Glide 3.0 Reference Manual

Programming the 3Dfx Interactive Glide™ Rasterization Library 3.0

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Introduction

This document is the official programming reference for version 3.0 of 3Dfx Interactive Glide Rasterization Library. The Glide Library is a low-level rendering and state management subroutine library that serves as a thin layer over the register level interface to the 3Dfx Interactive family of graphics accelerators. Glide permits easy and efficient implementation of 3D rendering libraries, games, and drivers on the graphics hardware. Glide only implements operations that are natively supported by the hardware. Higher level operations are located in the Glide Utility Library, which is currently part of Glide.

Glide serves three primary purposes:

- It relieves programmers from hardware specific issues such as timing, maintaining register shadows, and working with hard-coded register constants and offsets.
- It defines an abstraction of the graphics hardware to facilitate ease of software porting.
- It acts as a delivery vehicle for sample source code providing in-depth optimizations.

By abstracting the low level details of interfacing with the graphics hardware into a set of C-callable APIs, Glide allows developers targeting the graphics hardware to avoid working with hardware registers and memory directly, enabling faster development and lower probability of bugs. Glide also handles mundane and error prone chores, such as initialization and shutdown.

Glide currently consists of Glide APIs as well as Glide Utility APIs. All Glide APIs begin with the **`gr`** prefix, all Glide Utility APIs being with the **`gu`** prefix. Glide Utility APIs do not directly communicate with hardware registers; they are strictly layered on Glide APIs. Therefore, their functionality could be performed just as easily by application code. Glide Utility APIs are included in Glide for convenience.

A 3Dfx interactive graphics accelerator consists of a Pixel*fx* chip that performs pixel rendering operations and manages the video frame buffer, and one or more Texel*fx* chips that perform texture mapping operations. Each Texel*fx* chip contains one Texture Mapping Unit, or TMU. The term TMU is used throughout the rest of this manual.

The internal name for the graphics subsystem is “SST”. Some function names, type definitions, and constants within Glide reflect this internal name, which is easier to type than some variation of Voodoo Graphics, Voodoo Rush, or Voodoo^2.

Base Types

All 3Dfx Interactive programming libraries use a common set of platform-independent signed and unsigned types. These types can be found in **`3dfx.h`** and are described in the table below:

type name	*format*	*ANSI C type*
`FxU8`	8-bit unsigned	**`unsigned char`**
`FxI8`	8-bit signed	**`signed char`**
`FxU16`	16-bit unsigned	**`unsigned short int`**
`FxI16`	16-bit signed	**`signed short int`**
`FxU32`	32-bit unsigned	**`unsigned long int`**
`FxI32`	32-bit signed value	**`signed long int`**
`FxFloat`	32-bit floating point value	**`float`**
`FxBool`	32-bit signed	**`long int`**

Glide Types and Structures

Glide overlays the base types with a collection of type definitions whose names convey the kind of values that variables of that type will assume. Each type is associated with a character string prefix that becomes part of each predefined constant associated with the type. The table below lists the types, the underlying base type, and the prefix for constants that can be used to establish a value for a parameter of the associated type. In a few cases, the unifying prefix is not used and the table provides the list of associated constants instead.

enumerated type	*underlying base type*	*valid values or prefix*
GrChipID_t	FxI32	GR_FBI, GR_TMU0, GR_TMU1, GR_TMU2
GrCombineFunction_t	FxI32	GR_COMBINE_FUNCTION_
GrCombineFactor_t	FxI32	GR_COMBINE_FACTOR_
GrCombineLocal_t	FxI32	GR_COMBINE_LOCAL_
GrCombineOther_t	FxI32	GR_COMBINE_OTHER_
GrAlphaSource_t	FxI32	GR_ALPHASOURCE_
GrColorCombineFnc_t	FxI32	GR_COLORCOMBINE_
GrAlphaBlendFnc_t	FxI32	GR_BLEND_
GrAspectRatio_t	FxI32	GR_ASPECT_LOG2_
GrBuffer_t	FxI32	GR_BUFFER_
GrChromakeyMode_t	FxI32	GR_CHROMAKEY_
GrChromaRangeMode_t	FxI32	GR_CHROMARANGE_
GrTexChromakeyMode_t	FxI32	GR_TEXCHROMA_
GrCmpFnc_t	FxI32	GR_CMP_
GrColorFormat_t	FxI32	GR_COLORFORMAT_
GrCullMode_t	FxI32	GR_CULL_
GrDepthBufferMode_t	FxI32	GR_DEPTHBUFFER_
GrDitherMode_t	FxI32	GR_DITHER_
GrFogMode_t	FxI32	GR_FOG_
GrLock_t	FxU32	GR_LFB_
GrLfbBypassMode_t	FxI32	GR_LFBBYPASS_
GrLfbWriteMode_t	FxI32	GR_LFBWRITEMODE_
GrOriginLocation_t	FxI32	GR_ORIGIN_
GrLOD_t	FxI32	GR_LOD_LOG2_
GrMipMapMode_t	FxI32	GR_MIPMAP_
GrSmoothingMode_t	FxI32	GR_SMOOTHING_
GrTextureClampMode_t	FxI32	GR_TEXTURECLAMP_
GrTextureCombineFnc_t	FxI32	GR_TEXTURECOMBINE_
GrTextureFilterMode_t	FxI32	GR_TEXTUREFILTER_
GrTextureFormat_t	FxI32	GR_TEXFMT_
GrTexTable_t	FxU32	GR_TEXTABLE_
GrNCCTable_t	FxU32	GR_NCCTABLE_
GrTexBaseRange_t	FxU32	GR_TEXBASE_
GrEnableMode_t	FxU32	GR_MODE_
GrCoordinateSpaceMode_t	FxU32	GR_WINDOW_COORDS, GR_CLIP_COORDS
GrLfbSrcFmt_t	FxU32	

Glide also defines a small set of structures, as shown below.

structure name	*definition*	*description and usage*

GrLfbInfo_t	`typedef struct {`
	`    int  size;`
	`    void  *lfbPtr;`
	`    FxU32  strideInBytes;`
	`    GrLfbWriteMode_t  writeMode;`
	`    GrOriginLocation_t  origin;`
	`} GrLfbInfo_t;`
		Contains state information about the linear frame buffer. Used with **grLfgLock**.

GrTexInfo	`typedef struct {`
	`    GrLOD_t  smallLodLog2;`
	`    GrLOD_t  largeLodLog2;`
	`    GrAspectRatio_t  aspectRatioLog2;`
	`    GrTextureFormat_t  format;`
	`    Void  *data;`
	`} GrTexInfo;`
		Contains mipmap parameters. Used with **grTexDownloadMipMap**, **grTexMultibaseAddress**, **grTexSource**, and **grTexTextureMemRequired**.

GrResolution	`typedef struct {`
	`  GrScreenResolution_t  resolution;`
	`  GrScreenRefresh_t  refresh;`
	`  int  numColorBuffers;`
	`  int  numAuxBuffers;`
	`} GlideResolution;`
		Contains display screen parameters. Used with **grQueryResolutions**.

Predefined Constants

Glide predefines several constants and is also dependent upon several externally defined constants. These are documented in full in **glide.h**.

API Reference

The following is an API reference that lists the APIs provided by Glide, their purpose, usage, parameters, and notes describing their implementation.

NAME

`grAADrawTriangle` – draw an anti-aliased triangle

C SPECIFICATION

```
void grAADrawTriangle( const void  *a,
                       const void  *b,
                       const void  *c,
                       FxBool      antialiasAB,
                       FxBool      antialiasBC,
                       FxBool      antialiasCA
                     )
```

PARAMETERS

a, b, c	Pointers to the vertices defining the triangle.
antialiasAB	If **`FXTRUE`**, anti-alias the AB edge.
antialiasBC	If **`FXTRUE`**, anti-alias the BC edge.
antialiasCA	If **`FXTRUE`**, anti-alias the CA edge.

DESCRIPTION

Glide draws a triangle with the specified edges anti-aliased by setting up the alpha iterator so that it represents pixel coverage. **`grAlphaCombine`** must select iterated alpha and **`grAlphaBlendFunction`** should select **`GR_BLEND_SRC_ALPHA`**, **`GR_BLEND_ONE_MINUS_SCR_ALPHA`** as the RGB blend functions and **`GR_BLEND_ZERO`**, **`GR_BLEND_ZERO`** as the alpha blend functions if sorting from back to front and **`GR_BLEND_ALPHA_SATURATE`**, **`GR_BLEND_ONE`** as the RGB blend functions and **`GR_BLEND_SATURATE`**, **`GR_BLEND_ONE`** as the alpha blend functions if sorting from front to back. Opaque anti-aliased primitives *must* set alpha=255 in the vertex data. Transparent anti-aliased primitives are drawn by setting alpha to values less than 255; this alpha value is multiplied by the pixel coverage to obtain the final alpha value for alpha blending.

NOTES

If there is a steep gradient in a particular color space (i.e., green goes from 255.0 to 0.0 in a small number of pixels), then there will be visual anomalies at the edges of the resultant anti-aliased triangle. The workaround for this 'feature' is to reduce the gradient by increasing small color components and decreasing large ones. This can be demonstrated by changing the values of *maxColor* and *minColor* in **`test25`** of the Glide distribution. Note that this 'feature' is only present when the color combine mode includes iterated RGB or alpha as one of the parameters in the final color.

`GrAADrawTriangle` is independent of the GR_AA_ORDERED mode that enables anti-aliasing.

SEE ALSO

`grAlphaBlendFunction`, **`grAlphaCombine`**, **`grDrawTriangle`**, **`grEnable`**

NAME

grAlphaBlendFunction – specify the alpha blending function

C SPECIFICATION

```
void grAlphaBlendFunction( GrAlphaBlendFnc_t  rgb_sf,
                           GrAlphaBlendFnc_t  rgb_df,
                           GrAlphaBlendFnc_t  alpha_sf,
                           GrAlphaBlendFnc_t  alpha_df
                         )
```

PARAMETERS

rgb_sf	Specifies the red, green, and blue source blending factors. The following symbolic constants are accepted:

GR_BLEND_ZERO	**GR_BLEND_ONE**
GR_BLEND_DST_COLOR	**GR_BLEND_ONE_MINUS_DST_COLOR**
GR_BLEND_SRC_ALPHA	**GR_BLEND_ONE_MINUS_SRC_ALPHA**
GR_BLEND_DST_ALPHA	**GR_BLEND_ONE_MINUS_DST_ALPHA**
GR_BLEND_ALPHA_SATURATE	

rgb_df	Specifies the red, green, and blue destination blending factors. The following symbolic constants are accepted:

GR_BLEND_ZERO	**GR_BLEND_ONE**
GR_BLEND_SRC_COLOR	**GR_BLEND_ONE_MINUS_SRC_COLOR**
GR_BLEND_SRC_ALPHA	**GR_BLEND_ONE_MINUS_SRC_ALPHA**
GR_BLEND_DST_ALPHA	**GR_BLEND_ONE_MINUS_DST_ALPHA**
GR_BLEND_PREFOG_COLOR	

alpha_sf	Specifies the alpha source blending factor. The following symbolic constants are accepted:

GR_BLEND_ZERO	**GR_BLEND_ONE**

alpha_df	Specifies the alpha destination blending factor. The following symbolic constants are accepted:

GR_BLEND_ZERO	**GR_BLEND_ONE**

DESCRIPTION

Alpha blending blends the RGBA values for rendered pixels (source) with the RGBA values that are already in the frame buffer (destination). **grAlphaBlendFunction** defines the operation of blending. *rgb_sf* and *alpha_sf* specifies which of nine methods is used to scale the source color and alpha components. *rgb_df* and *alpha_df* specify which of eight methods is used to scale the destination color and alpha components.

Alpha blending is defined by the equations:

$$R = \min(255, R_s s_R + R_d d_R)$$

$$G = \min(255, G_s s_G + G_d d_G)$$

$$B = \min(255, B_s s_B + B_d d_B)$$

$$A = \min(255, A_s s_A + A_d d_A)$$

where R_s, G_s, B_s, A_s are the source color and alpha components, R_d, G_d, B_d, A_d are the destination color and alpha components, s_R, s_G, s_B s_A are the source blending factors, and d_R, d_G, d_B, d_A are the destination blending factors.

The blending factors are as follows:

blending factor	*component blend factor*
`GR_BLEND_ZERO`	0
`GR_BLEND_ONE`	1
`GR_BLEND_SRC_COLOR`	C_s / 255
`GR_BLEND_ONE_MINUS_SRC_COLOR`	1 – C_s / 255
`GR_BLEND_DST_COLOR`	C_d / 255
`GR_BLEND_ONE_MINUS_DST_COLOR`	1 – C_d / 255
`GR_BLEND_SRC_ALPHA`	A_s / 255
`GR_BLEND_ONE_MINUS_SRC_ALPHA`	1 – A_s / 255
`GR_BLEND_DST_ALPHA`	A_d / 255
`GR_BLEND_ONE_MINUS_DST_ALPHA`	1 – A_d / 255
`GR_BLEND_ALPHA_SATURATE`	min (A_s / 255, 1 – A_d / 255)
`GR_BLEND_PREFOG_COLOR`	color before fog is applied

where C_s and C_d are the corresponding R_s, G_s, B_s, A_s and R_d, G_d, B_d, A_d components respectively.

To disable alpha blending, call
`grAlphaBlendFunction(GR_BLEND_ONE, GR_BLEND_ZERO, GR_BLEND_ONE, GR_BLEND_ZERO)`

NOTES

The source of incoming alpha and color are determined by **`grAlphaCombine`** and **`grColorCombine`** respectively.

Alpha blending that requires a destination alpha is mutually exclusive with depth buffering. Attempting to use **`GR_BLEND_DST_ALPHA`**, **`GR_BLEND_ONE_MINUS_DST_ALPHA`**, or **`GR_BLEND_ALPHA_SATURATE`** when depth buffering is enabled will have undefined results.

On Voodoo Graphics systems, alpha blending and triple buffering are mutually exclusive as well.

`GR_BLEND_PREFOG_COLOR` is useful when applying fog to a scene generated in multiple passes. See the *Glide Programming Guide* for more information.

SEE ALSO

`grAADrawTriangle`, **`grAlphaCombine`**, **`grColorCombine`**

NAME

grAlphaCombine – configure the alpha combine unit

C SPECIFICATION

```
void grAlphaCombine( GrCombineFunction_t func,
                     GrCombineFactor_t   factor,
                     GrCombineLocal_t    local,
                     GrCombineOther_t    other,
                     FxBool              invert
                    )
```

PARAMETERS

func Specifies the function used in source alpha generation. Valid parameters are described below. The combine function names are prefixed with the string "**GR_COMBINE_FUNCTION_**": e.g. **GR_COMBINE_FUNCTION_ZERO** or **GR_COMBINE_FUNCTION_BLEND_LOCAL**.

combine function ***func***	*computed alpha*
ZERO	0
LOCAL	A_{local}
LOCAL_ALPHA	A_{local}
SCALE_OTHER **BLEND_OTHER**	$f * A_{other}$
SCALE_OTHER_ADD_LOCAL	$f * A_{other} + A_{local}$
SCALE_OTHER_ADD_LOCAL_ALPHA	$f * A_{other} + A_{local}$
SCALE_OTHER_MINUS_LOCAL	$f * (A_{other} - A_{local})$
SCALE_OTHER_MINUS_LOCAL_ADD_LOCAL **BLEND**	$f * (A_{other} - A_{local}) + A_{local}$ $\equiv f * A_{other} + (1 - f) * A_{local}$
SCALE_OTHER_MINUS_LOCAL_ADD_LOCAL_ALPHA	$f * (A_{other} - A_{local}) + A_{local}$
SCALE_MINUS_LOCAL_ADD_LOCAL **BLEND_LOCAL**	$f * (- A_{local}) + A_{local}$ $\equiv (1 - f) * A_{local}$
SCALE_MINUS_LOCAL_ADD_LOCAL_ALPHA	$f * (- A_{local}) + A_{local}$

factor Specifies the scaling factor used in alpha generation. Valid parameters are described below:

combine factor ***factor***	*scale factor (f)*
GR_COMBINE_FACTOR_NONE	Unspecified
GR_COMBINE_FACTOR_ZERO	0
GR_COMBINE_FACTOR_LOCAL	A_{local} / 255
GR_COMBINE_FACTOR_OTHER_ALPHA	A_{other} / 255
GR_COMBINE_FACTOR_LOCAL_ALPHA	A_{local} / 255
GR_COMBINE_FACTOR_TEXTURE_ALPHA	$A_{texture}$ / 255
GR_COMBINE_FACTOR_ONE	1
GR_COMBINE_FACTOR_ONE_MINUS_LOCAL	1 – A_{local} / 255
GR_COMBINE_FACTOR_ONE_MINUS_OTHER_ALPHA	1 – A_{other} / 255
GR_COMBINE_FACTOR_ONE_MINUS_LOCAL_ALPHA	1 – A_{local} / 255
GR_COMBINE_FACTOR_ONE_MINUS_TEXTURE_ALPHA	1 – $A_{texture}$ / 255

local Specifies the local alpha used in source alpha generation. Valid parameters are described below:

local combine source	*local alpha (A_{local})*
GR_COMBINE_LOCAL_NONE	Unspecified alpha.
GR_COMBINE_LOCAL_ITERATED	Iterated vertex alpha.
GR_COMBINE_LOCAL_CONSTANT	Constant alpha.
GR_COMBINE_LOCAL_DEPTH	High 8 bits from iterated vertex z.

other Specifies the other alpha used in source alpha generation. Valid parameters are described below:

other combine source	*other alpha (A_{other})*
GR_COMBINE_OTHER_NONE	Unspecified alpha.
GR_COMBINE_OTHER_ITERATED	Iterated vertex alpha.
GR_COMBINE_OTHER_TEXTURE	Alpha from texture map.
GR_COMBINE_OTHER_CONSTANT	Constant alpha.

invert Specifies whether the generated alpha should be bitwise inverted as a final step.

DESCRIPTION

grAlphaCombine configures the alpha combine unit of the graphics subsystem's hardware pipeline. This provides a low level mechanism for controlling all rendering modes within the hardware without manipulating individual register bits. The alpha combine unit computes the source alpha for the remainder of the rendering pipeline. The default mode is

```
grAlphaCombine( GR_COMBINE_FUNCTION_SCALE_OTHER, GR_COMBINE_FACTOR_ONE,
                GR_COMBINE_LOCAL_NONE, GR_COMBINE_OTHER_CONSTANT, FXFALSE);
```

The alpha combine unit computes the function specified by the combine function on the inputs specified by the local combine source, other combine source, and the combine scale factor. The result is clamped to [0..255], and then a bitwise inversion may be applied, controlled by the *invert* parameter.

The constant color parameters are the colors passed to **grConstantColorValue**. If the texture has no alpha component, then texture alpha is 255.

grAlphaCombine also keeps track of required vertex parameters for the rendering routines. **GR_COMBINE_FACTOR_NONE**, **GR_COMBINE_LOCAL_NONE,** and **GR_COMBINE_OTHER_NONE** are provided to indicate that no parameters are required. Currently they are the same as **`GR_COMBINE_FACTOR_ZERO`**, **`GR_COMBINE_LOCAL_CONSTANT`**, and **`GR_COMBINE_OTHER_CONSTANT`** respectively.

NOTES

The local alpha value specified by the *local* parameter and the other alpha value specified by the *other* parameter are used by the color combine unit.

Inverting the bits in a color is the same as computing (1.0 – color) for floating point color values in the range [0..1] or (255 – color) for 8-bit color values in the range [0..255].

SEE ALSO

`grColorCombine`, **`grConstantColorValue`**, **`grDrawTriangle`**

NAME

`grAlphaControlsITRGBLighting` – enables/disables alpha controlled lighting

C SPECIFICATION

`void grAlphaControlsITRGBLighting( FxBool enable )`

PARAMETERS

enable	Specifies whether the mode is enabled or disabled.

DESCRIPTION

When enabled, the normal color combine controls for local color (C_{local}) are overridden, and the most significant bit of texture alpha ($A_{texture}$) selects between iterated vertex RGB and the constant color set by **`grConstantColorValue`**. By default, alpha controlled lighting mode is disabled.

*value of **enable***	*high order bit of alpha channel*	*color combine local color*
`FXTRUE`	**`0`**	iterated RGB
`FXTRUE`	**`1`**	**`grConstantColorValue`**
`FXFALSE`	**`0`**	set by **`grColorCombine`**
`FXFALSE`	**`1`**	set by **`grColorCombine`**

NOTES

Some possible uses for this mode are self-lit texels and specular paint. If a texture contains texels that represent self-luminous areas, such as windows, then multiplicative lighting can be disabled for these texels as follows. Choose a texture format that contains one bit of alpha and set the alpha for each texel to 1 if the texel is self-lit. Set the Glide constant color to white and enabled alpha controlled lighting mode. Finally, set up texture lighting by multiplying the texture color by iterated RGB where iterated RGB is the *local* color in the color combine unit. When a texel's alpha is 0, the texture color will be multiplied by the local color which is iterated RGB. This applies lighting to the texture. When a texel's alpha is 1, the texture color will be multiplied by the Glide constant color which was previously set to white, so no lighting is applied.

If the color combine unit is configured to add iterated RGB to a texture for the purpose of a specular highlight, then texture alpha can be used as specular paint. In this example, the Glide constant color is set to black and iterated RGB iterates the specular lighting. If a texel's alpha is 0, the texture color will be added to iterated RGB, and specular lighting is applied to the texture. If the texel's alpha is 1, the texture color will be added to the Glide constant color which was previously set to black, so no lighting is applied. The result is that the alpha channel in the texture controls where specular lighting is applied to the texture and specularity can be *painted* onto the texture in the alpha channel.

SEE ALSO

`grColorCombine`, **`grConstantColorValue`**

grAlphaTestFunction

NAME

grAlphaTestFunction – specify the alpha test function

C SPECIFICATION

void grAlphaTestFunction(GrCmpFnc_t function)

PARAMETERS

function	The new alpha comparison function.

