



**COOPER** Security

Why narrow-band?

# Not all 868 MHz systems are the same!

In recent years, the most commonly available frequency for short range, low power radio devices has been 433 MHz. This is used by a multitude of different types of equipment including alarms, headphones, radio-controlled toys, weather stations, etc. The widespread use of this frequency is the main cause of poor radio alarm system operation; after all, you can't drive around the M25 at 8 a.m. without getting caught in traffic. However, help is at hand. The new European R & TTE Directive 1995/5/EC has brought some order to the way the frequencies are used, by 'reserving' a new, narrow-band 868.6625 MHz frequency for alarm systems. Some people may not be aware of the revolutionary implications of the new European Directive: this is the first time that radio alarm systems have been able to use a frequency reserved for them alone.

But don't be confused by the false claims of manufacturers' simply offering '868 MHz' products. Unless they stipulate narrow-band, the result is no better than the previous 433 MHz offerings since wide-band 868 MHz products do not have the protection of this dedicated alarm frequency. 'Standard 868 MHz' products are still subject to interference from other products legally permitted to use the rest of the 868 MHz band, many of which have very high power outputs with the ability to 'jam' wide-band receivers.

By choosing narrow-band, it's like driving around the M25 in the middle of the night!

Many manufacturers of alarm systems have tried to develop solutions to cope with the congestion on the 433 MHz band by using systems with two or more frequencies, or complex spread-spectrum products. We, at Cooper Security, believe this is not the best solution, since a car driving along the M25 at 8 a.m. will always take much longer to cover a given distance than one driving the same route at midnight.



*Saturated general 433 MHz frequency*

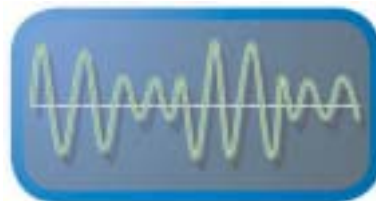


*Reserved Narrow-band 868 MHz frequency*

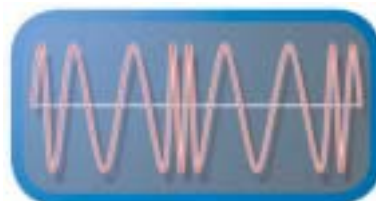
***Cooper Security was one of the first companies to launch genuine narrow-band 868.6625 MHz radio systems in Europe, and can rightfully claim to be the company with the greatest experience in the field.***

## RADIO MODULATION SYSTEMS

There are two possible ways of modulating a radio signal, namely amplitude modulation (AM) and frequency modulation (FM).



*Amplitude modulation, AM*



*Frequency modulation, FM*

As shown in the pictures above, in amplitude modulation the signal is not always at the same distance from environmental noise, but in frequency modulation it is. The receiver therefore has to operate with a considerable 'background noise'. Try switching your car radio to the AM band and finding a radio station with no background noise: it can't be done, no matter how good your radio is. Now try switching to the FM band and finding a radio station without noise: practically all stations will be free of background noise. Another useful feature of FM receivers is their capacity to tune to the strongest carrier (frequency): how often have you been trying to listen to an AM station when you find other stronger stations jumping on top and blocking your reception? This is almost unheard of on FM networks

Most wireless alarm systems use AM; Cooper Security only uses FM.

But Cooper Security's new 868.6625 MHz narrow-band technology goes beyond this, offering new levels of radio performance and reliability. The difference between our new narrow-band 868.6625 MHz secure radio and the existing 433 MHz and 868 MHz wide-band units is the difference between your old AM car radio and the latest DAB state-of-art listening experience!

Which would you prefer to listen to?

## RECEIVER BANDWIDTH

Radio receivers can only receive transmissions in their bandwidth; everything else is ignored. Greater bandwidth means less sophisticated transmitters and receivers, but it also increases the possibilities of receiving noise and interference. Conversely, with a narrower band everything has to be accurate and sophisticated, but the possibility of receiving noise is drastically reduced. This is why narrow-band systems are less common and more expensive.

Cooper Security only uses a narrow-band (20 kHz). If our system was converted to a wider band (200 kHz or more), it would be far cheaper - but would it be worth it? The market is already flooded with less professional, poorer performing, cheaper products.



Wide-Band



Narrow-Band

## RECEIVER TECHNOLOGY

With so many different products available on the market, we have become accustomed to receivers with antennae which may be integrated or external, single or double, polarized in one or two directions, etc.

Cooper Security developed its receivers after detailed research into the way that radio signals at 868 MHz are propagated inside buildings: when a transmitted signal strikes a solid body, such as a wall, some of it passes through in an attenuated form, and some of it is reflected. However, a reflected signal also undergoes a phase shift with respect to its original carrier. This sounds highly technical but the result is all too common – a 'dead spot'!



*Phase shifted signal not received*



*Dual Diversity Technology*

The 'dead spot' effect is worst at  $1/4$  of a wavelength, which is exactly the separation between the two antennae of the Cooper Security receiver. The two antennae (integrated and polarized, vertically and horizontally) are the visible aspect of an exclusive technology developed by Cooper Security, called Dual Diversity Technology. On receipt of a signal the receiver switches instantly between the two antennae and selects the strongest signal for processing, thus setting a new standard in alarm system receiver sensitivity and stability. The presence of two aerials in other products may not indicate the use of a true diversity system; some manufacturers merely connect the two aerials together, which is easier technically, but not effective.

