bteve

James Bowman

Jul 20, 2021

CONTENTS:

`bteve` is a Python driver for BridgeTek's EVE series GPUs. In particular it supports the Gameduino 3X series of display adapters.

It supports:

- Python running on Windows/MacOS/Linux, connected via a `SPIDriver` to the Gameduino or BT81x
- CircuitPython on an embedded board, including
  - Adafruit M4 Metro and Feather
  - Adafruit Metro M4
  - Teensy 4.x
  - Raspberry Pi Pico

```
import sys
import bteve as eve

if sys.implementation.name == "circuitpython":
    gd = eve.Gameduino()
else:
    from spidriver import SPIDriver
    gd = eve.Gameduino(SPIDriver(sys.argv[1]))
gd.init()

gd.ClearColorRGB(0x20, 0x40, 0x20)
gd.Clear()
gd.cmd_text(gd.w // 2, gd.h // 2, 31, eve.OPT_CENTER, "Hello world")
gd.swap()
```


```
import sys
import random
import bteve as eve

rr = random.randrange

if sys.implementation.name == "circuitpython":
```

(continues on next page)

(continued from previous page)

```
    gd = eve.Gameduino()
else:
    from spidriver import SPIDriver
    gd = eve.Gameduino(SPIDriver(sys.argv[1]))
gd.init()

while True:
    gd.Clear()
    gd.Begin(eve.POINTS)
    for i in range(100):
        gd.ColorRGB(rr(256), rr(256), rr(256))
        gd.PointSize(rr(100))
        gd.Vertex2f(rr(gd.w), rr(gd.h))
    gd.swap()
```

CHAPTER

ONE

MODULE CLASSES

1.1 Gameduino

The Gameduino class is a specialization of the base class *EVE*.

class Gameduino([*d*])

Parameters **d** (*spidriver*) – when running on a PC, a SPIDriver object for communicating with the EVE hardware

init()
Initialize the EVE hardware. Confirm that the BT81x is running, configure it for the attached screen, and render a blank frame.

On CircuitPython this method uses `cpy:sdcardio` to attach to the GD3X microSD card as `"/sd/"`, so any files on the card can be accessed with the prefix `"/sd/"`.

w
Width of the display, in pixels. Available after calling *init()*.

h
Height of the display, in pixels. Available after calling *init()*.

rd(*a*, *n*)
Read directly from EVE memory

Parameters

- **a** (*int*) – address in EVE memory
- **n** (*int*) – number of bytes to read

Return bytes memory contents

wr(*a*, *bb*)
Write directly to EVE memory

Parameters

- **a** (*int*) – address in EVE memory
- **bb** (*bytes*) – bytes to write

rd32(*a*)
Read a 32-bit value from EVE memory :param int a: address in EVE memory :returns int: memory contents

wr32(*a*, *v*)
Write a 32-bit value to EVE memory

Parameters

- **a** (*int*) – address in EVE memory
- **v** (*int*) – value to write

is_finished()

Returns True if the EVE command FIFO is empty

Returns bool True if the EVE command FIFO is empty

This method is the non-blocking equivalent of *EVE.finish()*.

result(*n=1*)

Returns int result field

Return the result field of the most recent command, if any.

1.2 EVE

This class provides all graphics drawing operations, graphics state operations, and graphics commands.

Methods for simple drawing and drawing state:

- *Begin()*
- *Vertex2f()*
- *LineWidth()*
- *PointSize()*
- *BitmapHandle()*
- *Cell()*
- *ColorRGB()*
- *ColorA()*
- *End()*
- *Vertex2ii()*

Methods for clearing the screen:

- *ClearColorA()*
- *ClearColorRGB()*
- *Clear()*

Methods to set the 2D scissor clipping rectangle:

- *ScissorSize()*
- *ScissorXY()*

Methods to set the tag state, so that touch events can be attached to screen objects:

- *ClearTag()*
- *TagMask()*
- *Tag()*

Methods to preserve and restore the graphics state:

- *RestoreContext()*
- *SaveContext()*

Methods to control rendering and display:

- *swap()*
- *flush()*
- *finish()*

Methods to set the alpha blend state, allowing more advanced transparency and compositing operations:

- *AlphaFunc()*
- *BlendFunc()*
- *ColorMask()*

Methods to set the stencil state, allowing conditional drawing and other logial operations:

- *ClearStencil()*
- *StencilFunc()*
- *StencilMask()*
- *StencilOp()*

Low-level methods to set the bitmap format (See *cmd_setbitmap()* for a higher-level alternative.):

- *BitmapExtFormat()*
- *BitmapLayoutH()*
- *BitmapLayout()*
- *BitmapSizeH()*
- *BitmapSize()*
- *BitmapSource()*
- *BitmapSwizzle()*
- *PaletteSource()*

Low-level methods set the bitmap transform matrix (See *cmd_scale()*, `cmd_translate()`, `cmd_setmatrix()` etc. for a higher-level alternative.):

- *BitmapTransformA()*
- *BitmapTransformB()*
- *BitmapTransformC()*
- *BitmapTransformD()*
- *BitmapTransformE()*
- *BitmapTransformF()*
- *Macro()*

Methods to set the precision and offset used by `Vertex2f()`:

- `VertexTranslateX()`

- VertexTranslateY()
- VertexFormat()

class EVE

AlphaFunc(*func*, *ref*)
Set the alpha test function

Parameters

- **func** (*int*) – specifies the test function, one of *NEVER*, *LESS*, *LEQUAL*, *GREATER*, *GEQUAL*, *EQUAL*, *NOTEQUAL*, or *ALWAYS*. Range 0-7. The initial value is ALWAYS(7)
- **ref** (*int*) – specifies the reference value for the alpha test. Range 0-255. The initial value is 0

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

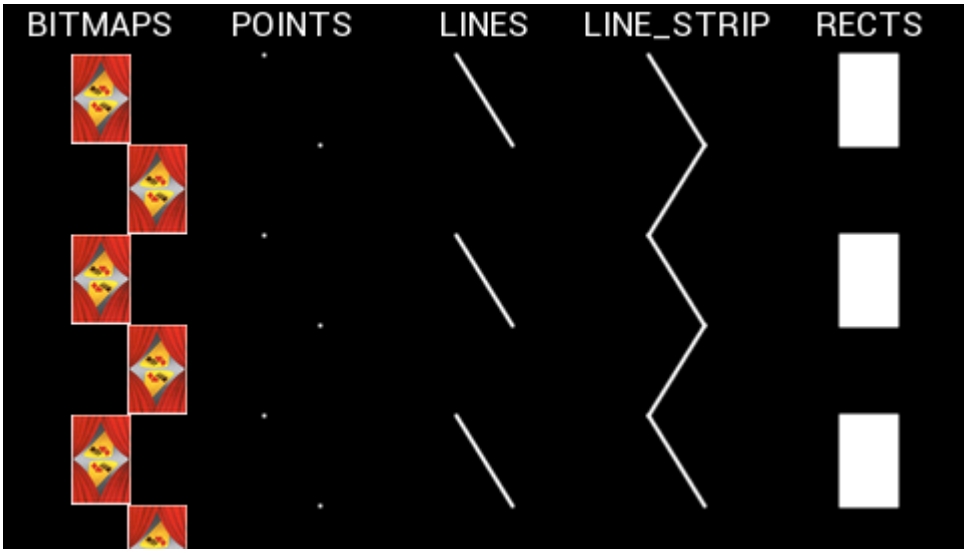
Begin(*prim*)
Begin drawing a graphics primitive

Parameters **prim** (*int*) – graphics primitive.

Valid primitives are *BITMAPS*, *POINTS*, *LINES*, *LINE_STRIP*, *EDGE_STRIP_R*, *EDGE_STRIP_L*, *EDGE_STRIP_A*, *EDGE_STRIP_B* and *RECTS*.

Examples

```
def zigzag(title, x):
    for i in range(3):
      gd.Vertex2f(x - 14,   25 + i * 90)
      gd.Vertex2f(x + 14,   25 + 45 + i * 90)
    gd.cmd_text(x, 0, 27, eve.OPT_CENTERX, title)

gd.Begin(eve.BITMAPS)
zigzag("BITMAPS", 48)

gd.Begin(eve.POINTS)
zigzag("POINTS",  48 + 1 * 96)

gd.Begin(eve.LINES)
zigzag("LINES",  48 + 2 * 96)

gd.Begin(eve.LINE_STRIP)
zigzag("LINE_STRIP",  48 + 3 * 96)

gd.Begin(eve.RECTS)
zigzag("RECTS",  48 + 4 * 96)
```



BitmapExtFormat(*format*)
Set the bitmap format

Parameters **format** (*int*) – bitmap pixel format.

BitmapHandle(*handle*)
Set the bitmap handle

Parameters **handle** (*int*) – bitmap handle. Range 0-31. The initial value is 0

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

BitmapLayout(*format*, *linestride*, *height*)
Set the source bitmap memory format and layout for the current handle

Parameters

- **format** (*int*) – bitmap pixel format, or GLFORMAT to use BITMAP_EXT_FORMAT instead. Range 0-31
- **linestride** (*int*) – bitmap line stride, in bytes. Range 0-1023
- **height** (*int*) – bitmap height, in lines. Range 0-511

BitmapLayoutH(*linestride*, *height*)
Set the source bitmap memory format and layout for the current handle. high bits for large bitmaps

Parameters

- **linestride** (*int*) – high part of bitmap line stride, in bytes. Range 0-7
- **height** (*int*) – high part of bitmap height, in lines. Range 0-3

BitmapSize(*filter*, *wrapx*, *wrapy*, *width*, *height*)
Set the screen drawing of bitmaps for the current handle

Parameters

- **filter** (*int*) – bitmap filtering mode, one of *NEAREST* or *BILINEAR*.

- **wrapx** (*int*) – bitmap x wrap mode, one of *REPEAT* or *BORDER*.
- **wrapy** (*int*) – bitmap y wrap mode, one of *REPEAT* or *BORDER*.
- **width** (*int*) – drawn bitmap width, in pixels. Range 0-511
- **height** (*int*) – drawn bitmap height, in pixels. Range 0-511

BitmapSizeH(*width*, *height*)
Set the screen drawing of bitmaps for the current handle. high bits for large bitmaps

Parameters

- **width** (*int*) – high part of drawn bitmap width, in pixels. Range 0-3
- **height** (*int*) – high part of drawn bitmap height, in pixels. Range 0-3

BitmapSource(*addr*)
Set the source address for bitmap graphics

Parameters **addr** (*int*) – Bitmap start address, pixel-aligned. May be in SRAM or flash. Range 0-16777215

BitmapSwizzle(*r*, *g*, *b*, *a*)
Set the source for the r,g,b and a channels of a bitmap

Parameters

- **r** (*int*) – red component source
- **g** (*int*) – green component source
- **b** (*int*) – blue component source
- **a** (*int*) – alpha component source

The source parameter may be one of:

- *ZERO* constant zero
- *ONE* constant one
- *RED* source bitmap red
- *GREEN* source bitmap green
- *BLUE* source bitmap blue
- *ALPHA* source bitmap alpha

BitmapTransformA(*p*, *v*)
Set the a component of the bitmap transform matrix

Parameters

- **p** (*int*) – precision control: 0 is 8.8, 1 is 1.15. Range 0-1. The initial value is 0
- **v** (*int*) – The a component of the bitmap transform matrix, in signed 8.8 or 1.15 bit fixed-point form. Range 0-131071. The initial value is 256

The initial value is **p** = 0, **v** = 256. This represents the value 1.0.

