TECHNICALHELP4U

Home Automation

Automation 101

Home Automation 101 Guide

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Basics of Automation

So, you want to automate your home or office?

T here are many reasons why you may wish to do so. Ease of use, security, economy, prestige, physical limitations. Regardless of the reason, regardless of your current ability, the goal of Automation 101 is to explain, in simple language and basic instructions, how to make the most of your system - without expensive set up and installation fees or beginner frustrations.

Some things you can do:

- Turn lights on/off and dim or brighten them remotely
- Have certain appliances turn on/off at set times.
- Have a motion sensor turn a light or camera on.
- Send an email or dial a pager!
- Turn lights on/off at sunrise and sunset.
- Announce caller id or weather information.

There are a few different 'flavors' of Automation protocol. We will focus on X-10 since it is the most common and least expensive. The principles however will apply to most protocols.

What is X-10?

X10 is a powerline interface communication protocol. What this means is that signals are sent along your existing electrical wiring (110 or 220/240). These signals do not interfere with your power, they simply communicate between modules and transmitters you plug into the wall or wire into electrical boxes. These modules can turn on, off , dim and send status information.

For the ability to control specific devices these modules have dials with which they have an address, which consists of a House (A through P) and Unit (1 through 16)

code. There are 256 possible addresses. The address of an X10 module is set by turning the red housecode dial to the same letters and the black number dial to a sequential number (ie.. A1..A16).

House/Unit codes are referred to in the following manner: A1, E4, N12, D16...

To turn on an X10 controlled device, you have to tell the module controlling that device to turn on. Modules monitor the powerline for a command specifically addressed to it. If the module is set to A1, it will only respond to signals addressed to "A1".

The technical explanation is that transmitters which plug into an AC outlet injects a 120Khz signal into the powerline as close to the zero crossing point (of the AC signal) as possible. This permits the transmitter and module to communicate via this short burst RF signal in binary format, a series of 1's and 0's representing on, off, dim levels, 'address' information and requesting status.

Note that "X-10" is a trademark of X-10 (USA) Incorporated.
 We will use "X10" unless referring specifically to a product of the holder of the "X-10" trademark.

As you can see, this is very simple, straightforward technology.

Installation is straightforward - basically plug and play, though certain modules and situations can present challanges. We will cover those and various setups later.

For now remember:

- No extra wiring is needed. Uses existing AC power lines.

- Signal travels from transmitter to reciever, up to 100'.

- Transceiver converts radio signal to powerline signal on AC line.

- Modules 'listen' to the AC line for their address and command.

What products are there?

Powerline control products can be divided into the following:

- Receivers, include lamp modules, appliance modules and wall plugs.
- Transmitters include wireless motion sensors, remotes and controllers.

- Transceivers include plug in modules, computer interfaces and coupler/repeater units.
- Security/Monitoring include motion sensors, cameras, lighting and chimes/horns.

A receiver unit turns on/off/chimes or dims when it receives an X10 command on the powerline.

A transmitter sends the RF signal over the airwaves to the Transceivers which plug into the AC line.

A transceiver converts the RF signal into powerline signals which go to the receivers.

Receivers

Receiver units constantly monitor the powerline looking for X10 codes. Do not put them on a filtered powerstrip as the X10 codes may not reach the receiver to give it the commands.

There are two kinds of Receiver units:
- Ones that can only receive commands (one way)
- Ones that both receive commands and can transmit their current status (two way)

Use prudence when considering 2 way modules as to many of these flood the powerline with commands resulting in poor command reception

Receiver units are available which can replace outlets and light switches, plug into outlets or be wired inline in the junction box, virtually any electrical item can be at least turned on/off with X10.

  It is very important to properly match the device you are controlling with the appropriately listed module otherwise severe damage to your electrical item and/or power line could occur.

Automation 101 : Receivers

Lamp Module LM465(X-10) $13
- Up to 300 Watt Incandescent lamp control.
- Dimmable, responds to 'All Lights On' command.
- *Available in Two Way model with same rating **LM14A** $33*

3 Pin Appliance Module AM466(X-10) $14
- Turns on/off up to: 15 amps, 1/3 hp, 500W
- *Available in 2 Pin model with same rating **AM486** $13*
- *Available in Two Way, 2 Pin Model with same rating **AM14A** $33*

Heavy Duty Appliance Module HD245(X-10) $30
- Turns on/off up to 20 amps 220 Volt
- *Available in 15 amps (spade style) 220 volt **HD243** $30*

Light Switch WS467(X-10) $13
- Up to 500 Watt Incandescent lamp control.
- Dimmable, responds to 'All Lights On' command.
- *Available in 3 Way (more than two switches control lights) same rating. **WS4777** $16*
- *Slave switches for 3 Way use. $8*

Decora Style Light Switch WS12A(X-10) $20
- 40 to 500 Watt Incandescent lamp control.
- Same model can work in 3 Way and 4 Way installations!
- *Decora slave switch works with WS12A only **WS14A** $10*

Wall Socket Module SR227(X-10) $16
- Turns on/off up to 15 amps 1800 Watts unrestricted load.
- Top outlet is controlled.

Switchlinc 2 way indoor Incandescent switch $80
- Up to 600 Watt Incandescent control, On/Off/Dim/Preset Dim
- *Available for fluorescent light, low voltage transformer 600 W. $95*
- *Available in one way version. $55*
- *Available in Leviton one way incandescent $55*
- *Leviton slave for 3 way $14*

HomePro Relay switch $45
- Turns on/off up to 20 Amp, 2400 watt loads.
- *Available in Leviton 15 Amp version $45*
- *Available in Heavy Duty Leviton 20A 250V AC 2HP $65*

Wall Switch
- Leviton Top outlet controlled, 15A 120V $30
- Heavy Duty Leviton 20 amps at 110V or 220V $50

Leviton In Line Fixture Relay $35

- 15A Resistive or Inductive Load
  (Use for fluorescent lights or incandescent without dimming)

- *HomePro 20A version $30*
- *HomePro Dimming Fixture Relay 300W Incandescent $39*

PC Receiver MR26A(X-10) $30

- Allows PC to receive X10 commands wirelessly.

