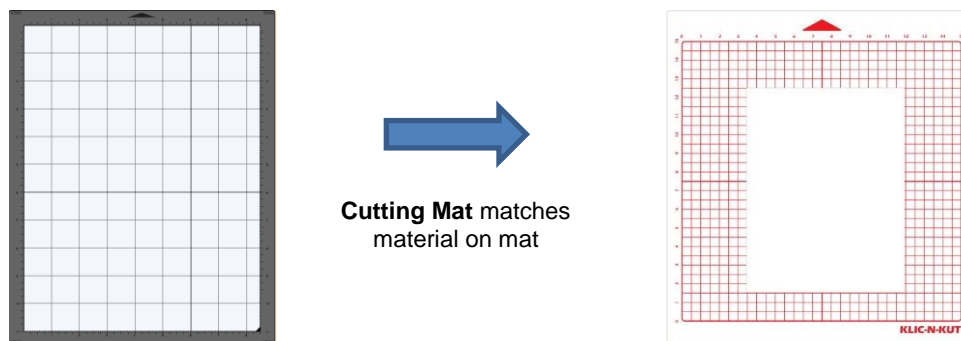


- **IMPORTANT:** Both **Cut Modes** are based on setting an XY origin on the cutter. On a Force, this origin is set by moving the tip of the blade (or pen or tool), on the left side of the dual head, to the lower right corner of the mat grid or the material.
- The following sections show where shapes will cut based on the possible combinations of **Cut Mode** and **Orientation**. Note that with **WYSIWYG** mode, there will be two options and the one that makes the most sense to you, is the one to use:

◇ **Cutting Mat Method:** The virtual **Cutting Mat** is the same dimensions as the actual cutting mat:



◇ **Material Method:** Create a custom virtual **Cutting Mat** that matches the dimension of the material to be cut:



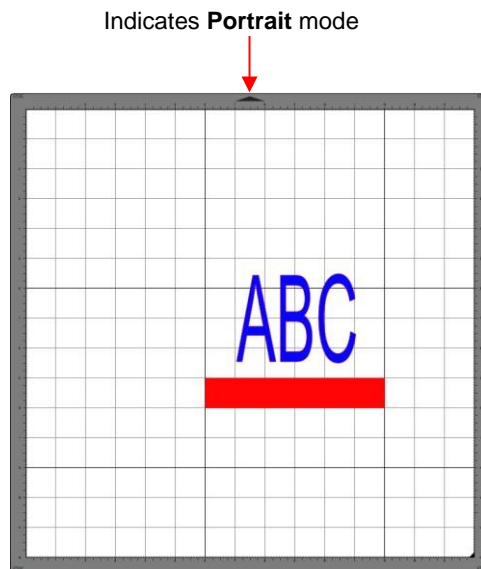
- The best way to learn how these setting affect where shapes cut is to recreate what you see in these screen shots and test them out with the test pen and paper. Eventually, it will all make sense to you and, of course, there's help available if you need it.

10.07.2 Origin Point

- This is the mode recommended for most applications as it economizes the use of your cutting materials.

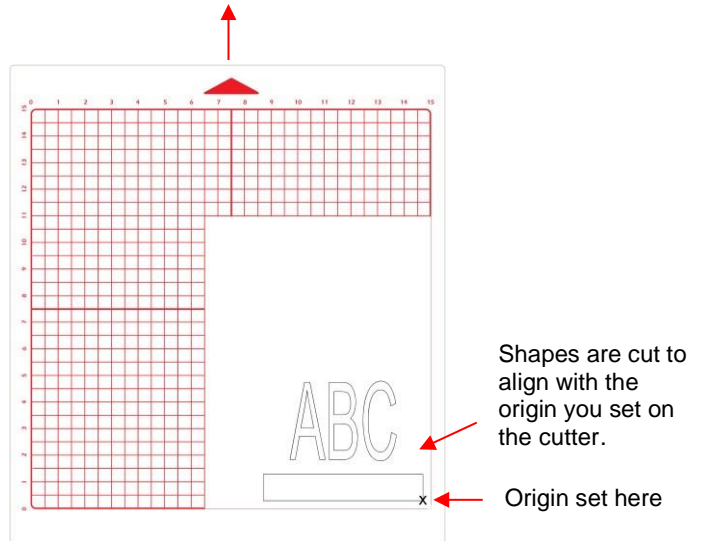
- Shapes can be located anywhere on the virtual **Cutting Mat**. The shapes will be moved and aligned to cut with the origin you set on the material. As mentioned earlier, the origin is set using the position of the **blade tip** (or other tool installed on the left side). It is typically set just inside the lower right corner of the material being cut.
- When more than one shape will be cut, the shape closest to the origin will be cut at the origin and any other shapes will be cut the distance and direction from that shape as positioned on the screen. The following figures show examples of where images will cut. Use the arrow on the **Cutting Mat** as a guide to the direction to insert the actual mat or material into your cutter.

◇ **Origin Point – Portrait Mode**



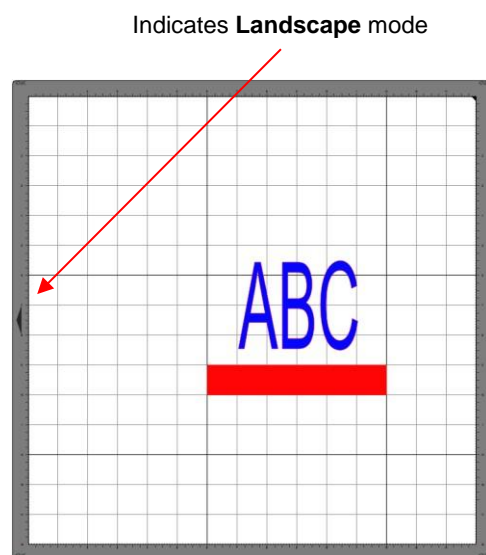
Location of shapes in SCAL

Feed the mat this direction into the cutter



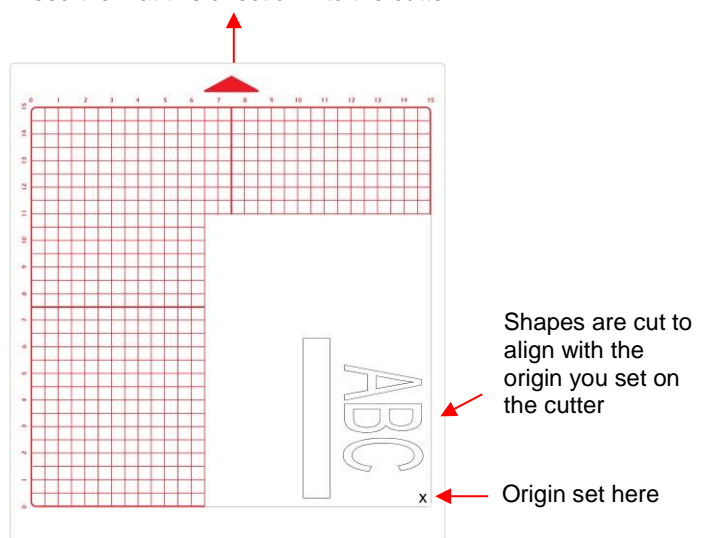
Where shapes will draw or cut on the material

◇ **Origin Point – Landscape Mode**



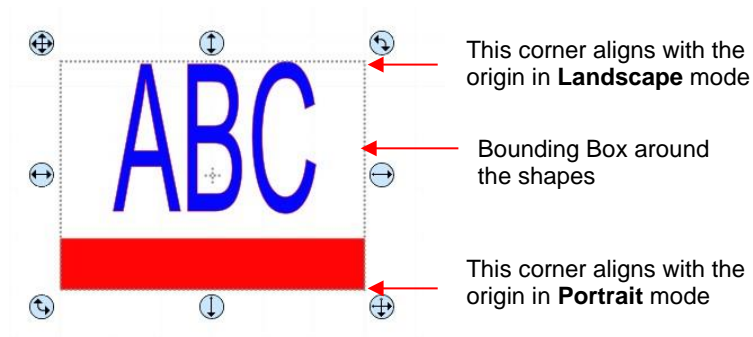
Location of shapes in SCAL

Feed the mat this direction into the cutter

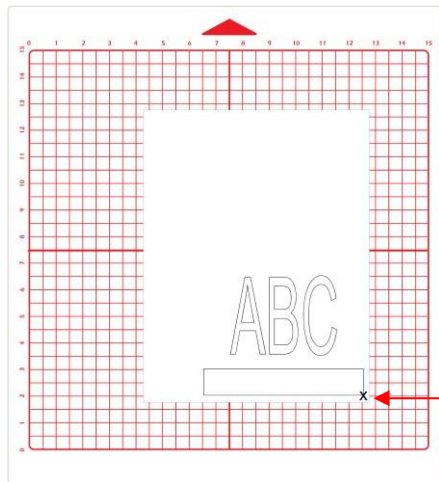


Where shapes will draw or cut on the material

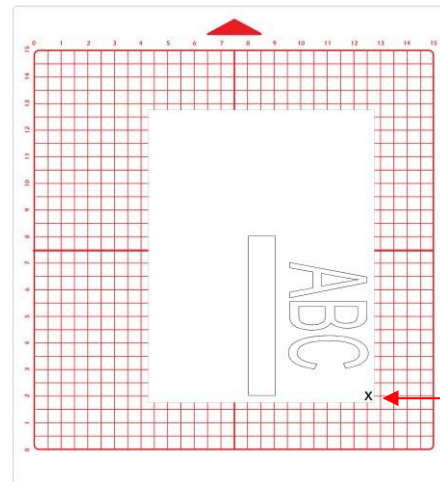
- Note that the alignment is based on the bounding box around the shapes:



- Also, note that the material can be located anywhere on the cutting mat because you are setting the origin on the material itself. It is usually advisable to set that origin just a little way inside the corner of the material so that you do not inadvertently cut off the edge.



Portrait mode

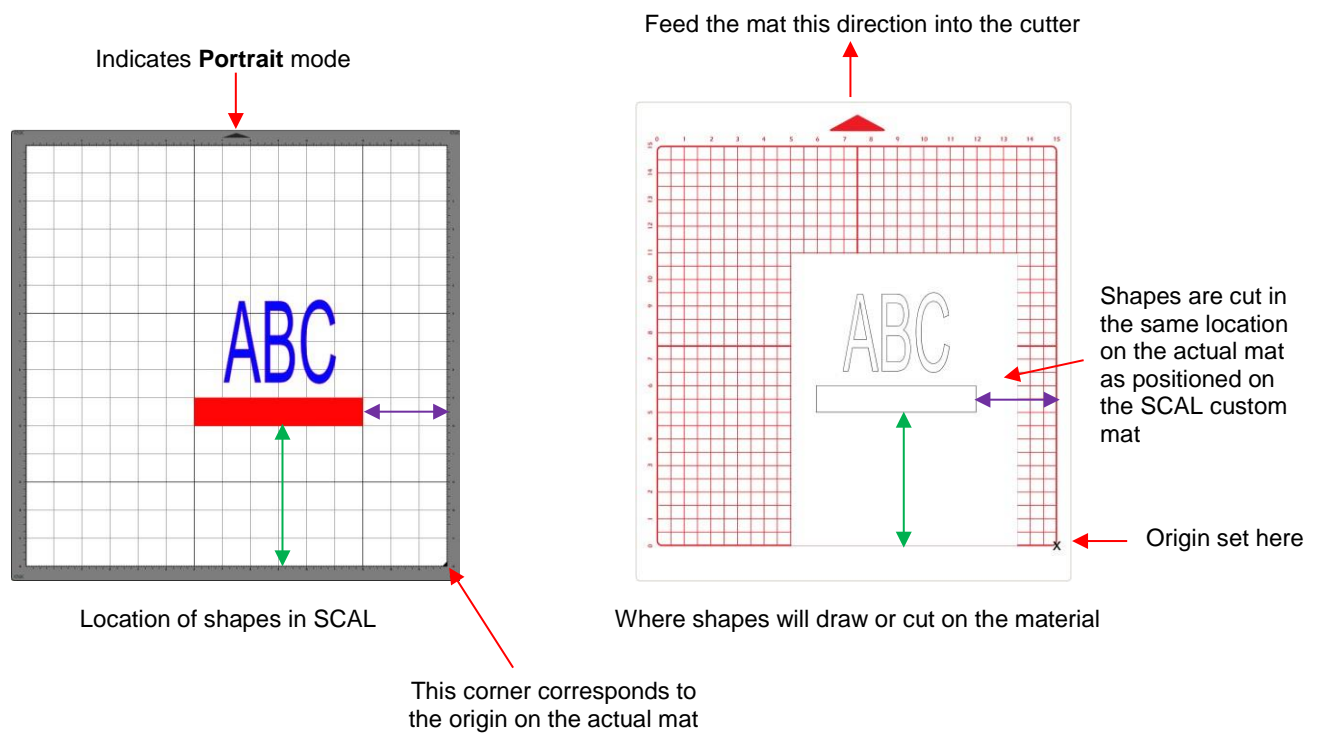


Landscape mode

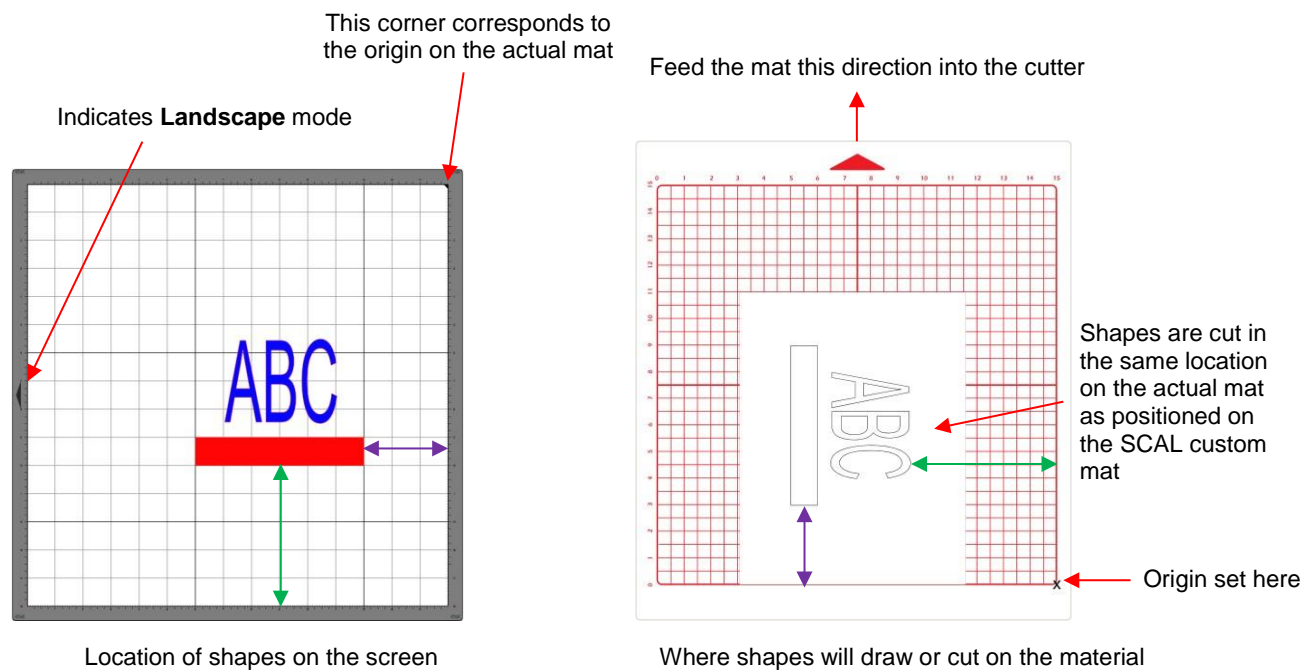
10.07.3 WYSIWYG

- This is the mode recommended when you need to cut shapes in very specific locations on your material (such as the center front of a greeting card).
- Shapes are cut based on where they are located on the virtual **Cutting Mat**. There are two methods used:
 - ◇ **Cutting Mat Method:** The virtual **Cutting Mat** dimensions should match those of the grid on the actual cutting mat. The origin is set in the exact lower right corner of the mat's grid. The material needs to be placed on the cutting mat so that it covers the area where the shapes will be cut.
 - ◇ **Material Method:** The virtual **Cutting Mat** dimensions should match those of the material being placed on the actual cutting mat. The origin is set in the lower right corner of the material regardless of where the material is placed on the mat. In the example later on, the material is assumed to be letter size (8.5" x 11").
- In the following diagrams the purple and green arrows are used to indicate the equivalent distances between the shapes and the origin on the virtual **Cutting Mat** and on the actual mat.

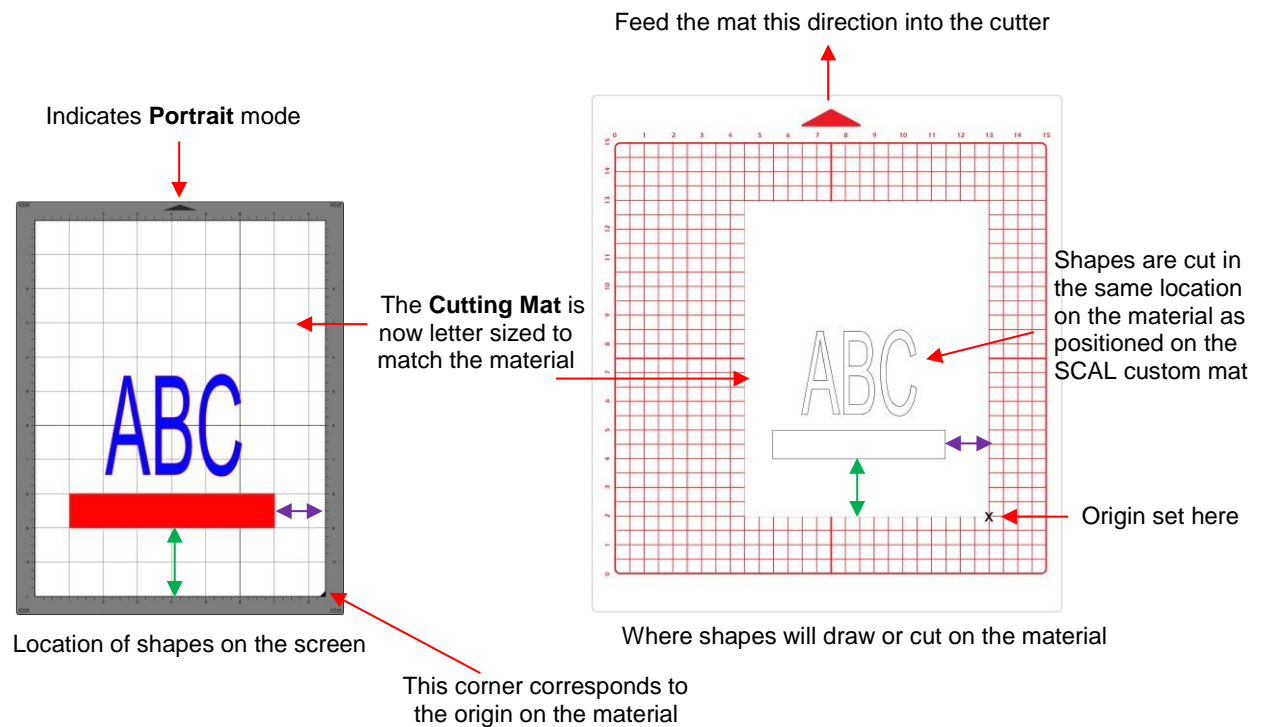
◇ WYSIWYG – Portrait – Cutting Mat Method



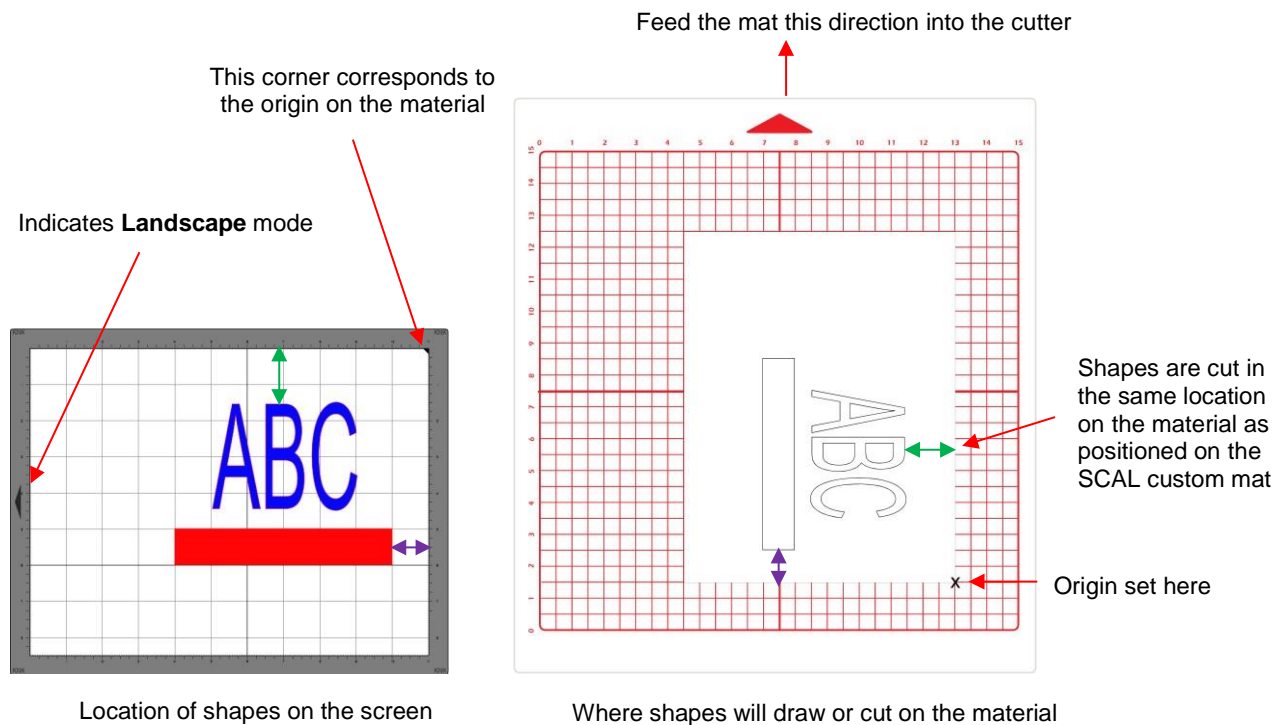
◇ WYSIWYG – Landscape – Cutting Mat Method



◇ WYSIWYG – Portrait – Material Method



◇ WYSIWYG – Landscape – Material Method

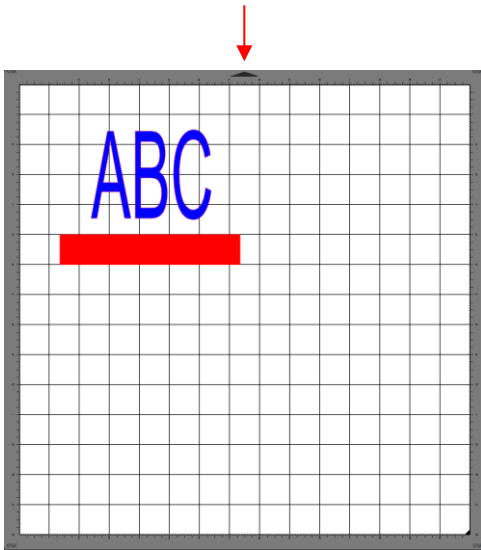


10.07.4 Center Point

- This is a mode not available with all cutters in SCAL. It was needed for use with the Orbitizer but can also have other useful applications, such as cutting a shape from the center front of a greeting card.
- Shapes can be located anywhere on the virtual **Cutting Mat**. The shapes will be moved and centered around the origin you set on the material. While in the other two cut modes, the origin is typically set just inside the lower right corner of the mat or material, with **Center Point** mode, you want to set the origin in the center of the material or mat:

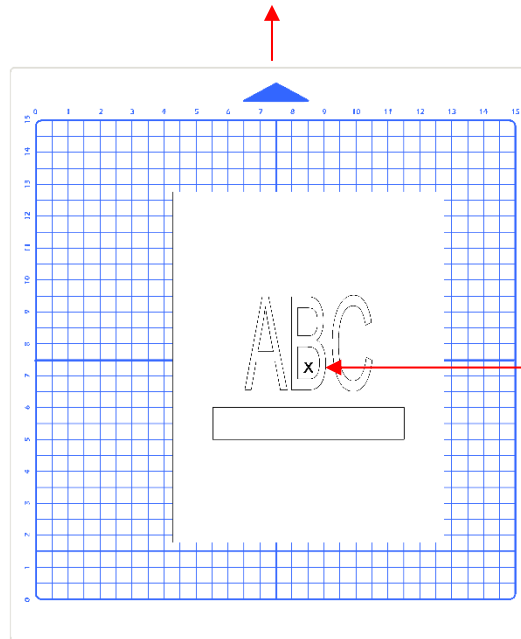
◇ Center Point - Portrait

Indicates **Portrait** mode



Location of shapes in SCAL

Feed the mat this direction into the cutter



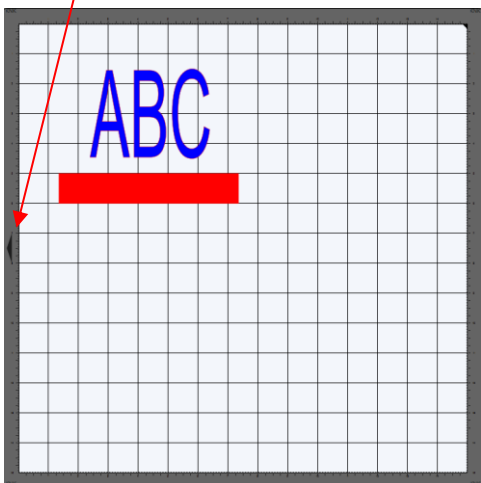
Origin set here

Shapes are centered around the origin you set on the material

Where shapes will draw or cut on the material

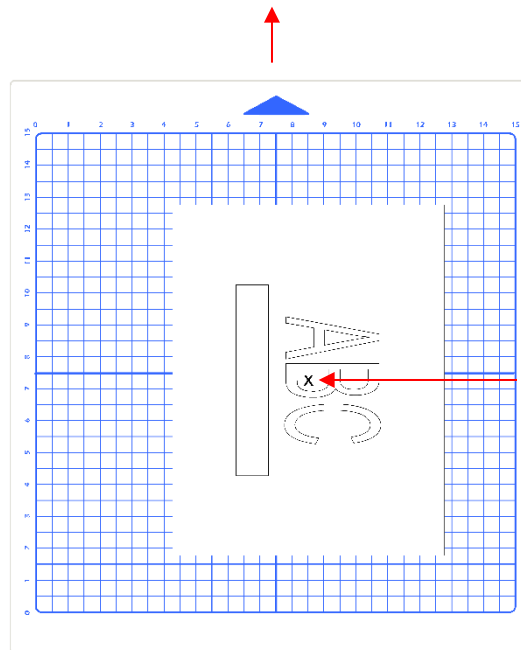
◇ Center Point – Landscape Mode

Indicates **Landscape** mode



Location of shapes in SCAL

Feed the mat this direction into the cutter

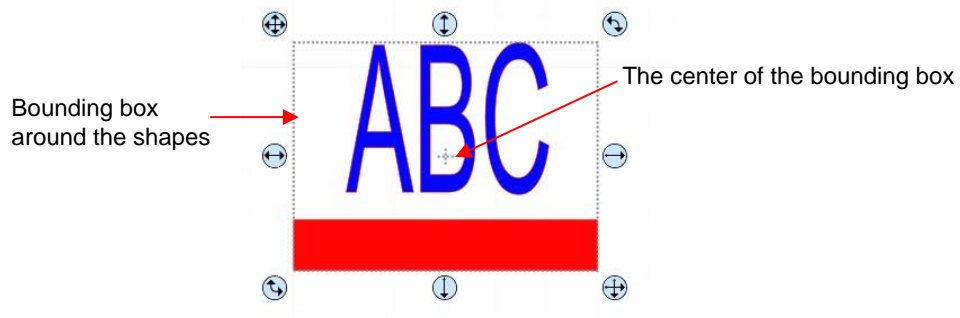


Origin set here

Shapes are centered around the origin you set on the material

Where shapes will draw or cut on the material

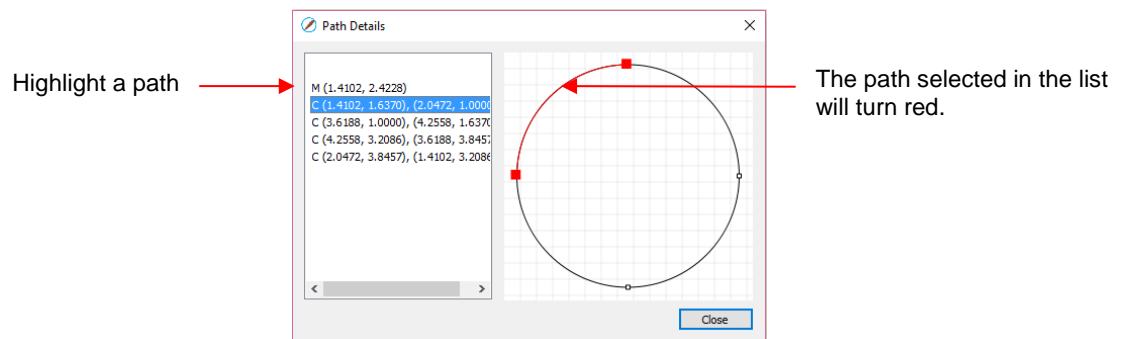
- ◇ Note that the alignment is based on the center of the bounding box around the shapes:



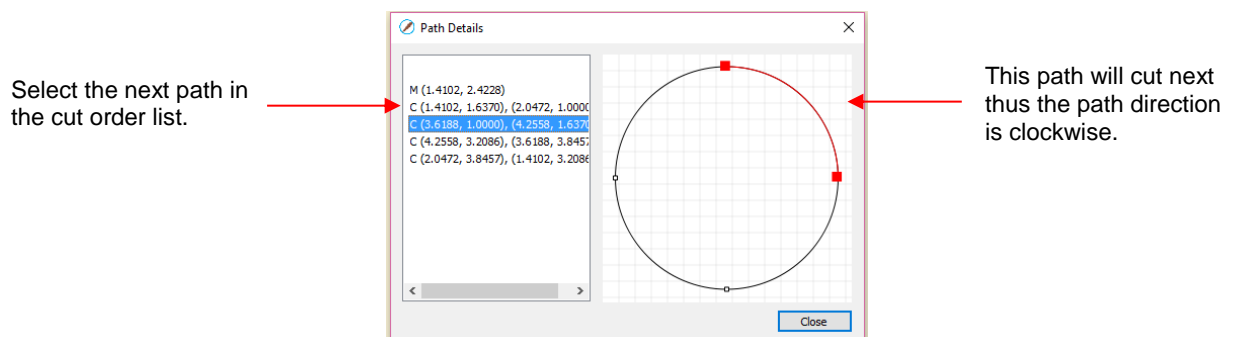
- ◇ Also, note that the material can be located anywhere on the cutting mat because you are setting the origin on the material itself. If you need the centering to be perfect:
 - Measure the material with a ruler to determine the center and mark the center with a pencil dot
 - Use the alignment pin in the blade holder to set the origin. It is far easier to see the tip of the pin than the tip of the blade.

10.08 Path Details and Reverse Path

- Sometimes a cutting issue can be resolved by reversing the direction of a cut. In SCAL, the cut direction (clockwise versus counterclockwise) can be checked using the following steps:
 - ◇ Select the shape, right-click and select **Path>Path Details**.
 - ◇ A window will open. On the left side is a list of the paths in the order they will cut. Click on any path in the list and that path will turn red:



- ◇ Select the next path in the list and you will then be able to determine the direction of the cut:

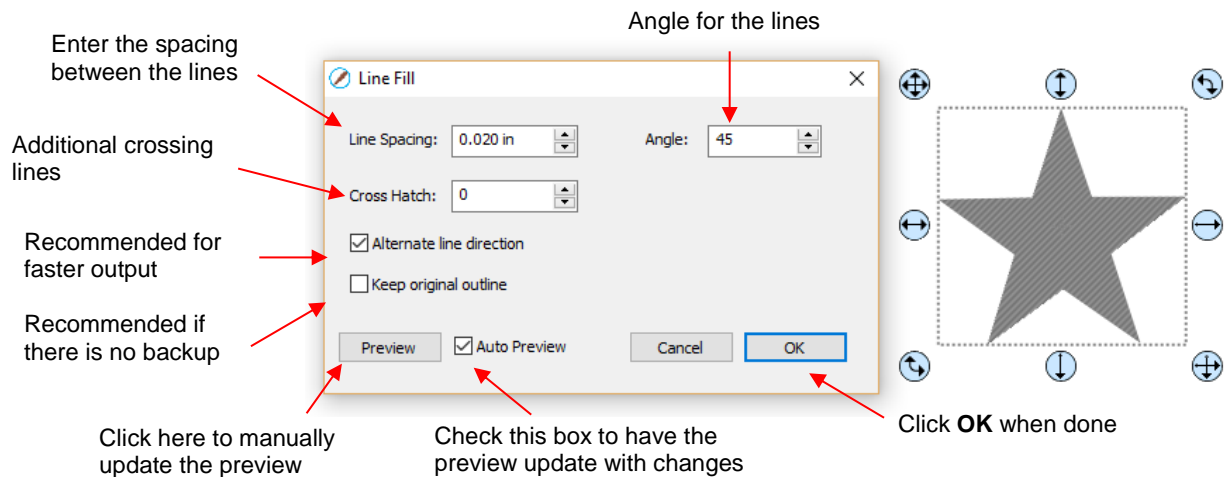


- To reverse the direction of a path, use either of the following after selecting the shape:

- ◇ Right-click and select **Path>Reverse Path**
- ◇ Go to **Path>Reverse Path**

10.09 Line Fill

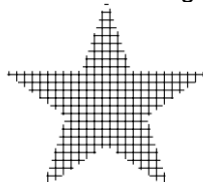
- The **Line Fill** function creates a line or hatch fill pattern, typically used for engraving with an engraving tool. It can also be used for coloring in shapes with a pen or embossing some materials with an embosser.
- To access this function, select a shape and go to **Effects>Line Fill**:



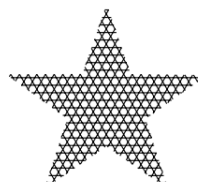
- ◇ **Line Spacing:** This is selected based on the width of the line produced by the tool to be used. If it's too small to accurately measure, use 0.02" or 0.5 mm for a small test shape and then adjust, as needed, to fit the tool and application.
- ◇ **Angle:** Choose an angle for the **Line Fill**. An **Angle** of 0 results in horizontal lines and an **Angle** of 90 results in vertical lines. Note the diagonal pattern in the prior screenshot using an **Angle** of 45.
- ◇ **Cross Hatch:** Increasing **Cross Hatch** adds additional intersecting lines to the pattern which can result in a more complete fill but will take longer to engrave or draw:



Cross Hatch = 0



Cross Hatch = 1

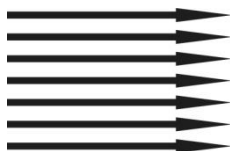


Cross Hatch = 2

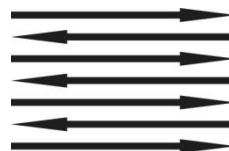


Cross Hatch = 4

- ◇ **Alternate Line Direction:** This controls whether the tool always returns to the same side before dropping down to engrave or draw. In some applications, it may need to be unchecked to provide a more even appearance, however it will take much longer to execute:



Alternate Line Direction: not marked
Tool only travels in one direction



Alternate Line Direction: marked
Tool travels in both directions

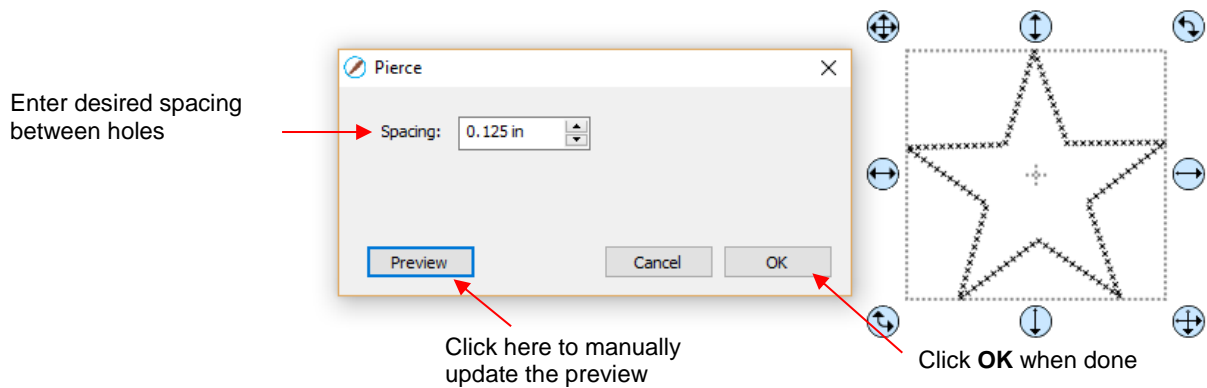
- ◇ **Keep Original Outline:** Usually a good idea in case you want to revise your pattern later on. Also, when working with lettering, having the outline improves readability:



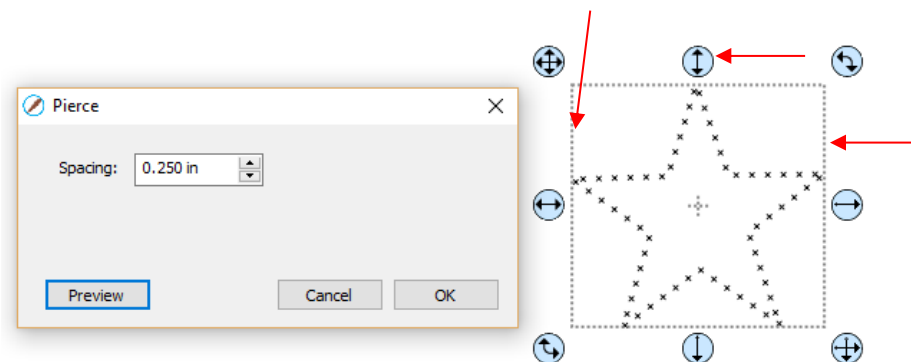
- For more information on using an engraver, refer to *Section 12.06*.

10.10 Pierce

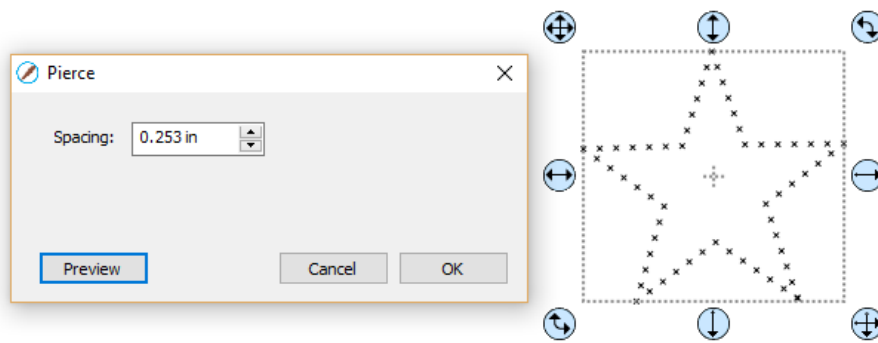
- The **Pierce** function creates holes for punch tools. This can be used to create pergamano designs and paper embroidery patterns.
- To access this function, select a shape and go to **Effects>Pierce**:



- Note that even though you see “X” shapes on the screen, the cutter head will be making downward punch movements.
- At this time, there is no editing available for a pattern created using the **Pierce** function. If you find that your design has holes that are not evenly spaced, try altering the spacing by tiny increments and clicking on **Preview**.
- ◇ For example, the star shape used above shows uneven spacing when a value of 0.25” is entered. Note how the star has holes too close to one another at the upper points:



- ◇ Gradually increasing the **Spacing** didn’t immediately result in an acceptable pattern until 0.253” was entered. Then the pattern looked even:

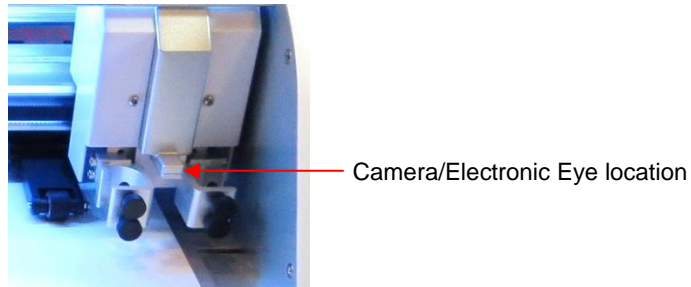


- If you have a shape that has the **Pierce** effect applied and want to remove it (even after the file has been saved and re-opened), select the shape and go to **Object>Remove Effects**.
- For more information on using a punch tool, refer to *Section 12.07*.

11. KNK Force: Print and Cut

11.01 What Is a Print And Cut (PNC)?

- The print and cut process involves printing an image from your design software to any printer you own and then, with the aid of a camera and electronic eye on the Force, having the image or images cut out with perfect precision.
- The camera is located in the small projection between the left and right side heads on the Force:



- Below are three typical kinds of print and cut applications. There are more examples than these so be sure to check out future subsections of this chapter:

- ◇ The cut line is along the actual border of the printed image(s):

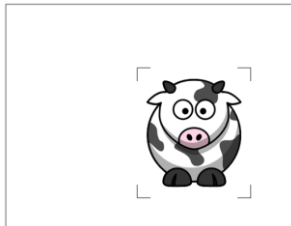


Image is precisely cut along printed borders

- ◇ The cut line is outside of the border but follows the shape of the printed image(s). This is also commonly referred to as a contour cut:



Image is cut in same shape but offset from outside printed borders

- ◇ The cut line follows a different shape from that of the printed images(s):



A custom shape is cut around the printed image.

11.02 What is a PNC Calibration?

- In order to get precise PNC results, you must tweak the camera calibration. This is nothing more than determining how far away the camera is located relative to the tip of the blade. Because the camera is manually installed, the distance from the center of the camera to the tip of the blade will vary some from one Force to the next. Also, you will want to use the same blade holder with all of your PNC applications, as the distance might change with slight differences in the holders.
- The distance is measured in an X direction and in a Y direction where X is how far right the center of the camera is located relative to the blade tip. Then Y is how far forward the center of the camera is located relative to the blade tip. Later in this tutorial, the location for entering these numbers will be shown.
- The calibration process involves performing and repeating a PNC to see how much you need to adjust the **X** and **Y** values in order to get perfect results. And you **SHOULD** be able to get perfect PNC's!

11.03 Camera Calibration Procedure

11.03.1 What You Need for Calibrating

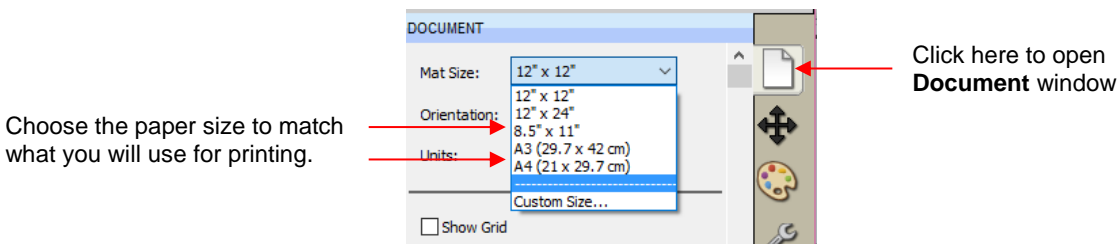
- You need to be well rested! You don't want to start learning the PNC process when you are tired, stressed, or in a hurry. Mastering a PNC comes when you have the time to repeat it about 4 times in a row. At that point, you will not only have repeated the process enough times to feel very comfortable with the order of the steps, but you'll have your calibration perfected and then be ready to do future PNC's quickly and with ease.
- It is recommended that the **Resolution/Sizing Calibration** presented in *Section 2.07* be performed before proceeding with the camera calibration.
- Next, you will need the following items:
 - ◇ Printer
 - ◇ Blade holder
 - ◇ Copy/printer paper in either Letter size (8.5" x 11") or A4 (21 x 29.7 cm)
 - ◇ Calibration File available here:

<http://www.iloveknk.com/FreeFiles/SVG/Force-Testing-and-Calibration-Files.zip>

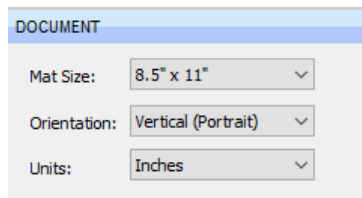
Important! In order to facilitate the calibration process, please follow all instructions exactly. Later, after calibration, you can change up methods, such as paper orientation and mat sizing, as desired.