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

BitmapTransformB(*p*, *v*)
Set the b component of the bitmap transform matrix

Parameters

- **p** (*int*) – precision control: 0 is 8.8, 1 is 1.15. Range 0-1. The initial value is 0
- **v** (*int*) – The b component of the bitmap transform matrix, in signed 8.8 or 1.15 bit fixed-point form. Range 0-131071. The initial value is 0

The initial value is **p** = 0, **v** = 0. This represents the value 0.0.

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

BitmapTransformC(*v*)
Set the c component of the bitmap transform matrix

Parameters **v** (*int*) – The c component of the bitmap transform matrix, in signed 15.8 bit fixed-point form. Range 0-16777215. The initial value is 0

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

BitmapTransformD(*p*, *v*)
Set the d component of the bitmap transform matrix

Parameters

- **p** (*int*) – precision control: 0 is 8.8, 1 is 1.15. Range 0-1. The initial value is 0
- **v** (*int*) – The d component of the bitmap transform matrix, in signed 8.8 or 1.15 bit fixed-point form. Range 0-131071. The initial value is 0

The initial value is **p** = 0, **v** = 0. This represents the value 0.0.

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

BitmapTransformE(*p*, *v*)
Set the e component of the bitmap transform matrix

Parameters

- **p** (*int*) – precision control: 0 is 8.8, 1 is 1.15. Range 0-1. The initial value is 0
- **v** (*int*) – The e component of the bitmap transform matrix, in signed 8.8 or 1.15 bit fixed-point form. Range 0-131071. The initial value is 256

The initial value is **p** = 0, **v** = 256. This represents the value 1.0.

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

BitmapTransformF(*v*)
Set the f component of the bitmap transform matrix

Parameters **v** (*int*) – The f component of the bitmap transform matrix, in signed 15.8 bit fixed-point form. Range 0-16777215. The initial value is 0

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

BlendFunc(*src*, *dst*)
Set pixel arithmetic

Parameters

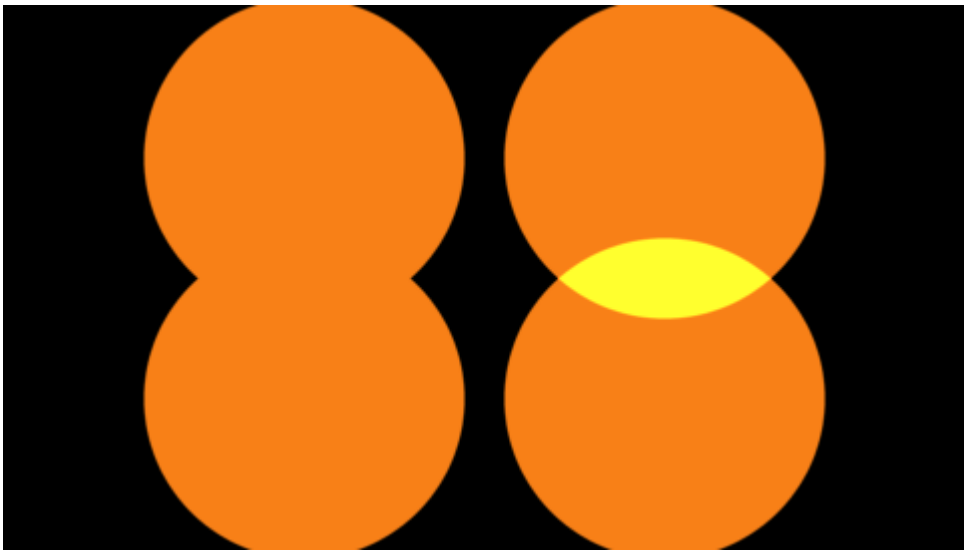
- **src** (*int*) – specifies how the source blending factor is computed. One of *ZERO*, *ONE*, *SRC_ALPHA*, *DST_ALPHA*, *ONE_MINUS_SRC_ALPHA* or *ONE_MINUS_DST_ALPHA*. The initial value is SRC_ALPHA

- **dst** (*int*) – specifies how the destination blending factor is computed, one of the same constants as **src**. The initial value is ONE_MINUS_SRC_ALPHA

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

Examples

```
gd.Begin(eve.POINTS)
gd.ColorRGB(0xf8, 0x80, 0x17)
gd.PointSize(160)
gd.BlendFunc(eve.SRC_ALPHA, eve.ONE_MINUS_SRC_ALPHA)
gd.Vertex2f(150, 76); gd.Vertex2f(150, 196)
gd.BlendFunc(eve.SRC_ALPHA, eve.ONE)
gd.Vertex2f(330, 76); gd.Vertex2f(330, 196)
```



Cell(*cell*)

Set the bitmap cell number used by *Vertex2f()* when drawing *BITMAPS*.

Parameters **cell** (*int*) – bitmap cell number. Range 0-127. The initial value is 0

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

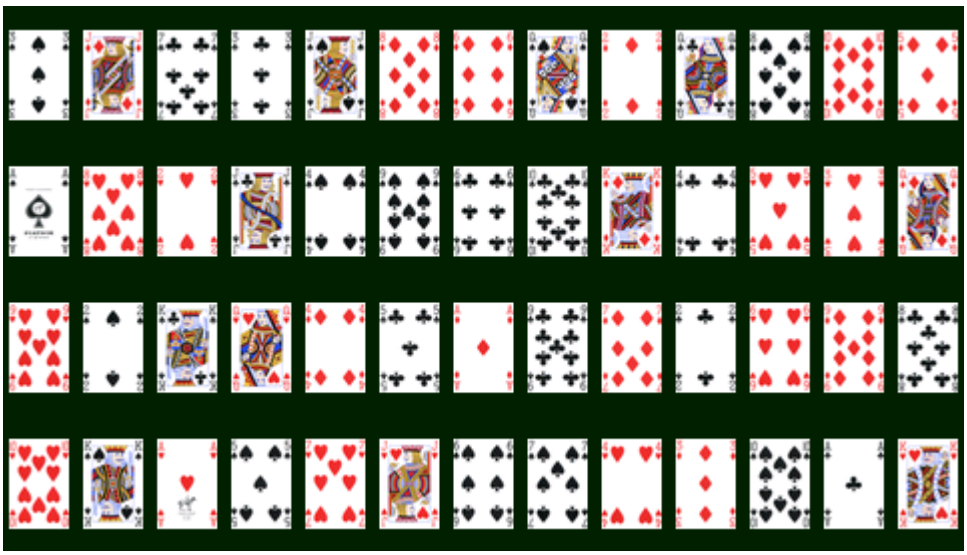
Examples

```
deck = list(range(1, 53))           # Cards are cells 1-52
random.shuffle(deck)
gd.ClearColorRGB(0x00, 0x20, 0x00)
gd.Clear()
gd.Begin(eve.BITMAPS)
for i in range(52):
    x = 3 + (i % 13) * 37           # 13 cards per row
    y = 12 + (i // 13) * 68         # 4 rows
```

(continues on next page)

(continued from previous page)

```
    gd.Cell(deck[i])                # select which card to draw
    gd.Vertex2f(x, y)               # draw the card
```



ClearColorA(*alpha*)
Set clear value for the alpha channel

Parameters **alpha** (*int*) – alpha value used when the color buffer is cleared. Range 0-255. The initial value is 0

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

ClearColorRGB(*red*, *green*, *blue*)
Set clear values for red, green and blue channels

Parameters

- **red** (*int*) – red value used when the color buffer is cleared. Range 0-255. The initial value is 0
- **green** (*int*) – green value used when the color buffer is cleared. Range 0-255. The initial value is 0
- **blue** (*int*) – blue value used when the color buffer is cleared. Range 0-255. The initial value is 0

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

Examples

```
gd.ClearColorRGB(0x00, 0x80, 0x80)          # teal
gd.Clear()
gd.ScissorSize(100, 200)
```

(continues on next page)

(continued from previous page)

```
gd.ScissorXY(10, 20)
gd.ClearColorRGB(0xf8, 0x80, 0x17)          # orange
gd.Clear()
```

Clear(*c=1*, *s=1*, *t=1*)

Clear buffers to preset values

Parameters

- **c** (*int*) – clear color buffer. Range 0-1
- **s** (*int*) – clear stencil buffer. Range 0-1
- **t** (*int*) – clear tag buffer. Range 0-1

Examples

```
gd.ClearColorRGB(0x00, 0x00, 0xff)  # Clear color to blue
gd.ClearStencil(0x80)               # Clear stencil to 0x80
gd.ClearTag(100)                    # Clear tag to 100
gd.Clear(1, 1, 1)                   # Go!
```

ClearStencil(*s*)
Set clear value for the stencil buffer

Parameters **s** (*int*) – value used when the stencil buffer is cleared. Range 0-255. The initial value is 0

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

ClearTag(*s*)
Set clear value for the tag buffer

Parameters **s** (*int*) – value used when the tag buffer is cleared. Range 0-255. The initial value is 0

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

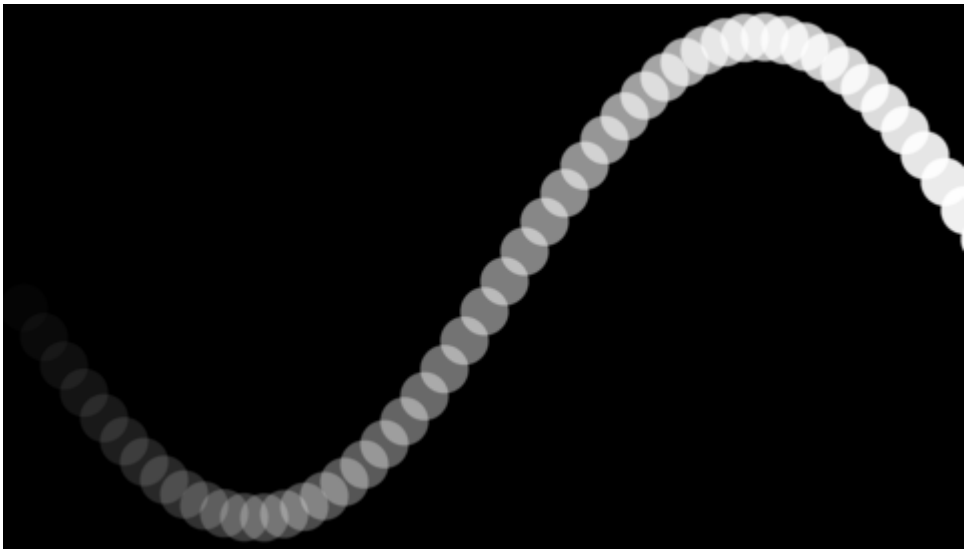
ColorA(*alpha*)
Set the current color alpha

Parameters **alpha** (*int*) – alpha for the current color. Range 0-255. The initial value is 255

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

Examples

```
gd.Begin(eve.POINTS)
gd.PointSize(24)
for i in range(0, 256, 5):
    gd.ColorA(i)
    gd.Vertex2f(2 * i, 136 + 120 * math.sin(i / 40))
```



ColorMask(*r*, *g*, *b*, *a*)

