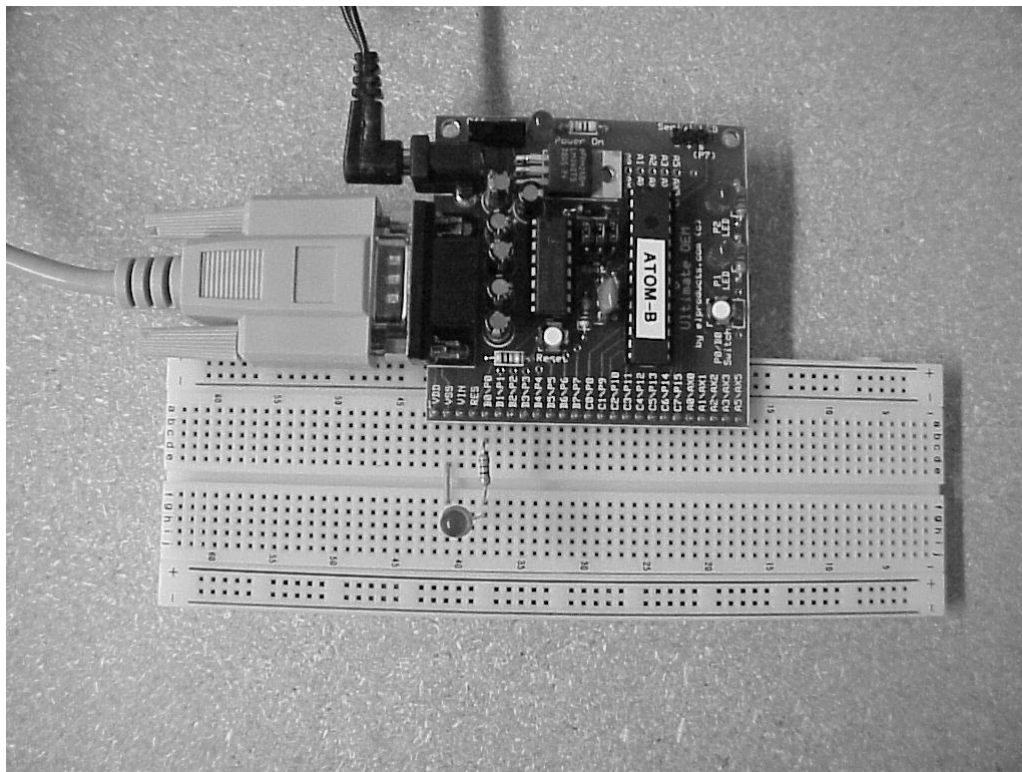


Chapter 5 – Flash an LED

Description

This is a very simple program but also a great starting point to make sure the software and the Ultimate OEM module are working together properly. This project is the same function as we used to setup the Ultimate OEM but this time we control an LED connected to the breadboard instead of the Ultimate OEM LED.

