Chapter 7

Editing Polylines

MillWrite provides two types of offsets;

1) CAD offsets
2) CAM offsets.

The differences between the two types of offsets are best illustrated with the drawings on this page. The arrow (shown as a solid line) is being offset in these drawings. The dotted lines show the offsets. There is both an inside offset and an outside offset.

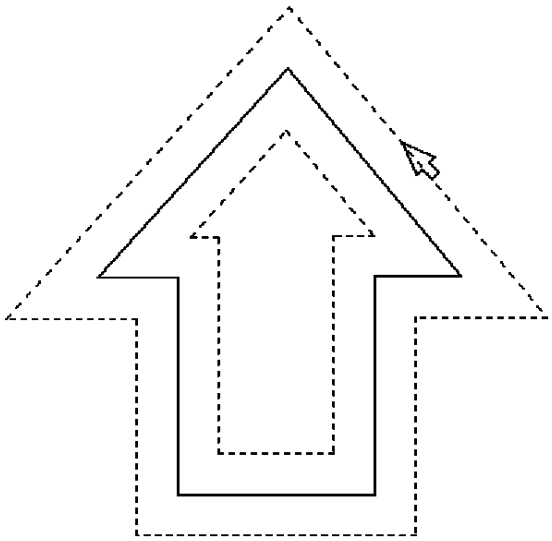


Figure 7-1

The two dotted polylines are inside and outside **CAD** *offsets of an arrow. A CAD offset is an exact replica of the original.*

CAD Offsets

The CAD type of offset (Figure 7-1) trys to exactly replicate the original geometry. MillWrite does not add or remove geometry unless it has to. Therefore, a CAD offset will normally have the same number of lines and arcs as the original.

This type of offset will fail if MillWrite cannot find an offset for a particular line or arc. MillWrite will not display an error message in such a case; rather, the offset will not be created, so you will not see an offset. For example, in Figure 7-1, if the inside offset was made much smaller, two of the horizontal lines of the arrow head would vanish. When that happens, MillWrite gives up and you do not get an offset.

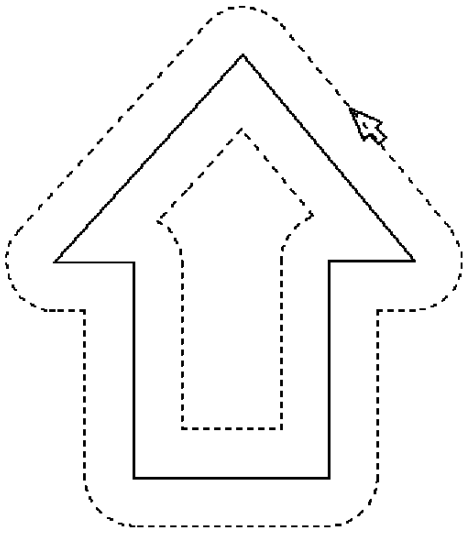


Figure 7-2

The two dotted polylines are inside and outside **CAM** *offsets of an arrow. A CAM offset rarely looks like the original.*

CAM Offsets

The CAM type of offset (Figure 7-2) will create arcs around the "outside" corners. This cteates the type of offset that a tool would follow. Unlike the CAD offset, MillWrite will rarely fail to produce this type of offset because this type of offset doesn't try to replicate the original.

This type of offset will sometimes create additional arcs and lines, which means that the offset may contain more arcs than the item it is an offset of.

Furthermore, a CAM offset may create more than one offset. For example, figure 7-3 shows an object with a pinched-in center. As you drag the offset of that object, the offset it is fine until you reach the point at which the center pinches off. Then MillWrite will create two offsets, as seen in Figure 7-4. By comparison a CAD offset of that same geometry when taken to such extremes will create the mess you see in Figure 7-5.

Offsetting Entire Polylines

Figures 7-6 shows the screen when you start the Offset function. At the top of the screen are two buttons where you chose between offsetting ***individual*** lines and offsetting ***entire polylines.*** There is a horizontal line underneath those two buttons, and a lot more buttons below that. The buttons underneath depend on whether you're chosen to offset individual lines or entire polylines.

Layer

you have the option of specifying the layer for the offset or you can let the offset be placed on which ever layer the original item is on. click the downward arrow to pick layers from the layer list or click the empty recessed box to its left and then type the number of the layer you want.

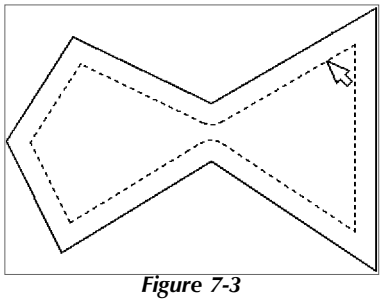


Figure 7-3

CAM offset

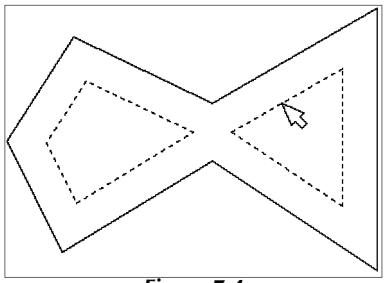


Figure 7-4

CAM offset

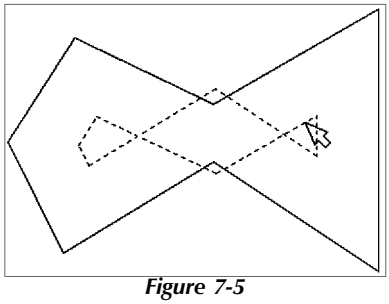


Figure 7-5

CAD offset

Delete Originals

if you check this box then after the offset it is complete the original item will be removed from the drawing.

Offset Both Sides

if you check this box MillWrite will create both an inside and an outside offset at the same time and at the same offset value.

Offset Value

if you want to specify the offset value just type the numbers. You do not have to first click this data entry field. MillWrite assumes that any numbers you type while offsetting are the offset value.

Drag Offset or Fixed Offset

if you want to drag the offset visually using the mouse, check the ***By Dragging*** box. Then touch the geometry with the mouse, and when you see the mouse icon change to show the words ***Drag Offset***, as seen in Figure 7-6, click the *left* mouse button and drag the offset.

