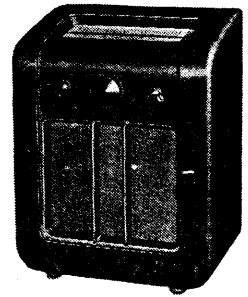


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EKCO SERVICE INFORMATION



UNIVERSAL MODEL 77
CONSOLE AND CONSOLETTA

GENERAL DESCRIPTION.

This model is a five valve (including rectifier) seven stage superheterodyne receiver for use on D.C. or A.C. 40-80 cycle mains, the consumption being **70 watts** on D.C. and **75 watts** on A.C. The Intermediate Frequency is **126.5 kc/s.**, while **Mullard** valves of the following types are used: V1—**FC13C** (octode frequency-changer), V2—**VP13C** (H.F. pentode I.F. amplifier), V3—**2D13C** (double diode A.V.C. and demodulator), V4—**Pen.36C** (steep slope output pentode), V5—**URIC** (half wave rectifier).

A pre-set condenser for suppressing second channel interference, variable tone control and sockets for connection of an extension speaker are incorporated, together with an internal speaker cut-out switch.

The instrument is built in two units, one being the main chassis carrying the H.F., I.F. and L.F. sections including the first four valves mentioned above, while the other is the power pack mounted on the floor of the cabinet, and carrying mains resistance, smoothing condensers and choke, decoupling resistance and indirectly heated rectifier valve.

CIRCUIT.

A fairly conventional superheterodyne circuit employing an inductively coupled bandpass input filter is used. Oscillations are produced in V1 by coupling the coils L7, L8 with L9, L10. These modulate the incoming signal so that an I.F. signal of 126.5 kc/s. is developed in the anode circuit of V1 and passed via the first I.F. transformer L11, L12 to V2.

After amplification by this valve the I.F. signal is applied through the second I.F. transformer L13, L14 to V3, where it is demodulated, the L.F. component being developed across R9 and applied through C23 via volume control VR1 to V4. The latter is of the steep slope type which can be fully loaded by an input of 5 volts and is, therefore, fed direct from the demodulator without using an intermediate stage of L.F. amplification.

A.V.C. is applied to the frequency-changer and I.F. valves, the necessary voltage being developed across R7 and R8 as the result of rectification by a diode of V3 of part of the I.F. signal fed to it from the primary of the second I.F. transformer through the small fixed condenser C20 incorporated in the transformer can.

SPECIAL POINTS.

BANDPASS FILTER UNIT.

The wave-change switch is incorporated in the same screening can as the bandpass input filter, and normally should not be subject to atmospheric action. Should the switch or bandpass filter give trouble, repair should not be attempted. The complete unit must be returned for replacement.

IMAGE REJECTOR.

In this model the small part of the aerial signal passed to the grid of the FC13C valve through the pre-set Image Rejector condenser C4 is in reverse phase to that arriving via the bandpass filter. By adjusting C4, the image of a strong local transmission breaking through the pre-selector circuits may thus be cancelled out, and the second-channel whistle accordingly suppressed.

The Image Rejector gives most perfect neutralisation at one frequency and for this reason the station which is known to give strongest reception on the medium wave band should be selected when proceeding to adjust C4. In most cases the station concerned will be the local Regional transmitter, but in case of doubt, connect a 0-15 milliammeter in series with R5 and ascertain which medium wave station causes the lowest reading. This test should preferably be carried out at night.

Look up the frequency of the selected station in a reliable published list and subtract 253 kc/s. (twice the I.F. of the receiver). The result is the frequency on which second channel interference may be caused, and the set should be tuned to the station operating on or near this frequency when adjusting the Image Rejector.

Notes. A *non-metallic* screw-driver must be used for adjusting the "Image Rejector." A piece of wood should, if necessary, be appropriately shaped for this purpose. Due to the use of an I.F. of 126.5 kc/s. it will be found that the frequency ascertained as above is generally either outside the medium wave broadcast band (as in the case of Scottish Regional, with an Image Frequency just below 600 metres) or in the swamp area of a British transmitter (as in the case of London National, with an Image Frequency 19 kc. below London Regional). In these circumstances second channel interference causes no trouble and the Image Rejector may, if necessary, be adjusted for suppression of interference caused by the next strongest medium wave transmission ascertained as above. Unless a second channel whistle appreciably interferes with a M.W. transmission of good programme value, however, the Image Rejector should not be adjusted after the receiver leaves the factory.

PILOT LAMP.

This is a special Ensign 200 volt 12 watt type connected in such a way that it always receives the proper voltage provided that the correct mains tapping is used.

Note. See that the lamp is not loose. It is most important that it should fit snugly in its holder; otherwise it may slide down sufficiently for the brass cap to come into contact with the holder and cause damage to the mains resistance. Normally, a ridge prevents the lamp from sliding too far into the holder. If necessary, the main chassis should be removed from the cabinet, and the holder bent over a little more so that the ridge may be fully effective.

