The Graphical User Interface (GUI)

The GUI allows the user to construct graphical representation of the controlled facility and the equipment in it. A GUI is not required for operation of the system. The entire system can be configured through the Configuration Editor and operated via the Operating Parameter Editor and real time data can be reviewed via the Classic Interface text based displays. However, creating a GUI can make the review of current system and equipment conditions much easier for the facility personnel.

Construction of the GUI encompasses:

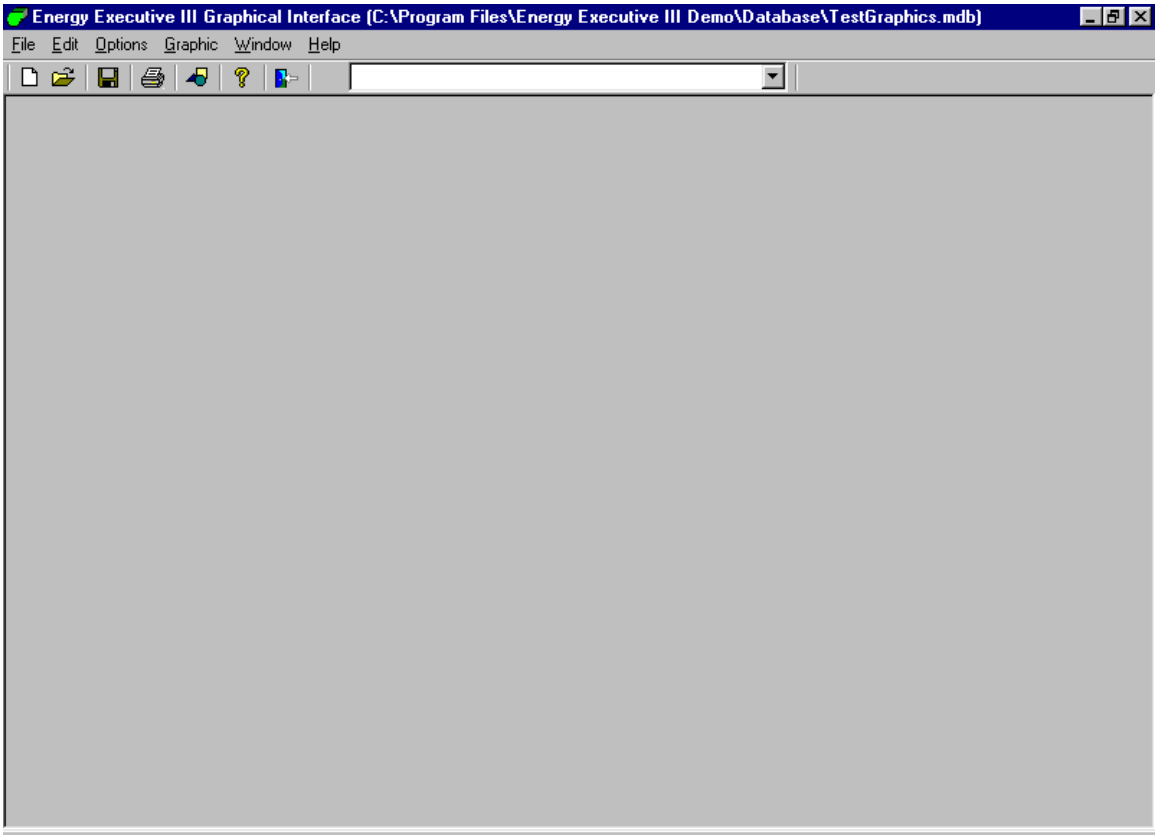
1. Creating forms/background screens: A form is a graphic object that may or may not have a background image associated with it. A form without an associated background image is a blank screen onto which you can put other graphic objects. Background images are drawings made with any standard drawing tool or digital pictures from any source that are saved in or converted to BMP, PCX or JPG format.
2. Attaching these forms/background images to the GUI by filename.
3. Associating configured point groups with the forms/background images.
4. Creating graphic objects on the forms/background images. These objects can be:
   4.1. Point Status boxes (Input points or Output points)
   4.2. Static Text
   4.3. Hot Spot Form Links
   4.4. Animations
   4.5. Flood areas
5. Configuring these objects with text descriptions, point values, links to other graphics, etc.

<u>Creating Forms/Background Images:</u>

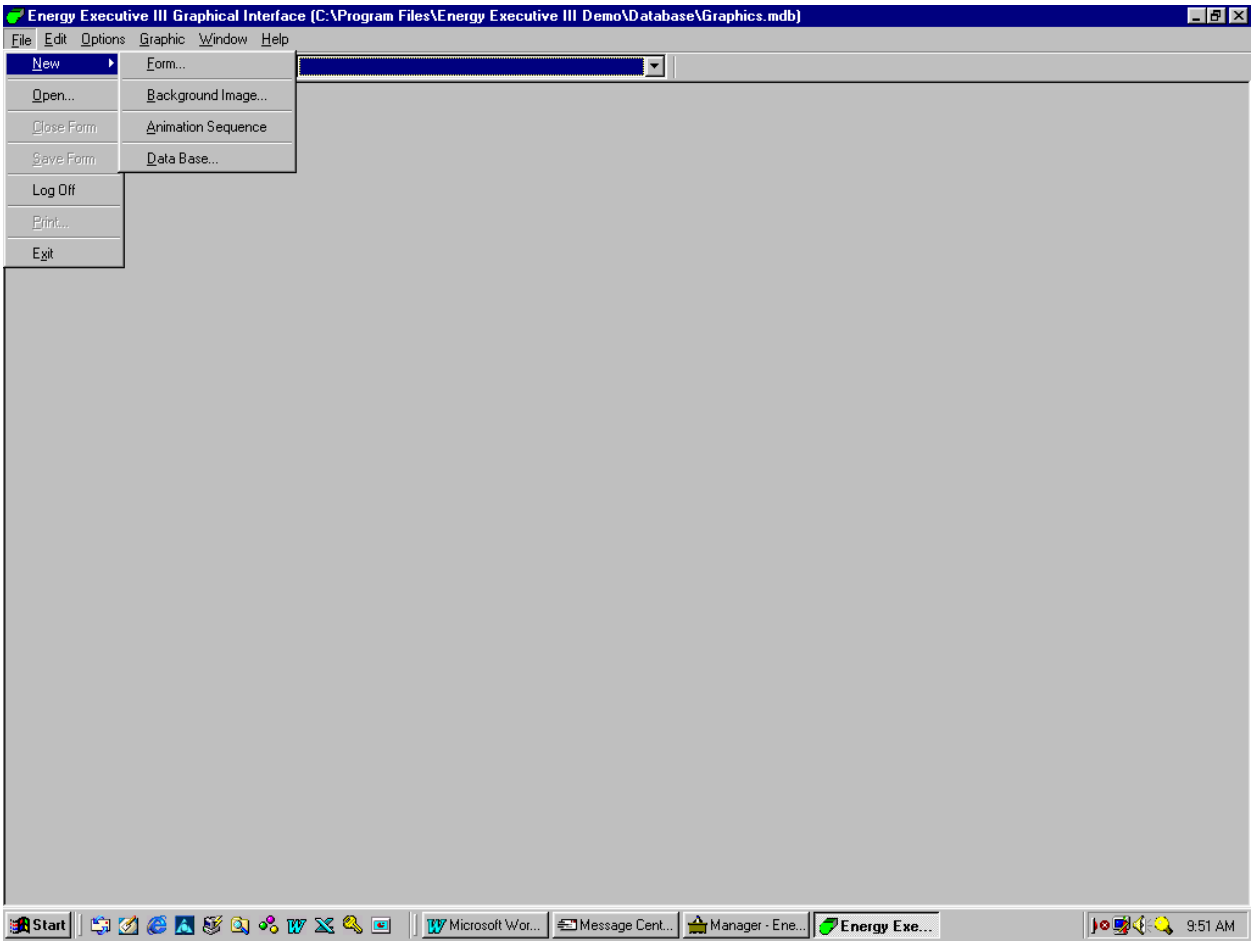
For background images or animation frames (more on these objects later) you can draw whatever you want with the graphic program of your choice and save it as a BMP, PCX or JPG file. You can also use digitized pictures or photographs in the GUI.

