2

Graphics

This chapter describes how to add static and dynamic graphics to a control panel and how to create and use custom graphics.

Any visible item on a Lookout*Direct* control panel is a graphic. All graphics are either static or dynamic. *Static* graphics never change state, but *dynamic* graphics change state to represent process variations. Lookout*Direct* provides an extensive graphics library. These graphics range from switches, potentiometers, and pushbuttons to bar graphs, valves, tanks, pumps, plates, insets, scales, and more. However, there might be times when the standard Lookout*Direct* graphics do not exactly fit your needs. You can use any other drawing software to create your own custom graphics.
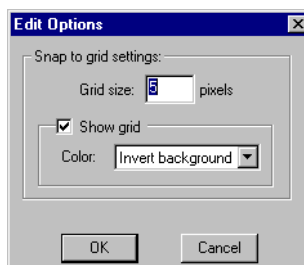
✎ **Note** Consider screen resolution when creating display panels (VGA versus Super VGA). The same panel appears differently on computers using different resolution display drivers. Read about screen resolutions in the description of *Panel* objects in the online help or the online PDF Lookout*Direct Object Reference Manual* before you design your panels.

Setting Snap to Grid

You can activate the snap to grid feature in Lookout*Direct* by selecting **Edit»Snap to grid**. This feature aligns objects you are positioning to a grid on the Lookout*Direct* panel.

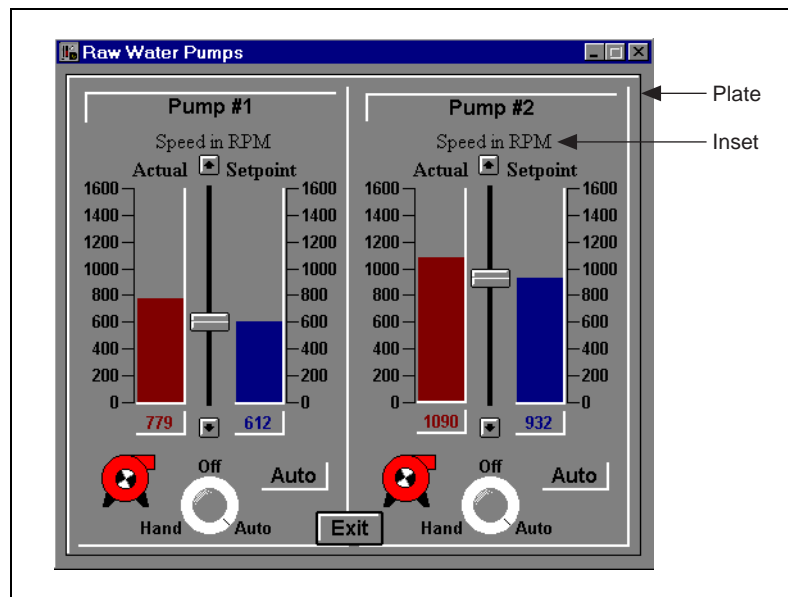You can adjust this grid by selecting **Edit»Options**. The **Edit Options** dialog box appears.

Use this dialog box to set the distance (in pixels) between grid points, show or hide the grid, and select different color options for the grid display.
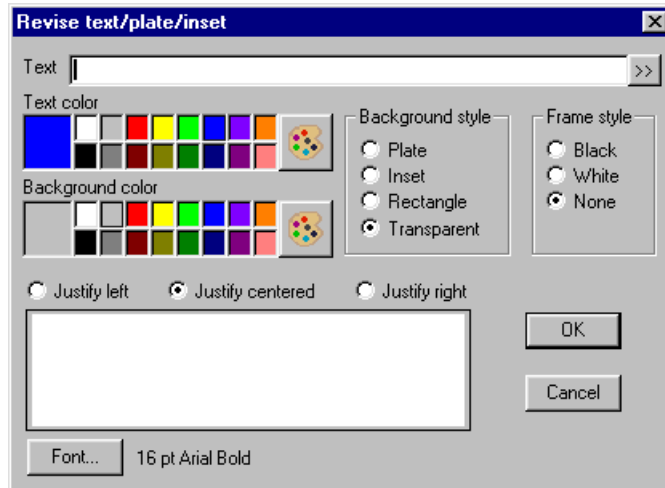
Static Graphics

Static graphics never change state. They exist on a control panel much the same way a picture hangs on your wall, never changing or moving. Static graphics range from text labels, plates, insets, and scales to complex schematic overviews and scanned photographic images.

