

BUSH VHF64 and RG66 a.m.-f.m. radio receivers

MODEL VHF64 is a 4-band 6-valve (plus rectifier and tuning indicator) a.m.-f.m. table radio with press-button band switching, separate treble and bass controls and a balanced 3-speaker system. Model RG66 is a console autoradiogram version with slight circuit differences.

For a.m. operation, V2 operates as a conventional frequency changer. A permanently connected ferrite rod aerial is fitted for l.w. and m.w. and sockets are provided for external aerial for use on s.w. and on l.w. and m.w. in poor reception areas.

L10/TC3/C16 (l.w.), L9/TC4 (m.w.) and L11/L12/TC5 (s.w.) are selected by press-button and tuned by VC1. Oscillator grid coils are L13/L14, with TC6 (s.w.), and L15/L6 with TC7 (m.w.). On l.w. operation, C25 and TC8 are switched across L16.

V3 and V4 are two pentode i.f. amplifiers, coupling being via T2 and T4. A third i.f. transformer T6 feeds one of the diodes of V5 which operates as a.m. detector. The d.c. component developed across the load resistor R22 is fed back, via filter components, to the mixer and i.f. stages as a.g.c. bias. C47, R21 and C49 form an i.f. filter.

The audio component across R22 is fed via S6C, R23 and S2F to the volume control VR1, then to the triode section of V5 which operates as an a.f. amplifier. The V5 output is fed via a tone correction network, incorporating separate bass and treble variable controls, to the output valve V7. Negative feedback over the audio stages is taken from the secondary of the

output transformer via C58, R31, C71, R45 and R26 to the V5 triode grid circuit.

The output transformer T8 drives two l.f. speakers. Additionally, an h.f. unit is driven via C64 from R37/C67, the d.c. polarising potential being fed via R34. Provision is made for the connection of an external 2.5Ω speaker or tape recorder.

For f.m. operation V1A operates as an earthed grid r.f. amplifier, the second triode section operating as a self-oscillating mixer. An internal loaded dipole is fitted and provision is made for connecting an external aerial. Oscillator and r.f. tuning is by means of iron dust cores moved by a cord drive system attached to the spindle of the a.m. tuning gang.

The i.f. signal is fed to a 3-stage i.f. amplifier consisting of V2A, V3 and V4, coupling being via T1, T2, and T4. The final i.f. transformer T7 feeds two diodes of V5 which operate as a ratio detector.

Limiting is achieved by the flywheel action of R30/C59, R16, R17/C39, C31 and R22. The d.c. potential developed across the d.c. reservoir circuit R30/C59 is fed back as a.g.c. bias to V4.

The a.f. output of the ratio detector is developed across C56 and fed, via de-emphasis circuit C54/R29/C55 and switch S6C and R23 to the volume control VR1, thence to the audio circuits as already described.

CIRCUIT DIFFERENCES

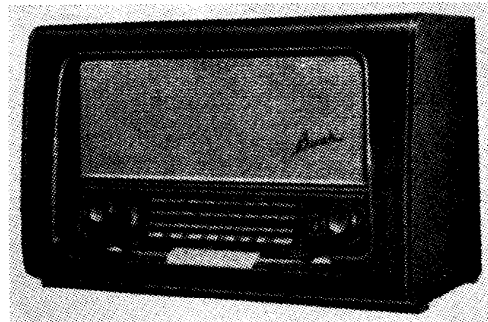
Early Models

Earlier versions of the VHF64 and RG66 differ from the circuit shown in the following ways:—

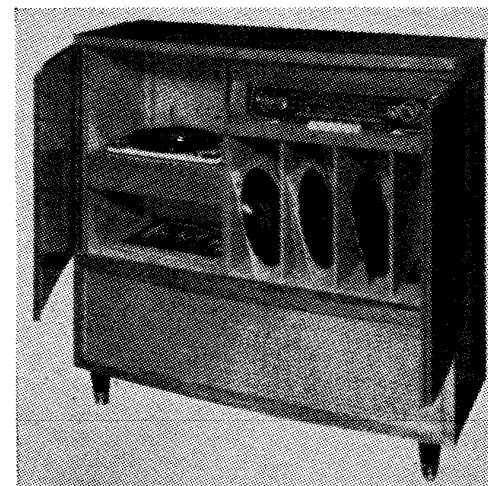
- (1) There was no hum-cancellation winding on the output transformer.
- (2) R40 (6.8kΩ) and C70 (0.2μF) were in series between pin 3 V7 and the junction of C68 and the h.t. line.
- (3) R26 was from VR1 to chassis; in later models it is situated on the output transformer.
- (4) R45 and C71 were not fitted.