As you drag the offset, the current offset value will be displayed at both the top and bottom of the screen.

If, in the middle of dragging, you realize that you want a specific offset value, just start typing it. In other words, you can switch between dragging the offset and specifying a fixed offset while you are in the middle of dragging the offset. As soon as you start typing a value, MillWrite will put a small window on the screen for you to enter the value. There will be a message on the right side of the screen to remind you of this option.

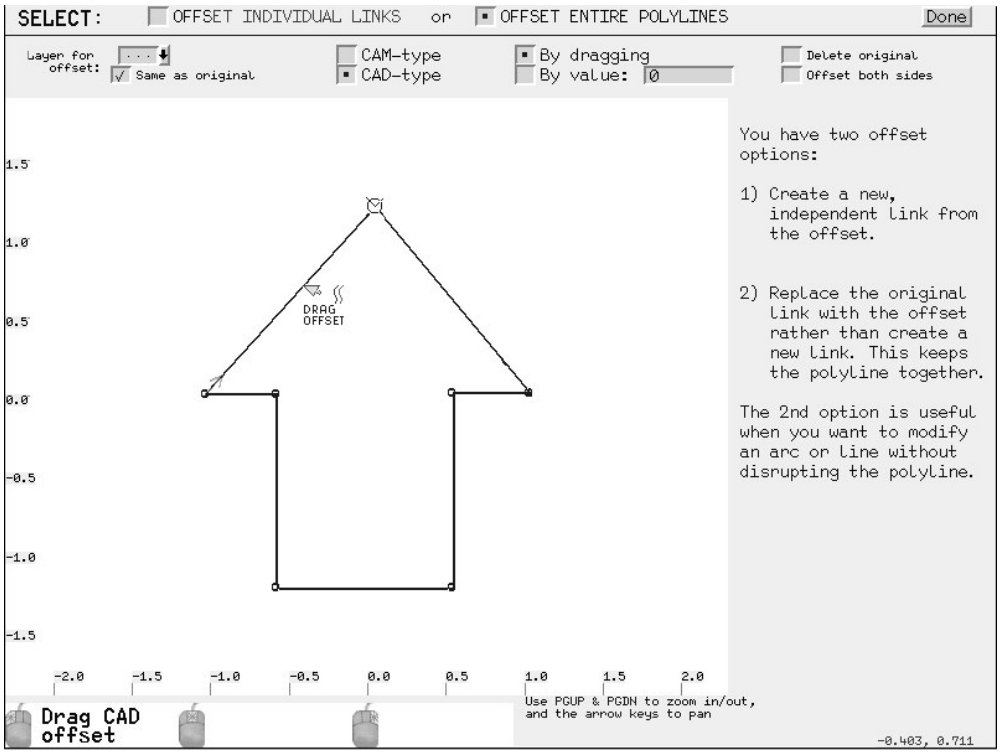


Figure 7-6

Offsetting individual lines

Figures 7-7 shows the screen when you choose the option to offset individual links. There is no option for CAD or CAM offsets. Instead, you have the option to create a new link or modify the original.

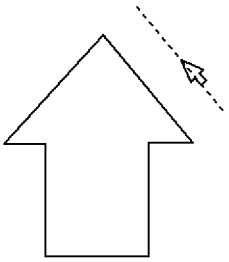


Figure 7-8

Create new link

Creating a new link is just like it says; in other words, if you offset an arc then an arc will be created, and if you offset a line, then a line will be created. Figure 7-8 shows a line being offset.

Modify the original

Figure 7-9 shows that same line being offset but this time MillWrite was set to ***modify the original***. The offset of the line is exactly the same; however, in this situation the offset remains part of the polyline, so the lines connected to it stretch to remain connected. This has the effect of moving a line within a polyline by a certain distance perpendicular to itself.

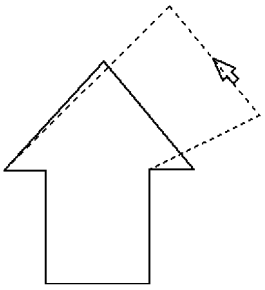


Figure 7-9

If you offset an ***arc*** while MillWrite has been set to modify it the original, this has the effect of increasing or decreasing the radius of the arc while keeping the center point at the same location, and the arc remains in the polyline.

When you set MillWrite to ***modify the original*** you will normally want to ***delete*** the original. This is one of the situations when you would check the ***Delete Original*** button.

