A), 6 (C) or 11 (B). The amplified signal is applied to the diode bridge direct via R12 and C5, and inverted via inverter A2, capacitor C6 and resistor R13. The two signals are summed by the bridge, amplified (in A3) and then split again into two, one of which is inverted by A4. The positive half cycles of the two signals are used to switch on T2 and T3 respectively. Capacitor C11 is then charged via R12. When the potential across this capacitor reaches a certain level, T1 is also switched on, after which a control current flows through the bridge via R21. This current lowers the resistance of the bridge so that the signal is attenuated (compressed). At the same time, the LED lights to indicate that the signal is being compressed. Capacitor C12 prevents any DC voltage from reaching the output.

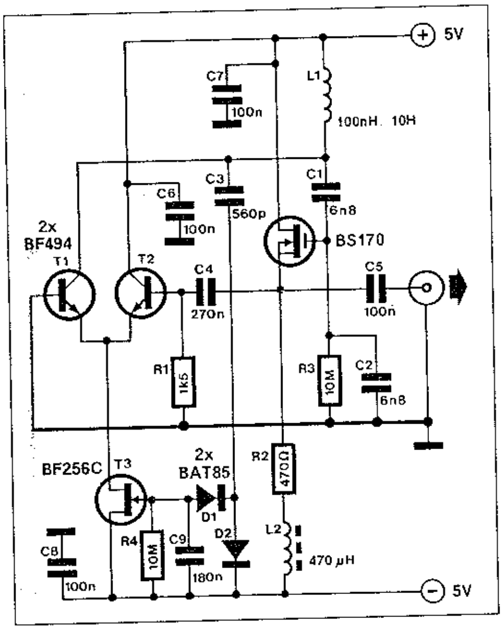
The output signal is taken from the wiper of P1. Low-pass section R20-C13 limits its bandwidth to 12 kHz.

Switch S2 enables the selection of various decay times of C11. The values shown in the diagram have in practice proved to be the most useful. Nevertheless, these values are subjective and may be altered to personal taste and requirements.

(W Teder)

065 TEST & MEASUREMENT

LC SINE WAVE GENERATOR



This compact LC oscillator offers a frequency range of about 1 kHz to almost 9 MHz and a low-distortion sine wave output.

The heart of the circuit is series-resonant circuit L1-C2-C3 in the feedback loop of amplifiers T1-T2. Transistor T2, which is connected as an emitter follower, serves as impedance converter, whereas T1, connected in a common base circuit, is a voltage amplifier whose amplification is determined by the impedance of L1 in its collector circuit and the emitter current. The feedback loop runs from the collector of T1 via the junction of capacitive divider C1-C2, source follower BS170 and the input impedance formed by R1 and C4. The whole is strongly reminiscent of a Colpitts circuit. The signal is also taken to the output terminal via C5.

Of particular interest is the amplitude control by the current source. The signal is rectified by two Schottky diodes, smoothed by C9 and then used to control the current through T3. The gain of amplifier T1 is therefore higher at low input levels than at higher ones. This arrangement ensures very low distortion, since the amplifier can not be overdriven.

The resonant frequency may be calculated from

$f = 1 / 2\pi \sqrt{[L1\ C1\ C2 / (C1 + C2)]}$

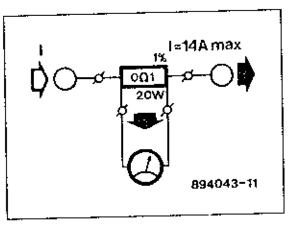
With values as shown, it extends from 863 Hz ($L1$ = 10 nH) to 8 630 MHz ($L1$ = 100 nH).

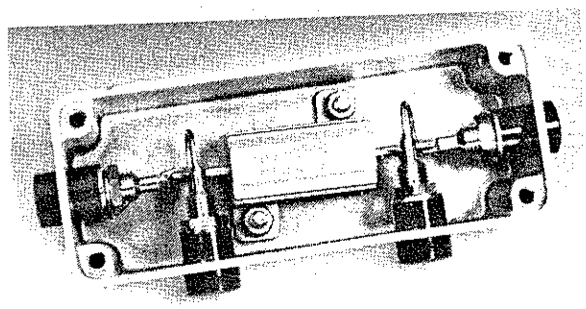
The unit may be used to measure the Q of inductors. To that end, a potentiometer is connected in parallel with L1 and adjusted so that the current through the amplifier is doubled. The Q is then calculated from

$Q = Rp / 2\pi f L$

066 TEST & MEASUREMENT

SHUNT FOR MULTIMETER





The current range in multimeters, particularly the more inexpensive ones, is restricted by the load limits of the internal shunts to 1–2 A. The photo shows how easily a precision heavy-duty resistor from Dale or RCL (0.1 Ω; 20 W; 1%) may be used as an external shunt. These resistors were not designed for this purpose, but they are much cheaper than custom made shunt resistors. The 20 W rating applies only, by the way, if a heat sink is used: without that its rating is only 8 W.

The maximum current through the device on a heat sink is about 14 A; the larger versions draw up to17.5 A. When mounting the shunt, make sure that the test terminals as well as the device terminals are soldered properly, otherwise the resistance of the terminals is added to the shunt.