Model RG66

The radiogram version of the VHF64 uses a basically similar chassis, with the



Model VHF64



Model RG66

RELEASE DATES AND ORIGINAL PRICES

VHF64: January, 1957. 47 gns. tax paid.

RG66: March, 1957. 98 gns. tax paid.

SERVICE SNAPS

BUSH VHF64 and RG66

Valves: Two EF89, one each ECC85, ECH81, EABC80, EM81, EL85 and EZ81.

Pilot Lamps: Two 6.5V, 0.3A. (Model RG66, also one at 110V 15W Pigmy).

Volume Control: 1MΩ.

Bass Control: 2MΩ.

Treble Control: 500kΩ.

Intermediate Frequencies: A.M.—470 kc/s. F.M.—10.7 Mc/s.

Electrolytics: 4μF, 70V; 5μF, 50V; 8μF, 350V; 50μF, 12V; 20+40+40μF, 350V.

Wavebands: 16-50m, 187-560m, 1050-1935m, 87.5-100 Mc/s.

Mains Input: 100-120V, 200-250V a.c.

following differences:—

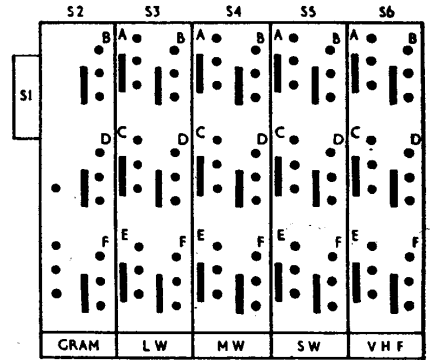
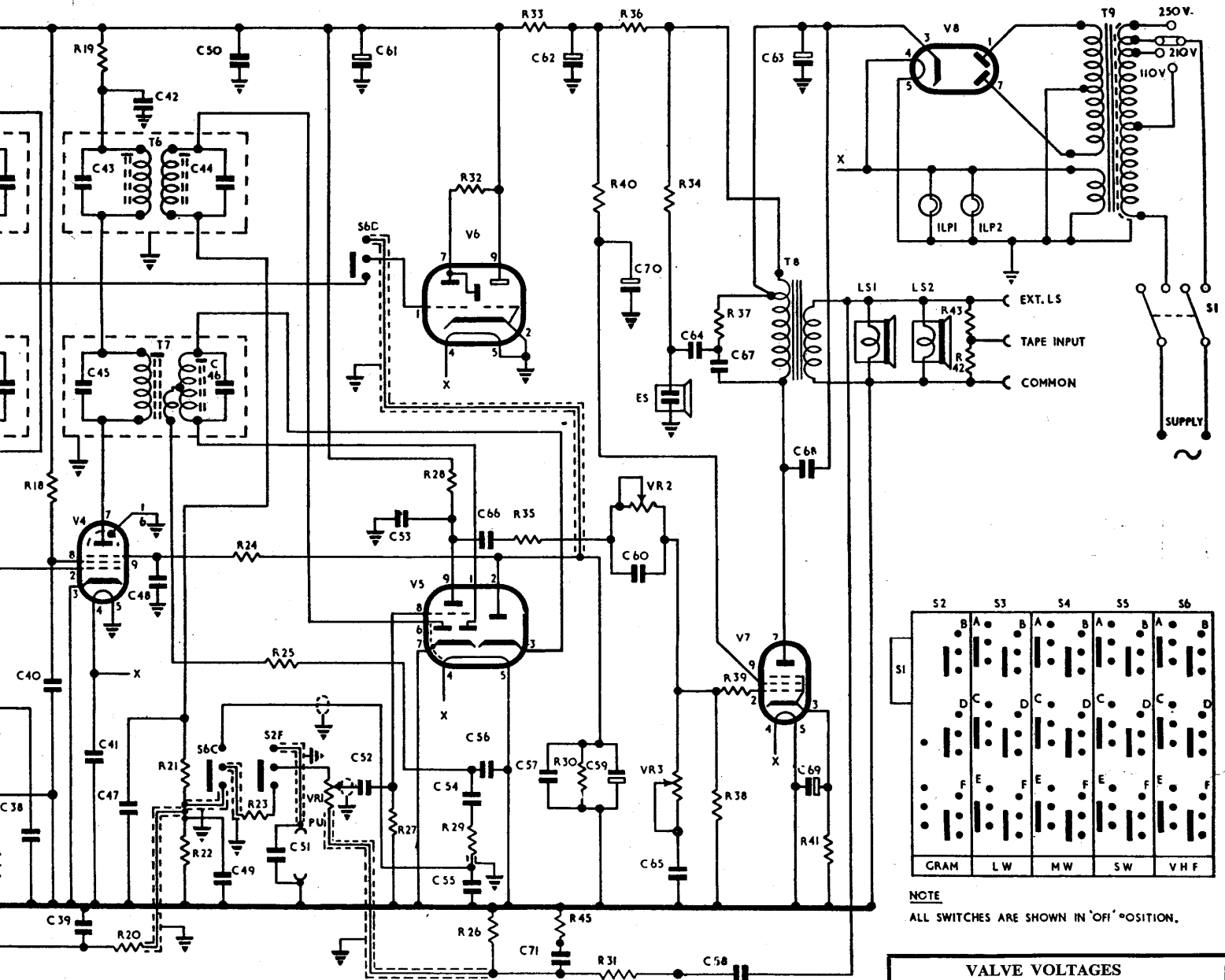
The speaker system consists of two 10in. l.f. units and a 4in. h.f. unit (in place of the electrostatic h.f. unit), this being connected in series with a 4μF 70V capacitor across the two l.f. units. R34 and C64 are no longer necessary and are deleted.

