



# CARVEWRIGHT™

## WOODWORKING SYSTEM

# TIPS & TRICKS

April 2008



## Carving Jigs - Carrier Boards, Sleds and Rails

by Ken "DocWheeler" Johnson - Michael Tyler, Editor

*Note from the Editor:* Many of you have requested that an article be compiled regarding the use of carving jigs (i.e., sleds, carrier boards and rails) with the CarveWright and CompuCarve machines. I was pleased that my friend Ken Johnson volunteered to tackle the job and enlist the input from others who are also experienced sled and carrier board users. Ken, aka "DocWheeler" on the CarveWright User Forum, worked many hours to put this together for the benefit of all machine owners. The goal is to illustrate and explain a few of the most common types of jigs and why they are used in certain situations.

And now, take it away, Ken!...

### Carrier Boards, Rails and Carving Sleds



**Figure 1** is a basic **Carrier Board** shown here for use with thin material (under 1/2"). The Left end (viewed from keypad) must be flush with the end of the Carrier Board; the right end of the Carrier Board can be longer than the carving material.

**Note:** To stay under the rollers, the carving cannot go completely across the material nor can the carving be within 3.5" of the ends of the Carving material and remain under the rollers.

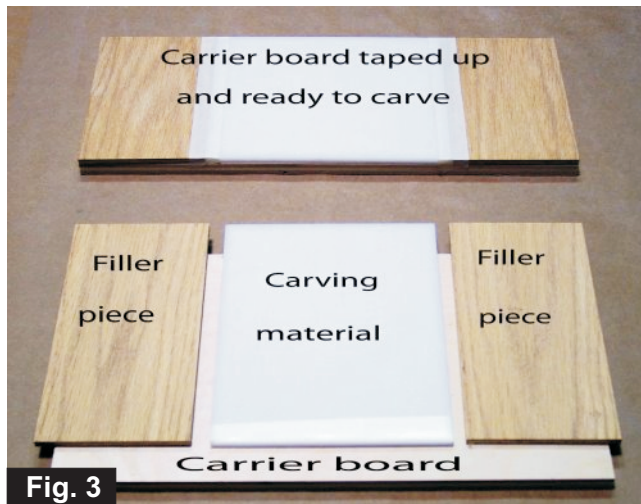
**Figure 2** Shows how **Rails** can be used for carving of narrow material (less than 1.5" wide) and/or material that is to be carved all the way across (where the rollers would lose compression by dipping into a carve region that spans the full width). By adding Rails, a carving can go completely across the width of the carving material without the rollers losing compression. The rails and carving material should be the same thickness.



Please visit the manufacturer's website for more information about the CarveWright machines and see the new Pattern Depot at: [www.carvewright.com](http://www.carvewright.com)

For Additional Patterns you can add to your Designer software library, please visit: [www.carvebuddy.com](http://www.carvebuddy.com)

## Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

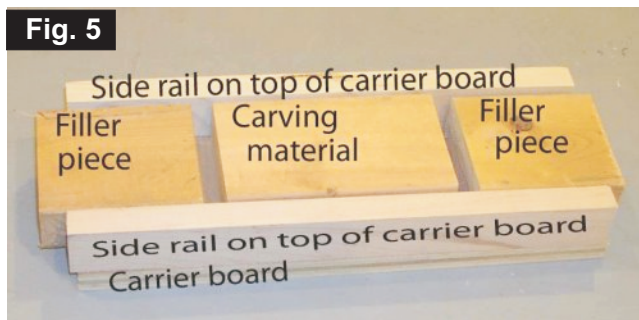


**Figure 3** shows another Carrier Board with filler pieces that allow for carving of the entire material length. This type of Carrier Board is used to eliminate waste of any carving material, yet maintain the project under the compression rollers at all times.

**Note:** Each of the two filler pieces need to be at least 3.5" long (from the edge of Carrier Board to carving material). The filler pieces make the machine think that the carving material has the required additional 7" length to maintain roller contact throughout the carving process.

