Radiolas 251 and 303

ELECTRICAL SPECIFICATIONS.

Voltage Rating	190-260 Volts
Frequency Rating	40-60 Cycles
Power Consumption	90 Watts
Tuning Ranges	(a) 1500-550 Kilocycles (b) 19-50 Metres
Intermediate Frequency	460 K.C.
Loudspeaker	Type D42
Loudspeaker Field Coil Resistance	1000 ohms.
Loudspeaker Audio Transformer	Type TA14Y

VALVES AND CIRCUITS.

6K7 R.F. Amplifier.
6A8 Detector-oscillator.
6K7 I.F. Amplifier.
6H6 Detector and A.V.C.
6F5 Audio Amplifier.
Two 6F6's Class A Pentodes.
80 Rectifier.
6E5 Tuning Indicator.

GENERAL CIRCUIT DESCRIPTION.

The Radiola 251 is an eight-valve "World Range" A.C. operated superheterodyne receiver incorporating such features as metal envelope valves, 6F6 output pentodes in Class "A" push pull, and a 6E5 "Visual Tuning Indicator".

Two distinct tuning ranges, using two separate sets of tuning coils, selected by a two position range switch, are used by this instrument.

(1) 1500-550 kilocycles (200-550 meters), which is the standard medium wave broadcasting band.

(2) 19-50 meters, which covers four short wave broadcasting bands.

The signal from the aerial enters the receiver, through the aerial isolating condenser (C-1), and after step-up by the aerial coil (T-1 or T-2) it is applied to the control grid of the 6K7 R.F. amplifier. The secondary of the aerial coil is tuned by the rear unit of the variable condenser (C-7). The signal is amplified by the 6K7 and is applied to the control grid of the 6A8 converter by the secondary of the R.F. coil (T-3 or T-4) which is tuned by the middle unit of the variable condenser (C-14). The oscillator elements of the 6A8 converter generate a local oscillator signal, which is always 460 K.C. higher in frequency than the R.F. signal. The oscillator coils (T-5 and T-6), and padding condensers (C-19—C20 and C-22) have been designed in conjunction with the variable condenser (C-29) to maintain this frequency difference throughout the tuning ranges of the receiver.

The I.F. signal, produced by the combining of the R.F. and local oscillator signals, appears in the plate circuit of the 6A8. The intermediate frequency stage is coupled to the 6A8 converter (input) and to the 6H6 second detector (output) by means of two I.F. transformers (T-7 and T-8). These transformers are adjusted to resonate at 460 K.C. by trimmer

