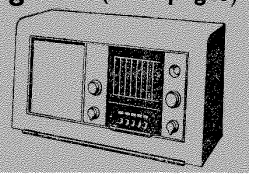
EKCO SERVICE DATA

MODEL A28



MODEL A28 is a specially designed superheterodyne receiver using six valves—including rectifier and tuning indicator—for operation on A.C. mains. There are four control knobs only, i.e. Tuning, Volume ON/OFF, Tone, Waveband switching.

Special features include 7 short-wavebands (with electrically controlled bandspread), M.W. and L.W. bands tuned manually, and Press-Button control of 3 M.W. and 2 L.W. stations. Provision is made for the use of an external loudspeaker, also a muting switch to silence the internal speaker if desired. Pick-up sockets are also provided.

MAINS SUPPLY: 200-250 volts, 40-80 c.p.s. Suitable taps are arranged on the mains transformer panel and the selector screw should be inserted in the tapping nearest to the local supply.

CONSUMPTION: 250 m.a. at 225 volts A.C.

VALVES:
V1—ECH35, Frequency changer.
V2—EF39, I.F. amplifier.
V3—EBC33, 2nd detector, A.V.C., L.F. amplifier.
V4—EL33, L.F. power amplifier.
V5—AZ31, Directly heated, full-wave rectifier.
V6—EM34, Tuning indicator.

All six valves are MULLARD and have international octal bases.

PILOT LAMPS: 6.2 volts. 300 m.a.

INTERMEDIATE FREQUENCY: 460 Kc/s.

L.S. SPEECH COIL IMPEDANCE. 3.0 ohms at 400 c.p.s. External speakers should therefore be of the low impedance type. The type as fitted in the receiver, or an Ekco Low Impedance Extension speaker, is recommended.

PICK-UP: For a satisfactory output level from the speaker, the input to V3 grid circuit from the pick-up should be in the region of 0.3 volts. Any radio breakthrough can be muted by earthing the muting socket on the rear panel, via a switch if desired. The pick-up leads should be removed from the sockets when using radio as the former becomes a low impedance shunt to V3 grid.

WAVERANGES:

1	13.7 to	14	metres,	21.75 to	21.4	Mc/s.
2	16.5 ,,	17	,,	18.1 ,,	17.7	,,
3	19.35,,	20	,,	15.5 ,,	15	,,
4	24.6 ,,	25.9	,,	12.2 ,,	11.6	,,
5	30 ,,	32.3	,,	10 ,,	9.28	,,
6	38 ,,	43	,,	7.9 ,,	7	,,
7	43.5 ,,	52.2	,,	6.9 ,,	5.75	,,
8	200 ,,	536	,,	1500 ,,	560	Kc/s.
9	800 ,,	2000	,,	375 ,,	150	,,

10 Press-Button control of Bands 8 and 9.

CIRCUIT DETAILS: Manual Tuning. Across the A and E sockets is connected a 460 Kc/s filter, L1.C1. This is designed with flat top characteristics—approximately 6 Kc/s spread—to prevent breakthrough of any R.F. signal at or about the intermediate frequency. On wavebands 1—7 inclusive, both aerial and oscillator circuits are tuned by the twin variometers, L2. L22, which are mechanically coupled and operate as a single unit.

Tuning is accomplished by sliding iron dust cores moved by a spring-loaded connecting rod which, in turn, is operated by a cam on the gang condenser shaft. Every care has been taken to ensure rigidity and constancy of this unit to prevent calibration drift.

On wavebands 1—6 inclusive, each variometer is shunted by an additional inductance to obtain correct frequency coverage.

On wavebands 1, 2 and 3, the oscillator anode voltage is increased slightly by shunting R10 with R9.

Reference to the circuit diagram will show a Colpitts oscillator circuit is used on wavebands 1 to 7.

On wavebands 8 and 9, the aerial is transformer-coupled to V1 grid, the secondary being tuned by C13, the aerial section of gang condenser. The oscillator circuit for wavebands 8 and 9 is of the more familiar H.F. transformer (Hartley) design, with the primary—anode coil—tuned by C34, the oscillator section of the gang condenser. The beat, or intermediate, frequency appearing in V1 anode circuit is fed via the 1st I.F.T. to V2, amplified and coupled by the 2nd I.F.T. to the detector diode of V3. After rectification, the signal is filtered by the resistance/capacity network R17. 22. C42. 43 then coupled by C41 via R19, R20 (V/C) and R23 to V3 triode grid. The amplified output of V3 is R/C coupled to V4 for final amplification then transformer-coupled to a low-impedance, permanent-magnet, speaker.

