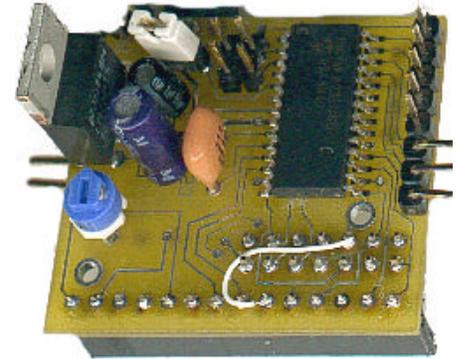


CLCD1 Serial 1 wire RS232 LCD development board

Can be used with most 14 pin HD44780 based character LCD displays

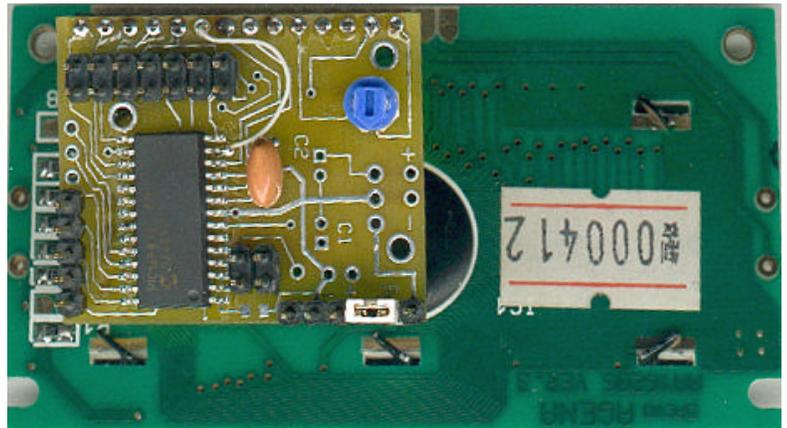


Use with 1,2,3 or 4 line displays. (Four line LCD shown above)



Shown assembled with optional 5v power supply regulator (Input 7-16vdc). Very compact. Only 1.25x1.5" in size

Can be mounted on the back of most displays that have 1x14 or 2x7 pin connections. Operates on 5v supply or with the optional 5v on-board regulator (7-16vdc IN). The PIC16F872 (or similar) microcontroller can be programmed via the provided ICSP header. A programmer such as MELab's EPIC Plus board can be used with a ribbon cable. Source code, written in PICBasicPro for the firmware is included. This allows the user to modify or re-write the code to suit their needs. Five I/O pins are available. These pins can be controlled via commands sent serially.



