

SDL_bgi 2.0.7 Quick Reference

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1 Introduction

SDL_bgi is an SDL2-based implementation of Borland Graphics Interface (BGI), a graphics library that was part of Turbo/Borland C compilers for DOS. BGI represented the *de facto* standard for computer graphics in the late eighties–early nineties, especially in education.

SDL_bgi is one of the easiest ways to do graphics programming in C. It is much simpler (but obviously, less complete) than SDL, OpenGL and the like. Teachers may find SDL_bgi a useful tool for introductory computer graphics courses.

For example, this is a minimal program that opens a window and draws 1000 random lines:

```
#include <SDL2/SDL_bgi.h>

int main (void)
{
    int i, gd = DETECT, gm;
    initgraph (&gd, &gm, "");
    setbkcolor (BLACK);
    cleardevice ();
    outtextxy (0, 0, "Drawing 1000 lines...");
    for (i = 0; i < 1000; i++) {
        setcolor (1 + random (15));
        line ( random(getmaxx()), random(getmaxy()),
              random(getmaxx()), random(getmaxy()) );
    }
    getch ();
    closegraph ();
    return 0;
}
```

The program includes the header file `SDL_bgi.h`, which contains all necessary definitions. The call to **initgraph()** opens a window; from now on, graphics functions may be called. **closegraph()** closes the window.

Within the window, pixel coordinates range from (0, 0), the upper left corner, to (**getmaxx()**, **getmaxy()**), the lower right corner.

Some graphic functions set the coordinates of the last drawing position, defined as CP (Current Position). At any given moment, a foreground, background and fill colour, line style, line thickness, and fill pattern, are defined. A viewport (subwindow) may also be defined, with or without clipping. All of these parameters can be changed using appropriate functions.

2 Constants

Many constants are defined in `SDL_bgi.h`. The most important are the following:

```
#define _SDL_BGI_H
#define SDL_BGI_VERSION 2.0.7

// everything gets drawn here

extern SDL_Window    *bgi_window;
extern SDL_Renderer *bgi_renderer;
extern SDL_Texture   *bgi_texture;

// available visual pages

#define VPAGES 4

// BGI fonts

#define DEFAULT_FONT      0 // 8x8
#define TRIPLEX_FONT      1 // all other fonts are not implemented
#define SMALL_FONT        2
#define SANSSERIF_FONT    3
#define GOTHIC_FONT        4
#define BIG_FONT           5
#define SCRIPT_FONT       6
#define SIMPLEX_FONT       7
#define TRIPLEX_SCR_FONT  8
#define COMPLEX_FONT       9
#define EUROPEAN_FONT     10
#define BOLD_FONT          11

#define HORIZ_DIR          0
#define VERT_DIR           1

#define USER_CHAR_SIZE 0

#define LEFT_TEXT          0
#define CENTER_TEXT        1
#define RIGHT_TEXT         2
#define BOTTOM_TEXT         0
#define TOP_TEXT           2

// BGI colours
```

```

#define MAXCOLORS      15
#define BLACK          0
#define BLUE           1
#define GREEN          2
#define CYAN           3
#define RED            4
#define MAGENTA        5
#define BROWN          6
#define LIGHTGRAY      7
#define DARKGRAY       8
#define LIGHTBLUE      9
#define LIGHTGREEN     10
#define LIGHTCYAN      11
#define LIGHTRED       12
#define LIGHTRED       12
#define LIGHTMAGENTA   13
#define YELLOW         14
#define WHITE          15

// line style, thickness, and drawing mode

#define NORM_WIDTH      1
#define THICK_WIDTH     3

#define SOLID_LINE      0
#define DOTTED_LINE     1
#define CENTER_LINE     2
#define DASHED_LINE     3
#define USERBIT_LINE    4

#define COPY_PUT        0
#define XOR_PUT         1
#define OR_PUT          2
#define AND_PUT         3
#define NOT_PUT         4

// fill styles

#define EMPTY_FILL      0
#define SOLID_FILL      1
#define LINE_FILL       2
#define LTSLASH_FILL    3
#define SLASH_FILL      4
#define BKSLASH_FILL    5
#define LTBKSLASH_FILL  6
#define HATCH_FILL      7
#define XHATCH_FILL     8
#define INTERLEAVE_FILL 9
#define WIDE_DOT_FILL   10
#define CLOSE_DOT_FILL  11
#define USER_FILL       12

// mouse buttons

#define WM_LBUTTONDOWN  SDL_BUTTON_LEFT
#define WM_MBUTTONDOWN  SDL_BUTTON_MIDDLE

