

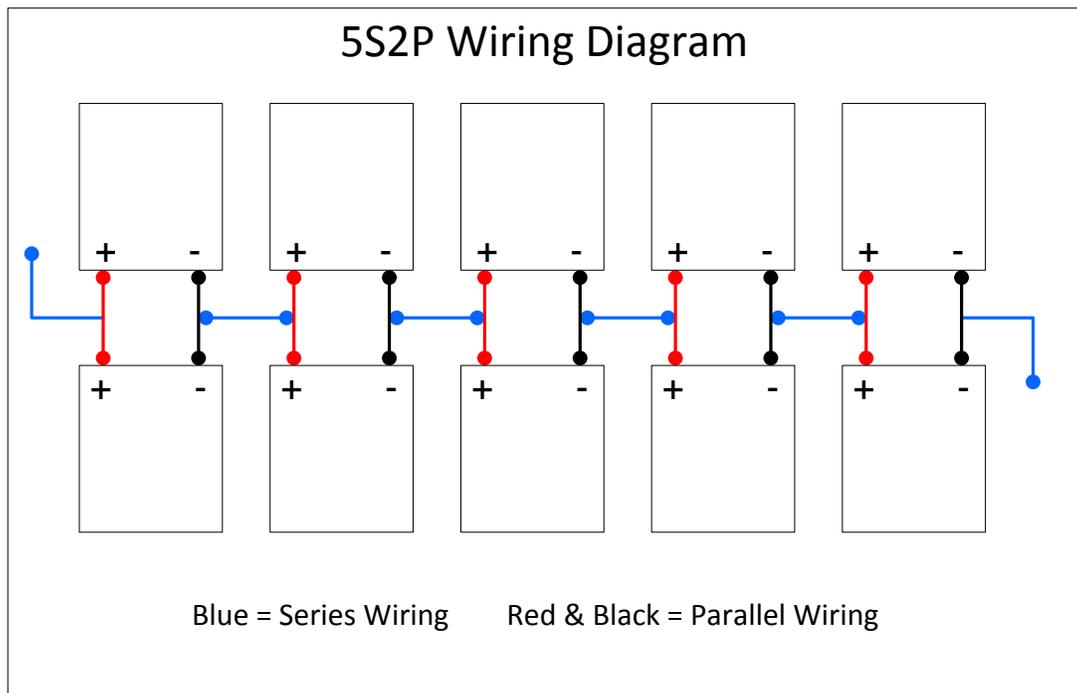
Batteries – What Do All of Those Numbers Mean?

by Kirk Sonnier

Lithium Polymer (LiPo) battery packs are labeled with a set of numbers describing many of its properties. For this discussion let's use a 5 cell, 5000mAh, 30C battery pack. This pack could also be designated as a 5S1P, 5000mAh, 30C battery pack. Let's break down each part of this designation to figure out what all of these numbers mean.

Series & Parallel Wiring Configurations

The 5S1P labeling describes several things about this pack. The "S" and the "P" parts of the labeling describe how the pack is configured (wired together). They also indirectly describe the voltage of the pack and capacity of each cell or cell component in the pack (more on this later). The number in front of the "S" tells us how many cells or cell components are wired in series. The number in front of the "P" tells us how many cells are wired in parallel. If a pack were labeled as a 5S2P pack then we would know the pack contained 5 more cells than a 5S1P pack. In other words, the pack would be made up of 10 cells configured to make up 5 cell components. Each cell component would have 2 cells wired together in parallel and each of the cell components would be wired together in series. A 5S1P pack would have 5 cells wired together in series. The "1P" part of the labeling is the default when the cells are wired in series only and is often times dropped from the labeling.



Voltage and Capacity

The average voltage of a LiPo cell is rated at 3.7 volts. This number is used when figuring out the voltage of the pack. A 5 cell pack has a voltage rating of 18.5 volts ($3.7V * 5 = 18.5V$). If you were to plug two 5 cell packs together in series the voltage of the combined packs would be 37V (NOTE: The at rest voltage of a fully charged cell is 4.2V). Our example pack has a capacity of 5000mAh (milliamp hours) which is equivalent to 5 amps. For us, the capacity of a pack can be thought of as fuel or run time. If you want more run time, you would plug additional packs together in parallel or purchase packs with a higher "P" labeling. For example, if you plugged two 5S1P 5000mAh packs together in parallel, you would have a 5S2P 10,000mAh pack. Conversely, plugging two 5S1P packs together in series gives you a 10S1P 5000mAh pack. Notice, if you want more voltage you plug packs together in series and if you want more capacity you plug packs together in parallel.

C Rating

The "C" rating of a pack describes how much power the pack can put out based on its capacity. A 5000mAh pack has a capacity of 5 amps. A 30C rating means the pack can continuously delivery 30 times its capacity until it is drained. So a 5000mAh pack can delivery 150A continuous ($5A * 30C = 150A$). Every pack also has a burst "C" rating. This means the battery can deliver that amount of power for a very limited amount of time, maybe a couple of seconds. Matching the "C" rating of a pack with the amp draw of the power system is very important to the health and longevity of your packs. If you have a high-powered EDF where the power system has an amp draw of 120A you would want to use packs with a minimum "C" rating that would be equal to 120A continuous but it would be better to use packs with a higher "C" rating than the system's amp draw. This prevents the packs from working too hard, reduces the heat produced by packs, and extends the life of the packs.