

## USING ELECTRONIC METERS FOR YOUR TRACK CAR

By Jay Boggs

Pittsburgh & Lake Erie, M-19, No. 299

I recently read an article about installing an alternator in an M-19, that was very interesting and helpful. My ex Pittsburgh & Lake Erie R.R. M-19 #299 received this addition also last fall, in time for my rail car trip to "Almost Heaven", West Virginia.

After all my mechanical work (hammering, bending and painting) was completed on the #299, I wanted to check the output of my junk yard alternator, to see if it was still working. If you want to do the same thing, a good meter will be required. This tool can be used for many jobs around the home as well as in the motor car shed. If you have little or no experience using meters, now is the time to start.

The first step is selecting the right type of meter for the job. A low cost meter is not much better than a test light, having limited range and poor accuracy. Remember, you get what you pay for. There are two types of meters, analog and digital. The analog has a needle to indicate the reading and the digital has a series of three or four numbers that appear in the window. The analog has been the old reliable workhorse, since Thomas Edison first invented utility bills. Most early models were used for only one type of measurement, and had only one range, typically 0-15 volts. To measure current flow (amperage) a different meter would be used. To cut costs and make meters easier to handle, several ranges were combined into one, and became known as the multi-meter.

Advantages of the multi-meter are lower cost, and the ability to check ignition timing. Meters today have many ranges, so that volts, amps, and ohms can be read by setting the switch to the correct position. An analog meter will usually have three or four DC volt ranges, 0-1.5 volts, 0-15 volts and 0-150 volts. The same number of AC volt ranges, current (amperage) ranges, and resistance (amperage) ranges are also provided.

The reason for so many ranges is that the most accurate reading is available when the needle is between 1/4 and 3/4 of the range being used. If you want to check out your battery in the track car, select the 0-15 volt DC range. This would be much more accurate than using the 0-150 volt range.

New technology has given us the digital style meter. Some of the advantages of the digital include

accuracy, readability, and ruggedness. The model that you choose should be easy to read and have a durable case. The test leads should fit tight in the meter jacks, and the probes should have a rib near the tip to prevent fingers from slipping off the end of the probe handles and onto the metal tip. This safety feature is found on all good probes. A set of insulated alligator clips that fit on the probes is also very handy. If you already have a good set of jumpers, they will help too. If not, you will need at least one piece of #14 gauge stranded wire, with an alligator clip on each end.

Some of you might wonder precisely what makes voltage different than amperage. Voltage is a unit of electrical *pressure*; the more voltage, the greater the pressure to "push" current (amperage). Direct current (DC) voltage is produced by batteries and generators. Alternating current (AC) voltage is generated by most power plants, to be used in homes and industry; it is also produced by automotive alternators.

Amperage is a unit or "amount" of electricity that flows in a wire, bulb, coil, or motor. For example, the small bulbs in a track car marker light use about 1 ampere (usually called *amp*). Resistance (ohms) is what limits the current in a circuit. For example, many ignition circuits have a resistor in them to reduce the current (amps) going through the points. This, along with the capacitor (in the past called a condenser) gives the points longer life.

Here's a safety tip, when using the meter...most voltages on track cars are 12 volts or less, except for the spark voltage, which can be quite high. Even the 12 volts though can be dangerous, due to the high amperage of storage batteries. Get in the habit of connecting the meter *before* turning on the power, read the meter, shut the power off, then disconnect the meter.

Here's a little exercise that you can try, if you either have, or intend on buying a meter. To find out if your track car battery is properly charged, (1.) select the proper scale, 0-15 volts DC for most analog meters, or 0-20 volts DC for most digital models. (2.) Find the positive and negative battery posts and connect the meter leads, using the alligator clips or jumpers. Since the battery is always "on", use caution, and connect only one lead at a time. (3.) Read the meter; a 6-volt battery should read 6.6 volts when fully charged. A 12-volt battery should read 13.2 volts when fully charged, and the maintenance-free batteries should read slightly higher...about 13.4 volts.

If your readings are lower than this, check your connections to be sure that you are connected to a clean

