

HEATHKIT DX-100U

CW/AM PHONE
TRANSMITTER FOR FULL
POWER OPERATION ON
ALL BANDS 10-160 METRES

SINCE it became available in this country, the Heathkit DX-100U, supplied in kit form by Daystrom, Ltd., has attracted a good deal of interest and attention—as indeed it might, for it is a well designed assembly, finishing as a nice-looking piece of equipment, both inside and out. Moreover, the DX-100U, being designed to an “international specification,” can run up to 180 watts fully modulated on all six communication bands. To conform to U.K. regulations, the necessary power-reduction provision is made in the circuitry.

The illustrations and diagrams herewith give a good idea of what the DX-100U looks like and how the circuits are arranged. On the RF side, the PA takes a pair of 6146's in parallel, with a switched tank assembly covering all bands 1.8 to 28 mc inclusive, and operating at a final plate voltage of 640v. The PA is clamped by a 6AQ5, with which R15 (Fig. 2) is a variable pre-set adjustment to get the clamp setting just right.

As shown by Fig. 2, the DX-100U can be operated either VFO or crystal controlled, V1 being switched out in the latter case; this is the 6AU6 variable oscillator which has two separate tuned circuits, one for the LF bands and the other for 7-28 mc; the selection of these windings and their associated condensers is effected automatically by the single band-change switch, which controls all switching

motions from VFO to PA. For crystal controlled working, the buffer V2 becomes the crystal oscillator, with V3 as the switched driver stage in either case.

Still looking at Fig. 2, it will be noted that two separate HT supplies are provided, with V14 as a bias rectifier. The inter-switching is so arranged that the modulator can only come on when the transmitter is put in the “Phone” position, this putting HT on the modulator screen line. When on either CW or phone, change-over control is either by a single front-panel switch or by relay *via* the remote-control socket on the rear chassis-drop. When on CW, the secondary of the modulation transformer T3 is shorted, a very essential precaution when keying at 150 watts input.

A neat speech amplifier circuit gives ample voltage gain with any crystal microphone, R23 being the audio control, between the two halves of the 12AX7. The audio driver stage is a 6CH6, and the modulators a pair of KT88's, which will give a good 100 watts of audio, ample for full modulation at maximum input. An interesting circuit feature is that the audio can be brought out separately, if required to operate with apparatus external to the transmitter itself — this is very useful where the station equipment includes, say, a transmitter for two metres, or some other band for which no modulator and power supply are available.

Since the paralleled PA valves and modulators require between them high peak currents under full-power conditions, two 5R4GY's in parallel are used in the main HT rectifier, which gives 700v. at 500 mA.

General Design

As can be seen from the photographs, the layout is such as to give a particularly neat

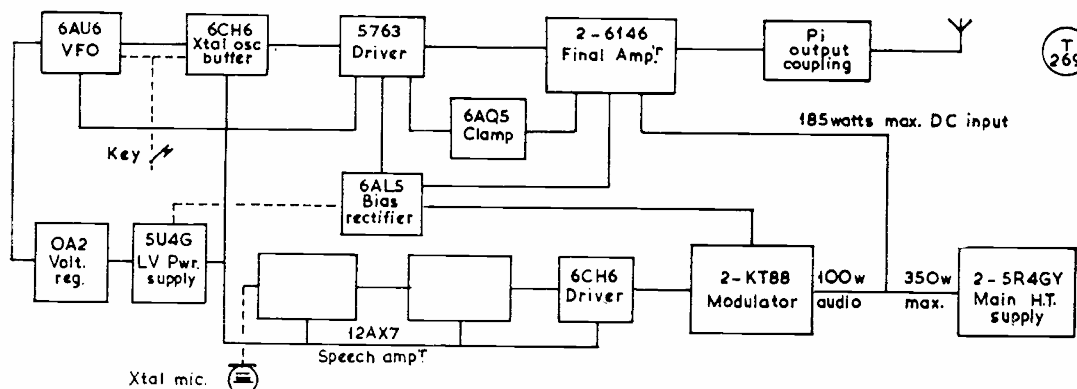


Fig. 1. Block schematic of the Heathkit DX-100U Transmitter, which uses a total of 15 valves, and can be operated on all six amateur bands.