Enable and disable writing of frame buffer color components

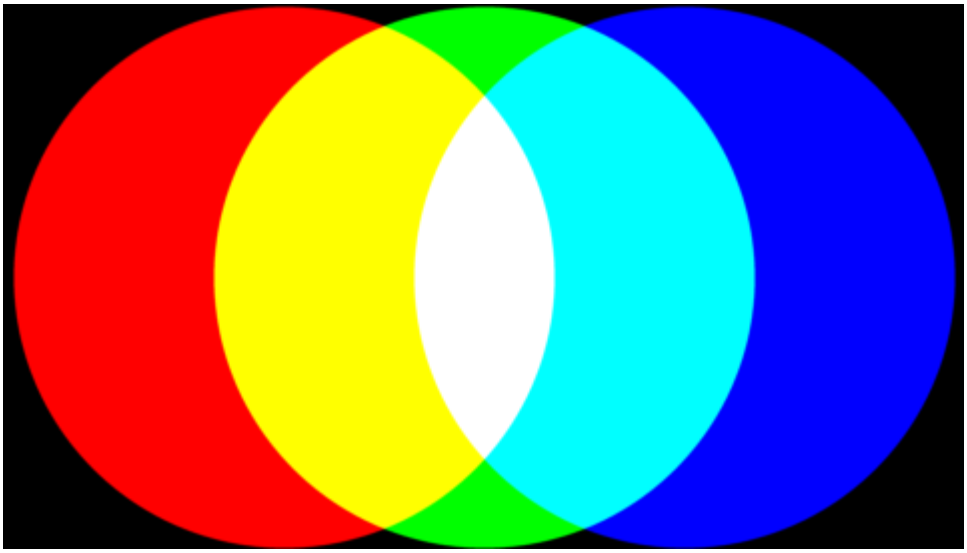
Parameters

- **r** (*int*) – allow updates to the frame buffer red component. Range 0-1. The initial value is 1
- **g** (*int*) – allow updates to the frame buffer green component. Range 0-1. The initial value is 1
- **b** (*int*) – allow updates to the frame buffer blue component. Range 0-1. The initial value is 1
- **a** (*int*) – allow updates to the frame buffer alpha component. Range 0-1. The initial value is 1

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

Examples

```
gd.PointSize(270)
gd.Begin(eve.POINTS)
gd.ColorMask(1, 0, 0, 0)          # red only
gd.Vertex2f(240 - 100, 136)
gd.ColorMask(0, 1, 0, 0)          # green only
gd.Vertex2f(240, 136)
gd.ColorMask(0, 0, 1, 0)          # blue only
gd.Vertex2f(240 + 100, 136)
```



ColorRGB(*red*, *green*, *blue*)

Set the drawing color

Parameters

- **red** (*int*) – red value for the current color. Range 0-255. The initial value is 255
- **green** (*int*) – green for the current color. Range 0-255. The initial value is 255
- **blue** (*int*) – blue for the current color. Range 0-255. The initial value is 255

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

Examples

```
gd.Begin(eve.RECTS)
gd.ColorRGB(255, 128, 30)                    # orange
gd.Vertex2f(10, 10); gd.Vertex2f(470, 130)
gd.ColorRGB(0x4c, 0xc4, 0x17)                # apple green
gd.Vertex2f(10, 140); gd.Vertex2f(470, 260)
```

End()
End drawing a graphics primitive

Vertex2ii() and *Vertex2f()* calls are ignored until the next *Begin()*.

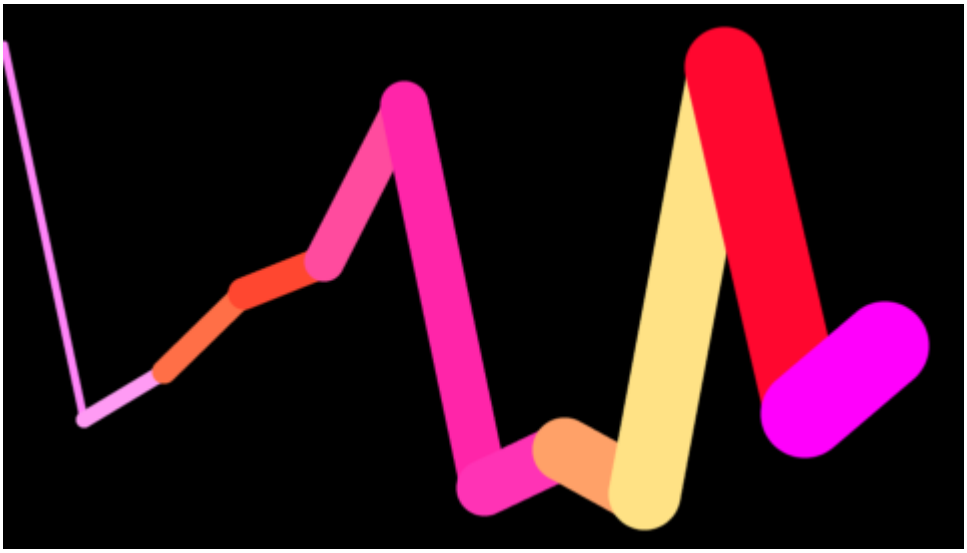
LineWidth(*width*)
Set the width of rasterized lines

Parameters **width** (*float*) – line width in pixels. Range 0-511. The initial value is 1

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

Examples

```
gd.Begin(eve.LINE_STRIP)
for x in range(0, 480, 40):
    gd.LineWidth(x / 10)
    gd.ColorRGB(0xff, random.randrange(256), random.randrange(256))
    gd.Vertex2f(x, random.randrange(272))
```



Macro(*m*)
Execute a single command from a macro register

Parameters **m** (*int*) – macro register to read. Range 0-1

Nop()
No operation

PaletteSource(*addr*)
Set the base address of the palette

Parameters **addr** (*int*) – Address in graphics SRAM, 2-byte aligned. Range 0-4194303. The initial value is 0

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

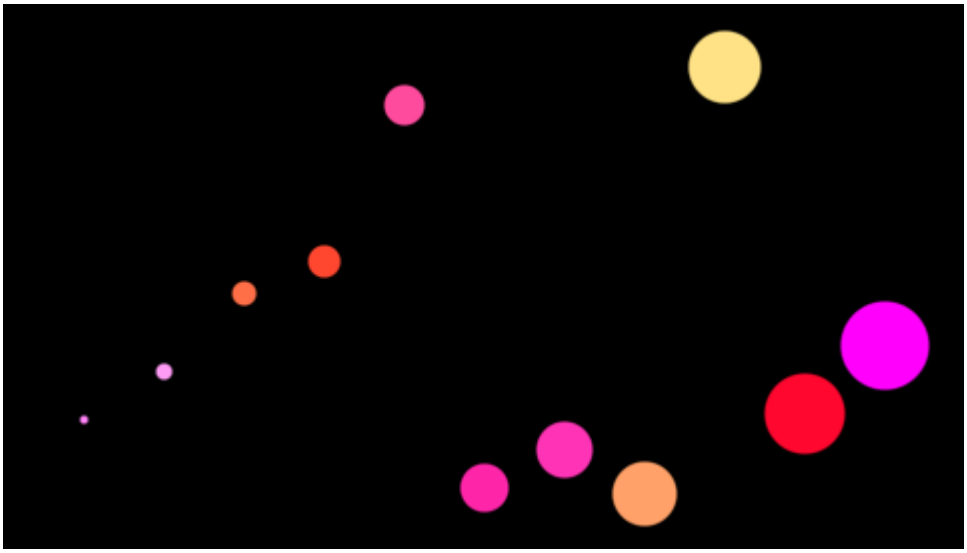
PointSize(*size*)
Set the diameter of rasterized points

Parameters **size** (*float*) – point diameter in pixels. Range 0-1023. The initial value is 1

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

Examples

```
gd.Begin(eve.POINTS)
for x in range(0, 480, 40):
    gd.PointSize(x / 10)
    gd.ColorRGB(0xff, random.randrange(256), random.randrange(256))
    gd.Vertex2f(x, random.randrange(272))
```



RestoreContext()
Restore the current graphics context from the context stack

SaveContext()
Push the current graphics context on the context stack. The hardware's graphics context stack is 4 levels deep.

Examples

```
gd.cmd_text(240,  64, 31, eve.OPT_CENTER, "WHITE")
gd.SaveContext()
gd.ColorRGB(0xff, 0x00, 0x00)
gd.cmd_text(240, 128, 31, eve.OPT_CENTER, "RED")
gd.RestoreContext()
gd.cmd_text(240, 196, 31, eve.OPT_CENTER, "WHITE AGAIN")
```

ScissorSize(*width*, *height*)
Set the size of the scissor clip rectangle

Parameters

- **width** (*int*) – The width of the scissor clip rectangle, in pixels. Range 0-4095. The initial value is hsize
- **height** (*int*) – The height of the scissor clip rectangle, in pixels. Range 0-4095. The initial value is 2048

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

Examples

```
gd.ScissorSize(400, 100)
gd.ScissorXY(35, 36)
gd.ClearColorRGB(0x00, 0x80, 0x80)
gd.Clear()
gd.cmd_text(240, 136, 31, eve.OPT_CENTER, "Scissor Example")
gd.ScissorXY(45, 140)
gd.ClearColorRGB(0xf8, 0x80, 0x17)
gd.Clear()
gd.cmd_text(240, 136, 31, eve.OPT_CENTER, "Scissor Example")
```

ScissorXY(*x*, *y*)
Set the top left corner of the scissor clip rectangle

Parameters

- **x** (*int*) – The x coordinate of the scissor clip rectangle, in pixels. Range 0-2047. The initial value is 0
- **y** (*int*) – The y coordinate of the scissor clip rectangle, in pixels. Range 0-2047. The initial value is 0

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

StencilFunc(*func*, *ref*, *mask*)
Set function and reference value for stencil testing

Parameters

- **func** (*int*) – specifies the test function, one of *NEVER*, *LESS*, *LEQUAL*, *GREATER*, *GEQUAL*, *EQUAL*, *NOTEQUAL*, or *ALWAYS*. The initial value is ALWAYS
- **ref** (*int*) – specifies the reference value for the stencil test. Range 0-255. The initial value is 0
- **mask** (*int*) – specifies a mask that is ANDed with the reference value and the stored stencil value. Range 0-255. The initial value is 255

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

StencilMask(*mask*)
Control the writing of individual bits in the stencil planes

Parameters **mask** (*int*) – the mask used to enable writing stencil bits. Range 0-255. The initial value is 255

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

StencilOp(*sfail*, *spass*)
Set stencil test actions

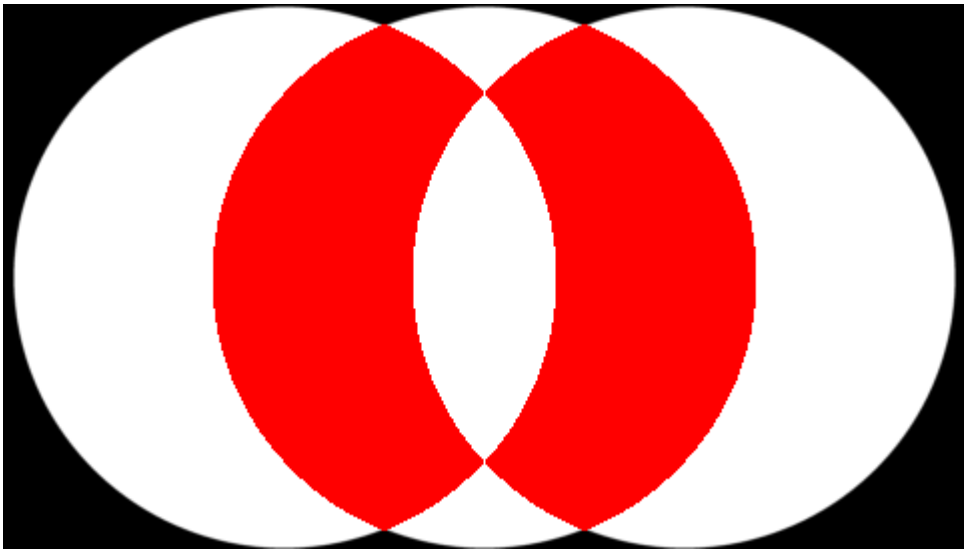
Parameters

- **sfail** (*int*) – specifies the action to take when the stencil test fails, one of *KEEP*, *ZERO*, *REPLACE*, *INCR*, INCR_WRAP, *DECR*, DECR_WRAP, and *INVERT*. The initial value is KEEP
- **spass** (*int*) – specifies the action to take when the stencil test passes, one of the same constants as **sfail**. The initial value is KEEP

These values are part of the graphics context and are saved and restored by *SaveContext()* and *RestoreContext()*.