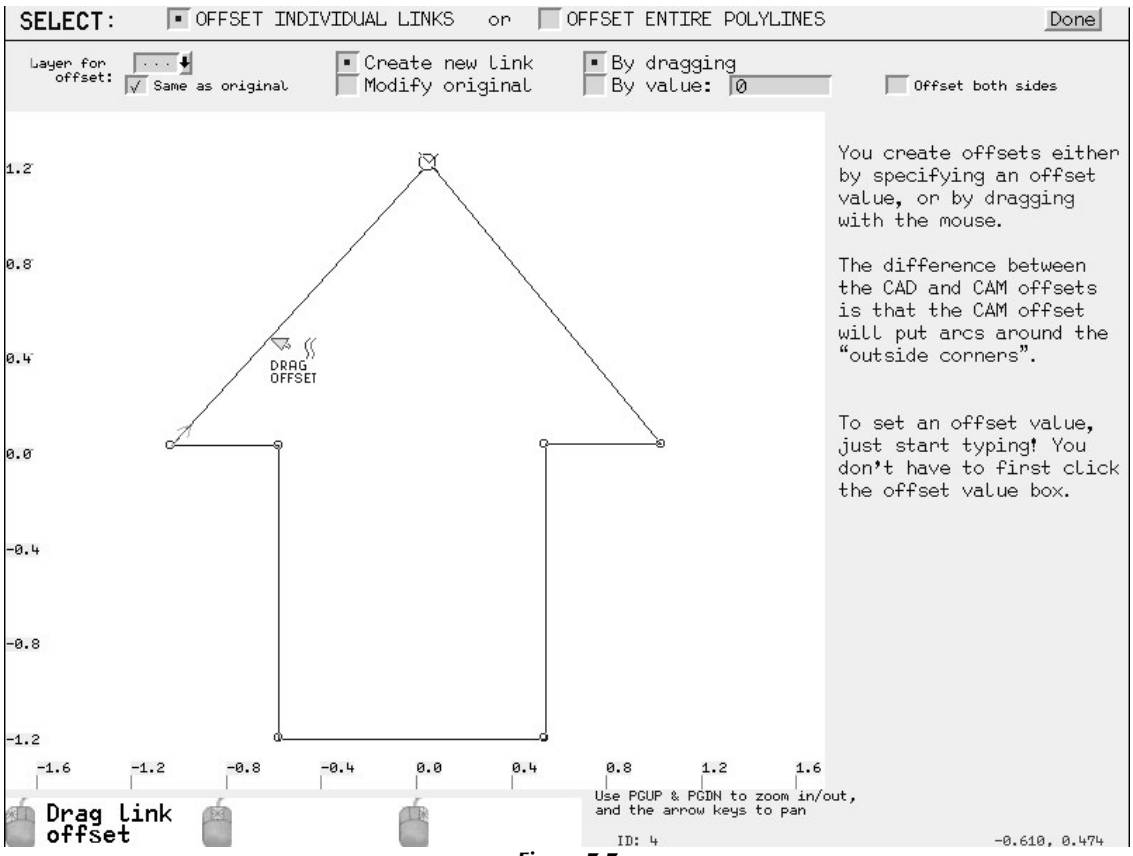


Figure 7-7

Fusing Items Together

Sometimes it is easier to create a shape by drawing two or more simple shapes and then combining the shapes together. MillWrite has a ***Fuse*** function for this purpose. For example in Figure 7-10 the two hexagons on the left side are fused together to create the shape on the right side.

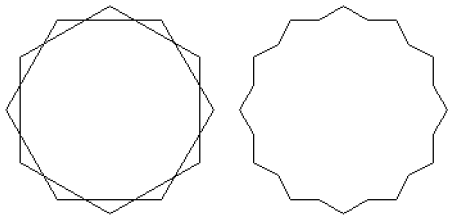


Figure 7-10

MillWrite fuses items together two at time, so if you have more than two items to fuse together, you must fuse two of them, and then take the result of that and fuse it with another one, and so on.

As an example of how to use the **Fuse** function, Figure 7-11 shows two shapes that are part of the MillWrite sample file called "Sample, Try Fusing Items Together". Start the fuse function by clicking the **Edit** button and then picking the **Fuse** function. Or just press the U key. The screen will change to that in Figure 7-11. MillWrite is waiting for you to pick the first item.

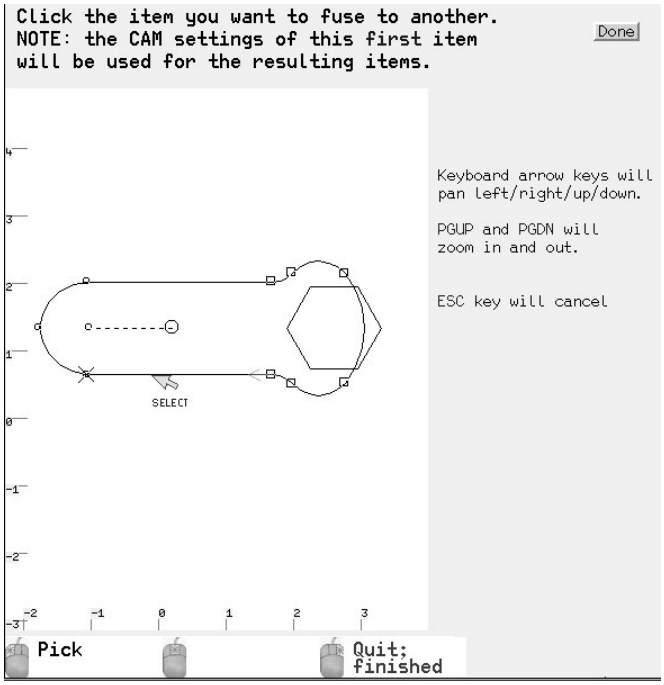


Figure 7-11

When you touch an item with the mouse, the mouse icon will change to show the word **Select**, as seen in the figure. It is important to note that the first item you pick will set the properties for the resulting geometry. In other words, if the first item you pick is on layer 16, then the resulting geometry will be on layer 16, and if the first item was set to engrave with tool #12, then the resulting geometry will also be set to engrave with tool #12.

After you pick two items to fuse together, MillWrite will display the possible combinations on the right side of the screen, as seen in Figure 7-12. There are five boxes that can be checked, and next to each one is a small image. The top image shows the original two pieces of geometry that you are fusing together, and below it are the four possible fusings. You click any or all of those five boxes to let MillWrite know which of them you want to keep in the drawing.

Normally you would want to delete the original geometry, so normally you do ***not*** check the top box. If you check the top box, then the original two items will remain in the drawing.

After checking the box you want you have to press the do it button. Then MillWrite will return to the fusing function and you could pick more items to fuse together.

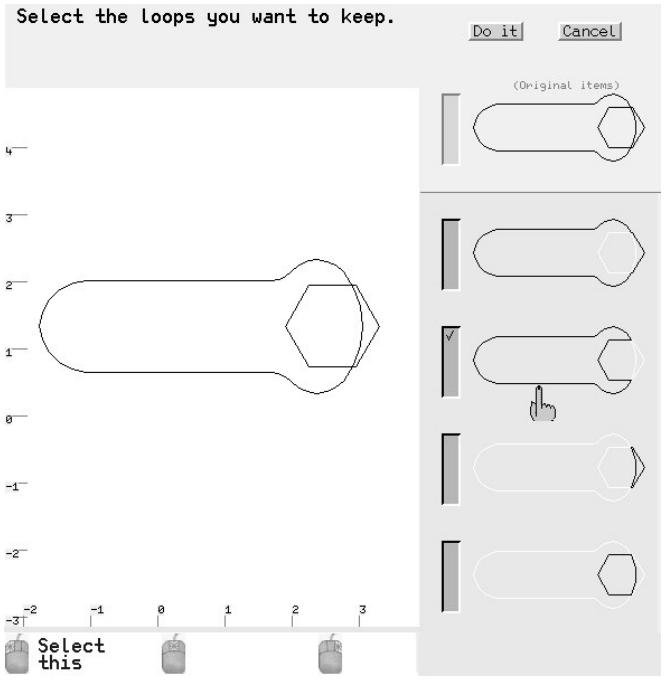


Figure 7-12

Fusing requires closed loops

Millwrite's fusing function requires geometry that forms a ***closed loop***. It is acceptable to use geometry that does not form a closed loop as long as it ***could*** form a closed loop. For example, in Figure 7-13, there is curved piece of geometry that is ***not*** closed. However, as shown by the dotted line in Figure 7-14, a line ***could*** be drawn from the start to the end node, which ***would*** create a closed loop.

