

# FOURWHEELING ACADEMY

## BATTERY INSTRUMENTATION

Story & Photos by Harry Lewellyn

All things automotive start with the battery. Given it's dead, you're stuck in your tracks without help. Knowing the status of your battery is very important, particularly when off the beaten path and using accessories like a winch, welder or refrigerator. This article details installing a Link 20 battery monitor in Dr. Martin Pryal's exotic 1995, 80 Series Land Cruiser.

### BATTERY BASICS

A battery is basically a reservoir. It's like a gas tank for electricity. You empty and fill it as you operate your ... car, yacht, RV, 4X, etc. The starter, engine, lights and particularly accessories drain the juice out, and the alternator typically "fills" it back up. Accessories include winches, 12 VDC refrigerators, inverters and welders. These can stress a battery beyond normal limits.

I suspect everyone has experienced a failing battery. It's usually a bad cell. It sometimes works and sometimes doesn't. Further, you can easily ruin a battery by discharging and charging it improperly (see Paralleling Batteries, page 10). With proper instrumentation, it's possible to see this coming and more.

### BATTERY INSTRUMENTATION

The Heart Interface Link series of battery monitors is the ultimate instrument for those who demand perfection. The Link 10 is a single battery monitor, and the Link 20 monitors two batteries or banks.

### UNDERSTANDING THE LINK 20

To understand Link instruments, look at the display face of a Link 20. At the very top (left side, below the words "BATTERY 1 STATUS," Figure 1) is a four-element "fuel" gauge extraordinaire. With various colors and flashes, the attention-getting display informs of your "tank" (battery) status. Below that is a numeric display that reports four things.

Starting from the left, look for the small V in a circle. That's battery voltage. This LED is on when battery voltage is in the display window. To the right of



Figure 1 The thin LINK 20 fits almost anywhere.

this is the goezinta and goezoutta battery amps (circled A). Next is amp-hour drain (Ah), followed by a (t) that reports time remaining to total battery depletion. That's like saying, "If you keep going as you are, you're going to run out of battery in the next t hours." Got it? Everything you've ever wanted to know about your battery and more.

The words below the "tank" lights hint at programmability. The SEL and SET buttons are for programming. With these, you can select, set, change, lock and otherwise adjust things I didn't even know about batteries like Peukert's exponent – huh? The Bat 1 and Bat 2 buttons select which battery is numerically displayed.

### LINK 20 INSTALLATION

Link 20 installation is relatively simple. You put a current shunt at the battery (Figure 2A), run an eight-wire instrument cable (Figure 2B, terminal shown, wires not connected) and mount the display unit in the cab (Figure 1).

Figure 3 is the wiring schematic, and don't try to cut corners. Although you may think it unnecessary to run so many apparently "common" plus and minus wires, it is required for proper operation. Further, you are only cheating yourself if you don't use twisted pairs for the current sense wires on the shunt. Twisted pairs all but eliminate noise on these lines. Remember, the Link 20 is reading as little as 0.00001 volt for 100 mA of current flow!

Although the internal microprocessor is the brain of the unit, the shunt is the heart. This allows you to measure charge

or drain current from 100 milliamps to 500 amps! That means you can look at big electrical loads like the starter, winch or welder. I recently had an opportunity to measure winch current, 249 Amps, pulling a tree stump! And as most of you know, these high-current drain accessories are the things that can get ahead of your charge system and put your battery in danger of damage or total depletion. The

same goes for overnight refrigerator drain.

The shunt was mounted to a Plexiglas plate attached to the top of the main battery. The Link 20 connect block was also attached here (Figure 2).

The display unit was mounted in the lower left corner of the center console. This safely kept it away from the driver's

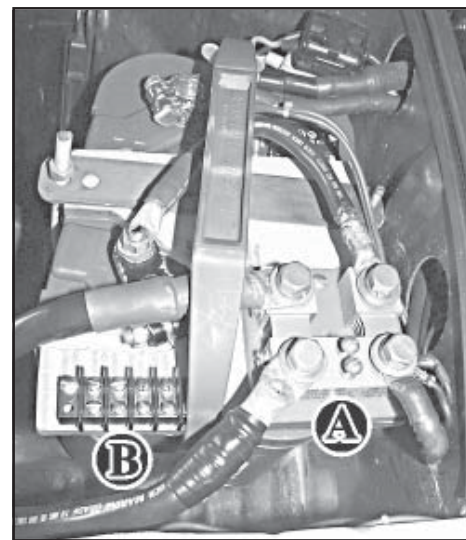


Figure 2 The LINK 20 shunt (A) is the heart of the unit. The terminal strip (B) is destined for the display panel.

right leg and knee, but was easy to view.

We routed the eight-conductor Link 20 cable to the side of the engine compartment and through the firewall, using grommets where needed. Again, it's important to understand that the shunt sense wires must be independent twisted pairs. This eliminates erroneous readings due to electrical noise.