11.03.2 Preparing the Calibration File

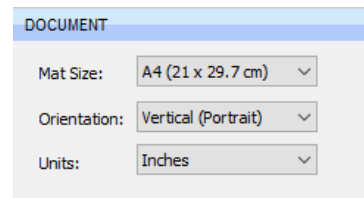
- (1) It is strongly recommended that you set the dimensions to match the paper size you'll be using for the calibration. Working closer to the origin of the Force reduces unnecessary movement that can introduce factors which may affect accuracy. In the **Document** window, open the **Mat Size** drop down menu and select either 8.5" x 11" or A4 (21 x 29.7cm):



- (2) Next change the mat orientation, if needed, so that you are working in **Portrait** mode. Currently, **Landscape** mode doesn't work for PNC on the Force. However, in order to use the diagram for adjusting calibration settings, it is very important to use Portrait. Your settings should now look like this:



or

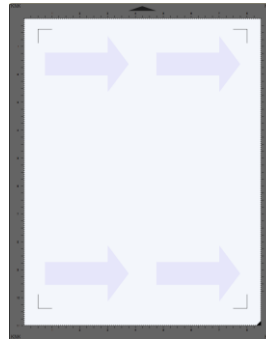


- (3) Inside the **Basic Shapes** folder from the downloaded zip file, you will find the following two files interspersed with the other files:

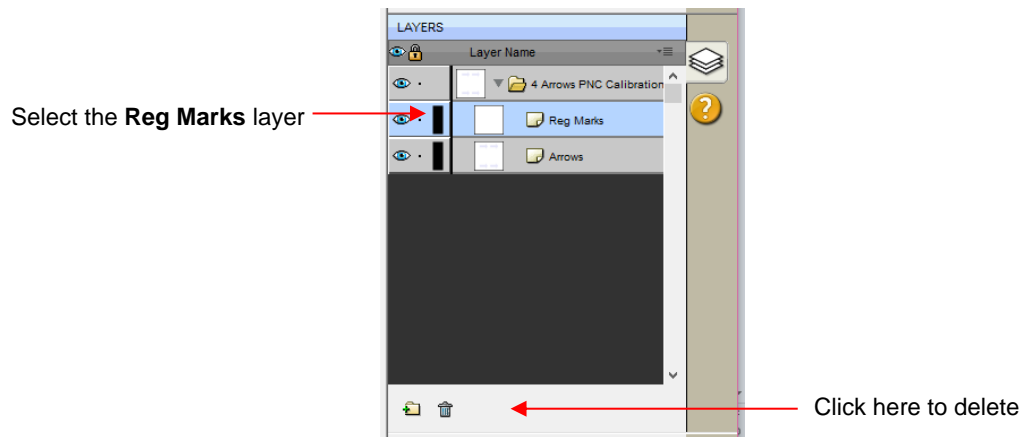
4 Arrows PNC Calibration - A4.svg

4 Arrows PNC Calibration - Letter.svg

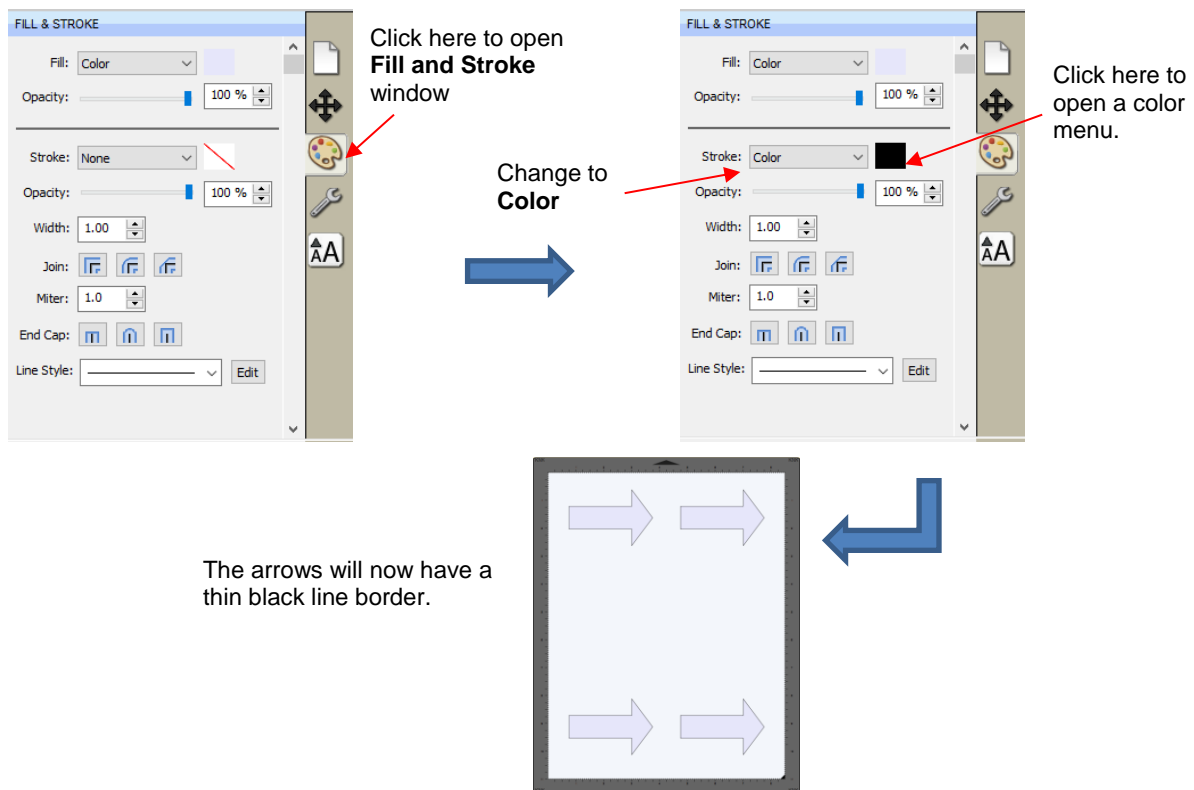
- (4) Use **File>Import** to open whichever one matches the printer paper you're using, i.e. A4 or Letter. Move the imported shapes so they are roughly centered in the document area:



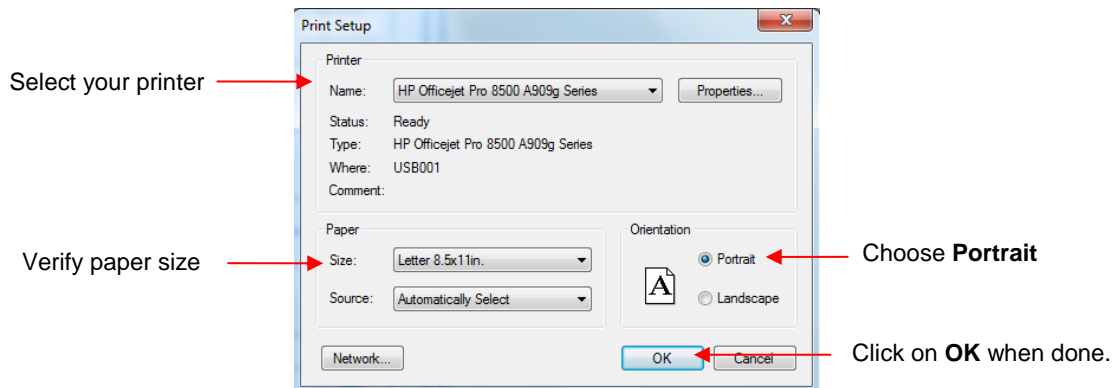
- (5) Because this calibration file was created for calibrating in C3, it contains a registration mark layer not needed in SCAL. On the **Layers Bar**, select the **Reg Marks** layer and delete it:



- (6) It is also recommended that the arrows be outlined for printing. Select that layer and click on the **Fill and Stroke** icon. Change the **Stroke** from **None** to **Color** and then click on the box to the right of that to open a color selection menu.



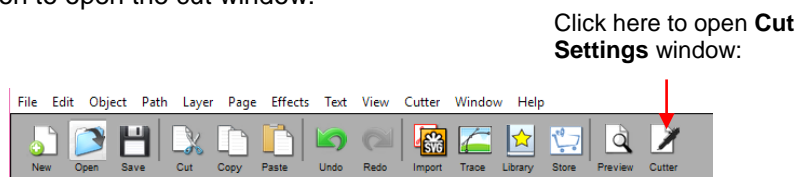
(7) Go to **File>Print Setup**, select the printer you plan to use, paper size, and **Orientation**:



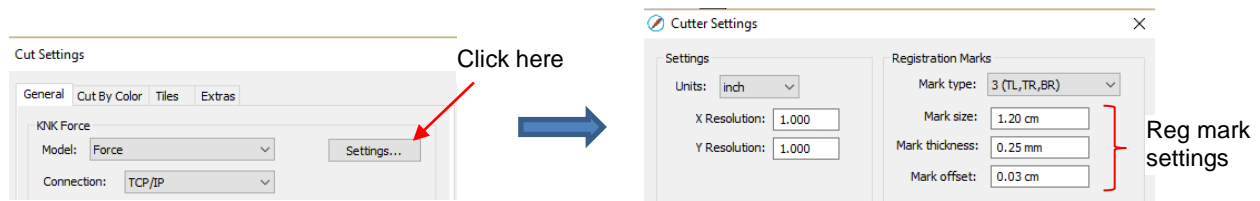
(8) Do NOT use **File>Print** at this point because the reg mark settings still need to be adjusted. This will be done in the next section.

11.03.3 Entering Settings and Printing

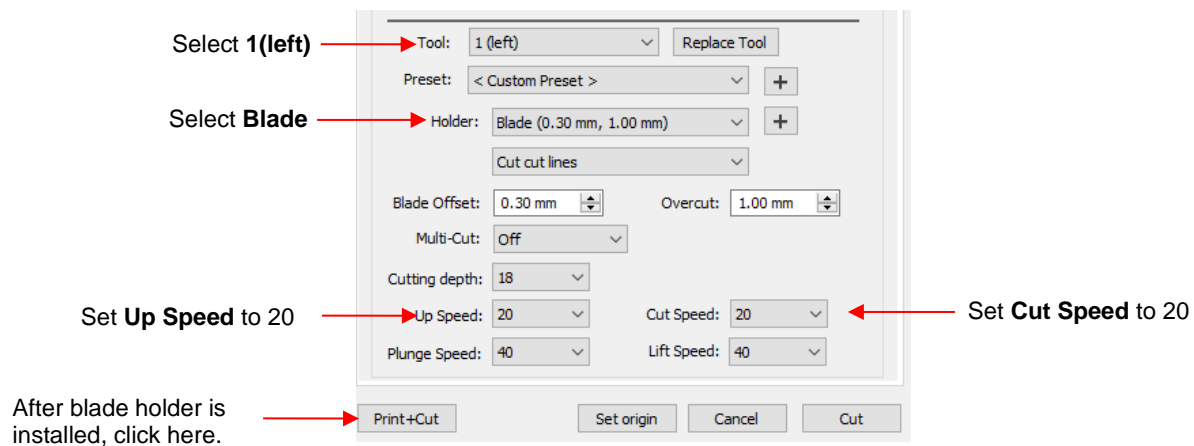
(1) Click on the **Cutter** icon to open the cut window:



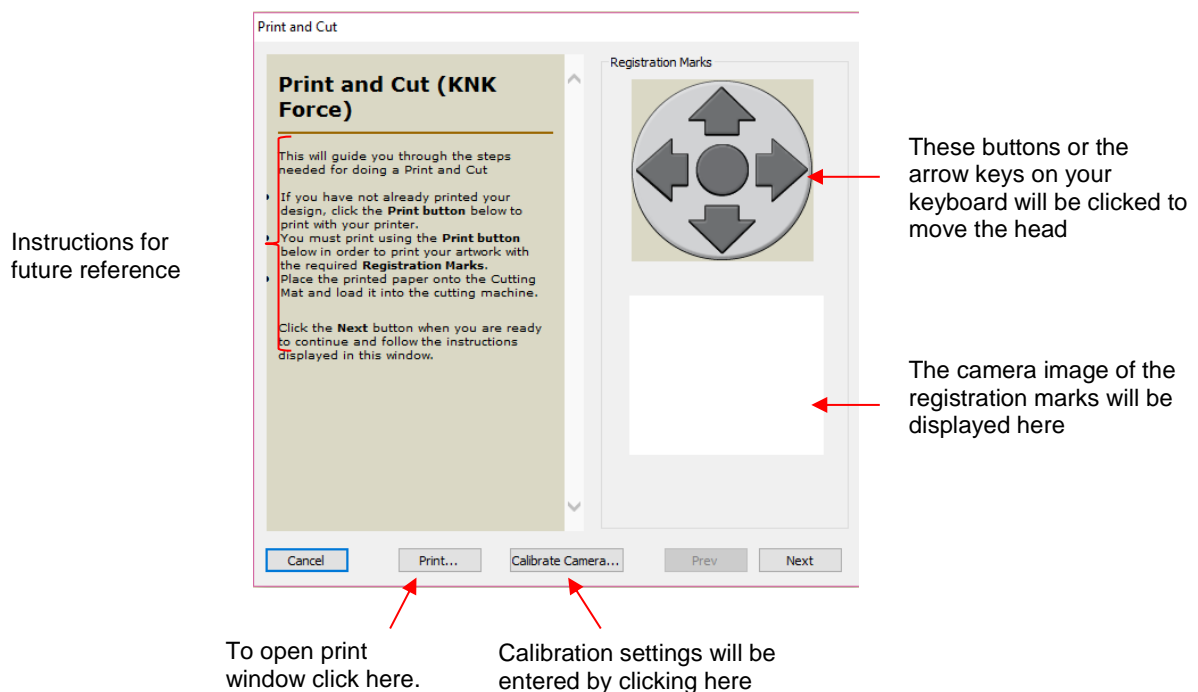
(2) Click on the **Settings** button to open the **Cutter Settings** windows:



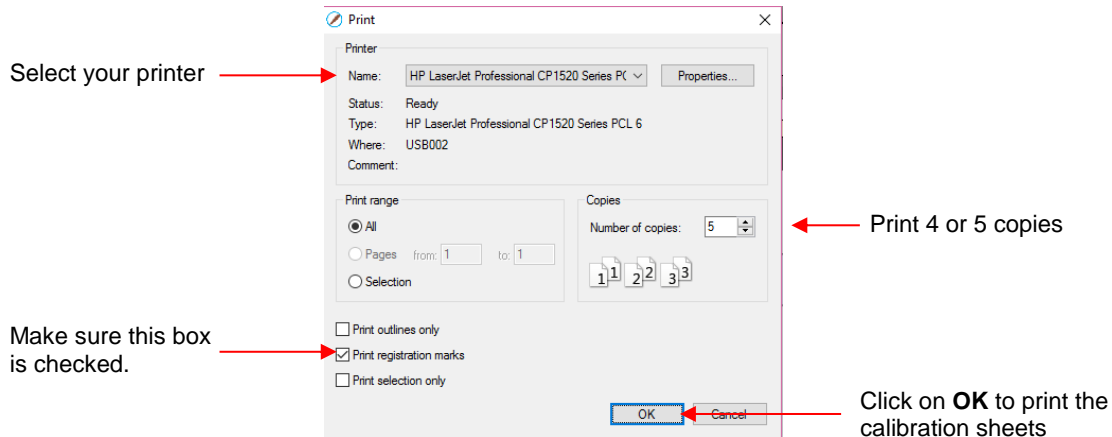
- (3) You can modify the settings for the reg mark size, line thickness and offset from the image to be cut. The latter one, **Mark offset**, should be changed from the current setting to 0.03 cm so that the reg marks will be as close as possible to the printed image. This isn't an absolute requirement but it does allow more of the page to be used for your project. Once the settings have been changed, click on **Save** at the bottom of that window.
- (4) Under **Tool**, select **1(left)** and enter the following settings. Use whatever **Cutting Depth** works best for cutting your printer paper. **Important:** Keep the **Up Speed** and **Cut Speed** low, as shown:



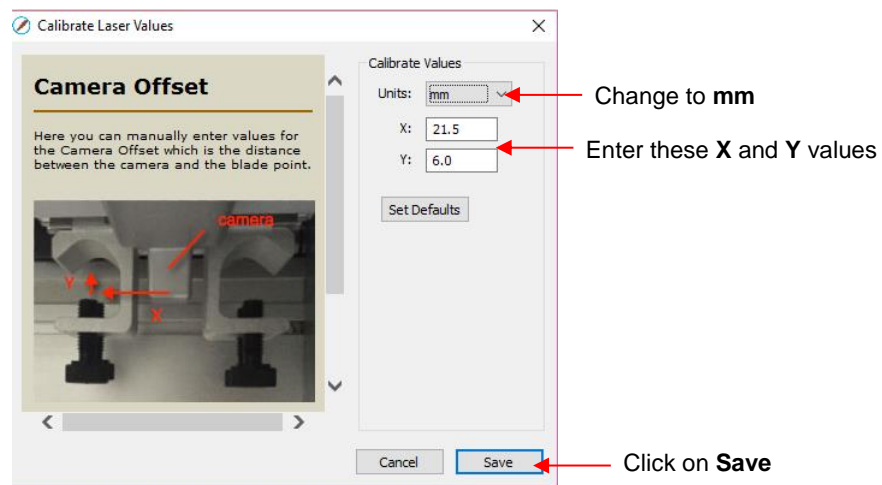
- (5) Load the blade holder onto the left side using **Replace Tool**. Then click on **Print+Cut**.
- (6) The following **Print and Cut** window will open.



(7) To print the arrows with the registration marks, click on **Print**:



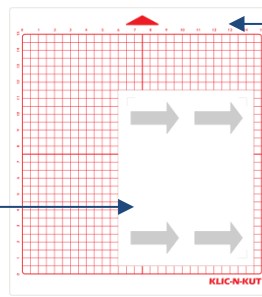
(8) After printing, click on the **Calibrate Camera** button. It is highly recommended that the calibration numbers be entered and adjusted in mm. So, change the **Units** and then enter the **X** and **Y** shown:



11.03.4 Setting the Registration Marks and Cutting

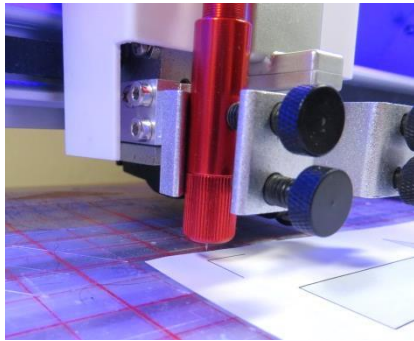
- The PNC process is to move the blade holder near each mark and then the camera sends a photo to the screen for tweaking the alignment. If you make the effort, at the start, to have the blade holder centered over the corner of the upper left printed registration mark, it makes the rest of the process go much faster. Also:
 - Do not have a bright light shining onto the printout as it can wash out the printed registration marks and make it more difficult to do the alignment.
 - Do not set an **XY origin** using the **Set origin** button in the **Cut Settings** window. There is a software bug that will cause the final cut to be located at the origin instead of based on the setting of the registration marks.
- Follow each step closely and you will find, after a few tests, that the procedure is quite easy to remember:
 - Place the printout onto the mat and align with the grid. As you are facing the Force, the printout should be on the mat in a portrait orientation with the arrow pointing towards the right end cap. It's important to have the printout fairly straight so that the camera will be able to move within a set distance of the target. The same goes for inserting the mat into the Force- align as straight as possible, using the horizontal grooves on the Force itself.

1. Place the printout onto the mat with the arrows pointing to the right.

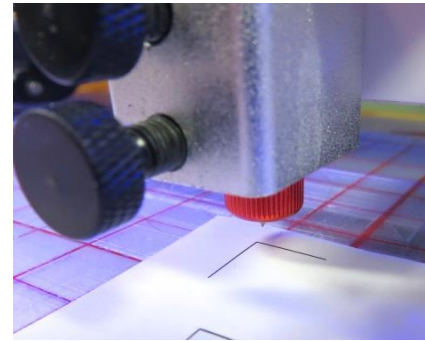


2. Insert the mat into the Force with this triangle pointing away from you.

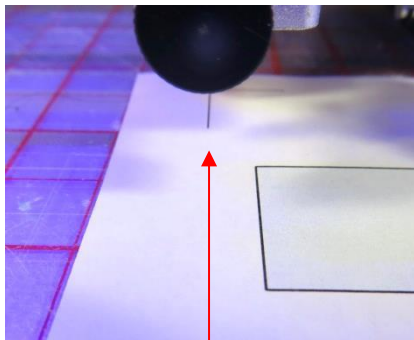
- (2) Click on **Next** and the head will move towards the upper left registration mark. You will then either click the onscreen direction buttons or use the arrow keys on your keyboard to move the tip of the blade approximately over the corner of that registration mark. Note that larger increments can be made by holding the **Shift** key while moving. Here are some photos take at different angles:



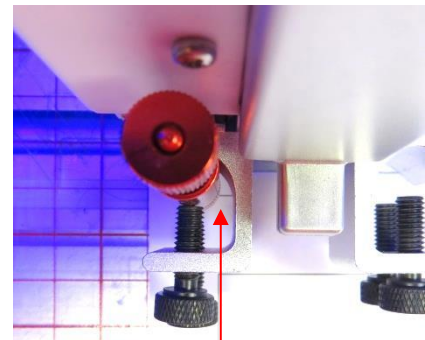
Close up from the left side



Close up from the right side



Close up face on to the front screw. Note how the vertical line of the reg mark is centered with the screw.



Close up take from above the blade holder. Note how the horizontal line of the reg mark is centered with the middle of the blade holder.

- (3) Once you have the blade tip approximately over the corner, click on **Continue**. The camera will then move into place and send an image. On your computer (or smart device) screen, click on the corner of the reg mark and the red “+” will jump to that location. Then use either the on-screen buttons or the arrow keys on your keyboard to perfectly align the center of the red “+” with the corner of the reg mark:



- (4) Once the red “+” is centered as shown in the far-right screenshot, then click on **Next**. The head will move to the next reg mark and the process is repeated. You do not necessarily have to check that the blade tip is over the second and third marks before having those images sent. It should be very close.

- (5) If you cannot see the corner of a reg mark in any of the projected camera images, note which direction the camera needs to move and then click on **Prev** at the bottom. In the following example, which occurred at the top right registration mark, you can tell that the camera needs to move down, as only the top line of the reg mark is visible:



- (6) After clicking on **Prev**, you will be taken back to the prior screen. Move only one or two increments in the directions needed and click on **Next**. It doesn't take very many clicks to move a significant distance relative to the size of the magnified image projected by the camera. For example, in this case above, only one click of the down arrow resulted in the needed change:

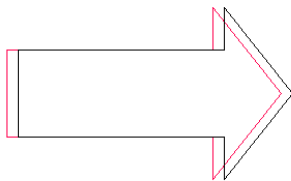


- (7) The reg mark is now clearly seen and the red "+" can be moved to the corner of that reg mark. Once aligned, click on **Next**.
- (8) Once you've completed all three, the head will return home to correct the blade direction and then will proceed to cut out the shapes.

11.03.5 Adjusting the X and Y Camera Offsets

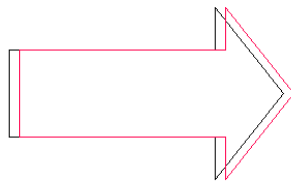
- (1) After the print and cut is completed, examine how the cut lines were made relative to the printed lines. If the offset is large enough, use a metric ruler to measure. If the offset is very small, then just estimating will be fine as you refine your calibration.
- (2) In the following diagram, the red lines represent the cut lines and the black lines represent the printed lines. Use this diagram to determine whether your **Offset** values need to be raised or lowered:

If the **red cut line** is left of the black print line, then increase the value of X.



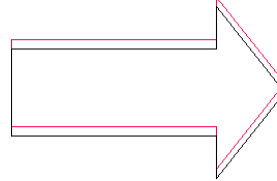
Red cut line is 1mm left of the black line: increase X from 21.5 to 22.5

If the **red cut line** is right of the black print line, then decrease the value of X.



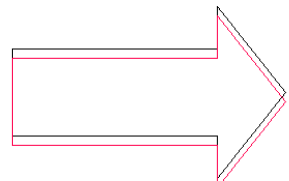
Red cut line is 1mm right of the black line: decrease X from 21.5 to 20.5

If the **red cut line** is above the black print line, then increase the value of Y.



Red cut line is above the black line: increase Y from 6.0 to 7.0

If the **red cut line** is below the black print line, then decrease the value of Y.



Red cut line is below the black line: decrease Y from 6.0 to 5.0

- (3) Go back to the calibration window (**Cutter>Print + Cut>Calibrate Camera**). Modify the **X** and **Y Camera Offset** settings. Again, switch to mm before entering new numbers. Start with at least 1 mm adjustments (like shown above). Click on **Apply Changes** before leaving this window.
- (4) It's a good idea to keep track of prior values so that you'll know which direction to change for subsequent calibration tests. Remember that you should expect to get perfect results, so keep adjusting those **X** and **Y** values until you get there. After adjusting by 1 mm, you should then adjust by 0.5 mm. Then even smaller. Once you are adjusting by 0.1 mm, you should be able to achieve the optimum settings. If you are still off by "just a hair" in one direction or the other, then adjust by a final 0.05 mm.
- (5) During the testing, you may find that one side is aligned but the other is not. For example, the cut line may be perfectly aligned with the print line on the lower side of the arrow but a little above the arrow along the upper side. Adjust the calibration based on the side that is off.
- (6) If you find that one or two arrows are perfect but the others are off:
 - ◇ Check the **CS** and **US** settings. Too high of a speed can cause inaccuracies.
 - ◇ Make sure the pinch wheels are still centered under the grey rectangles.
 - ◇ Make sure the bottom of the mat, the pinch wheels, and the grit shafts are clean.
 - ◇ Make sure nothing is interfering with the smooth traveling of the mat. This can include mat guides and support boxes in the back of the cutter.
 - ◇ Make sure the blade isn't cutting too deeply into the mat. Lower the **CD**, if necessary.
 - ◇ **IMPORTANT!** Once you have your calibration completed, **write down** these final **X** and **Y offsets!** Some of the software updates can cause the calibration numbers to reset to default values. It will save you time and frustration to have these numbers recorded so that you can quickly reenter them without repeating the calibration process.

11.04 Preparing an Actual Print and Cut Application

Video

- Here are the typical steps when preparing a PNC application:
 - ◇ Prepare the image that will be printed which can be either or both of the following:
 - An imported raster image such as a JPG or PNG which will need tracing (refer to *Section 7.03*)
 - A vector image (either imported or designed in SCAL) that will be printed but not cut
 - ◇ Make sure shapes that will only be printed are on a different layer than the shapes that will be cut.
 - ◇ Select each layer and then open the **Style Panel** (refer to *Section 10.01*). Under **Cut Line Type** choose:
 - **Print+Cut Cut:** for the layers that will be cut
 - **Print+Cut Print:** for the layers that will be printed
 - ◇ Print the project, making sure to mark the option to **Print registration marks**.
 - ◇ If needed, perform a test cut so that you know the best settings to use. This test cut can often be performed on the printout itself if there is room in waste area of the project.
 - ◇ Set the origin with the blade tip over the lower right registration mark.
 - ◇ Perform the cutting process, selecting **Print+Cut** from the **Cut Settings** window and following the instructions.

