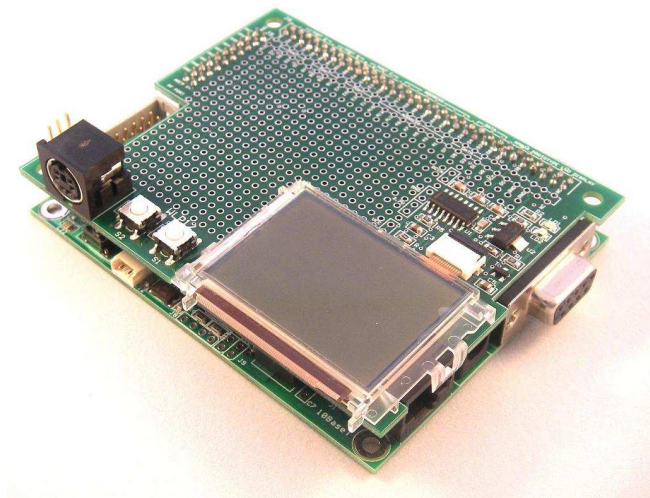


# WLP12 LCD Display and Keyboard Adapter For Amber Web Server

## Technical Reference Guide

PCB Rev 1.0



[www.soc-robotics.com](http://www.soc-robotics.com)

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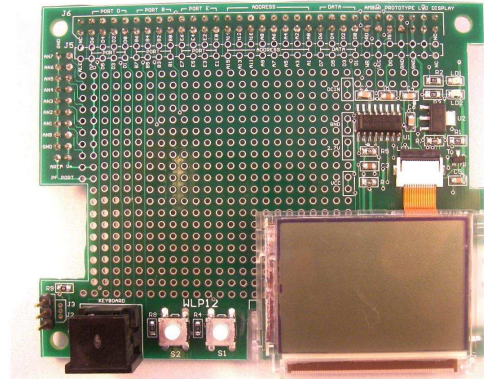
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## 1.0 Introduction

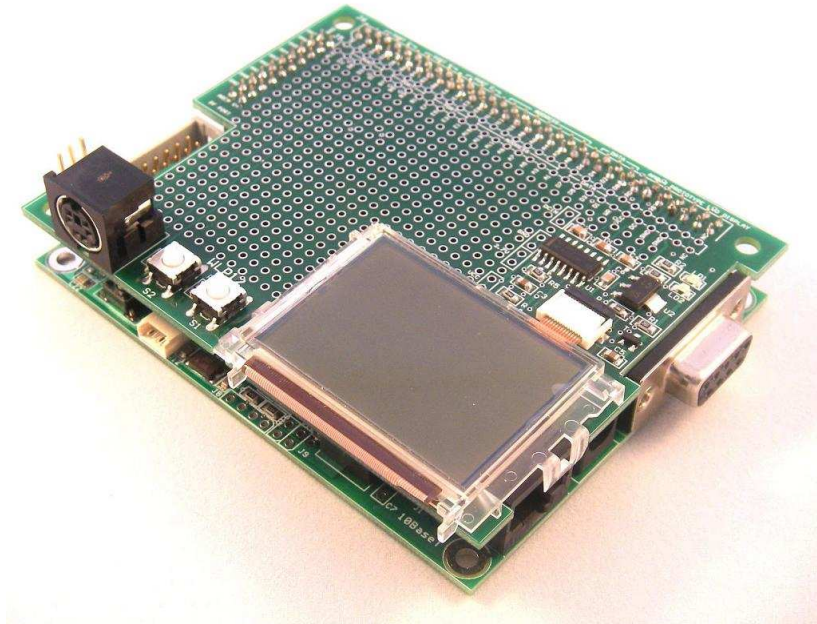
### 1.1 Features:

- 4x12 monochrome LCD display
- Attaches to Amber Web Server
- PS/2 Keyboard Interface
- Two status Leds – Red and Green
- UART1 header
- Prototyping area
- Serial UART interface
- 5v and 9-12V DC in
- Dimensions: 3.85x3.07 inch



### 1.2 Introduction

The WLP12 is a daughter card that attaches to the Amber Web Server and provides a 4x12 monochrome LCD display and PS/2 compatible keyboard interface connector. Source code to write characters to the LCD and read key strokes from an attached keyboard is included. A sample application that provides a set of software functions to send data to the LCD and capture keystrokes from the keyboard is included in the Amber SDK V1.4 distribution which is available for free download from [www.soc-robotics.com](http://www.soc-robotics.com).



