

LED Lighting for RVs

Foreword: This informative article is provided through the generosity of the nice folks at RVledbulbs.com and The Hitch Post of Ocala.

LED lighting is coming into wide use everywhere, but it's truly a natural for an RV. It works well on 12v power, is very low in power consumption and heat generation, is rugged and has an incredibly long service life, comes in a variety of brightness (lumens), can be aimed in any direction, and has a wide range of color temperature (shades of white). About the only downside to LED lighting is a relatively high cost, but that is offset by the long life. In fact, if you equip your RV with LED lighting, you may never buy another bulb as long as you own the RV!

LED Lighting Comparison

Attribute	 Leds	 12v Incandescent	 12v Fluorescent
Power Consumption (800 lumens)	6-8 watts	50-60 watts	15-20 watts
Heat Emission (800 lumens)	3.4 btu/hr	85 btu/hr	30 btu/hr
Lifetime	40,000 – 60,000 Hrs	1000-1800 Hrs	7500 Hrs
White (Color Temp K.)	2500-6000 K.	2500 K.	4000-6000 K.
Durability	Very rugged. Can handle bumping, jarring & vibration	Breakable bulb and filament	Tubes are breakable
Instant On	Yes	Yes	Some warm-up time
Environment impact	None	None	Has mercury
Cost per 100 lumens	\$5	<\$1	\$1

LED Lighting for RVs

Some other features of LEDs

Lower heat: If you have any halogen lights in your current RV, you know first hand how much heat they put out. Sometimes it seems you could cook on them! LEDs generate far less heat than a halogen and make an excellent replacement for them, either by substituting LEDs for the halogen bulb, or replacing the halogen fixture.

No shortened lifespan: If you have a light that gets switched on and off frequently, perhaps a porch light on a motion sensor or a closet with a door switch, an Led will last several times as long as either an incandescent or a fluorescent. The lifespan of a fluorescent is severely reduced by frequent on/off cycles, sometimes as much as 50% less. Incandescent lights aren't affected as much, though.

No loss of brightness: Incandescent and fluorescent bulbs deteriorate with age, gradually growing dimmer over time. Not so with an LED – it produces the same brightness from beginning to its eventual end.

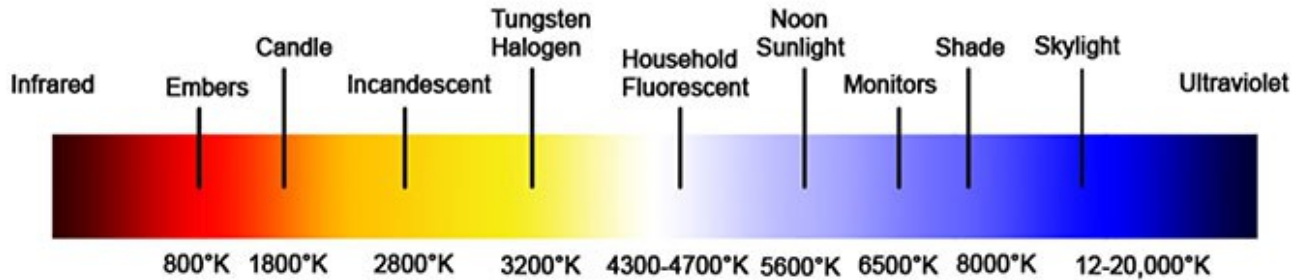
Brightness: What's a lumen?

We often think of a light bulb's brightness in terms of watts, because we have used that measure with incandescent bulbs for more than a century. But watts measure the amount of electrical power that a light bulb consumes rather than the amount of visible light it emits. Brightness is defined in lumens, which is a measure of how much light is perceived by the human eye. The easiest way to understand brightness in lumens is a comparison to another familiar measure. For example, a 60 watt household bulb is about 700-800 lumens (depending on age). A 15 watt fluorescent is about the same. On the automotive side, the common #1141 bulb is about 270 lumens when new and uses about 18 watts. Just remember: *The higher the lumens, the brighter the light.*

Understanding Color Temperature (whiteness)

We often say that the white light from a bulb is “warm” or “cool” or “natural”, but what do those really mean and how can you tell in advance what it will be? The light emitted by a bulb can be characterized by its Color Temperature, which is the color of light that would be emitted by a glowing piece of metal at a given temperature. Scientists use the Kelvin (K.) temperature scale to measure this, and 0 on the familiar Fahrenheit scale is about 460 K. A candle is about 1899 K. and a typical incandescent bulb is about 2700-3300 K. Fluorescents are available on a couple color ranges, usually called Cool White (6000 K.), Daylight (5000-5500 K.), Natural (4000-4500 K.) and Warm White (3000-3500 K.)

