Graphtec CE6000-60

Vinyl Cutter

Training:	Required
Reservation:	Required

Please check with Library staff to confirm minimum age certification requirements to use this machine with supervision and without supervision.

Updated October 2022

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Certification

To become certified on this piece of equipment you will need to attend a training class. By the end of the class, you will be able to:

-Know how to safely operate the Graphtec Vinyl Cutter.
-Understand basic design functions of CorelDraw as it relates producing vinyl creations.
-Know how to prepare and apply vinyl stickers for immediate or future use.
-Basic information about types of vinyl—Removable, Permanent, Heat Press

To sign up for a training session please inquire at the front desk.

Reservations

To reserve this piece of equipment you will need to first be certified on this equipment. After you attended a training for the vinyl cutter, you may sign up for a time slot to use the equipment. Inquire at the front desk for more information.

Additional Resources & Online Training:

Graphtec's Manufacturers' Manual for the Vinyl Cutter/Plotter can be accessed at: http://nlc.nebraska.gov/grants/InnovationStudios/Documents/ce6000_series_user_manual.pdf

Additional CorelDraw instructions may be accessed at: https://nlc.nebraska.gov/grants/InnovationStudios/Documents/CorelDRAW_SOPrev08-15-18.pdf

Online Training--While the Library Innovation Studios project was active in Nebraska, an online training course for the Graphtec Vinyl cutter was created (along with trainings on other makerspace machines). Makers and trainers may still access the courses at: https://my.nicheacademy.com/innovationtraining

Those who want to access the Library Innovation Studio lessons on Niche Academy, must first create a free personal account with a login. To create an account you enter a first name, last name, and email address.

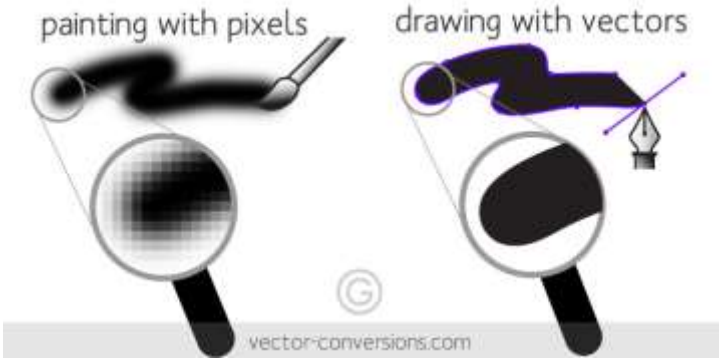
Those that go through the entire lesson for any of the subject matters/machines, will be provided a certificate of completion. Nebraska Library Commission staff will be able to view a list of who has completed the lessons, but will not be using or sharing email information.

Key Concepts

Raster vs. Vector

Two-dimensional images can be created using two different methods, either a raster or a vector. Raster images are composed of pixels and are capable of capturing a lot of detail—photographs are examples of raster images. Vector images are composed of perfect mathematical curves and can be infinitely scaled without a loss of quality—text in a text editor is an example of a vector image.

The vinyl cutter requires vector drawings to operate correctly. Raster images will not be visible to the vinyl cutter and must be converted to vector drawings prior to cutting.



CorelDraw Design Software

CorelDraw is an image manipulation program, used to create and modify images. CorelDraw focuses on vector images and may be used to convert raster images into vector images in order for the vinyl cutter to be able to cut the image. For more on CorelDraw see Pages 13-16 and 24-31.

Why is the Graphtec machine sometimes referred to as a Cutter/Plotter?
Although you may have only seen the Graphtec used to “cut” vinyl, the “Tool Holder” on the machine can either hold a blade or it can hold a special plotting pen that “draws” on the inserted material. That is why the machine is both a cutter and a plotter.

Vinyl Decals/Stickers

Vinyl decals are decorative stickers that can be applied to a variety of objects. Designs are sent from CorelDraw to the vinyl cutter using another program called Cutting Master 4. The design is cut into the thin layer of vinyl but not into the paper support backing. After the machine has cut the design, the waste vinyl must be removed in a manual process called weeding. Transfer paper/tape is applied to the vinyl to assist in the successful application or transfer of the decal. Just before applying the decal, the paper support backing on the vinyl is removed, exposing the sticky side of the vinyl. The decal is applied to the intended surface using a burnisher that is rubbed over the sticker to help adhere it to a surface. Once the vinyl sticker is properly secured, the transfer tape is removed at a sharp angle.

Reference Sheet

Approved Materials:

Thin paper and vinyl. Vinyl can be removable, permanent, and heat press vinyl. Check with the makerspace to see what types of vinyl they might have for sale.

FYI: Vinyl and transfer tape used in the Library Innovation Studios Project included:

TransferRite Ultra 582U Medium Tack Transfer Tape (6" & 12" 100-yard rolls)
Removable Indoor Vinyl: Oracal 631M Removable Vinyl (M is for matte finish)
Permanent Vinyl: Oracal 941 Premium Cast Vinyl
Note: Vinyl was purchased in 10-yard rolls—most 15" wide and some 24" wide

Max Cutting Area of Shortest Direction:
23.7" (603 mm) (when using 24" Vinyl)

Max Media Thickness:
.01" (0.25 mm)

Machine Accessories:

Retractable Cutoff knife
Self-Healing Cutting Mat
Burnisher
Removable Vinyl
Craft Knife (X-Acto Knife)
Dental Tools
Transfer Paper/Tape

Common Settings:

Heat Transfer Vinyl: Force of 12
Glitter Vinyl: Force of 15
Regular Vinyl: Force of 9

Proper Storage Humidity and Temperature Levels:

Vinyl should be stored in areas that are not too cold, too hot, or too humid/damp. Relative air humidity between 50% and 60% and temperature around 75°F is best. Do not let the storage area temperature to drop below 64°F and do not store vinyl in direct sunlight. Do not have vinyl stored too close to radiators or right next to air vents.

Proper Application Humidity and Temperature Levels:

Generally, vinyl should never be applied at temperatures below 50°F. However, for best application results, surface and ambient temperatures should be between 65°-75°F; with humidity levels resting between 50 - 70%. Newly applied graphics should remain in the application environment for at least 24 hours to promote uniform adhesion characteristics. A significant change in temperature should be avoided during the first 24 hours after the application is initially complete, as this may result in the material lifting or popping up in complex curved areas.

Application of "Removable Vinyl" on Walls—Do's and Don'ts:

Do's

- Choose a smooth, non-porous surface.
- Apply vinyl in temperatures between 65 and 75 degrees F if possible – never colder than 50 degrees.
- Works well on gloss and semi-gloss paint finished.
- If you need to clean the wall, use mild soap and water and make sure to allow time for complete drying.
- Allow up to 24 hours of bonding time before you remove the application tape from the vinyl if your wall is painted with "Low or No VOC" paints that are now on the market, as this paint has lower levels of vinyl adhesive bonding attributes.

Don't

- Don't apply to textured surfaces.
- Don't apply to uncured paint (curing takes at least 4 weeks).
- Don't apply to dusty or dirty surfaces.
- Don't apply in rooms with less than 50% humidity for the first 24 hours.
- Don't clean walls with isopropyl alcohol.

Workflow:

- Load vinyl into vinyl cutter machine
- Create design in CorelDraw or other software
- Machine cuts vinyl
- Slice off machine-cut vinyl with retractable cut-off knife
- Cut apart vinyl stickers if multiples were cut/created
- Weed unwanted vinyl off of backing and discard
- Apply transfer tape to front of weeded vinyl
- Remove backing from vinyl exposing sticky back-side of vinyl
- Affix exposed sticky-back side of vinyl to surface (wall, jar, notebook, etc.)
- Secure to surface by rubbing burnisher over transfer tape side of your sticker
- Carefully remove transfer tape at a sharp angle
- Smooth newly applied vinyl with burnisher if needed
- Remove vinyl roll from machine, and secure the end with painter's tape
- Return all tools and vinyl rolls used and dispose all waste that was created.
- Pay for vinyl (if applicable)

Graphtec Vinyl Cutter

Training Materials, Accessories and Software:

Graphtec CE6000-60 Cutter/Plotter
Retractable Cutoff Knife
Removable Vinyl
Self-Healing Cutting Mat
Craft Knife (X-Acto Knife)
Dental Tools/thread ripper (safer)
Transfer Paper/Tape
Burnisher

Training Overview

Makers will learn how to operate the cutter/plotter, how to load material, and how to process a sticker from weeding to affixing a sticker on a surface.

Safety

- Hair and loose clothing may be caught in the cutter head. Long hair should be tied back, long necklaces removed, sweatshirt strings tucked in, and flowing long sleeves rolled up.

- Keep your hands away from the machine when parts of the machine is in motion.

- Be aware that the machine's tool holder that moves side to side during cutting, has a sharp blade pointing downwards. Avoid being cut by keeping your hands away from that part. **Additionally, makers should NEVER remove the machine's tool/blade holder.** (Makerspace staff should also avoid removing that part unless an adjustment is called for. When that occurs, Makerspace staff should refer to the "Makerspace Only" section on how to do so properly.)

- Take care to not cut yourself or others on the retractable cutoff knife that is used to cut off the vinyl from the roll after the machine has cut your design into the vinyl.

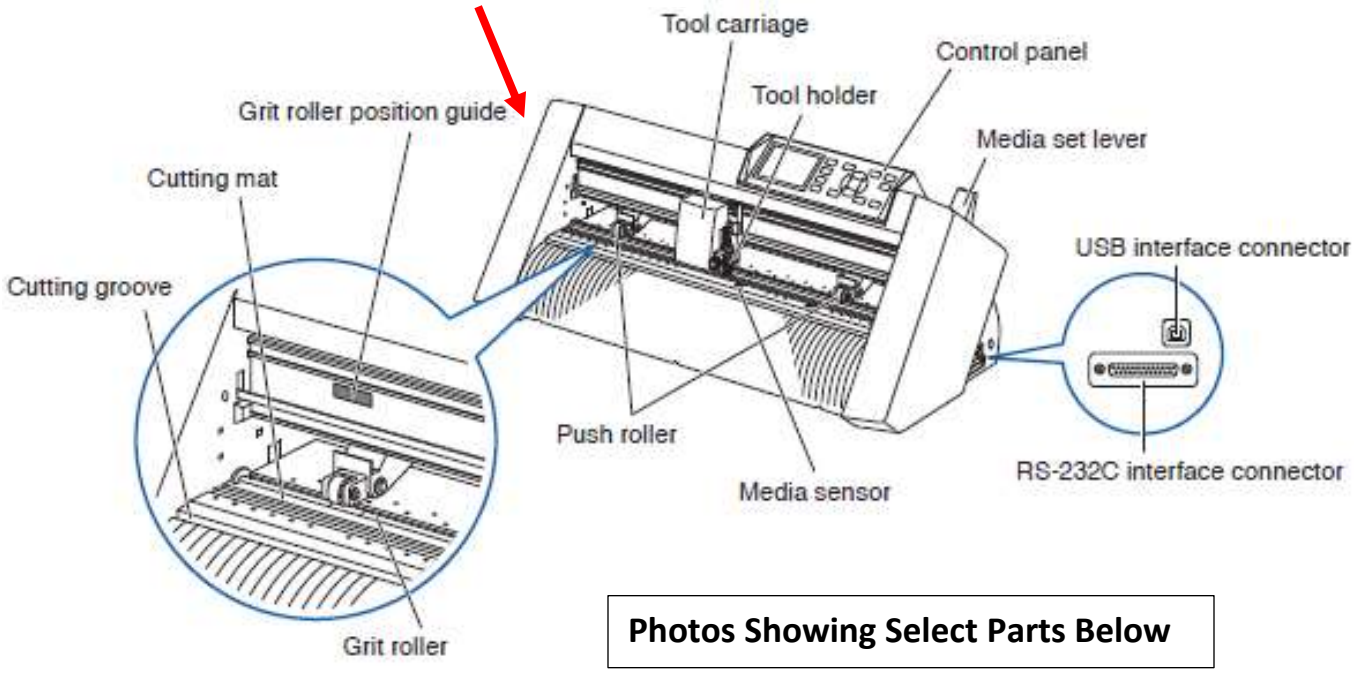
- Take care to not cut yourself or others on the X-Acto knives that can be used in the weeding process (the removal of waste vinyl from around the sticker).

