

THE



TWO'ER

Reviewed by R. C. HILLS, G3HRH



The Heathkit HW-30 (The Two'er) Transceiver.

THE HW-30 2m transceiver is designed to provide a complete station facility for the 144-146 Mc/s amateur band in the simplest and cheapest form. The equipment is entirely self-contained in an attractive cabinet and comes complete with microphone and a.c. power lead. The circuitry employs a total of five valves and three diodes, and by selecting appropriate terminals on the power socket, can be operated from battery supplies as an alternative to the built-in a.c. mains power unit. The transmitter section is crystal controlled and delivers some 2-3 watts output. The audio section doubles as a modulator, or as the later stages of the receiver, the front end of which is a single r.f. stage followed by a super-regenerative detector. The HW-30 is basically designed for the US market, and the tuning range extends over 144-148 Mc/s with a slight overlap at each end to cover their Civil Air Patrol channels.

The block diagram of the transceiver is shown in Fig. 1, and the function of the various stages is evident from the diagram. The chassis and control layout are reasonably straightforward, although two design features are rather disappointing. The single FT243 crystal socket provided is located inside the cabinet and any change of frequency necessitates the removal of the chassis to obtain access to the crystal position. The connection from the wafer on the TR switch to the aerial socket on the rear chassis drop is a plain piece of stiff tinned copper wire some 4 in. long which must radiate a considerable amount of the available r.f. inside the cabinet, and is also a potential radiation source of energy from the super-regenerative detector stage.

The HW-30 is remarkably simple to operate. The only controls provided (and indeed necessary) are VOLUME, TUNING, and TR SWITCH. The latter has an alternative spring-loaded position for rapid changeover. The remainder of the front panel is occupied by the ample 3½ in. loudspeaker, and two neon lamps to indicate POWER and TRANSMIT. The main ON-OFF switch is located on the volume control. A preset regeneration control is provided on the rear drop of the chassis together with an American type "phono" jack for the aerial connection, an octal socket for power supplies, and a primary fuse. The changeover from a.c. to d.c. power supplies is achieved by suitable links inside the octal power plug; as supplied with the review model this was wired for 240V a.c. operation, but it is understood that the full kit includes an additional connector wired for battery operation.

The performance of the HW-30 is much as one might expect in terms of receiver sensitivity and transmitter range. The review equipment was tested under varying conditions, principally to establish the useful range and also to assess the degree of re-radiation likely to be experienced from the super-regenerative receiver's oscillating detector, which could form a potential hazard to other users of the spectrum both within and outside the limits of the tunable range of the receiver. The mode of operation of a receiver of this type is such that, when tuned to an incoming strong signal, a whole family of spurious signals, cross-modulated by the received signal, is re-radiated at intervals of the regeneration "sque-

ging" frequency, extending away on both sides from the frequency of the received signal. Such spurious signals will be receivable on nearby receivers and will therefore form a serious interference hazard over a relatively wide range of frequencies. This is particularly important when commercial services operating adjacent to amateur bands have to be considered. The only effective way to reduce this type of "re-radiation" interference is by adequate screening of the offending receiver, and by isolation between the radiating detector and aerial using an r.f. amplifier stage. While the HW-30 must inevitably suffer from this disadvantage, by knowing the range to which the re-radiated signals are limited, it is possible to make some assessment of the conditions under which it may safely be used.

For the first test, the HW-30 was operated indoors at a site some 3-4 miles away from a well-equipped fixed station using a 6-over-6 beam and a sensitive crystal-controlled receiver. The HW-30 was operated into a piece of wire 19 in. long (approximately a quarter of a wavelength) which was pushed into the aerial socket. Perfectly good communications were maintained at RS57 level, even when the HW-30

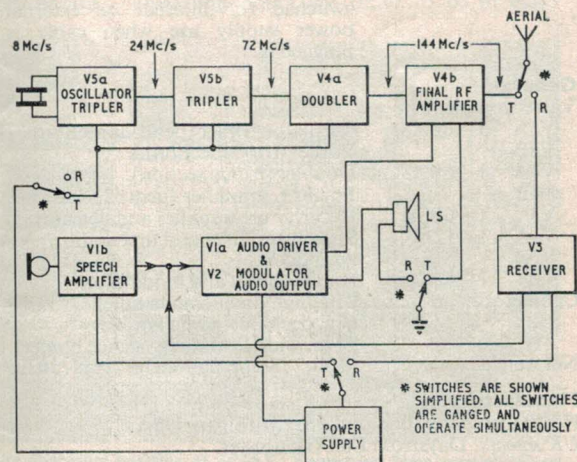


Fig. 1. A block diagram of the HW-30 2m transceiver.

was moved around in the room, and screened from the other station by metal objects. The modulation level was reported adequate, and by raising the voice or speaking too close to the microphone, limiting occurred which degraded the readability.