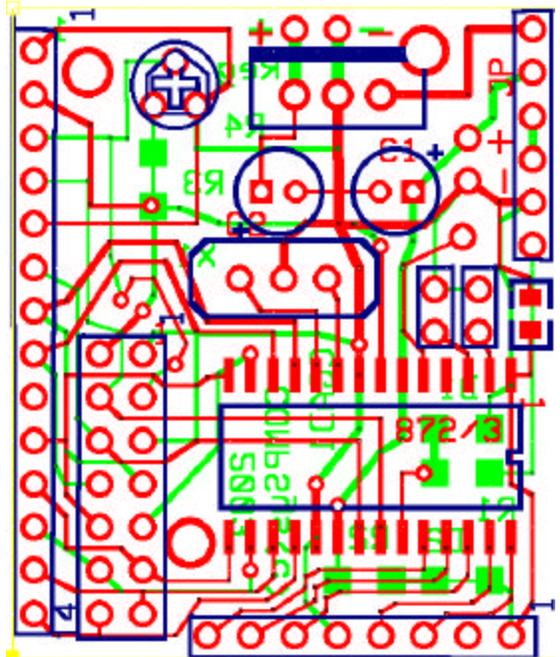
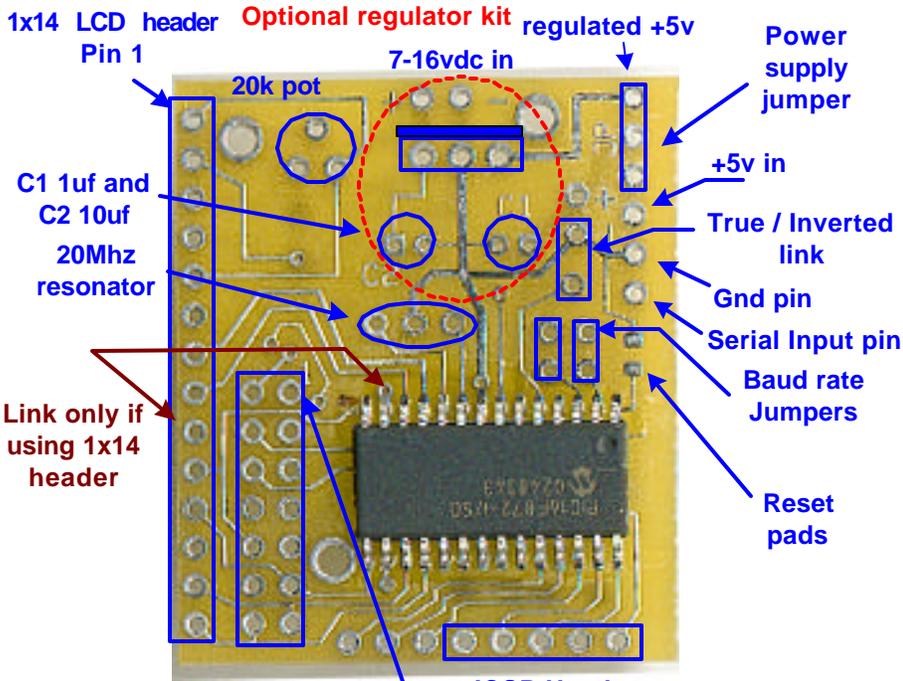
The board is provided assembled (without options) and the mcu programmed with CLCD Ver 1.0 firmware when shipped. Source code is also available for non-commercial use.

RS232 data can be configured for TRUE, such as a PC com port connection, or TTL INVERTED, when connecting to another microcontroller or TTL serial device. Baud rate can be selected via jumpers. Possible rates are 1200,2400,9600 and 19200 baud. 19200 baud may not be possible in all cases. Special commands can be sent to the LCD to display any character (0 to 255) in its CGRom. The user can also design and load up to 8 custom characters. The firmware includes 8 custom characters which can be altered as required. All standard HD44780 commands can be sent serially to the display.

Disclaimer and Terms of Agreement

As with any kit, only the individual parts supplied are guaranteed against defects and not the user assembled unit. All kit parts are purchased from reputable sources such as Digikey Inc, Allied Electronics and Mouser Inc, however, should a kit part be ascertained to be defective it will be replaced at no charge within 30 (thirty) days of the purchase date. Beyond that, COMPSys Workbench and / or the COMPSys developer(s) assume no liability and WILL NOT be held liable nor be held responsible wholly or in part for any damages caused by the construction of and / or use of their products sold .