One of the previous items should fit most any automation need you may have.
If you are controlling very high voltages or did not find a module to control you device,
contact an automation specialist to discuss your needs.

Transmitters

Transmitters send RF (radio frequency) waves containing the command requested to either
a computer interface or to a Transceiver which is plugged into the AC line.

Transmitters units include:
- Hand held Remote Controllers (Plug in Controllers send the powerline signal not RF and are listed in the Transceiver Section)
- Motion Detectors (send RF command on sensing motion & sunset/sunrise) Listed in Security section
- Computer based Send only module (Firecracker from X-10) Listed in Transceiver Section

The maximum range for an RF transmitter is 100 Feet. This is limited by the FCC. You can however
purchase repeaters and make modifications to extend this range.
In practice up to a 2400 SqFt modern home is fine with the existing range.

Automation 101 : Transmitters

Palm Pad Remote HR12A(X-10) $13
- 16 unit on/off control + Dim up/down buttons.
- 100 Foot range.
- *Available in Leviton model black $30*

6 in 1 RF & IR Remote (X-10) $20
- Control 6 theater components with IR + X10!
- Sleep timer
- *8 in 1 version $35*

Slimline Wireless Wall Switch SS13A(X-10) $20
- Turns on/off/dims 3 X10 devices + dim button
- *Available in gold SS15A $25*

New transmitters are being introduced on a frequent basis which can send X10 RF commands.
Many high end remotes, such as the Pronto from Phillips are also able to send X10 RF commands.

Transcievers

Transceivers are divided in the following groups

- Receivers which using an antennae listen for RF commands and convert them to the powerline signal
- Computer based which plug into the computer and the AC line sending commands directly.
- Plug in Controllers which send the powerline signal directly when a button is pressed.

Automation 101 : Transceivers

Firecracker CM17A(X-10) $50
- Allows computer programs to send X10 RF signals.

Telephone line interface TR16A(X-10) $30
- Send X10 signals by calling home and enter codes via touchtones.
- *Upgraded Leviton version $160*

Mini Controller MC460(X-10) $30
- Send X10 signals direct to the powerline, 8 unit control on/off/dim
- *Available in 16 unit Maxi control version **SC503** $25*
  These units are more like remote controllers, but since they plug into AC line and do not send RF, they are listed here.

Transceiver RR501(X-10) $20 Recommended for all installs
- 1 housecode control, functions as appliance module on code 1 or 9
- 100 Foot range.
- *Available in Mini version, no code selector **TM751** $13*

Powerline Interface module two way TW523(X-10) $30
- Send and receive X10 signals from 3rd party devices to the powerline
- *Available in transmitter only version **PL513** $20*
- *Available in Computer Interface version **CM11A** $50*
  CM11A recommended for all installs using Homeseer(tm)

Homeseer is a trademark of HomeSeer Technologies LLC,

Coupler/Repeater Units: Why would I need one?

X10 signals are sensitive to line noise and sometimes have trouble going from one phase to another in electrical wiring. If you have some modules which do not respond in certain areas, or periodically do not respond, a coupler/repeater may be required. A detailed review of this issue is available in our advanced section of this program.

Security

Automation 101 : Security

Motion Detector MS16A(X-10) $30
- Sends X10 command when motion is sensed
- Sends X10 command on sunrise/sunset if programmed.
- Indoor or outdoor use - 20' range.

Motion Detector MS13A(X-10) $20
- Sends X10 command when motion is sensed
- Sends X10 command on sunrise/sunset if programmed.
- Indoor use - 20' range.

Dual Floodlight Motion Detector PR511(X-10) $50
- Turns on floodlights and up to 4 other X10 modules when motion detected
- Adjustable time delay

Wireless Camera XX16A(X-10) $100
- Turn on/off using X10 command
- Transmit signal to receiver up to 100' away.
- Available in Wide Eye lens (120 deg vs 60 deg) **XX17A** $110

Floodlight Camera VT38A(X-10) $80
- Turns on camera when motion is sensed or X10 command received
- Camera works like above wireless camera.
- Turns on camera when motion detected within 20' range.

Video Receiver (no audio) VR31A(X-10) $50
- Required to receive the signal from Wireless cameras above.
- *RCA Video output to TV or VCR*
- *Available in audio version also - hear what is happening by the camera!*

Video to USB convertor VA11A(X-10) $70
- Input camera video to computer.

Remote Chime SC546A(X-10) $25
- Chimes when X10 command received

Controling Automation Products

There are many options available when deciding how to centralize your automation.
If you simply want to turn on/off and maybe dim 2 or 3 items, then you probably
don't need to have computerized control, but may decide to once you see what all can
be done.

Methods of Control:
- Remote Control: uses the RF remotes and plug in controllers only. Limited
functions.
- Computer Control: uses PC/Mac based program to run automation. From basic to
very

advanced functions available. Many programs are free or under $99.

- Standalone Controler (Ocelot, JDS): uses specialized components with logic circuitry to run automation system. Generally used in high end installations or in conjunction with Computer control.

You may be asking:

Why would I want to use a computer system to run my automation?
I can turn everything on/off or dim from my remote controller.

The simple answer is:
A computer program adds 'smarts' to your automation system.

- Control a group of lights by one button press.
- Have the program 'respond' to events such as email reception or incoming calls.
- Turn on or adjust HVAC system based on weather download from the internet.
- Control your automation system from anywhere in the world via web browser.

These are just some of the things the more advanced programs are capable of!

The following programs are the ones we generally recommend:

Firecracker (X10) $ Free - very basic

Active Home (X10) $ Free - $50 - more advanced, but still basic

Homeseer (Homeseer Technologies) $199 - the best of the net!