In order to test the typical range of the HW-30, it was

TECHNICAL SPECIFICATION

Transmitter Section

Power input to final	
r.f. amplifier ..	Approximately 5 watts.
Frequency control ..	8 Mc/s to 8.11 Mc/s quartz crystal. Pin spacing 0.5 in. Pin diameter 0.093 in. FT-241 or FT-243 crystal holder.
Modulation ..	A.m. anode modulation, automatically limited to not more than 100 per cent.
Output impedance	50 or 72 ohms.

Receiver Section

Receiver type ..	Super-regenerative detector preceded by r.f. preamplifier stage.
Sensitivity ..	Usable with signals as low as 1 micro-volt at the aerial terminals.
Speaker size ..	3½ in. circular.
Audio power output	Approximately 1 watt (undistorted).
Tuning range ..	143.0 Mc/s to 149.0 Mc/s.

Power Supply

Power rectifier ..	Two silicon diodes in full-wave voltage doubler circuit.
Power requirements	With built-in supply: 105-125 volts, 50/60 cycle a.c., 45 watts. With external supply: 6 volt operation—6 volts at 2.35 amps, 260 volts d.c. at 90 mA. 12 volt operation—12 volts at 1.2 amps, 260 volts d.c. at 90 mA.

Accessories

Microphone ..	Ceramic element, plastic case. Suitable for either hand or desk operation.
Connecting cables	Two supplied, one for 210-250 volt a.c. operation and one for 6 or 12 volt external d.c. power supply. Power circuits are automatically switched for internal or external power supply use when cable is plugged in.

General

Valve complement	
V5A 1—6BA8:	Oscillator/tripler (pentode section).
V5B	Tripler (triode section).
V4A 1—6BA8:	Doubler (triode section).
V4B	Final r.f. amplifier (pentode section).
V3 1—6BS8	Receiver preamplifier and detector.
V1A 1—12AX7	Speech amplifier and first audio.
V1B	Amplifier.
V2 1—6AQ5	Audio output and modulator.
Cabinet dimensions	8 in. high (including handle). 6 in. deep (including knobs). 9¾ in. wide (including licence holder).
Net weight ..	6½ lb. Shipping weight .. 10 lb.

Manufacturer

Heath Company, Benton Lane, Michigan, USA.
UK Agents: Daystrom Ltd, Gloucester.

Price £26. 5s.

operated into a pair of crossed dipole aerials at some 20 ft. above ground at a good v.h.f. location. Under these conditions, signals could be received from all directions at good strength up to 10-15 miles, and one or two outstanding stations at greater distances. The range of the transmitter appeared to match the limitations of the receiver. When connected to a large Yagi aerial system some 35 ft. above ground at the same site the effective range went up significantly, and stations up to 50 miles could be received. However, under these conditions the inherent lack of selectivity of the simple receiver became a problem in resolving adjacent signals.

Finally, in order to check the re-radiation from the regenerative receiver, a strong local station was tuned in, using the crossed dipoles, and the band searched on another receiver located at a site approximately 100 yards away, and using an 8 element Yagi. At this range the interference over the band was definitely very objectionable. However, at the same time, no trace of interfering signals could be found at a site just over a mile away. At no time was any TVI experienced on Bands I or III on a receiver in the same house, even when the HW-30 was operated standing on top of the receiver. Neither could any spurious radiation be detected on a sensitive communications receiver coupled tightly to the HW-30 aerial socket, when no signal was tuned in on the HW-30.

Conclusions

The Heathkit HW-30 represents a simple and reliable means of getting on the 2m band with a single package. It is neatly arranged, and, with the usual comprehensive Heathkit Manual, should be very simple to construct.

The useful range depends very much on the aerial system employed, but for semi-emergency or casual point-to-point communication it is very suitable. It is recommended that it is *not* used where several 2m stations are in very close proximity or when the band is very active, i.e., during contests or E-DX openings, but for local nets it is quite satisfactory. An ideal application would be as a constant stand-by "talk link" between two co-operating stations.

The circuitry is basically satisfactory, but some benefit might accrue from mounting the crystal holder on the outside of the front panel, and by replacing the aerial socket with a Belling-Lee bulkhead coaxial socket Cat. No. L1421, wiring back to the transmit-receive switch with coaxial cable to reduce radiation.

QRV QRT

A ruling by Ministry of Defence (Air) has deprived the long-established Royal Air Force Amateur Radio Society of its official journal *QRV*—at least for the time being. It appears, according to the Editor of News Letter No. 17, that "some person (lady) unknown has decided that the society can afford to have the magazine printed privately and that advertisements should cover the additional outlay." RAFARS members are assured that something will soon be arranged and that *QRV* will reappear.

"The Parabeam and How it Works"

An article by Vic Hartopp, Chief Development Engineer, J-Beam Aerials Ltd. describing the Parabeam has been published in a recent issue of *Electrical and Electronic Trader*. Designed to cater for television broadcasting on u.h.f. (470-574 Mc/s) the Parabeam is basically a long Yagi using a skeleton slot as radiator and another as reflector. The Parabeam is now being offered commercially.