DESCRIPTION

The alpha test discards pixels depending on the outcome of a comparison between the incoming alpha value and a constant reference value. **grAlphaTestFunction** specifies the comparison function and **grAlphaTestReferenceValue** specifies the constant reference value.

The incoming alpha value is compared to the constant alpha test reference value using the function specified by *function*. If the comparison passes, the pixel is drawn, conditional on subsequent tests, such as depth buffer and chroma-key. If the comparison fails, the pixel is not drawn. The default function is **GR_CMP_ALWAYS**.

The comparison functions are as follows:

function	*comparison function*
GR_CMP_NEVER	Never passes.
GR_CMP_LESS	Passes if the incoming alpha value is less than the constant alpha reference value.
GR_CMP_EQUAL	Passes if the incoming alpha value is equal to the constant alpha reference value.
GR_CMP_LEQUAL	Passes if the incoming alpha value is less than or equal to the constant alpha reference value.
GR_CMP_GREATER	Passes if the incoming alpha value is greater than the constant alpha reference value.
GR_CMP_NOTEQUAL	Passes if the incoming alpha value is not equal to the constant alpha reference value.
GR_CMP_GEQUAL	Passes if the incoming alpha value is greater than or equal to the constant alpha reference value.
GR_CMP_ALWAYS	Always passes.

Alpha testing is performed on all pixel writes, including those resulting from scan conversion of points, lines, and triangles, and from direct linear frame buffer writes. Alpha testing is implicitly disabled during linear frame buffer writes if the pixel pipeline is disabled (see **grLfbLock** and **grLfbWriteRegion**).

NOTES

The incoming alpha is the output of the alpha combine unit that is configured with **grAlphaCombine**.

SEE ALSO

grAlphaCombine, **grAlphaTestReferenceValue**, **grLfbLock**, **grLfbWriteRegion**

NAME

grAlphaTestReferenceValue – specify the alpha test reference value

C SPECIFICATION

void grAlphaTestReferenceValue(GrAlpha_t value)

PARAMETERS

value	The new alpha test reference value.

DESCRIPTION

The alpha test discards pixels depending on the outcome of a comparison between the pixel's incoming alpha value and a constant reference value. **grAlphaTestFunction** specifies the comparison function and **grAlphaTestReferenceValue** specifies the constant reference value. The default reference value is **0x00**.

The incoming alpha value is compared to the *value* using the function specified by **grAlphaTestFunction**. If the comparison passes, the pixel is drawn, conditional on subsequent tests such as depth buffer and chroma-key. If the comparison fails, the pixel is not drawn.

Alpha testing is performed on all pixel writes, including those resulting from scan conversion of points, lines, and triangles, and from direct linear frame buffer writes. Alpha testing is implicitly disabled during linear frame buffer writes if the pixel pipeline is disabled (see **grLfbLock** and **grLfbWriteRegion**).

NOTES

The incoming alpha is the output of the alpha combine unit that is configured with **grAlphaCombine**.

SEE ALSO

grAlphaCombine, **grAlphaTestReferenceValue**, **grLfbLock**, **grLfbWriteRegion**

NAME

grBufferClear – clear the buffers to the specified values

C SPECIFICATION

void grBufferClear(GrColor_t color, **GrAlpha_t alpha**, **FxU32 depth)**

PARAMETERS

color	The color value used for clearing the draw buffer.
alpha	The alpha value used for clearing the alpha buffer (ignored if alpha buffering is not enabled, i.e. a destination alpha is not specified in **grAlphaBlendFunction**).
depth	An unsigned value used for clearing the depth buffer (ignored if depth buffering is not enabled).

DESCRIPTION

Clears the appropriate buffers with the given values. **grClipWindow** defines the area within the buffer to be cleared. Any buffers that are enabled are cleared by **grBufferClear**. For example, if depth buffering is enabled, the depth buffer will be cleared. If an application does not want a buffer to be cleared, then it should mask off writes to the buffer using **grDepthMask** and/or **grColorMask** as appropriate.

Although color, alpha, and depth parameters are always specified, the parameters actually used will depend on the current configuration of the hardware; the irrelevant parameters are ignored.

The minimum and maximum values for depth buffer data can be retrieved by calling **grGet(GR_ZDEPTH_MIN_MAX,…)** or **grGet(GR_W_EPTH_MIN_MAX,…)**. The *depth* parameter can be one of these values or a direct representation of a value in the depth buffer. In the latter case the value is either a 1/*z* value (for **GR_DEPTHBUFFER_ZBUFFER** mode) or a 16-bit floating point format *q* value (for **GR_DEPTHBUFFER_WBUFFER** mode). The 16-bit floating point format is described in detail in the *Glide Programming Manual*.

NOTES

A buffer clear fills pixels much faster than triangle rendering; thus clearing the buffer is much faster than rendering a screen-sized rectangle. Clearing buffers is not always necessary, however, and should be avoided if possible. When depth buffering is disabled and every visible pixel is rendered each frame, simply draw each frame on top of whatever was previously in the frame buffer. When depth buffering is enabled, a sorted background that covers the entire area can be drawn with the depth buffer compare function set to **GR_CMP_ALWAYS** so that all pixel colors and depth values are replaced, and then normal depth buffering can be resumed.

The constants **GR_ZDEPTHVALUE_NEAREST** and **GR_ZDEPTHVALUE_FARTHEST** assume that depth values decrease as they get further away from the eye. However, any linear function of 1/*z* can be used for computing depth buffer values and therefore they can either increase or decrease with distance from the eye.

SEE ALSO

grClipWindow, **grColorMask**, **grDepthMask**, **grGet**, **grRenderBuffer**

Name

grBufferSwap – exchange front and back buffers

C Specification

void grBufferSwap(int swap_interval)

Parameters

swap_interval	The number of vertical retraces to wait before swapping the front and back buffers.

Description

grBufferSwap exchanges the front and back buffers in the graphics subsystem after *swap_interval* vertical retraces. If the *swap_interval* is 0, then the buffer swap does not wait for vertical retrace. Otherwise, the buffers are swapped after *swap_interval* vertical retraces. For example, if the monitor frequency is 60 Hz, a *swap_interval* of 3 results in a maximum frame rate of 20 Hz.

The exchange takes place during the next vertical retrace of the monitor, rather than immediately after **grBufferSwap** is called. If the application is double buffering, the graphics subsystem will stop rendering and wait until the swap occurs before executing more commands. If the application is triple buffering and the third rendering buffer is available, rendering commands will take place immediately in the third buffer.

Notes

A *swap_interval* of 0 may result in visual artifacts, such as 'tearing', since a buffer swap can occur during the middle of a screen refresh cycle. This setting is very useful in performance monitoring situations, as true rendering performance can be measured without including the time buffer swaps spend waiting for vertical retrace.

grBufferSwap waits until there are fewer than 7 pending buffer swap requests in the graphics command FIFO before returning.

See Also

grGet

NAME

`grChromakeyMode` – enable/disable hardware chroma-keying

C SPECIFICATION

`void grChromakeyMode( GrChromakeyMode_t mode )`

PARAMETERS

mode	specifies whether chroma-keying should be enabled or disabled. Valid values are **`GR_CHROMAKEY_ENABLE`** and **`GR_CHROMAKEY_DISABLE`**.

DESCRIPTION

Enables and disables chroma-keying. When chroma-keying is enabled, color values are compared to a global chroma-key reference value (set by **`grChromakeyValue`**). If the pixel's color is the same as the chroma-key reference value, the pixel is discarded. The chroma-key comparison takes place before the color combine function. By default, chroma-keying is disabled.

NOTES

The chroma-key comparison compares the chroma-key reference value to the *other* color specified in the configuration of the color combine unit.

SEE ALSO

`grColorCombine`, **`grChromakeyValue`**, **`grChromaRangeModeExt`**

NAME

`grChromakeyValue` – set the global chroma-key reference value

C SPECIFICATION

`void grChromakeyValue( GrColor_t value )`

PARAMETERS

value	The new chroma-key reference value.

DESCRIPTION

Sets the global chroma-key reference value as a packed RGBA value. The color format should be in the same format as specified in the *cFormat* parameter to **`grSstWinOpen`**.

NOTES

The chroma-key comparison compares the chroma-key reference value to the *other* color specified in the configuration of the color combine unit. The comparison is performed between colors with 24-bit precision; thus *value* must be set accordingly. See Table 10.1 in the *Glide Programming Guide* for details on how colors formats are expanded to 24 bits.

SEE ALSO

`grColorCombine`, **`grChromakeyMode`**, **`grChromaRangeExt`**

NAME

`grChromaRangeExt` – set the global chroma-range bounds and match criteria

C SPECIFICATION

`void grChromaRangeExt( GrColor_t color0, GrColor_t color1, FxU32 mode )`

PARAMETERS

color0, color1	Independent range values for red, green, and blue.
mode	Chroma-range match criteria. Only one mode value is currently supported: **`GR_CHROMARANGE_RGB_ALL_EXT`**.

DESCRIPTION

`grChromaRangeExt` sets the global chroma-range reference values as order-insensitive packed RGBA values. The color format for *color0* and *color1* should be the same one as specified in the *cFormat* parameter to **`grSstWinOpen`**. The order in which range values are specified for a particular color component is irrelevant, i.e. the {*color0, color1*} pairs {(130,36,87), (150,38,92)} and {(150,36,92), (130,38,87)} are equivalent.

The *mode* parameter determines the way the color ranges are used in the chroma test. Only one value is currently supported, **`GR_CHROMARANGE_RGB_ALL_EXT`**. In this mode, each color component pair defines an inclusive range such that *lower bound* ≤ *color* ≤ *upper bound*. If ***all*** components of the incoming pixel color fall within their ranges, the chroma test succeeds and the pixel is invalidated.

NOTES

Glide 3.0 is the first release to support **`grChromaRangeExt`**. The API is available only with hardware support. Use **`grGetString(GR_EXTENSION,…)`** and search for the sub-string "CHROMARANGE" to query for availability of this extension. If the extension is present, the entry point may be retrieved via **`grGetProcAddr`**.

The chroma-key comparison compares the chroma-key reference value to the *other* color specified in the configuration of the color combine unit. The comparison is performed between colors with 24-bit precision; thus *value* must be set accordingly. See Table 10.1 in the *Glide Programming Guide* for details on how colors formats are expanded to 24 bits.

Chroma ranging must be enabled before use. See **`grChromaRangeModeExt`**.

SEE ALSO

`grColorCombine`, **`grChromakeyMode`**, **`grChromaRangeModeExt`**, **`grGetProcAddr`**

NAME

grChromaRangeModeExt – enable or disable chroma range checking

C SPECIFICATION

void grChromaRangeModeExt(GrChromakeyMode_t mode)

PARAMETERS

mode	Chroma range checking enable flag. One of the two values: **GR_CHROMARANGE_DISABLE_EXT** or **GR_CHROMARANGE_ENABLE_EXT**

DESCRIPTION

grChromaRangeModeExt enables and disables chroma range checking. Chroma ranging is independent of chroma-keying, but must be enabled before use.

NOTES

Glide 3.0 is the first release to support **grChromaRangeModeExt**. The API is available only with hardware support. Use **grGetString(GR_EXTENSION,…)** and search for the sub-string "CHROMARANGE" to query for availability of this extension. If the extension is present, the entry point may be retrieved via **grGetProcAddr**.

SEE ALSO

grColorCombine, **grChromakeyMode**, **grChromaRangeExt**, **grGetString, grGetProcAddr**

grClipWindow

NAME

`grClipWindow` – set the size and location of the hardware clipping window

C SPECIFICATION

`void grClipWindow(FxU32 minx, FxU32 miny, FxU32 maxx, FxU32 maxy )`

PARAMETERS

minx	The lower x screen coordinate of the clipping window.
miny	The lower y screen coordinate of the clipping window.
maxx	The upper x screen coordinate of the clipping window.
maxy	The upper y screen coordinate of the clipping window.

DESCRIPTION

`grClipWindow` specifies the hardware clipping window. Any pixels outside the clipping window are rejected. Values are inclusive for minimum x and y values and exclusive for maximum x and y values. The clipping window also specifies the area **`grBufferClear`** clears.

At startup the default values for the clip window are the full size of the screen, e.g. (0,0,640,480) for 640×480 mode and (0,0,800,600) for 800×600 mode. To disable clipping simply sets the size of the clip window to the screen size. The clipping window should not be used for general purpose primitive clipping; since clipped pixels are processed but discarded; proper geometric clipping should be done by the application for best performance. The clipping window should be used to prevent stray pixels that appear from imprecise geometric clipping. Note that if the pixel pipeline is disabled (see **`grLfbLock`**), clipping is not performed on linear frame buffer writes.

NOTES

SEE ALSO

`grBufferClear`, **`grLfbLock`**

NAME

grColorCombine – configure the color combine unit

C SPECIFICATION

```
void grColorCombine(  GrCombineFunction_t func,
                      GrCombineFactor_t   factor,
                      GrCombineLocal_t    local,
                      GrCombineOther_t    other,
                      FxBool              invert
                    )
```

PARAMETERS

func Specifies the function used in source color generation. Valid parameters are described below:

combine function ***func***	*computed color*
GR_COMBINE_FUNCTION_ZERO	0
GR_COMBINE_FUNCTION_LOCAL	C_{local}
GR_COMBINE_FUNCTION_LOCAL_ALPHA	A_{local}
GR_COMBINE_FUNCTION_SCALE_OTHER **GR_COMBINE_FUNCTION_BLEND_OTHER**	$f * C_{other}$
GR_COMBINE_FUNCTION_SCALE_OTHER_ADD_LOCAL	$f * C_{other} + C_{local}$
GR_COMBINE_FUNCTION_SCALE_OTHER_ADD_LOCAL_ALPHA	$f * C_{other} + A_{local}$
GR_COMBINE_FUNCTION_SCALE_OTHER_MINUS_LOCAL	$f * (C_{other} - C_{local})$
GR_COMBINE_FUNCTION_SCALE_OTHER_MINUS_LOCAL_ADD_LOCAL **GR_COMBINE_FUNCTION_BLEND**	$f * (C_{other} - C_{local}) + C_{local}$ $\equiv f * C_{other} + (1 - f) * C_{local}$
GR_COMBINE_FUNCTION_SCALE_OTHER_MINUS_LOCAL_ADD_LOCAL_ALPHA	$f * (C_{other} - C_{local}) + A_{local}$
GR_COMBINE_FUNCTION_SCALE_MINUS_LOCAL_ADD_LOCAL **GR_COMBINE_FUNCTION_BLEND_LOCAL**	$f * (- C_{local}) + C_{local}$ $\equiv (1 - f) * C_{local}$
GR_COMBINE_FUNCTION_SCALE_MINUS_LOCAL_ADD_LOCAL_ALPHA	$f * (- C_{local}) + A_{local}$

factor Specifies the scaling factor *f* used in source color generation. Valid parameters are described below:

value for ***factor***	*scale factor used (f)*
GR_COMBINE_FACTOR_NONE	*unspecified*
GR_COMBINE_FACTOR_ZERO	0
GR_COMBINE_FACTOR_LOCAL	$C_{local} / 255$
GR_COMBINE_FACTOR_OTHER_ALPHA	$A_{other} / 255$
GR_COMBINE_FACTOR_LOCAL_ALPHA	$A_{local} / 255$
GR_COMBINE_FACTOR_TEXTURE_ALPHA	$A_{texture} / 255$
GR_COMBINE_FACTOR_ONE	1
GR_COMBINE_FACTOR_ONE_MINUS_LOCAL	$1 - C_{local} / 255$
GR_COMBINE_FACTOR_ONE_MINUS_OTHER_ALPHA	$1 - A_{other} / 255$
GR_COMBINE_FACTOR_ONE_MINUS_LOCAL_ALPHA	$1 - A_{local} / 255$
GR_COMBINE_FACTOR_ONE_MINUS_TEXTURE_ALPHA	$1 - A_{texture} / 255$

local Specifies the local color used in source color generation. Valid parameters are described below:

*value for **local***	*color used (C_{local})*
`GR_COMBINE_LOCAL_NONE`	Unspecified color.
`GR_COMBINE_LOCAL_ITERATED`	Iterated vertex color (Gouraud shading).
`GR_COMBINE_LOCAL_CONSTANT`	Constant color.

other Specifies the other color used in source color generation. Valid parameters are described below:

*value for **other***	*color used (C_{other})*
`GR_COMBINE_OTHER_NONE`	Unspecified color.
`GR_COMBINE_OTHER_ITERATED`	Iterated vertex color (Gouraud shading).
`GR_COMBINE_OTHER_TEXTURE`	Color from texture map.
`GR_COMBINE_OTHER_CONSTANT`	Constant color.

invert Specifies whether the generated source color should be bitwise inverted as a final step.

DESCRIPTION

`grColorCombine` configures the color combine unit of the graphics subsystem's hardware pipeline. This provides a low level mechanism for controlling all modes of the color combine unit without manipulating individual register bits.

The color combine unit computes the function specified by the combine function on the inputs specified by the local combine source, other combine source, and the combine scale factor. The result is clamped to [0..255], and then a bitwise inversion may be applied, controlled by the *invert* parameter. The resulting color goes to the alpha and depth units.

The default color combine mode is

```
grColorCombine( GR_COMBINE_FUNCTION_SCALE_OTHER,
                GR_COMBINE_FACTOR_ONE,
                GR_COMBINE_LOCAL_ITERATED,
                GR_COMBINE_OTHER_ITERATED,
                FXFALSE
              )
```

`GR_COMBINE_LOCAL_CONSTANT` and **`GR_COMBINE_OTHER_CONSTANT`** select the constant color specified in a previous call to **`grConstantColorValue`**. The iterated color selected by **`GR_COMBINE_LOCAL_ITERATED`** or **`GR_COMBINE_OTHER_ITERATED`** are the red, green, blue, and alpha values associated with a drawing primitive's vertices.

`grColorCombine` also keeps track of required vertex parameters for the rendering routines. **`GR_COMBINE_FACTOR_NONE`**, **`GR_COMBINE_LOCAL_NONE,`** and **`GR_COMBINE_OTHER_NONE`** are provided to indicate that no parameters are required. Currently they are the same as **`GR_COMBINE_FACTOR_ZERO`**, **`GR_COMBINE_LOCAL_CONSTANT`**, and **`GR_COMBINE_OTHER_CONSTANT`** respectively.

NOTES

In the tables above, A_{local} is the *local* alpha value selected by **`grAlphaCombine`** and A_{other} is the *other* alpha value selected by **`grAlphaCombine`**.

Inverting the bits in a color is the same as computing (1.0 – color) for floating point color values in the range [0..1] or (255 – color) for 8-bit color values in the range [0..255].

SEE ALSO

`grAlphaCombine`, **`grConstantColorValue`**, **`grDrawTriangle`**

NAME

`grColorMask` – enable/disable writing into the color and alpha buffers

C SPECIFICATION

`void grColorMask( FxBool rgb, FxBool alpha )`

PARAMETERS

rgb	The new color buffer mask.
alpha	The new alpha buffer mask.

DESCRIPTION

`grColorMask` specifies whether the color and/or alpha buffers can or cannot be written to during rendering operations. If *rgb* is **`FXFALSE`**, for example, no change is made to the color buffer regardless of the drawing operation attempted. The *alpha* parameter is ignored if depth buffering is enabled since the alpha and depth buffers share memory.

The value of **`grColorMask`** is ignored during linear frame buffer writes if the pixel pipeline is disabled (see **`grLfbLock`**). The default values are all **`FXTRUE`**, indicating that the associated buffers are writable.

NOTES

SEE ALSO

`grBufferClear`, **`grDepthMask`**, **`grLfbLock`**

NAME

grConstantColorValue – set the global constant color

C SPECIFICATION

void grConstantColorValue(GrColor_t color)

PARAMETERS

color	The new constant color.

DESCRIPTION

Glide refers to a global constant color in the color combine unit and alpha combine unit if **GR_COMBINE_LOCAL_CONSTANT** or **GR_COMBINE_OTHER_CONSTANT** are specified. This constant color is set with **grConstantColorValue**. The color format should be in the same format as specified in the *cFormat* parameter to **grSstWinOpen**. The default value is **0xFFFFFFFF**.

NOTES

SEE ALSO

grAlphaCombine, **grColorCombine**

Name

`grCoordinateSpace` – specify the coordinate space for vertices

C Specification

`void grCoordinateSpace( GrCoordinateSpaceMode_t mode )`

Parameters

mode	Specifies the coordinate space for vertices. One of the following values: **`GR_CLIP_COORDS`** or **`GR_WINDOW_COORDS.`**

Description

This API specifies the coordinate space for vertex coordinates. The *mode* parameter is one of the following:

mode	*description*
`GR_CLIP_COORDS`	Vertices are specified in clip coordinates.
`GR_WINDOW_COORDS`	Vertices are specified in native hardware device coordinates relative to the window origin.

When window coordinates are used, the application performs the coordinate divisions by *w*, providing *x*/*w*, *y*/*w*, *z*/*w*, 1/*w*, *s*/*w*, *t*/*w*, and *q*/*w* as necessary in the vertex structure (only *x*/*w* and *y*/*w* are mandatory). Window coordinates may be less than optimal on future hardware that can perform perspective division and viewport transformations.

When clip coordinates are used, the division by *w* is performed automatically. The minimal vertex specifies *x*, *y*, and *w*. If *z* buffering is enabled, *z* should be in the range [–*w*..+*w*]; otherwise, *z* data need not be given. Glide will automatically compute *x*/*w*, *y*/*w*, *z*/*w*, and 1/*w*, perform vertex snapping on the results, and then apply the viewport transformation to get window coordinates. Texture coordinates *s* and *t* are in the range [0..1] for all texture sizes and aspect ratios. Glide automatically computes *s*/*w*, *t*/*w*, and *q*/*w*.

Notes

Glide 3.0 is the first release to support **`grCoordinateSpace`**.

