SwitchLinc 2-Way™
Remote Control Dimmer
and Transmitter

For models:
2380W  SwitchLinc 2-Way 600-Watt in White
2380I  SwitchLinc 2-Way 600-Watt in Ivory
2381W  SwitchLinc 2-Way 1000-Watt in White
2381I  SwitchLinc 2-Way 1000-Watt in Ivory
Congratulations!
You’ve just purchased the highest quality powerline-controllable wall dimmer available. SwitchLinc® 2-Way dimmer is the world’s first two-way powerline remote control dimmer switch. It gives you remote control of lighting and inductive loads. It is also a transmitter, so it can be used to control other SwitchLinc, KeypadLinc™, and LampLinc™ modules in lighting “scenes” or to trigger home automation “events”. It responds to status request signals over the powerline to provide feedback to a controller that the signal was received and executed. Normally, this is a feature only found in expensive hardwired lighting systems.

The SwitchLinc 2-Way Dimmer can also be controlled remotely from a powerline transmitter. Each SwitchLinc 2-Way can be a member of up to 64 lighting scenes, allowing one powerline signal to set elegant “mood lighting.” The SwitchLinc’s X10/PLC address is electronically set; there are no code wheels on the unit to adjust.

SwitchLinc 2-Way is easily installed and programmed. It installs (connects to home wiring) just like a regular light switch. This makes it ideal for retrofits into existing homes and it easily installs in new homes, with no special training required.

Key Features
• 2-Way communications
• Scene-ready
• All settings are held in non-volatile memory (no code wheels to set)
• True rocker action (top = on/bright, bottom = off/dim)
• High quality micro switches give the user tactile feedback when pressed (no mushy feel)
• 8-level LED “Bar” shows brightness of circuit
• Status LED/ Set Button shows powerline activity and facilitates programming
• Wires in just like a standard wall switch*
  * Requires a neutral connection

Other SwitchLinc Models
SwitchLinc 2-Way Relay #23883W/I - (White or Ivory)
SwitchLinc Timer Relay #23883TW/I - (White or Ivory)
SwitchLinc Plus Dimmer #2386W/I - (White or Ivory)
SwitchLinc PLC Dimmer #2384W/I - (White or Ivory)
SwitchLinc Relay #23885W/I - (White or Ivory)
SwitchLinc Deluxe Dimmer (No PowerLine Control) #2387W/I - (White or Ivory)
SwitchLinc Multi-Way Companion Switch for 3-Way, 4-Way, & Up circuits #2382W/I - (White or Ivory)

Other Smarthome Products
Your SwitchLinc Dimmer is compatible with many of our other home automation products. If you need a more traditional-looking wall switch, check out the new ToggleLinc™ series of wall switches or the new SwitchLinc RX, which is ideal for retrofit applications where there isn’t a neutral wire at the switch’s wall box. The KeypadLinc Wall Mounted Transmitter allows you to control multiple devices from one location at the press of a single button. And for plug-in devices, the ApplianceLinc™ and LampLinc modules will automate just about anything that plugs in. Please visit the Smarthome web site or contact your distributor for more information.
CAUTION!!

Read and understand these instructions before installing. This device is intended for installation in accordance with the National Electric Code and local regulations in the United States, or the Canadian Electrical Code and local regulations in Canada. To reduce the risk of overheating and possible damage to other equipment, do not install a SwitchLinc to control a receptacle or fluorescent lighting fixture. For indoor use only. Connect only copper or copper-clad wire to this device. Before installing, disconnect power at circuit breaker or remove fuse to avoid shock or damage to the control. It is recommended that a qualified electrician perform this installation. Retain these instructions for future reference.

Dimming an inductive load (such as a ceiling fan) below the minimum voltage set by the manufacturer of the load device could cause damage to the load device from overheating. If the manufacturer of the load device does not recommend dimming, DO NOT use SwitchLinc 2-Way dimmer with that device (use SwitchLinc 2-Way Relay #23883W/I or Relay PLC #23885W/I). USER ASSUMES ALL RISKS ASSOCIATED WITH DIMMING AN INDUCTIVE LOAD.

Quick Start Instructions

<table>
<thead>
<tr>
<th>Quick Start Instructions</th>
<th>DEFAULT</th>
</tr>
</thead>
</table>
| Setting the Dimmer's Primary Address | 1. Press and hold the Set Button for 3 seconds (the LED will begin blinking and the load will come on)  
2. Send the desired address from any transmitter within 30 seconds (see page 6 for more detailed instructions) |
| Setting the Preset On-Level | 1. Adjust the dim level to the desired level 100%  
2. Tap the Set Button ONCE (see page 6 for more detailed instructions) |
| Setting the Fade-On Rate | 1. Adjust the dim level (Brighter = faster dimming)  
2. Double tap the Set Button (press it TWICE quickly) (see page 6 for more detailed instructions) |
| Factory Reset | 1. Gently pull the Set Button out to remove power for 5 seconds  
2. Push and hold in the Set Button for 5 seconds, then release resets to default settings  
3. When the LED Indicator comes on, the SwitchLinc is reset (see page 9 for more detailed instructions) |
| Programming a Scene | 1. Transmit the “clear” sequence: O16 N16 M16 P16 M16  
2. Adjust on the Dimmer to the desired brightness  
3. Send the following command sequence: M16 N16 O16 P16  
4. Transmit the desired scene address (house and unit code) to lock-in the new scene. (see pages 7 & 8 for more detailed instructions) |
Preparation

