

# MATCHBOX

# RECEIVER



## A miniature m.w. receiver using an integrated circuit to give good reception

A PORTABLE radio receiver able to give very good headphone reception from its internal ferrite aerial is nowadays quite easily constructed to fit inside a case the size of a matchbox due to miniaturisation of components. In fact the prototype receiver was fitted into an empty matchbox, assembly being in the tray and the outer part serving as a cover.

Tuning coverage is about 550 kilohertz to 1550 kilohertz, which is typical for the medium wave band.

### CIRCUIT

The circuit diagram of the receiver is shown in Fig. 1. The ferrite aerial L1 forms a tunable parallel resonant circuit with compression trimmer C1. The output from this network (r.f.) is fed to integrated circuit IC1 which is a ZN414. This is a multistage amplifier and detector and processes the incoming modulated r.f. and extracts the audio signals making them available at the output lead. Resistor R1 is the necessary feedback resistor for IC1 and R2 and VR1 form the load for IC1.

The output from the integrated circuit is coupled, via C4, to audio amplifier TR1 which provides a considerable increase in volume.

Power is from a single 1.4V mercury battery. As there is no space for a conventional on/off switch, the output jack SK1 is so arranged that closure of the contacts B and C switches on the receiver. It is thus switched on by plugging in the headphones, and switched off by withdrawing the plug.

### OUTPUT SOCKET

The output jack socket should be a switched type and can be 2.5mm or 3.5mm, but has to be

## Components . . .

### Resistors

R1 100k $\Omega$

R2 470 $\Omega$

R3 680k $\Omega$

All  $\frac{1}{4}$ W carbon  $\pm 10\%$

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### Capacitors

C1 450pF compression trimmer

C2 0.01 $\mu$ F plastic or ceramic

C3 0.1 $\mu$ F plastic or ceramic

C4 0.05 $\mu$ F plastic or ceramic

### Semiconductors

IC1 ZN414 a.m. radio integrated circuit

TR1 BC107 silicon npn

### Miscellaneous

VR1 1k $\Omega$  miniature carbon linear preset potentiometer

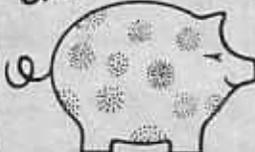
B1 MP675 1.4V mercury cell or similar

SK1 switched jack socket, 2.5mm or 3.5mm (see text)

Plain matrix board, 0.15in. 9 x 8 holes; ferrite-rod 37mm x 9mm ( $\frac{1}{4}$ in) diameter; 32 s.w.g. enamelled copper wire; knob (see text).

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**£2.40**

\*Based on prices prevailing at time of going to press

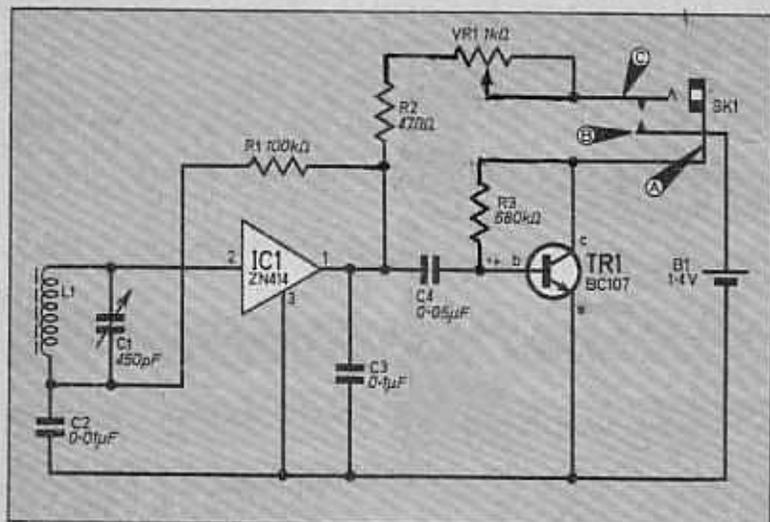


Fig. 1. Complete circuit diagram of the Matchbox Receiver

arranged so that the switchable contacts close when the plug is inserted. Jack sockets are normally made so that inserting the plug causes the contacts to open. If the required type is not readily available, the standard type should be modified. Some types of socket cannot be modified in this way so be alert when buying this component and inspect it to see if the modification can be carried out.

### AERIAL AND TRIMMER

The winding L1 is 60 turns of 32 s.w.g. enamelled copper wire wound side by side on a ferrite rod 37mm long and 9mm (3/8in) in diameter. Winding should begin 3mm from one end of the rod, and the end turns secured with adhesive. (The whole winding should not be covered with adhesive.)

Trimmer C1 as supplied has an adjusting screw for setting by screwdriver. This should be replaced by a 6BA bolt (about 25mm long), taking care to retain the insulated and metal washers under its head. The bolt projects enough to take a 6BA lock-nut and knob or metal or insulated terminal head, see Fig. 3. This is for hand tuning.