above-chassis assembly, with weight evenly distributed — the iron-core components are generous, and therefore heavy—and the chassis depth is such that there is plenty of room underneath for assembly and wiring. As in all Heathkit equipment, the chassis and panel are completely prefabricated and fully drilled, the register of the holes being accurate and everything a good square fit.

The panel layout makes for easy operation and the scaling on the variable controls is such that the settings for band-to-band adjustments can be accurately repeated. The driver control R8 sets the drive into the PA from band to band, and is the second knob from the left along the lower row in the front panel view. The large central knob in this row is the band-change switch, and alongside it (right) the aerial output coupling adjustment: this has a wider range of setting than usual as the total

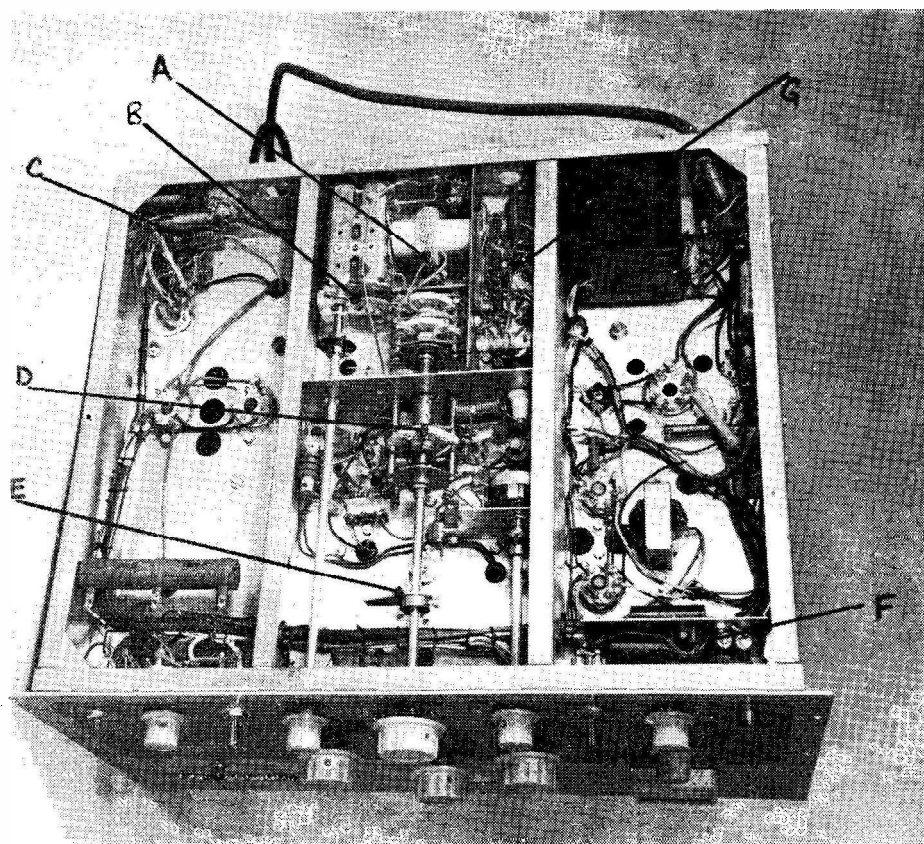
capacity available at C37 is .0015 μ F, made up by three 500 μ F condensers in triple gang. The two large knobs in the middle row are (right) PA tank tuning, C35 in Fig. 2, and the driver tuning condenser C25 on the other side.