See Also

`grClipWindow`, **`grDepthRange`**, **`grSstOrigin`**

grCullMode

NAME

grCullMode – set the cull mode

C SPECIFICATION

void grCullMode(GrCullMode_t mode)

PARAMETERS

mode	The new culling mode. Valid parameters are **GR_CULL_DISABLE**, **GR_CULL_NEGATIVE**, and **GR_CULL_POSITIVE**.

DESCRIPTION

Specifies the type of backface culling, if any, that Glide performs when rendering a triangle. Glide computes the signed area of a triangle prior to rendering, and the sign of this area can be used for backface culling operations. If the sign of the area matches the *mode*, then the triangle is rejected. **grCullMode** assumes that **GR_CULL_POSITIVE** corresponds to a counter-clockwise oriented triangle when the origin is **GR_ORIGIN_LOWER_LEFT** and a clockwise oriented triangle when the origin is **GR_ORIGIN_TOP_LEFT**.

location of the origin	*triangle orientation*	*sign of area of culled triangles*
GR_ORIGIN_LOWERLEFT	clockwise	negative
GR_ORIGIN_LOWERLEFT	counter-clockwise	positive
GR_ORIGIN_UPPERLEFT	clockwise	positive
GR_ORIGIN_UPPERLEFT	counter-clockwise	negative

NOTES

grCullMode has no effect on points and lines, but does effect all triangle rendering primitives including polygons.

SEE ALSO

grDrawTriangle, **grDrawVertexArray**, **grDrawVertexArrayContiguous**

NAME

`grDepthBiasLevel` – set the depth bias level

C SPECIFICATION

`void grDepthBiasLevel( FxU32 level )`

PARAMETERS

level	The new depth bias level.

DESCRIPTION

`grDepthBiasLevel` allows an application to specify a depth bias used when rendering coplanar polygons. Specifically, if two polygons are coplanar but do not share vertices, e.g. a surface detail polygon sits on top of a larger polygon, artifacts such as "poke through" may result. To remedy such artifacts an application should increment or decrement the depth bias level, as appropriate for the depth buffer mode and function, per coplanar polygon. For left handed coordinate systems where **`0x0000`** corresponds to "nearest to viewer" and **`0xFFFF`** corresponds "farthest from viewer" depth bias levels should be decremented on successive rendering of coplanar polygons.

Depth biasing is mutually exclusive of linear frame buffer writes.

NOTES

When using a floating point depth buffer (a *w* buffer), the bias is added after a floating point depth is computed, and the add is an integer add.

In depth buffering modes **`GR_DEPTHBUFFER_ZBUFFER_COMPARE_TO_BIAS`** and **`GR_DEPTHBUFFER_WBUFFER_COMPARE_TO_BIAS`**, the depth bias level specifies the value to compare depth buffer values against, and is not added to the source depth value when writing to the depth buffer. See **`grDepthBufferMode`** for more information.

SEE ALSO

`grDepthBufferMode`, **`grDepthMask`**

grDepthBufferFunction

NAME

`grDepthBufferFunction` – specify the depth buffer comparison function

C SPECIFICATION

```
void grDepthBufferFunction( GrCmpFnc_t func )
```

PARAMETERS

func	The new depth comparison function.

DESCRIPTION

`grDepthBufferFunction` specifies the function used to compare each rendered pixel's depth value with the depth value present in the depth buffer. The comparison is performed only if depth testing is enabled with **`grDepthBufferMode`**. The choice of depth buffer function is typically dependent upon the depth buffer mode currently active.

The valid comparison functions are as follows:

func	*comparison function*
`GR_CMP_NEVER`	Never passes.
`GR_CMP_LESS`	Passes if the pixel's depth value is less than the stored depth value.
`GR_CMP_EQUAL`	Passes if the pixel's depth value is equal to the stored depth value.
`GR_CMP_LEQUAL`	Passes if the pixel's depth value is less than or equal to the stored depth value.
`GR_CMP_GREATER`	Passes if the pixel's depth value is greater than the stored depth value.
`GR_CMP_NOTEQUAL`	Passes if the pixel's depth value is not equal to the stored depth value.
`GR_CMP_GEQUAL`	Passes if the pixel's depth value is greater than or equal to the stored depth value.
`GR_CMP_ALWAYS`	Always passes.

The default comparison function is **`GR_CMP_LESS`**.

NOTES

SEE ALSO

`grDepthBufferMode`, **`grDepthMask`**, **`grDepthBiasLevel`**, **`grLfbConstantDepth`**

NAME

`grDepthBufferMode` – set the depth buffering mode

C SPECIFICATION

`void grDepthBufferMode( GrDepthBufferMode_t mode )`

PARAMETERS

mode	The new depth buffering mode.

DESCRIPTION

`grDepthBufferMode` specifies the type of depth buffering to be performed. Valid modes are **`GR_DEPTHBUFFER_DISABLE`**, **`GR_DEPTHBUFFER_ZBUFFER`**, **`GR_DEPTHBUFFER_WBUFFER`**, **`GR_DEPTHBUFFER_ZBUFFER_COMPARE_TO_BIAS`**, or **`GR_DEPTHBUFFER_WBUFFER_COMPARE_TO_BIAS`**. If **`GR_DEPTHBUFFER_ZBUFFER`** or **`GR_DEPTHBUFFER_ZBUFFER_COMPARE_TO_BIAS`** is selected, then the graphics subsystem will perform 16-bit fixed point *z* buffering. If **`GR_DEPTHBUFFER_WBUFFER`** or **`GR_DEPTHBUFFER_WBUFFER_COMPARE_TO_BIAS`** is selected, then the graphics subsystem will perform 16-bit floating point *w* buffering. By default the depth buffer node is **`GR_DEPTHBUFFER_DISABLE`**. Refer to the *Glide Programming Guide* for more information about *w* and *z* buffering.

If **`GR_DEPTHBUFFER_ZBUFFER_COMPARE_TO_BIAS`** or **`GR_DEPTHBUFFER_WBUFFER_COMPARE_TO_BIAS`** is selected, then the bias specified with **`grDepthBiasLevel`** is used as a pixel's depth value for comparison purposes only. Depth buffer values are compared against the depth bias level and if the compare passes and the depth buffer mask is enabled, the pixel's unbiased depth value is written to the depth buffer. This mode is useful for clearing beneath cockpits and other types of overlays without effecting either the color or depth values for the cockpit or overlay.

Consider the following example: the depth buffer is cleared to **`0xFFFF`** and a cockpit is drawn with a depth value of zero. Next, the scene beneath the cockpit is drawn with depth buffer compare function of **`GR_CMP_LESS`** rendering pixels only where the cockpit is not drawn. To clear the color and depth buffers underneath the cockpit without disturbing the cockpit, the area to be cleared is rendered using triangles (not **`grBufferClear`**) with the depth bias level set to zero, a depth buffer compare function of **`GR_CMP_NOTEQUAL`** and a depth buffer mode of **`GR_DEPTHBUFFER_ZBUFFER_COMPARE_TO_BIAS`** or **`GR_DEPTHBUFFER_WBUFFER_COMPARE_TO_BIAS`**. All pixels whose previous depth buffer values are not equal to zero will be rendered and the depth buffer will be set to either unbiased *z* or *w* depending on the mode. Using this method, the color and depth buffers can be cleared to any desired value beneath a cockpit or overlay without effecting the cockpit or overlay. Or more desirably, sorted background polygons from the scene to be rendered that cover all of the visible area can be rendered in this mode, saving the time consuming clearing operation. After the depth buffer is cleared beneath the cockpit, the depth buffer mode is returned to either **`GR_DEPTHBUFFER_ZBUFFER`** or **`GR_DEPTHBUFFER_WBUFFER`** and the compare function is returned to its normal setting (**`GR_CMP_LESS`** in this example). Note that since this mode of clearing is performed using triangle rendering, the fill rate is one half that of a rectangle clear using **`grBufferClear`**. In the case where sorted background polygons are used to clear underneath the cockpit, this method should always be faster than the alternative of calling **`grBufferClear`** and then drawing the background polygons. In the case where background polygons are not used, both methods:

1. Clearing the buffers with **`grBufferClear`** and then repainting the cockpit.
2. Clearing beneath the cockpit with triangles and not repainting the cockpit.

should be compared and the faster method chosen. Avoiding a cockpit repaint is important; cockpits are typically rendered with linear frame buffer writes and while the writes are individually fast, the process can be lengthy if the cockpit covers many pixels.

NOTES

Since alpha, depth, and triple buffering are mutually exclusive of each other, enabling depth buffering when using either the alpha or triple buffer will have undefined results.

`GR_DEPTHBUFFER_ZBUFFER_COMPARE_TO_BIAS` and **`GR_DEPTHBUFFER_WBUFFER_COMPARE_TO_BIAS`** modes are not available in revision 1 of the Pixel*fx* chip (use **`grGet`** to obtain the revision number).

SEE ALSO

`grDepthBufferFunction`, **`grDepthMask`**, **`grDepthBiasLevel`**, **`grGet`**, **`grLfbConstantDepth`**

NAME

`grDepthMask` – enable/disable writing into the depth buffer

C SPECIFICATION

`void grDepthMask( FxBool enable )`

PARAMETERS

enable	The new depth buffer mask.

DESCRIPTION

`grDepthMask` specifies whether the depth buffer is enabled for writing. If *enable* is **`FXFALSE`**, depth buffer writing is disabled. Otherwise, it is enabled. Initially, depth buffer writing is disabled.

NOTES

Since the alpha and depth buffers share the same memory, **`grDepthMask`** should be called only if depth buffering is being used.

`grDepthMask` is ignored during linear frame buffer writes if the pixel pipeline is bypassed (see **`grLfbLock`**).

SEE ALSO

`grBufferClear`, **`grDepthBufferFunction`**, **`grDepthBufferMode`**, **`grDepthBiasLevel`**, **`grLfbConstantDepth`**, **`grLfbLock`**

NAME

`grDepthRange` – specify viewport depth range

C SPECIFICATION

`void grDepthRange( FxFloat` *near*, **`FxFloat`** *far***`)`**

PARAMETERS

near, far	range for depth values for *z* buffering

DESCRIPTION

`grDepthRange` specifies the viewport parameters for the depth component for *z* buffering. It is useful only when vertices are specified in clip coordinates.

If *z* buffering, clip-space *z* is in the range [-*w*, +*w*]. After division by *w*, *z* is in the range [-1, 1] which is mapped to the depth buffer according to [*near*, *far*], where [*near*=0, *far*=1] represents the entire range of the depth buffer, regardless of how many bits are in the depth buffer.

If *w* buffering, **`grDepthRange`** is ignored.

NOTES

Glide 3.0 is the first release to support **`grDepthRange`**.

SEE ALSO

`grCoordinateSpace`

NAME

grDisable – disable Glide operating modes

C SPECIFICATION

void grDisable (GrEnableMode_t mode)

PARAMETERS

mode Glide operating mode. Valid values are **GR_AA_ORDERED**, **GR_ALLOW_MIPMAP_DITHER**, **GR_PASSTHRU**, **GR_ SHAMELESS_PLUG**, and **GR_ VIDEO_SMOOTHING**.

DESCRIPTION

grDisable disables various Glide operating modes. The *mode* parameter is one of the following:

mode	*description*
GR _AA_ORDERED	An anti-aliasing method that requires objects to be sorted by depth. This mode applies to all primitives except strips and fans.
GR_ALLOW_MIPMAP_DITHER	**GR_MIPMAP_NEAREST_DITHER** mode. By default, this mode cannot be enabled with **grTexMipMapMode** because of the performance impact. Note that this does not actually set mipmap dithering; **grTexMipMapMode** must still be called.
GR_PASSTHRU	Pass through mode. When enabled, the graphics frame buffer will displayed. When disabled, the VGA frame buffer will be displayed. (This feature replaces the now-obsolete **grSstControl** API). Pass through mode is not supported by all hardware configurations. Use **grGet(GR_SUPPORTS_PASSTHRU,…)** to determine whether or not pass through mode is supported on the current system.
GR_VIDEO_SMOOTHING	Video smoothing mode. Enabling smoothing reduces dithering artifacts but may result in a slightly blurrier image. If the hardware does not support video smoothing, this function is a no-op.
GR_SHAMELESS_PLUG	The 3Dfx power shield shameless plug that is blended into each displayed frame.

NOTES

Glide 3.0 is the first release to support **grDisable**.

SEE ALSO

grAADrawTriangle, **grEnable**, **grGet**, **grTexMipMapMode**

grDisableAllEffects

NAME

`grDisableAllEffects` – disable all special effects in the graphics subsystem

C SPECIFICATION

```
void grDisableAllEffects( void )
```

PARAMETERS

none

DESCRIPTION

`grDisableAllEffects` disables all special effects (alpha blending, alpha testing, chroma-keying, fog, depth buffering) in the graphics subsystem with the exception of clipping, dithering, and the color/depth masks. Effects must be re-enabled individually.

NOTES

SEE ALSO

`grAlphaBlendFunction`, **`grAlphaTestFunction`**, **`grChromakeyMode`**, **`grDepthBufferMode`**, **`grFogMode`**

NAME

grDitherMode – sets the dithering mode

C SPECIFICATION

void grDitherMode(GrDitherMode_t mode)

PARAMETERS

mode	The new dithering mode.

DESCRIPTION

grDitherMode selects the form of dithering used when converting 24-bit RGB values to the 16-bit RGB color buffer format. Valid values are **GR_DITHER_DISABLE**, **GR_DITHER_2x2**, and **GR_DITHER_4x4**. **GR_DITHER_DISABLE** forces a simple truncation, which may result in noticeable banding. **GR_DITHER_2x2** uses a 2x2 ordered dither matrix, and **GR_DITHER_4x4** uses a 4x4 ordered dither matrix.

The default dithering *mode* is **GR_DITHER_4x4**. **grDitherMode** is *not* affected by **grDisableAllEffects**.

NOTES

SEE ALSO

NAME

`grDrawLine` – draw a one-pixel-wide arbitrarily oriented line

C SPECIFICATION

```
void grDrawLine( const void *a, const void *b )
```

PARAMETERS

a, b	Endpoints and attributes of the line.

DESCRIPTION

`grDrawLine` renders a one-pixel-wide, arbitrarily oriented line with the given endpoints. All current Glide attributes will affect the appearance of the line. The drawing mode set by the most recent call to **`grEnable`** determines the kind of line that will be drawn. For example, if **`GR_AA_ORDERED`** has been enabled, **`grDrawLine`** will draw an anti-aliased line. All current Glide attributes will affect the appearance of the line.

NOTES

The Glide 2.x routine **`grAADrawLine`** is obsolete in Glide 3.0. To draw an anti-aliased point, enable anti-aliasing by calling **`grEnable(GR_AA_ORDERED)`** before drawing the point with **`grDrawLine`**.

SEE ALSO

`grDrawPoint`, **`grDrawTriangle`**, **`grEnable`**

NAME

grDrawPoint – draw a point

C SPECIFICATION

void grDrawPoint(const void *pt)

PARAMETERS

pt	Location and attributes of the point.

DESCRIPTION

grDrawPoint renders a single point. The drawing mode set by the most recent call to **grEnable** determines the kind of point that will be drawn. For example, if **GR_AA_ORDERED** has been enabled, **grDrawPoint** will draw an anti-aliased point. All current Glide attributes will affect the appearance of the point. If many points need to be rendered to the screen, e.g. a sprite, use linear frame buffer writes instead.

pt is a pointer to a vertex structure whose internal layout has been specified by calls to **grVertexLayout**.

NOTES

The Glide 2.x routine **grAADrawPoint** is obsolete in Glide 3.0. To draw an anti-aliased point, enable anti-aliasing by calling **grEnable(GR_AA_ORDERED)** before drawing the point with **grDrawPoint**.

SEE ALSO

grDrawLine, **grDrawTriangle**, **grEnable**, **grLfbLock**, **grVertexLayout**

NAME

grDrawTriangle – draw a triangle

C SPECIFICATION

void grDrawTriangle(const void *a, **const void *b**, **const void *c)**

PARAMETERS

a, b, c	Location and attributes of the vertices defining the triangle.

DESCRIPTION

grDrawTriangle renders an arbitrarily oriented triangle. The drawing mode set by the most recent call to **grEnable** determines the kind of point that will be drawn. For example, if **GR_AA_ORDERED** has been enabled, **grDrawTriangle** will draw an anti-aliased triangle. All current Glide attributes will affect the appearance of the triangle.

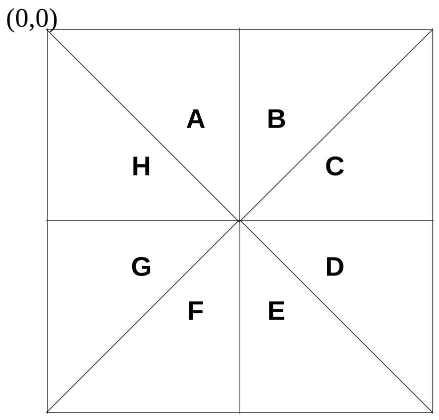
The parameters *a*, *b*, and *c* are pointers to vertex structures whose internal layout has been specified by calls to **grVertexLayout**.

Triangles are rendered with the following filling rules:

1. Zero area triangles render zero pixels.
2. Pixels are rendered if and only if their center lies within the triangle.

A pixel center is within a triangle if it is inside all three of the edges. If a pixel center lies exactly on an edge, it is considered to be inside for the left and horizontal bottom (lower *y* coordinate) edges and outside for the right and horizontal top (higher *y* coordinate) edges. If a pixel is outside any edge, it is considered to be outside the triangle.

In the following picture, a pixel whose center is at the intersection of the 8 triangles is rendered only by triangle D. The center pixel lies on a right edge in triangles A, B, E, F, G, and H. In triangle C and H, the pixel lies exactly on a top edge (high Y). But in triangle D, the pixel lies exactly on the bottom and left edges and is therefore considered to be inside the triangle.



These filling rules guarantee that perfect meshes will draw every pixel within the mesh once and only once.

NOTES

If **`GR_AA_ORDERED`** has been enabled, **`grDrawTriangle`** will anti-aliased all three edges of the triangle. To selectively anti-alias edges, use **`grAADrawTriangle`**.

SEE ALSO

`grAADrawTriangle`, **`grDrawLine`**, **`grDrawPoint`**, **`grEnable`**, **`grVertexLayout`**

grDrawVertexArray

NAME

grDrawVertexArray – draw a list of by-vertex vertices

C SPECIFICATION

void grDrawVertexArray (FxU32 mode, FxU32 count, void *pointers[])

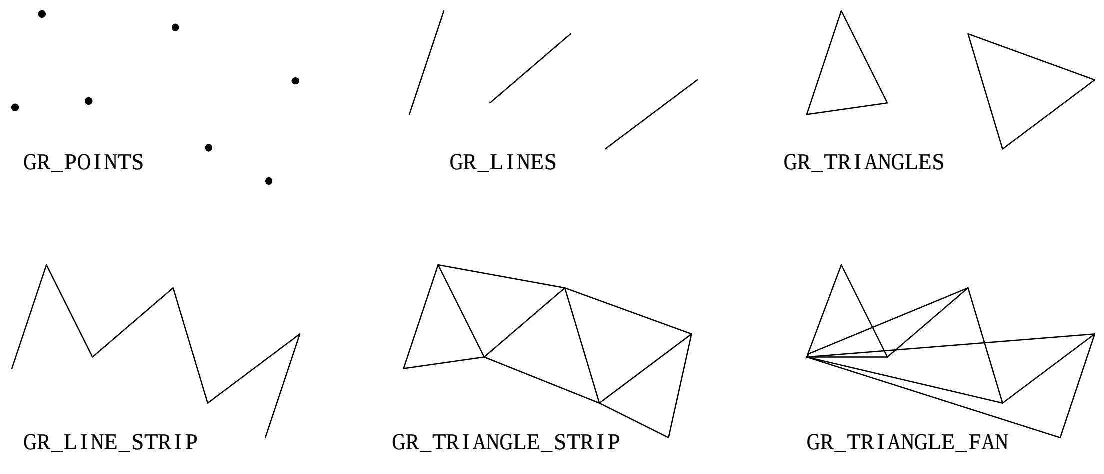
PARAMETERS

mode	Type of vertices. Valid values are **GR_POINTS**, **GR_LINE_STRIP**, **GR_LINES**, **GR_POLYGON**, **GR_TRIANGLE_STRIP**, **GR_TRIANGLE_FAN**, **GR_TRIANGLES**, **GR_TRIANGLE_STRIP_CONTINUE**, and **GR_TRIANGLE_FAN_CONTINUE**.
count	Number of vertices to draw.
pointers	Array of pointers to the vertex data.

DESCRIPTION

grDrawVertexArray draws the vertices identified by *pointers*, according to *mode*. It assumes the by-vertex format introduced in Glide 3.0, whereby the parametric values associated with a single vertex are bundled together. The vertex layout has been established by a series of calls to **grVertexLayout**.

The mode argument determines the shape that will be drawn with the vertices, as shown below.



Mode **GR_POLYGON** is inappropriate with the example vertex list, since they produce a non-convex polygon. If **GR_POLYGON** is specified, the points are drawn as a triangle fan and produce a different polygon than the one that results from connecting the vertices in sequence.

Mode **GR_LINES** expects a vertex list with an even number of vertices, and will ignore the last vertex in the example. Similarly, **GR_TRIANGLE** expects vertex triples and will ignore the last vertex in the example.

Two additional values are accepted for mode: **GR_TRIANGLE_STRIP_CONTINUE** and **GR_TRIANGLE_FAN_CONTINUE**. These two modes can be used in strictly limited circumstances: **grDrawVertexArray(GR_TRIANGLE_STRIP_CONTINUE,…)** must follow immediately after a command to draw or continue a triangle strip. Likewise, **grDrawVertexArray(GR_TRIANGLE_FAN_CONTINUE,…)** must follow immediately after a command to draw or continue a triangle fan.

