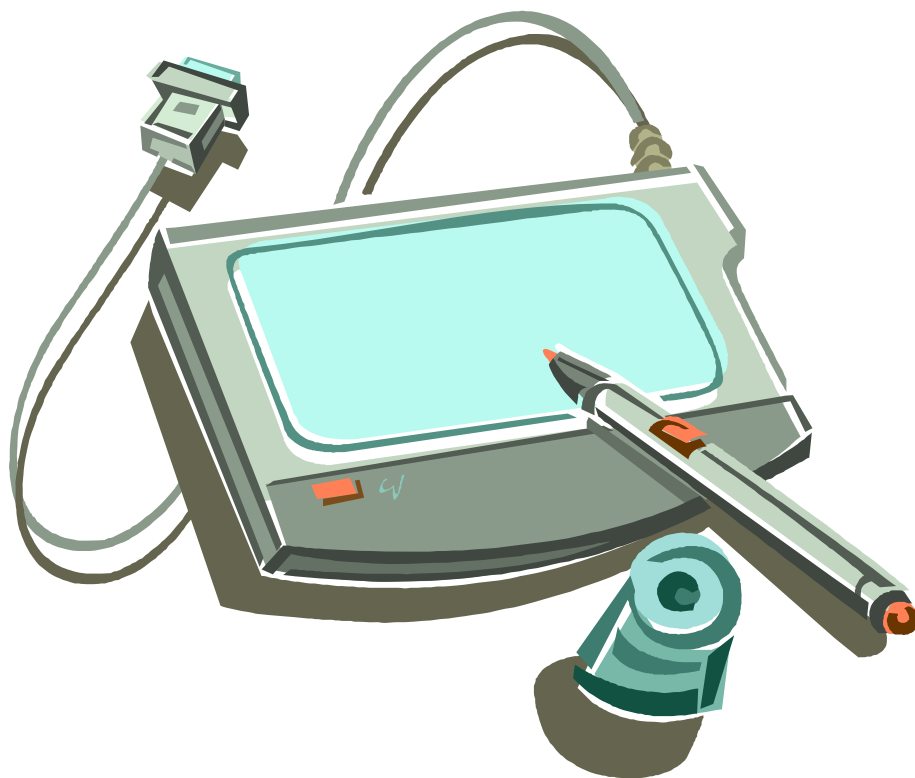




v o y a g e r s o u n d



## **Voyager Sound GraphiMix™ System**

### **Reference Manual (Shareware Version – 2007)**

**Voyager Intellectual property protected by U.S. Patent 5,212,733  
European Patents EP 0 517 848 B1**

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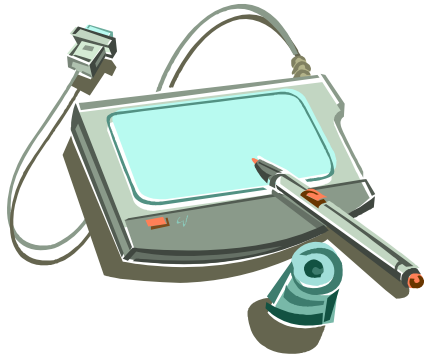
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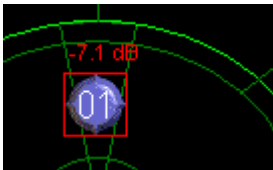
## Voyager Graphic User Interface



This section describes the Voyager Graphic User Interface in a hierarchical, ‘top-down’ manner.

### ***Using the Keyboard and the Mouse***

To move Mix Icons around the Mix Forms, use a **<left click, drag, and release>** on the icon to be moved. A single **<left click>** on an icon causes it to be selected. A selected Mix Icon is drawn with a red square surrounding it.

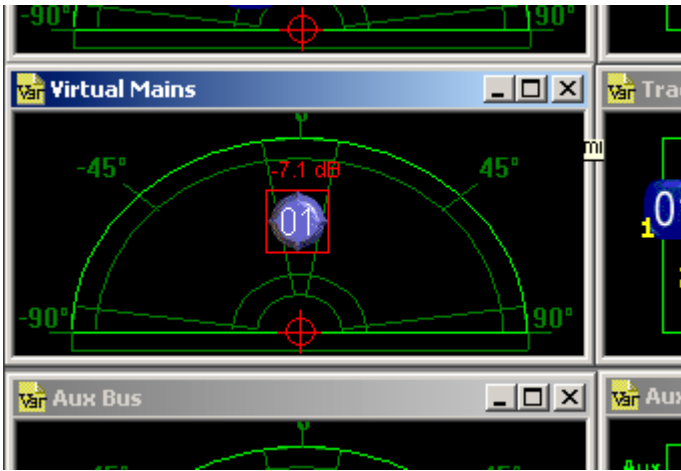


If the **<space bar>** on the keyboard is typed when a Mix Icon is selected, ‘Mouse Lock’ Mode is entered. The Mix Icon will be attached to any movement of the mouse without having to hold down the left mouse button. Another **<space bar>** toggles this mode off.

The keyboard cursor keys, **up**, **left**, **right**, and **down**, will move the selected Mix Icon in the appropriate direction. If the Mix Icon is on a rectangular Mix Form, then the icon moves up, down, left and right. If the Mix Icon is on a radial Mix Form, then the icon moves in and out in radius, and left and right in angular position. If the **<control>** key is held down when the arrow keys are pressed, the Mix Icon moves in larger increments.

A **<control-C>** typed on the keyboard (or if **copy** is selected from the Edit menu) copies the selected Mix Icon to the Windows clipboard. If no icon is selected then the selected Mix Form is copied to the clipboard. A **<control-X>** ‘cuts’ the selected icon or Mix Form and a **<control-V>** ‘pastes’ the contents of the Windows clipboard to the selected Mix Form or Mix Frame. These actions can also be selected from the Edit menu.

A selected Mix Form has the title bar drawn in blue. Any click on or within the Mix Form boundary will select that Mix Form (provided some other Mix Form isn't in the way).



To move a Mix Form, <left click and drag> on the Mix Form's title bar. To resize a Mix Form, <left click and drag> on a corner or a side of the Mix Form. The cursor will change to a double-arranged symbol when it is over a 'resize' point.

A <right-click> on Mix Forms or Mix Icons brings up the appropriate context menus. If GraphiMix is set to Build Mode, extra entries appear in these context menus. GraphiMix is toggled between Run Mode and Build Mode by toggling the Run/Build Mode button on the standard toolbar.



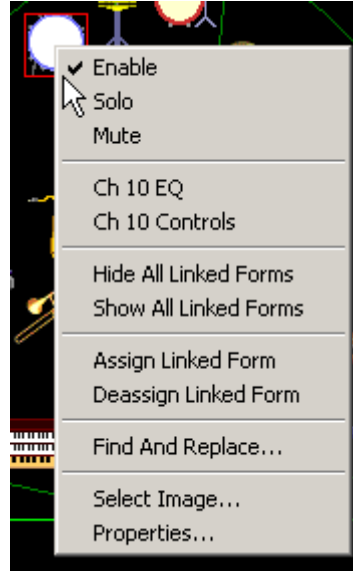
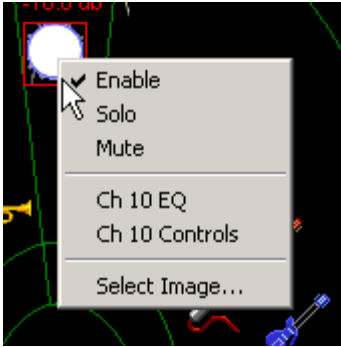
Standard Toolbar



This is a Mix Icon context menu.

'Run' mode

'Build' mode

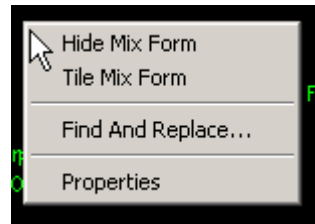


This is a Mix Form context menu.

'Run' mode

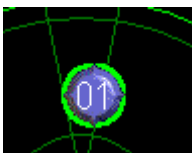


'Build' mode



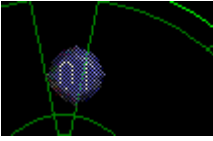
Mix Form and Mix Icon properties are displayed and modified by the selection of the Properties entry.

The <shift> and <control> keys modify the operation of the Mouse buttons.



A <shift-left click> toggles the Mix Icon in and out of 'Solo' mode. A Mix Icon in Solo Mode is drawn with a bright green halo. MIDI messages can be sent when the icon enters or leaves solo mode.

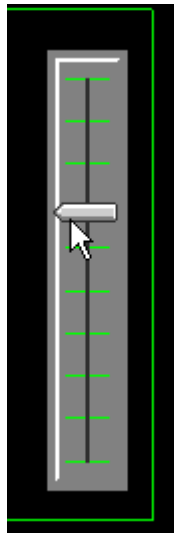
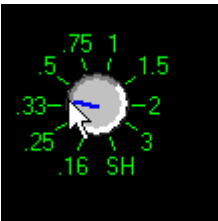
Solo mode typically 'solos' the track or bus so that it can be heard by itself, temporarily removing all other 'non-soloed' tracks from the mix.



A **<shift-right click>** toggles the Mix Icon in and out of ‘Mute’ mode. A Mix Icon in Mute Mode is drawn semi-transparently and dim. MIDI messages can be sent when the icon enters or leaves mute mode.

Mute mode typically ‘mutes’ the track or bus, temporarily removing its contribution to the mix or monitors.

A **<control-left click>** is used to adjust the setting of a knob, fader or list control. If the **<control>** key is not held down, the control’s position on the Mix Form is moved (via a normal **<left click and drag>** operation). However, if the **<control>** key is held down, the **<left click and drag>** operation is applied instead to the rotation of the knob or the movement of the slider or the list entry selection.

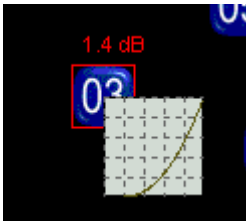


A **<control-left click>** on a switch toggles the state of the switch.

Knobs, faders, and switch Mix Icons can be optionally set so that their position is fixed. In this mode, the **<control>** key **is not needed** to adjust their fader, knob, or switch

positions when dragging. **All switches used in the templates are set this way so that the user can simply <left-click> on the switch or icon to change its state.**

The <mouse wheel> is also used in GraphiMix. If a Mix Icon is selected, the <mouse wheel> moves the icon according to the Mix Icon movement constraints (set in its properties dialog) and what kind of Mix Form it is placed on. If the Mix Icon is placed on a stereo Mix Form (semi-circle), then the <mouse wheel> moves the selected icon in a radial direction. On a normal Mix Icon with pan and volume controls, this would equate to moving just the volume control with the wheel. A <Shift-mouse wheel> would move the icon in an angular direction, i.e. adjust only the Pan control. If the control is placed on a rectangular Mix Form, then the <mouse wheel> moves the icon in the Y direction (up and down) and the <shift-mouse wheel> moves the icon in the X direction (side to side). This provides a vernier-type of control which is useful in making small precise adjustments.



A <control-mouse wheel> adjusts the Radius Mapping settings for the selected Mix Icon. The Radius mapping setting allows the user to provide more adjustment resolution near the high end or the low end of the adjustment range as opposed to a strictly linear mapping which provides constant resolution throughout the Mix Icon range.

The <Delete> key will delete the selected object such as Mix Icons, Mix Forms, and Links only if GraphiMix is in 'Build' mode.

## Keyboard and Mouse Summary

Keyboard:

UP, DOWN, LEFT, RIGHT	Move selected Mix Icon accordingly.
UP, DOWN, LEFT, RIGHT +<Control>	Move selected Mix Icon accordingly with larger steps
<Control-C>	Copy the selected Mix Icon or the selected Mix Form to the clipboard.
<Control-X>	Cut the selected Mix Icon or the selected Mix Form to the clipboard.

<Control-V>	Paste from the clipboard.
SPACE	Toggle 'Mouse Lock Mode' for the selected Mix Icon.
DELETE	Delete the selected object. Build mode must be enabled in order to use this key.
+,-	Zoom in/out selected Mix Form.

Mouse:

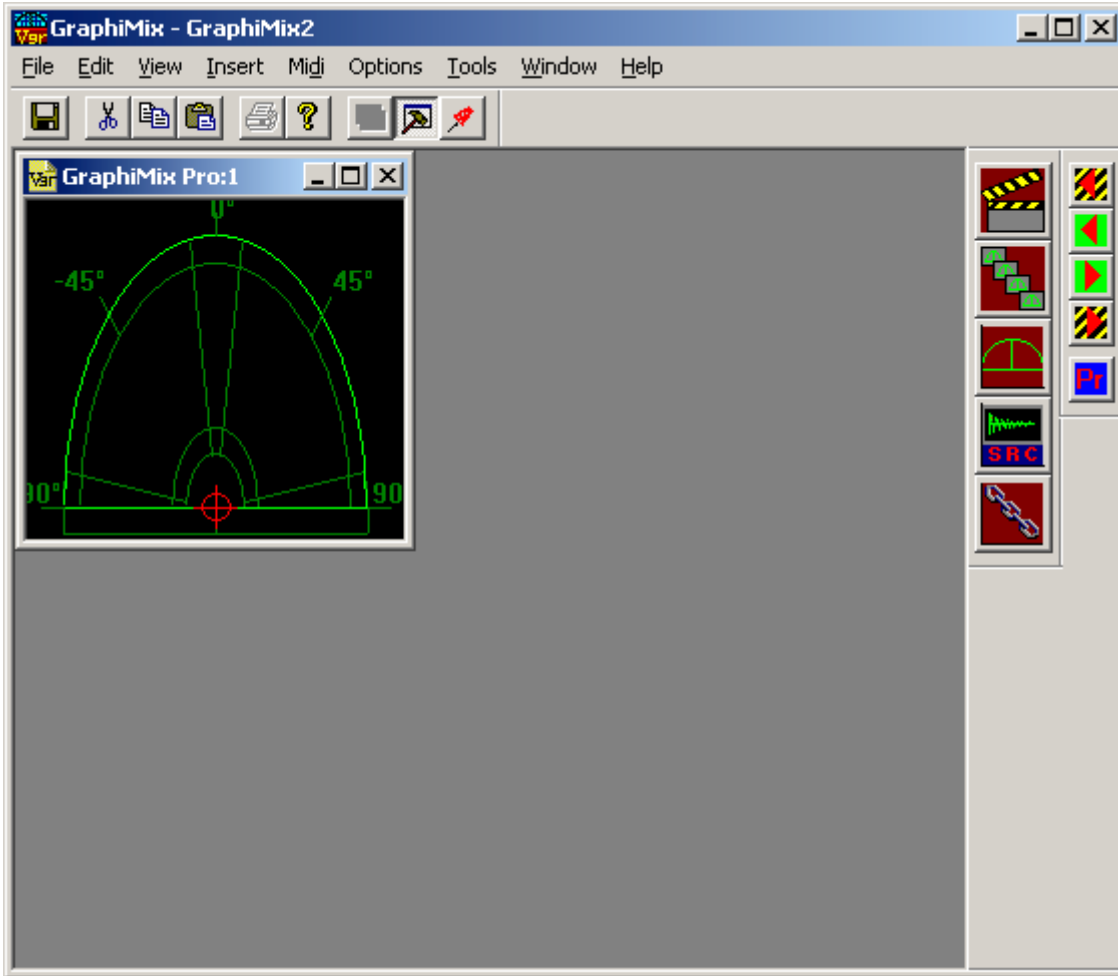
Keyboard	<Left Click>	<Mouse Wheel>	<Right Click>
-none-	Select Mix Icon or Mix Form. Drag Mix Icon or Mix Form.	Adjust Radius on Stereo/Quad Mix Form. Adjust Y on Rectangular Mix Forms.	Context Menu for Mix Icon or Mix Form.
<Shift>	Toggle Mix Icon in Solo Mode.	Adjust Angle on Stereo/Quad Mix Form. Adjust X on Rectangular Mix Forms.	Toggle Mix Icon in Mute Mode.
<Control>	Toggle Switch Mix Icon. Drag Knob and Fader settings.	Adjust Radius Mapping for Mix Icon.	Context Menu for Mix Icon or Mix Form.

### **Mix Frame**

The Mix Frame is the outermost window of the Voyager Mix System. The Mix Frame contains all of the Mix Forms that are active in a GraphiMix session. Mix tool bars, Icon bars, and tab bars can attach to the Mix Frame or be dragged free. The Main menus are contained on the Mix Frame.

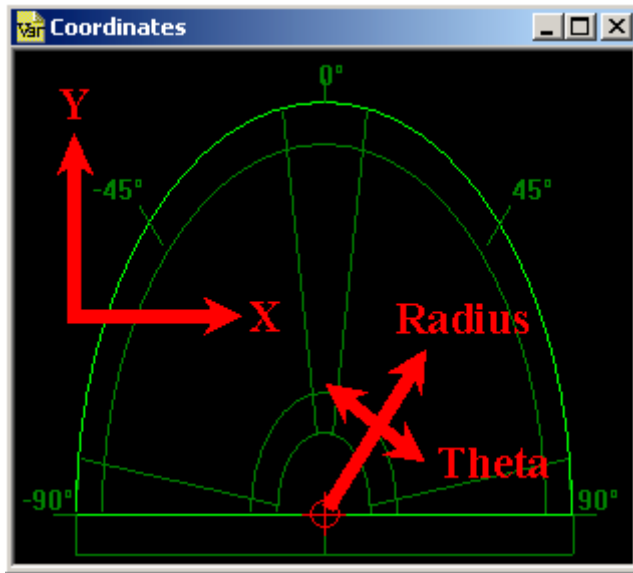
The Mix Frame window can be expanded to fit the screen, shrunk to a normal, resizable window, or minimized to an icon on the Windows Tool bar.

Mix Forms can be 'tiled' in 'Always Stay Tiled' mode. These Mix Forms will then completely tile the Mix Frame window. They will automatically readjust when the Mix Frame is resized, or when individual tiled Mix Forms have their size changed.



This is an example showing a Mix Frame containing a blank Stereo Mix Form and 3 attached Toolbars.

## Mix Forms and Mix Form Coordinates

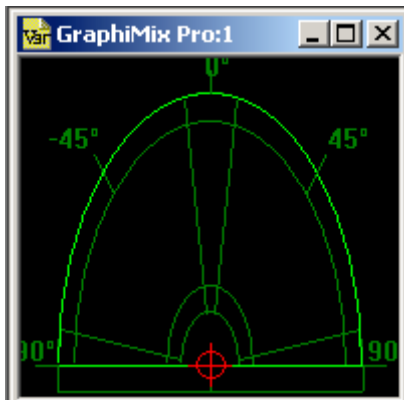


Mix Forms represent the ‘work surface’ for a collection of sound sources represented by Mix Icons, which are to be mixed together. A GraphiMix session, stored in a VOY file, may incorporate several different Mix Forms, each representing a ‘sub-mix’ mapped into some arbitrary set of mix hardware.

A Mix Form is created by first selecting Insert Menu->New Mix Form or by using the Mix Form Tool Bar.

There are four different types of Mix Forms, Stereo, Stereo Rectangular, Surround and Surround Rectangular. These are selected in the Mix Form Properties dialog. Mix Form Properties can be selected by a right mouse click on the Mix Form if GraphiMix is in ‘Build’ mode. For more information on ‘Build’ mode see *Using the Keyboard and the Mouse*, page 6.

A Mix Form can be ‘shrunk to an icon’, ‘expanded to full screen’, or ‘hidden’ by using the 3 buttons at the upper right corner of each Mix Form.



When a Mix Form is ‘hidden’, it is removed from view but is not deleted. To hide a Mix Form, <right-click> on a Mix Form and select ‘Hide Mix Form’, or <left-click> on the ‘X’ button at the upper right of each Mix Form. One of several ways to re-show a ‘hidden’ Mix Form is to select the ‘View Menu->Show All Hidden Mix Forms’ entry. This feature is useful in removing visual clutter by showing only the Mix Forms that are actively in use. All other Mix Forms (Mix Forms for EQ for every channel for example) can be hidden until needed.

To delete a Mix Form, GraphiMix must be in ‘Build’ mode. First, select the Mix Form to be deleted (Mix Form title will show in blue) and then type the <Delete> key on the keyboard. Alternatively, you can use the Edit Menu to delete the selected Mix Form.

GraphiMix allows a Mix Form to be ‘linked’ to an Icon. Right-clicking on a Mix Icon then allows the user to select a Mix Form that is linked to that Icon. In this way, a Mix Form can be created to hold EQ or effects controls for a particular channel and then be ‘hidden’. The hidden Mix Form can then be un-hidden by right-clicking on the linked Mix Icon and selecting it. Note that the ‘Linked Mix Form’ can be used with any controls, just like a normal Mix Form.

GraphiMix includes a feature called ‘Mix Form Groups’. Each Mix Form can be a member of one of any number of named Mix Form Groups. Mix Form Group Mode is entered by depressing the Mix Form Group Mode button on the standard toolbar. For more information on Mix Form Groups, see *Mix Form Groups*, page 36.



Standard Toolbar



Mix Form  
Groups Off



Mix Form  
Groups On

All Mix Forms have a Mix Form Origin. If the Mix Form is a Stereo or a Stereo Rectangular Mix Form, the Origin is at the bottom center of the Mix Form. If the Mix Form is a Surround or Surround Rectangular type, the Mix Form Origin is at the Center of the Mix Form.

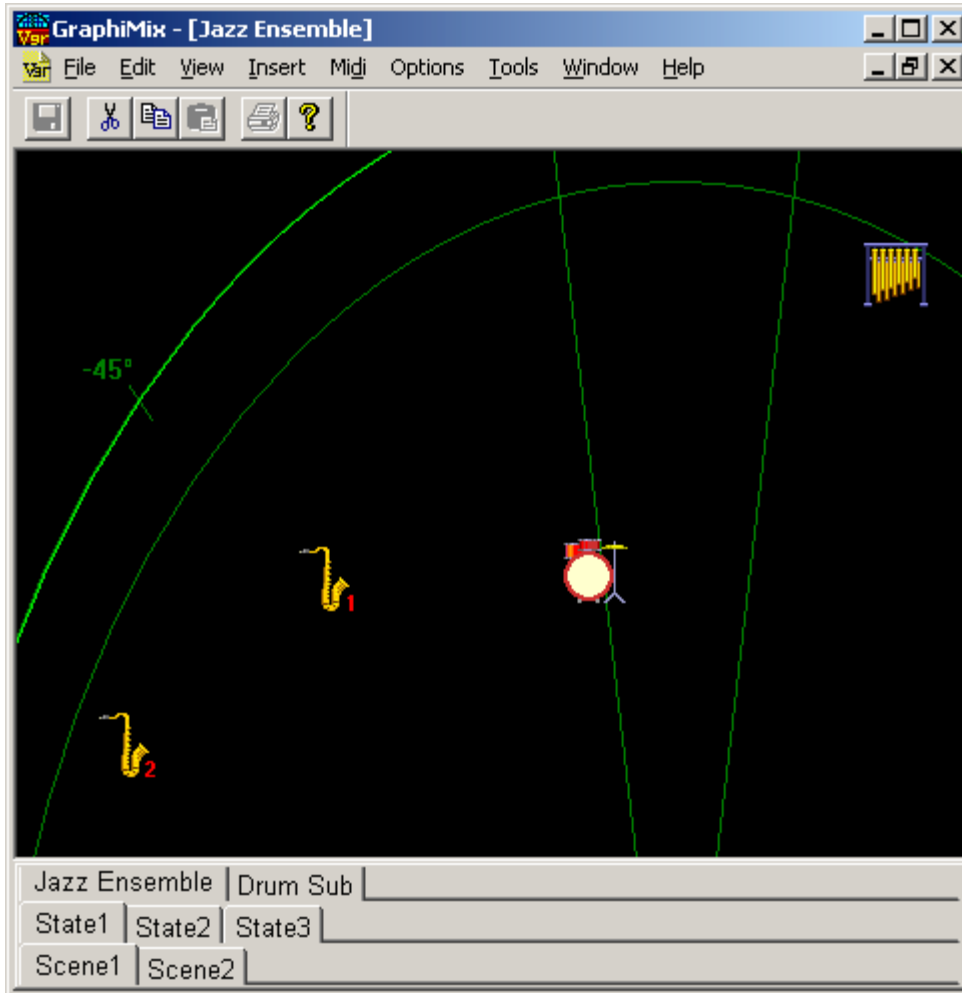
When a Mix Icon is placed on the Mix Form, the Mix Icon will have defined Mix Form Coordinates relative to the origin. These coordinates include Radius, Theta, X, and Y. The Radius coordinates range from 0 (at the origin) to 100% (at the radius boundary). The X and Y coordinates range from -100% to +100%, with 0 being at the origin. The Theta coordinates range from -180 to +180 degrees with 0 degrees indicating the front and 180 degrees indicating the rear.

Inverse versions of these Mix Form Coordinates are also supplied. The Inverse Radius coordinate, for example, will range from 100% at the Mix Form Origin to 0 at the radius

boundary. A typical fader control could be attached to the Inverse Radius coordinate to be 'loudest' at the Mix Form Origin and muted at the radius boundary.

A Complex Mix Icon such as a knob, fader, switch, or indexed list, adds additional coordinates, such as Fader and Inverse Fader, or ListIndex, to the available Mix Form Coordinates.

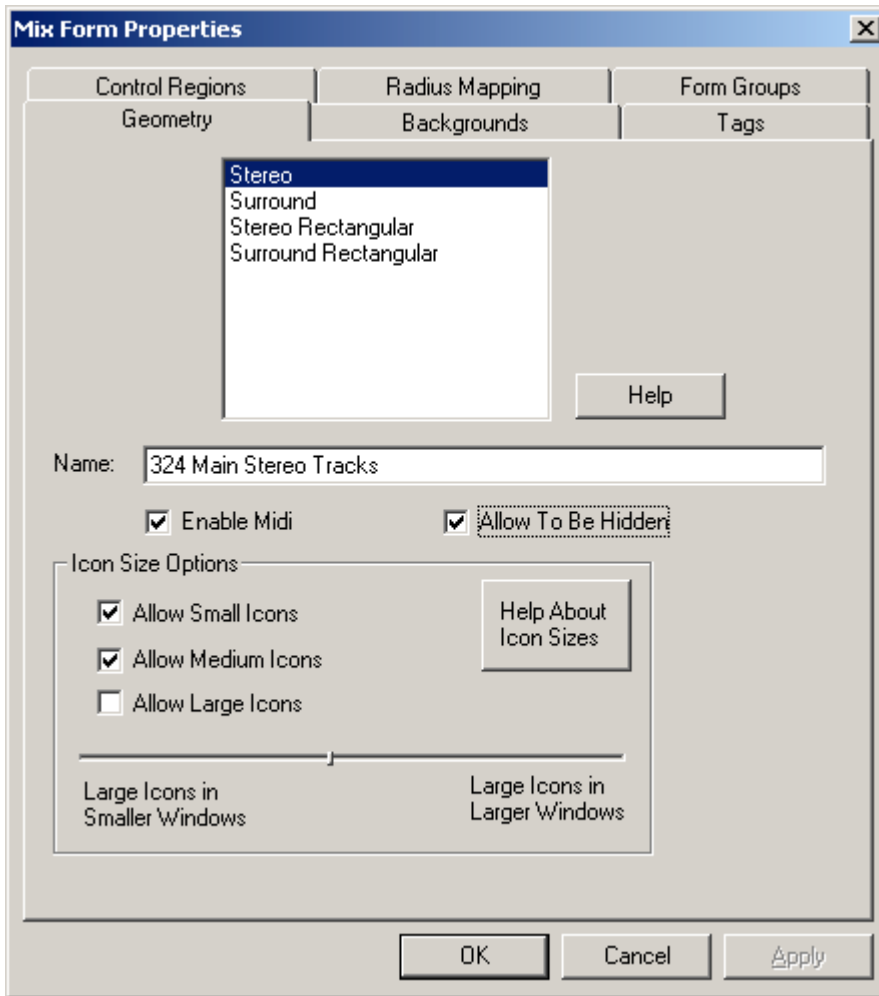
The view of a Mix Form can be 'zoomed' and 'un-zoomed' with the '+' and '-' keys respectively. The modes are also selectable from the View menu.



## Mix Form Properties

This dialog is selected by right-clicking on the Mix Form background and selecting 'Properties' when GraphiMix is in 'Build' mode.

## Geometry



The Mix Form Properties Geometry dialog selects which Mix Form Geometry is applied.

The Stereo Mix Form types are essentially 'half-plane' geometry, where X ranges from -100% to +100% but Y ranges from 0% to +100%. The Mix Form Origin is at the bottom center.

Surround Mix Form types use 'full-plane' geometry where both X and Y range from -100% to +100%. The Mix Form Origin is at the center of the Mix Form.

The 'Rectangular' Mix Form types only affect how a Mix Form 'looks' and does not affect the underlying coordinates that are always available.

The Mix Form name can be changed and entered in the Name field.

Midi can be disabled for all Mix Icons on the selected Mix Form by un-checking the Enable Midi checkbox.

An individual Mix Form can be prevented from being hidden if the 'Allow To Be Hidden' checkbox is un-checked. This is useful to prevent the top-level Mix Form (which is usually linked to many subordinate hidden Mix Forms) from being hidden itself.

Check boxes to Allow Small/Medium/Large Icons are provided. The Mix Icons will change their size dynamically as the Mix Form size is changed. There are 3 sizes provided for each Mix Icon Image. Some of these choices may be disallowed dependent on user preferences. For example to force small icons on a large Mix Form, deselect the Allow Medium and Allow Large Icon checkboxes. A slider is provided on this dialog that allows the user to set the automatic thresholds for changing the icon sizes to suit individual preferences.

### Stereo Mix Form

On a Stereo Mix Form the range of X is +/- 100%, and the range of Y is 0->100%. The green boundary indicates the perimeter where the radius coordinates reach their limits. Radius ranges from 0 at the flat radius to 100% at the radius boundary. Theta ranges from -90 to +90 degrees.

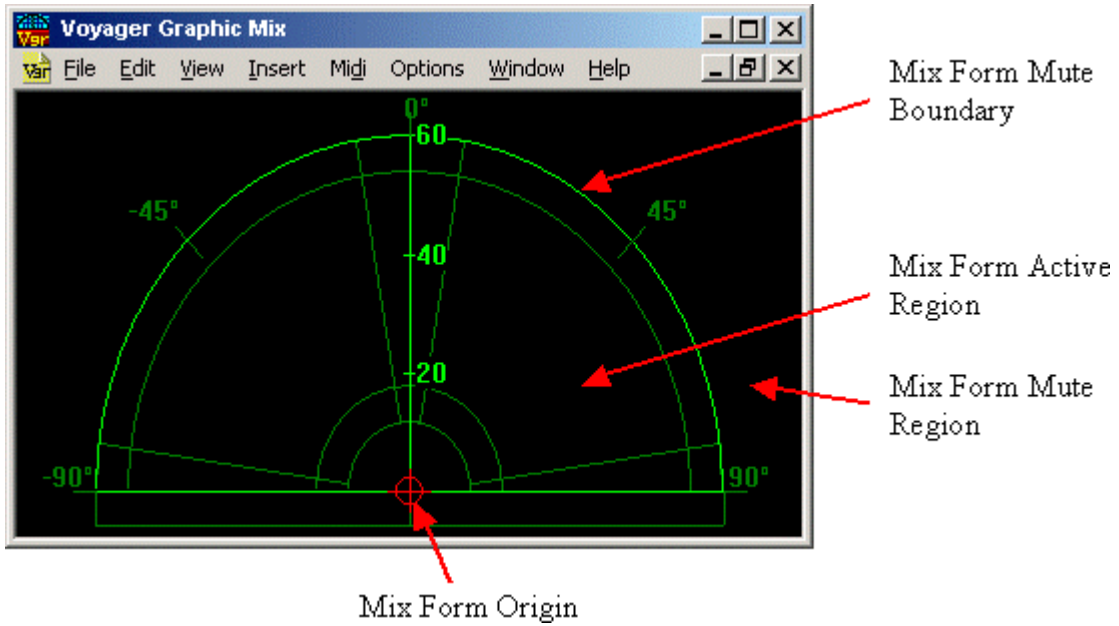
A Stereo Mix Form can be used for the typical fader-pan pot type of control. In this arrangement, a Mix Icon typically has at least two controls attached, a fader and a pan pot. The fader is usually 'attached to' the Inverse Radius Coordinate so that it is loudest at the Mix Form Origin, and the pan pot control is usually attached to the Theta Coordinate.

The effective Minimum radius of the Mix Icon is set by the Mix Form's Flat Radius (see, ***Radius Mapping***, page 34 ) and the Maximum radius is shown on the corresponding Mix Form.

The MIDI value output to the corresponding control ranges from the Minimum (set in the Mix Icons' Control Tab) at the Flat Radius to the Maximum (also set in the Mix Icons' Control Tab) shown on the Mix Form. The value actually output to the control depends on its position on the Mix Form, the value of the Flat Radius, and the setting of the Mapped Radius for the corresponding Mix Icon.

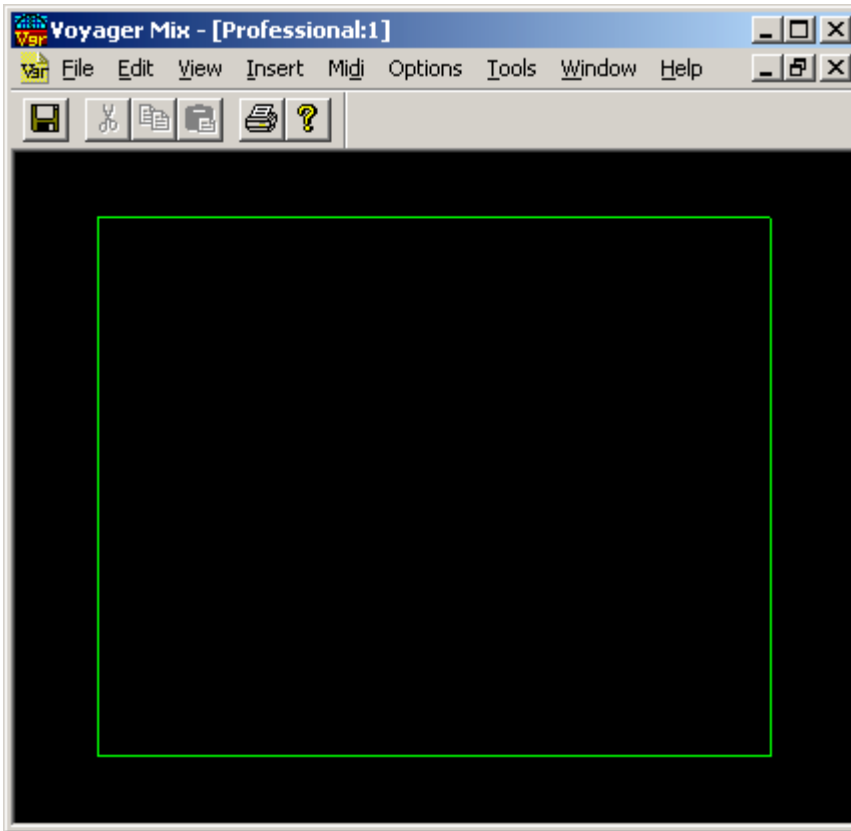
If the Inverse Radius coordinate is used for volume then the Inverse Radius component goes to 0 at the radius boundary. If a Mix Icon is placed beyond the boundary in the Mix Form Mute Region, the output value will remain at 0. Icons that are not currently active can be 'parked' in this region until needed and they will remain muted.

In this case, this radius boundary is referred to as the Mix Form Mute Boundary. The region inside the Mix Form Radius including the Mix Form Origin is the Mix Form Active Region. The Mix Form Mute Region is the region outside the active region.



## Stereo Rectangular Mix Form

A Stereo Rectangular Mix Form can be used for other types of controls, where X and Y might be a better choice for the graphic format of the desired controls. The range of X is +/- 100%, and the range of Y is 0->100% on this form. The green boundary indicates the perimeter where the X and Y components reach their limits.

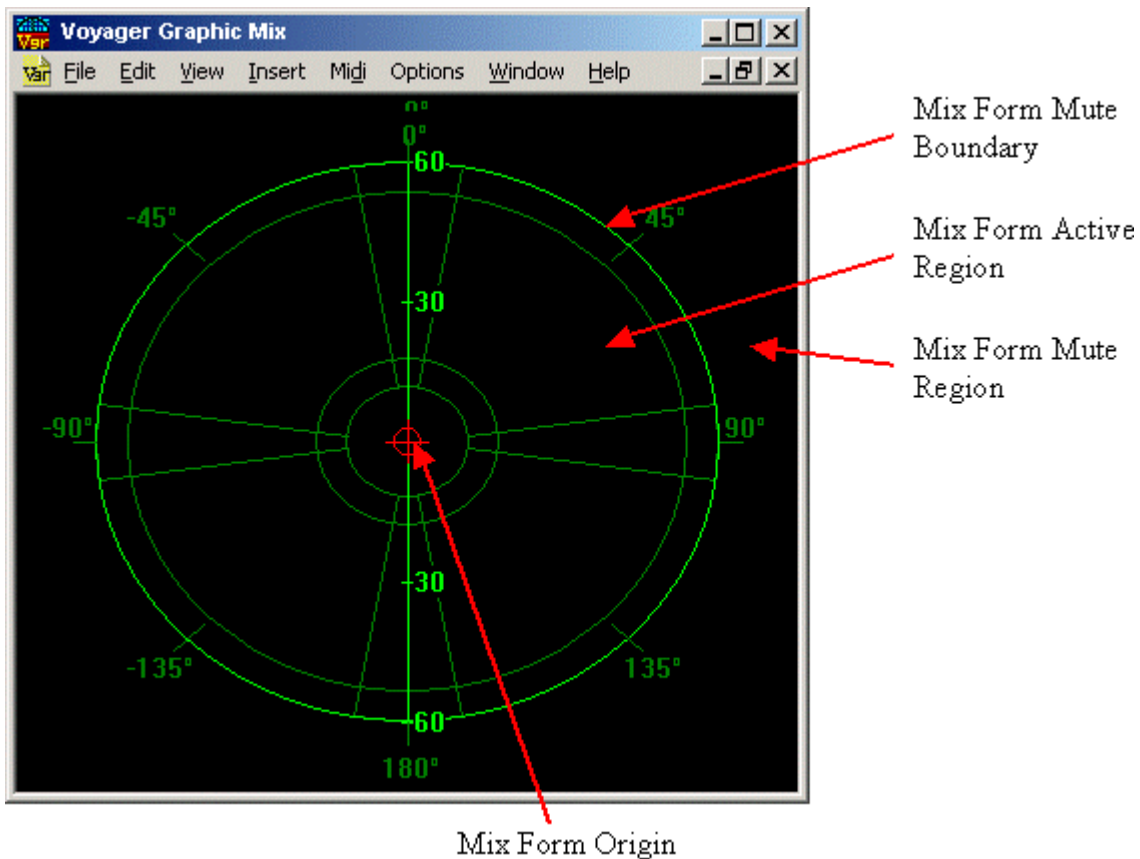


## Surround Mix Form

A Surround Mix Form is useful for creating surround-type mixes where a fader and a surround panner would be attached to the Mix Icon.

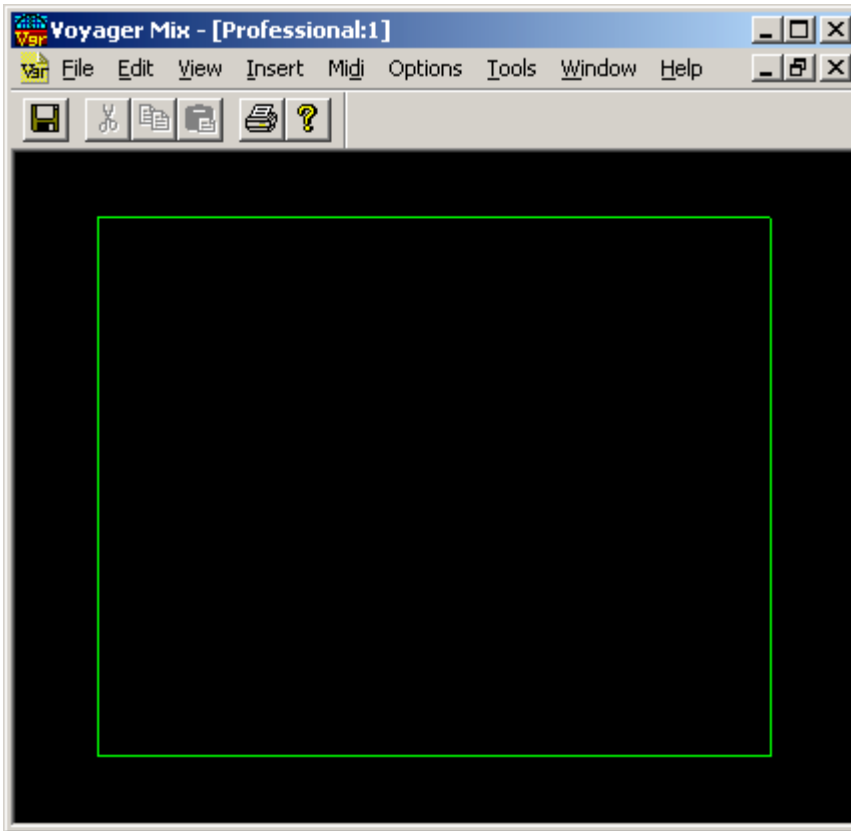
For a Surround Mix Form the range of X is +/- 100%, and the range of Y is -100% - >100%. The green boundary indicates the perimeter where the radius coordinate reaches its limit.

The Mix Form mapping using the Inverse Radius coordinate for volume level is shown.

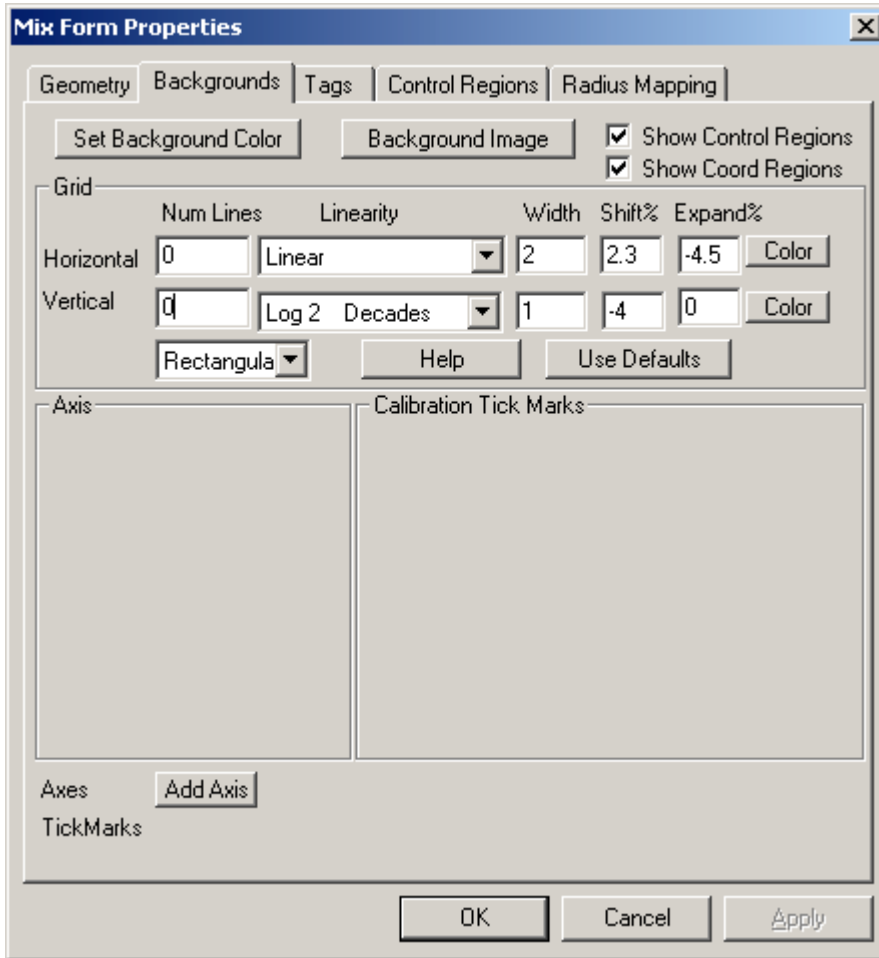


## Surround Rectangular Mix Form

A Surround Rectangular mirrors the same coordinate system as the Surround Mix Form but is more useful for non-(fader, surround pan pot) controls.



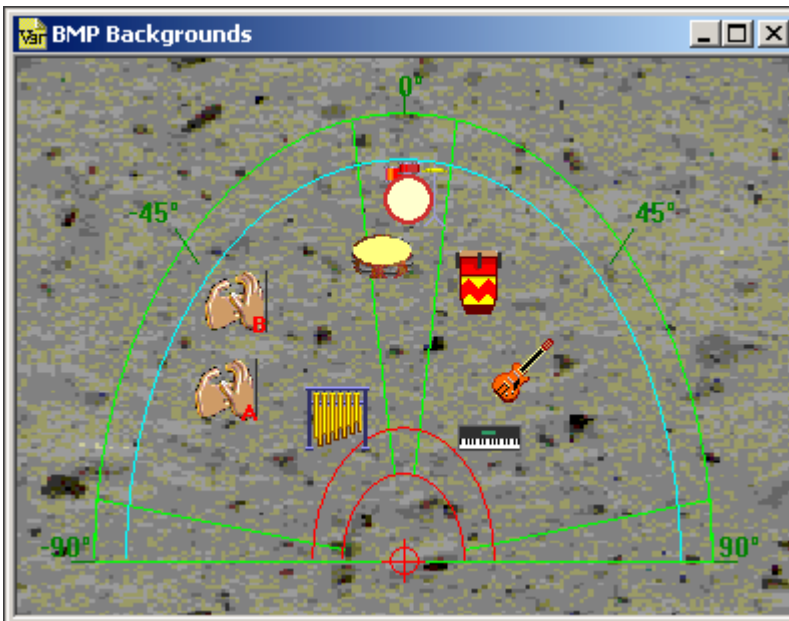
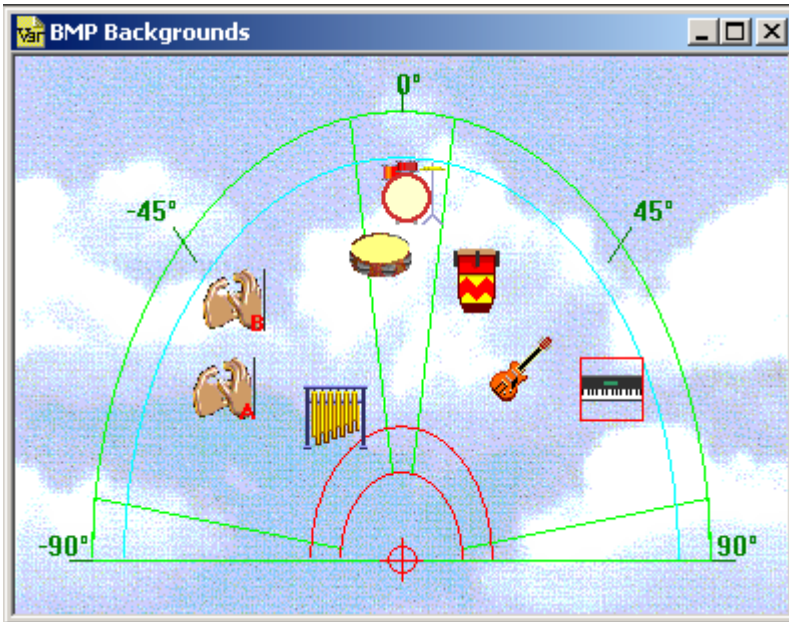
## Backgrounds



GraphiMix allows considerable customization of each Mix Form background. The background page of the Mix Form dialog box is shown above. The 'Set Background Color' button allows a selection of background colors. Black is the default background color.

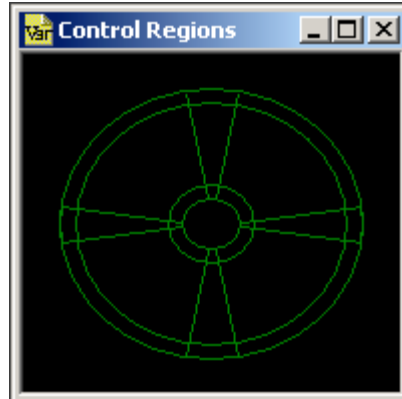
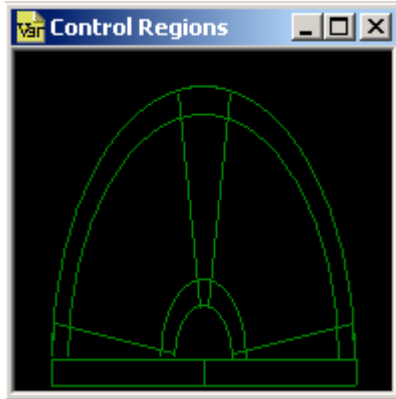
### Mix Form Background Images

The 'Background Image button' allows the user to specify a windows bitmap (BMP) image to fill the Mix Form background instead of a single color.



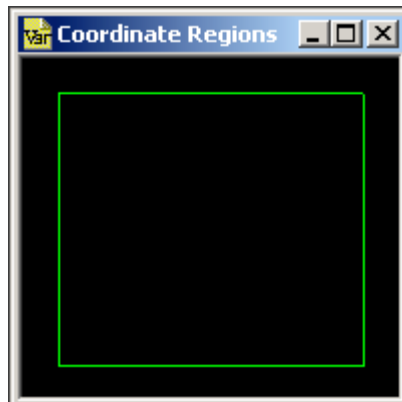
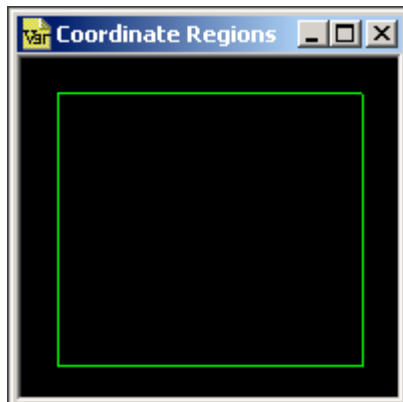
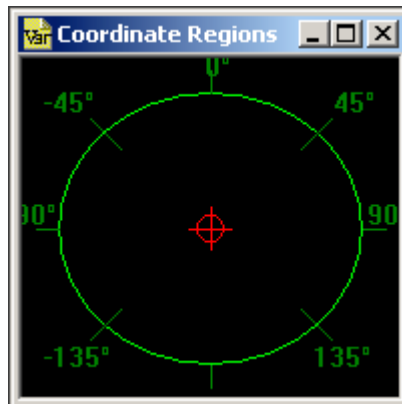
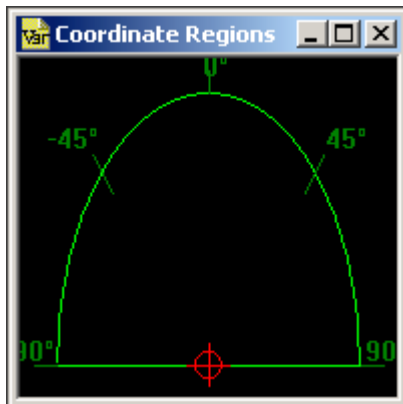
## Control and Coordinate regions

The 'Show Control Regions' checkbox allows the user to specify whether control regions are drawn over the Mix Form background.



The 'Show Coord Regions' checkbox allows the user to specify whether the Coordinate regions are drawn over the Mix Form background.

The Coordinate regions are the outer semicircle for stereo Mix Forms, the outer circle for the Surround Mix Forms, with the Mix Form Origin. The Coordinate region for rectangular Mix Forms is the outer rectangle.



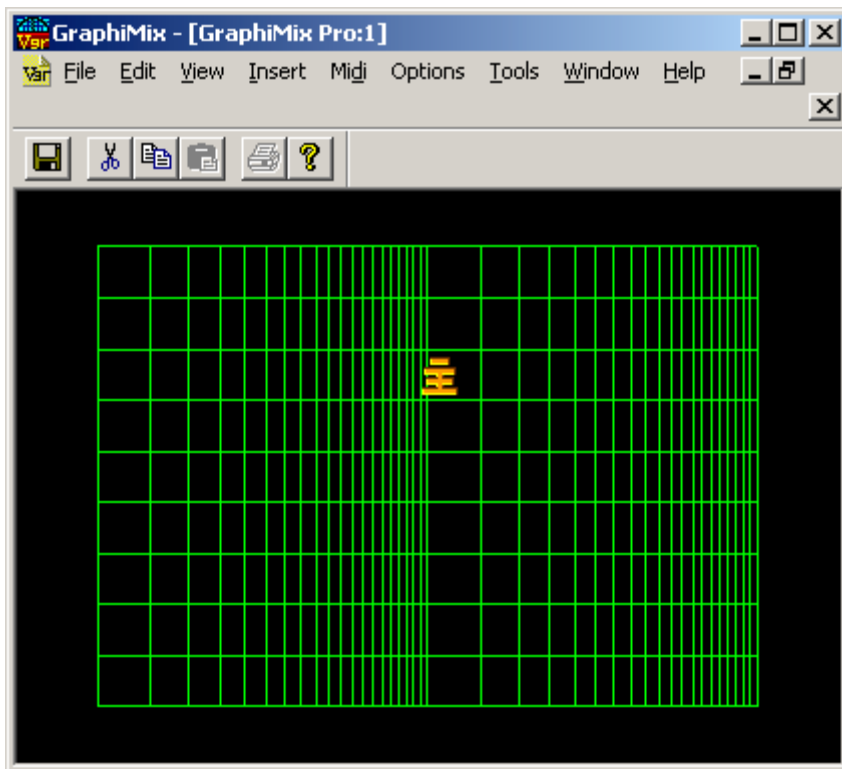
The 'Use Defaults' button removes all customization for this mix form and reverts the mix form to factory settings.

