

## Transmitters, Receivers and Accessories

### Features

- Wireless and Batteryless – using RF technology with ranges up to 300metres in ideal conditions
- Available in all MK wiring device aesthetics
- Quick and easy to install with no need for cabling from the switch to the lighting circuit
- Robust Metalclad Plus and Masterseal available
- 400w and 10AX receiver/repeaters available to cover most installation needs
- Switch Receivers are capable of switching all lighting types

### Description

Echo™ is an innovative range of entirely wireless, batteryless and self powered switches, only available from MK Electric.

Wireless – allows for instant switch installation and location flexibility, reducing disruption and cost.

Batteryless – low maintenance and low running costs makes echo a very versatile and sustainable option.

Self Powered – using innovative technology to 'harvest' energy.

### Echo™ Installer Guide

#### 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™ 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.

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 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™ 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 when they pass through certain materials 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 into consideration during any assessment for radio coverage.

Here are some typical guideline figures when using Logic Plus style 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 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.

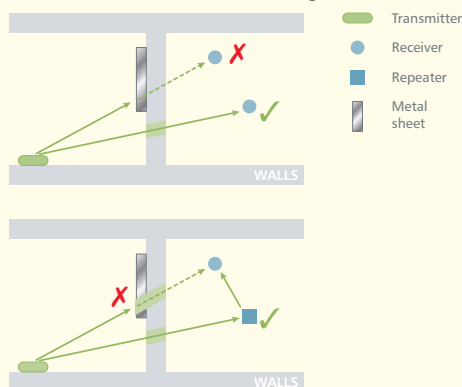
### 3. SCREENING

Objects made of metal, such as wall reinforcements, the metal foil often used in certain forms of insulation, 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 Transmitter mounted on metal surfaces (typically 30% loss of range).
- Transmitters 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.

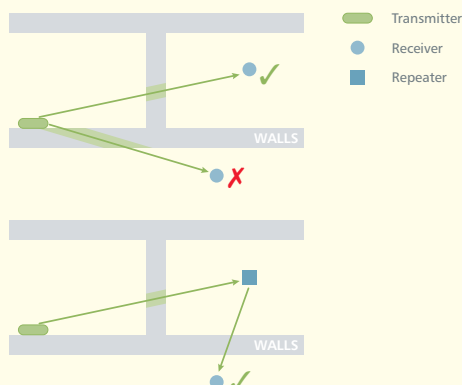
Depending on the material used to build the walls and assuming the distance between the transmitters and receivers are within specification, the illustrations above show a typical screening problem.

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 Transmitter and / or Switch 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.



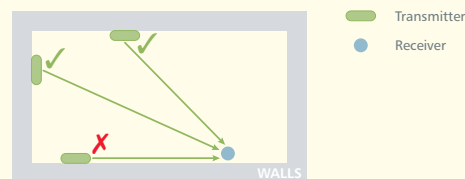
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Avoid an unfavourable penetration angle by repositioning the Transmitter and / or Receiver, or by using a Repeater.

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

### 5. ANTENNA INSTALLATION

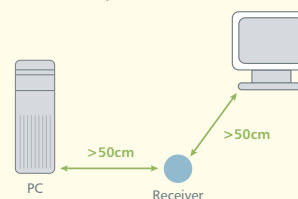
Switch Receivers should not be installed on the same wall as the Transmitter. When positioned near a wall, the radio waves are likely to be subject to interfering dispersions or reflections.



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.

### 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 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 new 10AX Switch Receiver/Repeater (K5420R) is also a repeater when not programmed with any switches. 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 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.

Only one repeater is intended for use in any single installation. Using more than one repeater is counterproductive (higher cost, cross-signal interference, etc).

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## 8. FIELD STRENGTH INDICATOR

The K5419R is a mobile Field Strength Indicator enabling the installer to determine the ideal mounting positions for 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 when 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 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 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.

### How to use the Field Strength Indicator:

Person 1 operates the 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 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 of the Transmitter and for identification of an interfering radio signal.

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

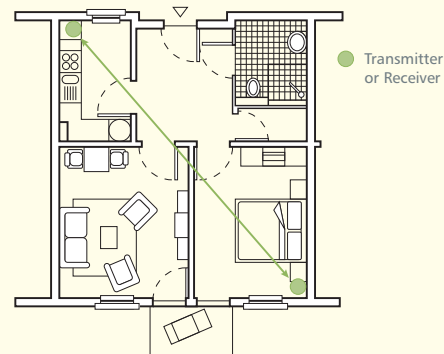
## 9. PLANNING INFORMATION FOR RESIDENTIAL BUILDINGS

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.

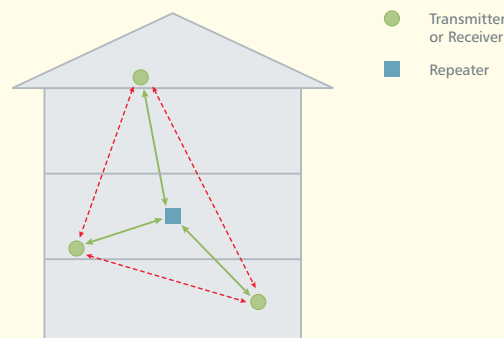
- Larger residential units with 3 rooms or more (living room and bedrooms) should be fitted with a Repeater. The Repeater should be centrally placed (e.g. in the centre of the middle floor).