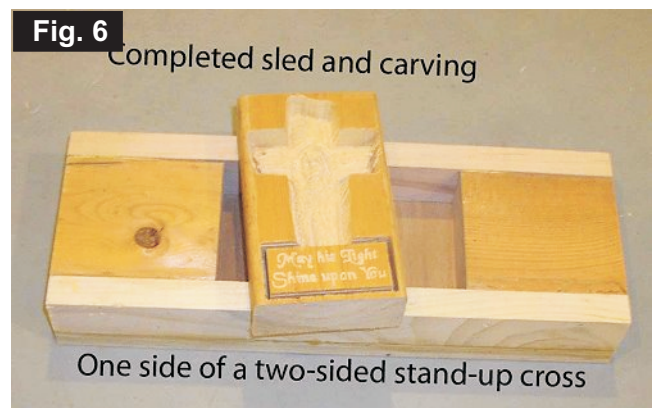
**Figure 4** shows a Sled with Rails on each side of the Carrier Board along with filler pieces so the material can be carved the entire length and width.

*Figures 1 through 4 by provided Ken Maurin (Kenm810)*



**Figures 5 and 6** show a Sled with the Rails on top of the Carrier board.

Note that the carving can be full length and full width of the material using a Sled. Also, for this two-sided-carve, positioning is a snap.





# Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

## •What is a carving Sled, Carrier board, or Rails?

- A **Carrier Board** is simply a board that is placed under the carving material to aid in carving (figure 1).
- **Rails** are side pieces that either add width or maintain roller support (figures 2, 9, and 12).
- The longer Carrier board can have blocking on the ends (Filler pieces) so that the rollers hold the project down securely (figure 3).
- A **Sled** is simply a Carrier Board with filler pieces that has Rails mounted to the sides (and flush with the bottom of the Carrier Board, figure 4) or on top of the Carrier Board (figures 5 and 17).

## •When to use a Sled, Carrier board, or Rails:

- The material is too thin to work properly in the machine (use something with a Carrier board).
- The material is too narrow or the carve goes all the way across the material (use something with Rails).
- The top and/or bottom of the material is uneven (use Carrier board or Sled).
- The bottom is not true enough to operate the board sensor (use something with a Carrier board or just rails).
- The carving goes the complete Length of the material (use Extended Rails or something with Filler pieces).
- The carving goes completely across the board (use simple Rails or a Sled).

## •Advantages of a Sled, Carrier board, and Rails:

- The material can be made to stay under the rollers at all times to avoid snipe, even when carving the entire length.
- The jigs can save seven inches of material (in length).
- Carvings can be done on things that otherwise would not work in the machine.
- Carvings can go all the way across the material without losing roller pressure if Rails are used.
- The carving can cover the entire surface of the material if desired.

## Disadvantages of a Sled or Carrier board with filler pieces:

- A Sled takes longer to construct than a Carrier board, and both take time away from using your CW!
- You will probably need several of them, so they occupy space in your shop.
- They add weight and possibly thickness to the project.
- The Cut path feature cannot be used if you have a Carrier board (or Sled), you will need to manually make a rout path instead and figure out a way to secure the pieces so they don't come loose during the cut out procedure.

## Essentially, whatever you create needs to do the following:

- 1) Hold the material to be carved firmly in position and under the rollers.
- 2) Have a bottom board that has parallel sides and a smooth bottom for the brass sensor.
- 3) Have a uniform top surface for the rollers to press upon.

## What is so special about 3.5" when talking about this kind of thing?

The rollers on the machine are 7" apart and the bit is centered between them. This means that the board must be 7" longer than the material that you intend to carve for it to stay under the rollers. And, the carving should not start within 3.5" (distance between roller support and the bit) of the end of the board.

## Some basics:

A **Carving Sled** is *different* than a **Scanning Sled**... this article is specifically about Carving Sleds (jigs)!

The CarveWright machine measures the board you put into it for carving (unlike a Scanning Sled), it measures the width (Y axis or height as seen in Designer) and then the length (X axis). When measuring the width (Y direction), it starts on the keypad side to find the first edge and then looks for the other edge. If the sensor, on the bottom of the Y truck, finds a "drop-off", it considers it an "edge". So you must position the sensor over an area that is nearly full-height across the sled (see Sled tips below).

When measuring length, the machine does not start looking for an end until some distance after it has a signal that the roller is un-compressed. This means that if there are no voids, or areas sensed as edges, within the last half-inch or so of the "Filler pieces", there is no need to cover holes/voids in the project when measuring the length.

## Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

**The simplest Carrier board** would be a board that is at least the same size as the piece you want to carve. The Carrier board may be needed to increase the thickness or give a better surface for the board sensor so that the machine functions properly. The material is fastened to this Carrier board with tape, glue, or anything else that will not damage the machine. With a simple Carrier board, you will not be able to safely carve closer than three and a half inches of either end of your material, and you should not carve completely across the board because it can rise as the carved-out area passes under the roller causing the carving to be damaged and possibly lose contact with the (brass) board tracking sensor.

**The simplest use of Rails** is just to add width to the project that is either too narrow or to add length to some material that is too short to carve, or where the carving would allow the roller to enter the carved-out area and allow the material to rise causing snipe.

**A little more involved is a Carrier board that is at least seven inches longer** than the board you are carving so that filler pieces can be attached. On the end of the Carrier board that the machine measures first (the Left end when facing the keypad), place a scrap of wood that is 3.5" long, the same thickness of the material to be carved, and the same width of the Carrier board (See figure 3, Filler Piece).

Next place the board that is to be carved (carving material), and then another "filler piece" similar to (or longer than) the one mentioned earlier. Now make sure that the two "filler pieces" and the Carving Material are all attached to the Carrier board (which can be extra long) with tape, glue, or something similar (figures 3, 13, 14, 15, and 16). If tape is used, make sure that it does not interfere with the bottom board sensor and does not get carved so much that it gums-up the bit.

With the added material on the ends (which is the same thickness as the material to be carved), the rollers will have a continuous flat surface to hold the project down and you can carve the entire Length of the Carving material that was placed between the two Filler pieces.

**If you add side Rails to your Carrier board, you have created a Sled.** With a Sled, you can carve the entire Length and Width of your Carving material and have it stay under the rollers at all times. Side rails can be at least a quarter inch higher than the Carving material although you may have difficulty with Centerline if the Carving material is below the bit-plate.

Note that you can carve the entire length and width of the material using **just rails** if you wanted to do so. An example would be the need to carve a piece of material that is  $\frac{3}{4}$ " thick, 1.25" wide, and 5" long. This small piece can be fastened (centered) between two pieces of material that are  $\frac{3}{4}$ " thick,  $\frac{3}{4}$ " (or more) wide, and 12" (or more) long. Tape would have to be applied across the ends for the sensor to "see". This would allow the small piece of material to be carved over its entire surface (see figures 9 and 12).

### **Answers to prompts, and the project design:**

You can tell Designer the actual thickness (Carving material plus Carrier board) or just the board thickness; the machine reads what you actually insert into it. Board thickness is mainly for the Designer display and a few safety checks, the machine works with what it actually "sees" with its sensors.

The width (Y axis) can be (1) the Width of the design (actually the height of the image you see in Designer), (2) the width of the Carving material, or (3) up to the width of the Carving Jig (the machine will center the mpc in Designer into the area it finds).

As for length (X axis), you can say that the board is either the length of the Carving Jig or just the length of the Carving Material. The machine knows the length of the project that you loaded on the memory card; it needs to know how much material is needed to do the carving if it is to be kept under the rollers; which is why it asks you that question.

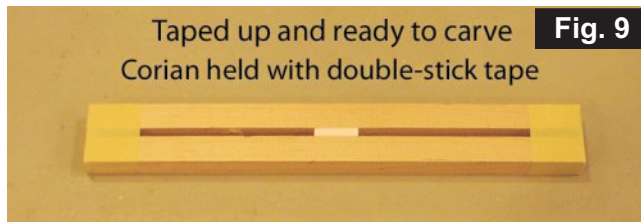
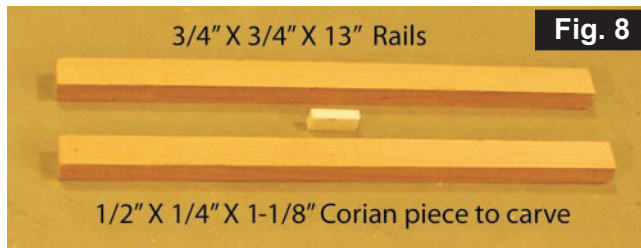
## Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

### Rail Tips:

Rails allow you to carve very small pieces as well as full width carvings where the carving would otherwise interfere with roller support. Rails should be at least  $\frac{3}{4}$ " wide because they bear the entire roller pressure. To find out what was possible, I ran a test that turned out quite well – although of no particular value other than to demonstrate the “extreme” of what can be done. I wanted to see if I could have the machine carve lettering on the edge of a small piece of  $\frac{1}{4}$ " material.