At far left in this row is the five-position meter switch, by which can be read driver plate current, PA grid current, PA plate current, main HT voltage, and modulator plate current. The single instrument is scaled in such a way as to make these readings direct, except in the case of the main HT, for which the scale reading must be doubled.

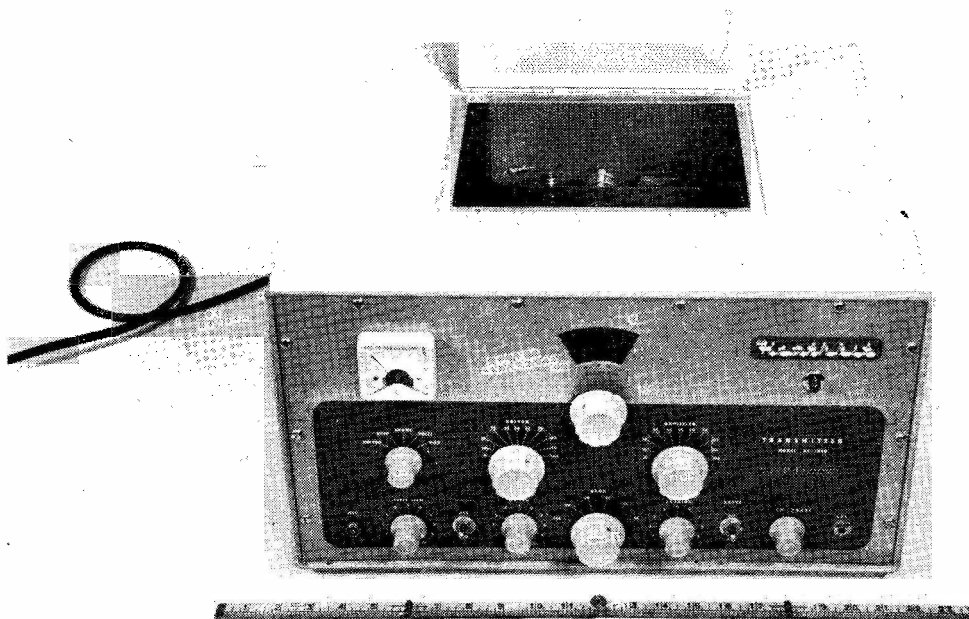
For reducing PA input, a simple circuit change, switch-controlled, is introduced at the screens of the PA valves. The transmitter can then be operated at inputs of from 5 to 30 watts.

The VFO Section

Any amateur-band transmitter can be made



Underneath the DX-100U as built from the Daystrom kit for the U.K. market. The items identified are: A, 160-metre coil; B, output tuning condenser, C37 in Fig. 2; C, RF chokes at remote control socket; D, band-switch assembly, VFO in front compartment, driver-PA behind; E, mechanical switch automatically selecting either L1 or L2 (see Fig. 2) for LF/HF VFO sections; F, speech amplifier assembly, in screened compartment behind main panel; and G, grid side of RF stage. The holes seen in various parts of the main chassis are for ventilation, the three in line in the left-hand compartment being for the 5R4GY parallel-connected rectifiers. The high-wattage resistor at lower left in this compartment is R32, R33 in the circuit of Fig. 2.



General appearance of the Heathkit DX-100U, as built from the parts supplied. The cabinet work is particularly good, and the ready-drilled chassis is rigid, well finished and adequately holed for ventilation. Band-change is by single-switch control (lower centre) and all bands Top to Ten are covered, for CW or high-level AM phone operation.

or marred by its drive oscillator, no matter how good the rest of the design may be. The VFO must not only be absolutely stable, with a good dial mechanism and an open scale for accurate frequency setting, but it must also give adequate output and key cleanly and sharply under CW conditions. These requirements are fulfilled in the case of the DX-100U, where the keying is in the cathodes of the VFO/Buffer stages.

