Ron’s Holiday Lights
PI Pixel Adapter

Assembly Instructions
# Table of Contents

INTRODUCTION..................................................................................................................3

PARTS .................................................................................................................................4
   Circuit Board .................................................................................................................4
   Components ..................................................................................................................4

ASSEMBLY – OVERALL REQUIRED PARTS ..................................................................5
   Required Parts .............................................................................................................5
   Install Order ...............................................................................................................5

ASSEMBLY – WS281X PIXELS .........................................................................................6
   Required Parts .............................................................................................................6
   Install Order – WS2811 Pixels ...................................................................................6
   Addition for WS2801 Pixels .......................................................................................7
   Circuit Tests ................................................................................................................7
   Finish Installation ......................................................................................................7

ASSEMBLY – FUSED POWER .........................................................................................9
   Required Parts .............................................................................................................9
   Install Order – Pixel Power Supply ...........................................................................9
   Install Order – Raspberry Pi Powered From 5v Pixel Power Supply .........................9
   Install Order – Raspberry Pi Powered From 12v Pixel Power Supply .......................10
   Circuit Tests ..............................................................................................................10

ASSEMBLY – REAL TIME CLOCK (RTC) .................................................................11
   Required Parts ...........................................................................................................11
   Install Order – Pixel Power Supply .........................................................................11

ASSEMBLY – NRF ..........................................................................................................12
   Required Parts ...........................................................................................................12
   Install Order – Pixel Power Supply .........................................................................12

ASSEMBLY – RENARD .................................................................................................13
   Required Parts ...........................................................................................................13
   Install Order – Pixel Power Supply .........................................................................13

ASSEMBLY – FINAL TESTING AND SETUP ...........................................................14
   TESTING ....................................................................................................................14
   Final circuit tests .......................................................................................................14
   Final Setup .................................................................................................................14

APPENDIX – A ..............................................................................................................16
   Document Revision History ......................................................................................16
INTRODUCTION

The PI Pixel Adapter was created to provide an easy method to connect two strands of pixels to a Raspberry Pi. In addition, the board provides a real time clock, fused power circuit for pixels and option to power the Pi from pixel power supply (12v to 5v), nRF header and a Renard/DMX connection.

The board can be built in its entirety OR with only the components needed for a customer’s specific use. The assembly instructions are divided into the major parts with an overall plan to ease of installation of all components.
PARTS

Circuit Board

The circuit board was designed by Ron P. and can be found at www.ronsholidaylights.com. The board has one SMD part (crystal for real time clock) and can be purchased with or without the crystal mounted. All other parts are through-hole components and are relatively easy to install.

Components

A component list can be obtained from www.ronsholidaylights.com and the parts can be purchased from any component store. The list referenced above is based on www.digikey.com part numbers.

In general, parts can be obtained for the following main sections of the board to allow for assembly of only the sections needed for your project:

- WS281x Pixels with external power supply
- WS281x Pixels with fused external power supply
- Power Raspberry Pi from pixel power supply (5v or 12v)
- Real Time Clock
- nRF header for wireless control of pixel strings
- Renard/DMX control
ASSEMBLY – OVERALL REQUIRED PARTS

Required Parts

The following parts are required to use any feature of the board OR the proximity to other parts dictates their installation at this step for ease of installation.

Parts should be installed in the specified order.

Install Order

1. C9
   a. This is only required for the real time clock BUT it will be much more difficult to solder once J8 is mounted so purchase/mount it now

2. J8
   a. Note position of J8 and tab in relation to board. This orientation is not required; however, it keeps the pin 1 orientation of the connector in a consistent position similar to other Raspberry Pi connectors. Solder all connections.
Required Parts

The following parts are required to connect WS281X pixels to the board. The first section is specifically for WS2811 pixels; the second section adds the R1 resistor pack, which allows for either WS2811 or WS2801 pixels.

Parts should be installed in the specified order.

**Install Order – WS2811 Pixels**

1. C5
2. J5/J6
3. U3 socket
   a. The socket component is actually a strip of 20 pins (2 strips in BOM)
   b. Use a sharp X-Acto knife or similar tool – cut carefully; it is easy to shear off a piece of the plastic and render it useless
   c. Cut one strip into sections of 7 (U3-top), 7 (U3-bottom) and 6 (R1 – used later)
   d. Cut one strip into a section of 8 (R2) and save the rest
   e. Mount the U3-top strip
   f. Mount the U3-bottom strip
4. R2 socket
   a. Mount the 8 section piece cut in the above step
5. J4 – Orientation MATTERS, note direction of part
6. J7 – Orientation MATTERS, note direction of part
7. Place header on J5 pins 1-2 (WS2811) or 2-3 (WS2801) for string 1
8. Place header on J6 pins 1-2 (WS2811) or 2-3 (WS2801) for string 2
Addition for WS2801 Pixels

9. Install R1 socket
10. Place header on J5 pins 2-3 for string 1
11. Place header on J6 pins 2-3 for string 2

Circuit Tests

With a multimeter set for continuity test the following connection points:

- 5v (pin 2) on J8 to U3 pin 1 socket
- GPIO18 (pin 12) on J8 to J5 (pin 1) for WS2811
- GPIO18 (pin 12) on J8 to R1 socket (pin 3)
- GPIO18 (pin 12) on J8 to DAT (pin 2) on J4
- GPIO19 (pin 35) on J8 to J6 (pin 1) for WS2811
- GPIO19 (pin 35) on J8 to R1 socket (pin 6)
- GPIO19 (pin 35) on J8 to DAT (pin 2) on J7
- Ground (pin 6) on J8 to U3 (pin 14)
- Ground (pin 6) on J8 to GND (pin 4) on J4
- Ground (pin 6) on J8 to GND (pin 4) on J7