Before installing SwitchLinc, please familiarize yourself with the following and take the necessary precautions listed here:

- Be sure that the fuse has been removed or the circuit breaker is turned off to the circuit being controlled. Installing SwitchLinc with the power on will expose you to dangerous voltages.
- SwitchLinc Wiring Diagram on page 5 will help you to determine the wire colors of the connections to the SwitchLinc and Multi-Way Companion Switch. Note: While the neutral connection is optional on the Multi-Way Companion Switch, the SwitchLinc 2-Way requires a neutral connection.
- Wiring for 3-way, 4-way, & up switch circuits follow conventional (standard, non-remote) wiring practice (plus the requirement for a neutral). Wiring the SwitchLinc Multi-Way Companion Switch requires the Line (Black) wire be accessible and be the same 110V leg of the house wiring. The White wire on the Multi-Way Companion Switch is connected to NEUTRAL ONLY. If neutral is not available, cap the White wire, which will simply causes the nightlight LED not to function.
- The SwitchLinc may feel warm during operation. The amount of heat generated is within approved limits and poses no hazards. To minimize heat build-up, ensure that the area surrounding the rear of the SwitchLinc has adequate ventilation (i.e., clear away excess insulation).
- Installation should be performed only by a qualified electrician, or by a homeowner who is familiar and comfortable with electrical circuitry. If there are any questions, consult an electrician or contact Smarthome’s Tech Support department for guidance.

Using SwitchLinc

<table>
<thead>
<tr>
<th>Basic Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input at Switch</strong></td>
</tr>
<tr>
<td>Tap top of rocker (when light is off)</td>
</tr>
<tr>
<td>Tap top of rocker (when light is on)</td>
</tr>
<tr>
<td>Press &amp; hold top of rocker</td>
</tr>
<tr>
<td>Tap bottom of rocker</td>
</tr>
<tr>
<td>Press &amp; Hold bottom of rocker</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advanced Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input at Switch</strong></td>
</tr>
<tr>
<td>Double-tap top of rocker *</td>
</tr>
<tr>
<td>Triple-tap top of rocker *</td>
</tr>
<tr>
<td>Double-tap bottom of rocker *</td>
</tr>
<tr>
<td>Triple-tap bottom of rocker *</td>
</tr>
</tbody>
</table>

* Double or triple tapping a SwitchLinc will cause the light to ramp at a two-second rate. Only programmed fade-on rates greater than two seconds are effected.
Step-by-Step Instructions
1. Disconnect the power for the existing switches at the circuit breaker or fuse panel. Verify that the power has been removed by trying to turn on the lights controlled by the switches.
2. Remove the trim plate from the existing switches.
3. Unscrew and pull the existing switches from the wall box.
4. Disconnect the wires from the existing switches.
5. If the SwitchLinc is being installed into a 3/4/5-way circuit, the SwitchLinc Multi-way Companion Switch must be installed in the wall box where power comes into the circuit. Follow the instructions included with the Multi-way Companion Switch to identify the "Hot," "Neutral," "Ground," and "Traveler" wires.
6. Before making any connections to SwitchLinc, gently pull the Set Button until a click is heard. This will open the "air gap" and isolate the SwitchLinc from the electricity when the circuit breaker is turned back on.
7. Orient SwitchLinc so the LED is at the top and make connections according to the "SwitchLinc Wiring Diagram" below. Wire Multi-way Companion Switches (if used) according to the "SwitchLinc Multi-Way Wiring Diagram" below.
8. After all connections have been made, ensure that all wire connectors are firmly attached and that there is no exposed copper except for the Ground wire.
9. Gently place the wires and switch into the wall box (with LED at top) and screw into place.
10. Turn the circuit breaker back on.
11. Restore power to the circuit by pressing in the SwitchLinc’s Status LED/ Set Button top until it is even with the front plastic trim ring. SwitchLinc will be operational when the green Status LED will come on.
12. After testing SwitchLinc for proper operation, install the faceplate (sold separately).

SwitchLinc 2-Way Wiring Diagram
(One switch controlling the load)

SwitchLinc Multi-Way Wiring Diagram
(Two or more switches controlling the load)

Note: When installing multiple SwitchLinc Dimmers in a J-box, or many on the same circuit breaker, please see specifications at the end of this manual for limitations and recommendations.
Setting the Primary Address

Each SwitchLinc requires a primary address to operate. It ships from the factory with "A1" as the default address; it will also have this address after performing a factory reset. Any of the 256 PLC/X10 addresses can be programmed.

The SwitchLinc does not use code wheels or dials to set its primary address. Instead, it will accept the first PLC address it finds on the powerline once the programming mode is started. Any PLC/X10 transmitter can be used to set the primary address.

Important: If you plan on sending status requests to the SwitchLinc 2-Way, make sure that each SwitchLinc 2-Way is programmed with a different primary address. Otherwise, their simultaneous responses to a status request will collide with one another.