In Figure 7-15 is another open loop, but in this case it's invalid because if you draw a line from the start to the end node, (the dotted line on the right side of the image), the result is a piece of geometry that crosses over itself. MillWrite would give you an error message if you tried to use that type of geometry.

The fusing function can also be used to **add** geometry rather than remove it. For example, in Figure 7-16 a circle is being added to the wrench.

Another use for the fuse function is to cut items in pieces. For example, in Figure 7-17 someone's heart is being broken.

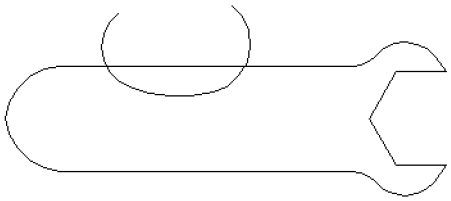


Figure 7-13

Figure 7-14

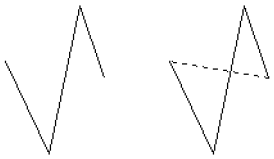


Figure 7-15

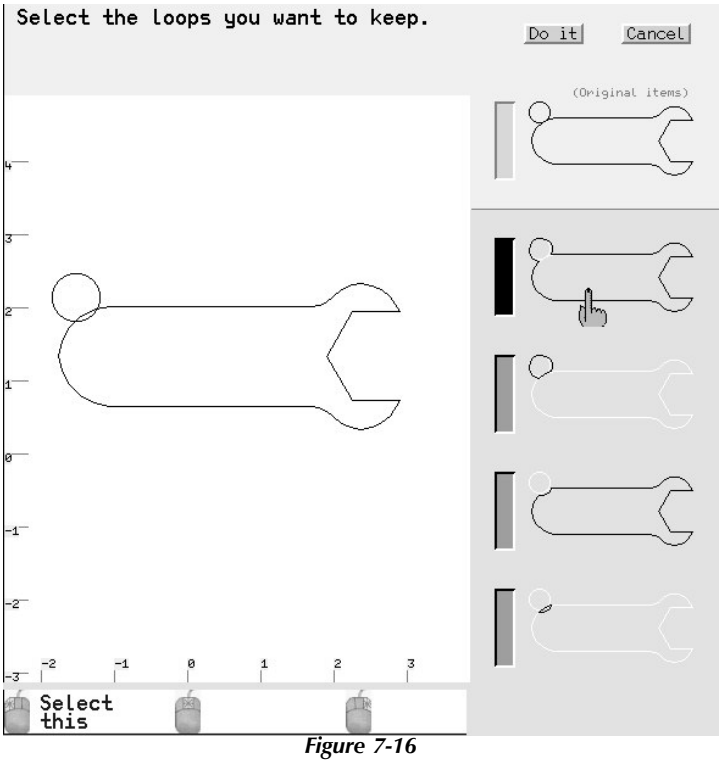


Figure 7-16

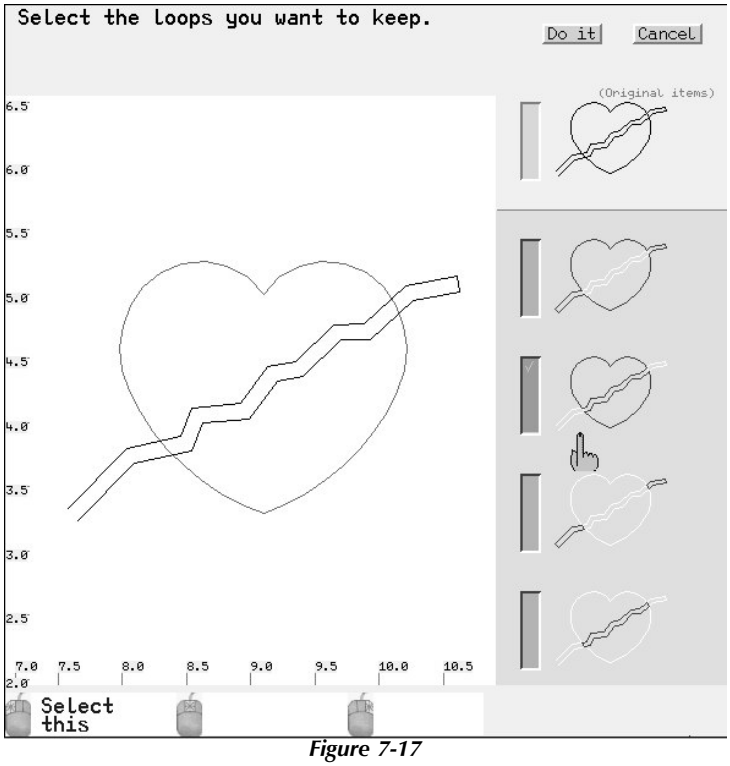


Figure 7-17

Extending and Trimming

MillWrite provides both extending of geometry and trimming of geometry in the same function.

The following figures will show how to use these functions. Figure 7-18 shows four lines. In Figure 7-19 one of the lines is dotted. Assume you want the three lines to exactly touch that dotted line without crossing over it. That dotted line will be the ***boundary*** that the other lines either extend to or are trimmed to.

To start the extend/trim function, click the **Edit** button and then pick in the **Extend/Trim** function, or just press the X key. The screen will change as seen in Figure 7-18. MillWrite is waiting for you to identify the boundary geometry. Touch the mouse to the line and the mouse icon will change to the show the word *Select*. Looking at the two mouse buttons in the lower left corner of the screen shows you that both the left and right buttons will set the boundary. Therefore, you can click either button on that line to specify it as the boundary.