NOTES

Glide 3.0 is the first release to support **grDrawVertexArray**. Six old routines for drawing polygons have been made obsolete by **grDrawVertexArray**: **grDrawPolygon**; **grDrawPlanarPolygon**; **grDrawPolygonVertexList**; **grDrawPlanarPolygonVertexList**; **grAADrawPolygon**; and **grAADrawPolygonVertexList**. The table below shows how to convert calls to the obsolete routines with calls to **grDrawVertexArray**. It assumes that the old **GrVertex** structure has been defined both syntactically and with calls to **grVertexLayout**.

old	*new*
grDrawPlanarPolygon(*nVerts*, *ilist*, *vlist* **)**	**grDrawVertexArray(GR_POYGON**, *nVerts*, *vlist* sorted according to *ilist* **)**
grDrawPolygon(*nVerts*, *ilist*, *vlist* **)**	**grDrawVertexArray(GR_POLYGON**, *nVerts*, *vlist* sorted according to *ilist* **)**
grDrawPlanarPolygonVertexList(*nVerts*, *vlist* **)**	**grDrawVertexArrayContiguous(GR_POLYGON**, *nVerts*, *vlist*, **sizeof(GrVertex))**
grDrawPolygonVertexList(*nVerts*, *vlist* **)**	**grDrawVertexArrayContiguous(GR_POLYGON**, *nVerts*, *vlist*, **sizeof(GrVertex))**
grAADrawPolygon(*nVerts*, *vlist* **)**	**grEnable(AA_ORDERED);** **grDrawVertexArray(GR_POLYGON**, *nVerts*, *vlist* sorted according to *ilist* **)**
grAADrawPolygonVertexList(*nVerts*, *vlist* **)**	**grEnable(AA_ORDERED);** **grDrawVertexArrayContiguous(GR_POLYGON**, *nVerts*, *vlist*, **sizeof(GrVertex))**

SEE ALSO

grDrawVertexArrayContiguous, **grEnable**, **grVertexLayout**

grDrawVertexArrayContiguous

NAME

grDrawVertexArrayContiguous – draw a contiguous list of by-vertex vertices

C SPECIFICATION

void grDrawVertexArrayContiguous (FxU32 mode, FxU32 count, void *vertex, FxU32 stride)

PARAMETERS

mode	Type of vertices. Valid values are **GR_POINTS**, **GR_LINE_STRIP**, **GR_LINES**, **GR_POLYGON**, **GR_TRIANGLE_STRIP**, **GR_TRIANGLE_FAN**, **GR_TRIANGLES**, **GR_TRIANGLE_STRIP_CONTINUE**, and **GR_TRIANGLE_FAN_CONTINUE**.
count	Number of vertices to draw.
vertex	Pointer to the first element of an array of vertex data.
stride	Size of a single vertex in the array.

DESCRIPTION

This is a specialized variant of **grDrawVertexArray** to account for the common case of all the vertices being in a linear array. The vertices are processed in order.

NOTES

Glide 3.0 is the first release to support **grDrawVertexArrayContiguous**. It is a generalization of the now-obsolete **grDrawPolygonVertexList**.

SEE ALSO

grDrawVertexArray

grEnable

NAME

`grEnable` – enable Glide operating modes

C SPECIFICATION

`void grEnable ( GrEnableMode_t mode )`

PARAMETERS

mode	Glide operating mode. Valid values are **`GR_AA_ORDERED`**, **`GR_ALLOW_MIPMAP_DITHER`**, **`GR_PASSTHRU`**, **`GR_ SHAMELESS_PLUG`**, and **`GR_ VIDEO_SMOOTHING`**.

DESCRIPTION

`grEnable` enables various Glide operating modes. The *mode* parameter is one of the following:

mode	*description*
`GR _AA_ORDERED`	An anti-aliasing method that requires objects to be sorted by depth. This mode applies to all primitives except strips and fans.
`GR_ALLOW_MIPMAP_DITHER`	Allow **`GR_MIPMAP_NEAREST_DITHER`** mode. By default, this mode cannot be enabled with **`grTexMipMapMode`** because of the performance impact. Note that this does not actually set mipmap dithering; **`grTexMipMapMode`** must still be called.
`GR_PASSTHRU`	Pass through mode. When enabled, the graphics frame buffer will displayed. When disabled, the VGA frame buffer will be displayed. (This feature replaces the now-obsolete **`grSstControl`** API). Pass through mode is not supported by all hardware configurations. Use **`grGet(GR_SUPPORTS_PASSTHRU,…)`** to determine whether or not pass through mode is supported on the current system.
`GR_VIDEO_SMOOTHING`	Video smoothing mode. Enabling smoothing reduces dithering artifacts but may result in a slightly blurrier image. If the hardware does not support video smoothing, this mode is a no-op.
`GR_SHAMELESS_PLUG`	The 3Dfx power shield shameless plug is blended into each displayed frame if this mode is enabled.

NOTES

Glide 3.0 is the first release to support **`grEnable`**.

SEE ALSO

`grAADrawTriangle`, **`grDisable`**, **`grGet`**, **`grTexMipMapMode`**

NAME

grErrorSetCallback – install a user-defined error-handler

C SPECIFICATION

```
typedef void (*GrErrorCallbackFnc_t)( const char *string, FxBool fatal );

void grErrorSetCallback( GrErrorCallbackFnc_t fnc );
```

PARAMETERS

function	Pointer to a function to be called with all future errors.

DESCRIPTION

grErrorSetCallback allows an application to install a callback function to handle error messages generated internally by Glide. The callback function accepts a string describing the error and a flag indicating if the error is fatal or recoverable. **grErrorSetCallback** is relevant only for the debug build of Glide; the release build of Glide removes all internal parameter validation and error checking, thus the user installed callback will never be called.

NOTES

SEE ALSO

grFinish

NAME

grFinish – force completion of all outstanding graphics commands

C SPECIFICATION

void grFinish (void)

PARAMETERS

none

DESCRIPTION

Calling **grFinish** forces all previously issued Glide commands to complete: it does not return until all effects from previous commands are fully realized on the screen. **grFinish** should be used judiciously as it can have severe performance impacts if called to frequently.

NOTES

Glide 3.0 is the first release to support **grFinish**. It replaces the now-obsolete **grSstIdle**.

SEE ALSO

grFlush

NAME

`grFlush` – flush the graphics FIFO

C SPECIFICATION

`void grFlush ( void )`

PARAMETERS

none

DESCRIPTION

Calling **`grFlush`** forces all previously issued commands to begin execution, guaranteeing they will complete in finite time. However, they may not all be completed upon return. Use **`grFinish`** to guarantee command completion upon return.

NOTES

Glide 3.0 is the first release to support **`grFlush`**. It is a no-op in current hardware because commands are not buffered (they are FIFOed, and the FIFO is guaranteed to drain). Future hardware designs may utilize a buffer rather than a FIFO; in that case, this command will become necessary. Developers interested in writing upward-compatible software should start using **`grFlush`** now.

SEE ALSO

`grFinish`

NAME

`grFogColorValue` – set the global fog color

C SPECIFICATION

`void grFogColorValue( GrColor_t value )`

PARAMETERS

value	The new global fog color.

DESCRIPTION

`grFogColorValue` specifies the global fog color to be used during fog blending operations. The color format should be in the same format as specified in the *cFormat* parameter to **`grSstWinOpen`**.

The fog operation blends the fog color (C_{fog}) with each rasterized pixel's color (C_{in}) using a blending factor ***f***. Factor ***f*** is derived from a user downloaded fog table based on either the pixels's *q* or *f* component, depending on the current **`grFogMode`**.

The new color is computed as follows:

$$C_{out} = \boldsymbol{f}\, C_{fog} + (1-\boldsymbol{f})C_{in}$$

NOTES

Fog is applied after color combining and before alpha blending.

SEE ALSO

`grDisableAllEffects`, **`grFogMode`**, **`grFogTable`**

NAME

`grFogMode` – enable/disable per-pixel fog blending operations

C SPECIFICATION

`void grFogMode( GrFogMode_t mode )`

PARAMETERS

mode	The new fog mode.

DESCRIPTION

`grFogMode` enables/disables fog blending operations. Valid parameters are **`GR_FOG_DISABLE`**, **`GR_FOG_WITH_TABLE_ON_Q`**, **`GR_FOG_ADD2`**, and **`GR_FOG_MULT2`**. The last two modes can be used in conjunction with the others to tailor the fog equation, as shown below. If the "FOGCOORD" extension is supported, then **`GR_FOG_WITH_TABLE_ON_FOGCOORD_EXT`** is also permitted.

The fog operation blends the fog color (c_{fog}) with each rasterized pixel's color (c_{in}) using a blending factor $\boldsymbol{f}$. A value of $\boldsymbol{f} = 0$ indicates minimum fog density and a value of $\boldsymbol{f} = 255$ indicates maximum fog density. The new color is computed as follows:

$$c_{out} = \boldsymbol{f}\, c_{fog} + (1-\boldsymbol{f})c_{in}$$

Factor $\boldsymbol{f}$ is determined by *mode*. If *mode* is **`GR_FOG_WITH_TABLE_ON_Q`**, then $\boldsymbol{f}$ is computed by interpolating between fog table entries, where the fog table is indexed with a floating point representation of the pixel's *q* (if using clip coordinates) or *w* (if using window coordinates) component. If *mode* is **`GR_FOG_WITH_TABLE_ON_FOGCOORD_EXT`**, then the fog table is indexed with a special vertex parameter, **`GR_PARAM_FOG_EXT`**.

*if **mode** sets*	*the fog equation is*	*where* c_{in} *is the color entering the fog unit,* c_{out} *is the result of fogging,* c_{fog} *is the fog color and*
`GR_FOG_DISABLE`	$c_{out} = c_{in}$	
`GR_FOG_WITH_TABLE_ON_Q`	$c_{out} = \boldsymbol{f}_{\mathrm{fog}[q]} \bullet c_{fog} + (1 - \boldsymbol{f}_{\mathrm{fog}[q]}) \bullet c_{in}$	$\boldsymbol{f}_{\mathrm{fog}[q]}$ *is computed by interpolating between entries in a fog table indexed with **q.***
`GR_FOG_WITH_TABLE_ON_FOGCOORD_EXT`	$c_{out} = \boldsymbol{f}_{\mathrm{fog}[v.fog]} \bullet c_{fog} + (1 - \boldsymbol{f}_{\mathrm{fog}[v.fog]}) \bullet c_{in}$	$\boldsymbol{f}_{\mathrm{fog[v.fog]}}$ *is computed by interpolating between entries in a fog table indexed with v.fog, the **`GR_PARAM_FOG_EXT`** parameter to **`grVertexLayout`**. This mode is valid only when the FOGCOORD extension is supported. See **`grGetString`**.*
`GR_FOG_MULT2`	$c_{out} = \boldsymbol{f}\, c_{fog}$	***f*** *is computed from a fog table.*
`GR_FOG_ADD2`	$c_{out} = (1 - \boldsymbol{f}\,) c_{in}$	***f*** *is computed from a fog table.*

NOTES

Fog is applied after color combining and before alpha blending.

Mode modifiers **`GR_FOG_ADD2`** and **`GR_FOG_MULT2`** are useful when applying fog to scenes that require several passes to generate. See the *Glide Programming Guide* for more information.

SEE ALSO

`grFogColorValue`, **`grFogTable`**

NAME

grFogTable – download a fog table

C SPECIFICATION

void grFogTable(const GrFog_t table[])

PARAMETERS

table	The new fog table.

DESCRIPTION

grFogTable downloads a new table of 8-bit values that are logically viewed as fog opacity values corresponding to various depths. The table entries control the amount of blending between the fog color and the pixel's color. A value of **0x00** indicates no fog blending and a value of **0xFF** indicates complete fog.

The fog operation blends the fog color (C_{fog}) with each rasterized pixel's color (C_{in}) using a blending factor ***f***. Factor ***f*** depends upon the most recent call to **grFogMode**. If the **grFogMode** is set to **GR_FOG_WITH_TABLE_ON_Q**, the factor ***f*** is computed by interpolating between fog table entries, where the fog table is indexed with a floating point representation of the pixel's *q* (if using clip coordinates) or *w* (if using window coordinates) component. The order of the entries within the fog table correspond roughly to their distance from the viewer. The exact world *w* corresponding to fog table entry *i* can be found by calling **guFogTableIndexToW(i)** or by computing:

```
pow(2.0,3.0+(double)(i>>2)) / (8-(i&3));
```

The new color is computed as follows:

$$C_{out} = \boldsymbol{f}\, C_{fog} + (1-\boldsymbol{f})C_{in}$$

An exponential fog table can be generated by computing $(1\text{-}e^{-kw})$*255 where *k* is the fog density and *w* is world distance. It is usually best to normalize the fog table so that the last entry is 255.

NOTES

In previous versions of Glide, fog tables had a fixed size of 64 entries. With Glide 3.0, the fog table size is variable and hardware dependent. Use **grGet(GR_FOG_TABLE_ENTRIES,…)** to retrieve the size for your system configuration.

The difference between consecutive entries in the fog table must be less than 64.

Fog is applied after color combining and before alpha blending.

There are several Glide Utility APIs for generating fog tables.

SEE ALSO

grFogMode, **grFogColorValue**, **grGet**, **guFogTableIndexToW**

NAME

grGet – return Glide state

C SPECIFICATION

FxU32 grGet (FxU32 pname, FxU32 plength, FxI32 *params)

PARAMETERS

pname	Encoded selectors for the environmental parameters to be returned.
plength	Length of the return buffer, in bytes.
params	Pointer to a buffer in which the parameters will be returned.

DESCRIPTION

grGet retrieves the values of selected Glide state variables. If successful, it returns the number of bytes written into the *params* buffer. If **grGet** fails (invalid context, invalid *pname* or NULL *params*), 0 is returned and the contents of the *params* array is unchanged.

*selector encoded in **pname***	*number of values returned*	*number of bytes returned*	*description of value(s) returned in **params***
GR_BITS_DEPTH	1	4	The number of bits of depth (*z* or *w*) in the frame buffer.
GR_BITS_RGBA	4	16	The number of bits each of red, green, blue, alpha in the frame buffer. If there is no separate alpha buffer (e.g. on Voodoo^2, the depth buffer can be used as an alpha buffer), 0 will be returned for alpha bits.
GR_BITS_GAMMA	1	4	The number of bits for each channel in the gamma table. If gamma correction is not available, **grGet** will fail, and the *params* array will be unmodified.
GR_FIFO_FULLNESS	2	8	How full the FIFO is, as a percentage. The value is returned in two forms: 1.24 fixed point and a hardware-specific format.
GR_FOG_TABLE_ENTRIES	1	4	The number of entries in the hardware fog table.
GR_GAMMA_TABLE_ENTRIES	1	4	The number of entries in the hardware gamma table. Returns **FXFALSE** if it is not possible to manipulate gamma (e.g. on a Macronix card, or in windowed mode).
GR_GLIDE_STATE_SIZE	1	4	Size of buffer, in bytes, needed to save Glide state. See **grGlideGetState**.
GR_GLIDE_VERTEXLAYOUT_SIZE	1	4	Size of buffer, in bytes, needed to save the current vertex layout. See **grGlideGetVertexLayout**.
GR_IS_BUSY	1	4	Returns **FXFALSE** if idle, **FXTRUE** if busy.
GR_LFB_PIXEL_PIPE	1	4	Returns **FXTRUE** if LFB writes can go through the 3D pixel pipe, **FXFALSE** otherwise.

selector encoded in ***pname***	*number of values returned*	*number of bytes returned*	*description of value(s) returned in* ***params***
`GR_MAX_TEXTURE_SIZE`	1	4	The width of the largest texture supported on this configuration (e.g. Voodoo Graphics returns 256).
`GR_MAX_TEXTURE_ASPECT_RATIO`	1	4	The logarithm base 2 of the maximum aspect ratio supported for power-of-two, mipmap-able textures (e.g. Voodoo Graphics returns 3).
`GR_MEMORY_FB`	1	4	The total number of bytes per Pixel*fx* chip if a non-UMA configuration is used, else 0. In non-UMA configurations, the total FB memory is **`GR_MEMORY_FB`** * **`GR_NUM_FB`**.
`GR_MEMORY_TMU`	1	4	The total number of bytes per Texel*fx* chip if a non-UMA configuration is used, else **`FXFALSE`**. In non-UMA configurations, the total usable texture memory is **`GR_MEMORY_TMU`** * **`GR_NUM_TMU`**.
`GR_MEMORY_UMA`	1	4	The total number of bytes if a UMA configuration, else 0.
`GR_NON_POWER_OF_TWO_TEXTURES`	1	4	Returns **`FXTRUE`** if this configuration supports textures with arbitrary width and height (up to the maximum). Note that only power-of-two textures may be mipmapped. *Not implemented in the initial release of Glide 3.0.*
`GR_NUM_BOARDS`	1	4	The number of installed boards supported by Glide. Valid before a call to **`grSstWinOpen`**.
`GR_NUM_FB`	1	4	The number of Pixel*fx* chips present. This number will always be 1 except for SLI configurations.
`GR_NUM_SWAP_HISTORY_BUFFER`	1	4	Number of entries in the swap history buffer. Each entry is 4 bytes long.
`GR_NUM_TMU`	1	4	The number of Texel*fx* chips per Pixel*fx* chip. For integrated chips, the number of TMUs will be returned.
`GR_PENDING_BUFFERSWAPS`	1	4	The number of buffer swaps pending.
`GR_REVISION_FB`	1	4	The revision of the Pixel*fx* chip(s).
`GR_REVISION_TMU`	1	4	The revision of the Texel*fx* chip(s).
`GR_STATS_LINES`	1	4	The number of lines drawn.
`GR_STATS_PIXELS_AFUNC_FAIL`	1	4	The number of pixels that failed the alpha function test.
`GR_STATS_PIXELS_CHROMA_FAIL`	1	4	The number of pixels that failed the chroma key (or range) test.
`GR_STATS_PIXELS_DEPTHFUNC_FAIL`	1	4	The number of pixels that failed the depth buffer test.
`GR_STATS_PIXELS_IN`	1	4	The number of pixels that went into the pixel pipe, excluding buffer clears.
`GR_STATS_PIXELS_OUT`	1	4	The number of pixels that went out of the pixel pipe, including buffer clears.
`GR_STATS_POINTS`	1	4	The number of points drawn.

selector encoded in ***pname***	*number of values returned*	*number of bytes returned*	*description of value(s) returned in* ***params***
`GR_STATS_TRIANGLES_IN`	1	4	The number of triangles received.
`GR_STATS_TRIANGLES_OUT`	1	4	The number of triangles drawn.
`GR_SWAP_HISTORY`	*n*	4*n*	The *swapHistory* buffer contents. The *i*th 4-byte entry counts the number of vertical syncs between the (current frame – *i)*th frame and its predecessor. If *swapHistory* is not implemented (e.g. on Voodoo Graphics and Voodoo Rush), **`grGet`** will fail, and the *params* array will be unmodified. *Use **`grGet(GR_NUM_SWAP_HISTORY_BUFFER,…)`** to determine the number of entries in the buffer.*
`GR_SUPPORTS_PASSTHRU`	1	4	Returns FXTRUE if pass through mode is supported. See **`grEnable`**.
`GR_TEXTURE_ALIGN`	1	4	The alignment boundary for textures. For example, if textures must be 16-byte aligned, 0x10 would be returned.
`GR_VIDEO_POSITION`	2	8	Vertical and horizontal beam location. Vertical retrace is indicated by y == 0.
`GR_VIEWPORT`	4	16	*x*, *y*, width, height.
`GR_WDEPTH_MIN_MAX`	2	8	The minimum and maximum allowable *w* buffer values.
`GR_ZDEPTH_MIN_MAX`	2	8	The minimum and maximum allowable *z* buffer values.

NOTES

Glide 3.0 is the first release to support **`grGet`**.

SEE ALSO

`grEnable, grGetProcAddress`, **`grGetString`**

NAME

`grGetProcAddress` – get a pointer to an extension function

C SPECIFICATION

`GrProc grGetProcAddress ( char *procName )`

PARAMETERS

procName	The name of the desired procedure.

DESCRIPTION

`grGetProcAddress` retrieves a pointer to the function named in *procName*. Use **`grGetString(GR_EXTENSION,…)`** to retrieve a list of supported extensions. If an extension is supported on the calling system, the extension name in the first column of the table can be found in the string returned by **`grGetString`**, and the procedure names found in the third column can be used as the *procName* argument to **`grGetProcAddress`**.

extension name	*description*	*associated procedure names*
CHROMARANGE	Chroma range feature in the pixel pipeline is supported.	**`grChromaRangeModeExt`** **`grChromaRangeExt`**
TEXCHROMA	Chroma range feature in the texture mapping unit is supported.	**`grTexChromaModeExt`** **`grChromaRangeExt`**
TEXMIRROR	**`GR_TEXTURECLAMP_MIRROR_EXT`** mode in **`grTexClampMode`** is supported.	
PALETTE6666	**`GR_TEXTURE_PALETTE_6666_EXT`** format is supported in **`grTexDownloadTable`** and **`grTexDownloadTablePartial`**.	
FOGCOORD	**`GR_PARAM_FOG_EXT`** vertex parameter in **`grVertexLayout`** is supported and **`GR_FOG_WITH_TABLE_ON_FOGCOORD_EXT`** is supported in **`grFogMode`**.	

NOTES

Glide 3.0 is the first release to support **`grGetProcAddress`**.

SEE ALSO

`grGetString`

NAME

`grGetString` – return environment information

C SPECIFICATION

`const char *grGetString ( FxU32 name )`

PARAMETERS

name	A selector that determines which string will be returned. Valid values are **`GR_EXTENSION`**, **`GR_HARDWARE`**, **`GR_RENDERER`**, **`GR_VENDOR`**, or **`GR_VERSION`**.

DESCRIPTION

`grGetString` returns a pointer to a text string, or NULL on error (invalid *name*).

selector	*description*
`GR_EXTENSION`	Returns a space-separated list of Glide extension names (the extension names themselves do not contain spaces). If no extensions are supported, a single space “ “ is returned.
`GR_HARDWARE`	Returns one of “Voodoo Graphics”, “Voodoo Rush”, “Voodoo2”, or “Banshee”. Other types may be added in the future.
`GR_RENDERER`	“Glide”.
`GR_VENDOR`	The vendor, “3Dfx Interactive”.
`GR_VERSION`	The Glide version. For example, “3.0”.