- If makerspace staff (or makers with permission) replaces the X-Acto blades with broken tips for new blades, make sure to properly dispose the used broken blades into a "Sharps" container (typically found in public restrooms). Do not dispose blades in wastebaskets without taping them between two cardboards or some other method to protect hands that might be later inserted into trash receptacles.

- Be aware that the makerspace has "safety weeders" for younger makers or those makers that do not want to weed vinyl the stickers with sharp blades. Alternative weeders that are less dangerous include dental picks and the point of a thread ripper. Some pointed cuticle utensils also make fine weeding tools.

Machine Layout

Power Switch is located on the left side of the machine

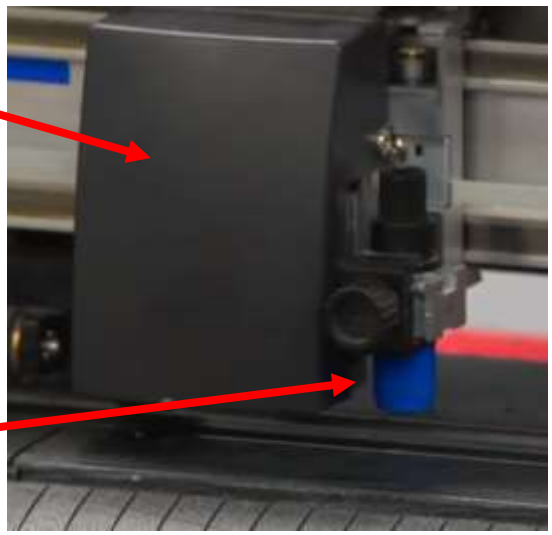


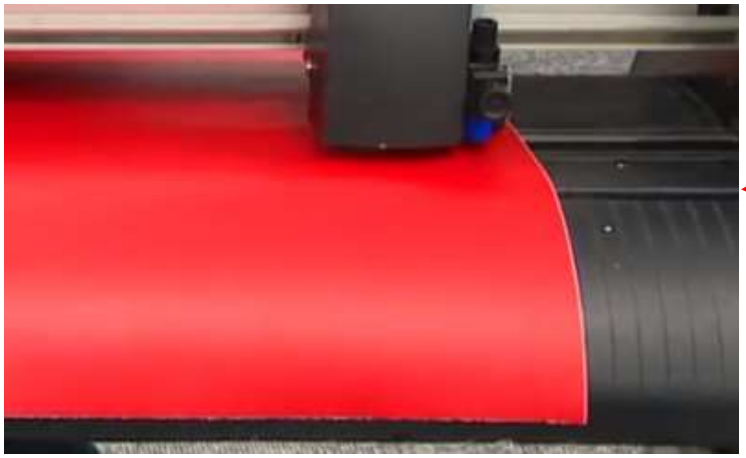
Photos Showing Select Parts Below

Tool Carriage (Head)

Note: It is rare that makerspace staff will ever need to adjust the depth of the blade unless makers are switching to a thicker or thinner vinyl. The blade is already adjusted to cut through the vinyl without cutting through its paper backing. Only makerspace staff are allowed to adjust the machine blade.

Tool (blade) Holder





Cut Off Groove

Use this grove to cut vinyl straight across with retractable cut-off blade

On the back of the machine is the "**Media Set Lever**" that lifts and lowers the "Push Rollers" (the wheels the holds down or releases the vinyl).

Lift the lever to lower the wheels to hold the material.

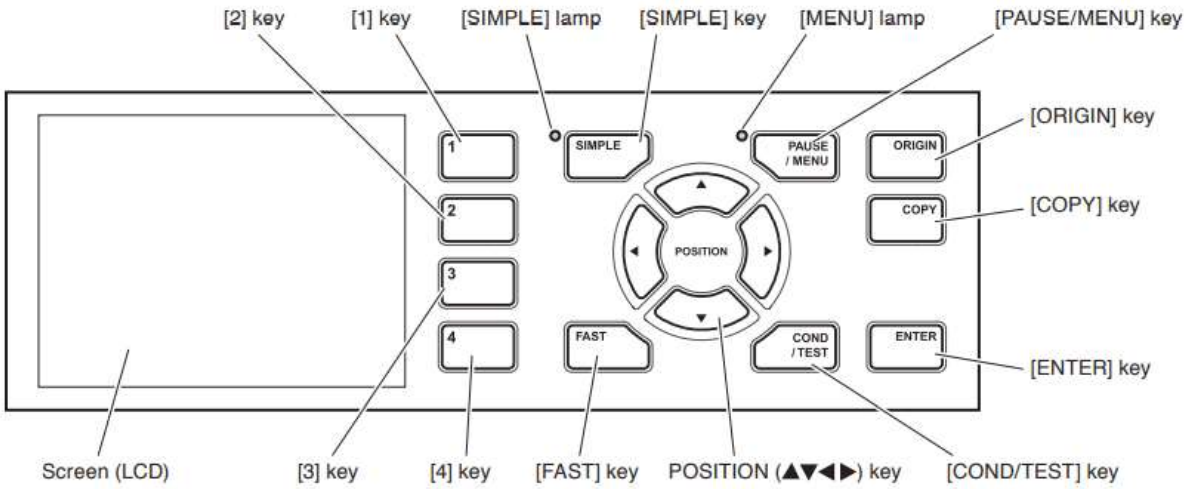
Lower the lever to raise the wheels to release the material/vinyl.

NOTE: When the vinyl cutter is not in use, the wheels should be in the "up" position—lever down.

The two wheels can be adjusted by moving them side to side to accommodate different widths of vinyl/material. Both wheels must be on the vinyl to push and pull the vinyl while computing and cutting and above a grit roller Located below the blue lines (See Page 10). See next page for more complete information on setting the push rollers/wheels.

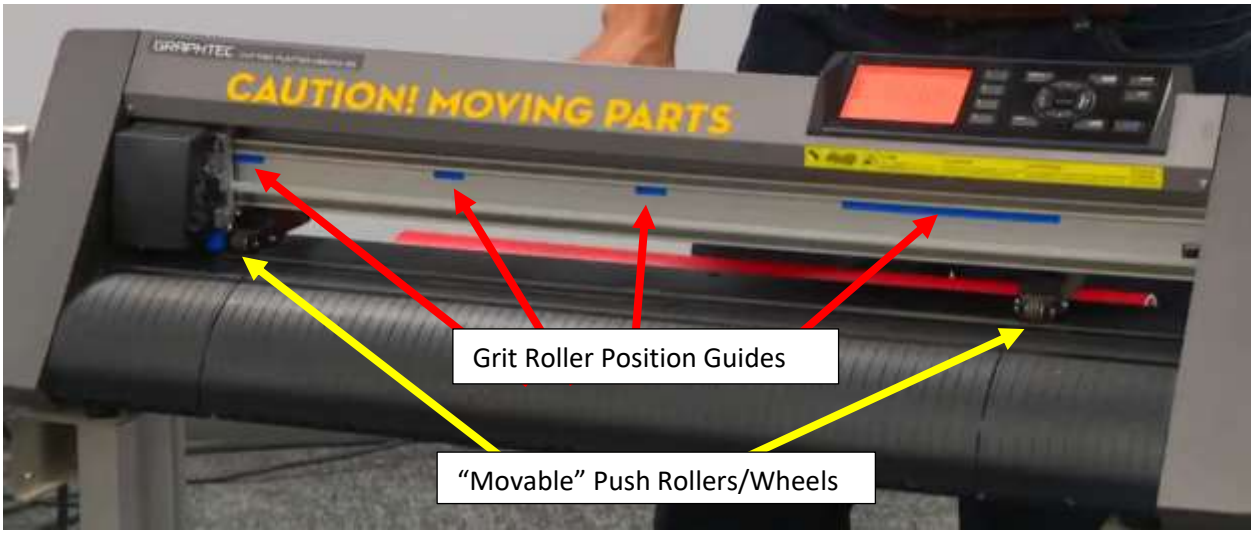
One of two "**Push Roller/Wheels**" that hold down material (seen on front of machine)

Control Panel on the Vinyl Cutter/Plotter



More about each of these buttons can be found in the Manufacturers' Manual by going to: http://nlc.nebraska.gov/grants/InnovationStudios/Documents/ce6000_series_user_manual.pdf

Proper Positioning of the Push Rollers/Wheels:



The Graphtec Vinyl Cutter machine has two **Push Rollers** (the adjustable wheels you can see) and four **Grit Rollers** that are recessed into the machine and sit under the vinyl. The Grit Rollers cannot move from side to side, but you can tell where they are located because Graphtec placed the **Grit Roller Position Guides** (the blue lines) above the four grit rollers that are housed in the machine for your reference.

IMPORTANT: In order for the machine to operate correctly, each of the two Push Rollers/wheels must be positioned above one of the Grit Rollers and on top of the vinyl/material you will be cutting. The Push Rollers should be no closer than 2/3-inch from the left and right edges of the material.

So basically the right wheel should be about an inch or so in from the right side of the vinyl and that wheel should be over the right longer grit roller or somewhere under that longest blue line. The left wheel should be about an inch in from the left side of the vinyl and under one of the short blue lines. If you are using 24" wide vinyl, position the left wheel under the most left blue line. When using 15" wide vinyl, position the left wheel under the second from the left blue line. When using 12" wide vinyl, position the left wheel under the third from the left blue line.