The 'Show Control Regions' check box determines whether or not control regions will be displayed. Control regions are described below.

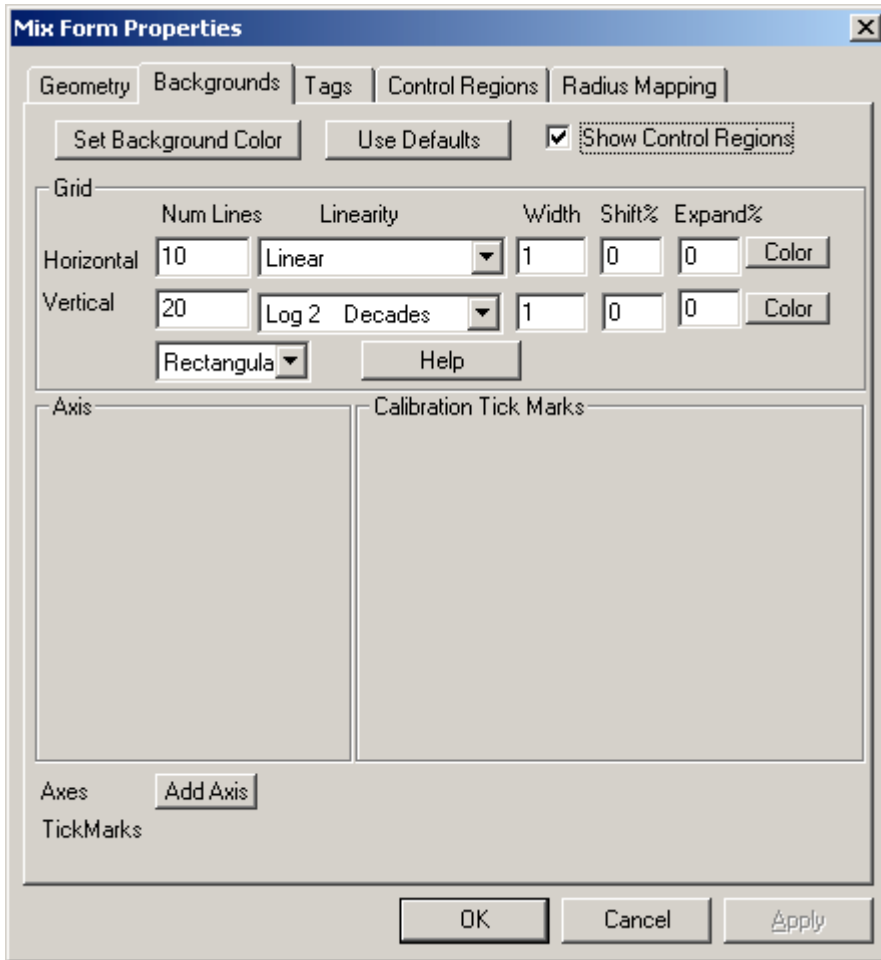
## Grids

Grids allow the user to visually calibrate a mix icon position to a particular MIDI device.

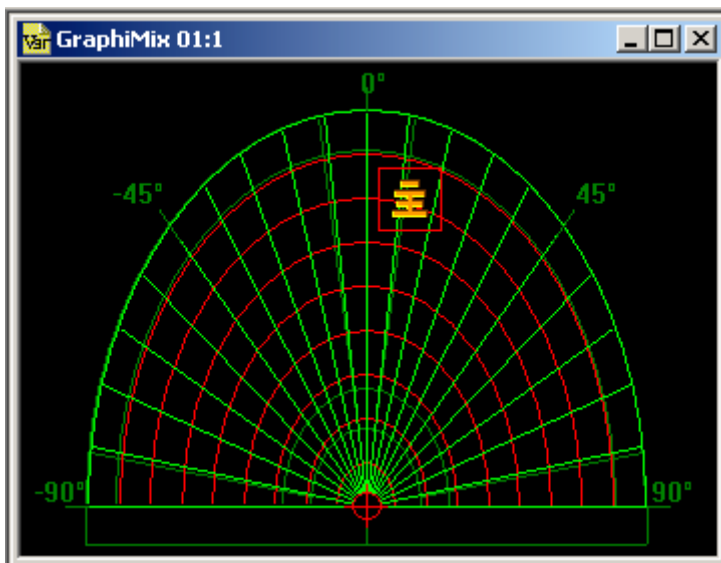
You may choose to have a horizontal grid or a vertical grid or both. For each grid, you specify the number of grid lines and the color and width of those grid lines. The linearity combo box allows you to specify either a linear grid, or one of several logarithmic or inverse logarithmic grid spacings. When using logarithmic or inverse logarithmic spacing, the number of grid lines specified is taken to mean the number of grid lines per decade. Grid lines may be rectangular or circular. Normally rectangular grids are used on rectangular mix forms and circular grids are used on circular mix forms, but there is no restriction.



Finally, each grid may be shifted by a given positive or negative percentage amount or expanded by a given positive or negative percentage amount in order to produce grids that line up exactly with user expectations for a given piece of equipment. Fractional percentage amounts such as 2.3 may be entered into any percentage field. As each change is made to the grid specification, the corresponding grid is immediately drawn in the selected mix form background. Move the dialog box if necessary to allow the mix form to be seen.



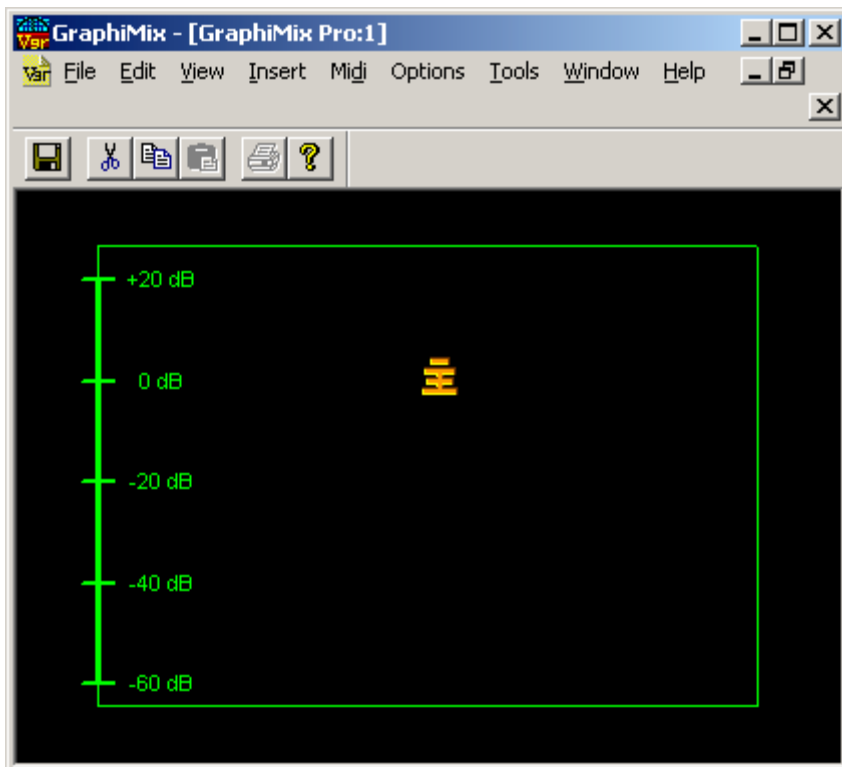
The mix form background shown above has 10 linearly spaced horizontal lines and 20 logarithmically spaced vertical grid lines per decade, with two logarithmic decades.



This mix form shows 10 radial grid lines and 20 angular grid lines.

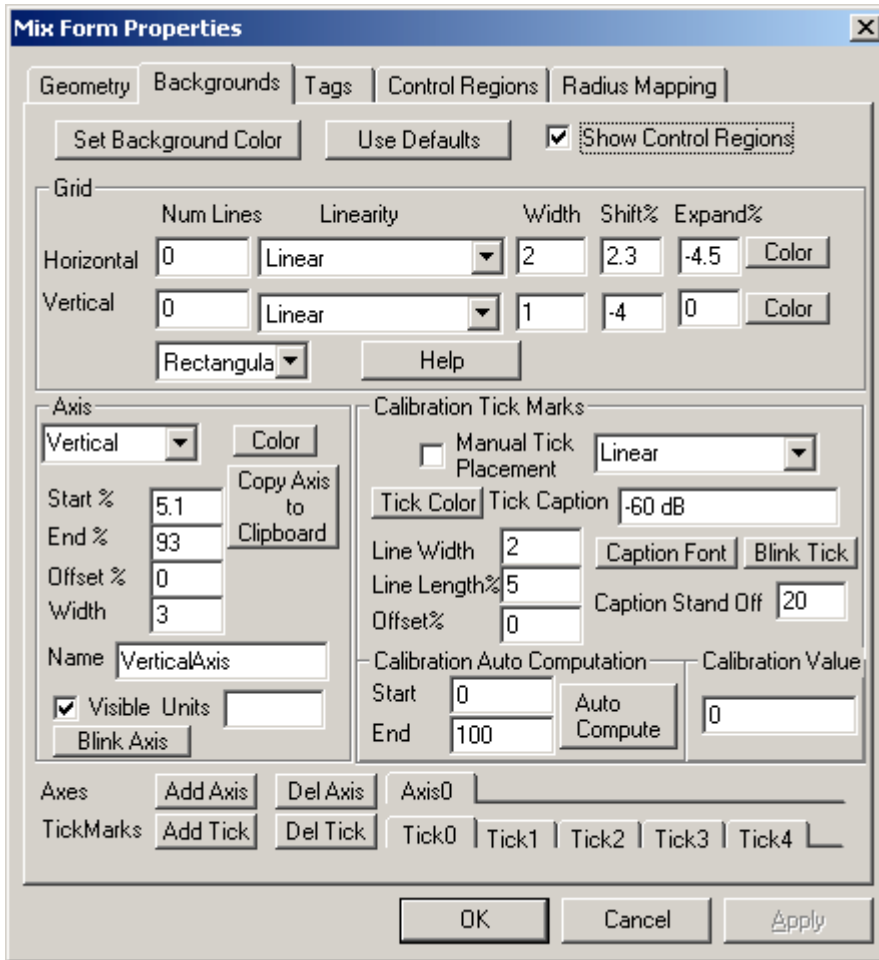
## Axes

An axis is a single line which may have any number of tick marks. A mix form may have any number of axes. To add an axis, click the 'Add Axis' button. To delete an axis, click the 'Del Axis' button. To select a particular axis, use the axis tab bar as shown below. The 'Add Axis' button always adds an axis to end of the list of axes. The 'Del Axis' button always deletes the currently selected axis.



An axis can be copied to the clipboard and 'pasted' to another Mix Form.

In the GraphiMix Pro version, Axes may also be used as calibration objects for controls to enable accurate Dynamic Status Displays that indicate the actual settings of the target hardware. See *Mix Icons, Dynamic Status*, page 68, for more information.



The axis style may be vertical, horizontal, radial, or circular, and is selected via the axis style combo box. The 'Color' button allows the axis color to be specified. Each axis has a start percent and an end percent value. These specify the starting and ending position of the axis in terms of the range over which MIDI is normally active on the mix form. However you may force the axis to start or end outside of this range by entering values outside of the range from 0 to 100. For example, an axis may start at -5.6% or end at 120%. The offset box specifies the position of the axis in the direction perpendicular to its length, again in terms of a percentage of allowable range.

The axis has a name. This name can be used to specify this axis as a calibration object for a particular control for a particular Mix Icon.

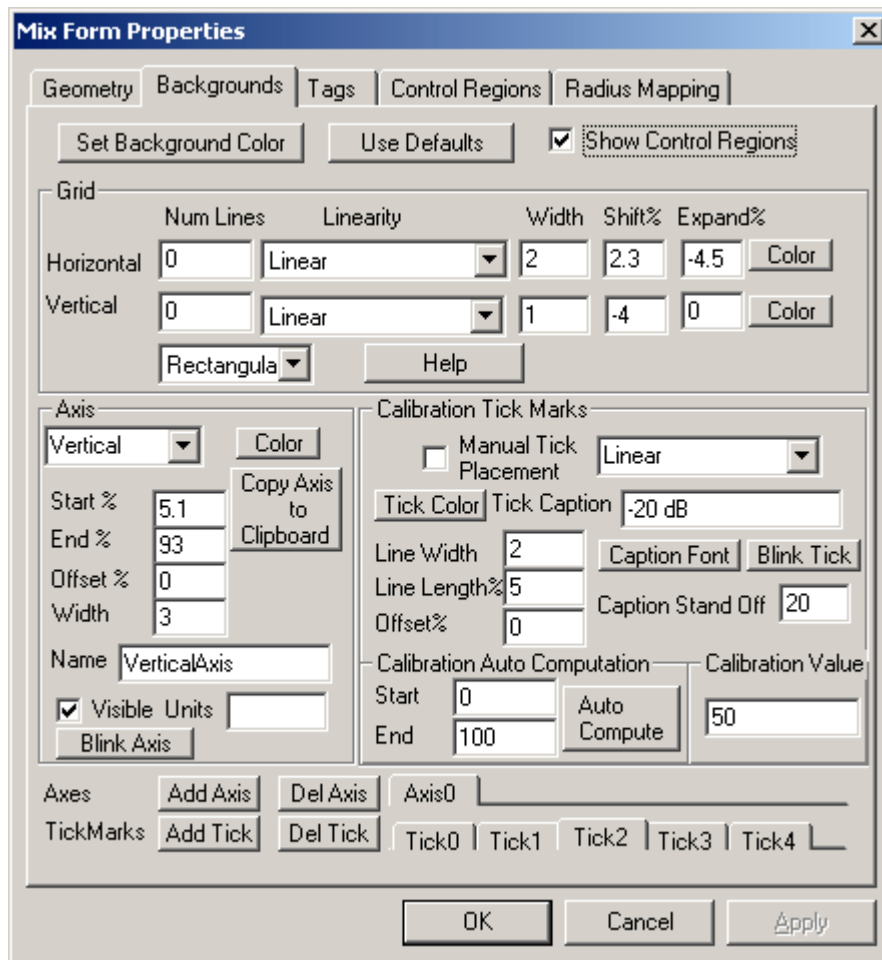
The axis may be visible or invisible. If an axis is used to specify a particular calibration for a particular control using dynamic status displays, it may be desirable to inhibit the actual display of the axis. In this case, the 'Visible' checkbox can be unchecked.

An axis can have its units specified such as 'dB', 'Hz', etc.

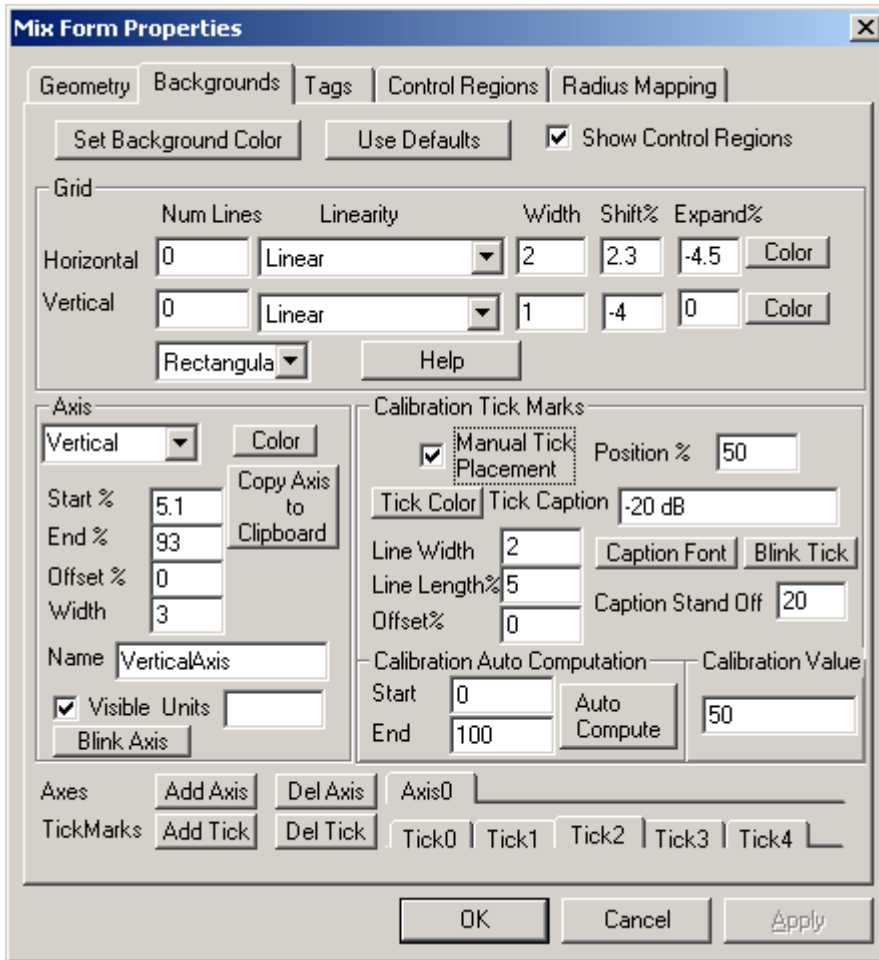
If multiple axes are available on this Mix Form, it may be difficult to discern which axis is being modified. The 'Blink Axis' button blinks the corresponding axis on the Mix Form for identification.

## Tick Marks

Tick marks allow calibration marks to be placed on axes. Each axis may have any number of tick marks. To add a tick mark, use the 'Add Tick' button. To delete a tick mark, use the 'Del Tick' button. To navigate among the tick marks for a particular axis, first use the axis tab bar to select the appropriate axis. Then use the tick tab bar to select the desired tick mark. The 'Add Tick' button always adds a tick mark to end of the list of tick marks. The 'Del Tick' button always deletes the currently selected tick mark.

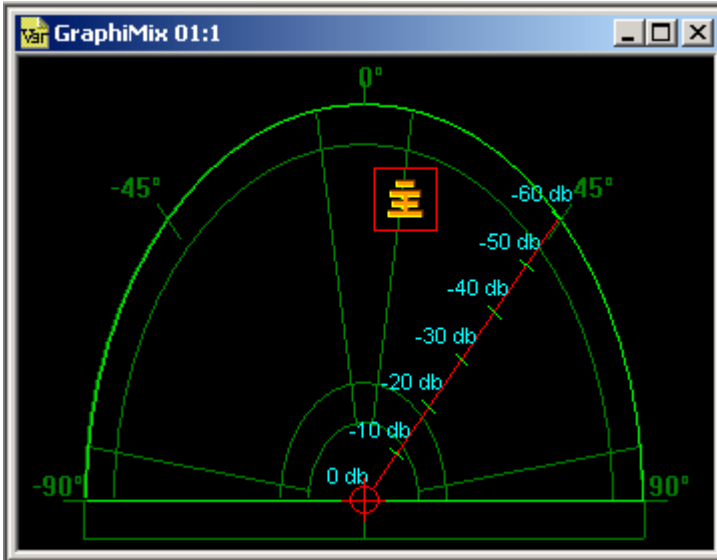


Tick marks may be placed linearly along the axis, or they may be spaced logarithmically or inverse logarithmically in any of several styles of decades. By clicking the 'Manual Tick Placement' box, the tick marks may be manually placed at any arbitrary desired position.



Tick marks have a width, a color, a length, and an offset. The offset percent is in the direction perpendicular to the associated axis. The offset percentage may be positive or negative.

An optional caption can be shown next to each tick mark. The caption standoff percentage is adjustable as well as the caption font and color.



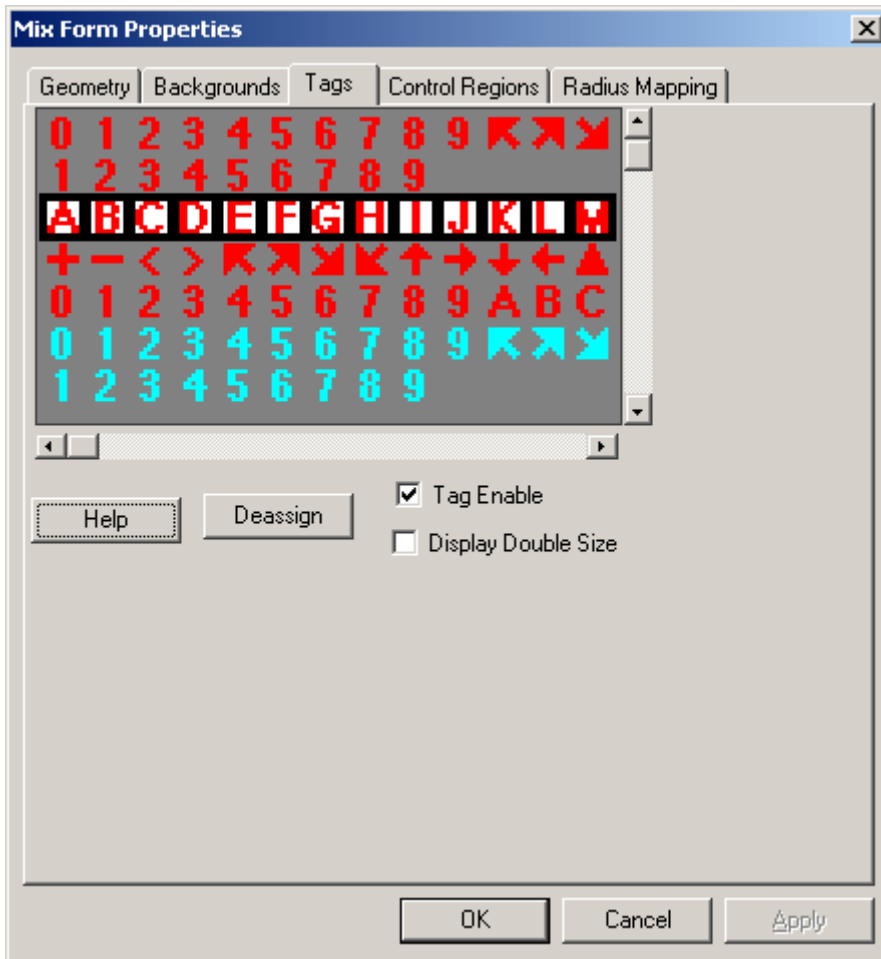
The above example shows a radial axis in red with 7 linearly spaced tick marks, each with a blue caption.

Each tick mark has an associated Calibration Value which is used to provide calibrated Dynamic displays for individual Mix Icons and their attached controls. These Calibration Values can be set individually for each tick mark or may be automatically generated based on each tick mark's position along the axis. To set them automatically, set the Start and End values in the Calibration Auto Computation box, and then click Auto Compute.

## Tags

When two identical mix icons are added to the same Mix Form (although they may be attached to different controls), tags may be optionally added to the icon image at the bottom right corner in order to visually distinguish between them. These Mix Icon Tags are automatically selected from a particular sequence which can be set by the user by clicking on a particular line of Tags in the Tag Display.

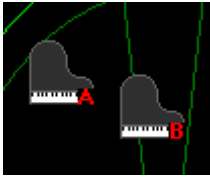
To add tags automatically, select the Tag Enable checkbox.



Tags can be displayed double size. To enable this select the Display Double Size checkbox.

To remove the selected tag sequence completely, click the Deassign button. This has the same effect as deselecting the Tag Enable checkbox.

Here is an example of identical icons with Tags attached.



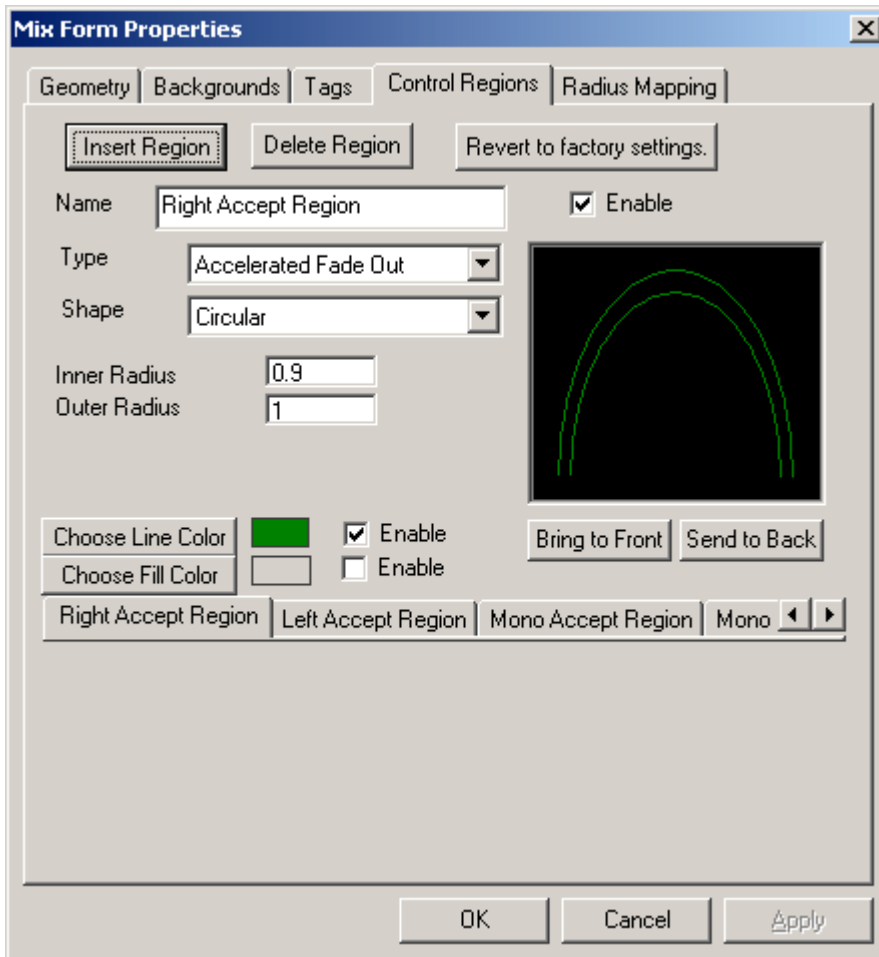
### ***Control Regions***

Control Regions are intended to be user definable regions where the user can define custom coordinates. These coordinates can be non-linear mappings of the underlying coordinate (such as Radius) or can be completely independent. This would allow the user to customize the response of any particular control or set of controls when in this region. These regions are drawn on the Mix Form in light green to give a visual indication of the location of these regions.

For example, a crescent-shaped region could be implemented in the Stereo Mix Form that was next to the Radius Boundary that could be an Accelerated Fade Out region. Instead of the control's value being strictly proportional to the Radial distance from the Mix Origin, The values could 'accelerate toward fadeout' when the Icon was in this region. This would allow a tradeoff between coarser control at the lowest volume settings of the fader (when the Mix Icon was in this control region), for finer control at the higher volume settings (when the Mix Icon is in the central region of the Mix Form).

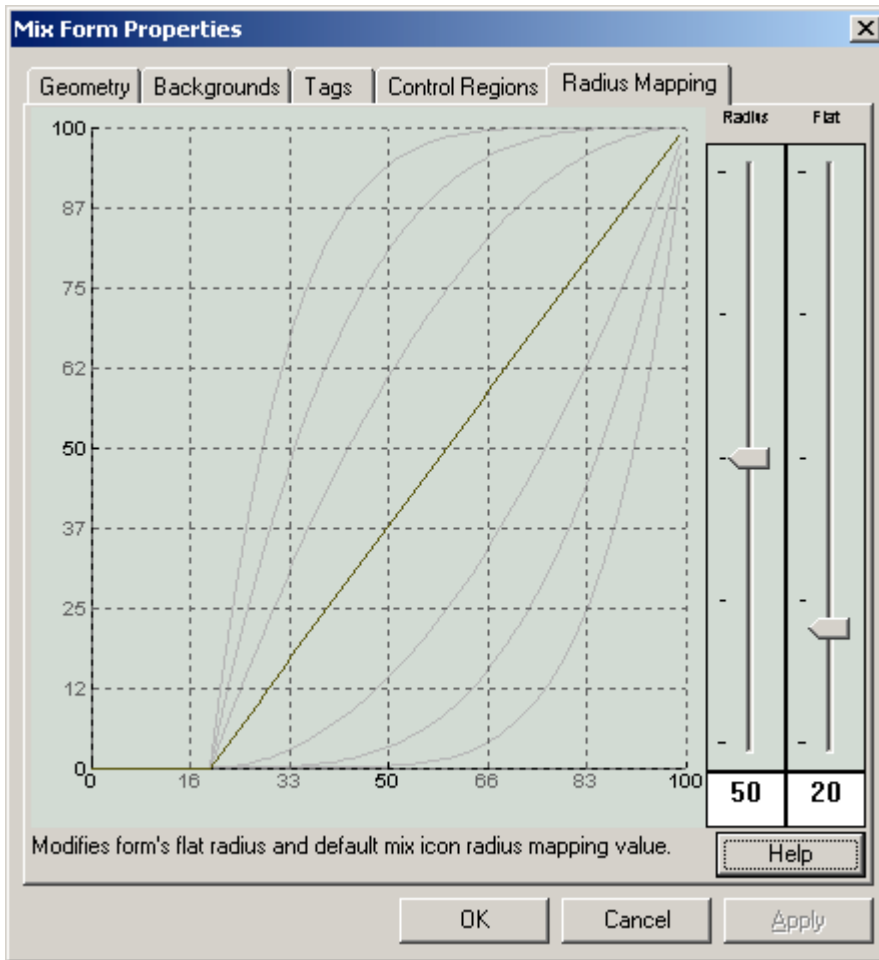
This can be very useful in mapping EQ settings to a particular area of a Stereo Mix form for automatic effects changes with Icon position.

At this point in GraphiMix development, control regions only draw, and there is no provision yet for defining custom coordinates to be used by controls attached to Mix Icons.



## ***Radius Mapping***

Radius Mapping is a mapping from the physical radius of a mix icon (on the Mix Form) to the value that is converted into MIDI. The mapping may be linear or non-linear. Radius mapping allows the user to make better use of the available space on a mix form and to match the characteristics of hardware devices. For example, there may not be enough room near the center of the mix form to conveniently place all of the mix icons that need to be near the center. In this case, the radius mapping mechanism can allow the user to effectively expand the center region to make more room.

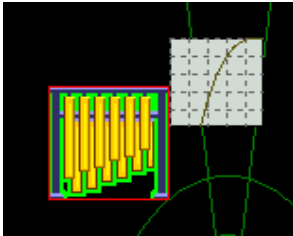


The horizontal axis in this graph shows the Mix Icon radius as shown on the Mix Form. The vertical axis represents the output value sent to the control. Note that at the left side of the graph, there is a 'flat' area where the output value is zero, yet the icon has a small radius. If 'inverse radius' is used as the control coordinate this icon radius would represent a control maximum value, i.e. the vertical axis would be inverted.

There are two parts to the radius mapping. The first part is the 'flat radius' value. The flat radius value allows the user to specify a radius, in percent, over which the corresponding control value will be constant and 'flat' (a maximum or a minimum). All radii with a value less than or equal to the flat radius will use a mapped radius of 0 when computing MIDI input or output. Each mix form has a single value of the flat radius value. All mix icons on the same mix form share the same flat radius value. When the flat radius is changed for one mix icon, it changes automatically for all mix icons on the same mix form.

The second part of the radius mapping is the 'radius mapping value'. The radius mapping value changes the shape of the mapping curve. When the radius mapping value is small, then the slope of the mapping curve will be small at small radii and large at large

radii. When the radius mapping value is large, then the slope of the mapping curve will be large at small radii and small at large radii. When the radius mapping value is set to 50 percent, the mapping is linear, i.e. has a constant slope throughout.



The radius mapping value may also be changed by using a <control-mouse wheel> action on a selected Mix Icon. This results in a small image of the mapping being shown at the cursor position. In this case the flat radius value is not changed.

The radius mapping attributes may be modified in a total of four different ways:

Action	Flat Radius Value	Radius Mapping Value
Right Click On Mix Icon, select Properties, then select Radius Mapping Tab	Changes flat radius for all mix icons on the mix form.	Changes radius mapping for this mix icon only
Right Click On Mix Form, select Properties, then select Radius Mapping Tab	Changes flat radius for all mix icons on the mix form	Changes the default radius mapping used by new mix icons
The Edit Preferences Menu (Select Radius Mapping Tab)	Changes the default flat radius used by new mix forms	Changes the default radius mapping used by new mix forms.
Control-Mouse wheel	No Change	Changes radius mapping for this mix icon only

### ***Mix Form Groups***

Mix Form Groups were created to allow GraphiMix to automatically display related controls, for example, the EQ and Aux Sends, when a Mix Icon is selected.

The Mix Form Group feature allows the engineer to assign each Mix Form to a specific, named group. When GraphiMix is in Mix Form Group Mode, all Mix Forms which are a member of the same 'Mix Form Group' will appear at one size and location on the screen.

Additionally, any Mix Icon that is selected and is linked to a Mix Form that belongs to a group will cause that icon's Mix Form to be displayed, and the previously visible Mix Form (linked to a different icon) will be automatically hidden.



Standard Toolbar

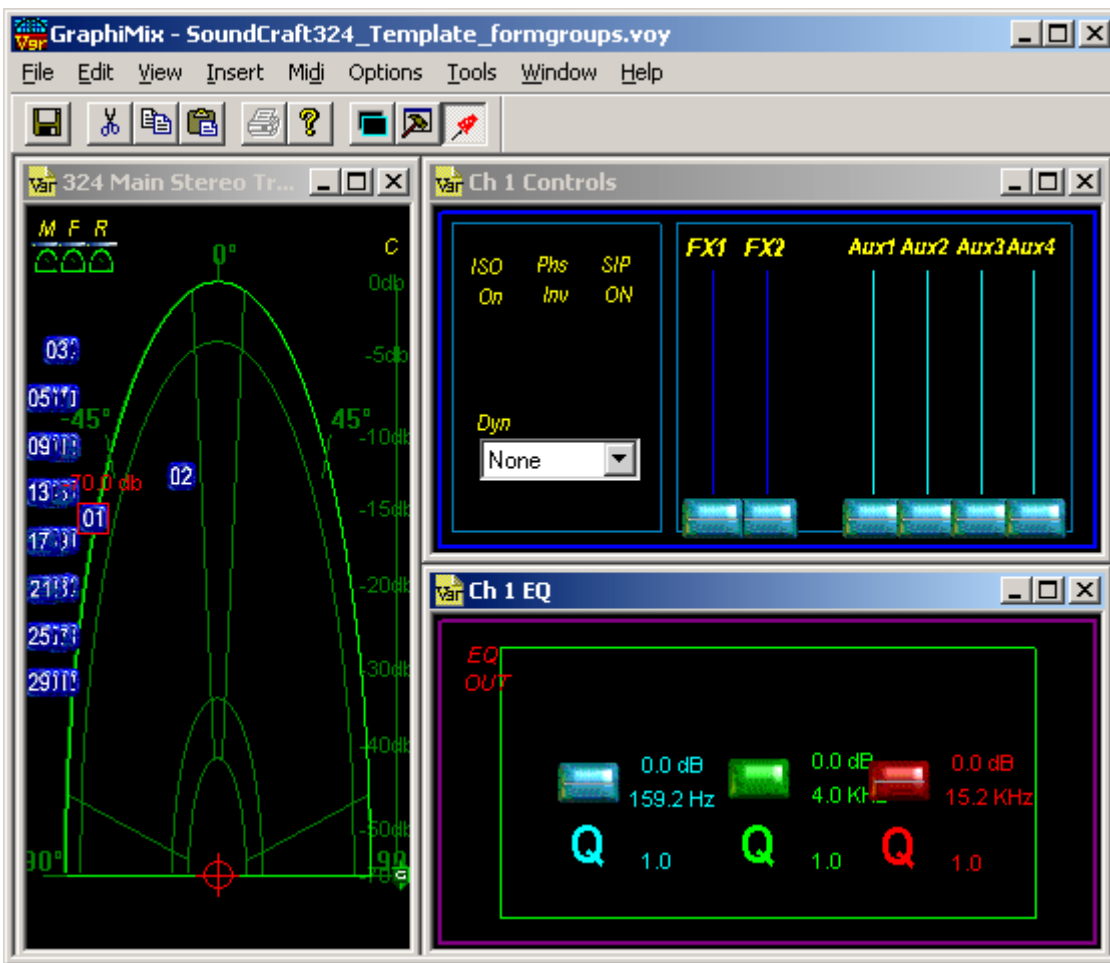


Mix Form  
Groups Off

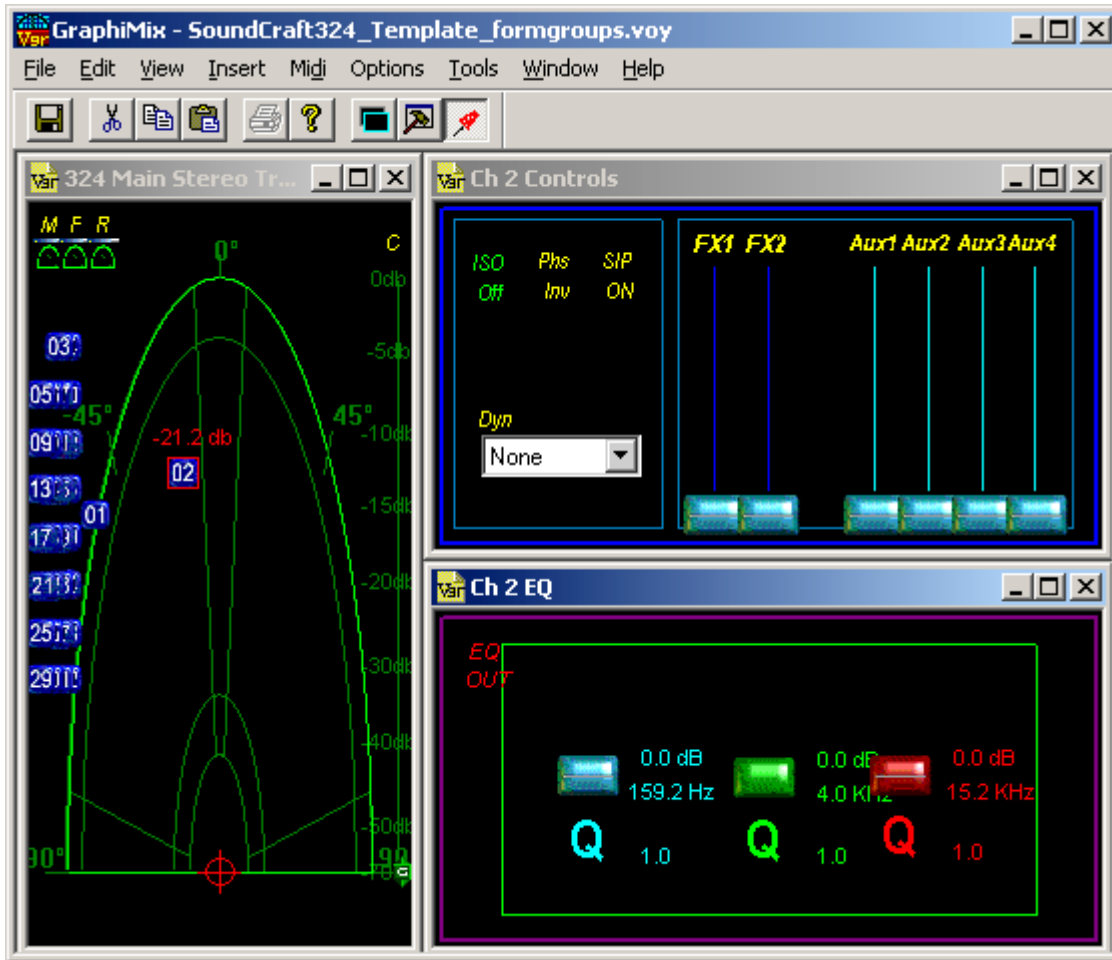


Mix Form  
Groups On

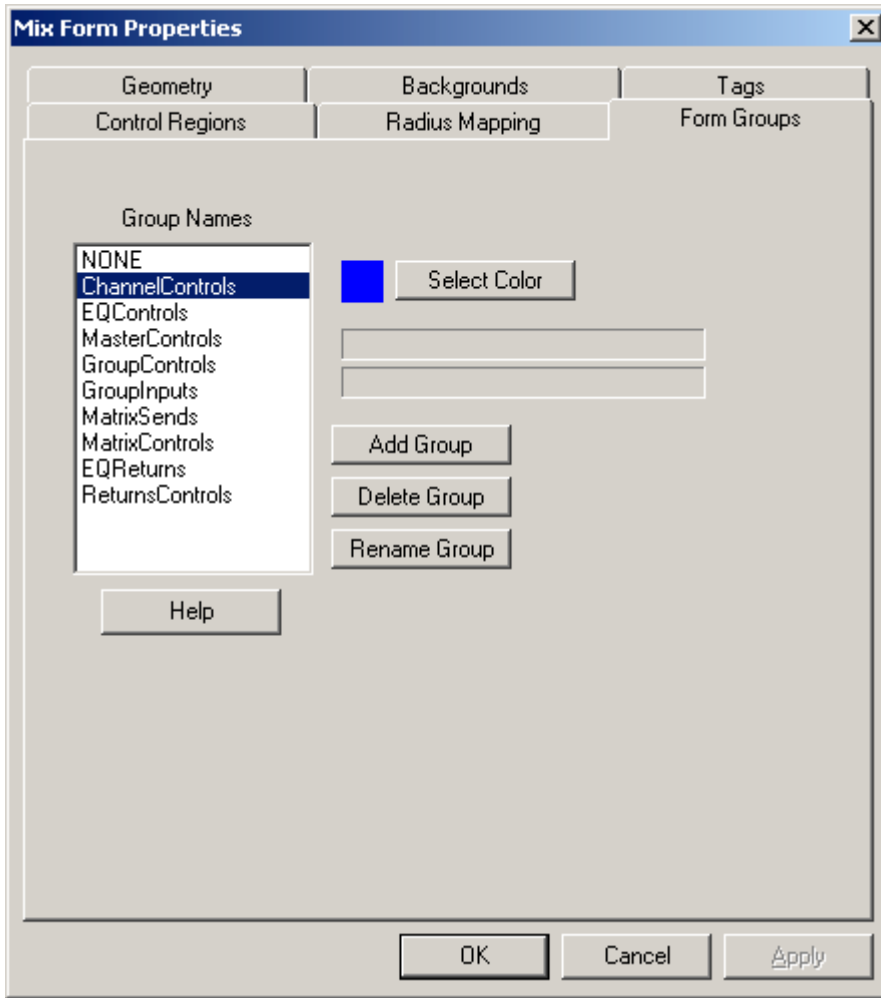
For example, if the EQ Mix Form for channel 1 is made visible by selecting it on the Mix Icon's context menu, it will show the EQ settings for that channel. Then, if the engineer subsequently clicks on the Channel 2 Mix Icon, the EQ Mix Form for channel 2 will automatically replace the one for channel 1, showing at the same size and location.



Channel 1's Control and EQ forms are shown in Mix Form Group Mode. Each form is a member of a separate Mix Form Group.



Now, channel 2's Mix Icon is selected. The respective Controls and EQ Mix Forms are automatically displayed at the same position and size as the previous channel's Mix Forms.



Each Mix Form Group can be assigned a color. When in Mix Form Group Mode, Mix Forms will display this color as a colored box around the outside of the selected Mix Form, indicating that GraphiMix is in this mode and that the selected Mix Form is a member of a specific Mix Form Group.

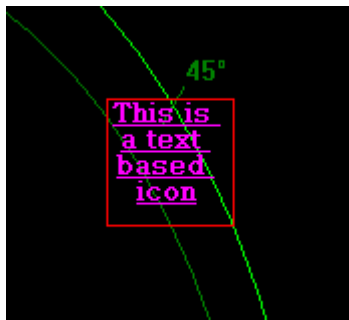
## Mix Icons and Controls

A Mix Icon typically represents a single source of sound or a collection of controls to be changed together to affect a single source of sound.

Examples of Mix Icons are:



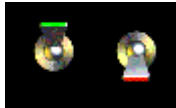
Normal Mix Icons (included with the GraphiMix) as instruments.



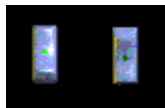
A custom text-based icon. Note that the background can be made transparent.



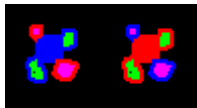
Three text-based icons. Foreground and background colors are selectable.



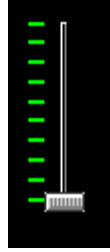
A switch icon. These can be used as normal Mix Icons and additionally add two coordinates (SwitchToOn and SwitchToOff) to the Mix Icon Coordinates available to a control.



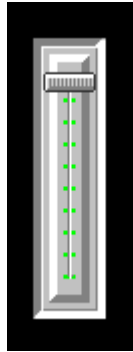
Another switch icon. These can be customized by user-supplied BMP files for each switch state.



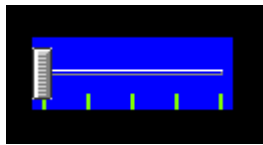
Another switch icon. A switch icon doesn't have to look like a switch.



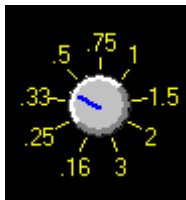
A vertical fader icon. These can be customized to suit almost any 'look'. These also can be used as normal Mix Icons and additionally add 2 new coordinates (Fader and InverseFader) to the list of Mix Icon Coordinates available to a control.



Another variant of a vertical fader.



An example of a horizontal fader.



A knob fader. This can be highly customized. A knob fader supports optional 'tick labels'.



An Indexed List Icon. This icon displays a text string that corresponds to the value received or sent. This text string is contained in a file of text strings which represent all possible values for this control. A typical use for this type would be to set a router or to simulate a multi-position switch.

A Mix Icon can represent an individual instrument on a MIDI composition or an input on a hardware mixer. An individual Mix Icon can have multiple audio controls attached to it. Each audio control would affect some parameter of the particular sound source or input channel. These controls can be faders, pan-pots, equalization controls, reverb controls, or anything that can be controlled by sending commands to it. It could even be a lighting controller used in a live venue.

When a Mix Icon is placed on a Mix Form it will have Mix Form Coordinates defined which characterize where the icon is placed relative to the Mix Form.

Any individual control can be 'attached' to a particular Mix Form Coordinate. These coordinates are translated by a Data Type method and the MIN and MAX settings, and any Radius Mapping settings, to the hardware control value. This value is then sent to the actual audio control with a message protocol that is defined by the selected GraphiMix VSL file.

This allows for extremely flexible configuration and control of arbitrary MIDI compatible hardware. A Mix Icon is placed on a Mix Form by first selecting the View Menu->View Icon Windows... menu entry. This brings up the VLB Windows dialog which contains a list of Mix Icon Directories. By selecting one or more of these directories, windows will appear which contains libraries of predefined icon images. Select an icon by depressing the left mouse button and drag it to the Mix Form. Release the left mouse button. This copies the selected icon to the selected Mix Form. An alternative way is to use the Insert Menu->New Mix Icon path.

Mix Icons can be moved between VLB windows by dragging and dropping them. New VLB directories can be created by right-clicking on the VLB Windows dialog. Once created, a VLB directory can be renamed or deleted by right-clicking on the selected VLB directory.

To select the Mix Icon Properties right-click on the selected Mix Icon. See *Mix Icon Properties*, page 54, for more information.

## **Moving Mix Icons within the Mix Form**

The Mix Icon can be moved around the Mix Form in various ways. The most direct way is to 'click and drag' the Mix Icon with the mouse. When a Mix Icon is selected, it is outlined with a red square. A selected Mix Icon will also receive commands from the keyboard.

When clicking and dragging with a mouse, the 'feel' of the Mix Icon movement can be adjusted, on a per Icon basis, in the Mix Icon Properties tab. This tab contains a slider bar for 'Mouse Smoothing During Drag Operations'. This allows the Mix Icon's responsiveness to be adjusted from 'quick and responsive' to 'slow and smooth'. See *Mix Icon Properties*, page 54, for more information.

The 'up' and 'down' arrow keys will move the selected icon in a radial direction if the Icon's movement is unconstrained (set in the Mix Icon Properties tab) or in a linear direction if the icon is in ConstantX or ConstantY mode.

The 'left' and 'right' arrow keys move the icon in an angular direction if the Icon is unconstrained or in a linear direction if in ConstantX or ConstantY mode.

If the space bar is typed when an icon is selected, the Mix Icon enters 'Mouse Lock Mode'. This 'attaches' the Mix Icon to the mouse without having to click and drag. In this mode, any movement of the mouse is reflected in movement of the selected Mix Icon. To 'release' the Mix Icon and leave 'Mouse Lock Mode', type the spacebar again.

On a stereo or surround mix form, the mouse wheel will cause the selected unconstrained mix icon to move along its radius. A <shift>-mouse wheel will move the selected unconstrained mix icon along its theta direction. On a rectangular mix form the mouse wheel moves an unconstrained mix icon in the y direction while a shift mouse wheel moves the icon in the x direction. If the icon has constraints then the movement of the icon will be modified by those constraints.

A <control>-mouse wheel changes the mix icon's radius mapping property. Radius mapping is described in a separate section of the user's manual.

Received messages can also cause the Mix Icon to move. If the Mix Icon has been moved by 'Internal' commands (mouse, keyboard) then it will ignore any commands coming from 'External' sources (i.e. MIDI) for a short time after the last Mix Icon move. This time is set by the Control Change Source Standoff Timer (CCSST) in the Edit->Preferences Menu.

Not all received messages will produce Mix Icon movement. Mix Icons only respond to MIDI messages if the Control Data Type is set to 'Fader', 'PanPot', or 'Surround PanPot'.

The internal state of a Mix Icon can be changed by holding down the <Control> key when clicking on the Mix Icon. For example, a <control-click> on a Switch icon, toggles the switch state On or Off. By holding down the <control> key and clicking and dragging the 'knob' or 'fader' handle, one can change the setting of the knob or fader without moving the icon on the Mix Form.

If the checkbox entitled 'Left Click Adjusts Fader Value' is checked in the Mix Icon Properties dialog, then the states described above are accessed without the use of the <control> key. For example, if this mode is set, a switch will toggle with a simple left click instead of a <control-left click>. A simple <left click-and-drag> will change the knob or fader value, instead of adjusting the position of the control on the Mix Form.

A <shift-left click> on a Mix Icon toggles the 'Solo' state on and off. A <shift-right click> on a Mix Icon toggles the 'Mute' state on and off. Controls could be attached to these states to switch a channel on a mixer to a 'Solo' or 'Mute' setting. The Mute and Solo states can also be accessed by using the Mix Icon's context menu (<right-click> on the Mix Icon).

## **Mix Icon Linking**

Mix Icons can be linked together. This provides the ability to 'gang' controls together, only in a much more flexible way than conventional consoles. When icons are linked, the

position of a Master Icon controls the positions of one or more Slave Icons. There are many different kinds of links that control how the Slave Icon moves with respect to the Master Icon.

To link a Master Icon to a Slave Icon, first click on the Link Button on the Mix Form Tool Bar. If the tool bar is not currently shown, click on the View menu->View Mix Form Tool Bar entry first.

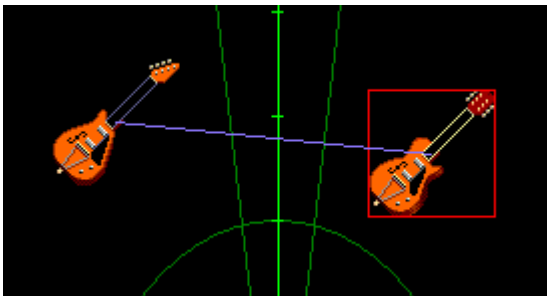


After selecting Linking Mode, the cursor changes to a 'chain-link' cursor. Click on the desired 'Master' Mix Icon and then click on the desired 'Slave' Mix Icon.

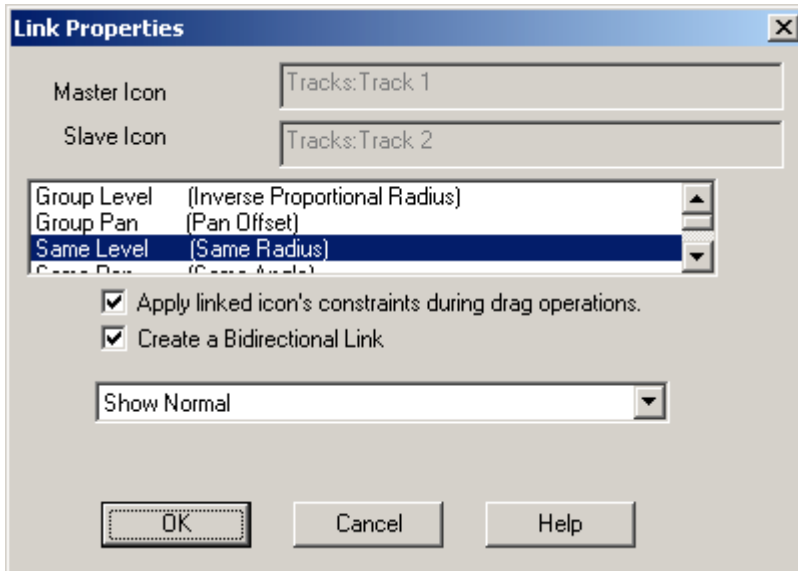
At this point, the link properties dialog will appear, prompting the user to choose the appropriate link type. Select the link type and properties and then click 'OK'.