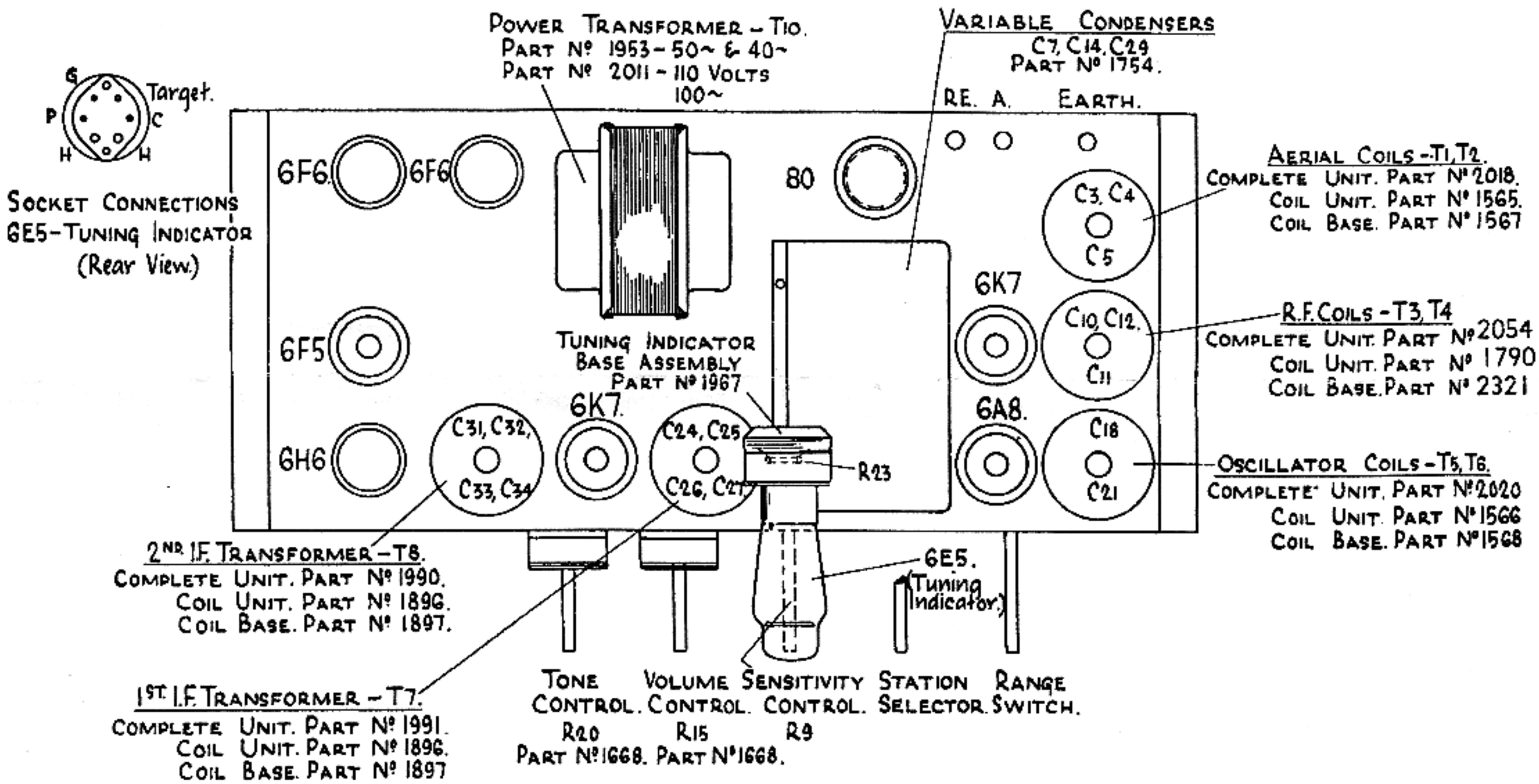


Fig. 40.—Layout diagram (top view), (251).