Remove Vinyl Roll

To remove the roll of vinyl from the machine, first release the locked wheels by lowering the “media set/lock lever” on the back of the machine (Figure 1). Rotate the roll of vinyl to retract the vinyl from the machine. As you lift the roll from the machine, take care to not unravel or loosen the vinyl on the roll.

Before storing the roll of vinyl, tighten the layers if they are loosely rolled, and secure the end of the vinyl with a piece of painter’s tape (in most cases you can reuse the used piece of painter’s tape.

Figure 1 – Lowering the Media Set Lever Shown on the Backside of the Machine

Load Vinyl Roll

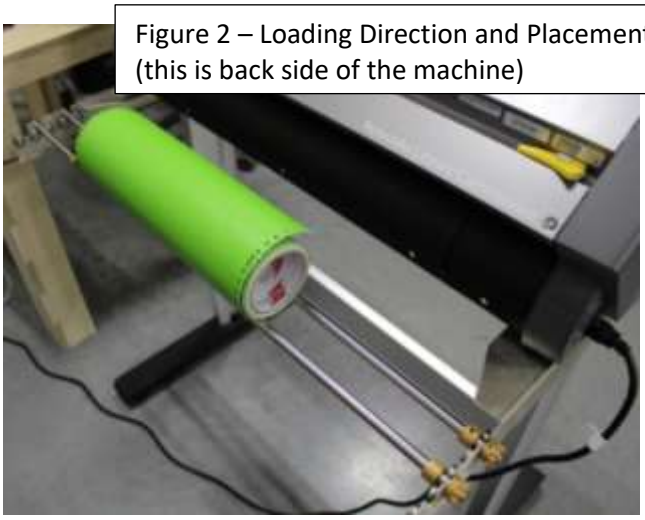


Figure 2 – Loading Direction and Placement (this is back side of the machine)

1. Once you have the vinyl roll you would like to use, remove the tape securing the roll. So that you do not lift the vinyl off of its paper backing at the cut end of the vinyl, make sure to remove the tape by first removing the end of the tape that is attached to the top layer of vinyl first. Then once the vinyl end is no longer attached to the rest of the roll, you may continue to peel off the remainder of the tape that is attached to the vinyl that lies underneath. (The issue that occurs if you peel the other end of the tape up first, is that you tend to separate the vinyl from its backing at the cut end of the vinyl.) Stick the end of the tape off the side of the machine so you can find it later when you need to put the roll away. Place the roll of vinyl on the two bars on the back of the vinyl cuter so that it unspools from the top with the cut edge facing the machine (Figure 2).

   Note: The manufacturer’s instructions instruct you to do more than simply sit the roll of vinyl on the two bars. However, simply setting the roll on the two bars without trying to “secure” the roll actually works better. Using the rod’s sliders to secure the roll can cause unwanted issues.

2. Unlock the “push rollers/wheels” by pressing down on the “media set/lock lever” (Figure 1 on previous page). Feed the vinyl through the plotter and make sure the vinyl is under both push rollers/drive wheels (slide the wheels along the rail as needed when the back lever is in the down position—not locked). Ideally, the wheels should be about 3/4 inch inside the ends of the vinyl. Each wheel MUST also be under a “blue grit roller indicator line” so that the wheels are above the hidden grit rollers in the base of the machine. This is described in more detail on Page 10. Pull through about 6 inches of vinyl and let it overhang (Figure 3). This overhang is important so that the material is positioned over the media sensor. The machine will retract the vinyl later.

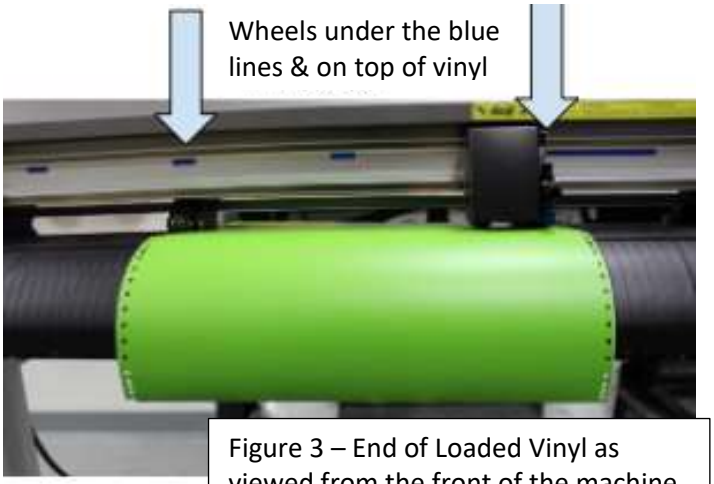


Figure 3 – End of Loaded Vinyl as viewed from the front of the machine

3. Check that the vinyl is properly loaded into the machine:

   - The edge of the vinyl should run parallel to the raised lines in the curved front of the machine (Figure 4).
   - The vinyl should be under both push rollers/drive wheels.
   - The drive wheels are located under the blue wheel locators (Figure 3). The wheels can be moved by sliding them left and right when the lock lever is in the down position—not locked.

Figure 4 – Parallel raised lines to help you make sure the vinyl is coming in straight

4. Engage the “push rollers/wheels” by pulling up on the “media set/lock lever on the back of the machine to secure the vinyl.

5. The machine can now detect that the vinyl is in place. On the control panel’s screen, it asks where we want to set the “Zero” position. We will press “1” to select “FRONT EDGE” of the vinyl (Figure 5). The “Tool Carriage/head” will move side to side to detect the right and left edges of the vinyl and will move the vinyl in and out to detect the front edge. It will automatically retract the vinyl to minimize waste material. The machine is now loaded and we are ready to go over to the computer to work on our design.

Figure 5 – Control Panel: Select “1” button for front edge position

Prepare Design File using CorelDraw

You will find some CorelDraw basics and tools discussed further in the Multi-Colored Sticker section on Pages 24-31. Here is a quick index of what you can find there:

Tip: Loading the vinyl first will help you in the design phase so make sure that step is completed.

On the computer, open CorelDraw and start a new file. On the Welcome screen click **Get started> New document** -OR- in the application window, click **File > New** (Figure 6). Select **“CorelDraw default”** for the destination from the Preset destination list box.

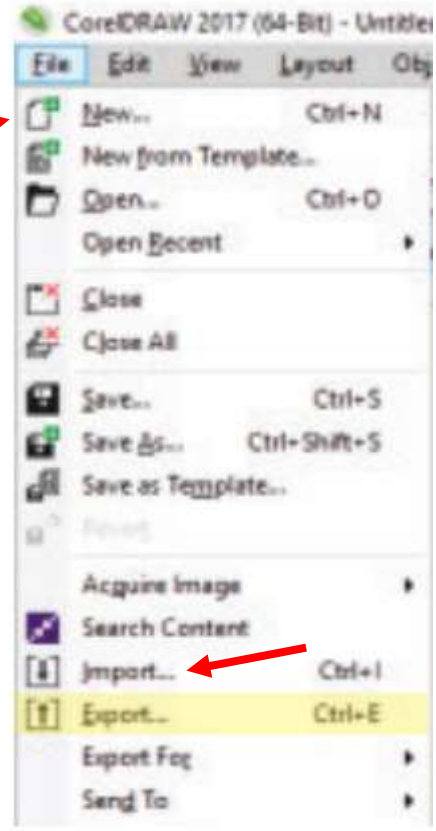


Figure 6 – CorelDraw Options under “File” Tab – Showcasing “New” and “Import”

In order for the vinyl cutter to cut a design it must be a **‘Vector’** graphic. The vinyl cutter does not recognize **‘Raster’** graphics, which are made up of pixels. There are two options to convert an image from a raster to a vector. One option is to manually recreate the design using CorelDraw’s drawing tools. This option can be more accurate to the original design but it takes a lot of time and expertise.

CorelDraw Trace Guide

“Tracing” (the easier conversion option), is a function in CorelDraw that lets you trace bitmaps to convert raster images to fully editable and scalable vector graphics. You can trace artwork, photos, scanned sketches, or logos and then easily integrate them into your designs.

Begin by pasting or importing an image into an artboard. More can be learned about selecting an image that works well on Page 26.

Copy/Paste

Right clicking on an image and selecting “Copy” places the picture on the computer’s virtual clipboard, right clicking on the artboard in CorelDraw and selecting “Paste” will add the image to the artboard. Not all images can be put onto the artboard in this way. If this fails move onto the “Import” option discussed below.

Import

Save the file to the computer (either the desktop or a flash drive) and then go to your CorelDraw file. Select “File” and then “Import” (Figure 6). Navigate to your file and select “Import.” A single left click will place the image on the artboard; or by left clicking and dragging you can specify the size of the object.

With the object now on the artboard and the object selected, click “Trace Bitmap” in the upper toolbar (Figure 7). There are different preset Traces that can be chosen based on the type of image you are tracing. General attributes of the options are as follows:

Quick Trace – A one-step command.

Centerline Trace – Uses unfilled closed and open curves (strokes) and is suitable for tracing technical illustrations, maps, line drawings, and signatures. The centerline trace method offers two preset styles: one for technical illustrations (for black and white sketches with thin faint lines) and another for line drawings (for black and white sketches for thick, prominent lines).

Outline Trace – Uses curve objects with no outlines and is suitable for tracing clipart, logos, and photo images. The outline trace method offers several preset styles suitable for a variety of images:

- Line art (for black and white sketches and illustrations)
- Logos (for simple logos with little detail and few colors)
- Detailed logo (for logos with fine detail and many colors)
- Clipart (for ready-to-use graphics)
- Low Quality Photo images (for low quality or fine detail you want to ignore)
- High Quality Phot images (for high quality, highly detailed photos)

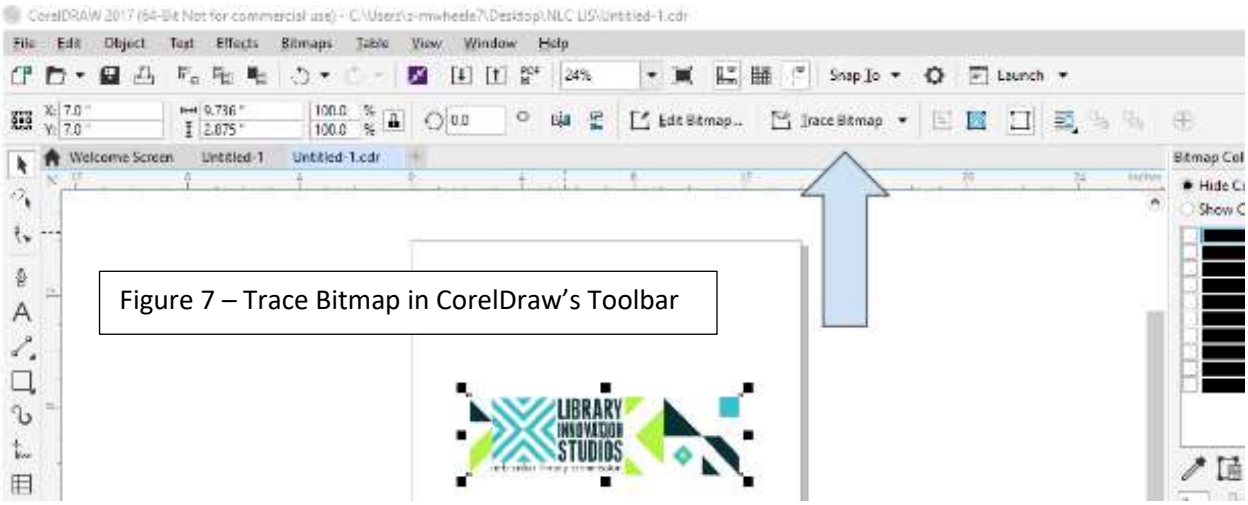


Figure 7 – Trace Bitmap in CorelDraw’s Toolbar

In our example featuring the Library Innovation Studio logo, we choose “Outline Trace” from the Trace Bitmap drop-down, and then “Detailed Logo” because we choose a fairly-detailed graphic (Figure 8).

