EKCO SERVICE DATA

MODELS TRG252, ARG255

See also Service News Sheets: Nos. .....

The two models in this series embody the same basic superheterodyne chassis, for reception of FM signals on the VHF band, and AM signals on the MW and LW bands. A total of seven valves, including the rectifier and tuning indicator are used.

Features include, an electronic indicator, built-in aerials for both FM and AM reception, and sockets for the connection of an external aerial, earth, dipole, and extension loud-speaker.

Both models operate from A.C. mains only.

MODEL TRG252 is a table radiogram, fitted with a three-speed automatic record player, and a 6 in. x 10 in. elliptical loud-speaker.

MODEL ARG255 is a console fitted with a similar record player, a 10 inch loud-speaker, and stowage compartments for records. A pilot light, used as an ON/OFF indicator, is fitted to the cabinet front.

MAINS SUPPLY: 200-250 volts, 50 c/s. A.C.

MAINS CONSUMPTION: 62 watts total. 50 (radio) + 12 (gram motor) watts.

CONTROLS

MODEL TRG252: Front of receiver, left, VOLUME—ON/OFF. Right, TUNING. Side of receiver, WAVEBAND SELECTOR. Front, TONE.

MODEL ARG255: Top of panel (under lid) left, TONE. Right, TUNING. Side of receiver, WAVEBAND SELECTOR. Top, VOLUME—ON/OFF.

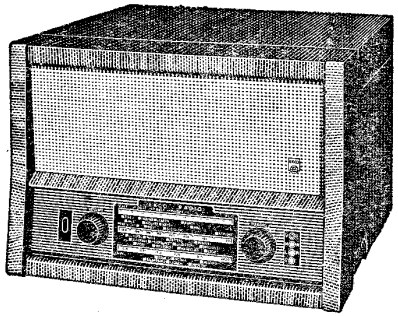
VALVES:

V1	ECC85	Earthed Grid RF Amp. and FM Mixer-Oscillator.
V2	ECH81	AM Freq. Changer and FM IF Amp.
V3	EF85	IF Amplifier.
V4	EABC80	FM Ratio Detector, AM Demodulator and AF Amp.
V5	EL84	AF Output.
V6	EZ80	HT Rectifier.
V7	DM70	Electronic Tuning Indicator.

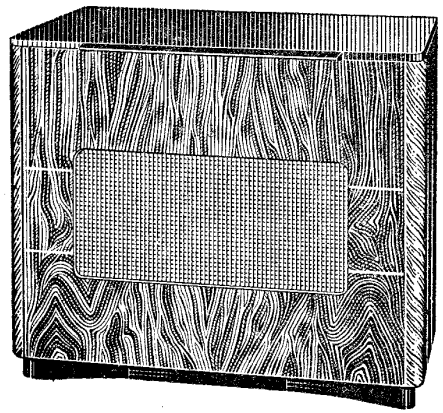
All valves are Mullard and have B9A bases, except V7 which has a B8D.

WAVEBAND COVERAGE:

Position 1	FM Band 2	87-100 Mc/s.	3-3.45 metres
Position 2	MW Band	545-1560 Kc/s.	192-550 metres
Position 3	LW Band	148-305 Kc/s.	983.6-2027 metres



MODEL TRG252



MODEL ARG255

INTERMEDIATE FREQUENCY: FM, 10.7 Mc/s., AM, 470 Kc/s.

LS IMPEDANCE: 3 ohms at 400 c/s. An external loud-speaker, when fitted, should have a similar impedance.

OUTPUT: 4 watts.

RECORD PLAYER: A Garrard model RC110 is fitted, incorporating a light weight turnover pick-up head. The head has two sapphire tipped styli which can be easily replaced. (See Service Notes).

CIRCUIT SUMMARY

FM/AM SWITCHING: The waveband selector comprises two wdely spaced wafers which contain respectively all five sections of SW1, two sections of SW2, and three sections of SW3.

SW1.A, SW1.B and SW1.C control the signal input to the AM frequency changer, and on position 1 (FM), short-circuit the MW/LW input coils and the AM signal feed. On positions 2 and 3, the signal short-circuit is removed and the appropriate MW/LW coil(s) made operative.

