

## User Training Manual

# *VINYL CUTTER*

## ARC SPACESHOP



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National Aeronautics and  
Space Administration

**Ames Research Center**  
Moffett Field, CA

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## I. Introduction

This document is for the user qualification training of the Vinyl Cutter, located at the Ames SpaceShop facility on the 2<sup>nd</sup> floor in Building 220. Before a user operates the machine, he/she must have signed the required documentation as described in the “SpaceShop Standard Operating Procedures”. For additional information, please see a SpaceShop staff member.

## II. Vinyl Cutter GX-24

The Vinyl Cutter GX-24 is a machine that allows users to cut materials such as vinyl, paint masks, reflective vinyls, or circuits using flexible sheets.

The specifications of the vinyl cutter are as follows:

- Accepts material from 2 to 27.5 inches wide
- Mechanical Resolution of 0.0005
- Cutting Speeds of up to 20 inches per second
- Maximum down force of 250 grams



Figure 1: Vinyl Cutter

### III. Safety Precautions

#### a. Vinyl Cutter Safety

##### SHALL...

- You **SHALL** notify SpaceShop staff prior to running any job.
- You **SHALL** wear closed-toe shoes at all times.
- You **SHALL** wear eye protection when working with tools and processes that involve chemicals, metal shards, wood chips or sawdust.
- You **SHALL** clean up your space after every job session, and leave 10-15 minutes for cleanup prior to shop closure.
- You **SHALL** secure badge and any loose items that might get caught in moving machinery.
- You **SHALL** clear the area around the cutter before turning on the machine.
- You **SHALL** use test strips before working on your final product to make sure the machine is working properly.
- You **SHALL** always handle the blade carefully.

##### SHALL NOT...

- You **SHALL NOT** leave a machine unattended while in operation.
- You **SHALL NOT** work alone while in the SpaceShop.
- You **SHALL NOT** use liquids, metals, or flammable objects inside the cutter.
- You **SHALL NOT** leave the vinyl cutter unattended while a job is in session.
- You **SHALL NOT** place hands or other objects in the path of the cutting arm while the job is in session.
- You **SHALL NOT** lean on the machine.
- You **SHALL NOT** wear ties, belts, or leave hair down while cutting arm is in operation.
- You **SHALL NOT** manually stop the machine while it is in motion.
- You **SHALL NOT** move the cutting head while the machine is turned on.

#### IV. Step-by-Step Tutorial

##### a. Tools Required

- Vinyl or Copper sheets
- Computer with Cut3
- Utility knife
- Scissors
- Fine Tweezers(for weeding)
- Transfer tape
- Magnifying Glass

##### b. Getting Started

1. Turn the **LOCKING KNOB COUNTER-CLOCKWISE** on the **BLADE HOLDER ASSEMBLY**, to remove the **BLADE HOLDER** (Figure 2).

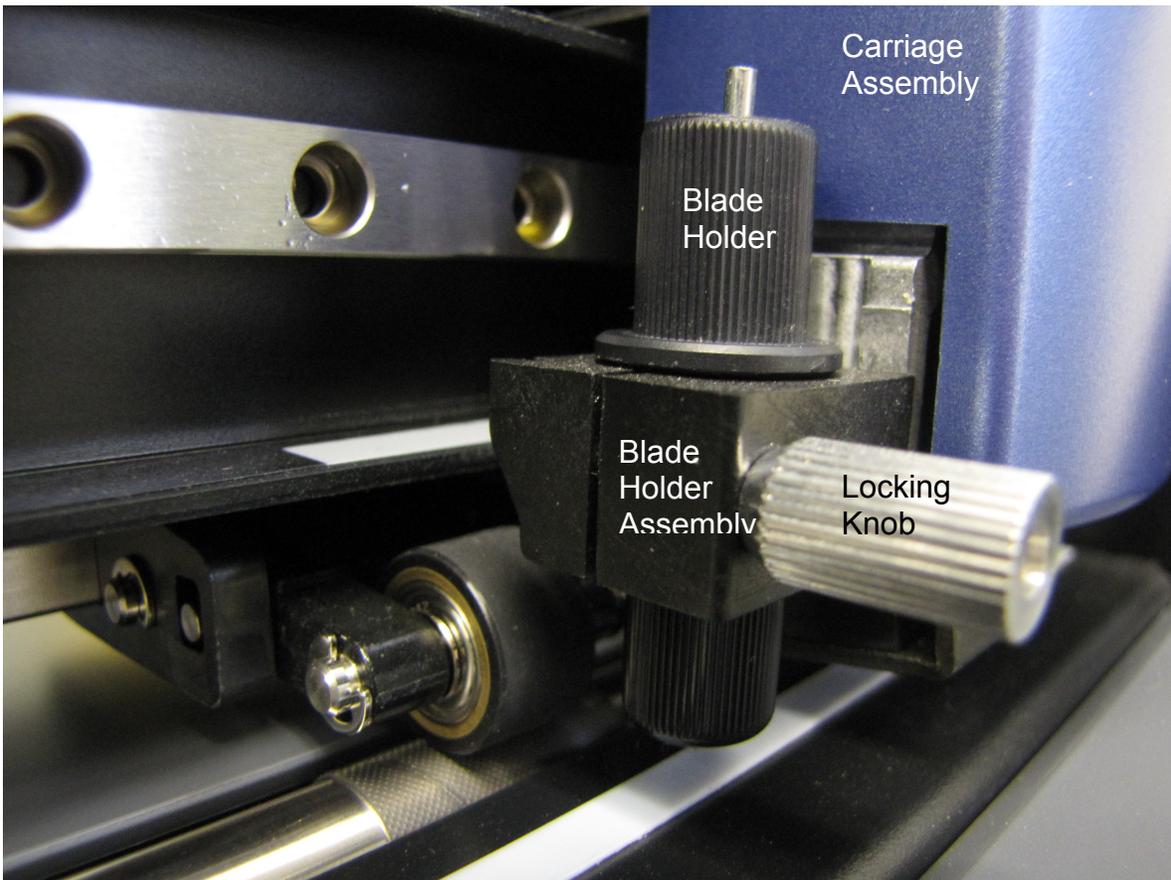


Figure 2: Carriage Assembly

2. While rotating the **BLADE HOLDER COUNTER-CLOCKWISE**, gently pull up until the **BLADE HOLDER** pops out of the **BLADE HOLDER ASSEMBLY** (Figure 2).
3. **INSPECT** the **BLADE TIP** for damage. See SpaceShop Staff regarding whether or not you will need to change your tip and how to inspect the tip (Figure 4).
4. If the **BLADE TIP** is damaged, hold the **BLADE HOLDER LOWER HALF** in your left hand and with your right hand, gently rotate the **BLADE HOLDER TOP HALF** counter-clockwise until you have both parts separated (Figure 3).
5. Press **DOWN** on the **PLUNGER** sticking out, and notice the blade moving down as you do. If you **LET GO**, the **PLUNGER** and blade move back into their initial position. Note: The **PLUNGER** is not attached to the bottom blade. It's used solely to move the blade to a safe position where you can now pull the blade out without having to touch the sharp edge itself (Figure 3 & Figure 4).

