



Troubleshooting X10

This article assumes a basic knowledge of X10 addresses and commands. For more information see <http://www.envioustechnology.com.au/support/x10.php>.

X10 is often mentioned in the same sentence as 'wireless' systems, or described as an alternative to hard-wired systems. In reality, X10 IS a hard-wired system, it just so happens that the hard-wiring is your home's existing electrical wiring network. This is the single most important feature of X10 – making it simple and cost-effective to install.

Certain aspects of your home's electrical wiring, as well as the fact that X10 shares the electrical wiring with your home's lights and appliances, means that in some installations there may be elements to be aware of which may contribute to signal range or other transmission problems. These problems may include the following:

Thee-Phase Power:

Ever heard of three-phase power? You may have noticed that the power poles generally carry four power wires, which consist of a neutral wire and three phase wires. Most homes only have two of these wires – one of the three phase wires and the neutral wire. Such installations are called "single-phase". X10 can travel between all circuits (lighting, power etc) if they are connected to the same phase.

In larger homes though, three-phase power may be required for devices such as central air-conditioning systems or simply to balance the electrical load. In these installations, all three phases (four wires) are connected to the home, and this is called three-phase power. X10 signals can not jump across from one phase to another (the wires are totally separated) without the use of a phase coupler. Different phase coupling options are available, including the use of three single phase filters (FD10's) wired together for coupling. The best option is the use of the active CR244 three-phase coupler. The FD10 option is cheaper, however it is 'passive' which means that it simply allows the X10 signal to pass from one phase to the other. The CR244 is 'active' meaning that it physically re-transmits the command onto the other phases – adding favourably to the reliability and range of the system. Note that if you have three phase power and you are using micromodules then for technical reasons you'll need the CR244 for phase coupling.

Electrical Pollution:

Going by several names, including 'noise' and 'interference', electrical pollution is basically frequencies superimposed onto the normal 50Hz sine wave of the mains power. This 'noise' comes from devices in your home that fail to clean up their own residual frequencies, resulting in these being released onto the electrical wiring – hence the term electrical pollution.

As an X10 signal is also a high frequency signal superimposed onto the electrical wiring (deliberately), if any interference is present with a similar frequency to the X10 signal then the range of the X10 transmission may reduce and certain Receiver Modules may not respond to commands. Filter modules are available to isolate this noise. Further information on sourcing and filtering noise is covered in the next section.

Range:

Like most communication methods, X10 signals lose strength the further and further away they get from the transmitter. In a typical home the distance the X10 signal will travel is around 80m, which includes the provision for some cable branching, a standard amount of 'noise' etc. If the receiver is too far away from the transmitter, then it will stop responding. Methods for detecting and rectifying range issues are shown below.

Troubleshooting Procedures

If you don't have three-phase power or you have a coupler installed and are still experiencing problems with your system, then the issue is likely to lie with either range, noise or a problem with the module itself. These problems are not overly common, however, should they occur, filters and repeaters ensure that in nearly all circumstances they can be resolved.

Before testing for noise, the very first thing to check is whether the module is actually working. This could be difficult if you only have one transmitter and one receiver, but if you have two or more of either type then it's much easier. Simply plug the transmitter and receiver into the same power point (maybe using a double-adaptor), to negate the effects of poor signal range or noise. Test whether the transmitter can control the receiver. If it can't and you're sure that the X10 addresses are configured correctly and being operated correctly then you may have a faulty module.

If you have a second receiver module, test it in a similar fashion. If the second receiver works, you know that the transmitter is not at fault and that it is more than likely a problem with the first receiver. If the second receiver doesn't work either then probably the transmitter at fault and you should consult your place of purchase for more information.

If you have no problem controlling the devices when they're installed in the same power outlet but you can't control them when they're in their required locations, then the problem is 99% likely to be related to one of the following issues:

Signal appears at wrong location on the electrical sine wave:

This is a very rare and unlikely problem which would only happen in large industrial-commercial installations where there is a large inductive/capacitive loading effect. As such we will discount it as unlikely to be the cause of your problem.

Signal strength is insufficient:

As the X10 signal has a range of around 80m in the average home, it is possible that by the time the signal reaches its destination its strength may have deteriorated to a level that the receiver module can't respond to. Remember that if your transmitter is on the power circuit (power fuse in your home) and the receiver is on a light circuit, then the signal has to travel to the fuse box and back out along the other circuit to reach the destination. So just because they're in the same room doesn't mean the signal doesn't have a long way to travel.

If you have three-phase power and have installed passive coupling (FD10 filters) then we recommend upgrading to the CR244 active repeater, which will increase the range. If you have a single-phase home then you could install a single-phase repeater unit, the SVX10. This device will re-transmit any signal that it receives, extending the range. It is best installed in the fuse box, which is often a mid-point to X10 transmissions that have to travel across different circuits in your home (separate lights & power circuits, etc).

Excessive electrical pollution (noise):

The fact that electrical pollution can affect the transmission of X10 signals makes sense - after all, it can be difficult for humans to communicate in a noisy environment even by yelling and yet a whisper is sufficient when there is no background noise. Different X10 modules work better than some in noisy situations. For example, the A10 range of modules have more advanced circuitry that lets them distinguish between valid signals and noise, as well as being able to pick up signals down to much lower signals strengths.

