

LIGHTING THE LARGE JC WHITNEY TRAVEL TRUNK

The JC Whitney travel trunk gets a lot of notice on various boards as it seems to be a fairly sturdy box at a reasonable price. It does not come with any lighting though many posts indicate there's an AdMore kit for the Givi 460 that fits it ... a kit that costs just under \$130 at retail and looks to use around 48 LEDs.

Presented here is a DIY setup that costs on the order of \$40 and employs 90 LEDs. I've no way to compare it to the AdMore kit's visibility but it is visible in daylight, and very noticeable at night. See <http://www.youtube.com/watch?v=seq5XCA5z3I> for a short video demo (you may have to manually type it in your browser).



Skills: Basic mechanical and electrical (lead identification, soldering) skills are required for this project.

Parts: Basic parts for this modification are two 30 LED SMD (Surface Mount Device) strips, two 15 LED SMD strips, three diodes, two resistors, and one six pin connector. Some miscellaneous wire, heat shrink tubing, and duct or gaffer's tape is also required.

The adhesive mount LED strips used here came from Best Hong Kong (<http://www.besthongkong.com/>). As of this writing they sold in 30 LED strips for \$10 each. The strips actually consist of sections, each of which is equipped with 3 LEDs, a resistor, and positive and negative solder pads. As a result, the strips can be cut to any length that is a multiple of 3 LEDs. However, the sections are electrically connected so each length cut only needs one positive and one negative lead. I ordered 3 strips and they actually came as one strip of 90 LEDs.

General purpose 1N4001 diodes and common 240 ohm, ½ watt, carbon resistors were used.

The connector is required to allow easy removal of the box. Only 5 leads are needed, but 6 pin connectors are more common. The one used here is a CON-60 from All Electronics (<http://www.allelectronics.com/>), but any suitable multi-pin connector should be adequate.

Assembly: The first step is to remove the wrap around plastic and lens from the box. There are three small screws in the interior of the box which allow their removal. One screw is in the center rear, the other two are on the sides where the lens meets the wrap around plastic.

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Once the lens is removed you will find a piece of white paperboard behind the lens. It's highly recommended that you discard this paper and replace it with some manner of highly reflective white tape. This will cause the red lens to serve as a red reflector ... something it does not do in the stock (paper) configuration.

With the reflective tape in place, it's time to affix the LED strips. As necessary, cut the strips to two 30 LED and two 15 LED strips. Measure twice (or more), cut once. The proper cut locations will be evident by the solder pads adjacent to the cut line.

The lens has ribs on the interior which divide the lens into three vertical bands. It is imperative that the LED strips be centered in these three spaces so they clear the ribs. It is suggested that you first find and mark a horizontal line that is centered in the lens space, then mark a second line above it exactly $\frac{1}{2}$ the width of the LED strip. This second line will be used to align the top of strip.

To use the center LED strip for turn signals, place the two 15 LED strips in the center section. They can be butted together at the center of the box to align with the 30 LED strips above and below, or offset to the sides however you wish. It's recommended that you carefully orient the strips so that all strips will have the same polarity (i.e., all positive sides up, or all down) just to make wiring simpler and less prone to error. When you're ready, tear the paper backing off of the center end of a 15 LED strip and place it on your guide line centered (or offset as you wish), holding it down with a finger. With your other hand, slowly remove more paper and continue touching the strip in position toward it's far end. As long as you do not place too much of the strip in contact, or press it down too hard, it will release to a degree for realignment ... but don't count on it. Try to put it on right the first time. Once the strip is in place, go back and press it firmly between the LEDs and resistors. Repeat for the 15 LED strip on the other side of the box.