A link has now been created between the Master and the Slave Mix Icons. To view and change the link properties, right-click on the drawn link. In order to see the created link, select the View Menu->View Links selections. The engineer can select all links to be drawn or only the links attached to the Master Mix Icon in the Options Menu->Link Options dialog.

The Master and Slave Mix Icons can be on different Mix Forms. Links can also be circular in the sense that a Master Mix Icon can also be a Slave at the same time. The only restriction is that a Mix Icon cannot be a slave to two different Icons at the same time as this would represent a conflict of control. To automatically create a bidirectional link, check the 'Create a Bidirectional Link' checkbox in the properties dialog.



By right-clicking on the link, the Link Properties tab will be shown. The user can select the linking rules in effect for this link.



Link types are:

<p>Group Level (Inverse Proportional Radius)</p>	<p>This is essentially the 'Master Fader' link type. As the link Master Mix Icon is adjusted from maximum (inner radius) to minimum (outer radius), the Slave Mix Icon is adjusted from (where it was when the link was created) to the minimum (outer radius). This is most useful as a single direction link. Multiple Slave Mix Icons, with settings at different levels, could all be faded out to the minimum settings, by adjusting the single Master Mix Icon.</p>
<p>Group Pan (Pan Offset)</p>	<p>This link type maintains a constant 'Pan Angle' offset between the Master Icon and the Slave Icon(s).</p>
<p>Same Level (Same Radius)</p>	<p>This link type sets the Slave icon to the same radius (with respect to Max and Min) as the Master icon. This is equivalent to 'grouping faders' on a conventional mix console. The slave pan angle is not changed.</p>

Same Pan (Same Angle)	This link type sets the Slave icon to the same pan angle as the Master icon. This is equivalent to 'grouping panpots' on a conventional mix console. The slave radius (volume level) is not changed.
Cross Fade	This link type sets the Slave icon to the inverse radius (with respect to Max and Min) as the Master icon. This is useful to 'cross-fade' level controls.
Cross Pan	This link type sets the Slave icon to the opposite pan angle as the Master icon. This is useful for 'cross-pan' arrangements.
Same Level and Pan	This link type sets the Slave icon to the same radius and pan angle as the Master icon. This is equivalent to 'grouping faders and panners' on a conventional mix console.
Same Level, Mirror Pan (Horizontal Mirror)	This link type sets the Slave icon to the same radius but (front-to-back) opposite pan angle as the Master icon. The Slave icon pan angle behaves as if it were reflected in a 'horizontal mirror'. This is most useful on Surround Mix Form types.
Same Level, Mirror Pan (Vertical Mirror)	This link type sets the Slave icon to the same radius but (left-to-right) opposite pan angle as the Master icon. The Slave icon pan angle behaves as if it were reflected in a 'vertical mirror'.
Same Level, Opposite Pan (Spherical Mirror)	This link type sets the Slave icon to the same radius but (left-to-right <i>and</i> front-to-back) opposite pan angle as the Master icon. The Slave icon pan angle behaves as if it were reflected in a 'spherical mirror'. For example, if the Master icon is placed to the front and right, the Slave icon will be positioned to the rear and left.

Same X	The Slave Icon has the same X coordinate as the Master Icon, its Y coordinate is preserved.
Same Y	The Slave Icon has the same Y coordinate as the Master Icon, its X coordinate is preserved.
Offset Label (Constant X/Y Offset)	The Slave Icon maintains a constant X and Y offset relative to the Master Icon. This is primarily useful if the user wants to 'label' a mix icon (for example, label a knob with a 'picture' of the content on that channel). This way the picture will track the position of the link Master icon.
Inverse Group Level (Proportional Radius)	This is essentially the 'Inverse Master Fader' link type. As the link Master Mix Icon is adjusted from maximum (inner radius) to minimum (outer radius), the Slave Mix Icon is adjusted from the maximum (inner radius) to (where it was when the link was created). This is most useful as a single direction link in a Master Fader configuration where the user has set the outer radius as the maximum volume or signal level.
Group Switch	This link type allows switches to be ganged together. The Master icon switch setting controls the switch settings of the linked Slave icons. The positions of the icons on the mix form are not changed.
Group Switch and Position	This link type allows switches to be ganged together. The Master icon switch setting controls the switch settings of the linked Slave icons. The positions of the icons are also linked for both Pan and Fade (angle and radius).

Group Mute	This link type allows the Mute state of Mix Icons to be ganged together. The Master icon mute setting controls the mute settings of the linked Slave icons. The positions of the icons on the mix form are not changed.
Group Mute and Position	This link type allows the Mute state of Mix Icons to be ganged together. The Master icon mute setting controls the mute settings of the linked Slave icons. The positions of the icons are also linked for both Pan and Fade (angle and radius).
Group Solo	This link type allows the Solo state of Mix Icons to be ganged together. The Master icon solo setting controls the solo settings of the linked Slave icons. The positions of the icons on the mix form are not changed.
Group Solo and Position	This link type allows the Solo state of Mix Icons to be ganged together. The Master icon solo setting controls the solo settings of the linked Slave icons. The positions of the icons are also linked for both Pan and Fade (angle and radius).
Group Mute, Solo, and Position	This link type allows the Solo and the Mute state of Mix Icons to be ganged together. The Master icon solo and mute settings controls the solo and mute settings of the linked Slave icons. The positions of the icons are also linked for both Pan and Fade (angle and radius).
Group Fader	This link type allows the Fader (or knob) position of Mix Icons to be ganged together. The Master icon fader settings controls the fader settings of the linked Slave icons. The positions of the icons on the mix form are not changed.

Group Fader and Position	This link type allows the Fader (or knob) position of Mix Icons to be ganged together. The Master icon fader settings controls the fader settings of the linked Slave icons. The positions of the icons are also linked for both Pan and Fade (angle and radius).
Invert Switch	This link type allows switches to be ganged together inversely. The Master icon switch setting sets the switch settings of the linked Slave icons to the opposite state. The positions of the icons on the mix form are not changed.
Group All States	This link type allows the Fader (or knob) position, and the Mute, Solo, and Switch states of Mix Icons to be ganged together. The Master icon settings controls the settings of the linked Slave icons. The positions of the icons on the mix form are not changed.
Group All States and Position	This link type allows the Fader (or knob) position, and the Mute, Solo, and Switch states of Mix Icons to be ganged together. The Master icon settings controls the settings of the linked Slave icons. The positions of the icons are also linked for both Pan and Fade (angle and radius).

If the slave Mix Icon has movement constraints selected then they will ‘override’ the linking rules unless the ‘Apply linked icon’s constraints during drag operations’ box is un-checked.

Links may be shown or hidden by using the ‘Link Options...’ dialog box under the Options menu. (See Link Options below.) The combo box on the link properties dialog box allows the user to specify one of the following options:

Show Normal	Default. Show only links or selected mix icon or show all links depending on link options setting.
Show Even If Disabled	Show this particular link even if it would not normally be shown.

Hide Even If Display Is Enabled	Hide this particular link even if it would normally be shown.

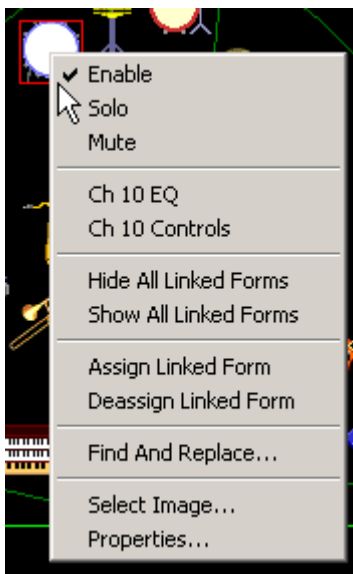
To remove a link, select it with a left-click, and then type the <DEL> key.

Note that a ‘Bidirectional link’ is really two independent, cross-pointing unidirectional links. It is possible to delete one link of the two (using the Mix Icon Properties dialog), even if the “Create a Bidirectional Link” checkbox is set. If you have difficulty with this, simply delete both links and create them anew.

## Mix Icon Linked Mix Forms

In GraphiMix, a <right-click> on an Icon brings up a context menu. One of the selections (in Build Mode) is “Assign Linked Form”. An Icon can be linked to one or more Mix Forms, which are referred to as ‘Linked’ Mix forms. These are commonly used to hold equalization or effects controls for a particular channel which is represented as a Mix Icon.

All Linked Mix Forms that are linked to a particular icon will show up as entries on that Mix Icon’s context menu for easy selection. Note that any type of control can be placed and used on a Linked Mix Form. Multiple Mix Forms can be linked to a single Icon. Once assigned, linked Mix Forms can be deassigned, hidden, or shown. Note that the ‘Linked’ form actions (Hide, Show, Assign, Deassign) and the Find and Replace entry are only shown on this context menu when GraphiMix is in ‘Build’ mode.



## **Normal Mix Icons**

A Normal Mix Icon is a Mix Icon with four internal states ( Solo On and Off, Mute On and Off). It is represented by an image that may be made from text with selectable background and foreground colors and fonts, or graphics imported from a windows bitmap file (BMP). Compressed bitmaps are not currently supported. Each Mix Icon has 3 types of images associated with it, the Normal image, the Bright image, and the Dim image. The Normal image is the image displayed when the Icon is in active use. The Dim image is displayed when the Mix Icon is in the 'Mute' state, or when the Icon is disabled. The Bright image is displayed when the Mix Icon is put into the 'Solo' state. Each normal Mix Icon image type has 3 sizes that it can switch to depending on the size of the Mix Form that it is placed on and the setting in the Options Menu->Icon Size Options dialog. Therefore each Normal Mix Icon has 9 images associated with it.

A Normal Mix Icon, when placed on a Mix Form, has 14 sets of coordinates defined. These are: Radius, Theta, X, Y, and Inverse version of these, for a total of 8, and MuteOn, MuteOff, SoloOn, and SoloOff. There are also two 'special' coordinates, ThetaRadius, and XY, that are used for the 'Surround' data types.

## **Complex Mix Icons**

A Complex Mix Icon is a Mix Icon with additional coordinates and more internal states. There are 4 Complex Mix Icon types, Switches, Knobs, Faders, and List icons.

### ***Switches***

A Switch Mix Icon type has 2 additional internal states, On and Off. Each State can be represented by any kind of Normal Mix Icon type, for example text or a windows bitmap. A switch Mix Icon therefore has 18 associated images, 9 for each state.

There are two different types of switch Icons, a Toggle switch and a Momentary switch.

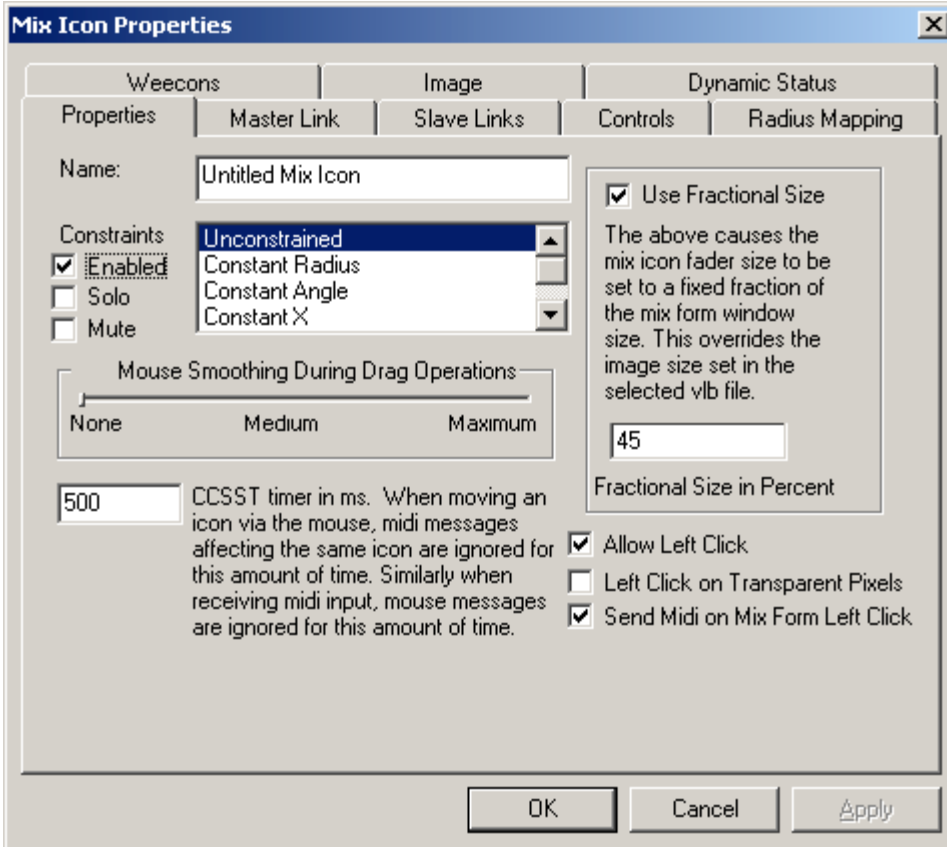
A switch Icon adds two additional coordinates to the Mix Icon Coordinate selection, 'SwitchToOn' and 'SwitchToOff'. Any controls 'attached' to these coordinates send messages only on these events.

### ***Knobs and Faders***

Knob and Fader Mix Icon Controls are a special type of Complex Mix Icon. The user can customize the look of Knobs and Faders by using the Edit/Create Icon Tool available on the Tools menu. These types can be different sizes, have different foreground and background colors and have labeled 'tick marks' (knob only). The Knobs and Fader types can be set, at run time, to 100 different positions, by holding down the <control> key and dragging the knob with the mouse to the desired setting. There are two separate Fader Mix Icon types, Vertical and Horizontal.

Knobs and Fader Mix Icons add two additional coordinates to the Mix Icon Coordinate selection drop-down list, Fader and Inverse Fader. Any controls ‘attached’ to these coordinates are affected only by the setting of the knob (or slider).

Fader Mix Icons can be set to ‘scale’ their size to a fraction of the Mix Form size. If this option is selected, the Fader Mix Icons will change their size as the Mix Form size is adjusted to be a constant, selectable fraction of the Mix Form size. This is set in the Mix Icon Properties dialog for the Fader Mix Icon. The value to set is in ‘percent of total Mix Form size’.



### ***Indexed List Icons***

The Indexed List Icon is a special type of Complex Mix Icon. It is essentially a multiple-selection switch with a text string for each entry. The entries are contained in a text file of text strings (one per line) with the file extension ‘VTL’. Each value of the control between Min and Max indexes to the corresponding text entry in this file.

This control is especially useful for routers or multi-function switches.

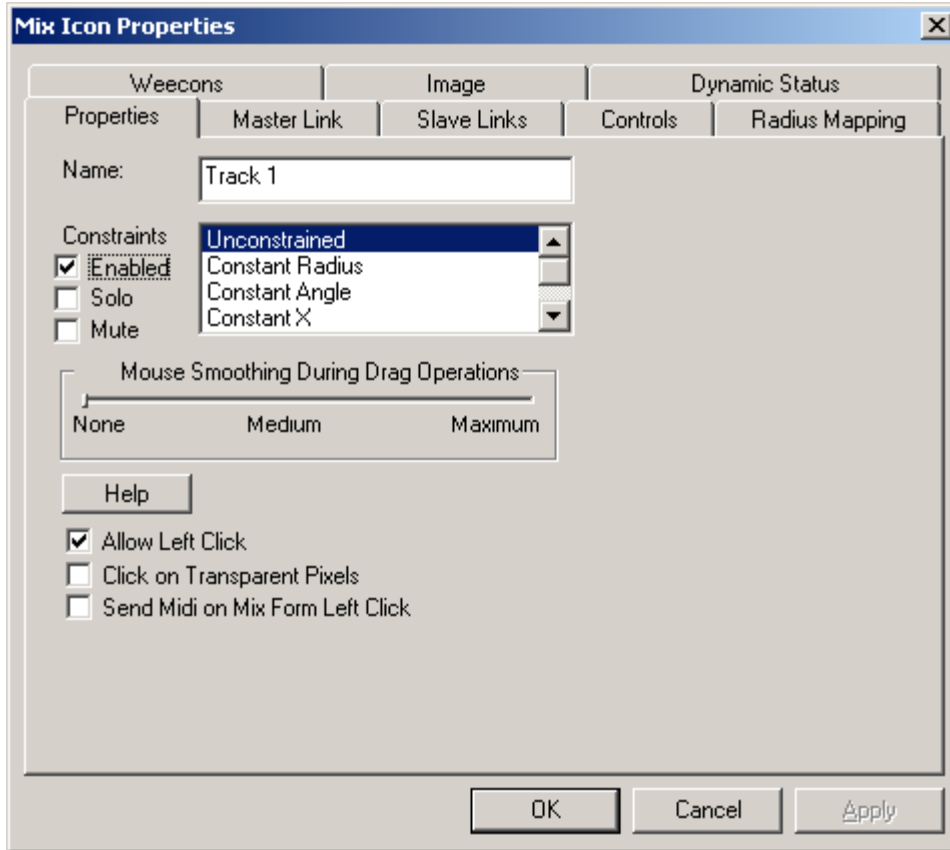


The user can create a List icon by using the Edit/Create Icon Tool available on the Tools menu and selecting 'Indexed List' as the icon type.

The List icon adds an additional coordinate, 'ListIndex', to the Mix Icon Coordinate selection drop-down list. Any controls 'attached' to this coordinate are affected by the setting of the list icon.

## Mix Icon Properties

The Mix Icon Properties tabbed dialog box appears when the user right-clicks on any Mix Icon and selects the 'Properties' entry. Tabs along the top of the dialog box select sub-pages of dialogs on specific topics.



### *Properties*

This tab contains a Name field to name the Mix Icon. The name of the mix icon will show up as a tool tip when the cursor rests over a mix icon.

This tab contains a Constraints select box to select the Mix Icon Constraints.

The movement of the Mix Icon on its Mix Form can be constrained in several ways.

These movement constraints are:

Unconstrained	Free movement, limited only to the Mix Form.
Constant Radius	The Mix Icon movement is limited to maintaining a constant radius around the Mix Form Origin.

Constant Angle.	The Mix Icon movement is limited to maintaining a constant angle relative to the Mix Form Origin
Constant X	The Mix Icon movement is limited to maintaining a constant X coordinate relative to the Mix Form Origin.
Constant Y	The Mix Icon movement is limited to maintaining a constant Y coordinate relative to the Mix Form Origin.
Fixed Position	The Mix Icon movement is limited to maintaining a fixed position relative to the Mix Form Origin.

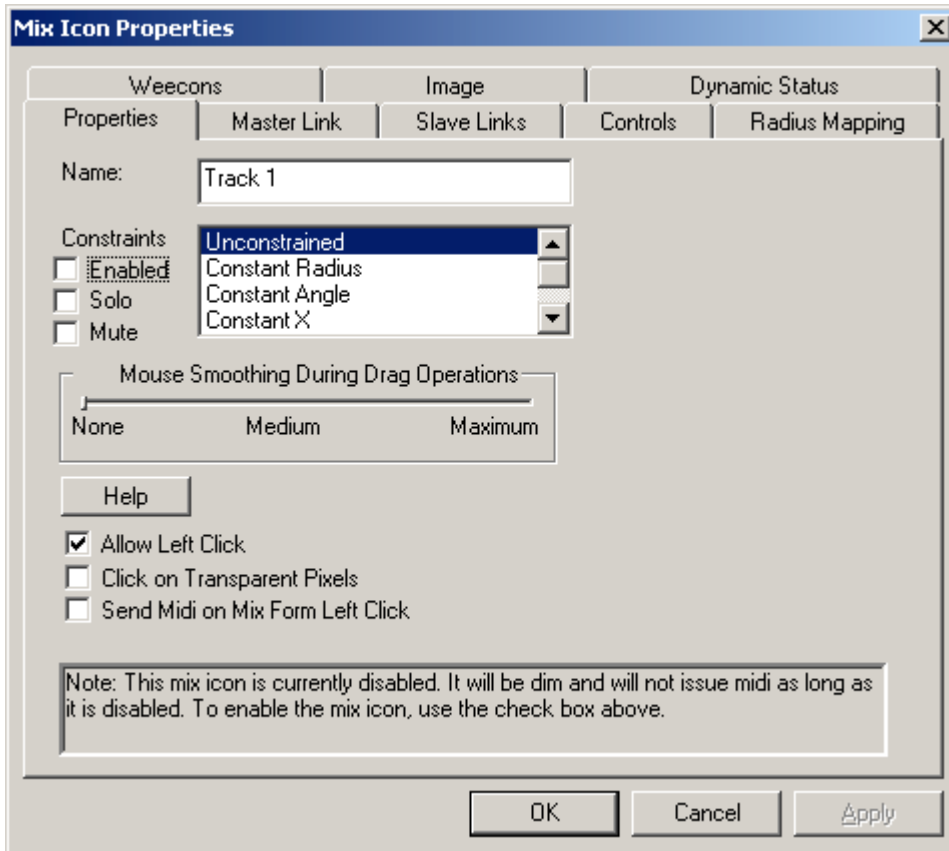
This tab contains a slider bar for ‘Mouse Smoothing During Drag Operations’. This allows the Mix Icon movement range from 'quick and responsive' (No smoothing) to 'slow and smooth' (Maximum smoothing).

The check box called ‘Allow Left Click’ determines whether or not the mix icon will respond to a left click. Disabling the response to a left click can be used to create a mix icon that will remain in place during normal usage. Such an icon may be used as a label or a visual calibration mark.

The ‘Click on Transparent Pixel’ determines whether or not a left click on a mix icon will take place when the click happens to be on a transparent pixel. Normally a click on a transparent pixel is ignored. However in some cases, such as with text-based icons, the user may want to make it easier to click on an icon.

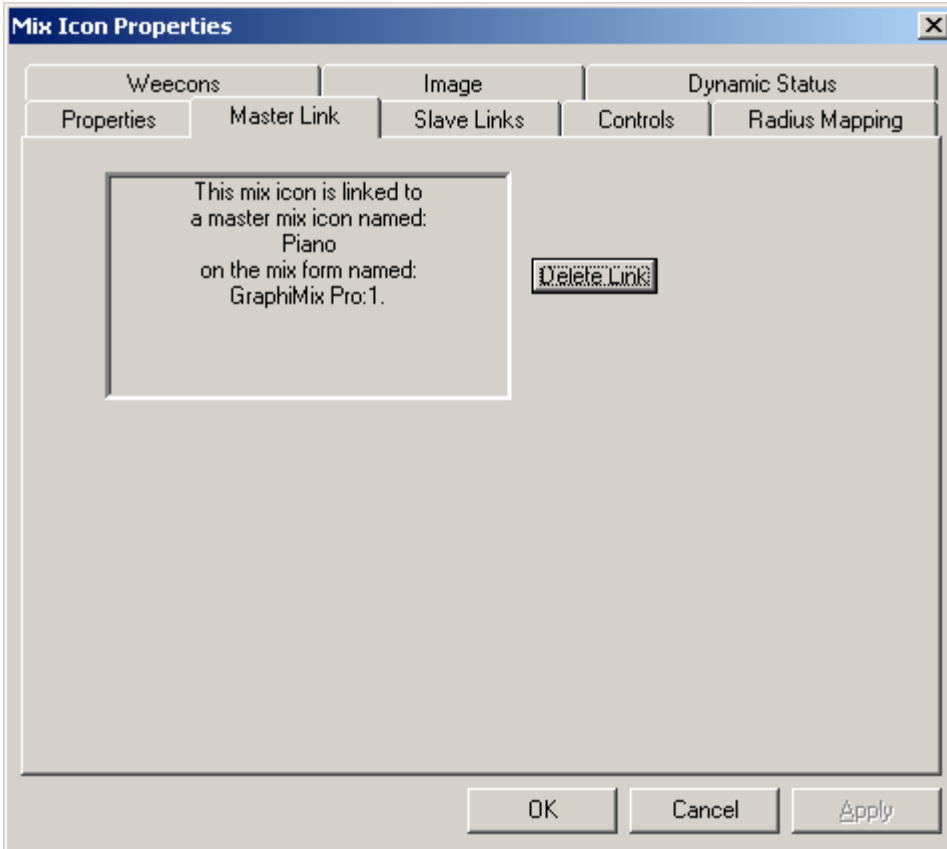
The ‘Send Midi on Mix Form Left Click’ check box determines whether or not this mix icon sends its MIDI data when the user left clicks on the mix form. Normally, MIDI data is sent only when the icon is moved, or its state changed, or when the Mix State is loaded or changed.

The three checkboxes to the left in this tab indicate the Enabled, Soloed, or Muted state of the Mix Icon. A Mix Icon will show as 'dim' if the Mix Icon is disabled, or if it is in the Mute state. A text box will show in this tab if the icon is in the 'dim' state to explain the reason for being dim.



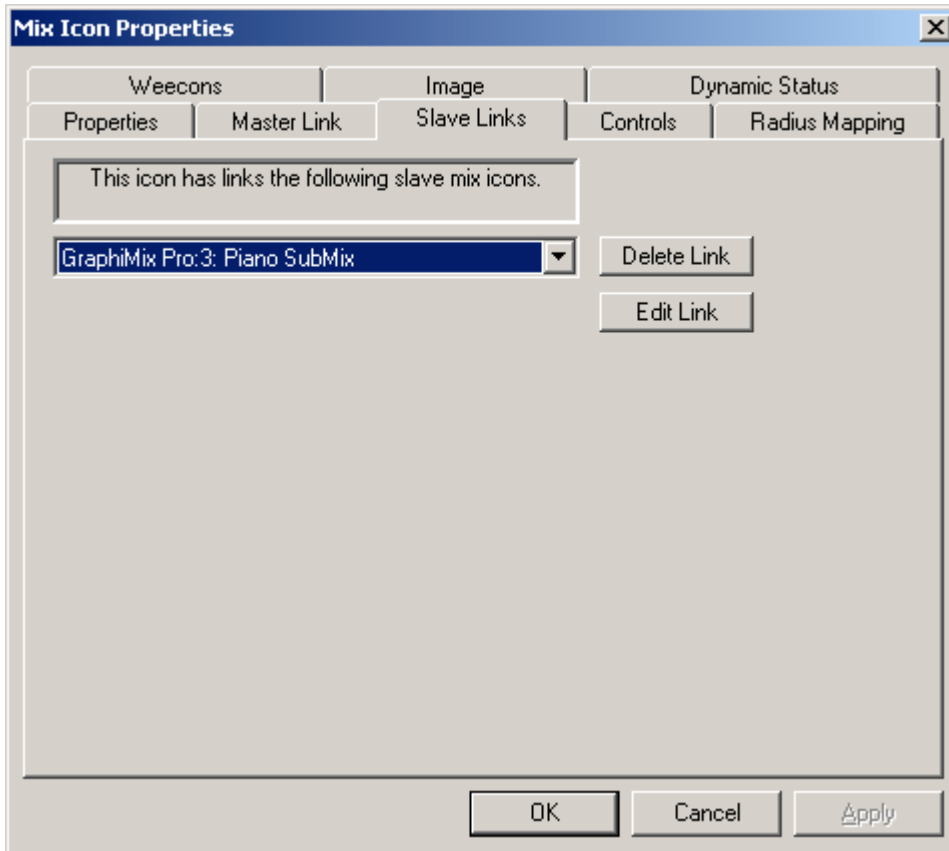
### ***Master Links***

This tab contains information about any Mix Icon Links to this Icon from a master icon. A link to this Icon would indicate that the position of the Mix Icon is controlled by the position of another Mix Icon.



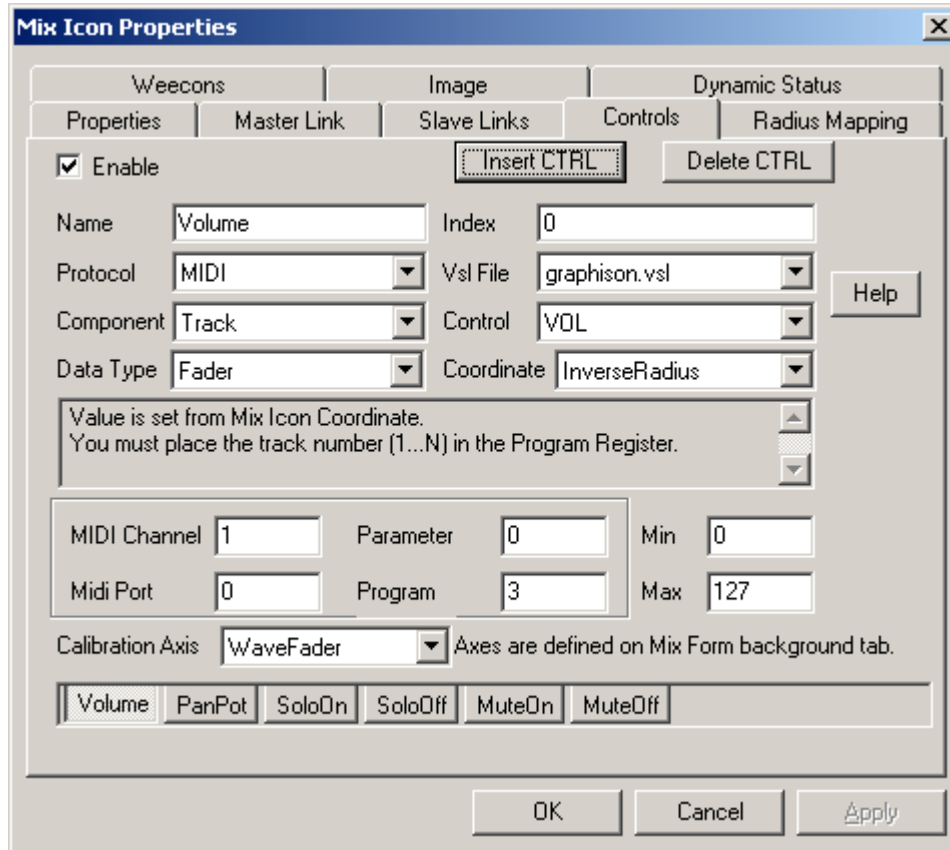
## Slave Links

This tab contains information about any Slave Mix Icons linked to this Icon. A slave link from this Icon would indicate that the position of this Mix Icon controls the position of another Mix Icon. For more information about linking Mix Icons, see *Mix Icon Linking*, page 43.



## Controls

This tab allows the user to configure the controls that are attached to this Mix Icon.



Mix Icons control sound by sending commands to audio controls. Each Mix Icon can control an arbitrary number of audio controls or effects parameters allowing very powerful control of audio with simple movements of Mix Icons.

GraphiMix incorporates an extremely flexible and extensible scheme for selecting and controlling individual and arbitrary parameters by setting the position of a Mix Icon on a Mix Form. Each placement of the Mix Icon establishes its position in the Mix Form Coordinate system. These coordinates are translated into messages that are sent to the controls individually.

Currently only MIDI and INTERNAL message protocols are supported. This will eventually be extended to other protocols such as TCP/IP and RS422.

Two buttons at the top allow the user to insert a new control (Insert CTRL) or delete one (Delete CTRL). Controls are selected by clicking on the tabs at the bottom of the page.

The controls can be named by typing a name like 'Fader12' or 'PanPot' into the 'Name' text box. The control will have a default name, 'ctrl<sequence number>', if no name text is entered.

Each control can be individually disabled by un-checking the Enable check box.

The VSL File field contains a list of VSL files. VSL files contain the message protocol information for each supported audio control. These controls in any particular file are typically all of the controls for a particular piece of audio hardware such as a PC sound card or a Yamaha ProMix01™ or any piece of equipment that can be controlled by a message. This field will list all available VSL files in the GraphiMix directory. The user needs to select one of the available files.

The Component field lists all of the available components in the selected VSL file. The user needs to select one of the available components. If there is no component specified in the VSL file, the string '<default>' will appear in the Component field.

The Control field lists all of the available controls in the selected Component for the selected VSL file. The user needs to select one from the list of available Controls.

The Data Type field lists all the available methods for converting a Mix Icon coordinate to the appropriate parameter in the audio hardware being controlled.

Currently available Data Type methods are:

### **Single Channel Methods**

Fader	Single channel fader (usually) assigned to the Radius Coordinate
PanPot	Single PanPot control (usually) assigned to the Theta Coordinate
SurroundPanPot	Single 360 degree PanPot control (usually) assigned to the Theta coordinate

### **Multichannel Methods**

PanFaderLeft	Simulate a panpot/fader combo with 2 single channel faders. Usually assigned to the ThetaRadius Coordinate. Index selects variable bank.
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PanFaderRight	Usually assigned to the ThetaRadius Coordinate. Index selects variable bank.
QuadFaderLeftFront	Simulate a discrete 4 channel surround mix with 4 single channel faders usually assigned to the ThetaRadius Coordinate. Index selects variable bank.
QuadFaderRightFront	“”
QuadFaderLeftRear	“”
QuadFaderRightRear	“”
QuadFaderCenter	Front-center method

### **Custom Methods**

Custom	Custom methods (none currently)
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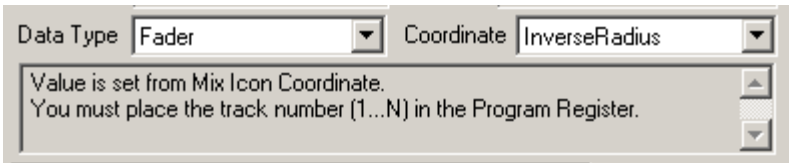
The PanFader and QuadFader Data Types use the Mix Icon Control Index field <0-9> to select which variable bank is being used for this control. For more information, see the Appendix, GraphiMix Internal Variables and Commands, page 159.

The Coordinate field lists all available Mix Icon Coordinates to be used in converting the Mix Icon position to a parameter message sent to a control. Currently available coordinates are:

Radius	Use Mix Icon Radius coordinate as input to Data Type method.
Theta	Use Mix Icon Theta coordinate as input to Data Type method
ThetaRadius	Use Mix Icon Theta and Radius coordinates as input to (MultiChannel) Data Type methods
X	Use Mix Icon X coordinate as input to Data Type method.
Y	Use Mix Icon Y coordinate as input to Data Type method.
XY	Use Mix Icon X and Y coordinates as input to (MultiChannel) Data Type methods.
InverseRadius	Use Mix Icon Inverse Radius coordinate as

	input to Data Type method.
InverseTheta	Use Mix Icon Inverse Theta coordinate as input to Data Type method.
InverseX	Use Mix Icon Inverse X coordinate as input to Data Type method.
InverseY	Use Mix Icon Inverse Y coordinate as input to Data Type method.
Fader	Optional Coordinates available on Knob, Vertical, and Horizontal Fader Mix Icon types.
Inverse Fader	Optional Coordinates available on Knob, Vertical, and Horizontal Fader Mix Icon types.
SwitchToOn	Optional Coordinates available on Switch Mix Icon types.
SwitchToOff	Optional Coordinates available on Switch Mix Icon types.
SoloOn	Coordinate activates when Mix Icon is put in solo mode.
SoloOff	Coordinate activates when Mix Icon is switched from solo mode.
MuteOn	Coordinate activates when Mix Icon is put in Mute mode.
MuteOff	Coordinate activates when Mix Icon is switched from Mute mode.
ListIndex	Coordinate available on List Mix Icon types.

The Description field holds information for the user identifying the control and other pertinent information so the user can correctly program this control. For instance, any use of the Index, Parameter, or Program fields should be shown here.

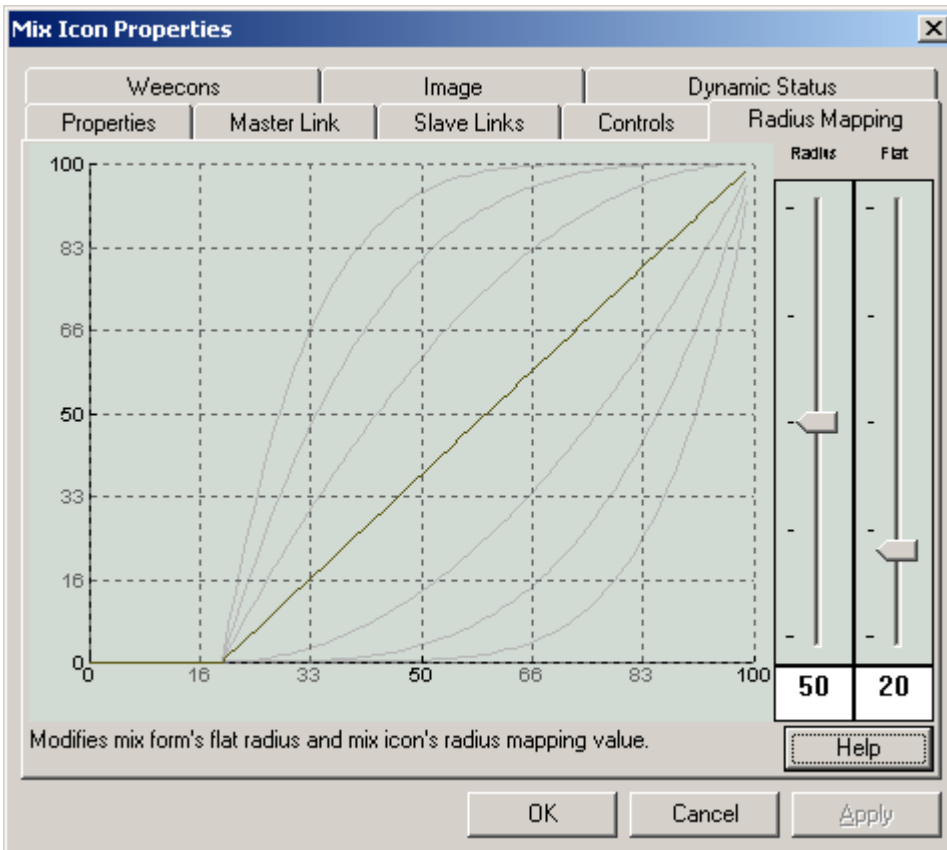


The Protocol field selects either MIDI, or INTERNAL. The INTERNAL Protocols are described in Voyager Internal Variables and Commands in the appendix and in the VygrInternal.VSL file.

If the MIDI Protocol is selected then the MIDI parameter fields will be used. The first MIDI parameter field is the MIDI Channel. This selects the MIDI Channel number used in the MIDI message sent to the audio control.

The Parameter field, the Index field, and the Program fields are optionally used to set parameters in the MIDI message dependent on the particular control and how it is written in the VSL file. For more information, see the *Appendix, Voyager System Language (VSL) Description*, page 142.

### Radius Mapping

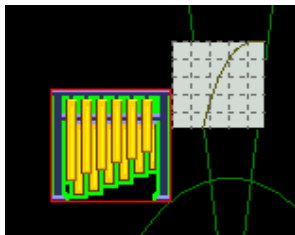


Radius Mapping is a mapping from the physical radius of a mix icon to the value that is converted into MIDI. The mapping may be linear or non-linear. Radius mapping allows the user to make better use of the available space on a mix form and to match the characteristics of hardware devices. For example, there may not be enough room near the center of the mix form to conveniently place all of the mix icons that need to be near the center. In this case, the radius mapping mechanism can allow the user to effectively expand the center region to make more room.

The horizontal axis in this graph shows the Mix Icon radius as shown on the Mix Form. The vertical axis represents the output value sent to the control. Note that at the left side of the graph, there is a ‘flat’ area where the output value is zero, yet the icon has a small radius. If ‘inverse radius’ is used as the control coordinate this icon radius would represent a control maximum value.

There are two parts to the radius mapping. The first part is the ‘flat radius’ value. The flat radius value allows the user to specify a radius, in percent, over which the corresponding midi output will be constant. All radii with a value less than or equal to the flat radius will use a mapped radius of 0 when computing MIDI input or output. Each mix form has a single value of the flat radius value. All mix icons on the same mix form share the same flat radius value. When the flat radius is changed for one mix icon, it changes automatically for all mix icons on the same mix form.

The second part of the radius mapping is the ‘radius mapping value’. The radius mapping value changes the shape of the mapping curve. When the radius mapping value is small, then the slope of the mapping curve will be small at small radii and large at large radii. When the radius mapping value is large, then the slope of the mapping curve will be large at small radii and small at large radii. When the radius mapping value is set to 50 percent, the mapping is linear, i.e. has a constant slope throughout.



The radius mapping value may also be changed by using a control-mouse wheel action. This results in a small image of the mapping being shown at the cursor position. In this case the flat radius value is not changed.

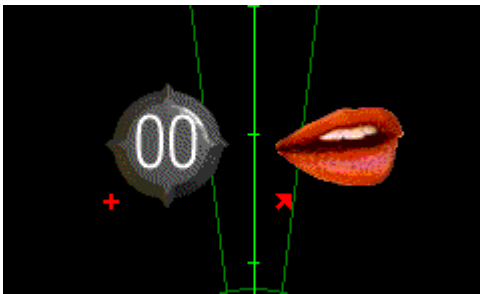
The radius mapping attributes may be modified in a total of four different ways:

Action	Flat Radius Value	Radius Mapping Value
Right Click On Mix Icon, select Properties, then select Radius Mapping Tab	Changes flat radius for all mix icons on the mix form.	Changes radius mapping for this mix icon only

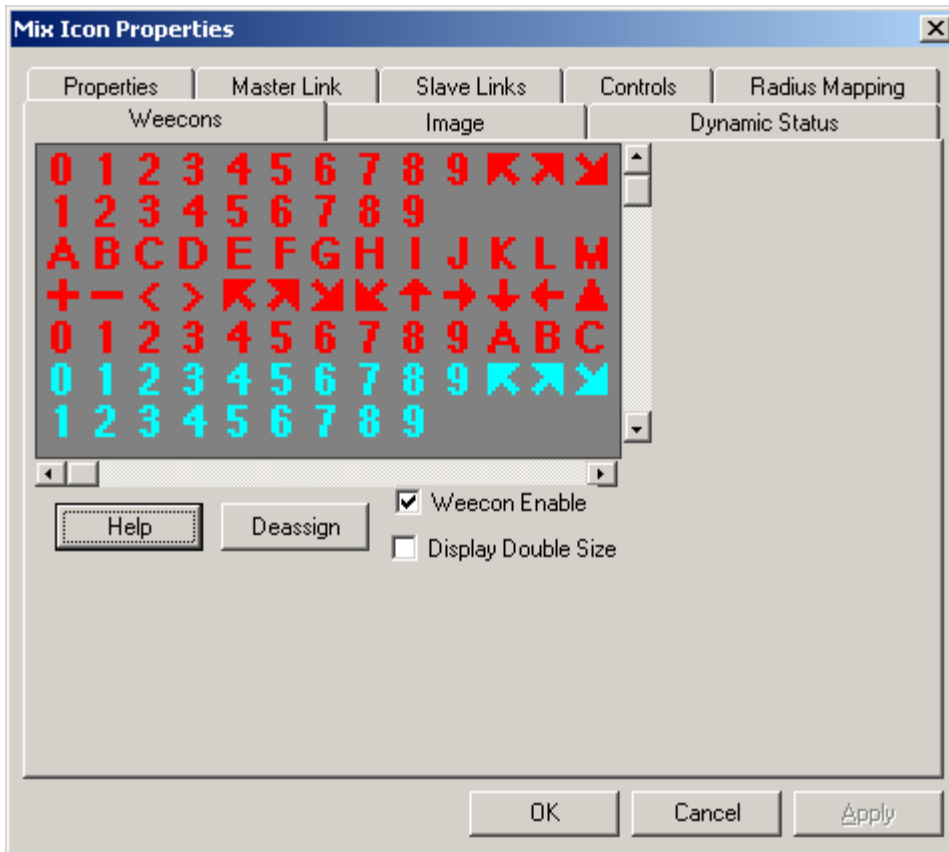
Right Click On Mix Form, select Properties, then select Radius Mapping Tab	Changes flat radius for all mix icons on the mix form	Changes the default radius mapping used by new mix icons
The Edit Preferences Menu (Select Radius Mapping Tab)	Changes the default flat radius used by new mix forms	Changes the default radius mapping used by new mix forms.
Control-Mouse wheel	No Change	Changes radius mapping for selected mix icon only

### *Weecons*

Weecons are tiny ('wee') icons that are optionally added to the lower left corner of a Mix Icon to further identify it.



Weecons for an individual Mix Icon are selected right-clicking on a selected Mix Icon to bring up the Mix Icon Properties->Weecons tab.

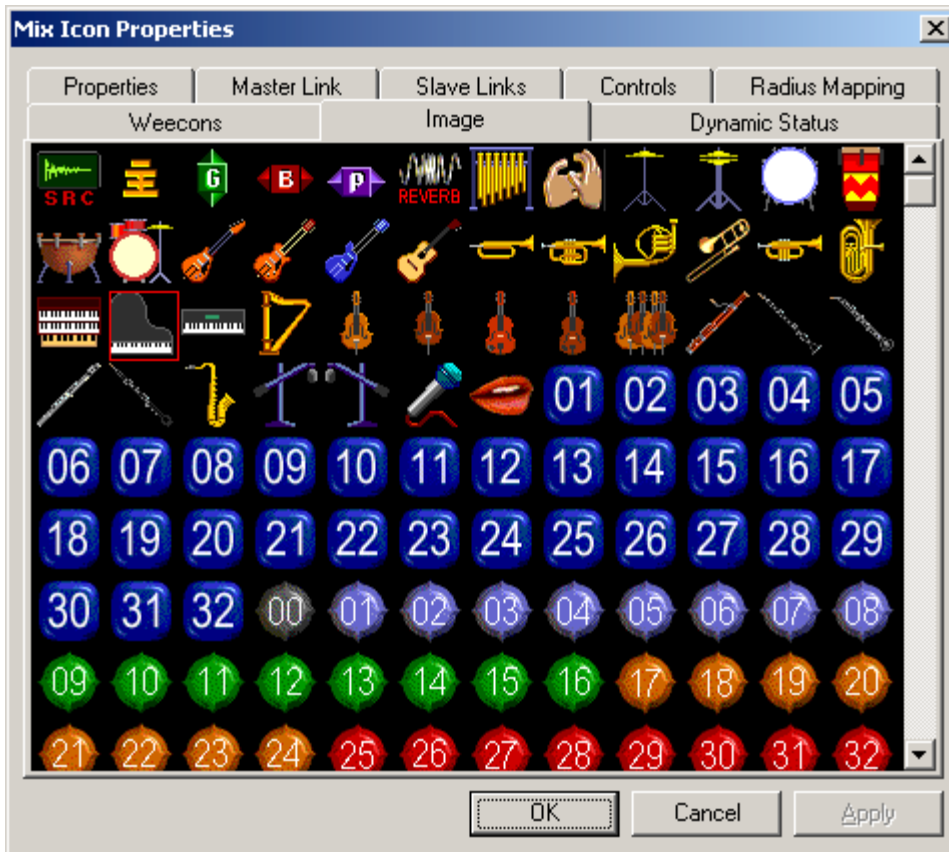


It may be necessary to use the same image to represent multiple Mix Icons on a single Mix Form. An example would be 5 microphone icons in a live venue. Small identifying tags can be added to the displayed Mix Icon to distinguish otherwise identical icon images. For example, 5 microphone icons could be used, each with tags attached with unique numbers 1 through 5 corresponding to channels 1 through 5.

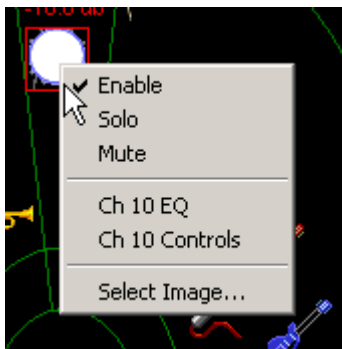
This tab includes a library of Mix Icon Weecon images. The images can be displayed double size as a check box option. The weecons can be separately enabled or disabled and can be de-assigned once assigned.

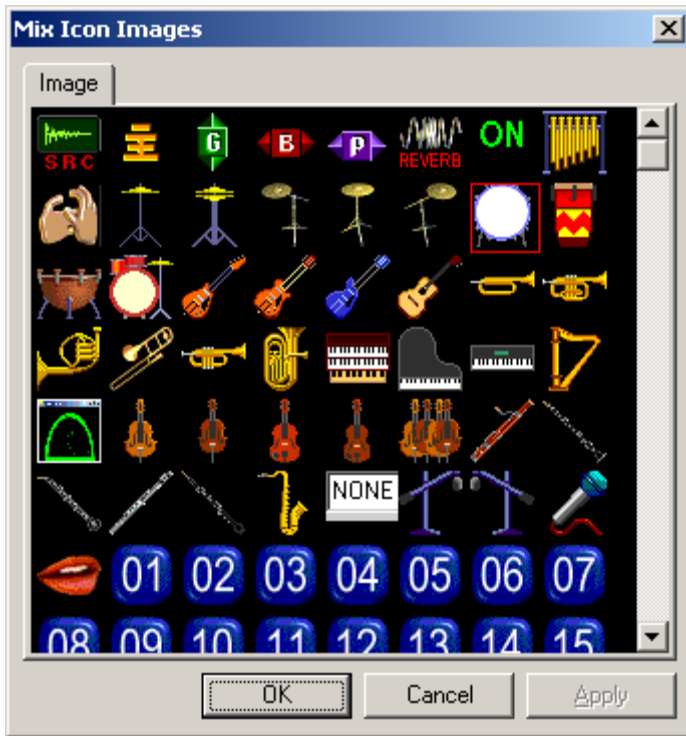
### ***Image***

This tab features a menu of available Mix Icon Images in all VLB windows. The selected Image will represent the position of the Mix Icon on the Mix Form.



The Images tab can also be accessed from a Mix Icon's context menu by clicking on 'Select Image...'.

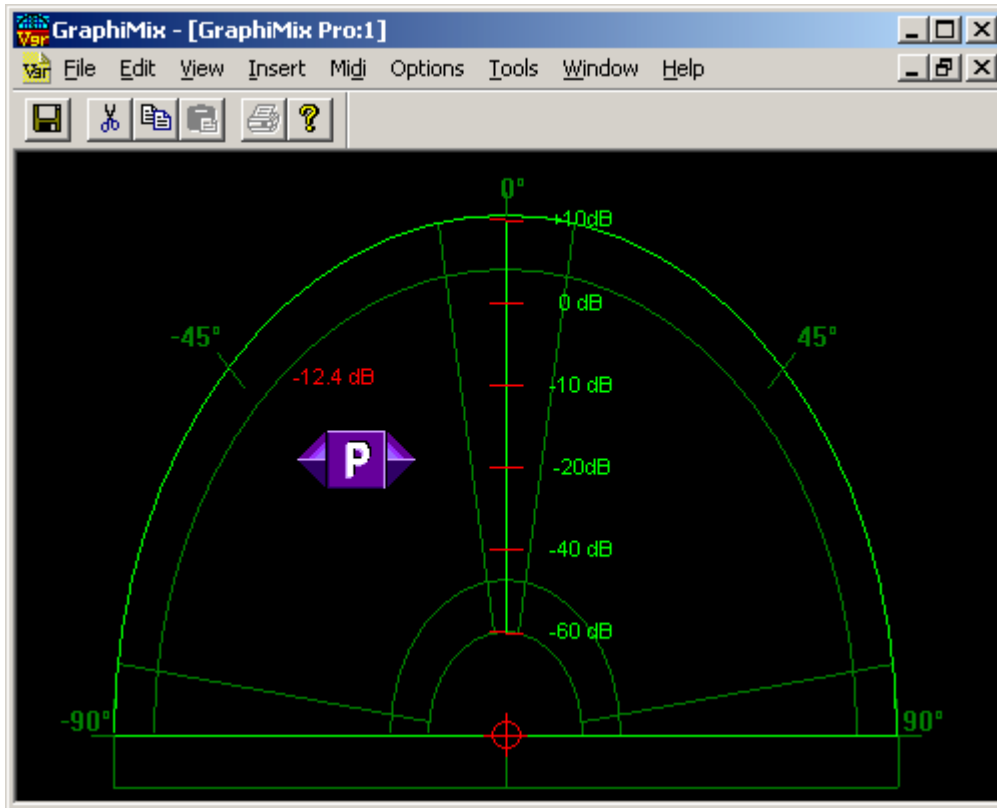




### *Dynamic Status*

The Dynamic Status display feature provides a calibrated readout of the target mix hardware settings as the Mix Icon is moved on the Mix Form. Up to two displays per icon can be shown, and they can be displayed in any one of three positions relative to the placement of the Mix Icon.

