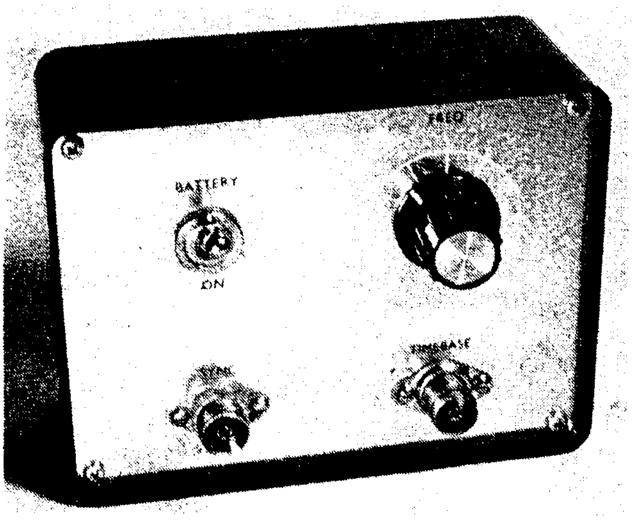


TIME BASE GENERATOR

By P. R. Arthur

In last month's issue we described a very simple wobbulator which is capable of operating with an oscilloscope offering a timebase output. The circuit described here enables the wobbulator to be employed with oscilloscopes which do not have the requisite timebase output.

The unit described in the article "Low Cost Wobbulator", which appeared in last month's issue, can be used on its own with an oscilloscope having a suitable timebase output, the latter being coupled to the variable capacitance diodes in the wobbulator. The combination of wobbulator and oscilloscope then allows the response curve of an a.m. receiver to be displayed on the cathode ray tube of the oscilloscope.

It is also possible to use the unit with an oscilloscope not having a timebase output, and this is achieved by employing a separate timebase generator for the wobbulator. The oscilloscope timebase then sweeps the spot across the face of the cathode ray tube while the additional timebase sweeps the wobbulator frequency across the receiver passband.

The timebase for the wobbulator also produces a positive pulse at the start of the flyback period and the pulse can be employed to synchronise the timebase of the oscilloscope when this has a triggered sweep mode. Using the trigger pulse to synchronise the two timebases is not essential, but it does ensure a stable trace. The author has obtained excellent results with this synchronising technique using a Russian C1-16 double beam oscilloscope, which is completely devoid of any form of timebase output.

RELAXATION OSCILLATOR

The timebase generator is based on a unijunction transistor relaxation oscillator. The circuit appears in Fig. 1.

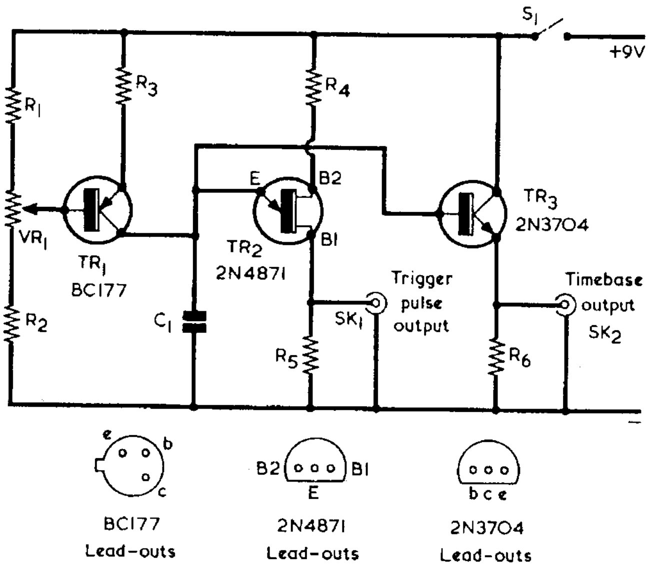


Fig. 1. The timebase generator incorporates a constant current source charging a capacitor, and produces a linear sawtooth at low output impedance

As soon as on-off switch S1 is closed, C1 commences to charge via transistor TR1. TR1 functions as a constant current source, whereupon the voltage across C1 rises in a linear manner with time. When the voltage across C1 reaches the emitter triggering level in the unijunction transistor, TR2, it discharges rapidly via the emitter and base 1 of the device into R5. It then commences to charge once more via TR1. Potentiometer VR1 controls the current passed by TR1 and therefore controls the rate at which C1 charges. In consequence VR1 operates as the timebase frequency control.

