

# **Battery Capacity Project**

**Measuring the amp-hour capacity of storage batteries**

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## Why measure?

- To determine the amp-hour capacity of a storage battery, typically lead-acid types used for backup power.
- To weed-out bad batteries that have been in service for a period of time.
- To select used batteries that may have useful capacity remaining.
- Because the real-life capacity of the battery system is important on solar powered systems to determine how long the battery bank could run attached loads.

## Equipment:

I bought a device that will measure amp-hours delivered to a **user-specified load** (up to about 10 amps on a 12v system).

The device will be able to measure amp-hour capacity of a battery system down to a **user-specified cut-off voltage**.

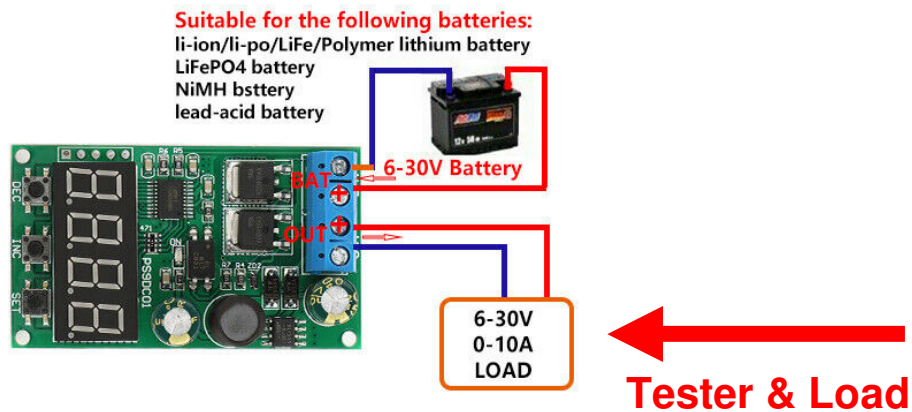
150W



From what I've been able to determine, this device will not shut down the load when the measurement is complete. It will only sound an audible alarm.

So, to get around the issue, I also obtained a low voltage cut-off relay that can be set to the terminus voltage of the battery – because you shouldn't drain a deep cycle battery more than 50% of its capacity or you'll shorten its charge/discharge cycle life.

## Wiring diagram



Because we are using batteries that are **not** new and fresh, it is undetermined how much capacity remains in a battery system that has been in service for a while. Automotive load testers generally just determine if a battery remains above a certain acceptable voltage (on a colorful bad/fair/good volt meter) when under a 50 or 100 amp load for 15 seconds.



The procedure is simple:

Charge the battery, then connect the metering device and allow it to discharge until terminus voltage is reached, typically 10.5 volts. The device will read directly in amp-hours.

Comparing the readings to the battery's published specs will give an indication of the battery's "health". Automotive batteries aren't always rated in amp-hours, but rather as "reserve capacity". It's the number of minutes a fully charged battery can deliver 25 amps. For example, a 100 amp-hour battery could mathematically deliver 25 amps for 240 minutes. So, to convert reserve capacity into amp-hours, the formula would be:  $A-H = RC(\text{mins}) / 60 \times 25$ .

Automotively, (when published) amp-hour ratings are measured over a 20 hour discharge period, that is, the discharge amps are adjusted to deplete the battery in 20 hours and that number of amps is used to calculate the amp-hour capacity (by multiplying the amperage rate times 20). So, if it takes a 10 amp load to drain the battery in 20 hours, then the amp-hour rating is  $10 \times 20$  or 200 amp-hours.

This procedure can also be used to measure the capacity of gel cells, like those used in UPSs. The amp hour rating is printed right on the battery, and it is possible to determine how much of that original capacity the battery retains when tested.

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