EXTENSION LOUDSPEAKER.

The "EXT. L.S." sockets are connected across the low resistance (*i.e.*, secondary) winding of the set output transformer. Any extension speaker used must therefore be a moving-coil type incorporating no output transformer but with a speech coil impedance of about three ohms. The resistance of the wiring to the extension speaker should be kept as low as possible, otherwise volume and quality of reproduction will suffer. Recommendations for suitable extension speakers will be supplied upon request.

REMOVING RECEIVER CHASSIS FROM CABINET.

Note. Instructions for removing power pack, speaker, scale or cabinet front panel are given on page 7.

1. Remove knobs by loosening grub screws.
2. Remove cheese-headed screws at the four corners of the chassis surface.
3. Slide the chassis backwards. A few early models were issued with short leads to the speaker silencing device at the rear of the chassis, necessitating the unsoldering of these leads to allow the latter to be withdrawn completely from the cabinet.

N.B.—It is most important that the receiver should not be operated with these leads disconnected. For this reason extension leads should be fitted to the speaker silencing device.

Before re-installing the chassis check the position of the pointer slider as indicated below.

RE-GANGING AND RE-ALIGNING PROCEDURE.

Should H.F. or I.F. circuits appear out of adjustment, proceed as indicated below, using an accurate service oscillator. Note that although the receiver chassis must be removed from the cabinet in order to re-gang the H.F. circuits, this is unnecessary when re-aligning the I.F. circuits.

RE-GANGING.

Remove receiver chassis from cabinet and check that when the drive disc is turned against its stop in a clockwise direction the gang condenser is at maximum capacity. If this is not the case, the necessary adjustment may be carried out by loosening the two grub screws in the drive boss.

With the gang condenser turned to maximum capacity as indicated, check that the pointer slider is $\frac{1}{32}$ " from the limit of its travel to the right. If necessary, the slider may be moved along the drive cord by loosening the small clip which holds it to the cord. The back of the slider is accessible through an elongated opening in the back of the reflector plate supporting strip.