## 1.3 Hardware

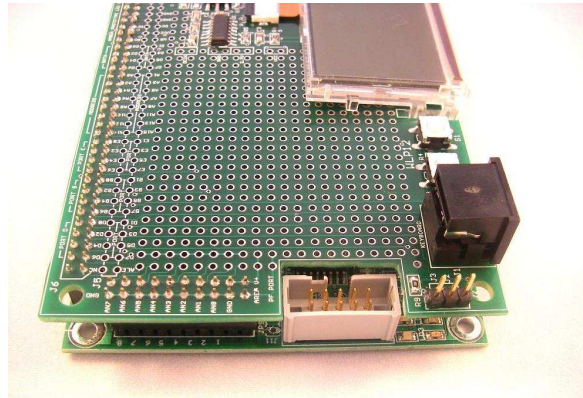
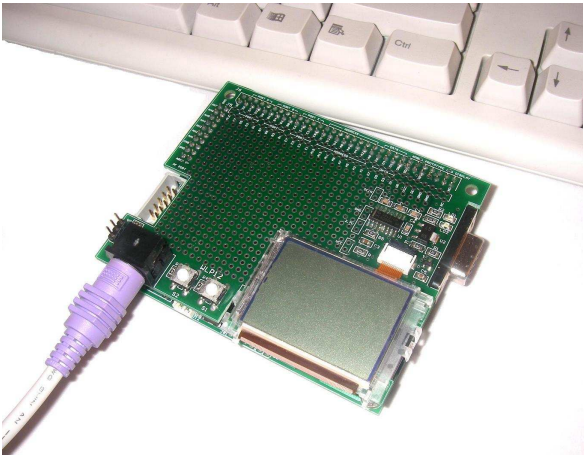
The WLP12 has a 4x12 monochrome LCD display, PS/2 keyboard interface, UART1 header, analog input port and prototyping area. The board provides 9-12V DC unregulated, 5VDC regulated and 2.8VDC regulated.

## 1.2 Software

A sample application is available in the Amber SDK V1.4 distribution to setup a browser based web page to write text to the LCD display and serial ports.

## 1.3 Applications

The sample application is an excellent starting point for building other embedded web server based applications.

