AUTOMATIC BATTERY CHARGERS

Accumate, Battery Tender & Yuasa Outsmart the Competition

Text by Tracy Martin
Photos by Lee Parks

THE LONG-AWAITED UPDATE to our original battery charger comparison (*MCN* July, 1998) is finally done. Since that original test, many of the battery charger manufacturers have produced "new and improved" versions of their products. We put 13 chargers to the test this time, and destroyed a couple of dozen batteries in the process. We also "used up" two *MCN* staff members in collecting the data for this and the previous comparison. Both individuals said, "Never again!"—probably in response to the $0.9 cents per hour that they were paid for their time and aggravation.

In our typical comprehensive fashion, we gathered chargers from nine manufacturers. Many of the units came with advertised claims about how their designs were better than the others, and which bells and whistles they provided. As always, we ignored the ad hype, and compared the chargers using the scientific method and several real-world tests.

This time around we had more clear winners than in the previous test. Four battery chargers achieved a perfect score of 15 points on our rating scale. In fact, the difference between chargers with scores higher than 13.0 was negligible. We tested as many of the advertised claims as possible, and these results were included in the "Notes" section for each battery charger. In addition to the three basic tests (battery initialization, maintenance and restoration), we added an amperage output test this time, in which we compared the chargers advertised milliamp (mA) output to the actual measured amperage when connected to an electrically loaded battery.

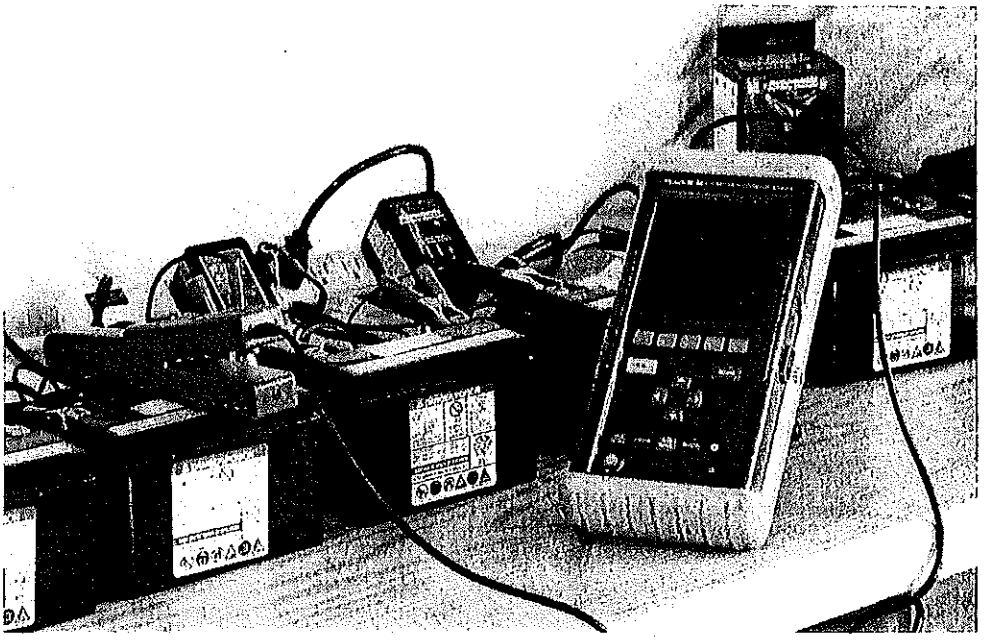
Test Instruments

A Fluke 98 Automotive ScopeMeter and Fluke 80i-110s Current Probe were used to accurately measure and record voltage and amperage. The accuracy of the ScopeMeter when measuring DC volts is plus or minus 0.5%. This instrument also has a digital recording oscilloscope that can, among other things, record up to 32 days of electronic measurements. We used this feature several times during the course of our testing. The 80i-110 current probe can read amperage levels as low as .010A, or 10mA. The combined cost of these test instruments was more than $3200, and while these were by no means the most expensive electronic tools available, we felt that these measuring devices were more than adequate for the purposes of testing and evaluating the battery chargers.

Testing Procedures

We tested the chargers in a similar manner to our previous battery charger evaluation. Rather than trying to sort out what each battery charger manufacturer's technology was, and how it affected battery charging, we simply measured the effect on the batteries themselves—before, during and after charging. Keep in mind that when a charger manufacturer designs "smart" charger tech-

nology, it can't know what type of battery the rider will connect to it. Therefore, the output of the battery charger, and the numbers we used for all our testing, were a compromise between the requirements of conventional and maintenance-free batteries. The bottom line when you are at home working in your garage is whether or not the charger will charge *your* battery, regardless of its type and condition. How it accomplishes the task is academic.



A Fluke 98 ScopeMeter was connected directly to each battery, where it measured and digitally recorded three months' worth of voltage readings. This meter has features that allowed us to record voltage over extended periods of time, which made measuring and rating all the easier.