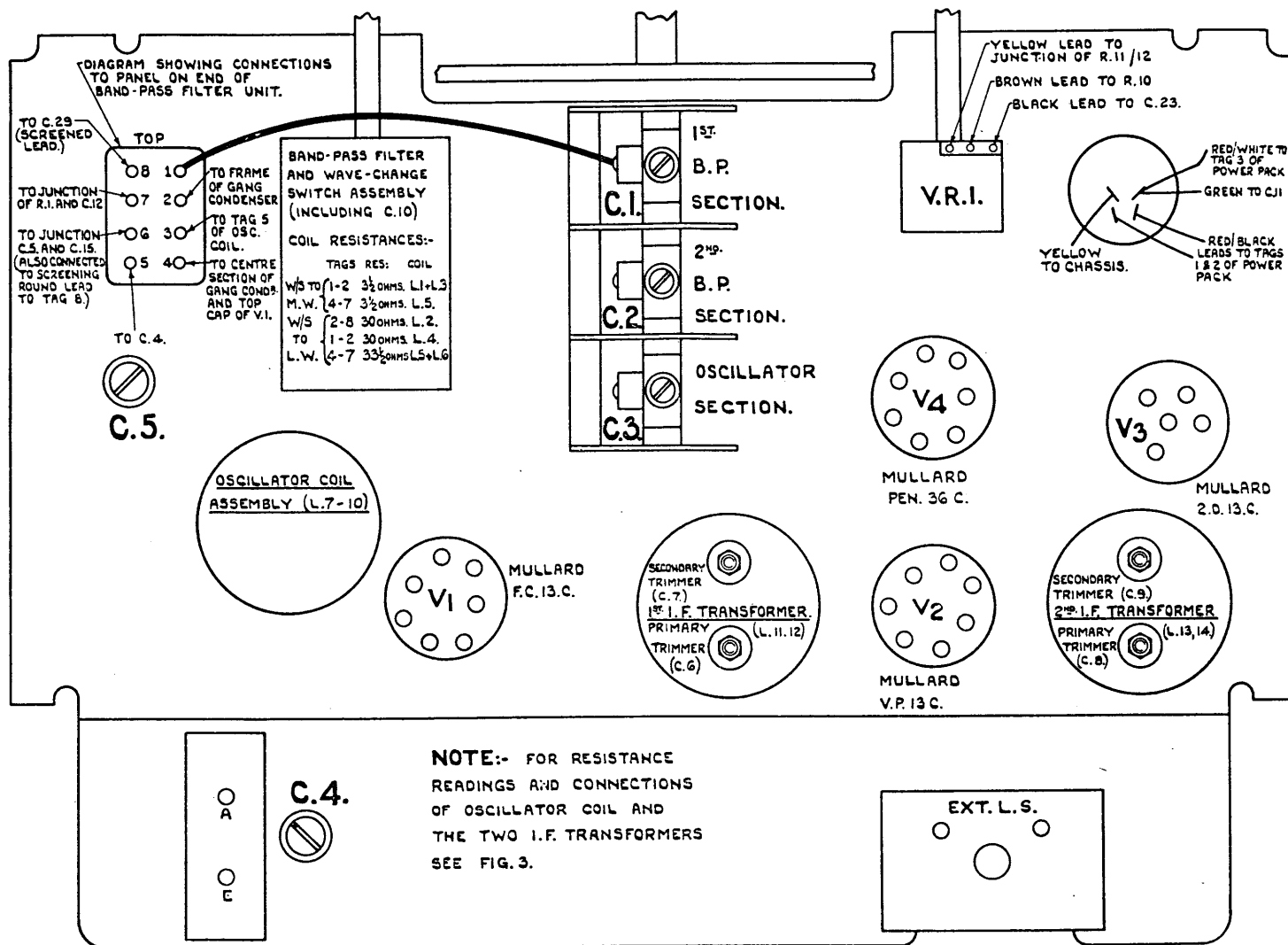


Fig. 1. Top of chassis. Bandpass coil resistances are shown.

If these points are in order re-gang the H.F. circuits as follows:—

1. Detach the reflector plate by removing the five fixing screws.
2. Connect a 0-15 millimeter between R5 and chassis.
3. Set service oscillator to 1,540 kc/s. (194.5 metres) and connect to "A" and "E" sockets.
4. Set the receiver wave-change switch to the M.W. position and the gang condenser to minimum.
5. Fully unscrew the oscillator trimmer, then screw it in slowly until minimum deflection on the milliammeter is obtained.
6. Set the service oscillator to 1,200 kc/s. (250 metres) and turn the receiver gang drive to obtain minimum milliammeter deflection.
7. Adjust the second and first bandpass trimmers on the gang condenser in that order for minimum deflection on the milliammeter.
8. Switch the receiver to the long wave band and set the service oscillator to 200 kc/s. (1,500 metres).
9. Check that minimum milliammeter deflection is obtained when the receiver scale pointer is exactly 3 inches from the right hand slider stop.

If this is not the case minimum deflection should be obtained by adjusting the L.W. series trimmer C5.

RE-ALIGNING.

1. Connect a 0-15 milliammeter between R5 and chassis.
2. Set oscillator to 126.5 kc/s. and apply this output to "A" and "E" sockets. (Tune receiver to 1,000 metres.)
3. Adjust the 1st I.F. primary, 1st I.F. secondary and 2nd I.F. primary trimmers in that order for minimum deflection on the milliammeter.
4. Adjust the 2nd I.F. secondary trimmer for maximum deflection.

CIRCUIT DIAGRAM—MODELS AD77 AND CTU77.