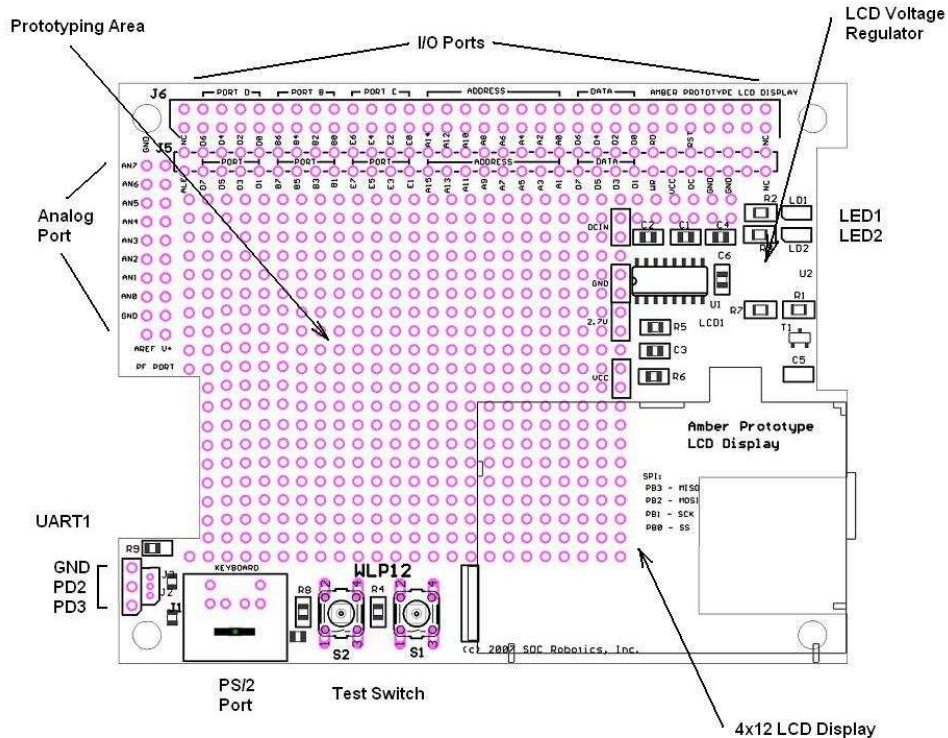




## 2.0 Detailed Description

### 2.1 Overview

The WLP12 attaches to the Amber Web Server and has a 4x12 character LCD display, PS/2 compatible keyboard interface, UART1 header and a prototyping area. Code is provided in Amber SDK V1.4 (available in the download section of the [www.soc-robotics.com](http://www.soc-robotics.com)) to transfer data to the LCD display using a web browser with specific form input.



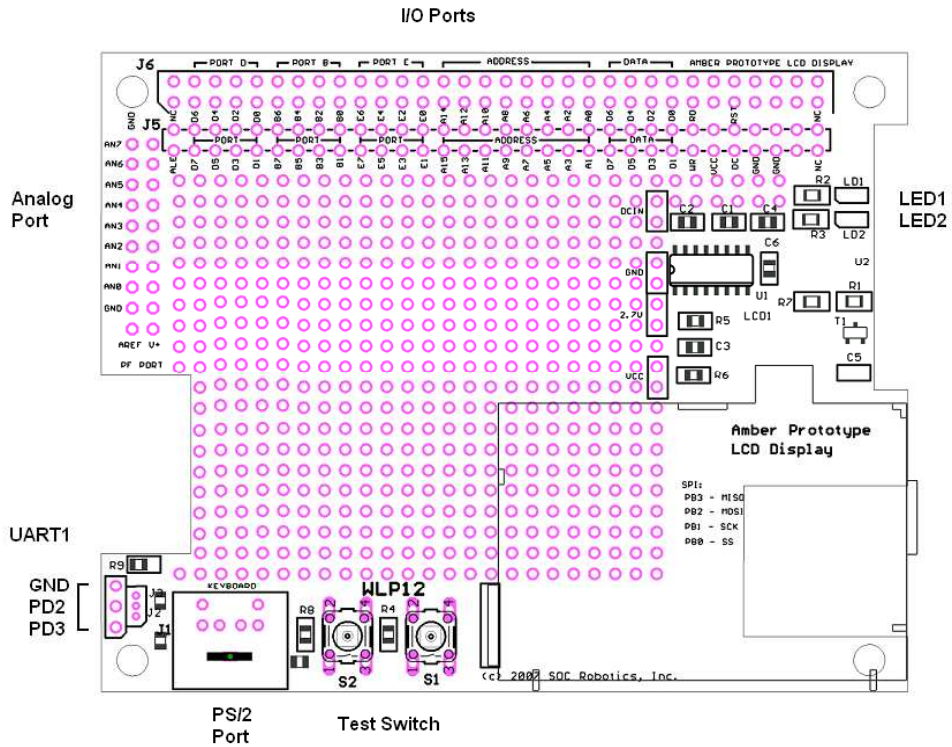
The following port pins control/attach to specific WLP12 ports/features:

- PB5 - Switch 1 input, pulled high with a 10K resistor
- PB6 - Switch 2 input, pulled high with a 10K resistor
  
- PD0 - PS/2 Clock input, alternate function I2C SCL
- PD1 - PS/2 Data input, alternate function I2C SDA
  
- PD2 - UART1 Rx/D
- PD3 - UART1 Tx/D
  
- PD5 - Led 1 Red, active low turns led on
- PD7 - Led 2 Green, active low turns led on
  
- PB0 - LCD SI Serial data line
- PB1 - LCD AD Command/data line select, 0 - command, 1 data
- PB2 - LCD CS\ Chip select, active low
- PB3 - LCD RES\ Chip reset, active low
- PB4 - LCD SCL Serial clock
- PB7 - LCD Led enable - 1 turn on, 0 turn off

## 2.2 WLP12 Connector Pin Assignments

The WLP12 attaches to the Amber Web Server. J6 supplies the logic signals power.

