

This is the Revision E version of the LED10 module. The status of this project is work in progress.

# Led10 Module (Revision E)

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## 1. Introduction

The LED10 module provides the ability to output 10 bits of data to 10 LED's on board.

## 2. Programming

The Led4 Module supports the standard shared commands in addition to the following commands:

Command	Send/Receive	Byte Value								Discussion
		7	6	5	4	3	2	1	0	
Write Lower	Send	0	0	0	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	Write <i>fghij</i> out to the lower 5 LED's.
Write Upper	Send	0	0	1	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	Write <i>abcde</i> out to the upper 5 LED's.
Bit Clear	Send	0	1	0	0	<i>b</i>	<i>b</i>	<i>b</i>	<i>b</i>	Turn LED <i>bbbb</i> off. MSB ( <i>bbbb</i> =1001) LSB ( <i>bbbb</i> =0000)
Bit Set	Send	0	1	0	1	<i>b</i>	<i>b</i>	<i>b</i>	<i>b</i>	Turn LED <i>bbbb</i> on.
Bit Toggle	Send	0	1	1	0	<i>b</i>	<i>b</i>	<i>b</i>	<i>b</i>	Toggle LED <i>bbbb</i> .
Bit Read	Send	0	1	1	1	<i>b</i>	<i>b</i>	<i>b</i>	<i>b</i>	Read status of LED <i>bb</i> .
	Receive	<i>r</i>	<i>r</i>	<i>r</i>	0	0	0	0	<i>b</i>	LED state is <i>b</i> . Blink rate is <i>rrr</i>
Read All	Send	1	0	0	0	0	0	0	0	Read all ten LED's.
	Receive	0	0	0	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	Upper five LED state is <i>abcde</i>
	Receive	0	0	0	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	Lower five LED state is <i>fghij</i>
Read Lower	Send	1	0	0	0	0	0	0	1	Read lower five LED's.
	Receive	0	0	0	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	Lower five LED state is <i>fghij</i>
Read Upper	Send	1	0	0	0	0	0	1	0	Read upper five LED's.
	Receive	0	0	0	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	Upper five LED state is <i>abcde</i>
Blink Rate Set	Send	1	0	0	0	0	0	1	1	Set Blink Rate
	Send	<i>r</i>	<i>r</i>	<i>r</i>	0	<i>b</i>	<i>b</i>	<i>b</i>	<i>b</i>	Set LED <i>bbbb</i> blink rate to <i>rrr</i> . On ( <i>rrr</i> =000) Slow ( <i>rrr</i> =001)

## LED10 Module (Revision E)

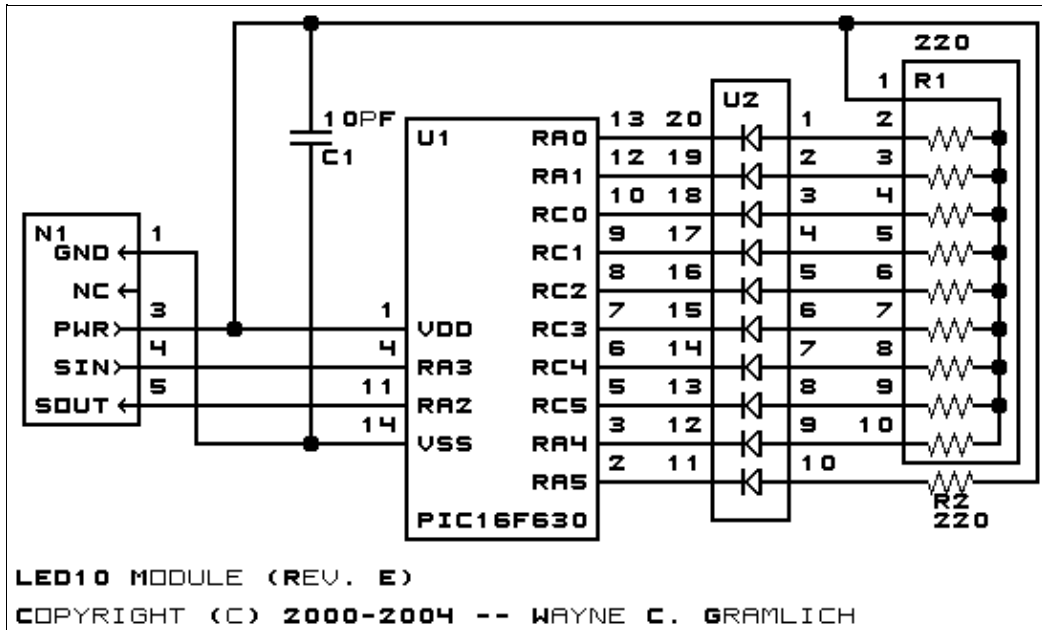
											Medium( <i>rrr</i> =100) Fast ( <i>rrr</i> =111)
Increment LED's	Send	1	0	0	1	<i>b</i>	<i>b</i>	<i>b</i>	<i>b</i>		Increment LED's starting at bit <i>bbbb</i>
Decrement LED's	Send	1	0	1	0	<i>b</i>	<i>b</i>	<i>b</i>	<i>b</i>		Decrement LED's starting at bit <i>bbbb</i>
Power Level Mode	Send	1	0	1	1	<i>l</i>	<i>l</i>	<i>l</i>	<i>l</i>		Set LED's to power level <i>llll</i> ; All off ( <i>llll</i> =000), All on ( <i>llll</i> >=1010)
<u>Shared Commands</u>	Send	1	1	1	1	<i>a</i>	<i>b</i>		<i>c</i>		Send shared command <i>abc</i> to Module.

### 3. Hardware

The hardware consists of a circuit schematic and a printed circuit board.

#### 3.1 Circuit Schematic

The schematic for the Led10 Module is shown below:



The parts list kept in a separate file --- [led10.ptl](#).

#### 3.2 Printed Circuit Board

The printed circuit board files are listed below:

[led10\\_back.png](#)

The solder side layer.

[led10\\_front.png](#)

The component side layer.

[led10\\_artwork.png](#)

The artwork layer.

[led10.gbl](#)

The RS-274X "Gerber" back (solder side) layer.

[led10.gtl](#)

## LED10 Module (Revision E)

The RS-274X "Gerber" top (component side) layer.

[led10.gal](#)

The RS-274X "Gerber" artwork layer.

[led10.drl](#)

The "Excellon" NC drill file.

[led10.tol](#)

The "Excellon" tool rack file.

## 4. Software

The Led10 software is available as one of:

[led10.ucl](#)

The  $\mu$ CL source file.

[led10.asm](#)

The resulting human readable PIC assembly file.

[led10.lst](#)

The resulting human readable PIC listing file.

[led10.hex](#)

The resulting Intel<sup>®</sup> Hex file.

## 5. Issues

Any fabrication issues are listed here.

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