Experience Level: Beginner  |  Time Required: 1 Hour

This device allows an x10 appliance module to properly control 120 VAC LED bulbs, string of holiday LED lights or CFL lighting devices. An x10 appliance module doesn’t function perfectly when controlling Compact Fluorescent bulbs and LED lighting. For example: LED bulbs dimly illuminate when the x10 appliance module is off, and some CFLs “fool” the appliance module’s Local Control circuitry and force the device to stay on. With both lamp types the Local Control function does not work. This project kit is a very simple circuit which does not defeat the Local Control feature of the x10 module.

**Required Tools & Parts:**

<table>
<thead>
<tr>
<th>Wire cutters</th>
<th>Wire stripper</th>
<th>Crimping tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pliers and needle nose pliers</td>
<td>Plastic cutting tools</td>
<td>Ruler</td>
</tr>
<tr>
<td>File</td>
<td>Exacto knife</td>
<td>Drill w/ 5/16&quot;, 5/32&quot;, &amp; 1/8&quot; drill bits</td>
</tr>
<tr>
<td>Soldering iron</td>
<td>Solder</td>
<td></td>
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</tbody>
</table>

**Kit Includes:**

<table>
<thead>
<tr>
<th>Relay</th>
<th>AC receptacle</th>
<th>AC power cord w/ pigtail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator LED</td>
<td>Rocker switch</td>
<td>Relay Socket</td>
</tr>
<tr>
<td>ABS enclosure, 6&quot; x 3.5&quot; x 1.875&quot;</td>
<td>Spade tongue connector</td>
<td>Faston terminals</td>
</tr>
<tr>
<td>Hookup wire 20 AWG, red, 10'</td>
<td>Machine screws, 6-32x1&quot;</td>
<td>Hex nuts, 6-32</td>
</tr>
</tbody>
</table>

**Step 1 - Caution Note**

When completed, this device will be connected to a 120 VAC wall outlet. Caution should be followed to insure that all connections are properly made and will not come loose. Always unplug this device from the 120 VAC wall outlet before opening. AC current rating for this device is 6 Amps.

Ground - The AC outlet used on this project has a grounding connection; however, this device is NOT intended to be used with any device that requires such a ground. It is therefore important to disable the ground connection on the outlet as instructed to in Step 3.

**Step 2 - System Diagram**
Step 3 - Schematic

Step 4 - Prepare Project Box - Drill holes for relay socket holder

Use the relay socket as a template to mark the position of the mounting holes. Refer to Figure 3 to the right.

1) Chose one of the short sides to mount the relay socket. Position the relay socket centered on the outside of the project box about 3/16" from top (with lid removed).
2) Tape the relay socket in place. Make sure the relay socket does not protrude beyond the plane of the top of the project box (the top is the open side).
3) Use a 1/8" drill bit to pass through the mounting holes of the relay socket. Hold the bit perpendicular to the project box side and in the center of the hole. Push down and manually turn the bit enough to make a mark on the project box. Mark both holes.
4) Remove the tape and relay socket from the project box.
5) Drill 5/32" holes in the project box where marked in the previous step. Do not mount the relay socket at this point.

Step 5 - Prepare Project Box - AC power cord

Cut a 1/4" wide by 3/8" deep slot located 2-1/2" from the side of the box that has the holes for the relay socket. Refer to the Figure 4 below.

Step 6 - Prepare Project Box - Slot for AC power cord

File down the inside edge of the project box around this slot opening as pictured. The AC power cord strain relief is to fit into this slot; however the thickness of the project box needs to be reduced for the strain relief to sit properly. File this edge down to 3/32" thick. Refer to Figure 5 below.
Step 7 - Prepare Project Box - Slot for AC power cord - lid

Cut a corresponding notch 5/8” wide out of the top cover of the project box as show. Refer to Figure 6 to the right.

Step 8 - Prepare Project Box - Cut slot for AC outlet

Cut a 3/4” wide by 1” deep slot centered on the small side opposite the relay socket. Refer to Figure 4 for general location. Do not fit the AC outlet fully in place yet.

Step 9 - Prepare Project Box - Cut slot for on/off switch

1) Cut a 3/4” wide by 3/8” deep slot located 3-1/2” from the relay socket side. Refer to Figure 4.
2) Cut a corresponding notch out of the top cover of the project box similar to the notch you cut for the AC power cord (Step 7).

Step 10 - Prepare Project Box - Drill hole for panel light

Drill a 5/16” inch hole centered 1-1/16” below the top of the box. Refer to Figure 4.

Step 11 - Prepare Wires

Prepare wires 1 through 7 for use later in the project.

LED connecting wires (wires 1 & 2)
1) Cut two 5” long lengths of connecting wire.
2) Strip off 1/4” of insulation from each end.
3) Crimp a spade lug on one end of each wire.
4) Crimp a quick connect lug on the remaining end of each wire.

