CONVERTING THE 'COMMAND' RECEIVER

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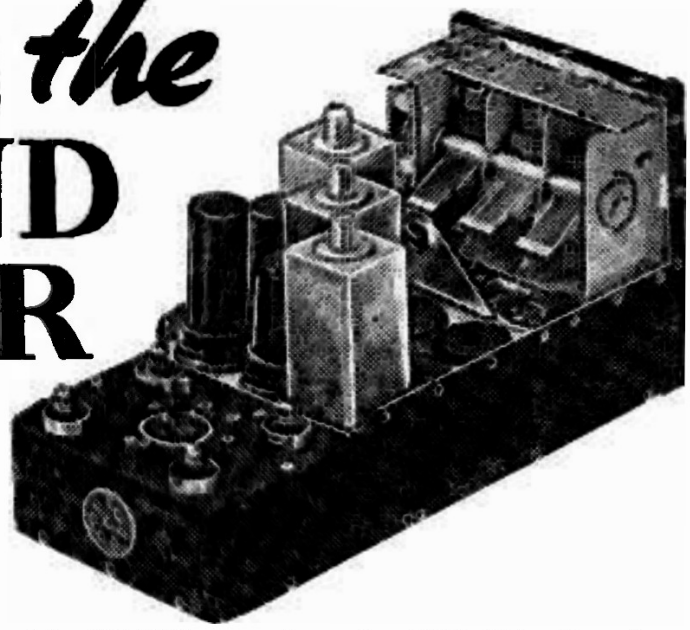


MODIFICATIONS OF THE BC455 FOR DX USE

By R. E. S. Coulson

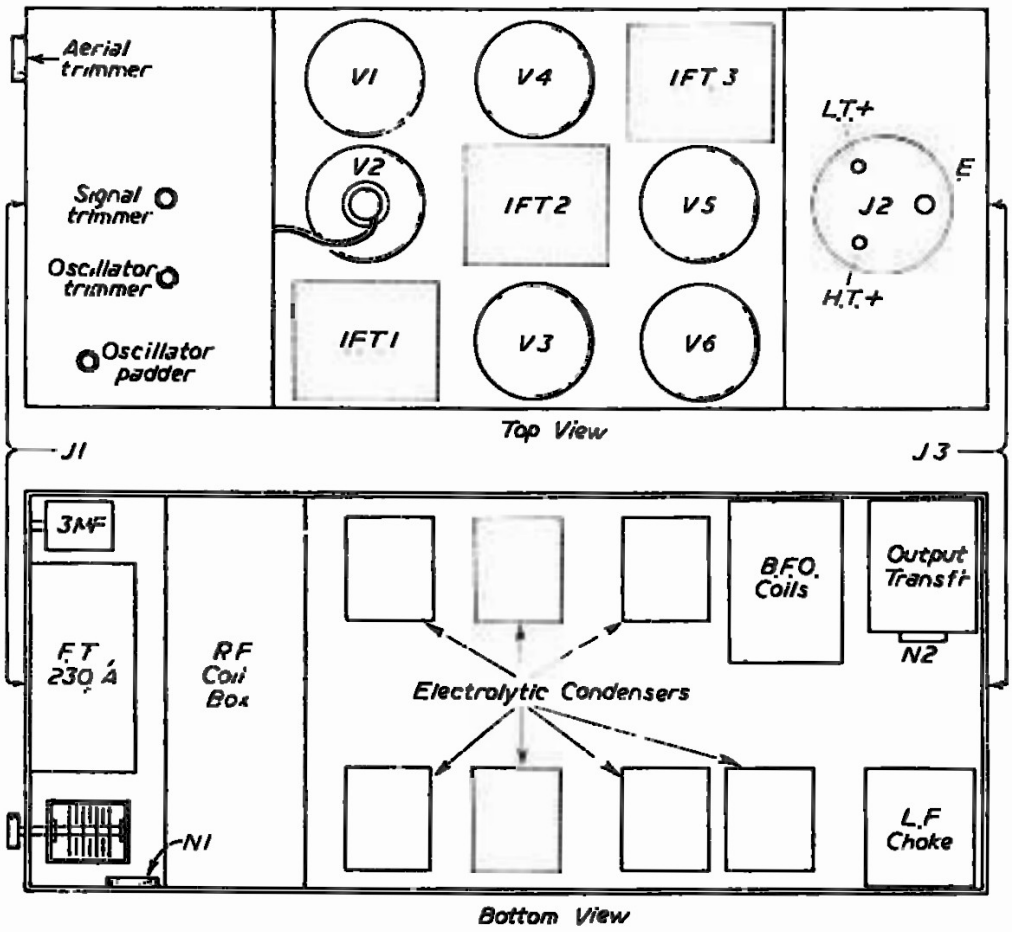
AS these receivers cover from 6 to 9 Mc/s, they may be used as they are on 40 metres, or the coils may be rewound to cover the 10-metre band, but the bandspread obtained is not great. A better plan is to modify the set by the addition of another piece of cheap surplus, the RF24 converter: the resulting double superhet may then be used on 10 and 15 metres as well as on 40 metres. With a set so modified and costing less than £2. I have heard amateur stations all over Europe, including Greece, Yugoslavia and Latvia, and in New Zealand, U.S.A., Canada, Brazil, Ecuador, Puerto Rico, Iceland, S. Africa, Mozambique, Morocco, Israel and Macao.

