Wireless LEDs for Model Making

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Overview

Tiny LED lights that are both wireless and battery-less are wonderful accessories for scale models, LEGO-compatible brick builds, and table-top gaming. This guide shows how you can add these delightful LEDs and their inductive charging coils to your designs.

You'll also learn how to build a shelf base and back stand to conceal the induction coil.
Parts

Large Inductive Coil and 10 Wireless LED Kit - 24V
Adding LEDs to anything makes it 5x better -- it's a scientific fact! But when you have LEDs, you've got wires and power supplies and all that stuff is kinda annoying. What if you...
https://www.adafruit.com/product/5141

Adjustable Power Supply w/ 2.1mm / 5.5mm DC - 3V to 24V at 2 Amp
Put your Snap! cassette on and sing along to "I got the power!" with this super useful power supply adapter where...
https://www.adafruit.com/product/5130

or

Small Inductive Coil and 10 Wireless LED Kit - 5V
Adding LEDs to anything makes it 5x better -- it's a scientific fact! But when you have LEDs, you've got wires and power supplies and all that stuff is kinda annoying. What if...
https://www.adafruit.com/product/5140
5V 2A (2000mA) switching power supply - UL Listed
This is an FCC/CE certified and UL listed power supply. Need a lot of 5V power? This switching supply gives a clean regulated 5V output at up to 2000mA. 110 or 240 input, so it works...
https://www.adafruit.com/product/276

Female DC Power adapter - 2.1mm jack to screw terminal block
If you need to connect a DC power wall wart to a board that doesn't have a DC jack - this adapter will come in very handy! There is a 2.1mm DC jack on one end, and a screw terminal...
https://www.adafruit.com/product/368

Materials

To build the wooden enclosure you'll need the following:

2 x Wood enclosure
10" wood pallet plaque

- Thin EVA foam sheet or felt sheet
- Staple gun and staples
- Electrical tape or Kapton tape
- Uglu squares or Glu Dots
- Hot glue gun and glue

Tools

- Drill with 1/4" and 3/8" bits
- Hobby knife
Light Your Car Models

Add LEDs

For some models, try simply fitting the LEDs into place. This may work well for things light vehicle headlights, lamps, and fire sources such a burning pyre.
Model Car Headlights

Some scale model die-cast cars feature translucent headlights. You can usually open these up by prying the plastic chassis from the body.

NOTE: a car with a metal chassis will interfere with the induction.

There is enough room here to place one LED per headlight, perfect!
Prep LEDs

A glue dot or other two-sided, transparent, squishy adhesive material is perfect for attaching LEDs.

Cut a small piece of the adhesive, then press the LED to it and peel off.

Press the LED into the backside of the headlight, or onto the plastic above it -- the plastic will act as a light pipe, allowing the light to shine through.

The advantage to this orientation is that it keeps the coil on the same plane as a floor-mounted induction coil for best power transfer.
Diffusers

You can try different materials to diffuse the light coming from the LEDs, such as wax paper, batting/cotton balls, hot glue sticks, and even the tops of conventional through hole LEDs.
Tabletop Game Miniatures

Model Modifications

Some models will benefit from a bit of modification. In this example, the Razor Crest tabletop gaming miniature (painted by the talented and lovely Brian Kesinger (https://adafru.it/Vce)) has two thrusters that would look great with some added glow.
Disassembly Thruster

Pulling apart the thruster reveals a nice location to add an LED.
**Add Light Hole**

Use a small, sharp tool to make a small hole in the thruster nozzle for the light to emit.

Use a small piece of Uglu or Glu Dot adhesive to affix the LED to the inside of the nozzle.
When using hobby knives and similar, you should wear eye protection and take care not to cut oneself or others.
Modify Model
A small hobby knife will make quick work of small bits of plastic that need to be removed for the nozzle to fit back onto the thruster engine body.
Repeat this process for the second engine, and then reattach them to the ship.
Inductive Coil Display Stands

Part of the magic of inductive LEDs is the moment where you look at them and wonder "how the heck are those lighting up like that?!". Hiding the inductive coil helps preserve that wonderful magic.