11.05 Automatic PNC

- Before using the **Auto Detection** option, please complete the following requirements:

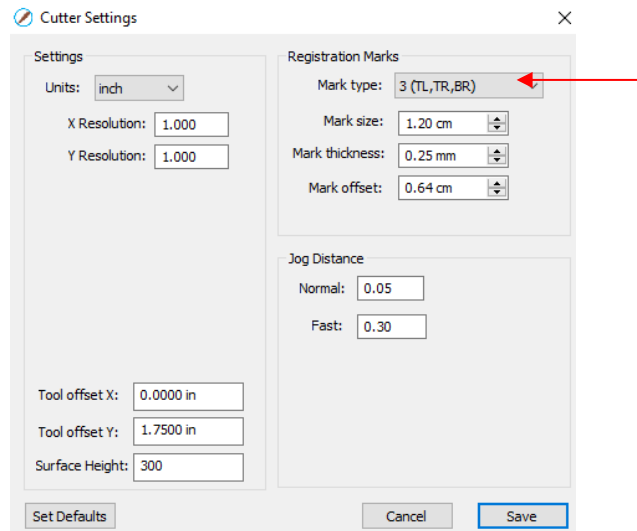
- ◇ Read and complete the steps in *Sections 11.03*. The manual calibration for the camera needs to be completed before attempting to do automatic PNC applications.
- ◇ Record your camera calibration settings! It is very common for those settings to resort to defaults during software updates and if you use other cutters with SCAL.
- ◇ Make sure you have updated SCAL to version 4.068 or later.
- ◇ Make sure you have updated C3 to version 0.5.57 or later.

- (1) Due to a current bug, you need to change the Camera offset values in C3 before using Auto PNC in SCAL. Open C3 and click on the **Settings** tab. In the **Basic settings** window, change the **Units** to **Inches**. Then click on **Apply Changes**:

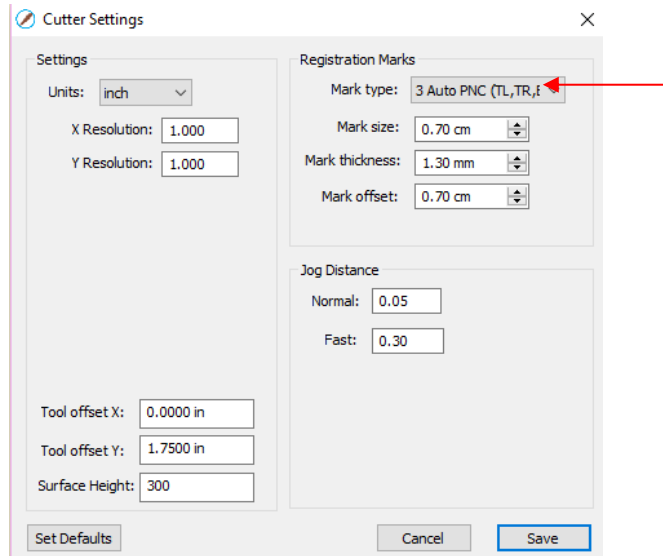
- (2) Click on **Machine settings** and please record your current camera offsets in case an update to the bug issue is resolved. Then change the **X offset for electronic eye** to 0.837 and **Y offset for electronic eye** to 0.224 as shown below, even though these are not your camera offsets. Then click on **Apply changes**.

- (3) In SCAL, to switch back and forth between Manual and Auto PNC, change the **Mark type** under **Cutter>Cutter Settings**. Then click on **Save**.

Manual PNC

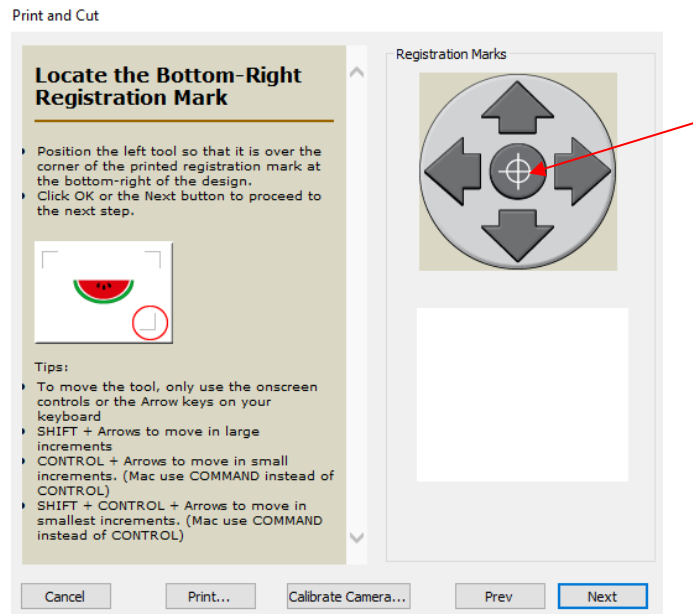


Auto PNC

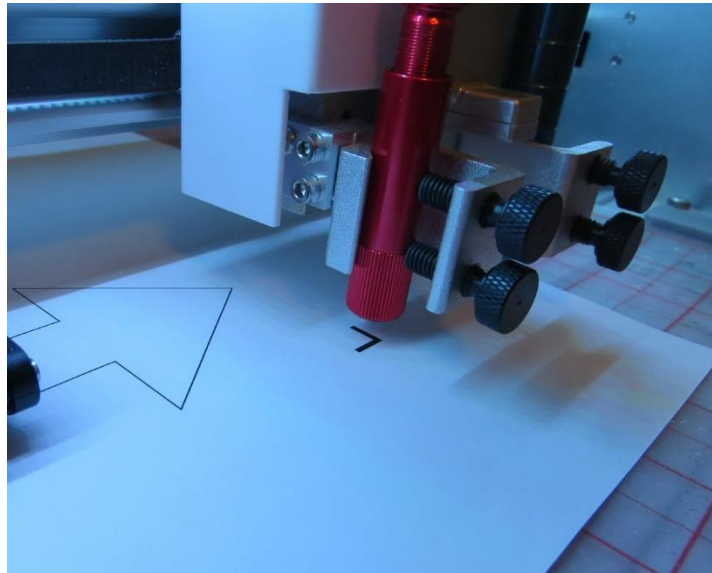


- Note: the reg mark thickness and size adjust to create smaller thicker marks for Auto PNC. It is recommended that you use the sizing that is set, because the camera's ability to auto-detect the marks is somewhat sensitive.

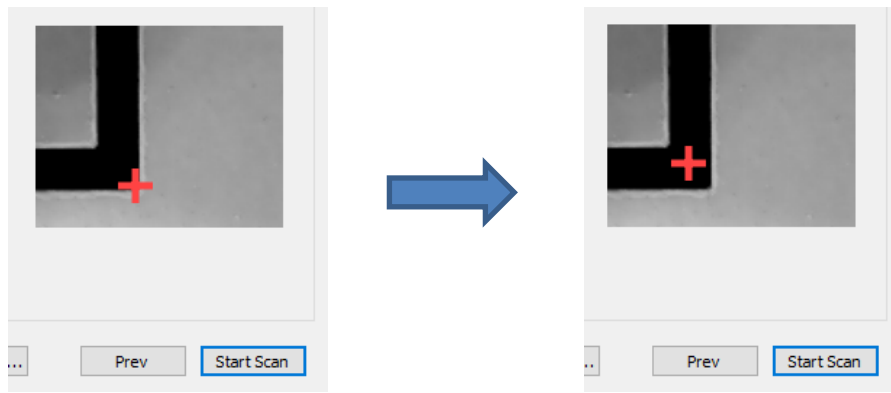
- (4) Create a test file, such as the four arrows... or anything you want to try out.
- (5) Go to the **Cut Settings** window, make any necessary adjustments to CD, CS, etc. Then click on **Print + Cut**.
- (6) Click on **Print** and print your test file with reg marks.
- (7) Click on **Calibrate Camera**. Verify that your camera calibration numbers match what you have written in your notes. Usually an update will reset them to the default numbers. Click on **Save**.
- (8) Click on **Next** and the head should move to the left. You should see the following. Note the white target in the middle of the four arrows.



- (9) You can now click on the arrows or use the arrows on your keyboard to move the blade holder so that it is approximately over the **lower right reg mark** (not the upper left which is used with manual PNC):



- (10) Click on **Next** and the camera will project an image so that you can see the reg mark. Click approximately in the middle of the reg mark and then click on **Start Scan**:

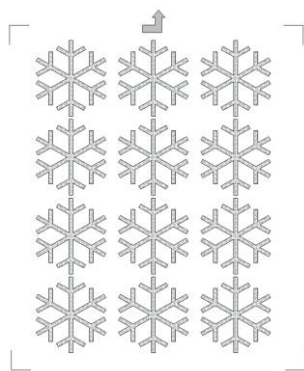


(11) The camera will now identify the lower mark, then the upper right mark, and finally the upper left mark and then cut out the shapes.

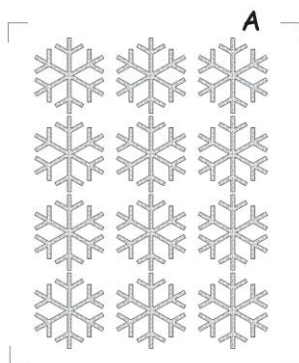
11.06 Print and Cut Tips

- When tracing imported images, the trace lines will not necessarily be perfectly aligned with the image. This can result in tiny bits of white appearing in certain spots, suggesting the PNC wasn't accurate. Zoom in close on the image so that you can see the trace line following the outline of the image. Look at the same spots where the cut didn't follow the image perfectly. This could be the cause of the inaccurate PNC. There are three ways of handling this situation:
 - ◇ Retrace the imported image, using a lower **Contrast** and/or **Smooth** setting to get a tighter fit of the trace line to the original graphic (refer to *Section 7.03*).
 - ◇ Use **Path Editing** to move the trace lines to more closely fit the original graphic (refer to *Section 8.10.2*).
 - ◇ Create an inset line to use for cutting instead of the original trace line (refer to *Section 8.05*).
- If a PNC is not precise and the cause is not the alignment of the trace lines, then check the settings you're using. Cutting too deeply into the cutting mat can cause a certain amount of drag on the mat, leading to errors, especially in applications with many shapes to cut. Also, make sure the pinch wheels, underside of the cutting mat, and the grit shafts are clean and free of any adhesive.
- If you wish to use **Landscape** mode for your print and cut applications, then change the **Orientation** on the **Document Panel** and under **File>Print Setup to Landscape** and orient the printout the correct way on the cutting mat. There is no need to modify the camera calibrations. Currently, however, Landscape mode does NOT work for PNC on the Force.
- Faster **Cut and Up Speeds** can be used when cutting thinner materials. For example, you should be able to use 30 and 30 with simple designs on thin paper. For regular cardstock, you might be able to use 25 and 25. For thicker cardstock, stick with 20 and 20. It also depends on the design. Very precise cutting around a printed image will need slower speeds than a large contour cut, such as the tag around the cow shown in *Section 17.01*. On the other hand, if the mat is moving numerous times, in and out of the cutter, a slight shifting can occur, especially at higher speeds. So, print and cuts with lots of images will need slower **Cut and Up Speeds**.
- If you are using PNC in your business and need faster cutting, Francisco Ulloa developed a method whereby he aligns the mat with the right-side endcap on the Force and designs his files so that all shapes cut counter-clockwise. This causes the skewing force on the mat to be countered by the presence of the endcap, keeping the mat straight. He has been able to use maximum **CS** for many of his PNC applications. Thank you, Francisco! (Note: To change the path direction on an SVG file in C3, refer to *Section 2.02.10*. To change the path direction within the original design program, refer to *Sections 4.02.1-4.02.5* and the *Quick Guide* table in *Section 4.04.3*).
- Remember that the calibration of the Offset is specific to the particular blade holder and blade type being used. Thus, if you change, the calibration should be checked and tweaked, as needed.

- If you have a symmetrical shape and or symmetrical layout for your PNC project, make sure it will be obvious how to place the printout onto the cutting mat. You might want to add some kind of identifier, such as a small arrow or a letter “A” before printing, so that you know which side goes up. For example:



or



12. KNK Force: Dual Head Applications

12.01 What Dual Heads Mean

- One of the best features of the KNK Force is the ability to use two tools at one time. Because the blade holder seats on the Force are fully adjustable, one can insert a wide range of pens, markers, embossers and other tools. However, any two tools will not necessarily be in the same positions relative to one another. For example, if you were to insert a pen along with the blade holder for a “draw and cut” application, you might end up with this:



Outside cut circle is
NOT aligned with pen
drawn circle

- Fortunately, an easy calibration procedure will ensure that the two tools will be properly aligned for the project you wish to do. Thus, after a quick calibration, your resulting project will look like this:

Outside cut circle is
aligned with pen
drawn circle



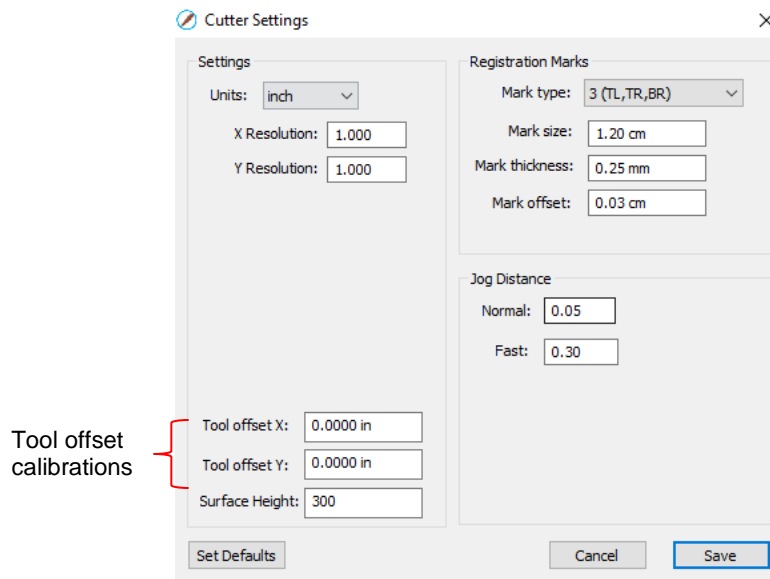
- The tools covered in this chapter include the Force embosser, engraver, punch, and also the use of markers and pens. For instructions on using the Force rotary tool, refer to *Chapter 13*.

12.02 Calibrating Two Tools for Alignment

- The calibration process involves having two tools, which have been inserted into the Force, “draw” a calibration shape. Note that you’ll have a different calibration for every combination of tools. For example, a calibration for two pens will be different from a calibration for a blade holder and a pen. And that calibration will be different from that of a blade holder and an embosser. Therefore, record every calibration you perform for future reference. That way the numbers for the calibration can simply be typed into SCAL when the time comes to utilize that combination of two tools.

12.02.1 Locating the Dual Head Calibration

- The tool offset calibrations are located in the **Cutter Settings** window which can be accessed in either of two ways:
 - ◇ Go to **Cutter>Cutter Settings**
 - ◇ Within the **Cut Settings** window, click on **Settings**
- The following window opens:



- If you have two tools already calibrated in C3, then reverse the signs and enter the same values in SCAL. For example:

In C3, the blade holder (left side) and embosser (right side) were calibrated to have the following offsets, entered under **Settings>Machine Settings**:

X offset for second tool	Y offset for second tool
-0.07	0.08

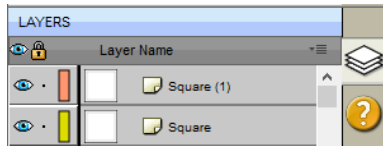
These same values would be entered this way in SCAL, but with a change in the signs. A negative number is changed to a positive and a positive number is changed to a negative:

Enter the same values but with a change in the signs.

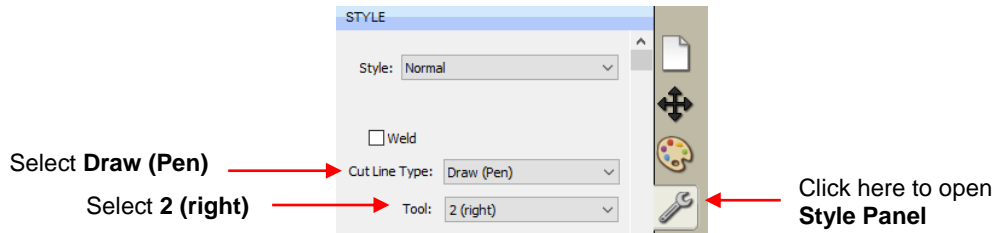
IMPORTANT: If you have the units set to cm or mm in C3 then, when entering the calibrations into the SCAL window above, you must add the units so that SCAL will convert to inches for you. For example, if the **Units** setting in C3 is mm and your X offset calibration is 1.35, then you would enter: -1.35 mm

12.02.2 Setting Up a Dual Head File

- Normally, one would have the blade holder loaded on the left side and the alternate tool on the right. For this reason, the right-side tool will usually be assigned as a **Pen** because pens, markers, embossers, engravers, etc. do not have a blade offset. This is how the following example is set up.
- A simple shape with vertical and horizontal lines works best for calibrating two tools. In this example, the square from the **Basic Shapes** folder in the **Library** will be used.
- After adding the shape to the **Cutting Mat**, increase the size to about 2" x 2" (~50 mm x 50 mm).
- Select it and duplicate it using **Ctrl+C** and **Ctrl+Shift+V** (or **Edit>Copy** and **Edit>Paste in Place**). This will ensure the duplicate is directly aligned with the original.
- You should now only see one square on the **Cutting Mat** but see two different layers on the **Layer Bar**:



- The next step is to assign one of the layers to the right side. Select either layer and then open the **Style Panel**. Change **Cut Line Type to Draw (Pen)** and change **Tool to 2 (right)**:



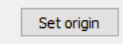
12.02.3 Entering Settings

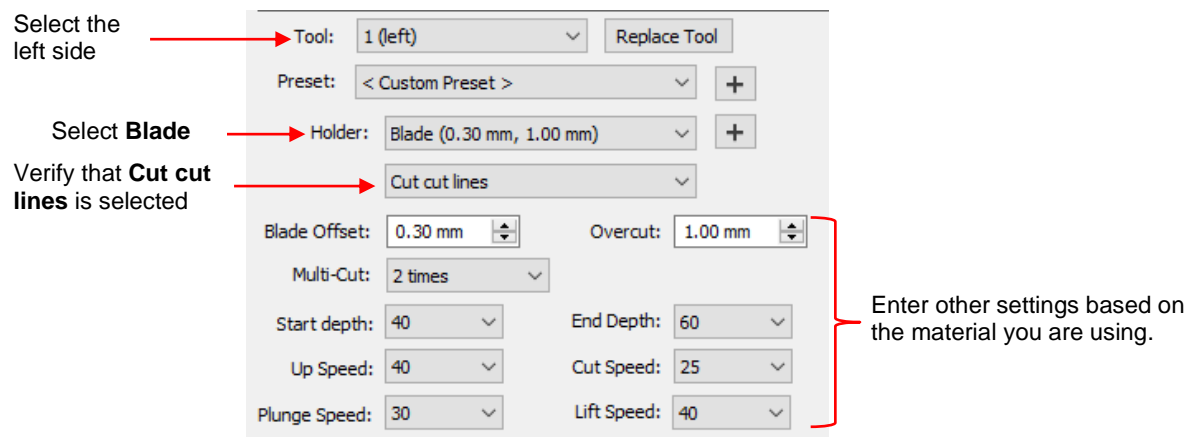
- Go to the **Cut Settings** window and change the **Cut Mode to WYSIWYG**:



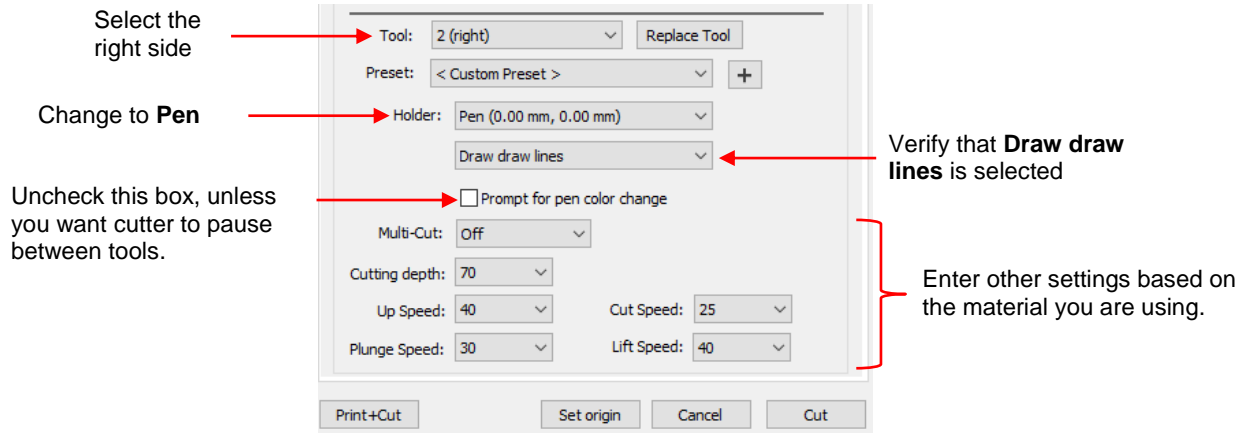
- Load the tools into both sides of the Force. Select one of the sides and then click on **Replace Tool**. Follow the instructions that appear. Then repeat for the other side.



- Click on **Set Origin**  and set the origin based on the tip of the left side tool.
- Under **Tool**, select **1 (left)** and then enter the settings you wish to use for the left side:

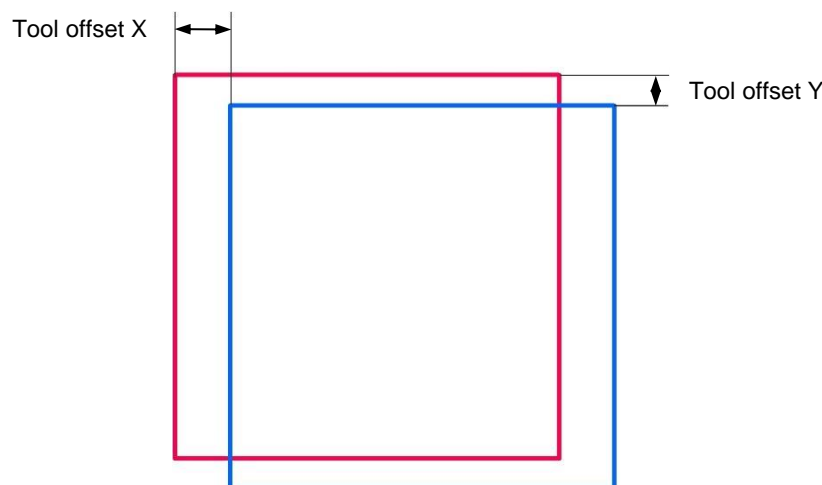


- Under **Tool**, select **2 (right)** and then enter the settings you wish to use for the right side:



12.02.4 Adjusting the Tool Offset Values

- Click on **Cut** and the Force will perform the dual head procedure.
- For a perfect calibration, the two squares should be perfectly aligned. To adjust the X and Y tool offsets, measure the left/right difference and the up/down difference:



- Go to **Cutter>Cutter Settings**. Use the following guidelines to change the values of **Tool offset X** and **Tool offset Y**:
 - ◇ If right tool is drawing too far left, increase **X** OR If right tool is drawing too far right, decrease **X**
 - ◇ If right tool is drawing too high, increase **Y** OR If right tool is drawing too low, decrease **Y**

Also, remember that:

- ◇ Increasing a negative number makes it less negative (e.g. from -1.5 to -1.4)
- ◇ Decreasing a negative number makes it more negative (e.g. from -0.8 to -0.9)
- Repeat the calibration test to make sure the two tools are in alignment. You might need to repeat once or twice more, until the results are perfect.

12.03 General Guidelines When Using Accessory Tools

- The Force accessory tools include the following: embosser, engraver, and piercer (aka punch tool). These guidelines also apply to other accessories, such as miscellaneous pens, markers, glue pens and other brands of tools that will fit into the Force. The Force rotary tool is covered in *Chapter 13*.
- Because the tips of these accessory tools are vertically centered with the shafts, the **Blade Offset** is always set to 0.
- It is a good practice to keep the pinch wheels away from where accessory tools will be applied. This provides a more even surface and keeps the wheels from smearing ink or glue when using those types of items. Thus, keep the outside pinch wheels on the outside edges of the cutting mat and keep the middle wheel in the up position. Alternatively, you can move the left pinch wheel to the far-left side, leave the right pinch wheel under the far-right rectangle, and then move the middle pinch wheel to the leftmost rectangle position to secure the left side of the mat.
- The table at the end of this chapter contains suggested settings for your initial testing. Remember that other factors can affect results, such as a different brand of paper, a different type of surface under the material, a different brand of pen or marker, etc. Always do tests first!
- When you discover your own best settings, be sure to record them in the blank form available later in this chapter.