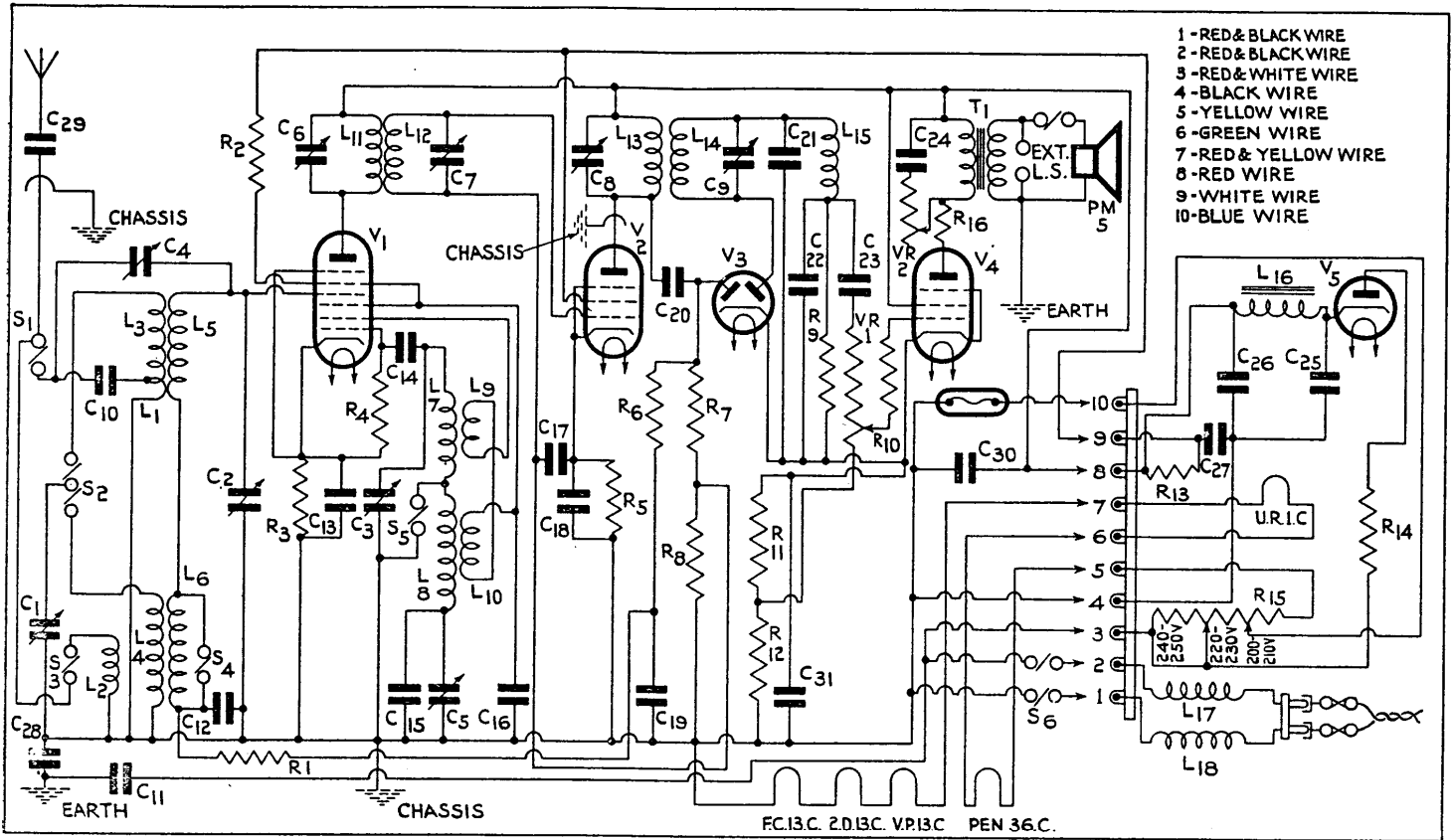


Fig. 2. Circuit diagram.

CIRCUIT KEY AND PRICE LIST.

| Ref. | Description. | Part No. | Price. | Ref. | Description. | Part No. | Price. | | | | | | | | |
|------|------------------------------|----------|--------|-------|------------------------|----------|--------------------|-------|---------------------|-------|-------------------------|-------|----------------------------|-------|---|
| L1 | M.W. prim. | SA142 | 9/6 | C17 | .05 mfd. condenser ... | A6315 | 9d. | | | | | | | | |
| L2 | L.W. prim. | | | SA160 | 5/6 | C18 | .1 " " " " " " " " | A3344 | 9d. | | | | | | |
| L3 | M.W. sec. 1 | | | | | SA148 | 5/6 | C19 | .01 " " " " " " " " | A3846 | 9d. | | | | |
| L4 | L.W. sec. 1 | | | | | | | SA146 | 5/6 | C20 | 15 c.m. " " " " " " " " | A5422 | 1/- | | |
| L5 | M.W. sec. 2 | | | | | | | | | DP923 | 1/6 | C21 | .0002 mfd. " " " " " " " " | A5274 | 9d. |
| L6 | L.W. sec. 2 | | | | | | | | | | | SA101 | 6/- | C22 | .0002 " " " " " " " " |
| S1-5 | Wave-change switch ... | SA73 | 3/- | | | | | | | | | | | C23 | .01 " " " " " " " " |
| L7 | M.W. grid | | | SA142 | 9/6 | | | | | | | | | C24 | .02 " " " " " " " " |
| L8 | L.W. grid | | | | | SA148 | 5/6 | | | | | | | C25 | 8 mfd. wet electrolytic condenser |
| L9 | M.W. anode | | | | | | | SA146 | 5/6 | | | | | C26 | 24 " dry electrolytic condenser |
| L10 | L.W. anode | | | | | | | | | DP923 | 1/6 | | | C27 | 2 " " " " " " " " |
| L11 | Prim. | | | | | | | | | | | SA101 | 6/- | C28 | .1 " condenser ... |
| L12 | Sec. | SA73 | 3/- | | | | | | | | | | | C29 | .001 mfd. " " " " " " " " |
| L13 | Prim. | | | SA142 | 9/6 | | | | | | | | | C30 | .1 " " " " " " " " |
| L14 | Sec. | | | | | SA148 | 5/6 | | | | | | | C31 | 50 " electrolytic condenser ... |