Tone compensated feed-back is employed in the L.F. stages, the voltages developed across L39 being applied to the grid circuit of V3. The effectiveness of the bass boost condenser C51, as such, is controlled by the tone control R29. Top lift is given to V3 grid by C44. Delayed A.V.C. voltage is obtained by coupling a portion of the signal voltage from V2 anode circuit via C39 to the remaining diode of V3. Part of the rectified voltage developed across the diode load R15. 16, is filtered by R13, C33, and again by R5, C7, before being applied to the grids of V2 and V1 respectively.

The tuning indicator, V6 is operated by a small voltage, tapped off the second detector circuit, being applied to its grid. The grid by-pass condenser, C45, eliminates modulation ripple on the indicator petals. V6 cathode is commoned to that of V3.

PRESS-BUTTON CONTROL: With the waveband switch at position 10, V1 grid connects to one side of the P.B. Switch, the associated contacts of which connect to the respective trimmers and M.W. and L.W. grid coils. Pressing any button connects the relevant trimmer and coil to V1 grid thereby allowing the grid circuit to be resonated.

When button 1 is pressed, in addition to the trimmer and grid coil being connected, L13 is brought into circuit to obtain correct frequency coverage.

The oscillator grid and anode are switched to the master oscillator coils L33, L34 respectively. The grid end of L33 is connected to the second half of the P.B. Switch (controlling shunt coils).

Pressing a button as above, connects the relevant coil across L33 and, by varying the inductance of the shunt coil, the oscillator circuit can be resonated.

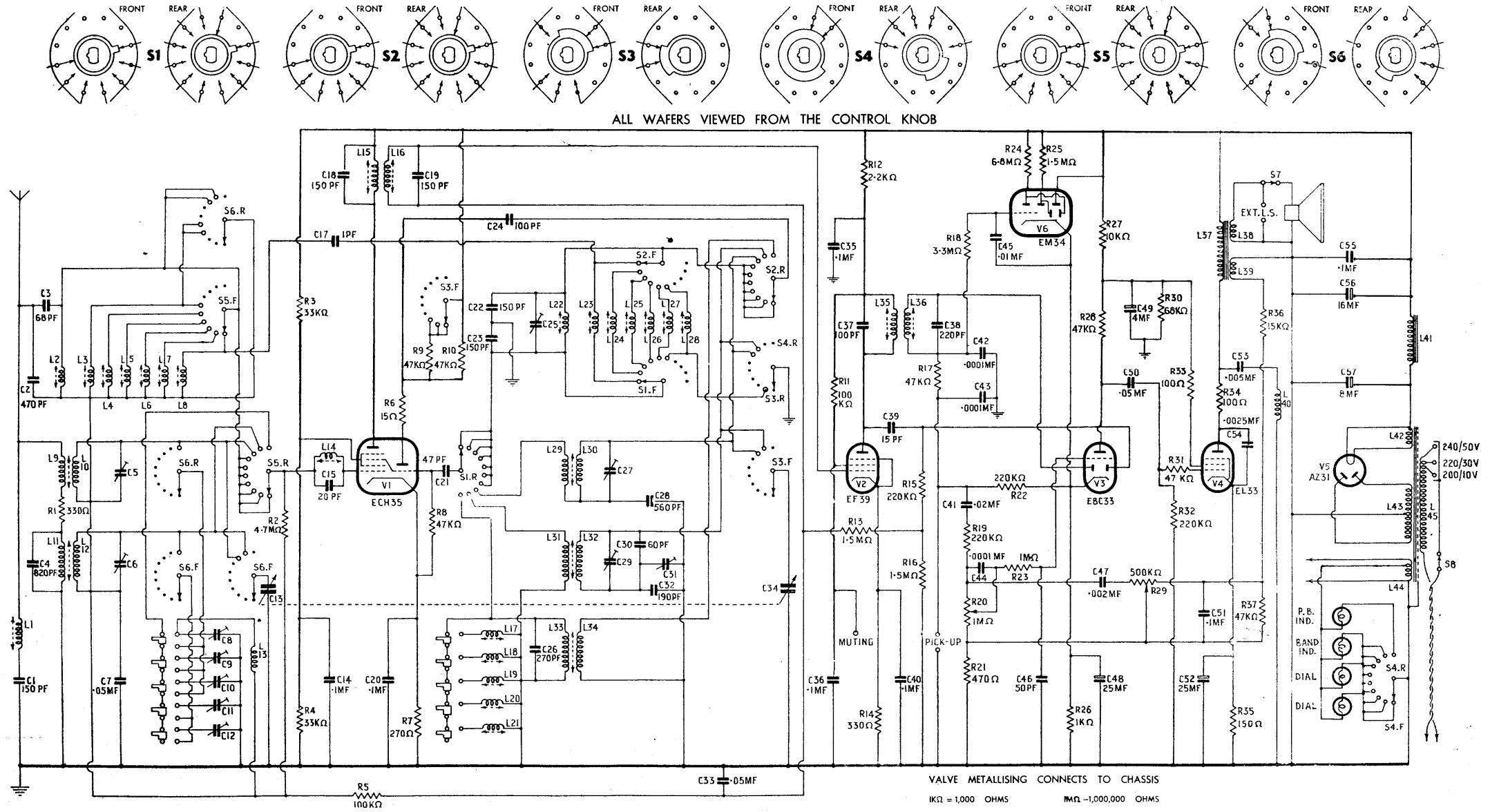
The press-button switch can only be operated on waveband 10, as a trip lever, operated by a cam on the switch spindle, holds the P.B.S. catch bar in the release position on wavebands 1 to 9.

