

# TEECES V3.1 KIT

This lighting system was designed by John V (Teeces) to be a simple, customizable, expandable and affordable solution for dome lighting. An Arduino micro-controller is used to tell LED driver chips which LEDs to turn on and off on several circuit boards that are daisy-chained together. Assembling the kits is easy, but can be time consuming and a little intimidating if you are unfamiliar with soldering electronics. Take your time and if you do make a mistake don't panic.

Almost any Arduino can be used, but the V3 was designed with an Arduino Pro Mini or Pro Micro in mind. A Pro Mini can be mounted directly to the back of the RLD. I offer pre-programmed Pro Micro's to complement the components kit.

For full details of V3 (and V2), see John's blog : [barrettandcarly.com/blog/elec](http://barrettandcarly.com/blog/elec)

For assembly tutorial videos, see my YouTube channel : [youtube.com/murphydigital](http://youtube.com/murphydigital)

## KIT CONTENTS

This parts list is from the April 2012 run of kits

- (1) set of 5 PCBs
- (8) MAX7219 LED Driver chips
- (8) 24-pin narrow sockets
- (5) 10K resistors (for PSI's)
- (5) 24K resistors (for FLD)
- (5) 28K resistors (for RLD)
- (6) 0.1uF capacitors (1 per PCB)
- (6) 10uF capacitors (1 per PCB)
- (1) single-row long pin headers
- (1) single-row female header
- (1) double-row pin headers (2x5 per PCB)
- (1) 2-position screw terminal
- (1) toggle on/off switch
- (1) piece of heatshrink tubing (for switch)

### LEDs:

- (64) 3mm flangeless red (4 extra)
- (68) 3mm flangeless green (6 extra)
- (14) 3mm flangeless yellow (1 extra)
- (59) 3mm flangeless white (5 extra)
- (41) 3mm flangeless blue (5 extra)
- (7) each 5mm red, blue, green, yellow
- (7) 5mm bright white
- (7) 5mm warm white

Note: 3mm red and yellow LEDs are Optek OVLBx4C7 series. All others are from Taizhou First Tech Electronic Co.

### REGULATOR PARTS (new for v3.1):

Regulator, heatsink & 2 capacitors.

### WIRES:

- (2) 5-pin 8inch (RLD to rearPSI, FLD to frontPSI)
- (1) 5-pin 24inch (RLD to FLD)
- (1) 5-pin 4inch (FLD to FLD)
- (2) 2-pin 12inch (used for power or HP's)
- (2) 2-pin 8inch (used for power or HP's)
- (1) 5-pin 12inch (spare)
- (1) 3-pin 8inch (optional Arduino Uno to RLD)

### CNC-CUT PARTS:

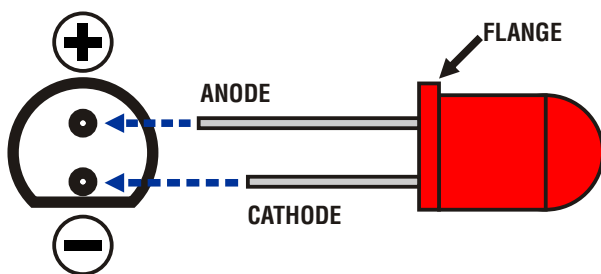
- (1) set of black acrylic logic bezels
  - (1) set of non-glare clear acrylic logic screens
  - (1) set of white Lexan PSI diffusers
- Note: PSI diffusers & boards fit standard 1 1/2" PVC DWV Couplings, found at any US hardware store.

## SUGGESTED ASSEMBLY ORDER

1. Rear Logic Display : the RLD is usually first in our chain, so start by placing and soldering all components (sockets, capacitors, 28K resistor & 5-pin double header). Once components are soldered, place the MAX7219 chips and Arduino Pro Mini into the sockets. Test the RLD by placing a few LEDs and applying power. v3.1 includes a regulator on the RLD; this means you can power everything by connecting 7v-14v to the RAW input on the RLD. Or you can connect 5v to the +5V header.
2. Rear PSI : this will be next in the chain. Start by soldering LEDs L10 and L4. Once they're soldered the socket and other components can be soldered. Place all the LEDs and test PSI by connecting it to the RLD. If all looks correct, solder the LEDs.
3. Front FLD 1 & 2 : assembly is identical to RLD but 24K resistors are used. Place all LEDs and test before soldering all LEDs.
4. Front PSI : assembly is identical to the Rear PSI.
5. RLD LEDs : With the FLD's under your belt, go back to the RLD and finish it off.

