

Optimizing Battery Life in Lutron Shades

Summary

Choice of batteries, as well as shade installation and setup, can have a significant impact on battery life in Serena and QS Triathlon shades. By choosing the right batteries, optimizing the installation environment, and optimizing the RA2 Select, RadioRA 2, or HomeWorks QS system configuration (where applicable), you can expect a shade to require fewer battery replacements over the course of its life.

1 Battery Life Checklist

The checklist below and explanations that follow can be used to help ensure the longest possible battery life for a shade.

1.1 Batteries:

- Replace all the batteries in a shade at the same time with brand-new batteries, all from the same package. Brand-new batteries will be unopened, and have an expiration date of no less than 7 years from the date of installation. Note that batteries slowly drain as they age, so a newly-manufactured battery will have a longer service life than a battery that expires in 1 year, even if the older battery has never been used.
- Choose batteries from a well-known, high-quality manufacturer. Follow all recommendations of the battery manufacturer. DO NOT mix batteries from different manufacturers or of different types (e.g., Lithium and Alkaline).
- Ensure that all batteries are installed in the correct orientation.
NOTE: A shade may still power up and operate even with one or two batteries reversed, but battery lifetime will be significantly reduced.
- D-Cell Shades:** Alkaline batteries are recommended for D-cell shades. Do NOT use Carbon-Zinc, Lithium, or Rechargeable D-cell batteries. Lutron recommends the use of Rayovac ReadyPower or Duracell Coppertop alkaline D-size batteries.
- AA-Cell Shades:** Battery life estimates in SCT/MyProjects are based on Lithium AA Cells, which will last longer than Alkaline batteries. Alkaline AA Cells will run the shade, but will not last as long as Lithium.
- Don't use expired batteries, or batteries with dents, scratches, label damage, corrosion at the metal terminals, or leakage.

1.2 Shade:

- Know when to replace your batteries by observing the shade button blink codes and shade movement speed (see the following pages for more information).
- Make sure the shade is clear of physical obstructions and snags throughout its travel.
- HONEYCOMB ONLY: Don't set the open limit too tightly (i.e., the hembar shouldn't be overly compressing the fabric when the shade is fully raised). When the open limit is set properly, the fabric shouldn't "relax" after opening, and the drive's LED shouldn't blink red after opening.
- Note that how often the shade is moved will have a noticeable impact on battery life; Lutron battery life estimates assume two cycles (two full up & down motions) per day.

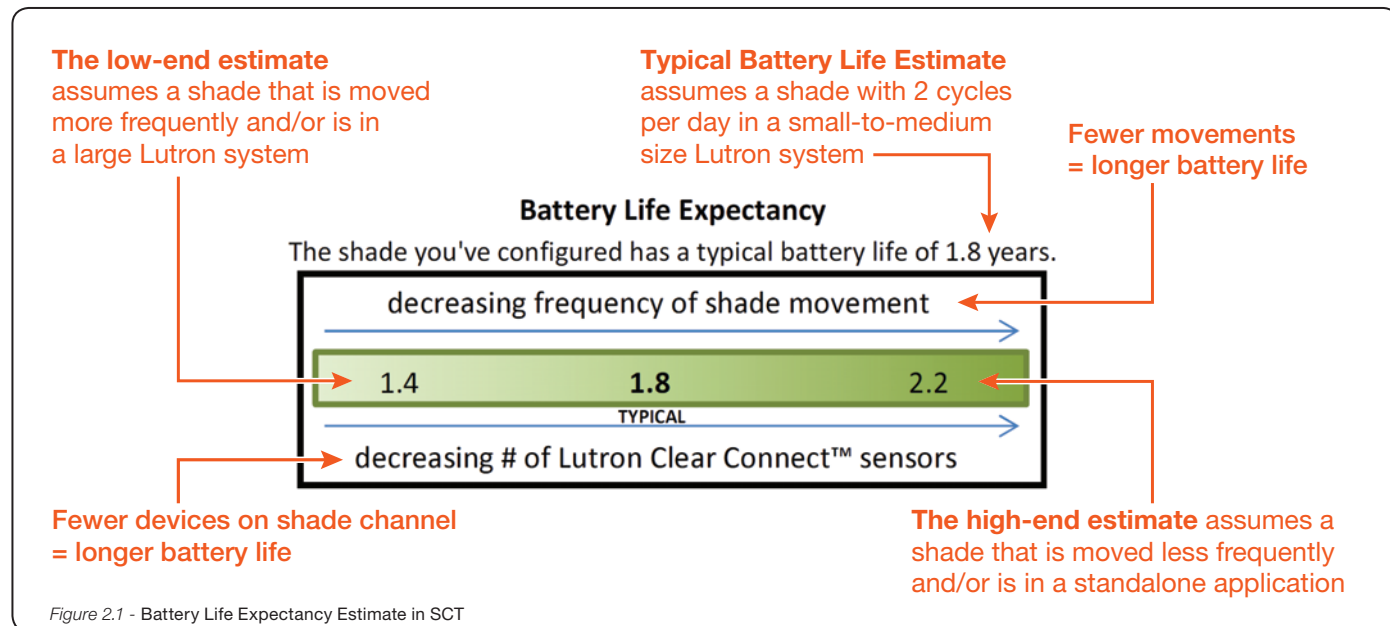
1.3 System:

- Where possible, keep shades on their own RF link* (and their own channel). Sensors and other devices sharing a channel have the potential to keep a shade awake more often, resulting in shorter battery life. See the following pages for more information.
- In some scenarios, 3rd-Party equipment integrating to Lutron systems can cause excessive Lutron RF traffic, which can drastically shorten the battery life of shades. When integrating to Lutron systems, care should be taken to ensure that 3rd-party integration drivers are correctly configured.

*An RF link is defined as the Main Repeater in a RA2 Select system, a single Main Repeater in a RadioRA 2 system, or one configurable link of a HomeWorks QS processor which is set to the RF link type. One RF link can have 100 devices and 100 zones maximum, including Repeaters/Processors.

2 Battery Life Expectancy Estimate in SCT/MyProjects

The battery life estimates provided in SCT/MyProjects are intended to set an expectation for typical battery life for each particular shade configuration. Actual battery life will vary with the batteries used, the application, and environment. In the SCT battery life estimate, the range of expected battery life is shown graphically, with varying assumptions of application and environment, particularly with respect to the size of the system/number of sensors, and the frequency of shade movement. Sensors are identified in particular, as they have a more significant impact on shade battery life than other devices.



3 LED Feedback and Low-Battery Behavior

Serena and Sivoia QS Triathlon battery-powered shades have internal battery-monitoring technology that is intended to reduce the probability of battery leakage. When its batteries are low, the shade will start providing **RED** LED feedback to indicate that they will have to be replaced. See the below table for the “Low Batteries” and “Very Low Batteries” cases. When the batteries are low, the shade will typically also start moving at 1/2 speed, and may stop prematurely during an attempted movement. When the batteries finally reach end-of-life, the shade will enter a hibernation mode,* where it will stop responding to movement commands and stop providing LED feedback.

Blink Code	Meaning	Possible Causes	Remedy
RED-GREEN-RED-GREEN	Hardware Reset	<ul style="list-style-type: none"> Batteries replaced Obstruction to movement/motor stall 	Replace Batteries Remove Obstructions
RED blink every 5 seconds	Low Batteries: Expect to replace within the next 3 months	<ul style="list-style-type: none"> Batteries are dying Low quality batteries Unmatched battery stack 	Replace Batteries
Solid RED during Movement	Very Low Batteries: Expect to replace within the next 2 weeks	<ul style="list-style-type: none"> Batteries are dead Low quality batteries Unmatched battery stack 	Replace Batteries
Eight fast RED blinks per second for 15 seconds	Obstruction	<ul style="list-style-type: none"> Obstruction to movement 	Clear Obstruction
Constant RED for 15 seconds after reset	Excess non-Lutron RF traffic	<ul style="list-style-type: none"> Stray RF traffic from non-Lutron devices 	Change Shade Channel ¹
Constant RED for 30 seconds after reset	Excess RF traffic from other Lutron systems	<ul style="list-style-type: none"> Other Lutron devices transmitting frequently Neighboring Lutron systems transmitting frequently 	Change Shade Channel ¹
One slow RED blink per second 15 seconds after reset	Excess local system RF traffic	<ul style="list-style-type: none"> Excess system traffic on shade channel 	Change Shade Channel ¹