Firecracker

Firecracker from X-10

- Simple program from X-10 shows virtual 'Palmpad'
Turn on/off or dim controlled modules. Free software download
ftp://ftp.x10.com/pub/applications/firecracker/xfire033.exe

Requires the following minimum hardware:
1 CM17A Firecracker

1 Transceiver TM751
Modules for controlled devices
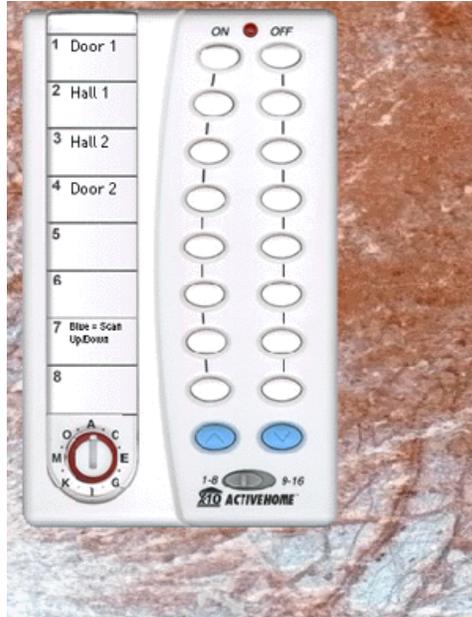
What is it all about?
- Plug the Firecracker into the serial port on your computer
- Install up to 16 X10 control modules
- Download and install the program

Now you can use the program instead of the physical remotes to control your X10 devices. Very simple.
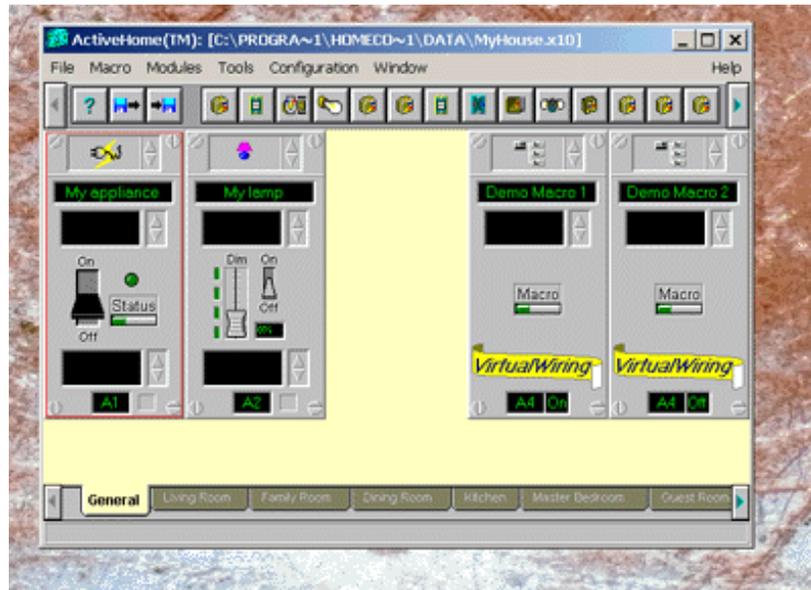But you can only control when at computer.

Active Home

Active Home from X-10

- Advanced program from X-10, allows for creation of macros and virtual devices.
- Program can download event information to CM11A interface, so computer can be off.
- Allows for control from computer screen.
- Requires CM11A interface, transeiver module and modules for controlled devices.

3 file software download
ftp://ftp.x10.com/pub/applications/activehome/setup.exe
ftp://ftp.x10.com/pub/applications/activehome/setup.w02
ftp://ftp.x10.com/pub/applications/activehome/setup.w03

What is it all about?
- Plug the CM11A to the serial port on your computer
- Install the various X10 control modules
- Download and install the program

Allows for preprogrammed control of your X10
modules. Control your devices based on sunrise and
sunset, set up various lighting scenes and more!

Homeseer

Homeseer from Homeseer Technologies LLC

- Highly advanced program allows complete control of automation products.
- Uses 'scripts', basically simple instructions, to control virtually any computer
function.

A short list of things Homeseer can do:

Set your lights to come on at sunset and off at sunrise
Set lights and appliances to go on and off at different times based on whether you are
home or not
Access all your lights and appliances remotely via the web
Control your lights and appliances via email
Send and reply to your email via the web
Control your VCR from the web
Have your computer speak when your email arrives and tell you who it was from
Automatically respond to email
Speak to your computer and have it execute commands, like launching programs,

reading mail, controlling lights and A/V equipment.
Control your heating and cooling system and keep track of how long the system has been on.
Interact with Microsoft Agent characters without using the keyboard to listen
Tell you who is calling and execute commands based on who it is.

Automation 101 : Standalone Controllers

There are a number of automation controllers available.

The top ones are the Stargate and Timecommander from JDS , Ocelot by Applied Digital and Houslink by Smartlinc

What is it all about?
- Basically mini computers which control modules
- Cost from $100 (ocelot) to $1,000 (basic Stargate)
- You configure by attaching computer to download 'programs' or hire a pro

Guess what? Yep, Homeseer can handle many (not all) of the tasks people want these controllers for through it's software and standard X10 modules! It is also compatible with these!

Controlling the system

Ok, so now what do I do?

When getting started in automation, first decide:

Do I want computer based control or not?
How much do I want to spend initially?
What devices do I want to control?

Our best recommendation is to start with the Activehome Kit and add modules as you are ready. The Activehome kit allows you to use most computer programs as well as remotes to control your devices.
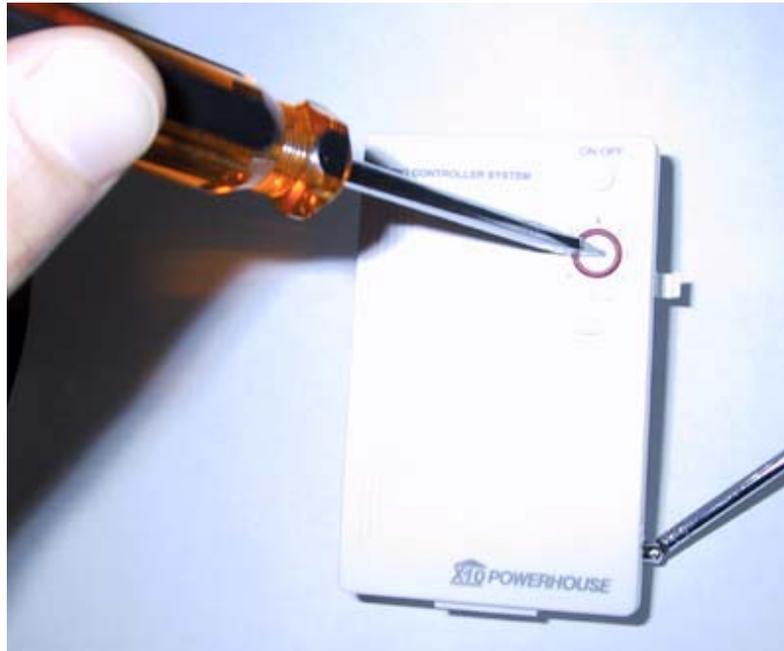
Make a list of all devices you want to control.
Each controlled device needs its own module.
You can control up to 16 devices per housecode - 256 total.
If not using computer control, each housecode needs its own transceiver module.