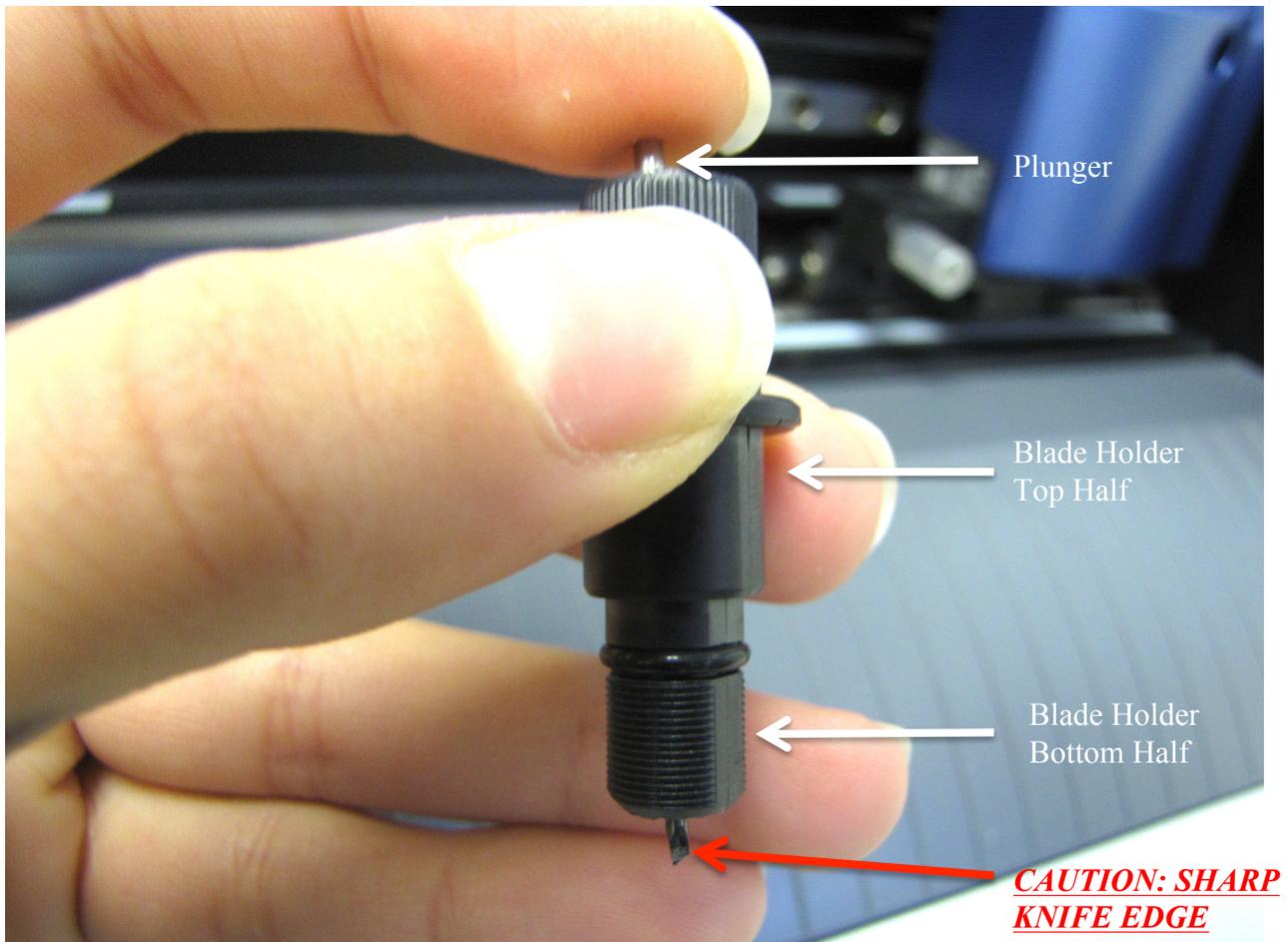


Figure 3: Blade Holder

6. Take the **NEW BLADE** and place in **SAME DIRECTION**, sharp end facing out and **PUSH GENTLY** into the **BLADE HOLDER**, until an inner **MAGNET** pulls the blade back into place.
7. Place the bottom half of the **BLADE HOLDER** disassembled in **STEP 4** in your left hand, and the top half in your right hand. Rotate the bottom knob in your left hand, **CLOCKWISE** until the top edge now joins the top half in your right hand.

Notice: You can still press down on the top **PLUNGER**, but if you **GENTLY** try scratching a surface, then the blade should cut through the vinyl, resisting movement back into the **BLADE HOLDER**. It is now secure and ready to be placed back in the **BLADE HOLDER ASSEMBLY**. We will later **ADJUST FORCE SETTINGS**, to apply pressure on the **PLUNGER** thus affecting how deep the blade cuts.

8. Place entire **BLADE HOLDER** back into the **BLADE HOLDER ASSEMBLY** and rotate the **LOCKING KNOB CLOCK-WISE** to tighten the assembly.



Figure 4: Blade Holder Components

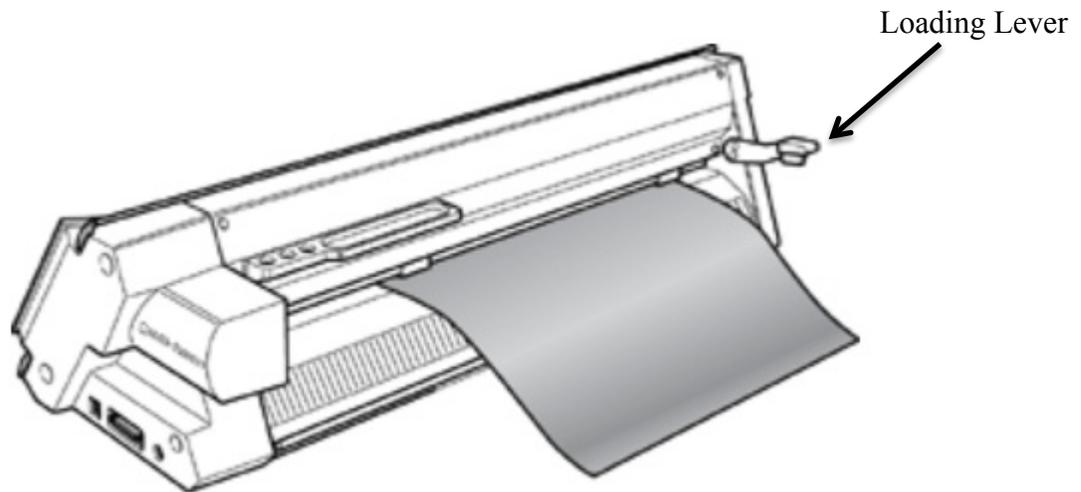


Figure 5: Loading Lever

9. Lower the **LOADING LEVER** (Figure 5).
10. Material is now pushed through the machine, pulled out on the front side of the machine and positioned so that both **MATERIAL EDGE 1 & MATERIAL EDGE 2** align with the **GUIDELINES** (Figure 6).

