

Echo™ Installer Guide



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1. INTRODUCTION

The MK echo™ range of products are different from all other products in MK's Wiring Devices portfolio in so far as the switches are RF transmitters which communicate with Switch Receivers. It is the Switch Receivers that actually switch the mains power.

Echo™ Switch Transmitters send an RF signal at 868.3 MHz. The unique feature of these products is that the signal transmission is made without the need for mains power, or batteries.

Compared to installing hard-wired systems, wireless systems are much simpler and provide the flexibility to relocate or add to a system.

Switch Receivers are mains failure sensitive, i.e. they will function under all normal conditions but will switch off in the event of a power cut or dramatic interruption in mains voltage.

A symbol is visible on all Switch Receivers to indicate the position of the antenna. Although not always possible, the best reception will always be achieved if the front face of the Switch Transmitter is directly facing the surface of the Switch Receiver on which the antenna symbol is shown.

Based on the physical principle of the propagation of radio waves, certain basic conditions should be observed. The following simple recommendations are provided to ensure successful installation and reliable operation of a robust radio network.

NOTE: A FIELD STRENGTH TEST MEASUREMENT SHOULD BE CARRIED OUT PRIOR TO EACH INSTALLATION TO ENSURE COMPLETE RELIABILITY.

2. PRINCIPLES OF RADIO SIGNALS IN BUILDINGS

As stated in the introduction, echo Switch Transmitters send wireless transmissions to the echo Switch Receivers. The receiver checks the incoming signal for accuracy and uses the data to control outputs. Radio signals are electromagnetic waves; hence the signal becomes weaker the further it travels.

Please note that RF signals also decrease in strength by certain materials found in the general area between the transmitted signal and the receiver.

While radio waves can penetrate a wall, they are dampened more than on a direct line-of-sight path. A few examples of different types of wall and the realistic typical reduction in signal strength that can be seen are:

MATERIAL	ATTENUATION
Wood, plaster, uncoated glass, with no metal content	0 – 10%
Brick, pressed board	5 – 35%
Ferro-concrete	10 – 90%
Metal, aluminium lining	90 – 100%

In practice, this means that the material used in a building must be taken onto consideration during any assessment for radio coverage.

Here are some typical guideline figures when using Logic Plus style Switch Transmitters with plastic frontplates:

Line-of-sight connections:	typically 30m range in corridors, or up to 100m in halls
Plasterboard walls / dry wood:	typically 30m range, through 5 walls
Brick walls / aerated concrete:	typically 20m range, through 3 walls
Ferro-concrete walls / ceilings:	typically 10m range, through 1 ceiling

All other Switch Transmitters in the range, that have metal frontplates, do of course cause a reduction in the signal strength and therefore the transmission distance. Generally, the line of site distance in a hall is reduced from 100m described above for Logic Plus, down to 30m.

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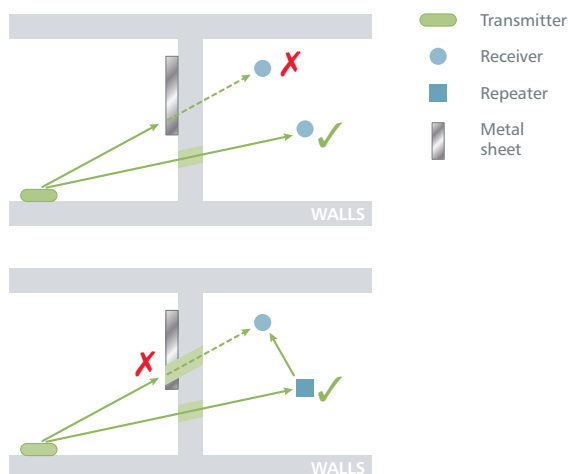
3. SCREENING

Objects made of metal, such as wall reinforcements, the metal foil often used in certain forms of insulations, or metallised heat protected glass, reflect electromagnetic waves and thus create what is known as a radio shadow and thereby a reduction in transmission distance.

The main factors decreasing coverage include:

- A Switch Transmitter mounted on metal surfaces (typically 30% loss of range).
- Switches with metal frontplates (typically 60% loss of range).
- Hollow lightweight walls filled with insulating wool on metal foil.
- Inserted ceilings with panels made of metal or carbon fibre.
- Lead glass or glass with metallised coating, steel furniture.

Please note: Fire-safety walls, elevator shafts, staircases and supply areas should be considered as screening.



Simple example of a possible screening problem.

