HOBBY CORNER

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Backing up AC power supplies

MANY OF YOU HAVE WRITTEN TO express an interest in providing backup power for various projects. Most often, the need is for a clock backup, but other devices, such as radio monitors and exit lights, have been mentioned. No matter what type device is involved, the goal remains the same—to have a battery take over automatically when the AC power fails.

Since most electronic circuits are powered by DC (rectified AC), using a battery as a back-up supply is a simple matter. If the device is operated strictly by AC, then you'll need an *inverter power supply*, which converts DC into AC. Such a device is too complicated to discuss in this column, but one was covered in a feature article in the March 1984 **Radio-Electronics**.

Figure 1 shows a simple circuit that can be used for backing up circuits powered by a DC power supply. When the supply is functioning normally, operating current is passed by diode D1 and goes to the device, all or a portion of which is connected to point A. (We will get to point B in a moment.)

The device continues to operate on DC (rectified AC) as long as there is no power interruption. But where does the backup battery come in? As long as the battery voltage is chosen to be lower than that of the DC supply, diode D2 is reverse biased and prevents the battery from affecting the device.

Now, suppose the AC power fails. The battery voltage is then higher than that of the DC supply, which is effectively zero. Diode D2 is now forward biased and passes battery current to operate the device. Of course, diode D1 is now reverse biased, and as such no battery current gets to the DC supply or point B.

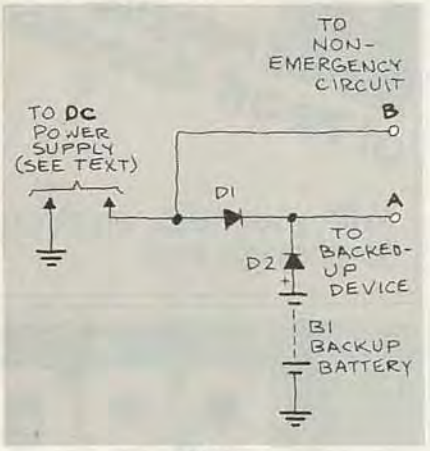

FIG. 1

When AC power is restored, everything goes back to normal: The DC power supply powers the device, and diode D2 is once again reverse biased. Thus, D2 automatically disconnects the battery, and the battery is saved for the next AC power-line failure.

Note that the circuit in Fig. 1 works *only* if the battery voltage is lower than that of the normal DC supply. That condition will cause no problem with most devices because the operating voltage can vary at least a volt or two without any apparent effect. Of course, if the device operates on a regulated voltage, be sure to place the backup circuit between the DC supply and the regulator.

The ratings on the diodes are not critical, provided they can handle the current and reverse voltage (PIV). The 1N4000 series works well for applications requiring currents up to 1A. Also keep in mind the maximum *P*eak *I*nverse *V*oltage (PIV) rating of the unit (it varies). The PIV rating of the 1N4000 is 50 volts, 1N4002 is rated 100 volts PIV, and so on. Make sure that you choose a PIV of at least twice the applied voltage for an extra margin of safety. (There is very little cost difference.)

Now, let's look at point B. Notice that it branches off the supply line before current reaches D1. Because D1 is reversed biased during power failures, anything connected to point B receives no battery-derived current. If the device contains some circuitry that need not be operated under emergency conditions, you may wish to disconnect that portion of the device from point A and connect it to B. That conserves battery power.

Say, for example, the device being powered is a clock that uses an oscillator to maintain time. (This circuit will not work for clocks that rely on the 60-Hz line to keep time!) You want to keep the clock's timing circuits "going" during a power failure, but you don't need the LED readout.

By connecting the display circuitry to point B and the timing circuits to point A, the timing circuits will operate much longer on the backup battery supply. And if

needed, you can put a normally open momentary switch between A and B to permit you to check the time during a power outage.

Certainly, a backup supply can be put in other types of devices. Just choose the diodes and the battery voltage appropriately. If the device is one that you want to be able to turn off without having the battery take over, simply put a switch in series with the device.

Those of you who wish to get fancy may want to use rechargeable batteries and build a trickle charger into the circuit to keep the batteries charged while the AC is operating. Doing so isn't worth the effort when dealing with clocks because a little 9-volt battery lasts a long time in that application. However, in other cases (such as with computers to save memory), a trickle-charged back-up battery is certainly worth the extra effort.

Expanding your horizons

I recently told you that I've moved into a new community. Since then I have re-discovered an old truth and "discovered" something that some friends have been telling me for years.

First, a bit of background: I'm an old dyed-in-the-wool ham who began with CW (code), got into AM phone, and had a fling with *S*ingle *S*ide*B*and (SSB) phones in the early days of that technology. (Anyone remember the 2EWL special?) After a few years, voice communication became tiresome to me and I "retired" to CW exclusively, apparently forever!

As I went from key to keyer, and then to keyboard, the use of 144 MHz (2 meters) changed and grew also, but with no participation or interest on my part. Over the years several friends urged me to get a microphone and try two meters, a suggestion that was quickly dismissed. After all, nothing above 30 MHz could be of much consequence (or so I thought).

In my new community, I met several new ham friends. In a short time, Jack KI4DL and Bob WA8MWI had put a two 2-meter, hand-held transceiver in my paws saying, "Try it and see how you like it." Thereby, I re-learned that old truth: hams are the friendliest people in the world, and can present a most convincing argument.

Well a guy just can't be impolite so I tried it and made my big discovery. Two meters is populated by a large contingent of hams and yet remains uncrowded. The countryside is literally peppered with repeaters (some linked to others far away) to increase coverage, and with auto-patches to make telephone calls conveniently from the car or elsewhere. Hey, this is FUN! And that is saying nothing about joy of easily taking an entire functioning ham station with you anywhere—car, office, lake, trail, mountain-top—anywhere.

If you're not a ham, become one—it is a great way to add a new dimension to your interest in electronics. It is not difficult to get a ham license. Look up a local ham operator for help, or write the American Radio Relay League in Newington, CT 06111. **R-E**

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