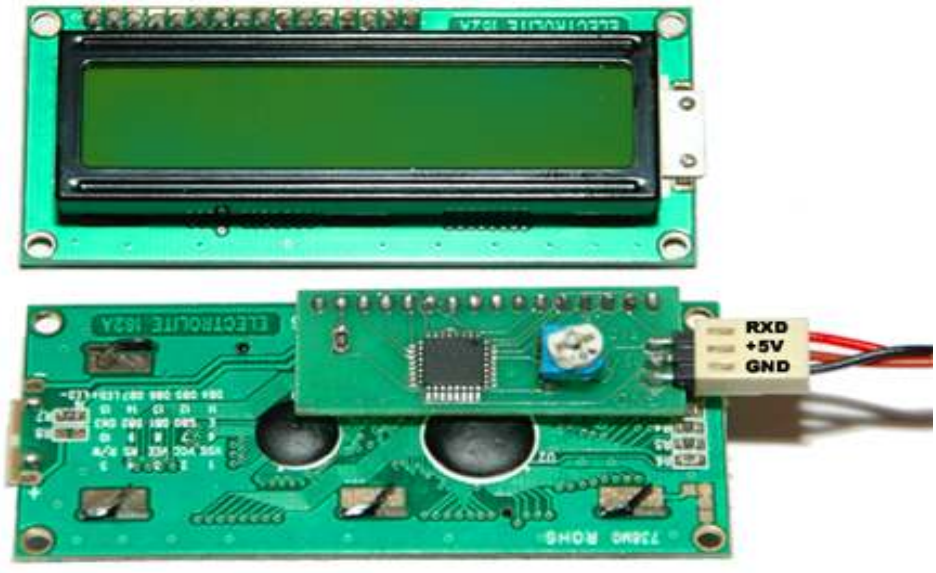
Robokits Serial LCD



Users Manual

Robokits India

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info@robokits.co.in

Robokits World

http://www.robokitsworld.com

Thank you for purchasing the Robokits 16X2 Serial LCD with backlight. The Serial LCD is cheap, with lots of functionalities and they are extremely easily to interface. It can be connected with PCs, microcontrollers or any other device which can send the serial commands. The interface contains only 3 pins, +5V, GND and RX. It uses only 1 microcontroller pin, and so it saves lots of hardware complexities and time. To interface with PC sample code in Visual Basic 6 is provided.

Features

- **Only 3 wire interface**
- **Works on 9600 baud**
- **Supports functions like Backlight on/off, Display on/off, Go to line/char, Line feed, Clear Screen, Change cursor type etc. in single command.**
- **Current consumption 20ma while backlight off and 70ma while backlight on.**
- **512 bytes buffer for serial interface.**
- **Up to 8 custom characters can be defined and used easily.**

This Product Includes

- **Serial LCD**
- **3 pin cable for connection.**
- **CD containing VB source code, user guide, sample codes in WinAVR.**

Setting up LCD for display

- **Connect +5V and GND for power. Connect the RX pin with TX pin of the microcontroller or PC RS-232 Serial link.**

- **On power up the LCD with display cursor on Character 1 Line 0.**
- **The LCD works on 9600 baud rate.**
- **LCD is normally initialized when powered and can be used directly after 20ms.**

Displaying Text

After powering up and connecting the LCD with serial Device, any ASCII codes from Decimal 32 to 127 to display characters, numbers and symbols, except '\' backslash(Decimal 92) and '~' tilde (Decimal 126). For connivance these two characters are defined as custom character 1 & 2 so that they can be inserted anywhere while displaying. These 2 characters can be overwritten as per your needs.

When a character is received, the Serial LCD displays that character at the current cursor position and then moves the cursor one position to the right. When you first turn on the LCD, the cursor is one line 0 character 0.

Here is the part of code for displaying text on Serial LCD in WinAVR.

```
#define UART_BAUD_RATE      9600

int main(void)
{

    uart_init( UART_BAUD_SELECT(UART_BAUD_RATE,F_CPU) );  //Initialize Uart
    sei();                            // Enable Interrupts

      uart_puts("ROBOKITS INDIA");
      uart_puts("www.robokits.co.in");
}
```

Moving the Cursor

The cursor automatically moves to the next character when an ASCII character is displayed. To move the cursor to some position there are various single byte commands.

For example, Left command (Decimal 8) move the cursor one character to left and Right Command (Decimal 9) moves one character to right. The Line Feed command (Decimal 10) moves the cursor to the next line but keeps the horizontal position same. The Carriage Return command (Decimal 13) also moves the cursor to next line but it moves to the first character. The Form Feed command (Decimal 12) clears the screen and moves cursor to starting position. After form feed command 5ms delay should be provided to give enough time to LCD to clear the screen.

It is also possible to jump to any line and character by sending Decimal 128 to 143 for the first line and 148 to 163 for second line. For example if the requirement is to move the cursor on third character on second line then send Decimal 150.

