

How to install a Lightning Switch® Receiver with a Relay

What follows is an explanation of how to use a relay with a Lightning Switch® Receiver to control devices that exceed the power limit of the Receiver. This explanation is valid for both 120V AC power and 12V DC power. Any differences between the 120V AC and 12V DC systems will be explained in the text below.

Heavy Loads:

If it is desired to control a device or several devices that need to draw more than (500W/120V AC or 84W/12VDC), either because of start-up requirements like that discussed below, or simply because the device always needs more power than 500/84 W, a relay can be used with the Lightning Switch® Receiver. Examples of devices that always pull more than 500/84W are hair dryers, space heaters, garbage disposers, certain motors and compressors.

High "Inrush Current"

Although Lightning Switch® Receivers are designed to handle up to 500/84 Watts of power, certain devices (such as computer monitors, transformers, and many devices that use large capacitors to help them start) actually pull more than their rated power for a few milliseconds after they are turned on. This phenomenon, which is well-known to electricians and electronics designers, but not widely understood by many consumers, is called "Inrush Current". Over a substantial period of time, the average number of Watts of power consumed by the device is accurate, but for the first few milliseconds, some devices use much more power to "start up" the system than they list on the data plate. Once the device is running, the power required by the device drops to the level specified. For this reason, sometimes a Lightning Switch® Receiver's fuse will blow, even though the nominal power required by the device being controlled (several computer monitors, for example) is less than 500/84 W.

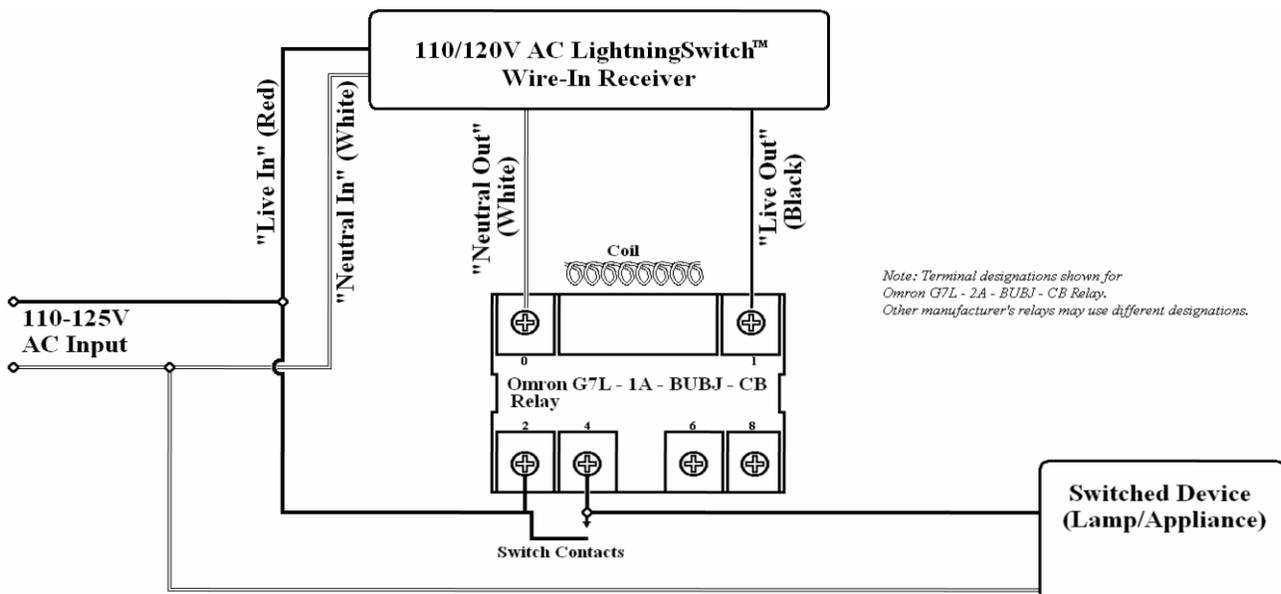
Regardless of whether the need for high power is transitory (as with computer monitors) or permanent (as with hair dryers and large motors), using a relay can resolve the issue.

Fundamentally, you'll use the Lightning Switch® Receiver to energize a coil in a relay. When the relay's coil is energized, the relay will "switch" on the power to the device being controlled. By using this system, the only power the Lightning Switch® Receiver needs to supply is enough to close the latch on the relay - typically just a few Watts. It is possible to purchase relays that can handle pretty much any voltage and amperage that you might need.