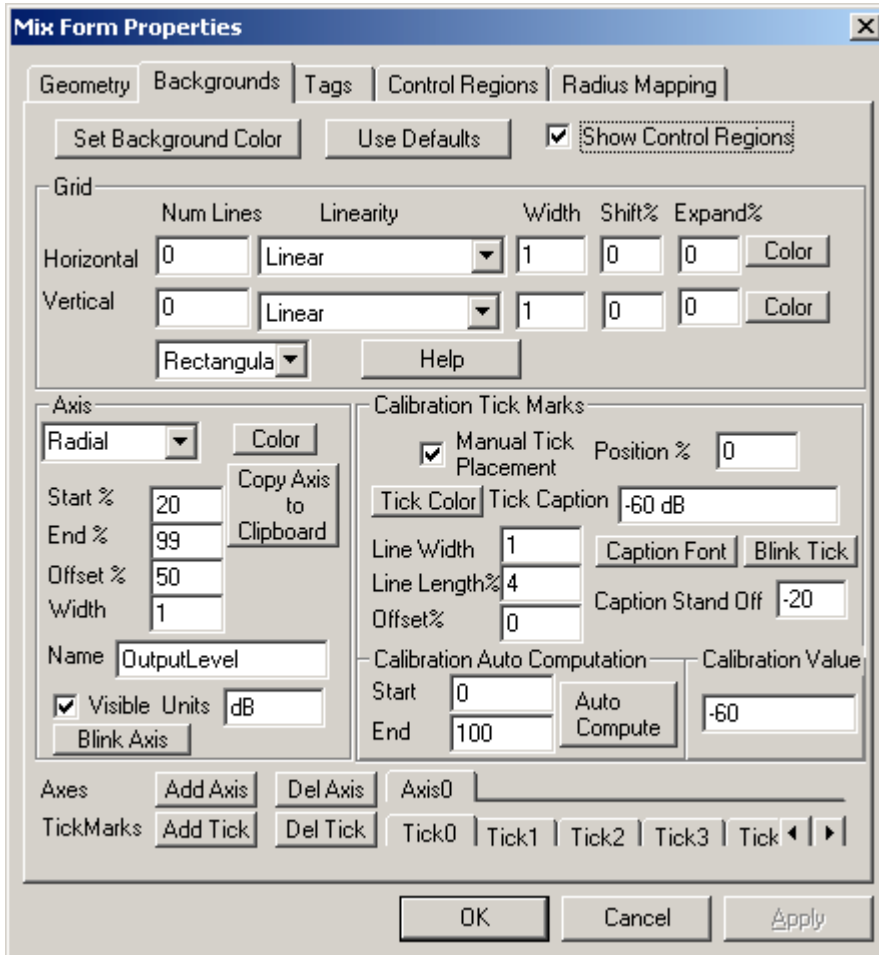
The Dynamic Status value displayed is a linear interpolation between the two nearest Tick marks, taking into account any Radius Mapping settings. For more accuracy, more Tick marks can be generated.



There are three steps that the user must complete before Dynamic Status Displays can be used.

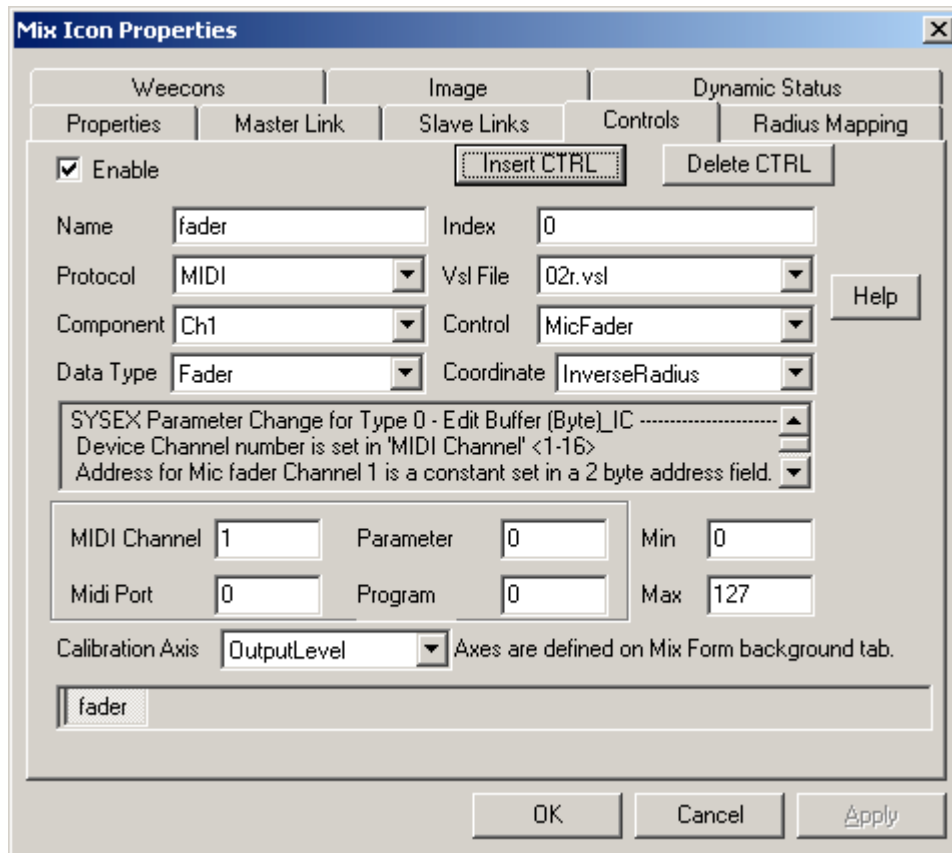
The first step is to create a Mix Form Axis by selecting the Mix Form and selecting the Backgrounds tab. To do this, <right-click> on the Mix Form background and select 'Properties' (with GraphiMix in 'Build' mode). Then click on the 'Backgrounds' tab at the top of the properties dialog.

Add an Axis and give it a name. This name will be referred to when setting up the rest of the Dynamic Display. Axes can be customized to almost any degree. However, this flexibility brings complexity. Iterate until the Axis calibration looks correct (it can be fine-tuned later). Note that the Axis itself can be hidden so that only the Dynamic Status displays indicate the settings and so the Mix Form is less cluttered. Hide it when done.

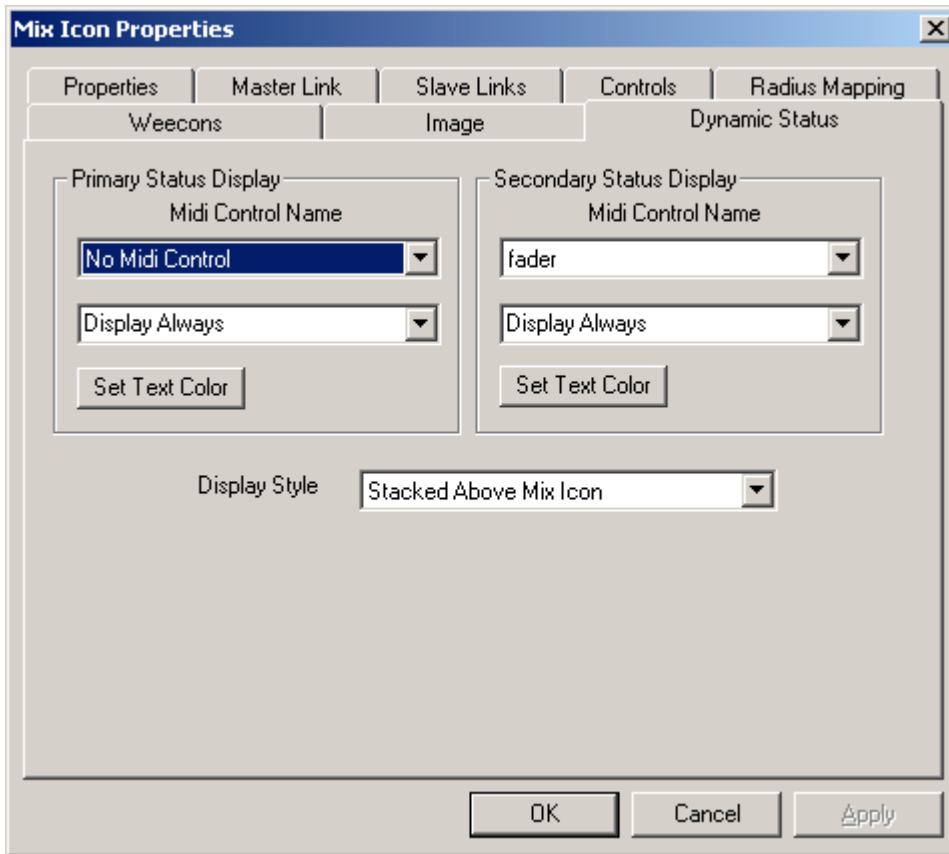


After defining a Mix Form Axis, the next step involves associating a particular control on a Mix Icon with this Axis.

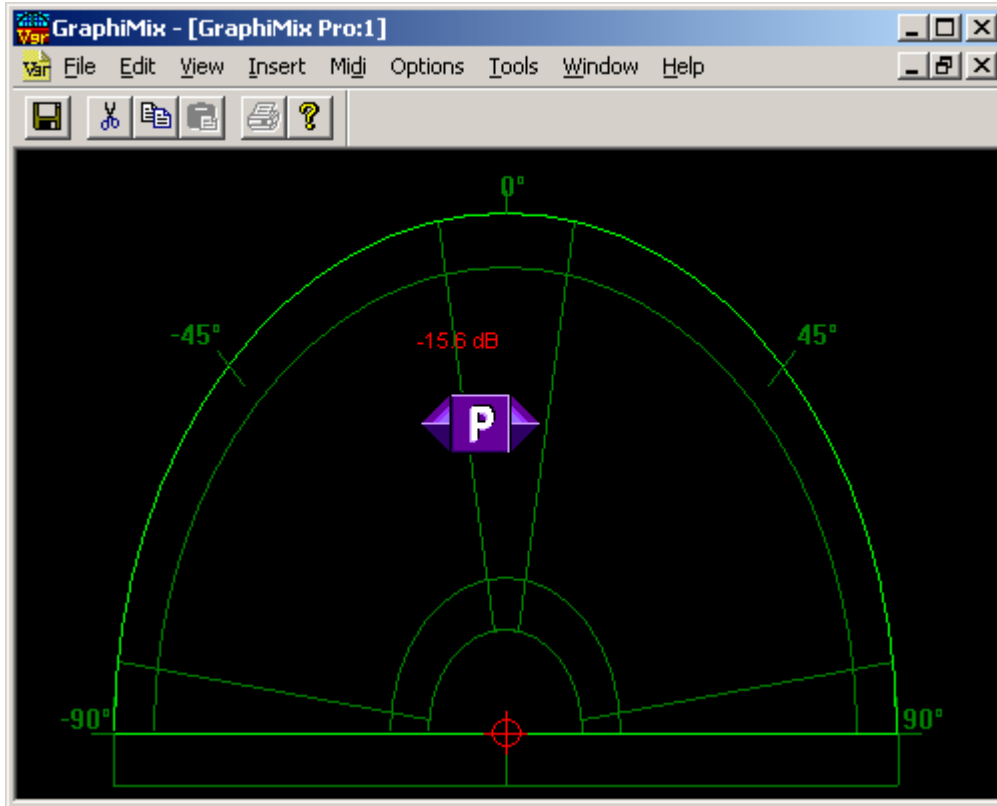
Do this by bringing up the Mix Icon Properties page (<right-click, select 'Properties') and selecting the Controls tab. Select the appropriate control by clicking on the appropriate tab at the bottom of this dialog. Now select the Calibration Axis from the drop-down list of available Mix Form Axes.



Finally, select the Dynamic Status tab of the Mix Icon Properties dialog and set either the Primary Status Display (top or left) or the Secondary Status Display (bottom or right) and select the Midi Control Name of the Mix Icon Control to be displayed. The Display Style drop-down list selects where the Dynamic Display is placed. The user can also select when and how the Display is printed and the Text Color.



Here is the result with the Mix Form Axis hidden.

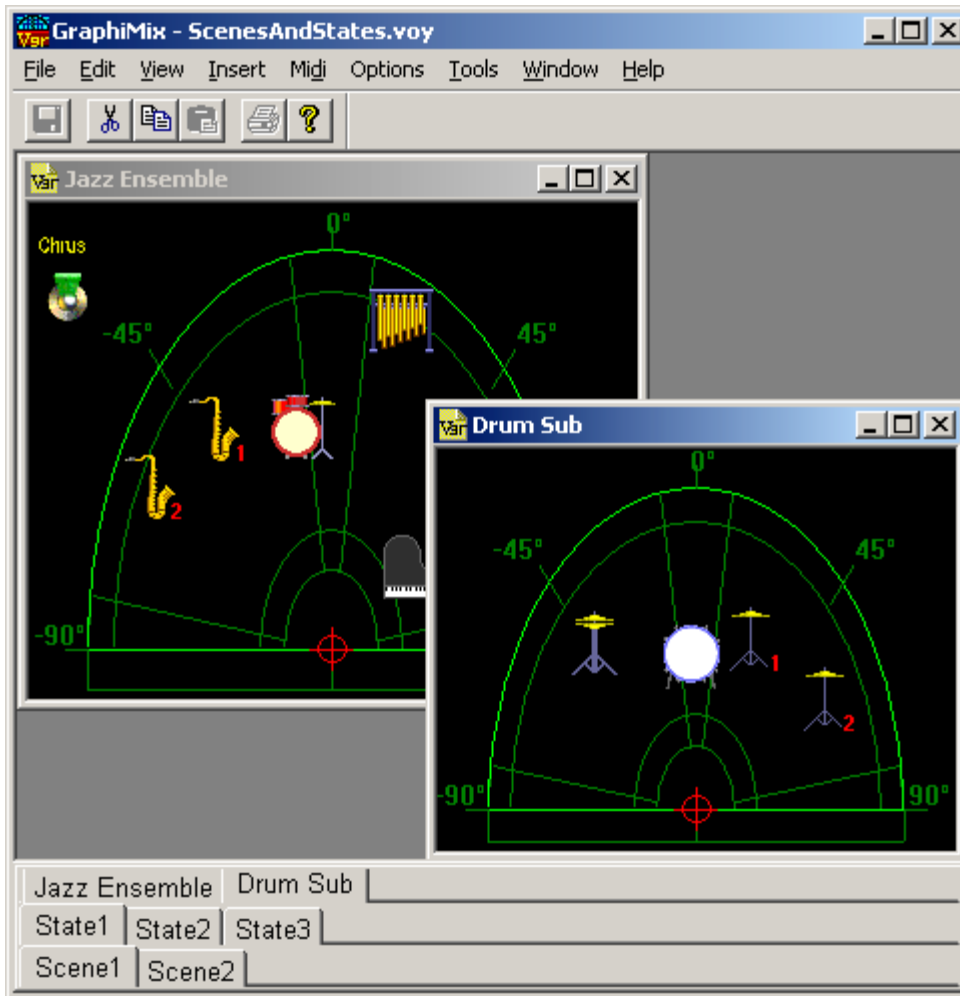


## Scenes and States

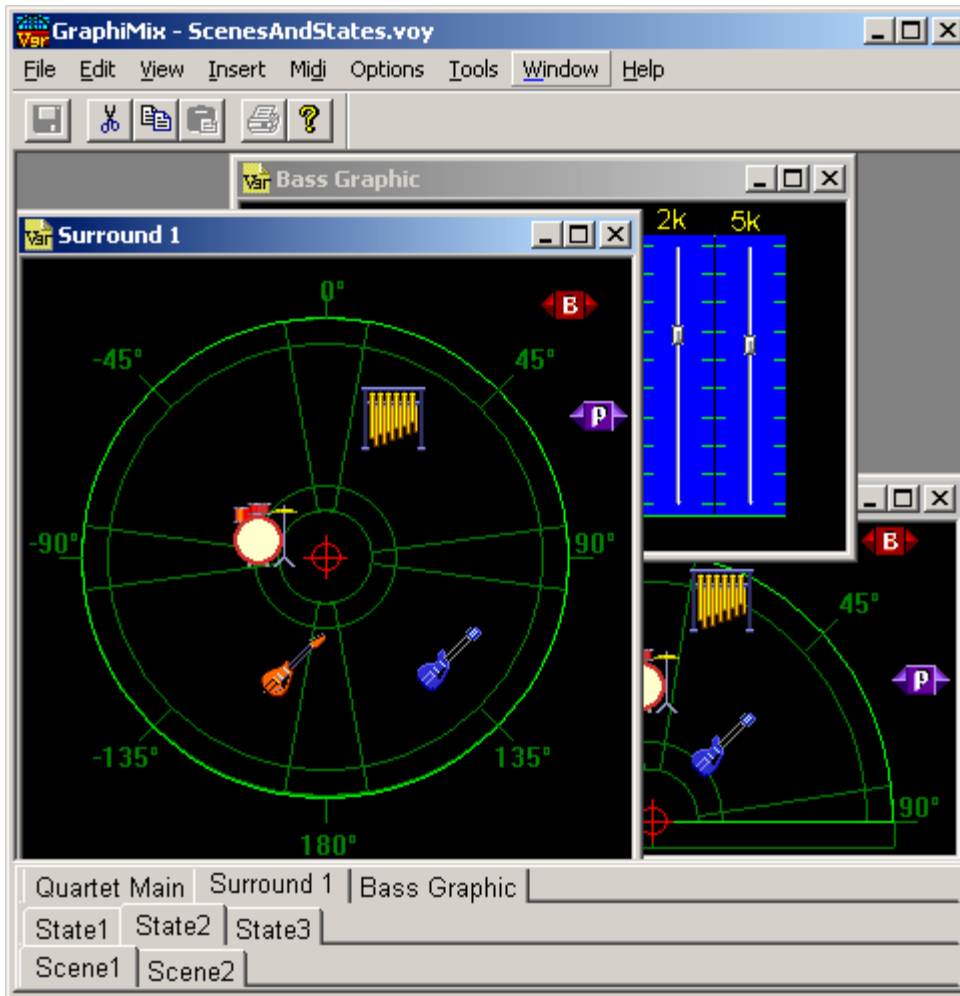
The entire GraphiMix mix surface including all of the Mix Form and Mix Icon positions and configurations may be saved as a 'state'. This state can also be recalled, allowing for the implementation of presets for specific Mix settings. These presets are stored as Mix States. One or more Mix States may be grouped together in a Scene, and there may be one or more Scenes in a specific GraphiMix session. This allows for incredible flexibility, allowing the user to entirely reconfigure his mix hardware and how he perceives and uses it individually for each scene or state with the touch of a mouse or keyboard button.

Scenes and states can also be 'Attached to' MIDI messages. Changing the state can cause a MIDI message to be sent to some target hardware or application. Similarly, GraphiMix can respond to an incoming MIDI message and change the state accordingly. For more information, see *Options Menu, Attach States To Midi Option*, page 104.

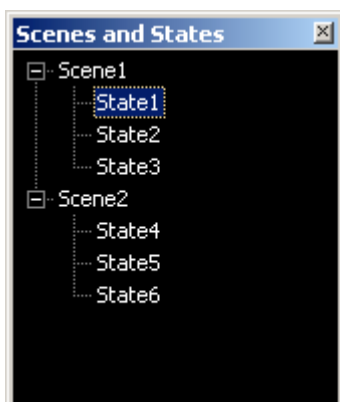
To make it convenient to access Scenes and States there are several on-screen tools available. These are on the Mix Form Tool Bar, the Scene and State Tool Bar, the Scene and States view window, and the Scene and State Tab bar. These can be accessed via the View Menu. See *View Menu* on page 87 for more details.



An example of a session with several Scenes and States is shown above. In Scene1:State1 there are two Mix Forms shown, “Jazz Ensemble” and “Drum Sub”.



In State2, there are 3 Mix Forms shown, “Quartet Main”, “Surround 1”, and “Bass Graphic”.



Here is the Scenes and States View Window for the above example. Both Scene1 and Scene2 have 3 states each. The names for particular scenes and states can be changed in this window by “editing in place” or by right-clicking on the appropriate scene or state and filling in the Name dialog box.

There is a Graphic Preview Mode for the ‘next’ state feature available. This mode is available on the Scenes and States Tool Bar as the ‘Pr’ button. If this button is clicked, the next state appears, but no control messages are sent. A timer will appear and start ‘ticking down’. While the timer bar is ‘ticking down’ the user has the option of ‘keeping’ the displayed state by clicking the ‘Keep’ button. If the user doesn’t click the ‘Keep’ button, the display reverts to the previous state. If the user does click the ‘Keep’ button, the new state is applied and the appropriate control messages are sent.

The Graphic Preview Timeout time is set in the Edit->Preferences menu. See *Edit Menu, Preferences*, page 87.











## **Tool Bars, Tab Bars, and Icon Bars**

Most Tool bars and Tab Bars can be attached to any side of the Mix Frame or can be ‘floated free’ to become their own independent window. One exception to this is the Scene and State Tab Bar which remains fixed to the bottom of the Mix Frame.

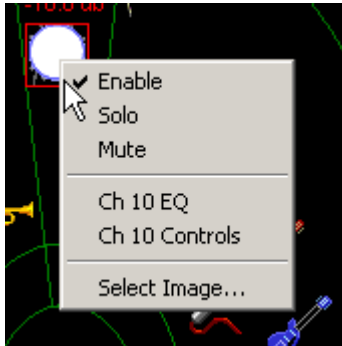
### **Standard Tool Bar**

The Standard Tool Bar contains buttons that Save the session, Cut the selected Mix Icon (or Mix Form) to the windows clipboard, Copy the selected Mix Icon (or Mix Form) to the clipboard, Insert the Mix Icon (or Mix Form) from the clipboard, select About Voyager (for version number info), bring covered Mix Forms to the Front, select between Run Mode and Builder Mode, and to select Mix Form Group Mode on and off.

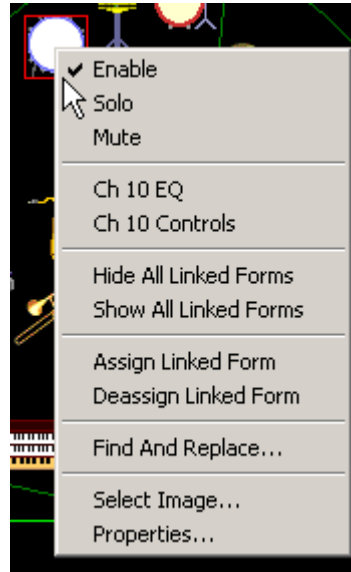


-  Save session
-  Cut selected Mix Icon or Mix Form
-  Copy selected Mix Icon or Mix Form
-  Paste selected object from Windows Clipboard
-  Bring up ‘About’ dialog for GraphiMix version information
-  Bring to Front Button.
-  Run Mode (button out)
-  Build Mode (button in)
-  Mix Form Group Mode off (button out)
-  Mix Form Group Mode on (button in)

When GraphiMix is in Run mode, certain entries on Mix Icon and Mix Form context menus are removed. This simplifies the menus by removing items that only pertain to designing and building a GraphiMix mix surface. Only entries that the engineer needs to use during the session are shown.



Context Menu in Run Mode



Context Menu in Build Mode

To print a Mix Form, select the Mix Form to be printed and then use the <Alt-PrintScreen> keys on the keyboard. This copies the image to the Windows clipboard. Then start a 'paint' application such as 'MS Paint' and paste in the image from the clipboard. This image can then be printed.

## Mix Form Tool Bar

The Mix Form Tool Bar contains five tools that help in the creation of a Mix session. These tools are from left to right (or top to bottom), the New Scene tool, the New State tool, the New Mix Form tool, the New Mix Icon tool and the Mix Icon Link tool.



This tool bar can be dragged from the Mix Frame and placed freely anywhere on the user's desktop or attached to the Mix Frame edges.

For more information please see:  
*Mix Forms and Mix Form Coordinates*, page 13,  
*Mix Icons and Controls*, page 40.

## Scenes and States Tool Bar

The Scenes and States Tool Bar has a series of arrow tool buttons that allow the user to move forward and backward by Scene (the outer arrows) or State (the inner arrows). The 'Pr' button selects a graphic preview mode for the next state.

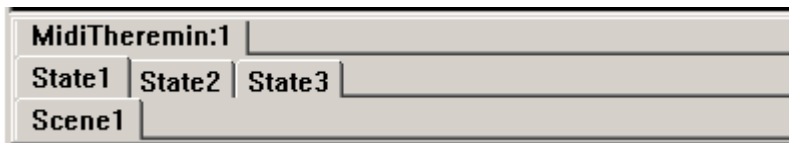


If the Graphic Preview Mode button is clicked, the next state appears, but no control messages are sent. While the timer bar is 'ticking down' the user has the option of 'keeping' the displayed state by clicking the 'Keep' button. If the user doesn't click the 'Keep' button, the display reverts to the previous state. If the user does click the 'Keep' button, the new state is applied and the new control messages are sent.



## Scenes and States Tab Bar

The Scene and State Tab bar shows the current Scene and State for the mix as well as all Mix Forms in the current state. The user can directly click on a Mix Form, a Scene tab or a State tab and switch directly to the selected scene and state and bringing the selected Mix Form to the front.



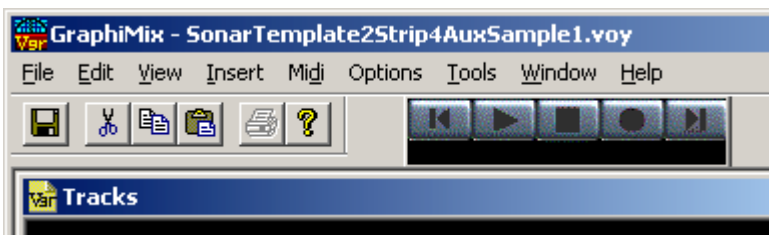
You may edit the name of any item in the Scene and State Tab bar by double clicking on the item. You may also re-order the items by dragging them.

## Icon Bars

Icon bars are user definable tool bars that can contain Mix Icons. To create an Icon Bar see *Insert Menu, New Icon Bar*, page 100. Icon bars can be 'hidden' and displayed horizontally or vertically.

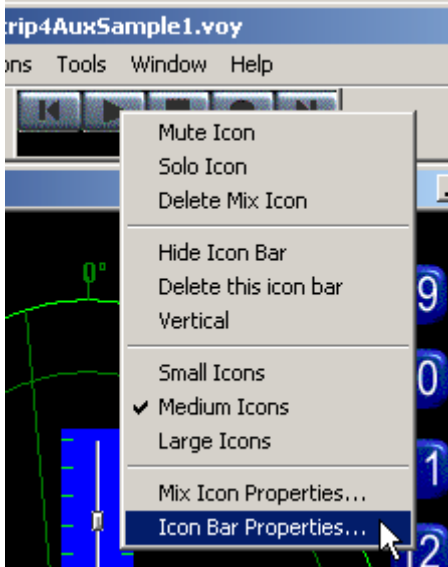


This is an example of an Icon Bar that is 'floating free'.

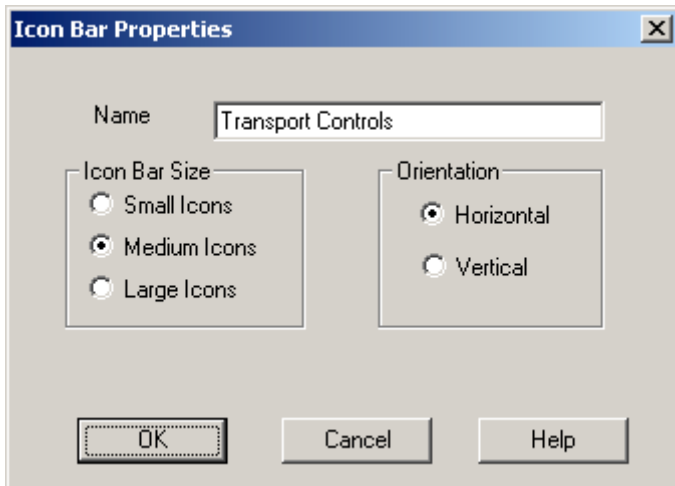


This is an example of the same toolbar docked on the top of the GraphiMix mainframe.

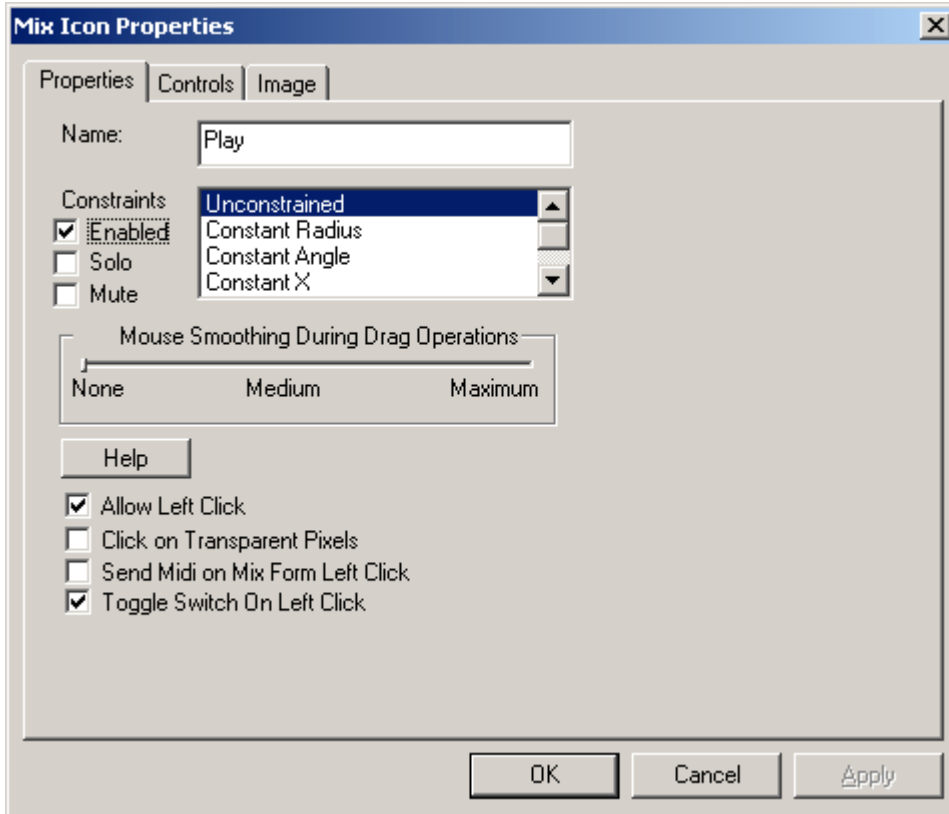
If the user <right-clicks> on any icon on the Icon bar, the Icon Bar context menu will appear. This allows the user to Mute and Solo the Mix Icon, Delete the Mix Icon, Hide or Delete the Icon Bar, switch between Vertical and Horizontal orientation, display of small, medium or large Mix Icons, and to select Mix Icon and Icon Bar Properties.



Shown below is the Icon Bar Properties dialog. This allows the user to set the Icon Bar Size, and its orientation, and to provide a name for the Icon Bar.

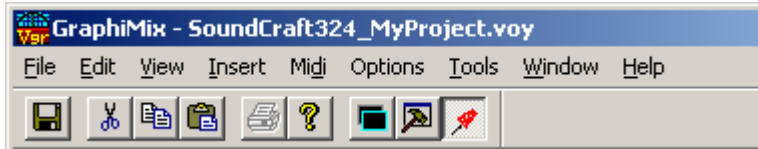


Shown below is the Mix Icon Properties dialog accessed from the Icon Bar context menu. This is similar to the Mix Icon Properties available on a <right-click> on a Mix Icon placed on a Mix Form, but with fewer options. For more information on Mix Icon Properties, see *Mix Icon Properties*, page 54.



## Menus

At the top of the Mix Frame window are arrayed all of the GraphiMix menus. These menus provide access to all the GraphiMix application functions.



Also shown is the Standard Tool Bar.

### ***File Menu***

This menu can also be selected by typing <Alt> then 'F'.

New	Starts a new Voyager project.
Open	Opens a Voyager project.
Close	Closes and saves the project.
Save	Saves the current project. Disabled in the Demo version.
Save-As	Saves the project with the option for another filename. Disabled in the Demo version.
Export Environment	Saves all files needed for a particular GraphiMix session except the VOY (session file) so that a GraphiMix session can be easily moved to another PC or installation.
Import Environment	Restores all files needed for a particular GraphiMix session except the VOY (session file) so that a GraphiMix session can be easily moved to another PC or installation.
Most Recent Session List ...	The most recent 10 session files opened or saved in GraphiMix. Selecting one of these files automatically opens that session.

Exit	EXIT the program.
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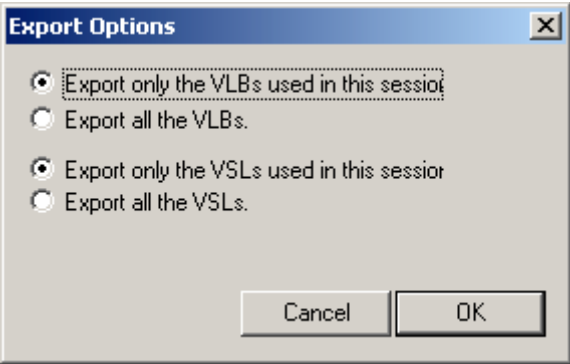
### Export Environment...

The session environment is all of the associated files that are used and referred to in a particular GraphiMix session. This includes the files that hold the hardware protocols, the VSLs, and the files that store the Mix Icon data structures and images, the VLBs. Note, that the session itself is separate from the environment, and is stored as a named file with the extension “.voy”.

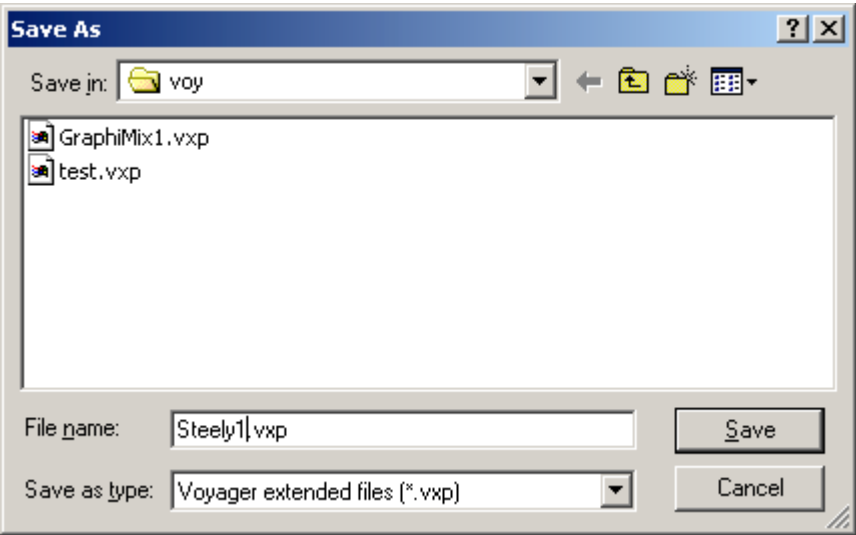
These files have to be in particular directories or subdirectories in order to be useable by GraphiMix.

The Export Environment... selection brings up a series of dialogs that result in saving the GraphiMix environment, in all or part, to a named file with the extension “.vxp”.

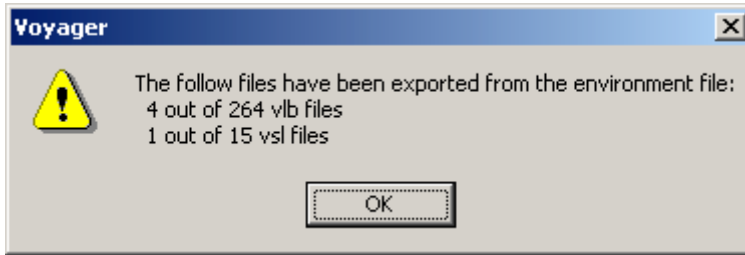
The first dialog prompts the user to select whether he wants to export just the VLBs and VSLs that are required by the current GraphiMix session, or all files.



The next dialog prompts for its name and where to save it.



Finally, a status dialog appears with Export Environment statistics.

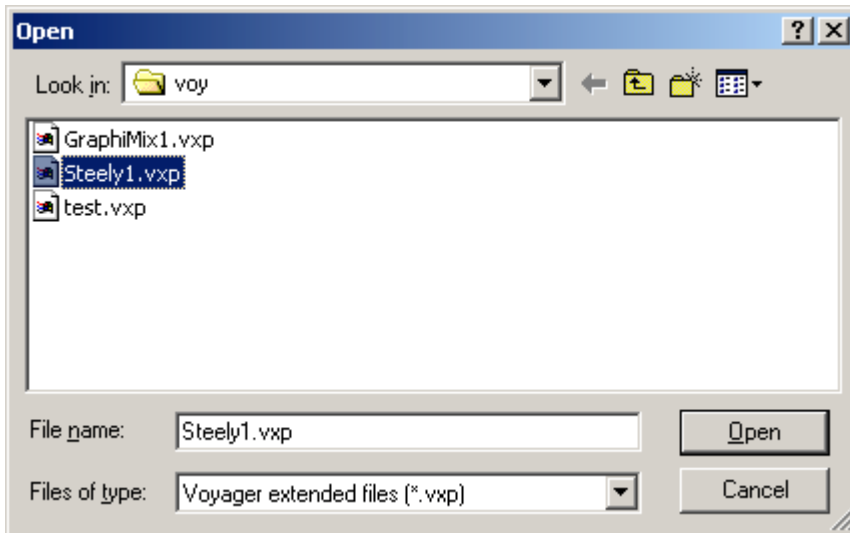


## Import Environment...

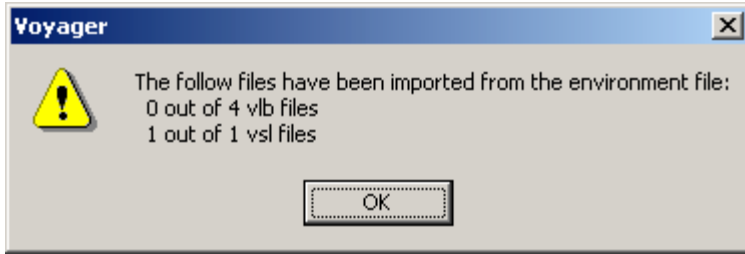
The Import Environment... selection brings up a series of dialogs that result in loading files into the GraphiMix environment from a named file with the extension “.vxp”.

Note that although the files may be transferred, the current GraphiMix variant must be sufficiently licensed to enable their use.

The first dialog prompts for the environment export file folder and name.



The next dialog shows the Import Environment statistics. Older files will not overwrite newer files.



## **Edit Menu**

This menu can also be selected by typing <Alt> then 'E'.

Preferences ...	Sets Options that affect the run-time performance of the GraphiMix system
Find and Replace ....	Brings up the Find and Replace dialog to enable automatic search and replacement of Mix Icon parameters.
Cut Mix Icon	If a Mix Icon is selected (Red box around icon image) then this menu item appears. Cut Mix Icon to windows clipboard.
Copy Mix Icon	If a Mix Icon is selected (Red box around icon image) then this menu item appears. Copy Mix Icon to windows clipboard.
Paste Mix Icon	If a Mix Icon is on the windows clipboard from a previous Cut or Copy operation, then this menu item appears. Copy Mix Icon from windows clipboard to currently selected Mix Form.
Delete Mix Icon	If a Mix Icon is selected (Red box around icon image) then this menu item appears. Delete Mix Icon.
Cut Mix Form	If a Mix Form is selected ( title bar highlighted in blue ) then this menu item appears. Cut Mix Form to windows clipboard.
Copy Mix Form	If a Mix Form is selected ( title bar highlighted in blue ) then this menu item appears. Copy Mix Form to windows clipboard.

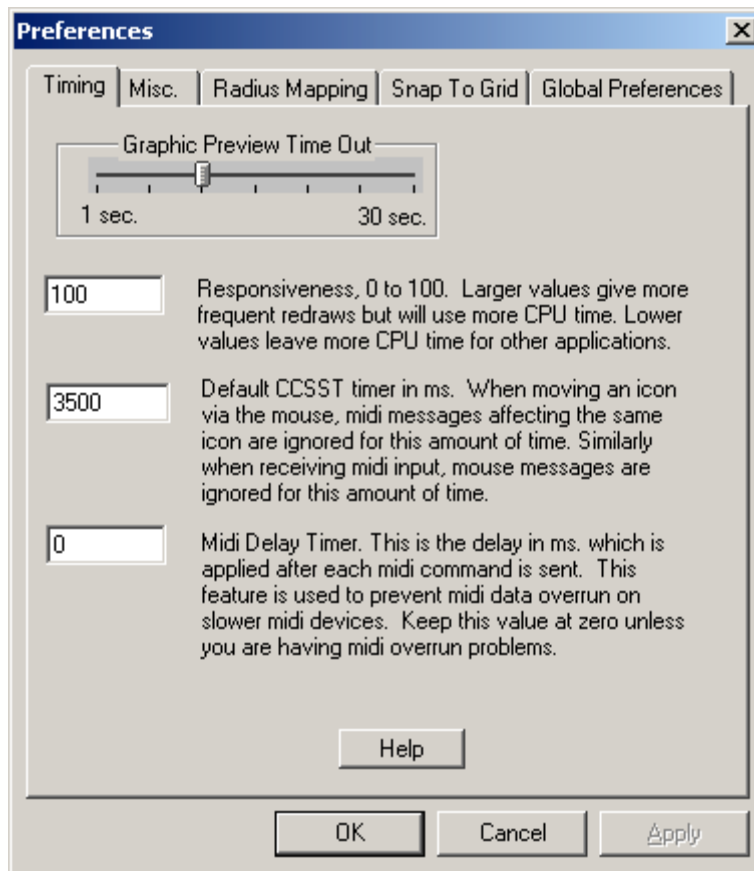
Paste Mix Form	If a Mix Form is on the windows clipboard from a previous Cut or Copy operation, then this menu item appears. Copy Mix Form from windows clipboard.
Delete Mix Form	If a Mix Form is selected ( title bar highlighted in blue ) then this menu item appears. Delete selected Mix Form.
Cut State	Cut current State (with all of its Mix Forms, Icons, and attached controls) to windows clipboard.
Copy State	Copy current State (with all of its Mix Forms, Icons, and attached controls) to windows clipboard.
Paste State	If a State is on the windows clipboard from a previous Cut or Copy operation, then this menu item appears. Copy State from windows clipboard.
Delete State	If there are two or more States in the session, then this menu item appears.
Cut Scene	Cut current Scene (with all of its States, Mix Forms, Icons, and attached controls) to windows clipboard.
Copy Scene	Copy current Scene (with all of its States, Mix Forms, Icons, and attached controls) to windows clipboard.
Paste Scene	If a Scene is on the windows clipboard from a previous Cut or Copy operation, then this menu item appears. Copy Scene from windows clipboard.
Delete Scene	If there are two or more Scenes in the session, then this menu item appears.

Paste Axis

If an Axis is on the windows clipboard from a previous Cut or Copy operation, then this menu item appears. To Cut or Copy an Axis, see *Mix Form Properties, Backgrounds*, page 22.  
Copy Axis from windows clipboard to currently selected Mix Form.

## Preferences

This tabbed dialog allows the user to read and modify global and default settings for various GraphiMix operational parameters.



## Timing

This dialog sets various parameters related to timing within GraphiMix.

The Graphic Preview Time Out slider sets the time that the Graphic Preview timer bar takes to 'tick down'. For more information see *Scenes and States Tool Bar*, page 78.

The Responsiveness number entry box sets a relative level of CPU loading as GraphiMix executes. For hardware console applications, this should normally be left at 100. If GraphiMix is being used on the same CPU with other time-critical applications, for example a Digital Audio Workstation application, the user may want to set this to 89 or below. Graphic redraws of Icon positions can be CPU intensive. As this number is set lower, GraphiMix redraws happen at lower priorities and with more 'forced context switches' to allow other tasks to use more of the CPU. Although graphic drawing may lag behind the actual icon moves, all MIDI input and output based on icon positions happen at normal priority.

The Default CCSST timer setting number entry box sets the standoff timer value for change of control of a particular Mix Icon between MIDI input (external control) or User mouse and keyboard input (internal control). This time needs to be set long enough to transfer all controls' MIDI messages to the target hardware on a scene or state change, otherwise echoed messages may 'push back' on the icon movements. The more controls that are in a particular state, the larger this number has to be. This number also has to be set larger if external MIDI is used rather than GraphiPorts because of the slower data rate. Setting this to a large timeout is only a problem if the user is using both the external hardware/application *and* GraphiMix to set the same control; the user then must wait this amount of time before switching which surface he is using.

The MIDI Delay Timer number entry box sets a delay after each MIDI message is sent to avoid problems with slower MIDI devices and causing MIDI overrun errors.

### ***Misc.***

The Miscellaneous tab holds settings that don't belong on any other tab.

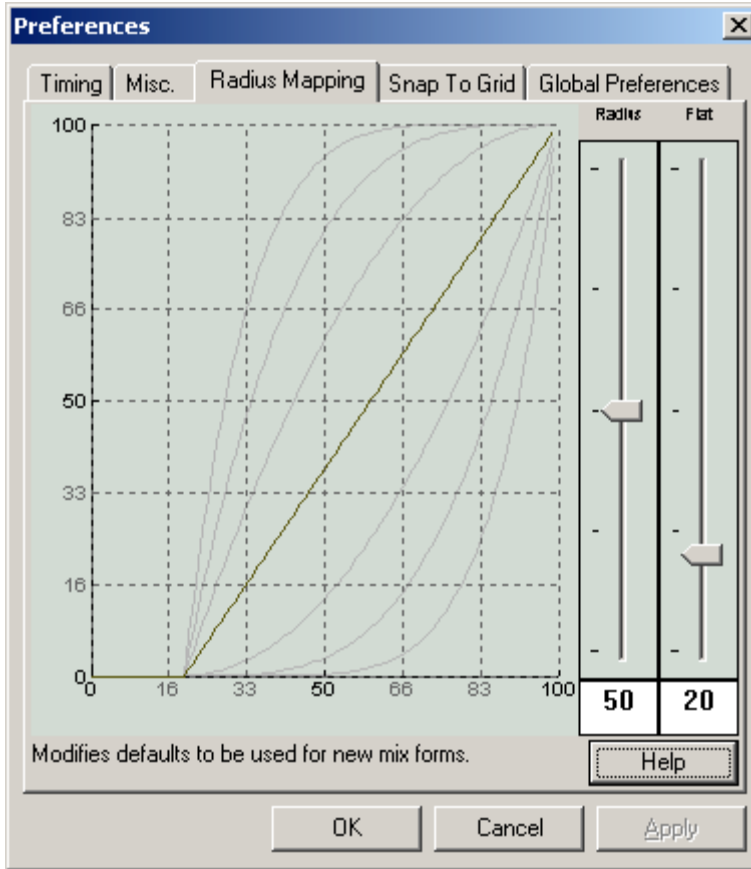


The 'Set Default Background Color' button allows the user to select the background color that will be used for new mix forms. This also changes the current background color displayed in the VLB windows.

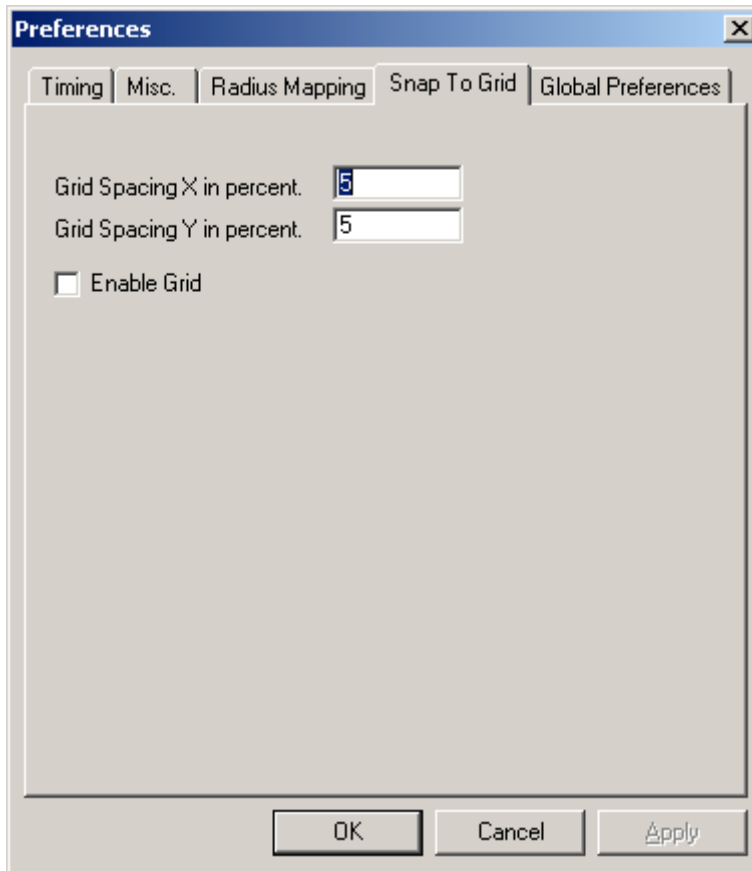
The 'Issue Warning on Icon Delete' checkbox sets whether the user is alerted when he attempts to delete a Mix Icon.

## Radius Mapping

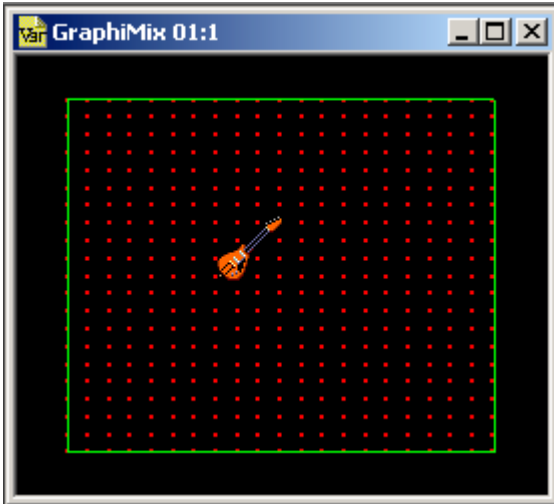
The radius mapping tab of the preferences dialog box allows the user to specify the default radius mapping that will be used for new mix forms. Radius mapping is described in the *Radius Mapping* section, page 34.



## *Snap To Grid*



The 'Snap To Grid' feature allows mix icons to be aligned relative to a grid. The X and Y grid spacing are specified in percent. When this feature is enabled, any mix icon which is manually dragged by using the mouse, will slide to the nearest grid point when the drag operation is completed.



When 'snap to grid' is enabled, the mix form background will show a red dot for each grid point. This feature is useful when setting up Mix Forms with arrays of controls that will be fixed in place. After the Mix Icons have been placed and their position fixed, this feature can be disabled.

## Global Preferences



The Global Preferences tab allows the user to determine whether GraphiMix will automatically open the last session file in use when it starts up.

The user can also set whether to display all VLB windows when the View Menu->View Icon Windows is selected by checking the 'Show all the VLB windows by default' checkbox. The default behavior is to display the Primary VLB window only.

## Find And Replace

The dialog box is titled "Find and Replace Control Attributes". It is divided into two main columns: "Search Criteria" and "Change to Replace". Each column contains a list of attributes with checkboxes and input fields. The "Search Criteria" column has checkboxes for Name, Vsl File, Protocol, Component, Control, Data Type, Coordinate, MIDI Channel, MIDI Port, Index, Parameter, Program, Min, and Max. The "Change to Replace" column has the same list of attributes. Below the columns is a dropdown menu set to "Search All Icons in This State", a "Help" button, and three buttons at the bottom: "Search and Replace", "Queried Search and Replace", and "Done".

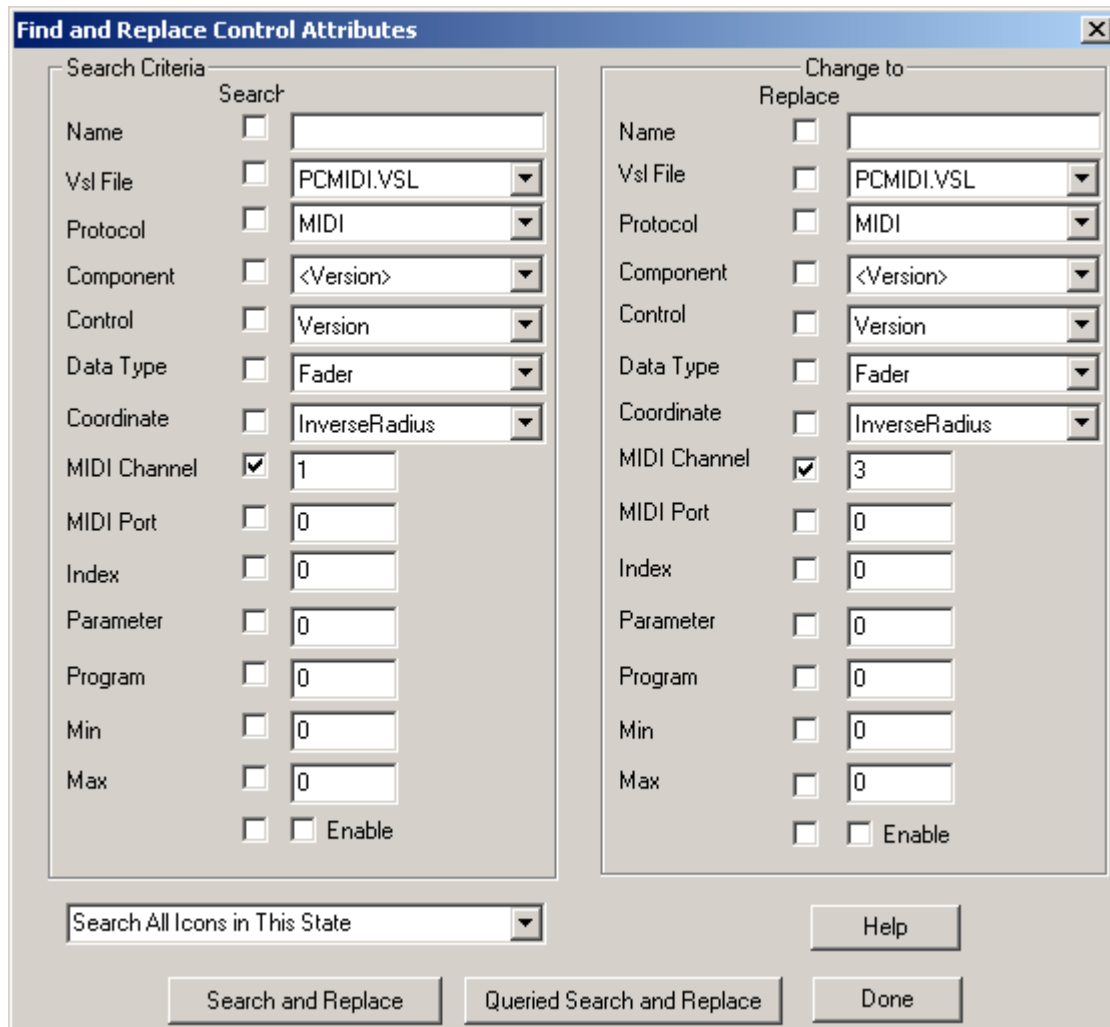
The Find and Replace facility, accessed in the Edit menu and in the Mix Form and Mix Icon context menus (in Build Mode), allows the user to quickly change the attributes of many mix icon controls. This is useful, for example, to change all (or a subset) of the controls from one midi channel assignment to another.