<u>Attaching Forms/Background Images to the GUI</u>:

First load the GUI from the "ENERGY EXECUTIVE III"® manager by clicking on the GUI icon on the "ENERGY EXECUTIVE III"® Manager Toolbar. The initial screen will look like this:



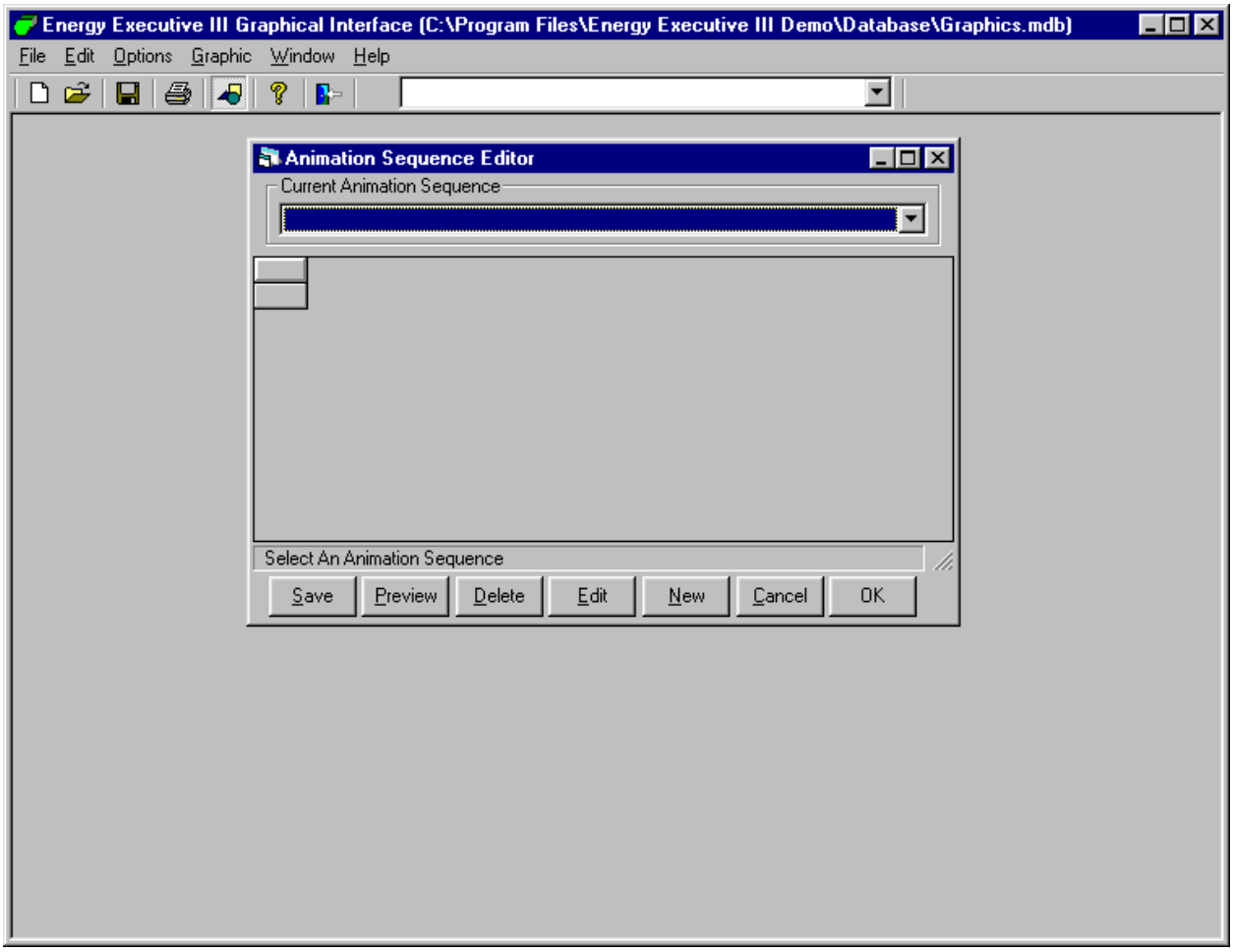
Before adding Forms or changing any graphic object, you must put the GUI into Design Mode. To do this either click on the Design Mode icon on the toolbar (fifth from left) or use the Options drop down menu and check Design Mode. Then click on “File” from the menu bar and “Form” from the drop down menu. The result will be similar to the following:



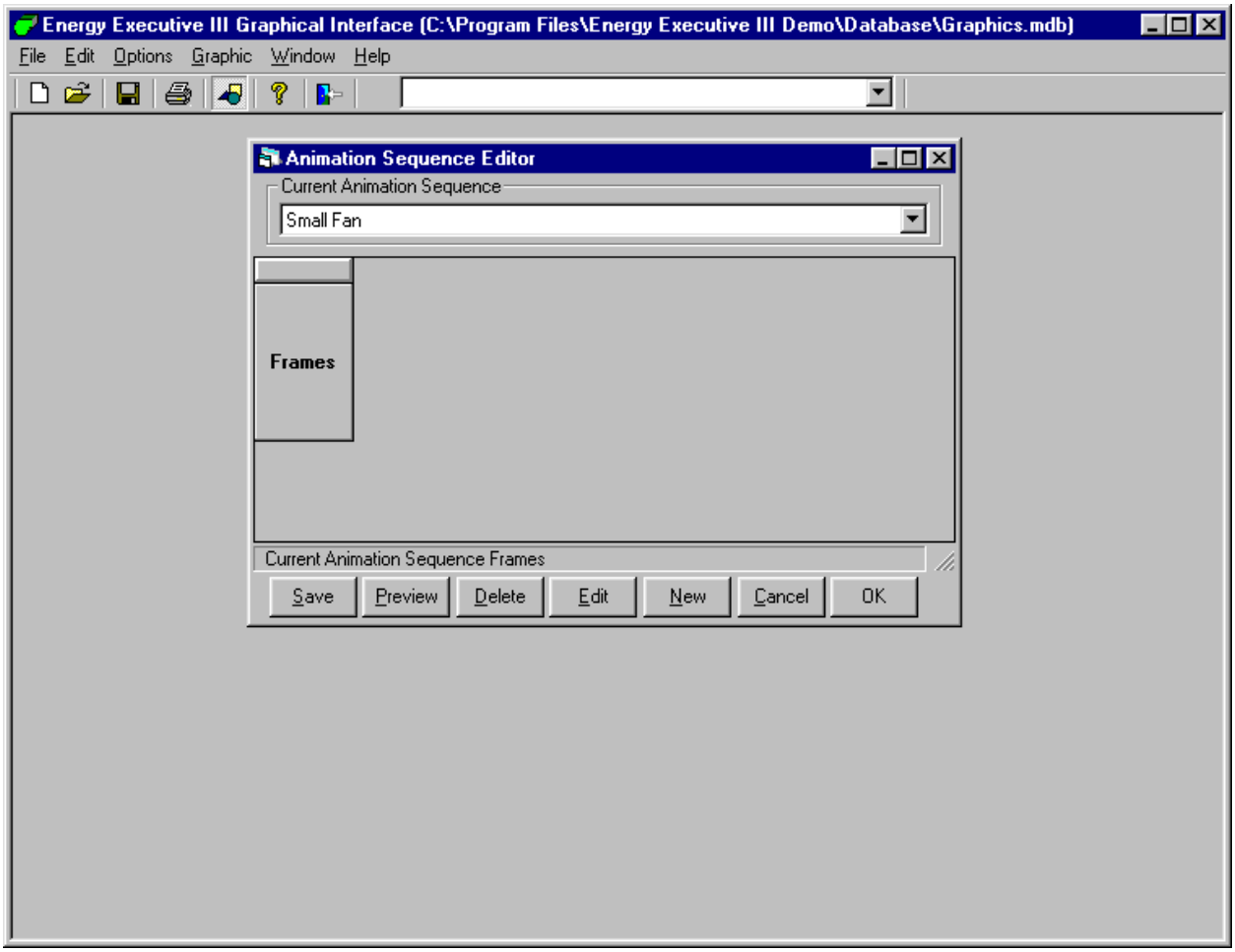
The following are the “File/New” Options (from the bottom up):