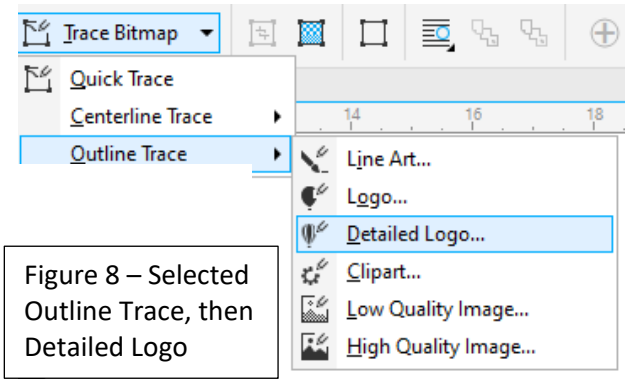
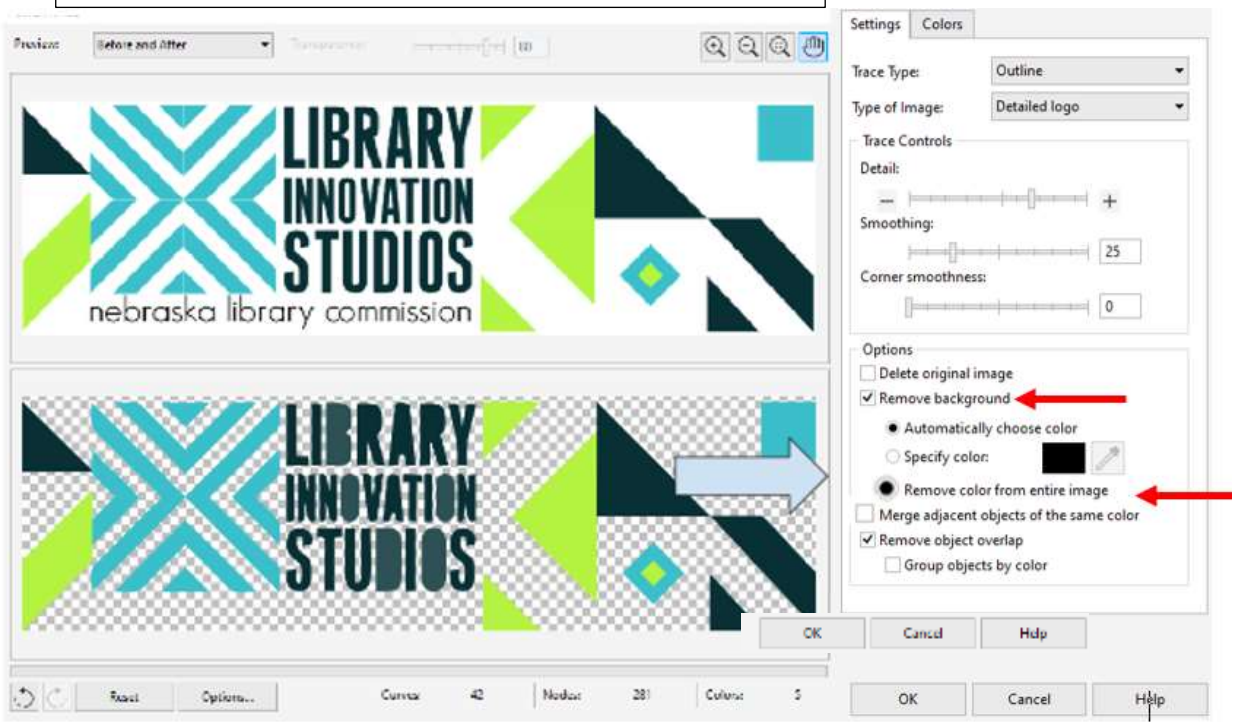


Figure 8 – Selected Outline Trace, then Detailed Logo

Each trace will show the original image (top picture) and a preview of the traced image (bottom picture). (When your images are taller than they are wide, these will be right and left pictures.) No matter which Trace option you selected, you can still adjust your image by using the “**PowerTRACE**” dialog box (left side of Figure 9). By adjusting the Detail, Smoothing, and Corner Smoothness ‘sliders’ you may find more or less appealing results. As you adjust the sliders, notice that the bottom (or right) “traced” picture either improves or gets worse depending on those adjustments. You will find there are some details that do not trace well. Overly complicated designs or small text will often be ignored by the Trace function.

For best results with the Vinyl Cutter, make sure to remove the background color from the image. Under options, select both “**Remove Background**” and “**Remove color from entire image**.” This will keep the vinyl cutter from cutting the same line twice. A common problem is when the software creates a ‘line on top of line’ because it is tracing each color. We can eliminate this double line that is created by the background color when we remove the background (in this instance the white color). A grey and white checkered background appears where it had been white to indicate there are no objects in that area. If the entire background is not checkered, you may “Shift” Click on the remaining background sections to remove those as well.

Figure 9 – PowerTRACE Screen Showing Sliders and Options



Using the menu, you can also elect to eliminate a specific color by checking the specific color box and then using the eyedropper tool to the right of that, to select a color to remove from the design.

For those who might want to try some new things, makers can also move from the "Settings" tab to the "Colors" tab. There you can merge colors if you want to. You can also select a specific number of colors that you want and the system will try to merge the design into that many colors. More on the Colors tab on Page 28.

When you are happy with the bottom (or right) image, click "OK" in the bottom bar. Doing so converts the design to a vector design and it sends the edited design to the vinyl cutter's Cutting Master 4 software. However, it will only be sent to print on a single color and not on multiple colors as shown in our example logo image. For training, we will be only cutting a single-color sticker.

Dividing cut lines for the different colors and layering your sticker with more than one color is an entirely different lesson. For more on multi-colored or multi-layered stickers see Pages 24-31.

Files may be adjusted for size and multiple copies in CorelDraw or you can do that in the "Launch" screen (the next step that follows on the next page).

To save your drawing, click on **File > Save as**. Type a filename in the File Name box. Locate the folder where you want to save the file. Remember, files saved on makerspace computers may not be there when you come back to the workstation. If you want to save a file for a return visit, use a cloud-based location or a removable USB drive.

For more on CorelDraw instructions that is a companion piece to the Vinyl Cutter SOP, refer to:
https://nlc.nebraska.gov/grants/InnovationStudios/Documents/CorelDRAW_SOPrev08-15-18.pdf

Final Launch Selections/Send File to Cutter

1. Send the design to the Cutting Master 4 software for final selections by selecting Cut/Plot (CM4) from the Launch dropdown menu (Figure 10).

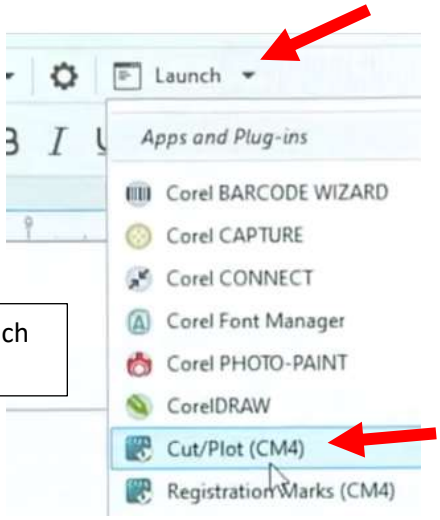


Figure 10 – How to Launch Cutting Master 4

2. This action will open two windows. The window entitled Cutting Master 4 will show the jobs the vinyl cutter is working on (Figure 11). This software enables the plotter to operate correctly. The user does not need to make any selections in this window, however the window cannot be closed otherwise the cutter/plotter will not be able to operate correctly. **You should "minimize" this window and leave it working in the background.**

Figure 11 – Minimize Window—DO NOT Close Cutting Master 4

3. The other window that opens is entitled "Cut/Plot" window. The Cut/Plot window will allow you to adjust the settings (Figure 12).