| L15 | I.F. choke ... | | | | | | | SA146 | 5/6 | | | | | R1 | 100,000 ohm resistance ... |
| L16 | L.F. choke ... | | | | | | | | | SA148 | 5/6 | | | R2 | 15,000 " " " " " " " " |
| L17 | Filter coil | | | | | | | | | | | SA146 | 5/6 | R3 | 300 " " " " " " " " |
| L18 | Filter coil | SA142 | 9/6 | | | | | | | | | | | R4 | 100,000 " " " " " " " " |
| C1 | 1st B.P. section | | | SA148 | 5/6 | | | | | | | | | R5 | 300 " " " " " " " " |
| C2 | 2nd B.P. section | | | | | SA146 | 5/6 | | | | | | | R6 | 1 megohm " " " " " " " " |
| C3 | Osc. section | | | | | | | SA73 | 3/- | | | | | R7 | 1/2 " " " " " " " " |
| C4 | Image rejector condenser ... | | | | | | | | | SA142 | 9/6 | | | R8 | 1/2 " " " " " " " " |
| C5 | L.W. osc. series trimmer ... | | | | | | | | | | | SA148 | 5/6 | R9 | 1/2 " " " " " " " " |
| C6 | Prim. trimmer | SA146 | 5/6 | | | | | | | | | | | R10 | 100,000 ohm " " " " " " " " |
| C7 | Sec. trimmer | | | SA142 | 9/6 | | | | | | | | | R11 | 165 " " " " " " " " |
| C8 | Prim. trimmer | | | | | SA148 | 5/6 | | | | | | | R12 | 250 " " " " " " " " |
| C9 | Sec. trimmer | | | | | | | SA73 | 3/- | | | | | R13 | 5,000 " " " " " " " " |
| C10 | .0008 mfd. condenser ... | | | | | | | | | SA142 | 9/6 | | | R14 | 50 " " " " " " " " |
| C11 | .1 " " " " " " " " | | | | | | | | | | | SA148 | 5/6 | R15 | Mains resistance ... |
| C12 | .1 " " " " " " " " | SA146 | 5/6 | | | | | | | | | | | R16 | 50 ohm " " " " " " " " |
| C13 | .1 " " " " " " " " | | | SA73 | 3/- | | | | | | | | | VR1 | 1/2 megohm volume control (incorporating "on/off" switch) |
| C14 | .0001 " " " " " " " " | | | | | SA142 | 9/6 | | | | | | | VR2 | 1/2 megohm tone control ... |
| C15 | .0008 " " " " " " " " | | | | | | | SA148 | 5/6 | | | | | T1 | Output transformer ... |
| C16 | .1 " " " " " " " " | | | | | | | | | | | | | | |