Displaying Text, Plates, Insets, Rectangles, and Lines

Effective use of text, plates, and insets make control panels intuitive and easy to use. The example below demonstrates how plates and insets organize information about two pumps.

To create static text, plates, insets, rectangles, or lines in Lookout*Direct*, select **Insert»Text/plate/inset**. The **Insert text/plate/inset** dialog box appears.

If you want to create a rectangle, line, plate, or inset, leave the **Text** field blank and choose a **Background style**. The preview window displays the element as it appears on a control panel.

To create a vertical or horizontal line, choose **Rectangle**. After clicking on **OK**, size the rectangle to the desired length, and reduce the width to the thickness you want your line to be. If you need the rectangle an exact size, use the yellow status bar, which indicates dimensions.

Note   Lookout*Direct* uses color grids in many dialog boxes. The grids make selecting colors quick and visually helpful. However, they might look slightly different from computer to computer.

Some computer display adapters can display only 16 solid colors on the screen. The standard VGA adapter in conjunction with the Windows VGA driver supports only 16 colors directly. Windows uses a technique called *dithering* to simulate the display of colors not directly supported as solid colors. For example, Lookout*Direct* might display orange as an alternating pixel pattern of red and yellow bits on the screen.

Some objects in Lookout*Direct* require solid colors, so if you specify a dithered color, Lookout*Direct* uses the nearest solid color instead. For example, a Trend object requires a solid color for its background and solid colors for the trend lines. Furthermore, Lookout*Direct* always displays text in a solid color. If you specify pastel green for a trend line color, you might get yellow instead. Bar graphs and control panel backgrounds can display dithered colors.
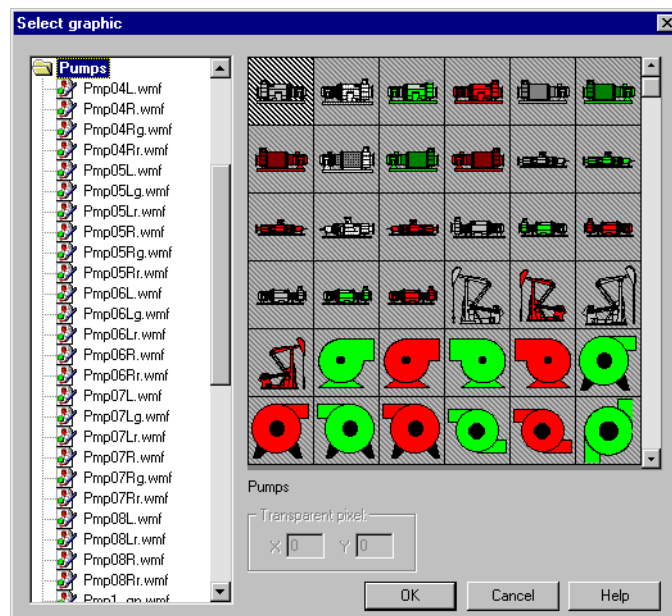
✎ **Note**   Some display adapters support 256 or even 16 million colors on the screen at one time. Even though Lookout*Direct* allows you to specify only 28 colors, Lookout*Direct* displays custom graphic files on control panels using all available colors.

Displaying Static Custom Graphics

Lookout*Direct* supports two graphical file types—Windows Device-Independent Bitmap (`.BMP`) and Windows Metafile (`.WMF`).

To display static bitmap and metafile graphic files on a control panel, select the **Insert»Graphic** command. The **Select graphic** dialog box appears.
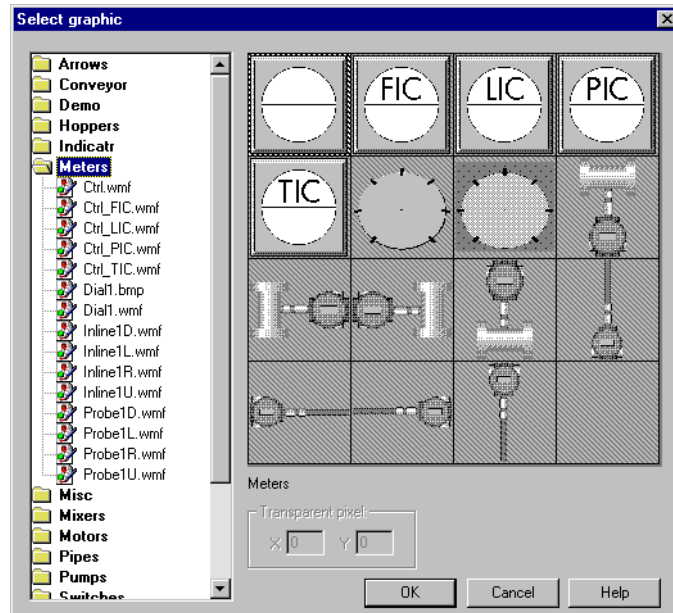

From the **Select graphic** dialog box, you can scroll through various directories containing a variety of graphic files. The list box includes all bitmaps and metafiles located in the `GRAPHICS` subdirectory under the root `LOOKOUTDIRECT` directory. As you select each category, you see thumbnail sketches displayed in the preview window to the right of the list box. Because graphics might stretch or shrink to fit in the preview window, they might not appear exactly as they do on a control panel.

