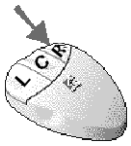
Chapter 1

Overview of MillWrite

Use ALL mouse buttons

You don't have to move the mouse as often in MillWrite as in other Window's programs because MillWrite uses the ***RIGHT*** mouse button to ***access*** menus, to ***cancel*** menus, and to cancel other operations.

For example, normally when you are inside a menu and you decide you want to get out of it, you have to move the



mouse outside of it, or you have to move the mouse to a CANCEL button and then click that button. But with MillWrite you only have to click the ***right*** mouse button. Depending on which menu you are in, and what you are in the middle of doing, either the menu will be closed, or the mouse will automatically move to the CANCEL button for you. (You can also press the Esc key to cancel menus)

For example, if you want to draw circles, click the left mouse button on the **Draw Circle** function. The menu will disappear and the left mouse button will be set to draw circles.

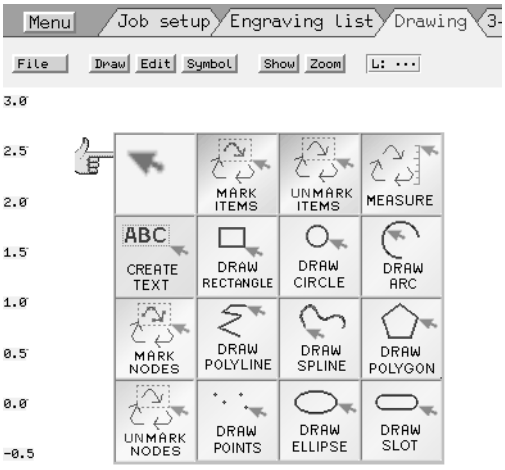
When you are finished drawing circles, click the right button again and select something else from the **New Item** menu. If you are finished drawing and want the left mouse button to return to its default condition, select the arrow in the upper left corner of the menu.

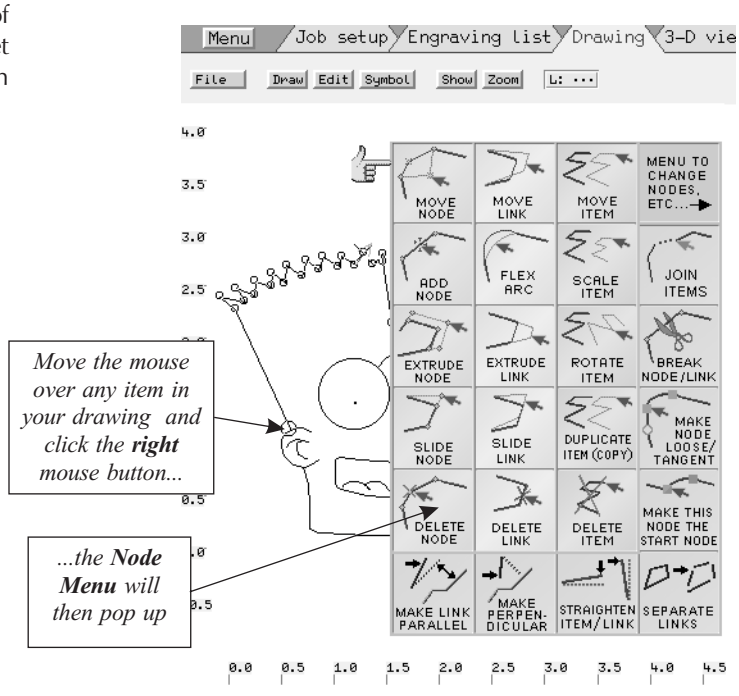
Right button: the NODE menu

When you are at the ***Drawing*** page you can access the geometry editing functions by touching any item in the drawing with the mouse and clicking the *right* mouse button. The ***Node Menu*** will then pop up, as seen below. You can then set the ***left*** mouse button to one of the geometry editing functions by clicking the *left* button on whichever function you want. You can also set the function of the ***middle*** button by clicking the *middle* button on one of the functions. If you decide to cancel the menu without doing anything, just click the ***right*** mouse button.

Right button: the NEW ITEM menu

When you are at the ***Drawing*** page and the mouse is ***not touching*** anything in the drawing, you can click the **right** mouse button for the **New Item** menu (seen below). After the menu appears, click the **left** mouse button on whichever of those functions you want to set the left button to. You can set the function of the ***middle*** button by clicking the *middle* button on one of the functions.





The Draw Menu

The New Item menu (page 1) lets you draw freehand with the mouse. The *Draw Menu* on the Drawing page (Figure 1-1) lets you draw by specifing XY coordinates and other values. These steps show how to draw a circle:

Step 1) Bring up the ***Draw*** menu.

Either click the *Draw* button at the upper left of the screen, or press D, which represents the D in Draw. The *Draw menu* will appear.

Step 2) Select the option to draw a **circle**.

A column of buttons will appear on the right side of the screen (Figure 1-2).

Step 3) Enter whatever values you know.

Assume you want a 3 inch diameter circle with its center at X0,Y0. Click on either the ***Center*** label, or on the recessed, *data entry box* to the right of that label. Then type the digit ***0***.

You could then press the Enter key to let MillWrite know you are finished entering digits into this field, and then you could press the DOWN arrow key (ie, ↓) to move to the field below.

However, you will avoid a keypress if instead you press ***only*** the DOWN arrow key. MillWrite lets you terminate a data entry ***and*** move up or down to the next or previous field. So pressing the DOWN key will put the cursor on ***Y Only*** field. Type a ***0*** here, and then press the DOWN arrow key. This puts the cursor on the ***Radius*** field. Type ***1.5*** and press Enter. You will now see a red, dashed outline of a circle, with its center on X0,Y0.

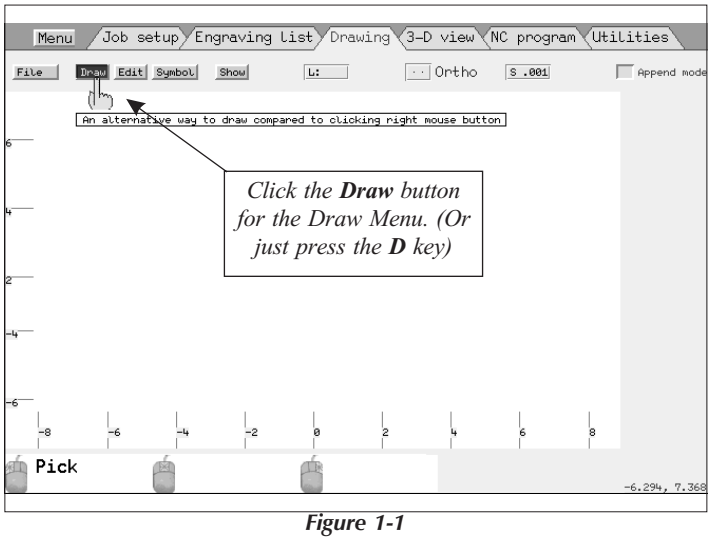


Figure 1-1

Step 4) Accept the circle.

The circle is shown in a red dashed line to because it is **temporary** rather than part of the drawing. While it is in this temporary condition you can alter the center point and/or the diameter. When you finished altering the circle, click the ***OK*** button. The dashed circle then becomes a solid circle. You now have a three inch circle in the center of the drawing.

Step 5) Terminate the circle drawing function.

You could create another cirlce by filling in the fields again. When you are finished creating circles, terminate by clicking the ***OK*** button, the ***Cancel*** button, or by pressing the Esc key.

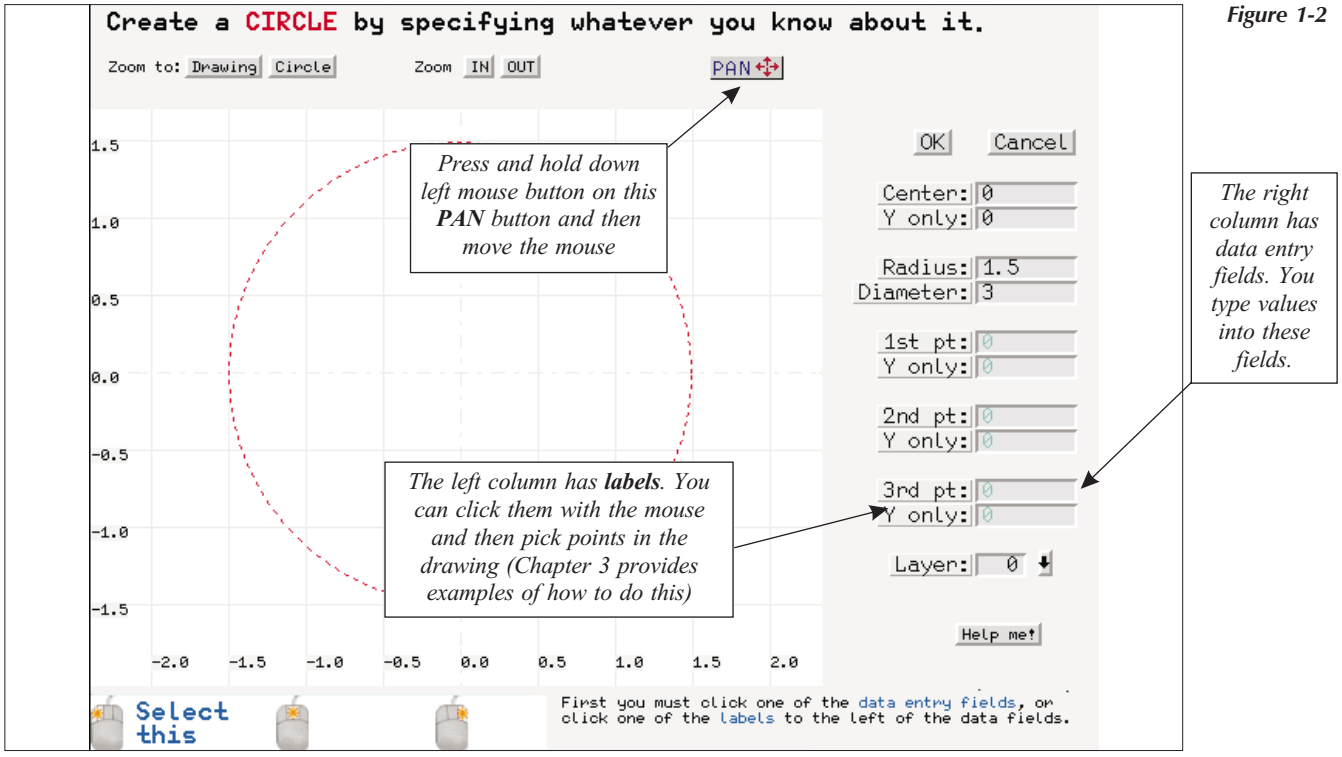


Figure 1-2

Terminology

Nodes

A ***node*** is an end point of a line or arc, or a control point of a spline. Nodes have X-Y coordinates.

When a line or arc is an independent item, it has **two** nodes. One node is the ***start node***, and the other is the ***end node***. When you touch the mouse to an item, MillWrite identifies the start node with a large circle, and the end node with a small circle.

Polylines

MillWrite allows lines, arcs, and splines to be joined together into ***polylines***, which are similar to AutoCAD's ***polylines***. When two lines are joined into a polyline, they share a node at their junction. For example, a polyline that consists of *two* lines will have *three* nodes. One node is the ***start node***, one is the ***end node***, and the middle node is just a ***node***.

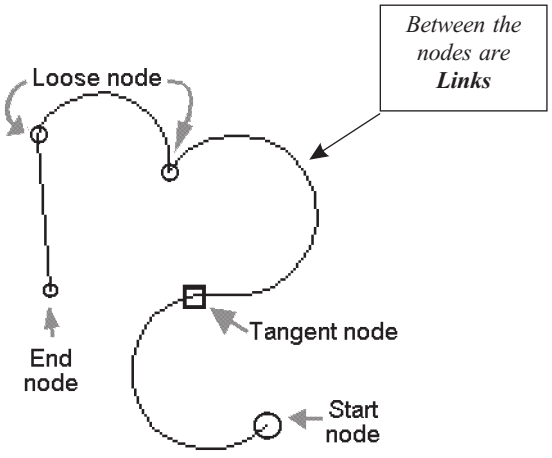
Links

A polyline is like a chain, and the lines, arcs, and splines that make up the polyline are similar to the links of the chain. MillWrite refers to the geometry between two nodes as a ***link***. A link may be a line, an arc, or a section of a spline.

Tangent and Loose nodes

The nodes that connect two links together may be set as **tangent** or **loose**. A ***loose*** node allows the adjacent links to swivel with no regard to the position of the other. Some CAD systems refer to such nodes as "***cusps***". If you set a node to be ***tangent***, then MillWrite will maintain the tangency between the links as you move or alter the polyline.