Battery Initialization

In our efforts to measure the effectiveness of all the chargers, we used up two dozen Yuasa YBXT9-BS maintenance-free batteries. New batteries require an initial charge before they are put into use and, therefore, this was our first test. If you install a battery without charging it first, relying on your bike's charging system to do the job, it will only have 80% of its total capacity...ever. In addition to having less overall power, battery life is shortened accordingly. This initial charge your new battery should have is called *bulk* or *initialization* charging, and not all chargers are capable of performing this function. All of the chargers we tested, with one exception, were able to obtain the minimum voltage necessary (12.8V) to initialize a new battery. Here is a brief description of our initialization testing procedure.

The batteries were filled using the acid pack included with each battery, according to the manufacturer's instructions. We did a lot of "tapping" on the battery case to release bubbles that were trapped between the plates. This ensures that as much electrolyte, and not oxygen, as possible is in contact with the plates. The batteries were then allowed to stand unmolested for one hour before the chargers were connected. All of our testing was done in an insulated, heated/air conditioned basement, so the ambient temperature only fluctuated between 70° and 72° F during our testing period. We recorded battery voltage every hour for a total of six hours, at which time the chargers were disconnected and the batteries left alone for another five hours.

We then measured open circuit voltage. Our definition of open circuit voltage is when nothing is connected to the battery and it has been at rest for several hours. According to several industry sources, a battery is properly initialized if the open circuit voltage reaches a minimum of 12.8V and does not exceed 13.8V. This range will work for both conventional and maintenance-free types of batteries. We measured the open circuit voltage of each battery and ranked the chargers in order of the highest voltage readings.

Battery Maintenance

A battery charger's ability to keep voltage levels high enough to maintain a charge, but not so high as to boil off battery water or damage the unit, is the most important aspect of battery maintenance. While one might occasionally initialize a new battery, or bring a dead one back to life after leaving the key on for a week, by far the most important reason for owning a battery charger is to maintain your motorcycle's battery at full charge over extended periods of non-operation. Our battery maintenance tests consisted of two parts, float-charging and battery-capacity testing.

Battery Float Testing

Float testing consisted of stressing the battery chargers' ability to maintain an acceptable voltage over time—37 days to be exact. The chargers were connected to their respective batteries and a #194 automotive instrument bulb was attached in parallel across each battery. This small bulb draws 270mA (0.27A) and simulates various devices that typically are found on a modern motorcycle, i.e., radios, alarms, clocks and E.F.I. computers. These types of electronics use the battery's energy to keep their memory alive and can draw upwards of 20–50mA. All of the chargers should have been capable of keeping the instrument bulb lit while charging the battery at the same time. The batteries, bulbs and chargers were left connected together for the duration of the test. Voltage was measured at the battery every 24 hours. Several chargers could not keep up with the instrument bulb's electrical load across the battery, and went down for the count within the first week.

We consulted with several industry experts to arrive at the ideal float charging numbers that we used for evaluating the results of this test. The charging "sweet spot" is 13.20–13.50V for all battery types. Any voltage levels above or below this range are not optimized for keeping a battery fully charged and healthy.

Battery Capacity Testing

Capacity testing stresses the battery charger's ability to restore a battery from a sudden drop in voltage. In the real world, when you leave your bike's ignition key in the "on" position for more than a few minutes, the battery voltage may drop low enough to prevent using the electric starter. A Honda GL1500 headlight bulb was connected across each battery for 45 minutes to simulate a non-attentive owner. The GL1500 bulbs are rated at 45W on the high-beam circuit and draw 3.24A. For our test, each battery was fully charged before connecting the Honda headlight bulbs. The chargers were connected, and charging voltage was checked every half-hour. After 2.5 hours the chargers were disconnected. The batteries then rested for 11 hours, after which time the open circuit voltage readings were taken. The chargers were ranked in the order of highest to lowest voltage readings. The scores from the float-charging and capacity tests were averaged to arrive at the total maintenance test score.

Battery Restoration

You let your best friend ride your bike. He comes back from his ride, parks it in your garage and closes the door. You can't remember if he gave you the key, and, when you look at the motorcycle several days later, you find it in the bike...in the "on" position. When faced with this unfortunate situation, ideally one would want to be able to connect a charger to the battery, come back the next day, start the engine and go for a ride. This is the condition that we simulated with the battery restoration test. We chose the same #194 instrument bulbs used for our float testing, and left them connected to the batteries until the voltage levels reached 5V. This low open circuit voltage represents a really deader-than-a-doornail battery, considering that a maintenance-free battery has 0% of its charge if the voltage drops to only 12.0V, and conventional batteries are dead at 11.8V or less. We connected the chargers to the dead batteries to see if they could bring them back to the world of the living.

