

# MCX-600

## Wireless Repeater for PowerCode Communications



## Installation Instructions

### 1. INTRODUCTION

The MCX-600 is a microprocessor controlled wireless repeater, designed to relay digital data between wireless PowerCode transmitters and a target PowerCode receiver. Repeater links are required when the target receiver is beyond the range of at least some of the wireless transmitters and is therefore incapable of receiving transmissions directly (see Figure 1).

If the distance between the transmitters and the target receiver is too large to be covered with one repeater, several auxiliary repeaters may be added along the communication path. This way, a multi-level network is created (see Figure 2).

Up to 16 auxiliary repeaters can be positioned between the farthest group of transmitters and the target receiver. Each repeater must be assigned a correct LEVEL TAG for the system to operate properly.

The repeater closest to the receiver is LEVEL 0. As repeaters are added, the level number increases, up to LEVEL 15 (maximum).

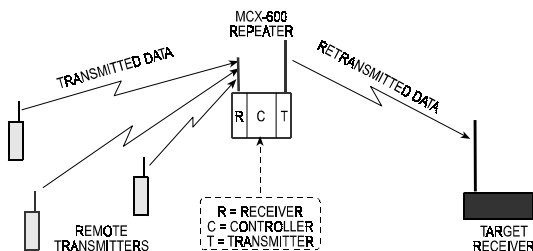
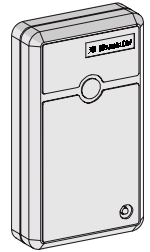


Figure 1. Single-Level Repeater Configuration

A receiver module, a transmitter module and a controller motherboard are the building blocks of the MCX-600. All 3 units are packaged in a small-size, easy-to-install plastic housing.

Both receiver and transmitter use short, down-hanging wire antennas. The MCX-600 is powered by 13 to 20 VDC supply or 11-16 VAC. A 9-Volt nickel-cadmium rechargeable battery provides backup in case of power failure. The battery is recharged by a built-in charger.



A fully charged 120 mAh battery allows emergency operation for 2 to 5 hours at 1:1 receive/transmit ratio (see Section 2 for details).

**The MCX-600 is not compatible with CodeSecure™ devices.**

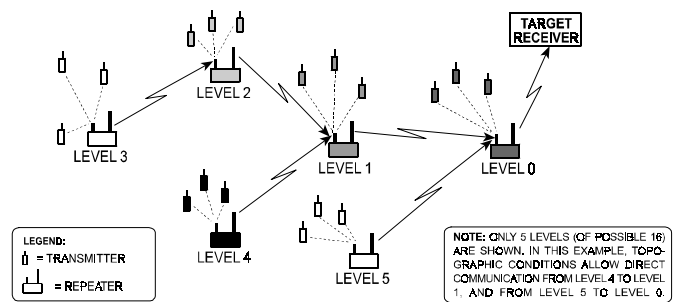


Figure 2. Multi-Level Repeater Configuration

### 2. SPECIFICATIONS

**Operating Frequencies:** 315, 433.9, 868.95 and 869.2625 MHz, or other frequencies in accordance with local requirements.

**Receiver Type:** Super-regenerative.

**Modulation Type:** 100% ASK.

**PowerCode ID:** One of 16,000,000 possible 24-bit codes

**Power Input Ranges:** 13 - 20 VDC, or 11 - 16 VAC, 100 mA min.

**Backup Battery:** 9 V-stytle rechargeable Ni-Cd or Ni-MH.

**Current drain at 14 VDC:**

Frequency (MHz) →	315 & 433	868.95	869.2625
With rechargeable battery	17.5 mA	30 mA	40 mA
Without rechargeable battery	5.5 mA	17.5 mA	27.5 mA

**Note:** Current drain is equal in the receive and transmit modes.

**Battery Backup Duration** (with fully charged 120 mA/h battery and 1:1 standby/transmit ratio):

5 hours (315 and 433.92 MHz units)

2.5 hours (868.95 MHz units)

2 hours (869.2625 MHz units)

**LED indicator:** Lights during transmission.

**Compliance with Standards:** Meets FCC Part 15, MPT 1340 and directive 1999/5/EC

**Operating Temperature:** 0 °C to 49°C (32° F to 120° F).

**Dimensions (H x W x D):** 110 x 63 x 25 mm (4-5/16 x 2-1/2 x 1 in.).

**Weight:** 73 g (2.6 oz).

### 3. CONFIGURATIONS AND FUNCTION

#### 3.1 Repeater IDs

PowerCode transmitters use 24-bit ID codes, randomly selected in the factory from over 16 million available combinations. When a PowerCode transmitter is keyed on, its code is received by the repeater and retransmitted to the target receiver.