The image below shows a polyline that consists of three arcs and one line. It has a total of five nodes and four links. At the junction between the first two arcs is a **tangent** node. The next two junctions are **loose** nodes. MillWrite shows the tangent nodes as *squares*, and the loose nodes as *circles*.



Snap

The word "Snap" is used to describe functions that cause the mouse to jump to an XY location. There are three different snap categories. A brief overview of them will be found at the pages in parenthesis.

- *Snap to nodes and links (page 7)*
- *Object Snap (page 8)*
- *Snap to Grid (page 5)*

Hi-liting items

MillWrite ***hi-lites*** items (ie, highlights) to show you which item you are currently working with. The next page explains this.

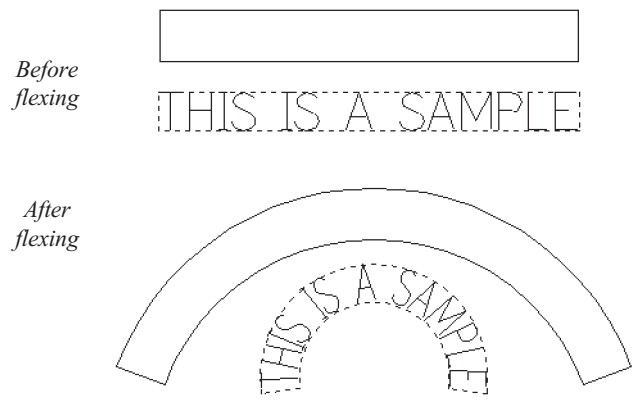
Flexible and Rigid lines

Lines can be designated as ***flexible*** or ***rigid***. When you set a line as rigid, you are informing MillWrite that you don't want it to become an arc. If you try to "flex" it into an arc using the ***Flex Link*** function, MillWrite will display a warning that the line is rigid and offer you the option to convert it to a flexible line. Therefore, by designating lines as rigid you can avoid accidentally changing them to arcs.

Flexing Lines, Rectangles, and Text

As the previous paragraph mentioned, you can use the ***Flex Link*** function to flex a line into an arc. MillWrite also lets you flex rectangles and text.

Text has a box around it, and the box has four links. A **rectangle** also has four **links**. In both cases, two of the four links are set as **rigid** lines and two are set as **flexible**. You can use the ***Flex Link*** function to flex the rectangle and the text. Below are some before and after images to show what happens when you flex text and rectangles. If the flex function refuses to flex the rectangle, you have the mouse on the rigid links; move the mouse to its adjacent link.

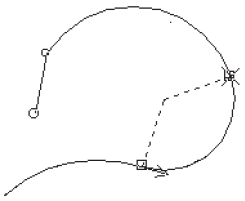


Put mouse over an item to Hi-Lite it

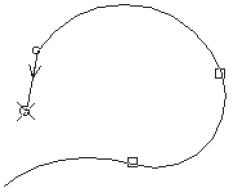
Most CAD and CAM systems require you to first ***click*** an item before you can edit it. With MillWrite, all you do is move the mouse over it. Whatever item the mouse is touching becomes ***"hi-lited"***.

How do you know when something is hi-lited?

When an **arc** is hi-lited, MillWrite draws two lines from the center point to each of the two nodes at the end of the arc, as seen in the image to the right. This shows you where the center point of the arc is.



When something other than an arc is selected, MillWrite puts circles (or squares) at the nodes. This "hi-lites" the nodes so that you can see where they are. In the image to the right, the line is selected.



Parameters appear when an item is hi-lited

When you touch the mouse to something in the drawing, the parameters for it appear along the right side of the screen (Figure 1-3). You can edit any of the parameters by sliding the mouse over to that area and clicking the left button. Or, when the mouse is touching the item, you can press the E key and MillWrite will move the mouse to the parameters area for you. (Look at the lower right corner of the screen for messages to remind you of such commands as the E key. The **E** in the word **Edit** along the bottom of th screen is a different color, indicating that it is a hotkey.)

In either case, once the cursor bar is in the parameters area you can change the shape of the item or change its usage. The **usage** field is where you specify whether you want the item in grade and, pocketed, contoured, or if it's just a drawing aid that will never be machined.

You can turn on or off the showing of the parameters when you touch an item. Normally you leave it on, but when you want to see more details in your drawing you can turn it off. When you turn off this option, the right portion of the screen will be used for the drawing. In such a case you have to press the E key to edit the parameters. The option to turn off the parameters is in the **Show** button menu.

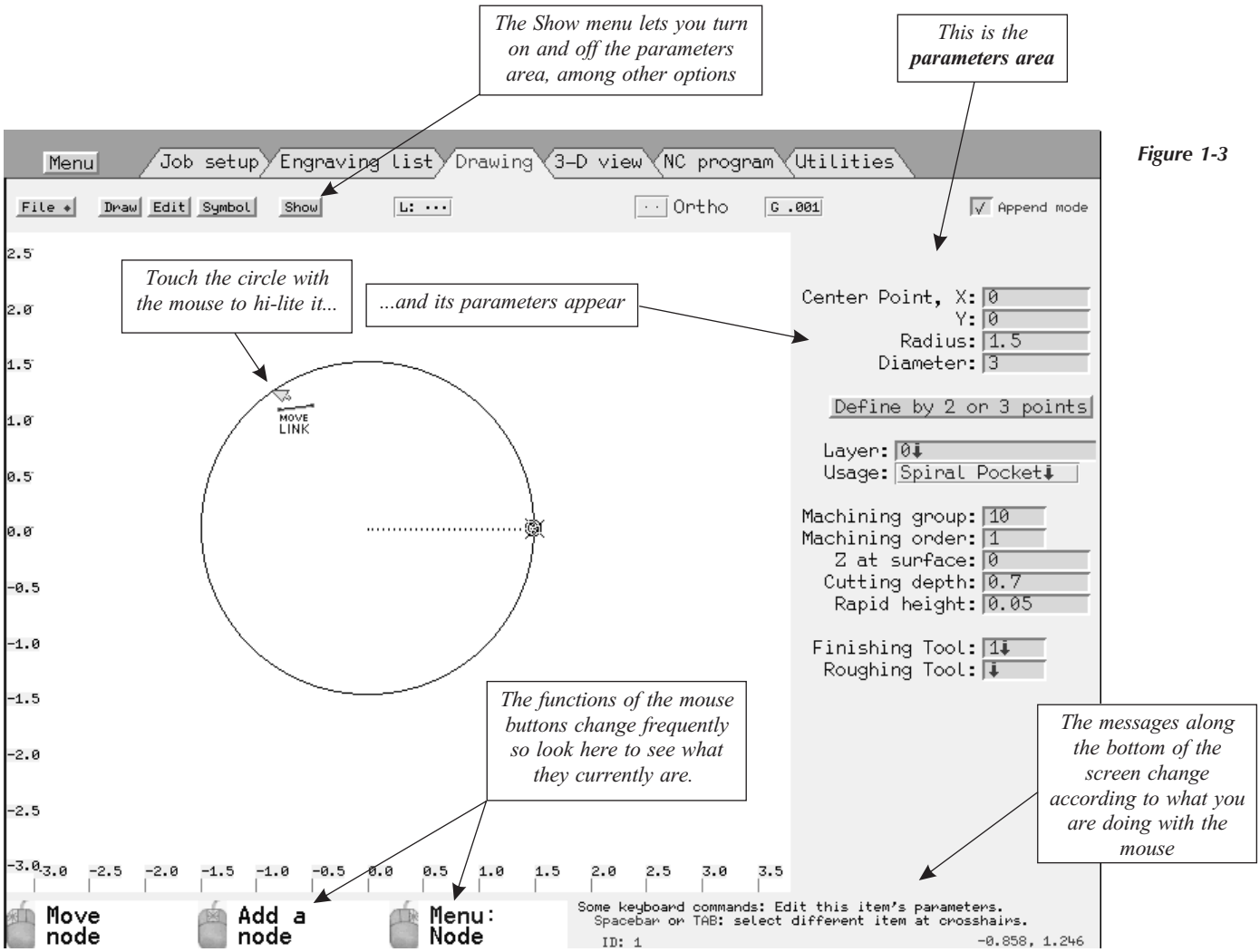
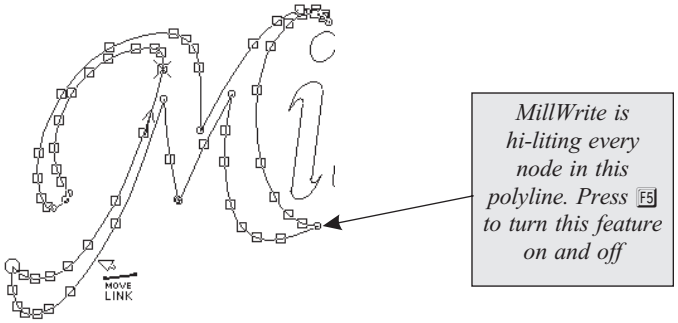


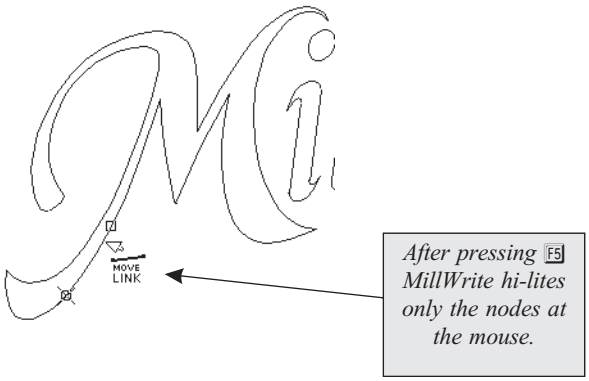
Figure 1-3

Show all nodes / Show only hi-lited link F5

You have the option of setting MillWrite to show ***every*** node in an item when it is hi-lited, or show ***only*** the link the mouse is touching. When ***all*** nodes are showing, you can easily see which nodes belong to the item. Press the F5 key to change between these two different modes. The two images to the left show the difference between showing all nodes and showing only the link at the mouse.

When an item has a lot of nodes, it may be easier to see the drawing when you turn off the showing of all nodes.



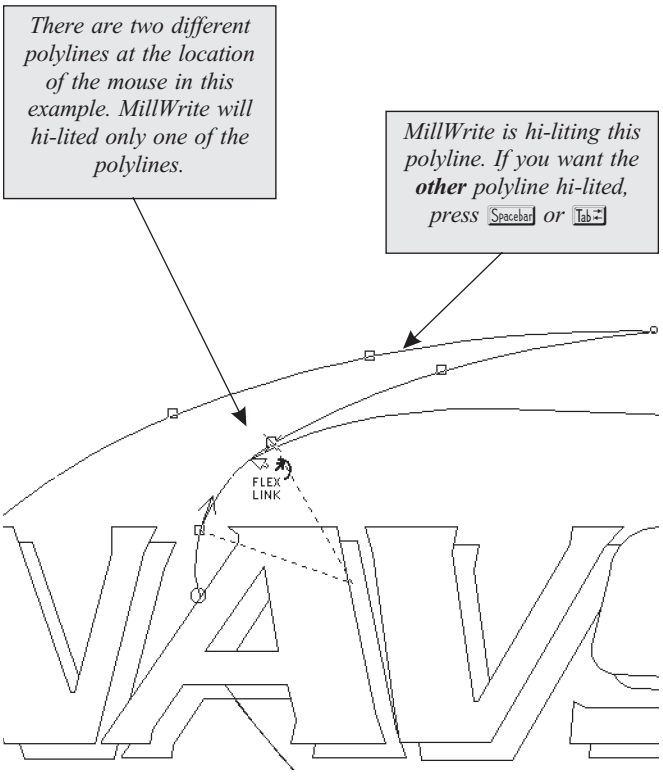


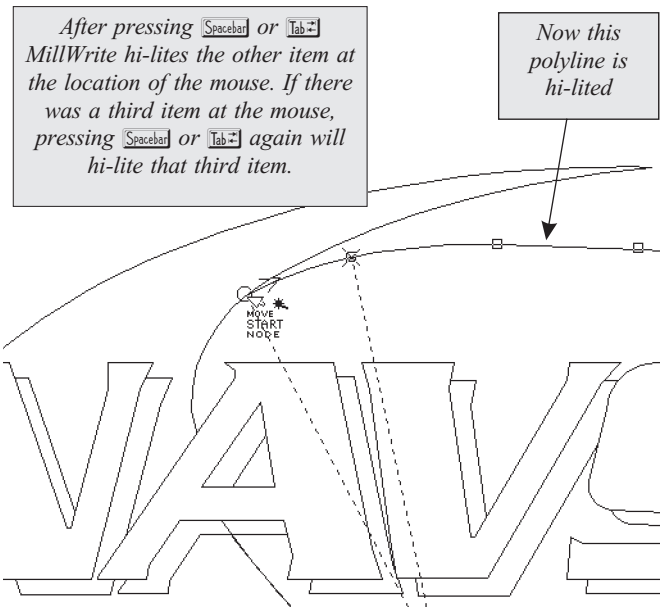
If MillWrite Hi-Lites the wrong item Spacebar / Tab

When your drawing has items on top of each other, or touching each other, MillWrite will sometimes hi-lite the wrong item when you try to edit one of them. The solution is to press either the **spacebar** or the **tab** key until the item you want has been hi-lited.

