

Length of Time Required to Charge a Battery

When installing a starter or alternator it is critical that the vehicle has a fully charged battery. A low or “dead” battery will most likely cause a good alternator and starter to overheat resulting in premature failure.

Putting a battery charger on the vehicle for 10 or 20 minutes will not recharge a battery that is significantly weak. In most cases it will take several hours, and in some cases, as many as 12 hours. On page 2 is a formula to determine how long it will take a low battery to be fully charged.

Before we get into the formula, let’s take a look at a few fundamental facts about charge rates:

Slow charge: It is best to charge the battery at low rates. These rates will vary somewhat depending on battery size and capacity. However, charge rates not exceeding 10 amps are considered slow charging. Slow charging of all batteries is highly recommended.

Fast charge: Rates above 20 amps are considered fast charging a battery and are generally not recommended. Repeated fast charge rates may reduce battery service life. Fast charge rates can also cause the battery to “Gas” or give off hydrogen gas. Hydrogen is highly flammable and when mixed in proper proportion with oxygen in the air, can be very explosive.

So how long should you charge your battery? This will depend on the amount of voltage that is remaining in your battery (state of charge) and the batteries reserve capacity (RC) or amp-hours (AH).

To Determine RC or AH:

Depending on the battery manufacturer either the RC or AH will be labeled on the battery. To determine how long to charge the battery we will need to know the AH rating. If your battery is rated in RC, simply multiply the RC by 0.6, this will equate to the approximate AH rating. For this text we will use a battery rated at 120 RC. Therefore: $120RC \times 0.6 = 72AH$.

To Determine State of Charge:

With the engine not running use a DC volt meter to measure the battery voltage. It is best to turn on the headlamp for 30 seconds before measuring to remove any surface charge. A battery that measures 12.2 volts has an approximate 50% state of charge. See Figure 1, on page 2, to determine other voltage readings to state of charge.



Fig. 1

<u>Voltage</u>	<u>State of Charge</u>
12.68	100%
12.45	75%
12.24	50%
12.06	25%
11.89	0%

Note: These readings are at 80° F. Voltage will drop 0.01 volts for every -10°F.

In the above example we have a battery at 50% state of charge with an amp-hours rating of 72. Therefore it will be necessary to charge about 36 amp-hours into the battery (72 AH x 50% = 36). At a charge rate of 10 amps, 36 amp-hours will require 3.6 hours to charge (36 AH. / 10 Amps = 3.6). Figure 2 (below) consist of a work sheet that you can use to determine how long it will take to charge your discharged battery.

Fig. 2

- A. _____ Reserve capacity
- B. x _____ x 0.6 _____ Multiplier
- C. = _____ Amp hours rating (also enter in line E)

- D. _____ % _____ State of charge
- E. x _____ Ampere hours
- F. = _____ Needed amp hours (also enter in line h)

- G. _____ Needed amp hours
- H. ÷ _____ Charge rate in amps
- I. = _____ Hours to charge battery