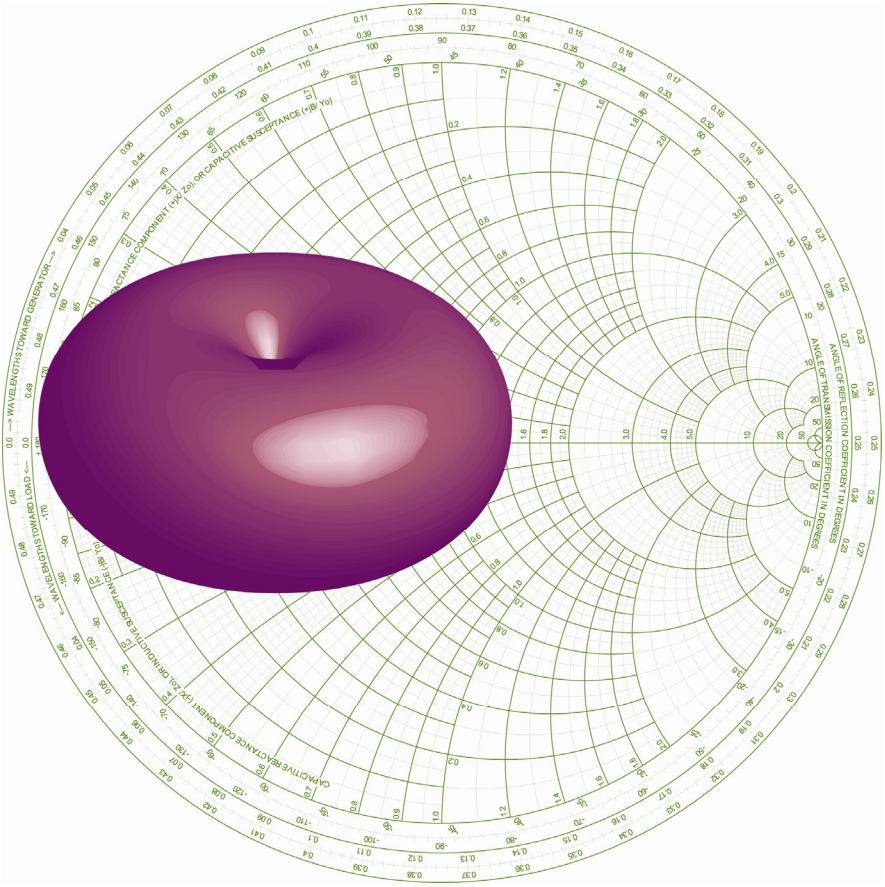
Guidance Notes for Wireless Alarm System Installations



COOPER Security

Scantronic

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Cooper Security Limited make every possible effort to update manuals and guides regularly to reflect changes in the product. If this document does not reflect the function of the product please let us know. You may be able to download a more recent version of the document from our website:

www.coopersecurity.co.uk

Cooper Security Ltd always advise that, in accordance with industry best practice, prior to the installation of a radio based system the installer carries out a radio site survey to ensure that the use of radio equipment is feasible at the location (see page 8).

Cooper Security Ltd cannot be held accountable for the incorrect installation or inappropriate use of our radio system products.

Whilst we endeavour to offer the highest level of customer support for all our products, if we are called to attend a site where it is discovered that radio equipment has been installed incorrectly or a radio site survey has not been carried out prior to installation the installer is liable for the full cost of our radio site survey

Cooper Security Ltd will carry out an advance radio site survey on behalf of any installer, for which a fee is payable.

By continuing to install the product it is acknowledged that the installer has read and agrees to the conditions outlined above.

How Can I Get the Best Performance?

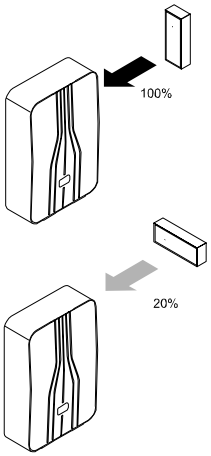
Wireless alarm systems are as reliable as the more traditional wired systems. However, you can get the best performance out of a system by installing each component in the optimum place for radio reception and transmission. These notes contain hints that will help you to identify those places.

