

# ***RC4 Series-3 Wireless Dimmers***

## ***Quick Start:***

### ***RC4 HSL Color Controller***

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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 35VDC. Dimmers should not be allowed to operate at dangerous temperatures. Appropriately sized wire and connectors must be used, along with suitable ventilation to dissipate heat, and external fuses rated for the load being operated.

**This guide is not intended to provide comprehensive electrical safety instructions. RC4 devices should be used only by qualified personnel.**

## ***Start with Basic Wireless Dimming***

Before you can make use of this guide, you need your RC4 Wireless system up and running in basic wireless dimming mode. Find the companion Quick Start Guide for the system you are using at:

<http://www.theatrewireless.com/support/manuals/>

Start with one of these, depending on the devices you are using:

- RC4Magic Series 3 Quick Start Guide
- RC4 W-DIM4 / W-DIMm3 Quick Start Guide
- RC4 LumenDim4 / LumenDimM4 Quick Start Guide

Tutorial videos help you use and understand RC4 technology. Find them at:

<http://www.theatrewireless.com/category/support/video/>.

Seeing the process is often easier than reading a manual.

Wireless dimming, with professional and reliable results, is easy – *it's easier than you think!*

## ***The RC4 Series 3 User Interface***

The RC4 Series 3 User Interface consists of numerous LEDs and recessed pushbuttons. All LED are behind small round holes. All buttons are behind small slotted openings. A small tool, like a bent paperclip, is required to press the recessed buttons.

Never insert a tool into a round hole – buttons are only behind slotted holes.

***Never insert a tool into a round hole – buttons are only behind slotted holes.***  
*Poking tools into round holes can damage LED indicators and circuit-board traces.*  
*Such damage is not covered under warranty.*

## Restore Defaults

If you are unsure of the settings in an RC4 Series-3 device, or if it is not responding as expected, you can restore default settings:

**Hold the recessed *Func* button while you press and release the *SetA* recessed button. The *DimA* indicator will blink, and most settings will be cleared to defaults.** Some firmware versions leave the PWM frequency and RC4 Digital Persistence™ setting unchanged after loading defaults.

To restore everything to original factory settings including PWM frequency and Digital Persistence:

**Hold both the *Func* and the *SetA* buttons while powering on the device and hold them for more than 5 seconds.** The COP indicator will light for 5 seconds in bootloader mode before reverting to normal operation. Hold the two buttons for this entire time.

*Restoring defaults is easiest with two bent paperclips, one for each button.*

## HSL - Hue/Saturation/Level Color Control

Color mixing has been a cornerstone of theatrical lighting design from the earliest days of incandescent lamps and gels. Today, LEDs offer even more vivid color while drawing less power, fitting into smaller spaces, and generating no heat.

The easiest way to mix color using DMX channels is to directly control each primary color with a separate dimmer: a channel for red, another for green, another for blue (RGB). Sometimes it helps to add a fourth channel for white (RGBW to improve light pastel shades) or amber (RGBA to improve differentiation in the orange-yellow range of the visible spectrum).

The primary technical disadvantage of direct RGB dimming is difficulty maintaining accurate color mix while fading three (or more) levels up and down. Even using a subgroup on a sophisticated DMX controller does not ideally solve this problem, because the limited resolution of 256 steps per dimmer causes visible skewing of colors at low levels – there just aren't enough steps to maintain accurate ratios.

Another disadvantage of RGB control relates to human perception of color in design. We don't think of color as a mix of primaries, we think of *robin's egg blue*, *hot pink*, or *lavender*.

The Hue/Saturation/Level model (sometimes called Hue/Saturation/Value) for controlling color was first developed in the 1970s for rudimentary computer-graphics applications. It remains one of the most popular ways to define and control color:

**Hue** (H) controls the mix of primary colors. One channel fades across the visible color spectrum starting at pure red, fading through yellows, to greens, to purples, and back to reds. The very top and very bottom of the range are both red, because the model is a circle, not a line, so the ends meet at the same point.

**Saturation** (S) controls the depth or brilliance of color. Less saturation adds more equal balance of all primary colors. At minimum saturation, the resulting color is pure white. Less saturated colors are often referred to as *pastels*. When controlling RGBW light sources, a lower saturation level increases the white output level.

**Level** (L) is simply overall brightness, solving the technical problem of maintain a particular mix while fading up and down. RC4 Series 3 dimmers handle color mixing with 16-bit arithmetic for a range of 65,536 steps – enough to keep color mixes looking good, even at low overall levels.

A significant advantage of HSL color control is economy of control channels. It is possible to create complex HSL drivers that use many primary color sources – RGBAW, for example. No matter how many source colors are used, HSL only requires three DMX channels for control.