Examples

```
gd.StencilOp(eve.INCR, eve.INCR); # incrementing stencil
gd.PointSize(270)
gd.Begin(eve.POINTS)              # Draw three white circles
gd.Vertex2ii(240 - 100, 136)
gd.Vertex2ii(240, 136)
gd.Vertex2ii(240 + 100, 136)
gd.ColorRGB(0xff, 0x00, 0x00)     # Draw pixels with stencil==2 red
gd.StencilFunc(eve.EQUAL, 2, 255)
gd.Begin(eve.RECTS);              # Paint every pixel on the screen
gd.Vertex2f(0,0); gd.Vertex2f(480,272)
```



TagMask(*mask*)
Control the writing of the tag buffer

Parameters **mask** (*int*) – allow updates to the tag buffer. Range 0-1. The initial value is 1

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

Tag(*s*)
Set the current tag value

Parameters **s** (*int*) – tag value. Range 0-255. The initial value is 255

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

Vertex2f(*x*, *y*)
Draw a vertex. This operation draws a graphics primitive, depending on the primitive set by *Begin()*.

Parameters

- **x** (*float*) – pixel x-coordinate
- **y** (*float*) – pixel y-coordinate

Vertex2ii(*x*, *y*, *handle*, *cell*)
Draw a vertex.

Parameters

- **x** (*int*) – x-coordinate in pixels. Range 0-511
- **y** (*int*) – y-coordinate in pixels. Range 0-511
- **handle** (*int*) – bitmap handle. Range 0-31
- **cell** (*int*) – cell number. Range 0-127

This method is an alternative to *BitmapHandle()*, *Cell()* and *Vertex2f()*.

VertexFormat(*frac*)
Set the precision of coordinates used by *Vertex2f()*

Parameters **frac** (*int*) – Number of fractional bits in X,Y coordinates. Range 0-7. The initial value is 4

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

VertexTranslateX(*x*)
Set the vertex transformation's x translation component

Parameters **x** (*float*) – signed x-coordinate in pixels. Range ±4095. The initial value is 0

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

VertexTranslateY(*y*)
Set the vertex transformation's y translation component

Parameters **y** (*float*) – signed y-coordinate in pixels. Range ±4095. The initial value is 0

This value is part of the graphics context and is saved and restored by *SaveContext()* and *RestoreContext()*.

cmd_animdraw(*ch*)
Draw an animation

Parameters **ch** (*int*) – animation channel

cmd_animframe(*x*, *y*, *aoptr*, *frame*)
Draw one animation frame

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **aoptr** (*int*) – animation object pointer
- **frame** (*int*) – description

cmd_animframeram(*x*, *y*, *aoptr*, *frame*)
Draw one animation frame from RAM

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **aoptr** (*int*) – animation object pointer
- **frame** (*int*) – description

cmd_animstart(*ch*, *aoptr*, *loop*)
Start an animation

Parameters

- **ch** (*int*) – animation channel

- **aoptr** (*int*) – animation object pointer
- **loop** (*int*) – description

cmd_animstartram(*ch*, *aoptr*, *loop*)
Start an animation from RAM

Parameters

- **ch** (*int*) – animation channel
- **aoptr** (*int*) – animation object pointer
- **loop** (*int*) – description

cmd_animstop(*ch*)
Stop playing an animation

Parameters **ch** (*int*) – animation channel

cmd_animxy(*ch*, *x*, *y*)
Play an animation

Parameters

- **ch** (*int*) – animation channel
- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate

cmd_apilevel(*level*)
Set the API level

Parameters **level** (*int*) – API level, 0 or 1.

API levelel. 0 is strict BT815 compatible, 1 is BT817.

Note: 817 only

---

cmd_append(*ptr*, *num*)
Append main memory to the current display list

Parameters

- **ptr** (*int*) – address in EVE memory, 32-bit aligned
- **num** (*int*) – byte count, 32-bit aligned

Executes **num** bytes of drawing commands from graphics memory at **ptr**. This can be useful for using graphics memory as a cache for frequently used drawing sequences, much like OpenGL's display lists.

cmd_appendf(*ptr*, *num*)
Append from flash to the current display list

Parameters

- **ptr** (*int*) – description
- **num** (*int*) – description

cmd_bgcolor(*c*)
Sets the widget background color

Parameters **c** (*int*) – RGB color

cmd_bitmap_transform(*x0*, *y0*, *x1*, *y1*, *x2*, *y2*, *tx0*, *ty0*, *tx1*, *ty1*, *tx2*, *ty2*, *result*)
Computes an arbitrary bitmap transform

Parameters

- **int** (*ty2*) – point 0 screen x-coordinate
- **int** – point 0 screen y-coordinate
- **int** – point 1 screen x-coordinate
- **int** – point 1 screen y-coordinate
- **int** – point 2 screen x-coordinate
- **int** – point 2 screen y-coordinate
- **int** – point 0 bitmap x-coordinate
- **int** – point 0 bitmap y-coordinate
- **int** – point 1 bitmap x-coordinate
- **int** – point 1 bitmap y-coordinate
- **int** – point 2 bitmap x-coordinate
- **int** – point 2 bitmap y-coordinate
- **result** (*int*) – return code. Set to -1 on success.

cmd_button(*x*, *y*, *w*, *h*, *font*, *options*, *s*)
Draw a button with a text label

Parameters

- **x** (*int*) – button top left x
- **y** (*int*) – button top left y
- **w** (*int*) – button width in pixels
- **h** (*int*) – button height in pixels
- **font** (*int*) – font for label, 0-31
- **options** (*int*) – rendering options, see below
- **s** (*str*) – label text

The `button` command draws a button widget at screen (`x`, `y`) with pixel size `w` x `h`. `label` gives the text label.

The label is drawn centered within the button rectangle. It may cross multiple lines, separated by newline characters.

The following options may be logically-ored together:

- *OPT_FLAT* render the element without 3D decorations
- *OPT_FORMAT* use a printf-style format string
- *OPT_FILL* apply multi-line text fill, see *cmd_fillwidth()*

Examples

```
gd.cmd_button(240 - 100, 136 - 40, 200, 80, 31, 0, "1 UP")
```

cmd_calibrate(*result*)
Start the touch-screen calibration process

Parameters **result** (*int*) – result code. Set to -1 on success.

cmd_calibratesub(*x*, *y*, *w*, *h*, *result*)
Start the touch-screen calibration process

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **w** (*int*) – width
- **h** (*int*) – height
- **result** (*int*) – result code. Set to -1 on success.

Note: 817 only

cmd_calllist(*a*)
Invoke a call list

Parameters **a** (*int*) – call list pointer

Note: 817 only

cmd_clearcache()
Clear the bitmap cache

cmd_clock(*x*, *y*, *r*, *options*, *h*, *m*, *s*, *ms*)
Draw a clock

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **r** (*int*) – description
- **options** (*int*) – see below
- **h** (*int*) – height
- **m** (*int*) – description
- **s** (*int*) – description
- **ms** (*int*) – description

The following options may be logically-ored together:

- *OPT_FLAT* render the element without 3D decorations
- *OPT_NOBACK* do not draw the dial back
- *OPT_NOTICKS* do not draw tick marks
- *OPT_NOSECS* do not draw seconds hand
- *OPT_NOHM* do not draw hours and minutes hands

Examples

```
gd.cmd_clock(240, 136, 120, 0, 8, 27, 13, 0)
```

```
gd.cmd_bgcolor(0x000000)
gd.ColorRGB(0x80, 0x80, 0x00)
gd.cmd_clock(240, 136, 120, eve.OPT_NOSECS | eve.OPT_FLAT, 1, 50, 0, 0)
```

cmd_coldstart()
Reset all coprocessor state to its default values

cmd_crc(*ptr*)
Compute a CRC-32 for the currently displayed image

Parameters **ptr** (*int*) – address in EVE memory

The 32-bit CRC is written to the given address.

cmd_dial(*x*, *y*, *r*, *options*, *val*)
Draws a dial, a circular widget with a single mark

Parameters

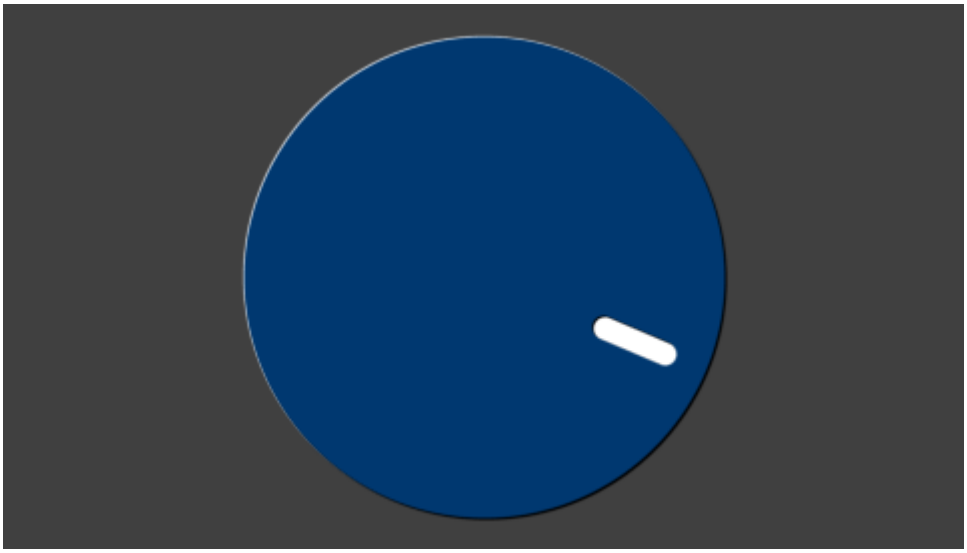
- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **r** (*int*) – description
- **options** (*int*) – see below
- **val** (*int*) – value, 0-65535

The following options may be logically-ored together:

- *OPT_FLAT* render the element without 3D decorations

Examples

```
gd.cmd_dial(240, 136, 120, 0, 5333)
```



cmd_dlstart()
Low-level command to start a new display list

cmd_endlist()
End a call list

Note: 817 only

---

cmd_fgcolor(*c*)
Set the widget foreground color

Parameters **c** (*int*) – 24-bit color

cmd_fillwidth(*s*)
Set the fill width used for multi-line text widgets

Parameters **s** (*int*) – fill width in pixels

cmd_flashattach()
Attach to the flash

cmd_flashdetach()
Detach from flash

cmd_flasherase()
Perform a full-chip erase on the flash

cmd_flashfast(*result*)
Enter fast mode

Parameters **result** (*int*) – result code. 0 on success.

cmd_flashprogram(*dest*, *src*, *num*)
Program flash from EVE memory

Parameters

- **dest** (*int*) – destination address in flash memory
- **src** (*int*) – source address in EVE memory
- **num** (*int*) – number of bytes to program

cmd_flashread(*dest*, *src*, *num*)
Read from flash

Parameters

- **dest** (*int*) – destination address in EVE memory
- **src** (*int*) – source address in flash memory
- **num** (*int*) – number of bytes to read

cmd_flashsource(*ptr*)
Set the flash source address for *cmd_videostartf()*.

