

This is the Revision D version of the LED10 Module. The status of this project is work in progress.

Led10 Module (Revision D)

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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) |

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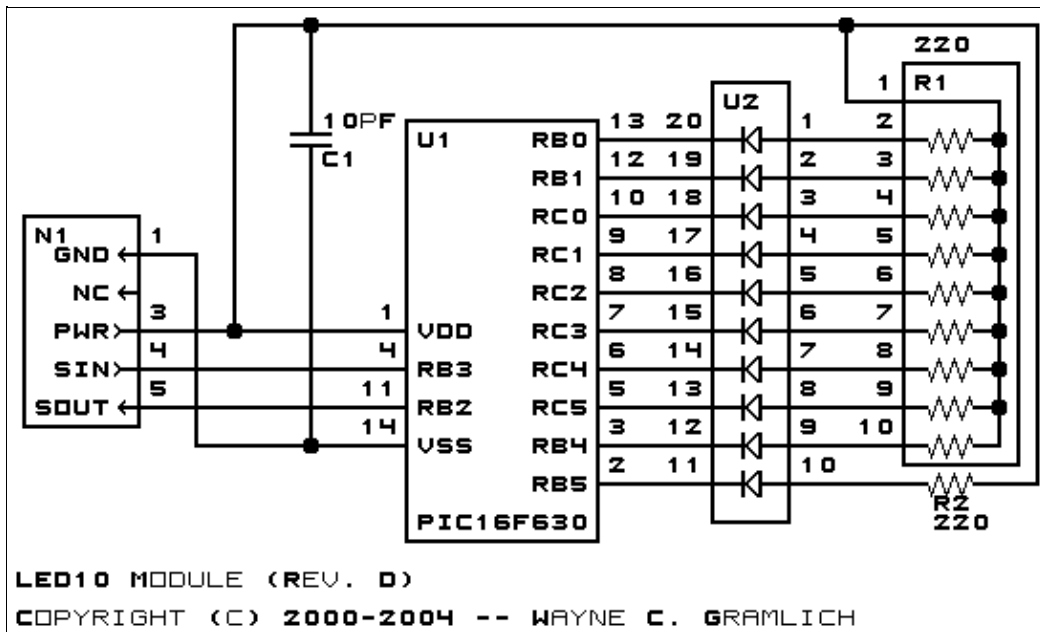
| | | | | | | | | | Medium(<i>rrr</i> =100) Fast (<i>rrr</i> =111) |
|------------------------|------|---|---|---|---|----------|----------|----------|---|
| Increment LED's | Send | 1 | 0 | 0 | 1 | <i>b</i> | <i>b</i> | <i>b</i> | Increment LED's starting at bit <i>bbbb</i> |
| Decrement LED's | Send | 1 | 0 | 1 | 0 | <i>b</i> | <i>b</i> | <i>b</i> | 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> | 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](#)

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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 μ 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[®] Hex file.

5. Issues

Any fabrication issues are listed here.

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