Database: The graphic objects associated with the GUI are stored in a database. The default database is stored in [Disk Drive and Folder into which the application was installed]\Database\Graphics.mdb. However, you may create several graphics databases and switch among them if desired. Using this Database option you can specify a new folder to hold the graphics database

Animation Sequence: In order to use an Animation Sequence as an object on a form, you must first define it here. Selecting Animation Sequence from this menu produces the following display:

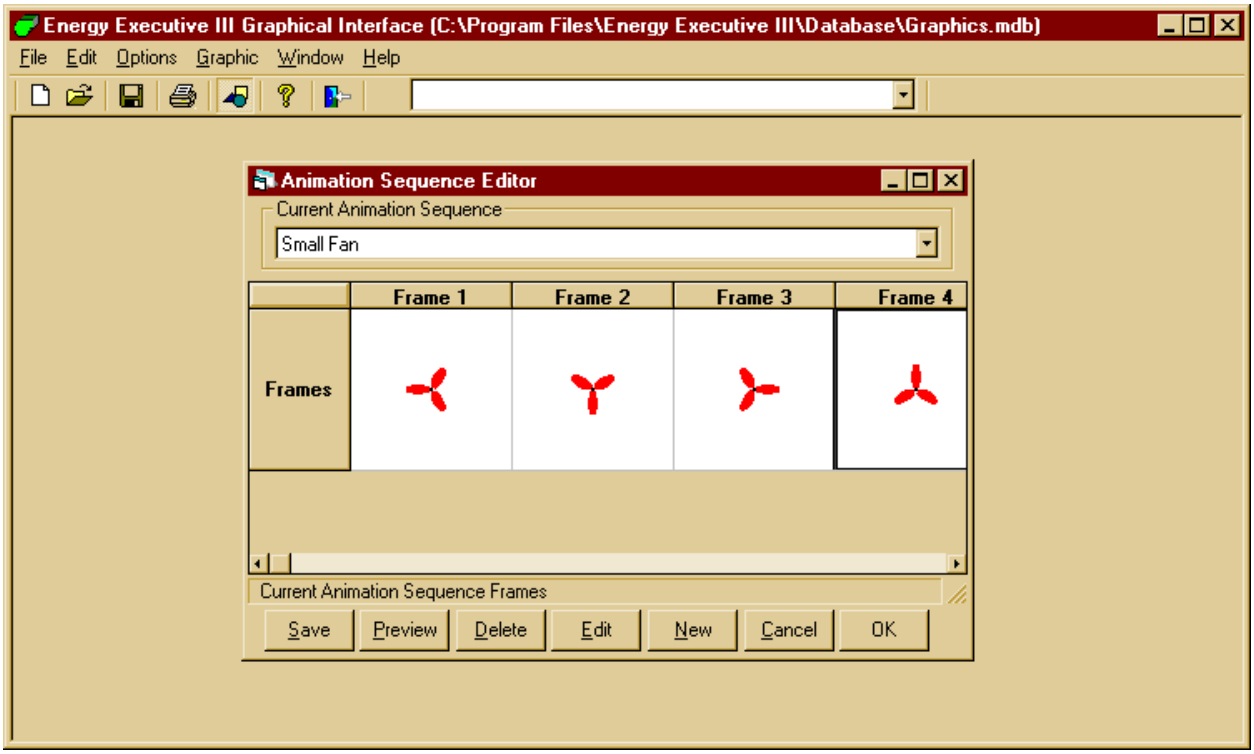


If this is the first sequence you are creating, the drop down pick list box will be empty (as it is in this example). If you have already created sequences, they will appear by name in the drop down pick list box. To create a new sequence, click on new. You will be prompted to enter a name for this sequence. After doing so, the name will appear in the drop down pick list box. When you highlight the name of the sequence the dialogue box will change to the following:



Notice that the left portion of the box now has within it a box named “Frames”. You will need to establish a series of frame objects which will then be “played” in order when the Animation Sequence is assigned to a graphic form (instructions below for assigning graphic objects to graphic forms). These frame objects must have been previously created before this step with whatever graphic program you wish to use and saved as a BMP files (PCX and JPG files cannot be used as Frames).

In our example we are creating an Animation Sequence that we have called “Small Fan”. In order to select the frames to use , double click on the “Frames” box. This brings up a folder browser from which you can located and select a frame to insert into the sequence. In our case we navigated to the “C:\Program Files\Energy Executive III Demo\Graphics\Utilities” folder and found four previously constructed frame objects called “Fan 1” through “Fan 4” and added them to the sequence one at a time. The screen now looks like this:

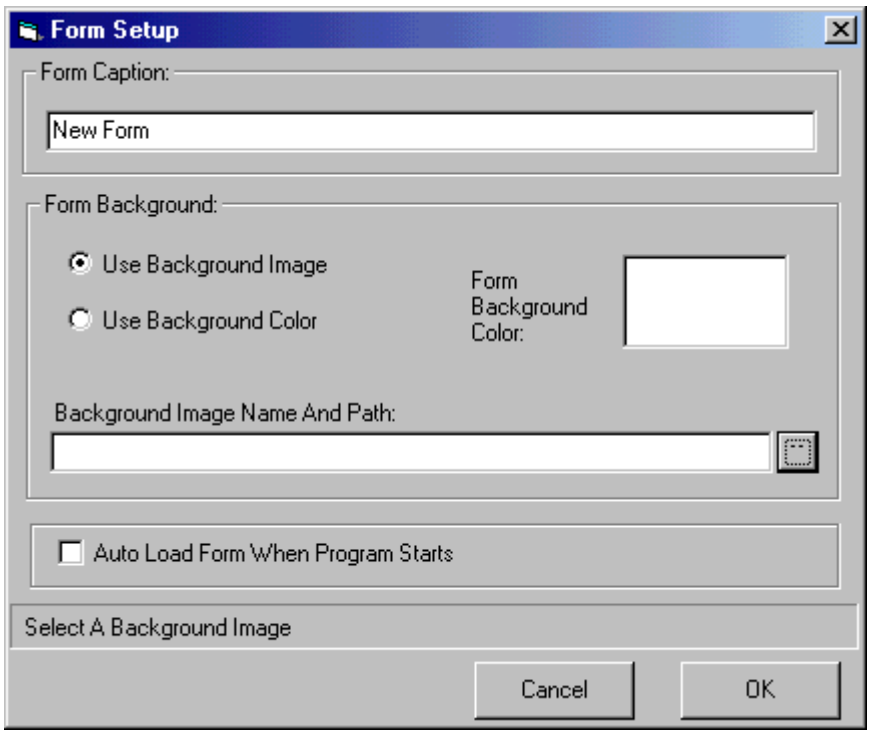


The sequence now shows a set of four fan pictures which will be played sequentially from left to right as associated with a graphic object.

You can create as many Animation Sequences as you wish.

Background Image: If you wish to actually create a new Background Image at this point, selecting this option will load your drawing tool. Use the GUI Options menu/Select Drawing Tool… submenu to specify the program you wish to use for a drawing tool.