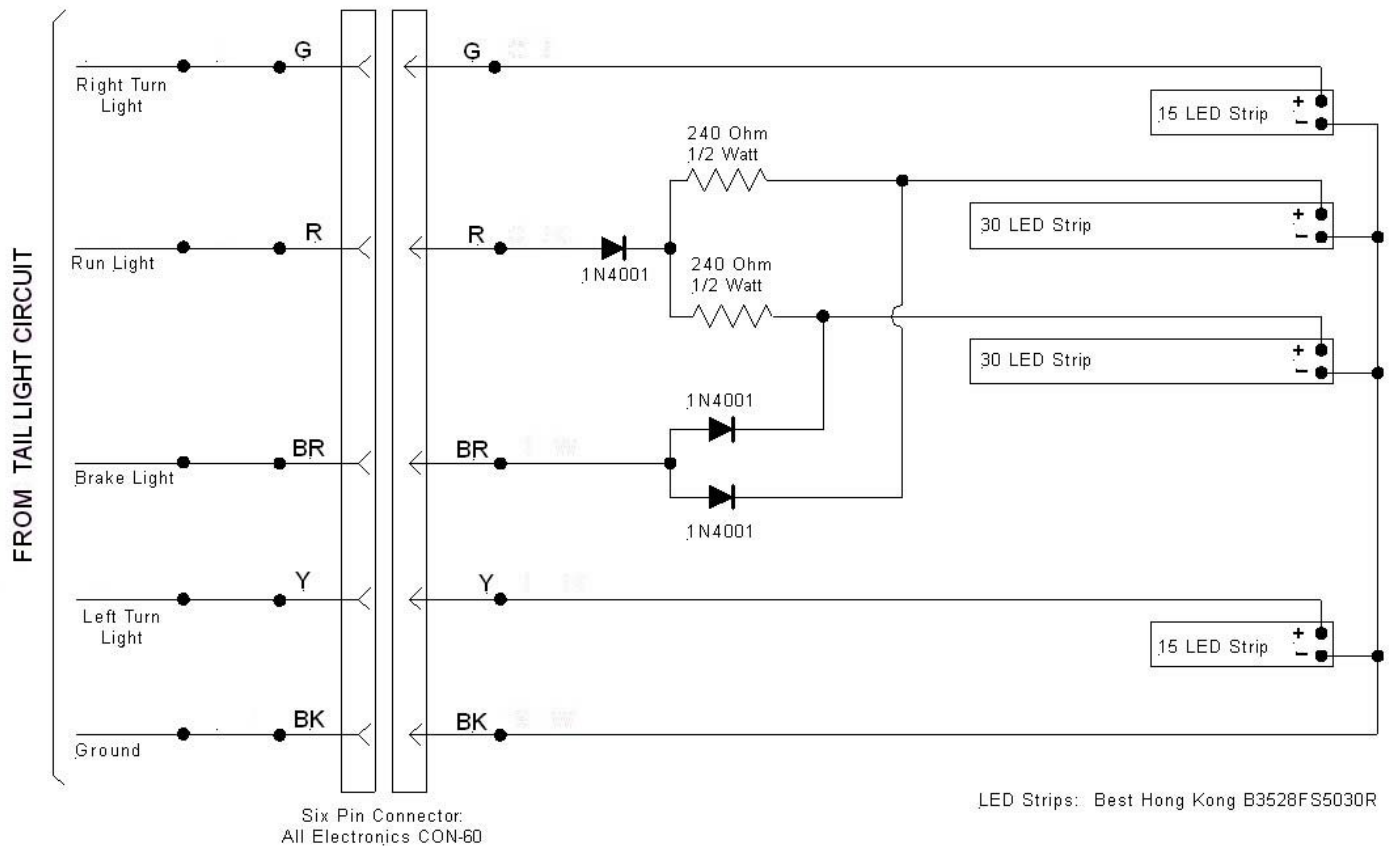
Mount the 30 strip LEDs above and below the 15 LED strips just mounted. As before, measure carefully and mark yourself a guide line. I found it easiest to handle this longer strip by first removing paper backing from the center of the strip and working my way out to the two ends separately. When completed, your box should look something like this.



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Wiring: The LED strips do not draw much current (~160mA for 30 LED Strip) so very small wires will suffice. I actually used conductors salvaged from an old multi-conductor telephone cable inside the box – probably 26 or 28 gauge. Basically most all of the wiring and electrical components will wind up in between the double walls of the box behind the LED strips. Each strip will require only one pair of leads, positive and negative. The circuit is as follows:

TOP BOX LIGHTS WIRING



To wire the LED strips, select a pair of solder pads on each strip, making sure they back up to an accessible section of the box double wall, and drill a very small hole next to the solder pad through the outside wall of the box, i.e., the hole gives access into the void between the two walls ... it does not go all the way into the interior of the box. Feed a wire through the hole and pull it out of the void with a needle nose pliers. Pull the slack out of the void and solder the wire to the solder pad. Repeat until you have all eight wires exposed at the top of the double wall, with enough slack to reach where they will splice to the connector wires – the exceptions being the positive 30 LED wires; and the ground wire which can be consolidated to one lead to go to the connector ground wire.

At this point you can solder together a small assembly which consists of the three diodes and two resistors. Be sure to insulate all leads as you put it together. You'll end up with an arrangement with two inputs (single and double tails of the diodes)

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and two outputs (each one being at the head of a diode and resistor). Solder the outputs to the wire coming from the positive side of each 30 LED strip.

