DRAKE 2-B RECEIVER ON TOP BAND*

NOTES ON A SIMPLE MODIFICATION

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The Drake 2-B was first introduced in 1959 and although it has been superseded by later models, in the writer's view it is still one of the best of the post-war Amateur receivers for s.s.b. and c.w. use. In addition to coverage of the 3.5 to 28 MHz. Amateur bands, it has a built-in facility which permits, with the use of extra crystals, reception on **five extra** bands each 600 KHz. wide anywhere in the range 3 to 32 MHz. It is this facility which can be used to extend the coverage to include the 160 metre band.

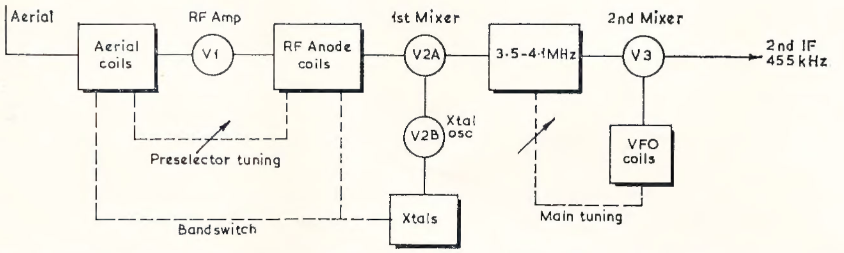

Fig. 1.—Block diagram of the Drake 2-B Receiver, showing r.f. and mixer arrangements—see text.

As will be seen by reference to the block diagram (Fig. 1), the receiver is a multiple-conversion superhet. having a basic tuning range of 3.5 to 4.1 MHz. A crystal oscillator and mixer stage is switched into circuit for the Amateur bands 7 to 28 MHz. and for the five extra bands in the spectrum above 4.1 MHz. The grid and anode circuits of the r.f. stage are tuned independently of the main frequency control by the use of a separate pre-selector control comprising L/C circuits which resonate at 7 MHz. ± 2 MHz. Coverage of the other bands and frequencies is obtained by the switching of capacitive or inductive shunts across the pre-selector coils to raise or lower their inductance.

To receive 160 metres, triple-conversion is used, as on the 7 to 28 MHz. bands. As the pre-selector circuits will only tune down to 3.3 MHz., it is necessary to add capacity so that they will resonate at 1.9 MHz. at mid-scale of the pre-selector tuning. This can be done by using the extra band "A" switch position to bring in capacitive shunts, which in conjunction with a suitable crystal fitted in the "A" socket, will provide the coverage required. By using band "A", the modification has no effect on the performance or the operation of the receiver on the other bands, as the shunts are only in circuit on 160 metres.

A total padding capacity of about 1500 pF. is required across each section of the pre-selector tuned circuits. This capacity is made up from a 0.001 uF. silver mica condenser in parallel with a 700 pF. compression-type mica trimmer. At first sight it might be thought that the addition of such a large capacity in shunt with the condensers already in circuit would have detrimental effects of the Q of the tuned circuits in the r.f. stage. In practice this was not found to be a problem as the pre-selector can be tuned over the frequency range required and more than sufficient gain is available from the r.f. stage to blanket the noise from the succeeding mixer stages.

CRYSTAL FREQUENCY

To convert the 1.8 to 2.0 MHz. signal frequency to fall within the range of the tunable i.f. (3.5 to 4.1 MHz.), the crystal oscillator has to operate between 1.7 and 2.1 MHz. for product mixing, or between 5.5 to 5.9 MHz. for difference mixing. At G6LX, a crystal frequency of 5.5 MHz. is used to obtain a coverage of 1.8 to 2.0 MHz. with the receiver tuned 3.7 to 3.5 MHz. Product mixing is not recommended, as apart from the problem of the oscillator being in the band in the 1.8 to 2.0 MHz. segment, there are difficulties with strong second-channel signals and in-band birdies. Using difference mixing, there are no obvious spurious or second channel signals within the 1.8 to 2.0 MHz. band. It is suggested that a crystal having an exact multiple of 100 KHz. be used as this will provide a direct frequency read-out on the main tuning scale.

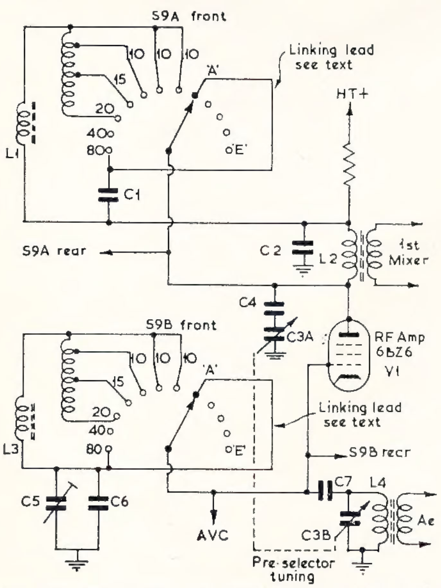

Fig. 2A.—Part of the r.f. stage circuit of the Drake 2-B before modification. Component values are as original—see handbook.