```

```

#define WM_RBUTTONDOWN SDL_BUTTON_RIGHT
#define WM_WHEELUP      4 // SDL_MOUSEWHEEL no longer exists
#define WM_WHEELDOWN    5 // ditto
#define WM_MOUSEMOVE     SDL_MOUSEMOTION

#define PALETTE_SIZE     4096

#define KEY_HOME         SDLK_HOME
#define KEY_LEFT         SDLK_LEFT
#define KEY_UP           SDLK_UP
#define KEY_RIGHT        SDLK_RIGHT
#define KEY_DOWN         SDLK_DOWN
#define KEY_PGUP         SDLK_PAGEUP
#define KEY_PGDN         SDLK_PAGEDOWN
#define KEY_END          SDLK_END
#define KEY_INSERT       SDLK_INSERT
#define KEY_DELETE       SDLK_DELETE
#define KEY_F1           SDLK_F1
#define KEY_F2           SDLK_F2
#define KEY_F3           SDLK_F3
#define KEY_F4           SDLK_F4
#define KEY_F5           SDLK_F5
#define KEY_F6           SDLK_F6
#define KEY_F7           SDLK_F7
#define KEY_F8           SDLK_F8
#define KEY_F9           SDLK_F9
#define KEY_F10          SDLK_F10
#define KEY_F11          SDLK_F11
#define KEY_F12          SDLK_F12
#define KEY_LEFT_CTRL    SDLK_LCTRL
#define KEY_RIGHT_CTRL   SDLK_RCTRL
#define KEY_LEFT_SHIFT   SDLK_LSHIFT
#define KEY_RIGHT_SHIFT  SDLK_RSHIFT
#define KEY_LEFT_ALT     SDLK_LALT
#define KEY_LEFT_WIN     SDLK_LSUPER
#define KEY_RIGHT_WIN    SDLK_RSUPER
#define KEY_ALT_GR       SDLK_MODE
#define KEY_TAB          SDLK_TAB
#define KEY_BS           SDLK_BACKSPACE
#define KEY_RET          SDLK_RETURN
#define KEY_PAUSE        SDLK_PAUSE
#define KEY_SCR_LOCK     SDLK_SCROLLOCK
#define KEY_ESC          SDLK_ESCAPE

// graphics modes

#define DETECT           0
#define grOk            0
#define SDL_CGALO       0
#define SDL_CGAHI       1
#define EGA              2
#define EGAHI           2
#define EGALO           2
#define SDL_EGA         2
#define SDL              3
#define VGA              3

```

```

#define SDL_VGA          3
#define SDL_640x480     3
#define SDL_HERC        4
#define SDL_PC3270      5
#define SVGA            6
#define SDL_SVGALO      6
#define SDL_800x600     6
#define SDL_SVGAMED1    7
#define SDL_1024x768    7
#define SDL_SVGAMED2    8
#define SDL_1152x900    8
#define SDL_SVGAHI      9
#define SDL_1280x1024   9
#define SDL_WXGA       10
#define SDL_1366x768   10
#define SDL_USER       11
#define SDL_FULLSCREEN 12

```

3 Structs

Some of the BGI functions use the following structs:

```

struct arccoordstype {
    int x;
    int y;
    int xstart;
    int ystart;
    int xend;
    int yend;
};

struct date {
    int da_year;
    int da_day;
    int da_mon;
};

struct fillsettingstype {
    int pattern;
    int color;
};

struct linesettingstype {
    int linestyle;
    unsigned int upattern;
    int thickness;
};

struct palettetype {
    unsigned char size;
    signed char colors[MAXCOLORS + 1];
};

struct textsettingstype {
    int font;

```

```

    int direction;
    int charsize;
    int horiz;
    int vert;
};

struct viewporttype {
    int left;
    int top;
    int right;
    int bottom;
    int clip;
};

struct bgi_info {
    int colour_index;
    char *colour_name;
    unsigned long pixel_value;
};

struct rgb_colour {
    int colour_index;
    unsigned long pixel_value;
};

```

4 Note for SDL2 Programmers

The following variables, declared in `SDL_bgi.h`, are accessible to the programmer:

```

SDL_Window    *bgi_window;
SDL_Renderer  *bgi_renderer;
SDL_Texture   *bgi_texture;

```

and can be used by native SDL2 functions. That is, you can use BGI and native SDL2 functions together, as in the following code snippet:

```

SDL_Surface *bitmap;
SDL_Texture *texture;
...
bitmap = SDL_LoadBMP ("picture.bmp");
texture = SDL_CreateTextureFromSurface (bgi_renderer, bitmap);
SDL_RenderCopy (bgi_renderer, texture, NULL, NULL);
SDL_RenderPresent (bgi_renderer);
...

