BUILD THE AMLIGNER

By DON LANCASTER

. . . A MULTIPURPOSE TUBELESS, TRANSISTORLESS, CORDLESS BC-BAND SIGNAL GENERATOR FOR THE RADIO AFICIONADO

A BROADCAST-BAND AM signal generator without test cables or even a line cord? Yes! And what's more, it uses no tubes, no transistors, no integrated circuits . . . nothing but a diode, a resistor, a coil, and a couple of capacitors.

Yet, here's an r.f. signal generator that you can use to signal-trace radio receiver troubles, to align the receiver i.f. and front end—provided you first calibrate the unit—and which, in conjunction with any broadcast-band receiver, can be used as a code-practice oscillator by merely substituting the on-off switch for an ordinary telegraph key.

And what's the miracle ingredient that makes all this possible? Nothing more than a low-power, short-range radio transmitter that sends out an r.f. carrier modulated by a 800-hertz tone signal which is picked up by a receiver placed about eight feet away. We call it, affectionately, the "AMLIGNER." You can build it for about $7.00.

How It Works. The AMLIGNER (Fig. 1) is basically a free-running relaxation oscillator operating at 800 hertz. The circuit is powered by a 22.5-volt battery,

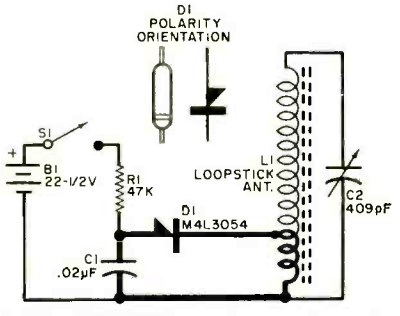
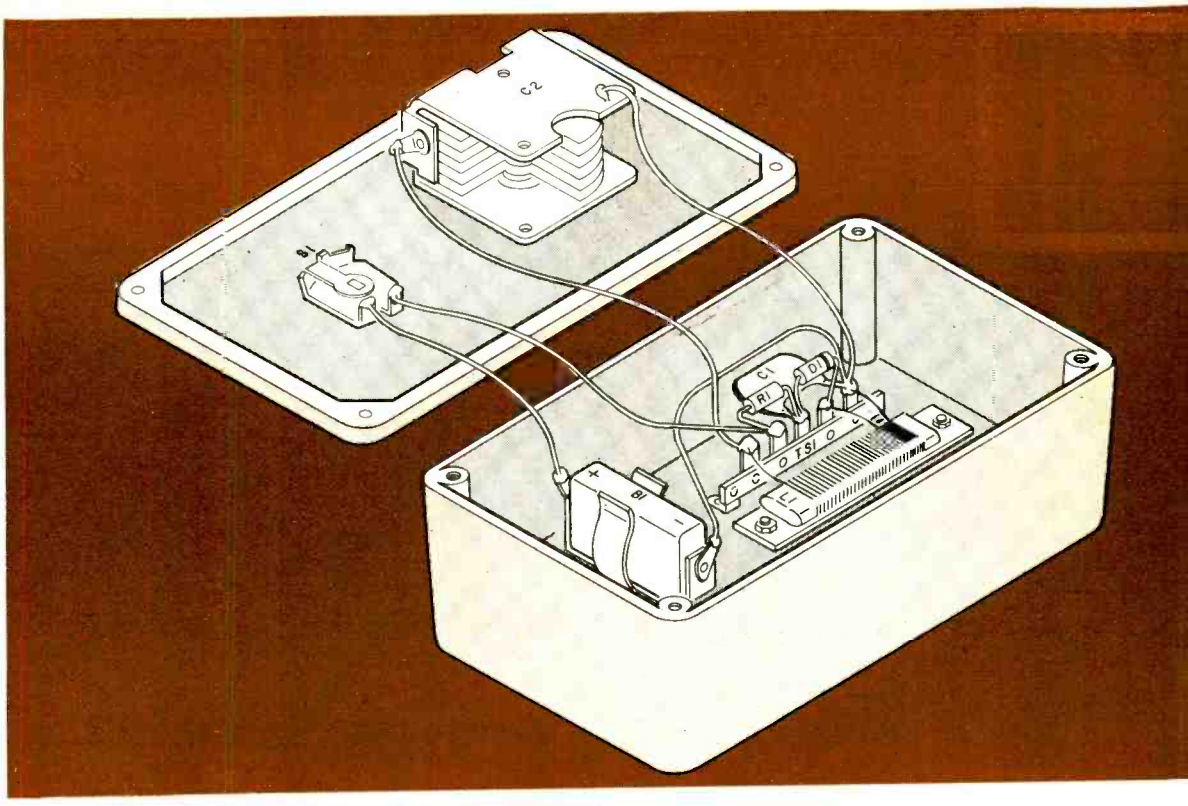


Fig. 1 The AMLIGNER is a free-running relaxation oscillator whose frequency is determined essentially by the value chosen for charging capacitor C1.