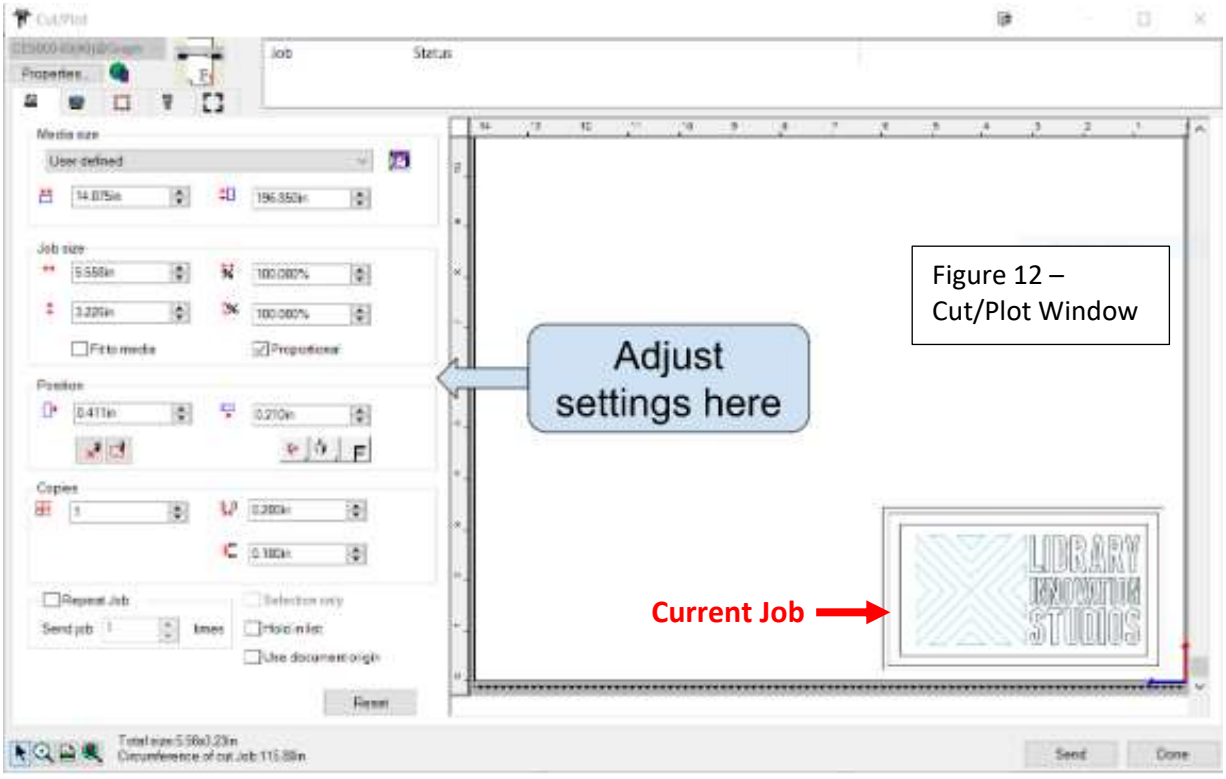


Figure 12 – Cut/Plot Window

4. In the left hand side of the Cut/Plot Window, there are multiple tabs to change the properties of your job. The first tab is “General” (Figure 13). Selections on that tab allows you to change the size of your media (the vinyl), the size and position of the job, and the number of copies of your design to lay out. On the screen’s right side is a representation of your design.

Figure 13 – General Tab of the Cut/Plot Window

5. The first area under the General Tab is “**Media Size**” area (Figure 14). There are two ways to enter the size of your vinyl loaded in the machine. The best way (if you have already loaded your vinyl and gone through the steps on Pages 11-12), is to click on the red question mark button. Doing so imports the information from the vinyl cutter’s measurements into the Cutting Master 4 (CM4) interface. Failure to click on the red question mark can result in incomplete cut jobs. The alternative option is to enter the material size in the “User Defined” area in the horizontal and vertical media size boxes.

Figure 14 – Media Size Selections

6. The **Job Size** area (Figure 15) allows you to adjust the size of your graphic either by inches or by a percentage increase/decrease. Check the “Proportional” box if you want to make sure you do not change the proportions of your graphic. When that box is checked, you only need to change the width or height and the other one will be automatically adjusted to keep your graphic in the same proportions as in the original design. Checking “Fit to media” (and Proportional) will automatically resize your graphic as big as it can be and still fit your material.

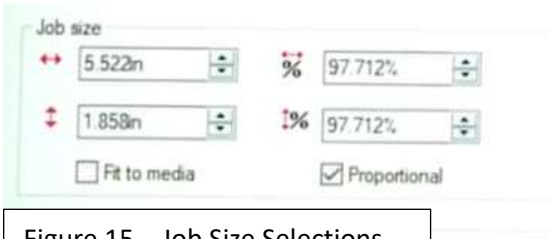


Figure 15 – Job Size Selections

7. You can click and drag your design if you wish or you can use the **Position** area (Figure 16) to change the location of the design on the sheet. Many put the design in the lower right hand corner. Keep in mind that some vinyl have punched holes at the two ends (those holes are not needed for this vinyl cutter). Make sure your design does not overlap those pre-punched holes. The user may also rotate the design or mirror the design in this box.

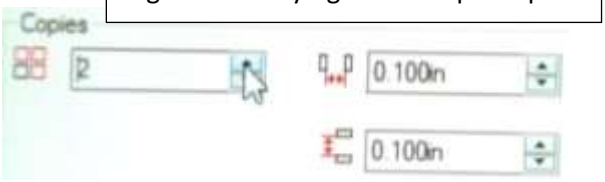
Figure 16 – Position options to include “Rotate” and “Mirror”

Why Rotate Your Design? – To save vinyl you might also consider "rotating" your design. Let us assume your design is a dog that is 10 inches tall and 4 inches wide and you only need to print one copy. You could lay your dog down on its side so you only use up just over 4 linear inches of vinyl rather than just over 10 inches if you do not rotate your design. To rotate your design click on the "Man" drop-down graphic (Figure 16), and click on the man lying on his side to rotate the design 90 degrees.

When Should you Mirror Your Design? – There are instances when you will want to mirror your design. If a business would like to have a vinyl graphic that shows their store hours and they want to place that on the inside of their glass door so they it can be read from the outside, they will want to mirror their design. Use the backwards "F" button to mirror the image (Figure 16).

Figure 17 – Laying out multiple copies

8. The **Copies** area allows you to layout multiple copies and determine how far apart the copies should be from each other (Figure 17).



Why Make Multiple Copies? – If you only need one copy of the design…should you still make multiples? When you cut off the vinyl roll to remove your machine-cut images, you will be cutting the vinyl off in a straight line across the entire width of the vinyl. This sometime allows you to print multiple stickers without wasting vinyl. Let us assume your final design is 4" x 4" and you are using 15" wide vinyl. You might as well create multiples of your design in a horizontal row so that if you have trouble weeding or while affixing your sticker, you have additional images cut and ready without wasting additional vinyl. In this example, you would have room for three designs in your row.

9. Typically, makers will only use the selections described above under the first tab. The remaining tabs allow for advanced settings and producing designs that are too large to fit on one width of vinyl, (a process called tiling). This document does not cover these additional tabs.

10. Once you are happy with your work piece—size, location, number of copies, etc., send the job to the cutter by pressing "Send" in the lower right hand corner of the Cut/Plot Window.

    Note: If you need to "Pause" or "Quit" the job, hit the Pause/Menu button on the machine's control panel. On the screen, it will read, "Job is Interrupted." As indicated on the screen, push '1' to Continue Job or '2' to Quit Job.

11. Once you press "Send," the cutter/plotter will begin cutting your vinyl. Keep your hands away from the moving parts. When the machine if finished cutting, the cutter head will stop moving and the screen on the machine's control panel will return to the main menu.

Process the Vinyl and Affix the Sticker Art

Figure 18 – Pushing the "down" arrow on the Control Panel

1. Before you can cut off the portion of the vinyl that contains your freshly cut design, you will need to move the vinyl forward so as not to cut in the middle of your design. There are two ways to advance the vinyl forward. You can use the "Down Arrow" on the machine's control panel (Figure 18), until the newly cut design is completely past the "cut-off groove" in the machine. (If you overshoot your mark, you can use the "Up Arrow." It is hard to see the cut design in the vinyl, so make sure the entire work piece if below the "slice groove." (The other way to extend the vinyl is to unlock the wheels by pressing down on the lever on the back of the machine, pull the vinyl out to that location described above, and then pull the lever up to lock the vinyl in place. However, using the down arrow described above is easier.)

2. Extend the blade out of the **retractable cut-off knife** and pull it through the machine's cut-off groove to completely cut off the vinyl in a straight line (Figure 19). Take care to keep the blade in the cutoff slot to avoid cutting the machine's surface.

   (Note: If you are going to cut another project with this same roll of vinyl roll you will need to lift the wheels up with the lever on the back, then lower them down again, then select '1' so the machine can find the front edge again.)

Figure 19 – Cut off the Vinyl above the design work by pulling your Cut-off Knife through the Cut-off Groove

3. Assuming you are done with the vinyl cutter, remove the roll of vinyl from the machine. To do this release the locked wheels by lowering the "media set/lock lever" on the back of the machine. Rotate the roll of vinyl to retract the vinyl from the machine. As you lift the roll from the machine, take care to not unravel or loosen the vinyl on the roll. Before storing the roll of vinyl, tighten the layers if they are loosely rolled, and secure the end of the vinyl with a piece of painter's tape (in most cases you can reuse the used piece of painter's tape).

   Make sure to leave the wheels in the up position (which means the lever is in the down position). This will ensure the wheels are not pressing down on the drum for extended time periods.

   Turn off the vinyl cutter using the switch on the left side and take the detached vinyl piece to the self-healing cutting mat (that protects the table from cuts) for processing. Generally, makerspace staff will ask that you leave the computer on.

4. Keeping the vinyl sheet on the self-healing cutting mat, use the craft knife or the dental tool to pick up the edges of the waste vinyl for removal (Figure 20). The removal of the waste vinyl is called "weeding." Continue this process until you have removed all of the waste vinyl, leaving only the vinyl that is part of the sticker still affixed to its backing.

Figure 20 – The Weeding Process

Figure 21 – Burnishing transfer paper/tape onto the top of the weeded vinyl

5. In order to successfully transfer your sticker to a surface, apply "transfer paper/tape" to the front of the sticker to keep all of the separate pieces properly aligned. Unroll and cut off enough transfer paper/tape to more than cover your design. Apply the tacky side of the transfer paper/tape to the front of your weeded vinyl sticker and rub the burnisher over the transfer paper/tape a few times so that it properly adheres to the vinyl (Figure 21). If the item you will be affixing your sticker to is elsewhere, you may stop here.

Figure 22 – Remove the vinyl's original paper backing

6. When you are ready to apply your sticker, first peel the paper backing off the vinyl sticker (the paper backing generally features grid lines and the brand and type printed on it). The best way to peel off the backing is to do so at a sharp angle to help prevent the vinyl from lifting off the transfer tape (Figure 22). The sticky side of the vinyl is now exposed so take care not to touch or get dust and dirt on your sticker. At this point, the transfer paper/tape is still affixed to the vinyl sticker.

7. Press the transfer paper/tape and vinyl up against your desired object while making sure the sticker is exactly positioned where you want it before the sticky side of the vinyl touches the surface. Again, rub the burnisher over the transfer paper/tape a few times in order to firmly stick the vinyl sticker to the wall, paper, jar or whatever other surface is the destination for your sticker.

8. Now that you sticker is affixed to your surface, slowly peel the transfer paper/tape back at a sharp angle making sure to leave the sticker stuck on its new home (Figure 23). Note: Removing both the vinyl sticker paper backing and the transfer paper/tape at a sharp (near the surface) angle helps to keep your sticker adhered. When you lift either the sticker backing or the transfer tape at closer to a 20 to 90-degree angle, you are more likely to lift the vinyl sticker up with layer you are trying to peel off.

Figure 23 – Peeling Transfer Paper/Tape off the affixed sticker at a sharp angle

Quick Recap of "Processing the Sticker" for Return Makers

- Weed off the unwanted design – leaving only the sticker parts.
- Apply Transfer Paper/Tape—tacky side to the front of the weeded vinyl sticker.
- Rub the burnisher across the Transfer Paper/Tape side.
- Peel off the sticker's paper backing at a sharp angle.
- Stick the sticker to the desired object.
- Rub the burnisher across the Transfer Paper/Tape side to secure the sticker.
- Peel off the Transfer Tape at a sharp angle from your newly affixed sticker.