CLCD Board layout and components

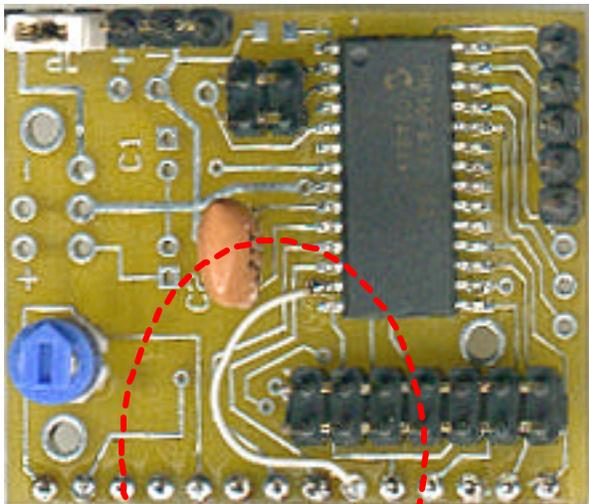


LCD Pins

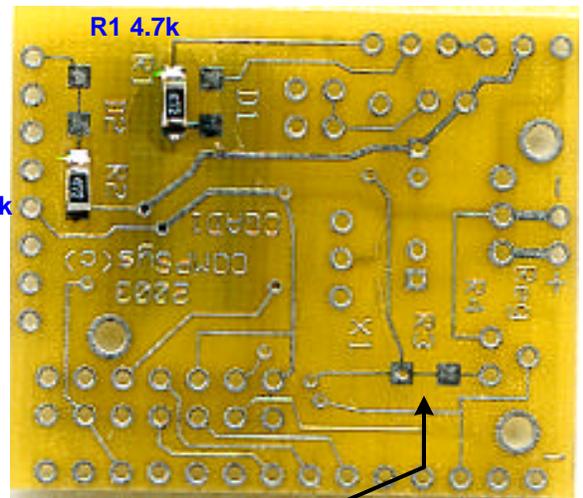
02-01	01 - GND
04-03	02 - +5v
06-05	03 - Vlcd (contrast)
08-07	04 - RS
10-09	05 - RW
12-11	06 - E
14-13	07- 14 DB0-DB7 data bus

ICSP Programming Connection

D1 and D2 are for optional 1N4148 diodes if line filtering is required



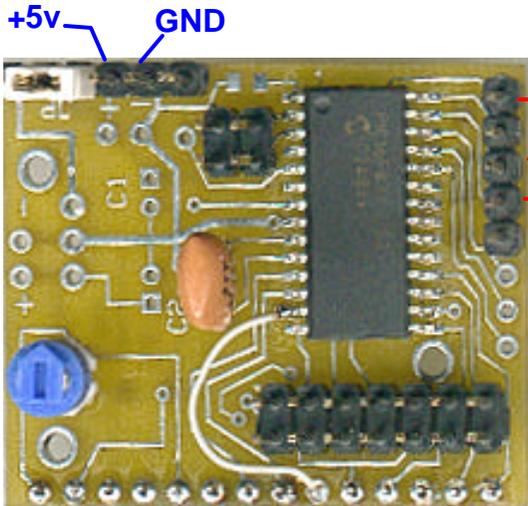
Wire Link if using 1x14 header



On some LCDs a resistor may be required between the POT and Vdd for optimum contrast. An smd chip resistor can be installed at R3 by cutting the small trace between the pads.

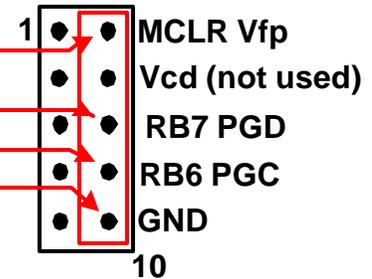
CLCD Settings and connections

Programming the PIC16F872 using MELab's EPIC programmer



The CLCD board must have its own power supply being programmed

EPIC 2x5 Header



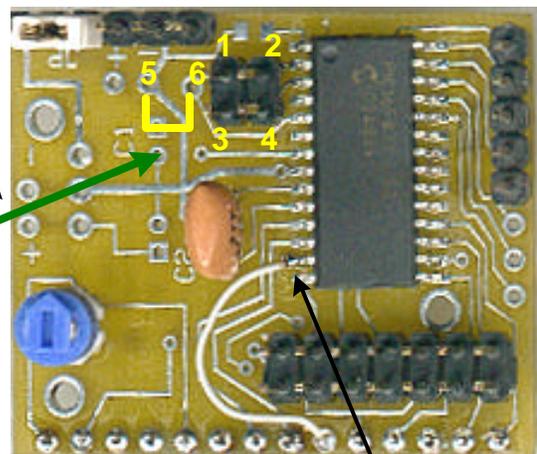
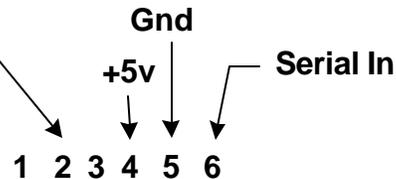
Only EPIC Pins 2,6,8 and 10 are used to connect to the ICSP header on the CLCD board