The most important objective in a wireless installation is to make sure that the receiver can pick up an adequate signal. There are several factors that can weaken the signal on its way from the transmitter. Generally speaking these are polarity, absorption, reflection and interference. To keep things simple we'll deal with each of these in turn, but don't forget that in real life all of these things can be happening at the same time.

Polarity

Even when there are no obstructions between transmitter and receiver the way that the aerials within the transmitters are shaped means that they send a stronger signal in some directions, and a weaker signal in others.

All Scantronic transmitters are designed to send their signal as evenly as possible in all directions when the product is placed "upright". The aerial in the receiver is designed for good all-over reception, but performs better when signals are coming in from transmitters at the same height as the receiver. In addition, both receiver and transmitter use "vertically polarised" radio waves.

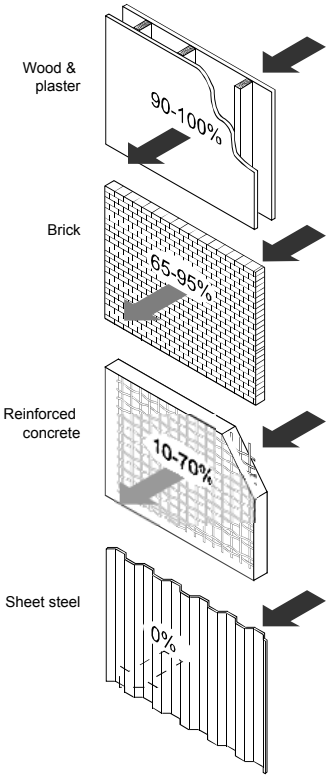


So, when you are thinking about where in a building the transmitters and receiver should go, you must remember to place them all the **same** way up and all the **right** way up.

Absorption.

Generally, radio waves travel in straight lines in the same way as visible light. Like visible light, radio waves are absorbed by materials. But, radio waves are absorbed by different materials to visible light, and can pass through some things that visible light cannot.

The diagram on the right gives you some idea of how well different materials absorb radio waves.



You also have to allow for the fact that the Earth itself will absorb radio waves. To lessen this effect you should mount the transmitters and receiver as high as possible. At the very least, you should mount transmitters and receivers more than one meter above floor level.

Reflection

Since radio waves travel in the same way as visible light, they can be reflected, and by many of the same things that visible light is reflected by. The most important reflector of radio waves is sheet metal. This means that, for example, metal foil coated plaster board can completely reflect the radio signals from a transmitter, as can mirrors, or copper hot water cylinders.

If you intend to transmit between buildings, then glass is a special problem to watch out for. Ordinary window glass is as transparent to radio waves as it is to light. However, many modern exterior windows have a thin, invisible, metallic coating to improve their insulation properties. This coating is very opaque to radio. For example,

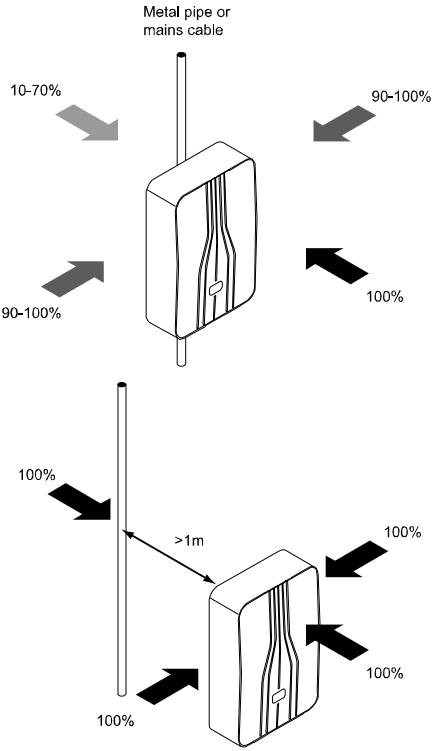
windows made of commonly available insulating glass can reflect up to 90% of the signals from a transmitter. If your transmitters and receivers are all going to be sited inside the same building (for example in a domestic installation) then metal coated glass external windows should not cause a problem.

One way that radio waves differ from visible light is that they can also be reflected by fine wire meshes, for example by chicken wire fences, or fire safety glass (which has an embedded wire mesh).