For example, in the images below, the mouse is at a location where it is on top of two different arcs. MillWrite has to make a decision about which arc to hi-lite in such a case, but MillWrite may not choose the arc you want.

When MillWrite makes the wrong decision on which arc you are trying to hi-lite, just press the Spacebar or Tab key to force MillWrite to hi-lite the next item it finds at that location. The image to the bottom right shows what happens after pressing Spacebar or Tab. The mouse is at the same location, but MillWrite has hi-lited the start node of a different arc of a different polyline.



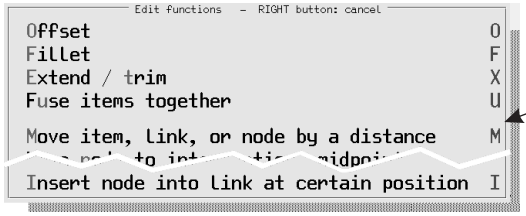


Keyboard usage

Shortcuts for Menu Functions

The keyboard shortcuts are listed along the right edge of the menus in a different color. For example, in the Edit Menu (a portion is show below), the ***O*** key is the keyboard command for the ***Offset*** function, and F is the shortcut for the ***Fillet*** function. Therefore, rather than click on the Edit menu for those functions, you can just press O for the Offset function, or F for the Fillet function.

If you see the caret (ie, ^) in a menu, that represents the ***CTRL*** key, so ^***S*** represents Ctrl S, and ^Z is Ctrl Z.

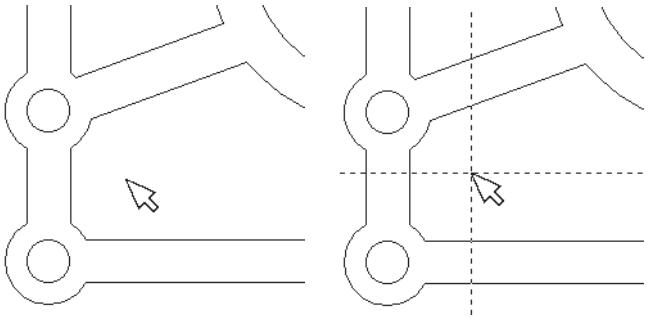


Keyboard shortcuts are along right edge of menus

Crosshairs

You can turn the crosshairs on and off with the ~ key. (This is ***not*** the key with the quotation marks; rather, it is the key with a *tilde* and a backwards accent mark.)

The crosshairs is useful when you want to see how items line up horizontally or vertically. The two images below show the same drawing with and without the crosshairs.



Snap to Grid

F9

As with AutoCAD, you can turn on and off an imaginary grid with the F9 key. When the grid is **on**, the mouse will jump from one grid point to the next. For example, if you set the grid to 0.5 inch, then the mouse will move in increments of 0.5 inch.

There is a button on the drawing page that shows whether the grid is on or off, and if it is on, the button shows the value of the grid (see image at the bottom of this page). The letter **G** in the button represents the word Grid. In the image at the bottom of this page the grid is on it and it has a value of 0.001. When the grid is ***off*** you will see the word **OFF** in the button.

Ortho mode

F8

The **ortho** mode lets you restrict movement to only horizontal, or only vertical. For example, if you set the ortho mode to vertical only, then when you drag nodes or draw lines, they will only move up or down; they will not be able to move side to side. This allows you to move an object upwards or downwards without worrying about it slipping left or right.

Ortho mode has three states. Each time you press F8 (or click the ortho button) the ortho mode changes to its next state. The three states are:

- *Off (as seen in the image at bottom of page)*
- *Restrict movement to horizontal*
- *Restrict movement to vertical*

Zooming and panning with the Keyboard

Page Up, Page Down — Zoom in, Zoom out

T — Pan, up

← → — Pan, left and right

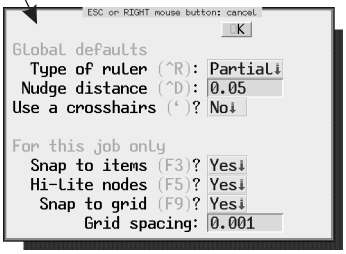
↓ — Pan, down

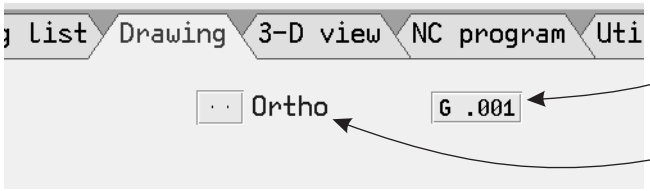
Q — The point you click with the mouse becomes **center of the screen**. You can then zoom in and out without that location changing.

Z — Zooms in (or out) to show the **hi-lited link**.

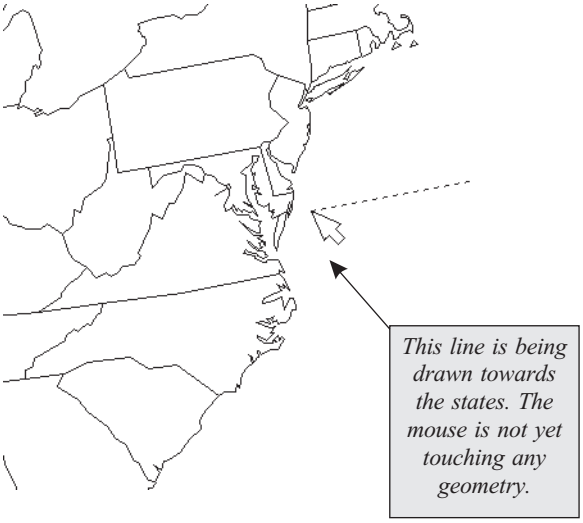
G — **Go to XY Coordinate.** Shifts the view of the drawing to the X-Y coordinate you specify. For example, to see the area around an X-Y coordinate of X3.45 Y-12.7, press G and then type the numbers. You do not need to type the letters X or Y. Separate the values with spaces or a comma. MillWrite will then put X3.45 Y-12.7 in the center of the screen, and you can press Page Up or Page Down to zoom in or out without moving the center of the screen from X3.45 Y-12.7

Clicking the Grid button brings up a menu.





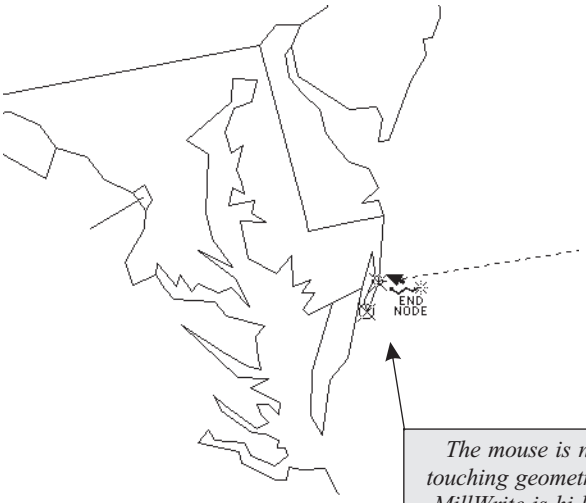
Clicking the Ortho button changes the ortho mode



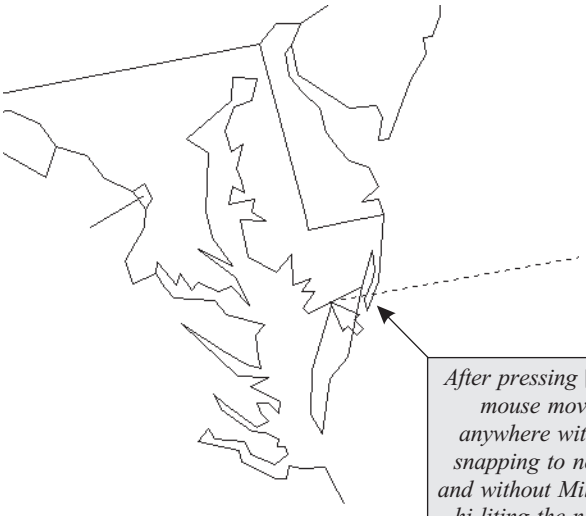
This line is being drawn towards the states. The mouse is not yet touching any geometry.

Snapping to nodes and links

MillWrite uses the word ***snap*** in a few different ways. For example, you can *snap to grid*, as mentioned on page 6. You can also snap to nodes or links. To understand this feature, consider the images to the left. In the first image a line is being drawn towards the state of Virginia. As the mouse gets near the geometry that makes up the states, MillWrite snaps the end of the line to one of the nodes. MillWrite is making the assumption that you want to draw the line to one of those nodes. However, if you ***don't*** want to do that, you must turn ***off*** the ***snap to node*** feature by pressing the F3 key. When it is off, the mouse can move anywhere without MillWrite hi-liting nodes, as seen in the bottom image. Press the F3 key at anytime to turn this feature on and off.



The mouse is now touching geometry, so MillWrite is hi-liting nodes, snapping the line to the nodes, and changing the mouse icon to show you that it is over a node.



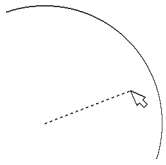
After pressing F3 the mouse moves anywhere without snapping to nodes, and without MillWrite hi-liting the ndoes.

Restrict snapping with CTRL and SHIFT

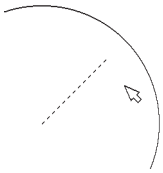
Whenever you draw lines or move nodes, you can hold the Ctrl key down to restrict movement to only vertical or only horizontal. If the **snap to node** feature is also turned on, then when you touch an object MillWrite will snap to it while at the same time restricting movement to vertical or horizontal.

If you hold ***both*** the Ctrl and one of the shift keys (ie, Shift) down, MillWrite will restrict movement to 45° angles, specifically, 45°, 135°, 225°, 315°. The images below illustrate this.

In this image a line is being drawn from the center of a circle. The end of the line is at the location of the mouse because the mouse is dragging it.

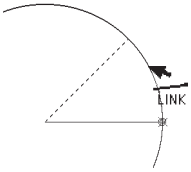


In this image both the control and a shift key are pressed down, and the line snaps to the nearest 45° angle.



In this image the mouse has touched the circle. You can tell that the mouse has touched the circle because the mouse icon has changed and MillWrite has drawn the radius of the circle.

The line has snapped to the circle but it has been restricted by the control and shift key to snapping along a 45° angle.



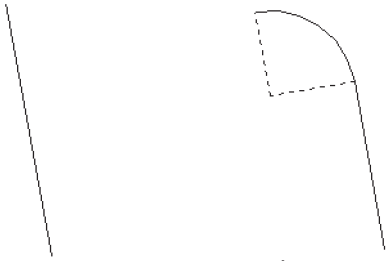


Figure 1-4

Figure 1-5

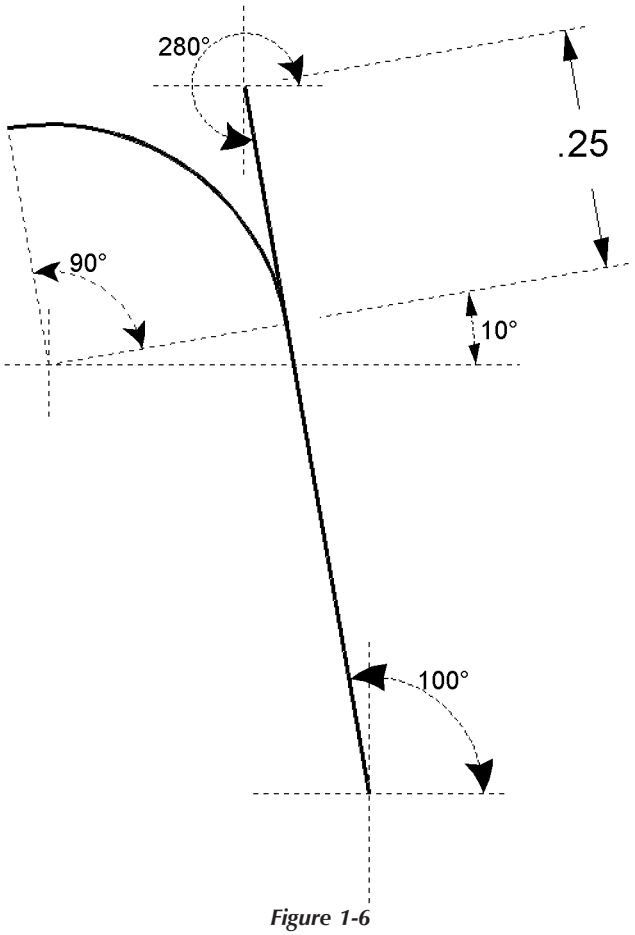


Figure 1-6

Example of Object Snap

Figure 1-4 shows a line at a 100° angle as measured from the bottom of the line. Figure 1-5 shows the same line except that the top .25 inch of the line has been replaced with a tangent arc that has a .25 inch radius. This example will show how to change the line in Figure 1-4 into the line and arc in Figure 1-5 in order to provide an overview of the **Object Snap** features.