### WLP Connector Assignment

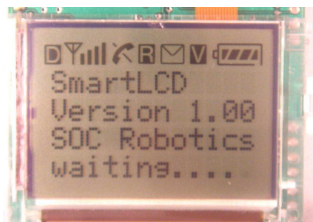


## 2.3 LCD Display

The 4x12 monochrome LCD display is controlled by manipulating signal lines PB0, PB1, PB2, PB3, PB4 and PB7. The function of these lines is as follows:

- PB0 - LCD SI Serial data line
- PB1 - LCD AD Command/data line select, 0 - command, 1 data
- PB2 - LCD CS\ Chip select , active low
- PB3 - LCD RES\ Chip reset, active low
- PB4 - LCD SCL Serial clock
- PB7 - LCD Led enable - 1 turn on, 0 turn off

A sample web server application is available (ambermonwlp12.hex) that initializes and sends character data to the display. Note that the display also supports graphic objects. A datasheet describing the programming procedure for the LCD controller is included in the V1.4 kit.



### 2.4 PS/2 Keyboard Interface

The PS/2 port supplies CLK and DATA from a standard PC keyboard. CLK is routed to pin PD0 and DATA is routed to pin PD1. Both these pins can be setup in software to generate interrupts. A sample web server application is available ambermonwlp12.hex that captures keyboard input, displays it on the LCD screen and sends the keyed input to a browser window when requested.

### 2.5 UART1 Header

UART1 is routed to a header beside the PS/2 connector.

PD2 - UART1 Rx/D  
PD3 - UART1 Tx/D

The sample application sets UART1 baud rate to 38,400, no parity, 8 data bits and one stop bit.

### 2.6 LEDs

The WLP12 has two LEDs controlled by PD5 and PD7. Pulling either line low turns on the respective LED.

PD5 - Led 1 Red, active low turns led on  
PD7 - Led 2 Green, active low turns led on

### 2.7 Analog Interface

The Amber's analog input port is connected to the WLP12. Make sure that the Aref input jumper is attached on the Amber Web Server PCB.

### 2.8 Expansion Port

The Amber Web Server's main expansion bus is connected to the WLP12 and routes most of the signals on the 64pin connector to the WLP12.

### 2.9 Prototype Area

The WLP12 has a large prototyping area that provides development space for custom circuits.

### 2.10 Switch Input

The WLP12 has two switch inputs that can be read by Amber software.

PB5 - Switch 1 input, pulled high with a 10K resistor  
PB6 - Switch 2 input, pulled high with a 10K resistor



## 3.0 Software and Applications

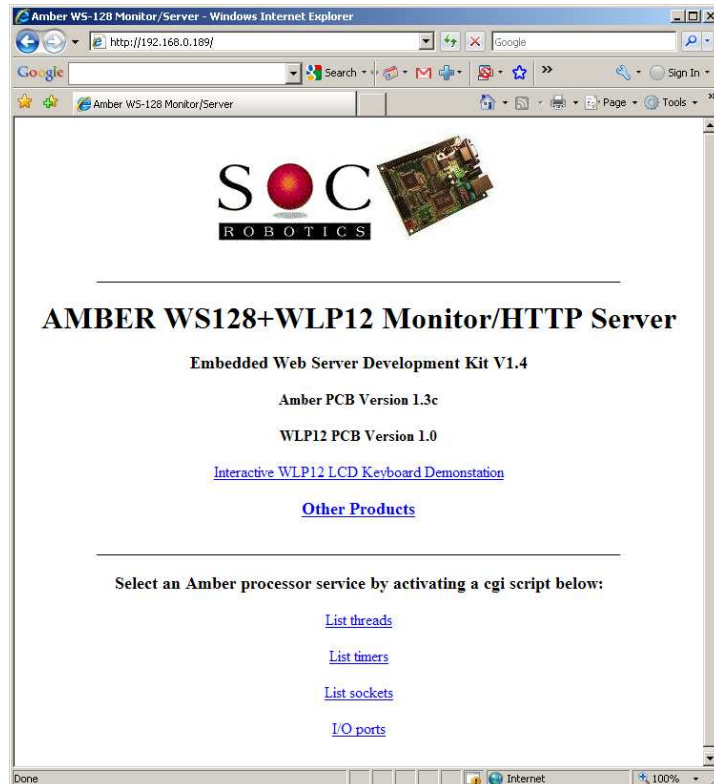
### 3.1 Introduction

The WLP12 subcomponents are controlled by the Amber Atmega128 processor. A sample web browser application is available for free download from our web site [www.soc-robotics.com](http://www.soc-robotics.com) and is included in the Amber SDK V1.4 distribution. This distribution is available from SOC Robotics download section.

