

Lithium Battery voltage response while starting a vehicle

April 2014 – Shawn Higbee

Do you ever wonder what happens to the battery voltage when the key is turned on, head light shining, and then press the starter button on your motorcycle?

The graph below helps to visualize the steps in voltage drop and rise while trying to start your motorcycle. This graph is assuming the lithium starter battery was fully charged to 14.4V before turning on the key. Once the key is turned on, the vehicle electronics and lights will pull power from the battery and the voltage level will drop quickly to ~13.8V and continuously discharge at a steady rate until you press the starter button. If the key is left on for 5 seconds or more the voltage could drop near 13V before the starter button is pressed. At this point the battery responds with a large burst of power to crank the engine and the voltage drops dramatically. The voltage drop to 12V on the graph indicates that the starter button was pressed and held during this period. After the starter button is release the battery voltage rebounds almost immediately to 12.86V and then slowly climbs to its nominal voltage over time.

Specific to a fully charged Shorai LFX battery the voltage performance under load would typically measure 10.5V-12.5V during continuous cranking. If the battery voltage drops below 10V during a start attempt the battery might be undersized for the application, low in charge, require warm-up in cold ambient temperatures, or need to be replaced. After a short key on event or starting attempts, 13.1 to 13.3V is a comfortable resting voltage for the Shorai LFX battery. In these short transient discharge events the voltage level does not represent the battery state of charge (SOC). However, if the battery is left to rest for a 24hour period after the load is removed the resting voltage will slowly rise up to a higher reading. Or if the engine started, it will charge the battery and the measured voltage will climb to 13.6-14.4V quickly. Most modern motorcycle charging systems output enough power to recharge a lithium battery in less than 15 minutes.