Wrap-Up/Cleanup Procedure

1. Turn off the vinyl cutter and unload the vinyl. To remove the roll of vinyl from the machine, first release the locked wheels by lowering the “media set/lock lever” on the back of the machine. Rotate the roll of vinyl to retract the vinyl from the machine. As you lift the roll from the machine, take care to not unravel or loosen the vinyl on the roll. Before storing the roll of vinyl, tighten the layers if they are loosely rolled, and secure the end of the vinyl with a piece of painter’s tape (in most cases you can reuse the painter’s tape that may have been placed on the machine). Do not use other types of tape or rubber bands to secure the roll as these may damage the vinyl.

   Make sure to leave the wheels in the up position (which means the lever is in the down position). This will ensure the wheels are not pressing down on the drum for an extended period of time.

   Note, although it is usually expected that you turn off the vinyl cutter with the switch on the left side, generally makerspace staff will ask that you not turn off the computer. When in doubt, just ask.

2. Pick up and dispose the waste vinyl, the removed backing paper, and used Transfer Paper/Tape.

3. Retract or cap any blades so they are not exposed when not in use.

4. Return all tools and vinyl to their assigned locations. Never leave sharp tools out where children may find them.

Designing Multi-Colored Stickers in CorelDraw

Section 1—Basics of CorelDraw

Three-Colored Cookie Jar Vinyl Sticker

Understanding Clicks & Scroll Instructions

"Click" = Push Left Mouse Button 

"Right Click" = Push Right Mouse Button 

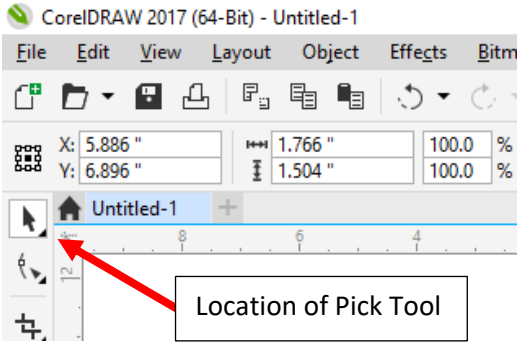
Middle Click" = Push the Mouse Wheel

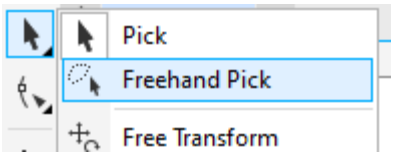
"Click and Hold" = Press down without releasing until the next step is done

"Scroll" = Rotating the scroll wheel up or down (as directed) by  resting your finger in the scroll wheel and moving your finger forward (up), or back towards you (down)

Selecting a Portion of your Image Using "Pick Tool" 

There are multiple methods to select one or multiple objects on your screen. The simplest is the **Pick Tool**. As shown in the image to the right, the pick tool is located near the top of the left menu bar. You can use the pick tool in two ways. You can just click on the object you want to select or you can click and hold to then drag your mouse over multiple objects to select them all.





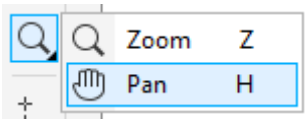
There is also the **Freehand Pick** tool you can use by clicking the small triangle on the bottom right of the Pick tool that triggers the drop-down options. When using the Freehand Pick you click and hold while drawing around the objects you want to select.

To select everything you can press **Ctrl** and the **"A"** key at the same time. 

To select multiple specific objects that are not able to be grouped another way, use the Pick tool, then while holding the **Shift** key, click each object you want selected.

Zooming 

To zoom, scroll up on the scroll wheel. To zoom out, scroll down. You can also use the **Zoom Tool** and the left click on the drawing to zoom in and right click to zoom out. Pressing the "Z" key will also select the zoom tool. NOTE: The screen will move towards your cursor as you zoom.



Panning 

Panning is the process of moving around a large or detailed image to view particular areas more closely. There are two ways to pan. To move around the drawing, middle click and hold while dragging your mouse to pan. Alternatively, you can use the **Pan tool** (found in the dropdown of Zoom (see image above), then click and hold while dragging your mouse to pan. Pressing the "H" key will also select the pan tool.

Copying

To copy an object you have to first select it. Then you can copy it by doing one of three things: pressing CTRL+C, right clicking on the object and click on copy in the menu that pops up, or clicking Edit then Copy on the menu that appears.

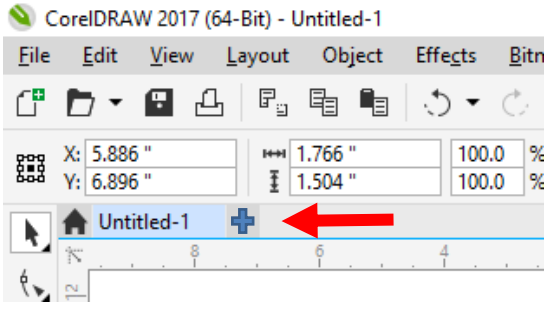
Pasting

To paste an object you have to first copy it. Then you can paste it by doing one of three things: pressing CTRL+V, right clicking on the object and click on paste in the menu that pops up, or clicking Edit then Paste on the menu that appears.

Section 2—Designing your Image

Creating the Document

When you first open CorelDraw, you will usually have a welcome screen that you can close if you want to. You will then need to create a new document by either going to File->New or clicking the **New Document** button that looks like a plus symbol in near the top left.



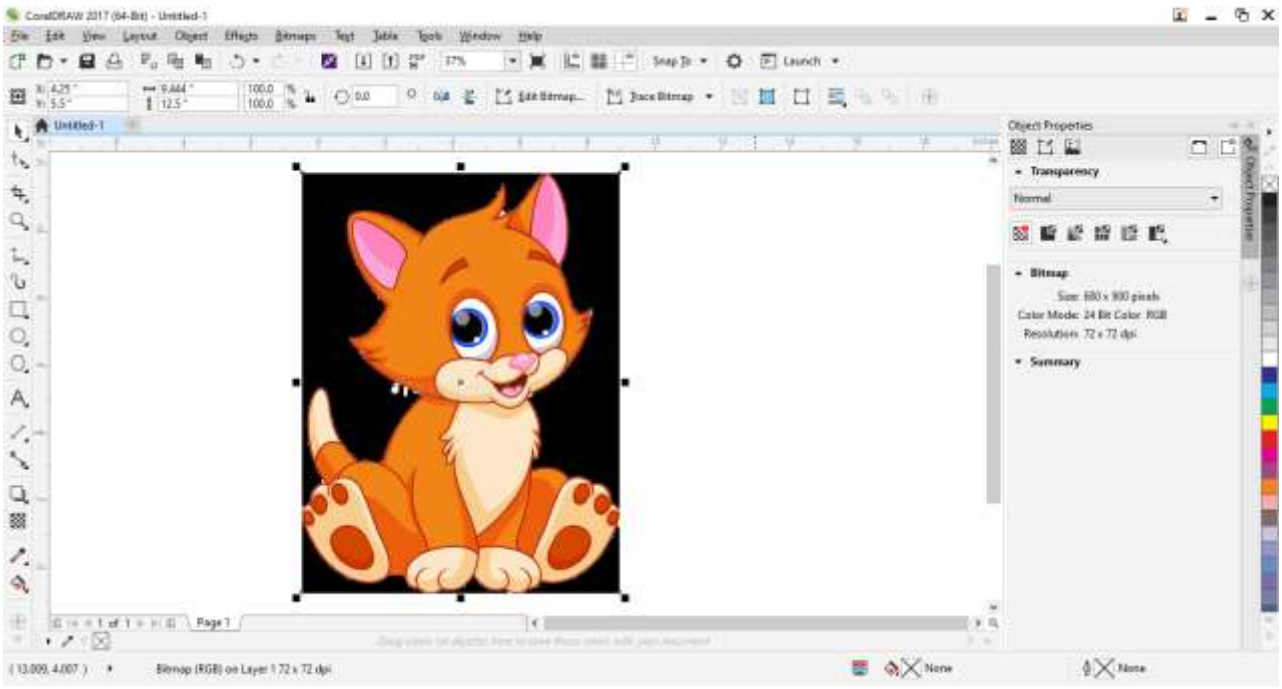
On the new document, if you do not want the machine to cut an unneeded border around your image, you should set the size to zero height and zero width. You can change both right above the new document button.

Finding your Image

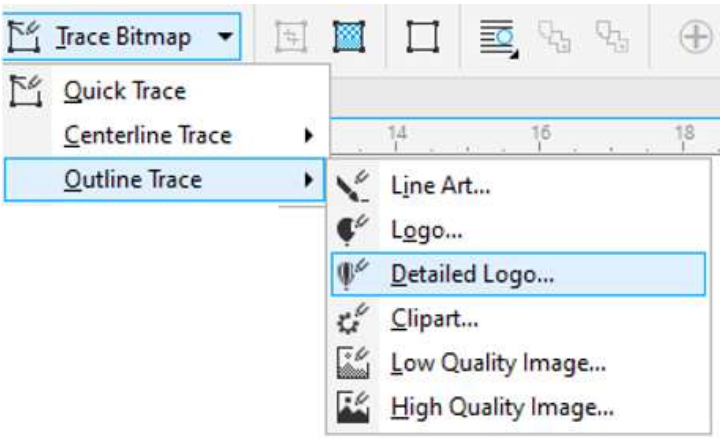
Finding the right kind of image can be the most important step in this process. While the image in the example below looks simple, it is not. With the shading and several colors, it makes every following step more complicated. The best images will have two or three colors and very sharp lines. You can find an image on Google Images or any other image browser. Using search terms like clipart, logo, and black and white can help focus in on images that are more useful. **Copy** the image that you choose and **Paste** it in your new document.

Consider these tips in finding an image:

- Images with small dots or pieces will make it harder to weed the vinyl.
- Images with lines that do not connect will need to be edited so that the vinyl is cut properly (lines connected), so it can be weeded.
- The more colors your image has, adds to the difficulty and amount of vinyl needed for the project.
- Black and white images will be easier to work with than pictures with lots of different shadings of colors.