1. Using the tip of a very small screwdriver, press and hold the Status LED/ Set Button for approximately 3 seconds then release. The green Status LED/ Set Button will begin blinking and the load will come on.
2. Within 30 seconds, transmit the desired primary address (housecode and unit code) from any transmitter. The light(s) controlled by the SwitchLinc will blink and the Status LED/ Set Button will stop flashing.
3. Confirm that the address was accepted by turning it on or off from a remote transmitter.

Setting the Preset On-Level (Optional)

The Preset On-Level is the brightness level that SwitchLinc will adjust to when activated or it receives a powerline carrier (PLC) ON-command to its primary address. It can be set to resume to the same brightness level each time or to the previous brightness level before it was turned off.

Setting a fixed brightness level:
1. Adjust the brightness of the load (at the SwitchLinc or remotely with dim commands) to the desired level.
2. Tap the Status LED/ Set Button ONCE.
   The light(s) will blink indicating that it has set the new on-level.

Setting the Resume Dim mode:
1. Turn the light off.
2. Tap the Status LED/ Set Button ONCE.

Setting the Fade-On Rate (Optional)

The "Fade-On Rate" is the speed that SwitchLinc brings the brightness of the connected light(s) up or down when manually activated or it receives a powerline carrier (PLC) ON-command to its primary address. From the SwitchLinc, the rate is adjustable between .1 and 9 seconds, (the factory default rate is 2 seconds).

1. Adjust the brightness of the load (at the SwitchLinc or remotely with dim commands) so that the brighter the load, the faster the fade-on rate will be.
2. Tap the Status LED/ Set Button TWICE.
   The light(s) will blink indicating that it has set the new fade-on rate.

(See the Advanced Primary Address Programming section for instructions to set a fade-on rate for longer than 9 seconds and remotely setting the ON level.)
Advanced Primary Address Programming

The SwitchLinc's Fade-on and Preset On-Level can be remotely set using a Maxi-
Controller (Smarthome #4020) or an equivalent transmitter capable of sending
Housecode and Unit Code without ON or OFF. These procedures will not work with a
transmitter that sends both the address and command on one
button press (e.g. Mini-Controller).

Remotely Setting the Preset On-Level (Optional)
This is the alternative method for setting dimmer’s default on-level.

1. Transmit the “clear” sequence:

   | O16 | N16 | M16 | P16 | M16 |

2. Send the house/unit code for the SwitchLinc and adjust the dim level or send pre-
set dim level.

   | P16 | N16 | M16 | O16 | M16 |

3. Send the following command sequence to lock-in the new on-level.

   The light(s) will blink indicating that it has set the new on-level.

Remotely Setting the Fade-on Rate (Optional)

1. Transmit the “clear” sequence:

   | O16 | N16 | M16 | P16 | M16 |

2. Send the house/unit code for the SwitchLinc followed by the PRESET DIM from the
   table below. (Alternatively, send BRIGHT or DIM signals to change the light's
   brightness to a comparable level.)

<table>
<thead>
<tr>
<th>Preset Dim Level</th>
<th>Fade-on Rate in Seconds</th>
<th>Preset Dim Level</th>
<th>Fade-on Rate in Seconds</th>
<th>Preset Dim Level</th>
<th>Fade-on Rate in Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>0.1</td>
<td>63%</td>
<td>26.0</td>
<td>29%</td>
<td>120.0</td>
</tr>
<tr>
<td>97%</td>
<td>0.2</td>
<td>61%</td>
<td>28.0</td>
<td>26%</td>
<td>180.0</td>
</tr>
<tr>
<td>94%</td>
<td>0.3</td>
<td>58%</td>
<td>30.0</td>
<td>23%</td>
<td>210.0</td>
</tr>
<tr>
<td>90%</td>
<td>0.5</td>
<td>55%</td>
<td>32.0</td>
<td>19%</td>
<td>240.0</td>
</tr>
<tr>
<td>87%</td>
<td>2.0</td>
<td>52%</td>
<td>34.0</td>
<td>16%</td>
<td>270.0</td>
</tr>
<tr>
<td>84%</td>
<td>4.5</td>
<td>48%</td>
<td>36.5</td>
<td>13%</td>
<td>300.0</td>
</tr>
<tr>
<td>81%</td>
<td>6.5</td>
<td>45%</td>
<td>38.0</td>
<td>10%</td>
<td>330.0</td>
</tr>
<tr>
<td>77%</td>
<td>8.5</td>
<td>42%</td>
<td>40.0</td>
<td>6%</td>
<td>360.0</td>
</tr>
<tr>
<td>74%</td>
<td>19.0</td>
<td>39%</td>
<td>42.0</td>
<td>3%</td>
<td>390.0</td>
</tr>
<tr>
<td>71%</td>
<td>21.5</td>
<td>35%</td>
<td>44.0</td>
<td>0%</td>
<td>420.0</td>
</tr>
<tr>
<td>68%</td>
<td>23.5</td>
<td>32%</td>
<td>46.0</td>
<td></td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29%</td>
<td>48.0</td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

3. Send the following command sequence to lock-in the new fade-on rate

   | O16 | P16 | N16 | M16 | O16 |

The light(s) will blink indicating that it has set the new fade-on rate.

