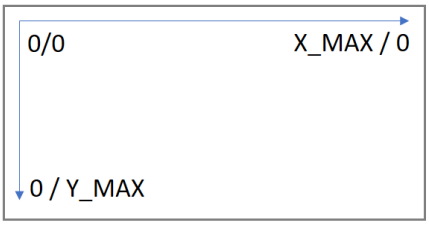
Smart I2C GLCD – Instructions

Version 1-1, 28-Dec-2017 – Stephan Laage-Witt

Coordinate System



The coordinate 0/0 defines the upper left corner.

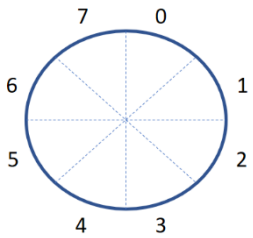
Y_MAX is 63.

X_MAX is 127 for displays with 2 graphic controller chips, and 191 for those with 3 chips

Coordinate specifications outside this range may give unpredictable results.

Instruction Set

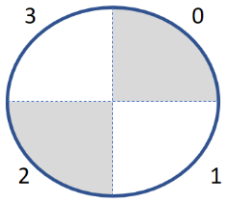
Mnemonic	Code	Parameters (bytes)
GLCD_ON	**01**	None
Switches on the display.		
GLCD_OFF	**02**	None
Switches display off and enters low power mode. The display is blanked; however, display memory will be maintained.		
GLCD_SET_LIGHT	**03**	Light level [range: 0…10]
Sets the level of the display back light. The range is 0 (completely switched off) to 10 (maximum light level). The new value is saved to the eePROM and will be used as default setting after power on.		
GLCD_DIM_ON	**04**	None
Shuts off the display back light. The default light level (as stored in the eePROM) remains unchanged. This command is useful for temporarily switching off the display light, e.g. to reduce power consumption.		
GLCD_DIM_OFF	**O5**	None
Restores the display back light to the previous value (prior to GLCD_DIM_ON).		
GLCD_SET_I2C	**06**	I2C address [range: 8…127]
Changes the current I2C address to a new value. The display will be reset. The new I2C address is captured in the eePROM and will be used as default at power on.		
GLCD_VERBOSE_ON	**07**	None
Activates verbose mode. In this mode, the display shows the following additional information: 1) At start-up, key parameters (firmware version, I2C address, display back light level) 2) During use, unknown instruction tokens are displayed preceded by '*' This mode is useful for debugging. Verbose setting is preserved in the eePROM.		
GLCD_VERBOSE_OFF	**08**	None
Deactivates verbose mode		
GLCD_AUTOSCROLL_ON	**09**	None
Activates auto scroll for text output via the instructions GLCD_DRAW_STRING, GLCD_DRAW_CHAR, GLCD_DRAW_UDEC, GLCD_DRAW_SDEC. Auto scroll includes line feed/carriage return at the right border and scrolling upwards at the bottom border. Auto scroll setting is preserved in the eePROM.		
GLCD_AUTOSCROLL_OFF	**10**	None
Deactivates auto scroll. Text output beyond the right or bottom border are being ignored.		