A 220Ω resistor is connected from the earthy end of the volume control VR1 to the blank tag of S5F, so that on s.w. operation it is effected shunted across R26.

REMOVAL OF CHASSIS

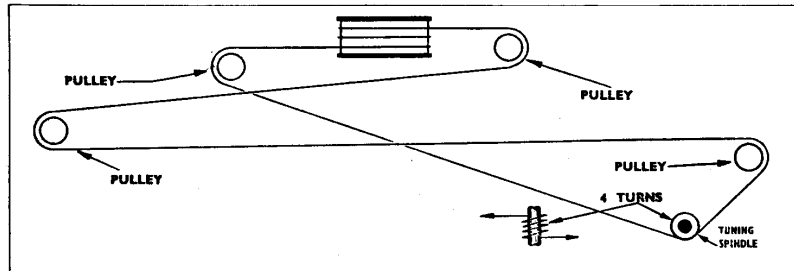
Remove four 2BA bolts from below chassis, slide out chassis to extent of aerial and speaker leads. Release speaker leads (four) from output transformer, noting colour coding. Remove rod aerial by gently dislodging rubber grommets from brackets. Chassis may now be completely removed.

Schematic Diagram of Bush VH64 and RG66 a.m.-f.m. radio receivers



NOTE
ALL SWITCHES ARE SHOWN IN 'OFF' POSITION.

- TC8 3-30pF
- VC1 528pF
- VC2 528pF
- * Model VHF64 only.
- All capacitors 350V unless otherwise stated.
- Inductors**
- L10 12Ω
- L15 1Ω
- T2 pri. 14Ω
- sec. 14Ω
- T4 pri. 14Ω
- sec. 14Ω
- T6 pri. 14Ω
- sec. 14Ω
- T8 pri. 230Ω
- T9 pri. 18.5Ω
- h.t. sec. 188Ω
- All other windings below one ohm.