After setting that line to be the boundary, the message along the right side of the screen will change, and so will the function of the left mouse button, as seen in Figure 7-19. Also, the boundary line will become dotted and start to blink to identify it as the boundary.

Now that you have set boundary geometry you can click on each line that you want to extend or trim to that boundary. Referring to Figure 7-19, the middle line crosses the boundary, so to ***trim*** it to the boundary you put the mouse on the portion that you want to ***keep*** and click the left mouse button. Figure 7-20 shows the result.

Referring to Figure 7-21, the mouse is placed on a line that is to be ***extended*** to the boundary, and then the left mouse button is clicked. Figure 7-22 shows the result.

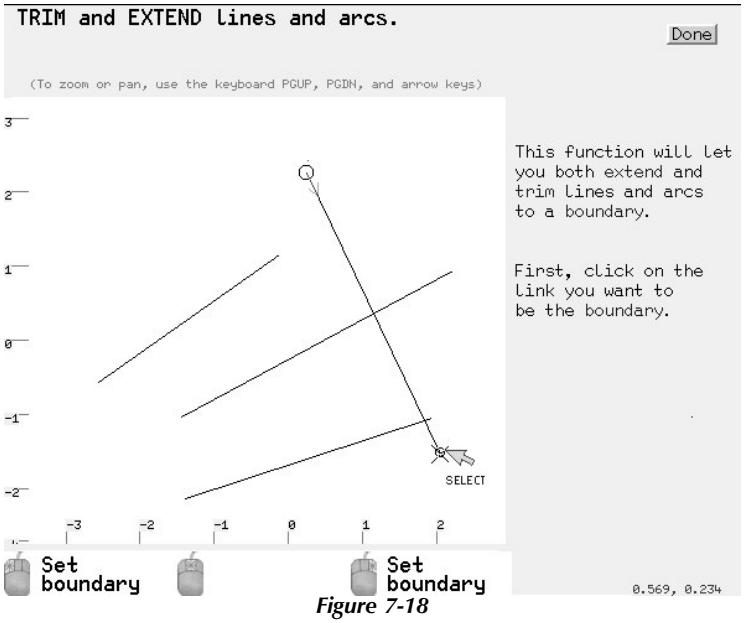


Figure 7-18

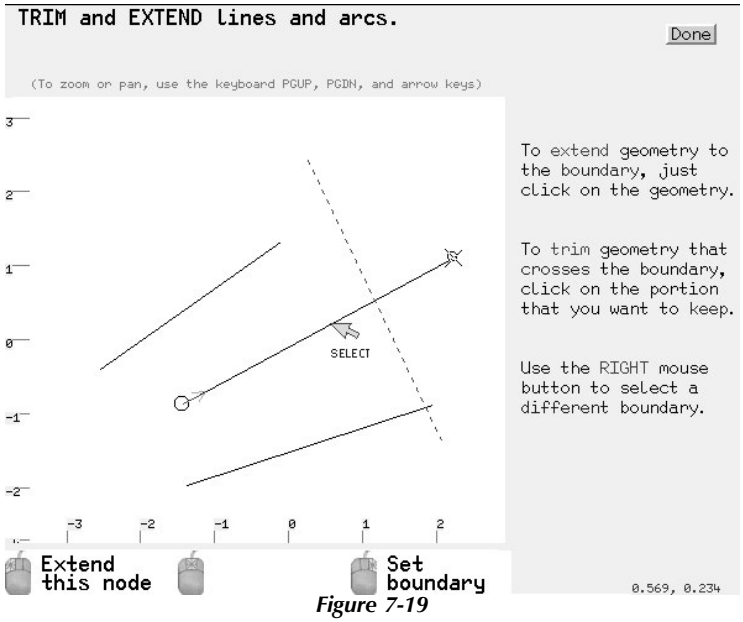


Figure 7-19

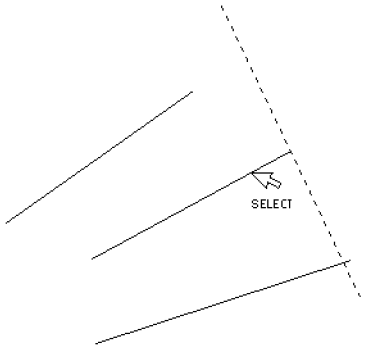


Figure 7-20

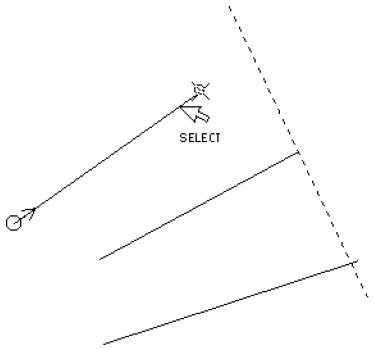


Figure 7-21

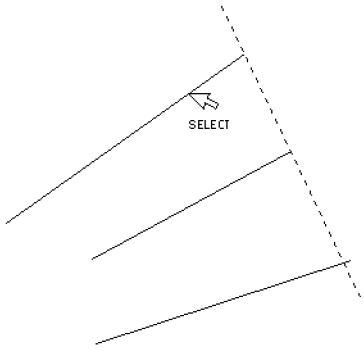


Figure 7-22

Changing the Trim Boundary

Notice that in Figure 7-19 the *right* mouse button is set to the ***Set Boundary*** function. That means that you can put the mouse on any of those lines and click the ***right*** mouse button to set one of them as the boundary.

Figure 7-23 shows the result of clicking the right mouse button on the line at the mouse. That line has become dotted because it is now the boundary.The original boundary is now a solid line because it is no longer a boundary.

Assume you want the original boundary to be trimmed to the new boundary. As seen in Figure 7-24, put the mouse on the portion of the line you want to ***keep*** and click the left mouse button. Figure 7-25 shows the results.

By clicking the right mouse button you can continually set a new boundary, and by clicking the left button you can extend or trim geometry to that boundary.