The search criteria are specified using the data on the left half of the dialog box. To include a field as a part of the search criteria, check the appropriate box and enter the value which will be searched for. Be sure to select the appropriate VSL file first since the displayed fields are dependant on this choice. Then you must select the appropriate Component since the controls depend on the selected component.

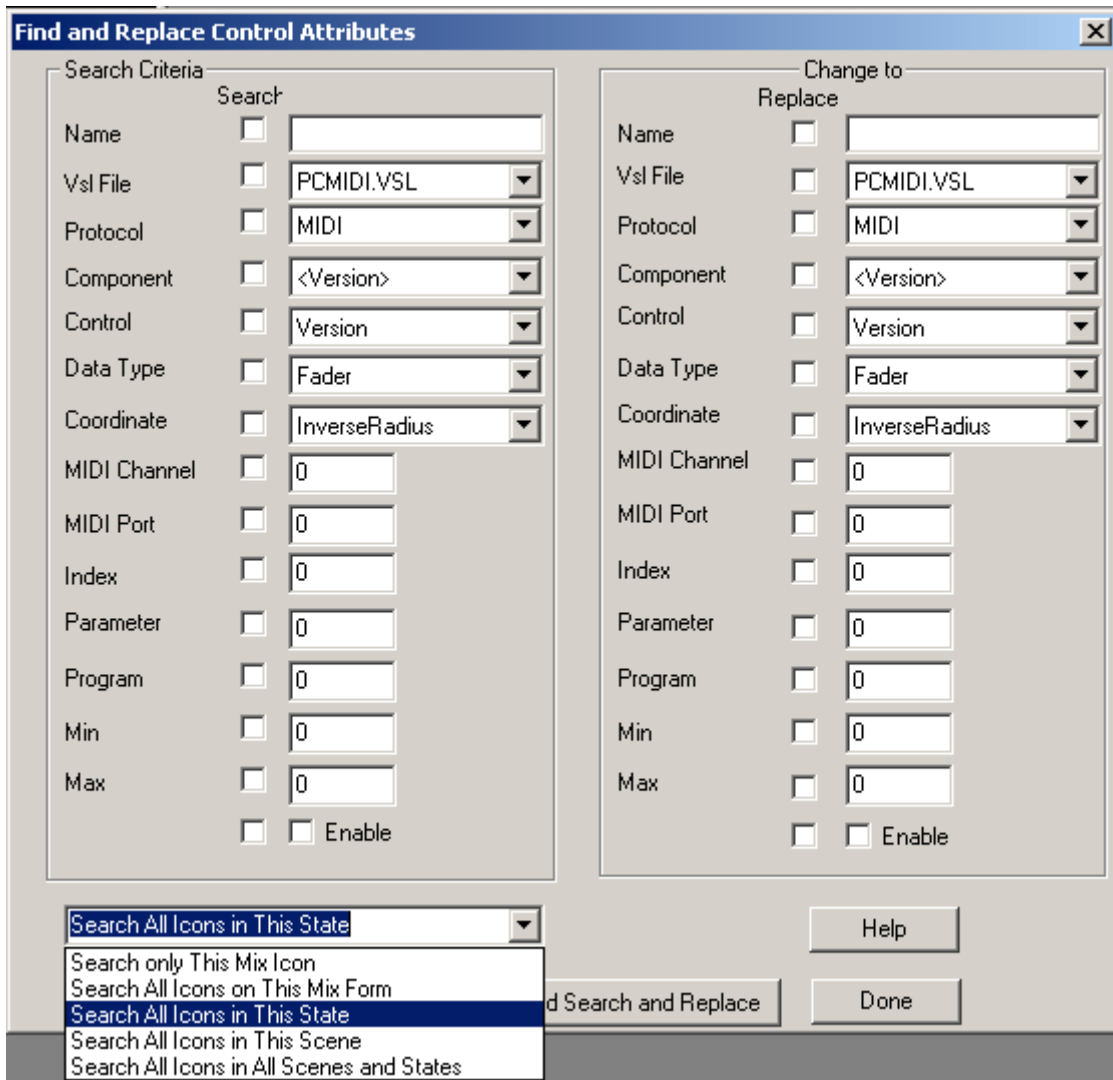
All checked search criteria must be met simultaneously in order for a particular control to pass the search condition. In some circumstances the user may want to leave all the

search criteria unchecked in order to apply the change to all mix icon controls. All of the unchecked fields are ‘wildcarded’.

The ‘Change to’ fields on the right hand side of the dialog box specify what to change the field to. When the all search criteria are satisfied, the checked fields on the right are changed to the specified value.



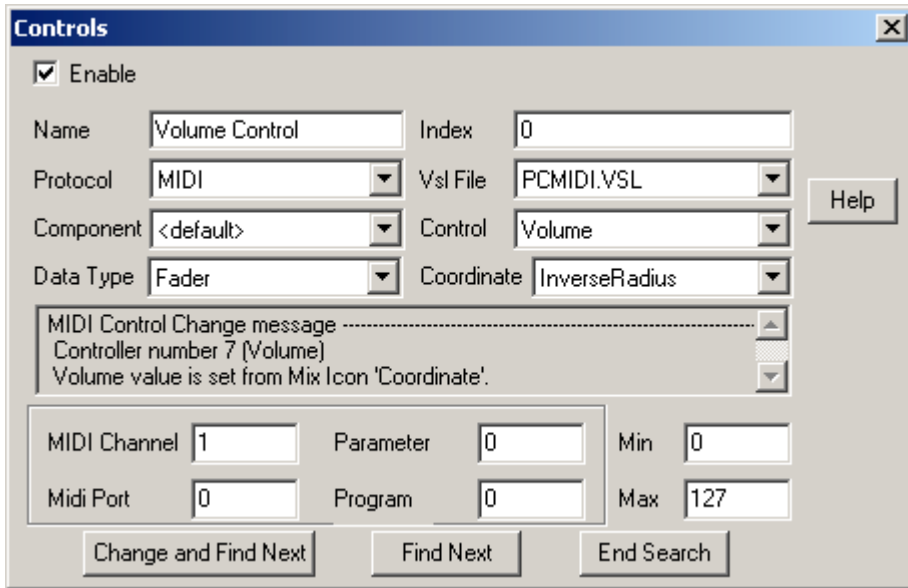
For example, to change all mix icon controls in this State which are currently on MIDI channel 1 to MIDI channel 3, the above dialog box settings would be used.



The search may be applied to:

- all of the controls on a given mix icon
- all controls on a given mix form
- all controls in a given state
- all controls in a given scene
- all controls in all scenes and state

The user may do an automated search and replace by clicking the 'Search and Replace' button, or the user may do a queried search and replace by clicking the 'Queried Search and Replace' button. This allows the user to view and optionally edit the attributes of a selected set of controls or of all controls. Often the user will want to do a queried search without any replacement specified if he wants to edit each matched controls manually, or simply to review all controls that meet the search criteria.



When doing a queried search and replace, the user is shown each qualifying control before any change is made. The user may select ‘Change and Find Next’, or ‘Find Next’, or ‘End Search’. The user may also hand edit the control to make any desired changes.

### **View Menu**

This menu can also be selected by typing <Alt> then ‘V’.

Disable/Hide All Tool Windows	This entry, when clicked, hides all Icon and VLB windows, the Icon status window, and the Scenes and States status window if they are shown. This entry toggles between hiding the windows and ‘unhiding’ these windows if they were previously hidden.
Standard Toolbar	Brings up the standard application toolbar
Mix Form Tool Bar	Brings up the Mix Form Tool Bar (see Mix Form Tool Bar, page 77 for more information)
Scene and State Tool Bar	Brings up Scene and State Tool Bar
Scene and State Tab Bar	Brings up Scene and State Tab Bar
Icon Bars	This entry leads to a sub-menu where individual Icon Bars can be hidden or shown.

View Links	Allow links between Mix Icons to be shown.
View Icon Windows ...	Brings up the VLB Windows selection dialog and any enabled VLB folders. Mix Icons are stored as files with the extension VLB.
View Status Window	Brings up Status of Selected Mix Icon window
View States Window	Brings up Scenes and States Window
Show All Hidden Mix Forms	Shows all hidden Mix Forms.
Zoom In	Zoom in to selected Mix Icon
Zoom Out	Zoom out from selected Mix Icon

### **View Icon Windows ...**

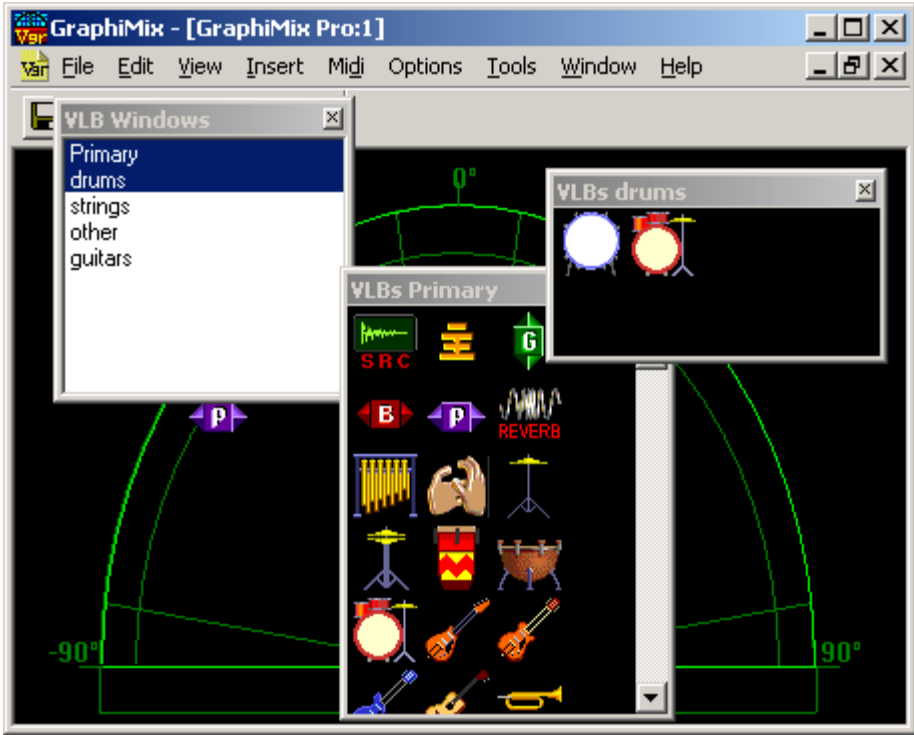
Mix Icons are stored in files named VLB files. These files are stored in directories. These directories are shown in the VLB Windows dialog which is shown when the ‘View Menu->View Icon Windows ...’ menu selection is made. All VLB directories are listed in this dialog and they can be individually selected by <left-clicking> on their names in this list.

Mix Icons can be moved between these VLB directories by simply clicking and dragging them from one window to another. A <left-click-and-drag> simply moves the Mix Icon from one window to another. A <right-click-and-drag> gives the user the option of moving or copying the selected Mix Icon.

VLB directories can be created by <right-clicking> on the VLB Windows window. By <right-clicking> on a selected VLB directory, the user can Create, Rename, or Delete that directory.

By <right-clicking> on a VLB Window, the user can Create a new VLB, Create a new Window, Delete or Rename this window, or View the VLB Windows Window.

By <right-clicking> on a particular Mix Icon or VLB, the user can Edit, Copy, or Delete that VLB, or View the VLB Windows Window.



***Insert Menu***

This menu can also be selected by typing <Alt>, then 'I'.

New Mix Icon	Insert new Mix Icon at cursor location
New Mix Form	Insert new Mix Form
New State	Insert new state
New Scene	Insert new scene
New Icon Bar	Insert a new and empty Icon Bar

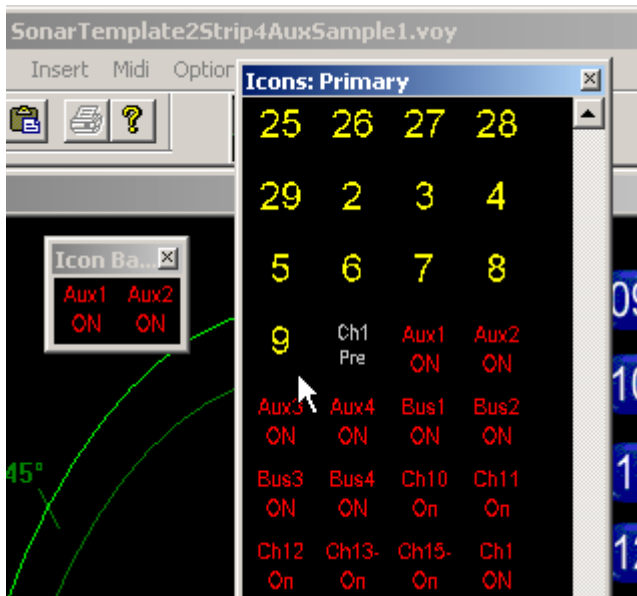
## New Icon Bar

Icon bars can be created by selecting 'New Icon Bar' on the Insert menu.



To populate an Icon bar, bring up an Icon window and drag or drop Mix Icons (usually some form of momentary or toggle switch) on to the bar.

The only Mix Icon coordinates that can be used by a control attached to an icon on the Icon bar are SwitchToOn, SwitchToOff, MuteOn, MuteOff, SoloOn, and SoloOff. No positional coordinates are defined in an Icon Bar.



For more information on Icon Bars, see *Tool Bars, Tab Bars, and Icon Bars*, page 79.

## MIDI Menu

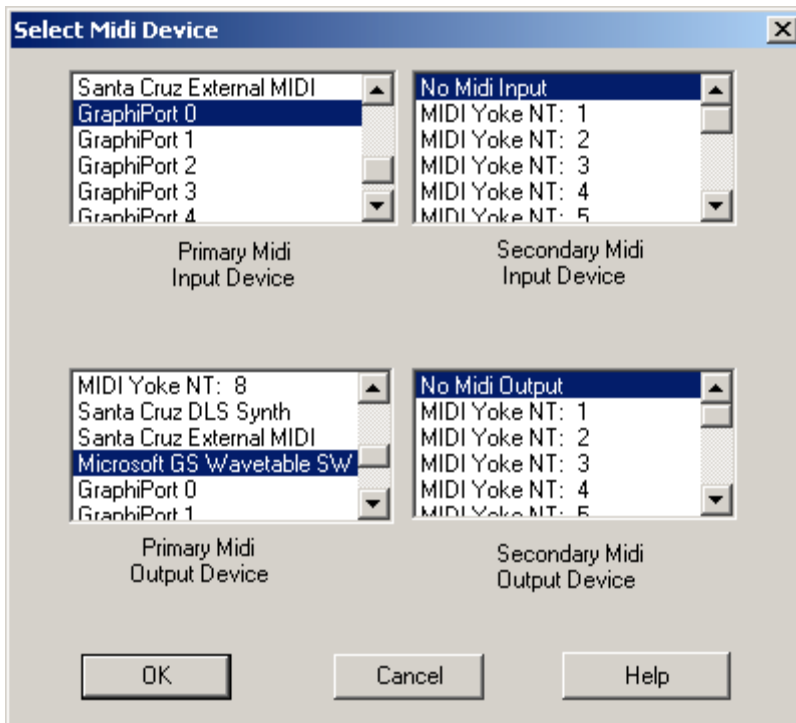
This menu can also be selected by typing <Alt> then 'M'.

Enable Primary Midi Input	Enable/Disable Primary Midi Input if selected
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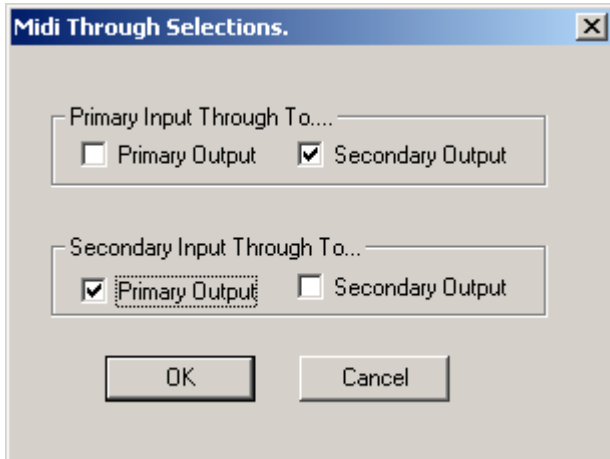
Enable Primary Midi Output	Enable/Disable Primary Midi Output if selected
Enable Secondary Midi Input	Enable/Disable Secondary Midi Input if selected
Enable Secondary Midi Output	Enable/Disable Secondary Midi Output if selected
Select Midi Devices ...	Bring up Select Midi Devices dialog
Midi Through ...	Bring up the Midi Through dialog.

See *Using MIDI with GraphiMix*, page 135, for more information.

This is the Select Midi Devices... dialog. Settings for Primary and Secondary midi ports can be selected here.



This is the Midi Through ... selections dialog. MIDI through modes for Primary and Secondary inputs and outputs can be set here.



### Options Menu

This menu can also be selected by typing <Alt> then 'O'

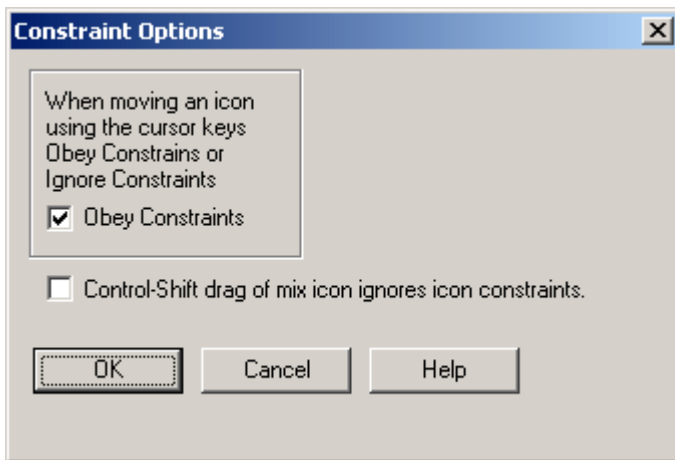
Icon Size Options	This selects the Icon Size Options dialog.
Constraint Options ...	This selects the Constraint Options dialog.
Link Options ...	This selects the Link Options dialog.
Attach States To Midi ...	This selects the Attach States To Midi dialog.

### Icon Size Options



Check boxes to Allow Small/Medium/Large Icons are provided. The Mix Icons will change their size dynamically as the Mix Form size is changed. There are 3 sizes provided for each Mix Icon Image. Some of these choices may be disallowed dependent on user preferences. For example to force small icons on large Mix Forms, deselect the Allow Medium and Allow Large Icon checkboxes. A slider is provided on this dialog that allows the user to set the automatic thresholds for changing the icon sizes to suit individual preferences.

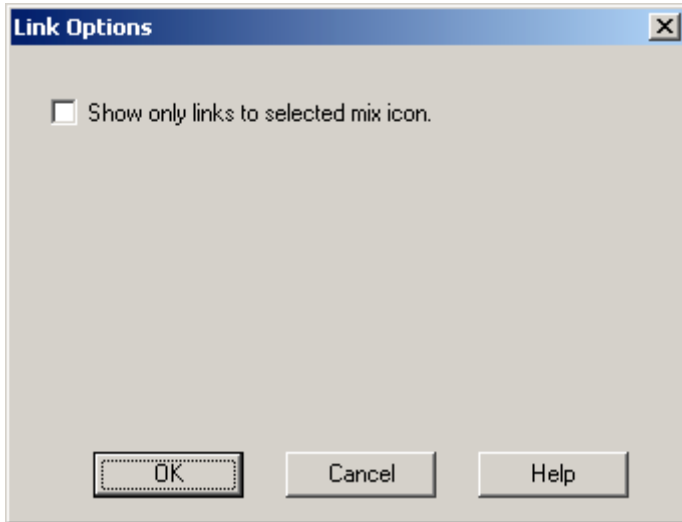
## Constraint Options



Keyboard ‘cursor keys’ can be used to move the selected Mix Icon in addition to the mouse. These movements may or may not obey the Mix Icon Movement constraints. There is a checkbox provided to customize this setting.

By checking the ‘Control-Shift drag’ checkbox, the user can permit a <control-shift-drag> action to temporarily ignore the Mix Icon movement constraints. This could be used, for example, to reposition a Mix Icon that is set with the Fixed Position movement constraint.

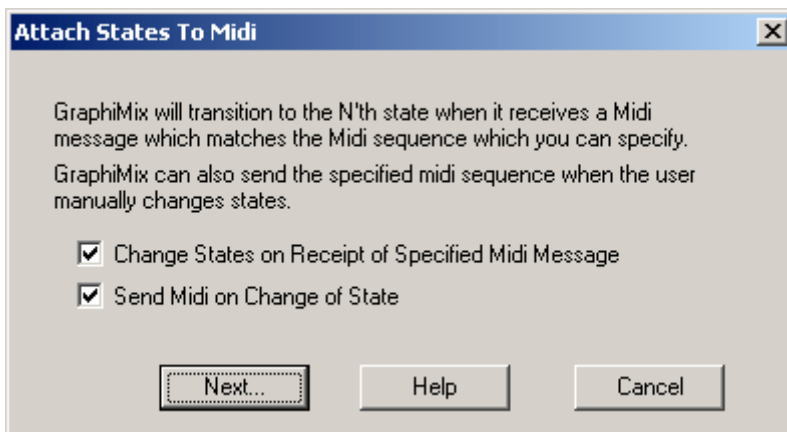
## Link Options



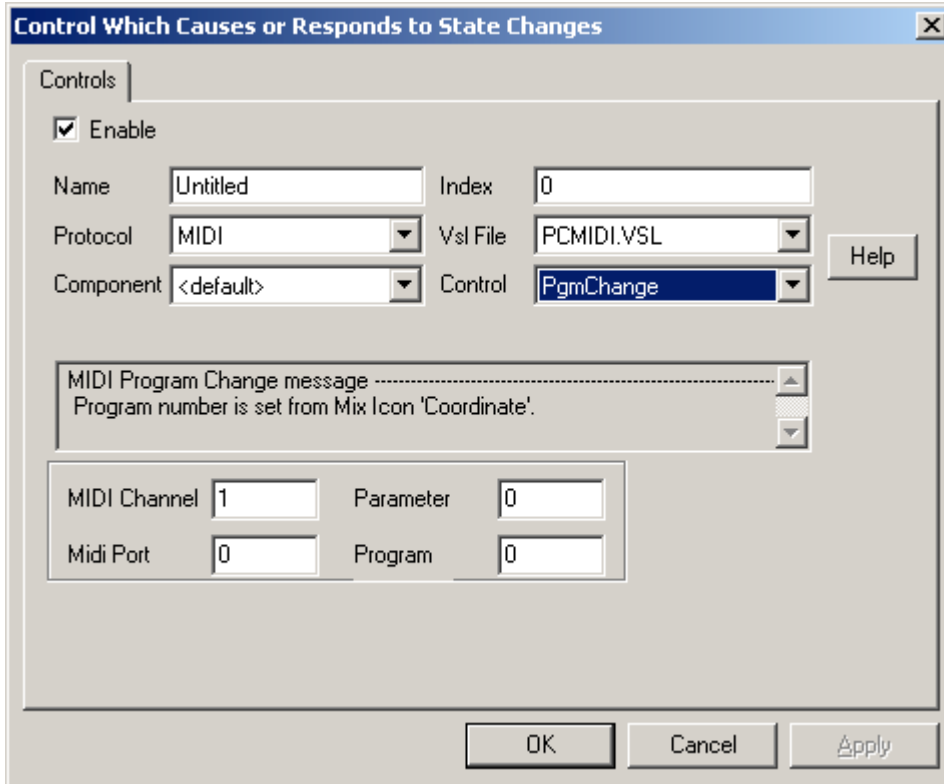
Mix Icon links can be enabled to be shown in the View Menu. If Mix Icon links are shown, this dialog box allows the user to select all links to be shown (the default) or only the links attached to the selected Mix Icon. To show only links attached to the selected Mix Icon, check this box.

## Attach States To Midi Option

GraphiMix can issue a Midi command when the user selects a new State. It can also change state in response to a received Midi command. This can be used to synchronize state or scene changes with external equipment or controllers.



Clicking 'Next...' brings up the following dialog.



Any control from any VSL can be specified. A common Midi message used for this purpose is the Midi 'Program Change' command. The dialog above shows the selection of this control which is available in the PCMidi VSL file. The value that selects States is zero-based, e.g. State 1 is selected with a value of 0, State 2 is selected with a value of 1, etc. States are indexed sequentially across Scenes.

## ***Tools Menu***

This menu can also be selected by typing <Alt> then 'T'.

There are several special tools listed under the 'Tools' menu that aid in creating and customizing the Voyager GraphiMix user and hardware interfaces.

Some of these tools may not be available to all users depending on the version of the Voyager GraphiMix that was purchased.

## **Convert Yamaha DME32™ Configuration File Tool**

The Yamaha DME32™ is a versatile 'Mix Engine' that allows the user to completely customize the functionality and configuration of this device. The user can graphically add and connect 'components' such as effects and other audio processing as well as filtering and mixing components to make any configuration that he desires. The Yamaha DME

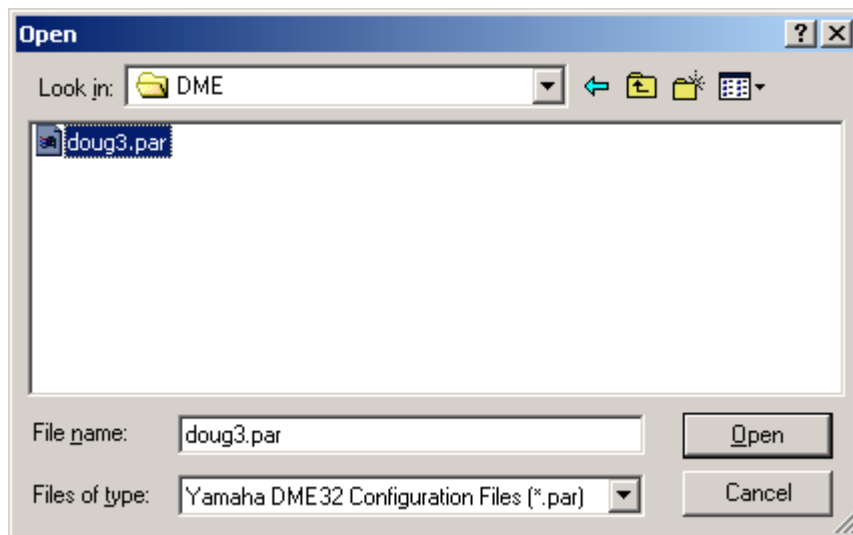
Manager™ allows the user to graphically design and wire his custom configuration with ‘click and drag’ operations.

When the configuration is complete, the DME Manager™ can output a parameter file (PAR file) that assigns a SYSEX parameter change number with individual MIN and MAX values for each configured control.

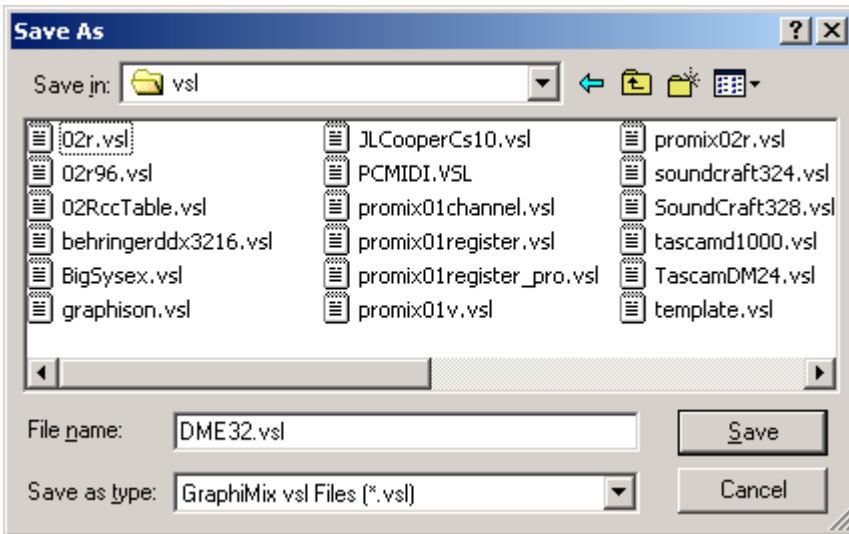
In order to generate a PAR file, do the following.

1. Select the components you want to include in the .PAR file by selecting or dragging the mouse over the components on the schematic in the DME Manager.
2. Now, in the DME Manager, **print** the parameters to a file, which will then be your .PAR file. It is ASCII text.

The Voyager Sound GraphiMix Convert DME32 Configuration File tool allows the user to convert the PAR file output from DME32 Manager™ into a GraphiMix VSL file automatically. This tool automatically generates SYSEX commands based on the DME32™ PAR file and stores them in the file, DME32.VSL. If the user makes an incremental change to the DME configuration, he can simply re-run the tool and the corresponding new VSL will be generated. If the user is simply adding controls to the configuration, all original controls will still be valid, and the user will be ‘on the air’ with the new configuration in seconds. This eliminates the need for the user to reprogram the MIDI Control Change table every time he makes any changes to the DME configuration.



The resulting VSL must be placed in the same directory as the other GraphiMix VSL files ( the VSL subdirectory of the main directory which contains the GraphiMix.EXE file) to be available to a mix session.



**Sample input:**

UNIT	COMPONENT	NO.	PARAMETER	VALUE	MAX	MIN
1	4x4 Matrix	0	Fader1	209	255	0
		1	OnOff1	1	1	0
		2	Solo1	0	1	0

**Sample output:**

```

4x4_Matrix:Fader1
! ----- VSL control <c>Voyager Sound Inc 2001 -----
! Yamaha DME-32 MIDI SYSEX Parameter Change Number <hex> 0
! Parameter Value is set from Mix Icon 'Coordinate'.
MIN 0
MAX 255
PB HF0 H43 # System Exclusive Message and Manufacturer ID
PN 1 MC # substatus + midi channel
PB H3E H05 # group ID (digital mixer)
PB 0 H30 # byte operation for edit buffer
PN H0 H0 H0 H0 H0 H0 H0 H0 # Parameter number
PN H0 ICHH H0 ICHL H0 ICLH H0 ICLL # Parameter Value
PB HF7 # end of system exclusive
SN;

4x4_Matrix:Fader1_PR
! ----- VSL control <c>Voyager Sound Inc 2001 -----
! Yamaha DME-32 MIDI SYSEX Parameter Change Number <hex> 0
! Parameter Value is set from 'Parameter'.
MIN 0

```

MAX 255  
PB HF0 H43 # System Exclusive Message and Manufacturer ID  
PN 1 MC # substatus + midi channel  
PB H3E H05 # group ID (digital mixer)  
PB 0 H30 # byte operation for edit buffer  
PN H0 H0 H0 H0 H0 H0 H0 H0 # Parameter number  
PN H0 PRHH H0 PRHL H0 PRLH H0 PRL # Parameter Value  
PB HF7 # end of system exclusive  
SN;

4x4\_Matrix:OnOff1

! ----- VSL control <c>Voyager Sound Inc 2001 -----  
! Yamaha DME-32 MIDI SYSEX Parameter Change Number <hex> 1  
! Parameter Value is set from Mix Icon 'Coordinate'.  
MIN 0  
MAX 1  
PB HF0 H43 # System Exclusive Message and Manufacturer ID  
PN 1 MC # substatus + midi channel  
PB H3E H05 # group ID (digital mixer)  
PB 0 H30 # byte operation for edit buffer  
PN H0 H0 H0 H0 H0 H0 H0 H1 # Parameter number  
PN H0 ICHH H0 ICHL H0 ICLH H0 ICLL # Parameter Value  
PB HF7 # end of system exclusive  
SN;

4x4\_Matrix:OnOff1\_PR

! ----- VSL control <c>Voyager Sound Inc 2001 -----  
! Yamaha DME-32 MIDI SYSEX Parameter Change Number <hex> 1  
! Parameter Value is set from 'Parameter'.  
MIN 0  
MAX 1  
PB HF0 H43 # System Exclusive Message and Manufacturer ID  
PN 1 MC # substatus + midi channel  
PB H3E H05 # group ID (digital mixer)  
PB 0 H30 # byte operation for edit buffer  
PN H0 H0 H0 H0 H0 H0 H0 H1 # Parameter number  
PN H0 PRHH H0 PRHL H0 PRLH H0 PRL # Parameter Value  
PB HF7 # end of system exclusive  
SN;

4x4\_Matrix:Solo1

! ----- VSL control <c>Voyager Sound Inc 2001 -----  
! Yamaha DME-32 MIDI SYSEX Parameter Change Number <hex> 2  
! Parameter Value is set from Mix Icon 'Coordinate'.  
MIN 0  
MAX 1

```

PB HF0 H43 # System Exclusive Message and Manufacturer ID
PN 1 MC # substatus + midi channel
PB H3E H05 # group ID (digital mixer)
PB 0 H30 # byte operation for edit buffer
PN H0 H0 H0 H0 H0 H0 H0 H2 # Parameter number
PN H0 ICHH H0 ICHL H0 ICLH H0 ICLL # Parameter Value
PB HF7 # end of system exclusive
SN;

```

4x4\_Matrix:Solo1\_PR

```

! ----- VSL control <c>Voyager Sound Inc 2001 -----
! Yamaha DME-32 MIDI SYSEX Parameter Change Number <hex> 2
! Parameter Value is set from 'Parameter'.
MIN 0
MAX 1
PB HF0 H43 # System Exclusive Message and Manufacturer ID
PN 1 MC # substatus + midi channel
PB H3E H05 # group ID (digital mixer)
PB 0 H30 # byte operation for edit buffer
PN H0 H0 H0 H0 H0 H0 H0 H2 # Parameter number
PN H0 PRHH H0 PRHL H0 PRLH H0 PRLl # Parameter Value
PB HF7 # end of system exclusive
SN;

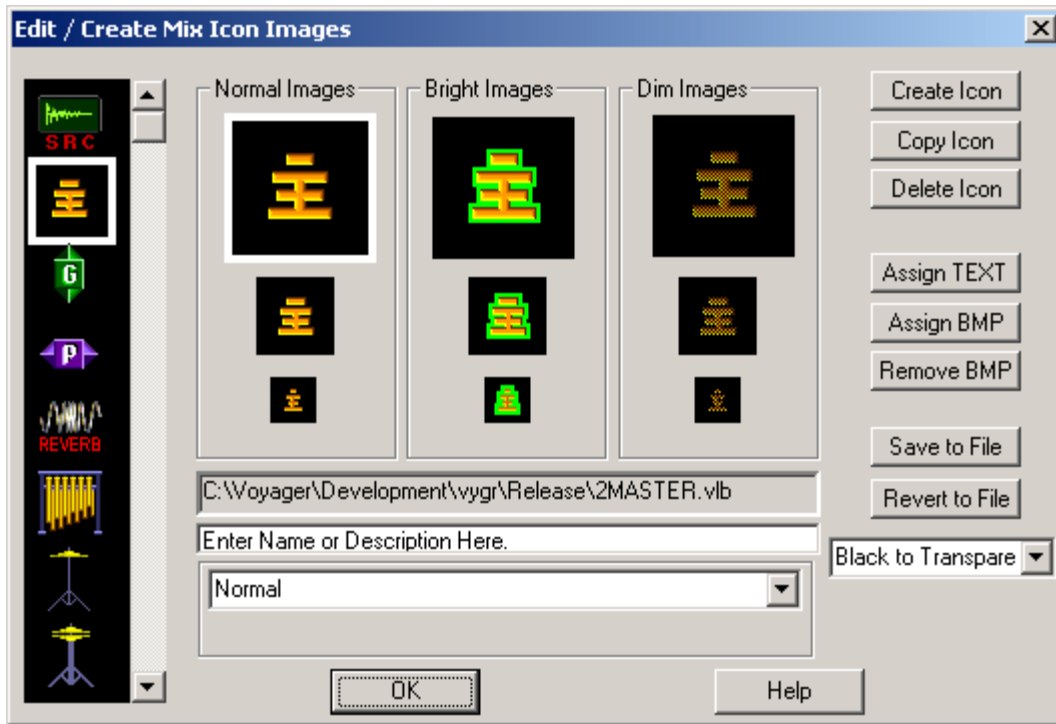
```

Note that two VSL controls are added for each DME32 control. This gives the user the flexibility of programming the DME control with a Mix Icon Coordinate or as a setting in the 'Parameter' field in the Mix Icon Control dialog.

For more information on the VSL language, see *Appendix, Voyager System Language (VSL) Description*, page 142.

## Edit/Create Mix Icon Images Tool

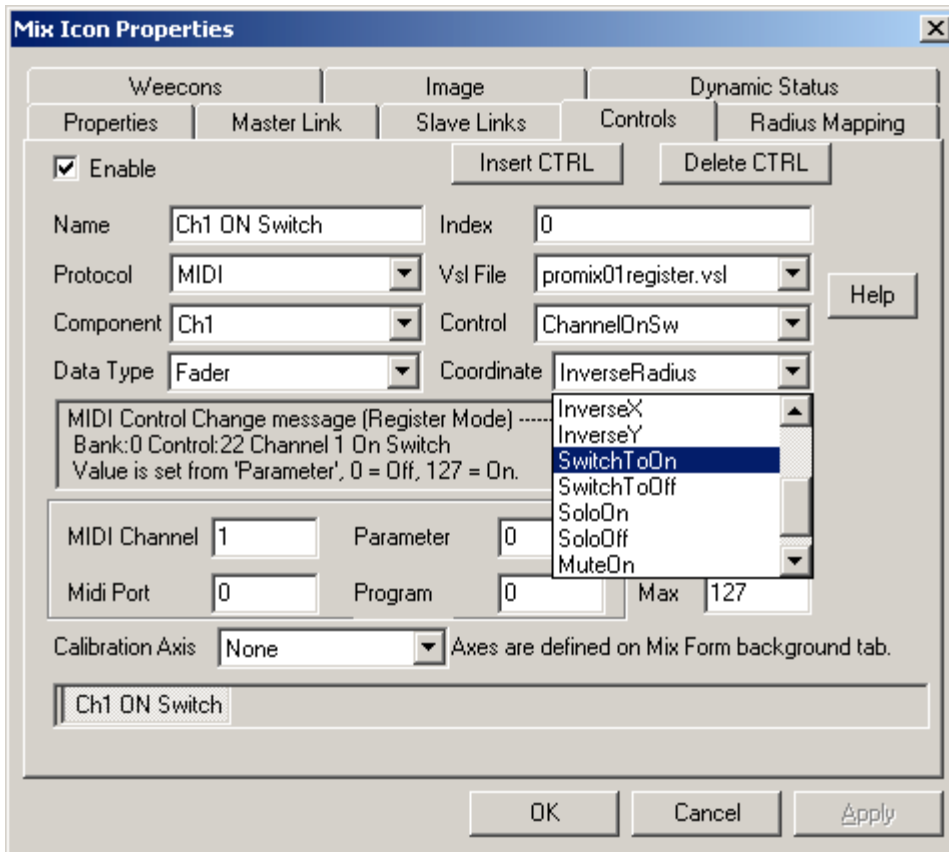
This tool allows the user to create custom Mix Icons using his own images and custom settings. These Mix Icons can be used as dynamic controls, or as control labels or calibration markers. This allows a user to customize the look and appearance of his graphic interface in an almost unlimited fashion.



There are several different types of Mix Icons. These types are a Normal Icon, a Toggle Switch Icon, a Momentary Switch Icon, a Knob Fader Icon, Horizontal and Vertical Fader Icons, and an Indexed List Icon.

A Normal Icon has four states, Mute On and Off, and Solo On and Off. It passes its Mix Form coordinates and states to the attached controls. A Normal Icon can be created from a standard Windows bitmap file (compressed bitmaps are not yet supported), or as a text-based Icon with selectable background and foreground colors and fonts. A sample directory of BMP images is included with the GraphiMix release.

A Switch Icon has two additional internal states, Switch On and Off. Each state may have its own individual graphic design. There are two different types of switch Icons, a Toggle switch and a Momentary switch. A switch Icon adds two additional coordinates to the Mix Icon Coordinate selection, 'SwitchToOn' and 'SwitchToOff'. Only one of these coordinates 'fire' at a time depending on the switch state. Controls 'attached' to these coordinates send messages only on the active event.



Knobs and Fader Mix Icon types have effectively 100 internal states, one for each setting of the knob or slider. Knobs, horizontal faders and vertical faders can be customized to a great degree with the built-in menus for this purpose. Knobs and Faders do not take in windows bitmaps. A knob or a fader adds two additional coordinates to the Mix Icon Coordinate selection, 'Fader' and 'Inverse Fader'.

Indexed List Icons display a text string that is read from a text file. This text file with the extension VTL is a normal text file with one text string per line. The text string displayed by the icon is indexed by the setting of the coordinate 'ListIndex'. This is useful when creating a multi-function switch control, such as a signal router. Indexed List Icons do not use windows bitmaps.

### ***Creating Normal Icons***

To create or edit a Normal Mix Icon, select the Tools Menu->Edit/Create Mix Icon dialog.

To create a new icon, click on the Create Icon button at the top right. To copy and modify an existing Icon, select the icon to be copied from the image menu at the left, and click on the Copy Icon button (under the Create Icon button).

There are 3 sets of images shown, the Normal Images, the Bright Images, and the Dim Images. The Normal image is the image displayed when the Icon is in active use. The

Dim image is displayed when the Mix Icon is disabled or Muted. The Bright image is displayed when the Mix Icon is in 'Solo Mode'.

There are 3 sizes for each type of image provided for a total of 9 images. These different sizes are used to scale the Mix Icon image to the size of the Mix Form. For example, if an icon is placed on a Mix Form, and then the Mix Form is shrunk by 'grabbing' a corner of the Mix Form with the mouse and adjusting the size smaller, the Mix Icon will shift to a smaller image to fit. There are 3 sizes provided to accommodate both large and small Mix Forms. The threshold for the size adjustment is adjustable under the Options Menu. Additionally, each of the three sizes can be specifically disabled with this menu.

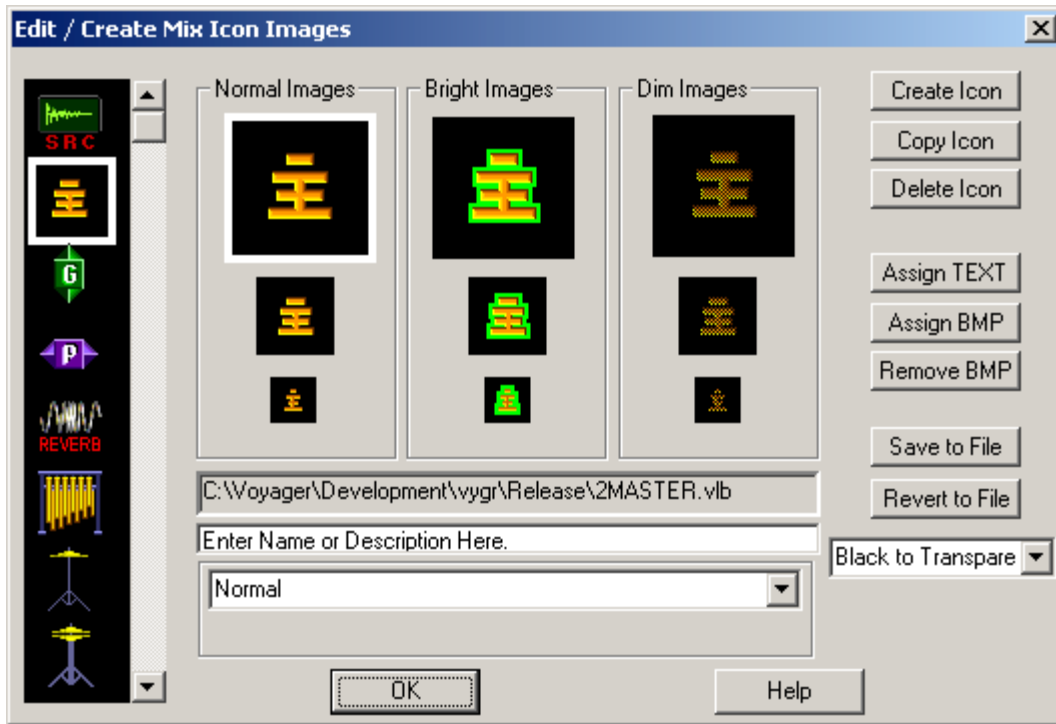
One way to specify the look of a Mix Icon is to import a windows bitmap file (BMP). Each individual image (of the 9) may be selected and individually assigned to a BMP. If an image is selected and assigned, the same image will 'inherit' across all the other images and variations which haven't been assigned to a BMP or Text Icon. A sample directory of BMP images is included with the GraphiMix release.

The Bright image default is automatically created by putting a light green border around all transparent-to-nontransparent borders. The Dim Image default is automatically created by setting every other pixel to transparent.

If all images have been assigned, the user can still change any one image in particular by selecting it and using the 'Assign BMP' or 'Assign TEXT' buttons. To remove a particular image, once assigned, click on the 'Remove BMP' button. This allows it to 'inherit' images again. If an image is 'unfilled', it will display as a light green square.

Text can be assigned instead of a BMP. The Text color and font can be selected as can the background color.

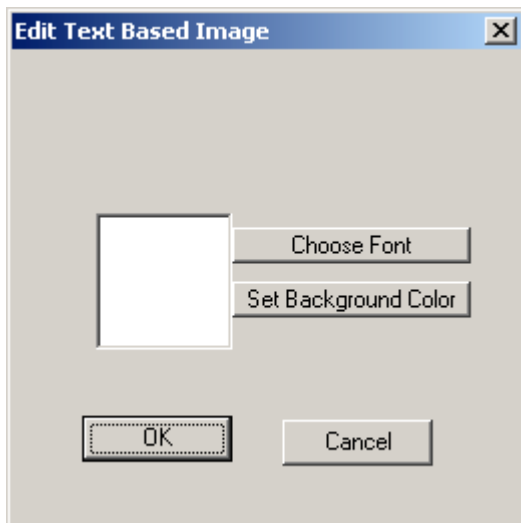
If the background color of the BMP or text is set to pure black (RGB=0,0,0) or pure white (RGB = 255,255,255) these areas can be made transparent by selecting the 'Transparency Mode' dropdown list at the bottom right of the dialog. The choices are Black to Transparent, White to Transparent, No Transparency.



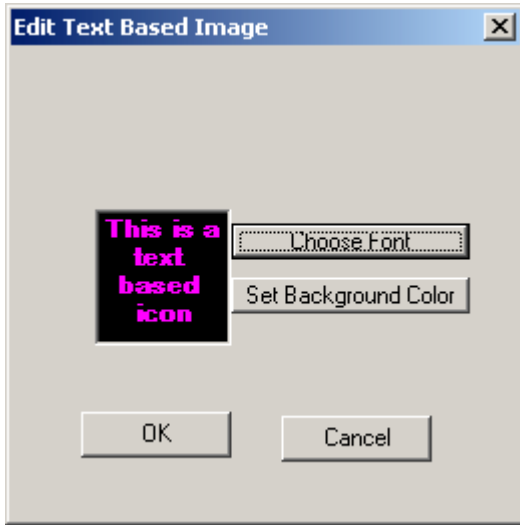
### *Creating Text Icon Images*

To create a Text Icon Image, select the image (of the 9) that you wish to assign text to, and then click on the 'Assign TEXT' button. The 'Edit Text Based Image' dialog box will appear.

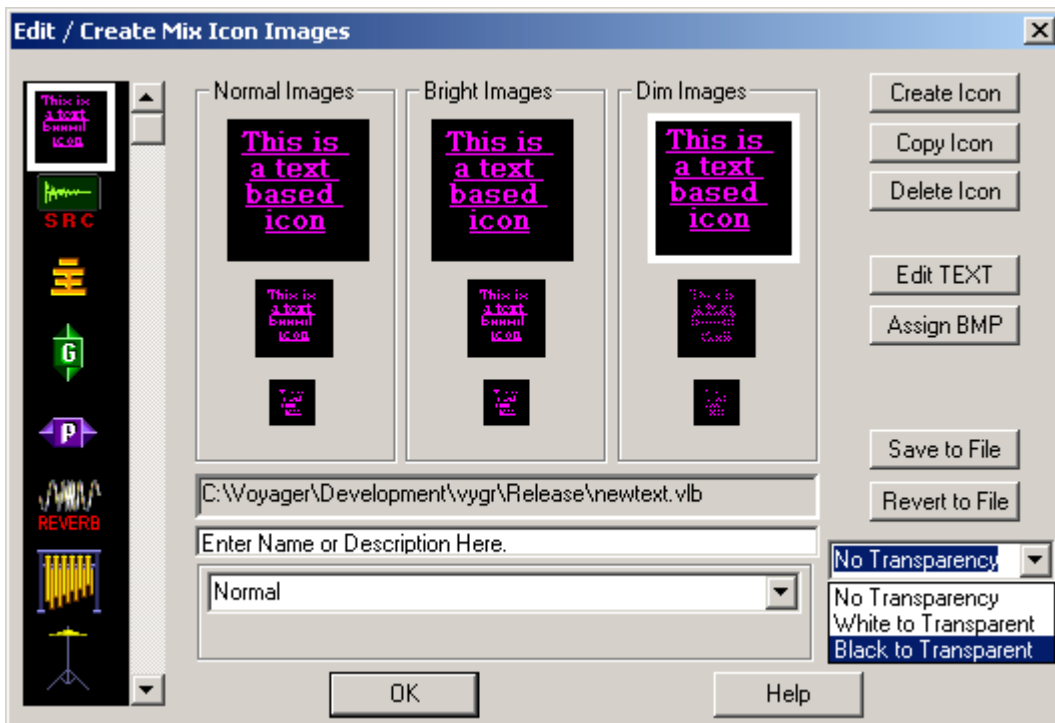
Choose a font and set a background color. Pure black or pure white can be turned into transparent background in the main dialog.



Click inside the square and type the centered text into the text entry box.

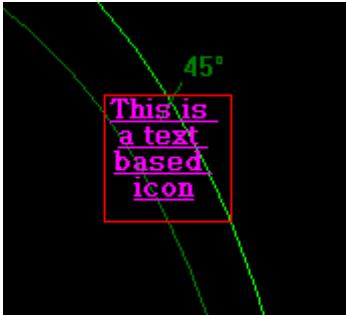


Click 'OK' when done and return to the main dialog. Select the transparency mode and enter an optional name or description for this Mix Icon. The 'name or description' field is used to generate tool tips for mix icon images. When the cursor rests over a mix icon image in the icon image selection window, a tool tip will be generated. The tool tip will be the description entered, if one exists, or will be the type of mix icon, such as 'Toggle Switch', if no description was entered.



Click on 'OK' when finished and save the VLB file.

Your new Mix Icon now appears in the Mix Icon Selection Window. To use this icon in a mix, <right-click> and drag the new icon from the selection window to your Mix Form.



Note the transparent background.

### ***Creating Mix Icon Images from BMP files***

Windows bitmap files (BMP's) can be used to fill any or all of the Mix Icon Images. Select the image to be filled and click on the 'Assign BMP' button. An Open File dialog will appear. Navigate to the BMP file to use. Click 'Open' to select the file. A sample directory of BMP images is included with the GraphiMix release.

The large icon is a 64X64 pixel square. The middle icon is 32X32, and the smallest is 16X16. Monochrome, 16 color, 256 color, and 24 bit color bitmap formats are supported. Compressed bitmap formats are not currently supported. Any size BMP can be read in. It is automatically scaled to the proper size.