BAND SWITCHING is accomplished by twelve rotary switches arranged as six double-sided wafers operated in tandem by a common spindle. The wafers are numbered 1 to 6 from the control end with a suffix F or R added to denote front or rear of a wafer. The contacts are numbered 1 to 12 clockwise for reference between diagrams only, and have no relation to the waveband. Thus S2, R.10 indicates: rear of second wafer, contact 10.

S1.F. selects the grid ends of L23 to L28 and connects them to the grid end of L22—oscillator variometer. Switch has no contact on wavebands 7, 8, 9 and 10.

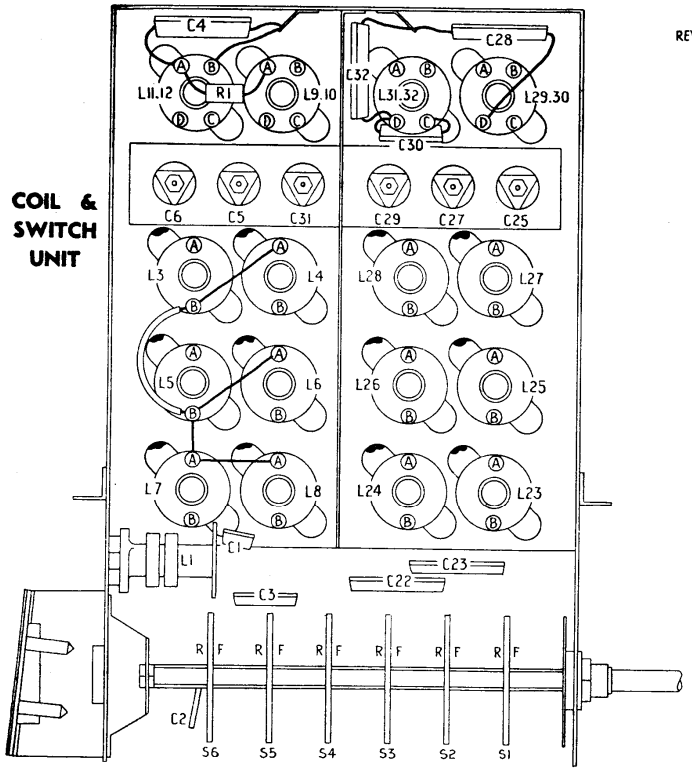
S1.R. connects the appropriate oscillator grid coil to the oscillator grid circuit. On waveband 10, the P.B. Switch is also brought into circuit with L33.

(Continued page 4)

