Light-O-Rama

Easy Light Linker™

RF-V4 Wireless Module

User Manual

March 1, 2006

V1.0

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Introduction

The Light-O-Rama (LOR) *Easy Light Linker* is a transceiver designed to work with LOR controllers. The user can select one of 32 operating frequencies in the 902 to 928 MHz band. The user can select a network speed of either "Long range" (19.2 Kbps) or "Average" (56K bps.) The device is powered by the LOR controller it is connected to, or if connected to a PC without an LOR lighting controller, by an LOR Deluxe USB-485 adapter. The Deluxe adapter has a power supply in it for the transceiver.

The device automatically operates as a receiver or a transmitter. Right out of the box, it is configured to operate at 56K on frequency 16. If there is no frequency conflict with other devices (LOR or other manufacturers) no additional configuration is necessary to use the transceivers.

The frequency range used by *Easy Light Linker* is reserved by the FCC for ISM (Instrument, Scientific & Medical) devices. There are 900MHz phones which may share this air space. You may have to try other frequencies if you encounter problems.

The outdoor range is up to 1000 feet. But, as they say, your mileage may vary. The device can be used to connect the indoor PC show director to outdoor controllers. Range will be affected by the walls the signal must pass through (see Installation Considerations.)

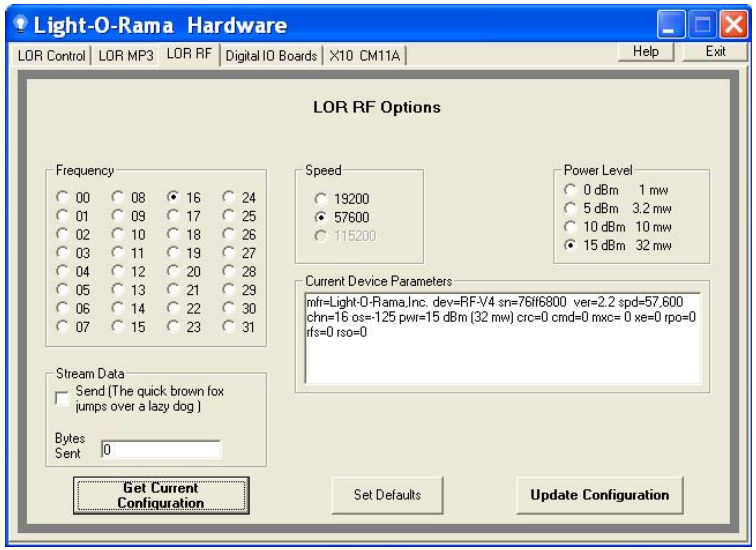
What's in the Box

Your *Easy Light Linker*™ wireless module includes the transceiver, bottom cover, bottom cover screws and user's manual.

If you purchased the *Easy Light Linker* with the PC adapter, then you will also have an LOR Deluxe USB-485 (USB to RJ45 RS485) adapter and USB cable.

Transceiver Configuration

The LOR Hardware Utility is used to change the default configuration of the *Easy Light Linker* transceiver. Run the utility and click on the "LOR RF" tab. The following screen will be displayed:



The transceiver must be the only transceiver unit connected to the PC. The transceiver must be connected to the PC with an LOR Deluxe USB-485 adapter unless there is also a 16 channel controller daisy chained.

Click "Get Current Configuration." The Hardware Utility will send a request for configuration to the transceiver and fill in the current configuration

buttons. The “Current Device Parameters” window will display this information and more.

Radio Frequency (RF channel)

You can select the frequency by clicking one of the 32 frequency buttons (0 to 31). This is only required if a nearby user has LOR transceivers or some other device operating in the 900 MHz band is interfering with your show. After making you selection, click the “Update Configuration” button to change the transceiver’s persistent memory.

Network Speed (RS485 link speed)

You can select the RS485 network speed by clicking either the 19200 button or the 57600 button. After making you selection, click the “Update Configuration” button to change the transceiver’s persistent memory.

Transmit Power

You can select the transmitter power output by clicking one of the “Power Level” buttons. After making you selection, click the “Update Configuration” button to change the transceiver’s persistent memory.

Persistent Memory

The transceiver has an EEPROM that is part of the CPU to remember its configuration settings over power failures. The transceiver will immediately reboot when “Update Configuration” completes its work. This reboot causes the transceiver to load the new configuration from the EEPROM.

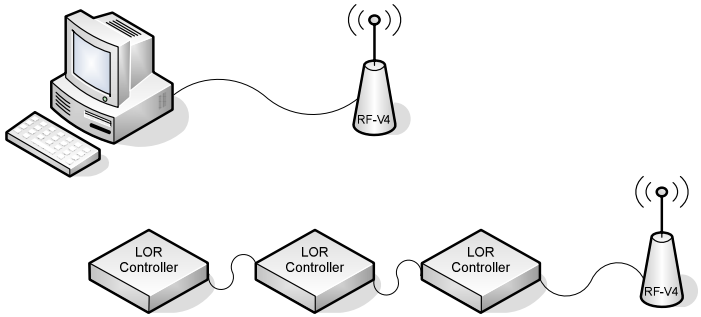
Important Note

If you change the RS485 network speed you must also do this in the Sequence Editor and Show Player if the PC is connected to a transceiver that controls your show. Transceivers do not automatically detect the network speed. If the PC’s or MP3 Director’s speed does not match the transceiver, the transceiver will not recognize and therefore not transmit LOR commands.