The most basic set up would consist of a remote and a transceiver.

This transceiver has a built in appliance module.

Set the remote and the transceiver to the same housecode.

The housecode is set by a red dial A through P

See the Unit code slide switch?
Set to 1 on the transceiver, and to 1.2 on the remote

This remote can control either unit 1 & 2 or unit 5 & 6. Not all remotes need to have unit codes set.

Now this transceiver will turn it's built-in plug on/off when the corresponding button on the remote is pressed.   But we want to control more than one device right?
So we get a lamp module to control the lamp by the bed.

Set the lamp module to the same housecode.
M in this case.

See the Unit code dial? - it is usually black
Set to 2, since the transceiver is on 1.

Ok, so now we can turn two devices on or off via remote control from up to 100 feet away.

You can add up to 14 more X10 modules before you need to add another transceiver.
Set each new module to an unused unit code.

Another transceiver will be needed after 16 total devices because a transceiver is set to a specific housecode.

If you have more than 16 total devices, computer control via Homeseer is the best way to go, homeseer does not require added transceivers for each housecode if you are using the CM11A interface. This interface comes with the Active Home kit.

The palmpad type remote is recommended since it can easily control 16 devices.

Here is your shopping list for basic control:

One Transceiver $20
One Remote controller $20

Both set to same housecode, allows one device control

For slightly more advanced control you want to add:

One palmpad type remote
Up to 15 more modules to control devices

Now lets turn up the power a bit, on we go to Computer Control!

Over the years, we have tested a number of programs for controlling X10 automation devices. Many, like the Firecracker, simply provide an onscreen remote with which you
can turn on/off and dim your devices. Others, like Active Home from X-10 are a bit more
advanced and allow you to have scenes. A scene allows you to control many devices with
one X10 command. For example, you could set up the X10 command A2 On to:

- Turn on and dim to 50% your family room lights.
- Turn off all other lights in the house.
- Start your popcorn maker which is connected to an X10 appliance module.

The limitation of Active Home is that it only controls X10 devices and only 'reacts' to time triggers or X10 signal triggers.

This is the reason we encourage users to purchase the Homeseer program.
For under $200 you have a true home automation program which is very robust and 'reacts'
to many different triggers, time, X10, temperature, email, phone calls and much more.

Let us review this program in more depth....

Automation 101 : Putting it all together

Setting up for Computer Control:

Plug in the CM11A and MR26A to your computer's serial ports.
- The CM11A permits Homeseer to send commands.
- The MR26A permits Homeseer to receive RF commands.

Though Homeseer does not use the transceiver (the CM11A injects the signal to the powerline), it is still useful to have one as a back up in case your computer is down.

Set up your remotes and modules to their addresses.

etting up Device codes and House codes:

Some planning is needed when you are deciding on what codes to use.

Think of the housecode as a street name and the unit code as a house number, each device should have a unique address.

When setting up a basic automation system with remote control only or with a simple software program such as Firecracker or Active Home, then make sure you set all your devices to the same house code.

When setting up advanced automation, where you can use all housecodes, we suggest you use the following setup:

House codes A-K set aside for modules, with house code C used for cameras.
Put motion sensors on house code M and use house codes O & P for remotes.

It is helpful to write down your modules and their addresses as you plan this:

A1 = Lamp Module, Family Room - Accent lights
A2 = Lamp Module, Family Room - Fireplace
A3 = Appliance Module, Family Room - TV
A4 = Lamp Module, Bedroom 1 - Reading Lamp
A5 = Light Switch, Bedroom 1 - Ceiling light
...
...
A16 = Universal Module, Office - Speaker
B1 = Chime Module, Hallway
B2 = Appliance Module, Garage Door
C1 = Wireless Camera, Front Door
C2 = Wireless Camera, Driveway
M1 = Motion Sensor, Front Door
M2 = Motion Sensor, Hallway

Once you have your list, go ahead and set the house and unit codes for your modules

Audio, Video & IR Distribution

Sources, Zones and IR

Once you have set up your automation system, you may find that you desire to hear the 'announcements' from your computer system throughout the building. While you are at it, perhaps you wish to be able to view the security camera video on TV's, computers or monitors placed in various locations, or even send the audio and video from one entertainment center to another.

There are a number of ways to distribute your audio, video and IR throughout even the largest of areas. With some creativity and ingenuity, you can do this with minimal costs.

Source = Video/Audio output device (CD, TV, Amplifier, PC sound card etc)
        How many sources will you want to control or listen to?

Zones = The areas where you want to hear or view the signals. (Master bedroom, Garage, Outside)

How many areas (zones) do you want? Do you want to individualy turn them on/off?

IR = Infra Red Signals (remote control)
Do you want to control the Source devices from the individual Zones?

Automation 101 : Audio, Video & IR Distribution

Sources, Zones and IR

It can seem overwhelming and frustrating when you first look at it all on the surface. You hear about things such as multi zone, multi source, modulation, signal loss, impedance matching and then you get even more confused. Dont fret. It is simple when you approach this one step at a time.

When considering distribution you can have a hardwired system, or a wireless system.

Wireless:
Todays wireless technology works fairly well and you have many options to choose from.
Wireless systems consist of a *Sender* and a *Receiver*.
Most systems, such as this one from X10 transmit on *2.4 GHz*
Range is up to 100', but reception is not always perfect.
These are 'plug & play', audio & video and around $100 each.

Hardwired:
Our preferred method of distributing audio/video and IR is through hardwired systems and inwall speakers. This is for reliability and consistency. Even if your home is not prewired, it is easy to run the needed wire throughout most any area. At a bare minimum, you can also use unused wires in your existing telephone line to distribute a mono audio signal! Read on, let us show you how.