✎ **Note**   If you know the name of the file, type the first letter of the filename. The list box automatically scrolls to the first file beginning with that letter.

If you choose a bitmap (`.BMP`) file, you can use the **Transparent pixel** data fields to specify which color pixels in that graphic you want to be

transparent in LookoutDirect. Imagine the viewing area as an X-Y coordinate plane with (0,0) being the top left corner of the graphic (not the entire viewing area). You can enter any **X** and **Y** coordinates, and the corresponding pixels become transparent, as do all other pixels that color. The **Transparent pixel** fields do not have any default values. If you leave the **X** and **Y** fields blank, no pixels become transparent.

You can use a multicolor bitmap as a type of mask. For this to work, some part of the bitmap (usually the interior) must be transparent and the rest of the graphic opaque—masking the underlying part of the control panel. In the case of the interface selected above (the second from the left in the second row), the pixels to be made transparent are gray. You can insert another Lookout*Direct* element, such as a bar graph, to furnish a convenient visual warning, such as a rising color level.

You could guess the X,Y coordinates of any grey pixel on the graphic. It helps to know that the center of the graphic is (-1,-1). In the example above, (-1,-1) is a black pixel; to select a gray pixel, you would have to offset your choice to (-1,0). Because this is a gray pixel, all other gray pixels become transparent when inserted on a control panel.

Note   Windows metafiles are normally easier to use and manipulate than bitmap images. Unlike bitmaps, metafiles can be resized in Lookout*Direct*. Because of their inherent structure, you can also use metafiles as masks without specifying transparent pixels. Had the

example above used a `.WMF` graphic, the area in gray would have appeared in the Lookout*Direct* window as a crosshatched area.

Dynamic Graphics

Many process control panels require some type of animation, such as a pump changing colors to represent on and off. Table 2-1 lists the Lookout*Direct* elements that use animation or change states.

Table 2-1. Tools for Displaying Dynamic Graphics

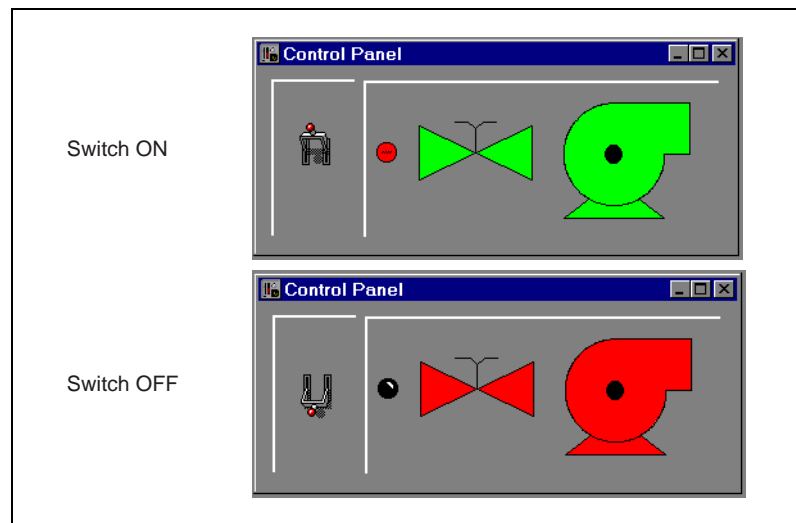| Lookout*Direct* Component	Description
Animator object class	An Animator object provides full graphical animation including horizontal and vertical motion, dynamic resizing and visibility, dynamic sequencing, and color changing.
Multistate object class	A Multistate object displays up to six different custom graphics based on advanced if-then-else logic.
Pipe object class	A Pipe object makes a rectangle or line (of any dimension) change colors or blink, based on advanced if-then-else logic.
DialGauge object class	A DialGauge object displays a numeric signal as a sweeping needle on an analog gauge or dial.
Gauge object class	A Gauge object makes a numeric expression (digital number or barchart) change colors or blink based on advanced logic.
Spinner object class	A Spinner object is a small rotating disk. It can be turned on and off with a logical signal, and its rotation speed and direction are controlled by a numeric value.
Switch object class	A Switch object can represent its two positions using standard switch symbols or custom graphics.
Pushbutton object class	A Pushbutton object looks like a button that changes when depressed, but you can also make it transparent. You might use transparent pushbuttons over custom graphics.
Pot object class	A Pot object can be displayed as a knob, vertical slider, horizontal slider, increment and decrement buttons, or a digital number.
Logical expression	When you create an expression that results in a logical value, you can represent that value using standard lights, text, or custom graphics.

