Maintaining QSI/Proto-Sound Batteries

By Ted Piunno

This article is Part Two of a two part series on QSI/Proto-Sound systems and batteries.

In our last newsletter I presented information I gathered regarding the memory scrambling issues associated with QSI/Proto-Sound batteries. I also listed sources for replacement 9 volt batteries. In this article, I'll discuss methods for testing and charging these 9 volt batteries. MTH recommends that you set the engine on a section of track and apply 12 to 16 volts for about 14 hours. But there are other more convenient methods you can use to charge the battery. Keeping your Proto-Sound batteries in good condition will protect your engines from becoming vulnerable to the scrambled memory problem.

Testing 9 volt batteries

Several methods for testing the condition of the 9 volt battery have been suggested. All have advantages and disadvantages. I recommend that you choose the one that you are most comfortable with.

Testing a battery is done by measuring its output voltage while it is delivering power to its intended load or a similar 'dummy' load. Measuring the voltage output of a battery without a load can give you a false indication of the battery's condition. For example, an unloaded 8.4 volt battery might show 7.3 volts on a multimeter. This might lead you to believe the battery still holds an acceptable charge. However, the voltage will drop to below 6 volts when place under a load. Under load, a sufficiently charged 8.4 volt battery should measure between 7.3 to 9.1 volts. The Proto-Sound circuitry normally demands about 20 milliamps of current from the battery and can occasionally peak to 50 milliamps (1 milliamp = .010 amps). Therefore, its battery voltage should be measured while delivering at least 50 milliamps.

MTH suggests that you can temporarily substitute a 9 volt alkaline battery to determine if the re-chargeable battery is low. The logic is simple - if the engine works properly with the substitute battery, then the re-chargeable battery is not sufficiently charged. If you do try a substitute alkaline battery, I don't recommend running the engine for more than a few hours since the charging circuitry will attempt to charge the battery. The chemistry of an alkaline battery is not designed to handle a charging current.

DCS battery check

If you are running the engine using MTH's DCS, you can have DCS report the battery condition. See your DCS Operators Manual.

On-the-rail sound test:

With this method you listen to the engine sounds as it is powering down. Use this method with caution. If the engine hasn't been run or charged for several years, the battery may be low or dead, which opens you up the possibility of corrupting the memory. This method is more appropriate for monitoring the condition of the good battery during regular use of the engine.

Here's how it's done. Turn on the track power and listen for the engine startup sounds to play. Wait at least 10 seconds, turn off the track power and count the number of seconds that the sounds continue to play. Seven to ten seconds means your battery is sufficiently charged. If the time is less then seven seconds, or if you hear more than a few seconds of sputtering, the battery needs to be charged. Other low battery symptoms are listed on MTH's Web site (http://www.protosound2.com/).

Battery tester:

This method requires that you open up the engine or tender and remove the battery to test it. Use a battery checker that puts at least a 40 milliamp load on the battery and has a scale for reading '9 volt' NiMh or NiCd re-chargeable batteries. Finding such a battery tester may be difficult since most use a 10 milliamp load for the 9 volt battery test.

Voltage measurement under load:

This method also requires that you remove the battery from the engine but is probably the best way to check the condition of a battery. With this method, you measure the voltage output of the battery under load.

Figure 4 shows a battery test configuration with a dummy load resistor that you can use to measure the condition of an 9 volt battery. Connecting two 220 ohm, ½ watt resistors (Radio Shack #271-1111) by twisting their leads together (parallel) effectively gives you a 110 ohm, 1 watt load. Test the battery by touching the resistor and the multimeter leads to the battery terminals as shown in Figure 4 for about 10 seconds. The voltage reading should stay above 7.3 volts. If it doesn't the battery in not sufficiently charged.

