

# RC4Magic

## Series 2 R3

Wireless DMX and  
Wireless Dimming System



*DMXioR3/R3+*  
Data Transceiver

# User Manual

**All RC4Magic devices are warranted for life.**

*If it stops working, and you have not misused or abused it, we fix.  
For free. Forever. Details on page 30.*

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## Disclaimers

### **WIRING AND INSTALLATION OF BATTERIES, DIMMERS, AND LOADS MUST BE IN ACCORDANCE WITH APPLICABLE LOCAL AND NATIONAL ELECTRICAL CODES.**

RC4 Wireless devices and equipment are operated at the user's own risk and RC4 Wireless accepts no liability, either direct or consequential, as a result of using this equipment.

### Not for Use Where Human Safety May Be At Risk

**RC4 Wireless accepts no liability for direct, indirect, or consequential damages resulting from the use of any RC4 Wireless product or group of products.** RC4 Wireless does not guarantee the suitability of any product for any purpose; user assumes all risk. RC4 dimmers must be used strictly in accordance with manufacturer's instructions and cannot be used for unsupervised operation. RC4 Wireless products must be installed and operated only by qualified technicians, as outlined in the manufacturer's documentation, and should be inspected and tested on a regular basis to ensure proper and safe operation.

### Not for Control of Pyrotechnical Devices

**RC4 Wireless products should not be used to control pyrotechnics of any kind.** A brief output surge on dimmer outputs during power-up could trigger these devices. RC4 Wireless accepts no liability if RC4 equipment is used for this or any other purpose.

### Product Safety

**RC4 receiver/dimmers are capable of controlling very large currents at up to 30VDC (typically 12V). Dimmers should not be allowed to operate at dangerous temperatures.** Appropriately sized wire and connectors must be used, along with suitable ventilation and external fuses rated for the load being operated. Additional information is provided in this manual, but this manual is not intended to be a comprehensive electrical safety guide,

## Statements of RF Conformity

### United States (FCC)

RC4Magic Series 2 devices contain XBeePro radios, **FCC ID OUR-XBEEPRO**, and comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions: *(i)* these devices may not cause harmful interference and *(ii)* these devices must accept any interference received, including interference that may cause undesired operation.

### Canada (IC)

RC4Magic Series 2 devices contain XBeePro radios, **IC: 4214A-XBEEPRO**.

### Japan

RC4Magic Series 2 devices contain XBeePro radios, **ID: 005NYCA0378**.

### Europe (ETSI)

XBeePro radios used in RC4Magic Series 2 devices have been certified for use in most European countries. Norway prohibits operation near Ny-Alesund in Svalbard. Other restrictions may apply. For additional information, please contact RC4 Wireless.

### Other Countries and Jurisdictions

XBeePro radios used in RC4Magic Series 2 devices have also been issued Declarations of RF Conformity for Australia/New Zealand, and Korea. For additional information, please contact RC4 Wireless.

## RC4Magic Quick Start – It's Easy!

RC4Magic Series 2 is truly Plug-n-Play – you can start using it right away.

### DMX Transmitter

If your system has just one DMXio module, it will be factory configured as a transmitter.

If you have multiple DMXio modules, only one is configured as a transmitter, the rest are configured as receivers. A temporary label has been provided to identify the transmitter.

Connect a supplied wall-transformer power supply to your DMXio transmitter. Plug in a DMX data source and see that the **dmx/RFc** LED comes on. That's it – you're on the air.



### DMX Receiver

Connect a supplied wall-transformer power supply to a DMXio receiver. It can take up to 15 seconds for the receiver to connect with the transmitter. When the RF data LED starts blinking and shimmering, you have DMX data coming out. You now have a 200+ foot wireless DMX link.

### Identifying Transmitters and Receivers

If you've lost track of which DMXio is your transmitter, watch the LEDs during power-up. An LED chase from left to right – "signal going out" – indicates a transmitter. A chase from right to left – "signal coming in" – indicates a receiver.

***Now it's time to read through this manual to learn how to change system IDs, interpret the LEDs, and more.***

***Thank you for choosing RC4Magic Series 2!***

## RC4Magic – An Overview



### DMX Cable Replacement / DMX Distribution

The heart of RC4Magic Series 2 (RC4M-S2) is the DMXio module. (This manual refers specifically to the DMXioR3, which provides several features not available in earlier versions.)

A DMXio can act as a wireless transmitter or receiver, and any number of receivers can be used in a system. A pair of DMXio units configured as transmitter and receiver replaces a standard DMX cable. RC4Magic modules work reliably to distances beyond 200 feet within most theatres and performance spaces.