Each MCX-600 repeater has its own unique, factory determined 24-bit PowerCode ID, that is only utilized for reporting the repeater's own service messages (see Para. 3.4).

#### 3.2 Single Repeater Links

In many cases, a single repeater is enough to bridge the communication gap between the deployed transmitters and the target receiver. In a single repeater setup, all 4 levers of the on-board DIP switch level selector must be set to OFF - i.e. LEVEL 0.

A repeater at LEVEL 0 will simply re-transmit any received message, without adding its own level tag (which is only significant in multi-repeater networks - see Para. 3.3). Refer to Section 4 for detailed communication routine.

#### 3.3 Multi Repeater Networks

##### A. The Multi-Level Concept

An auxiliary repeater positioned somewhere along the communication path retransmits data received from any higher level repeater to any lower level repeater, but may also be used to retransmit data received from transmitters deployed near it, in its local coverage area (see Figure 2).

Data flows from the highest level repeater through intermediate repeater links to the lowest level repeater (LEVEL 0) and finally reaches the target receiver.

By virtue of differences in message format and the level tag (see Figure 3), each repeater in a multi-level network can distinguish between signals coming from nearby transmitters and signals coming from higher or lower level repeaters. The repeater's response is based on this distinction.

At all levels except for level 0, messages are retained in the repeater's memory until taken care of by the next repeater.

### B. Selecting Level Tags

The 4-position DIP switch on the repeater's PCB allows the installer to select the desired level by setting its 4 switch levers to 16 different combinations, as shown in Figure 3.

All repeaters leave the factory with the 4 level selection switches set to OFF (Level 0 is selected).

## 3.4 Service Messages

Three kinds of event codes are automatically included in a service transmission in addition to the repeater's own 24-bit ID:

- Power Failure/Low Battery
- Tamper
- Hourly test report.

The **power failure/low battery** message is transmitted 30 minutes after loss of power (AC or DC) at the voltage input terminals. Upon power failure, recharging stops and the backup battery takes over. It is therefore correct to assume that without power input, the battery is gradually weakening and may be reported as "low".

LEVEL	Switch Settings	LEVEL	Switch Settings	LEVEL	Switch Settings	LEVEL	Switch Settings
LEVEL 0		LEVEL 4		LEVEL 8		LEVEL 12	
LEVEL 1		LEVEL 5		LEVEL 9		LEVEL 13	
LEVEL 2		LEVEL 6		LEVEL 10		LEVEL 14	
LEVEL 3		LEVEL 7		LEVEL 11		LEVEL 15	

Figure 3. Selecting Level Numbers

**Power / battery restore** is reported only in the following test report. **Tamper restore** is reported immediately upon occurrence.

If the **tamper** or **power failure** condition persists long enough, the respective alerts will be sent out again with each test report.

The repeater ID in the outgoing service message identifies the message origin (the specific repeater) to the receiver. Service personnel will therefore know exactly where the problem lies.

## 4. THE COMMUNICATION PROCESS

Once the repeater is powered up, its receiver section stands by for incoming messages, whereas its transmitter section is inactive.

A. Repeaters at any level collect and save messages received from transmitters deployed in their respective coverage areas and also from repeaters in higher levels. Messages are rejected if they do not include the proper 24-bit ID format and/or do not pass the checksum test.

B. Valid messages are saved in the message buffer, for retransmission as soon as transmission is allowed.

*Note: Before retransmission, the repeater checks whether the RF channel is free - it is programmed to transmit on a free channel only. However, in case of continuous interference or uninterrupted stream of incoming messages, a 30-second timeout will cause the repeater to stop receiving, retransmit the contents of its message buffer and revert to the receive mode.*

C. Once transmission is allowed, the repeater retransmits all messages stored in its buffer, "first in, first out".

*Note: To prevent collision of messages transmitted by repeaters at various levels, a different REPEAT INTERVAL (inter-message interval) is programmed for each level. This interval is determined automatically as a function of the repeater's LEVEL.*

D. Upon retransmission, messages are picked up by the target receiver (if the system includes only a single repeater) or by a **lower level repeater** for further transmission towards the target receiver.

E. If a repeater (Level 1 and up) receives a message transmitted by a lower level repeater and identifies it as one it had already retransmitted, it will stop repeating the message and will delete the message from its buffer.

F. Without acknowledgement from a lower level repeater, the higher level repeater will transmit the message again after the "repeat interval" (which depends on the repeater's level). A maximum of 8 repetitions is allowed before the repeater "gives up" and passes on to the next message.

