Ample Power Company

Managing A Battery Bank

You mean it's not Automatic?

Despite all the hours of engineering that have been devoted to electrical system design in the last 20 years, only the Ample Power EnerMatic Controller achieves complete automation. Without that units, the user still plays a very important part in how well the system functions.

With today's tools, however, those users who expend a little effort to understand batteries, and how alternator regulators and battery chargers interact will have no problem managing their electrical system.

The users who wish to rely on a single parameter presented on their digital monitor will be dissappointed when they discover that batteries can still go dead at inopportune moments, and even expensive batteries can be destroyed. It is still necessary that users understand several readings from their monitoring system and be able to correlate that information into meaningful judgements about battery state–of–charge, and long term health.

The most basic parameters to be understood are Volts and Amps. While Amp–hour information is very useful, without an understanding of Volts and Amps, one can easily be mis–lead by reported Amp–hours.

A Full Battery

Every human endeavor begins with a reference point. If you're leaving for a long trip, the reference point is home. If you're intent on discovering the meaning of life, a common reference point may be a conviction that there is a supreme designer. While a reference point may change while undertaking either a physical or metaphysical journey, the lack of a reference point indicates trouble ahead.

The reference point for a battery operated system is hardly profound. Like a fuel tank, knowing when it's full is the very most important piece of information knowable. If you know when a battery is full, then all else is as easy as counting to two if you know how to count to one.

A battery is full, when the voltage between its terminals is high enough to cause electrolyte gassing, and the current through the battery has declined to a low and steady–state value. For typical liquid electrolyte batteries, a potential of 14.4 Volts across the terminals is high enough to cause gassing at 77° F. At this voltage, current will naturally decline to a relatively low percentage of the Amp–hour rating of the battery. What that current declines to is easily determined. Apply 14.4 Volts until the current stabilizes . . . that is, shows very little decline as time goes on. For healthy batteries, expect the final steady–state current to be less that 2% of the Amp–hour rating. That is for a 100 Amp–hour battery, steady state current should be less than 2 Amps.

Your regulator may not reach 14.4 Volts, in which case, you will not reach a full charge. However, no matter what voltage your system eventually achieves, when the voltage is a maximum, and current no longer declines, the batteries are as full as they are going to get. This is your reference point!

Amp–Hour Information

Without a full charge reference point, all the Amp–hour information in the world is as meaningless as any single grain of sand in the Sahara desert. So what if your meter displays 65 Amp–hours consumed. Did it read zero when the batteries were full? Conversely, when it read zero, were the batteries full? If you can't answer these questions, then you actually know nothing about the state of your batteries because you have no reference point!

OK, assume that your batteries reached a full charge, and coincidentally, the Amp–hours remaining showed 100%. Since then, you've gone through several charge and discharge cycles. How accurate is the present display that may show 75% remaining? That depends on a host of uncertainties. Has the rate of discharge been properly accounted for by calculations using Peukert's equation? Is battery recharge efficiency accurately determined by your monitor? Have you programmed the monitor with accurate battery capacity? If you can't answer affirmatively for all of these questions, then, once more, you don't really know the state of your batteries.

Keeping it Manageable

To keep your system manageable, you need to become familiar with the voltage and current readings as the battery discharges and charges. You need to be able to determine full charge, and from that reference point, you need to know how many Amp–hours have been discharged, not only for a simple Amps times time calculation, but also one using Peukert's equation for rate of discharge effects. You also need to know the temperature of the battery.

Don't Forget Alarms

Only a brain dead philosopher could derive some enjoyment over the question surrounding sound, or lack thereof, of a tree falling without an observer. Can a battery go dead if you aren't there to observe it? If you don't think so, turn on all your lights and leave for a week. A philosopher may argue that the battery only went dead the instant you returned and observed it's state of charge, but warm beer in the refrigerator may tell a different story.

Unless you have the freedom to observe your electrical system 100% of the time, you need alarms. To satisfy the philosopher, we might suggest that the alarm system is the observer, and therefore the batteries can go dead before a human observer make notes. In any case, alarms can notify you that something unwanted is happening to your electrical supply. An alarm could even save your life.