Any number of receivers can be used in an RC4Magic system, taking the place of splitters and distribution boxes, providing superior electrical isolation along with uncluttered convenience.

Configured as a transmitter, the DMXio encodes and encrypts the incoming DMX universe, and broadcasts it using Direct Sequence Spread Spectrum (DSSS) digital radio. Unlike wired DMX, the broadcast signal includes error checking and correction codes, and is not affected by minor interruptions and interference. Incoming DMX channels are broadcast with appropriate speed, redundancy and accuracy; additional bandwidth is dynamically allocated to channels that are changing. This allows RC4Magic to use less radio bandwidth than competing systems while still delivering excellent DMX data performance.

As a receiver, the DMXio decodes the rf signal from the associated transmitter, rebuilds the DMX universe, and generates a DMX signal with the same channels and packet timing as the original input. DMX in and out are compliant with the USITT DMX512/1990 standard.

RC4Magic Series 2 does not transmit DMX messages with start codes other than zero. Thus, it can only be used for dimmer data. It will not work with non-zero packets carrying proprietary data or RDM packets.

Every RC4Magic user is initially assigned 3 unique private system ID codes and more can be assigned if needed. No other user in the world has the same unique codes you have. RC4Magic ID codes are managed by RC4 Wireless and authorized representatives through a worldwide online database system.

***No other wireless DMX system in the world – at any cost – provides this level of data security.***

Each of your RC4Magic Series 2 devices is programmed with 3 unique private ID codes that belong to you, plus a public ID (PAN ID 999). Your IDs are labelled on the outside of each unit, along with the device serial number.

When ordering additional devices for an existing RC4Magic Series 2 system, you specify the ID numbers to be installed, which can be any combination of IDs previously assigned to you, and/or new IDs. To ensure the reliability and security of all RC4Magic Series 2 systems for all users, every new system for a new user is assigned its own set of new private IDs.

In the rare case where multiple RC4 Magic Series 2 users need to share or pool their equipment, the common public ID can be used.

## Power-Up Sequence and Radio Channel Assignments

When an RC4Magic Series 2 DMXio transmitter first powers up, it scans the 2.4GHz radio band, which is quite large and supports many radio channels, looking for an area with the least traffic and lowest rf power levels. It then sets itself to operate on that frequency and begins transmitting DMX packets encoded with a specific system ID number. When this power-up process is complete, the **RF data** LED blinks rapidly or shimmers indicating data being sent.

When a DMXio receiver or DMX2dim/4dim receiver-dimmer powers up, it scans the 2.4GHz band looking for signals from a DMXio transmitter on the selected ID number. When the PAN connection is established, the **RF Con** LED (on a receiver-dimmer) or **dmx/RFc** LED (on a DMXioR3) will blink steadily. When DMX channel data starts flowing, the **RF data** LED will blink and shimmer.

If a receiver does not receive valid data for 10 seconds, the start-up scan procedure repeats. Thus, if the transmitter has been turned off and back on (or there has been a power failure) and it selects a different frequency range to transmit in, the receiver will rescan and reconnect. Thus, receivers always follow transmitters on the same System ID.

Multiple RC4Magic Series 2 systems using different IDs can operate at the same time in the same space, and each system will provide a separate wireless DMX universe. In a space with little or no other radio activity, there is enough bandwidth in the 2.4GHz band to support up to 15 full-speed RC4Magic Series 2 systems, each with any number of receivers and dimmers. Even in crowded rf environments there will usually be enough bandwidth for 3 or more separate RC4Magic systems.

***One wireless DMX universe with up to 512 channels uses one RC4Magic system ID. A DMXio transmitter on a separate ID is required for each different DMX universe you broadcast. Thus, 4 System IDs provide 4 individual wireless universes, provided you have enough RC4Magic hardware to make use of them. You can add RC4Magic devices to your system at any time – just tell us your System IDs when you order.***

## Advanced Settings

The DMXioR3 transceiver provides several advanced features that are selected by pushing recessed pushbuttons with a bent paperclip or other slim tool. Few users do anything beyond selecting between Tx (transmitter mode) and Rx (receiver mode). Available settings include:

**Tx / Rx Mode.** Select whether a DMXio is transmitting DMX data arriving on a cable (Tx), or receiving rf data and outputting DMX on a cable (Rx).