Parameters **ptr** (*int*) – source address in flash memory

cmd_flashspidesel()
Deselect the flash

cmd_flashspirx(*ptr*, *num*)
Perform a raw SPI read from flash

Parameters

- **ptr** (*int*) – destination address in EVE memory
- **num** (*int*) – number of bytes to read

cmd_flashspitx(*num!*)
Perform a raw SPI write to flash

Parameters **int** (*num*) – number of bytes to write

This command is followed by the num bytes of inline data.

cmd_flashupdate(*dest*, *src*, *num*)
Program flash from EVE memory

Parameters

- **dest** (*int*) – destination address in flash memory
- **src** (*int*) – source address in EVE memory
- **num** (*int*) – number of bytes to program

cmd_flashwrite(*ptr*, *num*)
Program flash from inline data

Parameters

- **ptr** (*int*) – destination address in flash memory
- **int** (*num*) – number of bytes to program

This command is followed by the num bytes of inline data.

cmd_fontcache(*font*, *ptr*, *num*)
Set up a font cache

Parameters

- **font** (*int*) – font number 0-31

- **ptr** (*int*) – start of font cache area
- **num** (*int*) – number of bytes to use for font cache

Note: 817 only

cmd_fontcachequery(*total*, *used*)
Return statistics on font cache usage

Parameters

- **total** (*int*) – Total number of available bitmaps in the cache
- **used** (*int*) – Number of used bitmaps in the cache

cmd_gauge(*x*, *y*, *r*, *options*, *major*, *minor*, *val*, *range*)
Draw an indicator gauge

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **r** (*int*) – radius
- **options** (*int*) – see below
- **major** (*int*) – number of major tick marks
- **minor** (*int*) – number of minor tick marks
- **val** (*int*) – gauge value
- **range** (*int*) – range of gauge

Examples

```
gd.cmd_gauge(240, 136, 120, 0, 4, 2, 5333, 65535)
```

cmd_getimage(*source*, *fmt*, *w*, *h*, *palette*)

Returns all the attributes of the bitmap made by the previous *cmd_loadimage()*, *cmd_playvideo()*, *cmd_videostart()* or *cmd_videostartf()*.

Parameters

- **source** (*int*) – description
- **fmt** (*int*) – description
- **w** (*int*) – width
- **h** (*int*) – height
- **palette** (*int*) – description

cmd_getmatrix(*a*, *b*, *c*, *d*, *e*, *f*)

Returns the current bitmap transform matrix

Parameters

- **a** (*int*) – matrix coefficient
- **b** (*int*) – matrix coefficient
- **c** (*int*) – matrix coefficient
- **d** (*int*) – matrix coefficient
- **e** (*int*) – matrix coefficient
- **f** (*int*) – matrix coefficient

The matrix is returned as:

begin{bmatrix} a & b & c \ d & e & f \ end{bmatrix}

cmd_getprops(*ptr*, *w*, *h*)

Returns the parameters of the last loaded image

Parameters

- **ptr** (*int*) – bitmap source address
- **w** (*int*) – width
- **h** (*int*) – height

cmd_getptr(*result*)

Returns the first unallocated memory location

Parameters **result** (*int*) – first unused address in EVE memory

cmd_gradcolor(*c*)

set the 3D widget highlight color

Parameters **c** (*int*) – a 24-bit color

cmd_gradient(*x0*, *y0*, *rgb0*, *x1*, *y1*, *rgb1*)

Draw a smooth color gradient between two points

Parameters

- **int** (*rgb1*) – point 0 x-coordinate
- **int** – point 0 y-coordinate

- **int** – a 24-bit color for point 0
- **int** – point 1 x-coordinate
- **int** – point 1 y-coordinate
- **int** – a 24-bit color for point 1

Examples

```
gd.cmd_gradient(0, 0,   0x0060c0, 0, 271, 0xc06000)
gd.cmd_text(240, 136, 31, eve.OPT_CENTER, "READY PLAYER ONE")
```

cmd_gradienta(*x0*, *y0*, *argb0*, *x1*, *y1*, *argb1*)

Draw a smooth color gradient between two points with alpha transparency

Parameters

- **int** (*argb1*) – point 0 x-coordinate
- **int** – point 0 y-coordinate
- **int** – a 32-bit color for point 0
- **int** – point 1 x-coordinate
- **int** – point 1 y-coordinate
- **int** – a 32-bit color for point 1

cmd_hsf(*w*)

Configure the horizontal scanout filter

Parameters **w** (*int*) – width in pixels

Note: 817 only

cmd_inflate(*ptr*)
Decompress data into EVE memory

Parameters **int** (*ptr*) – destination pointer in EVE memory

cmd_inflate2(*ptr*, *options!*)
Decompress data into EVE memory

Parameters

- **ptr** (*int*) – destination pointer in EVE memory
- **int** (*options!*) – options

cmd_interrupt(*ms*)
Trigger an interrupt

Parameters **ms** (*int*) – delay before triggering interrupt in milliseconds

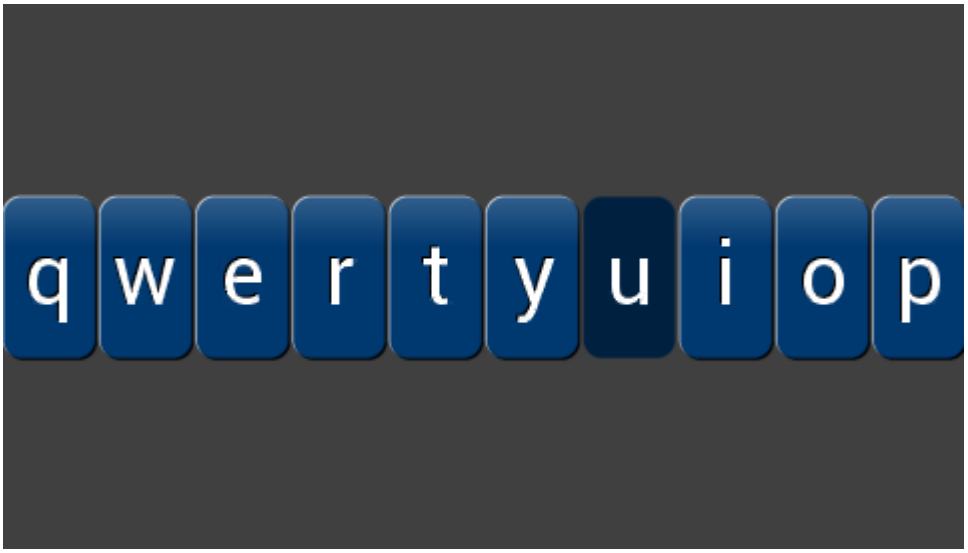
cmd_keys(*x*, *y*, *w*, *h*, *font*, *options*, *s*)
Draw a row of keys

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **w** (*int*) – width
- **h** (*int*) – height
- **font** (*int*) – font number 0-31
- **options** (*int*) – see below
- **s** (*str*) – key labels

Examples

```
gd.cmd_keys(0, 136 - 40, 480, 80, 31, ord('u'), "qwertyuiop")
```



cmd_loadidentity()
Set the current bitmap transform matrix to the identity:

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

cmd_loadimage(*ptr*, *options!*)
Load an image into a bitmap

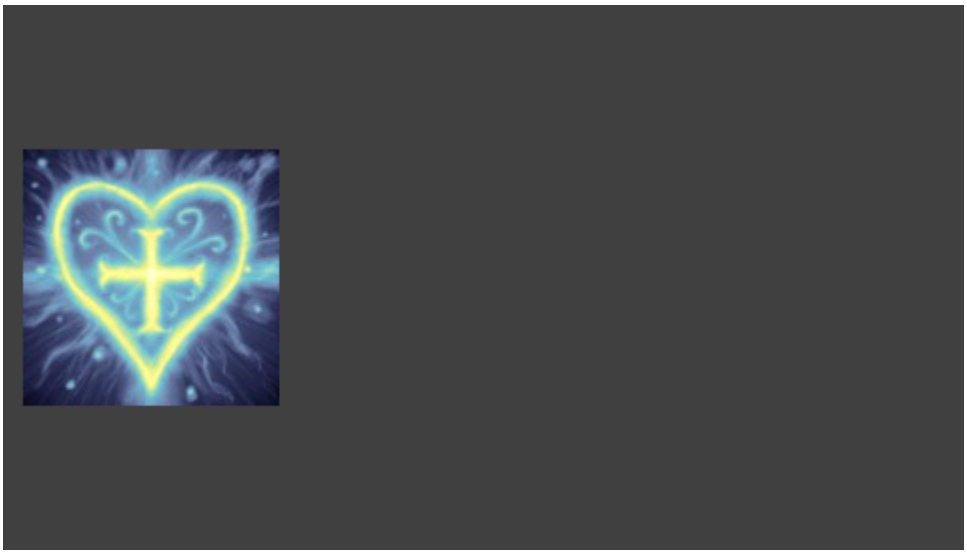
Parameters

- **ptr** (*int*) – destination address in EVE memory
- **int** (*options*) – options

This command is followed by the image data itself. Images may be in JPG or PNG format.

Examples

```
gd.cmd_loadimage(0, 0)
gd.load(open("assets/healsky3.jpg", "rb"))
gd.Begin(eve.BITMAPS)
gd.Vertex2f(10, 72)
```



cmd_logo()
Display the BridgeTek logo.

cmd_mediafifo(*ptr*, *size*)
Set the memory region used for the media FIFO

Parameters

- **ptr** (*int*) – start address in EVE memory
- **size** (*int*) – size of the media FIFO in bytes

cmd_memcpy(*dest*, *src*, *num*)
Copy EVE memory

Parameters

- **dest** (*int*) – destination address in EVE memory
- **src** (*int*) – source address in EVE memory
- **num** (*int*) – number of bytes to copy

cmd_memcrc(*ptr*, *num*, *result*)
Compute the CRC-32 of a region of EVE memory

Parameters

- **ptr** (*int*) – start address in EVE memory
- **num** (*int*) – size of region in bytes
- **result** (*int*) – address to write destination CRC in EVE memory

cmd_memset(*ptr*, *value*, *num*)
Set a region of EVE memory to a byte value

Parameters

- **ptr** (*int*) – destination address in EVE memory
- **value** (*int*) – byte value
- **num** (*int*) – size of region in bytes

cmd_memwrite(*ptr*, *num*)
Write the following inline data into EVE memory

Parameters

- **ptr** (*int*) – destination address in EVE memory
- **int** (*num*) – number of bytes to write

This command is followed by the inline data, and is padded to a 4-byte boundary. See *cc()* and `align4()`.

cmd_memzero(*ptr*, *num*)
Set a region of EVE memory to zero

Parameters

- **ptr** (*int*) – destination address in EVE memory
- **num** (*int*) – size of region in bytes

cmd_newlist(*a*)
Start compiling a call list

Parameters **a** (*int*) – call list pointer

Note: 817 only

---

cmd_nop()
No operation.

cmd_number(*x*, *y*, *font*, *options*, *n*)
Draw a number

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **font** (*int*) – font number 0-31
- **options** (*int*) – see below
- **n** (*int*) – number

renders a number `n` in font `font` at screen (`x`, `y`). If an integer n is supplied as an option, then leading zeroes are added so that n digits are always drawn.

