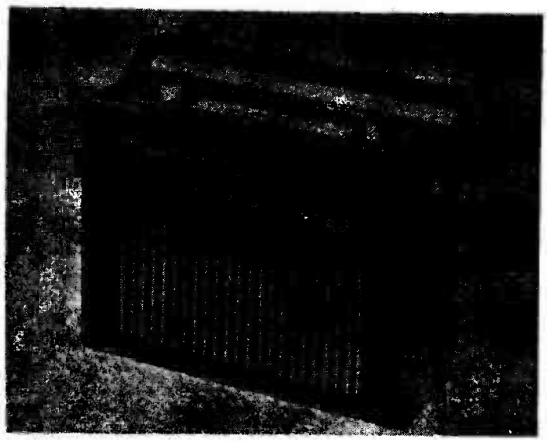
Kit Review

The Heathkit "OXFORD" Portable Receiver

Model UXR-2



SPECIFICATION

Tuning Range	Medium wave, 555 to 192 metres (540 to 1,560 kc/s) Long wave, 1,800 to 1,000 metres (167 to 300 kc/s)
Loudspeaker	7 x 4in high flux, 3Ω impedance
Power Output	500mW (r.m.s.) at 1 kc/s
Battery	9 volt, Ever Ready PP9 or Drydex DT9 (or equivalent)
Battery Life	300–500 hours
Transistors, Diodes	3—AF117 Mix/Osc and IF amplifier 1—OC71 AF amplifier 1—OC81D driver 2—OC81 audio output (matched pair) 1—AA129 temp. compensating diode 1—OA90 detector diode 1—OA81 AGC diode (or equivalent types to above)

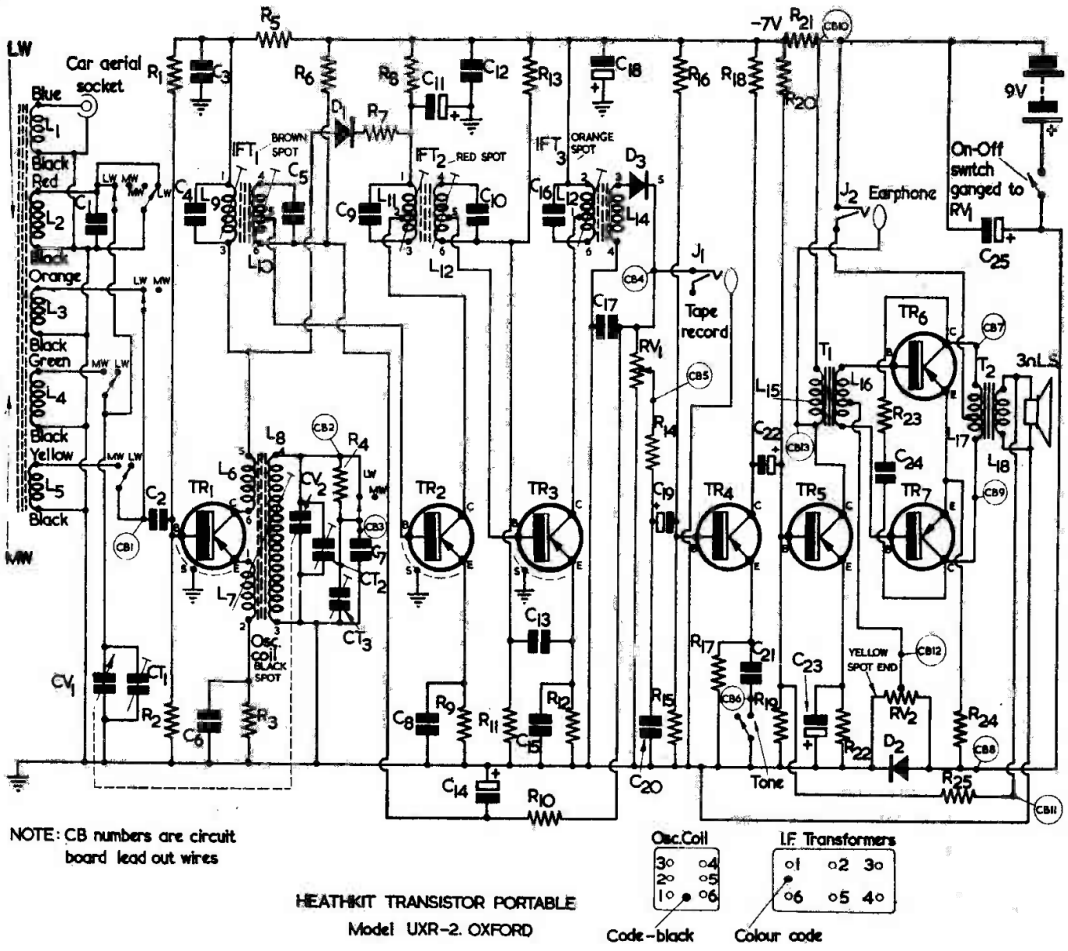
Sensitivity (50mW output 30% modulation):	*Sensitivity*	*Signal to Noise Ratio*
Medium Wave at 1,000 kc/s	19μV/m	3dB
	200μV/m	20dB
Long Wave at 200 kc/s	56μV/m	3dB
	500μV/m	20dB
Selectivity:	*Bandwidth (6dB points)*	*Attenuation (± 9 kc/s)*
Weak Signal	± 3.7 kc/s	44dB
Strong Signal	± 3.0 kc/s	38dB