Figure 1-6 shows what you know about the arc and line. The arc has a .25 radius and sweep of 90°. You also know that the start of the arc is .25 inches from the end of the line. You could calculate where the center point of the arc is, and what the coordinates are for the start and end of the arc, but the **Object Snap** functions provide a way to create the arc without doing any calculations.

To create the line, bring up the **Draw** menu by clicking the **Draw** button at the upper left corner of the screen, or just press the D key. Then select the **Line** function. The process is similar to the circle example on page 2. As with circles, you fill in only the fields you know; ie, you don't have to fill in all fields. So enter a length, such as 1.4, and set the angle to 100°. The line is complete, so click OK, and then cancel the drawing function.

To draw the arc, bring up the **Draw** menu and select the **Arc** function. The screen will change as seen in Figure 1-7.

You know that the start point of the arc is .25 inches from the end of the line, so begin by specifying the start point of this arc. Click the left mouse button on the ***start*** label (as seen in Figure 1-7). The label will begin blinking in blue and a message on the bottom right corner of the screen will remind you that you can click the ***right*** mouse button for the **object snap** functions. So click the right mouse button on the label **start**. (If you had known that you could do this with the right button, you could have clicked *only* the right button, ie, you do not have to click the left button first, and then the right).

The **Object Snap** menu will pop up in the middle of the screen (Figure 1-8). Since you know that the start point of the arc is at a certain distance from the end point of the line, select the **At A Distance** option.

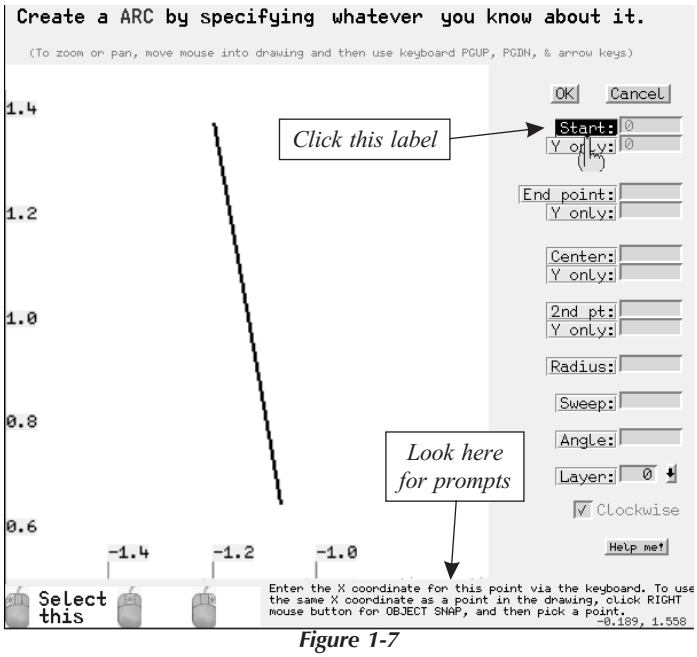


Figure 1-7

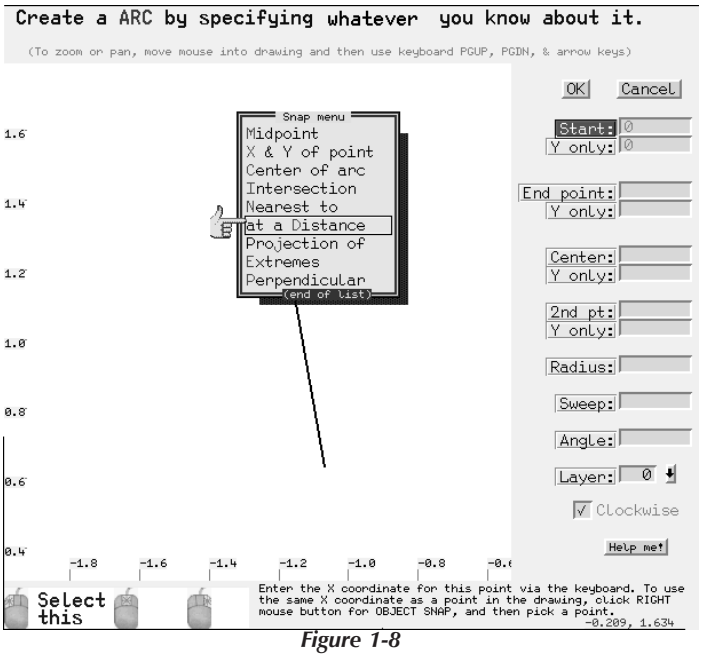


Figure 1-8

The screen will change as seen in Figure 1-9. At the top of the screen is a data entry field where you can specify the distance and angle. The distance and angle is from a ***reference point***. Therefore, you must specify **both** a reference point **and** a distance and angle from that reference point.

The reference point in this situation is the upper end of line. If you forget how to set the reference point, at the top of the screen is a prompt to remind you that you set the reference point with the mouse. Put the left mouse button on the end of the line, as seen in Figure 1-9, and click the left button. At the top of the screen the coordinates for the reference point will change to whatever they are for the end of that line.

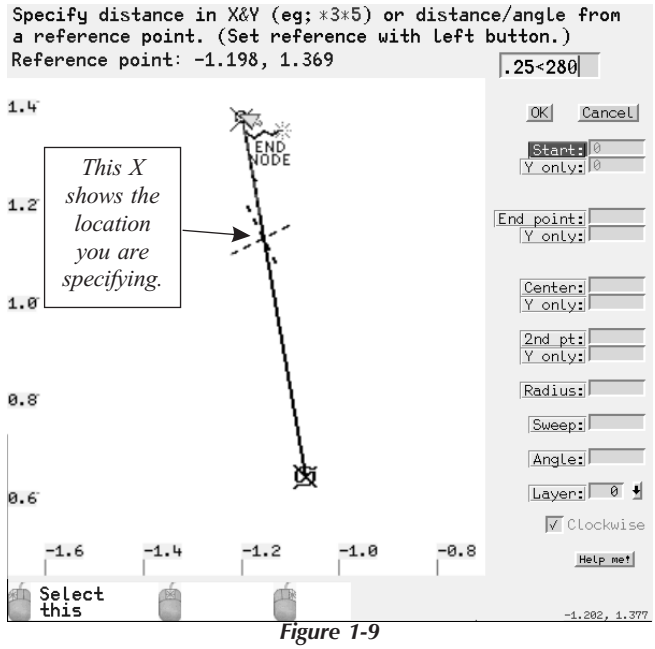


Figure 1-9

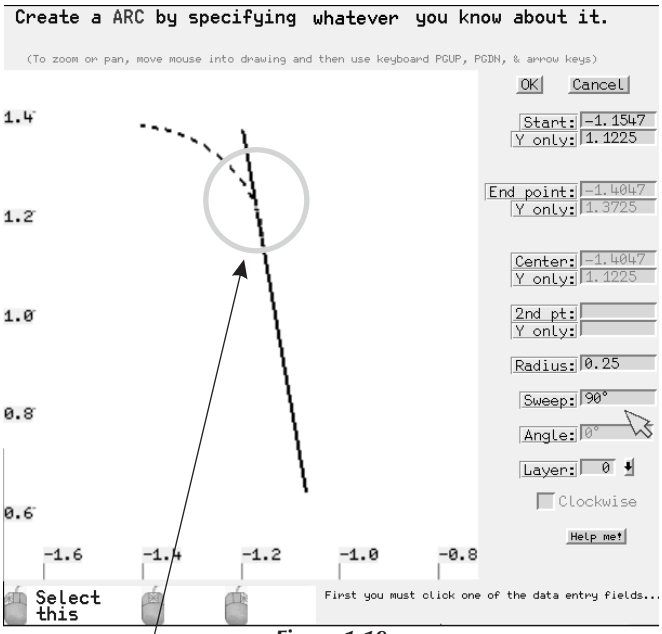


Figure 1-10

If you click the wrong point, just click until you get the right one. MillWrite will not do anything until you press the Enter key, so it doesn't matter if you make a mistake when you pick the reference point.

You must also specify the distance and angle from that reference point. The distance is .25 inches, but what is the angle? Referring to Figure 1-6, the line has an angle of 100° as measured from the **bottom** of the line. However, the start point for the arc is being measured from the **top** of the line, and from the top of the line the angle of the line is 280°. Therefore, the distance and angle you specify is .25 inch at an angle of 280°.

How to specify distances and angles

Specify the distance first followed by the angle. Between the two values type either **>** or **<**. Therefore, to enter a distance of 0.25 inches at 280°, type **.25<280**

To enter the distance and angle, ***just start typing***. You do **not** have to first click the data entry box. Actually, if you ***try*** to click the box you will find the mouse doesn't even move to it.

As you type the values **.25<280**, MillWrite will put an X at the resulting point to show you the location you are specifying (see Figure 1-9).

It is important to realize that it doesn't matter if you specify the distance and angle first and ***then*** click on the reference point, or if you click on the reference point first and ***then*** specify the distance and angle. Nothing happens until you press the Enter key, so you can change the reference point and/or the distance and angle as many times as you want.

Also, if you knew the length of this line then you could have used the ***lower*** end of the line as the reference point instead of the upper end. For example, if you knew that this line was 1 inch long, then the arc would start .75 inches from the ***bottom*** of the line. You could set the **bottom** of the line as the reference point, and for the distance and angle you would enter **.75<100**. The result would be the same point in either case.

After you specify the distance, angle, and reference point, press the Enter key. This sets the start point. You will see the coordinates displayed in **Start** field.

Now move the cursor down to the **Radius** field. Enter **.25** and press the **down arrow** key. This puts the cursor on the **Sweep** field. Enter **90**, and press the **down arrow** key.

You just specified enough info to create an arc, so MillWrite will draw an arc, as seen in Figure 1-10. However, this arc is ***incorrect*** because MillWrite is assuming it has a start angle of zero degrees since you haven't specified the start angle. If you zoom in to get a better view of the arc, you will find that the arc is not tangent when it has a start angle of zero degrees. In the **angle** field you must enter ***10***. (See Figure 1-6 to understand where the 10° comes from; the ***start angle*** of an arc is measured from the ***center*** of the arc.)

Figure 1-11 shows the result. This arc is now complete so click the OK button. MillWrite will draw the arc in a solid line. You're done with the arc drawing function, so click the OK button, or the CANCEL button, or just press the Esc key.

Now all you have to do to complete this job is to chop off .25 inches from the end of the line. There are several ways to do this. For example, you could ***trim*** the line at the arc. Or you could ***break*** the line at the start of the arc and then ***delete*** the quarter inch piece from the end. The easiest method is to ***drag*** the end of the line to the start of the arc.

Start by putting the mouse on the end node of the line. As seen in Figure 1-12, the mouse icon should change to show the words ***Move Node***. If you find that the mouse has something else, such as ***Draw Circle***, or ***Slide Node***, click the ***right*** mouse button for the ***Node Menu***. Then select the ***Move Node*** function from that menu.

Click the left mouse button and start moving the mouse. As seen in Figure 1-13, the line becomes dotted, and as you move the mouse, you move the end node of the line.

Move the mouse to the start of the arc. When you touch the start node of the arc, the mouse icon will change to show the words ***Start Node***, as seen in Figure 1-14. Also, you will see both nodes of the arc become hi-lited, and two dotted lines will be drawn from the center of the arc to the nodes of the arc. MillWrite is showing you that the mouse has touched this arc. This requires you have the ***snap to node*** function turned **on** (the F3 key; see page 7). Click the **left** mouse button to terminate the drag function. You have completed this job.

> Note: If you do not have the **snap to node** function on when you drag nodes, you cannot be guaranteed that the ends of the lines and arcs have the exact same X Y coordinates. Rather, the lines and arcs in your drawing will appear to be touching each other, but in reality there will be tiny gaps between them. So make sure that the **snap to node** function is ***on*** when you drag nodes. Press the F3 key to toggle the snap to node feature on and off.