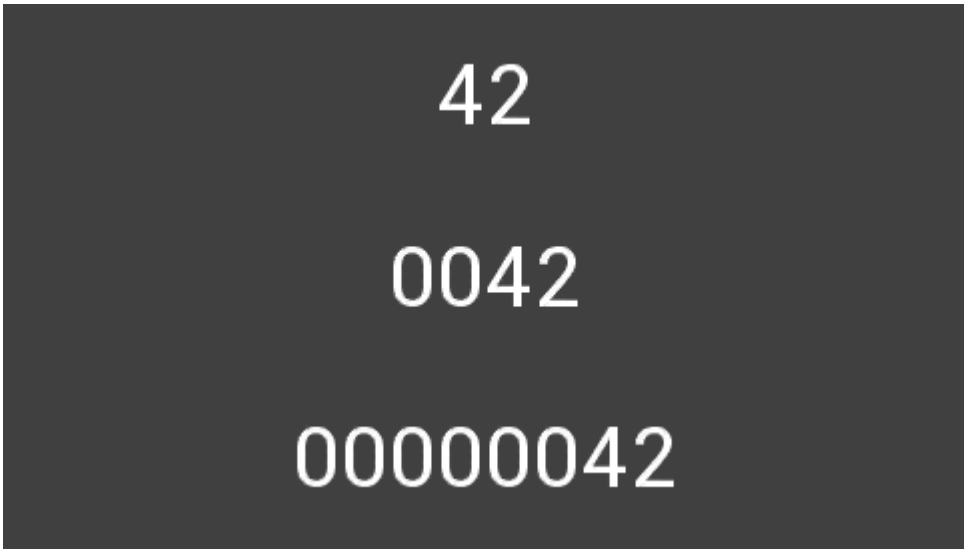
The following options may be logically-ored together:

- *OPT_CENTER* shorthand for (*OPT_CENTERX* | *OPT_CENTERY*)
- *OPT_CENTERX* center element in the x direction
- *OPT_CENTERY* center element in the y direction
- *OPT_SIGNED* treat paramter `n` as signed. The default is unsigned
- 0-32 draw the number so that n digits are always drawn

See also *cmd_setbase()*

Examples

```
gd.cmd_number(240, 45, 31, eve.OPT_CENTER, 42)
gd.cmd_number(240, 136, 31, eve.OPT_CENTER | 4, 42)
gd.cmd_number(240, 226, 31, eve.OPT_CENTER | 8, 42)
```



cmd_pclkfreq(*ftarget*, *rounding*, *factual*)
Set the PCLK frequency

Parameters

- **ftarget** (*int*) – target frequency, in Hz
- **rounding** (*int*) – rounding mode
- **factual** (*int*) – return value, actual frequency

Note: 817 only

cmd_playvideo(*options!*)
Play a video from inline video data

Parameters **int** (*options*) – playback options

cmd_progress(*x*, *y*, *w*, *h*, *options*, *val*, *range*)
Draw a progress bar

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **w** (*int*) – width
- **h** (*int*) – height
- **options** (*int*) – see below
- **val** (*int*) – progress bar value
- **range** (*int*) – progress bar range

Examples

```
gd.cmd_progress(10, 136, 460, 10, 0, 25333, 65535)
```

The following options may be logically-ored together:

- *OPT_FLAT* render the element without 3D decorations

cmd_regread(*ptr*, *result*)
Reads a 32-bit value from EVE memory

Parameters

- **ptr** (*int*) – source address in EVE memory
- **result** (*int*) – register value

cmd_regwrite(*ptr*, *val*)
Writes a 32-bit value to EVE memory

Parameters

- **ptr** (*int*) – address in EVE memory
- **val** (*int*) – 32-bit value

cmd_resetfonts()
Reset all ROM fonts (numbers 16-31) to their default settings

cmd_return()
Return from a Call List

Note: 817 only

---

cmd_romfont(*font*, *romslot*)
Load a ROM font into a font handle

Parameters

- **font** (*int*) – font number 0-31
- **romslot** (*int*) – ROM font number 16-34

cmd_rotate(*a*)
Apply a rotation to the bitmap transform matrix

Parameters **a** (*float*) – clockwise rotation angle, in degrees

cmd_rotatearound(*x*, *y*, *a*, *s*)
Apply a rotation and scale to the bitmap transform matrix around a given point

Parameters

- **x** (*int*) – center of rotation x-coordinate
- **y** (*int*) – center of rotation y-coordinate
- **a** (*float*) – clockwise rotation angle, in degrees
- **s** (*float*) – scale factor

cmd_runanim(*waitmask*, *play*)
Run all active animations

Parameters

- **waitmask** (*int*) – description
- **play** (*int*) – y-coordinate

Note: 817 only

cmd_scale(*sx*, *sy*)
Apply a scale to the bitmap transform matrix

Parameters

- **sx** (*float*) – x-axis scale factor
- **sy** (*float*) – y-axis scale factor

cmd_screensaver()
Run the screen-saver function. Use *cmd_stop()* to stop it.

cmd_scrollbar(*x*, *y*, *w*, *h*, *options*, *val*, *size*, *range*)
Draw a scroll bar

Parameters

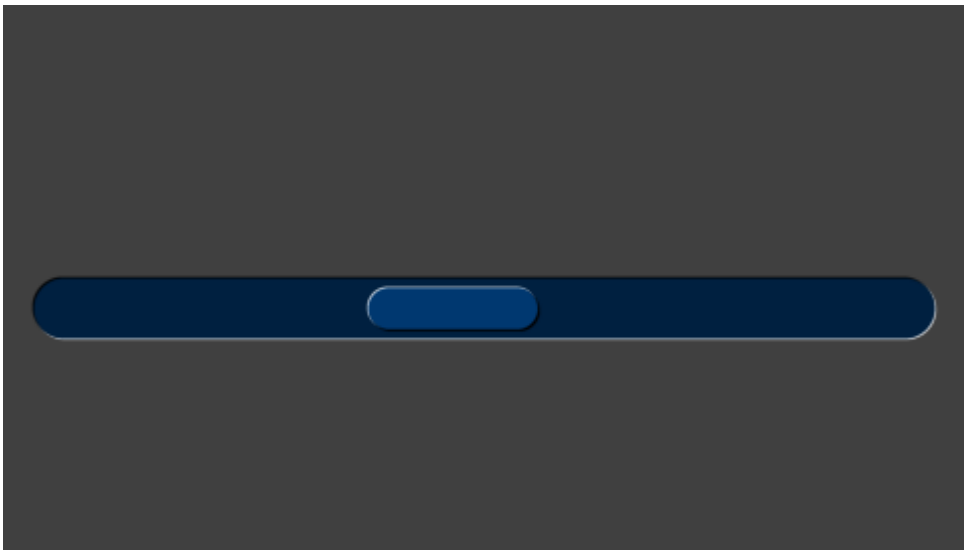
- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **w** (*int*) – width
- **h** (*int*) – height
- **options** (*int*) – see below
- **val** (*int*) – bar starting position
- **size** (*int*) – bar size
- **range** (*int*) – range of entire bar

The following options may be logically-ored together:

- *OPT_FLAT* render the element without 3D decorations

Examples

```
gd.cmd_scrollbar(30, 136, 420, 30, 0, 25333, 10000, 65535)
```



cmd_setbase(*b*)
Set the base used by cmd_number. The default base is 10 (decimal)

Parameters **b** (*int*) – base, 1-36

cmd_setbitmap(*source*, *fmt*, *w*, *h*)
Set all the parameters for a bitmap.

Parameters

- **source** (*int*) – bitmap source address in EVE memory
- **fmt** (*int*) – bitmap format, see *Bitmap Formats used by EVE.BitmapLayout() and EVE.cmd_setbitmap()*
- **w** (*int*) – width
- **h** (*int*) – height

cmd_setfont(*font*, *ptr*)
Load a font slot from a font in RAM

Parameters

- **font** (*int*) – font number 0-31
- **ptr** (*int*) – address to the font register value

cmd_setfont2(*font*, *ptr*, *firstchar*)
Load a font slot from a font in RAM

Parameters

- **font** (*int*) – font number 0-31
- **ptr** (*int*) – address of the font descriptor block in EVE memory
- **firstchar** (*int*) – first valid character in font

cmd_setmatrix()
Append the current transform matrix to the display list.

cmd_setrotate(*r*)
Change screen orientation by setting *REG_ROTATE* and adjusting the touch transform matrix.

Parameters **r** (*int*) – new orientation

cmd_setscratch(*handle*)
Set the bitmap handle used for widget drawing. The default handle is 15.

Parameters **handle** (*int*) – bitmap handle

cmd_sketch(*x*, *y*, *w*, *h*, *ptr*, *format*)
Begin sketching. Use *cmd_stop()* to stop it.

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **w** (*int*) – width
- **h** (*int*) – height

- **ptr** (*int*) – bitmap start address
- **format** (*int*) – either *L1* or *L8*

cmd_slider(*x*, *y*, *w*, *h*, *options*, *val*, *range*)
Draw a slider

Parameters

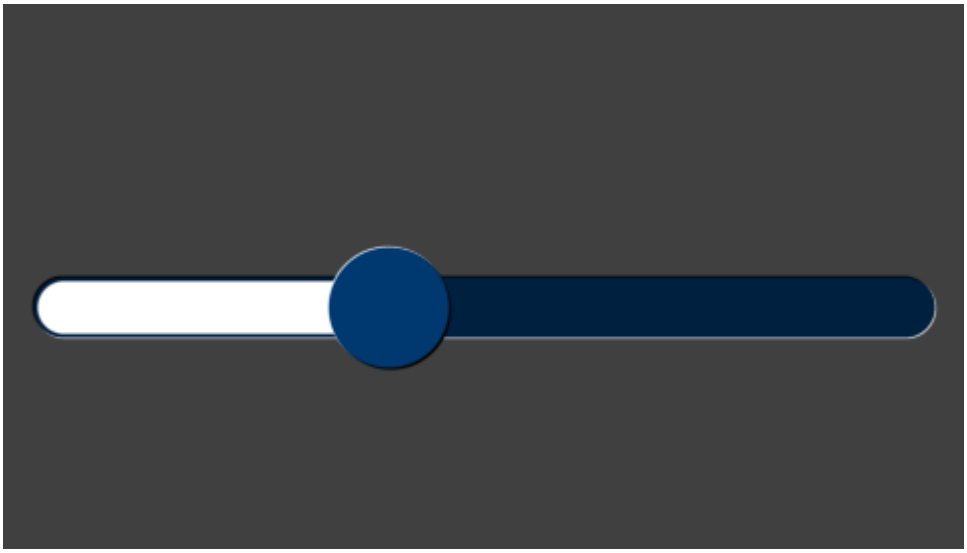
- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **w** (*int*) – width
- **h** (*int*) – height
- **options** (*int*) – see below
- **val** (*int*) – position of slider knob
- **range** (*int*) – range of entire slider

The following options may be logically-ored together:

- *OPT_FLAT* render the element without 3D decorations

Examples

```
gd.cmd_slider(30, 136, 420, 30, 0, 25333, 65535)
```



cmd_snapshot(*ptr*)
Write a snapshot of the current screen as a bitmap

Parameters **ptr** (*int*) – destination bitmap address in EVE memory

cmd_snapshot2(*fmt*, *ptr*, *x*, *y*, *w*, *h*)
Write a snapshot of the current screen as a bitmap

Parameters

- **fmt** (*int*) – bitmap format
- **ptr** (*int*) – destination bitmap address in EVE memory
- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **w** (*int*) – width of snapshot rectangle
- **h** (*int*) – height of snapshot rectangle

cmd_spinner(*x*, *y*, *style*, *scale*)

Display a "waiting" spinner Use *cmd_stop()* to stop it.