SW1.D and SW1.E control the grid and anode circuits respectively of the triode oscillator, rendering this section of V2 inoperative on position 1, and connecting in the MW and LW oscillator circuits on positions 2 and 3.

SW2.A connects a capacitor C36 across the IF primary to detune the FM IF circuit when on AM operation.

SW2.B switches in the pick-up on gram operation.

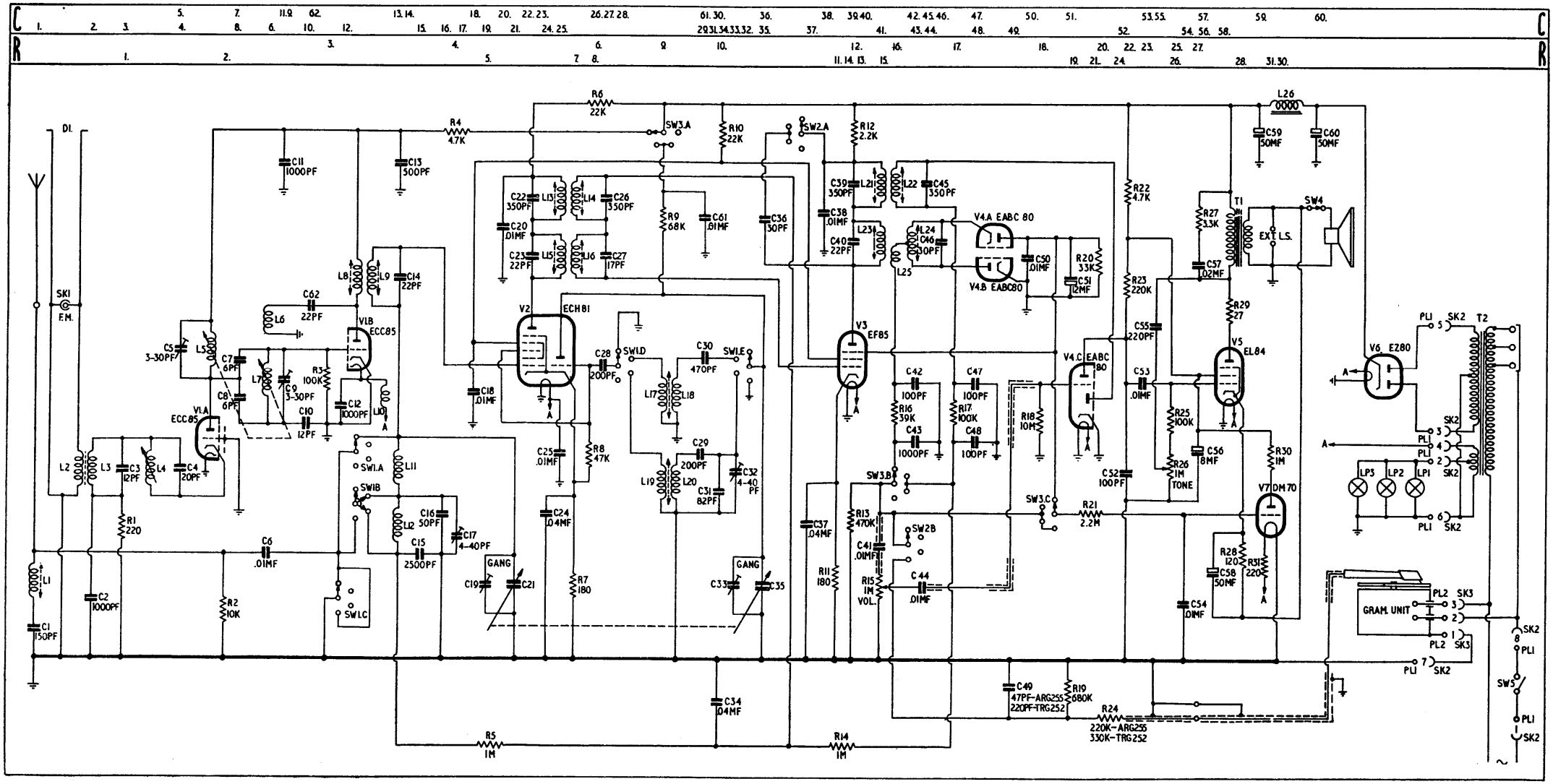
SW3.A connects the HT feed to V1 and breaks the feed to the oscillator sections of V2 for FM operation ; the reverse procedure occurs when switched to AM.SW3.B selects the FM audio on position 1, or the AM audio on positions 2 and 3 for application to the succeeding AF amplifying circuits. SW3.C selects FM or AM drive for the tuning indicator.