12.04 Drawing with a Pen or Glue Pen

Ideas!

Demo: [Video](#)

- Most pens, markers, glue pens, etc. can be directly inserted into the blade holder seat on the Force. It's not necessary to tighten both screws as long as one of them can lock onto a flat vertical surface on the tool.
- For glue pens and ball point pens, it's best to prime them (scribble on scrap paper) shortly before mounting so that the ink or glue is ready to flow. Another option is to have a separate layer with a test shape that will be drawn before the project. That shape can be positioned to draw on a scrap outside of the main material you're using for the project.
- In the suggested settings at the end of this chapter, take note of the very low setting for an ultra-fine tip Sharpie. It is very easy to bend these tips if the **CD/ED** is set too high. So, start with a very low setting and plan to draw a small test shape to see if the results will be satisfactory. Slower speeds also help yield more consistent results with markers.
- As with most other accessory tools, set the Z origin using the top of the material. To avoid marking your project material, a scrap of the material, placed elsewhere on the mat, can be used for this purpose.
- For lettering, using single line / open path fonts work well, as they do not require a fill. Refer to *Section 6.11*.
- If you do want to "color in" your shapes, use the **Line Fill** function presented in *Section 10.09*.

12.05 Embossing and Scoring

Embossing: [Ideas!](#)

Scoring: [Ideas!](#)

Embossing Aluminum: [Video](#)

- The [Force Embossing Tool](#) has two ends. One end is slightly smaller than the other and useful when scoring paper or cardstock for foldup projects. The larger end is more suitable when embossing paper or cardstock for decorative purposes.
- When scoring, the surface beneath the paper or cardstock can be the mat itself. Note that if your score lines are not "deep" on the reverse side then fold ALL score lines forward first. Flip over the project and you

will be able to then fold any score lines in the opposite direction easily. This works really well with popup cards.

- For embossing, you will want something soft beneath the material which permits a deeper depression when pressed with an embossing tool. The material often chosen is a smooth [non-slip shelf liner](#). Other choices include craft foam, rhinestone rubber, a thick fabric, and felt. These materials can be pressed to the mat itself and taped, as needed. The paper or cardstock is then taped to the top of the cushioned material.
- If you are planning to emboss and cut using the dual head function on the Force, you will need to use a surface material suitable for cutting so that it can have a repositionable adhesive applied. In this case, the shelf liner would work best.
- As with other accessory tools, set the Z origin based on the top of the material.
- Embossing outlines works much better than attempting to fill in shapes which can lead to warping of the material. Creating a few outlines, which are very close together, can provide a thicker look to the embossing.
- You can also use other brands of embossers, however make sure they can be gripped in a flat location by the front screws on the Force. If needed, you can mount only using one of the two screws.
- In general, you will need a slightly higher **ED** and more passes with a larger ball tip than with a smaller ball tip.
- Using aggressive settings when scoring can cause the cutting mat to skew, resulting in cut lines no longer properly aligned with the score lines. Here are several suggestions for correcting this problem:
 - ◇ Reduce the **CD/ED** setting and increase **Multi-cut**.
 - ◇ Add mat guides to stabilize the cutting mat. Refer to *Appendix D3*. (Personally, I find using just one mat guide on the right side works better than using both.)
 - ◇ Change the **Path Direction** on score lines. Refer to *Section 10.08*.

12.06 Engraving

More Info **Ideas!**

- The [Force Engraving Tool](#) can be used for thin line (aka scratch) engraving on surfaces such as metals, vellum, scratchboard, and acrylic. For deeper and/or thicker engraving, consider purchasing the KNK Force Rotary Tool.
- You can engrave on materials that cannot be cut on the KNK Force, such as jewelry charms, dog tags, and trophy plates.
 - ◇ You will need to use an alignment method to make sure the engraving is positioned perfectly on the pre-cut item.
 - ◇ One method is to cut an opening from chipboard that is the same shape as the item to be engraved. This will help stabilize the shape for engraving. Note the origin used, before the cut, so that the same origin can be used for the engraving.
 - ◇ Another method is to draw the same shape onto a piece of cardstock and then align and tape the item to be engraved onto that shape. Again, you will need to note the origin used to make sure the alignment is perfect.
- The material being engraved needs to be taped securely (even if a chipboard template has been cut) and the Z origin set based on the top of the material.
- For designing fill patterns for engraving, refer to *Section 10.09*.

12.07 Using the Punch Tool

Ideas!

- The [Force Punch/Piercing Tool](#) can be used for creating decorative designs (such as pergamano and other parchment arts) or for creating small holes for paper embroidery.
- To protect the mat and the thin punch, it is recommended that a thick soft material be used as a cushion between the paper/cardstock and the cutting mat. Suggested materials that work well include [non-slip shelf liner](#), craft foam, and rhinestone rubber. Press the soft material to the mat and place tape on the outside edges to protect it. Also, use a low **Plunge Speed** (20 or lower) to help protect the delicate tip
- If you are planning to punch and cut using the dual head function on the Force, you will need to use a surface material suitable for cutting so that it can have a repositionable adhesive applied. In this case, the shelf liner would work best.
- Unlike with the other accessory tools, set the Z origin based on the top of the soft surface versus the top of the material being punched.
- To design a punch pattern, refer to *Section 10.10*.

Settings Form for Force Accessory Tools¹

Application: Drawing, Embossing, Debossing, Scoring, Engraving, Punching, etc.

Tool: Pen, Glue Pen, Embosser/small end; Embosser/large end; Engraver, Piercer, etc

Surface: Mat, Foam over mat, Shelf liner over mat, etc.

Settings: P – Passes; SD – Start Depth; CD/ED: Cut Depth/End Depth; CS – Cut Speed; PS – Plunge Speed

[illegible]

Suggested Settings for Various Force Accessories¹

Settings: P – Passes; SD – Start Depth; CD/ED: Cut Depth/End Depth; CS – Cut Speed; PS – Plunge Speed

<u>Material</u>	<u>Application</u>	<u>Tool</u>	<u>Surface</u>	<u>P</u>	<u>SD</u>	<u>CD/ED</u>	<u>CS</u>	<u>PS</u>	<u>Other Comments</u>
Paper	Drawing	Test Pen	Mat	1		35	25	40	
Cardstock	Drawing	Sharpie: ultra fine tip	Mat	1		1 - 5	20	15	Use a low PS to protect delicate tip; do tests at low CD and work upwards
Cardstock - Neenah 65lb	Scoring	Embossing - small end	Mat	3		95	25	40	
Cardstock - Neenah 80lb	Scoring	Embossing - small end	Mat	2		100	25	40	
Cardstock - WorldWin CutMates	Scoring	Embossing - large end	Duck Shelf Liner	2		70	25	30	Don't use middle pinch wheel; keep wheels away.
Coated Cover: 18 pt Tango	Scoring	Uniball Signo Pen	Mat	2	40	80	20	20	Reversed directions on half of score lines for a box
Cardstock - C&C Mirror Board: 250 gm	Debossing	Embossing - small end	Mat	1		40-60	20	30	C&C: Create & Craft; sold in UK
Cardstock - C&C Pearlescent Bright Burst: 250 gsm	Debossing	Embossing - small end	Mat	1		80	20	30	C&C: Create & Craft; sold in UK
Cardstock - First Edition: 216 gm	Debossing	Embossing - small end	Mat	1		80	20	40	C&C: Create & Craft; sold in UK
Cardstock - Darice Coordinates	Embossing	Embossing - small end	Mat	2		95	25	40	
Cardstock - Neenah 65lb	Embossing	Embossing - large end	Duck Shelf Liner	3		110	35	40	Don't use middle pinch wheel; keep wheels away.
Cardstock - Neenah 80lb	Embossing	Embossing - large end	Duck Shelf Liner	3		115	35	40	Don't use middle pinch wheel; keep wheels away.
Acrylic - Plaskolite	Engraving	Engraver	Mat	2	20	35	25	40	0.05" Plaskolite from Home Depot
Aluminum	Engraving	Engraver	Mat	4		40	30	40	PS and LS = 20
Mirror	Engraving	Red Blade	Mat	1		5	15	7	Tape securely to the mat
Cardstock - Neenah 65lb	Punching	Piercer	Duck Shelf Liner	2		115	20	25	
Vellum - Heavy	Punching	Piercer	Duck Shelf Liner	2		100	20	25	
Cardstock	Stippling	Cuttlelola	Mat	1		1	10-25	30	Use different speeds to control fill pattern

¹ © 2015, 2016, 2017, 2018 Accugraphic Sales, Inc., All Rights Reserved

13. KNK Force: Rotary Tool

Much Different Tool!

Much Different Approach!

The following is a MUST READ!

- **Safety First!** Please read *Section 13.01* before using the rotary tool.
- Unlike with the blade holder, there is no spring which offsets the downward movement of the rotary tool. Thus, the tool will reach the **Cutting Depth / End Depth** entered. The number of **Passes** needed will depend on the thickness and density of the material.
- Start with engraving for practice. There is less risk of breaking a bit or damaging the cutter.
- Be conservative in your approach. Use slow **Speeds** (all four), as recommended, and more **Passes** versus fewer.
- The general approach to cutting involves these steps:
 - (1) Measure the thickness of the material to be cut (*Section 13.04.1*).
 - (2) Enter the thickness and **Surface Height** into the [Rotary Tool Online Calculator](#) to obtain a **Cutting Depth / End Depth** for testing (*Section 13.04.2* and *13.04.3*).
 - (3) Perform the **Pen Test** (*Section 13.05*). Repeat until the correct **Cutting Depth / End Depth** is determined.
 - (4) Select an appropriate cutting bit for the rotary tool and mount the rotary tool in the Force (*Section 13.06* and *Section 13.07*).
 - (5) Enter all settings (*Section 13.03*).
 - (6) Review the **Important Checklist** (*Section 13.09.2*) before cutting.



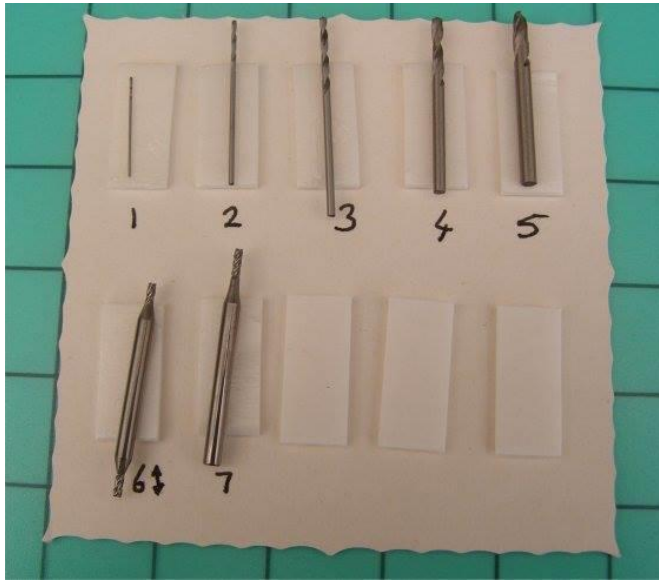
13.01 Important Safety and Operating Considerations

- Accugraphic Sales, Inc. will not assume any liability for personal injury that might occur due to the use of the rotary tool. Thus, all users take full responsibility in regards to personal safety.
- The rotary tool should only be operated by an adult.
- Safety glasses should be worn at all times, while operating the rotary tool.
- Keep hands, hair, loose clothing, jewelry, etc. away from moving parts.
- Do not leave the rotary tool unattended when in use. Materials can become extremely hot during cutting and are subject to burning! If a material begins to smoke, immediately turn off the rotary tool and the Force!
- Always turn off the rotary tool when not in use, to avoid a “false” or accidental start.
- Always disconnect the power cord from the power adapter before making any adjustments or attaching any accessories.
- Accessories must be rated for at least the speed recommended on the tool’s warning label. Wheels and other accessories running over the rated speed can fly apart and cause injury.
- Unplug the rotary tool when changing out bits. Make sure the collet nut is tightly attached.
- Do not immediately touch the rotary bit or collet after turning off the rotary tool. They both need sufficient time to cool down
- There is a vacuum attachment on the rotary adaptor. This attachment should work with most vacuum hoses if you wish to remove the debris while operating the tool. (Note: at the time of this writing, the vacuum attachment has not yet shipped.)
- Avoid bumping the Force or the mat while the rotary tool is in use. This can cause defects or even breakages in the final product.
- Keep the pinch wheels clean. An accumulation of dust or fine shavings can prevent proper gripping of the mat and will result in a distortion of the cut.
- Please read all of the instructions carefully. Do not “push the limits” with this tool!
- To protect the bits, it’s especially important to use correct settings. It is very easy to break the thinner drill bits without following proper precautions!
- Use the correct types of bits for the application. For example, the bits used for drilling holes should not be used for engraving or cutting. Refer to *Section 13.02*.
- Replace bits once they become blunt or dull. Return to conservative settings when testing new bits.
- Again... Always keep body parts clear of the rotary bit. The KNK Force is capable of quick and sudden movements. Coming into contact with the spinning rotary bit can cause serious injury.

13.02 Contents in the Rotary Tool Kit

- The [KNK Force rotary tool kit](#) consists of the following items:
 - ◇ Rotary tool with collet nut
 - ◇ Power cord and AC/DC adaptor
 - ◇ Adaptor for attaching to the KNK Force
 - ◇ 5 drill bits
 - ◇ 1 1/16” X 1/4” cutting end mill
 - ◇ 1 1/16” x 1/8” cutting & engraving end mill
 - ◇ 6 brass collets (one is on the shaft)
 - ◇ Allen wrench

- The included bits may vary. The following photo shows a typical kit with an explanation of how the bits should be used:



1, 2: These two thin and fragile bits are included for working with PCBs (drilling tiny holes for housing components). Do not use them with thick dense materials.

3, 4, 5: Use these for drilling holes.

6, 7: Use these for engraving and cutting.

- The following links shows different kinds of bits that can be used in rotary tools and appropriate applications for those bits:

<http://woodcarvingillustrated.com/blog/choosing-power-carving-bits/>

<http://krcims.com/wp-content/uploads/2014/03/2012AccessoryPoster.jpg>

13.03 Settings for the Rotary Tool

- Before getting started on the details, here is a demo video of a rotary tool project from start to finish. This will provide you an overview of what is involved when using the rotary tool: [Video](#)
- IMPORTANT!** Be conservative with settings:
 - ◇ Use slower speeds as recommended in the table which follows.
 - ◇ Use multiple Passes, thus allowing the tool to work its way through the material. Set the **SD** by dividing the **ED** by the number of **Passes**.
 - ◇ When performing the initial test, examine the results and, if you need to increase **CD/ED**, do so in conservative increments.
- The following table is a summary of the settings used for the Force rotary tool. This is for your convenience and should not preclude you from reviewing *Section 2.03* for details regarding each setting.

Setting	<u>Section to Read</u>	<u>Description</u>	<u>Typical Range for Rotary Tool Use</u>
Cutter>My Cutter>KNK Force			
Tool	2.03.1	Since the adaptor for the rotary tool only works on the left side, the Tool should be set to the left	1 (left)
Multi-cut (aka Passes), P	2.03.2	Number of repeats to perform on a shape before moving to next shape	1-20; usually 2 - 8
Start depth, SD	2.03.4	The target depth for the first pass	Ending Depth divided by Passes
Cutting depth / End depth, CD/ED	2.03.3	Maximum depth tool will travel in Z direction before going no further	Use online calculator
Cut speed, CS	2.03.6	How fast the tool travels while in the down position	1-10
Up speed, US	2.03.5	How fast the tool travels in the up position, moving from one location to another to begin cutting	10-15
Plunge speed, PS	2.03.7	How fast the tool drops from the up position to the down position	5-10
Lift speed, LS	2.03.8	How fast the tool rises from the down position to the up position	10-15
Blade offset, BO	2.03.9	A rotary tool has an offset of 0 because the tip is centered with the center of the shaft	0
Overcut	2.03.10	A rotary tool doesn't need overcut because the tip is centered with the center of the shaft	0
Cutter>Cutter Settings			
Surface Height, SH	13.04.2	The location where the head will drop for setting the Z origin (may need to be lowered for thicker materials)	use final value in online calculator

13.04 Determining Settings for Cutting a New Material

The following subsections present a recommended method for determining the best settings for cutting. While you may be tempted to use a “trial and error” process, this can lead to damaging the Force if the bit ends up going too deep and gouging the cutter!

13.04.1 Measure the Thickness of the Material

- Manufacturers will often round up the actual thickness of a material and report that higher number on the packaging or even in the specs. Thus, it's important to determine the true thickness as accurately as possible.
 - ◇ You can measure the material in mm or in inches. The online calculator is set up for either.
 - ◇ If you own a caliper, then measure in several locations and then plan to enter an average value into the online calculator.
 - ◇ If you do not own a caliper, then measure to the best of your ability using a ruler with small increments.
- Don't fret if you feel the measurement isn't precise. The **PenTest** presented in *Section 13.05* will help you adjust the **CD/ED** setting so that you won't cut through the mat.

13.04.2 Surface Height

- The **Surface Height (SH)** is a specific location where the head will drop for setting the **Z Origin**.

- The default for **Surface Height** is 300 but that value can be changed to any whole number between 0 and 670. With a setting of 0, the head is at its highest location along the Z axis; with a setting of 670, the head is at its lowest.
- With the existing Force accessories, it's unlikely that a **Surface Height** larger than 300 would ever be needed. However, if inserting materials thicker than ~ 0.075" (1.9 mm), the **Surface Height** will need to be decreased. The online calculator will indicate when this is needed by showing "*Fail*" as the test result.
- If a change in **Surface Height** is required for the calculator test to pass, go to **Cutter>Cutter Settings** and change the **Surface Height** to the new value and click on **Save**:

The image shows two side-by-side screenshots of a software dialog box, connected by a blue arrow pointing from left to right. The dialog box has a light gray background and contains three input fields: 'Tool offset X:' with the value '0.0699 in', 'Tool offset Y:' with the value '-0.0778 in', and 'Surface Height:' with the value '300'. Below these fields are three buttons: 'Set Defaults', 'Cancel', and 'Save'. In the right-hand screenshot, the 'Surface Height' value has been changed to '200'.

- **IMPORTANT:** Make a note to change the **Surface Height** back to 300 before using your blade holder again for regular cutting. The settings in the Chapter 2 tables and your own recorded settings are based on an **SH** of 300.

13.04.3 CD/ED Calculator

- The online calculator is available here:
<http://www.iloveknk.com/wp-content/uploads/2016/04/Force-RotaryTool-Calculator.htm>
- A few things to note about using the calculator:
 - ◇ Read the instructions starting at the bottom half of the table. You only have to enter two numbers: the **Surface Height** setting (found under **Cutter>Cutter Settings**) and the thickness of the material based on your measurement. Then click on **Update** at the bottom.
 - ◇ If you need to lower the **Surface Height**, try 200 first and then continue dropping by 50 until the calculator indicates "*Pass*".
 - ◇ Write down both the **Calculated ED** and the **Recommended ED** values, as well as the **Surface Height** needed to pass both tests. Remember to change the **Surface Height** in SCAL to match (**Cutter>Cutter Settings**).

Calculation of Ending Depth for Force Rotary Tool Use

Note: Use either the left side or the right side, based on units of measurement for the **Material Thickness**. The units you've selected in C3 does not affect the outcome.

Then carefully follow the instructions at the bottom of the screen.

Use left side for mm;
right side for inches

Material is measured in mm		Material is measured in inches	
Surface Height	<input type="text" value="100"/>	Surface Height	<input type="text" value="100"/>
Material Thickness, mm	<input type="text" value="3.18"/>	Material Thickness, inches	<input type="text" value="0.03"/>
Calculated Ending Depth, ED	356	Calculated Ending Depth, ED	71
Test	Pass	Test	Pass
* Recommended Ending Depth, ED	282	* Recommended Ending Depth, ED	23

Instructions:

Follow these
instructions,
step-by-step.

1. Enter **Surface Height** found under **Settings>Machine Settings** in C3.
2. Enter the thickness of the material to be cut (use left side for mm OR use right side for inches). Do not include the mat.
3. Click on the **Update** button below.
4. If **Test** shows "Fail", reduce the **Surface Height** (range: 0 - 300).
5. Change **Surface Height** under **Settings>Machine Settings** to match the **Surface Height** used above.
6. Use the **Recommended Ending Depth** value under **Cut>Layer Settings**.
7. For **Starting Depth** under **Cut>Layer Settings**, use **Ending Depth** divided by **Passes**.
8. When changing settings, increase **Passes** before increasing **Ending Depth**. Increase **ED** by only 10 at a time. Do not exceed the **Calculated Ending Depth** shown above.

* Because manufacturers will round up material thickness, use the **Recommended Ending Depth** for the initial test cut to avoid damaging the cutting mat. It assumes the thickness is lower than manufacturer's specs. If you have a caliper, measure the material thickness in several spots and use that measurement in the calculator. Then select a slightly lower ED than the **Calculated Ending Depth** shown above.

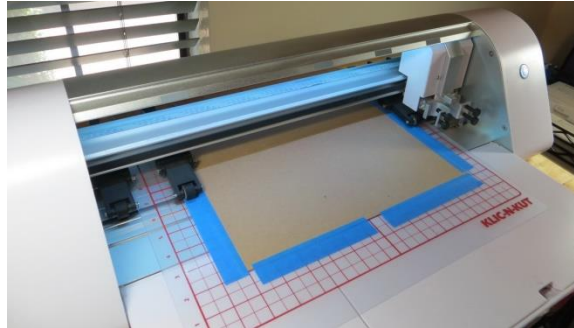
Click on **Update** after
making any changes

Update	Print
---------------	--------------

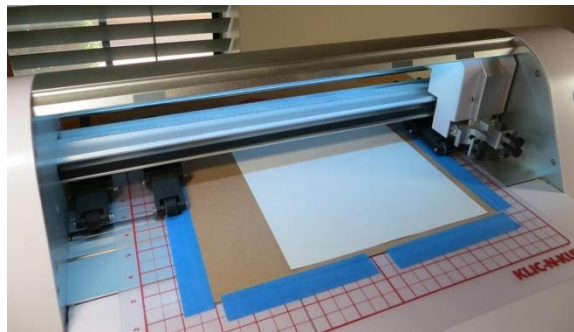
13.05 Pen Test for Verifying CD/ED Before Cutting

- A safe and relatively easy test will help you adjust the **CD/ED** so that you will cut through your material but not cut through the mat. Before performing this test, have the following items available:
 - ◇ Pen with a firm nib
 - ◇ Material to be cut
 - ◇ Sheet of chipboard or other material to protect the cutting mat
 - ◇ Masking Tape
 - ◇ Sheet of copy paper
 - ◇ Optional: small piece of aluminum foil or plastic wrap to protect the material from ink
- Perform this test any time you are cutting a new material:
 - (1) If you used a caliper to measure the thickness of the material, then use the **Calculated CD/ED** for this test. If you used the manufacturer's reported thickness or you are approximating with a ruler, then use the **Recommended CD/ED**.
 - (2) Use a small basic shape, such as a circle or a square, for the test.

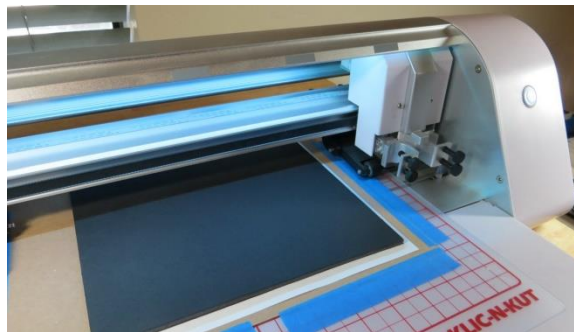
- (3) It's best to use the left side seat for this test. If you already have the rotary tool mounted, remove it, so that a pen can be installed. **Do not use the test pen** or any other type of pen that requires significant downward pressure for ink flow.
- (4) Place the chipboard (or an alternate material) onto the mat. The purpose of this layer is to protect the cutting mat from the rotary tool. While the test is used to optimize the **CD/ED**, it's not unusual to need a slightly higher setting because materials are not always consistent in thickness. Thus, it is expected that the bit will be cutting into the layer beneath the material in some places. Use masking tape to secure this protective layer to the cutting mat.