The following extensions are potentially available in Glide 3.0, with support dependent on the hardware capabilities of the system Glide is running on:

extension name	*description*
CHROMARANGE	Chroma range feature in the pixel pipeline is supported. Two new functions can be called using grGetProcAddress: **`grChromaRangeModeExt`** and **`grChromaRangeExt`**.
TEXCHROMA	Chroma range feature in the texture mapping unit is supported. Two new functions can be called using grGetProcAddress: **`grTexChromaModeExt`** and **`grChromaRangeExt`**.
TEXMIRROR	**`GR_TEXTURECLAMP_MIRROR_EXT`** mode in **`grTexClampMode`** is supported.
PALETTE6666	**`GR_TEXTURE_PALETTE_6666_EXT`** format is supported in **`grTexDownloadTable`** and **`grTexDownloadTablePartial`**.
FOGCOORD	**`GR_PARAM_FOG_EXT`** vertex parameter in **`grVertexLayout`** is supported and **`GR_FOG_WITH_TABLE_ON_FOGCOORD_EXT`** is supported in **`grFogMode`**.

NOTES

Glide 3.0 is the first release to support **`grGetString`**.

SEE ALSO

`grGet`, **`grGetProcAddress`**

NAME

`grGlideGetState` – get the current state of the current graphics subsystem

C SPECIFICATION

`void grGlideGetState( void *state )`

PARAMETERS

state	Pointer to a buffer where the state is to be stored.

DESCRIPTION

`grGlideGetState` makes a copy of the current state of the current graphics subsystem. This allows an application to save the state and then restore it later using **`grGlideSetState`**. Use **`grGet(GR_GLIDE_STATE_SIZE,…)`** to determine how much space will be needed (and hence, how big the *state* buffer should be).

NOTES

SEE ALSO

`grGet`, **`grGlideSetState`**

NAME

grGlideGetVertexLayout – get the current vertex layout

C SPECIFICATION

void grGlideGetVertexLayout(void *layout)

PARAMETERS

layout	Pointer to a buffer where the state is to be stored.

DESCRIPTION

grGlideGetVertexLayout makes a copy of the current vertex layout established by calls to **grVertexLayout**. This allows an application to save the layout and then restore it later using **grGlideSetVertexLayout**. Use **grGet(GR_GLIDE_VERTEXLAYOUT_SIZE,…)** to determine how much space will be needed (and hence, how big the *layout* buffer should be).

NOTES

Glide 3.0 is the first release to support **grGlideGetVertexLayout**.

SEE ALSO

grGet, **grGlideSetVertexLayout**, **grVertexLayout**

NAME

grGlideInit – initialize the Glide library

C SPECIFICATION

void grGlideInit(void)

PARAMETERS

none

DESCRIPTION

grGlideInit initializes the Glide library, performing tasks such as finding any installed graphics subsystems, allocating memory, and initializing state variables. **grGlideInit** must be called before any other Glide routines are called (the one exception is noted below).

NOTES

grGet(GR_NUM_BOARDS,…) is the only API that can be called before **grGlideInit**.

SEE ALSO

grGet, **grGlideShutdown**, **grSstWinOpen**, **grSstSelect**

NAME

`grGlideSetState` – set the state of the currently active graphics subsystem

C SPECIFICATION

`void grGlideSetState( const void *state )`

PARAMETERS

state	Pointer to a buffer containing the new state.

DESCRIPTION

`grGlideSetState` sets the state of the currently active graphics subsystem. This API is typically paired with calls to **`grGlideGetState`** so that an application can save and restore the state.

SEE ALSO

`grGlideGetState`

NAME

`grGlideSetVertexLayout` – set the current vertex layout

C SPECIFICATION

`void grGlideSetVertexLayout ( const void *layout )`

PARAMETERS

layout	Pointer to a buffer containing a vertex layout previously saved by **`grGlideGetVertexLayout`**.

DESCRIPTION

`grGlideSetVertexLayout` restores the vertex layout previously saved by **`grGlideGetVertexLayout`**.

SEE ALSO

`grGlideGetVertexLayout`

Name

grGlideShutdown – shut down the Glide library

C Specification

void grGlideShutdown(void)

Parameters

none

Description

grGlideShutdown frees up any system resources allocated by Glide, including memory, and interrupt vectors. **grGlideShutdown** should be called immediately before program termination.

Notes

See Also

grGlideInit

NAME

`grLfbConstantAlpha` – set the constant alpha value for linear frame buffer writes

C SPECIFICATION

`void grLfbConstantAlpha( GrAlpha_t alpha )`

PARAMETERS

alpha	The new constant alpha value.

DESCRIPTION

Some linear frame buffer write modes, specifically **`GR_LFBWRITEMODE_555`**, **`GR_LFBWRITEMODE_565`**, **`GR_LFBWRITEMODE_888`**, **`GR_LFBWRITEMODE_555_DEPTH`**, and **`GR_LFBWRITEMODE_565_DEPTH`**, do not contain alpha information. **`grLfbConstantAlpha`** specifies the alpha value for these linear frame buffer write modes. This alpha value is used if alpha testing and blending operations are performed during linear frame buffer writes. The default constant alpha value is **`0xFF`**.

NOTES

If a linear frame buffer format contains alpha information, then the alpha supplied with the linear frame buffer write is used, and the constant alpha value set with **`grLfbConstantAlpha`** is ignored.

SEE ALSO

`grAlphaTestFunction`, **`grAlphaBlendFunction`**

NAME

grLfbConstantDepth – set the constant depth value for linear frame buffer writes

C SPECIFICATION

```
void grLfbConstantDepth( FxU32 depth )
```

PARAMETERS

depth	The new constant depth value.

DESCRIPTION

Some linear frame buffer write modes, specifically **GR_LFBWRITEMODE_555**, **GR_LFBWRITEMODE_565**, **GR_LFBWRITEMODE_1555**, **GR_LFBWRITEMODE_888**, and **GR_LFBWRITEMODE_8888** do not include depth information. **grLfbConstantDepth** specifies the depth value for these linear frame buffer write modes. This depth value is used for depth buffering and fog operations and is assumed to be in a format suitable for the current depth buffering mode. The default constant depth value is **0x00**.

NOTES

If a linear frame buffer format contains depth information, then the depth supplied with the linear frame buffer write is used, and the constant depth value set with **grLfbConstantDepth** is ignored.

SEE ALSO

grDepthBufferMode, **grFogMode**

NAME

grLfbLock – lock a frame buffer in preparation for direct linear frame buffer accesses

C SPECIFICATION

```
FxBool grLfbLock( GrLock_t            type,
                  GrBuffer_t          buffer,
                  GrLfbWriteMode_t    writeMode,
                  GrOriginLocation_t  origin,
                  FxBool              pixelPipeline,
                  GrLfbInfo_t         *info
                )
```

PARAMETERS

type	Lock type.
buffer	Buffer to lock.
writeMode	Requested destination pixel format.
origin	Requested *y* origin of linear frame buffer.
pixelPipeline	If **FXTRUE**, send linear frame buffer writes through the pixel pipeline.
info	Structure to be filled with pointer and stride info.

DESCRIPTION

When a Glide application desires direct access to a color or auxiliary buffer, it must lock that buffer in order to gain access to a pointer to the frame buffer data. This lock may assert a critical code section which effects process scheduling and precludes the use of GUI debuggers; therefore, time spent doing direct accesses should be minimized and the lock should be released as soon as possible using the **grLfbUnlock** API. An application may hold multiple simultaneous locks to various buffers, depending on the underlying hardware. Application software should *always* check the return value of **grLfbLock** and take into account the possibility that a lock may fail.

A lock *type* is a bit field created by the bit-wise OR of one read/write flag and an optional idle request flag. The read/write flag can be one of:

read/write flag	*description*
GR_LFB_READ_ONLY	*info.lfbPtr* should only be used for read access; writing to this pointer will have undefined effects on the graphics subsystem.
GR_LFB_WRITE_ONLY	*info.lfbPtr* should only be used for write access; reading from this pointer will yield undefined data.

The idle request flag can be one of:

idle request flag	*description*
`GR_LFB_IDLE`	The 3D engine will be idled before **`grLfbLock`** returns. This is the default behavior if no idle request flag is specified.
`GR_LFB_NOIDLE`	The 3D engine will not be idled; there is no guarantee of serialization of linear frame buffer accesses and triangle rendering or buffer clearing operations.

An application may attempt to lock any Glide buffer. Currently supported buffer designations are **`GR_BUFFER_FRONTBUFFER`**, **`GR_BUFFER_BACKBUFFER`**, and **`GR_BUFFER_AUXBUFFER`**.

Some 3Dfx hardware supports multiple write formats to the linear frame buffer space. An application may request a particular write format by passing a *writeMode* argument other than **`GR_LFBWRITEMODE_ANY`**. If the destination pixel format specified is not supported on the target hardware, then the lock will fail. Supported pixel formats are:

writeMode	*description*
`GR_LFBWRITEMODE_565`	Frame buffer accepts 16-bit RGB 565 pixel data.
`GR_LFBWRITEMODE_555`	Frame buffer accepts 16-bit RGB-555 pixel data. The MSB of each pixel is ignored.
`GR_LFBWRITEMODE_1555`	Frame buffer accepts 16-bit ARGB-1555 pixel data. The alpha component is replicated to 8-bits and copied to the alpha buffer if the alpha buffer has been enabled with **`grColorMask`**.
`GR_LFBWRITEMODE_888`	Frame buffer accepts 24-bit RGB 888 pixel data packed into 32-bit words. The most significant byte of each word is ignored. If dithering is enabled, then color will be dithered down to the real frame buffer storage format if necessary.
`GR_LFBWRITEMODE_8888`	Frame buffer accepts 32-bit ARGB 8888 pixel data. The alpha component is copied into the alpha buffer if the alpha buffer has been enabled with **`grColorMask`**. If dithering is enabled, then color will be dithered down to the real frame buffer storage format if necessary.
`GR_LFBWRITEMODE_565_DEPTH`	Frame buffer accepts 32-bit pixels where the two most significant bytes contain 565 RGB data, and the two least significant bytes contain 16-bit depth data.
`GR_LFBWRITEMODE_555_DEPTH`	Frame buffer accepts 32-bit pixels where the two most significant bytes contain 555 RGB data, the most significant bit is ignored, and the two least significant bytes contain 16-bit depth data.
`GR_LFBWRITEMODE_1555_DEPTH`	Frame buffer accepts 32-bit pixels where the two most significant bytes contain 1555 ARGB data. The alpha component is replicated to 8-bits and copied to the alpha buffer, if alpha buffering has been enabled with **`grColorMask`**.
`GR_LFBWRITEMODE_ZA16`	Frame buffer accepts 16-bit auxiliary buffer values. This is the only *writeMode* that is valid when locking the auxiliary buffer. Alpha buffer values are taken from the 8 least significant bits of each sixteen bit word.
`GR_LFBWRITEMODE_ANY`	Lock will return the pixel format that most closely matches the true frame buffer storage format in the *info.writeMode*.

If the application specifies **`GR_LFB_WRITEMODE_ANY`** and the lock succeeds, the destination pixel format will be returned in *info.writeMode*. This default destination pixel format will always be the pixel format that most closely matches the true pixel storage format in the frame buffer. On Voodoo Graphics and

Voodoo Rush, this will always be **`GR_LFBWRITEMODE_565`** for color buffers and **`GR_LFBWRITEMODE_ZA16`** for the auxiliary buffer. The *writeMode* argument is ignored for read-only locks.

Some 3Dfx hardware supports a user specified *y* origin for LFB writes. An application may request a particular *y* origin by passing an *origin* argument other than **`GR_ORIGIN_ANY`**. If the *origin* specified is not supported on the target hardware, then the lock will fail. If the application specifies **`GR_ORIGIN_ANY`** and the lock succeeds, the LFB *y* origin will be returned in *info.origin*. The default *y* origin will always be **`GR_ORIGIN_UPPER_LEFT`** for LFB writes. Currently supported *y* origin values are:

y ***origin***	*description*
`GR_ORIGIN_UPPER_LEFT`	Addressing originates in the upper left hand corner of the screen.
`GR_ORIGIN_LOWER_LEFT`	Addressing originates in the lower left hand corner of the screen.
`GR_ORIGIN_ANY`	Lock will always choose **`GR_ORIGIN_UPPER_LEFT.`**

Some 3Dfx hardware allows linear frame buffer writes to be processed through the same set of functions as those pixels generated by the triangle rasterizer. This feature is enabled by passing a value of **`FXTRUE`** in the *pixelPipeline* argument of **`grLfbLock`**. If the underlying hardware is incapable of processing pixels through the pixel pipeline, then the lock will fail. Use **`grGet(GR_FLB_PIXEL_PIPE,…)`** to determine whether or not LFB writes can utilize the pixel pipeline.

When enabled, color, alpha, and depth data from the linear frame buffer write will be processed as if they were generated by the triangle iterators. If the selected *writeMode* lacks depth information, then the value is derived from **`grLfbConstantDepth`**. If the *writeMode* lacks alpha information, then the value is derived from **`grLfbConstantAlpha`**. Linear frame buffer writes through the pixel pipeline may not be enabled for auxiliary buffer locks. The *pixelPipeline* argument is ignored for read only locks.

Upon successful completion, the user provided **`GrLfbInfo_t`** structure will be filled in with information pertaining to the locked buffer. The **`GrLfbInfo_t`** structure is currently defined as:

```
typedef struct {
   int                 size;
   void                *lfbPtr;
   FxU32               strideInBytes;
   GrLfbWriteMode_t    writeMode;
   GrOriginLocation_t  origin;
} GrLfbInfo_t;
```

The **`size`** element must be initialized by the user to the size of the **`GrLfbInfo_t`** structure, e.g.:

```
info.size = sizeof( GrLfbInfo_t );
```

This **`size`** element will be used to provide backward compatibility for future revisions of the API. An unrecognized size will cause the lock to fail. The **`lfbPtr`** element is assigned a valid linear pointer to be used for accessing the requested buffer. The **`strideInBytes`** element is assigned the byte distance between scan lines.

NOTES

An application may not call any Glide routines other than **`grLfbLock`** and **`grLfbUnlock`** while a lock is active.

The *info.lfbptr* is invalid and may not be used outside a **`grLfbLock`** /**`grLfbUnlock`** pair.

Using **`GR_LFB_NOIDLE`** may interfere with sound generation.

SEE ALSO

`grGet`, **`grLfbUnlock`**, **`grLfbConstantAlpha`**, **`grLfbConstantDepth`**, **`grLfbReadRegion`**, **`grLfbWriteRegion`**

grLfbReadRegion

NAME

grLfbReadRegion – efficiently copy a pixel rectangle from a linear frame buffer

C SPECIFICATION

```
FxBool grLfbReadRegion( GrBuffer_t  src_buffer,
                        FxU32       src_x,
                        FxU32       src_y,
                        FxU32       src_width,
                        FxU32       src_height,
                        FxU32       dst_stride,
                        void        *dst_data
                      )
```

PARAMETERS

src_buffer	Source frame buffer. Valid values are **GR_BUFFER_FRONTBUFFER**, **GR_BUFFER_BACKBUFFER**, and **GR_BUFFER_AUXBUFFER**.
src_x, *src_y*	Source *x* and *y* coordinates. The *y* origin is always assumed to be at the upper left.
src_width, *src_height*	Width and height of source rectangle to be copied from the frame buffer.
dst_stride	Stride, in bytes, of destination user memory buffer.
dst_data	Pointer to destination user memory buffer.

DESCRIPTION

This API copies a rectangle from a region of a frame buffer into a buffer in user memory; this is the only way to read back from the frame buffer on Scanline Interleaved systems.

A *src_width* by *src_height* rectangle of pixels is copied from the buffer specified by *src_buffer*, starting at the location (*src_x*, *src_y*). The pixels are copied to user memory starting at *dst_data*, with a stride in bytes defined by *dst_stride*.

The frame buffer *y* origin is always assumed to be at the upper left. The pixel data read will always be 16-bit 565 RGB.

The *dst_stride* must be greater than or equal to *src_width* * 2.

NOTES

On Voodoo^2 systems, **grLfbReadRegion** may not be used in conjunction with triple buffering.

SEE ALSO

grLfbLock, **grLfbUnlock**, **grLfbConstantAlpha**, **grLfbConstantDepth**, **grLfbWriteRegion**

NAME

`grLfbUnlock` – unlock a frame buffer previously locked with **`grLfbLock`**

C SPECIFICATION

`FxBool grLfbUnlock( GrLock_t type, GrBuffer_t buffer )`

PARAMETERS

type	Lock type. Valid values are **`GR_LFB_READ_ONLY`** and **`GR_LFB_WRITE_ONLY`**.
buffer	Buffer to unlock. Valid values are **`GR_BUFFER_FRONTBUFFER`**, **`GR_BUFFER_BACKBUFFER`**, and **`GR_BUFFER_AUXBUFFER`**.

DESCRIPTION

When an application desires direct access to a color or auxiliary buffer, it must lock that buffer in order to gain access to a pointer to the frame buffer data. When the application has completed its direct access transactions and would like restore 3D and GUI engine access to the buffer, then it must call **`grLfbUnlock`**.

NOTES

An application may not call any Glide routines other than **`grLfbLock`** and **`grLfbUnlock`** while a lock is active.

The *info.lfbptr* is invalid and may not be used outside a **`grLfbLock`** /**`grLfbUnlock`** pair.

SEE ALSO

`grLfbLock`, **`grLfbConstantAlpha`**, **`grLfbConstantDepth`**

NAME

grLfbWriteRegion – efficiently copy a pixel rectangle into a linear frame buffer

C SPECIFICATION

```
FxBool grLfbWriteRegion( GrBuffer_t     dst_buffer,
                         FxU32          dst_x,
                         FxU32          dst_y,
                         GrLfbSrcFmt_t  src_format,
                         FxU32          src_width,
                         FxU32          src_height,
                         FxBool         pixelPipeline,
                         FxI32          src_stride,
                         void           *src_data
                       )
```

PARAMETERS

dst_buffer	Destination frame buffer. Valid values are **GR_BUFFER_FRONTBUFFER**, **GR_BUFFER_BACKBUFFER**, and **GR_BUFFER_AUXBUFFER**.
dst_x, *dst_y*	Destination *x* and *y* coordinates The *y* origin is always assumed to be at the upper left.
src_format	Format of source image.
src_width, *src_height*	Width and height of source image.
pixelPipeline	Enable pixel pipeline processing for source data.
src_stride	Stride of source image.
src_data	Pointer to image data.

DESCRIPTION

This API copies a rectangle from a region of memory pointed to by *src_data* into the linear frame buffer as efficiently as possible. The image may be in one of the following source formats:

GR_LFB_SRC_FMT_565	RGB 565 color image.
GR_LFB_SRC_FMT_555	RGB 555 color image.
GR_LFB_SRC_FMT_1555	RGB 1555 color image.
GR_LFB_SRC_FMT_888	RGB 888 color image each pixel padded to 32-bits with RGB in low order 24-bits.
GR_LFB_SRC_FMT_8888	ARGB 8888 color image.
GR_LFB_SRC_FMT_565_DEPTH	RGB 565 and 16-bit depth value packed into each 32-bit element of image.
GR_LFB_SRC_FMT_555_DEPTH	RGB 555 and 16-bit depth value packed into each 32-bit element of image.
GR_LFB_SRC_FMT_1555_DEPTH	RGB 1555 and 16-bit depth value packed into each 32-bit element of image.

`GR_LFB_SRC_FMT_ZA16`	Two 16-bit depth or alpha values. Alpha values are stored into odd bytes.
`GR_LFB_SRC_FMT_RLE16`	16 BPP RLE Encoded image - see notes.

Not all 3Dfx graphics subsystems will support all source image formats. The function will fail, returning **`FXFALSE,`** if the source format specified is not supported by the 3D hardware.

The *src_data* pointer must point to the starting pixel of the rectangle to be copied. A rectangle in memory defined by *src_width*, *src_height*, and *src_stride* will be copied into the buffer designated by *dst_buffer* at the location (*dst_x*, *dst_y*). *src_stride* is defined as bytes per scan line in the source image.

If *pixelPipeline* is set to **`FXTRUE`**, source data will be processed through the pixel pipeline before being written into the linear frame buffer. Not all 3Dfx graphics subsystems will support pixel pipeline processing on LFB writes (e.g. Voodoo Rush). The **`grLfbWriteRegion`** function will fail, returning **`FXFALSE`**, if pixel pipeline processing is enabled on a system that doesn't support it. Use **`grGet(GR_FLB_PIXEL_PIPE,…)`** to determine whether or not LFB writes can utilize the pixel pipeline.

The frame buffer *y* origin is always assumed to be at the upper left.

NOTES

The **`GR_LFB_SRC_FMT_RLE16`** format is a two-word format consisting of one 16-bit count word and one 16-bit color word. The count word should be treated as a signed 16-bit integer. Negative values are currently ignored.

The Glide 3.0 release is the first release to include the *pixelPipeline* argument to **`grLfbWriteRegion`**.

SEE ALSO

`grGet`, **`grLfbLock`**, **`grLfbUnlock`**, **`grLfbConstantAlpha`**, **`grLfbConstantDepth`**, **`grLfbReadRegion`**

NAME

`grLoadGammaTable` – load the hardware gamma correction table

C SPECIFICATION

`void grLoadGammaTable ( FxU32 nEntries, FxU32 *r, FxU32 *g, FxU32 *b )`

PARAMETERS

nEntries	The number of elements in the color parameter arrays.
r, g, b	Arrays of RGB values that will interpolated to generate an output gamma value.

DESCRIPTION

`grLoadGammaTable` loads the hardware gamma correction table with *nEntries* red, green, and blue values that will be interpolated to generate an output gamma value. If *nEntries* is less than the size of the hardware-dependent gamma table, the first part of the table will be overwritten by the new values. If *nEntries* is greater than the gamma table size, the extra values are discarded. The size of the gamma table may be obtained by calling **`grGet(GR_GAMMA_TABLE_ENTRIES)`**. The entries in the gamma table must be monotonically increasing in each color component,; otherwise, the results are undefined.