Parameters

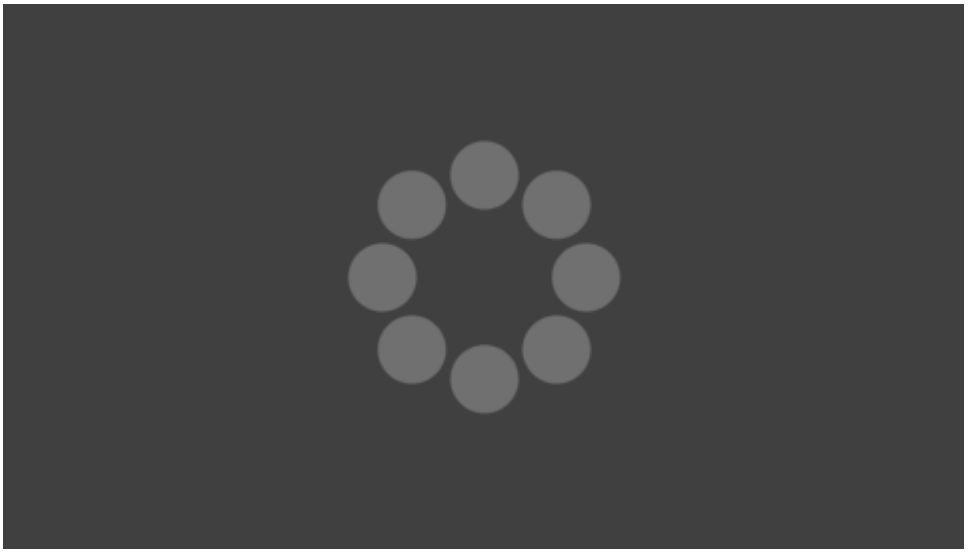
- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **style** (*int*) – see below
- **scale** (*int*) – element size. 0 is small, 1 medium, 2 huge.

There are four spinner styles available:

- `0` circular
- `1` linear
- `2` clock
- `3` rotating disks

Examples

```
gd.cmd_spinner(240, 136, 0, 1)
```



cmd_stop()
Stop any currently running background tasks.

cmd_swap()
Low-level command to swap the display lists

cmd_sync()
Delay execution until the next vertical blanking interval

cmd_testcard()
Draw a diagnostic test-card

Note: 817 only

---

cmd_text(*x*, *y*, *font*, *options*, *s*)
Draws text

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **font** (*int*) – font number 0-31
- **options** (*int*) – see below
- **s** (*str*) – text

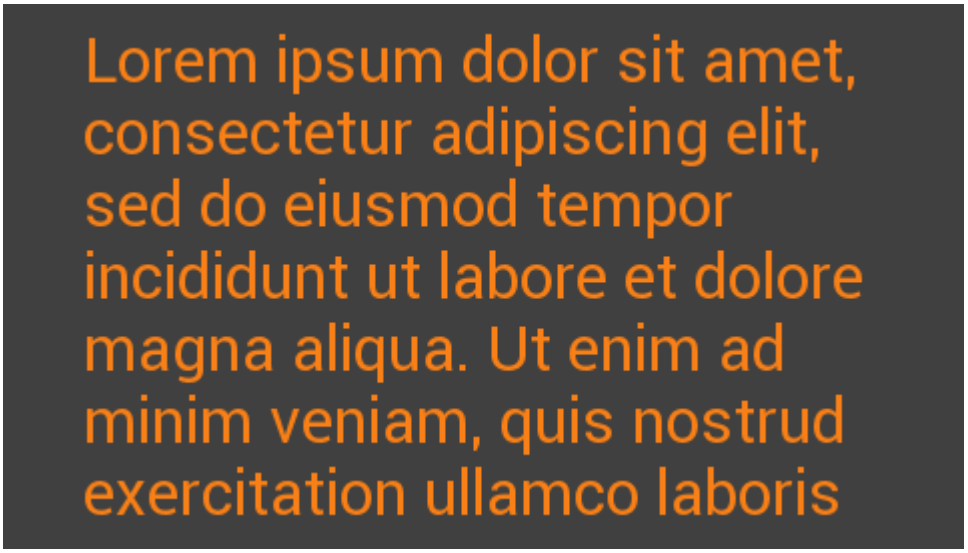
renders a number `n` in font `font` at screen (`x`, `y`).

The following options may be logically-ored together:

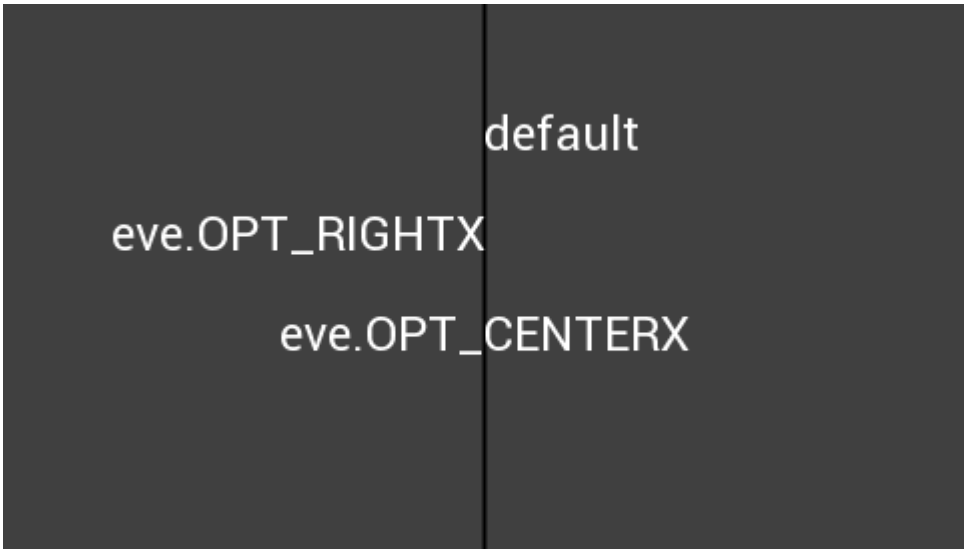
- *OPT_CENTER* shorthand for (*OPT_CENTERX* | *OPT_CENTERY*)
- *OPT_CENTERX* center element in the x direction
- *OPT_CENTERY* center element in the y direction
- *OPT_RIGHTX* right-justify the element
- *OPT_FILL* apply multi-line text fill, see *cmd_fillwidth()*
- *OPT_FORMAT* use a printf-style format string

Examples

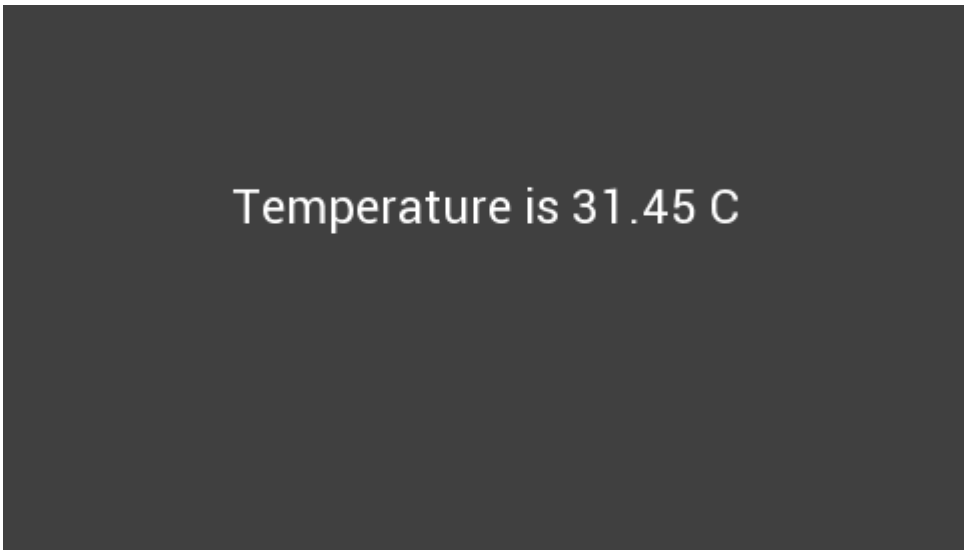
```
ipsum = 'Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do␣
↪eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim␣
↪veniam, quis nostrud exercitation ullamco laboris'
gd.cmd_fillwidth(400)
gd.ColorRGB(0xf8, 0x80, 0x17) # orange
gd.cmd_text(40, 10, 30, eve.OPT_FILL, ipsum)
```




```
gd.ColorRGB(0x00, 0x00, 0x00)
gd.Begin(eve.LINES)
gd.Vertex2f(240, 0)
gd.Vertex2f(240, gd.h)
gd.ColorRGB(0xff, 0xff, 0xff)
gd.cmd_text(240, 50, 29, 0, "default")
gd.cmd_text(240,100, 29, eve.OPT_RIGHTX, "eve.OPT_RIGHTX")
gd.cmd_text(240,150, 29, eve.OPT_CENTERX, "eve.OPT_CENTERX")
```



```
t = 31.09
gd.cmd_text(240,100, 29, eve.OPT_FORMAT | eve.OPT_CENTER,
            "Temperature is %d.%02d C", int(t), int(t * 100) % 100)
```



cmd_toggle(*x*, *y*, *w*, *font*, *options*, *state*, *s1*, *s0*)

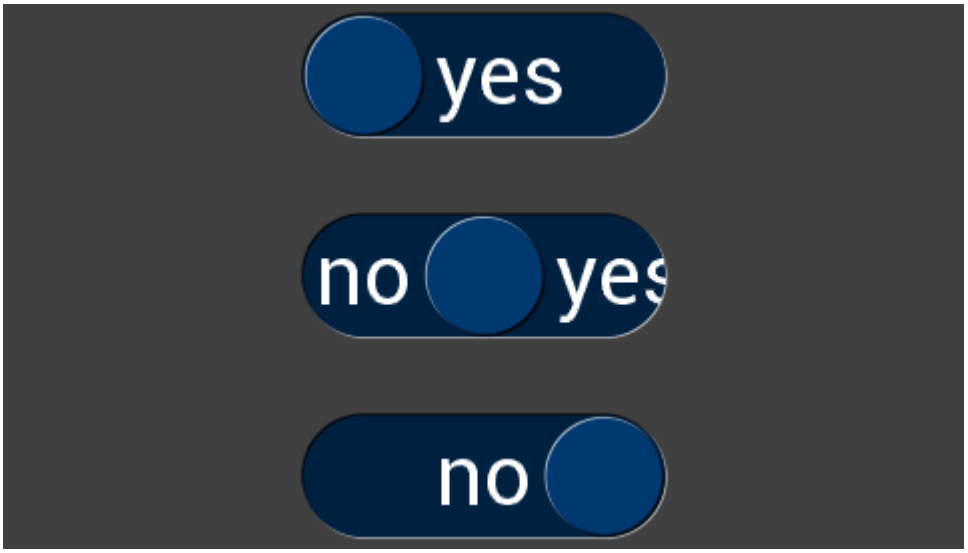
Draws a toggle widget

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **w** (*int*) – width
- **font** (*int*) – font number 0-31
- **options** (*int*) – see below
- **state** (*int*) – toggle position 0-65535
- **s1** (*str*) – label for right side
- **s0** (*str*) – label for left side

