



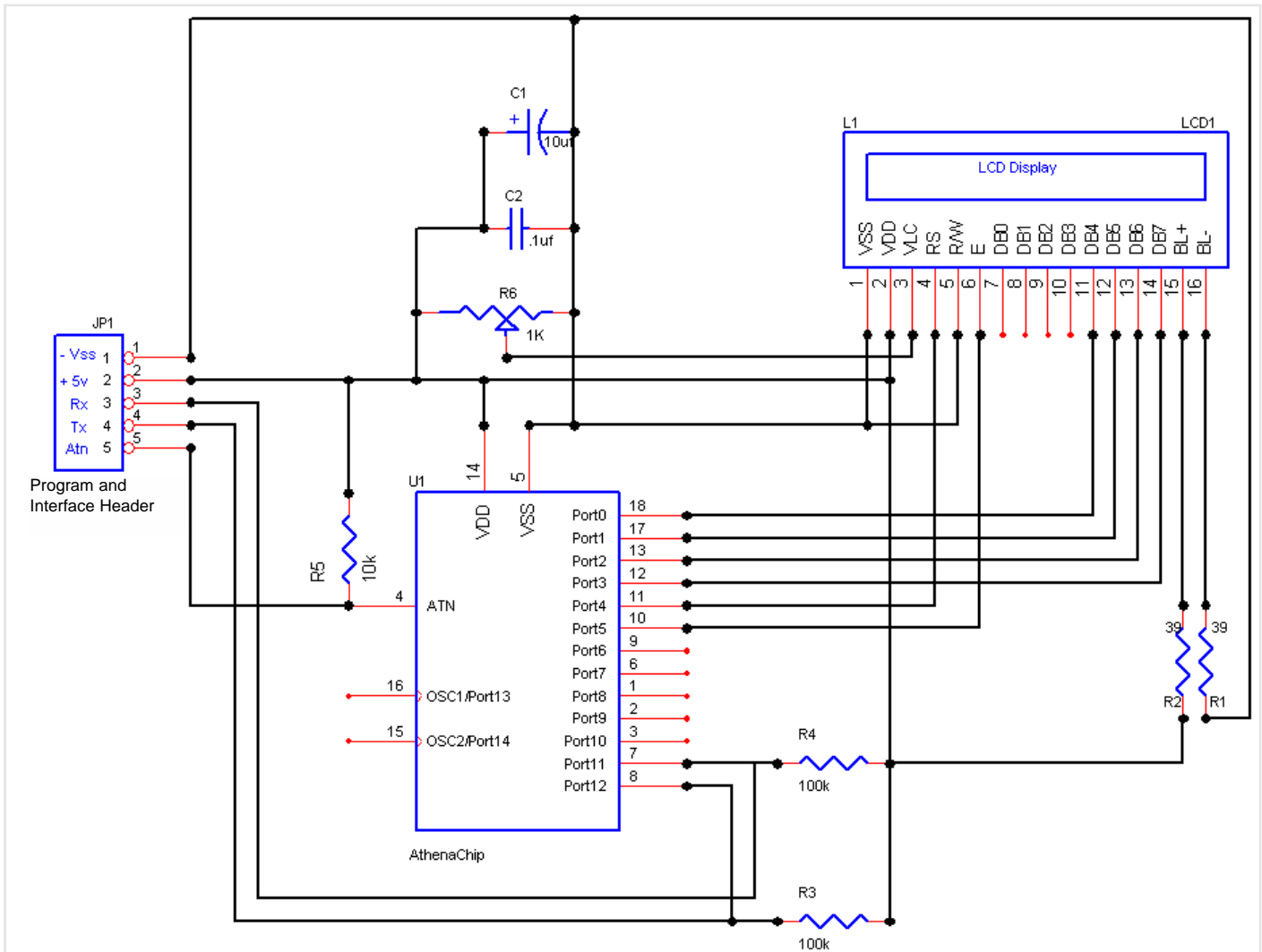
Build a Serial LCD with the Athena

This project will show you how to use the Athena to convert a parallel LCD to a serial LCD. The Athena has an 80 byte interrupt driven UART that can collect serial data in the background. Using the built-in LCD commands we can send collected data to the LCD with little or no effort.

Hookup

The Athena LCD commands are hard wired to various IO ports so only one hookup configuration is available. Schematic 1 shows this hookup. The actual backlight hookup on your LCD may vary so check the data sheet for your LCD.

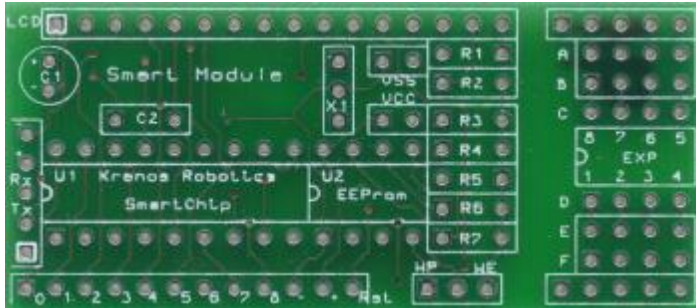
Jp1 can be used to program the Athena. Once the Athena is programmed you only need pins 1-3 on the header.



Athena - Serial LCD

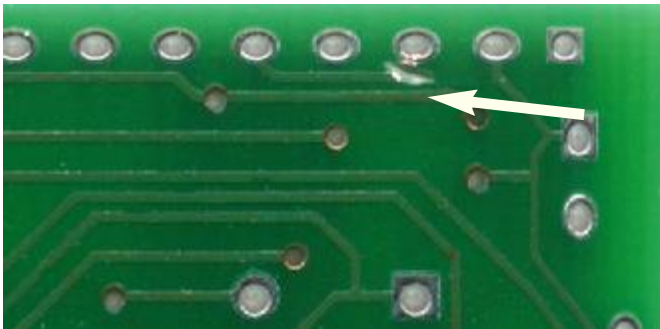
To make life a bit easier you can use one of the Kronos Robotics PCB boards to create a nice little piggy back for most parallel LCD's.