Scene Address Programming

The SwitchLinc 2-Way can be a member of up to 64 scenes. A scene address is a sin-
gle address (just like a primary address), and is set at the time scene membership is
programmed. Using a single command to trigger a scene is much less complicated than
using an intelligent computer controller to initiate a macro that in turn sends dozens of
commands over the next few minutes to turn on multiple receivers and set brightness
levels (for dimming-enabled modules).

When an ON signal is transmitted to scene-enabled modules, all members programmed
to that address will turn on to their independent ON-levels and at their independent
fade-on rates for that scene. Transmitting an OFF for a scene address will turn off all
modules that are members of that scene. Modules will react to dim and bright com-
mands after the scene address is sent, however, they will ignore All Light On
and All Units Off commands for the scene address' house code.
Scene Address Programming (continued)

SwitchLinc 2-Way is compatible with these other scene-enabled Smarthome products:

- ToggleLinc™ 2-Way and Plus Dimmers
- LampLinc™ 2-Way & Plus Modules
- ApplianceLinc™ 2-Way Modules
- KeypadLinc™ Wall Mounted Controllers with Integrated Dimmer

The scenes for all these modules can be setup simultaneously using the same programming sequence. Signals sent by transmit-enabled Smarthome products, like those above, will be received and understood by the SwitchLinc 2-Way!

Transmitters that can set up scenes

Scenes can be programmed with a ControLinc™, a Maxi-Controller or any transmitter capable of sending Housecode and Unit Code address without an ON or OFF command. Transmitters in which one button is pressed to turn a load on or off WILL NOT WORK. When using one of these equivalent transmitters, be careful when pressing the buttons. Programming will be ignored if some commands are not sent in the proper sequence. "Fat-Fingering" or accidentally pressing the same button twice may prevent the programming from being accepted.

If KeypadLinc controllers are installed in the house and one of their buttons is programmed to transmit to Smarthome scene-enabled receivers, it can be used to quickly set up scenes (see the KeypadLinc manual for more information).

Smarthome TouchLinc™ Touchscreens have a built-in wizard to help automate the scene setting process. Many computer programs like Smarthome Manager, Indigo for Macintosh, HCA, and HomeSeer have tools to aid in setting up scenes and many other features. Please check with your automation software supplier for availability.

Programming Scene Membership and On-Levels:

1. Transmit the “clear” sequence:
   
   O16  N16  M16  P16  M16

2. Activate the SwitchLinc (manually or remotely) by turning it on and adjusting the brightness to the desired brightness level for the scene. (Hint: a scene can trigger a module to go off by setting the dim level to 0%)

3. Send the following command sequence:
   
   M16  N16  O16  P16

4. Transmit the desired scene address (house and unit code) to lock-in new scene. The light(s) will blink and come to 100% brightness to indicate that it has set the new scene.

Programming Scene Fade-on Rates (optional):

The fade-on rate of each scene is individually adjustable from 1 to 540 seconds (9 minutes). If this setting is not adjusted, the SwitchLinc will use the fade rate of the primary address for the scene.

1. Transmit the “clear” sequence:
   
   O16  N16  M16  P16  M16

2. Using an PLC Controller, send the primary address of the SwitchLinc and adjust the dim level corresponding to the fade-on rate time using the table on page 7 (brighter=faster).

3. Send the following command sequence:
   
   N16  O16  P16  M16

4. Transmit the scene address (house and unit code). The light(s) will blink indicating that the new fade-on rate has been set.
Removing the SwitchLinc from a Scene:
1. Transmit the “clear” sequence:
   O16  N16  M16  P16  M16
2. Using an PLC Controller, send the primary address of the SwitchLinc plus an ON or OFF or press either the ON or OFF button on the SwitchLinc.
3. Send the following command sequence:
   O16  P16  M16  N16
4. Transmit the scene address (house and unit code) that is to be removed. The light(s) will blink (if they are still on) indicating that the scene has been removed.

Other Options
Disable PLC transmissions
The SwitchLinc’s ability to transmit may be disabled if the feature is not needed, interferes with other home automation tasks, or just to cut down on the amount of PLC traffic on the lines. It can be re-enabled later if necessary. Please note that the electronics that connect the SwitchLinc’s transmitter circuitry to the AC line are still in place and, like all transmitters, will absorb some of the signal from other transmitters. For more information, please see page 10, “How Powerline Signals Travel Around a Home and How to Improve Reliability”.
1. Transmit the “clear” sequence:
   O16  N16  M16  P16  M16
2. Activate all the switches for which you want to disable by sending the primary Housecode, Unit Code, and ON.
3. Send the following command sequence to disable the transmitter:
   M16  N16  P16  O16  P16
The light(s) will blink indicating that SwitchLinc’s transmitter is now disabled.

Enable PLC transmissions (default is enabled)
1. Transmit the “clear” sequence:
   O16  N16  M16  P16  M16
2. Activate all the switches for which you want to disable by sending the primary Housecode, Unit Code, and ON.
3. Send the following command sequence to enable the transmitter:
   O16  M16  N16  P16  P16
The light(s) will blink indicating that SwitchLinc’s transmitter is now enabled.