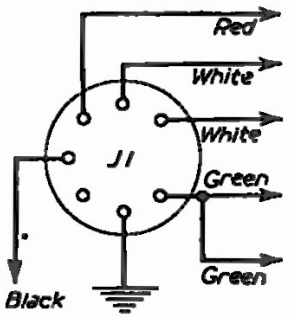
The BC455 is one of a series (SCR 274) of receivers intended for use in aircraft. The valve line-up is 12SK7(R.F.), 12K8(F.C.), 12SK7($1F_2$), 12SK7($1F_2$) 12SR7(B.F.O., Det.), 12A6(Output). In addition, there are two neons, one across the aerial coil, the other across the output transformer.

The BC455 was intended for rack mounting and remote control. Because of this it has no controls, and all inputs and outputs are taken through plugs and sockets.

BC455: Description

As may be seen from the circuit diagram (Fig. 2a, b, c, d), the BC455 is a six-valve superhet, covering 6 to 9 Mc/s, with an I.F. of 2.83 Mc/s. The first stage is an R.F. stage, using a 12SK7 pentode in a conventional circuit. For ease of alignment the aerial-coil trimmer is brought out to the front panel. A neon





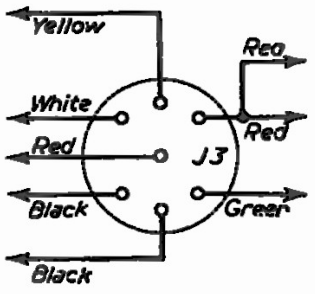


Fig. 1.—Top and bottom views of the receiver.

lamp (which strikes at about 80 volts) is connected across the aerial coil to prevent overloading of V1.

Coupling to the second stage, the frequency changer (12K8) is by dust-cored coil L2, L3. The frequency changer is also standard, except that the oscillator triode is tuned in the anode circuit. The output from the F.C. is passed by L6, L7 (I.F.T.$_1$) to the I.F. amplifier. This is a two-stage job, having two 12SK7s coupled in the "middle" by L8, L9 (I.F.T.$_2$). The A.V.C. system departs from the standard practice: the A.V.C. voltage for the set is not obtained from the D.D.T. stage, but from the diode action of the first grid and cathode of V4, the second I.F. amplifier valve. This is tapped via R11 and C15 and applied via R5 and C7C to V1 via R2, and directly to V3. The cathode return to V1, V2, V3 is made through the gain control line and by way of that down to earth through a 50 K