NOTES

It is strongly recommended that **`guGammaCorrectionRGB`** be used instead of **`grLoadGammaTable`**.

Glide 3.0 is the first release to support **`grLoadGammaTable`**.

SEE ALSO

`grGet`, **`guGammaCorrectionRGB`**

NAME

grQueryResolutions – query for possible frame buffer configurations

C SPECIFICATION

```
typedef struct {
   GrScreenResolution_t  resolution;
   GrScreenRefresh_t     refresh;
   int                   numColorBuffers;
   int                   numAuxBuffers;
} GrResolution;


FxI32 grQueryResolutions ( const GrResolution     *resTemplate,
                            GrResolution           *output
                          )
```

PARAMETERS

resTemplate	Template containing query constraints.
output	Pointer to an array of **GrResolution** structures that will receive the resolution information.

DESCRIPTION

grQueryResolutions returns all available frame buffer configurations that match the constraints specified in the template *resTemplate*. The constraints are specified as either **GR_QUERY_ANY** or a specific value in each of the four fields in the **GrResolution** structure. **grQueryResolutions** returns the number of bytes required to contain the available resolution information. Typically, a Glide application program calls **grQueryResolutions** with a NULL *output* parameter initially and uses the return value allocate space, then calls **grQueryResolutions** again to return the information. This process is demonstrated in the code fragment below:

```
GrResolution   query;
GrResolution   *list;
Int            listSize;

/* find all possible modes that include a z-buffer */
query.resolution      = GR_QUERY_ANY;
query.refresh         = GR_QUERY_ANY;
query.numColorBuffers = GR_QUERY_ANY;
query.numAuxBuffers   = 1;

listSize = grQueryResolutions( &query, NULL );
list = malloc( listSize );
grQueryResolutions( &query, list );
```

NOTES

Glide 3.0 is the first release to support **grQueryResolutions.**

SEE ALSO

grGet, **grGetString**, **grSstWinOpen**

NAME

grRenderBuffer – selects the current color buffer for drawing and clearing

C SPECIFICATION

void grRenderBuffer(GrBuffer_t buffer)

PARAMETERS

buffer	Selects the current color buffer. Valid values are **GR_BUFFER_FRONTBUFFER** and **GR_BUFFER_BACKBUFFER**.

DESCRIPTION

grRenderBuffer selects the buffer for primitive drawing and buffer clears. The default is **GR_BUFFER_BACKBUFFER**.

NOTES

SEE ALSO

grBufferClear, **grDrawLine**, **grDrawPoint**, **grDrawTriangle**, **grDrawVertexArray**, **grDrawVertexArrayContiguous**

NAME

`grReset` – reset selected Glide state

C SPECIFICATION

`FxBool grReset ( FxU32 what )`

PARAMETERS

what	The piece of state to reset.

DESCRIPTION

`grReset` resets statistic counters and vertex layouts. The argument *what* is one of the selectors listed below.

selector	*description*
`GR_STATS_PIXELS`	Reset all the pixel statistic counters.
`GR_STATS_POINTS`	Reset all the point statistic counters.
`GR_STATS_LINES`	Reset all the line statistic counters.
`GR_STATS_TRIANGLES`	Reset all the triangle statistic counters.
`GR_VERTEX_PARAMETERS`	Reset **`grVertexLayout`** parameter offset to zero, and all parameter modes to **`GR_PARAM_DISABLE`**.

The current values of the statistics counters and the vertex layout size can be retrieved with calls to **`grGet`**.

NOTES

Glide 3.0 is the first release to support **`grReset`**. It replaces the now-obsolete API **`grSstResetPerfStats`**.

SEE ALSO

`grGet`

Name

`grSelectContext` – activate a context

C Specification

`FxBool grSelectContext ( GrContext_t context )`

Parameters

context	A context handle.

Description

When programming a full screen Glide application, the developer has complete ownership of the 3D hardware and texture ram. Many applications will be developed to run under Windows 95, however, and must be prepared to restore the graphics state after a period of inactivity.

To gracefully handle the loss of resources (e.g. to another 3D application being scheduled by the Windows 95 operating system), an application is required to periodically (typically once per frame) query with **`grSelectContext`** to determine if Glide's resources have be reallocated by the system. *Context* is a context handle returned from a successful call to **`grSstWinOpen`**.

If none of the rendering context's state and resources have been disturbed since the last call, **`grSelectContext`** will return **`FXTRUE`**. In this case no special actions by the application are required. If it returns **`FXFALSE`**, then the application must assume that the rendering state has changed and must be reestablished (by re-downloading textures, explicitly resetting the rendering state, etc.) before further rendering commands are issued.

Notes

Glide 3.0 is the first release to support **`grSelectContext.`**

See Also

`grSstWinOpen`

NAME

`grSstOrigin` – establishes a *y* origin

C SPECIFICATION

`void grSstOrigin( GrOriginLocation_t origin )`

PARAMETERS

origin	Specifies the direction of the *y* coordinate axis. **`GR_ORIGIN_UPPER_LEFT`** places the screen space origin at the upper left corner of the screen with positive *y* going down. **`GR_ORIGIN_LOWER_LEFT`** places the screen space origin at the lower left corner of the screen with positive *y* going up.

DESCRIPTION

`grSstOrigin` sets the *y* origin for all triangle operations, fast fill, and clipping rectangles.

NOTES

`grSstOrigin` overrides the *y* origin specified in **`grSstWinOpen`**.

SEE ALSO

`grSstWinOpen`

NAME

`grSstSelect` – make a graphics subsystem current

C SPECIFICATION

`void grSstSelect( int which_sst )`

PARAMETERS

which_sst	The ordinal number of the graphics subsystem to make current. This value must be between 0 and the number of installed subsystems returned by **`grGet(GR_NUM_BOARDS,…)`**.

DESCRIPTION

`grSstSelect` selects a particular installed graphics subsystem as active. If the value passed is greater than the number of installed graphics subsystems and you are using the debug build of Glide, a run-time error will be generated.

NOTES

SEE ALSO

`grGet`, **`grSstWinOpen`**

NAME

`grSstWinClose` – close a graphics context

C SPECIFICATION

`FxBool grSstWinClose( GrContext_t context )`

PARAMETERS

context	The graphics context to close.

DESCRIPTION

`grSstWinClose` closes a graphics context. It will fail, returning **`FXFALSE`**, if *context* is not a valid handle to a graphics context. Otherwise, it returns the state of Glide to the one following **`grGlideInit`**, so that **`grSstWinOpen`** can be called to open a new context.

NOTES

Glide 3.0 is the first release to require the *context* parameter for **`grSstWinClose`**.

SEE ALSO

`grSstWinOpen`

NAME

grSstWinOpen – opens the graphics display device

C SPECIFICATION

```
GrContext_t grSstWinOpen( FxU32                 hWin,
                          GrScreenResolution_t  res,
                          GrScreenRefresh_t     ref,
                          GrColorFormat_t       cFormat,
                          GrOriginLocation_t    org_loc,
                          int                   num_buffers,
                          int                   num_aux_buffers
                        )
```

PARAMETERS

hWin — Specifies a handle to the window. The interpretation of this value depends on the system environment. Applications run on Voodoo Graphics or Voodoo^2 hardware must specify **NULL** as well. Win32 full screen applications running on Voodoo Rush system must specify a window handle; a **NULL** value for *hWin* will cause the application's real window handle (i.e. what is returned by **GetActiveWindow**) to be used. Since Win32 pure console applications do not have a window handle, they can be used only with Voodoo Graphics or Voodoo^2 systems and a **NULL** window handle is required.

System environment	***hWin** value*
Win32 Full Screen	
Win32 Pure Console	**NULL** (Voodoo Graphics and Voodoo^2 only).

res — Specifies which screen resolution to use. Refer to **sst1vid.h** for available video resolutions, e.g., **GR_RESOLUTION_640x480** and **GR_RESOLUTION_800x600**. In addition, the resolution **GR_RESOLUTION_NONE** is permitted (*but not recommended*) for Voodoo Rush. This signals Glide to use the user specified window (see the *hWin* parameter). Specifying **GR_RESOLUTION_NONE** on a Voodoo Graphics or Voodoo^2 system will cause the call to fail.

ref — Specifies the refresh rate to use. Refer to **sst1vid.h** for available video resolutions, e.g., **GR_REFRESH_60Hz** and **GR_REFRESH_72Hz**. The *ref* parameter is ignored when a Win32 application is running in a window (Voodoo Rush systems only).

cFormat Specifies the packed color RGBA ordering for linear frame buffer writes and parameters for the following APIs: **`grBufferClear`**, **`grChromakeyValue`**, **`grConstantColorValue`**, and **`grFogColorValue`**. The following table illustrates the available formats:

color format	*hex variable organization*
`GR_COLORFORMAT_RGBA`	**`0xRRGGBBAA`**
`GR_COLORFORMAT_ARGB`	**`0xAARRGGBB`**
`GR_COLORFORMAT_BGRA`	**`0xBBGGRRAA`**
`GR_COLORFORMAT_ABGR`	**`0xAABBGGRR`**

org_loc Specifies the direction of the *y* coordinate axis. **`GR_ORIGIN_UPPER_LEFT`** places the screen space origin at the upper left corner of the screen with positive *y* going down (a la IBM VGA). **`GR_ORIGIN_LOWER_LEFT`** places the screen space origin at the lower left corner of the screen with positive *y* going up (a la SGI GL).

num_buffers Specifies the number of rendering buffers to use. Supported values 2 (double-buffering) or 3 (triple buffering). If there is not enough memory to support the desired resolution (e.g. 800×600 triple buffered on a 2MB system), an error will occur.

num_aux_buffers Specifies the number of auxiliary buffers required by an application. The auxiliary buffers are used either for depth or alpha buffering. Permitted values are 0 or 1. For full screen applications, this parameter allows Voodoo Graphics, Voodoo^2, and Voodoo Rush systems to validate whether the available video memory will support the application's requirements for color and auxiliary buffers at a specified screen resolution. For a windowed application running on Voodoo Rush, this parameter allows an application to run in a larger 3D window if a depth buffer is not necessary (depth and back buffers share the same off-screen video memory).

DESCRIPTION

`grSstWinOpen` initializes the graphics to a known state using the given parameters. It supports Voodoo graphics, Voodoo^2, and Voodoo Rush, and either full-screen or windowed operation in the latter. By default all special effects of the hardware (depth buffering, fog, chroma-key, alpha blending, alpha testing, etc.) are disabled and must be individually enabled. All global state constants (chroma-key value, alpha test reference, constant depth value, constant alpha value, etc.) and pixel rendering statistic counters are initialized to **`0x00`**. Upon success, an opaque graphics context handle is returned; otherwise zero is returned. If **`grSstWinOpen`** is called on an already open window, **`FXFALSE`** will be returned.

NOTES

Glide 3.0 is the first release to introduce graphics window context handles. Only one graphics context may be created and active at a time. This restriction may be relaxed in future releases.

SEE ALSO

`grSstWinClose`

NAME

grTexCalcMemRequired – return the texture memory consumed by a texture

C SPECIFICATION

```
FxU32 grTexCalcMemRequired( GrLOD_t            smallLOD,
                            GrLOD_t            largeLOD,
                            GrAspectRatio_t    aspect,
                            GrTextureFormat_t  format
                            )
```

PARAMETERS

smallLOD, largeLOD	The smallest and largest LODs in the mipmap. Values are chosen from the following: **GR_LOD_LOG2_1**, **GR_LOD_LOG2_2**, **GR_LOD_LOG2**, **GR_LOD_LOG2_4**, **GR_LOD_LOG2_8**, **GR_LOD_LOG2_16**, **GR_LOD_LOG2_32**, **GR_LOD_LOG2_64**, **GR_LOD_LOG2_128**, and **GR_LOD_LOG2_256**.
aspect	Aspect ratio of the mipmap. Values are chosen from the following: **GR_ASPECT_LOG2_8x1**, **GR_ASPECT_LOG2_4x1**, **GR_ASPECT_LOG2_2x1**, **GR_ASPECT_LOG2_1x1**, **GR_ASPECT_LOG2_1x2**, **GR_ASPECT_LOG2_1x4**, and **GR_ASPECT_LOG2_1x8**.
format	Format of the mipmap. Values are chosen from the following: **GR_TEXFMT_RGB_332**, **GR_TEXFMT_YIQ_422**, **GR_TEXFMT_ALPHA_8**, **GR_TEXFMT_INTENSITY_8**, **GR_TEXFMT_ALPHA_INTENSITY_44**, **GR_TEXFMT_P_8**, **GR_TEXFMT_8332**, **GR_TEXFMT_AYIQ_8422**, **GR_TEXFMT_RGB_565**, **GR_TEXFMT_ARGB_1555**, **GR_TEXFMT_ARGB_4444**, **GR_TEXFMT_ALPHA_INTENSITY_88**, and **GR_TEXFMT_AP_88**.

DESCRIPTION

grTexCalcMemRequired calculates and returns the amount of memory a mipmap of the specified LOD range, aspect ratio, and format requires. Because of the packing requirements of some texture formats the number returned may reflect padding bytes required to properly align the mipmap in memory. See **grGet(GR_TEXTURE_ALIGN,…)**.

NOTES

The value returned includes memory for both the even and odd mipmap levels. In the case where a mipmap is split across two TMUs with the even levels in one TMU and the odd levels in the other TMU, use **grTexTextureMemRequired** to compute the memory requirements of each TMU.

It is possible that memory required for a mipmap is less than the sum of the memory required for its individual mipmap levels. When multiple mipmap levels are packed into one mipmap, they will be loaded into contiguous memory.

SEE ALSO

grGet, **grTexTextureMemRequired**

NAME

grTexChromaModeExt – set the chroma-key mode for a given TMU

C SPECIFICATION

void grTexChromaModeExt (GrChipID_t tmu, GrChromakeyMode_t mode)

PARAMETERS

tmu	The TMU. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
mode	One of the following:

mode	*description*
GR_TEXCHROMA_DISABLE_EXT	Disable texture chroma keying.
GR_TEXCHROMA_ENABLE_EXT	Enables texture chroma keying. Chroma texels obtain **0x00** for RGBA.

DESCRIPTION

grTexChromaModeExt sets the chroma range mode for the specified TMU. It is independent of the chroma-key and chroma range modes in the pixel pipeline.

NOTES

Glide 3.0 is the first release to introduce **grTexChromaModeExt**. The API is available only with hardware support. Use **grGetString(GR_EXTENSION,…)** and search for the sub-string "TEXCHROMA" to query for availability of this extension. If the extension is present, the entry point may be retrieved via **grGetProcAddr**.

The TEXCHROMA extension is independent of the chroma-key and chroma range modes in the pixel pipeline.

SEE ALSO

grChromakeyMode, **grChromaRangeModeExt**, **grGetProcAddress**, **grGetString**, **grTexChromaRangeExt**

grTexChromaRangeExt

NAME

grTexChromaRangeExt – set chroma-range values for a given TMU

C SPECIFICATION

```
void grTexChromaRangeExt ( GrChipID_t            tmu,
                           GrColor_t             color0,
                           GrColor_t             color 1,
                           GrTexChromakeyMode_t  mode
                         )
```

PARAMETERS

tmu	The TMU. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
color0, *color1*	Independent range values for red, green, and blue.
mode	Chroma-range match criteria. Only one mode value is currently supported: **GR_TEXCHROMARANGE_RGB_ALL_EXT**.

DESCRIPTION

grTexChromaRangeExt sets the chroma range values for the TMU specified by *tmu*.

The color format for *color0* and *color1* should be the same one as specified in the *cFormat* parameter to **grSstWinOpen**. The order in which range values are specified for a particular color component is irrelevant, i.e. the {*color0, color1*} pairs {(130,36,87), (150,38,92)} and {(150,36,92), (130,38,87)} are equivalent.

The *mode* parameter determines the way the color ranges are used in the chroma test. Only one value is currently supported, **GR_TEXCHROMARANGE_RGB_ALL_EXT**. In this mode, each color component pair defines an inclusive range such that *lower bound* ≤ *color* ≤ *upper bound*. If ***all*** components of the incoming pixel color fall within their ranges, the chroma test succeeds and the pixel is invalidated.

NOTES

Glide 3.0 is the first release to introduce **grTexChromaRangeExt**. The API is available only with hardware support. Use **grGetString(GR_EXTENSION,…)** and search for the sub-string “TEXCHROMA” to query for availability of this extension. If the extension is present, the entry point may be retrieved via **grGetProcAddr**.

The TEXCHROMA extension is independent of the chroma-key and chroma range modes in the pixel pipeline.

SEE ALSO

grChromakeyValue, **grChromaRangeExt**, **grGetProcAddress**, **grGetString**, **grTexChromaModeExt**

grTexClampMode

NAME

grTexClampMode – set the texture map clamping/wrapping mode

C SPECIFICATION

```
void grTexClampMode( GrChipID_t             tmu,
                      GrTextureClampMode_t   sClampMode,
                      GrTextureClampMode_t   tClampMode
                    )
```

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
sClampMode	The new mode for the *s* direction, either **GR_TEXTURECLAMP_CLAMP** or **GR_TEXTURECLAMP_WRAP**.
tClampMode	The new mode for the *t* direction, either **GR_TEXTURECLAMP_CLAMP** or **GR_TEXTURECLAMP_WRAP**.

DESCRIPTION

grTexClampMode sets the texture mapping clamping/wrapping mode for both the *s* and *t* directions. If *wrapping* is enabled, then texture maps will tile, i.e. values greater than 255 for window coordinate systems, or 1.0 for clip coordinate system, will wrap around to 0. If *clamping* is enabled, then texture map indices will be clamped to 0 and 255 (window coordinates) or 0.0 and 1.0 (clip coordinates).

If the TEXMIRROR extension is supported, then either *sClampMode* or *tClampMode* or both may be set to **GR_TEXTURECLAMP_MIRROR_EXT**. See the *Glide 3.0 Programming Manual* for a description of extensions in general and the TEXMIRROR one in particular.

NOTES

Both modes should always be set to **GR_TEXTURECLAMP_CLAMP** for perspectively projected textures.

SEE ALSO

grGetString, grTexSource

NAME

grTexCombine – configure a texture combine unit

C SPECIFICATION

```
void grTexCombine(  GrChipID_t              tmu,
                    GrCombineFunction_t     rgb_function,
                    GrCombineFactor_t       rgb_factor
                    GrCombineFunction_t     alpha_function,
                    GrCombineFactor_t       alpha_factor,
                    FxBool                  rgb_invert,
                    FxBool                  alpha_invert
                  )
```

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
rgb_function	Specifies the function used in texture color generation. Valid parameters are described below:

combine function	*effect*
GR_COMBINE_FUNCTION_ZERO	0
GR_COMBINE_FUNCTION_LOCAL	C_{local}
GR_COMBINE_FUNCTION_LOCAL_ALPHA	A_{local}
GR_COMBINE_FUNCTION_SCALE_OTHER **GR_COMBINE_FUNCTION_BLEND_OTHER**	$f * C_{other}$
GR_COMBINE_FUNCTION_SCALE_OTHER_ADD_LOCAL	$f * C_{other} + C_{local}$
GR_COMBINE_FUNCTION_SCALE_OTHER_ADD_LOCAL_ALPHA	$f * C_{other} + A_{local}$
GR_COMBINE_FUNCTION_SCALE_OTHER_MINUS_LOCAL	$f * (C_{other} - C_{local})$
GR_COMBINE_FUNCTION_SCALE_OTHER_MINUS_LOCAL_ADD_LOCAL **GR_COMBINE_FUNCTION_BLEND**	$f * (C_{other} - C_{local}) + C_{local}$ $\equiv f * C_{other} + (1 - f) * C_{local}$
GR_COMBINE_FUNCTION_SCALE_OTHER_MINUS_LOCAL_ADD_LOCAL_ALPHA	$f * (C_{other} - C_{local}) + A_{local}$
GR_COMBINE_FUNCTION_SCALE_MINUS_LOCAL_ADD_LOCAL **GR_COMBINE_FUNCTION_BLEND_LOCAL**	$f * (- C_{local}) + C_{local}$ $\equiv (1 - f) * C_{local}$
GR_COMBINE_FUNCTION_SCALE_MINUS_LOCAL_ADD_LOCAL_ALPHA	$f * (- C_{local}) + A_{local}$

rgb_factor Specifies the scaling factor *f* used in texture color generation. Valid parameters are described below:

combine factor	*scale factor* (*f*)
GR_COMBINE_FACTOR_NONE	*unspecified*
GR_COMBINE_FACTOR_ZERO	0
GR_COMBINE_FACTOR_LOCAL	C_{local} / 255
GR_COMBINE_FACTOR_OTHER_ALPHA	A_{other} / 255
GR_COMBINE_FACTOR_LOCAL_ALPHA	A_{local} / 255
GR_COMBINE_FACTOR_DETAIL_FACTOR	β
GR_COMBINE_FACTOR_LOD_FRACTION	λ
GR_COMBINE_FACTOR_ONE	1
GR_COMBINE_FACTOR_ONE_MINUS_LOCAL	$1 - C_{local} / 255$
GR_COMBINE_FACTOR_ONE_MINUS_OTHER_ALPHA	$1 - A_{other} / 255$
GR_COMBINE_FACTOR_ONE_MINUS_LOCAL_ALPHA	$1 - A_{local} / 255$
GR_COMBINE_FACTOR_ONE_MINUS_DETAIL_FACTOR	$1 - \beta$
GR_COMBINE_FACTOR_ONE_MINUS_LOD_FRACTION	$1 - \lambda$

alpha_function Specifies the function used in texture alpha generation. Valid parameters are described below:

combine function	*effect*
GR_COMBINE_FUNCTION_ZERO	0
GR_COMBINE_FUNCTION_LOCAL	A_{local}
GR_COMBINE_FUNCTION_LOCAL_ALPHA	A_{local}
GR_COMBINE_FUNCTION_SCALE_OTHER **GR_COMBINE_FUNCTION_BLEND_OTHER**	$f * A_{other}$
GR_COMBINE_FUNCTION_SCALE_OTHER_ADD_LOCAL	$f * A_{other} + A_{local}$
GR_COMBINE_FUNCTION_SCALE_OTHER_ADD_LOCAL_ALPHA	$f * A_{other} + A_{local}$
GR_COMBINE_FUNCTION_SCALE_OTHER_MINUS_LOCAL	$f * (A_{other} - A_{local})$
GR_COMBINE_FUNCTION_SCALE_OTHER_MINUS_LOCAL_ADD_LOCAL **GR_COMBINE_FUNCTION_BLEND**	$f * (A_{other} - A_{local}) + A_{local}$ $\equiv f * A_{other} + (1 - f) * A_{local}$
GR_COMBINE_FUNCTION_SCALE_OTHER_MINUS_LOCAL_ADD_LOCAL_ALPHA	$f * (A_{other} - A_{local}) + A_{local}$
GR_COMBINE_FUNCTION_SCALE_MINUS_LOCAL_ADD_LOCAL **GR_COMBINE_FUNCTION_BLEND_LOCAL**	$f * (-A_{local}) + A_{local}$ $\equiv (1 - f) * A_{local}$
GR_COMBINE_FUNCTION_SCALE_MINUS_LOCAL_ADD_LOCAL_ALPHA	$f * (-C_{local}) + A_{local}$

alpha_factor Specifies the scaling factor *f* used in texture alpha generation. Valid parameters are described below:

combine factor	*scale factor* (*f*)
`GR_COMBINE_FACTOR_NONE`	*unspecified*
`GR_COMBINE_FACTOR_ZERO`	0
`GR_COMBINE_FACTOR_LOCAL`	A_{local} / 255
`GR_COMBINE_FACTOR_OTHER_ALPHA`	A_{other} / 255
`GR_COMBINE_FACTOR_LOCAL_ALPHA`	A_{local} / 255
`GR_COMBINE_FACTOR_DETAIL_FACTOR`	β
`GR_COMBINE_FACTOR_LOD_FRACTION`	
`GR_COMBINE_FACTOR_ONE`	1
`GR_COMBINE_FACTOR_ONE_MINUS_LOCAL`	1 – A_{local} / 255
`GR_COMBINE_FACTOR_ONE_MINUS_OTHER_ALPHA`	1 – A_{other} / 255
`GR_COMBINE_FACTOR_ONE_MINUS_LOCAL_ALPHA`	1 – A_{local} / 255
`GR_COMBINE_FACTOR_ONE_MINUS_DETAIL_FACTOR`	1 – β
`GR_COMBINE_FACTOR_ONE_MINUS_LOD_FRACTION`	

rgb_invert Specifies whether the generated texture color should be bitwise inverted as a final step.

alpha_invert Specifies whether the generated texture alpha should be bitwise inverted as a final step.