Factory Reset
If the SwitchLinc begins to operate strangely, the factory reset procedure can be used to clear the EEPROM’s memory and restore it factory default settings. Doing this procedure will clear the unit of all scene addresses and fade-on rates.
1. Gently pull out the Status LED/ Set Button on the SwitchLinc until a click is heard. This completely removes the power from the SwitchLinc.
2. Wait five seconds, push in and hold in the Status LED/ Set Button.
3. Release the Status LED/ Set Button after five seconds.
4. WAIT approximately 25 seconds until the Status LED/ Set Button illuminates before using the switch. During this time, the Status LED/ Set Button will remain off and the load controlled by the SwitchLinc will be off. When the reset procedure is complete, the load will come on to 100% and the SwitchLinc is ready for initial programming or use.
Disable Programming
Once the SwitchLinc is set up, it can be programmed to lockout any changes. Any changes made at the unit or remotely will be ignored. Please note that all SwitchLinc, LampLinc, and KeypadLinc modules that are plugged in or electrically active will receive these commands and also be locked out.

1. Send the following command sequence to disable the programming:

   M16 016 P16 N16 P16

   The light(s) will blink (if they are on) indicating the command was received.

Re-Enable Programming (default is enabled)
1. Send the following command sequence to enable programming:

   N16 M16 016 P16 P16

   The light(s) will blink (if they are on) indicating the command was received.

Other Features
Power Restore
In the event of a power loss, the SwitchLinc will automatically return the lighting circuit being controlled to its last brightness level when the power was interrupted.

Querying SwitchLinc
It is possible with some home automation interfaces and products to query the status of a SwitchLinc 2-Way Dimmer. It will respond to Status Request signals that are received for its base address. The following is a sample session from a HouseLinc controller:

<table>
<thead>
<tr>
<th>Example: SwitchLinc is on full Brightness</th>
<th>Example: SwitchLinc is OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sent by Interface</td>
<td>Sent by Interface</td>
</tr>
<tr>
<td>A Unit(1)</td>
<td>HC: A Unit(1)</td>
</tr>
<tr>
<td>House A, Unit(1), Status Request</td>
<td>House A, Unit(1), Status Request</td>
</tr>
<tr>
<td>Received from SwitchLinc</td>
<td>Received from SwitchLinc</td>
</tr>
<tr>
<td>House A, Unit(1), Status is ON</td>
<td>House A, Unit(1), Status is OFF</td>
</tr>
<tr>
<td>HC: A Unit(1)</td>
<td>HC: A Unit(1)</td>
</tr>
<tr>
<td>House A, Unit(1), Preset Dim High 100%</td>
<td>House A, Unit(1), Off</td>
</tr>
</tbody>
</table>

How Powerline Signals Travel Around A Home and How To Improve Reliability
Most homes in North America have two lines of 120 volts coming into the home from the utility company. This split-single phase electricity is divided out at the home’s breaker box into the circuits that feed light switches, plug-in outlets, and appliances. Half of the electricity outlets and wall switches are fed by one of the 120-volt lines and the second 120-volt line feeds the other half. The intermittent operation of PLC/X10 modules usually happens when the transmitter is sending signals on one line and the receiver module is plugged into an outlet on the other line. For the signals to get to the receiver, it must leave the home, travel to the utility company transformer then come back in on the other AC line. By the time the signal gets back to the home, travels through the electrical meter and circuit breaker box, there may not be enough signal left to trigger the module.

The first order of business will be to install a coupler-repeater, also known as amplifier. A coupler-repeater will ‘see’ the incoming signal, re-generate it, and blast it out over both lines of the 120 volts. We recommend that any home larger than 3000 square feet install a coupler-repeater. In smaller homes, a passive phase coupler also known as a signal bridge may give satisfactory results.
How To Improve Reliability (continued)

Once the signal has been amplified, it’s time to preserve it. Since PLC signals go everywhere in the home, some electrical devices will have more of an effect on the signal strength than other devices. PLC signals are like water pressure in pipes, it actually goes everywhere it can, not just to the receiving module. In the last 20 years, an explosion of electrical devices has invaded our homes. Computers, video gear, and fancy high-end electronics are more present than in years past. The more complicated the electrical power supply is in a device, the more likely it is to absorb PLC signals. Engineers who design power supplies build in traps to filter out and kill electrical noise. Unfortunately, the PLC signals looks like electrical noise to these devices. The result is that a large percent of the transmitted signal is lost to these devices leaving less for the receivers. The most common sources of signal loss are:

- Televisions
- Computer systems
- Audio/Video gear
- Computer UPS’s and power strips
- Power supplies for laptops and cell phones

Testing for the problem is simple. If a device is suspected of causing signal absorption, unplug the device and then re-transmit the signal. It is very important that the device is unplugged and not just turned off! If the controlled product begins working after the appliance is unplugged, then a filter will be needed on that device to keep PLC signals from being absorbed and raise the signal strength of the entire home. Smarthome has many filters that will fix the problem. An average home will need between three and five filters. If you are in the business of installing automation systems and not in the ‘call-back’ business, include some of these in your bid as part of the standard package.