**Figure 7** shows the project in Designer where the size of the board is  $\frac{3}{4}$ " thick X  $\frac{1}{4}$ " wide X 1" long, much too small to work in the machine, normally. Although Designer will allow you to create this, it will not “upload” to the card, so the size will need to be increased. The size of 1.5" X 7" is shown in figure 10, actually still too narrow for the machine, but it will upload.



**Figures 8 and 9** show the rails and the small piece of material to be carved, and what it looked like taped. Given the small size, the actual piece was  $\frac{1}{8}$ " longer to make sure that the very small carving hit the very small target with my imprecise positioning! Since the small piece of material has no support under it, double-stick tape was used to attach it to the Rails.



**Figure 10** shows the increased board size in Designer with the overall size of the project (with the Rails attached). The machine was told to use the original width, center on length, and not to stay under the rollers (even though it automatically WILL stay under the rollers because of the length of the rails).

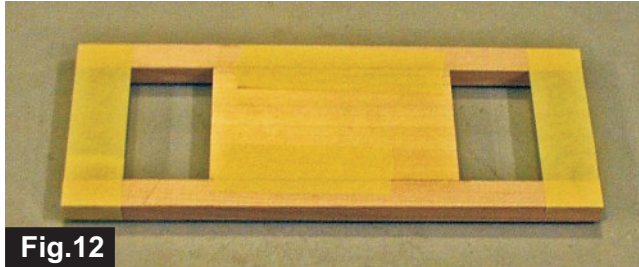
**Figure 11** shows the final result with the carving trimmed to 1" and filled in with paint.



# Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

## Rail Tips (cont.):

When the rails are the same length as the Carving material (figure 2) you can carve the entire width and remain under the rollers. With the **Extended Rails** (longer than the Carving material as in figure 12), you can also carve the entire length, and since there is no Carrier board, the Cut Path feature *can* be used!



**Figure 12** uses the same rails as was used in figures 8 and 9, and is shown with a 6" X 3.5" piece of material fastened between them. Note that the "blank hole areas" are not seen when the Length is being measured since the edge sensor does not start looking for an edge until sometime after the roller becomes Un-compressed. When measuring the width in Figure 12, anywhere in the middle would work. Extended Rails may become your favorite since the Cut Path feature will work. Just make sure the rails are 7" longer than your carving material.

As seen later on in figure 22, side Rails on a sled can be raised by simply taping a thin strip of 3/4" (or more) wide material on top of existing Rails; just make sure that they go the full length and are of equal thickness. This might be necessary if you use double-stick tape under the carving material and it becomes higher than the Rails. If you add height to the Rails, add height to the last inch or so of the end Filler pieces so the sensor measures accurately.

## Sled Tips:

The firmware: In most instances, the machine measures the width entirely from the keypad side and any voids that are found are thought to be edges. Since the machine measures the width first, position the Sled so it is under both rollers AND the edge sensor (on the bottom of the Y truck) is above a part of the project (or filler piece) that has no voids or dark colorations across that part of it. You could make the "filler pieces" longer to make this easier to adjust, or put tape (or paper) across it at the place you select to start the width measurement. But, since the edge sensor is close to the left roller, all that is necessary is to position the left end of the "jigged" project just a little past the center of the left roller and the edge sensor will be over the filler piece.

(See "Most common setup options and results" later on in this article for more details.)

The following are examples of Carrier boards and Sleds.



**Figures 13 and 14** by Al Ursich (Digitalwoodshop) shows how he turns scraps into items for sale. In figure 13, the 3.5" filler is shown on the left and in figure 14 it is shown on the right; these are the ends that the machine is to measure first. Al turns the carving material over to create a double-sided carving of the bear.

