

## Contour Cutting Printed Images with the Graphtec Cutter and Axis Alignment function

NOTE

The instructions in this TNC are for cutting a contour cut around a printed image (from an independent printer) on your Graphtec cutter.

**NOTE:** These instructions are not for people utilizing sign software applications such as FlexiSign, Cadlink Signlab, and Gerber Omega where the software has its own algorithm for aligning the axis.

## Why and What is Axis Alignment?

To explain what Axis Alignment is all about, we have to understand what the cutter requires to cut accurately around the image. When pre-printed media is loaded in the plotter, it should be loaded at exactly the same orientation as it was on the printer. This ensures that the position of the contour will match the printed image. Since placement of the exact angle of the print cannot be done manually, the AXIS ALIGNMENT function allows for adjusting the angle electronically. For further refinement, the AXIS ALIGNMENT can electronically adjust for the stretch of the media in cases where the print has been expanded from the heat during hot lamination or has been expanded during printing from a thermal transfer device (such as the Gerber Edge TM). Without the Axis Alignment feature, the cutter will cut the contour completely at a wrong angle, or the stretch factor will cause the contour to be too short.

To electronically compensate for the angle and stretch, the cutter requires three factors. These factors work to make adjustments to the cut data it receives from the software. Factors 1 and 2 are absolutely required. The third factor is optional, depending upon how the graphic was produced. The factors are:

1. The origin point of the contour cut line.

2. The angle of the media placed in the cutter. The cutter accomplishes this with two points that are obtained by different interactive methods. The angle of the print is calculated by the angle of a virtual line created by the two points.

3. The stretch factor. As mentioned above, if the film with the image has been placed through a laminator, or if a thermal transfer printer has produced the image on vinyl, the stretch will need to be factored in. By comparing the distance between the registration marks on the printed image with the distance of the same registration marks in the graphic software.

For the cutter to attain these three factors, registration points are used and included on the print.

The Ce1000, CE2000, and the FC2230 series have the ability to obtain the first two factors but do not have ability to obtain the third factor.

NOTE

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## The Print and Cut Process

In the print and cut process there are 7 steps. The steps are grouped into two sections: "Preparing and Printing the Image" and "Cutting the Contour". Steps 5 and 6 are generally where most of the confusion lies. But to achieve print and cut accuracy, there is a need to also cover creating the contour to achieve the desired results and correct placement of the registration marks found in steps 2 and 3. The first four steps are achieved by using the software graphics application (referred to as SGA) such as CorelDraw or Adobe Illustrator. Steps 5 through 7 are achieved using the printer and the cutter.

## Preparing and Printing the Image.

Preparing the image properly is an important step before printing and using the Axis Alignment feature

- Step 1: Designing the image using a graphics application.
- Step 2: Creating the contour path around the image in the same graphics application.
- Step 3: Placing registration marks around the outside of the image
- Step 4: Printing the image and the registration marks

### Cutting the Contour

- Step 5: Taking the printed image and placing it in the cutter
- Step 6: Using the Axis Alignment feature on the cutter.
- Step 7: Sending the contour path line to the cutter for cutting around the image.

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**Reminder:** The information provided here is based on using the Graphtec Axis Alignment feature. For using your software alignment feature, please refer to software users manual.

## Preparing and Printing the Image for Contour Cutting

## Step 1: Creating the Contour

After creating the image, the contour has to be created. Placing the contour line is generally easy if the image is vector based. Using the inline/outline feature works well.

The difficulty comes when trying to create a contour around a bitmap image surrounded by white space. Most graphics programs have ways of handling this. Generally a tracing program is involved for the most bitmap shapes. Many times, simply drawing a shape and placing it around the bitmap can be the desired contour cut path.

**Tip:** Using an Alignment feature in the SGA is usually best for the accurate placement of the simple shape).

For more information using an inline/outline feature or dealing with a bitmap, check your SGA user's manual for needed guidance.

**Tip:** You may desire the contour line to be offset from the border of your image. This will leave a white margin around the image. However, in many cases you may desire to have the image cut without a white margin. If this is the case, have your software put a bleed on the image. This is where the border of the image will



extend or bleed the color out beyond its normal border. Whereas the contour cut line will still be the original border, it removes the chances of a slim margin of white margin showing through.

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## Step 3: Placing the Registration Marks

### The Registration Marks' Size and Shape

Once the graphic design has been created and the contour line is in place in the SGA, the next step is placing the registration marks. They should have these criterions:

- 1. The three registration marks should look like three 'L's.
- 2. The length of the line or arms should be minimum of  $\frac{1}{2}$  " in length (12.5 mm).
- 3. The line thickness should be the thinnest possible, yet at the same time, be visible on the print to locate.

**Note:** For those of you who have the FC5100 Auto Registration mark Sensor option, your registration marks should have a length  $\frac{1}{2}$ "as mentioned in step 2 and a thickness of 0.025 inches (0.6mm).