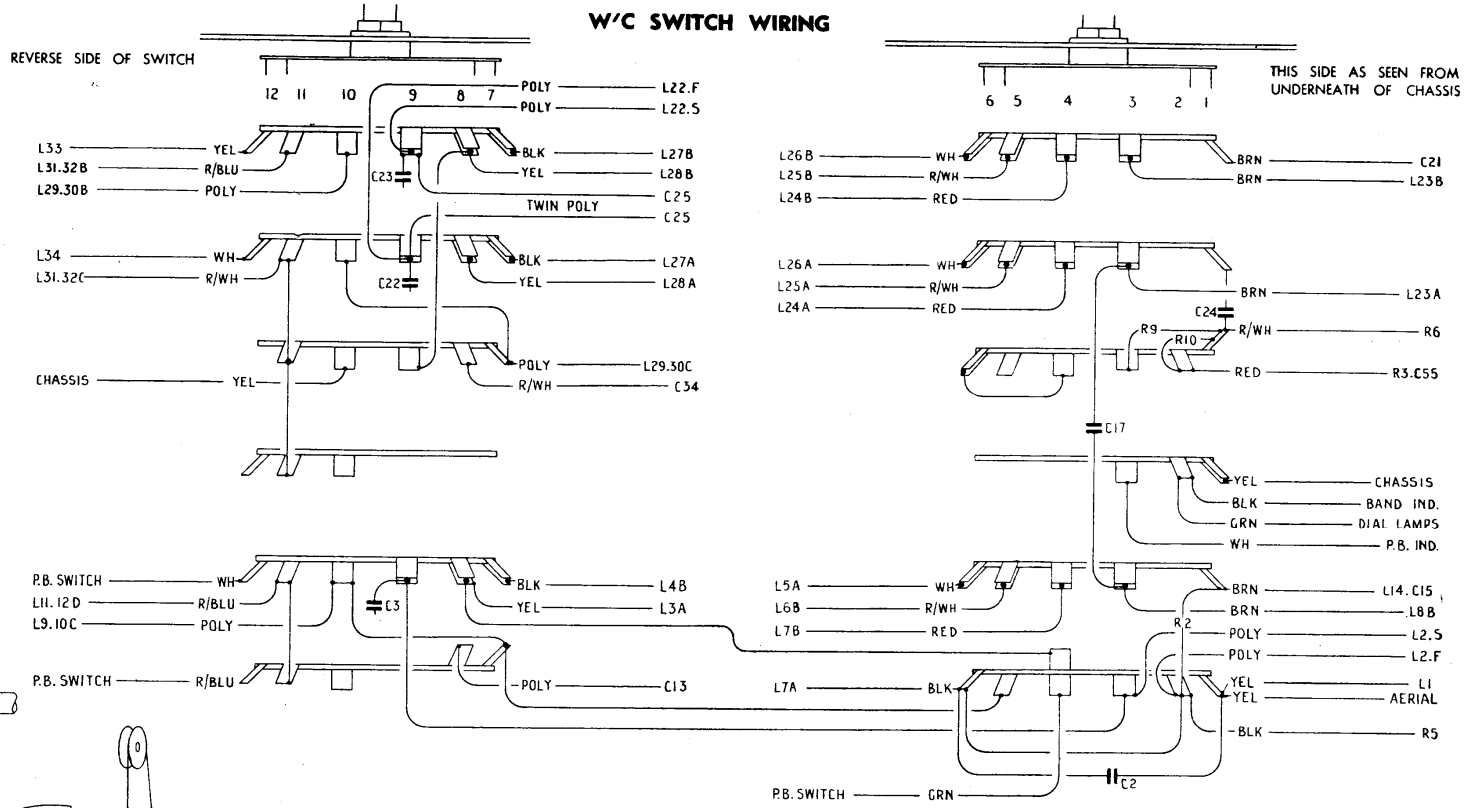


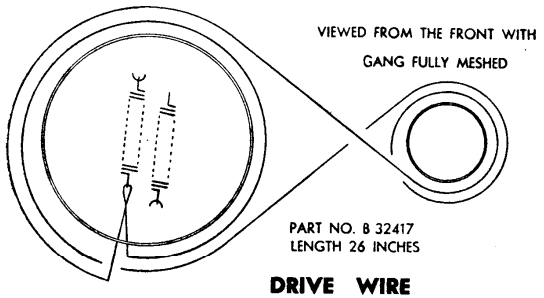
CIRCUIT DIAGRAM

COIL & SWITCH UNIT

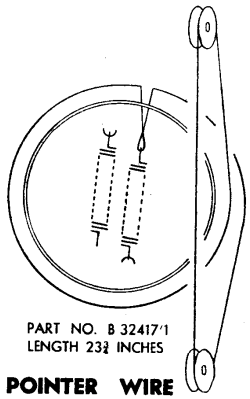


W/C SWITCH WIRING





DRIVE WIRE



POINTER WIRE

D.C. RESISTANCE OF WINDINGS

COIL	OHMS
L1	8
L2	LESS THAN 1
L3	" "
L4	" "
L5	" "
L6	" "
L7	" "
L8	" "
L9	9.5
L10	4.5
L11	32
L12	26
L13	15.5
L14	LESS THAN 1
L15	9

COIL	OHMS
L16	9
L17	1.8
L18	3.5
L19	3.5
L20	5.5
L21	6.5
L22	LESS THAN 1
L23	" "
L24	" "
L25	" "
L26	" "
L27	" "
L28	" "
L29	1
L30	2.2

COIL	OHMS
L31	2.5
L32	4.5
L33	9
L34	3
L35	14
L36	7
L37	334
L38	LESS THAN 1
L39	42
L40	215
L41	620
L42	LESS THAN 1
L43	300 + 280
L44	LESS THAN 1
L45	35 + 4 + 4

VOLTAGE & CURRENT DATA

VALVE	ELECTRODE	VOLTS	M.A
V1 ECH35	ANODE	270	3.0
	S. GRID	95	1.4
	OSC. ANODE	100	3.8
	CATHODE	2.2	8.2
V2 EF39	ANODE	255	5.5
	S. GRID	95	1.4
	CATHODE	2.3	6.9
V3 EBC33	ANODE	140	1.8
	CATHODE	3.1	1.8 + 1.3
V4 EL33	ANODE	260	31
	S. GRID	236	4
	CATHODE	5.2	35
V5 AZ31	ANODES	300 v + 300 v RMS	
	HT +	310	58
V6 EM34	TOTAL CURRENT	1.3 M.A	

OSC. ANODE SUPPLY INCREASED ON SW1 2 & 3

S2.F. selects the anode ends of L23 to L28 and connects them to the anode end of L22. Switch has no contact on wavebands 7, 8, 9 and 10.