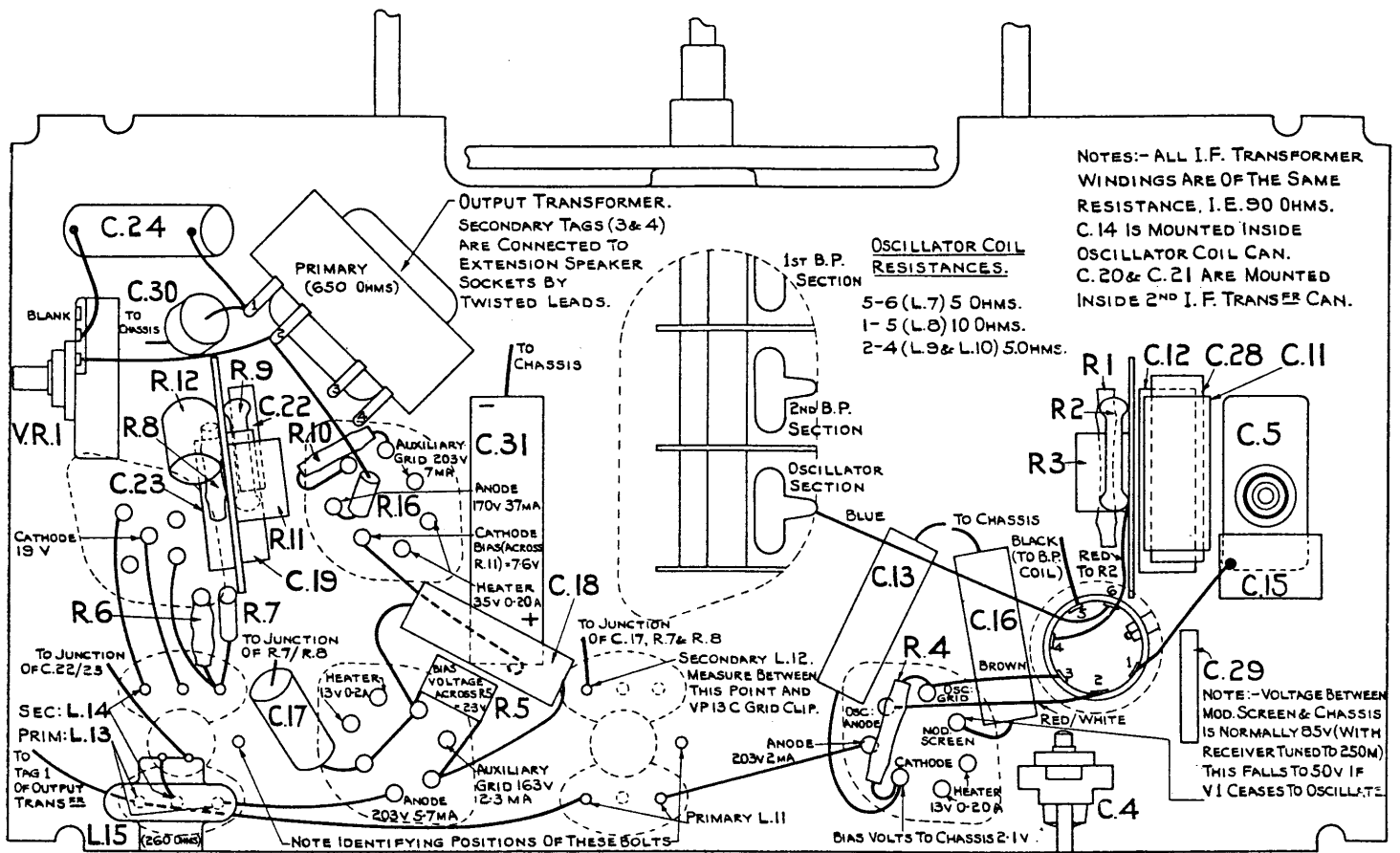


Fig. 3. Underside of receiver chassis.

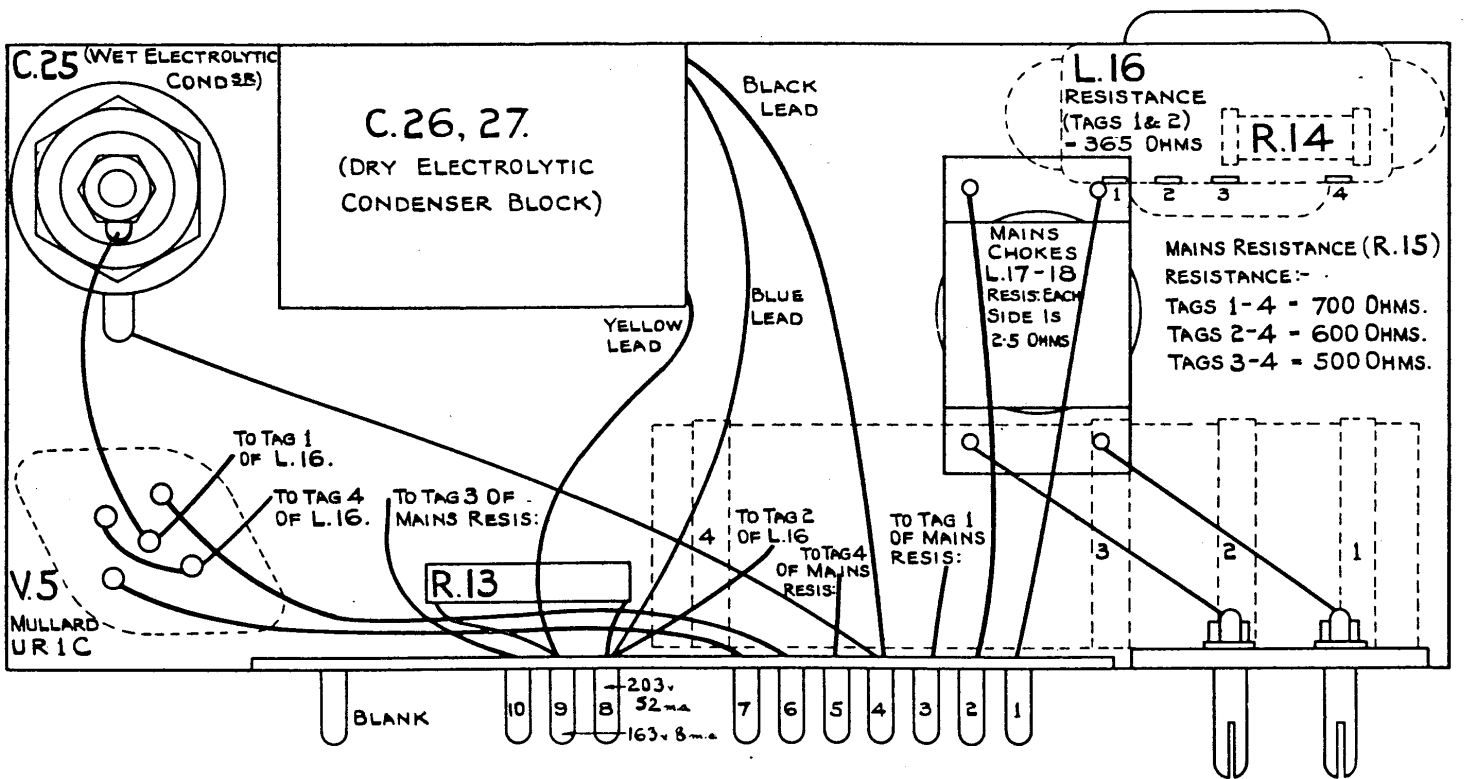


Fig. 4. Underside of power pack.