## ANTI-COLLISION TECHNOLOGY

All receivers have one limitation in common: they can only handle one event at a time. This means that, where multiple reception occurs, at best one event is processed and the others are lost; at worst, none of the events are processed.

Cooper Security has developed an exclusive anti-collision communication protocol in which a data packet is retransmitted up to 6 times, even if it would have been sufficient for the receiver to receive it only once. The exclusivity lies in the fact that the time intervals between one packet and the next are randomised in the range from 120 ms to 2 seconds; each transmission is different from all the others!



*Possible collision*



*Collision prevented*

## SABOTAGE PREVENTION

There are two possible ways of sabotaging a radio system: by preventing the transmitter from transmitting, or by preventing the receiver from receiving.

To protect its transmitters, Cooper Security has fitted all of them with integrated antennae, anti-tamper protection which detects removal or opening, and a self-monitoring system whereby each transmitter sends a test signal every 29 minutes for normal security or every 4 minutes for higher security. If the receiver fails to receive this test transmission, it reacts in the pre-programmed way.

To prevent the receiver from operating correctly, it is necessary to generate a frequency identical to the operating frequency and transmit it at very high power; if the Cooper Security receiver detects radio interference for more than 30 seconds, it again reacts in a pre-programmed way.

## TRANSMITTER LEARNING

A receiver must be able to learn a transmitter in order to recognize and control it. Cooper Security's new narrow-band range does not use confusing DIP-switches; instead it offers a choice of radio learning or a unique, secure optical infrared method for which it holds an international patent.

The new Cooper Security narrow-band receivers are fitted with infrared receivers. To enable a transmitter to be learnt, it simply has to be made 'visible' to the receiver. This operation is safe and simple: there is no possibility of error.

## 868 MHZ NARROW-BAND RANGE

Part No.	Description	Replacement for	Battery Type	Max Power	9960 RFX		Homelink 75		762 & 768/9 Receivers			
					Internal Aerial		Internal Aerial		Internal Aerial		External Aerial	
					mW	Max Range	-6dB*	Max Range	-6dB*	Max Range	-6dB*	Max Range
701REUR-50	Pendant PA long range	4601-50	3v Li	10	N/A	N/A	300	150	700	350	1km	500
701REUR-60	Pendant short range	4601-60	3v Li	10	N/A	N/A	170	85	400	200	600	300
702REUR-00	Brooch pendant	4601-75	3v Li	1	N/A	N/A	75	38	175	88	250	125
703REUR-00	4-ch. programmable TX	4603/24	2 x AA	10	940	470	300	150	750	375	1km	500
705REUR-00	2-ch. hand-held PA	4605-55	3.6v Li 1/2 AA	10	N/A	N/A	180	90	430	215	610	305
706REUR-00	Lone worker tilt/ PA	4606-55	3.6v Li 1/2 AA	10	N/A	N/A	N/A	N/A	700	350	1km	500
714REUR-00	Small PIR	4608-60, 715-02	3v Li AA	10	750	375	250	125	600	300	1km	500
719REUR-02	P/E Smoke Detector TX	4609, 719-00	9v PP3 + 2 x AA	10	940	470	300	150	750	375	1km	500
723REUR-00	4-ch telecommand	NEW	3v Li Mn O <sub>2</sub> CR-2032	1	225	113	75	38	N/A	N/A	N/A	N/A
725REUR-50	4-ch telecommand	Existing	3v Li Mn O <sub>2</sub> 1/3 N	1	225	113	75	38	N/A	N/A	N/A	N/A
726REUR-50	Hand held long range PA	4602-55	3.6v Li 1/2 AA	10	875	438	300	150	700	375	1km	500
726REUR-60	Long range version	726-00	3.6v Li 1/2 AA	10	540	270	180	90	430	215	610	305
734REUR-00	Contact TX with analyser	4604, 735-50	3v Li CR2	10	750	375	250	125	600	300	1km	500
734REUR-01	FSL version	4604, 735-50	3v Li Mn O <sub>2</sub> CR2	10	750	375	250	125	600	300	1km	500
739REUR-00	BGD TX Sentrol 5845	NEW	3v Li Mn O <sub>2</sub> CR2	10	750	375	250	125	600	300	1km	500
7500REUR-21	Homelink 75 kit	NEW	Ni-Mh 6 x 1.2v	10 x 32 out puts	N/A	N/A	700	375	1km	500		
762REUR-00	2-ch programmable RX	4612-50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
768REUR-50	8-ch programmable RX	4618-50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
769REUR-00	8-ch expander	4619-50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
790REUR-00	Test meter	747-00	9v PP3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
792REUR-00	1/4 wave internal aerial	4594BO	N/A	N/A	N/A	N/A	N/A	N/A	YES	YES	YES	YES
794REUR-00	1/2 wave co-linear aerial	4595BO	N/A	N/A	N/A	N/A	N/A	N/A	YES	YES	YES	YES
797REUR-00	1/2 wave standard aerial	4597BO	N/A	N/A	N/A	N/A	N/A	N/A	YES	YES	YES	YES

\* -6dB attenuated reception is required by EN50131-5-3 test procedure.

Cooper Security is committed to increasing the reliability and professionalism of its products, but problem-free operation can only be achieved if installers follow certain simple procedures, such as radio coverage testing during the initial inspection.

Ask your regular distributor for information on the regular, free training courses run by Cooper Security to make radio communication more widely understood and the benefits available to all installers.