FM RF AND IF CIRCUITS: The signal is coupled to the cathode of an earthed grid triode V1.A via L2.L3 and an IF filter L4.C4, the output at RF appearing at the tuned anode (pin 6).

V1.B in conjunction with L7.C7.C8.C9 and the feedback coil L6, form a free running oscillator which beats with the incoming RF signal to produce an IF of 10.7 Mc/s. at the anode (pin 1).

The two trimmers C5 and C9 are pre-set, so that after initial alignment these circuits are tuned by the ganged cores of L5 and L7, being spring loaded and cam driven from the main tuning drive.

V1.B output is coupled via L8.L9 to V2 which functions as a pentode amplifier on FM, the triode being inoperative. The output of V2 is then coupled via L15.L16 to V3 for final amplification at 10.7 Mc/s.



CIRCUIT DIAGRAM

FM RATIO DETECTOR: The third FM IF transformer has three windings with phase controlled coupling, so that the signal voltages in the primary L23 and the tertiary L25 are always in phase with each other, whilst the secondary L24 voltage will be out of phase by varying degrees.

The voltages at each end of L24 however, are always anti-phase with each other and, when rectified by the opposed diodes, produce a DC voltage across R20 which is controlled against any rapid variation by the reservoir action of the large capacity C51.

This means that R20 voltage will vary only with the relatively slow variations of signal strength, and will remain unaffected by any audio content, so that any noise and AM audio will be suppressed.

The conversion of the modulation of the FM signal to AF is solely the result of phase inequalities across the transformer. At the centre frequency, 10.7 Mc/s., the voltage developed at each end of L24 will be $\pm$90 degrees out of phase with L23, whilst L25 voltage remains constantly in phase with L23. The voltage of L25 is injected to the centre point of L24 and is used as a reference for the voltages at each end of the latter, the effective value of which is the algebraic sum of an end voltage and the reference voltage.

At 10.7 Mc/s., each end voltage plus the reference voltage is equal to, but anti-phase with, its counterpart, and the current set up in each half circuit is equal and opposite, resulting in a null or DC condition at the centre of L24, and therefore no audio output.

As the primary signal is deviated from the centre frequency by its frequency modulation, the phase of L24 ends will vary in equal but opposite degrees, which means that the phase of one end will approach that of L23, and that of the other end will recede. Therefore when each end voltage phase is added algebraically to the reference voltage phase, the effective end voltages will no longer be equal, and unequal currents will result in each half circuit.

A difference current will then appear at the centre point of L24 and will flow via L25 to set up a voltage across the external load capacitor C42. This difference current will vary in direct sympathy with the phase differences of L24.L25, which vary with the modulation deviation of the primary signal. Hence the voltage across the external load will vary with the audio content of the FM signal.

LIMITING: This is carried out as an automatic function of the ratio detector reservoir circuit, and no separate limiter is therefore required.

DE-EMPHASIS: To assist in countering the effects of noise modulation upon the signal, the higher frequencies of the audio range are deliberately emphasised at the transmitter. Within the receiver the signal is bought back to normal by de-emphasising these same frequencies to a like degree, by a 50uS filter comprising R16.C43 and stray capacities, connected across the audio load C42.

FM AGC AND TUNING INDICATOR: As mentioned under the heading Ratio Detector, a DC voltage that is relative to signal strength, is developed across R20. A feed from the negative side of this resistor applies the voltage to G3 of the final IF amplifier V3 as AGC.

A similar negative feed is taken via the filter R21.C54 to the tuning indicator V7 as grid drive.