S2.R. connects the appropriate oscillator anode coil to the oscillator anode circuit.

S3.F. shunts R9 across R10 on the wavebands 1, 2 and 3. No contact on wavebands 4, 5, 6 and 7. Connects the oscillator section of the gang condenser, C34, to the oscillator anode circuit on wavebands 8 and 9. No contact on waveband 10.

S3.R. connects the oscillator grid end of L28 to chassis when L24 (waveband 2) is in circuit. Switch has no contact on wavebands 1 and 3 to 10 inclusive.

S4.F. completes the circuit of the dial and band indicator lamps on wavebands 1 to 9, no contact on waveband 10.

S4.R. connects the oscillator anode end of L30 to chassis when L22 (waveband 7) is in circuit. Connects the oscillator anode end of L32 to chassis when L30 (waveband 8) is in circuit. Completes the circuit of the P.B. indicator lamp on waveband 10. No contact in wavebands 1 to 6 and 9.

S5.F. selects coils L3 to L8 and connects them in shunt with L2—aerial variometer. No contact on wavebands 7, 8, 9 and 10.

S5.R. connects the appropriate aerial secondary coil to V1 grid on wavebands 1 to 9. On waveband 10 it connects one half of P.B. Switch to V1 grid.

S6.F. connects C13, aerial section of gang condenser, to L10 on waveband 8, and to L12 on waveband 9. On 10, it connects the P.B. switch with L12. No contact on wavebands 1 to 7 inclusive.

S6.R. short circuits L3 when L5 or L4 (wavebands 4 or 5) is in circuit. Short circuits L2 on wavebands 8 and 9. No contact on wavebands 1, 2, 3, 5, 6 and 7. Connects L10 to P.B. Switch on waveband 10.

MECHANICAL DETAILS: For ease of service, the receiver chassis can be regarded as four complete units. (*a*) Main chassis; (*b*) Coil and switch unit; (*c*) Press Button unit; (*d*) Tuner unit.

CHASSIS REMOVAL: Remove the four control knobs and the P.B. escutcheon. Remove the back cover, then the four wood screws at left side of cabinet, and the four 2BA base screws. Draw clear V6 from its clip. The chassis can now be drawn clear to the extent of the speaker leads.

MAIN CHASSIS: All components fitted to this are readily accessible.

COIL AND SWITCH UNIT: To remove this unit from the chassis it will be necessary to disconnect 20 wires, one waveband indicator spring, the outer cam and the support bracket on the W/C spindle, before removing the six 4BA nuts and bolts securing this unit.

All but one of the twenty wires emanate from the switch and are shown on the diagram of the switch.

The remaining wire connects to chassis, so no undue difficulty should be experienced in effecting a change if necessary.

The coil box is divided into two compartments, the one to the right containing oscillator coils, and the other holding the aerial coils and 460 Kc/s filter assembly.

Although some of the coils may appear similar, they are not interchangeable.

All the individual coil assemblies are mounted in a definite relationship to each other and this must be adhered to when replacing any unit. The four coils across the top of the box have two windings each while the remainder are single wound.

To simplify replacement, each unit is colour coded. On the circular tag panel of each double wound unit is a white spot which, in all cases, should occupy the 6 o'clock position.

Each single wound unit is marked with a green spot on one side of the base and this should be uppermost when installed.

The 460 Kc/s filter coil is mounted with the two joined tags on the switch side.

PRESS-BUTTON UNIT: To remove this unit, there are only six wires—from the master oscillator coils and P.B. Switch—to remove. The next step is to remove the two outer P.B. knobs. These are held in position by a compound that can be softened by heating the stems adjacent to the knobs with the end of a soldering iron. Do not use any form of flame heat.

Remove the four corner 2BA nuts, bolts and spacers and ease out the released unit. Unclip the P.B. indicator lampholder. When replacing, do not forget to reclip the lamp before bolting to chassis. The P.B. knobs can be replaced in a manner similar to their removal. Components on this unit are few, and the diagrams give all necessary information.

TUNER UNIT: The need for replacing this unit should be extremely rare, for only fairly extensive mechanical damage should make this necessary. However, with care, any component can be replaced.