PRE-SELECTOR MODIFICATION

It is first necessary to identify the two switch wafers that are associated with the pre-selector input and output circuits and the connections to the wafers that correspond to switch positions "A" and "80". These wafers are the first two looking from the front panel and as wired have a linking lead between the connections for "A" and "80" (see Fig. 2A). The modification consists of removing these leads and wiring in the padding condensers (C1A, CT1A, C2A and CT2A) as shown in Fig. 2B. While there is sufficient room to mount the extra components on short brackets attached to the chassis, this was not found to be necessary and the condensers and trimmers are wired directly between the switch contacts and the 80 metre shunts using short lengths of 18 gauge tinned copper wire. If brackets are used, it should be remembered that most types of compression trimmers are constructed so that one side is at earth potential and insulated spacers will be required between the trimmers and the mounting brackets.

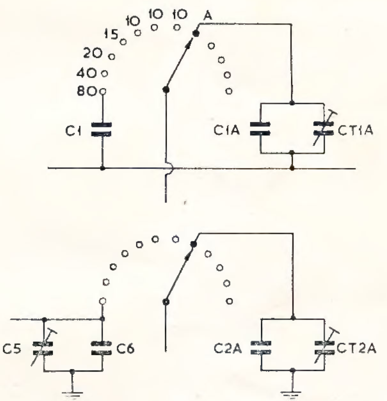

Fig. 2B.—The preselector modifications for Top Band in the Drake 2-B. C1A, C2A are 0.001 uF. silver mica. CT1A, CT2A 700 pF. compression-type trimmers—see text.

ALIGNMENT

Once the pre-selector modifications have been completed and a crystal of the correct frequency inserted into the crystal socket "A", the only thing that remains is to adjust the trimmers CT1A and CT2A in order to resonate the pre-selector tuned circuits to 160 metres. This is a very simple adjustment which can be done without the use of a signal generator or other test equipment.

(Continued on Page 9)

* Reprinted from "The Short Wave Magazine," March, 1971.

transformer was an ex-radio speaker output transformer for 15 ohm output. The 500 μF. capacitor is mainly to allow peak voltage to build up. Fig. 5 shows the voltage drop against current taken for this p.s.u., and is included as a matter of interest for those contemplating a similar type of p.s.u.

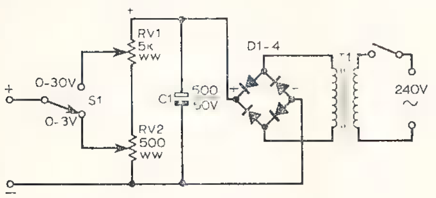

Fig. 4.—0-30v. p.s.u. circuit diagram.

C1—500 uF.
RV1—5K ohm wire wound potentiometer.
RV2—500 ohm wire wound potentiometer.
S1—Single-pole, 2-way.
D1-4—75v. p.i.v. silicon rectifier diodes.
T1—20v. miniature mains (Radio Spares).
Terminals or sockets—2 off.

CONSTRUCTION

The tester shown is constructed in a ½" wall wooden box with an ⅛" thick paxoline panel. After marking out and drilling, a sheet of substantial plain white paper is placed over the finished drilled panel and all holes rubbed in. Hole centres are easily found to allow the paper to be marked up, using a suitable pair of compasses and pen for all necessary inscriptions. The panel is then lightly gummed and the paper placed in position. After allowing a period for drying out, the author used 2" wide Sellotape to cover the papered panel and wrap a little around the edges. The large holes can be cut radially before folding inwards and the small holes pierced with pen or pencil.

Assembly of the switches, variable resistors, etc., can then take place, the Sellotape protecting the panel while wiring and soldering takes place. RV1 is a linear wire wound potentiometer and the panel can be pre-marked 0 to 6v. as the input resistance is constant. It is advisable to subdivide the 0 to 1 division into either 10 or 5 further divisions.

It is not possible to divide out the sweep of RV2 and RV3 as the load here is not constant, as can be seen by Fig. 5, which, in a way, simulates the varying load presented by the FET drain current. The station multimeter across B2 input to the tester when in use shows this up as widely varying voltages at identical positions of RV3.

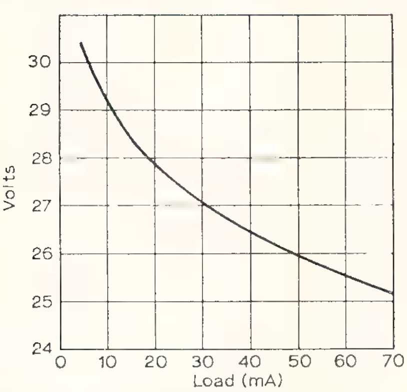

Fig. 5.—P.s.u. voltage drop against load in mA.

DRAKE 2-B RECEIVER

(Continued from Page 3)

The receiver bandswitch is set to 160 metres (band "A") and the pre-selector control to mid-scale. The main tuning control is set to the frequency that corresponds to 1.9 MHz. and the trimmers CT1A and CT2A carefully adjusted for maximum received noise without an aerial connected. If the receiver is fitted with the optional 100 KHz. calibrator, this can be switched on and the trimmers adjusted for maximum S meter reading.