The sample program can be used as a starting point for custom application development.

### 3.2 Amber SDK V1.4 Distribution

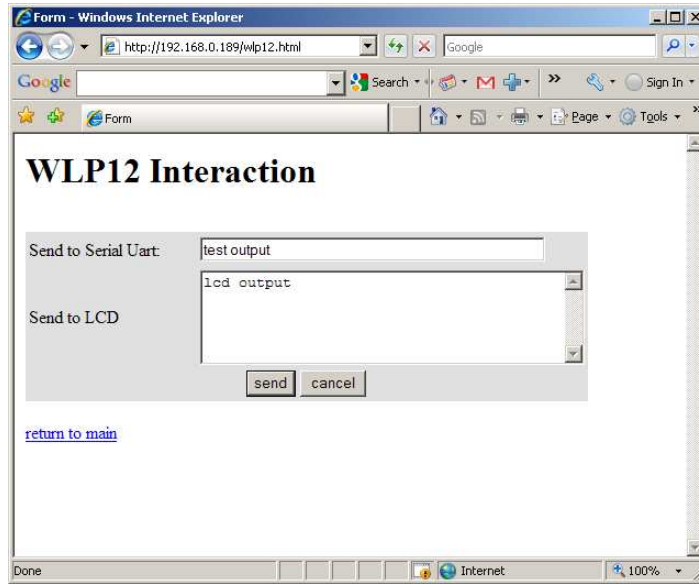
The Amber SDK V1.4 distribution contains a sample program called AmberMonWLP12.hex that interacts with the WLP12 LCD display and keyboard interface. Complete source code is provided so you can modify/enhance the basic functionality. The screen shot below is the starting page served by ambermonwlp.hex embedded web server application running on the Amber.



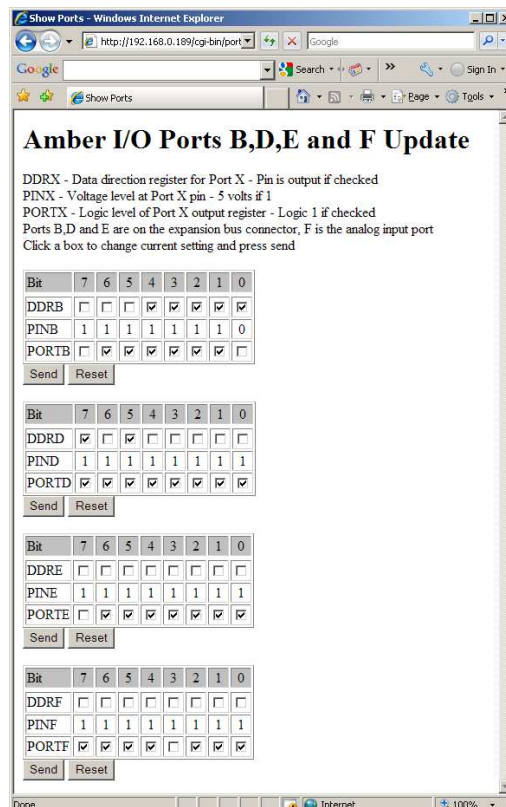
### 3.3 AmbermonWLP12.c Brief Overview

The sample application ambermonwlp12 configures the Amber/WLP12 as an embedded web server that allows a web browser user to send text data to the WLP12 display, serial uart0 or serial uart1. Keyboard data is captured and displayed on the LCD display and uploaded to a display page when requested by the browser user. The complete source code with this application is provided in a project folder compatible with Ethernut 4.8.3 distribution and compiled by the WinAVR 20090313 distribution.

By pressing the Interactive WLP12 LCD Keyboard Demonstration link the following page is brought up. By entering text into the two dialogue boxes and pressing the SEND button the text is sent to UART0 and the LCD display.