The lock-nut is positioned so that the compression trimmer plates can spring fully open, or tuning coverage will be restricted and the high frequency end of the band cannot be reached.

### COMPONENT BOARD

The prototype unit was built using 0.15 inch plain matrix board size 9 by 8 holes. The layout of the components on the board and the interconnecting wires on the underside of the board are shown in Fig. 2.

Begin by inserting a few components at a time, beginning with the resistors and capacitors and carrying out the underside wiring as you go along. Pay special attention to the lead-out con-

nections when soldering IC1 in position and use a heatsunt on the leads when soldering; similarly with TR1.

Joints and leads should be flat against the board so as to avoid raising the board more than about a millimetre or so above the base of the matchbox tray when mounted in position. Sleving is necessary on the lead on the underside from C3 to battery negative, see Fig. 2.

As the battery has a long life, connections are soldered directly to it; the case is the positive terminal. The ferrite rod assembly is secured to the component board with adhesive.

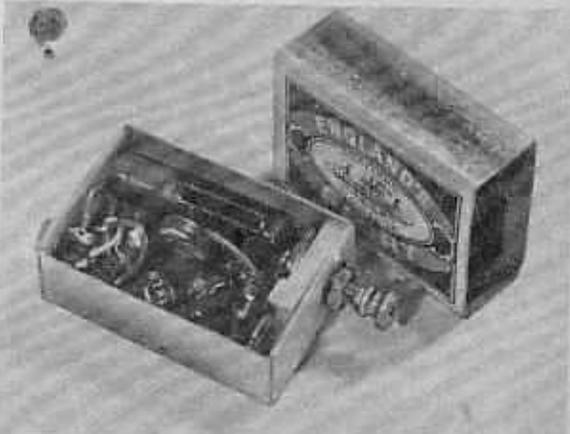
When all the board mounted components have been secured in position, SK1 and C1 should be wired in.

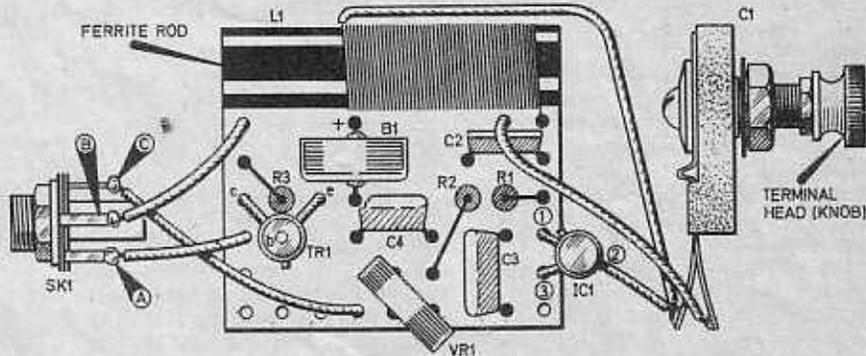
### TESTING AND SETTING UP

Best results, and most comfortable listening, will be obtained with a complete headset, although a single miniature earphone is of course

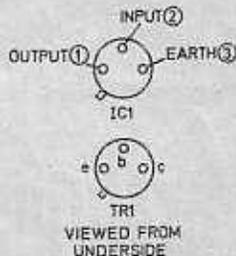
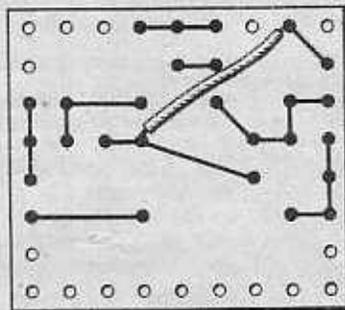
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Photograph showing the construction of the receiver.





**Fig. 2. Layout and wiring of the Matchbox Receiver.**



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easy to carry at other times. Medium or high impedance units, or headphones of about 2,000 ohms, are most suitable.

With the 'phones plugged in, adjusting C1 should tune in the stations which are best received in the locality. Some may be too loud, causing overloading, and this is corrected by turning the receiver to reduce signal pick up by the ferrite rod, if needed.

Potentiometer VR1 is adjusted with a small

screwdriver. When VR1 is at a low value, or zero, volume is greatest, but oscillation may accompany some signals. If so, turn VR1 to increase resistance so that oscillation ceases. The setting is not critical. Later readjustment of VR1 will give some extra life for a failing battery.

All that remains to be done is fit the assembly into a matchbox—or other case if you desire—and the receiver is complete and ready for use.



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# SHOP TALK

By Mike Kenward

## **Matchbox Receiver**

Parts for the *Matchbox Receiver* must of course all be small—remember this point when buying the capacitors in particular. The output socket also acts as the on/off switch and must be of a particular type which is modified—see text.

The trimmer used for tuning can be modified to provide a tuning “knob” or a special conversion spindle can be purchased from Home Radio. The short piece of ferrite rod required is not likely to be sold as such and will have to be cut from a larger piece; do this by filing a notch around the rod at the required point and breaking off the section over the edge of a table.