You can use a shelf, box, frame, or other covering made from materials such as wood, foamcore, plastic, fabric, or cardstock/cardboard to hide the inductive coil, while retaining its coupling power to the LEDs.
Here is just one example using premade palette box frames from a craft store.

Coil Angles

In some cases, your model or display requirements may dictated the use of two coils in order to cover the full range of LED rotation angles. As the angles diverge, you may see reduced power (dimmer LEDs) and then eventually, no power transfer at all.

Here, we place two coils, one on the base and one behind. This is perfect for models where you have a wide range of LED angles required.
Build the Circuit

First, build the circuit to plan the display shelf build.

This isn’t a requirement, but you can cover the board and exposed contacts of the power jack with an insulator, such as heat shrink tubing, electrical tape, and Kapton tape.

Use a DC power splitter cable to connect both coils to your power supply.

Then, plug both of the coil transformers into the power splitter cable.
Embed Coils
Place the coil inside the enclosures. Attach them to the undersides with adhesive.

Here, one is attached with Kapton tape, the other with high temperature hot glue.
Prepare the Enclosures
Mark and drill a hole in one of the enclosures as shown to run the power cable.

You can use a pilot bit followed by a 3/16" bit to fit the plug diameter.
Power Jack
Insert the power plug into the jack through the drilled hole to align it, then affix the jack with hot glue and allow to set.

Second Stand
If you’re making the second stand to act as the "wall" of the display, there is no need to drill through the wood, you should affix the power jack facing out of the back as shown here.
Bottom Covering
You can finish off each stand by covering the exposed bottom.

Here, I've used thin EVA foam on one and black felt on the other, simply cutting them to size and using a staple gun to secure them.
Wall Covering
Here you can punch a small hole for the power jack access through the felt or foam before tacking it in place.

Power 'em Up
You can now turn on your power and light up your models!
The rear panel can be glued and clamped down for a permanent assembly, or simply rest on top of the bottom platform for reconfigurability.
LEGO-Compatible Brick Lighting

You can create great-looking scenes by lighting translucent plastic construction bricks based on [Hilary Page's Self-Locking Building Bricks](https://adafru.it/Vcf) design, such as Mega Bloks, Best-Lock, BanBao, and, oh, what's that Danish company again? Oh, yeah, LEGO.

Inductive LEDs are a great alternative to existing brick lighting methods, since they require neither batteries nor wires, so you can really get them into small places!
The smaller LEDs from the 5V inductive LED kit fit nicely inside of the standard LEGO-compatible brick tube. The larger LEDs from the 24V inductive LED kit only fit in larger spaces of some bricks. Both types of LED work with both coil sizes.

**Embedded LEDs**

Simply drop some of the smaller LEDs into the tube or spaces in a translucent brick, then cap off the bottom with a plate as shown.
With a pair of coils you can light up the bricks in most positions and orientations.
Brick Fiction

A mix of small and large LEDs is use here to create this scene inspired by Pulp Fiction. Note the smaller LEDs in lighting fixtures, while two large LEDs are used to give Vincent's briefcase its distinctive glow as Jule's watches from a slightly safer distance.

The pair of coils allows for coverage of a large volume of induction space.
3D Printed Brick

We designed two different sizes of LEGO compatible bricks. One houses a single LED and the other can fit two LEDs.

The LEDs are fitted inside the 3D printed brick and twist to lock them into place.

This makes them non-destructive so you can still pop them out if you ever need to.
The double LED brick uses a divider that holds them tightly in place so they won’t rattle once fitted inside.

We found these two sizes work with just about any combination of bricks so you can use the right one to illuminate your builds.

Parts List

STL files for 3D printing are oriented to print "as-is" on FDM style machines. Original design source may be downloaded using the links below.

- Lego LED Brick
- Lego LED Brick solo
- Lego LED Wall
Slicing Parts

Supports are required. Slice with setting for NinjaFlex 85a material.

The parts were sliced using CURA using the slice settings below.

- 210c extruder
- 0.2 Initial layer height
- .2 layer height
- 10% gyroid infill
- 60mm/s print speed
- 60c heated bed

Edit STLs
https://adafruit.it/VsC

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