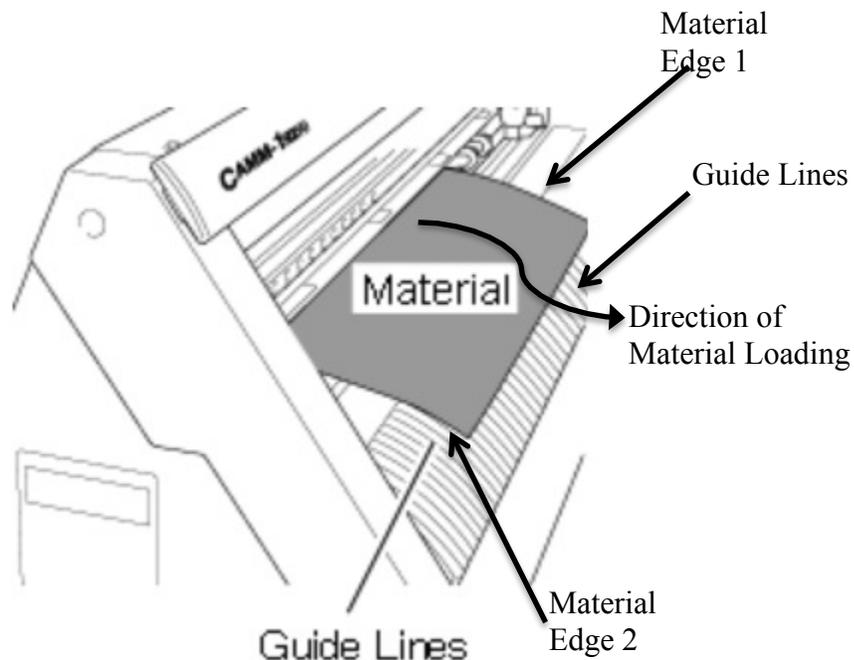


Figure 6: Vinyl Cutter Base

11. To load a roll of material into the base using the **ROLLER BASE**, **PULL OUT** a length of material longer than what is needed for cutting, leaving some slack (Figure 7 & 8).

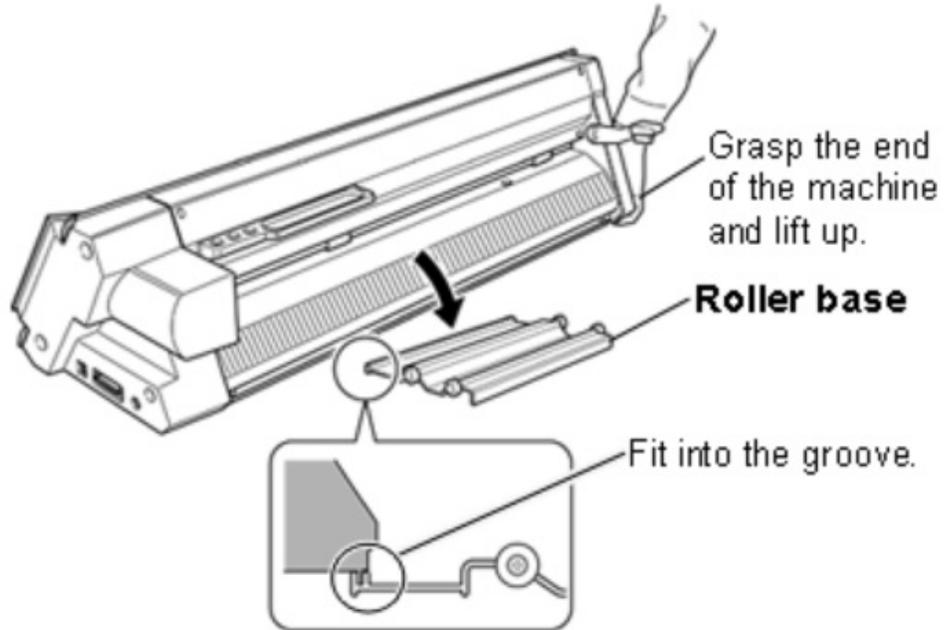


Figure 7: Roller Base

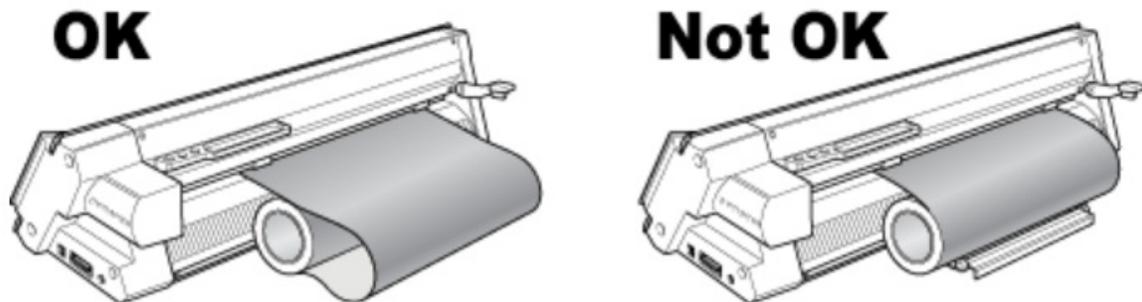


Figure 8: Roller Base with loose roll attached

12. If you are not using the **ROLLER BASE**, cut off a sheet of material and insert into the machine from the back-side. (Figure 9).