AM RF AND IF CIRCUITS: AM signals may be received by using the internal Ferrite rod aerial, or by a separate external aerial.

With the internal aerial, signals are induced direct into the grid coils of V2 (heptode). With the external aerial the signal is ' bottom ' coupled to the coil in use via a mains isolating capacitor C6. R2 is included to minimise modulation hum. L1 and C1 form an effective IF rejector circuit.

In the oscillator stage, conventional anode tuned circuits are used. The IF output at V2 heptode anode is coupled by L13.L14 to V3 for amplification, and from V3 anode via a further IF transformer L21.L22 to a single diode of V4 for demodulation.

AF CIRCUITS: The FM audio output from the de-emphasis network R16.C43 is selected on position 1 of SW3.B and applied to the volume control R15.

The AM audio is developed across the diode load R17, passed via positions 2 and 3 of SW3.B to the volume control circuit.

From the volume control, the signal is fed via C44 to the triode section of V4, amplified, and then coupled by C53 to V5 for final amplification. Negative feedback from the output transformer secondary, is applied to the cathode circuit of V5 via R28.

AM AGC AND TUNING INDICATOR: From the diode load, the rectified voltage is tapped off, filtered, and applied as AGC voltage to the control grids of V2 and V3. A feed is also taken on positions 2 and 3 of SW3.C to the grid of the tuning indicator V7.

POWER SUPPLIES: After single pole switching, the mains input is connected across the primary winding of T2 which is tapped for three different levels of input voltage.

Full wave rectification (V6) is employed in the secondary, smoothing of the DC output being provided by C60.L26 and C59.

The valve heaters are connected in parallel and obtain their voltage from a single winding on T2. A dropping resistor is connected in the filament of V7 to reduce the voltage to the required level. The indicator lamps are connected across a tap on the heater winding

CHASSIS LAYOUT DIAGRAMS: The TRG252 chassis and that of the ARG255 are largely the same and, to avoid duplication, the top and underneath views have been produced to cover both models.

These diagrams, as drawn in full line, show the ARG255 chassis.

For the TRG252, LP1 and LP2, are positioned at the upper corners of the scale, and LP3 is deleted.

The V/C and T/C are transposed, and their associated components R13.C41.C44 and R25.C55 are repositioned as shown in broken line. C44 is moved with the V/C, R25 with the T/C, and R13.C41 adjacent to the centre section of the waveband switch. C55 is moved to between V6 and T1.