Smarthome’s BoosterLinc™ can solve localized problems

Smarthome’s BoosterLinc™ Plug-In Amplifier

SignaLinc Repeater is ideal for improving the home automation signal strength throughout all the outlets in a home. But, as the PLC signals travel down a circuit and away from the repeater, it will weaken by the same factors listed above. Additionally, the signal will get weaker as it passes installed PLC transmitters. Each PLC transmitter contains a tuned circuit that when it’s not sending signals it’s absorbing them! In addition to plug-in transmitters, LampLinc™ 2-Ways, SwitchLinc™ 2-Ways, ToggleLinc™ 2-Ways, ApplianceLinc™ 2-Ways, KeypadLinc™ Controllers, or any module with 2-way abilities will load down the available signal. With so many transmitters installed, the signal is loaded down to a point where some modules will be unable to receive a signal. Installing multiple 2-way devices on one branch circuit may necessitate the use of local amplifier like Smarthome’s BoosterLinc.
Helpful Tools
If you’re investing in home automation, there are a few tools that will make your projects run smoother:

Maxi-Controller
This plug-in transmitter has the ability to send individual PLC commands. The buttons are separated into Addresses and Command functions. To use this controller, you have to press the address (for example, “5”), then the command (ON, OFF, BRIGHT, etc.). Many of the features found in Smarthome products need to be programmed with individual button presses. Using a controller that sends the address and command with one button press will not work. For more info visit: www.smarthome.com/4020.html

Signal Meter
This is an invaluable tool when it comes to installing and diagnosing problems. By knowing the signal’s strength at a specific location, you can make sure that the signal will always trigger that module. Generally, it is ideal to have at least 100mV at each location. Conservative installers will want even more; perhaps 250mV just in case the homeowner installs a new big-screen TV after final installation. The extra margin will still give the receivers enough signal strength to be reliably triggered. These units can also be used to measure the effects of signal absorption mentioned earlier. Plug in the signal meter and measure the signal’s strength, then unplug any devices that are plugged into that and nearby outlets. If 10% or greater change is observed, install a filter (like FilterLinc™) on that device.

Voltmeter or Voltage Tester
During the installation of a home automation wall switch or controller, it may be necessary to identify the wires inside the wall box. Knowing for sure which wire is the HOT or LINE wires can reduce the guesswork when installing a single switch and it is absolutely necessary when working with 3-way lighting circuits. A voltmeter is ideal for this application. Many of the digital models can also read current so you’ll know how much power is being drawn by the switch’s load.

A simpler measurement tool, available at most home improvement centers, is a voltage sensor. This device, often costing less than $20, can sense voltage when placed near a wire. The tip of the voltage sensor can tell if voltage is on the wire without touching the bare copper conductor or breaking the insulation.

When using these tools, be certain to read and understand the safety instructions. Often when these tools are used, the power to the circuit will need to be turned on. When working around live electrical wires, take your time and concentrate on the task.

Helpful Hints for New Construction
By design, X10 (also known as PLC) equipment does not need much in the way of special wiring. The following are six items we recommend for all homes with PLC installations:

1. Ask the builder or electrician to run the neutral wire to each wall switch location. This wiring may be a code requirement or a regular practice in your area, but unless explicitly specified, it may get omitted. Most SwitchLinc Dimmers and all KeypadLinc Controllers require the neutral connection.

2. Specify the installation of deep J-boxes in all locations where PLC switches, receptacles, or transmitters will be used. While all PLC products fit in the spacing offered by all North American electrical boxes, the deep models have extra working space and make the installation go a little easier. Deep boxes only costs a few cents more than normal depth models. Look for single gang boxes that are 22cu or higher (cubic inches) and double gang boxes that are 36cu. or higher.

3. If the automation switch is dimming-enabled and is going to be controlling 400 watts or more, do not place insulation around the wall box and consider using metal junction boxes. Dimmers that control high loads will dissipate heat, which may be felt through the switch faceplate. Metal boxes will more efficiently draw out the heat and spread it over all the surfaces of the box. By keeping wall insulation a few inches from the box, free air will help move the heat away.
4. Install a whole-house surge suppressor. Adding a good whole-house surge protector at the breaker will help protect against costly damage to the PLC components and other delicate electrical equipment.

5. Install a PLC phase coupler (signal bridge) or coupler-repeater (amplifier) at the incoming electrical service. A common problem with PLC signals is getting the signals between the two legs of electricity that service the home. A coupler-repeater is recommended for homes of 3,000 square feet or greater. Smaller homes will generally work well with a passive phase coupler.

6. Work with the electrician to isolate non-automation loads. Ask the electrician to place the non-PLC carrying lines on one of the two incoming lines. Having the kitchen and laundry appliances plus the heating systems on one phase will help keep potential noise off the signal-carrying lines. He probably won’t be able to accommodate 100% of the loads on one phase or another, but an attempt should be made.

Glossary of Terms

PLC- Power Line Control- A control signal that is embedded onto the electricity lines. X10 signals are a form of PLC signals.

X10 Address- The Address part of a PLC signal contains the House and Unit code. An Address can be Unit codes 1 to 16 and House codes A - P. There are 256 total X10 addresses. Examples of PLC Addresses are A-1, B-5, P-15, O-9.