FAULT FINDING.

If the receiver has failed to function, but valves and pilot lamp light up, ensure that the speaker silencing screw is screwed in and try a new set of valves.

L.F. SECTION.

If valves are in order test the L.F. section of the receiver by placing a finger on the grid socket of the Pen. 13C valve holder. Normally a loud hum should be heard. If there is no hum, test the L.F. section of the receiver by checking up the power pack voltage and current readings with the aid of Fig. 4. Any appreciable error should indicate the location of the fault. For instance, no H.T. between chassis and tag 8 suggests a defective R14, L16 or rectifier valve. Should the voltage reading at tag 8 be high, and current reading low, the individual valve voltage and current readings should be checked up with the aid of Fig. 3 in order to trace a probable disconnection.

Note. Should it be desired to unsolder one or more of the tags attaching the multiple cable paxolin strip to the corresponding tags on the power pack chassis, use a strip of aluminium about 8" by ¼". As each pair of tags is unsoldered, the strip may be inserted between the tags, thus preventing them from adhering together again as the solder cools.

OSCILLATOR SECTION.

If the L.F. section is found to be in order, ascertain whether the FC13C valve is oscillating by shortcircuiting the oscillator section of the gang condenser and noting whether the voltage between the modulator screen and chassis decreases from 85 to 50 volts. Should this not be the case check up the components associated with the oscillator section of the FC13C valve, not forgetting that insulation from chassis of L9, L10 and L7, L8 may have deteriorated. (Note that L7, L8 are only connected to chassis when the wavechange switch is at the M.W. position.)

I.F. AND DEMODULATOR SECTION.

Should the FC13C valve be oscillating satisfactorily check the gain through the receiver step by step as follows: Connect one terminal of the service oscillator through a condenser of approx. .01 mfd. to the anode socket of the VP13C valve holder. Connect the other terminal of the oscillator to receiver chassis. Connect a suitable output meter (0-5 volts range) to the "EXT. L.S." sockets, turn VR1 to maximum, and adjust the oscillator output to maximum.

This should normally result in appreciable reading on the output meter. Should there be no output from the receiver, there is a fault in the second I.F. primary (check resistance) or in the demodulator circuits (check resistance of L14, L15, R9, temporarily replace C21, C22 and 23).

If there is satisfactory reading on the output meter, adjust this to half-scale deflection by varying the input from the service oscillator. Leave one oscillator lead connected to chassis and transfer the other to the cap of the FC13C valve. It should now be possible to reduce the service oscillator output in order to obtain the same output meter reading, thus giving an indication of gain in the I.F. circuits.

Obviously, if the same oscillator input is required, or the receiver output drops to zero, there is subnormal gain in the I.F. circuits. This may be due to a faulty 1st I.F. transformer (check resistance) or to C13, C16, C17, C18, R2, R3, R5, R8.

INPUT SECTION.

If the gain through the receiver from the FC13C control grid is satisfactory but radio signals are still absent, the bandpass filter may be at fault (see page 1). Before replacing the unit ensure that the trouble is not due to a shortcircuiting gang trimmer, or to an easily repairable break in one of the wires leading out from the bandpass filter itself.

PRICES OF PARTS NOT GIVEN IN CIRCUIT KEY.

| Description. | Part No. | Price. | Description. | Part No. | Price. |
|-------------------------------|----------|--------|---|----------|--------|
| Walnut cabinet (body) | DP1117 | 20/- | Scale | D6318 | 2/6 |
| " " (front panel) | F6141 | 6/6 | Back cover (including mains lead | DP1145 | 6/- |
| " tuning knob | DP1078 | 1/6 | assembly) | | |
| " volume control knob | DP967 | 9d. | Mains lead assembly (including fuses) ... | DP759 | 3/6 |
| " wave switch knob | DP968 | 9d. | Pilot lamp | B5934 | 2/6 |
| " tone control knob | DP1124 | 9d. | Reflector plate | C6374 | 1/- |
| Black cabinet (body) | DP1117/1 | 24/- | Reflector plate supporting strip | A6535 | 2d. |
| " " (front panel) | F6141/1 | 8/6 | Speaker baffle | D6487 | 1/- |
| Ivory tuning knob | DP1078/1 | 2/- | Speaker supporting strip | A6310 | 3d. |
| " volume control knob | DP967/1 | 1/- | Pointer | C6368 | 6d. |
| " wave-switch knob | DP968/1 | 1/- | Cable and tag strip assembly | DP1080 | 2/6 |
| " tone control knob | DP1124/1 | 1/- | | | |

All prices given in this manual are retail. They are subject to alteration without notice.

REMOVING POWER PACK, SPEAKER, SCALE OR CABINET FRONT PANEL.

POWER PACK.

The multiple cable between receiver chassis and power pack is sufficiently long to allow removal of the former from the cabinet, without the power pack. Should it also prove necessary to withdraw the latter from the cabinet, this may be done by removing the screw holding the supporting bracket to the speaker yoke, and the four cheese-headed screws in the base of the cabinet.