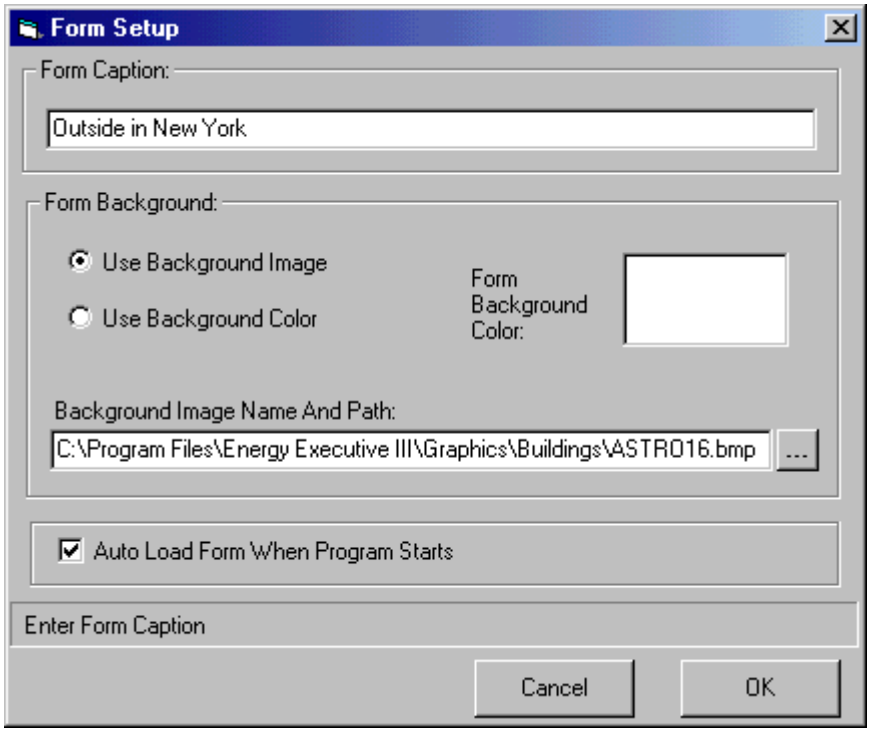
Form: If you have already created the background objects to be used with the GUI or desire to create a customized text type display, select Form to move to the following dialogue box:



In the Form Setup dialog box, fill in:

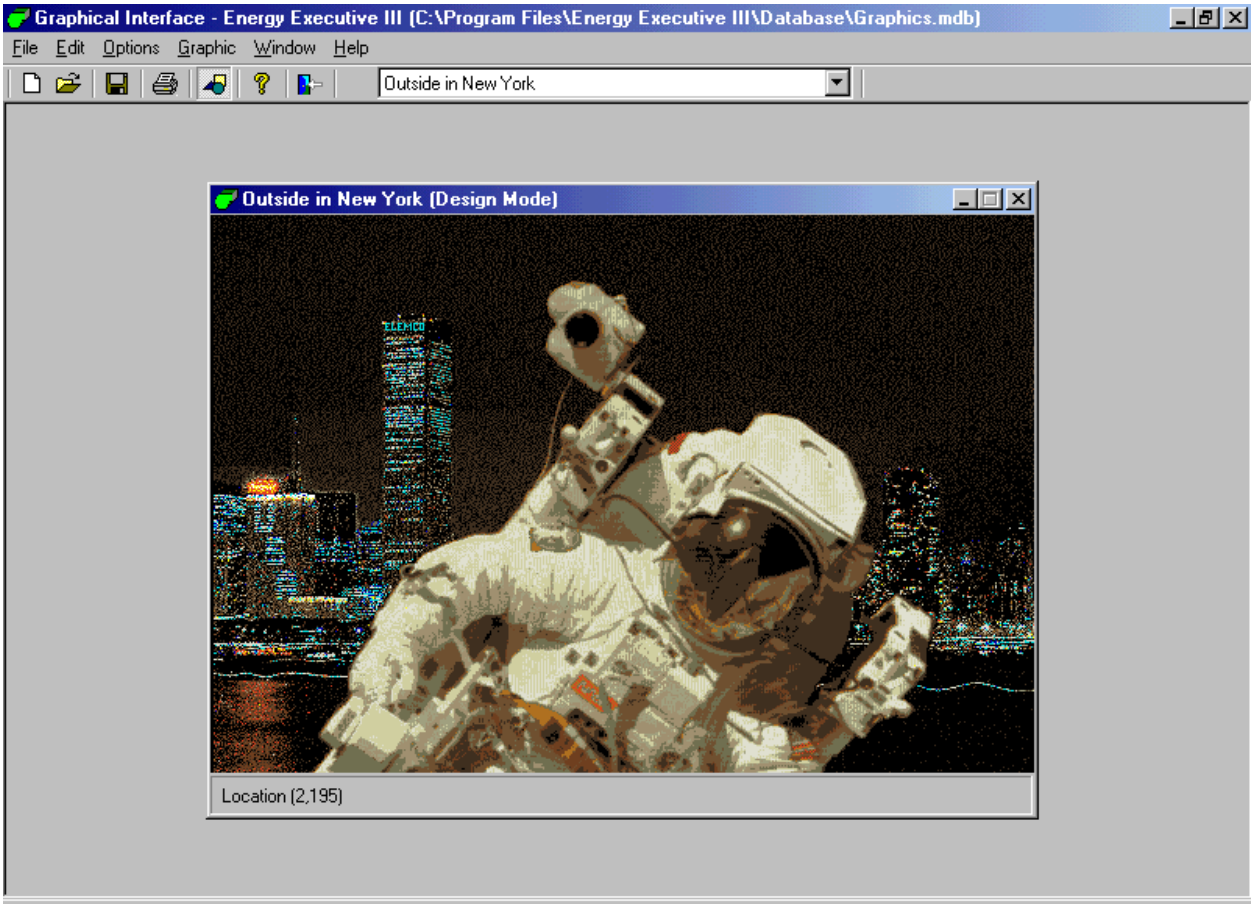
1. Form Caption: This will be the name that appears in the title bar of the form when it is displayed in the GUI.
2. Use Background Image: Click this radio button if you want to use a background image for this form. This would be a drawing, picture or other digitized image that you have previously created or obtained somehow.
3. Use Background Color: Click this radio button if you are not going to use a background image on this form and simply want to crate an empty "page" upon which you can put some standard GUI objects as described below.
4. Form Background Color: If you are not using a background image on this form, select a background color by double clicking on the box to the right of this prompt and selecting a color from the palate that appears.
5. Background Image Name and Path: If you are using a background image on this form, enter the name and path of the image file or locate it on your computer using the browser (the box with the three dots in it to the right of the input field).
6. Auto Load Form When Program Starts: Check this box if you want the form to load automatically when the GUI loads

An example of a completed Form Setup dialog box might be as follows:



In this example we have named our form “Outside in New York”, have elected to use the background screen called “ASTRO16.bmp” located in the named folder and also have decided that this form should load automatically when the GUI loads.

The result of our efforts is the following:



In this case we used a digital picture from a library of graphic objects.

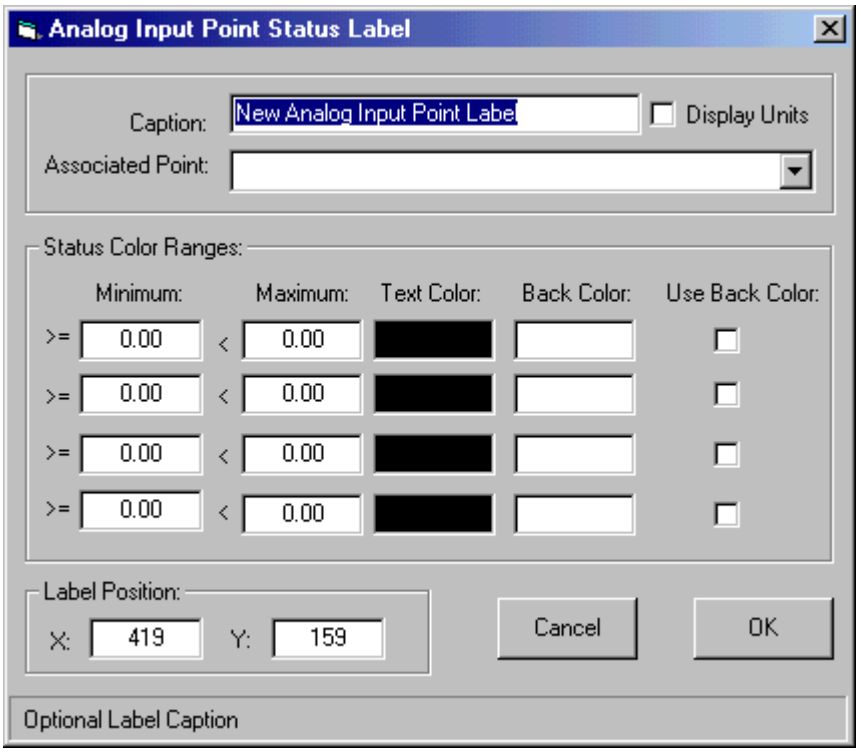
At this point you can add objects to your background image. For example:

Point Status Boxes:

To place an analog input status on this picture, while in Design Mode:

1. Place the mouse cursor on the picture and right click
2. Select "New" from the first menu box, "Input Points" from the second menu box and "Analog Input Status" from the third menu box:

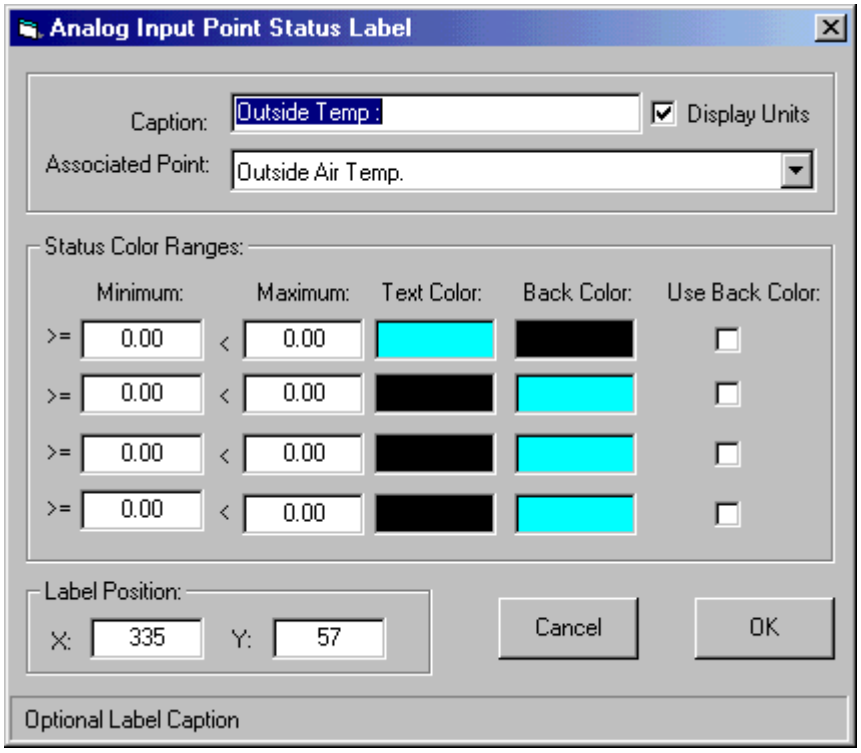
This will produce the following screen:



In the Analog Input Point Status Label dialog box, fill in:

1. Caption: A caption to be shown to the left of the associated point value.
2. Display Units: Check this box to include engineering units to the right of the displayed value.
3. Associated Point: The I/O point to be used to get the value to be posted. Use the drop down list to select the Associated Point.
4. Status Color Ranges: The Label Object can use any of 4 color schemes selected and defined here. The color schemes are associated with ranges of values for the input point. For each range you can specify a Minimum and Maximum value. If the value of the input point is greater than or equal to (>=) the Minimum and less than (<) the Maximum value the colors used will be those specified in the color boxes to the right of the range. Each range is associated with a particular foreground and background color as defined by the colors selected in these color boxes. Colors are selected from a color palate that appears when you double click on the boxes under the Text Color and Back Color column headings. If you don't want to use any background color (i.e. just post the value in the foreground text color over whatever color appears on the background image), do not check the box under the column heading "Use Back Color".
5. Label Position: This is the position in pixel coordinates at which the object will display. You can set the position by changing these numbers, or, in design mode, you can drag and drop any graphic object using the left mouse button as done with many Windows functions.

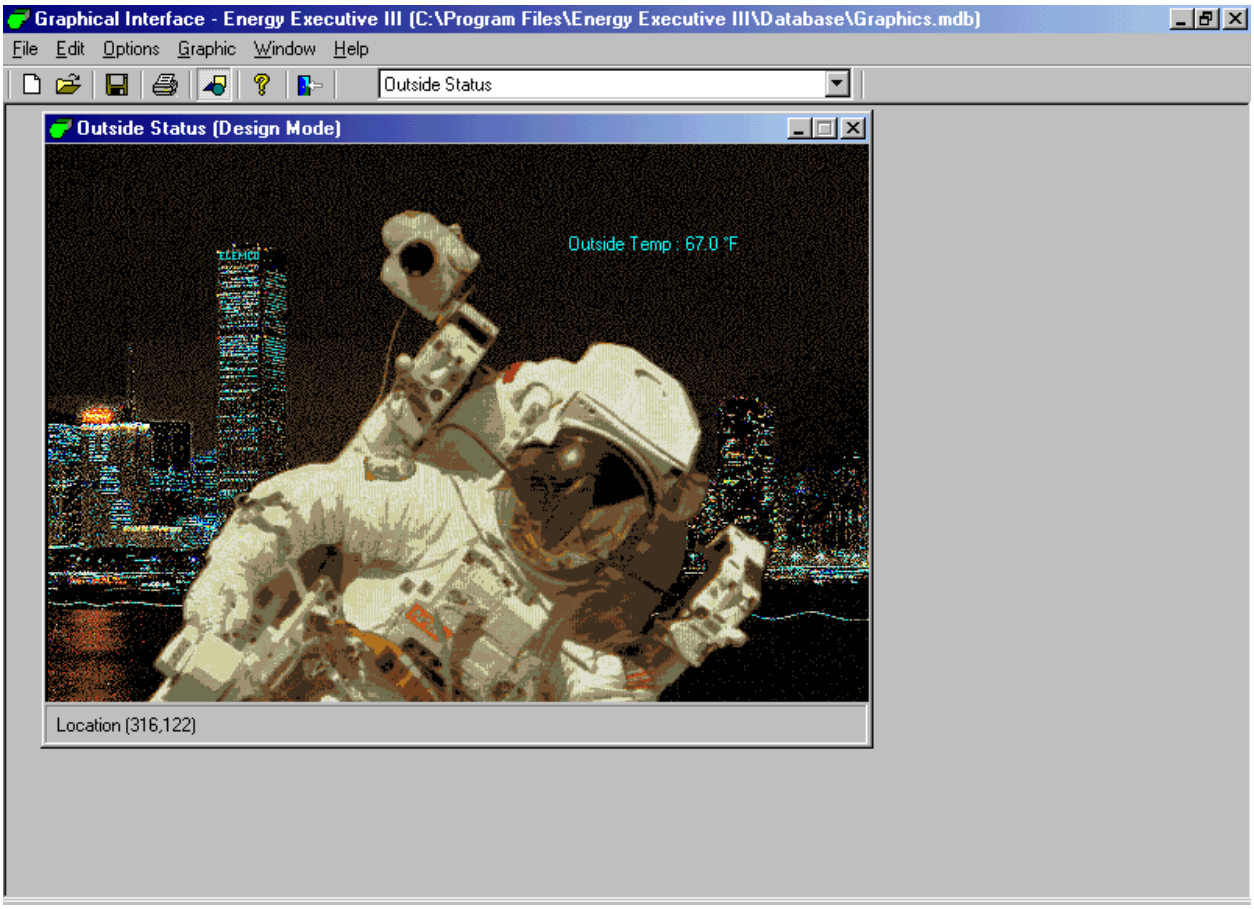
A simple example of the selections one might make in this dialogue box is as follows:



In this example we:

1. Named the Analog Input Point object “Outside Temp”
2. Selected the “Outside Air Temp” as the point from the available points in the group associated with this picture
3. Did not select any particular ranges for use with different color schemes or the use of the background color. We just want the text and value to appear in white on whatever color is already on the background image.
4. The X Y coordinate position is the place on the screen where we clicked to add the new point. Note that in Design Mode, the position of any graphic object on the picture can be changed by simply “dragging” the object to a new location. If desired, you can also change the X Y coordinates in this dialogue box.