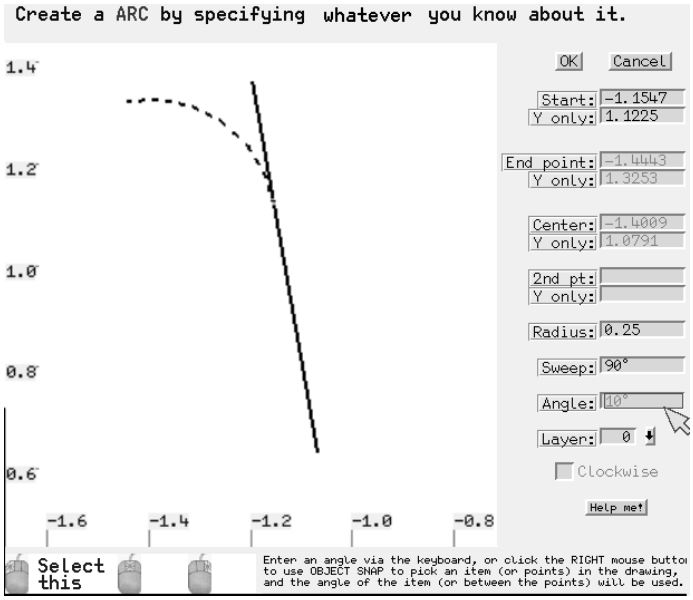


Figure 1-11

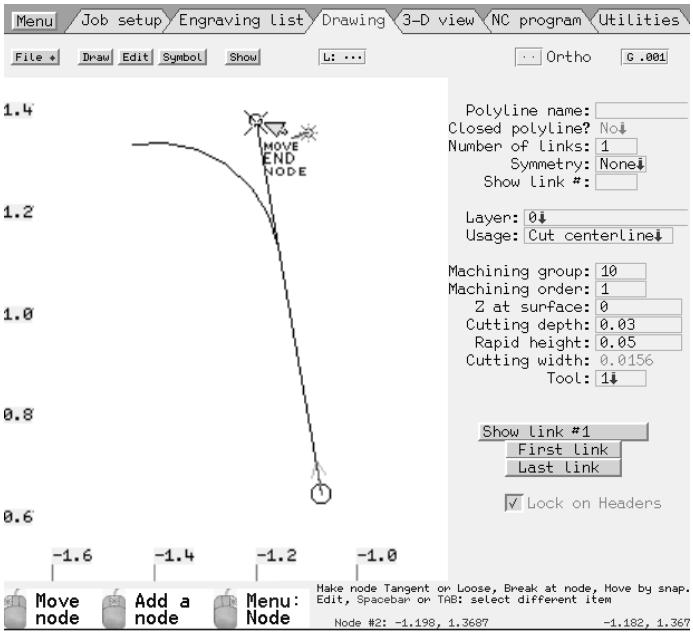


Figure 1-12

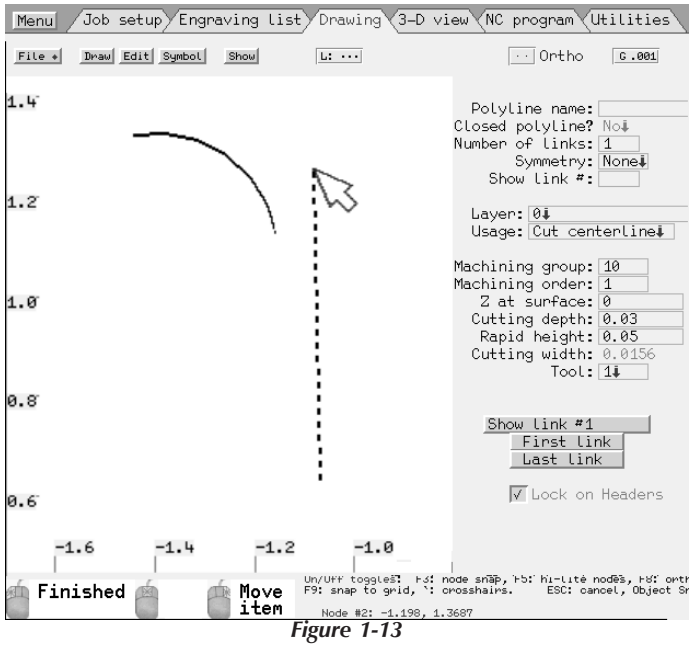


Figure 1-13

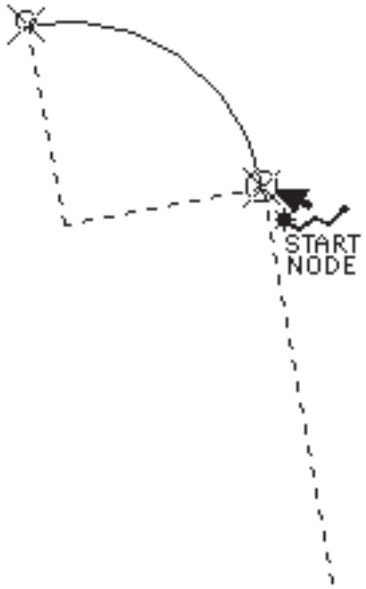


Figure 1-14

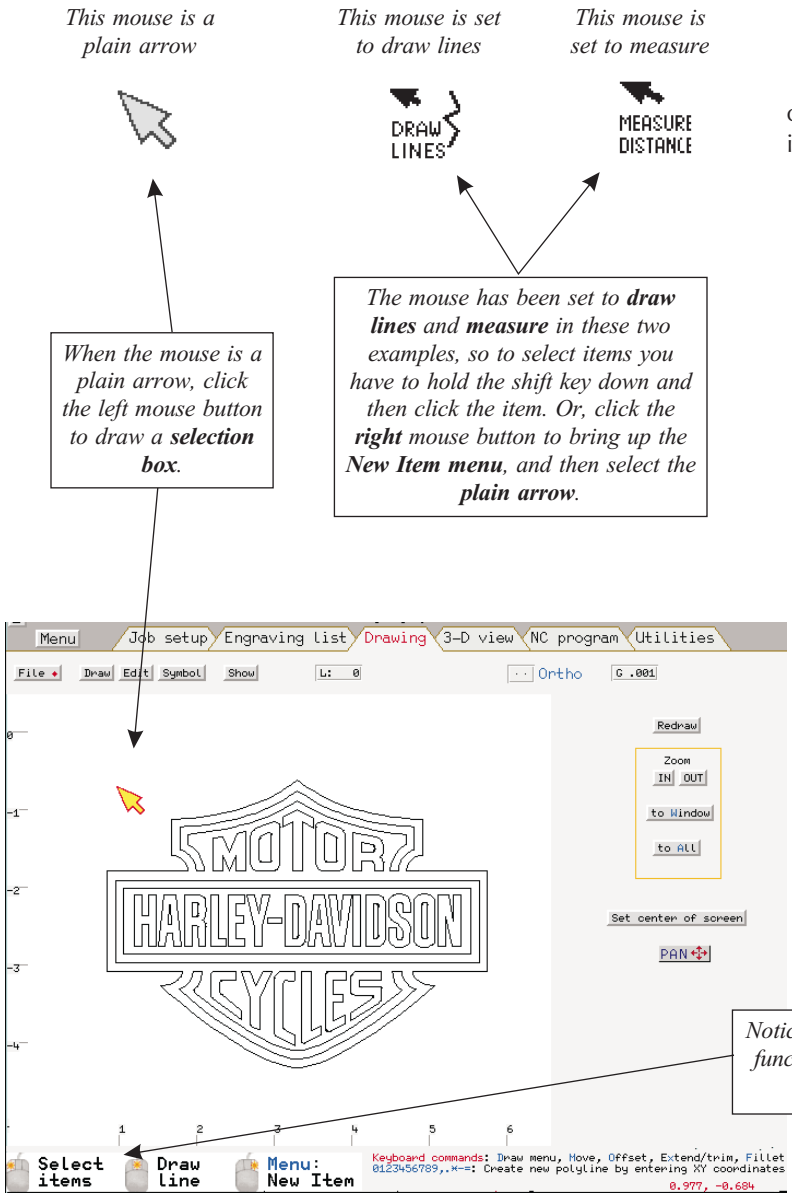


Figure 1-15

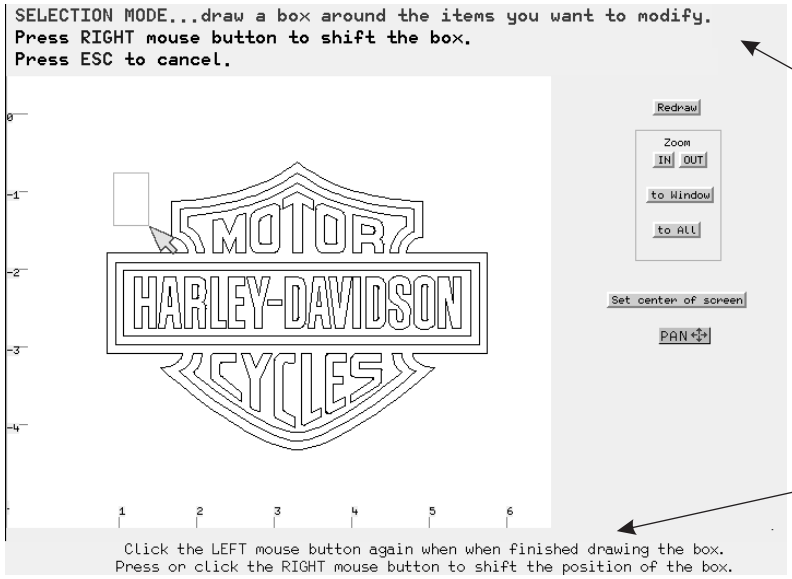


Figure 1-16

Selecting items

MillWrite lets you ***select*** one or more items for more complex editing operations. There are two ways to select item(s):

1) Press and hold a *SHIFT* key (ie, ⇧Shift) and then click an item you want to select. MillWrite will selecct that item and switch to its ***Selection Mode***. You can release the ⇧Shift key and select more items by clicking on them or by drawing a selection window around them.

2) Draw a **selection window**. To do this, move the mouse to an empty area of the drawing. When the mouse is a **plain arrow** (as in Figure 1-15) you can click the mouse and draw a window around the items you want to select (Figure 1-16). This causes MillWrite to switch to its ***Selection Mode***, even if you don't select anything.

   Note: if the mouse icon shows words, such as DRAW LINES (see the three images at top of page), click the **right** mouse button for the **New Item** menu and select the **plain arrow** in the upper left of the menu (see bottom of page 1 for the **New Item** menu).

The Selection Screen

Figure 1-17 shows the selection screen. At the top of the screen you can see that eight items have been selected, and the selected items are drawn in dotted lines.

When the mouse is not touching anything, it shows a smaller mouse drawing a box, which is suppose to remind you that if you click the mouse button, you will draw a box that will select or un-select items. If you click the left button, you draw a box that selects items, but if you click the right mouse button you draw a box that un-selects items.

The Geometry Clipboard

You can copy and/or add selected items to the **geometry clipboard**. If you click the **Add** button, you add selected items to whatever items are already in the clipboard. If you click the **Cut** button, MillWrite will clear the geometry clipboard, delete the items from the drawing, and move the items into the clipboard. In figure 1-17 the clipboard is empty, as you can see by the message underneath the **Add** and **Cut** buttons. If you put something into the clipboard, this message changes to show you the number of items in the clipboard. You will also have the option to **empty** the clipboard, which deletes whatever is in the clipboard.