- (5) Tape a piece of copy paper over the protection layer:

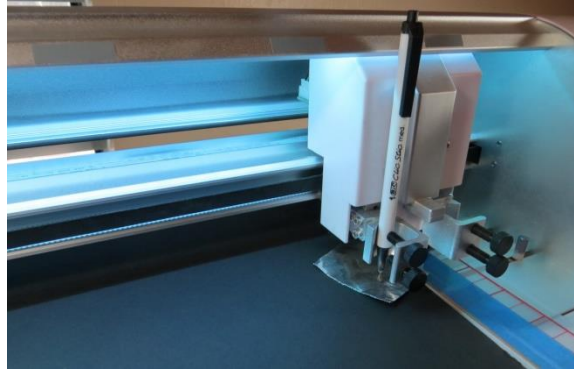


- (6) Now place the material you will be cutting on top of the paper:



- (7) Under **Cutter>Cutter Settings**, enter the **Surface Height** to match what was used in the online calculator. Click on **Save**.
- (8) Open the **Cut Settings** window and click on **Replace Tool**. Remove the left side tool, if something is already installed.
- (9) Click on **Continue** and the left side will drop.
- (10) **IMPORTANT!** At this point, do NOT use the arrow keys to move the head to a new location because the head will raise up. It MUST be in the down position before inserting the pen.

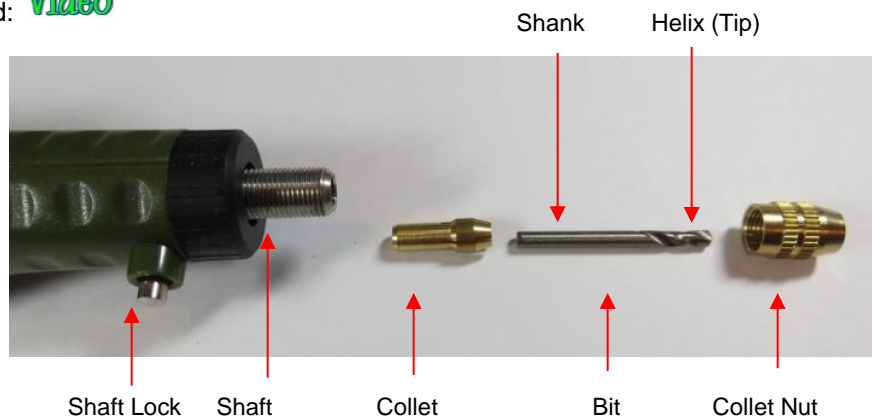
- (11) Insert the pen so that the nib is touching the top of the material. If you are worried about ink marking the material, place a thin piece of aluminum foil or plastic wrap on the material first. But do not use anything thicker than that:



- (12) Tighten the front screws and click on **Continue** so that the left side raises and returns home. Remove the material but leave the sheet of paper.
- (13) The top of the paper represents the **CD/ED** target location for the cut. Enter the **CD/ED** from the online calculator. Only use 1 pass for the test. Speeds can be left at default or made faster, if desired. This is a test to simply determine if the **CD/ED** is accurate for the material you are cutting.
- (14) Set an XY origin and then execute the drawing of the test shape.
- ◇ If the pen fails to make a mark on the paper, increase the **CD/ED** by 20 and repeat.
 - ◇ If the pen makes a dark mark and indents the paper, decrease the **CD/ED** by 10 and repeat.
 - ◇ If the pen makes a very faint mark on the paper, then the **CD/ED** is within range of making a successful cut.
- (15) You are now ready to test cut with the rotary tool, using this new **CD/ED** that passed the pen test. Remember to increase **Multi-cut** and decrease speeds so that the bit can work its way through the material. For a **Start Depth (SD)**, use **ED** divided by the number of **Passes**.

13.06 Attaching a Drill Bit² to the Rotary Tool

Alternative method: **Video**



- Select the bit you wish to use and a corresponding collet. The bit should be snug but not be forced into the collet:

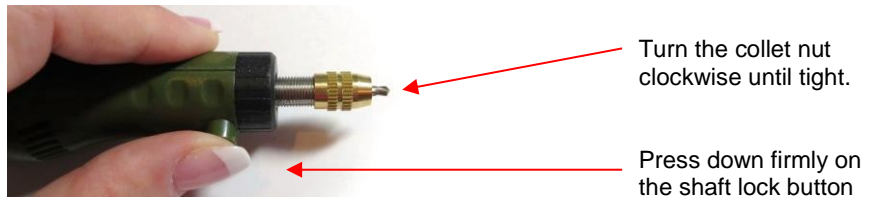
² For convenience, "bit" refers to either a drill bit or an end mill



- Remove the collet nut from the rotary tool. Slide the collet and bit onto the shaft:



- Slide collet nut over the collet and bit. Press and hold the shaft lock button while tightening the collet nut onto the shaft:

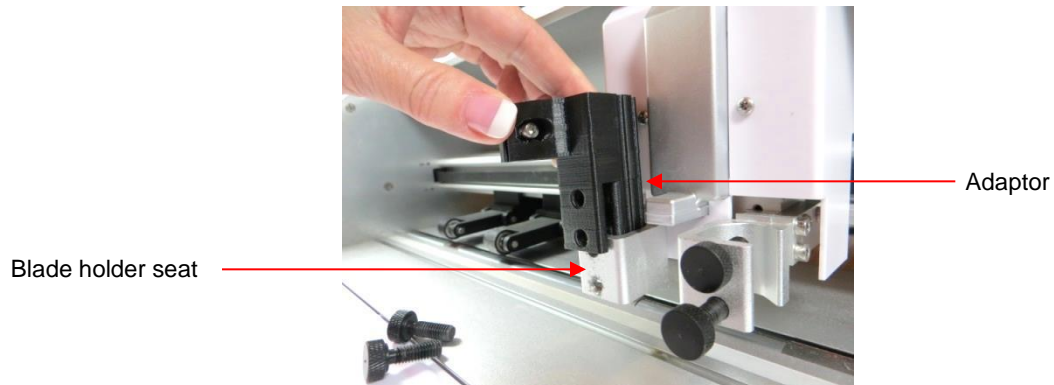


- Once the collet nut is hand-tight, release the button.

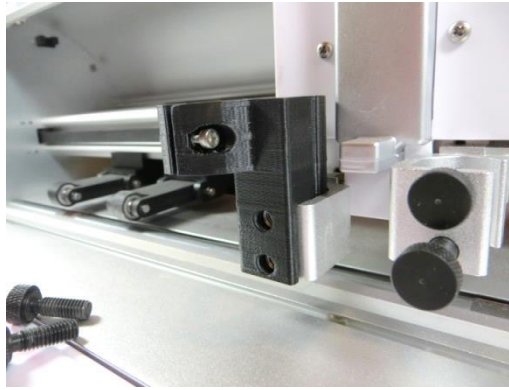
13.07 Attaching the Rotary Tool to the KNK Force

13.07.1 Attaching the Adaptor to the Blade Holder Seat

- Turn off the KNK Force and make sure the rotary tool is not plugged in.
- Move the Force head to the left a few inches to allow more room for installing the tool.
- Completely remove the front two screws on the left side blade holder seat.
- Slide the adaptor onto the left blade holder seat so that the slot in the adaptor slides over the front of the seat:



- Push the adaptor straight down until the holes in the adaptor align with the holes in the blade holder seat:



- Reinsert the two front screws so that they pass through the adaptor and through the blade holder seat. Hand tighten those screws:



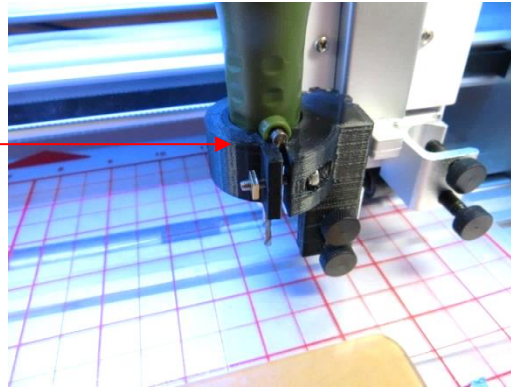
13.07.2 Inserting the Rotary Tool into the Adaptor

- Place the material to be cut or engraved onto the cutting mat. It's usually a good idea to tape down materials along the outside edges with masking tape to prevent slippage. While it is not shown in the following photos, it is highly recommended that a material such as a sheet of chipboard be taped over the mat to provide a protective layer, as mentioned in the Pen test (*Section 13.05*).
- Click on **Replace Tool**. At this point, you should only have the rotary adaptor installed on the left side. Click on **Continue** so that the left side will move down. The distance it drops is based on the **Surface Height** entered.
- ***IMPORTANT!*** At this point, do NOT use the arrow keys to move the head to a new location because the head will raise up. It **MUST** be in the down position before inserting the pen.
- ***IMPORTANT!*** Verify that the screen in SCAL is now showing it's time to insert the tool:

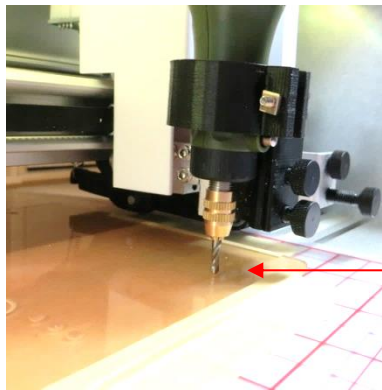


- Insert the rotary tool with the shaft lock pointing forward so that it can slide through the small opening on the front.

Shaft lock faces forward

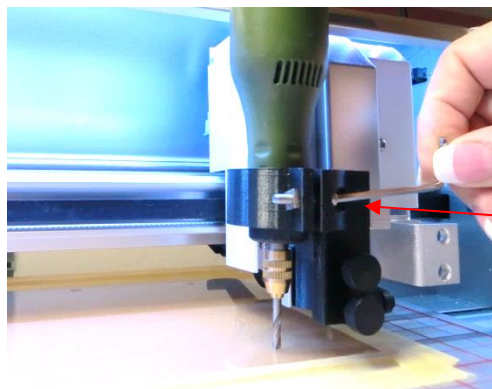


- Move the mat so that the **Z origin** will be set over the top of the material.
- Slide the rotary tool straight down until the tip of the bit touches the top of the material. If the bit cannot reach the surface, remove the rotary tool, press the shaft lock, loosen the collet nut and slide the bit out for more exposure. Retighten the collet nut and reinsert the rotary tool into the adaptor.



The tip should touch the top of the material.

- Tighten the adaptor using the included Allen wrench. You may find it easier to turn the wrench if you remove the screws from the right-side seat:



Tighten screw using included Allen wrench.

- Attach the AC/DC adaptor to the power cord and plug into a power outlet. There is a speed control dial on the adaptor. Also, there is a power on/off switch on the rotary tool itself. Before starting the cut or the engraving, remember to turn on the rotary tool! ☺

Turn on the power to the rotary tool here.



13.08 Engraving

- **IMPORTANT!** Do not attempt to use the smaller thinner drill bits for engraving!
- With engraving, the **CD/ED** is how deep you want the engraving to be. In general, that number can be relatively low. The best approach is to refer to the table at the end of this chapter. If the material or a similar material is not listed, then start with a conservative estimate, such as 5. More passes and a higher **ED** can be used to achieve the desired effect. Also, use a low **SD** to allow the tool to work its way to the engraving depth desired.
- The change in **CD/ED** varies slightly along the Z Axis. For engraving, you can approximate the **CD/ED** to enter using the following table. As with all applications, performing tests with small shapes is the key to optimizing the settings:

CD/ED	inches	mm
1	~0.0004	~0.01
10	~0.004	~0.10
15	~0.006	~0.15
20	~0.008	~0.20
30	~0.012	~0.30
40	~0.016	~0.41
50	~0.020	~0.51
60	~0.024	~0.61
70	~0.028	~0.71
80	~0.032	~0.81
90	~0.036	~0.91
100	~0.040	~1.02
120	~0.048	~1.22

CD/ED	inches	mm
140	~0.056	~1.42
150	~0.060	~1.52
160	~0.064	~1.63
180	~0.072	~1.83
200	~0.08	~2.03
220	~0.088	~2.23
240	~0.096	~2.44
260	~0.104	~2.64
280	~0.112	~2.84
300	~0.120	~3.05
320	~0.128	~3.25
340	~0.136	~3.45
360	~0.144	~3.66

For Engraving Use only!

Refer to the [Online Calculator](#) for determining CD/ED when cutting

- Remember to set all four speeds to appropriate low values. Refer to the table in *Section 13.03*.
- **Reminder:** Avoid bumping the Force or the mat while the rotary tool is in use. This can cause defects or even breakages in the final product.
- **Reminder:** Keep the pinch wheels clean. An accumulation of dust or fine shavings can prevent proper gripping of the mat and will result in a distortion of the engraving.
- For more information on engraving, check out the following link submitted by Michele Harvey:
<http://www.ataresinc.net/EngFact.html>
- Single line fonts are very useful in engraving. Here is a link for a free collection in TTF format:
http://www.mrrace.com/CamBam_Fonts/

13.09 Cutting

Demo: Cutting a vinyl record [Video](#)

Demo: Carving a Speedball Stamp Block [Video](#)

13.09.1 Things to Keep in Mind

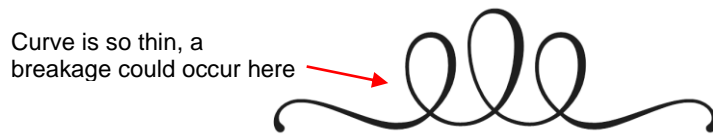
- **IMPORTANT!** If you haven't read *Sections 13.03 – 13.05*, then go back and work through them. It is very easy to ruin a cutting mat and even damage the surface of your Force if you have incorrect settings.
- **IMPORTANT!** Do not attempt to use the smaller thinner drill bits for cutting!
- Always increase **Passes** before increasing **ED**. The pen test determines the **ED** needed for the material but the rotary tool may need more passes in order to fully penetrate the material being cut.
- Reminder: Avoid bumping the Force or the mat while the rotary tool is in use. This can cause defects or even breakages in the final product.
- Reminder: Keep the pinch wheels clean. An accumulation of dust or fine shavings can prevent proper gripping of the mat and will result in a distortion of the cut.
- A flow chart procedure for test cutting with the Force rotary tool is presented in *Appendix D5*. Use this to troubleshoot any issues.
- Once you have finished using your rotary tool and switch back to the blade holder, remember to change back the **Surface Height** (assuming it was changed from the normal setting of 300).

13.09.2 Important Checklist Before You Cut!

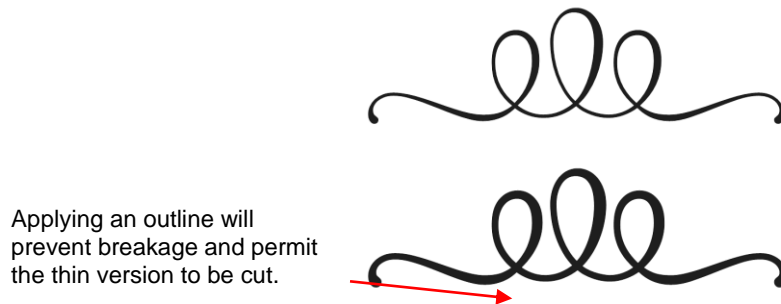
- Have you measured the thickness of the material and used the online calculator to determine an **End Depth**, **Start Depth**, and **Surface Height** for the test cut?
- Have you performed the pen test for verifying the accuracy of the **End Depth**?
- Do you have your material securely taped to the mat, in the required location, and the mat inserted into the cutter?
- Do you have the mat under at least two pinch rollers and the levers lowered in the back?
- Are the pinch rollers aligned under gray labels?
- Have you set the **Z Origin**?
- Have you entered all settings? Have you set enough **Passes** and entered slow speeds, as appropriate for use with the rotary tool?
- Have you set the XY origin at the front right corner of your material (or where you need the origin to be)?
- Have you selected the correct type of bit for your application? Is everything installed securely?
- Have you turned on the power to the rotary tool?
- Do you know, with confidence, where your shapes are going to cut?

13.10 Design Considerations

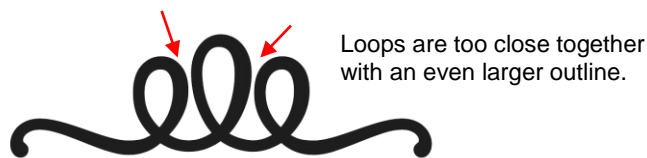
- Because a rotary tool is considerably thicker than a blade, adjustments in the design may be required.
 - ◇ For example, if a shape is thin, it might not cut successfully because the bit is wider than the thickness of one or more paths on the shape:



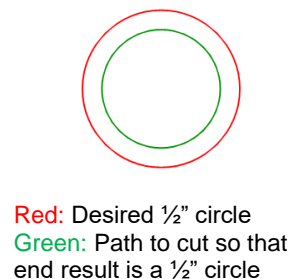
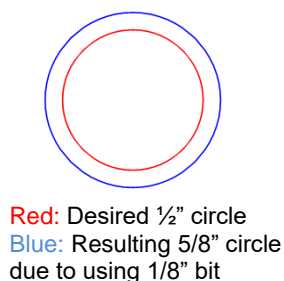
- ◇ The solution is to thicken the shape in the design software. You can use either **Path>Path Offset** (refer to *Section 8.05*), **Effects>Shadow Layer** (refer to *Section 9.04*) or the **Style** setting on the **Style Panel** (refer to *Section 10.01*).
- ◇ When determining the outline size, try half the size of the bit that will be used in the rotary tool. For example, for 1/16" bits, use 0.031." For 1/8" bits, use 0.062."



- ◇ However, depending on the design, too large of an outline might also cause a breakage elsewhere. For example, in the design above, if a larger outline is created, then the gap between the loops might be too close for successful cutting:



- Thus, there will be limitations in what designs can be cut with the rotary tool. Try using a small rectangle in SCAL which is the same size as the rotary diameter bit to determine if your design is viable for cutting. When needed, making the design larger, if possible, will be one solution. Another is using a smaller bit for cutting.
- ◇ Conversely, there are situations where an inline is required in order to get the correct final size. For example, if you are attempting to drill a 1/2" hole into an object using a 1/8" bit, then the hole will end up being 5/8" in diameter due to the extra 1/16" extending beyond the cut path and all around the circle.
- ◇ Thus, in this case, applying an inline of 1/16" (0.0625") will create a design circle that is 3/8" in size. When this 3/8" circle is cut with a 1/8" bit, the resulting circle is 4/8" or 1/2" in diameter.



- In two of the outline functions mentioned earlier (**Path Offset** and **Shadow Layer**), there is an **Inset Offset / Inset Shadow** option to create an inline instead of an outline.
- Also, check out Cutterpunk's video on designing a file in SCAL for rotary use: [Video](#)

Settings Form for Force Rotary Tool¹

[illegible]

¹ © 2015- 2018 Sandy McCauley, All Rights Reserved

Suggested Engraving Settings for Force Rotary Tool¹

These suggested settings are for initial test cut purposes. Note that Z Origin should be set on top of the material you are engraving.







P – Passes; SD – Start Depth; CD/ED: Cut Depth/End Depth; CS – Cut Speed; US – Up Speed; PS – Plunge Speed; LS – Lift Speed

IMPORTANT: review and adhere to all safety instructions presented in Section 13.01 before using the rotary tool







<u>Material</u>	<u>Source of Material</u>	<u>Applic.</u>	<u>P</u>	<u>SD</u>	<u>CD/ED</u>	<u>CS</u>	<u>US</u>	<u>PS</u>	<u>LS</u>	<u>Other Comments</u>
Acrylic - 1/8"		Engraving	1		2	10	20	10	20	
Decorative Plastic Sheet		Engraving	1		2	10	20	10	20	Dual color, 'engrave' the top color off to reveal the pattern in the 'core' color. www.decorativeplasticsheets.com
Gold Mirrored Plastic	Midwest Products (see Comments)	Engraving	1		15	15	20	10	20	Midwest Products 707-01 Super Sheets Mirror Styrene, 0.040 Inch
Plexiglass (aka hard acrylic)	clearscraps.com	Engraving	3	1	10	15	15	10	15	

¹ © 2015, 2016, 2018 Accugraphic Sales, Inc., All Rights Reserved


Appendix A SCAL: Key Board Shortcuts










<u>Shortcut</u>	<u>Icon</u>	<u>Description</u>	<u>Menu (m:) and/or Icon (i:) Location</u>
Main Screen and Project Functions			
Ctrl+N		Open a new file/project	m:File>New Project i:Toolbar
Ctrl+O		Open an existing .scut file/project	m:File>Open Project i:Toolbar
Ctrl+S		Save a file/project	m:File>Save Project i:Toolbar
Ctrl+Shift+S		Save file/project in new location	m:File>Save Project As
Ctrl+P		Print	m:File>Print
Ctrl+Z		Undo last action	m:Edit>Undo i:Toolbar
Ctrl+Shift+Z		Redo last action	m:Edit>Redo i:Toolbar
		Open Document Panel	i:Properties Panel
Right click>Mat Size		Change the size of the Cutting Mat	m:Cutter>Mat Size
Right click>Mat Orientation		Toggle between Landscape and Portrait	m:Cutter>Mat Orientation
Right click>Show Rulers		Toggles Rulers on and off	
Right click>Ruler Units		Set units for software: in, cm, mm	m:View>Ruler Units
Alt+F4		Close SCAL	m:File>Exit

Zooming and Panning Tools








Click icon and drag mouse		Zoom in on selected area	i:Tools Panel
Ctrl+ +++ (or right click>Zoom In)		Zoom in	m:View>Zoom In i:Tools Panel>Tool Options
Ctrl+ --- (or right click>Zoom Out)		Zoom out	m:View>Zoom Out i:Tools Panel>Tool Options
		Zoom to selected shape	m:View>Zoom Selection i:Tools Panel>Tool Options
Ctrl+F		Zoom so cutting mat fits in window	m:View>Fit to Window i:Tools Panel>Tool Options
Alt+roll mouse wheel		Zoom in and out, centered on middle of cutting mat	
Spacebar+drag left mouse button		Pan workspace	i:Tools Panel

Help











		Open Hints window	i:Properties Panel
F1		Open Help window	m:Help>Help

<u>Shortcut</u>	<u>Icon</u>	<u>Description</u>	<u>Menu (m:) and/or Icon (i:) Location</u>
Importing and Exporting			
Ctrl+Shift+I		Import a file	m:File>Import i:Toolbar
Ctrl+Shift+E		Export a file (save in a different format)	m:File>Export
Ctrl+Shift+T		Open Trace Image window	m:File>Trace Image i:Toolbar
Ctrl+1		Open the Library window	m:Window>Library i:Toolbar
		Open the eshape store window	m:File>eshape Store i:Toolbar
Selecting and Moving Shapes			
Click on shape		Left click on shape to select it	i:Tools Panel
Shift + click on shape		Add additional shapes to selection	
Freely drag mouse around shapes		Lasso select shapes	i:Tools Panel
Ctrl+A (or right click>Select All)		Select all shapes	m:Edit>Select All
Ctrl+Shift+A		Deselect all shapes	m:Edit>Deselect All
Right click>Transform>Move		Move a shape to a new location	
Duplicating Shapes			
Alt + drag shape		Creates a duplicate of the shape being dragged	
Alt + click on shape		Creates a duplicate of shape on top of original	
Ctrl+C (or right click>Copy)		Copy to clipboard	m:Edit>Copy i:Toolbar
Ctrl+V (or right click>Paste)		Paste from clipboard	m:Edit>Paste i:Toolbar
Ctrl+Shift+V (or right click>Paste in Place)		Paste in place from clipboard (on top of original)	m:Edit>Paste in Place
Ctrl+Alt+Shift+V		Fill the grid with selection from clipboard	m:Edit>Paste (Auto Fill)
Ctrl+D		Create duplicate copies of selected shape (s)	m:Object>Duplicate
Ctrl+Shift+D		Create duplicate copies in a circular formation	m:Object>Duplicate Rotated
Cutting/Deleting Shapes			
Ctrl+X (or right click>Cut)		Cut to clipboard	m:Cut to clipboard
Del (or right click>Delete)		Delete selected shape(s)	
Hold Del and click on one shape at a time		Deletes each shape as it is left clicked	





Shortcut**Icon****Description****Menu (m:) and/or Icon (i:) Location****Text and Font Icons**