A linear sawtooth waveform is produced at the emitter of TR2, but this is at a fairly high impedance, particularly when the circuit is operating at slow sweep speeds. The waveform at the emitter is, accordingly, coupled to the base of the emitter follower, TR3. This offers a low output impedance at the timebase output socket whilst ensuring a very low level of loading on the waveform shaping circuit. The timebase output socket connects directly to the timebase input socket of the wobbulator via screened cable.

A positive-going pulse is developed across R5 during the discharge period of C1, and this may be used to trigger the timebase of the oscilloscope. The sweep frequency is continually variable from a few Hertz to several hundred Hertz, the exact range being dependent upon tolerances in the values of R1, R2, VR1 and C1, and in the triggering voltage of TR2.

Power is obtained from a PP3 9 volt battery, current consumption ranging from about 2 to 5mA according to the setting of VR1. The 2N4871 specified for TR2 is available from Henry's Radio, Ltd.

COMPONENTS

Resistors
(All fixed values ¼ watt 5%)
R1 3.3kΩ
R2 47kΩ
R3 390Ω
R4 390Ω
R5 220Ω
R6 8.2kΩ
VR1 5kΩ potentiometer, linear

Capacitor
C1 0.47μF plastic foil, type C280 (Mullard)

Semiconductors
TR1 BC177
TR2 2N4871
TR3 2N3704

Switch
S1 s.p.s.t. toggle

Sockets
SK1, SK2 coaxial sockets

Miscellaneous
Case, "A.B.S." type M3, 130 x 100 x 50mm. (Doram)
PP3 battery (Ever Ready)
Battery connector
Knob
Veroboard, 0.1in. matrix
Veropins, 0.1in.

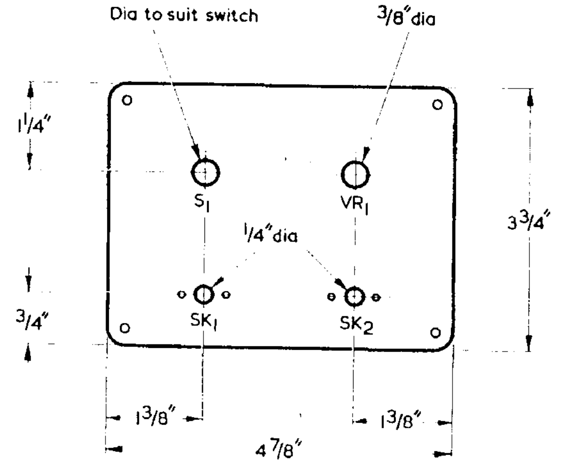
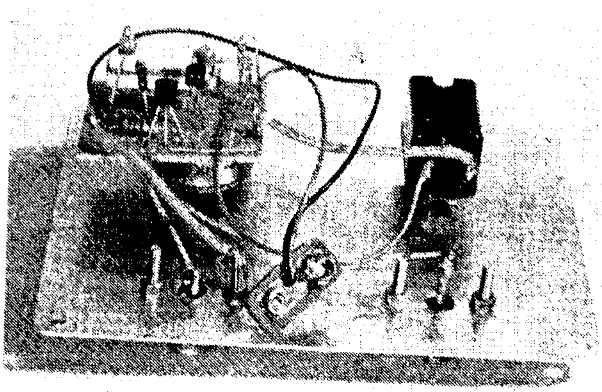


Fig. 2. The front panel is drilled out in the manner shown here

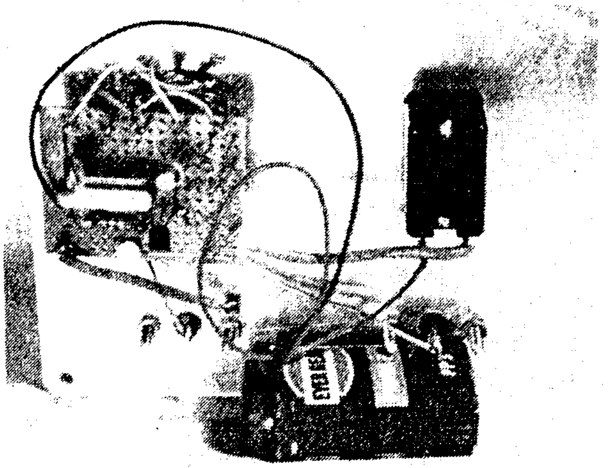
CONSTRUCTION

The prototype is housed in an "A.B.S." case type M3, obtainable from Doram Electronics, Ltd. This is a plastic case with metal front panel and measures 130 by 100 by 50mm. Fig. 2 shows the holes required in the front panel. The two small mounting holes for each coaxial socket are marked out with the aid of the socket itself. They are drilled 6BA clear with a No. 31 twist drill. A solder tag is fitted under the inner securing nut of the timebase output socket, SK2, to provide a chassis connection.