Setting up a hardwired system.

Here is our starter setup for distributing home automation announcements (caller id, weather, news) and music (mp3, cd, etc...).

1. Ensure your Automation PC has a quality sound card in it which is Full Duplex with a 'line in'.

2. Run your music source (output from your stereo system, or from a MP3 computer sound card) to
    the line in of the automation PC. This will allow you to distribute both through the same lines.

3. How much do you want to spend? If you can afford $400 - $2000 then you can get yourself a
    component designed specifically for distribution. These components are basically multi channel

amplifiers to which you connect each 'zones' speakers.

A popular brand is Kustom, (shown below). A keypad in each room (zone) permits control of volume and relays IR commands back to the components to 'remotely' control them.

Not all of us can afford to go that route, which can end up being thousands for many zones.

Using simple X10 modules and basic techniques you can save quite a bit of money.

How many zones are we routing the audio to and do you need stereo in each zone?
You see, the speaker output from the computer sound card is Right and Left and can power two speakers (zones) up to a few watts (any computer speakers).

For areas such as an office, kitchen or garage, one speaker is generally adequate and stereo is not really needed so you could simply run the wires from these two speakers anywhere in the house and put the speakers there to hear your announcements and music.

For additional zones, use a splitter plug.
Here is a picture of a dual splitter, we usually
use the triple since that gives us more outputs.

We generally set up the automation wiring to have mini plug jacks which can accomodate the
speaker out from the computer.

Here is an example of wiring for an automation computer. The stereo jack (this is what you connect the computer speaker output to) below actually is a 3 way splitter providing 6 channels of mono output, the outputs are behind the plate and go to: living room (stereo 2), Entertainment room (stereo2) , Master Bedroom & Bath (mono 1) and garage (mono 1) - 6 total channels.
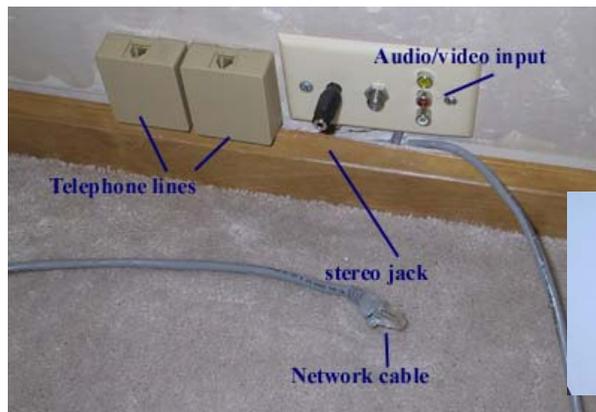
We cut off the 3 plug ends on the splitter and wired inwall speaker wiring to each end.
For the stereo runs we used CL2 which is 3 conductor, for mono the CL3 was fine.

Ensure wiring meets codes and prevents interference during long runs, minimizing noise.

In each of these zones (4 total from 6 outputs) we need to decide what kind of speakers we want, and how we will power them.

Zone 1 Living room uses 2 outputs for stereo sound.
Zone 2 Entertainment room uses 2 outputs for stereo sound.
*Zone 3 Bedroom & Bath uses 1 output for mono sound.*
Zone 4 Garage uses 1 output for mono sound.

In the **living room** we opted for a pair of inwall speakers powered by a Sony stereo receiver.

The CL2 wiring (3 conductor for R & L signal) was ran to our location and connected to the inwall RCA connector to simplify connection to stereo system aux input.

Volume control and on/off is accomplished in the room or remotely via IR.
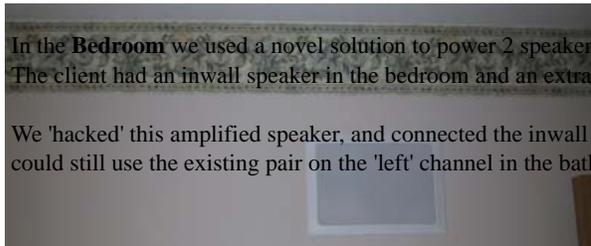
In the **Bedroom** we used a novel solution to power 2 speakers with a mono output.
The client had an inwall speaker in the bedroom and an extra set of powered computer speakers.

We 'hacked' this amplified speaker, and connected the inwall speaker to the 'right' channel and we could still use the existing pair on the 'left' channel in the bathroom.

Input from Automation computer

Left speaker output (to bathroom)

Right speaker output to inwall speaker above

Volume and treble control

Bathroom speaker had it's own inwall volume control

As you see, you can use many different approaches to distribute the audio throughout from one source. By setting up a networked computer dedicated to MP3 and Cd music which outputs it's sound to the line in of the automation computer you can use X-10 commands to start/stop and change songs, more on that later.

How do we use X10 commands to turn one zone on/off?

- Use a Universal Module UM506

This module will turn on or off when command is received.

By running one of the signal wires through the relay we can control that zone or speaker. The hot lead to each zone is used, not the amplified signal to the speaker.

You could set up a macro, activated by motion detectors in each room to turn on the light modules and universal modules in that zone, or have them turn on/off depending on time of day.

Red or Black signal wire from computer

To amplifier or powered speakers.

Signal Ground wire
Generally the uninsulated one.

Video

Video distribution is more difficult than audio since special attention needs to be given to the type of wiring used, distances you wish to cover and how many zones you wish to send it to.

In video equipment wiring the 75 ohm coaxial cable is the standard to carry video signals.
Any well-made 75-ohm cable will be fine. The main requirements for video cable are adequate shield, and proper (75-ohm) impedance. A normal RG-59 cable (or better) is good to carry video signals (compsite video, S-video, RGB, component video etc.) for long distances. For best baseband video performance avoid cheap TV aerial cable, use proper pro-grade video cable, which has much heavier shielding. We use only quality RG-6 cable for video transmission up to 1500 feet.

Use of wall jacks makes installation easy and allows you to have either RCA or Coax type connections on them. Many of the newer DVD players, TV's and Home theater receivers have RCA outputs for 2 or more monitors. Use these outputs to send your signals or purchase a commercial video switcher / amplifier. If you need to split a video signal, it is possible to use Y adapters and splicing the wire, but keep in mind the more you do so, the more the signal starts to degrade. It is recommended you use an amplified splitter.
This one also amplifies audio signals.
For up to 6 zones.