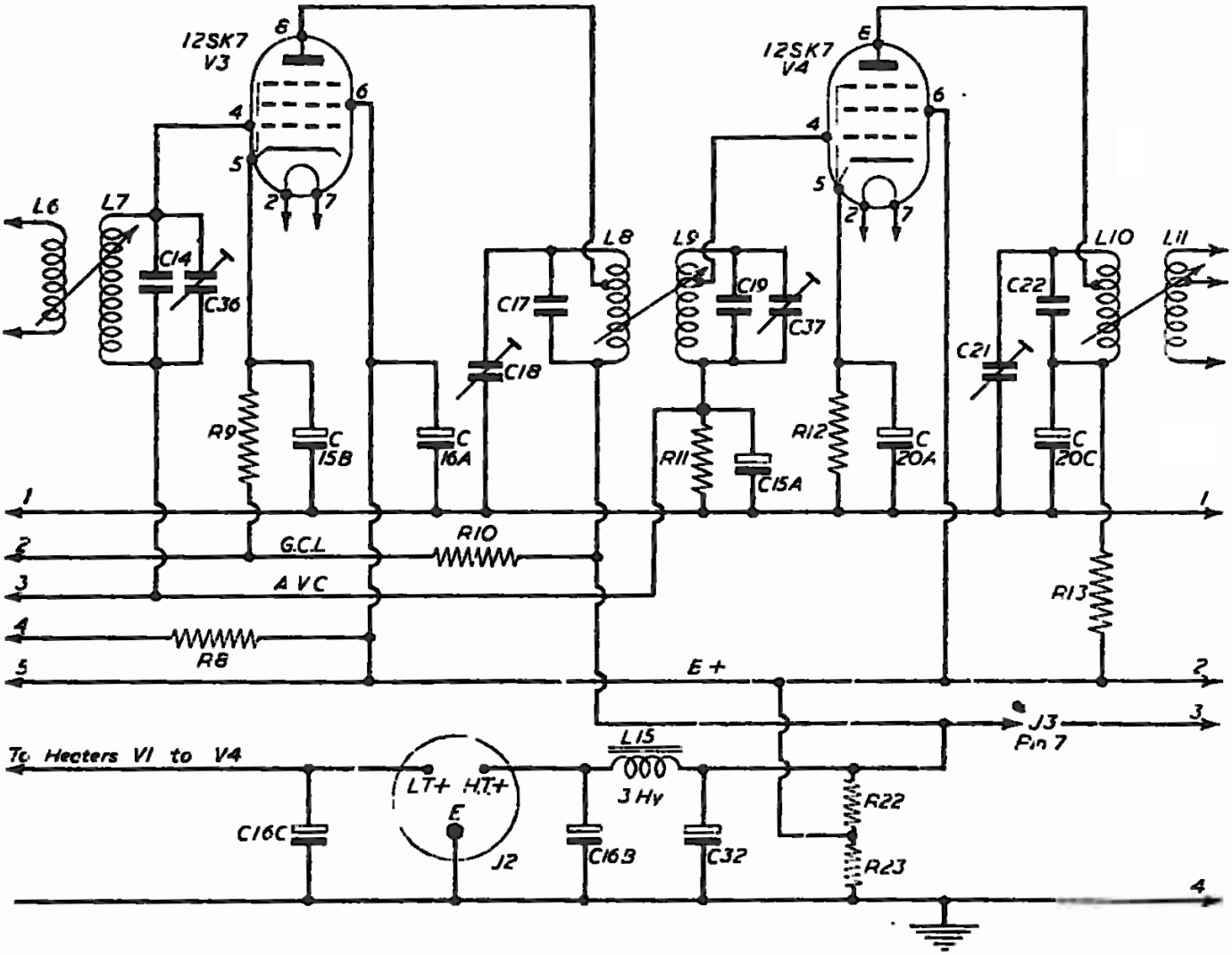


Fig. 2 (cont.)—The BC455/B I.F. amplifier. A list of parts appears on page 608.

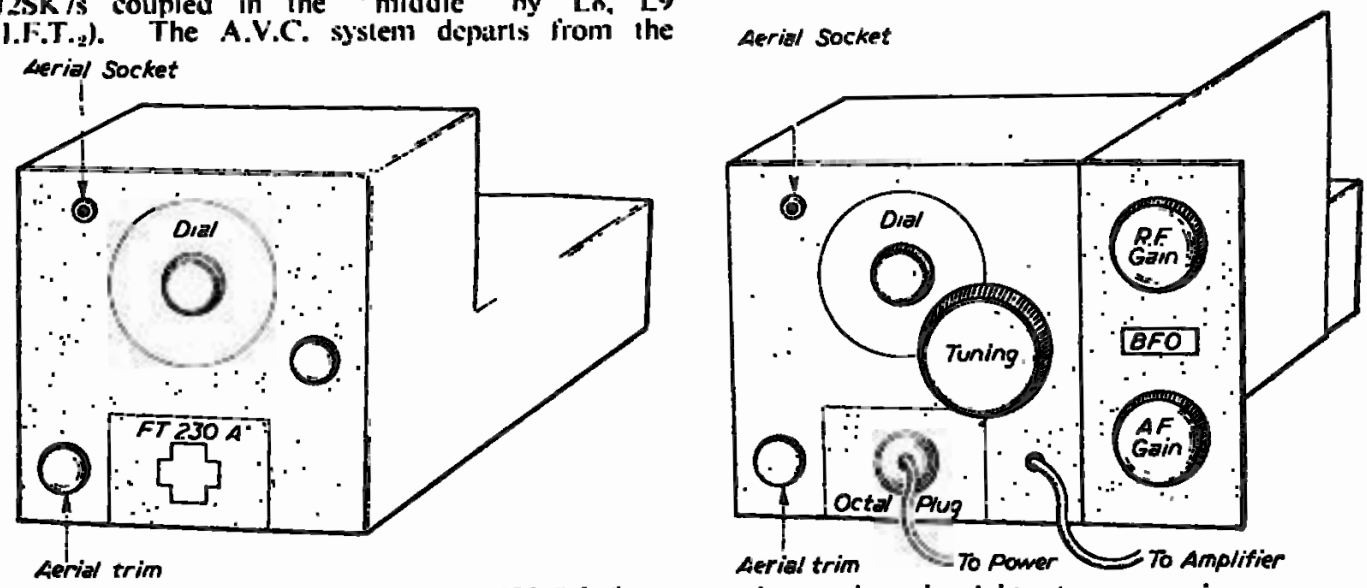


Fig. 5.—On the left the BC455/B before conversion, and on the right, after conversion.

potentiometer. This acts as a volume control.

Detection is by one of the diodes of the 12SR7. The triode section of this valve is used as a B.F.O., with L12 and L13. Tuning is adjusted by means of a hole in the side of the chassis, through which C28 may be reached. This varies the B.F.O. pitch. The cut-off of the B.F.O. is accomplished by shorting down to earth the junction of R15 and R17. The A.F. signal is tapped from the bottom of L11 and passed via R18, 19, to C28, and the grid of the 12A6. The anode circuit of this valve carries a 'phone transformer giving outputs for 300-ohm or 4,000-ohm 'phones. It is shown in the 4,000-ohm position.

RF24: Description

The RF24 (Fig. 3) consists of an R.F. stage, VR65(SP61), feeding via a R.C. coupling to the grid coil of a mixer valve, VR65, which is cathode-coupled to a separate oscillator, VR65. The unit is switch-tuned and covers 20-30 Mc/s with an I.F. output in the region of 7-9 Mc/s. It has an output band-width of about 2 Mc/s, centred on 8 Mc/s.