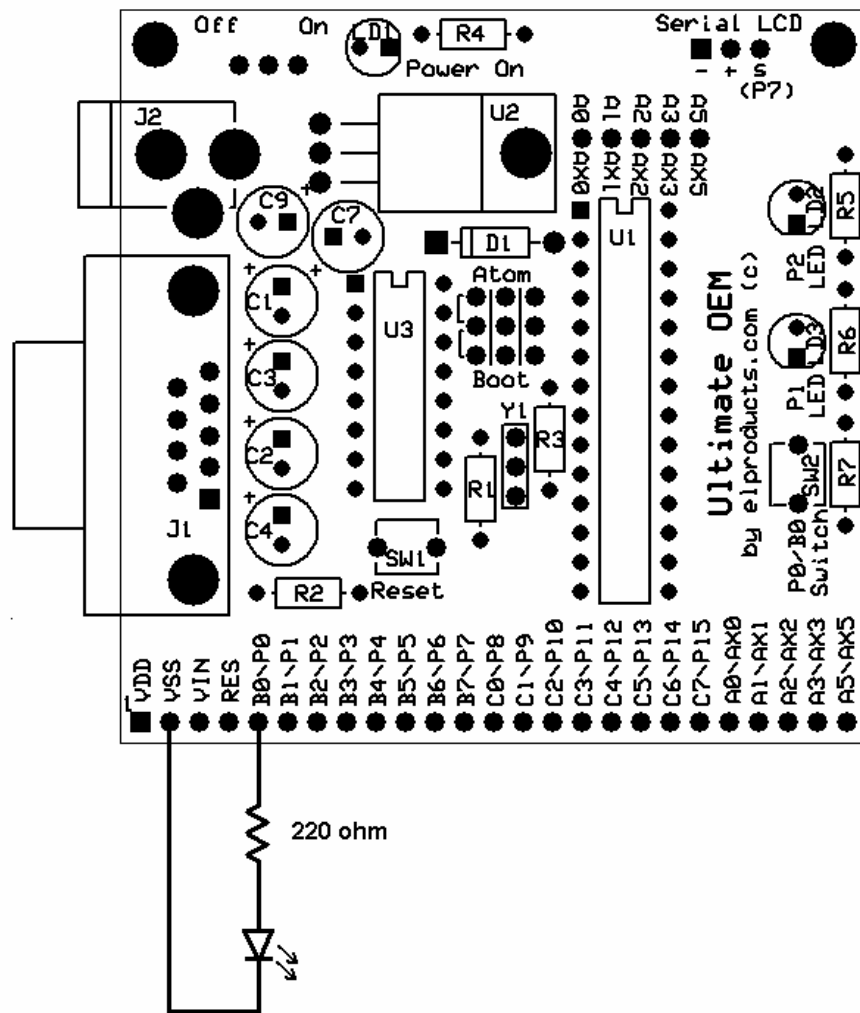
This project will flash an LED, connected to P0, on and off at a one second rate. The firmware chip does this by cycling the P0 pin between a high level (5-volts) and low level (ground). A one second delay is inserted between the commands that set the P0 pin high and low.



Project Setup

The Ultimate OEM module has the I/O pins brought out to a 90 degree header that plugs easily into a breadboard. The connections of the LED and series 220 ohm resistor connect between the P0 pin and ground or Vss on the Ultimate OEM header. Also make sure the power adapter is plugged into the Ultimate OEM module and the wall socket.

The schematic below shows the LED properly wired to the P0 pin.



Software

The program listing below will perform the flash LED0 function. You can type the program in or you can download it off the included disk.

```
' *** Main program loop ***  
  
main:          ' main loop label  
high P0       ' Turn LED on  
pause 1000    ' Delay for 1 second  
  
low P0        ' Turn LED off  
pause 1000    ' Delay for 1 second  
  
goto main    ' Loop back to main label and do it again  
  
end           ' End of the program
```

How it works

The software program controls the LED and flashes it at the one-second rate. To understand the software, lets step through the major sections of code.

An apostrophe in front of the description line tells the Atom compiler that the line is a comment and not a command. After the description the label "main" marks the beginning of the software.

```
' *** Main program loop ***  
  
main:
```

This label "main" defines a location, within the program, where the main section of code begins. Under this label is where the LED is functioned. The HIGH and LOW command do most of the work. The HIGH command is used to output 5-volts to the LED. The LOW command is used to output ground or 0-volts to the LED. Both commands are followed by P0 which is the label for the Atom pin connected to the LED.

```
high P0 'Set LED on
```

```
low P0 'Set LED off
```

Because the HIGH and LOW commands are so quick, a delay between these commands is required to make the LED blink visible. The amount of time the LED is off or on is controlled by the PAUSE command.

The PAUSE command does nothing but delay. The PAUSE command includes a number that determines how many milliseconds (1/1000's of a second) to delay. In this case 1000 is used which represents 1000 milliseconds or 1 second.

```
pause 1000 ' Delay for 1 second
```

Finally the program goes into a loop so the whole process can be completed over and over again. Using the GOTO command generates the loop. The GOTO command is used to jump program control back to the top of the loop or to the "main" label.

```
goto main ' Loop back to main label and do it again
```

To make sure the program does not get lost, the END command is added at the bottom. If this command is ever encountered, the program will stop running until the reset switch is pressed or power is removed and reconnected.

Next steps

A simple next step is to change the delay time from one second to something much faster or slower. Another option is to add another LED. Just repeat the group of HIGH, LOW and PAUSE commands to the main loop. Then modify the pin number of the second group to drive a different pin with a separate LED connected. You can alternate flashing the LEDs similar to a train track warning signal. This is a great modification to this simple project.