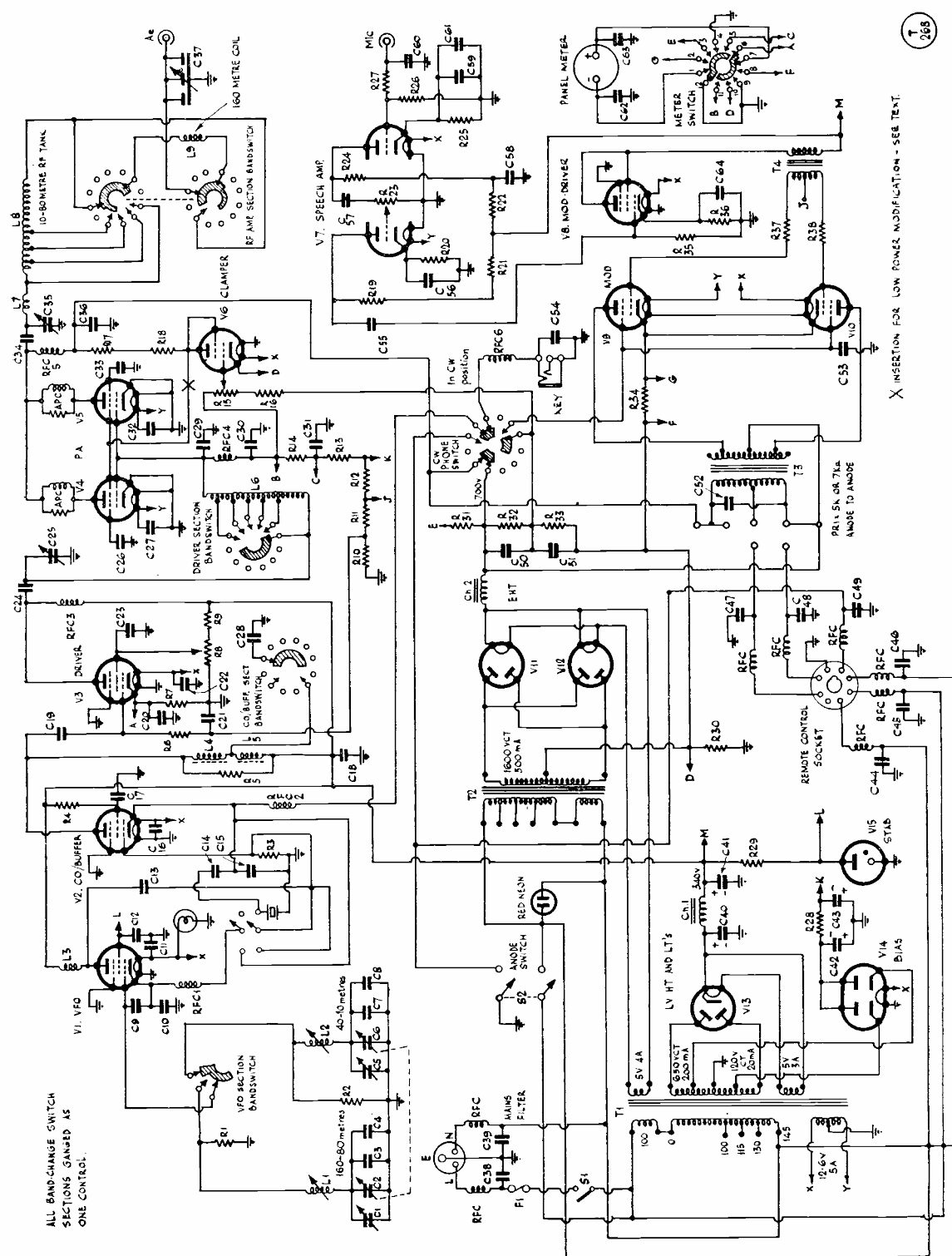
It can be stated that the CW note is excellent, the re-setting accuracy high, and the stability very good indeed; great care has been taken with the general design and layout of the VFO section, and the HT to the screen of the 6AU6 is stabilised, as shown by V15 in Fig. 2. The dial mechanism is smooth and positive, with a good open scale, and on any band the VFO can be set up close to a given frequency. As regards output, there is no trouble in getting

more than enough grid current into the PA on all bands.