Table 2-1. Tools for Displaying Dynamic Graphics (Continued)

Lookout*Direct* Component	Description
Numeric expression	When you create an expression that results in a numeric value, you can represent that value using a digital number or a vertical or horizontal bar chart.
Text expression	When you create an expression that results in a text value, you can represent that value using any style and size font loaded on your computer.

For information on a specific object class, refer to the online help or the online PDF Lookout*Direct Object Reference Manual*. For information on expressions, refer to Chapter 1, *Expressions*.
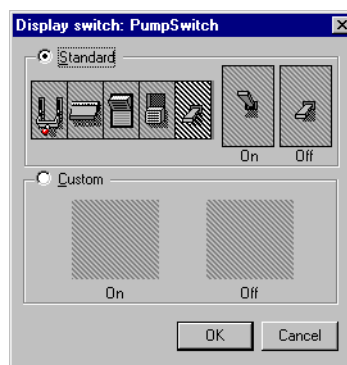
Displaying Dynamic Logical Signals

Logical expressions and Switch objects are two commonly used graphical animation tools. You can display the signal a Switch object generates in a variety of ways.
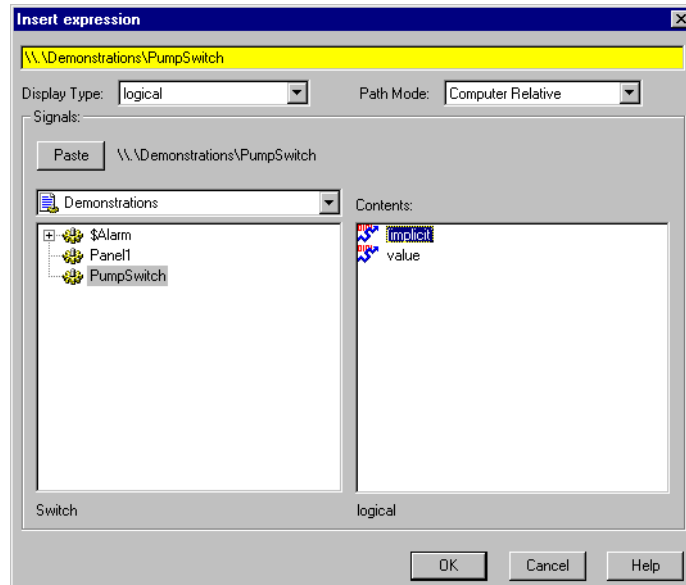

The Switch is shown in the On and Off positions. The graphics on the right side of the control panel show three ways of graphically displaying the logical signal generated by the Switch. The graphics representing the Switch signal are expressions of the `(implicit)` value of the switch, created through the **Insert»Expression** menu command.

To create a Switch object, first choose the logical signal that you want to represent with dynamic graphics (for example, a logical input from a PLC). Then, select an object to display the logical signal. For this example, use a Switch to simulate a contact from a motor starter relay.
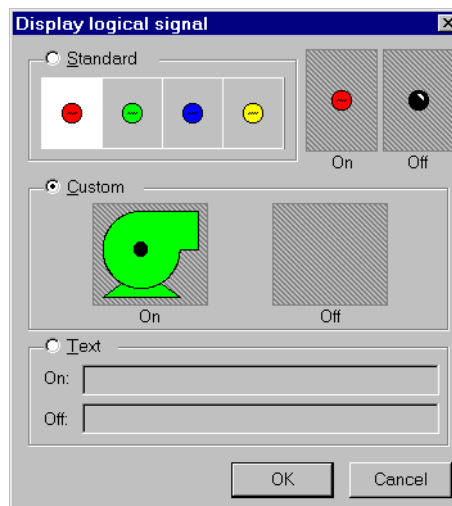
Create a Switch and call it PumpSwitch. After you define the Switch parameters, LookoutDirect presents the display parameters dialog box for the Switch object (as shown in the following figure). You can choose to represent PumpSwitch with one of the standard graphics, or you can use custom graphics. For this example, select a standard graphic and click on **OK**.