IMPORTANT!
DO NOT REVERSE POLARITY!
It will destroy the IC

1-2 Jumpered for optional on board regulator

2-3 Jumpered for external +5v supply on PIN 4

Optional 7-16vdc if regulator is used



Wire Link must be soldered in place if the 1x14 header is to be used

5-6 Open = TRUE RS232	5	6	1	2
5-6 Link = INVERTED RS232	●	●	●	●
			3	4

Baud Rate Settings

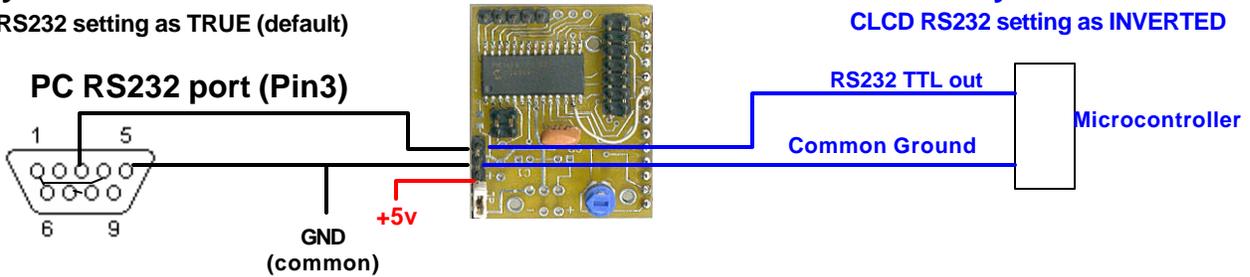
1200	1-2 Open	3-4 Jump
2400	1-2 Jump	3-4 Open
9600	1-2 Open	3-4 Open
19200	1-2 Jump	3-4 Jump

The pin settings are only detected once in the beginning of the program

CLCD Usage Notes

CLCD to a PC com port
or any RS232 terminal device
CLCD RS232 setting as TRUE (default)

CLCD to a mcu
or any TTL device
CLCD RS232 setting as INVERTED



Setting: baud rate, 8 bits, No parity, 1 stop bit

1. Connect the LCD to the CLCD board using either the 1x14 or 2x7 header. Make sure that the pin orientation is correct. Pin numbers on the LCD should match those on the CLCD board
2. Check for proper baud and polarity settings for the device being connected to. The default is 9600,8,N,1 TRUE
3. Connect the CLCD to the terminal or TTL device and apply power. The LCD should display a message and indicate the baud rate and polarity. Example: T9600 means TRUE polarity at 9600 baud
N2400 would mean INVERTED at 2400 baud
4. The CLCD is now active and is **waiting for a sequence of 2 carriage returns** (ASCII 13)
Terminal: Start the terminal and press the RETURN key (carriage return) twice. The CLCD now enters a loop waiting for characters. Characters typed on the terminal will be displayed on the LCD. The CLCD will also recognize the TAB and BACKSPACE keys. **The \ , [and] keys are reserved for special control.**

Microcontroller Code Example in PICBasicPro :

```

serout2 SOpin,baud,[13,13]           ' 2 carriage returns ,init LCD
serout2 SOpin,baud,[$FE,1]           ' Clear the LCD
pause 30                               ' pause 30ms for clearing
serout2 SOpin,baud,["Hello"]         ' Message
serout2 SOpin,baud,[$FE,$CO,"World!"] ' Move to Line 2 rest of message
    
```

5. Special Control Code characters: **** BACKSLASH **[** LEFT BRACKET **]** RIGHT BRACKET
If the CLCD is sent any one of the above 3 special characters it will wait for the necessary parameters.

