



## Getting Started with LED Lighting



***Profoundly Change the World with Just One LED  
Light Bulb***



## **LED Light Bulbs**

In the decade since we first introduced the multi-bulb LED flashlights, MAC1INDUSTRIES CORP has stayed on the forefront of consumer LED lighting products. We're now proud to offer you the next generation of lighting for your home. C. Crane's LED bulbs are designed with standard light bulb bases (also known as Edison bases), so they'll fit into just about any lighting fixture you already have. With just a little planning, you'll be able to enjoy the benefits of LED lighting just about anywhere.

The best way to start using LED light bulbs is to try one bulb first. Swap a regular bulb on your porch, in a ceiling can, task or accent light, or maybe replace a bulb that you leave on at night. To get familiar with LED light bulbs, we recommend you experiment with different lighting combinations and see how their reduced light output works for you.

### ***LED Light Bulb Benefits***

Save money on electricity  
Light the color of daylight  
Use only 2-10 watts of electricity  
(1/3rd to 1/30th of Incandescent or CFL)  
Long lasting - up to 80,000 hours bulb life  
Cool running (warm to the touch) - little heat compared to standard bulbs

Instant on/off  
Works in cold weather  
Can sustain moderate power surges  
Durable bulbs with no fragile filaments to break from shaking and rattling  
Directional lighting generates less wasted light  
Works with sensor activated lights

### ***LED Energy Efficiency***

Here's how LED light bulbs compare to ordinary bulbs: A regular 40 Watt incandescent bulb burns through a lot more energy than it needs to produce the light you see. Remember those toy ovens that used an incandescent light bulb to bake brownies? A large percentage of the energy that goes into a 40 Watt bulb is wasted as heat - great for baking brownies, not so great for conserving electricity and saving money. LED light bulbs, on the other hand, generate very little heat as they glow, instead transferring most of their energy directly into light.

The latest LED light bulbs now produce about the same amount of light per watt as compact fluorescent bulbs (CFL). However, unlike incandescent bulbs and CFLs, which splash light in all directions, LED bulbs are directional. They drive their light in one

direction, so that you have light exactly where you want it. This directional lighting equals savings in yet another fashion. Led's don't waste light (energy) on areas you don't need illuminated, which is also why they're perfect task lights.

### ***LED Energy Efficiency***

Prior to the introduction of LED light bulbs, if you wanted to use a low watt (less than 4 watts) bulb for ambient lighting, you had to settle for a hard-to-find, expensive, incandescent light or an unsightly florescent. Current LED bulbs are designed to fit standard bases, range from 0.85 to 7.3 watts, and are made for low light situations. In addition to low wattage, you get the bonus of long life and In a garage or basement under heavy foot traffic, incandescent bulbs are just too fragile to last very long.

Too much vibration and the filament breaks and you're left with darkness or the hassle of changing another bulb. Not so with LED light bulbs. Since LED light bulbs have no filament, there's nothing to rattle apart and break. So they'll not only save you money in the cost of bulb replacement, they'll save you the trouble of climbing onto a chair or rickety ladder to swap out that incandescent bulb that keeps burning out energy efficiency, which all adds up to a 90% savings over standard bulbs

### **A Cool, New Color of Light**

LED light bulbs bring a white light into a room. Unlike the yellow light we're so used to seeing from incandescent bulbs, the white light cast by Led's is closer to the color temperature of daylight. The white light of Led's is easier on your eyes and also provides the added benefit of lifting your mood in the summer and winter time. The white light also mixes in wonderfully with ordinary lights around your home or workplace, and it's a great light to read by.

Use an LED light bulb in a task or reading light, and you'll have a bright, white light to work by. Led's not only produce light more efficiently, they have a tiny mirror that reflects light in one direction. A directed light means less wasted light

Ceiling cans (or recessed lighting) have become one of the most common styles of lighting for homes in the U.S. They are typically installed in groups simply for symmetry. Ceiling cans are an ideal place for LED light bulbs.