Controlling the LCD Display

The LCD display and backlight can be turned on and off by sending one byte commands. Decimal 21 turns the display off, while Decimal 22-25 turns it with different cursor options. Decimal 17 and 19 can be used to make the backlight off and on.

Defining and Using Custom Characters

Upto 8 Different Characters can be defined and used in the Serial LCD. These characters are stored in RAM of the LCD itself and so they should be redefined again once the power is off.

To define the custom character Send one Decimal from 248 to 255 (For custom char. 1 to 8) followed by 8 bytes data which defines the pixels of character. The data bytes define the character starting at the topmost row of pixels, as shown in the example code.

```
#define UART_BAUD_RATE      9600

int main(void)
{

    uart_init( UART_BAUD_SELECT(UART_BAUD_RATE,F_CPU) );  //Initialize Uart
    sei();                              // Enable Interrupts

      uart_putc(250);     // Define 3rd Custom Character
      uart_putc(0);       //%00000
      uart_putc(4);       //%00100       *
      uart_putc(14);      //%01110      ***
      uart_putc(31);      //%11111     *****
      uart_putc(4);       //%00100       *
      uart_putc(4);       //%00100       *
      uart_putc(4);       //%00100       *
      uart_putc(4);       //%00100       *

      uart_putc(2);       // Recall 3rd custom character
}
```

Robokits Serial LCD Command Set

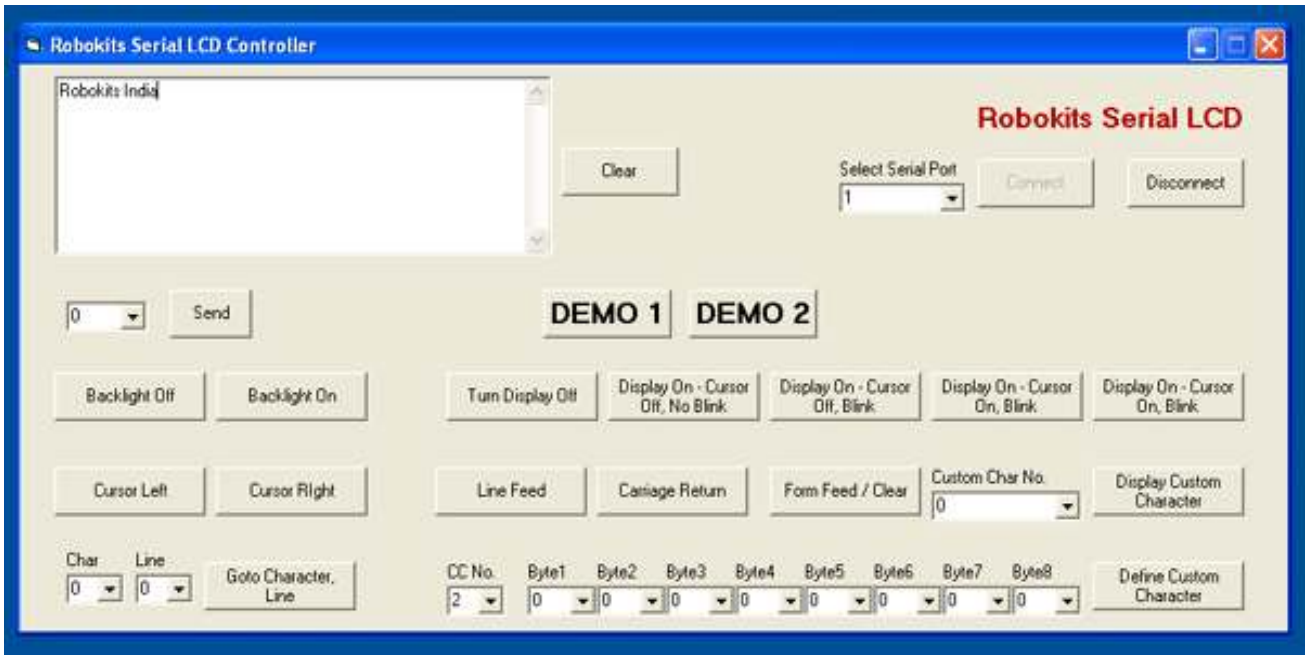
Below is the command set in Decimal and Hex. Any commands sent other than these are ignored by the serial LCD when received.