```

5 Standard BGI Graphics Functions

The following are standard BGI functions, as implemented for example in Turbo C. They are all prototyped in `SDL_bgi.h`.

Unless otherwise specified, graphics routines draw shapes using the current drawing colour, i.e. as specified by `setcolor()`.

```
void arc (int x, int y, int stangle, int endangle, int radius);
```

Draws a circular arc centered at (x, y) , with a radius given by *radius*, traveling from *stangle* to *endangle*. The angle for **arc()** is measured counterclockwise, with 0 degrees at 3 o' clock, 90 degrees at 12 o' clock, etc.

Note: The *linestyle* parameter does not affect arcs, circles, ellipses, or pieslices. Only the *thickness* parameter is used.

```
void bar (int left, int top, int right, int bottom);
```

Draws a filled-in rectangle (bar), using the current fill colour and fill pattern. The bar is not outlined; to draw an outlined two-dimensional bar, use **bar3d()** with *depth* equal to 0.

```
void bar3d (int left, int top, int right, int bottom, int depth, int topflag);
```

Draws a three-dimensional, filled-in rectangle (bar), using the current fill colour and fill pattern. The three-dimensional outline of the bar is drawn in the current line style and color. The bar's depth, in pixels, is given by *depth*. If *topflag* is nonzero, a top is put on.

```
void circle (int x, int y, int radius);
```

Draws a circle of the given *radius* at (x, y) .

Note: The *linestyle* parameter does not affect arcs, circles, ellipses, or pieslices. Only the *thickness* parameter is used.

```
void cleardevice (void);
```

Clears the graphics screen, filling it with the current background color. The CP is moved to (0, 0).

```
void clearviewport (void);
```

Clears the viewport, filling it with the current background color. The drawing CP is moved to (0, 0), relative to the viewport.

```
void closegraph (void);
```

Closes the graphics system.

```
void detectgraph (int *graphdriver, int *graphmode);
```

Detects the graphics driver and graphics mode to use. In SDL_bgi, the default is 800x600 (SVGA).

```
void drawpoly (int numpoints, int *polypoints);
```

Draws a polygon of *numpoints* vertices. *polypoints* is a pointer to a sequence of (2 * *numpoints*) integers; each pair gives the *x* and *y* coordinate of each vertex.

```
void ellipse (int x, int y, int stangle, int endangle, int xradius, int yradius);
```

Draws an elliptical arc centered at (*x*, *y*), with axes given by *xradius* and *yradius*, traveling from *stangle* to *endangle*.

```
void fillellipse (int x, int y, int xradius, int yradius);
```

Draws an ellipse centered at (*x*, *y*), with axes given by *xradius* and *yradius*, and fills it using the current fill color and fill pattern.

```
void fillpoly (int numpoints, int *polypoints);
```

Draws a polygon of *numpoints* vertices and fills it using the current fill color.

```
void floodfill (int x, int y, int border);
```

Fills an enclosed area, containing the *x* and *y* points bounded by the *border* color. The area is filled using the current fill color.

```
int getactivepage (void);
```

Returns the active page number.

```
void getarccoords (struct arccoordstype *arccoords);
```

Gets the coordinates of the last call to **arc()**, filling the *arccoords* structure.

```
void getaspectratio (int *xasp, int *yasp);
```

Retrieves the current graphics mode's aspect ratio. In SDL_bgi, *xasp* and *yasp* are both 10000 (i.e. the pixels are square).

```
int getbkcolor (void);
```

Returns the current background color.

```
int getcolor (void);
```

Returns the current drawing (foreground) color.


```
struct palettetype *getdefaultpalette (void);
```

Returns the palette definition structure.

```
char *getdrivername (void);
```

Returns a pointer to a string containing the name of the current graphics driver.

```
void getfillpattern (char * pattern);
```

Copies the user-defined fill pattern, as set by `setfillpattern`, into the 8-byte area pointed to by *pattern*.

```
void getfillsettings (struct fillsettingstype *fillinfo);
```