SPEAKER.

After removing the receiver chassis as indicated on page 2 and the power pack as above, remove the four self-tapping screws holding the baffle board to the cabinet. This allows the speaker to be withdrawn.

Note. Do not remove speaker from the baffle, as this will involve making holes in the speaker silk in order to gain access to the heads of the speaker fixing bolts. These holes would be visible from the front of the receiver and accordingly necessitate replacement of the speaker silk.

SCALE.

Remove receiver chassis from cabinet as indicated on page 2, and loosen the cheese-headed screw in the brass clamp at each of the four scale corners. Withdraw the scale from the clamps.

Note. When fitting a new scale, take care that the "M" of the word "MEDIUM" is $\frac{1}{8}$ " from the edge of the scale aperture in the moulded front panel.

CABINET FRONT PANEL.

Remove the receiver chassis, power pack and speaker, and loosen the self-tapping screws in the four steel clamps at the top of the cabinet. Remove the cabinet front, taking care to retain the packing pieces under the two side clamps.

Note. When fitting a new cabinet front, make certain that it is spaced equidistantly from the sides of the main cabinet. The packing pieces mentioned above should be used for this purpose.

FITTING NEW DRIVE CORD.

Should the drive cord require replacement much time and trouble will be saved by following the exact procedure outlined below.

1. Remove the main chassis from the cabinet as indicated on page 2.
2. Remove all valves from their holders.
3. Remove the small countersunk-head brass screw at one end of the slider bar, and loosen the other. (Both are accessible through holes in the reflector plate supporting bracket.) The slider bar can now be tilted in order to slip off the slider.
4. Remove the spring from the old cord and fasten it to the ends of the new cord by means of the tag provided. (The new cord should be exactly forty inches long.) Mark the new cord in the middle by means of pencil or chalk, then loop it and pass the loop through the slot in the edge of the drive drum from the inside. The use of a piece of wire hooked at the end will simplify this procedure.
5. Now remove the pointer slider from the old cord and fix it to the new cord so that the little clip at the back of the slider coincides with the mark mentioned in 4.
6. Restore the pointer to the slider bar and refix the latter by means of the screws mentioned in 3. The piece of hooked wire can be used to manoeuvre the first screw into position.
7. Pass cord over the two pulleys.
8. Now hook the spring on to one of the hooks on the inside of the drum, taking care that the loop on the spring is flat against the drum. The hooks will be most accessible from the back of the receiver when the gang condenser is turned to the minimum position.
9. Keeping tension on the ends of the cord in order to prevent the spring slipping off the hook, pass the cord from the right-hand pulley down round the bottom of the drum in an anti-clockwise direction, and that from the left-hand pulley up and round the drum in a clockwise direction.

SERVICE PROCEDURE.

Before consigning a receiver to any Ekco service depot, *make quite certain that the trouble is not due to a faulty valve* or other very minor defect, otherwise a minimum charge of 7/6 will be made for expenses in testing, handling, packing and carriage.

If it proves necessary to return a receiver or component part, *the customer's guarantee registration card must be enclosed*. Free repairs of a receiver, or replacement of a component part, cannot be effected if the guarantee has expired or the instrument has not been registered by the customer. In the latter connection please note that cards forwarded to us must be those originally issued with the receiver concerned. If they are not available for any reason application should be made to us for duplicates. *Altered cards taken from other receivers will not be accepted by us for registration purposes*.

Stock receivers returned for repair *must* include the instruction booklet and blank guarantee card.

Delivery of products returned "Carriage Forward" will not be accepted.

When ordering replacement parts, please give an adequate description and quote the part number where possible.

Do not return separately parts of complete components such as gang condensers, speakers and volume controls.

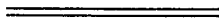
Orders for replacement knobs should indicate the colour and state whether for tuning, volume or tone control or wave-change switch.

When ordering instruction booklets (for which a charge of 6d. will be made) do not fail to indicate the serial number of the receiver.

Should it be necessary to communicate with us concerning a defect in an Ekco receiver, remember that in giving the fullest possible details you will be helping us to diagnose the trouble accurately.

Always forward service correspondence, orders, receivers or components to your nearest Ekco service depot (see addresses below).

FAILURE TO OBSERVE THE ABOVE WILL RESULT IN DELAY.



"SERVICE," E. K. COLE LTD., EKCO WORKS, SOUTHEND-ON-SEA. Telephone: Southend 49491.

Scottish Service Depot: 27, Cadogan Street, Glasgow, C.1. Telephone: Central 5357/8.

Manchester Service Depot: Bombay House, 59, Whitworth Street, Manchester. Telephone: Central 6711/2. (Goods address: 7, Bombay Street, Manchester.)

Bristol Service Depot: 14, Redcross Street, Bristol. Telephone: Bristol 22269.