Even though you may think that there are no metal sheets or films near your transmitters, don't forget that reinforcing bars in cement can act as reflectors, as can the sheet metal flooring in many flats and commercial buildings, and also the wire mesh used on some thatched roofs.

Finally, because of the nature of radio compared with visible light, cables and wiring have a much greater effect on radio.

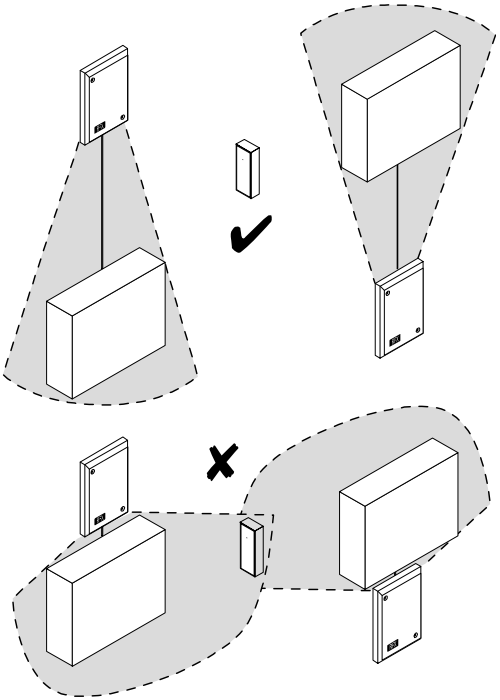
A single long cable next to a transmitter's aerial can act as a reflector, blocking the signal from the transmitter over a large angle in the direction of the cable. For that reason it is a good idea to avoid putting a transmitter or receiver any closer than 1m to a cable run, metal piping, or other wiring.



Also, If using remote aerials, never run the cable to the aerial in parallel with water pipes or other cabling unless they are more than 1m away. If you have to cross such obstacles, cross at 90 degrees.

Wireless alarm system control units have to have a standby battery. This battery is a very good reflector/absorber of radio signals. This is one of the reasons why Cooper Security recommend that you mount radio or hybrid control units vertically, so that the aerials are above the battery. In this position the battery does not block signals from transmitters on the same level as the receiver.

If the receiver is in a separate box to the control unit, as in a radio expander, you should fit the receiver at least 1m away from the control unit. If you fit the receiver immediately above the control unit then the case of the control unit will block signals from the receiver, and it will give poor performance. (Never put the receiver directly under the control unit.)



The same problem is caused by any metal box, for example a mains supply consumer unit, or water cylinder. Never mount transmitters or receivers directly below large metal objects.

Interference

Many products give off radio waves at a variety of different frequencies. A good receiver will ignore all radio frequencies EXCEPT for the one it is designed to receive.

All Cooper Security receivers operating on 868.6625MHz are using a frequency specifically reserved for wire-free alarm systems. In addition Cooper Security receivers use high performance SAW (Surface Acoustic Wave) filters to reject signals on nearby frequencies. However, if there are lots of signals from other products transmitting on the same frequency, then the receiver may well lose the ability to "hear" the correct signal above the background noise.

In addition to signals on the same frequency, if a receiver is near to a powerful transmitter then, even though they are operating on different frequencies, the strength of the electrical fields from the transmitter can block (or even damage) the receiver. So never install a transmitter or receiver (including a radio expander) closer than 1m to a radio source, other electronic devices, or heavy duty electrical equipment.

Even though some electrical devices like digital clocks may only generate very low power interfering signals, when they are a metre or less from the alarm system receiver they can be "noisy" enough to swamp the signals from alarm system transmitters which are much further away.

As an analogy, think of a midge buzzing inside your ear. Even though the midge is small, it can blot out the noise of a loud television on the other side of the room.

The interference disappears as the distance between the two units increases. One metre is considered the closest distance for best performance.

Note that legal WiFi devices and DECT portable home phones that operate on 2.4GHz or 1.9GHz do not cause problems, apart from when they are very close to the alarm system receiver.

Jamming

Scantronic receivers can detect interference. If interference is present for more than 25 seconds out of 60 then the receiver reports "jamming" (usually by operating an output or making a LED glow). If the receiver hears no interference for 60 seconds then the receiver cancels the "jamming" report.