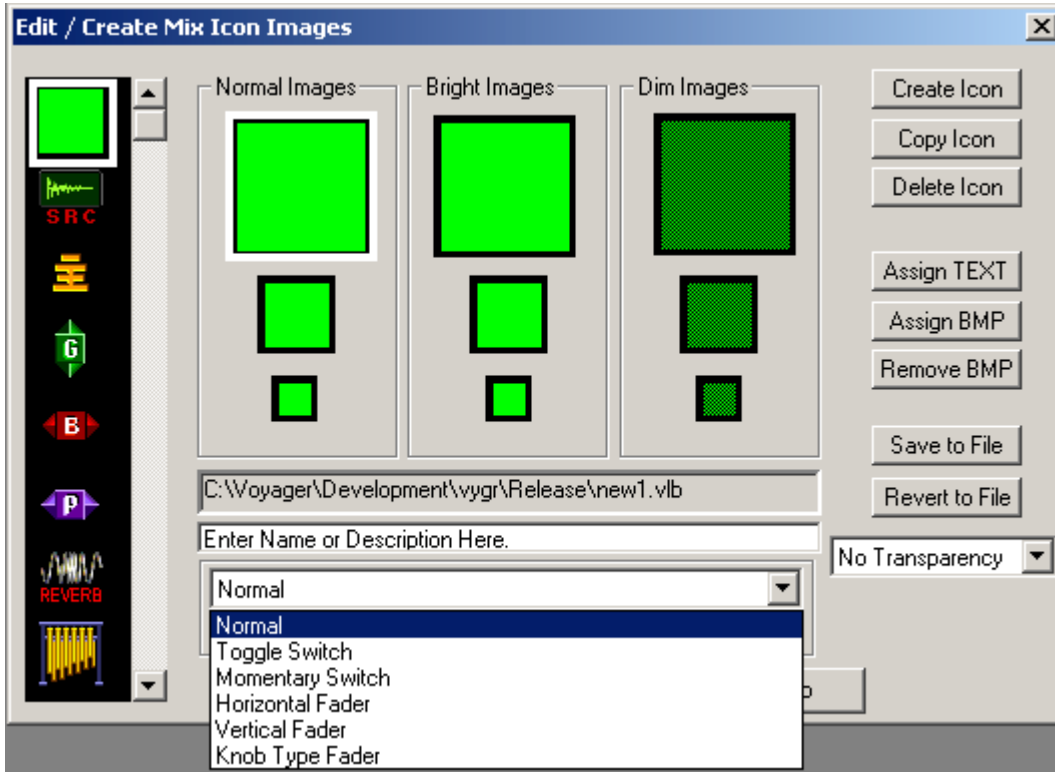
All images are automatically converted to the Voyager 256 color palette. The GraphiMix palette is a 'web-compatible palette' with a few special entries. All BMP's are converted to the nearest palette entry as they are read in. For this reason, there may be slight color differences between the Mix Icon Image and the original BMP.

### ***Switch Icon Creation***

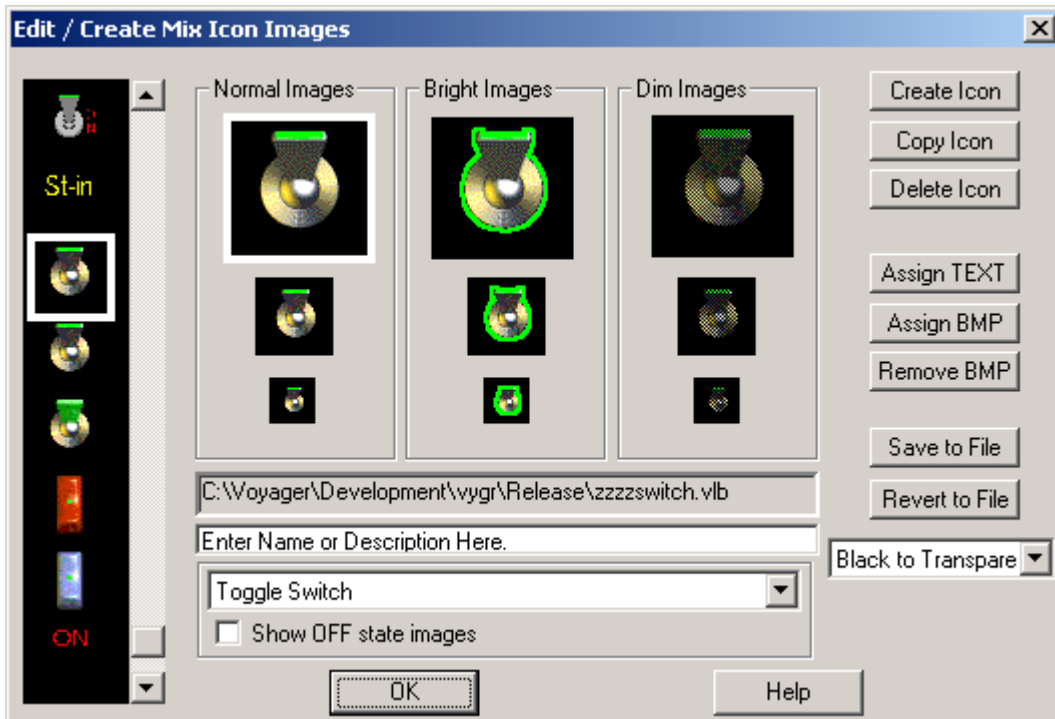
Switch Mix Icons have an additional two states, an ON state and an OFF state. Switches may be momentary or toggle type switches. A momentary switch is ON when the mouse button is depressed and OFF when the button is released. A toggle switch can be either ON or OFF and toggles between these two states when the mouse button is clicked.

To change the state of a switch, the <control> key on the keyboard must be held down when the left mouse button is depressed. Switch Mix Icons also have a 'Toggle Switch on Left Click' checkbox in the Mix Icon Properties dialog. If this is checked, the <control> key does not have to be depressed to toggle the switch. A simple <left-click> will then toggle the switch. A mouse <left click-and-drag> on this icon will be disabled when in this mode.

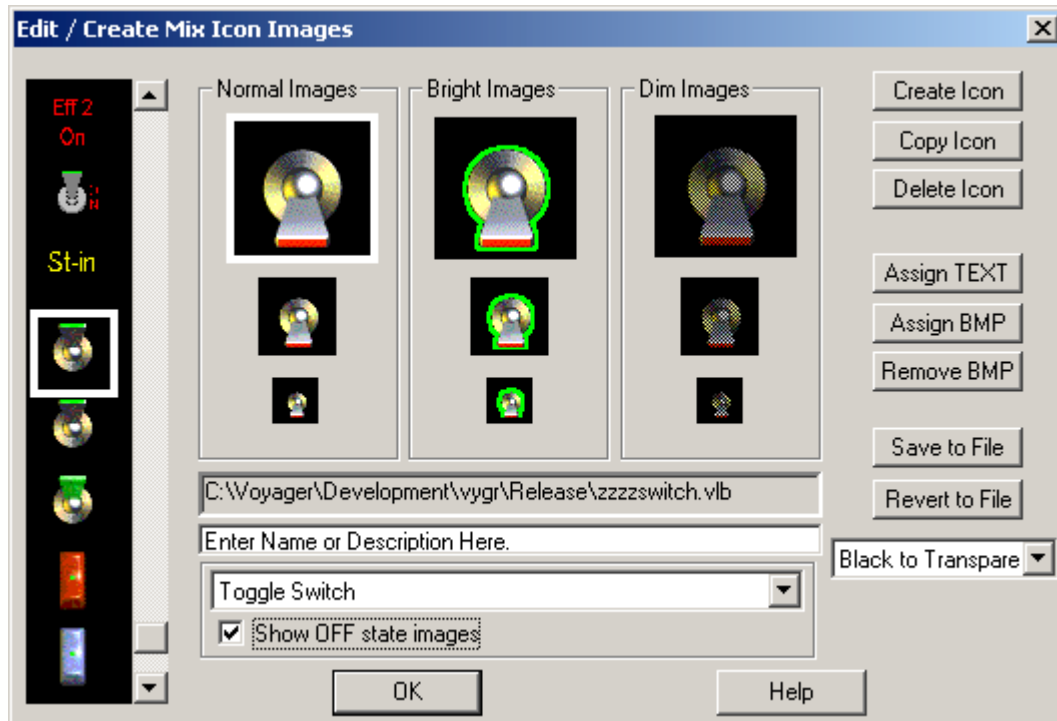
Each state of a switch has 9 associated images, identical to a normal icon image, for a total of 18 images. All of these images can be individually specified for each state.



This is an example of the dialog for the Switch On state.



This is the Switch Off state.



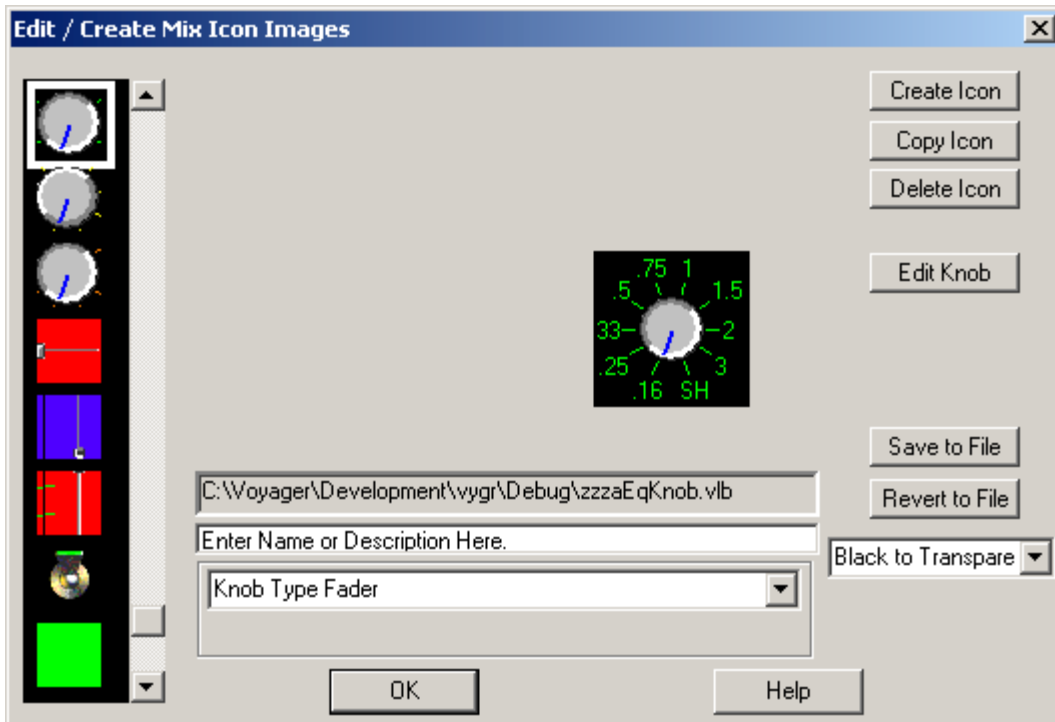
### ***Knob Icon Creation***

The Knob Icon is a complex Mix Icon type. Because of the very large number of image states (100), the image is captured at runtime, from the control itself. A significant difference from the other Mix Icon types is that there is only one image size for each Knob and Fader Mix Icon. The Knob and Fader icons can be customized to be large or small with the Create Icon Image Tool, but the resulting Mix Icons do not automatically scale with the Mix Form size. Both Horizontal and Vertical Faders (but not Knobs) can be sized to be a fraction of the Mix Form size so that these will scale exactly (instead of 3 different sizes). The designer of the Mix Session must take this into account when designing the Mix Forms and the session layout.

To change the state of a Knob Mix Icon, hold down the keyboard <control> key and then 'click-and-drag' the rotary knob at the knob pointer or index. To position the Knob Mix Icon on the Mix Form, click-and-drag without the <control> key depressed. The <control> key therefore determines whether the mouse commands go to the position of the Mix Icon on the Mix Form, or to the setting of the Mix Icon knob.

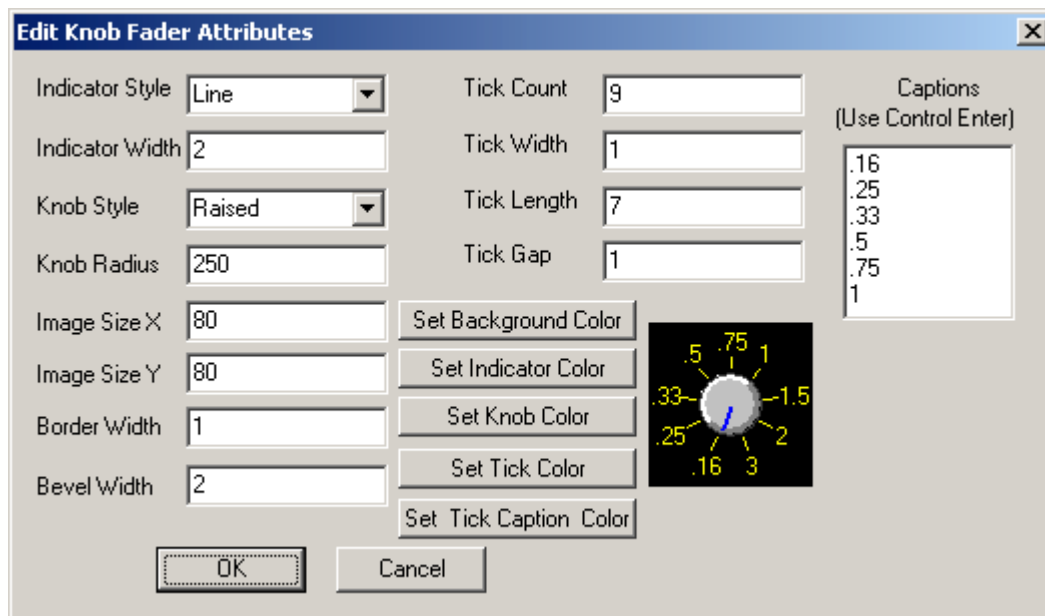
The use of the <control> key can be avoided if the 'Left Click Adjusts Fader Value' checkbox in the Mix Icon Properties dialog is checked. When in this mode, the <control> key does not have to be depressed. A simple <left-click-and-drag> will then operate the knob. The position of the Knob Icon is fixed on the Mix Form when in this mode.

The image of Knob Mix Icon can be easily customized. To Edit or create a Knob Mix Icon, select the Mix Icon type drop down list to 'Knob Type Fader'. Then click on the Edit Knob button. Note that only the central portion of a Knob or a Fader Icon Image is shown in the Icon Image Selection window to the left of the main dialog as well as in the Mix Icon Selection window. These Mix Icons types will be full size when placed on a Mix Form.



The following dialog shows all the parameters that affect the appearance of a Knob Mix Icon. The Knob Mix Icon is the only type, at the current time, that supports tick mark Captions.

Each caption is entered on a separate line in the Captions text box. Use <control-Enter> to add a new line within this text box. Use the keyboard arrow keys to navigate around this text box.



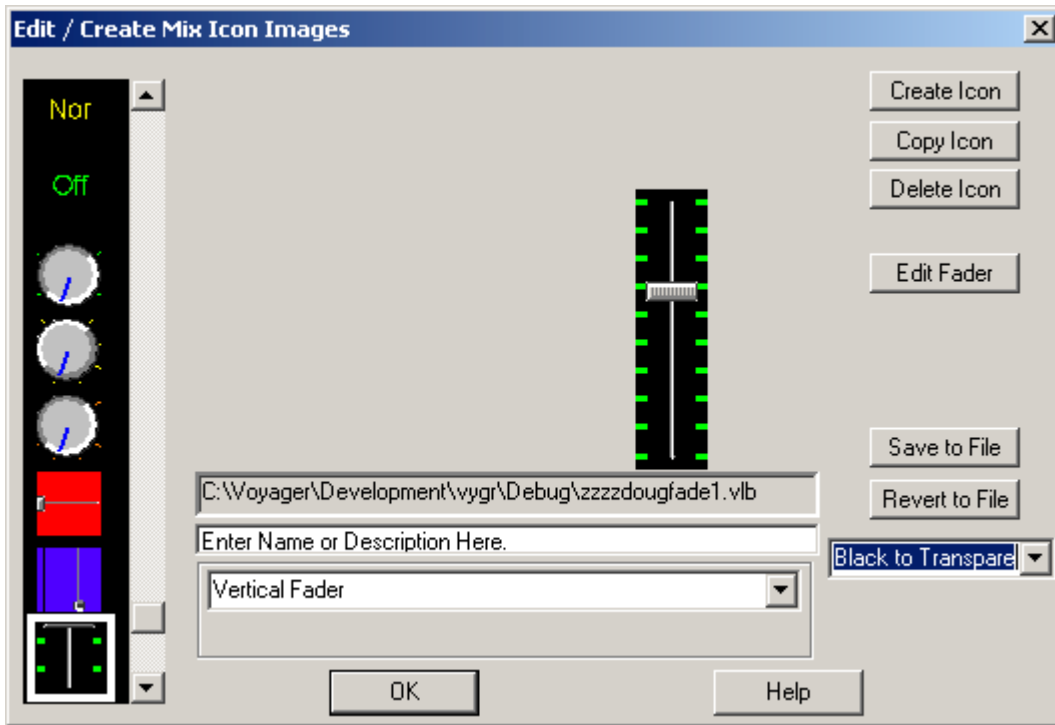
### ***Fader Icon Creation***

The Fader Icon is a complex Mix Icon type. Because of the very large number of image states (100), the image is generated at run time. Unlike the Knob, Fader Mix Icons can be set to 'scale' their size to a fraction of the Mix Form size. If this is selected, the Fader Mix Icons will change their size as the Mix Form size is adjusted to be a constant, selectable fraction of the Mix Form size. This is set in the Mix Icon Properties dialog for the Fader Mix Icon.

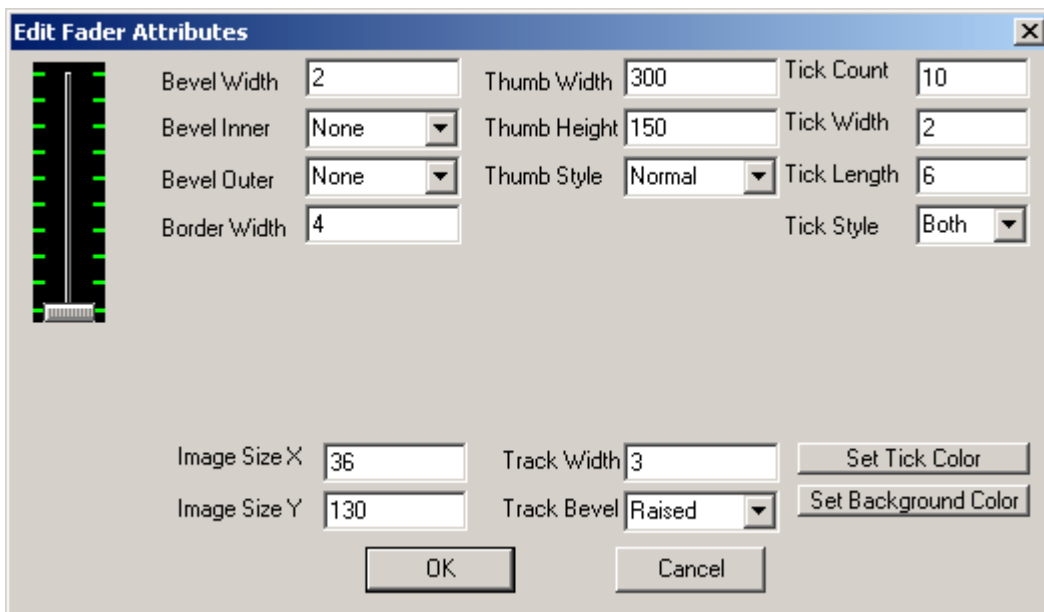
To change the state of a Fader Mix Icon, hold down the keyboard <control> key and then 'click-and-drag' the fader slider. To position the Fader Mix Icon on the Mix Form, click-and-drag without the <control> key depressed. The <control> key therefore determines whether the mouse commands go to the position of the Mix Icon on the Mix Form, or to the setting of the Mix Icon slider.

The use of the <control> key can be avoided if the 'Left Click Adjusts Fader Value' checkbox in the Mix Icon Properties dialog is checked. When in this mode, the <control> key does not have to be depressed. A simple <left-click-and-drag> will then operate the fader. The position of the Fader Icon is fixed on the Mix Form when in this mode.

The image of a Fader Mix Icon can be easily customized. To edit or create a Fader Mix Icon, select the Mix Icon type drop down list to 'Vertical Fader' or 'Horizontal Fader'. Then click on the Edit Fader button.

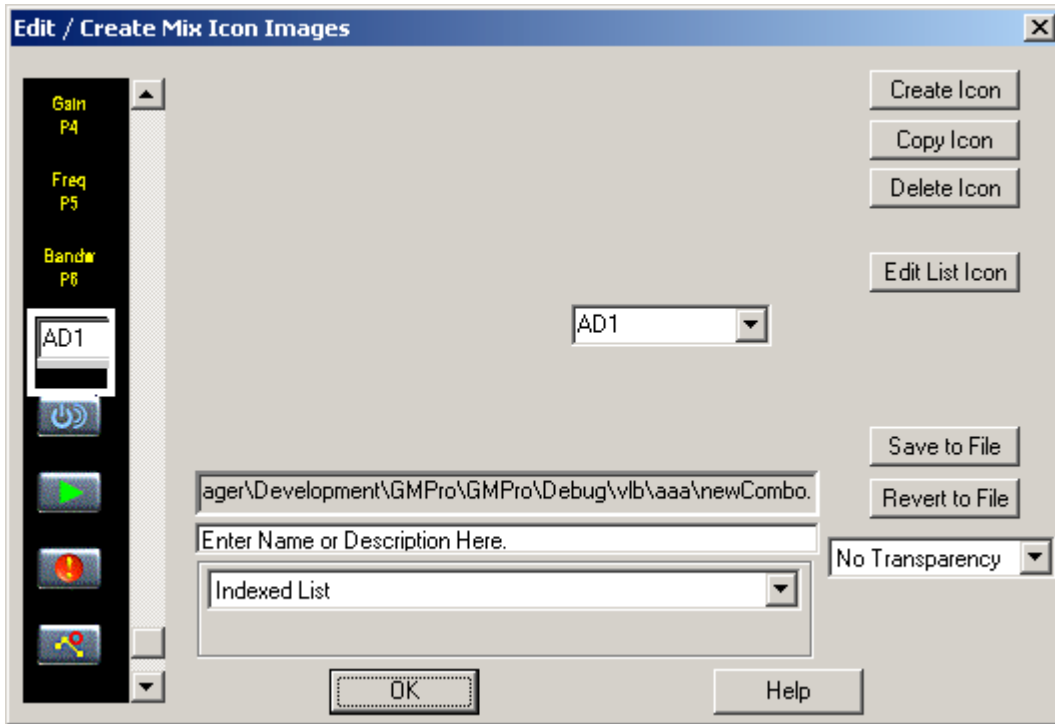


This dialog shows all the parameters that affect the appearance of a Fader Mix Icon. The Fader Mix Icon does not support captions at the current time.

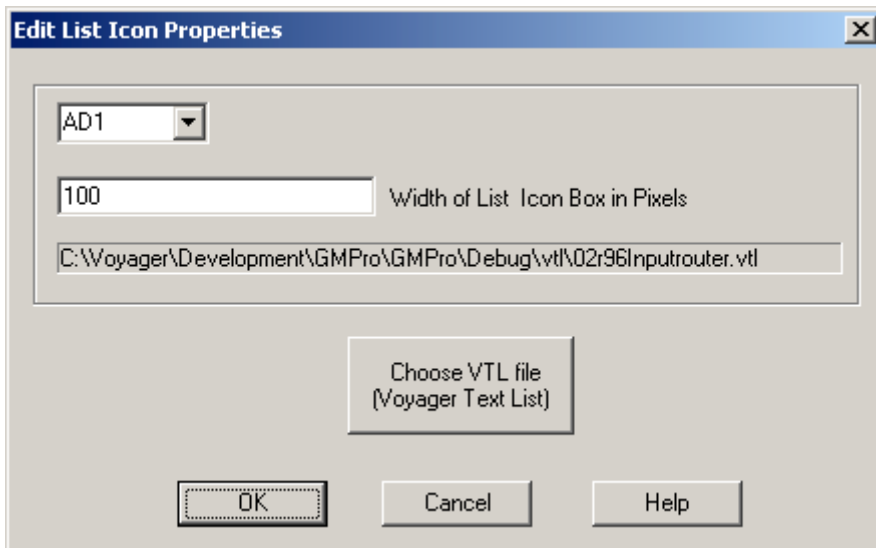


## Indexed List Icon Creation

The user can create an Indexed List icon by using the Edit/Create Icon Tool available on the Tools menu and selecting 'Indexed List' as the icon type.

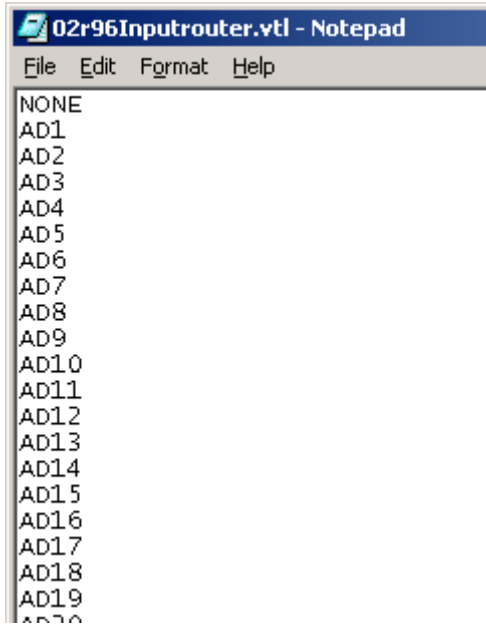


These icons can have different widths, set in the Edit List Icon Properties dialog.



The VTL file is a normal text file with a text string on each line. The icon displays the text string out of this file that is indexed by the ListIndex coordinate in the Mix Icon Control Properties dialog.


Here is an example of a VTL list shown in Notepad.



### ***Window Menu***

This Menu allows the user to Cascade or Tile Mix Forms on the screen. This menu can also be selected by typing <Alt> then ‘W’. This menu controls the display of Mix Forms according to their individual Mix Form display modes. These modes are set in the Mix Form context menu (<right-click> on the Mix Form background).

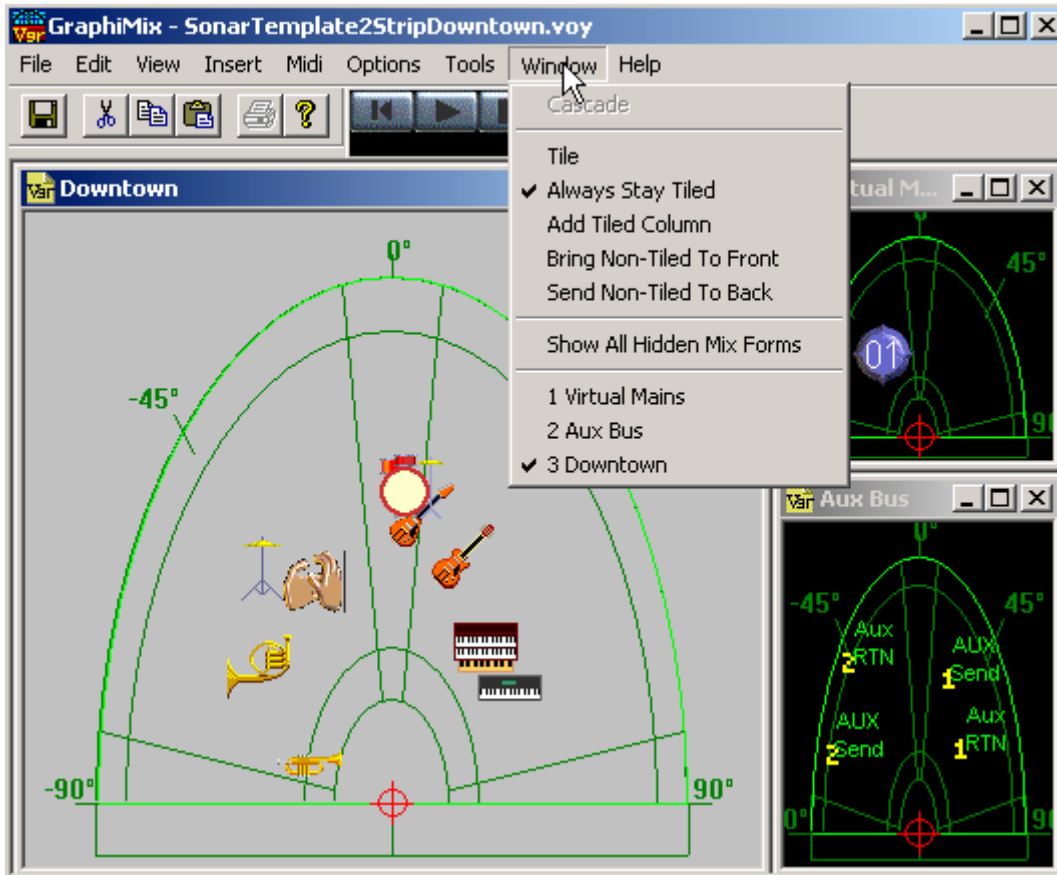
Cascade	Arrange all non-hidden, non-minimized, Mix Forms in this state in an overlapping, cascaded fashion.
Tile	Arrange all non-hidden, non-minimized, Mix Forms in this state in an abutting, tiled fashion.
Always Stay Tiled	This sets all visible Mix Forms into the Tiled Mix Form Display Mode
Add Tiled Column	Selecting this entry adds another column to the Tiled Mix Form Display. Mix Forms can be dragged and dropped on to the new column to populate it.

Bring Non-Tiled To Front	<p>Mix Forms that are visible but are not tiled can be displayed 'behind' the tiled Mix Form display. To bring these to the front, click on this entry.</p> <p>The Standard Tool Bar also has a 'Bring To Front' button for easy access.</p> 
Send Non-Tiled To Back	<p>Mix Forms that are visible but do not have the 'OK to Tile' checkbox set can be displayed 'behind' the tiled Mix Form display. To send these to the back, click on this entry.</p>
Show All Hidden Mix Forms	<p>'Un-Hide' all hidden Mix Forms.</p>
MixForms...	<p>List of all Mix Forms in the current State.</p>

### **Tiled Mix Form Display Mode**

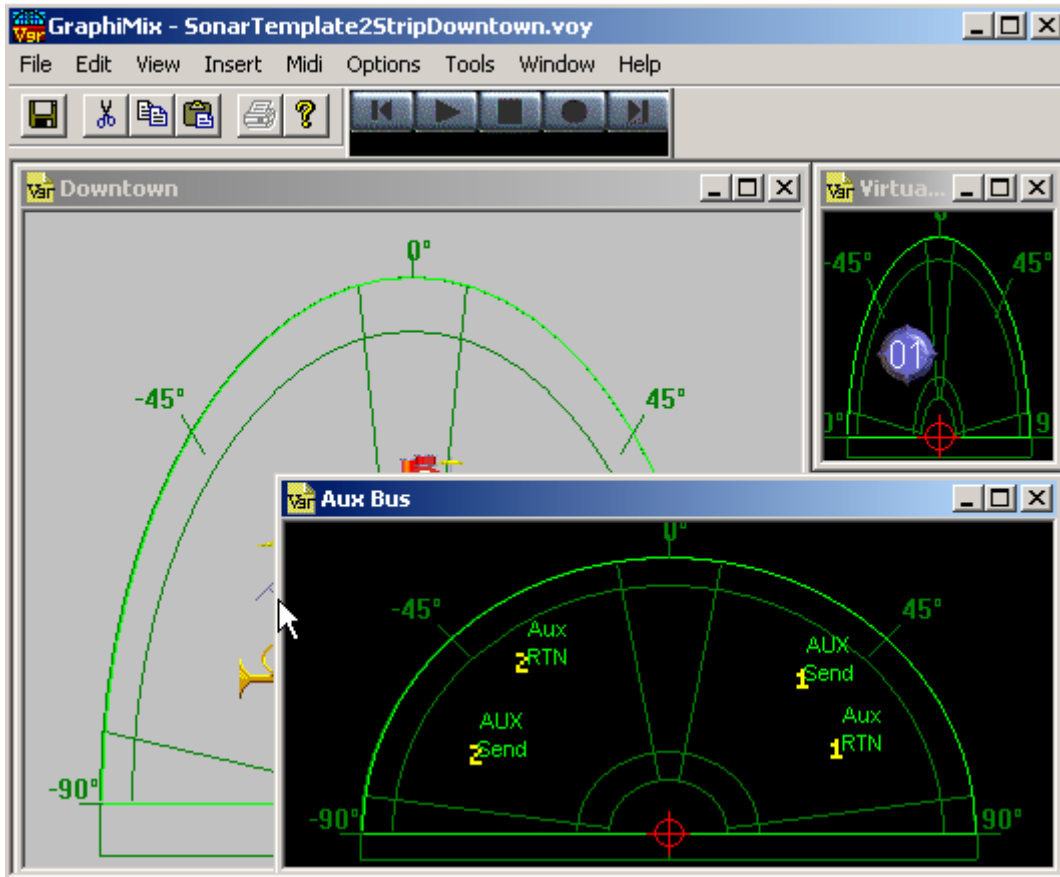
This is a useful feature that allows the user to most efficiently use and access the GraphiMix mix surface. Most template sessions use this mode for the most frequently accessed Mix Forms.

This mode is accessed from the Window menu in GraphiMix.

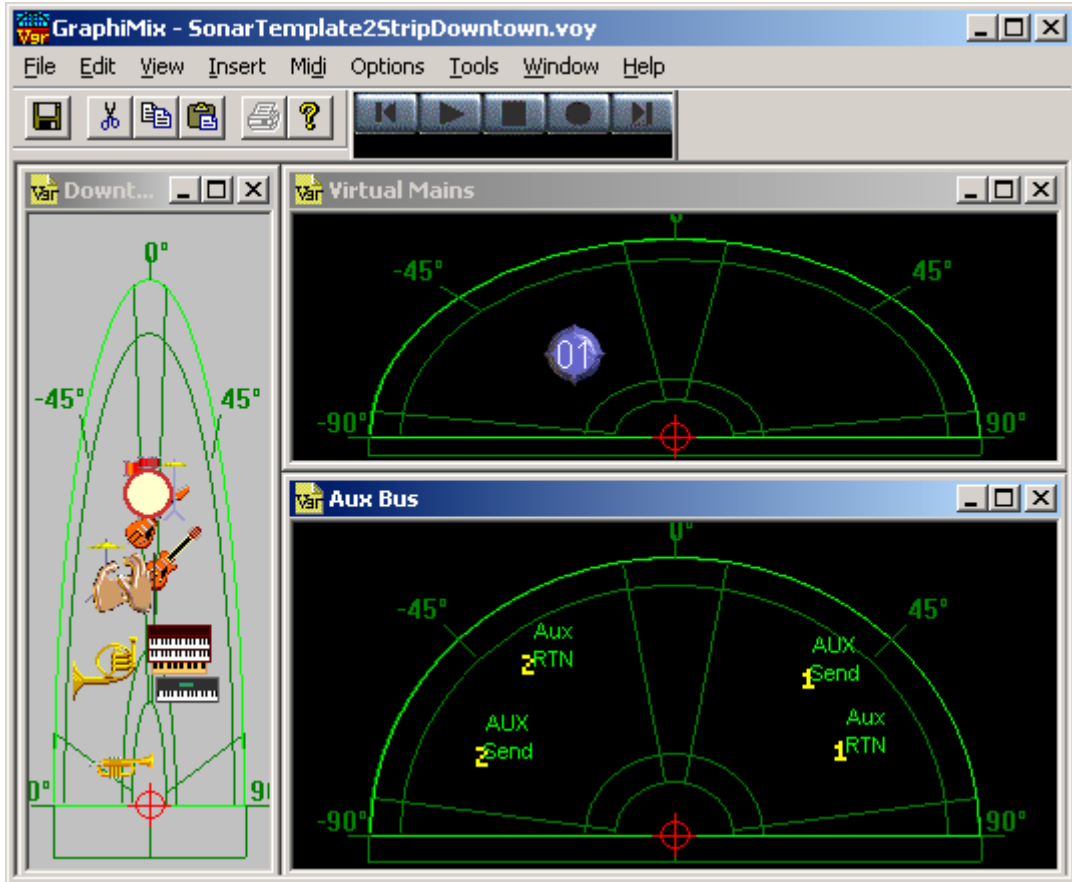


A Mix Form can be a free-floating window of any size (inside the GraphiMix mainframe), or it can be hidden, or it can be minimized, or it can be tiled. A tiled Mix Form shares and fully occupies the GraphiMix application window frame with all other tiled Mix Forms.

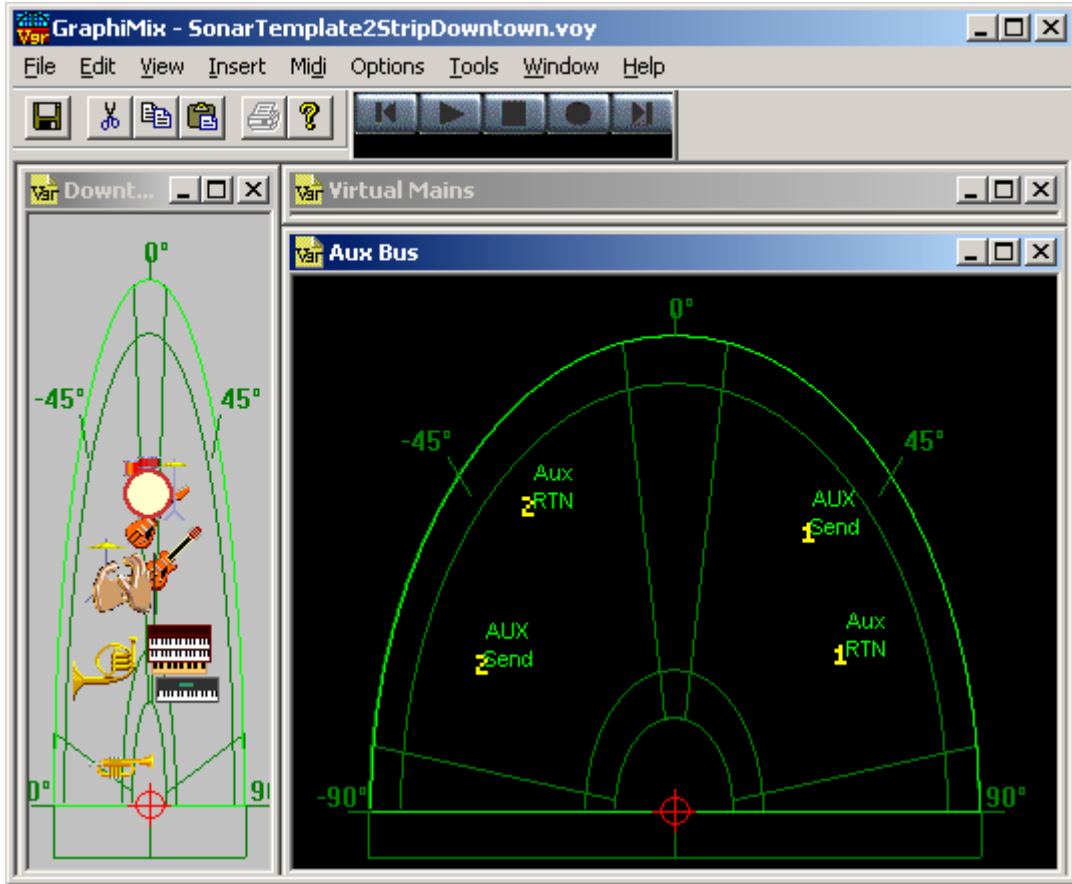
By clicking and dragging on a side or top or bottom of a mix form that is tiled, the user can change the size of the selected mix form and all other tiled mix forms will then re-adjust their edges to fit the new size.



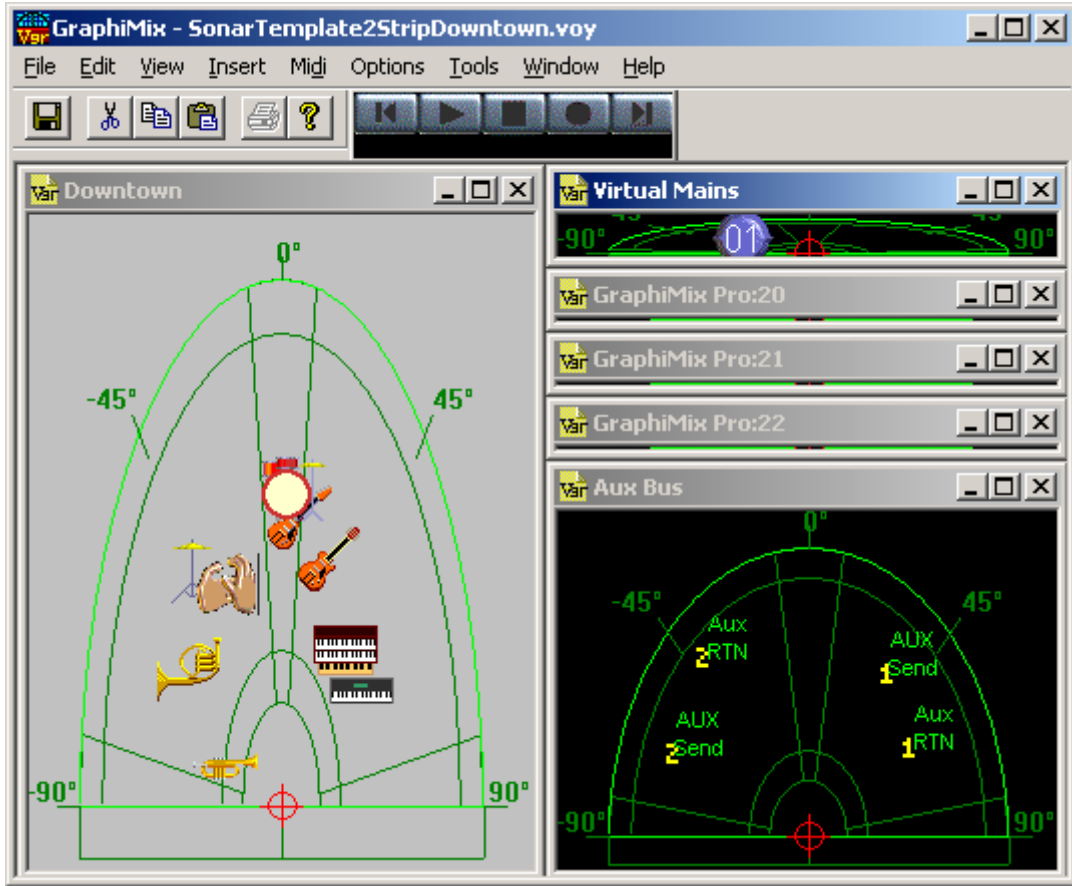
When the mix form is released, the columns will readjust to accommodate the new size.



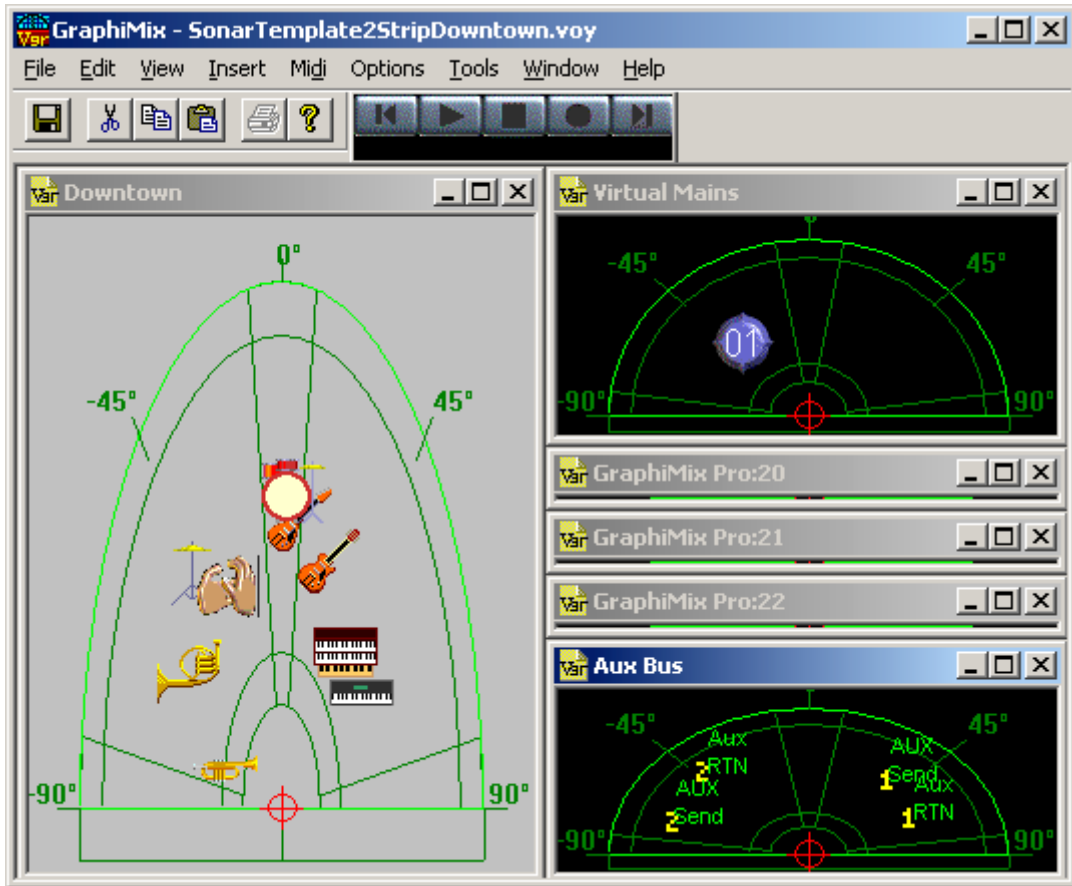
There is a minimum column width and a minimum Mix Form height within a column.



A Mix Form that is 'rolled up' to its minimum height or its minimum width is 'sticky' in the sense that it will tend to stay minimized when the tiling is adjusted. For example, in the following image, there is a stack of mix forms in the rightmost column with only two mix forms 'open' and the rest 'rolled-up' to their minimum height.

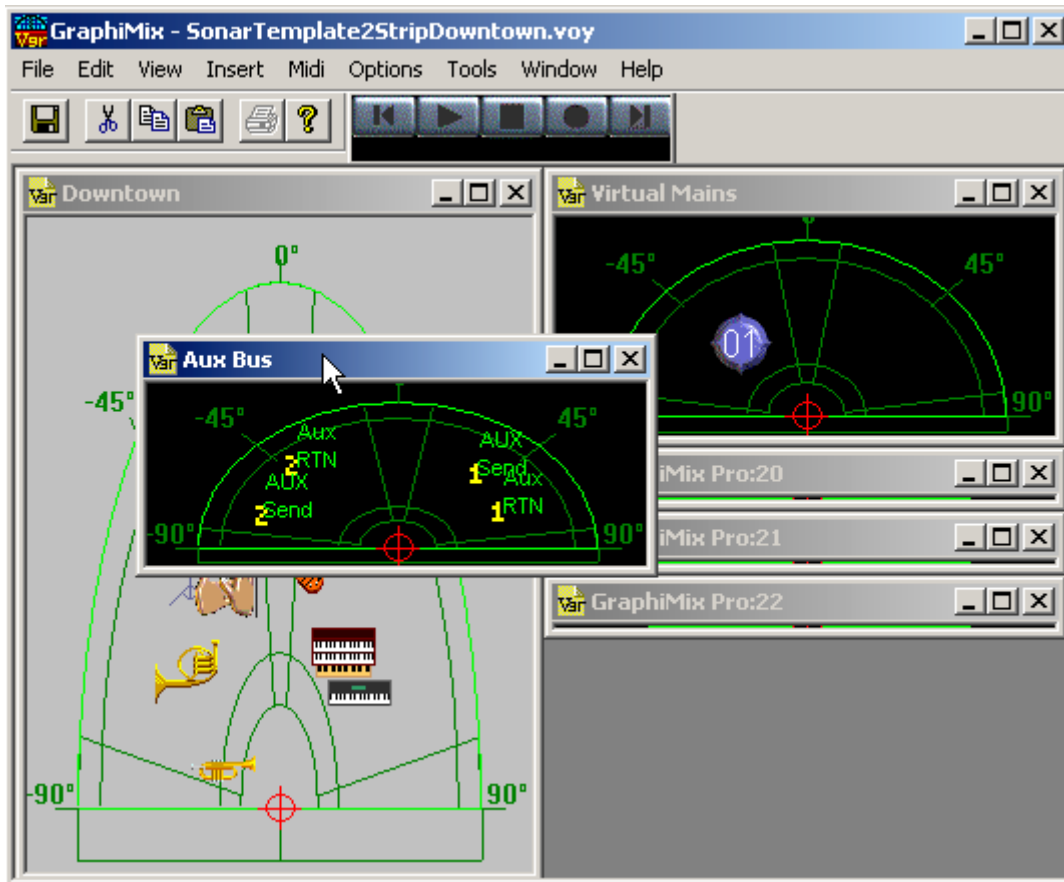


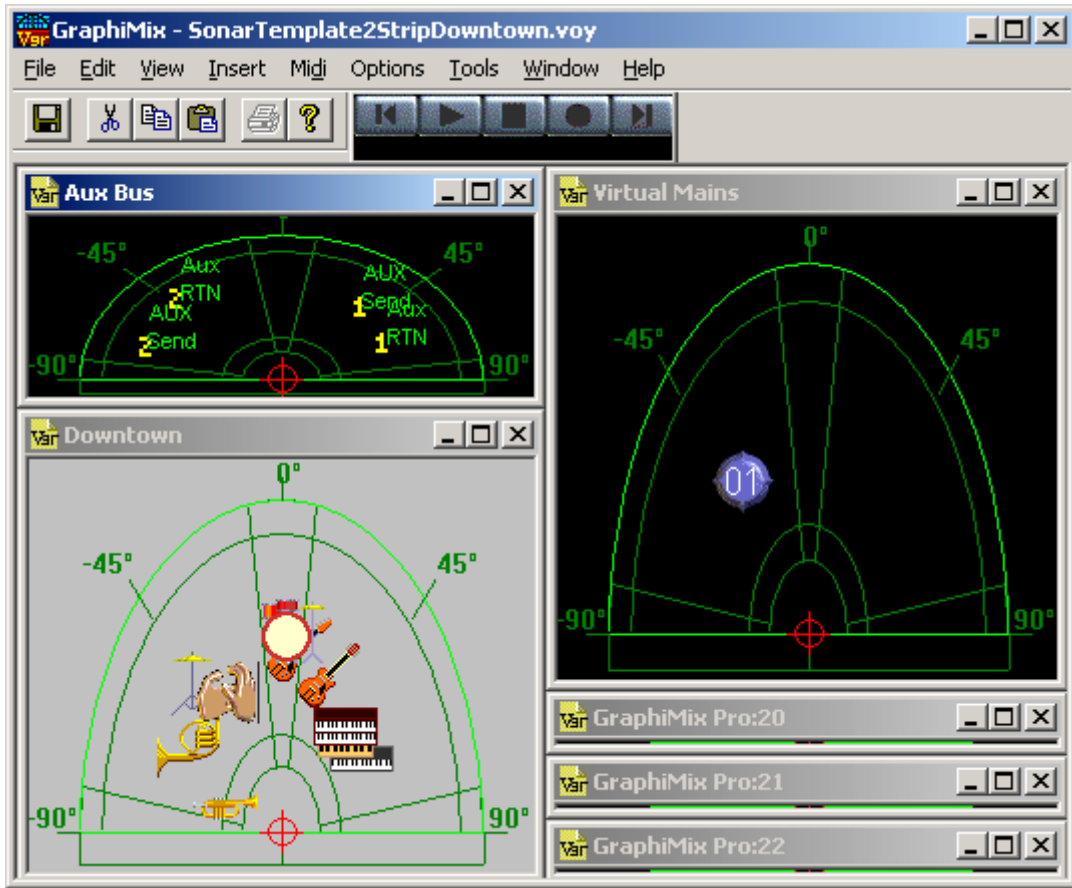
If the 'Aux Bus' Mix Form height is resized, the 'Virtual Mains' Mix Form will change its height in return. All of the other Mix Forms in that column will remain 'rolled-up'.



The same behavior will occur when the widths are adjusted.

To move Mix Forms from column to column or to a different place in the same column, simply drag the selected Mix Form (use the title bar) to the new position and release it. It will automatically retile into the appropriate place.





## Help Menu

This menu can also be selected by typing <Alt> then 'H'.

Registration ...	Registration dialog. Select this dialog to input required and optional information to register your copy of the Voyager GraphiMix and obtain a valid license number.
License ...	Licensing dialog. Select this dialog to input the licensing information obtained from Voyager Sound Inc to enable all appropriate features.
About GraphiMix ...	Select this entry to view the Voyager GraphiMix version and revision information.