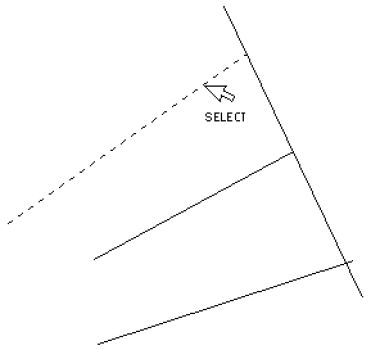


Figure 7-23

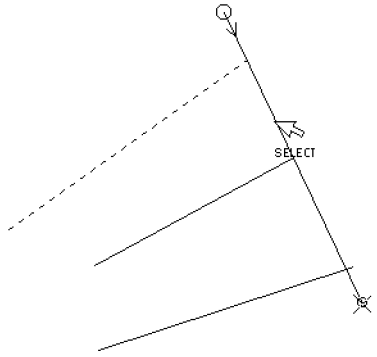


Figure 7-24

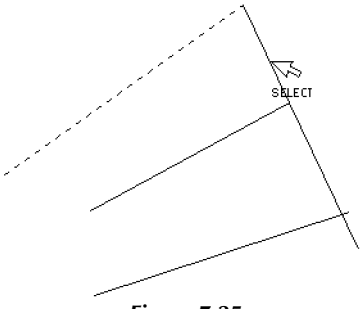


Figure 7-25

Extending and Triming with Arcs

The situation becomes a little more complicated with arcs because there are two possible intersection points. For example, in Figure 7-26, the arc has been specified as the boundary. The mouse has been placed on the line. If you click the mouse button on the line you are asking MillWrite to extend the line to the arc. However, there are two possible directions to extend that line. MillWrite will extend the line from the point that is closest to the mouse when you click the button. Figure 7-27 shows the result.

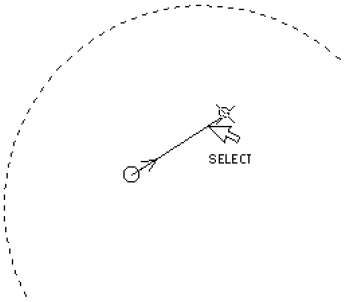


Figure 7-26

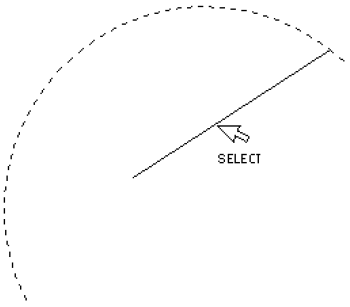


Figure 7-27

Filletting Polylines

MillWrite can fillet two lines, an arc and a line, or two arcs within a polyline. You start the **Fillet** function either by pressing the F key or by picking the **fillet** option from the **Edit** menu. Figure 7-28 shows the screen after the fillet command has started. There are two methods for filleting: **drag** a fillet, or fillet by **value**. If you want to fillet by value, just type the value. You don't have to first click the **by value** button or the data entry box that holds the fillet value.

After deciding which method of filleting you want, put the mouse on the node you want to fillet or on the line or arc you want to become a fillet.

Dragging fillets

In Figure 7-28 the **dragging** option has been chosen. The mouse was then placed on a node and MillWrite changed the mouse icon to show the words **drag fillet**. When you see those words you know that the fillet function is ready, so click the left mouse button and move the mouse to drag the fillet. Figure 7-29 shows the fillet being dragged. The radius of the fillet is displayed both the top and bottom of the screen. After releasing the mouse button, the radius of that fillet will remain in the data entry box in case you want to fillet other nodes to the same radius.

While you are dragging the fillet, if you realize you want a specific radius, just start typing it, as the message on the right side of the screen will remind you.

Fillet a node or a link?

If you click the mouse on a **node**, as in Figure 7-28, MillWrite creates a tangent arc at that node. This adds one more link to the polyline.

If you click the mouse on a line or arc, MillWrite converts that link into a tangent arc. The number of links in the polyline will remain the same. Figure 7-30 shows a polyline that consists of a line, an arc, and a line. If you want the arc to become a fillet between the two lines, click the mouse on the arc. MillWrite will convert it to a tangent arc, as seen in Figure 7-31.

You can also do this with lines. In Figure 7-32 a polyline consists of three lines. If you click the mouse on that middle line, it becomes a tangent arc between the other two lines.

Fillet by value

If you want the fillets to be a certain value, enter the value and then click on whichever node, line, or arc you want to be set to that value. For example, in Figure 7-34 the fillet value has been set to a radius of 0.2 inches, and three nodes have already been set to that fillet value.

Removing fillets - filleting with zero radius

To remove a fillet, set the fillet value to zero and then click on the fillet. Figure 7-35 shows a fillet value of zero with the mouse about to click on the large fillet that was created in Figure 7-29. Figure 7-36 shows the result. The fillet has been removed. Removing a fillet and removes one of the links in the polyline.