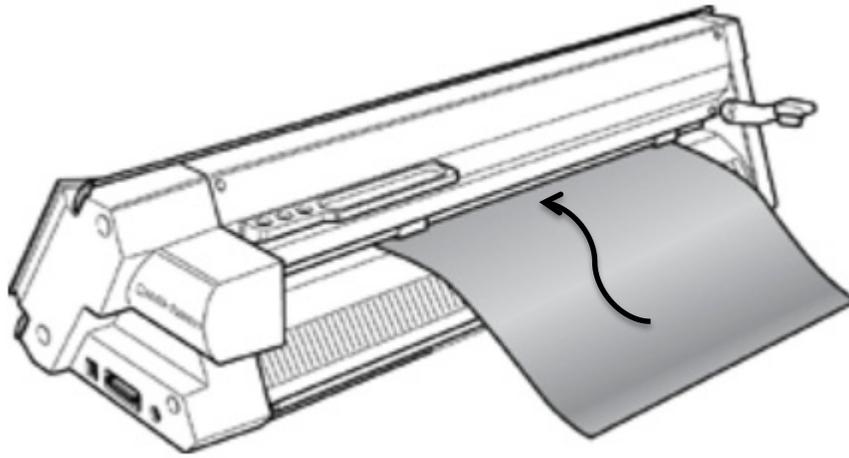


Figure 9: Using sheets in the Vinyl Cutter

13. Depending on the width of your material, **ALIGN** the **LEFT EDGE** and **RIGHT EDGE** of the material within the boundaries of two white marks, called the **VERIFICATION MARKS** (Figure 10).

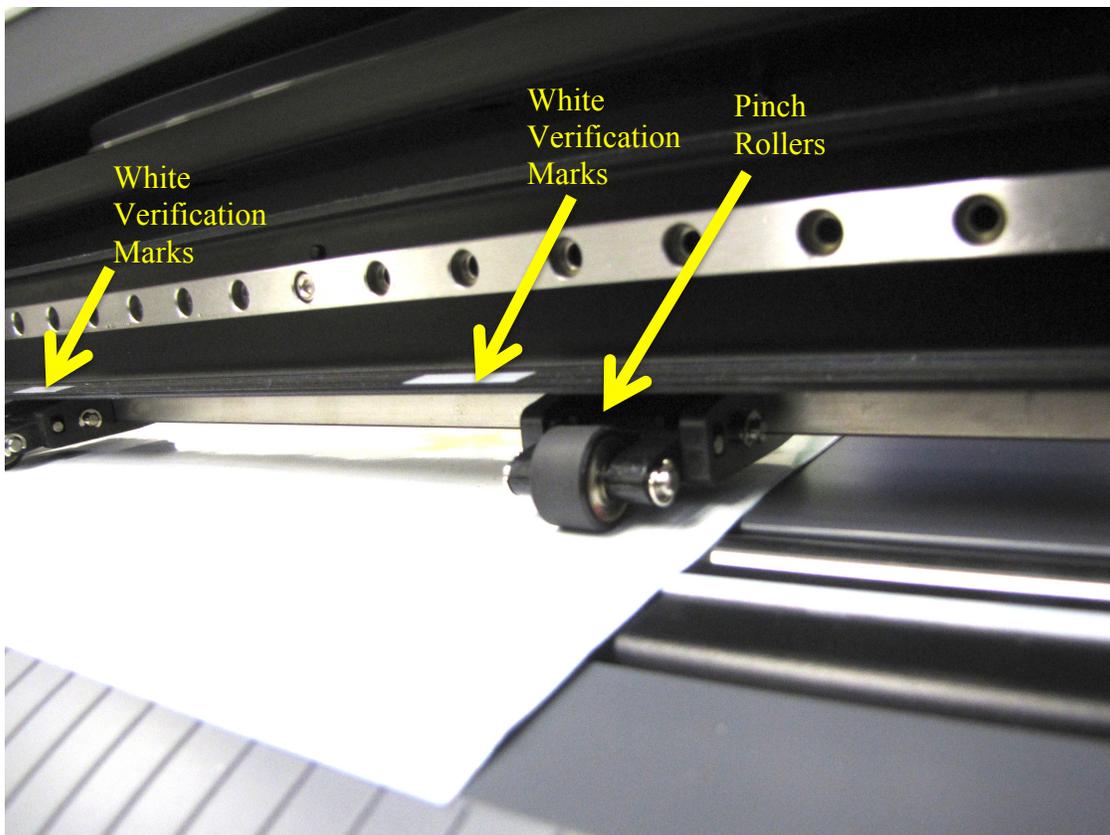


Figure 10: Pinch Rollers & Verification Marks

14. **MOVE** the **PINCH ROLLERS** such that they are positioned at the edges of the material, and also inside the areas of the **VERIFICATION MARKS** (Figure 11).

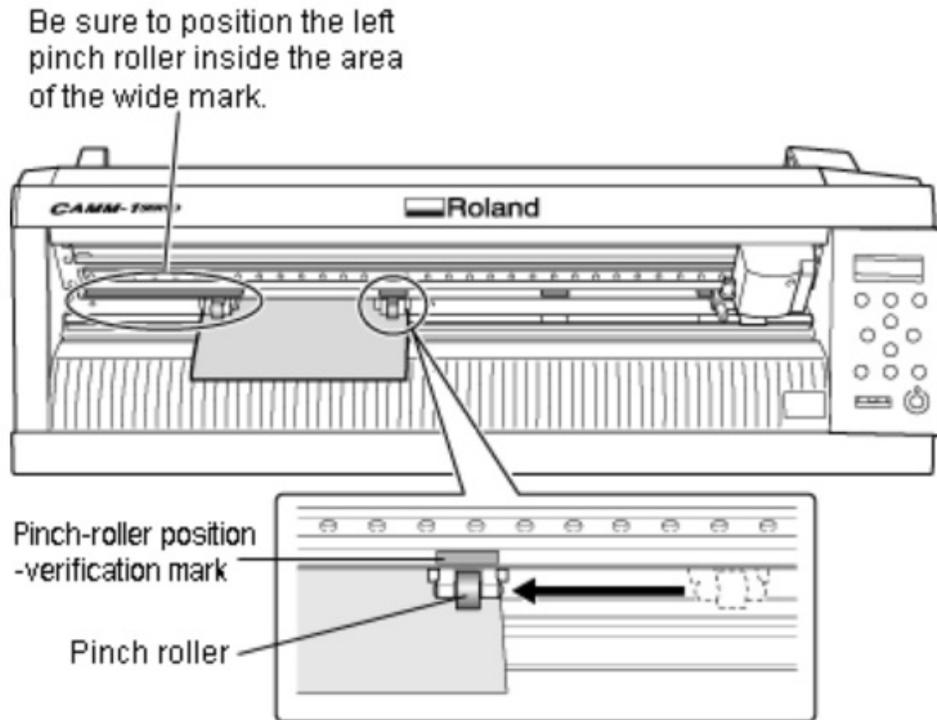


Figure 11: Pinch Roller Verification Mark

The left pinch roller can be used within the area shown.  
When using materials with widths other than those shown below, adjust the position of the left pinch roller.

