Bandspreading the B2

By A. G. DUNN (G3PL)*

THE B2 receiver is a compact and sensitive little communications receiver but it has a weakness which makes it tedious to use for amateur work. The tuning dial is very small, and although a magnifying lens is fitted it is trying to the eyes to obtain an accurate dial reading. The number of dial divisions occupied by the three amateur bands which the receiver covers is small. To overcome these defects a simple method of spreading the amateur bands over the greater part of the dial was tried and found very successful.

The receiver has three frequency ranges, each of which includes one amateur band, so simplifying the modification procedure.

The Method

The method used to obtain bandspread is to insert a trimmer condenser in series with each of the two sections of the tuning condenser. The existing trimmers are readjusted to give the required coverage, in conjunction with the series trimmers. In order to keep the modifications down to the barest minimum the bandspread is adjusted as required on one of the three bands; the other two then have to take "pot luck." It would be hardly practicable to obtain full-dial coverage of the 14 Mc/s band as the bandspread on the other two bands would be far too great and only a small portion of either would be receivable. If the 3.5 Mc/s band were given priority the coverage on the other two bands would be approximately 7 to 8 Mc/s and 14 to 16 Mc/s. This would be much better than no spread, but the writer required more spread and the 7 Mc/s band was given priority.

The modification can be carried out without the use of a signal generator if an auxiliary receiver, capable of picking up the signal radiated by the oscillator of the B2 and identifying its frequency, is available. Even this can be dispensed with, but its use saves a lot of time.

The Priority Band

Before starting the modification, the B2 receiver should be properly lined up. The intermediate frequency is 470 kc/s but this does not seem very critical. After connecting the series trimmers as shown in Fig. 1, the procedure is as follows.

With the "Waveband" switch on the 5.2 to 9 Mc/s range, turn the dial to 0. Adjust the series trimmer on the oscillator section of the tuning condenser until the oscillator frequency is 7470 kc/s approximately, as determined by the auxiliary receiver. Adjust the series trimmer in the mixer grid circuit until maximum noise, or signal, is heard. Check by listening that the circuit is tuned to 7 Mc/s (owing to the lack of an r.f. stage, it is easy to tune this circuit to the image frequency). The frequency coverage of the receiver should then be checked and should be about 7 to 9 Mc/s.

Turn the dial to 180. Adjust the existing parallel trimmer C2E in the oscillator circuit until the oscillator is working on 7.8 Mc/s. If this cannot be done by the trimmer alone, the iron core of the coil should be screwed in a little. The core adjusting screws are accessible by removing the "Waveband" knob and the oblong plate marked "Megacycles." The oscillator coils are at the bottom, that concerned being the middle one. Adjust the mixer grid parallel trimmer C2B and the core of the grid coil if necessary, until maximum noise is heard. Check by listening that signals on about 7330 kc/s are being received and then check the frequency coverage. It should be about 6 to 7.3 Mc/s.

Turn the dial to 0. Reduce the oscillator series trimmer still further, until the oscillator is again on 7470 kc/s. Adjust the mixer grid series trimmer until maximum noise is heard. Check that signals on 7 Mc/s or a little lower are being received.

The frequency coverage should then be 7 to 7.3 Mc/s. Final adjustments should be made to give a small overlap at each end. It is important that the series trimmers are not touched again; they may be sealed to prevent alteration.