To remove the scale, loosen the four corner 6BA screws, allowing them to remain in the holes and spacers. Hold each side of the scale and plate together and slide them downwards until the pointers disengage from the top holes. Draw clear. Keeping the screws and spacers in position greatly assists in the replacement.

Removal of the light excluder plate—behind the drive wires—will expose the whole drive system sufficiently for any replacements to be carried out. See notes on drive wires.

It will now be possible to remove the gang condenser.

Remove the two 2BA nuts on the front of the gang and the 4BA screw and nut on the rear suspension. Loosen both grub screws on the drive drum bush and ease the gang slightly to the rear, where the two connections can be unsoldered.

With the gang removed, the twin variometers are now exposed. A thin screwdriver will be required, the blade being approximately 5 inches long, and thin enough to pass through a 4BA nut.

If it is necessary to replace a variometer, first clear the sealing compound on the core spindle thread. Then, with the screwdriver, screw back the core into the former until it can be drawn clear at the back.

Disconnect the wires and remove faulty coil from the frame by removing the securing nut.

To fit the new coil, slide out its core and stem, then fit the coil former in position, keeping the start and finish of the winding in the same relationship as the faulty coil—see diagrams. Slide in the core, stem first, until the slotted end engages the 4BA nut and hold it in this position with a pencil or similar tool in the coil base. Insert the screwdriver through the 4BA nut and engage the stem slot, then screw into position. The final core adjustment is given in Calibration Details. When replacing the remaining components the correct position for the drive drum is shown on the drive wire diagrams.

WAVEBAND INDICATOR: This consists of a channelled frame, slotted at definite intervals, enclosing a perspex bar fluted to correspond with the frame slots. The small facets so formed, act as prisms to reflect the light emitted by the end lamp. The whole is spring loaded at each end and rides on four rollers behind the scale plate. Movement is imparted by a cam on the W/C switch spindle operating a latch bar. To reposition the cam, turn the W/C switch to position 1 or 10 and adjust cam setting until the first or last scale aperture, as the case may be, is correctly illuminated.

PILOT LAMPS: Four are fitted and are all the same type, with the exception that the P.B. Indicator is frosted. Two illuminate the scale and another, the waveband indicator, on switch positions 1 to 9. All three are switched off on position 10 when the fourth lamp is connected. This is the press-button indicator situated behind the escutcheon covering the press-button aperture. 5 volts R.M.S. is supplied to the filaments from a tapping on the 6.3 volts heater winding.

(Continued page 5)

PILOT LAMP HOLDERS: All four are of similar design, the difference being in the angular placement of the body and tags to the clips. The clip is insulated from the body and reversal of the leads will therefore have no ill effect. Should a type be fitted where the clip is common to one contact, there is a danger of short circuiting the supply winding on the mains transformer as one side of this is connected to chassis. For the same reason, care should be taken to ensure that the body and tags are clear of the chassis.

DRIVE WIRE REPLACEMENT: Both drive wires are supplied cut to correct length and with ready-made loops at the ends. The part numbers are given in the diagrams.

To replace either wire, remove the scale, plate and the back plate as described under Tuner Unit.

Leave the spring temporarily in position, pass one end of the new wire through the slot in the drum and hook over the free end of the spring. With the aid of a pair of tweezers, lay in the wire according to the diagram, taking care to avoid kinks. Keep the wire reasonably taut and pass the free end through the same slot in the drum. Release the lower end of the spring and ease upward to hook the second loop on with the first. With a pair of thin-nosed pliers grip the spring at the free end and hook over the drum lug.

POINTER SETTING: With the gang fully meshed, the pointers should coincide with the datum line crossing the scale at the top. Adjust the pointers as necessary by loosening the two securing screws in the carrier and sliding the latter along the wire into position. Tighten up the screws. This should be checked and adjusted prior to any recalibration.

I.F. ALIGNMENT: Switch to M.W. waveband 8, and fully mesh the gang. To the EXT.L.S. sockets connect an output meter such as a suitable AC range of an AVOMETER. Connect the signal generator E to E of chassis and the " live " lead via a 0.1 mfd. condenser to the top cap of V1.

Inject a modulated 460 Kc/s signal and adjust, for maximum output, the four I.F.T. cores in the following order :

2nd I.F.T. upper and lower, then the 1st I.F.T. upper and lower.

Reduce the signal input as necessary during this operation and check the functioning of the tuning indicator V6 when peaking.

I.F. FILTER ADJUSTMENT: Remove the 0.1 mfd. condenser and inject the 460 Kc/s signal via the dummy aerial into A and E of chassis. Adjust the core of L1 for minimum output.