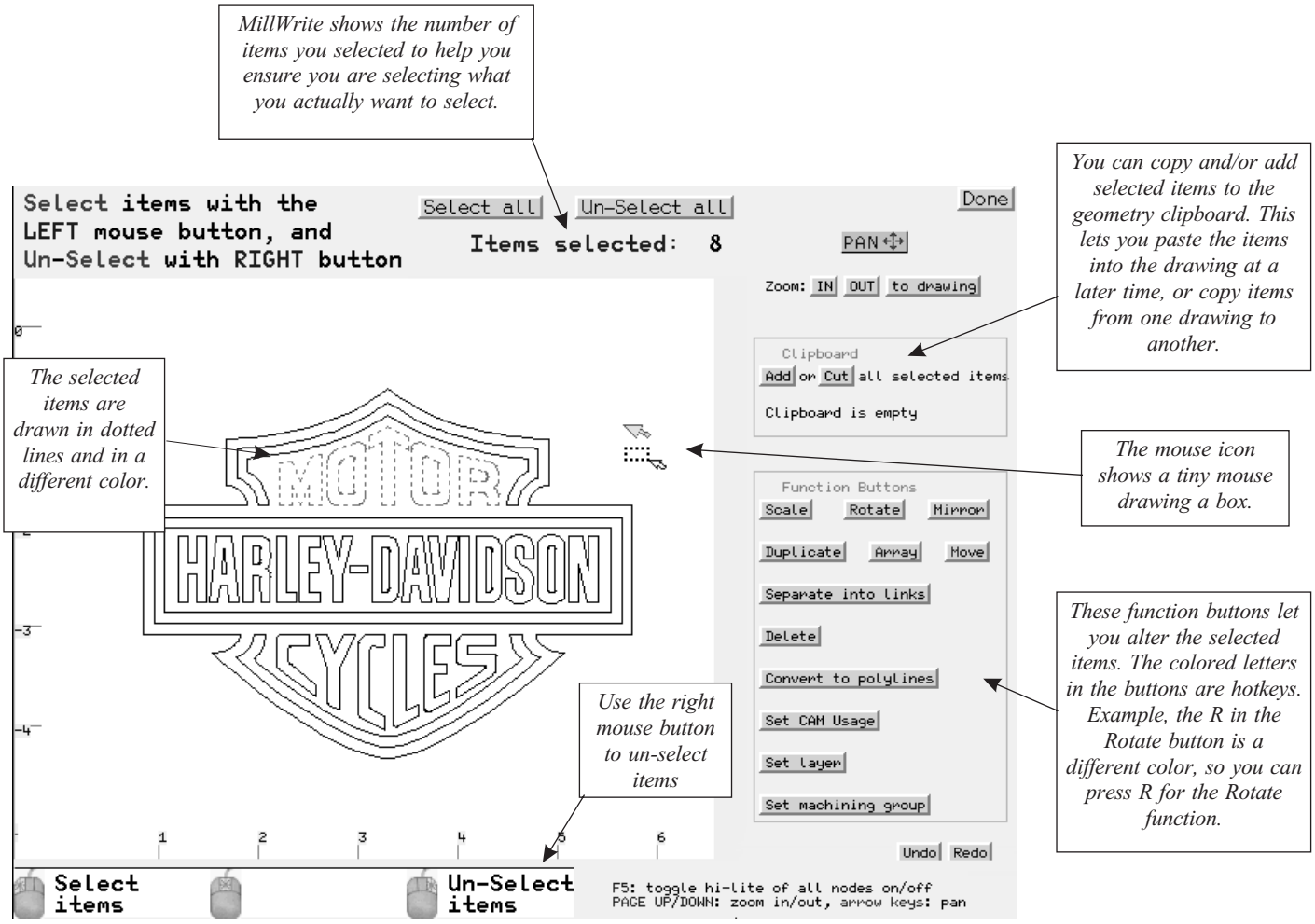
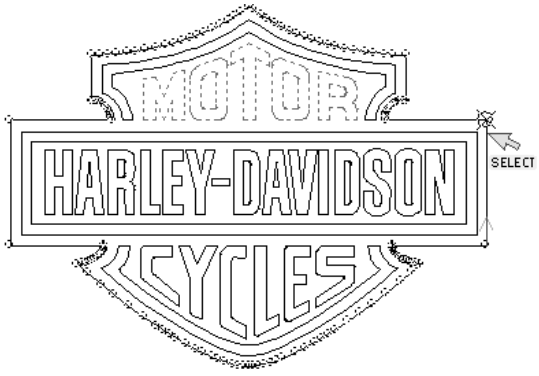


Figure 1-17



*When the mouse is touching something, the item becomes hi-lited and the mouse icon changes to show the word "Select". You can select the item simply by clicking the **left** button. Or click the **right** button to un-select it.*

Importing AutoCAD DXF files

You can import a DXF file for two different purposes. One is to import the file for ***machining*** or ***editing***. The other is to import the file to use as a ***template***.

Importing DXF files for machining or editing

From the **File** menu select the **Import/Export** option, and then select the option to **Import A DXF File**. This brings up the data entry screen seen in Figure 1-18. The first two fields should be easy to understand, but the other fields need an explanation.

CAM operation

This is where you select the CAM operation for all items in the DXF file. In Figure 1-18 the CAM operation is set to **Cut Centerline**. This is what you would set it for if you want to engrave the DXF file. If you do not want to machine any of it, then you could set the CAM operation to **Drawing Aids**.

If the DXF file consists of a mixture of drawing aids, engravings, and boundaries that you want to pocket or contour, you have to select one of those CAM operations and then manually change the items that need some other CAM operation.

Join items together?

A DXF file may have hundreds of lines and arcs, many of which are touching each other end to end in a continuous path. But the CAD system that created the DXF file may not export those continuous paths as polylines. Instead, the drawing may consist of hundreds of individual lines and arcs scattered about haphazardly.

If you set this field to YES, MillWrite will analyze the geometry in the DXF file and connect all lines and arcs that are touching each other end to end. The only time this may cause problems is if you want to pocket or contour the items and if there are lines and arcs on top of each other. In that case MillWrite will create polylines that have segments on top of each other. The lines and arcs that cross each other or are on top of each other may interfere with the pocketing.

Ignore gaps up to

If a drawing is made properly, there will not be any gaps between the lines and arcs that are suppose to be touching end to end. But in reality there are often tiny gaps between lines. This field let's you compensate for gaps. If MillWrite finds a gap between two items that is less than whatever value you enter here, MillWrite will join the two items together. For example, in Figure 1-18 the gap is 0.0002 inches. If two lines are within 0.0002 inches of touching each other, MillWrite will join them together. (This field is available only if you set the **Join Items Together** field to YES.)

Reorder afterwards?

The geometry in a DXF file is usually created in a haphazard manner. If you were to engrave the geometry in the same order that the DXF file has the geometry listed, then the machine would waste a lot of time making rapid moves.

If you set the **Reorder Afterwards** field to YES, MillWrite will analyze the items in the DXF file and reorder them so that they are machined in a manner that reduces the quantity and length of the rapid moves.

Figures 1-19 and 1-20 show how these fields can affect an NC program. In Figure 1-19 a company logo was imported with both the **Reorder Afterwards** field and the **Join Items Together** field set to **NO**. There was a total of 139 items (ie, 139 lines and arcs) in that DXF file, most of which were scattered haphazardly. MillWrite engraved the logo in exactly the order the DXF file specified them, and the result was rapid moves all over the place. (The rapid moves are the dotted lines.)

Then the same DXF file was imported with the **Reorder Afterwards** field set to YES. When MillWrite created an NC program, there were fewer rapid moves, and the rapid moves were shorter (Figure 1-20).

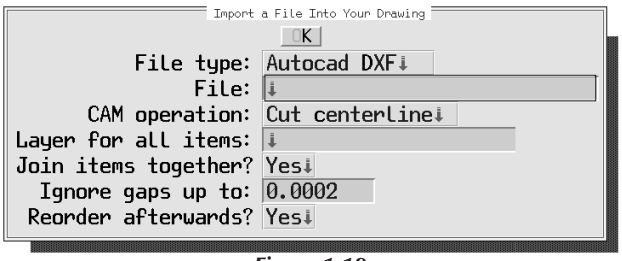


Figure 1-18

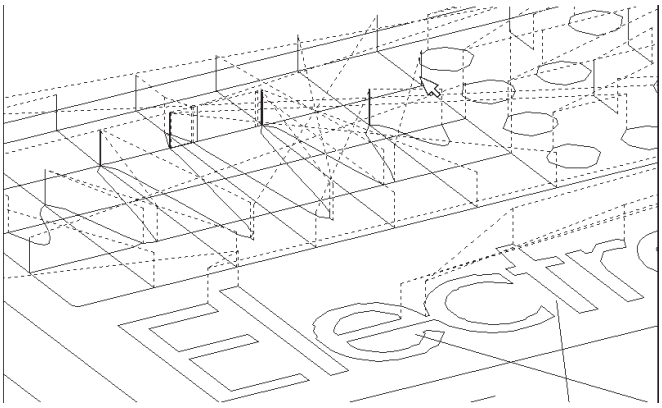


Figure 1-19

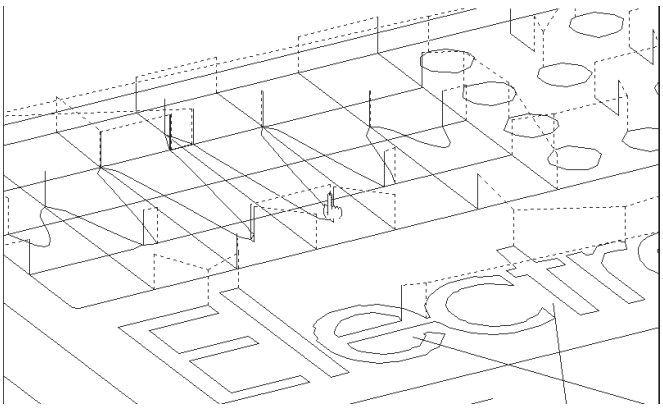


Figure 1-20

Layer for all items

If you are importing the DXF file into a drawing that already has several layers, and if you want to keep the geometry in this DXF file separate from the rest of the drawing, you could specify a layer for the entire DXF file. For example, you could put the entire DXF file on layer 52. If you leave this field blank, then whatever layers are in the DXF file will be retained when you import the file. The only problem with trying to retain the original layers of the DXF file is that CAD systems create layers in a different manner, so MillWrite may interpret the layers incorrectly.

Importing DXF files for templates

From the **File** menu select the **Import/Export** option, and then **Select a DXF File as a Template**.

When you import a DXF file as a template, MillWrite assumes you only want to look at the DXF file rather than machine it or edit it. As an example of why you would want to import a DXF file for a template, consider the panel in Figure 1-21. Assume you have to engrave the text and rounded rectangles to identify all those switches and knobs. One way to do this is to analyze the blueprint and then figure out the X and Y coordinates for all the text and rounded rectangles. But an easier method is to import a drawing of the switches and knobs (Figure 1-22) and use it as a template. Then you could put the text and rectangles in their proper positions visually.

A template provides visual verification that you have everything in the proper position. And since the template is not editable, you will not be bothered with the mouse accidentally selecting items in the template.

Since MillWrite can export DXF files, you could create a drawing in MillWrite, then export it as a DXF file, and then import it as a template; ie, you can make templates for yourself.