**Figure 1: Mini PIC chip PCB (PCB 8)
Kronos Robotics Part # 16150**



The board ties the contrast control for the LCD to Vdd so this must be modified for **most** LCD's. There are two ways to make this modification. The first is shown in Figure 2. By cutting this trace you can connect a resistor directly to the LCD as shown in Figure 3.

Figure 2: Cut trace as shown so contrast resistor can be connected to LCD.



If you don't want to cut the trace you can remove the pin from the female header or cut the pin from the LCD. The pin number is 3.

Figure 3: Small contrast resistor connected to LCD.



Figure 4 shows the populated board with the programmed Athena. You will use pins 1-3 on the 5 pin header to send commands to the Athena.

Figure 4: Populated PCB with female header.



We used a female header so we can remove the LCD. Notice the small prototype area on the right hand side of the board.

This board also has provisions for a 20Mhz resonator so you can use the AthenaHS for more speed if needed.

Program

The program sets up the LCD then prints the splash screen. It waits for 2 seconds then erases the display. If you don't see this splash screen you have not wired the LCD properly or the contrast is not set properly.

The data collection is done automatically in the background so all we have to do is check the buffer periodically. This is done with the dbugin command. If no data is in the buffer the command will jump to the label given. If data is in the buffer the variable provided will be populated and the command will fall through.

We use the branch command to branch to a given point based on the data we have just collected. Some commands require additional information and we will issue an additional debugin command to collect this data as needed.

Note that we have provided a provision for setting line 1 or 2 but not for 3 and 4. I'm going to leave that up to you as the provision to add this code has been made available to you.

Most parallel LCD's use a Hitachi 44780 or equivalent LCD as a controller. This controller supports 1 or 2 line LCD's only.

The character memory is mapped with data memory 0-63 mapped to line 1 and memory 65-127 mapped to line 2. If the lines on the LCD are only 20 characters the data will still be populated allowing you to scroll the data.

Most 4 line LCD's will map this undisplayed data to the 3rd and 4th lines. So even though the controller was designed for 2 line LCD's it can be used with 4line LCD's.

Once you figure out how your 4 line LCD has been memory mapped you can modify the code for the cmd3 and cmd4 jump points.

Note that some very large LCD's like 4x40 displays use 2 controllers. These can not be used with the Athena

Program 1: This simple program is all that is needed to create a SERIAL LCD interface

```
'Serial LCD

dim indat,tdat
lcdinit

'Note that the LCD routines are hard coded to
'D4 = Port 0
'D5 = Port 1
'D6 = Port 2
'D7 = Port 3
'RS = Port 4
'E = Port 5
lcdwrite "Kronos Robotics", control 195, "Serial LCD"

longpause 8,250

lcdcontrol 1

loop:

debugin loop,indat

branch indat,cmd0,cmd1,cmd2,cmd3,cmd4,cmd5,cmd6

lcdchar indat
goto loop

cmd0:
goto loop

cmd1:
debugin loop,indat
tdat = indat + 127
lcdcontrol tdat
goto loop

cmd2:
debugin loop,indat
tdat = indat + 191
lcdcontrol tdat
goto loop

cmd3:
goto loop

cmd4:
goto loop

cmd5:
debugin loop,indat
lcdcontrol indat
goto loop

cmd6:
debugin loop,indat
lcdchar indat
goto loop
```

LCD Commands

Cmd 0

Resync

Cmd 1,x

Set position to line 1 pos x.

Athena Example:

```
serout 2,1,1,"Hello"
```

Cmd 2,x

Set position to line 2 pos x.

Athena Example:

```
serout 2,2,1,"Hello"
```

Cmd 3

Reserved

Cmd 4

Reserved

Cmd 5,x

Send control code x to LCD. See the LCD data sheet for valid commands.

- 5,1 Clear the display
- 5,2 Home the display
- 5,14 Cursor on, no Blink
- 5,15 Cursor on, with Blink
- 5,12 Cursor off
- 5,20 Shift Cursor Right
- 5,16 Shift Cursor Left
- 5,28 Shift Display Right
- 5,24 Shift Display Left
- 5,64 Program built in character generator

Athena Example:

```
serout 2,5,1 'Clear Display
```

Cmd 6,x

Send Raw data x to LCD.

All other data is sent to the LCD as data.

Athena - Serial LCD

Related Products

Athena<http://kronosrobotics.com/xcart/customer/product.php?productid=16276>
EZRS232 Driver<http://kronosrobotics.com/xcart/customer/product.php?productid=16167>
PCB 8<http://kronosrobotics.com/xcart/customer/product.php?productid=16150>
Female Header<http://kronosrobotics.com/xcart/customer/product.php?productid=16291>
Male Header<http://kronosrobotics.com/xcart/customer/product.php?productid=16290>
18 Pin Socket<http://kronosrobotics.com/xcart/customer/product.php?productid=16281>

LCD<http://www.crystalfontz.com> (Part # CFAH1602B-YYB-JP or equiv)

Athena EDU<http://kronosrobotics.com/xcart/customer/product.php?productid=16299>
7.5v Switching AC Adapter<http://kronosrobotics.com/xcart/customer/product.php?productid=16305>
9 Pin Cable<http://kronosrobotics.com/xcart/customer/product.php?productid=16259>
Breadboard & Wire Kit<http://kronosrobotics.com/xcart/customer/product.php?productid=16303>