DESCRIPTION

`grTexCombine` configures the color and alpha texture combine units of the graphics hardware pipeline. This provides a low level mechanism for controlling all the modes of the texture combine unit without manipulating individual register bits.

The texture combine unit computes the function specified by *rgb_function* and *alpha_function* using *rgb_factor* and *alpha_factor* as scale factors on the local (C_{local} and A_{local}) and upstream (C_{other} and A_{other}) filtered texels. The result is clamped to [0..255], and then a bitwise inversion may be applied, controlled by the *rgb_invert* and *alpha_invert* parameters. The final result is then passed downstream, to either another TMU or the Pixel*fx* chip.

In the *rgb_factor* and *alpha_factor* tables, β is the detail blend factor that is computed as a function of LOD, and λ is the fractional part of the LOD. See **`grTexDetailControl`** for further information.

`grTexCombine` also tracks required vertex parameters for the rendering routines. **`GR_COMBINE_FACTOR_NONE`** indicates that no parameters are required; it is functionally equivalent to **`GR_COMBINE_FACTOR_ZERO`**.

NOTES

C_{local} and A_{local} are the color components generated by indexing and filtering from the mipmap stored on the selected TMU; C_{other} and A_{other} are the incoming color components from the neighboring TMU.

Inverting the bits in a color is the same as computing (1.0 – color) for floating point color values in the range [0..1] or (255 – color) for 8-bit color values in the range [0..255].

The TMU closest to the Pixel*fx* chip is **`GR_TMU0`**. If a TMU exists upstream from **`GR_TMU0`**, it is **`GR_TMU1`**. If a TMU exists upstream from **`GR_TMU1`**, it is **`GR_TMU2`**.

SEE ALSO

`grDrawTriangle`, **`grTexLodBiasValue`**, **`grTexDetailControl`**

NAME

grTexDetailControl – set the detail texturing controls

C SPECIFICATION

```
void grTexDetailControl(  GrChipID_t  tmu,
                          int         lodBias,
                          FxU8        detailScale,
                          float       detailMax
                        )
```

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
lodBias	Controls where the blending between the two textures begins. This value is an LOD bias value in the range [–32.. +31].
detailScale	Controls the steepness of the blend. Values are in the range [0..7] are valid. The scale is computed as $2^{detailScale}$.
detailMax	Controls the maximum blending that occurs. Values in the range [0.0..1.0] are valid.

DESCRIPTION

Detail texturing refers to the effect where the blend between two textures in a texture combine unit is a function of the LOD calculated for each pixel. **grTexDetailControl** controls how the detail blending factor, β, is computed from LOD. The *lodBias* parameter controls where the blending begins, the *detailScale* parameter controls the steepness of the blend (how fast the detail pops in), and the *detailMax* parameter controls the maximum blending that occurs. Detail blending factor β is calculated as

$$\beta = \min(\ detailMax,\ \max(\ 0,\ (lodBias - \text{LOD}) \ll detailScale\ ) / 255.0\ )$$

where LOD is the calculated LOD before **grTexLodBiasValue** is added. The detail blending factor is typically used by calling **grTexCombine** with an *rgb_function* of **GR_COMBINE_FUNCTION_BLEND** and an *rgb_factor* of **GR_COMBINE_FACTOR_DETAIL_FACTOR** to compute:

$$C_{out} = \beta * detail\_texture + (1 - \beta) * main\_texture$$

NOTES

An LOD of *n* is calculated when a pixel covers approximately 2^{2n} texels. For example, when a pixel covers approximately 1 texel, the LOD is 0. When a pixel covers 4 texels, the LOD is 1, and when a pixel covers 16 texels, the LOD is 2.

Detail blending occurs in the downstream TMU. Since the detail texture and main texture typically have very different computed LODs, the detail texturing control settings depend on which texture is in the downstream TMU.

SEE ALSO

grTexCombine, **grTexLodBiasValue**

grTexDownloadMipMap

NAME

grTexDownloadMipMap – download a complete mipmap to texture memory

C SPECIFICATION

```
void grTexDownloadMipMap ( GrChipID_t  tmu,
                           FxU32       startAddress,
                           FxU32       evenOdd,
                           GrTexInfo   *info
                         )
```

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
startAddress	Offset into texture memory where the texture will be loaded.
evenOdd	Which mipmap levels to download. Valid values are **GR_MIPMAPLEVELMASK_EVEN**, **GR_MIPMAPLEVELMASK_ODD**, and **GR_MIPMAPLEVELMASK_BOTH**.
info	Format, dimensions, and image data for texture.

DESCRIPTION

grTexDownloadMipMap downloads an entire mipmap to an area of texture memory specified by *startAddress*. Valid values for *startAddress* must be between the values returned by **grTexMinAddress** and **grTexMaxAddress**.

NOTES

The **GrTexInfo** structure has changed in Glide 3.0. See **glide.h** for more information.

An error will occur if the mipmap is loaded into an area that crosses a 2MB boundary. See the *Glide Programming Manual* for more information.

SEE ALSO

grTexDownloadMipMapLevel, **grTexMinAddress**, **grTexMaxAddress**, **grTexTextureMemRequired**, **grTexSource**

NAME

grTexDownloadMipMapLevel – download a single mipmap level to texture memory

C SPECIFICATION

```
void grTexDownloadMipMapLevel ( GrChipID_t        tmu,
                                FxU32             startAddress,
                                GrLOD_t           thisLod,
                                GrLOD_t           largeLod,
                                GrAspectRatio_t   aspectRatio,
                                GrTextureFormat_t format,
                                FxU32             evenOdd,
                                void              *data
                              )
```

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
startAddress	Starting address in texture memory of the largest level of the mipmap.
thisLod	Constant describing LOD to be downloaded. Values are chosen from the following: **GR_LOD_LOG2_1**, **GR_LOD_LOG2_2**, **GR_LOD_LOG2**, **GR_LOD_LOG2_4**, **GR_LOD_LOG2_8**, **GR_LOD_LOG2_16**, **GR_LOD_LOG2_32**, **GR_LOD_LOG2_64**, **GR_LOD_LOG2_128**, and **GR_LOD_LOG2_256**.
largeLod	Constant describing largest LOD in the complete mipmap of which *thisLod* is a part. Values are chosen from the following: **GR_LOD_LOG2_1**, **GR_LOD_LOG2_2**, **GR_LOD_LOG2**, **GR_LOD_LOG2_4**, **GR_LOD_LOG2_8**, **GR_LOD_LOG2_16**, **GR_LOD_LOG2_32**, **GR_LOD_LOG2_64**, **GR_LOD_LOG2_128**, and **GR_LOD_LOG2_256**.
aspectRatio	Constant describing aspect ratio of texture image. Values are chosen from the following: **GR_ASPECT_LOG2_8x1**, **GR_ASPECT_LOG2_4x1**, **GR_ASPECT_LOG2_2x1**, **GR_ASPECT_LOG2_1x1**, **GR_ASPECT_LOG2_1x2**, **GR_ASPECT_LOG2_1x4**, and **GR_ASPECT_LOG2_1x8**.
format	Constant describing format of color data in texture image. Values are chosen from the following: **GR_TEXFMT_RGB_332**, **GR_TEXFMT_YIQ_422**, **GR_TEXFMT_ALPHA_8**, **GR_TEXFMT_INTENSITY_8**, **GR_TEXFMT_ALPHA_INTENSITY_44**, **GR_TEXFMT_P_8**, **GR_TEXFMT_8332**, **GR_TEXFMT_AYIQ_8422**, **GR_TEXFMT_RGB_565**, **GR_TEXFMT_ARGB_1555**, **GR_TEXFMT_ARGB_4444**, **GR_TEXFMT_ALPHA_INTENSITY_88**, and **GR_TEXFMT_AP_88**.
evenOdd	Which mipmap levels to download. Valid values are **GR_MIPMAPLEVELMASK_EVEN**, **GR_MIPMAPLEVELMASK_ODD**, and **GR_MIPMAPLEVELMASK_BOTH**.
data	Raw texture image data.

DESCRIPTION

`grTexDownloadMipMapLevel` downloads a single mipmap level. *startAddress* points to the beginning of the mipmap; Glide will calculate an offset from *startAddress* to the beginning of the level to be replaced.

startAddress must lie between the values returned by **`grTexMinAddress`** and **`grTexMaxAddress`**.

An error will occur if the mipmap level is loaded into an area that crosses a 2MB boundary. See the *Glide Programming Manual* for more information.

NOTES

SEE ALSO

`grTexDownloadMipMap`, **`grTexDownloadMipMapLevelPartial`**, **`grTexMinAddress`**, **`grTexMaxAddress`**, **`grTexTextureMemRequired`**, **`grTexSource`**

grTexDownloadMipMapLevelPartial

NAME

grTexDownloadMipMapLevelPartial – download part of a single mipmap level to texture memory

C SPECIFICATION

```
void grTexDownloadMipMapLevelPartial( GrChipID_t        tmu,
                                      FxU32             startAddress,
                                      GrLOD_t           thisLod,
                                      GrLOD_t           largeLod,
                                      GrAspectRatio_t   aspectRatio,
                                      GrTextureFormat_t format,
                                      FxU32             evenOdd
                                      void              *data,
                                      int               start,
                                      int               end
                                    )
```

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
startAddress	Starting address in texture memory of the largest level of the mipmap.
thisLod	Constant describing LOD to be downloaded. Values are chosen from the following: **GR_LOD_LOG2_1**, **GR_LOD_LOG2_2**, **GR_LOD_LOG2**, **GR_LOD_LOG2_4**, **GR_LOD_LOG2_8**, **GR_LOD_LOG2_16**, **GR_LOD_LOG2_32**, **GR_LOD_LOG2_64**, **GR_LOD_LOG2_128**, and **GR_LOD_LOG2_256**.
largeLod	Constant describing largest LOD in the complete mipmap of which *thisLod* is a part. Values are chosen from the following: **GR_LOD_LOG2_1**, **GR_LOD_LOG2_2**, **GR_LOD_LOG2**, **GR_LOD_LOG2_4**, **GR_LOD_LOG2_8**, **GR_LOD_LOG2_16**, **GR_LOD_LOG2_32**, **GR_LOD_LOG2_64**, **GR_LOD_LOG2_128**, and **GR_LOD_LOG2_256**.
aspectRatio	Constant describing aspect ratio of texture image. Values are chosen from the following: **GR_ASPECT_LOG2_8x1**, **GR_ASPECT_LOG2_4x1**, **GR_ASPECT_LOG2_2x1**, **GR_ASPECT_LOG2_1x1**, **GR_ASPECT_LOG2_1x2**, **GR_ASPECT_LOG2_1x4**, and **GR_ASPECT_LOG2_1x8**.
format	Constant describing format of color data in texture image. Values are chosen from the following: **GR_TEXFMT_RGB_332**, **GR_TEXFMT_YIQ_422**, **GR_TEXFMT_ALPHA_8**, **GR_TEXFMT_INTENSITY_8**, **GR_TEXFMT_ALPHA_INTENSITY_44**, **GR_TEXFMT_P_8**, **GR_TEXFMT_8332**, **GR_TEXFMT_AYIQ_8422**, **GR_TEXFMT_RGB_565**, **GR_TEXFMT_ARGB_1555**, **GR_TEXFMT_ARGB_4444**, **GR_TEXFMT_ALPHA_INTENSITY_88**, and **GR_TEXFMT_AP_88**.
evenOdd	Which mipmap levels to download. Valid values are **GR_MIPMAPLEVELMASK_EVEN**, **GR_MIPMAPLEVELMASK_ODD**, and **GR_MIPMAPLEVELMASK_BOTH**.
data	Raw texture image data.

start, end	Starting and ending rows of the mipmap to download.

DESCRIPTION

`grTexDownloadMipMapLevelPartial` downloads part of a single mipmap level. *startAddress* points to the beginning of the mipmap; Glide will calculate an offset from *startAddress* to the beginning of the level to be replaced, with *start* and *end* determining the specific rows of the mipmap level to replace.

Valid values for *startAddress* must be between the values returned by **`grTexMinAddress`** and **`grTexMaxAddress`**. *startAddress* should point to the beginning of the mipmap even if the starting row to be downloaded is not the first row in the texture.

NOTES

To download one row of the texture, use the same value for *start* and *end*.

An error will occur if the mipmap is loaded into an area that crosses a 2MB boundary. See the *Glide Programming Manual* for more information.

SEE ALSO

`grTexDownloadMipMap`, **`grTexDownloadMipMapLevel`**, **`grTexMinAddress`**, **`grTexMaxAddress`**, **`grTexTextureMemRequired`**, **`grTexSource`**

grTexDownloadTable

NAME

grTexDownloadTable – download an NCC table or color palette

C SPECIFICATION

void grTexDownloadTable(GrTexTable_t type, **void *data)**

PARAMETERS

type	Type of texture table. The valid values are: **GR_TEXTABLE_NCC0** – Narrow-channel compression table 0, **GR_TEXTABLE_NCC1** – Narrow-channel compression table 1, **GR_TEXTABLE_PALETTE** – 256 entry color palette containing 8-bit RGB. **GR_TEXTABLE_PALETTE_6666_EXT** – 256 entry color palette containing 6-bit ARGB. *This is an extension and may not be supported on all hardware*.
data	Table data, either of type **GuNccTable** or **GuTexPalette**.

DESCRIPTION

grTexDownloadTable downloads either an NCC table or a 256-entry color palette. The color palette is referenced when rendering texture formats **GR_TEXFMT_P_8** or **GR_TEXFMT_AP_88**. One of two NCC tables is used when decompressing texture formats **GR_TEXFMT_YIQ_422** or **GR_TEXFMT_AYIQ_8422**. Use **grTexNCCTable** to select one of the two NCC tables.

NOTES

grTexSource does not download a texture's table – this must be done separately using **grTexDownloadTable**.

grTexDownloadTable does not download an NCC table if the table address is the same as the last table downloaded. Therefore, if the table's data has changed, it must be copied to a new address before downloading.

Glide 3.0 implements one global palette and two global NCC tables. Previous versions of Glide allowed palettes and NCC tables to differ on each TMU. In Glide 3.0, however, if one TMU is using palette textures, then the others cannot be in NCC mode. Similarly, if one TMU is using a compressed texture, the palette is off limits to the other TMUs.

SEE ALSO

grGetString, **grTexDownloadTablePartial**, **grTexNCCTable**, **grTexSource**

grTexDownloadTablePartial

NAME

`grTexDownloadTablePartial` – download a subset of an NCC table or color palette

C SPECIFICATION

```
void grTexDownloadTablePartial(  GrTexTable_t  type,
                                 void          *data,
                                 int           start,
                                 int           end
                               )
```

PARAMETERS

type	Type of texture table. Valid values are: **`GR_TEXTABLE_PALETTE`** – 256-entry color palette containing 8-bit RGB. **`GR_TEXTABLE_PALETTE_6666_EXT`** – 256-entry color palette containing 6-bit ARGB. *This is an extension and may not be supported on all hardware.*
data	Table data, either of type **`GuNccTable`** or **`GuTexPalette`**.
start, end	Starting and ending entries to download.

DESCRIPTION

`grTexDownloadTablePartial` downloads part of a 256-entry color palette to a TMU. Entries from *start* up to and including *end* are downloaded. The color palette is referenced when rendering texture formats **`GR_TEXFMT_P_8`** or **`GR_TEXFMT_AP_88`**.

NOTES

To download one entry, use the same value for *start* and *end*.

Partial downloading of NCC tables is not supported at this time.

SEE ALSO

`grGetString`, **`grTexDownloadTable`**, **`grTexNCCTable`**, **`grTexSource`**

NAME

grTexFilterMode – specify the texture minification and magnification filters

C SPECIFICATION

```
void grTexFilterMode( GrChipID_t             tmu,
                      GrTextureFilterMode_t  minFilterMode,
                      GrTextureFilterMode_t  magFilterMode
                    )
```

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
minFilterMode	The minification filter, either **GR_TEXTUREFILTER_POINT_SAMPLED** or **GR_TEXTUREFILTER_BILINEAR**.
magFilterMode	The magnification filter, either **GR_TEXTUREFILTER_POINT_SAMPLED** or **GR_TEXTUREFILTER_BILINEAR**.

DESCRIPTION

grTexFilterMode specifies the texture filters for minification and magnification. The magnification filter is used when the LOD calculated for a pixel indicates that the pixel covers less than one texel. Otherwise, the minification filter is used.

NOTES

SEE ALSO

grTexSource

NAME

grTexLodBiasValue – set the LOD bias value

C SPECIFICATION

void grTexLodBiasValue(GrChipID_t tmu, **float bias)**

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
bias	The new LOD bias value, a signed floating point value in the range [-8..7.75].

DESCRIPTION

grTexLodBiasValue changes the current LOD bias value, which allows an application to maintain fine grain control over the effects of mipmapping, specifically when mipmap levels change. The LOD bias value is added to the LOD calculated for a pixel and the result determines which mipmap level to use. Smaller LOD values make increasingly sharper images which may suffer from aliasing and moiré effects. Larger LOD values make increasingly smooth images which may suffer from becoming too blurry. The default LOD bias value is 0.0.

During some special effects, an LOD bias may help image quality. If an application is not performing texture mapping with trilinear filtering or dithered mipmapping, then an LOD bias of 0.5 generally improves image quality by rounding to the nearest LOD. If an application is performing dithered mipmapping (i.e., **grTexMipMapMode** is **GR_MIPMAP_NEAREST_DITHER**), then an LOD bias of 0.0 or 0.25 generally improves image quality. An LOD bias value of 0.0 is usually best with trilinear filtering.

NOTES

The *bias* parameter is rounded to the nearest quarter increment.

SEE ALSO

grTexMipMapMode, **grTexSource**

NAME

`grTexMaxAddress` – return the highest start address for texture downloads

C SPECIFICATION

`FxU32 grTexMaxAddress( GrChipID_t tmu )`

PARAMETERS

tmu	Texture Mapping Unit to query. Valid values are **`GR_TMU0`**, **`GR_TMU1`**, and **`GR_TMU2`**.

DESCRIPTION

`grTexMaxAddress` returns the upper bound on texture memory addresses for a specific TMU.

NOTES

The returned address is the highest valid texture start address and is valid only for the smallest mipmap level **`GR_LOD_LOG2_1`**.

SEE ALSO

`grTexMinAddress`, **`grTexDownloadMipMap`**, **`grTexDownloadMipMapLevel`**, **`grTexSource`**

NAME

`grTexMinAddress` – return the lowest start address for texture downloads

C SPECIFICATION

`FxU32 grTexMinAddress( GrChipID_t tmu )`

PARAMETERS

tmu	Texture Mapping Unit to query. Valid values are **`GR_TMU0`**, **`GR_TMU1`**, and **`GR_TMU2`**.

DESCRIPTION

`grTexMinAddress` returns the lower bound on texture memory addresses for a specific TMU.

