A Top Band Portable Transmitter-Receiver for R.A.E.N. Use

By G. LANCEFIELD (G3DWQ)*

THE equipment to be described was designed for use in connection with the Radio Amateur Emergency Network and is intended for short range phone working on Top Band with a random length of aerial wire, the main consideration being portability. It can, of course, be used for normal portable working on that band with a longer aerial and also for local nets from the home station.

The complete station is carried in a small attache case which houses the transmitter/receiver, batteries, headphones, key, aerial wire, etc.

The Receiver

The receiver circuit is a standard five valve superhet using the 1·4 volt series of valves. The input for the r.f. stage is taken from the p.a. anode, the aerial tuning circuit being common for the transmitter and receiver. This has several advantages. For example useful space is saved, the receiver r.f. stage is matched to the type of aerial in use, and the r.f. and p.a. stages can be tuned simultaneously in either the send or receive positions.

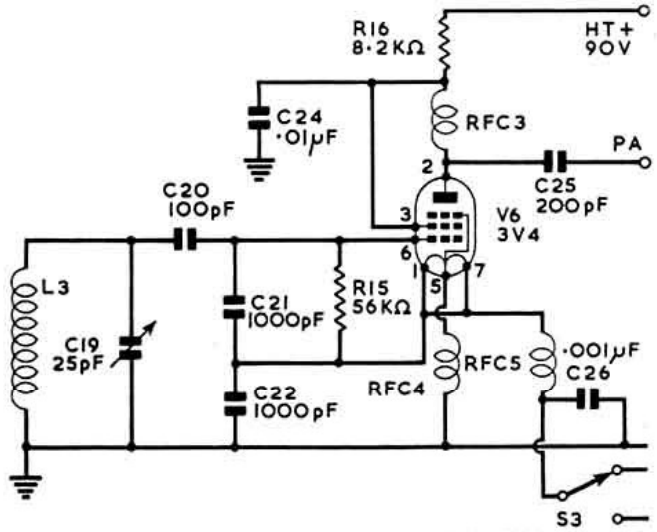


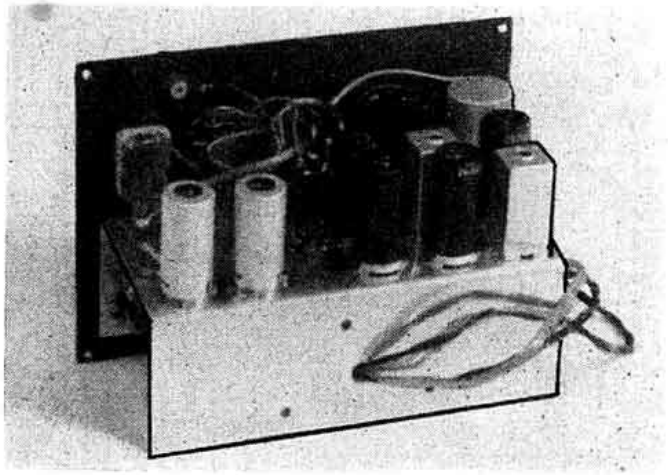
Fig. 1. Alternative v.f.o. circuit. C20, 21 and 22 should be silver mica condensers. L3 is 75 turns 26 s.w.g. enamelled close wound on a 1 in. diameter former 1¼ in. long.

The mixer input and oscillator tuning are separate, small bandspread capacitors being used to tune each coil in conjunction with fixed padding capacitors. In practice the receiver is quite easy to tune without the use of slow motion drives.

The rest of the receiver circuit follows standard practice, the last two stages being switched by the send/receive switch to act as the modulator on transmit, the output transformer primary acting as the modulation choke and the secondary circuit being broken to prevent audio feedback. There is no gain control in the audio circuit, the full output of the crystal microphone being used to give about 90 per cent. modulation. The send/receive switch cuts out the filaments of the first three stages in the receiver when in the send position, leaving V4 and V5 operating to act as the modulator.

The Transmitter

The transmitter uses a two-stage circuit with two 3V4 valves as v.f.o. and p.a. The v.f.o. is a modified Colpitts



Internal View

The receiver portion is to the right of the chassis and the transmitter to the left. The receiver valves are in the black screening cans. The larger screening can near the front panel at the right is the mixer coil. The oscillator coil, v.f.o. coil and output transformer are mounted under the chassis.

circuit which has proved very stable. The original design employed an electron coupled Colpitts circuit, but this was discarded because of the need for filament chokes with a very low d.c. resistance, and such chokes were not available. One model has been built, however, to the original design, and the circuit is given for reference in Fig. 1.