The resultant graphic image after implementing this Analog Input Status box is:



Other point status objects can be created in a similar manner including:

1. Control Point Status (analog or digital)
2. Digital Input Status
3. Meter Input Status

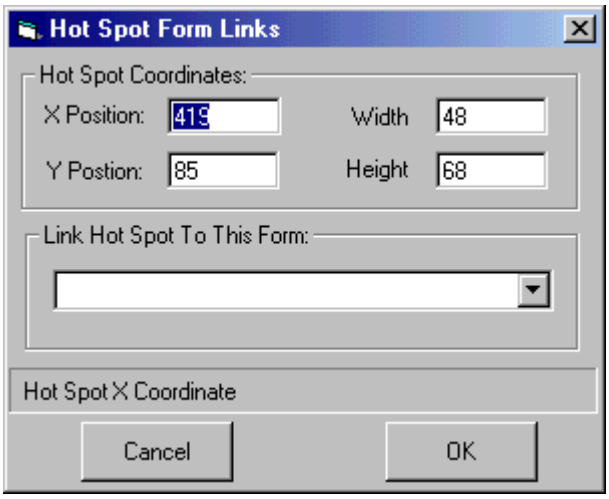
Once created, point status objects can be edited when in Design Mode by right clicking on the object and selecting "Edit" from the menu box or by simply double clicking on the object.

Hot Spot Form Links:

In our example (the "Outside Status" picture), we have also created a Hot Spot Form Link over the visible area of the World Trade Center building behind the floating astronaut. Hot

Spot Form Links are created in a similar fashion to Point Status Boxes but with different properties. To do so:

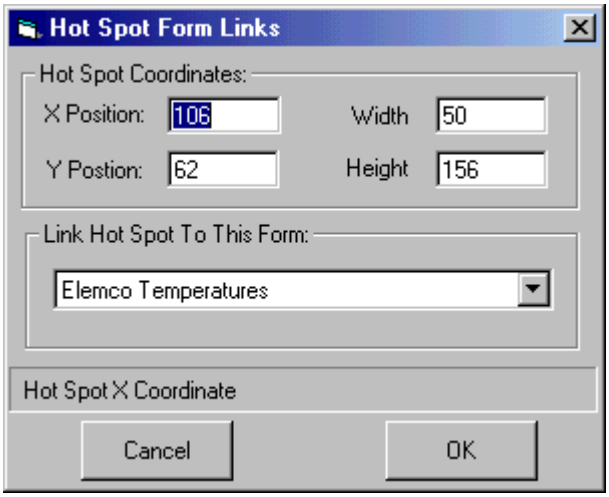
1. Make sure that the GUI is in “Design Mode”.
2. Place the mouse cursor on the picture and right click
3. Select “New” from the first menu box and “Hot Spot Form Link” from the second menu box
4. With the resultant crosshair cursor, make a box around the area of the screen that you want to be a “hot spot”. This will be the area on which the operator will click to load the linked picture.
5. After you select the area, the following screen will appear:



In the Hot Spot Form Links dialog box, fill in:

1. The X and Y positions and the Height and Width are determined by the box you drew.
2. Link Hot Spot To This Form: Select the picture that you want to link to this hot spot from the drop down list of pictures that are associated with the GUI. The drop down list will only contain names of previously created Forms/Background Images. Therefore, if you try to establish a Hot Spot Link on the first from you create, there will be nothing to link to but itself!

An example of the selections one might make in this dialogue box is as follows:



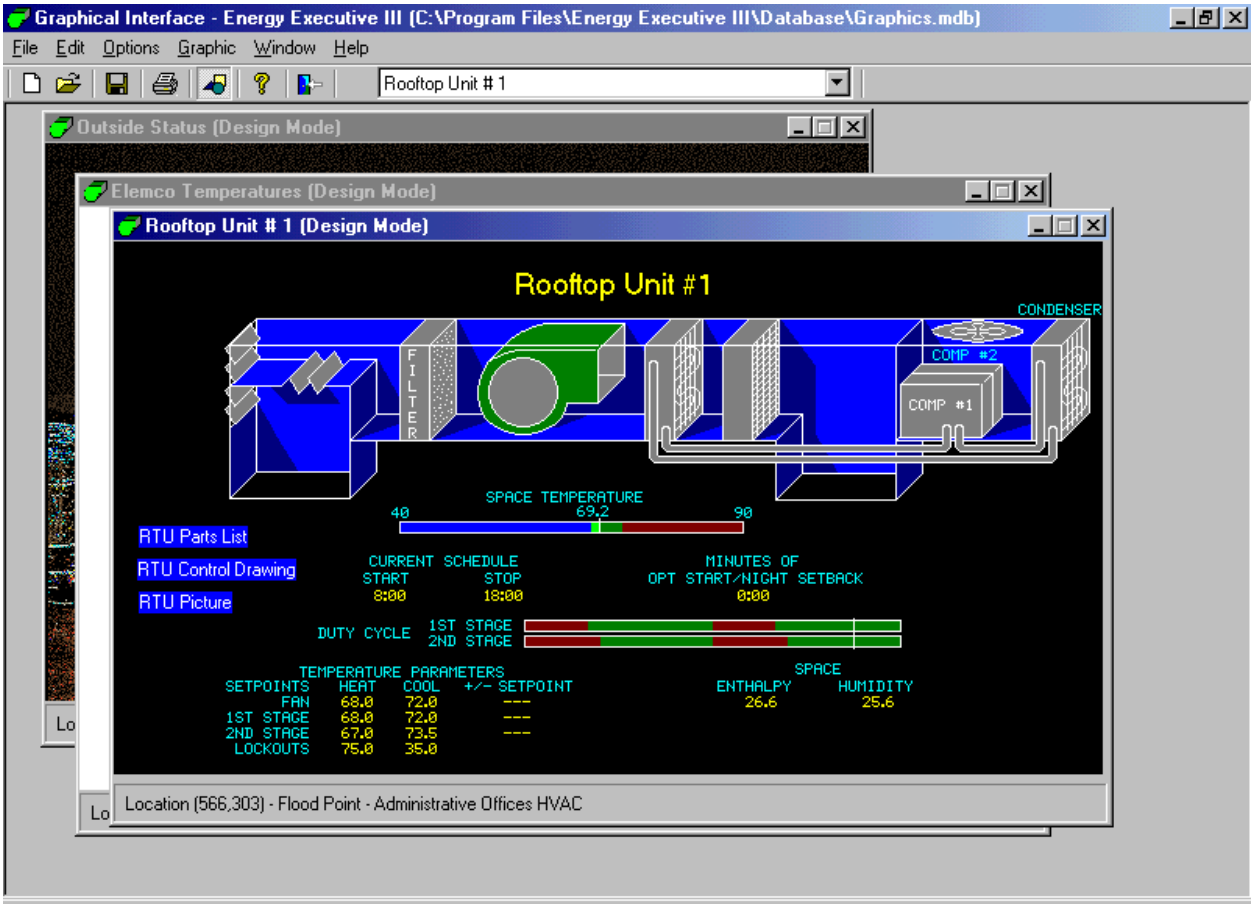
In our example we drew a hot spot over the entire World Trade Center building and linked the form "Elemco Temperatures" to it (The "Elemco Temperatures" form had previously been created). After this process is completed and you take the GUI out of Design Mode (via the Options menu or the Tool Bar icon), the mouse cursor will turn from an arrow into a pointing finger whenever it is positioned over a hot spot that is defined as a Hot Spot Form Link. Double clicking over the hot spot will cause the linked picture to be loaded and put into the foreground in front of the calling picture. Using this feature you can create scripts that guide the operator through a series of logical graphical images. Once on the screen, any image can be closed with the Windows "X" box

Once created, picture link objects can be edited when in Design Mode by right clicking on the object and selecting "Edit" from the menu box or by double clicking on the object.