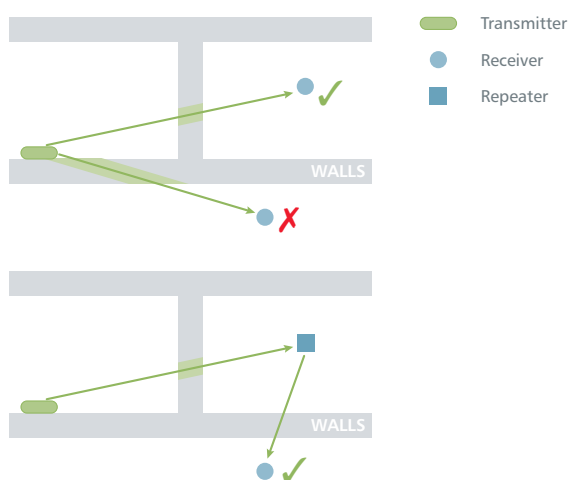
Dependent on the material used to build the walls and assuming the distance between the transmitters and receivers being within specification, the illustrations above show a typical screening problem.

For the best range performance a minimum distance of 10mm to 20mm, should be allowed from the whole length of the antenna to any conductive objects, which effectively means the area surrounding the Switch Receiver module.

Avoid screening by repositioning the Switch Transmitter and / or Receiver away from the screening objects (radio shadow), or if this is not possible, by using a Repeater.

4. PENETRATION ANGLE

The angle at which the transmitted signal hits the wall is very important. The effective wall thickness – and with it the signal attenuation – varies according to this angle. Signals should be transmitted as directly as possible through the wall. Wall niches should be avoided.

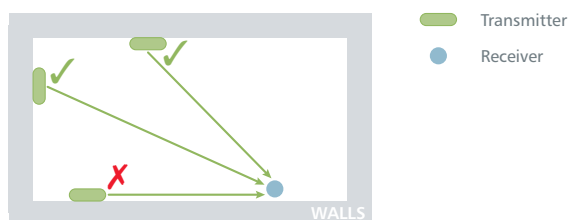


Avoid an unfavourable penetration angle by repositioning the Switch Transmitter and / or Receiver, or by using a Repeater.

Do not position a Switch Receiver behind a Switch Transmitter. In this position the signal strength is greatly reduced, even if there is no wall in-between.

5. ANTENNA INSTALLATION

Switch Receivers should not be installed on the same wall as the Switch Transmitter. When positioned near a wall, the radio waves are likely to be subject to interfering dispersions or reflections.

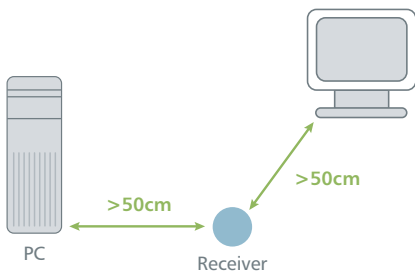


In a similar manner to the comment in the previous section, positioning transmitters and receivers along the same wall will mean the signal strength is greatly reduced.

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6. DISTANCE BETWEEN SWITCH RECEIVERS AND A SOURCE OF INTERFERENCE

The distance between Switch Receivers and other transmitters (e.g. GSM / DECT / wireless LAN) or high-frequency sources of interference (computers, audio and video equipment) should be at least 500mm. However, echo Switch Transmitters can be installed next to any other high-frequency transmitter without a problem.



7. USE OF REPEATERS

In the case of poor reception, it may be helpful to use a Repeater.

The echo Repeater (K5414R) does not require any configuration (e.g. programming) and will become operational simply by connecting it to the mains supply. The various possibilities of use are shown by the illustrations in sections 3. SCREENING and 4. PENETRATION ANGLE.

A Repeater has similar requirements in being positioned as a Switch Receiver, i.e. it too has an antenna and needs to receive the signal from the Switch Transmitter and be within range of the Switch Receiver with which it is intended to communicate.

While planning, it may be worth considering retrofitting the system with a Repeater.

In their basic function, Repeaters cannot be cascaded, transmitted signals that have been repeated once are not repeated again ("one-level" repeater).

Do not use too many Repeaters in a given installation as this is counterproductive (higher costs, cross-signal interference etc.)