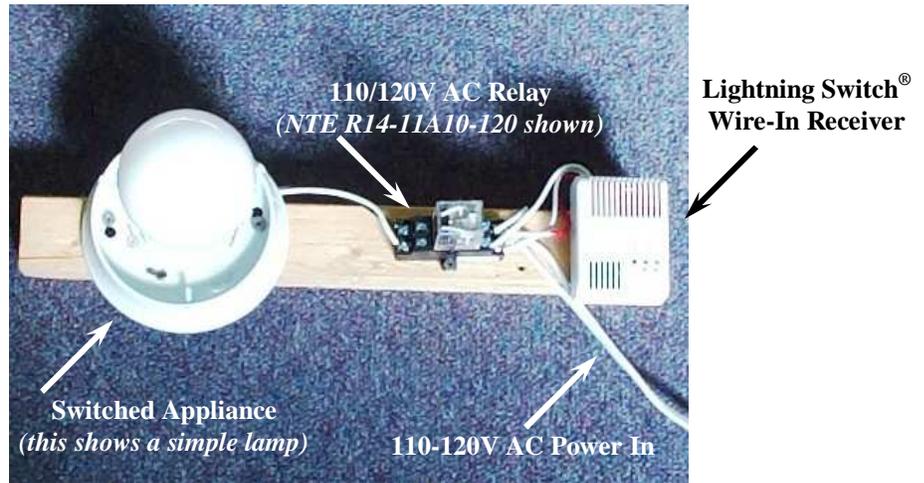
It is important to note that you must meet local building codes. It is not possible for us to know all the details of your local code requirements, so you must check this yourself. Don't be a victim of unsafe acts. If you are not knowledgeable or think you are unqualified to work on an electrical installation or repair, do not attempt to do so. Hire a qualified expert such as an electrical contractor and obtain the proper building permits for the work to be done.

Wiring Diagram:

In order to be able to respond to commands from Lightning Switch® Transmitters, the Receiver must always be powered. The output of the Receiver goes to the coil of the relay, and the output of the relay goes to the device being controlled. Here's what the wiring diagram might look like: *Note: 120V AC wiring diagram is shown - 12V DC is similar.*



Here are two photos of such a setup. This photo shows an NTE relay mounted on a socket. If you use an Omron relay, you won't need a socket. Because the relay has mounting lugs built into the housing.



About Relays:

Any one of many manufacturers' relays may be used for this type application. You'll want to use a relay that operates on the same voltage supplied by the Lightning Switch® Receiver - in this example, 110/120V AC. If you have a 12V DC application, you will need to use one of our 12V Receivers. The relay should be sized to carry at least the number of Amps that your circuit will carry. It is best to use an oversize relay, since a little "overkill" doesn't hurt anything and will always give you a "cushion" in case you later decide to add more appliances to the load. To help you decide what Amperage relay to choose, remember that

| | | |
|--------------------|----|----------------------|
| Amps = Watts/Volts | or | Volts X Amps = Watts |
|--------------------|----|----------------------|

So if you know that your devices use a total of 600 Watts, you'll need to have at least 600/120 = 5 Amps. The relay shown in this example is a 10A relay, so it will provide 120 X 10 = 1200W of power. If you use a 15A relay, you'll have the capability of providing up to 120 X 15 = 1800W of power. Be sure to provide a little extra power for a "factor of safety" since you may not know how many Watts your device pulls when it is starting up.

Many common relays are DPDT type. If you can find a SPST NO relay for the voltage you are working with, it will work fine, and might cost a few dollars less. In this case, you'll only cut and switch the "Live" or "Hot" wire. With a DPDT relay, you'll switch both the "Live" and "Neutral" wires. Either way is OK. Sometimes you'll have an opportunity to wire your relay either "normally open" or "normally closed." What this means is whether or not the power is sent to your appliance when the relay is not actuated/energized. You can do it either way, but "normally open" is the most logical approach. This means that your device will not be powered unless the Lightning Switch® Receiver has been turned "On" by the Transmitter. The example shown here is wired "normally open." If you wire it "normally closed", the default position is "On." (*"Normally closed" means that the device is normally "On," and will only be turned "Off" if the Lightning Switch® Receiver has been turned "On" by the Transmitter.*)

Sources for relays:

You can purchase relays from most electrical supply stores or from the Web. Two good sources on the web are Allied Electronics and Mouser. The relay will have both a manufacturer's part number and a supplier's part number. You can usually search by either number.