To insert an expression representing the signal generated by the Switch object, use the **Insert»Expression** command and select PumpSwitch, or drag and drop the signal from the LookoutDirect Object Explorer.

When you click on **OK**, the **Display logical signal** dialog box appears. From the **Display logical signal** dialog box, select display characteristics for a logical signal expression.
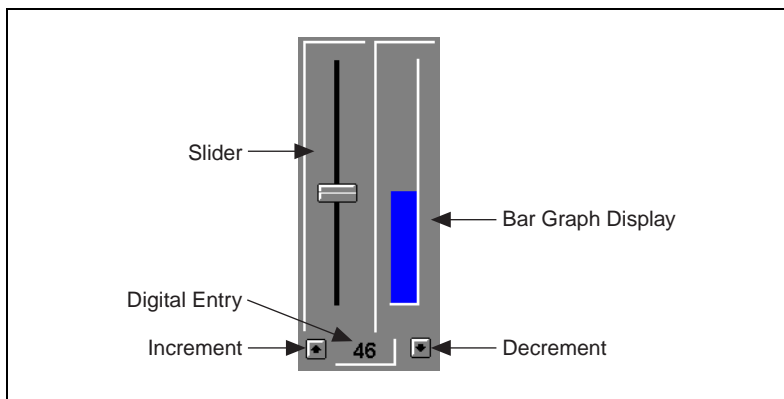

Click on the **Custom** selection, and then on the **On** and **Off** list boxes, scrolling through the choices until you find the appropriate graphic. Your **On** and **Off** graphic selections appear as thumbnail sketches in the two preview windows to confirm and verify your selection.

Click on **OK** and test your example by flipping the switch. The graphics should change according to your selections in the **On** and **Off** preview windows. To customize your switch, experiment with the **Text** selection in the **Display logical signal** dialog box.
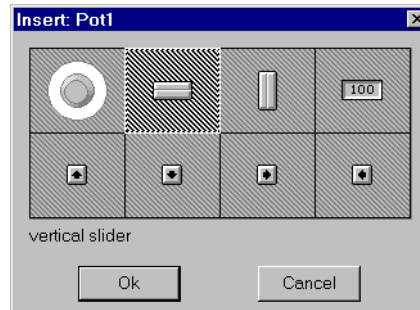
Use this same basic method to display any dynamic signal on a control panel. If you want to represent more than two conditions with dynamic graphics, use a Multistate object. Similarly, you can use a Pipe object to make a line or rectangle dynamically change colors and blink.

Displaying Dynamic Numeric Signals

You can use a Pot object to display dynamic numeric signals. The following illustration shows the Pot as a slider, a digital entry, and increment and decrement buttons—all are graphical representations of the same Pot object.
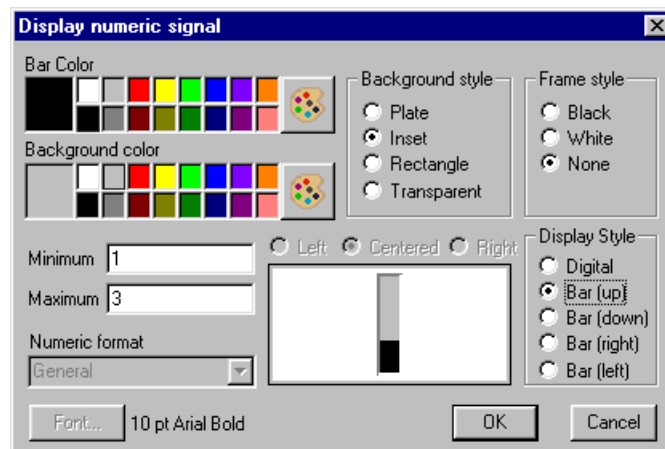

To use a Pot object to display a signal, first choose the numeric signal that you want to represent with dynamic graphics, such as an analog input from a PLC. Then, select an object to graphically display the dynamic numeric signal. For this example, create a Pot object and name it `PumpSpeed`. After you define the Pot parameters, a display parameters dialog box appears. In this example, the dialog box is named **Insert: Pot1**. You can choose to represent the Pot with any of the standard graphics.

Use the **Insert»Expression** command (or click and drag) and select
`PumpSpeed` to insert an expression that represents the signal generated by the
Pot object.

When you click on **OK**, the **Display numeric signal** dialog box appears.
From this dialog box, select the display characteristics for a numeric signal
expression.