Note that in these examples only one end of the boards need to have a 3.5" filler piece, because the other end of the project already has sufficient length (i.e., there is more than 3.5" of "non-carve-area" at one end already).





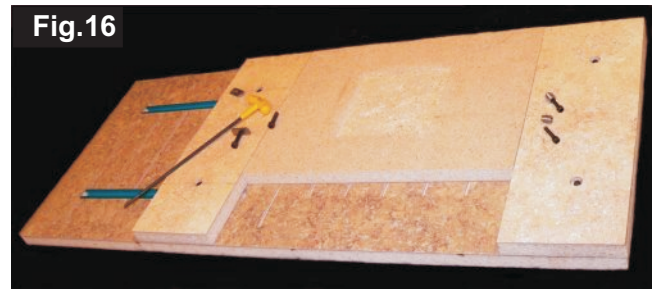
# Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

## Sled Tips (cont.):

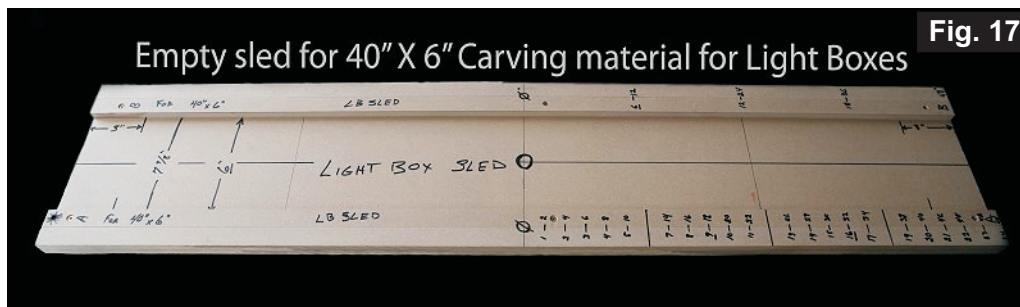


**Figure 15** by Jim Krasselt (RouterJim) made a sled with adjustable end pieces to hold various sizes of carving material securely. Jim placed connection points periodically along the Carrier board so he can reposition the filler pieces to accommodate various lengths of carving material.

**Figure 16** by BJ Bethke also built an adjustable sled. The photo shows his use of T-slots to adjust one filler piece (the other is fixed permanently at one end of the sled). Although one filler piece is fixed, by adding more attachment points, BJ could use this for even smaller pieces.



**Fig.16**



**Fig. 17**



**Fig. 18**

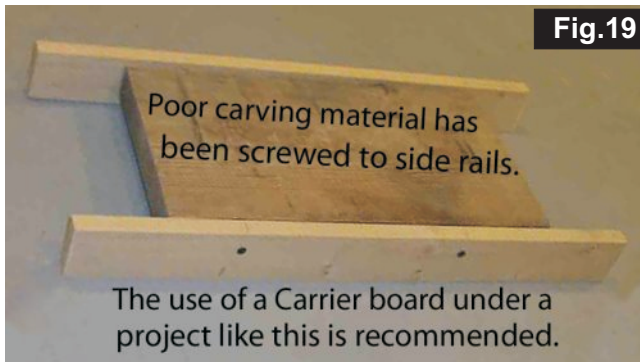
**Figures 17 and 18** by Dan Schmaltz (DirtyDan) showing his custom sled to rout material as part of the process for making his lithopane boxes.

Note that the Rails are on top of the Carrier board and that the Filler pieces are removable.

The following pages show extended applications of the same concept with detailed Sled examples.

## Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

### Carving a “bad” board or “irregular” board using a sled...



Note that there are no “filler pieces” or Carrier board shown in *Figure 19*, a Carrier board is recommended to distribute the pressure on the sandpaper belts. Fillers are not necessary, but you will need something for the sensor to see at the ends of the Rails or you will get a “400 error”. All that is necessary is to apply tape on the last inch.



*Figure 20* - Since the Rails provide a surface for the rollers, tape is all that is needed for the sensor to see. Not knowing any better at the time, I taped the entire end areas... a  $\frac{3}{4}$ ” wide strip of tape on each end would have worked just fine.