A.G.C. Range (for 6dB change in audio output)	62dB
Size	11in wide x 8in high x 3⅞in deep
Net Weight	6lb with battery
Shipping Weight	7½lb (less battery)

THE MODEL UXR-2 HAS BEEN SPECIFICALLY designed for those who require a luxury portable transistor receiver for use both in the home as a domestic receiver and in the car where, by virtue of its design and physical dimensions, it is capable of being stowed under the dashboard. For this latter purpose it is fitted with a car aerial input socket and, as may be seen from the illustration herewith, the tuning scale is placed at the top of the cabinet so that, when placed under the dashboard, the tuning scale and controls are facing the user. The stout metal-reinforced leather handle is fitted to the case in such a manner that it may be housed under the receiver, thus positioning the full scale dial at an inclined angle and making the scale clearly visible to the operator.

The UXR-2 may also be used as a personal portable receiver, an output socket for a personal earpiece being one of the features of the design. The slide rule type tuning scale is fitted with a slow motion drive, this considerably assisting with respect to the ease and correct tuning-in of any station. The controls include a combined volume and on/off control, a tuning control, and 3 push buttons for tone, medium and long wave respectively. The cabinet itself is made of real solid leather and the control knobs and dial edging are trimmed with polished brass, giving the whole assembly a most attractive appearance.

In addition to the output sockets previously mentioned, provision has also been made for an output socket for use with a tape recorder.



The kit of this receiver is supplied complete with quite the most complete and comprehensive construction manual that we have ever seen. Also included with this well-produced 44 page manual is a 15 x 10in circuit diagram (this being in addition to one included in the manual itself), a component identification chart (8¼ x 11in), five large "exploded" point-to-point diagrams (15 x 11in approx.)—each of the above mentioned sheets being separate from the manual—and a guarantee registration card. The approximate sizes mentioned above are those of the actual diagrams. The manual itself is an absolute mine of information containing colour codes, glossary of radio terms used, servicing information, an introduction to transistors, fault finding chart, operation instructions, and point-to-point disturbance tests. The whole is liberally interspersed with drawings and wiring diagrams, etc.

Circuit

The latest circuit techniques have been used; and printed circuit board construction, together with the inclusion of pre-aligned double-tuned i.f. transformers for higher sensitivity and 7 transistors plus 3 diodes, make this receiver an outstanding design.

Signals are picked up by the ferrite rod aerial on which are fitted the medium wave coils (L_4 L_5) and the long wave coils (L_2 L_3), wave change being effected by operation of the two push-button switches. The desired station is tuned by one section of the variable capacitor CV_1, the desired signal then being coupled to the base of transistor TR_1.