\nnn LCD Control code (same as 254) followed by a THREE digit decimal value nnn
Example: To clear the LCD send **\001**

HD44780 Control codes:

Hex	Dec	
\$01	001	Clear display
\$02	002	Return home (beginning of first line)
\$08	008	Blank display (doesn't clear memory)
\$0C	012	Cursor off
\$0D	013	Block cursor
\$0E	014	Underline cursor on
\$0F	015	Blinking cursor on
\$10	016	Move cursor left one position
\$14	020	Move cursor right one position
\$18	024	Scroll all lines 1 char left
\$1C	028	Scroll all lines 1 char right
\$C0	192	Move cursor to beginning of second line
'94	148	Move cursor to beginning of third line
\$D4	212	Move cursor to beginning of fourth line
\$80	128+addr	DDRAM cursor position
\$40	064+addr	CGRAM pointer

CLCD Usage Notes (cont)

6 **[nnn]** Character code. When using a terminal, you may want to display any of the 000-255 LCD characters. This becomes possible by inserting a **]** before the THREE digit number (must be 3 digits!)

Example
 To display the CGRom character:
 High nibble 1011
 Low Nibble 0001 = 10110001 = 177 (hex \$B1)
 Type: **]**177 at the terminal



The above was displayed by sending the line below:

`Y128]007]007 Serial 1 Wire]006]006]192 LCD Connection at 1482400,9600,19200 baud]215from PC or MCU`

Higher 4bit / Lower 4bit	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
xxxx0000		0	1	2	3	4	5	6	7	8	9	A	B
xxxx0001		!	@	#	\$	%	&	'	()	*	+	,
xxxx0010		"	#	\$	%	&	'	()	*	+	,	.
xxxx0011		"	#	\$	%	&	'	()	*	+	,	.
xxxx0100		\$	%	&	'	()	*	+	,	.	/	?
xxxx0101		%	&	'	(	)	*	+	,	.	/	?	0
xxxx0110		&	'	(	)	*	+	,	.	/	?	0	1
xxxx0111		'	(	)	*	+	,	.	/	?	0	1	2
xxxx1000		(	)	*	+	,	.	/	?	0	1	2	3
xxxx1001		)	*	+	,	.	/	?	0	1	2	3	4
xxxx1010		*	+	,	.	/	?	0	1	2	3	4	5
xxxx1011		+	,	.	/	?	0	1	2	3	4	5	6
xxxx1100		,	.	/	?	0	1	2	3	4	5	6	7
xxxx1101		.	/	?	0	1	2	3	4	5	6	7	8
xxxx1110		/	?	0	1	2	3	4	5	6	7	8	9
xxxx1111		/?	0	1	2	3	4	5	6	7	8	9	A

7. **[nn]** Special CLCD Control codes **[** followed by TWO digits **nn**

PORTB Pin Control

- [30 Pin 3 LOW [31 Pin 3 HIGH [40 Pin 4 LOW [41 Pin 4 HIGH
- [50 Pin 5 LOW [51 Pin 5 HIGH [60 Pin 6 LOW [61 Pin 6 HIGH
- [99 Display opening message

Create up to 8 custom CGRam characters for ASCII characters 000 to 007 **]** and **98** followed by NINE 3 digit numbers

The first 3 digit number is the CGRam address of each custom character (000-007) which can be one of the following: 064, 072, 080, 088, 096, 104, 112, or 120

The following 8 numbers represent the 8 bytes that form the 5x8 bit character as shown on the right.