If the project in Designer was told that the “board” length was 17”, the machine would be told to Stay under the rollers. If the “board” length in Designer was 24” (the actual Rail length), the machine would be told Not to stay under the rollers (even though it really WILL automatically stay under the rollers because the length of the rails is 7” longer than the carving area in this example). The project “Y” dimension could be the width of the carving, the width of the actual board, or the outside width of the Rails. And, as noted, it should be placed on a Carrier board to avoid tearing the sandpaper belts and to better distribute the pressure. (*Figure 21*)

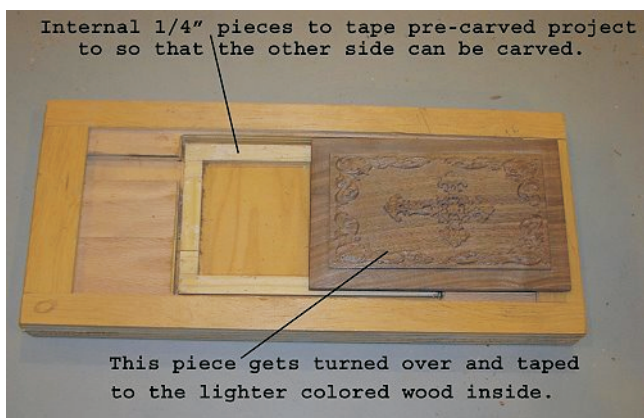




## Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

The following are Sleds used for a jewelry box design...

This Sled in **Figure 22** was used to carve both faces of jewelry box base pieces and the bottom surface of jewelry box lids. The material was 13/16" and thick double-stick was used so the Sled height was raised by fastening some 1/4" material on the edges making the Sled three layers thick. Material was also placed on the ends so that the sensor could accurately find the ends of the Sled. Of possible interest, the opening where the Carving material is placed was carved out of the two scrap pieces, shown screwed to the Sled, with an mpc. This way, the centered carving area that will be used is placed on the Sled exactly where the machine thinks it is.



The Sled in **Figure 23** holds the Lids that had one side previously carved. Material was secured in the bottom and then shaped using an mpc so that the lid carving fit into the recess.

The top Sled in **Figure 24** has removable inserts to accommodate material for the front, back, and ends of the jewelry boxes (shown sitting on top of the Sled). The lower Sled shows the Sled in figure 23 with the lid held in position with double-stick tape and shown here as it was carved. Note: the Sled in figure 23 (and bottom of figure 24) had to have tape placed across the 1/2" deep space between the two pieces of scrap used to make the area surrounding the recessed area for the Carving in order to get an accurate width measurement; the 1/4" drop-off did not create a problem for either sled in figure 23 or 24, it did not trigger an "edge" reading for the sensor. For this project, I simply made all three sleds 18" long, had the "boards" in Designer the actual carve sizes, and always told the machine to "Center on length" and Not to stay under the rollers.



## Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

Common setup options and results (to stay under the rollers)...

*Keep in mind that the actual material that will be carved is actually 8" by 12" in all of these examples, just the Designer board size changes. Also, this could be carved directly on a 19" by 9-1/4+" board.*

**Option 1)** The board in Designer is the length and width of the carved area.



**Figures 25 and 26** show an 8" by 12" carving area on a 8" by 12" board in Designer. With this design, the mpc tells the machine that the project is 12" long by 8" wide and has a carving over the entire surface. The only way the machine can accomplish this with adequate roller support is if the Carving Jig is 19" long and about 9.5" wide. So the machine would be told to "Stay under the rollers" (the machine then adds 3.5" to each end of the 12" mpc dimension when this is done) and either "Center on length" or "Place on end". Figure 26 shows the outline of the Carving Jig that would be needed to produce it, including the added necessary width.

**Option 2)** The board in designer is the length of the Carving Jig (at least 7" longer than the carve area, and the carve area is centered on the board).



**Figures 27 and 28** show how the same project can be created in Designer on a "board" that is the length of the Carving Jig, 19" for this project. With this length board in Designer the machine would be told to NOT stay the rollers since the 7" has already been added, and really WILL stay under the rollers automatically. For placement it would be told to either "Place on end" or "Center on length". The board in Designer could have been made the same dimensions as the sled and been handled this same way.



## Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

### Common setup options and results (to stay under the rollers)...(cont.)

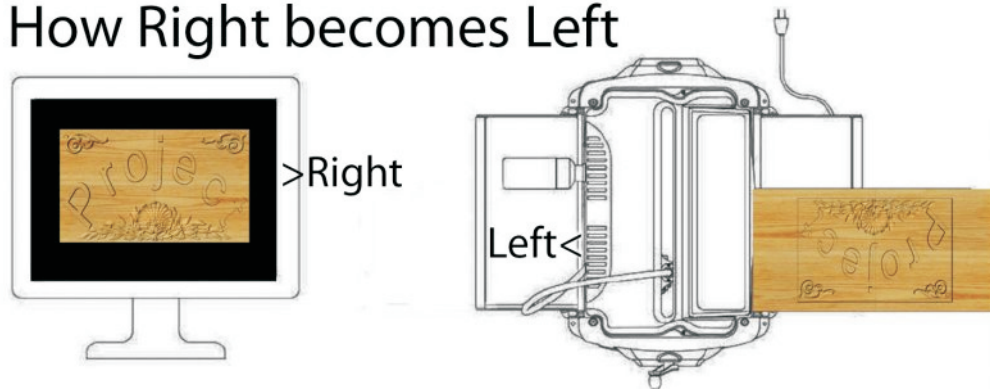
**Option 3)** The board in Designer is the length of the carving area plus 3.5" un-carved area on the right (the end where the length measurement starts).



**Figures 29 and 30** show the same project designed with just the carve region and the “first end to be measured” with a 3.5” un-carved area; this board size would be 8” by 15.5”. With this option, only one end of the project is of importance. The machine would be instructed to Not stay under the rollers and to “Place on end”.

Please note that the Right end of the image in Designer becomes the Left end of the project in the machine because the machine directions are such that the keypad is the front and the project is positioned with its top toward the keypad so that it is upside/down as viewed from the keypad side.

### How Right becomes Left



**Figure 31** shows how the Right edge of the project in Designer ends up on the Left.

*Figures 5 through 12 and 19 through 31 by Ken Johnson (DocWheeler).*



# Carving Jigs - Carrier Boards, Sleds and Rails (cont.)

## Final notes on setup options...

Problems arise if the two end Filler pieces are of different length and the machine is told to “Center on length”, the carving would end up being carved off-centered in the Carving material itself. Also, if the Filler pieces are Not 3.5” and the machine is told to “Place on end”, the carving will not be positioned on the material as expected.

*(Inserted by Editor: It is important that the end filler pieces be at least 3.5” long and are of equal length to avoid such problems.)*

To add a lot more complexity and illustrate how to make this much too difficult, let us say that you have a 10” carved/lettered area placed in the center of a board in Designer that is 15” long. And let's say you center this in a Carving Jig that is 18” long. The mpc length is 15”, the machine measures the “material” as 18”, and you actually need 17” (10” carve + 7” for ends). If you tell it to stay under the rollers, it will add 7” to the 15” mpc and expect 22” of material (4” more than you offer it), so it will ask if you want to “scale to length” (which you do NOT want to do!).

On the other hand if you tell it not to stay under the rollers, it will expect the material to be 15” or longer (which it is at 18”). Now if you tell it to “place on end”, the carving would start 12.5” from the left end so that the final 1” of the carving will be carved under only one roller, you would have to “center on length” or “jog to position” to have it remain under both rollers.

This gets way too tedious, so it may be simpler to have the board length in Designer the length of the carved area or the length of the Carving Jig and (a) always “center on length” or (b) if your material starts at 3.5” from the left end of the Carving Jig, is to “Place on end” where the machine just checks to make sure there is enough length. Option (b) is illustrated in the figures 13, 14, 29, and 30.

## IN CONCLUSION

I wish to acknowledge my appreciation to Ken Maurin, Al Ursich, Jim Krasselt, BJ Bethke, and Dan Schmaltz for allowing the use of their photographs in this document, especially to Ken Maurin who graciously supplied some great pictures as the need arose. And, to Michael Tyler of CarveBuddy.com for composing this into the final form.

### *Editor's Note:*

*Thanks again, Ken and all the other contributors for your time and hard work putting this article together for us - we appreciate it very much! (round of applause!)*