Variable capacitors CV_1 and CV_2 are ganged and the latter tunes L_8, which appears in the oscillator circuit. The trimmer CT_3, in parallel with C_7, is switched across L_8 during long wave operation, thus lowering the oscillator frequency in order to maintain the 470 kc/s intermediate frequency.

The i.f. of 470 kc/s is selected by the transformers IFT_1, $_2$ and $_3$, and amplified by the transistors TR_2 and TR_3. It is then passed to the detector circuit consisting of the diode D_3, capacitor C_{17} and the volume control RV_1, which forms the diode load. The a.g.c. voltage is filtered by resistor R_{10} and

Components List

Resistors (all ½ watt 10%)

R_1	33kΩ
R_2	6.8kΩ
R_3	1kΩ
R_4	150kΩ
R_5	100Ω
R_6	56kΩ
R_7	680Ω
R_8	2.2kΩ
R_9	680Ω
R_{10}	8.2kΩ
R_{11}	4.7kΩ
R_{12}	1kΩ
R_{13}	22kΩ
R_{14}	3.9kΩ
R_{15}	15kΩ
R_{16}	82kΩ
R_{17}	1kΩ
R_{18}	3.9kΩ
R_{19}	8.2kΩ
R_{20}	39kΩ
R_{21}	560Ω
R_{22}	1kΩ
R_{23}	100Ω
R_{24}	4.7Ω
R_{25}	39kΩ
RV_1	5kΩ log.
RV_2	200Ω

Capacitors

C_1	47pF
C_2	0.025μF
C_3	0.1μF
*C_4	560pF
*C_5	560pF
C_6	0.025μF
C_7	270pF
C_8	0.1μF
*C_9	270pF
*C_{10}	270pF
C_{11}	2μF
C_{12}	0.05μF
C_{13}	0.025μF
C_{14}	8μF, electrolytic, 12V wkg.
C_{15}	0.025μF
*C_{16}	250pF
*C_{17}	0.01μF
C_{18}	200μF, electrolytic, 16V wkg.
C_{19}	0.5μF, electrolytic, 50V wkg.
C_{20}	0.05μF
C_{21}	0.1μF
C_{22}	0.5μF, electrolytic, 50V wkg.
C_{23}	100μF, electrolytic, 4V wkg.
C_{24}	0.25μF
C_{25}	200μF, electrolytic, 12V wkg.

Variable Capacitors

CV_1	387pF
CV_2	174pF
CT_1	20pF
CT_2	20pF
CT_3	40–110pF

Semiconductors

TR_1	AF117
TR_2	AF117
TR_3	AF117
TR_4	OC71
TR_5	OC81D
TR_6	OC81 } Matched pair
TR_7	OC81 }
D_1	OA81
D_2	AA129
*D_3	OA90

* Form part of i.f. transformer assembly.

capacitor C_{14}, and is applied to the base return of the i.f. amplifier TR_2, thus controlling the amplification of this stage over the normal signal levels. Further a.g.c. action is provided by diode D_1, this damping the tuned circuit L_9 in IFT_1 when very strong signals are present. The diode D_1 will only conduct when the voltage at its cathode becomes more negative than the voltage on its anode—this occurring when a very high a.g.c. voltage is apparent.

The rectified audio signal is tapped off from the volume control RV_1 via its slider and is then fed, via R_{14} and C_{19}, to the base of TR_4 the audio amplifier. Fitted in the emitter circuit of this stage is the capacitor C_{21}, which provides treble boost when the Tone push-button is operated.

The signal is now coupled from the collector of TR_4 to the base of TR_5 via C_{22}, TR_5 being the driver stage. At the collector of this stage, signals are passed by the driver transformer T_1 to the bases of TR_6 and TR_7, these providing the output stage. These two transistors are operated in class B for maximum battery economy, the current taken being almost directly proportional to the sound output level.

The output transistors TR_6 and TR_7 are transformer coupled by T_2 to the speaker in order to provide the correct matching, negative feedback being provided by R_{25} which is connected from the secondary winding of the output transformer to the base of the driver stage TR_5. The feedback circuit provides improved frequency response and the reduction of harmonic distortion.