## 5. INSTALLATION

### 5.1 Repeater's Location Selection

A. In a single repeater setup, install the repeater where good communication is assured with the target receiver and with the transmitters deployed in the repeater's coverage area. In multi-repeater networks, good communication must be assured with the deployed transmitters and the repeaters at the next higher and next lower levels.

B. Do not stretch the coverage area to its utmost limit, because this can disrupt your communication link. It is better to add repeaters than to rely on marginal reception.

C. Mount the repeater as high as possible above the floor and well away from metal chimneys, large metal cabinets, metal doors and reinforced concrete walls, all of which may reduce the communication range.

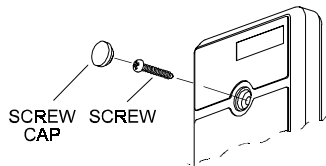


Figure 4. Front cover Assembly

### 5.2 Mounting Procedure

A. Remove the screw and the front cover (see Fig. 4). The round plastic cap is supplied separately in a small nylon bag.

B. Mount the base (equipped with the printed circuit board) in the selected location, using the mounting knockouts (see Fig. 5).

C. Make sure the antenna wires hang down vertically (do not allow them to bend close together). Tape them to the wall if necessary.

D. Snap the battery clip onto the battery and place the battery in the vacant space above the P.C. board.

E. Plug the AC adapter into an uninterruptible AC outlet and connect the low voltage wires to the repeater's 14 V terminals.

*Note: Any standard DC power supply or AC step-down transformer would do, if it delivers 12V AC or DC / 100 mA. (Refer to Section 2 for input voltage limits.)*

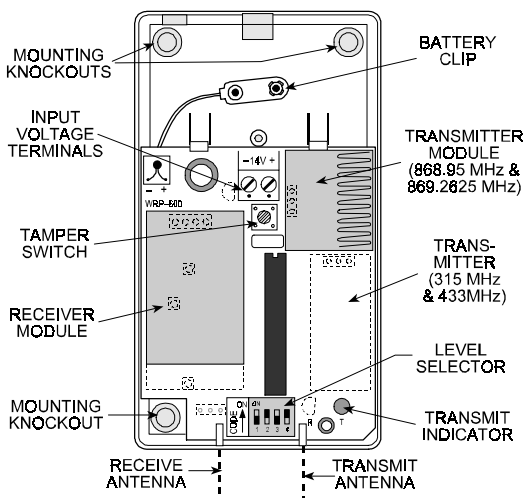


Figure 5. MCX-600, Cover Removed

## 6. PREPARATION FOR USE

### 6.1 Enrolling the Repeater's ID into the Target Receiver's Memory

Messages received from deployed transmitters are retransmitted by the MCX-600 "as is" with the original transmitter's ID, but service messages initiated by the repeater use the repeater's own ID. The receiver must therefore learn the ID codes of all transmitters used in the system, including the repeaters (which have built-in transmitter modules).

Refer to the particular receiver's installation manual for "learning procedure". At a certain stage of this procedure, a transmission must be made from the wireless transmitter in order for the ID to be enrolled.

**CAUTION!** Make sure the repeater's level selector is set to "LEVEL 0" (the factory default setting - see Figure 3) during the learning session. If this is not so, the repeater's ID will not be enrolled. You can set each repeater to the desired level later (see Para. 6.2).

Initiating a transmission from the MCX-600 is quite simple - you may cause it to transmit any message such as **tamper**, or **tamper restore**, or a **supervision message**.

- A **tamper** message will be transmitted as soon as the front cover is removed.

- A **tamper restore** message will be transmitted if the MCX-600 tamper switch is pressed shut.

A **Supervision** message will be transmitted if you power up the repeater and wait 5 minutes.

### 6.2 Level Tagging

Select the repeater's level with the 4-position LEVEL SELECTOR (see Figures 3 and 5):

- If your MCX-600 is the only repeater in the system, verify that all switch levers remain OFF, thus selecting LEVEL 0.
- If your MCX-600 is part of a multi-repeater network, select the level at which the repeater will operate, as instructed in Paragraph 3.3 B.

### 6.3 Testing

- Position the front cover hole over the LED. Secure the front cover with the screw and mount the plastic cap (see Figure 4).
- Refer to the operating instructions for the transmitter(s) and receiver being used. Test the receiver with each transmitter in the system for range and proper reception.
- Verify that the receiver reacts properly to messages received via the repeater (or via a chain of repeaters).
- Should you have a problem with signal reception, change the location of the transmitter(s), repeater(s) and/or receiver to improve reception.
- Disconnect the power supply and verify that the repeater functions correctly on battery power only.
- Reconnect the power supply, remove the battery and verify that the repeater functions correctly.
- Reinstall the battery.