		Open Text Panel	i:Properties Panel
		Bold	i:Text Panel
		Italic	i:Text Panel
		Reload installed fonts list	i:Text Panel
		Add font to Favorites	i:Text Panel
		Type text	i:Tools Panel
		Connect interior shapes to the outside	i:Tools Panel

Library










Ctrl+1		Open the Library window	m:Window>Library i:Toolbar
		Add folder	i:Library>Shapes tab i:Library>Project tab
		Delete folder	i:Library>Shapes tab i:Library>Project tab
		Add file to selected folder	i:Library>Shapes tab i:Library>Project tab
		Refresh	i:Library>Shapes tab i:Library>Project tab
		Change to List View	i:Library>Shapes tab i:Library>Project tab
		Change to Thumbnail View	i:Library>Shapes tab i:Library>Project tab
		Search on keyword	i:Library>Shapes tab i:Library>Project tab
		Sync with eStore or access Download Manager	i:Library>Shapes tab i:Library>Project tab
		Temporarily open a font	i:Library>Fonts tab




Manipulating and Coloring Shapes

		Open Position & Size Panel	i:Properties Panel
Right click>Transform>Scale		Resize a selected shape	
Right click>Transform>Rotate		Rotate a selected shape	i:Position & Size Panel
Right click>Transform>Flip Horizontal		Mirror/Horizontally flip a selected shape	i:Position & Size Panel
Right click>Transform>Flip Vertical		Vertically flip a selected shape	i:Position & Size Panel
Ctrl+Shift+Up (or right click>Arrange>Bring to Front)		Bring selected shape to top	m:Object>Arrange>Bring to Front






<u>Shortcut</u>	<u>Icon</u>	<u>Description</u>	<u>Menu (m:) and/or Icon (i:) Location</u>
Manipulating and Coloring Shapes (continued)			
Ctrl+Up (or right click>Arrange>Bring Forward)		Bring selected shape up one level	m:Object>Arrange>Bring Forward
Ctrl+Down (or right click>Arrange>Send Backward)		Send selected shape down one level	m:Object>Arrange>Send Backward
Ctrl+Shift+Down (or right click>Arrange>Send to Back)		Send selected shape to the bottom	m:Object>Arrange>Send to Back
Ctrl+Alt+L (or right click>Lock)		Lock selected shape	m:Object>Lock
Ctrl+Alt+Shift+L (or right click>Unlock All)		Unlock all shapes	m:Object>Unlock All
Right click>Hide		Hide select shape	m:Object>Hide
Right click>Show All		Show all shapes	m:Object>Show All
Ctrl+G (or right click>Group)		Group selected shapes	m:Object>Group
Ctrl+Shift+G (or right click>Ungroup)		Ungroup selected shapes	m:Object>Ungroup
Ctrl+B (or right click>Break Apart)		Break a shape into all of its individual paths	m:Object>Break Apart
Ctrl+Shift+B		Join selected shapes into a single shape	m:Object>Merge
		Open Fill & Stroke Panel	i:Properties Panel
		Copy a Fill and/or Stroke color from one shape to another	i:Tools Panel
		Edit a gradient start and end points	i:Tools Panel
		Distort a shape	i:Tools Panel

Layers Panel







		Open the Layers Panel	i:Properties Panel
Right click>Hide		Hide a layer	m:Object>Hide i:Layers Panel
		Show a layer	i:Layers Panel
Click icon + Show/Hide>Hide All Layers		Hide all layers	m:Layer>Show/Hide>Hide All Layers i:Layers Panel
Right click>Show All (or click icon + Show/Hide>Show All Layers)		Show all layers	m:Layer>Show/Hide>Show All Layers i:Layers Panel
Ctrl+Alt+L (or right click>Lock)		Lock a layer	m:Object>Lock i:Layers Panel
		Unlock a layer	i:Layers Panel
		Lock all layers	m:Layer>Lock/Unlock>Lock All Layers i:Layers Panel
Ctrl+Alt+Shift+L (or right click>Unlock All)		Unlock all layers	m:Layer>Lock/Unlock>Unlock All Layers i:Layers Panel





<u>Shortcut</u>	<u>Icon</u>	<u>Description</u>	<u>Menu (m:) and/or Icon (i:) Location</u>
Layers Panel (continued)			
Right click>Delete		Delete the selected layer	m:Layer>Delete Current Layer i:Layers Panel
		Create a new layer	m:Layer>Add Layer Folder i:Layers Panel
		Open Layer Options Menu	i:Layers Panel

Designing Tools




Alt+U (or right click>Path>Union)		Weld selected shapes to remove overlap	m:Path>Union
Right click>Path>Intersection		Apply the Boolean Join intersection to two shapes	m:Path>Intersection
Right click>Path>Exclude		Apply the Boolean Join exclude to two shapes	m:Path>Exclude
Right click>Path>Front Minus Back		Apply the Boolean Join front minus back to two shapes	m:Path>Front Minus Back
Right click>Path>Back Minus Front		Apply the Boolean Join back minus front to two shapes	m:Path>Back Minus Front
		Draw straight lines and Bézier curves	i:Tools Panel
		Freehand draw thin lines	i:Tools Panel
		Freehand draw thick lines	i:Tools Panel
		Draw basic shapes: rectangle, rounded rectangle, circle, triangle, polygon, star, spiral	i:Tools Panel
		Measure distances and angles on screen	i:Tools Panel
Right click>Appearance>Add Shadow Layer		Add an outline or inline to a selected shape	m:Effects>Shadow Layer
Right click>Appearance>Lattice		Create a lattice design in a selected shape	m:Effects>Lattice
Right click>Appearance>Rhinstones		Create a rhinestone outline or fill on a selected shape	m:Effects>Rhinstones

Editing Tools

		Move or reshape a path or move and edit nodes	i:Tools Panel
		Erase parts of a shape	i:Tools Panel
		Make thin, straight-line cuts through a shape	i:Tools Panel
		Drag the mouse to marquee-select an area to be retained	i:Tools Panel
Alt + drag Bezier control point		Only reshape the current path and not adjoining path	i:Tools Panel
Right click>Path>Simplify		Reduce the number of nodes in the selected shape	m:Path>Simplify
Right click>Path>Split Path		Break the path between the two selected nodes	m:Path>Split Path i:Tools Panel

<u>Shortcut</u>	<u>Icon</u>	<u>Description</u>	<u>Menu (m:) and/or Icon (i:) Location</u>
Editing Tools (continued)			
Right click>Path>Reverse Path		Reverses the direction the path will cut	m:Path>Reverse Path
Right click>Path>Object to Path		Remove the text, rhinestone or lattice status	m:Path>Object to Path
Right click>Path>Close Path		Close shape by adding a straight line between the start and ending nodes	m:Path>Close Path
Right click>Path>Convert Node to Corner		Convert current selected node to corner	i:Tools Panel>Tool Options
Right click>Path>Convert Node to Cusp		Convert current selected node to cusp	i:Tools Panel>Tool Options
Right click>Path>Convert Node to Smooth		Convert current selected node to smooth	i:Tools Panel>Tool Options
Right click>Path>Convert Node to Symmetric		Convert current selected node to symmetric	i:Tools Panel>Tool Options
Right click>Path>Path Details		Show path to be travelled when shape cuts	

Output

		Open controller window for current default cutter	m:Cutter>Cut with (name of cutter) i:Toolbar
Ctrl+Shift+P		Show preview of cut shapes	m:Cutter>Preview i:Toolbar
Ctrl+P		Open print window	m:File>Print
		Open Style Panel	i:Properties Panel

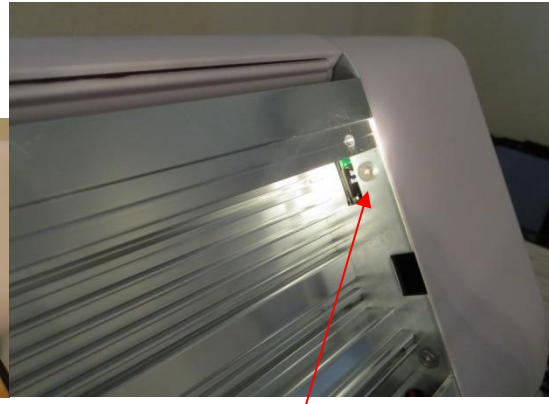
Appendix B KNK Force and SCAL: Troubleshooting

B1 Communicating Issues

I am trying to set up the connection for my Force and it has flashing white lights. It never reaches the stage of a steady light.

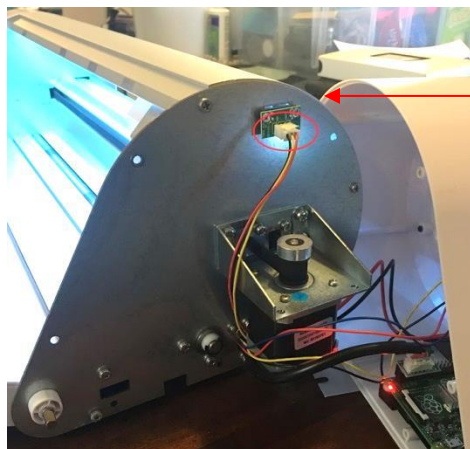
- ◇ Most likely, the SD card has become unseated from the computer inside of the Force. Turn off the Force and unplug it. Rotate the Force until you can access the bottom panel. Remove 6 screws, including the two that hold on the small feet. Remove the panel and on the right-side end cap you'll see two openings. One of them has the micro SD card. Use a flashlight if necessary to see it. Gently push the card to fully unseat it and then push again to reseat it, just like you do with other SD card readers.

Rotate Force to this position and remove 6 screws



Gently reseat the micro SD card

- ◇ The cable between the main board and the Raspberry Pi (RPI) board may have lost a good contact. The connector on the main board is usually pretty firm, but the connection inside the side cover is more susceptible to shock and should be re-seated. Turn off the Force and unplug it. Perform the steps above to remove the bottom panel. Remove the side cover that holds the power button. The side cover is held by six screws. Two are visible from the front (look at the side plate near the edge). One is visible from the rear, also at the edge of the side plate. One is under the top cover at the rear and two are seen from the bottom after removing the bottom panel. After removing the side cover, there are cables/wires that attach to a pin connector on a small card (the RPI board) on the side plate at the top. The connector is a two-piece connector (male/female) with the female attached to the card and the male inserted into the female connector. Unseat the male connector from the female connector and reseat.



- ◇ The third possibility is that the micro SD card needs to be re-flashed with the software. Go to this link: <http://knkusa.com/c3-installation-guide/>. After the card is reinstalled and you are back in C3, check the status. You will most likely need to update to the latest version of C3.
 - ◇ If these solutions do not resolve the issue, please start a support ticket using this link: <http://knkusa.com/support/> or by calling 800-268-3672.
-


My Wi-Fi connection to the Force frequently disconnects.

- ◇ Make sure you are running the latest update of C3. Even if you do not use C3, the upgrades sometimes contain important firmware updates.
 - ◇ Follow the instructions in *Section 2.05.2* of the *C3 User Manual* to set up a static IP Address.
 - ◇ If it continues, please start a support ticket using this link: <http://knkusa.com/support/> or by calling 800-268-3672.
-

*My IP address for the Force is no longer working. When I click on my list of networks, I see **KNK_Force_recovery**.*

- ◇ Watch this video: **Video**
-

When I first start up the Force and try to make my first cut from SCAL, the Force is often disconnected.

- ◇ Try clicking on the **Reload** icon  in the **Cut Settings** window and then verifying the connection is working by clicking the **Test Connection** button, next to it.
-

After I use SCAL to cut, the Force has a blue light and I cannot get anything to cut from C3. Is this normal?

- ◇ Yes, it is normal. SCAL must use an API (Application Program Interface) to communicate with the Force. Once it's in that mode, you cannot switch back to using C3 without restarting the Force.
-

I have a lot of problems with the Force not being connected. I frequently need to reload the connection and even restart the Force.

- ◇ A powered USB hub may be the best solution. The Wi-Fi adaptor is then plugged into the hub and the hub into the Force. Use the KNK recovery video to get reconnected. **Video**
-

B2 Operating Issues

I need to replace one of the black plastic screws on the blade holder seat. Can I buy a metal one at a hardware store? What size should I buy?

- ◇ Yes, you can buy a metal screw to replace a plastic one. The size is: M6-1.0x25.

The start and end of a closed shape are not matching up.

- ◇ If the gap is very small, verify that you have an **Overcut** set (refer to *Section 2.03.10*).
 - ◇ For wider gaps, make sure the two outer pinch wheel locations are being used AND the pinch wheels are clearly centered under the grey rectangles above the pinch wheels.
 - ◇ Make sure the mat can travel freely and isn't running into a cord, a wall, or any other firm object which might cause the mat to shift.
 - ◇ Follow the recommended **Cut Speed** for the material being cut. If the speed is too fast, the mat will shift because the blade cannot cut the material fast enough.
 - ◇ Make sure the blade isn't cutting too deeply into the mat which can cause the mat to be caught up by the blade.
-

My Force isn't level. It leans slightly to one side and my cuts are uneven.

- ◇ The Force doesn't need to be perfectly level in order to get even cuts. **Video** Instead, try increasing the **CD/ED** by 5 and do not use the middle pinch wheel. Only use the two outside pinch wheels, positioned under the far left and far right gray rectangles.
-

The rotary tool adaptor broke when I tried to insert it. What do I do?

- ◇ Please call KNK USA (800-268-3672) or start a support ticket: <http://knkusa.com/support/>
-

Suddenly, I'm hearing a clunking/stuttering sound during a cut.

- ◇ This is the sound that results when the blade is being forced through a material much faster than the material can be cut. First, try reducing the **Cut Speed** by increment of 10 or more. It might also be necessary to use more passes and a lower **Start Depth**.
-

The fold down table has red streaks on it. This seems to be the ink from the mat. What do I do?

- ◇ This is addressed in *Section 1.10* of the *C3 User Manual*.
-

The rollers are ripping the top layer of my material.

- ◇ It's important to keep the rollers clean of adhesive. Use Un-Du or Goo Gone or even isopropyl alcohol to thoroughly clean the wheels.
-

B3 Cutting Issues

*I'm using the recommended settings, including the **Blade Tension**, but my cuts are too deep! I'm even cutting all the way through vinyl!*

- ◇ Most likely, while setting the **Z Origin**, you are inserting and tightening the blade holder at the wrong step. Carefully read the screen. You must make sure that you insert the holder while the blade holder seat is in the down position and not during the step before nor during the steps afterwards.
 - ◇ Also, after the head lowers, you cannot then move the head to a new location because it will raise up. This will then cause you to insert the blade holder incorrectly.
-

The corners on my rectangles and lettering are rounded instead of sharp.

- ◇ Verify that you have the correct **Blade Offset** entered. Refer to *Section 2.03.9*.
 - ◇ Sometimes blades can be slightly off spec. Use a small test square or rectangle to tweak the **Blade Offset** value. Note that increasing it will sharpen corners, but if the value is too high you'll begin to see tiny projections or bubbles.
-

The outside paths are cutting before the inside paths. How do I get it to cut the other way around?

- ◇ Select the shapes and apply **Object>Merge**. This should then cause internal (child) shapes to cut before external (parent) shapes.
-

I'm drawing with the test pen and there are bubbles at the corners.

- ◇ For perfect corners, turn off **Blade Offset** (set to 0) since you do not need an offset for pens.
-

My cut started out fine but by the end of the cut, it's not cutting through the material.

- ◇ Make sure the blade holder housing doesn't have any bits of material inside of it.
 - ◇ Make sure the front screws are tight so that the blade holder isn't slipping upwards during the cut.
-

My material isn't being cut at all. I'm barely seeing a scratch.

- ◇ Try resetting the **Z Origin**. Remember to remove your blade holder first and reload it when the head has moved to the down position.
- ◇ Check the blade to make sure it isn't chipped.

- ◇ Confirm the settings for that material, including the **Blade Tension**.
-

My cut is clean in some places but not in others. Why am I not getting consistent cutting?

- ◇ Make sure your material is pressed firmly onto a clean and sticky mat (assuming you are cutting a material with no backing sheet, such as paper or cardstock). If you are cutting a material with a backing sheet, make sure the material is still adhered to that sheet. For example, vinyl that has been in storage for a long period of time or exposed to extreme cold temperatures can sometimes separate from the backing sheet. Brayering the vinyl will usually stabilize it well enough for cutting.
 - ◇ Do not use the middle pinch wheel and make sure you have the outer pinch wheels under the outer rectangles with your material then located in the middle of the mat. The pressure of the wheels on the mat can alter the depth of the material at those locations and cause cutting issues.
 - ◇ You may need to increase the **Cut Depth** (raise by a setting of 5) or the **Blade Tension** (raise by ½). Repeat the cut.
 - ◇ Your material may require two passes. If a material is not homogenous or if it is heavily textured, using two passes is sometimes needed to get the entire shape cut cleanly. Also, if the material has been exposed to humidity, then it will become difficult to cut in one pass. You can dry paper and cardstock in a slightly heated oven for around 15 minutes or so to release the moisture. Preheat the oven at the lowest temperature and then turn it off before putting your paper into the oven.
-

I am getting a lot of tearing in my cuts.

- ◇ A number of things can cause tearing so work through this check list:
 - Too much force is being applied. If you see cut lines in your mat, first make sure the **Blade Tension** is appropriate for the material you are cutting. It may be too high. Assuming it is fine, decrease the **Cut Depth** by, say, 5 or 10 and do test cuts until a clean cut is achieved.
 - The blade is chipped. Try a different blade.
 - The paper is not adhered well to the mat. Make sure the mat is clean, sticky, and the paper is pressed smoothly and evenly on the surface. If the tearing is occurring when trying to remove the cut item from the mat, try using an artist's palette knife (or other thin spatula-type tool) to gently lift up most of the cut shape before lifting it from the mat.
 - You may have too many nodes in the shape. Use node reduction steps in the design software to simplify the cut.
 - The design itself may be too intricate for the size you are cutting it. Look at the file in the design software to see if thinner areas can be thickened and excess nodes removed using a simplify function.
 - The material itself may be subject to tearing, especially on intricate cuts. Also, if the cardstock has been exposed to humidity, then the moisture in the material can make it difficult to cut cleanly. Try blow drying the cardstock or placing in a slightly warm oven for half an hour. Worst case, try a different cardstock.
-

At the start of every cut, the blade will make a tiny cut on my material and then proceed to the first shape. Why is it doing that and how do I prevent it?

- ◇ That tiny cut is to set the blade in the correct direction for the first cut. You may need to rearrange the location of the material on the cutting mat or temporarily place a few Post It notes in that location to prevent your material below from being cut.

I'm using the embosser and blade holder for a score and cut application. I've carefully calibrated the offset for the two tools, however when I cut the project, the cut lines are not aligned with the score lines.

- ◇ Using aggressive settings when scoring can cause the cutting mat to skew, resulting in cut lines no longer properly aligned with the score lines. Here are several suggestions for correcting this problem:
 - Reduce the **CD/ED** setting and increase **Passes**.
 - Add mat guides to stabilize the cutting mat. Refer to *Appendix D3*.
 - Change the **Path Direction** on score lines. Refer to *Section 10.08*.

B4 Software Issues

I noticed that some of the settings I see in the screenshots in this manual are not in my version.

- As long as you are staying up to date with SCAL releases, then these are most likely settings only available in the Pro version of SCAL.

*The **Shapes** tab in the Library doesn't show any shapes. Do I need to install them separately? I'm on a Mac.*

- This occurs when the user has dragged the Sure Cuts A Lot program to the desktop. It needs to remain in the Applications folder.

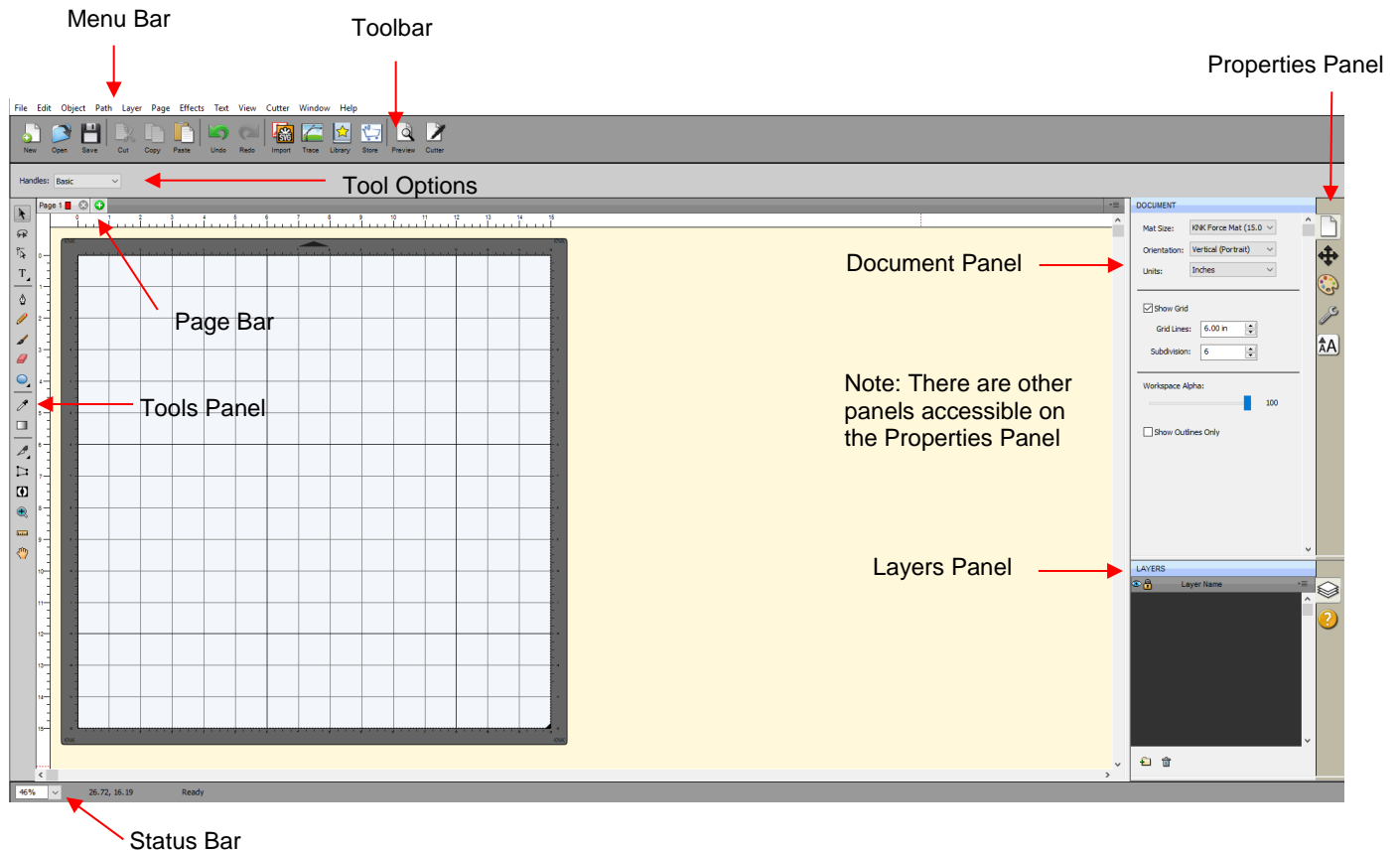
*I set the **Cut Line Type** to **Draw (Pen)** but my shapes are not being drawn. Nothing is happening.*

- In the **Cut Settings** window, you need to change the **Holder** setting to **Pen**.
-

Appendix C SCAL: Map and References

C1 Screenshot of SCAL Screen

Below is a screen shot of the main screen in SCAL identifying ONLY **Bars** and **Panels**.



C2 Bars

- The bars in SCAL have components positioned left to right. The following sections present the four bars and where to find more information for each item on that bar.