¹For information on changing the channel of a battery-powered shade, contact Lutron Technical Support

Table 3.1 - LED Blink Codes

***IMPORTANT:** When replacing batteries in a shade that has entered hibernation mode (i.e., it isn't responding to commands, and isn't displaying any LED feedback), you must wait 5 minutes after removing the old batteries before inserting the new ones. This will allow time for a full reset, ensuring that the shade exits hibernation mode and resumes normal operation when the new batteries are installed. With shades produced in 2014 and later, instead of waiting 5 minutes, you may install new batteries, then press and release the shade button one time to exit hibernation mode and resume normal operation.

4 Systems and Sensors

Battery-powered shades spend the majority of their life in a sleep state, in which they're conserving energy and waiting for a radio signal to issue a raise or lower command. Once a radio signal of Lutron origin is detected, the shade wakes up and decodes the message to determine if it should take action based on the command it processed. Note that the shade will wake up even if the signal is not intended for the shade. Each time this occurs, a small amount of energy is consumed. As a result, shades consume more energy in areas with more system radio traffic on the shade's channel.

When a shade is part of a Lutron RA2 Select, RadioRA 2, or HomeWorks QS system, it is likely to consume more energy when not moving, as it will be responding to more radio signals than a standalone shade. In a typical system, this impact is minimal—but as systems grow larger (especially when there are sensors included), the toll on battery life does as well. Sensors are particularly prone to having this impact, as they are transmitting much more frequently than other devices (such as keypads, which only transmit during direct user interaction). Certain types of wireless Lutron sensors will have a significant negative effect on shade battery life, and should be placed on a separate RF link from the shades; these include daylight sensors, window sensors, and temperature sensors. See section 4.2 for instructions.

Lutron sensors that can affect battery life:

- Radio Powr Savr Occupancy/Vacancy sensors
- Wireless Daylight sensors
- Wireless Window sensors
- Wireless Temperature sensors

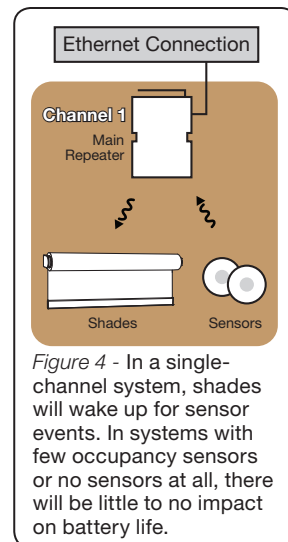


Figure 4 - In a single-channel system, shades will wake up for sensor events. In systems with few occupancy sensors or no sensors at all, there will be little to no impact on battery life.

4.1 Mitigating the Impact of Sensor Traffic in RA2 Select Systems:

To mitigate this impact in RA2 Select systems, there are a few design options:

1. Order Triathlon shades with "Plug-in" or "Panel" power supplies, or order Sivoia QS Wireless shades instead.
NOTE: Triathlon shades cannot be field-converted from battery-powered to wired-power (plug-in or power panel), so this option is only available before shades are ordered.
2. Minimize the number of Radio Powr Savr occupancy sensors used in the system; the fewer the sensors, the less impact there will be on shade battery life. As a rule of thumb, limiting the system to include no more than 4 occupancy sensors shall result in a 25% or smaller reduction in shade battery life.
3. Do not add the Radio Powr Savr occupancy sensors, or the load control devices controlled by them, to the RA2 Select System. The load controls will still be controlled by the occupancy sensors, automatically turning lights off and (optionally) on, based on the room's occupancy state, but they won't be controllable via the RA2 Select app, scheduled events, or integration to 3rd-party systems. This will minimize the battery life impact of the RF occupancy sensors on the shades (e.g., 4 occupancy sensors shall result in a total shade battery life reduction of 10% or less).
4. Use non-wireless in-wall occupancy sensors instead, such as Maestro MS-OPS2H (switch/sensor) or MSCL-OP153MH (dimmer/sensor) devices. These devices will not communicate to the system, but will provide the sensor functionality and will match the aesthetic of the RA2 Select in-wall load controls.
5. Upgrade system to RadioRA 2, and use the multichannel strategy outlined in section 4.2 on the following page.