Figure 2



These Registration Marks are the actual size and thickness

### The Registration Marks' Placement

### Note: I will reference AXIS POINT(s) as AP.

We have found that the best method of placing the registration marks on the drawing as shown in figure 3. You will notice the distances between origin point (or AP1) and the other points (AP2 and AP3) are greater than the image and rounded up to the next 5-inch increment. In this case, they are placed at a 10-inch increment from AP1 since the image is 4 inches in length by 7 inches in width. (You could also place them at 5-inch increment and the 10-inch increment respectively but I find if you make the distance the same you can create templates. See the Perfect Idea below). Thus, if the image were, for instance, 11 by 14 inches then I would set the distances at the 15-inch increment from AP1.



Note that the position and angle should be so the registration mark's corners are pointed outward from the image creating an virtual square.

#### **Registration Mark Margins**

Placement of these marks is critical. When considering the placement of the registration marks, consider these factors:

First, the registration marks have to be positioned in a way that the image or the contour does not cross over outside of the virtual square the registration marks create. See Figure 4.



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Secondly, when placing the print in the cutter, the registration marks have to be positioned so that they are within the pinch rollers on the cutter. Therefore, margins from the edge of the print should be incorporated. Figure 5 shows approximately what the minimum margins should be.

**Perfect Idea:** Sometimes creating these registration marks over and over again can be cumbersome. Why not create several documents with the placement of only the 3 marks and then save them as templates (or regard them as templates). This way, instead of creating the marks with each print and cut job, you can import the correct template directly into the current image and position the marks as described above. For instance create template files with the names of 10-inch, 20-inch, 30-inch.



## Cutting the Contour Using the Normal Methods

**Note:** If you have the Fc5100 with the Optical Sensing option move on to Cutting the Contour with FC5100 Series Optical Sensor,

## Step 5: Placing the Print in the Cutter

For reference purposes, in Figure 6 I have labeled each registration mark and their purpose. It is important to know the direction of the print when placing it in the cutter so that when the cutter asks for these points, you will be familiar with which point it is asking for.

When placing the print in the cutter, notice that the front edge of the print is the edge located closest to the axis point 1 (origin point) and, in the case of three points, axis point 3. The origin point is always on the right side as you face the cutter. The origin point (AP1) is the origin of all the points of the contour cut. Thus, the origin point on the print should be the same in the software. Otherwise, you will have a contour on the cutter that is either rotated or completely off.

Hint: To get familiar with the orientation of how the software will send the cut, use a pen instead of using the cutting tool when sending the cut data.

## Accurately Positioning the Print in the Cutter

When placing the print in the cutter, if the print is at too much of an angle, you will not be able to obtain the registration mark due to the possibility of being outside the cutter wheels. The best way to align the print is to use the front two marks (AP1, AP3). When placing the print in the cutter, maneuver the print so that the marks are over a groove on the cutter panel. By placing your fingers on the two marks you will be able to feel the groove beneath the printed material. This will ensure that the print is somewhat or as close as you can get. The Axis Alignment feature will do the rest.



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## Locating the Registration Points

The method of locating the three points mentioned above is done with what is called a locator device. There are three types of locators:

The Bombsight method. This is where a magnified eyepiece fits into the tool holder and utilizes a crosshair for alignment. When using the bombsight to locate a point, press the tool holder down so the tip of the bombsight touches the film.

**The Pen method.** This is usually the least expensive way since the pen comes in the cutter's accessory package. When pressed down, the pen makes a mark allowing you to see the position of the pen in relation to the location of the registration points.

The Light Point (only featured on the FC4100 and FC5100 series) method. The Light Point will project a beam of light onto the vinyl to visually help in locating the points. This method is easiest as it allows you to see the position of the marks without bending over. Generally this method is not as accurate as the other methods mentioned here but is more for expedience.

**The Optical Sensor method**. The last method is only available with the FC5100 and the FC4200 flatbed series. This is a factory-installed option for the FC5100 series and a standard feature with the FC4200 flatbed series. This method utilizes an automated optical sensor that will automatically search and locate each point. This is great since it increases the speed and accuracy. If the optical sensor is not able to find the registration marks check the following:

Transparent media. Due to the media's transparency, the sensor will detect the surface of the plotter's writing panel, preventing the accurate recognition of registration marks. Any media that is not white, or ink that is not black. Use of a colored medium or registration marks of any color other than black, prevents the accurate recognition of registration marks. Coarsely textured drawings or media. A medium with a stained or wrinkled surface or with faintly plotted registration marks prevents the accurate recognition of registration marks. Improperly secured media. If the media comes loose, the registration marks cannot be recognized. Excessively thick media. Registration marks cannot be recognized if the media's thickness exceeds 0.3mm because it raises the registration mark to a point outside of the sensor's focal point.