Allied Electronics:

<http://www.alliedelec.com/Search/SearchResults.asp?SearchQuery=g7l>

Mouser:

http://www.mouser.com/search/Refine.aspx?Ne=1447464+254016&Ntt=*653G7L2ABAC1*&Ntx=mode%2bmatchall&Mkw=653-G7L-2AB-AC1&N=1323038&Ntk=Mouser_Wildcards

100-120V AC Relays:

Here is the info for a 25Amp, 100-120V AC relay. The price is about \$12-\$15

• **With Screw Terminals:**

Manufacturer (Omron) Part # G7L-2A-BUBJCB-AC100/120 with Screw Terminals

- 2A- means it is a DPDT type.
- 1A- means it is a SPST type.
- BUB means it has Screw Terminals.
- TUB means it has Spade Lugs.

Allied Part # 821-7007 with Screw Terminals
Mouser Part # 653-G7L-2AB-AC1 with Screw Terminals

- **With Spade Lugs:**

Manufacturer (Omron) Part # G7L-2A-TUBJCB-AC100/120 with Spade Lugs
Allied Part # 821-7020 with quick connect Spade Lugs
Mouser Part # 653-G7L-2A-AC1 with quick connect Spade Lugs

Both types of Relays (Spade Lugs and Screw Terminals) have the same specs, so either one will work perfectly. You can use a SPST or a DPST type. Either one will work properly. The wiring diagram shows a SPST type.

12V DC Relays:

Here is the info for a 25Amp, 12V DC relay. The price is about \$12-\$15

- **With Screw Terminals:**

Manufacturer (Omron) Part # G7L-2A-BUBJCB-DC12 with Screw Terminals
-2A- means it is a DPDT type.
-1A- means it is a SPST type.
-BUB means it has Screw Terminals.
-TUB means it has Spade Lugs.
Allied Part # 821-7009 with Screw Terminals
Mouser Part # 653-G7L-2AB-DC12 with Screw Terminals

- **With Spade Lugs:**

Manufacturer (Omron) Part # G7L-2A-TUBJCB-DC12 with quick connect Spade Lugs
Allied Part # 821-0355 with quick connect Spade Lugs
Mouser Part # 653-G7L-2AJ-DC12 with quick connect Spade Lugs

Both types of Relays (Spade Lugs and Screw Terminals) have the same specs, so either one will work perfectly. You can use a SPST or a DPST type. Either one will work properly. The wiring diagram shows a SPST type.

Protective Enclosure:

Once again, it is important to note that you must meet local building codes. It is not possible for us to know all the details of your local code requirements, so you must check this yourself. Don't be a victim of unsafe acts. If you are not knowledgeable or think you are unqualified to work on an electrical installation or repair, do not attempt to do so. Hire a qualified expert such as an electrical contractor and obtain the proper building permits for the work to be done.

As you can see from the photos, the contact screws for the relay socket are exposed. You'll want to mount the socket and relay inside a protective enclosure or box of some kind, to keep curious fingers from touching the 120V power leads. You can get suitable boxes from many sources including the Mouser Web site:

<http://www.mouser.com/?D=320&Ne=0&handler=data.listcategory&N=320> or

<http://www.mouser.com/?handler=data.listcategory&Ne=320&N=323>

You can also get boxes at your nearby electrical supply store. The photos shown above do not show any enclosure, which is not needed for performance.

The box only really needs to be large enough to hold the relay and socket assembly, which is where all connections will be made. The Lightning Switch[®] Receiver can be mounted on the outside of the box with screws or industrial-strength double-stick tape, which we can supply at no extra cost (be sure to ask for it, because we normally only supply double-stick tape with our Transmitters). Mounting the Receiver on the outside of the relay box makes it convenient for you in case you ever want to add or change Transmitters and need to press the "Learn" or "Erase" buttons. If you prefer, or if your local code requires it, the Receiver can be mounted inside the protective enclosure with the relay and socket. It will work either way. Mounting the Receiver at least a few inches from the relay may help to ensure excellent performance. In the example shown, the Receiver is mounted less than 2 inches from the relay, and it works fine.

We hope this contains everything you need to be able to select and use a relay with your Lightning Switch[®] Receiver. If you have any questions, feel free to call us at **1-888-MY SWITCH** (1-888-697-9482) or E-Mail us at <feedback@lightningswitch.com>.