### 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.

## 10. TROUBLESHOOTING

The foregoing information on selecting the ideal place of installation for 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
<b>No transmission received</b>	Transmitter fails to transmit	<b>Close to the Transmitter (distance of around 20-50cm), the Field Strength Indicator does not receive a transmission signal:</b> Activate the Transmitter, the GREEN LED fails to illuminate. Result – The Transmitter appears to be faulty. Replace the Transmitter.
	Transmitter installed outside the receiver range	<b>Near the receiver (distance of around 20 - 50cm), the Field Strength Indicator does not receive a transmission signal:</b> Activate the Transmitter, the GREEN and AMBER LEDs fail to illuminate. Result – Reposition Transmitter or Switch Receiver and follow the information on coverage and installation. Possible need for a Repeater to be added.
	Transmitter was removed (or maybe exchanged)	Always remember to delete the Transmitter from the Switch Receiver's memory before removing it, and/or always add any new transmitter to the Switch Receiver's memory.
	Receiver does not receive	<b>Close to the Switch Receiver the Field Strength Indicator demonstrates good reception of the transmitted signal:</b> Activate the 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 Transmitter into the Switch Receiver.
	Some form of jamming is present	The GREEN Class A or AMBER Class B LEDs 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.
<b>Transmission only intermittently received</b>	Receiver is placed at the limit of the transmitter's range	<b>When placed near the Switch Receiver (at a distance of around 20-50cm) the Field Strength Indicator does not receive a proper transmission signal:</b> When a Transmitter is operated, neither the GREEN nor AMBER classification LEDs of the Field Strength Indicator are illuminated, but the AMBER "Telegram Valid" LED is illuminated. Result – Poor reception, consider repositioning either the Transmitter or Switch Receiver, or alternatively use a 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 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 Transmitter to move outside the reception range.
	Some form of jamming is present	The GREEN or AMBER classification LEDs are illuminated only intermittently, but the AMBER "Telegram Valid" LED remains off (no valid echo™ transmission). Result – remove the cause of the jamming.

## 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.

To find out more, visit: [www.mkelectric.co.uk](http://www.mkelectric.co.uk)

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## Transmitters

### Standards and approvals

BS EN 60669-1, BS EN 60669-2-1,  
ETSI EN301 489-1 & -3, ETSI EN61000-6-2,  
ETSI EN300 220-3

### Technical specification

#### Physical

Operating temperature:  
-5°C to + 40°C

Operating frequency:  
868.3 MHz

IP rating:  
IP2XD

Max. Installation altitude:  
2000 meters



### Dimensions

Transmitters: 86mm x 86mm

Fixing centres: 60.3mm

### Mounting Transmitters

- All Transmitters can be mounted to any 1-gang back box.
- All can be mounted directly to the wall surface – screws supplied.
- All can be mounted to back boxes – screws supplied.
- Logic Plus and Aspect type Transmitters can also be mounted using supplied adhesive pads

## Switch Receivers and Repeater

### Standards and approvals

BS EN 60669-1, BS EN 60669-2-1,  
ETSI EN301 489-1 & -3, ETSI EN61000-6-2,  
ETSI EN300 220-3

### Technical specification

#### ELECTRICAL

##### K5418R

Voltage rating:  
250V a.c. 50Hz

Current ratings:

This is a small load switch receiver that can be used typically for 400W resistive loads and 360W inductive.

Terminals:

Terminal screw size: M2.6

Rated terminal screw torque: 0.4 Nm

Terminal capacity:

Single wire (solid): 1.5 mm<sup>2</sup>

Stranded wire (flex.): 1.0 mm<sup>2</sup>

Stranded wire with ferrules: 0.75 mm<sup>2</sup>

##### K5420R (When used as a receiver)

Voltage rating:  
250V a.c. 50Hz

Current ratings:

10AX – No de-rating when used on standard magnetic ballast fluorescent loads.

Terminals:

Terminal screw size: M3

Rated terminal screw torque: 0.5 Nm

Terminal capacity:

4 x 1mm<sup>2</sup>

3 x 1.5mm<sup>2</sup>

2 x 2.5mm<sup>2</sup>

#### PHYSICAL

Operating temperature:  
-5°C to + 40°C

IP rating:

IP2XD

Max. Installation altitude:

2000 meters



K5418R



K5414R



K5420R

### K5420R

The 10AX Receiver/Repeater can function both as a 1 level repeater and as a 10AX Switch Receiver.

### K5414R

The Repeater does not pass current, but all other details are the same as the 10AX Switch Receiver/Repeater K5420R.

### Dimensions

#### 10AX Switch Receiver/Repeater – K5420R

Length: 175.5mm

Width: 50.3mm

Height: 33.25mm

#### 1 Level Repeater - K5414R

Length: 175.5mm

Width: 50.3mm

Height: 33.25mm

#### Small Load Switch Receiver – K5418R

Length: 47.4mm

Width: 34.6mm

Height: 28.8mm

For complete technical information on all Echo™ products, please visit [www.mkelectric.co.uk](http://www.mkelectric.co.uk)