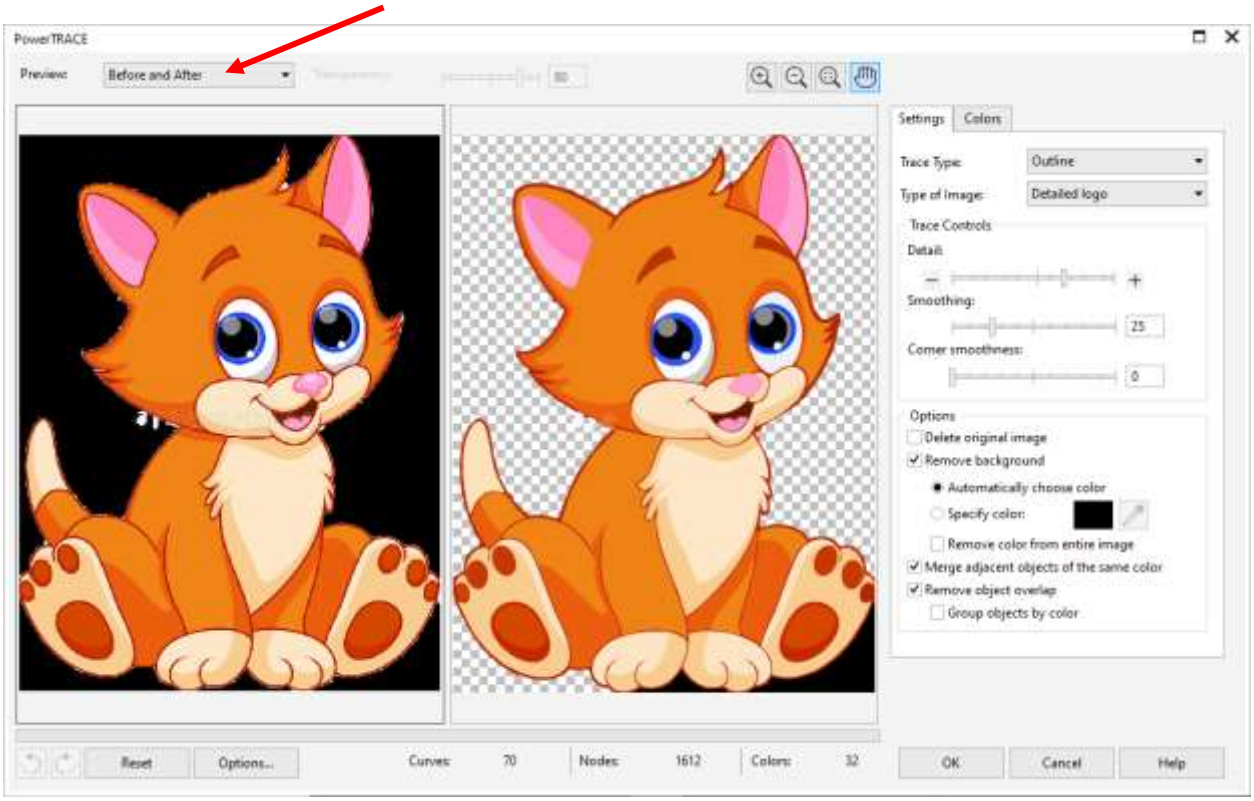
Convert to Vectors



First, select the image and then click Trace Bitmap. Then hover over Outline Trace then click the option that you prefer under that.

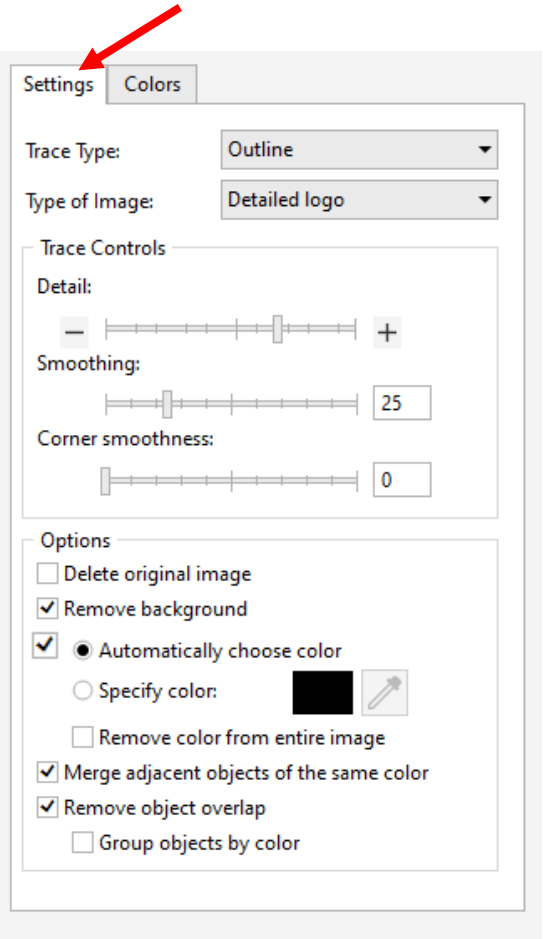
Choosing “Detailed Logo” often gives you the best results, but you can still switch that selection in the next screen if you want to try a different option.

NOTE: When you bring in an image, you can read how big your image is. Let us say the image your selected is 9” x 11”. If you know you want your image to be no taller than 5 inches, you can change the height to 5” and the other number will automatically change in the correct proportion. Although you learned earlier that you can also change the size later in the “Cut Master 4” software, in the case of a multi-colored sticker you want to adjust the size of your graphic in CorelDraw. This is because we are going to end up with multiple designs to cut and we will want them to be consistently sized as they will become part of a single art piece. If you resize later, adjust by percentage and use that same percentage for each layer.



After you choose your trace option, a dialog box like the one above opens. At the top left is “Preview.” This we set to “Before and After.” This allows you to view both the original image and what the results are with the current settings.

Here is a better view of the **"Settings Tab"** options in the right side of the dialog box. As you can see at the top, you can still reselect your **Trace Type** and **Type of Image** to find the best option.



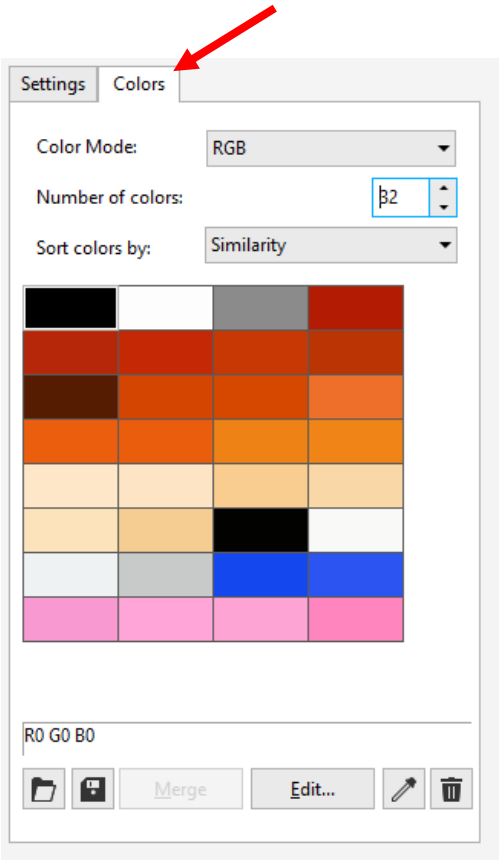
In the middle, are the **Trace Controls**. You can slide the sliders back and forth to help smooth out jagged lines and choose the amount of detail. These settings will be different for every picture so you will just have to play around for the right settings. It may be hard to see changes in the "after" picture as you move the sliders. Zoom in for a better look (using the magnifier with the + sign in the top tool bar). Use the Pan tool to check if you need to do more smoothing.

Near the bottom are the **Options**. In many cases checking all four far-left boxes works for what you might be doing.

Depending on the picture, choose either **Automatically choose color** or **Specify color** to remove the background. In the case of our cat example, we want to remove the black in the background. You can choose "automatically choose color" and see what the software removed. The parts removed were replaced with a checkered pattern—see picture on the previous page. Notice that the black in the lower right hand corner was not removed. Here you can push "Shift" on the keyboard and then Click on the background sections that have not been removed to remove these.

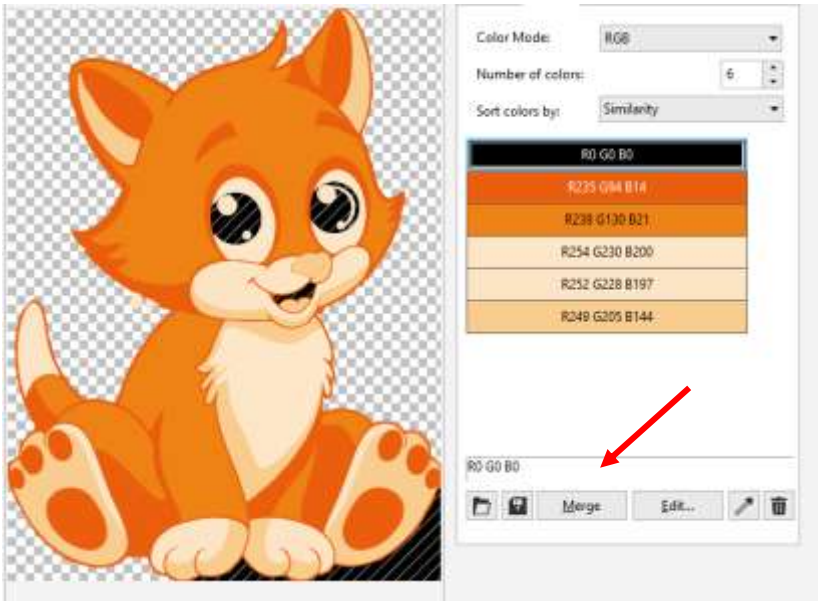
You can also choose **Specify Color**, then click the eyedropper to select the color to remove.

By selecting the **"Colors" tab** at the top right of the dialog box the menu shown to the right pops up. This shows all of the colors your image will have after you hit OK. You do not have to mess with this menu while making your image but it can be helpful. If you reduce the number of colors, it will try to merge similar colors or remove them automatically.



This can be helpful to get the image to a reasonable number of colors you want to cut on the vinyl cutter. However, if the change in the number of colors is too large, you can lose important colors.

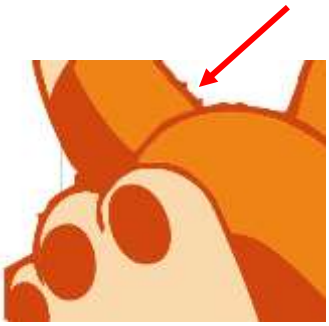
This shows what happened when we moved to six colors. The pinks were removed but multiple tans and oranges remained. We can narrow down the colors even more by clicking on one color then “Ctrl click” similar colors we want to join with it. Once the similar colors are selected, merge them by clicking **“merge”** at the bottom of the screen.
Since moving to six colors removed all pinks, let us try starting with nine colors to see if that works better. Keep in mind that we are not as concerned with the colors on the screen, but the lines created by those colors.



Here the number of colors was changed to nine colors. Nine is still too many colors if your final product is smaller. (But we do like that there is not an extra line in the pink part of those ears.) If your final sticker is going to be larger such as 12 inches, than the size of pieces are big enough to handle this many colors.