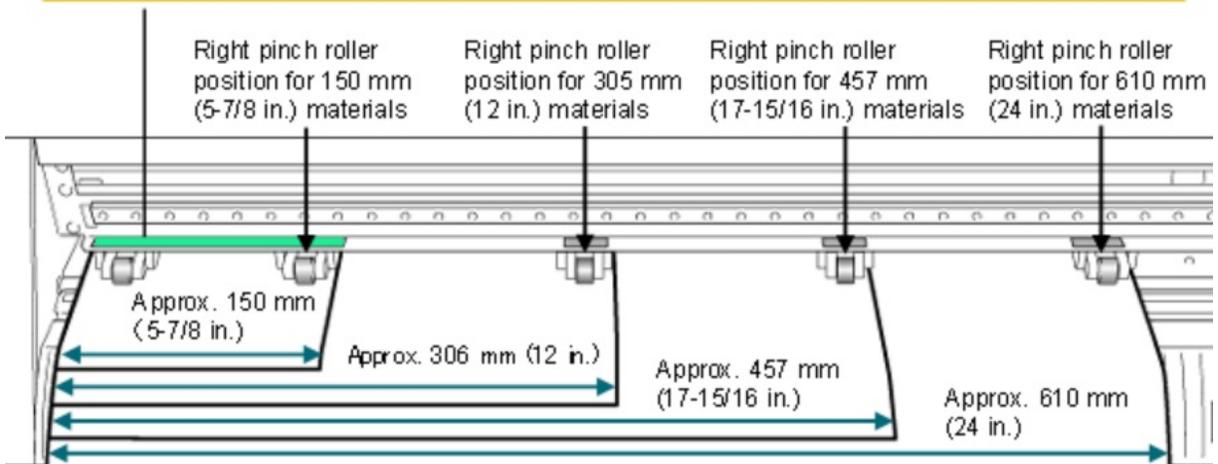


Figure 12: Material Position along Vinyl Cutter

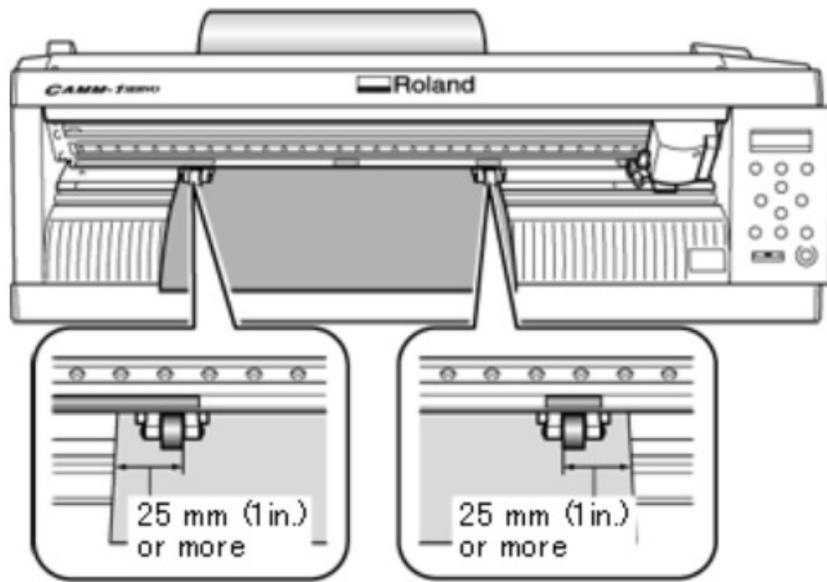


Figure 13: Pinch Roller alignment to material edges

15. **ALIGN** both edges of your material so it lies parallel to the **GUIDE LINES**.

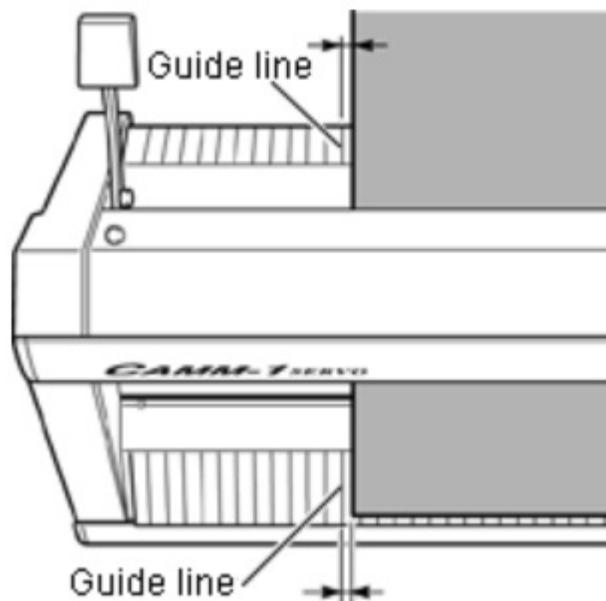


Figure 14: Guide Line for Material Alignment

16. **RAISE** the **LOADING LEVER** to **SECURE** material in place.

**WARNING:** Do not use excessive force when moving the loading lever, so as not to damage it. Also, if the material you are using is curled upward, or leading edge of material is bent or creased, make sure to stretch and flatten before use.

17. Press the **POWER** button to turn on the vinyl cutter. It will ask you to select a material type. Use the arrows on the **PANEL** to select the material (Roll, Sheet....). Press **ENTER**.

Note: Carriage Assembly will now move across the Vinyl Cutter to prepare to cut.



Figure 15: Vinyl Cutter Display Panel

18. To check that the material is feeding properly, press the **MENU** key several times to display the **UNSETUP** screen in the figure.

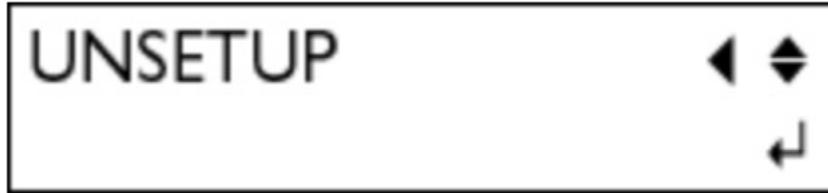


Figure 16: UNSETUP Display Panel

19. Press the **DOWN ARROW** key to display the **CONDITION** screen in the figure.



Figure 17: Condition Display Panel

20. Press the **RIGHT ARROW** key, and now press the **UP ARROW** key to display the **AREA** screen in the figure. Think of AREA (in this tutorial) as the length of your material being fed through (sheet of material).



Figure 18: AREA display panel

21. Press the **RIGHT ARROW** key to enable changing the **AREA**. Area is synonymous here with length of material.

22. Now press the **UP** and **DOWN ARROW** keys to set the value for the required length of the material.

Note: It's a good idea to set a value that is roughly 0.2 meters longer than your required material length.

23. Press **ENTER** to enable the setting.

Note: The set length of material moves out to the front, then is immediately pulled back and taken up again.