Conversion

First, the heater circuit. Twenty-four-volt dynamotors are in very short supply, and it is therefore advisable to re-wire the valve heaters to 12-volt supply, so that they may be used either with a dynamotor or with a filament transformer.

The heater connections to all valves except the 12SR7 are to pins 2 and 7. On the 12SR7 pin 2 bears the grid, and the heater connections are to pins 7 and 8. The heaters are originally connected in series

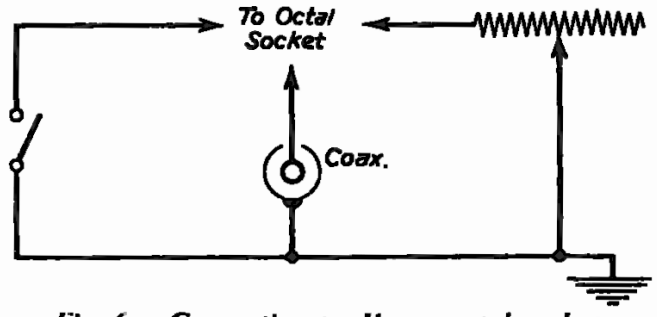


Fig. 6.—Connection to J1 or octal socket.

parallel, and must be converted to parallel in the manner shown in Fig. 4. The R.F.C. in the white lead, which goes from J1 to J3 is removed, the two white wires soldered together and wired to the H.T.+ connection on J2, so that a connection is made between J1 and J2. This carries H.T.+ input to the receiver.

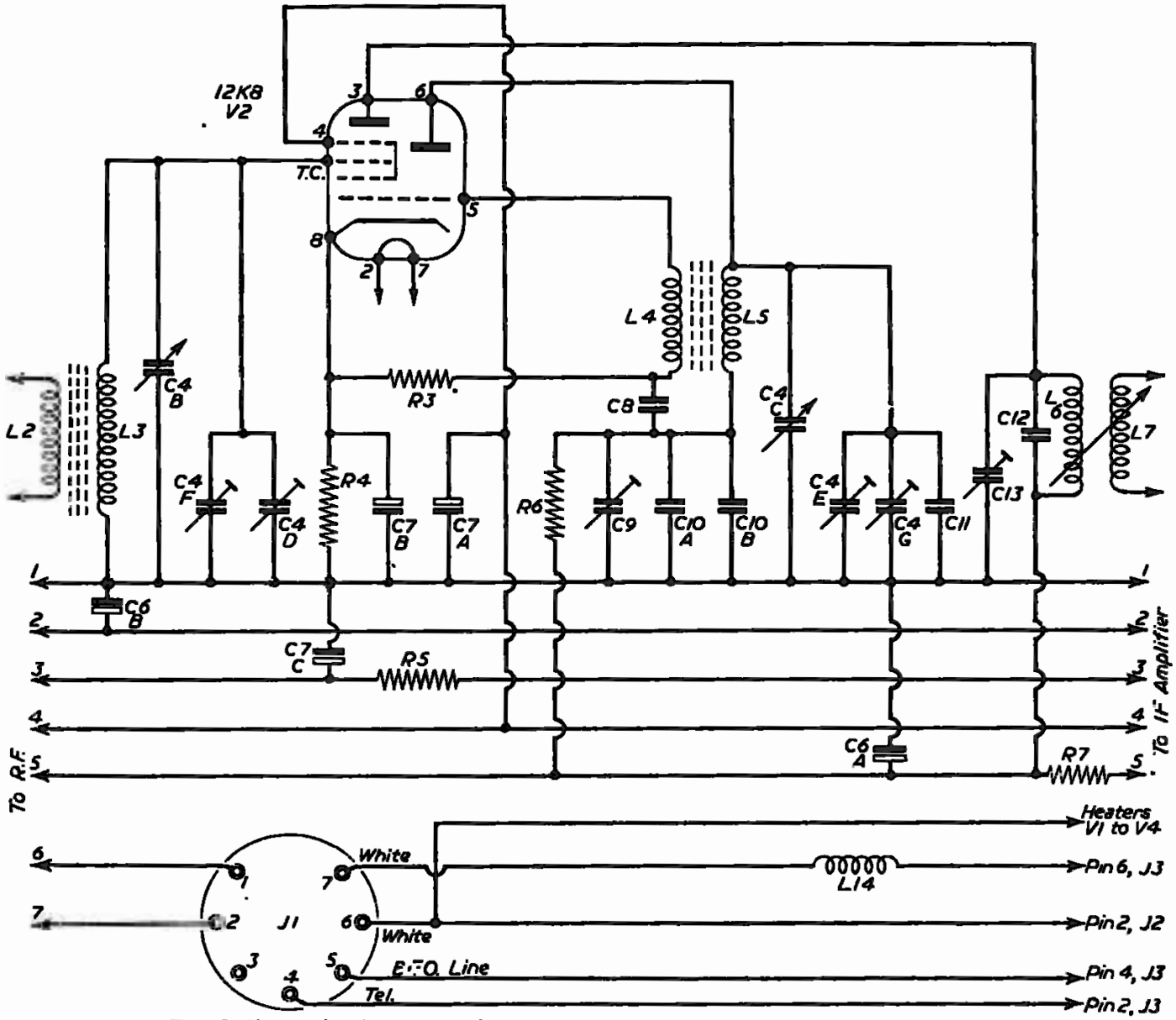


Fig. 2 (b).—The frequency-changer circuit. A list of parts appears on page 608.