Finish Installation

1. Install U3 chip
   a. Orientation MATTERS – the dot on the chip represents pin 1 and should be placed on the bottom lower left
   b. Pins may need to be bent in slightly to fit in socket – MAKE SURE all pins are properly seated into the individual sockets; very easy to be on one side or the other
2. Install R2 into socket
3. Install R1 into socket (if setup for WS2801 pixels)
4. Connect pixels to J4 jumper
5. Connect pixels to J7 jumper *** CAUTION ***
   a. On the original board the SILKSCREEN LABELS are wrong – the wording for GND and VIN are swapped. The physical connections are correct so hook up wires in same order as indicated on J4. DAMAGE TO PIXELS will occur if this step is not followed.
The following is a picture of the Pi Pixel Adapter board, configured for WS2811 pixels, attached to a Raspberry Pi v2.
Required Parts

The following parts are required to connect a pixel power supply to the board. The first section is specifically for powering pixels only. The second section provides a path to power the Pi device from the pixel power supply by feeding power to the 5v pins 2 and 4 on the J8 header.

Parts should be installed in the specified order.

**Install Order – Pixel Power Supply**

1. F1  
   a. May be a little tight in PCB holes
2. F2  
   a. May be a little tight in PCB holes
3. J3

**Install Order – Raspberry Pi Powered From 5v Pixel Power Supply**

1. Jumper  
   a. Install a jumper on underside of PCB board following silkscreen instructions
Install Order – Raspberry Pi Powered From 12v Pixel Power Supply

1. C2
2. C3
3. C4
4. U2
   a. CAUTION – Version 1 of the PCB board flipped the in/out pins of the buck convertor.
   b. Remove the header from the buck converter; turn over the converter and re-solder header to mount the converter upside down on the Pi Pixel Adapter, thus flipping the pins on the adapter board.

Circuit Tests

Test the voltage BEFORE connecting the Pi Pixel Adapter to the Pi device. Connect the pixel power supply to the board and energize.

With a multimeter set for DC test the following connection points:
   • 5v pins on J8
     o Pin 2 (5v) and 6 (GND)
     o Pin 4 (5v) and 6 (GND)
Required Parts

The following parts are required to connect the real time clock to the board.

Parts should be installed in the specified order.

**Install Order – Pixel Power Supply**

1. R3  
   a. Orientation does not matter; good practice to install so colors are read from left to right
2. D1  
   a. Orientation MATTERS – position band to the right as depicted on board silkscreen
3. U4  
   a. Orientation MATTERS – pin 1 at bottom right; note small circle on part and board silkscreen. May have to bend in pins slightly to fit in holes.
4. C7  
   a. Be careful to not create a solder bridge with RTC chip
5. C8  
   a. Be careful to not create a solder bridge with RTC chip
6. C6
7. R1 socket  
   a. If WS2801 step was completed this socket is already installed; skip to next step  
   b. Use 6 hole socket cut in WS2811 step.  
      i. If previous step not used, the socket component is actually a strip of 20 pins (2 strips in BOM)  
      ii. Use a sharp X-Acto knife or similar tool – cut carefully; it is easy to shear off a piece of the plastic and render it useless  
      iii. Cut one strip into a section of 6
8. B1  
   a. Place a small amount of flux on silver spot where battery will touch and then place a small solder blob to provide a good connection point for battery (see picture below)  
   b. For the 2 board connectors use plenty of solder; heat once and solder then reheat and apply additional solder as needed.
Required Parts

The following parts are required to connect the nRF wireless header to the board.

Parts should be installed in the specified order.

**Install Order – Pixel Power Supply**

1. C10
2. C11
3. J9

The following is a picture of the Pi Pixel Adapter board, configured for WS2811 pixels, fused pixel power with option to power the Pi, the nRF header and the real time clock.
Required Parts

The following parts are required to connect the Renard components to the board.

Parts should be installed in the specified order.

**Install Order – Pixel Power Supply**

1. J2
2. C1
3. U1 socket
4. U1
TESTING

**Final circuit tests**
1. Test BEFORE connecting the Pi Pixel Adapter to the Pi device
2. Connect power to Pi Pixel board
3. Check 5v connections as in previous step
   a. Pin 2 (5v) and 6 (GND)
   b. Pin 4 (5v) and 6 (GND)

**Final Setup**
1. Turn off power to adapter board and install battery in direction shown (+ up)
2. Test RTC pin 3 (battery) and pin 4 (ground); should have 3v
3. Connect Pi Pixel Adapter board to the Pi device.
4. Do NOT plug in Pi power supply if using the adapter board option to power the Pi device; otherwise connect the Pi power adapter to the Pi device.
5. Test the adapter board RTC chip for 3v power; bottom left pin 8 and top right pin 4 (GND)
6. Within FPP on the Status/Control tab, select Config/Set Time to setup the RTC
   a. Select PiFace
   b. Reboot and set time
7. Connect pixels
The following is a picture of the Pi Pixel Adapter board connected to an external 12v power supply and 2 100-node WS2811 pixel strands.
APPENDIX – A

Document Revision History

<table>
<thead>
<tr>
<th>David Mattingly (DMJPixel)</th>
<th>March 1, 2016</th>
<th>Document creation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>