

# LCD Technical FAQ

## Contents:

- [[Previous](#)] segment | [[Sub-ToC](#)] for this document | Main [[Table 'O Contents](#)]
- [4.3.2\) Interfacing to the Microchip PIC microcontrollers](#)
- [4.4\) Serial Interface](#)
- [4.5\) LCD Serial Backpack](#)
- [Chapter 5\) LCD Controller chip pinout](#)
- [Chapter 6\) FTP and other sites](#)
- [**This is the last segment**]

shift register (74LS164) and an 8-bit D-flipflop (74LS244). MOSI and SCK are connected to the SR's data in and clock pins, /SS is connected to the clock of the FF. Outputs 7-4 are D7-D4, out 3 is Enable, out 2 is RS, R/W is tied to ground. Delays are based on an 8 MHz clock.

[[MOT20x1.ASM](#)] (link to file)

---

## 4.3.2) Interfacing to the Microchip PIC microcontrollers

Sample program and schematics appear in the application note AN587 in the Microchip Embedded Control Handbook for 1994/95.

A program for driving an LCD with a PIC appears in the [/pub/picsrc](#) directory of the Parallax FTP site <ftp://ftp.parallaxinc.com> It is written for the Parallax 8051-lookalike assembler.

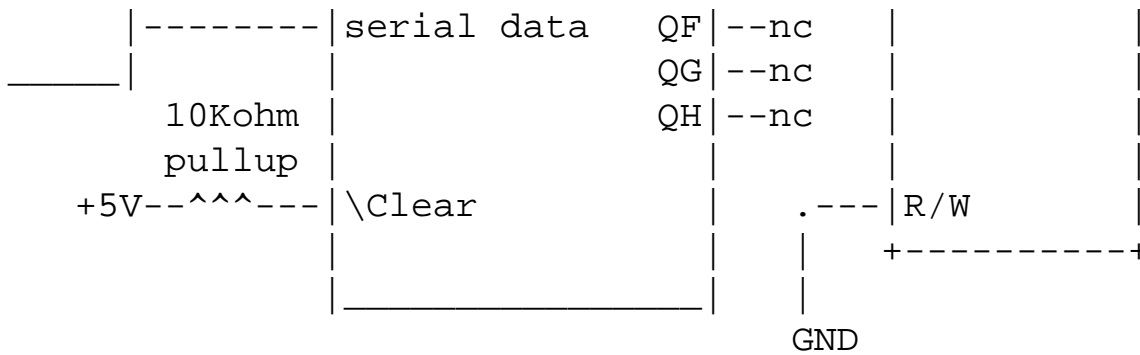
Sample program and a schematic appear in the "PIC16C84 sub-page" of Peer Ouwehand's "How to control HD44780-based Character-LCD" at <http://www.iaehv.nl/users/pouweha/lcd.htm> programmed in PIC assembly language.

---

## 4.4) Serial Interface

A way to save even more I/O space is to use a serial interface, requiring just 3 digital output port pins. It uses a shift register with serial-in, parallel-out, and output latch. This setup allows the convenient coding





Save another I/O line with this idea from Robert Rolf:

"On your SPI example, you can free up the latch line by using the clock line with a diode, pullup, and capacitor. I use the SPI in normally high mode, rising clock for data bits. 10K pullup, 10nF to GND, and the clock through diode pulls it low. After all the bits are shifted in, the RC times-out, and clocks [latches] the '595."

## 4.5) LCD Serial Backpack

The LCD Serial Backpack from Scott Edwards Electronics lets you communicate with a one- or two-line LCD over an asynchronous serial port at 2400 or 9600 bps. Both TTL and RS-232 voltage levels are supported. The Backpack is a tiny daughterboard with an onboard processor, fitting neatly behind any LCD module, having solder pads for both 2x7 and 1x14 hookups. Backpacks are sold alone or with a variety of LCDs. Call (520) 459-4802.