Fills the `fillsettingstype` structure pointed to by *fillinfo* with information about the current fill pattern and fill color.

```
int getgraphmode (void);
```

Returns the current graphics mode.

```
void getimage (int left, int top, int right, int bottom, void *bitmap);
```

Copies a bit image of the specified region into the memory pointed by *bitmap*.

```
void getlinesettings (struct linesettingstype *lineinfo);
```

Fills the `linesettingstype` structure pointed by *lineinfo* with information about the current line style, pattern, and thickness.

```
int getmaxcolor (void);
```

Returns the maximum color value available (`MAXCOLORS`). If RGB colors are being used, it returns `PALETTE_SIZE`.

```
int getmaxmode (void);
```

Returns the maximum mode number for the current driver. In `SDL_bgi`, the default is `SDL_FULLSCREEN`.

```
int getmaxx (void);
```

Returns the maximum *x* screen coordinate.

```
int getmaxy (void);
```

Returns the maximum *y* screen coordinate.

```
char* getmodename (int mode_number);
```

Returns a pointer to a string containing the name of the specified graphics mode.

```
void getmoderange (int graphdriver, int *lomode, int *himode);
```

Gets the range of valid graphics modes. The *graphdriver* parameter is ignored.

```
void getpalette (struct palettetype *palette);
```

Fills the *palettetype* structure pointed by *palette* with information about the current palette's size and colors.

```
int getpalettesize (void);
```

Returns the size of the palette (`MAXCOLORS + 1` or `MAXRGBCOLORS + 1`).

```
int getpixel (int x, int y);
```

Returns the color of the pixel located at (x, y) .

```
void gettextsettings (struct textsettingstype *texttypeinfo);
```

Fills the *textsettingstype* structure pointed to by *texttypeinfo* with information about the current text font, direction, size, and justification.

```
void getviewsettings (struct viewporttype *viewport);
```

Fills the *viewporttype* structure pointed to by *viewport* with information about the current viewport.

```
int getvisualpage (void);
```

Returns the visual page number.

```
int getx (void);
```

Returns the current viewport's *x* coordinate.

```
int gety (void);
```

Returns the current viewport's *y* coordinate.

```
void graphdefaults (void);
```

Resets all graphics settings to their defaults: sets the viewport to the entire screen, moves the CP to (0, 0), sets the default palette colors, the default drawing and background color, the default fill style and pattern, the default text font and justification.

```
char* grapherrormsg (int errorcode);
```

Returns a pointer to the error message string associated with *errorcode*, returned by **graphresult()**.

```
int graphresult (void);
```

Returns the error code for the last unsuccessful graphics operation and resets the error level to grOk.

```
unsigned imagesize (int left, int top, int right, int bottom);
```

Returns the size in bytes of the memory area required to store a bit image.

```
void initgraph (int *graphdriver, int *graphmode, char *pathtodriver);
```

Initializes the graphics system. In SDL_bgi, you can use SDL as *graphdriver*, then choose a suitable graphics mode (listed in **graphics.h**) as *graphmode*. The *pathtodriver* argument is ignored; you can also use NULL for **graphdriver* and **graphmode*.

After **initgraph()**, all graphics commands are immediately displayed, as in the original BGI. This makes drawing very slow; you may want to use **initwindow()** instead.

```
void initwindow (int width, int height);
```

Initializes the graphics system, opening a *width*×*height* window. If either *width* or *height* is 0, then SDL_FULLSCREEN will be used.

The user is in charge of updating the screen using **refresh()**.

```
int installuserdriver (char *name, int (*detect)(void));
```

Unimplemented; not used by SDL_bgi.

```
int installuserfont (char *name);
```

Unimplemented; not used by SDL_bgi.

```
void line (int x1, int y1, int x2, int y2);
```

Draws a line between two specified points; the CP is not updated.

```
void linerel (int dx, int dy);
```

Draws a line from the CP to a point that is (dx, dy) pixels from the CP. The CP is then advanced by (dx, dy) .

```
void lineto (int x, int y);
```

Draws a line from the CP to (x, y) , then moves the CP to (dx, dy) .

```
void moverel (int dx, int dy);
```

Moves the CP by (dx, dy) pixels.

```
void moveto (int x, int y);
```

Moves the CP to the position (x, y) , relative to the viewport.

```
void outtext (char *textstring);
```

Outputs *textstring* at the CP.

```
void outtextxy (int x, int y, char *textstring);
```