24. Press **MENU** to go back to the screen in the figure.

WARNING: If the material comes loose from the pinch rollers, press the **PAUSE** key to stop operation. Then reload the material, starting over from the beginning. Also, always check the material feed. If you start cutting without checking the material feed, correct cutting results may not be obtained and you will damage your material.

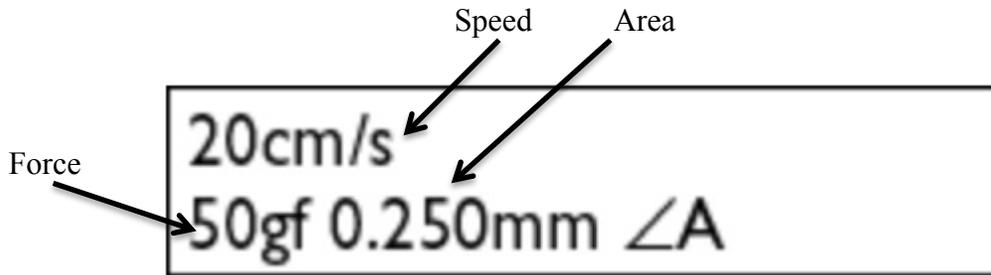


Figure 19: Main Display Panel

25. Now lets set the origin of your cutting job. Press the **ORIGIN** key on the panel (Figure 15).

26. **ALIGN** center of blade to the position you wish to define as your origin by using the cursor keys to move the **CUTTING CARRIAGE**. Start at the left edge as illustrated in Figure 20 as your origin.

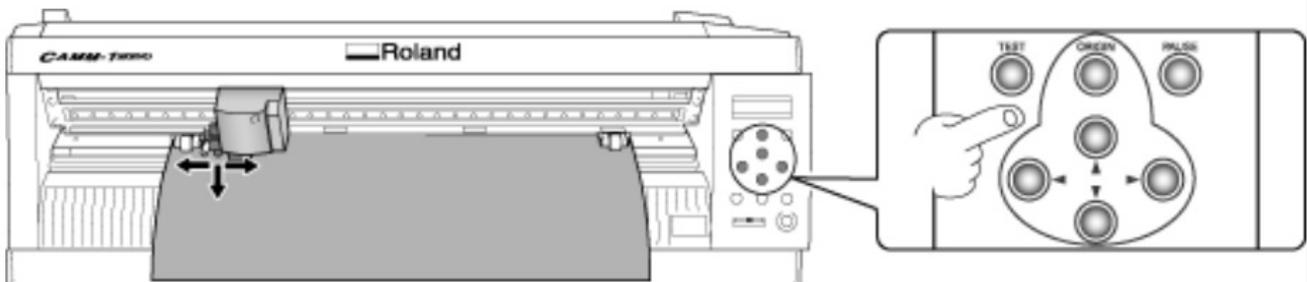


Figure 20: Origin of Job

27. Hold down the **ORIGIN** key for a second or longer. **ORIGIN SET** appears and the text flashes.

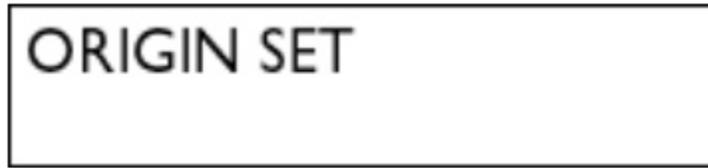


Figure 21: ORIGIN SET Display Panel

28. Now you are back to the main screen.

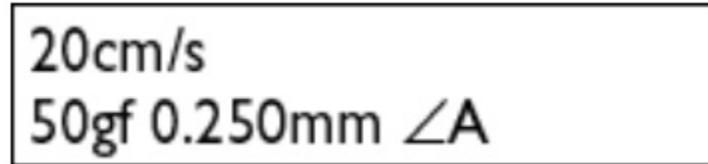


Figure 22: Main Display Panel

29. To perform a cutting test to see how the current settings work in relation to the material we have chosen, make sure the **PEN FORCE SLIDER** is centered at "0", next to the power button.

30. Hold down the **TEST** key for one second or longer and the test pattern is automatically cut.

31. Now press the **DOWN ARROW** key to feed material toward you. With a pair of fine tweezers, we will now test the ease of peeling off the cut shapes, and check the cutting quality. The test should have cut a **SQUARE** inside a **CIRCLE**.

32. **PEEL OFF** the **CIRCLE**. If the circle peels off alone without the inscribed square, then proceed to the next section. If the square also peels off with the circle, we need to **CHANGE THE BLADE FORCE** by increasing it.

Note: The perfect cutting conditions would ideally leave faint traces on the material's carrier paper. If not, **CHANGE THE BLADE FORCE** for better results.

33. Press the **FORCE** key to display the screen for setting blade force as seen in the figure.

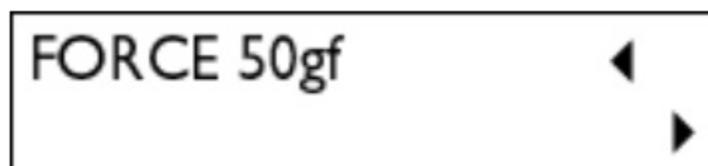


Figure 23: FORCE display panel

34. Press the **RIGHT ARROW** key. Now press the **UP** and **DOWN** arrow keys to change the value. You'll see the current value on the top, and the new value adjusted on the bottom.