LED Lighting for RVs



LEDs are now available in a wide variety of color temperatures, all the way from a warm 3000 K. to a cool 6000 K. Red, green and blue LEDs are also available, and tiny clusters of color LEDs are used to produce almost every imaginable shade.

Choosing Your LED

Bulb & Socket

If you already have lighting fixtures and just want to replace the existing bulbs, the basic choice is dictated by the socket type. 12v incandescent bulbs generally have a push in and twist socket called a *bayonet* base that locks into a tube with the two pins protruding from the sides. The pointed end is the positive connector and the base itself is the negative.



Another common type is the *Bi-pin*, with two thin wire connectors that stick out and insert into matching holes in the fixture. A bi-pin base is designated by a G plus a number, e.g. G4, and the number is the spacing between the pins in millimeters (mm). A typical 12v halogen bulb has a G4 base. A T8 style fluorescent tube has a G13 bi-pin on each end.

A *wedge* base also has wires for the electrical contacts, but they lie against the base of the bulb rather than sticking out like a bi-pin.



LED Lighting for RVs



The *festoon* base is a simple metal cap at either end of a (usually) short bulb body. It snaps into metal spring contacts, rather like a cartridge fuse.

For most bulb bases, you will be able to choose from a selection of brightness (lumens) and Color Temperature. Some may even be offered in red, green, blue or amber.

When replacing an existing bayonet, bi-pin, or festoon bulb with an LED that has a matching base, you simply plug the bulb into the socket. No different than replacing any other bulb. But when replacing a fluorescent tube with an equivalent LED tube fixture, you do not use the fixture ballast and wire the LED direct to 12v power. The LED tube will have two wires dangling from the bulb for that purpose. The bi-pins on the ends are there simply for a compatible mechanical mounting in the fixture, making it easy to mount the LED tube in a standard fluorescent fixture. The direct 12v connection makes it an ideal replacement for a failing ballast – just toss the old ballast in the trash and wire in your new LED tube. It also eliminates the hum or electrical interference that sometimes accompanies a fluorescent.

Pre-mounted LED fixtures

If you are willing to replace or modify your fixtures, your choices open up further. LED lighting fixtures are available in the familiar recessed “puck light” form factor. These are great for replacing halogen puck fixtures, or adding new lights under a cabinet or in the ceiling. There are also outdoor fixtures, some with built in day/night and/or motion sensors. And traditional dome lights styles as well. You can also buy any existing marine or RV light fixtures and replace the bulbs with LEDs.



LED Lighting for RVs

Strip Lighting

LEDs are also available pre-mounted in long thin strips, about 1/4" wide and often sold in 5 meter (16.5 ft) lengths with an adhesive backing already applied. The strips contain hundreds of SMDs (Surface Mounted Devices) and can be cut to the desired length, which gives you control of the total brightness as well as flexibility in mounting. You can place multiple short strips in an existing fixture (in lieu of the previous bulb type), or make your own decorative lighting by placing strips directly on a surface, e.g. under a cabinet or along a trim molding. Use your imagination!

Commonly available strips use either #5050 or #3528 SMDs. The 5050 is brighter than the 3528, but also more expensive and uses a bit more power. The SMDs can be packed tightly on the strip or spaced out more. Typically a 16.5 ft strip will contain either 100 or 300 SMDs. SMD strips are designed to operate on 12v DC, so can be wired direct to the RV 12v system, or can be used with a 12v power supply and plugged to 120v outlet.



Strips are available in all white with a choice of warm or cool white color temperature, in red, green or blue solid colors, or in multi-color (RGB) arrays. The multi-color arrays can be electronically controlled to be a solid red, green, or blue, or a blend of those colors to produce a variety of shades. You can even have them alternating, blinking, or continuously changing color!



This gives you an idea of the many, many choices available to you in utilizing LEDs in your RV. Visit www.RVledbulbs.com to see a variety of LED offerings, replacement bulbs, fixtures and strips.