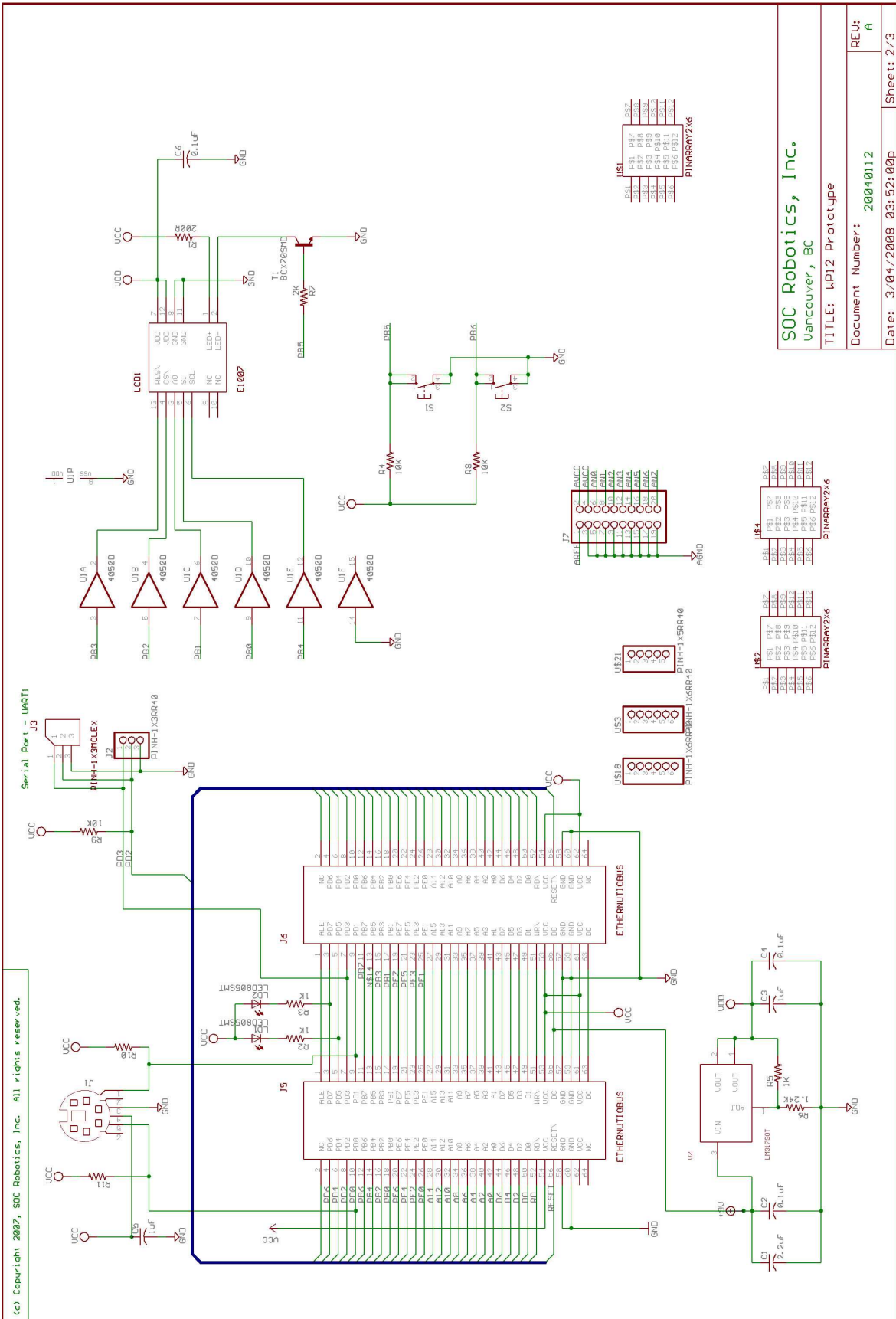
By pressing the IO Ports link on the opening page you go to the follow page. This page allows you to change the direction and level of Atmega128 ports B, D, E and F. Remember that port pins D5 and D7 control the Red and Green LEDs on the WLP12 respectively. By setting port direction bits DDRD5 and DDRD7 high (outputs) and setting PORTD5 and PORTD7 low both LEDs will turn on.





