Technical Papers: Vehicle Battery

Clip and Read Measurement of Offdraw Current in a Vehicular Battery

On a production line an objective is to measure the 20 mA offdraw current accurately and quickly in each of a group of similar vehicles. To achieve this, I worked with a group of Chrysler people concerned with Quality Assurance. We did the work of a methods person to set up the Clip and Read procedure for using a MER™ Meter on a Jeep; and then used the procedure on ten Jeeps of several different models. All measurements were 28 mA or less, so all were shown to meet specification.

The production method used was: Clip the MER™Clip around the battery cable [1] in the method position, and read the meter.

By method position, I mean the best location and orientation for the clip on the battery cable as determined by a methods person. To find this it helps to know the true offdraw current. When feasible, the preferred way is to lift a cable from a battery post and connect a Fluke model 87 ammeter in series with the cable. When the full sleep state was reached, the true offdraw was 19.5 mA.

To set up the method position, we set the zero control on the MER™so that it read zero when the clip was held over the shoulder, in free air, away from metal. Then the clip was put around first the red and then the black battery cable at several locations. Each MER™reading was noted and compared with the true reading -- in the natural or free and easy position, and also over the span of the reasonably extreme clip orientations -- all with the cabled arm of the clip in first the up position, and then reversed, in the down position.

This data [2] was used to point to the better positions for the clip on a cable, where the MER™ reading was fairly close to true, where it was stable and repeatable, and where the span of readings taken over the extreme orientations of the clip was minimal.

The better positions were further from magnets, i.e., an alternator, windshield washer pump, or air conditioner clutch, because a magnet near the clip usually shifts the zero setting of any non-contact ammeter. This is especially noticeable when the clip is on a cable near a magnet and its orientation is changed by rotating the handle. We compared a standard [3] Meter with a MER™[4] Meter and found that the MER™readings were 2 or 3 times more stable than the standard.

For the user's convenience, we chose as the method position one of the better positions which was easy to use. The clip could be placed beside the battery around the two red cables near the positive battery post, and the arm laid horizontally on the engine. Readings were repeatable, but the MER™ reading was 4 mA low due to zero offset from a magnet. We could have caused the MER™to read the true current by setting the zero up 4 mA, but instead we chose to set it to zero and mentally correct each MER™reading by adding 4 mA.

This work to set up a method took about ½ hour. We next applied the method to ten vehicles in the manner of a production person.

The clip was put in the method position on the battery cable and the MER™reading noted. If the reading was 16 mA we corrected it by adding the 4 mA zero offset, and recorded 20 mA.

For the 10 vehicles tested, the average corrected offdraw current indicated by the MER™was 20 mA. The peak deviations were -2 and +8 mA from the average.

One vehicle had a magnetic anomaly such that in the method position, the MER™had 10 mA greater offset than expected. This caused us to record +28 mA offdraw -- the specified maximum, when the true offdraw was 18 mA.

If the magnetic anomaly had produced a negative offset, then a vehicle having 38 mA offdraw would appear to just meet the 28 mA limit. Over 21 days, this 38 mA offdraw would take 19 A.Hr. from the battery. This would leave 47 A.Hr. or 71% of full charge in a 66 A.Hr. battery; enough for quite a few starts.

Conclusions:

The Clip and Read Method:

Put the clip on a battery cable in the method position and read the MER™ Meter.
Is a fast and accurate way to measure offdraw current in production to a 28 mA specification. The zero setting should be checked now and then by placing the clip in a location having minimal magnetism, i.e., over the user's shoulder, and away from metal.

The methods person sets up a method position for the MER™clip by taking at least ten readings in several orientations and on both cables. The better positions are those where readings are close to true, and repeatable. The method position is the better position which is most convenient for a production person to use.

The MER™ Meter is about twice as stable as the standard when the clip is near a magnet in a vehicle.

[1] In this note, cable means all of the red cables and wires going to the positive terminal of the battery, or all of the black cables and wires going to the negative terminal. A preferred method position is one where the clip will surround all red, or all black wires at once. However, it may be necessary to separately read first one red cable, and then the other, and add the results.

[2] The average of all this data is expected to be within 5 mA of true. It is used as true when it is not feasible to lift a battery cable.

[3] Swain Meter™ Model Digital+, SN 2415.

[4] Swain Meter™ Model MER, SN 24111.