X10 Command- The Command is action part of a PLC signal. It tells the module what to do when it sees its address. Examples of a command are ON, OFF, Bright, DIM, PRedim, All Light ON, and All Units OFF. There are other rarely used commands, but these are the most common ones.

Status & Status Request- Some receivers, like SwitchLinc Timer, have the ability to report their status when asked. These modules contain transmitters that can send signals. When a transmitter sends a Status Request command, the module will reply with its status (On, Off, PRedim at some %).

Resume Dim Level- If set, the SwitchLinc can come on to the level it was at before it was turned off. (Not used in non-dimmable products.)

PreDim Level- One of 32 brightness levels the SwitchLinc can instantly (or slowly) change the light’s brightness to a predefined brightness level. (Not used in non-dimmable products.)

Scenes in SwitchLinc- SwitchLinc Wall Switches can be set up to respond to multiple signals and when received come onto a predefined brightness level all with one signal. One scene signal from a KeypadLinc or any transmitter can instantly (within seconds) change the lighting mood in your home.

Maxi Controller- A transmitter that has separate buttons for the unit codes and the commands. In some of the advanced set up functions for the SwitchLinc, it is necessary for only a unit code to be sent. The X10 SC-503, Leviton 6320, Stanley 370-2549 are examples of Maxi-Controllers. We recommend having a Maxi Controller to set up the SwitchLinc Timer.

X10 Keypress- This is a signal that only contains the house and unit code WITHOUT a command. The Maxi-Controller, some TouchLinc LCD controllers, and home automation interfaces can produce a keypress command.

Appliance Module- A receiver device that can be used with any type of load, including lighting. It will never contain dimming control as it always has a hard contact relay. An Appliance Module will ignore the All Lights ON command.

Lamp Module- A receiver that is used to control only lighting devices. It may contain dimming control or it may have a hard contact relay. A Lamp Module will respond to the All Lights ON command. SwitchLinc Timer is defined as a lamp module so it will respond to the All Lights ON for the primary address housecode.

Hot or Line- The wire in the junction box that contains the incoming electricity from the electrical panel. It is usually black and may be tied with a wire nut to other black wires in the rear of the box.

Load- The wire in the junction box that goes to the light(s). Usually, there is just one load wire in a junction box and it is black. It has no voltage when the switch is off.

Neutral- While not used on a mechanical switch to control a load, SwitchLinc will need a neutral wire to operate. Generally, the neutral wires are white and located in the rear of the junction box. There may be two or more wires tied together by a wire nut.
## Troubleshooting & Technical Support

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light controlled by SwitchLinc turned itself ON.</td>
<td>SwitchLinc was triggered by a scene.</td>
<td>Check scene membership and remove unwanted scenes from SwitchLinc, or perform a Factory Reset to reset SwitchLinc to factory defaults. Install an PLC Signal Blocker for the home.</td>
</tr>
<tr>
<td>Light does not appear to come ON or go OFF when SwitchLinc is tapped (manually).</td>
<td>Primary address fade-on rate may be set too slow.</td>
<td>Increase fade-on rate if desired (see page 6).</td>
</tr>
<tr>
<td>SwitchLinc will not take programming of scene, fade-on rate, etc.</td>
<td>SwitchLinc may be in Program Disable mode.</td>
<td>Re-enable Program mode or perform a Factory Reset to reset SwitchLinc to factory defaults.</td>
</tr>
<tr>
<td>SwitchLinc is not transmitting (will not control a scene).</td>
<td>SwitchLinc may be in Disable PLC Transmit mode.</td>
<td>Re-enable PLC Transmit mode or perform a Factory Reset to reset SwitchLinc to defaults.</td>
</tr>
<tr>
<td>SwitchLinc is locked up.</td>
<td>Surge in power line.</td>
<td>Reset SwitchLinc by pulling out the Set Button for a minute and then pressing it in.</td>
</tr>
<tr>
<td>LED is not visible and or SwitchLinc is not controlling the light.</td>
<td>SwitchLinc is in system off position.</td>
<td>Press in the Set Button/Status LED.</td>
</tr>
<tr>
<td>Existing switch only has two wires.</td>
<td>SwitchLinc needs a neutral wire in order to operate. Use SwitchLinc RX #2386W2.</td>
<td>Look in the rear of the junction box for a group of white wires all tied together with a wire nut. Those are the neutral wires; connect the SwitchLinc's white wire there.</td>
</tr>
<tr>
<td>Difficulty setting scenes with a maxi-controller.</td>
<td>The CLEAR or SET commands were not sent in the correct order.</td>
<td>Don't hold down the buttons too long, it may send duplicate codes (i.e. two O16 codes).</td>
</tr>
<tr>
<td>SwitchLinc is not receiving signals.</td>
<td>Check the Status LED/Set Button.</td>
<td>It will blink when there is any PLC activity on the line.</td>
</tr>
<tr>
<td>The load is buzzing when on or dimmed.</td>
<td>The triac inside the SwitchLinc needs to turn off the electricity to the load 120 times per second to 'listen' for PLC signals. This causes the electricity going to the load to be slightly choppy.</td>
<td>The bulb's filaments are vibrating. Using rough service, 130-volt, or appliance grade bulbs will reduce the noise. Run the SwitchLinc in the full-on mode, or consider getting one of the SwitchLinc Relay models that have no-dimming abilities.</td>
</tr>
<tr>
<td>SwitchLinc turns on, but not off by PLC control.</td>
<td>The load is producing electrical noise that is interfering with SwitchLinc's reception of PLC signals.</td>
<td>Install a noise filter like Smarthome #4835 between the load and the SwitchLinc or increase the signal strength with a coupler-repeaters to overcome the line noise.</td>
</tr>
<tr>
<td>The switch is getting too warm to the touch.</td>
<td>It is normal for wall dimmers to get warm.</td>
<td>SwitchLinc will dissipate 1-watt per 100 watts controlled. Using metal junction boxes, removing insulation around the outside of the box, or using a smaller load can help lessen the heat.</td>
</tr>
</tbody>
</table>