However, keep in mind your vinyl supply. Do you have enough vinyl colors available for the number of colors in your design? Remember, the more colors you have, the more vinyl will be used in your final product adding to the cost and the time consumed in affixing your final multi-layered sticker.

Additional Potential Issue: This shows an issue with our edited cat image. When you zoom in you can see all the jagged edges. When you discover an issue such as this, you will need to start again with a higher level of smoothness with the “Smoothing” slider.

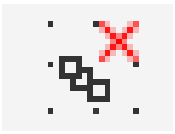


Separating Colors and Order of Layers

Once you have a good basic image you need to separate the colors into separate cut paths. Decide what order of colors should be back to front—in other words, which colors will be the bottom layer, next layer, etc. when you affix the stickers. First, decide what the outermost color is and if that should be the back or front. Often that color might be put in the back (the first layer affixed), with the inner pieces (eyes, nose, accessories), placed in layers above. However, this can be problematic if there are many pieces and they are quite small. Therefore, consider how best to layer the graphic you selected.

Let us assume the image is a Dalmatian that has many small black spots on a white body. If you have ever tried to affix many little spots on a surface you may have discovered that it is hard to transfer each spot effectively. In the case of our spotted Dalmatian, perhaps the background (or bottom layer) should be a black outline of the dog. Then layered on top of the black vinyl would be your white dog that has its spots weeded out. This allows the black spots to show up through the upper white layer.

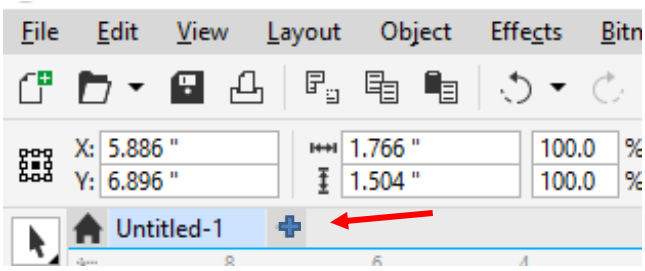
Break the image into its various pieces by selecting the object and clicking **Ungroup All** (tool bar image for ungroup as shown here).



At this point, you will want to select and delete all the little extra bits that you do not want. For instance in the cat picture, no matter what we tried while tracing the bitmap, the little gray smudge remained.
Refer to “Selecting a Portion of your Image” on Page 24 and use the **Freehand Pick** tool to select and then delete these unwanted bits.

Creating Background Layer

Select all objects of the final result by using CTRL+A. Then copy them by using CTRL+C. Create a new document by clicking the **New Document** button that looks like a plus symbol near the top left.



On the new document set the size to zero height and zero width, otherwise you will be cutting an unneeded border around your image. You can change these numbers right above the new document button. Then paste by using CTRL+V.

With everything selected, click the **Combine** button: 

Then the **Break** Apart button: 

Then the **Weld** button: 

This should give you one single outline (or silhouette) but if not, you will have to do some fiddling with the curves. Welding individual pieces together in steps often works to get this outline—the background color cut line.

Foreground Layer(s)

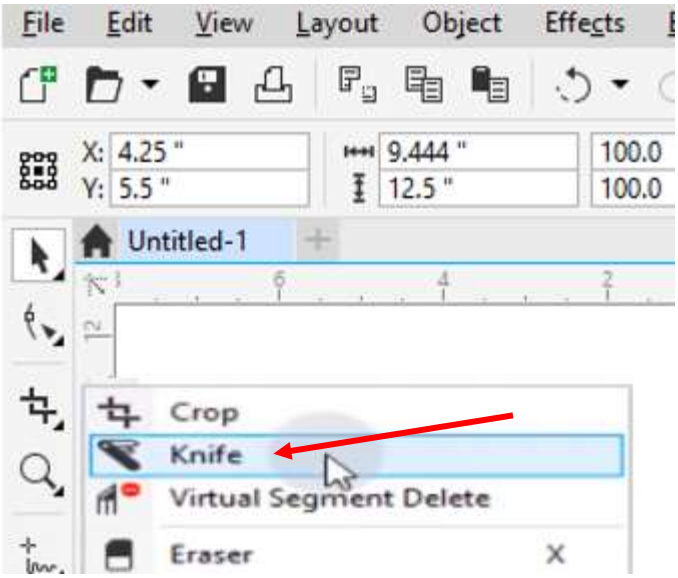
For every color in your image, you will need to create a separate document with the cut lines for that color. Create a new document like in the background layer then copy all objects of a single color to the new document. There are a few ways to do this.

- The first option is to individually select the copy then paste each object of the chosen color to the new document.
- Another option is to copy all objects over like in the background layer then select and delete each piece you do not want.
- Finally, you can select the specific objects using the shift click method then copying them over.

You will need to repeat this for each vinyl color. Other than the background that was already done in the previous step.

Using the Knife Tool to Separate One Color into Two or To Connect Lines that were "Not" Connected in the Original

Perhaps the image you grabbed had an "unconnected" line that will be necessary to connect for proper weeding. Or perhaps you want to draw a line in your image so that you can add another color. Perhaps you would like your tree frog's hands and feet orange but the image you selected did not have a cut line drawn at the wrists and ankles. You may use the "Knife" symbol from the tool bar to slice through the parts that you would like an additional color or where you may need to complete a line. Make sure to go the entire width with your cut line so that your line reaches the border. In the case of our frog, extending over the border is not problematic because the cut lines extended into a part that will be removed in the weeding process.



To find the Knife tool, expand the "Crop" tool to expose the drop-down box. From there you can choose from Crop, Knife, Virtual Segment Delete, and Eraser.

Although we discussed using the knife, you may find times where using the "Eraser" may also come in handy.

Once you are happy with all your layers, you can convert them to vectors by clicking on OK. Then follow the Launch instructions as detailed on Page 17.

For Makerspace Staff ONLY Section

Troubleshooting

Problem: The vinyl cutter is pulling up some of the design.

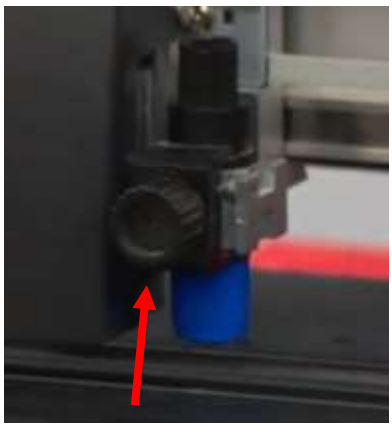
Solution: The file likely has two shapes with that line, one interior and one exterior. Revisit your design and confirm only one line exists. Refer to the 'Remove Background' discussion in the CorelDraw Trace Guide section on Page 15.)

Alternative Solution (ONLY for Makerspace Staff Action): There could be a piece of vinyl stuck to the blue tip of the tool holder (perhaps caused by the line-on-line issue mentioned above). Makerspace staff may want to remove the tool holder (see below) and peel away any stuck vinyl.

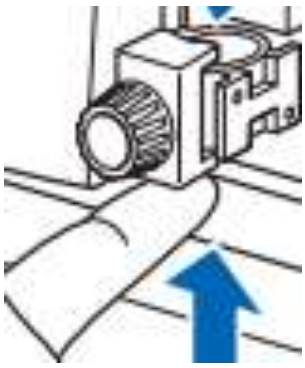
Problem: The vinyl cutter is cutting through both the vinyl and the paper backing.

Solution: First, check the cut settings on the vinyl cutter. On the vinyl cutter press "COND/TEST" and check the "FORCE" against these settings: heat transfer vinyl: Force of 12; glitter vinyl: Force of 15; regular vinyl: Force of 9.

(For Makerspace Staff Only) If changing the 'force' does not work, staff can remove the cutter blade by unscrewing the holder screw and lift up, to check how much of the blade is exposed. During training, makers should be warned not to touch this part of the machine. Even makerspace staff should not "remove" the blade from the housing. See the graphic below for the correct blade height. If you were cutting through both the vinyl and its paper backing, the blade is probably extended too far. It can be adjusted in or out, by twisting the black end without removing the blade.



Loosen the "Tool Holder Screw/Knob" by turning it counter clockwise



While pushing up on the tool holder…

Lift the tool up and out, being careful NOT to touch the blade protruding from the blue end

Correct Blade Height

To adjust the blade depth, twist the back end of the “Tool Holder”

To reinstall the Tool Holder, loosen the front screw/knob, lift the retainer clip, and drop in the tool holder blue end down. Push the tool all the way into the holder until its flange contacts the upper part of the holder and then tighten the front screw/knob by rotating the knob clockwise and tighten firmly but not excessively. DO NOT FORGET TO TIGHTEN THIS KNOB.

Replacement machine blade/spring pairs: Although you can purchase replacement blades for this vinyl cutter, it may be years before you need to change the blade. When removing the blade (and its tiny spring) from the holder, it is easy to drop it and not be able to find it because it is so small. You may want to do this task over a pan or large bowl so you don’t lose the blade or it’s screw.

Manufacturer’s Manual: Makerspace staff who want to learn more about setting blade length, force, speed, acceleration, and offset can also refer to the manufacturers’ manual. You will find an extensive trouble shooting section in Chapter 13 of the Manufacturer’s Manual. You may access that manual at: http://nlc.nebraska.gov/grants/InnovationStudios/Documents/ce6000_series_user_manual.pdf

Periodic Maintenance Information (Only if Needed)

If the vinyl cutter machine gets dusty or dirty, clean the machine casing (the grey outer shell of the machine) using a dry cloth that has been moistened with a neutral detergent diluted in water. NEVER use thinner, benzene, alcohol, or similar solvents to clean the casings, as they will damage the finish.

Clean the cutting mat area (the black part of the machine) using a dry cloth. In the case of stubborn stains, you can moisten the cloth with that diluted detergent. Take care to not cut yourself on the blade.

Clean the plotter's media (material) sensors using a cloth moistened with a neutral detergent diluted in water. NEVER use thinner, benzene, alcohol, or similar solvents as that will damage the sensors.

If and only if the Y rail sliding surface gets dirty, gently wipe the dirt away with a clean, dry cloth. **DO NOT WIPE ALL THE LUBRICANT OFF**. Note the Y rail sliding surface has a lubricant on it so be sure not to wipe off all the lubricant.

Never lubricate the mechanisms of the plotter.

Some makerspaces will cover their machines with a clean cloth or plastic sheet when it is not in use.

Your vinyl cutter should not be stored in direct sunlight or in very warm temperatures.

Proper Storage Humidity and Temperature Levels

Vinyl should be stored in areas that are not too cold, too hot, or too humid/damp. Relative air humidity between 50% and 60% and temperature around 75°F is best. Do not let the storage area temperature to drop below 64°F and do not store vinyl in direct sunlight. Do not have vinyl stored too close to radiators or right next to air vents.

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