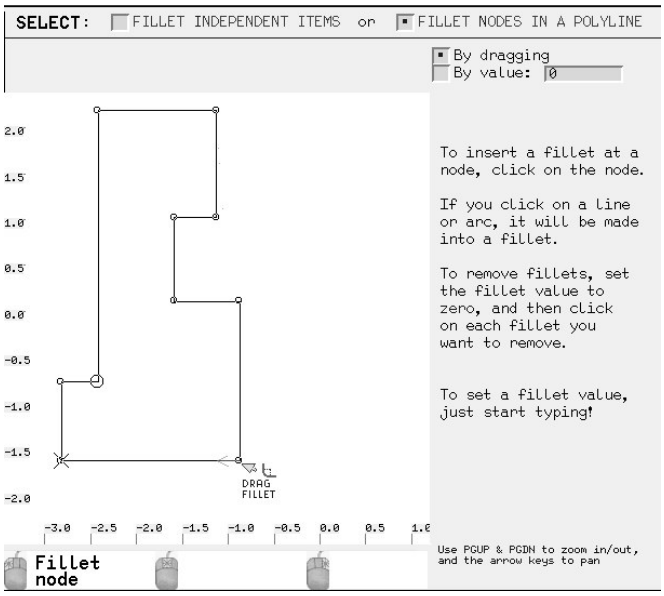


Figure 7-28

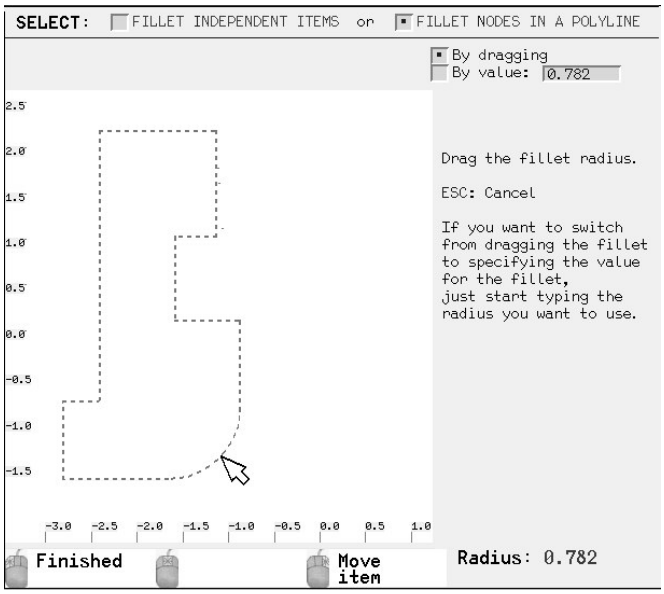


Figure 7-29

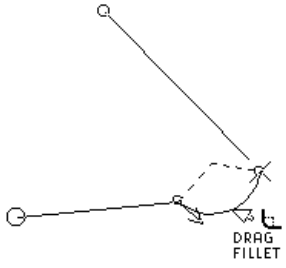


Figure 7-30

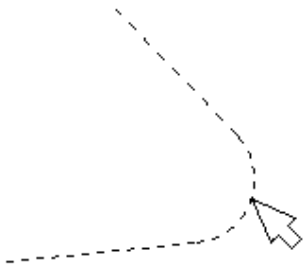


Figure 7-31

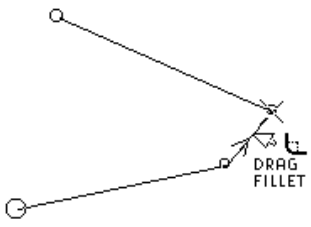


Figure 7-32

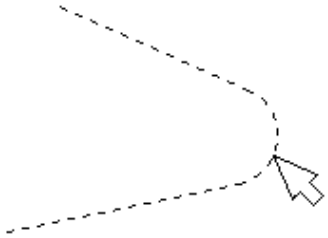


Figure 7-33

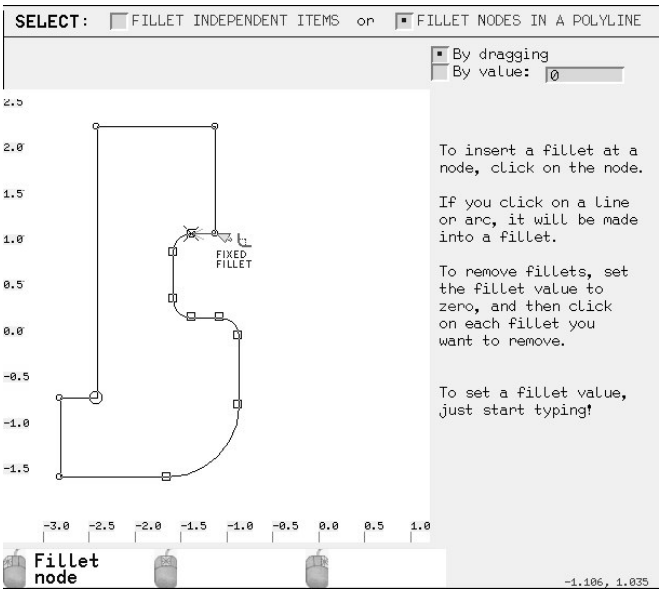


Figure 7-34

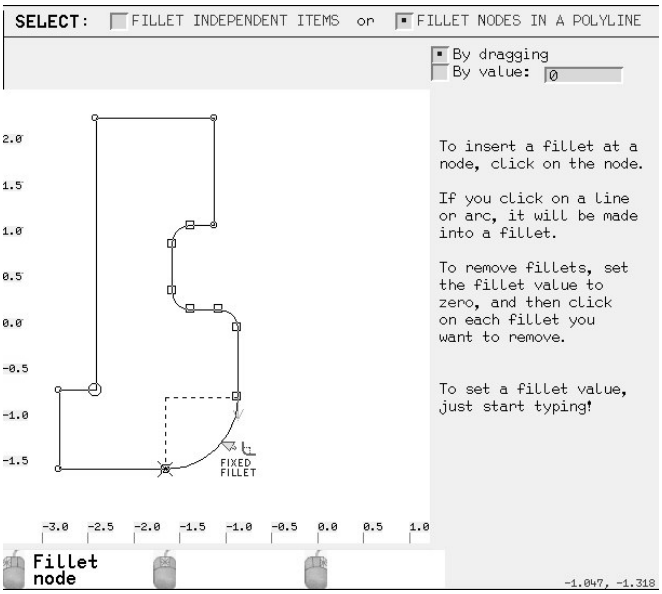


Figure 7-35

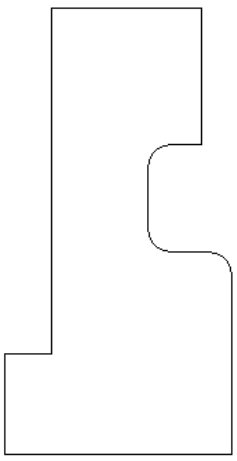
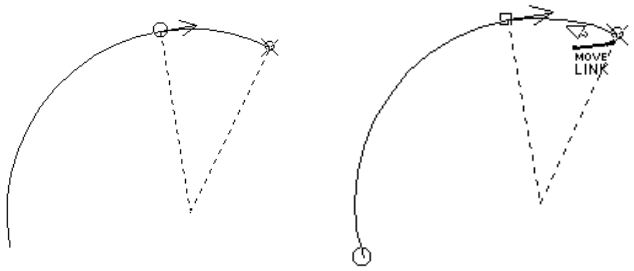


Figure 7-36

Inserting nodes into polylines

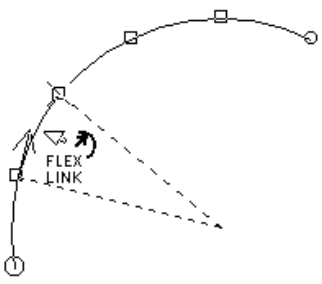
This is the same as the keyboard version of the **Break** function (discussed in the previous chapter), and you see the same menus, but the **Insert** function doesn't split the link. For example, in the previous chapter the arc on the left (repeated in the image below) was broken at a sweep of 35°. Each piece of the arc becomes an independent arc after it was broken. But when a node is ***inserted*** into the arc, the arc becomes a polyline of two arcs (which has three nodes), and the middle node is set to **tangent**. The image on the right shows the mouse touching the arc, and all three nodes are hi-lited. This shows that all three nodes belong to the same polyline. The middle node is shown as a square because it's tangent.