Outputs *textstring* at (x, y) .

```
void pieslice (int x, int y, int stangle, int endangle, int radius);
```

Draws and fills a pie slice centered at (x, y) , with a radius given by *radius*, traveling from *stangle* to *endangle*. The pie slice is filled using the current fill colour.

```
void putimage (int left, int top, void *bitmap, int op);
```

Puts the bit image pointed to by *bitmap* onto the screen, with the upper left corner of the image placed at $(left, top)$. *op* specifies the drawing mode (COPY_PUT, etc).

```
void putpixel (int x, int y, int color);
```

Plots a point at (x, y) in the color defined by *color*.

```
void rectangle (int left, int top, int right, int bottom);
```

Draws a rectangle delimited by $(left, top)$ and $(right, bottom)$.

```
void refresh (void);
```

Updates the screen.

```
int registerbgidriver (void (*driver)(void));
```

Unimplemented; not used by SDL_bgi.

```
int registerbgifont (void (*font)(void));
```

Unimplemented; not used by SDL_bgi.

```
void restorecrtmode (void);
```

Hides the graphics window.

```
void sector (int x, int y, int stangle, int endangle, int xradius, int yradius);
```

Draws and fills an elliptical pie slice centered at (x, y) , horizontal and vertical radii given by $xradius$ and $yradius$, traveling from $stangle$ to $endangle$.

```
void setactivepage (int page);
```

Makes $page$ the active page for all subsequent graphics output.

```
void setallpalette (struct palettetype *palette);
```

Sets the current palette to the values given in $palette$.

```
void setaspectratio (int xasp, int yasp);
```

Changes the default aspect ratio of the graphics. In SDL_bgi, this function is not necessary since the pixels are square.

```
void setbkcolor (int color);
```

Sets the current background color using the default palette.

```
void setcolor (int color);
```

Sets the current drawing color using the default palette.

```
void setfillpattern (char *upattern, int color);
```

Sets a user-defined fill pattern. $upattern$ is a pointer to a sequence of 8 bytes; each byte corresponds to 8 pixels in the pattern; each bit set to 1 is plotted as a pixel.

```
void setfillstyle (int upattern, int color);
```

Sets the fill pattern and fill color. $upattern$ is a pointer to a sequence of 8 bytes, with each byte corresponding to 8 pixels in the pattern.

```
unsigned setgraphbufsize (unsigned bufsize);
```

Unimplemented; not used by SDL_bgi.

```
void setgraphmode (int mode);
```

Shows the window that was hidden by **restorecrtmode**(). The *mode* parameter is ignored

```
void setlinestyle (int linestyle, unsigned upattern, int thickness);
```

Sets the line width and style for all lines drawn by **line()**, **lineto()**, **rectangle()**, **drawpoly()**, etc. The line style can be **SOLID_LINE**, **DOTTED_LINE**, **CENTER_LINE**, **DASHED_LINE**, or **USERBIT_LINE**; in the latter case, the user provides a 16-bit number (*upattern*) whose bits set to 1 will be plotted as pixels.

The line thickness can be set with **NORM_WIDTH** or **THICK_WIDTH**.

Arcs, circles, ellipses, and pieslices are not affected by *linestyle*, but are affected by *thickness*.

```
void setpalette (int colornum, int color);
```

Changes the standard palette *colornum* to *color*.

```
void settextjustify (int horiz, int vert);
```

Sets text justification. Text output will be justified around the CP horizontally and vertically; settings are **LEFT_TEXT**, **CENTER_TEXT**, **RIGHT_TEXT**, **BOTTOM_TEXT**, and **TOP_TEXT**.

```
void settextstyle (int font, int direction, int charsize);
```

Sets the text font (only **DEFAULT_FONT** is actually available), the direction in which text is displayed (**HORIZ_DIR**, **VERT_DIR**), and the size of the characters. If *charsize* is an integer number, the text will be scaled by that number; if it is 0, the text will be scaled by **setusercharsize**().

```
void setusercharsize (int multx, int divx, int multy, int divy);
```

Lets the user change the character width and height. If a previous call to **settextstyle**() set *charsize* to 0, the default width is scaled by *multx*/*divx*, and the default height is scaled by *multy*/*divy*.

```
void setviewport (int left, int top, int right, int bottom, int clip);
```

Sets the current viewport for graphics output. If *clip* is nonzero, all drawings will be clipped (truncated) to the current viewport.

```
void setvisualpage (int page);
```

Sets the visual graphics page number.

```
void setwritemode (int mode);
```

Sets the writing mode for line drawing. *mode* can be COPY_PUT, XOR_PUT, OR_PUT, AND_PUT, and NOT_PUT.

```
int textheight (char *textstring);
```

Returns the height in pixels of a string.

```
int textwidth (char *textstring);
```

Returns the height in pixels of a string.