Power Socket

Between the front panel and the coil-box will be found adaptor F-T230A, which carries J1. It is entirely removed, complete with J1, and a piece of aluminium sheet is bolted in its place. This carries an octal socket, to which the connections of J1 are taken. An octal plug carrying the three input power leads is plugged into this socket.

Controls

These need some additional chassis space, which is obtained by bolting an L-shaped piece of aluminium sheeting to the right-hand side of the receiver (Fig. 5).

(a) *B.F.O.* This is a switch from the red wire of the octal socket down to chassis. When the switch is on, the B.F.O. is off, and vice versa. Mount in middle of side panel.

(b) *R.F. Gain Control.* This is a 50 K potentiometer connected as a variable resistance between the green octal plug wire and earth. Mount as top control on side panel.

(c) *A.F. Gain Control.* This is a .1 megohm potentiometer connected in place of R18 and R19.

(d) *Tuning Control.* Force a tube of ¼in. inside diameter over the spindle in the tuning aperture and into this tube force a ¼in. spindle. A knob may then be fixed on it: no slow-motion drive is needed.

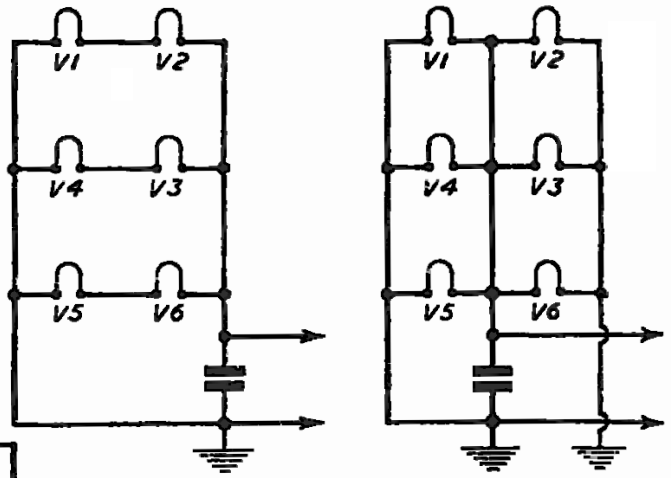


Fig. 4.—Heater circuit connections.

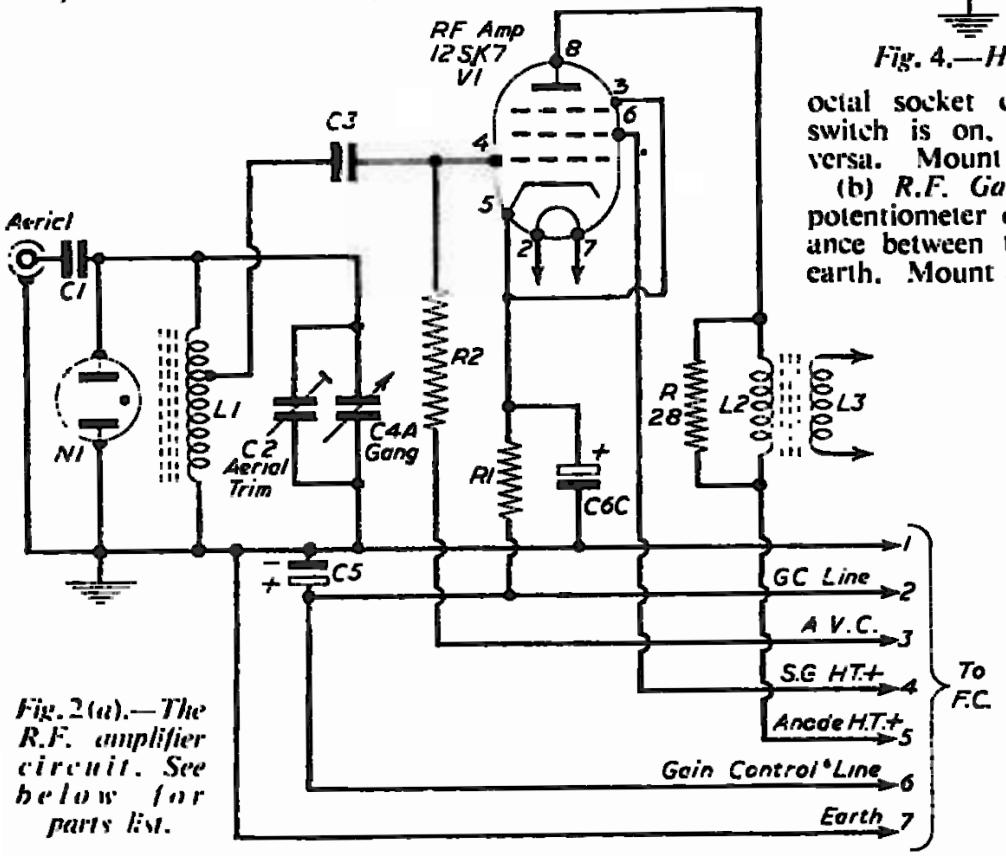


Fig. 2(a).—The R.F. amplifier circuit. See below for parts list.