CALIBRATION: Check the pointer against the datum line. Switch to Band 8, and tune to 250 metres (1200 Kc/s). Inject this frequency into A and E sockets, then adjust C27 for maximum output coincident with correct calibration. Tune to, and inject 230 metres (1300 Kc/s) then adjust C5 for maximum output. Tune to, and inject 500 metres (600 Kc/s), then adjust the cores of L29.30, and L9.10 for maximum output with correct calibration. Repeat these adjustments until there is no further improvement.

Switch to Band 9. Tune to and inject 1000 metres (300 Kc/s) and adjust C29 and C6 for maximum output with calibration. Tune to and inject 1400 metres (214 Kc/s), and adjust L31.32 core for maximum output, etc. Tune to and inject 1800 metres (166 Kc/s), and adjust C31 and L11.12 core. Repeat these adjustments until there is no further improvement.

Switch to Band 7. Note—It is important to note that any mis-allgnment on this waveband may affect the accuracy of the remaining S.W. bands, because the aerial and oscillator circuits are shunted by suitable inductances in each case. The possible combinations of L/C with L22 and C25 for a given frequency are numerous and an erroneous combination will be obtained if the L and C are not correctly set up.

To reset C25 an accurate inductance of 13.28 uH. should be connected in place of L22 using the self-same leads connecting L22. Tune to and inject 4.055 Mc/s signal into A and E, and adjust C25 for maximum output. The oscillator circuit must be working on the H.F. side of the signal. Reconnect L22.

Experience has shown that the type of trimmer used for C25 is, almost without exception, constant over considerable periods of time and it is therefore recommended that the trimmer is not touched, any adjustments being made on L22.

Tune to, and inject 48 metres (6.3 Mc/s), then adjust the cores of L22 and L2 for maximum output.

Switch to Band 6. Tune to, and inject 41.2 metres (7.25 Mc/s) and adjust the cores of L28 and L3.

Switch to Band 5. Tune to, and inject 31 metres (9.7 Mc/s) and adjust the cores of L27 and L4.

Switch to Band 4. Tune to, and inject 25.2 metres (11.9 Mc/s), and adjust the cores of L26 and L5.

Switch to Band 3. Tune to, and inject 19.7 metres (15.2 Mc/s), and adjust the cores of L25 and L6.

Switch to Band 2. Tune to, and inject 16.82 metres (17.8 Mc/s), and adjust the cores of L24 and L7.

Switch to Band 1. Tune to and inject 13.95 metres (21.5 Mc/s), and adjust the cores of L23 and L8.

For Television Sound, tune to scale position and inject 41.5 Mc/s, then adjust core of L14 for maximum output.

In cases where double peaks are noticed, tune to the peak having lowest frequency.

P.B. MASTER COIL ADJUSTMENT: Switch to Band 10 and release all buttons. Inject a 960 Kc/s signal via a 0.1 mfd. condenser to the top cap of V1, and adjust the core of L33.34 for maximum output.

Note.—This is the image signal, the oscillator will be working at 500 Kc/s.

This adjustment will only be necessary if it is found that the " button adjustors " will not cover their respective frequency coverage.

PRESS-BUTTON ADJUSTMENT: Remove the button escutcheon to expose the adjustors. Switch to Band 10 and press the required button, taking note that the new station is within its frequency range. Adjust the upper key (inductance) until the station is tuned for maximum spread on the tuning indicator. Increase volume by resonating the lower key (capacity). Slide in the new station-name and replace escutcheon.

BUTTON COVERAGES:

1	200	—	284	metres	1500	—	1050 Kc/s.
2	267	—	420	,,	1123	—	715 ,,
3	342	—	560	,,	880	—	540 ,,
4	1160	—	1610	,,	259	—	186 ,,
5	1430	—	1986	,,	210	—	151 ,,