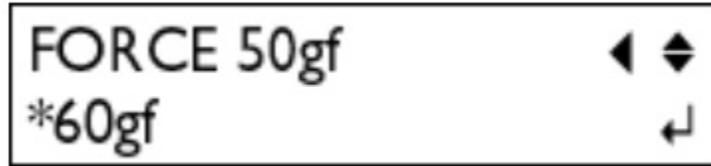


Figure 24: Setting FORCE

35. Press **ENTER** to enable the setting.

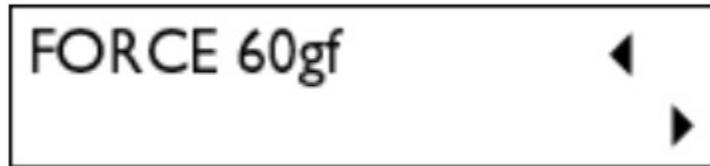


Figure 25: FORCE Display Panel

36. Press the **MENU** key to go back to the screen in the figure, and notice the newly adjusted **FORCE** value.

37. You are now ready to cut. Click on **CutStudio**.



Figure 26: CutStudio Icon

38. Load your design file. **FILE>OPEN** or **FILE>IMPORT**.

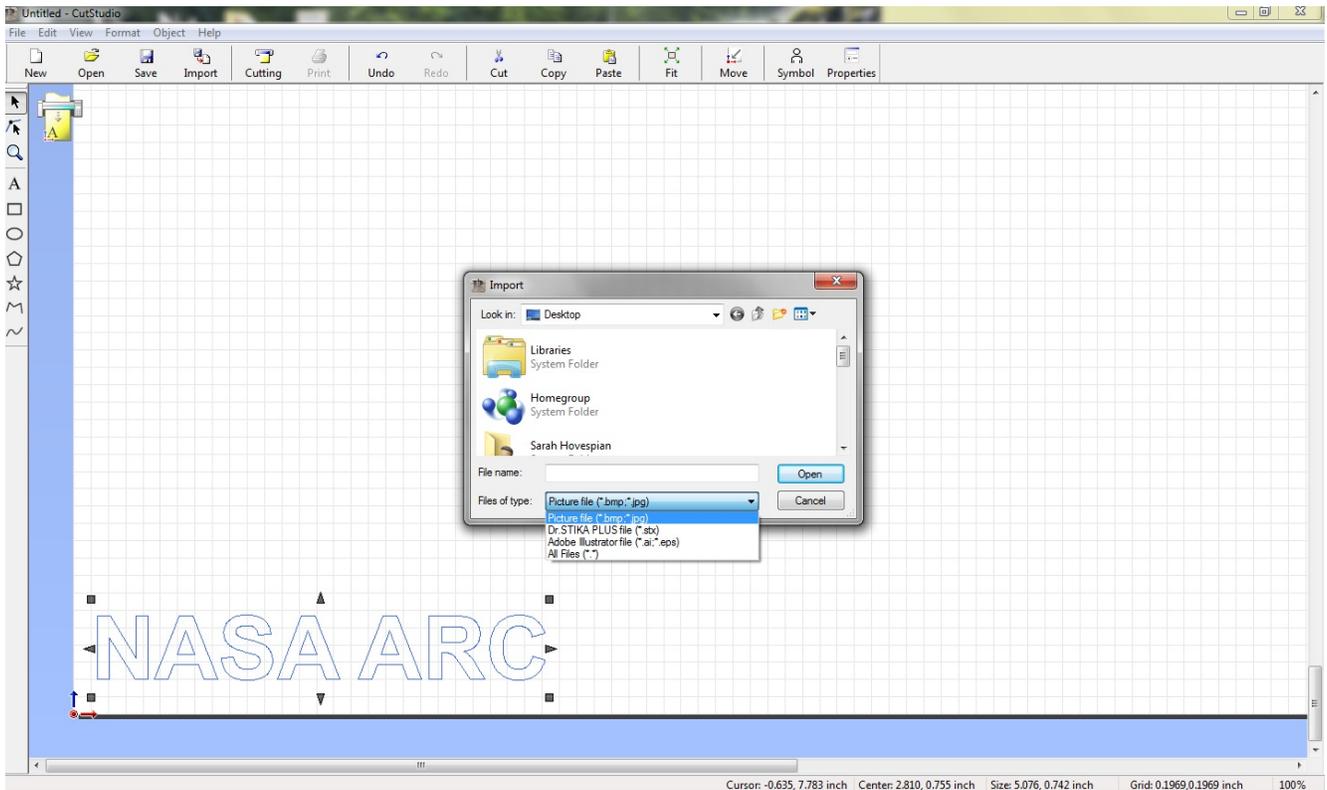
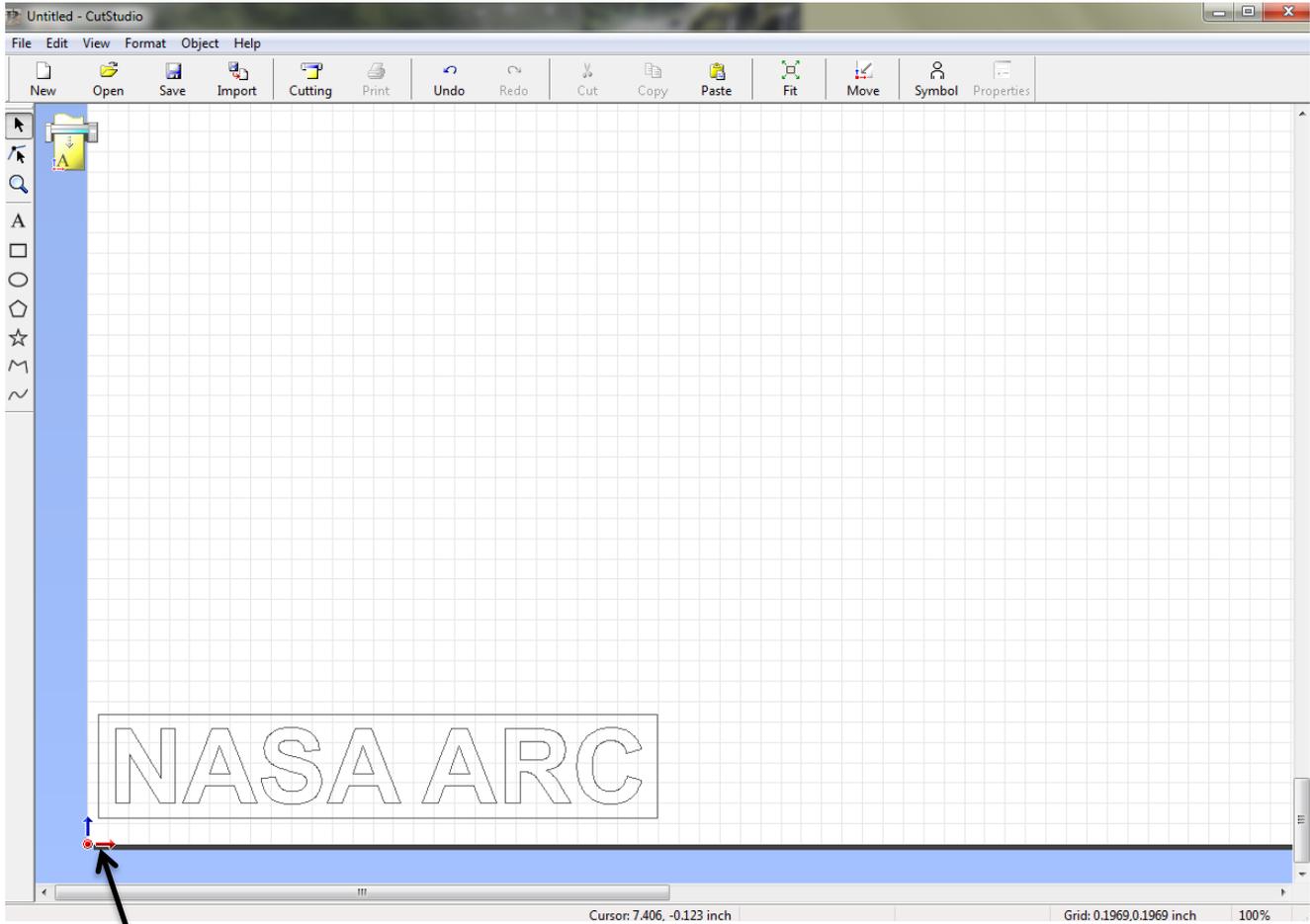