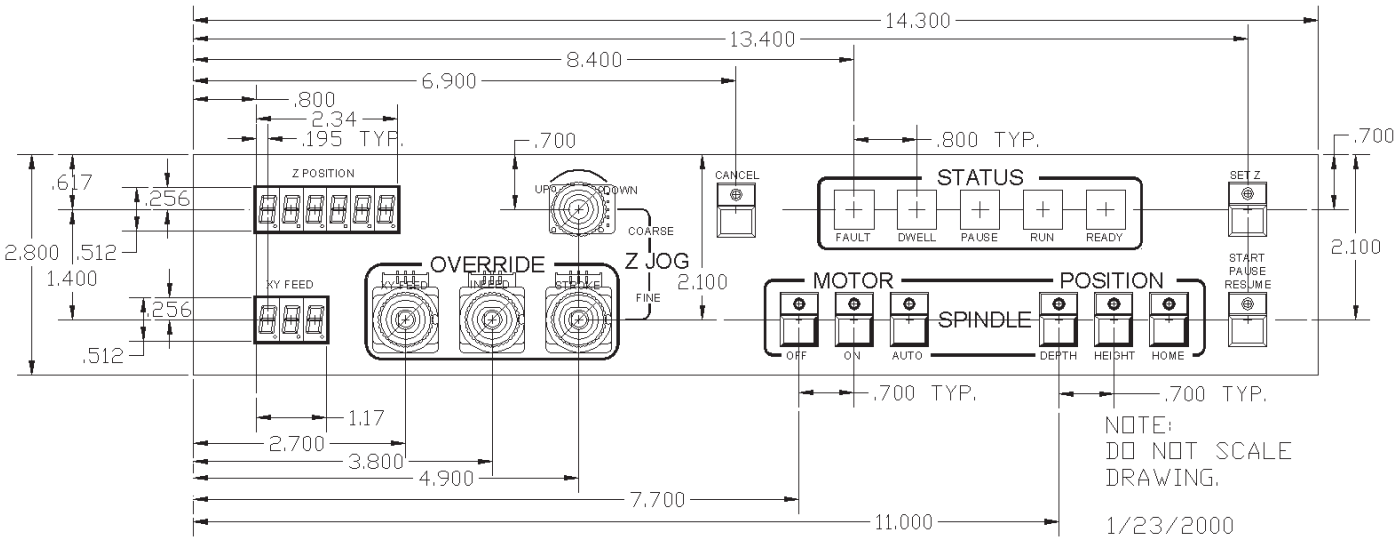


Figure 1-21

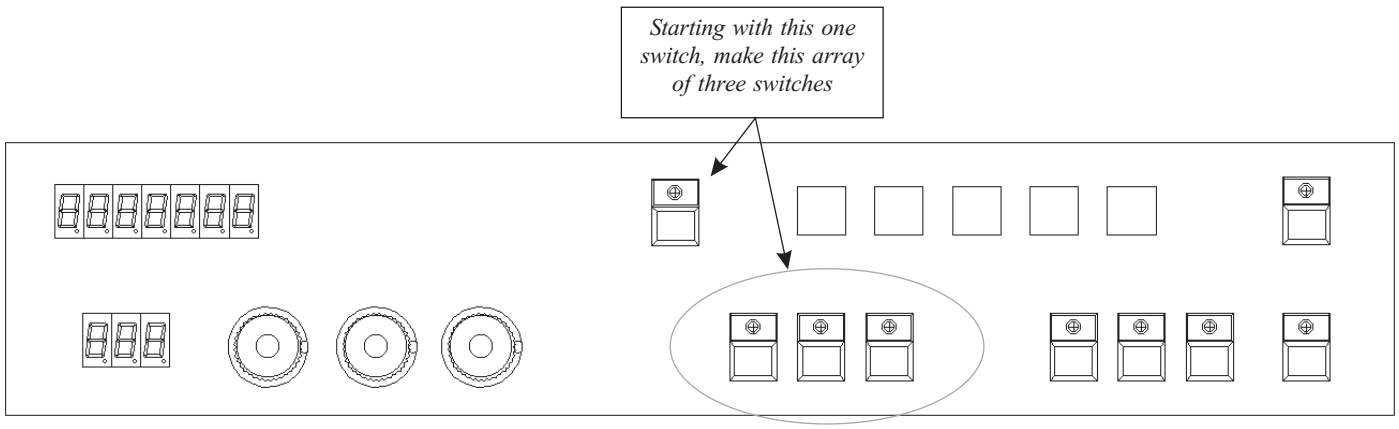


Figure 1-22

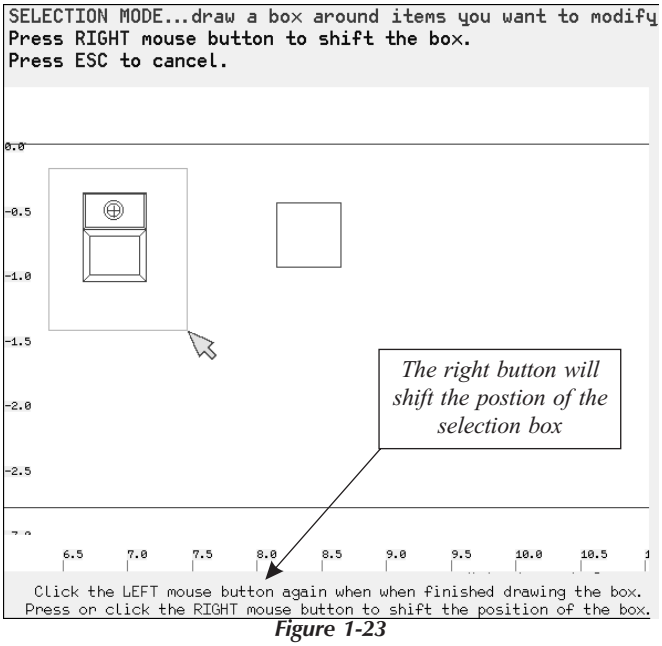


Figure 1-23

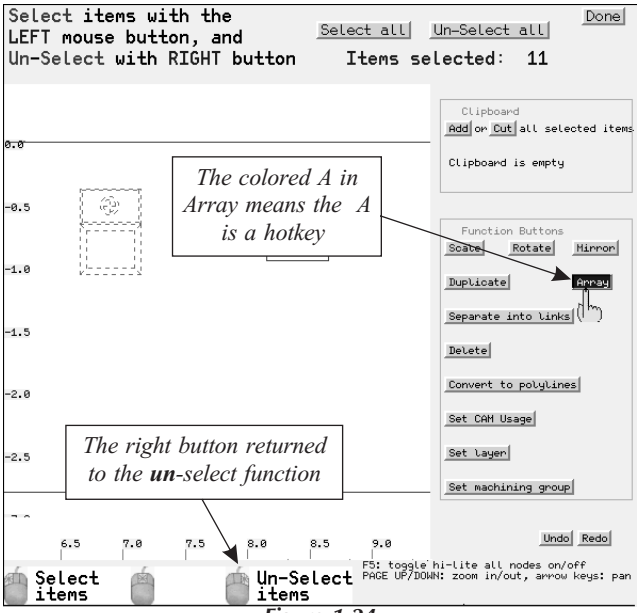


Figure 1-24

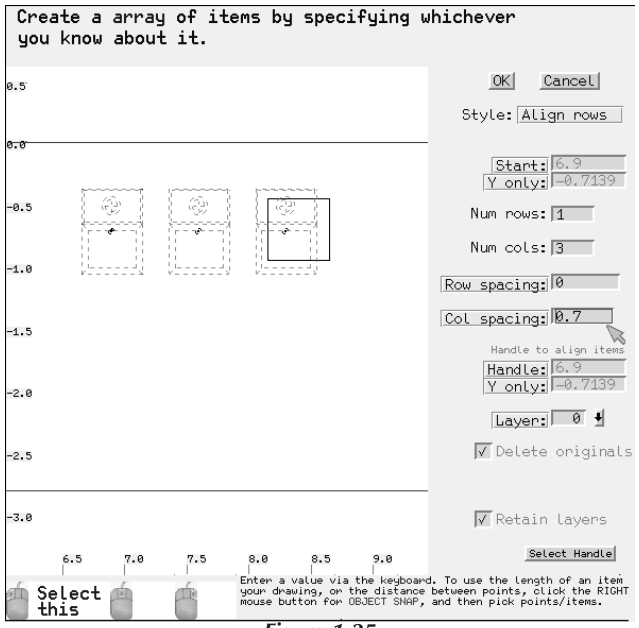


Figure 1-25

Creating Arrays of Items

Assume you want to create the template file seen in Figure 1-22, and so far you have drawn one of the switches, as seen in Figure 1-23 (a close-up of that area). This example will create an array of three switches from that one switch.

Set X0.0, Y0.0

The first thing to do before trying to make an array is to set X0.0, Y0.0 to a suitable location. Since this panel is rectangular, and since the dimensions are measured from the left and top edges, it will be easiest to make the upper left corner X0 Y0. The easiest way to do that is to bring up the **Main Menu** by clicking the **Menu** button at the upper left corner of the screen (or by pressing the Esc key). Then, from the **Main Menu**, select the option to **Move XY Location**, and then select the option to put X0 Y0 at the upper left corner.

Select the items to make an array of

To make an array of that switch you first ***select*** all the geometry in it. As was described on page 11 in regards to ***selecting items***, draw a window around the switch. As soon as you start to draw the selection window, MillWrite changes the prompts at the top and bottom of the screen to let you realize that you're starting the selection mode. (see Figure 1-23).

After you've finished drawing the selection window the screen changes to that of Figure 1-24. If you didn't select all the geometry in the switch you could draw another window around the items you missed. Or, if you selected items that you were **not** suppose to select, you could ***unselect*** them either by clicking the ***right*** mouse button on each of them, or by drawing a window around them with the ***right*** mouse button.

After you select all the geometry in the switch, click the **Array** button (Figure 1-24), or press A which is the hotkey for the Array function (the A in Array is a different color, indicating it is a hotkey).

MillWrite will change the prompts on the screen and provide data entry fields along the right side for you to specify the array. As with the **Draw** functions, you fill in only the fields that you know; i.e., you don't have to fill in every field.

There is one row and three columns of switches, so enter 3 for the number of columns. Figure 1-21 shows that the switches are separated from each other by 0.7 inches, so move the cursor down to the **Column Spacing** field enter .7. This gives MillWrite enough information to create an array and it will draw three columns of the switch as seen in Figure 1-25.

However, MillWrite is defaulting to putting the array on top of the original switch, but the array needs to be moved down and to the right. So now you need to change the starting position of the array.

At the top of the data entry fields is a field labeled **Start**. The default for MillWrite is to set this to the center of whatever you're making an array of. That is why this array of three switches starts on top of the original switch.

According to the dimensions of Figure 1-21, the first of these three buttons starts 2.1 inches below the top of the panel, and 7.7 in. from the left edge of the panel. Since the upper left corner of the panel has been set to X0.0, Y0.0, that means the first of those three buttons is centered on a coordinate of X7.7, Y-2.1. So enter those coordinates into the

start data field. MillWrite will then change the position of the array, as seen in Figure 1-26.

Notice in Figure 1-26 that MillWrite put a small dot at each of the array locations. The significance of those array locations will be seen later. For now notice that each switch is centered on one of the array locations.

The array is now finished. However, look near the bottom of the data fields of Figure 1-26. There is a check box where you can select whether you want to delete the original item that you're making an array of. In this particular case you do **not** want to delete that original switch, so take the check mark off by clicking on it.

You can now click the **OK** button. The array function will terminate and you return to the **Selection Mode**. As seen in Figure 1-27, the original switch has been un-selected, and the three switches that you just created have been selected, giving a total of 33 selected items.

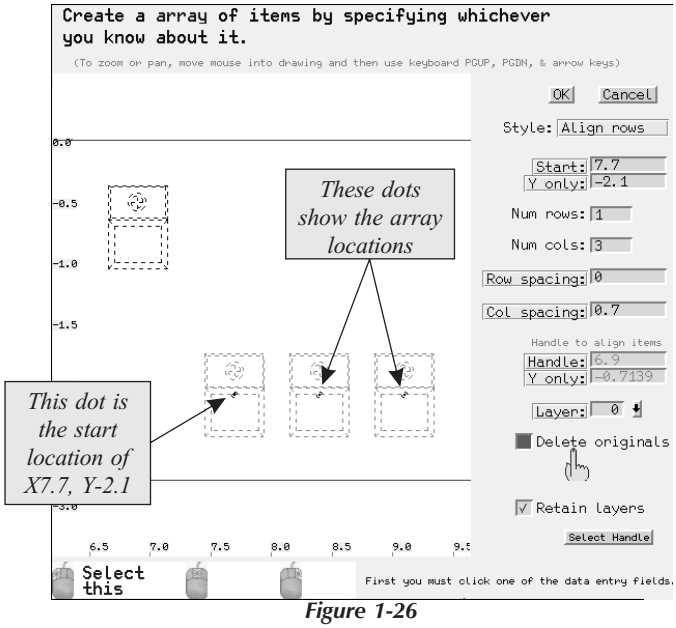


Figure 1-26

The Duplicate function

The drawing in Figure 1-21 shows that next to these three switches are three more switches. We could use the **Array** function to create these three other switches. But this time let's use the **Duplicate** function so you can see how that function works. Besides, if you have to make only ***one*** copy of something, it is easier to use the **Duplicate** function rather than the **Array** function.

Click the **Duplicate** button (or press D, which is the hotkey). Whenever you copy or move items, MillWrite will put up a menu with two choices (Figure 1-27) and ask if you want to **drag** the items or **specify distances or angles.** For this example, it is best to select the option to specify distances because we know exactly how far we want to place the duplicates from the orginals.

The screen will change, as seen in figure 1-28. Along the right side of the screen are data entry fields that let you specify where to place the duplicates. You do **not** put values in all of these data fields; rather, you put values only in the fields you know. There are three different ways to specify the destination:

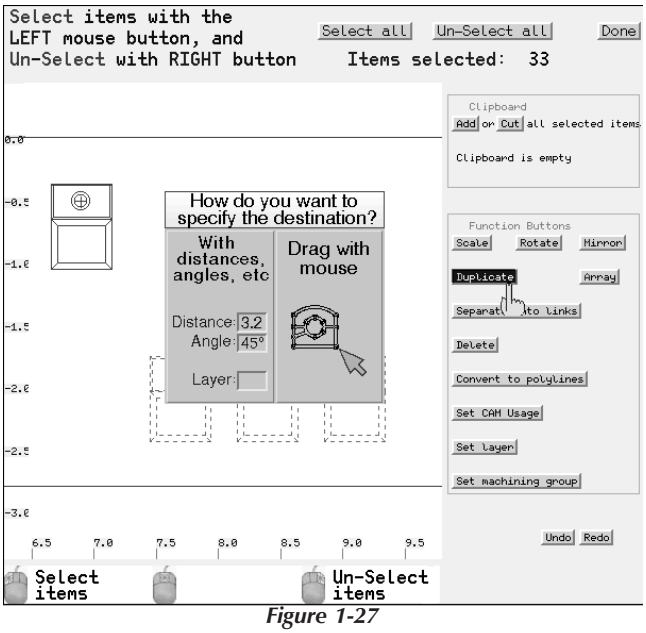


Figure 1-27

1) Specify a From point and a To point

If there are two points in your drawings that are the exact distance and angle from each other that you want the duplicates to be separated from their originals, you could select those two points. MillWrite would then calculate the distance and angle between those points, and then position the duplicates at that same distance and angle. You could either pick the points with the mouse or type the coordinates with the keyboard.