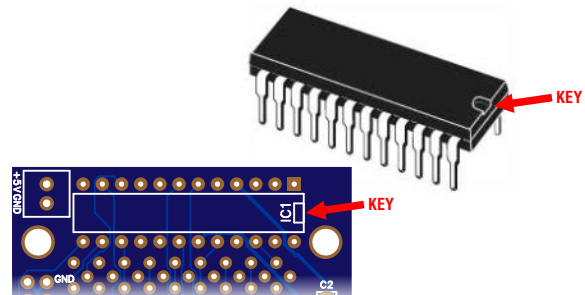
## LED POLARITY

LEDs have a long positive leg (the anode) and short negative leg (the cathode), and need to be correctly placed on the PCBs. Examine each LED and the symbol printed on the PCB as shown. If LEDs are placed incorrectly the circuits will behave unexpectedly.



## IC CHIP ORIENTATION

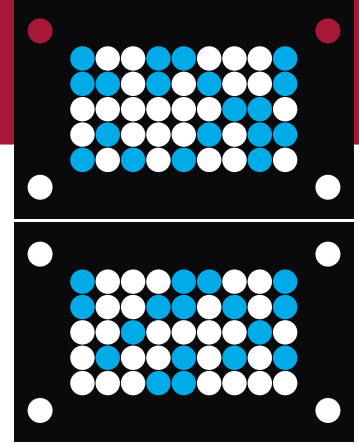
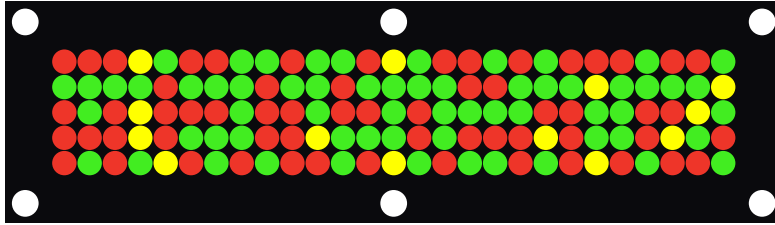
IC chips must also be placed in the correct orientation, and may cause damage if placed the wrong way around. Each chip's location on the PCB shows a 'key' on one side. Similarly, each chip has one keyed end. These keys must be aligned together.



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## TYPICAL LOGIC DISPLAY PATTERNS

There are no 'correct' color patterns to use, but here are the patterns that builders have been using. These are believed to be a good representation of the screen-used logic displays, but please feel free to deviate from these as you see fit. These were originally suggested in Scott Gray's J.E.D.I Display manual. You can use my randomizer script ([joymonkey.com/run/logics](http://joymonkey.com/run/logics)) to generate different patterns.

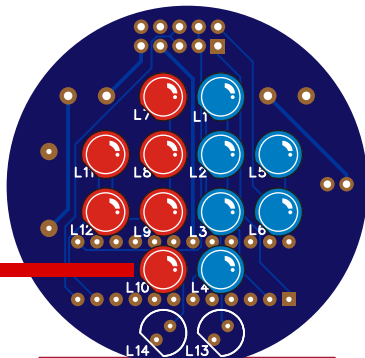


## PROCESS STATE INDICATORS

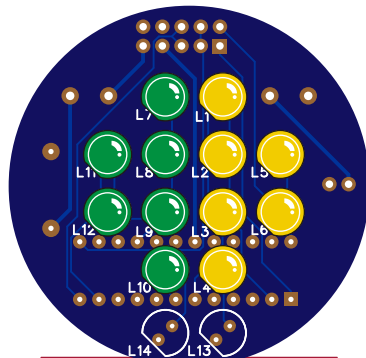
PSI's are assembled similarly to the Logic Displays, however there are some points to note.

### WARNING

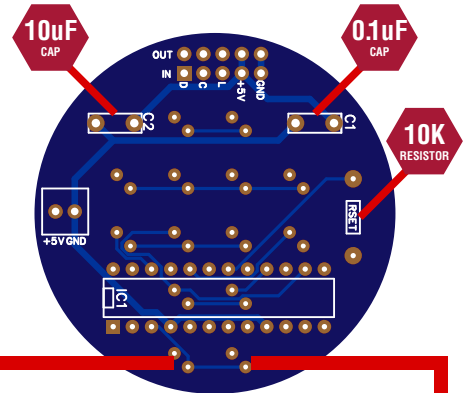
L10 and L4 LEDs must be soldered BEFORE attaching the socket.