## 7. NOTES AND WARNINGS

### 7.1 Product Limitations

Visonic Ltd. wireless systems are very reliable and are tested to high standards. However, due to their low transmitting power and limited range (required by FCC and other regulatory authorities), there are some limitations to be considered:

- Receivers may be blocked by radio signals occurring on or near their operating frequencies, regardless of the code selected.
- A repeater can only respond to one transmitter signal at a time.
- Wireless equipment should be tested regularly to determine whether there are sources of interference and to protect against faults.

### 7.2 Compliance with Standards

The 315 MHz version of this device complies with FCC Rules Part 15. Operation is subject to two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference that may be received or that may cause undesired operation.

**WARNING!** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The digital circuitry of this device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses and can radiate radio frequency

energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio and television reception. However, there is no guarantee that interference will not occur in a particular installation. If this device does cause such interference, which can be verified by turning the device off and on, the user is encouraged to eliminate the interference by one or more of the following measures:

- Re-orient or re-locate the receiving antenna.
- Increase the distance between the device and the receiver.
- Connect the device to an outlet on a circuit different from the one which supplies power to the receiver.
- Consult the dealer or an experienced radio/TV technician.

This device complies with the essential requirements and provisions of Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio and telecommunications terminal equipment.

### 7.3 Frequency Allocations for Wireless Devices in European (EU) Countries

- **433.92 MHz** has no restriction in any EU member state.
- **418 MHz** is allowed in the UK only.
- **315 MHz** is not allowed in any EU member state
- **868.95 MHz (wide band)** is allowed in all EU member states except for Belgium.
- **869.025 MHz and 869.2625 MHz (narrow band)** are not restricted in any EU member state.

## WARRANTY

Visonic Ltd. and/or its subsidiaries and its affiliates ("the Manufacturer") warrants its products hereinafter referred to as "the Product" or "Products" to be in conformance with its own plans and specifications and to be free of defects in materials and workmanship under normal use and service for a period of twelve months from the date of shipment by the Manufacturer. The Manufacturer's obligations shall be limited within the warranty period, at its option, to repair or replace the product or any part thereof. The Manufacturer shall not be responsible for dismantling and/or reinstallation charges. To exercise the warranty the product must be returned to the Manufacturer freight prepaid and insured.

**This warranty does not apply in the following cases:** improper installation, misuse, failure to follow installation and operating instructions, alteration, abuse, accident or tampering, and repair by anyone other than the Manufacturer.

This warranty is exclusive and expressly in lieu of all other warranties, obligations or liabilities, whether written, oral, express or implied, including any warranty of merchantability or fitness for a particular purpose, or otherwise. In no case shall the Manufacturer be liable to anyone for any consequential or incidental damages for breach of this warranty or any other warranties whatsoever, as aforesaid.

This warranty shall not be modified, varied or extended, and the Manufacturer does not authorize any person to act on its behalf in the modification, variation or extension of this warranty. This warranty shall apply to the Product only. All products, accessories or attachments of others used in conjunction with the Product, including batteries, shall be covered solely by their own warranty, if any. The Manufacturer shall not be liable for any damage or loss whatsoever, whether directly, indirectly, incidentally, consequentially or otherwise, caused by the malfunction of the Product due to products, accessories, or attachments of others, including batteries, used in conjunction with the Products.

The Manufacturer does not represent that its Product may not be compromised and/or circumvented, or that the Product will prevent any death, personal and/or bodily injury and/or damage to property resulting from burglary, robbery, fire or otherwise, or that the Product will in all cases provide adequate warning or protection. User understands that a properly installed and maintained alarm may only reduce the risk of events such as burglary, robbery, and fire without warning, but it is not insurance or a guarantee that such will not occur or that there will be no death, personal damage and/or damage to property as a result.

**The Manufacturer shall have no liability for any death, personal and/or bodily injury and/or damage to property or other loss whether direct, indirect, incidental, consequential or otherwise, based on a claim that the Product failed to function.**

However, if the Manufacturer is held liable, whether directly or indirectly, for any loss or damage arising under this limited warranty or otherwise, regardless of cause or origin, the Manufacturer's maximum liability shall not in any case exceed the purchase price of the Product, which shall be fixed as liquidated damages and not as a penalty, and shall be the complete and exclusive remedy against the Manufacturer.

**Warning:** The user should follow the installation and operation instructions and among other things test the Product and the whole system at least once a week. For various reasons, including, but not limited to, changes in environmental conditions, electric or electronic disruptions and tampering, the Product may not perform as expected. The user is advised to take all necessary precautions for his/her safety and the protection of his/her property.

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