Before proceeding you'll need to decide how you want to route the wiring through the box and out to the male side of the connector, as well as from the bike taillight wiring to the female side of the connector. The following will give you an idea of how it was done on a 2008 Burgman 400.



Here you can see that the strip wiring (including diodes and resistors) has been pushed down into the double wall void, and covered with gaffer's tape. The male connector wires have been run through a hole drilled in the front bottom of the box, spliced to the wires from the strips, and then secured to the interior of the box with tape.

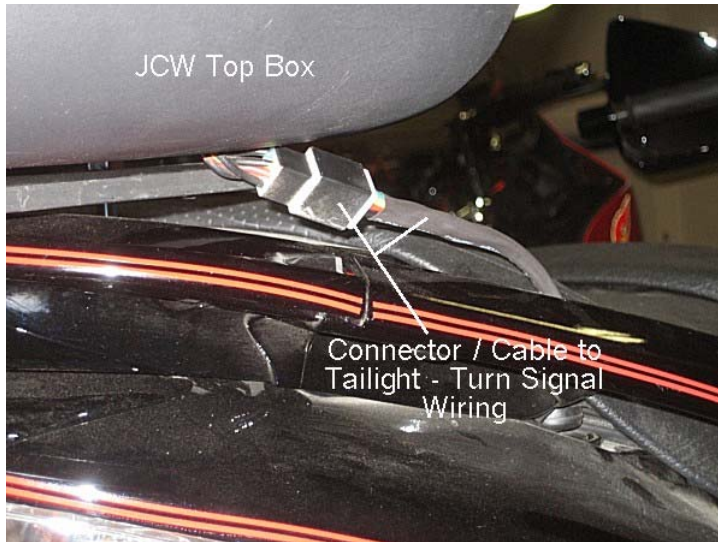
This view shows how the wires connected to the bike wiring were encased in heat shrink tubing and fed through an existing gap under the bodywork to come up just to the rear of the seat. This worked out really well on the Burgman – no modification to the bike at all. Depending on where you have to go to access your bike's tail, brake, and turn signal wiring, your installation may be more or less complicated.



Once you've decided on routing and have pulled the male connector wires into the box, splice them to the appropriate diode input or wire from the LED strips per the circuit diagram. Note that you'll have four wires spliced to the ground wire (negative), one each to the right and left turn signals (positive), one to the single

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diode tail (positive – run light), and one to the double diode tail (positive, brake light). Again, it's strongly recommended that you insulate all connections with heat shrink tubing. Once all the box wiring is done and secured, reassemble the lens and plastic wrap around. Be careful when replacing the lens, being sure to not force it and catch the LED strips on a rib.



This last view is of the box mounted on the bike and the two connectors mated under the box. This particular connector is not outdoor rated but it is fairly well protected. I only ride in the rain if I get caught out in it, so I don't anticipate a problem. This connector's water resistance could be improved by some silicon caulk where the wires enter the connector, and some manner of sealing after mating ... or one could use a water resistant connector.

Wiring the bike side of the connector will be as varied as there are bikes. In the case of the Burgman 400, the tail/turn/brake light wiring was easily accessed after removing the center frame cover (the rear facing piece under the pillion rider handle cover – the piece with the Suzuki logo). Splicing into the bike wiring can be done with crimp on adaptors, but I don't like them. I prefer to cut, strip, solder and insulate with heat shrink.

Operation Theory: The circuit is fairly straightforward given the connections shown. The diodes are in the run and brake light leads as these functions share the same LED strips. The diodes prevent either from back feeding to other, e.g., so the run signal to the LED strips doesn't back feed and operate the brake filament in the bike lights, and vice versa. The 240 ohm resistors are simply there to drop the run light voltage going to the LED strips so they do not come on at full brightness. The LED strips are designed to operate at the nominal 12V so there is no need for an external current limiting resistor. Those are built in to the strip. The choice of 240 ohm resistors was purely subjective, based on viewing the LEDs' brightness with various different resistor values while comparing them to full voltage brightness. One could conduct the same trial with the strips on the workbench to see if the brightness at a different value suits them better.

Disclaimer: As is the case with all "good Samaritan" submissions, I assume no liability and make no guarantees or warranties as to the functionality or suitability of any attempt one may make to duplicate this project, or as to the attendant loss or damage that may result from one attempting this modification - proceed entirely at your own risk should you chose to do so.

Author may be contacted at author@lsvl.info