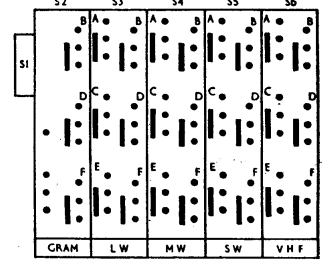
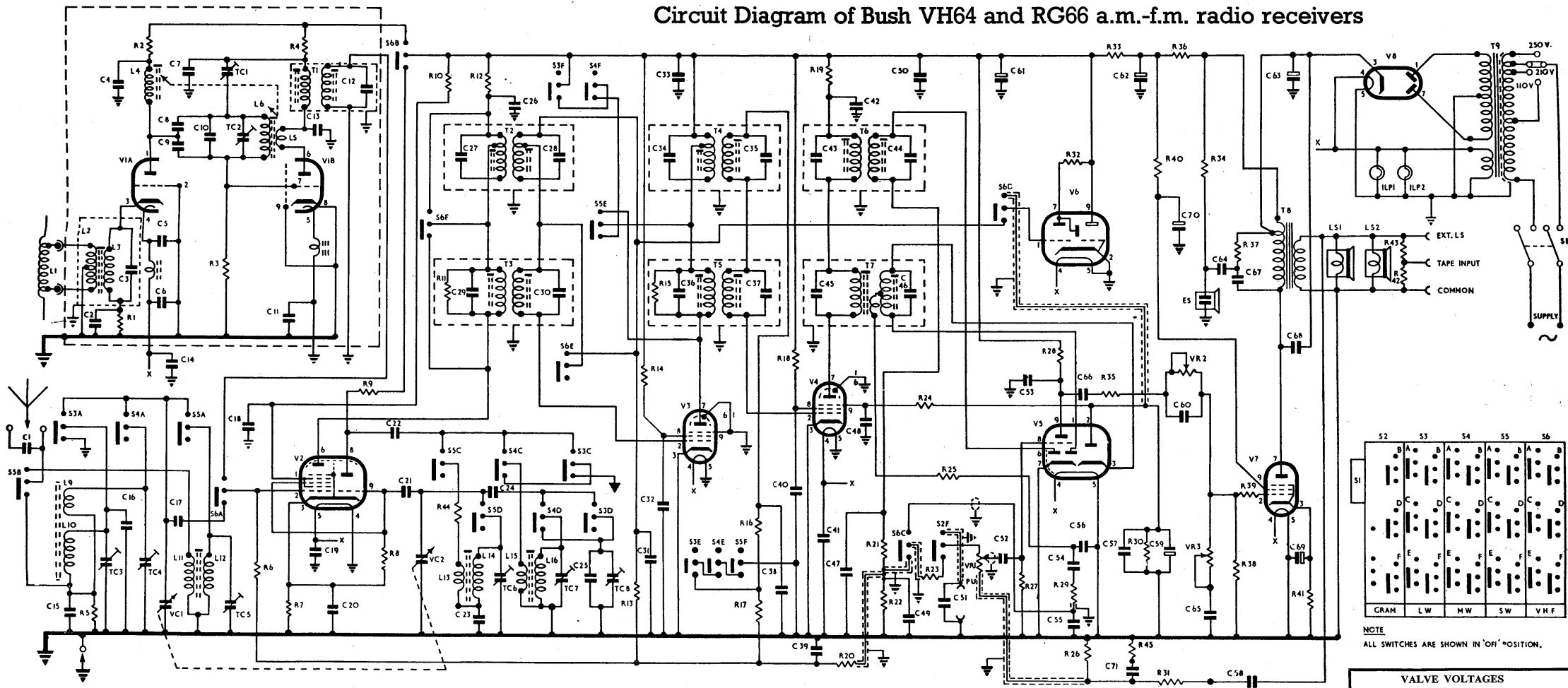
A.M. DRIVE CORD SYSTEM

To replace the a.m. drive cord, remove tuning scale, turn gang to maximum. Secure one end of cord (total length required—63in. nylon braided glass yarn) to the special securing clip, attached to both tension springs. Pass free end of cord out through opening in drive drum rim and take it clockwise round drum 1½ turns. Continue as shown in diagram above, securing free end to the second clamp on the securing slip. Check that the scale cursor coincides with the calibration dots at the l.f. end of tuning scale, with gang fully meshed.