Flood Areas:

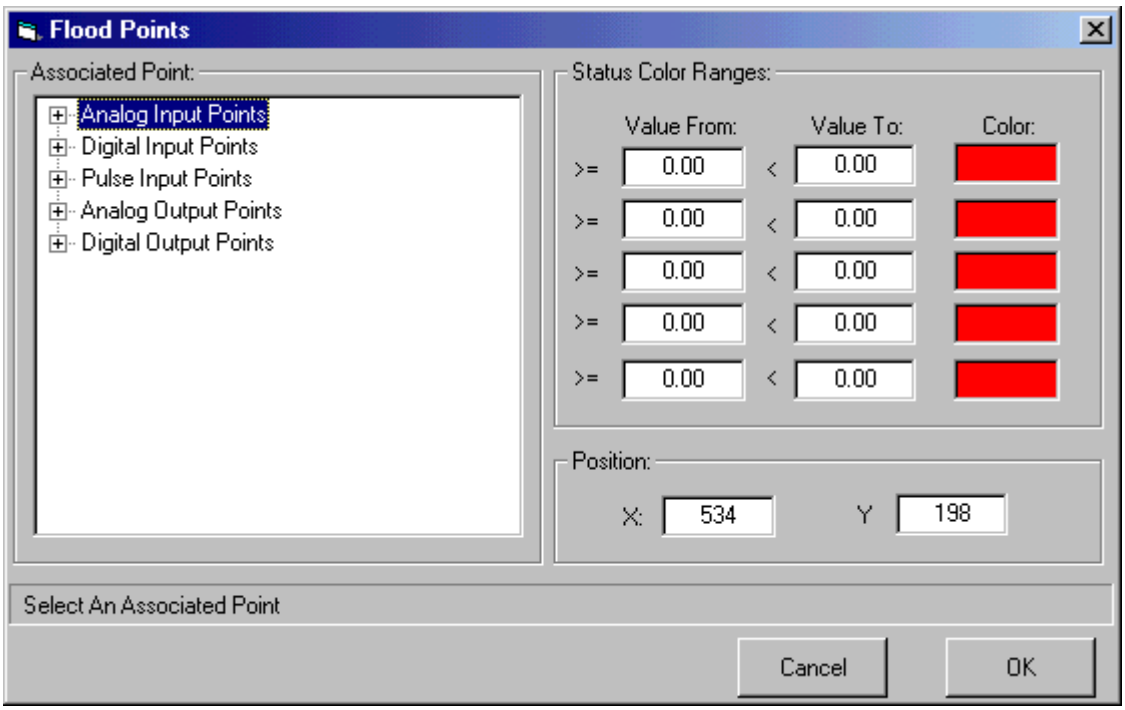
A flood area is an area of a picture that you would like to "flood" with a color based on a point event (e. g., a change in status of a controlled load). Before configuring a flood box on a background image, that picture must have an enclosed area that you wish to flood. These areas are drawn onto the background picture with whatever graphic program you use to create the pictures.

The following is a picture of a Roof Top Package HVAC unit that has been created with a third party drawing program and attached to the GUI as described earlier in this section.



In our example (the "Roof Top Unit # 1" picture), we have created a Flood Area in the casing of the fan. Flood Areas are created in a similar fashion to Point Status Boxes but with different properties. To do so:

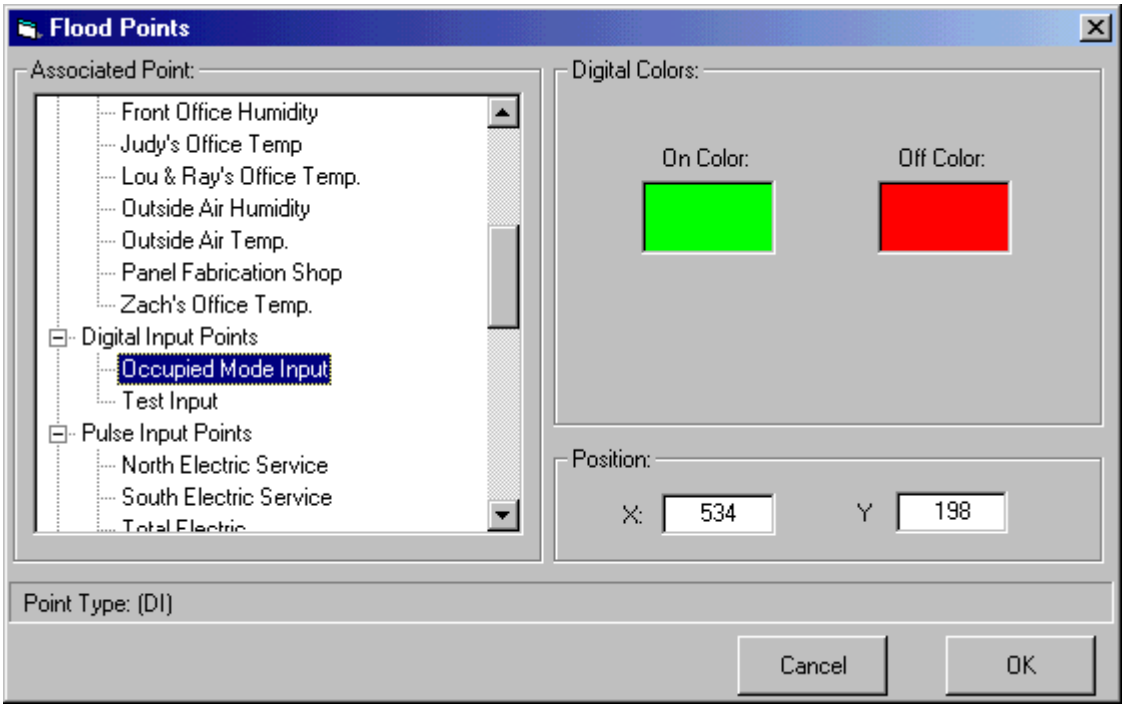
1. Make sure that the GUI is in "Design Mode".
2. Place the mouse cursor someplace on the picture and right click. Remember to note the place where you clicked. This is where the flood point locator box will be when you have finished defining the flood point. After the definition is complete, you will be able to drag this box to the appropriate place on the form.
3. Select "New" from the first menu box and "Flood Point…" from the second menu box and the following dialogue box will appear:



The left side of the dialogue box allows you to select a point to use as a control for the flooding of this area. This box provides a "Windows Explorer" type tree directory of all configured points in the system from which to choose. Click the "+" sign to expand the list of any type of point (analog input, digital input, pulse input, analog output, digital output). When the point you wish to use is displayed click on it to highlight it.

The right side of the box will change depending upon what type of point you have selected. Analog and meter points will have a display like the one depicted in the example above. This will allow for up to five ranges of point values to be associated with five different flood colors. For each range you can specify a Value From and Value To. If the value of the input point is greater than or equal to (>=) the Value From and less than (<) the Value To, the color used will be that displayed in the color box to the right of the range. Colors are selected from a color palate that appears when you double click on the box under the heading.

Selecting a digital type point will produce the following dialogue box:



The right side of the box will now only allow the selection of two colors; one to be associated with an "ON " condition and one to be associated with an "OFF " condition. Once again, colors are selected from a color palate that appears when you double click on the box under the heading.

Regardless of what type of point you select, after you have finished identifying ranges and colors to use for your flood point, click "OK" to move on. Once this is done, the area around the pixel where you originally clicked will turn colors based on condition of the associated point. Also, there will a small box that appears when you move the cursor over the spot that you originally clicked on to create the flood point. Drag this box into the area of the picture that you actually want to be your flood area. Note that designation of the pixel coordinate to begin the flooding of color will be defined by the upper left hand corner of the flood point locator box. This means that if you have a very small flood area that is actually smaller than the flood point locator box, just make sure that the upper left hand corner of the flood point locator box is located over the desired flood area.

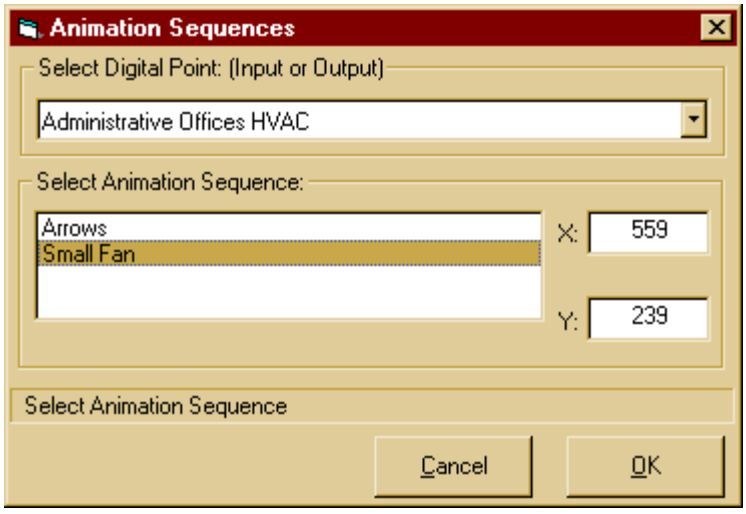
Once this procedure is complete, this will be the zone that will begin to flood with color when the point event occurs. The flooding of color will continue in all directions until a border is reached.