Constructional Points

The transmitter as illustrated here was built from a standard production kit, to the instructions given in the DX-100U manual, using the parts supplied. The manual runs to some 64 pages, covering not only the assembly of the transmitter, section by section, in great detail but also its setting up, testing, installation, maintenance, and servicing. The wiring-out instructions are given in point-to-point form, with large pictorial diagrams, and provided the assembly and wiring procedures are followed as laid down in the manual, one simply should not go wrong.

Several sections of the transmitter are put together as sub-assemblies before being fitted



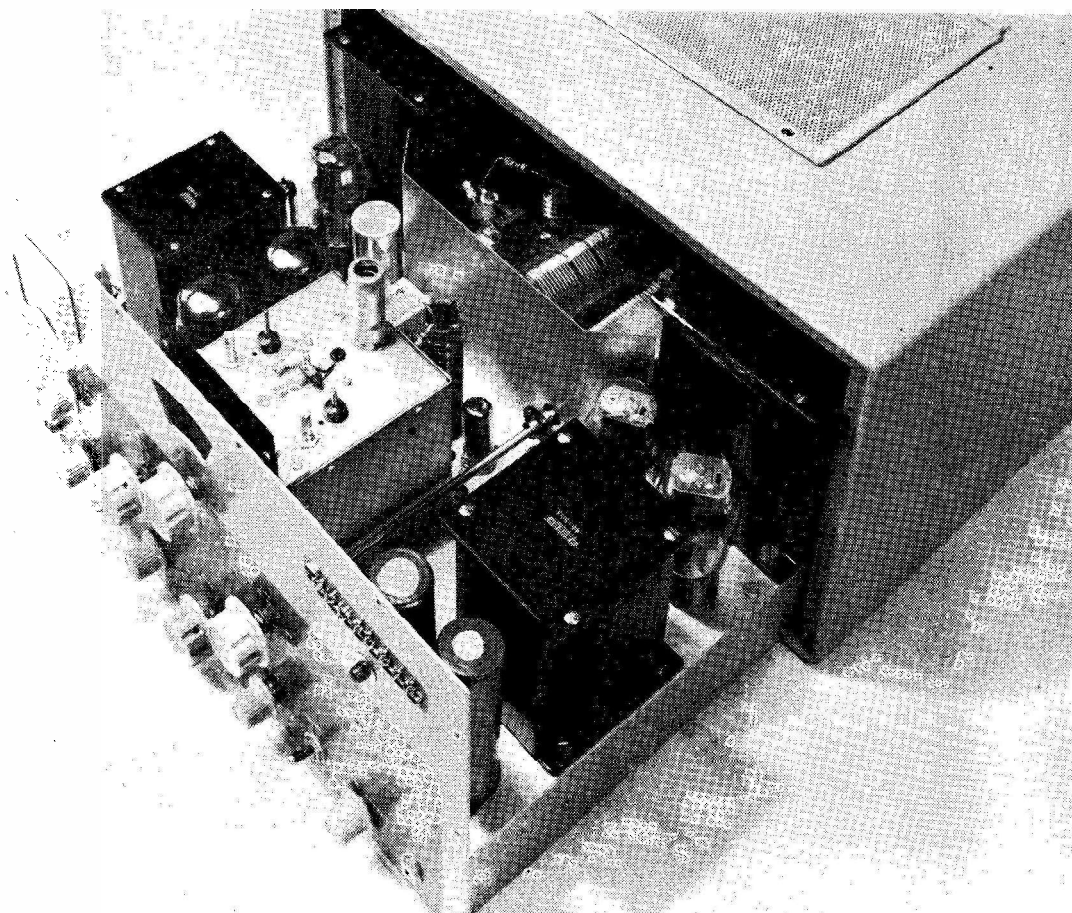
into the main chassis, which simplifies construction considerably; the most difficult of these items to install is the 6146 PA sub-chassis, and in one or two other places a little bending and squeezing may be necessary to get parts together correctly—for instance, in our model the earthy end of the driver tuning condenser C25 fouled the PA screen until some adjust-

