

RA BASIC OPERATION

RA operates in one of three modes: LOW, HIGH and FLASH.

To turn on RA, plug it into a BatPak, turn on the BatPak by single pressing the BatPak power button, and then press the RA button. RA will power on in the mode it was last in when it was powered off. Pressing the RA button within two seconds of the last button press will cycle modes from LOW to HIGH to FLASH with each press.

To turn off RA, wait two seconds or longer since the last button push and then press the button. RA will power off and remember which mode it was in when it powered off.

BRIGHTNESS ADJUSTMENT

With RA in LOW or HIGH mode, push and hold the button to adjust brightness. While the button is held, RA will cycle through its brightness settings. When the desired setting is reached, simply release the button. RA will remember the new setting for that mode. When the lowest or brightest setting is reached, RA will flash three times before adjusting the brightness in the opposite direction.

FLASH MODE

FLASH mode uses the brightness setting from the HIGH mode. With RA in FLASH mode, push and hold the button to cycle through the available rates. While the rate is adjusting, RA will flash three times at each rate setting before moving to the next setting. From the lowest flash rate setting, RA will change to an SOS flash pattern - three quick flashes, followed by three long flashes, followed by three quick flashes. When the desired setting is reached, simply release the button. RA will remember the new setting for FLASH mode.

MOONLIGHT POWER ON MODE

Not many things are more annoying than being blinded by a bright light when you wake up in the middle of the night. To power on RA in its lowest light setting regardless of how RA was set at last power off, press and hold the button for three seconds. RA will turn on at its lowest brightness. To turn off RA, wait at least two seconds and press the button. Moonlight mode is not stored as the last used setting. RA will return to the last used mode (LOW, HIGH or FLASH) when turned on with a single button push. Adjusting brightness in Moonlight Power On Mode will switch RA to LOW mode and store a new LOW brightness setting.

FACTORY SETTINGS

RA comes set from the factory with LOW mode set to 30% brightness, HIGH mode set to 100% brightness, and flash rate at about 5 times per second. To restore those settings on your RA, Press and hold the button. After three seconds RA will power on in Moonlight mode. Continue to hold the button (about twelve seconds total) until RA flashes three times and then shuts off. Release the button. Factory settings are now restored.

THERMAL MANAGEMENT

RA was designed to dissipate the heat that accompanies bright lighting. It is normal for the unit to become warm especially when used at high brightness. In virtually all real-world conditions, RA will continuously output full rated brightness. For abnormal or fault conditions, RA has a mechanism to prevent overheating. If the operating temperature of the LEDs start to approach their upper limit, power to the LEDs is reduced to keep them within their safe operating range.

Caution: Ensure that RA is not operated while covered or enclosed. It is good practice to disconnect RA from the power source when packed away or not in use.

POWER MANAGEMENT

RA is designed to be used with a high-current, 2A or greater, USB-A power port. If RA is attempted to be used with a low-current source such as a computer USB port or a low-current battery pack, RA will try to adjust its brightness to stay within the capabilities of the power source. While this may work, it can produce unpredictable and unsafe results. It is strongly recommended that RA be connected only to a USB-A powerport capable of supplying 2A.

WARNING! RA produces very bright light! Extended exposure to bright light can harm your eyes.
Do not look directly into light at close distances! **Do not** shine light directly at someone at close distances!

BATPAK OVERVIEW

The BatPak operates much the same as an ordinary power bank. However, it has a few differences to make it work with RA.

The **first difference** is that the auto shutoff feature on the BatPak only becomes active after a four hour time period. This is to allow the lights to be turned on and off via the push button switch on the lights as well as be used at low-light levels. Ordinary power banks shut off after about 30 seconds if the current draw is less than 50 mA. Since the lowest light setting on RA is well below 50 mA, ordinary power banks are impractical to use at low light settings. Also, anytime you turn off RA for longer than 30 seconds, an ordinary power bank will auto-shutoff, thus requiring both the power bank and the lights be turned back on. This can be extremely inconvenient in many situations. The four hour auto-shutoff on the BatPak allows continuous low-light use and convenient intermittent light use.

The **second difference** in the BatPak compared to an ordinary power bank is that all of the BatPak outputs are high-current and each will support RA at full brightness individually and simultaneously. Many ordinary powerbanks have a high-current output and a low-current output which share the same power circuit. When using two RA at full brightness, an ordinary power bank will often overheat and turn off.

The **third difference** is that the BatPak uses high-energy-density lithium ion cells that each hold 3,350 mAh of charge. Many ordinary power banks use standard-density 2,600 mAh cells. This gives BatPaks a 29% runtime improvement over standard power banks for the same number of cells and similar weight.

We didn't start out with a goal to build our own power banks, but the normal operation and performance of standard power banks didn't meet the practical needs for powering RA.

CHARGING THE BATPAK

The BatPak ships with a partial charge for safety reasons. You can use the BatPak right away, but it is recommended that you charge it first.

To charge the BatPak, connect the micro-USB input port to any live USB-A power port using the included cable. A car charger, wall charger (neither included) or powered computer USB port will charge the BatPak. The speed of the charge will be determined by the amount of power available by the supplying USB power port.

The four orange Charge Status LEDs will blink to indicate charging, and are a fuel gauge indicating how "full" the BatPak is charged.

CHARGE LEVEL METER

The four orange Charge Status LEDs are a fuel gauge indicating how "full" the BatPak is charged. These tables illustrate the charge level indicated by the LEDs during charging and discharging.

Charging	
4	Full
3 + flashing	75-99%
2 + flashing	50-74%
1 + flashing	25-49%
flashing	0-24%

Discharging	
4	>75%
3 + flashing	50-74%
2 + flashing	25-49%
1 + flashing	3-24%
flashing	< 3%

TURNING ON AND OFF THE BATPAK

The four orange Charge Status LEDs also function as power on indicators. With the Charge Status LEDs off, press the power button once to turn the unit on. Once on, the unit will remain on for approximately four hours and then will automatically shut off as long as the BatPak is not supplying power to a load.

To turn the unit off, wait two seconds from the last button press and double-press the power button. This will turn the BatPak off.

BRIGHTNESS VS. RUN TIME

This table lists how long the batteries will last starting from a full charge. The numbers are for a single RA at a corresponding brightness. To get battery life for two RA running at the same brightness, divide the number of hours by two.

Setting	Lumens	Run Time		
		BatPak 1	BatPak 2	BatPak 3
20	800	3 hours	6 hours	9 hours
19	650	3.5 hours	7 hours	11 hours
18	525	4 hours	8 hours	13 hours
17	425	5 hours	10 hours	15 hours
16	350	6 hours	12 hours	18 hours
15	275	7 hours	14 hours	21 hours
14	225	8 hours	16 hours	25 hours
13	175	10 hours	19 hours	29 hours
12	150	11 hours	23 hours	34 hours
11	120	14 hours	27 hours	41 hours
10	100	16 hours	32 hours	48 hours
9	80	19 hours	38 hours	57 hours
8	65	22 hours	45 hours	67 hours
7	50	26 hours	53 hours	79 hours
6	40	31 hours	62 hours	94 hours
5	35	37 hours	74 hours	111 hours
4	30	44 hours	87 hours	131 hours
3	25	52 hours	103 hours	155 hours
2	20	61 hours	122 hours	183 hours
1	15	3 days	6 days	9 days

To keep it simple, we sized the BatPaks with their total energy corresponding to their model number. The BatPak 2 lasts twice as long as the BatPak 1 and then of course the BatPak 3 lasts 3 times as long as the BatPak 1.