Video

Another alternative is to use a RF modulator. These devices take the video and audio signals and convert them to a signal viewable on a TV channel. You can even use multiple ones with filters and inject your own 'stations' onto your home cable wiring.

That is what the coax line is used for in the photo. This wiring closet also housed this home's DVD player. A modulater set to channel 56 injected the signal into the homes cable wiring, a special in-line filter - stripped the channel clean before the modulator.
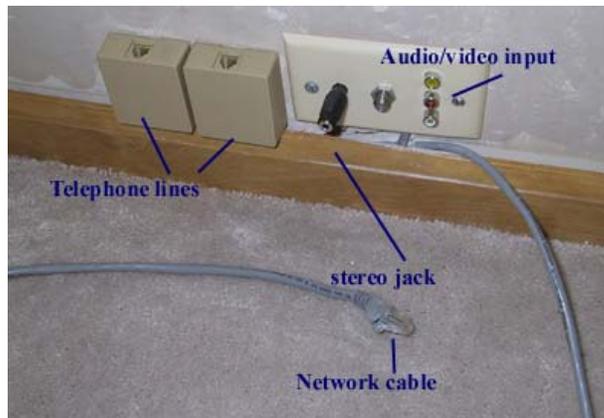
Example of an RF modulator. The DVD player had 2 sets of RCA outputs, one set was connected to the inputs of the modulator unit.

Infrared IR

With automation systems, especially ones controlled by Homeseer software, you will want to send IR signals from the computer to the audio/video components you wish to control using X10 commands

This can be done with any pair of wires, from the unused pair in your telephone wiring to an extra pair of speaker wire or pair of wires in a Cat 5 bundle. We generally use a pair of wires in a Cat 5 bundle to run the IR signal from the computer to where it needs to go. If we need the computer to send not only to the home entertainment room, but the living room TV and the pool stereo we simply run the pair of wires there also - Generally run to each zone.

By using Cat 5 for this wire, we also have an extra 3 wires for installing IR receivers in each zone. IR Receivers can be built into the volume control for each zone:
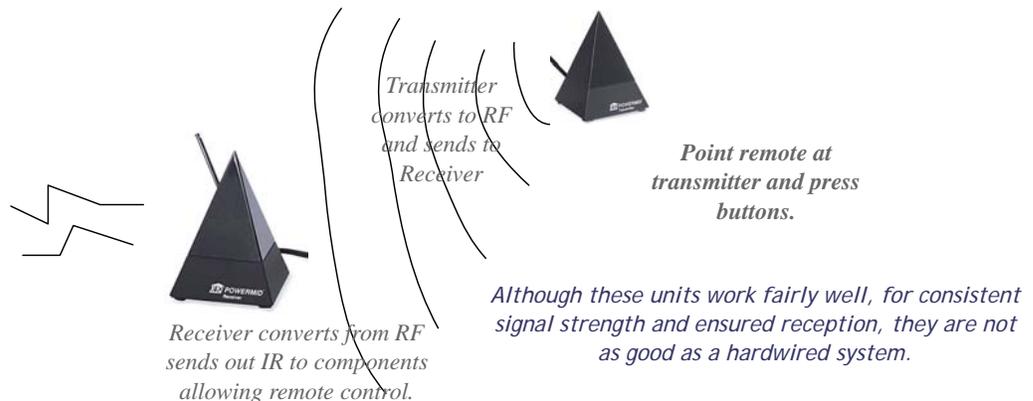
The 3 wires are connected to a connection block (shown below)

The connection block has mini plug outputs which you can use, self stick mini emitters with

Infrared IR

You can also choose to use wireless IR transmitters. These consist of a base unit you put in each zone, which you point your remote at, it converts the signal to RF and sends it to the receiver which is placed in front of the component you wish to control. By using the same brand of wireless system, you can have one receiver and many transmitters.

Transmitter converts to RF and sends to Receiver

Point remote at transmitter and press buttons.

Receiver converts from RF sends out IR to components allowing remote control.

Although these units work fairly well, for consistent signal strength and ensured reception, they are not as good as a hardwired system.

There are three main problems associated with X-10 based automation:

- RF command reception problems.
   This occurs when stray RF commands from other automation systems in the area cause
   interference with your system. Aside from shielding your building from outside RF (not
   feasible), your other option is to change the 'house' code of your devices.

Monitor your computer programs logs to see if stray RF is a problem in your area. The Homeseer program logging feature is terrific for monitoring.

- Phase related powerline command reception problems.

On a standard North American wiring system, larger buildings are supplied by two 'legs' of a
transformer (the transformer is the big box outside your building, or on the power pole,
which has high voltage coming into it, and outputs lower 110/220 volts). Sometimes your X-10 signals have to travel from the end of one leg (where you plugged in your interface or transceiver) all the way back to the transformer and back out, up the other leg.

By the time the signal makes this journey, it may be too weak to activate any modules.

Symptom: Modules in certain parts of the home work sometimes, or not at all.
Diagnosis: Turning on 220V appliances (such as electric stove) allows modules to work.

There is also the related problem of the X10 signal simply not being strong enough to active modules far away, such as in homes over 3000 sqft. To combat these problems the industry has developed, Couplers and Amplifiers/Repeaters.

Coupler: *This device, also known as a signal bridge, allows the X-10 signals to pass between the two legs (phases) of the power supply, without having to make the trip to the transformer and back. Signal bridges can be active or passive. Most passive signal bridges are nothing more than a 0.1 mfd 300 VAC capacitor connecting the two hot legs. There is nothing wrong in using a capacitor as a low impedence pathway for X10 signals and for most users works fine. These can be installed in many unobtrusive ways and will even fit right inside any breaker box or unused 220V AC outlet. Keep in mind however that it is against most building codes to do so, be sure to check with your licensing authority.*

standard 220 outlets have a neutral and 2 hot wires

0.1 mfd
300 VAC

tip: try moving your transceiver or computer interface closer to the breaker box first.