Correct adjustment of the trimmers can be checked by retuning to 1.8 MHz. and the pre-selector control adjusted for a noise peak (or maximum S meter reading on the calibrator signal). This peak should occur with the pre-selector at near maximum capacity (pre-selector dial near 3.5). A similar check at 2.0 MHz. should provide a pre-selector peak at near minimum capacity (28 MHz. on the dial). Provided that the trimmers have been correctly set, tracking over the band will be satisfactory and the aerial can be connected. If it is found that the pre-selector will not peak at the band edges, or if there is an obvious difference in sensitivity over the band, this is a sure indication that the trimmers were not set correctly at 1.9 MHz. and further adjustment is required.

PERFORMANCE

A number of Drake 2-B receivers have been similarly modified for 160 metres, using the arrangement described. In every case the sensitivity throughout the band has compared favourably with that attainable on 80 metres. The G6LX receiver has been used extensively for Top Band DX working and by the Croydon N.F.D. Group, with excellent results.

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OVERSEAS MAGAZINE INDEX

This month five magazines were available to us: 1, "Break-In," July; 2, "CQ," Sept.; 3, "QST," July; 4, "Radio Communication," August; 5, "Short-Wave Magazine, July (all 1971 issues). Material available varied, as usual, with the accent upon antennas.

Antennas: An optimum performance array for 160, 40 and 20 metres; A half-Wave DDRR Antenna; An Antenna for 75 metre WAS; The K7GCO Modified HT-18 Hy-Tower; A Rotatable Dipole for 20, 40 and 80 metres: A Cheap 10 metre Vertical, see key 1; The Ground Image Vertical Antenna (3); "Two-Toter" Lightweight Portable Beam for 2 metres (3); Development of an All-Band Vertical (4).

Accessories: A Simple IC Keyer with weight control (3); Katsumi CW Monitor and Electronic Keyer, review (5).

General: A Second Look at Linear Integrated Circuits (3); A 20 MHz. Digital Frequency Meter using TTL ICs, Part 2 (4); Microwave Diodes (4); Modern Filter Design for the Radio Amateur (4); The Solar Link (Amateur Radio Astronomy) (4).

Receiving: A Solid State Noise Blanker (3); A Tunable 440 MHz. FM Receiver (3); Heath Model SB-303 Receiver, review (3); An RF Noise Bridge and its uses (5); More about Satellite Reception, Part 3 (5).

Transmitting: A Power Bridge and SWR Indicator for 2 metres (3).

Other: Standard Frequency and Time Transmissions (1); Space Conference Interim Report (2).

—VK3ASC.

ACITRON SSB-400

(Continued from Page 7)

to obtain the maximum output consistent with the best linearity. For example, if a transmitter is operated at 400 watts p.e.p. r.f. output it can only be correctly adjusted when running at this level. If it is tuned up at a value below this level and the drive is then increased to full input, it will be substantially maltuned and most certainly not optimised for best linearity.

In order to meet the above, the following requirements have to be met:

(a) A power supply capable of running with a continual two-tone input at the full p.e.p. rating, with little or no voltage drop;

(b) A p.a. tube or tubes capable of standing the full p.e.p. rating for some time.

However, in practice allowing for 50% transmit/50% receive time, the actual duty cycle on speech wave forms is as little as 15% to 20%.

In summarising, it is sufficient to say that for normal operation of s.s.b. equipment, i.e. voice, we require valve and power supply capabilities far in excess of what is necessary simply to enable the transmitter to be correctly tuned.

The novel (patented) tune-up system employed in the SSB-400 overcomes this problem using a different technique. The system of tuning is accomplished by feeding a low-duty cycle wave form into the transmitter audio input. In practice, this consists of a tone burst, with a one to ten mark to space ratio, meaning that the transmitter is running during these bursts to its full rated input, but is only running an average power in the order of 10% of its maximum rating

This in effect means that although the transmitter is running to its full rated p.e.p. input there is only one-tenth of the drain on both power supply and p.a. tube. This enables the operator to be relatively slow in carrying out the tune-up procedure and still have little possibility of damaging the final valve.

The price of the SSB-400 transceiver is $750.

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HY-Q ELECTRONICS TO MANUFACTURE IN SINGAPORE

Hy-Q Electronics Pty. Ltd., the Melbourne based quartz crystal manufacturers whose Frankston, Vic., plant is now operating at capacity, are to start manufacturing in Singapore.

Mr. T. A. Dineen, marketing director of Hy-Q, stated on his return from Singapore that the new operation Hy-Q Electronics Internatinal Pty. Ltd. will be in production early in 1972 and that a new air-cnditioned factory is already under construction.

Hy-Q Electronics will be joined in this venture by O'Connors Pty. Ltd., a Singapore based organisation with a 30% holding in the new company.

Mr. Dineen recently carried out a survey of East Asian markets, and with Mr. P. E. Cooper, chairman of Hy-Q Electronics, and Mr. R. C. Richards, managing director, concluded the negotiations with O'Connors and the Singapore Government.

BEWARE OF . . . CHAIN LETTERS

Another batch are in circulation. If you get one, tear it up!