Here is a typical set up of ceiling cans. During the construction of a home, the number of cans contractors install is based solely on providing balance. After you have moved in and arranged your furniture, take a step back and dissect your room. Are there areas where you do not need or want the excess light produced by an incandescent bulb, such as in a can light over a window? Would low level lighting be more appropriate and desirable in that location? If so, then this is a great place for This energy efficient bulb provides ambience and brings dynamic

lighting to a room, yet it looks like an ordinary bulb. With just a little planning you will have light where you need it and you will get paid back handsomely for your efforts - with a 90% savings on the bulb you replaced.

LED light bulbs cost just pennies a day to run, so they are perfect for those always-on or accidentally-left-on lights like on porches. Since they last up to 80,000 hours, LED light bulbs are also great for those hard-to-reach places with LEDs emit monochromatic light therefore any harmful ultra-violet or infra-red light has been eliminated making them safe to illuminate paintings and other types of art. The bluish color of LED light bulbs adds a whole new and exciting dimension to artwork. Here it's difficult or dangerous to change the light bulb.

We think nightlights should be cheap to operate, and we think the bulbs should last a long time — which is why we designed our very own. Runs cool, won't shatter like glass bulbs, and is super energy efficient — using less than 1 watt of power. 120 Volts and lasts up to 80,000 hours. Fits most standard night light fixtures

Using LEDs at work and saving money while maintaining good lighting requires thought and some basic change. Most work areas need at least two types of lighting:

1. Light to navigate the work space safely.
2. Light to carry out the task at hand (task lighting).

Since LED light bulbs are directional, they are perfect for task lighting. With a little planning and experimentation, once you achieve the setup that is right for the job the only difference you will notice will be the 90% savings on your electric bill.

At work, LED light bulbs can be real money and headache-savers. Install them in hard-to-reach areas to cut down on maintenance costs, or in areas where a vibration-resistant light is of the essence - like in an emergency corridor, in a workshop, or down by a fuse box.

An LED light bulb can last you up to 80,000 hours. That averages out to 16 hours of light per day for 12 years.

LED light bulbs are so energy efficient that, depending on how often you have them on, they'll actually pay for themselves in just over a year.

The best way to conserve energy is to use less of it. LED light bulbs are directional - which means that they only put the light where you aim it or where

you need it. Incandescent bulbs, on the other hand, just sit there and throw their glow all over the place - wasting electricity and generating heat.

LED light bulbs run cool, so they're safer to use than fragile, burning hot halogen and incandescent bulbs.

LEDs turn on instantly - which has been a big benefit in car brake lights and is also a welcome feature when testing lights in a dark basement.

LEDs do not use mercury like CFLs - so disposal concerns aren't the same.

Recent studies suggest that the light produced by LED light bulbs can help people stay more alert.

LED light bulbs are not like ordinary lights. Not only do they last thousands of hours longer than incandescent bulbs and cost less money to run, they also produce a cool white light that's more pleasant around the house and at work.

If you've got ceiling cans, take a look at where they aim their light. Do all those lights in the ceiling really need to be hot-burning, yellow lights? Or are there a few spots up there where it's just the balance of fixtures that called for a can to be installed? If there's a spot like that in your ceiling, it's an ideal place to put an LED spotlight. With LED light bulbs you can create your own lighting design for your home. Best of all, when you install an LED light bulb you're instantly saving money on your electricity. LED light bulbs are also perfect as that always-on light you use around your home. No matter how long you keep it on, it's only warm to the touch (not burning hot like standard bulbs) and it won't use a lot of electricity.

As different states adopt different energy efficiency policies, you'll see more and more incentives for using LED light bulbs in your home. Some states even offer rebate programs that might even help you offset the cost of installing LED light bulbs in more places throughout your home.

Soon, LED light bulbs will be as bright as a standard 60 Watt bulb. Once we hit that threshold, the C. Crane Company will help light the way toward a more energy efficient, intelligently lighted America.



### **Benefits:**

Long-lasting - LED bulbs last 10 times as long as compact fluorescents, as and 133 times longer than typical incandescent.

Durable - Since Led's do not have a filament, they are not damaged under circumstances when a regular incandescent bulb would be broken. Because they are solid, LED bulbs hold up well to jarring and bumping.

Cool - these bulbs do not cause heat build-up; Led's produce 3.4 btu's/hour, compared to 85 for incandescent bulbs.

Energy-saving - Led's use a fraction of the wattage of incandescent bulbs.