VALVE VOLTAGES			
Valve	Anode	Screen	Cathode
V1A V1B } ECC85 {	155* 140*	—	1.4
V2A ECH81	190	100	2
V3 EF89	200	100	—
V4 EF89	200	75	—
V5 EABC80	70	—	—
V6 EM81	200	—	—
V7 EL84	290	245	7
V8 EZ81	—	—	300

* F.m. only. All other readings given are for a.m. operation. On f.m., anode voltages of V2, V3, V4 and V6, and screen voltage of V3 are approximately 20V less than figures given.
Total h.t. current—90mA (a.m.) or 100mA (f.m.).

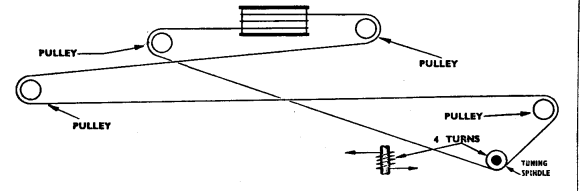
Circuit Diagram of Bush VH64 and RG66 a.m.-f.m. radio receivers



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COMPONENT LIST

Resistors	R1 150Ω	R21 27kΩ	R40 1.5kΩ	C11 560pF	C34 110pF	C56 0.001μF	TC8 3-30pF
R2 2.2kΩ	R22 220kΩ	R42 150kΩ	C12 47pF	C35 110pF	C57 0.04μF, 200V	VC1 528pF	VC2 528pF
R3 100kΩ	R23 180kΩ	R43 100Ω	C13 10pF, 750V	C36 47pF	C58 0.02μF, 150V	VC2 528pF	* Model VHF64 only.
R4 6.8kΩ, 1/2W	R24 10kΩ	R44 470Ω	C14 0.04μF, 200V	C37 47pF	C59 5μF, 50V	VC2 528pF	All capacitors 350V unless otherwise stated.
R5 10kΩ	R25 100Ω	R45 470Ω	C15 0.0075μF	C38 0.001μF, 400V	C60 560pF	VC2 528pF	
R6 1MΩ	R26 1.5kΩ	VR1 1MΩ	C16 140pF	C39 0.02μF, 150V	C61 20μF	VC2 528pF	
R7 150Ω	R27 6.8kΩ	VR2 2MΩ	C17 560pF	C40 0.04μF, 200V	C62 40μF	VC2 528pF	
R8 47kΩ	R28 220kΩ, 1/2W	VR3 500kΩ	C18 0.04μF, 200V	C41 0.01μF, 400V	C63 40μF	VC2 528pF	
R9 18kΩ, 1/2W	R29 22kΩ	All resistors 1/2W unless otherwise stated.	C19 0.001μF	C42 0.01μF, 400V	C64 0.005μF, 750V	VC2 528pF	
R10 22kΩ, 1/2W	R30 22kΩ		C20 0.04μF, 200V	C43 110pF	C65 0.01μF, 500V	VC2 528pF	
R11 22kΩ	R31 8.2kΩ		C21 68pF, 750V	C44 110pF	C66 0.05μF	VC2 528pF	
R12 2.2kΩ, 1/2W	R32 470kΩ		C22 150pF	C45 10pF	C67 0.01μF, 750V	VC2 528pF	
R13 2.2MΩ	R33 1.2kΩ, 6W		C23 0.005μF	C46 47pF	C68 0.001μF, 750V	VC2 528pF	
R14 33kΩ, 1/2W	R34 220Ω		C24 515pF	C47 47pF, 750V	C69 50μF, 12V	VC2 528pF	
R15 22kΩ	R35 68kΩ		C25 450pF	C48 0.04μF, 200V	C70 8μF	VC2 528pF	
R16 39kΩ	R36 1kΩ, 6W		C26 0.01μF, 400V	C49 100pF, 750V	C71 0.02μF, 150V	VC2 528pF	
R17 2.2MΩ	R37 10kΩ, 1/2W		C27 110pF	C50 0.01μF, 400V	TC1 3-15pF	VC2 528pF	
R18 33kΩ, 1/2W	R38 1MΩ		C28 110pF	C51* 0.002μF	TC2 3-15pF	VC2 528pF	
R19 2.2kΩ, 1/2W	R39 2.2kΩ		C29 47pF	C52 0.04μF, 200V	TC3 3-30pF	VC2 528pF	
R20 2.2MΩ			C30 47pF	C53 560pF	TC4 3-30pF	VC2 528pF	
			C31 0.01μF, 400V	C54 0.04μF, 200V	TC5 3-30pF	VC2 528pF	
			C32 0.04μF, 200V	C55 270pF, 500V	TC6 3-30pF	VC2 528pF	
			C33 0.01μF, 400V		TC7 3-30pF	VC2 528pF	