All the small components are mounted on a Veroboard panel of 0.1in. matrix, this having 13 holes by 15 copper strips. There are no breaks in the strips.



The small components are all assembled on a Veroboard panel positioned behind the sweep speed potentiometer



Another view illustrating the internal layout

The component layout on the panel is illustrated in Fig. 3. Veropins suitable for 0.1in. Veroboard are used for the points where external connections are made to VR1 and the sockets, etc. The two connections to VR1 track are designated "A" and "B". The lead marked "A" connects to the potentiometer tag corresponding to maximum clockwise rotation of its spindle. The lead indicated as "B" connects to the other track tag.

The component panel is positioned behind VR1 with its copper side facing the front panel, and with the Veropins which connect to the potentiometer at the top. Short single strand wires connect the panel to the rest of the circuit, and these provide the panel with a mounting of adequate rigidity.

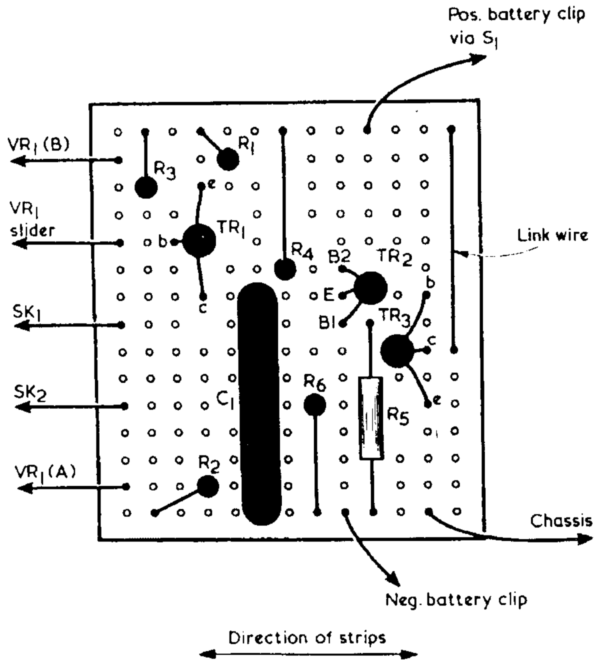
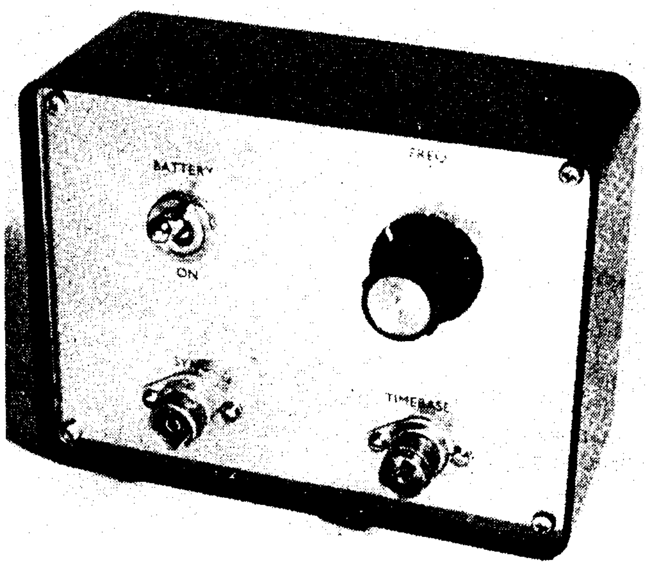


Fig. 3. Component layout on the Veroboard panel. There are no breaks in the copper strips

There is plenty of space for the battery at the bottom of the case. It can be held in place with a simple clamp affixed to the front panel. Alternatively, a piece of foam rubber or plastic glued to the rear of the panel can retain it in position.



The front panel is marked up with legends taken from Panel-Signs Set No. 4, available from Data Publications, Ltd.

USING THE GENERATOR

As already mentioned, the timebase output connects to the timebase input of the wobbulator. The trigger pulse output connects, where applicable, to the trigger input of the oscilloscope. The equipment is then set up in much the same way as with the wobbulator on its own, except that it is now also necessary to adjust the frequency control of the additional timebase. The frequency is set up such that one complete picture of the displayed receiver passband fills, or nearly fills, the oscilloscope screen from side to side. ■