The p.a. is capacity coupled to the v.f.o. and although the value of coupling capacitor is rather large no pulling is experienced. The aerial is directly coupled to the p.a. coil and the large number of taps on the coil, selected by the switch, enables practically any length of wire to be used. On transmit the send/receive switch applies filament voltage to the transmitter valves and connects the p.a. anode to the anode of the receiver output valve. It also switches another resistor across the bias resistor to maintain the correct bias for V5. The net switch applies filament voltage to V6 whilst receiving so that the v.f.o. may be " netted."

One 90 volt high tension battery (Ever-Ready Type Portable 61) is used for the transmitter/receiver, and a 1·5 volt battery (Ever-Ready Type AD14) for the filament supply.

The circuit of the complete transmitter-receiver is given in Fig. 2.

Construction

The transmitter/receiver unit is built on a chassis 7¼ in. long by 3¾ in. wide by 2½ in. deep, with a front panel 8 in. by 6 in. and fits into an instrument box, 8 in. by 6 in by 4 in.

The photograph gives a good idea of the construction and layout. Miniature i.f. transformers are used and providing small types of resistors and capacitors are also used no difficulty should be experienced in wiring.

Adjustment

Alignment of the receiver is very simple, no tracking or padding of the r.f. circuits being necessary due to the

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separate tuning controls for the mixer and oscillator. It is preferable to use a signal generator if one is available, in order to get the best performance from the receiver. First earth the a.v.c. line by shorting C11 to the chassis, and apply a modulated signal of 465 kc/s to the grid of the mixer valve (V2). Peak the i.f. transformers beginning with I.F.T.2, follow with the first transformer and repeat until maximum output is obtained, preferably using an output meter. Next apply a signal at 1·8 Mc/s and with the oscillator and mixer tuning condensers fully meshed adjust the core of the oscillator coil (L2) for maximum output. Then adjust the core of L1 (the mixer coil) for maximum also. Check that the receiver tunes up to 2 Mc/s with the tuning condensers at minimum. With the values given the receiver should just cover the band. When listening round the band the two receiver tuning controls must, of course, be kept roughly in step.

If a signal generator is not available the receiver can be lined up using a frequency meter or the station Top Band transmitter tuned to 1·8 Mc/s and adjusting the cores of L2 and L1 as described above, but in this case it is better to leave the i.f. transformers until last as the transformers specified are pre-aligned. When the mixer and oscillator coils have been set to 1·8 Mc/s, attach an aerial, tune in a signal and very carefully peak the i.f.t cores for maximum signal in the 'phones or speaker.