### Before Starting the Cutter's Axis Alignment Process:

Confirm that the image has been printed with three 'L' shaped registration marks surrounding the image, as discussed in Preparing and Printing the Image for Contour Cutting.

### Using a Bombsight, Pen, or Light Point:

Review the instructions in your User's manual on how to get to the Axis Alignment option. Typically most Graphtec cutters have a button on the control panel. Otherwise, scrolling through the control panel menu will help you to arrive at the Axis Alignment feature.

Once the axis alignment is started, the cutter will start asking for the position of the registration points: AXIS POINT 1, AXIS POINT 2, and AXIS POINT 3 (if available). When each AXIS POINT is asked for, use the arrow keys to position the locator to the first point. To orient you to each point's location, look at the example we used in Diagram 6 previously.

The last thing that the cutter's Axis Alignment feature will ask for is "what is the true distance from AP1 to Ap2, and the true distance from AP1 to AP3. If you have created the image with the registration marks set at the 5-inch increment, it is easy to enter those values. If not, you will have to go the software and use the measuring tool to obtain the distance originally intended.

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**Note:** If you are using the pen or the bombsite for a locator, when approaching the different points be sure to press the tool holder down to the film.

**Note:** If the image on the print is too large so that part of the registration points run under the wheels, refer to the section: Moving the Pinch Roller to Your Advantage in TNC - Good Tracking From Your Cutter. Cutting the Contour with FC5100 Series Optical Sensor

### Step 5: Using the Optical Sensor Feature

In this method, the placement of the registration marks is critical. Please review the section Preparing and Printing the Image for Contour Cutting if you have not done so already.

### Before You Place the Print in the Cutter the Cutter Needs to be Configured.

There are two types of registration marks that can be used. We will be using Type 2. This is where the corner points outward. You can use Type 1 (see page 2 of your FC5100 Auto Registration Mark Sensor manual) but I find that there are more steps involved with this choice of setup. Plus, using one type versus the other type of marks does not ensure better accuracy.

### To set the registration mark type do the following:

- 1) Press the Menu key
- 2) Press Next Page once
- 3) Press F1 to select AUTO REG MARK
- 4) Press the F2 key to select MARK TYPE
- 5) Press the F4 key to select the type 2 pattern.
- 6) Press the ENTER key to register your setting.

Secondly, there are two methods of axis alignment: 2-point and 3-point. Whether you choose the 2-point or 3-point method is up to you. For better accuracy, I usually choose the 3-point where the stretch in both directions is taken into account. I find the time differences between the methods are minimal. Choose the F2 key to select DISABLE when you do not wish to use the AUTO REG. MARK sensing function. A \* mark appears next to the current setting.

### To set the registration marks method do the following:

- 1) Press the Menu key
- 2) Press Next Page once
- 3) Press F1 to select AUTO REG MARK
- 4) Press the F1 key to select MARK SCAN MODE
- 5) Press the F4 key to select the 3-POINTS method
- 6) Press the ENTER key to register your setting.

### Starting the Scan

Once the print has been placed in the cutter, as soon as the media has been latch the process will start. It will first scan for the pinch rollers then the menu will show the following:

AUTO REG. MARK
AUTO>
MANUAL>

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**NOTE:** To ensure that the print has been placed in the cutter as straight as possible, review the section "Accurately Placing the Print in the Cutter".

1. Move the head within the first registration mark AP1. See diagram 8.

2. Press F3 for AUTO or F4 for Manual.

The difference between AUTO and MANUAL is this:

When MANUAL is selected, you must enter the distance between the registration marks to set the scaling factor after the scan. Therefore, you must know the distance between the registration marks.



grey area of AP1 (origin point).

When AUTO is selected, when the cutter scans the registra-

tion mark, after the scan, if the distances between the registration marks are found to be on a resolution increment, this tells the cutter there is no stretch thus there is no need for adjustment to the contour. For instance, if the resolution is set to .25, this tell the cutter to expect to find the registration marks at a 1/4" increment. If it finds the registration mark is not at a 1/4" but is off 1/16" then it know to adjust the contour for stretch. This is the faster method of scanning. The issue with this method is if the registration marks distances inaccuracy on the print was so far off that it is greater that the resolution, inaccurate adjustment will occur. For instance if the actual distance is 1" off, the printer will not adjust because it is still on a 1/4" increment.

3. The cutter will now scan AP1, AP2, and AP3.

4. Once the scan is complete, if AUTO was selected go to step 6. Otherwise, if MANUAL was chosen, it will display the distances between Ap1 and Ap2.

If the distance is off, enter the actual distance value by using the arrow keys.

**Tip:** If you have used a standard distance for all you registration marks (12" for instance) this will be easy to remember.

5. Next the cutter will display the distances between AP1 and AP3.

If the distance is off, enter the actual distance value by using the arrow keys.

Step 7: Send the cut data from the software.