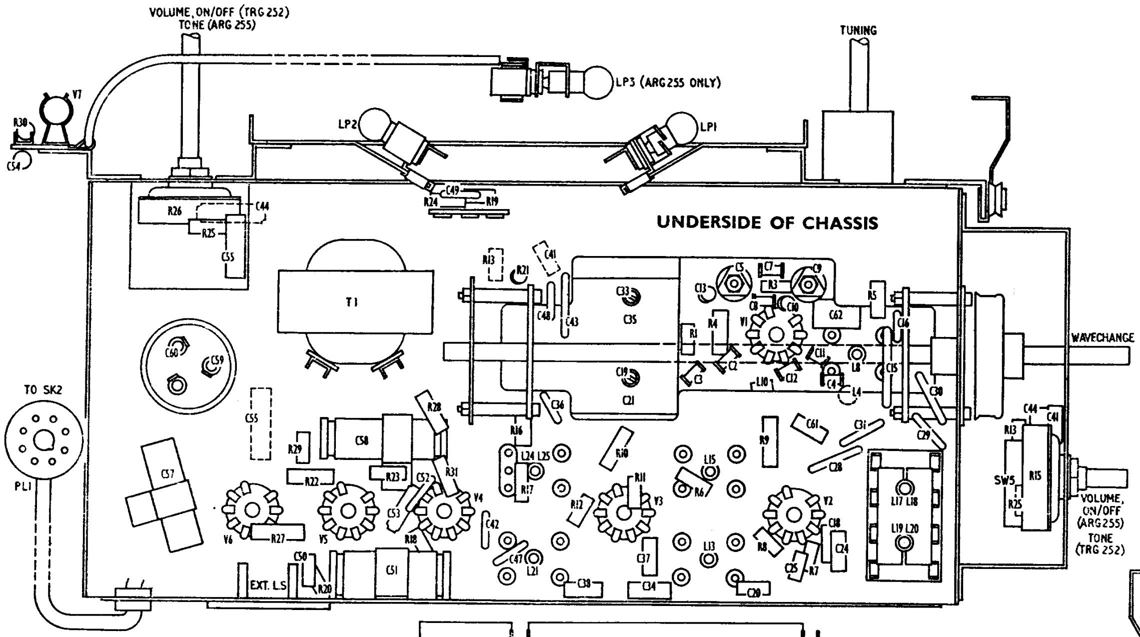
CHASSIS REMOVAL

MODEL TRG252: Remove the back cover. Remove the power supply plug PL1, FM aerial lead (internal), LS and pick-up leads.

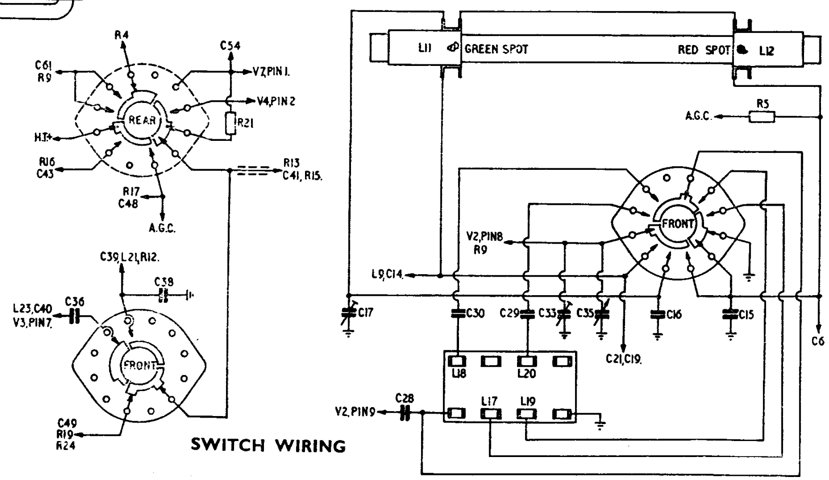
Remove the two control knobs on the front of the receiver.

Remove the chassis baseboard, held by three 4BA screws in the front, and three 2BA screws at the rear of the cabinet. The front screws are retained by permanently fitted nut plates, while the rear screws have ordinary standard nuts.

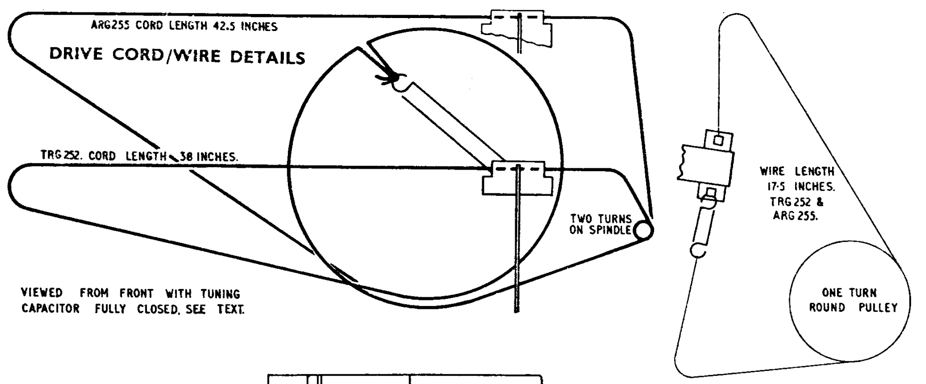
Next slide the baseboard towards the rear of the receiver, then finally withdraw the chassis complete with baseboard. Care should be taken when removing the chassis, to ensure that the control spindles do not damage the scale plate.