Batteries will last 10 to 15 times longer than with incandescent bulbs. Also, because these bulbs last for years, energy is saved in maintenance and replacement costs. Many cities in the US are replacing their incandescent traffic lights with LED arrays because the electricity costs can be reduced by 80% or more.

Light for remote areas - because of the low power requirement for Led's, using solar panels becomes more practical and less expensive than running an electric line or using a generator for lighting.

### **Limitations:**

Cost - although the cost keeps going down, Led's are still expensive. A single AC bulb (30 LED), replacing a 25 watt incandescent, may cost about \$40.

Light Field - Led's are focused lights, and therefore are best as task specific lighting such as reading lights, desk lamps, night lights, spotlights, security lights, signage lighting, etc. They do not radiate light in 360 degrees as an incandescent does. The light will be bright where you point it towards.

New designs in LED bulbs are addressing this problem of directional focus.

Diffuser lenses with clustered bulbs are becoming more common on the market which is broadening the applications for LED use in the home.

### **LED Colors:**

**Red** - red is the traditional color for maintaining night vision.

**Green** - green is now the preferred color for pilots and the military. The green color is also great for retaining night vision, and it doesn't erase the red markings on maps and charts.

**Blue** - many people like the blue because it is very easy on the eyes. Blue appears to be a good reading light for elderly eyes. Elderly folks report that they can read under the blue light for hours without eyestrain, compared to severe eyestrain in less than 30 minutes with incandescent lighting.

**White** - the most popular of the LED colors. It produces a soft white light, without harsh reflection, glare or shadows.

Amber - LED amber bulbs do not attract flying insects, as do ordinary white bulbs. Amber Led's are used outdoors in areas such as patios and decks where insects flying around lights are a nuisance.

Although Led's are expensive, the cost is recouped over time and in battery savings. For the AC bulbs and large cluster arrays, the best value comes from commercial use where maintenance and replacement costs are expensive. Traffic lights, for example, are being switched over to Led's in many cities.

Smaller arrays, such as those in flashlights, headlamps and small task lights are great for specialty and outdoor use. New clustered arrays with various lenses are now available for more residential applications

### Mercury and CFLs

Mercury is a toxic metal associated with contamination of water, fish, and food supplies, and can lead to adverse health affects. A CFL bulb generally contains an average of 5 mg of mercury (about one-fifth of that found in the average watch battery, and less than 1/100th of the mercury found in an amalgam dental filling). A power plant will emit 10mg of mercury to produce the electricity to run an incandescent bulb compared to only 2.4mg of mercury to run a CFL for the same time.

The net benefit of using the more energy efficient lamp is positive, and this is especially true if the mercury in the fluorescent lamp is kept out of the waste stream when the lamp expires

With our led energy bulbs has no mercury.

All fluorescent lamps do not contain the same amount of mercury. Philips lamps with Alto Lamp Technology, for instance, contain less mercury than conventional fluorescent lamps.

Philips claims the bulbs have the lowest amount of mercury of any bulb on the market at less than 3.8 mg per bulb. To achieve this, Philips uses a specially

developed mercury capsule which ensures the exact amount of mercury is placed in a tiny glass capsule which is attached to the lamp cathode. To purchase the new 'Alto' CFLs,

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### Important Note: Handling and Disposal of CFLs

The mercury in compact fluorescent bulbs poses no threat while in the bulb, but if you break one:

- open a window and leave the room for 15 minutes or more
- use a wet rag to clean it up and put all of the pieces, and the rag, into a plastic bag
- place all materials in a second sealed plastic bag
- call your local recycling center to see if they accept this material, otherwise put it in your local trash. Wash your hands afterward.

Although household CFL bulbs may legally be disposed of with regular trash (in most US states), they are categorized as household hazardous waste. As long as the waste is sent to a modern municipal landfill, the hazard to the environment is limited. However, CFLs should not be sent to an incinerator, which would disperse the mercury into the atmosphere.

Burned out CFLs can be dropped off at Home Depot and IKEA stores. Another solution is to save spent CFLs for a community household hazardous waste collection, which would then send the bulbs to facilities capable of treating, recovering or recycling them. For more information on CFL disposal or recycling, you can contact your local municipality