NOTES

SEE ALSO

`grTexMaxAddress`, **`grTexDownloadMipMap`**, **`grTexDownloadMipMapLevel`**, **`grTexSource`**

NAME

grTexMipMapMode – set the mipmapping mode

C SPECIFICATION

void grTexMipMapMode(GrChipID_t tmu, **GrMipMapMode_t mode**, **FxBool lodBlend)**

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
mode	The new mipmapping mode. Valid values are **GR_MIPMAP_DISABLE**, **GR_MIPMAP_NEAREST**, and **GR_MIPMAP_NEAREST_DITHER**.
lodBlend	**FXTRUE** enables blending between levels of detail for trilinear mipmapping. **FXFALSE** disables LOD blending.

DESCRIPTION

grTexMipMapMode sets the mipmapping mode for the graphics hardware. The graphics hardware performs mipmapping with no performance penalty. Either no mipmapping, nearest mipmapping, or nearest dithered mipmapping can be performed. Nearest mipmapping (**GR_MIPMAP_NEAREST**) selects the nearest mipmap based on LOD. Dithered nearest mipmapping (**GR_MIPMAP_NEAREST_DITHERED**) dithers between adjacent mipmap levels to reduce the effects of mipmap banding but without the cost of trilinear filtering with LOD blending.

NOTES

GR_MIPMAP_NEAREST_DITHERED mode can degrade fill-rate performance by 20-30% in some applications. If this mode is used, performance should be benchmarked to determine the cost of the increased quality. In order to prevent inadvertent use of the **GR_MIPMAP_NEAREST_DITHERED** mode, it's availability must be specifically enabled by calling **grEnable(GR_ALLOW_MIPMAP_DITHER)**. Note that **grEnable** merely make the mode available; it must still be enabled by calling **grTexMipMapMode**.

GR_MIPMAP_NEAREST truncates the LOD calculated for each pixel. To round to the nearest LOD, set the LOD bias value to 0.5 with **grTexLodBiasValue**.

GR_MIPMAP_NEAREST should be used when *lodBlend* is **FXTRUE**.

SEE ALSO

grEnable, **grTexLodBiasValue**, **grTexSource**

NAME

grTexMultibase – enables or disables multibase addressing

C SPECIFICATION

void grTexMultibase(GrChipID_t tmu, **FxBool enable)**

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
enable	**FXTRUE** enables multibase addressing, **FXFALSE** disables multibase addressing.

DESCRIPTION

grTexMultibase enables or disables multibase addressing. Normally, mipmap levels are stored sequentially in texture memory. Multibase addressing allows mipmap levels to be loaded into different texture memory locations. Multibase addressing must be enabled before downloading a multibased texture, and before rendering using a multibased texture. Multibase addressing must be disabled before downloading or rendering from a texture with a single base address.

NOTES

Use **grTexMultibaseAddress** to specify the multiple base addresses for a multibased texture.

An error will occur if a mipmap level is loaded into an area that crosses a 2MB boundary. See the *Glide Programming Manual* for more information.

SEE ALSO

grTexMultibaseAddress, **grTexSource**

NAME

grTexMultibaseAddress – specify one base address for a multibased texture

C SPECIFICATION

```
void grTexMultibaseAddress( GrChipID_t        tmu,
                            GrTexBaseRange_t  range,
                            FxU32             startAddress,
                            FxU32             evenOdd,
                            GrTexInfo         *info
                          )
```

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **GR_TMU0**, **GR_TMU1**, and **GR_TMU2**.
range	Which base address to specify. Valid values are **GR_TEXBASE_256**, **GR_TEXBASE_128**, **GR_TEXBASE_64** and **GR_TEXBASE_32_TO_1**.
startAddress	Starting address in texture memory for texture.
evenOdd	Which mipmap levels reside on this TMU for this texture. Valid values are **GR_MIPMAPLEVELMASK_EVEN**, **GR_MIPMAPLEVELMASK_ODD**, and **GR_MIPMAPLEVELMASK_BOTH**.
info	Format and dimensions of the texture.

DESCRIPTION

grTexMultibaseAddress specifies one base address for a texture with multiple base addresses. Normally, mipmap levels are stored sequentially in texture memory. Multibase addressing allows mipmap levels to be loaded into different texture memory locations. Four different base addresses are specified for a multibased texture, one for **GR_LOD_LOG2_256**, one for **GR_LOD_LOG2_128**, one for **GR_LOD_LOG2_64**, and one for **GR_LOD_LOG2_32** through **GR_LOD_LOG2_1**. In each case, *startAddress* should point to the texture memory location for the corresponding mipmap level.

All of the base addresses for a multibased texture should be specified before downloading the texture or rendering from the texture.

NOTES

The **GrTexInfo** structure has changed in Glide 3.0. See **glide.h** for more information.

grTexSource does not restore the multiple base addresses for a multibased texture, but does set the base address for mipmap level **GR_LOD_LOG2_256**. Therefore, it is not necessary to call **grTexMultibaseAddress** with a *range* of **GR_TEXBASE_256** after a call to **grTexSource**.

If a mipmap does not include some of the larger mipmap levels, then the base addresses associated with these missing levels need not be specified.

An error will occur if a mipmap level is loaded into an area that crosses a 2MB boundary. See the *Glide Programming Manual* for more information.

SEE ALSO

grTexMultibase, **grTexSource**

NAME

grTexNCCTable – select an NCC table

C SPECIFICATION

void grTexNCCTable(GrNCCTable_t table)

PARAMETERS

table	NCC table to use for decompressing compressed textures. Valid values are **GR_TEXTABLE_NCC0** and **GR_TEXTABLE_NCC1**.

DESCRIPTION

grTexNCCTable selects one of the two NCC tables as the current source for NCC decompression operations. Before rendering operations commence, the appropriate NCC table should be downloaded using **grTexDownloadTable**.

NOTES

Glide 3.0 implements two global NCC tables. Previous versions of Glide allowed different NCC tables on each TMU.

SEE ALSO

grTexDownloadTable, **grTexSource**

NAME

`grTexSource` – specify the current texture source for rendering

C SPECIFICATION

```
void grTexSource(  GrChipID_t  tmu,
                   FxU32       startAddress,
                   FxU32       evenOdd,
                   GrTexInfo   *info
                 )
```

PARAMETERS

tmu	Texture Mapping Unit to modify. Valid values are **`GR_TMU0`**, **`GR_TMU1`**, and **`GR_TMU2`**.
startAddress	Starting address in texture memory for texture.
evenOdd	Which mipmap levels have been downloaded at *startAddress*. Valid values are **`GR_MIPMAPLEVELMASK_EVEN`**, **`GR_MIPMAPLEVELMASK_ODD`**, and **`GR_MIPMAPLEVELMASK_BOTH`**.
info	Format and dimensions of the new texture.

DESCRIPTION

`grTexSource` sets up the area of texture memory that is to be used as a source for subsequent texture mapping operations. The *startAddress* specified should be the same as the *startAddress* argument to **`grTexDownloadMipMap`**, or the starting address used for the largest mipmap level when using **`grTexDownloadMipMapLevel`** or **`grTexDownloadMipMapLevelPartial`**.

NOTES

The **`GrTexInfo`** structure has changed in Glide 3.0. See **`glide.h`** for more information.

An error will occur if a mipmap level is loaded into an area that crosses a 2 Mbyte boundary. See the *Glide Programming Manual* for more information.

SEE ALSO

`grTexDownloadMipMap`, **`grTexDownloadMipMapLevel`**, **`grTexDownloadMipMapLevelPartial`**, **`grTexMinAddress`**, **`grTexMaxAddress`**, **`grTexTextureMemRequired`**

NAME

`grTexTextureMemRequired` – return the texture memory consumed by a texture

C SPECIFICATION

`FxU32 grTexTextureMemRequired( FxU32 evenOdd, GrTexInfo *info )`

PARAMETERS

evenOdd	Which mipmap levels are included: even, odd or both. Valid values are **`GR_MIPMAPLEVELMASK_EVEN`**, **`GR_MIPMAPLEVELMASK_ODD`**, and **`GR_MIPMAPLEVELMASK_BOTH`**.
info	Format and dimensions of the texture.

DESCRIPTION

`grTexTextureMemRequired` calculates and returns the number of bytes required to store a given texture, including any padding bytes required to properly align the mipmap in memory. See **`grGet(GR_TEXTURE_ALIGN,…)`**. The number returned may be added to the start address for a texture download to determine the next free location in texture memory.

NOTES

The **`GrTexInfo`** structure has changed in Glide 3.0. See **`glide.h`** for more information.

SEE ALSO

`grGet`, **`grTexCalcMemRequired`**, **`grTexDownloadMipMap`**, **`grTexDownloadMipMapLevel`**, **`grTexMinAddress`**, **`grTexMaxAddress`**, **`grTexSource`**

NAME

`grVertexLayout` – specify the format of by-vertex arrays

C SPECIFICATION

`void grVertexLayout ( FxU32 param, FxI32 offset, FxU32 mode )`

PARAMETERS

param	Parameter selector.
offset	Offset of the parameter data from the vertex pointer, in bytes.
mode	**`GR_PARAM_ENABLE`** or **`GR_PARAM_DISABLE.`**

DESCRIPTION

`grVertexLayout` specifies the internal format of the vertex structure for arrays organized in the *by-vertex* format. All parameters associated with a vertex (color, texture coordinates, etc.) are grouped together in a vertex structure, and there is a single array of these vertex structures. The layout of each vertex is defined with **`grVertexLayout`**, and drawn with **`grDrawVertexArray`**.

`grVertexLayout` is called once for each value of *param*, chosen from the tables that follow. Every vertex must include **`GR_PARAM_XY`**; the other components depend on your choice of coordinate space and rendering modes.

When using **clip coordinates**, use these values for *param*:

param	*type*	*size in bytes*	*description*	*values*	*usage*
GR_PARAM_XY	*FxFloat*	8	*x* and *y* coordinates. *Vertex snapping is no longer required*.	In the range [–*w*..*w*].	**Required**. Must be at *offset* 0.
GR_PARAM_Z	*FxFloat*	4	*z* coordinate.	In the range [–*w*..*w*].	When z buffering is enabled.
GR_PARAM_W	*FxFloat*	4	*w* coordinate.	In the range [1..64K].	Required.
GR_PARAM_Q	*FxFloat*	4	*Usage depends on choice of coordinate space*.	Depth/fog iterator.	When using fog mode **GR_FOG_WITH_TABLE_ON_Q** or *w* buffering is enabled. Defaults to 1 if not defined.
GR_PARAM_ST*n*	*FxFloat*	8	*s* and *t* coordinates for TMU *n*.	*s*, *t* in range [0,1] for one repeat of the texture. *Independent of aspect ratio*.	When texture mapping.
GR_PARAM_Q*n*	*FxFloat*	4	*q* coordinate for TMU *n*.		When texture mapping with projected textures. Defaults to GR_PARAM_Q if not defined.
GR_PARAM_A	*FxFloat*	4	*alpha* value.	In the range [0..1]	When using alpha blending, alpha testing, or anti-aliasing.
GR_PARAM_RGB	*FxFloat*	12	*RGB* triplet.	In the range [0..1]	Choose one of the two color formats.
GR_PARAM_PARGB	*FxU32*	4	Packed ARGB, one byte per component.	Each component is an integer in the range [0..255]	
GR_PARAM_FOG_EXT ***(if FOGCOORD extension is supported)***	*FxFloat*	4	Fog table index.	*f/w* in the range (0..1]	When using fog mode **GR_FOG_WITH_TABLE_ON_FOGCOORD_EXT**

When using **window coordinates**, choose from these values for *param*:

param	*type*	*size in bytes*	*description*	*values*	*usage*
GR_PARAM_XY	*FxFloat*	8	*x* and *y* coordinates. *Vertex snapping is no longer required*.	*x*/*w*, *y*/*w* in the range [–2048..2047]	**Required**. Must be at *offset* 0.
GR_PARAM_Z	*FxFloat*	4	*z* coordinate.	Stored as 1/*z*. In the range [0..64K]	When z buffering is enabled.
GR_PARAM_Q	*FxFloat*	4	*Usage depends on choice of coordinate space*.	1/*w*	Required.
GR_PARAM_ST*n*	*FxFloat*	8	*s* and *t* coordinates for TMU *n*.	Stored as *s*/*q*, *t*/*q* in the range [0..256] for one repeat of the texture. *The range of the smaller dimension is limited by the aspect ratio*. *See Chapter 9*.	When texture mapping.
GR_PARAM_Q*n*	*FxFloat*	4	*q* coordinate for TMU *n*.	In the range [0..255]	When texture mapping with projected textures. Defaults to GR_PARAM_Q if not defined or if disabled.
GR_PARAM_A	*FxFloat*	4	*alpha* value.	In the range [0..255]	When using alpha blending, alpha testing, or anti-aliasing.
GR_PARAM_RGB	*FxFloat*	12	*RGB* triplet.	In the range [0..255].	Choose one of the two color formats.
GR_PARAM_PARGB	*FxU32*	4	Packed ARGB, one byte per component.	Each component is an integer in the range [0..255].	
GR_PARAM_FOG_EXT ***(if FOGCOORD extension is supported)***	*FxFloat*	4	Fog table index.	Stored as *f*/*q* in the range (0..1].	When using fog mode **GR_FOG_WITH_TABLE_ON_FOGCOORD_EXT**

offset is the offset in bytes of the parameter data from the vertex pointer. The offset can be either positive or negative.

mode is either **GR_PARAM_ENABLE** or **GR_PARAM_DISABLE**. Disabling a parameter will potentially cause it to inherit the last known value. When a parameter is disabled the offset argument is ignored. Disabling a mandatory parameter like **GR_PARAM_XY** will cause a fatal Glide error.

grVertexLayout modifies the behavior of all **grDrawVertex*** APIs.

NOTES

Glide 3.0 is the first release to support **`grVertexLayout`**.

The **`GrVertex`** structure has disappeared in Glide 3.0, to be replaced by a user-defined structure whose layout is communicated through calls to **`grVertexLayout`**. To create the old structure, define it in the application and execute the appropriate calls:

```
typedef struct{
   float x, y, z;           /* X, Y, Z */
   float r, g, b;           /* R, G, B */
   float ooz;               /* 65535/Z (used for Z-buffering) */
   float a;                 /* Alpha */
   float oow;               /* 1/W (used for W-buffering, texturing) */
   GrTmuVertex tmuvtx[GLIDE_NUM_TMU];
} MyVertex;                 /* old GrVertex */

grCoordinateSpace(GR_WINDOW_COORDS);
grVertexLayout(GR_PARAM_XY, 0, GR_PARAM_ENABLE);
grVertexLayout(GR_PARAM_RGB, 12, GR_PARAM_ENABLE);
grVertexLayout(GR_PARAM_Z, 24, GR_PARAM_ENABLE);
grVertexLayout(GR_PARAM_A, 28, GR_PARAM_ENABLE);
grVertexLayout(GR_PARAM_Q, 32, GR_PARAM_ENABLE);
grVertexLayout(GR_PARAM_ST0, 36, GR_PARAM_ENABLE);
```

To conserve memory, define only the parameters that will be used by the rendering mode and coordinate space settings you have chosen.

SEE ALSO

`grDrawVertexArray`, **`grFogMode`**, **`grGet`**, **`grGetString`**, **`grGlideGetVertexLayout`**, **`grGlideSetVertexLayout`**

NAME

`grViewport` – define a viewport

C SPECIFICATION

`void grViewport ( FxI32 x, FxI32 y, FI32 width, FxI32 height )`

PARAMETERS

x, y	The origin of the viewport, relative to the screen origin.
width, *height*	The width and height of the viewport.

DESCRIPTION

`grViewport` specifies the viewport transformation. The current **`grSstOrigin`** setting determines whether *x* and *y* specify the upper left corner or the lower left corner. Negative *width* and *height* are allowed and mirror the image about the *x* or *y* axis. If (x_s, y_s) represent normalized screen coordinates, then the window coordinates (x_{win}, x_{win}) are computed as:

$$x_{win} = (x_s+1)(width/2) + x \quad \text{and} \quad y_{win} = (y_s+1)(height/2) + y$$

NOTES

Glide 3.0 is the first release to support **`grViewport`**.

SEE ALSO

gu3dfGetInfo

NAME

`gu3dfGetInfo` – get information about the mipmap stored in a **`.3DF`** file

C SPECIFICATION

`FxBool gu3dfGetInfo( const char *filename, Gu3dfInfo *info )`

PARAMETERS

filename	Name of the **`.3DF`** file.
info	Pointer to a **`Gu3dfInfo`** structure to fill with information about the mipmap.

DESCRIPTION

`gu3dfGetInfo` allows an application to determine relevant information about a **`.3DF`** file located on disk. The information is assigned to the appropriate member elements of the *info* structure. The **`Gu3dfInfo`** structure is defined in **`glide.h`**.

After an application has determined the characteristics of a **`.3DF`** mipmap, it is responsible for allocating system memory for the mipmap. This pointer is stored in the *info*®*data* pointer and used by **`gu3dfLoad`**.

NOTES

SEE ALSO

`gu3dfLoad`

NAME

`gu3dfLoad` – load a **`.3DF`** file into system memory

C SPECIFICATION

`FxBool gu3dfLoad( const char *filename, Gu3dfInfo *info )`

PARAMETERS

filename	Name of the file to load.
info	Pointer to a **`Gu3dfInfo`** structure that **`gu3dfLoad`** fills in after loading the file.

DESCRIPTION

`gu3dfLoad` loads a **`.3DF`** file specified by *filename* into the pointer specified by *info®data*. **`gu3dfLoad`** returns **`FXTRUE`** if the file was successfully loaded; otherwise it returns **`FXFALSE`**. It is assumed the *info* structure passed has been appropriately configured with a call to **`gu3dfGetInfo`**.

NOTES

SEE ALSO

`gu3dfGetInfo`

NAME

guFogGenerateExp – generate an exponential fog table

C SPECIFICATION

void guFogGenerateExp(GrFog_t *fogTable, float density)

PARAMETERS

fogTable	Pointer to an array that will receive the generated fog table values.
density	The fog density, typically between 0.0 and 1.0.

DESCRIPTION

guFogGenerateExp generates an exponential fog table according to the equation:

$$e^{-density*w}$$

where *w* is the eye-space *w* coordinate associated with the fog table entry. The resulting fog table is copied into *fogTable*.

NOTES

The fog table is normalized (scaled) such that the last entry is maximum fog (255).

SEE ALSO

grFogMode, **grFogTable**, **guFogGenerateExp2**, **guFogGenerateLinear**, **guFogTableIndexToW**

NAME

guFogGenerateExp2 – generate an exponential squared fog table

C SPECIFICATION

void guFogGenerateExp2(GrFog_t *fogTable, float density)

PARAMETERS

fogTable	Pointer to an array that will receive the generated fog table values.
density	The fog density, typically between 0.0 and 1.0.

DESCRIPTION

guFogGenerateExp2 generates an exponential squared fog table according to the equation:

$$e^{-(density*w)2}$$

where *w* is the eye-space *w* coordinate associated with the fog table entry. The resulting fog table is copied into *fogTable*.

NOTES

The fog table is normalized (scaled) such that the last entry is maximum fog (255).

SEE ALSO

grFogMode, **grFogTable**, **guFogGenerateExp**, **guFogGenerateLinear**, **guFogTableIndexToW**

Name

guFogGenerateLinear – generate a linear fog table

C Specification

```
void guFogGenerateLinear(  GrFog_t   *fogTable,
                           float     near,
                           float     far
                         )
```

Parameters

fogTable	Pointer to an array that will receive the generated fog table values.
near	The eye-space *w* coordinate where minimum fog exists.
far	The eye-space *w* coordinate where maximum fog exists.

Description

guFogGenerateLinear generates a linear (in eye-space) fog table according to the equation:

$$(w - near)/(far - near)$$

where *w* is the eye-space *w* coordinate associated with the fog table entry. The resulting fog table is copied into *fogTable*.

Notes

The fog table is clamped so that all values are between minimum fog (0) and maximum fog (255).

guFogGenerateLinear fog is linear in eye-space *w*, *not* in screen-space.

See Also

grFogMode, **grFogTable**, **guFogGenerateExp**, **guFogGenerateExp2**, **guFogTableIndexToW**

NAME

guFogTableIndexToW – convert a fog table index to a floating point eye-space *w* value

C SPECIFICATION

float guFogTableIndexToW(int i)

PARAMETERS

i	The fog table index, between 0 and **GR_FOG_TABLE_SIZE**.

DESCRIPTION

guFogTableIndexToW returns the floating point fog coordinate value associated with entry *i* in a fog table. Because fog table entries are non-linear, it is not straight forward to initialize a fog table. **guFogTableIndexToW** assists by converting fog table indices to eye-space *w* values.

NOTES

guFogTableIndexToW returns the following:

```
pow(2.0, 3.0+(double)(i>>2)) / (8-(i&3));
```

SEE ALSO

grFogMode, **grFogTable**, **guFogGenerateExp**, **guFogGenerateExp2**, **guFogGenerateLinear**

NAME

guGammaCorrectionRGB – set up gamma correction tables

C SPECIFICATION

void guGammaCorrectionRGB (FxFloat gRed, FxFloat gGreen, FxFloat gBlue)

PARAMETERS

gRed	The gamma correction value for the *red* component.
gGreen	The gamma correction value for the *green* component.
gBlue	The gamma correction value for the *blue* component.

DESCRIPTION

guGammaCorrectionRGB sets the gamma tables by computing a gamma correction curve for each color component using the equation:

$$c_\gamma = 255 * (c/255)^{1/\gamma}$$

where c is the original red, green, or blue color component in the range [0, 255], γ is the component-specific gamma value, and c_g is the gamma-corrected color component value.

The gamma-corrected values are used to generate a hardware-dependent gamma table, which is automatically downloaded.

NOTES

Glide 3.0 is the first release to support **guGammaCorrectionRGB**. It replaces the now-obsolete **grGammaCorrectionValue**.

SEE ALSO

FOLE90	Foley, J., A. van Dam, S. Feiner, and J. Hughes, “Computer Graphics”, Addison-Wesley, Reading, 1990
SUTH74	Sutherland, I. E. and G. W. Hodgman, “Reentrant Polygon Clipping”, **CACM** 17(1), 32-42
WILL83	Williams, L., “Pyramidal Parametrics”, *SIGGRAPH 83*, 1-