A.M. DRIVE CORD SYSTEM
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Check that the scale cursor coincides with the calibration dots at the l.f. end of tuning scale, with gang fully meshed.

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* F.m. only. All other readings given are for a.m. operation. On f.m., anode voltages of V2, V3, V4 and V6, and screen voltage of V3 are approximately 20V less than figures given.
Total h.t. current—90mA (a.m.) or 100mA (f.m.).

Alignment Procedure

Model VHF64 may be aligned in its cabinet if the wooden panel beneath the chassis is removed. The chassis must be removed when aligning Model RG66.

All cores should be adjusted to the peak which occur nearer the adjusting end of the former. All i.f. transformers have their secondaries at the top, except T7.

A.M. ALIGNMENT

I.F. Circuits

Switch to m.w., set pointer to 300m, inject signal of 470 kc/s (modulated) to pin 2 V4 and adjust secondary and primary of T6 for maximum audio output.

Transfer input to pin 2 V3 and trim the secondary and primary of T4 for maximum output. Transfer input to pin 2 V2 and adjust secondary and primary of T2 for maximum output.

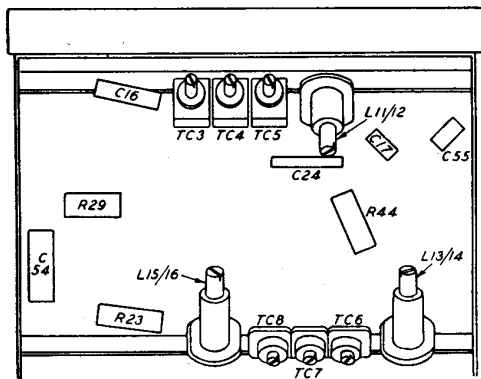
R.F. Circuits

With signal generator connected to the a.m. aerial sockets, proceed as follows, all adjustments being for maximum audio output.

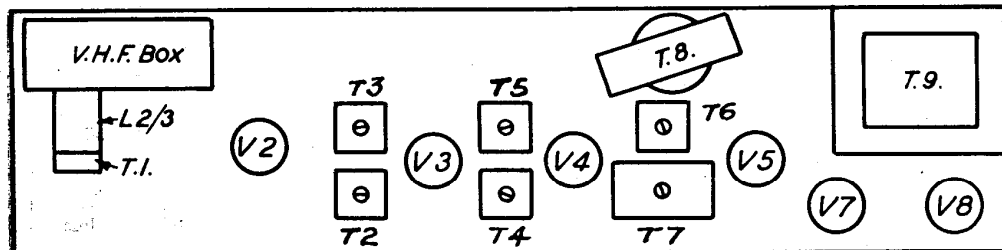
Tune receiver to 500m, inject signal of 600 kc/s (modulated) and trim L15/L16. Retune receiver to 200m, signal generator to 1,500 kc/s, and trim TC7.

Repeat these operations and check calibration.

Switch to l.w., tune to 1,400m, inject signal of 214 kc/s, and trim TC8. Repeat and check calibration.



Underneath view of tuner compartment, showing positions of mixer and oscillator trimmers and coils.



Top view of chassis showing location of valves and i.f. transformers.

Switch to s.w., tune to 50m, inject signal of 6 Mc/s and trim L13/L14 and L11/L12. Retune receiver to 20m, signal generator to 15 Mc/s, and trim TC6 and TC5.