DEC	HEX	COMMAND ACTION
0	00	Display custom character 1
1	01	Display custom character 2
2	02	Display custom character 3
3	03	Display custom character 4
4	04	Display custom character 5
5	05	Display custom character 6
6	06	Display custom character 7
7	07	Display custom character 8
8	08	Backspace / Left - The cursor is moved one position to the left. Thecommand doesn't erase the character.
9	09	Right - The cursor is moved one position to the right. The command doesn't erase the character.
10	0A	Line Feed - The cursor is moved down one line. For the two line LCD model, if on line 0 it goes to line 1.
12	0C	Form Feed - The cursor is moved to position 0 on line 0 and the entire display is cleared.
13	0D	Carriage Return If on line 0 the cursor is moved to position 0 on line 1.
17	11	Turn backlight on
18	12	Turn backlight off (Default)
21	15	Turn the display off
22	16	Turn the display on, with cursor off and no blink
23	17	Turn the display on, with cursor off and character blink
24	18	Turn the display on, with cursor on and no blink (Default)
25	19	Turn the display on, with cursor on and character blink
128	80	Move cursor to line 0, position 0
129	81	Move cursor to line 0, position 1
130	82	Move cursor to line 0, position 2
131	83	Move cursor to line 0, position 3
132	84	Move cursor to line 0, position 4
133	85	Move cursor to line 0, position 5
134	86	Move cursor to line 0, position 6
135	87	Move cursor to line 0, position 7
136	88	Move cursor to line 0, position 8
137	89	Move cursor to line 0, position 9
138	8A	Move cursor to line 0, position 10
139	8B	Move cursor to line 0, position 11
140	8C	Move cursor to line 0, position 12

DEC	HEX	COMMAND ACTION
141	8D	Move cursor to line 0, position 13
142	8E	Move cursor to line 0, position 14
143	8F	Move cursor to line 0, position 15
148	94	Move cursor to line 1, position 0
149	95	Move cursor to line 1, position 1
150	96	Move cursor to line 1, position 2
151	97	Move cursor to line 1, position 3
152	98	Move cursor to line 1, position 4
153	99	Move cursor to line 1, position 5
154	9A	Move cursor to line 1, position 6
155	9B	Move cursor to line 1, position 7
156	9C	Move cursor to line 1, position 8
157	9D	Move cursor to line 1, position 9
158	9E	Move cursor to line 1, position 10
159	9F	Move cursor to line 1, position 11
160	A0	Move cursor to line 1, position 12
161	A1	Move cursor to line 1, position 13
162	A2	Move cursor to line 1, position 14
163	A3	Move cursor to line 1, position 15
248	F8	Define custom character 1. This command must be followed byeight data bytes.
249	F9	Define custom character 2. This command must be followed byeight data bytes.
250	FA	Define custom character 3. This command must be followed byeight data bytes.
251	FB	Define custom character 4. This command must be followed byeight data bytes.
252	FC	Define custom character 5. This command must be followed byeight data bytes.
253	FD	Define custom character 6. This command must be followed byeight data bytes.
254	FE	Define custom character 7. This command must be followed byeight data bytes.
255	FF	Define custom character 8. This command must be followed byeight data bytes.

Controlling with PC

This serial LCD can be easily controlled with PC using terminal software like Hyperterminal. In addition to this if you want to make custom code to control the LCD, a sample Visual Basic 6 project is provided on the CD which demonstrates all the features and functions of Serial LCD. On typing text in the text box it is displayed on LCD. By clicking on different buttons they demonstrate the functions. Demo1 shows different functions on the lcd. Demo2 displays the current mouse position (X and Y) on LCD.



ASCII Codes

Lower 4 Bits \ Upper 4 Bits	0000	0001	0010	0011	0100	0101	0110	0111
xxxx0000	CG RAM (1)			0	@	P	`	p
xxxx0001	(2)		!	1	A	Q	a	q
xxxx0010	(3)		"	2	B	R	b	r
xxxx0011	(4)		#	3	C	S	c	s
xxxx0100	(5)		$	4	D	T	d	t
xxxx0101	(6)		%	5	E	U	e	u
xxxx0110	(7)		&	6	F	V	f	v
xxxx0111	(8)		'	7	G	W	g	w
xxxx1000	(1)		(	8	H	X	h	x
xxxx1001	(2)		)	9	I	Y	i	y
xxxx1010	(3)		*	:	J	Z	j	z
xxxx1011	(4)		+	;	K	[	k	{
xxxx1100	(5)		,	<	L	¥	l	|
xxxx1101	(6)		-	=	M	]	m	}
xxxx1110	(7)		.	>	N	^	n	→
xxxx1111	(8)		/	?	O	_	o	←

Service and Support

Service and support for this product are available from Robokits India. The Robokits Web site (http://www.robokits.co.in) maintains current contact information for all Robokits products.

Limitations and Warranty

The Robokits Serial LCD is intended for personal experimental and amusement use and in no case should be used where the health or safety of persons may depend on its proper operation. Robokits provides no warrantee of suitability or performance for any purpose for the product. Use of the product software and or hardware is with the understanding that any outcome whatsoever is at the users own risk. Robokits sole guarantee is that the software and hardware perform in compliance with this document at the time it was shipped to the best of our ability given reasonable care in manufacture and testing. All products are tested for their best performance before shipping, and no warranty or guarantee is provided on any of them. Of course the support is available on all of them for no cost.

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