Dividing a Link

The **Insert** function puts only **one** node into a link. If you want to insert **several** nodes that are evenly spaced from each other, then you can use the ***Divide*** function. Click the **Edit** menu button and pick the **Divide link** option. MillWrite will ask you to pick the link you want to divide, and after you clicked on that link, MillWrite will ask you how many pieces you want to divide it into. In the image below, the arc was divided into five pieces. Four nodes were added to the arc and each was set to tangent.

The divide function keeps all the new links together in one polyline. If you want them separated into individual lines and arcs, you have to separate them afterwards (see the **Separate Links** function).



Set the size of the drawing

Although you can resize individual items and groups of items, there may be times when you want the entire drawing to be larger or smaller. MillWrite has three functions to do that. From the main drawing menu, select the **Rotate, Mirror, Scale** option. This will bring up another menu, as seen in Figure 7-37. The first three options in this menu allow you to change the size of the entire drawing. The options are:

- *Scale by an specified **scale factor***
  This option lets you specify a scale factor such as 2, which will double the size of the drawing, or 0.5, which will reduce the drawing in half.
- *Scale to fit a certain **height***
  If you want the drawing to fit within a certain height, you can select this option and specify the height. MillWrite will then resize the entire drawing so that it exactly fits that height.
- *Scale to fit a certain **length***
  If the drawing has to fit within a certain length, this option lets you specify that length, and MillWrite will scale the entire drawing so that it fits that length.

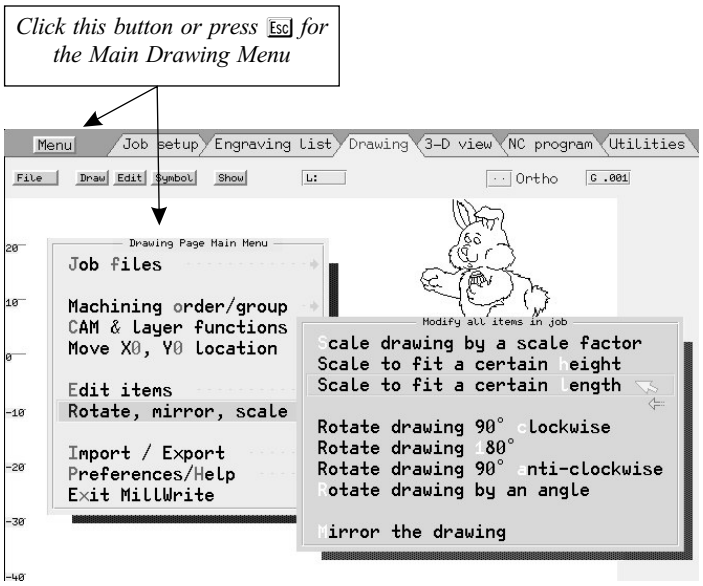


Figure 7-37

Rotate or Mirror the drawing

If you have to make a mirror image of a drawing, it's much easier to set it up in a non-mirrored form, and then mirror it only when you are ready to produce an NC program. Then you can un-mirror it after you've created the NC program.

The same is true of rotated drawings; it's easier to work on the drawing when it's in a non-rotated form, and then rotate it when you are ready to make the NC program. Figure 7-37 shows the different rotation and mirroring options.

Reorder items / Reduce rapid moves

MillWrite engraves or cuts geometry according to the **Machining Order** and **Machining Group** that you set each item to. (The Machining Order issue is discussed in more detail at the end of Chapter 9.) If you do not set the machining order for the items in your drawing, MillWrite will cut them in whatever arbitrary order they happen to be in. This can create an inefficient tool path because the tool may spend a lot of time picking itself up and moving from one item to the next.

Setting the machining order for hundreds of items that can take a long time, so MillWrite has an option to reorder items by itself. Page 11 discussed an option to reorder the geometry as you import an AutoCAD DXF file. MillWrite also provides this function from the main drawing menu. From the main drawing menu, select the **Machining Order/Group** option. That brings up another menu, as seen in Figure 7-38. The first option in that menu is to **Reduce Rapid Moves**. This function will reorder all the geometry in the drawing to reduce the quantity and length of the rapid moves.

The menu also provides a function to set the machining orders according to the layer number of each item. This would be useful if you put items on layers in the order that you want them to be cut.

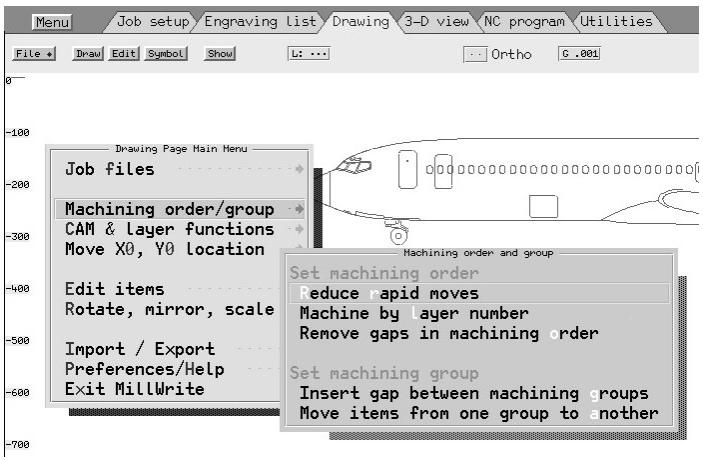


Figure 7-38