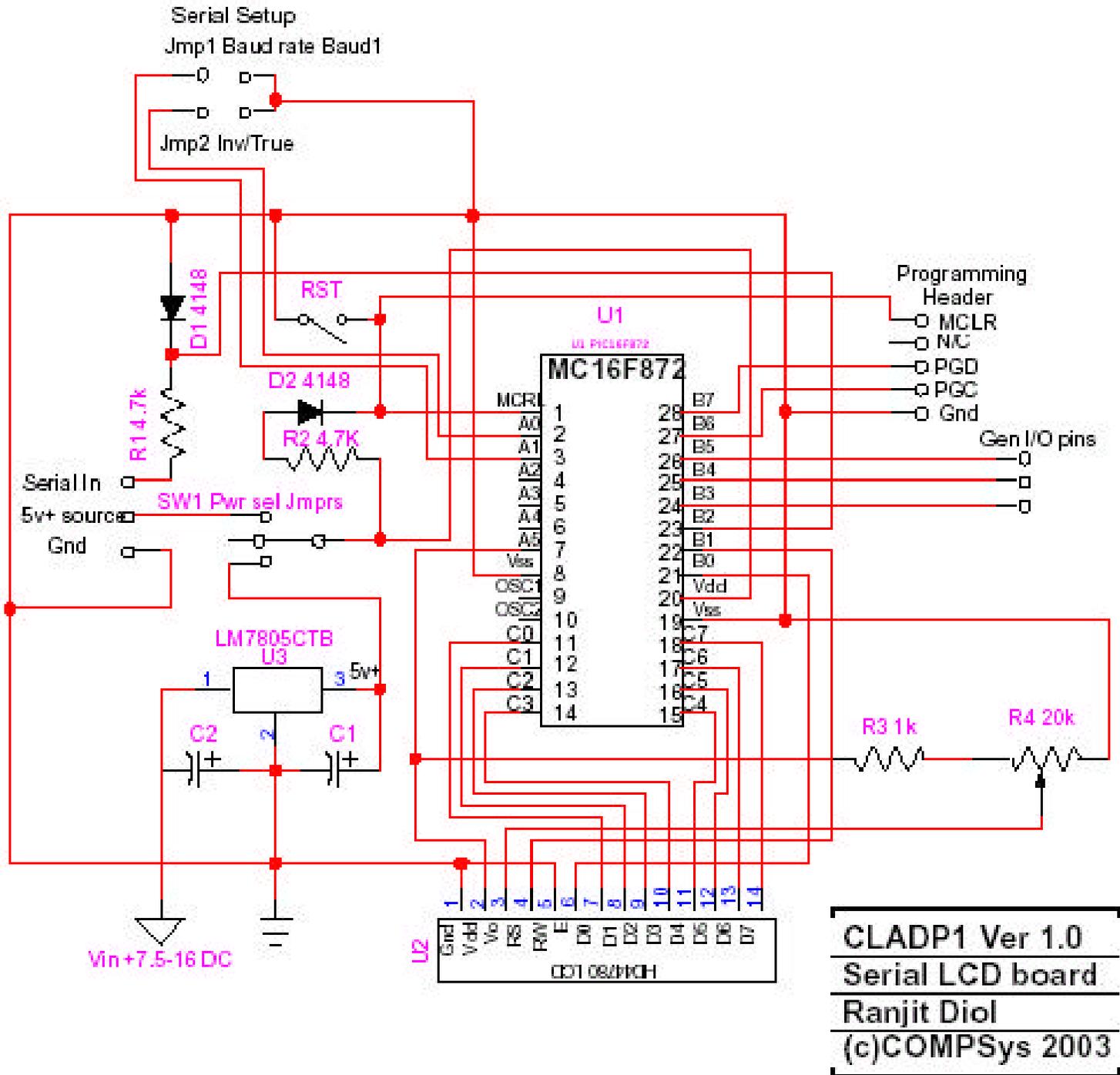
To set the Up Arrow character as ASCII 003 send the following to the CLCD

`[98088004014031004004004004000` the ASCII character 3 now will be displayed as the Up Arrow

5x8 Character

Byte	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Value
Byte 0	□	■	□	□	□	004
Byte 1	□	■	■	■	□	014
Byte 2	■	■	■	■	■	031
Byte 3	□	□	□	□	□	004
Byte 4	□	□	■	□	□	004
Byte 5	□	□	■	□	□	004
Byte 6	□	□	■	□	□	004
Byte 7	□	□	□	□	□	000

CLCD Ver 1.0 Schematic



Please note: Due to constant changes in pcb layout and design, this schematic should be used as general reference only. Part values may not match those on the printed circuit board