C2.1 Menu Bar

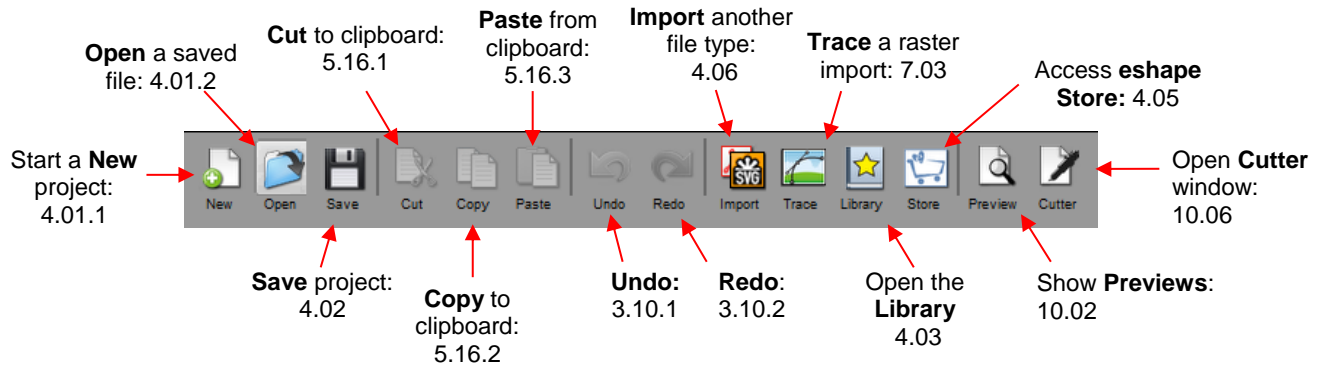
- Like most computer applications, the **Menu Bar** is located at the top of the screen and provides access to most of the functions in the software.

File Edit Object Path Layer Page Effects Text View Cutter Window Help

- Throughout the user manual, a reference such as this: Go to **Path>Simplify** refers to using the **Menu Bar** to access a function. In this case, you would click **Path** on the **Menu Bar** and then click on **Simplify** in the submenu that appears.
- Because there are dozens of submenu options, each one isn't listed with a reference. Instead, it is recommended that you use a search function to locate any given listing within the user manual.

C2.2 Toolbar

- The **Toolbar** is located at the top of the screen, just below the **Menu Bar**.



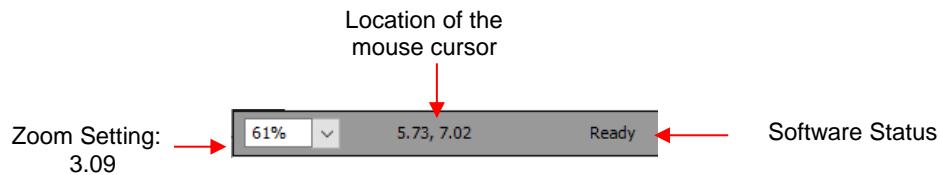
C2.3 Pages Bar

- All information on the **Pages Bar** is presented in *Section 3.11*.



C2.4 Status Bar

- The **Status Bar** is located at the bottom of the screen:



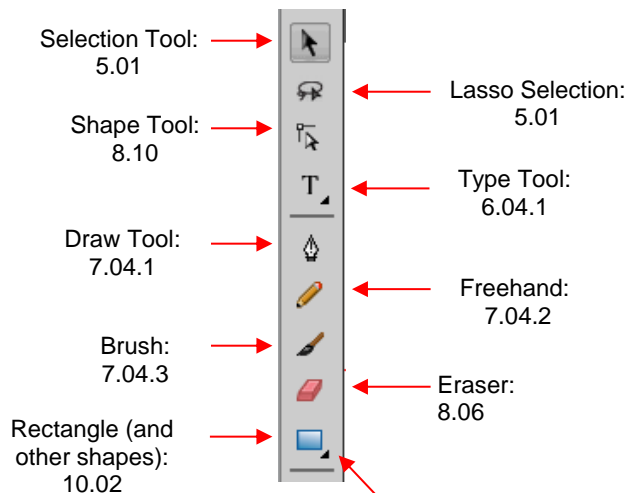
C3 Panels

- The panels in SCAL have components positioned top to bottom. The following sections present the four bars and where to find more information for each item on that bar.

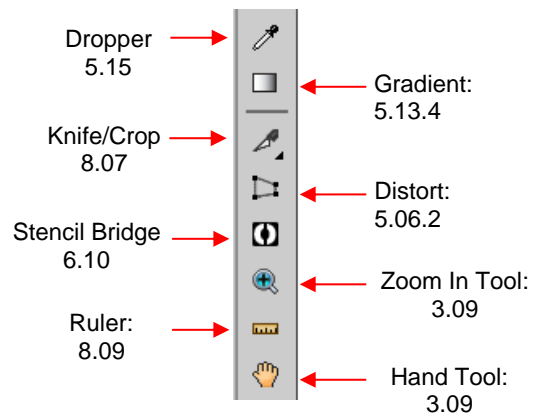
C3.1 Tools Panel

- The **Tools Panel** is located along the left side of the screen:

Upper part



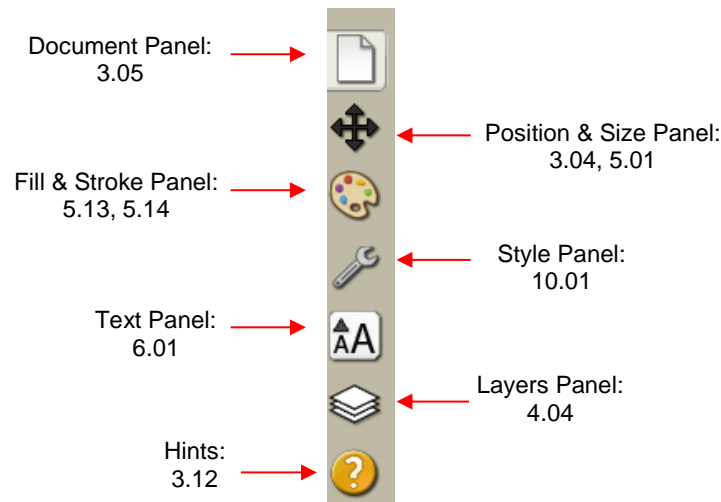
Lower part



Note: Icons with a small black arrow have more options when left mouse button is held down

C3.2 Properties Panel

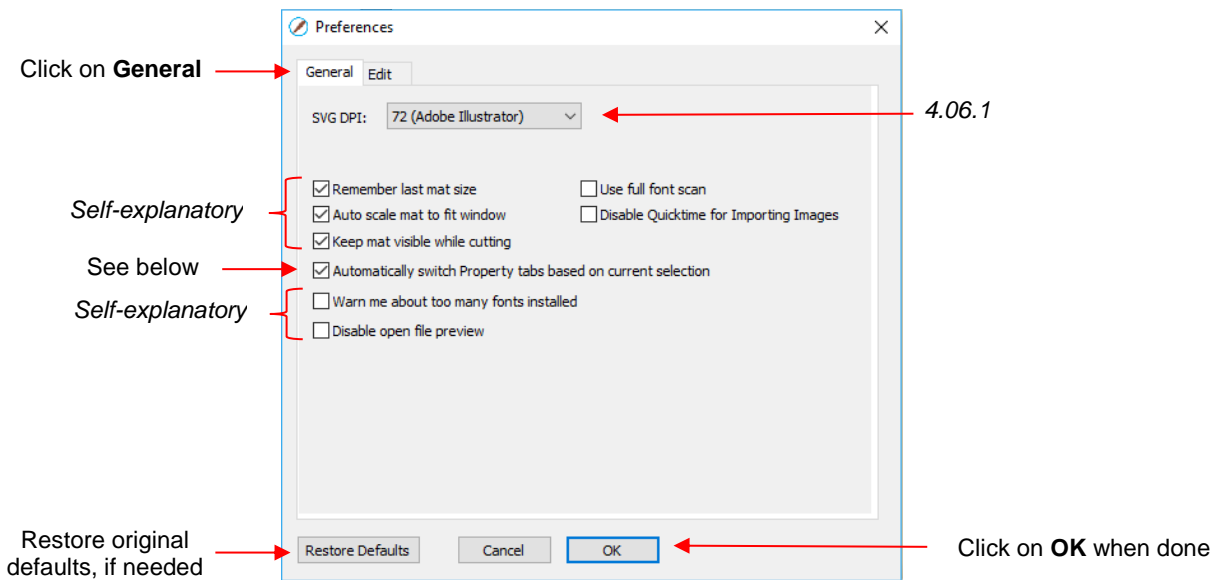
- The **Properties Panel** is located on the right side of the screen and contains 6 subpanels and a Hints access:



C4 Preferences

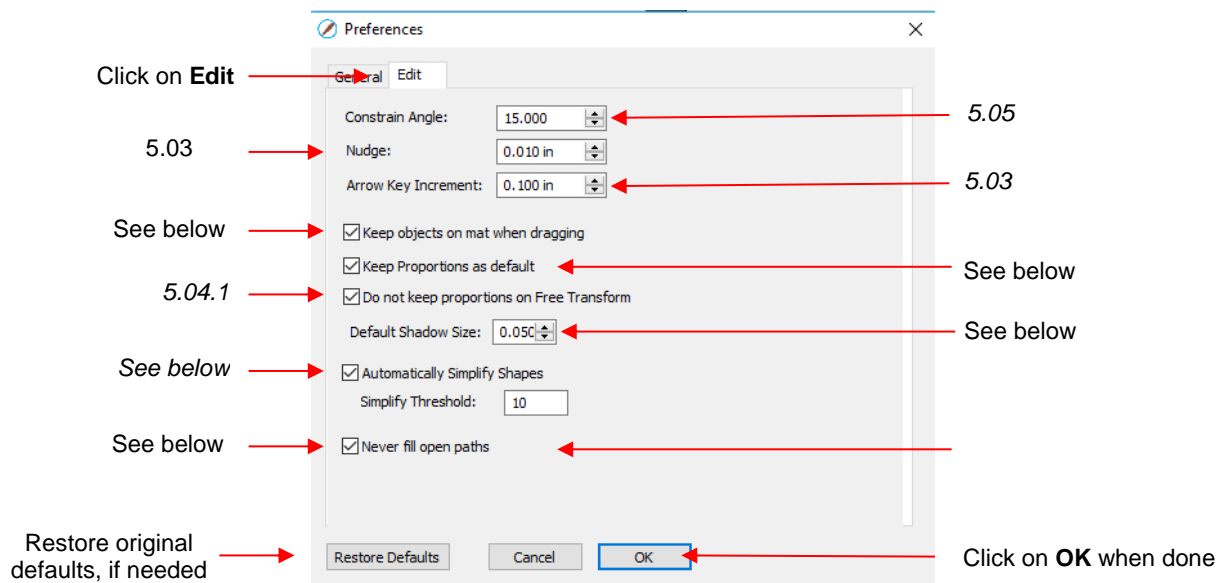
- The following preferences can be found under **Edit>Preferences** (or, on a Mac, press **Command + ,**). If the preference was already presented in other sections, it is noted in the screen shots. For those not previously mentioned, details are presented if they are considered important.

C4.1 Preferences: General Tab

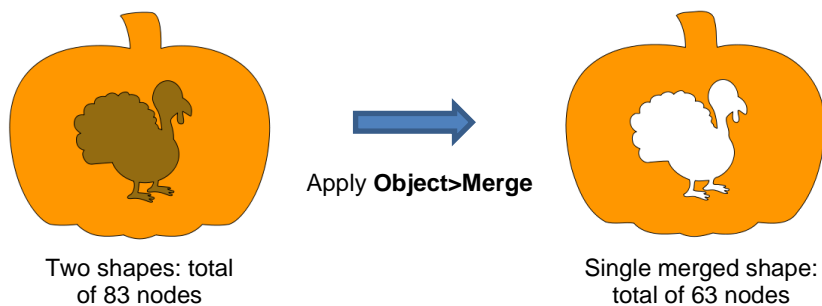


- Automatically switch Property tabs based on current selection:** with this option turned on, the **Properties Subpanel** related to the task at hand will open. For example, when you select a shape, the **Position & Size Panel** will open. When you click on the **Type Tool**, the **Text Panel** will open.

C4.2 Preferences: Edit Tab

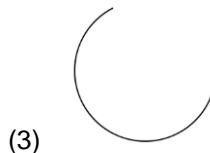


- **Keep objects on mat when dragging:** With this option checked, you cannot drag shapes beyond the outside borders of the **Cutting Mat**. You can, however, move them beyond the **Cutting Mat** by entering the desired **X, Y** location on the **Position & Size Panel**.
- **Keep Proportions as default:** With this option checked, the **Keep Proportions** setting on the **Position & Size Panel** will automatically be checked when you launch SCAL and will remain checked until you uncheck it. If you choose to uncheck this option, you will need to relaunch SCAL and the **Keep Proportions** setting will be unchecked.
- **Default Shadow Size:** This affects the initial **Size** shown under **Effects>Shadow Layer**.
- **Automatically Simplify Shapes:** With this option checked, nodes will be reduced after certain functions are applied. For example, the following two shapes (pumpkin and turkey) have a total of 83 nodes. If you select them and apply **Object>Merge** so that the inside turkey will cut before the outside pumpkin, the total number of nodes is reduced to 63 because of the **Automatically Simplify Shapes** option being checked.



- **Never fill open paths:** Unlike most other vector programs, SCAL offers the ability to fill open shapes by applying an invisible straight line to close the shape. By unchecking this option and selecting a **Fill Color**, **Pattern**, or **Gradient**, the open shapes on your **Cutting Mat** will contain that **Fill**.

◇ For example, here is a circle with a section cut off. The option to **Never fill open paths** is still checked:



◇ The **Never fill open paths** is now unchecked and various **Fills** options applied:



Fill: Color



Fill: Pattern



Fill: Gradient

- ◇ Note that even though the shape appears to be closed, it is not. If you were to cut this shape, it would still be attached to the outside material.

Appendix D KNK Force: Additional Information

D1 More about Z Origin

- If you refer back to *Section 2.06.3* of the *C3 User Manual*, there is a table of different situations and whether you use the top of the material or the top of the mat for setting the Z origin. The following information will help you understand why it matters and how it affects depth settings.

D1.1 Why Do You Sometimes Set the Z Origin on the Mat versus the Material?

- When cutting with a blade, it is recommended you use the top of the mat for setting the origin. If you use the top of material instead, then you're more likely to introduce error and inconsistencies due to things like:
 - ◇ material not properly pressed down to the mat
 - ◇ tiny waste scraps on the mat, beneath the material
 - ◇ inconsistencies in the material itself
- When cutting rolled materials without a cutting mat (such as vinyl or rhinestone template material), setting the origin on top of the material will work well. These materials are not subject to the same issues as noted above.
- Currently, when cutting with a rotary tool, it is recommended that you use the top of the material for the origin. You will need to know the thickness of the material so that you do not cut through it and into the mat. Using the top of the material allows you to set a **Start Depth** lower than the **End Depth** and then work through the material in passes, as needed.
- When embossing, drawing, engraving, etc. with either the blade holder and when engraving with the rotary tool, you need to use the top of the material for the origin since you are only trying to penetrate a portion of the material. Otherwise, you would need to enter a negative **Cutting Depth**.
- The piercer or punch tool is similar to cutting. You want to fully penetrate the material, thus setting the origin on the mat is recommended.

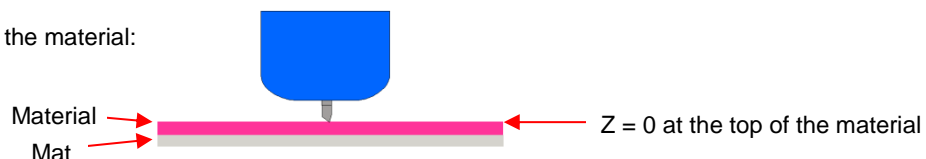
D1.2 How does Setting the Origin on the Mat Affect the Settings?

- For blade cutting, if you set the origin on top of the material instead of on top of the mat, you will need higher **Cutting Depth** settings. First, think about what **Z Origin** means. Remember that it's defining a certain height location to be 0:

Setting the origin on the mat:



Setting the origin on the material:



- Now, let's assume that when the origin is set on the top of the mat, the **Cutting Depth (CD)** required is 75 for that particular material. That's the **CD** required to get the blade tip to that location plus compensate for the resistance of the material and the compression of the spring inside the blade holder. Instead, if you were to set the origin on top of the material, then you need that same **CD** of 75, but then an additional amount of **CD** ~ equal to the thickness of the material.

- Another situation involves cutting rolled materials which have a backing that is not cut. These materials (vinyl, HTV, rhinestone flock, etc.) can be cut on the cutting mat or cut by directly inserting the materials into the Force. Here are the factors which will directly affect the **Cutting Depth** needed:
 - ◇ If the **Z Origin** is set on top of the material or on top of the mat (the difference in **CD** can be as much as 45 with vinyl because the backing sheet is so much thicker than the vinyl)
 - ◇ If the material is on a mat or directly loaded into the Force
 - ◇ If the backing sheet is removed first before placing on the mat (this is common with rhinestone template materials)
- In the recommended settings table at the end of Chapter 2, you will find separate settings for cutting rolled materials (such as vinyl or rhinestone template material), both on a mat or without using a mat. The **Cutting Depth** settings for those reflect this difference.

D2 Calculation of Depths in Multi-Pass Applications

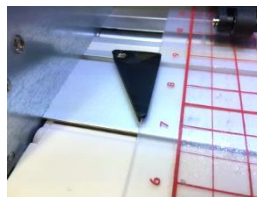
- **Multi-pass Depth Increase** is defined as how much deeper the tool will attempt to move, starting after the first pass. It is a linear calculation based on the **Starting Depth**, **Ending Depth** and the number of **Passes**:

$$\text{Multi-Pass Depth Increase} = (\text{Ending Depth} - \text{Starting Depth}) / (\text{Passes} - 1)$$

- For example, if **Starting Depth** = 100 and **Ending Depth** = 200, then the target depths for each pass would be:

2 Passes		3 Passes		4 Passes		5 Passes		6 Passes
100		100		100		100		100
200		150		133		125		120
		200		166		150		140
				200		175		160
						200		180
								200

D3 Mat Guides

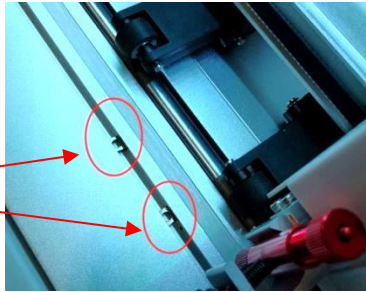


- Ricardo Bernardino first posted his design file for mat guides on June 21, 2016. He shared the design file with KNK USA and it was modified slightly and then posted for downloading here:

<https://www.myminifactory.com/object/knk-force-cutting-mat-guides-22496>
- To find a local 3D printing company to print these guides, use this link: <https://www.3dhubs.com/>. The least expensive plastic will work just fine.
- You can also purchase a set of the mat guides and screws at this link:

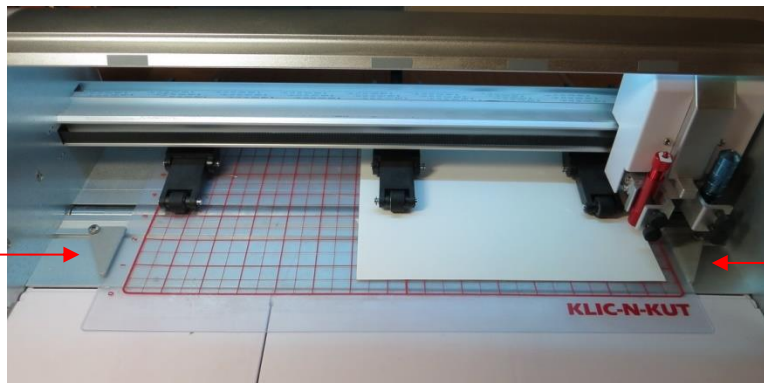
<http://knkusa.com/product/knk-force-mat-guides-left-right/>
- The mat guides fit into the groove in front of the cutting strip. Two M4 screws (~ 10 – 12 mm long) are then screwed through the mat guides and into the small nuts already present inside the groove:

Nuts inside KNK
Force groove



- A few tips on installing:
 - ◇ Identify which guide is the left side and which is the right. Refer to photo below.
 - ◇ Slide the left nut to the far-left side and right nut to the far-right side.
 - ◇ Turn off the Force so that the head can be moved to the middle of the cutter.
 - ◇ Insert the mat into the desired position and drop the pinch wheels so that you can make sure the wheels are on the outside edges of the mat. Make sure the mat is aligned straight in the Force.
 - ◇ The mat guides have nubs which will be pushed down, into the groove, once you have everything positioned. Hold the right mat guide above the groove and then slide the nut over until the hole in the nut is visible through the hole in the mat guide. Then push the mat guide straight down. Screw in the right-side screw.
 - ◇ Repeat on the left side. Make sure the mat is snugly fitting between the two mat guides before screwing in the left side screw.

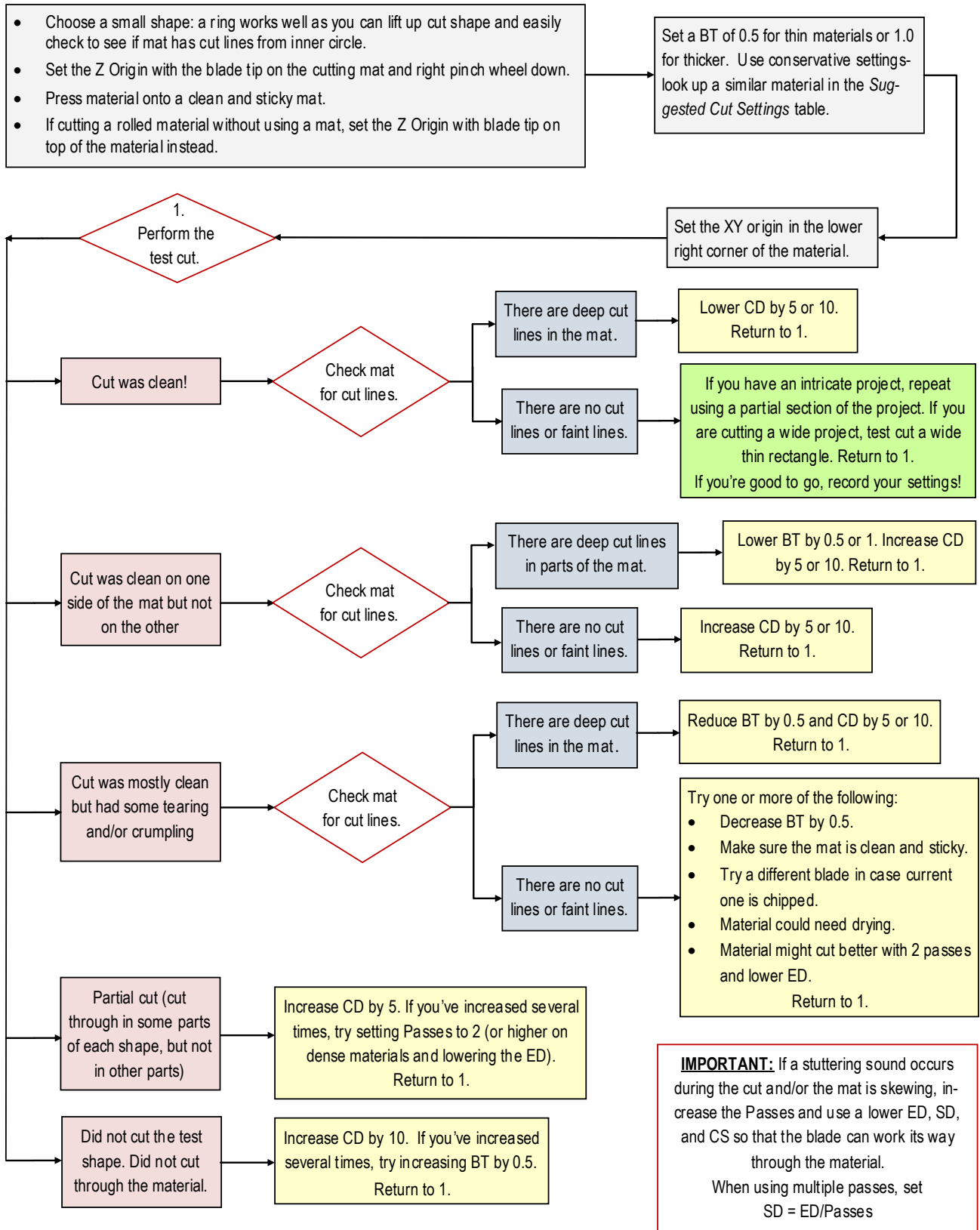
Left side
mat guide



Right side
mat guide

- Some users find that only using the right mat guide works best for them. I happen to be one of those users and discovered that both PNC applications and score and cut applications were more accurate when only using the right one.

D4. Test Cutting a Material Using the Force Blade Holder



D5. Test Cutting a Material Using the Force Rotary Tool