Couple signal generator leads to a single loop of wire (about 5in. diameter), place it about 12in.-18in. away from cabinet. Switch receiver to m.w., tune to 200m, tune generator to 1,500 kc/s and trim TC4. Switch to l.w., tune receiver to 1,400m and generator to 214 kc/s and trim TC3.

F.M. ALIGNMENT

Switch receiver to f.m., connect two matched 47kΩ resistors in series between pin 2 V5 and chassis, with a high resistance meter across the resistors.

Inject 10.7 Mc/s signal to pin 2 V2, turning volume control to minimum. Adjust T7 primary for maximum d.c. output, starting with core 3/4in. inside former.

Note that with the exception of T7 primary, the correct peak associated with all the cores is the first one reached—from the top of former as the core enters the secondary winding or from the base of former as the core enters the primary winding.

Note also that during alignment it is advisable to adjust the input just sufficient to maintain an output of 4V on the voltmeter.

Connect a 1kΩ resistor across the T5 secondary and adjust T5 primary for maximum output. Transfer damping resistors to primary and adjust secondary.

Transfer resistor to T3 secondary and trim primary. Transfer resistor to primary and adjust T3 secondary. Readjust T7 primary for maximum d.c. output.

Connect test meter (50μA range) between the junction of the two 47kΩ resistors and junction of R25/C54/C56. With generator still tuned to 10.7 Mc/s, adjust T7 secondary to produce zero response on the microammeter (starting with core 3/4in. inside former), this occurring midway between a positive-going and a negative-going peak.

Transfer generator to f.m. aerial sockets and adjust T1 secondary for maximum d.c. output.

R.F. Circuits

Tune receiver and generator to 88 Mc/s. Slacken the locking nut on the pivoted adjuster (see diagram of v.h.f. tuner drive) and rotate the arm for maximum d.c. output. This operation adjusts the cores of L4 and L5/6. Tighten locking screw.

Retune receiver and generator to 95 Mc/s and adjust L2/L3 for maximum d.c. output. Check calibration.

Note: Trimmers TC1 and TC2 are factory preset and normally should not need readjustment.

V.H.F. UNIT

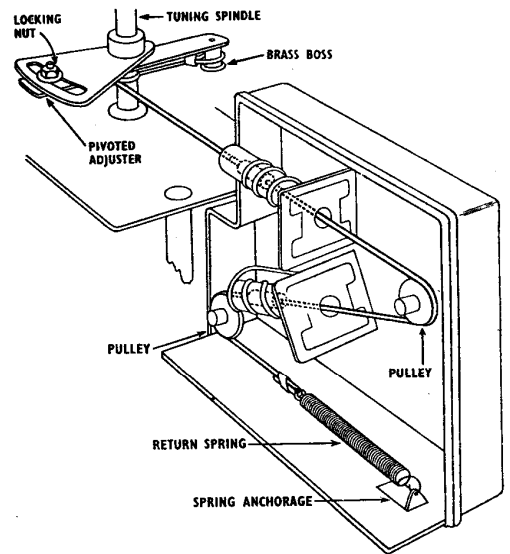
Removal of V.H.F. Box

Unsolder the five connections to the box, under chassis, noting the connections are (1) to S6B, (2) to Pin 5 of V1, C14, (3) Chassis, (4) to S6A, and (5) to Chassis.

Set the tuning capacitor to minimum and slip the cord loop from the brass boss. Remove the three bolts holding the box to the bracket and remove the single bolt adjacent to the connection spigots below chassis.

Replacing V.H.F. Tuning Drive

In the event of breakage of either cord or cores, the complete assembly should be obtained and fitted as described.



View of v.h.f tuner unit with screening cover removed.

Remove front side of v.h.f. box by removing the seven retaining screws. Set tuning capacitor to minimum to ease tension on the return spring in the box when the cord is fitted. Thread assembly of tuning cores through coil formers and hook spring to its anchorage.

Take one turn in a clockwise direction round capacitor spindle and slip loop in cord over the brass boss. If necessary, reset pivoted adjuster as laid down in the v.h.f. alignment procedure.