**Graphics LCD Displays (GLCD)**

A graphic LCD (liquid crystal display) is an electronic visual display technology used in different gadgets and information-output sources, mostly in display screens of electronic devices. This technology employs manipulating tiny crystals of a contained liquid crystal solution through precise electronic signals to perform graphic display operations over a two-dimensional physical screen.

There are several GLCD screens and controllers in use currently. For small applications, the 128 X 64 pixel monochrome GLCD with KS0108 controller is one of the most commonly used displays. This unit is a very clear STN type LCD with a simple command interface. Utilizes the extremely common KS0108B parallel interface chipset.

Connect GLCD backpack containing GLCD firmware to the GLCD and then send the commands through the serial monitor to perform different operation.

**Commands for GLCD**

* **bud=x**

This command is used to select the baud rate.

Where x is

* + - * + 0 = 1200 baud rate
        + 1 = 2400 baud rate
        + 2 = 4800 baud rate
        + 3 = 9600 baud rate
        + 4 = 19200 baud rate
        + 5 = 28800 baud rate
        + 6 = 38400 baud rate
        + 7 = 57600 baud rate
        + 8 = 115200 baud rate

Eg:

1. To select 9600 baud rate we should type the command “**bud=3**”
2. To select 57600 baud rate we should type the command “**bud=7**”

* **std(x,y,c)**

This command is used to set the dot on the screen.

Where x, y & c are the horizontal position, vertical position & black or white dot respectively

Eg:

1. std(10,30,1) the black dot will appear in horizontal 10th & vertical 30th position.
2. std(100,3,0) the white dot will appear in horizontal 100th & vertical 3th position.

Note: x- Should be within range 0 to 128.

y- Should be within range 0 to 64.

* **dvl(x,y,z,c)**

This command is used to draw vertical line on the screen.

Where x, y, z & c are the horizontal position, vertical position, height of line & black or white dot respectively

Eg:

1. dvl(11,30,10,1) the size of 10 black vertical line will appear in horizontal 11th & vertical 30th position.
2. dvl (20,30,10,0) the size of 10 white vertical line will appear in horizontal 20th & vertical 30th position.

Note: x- Should be within range 0 to 128.

y- Should be within range 0 to 64.

h- Should be within range 0 to 64.

* **dhl(x,y,z,c)**

This command is used to draw horizontal line on the screen.

Where x, y, z & c are the horizontal position, vertical position, height of line & black or white dot respectively.

Eg:

1. dhl(11,30,10,1) the size of 10 black horizontal line will appear in horizontal 11th & vertical 30th position.
2. dhl(20,30,10,0) the size of 10 white vertical line will appear in horizontal 20th & vertical 30th position.

Note: x- Should be within range 0 to 128.

y- Should be within range 0 to 64.

z- Should be within range 0 to 128.

* **drt(x,y,z,w,c)**

This command is used to draw rectangle on the screen.

Where x, y, z, w & c are the horizontal position, vertical position, width, height & black or white dot respectively

Eg:

1. drt(11,30,10,18,1) the width of 10 height of 18 black rectangle will appear in horizontal 11th & vertical 30th position
2. drt(111,30,5,10,0) the width of 5 height of 10 white rectangle will appear in horizontal 111th & vertical 30th position

Note: x- Should be within range 0 to 128.

y- Should be within range 0 to 64.

z- Should be within range 0 to 128.

w- Should be within range 0 to 64.

* **frt(x,y,z,w,c)**

This command is used to fill rectangle with black or white dots on the screen.

Where x, y, z, w & c are the horizontal position, vertical position, width, height & black or white dot respectively.

Eg:

1. frt(11,30,10,18,1) the width of 10 height of 18 rectangle filled with black dots will appear in horizontal 11th & vertical 30th position.
2. frt(111,30,5,10,0) the width of 5 height of 10 white rectangle filled with white dots will appear in horizontal 111th & vertical 30th position.

Note: x- Should be within range 0 to 128.

y- Should be within range 0 to 64.

z- Should be within range 0 to 128.

w- Should be within range 0 to 64.

* **irt(x,y,z,w,c)**

This command is used to invert rectangle with black and white dots on the screen.

Where x, y, z, w & c are the horizontal position, vertical position, width, height & black or white dot respectively.

Eg:

1. irt(11,30,10,18,1) the width of 10 height of 18 rectangle filled with black dots will appear in horizontal 11th & vertical 30th position.
2. irt(111,30,5,10,0) the width of 5 height of 10 white rectangle filled with white dots will appear in horizontal 111th & vertical 30th position.

Note: x- Should be within range 0 to 128.

y- Should be within range 0 to 64.

z- Should be within range 0 to 128.

w- Should be within range 0 to 64.

* **dcl(x,y,z,c)**

This command is used to draw circle on the screen.

Where x, y, z & c are the horizontal position, vertical position, radius & black or white dot respectively

Eg:

1. dcl(11,30,10,1) the radius of 10 black circle will appear in horizontal 11th & vertical 30th position.
2. dcl(20,30,10,0) the radius of 10 white circle will appear in horizontal 20th & vertical 30th position.

Note: x- Should be within range 0 to 128.

y- Should be within range 0 to 64.

z- Should be within range 0 to 64.

* **fcl(x,y,z,c)**

This command is used to fill circle on the screen.

Where x, y, z & c are the horizontal position, vertical position, radius & black or white dot respectively.

Eg:

1. fcl (11,30,10,1) the radius of 10 circle filled with black dots will appear in horizontal 11th & vertical 30th position.
2. fcl (20,30,10,0) the radius of 10 circle filled with white dots will appear in horizontal 20th & vertical 30th position.

Note: x- Should be within range 0 to 128.

y- Should be within range 0 to 64.

z- Should be within range 0 to 128.

w- Should be within range 0 to 64.

* **txt**

This command is display text on your screen.

Type txt and press enter after that whatever you type that will be displayed on the screen or send txt \n to the serial port and send the characters you want to display on the screen and once it is done terminate using “**;**”.

Eg

txt \n

hello world ;

* **clr**

This command is used clear the display.

* **sct(x,y)**

To select the particular (x,y) coordinate, the action will start from particular coordinate.

Note: x- Should be within range 0 to 128.

y- Should be within range 0 to 64.

* **sft(x,c)**

To select the font definition as the current font. Subsequent printing functions will use this font, where x is used to select different font and c is used to select Black or White color.

When x is

* + - * + 0 = Arial\_bold\_14
        + 1 = Arial 14
        + 2 = Corsiva\_12
        + 3 = fixednums7x15
        + 4 = fixednums8x16
        + 5 = fixednums15x31
        + 6 = SystemFont5x7
* **sfc(x)**

This command sets the color of the currently selected font.

If x= 0, it selects Black color, if x= 1, it selects White color.

**Applications**

GLCD can be used in the following applications as a display units

* Cell phones screens,
* Laptop computer screens,
* LCD monitors, calculators,
* Digital readers,
* Electronic diaries and watches,
* Flat-screen televisions, and many other electronic devices or gadgets that display information in visual or text-based format.
* Scientific applications where we want to display graphical data such as bar chart or x-y graph and so on
* Industrial automation and control, where various plant characteristics can be easily monitored or changed.