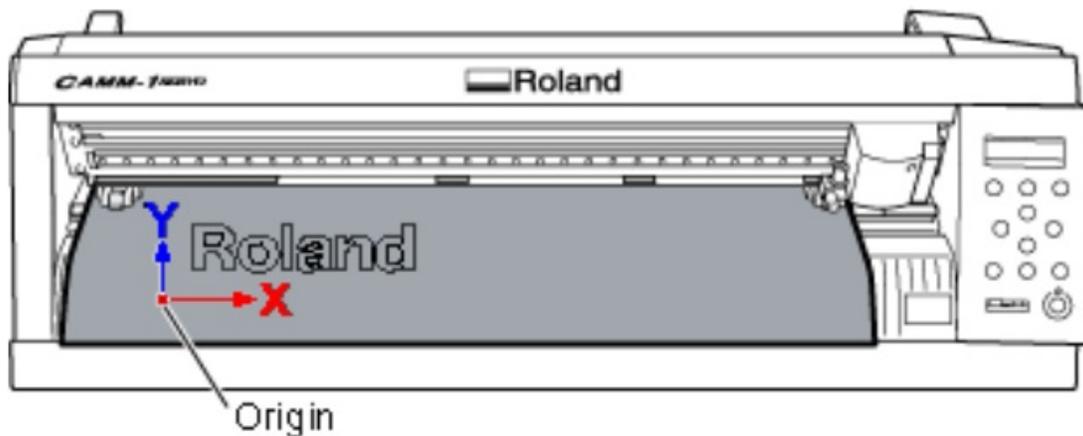
Figure 27: Import File Types

39. Position your file near or at the origin on your **SCREEN**. Notice the origin icon on the interface and for the vinyl cutter. Always place your drawing close to the XY ORIGIN in CutStudio. The origin in your interface coincides with the origin as you have set it on the vinyl cutter.



origin

Figure 28: File Position at Origin in CutStudio



Origin

Figure 29: CutStudio Origin Coincides with Vinyl Cutter Origin

40. Click on **FILE>CUTTING** to **CUT**.

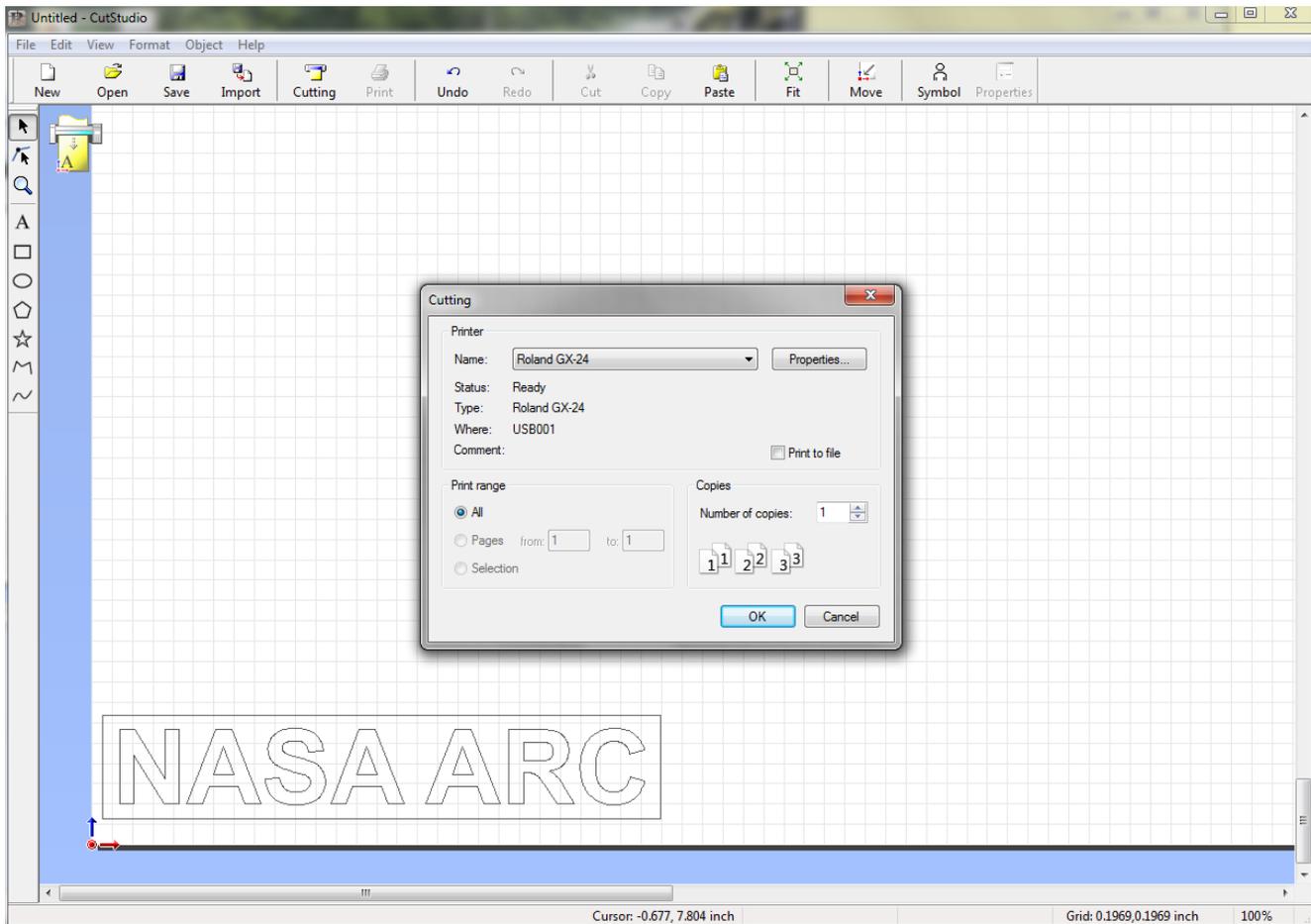


Figure 30: Cutting Menu

41. The vinyl cutter has now cut over every vector line you had in your file. The rectangle is added around the letters to make it easier to weed out the letters.



Figure 31: Vinyl Cut File

42. Congratulations! You have successfully completed the Vinyl Cutter Training!

To learn more advanced techniques, please consult a SpaceShop staff member for more information.