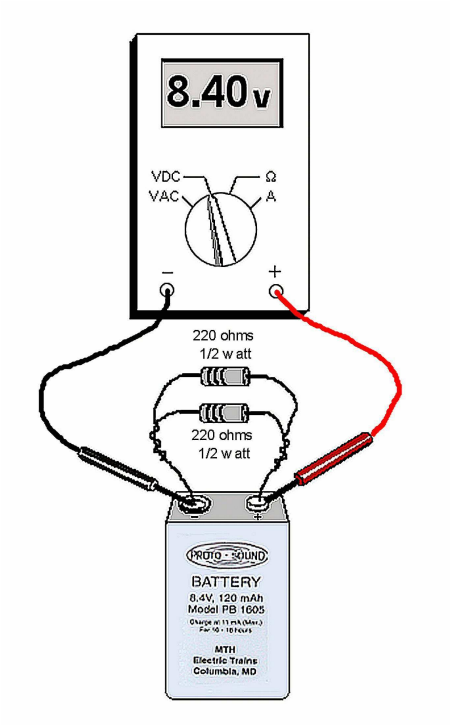

Figure 4
Testing an 8.4 volt battery under a dummy load

Charging 9 volt batteries

MTH recommends that you charge the Proto-Sound battery using a charging current of 11 milliamps for 16 hours. This also happens to be the charging rate produced by the Proto-Sound circuitry. Alternatively, you can charge the battery using a separate charger. Make sure you discharge NiCd batteries under a load such as the resistor pair shown in Figure 4 for a few hours before recharging. Following are several methods for charging Proto-Sound or replacement batteries.

Charging during engine operation

When the engine is in operation the Proto-Sound circuitry attempts to charge the battery at 11 milliamps. However, this is only true when the track voltage is running between 12 and 18 volts. The charging current is directly proportional to the track voltage, that is, lower voltages will produce lower charging currents.

This method works fine as long as you are running the engine for long periods of time with MTH's DCS control system, which keeps a constant 18 volts on the track (DCS controls the engine speed through the Proto-Sound digital control circuitry). But many of us run the engines in conventional mode using Lionel ZWs or Trainmaster control systems. In conventional mode the track voltage is typically varied between 9 and 18 volts. Most engines will cruise at 10 or 11 volts. This means that the battery charging current will be lower than the recommended value and the battery may not fully charge.

On-the-rail static charging

This method has you set the engine on the rails and power it up in reset mode or neutral mode for 14 hours. There is an obvious risk here. If the power should glitch for any reason, the engine could switch out of neutral and take off at full power. Some owners have set up a separate small section of track with the center rail taped over on each end. Should the engine move in either direction it will stop when it reaches the tape. If you try this method in conventional mode you'll probably want to turn the engine's volume down as the engine sound effects can become annoying to some people.

Battery chargers

This method requires that you open up the engine or tender, pull the battery and place it in a charger. The batteries are relatively easy to remove once you remove the engine shell. Most NiMh/NiCd battery chargers equipped for 9 volt batteries, such as the Energizer battery charger (Target Stores, $19.95) shown in. Figure 5, will charge the Proto-Sound NiCd battery. NiMh batteries require different charging times, so follow the charger manufacturer's instructions when charging Proto-Sound or replacement batteries.

Figure 5
Energizer Model CHM4FC Universal Battery Charger

External charger modification

This method requires that you install a charging jack to your Proto-Sound locomotive, similar to the charging jack found on newer Proto-Sound 2.0 engines. This allows you charge the battery by simply removing the engine from the track and plugging an external charging device into the jack. The jack can also be used test the battery without removing it from the engine. The April, 2003 issue of *O Gauge Railroading* has an article with complete instruction for installing a charging jack in your Proto-Sound engine. In The *Editor's Corner* column of the June, 2003 issue of *OGR* there is some follow-up information regarding isolation of the charging jack from the PS-1 electronics and the engine chassis.

An ounce of prevention

If you have a Proto-Sound engine that has been sitting on the shelf for months, test the battery before operating the engine. As I mentioned in the previous article, if you don't have a method for testing the battery, go ahead and replace it with a known good battery. It's an inexpensive form of insurance for protecting an expensive engine.