**Channel Groups.** Normally, the DMXioR3 transmits the complete incoming DMX universe, up to 512 channels. You can limit transmission to the first 128, 256, or 384 DMX channels coming in. This increases the rf bandwidth allocated to the selected group, increasing data fidelity and demanding less of RC4Magic data compression.

**RF Power.** DMXio transmitters shipped within North America are preset to transmit 100 mW (18 dBm) of RF power. Units shipped to Europe, Japan, and jurisdictions with similar regulations, are preset to transmit 10mW (10dBm). Only the lowest power level is permitted in most locations outside North America. Within North America, a range of user-selectable power levels are available.

**ID Select.** By default, all RC4Magic Series 2 devices are set to their first unique System ID, identified as ID0 (ID zero). Any of 3 unique IDs or the common public ID (ID3) can be selected (except on the DMX2dim, which cannot select ID2). The actual alphanumeric values for ID0, ID1, and ID2 are labeled on each RC4Magic Series 2 device. (Only ID3 is the same for every unit sold; that code, the Public ID, is 999.)

Additional information about device configuration is provided later in this manual.

## DMXio R3 User Interface

The DMXio R3 provides five LED indicators and four recessed pushbuttons for access to all settings.

These LEDs and buttons – the user interface, or UI – have one set of functions during normal Running mode, and other functions that occur only during Power Up.

### LEDs at Power Up

During power up the five LEDs chase, blink, and chase again. The direction of the chase indicates Tx (transmit) or Rx (receive) mode. The blinking between the two chases indicates which System ID is currently selected.

For example, LEDs on a transmitter set to System ID0 (ID zero) will chase left to right, briefly blink the red **Ch grps** LED, then chase left to right again. The unit then proceeds to Running mode.

*Blink chase direction is as viewed with mounting flanges down and connectors, LEDs, and buttons facing you.*

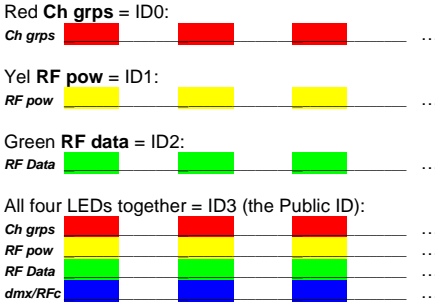






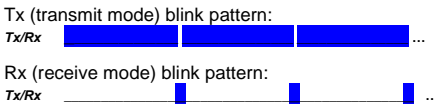
DMXioR3 LED indicators use blink patterns to indicate various settings.

Between power-up chase patterns, the System ID indicators are:

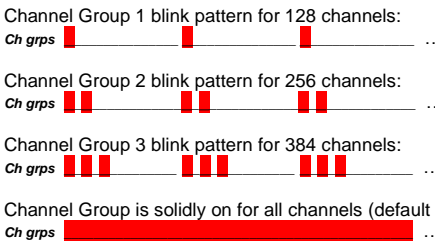


## LEDs in Running Mode

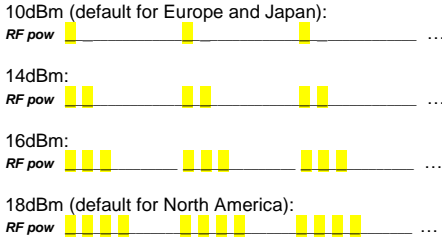
The blue **Tx/Rx** indicator is closest to the DC power inlet. In Tx mode, it is ON with a short blip off approximately once per second. In Rx mode, it is OFF with a short blip on approximately once per second. The short blips serves as a Computer-Operating-Properly (COP) indicator. The presence of these blips tells us that the microprocessor is running, even if no other LEDs are currently on.



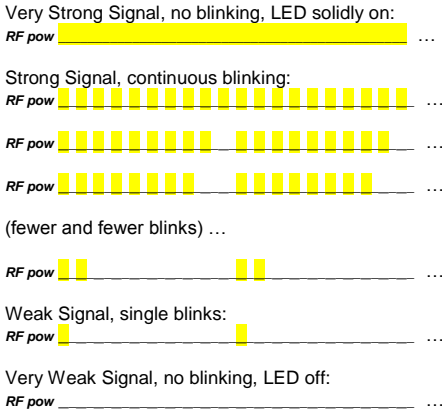
The red **Ch grps** LED indicates how many DMX channels are being broadcast in Tx mode. Normally, this LED is solidly on, not blinking, to indicate that all incoming channels are being transmitted exactly as they arrive at the DMX input. Limited groups of channels are indicated by blink patterns:



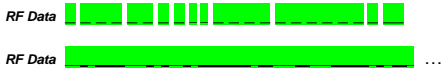
The **yellow RF pow indicator** shows transmitter output power in Tx mode, or received signal strength in Rx mode. In Tx mode, power level blink patterns are:



In Rx mode, receive signal strength indication (RSSI) blink patterns range from:

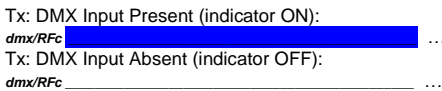


The **green RF Data LED blinks with each data packet, either transmitted or received**. When no DMX channels are changing, this can appear as a very rapid blink. Changing DMX levels will cause this LED to shimmer or even appear solidly on because there are many data packets very close together:

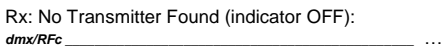


The **blue dmX/RFc LED** indicates the presence of incoming DMX data (**dmx**) in Tx mode, or connection with an associated transmitter (**RFc**) in Rx mode.

In Tx mode, this indicator is solidly on when DMX data is present. It will go off after one second if DMX data is no longer present:



In Rx mode, this indicator is off when there is no active PAN connection to a transmitter. When the unit has successfully connected to a DMXio transmitter with the correct System ID number, this indicator will continuously blink at moderate speed:



Rx: Transmitter Found and Connected:

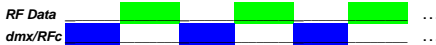


## LEDs in Edit Mode

When recessed buttons are used to change settings in Running mode, the unit temporarily enters Edit Mode. When desired settings are correctly indicated on the LEDs, these new settings are saved to non-volatile Flash memory by pressing the **save & run** button (further details are provided later in this manual).

While in Edit Mode, the **Tx/Rx**, **Ch grps**, and **RF pwr** indicators work as described above. The remaining two LEDs, **RF data** and **dmx/RFc**, toggle back and forth to indicate that settings are in the process of being altered and have not yet been saved:

Edit Mode:



When the **save & run** button is pressed, new settings are stored in Flash memory, the LEDs do a quick back-and-forth chase, and the unit restarts with a full Power Up sequence.

## Recessed Buttons

The four DMXioR3 buttons are recessed behind small holes in the case, to the right of the LED indicators, directly above the female DMX connector. They are hidden to avoid unwanted changes to settings, which most users never need to adjust. To operate these buttons, use a bent paperclip or other slim tool:



**DMXio buttons are very small and are not intended for rough handling. Press them gently. You will feel a slight click or gentle pop as they depress.**

**Do not poke anything into the LED openings. Doing so may damage the LEDs and other circuitry. Such damage is NOT covered under warranty.**

## Buttons at Power Up

If a button is pressed while a unit is powered up, it invokes a “secret key” function. During DMXioR3 power up, each recessed button selects a System ID:

- Set Tx/Rx** selects ID0
- Set Ch grps** select ID1
- Set RF pwr** selects ID2
- save & run** selects ID3 (Public ID)

Press and hold the desired button, then apply power. As soon as the Power Up LED sequence appears, release the button. *Continuing to hold the button after Power Up will invoke that button’s Running function.*

The new system ID is immediately saved in non-volatile Flash memory. During Power Up, the LED sequence will indicate the selected ID as described above in *LEDs at Power Up*.

## Buttons in Running Mode

In Running mode, buttons should be tapped, rather than held – that is, they should be gently pressed until they click, then released. Tapping any of the three Set buttons will invoke Edit Mode, which is indicated by a pair of toggling LEDs as described on the previous page.

**While in Edit Mode the unit is not a functioning transmitter or receiver.  
You must exit Edit Mode to resume normal Running operation.**

The **Tx/Rx**, **Ch grps**, and **RF pwr** LEDs indicate settings being selected by the buttons.

Each tap of the **Set Tx/Rx** button will toggle the mode, changing the blink pattern of the **Tx/Rx** LED. Tap it until the desired mode is indicated.

Each tap of the **Set Ch grps** button will increment through the available channel group settings. Repeatedly tap the button until the **Ch grps** LED indicates the desired setting. When the **Ch grps** LED is continuously on (not blinking) all incoming DMX channels are transmitted. This is the default and most commonly used setting.

Each tap of the **Set RF pwr** button will increment through the available rf power settings. Repeatedly tap the button until the **RF pwr** LED indicates the desired setting.

When the **Tx/Rx**, **Ch grps**, and **RF pwr** LED all indicate the desired settings, tap the **save & run** button. This saves the new settings to non-volatile Flash memory and restarts the unit. You will see the Power Up LED sequence, followed by normal Running mode with the selected settings.