In order to reduce cross-over distortion, it is necessary to provide a small forward bias voltage at the base of the output transistors. In this receiver the bias voltage is stabilised by the junction diode D_2, and is set by the variable resistor RV_2. In order to prevent battery voltage falling on high current peaks, the capacitor C_{25} has been included across the supply. To further ensure stability of operation,

both C_{18} and R_{21} have been fitted to provide isolation between the output and the other stages.

The receiver power is supplied by a single 9 volt battery, the positive terminal of this being connected to the emitters of the output stage via the on/off switch (integral with RV_1) and the junction of the stabilising components R_{24}, RV_2 and D_2.

RADIO topics

By RECORDER

NEW AUDIO AMPLIFYING VALVES are always of interest, and a particularly noteworthy type has appeared on the Continent this year. This new valve is the ECLL800 and it is manufactured by Standard Elektrik Lorenz AG, of Stuttgart. At the time of writing, I haven't heard of an equivalent type being manufactured in (or imported into) the U.K., although such a possibility is quite feasible when the advantages of the valve are considered.

The ECLL800

The Continental valve coding system is very helpful, and it is possible to obtain a good idea of the ECLL800's make-up from its type nomenclature. Thus, the E tells us that it has a 6.3 volt heater, the C that it includes a triode, the two L's that it also includes two output pentodes, and the 8 that it fits into a B9A base. The two 0's at the end of the type number refer to the design or development. We know, therefore, that the ECLL800 is a triode-double-output-pentode.

The purpose of the ECLL800 is to provide a push-pull output stage at high power, and it has the advantage that it contains its own phase reversing triode as well. I am indebted to the June issue of the Dutch magazine *Radio Electronica* for this information, and also for the details of operation which follow. Many of these details are, incidentally, also given in a Standard Elektrik Lorenz advertisement in the July issue of the German amateur radio magazine *Das DL-QTC*.

A typical operating circuit for the ECLL800 appears in Fig. 1. In this diagram, a single-phase a.f. input is applied to the triode section of the valve and is also passed direct to the grid of one of the output pentodes. The signal on the anode of the triode is then passed to the grid of the other output pentode. Since the triode anode signal is 180° out of phase with that at its grid, both pentodes now become capable of operating in push-pull. Their anodes feed, in consequence, into the centre-tapped primary of a push-pull output transformer.

An unusual feature is that the triode does not employ any of the normal phase-splitting circuits. It would appear that it is so designed that it offers a stage gain of unity with the component values shown.

The base pin connections are given in Fig. 2, and I have shown these in a separate diagram, rather than give pin numbers in Fig. 1, because the separate diagram demonstrates very well the ingenious manner in which all the electrode connections are accommodated by nine pins only. Thus, pin 2 carries the connection for the grid of the triode as well as the grid of one of the output pentodes. Similarly, the two screen-grids are brought out at pin 9. Pin 7 takes a really jumbo-sized collection of electrodes, these comprising all the cathodes and both the suppressor grids.

A very popular output valve these days is the EL84, and it can be

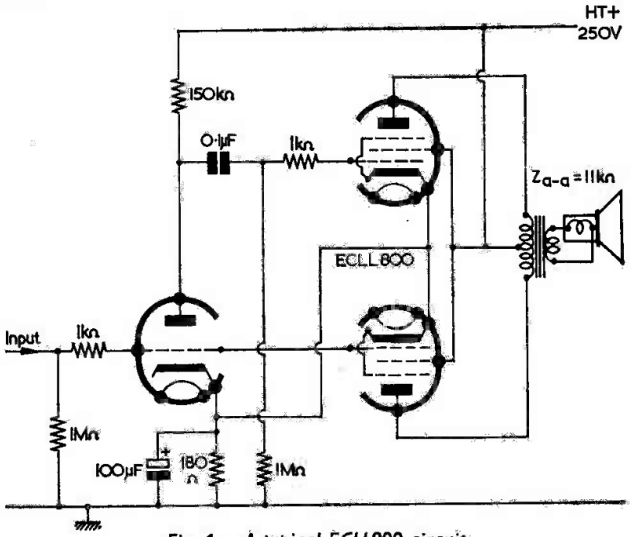


Fig. 1. A typical ECLL800 circuit