Some chargers are purposely designed to *not* activate a charge, or even turn on, if the battery voltage level is below a set amount. According to several charger manufacturers, this feature is a safety device that is intended to prevent charging a battery with a shorted cell and possibly overheating the charger. Several sets of battery charger instructions even recommended that another charger be used to bring up the voltage high enough before connecting their charger. Other manufacturers use different types of safety circuits to prevent battery and charger damage, and their chargers will charge a battery with very low voltage levels. We felt that you should know how a specific charger dealt with this low voltage dilemma and, therefore, did not do anything special except simply connect each charger to its dead battery and monitor what happened. The chargers were left connected for 36 hours with the voltage recorded every 12 hours. After the charging was finished we let the batteries sit disconnected for 12 more hours, and then recorded the open circuit voltage. The chargers were ranked in the order of highest to lowest voltage readings on the batteries.

Cold Charging Test

We performed the cold charging test on the chargers that made specific claims of some type of internal temperature compensation. The theory is that if your garage is at 30° F, the charger should increase the charging voltage slightly to overcome the cold environment. In our climate-controlled basement, each charger was connected to a battery long enough for the voltage to stabilize, and a reading was taken. We then placed both the chargers and their batteries inside a refrigerator (43° F) for 12 hours, and recorded the voltage again. Any differences in the readings are indicated in the description of each charger.

Amperage Output Test

Finally, we checked each charger's advertised amperage output. A Sun Electric VAT-40 battery tester was used to place a load on the battery. The charger was connected to the battery and allowed to stabilize. We then loaded the batteries with the VAT-40 so the voltage dropped to 12.0V. With the load applied, the output amperage of each charger was recorded and compared to the manufacturer's claimed output. About half of the chargers fell short of their rated outputs.

Conclusion

After monitoring amps and volts during all hours of the day and night for over three months, we were able to determine several winners in our comparison. Those chargers with perfect scores of 15 points are (in alphabetical order):

- **AccuMate**
- **Battery Tender 6A**
- **Yuasa 1.5A**
- **Yuasa 900mA**

The chargers whose scores were slightly off of perfect, but still good enough to warrant your serious consideration, include:

- **Battery Doc**
- **Battery Tender Plus**
- **Battery Tender Junior**

You really can't go wrong with any of them, but each takes a slightly different path to charging Nirvana.

The Battery Tender 6A charger, while "only" delivering 4.6A, was still the performance champ of the group as far as speed and power, but doesn't provide quite as much information with its two lights as the 1.5A Yuasa and the Battery Tender Plus. The 6A unit also costs considerably more than its 1.5A competition.

The AccuMate has a slick-looking case and also provides a 6V/12V switch for using with older bikes and cars with 6V electrical systems. Of course, that also means you can damage your 6V battery if you accidentally leave it on the 12V setting.

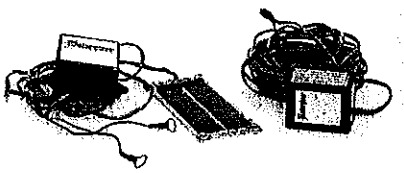
The Battery Doc came with a cigarette lighter adapter and a handy carrying case, which made a nice charging "package."

The Accu-Charger 1450 retains its title as our *MCN* "Best Buy" because of its strong performance and super-low price of only $22.59. However, under close examination, the quality and durability of this charger are not equal to its more expensive competition. If price is a major issue, this unit has no peers. If not, there are plenty of higher-quality units here to choose from.

The rest of the pack suffered from either over-protective features that did not allow charging if the battery was below a certain voltage level, or simply didn't have enough electrical horsepower to keep up with the rigors of our tests.

The bottom line is you can expect excellent performance from any of our "Recommended" chargers, so, if you already own one of them, it probably doesn't pay to upgrade at this time to one of the others.

Solargizer Needs More Juice



The Solargizer Battery Maintenance System (p# 735X210) is not advertised as a traditional battery charger, but as a solar-powered device. The charger utilizes "pulse technology" to charge and reduce sulfation in 12V batteries. It also makes use of a small solar panel in combination with a "500mA" transformer. The 110V transformer is for use on overcast days. We put the Solargizer to the test and found that in bright sunlight (during the month of August), the solar panel was only outputting 6mA into the battery. This presents a problem if the battery you're charging is connected to a vehicle that uses a digital clock, radio or has electronic fuel injection. Even in their dormant state, these devices typically draw more than 15mA from the battery.

We connected the Solargizer to a battery and found that after four weeks, battery voltage was holding steady at 12.76V. This charging voltage is too low for a maintenance-free battery, and barely adequate for a conventional one. With the transformer plugged into the charger, the measured output was only 21mA instead of the advertised 500mA. Because of these low amperage outputs (both solar and 110V transformer), the Solargizer was unable to complete any of our tests. It is possible that if it was hooked up to a disconnected battery, the solar panel could keep a battery partially charged, but this is marginal at best, so we can't recommend it.

The $119.95 Solargizer is manufactured by PulseTech Products Corporation, 1100 South Kimbal Avenue, Southlake, TX 76092; (800) 580-7554; www.pulsetechproducts.com.