6 Non-Graphics Functions and Macros

```
void delay (int millisec);
```

Waits for *millisec* milliseconds. In “slow mode”, a screen refresh is performed.

```
int getch (void);
```

Waits for a key and returns its ASCII code. In “slow mode”, a screen refresh is performed.

```
int kbhit (void);
```

Returns 1 when a key is pressed. In “slow mode”, a screen refresh is performed.

```
int random (int range) (macro)
```

Returns a random number between 0 and *range* - 1.

7 SDL_bgi Additions

```
int COLOR (int r, int g, int b);
```

Can be used as an argument for **setcolor()** and **setbkcolor()** to set an RGB color.

```
int RED_VALUE (int color)
```

Returns the red component of an RGB color.

```
int GREEN_VALUE (int color)
```

Returns the green component of an RGB color.

```
int BLUE_VALUE (int color)
```

Returns the blue component of an RGB color.

```
int IS_BGI_COLOR (int color);
```

Returns 1 if the current color is a standard BGI color (not RGB). The argument is actually redundant.

```
int IS_RGB_COLOR (int color);
```

Returns 1 if the current color is in RGB mode. The argument is actually redundant.

```
void event (void);
```

Returns 1 if an event (mouse click or key press) has occurred.

```
void eventtype (void);
```

Returns the type of the last event; either `SDL_KEYPRESS` or `SDL_MOUSEBUTTONDOWN`.

```
int getevent (void);
```

Waits for a keypress or mouse click, and returns the code of the mouse button or key that was pressed.

```
int getmaxheight (void);
```

Returns the screen (root window) height.

```
int getmaxwidth (void);
```

Returns the screen (root window) width.

```
void getmouseclick (int kind, int *x, int *y);
```

Sets the x,y coordinates of the last *kind* button click expected by `ismouseclick()`.

```
int initwindow (int width, int height);
```

Opens a $width \times height$ graphics window.


```
int ismouseclick (int kind);
```

Returns 1 if the *kind* mouse button was clicked.

```
int mouseclick (void);
```

Returns the code of the mouse button that was clicked, or 0 if none was clicked.

```
int mousex (void);
```

Returns the X coordinate of the last mouse click.

```
int mousey (void);
```

Returns the Y coordinate of the last mouse click.

```
void _putpixel (int x, int y);
```

Plots a point at (*x*,*y*) using the current drawing color. This function is faster than **putpixel()**, since it is not immediately displayed.

```
void readimagefile (char * filename, int x1, int y1, int x2, int y2);
```

Reads a **.bmp** file and displays it immediately at (*x1*, *y1*). If (*x2*, *y2*) are not 0, the bitmap is stretched to fit the rectangle *x1*,*y1*—*x2*,*y2*; otherwise, the bitmap is clipped as necessary.

```
void refresh (void);
```

Updates the screen contents, i.e. displays all graphics.

```
void sdlbgifast (void);
```

Triggers “fast mode”, i.e. **refresh()** is needed to display graphics.

```
void sdlbgislow (void);
```

Triggers “slow mode”, i.e. **refresh()** is not needed to display graphics.

```
void setalpha (int col, Uint8 alpha);
```

Sets alpha transparency for colour *col* to *alpha* (0–255).

```
void setbkrgbcolor (int n);
```

Sets the current background color using using the *n*-th color index in the RGB palette.

```
void setrgbcolor (int n);
```

Sets the current drawing color using the n -th color index in the RGB palette.

```
void setrgbpalette (int n, int r, int g, int b);
```

Sets the n -th entry in the RGB palette specifying the r , g , and b components.

Using `setrgbpalette()` and `setrgbcolor()` is faster than setting colors with `setcolor()` with a **COLOR()** argument.

```
int swapbuffers (void);
```

Swaps the current active and the current visual graphics pages.

```
int xkbhit (void);
```

Returns 1 when any key is pressed, including Ctrl, Shift, etc. In “slow mode”, a screen refresh is performed.

```
void writeimagefile (char * filename, int left, int top, int right, int bottom);
```

Writes a `.bmp` file from the screen rectangle defined by $left, top—right, bottom$.

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