The transmitter v.f.o. is next adjusted by switching to the

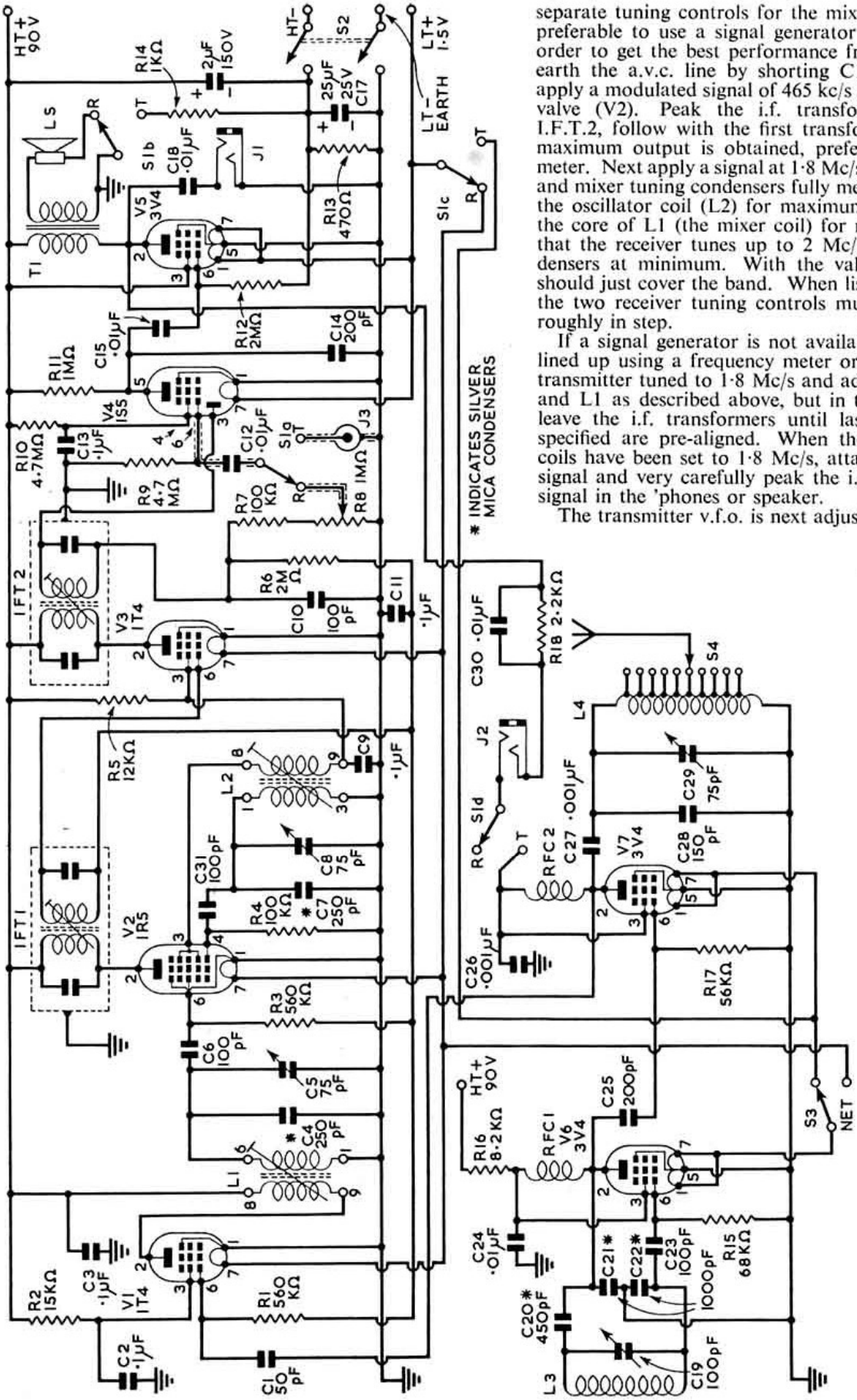

Fig. 2. Circuit diagram of the portable transmitter-receiver-described by G3DWQ. The i.f. transformers are Repanco type MSE. L1, Maxi-Q miniature dual purpose coil range 3 (yellow); L2, Maxi-Q miniature dual purpose coil range 3 (red); L3, 50 turns 34 d.c.c. wave-wound on a ½ in. diameter Aladdin former with dust-iron core; L4, 40 turns 24 s.w.g. enamelled close wound on a 1½ in. diameter former, tapped every four turns; S1, a, b, c, d, semi-midget 4 pole 2 way rotary switch; S2a, b, 2 pole on/off switch (part of gain control R8); S3, single pole change-over toggle switch; S4, semi-midget 10 way single pole rotary switch. All resistors may be ½ watt rating. Note: The + and − signs against condenser C17 should be reversed.

" net " position and listening on the station receiver or by using a frequency meter and adjusting the core of the v.f.o. coil (L3). Set the v.f.o. condenser to half mesh and tune the coil slug until the frequency is 1·9 Mc/s, then check that the condenser covers the band, which it should do with a small overlap at each end.

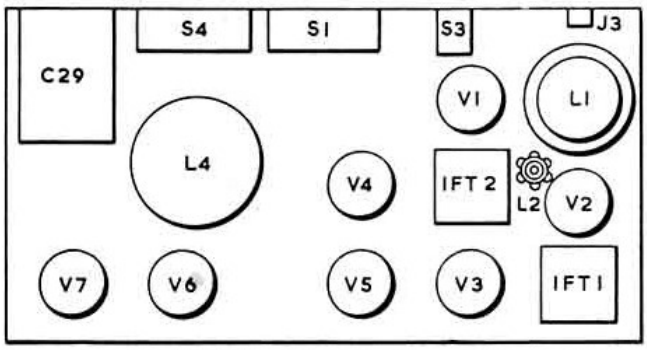

Fig. 3. Chassis layout for the Top Band portable transmitter-receiver.