Animation Point:

An Animation Point is used to put a previously defined Animation Sequence on a Form (see the section earlier in this chapter regarding creating Animation Sequences). These Animation Sequences can they be "played" based in the condition of I/O points in the system.

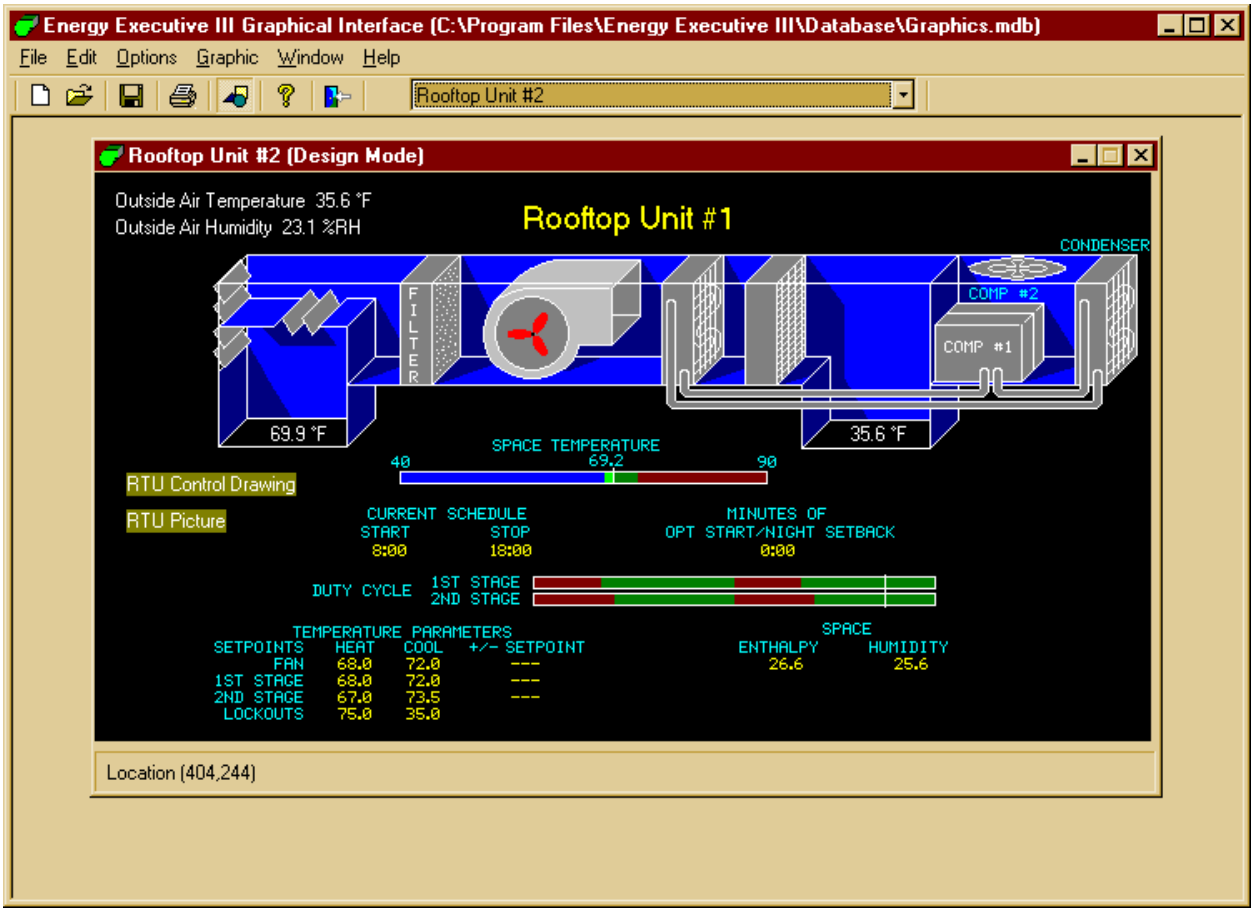
Sticking with our Roof Top Package HVAC unit graphic, we can place a moving fan in the fan box. To do so,

1. Make sure that the GUI is in "Design Mode".
2. Place the mouse cursor someplace on the picture and right click.
3. Select "New" from the first menu box and "Animation Point…" from the second menu box and the following dialogue box will appear:



4. Select an I/O Point from the drop down pick list at the top of the dialogue box the state if which will initiate the sequence. In our example we selected "Administrative Offices HVAC".
5. Select a previously configured Animation Sequence from the list in the bottom part of the dialogue box.
6. Either program the X and Y pixel coordinates for the Animation Point or click on OK and then drag the animation object to the desired postion on the form.

The end result of our efforts was the following:



In this case, when the "Administrative Offices HVAC" point turns in the Animation Sequence will play continuously depicting a fan turning clockwise. Note that if you want the fan to turn counter-clockwise, you will need to reverse the order of the frames in the Animation Sequence defined earlier.

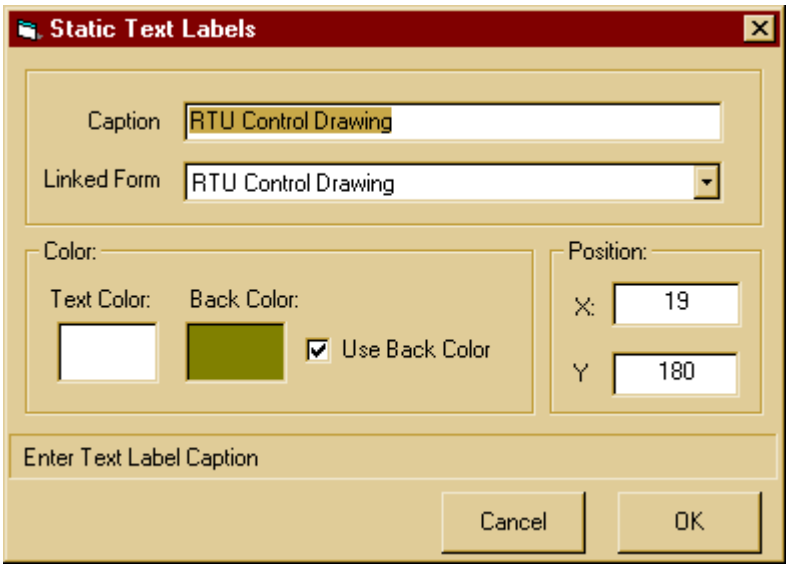
Animations can greatly enhance the visual effectiveness of the GUI, but it will take time to develop them and make sure that all the components are sized correclty and operate as planned.

Static Text Labels :

Static Text Labels, as the name implies, are simply labels with programmable text placed on the form. To create a Static Text Label:

1. Make sure that the GUI is in "Design Mode".
2. Place the mouse cursor someplace on the picture and right click.

3. Select “New” from the first menu box and “Static Text…” from the second menu box and the following dialogue box will appear:



4. Enter a Caption for the the object which is just a name with which to reference it.
5. If desired you can select antoher form from the “Linked Form” drop down list box to link to the Static Text Label. As with Hot Spot Form Links, after a link has been established and you take the GUI out of Design Mode (via the Options menu or the Tool Bar icon), the mouse cursor will turn from an arrow into a pointing finger whenever it is positioned over a Static Text Label that has a form linked to it. Double clicking over the Static Text Label will cause the linked picture to be loaded and put into the foreground in front of the calling picture.
6. Select a Text Color and a Background Color for the Static Text Label and check the “Use Back Color” box if you want to use the Background Color. If you don’t check this box, the Static Text Label will be posted as just the text in the Text color over what ever background form you are using.
7. Either program the X and Y pixel coordinates for the Static Text Label or click on OK and then drag the Static Text Label to the desired postion on the form.

Using the GUI:

Using the GUI once the graphics have been designed and implemented is simple. All forms, pictures and background images that have been created and assigned to the GUI are listed in the drop down box on the menu bar at the top of the GUI screen. Select the desired picture from the list to review. If you have implemented Picture Links, you can move from one picture to the next via the established links. When not in Design Mode, the mouse cursor will turn into a pointed finger only when it is positioned over a picture link. Double clicking while positioned over such a link will bring up the linked image.