Wireless Network Configurations

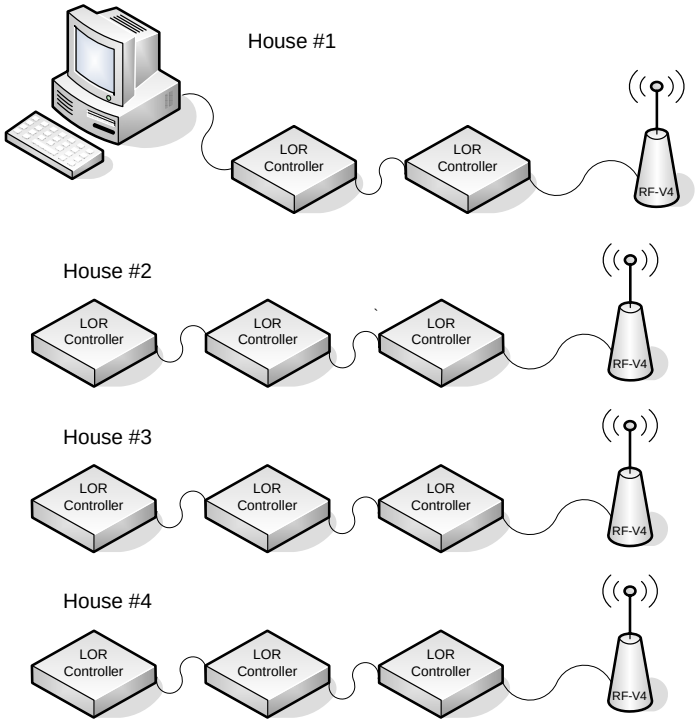
This section shows a few ways you can use *Easy Light Linkers* to link LOR networks. They behave as wire replacements, so anything you can do with over a hard wire, you can do through the wireless units.

Indoor to outdoor link



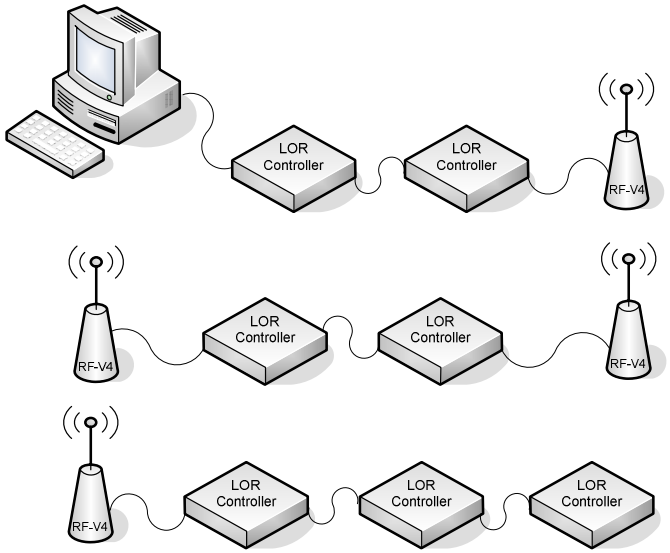
The *Easy Light Linkers* are used to transfer data from the indoor PC directing the show to the outdoor controllers. Aside from the obvious advantage of not requiring a hole in the house for the wire, it also completely isolates the PC from the outside world. Even if a controller is knocked over and allowed to fill with water, there is no possibility of AC voltage getting into the cable to the PC.

Multiple Homes



Here we use *Easy Light Linkers* to provide a coordinated the show for multiple homes. House #1 is directing the show for all four houses. The effect is dramatic when the homes are adjacent and/or across from one another such that the observer is inside the show rather than watching from the outside. You can mix cables with *Easy Light Linkers* as needed.

Long Distance Relay



Here *Easy Light Linkers* are used to relay information beyond the range of the first transmitter. The *Easy Light Linkers* on the right are set to one frequency. The ones on the left are set to another frequency. The PC directing the show transmits the data for the show using the locally connected *Easy Light Linker*. The right *Easy Light Linker* in the second row of the diagram receives this show data and sends it to the attached controllers and the *Easy Light Linker* on the left side which re-transmits the show data on a different frequency to be received by the *Easy Light Linker* in the bottom row.

Installation Considerations

The *Easy Light Linker* was designed to be a simple replacement for the data cable between LOR controllers and/or the controlling PC. It requires no change (software or hardware) in any LOR controller. You do not configure *Easy Light Linkers* as transmitters or receivers. They automatically switch as necessary by continuously monitoring both the RF (Radio Frequency) for LOR commands and the RS485 (hardwired cable) for LOR commands.