Mnemonic	Code	Parameters (bytes)
GLCD_ENTER_SLEEP_MODE	**11**	None
Enters the sleep mode of the controller to further reduce power consumption. This function requires the back light to be switched off (light level 0 or dim function on) to become active. Otherwise it will be ignored. Sleep mode will be disabled by any following instruction. Power consumption will be reduced by approximately 1mA.		
GLCD_CLEAR_SCREEN	**15**	mode
Erases the display. If mode is 0, then the display is filled with "off"-pixels, otherwise "on"-pixels.		
GLCD_SET_PIXEL	**16**	x, y, mode
Sets a pixel at the specified coordinate. If *mode* equals 0 then an "off"-pixels is set, otherwise an "on"-pixel.		
GLCD_DRAW_LINE	**17**	x_start, y_start, x_end, y_end, mode
Plots a straight line. If *mode* equals 0 then "off"-pixels are used, otherwise "on"-pixels.		
GLCD_DRAW_DOTTED_VER_LINE	**19**	x_pos, y_start, y_end, spacing, mode
Plots a dotted vertical line. *x_pos* specifies the x coordinate for the vertical line. *y_start* and *y_end* define the start and end position of the line. *spacing* defines the number of empty pixels between the dots. The value 0 results in a solid line. *mode* specifies whether "off"-pixels (mode equals 0) and are "on"-pixels should be used.		
GLCD_DRAW_DOTTED_HOR_LINE	**20**	y_pos, x_start, x_end, spacing, mode
Plots a dotted horizontal line. *y_pos* specifies the y coordinate for the horizontal line. *x_start* and *x_end* define the start and end position of the line. *spacing* defines the number of empty pixels between the dots. The value 0 results in a solid line. *mode* specifies whether "off"-pixels (mode equals 0) and are "on"-pixels should be used.		
GLCD_DRAW_FUNCTION	**20**	n, x_start, mode, y data points {y1, y2, … yn}
Plots a series of y-coordinates from left to right. *n* specifies the number of data points to be plotted. *x_start* is the first x-coordinate position. The x-coordinate will be auto-incremented by 1 (shifted to the right) for each data item. The sum of *n* and *x_start* must not exceed X_MAX to avoid plotting beyond the right border of the display. *mode* specifies whether "off"-pixels (mode equals 0) and are "on"-pixels should be used. *{y1 … yn}* are the data points to be plotted. The number of data points must match *n*.		
GLCD_DRAW_SCATTER	**21**	n, x_start, mode, y_data points {y1, y2, … yn}
Same as "GLCD_DRAW_FUNCTION", except that the y data points are not connected.		
GLCD_DRAW_RECTANGLE	**22**	x_start, y_start, x_end, y_end, mode
Plots a rectangle of straight lines with *start* being the upper left corner and *end* the lower right coordinate. If *mode* equals 0 then "off"-pixels are used, otherwise "on"-pixels.		
GLCD_DRAW_FILLED_RECTANGLE	**23**	x_start, y_start, x_end, y_end, mode
Same as "GLCD_DRAW_RECTANGLE", except that the rectangle will be filled.		
GLCD_DRAW_CIRCLE	**25**	x_origin, y_origin, radius, segment, mode
Plots a circle at *origin* with *radius* as specified. *Segment* specifies the sector(s) to be plotted. Each bit represents a sector as shown on the right. Any combination is possible. E.g. *0b11111111* plots a full circle, *0b00001111* specifies a right half circle, etc. If *mode* equals 0 then "off"-pixels are used, otherwise "on"-pixels.		

Mnemonic	Code	Parameters (bytes)
GLCD_DRAW_FILLED_CIRCLE	**26**	x_origin, y_origin, radius, segment, mode

Plots a filled circle at *origin* with *radius* as specified.
Segment specifies the sector to be plotted. Each bit represents a sector as shown, with any combination being possible. Only the 4 lower bits are interpreted. E.g. *0b00001111* plots a full filled circle, etc.

If *mode* equals 0 then "off"-pixels are used, otherwise "on"-pixels.

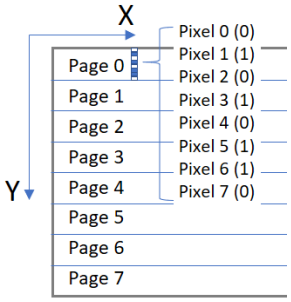


GLCD_LOAD_RAW	**30**	x_pos, y_page [range: 0 … 7], n, raw data bytes {db1, db2, … dbn}

Loads data bytes directly into the display memory. Display memory is organized into 8 rows of bytes with each byte representing a vertical column of 8 pixels.

x_pos specifies the starting position. *y_page* defines the selected page.

n is the number of bytes to be loaded, starting a *x_pos* and incrementing to the right. Data exceeding X_MAX will be ignored.

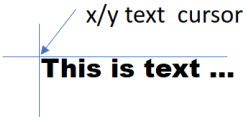


GLCD_DRAW_CHAR	**32**	char

Plots a character using the currently selected font set. The character is plotted at the current text cursor position. The cursor position specified the upper left corner of the character and will be shifted to the right end of the character.

GLCD_DRAW_STR	**33**	zero terminated string {char1, char2, … char n, 0}

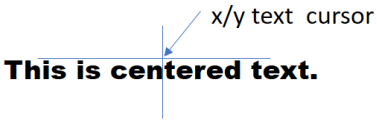
Plots a string. The current text cursor position specified the upper left corner of the string and will be shifted to the right edge of the string after execution.
The system handles 2 special characters:
'\n' = ASCII(13) -> new line, advances to the next line below the current line, scrolls the display up if needed, and positions the cursor to the left edge of the display.
'\t' = ASCII(8) -> advances the cursor to the next tab position. Tab positions are every 32 pixel.



