



## **Battery series and parallel wiring:**

Wiring batteries in series or parallel is the same wiring methods used above. What will change is voltage and current of the system. We will only go into 6 volt and 12 volt batteries since these are the most common for car audio. Also be aware of more industrial vehicles such as semi-trucks and other large vehicles. They commonly operate on a 24 volt system that is usually comprised of multiple 12 volt batteries wired in series or series-parallel combinations. Other electric vehicles may have 3 or 4 batteries or groups of batteries wired in series for a 36 volt or 48 volt system. It is not acceptable to “tap” into just one of the 12 volt batteries wired in series for an audio system. This puts all of the load on that battery and will cause battery failure. For this you must use a voltage reducer or convertor that will drop the voltage from 48, 36, or 24 volts down to 12 volts while spreading the load over all of the batteries.

Remember that whatever your final voltage is, you will have to have a charger that is the same rating as the total voltage in the circuit. If you have two 12 volt batteries wired to a 24 volt circuit, you will need a 24 volt charger. A 12 volt charger will not charge the 24 volt circuit.

### **Parallel battery wiring:**

When you parallel two batteries together, the current rating is the sum of the two batteries added together. The voltage is still the same as the voltage rating on the batteries. You must make sure that both batteries are the same rated voltage and similar current capabilities. If they are not, you may damage one of the batteries from over charging or larger current draw. Just remember, since you have 2x the capacity, it will take 2x longer to fully recharge both. That is why this is popular for car audio and boating especially when using electric trolling motors.

Some batteries capacities are rated by “Ah” or “amp hours”. Most car batteries are rated “CCA” or “cold cranking amps”. The formula works the same for either rating. Be sure that your batteries are the same rating to make sure you don’t damage one of the batteries from overcharging.

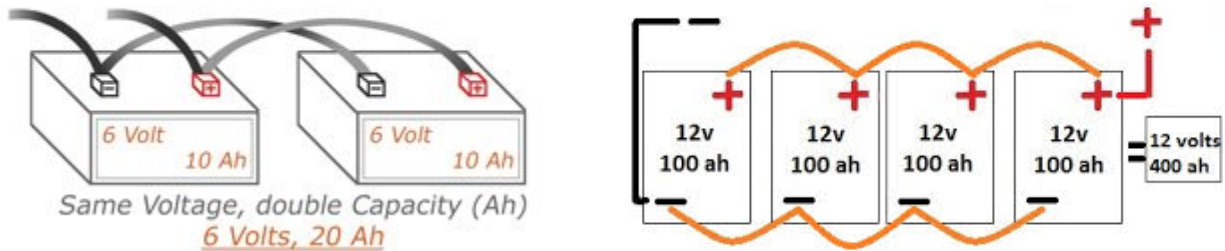
### **Example:**

Two 12 volt, 600 CCA batteries in parallel will give you 12 volts and 1200 CCA. This means that the voltage is the same but you have 2x the current reserve so you can operate your electronics for 2x as long before the batteries need to be charged.

Two 6 volt, 10Ah (amp hour) batteries wired in parallel would give you 6 volt and 20 Ah.

Four 12 volt, 100 Ah batteries in parallel would give you 12 volts and 400 Ah.

### Batteries Joined in Parallel



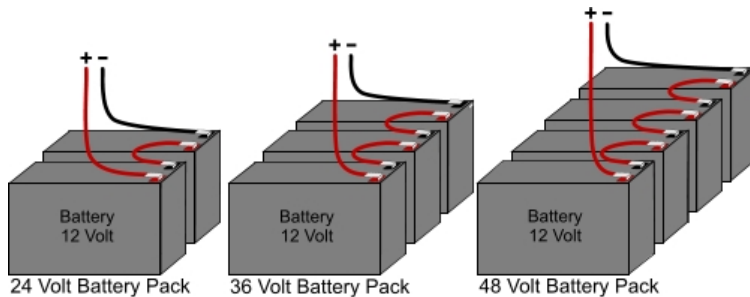
### Series battery wiring:

When you series two 12 volt car batteries, you will add the voltage of each for the total voltage output (24 volts). The current will stay the same. Since power (P) is calculated by voltage (V) x current (I) ( $V \times I = P$ ), you will note that since you are effectively doubling the voltage to 24 volts and the current is the same, the power is also double. That is why with an unregulated power supply, you will lose power as voltage drops. You can obtain a 12 volt system with 6 volt batteries by wiring them in series.

### Example:

Two 6 volt, 200 CCA batteries wired in series would give you 12 volt and 200 CCA.

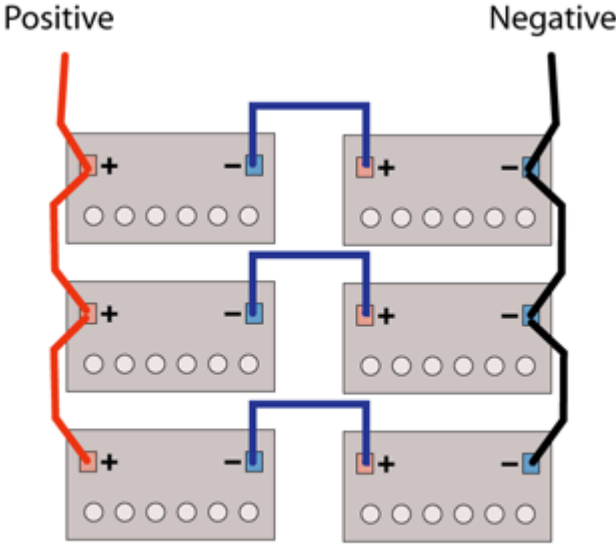
Three 12 volt, 600 CCA batteries in series would give you 36 volts and 600 CCA.



Sometimes you need more voltage and capacity. This is where you need series-parallel battery wiring. This is a common practice for Semi-trucks and construction equipment. It is also used in some all electric vehicles like golf cars and ultra-efficient electric vehicles like the Tesla.

### Example:

If you wire four 12 volt 300 Ah batteries in series parallel you would have 24 volts with 600 Ah capacity.



Series/Parallel Wiring Combination