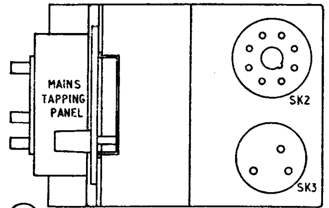
UNDERSIDE OF CHASSIS
VOLUME, ON/OFF (TRG 252)
TONE (ARG 255)
TUNING
LP3 (ARG255 ONLY)
LP2
LP1
V7
R30
C54
WAVECHANGE
VOLUME, ON/OFF (ARG255)
TONE (TRG 252)
TO SK2
PL1
EXT. L.S
T1
SW5



SWITCH WIRING
REAR
FRONT
GREEN SPOT
RED SPOT
A.G.C.
V7,PIN1.
V4,PIN2
V2,PIN8
V2,PIN9
L9,C14.
L23,C40
V3,PIN7.
C21,C19.

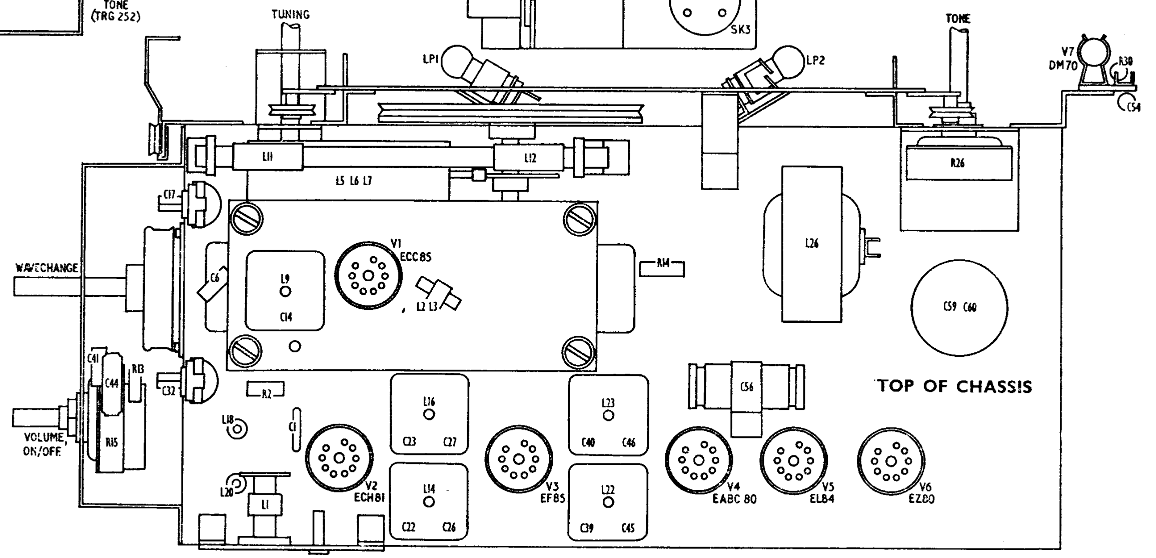


DRIVE CORD/WIRE DETAILS
ARG255 CORD LENGTH 42.5 INCHES
TRG 252. CORD LENGTH 38 INCHES.
TWO TURNS ON SPINDLE
VIEWED FROM FRONT WITH TUNING CAPACITOR FULLY CLOSED. SEE TEXT.
WIRE LENGTH 17·5 INCHES. TRG 252 & ARG 255.
ONE TURN ROUND PULLEY



MAINS TAPPING PANEL
SK2
SK3

DETAIL OF T2



TOP OF CHASSIS
TUNING
TONE
LP1
LP2
V7 DM70
R30
C54
WAVECHANGE
VOLUME, ON/OFF.
L5 L6 L7
V1 ECC85
V2 ECH81
V3 EF85
V4 EABC 80
V5 EL84
V6 EZ80
L26
C59 C60
C56
R26

MODEL ARG255: Remove the back cover. Remove the power supply plug PL1, FM aerial lead (internal), LS and pick-up leads. Remove all four control knobs.

Withdraw the reccrd storage case by removing two screws located at the bottom of the case. Unclip the pilot lamp from the front of the cabinet.

Finally remove the 4 hexagon headed chassis securing screws, accessible through the cut-away section of the panel, normally holding the record storage case. This should be carried out by means of a 2BA box spanner with a fairly short shank.

Note: When performing this last operation, it is necessary to support the chassis.