If you choose **Digital** display style, you can use the **Font** button to select the
desired font style and size. You can also specify a **Numeric format** for the
value. For more information on numeric formats, refer to the *LookoutDirect
Getting Started Guide, Chapter* 3, *Getting Started with LookoutDirect*

Click on **OK** and test your example by adjusting the Pot. The graphics should
change according to your selections.

If you want to represent the numeric signal with moving custom graphics, use
the Animator object class.
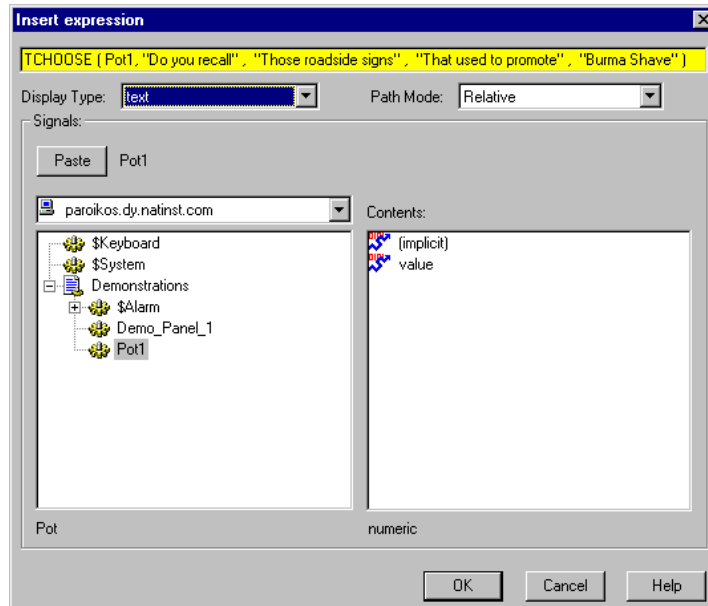
Displaying Dynamic Text Signals

You can display dynamic text messages on a control panel with text expressions. You can easily display up to two separate text messages using logical signals, but there are times when you need to display three or more separate text messages in a single statement. If you have more than two separate messages, a numeric signal might determine which message to display.

To graphically display a dynamic text signal, first choose the numeric signal that you want to use to control which message is displayed, perhaps an analog input from a PLC. Then, select a graphical object to display that signal. This example uses a Pot object.
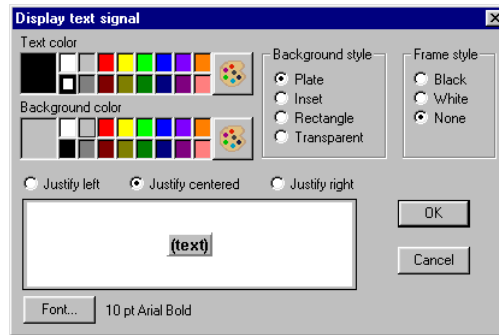
Create a Pot object and call it `Pot1`. Define the Pot minimum, maximum, and resolution parameters as 1, 4, and 1 respectively. Select the **Insert»Expression** command and enter the following expression in the dialog box that appears.

```
TCHOOSE(Pot1, "Do you recall", "Those roadside signs",
"That used to promote", "Burma Shave".
```

See Chapter 1, *Expressions*, for information on the *TCHOOSE* function.

When you click on **OK**, the **Display text signal** dialog box appears. From this dialog box, select display characteristics for a text signal expression. Use **Plate** as your background style.

Click on **OK** and test your example by adjusting the Pot. The text should change according to your expression.

Finding a Lost Graphics File

Lookout*Direct* uses a standard missing graphics bitmap to mark a location on a panel where a graphic should be present but cannot be found in the location Lookout*Direct* expects. The status bar at the bottom of the Lookout*Direct* screen displays the path and filename of the missing graphic.

Right-clicking on the missing graphic bitmap displays a standard screen that also tells you the name of the missing graphics file and the previous path.

To restore the look of your panel, either put a new copy of the graphic in the location in which Lookout*Direct* expects to find it, or delete the missing graphic bitmap and place a new copy of the graphic from its current location.

Creating Custom Graphics

There might be times when none of the Lookout*Direct* standard graphics exactly fits your needs. You can use any drawing software to create your own custom graphics. Lookout*Direct* supports both Windows Device-Independent Bitmaps (`.BMP`) and Windows Metafiles (`.WMF`).