This means that if you are trying to find the source of an interfering signal by switching off devices that may be generating the interference then you should wait at least 60 seconds for a "jamming" indication to clear. You could easily miss the effect of switching off the offending device by not giving the receiver long enough to register that the interference has gone.

Radio Site Survey

It is very difficult to predict exactly, just by looking at a site, how well the transmitters and receivers of a wireless alarm installation will perform. Cooper Security **strongly** recommend that you measure the radio environment at a site before you start the installation.

Site Survey With The 790r

The 790r signal strength meter is specifically designed to help you carry out a radio site survey at 868MHz. The 790r works with a test transmitter, the 734REUR-01, that you place at the position you think will work for the **receiver**. When you switch the transmitter on you can tour the site with the 790r and measure how strong the signal is at each of your proposed transmitter locations. This procedure works because radio waves do not care in which direction they travel along a particular path. They will experience the same conditions going from A to B as they do going from B to A.

The front of the 790r shows graphically the strength of the signal it picks up from the test transmitter. The 790r and 734 are calibrated so that they show signal strength in "units". Cooper Security recommend that for the best operation of any 868MHz device the 790r should show between four and nine units of signal strength. If the

790r shows less than four units then the transmitter (or receiver) are probably in a bad position.

When you alter the position of either the receiver or transmitter you may not have to move either of them very far in order to improve the signal strength. Because radio waves at 868MHz are only about 350mm long, reflections of the waves over different paths may give you 'hot spots' of good reception quite nearby. Try moving the 790r around slowly near to the original position (roughly 80mm - 100mm away) to see if you can improve reception before you decide to choose a very different site for a transmitter/receiver.

The 790r will also let you listen to the signal from the test transmitter. You will hear a short "buzz" each time the 734r transmits. This will let you gain a good idea if there is any interference from other sources. If you have difficulty hearing the "buzz" from the test transmitter over any background noise then that position is probably too noisy for the device you plan to put there.

Control Unit Signal Strength Commands

All Scantronic 868MHz receivers have built-in signal strength measuring features. Once you have placed the receiver and its transmitters then you can use the signal strength commands provided by the receiver to check that it really can hear each of transmitters.

GSM Signals

Mobile phones on GSM networks are prone to the same problems as alarm system transmitters and receivers. If your alarm system uses a GSM module to report alarms then you must take care to select a good site for the module's aerial.

If you want to check the signal strength of a GSM network at the position you intend to install the aerial then you can use a mobile phone. However, be aware that you may get a false reading because:

1. Your mobile phone may not be using the same network as the one you intend for the GSM module. Provided that

your phone is unlocked then you should install the SIM card that you intend to use with the GSM module into your phone in order to carry out the tests.

2. You may not be holding your mobile phone in exactly the same position as the place you intend for the module's aerial. A difference of a few centimetres can make a big difference in signal strength.

Transmitting Between Buildings

If you want to site transmitters and receivers in separate buildings then pay special attention to problems caused by absorption and reflection by walls, especially those with exterior metal cladding. You may also need to extend the range of either the transmitters or the receivers. Several Cooper Security radio products allow you to attach remote external aerials for this purpose.

It is possible to use a 703r transmitter in mode 9 as a test transmitter. (This feature is documented in the 703r installation guide on page 25). The 703r takes an external antenna, giving greater range. **NOTE:** Make sure that you use the same antenna on the receiver in the final installation.

If you are using several receivers with remote aerials then make sure you place the remote aerials at least 3m metres apart.

Note: When installing external aerials make sure that you take suitable lightning precautions.