DRIVE CORD: Befcre fitting a new drive cord, it should be stretched for about 24 hours, to prevent slack drive developing after a short period of use. Details of fitting a replacement cord are given in the appropriate diagram.

ALIGNMENT: IF Alignment (FM).

Set the W/B control to position 1 (FM), set the Volume control for maximum output, and tune the receiver to 87 Mc/s.

Connect an output meter (3 ohms) across the speaker tags, disconnect the lead to the FM internal aerial, and connect a DC voltmeter (10V) of the 20,000 ohms-per-volt type across the ratio detector load resistor R20.

Inject a 10.7 Mc/s. signal to the grid (pin 2) of V3 through a .01 mf series isolating capacitor.

Note: If an AM generator is used, the signal should be unmodulated; if it is an FM type the signal should be deviated ±25 Kc/s. at 400 c.p.s.

Tune L23 for maximum output.

Connect two 220K resistors in series across R19, and a microammeter (0-100) from the junction of these resistors to the junction of R16 and C42, then tune L24 for zero current.

Check that the adjustment of tuning produces change of current polarity about the zero point and then leave the coil adjusted to zero. Remove the microammeter and series resistors.

Inject a 10.7 Mc/s. signal to the grid (pin 2) of V2. Tune L15 and L16 for maximum output.

Check that the IF response is symmetrical at ±100 Kc/s. off tune. If not, retune L23.

Inject a 10.7 Mc/s. signal to the cathode (pin 8) of V1. Tune L8 and L9 for maximum output.

Inject the signal to the primary of the aerial coil L1. Tune L4 for minimum output. Check sensitivity and bandwidth.

SENSITIVITY: Input to grid of V3. Deviation ±25 Kc/s. at 400 c.p.s. 25 millivolts for 500 milliwatts output.

Input to the grid of V2, 1 millivolt for 500 milliwatts output.

Input to the cathode of V1, 1 millivolt for 500 milliwatts output.

BANDWIDTH: Input to grid 1 of V3 ±250 Kc/s. for 6dB.

Input to grid 1 of V2 ±150 Kc/s. for 6dB.

Input to cathode of V1 ±110 Kc/s. for 6dB.

IF ALIGNMENT (AM): Set the W/B control to position 2 (MW) and tune the receiver to 545 Kc/s.

Inject a signal at 470 Kc/s. to the grid of V2. Tune L22.L21.L14 and L13 for maximum output.

RF ALIGNMENT (FM): RF alignment of the FM band may be carried out by one of the fol.owing methods :—(1) By using an unmodulated signal input and tuning for peak D.C. volts across R20 or (2) By using a frequency modulated signal input and tuning for maximum audio output. It is recommended that alignment be carried out by method (1) as alignment for peak audio output can give erroneous results if the IF amplifier and ratio detector are not perfectly symmetrical.

Set the W/B control to position 1 and tune the receiver to 94 Mc/s. Set trimmer C5 to approximately mid-position and C9 to maximum capacity.

Inject a 94 Mc/s. signal to the FM aerial socket from a 75 ohms source. Reduce the capacity of C9 until a second response is located. (First response corresponds to the image with the oscillator on the LF side of the input signal).

Adjust C5 for maximum output voltage across load resistor. Re-adjust C9 trimmer as necessary.

Inject a 98 Mc/s. signal and tune the receiver to the same frequency. Check calibration and sensitivity. Repeat at 90 Mc/s. If the coverage is not correct, it may be necessary to adjust the position of the operating cam on the tuning capacitor shaft. This cam has a ' throw ' greater than the 180 deg. required for full scale, and may be set to cover the required range. Calibration tolerance is ±0.5 Mc/s.

RF ALIGNMENT (AM)

MW: Set the W/B control to position 2, and the volume control to maximum.

All input signals are injected to the external aerial and earth sockets via a standard 200pf dummy aerial.

Tune to and inject a 600 Kc/s. signal, then tune L18 for maximum output.

Tune to and inject 1400 Kc/s. signal then adjust C33 trimmer for maximum output.

Repeat adjustments at 600 and 1400 Kc/s. until there is no further improvement.

Tune to and inject 600 Kc/s. signal. Tune L11 by sliding it along the Ferrite rod, for maximum output.