2) Specify an XY Distance and Angle

If you already know the distance and angle that you want the duplicates to be placed in relation to the originals, you could enter that distance and angle in these fields.

3) Specify an X Distance and Y Distance

This is in case you know the distance in X and the distance in Y but not the angle or the XY distance.

In the case of this particular example, we know the X distance is 3.3 inches and the Y distance is zero, so we could

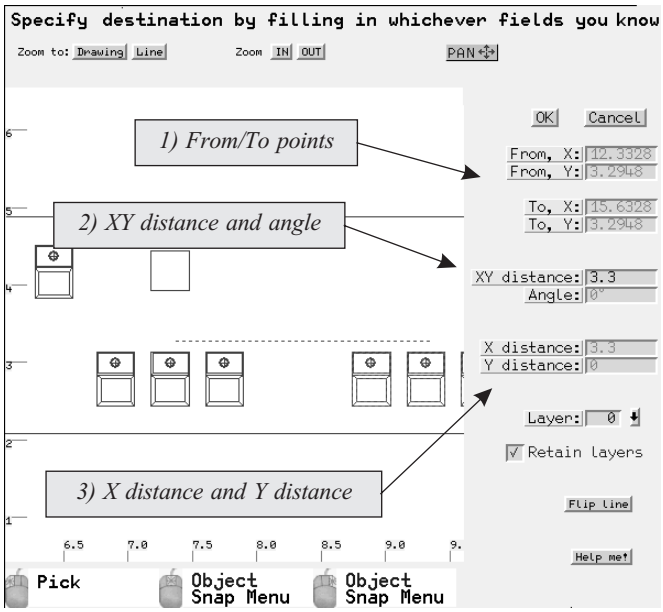


Figure 1-28

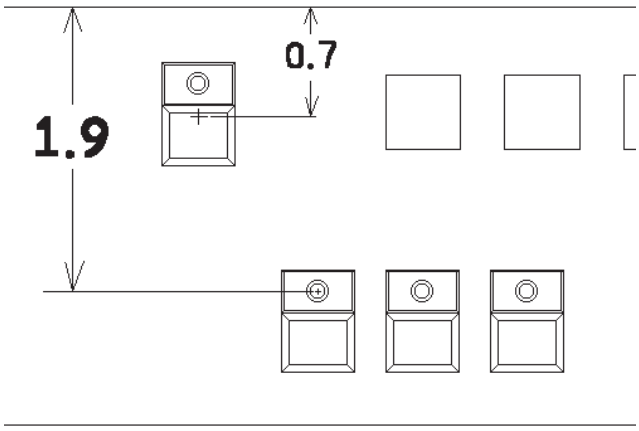


Figure 1-29

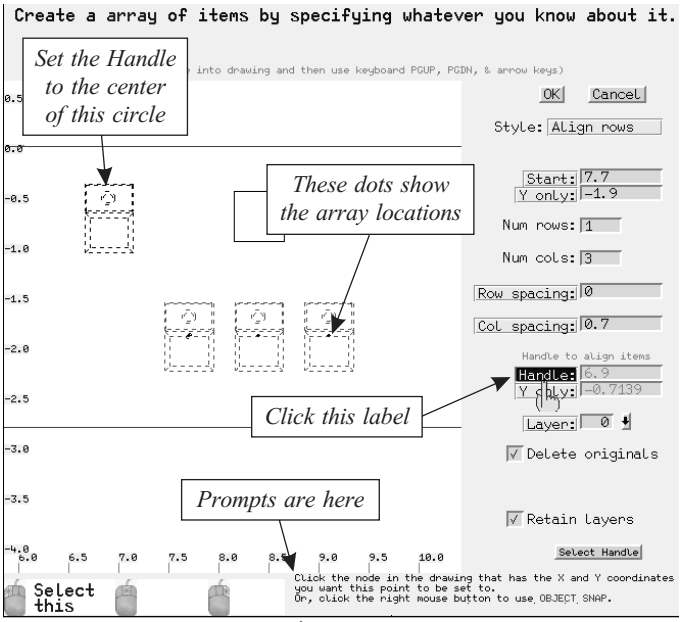


Figure 1-30

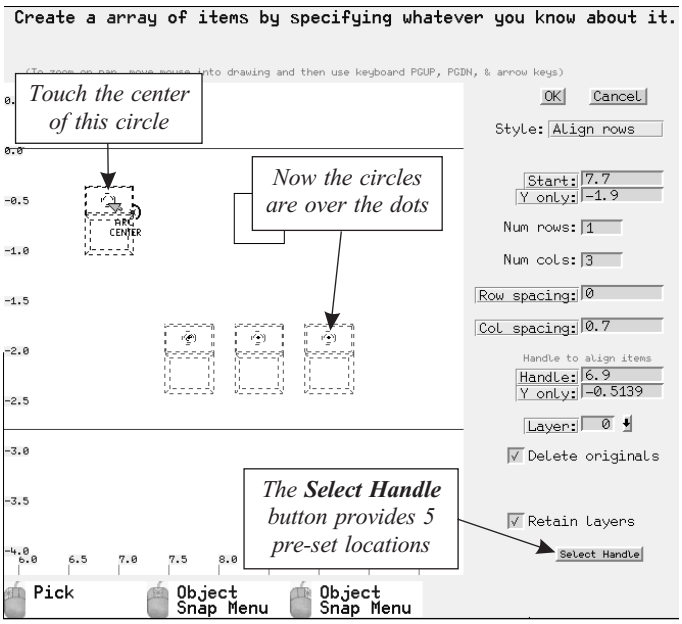


Figure 1-31

enter an X distance of 3.3 and a Y distance of zero. We also know that the XY distance is 3.3 and the angle is 0°. So we could also enter 3.3 as the XY distance and specify an angle of 0°. We could also enter a **From** point of X0, Y0, and a **To** point of X3.3, Y0. Or we could specify a **From** point of X5.5, Y6, and a **To** point of X8.8, Y6. All of these methods give us the same destination because they all give a distance of 3.3 in X and zero in Y.

Notice the dotted line in Figure 1-28. This line shows you the direction and angle that you are specifying. The start point for this line has been arbitrarily chosen by MillWrite; it is merely to show you the direction and angle that you are placing the duplicates. If you had specified a **From** point then MillWrite would draw this dotted line from that particular point.

The Handle of the array

One the array data fields is called **Handle**. To understand the purpose of the handle the drawing needs to be modified to make it more complicated. Figure 1-29 shows the modification. The switch that the array is created from is still specified as being 0.7 inches below the top of the panel as measured to **its center**. But now the three switches are specified as being 1.9 inches below the top of the panel, as measured to the **center of the circle** that each switch contains. Previously all switches were measured from the top of the panel to the **center of the switch**.

This inconsistency in measuring the positions of the switches makes the array more difficult to create. Now you don't know where the centers of the three switches are, nor do you know the distance between the switch at the top and the three at the bottom. If you knew the dimensions of a switch you could figure out whatever you needed to know, but the less figuring you do, the fewer mistakes you make. However, the **handle** option allows you to create this array without doing any calculations.

To create the array, you first **select** the initial switch (see page 11 about selecting items), then click the **Array** button, and then fill in the fields as seen in Figure 1-30. All fields get the same values as before except for the ***Start Y*** coordinate, which is now -1.9. MillWrite will then draw the three switches.

Notice the three dots in Figure 1-30. These identify the array locations. MillWrite has centered each switch on one of those array locations. But this time each switch needs to be placed at its array location so that the center of its circle is at one of the dots.

This is when you use the **Handle** option. The **Handle** tells MillWrite where to pick up the object you are making an array of. The handle is like the suction cup that you use to pick up a glass window. To make this particular array, you want MillWrite to pick up the initial switch at the center of its circle, and then lay each copy onto one of the array locations at that handle location. Therefore, the center of that circle will be the handle.

If you knew the coordinates of the center of that circle, you could type them into the handle data field. However, it is easier to pick the point with the mouse, and you're less likely to make a mistake.

To pick a point in the drawing for the handle, first click on the label **Handle** to let MillWrite know which field you are

setting. The prompt at the bottom of the screen will change to remind you to pick a point in the drawing with the mouse. You can see this prompt in Figure 1-30.

Then move the mouse into the drawing and touch the center of the circle, as seen in Figure 1-31. You will know when you have touched the center when you see the mouse icon change to show the words **Arc Center**. Then click the left mouse button. The coordinates in the **Handle** field will change to whatever they are at the center of that circle. Also, MillWrite will update the positions of the three switches in the array so that their handle is at an array point, as seen in Figure 1-31. The array is now complete so press the OK button. (Remember to un-check the **Delete Originals** box.)

You can also set the handle point with the **Object Snap** functions. For example, you could set the handle to the intersection of two lines in the drawing, or you could set it to the midpoint of some line or arc, or you can set at to be a certain distance and angle from some point in the drawing.

The CONTROL and ALT keys

When you press and hold either the Ctrl or Alt keys, MillWrite will put a menu up along the bottom of the screen to remind you of what CTRL or ALT commands are available. If you press the Ctrl key when you are at the *Drawing page*, the menu in the image in Figure 1-32 pops up.

The colored letters in the menu are the *hotkeys*. There are some exceptions, such as the ***backspace*** key; the entire word ***backspace*** is colored. Also, some words are colored but in a different color than the hotkeys. These are messages to you rather than hotkeys.

The Ctrl or Alt menus are different at the drawing page than at the other pages. If you do not see a menu when you press the Ctrl or Alt key, that means there are no Ctrl or Alt key functions for whatever you are doing.

Some the CTRL key commands are:

Close job — Ctrl F4

This option doesn't show in the menu because it is a standard *Microsoft Windows* command, so it is assumed that you already know it. The command closes the job file and starts a new, empty drawing. You are prompted to save the existing job, if it hasn't been saved already.

Save job file — Ctrl S

This will save the job file on disk.

Toggle zoom on Go to X-Y coordinate — Ctrl G

This determines if MillWrite zooms in to show the location you specify with the "Go to X-Y coordinate" function (page 6). If not zooming, the "Go to X-Y coordinate" function merely shifts the view.

Nudge hi-lited item — Ctrl D Ctrl → ↑ ← ↓

One of the messages in the Ctrl menu that doesn't have a colored hotkey is *"Keyboard arrow keys: nudge hi-lited item up/down/left/right"*. This reminds you that when the mouse is touching an item you can hold down the Ctrl key and then press the arrow keys to move the item by whatever you set the nudge distance to. If you set the nudge distance to .01, you can move items in increments of .01. Of course, as soon as you nudge the item into a different position, the mouse will not be touching it, so don't let go of the Ctrl key until you have the item in position. Press Ctrl D to set the nudge distance.

Toggle boxes on/off — Ctrl B

Text items have dotted boxes around them, which is what you grab them by to move or modify them. But they clutter the screen. To see the drawing more clearly, toggle the boxes on and off with Ctrl B.

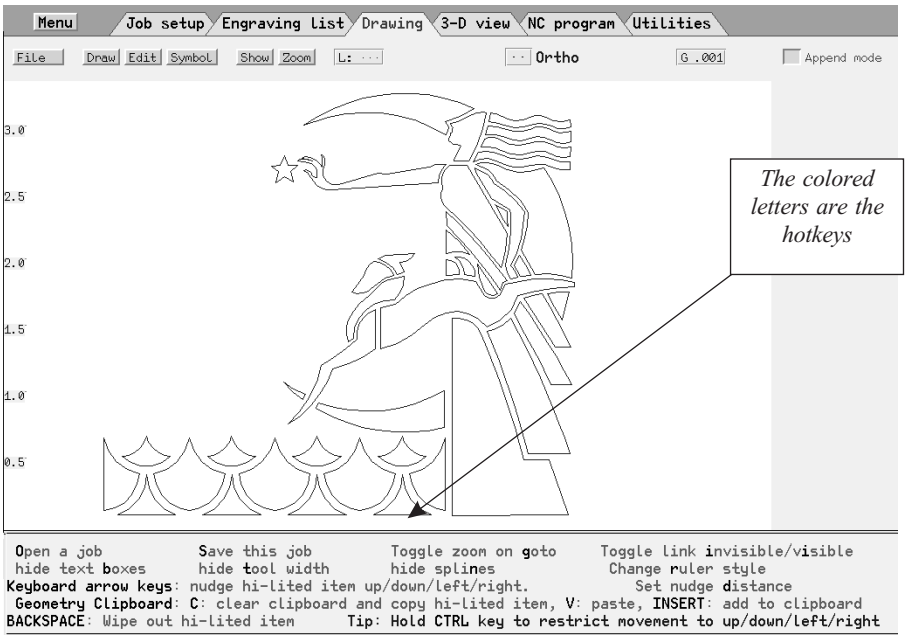


Figure 1-32

When you press the CTRL or ALT key, a menu pops up along the bottom of the screen.