## DMXioR3 Transmitter Setup

Only one DMXio should be operated in transmitter mode on each system ID. Multiple transmitters on the same ID will produce undesirable and unpredictable results if they are within 300 feet of each other.

### Mode Selection and Connections

To use an RC4Magic DMXioR3 as a transmitter, it must be in Tx mode. This mode is indicated at Power Up by LEDs chasing left to right. After power up, Tx mode is indicated by the **Tx/Rx** LED being predominantly on, with short blips off approximately once per second. (The short blips are a Computer Operating Properly – COP – indication.)

With power and DMX data connected, the DMXioR3 in Tx mode will begin transmitting.

The DMX input is compliant with USITT DMX512/1990(4us), with no internal termination. If you are putting the DMXio at the end of a long DMX cable, a terminator plug should be inserted in the DMX output jack or inline at the input jack. For short cable runs, termination is often (but not always) unnecessary.

Power should be 6 – 18VDC (normally 9 – 12V) and can come from the power supply provided (wall transformer) or batteries. A small pack of 6 AA or AAA batteries, or a 9V or 12V battery, can be used for portable operation with, for example, a battery powered DMXter, Pocket Console DMX, or other mobile DMX signal source. The power inlet is a standard 2.1mm receptacle, center-positive.

The DMX output jack is ideal for inserting the DMXio in a wired DMX network. With a short DMX cable, the DMXio can be positioned at the output of your lighting console or other controller, before your DMX signal continues to other devices in your system. Internally, the DMX input connects directly to the DMX output, so the data will always pass through, even if the DMXio is not powered.

Once everything is connected, position the red circle RF Hotspots on all RC4Magic devices so they are all facing upward. If this is difficult, face the RF Hotspots towards any common reflective surface, like a wall, ceiling, or open floor area.

Line-of-sight is NOT required for RC4Magic, but dense objects between units – like concrete walls – will attenuate the radio signal and reduce the available range.

Most DMX controllers output a full universe of 512 channels. Some controllers output a smaller universe of 128, 256, or other number channels. The maximum packet rate for 512 channels is 44 packets per second. Many controllers output fewer than 44 packets per second; 30 packets per second is somewhat common.

With all channel groups enabled (the **Ch grp** LED indicator solidly on, not blinking) the DMXio transmits all DMX channels that are coming in. Associated DMXio receivers will output the same number of channels and packet rate as is arriving at the transmitter.

You can change the Channel Group setting so that the DMXioR3 transmits 128, 256, or 384 channels, regardless of how many channels are arriving at the DMX input jack. This is useful if you do not require the full universe over a wireless link. Fewer channels reduces rf bandwidth, and increases data fidelity.



## DMXio Receiver Setup

Any number of DMXio units in receiver mode can be used in an RC4Magic Series 2 system.

### Mode Selection and Connections

To use an RC4Magic DMXioR3 as a receiver, it must be in Rx mode. This mode is indicated at Power Up by LEDs chasing right to left. After power up, Tx mode is indicated by the **Tx/Rx** LED being predominantly off, with short blips on approximately once per second. (The short blips are a Computer Operating Properly – COP – indication.)



Connect the supplied power adaptor, and connect the DMX output to your DMX devices. It can sometimes take 10 seconds or more for a DMXio receiver to find and connect to a transmitter and begin outputting DMX data, but it will often connect much faster.

DMX output is compliant with USITT DMX512/1990, and closely mimics the data going into the associated DMXio transmitter.

With all channel groups enabled (the **Ch grp** LED indicator is solidly on, not blinking, on the associated transmitter) the DMXioR3 receiver will output the same number of channels and packets per second that are arriving at the transmitter input. DMX packets can contain anywhere from 1 to 512 channels, with a frame rate of anywhere from 12 packets to thousands of packets per second. (Of course, high frame rates require fewer channels in each packet.)

If you are putting the DMXio receiver at the beginning of a long DMX cable run, a terminator should be used at the far end. For short cable runs, termination is often (but not always) unnecessary.

***Remember: The DMXio receiver is a DMX data source and acts as a controller – just like the DMX output on your console or DMX controller.***

Power should be 6V – 18VDC and can come from the power supply provided (wall transformer) or batteries. A small pack of 6 AA or AAA batteries, or a 9V or 12V battery, can be used for portable operation. The power inlet is a standard 2.1mm receptacle, center-positive.