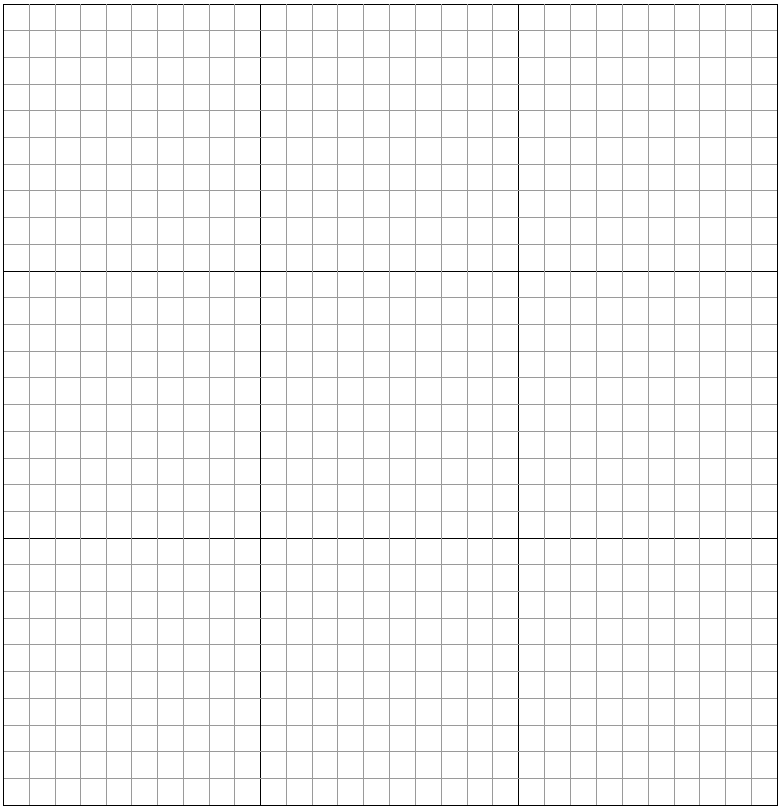
Finally

The information in this document is provided as a guide only, for use with Cooper Security 868 MHz radio transmitters and receivers. If you carry out a careful and methodical site survey you should be able to successfully install and commission Cooper Security radio products. To help you we have provided some blank forms on page 11 that you can use to record the results of your survey. For any further information please contact you local Cooper Security area account manager.

Radio Products Site Survey Sheet

Name and Contact Number		
Address		

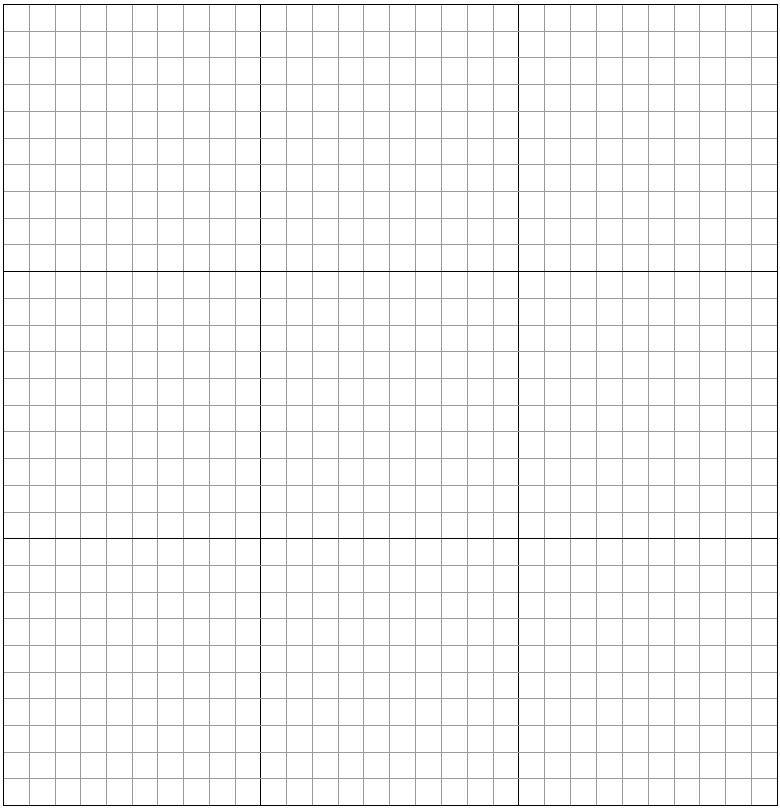
System Layout Diagram (floor 1)



Signal Strength Readings (0-9) Lowest acceptable signal strength is 4

Location	1-9	Location	1-9	Location	1-9	Location	1-9

System Layout Diagram (floor 2)



Signal Strength Readings (0-9) Lowest acceptable signal strength is 4

Location	1-9	Location	1-9	Location	1-9	Location	1-9

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