GLCD_DRAW_CENTER_STRG	**34**	zero terminated string {char1, char2, … char n, 0}

Same as GLCD_DRAW_STR, except that the string is centred at the current x-position of text cursor.

The string length must not exceed 64 characters. Longer strings are truncated. Special characters ('/n' or '/t') are not allowed for this function.



GLCD_DRAW_UDEC	**35**	upper byte, lower byte [of unsigned integer, 16 bits], number of digits [1 … 5], decimal point position [0 … number of digits – 1]

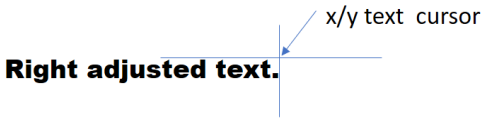
Prints a decimal representation of a 16 bit value at the current position to the text cursor (see GLCD_SET_CURSOR)

Upper byte and *lower byte* represent the 16 bits value *to be* displayed. The routine does not handle negative values.

Number of digits specifies the expected number of positions. The decimal value will be right adjusted and filled with leading spaces to reach the requested number of digits. It is the user's responsibility to ensure that the number of digits allows the decimal value to be displayed. E.g. 3 digits can handle values up to 999 and will give unpredictable results for greater values.

Decimal point position specifies the position of a decimal point, counting from the right. 0 omits any decimal point. E.g. a value of 2 inserts a decimal point two positions from the right. This feature is useful for fixed point arithmetic.

Example: 123, 4, 2 -> "`_1.23`"
123, 5, 0 -> "`__123`"

Mnemonic	Code	Parameters (bytes)
GLCD_DRAW_SDEC	**36**	upper byte, lower byte [of signed integer, 16 bits], number of digits [1 … 5], decimal point position [0 … number of digits – 1]
Same as GLCD_DRAW_UDEC, however handles signed integers. Example: -123, 4, 2 -> “`_-1.23`” -123, 5, 0 -> “`__-123`”		
GLCD_DRAW_RADJ_STR	**37**	zero terminated string {char1, char2, … char n, 0}
Same as GLCD_DRAW_STR, except that the string is right adjusted at the current x-position of the text cursor. The string length must not exceed 64 characters. Longer strings are truncated. Special characters (‘/n’ or ‘/t’) are not allowed for this function. 		
GLCD_SET_CURSOR	**50**	x, y
Sets the cursor for char and string commands		
GLCD_SET_FONT	**51**	font [0 … 5]
Sets the font set accordingly. For the list of available fonts, see separate chapter.		
GLCD_SCROLL_UP	**52**	Pages [1 … 4]
Scrolls up the display from bottom to top by the number of *pages* as specified. A page is a row of 8 pixel lines. This function creates space at the bottom of the display. The upper portion of the display memory will be discarded.		
GLCD_GET_STR_WIDTH	**60**	zero terminated string {char1, char2, … char n, 0} Returns: (byte) str_width
The function calculates the horizontal width (number of pixel) of the submitted string, based on the current font set. Maximum string length is 64 characters. Special characters (e.g. line feed, tabulator) are being ignored. Note: The I2C read functions require synchronous execution. This means that the instructions buffer needs to be empty in order to deliver the correct return value.		
GLCD_GET_CURSOR	**61**	None Returns: (byte) x_cur, (byte) y_cur
Returns the current position of the text cursor. Note: The I2C read functions require synchronous execution. This means that the instructions buffer needs to be empty in order to deliver the correct return value.		
GLCD_GET_FONT	**62**	None Returns: (byte) font
Returns the number of the currently selected font. Note: The I2C read functions require synchronous execution. This means that the instructions buffer needs to be empty in order to deliver the correct return value.		
GLCD_GET_MAX_XY	**63**	None Returns: (byte) max_x, (byte) max_y
Returns the display width and height in terms of the maximum x- and y-position Note: The I2C read functions require synchronous execution. This means that the instructions buffer needs to be empty in order to deliver the correct return value.		
GLCD_GET_FONT_HEIGHT	**65**	None Returns: (byte) font_height
Returns the height (number of pixels) of the currently selected font Note: The I2C read functions require synchronous execution. This means that the instructions buffer needs to be empty in order to deliver the correct return value.		

Fonts

Font 0 is a fixed space font and set as default at system start-up. Fonts 1 to 6 are fonts of different height and variable character widths, as shown below. For all fonts, the available ASCII values are limited to 32 to 127. ASCII values outside this range are ignored.