SERVICE DEPT., E. K. COLE Ltd.,
Somerton Works, Arterial Road,
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SCOTTISH SERVICE DEPOT:
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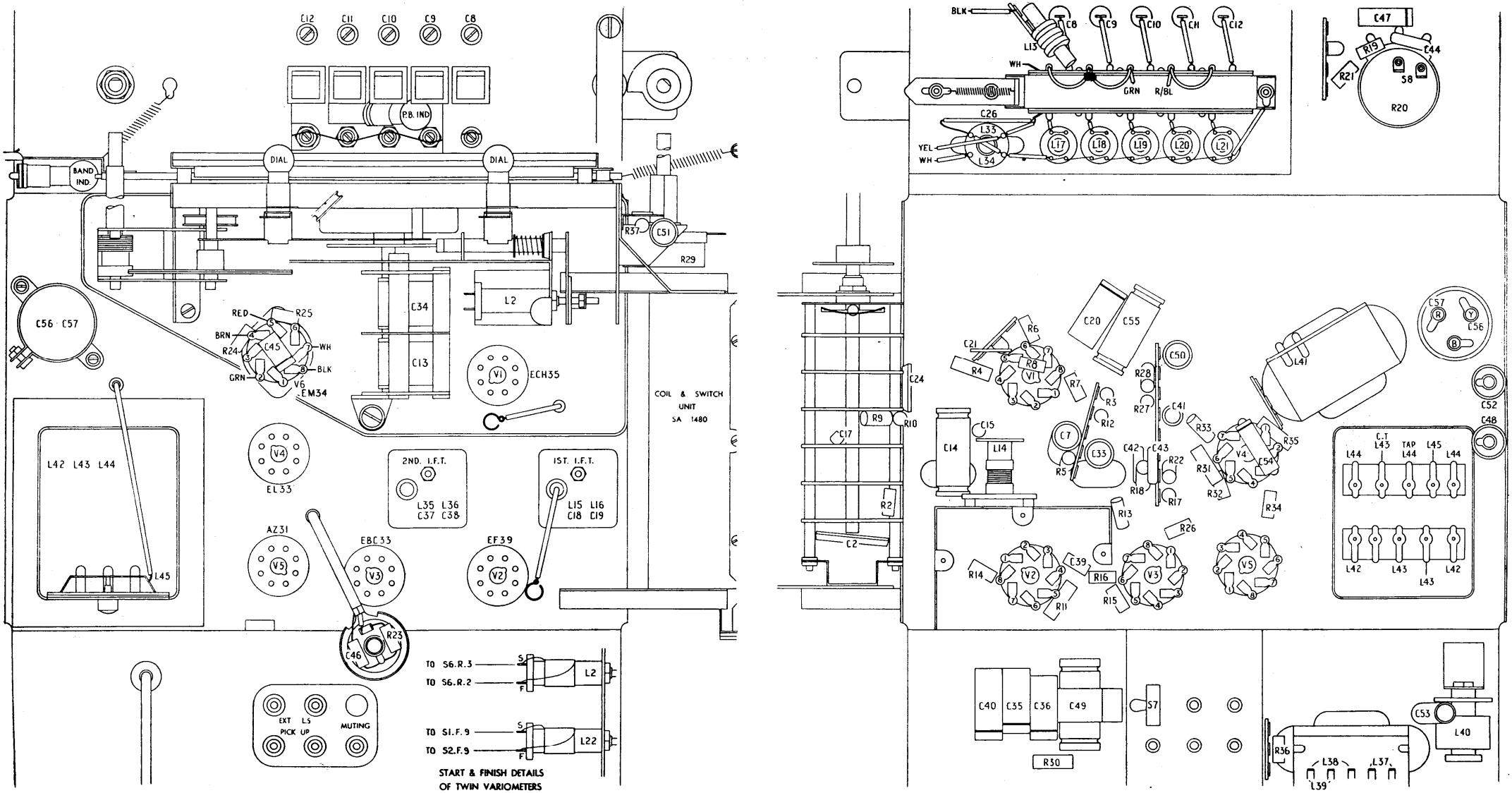
NORTHERN SERVICE DEPOT:
55, Whitworth Street,
Manchester.
'Phone: Central 6711/2.

WESTERN SERVICE DEPOT:
14, Redcross Street,
Bristol.
'Phone: Bristol 26311.


C12
C11
C10
C9
C8
P.B. IND
DIAL
DIAL
BAND IND.
R37
C51
R29
C56 C57
RED
R25
BRN
R24
C45
WH
BLK
GRN
V6
EM34
C34
C13
L2
V1
ECH35
COIL & SWITCH UNIT SA 1480
L42 L43 L44
L45
V4
EL33
2ND. I.F.T.
L35 L36
C37 C38
1ST. I.F.T.
L15 L16
C18 C19
AZ31
V5
EBC33
V3
EF39
V2
R23
C46
TO S6.R.3
TO S6.R.2
S
F
L2
TO S1.F.9
TO S2.F.9
S
F
L22
EXT LS
PICK UP
MUTING
START & FINISH DETAILS
OF TWIN VARIOMETERS
BLK
C8
C9
C10
C11
C12
L13
WH
GRN
R/BL
C26
L33
L34
YEL
WH
L17
L18
L19
L20
L21
C47
R19
C44
R21
S8
R20
C24
R9
R10
C17
C2
R2
C21
R6
R4
R8
V1
R7
C20
C55
C50
R28
R27
C41
R3
R12
C15
C14
L14
C7
C33
R5
C42
C43
R22
R18
R17
R13
R33
R31
V4
R52
R35
C54
R34
L41
C57
R
Y
B
C56
C52
C48
C.T
L43
TAP
L44
L45
L44
L44
L42
L43
L42
L43
R14
V2
C39
R16
V3
R15
R11
R26
V5
C40
C35
C36
C49
R30
S7
C53
L40
R36
L38
L37
L39