Once everything is connected, position the red circle RF Hotspots on all RC4Magic devices so they are all facing upward. If this is difficult, face the RF Hotspots towards any common reflective surface, like a wall, ceiling, or open floor area.

Line-of-sight is NOT required for RC4Magic, but dense objects between units – like concrete walls – will attenuate the radio signal and reduce the available range.

## Optimizing Radio Performance



Under ideal circumstances, the range of RC4Magic Series 2 radios exceeds 300 feet and has been reported to be as far as 700 feet. But ideal circumstances are rare. Our published specification of 200 feet is realistic in most situations.

Range is affected by:

1. The orientation of the antennas (RF Hotspots) relative to each other.
2. The number of obstructions between radios.
3. The density of obstructions between radios.
4. Other activity in the 2.4GHz radio band, including leaky microwave ovens.
5. General electrical interference from ac dimmer racks and other power equipment.

Each piece of the RC4Magic Series 2 system has a radio antenna inside which must not be obstructed with metal or other dense objects. This is why the cases are made of tough ABS plastic – they must be transparent to radio waves. The position of the internal antenna is indicated with red circles on the device label – this is called the RF Hotspot.

For best performance, face all RF Hotspots in the same direction, usually upward.

Often there are numerous obstructions between the transmitter and receivers, or there are several receivers positioned in various locations and orientations around the performance space. In this case, try to aim all the RF Hotspots toward a common reflective surface, like a ceiling or wall. The closer the receiver is to the transmitter, the less important orientation becomes.

The high frequency radio signals used by the RC4Magic system tend to reflect more than penetrate. This means that more of the signal will bounce around a room, rather than radiate through the walls to an adjacent space. This helps improve performance between receivers in a performance space, even when line-of-sight between devices is not possible.

Even so, some of the radio signal does penetrate walls and other objects. Provided the transmitter is not too far away, you can successfully place receivers inside theatrical props and practicals, behind flats, and under risers. In these cases, try to place the transmitter as close as possible to these pieces.

An inexpensive RF spectrum analyzer, like the Metageek WiSpy, can be used to inspect the 2.4Ghz radio band and see how well the RC4Magic signal (and other signals) are getting around your space. WiSpy analyzers are available from RC4Wireless at [www.theatrewireless.com](http://www.theatrewireless.com), [www.metageek.net](http://www.metageek.net), and elsewhere.



## How do I...

### ... Change a DMXioR3 from transmitter to receiver, or receiver to transmitter?

Using a bent paperclip or other small tool, press the **Tx/Rx** recessed button. Then press the **save & run** button. See the DMXio section earlier in the manual for additional information, including how to read the LEDs indicating the currently selected mode.

### ... Select a different ID for a DMXioR3?

You choose between 4 different IDs (ID0, ID1, ID2, or ID3) by holding down a recessed button while powering on the unit. When you see the LEDs chase, let go of the button. Details are provided earlier in this manual.

### ... Combine multiple RC4Magic Series 2 systems for a large project?

You can do this by selecting ID3 on all devices being used together. ID3 is the Public ID, and is the same (ID 999) for all RC4Magic Series 2 units.

## Troubleshooting and Frequently Asked Questions

### General

#### What simple actions can I try if I am having performance difficulties with my RC4Magic Series 2 system?

First, turn your DMXio transmitter off and on. This will force it to rescan the 2.4GHz radio band and find a new radio channel. Receivers that are already running will take approximately 10 seconds to respond to the loss of data and find the transmitter on the new channel.

### Radio Performance

#### How common are radio interference problems?

**Not common at all.** We give this issue a fair amount of attention because users fear radio problems and are very concerned about them. In fact, RC4Magic radios are among the best available and rarely suffer problems. Their ability to automatically seek out and use unoccupied frequencies virtually eliminates radio related issues, and makes it very easy to overcome them when they do arise.

#### What is the maximum range of the RC4Magic radio link?

Under ideal circumstances, range exceeds 300 feet. More typically, it is around 200 feet. Depending on your situation, range could be less. See *Optimizing Radio Performance* in this manual for additional information.

#### Is it possible to extend the range of the RC4Magic radio link?

Range can be improved by reducing obstructions, aiming the RF Hotspots differently, eliminating sources of electrical interference, moving devices away from sources of electrical interference (like dimmer racks and dirty arcing lamp sockets) and trying other RF Channels (by turning the DMXio transmitter off and on, forcing a new scan for the clearest channel).



In particular, substantial improvements can be achieved by placing the transmitter high enough to radiate over people's heads.