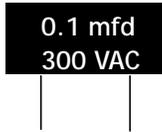*The capacitor connects the two hot wires*

Commercially available couplers can either be wired in by a licensed electrician, or there are plug in versions available also.
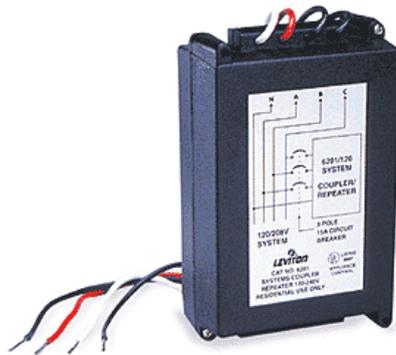

Leviton Signal Bridge $45

Signalinc plug in Signal bridges $90

0.1 mfd
300 VAC

Capacitor $0.50

- Amplifiers and Repeaters

Somtimes simply coupling the two legs (or more if a nonstandard set up) of the power supply still does not fix the problems with all modules. The following devices listen for the X10 commands and amplify or repeat signals which require it.

Leviton signal amplifier/repeater boosts signals to 7V! $165

A must for larger installs over 3000 sqft.

Troubleshooting summary:

1. Ensure you are transmitting and receiving commands. Use your computer log to verify.

2. Try moving your transceiver closer to the breaker box. If using a computer interface, try
    moving it closer to the breaker box. It is ok to lengthen the 'telephone' wire

connection to
the computer interface. We usually run Cat 5 from the automation computer to the breaker
box on new installs anyway. Use the conductors in this to carry the signals, simply wire in
some 'telephone jack' connectors to simplify installation and removal.

3. If your knowledge and electrical codes allow, use an inexpensive capacitor signal bridge.

4. Install AC power filters on your major appliances, TV's, computers and any AC motors.

5. Do not have your modules plugged into any AC filters or power strips - these do not pass
the X-10 signals.

6. Use commercially available couplers, repeaters and amplifiers.

Automation 101 : Network Primer

Networking

To get the most out of your automation system a network connecting your computers is
very useful. The benefits of networking your computers are many:

- *Ability to control your Homesee program from other computers.*
- *Access files on connected computers.*
- *Share peripherals such as printers among your computers.*

Automation systems should have a broadband connection to the Internet if you are pulling
data (such as weather information) or if you are sending data (such as video clips from your
security cameras.
A broadband connection can be a cable modem, DSL modem, or even via a satellite link.

The following items are needed:

- *Network card for each computer*
- *Router to 'split' the signals to each computer*
- *Gateway/Firewall to connect to your modem (Cable, DSL or satellite)*

Your network can be either wireless or wired. Current wireless technology is good, but

there
are some security issues and the costs can be rather high for some users. There are also ways
to network your computers via phoneline (HomePNA) and over the powerline. You can even
mix & match these technologies with each other using the appropriate 'bridges'. We currently
encourage customers to stick with traditional wired (Ethernet or Fast Ethernet), unless they
are unable to run the CAT5 wire - such as in leased buildings or apartments where it may be
prohibited. Of course, some customers simply do not want the added hassle or expense of
running additional wiring. If that is the case, steer clear of HomePNA and powerline for the
time being, and go wireless. The phoneline technology is still rather new and sometimes buggy,
and with automation systems using the powerline for signals already, it is not a good idea to
use it for network traffic also.

When setting up an ethernet network, be sure to select components rated 10/100. This is
the speed at which traffic can flow on your wires in MegaBits per Second. 10 MBPS will work
for most network applications, but for a slightly increased cost you can go with 100 MBPS
a speed which is required for better streaming video and audio.

Ethernet Network Overview: We recommend the following network and components.

- Broadband Internet connection
- Linksys Cable/DSL Router (under $100)
- Ethernet network card for each PC - ensure it is 10/100 (under $25 each pc)
- Cat 5 or Cat 5e network cable ran to each PC from the Router.

We choose the Linksys cable/DSL Router (such as the BEFSR41).
It is very simple to set up and the documentation with it is excellent.
The Linksys combines security with distribution and is inexpensive.

Follow the instructions that came with your Linksys to set it up. You will need to know the

connection information for your broadband setup - the install directions explain all this.

Most any Ethernet card will work, however for ensured compatibility choose a 3com brand.

Installing your network card.

1. Always back up important files before installing any new hardware or software.
2. Put together, and follow, a plan that includes:
    - the PCs you're going to network,
    - their operating system(s) & where they'll be positioned
    - what printers and drives you'll want to share, and how you'll access the Internet
3. Follow the network adapter installation steps in the documented order
    some require hardware first, others need software first.
    Note that in some cases you may be prompted to restart your PC several times while
    installing a network adapter. In fact, if you find the installation doesn't work,
    restarting once or twice will often solve the problem.
4. Keep your original operating system disk on hand you will be prompted for it.
5. You may receive a version conflict message during installation stating that a file
    about to be copied to your system is older than a file already on your computer
    choose to keep the newer file that's already on your system.
6. If installing a network adapter inside a PC, be sure that you turn off and unplug the
    computer before inserting the new card to prevent damage to your PC.

You need to configure each PC you installed a network adapter in for it to communicate with
other PCs on your network. This process is accomplished using the Windows Network configuration utility found by clicking Start/Settings/Control Panel/Network.

Before your computers can 'see' each other on the network, the following must be done:

- Have a working network adapter in each computer
- Each computer must have a unique name
- Each computer must have a common workgroup name.

These tasks can all be accomplished using the Windows Network Configuration Utility.

For further details on Networking, do a search on the internet for 'Home networking'

Automation 101 : Automation Examples and tips

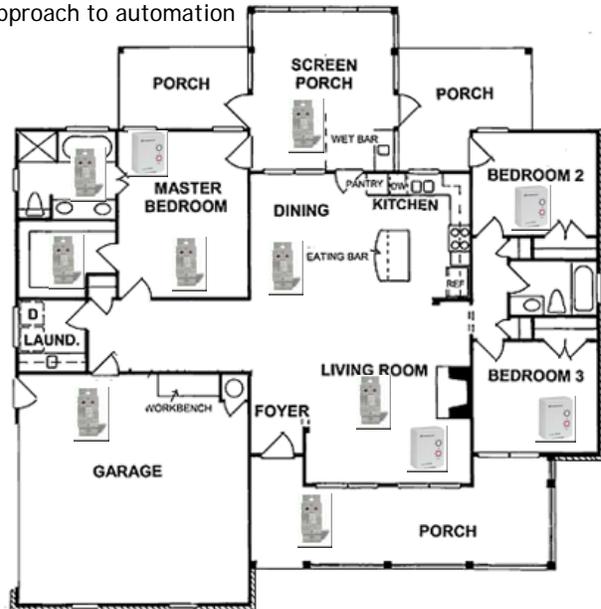Let us show you one homeowners approach to automation
Key features desired were:

Security
Light automation
Weather reports
Caller ID

Lighting control:

WS467 in Living, M. Bedroom, Closet & Bath, Garage, F & R Porch lights, Dining - 8 total. Controlling ceiling lights.