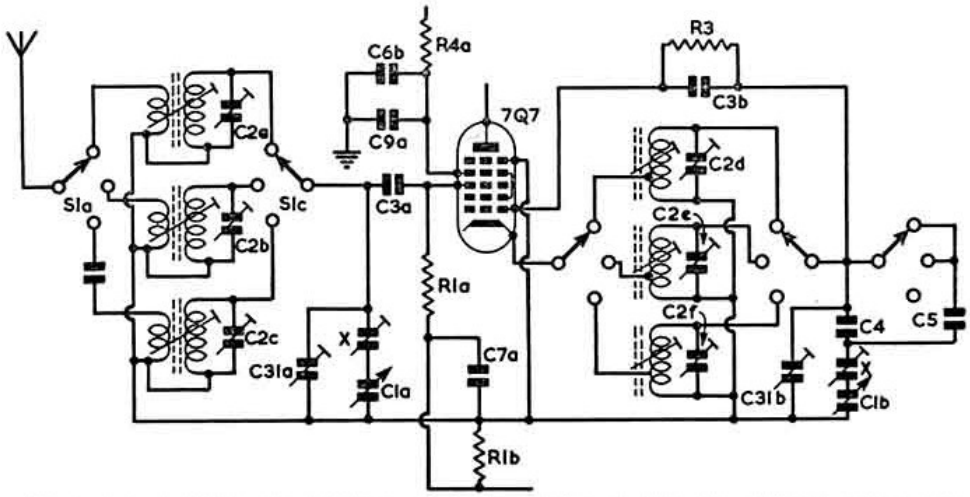

Fig. 1. The frequency changer stage of the B2 receiver showing the modifications to provide bandspread. Component designations are as given in the circular issued to members with the October, 1947, issue of the Bulletin. The extra trimmers marked X are 3-30 $\mu\mu$F each.

The 14 Mc/s Band

This band is covered in the 8.7 to 15.5 Mc/s position of the "Waveband" switch. Turn the dial to 0. Set the oscillator on 14470 kc/s by means of the parallel trimmer C2D, and adjust the mixer trimmer C2A for maximum noise, checking on signals to make sure it is tuned to 14 Mc/s. The coverage should then be about 14 to 14.8 Mc/s but owing to the method of obtaining bandspread the amateur band should cover about 100 degrees. Final adjustments should be made to give a slight overlap at the lower frequency end of the band so that 14 Mc/s comes at about 20 degrees.

The 3.5 Mc/s Band

The same procedure is followed on the lowest frequency range, adjusting the oscillator circuit so that it works on 3970 kc/s and then resonating the mixer grid circuit at 3.5 Mc/s. It will probably be found necessary to adjust the parallel trimmers C2C and C2F to maximum capacity and make final adjustments by adjusting the cores of the oscillator and mixer coils. The cover-

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Keep Those Leads Short!

By "SENEX"

THE importance of short connecting leads in radio circuits for use at very high frequencies is well known and has been stressed frequently in these pages. The stray reactance of even an inch or two of wire can cause strange effects at v.h.f. Some of these can be totally unsuspected, because they may not cause obvious peculiarities in the tuning up or operation of the equipment.

An example was found recently in a commercial v.h.f. radiotelephone which has been given type approval by the G.P.O. In spite of this, it can infringe the G.P.O. regulations regarding spurious emissions by many decibels, because of long leads.

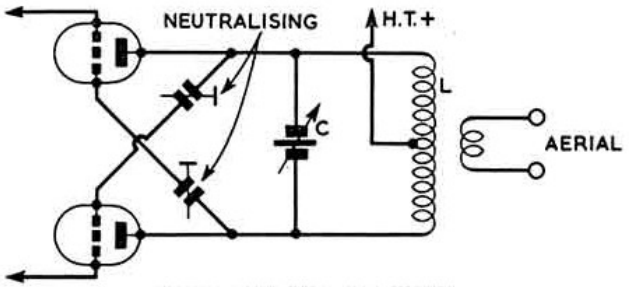

Fig. 1. P.A. stage tank circuit.

The transmitter p.a. stage (Fig. 1) consists of a pair of triodes in push-pull. The tank circuit is formed by a self-supporting coil mounted on the stator terminals of a butterfly split-stator condenser. This assembly is mounted on a bracket two inches above the chassis; the valveholders are mounted through the chassis with the connections underneath. The two anode leads, which are taken through large holes in the chassis deck, are both some three inches long.

The final transmitter frequency is 72 Mc/s, controlled by a 12 Mc/s crystal. During an investigation of TVI it was found that a strong signal was being radiated on 84 Mc/s. This signal was about 4½ S points below the 72 Mc/s carrier in strength, and was obviously caused by energy at the seventh harmonic of the crystal frequency, produced in the frequency multiplying stages, reaching the p.a. stage. There were also weak signals at other harmonics of the crystal frequency, but these were well below the G.P.O. figures for permitted radiation. It was something of a mystery why the seventh harmonic signal should be so strong.