When using RC4Magic Series 3 dimmers, RC4MagicPC allows the red-green-blue-white balance to be fine-tuned. Thus, the full-mix white color temperature can be optimized so that white really does look white, regardless of light sources used. This is particularly handy with custom-built props.

## ***Enabling HSL Mode***

***For complete details on selecting the various modes available in RC4 Series 3 devices, see RC4 Quick Start – Selecting Device Modes, and the complete RC4 Wireless Series 3 Wireless Dimmers User Manual.***

RC4 HotPatch™ provides eight basic device configurations. When using RC4Magic devices, dimmer source patching can be further customized using RC4MagicPC software.

Press and hold the Func button, then press and release (i.e. tap) the SetB button. The selected mode will increment, and the DimA and DimB indicators will provide a pattern of 3 blinks to indicate the newly selected mode. Each press of the SetB button while holding the Func button cycles to the next mode listed below, returning to the first mode after the last mode, around and around.

When changing mode, the DimA and DimB indicators provide feedback to the user. This also causes loads connected to these outputs to blink. Only two indicators are used so that the same indication method can be used on all devices with 2 or more dimmers.

Of the eight available, these modes utilize the HSL Color Controller:

**HSL -> DimA/B/C (RGB), DMX -> DimD [Blink BAA]**

DimA		•	•
DimB	•		

The HSL color controller uses three DMX control channels for Hue, Saturation, and Level, and translates this information to dimmer levels for red, green, blue, and white light sources.

Connect red to DimA, green to DimB, and blue to DimC.

In this mode, DimD is not the HSL white channel. Instead, it is directly controlled by the DMX channel assigned for DimD. Thus, this mode provides a 3-color HSL engine and one general purpose dimmer.

**HSL -> DimA/B/C/D (RGBW) [ABA]**

DimA	•		•
DimB		•	

All 4 dimmers are controlled by the HSL engine. Connect red to DimA, green to DimB, blue to DimC, and white to DimD.

*The HSL modes listed below also utilize the RC4 Flkr Effects engine. More information is provided in RC4 Series-3 Quick Start - RC4 Flkr Engine.*

**Flkr -> HSL -> DimA/B/C, DMX -> DimD [BAB]**

DimA		•	
DimB	•		•

The RC4 Wireless Flkr Engine modulates the HSL color controller. The HSL controller output drives DimA,B, and C for RGB control.

DimD is is directly controlled by the DMX channel assigned for DimD.

**Flkr -> HSL -> DimA/B/C, Flkr -> DimD [ABB]**

DimA	•		
DimB		•	•

The RC4 Wireless Flkr Engine modulates the HSL color controller. The HSL controller output drives DimA,B, and C for RGB control.

DimD is directly controlled by the 4<sup>th</sup> output of the Flkr Engine, bypassing the HSL controller.

### ***Flkr -> HSL -> DimA/B/C/D (RGBW) [BBB]***

DimA			
DimB	•	•	•

The RC4 Wireless Flkr Engine modulates the HSL color controller. The HSL controller output drives all 4 dimmers for RGBW control.

In this mode, the 4<sup>th</sup> output of the Flkr Engine is not used.

## ***HSL Color Control Models***

The HSL color controller on 3- and 4-channel devices uses three DMX control channels for Hue, Saturation, and Level, and translates this information to dimmer levels for red, green, blue, and white light sources.

### ***RGB***

The most popular implementation of HSL control uses light sources for red, green and blue. As Saturation is reduced, an even mix of all three primary sources is added to the current Hue. At minimum saturation, all 3 primaries are even and the color is reference white.

### ***RGBW***

When using an additional primary source of white, the white channel fades up as the Saturation control is reduced. This mixes real white into the mixed white described above.

### ***Cross-Fade / Hybrid White***

The HSL color controller on 2-channel devices provides only cross-fading and uses only two control channels: Hue (cross-fade point) and Level (overall brightness). This is ideal for smooth selection of white color-temperature using hybrid-white 2-channel LEDs.

### ***Setting HSL Control Channels***

RC4 OneTouch™ makes it easy to assign a DMX channel to each of the three HSL control channels. The process is the same as for assigning DMX channels directly to dimmers in normal DimA/B/C mode. Follow the steps in the Quick Start Guide for the particular Series 3 device you are using.

On 3- and 4-channel Series 3 devices:

- SetA sets the Hue (H) channel
- SetB sets the Saturation (S) channel
- SetC sets the Level (L) channel

On 4-channel devices only, SetD sets the DimD DMX channel assignment, which may or may not be evident, depending on the current HotPatch™ mode settings. Note that 4-channel devices in RGBW mode do not require an additional HSL control channel.

On 2-channel devices, which provide only cross-fading and do not support Saturation (S):

- SetA sets the Hue (H) channel
- SetB sets the Level (L) channel



## ***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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Raleigh, NC, 27615  
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