8. FIELD STRENGTH INDICATOR

The K5419R is a mobile Field Strength Indicator enabling the installer to determine the ideal mounting positions for Switch Transmitters and Receivers. Furthermore, faulty connections of devices already installed can be checked. The unit shows the

field intensities of radio signals received and any interfering radio signals in the 868MHz range:

Using the Field Strength Indicator, allows the installer to review the strength of received signals at the proposed receiver locations – to ensure reliable operation you should aim to have consistent GREEN or AMBER signals on the indicator.

The meaning of the four LEDs at the top section of the Field Strength Indicator, are as follows:

- The right hand AMBER LED is headed "Telegram Valid". This signifies that an 868MHz signal has been detected.
- The left hand RED LED signifies that the signal strength is insufficient for a good installation. This LED will be illuminated immediately the Power button is switched on.
- The AMBER "Class A" LED signifies that the installation will be good. The only proviso to this is that the Switch Receiver is not to be recessed in the wall or have any further potential screening situated around it, which could further increase signal attenuation.
- GREEN, the "Class B" LED, ensures an excellent installation, even if there is a little further screening caused for instance, by mounting it below a wall surface, assuming this is not in a metal box.

To get the best results, always hold the Switch Transmitter exactly where it is intended to be installed and place the Field Strength Indicator exactly where the Receiver will be installed.

When the Transmitter is operated and the GREEN LED is illuminated, this signals that the receiving field force possesses sufficient power reserve for a reliable installation. There will be generous provision for subsequently changing conditions of the surroundings (i.e. additional screening caused by lightweight walls, shadowing by people etc.).

If the signal received is AMBER, repeat the test three times. If three AMBERS or a mixture of AMBER and GREEN are received, the installation will be good. The only proviso to this is that the Receiver is not to be recessed in the wall or further screened in any way, which in itself would increase any signal attenuation. If just RED appears during the three tests, the present intended installation is not acceptable.

If just the RED LED is illuminated, this indicates that the present intended installation is not acceptable.

If the signal is not good enough in the initial layout, consider rearranging the position of the Switch Receiver to see if the signal strength can be improved.

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How to use the Field Strength Indicator:

Person 1 operates the Switch Transmitter and generates the radio signal by pressing the switch. Person 2 checks the field strength received on the display of the device and thus determines the ideal position.

Alternatively, if conducting the investigation alone, press the "1 min." button on the Field Strength Indicator, then from the moment of pressing the Switch Transmitter, you have that long to return to the indicator to determine the suitability of the proposed installation.



Field Strength Indicator K5419R.

The Field Strength Indicator can be used for on-site determination of the ideal mounting position and for identification of an interfering Switch Transmitter.

Even after careful planning, the Field Strength Indicator should be used to verify proper reception at the Switch Receiver position during installation.

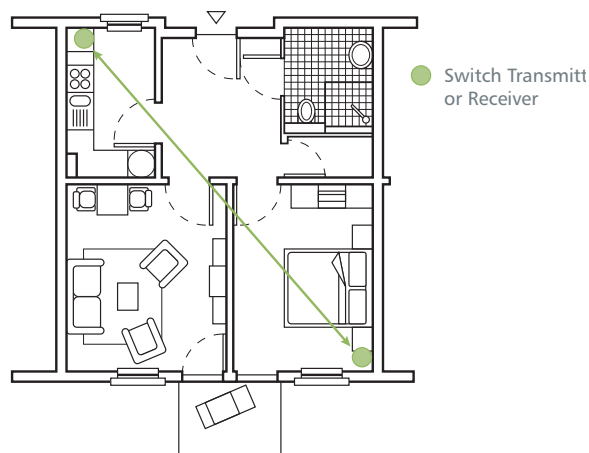
9. PLANNING INFORMATION FOR RESIDENTIAL BUILDINGS

For applications restricted to one or two rooms, e.g. when retrofitting a switch, the direct transmission range will normally be adequate. For applications "throughout" a building, the following differentiations must be made:

Flats, terraced houses and single-family houses of up to 400sqm.