LM465 in Living, bedrooms 2 and 3, & master bedroom. 4 total Controlling table lamps.

The homeowner set up the computer running Homeseer in Bedroom 2,

Computer specs:
500 MHZ Celeron Chip, 128 MB ram
Internet and telephone connection

Audio distribution was:

**Inwall speakers:**
Screen porch & living room.
Volume control was built into the wall and each speaker was powered by an inexpensive reciever under the kitchen cabinets.

Computer speakers:
Master Bedroom, Bath & Garage
Local volume control on speakers, Plugged into appliance modules AM486 (3 total), to control.

IR from Homeseer was ran to the Living room center and to the receiver controlling the inwall speakers.
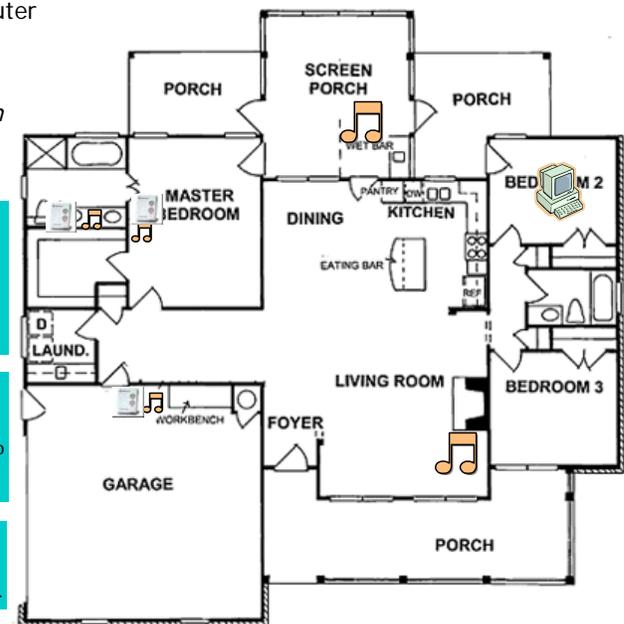
Final touches included motion sensors, wireless cameras and, slim keypads for special functions.

Motion sensors were installed in the screen porch, front porch and in the garage. 3 total.

A wireless camera was set up by the front door & rear porch 2 total.
The receiver was put in the Living room, with the RCA video output split to the Homeseer computer and the TV in the living room.

3 button Wireless switch was put in the Foyer area to notify the system of home/away status and to control playing of mp3's via winamp
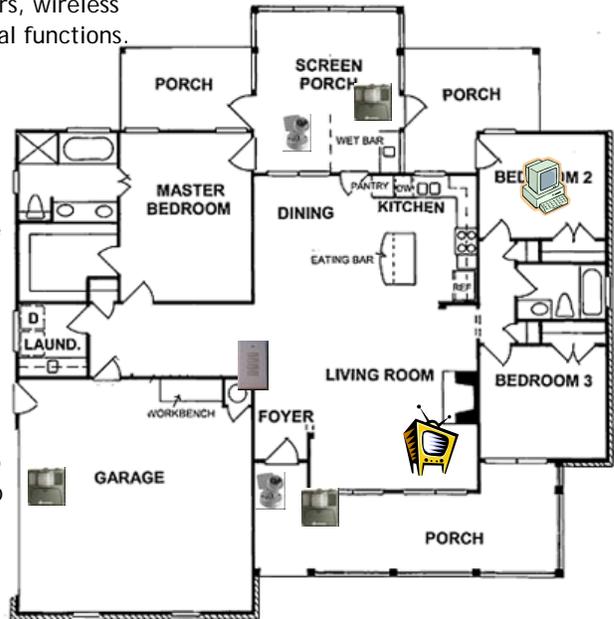
Tips & Hints:

- Set up a timed event to send an On or Off signal to keep certain items on or off.

- Use in-line modules to control individual banks of lights controlled by one switch.

- Use Appliance or Wall socket module for to turn computers on/off. This was used by
  GTE to remotely reset locked servers.

- Plug coffee pots into controlled outlets, send OFF signal at certain times.

- Use X10 controlled chimes/horns as emergency signals in large buildings.

- Plug room air conditioners into controlled outlets, send On or Off signal depending on
  downloaded weather temperatures.

- Set up a motion sensor at your front door. Have it trigger an event which turns on the
  front camera, sounds a chime and records the video of who triggered it.

- Set up a motion sensor around the pool area.   Have it trigger alarm based on motion.
      Set up an event to 'turn on' or 'turn off' the sensor based on button press.

You will be
  alerted when pool area is on, and no alarm will ring when in 'off' mode.

- Use motion sensor in model home to turn demo VCR or music on when room is occupied.

- Use Universal Module to open/close garage door based on X10

- Use light modules or floodlamps for your boathouse, turn on/off from boat or home.

- Set up floodlamp with motion sensor to turn on when you pull up in driveway.

- Activate all front lights with X10 based on time of day or motion.

- Set up all holiday decorations with X10 to turn on off based on time of day.

- Control vacation home lighting with X10, log in remotely via Homeseer or telephone.

- Set up an event to turn on all lights in the house and sound chime. 'Panic' button.

-     - Set up Goodbye and Home events which turn items on/off when you arrive /leave.

- For confined or handicap individuals, set up a palm pad to handle tasks for them.

- Use light modules or floodlamps for your barn or remote buildings.

- Set up X10 controlled relays to turn on/off your sprinkler system.

- If you have a barking dog, simply turn on the sprinkler each time he starts barking.

- Use X10 to control motorized fireplace dampers.

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