A.F. Output

The black wire from the octal plug is fixed to the centre connection of coaxial cable, and the outer braiding is earthed. Take the cable to H.R. 'phones or to an amplifier.

(To be continued)

COMPONENTS LIST

PARTS FOR FIG. 2 (a)

R1—620 Ω
R2—2 MΩ
R28—51 KΩ
C1—11 pF
C2—15 pF trimmer
C3—100 pF
C4a—346 pF
C5—3 pF
C6C—.05 μF

PARTS FOR FIG. 2 (c)

C14—180 pF
C36—17 pF
C15B—.05 μF
C16A—.22 μF
C16C—.22 μF
C17—180 pF
C18—17 pF
R8—200 Ω
R9—620 Ω
R10—360 KΩ
C15A—.05 μF
C19—180 pF
C37—17 pF trimmer
C20A—.05 μF
C20C—.05 μF
C16B—.22 μF
C32—5 μF 300 v.w.
C21—17 pF trimmer
C22—180 pF
R11—100 KΩ
R12—510 Ω
R13—200 Ω
R12—7 KΩ
R23—7 KΩ
L15—L.F. choke 3 henrys

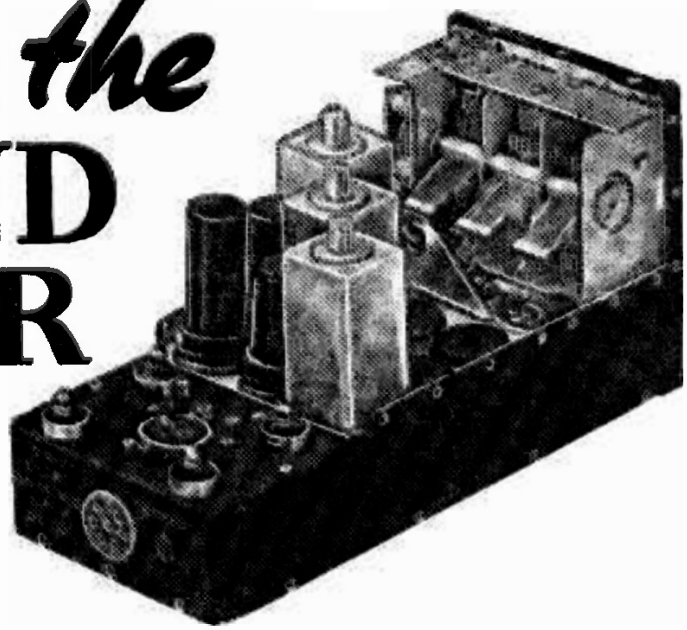
PARTS FOR FIG. 2 (d)

C23—180 pF
C38—17 pF
C24—200 pF
C15C—.05 μF
C26—100 pF
C27—335 pF
C28—34 pF
C29—.006 pF
C30—.15 μF
C20B—.01 μF
C35—750 pF
R14—100 KΩ
R15—20 KΩ
R16—100 KΩ
R17—100 KΩ
R18—510 KΩ
R19—100 KΩ
R20—2 MΩ
R21—1.5 KΩ

PARTS FOR FIG. 2 (b)

C4 B, C—gang 346 pF
C4 F, D, E, G—50 pF trimmer
C6B—.05 μF
C7C—.05 μF
C7B—.05 μF
C7A—.05 μF
C8—200 pF
C9—40 pF trimmer
R3—51 KΩ
R4—620 Ω
R5—150 KΩ
C6A—.05 μF
C10 A, B—670 pF total
C11—3 pF
C12—180 pF
C13—17 pF
R6—300 KΩ
R7—200 Ω
L14—RFC—112 μH

Converting the COMMAND RECEIVER



MODIFICATIONS OF THE BC455 FOR DX USE

By R. E. S. Coulson

(Continued from page 608 November issue)

THE output transformer has an output impedance of 4,000 ohms, so will feed nicely into a pair of H.R. phones. (Try this and you will see the need for two potentiometers.) If, however, it is desired to use a loudspeaker, it is preferable to feed the output into an amplifier, which may consist of a 6V6.

Addition to RF24

The set thus modified, when connected to a suitable power supply (12 volts .9 amps, 300 volts 60 mA) is an excellent receiver for the 40-metre band; many British and European amateur and short-wave broadcast stations can be heard with it. It can be worked also on the most useful DX bands, 10 and 15 metres, by the addition of the RF24. This comes supplied with three valves, SP61s (6.3 volts) and ready to work. All that needs to be done is the wiring up.