4 Systems and Sensors *continued*

4.2 Mitigating the Impact of Sensor Traffic in Larger RadioRA 2 and HomeWorks QS Systems:

To mitigate the impact of sensor traffic in systems with more than one RF link, it is possible to change the channel on which shades operate and effectively isolate them from any other RF activity in your area. Each RF link requires its own unique frequency and the system programming software will automatically configure each RF link to have a unique frequency or channel.* The diagrams at right illustrate system design options to optimize battery life. Both options are available under either system. In a RadioRA 2 system (*figure 4.2.a*) or HomeWorks QS system (*figure 4.2.b*) with more than one (1) main/hybrid repeater, a shade will automatically operate on the same RF channel as the repeater/RF link to which it is assigned.

Note that the default RF channel used by the first RF link added to a design is 433.6 MHz which is the default frequency out-of-the-box for all wireless sensors. The frequency of wireless sensors can be changed, but for the purposes of simplicity and efficiency for the installer, it is recommended to place the sensors onto the RF link with the default frequency when possible.

Note that in multi-residence buildings, it is possible that RF traffic from neighboring Lutron systems could also cause undesired wakeups and shade battery life reduction. In buildings such as this, it is recommended to change the shades to a non-default RF channel. For information about changing the channel of shades, contact Lutron Technical Support.

Battery-powered shades have an internal mechanism to detect excess radio traffic and suggest a channel change via LED blink code. Refer to *Table 3.1* on page 2 for more information.

*To manually change the RF Channel of a main repeater, go to the “design” tab in the GUI and type [Alt+F6]. Then, right-click on a main repeater and choose “Advanced Settings”. Assign a frequency from the menu, ensuring that each main repeater in the system uses a different frequency.

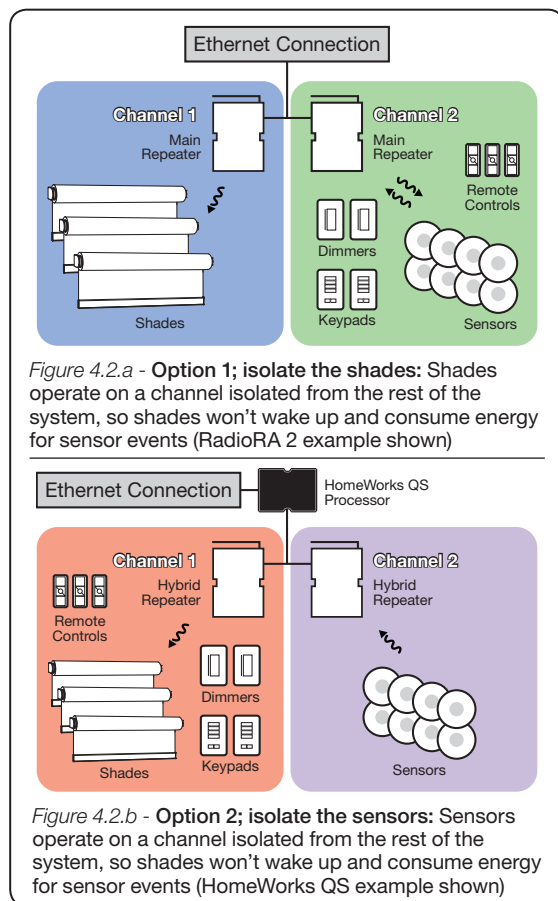


Figure 4.2.a - Option 1; isolate the shades: Shades operate on a channel isolated from the rest of the system, so shades won't wake up and consume energy for sensor events (RadioRA 2 example shown)

Figure 4.2.b - Option 2; isolate the sensors: Sensors operate on a channel isolated from the rest of the system, so shades won't wake up and consume energy for sensor events (HomeWorks QS example shown)