If these solutions have been tried, the manual has been reviewed, and you still cannot resolve an issue you’re having with the SwitchLinc, please call our Technical Support Dept. at 949-221-9200 or e-mail tech@smarthome.com.
Specifications

- **Load types:** Permanently installed incandescent and inductive loads
- **Operation:** Dimming Triac (12-amp Rated)
- **Maximum load:** (2380) 600 watts / (2381) 1,000 watts
- **Input power:** 120 VAC, 60 Hz
- **Connections (16 AWG):** Black (to line), Red (to load), White (to neutral, required)
- **Addresses:** 1 PLC (X-10) Base (Primary) Address of 256 possible
  Up to 64 PLC (X-10) Scene Addresses of 255 possible
- **On-Level:** (Primary Address) 1 of 31 possible (3.2%-100%) or resume dim
  (Scene Address) 1 of 32 possible (0%-100%)
- **Fade-on Rate:** 0.12 to 9 seconds if programmed locally
  0.12 sec. to 9 minutes if programmed remotely
- **SwitchLinc Dimmers per gang box (max):** 4
- **SwitchLinc Dimmers maximum per circuit:** 10 (with more than 5, a PLC amplified coupler-repeater is highly recommended)
- **Minimum load:** No minimum load required
- **Operating temperature range:** 40° F to 104° F
- **Minimum PLC transmit level:** 2V
- **Minimum PLC receive level:** 10mV
- **Maximum PLC signal rejection:** 200mV
- **Mounting:** Mounts in single or multiple-ganged J-box (200W of load control is lost on 600W SwitchLinc for each immediately adjacent dimmer installation; e.g., 600W load control becomes 400W with a SwitchLinc to the immediate right or left. Use a triple-gang box with a mechanical switch in the center to avoid downgrading.

- **Status indicator:** Green LED
- **Brightness indicator:** 8 Green LEDs
- **Dimensions - (2381)**
  - Front Bracket: (Width) 2.36" (Height) 4.14" (Depth) 1.73"
  - Main Body: (Width) 1.74" (Height) 2.71" (Depth) 1.40"

  **(2380 & 2382)**
  - Front Bracket: (Width) 1.73" (Height) 4.14" (Depth) 1.73"
  - Main Body: (Width) 1.74" (Height) 2.71" (Depth) 1.40"

- **Safety tested for use in the U.S. and Canada**

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**Invest in Better Home Automation Products**

Unlike most electric items, many PLC-based products haven't changed much over the years.

Our Marketing and Customer Service teams surveyed our customers, like you, and our engineers have invented new and better wall switches and plug-in modules. We include more features, higher load handling, and better signal sensitivity for a superior user experience. While in some cases, they cost more; we hope you'll agree that not having to replace a dead module every couple years is worth the added expense and reduced aggravation. Please visit a retailer or distributor for the complete line of automation products from Smarthome Design. Check out our web site at: http://www.smarthome.com/smarthomedesignstore.html
About SwitchLinc Dimmer’s Certification
SwitchLinc has been thoroughly tested by ITS ETL SEMKO, a nationally recognized independent third-party testing laboratory. Products bearing North American ETL Listed mark signifies that the product has been tested to and has met the requirements of a widely recognized consensus of U.S. and Canadian product safety standards, that the manufacturing site has been audited, and that the manufacturer has agreed to a program of quarterly factory follow-up inspections to verify continued conformance.

Smarthome Limited Warranty
Smarthome warrants to the original consumer purchaser of this product that, for a period of two years from the date of purchase, this product will be free from defects in material and workmanship and will perform in substantial conformity to the description of the product in this Owner's Manual. This warranty shall not apply to defects or errors caused by misuse or neglect.

If the product is found to be defective in material or workmanship or if the product does not perform as warranted above during the warranty period, Smarthome will either repair it, replace it or refund the purchase price, at its option, upon receipt of the product at the address below, postage prepaid, with proof of the date of purchase and an explanation of the defect or error. The repair, replacement, or refund that is provided for above shall be the full extent of Smarthome's liability with respect to this product.

For repair or replacement during the warranty period, call Smarthome customer service to receive an RA# (return authorization number), properly package the product (with the RA# clearly printed on the outside of the package) and send the product, along with all other required materials, to:
Smarthome
ATTN: Receiving Dept.
16542 Millikan Ave
Irvine, CA 92606-5027

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