At the rear of the RF24 will be found a six-pin Jones plug. The power leads (carrying 6.3 volts 1.8 amps. and 200 volts 10 mA) and the I.F. output are taken through this plug. Connections are given on the circuit diagram (Fig. 3). The I.F. output is taken by about 1ft. 6in. of coaxial to the aerial terminal on the BC455. The coaxial socket on the front of the RF24 may be left, or replaced by a " drop-through "

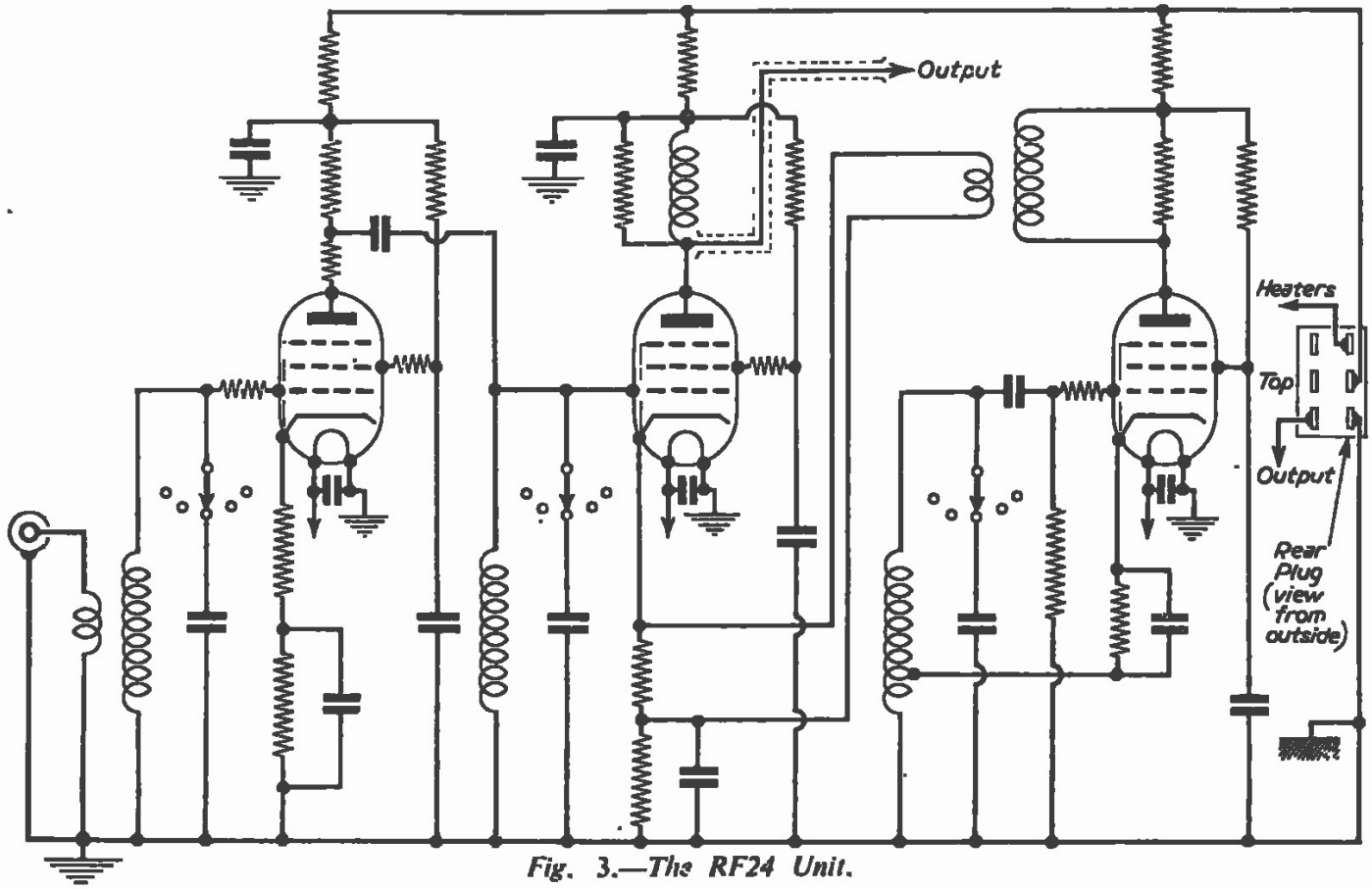


Fig. 3.—The RF24 Unit.

type of normal coaxial socket. A dipole aerial is then connected to the RF24 via the coaxial socket, the power switched on, and the RF24 switched to range 5. The BC455 is then tuned patiently from 7 to 9 Mc/s (over the 10-metre band). When a station is found, the trimmers of range 5 are adjusted to peak it up. The 15-metre band is explored in the same way, with the RF24 switched to range 1, and the BC455 tuned from about 8 to 8.5 Mc/s.

Aerials

Any short-wave receiver performs best on an aerial which has been cut for the band in use. The command set is no exception, and so if one has enough space one can erect some aerials of very high efficiency. The ideals are an aerial for each band, 10, 15 and 40 metres. A fairly good substitute is a dipole for 10 and a 66ft. top for the other two. As an alternative one could press into use the domestic television aerial, or the one normally employed for the reception of the BBC F.M. signals.

It would perhaps be as well to study the article which begins on page 725 in this issue.