It is also possible to use high gain and/or directional external antennas with the DMXio. This requires returning the units to the factory for modifications at additional cost, or purchasing the DMXioR3-HG. Wireless data can be transmitted over very long distances using precisely aimed directional antennas. Contact RC4 Wireless for additional information.

Note that most users do not require the DMXioR3-HG with external antenna; our internal antennas are very efficient, despite being hidden within the device enclosure.

### **How can I tell if a performance problem is related to radio interference or not?**

Watch the LED indicators on the RC4Magic units. See that the RF Con indicator is blinking steadily on the receiver. If it is, then the receiver has found and connected with the transmitter. Now check the receiver RF Data indicator. It should blink and shimmer with DMX activity. If it occasionally drops out or appears dim, then some DMX data packets are getting lost. In this case, try aiming the RF Hotspot differently and/or reducing the distance between the transmitter and receiver. Also, watch the speed of the receiver RSSI LED, which indicates the strength of the radio signal. The faster the blink, the better the signal. If it is blinking so rapidly that it looks more like a flicker than a blink, then signal is excellent.

You can also monitor radio activity with external test equipment. The low-cost Wi-Spy spectrum analyzer from [www.metageek.net](http://www.metageek.net) is particularly useful, and is available from RC4 Wireless.

### **What causes radio interference?**

Radio interference is caused by other radio signals on or near the same frequency, and sometimes by harmonics of lower radio frequencies. Sources include other radio devices (including WiFi, Bluetooth, and Zigbee devices) and leaky microwave ovens.

Many radio devices (including WiFi, Bluetooth, and Zigbee) only transmit when they need to. Thus, it is possible that the RC4Magic could find a free channel that is not actually free all the time – intermittent interference could occur when the other device occasionally transmits. In this case, turn the RC4Magic DMXio transmitter off and on, forcing it to find a new channel. Ideally, turn it on when other devices are transmitting. This ensure that the DMXio will see the signal and avoid that channel.

Very few rf devices are as accommodating as RC4Magic – most are user- or factory-configured for a particular rf channel and stay there. Thus, it is often best to turn on your RC4Magic system last, after all other systems are up and running.

## **Mounting and Positioning**

### **Can I put an RC4Magic receiver inside a metal prop, practical, or wagon?**

If a radio receiver is completely surrounded by metal, particularly grounded metal, it is unlikely to work well. Our product cases are made of tough ABS plastic because it is transparent to radio waves; non-metallic materials should be used whenever possible. When this is not possible, some signal will usually get through openings in metal framework.

Mesh does not pass radio at all frequencies. The spacing of the mesh relative to the radio wavelength determines how much signal will pass through. this is why a carefully engineered glass and mesh window can be used in the door of a microwave oven. If you build a box out of old microwave oven doors and put an RC4Magic device inside, you'll be able to see it but it won't pick up any signal.

If possible, build your set pieces out of fibreglass, wood, and plastic. These materials are more transparent to radio than metal is. Minimize the use of metal. Metal framing is fine, but a non-metallic covering over the frame is preferred.

### **How critical is RF Hotspot positioning?**

At distances under 100 feet, RF hotspot positioning is usually not critical at all. When trying to operate at the greatest possible distances, positioning becomes much more important. Performance is usually best when all Hotspots face up, but there are some cases where it is better to face them towards a clear nearby surface, like the theatre back wall.

In general, a common reflective surface helps the signal propagate. Thus, facing everything up works well indoors in a theatre, but doesn't work as well outdoors.

## RC4Magic Series 2 Specifications

### RC4Magic RF Technology

Indoor/Urban Range:	Up to 300' (100 m), 200' (66 m) typical
Outdoor Line-of-Sight Range:	Up to 1 mile (1.6 km)
Transmit Power Output:	Up to 100 mW (20 dBm) EIRP <sup>1</sup>
Receiver Sensitivity:	-100dBm
Operating Frequency:	2.4 GHz ISM band
Agency Approvals:	United States FCC OUR-XBEEPRO Canada IC 4214A XBEEPRO Europe CE ETSI <sup>1</sup> Japan 005NYCA0378 <sup>1</sup>

<sup>1</sup> RC4Magic radio modules must be configured for 10dBm output in Europe, Japan and some other jurisdictions. Output power is configurable using the recessed **Set RF pwr** button.

### RC4Magic DMX Protocol Compliance

DMX inputs and outputs comply with USITT DMX512/1990(4us). Packets with non-zero start codes are not transmitted; RC4Magic cannot transfer proprietary data or RDM packets. DMXio receiver output closely mimics DMXio transmitter input, providing the same number of DMX channels and the same number of packets per second (pps).