After you create a custom graphic file, copy it to the `GRAPHICS` subdirectory of your choice in your Lookout*Direct* root directory. Because Lookout*Direct* can use only graphics located in the `GRAPHICS` directory and subdirectories, keep all standard and custom graphics in the `GRAPHICS` subdirectories. Lookout*Direct* can access your custom graphic file any number of times in the same or different process files from the `GRAPHICS` subdirectories.
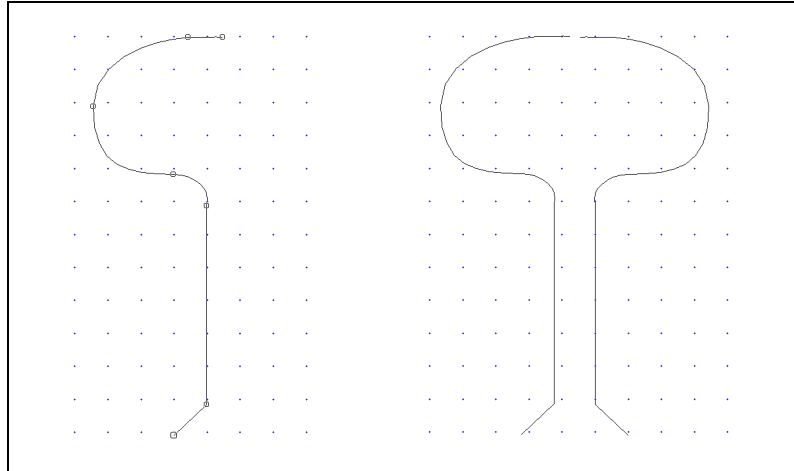
Creating Custom Graphics Example

This section describes how to create custom graphics for use in Lookout**Direct**. This example sketches out the creation of an elevated tank graphic you can use to show water level in a real tank. You export that tank graphic to Lookout*Direct*, implement the display in Lookout*Direct*, and test it. The example might only parallel what you would have to do with your own graphics creation program, but should serve as an illustration of the important points.
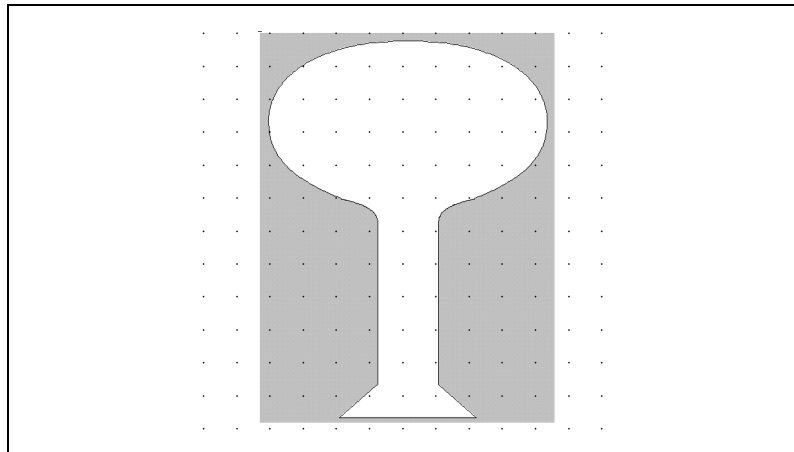
If you have not already mastered using a drawing program, you should allow yourself time to become accustomed to using the drawing application of your choice. The illustration below is from a third-party drawing application.

Creating the Graphic

1. Draw half of the tank.
2. Copy the tank half and mirror the image to create the other half.
3. Connect and refine the halves to create an enclosed tank object.

4.   Refine your image until it looks the way you want.

5.   Draw a rectangle around the tank and connect both the rectangle and tank into a single object.

6.   To match the background color of the mask to the control panel, select the object group and click on the gray color bar selection.

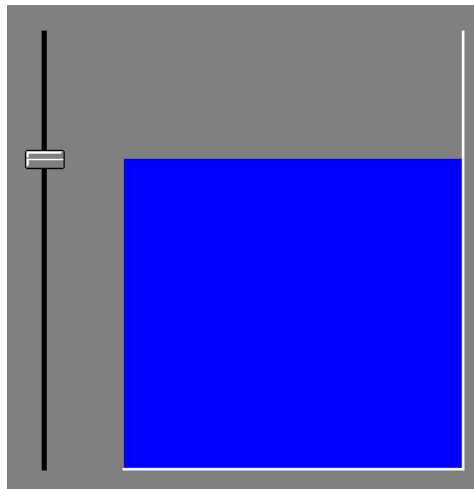7.   Select invisible for the line style.