The best way to work out whether you are experiencing noise related issues is to eliminate the possible noise from the source - the appliances. Unplug from the power outlet devices which may be causing the interference, starting with flat panel TV's, computers, motors, microwave and fluorescent or energy-saver lamps (Note: Don't assume that an electronic device can only generate noise when it is switched on, if you suspect something in particular may be generating noise then unplug it!). Once that is done, again try controlling the X10 devices that were not responding. If they work then one of the devices that you turned off was generating noise affecting the signal, so we just now need to find which one. If the system still doesn't work then turn off the remaining devices in your home and then the X10 products should work after that (unless there's a range problem, see 'signal strength' above).

Next, plug in and turn the devices back on one-by-one and after each one is turned on test the receiver. At the point where it stops responding again you'll know that the last thing you turned back on is generating noise sufficient to affect the receiver. That device can then be isolated so that the noise generated does not affect your system. Plug in appliances can be isolated using the FM10 plug-in filter, wired in appliances or complete circuits can be isolated using the AF300 blocking filter.

It may be possible that noise is coming from a particular lighting circuit, and not an appliance. If you notice that certain devices aren't responding when lights are on first try turning all of your lights on (the affected X10 devices shouldn't respond). Then try turning one of your light circuits off at the switch board. If your X10 system works then one of the lights on that circuit is at fault. If you do not have any X10 receivers on that light circuit you may wish to filter the whole circuit using an AF300 filter. If you do have X10 devices on that circuit then you won't be able to filter the entire circuit and will need to find the light generating the interference. This can be done by switching off all of the lights on that circuit one by one (after switching the breaker back on!) until the X10 system responds. When you find the light in particular it can be filtered by installing an AF300 filter on the output side of the switch.

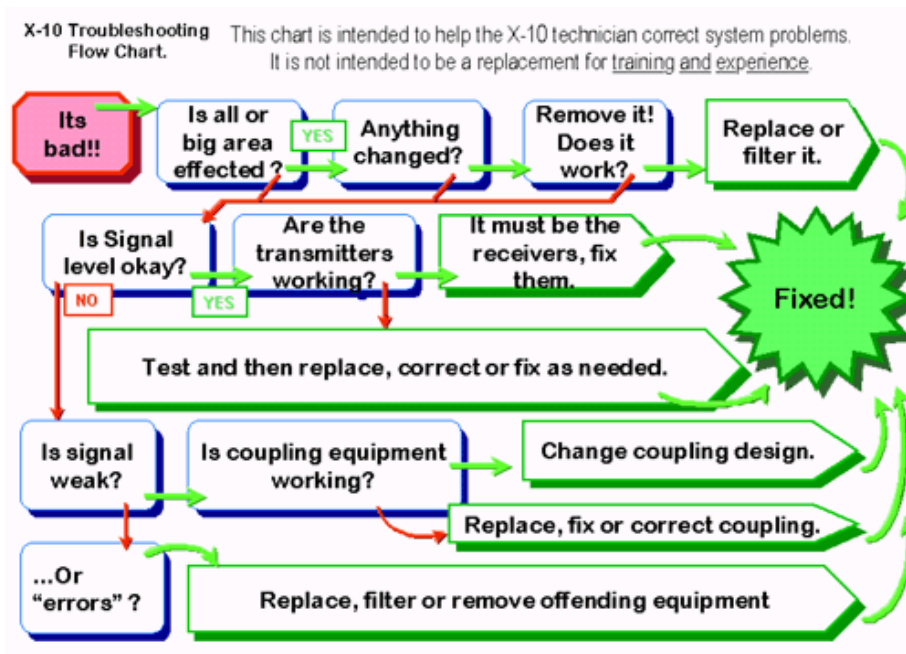
If turning everything off does not solve the problem, then it's possible you have some stray noise coming in from the street. You may then wish to install the FD10 filter (you'll need three for three phase power) into your switch board to filter this noise. Note: FD10's can also be used for coupling three phases however they are passive couplers only. The CR244 active coupler however is not a filter. It is possible to install 3 x FD10's in a filtering only configuration to be used in conjunction with the CR244.

If you have an AT004 Test Receiver unit, this product can provide quantitative results regarding noise levels. The AT004 will display both the X10 signal strength as well as the level of noise in the system. You can test the noise level and signal strength in each location you wish to install an X10 receiver, normally the X10 signal needs to be around twice the level of the noise level in order for it to be received correctly. Also, you can write down the noise level after each device you have turned off in the procedure above, which will allow you to see the noise attributable to each appliance (maybe the problem isn't with one appliance in particular, but several which together cause the issue).

Trouble-Shooting Flow Chart

The following is a flow chart of the troubleshooting procedure to be followed should you have problems with your X10 installation. Note that it is a guide only and includes questions you may not be able to answer without X10 test equipment (eg. To measure signal strength). Should you have persistent problems please contact your X10 dealer or installer. Flow charts used with permission from Phil Kingery and ACT.

Simple version:



Detailed version:

X-10 Troubleshooting Flow Chart.

This general X-10 troubleshooting chart is intended to be a foundation which the X-10 technician can use to help determine and correct X-10 system problems. It is not intended to be a replacement for training and experience. It is assumed that the technician on site is knowledgeable with standard X-10 test equipment and devices.



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