PARTS LIST

B1—22½-volt battery
C1—0.02-μF, 50-volt Mylar capacitor
C2—15 to 409 pF TRF variable capacitor (similar to Allied Radio 43 A 3524)
D1—Motorola M4L3054 four-layer diode (available from Allied Radio, Chicago, Ill.)
L1—Loopstick antenna (similar to J. W. Miller Company 2004)
R1—47,000-ohm, ½-watt resistor, ± 10%
S1—S.p.s.t. rotary switch
1—Plastic case and cover (similar to Harry Davies 240 and 241, or Allied Radio 42 D 7885 and 42 D 7887, respectively)
Misc.—¾" and 1¾" plastic knobs, #6 hardware or pop rivets, battery holder, 5-pin terminal strip, wire, solder, etc.



Housed in a plastic instrument case, the AMLIGNER can be assembled and wired in a matter of minutes. When wiring components to the terminal strip, be sure to observe polarity orientation of diode D1.

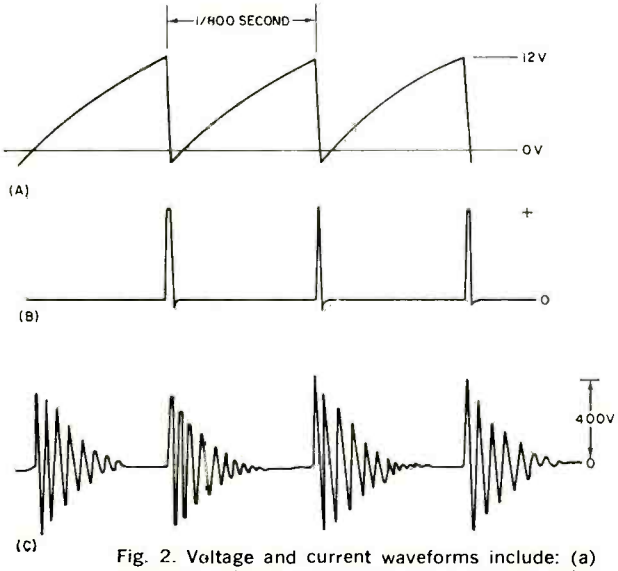


Fig. 2. Voltage and current waveforms include: (a) sawtooth voltage across C1; (b) a current pulse through D1; and (c) a ringing waveform across C2.

which is in series with switch *S1*, limiting resistor *R1*, and capacitor *C1*, shunted by *D1* and the primary of *L1*, a loopstick antenna. The "heart" of the circuit is *D1*, a four-layer diode which snaps on with a 12-volt forward bias and snaps off when the current through it drops below 1 milliampere.

With *S1* closed, *C1* begins to charge through *R1*. When the capacitor charge reaches 12 volts, *D1* avalanches and the capacitor discharges through the primary of *L1*. With *C1* discharged, *D1* turns off and does not turn on again until *C1* recharges to 12 volts. This on-off cycle occurs at a rate of 800 times a second, producing a sawtooth voltage waveform as shown in Fig. 2(a). The waveform of the current through *D1* is shown in Fig. 2(b).

As *D1* turns off, the sudden decrease of current sets up an oscillating current of a few hundred microseconds duration, and at the natural resonant frequency of the *C2-L1* tank circuit, producing the ringing waveform shown in Fig. 2(c).

(*Continued on page* 99)

THE AMLIGNER

(*Continued from page* 61)

Also, the discharge of *C1* through the primary of *L1* induces a rapidly changing voltage in the coil. This voltage is stepped up by transformer action, placing a potential of several hundred volts across tuning capacitor *C2*.

Adjustment of capacitor *C2* determines the frequency of the r.f., carrier which is independent of battery voltage. Since *L1* is an antenna as well as a transformer, it radiates an r.f. energy that can be picked up on any nearby broadcast receiver. The power radiated is well within the limits allowed by FCC regulations.

Construction. The circuit must be housed in a non-metallic box. A plastic instrument case is just about ideal for this purpose, but you could use a Masonite or wooden case. Simply follow the pictorial diagram (p. 61). Be sure to keep the leads on *C1, D1,* and the primary of *L1* as short as possible to prevent excessive signal losses in the middle of the band. And, of course, observe polarity when hooking up the battery and diode.

The circuit should perform well with just about any loopstick you care to use, but you'll no doubt encounter performance variations from loopstick to loopstick. The one in the Parts List is quite suitable for this application. You'll also find some performance variations in tuning capacitors, requiring that you custom-calibrate your own dialplate against the frequencies of local radio stations, or with the aid of a signal generator.

Operating Hints. When using the AMLIGNER, place it as far away from the receiver as you can so that it will operate on the weakest signal possible. This procedure will insure sharp tuning.

For best results when making oscillator tracking adjustments or car radio antenna trimmer adjustments, always use frequencies at the high end of the dial (around 1600 kHz). Before attempting to adjust the receiver i.f., make certain the AMLIGNER has been properly calibrated for the desired i.f. -30-