Table of Values

Circuit of the DX-100U CW/AM Phone Transmitter

C1, C5	= 20 μ F	C26, C28,	R9	= 6,500 ohms	Ch2	= 6 Hy, 500 mA	V4, V5	= 6146, (QVO6/20)
C2, C3	= 35 μ F	C33	R11	= 470 ohms	L1	= 114.5 μ H	V6	= 6AQ5
C3, C7	= 10 μ F	C34, C36	R14	= 5.55 ohms	L2	= 9.3 μ H	V7	= 12AX7
C19, C29	= 47 μ F	C35	R15, R23	= 1-megohm potentiometer	L3	= 28.0 μ H	V9, V10	= KT88
C4	= 10 μ F	C37	R16, R24,	= 500 μ F	L4	= 65 μ H	V11, V12	= 3RGY
C6	= 4.7 μ F	C38	R26, R35	= 500 μ F	L5	= 15 μ H	V13	= 504G
C8	= 1 μ F	C40, C41	R17, R18	= 40 μ F, elect.	L6	= 10-160m. driver	V14	= 6AL5
C55, C57	= 510 μ F	C42, C43	R20, R25	= 20 μ F, elect.	L7, L8	= 10-80m. PA tank	V15	= OA2
C11, C17,		C44, C45	R27	= 125 μ F, elect.	L9	= 160m. PA coil		
C16, C17,		C50, C52	R28, R37,	= .02 μ F, 2 kV	S1	= SPST toggle		
C18, C20,		C53, C58	R38	= wkng.	S2	= DPDT toggle		
C21, C22,		C56, C59,	R39	= 0.1 μ F	APC	= Anti-parasitic		
C23, C27,		C64	R40, R34,	= 2 μ F		= chokes on		
C30, C31,		C60	R31	= 220 μ F		resistor forms, 4t.		
C32, C38,		C61	R32, R33	= 22,000 ohms	T1	= 650-120-0v./200		
C39, C44,		C62	R36	= 680 ohms	T2	= 800-0v./500 mA		
C45, C46,		R1	RFC	= Filter chokes	T3	= Mod xformer, 2,800-ohm sec./		
C47, C48,		R2, R10,	RFC1,	= 100,000 ohms		5,000-ohm pri.,		
C49, C54,		R12, R13	RFC2,	= 47,000 ohms		A-A.		
C51, C62,		R3, R19,	RFC3	= 27,000 ohms	T4	= Driver xformer,		
C61,		R22	RFC4	= 1.1 mH choke		2:1		
C63, R5,	= .005 μ F	R4, R5,	RFC5	= 2.5 mH choke				
C13	= 100 μ F	R21	RFC6	= 1 mH 500 mA	V1	= 6AU6 (EF84)		
C14	= 22 μ F	R6	RFC7	= 1.02 ohms	V2, V8	= 6CH6		
C15	= 150 μ F	R7	RFC8	= 25,000-ohm	V3	= 5763		
C16	= 68 μ F	R8	Ch1	= potentiometer				
C24	= 75 μ F							
C25								

Fig. 2. Circuit complete of the DX-1000, for which all values are given here. Input up to 150 watts is easily obtainable on any HF band, with ample modulation capability.