Loaded Help Files ...	<p>Depending on the version of GraphiMix and the Mixer 'packages' available, there will be one or more help files available here. All versions of GraphiMix will have the GRAPHIMIX.HLP file loaded here. Other HLP files, such as GraphiMixForSonarUsers, will optionally be displayed here. Click on one to select it and run the help utility.</p>
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## **MIDI**

The Voyager GraphiMix System can send and receive MIDI commands to control and be controlled by other MIDI applications and hardware. GraphiMix sends and receives these commands by way of MIDI devices or ports. These devices/ports are set in the “Midi Menu->Select Midi Devices...” menu.

Received MIDI commands are processed and matched up to specific controls, based on their individual settings, to cause movement of the appropriate Mix Icons.

Movement of a Mix Icon, caused by the dragging it with the mouse for example, causes each Mix Icon’s attached controls to output MIDI messages dependent on the settings in the Mix Icon Properties->Controls tab.

If a message is received by a Mix Icon from an external source, the sending of an identical message based on its new position is inhibited for a short time. Similarly, if the movement of a Mix Icon (by a mouse or keyboard) causes MIDI to be sent, then the movement in response to a received MIDI message is inhibited for a short time (the CCSST time). This is done primarily to prevent MIDI feedback from a device that echoes all received commands.

One of the best WEB based sources for MIDI documentation is <http://www.harmony-central.com/MIDI/Doc/>

A basic understanding of MIDI is essential for effective use of the Voyager GraphiMix System.

### ***What is MIDI?***

The **Musical Instrument Digital Interface (MIDI)** was invented in the early 1980’s by a group of synthesizer manufacturers as a way to connect instruments together to make sound. Since then it has evolved into the protocol of choice for controlling everything from sound synthesizers to tape machines.

MIDI is simply a communications protocol consisting of messages that consist of as few as 1 byte and up to thousands of bytes. For external hardware, a MIDI port runs at 31250 baud. Since each byte is a 10 bit sequence in this protocol (eight data bits + two stop bits), 3125 bytes can be sent each second.

Each MIDI message contains a single status byte and zero or more data bytes. All status bytes are in the range of 128-255 and all data bytes are in the range of 0-127. This allows easy identification of status and data bytes. This also limits data in a single byte of a MIDI message to 7 bits. The lower 4 bits of the status byte hold the MIDI channel (1-16) which is encoded as the values 0-15. The upper 4 bits of the status byte hold the type of the MIDI message.

The most common type of data sent using MIDI is the Channel message. There are 7 types of Channel messages, each having one or two associated data bytes. These message types are shown in the following table.

Status Byte (hex)	Data 1	Data 2	Message type
0x8n (n = MIDI channel number <0-15> )	Note	Velocity	Note Off
0x9n	Note	Velocity	Note On
0xA n	Note	Pressure	Key Aftertouch
0xB n	Control #	Value	Control Change
0xC n	Program #		Program Change
0xD n	Pressure		Channel Aftertouch
0xE n	LSB	MSB	Pitch Bend
0xF0	(SYSEX data)	(SYSEX data)	System Exclusive

System Exclusive (SYSEX) MIDI messages can be of arbitrary length. The value of the status byte of a SYSEX message is 240 (0xF0) and the final data byte in the message is a 247 (0xF7). SYSEX messages were originally used to transfer blocks of data, sometimes consisting of thousands of bytes. These blocks of data would specify complete setups of all the controls on a mixer, or settings or patches for MIDI musical synthesizers.

Recently console manufacturers have been utilizing this form of message to encode parameter changes using relatively short (12 bytes or so) messages. SYSEX messages can also be of variable length, allowing the device to compactly specify the settings for multiple adjacent controls in a single SYSEX message.

Control Change messages used to control devices can become quite complex and the setting of a single control can involve a series of 3 byte Control Change messages with optional and defaulted sub-messages.

GraphiMix supports all known MIDI message protocols using the Voyager Sound VSL protocol description language.

The Voyager GraphiMix most commonly makes use of the MIDI Control Change and Program Change messages to control mix hardware. SYSEX is used as well in some cases if the manufacturer uses this form of MIDI message to communicate with some or all of his hardware. The MIDI Theremin demo utilizes most of the above listed message types to create sounds using the PC MIDI synthesizer included in most PC's.

## ***MIDI Devices***

GraphiMix (and other applications such as sequencers) receive MIDI messages from and output MIDI messages to MIDI devices. These devices may do something in response to

MIDI, or they may just act as a 'connection' to pass MIDI from one application to another. These devices may also be known as MIDI ports as they port data in to or out of an application.

## **MIDI Synthesizers**

MIDI Synthesizers produce sound in response to MIDI messages. Most common PC's have a sound card with a built-in MIDI synthesizer. The name of this synthesizer device often has the word SYNTH in it or you may use the MICROSOFT GS WAVETABLE if it exists. External Midi Synthesizers are available and usually provide much better sound quality and a larger range of available sounds or voices.

## **External MIDI Ports**

A PC communicates with external MIDI hardware using one or more external MIDI ports. Most sound cards (they may need an adapter cable) will provide at least one MIDI port (one input and one output). Other devices are available that can provide more MIDI ports via USB or Firewire, or by plugging into a PCI card slot or PCMCIA port.

## **GraphiPorts**

GraphiPorts are in-memory MIDI ports that provide MIDI communications between Voyager Sound applications such as GraphiMix, GraphiSeq, and GraphiSpy and the Cakewalk SONAR plug-in, GraphiSon. These special MIDI ports do not use the PC's MIDI resources and do not count against the total number of MIDI ports that a PC can support.

GraphiPorts can only have a single sender and a single receiver.

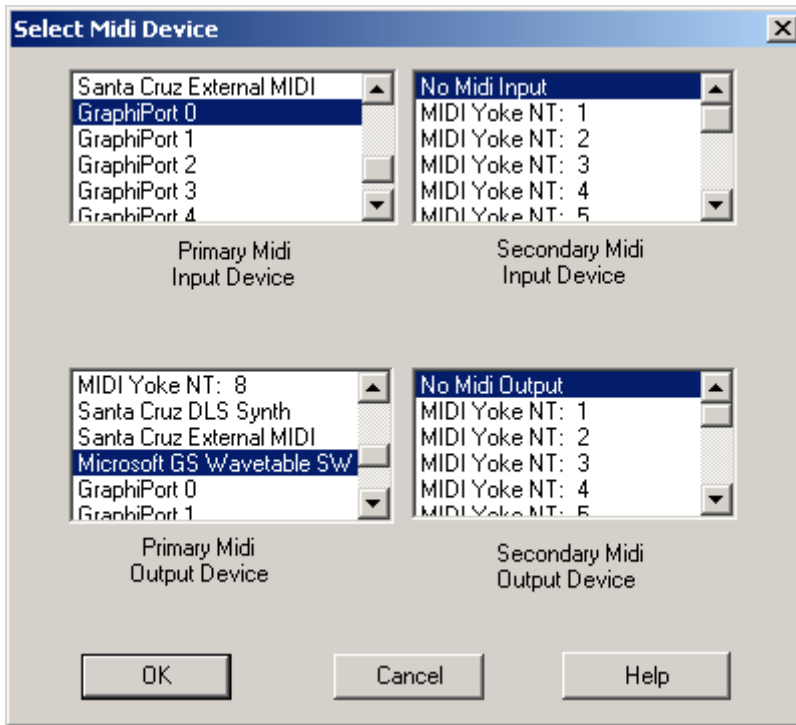
## **MIDI-YOKE™ Ports**

A useful utility which enables software MIDI applications like GraphiMix to communicate with other MIDI applications within the computer is MIDI YOKE™. This utility is available from a company called MIDIOX™. MIDI YOKE™ is included in the GraphiMix installation and can optionally be installed by the user. We recommend visiting their site at <http://www.midiox.com>. This program installs a series of MIDI I/O ports which show up as MIDI devices. For instance, to send MIDI data from GraphiMix to a MIDI sequencer, select 'YOKE1' as an output for GraphiMix, then select 'YOKE1' as a MIDI input for your software sequencer. When the sequencer is directed to record, it will capture the MIDI data sent from the GraphiMix program. You can send data back to GraphiMix via 'YOKE2'. Set your sequencer to output its MIDI data on 'YOKE2' and set GraphiMix to receive on 'YOKE2'

MIDI-Yoke ports can have multiple receivers, i.e. A sequencer could output on a MIDI YOKE port and both GraphiMix and GraphiSpy could receive the data.

## ***Using MIDI with GraphiMix***

GraphiMix supports two sets of MIDI devices, the Primary set and the Secondary set. These are identical and provide the ability to send and receive from two different MIDI devices.



This menu is obtained by selecting the Midi Menu->Select Midi Device entry.

When this dialog is selected, it should show all the available MIDI devices on the user's computer for Input and Output. To enable GraphiMix to output MIDI based on the position of a Mix Icon and its attached controls, select the appropriate Output Device. If MIDI is being sent to external MIDI hardware (such as a MIDI mixer), select the External or UART setting. If the MIDI messages are being sent to a software application (such as a MIDI sequencer) then the Output device will likely be a software MIDI port such as a MIDI YOKE™ port.

Similarly, to receive MIDI messages from an application or device, select the appropriate Input device such as the External device or UART if it is an external hardware device, or a MIDI YOKE™ port, if it is from another application.

Any MIDI messages that are not attached to controls are discarded if they are received. System Exclusive messages (SYSEX) are fully supported.

### ***The CCSST (Control Change Source Standoff Timer)***

The GraphiMix system incorporates the notion of the Control Change 'Source'. A Control Change event (not to be confused with a MIDI Control Change message) is

anything that causes the Mix Icon to change state. A control change can be caused either by Mix Icon movement on the Mix Form or a change in its internal state (like a switch for example). The source of these changes can be 'internal' to GraphiMix caused by the mouse or the keyboard, or MIDI received from an external source. The Control Change Source refers to the last source of changes for this particular Mix Icon that actually caused a change.

GraphiMix has a built in delay for each Mix Icon called the CCSST (Control Change Source Standoff Timer) during which time it will ignore control changes coming from a different source than the source that moved it previously for a given Mix Icon. The CCSST timer can be set in the Edit Menu->Preferences->Timing dialog.

The CCSST time needs to be set long enough to transfer all controls' MIDI messages to the target hardware on a scene or state change, otherwise echoed messages may 'push back' on the icon movements. The more controls that are in a particular state, the larger this number has to be. This number also has to be set larger if external MIDI is used rather than GraphiPorts because of the slower data rate. Setting this to a large delay is only a problem if the user is using both the external hardware/application *and* GraphiMix to set the same control; the user then must wait this amount of time before switching which surface he is using.

For example, If GraphiMix was set to input MIDI control changes from an external hardware mixer, and to output MIDI messages to the same external hardware mixer, a legal configuration, then one could move the Mix Icons by moving faders on the hardware mixer and subsequently move the external faders by moving the Mix Icons with a mouse. This will work, but to avoid feedback from the external mixer, GraphiMix will ignore messages from the mixer while its Mix Icons are being moved with the mouse and for a short time (the CCSST timeout) after the messages stop. This assumes that the user is either using the controls on the hardware mixer to do the mix or he is using GraphiMix to control the hardware mixer at any one time. The user cannot have a hand on the same control on both at the same time. He can, however, alternate between using the console and using GraphiMix as long as he waits for the CCSST timeout time before choosing a different mix surface.

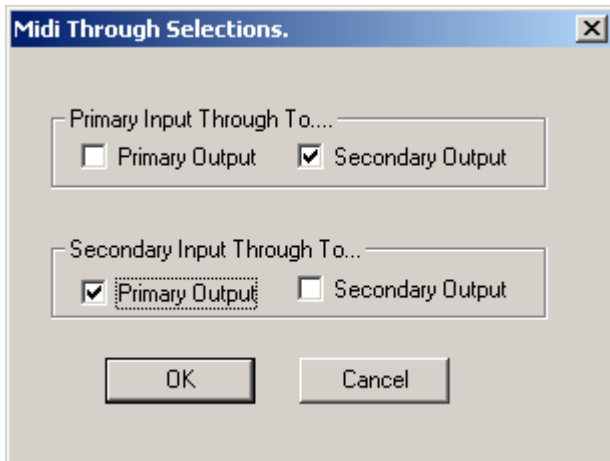
## ***MIDI Sequencers***

You can use a MIDI sequencer to record and play back MIDI data including control change commands from the GraphiMix. GraphiMix can be set up to output MIDI to the sequencer (usually through a MIDIYOKE™ port or equivalent) and to respond to control change MIDI messages on playback by receiving MIDI. For example, the secondary set of MIDI Devices supported by GraphiMix can be used to 'connect' to a sequencer, while the primary set would be connected to the target console.

## ***MIDI Through***

GraphiMix now supports MIDI Through mode. Each MIDI input port (primary or secondary) can be independently set to echo its data to either MIDI output. This is useful

when a MIDI sequencer is being used to record and play back control changes sent to a Mix console.



For example, to use a sequencer to record and play back with GraphiMix while it is also connected to a mix console, connect the mix console to MIDI input and output using the GraphiMix primary ports and connect the sequencer to MIDI input and output using the GraphiMix secondary ports. Now set the MIDI Through selections as shown above, i.e. Primary Input to Secondary Output and Secondary Input to Primary Output. Now, control changes made in GraphiMix or on the target mix console will be recorded with the sequencer. When the sequencer is played back, the MIDI sequences will be sent to both GraphiMix and to the target console. In this case, turn off MIDI Through on the target console and on the sequencer, otherwise, a MIDI feedback loop may result.

It is possible to create MIDI feedback loops by connecting the inputs and outputs of applications and GraphiMix in a configuration which may result in improper or intermittent behavior. GraphiMix attempts to prevent these loops by inhibiting the re-sending of messages it has received, but the MIDI Through messages have no such restriction.

### ***System Exclusive (SYSEX)***

GraphiMix does fully support the input and output of MIDI System Exclusive messages. GraphiMix also supports SYSEX VSL templates which enables it to respond to variable length SYSEX messages.

### ***Control Change Messages***

In recent years, there has been an effort to extend the complexity of MIDI Control Change Messages to protocols that support 14 bit controllers, defaulted parameters, increment/decrement controllers, and others. GraphiMix fully supports all known Control Change message protocols.

## **GraphiMix Files**

### ***VOY Files***

Each mix session can be saved to a named file with the extension '.voy' by using the File Menu->Save or Save As selections. VOY files can be also loaded in to the GraphiMix system by using the File Menu->Open selection. A GraphiMix session can also be started by double-clicking on the VOY file. These VOY files can be in any directory, but by default, are saved in the VOY subdirectory of the GraphiMix root directory.

The VOY file is a proprietary Voyager data file which is capable of storing an entire GraphiMix session.

### ***VSL Files***

Each hardware control that is useable by the GraphiMix system must be defined in a named file with the extension '.vsl'. The VSL file contains information about that control including a message protocol. Typically, each controllable device that is connected to the PC running the Voyager Sound GraphiMix system will have at least one VSL file in the VSL subdirectory of the GraphiMix root directory.

Small VSL Files with up to 32 controls can be created and used by the engineer. Any number of small VSL files may be created. Larger, production VSL's, require a checksum that can only be created by Voyager Sound Inc. Currently, these production VSL files are only available from Voyager Sound Inc. Please contact us (see ***Contact Information***, page 176) for requests and available updates.

### ***VLB Files***

Each Mix Icon's image and default data structures are contained in a named file with the extension '.vlb'. These VLB files are contained in the VLB subdirectory of the GraphiMix root directory or in named subdirectories of this directory.

When the View menu->View Icon Windows.. entry is selected, all VLB's that are shown in the VLBs Primary window reside in the VLB subdirectory. All other windows exist as subdirectories to the VLB subdirectory.

### ***VXP Files***

Any particular mix session can incorporate custom Mix Icons, custom VSL files, and other custom files that the user has created. This can create a problem when the engineer has to move the GraphiMix session to another PC. He has to copy the VOY files and any other custom files and then put them in all the correct places on the new PC.

To simplify this process, the user can select Export Environment... from the File Menu to export all files associated with a particular mix session (except for the VOY file itself).

This essentially exports the mix session environment to a named file with the extension ‘.vxp’.

In order to ‘move’ a mix session and environment, the engineer has to copy the VOY file and the VXP file to the new PC. By selecting File Menu->Import Environment he can replicate his GraphiMix environment and then he can load the copied VOY file into GraphiMix. The user may have to re-select the MIDI input and output devices, depending on the new hardware configuration.

For more information see the *File Menu, Export Environment...*, page 83, and *Import Environment...*, page 84.

### **VTL Files**

The Indexed List Mix Icon uses a text file with the extension ‘.vtl’ to hold the text strings that it will display based on the value of the Mix Icon coordinate ListIndex. Each text string is on a single line of the VTL file. The Indexed List Mix Icon uses the value of ListIndex to index into this VTL file to select the appropriate text string to display.

### **TAG Files**

Weecon and Tag sequences are stored in named files with the extension ‘.tag’. These files reside in the TAG subdirectory of the GraphiMix root directory.

### **BMP Files**

Windows bitmap files are named files with the extension ‘.bmp’. These files hold images that can be created by various windows applications such as MSPAINT. The BMP subdirectory of the GraphiMix main directory holds miscellaneous BMP files for the user to use for custom Mix Icons if he so desires.

### **DLL Files**

Windows DLL files are dynamically linked library files that provide a plug-in capability to extend the feature set of applications. GraphiMix uses many DLL’s during its normal operation on a Windows PC. Voyager Sound also provides a plug-in, GraphiSon.DLL, for Cakewalk’s SONAR digital audio workstation application which allows it to communicate with GraphiMix.

### **CHM Files**

Compiled HTML files are named files with the extension ‘.chm’. The GraphiSon.chm file provides a hyper-linked help file for the plug-in for Cakewalk’s SONAR application.

## **GraphiMix Support Packages**

Various Mix hardware support packages are included with the GraphiMix. Each support package includes one or more VSL files which contain the messages used to communicate with the hardware as well as one or more template session (VOY) files that provide initial setups and controls to use with the target hardware. Detailed documentation is also provided in each support package.

Voyager Sound will be continuing to add support for new mix hardware as development proceeds. Licensed users of the GraphiMix are entitled to free updates for one year after purchase. Updates may include fixes and new features as well as new support packages as they become available. Please check our web site <[VoyagerSound.com](http://VoyagerSound.com)> for announcements and availability of updates.

## Appendix

### ***Voyager System Language (VSL) Description***

VSL files contain the 'recipes' to allow GraphiMix to construct the proper message packet to send to the hardware control.

Most often, these recipes are printed in the back of the manual for the equipment to be controlled.

These recipes usually involve a byte-by-byte or even nibble-by-nibble description of the message to be sent. Certain nibbles are the message type, others are the MIDI channel, or a constant representing the address or number of the control to be changed. The values can be a single (7 bit) byte or 2 (7 bit) bytes, or spread out over several bytes a nibble at a time.

Some of these recipes can be quite complex in their description.

Voyager designed the VSL language to handle all of these diverse descriptions and requirements to compactly encode these message formats in a form that can be used by GraphiMix.

This VSL language is written as text so it can be read and written with text editors such as Notepad™. There is a checksum appended to the file that is required to match the VSL text if the numbers of controls in the file exceeds 32 controls. At present, only Voyager Sound can create this checksum. This is to insure quality control on the production version of these files and to implement licensing level constraints. The user can write any number of VSL files with 32 or fewer controls for custom needs. The checksum is not required for these small VSL files.

The GraphiSpy application included with this release, or the MIDI-OX™ application, available from a download on the Voyager Sound web site, are very useful in debugging VSL files and control messages.

### **VSL Control Format**

The following is an example of a VSL entry for a single control.

```
# ----- Control Change Table (register mode) -----
Ch1:InputLevel
      ! MIDI Control Change message (Register Mode) -----
      ! Bank:0 Control:0 Input1 Level control
      ! Value is set from Mix Icon 'Coordinate'.
      ! Midi Channel is set in 'MIDI Channel' <1 - 16>.
      MIN 0
      MAX 127
```

```

PC MIDI
PN HB # push nibble hex B == Control Change
    MC # push nibble as MIDI Channel
    6 2 # H62 specifies NRPN (a MIDI flag indicating
        # 'bank')
    0 0 # bank 0
    HB # push nibble hex B == Control Change
    MC # push nibble as MIDI Channel
PB 00 # push control number as byte
IC # push data value <0-127>
SN # send it now
; # done with record

```

This is another example.

```
NoteOn PN H9 MC PB IC PR SN;
```

The VSL Control Recipe entry consists of a series of tokens, starting with a control name and terminating with a ';'. Individual tokens are terminated with 'white space' (spaces, tabs, return, linefeeds).

Many of the tokens have both long names and shortcuts. For example, you can type 'PUSHNIBBLE' or you can type 'PN'. Most developers will quickly learn to use the shortcuts.

### ***Comments Token***

The comment character is a '#'. Everything from a '#' to the end of the line is considered a comment. There are two 'null' characters '[' and ']', that have no effect other than to enhance readability.

### ***Control Name Token***

A VSL Control Recipe entry starts with the control name. A control name string consists of an optional <component + ':'> followed by the <control name>. The control name string should be unique. If another identically named control is encountered in the same VSL file it will be replaced. In the first example above, the control component is 'Ch1' and the control name is 'InputLevel'. In the second example, the control name is 'NoteOn'. If no Component is specified, the name <default> will be shown in the component box in the Mix Icon Properties dialog. Control names can consist of numbers and letters and the characters '-', '<', '>', and '\_'. White space (tabs, spaces, return, linefeed) terminates a control name string.

### ***Description Token***

The description token is begun with a '!' and runs to the end of the line. Several description lines may be included. The description is displayed in the Mix Icon Properties Controls tab when the control is specified by the selection of the VSL file, the component and the control name fields in this dialog.

### ***MIN and MAX Tokens***

The MIN and the MAX tokens are followed by a value token that specifies the control's Minimum and Maximum legal values. The minimum defaults to 0 and the maximum defaults to 127 if these values are not specified. These values can specify multi-byte limits, for example a 14 bit value could have 16383 set as the MAX. These values only apply to the Mix Icon Coordinate value and the assigned Data Type. They do not apply to values set in other fields such as the Index, Parameter, or Program fields.

These MIN and MAX values set in the VSL file can be overridden by the user in the Mix Icon Properties Controls tab. These values are saved in the VOY session file.

### ***Protocol Token***

The Protocol token (PROTOCOL or PC) specifies the message protocol. For this release, the only valid protocols are MIDI and INTERNAL. For MIDI applications, the protocol should be set to MIDI. This token defaults to MIDI if not specified. The INTERNAL protocol is used to set variables inside the GraphiMix. These variables currently specify the algorithm settings for deriving the complex control data types used for surround sound-fader operation. For more information on these data types see Mix Icon Properties, page 54. For more description of these internal protocols and message types see *GraphiMix Internal Variables and Commands*, page 159.

### ***PUSH Data Operators***

A Control message consists of a series of data bytes that is output to some device using some particular hardware protocol, for example MIDI. This is implemented within Voyager as a series of data values of 4, 8, or 16-bit widths that are 'pushed' onto the output stream and sent to the device in order.

These control message values are implemented by the PUSHNIBBLE (PN), PUSHBYTE (PB), and PUSHWORD (PW) tokens.

The PUSHNIBBLE, PUSHBYTE and PUSHWORD tokens are sticky in the sense that once they are specified, they apply to all data that immediately follows without any intervening other commands. Once a PN, PB, or PW command has been given, all future numerical data will be assumed to also be pushed as a nibble, byte, or a word until the first non-numeric item is encountered or until a new push command is encountered. This prevents the developer from having to type PN (for example) repeatedly.

Decimal values are entered directly. Hexadecimal values are given by putting an H before the number as in H30 or H3AC.

Calculations are started with an open parenthesis character '(' and terminated by a ')'.

The file format is case insensitive.

For example the strings 'PN 9 PN 8 PN 7 PN 6' is equivalent to

'PN 9 8 7 6'.

A 'PW H9876' is equivalent to 'PB H98 H76' is equivalent to 'PN H9 H8 H7 H6'

### ***Control Value Tokens***

Data values in the VSL control recipe can also be dynamic values, derived from the position of the Mix Icon on the Mix Form. This is what allows the movement of a Mix Icon to send messages to an attached hardware mixer to change a fader value (for instance). The icon's positional information is available in the ICONDATA (derived from the assigned Coordinate and the Data Type), as well as the ICONRADIUS, ICONTHETA, ICONX, and ICONY variables.

Some of these values are variables set in a entry box in the Mix Icon Properties Controls dialog. These variables are the MIDICHAN <MC>, PARAMDATA <PR>, PROGRAM <PG>, and INDEX <IX>.

ICONDATA, <IC>, is derived from the assigned Data Type and Coordinate, and the MIN and MAX values. The Data Type selects the positional mapping algorithm, 0-based mapping (fader) or center-based mapping (panpot). Other Data Types are for complex Stereo and Surround control of fader input-by-output matrix configurations. The Coordinate field selects which of the Mix Icon Coordinates the control will be 'attached' to.

ICONRADIUS, <RD>, is the Mix Icon Radius, (127 at boundary radius, 0 at Mix Origin).

ICONTHETA, <TH>, is the Mix Icon Theta (theta 0, left -> 127, right).

ICONX, <PX>, is the absolute value of the Mix Icon's X position (0 = center, 127 = left/right (same as fader))

ICONY, <PY>, is the absolute value of the Mix Icon's Y position (0 = center/origin, 127 = top/bottom (same as fader))

MIDICHAN, <MC>, which takes the value of the 'MIDI Channel' (1-16) dialog box and subtracts 1 (yielding 0-15). This is the only field that modifies the value set by the user by subtracting 1.

PARAMDATA, <PR>, is the value set in the 'Parameter' dialog box in the Mix Icon Properties Controls tab.

PROGRAM, <PG>, is the value set in the 'Program' dialog box in the Mix Icon Properties Controls tab.

INDEX, <IX> , is the value set in the ‘Index’ dialog box in the Mix Icon Properties Controls tab.

Complete list of Control Value tokens.

Control Value Token	Token shortcut	Description
MIDICHAN	MC	MIDI channel number
INDEX	IX	Control Index Value
INDEXH	IXH	Control Index Value – High byte
INDEXL	IXL	Control Index Value – Low byte
INDEX14H	IX14H	Control Index Value – High <7bits>
INDEX14L	IX14L	Control Index Value – Low <7bits>
INDEXHH	IXHH	Control Index Value – High byte, High Nibble
INDEXHL	IXHL	Control Index Value – High byte, Low Nibble
INDEXLH	IXLH	Control Index Value – Low byte, High Nibble
INDEXLL	IXLL	Control Index Value – Low byte, Low Nibble
ICONDATA	IC	Control Mix Icon Value determined by Data Type and Coordinate selection
ICONDATAH	ICH	Control Mix Icon Value – High byte
ICONDATAL	ICL	Control Mix Icon Value – Low byte
ICONDATA14H	IC14H	Control Mix Icon Value – High <7bits>
ICONDATA14L	IC14L	Control Mix Icon Value – Low <7bits>
ICONDATAHH	ICHH	Control Mix Icon Value – High byte, High nibble
ICONDATAHL	ICHL	Control Mix Icon Value – High byte, Low nibble
ICONDATAALH	ICLH	Control Mix Icon Value – Low byte, High nibble
ICONDATAALL	ICLL	Control Mix Icon Value – Low byte, Low nibble
ICON28HH	IC28HH	High 7 bit nibble of a 28 bit word

ICON28HL	IC28HL	Next highest 7 bit nibble of a 28 bit word
ICON28LH	IC28LH	Next lowest 7 bit nibble of 28 bit word
ICON28LL	IC28LL	Least significant 7 bit nibble of 28 bit word
PARAMDATA	PR	Control Parameter Value
PARAMDATAH	PRH	Control Parameter Value – High byte
PARAMDATAL	PRL	Control Parameter Value – Low byte
PARAMDATA14H	PR14H	Control Parameter Value – High <7bits>
PARAMDATA14L	PR14L	Control Parameter Value – Low <7bits>
PARAMDATAHH	PRHH	Control Parameter Value – High byte, High nibble
PARAMDATAHL	PRHL	Control Parameter Value – High byte, Low nibble
PARAMDATAHLH	PRLH	Control Parameter Value – Low byte, High nibble
PARAMDATALL	PRLl	Control Parameter Value – Low byte, Low nibble
PROGRAM	PG	Control Program Value
PROGRAMH	PGH	Control Program Value – High byte
PROGRAML	PGL	Control Program Value – Low byte
PROGRAM14H	PG14H	Control Program Value – High <7bits>
PROGRAM14L	PG14L	Control Program Value – Low <7bits>
PROGRAMHH	PGHH	Control Program Value – High byte, High nibble
PROGRAMHL	PGHL	Control Program Value – High byte. Low nibble
PROGRAMLH	PGLH	Control Program Value – Low byte, High nibble
PROGRAMLL	PGLL	Control Program Value – Low byte, Low nibble
ICONRADIUS	RD	Mix Icon Radius 0==rim 127==center
ICONTHETA	TH	Mix Icon Theta theta 0==left 127==right
ICONX	PX	Mix Icon X absolute value
ICONY	PY	Mix Icon Y absolute value

## VSL Arithmetic Computation

A Data Value can be the result of a computation, combining constants and variables to calculate a single data value. A Computed Data Value is an open parenthesis followed by an algebraic expression followed by a close parenthesis. Parenthesis can be nested.

The following table gives the algebraic operators and their meaning and precedence.

Symbol	Precedence	Meaning
(	0	Start of a computation.
)	0	End of a computation.
NOT	1	Unary bitwise NOT operator
-	1	Unary minus when attached to data.
*	2	multiply
/	2	divide
%	2	modulo
+	3	add
-	3	subtract
<<	4	left shift
>>	4	right shift
AND	5	bitwise AND
XOR	6	bitwise EXCLUSIVE OR.
OR	7	bitwise OR

Computation expressions are parsed in order of precedence, with left to right evaluation of operators at the same precedence level. The above precedence levels and parsing description are almost identical to those used in the C language.

An example of a computation is:

$((3 + IX * 4) \ll 2)$

If a computation contains an Icon Coordinate (IC..., RD, TH, PX, PY), it is a *dynamic computation* and will not be used to compare against a received MIDI message. However, if it doesn't contain an Icon Coordinate, it is a *static computation*, and will be used to match against an incoming MIDI message. Static computations can contain any other register values, for example, Program, <PG...>, Parameter <PR...>, Index <IX...>, etc.

## ***VSL Control Commands***

There are two commands which determine when and how the assembled control message is sent. These are SENDNOW, and DELAY.

SENDNOW , <SN>, causes the message to be sent at this point in the message sequence. This command can be used to sequence multiple messages in a single control sequence if necessary.

DELAY, <DE>, causes the message to be queued and then sent after delaying a certain number of milliseconds. This token requires a subsequent value that sets the number of milliseconds to be delayed in 5mSec increments. The delay actually set is 5 \* (the delay value) mSec. Currently, SYSEX messages are not queued.

Example:

sounds:Low-Boing

! Program number is set in 'Parameter' (127 max).

! Note No. in 'Theta', attack in 'Radius'.

! Note Off delay is set in 'Program'

PN HC MC PB PR SN #program change (in parameter)

PN H9 MC PB TH RD SN #note on (in Theta) attack (in Radius)

PN H8 MC PB TH PG DE PG; #note off (in Theta) with delay (in program)

sounds:High-Boing

! Program number is set in 'X'

! Note number is set from (127-Theta), Attack is 'Radius'

! Note off aftertouch in 'Program', Delay in Y

MIN 0

MAX 127

PC MIDI

PN HC MC PB PX SN #program change (in X)

PN H9 MC PB (127+ -TH) RD SN #note on (in 127 - Theta) attack (in Radius)

PN H8 MC PB (127+ -TH) PG DE PY; #note off (in 127 - Theta) with delay (in Y)

This example shows two VSL controls in the component 'sounds'. Each control consists of 3 separate MIDI commands that set the sound 'voice' (Program Change), the NoteOn command, and a delayed NoteOff command which sets the note duration of 'delay'.

## **VSL Advanced Topics**

The VSL language, as initially specified, is essentially a string 'construction' language, and each received string is matched against all active controls' 'send' strings. Each match causes the Mix Icon attached to that control to respond appropriately.

The MIDI protocol, especially as it pertains to messaging to hardware other than music synthesizers, has undergone considerable development over recent years. However, some of the 'new' MIDI protocols require that the received string be further processed to find a

match, e.g. the string that is sent to a particular control by GraphiMix may not exactly match the string that is received back from the same control. This complicates the creation of the VSL specifications for these protocols, essentially requiring the author of the VSL to identify the exact protocols that apply and marking where they can appear in the received strings.

These features require special commands, called Pseudo-Ops, to be inserted at specific places in the VSL language sequence for a particular control. These VSL pseudo-ops are described below.

### ***Control Change Protocol Pseudo-Ops***

The Control Change message (starting with hexadecimal 'B') has been extended to allow for a larger number of addressable controllers, and for greater controller data precision to 14 bits. Some components of the specification for a single control can be defaulted, i.e. not sent every time.

Parameters controllers are a subset of the control change message group, and they are divided into the registered and non-registered numbers (RPN and NRPNs). RPNs are intended to apply universally, and to be registered with the MIDI Manufacturers' Association (MMA), while NRPNs may be manufacturer specific.

Parameter controllers operate by specifying the address of the parameter to be modified, followed by a control change message to set the value or to increment or decrement the current value. The address of the parameter can be set in two stages, with an MSbyte and then an LSbyte message, so as to allow for up to 16384 possible parameter addresses. The controller numbers (hex)62 and (hex)63 are used to set the LS and MSbytes (7 bit values) respectively of an NRPN, while (hex)64 and (hex)65 are used to address RPN's.

The sequence of messages required to address and change a parameter is as follows:

Message 1

(hex) [Bn] [62 or 64] [LSB]

Message 2

(hex) [Bn] [63 or 65] [MSB]

Message 3

(hex) [Bn] [60 or 61] [7F] – or – [Bn] [06] [MSBData] [Bn] [26] [LSBData]

Message 3 represents either data increment [(hex)60] or data decrement [(hex)61], or a 14 bit data entry slider control change with MSbyte ((hex)06) and LSbyte ((hex)26) parts. If the control has not moved very far, it is possible that only the MSbyte message need be sent. In that case, the MSbyte message would be defaulted.

Not all MIDI protocols in use adhere to the section above. Sometimes only the LSbyte of an NRPN is sent, sometimes only the MSbyte. Sometimes these RPN or NRPN parameters are defaulted, that is, if the MIDI traffic is high, the console may not send this part of the message every time.

As for data, sometimes only 7 bit data is sent, sometimes 14 bits of data are sent, and sometimes one of the two messages for the 14 bit data is defaulted, including the last message sent.

Some manufacturers ignore the above multi-byte protocol and use all available controller numbers as 7 bit controllers. Some manufacturers specify conflicting protocols for different console models.

To address these issues, the GraphiMix VSL language includes a series of CC (control change) pseudo-ops. These are inserted in the VSL specification just before specifying an RPN or default-able Control Change (CC) data type message.

These are:

CC_RPN	An RPN or NRPN parameter (must be sent every time)
CC_RPN_DEFAULT	The following 3 byte control change message is an RPN or NRPN Ms or Lsbyte and can be defaulted (not sent every message if it doesn't change)
CC_INCREMENTAL	The following 3 byte message is an INCR/DECR message
CC_14BIT_MSB	The following 3 byte message is the MS (7 bits) of a 14 bit continuous controller value
CC_14BIT_MSB_DEFAULT	The following 3 byte message is the MS (7 bits) of a 14 bit continuous controller value and can be defaulted
CC_14BIT_LSB	The following 3 byte message is the LS (7 bits) of a 14 bit continuous controller value
CC_14BIT_LSB_DEFAULT	The following 3 byte message is the LS (7 bits) of a 14 bit continuous controller value and can be defaulted

For example, here is the VSL description for a 12 byte CC message, consisting of 4 individual CC messages. The NRPN MSB is defaulted and the LSbyte of the 14 bit data is also defaulted.

```

Component:12ByteControl                                #control name

MIN              0                                     #min value of control
MAX              16383                                 #max value of control
PC              MIDI                                  #MIDI protocol
CC_RPN          #The following CC message is a
                # required (N)RPN message
PN              HB MC                                # (hex) B for CC, Midi channel goes

```

		# in second nibble
		# PN stands for 'PushNibble'
PB	H62	#Specify a NRPN LSByte
		# PB stands for 'PushByte'
	H12	#The LSByte value for this control
CC_RPN_DEFAULT		#The following CC message is a
		# defaulted (N)RPN message
PN	HB MC	# (hex) B for CC, Midi channel goes
		# in second nibble
PB	H63	#Specify a NRPN MSByte
	H34	#The MSByte value for this control
CC_14BIT_MSB		#The following CC message is a
		# required 14 bit data value MSByte
PN	HB MC	# (hex) B for CC, Midi channel goes
		# in second nibble
PB	H06	#Specify a 7 bit controller
	IC14H	#upper 7 bits of 14 bit data
CC_14BIT_LSB_DEFAULT		#The following CC message is a
		# defaulted 14 bit data value LSByte
PN	HB MC	# (hex) B for CC, Midi channel goes
		# in second nibble
PB	H26	#Controller's low order 7 bits of a
		#14 bit value
	IC14L	#lower 7 bits of 14 bit data
SN ;		#end of VSL spec

Here is the description of a 6 byte message consisting of 2 CC messages. The first is an NRPN LSByte message which can be defaulted, followed by a 7 bit controller data message. Note that no pseudo-op is required for 7 bit data CC messages.

Component:6ByteControl		#control name
MIN	0	#min value of control
MAX	127	#max value of control
PC	MIDI	#MIDI protocol
CC_RPN_DEFAULT		#The following CC message is a
		# defaulted (N)RPN message
PN	HB MC	# (hex) B for CC, Midi channel goes
		# in second nibble
PB	H62	#Specify a NRPN LSByte

```

                                H01                #The LSByte value for this control
PN                                HB MC            # (hex) B for CC, Midi channel goes
                                # in second nibble
PB                                H06              #Specify a 7 bit controller
                                IC                 # 7 bit data
SN ;                               #end of VSL spec

```

Here is an example of a six byte incremental control.

```

Component:IncrmntlControl        #control name
MIN                               0                #min value of control
MAX                              127              #max value of control
PC                               MIDI              #MIDI protocol
                                #The following CC message is a
                                # required message
PN                                HB MC            # (hex) B for CC, Midi channel goes
                                # in second nibble
PB                                H62              #Specify a NRPN LSByte
                                H01                #The LSByte value for this control
CC_INCREMENTAL                   #The next message will match for
                                # INCR or DECR
PN                                HB MC            # (hex) B for CC, Midi channel goes
                                # in second nibble
PB                                H60              #Specify incremental data CC
                                H7F                # don't care data
SN ;                               #end of VSL spec

```

### *Signed Data Pseudo-Op*

Some manufacturers occasionally use signed data in their message protocols. This data format uses the most significant bit as a sign bit generating the following sequences:

Signed (hex)	Decimal
40	-64
7F	-1

0	0
3F	63

Most MIDI control change messages use unsigned data.

Unsigned (hex)	Decimal
0	0
3F	63
40	64
7F	127

Note, that as a GraphiMix control is moved from MIN to MAX, the sequence of signed data values jump from 7F to 0 as the values transition from -1 to 0, in the middle of the movement.

Here is an example of signed data used in a Control Change VSL.

```

Component:SignedControl          #control name

MIN          -64                #min value of control
MAX          63                  #max value of control
PC           MIDI                #MIDI protocol
SIGNED
PN           HB MC              # (hex) B for CC, Midi channel goes
                                # in second nibble
PB           H62                 #Specify a NRPN LSByte

                                H01                #The LSByte value for this control

PN           HB MC              # (hex) B for CC, Midi channel goes
                                # in second nibble
PB           H06                 #Specify a 7 bit controller

                                IC                 # 7 bit signed data

SN ;                               #end of VSL spec

```

Here is an example of signed data used in a SYSEX VSL.

```

Component:SignedControl          #control name

MIN          -8192               #min value of control
MAX          8191                #max value of control
PC           MIDI                #MIDI protocol
SIGNED
PB           HF0                  # Start Sysex

```

	H00	#3 byte manu ID
	H01	#
	H42	#
	H12	# Parameter number
	IC14H	# 14 bit signed data
		# MS 7 bits
	IC14L	# LS 7 bits
	HF7	#End of Sysex
SN ;		#end of VSL spec

Here is an example of a SIGNED pseudo-op in combination with the CC\_INCREMENTAL pseudo-op to support, for example, a JLCooper CS10 Wheel control.

CS10:Wheel		# control name
SIGNED		
PC	MIDI	
MIN	-64	
MAX	63	
CC_INCREMENTAL		
PN	HB	# push nibble hex B = Control Change
	HF	# midi channel 16
PB	H60	# Pan
	IC	# value
SN;		# end of VSL

### *Sysex Templates for Variable Length messages*

System exclusive messages have also gotten more complex with variable-length protocols that allow a single message to specify two or more controls at a time. These messages have 2 components, a sequence of one or more bytes that specify a **parameter number** (specifying which control the message is for) and a sequence of one or more bytes that specify the **parameter value** (specifying what value to set that control to).

If two adjacent controls are being adjusted at the same time (for example two side-by-side faders), and they are adjacent in SYSEX parameter numbers, then a single SYSEX message is generated, where the data for the second control is added at the end of the message. The parameter number is essentially being auto-incremented (to the next control), and the data to be substituted for the second control is added at the end. This can extend for many controls if the many controls are being adjusted together.

In order for GraphiMix to respond correctly to these messages, a **SYSEX template VSL**, must be created that describes how to correctly interpret these variable length messages. There is just one of these template VSLs for each form of variable length SYSEX message.

This template VSL must have the component name "sysex\_template". Any VSL that is a member of this component is put on a special list and is compared to incoming MIDI SYSEX messages to see if it is a variable length message. If there is a match, GraphiMix creates multiple, separate messages, one for each parameter being addressed, and then does its normal input MIDI message processing on each. Normally, this VSL template would be in the VSL file that contains the controls that use that form of the SYSEX variable length message. It is not necessary to attach this VSL to a Mix Icon, but it is necessary that the template VSL reside in the same VSL file as the relevant SYSEX VSLs (that *are* attached to icons) in order to insure that it is loaded into GraphiMix.

The parameter number part of the template VSL specification must be marked with pseudo-ops that specify the exact sequence of bytes that contains the parameter number to be auto-incremented. The beginning is marked with "AUTO" and the end of the sequence is marked with "AUTOEND".

The data to be substituted with extra bytes at the end of the message must also be marked with "SUBS" and "SUBSEND".

Here is an example of a variable length SYSEX VSL.

```

sysex_template:VSLtemplate                                #component is sysex_template
                                                           #control name
MIN                0                                       #min value of control
MAX                65535                                   #max value of control
PC                MIDI                                    #MIDI protocol
PB                HF0                                     # Start Sysex
                                                           #
                                                           #3 byte manu ID
                                                           H00
                                                           #
                                                           H01
                                                           #
                                                           H42
AUTO              # Begin Auto-Incremented param num
                                                           # Parameter number (high byte)
                                                           H00
                                                           # Parameter number (low byte)
                                                           H00
AUTOEND          # End Auto-Incremented param num
SUBS             # Begin substituted data area
                                                           # 16 bit data
                                                           # MS 4 bits
                                                           ICHH
                                                           # next 4 bits
                                                           ICHL
                                                           # next 4 bits
                                                           ICLH

```

SUBSEND	ICLL	# LS 4 bits
		# End substituted data area
	HF7	#End of Sysex
SN ;		#end of VSL spec

Two adjacent controls that use the above form of SYSEX message, would respond to the string: (hex) "F0 00 01 42 12 34 05 0C 0E 02 04 0E 05 01 F7".

The first control at parameter number (hex)1234 would get data (hex)5CE2, the second control at parameter number (hex)1235 would get data (hex)4E51.

## VSL Formal Syntax Description

Formal Syntax Description:

The following paragraph is a precise definition of the command syntax.

Please read it very carefully. It is precise and very dense.

It is essentially stated in Backus Naur Form (BNF) without using the Backus Naur formalism.

At the top level, the syntax is any number of CONTROLS where CONTROL is either a CONTROL\_NAME or a COMPONENT\_NAME followed by ':' followed by CONTROL\_NAME.

The control is followed by any number of COMMANDS, followed by a semicolon.

A COMMAND is a COMMAND\_TYPE followed by zero or one DATA\_ELEMENTS.

A DATA\_ELEMENT is a number or a number preceded by an H (for hex data) or a COMPUTATION.

A COMPUTATION is a an Open Parenthesis '(' followed by CALCULATION\_OPERATION, terminated by a close parenthesis ')'.

A CALCULATION\_OPERATION is one of the calculation operations given below along with optional one word of data.

Here is the description using BNF. I use only the shortened form of the command names. Note that because of the 'sticky' PushData commands above, a BNF description is not completely adequate.

White space character is a space or a tab.

<WSC> ::= ' ' | 'tab'

White space is any sequence of white space characters.

<WS> ::= <WSC>\*

A VSL is any number of controls

<VSL> ::= <CONTROL> \*

A control name is either a full control name or a partial control name.

<CONTROL\_NAME> ::= <FULL\_CONTROL\_NAME> |  
<PARTIAL\_CONTROL\_NAME>

A partial control name is any sequence of alphabetic characters.

<PARTIAL\_CONTROL\_NAME> ::= <a-z>\* // Any number of characters.

A component name is any sequence of alphabetic characters.

<COMPONENT\_NAME> ::= <a-z>\* // Any number of characters.

A full control name is a component name followed by a : followed by a partial control name.

<FULL\_CONTROL\_NAME> ::= <COMPONENT\_NAME> ':'  
<PARTIAL\_CONTROL\_NAME>

A control is optional white space followed by a control name followed

by any number of commands followed by optional white space followed by a semicolon.

<CONTROL> ::= [WS] <CONTROL\_NAME> <WS><COMMAND>[WS] \* ';' ;

A command is either a no data command or a command that takes one piece of data or a set once command.

<COMMAND> ::= <NO\_DATA\_COMMAND> | <CC\_PSEUDO\_OP> |  
<SIGNED\_PSEUDO\_OP> |  
<SYSEX\_TEMPLATE\_PSEUDO\_OP > |  
<ONE\_DATA\_COMMAND> |  
<SET\_ONCE\_COMMAND>

A no data command is one of the following:

<NO\_DATA\_COMMAND> ::= 'SN'

A Control Change Pseudo-Op is one of the following:

<CC\_PSEUDO\_OP> ::= 'CC\_RPN' | 'CC\_RPN\_DEFAULT' | 'CC\_INCREMENTAL' |  
'CC\_14BIT\_MSB' | 'CC\_14BIT\_MSB\_DEFAULT' |  
'CC\_14BIT\_LSB' | 'CC\_14BIT\_LSB\_DEFAULT'

A Signed Data Pseudo-Op is one of the following:

<SIGNED\_PSEUDO\_OP> ::= 'SIGNED'

A System Exclusive Template Pseudo-Op is one of the following:

<SYSEX\_TEMPLATE\_PSEUDO\_OP > ::= 'AUTO' | 'AUTOEND' | 'SUBS' |  
'SUBSEND'

A one data comand is PN, PB, or PW or DE followed by a data element.

<ONE\_DATA\_COMMAND> ::= [WS] 'PN' | 'PB' | 'PW' | 'DE' <DATA\_ELEMENT>

A set once command is a MIN or a MAX followed by a numeric data field..

<SET\_ONCE\_COMMAND> ::= 'MIN' | 'MAX' <NUMERIC\_DATA>

A numeric data field is a single integer in decimal or a hex number preceded by an H.

<NUMERIC\_DATA> ::= <decimalnumber.> | 'H' <hexnumber>

A data element is a number of H followed by a number or MC, or MX, or MI or MI2 or a COMPUTATION.

<DATA\_ELEMENT> ::= <decimalnumber> | 'H'<hexnumber> |  
'MC' | 'IX' | 'IC' | 'PR' | 'PG' | ... | <COMPUTATION>

A computation is an open parenthesis followed an algebraic expression followed by a close parenthesis.

<COMPUTATION > ::= [WS] '('{WS} < ALGEBRAIC\_EXPRESSION>[WS] ')'

Computation expressions are parsed in order of precedence, with left to right evaluation of operators at the same precedence level.

The above precedence levels and parsing description are almost identical to those used in the C language.

Example: An example of a computation is:

((3 + IX \* 4) << 2)

## ***GraphiMix Internal Variables and Commands***

### **Description of internal commands.**

The complex Data Types are used to create Stereo and Surround mixes by operating on input-by-output fader matrix configurations. An example of this configuration would be a setup where each input channel is connected to an output bus by way of a single fader. If there were four output busses, each input would have four faders, one for each output bus.

For a simple example, a standard single input channel fader followed by a stereo panpot configuration could be simulated by the appropriate settings of two faders which are connected between the input channel and each of the two stereo output channels.

A 5 channel surround system would send appropriate settings to the 5 faders for each input channel.

The 'appropriate settings' are represented by equations that combine 'internal constants' with the current Mix Icon coordinates to arrive at a value that is sent to some physical control.

The equations are shown below. The ‘internal constants’ can be set and stored in up to 10 different ‘banks’, to provide different ‘multi-channel positional fader behaviors’. Each bank can be referenced individually by each Mix Icon Control with the setting in the Index field. These internal constants can be modified by using control VSLs included in VygrInternal.VSL with the protocol set to ‘INTERNAL’.

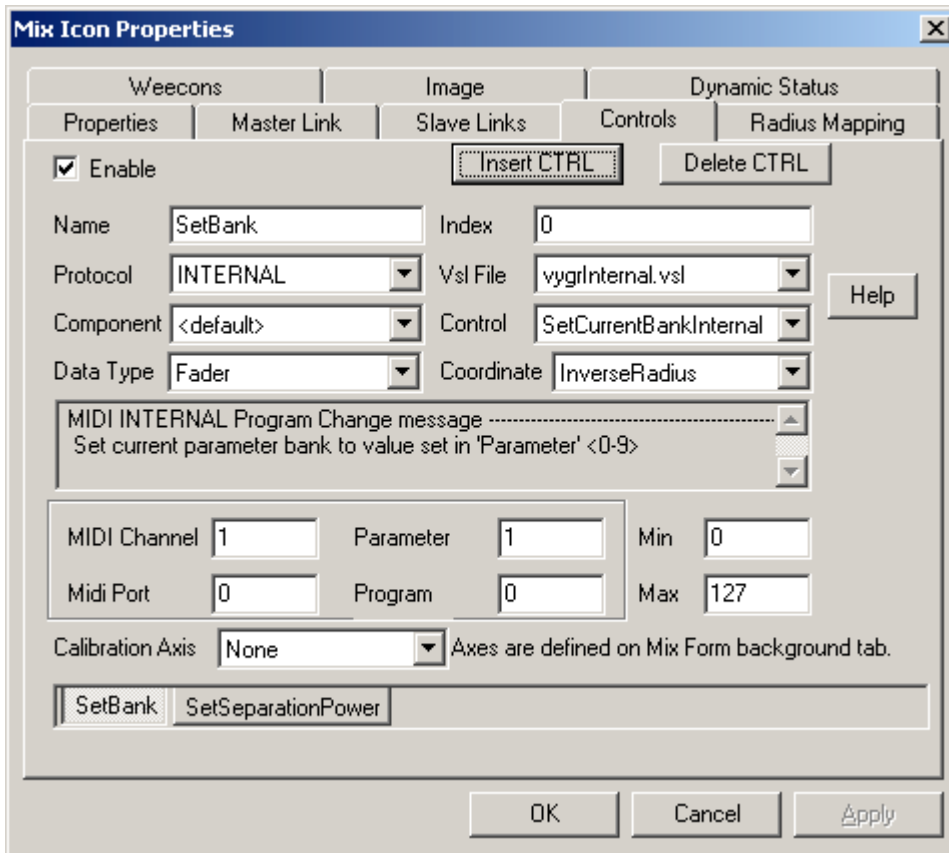
An Excel spreadsheet, GraphiMixFaderPlots.xls, is included with the release to help the engineer determine the appropriate settings for these internal constants.

With future releases, Voyager Sound intends on providing multiple, different sets of equations for Stereo and Surround positional behaviors including a way for the user to add custom functions.

### **Stereo Fader algorithm.**

One example of the use of these ‘positional fader behaviors’ would be to vary the stereo panpot convergence or the surround panner characteristics setting with the individual sound source.

To set the bank number for these variables when setting their values, use the SetCurrentBankInternal control as the first control in the Mix Icon Properties Controls Tab. Here we set the bank to 1.



Follow with the setting for this particular bank. We set the Separation Power to 32 which represents a '0.5' in the equation for this variable.