Results

Two sets have so far been built and are giving excellent results for the low power input—about half a watt. Speech quality is very good, and whilst not designed for c.w. the p.a. can be keyed by means of the jack socket on the panel. The note is T9. This socket is also used for metering the p.a. current.

With a kite aerial RS59 reports have been received at 10 miles distance. Using the normal station Top Band aerial contact has been maintained with a mobile station up to about 10 miles depending upon the terrain. With a random length of wire (20/30 feet) dependable cross-town working can be achieved.

Astronautics

A special course of eight lectures on Astronautics (space flight) will be given by L. S. Snell, A.M.I.Mech.E., A.F.R.Ae.S., F.B.I.S., and G. S. Brosan, Ph.D., M.I.E.E, F.R.A.S., F.B.I.S., on Monday evenings from 7 p.m. to 9 p.m. commencing on October 20, 1958, at the Willesden Technical College, London N.W.10. Syllabus: Propulsion and propulsion systems; Construction of vehicle; Steps; Guidance; Orbits; Anciliary problems. Time will be allowed for discussion on each evening. Fee for the course, £1.

All enquiries and applications for admission should be made to Willesden Technical College, Denzil Road, London, N.W.10.

Large Attendance at Bridlington

THE North-east of England Official Regional Meeting held in the Spa Royal Hall, Bridlington, E. Yorkshire, on Sunday, September 21, 1958, attracted an attendance approaching 200, including about 40 ladies.

The meeting was preceded by an inspection, by the Mayor of Bridlington (Alderman O. S. Clapp, J.P., C.C.), of some 40 mobile stations, mounted in cars, vans and shooting brakes, many of which had come from long distances to support the Rally.

It is unusual for a civic leader to have knowledge of radio matters but the present Mayor of Bridlington, an ex-R.A.F. Wing Commander who lectured on radar and radio during the last war, provides an exception. Winner of the prize for the best piece of mobile equipment on display was Mr. A. G. Stormont, G3GWR of Sheffield.

Prior to the opening of the business meeting Alderman Clapp extended a civic welcome to those present.

It had been anticipated that the President (Mr. L. E. Newnham, G6NZ) would be present at the meeting but a severe cold prevented his attendance which left the responsibility for discussing the current activities of the Society and of answering questions on the shoulders of the General Secretary. During the day, Mr. Clarricoats had the pleasure of meeting a number of old friends (including Tommy Woodcock, G6OO; Arthur Watson, G6UJ; Eric Martin, G6MN and George Wigglesworth, G2BH) who had supported him at Yorkshire meetings more than a quarter of a century ago when the " little black book " was famous.

The O.R.M. was organised on behalf of the Region 2 Representative (Mr. Jack Petty, G4JW of Sheffield) by Mr. Cliff Metcalfe, G3DQ (Zone A Representative) and Mr. Arthur Dunn, G2ACD, who had the enthusiastic co-operation of members of the Scarborough Amateur Radio Club. The control station for the Mobile Rally was operated from the Spa Royal Hall by Mr. Harry Jones, G3GBH

The organizers wish to place on record their thanks to the Bridlington Corporation for the use of the Spa Royal Hall at no cost to the Society, and to the many radio concerns and local residents who donated gifts to the free draw and raffle. The Mayoress and Mrs. Metcalfe presented the prizes.

VE2AWY Enquiries

SOME months ago VE2AWY received on loan from a U.K. amateur a copy of the R.S.G.B. BULLETIN containing an article on the G4ZU beam. VE2AWY promised to return the issue after perusal but the sender omitted to give his name and address. If this should catch the eye of the person who made the loan perhaps he will drop a line to VE2AWY.

The traditional Ham Party held at the home of R.S.G.B. Vice-President, T. A. St. Johnston, G6UT, Little Hallingbury, Hertfordshire, took place this year on August 31. " Mine Host," in shirt sleeves in centre of picture, entertained more than 80 members and their ladies. Old timers present included G4UX, 5UM, 6HU, 6LL and 6WU.