Use a LAN cable to connect the *Easy Light Linker* to either an LOR controller or a PC using an LOR Deluxe USB-485 adapter.

Please take the time to read through the following dos and don’ts.

1. The cable between the transceiver and the controller or adapter must be 25’ or less. The transceiver is powered by the controller(s) or an LOR Deluxe USB-485 adapter. A long cable causes excessive voltage drop resulting in transceiver failure.

2. The antenna should point up, be a least a foot away from any vertical surface and about 8’ off the ground. If possible, try to avoid obstructions between transceivers.

3. The case is water tight for water falling on top of it (antenna pointing up.) Do not mount the

transceiver where water can splash upward or be forced into the case from below. (I.e. avoid mounting it where an irrigation system may force water up into the case.)

4. Don't use data cables with boots. The boot results in too tight a fit against the transceiver case and puts too much stress on the RJ45 jack when the bottom cover is put on.

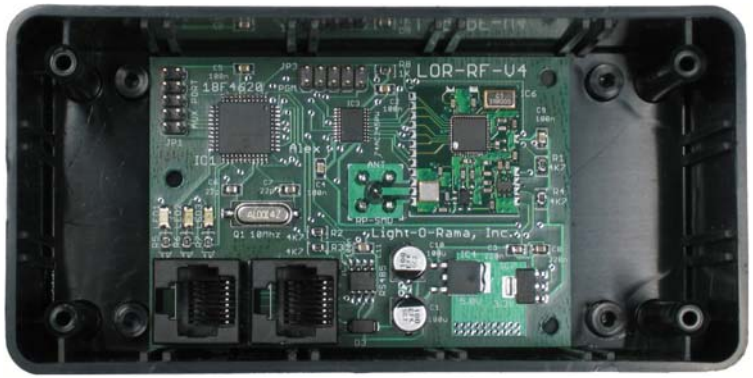
5. After connecting the data cable, route the wire though the notch in the bottom panel. The notch should be placed on the opposite side of the case from the RJ45 jack to minimize strain on the RJ45 connector.

6. Always put the bottom on the case after connecting the communications cable.

7. If you are using the device to connect from an indoor show director (PC or MP3 Director) to outdoor controllers be aware that the walls the signal must pass through will affect the range. If the house is covered in aluminum, you may have to place the transmitter in a window.

8. NEVER remove the antenna. It is sealed to the case with silicone and removing it will break this seal possibly allowing water to enter and destroy the transceiver.

Circuit Board



Easy Light Linker Open Bottom

The above picture shows the *Easy Light Linker* with the bottom cover removed. The RJ45 connectors for power and communication are on the lower left. The CPU is above the RJ45 connectors. The transceiver module is the postage stamp sized surface mount board on the upper right.

The transceiver contains no user serviceable parts.

Status LEDs

There are three labeled LEDs above the RJ45 connectors. They are used as follows:

LED1 This LED pulses approximately once per second when the unit has successful configured itself and is operating. It may pulse more slowly if the unit is extremely busy.

LED2 This LED indicates transmission activity. If the device is functioning as a transmitter, it is ON when the radio transmitter is active. If the device is functioning as a receiver, it is ON when data is being transmitted on the RS485 network line.

LED3 This LED indicates an error, usually an overrun. Overruns occurs when the show is too complex for the transceiver. Meaning that the unit is unable to keep up with the data required to run the show. This LED really shouldn't light.

Pin Headers

No connections should be made to the two pin headers on the circuit board. One of these headers is used to program the board at the factory. The other is reserved for possible future versions of the software to provide a limited number of input/output ports.

Internals

The *Easy Light Linker* is based on a 10 MIP CPU directing a 900 MHz transceiver. There is a SAW filter between the antenna and the transceiver to provide for superior transmission purity and rejection of adjacent frequency signals during reception. The antenna used is a dipole to concentrate transmit energy and increase receiver sensitivity.

Every effort has been made to achieve maximum range given the power levels permitted by US and Canadian radio device regulations.

Specifications

Power requirements	9 VDC, 150 ma
Transmit power levels	0 dBm (1 mw) 5 dBm (3.2 mw) 10 dBM (10 mw) 15 dBm (32 mw)
Frequency range	902 – 928 MHz
RF channels	32
RS485 link speeds	19,200 bits/second 57,600 bits/second

Radio Frequency Compliance

USA

FCC ID: TU7-RF02

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

Canada

IC: 6255A-RF02

This Class A/B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A/B respecte toutes les exigences du Réglement sur le matériel brouilleur du Canada.

Modifications Warning

Changes or modifications to this device not expressly approved by Light O Rama could void the user's authority to operate this device.

RF Exposure Warning

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This device's external antenna must be installed in accordance with provided instructions and it must be operated with a minimum 20 cm spacing between antennas and all persons' bodies (excluding extremities of hands, wrists and feet) during wireless mode of operation. Further, this transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

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