The DX-100U complete, upper chassis view, withdrawn from cabinet. At centre is the VFO unit, with the PA in line behind the screening partition. The modulator, consisting of a pair KT88's, is at upper left, with its speech amplifier section beneath the meter and immediately behind the front panel. In the PA compartment, the coil section visible is for 3.5-21 mc, there being separate coils for 10m. and Top Band. The iron-core components are generously rated, and high quality parts are used throughout.

necessary to proceed methodically with the VFO adjustment if good tracking—dial setting against frequency reading on a calibrated receiver or frequency meter—is to be obtained across all bands. When this is achieved, the VFO control is a joy to use, as the scale is clearly marked and well illuminated and, as mentioned earlier, one can put the VFO very accurately on frequency.

Having got grid drive on all bands, and made a note of the adjustments, the next thing is to set the clamp control R15 as explained in the manual and check the PA for RF output. This is done by putting a 100-watt lamp, on a length of coax, across the output (aerial) socket and then, having turned the drive well back and set the PA tank tuning and output condensers at about half-mesh, maximum dip is found in the usual way ; thereafter, the output

loading and PA tank condensers are adjusted for maximum RF in the lamp as the grid drive is brought up—this procedure is carried out in different ways by different people, but as good a way as any is laid down in the DX-100U manual.

Incidentally, one way of getting a PA very nearly to resonance *without* HT on it we have never seen explained in any book : It is to apply drive, turn up the receiver on the frequency till a good, loud beat note is heard, and then rotate the PA tank condenser—at one point, a distinct "wheep-wheep" will be heard in the beat note as the PA tank goes through resonance ; this will then be the tune position, near-enough, for that frequency, and HT can be put on the PA in the knowledge that there will only be a slight movement necessary to get the dip setting.

On all bands 80-10 metres, the 100-watt lamp should light to full brilliancy when the transmitter is correctly adjusted all through: there is no use trying for full power on Top Band, even on a lamp load, as (in our model at least) the 160-metre coil "cooks" unpleasantly, so for U.K. operators anyway the QRP switch must be used!

Having got full RF output in the CW position, going over on the phone-CW switch will (if all is as it should be) bring in the modulator and, as the audio gain control is advanced, the lamp will show increment modulation. Speech quality is good. Some "talk-back" when the modulation was pushed up was found to be due to a looseness in the laminations of the driver transformer T4.

On sustained runs on full power, with the transmitter in its cabinet, heating is not excessive, and for extra ventilation the cabinet top

can be opened, as shown in one view.

In General

The Heathkit DX-100U is in every way a very attractive design for the constructor who wants a full-power all-band job. It is capable of excellent results on the air on both CW and phone, and it is easy, and very interesting, to build. The parts supplied are of first-class quality and the finished transmitter in its cabinet is a handsome piece of equipment.

Construction of the DX-100U as illustrated here, and adjustments to the point of bench testing into a dummy load, absorbed about 35 working hours, no special tools being required nor were any serious snags encountered. Before the work commenced, some time was spent in a thorough reading of the manual — this is strongly recommended as it makes construction easier and quicker.



The all-Heathkit station established at the Daystrom Factory just outside Gloucester, on the Bristol road. Signing G3JPP/A, the gear includes a Heathkit DX-40U, a DX-100U, a Heathkit Mohawk receiver (at left, on the table) and various items of test gear and measuring equipment. The DX-100U as supplied in the U.K. is the central piece on the upper shelf.

GUIDE TO BROADCASTING STATIONS

In addition to the main sections listing both geographically and in order of frequency all European long- and medium-wave broadcasting stations and nearly 2,500 short-wave stations of the world, the twelfth edition includes a list of over 1,000 European VHF sound broadcasting stations and another giving Europe's main television stations.

The regular revision of *Guide to Broadcasting Stations* is an essential, if formidable, task, and many

hundreds of additions and amendments have been made in preparing this edition. It has also been considerably enlarged to accommodate a number of additional features giving useful information for the broadcast listener. These include standard time throughout the world, international allocation of call-signs and a wavelength-frequency conversion table. Published by Iliffe & Sons Ltd. Size 7½ in. x 4½ in., 110 pages. Price 3s. 10d., post free, obtainable from Publications Dept., Short Wave Magazine, Ltd.