Front PSI



Rear PSI

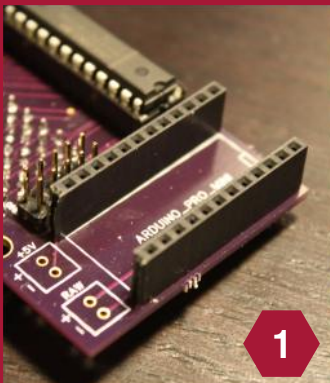


### HOLE PROJECTORS

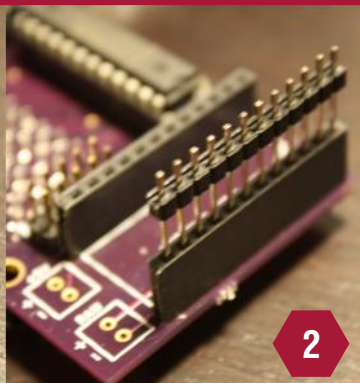
Solder a 2-pin header to the BACK of L14 and L13. HP LEDs can then be attached to each header using 2-pin jumper wires.

## ARDUINO PRO MICRO PIN HEADERS

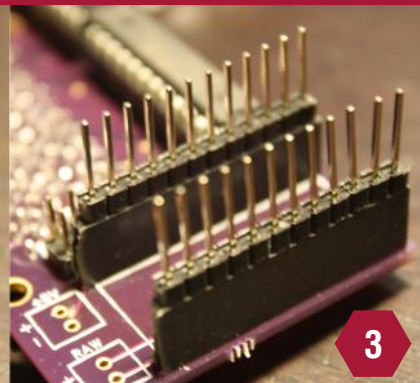
Long pin headers are used with the Pro Micro so they can be accessed from either side. Here's how they are soldered to the Pro Micro. (2) Use the female headers on the RLD to position the pin headers. (3) Slide the black plastic part of the pins down so they touch the female header. (4) With the pins still in the female headers, place the Pro Micro onto the pins and solder them to the top of the Pro Micro.



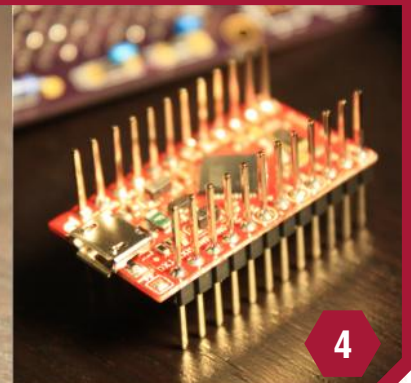
1



2



3



4

# TEECES V3.1 KIT

## V3.1 POWER OPTIONS

The lighting system needs a 5V power source and now includes a 5V regulator. The regulator means that if you don't have a 5V source available you can connect 7V to 14V to the RAW input and it will be converted to 5V for you. Depending on brightness settings & patterns, a full chain of boards will draw between 120mA and 200mA of current.

**NOTE:**  
When powering with a power source over 5V, connect to the **RAW** header. This applies only to the V3.1 board, which has extra components to convert the voltage to a safe 5V.

**REGULATOR**  
Ensure that the regulator components are soldered in place in the orientation shown in this photo. Each capacitor has its value (10uF or 1uF) printed on it. The capacitor's white stripe should line up with the "-" symbol on the board.

## HOOKING IT ALL UP

It is recommended to connect the boards together in two separate chains, as shown below. As each board is completed, hook it up to the previous board using 5-pin jumper wires as shown and test it out. Ensure that the wires are correctly connected - GND OUT must always go to GND IN on the next board. Try to use the shortest jumper wires possible to keep the signal from the Arduino as strong as possible.

**FRONT CHAIN**  
OUT2 is typically used for the front chain to connect the FLD's and Front PSI.  
OUT2 uses Arduino pins...  
14,16 and 10 of an Arduino Pro Micro  
Or...  
10,11 and 12 of an Arduino Pro Mini

**REAR CHAIN**  
The rear chain typically consists of the RLD itself and the Rear PSI. OUT1 is used to connect the Rear PSI.  
This chain uses Arduino pins...  
7,8 and 9 of an Arduino Pro Micro  
or Pro Mini.

Note that for this two-chain configuration to work, the Arduino needs to be programmed with the appropriate sketch. Prior to my March 2012 run of kits, the Arduino Pro Mini's that I provided were programmed for a single chain - these Pro Mini's would need to be re-programmed in order for the lighting system to work as shown here.

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## V3.1 ADDITIONAL NOTES

Each board requires two capacitors for the LED drivers. These are small blue ceramic capacitors and are valued 0.1uF and 10uF. On the new v3.1 RLD there are three different locations that these could be placed. These are directly under the LED driver chips and are best soldered on the opposite side of the PCB (the same side as the LEDs). It is recommended that the capacitors be soldered under the center LED driver.