Jumper wires (wires 3 & 4)
1) Cut two 1-3/4” long lengths of connecting wire.
2) Strip off 1/4” of insulation from each end.
3) Crimp a spade lug on both ends of each wire.

Outlet wires (wires 5 & 6)
1) Cut two 6” long lengths of connecting wire.
2) Strip off 1/4” of insulation from one end of each wire.
3) Crimp a spade lug on one end of each of these wires.
4) Strip off 3/8” of insulation from the remaining end of each wire.

Switch wire (wire 7)
1) Cut a 6” long length of connecting wire.
2) Strip off 1/4” of insulation from each end.
3) Crimp a spade lug on one end.
4) Crimp a quick connect lug on the remaining end.
Step 12 - AC Outlet - Ground block

Fill ground hole with epoxy (or something to disable the ground connection. [This device is designed only for a two pronged AC plug. Therefore there should be no load connected to this device that requires a ground. This step to disable the ground is important so only two pronged loads are connected.] See Figure 7 above.

Step 13 - AC Outlet - Solder wires

Solder the pigtail ends of wires 5 and 6 you prepared in step 11 to the AC Outlet terminals. Refer to Figure 4 above and Figure 8. Do not solder a wire to the ground connection.

Step 14 - Prep and Mount AC Line Cord

1) Crimp a spade lug on one lead of the AC line cord.
2) Crimp a quick connect lug on the remaining lead.
3) Place AC Line cord strain relief in box slot made in step 6.

Step 15 - Switch Prep

1) Connect the wire with the quick connect lug from the AC Line Cord to one of the terminals of the switch.
2) Take wire 7 you prepared in Step 11. Connect the quick connect lug to the remaining switch terminal.

Step 16 - LED Panel Lamp Prep

1) Insert LED lamp module into the 5/16" hole you drilled in Step 10.
2) Take wires 1 and 2 you prepared in Step 11. Connect the quick connect lug ends from each wire to the LED Lamp terminals.

Step 17 - Connect Wires to Relay Socket

Make the following connections to the relay socket. Refer to Figure 9 of relay socket terminals. (Remember that the relay socket is not mounted in the project box at this point). Some relay socket terminals will have two connections. You can bend the top spade lug as seen in the picture to the right to fit 2 lugs on one terminal.

Take the jumper wires 3 and 4 prepared in Step 11.
1) Connect one jumper to terminals 1 and 2.
2) Connect the remaining jumper to terminals 7 and 8.
3) Connect wire 1 from the LED lamp to terminal 8 and tighten.
4) Connect wire 2 from the LED lamp to terminal 1 and tighten.
5) Connect the spade lug on the remaining AC Line cord wire to relay socket terminal 7 and tighten.
6) Connect the spade lug from wire 7 of the switch to relay socket terminal 2 and tighten.
7) Connect the spade lug from wire 5 of the outlet to relay socket terminal 3 and tighten.
8) Connect the spade lug from wire 6 of the outlet to relay socket terminal 6 and tighten.
9) Mount the relay socket to the project box using the 1" 6-32 screws and nuts.

Step 18 - Install Relay

Plug the relay into the relay socket. Note that it is keyed and can only be inserted in one direction.

Step 19 - Install AC Outlet

Flare the side mounts of the AC outlet and slide the outlet into the slot you cut into the project box in step 8. See Figure 10.
Step 20 - Install Switch
Slide the switch in place. See Figure 11.

Step 21 - Secure the Project Box Top
Secure the project box top with the four screws that came with the box. Refer to beginning of instructions for a picture of completed project.

Step 22 - Optional Load Resistor
The load of the relay coil and LED lamp should be enough for the x10 module to sense it has a load. If you have an x10 module that requires an additional load to work properly then follow this step. Of course you will need to partially disassemble your project to complete this step.

Connect the optional 10K 5 watt resistor (Jameco P/N 661036) to relay socket terminals 4 and 5. Refer to Figure 12 and 9 above.

Step 23 - Device Operation
Details of how the x10 adapter operates.
1) Plug the X10 adapter you just made into an x10 appliance module.
2) Plug lamp or LED holiday light string into the outlet of the x10 adapter.
3) Be sure switch of lamp fixture is on.
4) See picture below for operation matrix.

<table>
<thead>
<tr>
<th>x10 module state</th>
<th>x10 adapter switch state</th>
<th>LED</th>
<th>x10 adapter output state</th>
</tr>
</thead>
<tbody>
<tr>
<td>off</td>
<td>off</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>off</td>
<td>on</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>on</td>
<td>off</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>off*</td>
<td>on-&gt;off-&gt;on</td>
<td>on</td>
<td>on</td>
</tr>
</tbody>
</table>

* - x10 module turns on when x10 adapter is switched on - off - on