**Mix Icon Properties**

Properties | Master Link | Slave Links | **Controls** | Radius Mapping

Enable    Insert CTRL    Delete CTRL

Name: SetSeparationPower    Index: 0

Protocol: INTERNAL    Vsl File: vygrInternal.vsl    Help

Component: <default>    Control: SetSeparationPowPrInte

Data Type: Fader    Coordinate: InverseRadius

MIDI INTERNAL Program Change message -----  
Set Separation 'Power' to value set in 'Parameter' <0-127>  
<0-127> => {0.0 to 2.0F}

MIDI Channel: 1    Parameter: 32    Min: 0

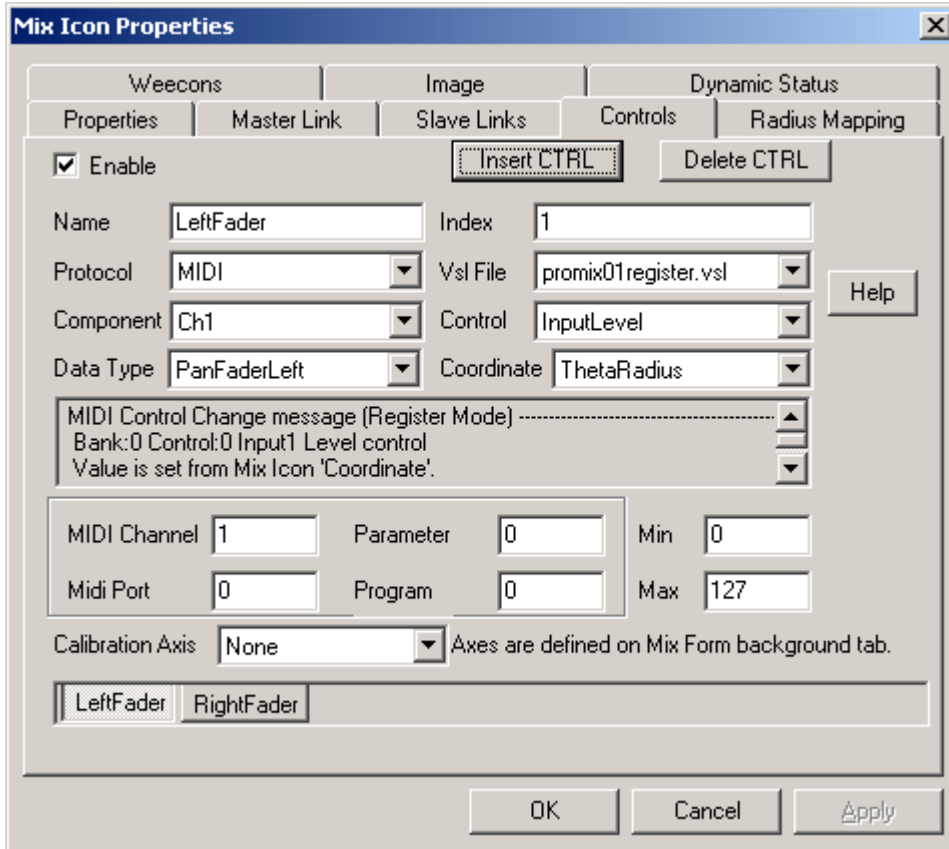
Midi Port: 0    Program: 0    Max: 127

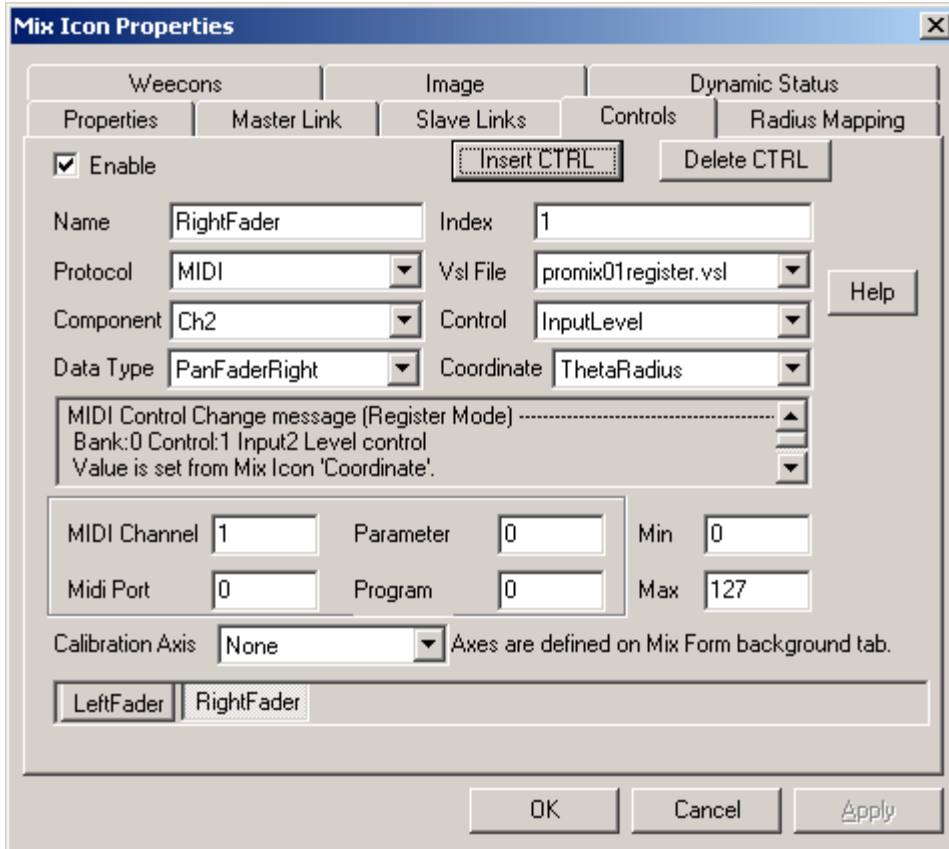
Calibration Axis: None    Axes are defined on Mix Form background tab.

SetBank    SetSeparationPower

OK    Cancel    Apply

Notice that the Index field is set to 1 for the left and right controls in the following Mix Icon Controls setup to use Parameter Bank 1 for this particular set of pan-fader characteristic curves. This uses two fader-type level controls on the target mixer to simulate a fader-panpot combination with settable center convergence.





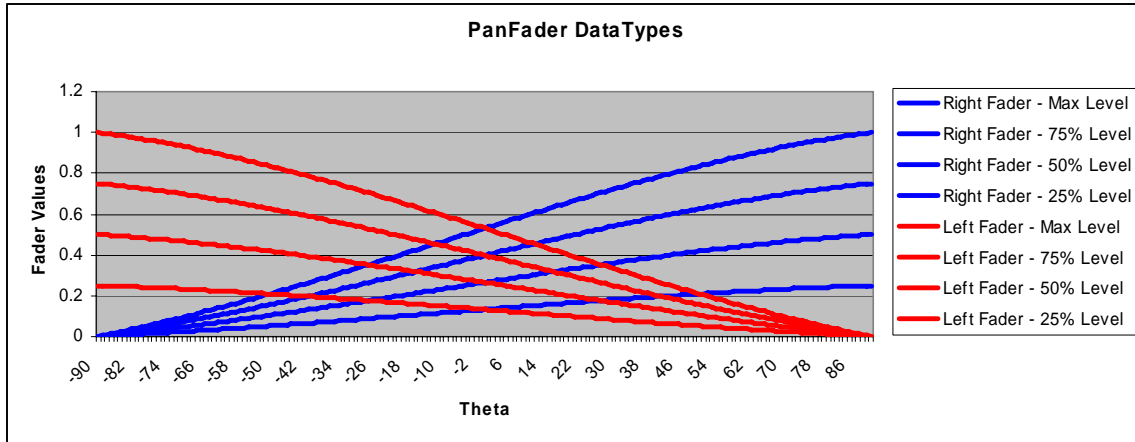
### Right

```
faderMult = 1.0 - (SeparationPower[bank] - 1.0) * (( MixIconTheta - 90) / 180)
fader = faderMult * MixIconRadius * (sin((90 + MixIconTheta) * 0.5F))
fader = min(fader, 1.0)
fader = max(fader, 0.0)
FaderVal = (MIN + (MAX - MIN)*Fader)
```

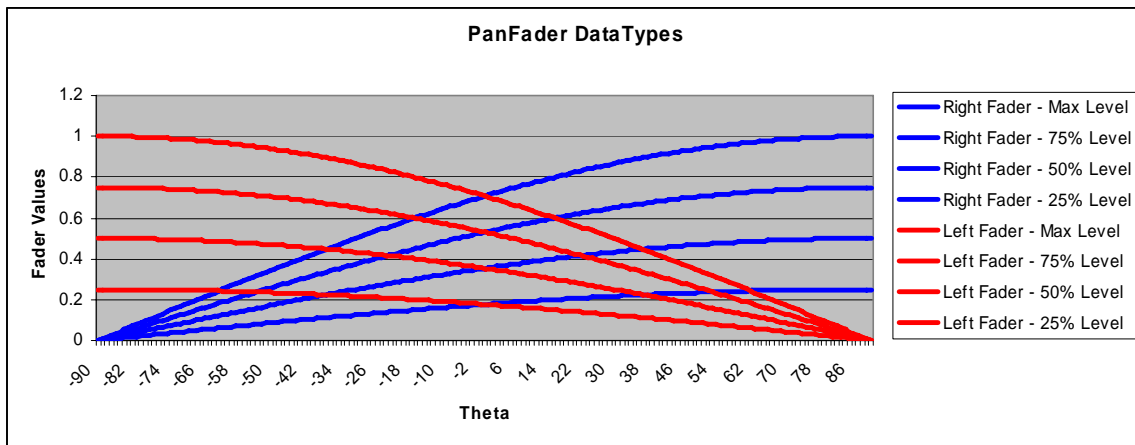
### Left

```
faderMult = 1.0 - (SeparationPower[bank] - 1.0) * (( - 90 - MixIconTheta) / 180);
fader = faderMult * MixIconRadius * (sin((90 - MixIconTheta) * 0.5F));
fader = min(fader, 1.0)
fader = max(fader, 0.0)
FaderVal = (MIN + (MAX - MIN)*Fader)
```

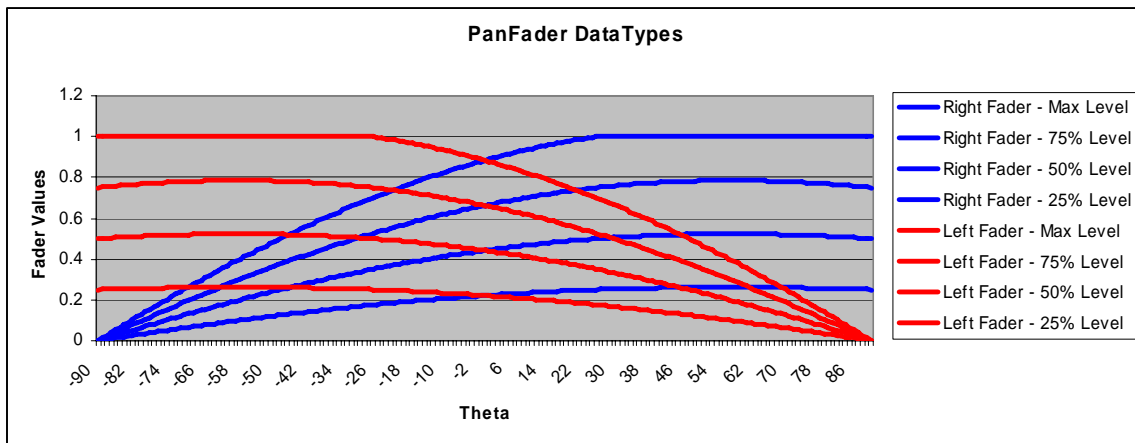
Example of fader characteristic curves with SeparationPower set to 0.5 (parameter value 32).



Example of fader settings with SeparationPower set to 1.0 (parameter value 64 – default setting).



Example of fader settings with SeparationPower set to 1.5 (parameter value 96).



## Quad Fader algorithm.

$Width = (WidthMult[bank] / \text{pow}(\max(\text{SeparationMin}[bank], \text{MixIconRadius}), \text{SeparationPower}[bank])) - WidthMult[bank] + WidthMin[bank]$

$ThetaDiff = \text{abs}(\text{MixIconTheta} - \text{ChannelTheta}[bank])$

$fader = (1.0 - \text{MixIconRadius}) * \text{exp}(-\text{ThetaDiff}/\text{Width}[bank])$

$fader = \text{min}(fader, 1.0)$

$fader = \text{max}(fader, 0.0)$

$\text{FaderVal} = (\text{MIN} + (\text{MAX} - \text{MIN}) * fader)$

Set variable bank then set variables

Note that each QuadFader data types' center theta can be set individually. With 5 QuadFader types and 10 banks, one could potentially have 50 discrete output channels, each at a separate angle.

### Initialized Values for ChannelTheta

LEFT\_FRONT\_THETA -45.0F

RIGHT\_FRONT\_THETA 45.0F

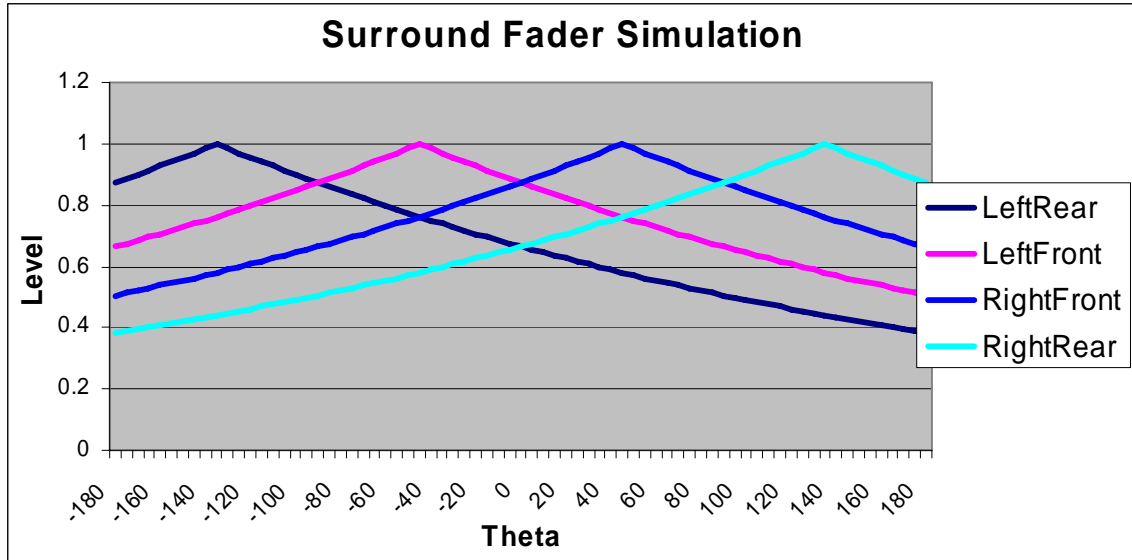
LEFT\_REAR\_THETA -135.0F

RIGHT\_REAR\_THETA 135.0F

CENTER\_THETA 0.0F

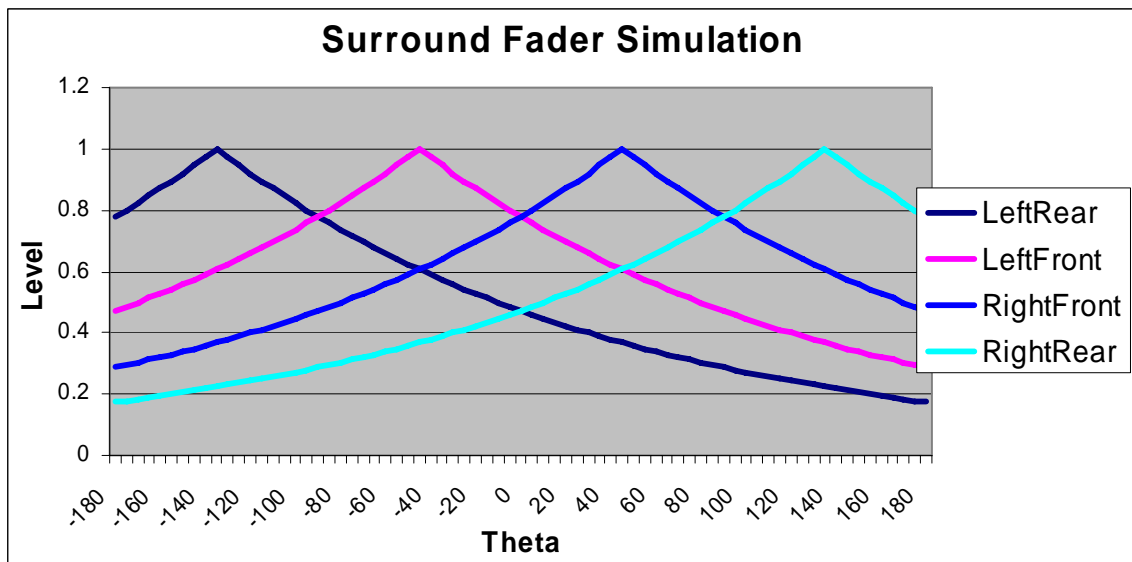
This chart shows the characteristic curves for four of the QuadFader data types. There are 5 total of these data types, the center one is not shown to minimize chart clutter. These curves shows the settings when the Mix Icon is set for maximum volume, essentially changing the panner setting only. Of course, as the radius of the Mix Icon is changed, the volume level overall also changes, fading to zero at the mute radius. This provides a dynamic surround effect where not only does the direction change as the pan angle is changed, but the volume level also modulates with the loudest being the center of the mix form, falling to mute at the mute radius.

This plot represents the default settings of Surround Fader data types.



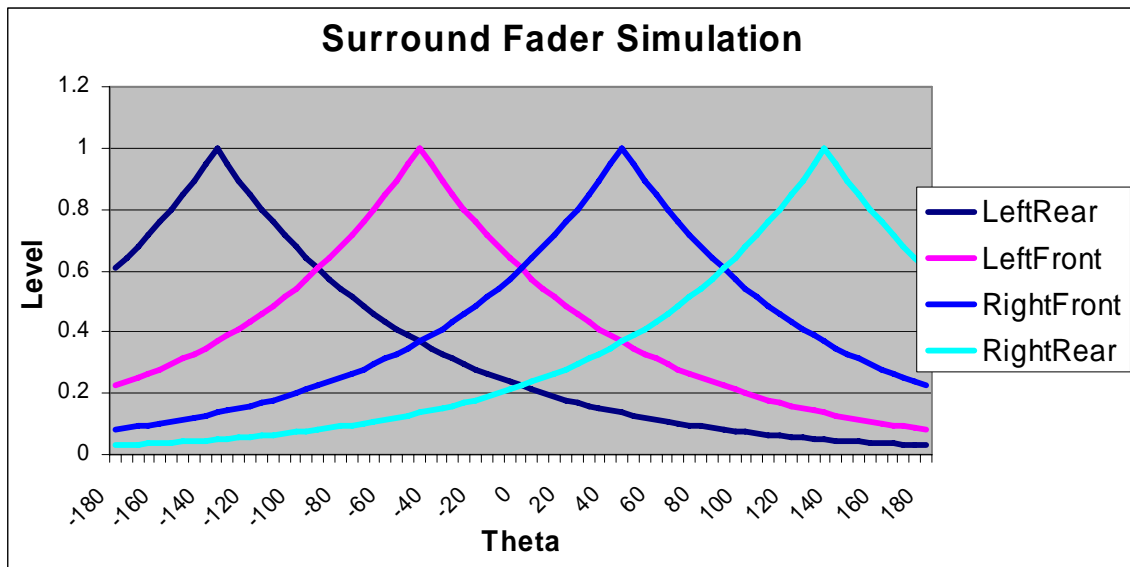
Parameter	Default	Parameter Value To be used in VygrInternal.VSL	Default
SeparationMin(0.01 .. 1.28)	0.05	4	4
SeparationPower(0..2)	1	64	64
WidthMult(0..254)	100	50	50
WidthMin(1 .. 128)	30	29	29

This chart represents the settings when the SeparationMin parameter is changed to 0.4. Note that there is now more directionality and that the off-angle channels are more attenuated, even at maximum output level..



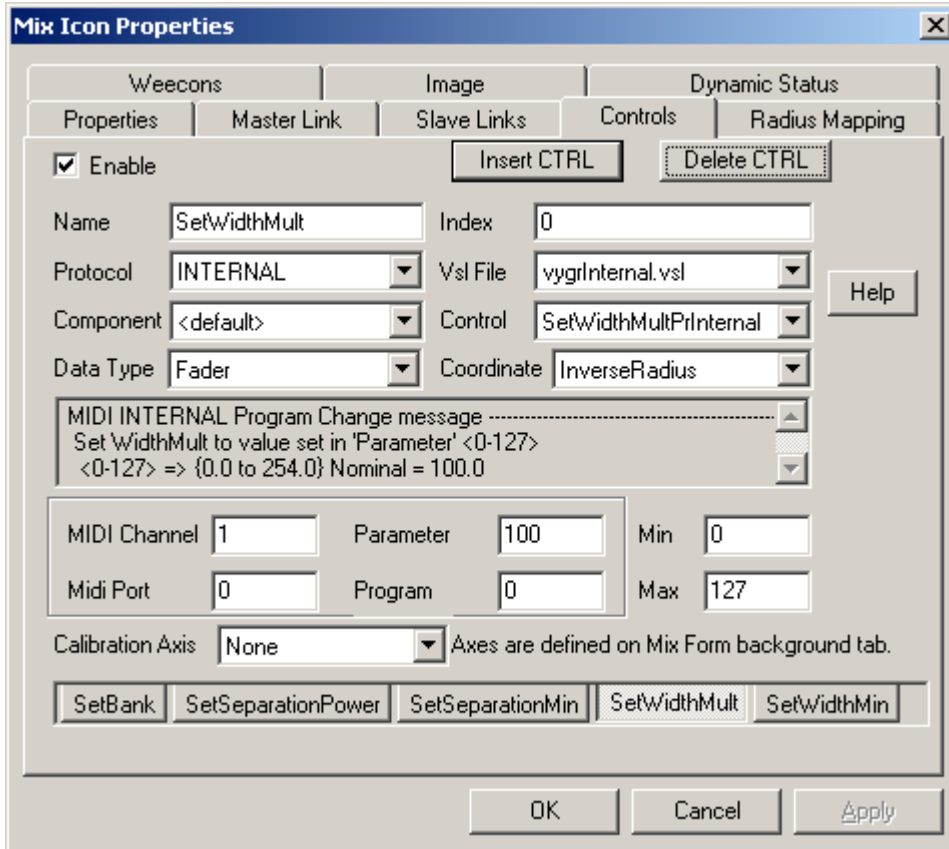
Parameter	Default	Parameter Value To be used in VygrInternal.VSL	Default
SeparationMin(0.01 .. 1.28)	0.4	0.05	39
SeparationPower(0..2)	1	1	64
WidthMult(0..254)	100	100	50
WidthMin(1 .. 128)	30	30	29

This chart represents the characteristic curves when the WidthMult parameter is decreased to 20.

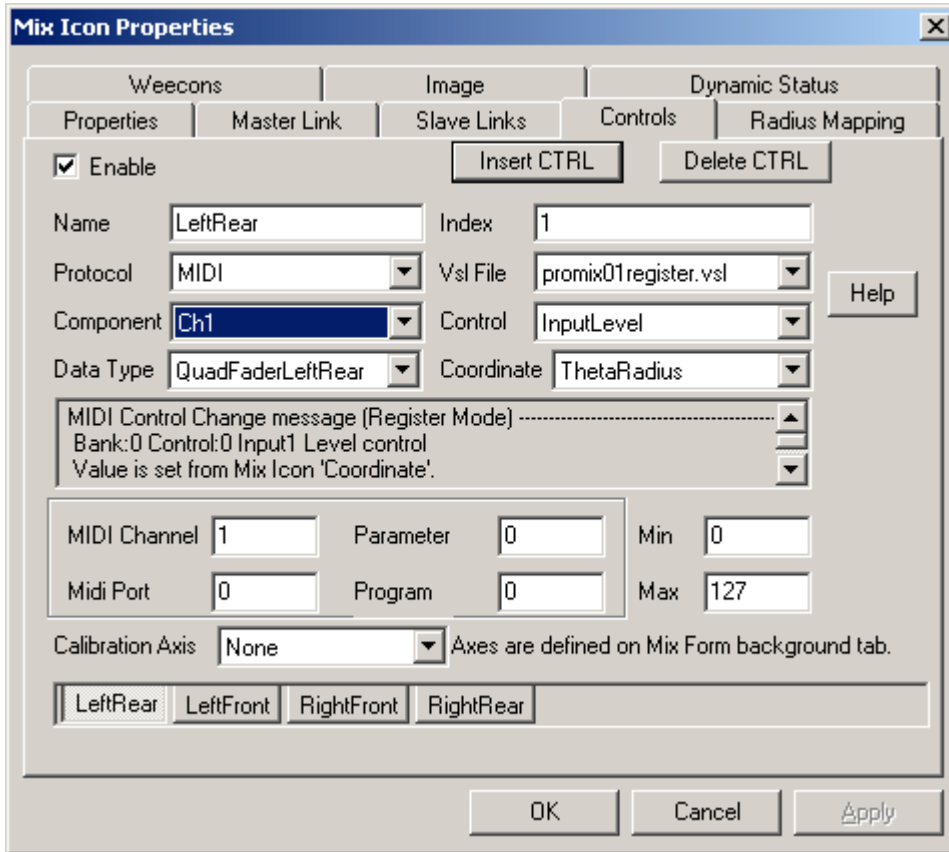


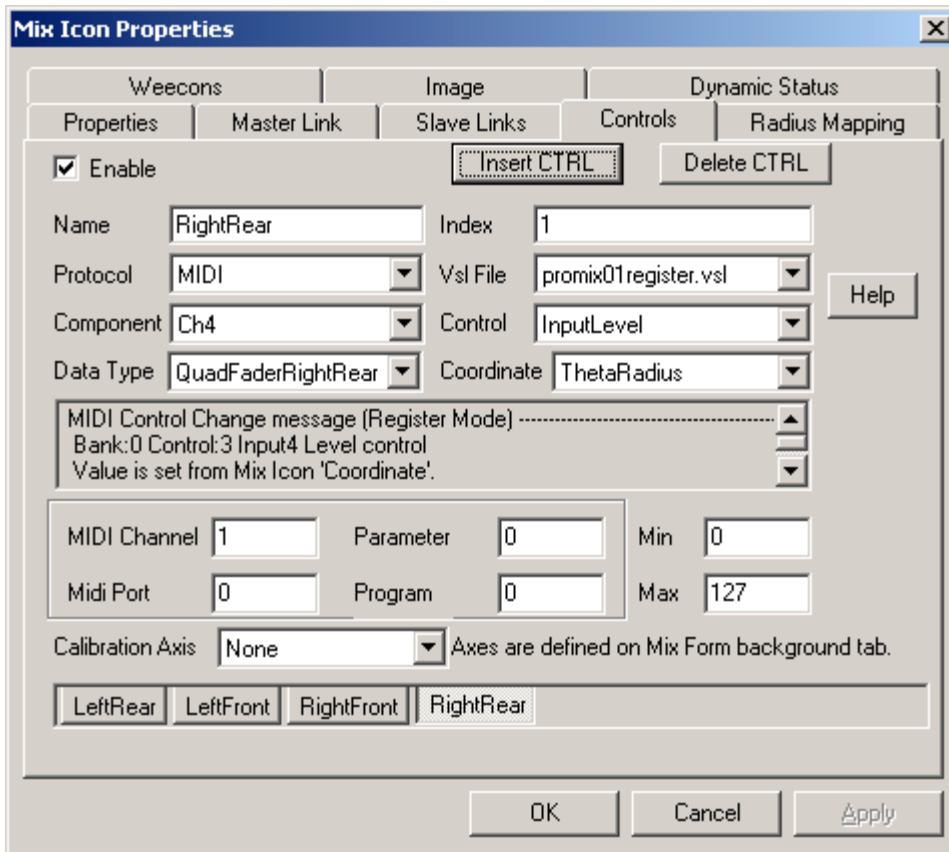
Parameter	Default	Parameter Value To be used in VygrInternal.VSL	Default
SeparationMin(0.01 .. 1.28)	0.05	0.05	4
SeparationPower(0..2)	1	1	64
WidthMult(0..254)	20	100	10
WidthMin(1 .. 128)	30	30	29

Here is an example of a Mix Icon control setup to set the Quad data type parameters using the INTERNAL protocol. Note that if a setup Mix Icon is configured as shown and is present on the Mix Form, then it will issue its configuration setup commands automatically when the Mix Form gets the focus (becomes the selected Mix Form).



Here is an example of a Mix Icon setup using the Quad data types to set 4 individual channels on a target console.





## VygrInternal.VSL

```

# VygrInternal.VSL
# Version: 1.0
# Copyright 2001 Voyager Sound Inc.
#
# VSL for VYGR internal controls
#
# Edit history
# KK 8:30Am 26-Nov-2001 creation K. Krug
<Version>:Version
    ! VygrInternal VSL <copyright> 2001 Voyager Sound Inc.All Rights Reserved
    ! Version 1.0 11/26/01 Creation
    ! PROTOCOL INTERNAL
    ;

<Version>:Version
PC INTERNAL
    ! VygrInternal VSL <copyright> 2001 Voyager Sound Inc.All Rights Reserved
    ! Version 1.0 11/26/01 Creation
    ! PROTOCOL INTERNAL

```

```

;

#
# Edit history
# KK 8:30 AM 11/26/01 Creation

ResetToFactorySettingsInternal
PC INTERNAL
! MIDI INTERNAL Program Change message -----
! Reset to Factory Settings for all banks
PN HB MC PB 0 0 SN;

SetCurrentBankInternal
PC INTERNAL
! MIDI INTERNAL Program Change message -----
! Set current parameter bank to value set in 'Parameter' <0-9>
PN HB MC PB 1 PR SN;

SetLeftFrontThetaPrInternal
PC INTERNAL
! MIDI INTERNAL Program Change message -----
! Set Left Front channel angle to value set in 'Parameter' <0-127>
! <0-127> => {-180 to +180}
PN HB MC PB 16 PR SN;

SetLeftFrontThetaInternal
PC INTERNAL
! MIDI INTERNAL Program Change message -----
! Set Left Front channel angle to value set in Mix Icon Coordinate
PN HB MC PB 16 IC SN;

SetRightFrontThetaPrInternal
PC INTERNAL
! MIDI INTERNAL Program Change message -----
! Set Right Front channel angle to value set in 'Parameter' <0-127>
! <0-127> => {-180 to +180}
PN HB MC PB 17 PR SN;

SetRightFrontThetaInternal
PC INTERNAL
! MIDI INTERNAL Program Change message -----
! Set Right Front channel angle to value set in Mix Icon Coordinate
PN HB MC PB 17 IC SN;

SetLeftRearThetaPrInternal
PC INTERNAL

```

! MIDI INTERNAL Program Change message -----  
! Set Left Rear channel angle to value set in 'Parameter' <0-127>  
! <0-127> => {-180 to +180}  
PN HB MC PB 18 PR SN;

SetLeftRearThetaInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set Left Rear channel angle to value set in Mix Icon Coordinate  
PN HB MC PB 18 IC SN;

SetRightRearThetaPrInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set Right Rear channel angle to value set in 'Parameter' <0-127>  
! <0-127> => {-180 to +180}  
PN HB MC PB 19 PR SN;

SetRightRearThetaInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set Right Rear channel angle to value set in Mix Icon Coordinate  
PN HB MC PB 19 IC SN;

SetCenterThetaPrInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set Center channel angle to value set in 'Parameter' <0-127>  
! <0-127> => {-180 to +180}  
PN HB MC PB 20 PR SN;

SetCenterThetaInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set Center channel angle to value set in Mix Icon Coordinate  
PN HB MC PB 20 IC SN;

#---

SetSeparationPowPrInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set Separation 'Power' to value set in 'Parameter' <0-127>  
! <0-127> => {0.0 to 2.0F}  
PN HB MC PB 21 PR SN;

SetSeparationPowInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set Separation 'Power' to value set in Mix Icon Coordinate  
PN HB MC PB 21 IC SN;

SetWidthMultPrInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set WidthMult to value set in 'Parameter' <0-127>  
! <0-127> => {0.0 to 254.0} Nominal = 100.0  
PN HB MC PB 22 PR SN;

SetWidthMultInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set WidthMult to value set in Mix Icon Coordinate  
! <0-127> => {0.0 to 254.0} Nominal = 100.0  
PN HB MC PB 22 IC SN;

SetMinSeparationPrInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set MinSeparation to value set in 'Parameter' <0-127>  
! <0-127> => {0.01 to 1.28} Nominal = 0.05  
PN HB MC PB 23 PR SN;

SetMinSeparationInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set MinSeparation to value set in Mix Icon Coordinate  
! <0-127> => {0.01 to 1.28} Nominal = 0.05  
PN HB MC PB 23 IC SN;

SetWidthMinPrInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set MinSeparation to value set in 'Parameter' <0-127>  
! <0-127> => {1.0 to 128.0} Nominal = 30.0  
PN HB MC PB 24 PR SN;

SetWidthMinInternal  
PC INTERNAL  
! MIDI INTERNAL Program Change message -----  
! Set MinSeparation to value set in Mix Icon Coordinate  
! <0-127> => {1.0 to 128.0} Nominal = 30.0

PN HB MC PB 24 IC SN;

SetWidthMaxPrInternal

PC INTERNAL

! MIDI INTERNAL Program Change message -----

! Set MaxSeparation to value set in 'Parameter' <0-127>

! <0-127> => {500 to 3040} Nominal = 1000

PN HB MC PB 25 PR SN;

SetWidthMaxInternal

PC INTERNAL

! MIDI INTERNAL Program Change message -----

! Set MaxSeparation to value set in Mix Icon Coordinate

! <0-127> => {500 to 3040} Nominal = 1000

PN HB MC PB 25 IC SN;

# -- Generic control changes

ControlChangeInternal

PC INTERNAL

! MIDI INTERNAL Program Change message -----

! Parameter number is set in 'Parameter' <0-127>

! Parameter value is set from Mix Icon 'Coordinate'.

PN HB MC PB PR IC SN;

ControlChangeInternalPG

PC INTERNAL

! MIDI INTERNAL Program Change message -----

! Parameter number is set in 'Parameter'

! Parameter value is set in 'Program' <0-127>.

PN HB MC PB PR PG SN;

## ***About This Manual***

This manual is provided with the release and is available in the GraphiMix install directory as GraphiMixReferenceManualShareware.pdf. The GraphiMix Users Guide is also available and is named GraphiMixUsersGuideShareware.pdf.

## ***Contact Information***

Due to this free shareware opportunity, support will be given to those who submit a shareware fee of \$25 (US) sent via US post. Please include your email address. You will be sent a receipt.

To send us a postal letter, send it to:

**Support  
Voyager Sound Inc  
P.O. Box 115  
Weston, MA. 02493 U.S.A.**

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U.S. Patent 5,212,733

Foreign Patent 0517848

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## Glossary and Definitions

ACTIVE REGION	The area of the Mix Form between the Mix Form Origin and the 100% Radius coordinate (on a Stereo Mix Form) or the +/- 100% X and Y coordinates. The area outside the Active Region has the Radius Coordinate set at 100%. The X and Y coordinates are similarly 'pinned' at their maximum and minimum settings.
BMP	An abbreviation for a Windows Bitmap File.
BUILD MODE	This is a mode of GraphiMix that allows the user to 'build' his mix surface, change Icon and Mix Form properties and otherwise change the look, feel, or function of his GraphiMix session. When in 'Build' mode extra menu entries are added to Mix Icon and Mix From context menus to facilitate these actions. GraphiMix can be either in 'Build' mode or in 'Run' mode.
CHANNEL	A single input to an audio console. Also, in MIDI, a number between 1 and 16 that specifies the MIDI channel for the communication.
CLICK	A press of a mouse button.
CLIPBOARD	A Windows feature. The user can 'cut' or 'copy' to the clipboard, then possibly select a different window or application, and finally 'paste' the clipboard object on to the destination.
CONSTRAINT	Mix Icon movement on the Mix Form can be limited in certain ways. For example, the Mix Icon can be allowed to move up and down only and not side-to-side. In this case the movement constraint would be 'ConstantX', it can only change the Y coordinate. The 'Fixed Position' constraint does not allow the Mix Icon to move at all.
CONTROL	A control is usually a piece of hardware that allows the user to manipulate some parameter of the audio production. A volume control or fader that receives input from a source of audio and outputs to a single bus would be an example of a control. Any

	mechanism that allows the user to manipulate some parameter of an audio mix would be a control.
CONTROL RECIPE	<p>A specification or 'recipe' that describes how a control can be communicated with. It effectively describes the message protocol to a particular control. These message protocols are designed by the companies that manufacture the hardware or software. Most of the time, these protocols are described in the equipment manuals.</p> <p>The Control Recipe describes how to construct a particular message, using the GraphiMix™ VSL language. These recipes usually include constants that indicate which control is being addressed, and over what channel, as well as numbers that indicate the setting to be applied.</p>
CONTROL-KEY	The Control Key on the PC keyboard is usually located at the lower left and right bottom corners. A Control-Key command involves holding the Control Key down while pressing another key or clicking the mouse.
DIALOG	A Dialog is a Menu screen put up by GraphiMix™ to allow the user to set and select various parameters. A Dialog Box is a single entry on a Dialog menu screen.
DOUBLE-CLICK	Two rapid mouse clicks in sequence. The threshold that defines the difference between two single clicks and a double click can be set using the Windows operating system.
DOWNLOAD	When the user is connected to the Internet, he can browse to web sites which enable him to copy files from a remote computer to his own, local computer. This process is referred to as a download.
EFFECTS	Controls which modify the sound and add filtering and reverberation are called audio effects.
EMAIL	Electronic mail that can be sent from the users computer to other computers by using the Internet.
EQ	EQ is short for Equalization. Equalization usually means modifying the audio work by filtering and not by adding effects, such as reverberation.

EVENT	When a Mix Icon changes state, either by moving its position or changing its internal states such as a switch changing from On to Off, an event is generated. This event usually results in a message being sent to all of the Controls which are attached to the selected Mix Icon if the event represents a change to the particular control.
EXECUTABLE	An executable is a file with the filename extension '.EXE'. These files usually represent programs and applications that are 'run' by the user.
FADER	A fader usually refers to a type of volume control that slides up and down (or side to side) in a linear fashion. A 'knob' would be a volume control that works in a rotary fashion.
FEEDBACK LOOP	A feedback loop is created when an output of a system is fed back into the input. An example would be when a microphone on stage gets too close to the speaker which usually results in a loud squeal. With MIDI, it is possible to hook a MIDI input to the same MIDI output which can result in erroneous operation. MIDI Yoke™ includes a mechanism to detect MIDI feedback and will disable its port if it is detected.
FIELD	A field usually holds a number or a character string. In dialog menus, there are usually fields that hold an individual selection of a number or a name which can be changed by the user.
FONT	A font selects the 'style' of alphanumeric character text. 'Times New Roman' and 'Arial' are examples of font names.
GLASS CONSOLE	A 'Glass console' is a software application that provides control of a hardware or software audio console by representing the individual controls as a simulation of a hardware console. The on-screen adjustments are made by adjusting graphic faders, switches, and knobs with the mouse.
GRAPHIC MIX	The Voyager Sound Graphic Mix is a new and unique way to control hardware and software consoles using

	Mix Icon graphics placed on multiple Mix Forms. Each Mix Icon changes the settings of several attached controls with a single movement, greatly multiplying the ability of the sound mix engineer to interactively control the mix on a computer screen.
GRAPHIC USER INTERFACE	A Graphic User Interface is a system of on-screen displays and mouse and keyboard interactions that provide a way for the user to specify actions to the computer. An example of a Graphic User Interface (abbreviated as GUI) is the Windows Operating System.
HARDWARE CONTROL	A hardware control is usually a piece of electronics that processes and modifies audio signals in a way that can be changed according to the engineer's requirements. A hardware control can be as simple as a knob or fader potentiometer, physically moved by the engineer, or as complex as a software algorithm encoded into a digital audio processing device.
KNOB	A knob is a rotary device that changes one or more mix parameters.
LICENSE NUMBER	The Voyager Sound GraphiMix™ requires four fields of information to enable all its features. The License Number is created by Voyager Sound based on the other three registration fields for each licensed user.
LINK	A link is a connection from a 'Master' Mix Icon to one or more 'Slave' Mix Icons. The position of the Slave Mix Icons is controlled by the position of the Master Mix Icons and by the linking rules that determine what the positional relationship is. Various linking rules can be specified by the user.
MENU	A Menu is a page that 'drops' down or otherwise appears to allow the user to select various options or parameters from a 'menu' of options or parameters.
MIDI	The <b>M</b> usical <b>I</b> nstrument <b>D</b> igital <b>I</b> nterface (MIDI) was invented in the early 1980's by a group of synthesizer manufacturers as a way to connect instruments together to make sound. Since then it has evolved into the protocol of choice for controlling everything from sound synthesizers to tape machines.

	MIDI is a communications protocol consisting of messages that consist of as few as 1 byte and up to thousands of bytes.
MIDI INPUT	A device or application that can receive and act upon MIDI messages must have its MIDI Input source selected.
MIDI OUTPUT	A device or application that can send MIDI messages to other devices or applications must have the appropriate MIDI Output device specified.
MIDI PORT	A MIDI port is a hardware or software device that sends and receives MIDI messages to external hardware or other software applications.
MIDI SEQUENCER	A MIDI sequencer is like a ‘tape recorder’ for MIDI. It receives and stores sequences of MIDI messages and can then ‘Play them back’. Some sequencers allow the engineer to modify the stored sequences and add more sequences to different tracks to allow the engineer to build up large multi-track compositions.
MIDI THRU	Some MIDI devices can receive MIDI messages from other devices and then ‘pass them on’ to its MIDI output, mixed with its own MIDI messages. This mode of operation is known as ‘MIDI Thru’ mode.
MIDI YOKE™	MIDI Yoke™ is a set of software drivers that create software MIDI ports. These ports can be used to ‘plug together’ software MIDI applications. For example, one application can output to a MIDI Yoke™ port and a different application on the same computer can receive input from that same MIDI Yoke™ port, effectively connecting the output of the first application to the input of the second.
MIRROR	When linking Mix Icons, the link rules can be set to determine how the linked Icon’s movements are controlled. A common linking rule is a ‘mirror’ operation where one of the coordinates would be inverted around the Mix Origin, creating a ‘mirror’ effect, as if the Mix Icon were reflected around the Mix Origin.
MIX CONSOLE	A Mix Console is a device that usually controls

	<p>multiple channels of audio inputs and outputs. The audio on these inputs can have their volume and filtering adjusted and effects added before being sent to the outputs.</p> <p>Mix Consoles are used by the audio engineer to create final works of audio production such as records or movies by manipulating the Mix Console controls to achieve the desired effect.</p>
MIX FORM	<p>A Mix Form is a window that has one or more Mix Icons placed on it to control some piece of audio hardware or software.</p> <p>A stereo Mix Form represents a half plane where the Mix Form Coordinates can range from +/- X to only +Y. A Surround Sound Mix Form represents a full plane where the Mix Form Coordinates range from +/- X and +/- Y. The maximum values of the coordinates are 100% and the minimums are 0 at the Mix Form Origin.</p>
MIX FORM COORDINATE	<p>A Mix Form Coordinate is one of Radius, Theta, X, and Y. These coordinates are converted into control commands by the placement of a Mix Icon and the individual VSL control settings.</p>
MIX FORM ORIGIN	<p>The Mix Form Origin is where the Radius, X and Y have a value of 0%. For a Stereo Mix Form, the Mix Form Origin is at the bottom center, for a Surround Mix Form, the Mix Form Origin is in the center.</p>
MIX FRAME	<p>The Mix Frame is the outermost window of a GraphiMix™ mix session.</p>
MIX ICON	<p>A Mix Icon is a graphic object that is placed on a Mix Form to represent and control a collection of controls that affect the Mix Parameters for a single source of sound. For example, a single Mix Icon may control both the volume and the pan position mixer controls for a single channel.</p>
MIX ICON STATE	<p>The Mix Icon State is represented by its coordinates on the Mix Form as well as the setting of any internal states that it may have. A switch-type Mix Icon, for example, has two additional states, Switch On and Switch Off, in addition to the coordinates of its position on the Mix Form.</p>

MUTE BOUNDARY	The Mute boundary is the circle that is at the 100% Mix Form Radius coordinate. If a fader is attached to the InverseRadius Mix Icon coordinate, then the value of the attached fader will be 0 (muted) at this point. At any point beyond this Mute Boundary, the fader will remain muted. This area is the Mute Region. For X/Y Mix Forms, the Mute Boundary is a square at +/- 100% X and Y coordinates.
MUTE REGION	The Mute Region is the area that is beyond the Mute Boundary, depending on the Mix Form type. If the Inverse coordinate function is used, this area can be used to 'park' inactive or muted Mix Icons.
NON-LINEAR	A Non-Linear function is a function where the output changes in an abrupt manner and does not follow a straight line.
PANPOT	A Panpot control usually takes an audio signal and distributes it between two or more output channels. The relative distribution between the output channels can be changed by setting the pan position appropriately. For example, if the stereo pan position control is in the middle, the signal is evenly divided between the two output channels. If it is turned toward the right, then more signal is sent to the right output then to the left output.
PANPOT CONVERGENCE	The Panpot Convergence refers to exactly how the signal is distributed to the output channels as the control is centered. Normally, signal power is conserved, and if the control is centered, each output's level is -3dB down from the input (total output power = total input power). In some situations, the user may desire that both channels get boosted or cut from this value. This change is made by adjusting the Panpot convergence up or down.
PAR FILE	The Yamaha DME32™ can output a file that describes its custom configuration of mixer controls and effects. This PAR file can be imported by the GraphiMix02™ to create a custom VSL file which can be used in a GraphiMix™ mix session.
PC SOUND CARD	A personal computer that features sound capability

	(beyond keyboard beeps) contains a PC Sound card. Most PC Sound cards can respond to MIDI commands to create and modify sounds.
PIXEL	A pixel is another name for a Picture Element, which is a single, addressable 'dot' on a graphic display.
PROTOCOL	A message Protocol is an instruction for how to construct a message to be sent and received between two communicating devices. MIDI and TCP/IP are two examples of message protocols.
PURCHASE NUMBER	The Voyager Sound GraphiMix™ requires four fields of information to enable all its features. The Purchase Number is issued by Voyager Sound based on the product and the date of purchase.
QUAD	One of several different types of Surround Sound. Quad usually involves 4 separate speakers and 4 separate channels of sound.
RADIUS	The Radius represents the Mix Icon's distance from the Mix Origin.
RADIUS BOUNDARY	The Radius boundary is where the Mix Form Radius Coordinate becomes 100%.
REBOOT	Some software installations may require the user to shut down Windows (using the Start->Shut down menu in the desktop's lower left corner) and restart. This is termed a 'reboot'.
REGISTRATION FIELD	The Voyager Sound GraphiMix™ requires four fields of information to enable all its features. These fields are called 'Registration Fields'. These can be accessed under the 'Help' menu.
RESPONSIVENESS	GraphiMix™ can 'smooth out' the mouse movement by effectively averaging many mouse move events and outputting the time average instead of the current mouse position. This has the effect of giving the Mix Icon a 'smoother' feel when adjusting its position with the mouse.
REVERB	Reverb is a type of effect that adds 'echo' to the audio signal. Depending on the amount and kind of echos

	(reverb parameters) the effect can range from simulating room acoustics to a setting that is an intentional distortion to create a unique effect.
RS422	RS422 is a serial port hardware interface standard. Message protocols may specify serial interface standards such as RS232, RS422, or MIDI.
RUN MODE	This is a mode of GraphiMix that limits the user to 'running' his mix surface. When in this mode, GraphiMix inhibits the user from changing Icon and Mix Form properties or otherwise changing the look, feel, or function of his GraphiMix session. When in 'Run' mode, all extraneous menu entries are removed from Mix Icon and Mix Form context menus that aren't needed during a mix. GraphiMix can be either in 'Build' mode or in 'Run' mode.
RUNTIME	'Runtime' refers to when engineer is using GraphiMix™ to actually perform the audio mix. This is in contrast to when the engineer is designing the mix session by creating Mix Icons and Mix Forms.
SCENE	A GraphiMix™ scene contains one or more Mix Session States. Each state contains an entirely separate copy of the Mix Session allowing for extreme flexibility in defining Mix Session presets.
SOFTWARE METHOD	A 'Software Method' defines a certain algorithm for converting one kind of data value (such as a Mix Icon Coordinate) to another (such as a control value).
SPLASH SCREEN	The Splash Screen is the initial screen image that comes up on the user's monitor. The splash screen contains the application manufacturers name and the US and foreign patents that apply.
STATE	A GraphiMix™ state contains an entirely separate copy of a mix session. Each Mix Session State can represent an entirely different arrangement for control of the mix hardware.
STEREO	A Stereo mix usually has at least two sets of output channels, one labeled 'Left' and one 'Right'.
SUB MIX	A 'Sub-Mix' usually involves a subset of the available

	inputs that are mixed together separately before entered into the 'Main Mix'. An example would be a situation where a drum set might have several microphones placed to optimally record the bass drum, the cymbals, the high-hat, and the toms. These separate inputs might be mixed together with a 'drum sub-mix' before the single or stereo output of this sub-mix is entered into the 'main mix' with the rest of the channels representing all the other instruments in the session.
SURROUND	A 'Surround' mix involves output channels that represent a 360 degree sound field when played. An example would be a multi-channel movie mix where sound effects can come from behind and even from within the audience. This can range from as few as 3 to a large number of output channels. The GraphiMix™ provides several types of Surround Mix Forms.
SWITCH	A switch is a two state device consisting of an ON and an OFF state. A multiple-pole switch is actually a series of two state switches mechanically or algorithmically linked together.
SYSEX	MIDI <b>SY</b> stem <b>EX</b> clusive messages are abbreviated as SYSEX and are a type of variable-length MIDI message.
SYSTEM EXCLUSIVE	MIDI System Exclusive messages are a message type that begins with a <hexadecimal>F0 and ends with a <hexadecimal>F7. This is the only MIDI message type that is variable length. In practice, SYSEX messages are used to signal everything from control and program changes to bulk dumps and loads of the entire hardware system state.
TAB BAR	A Tab bar is a toolbar of tabs, each tab pulling up a separate page, menu, or Mix System State.
TCP/IP	This is a message protocol used over networks to allow computers to access other computers and the world wide web. It is an acronym that stands for Transport Control Protocol-Internet Protocol.
TEMPLATE SESSION	Creating a Mix Session from a blank Mix Form can be

	<p>somewhat tedious if a large number of controls are to be created. To speed this process somewhat, Voyager Sound Inc provides several ‘template’ Mix session files already set up to interface to several popular digital mix consoles via MIDI. These ‘template’ session files can be copied, modified, and customized to any degree. Individual Mix Icons with controls attached can be copied, cut, and pasted to other Mix Forms.</p>
THETA	<p>A Mix Form and Mix Icon Coordinate. Front center is 0 degrees. Negative angles are on the left and positive angles are on the right. When converted to a Mix Icon control value, MIN is at the left extreme and MAX is at the right extreme.</p>
TOKEN	<p>A token in the VSL Control language is an individual value or identifier, in a stream of such identifiers, that represents a value or a computation in the output message protocol specified in the VSL entry for a particular control. For example, the MIDI channel number, the address of the control in a control change command, or the value sent to a mix console fader control would all be represented as tokens in the VSL file.</p>
TOOL BAR	<p>A tool bar is a collection of icons that perform actions within the GraphiMix™ application when clicked with the mouse. A toolbar can be attached as a unit to the Mix Frame or floated free as an independent window.</p>
TOOL KIT	<p>GraphiMix™ includes a ‘kit’ of tools that help the user construct and customize the Graphic User Interface he uses to control the attached mixer hardware.</p> <p>The user can create his own Mix Icons and their behaviors, decide how his hardware is to be controlled by Mix Icon movement, and how many or how few controls he wants on each Mix Form.</p> <p>GraphiMix™ is really a toolkit of parts that can be assembled in many unique and individual ways to suit any engineer and any session requirements to create a more effective way to control audio mix hardware.</p>
TOP-DOWN	<p>A term that means from the most general description progressing to the most detailed description.</p>

TRACK	A Channel on a console.
TRACK STRIP	A Channel on a console that includes all the controls that are relevant to that channel.
UART	An acronym that means <b>U</b> niversal <b>A</b> synchronous <b>R</b> eceiver <b>T</b> ransmitter. A UART is a device that sends and receives messages to external devices through a variety of serial protocol interface standards.
VIRTUAL CONSOLE	A Virtual Console is a representation of an audio mix console on a computer screen. A virtual console may appear as a graphic simulation of a standard hardware console (a 'Glass Console') or as a multi-dimensional Graphic User Interface (the GraphiMix™).
VLB FILE	The GraphiMix™ uses a file with the filename extension '.VLB' to hold each individual Mix Icon Object and its image. Each Mix Icon that is shown in the Mix Icon Selection Window and in the Mix Icon Images properties tab is represented by a single VLB file. An individual VLB may be used by more than one Mix Icon at a time and on more than one Mix Form.
VOY FILE	A GraphiMix™ session is stored in a file with the filename extension '.VOY'.
VSL FILE	The control recipes that detail the message protocol for a particular piece of controllable hardware is contained in a file with the filename extension '.VSL'. An individual user may create VSL files with up to 32 controls each. Larger VSL files are available from Voyager Sound Inc.
WEECON	A tiny ('wee') icon can be attached to the corner of a Mix Icon to add extra distinguishing marks to allow the user to visually discriminate the selected Mix Icons.
WORK SURFACE	The term 'Work Surface' refers to the placement and arrangement of the collection of controls arrayed on a screen or on the surface of a mix console. The design of the 'work surface' can help or hinder the engineer's

	ability to create the audio work-in-progress.
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