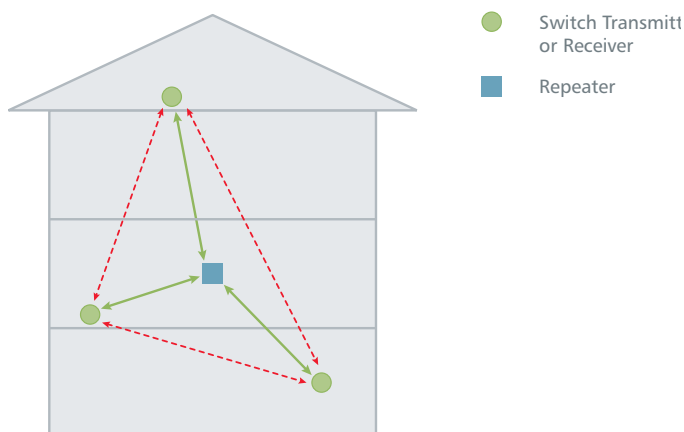
- Larger residential units with 3 rooms or more (living room and bedrooms) should be fitted with a Repeater. The Repeater should be centrally placed (e.g. in the centre of the middle floor).
- Repeaters are designed in such a way that a second Repeater can be added in case of heavy ceiling reinforcement or other screening.

Small residential unit (up to 3 walls and 1 ceiling)



Bedsit or up to 2 floors in a townhouse: the direct transmission range is usually adequate.

Multi-room flat and one-family house (more than 3 walls, more than 1 ceiling)



To ensure radio coverage in a larger residential unit, it is generally advisable to install a central Repeater.

Note: Using too many Repeaters is counterproductive (higher costs, cross-signal interference).

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10. TROUBLESHOOTING

The foregoing information on selecting the ideal place of installation for Switch Transmitters and Switch Receivers has been provided to ensure a smooth operation of the devices. If, however, you still experience problems, please refer first to the following table for troubleshooting:

FAULT	POSSIBLE CAUSE	CHECKING AND POTENTIAL REMEDY
No transmission received	Switch Transmitter fails to transmit	Close to the Switch Transmitter (distance of around 20-50cm), the Field Strength Indicator does not receive a transmission signal: Activate the Switch Transmitter, the GREEN LED fails to illuminate. Result – The Switch Transmitter appears to be faulty. Replace the Switch Transmitter.
	Switch Transmitter installed outside the receiver range	Near the receiver (distance of around 20 - 50cm), the Field Strength Indicator does not receive a transmission signal: Activate the Switch Transmitter, the GREEN and AMBER LED's fail to illuminate. Result – Reposition Switch Transmitter or Switch Receiver and follow the information on coverage and installation. Possible need for a Repeater to be added.
	Switch Transmitter was removed (or maybe exchanged)	Always remember to delete the Switch Transmitter from the Switch Receiver's memory before removing it, and/or always add any new transmitter to the receiver's memory.
	Receiver does not receive	Close to the Switch Receiver the Field Strength Indicator demonstrates good reception of the transmitted signal: Activate the Switch Transmitter; the GREEN or AMBER LED of the Field Strength Indicator is illuminated. Result – Check the receiver is functioning and replace the Switch Receiver if necessary.
	Transmitter not programmed (or wrong transmitter programmed)	Re-programme the Switch Transmitter into the Switch Receiver.
	Some form of jamming is present	The GREEN Class A or AMBER Class B LED's of the Field Strength Indicator are illuminated consistently: but the "Telegram Valid" LED is not illuminated. Result – There is some form of "jamming" occurring. Find and remove the source of jamming.
	High-frequency jamming near receiver	Move cause of jamming (telephone, PC etc.) at least 50cm away from the Switch Receiver.
Transmission only intermittently received	Receiver is placed at the limit of the transmitter's range	When placed near the Switch Receiver (at a distance of around 20-50cm) the Field Strength Indicator does not receive a proper transmission signal: When a Switch Transmitter is operated, neither the GREEN nor AMBER classification LED's of the Field Strength Indicator are illuminated. Although the AMBER "Telegram Valid" LED is illuminated. Result – Poor reception, consider repositioning either the Switch Transmitter or Switch Receiver, or alternatively use Repeater
	Occasional change in environmental conditions (cupboard, door, plants, people, interferes with transmission signal)	Check the distance from high-frequency sources of interference, should be at least 50cm. Alternatively, the Switch Receiver has been placed at the limit of the Switch Transmitter's range.
	The position of the transmitter changes occasionally (e.g. transmitter fitted to a mobile object)	Ensure any movement does not cause the Switch Transmitter to move outside the reception range.
	Some form of jamming is present	The GREEN or AMBER classification LED's are illuminated only intermittently, but the AMBER "Telegram Valid" LED remains off (no valid echo transmission). Result – remove the cause of the jamming.

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11. DISCLAIMER

The information provided in this document describes typical features of the echo system and should not be misunderstood as specifying operating characteristics. No liability is assumed for errors and / or omissions. We reserve the right to make changes without prior notice.

For further information, visit:

www.switchonmk.com

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