Tune to and inject 1400 Kc/s. signal and adjust C19 trimmer for maximum output.

Repeat the adjustments described above. Check calibration and coverage. Seal the MW aerial coil L11.

LW: Set the W/B control to position 3, tune the receiver to and inject 150 Kc/s. Tune L20 for maximum output.

Tune to and inject 300 Kc/s. and adjust C32 trimmer for maximum output.

Repeat the adjustments at 150 and 300 Kc/s. until there is no further improvement.

Tune to and inject 150 Kc/s. Tune L12, by sliding it along the Ferrite rod, for maximum output.

Tune to and inject 300 Kc/s. Adjust C17 trimmer for maximum output.

Repeat the adjustments described above. Check calibration and coverage. Seal the LW aerial coil L12.

SERVICE NOTES

AERIALS: Where it is desired to use separate external aerials for AM and FM reception on early models, the lead connecting the FM dipole socket and the AM aerial socket should be removed to avoid AM overloading.

REPLACEMENT OF STYLI: Should it become necessary to replace a stylus, it can be removed from the pick-up head, simply by applying a gentle leverage under the shank of the stylus with a pair of tweezers, or similar tool.

All styli are painted according to their function, i.e. red for 33/45 r.p.m. and green for 78 r.p.m.

After replacement, ensure that the two small claws, located at the head of the stylus, fit over the insulated transmission piece of the pick-up head.

VALVE VOLTAGES AND CURRENTS—Conditions: 225V mains input to 220-230V tap. Voltages with 20,000 ohms/volt meter. Chassis as negative. No signal input.

(*a*) FM RANGE

VALVE	ANODE		GRID 2		CATHODE	
	V	mA	V	mA	V	mA
V1.A	182	7.7	—	—	1.58	7.7
V1.B	177	8.3	—	—	—	8.3
V2 (Hex)	231	6.58	101	4.2	1.82	10.0
V3	225	9.4	101	2.1	2.11	11.8
V4	72.8	—	—	—	—	—
V5	218	39.4	220	4.4	6.50	43.8

(*b*) AM RANGE

VALVE	ANODE		GRID 2		CATHODE	
	V	mA	V	mA	V	mA
V1 A.B	—	—	—	—	—	—
V2 (Hex)	252	2.82	96	5.38	1.80	9.92
V2 (Osc)	86.7	2.32	—	—	—	—
V3	240	8.5	96	1.82	1.96	10.8
V4	74.8	—	—	—	—	—
V5	229	41.8	232	4.4	6.91	46.2

VALVE BASE DATA

VALVE	1	2	3	4	5	6	7	8	9
V1 ECC85	A″	G″	K″	H	H	A′	G′	K′	S
V2 ECH81	G2.G4	G1	K.G5.S	H	H	A	G3	A.t	G.t
V3 EF85	K	G1	K	H	H	S	A	G2	G3
V4 EABC80	A‴d	A″d	K″d	H	H	A′d	Kt.K′d K‴d.S	G	A
V5 EL84	I.C	G1	K.G3	H	H	I.C	A	I.C	G2
V6 EZ80	A′	I.C	K	H	H	I.C	A″	I.C	I.C
V7 DM70	G	I.C	—	F	F	—	—	A	

DC RESISTANCE OF WINDINGS

Component	Ohms	Part No.
L1	16	DP23313
L2	*	DP23003
L3	*	DP23003
L4	*	DP22974
L5	*	A49288
L6	*	—
L7	*	A49288
L8	*	SA5344
L9	*	
L10	*	A49343
L11	1.3	DP22964
L12	8.4	DP22965
L13	12	SA5343
L14	10.5	
L15	*	SA5345
L16	*	

Component	Ohms	Part No.
L17	*	DP22929/1
L18	2.3	
L19	1.4	
L20	7.5	
L21	12	SA5343
L22	10.5	
L23	*	SA5346
L24	*	
L25	*	
L26	215	SA5455
T1 Pri	700	SA5193/1
T1 Sec	*	
T2 Pri	30	SA5454
T2 Sec H.T.	220	
T2 Sec L.T.	*	

* Less than 1 ohm.

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