Examples

```
gd.cmd_toggle(180,  20, 120, 31, 0, 0,     "yes", "no")
gd.cmd_toggle(180, 120, 120, 31, 0, 32768, "yes", "no")
gd.cmd_toggle(180, 220, 120, 31, 0, 65535, "yes", "no")
```




```
gd.cmd_text(gd.w // 2, 100, 30, eve.OPT_CENTER, "What is your age, Liesl?")
gd.cmd_toggle(180, 160, 120, 31, eve.OPT_FORMAT, 32768, "%d", "%d", 17, 16)
```

The following options may be logically-ored together:

- *OPT_FLAT* render the element without 3D decorations
- *OPT_FORMAT* use a printf-style format string

cmd_track(*x*, *y*, *w*, *h*, *tag*)
Start tracking touches for a graphical object

Parameters

- **x** (*int*) – x-coordinate
- **y** (*int*) – y-coordinate
- **w** (*int*) – width
- **h** (*int*) – height
- **tag** (*int*) – object tag number 0-255

Up to 255 objects may be tracked. Each object may be either linear (if either `width` or `height` is 1) or rotary (if both `width` and `height` are 1).

cmd_translate(*tx*, *ty*)
Apply a translation to the bitmap transform matrix

Parameters

- **tx** (*int*) – translation in x-axis
- **ty** (*int*) – translation in y-axis

cmd_videoframe(*dst*, *ptr*)
Decode a single video frame

Parameters

- **dst** (*int*) – bitmap destination in EVE memory
- **ptr** (*int*) – completion flag address in EVE memory

cmd_videostart()
Start video playback

cmd_videostartf()
Start video playback

cmd_wait(*us*)
Wait

Parameters **us** (*int*) – wait duration in microseconds

Note: 817 only

---

cc(*b*)
Append bytes to the command FIFO.

Parameters **b** (*bytes*) – The bytes to add. Its length must be a multiple of 4.

finish()
Send any queued drawing commands directly to the hardware, and return after they have all completed execution.

flush()
Send any queued drawing commands directly to the hardware.

swap()
End the current display list and dispatch it to the graphics hardware. Start compiling the display list for the next frame.

screenshot_im()
Return the current screen contents as an image

Returns image Image of the current screen

The returned image is a PIL `Image` with mode `RGB` and size (`w`, `h`).

It can be saved to a file with:

```
gd.screenshot_im().save("screenshot.png")
```

Note: available on PC only

CHAPTER

TWO

MODULE CONSTANTS

2.1 Constants for EVE.StencilFunc() and AlphaFunc()

```
NEVER = 0
LESS = 1
LEQUAL = 2
GREATER = 3
GEQUAL = 4
EQUAL = 5
NOTEQUAL = 6
ALWAYS = 7
```

2.2 Constants for BitmapSwizzle()

```
RED = 2
GREEN = 3
BLUE = 4
ALPHA = 5
```

2.3 Bitmap Formats used by EVE.BitmapLayout() and EVE.cmd_setbitmap()

```
ARGB1555 = 0
L1 = 1
L4 = 2
L8 = 3
RGB332 = 4
ARGB2 = 5
ARGB4 = 6
```

RGB565 = 7

PALETTED = 8

TEXT8X8 = 9

TEXTVGA = 10

BARGRAPH = 11

PALETTED565 = 14

PALETTED4444 = 15

PALETTED8 = 16

L2 = 17

GLFORMAT = 31

ASTC_4x4 = 0x93B0

ASTC_5x4 = 0x93B1

ASTC_5x5 = 0x93B2

ASTC_6x5 = 0x93B3

ASTC_6x6 = 0x93B4

ASTC_8x5 = 0x93B5

ASTC_8x6 = 0x93B6

ASTC_8x8 = 0x93B7

ASTC_10x5 = 0x93B8

ASTC_10x6 = 0x93B9

ASTC_10x8 = 0x93BA

ASTC_10x10 = 0x93BB

ASTC_12x10 = 0x93BC

ASTC_12x12 = 0x93BD

2.4 Filter types for `BitmapSize()`

NEAREST = 0

BILINEAR = 1

2.5 Wrap types for `BitmapSize()`

```
BORDER = 0
REPEAT = 1
```

2.6 Actions for `StencilFunc()`

```
KEEP = 1
REPLACE = 2
INCR = 3
DECR = 4
INVERT = 5
```

2.7 Blend factors for `BlendFunc()`

```
ZERO = 0
ONE = 1
SRC_ALPHA = 2
DST_ALPHA = 3
ONE_MINUS_SRC_ALPHA = 4
ONE_MINUS_DST_ALPHA = 5
```

2.8 Primitive types for `Begin()`

```
BITMAPS = 1
POINTS = 2
LINES = 3
LINE_STRIP = 4
EDGE_STRIP_R = 5
EDGE_STRIP_L = 6
EDGE_STRIP_A = 7
EDGE_STRIP_B = 8
RECTS = 9
```

2.9 Options bitfields

OPT_MONO = 1

OPT_NODL = 2

OPT_FLAT = 256

OPT_CENTERX = 512

OPT_CENTERY = 1024

OPT_CENTER = 1536

OPT_NOBACK = 4096

OPT_NOTICKS = 8192

OPT_NOHM = 16384

OPT_NOPOINTER = 16384

OPT_NOSECS = 32768

OPT_NOHANDS = 49152

OPT_RIGHTX = 2048

OPT_SIGNED = 256

OPT_FULLSCREEN = 8

OPT_MEDIAFIFO = 16

OPT_FORMAT = 4096

OPT_FILL = 8192

2.10 Sample formats for use with REG_PLAYBACK_FORMAT

LINEAR_SAMPLES = 0

ULAW_SAMPLES = 1

ADPCM_SAMPLES = 2

2.11 Instrument names for use with REG_SOUND

HARP = 0x40

XYLOPHONE = 0x41

TUBA = 0x42

GLOCKENSPIEL = 0x43

ORGAN = 0x44

TRUMPET = 0x45

PIANO = 0x46

CHIMES = 0x47

```
MUSICBOX = 0x48
BELL = 0x49
CLICK = 0x50
SWITCH = 0x51
COWBELL = 0x52
NOTCH = 0x53
HIHAT = 0x54
KICKDRUM = 0x55
POP = 0x56
CLACK = 0x57
CHACK = 0x58
MUTE = 0x60
UNMUTE = 0x61
```

2.12 Hardware register addresses

```
RAM_CMD = 0x308000
RAM_DL = 0x300000
REG_CLOCK = 0x302008
REG_CMDB_SPACE = 0x302574
REG_CMDB_WRITE = 0x302578
REG_CMD_DL = 0x302100
REG_CMD_READ = 0x3020f8
REG_CMD_WRITE = 0x3020fc
REG_CPURESET = 0x302020
REG_CSPREAD = 0x302068
REG_DITHER = 0x302060
REG_DLSWAP = 0x302054
REG_FRAMES = 0x302004
REG_FREQUENCY = 0x30200c
REG_GPIO = 0x302094
REG_GPIO_DIR = 0x302090
REG_HCYCLE = 0x30202c
REG_HOFFSET = 0x302030
REG_HSIZE = 0x302034
REG_HSYNC0 = 0x302038
```

REG_HSYNC1 = 0x30203c

REG_ID = 0x302000

REG_INT_EN = 0x3020ac

REG_INT_FLAGS = 0x3020a8

REG_INT_MASK = 0x3020b0

REG_MACRO_0 = 0x3020d8

REG_MACRO_1 = 0x3020dc

REG_OUTBITS = 0x30205c

REG_PCLK = 0x302070

REG_PCLK_POL = 0x30206c

REG_PLAY = 0x30208c

REG_PLAYBACK_FORMAT = 0x3020c4

REG_PLAYBACK_FREQ = 0x3020c0

REG_PLAYBACK_LENGTH = 0x3020b8

REG_PLAYBACK_LOOP = 0x3020c8

REG_PLAYBACK_PLAY = 0x3020cc

REG_PLAYBACK_READPTR = 0x3020bc

REG_PLAYBACK_START = 0x3020b4

REG_PWM_DUTY = 0x3020d4

REG_PWM_HZ = 0x3020d0

REG_ROTATE = 0x302058

REG_SOUND = 0x302088

REG_SWIZZLE = 0x302064

REG_TAG = 0x30207c

REG_TAG_X = 0x302074

REG_TAG_Y = 0x302078

REG_TAP_CRC = 0x302024

REG_TOUCH_ADC_MODE = 0x302108

REG_TOUCH_CHARGE = 0x30210c

REG_TOUCH_DIRECT_XY = 0x30218c

REG_TOUCH_DIRECT_Z1Z2 = 0x302190

REG_TOUCH_MODE = 0x302104

REG_TOUCH_OVERSAMPLE = 0x302114

REG_TOUCH_RAW_XY = 0x30211c

REG_TOUCH_RZ = 0x302120

REG_TOUCH_RZTHRESH = 0x302118

```
REG_TOUCH_SCREEN_XY = 0x302124
REG_TOUCH_SETTLE = 0x302110
REG_TOUCH_TAG = 0x30212c
REG_TOUCH_TAG_XY = 0x302128
REG_TOUCH_TRANSFORM_A = 0x302150
REG_TOUCH_TRANSFORM_B = 0x302154
REG_TOUCH_TRANSFORM_C = 0x302158
REG_TOUCH_TRANSFORM_D = 0x30215c
REG_TOUCH_TRANSFORM_E = 0x302160
REG_TOUCH_TRANSFORM_F = 0x302164
REG_TRACKER = 0x309000
REG_TRIM = 0x302180
REG_VCYCLE = 0x302040
REG_VOFFSET = 0x302044
REG_VOL_PB = 0x302080
REG_VOL_SOUND = 0x302084
REG_VSIZE = 0x302048
REG_VSYNC0 = 0x30204c
REG_VSYNC1 = 0x302050
REG_MEDIAFIFO_BASE = 0x30901c
REG_MEDIAFIFO_READ = 0x309014
REG_MEDIAFIFO_SIZE = 0x309020
REG_MEDIAFIFO_WRITE = 0x309018
REG_GPIOX = 0x30209c
REG_GPIOX_DIR = 0x302098
REG_FLASH_SIZE = 0x309024
REG_FLASH_STATUS = 0x3025f0
REG_ADAPTIVE_FRAMERATE = 0x30257c
```

CHAPTER

THREE

INDICES AND TABLES

- genindex
- search

INDEX

D

E

F

G

S

T

U

V

W

X

Z