# Switching Lights With X10 Controllers

by Martin Holladay

After years of predictions that practical home automation is just around the corner, many builders prefer to avoid smart-home devices. But even techno-skeptics may want to take a second look at one type of home automation technology. A communications protocol called X10 can be used to control lights or appliances with low-voltage signals sent over regular 120-volt household electrical wiring. Although X10 components can be configured into complex whole-house automation systems, individual components are simple to install, cheap, and widely available. A remodeler might consider using X10 modules for such simple applications as a wall switch that controls a distant light.

X10 technology was developed in Scotland in 1978. The original patents have expired, and the protocol is now shared by several manufacturers. In order to differentiate themselves from the original manufacturer, X10 Wireless Technology, most competing manufacturers prefer to describe their products as "power line carrier" (PLC) systems.

## The Parts

There are two types of X10 components: receivers and controllers. Any light or appliance to be controlled must be plugged in to (or hardwired to) a receiver. There are several types of receivers:

- ceiling-mounted receivers designed to fit into a deep electrical box that serves a light fixture
- screw-in lamp receivers
- switch receivers that mount in a standard electrical box, replacing a wall switch
- receptacle receivers that mount in a receptacle box, allowing any appliance plugged in to the receptacle to be controlled
- portable plug-in receivers that can control any lamp or appliance plugged in to them

Receivers are available to control lighting up to 500 watts or motor loads up to 20 amps. Each receiver is assigned an address; up to 256 different addresses are possible. To turn on three light fixtures simultaneously, the receivers for all three are assigned the same address. Receivers for incandescent lights are usually dimmable, and the dimming function can be programmed in different ways using so-called macro functions.

Leviton's X10 products, called Decora Home Controls, include switch controllers, controlled receptacles, and a whole-house programmer (left). The system allows the installation of a switch to control a distant light, with no wires running between the switch and the fixture.

***Controllers.*** X10 signals are sent by controllers, or transmitters. There are several types, including:

- wall-mounted controllers, usually with rocker switches or a keypad, designed to fit in an electrical box
- hand-held remotes that send radio or infrared signals to a plug-in transceiver
- wall-mounted, battery-powered, wireless controllers that send signals to a plug-in transceiver
- computer controllers that plug in to the serial port of a personal computer

## What Can They Do?

X10 proponents often extol the genie-like power of the technology, which permits a homeowner to control any appliance in the house from his hot tub. More typically, X10 components are used in a home security system to control devices like cameras, automatic telephone dialers, and barking-dog alarms. In addition, energy-management controllers are available to control hvac systems.

But one of the most useful characteristics of X10 technology is the ability to install a light switch without running any wires between switch and fixture — for example, to control exterior floodlights mounted on a second-floor soffit from a first-floor switch. Installing a couple of $25 control modules can be cheaper than fishing new wires to a distant light. An X10 switch can be installed wherever there is power — or, if the homeowner doesn't mind changing batteries, from a wireless switch glued to the drywall.

***Compatibility issues.*** One of the virtues of X10 technology, at least in theory, is that components from different manufacturers are compatible, since they use an agreed-upon signaling protocol. But manufacturers couldn't resist introducing improvements to the system, and those improvements limit compatibility.

"Most X10 manufacturers have taken liberties with the system and made

their own proprietary changes," says Andrew Ahart, product marketing manager for Lightolier Controls, a manufacturer of X10 components. "Everybody has tweaked it. Our system is compatible with other X10 systems, but there are a few discrepancies — for example, our on-off function works with other X10 equipment, but not our whole-house macros." Similarly, Leviton X10 components use programming functions that are incompatible with the signaling systems of other manufacturers.

***Cost.*** A simple X10 transmitter or receiver costs between $19 and $70. "Our dimming module costs about 20% more than a good digital wall dimmer," says Ahart. "A whole-house controller costs about $200."

## Pitfalls for the Unwary

Although most X10 installations go smoothly, installers need to be aware of several potential problems, including stray signals, uncoupled phases, and unwanted electronic noise. "We've had problems where two houses come off the same transformer, and one of the homeowners can turn the other guy's lights on from across the street," says Steve Coe, general manager at Precision Electric in Norwalk, Conn. The solution to this glitch is simple: Change the shared codes in one of the houses.

***Phase coupling.*** At a home's load center, the 240-volt service is split into two 120-volt phases, or legs. Since not every circuit in a home is on the same leg, an X10 signal transmitted on one leg may not reach a receiver located on the other leg. "If you think you've got a phase-coupling problem, turn on a 240-volt appliance — a range, dryer, or air conditioner — to allow the phases to be coupled," says Al Bilotti, tech support director for X10 Pro division. "See if that solves the problem." If that doesn't solve the problem, the home will require the installation of a phase coupler, which costs between $30 and $100.

***Electrical noise.*** Some common electrical devices in the home — including some TVs, VCRs, audio equipment, computers, and fax machines — may create electronic noise that interferes with X10 signals. "For something to cause noise, it has to have a power supply or transformer," says Nolan Kyees, technical support specialist for X10 Pro. "Fluorescent lights and low-voltage lights have ballasts and transformers, and therefore the potential to cause noise. The problem is, without testing you can't tell how much noise there is."

Fortunately, every technical problem has a technical solution. Once an offending device has been identified — by means of either test equipment or trial-and-error unplugging — it can be equipped with a noise filter to block the frequency interfering with the X10 signal. "You need to create an environment that allows the transmission of our signals," says Bilotti. "If you need a plug-in noise filter for the TV, it's a $40 item."

***Weighing the pros and cons.*** Noise problems are fairly rare and are relatively easy to fix, but the possibility of encountering a signaling problem months after installation — for example, when a homeowner purchases a new "noisy" appliance — may convince some callback-wary remodelers that it's worth fishing the switch wires, after all. "We had an installation once, and we started getting callbacks, and then more callbacks," says Coe. "It finally turned out that the woman had an infant-monitoring system that operated on the same frequency. The two systems were just not compatible. The bottom line is, this is a technical system and it requires an educated contractor to install it."

***Manufacturers.*** The major manufacturers of X10 components include Leviton (800/323-8920, www.leviton.com), Lightolier Controls (800/526-2731, www.lolcontrols.com), SmartLinc (949/794-0950, www.smartlinc.com), and X10 USA (800/675-3044, www.x10.com). Retailers include Radio Shack (800/843-7422, www.radioshack.com), Smarthome (800/762-7846, www.smarthome.com), and Worthington Distribution (800/282-8864, www.worthdist.com).



Lightolier Controls uses X10 technology for its lighting controllers, including this wall-mounted switch that can be programmed with four different "scenes" (above). A wireless remote (right) is also available.