## 5.0 WLP12 Circuit Schematics

<p>(c) Copyright 2007, SOC Robotics, Inc. All rights reserved.</p>	<h1>WP12 Prototype and LCD Display</h1> <h2>Rev 1.0</h2>		<p><b>SOC Robotics, Inc.</b> Vancouver, BC</p> <p>TITLE: WP12 Prototype</p> <p>Document Number: 20040112</p> <p>Date: 3/04/2008 03:52:00p</p>	
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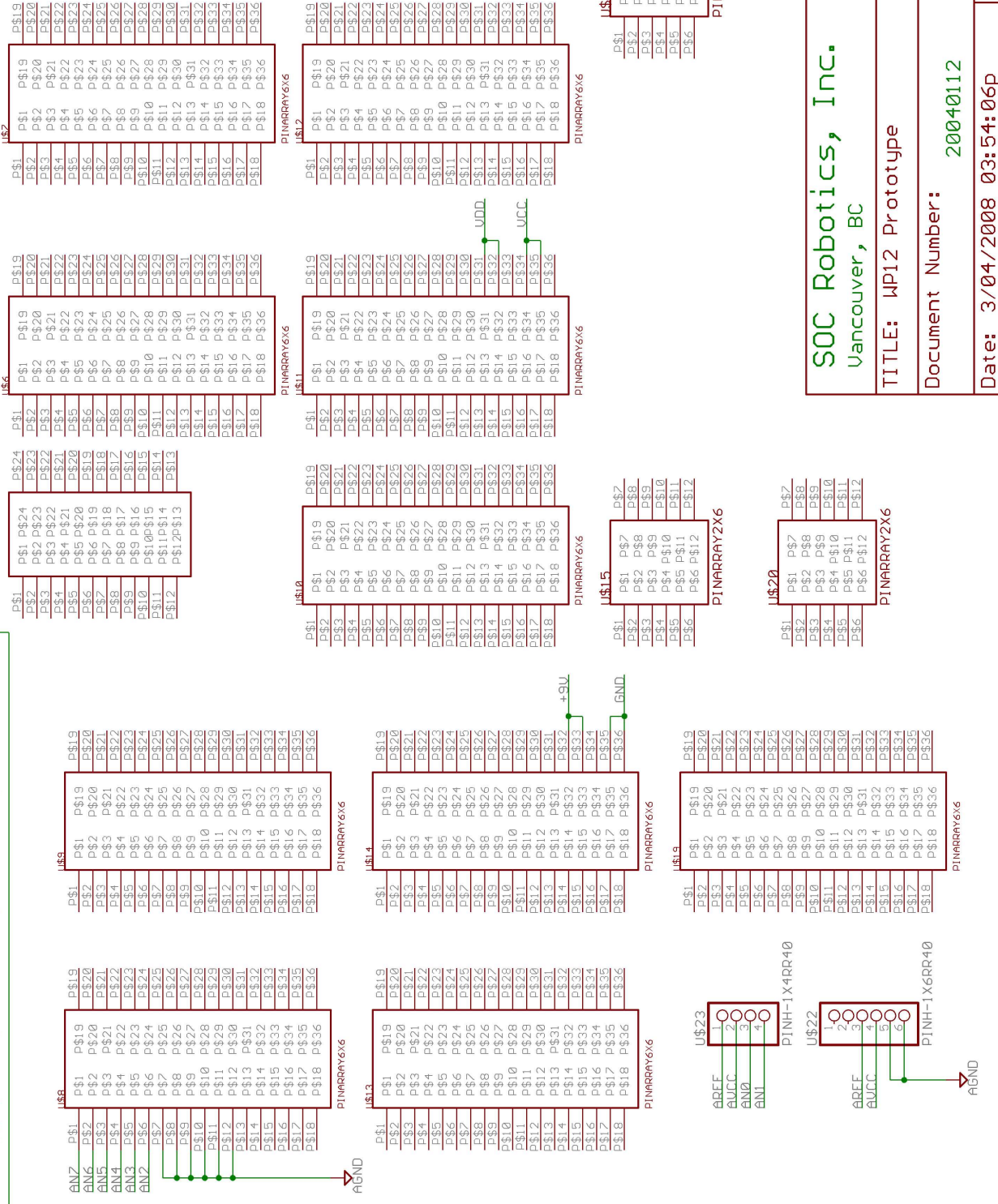
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TITLE: WLP12 Prototype  
Document Number: 20040112  
Date: 3/04/2008 03:52:00p

REV: A  
Sheet: 2/3



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TITLE: WLP12 Prototype

Document Number: 20040112

REV: A

Date: 3/04/2008 03:54:06p Sheet: 3/3

**Notes:**