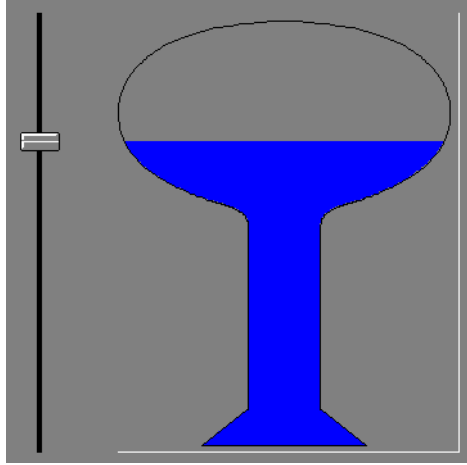## Save or Export the Graphic and Place in Lookout*Direct*

1. Save or export your new graphic from the drawing program as a
    Windows Metafile (.WMF) in the directory
    C:\LOOKOUT\GRAPHICS\TANKS and name your new graphic
    ELEVTANK.WMF.

2. Export.

Testing the Graphic in Lookout*Direct*

1. Launch Lookout*Direct*.

2. Create a Pot object using the **Object»Create** command.

3. Select **Insert»Expression**, choose the Pot object, and click on **OK**.

4. In the **Display numeric signal** dialog box, select **Bar (up)** for the
    Display style, **Rectangle** for the **Background Style**, and click on **OK**.

5. Use the **Insert»Graphic** command to insert your new graphic,
    ELEVTANK.WMF, over the bar graph.

6. Position the graphic over the bar graph and stretch it to size.

7. Toggle out of edit mode and test your example by moving the slider up
    and down.

Graphic File Types

Lookout*Direct* accepts both Windows Device-Independent Bitmaps (.BMP) and Windows Metafiles (.WMF).

Bitmaps

Bitmaps are raster files, made up of differently colored pixels. Because each pixel in the bitmap takes up one pixel on the screen, bitmap images are always rectangular and never resizable. You can display raster images on control panels that are not rectangular in Lookout*Direct* by using transparent pixels for the parts of the rectangle you do not want to show.

Bitmap files typically have a .BMP file extension. The Paint program that comes with Windows can read .PCX bitmap files (another very common bitmap format) and convert those files to Windows bitmaps.

Metafiles

Metafiles are vector files, consisting of coordinates that are connected by lines and curves, as well as area-fill commands. A vector file can consist solely of two sets of coordinates connected by a line or a complex set of colored area fills and colored lines and curves to create line art images. Metafile images are not necessarily rectangular.

Because metafiles contain a set of coordinates, they can be resized and stretched to any size or aspect ratio. Microsoft does not add information in the basic metafile file format for metafile size information. The Aldus Corporation (authors of PageMaker) created a metafile header that contains metafile size information. Most software packages that generate metafiles also add this header information. Without the header, Lookout*Direct* cannot maintain the correct aspect ratio (width to height ratio) for a metafile. To determine if a metafile has this information, resize the graphic on a control panel while holding down <Ctrl>. If aspect information is available, Lookout*Direct* does not stretch the metafile drawing out of proportion.

Bitmaps or Metafiles?

Which format is better: bitmap or metafile? Both have strengths and weaknesses. You might want to use a combination of metafiles and bitmaps. Bitmaps effectively handle large background schematics or system overviews, and metafiles work well for individual pumps, valves, lamps, and other miscellaneous graphics.

Bitmaps usually display faster than metafiles. In fact, a complex drawing rendered as a bitmap can display 100 times faster than the corresponding metafile. If you want to display scanned photographic quality images with hundreds of colors, use bitmaps.

Metafiles are resizable—you can stretch them to any size or aspect ratio. Metafiles are typically smaller than bitmap files, so they take up less disk space and consume less memory than bitmap files. You can use one file that contains a metafile drawing of a pump to display several pumps of various sizes on the screen. With most drawing programs, you can save your line art images as metafiles. You can also copy the image on screen to the Windows clipboard and paste it into a paint program for bitmap conversion.

Memory Considerations

Lookout*Direct* loads each graphic into computer memory the first time it is displayed. The image remains in memory until Lookout*Direct* or another application needs more memory than is available. When more memory is needed, the graphic is discarded from memory and reloaded from disk the next time it is displayed, so that you can display more bitmaps and metafiles on the screen than can be held in memory at one time.

If you are running Windows in enhanced mode on a 386 or 486 computer, you have virtual memory. Windows uses virtual memory to swap memory images between RAM and disk, giving applications the appearance of more memory. If available memory becomes low and Windows must use virtual memory to handle applications and data between disk and memory, you might notice a slower application speed. For more information on virtual memory, refer to your Windows user guide. If your computer disk drive light flashes every time you pull up a new control panel in Lookout*Direct*, consider purchasing more RAM.