USEFUL TROUBLESHOOTING HINTS & TIPS

The best solution to any problem is often the simplest one. Here are some easy-to-use ideas that really work.

ELLIOT S. KANTER

A SHORT TIME AGO, I RECEIVED A CALL from a sales engineer who I'd helped before with certain technical problems. This time he had a serious problem that demanded an immediate resolution, as human lives hung in the balance. It seemed that around four in the afternoon each day, the telemetry units in his hospital's coronary-care unit were "clobbered" by brief but overpowering interference.

As you might suspect, the tiny radio transmitters (Fig. 1) that were attached to the patients are low-power (power output is about 1 microwatt) and they transmit in the VHF portion of the radio spectrum. Not being able to drive the 150 miles or so to the hospital, I reasoned that there was a pattern (i.e. specific time each day) and that only the telemetry equipment was being interfered with. About a week or so before, I had posed a question to my class of BMET's (*Biom*edical *E*quipment *T*echnicians), that asked them to determine a harmonic relationship between a CB transmitter and patient telemetry, and if a harmonic relationship could be identified, what specific telemetry frequencies (there are about eighty) would be affected.

I pulled out my list of calculations, and determined that the telemetry-transmitter frequency was the same as the seventh harmonic of a CB frequency. A quick call to the engineer with the suggestion that he take a walk around the area immediately surrounding the hospital resulted in both identification of the source and a cure. It appears that a nearby citizen was operating an illegal linear amplifier or "kicker." After a few words of explanation, he disconnected the linear and the interference was gone.

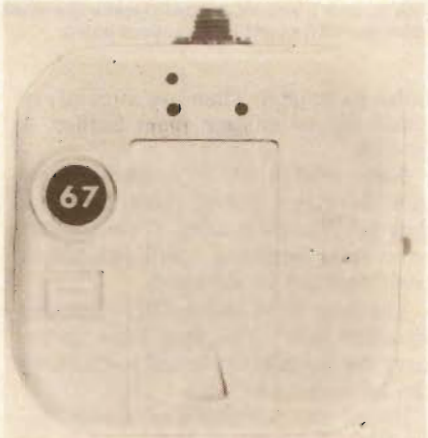

FIG. 1—MEDICAL-TELEMETRY transmitter. Some of those transmitters have power outputs on the order of a microwatt and a range of about 250 feet.

Naturally, the majority of CB users do not operate illegally, but if you do come across a problem like that one, why not stop a minute and determine what frequencies *could* (not necessarily would) have a harmonic relationship that might cause problems. Remember, it is not the properly-operated RF source that will cause the problem, but rather one improperly used or adjusted that can frequently be at the root of a problem.

Staying with low-powered RF sources for a while longer, I found that I needed an easy and cheap method of being certain that one of those small telemetry transmitters was really putting out RF. Again, I was faced with the fact that one particular model didn't even put out a full microwatt, and a frequency counter was a clear case of over-kill. What did evolve is shown in Fig. 2, a simple, cheap, and easy-to-build RF sniffer, in a shielded metal case.

If you are an "old-timer," you will recall the circuit as an add-on RF probe for use with a VTVM. It can be used with digital voltmeters as well. If you deal with devices like medical telemetry equipment, you might want to replace the probe and ground leads with either plugs or jacks to match the input (which is also the output) of the telemetry transmitter. Shielded cable is a must (RG-58/U or RG-174/U) from the probe to the VTVM. The device detects RF and displays it as a DC voltage. While that will not give you a calibrated indication of the power output, it will show you when RF output is there.

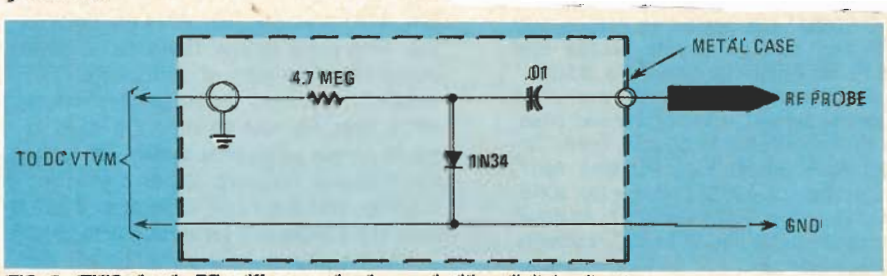

FIG. 2—THIS simple RF sniffer can also be used with a digital voltmeter.