Minimum number of DMX channels per packet:	1
Maximum number of DMX channels per packet:	512
Maximum packet-per-second rate:	44pps with 512 channels, 10000pps with 1 channel

### DMXioR3

RF Specifications as indicated above. Hidden internal antenna (external high-gain antenna option available).

Dimensions:	3.4" x 2.2" x 1.6" nominal (approx. 86mm x 56mm x 40mm)
Power Input:	6VDC – 18VDC, 300mA (from a battery or power adaptor) standard 2.1mm power receptacle, center positive a power adaptor is provided with each DMXio unit

#### Transmitter Mode

Only 1 DMXio transmitter should be operated on each system ID.	
4 selectable RF output power levels.	
4 selectable DMX channel ranges (default is ALL channels).	
DMX Input:	meets USITT DMX512/1990(4us) with 1-second data hold after data dropout NO INTERNAL DMX TERMINATION straight-thru hardware connection from DMX input to output
DMX Output:	

#### Receiver Mode

Any number of DMXio receivers may be used in a system.	
DMX Output:	meets USITT DMX512/1990, closely mimics DMX data coming into the associated DMXio transmitter, providing the same number of DMX channels with the same number of packets per second straight-thru hardware connection from DMX input to output (output signal is present on both DMX connectors)



## Warranty Policy

RC4 Wireless warranty policies are the best in the business. If you don't agree, let us know why.

### Seven-Day Easy Return

You may return any new RC4 Wireless Products delivered to you within the last seven days for a refund, *excluding custom engineered and/or custom manufactured items*. We regret that we cannot refund the shipping charges, or pay for shipping the item back to us. We will not hassle you with mountains of paperwork, but we do require that items be returned *unused in the original packaging*.

### We Guarantee Your Satisfaction

The RC4 Wireless RC4Magic Series 2 warranty is the best in the business. If your RC4Magic Series 2 product is not working properly and you didn't misuse or abuse it, we'll fix it.

#### **For Free. Forever.\***

We announced our lifetime warranty policy in March 2013. It is retroactive to all users of RC4Magic Series 2 devices, no matter when they were purchased.

For the first year that you own our products, we will even cover the shipping costs for ground service within North America (continental USA, Canada, and Mexico), not including customs fees when crossing any international border. After the first year, shipping costs are your responsibility.

In most cases (solely at the discretion of RC4 Wireless) when you notify us of a problem, we promptly ship a replacement unit, along with packaging for return of your old one. The replacement may be refurbished, rather than new, but will be in like-new condition. The same lifetime warranty applies to the replacement, just as if it was the unit you originally purchased.

#### **\*Disclaimers We Must Make**

All repair periods are subject to parts availability, and do not apply to holidays or our corporate vacation times. For critical projects, we recommend purchasing spare equipment.

You cannot use our equipment in a show, then return it for a refund: our warranty is not a free rental program.

Our warranty does not apply to devices that have been abused, misused, or mishandled. We will not be responsible for physical damage, failures caused by incorrect wiring, electrical overloading and/or over-voltage, overheating caused by insufficient ventilation, or damage caused by insufficient packaging during shipping.

We will not be responsible for counterfeit or look-alike products not originally manufactured by RC4 Wireless.

We will not be responsible for consequential damages to other equipment, or for lost revenues. We do not guarantee our equipment to be suitable for applications other than those discussed in our application notes and brochures. In particular, no RC4 products should ever be used to control pyro devices.

Published power output ratings of some items are accurate only at specific voltages, duty-cycles, and operating temperatures. Some items may require additional cooling and/or protection circuitry to operate reliably with certain loads. Call RC4 Wireless for advice if you are unsure about any operating characteristics.

If your account payments are not up to date, we reserve the right to withhold service until payment is received.

RC4 Wireless pricing, warranty terms, and technical specifications are subject to change without notice.

**We want you to be a happy and satisfied customer. Please help us serve you better by letting us know exactly what you need. Thank You!**

## How to Reach RC4 Wireless

### Physical Address

**RC4 Wireless** is a registered trade-name of **Soundsculpture Incorporated** of North Carolina.

**Soundsculpture Incorporated / RC4 Wireless**  
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USA

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Emergency Cellular 919-400-3961  
Toll Free Fax 1-866-237-6641 (North America)

### Internet

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# RC4Magic

## Series 2 R3

Wireless **DMX** and Wireless **Dimming** System  
**DMXioR3/R3+ User Manual v1.0 USA Aug-2014**

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