# Chapter 5) LCD Controller chip pinout

NEC UPD44780 LCD Display Controller Pinouts:

PIN DEFINITION

==== =====

1	SEG 22	
2	SEG 21	
3	SEG 20	
4	SEG 19	666665555555555444444444
5	SEG 18	432109876543210987654321

6	SEG 17	65	40
7	SEG 16	66	39
8	SEG 15	67	38
9	SEG 14	68	37
10	SEG 13	69	36
11	SEG 12	70	35
12	SEG 11	71	34
13	SEG 10	72	33
14	SEG 9	73	UPD44780 TOP 32
15	SEG 8	74	31
16	SEG 7	75	30
17	SEG 6	76	29
18	SEG 5	77	28
19	SEG 4	78	NOTCHED CORNER 27
20	SEG 3	79	/AND POSSIBLE DOT 26
21	SEG 2	80	o 25
22	SEG 1	\	111111111122222
23	GND		123456789012345678901234
24	OSC 1		
25	OSC 2		
26	V1		
27	V2		
28	V3		
29	V4		
30	V5		
31	CL 1		
32	CL 2		
33	VCC		
34	M	-	
35	D	-	
36	RS	-	Reset, assert once
37	R/W*	-	Hold low for write operation
38	E	-	Clock low to latch data.
39	DB 0	-	The data bus
40	DB 1	-	
41	DB 2	-	
42	DB 3	-	
43	DB 4	-	
44	DB 5	-	
45	DB 6	-	
46	DB 7	-	

```
47 COM 1
48 COM 2
49 COM 3
50 COM 4
51 COM 5
52 COM 6
53 COM 7
54 COM 8
55 COM 9
56 COM 10
57 COM 11
58 COM 12
59 COM 13
60 COM 14
61 COM 15
62 COM 16
63 SEG 40
64 SEG 39
```

```
65 SEG 38
66 SEG 37
67 SEG 36
68 SEG 35
69 SEG 34
70 SEG 33
71 SEG 32
72 SEG 31
73 SEG 30
74 SEG 29
75 SEG 28
76 SEG 27
77 SEG 26
78 SEG 25
79 SEG 24
80 SEG 23
```

</pre>

(Section 6 by Frank Hausman)

---

## Chapter 6) FTP and other sites

- This FAQ.
  - <ftp://ftp.armory.com/pub/user/rstevew/LCD/lcdfaq.zip>  
(other LCD references here, too)
  - [http://www.repairfaq.org/filipg/LINK/F\\_LCD\\_tech.html](http://www.repairfaq.org/filipg/LINK/F_LCD_tech.html)  
(other LCD references here, too)
  
- LCDFAQ: Liquid Crystal Display physics & principles of operation by Scott M. Bruck, August 1993.
  - <ftp://ftp.ee.ualberta.ca/pub/cookbook/faq/LCD2.doc>
  - [http://www.repairfaq.org/filipg/LINK/F\\_LCD\\_theory.html](http://www.repairfaq.org/filipg/LINK/F_LCD_theory.html)
  
- How to control HD44780-based Character-LCD by Peer Ouwehand, 2/22/96. A good tutorial and referenceR, with examples.
  - <http://www.iaehv.nl/users/pouwaha/lcd.htm>
  
- LCD Module tutorial and reference by Ian Harries, including examples such as driving LCD with the IBM PC parallel port and other application ideas.
  - <http://www.doc.ic.ac.uk/~ih/doc/lcd/>
  
- 4-bit interface sample in-line assembly code, by Jordan Nicol, for implementation under Dunfield's Micro-C for the Miniboard. It uses port pins PA7-PA3 for 4-bit data and PC6 and PC7 for RS and E.
  - <ftp://cher.media.mit.edu>
  
- Parallax Basic Stamp applications.
  - <ftp://wpi.wpi.edu/stamp>
  - <ftp://ftp.parallaxinc.com/pub/stamp>
  
- Jeff Sampson's graphic LCD controller info page.
  - <http://www.skypoint.com/~jeffs39/lcdindex.htm>
  
- Chris Hirsch's LCD page.

- <http://www.cs.colostate.edu/~hirsch/LCD.html>
- LCD Forum discussion list.
  - <http://www.eio.com/public/lcd>

---

Please check attribution section for Author of this document! This article was written by **filipg@repairfaq.org** [\[mailto\]](mailto:filipg@repairfaq.org). The most recent version is available on the WWW server <http://www.repairfaq.org/filipg/> [\[Copyright\]](#) [\[Disclaimer\]](#)