LIST OF PARTS FOR FIG 2 (d)

C23—180pF	C35—750 pF
C38—17 pF	R14—100 KΩ
C24—200 pF	R15—20 KΩ
C15C—.05 μF	R16—100 KΩ
C26—100 pF	R17—100 KΩ
C27—335 pF	R18—510 KΩ
C28—34 pF	R19—100 KΩ
C29—.006 μF	R20—2 MΩ
C30—.15 μF	R21—1.5 KΩ
C20B—.01 μF	

Performance

As already mentioned, signals have been heard from many countries, both on C.W. and phone. The sensitivity seems to be better than a lot of factory made receivers, as I have heard amateurs discussing conditions over the air and saying that "the ten metre band seems to be bad": on turning to that band I usually find it "wide open" and have heard some of my best D.X. then. One day I heard a GB2 calling CQ on top of a QRP CN8, also calling CQ DX. That GB2 has a well-known commercial short-wave receiver and lives only about 12 miles away from me.

Additional Notes

It may be found that the gain of the RF24 is too high, in which case a third gain control may be fitted. This is best carried out by removing the name plate of the RF24 and cutting a $\frac{3}{8}$in. hole in the front panel where it was fixed. It should have a value of about 10KΩ.

It is regretted that we are unable to suggest any further modification in the case of this particular receiver.

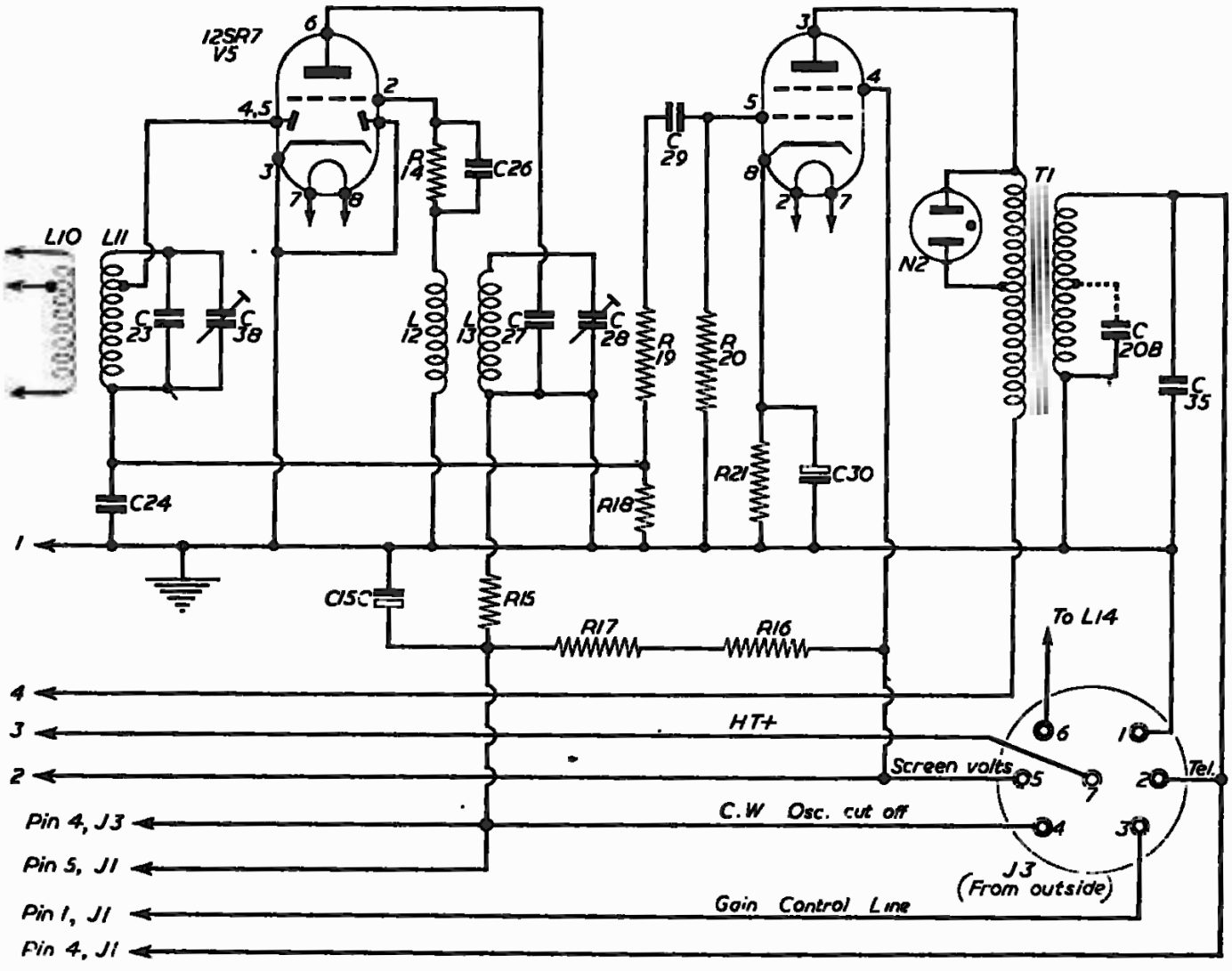


Fig. 2 (d).—Detector, B.F.O. and output stage. A list of parts is repeated above, for this section.