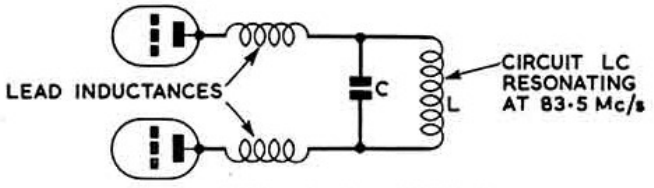

Fig. 2. Effective circuit at 83.5 Mc/s.

Using a grid dip oscillator on the tank circuit disclosed that, in addition to the expected resonance at 72 Mc/s, there was another at about 83.5 Mc/s. This was close enough to the seventh harmonic of the crystal frequency to develop an appreciable amount of power at 84 Mc/s.

The second resonance exists because of the long anode leads in the p.a. stage. The coil and tuning condenser resonate by themselves at 83.5 Mc/s, the inductance of the anode leads acting to isolate this circuit from the effect of the valve capacitances. The effective circuit is shown in Fig. 2.

At frequencies lower than 83.5 Mc/s, the circuit LC is inductive. The total inductance, made up of the inductances of the anode leads plus the effective inductance of the circuit LC, resonates at 72 Mc/s with the stray and valve capacitances, as shown in Fig. 3. Calculated from a well-known formula, the inductance of a three inch length of 16 s.w.g. wire is approximately 1.39 μH.

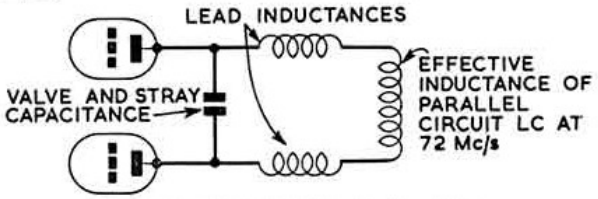

Fig. 3. Effective circuit at 72 Mc/s.

If the anode leads had no inductance, only one resonance would be possible. In practice, reducing the length of the leads to about an inch would reduce the inductance sufficiently to avoid trouble of this sort.

Although this article refers particularly to commercial equipment, it may serve to point once more the moral of the title: "Keep Those Leads Short!"; this kind of thing could happen in *your* rig, and the unwanted signal could be right in the middle of Band II F.M. Broadcasting or Band III television.

New Year Honours' List

AMONG those whose names appeared in the New Year Honours' List were Brigadier Richard Gambier-Parry, C.M.G., Director of Communications, Foreign Office (K.C.M.G.); Captain C. F. Booth, O.B.E., Assistant Engineer-in-Chief, G.P.O. (C.B.E.); Lt.-Col. P. N. G. Whitlam, G6PW (O.B.E.). We offer them congratulations on behalf of their friends in the Society.

Simple Wobbulator—continued from page 318

produce a large trace in the vertical and VR2 to sweep the horizontal direction fully. Normally two traces will be seen which, by adjusting the phase-shift control VR3, can be made to cover each other. S1 is then closed, which blanks out one trace. If the top or bottom of the trace is distinctly flat the video stage is overloaded and VR4 has to be turned down. As very little voltage is needed in normal reception areas, it is preferable for VR4 to have a logarithmic characteristic. The trace will have the familiar general shape of double, upper or lower sideband reception. By tuning C9 the "nick" will move along the trace and reveal the gain of the receiver at any frequency within the television band.

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age on this band will be about 3.5 to 3.65 Mc/s, which is sufficient for c.w. work. It could obviously be adjusted to cover the telephony band instead, the coverage then being about 3.63 to 3.8 Mc/s.

The system outlined above has the advantage, from the c.w. man's point of view, that the bandspread is greatest at the lower frequency end of each band and therefore gives best results in the c.w. sections of the various bands.