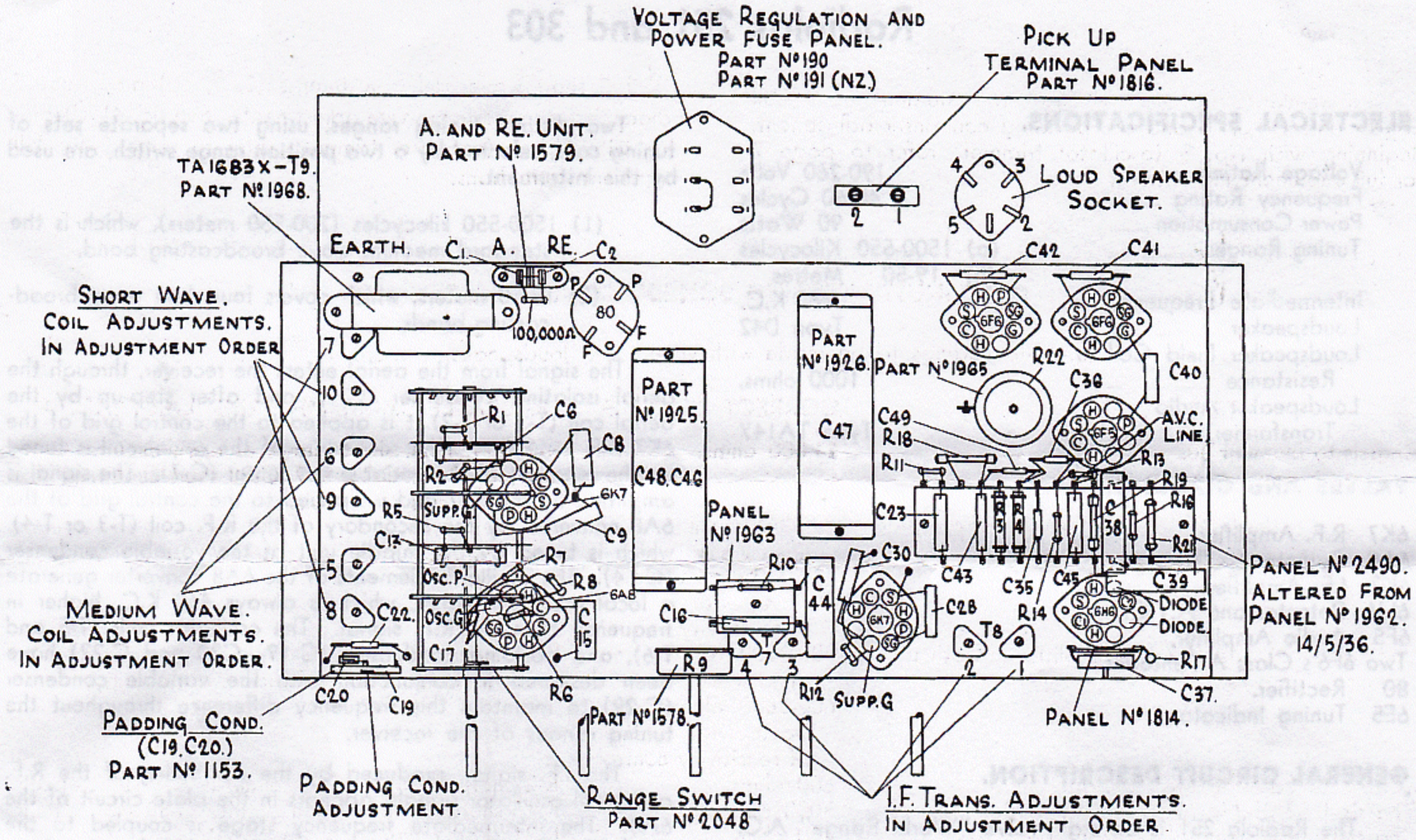


Fig. 41.—Layout diagram (underneath view), (251).

condensers across both their primary and secondary windings. The output of the I.F. stage is applied by the secondary of the second I.F. transformer (T-8) to the diodes of the 6H6 second detector where it is rectified across resistors R-14 and R-15.

An audio signal is developed in the diode circuit of the 6H6 across R-15, which has a dual function (diode load resistor and volume control), and as R-15 is a variable resistance control, the magnitude of the audio signal carried through its variable arm to the control grid of the 6F5 audio amplifier (via C-37) may be adjusted to the desired level. A D.C. voltage is produced in the diode circuit of the 6H6 (across R-14 and R-15) proportional to the incoming signal, and it is applied as a grid bias voltage to the control grid circuits of the 6K7 R.F. amplifier, 6A8 converter, and 6K7 I.F. amplifier for automatic volume control.

The output of the 6F5 is resistance-capacity coupled to two 6F6 output pentodes in Class "A" push-pull, where it is amplified again for reproduction by the loudspeaker; the necessary matching between the push-pull output stage and the loudspeaker being accomplished by the transformer T.A.14Y.

The voltage produced in the A.V.C. circuit is applied to the control arid of the 6E5 "Visual Tuning Indicator", and variations in this voltage are visible on a luminous screen within the indicator. The control voltage applied to the 6E5 is independent of the audio signal from the volume control, hence the receiver may be tuned-in visually, with the volume control in the minimum (anticlockwise) position.

The tone control circuit consists of a variable control (R-20) connected in series with a .01 mfd. paper condenser (C-43), between the plate of the 6F5 audio amplifier and earth.

NOTE.

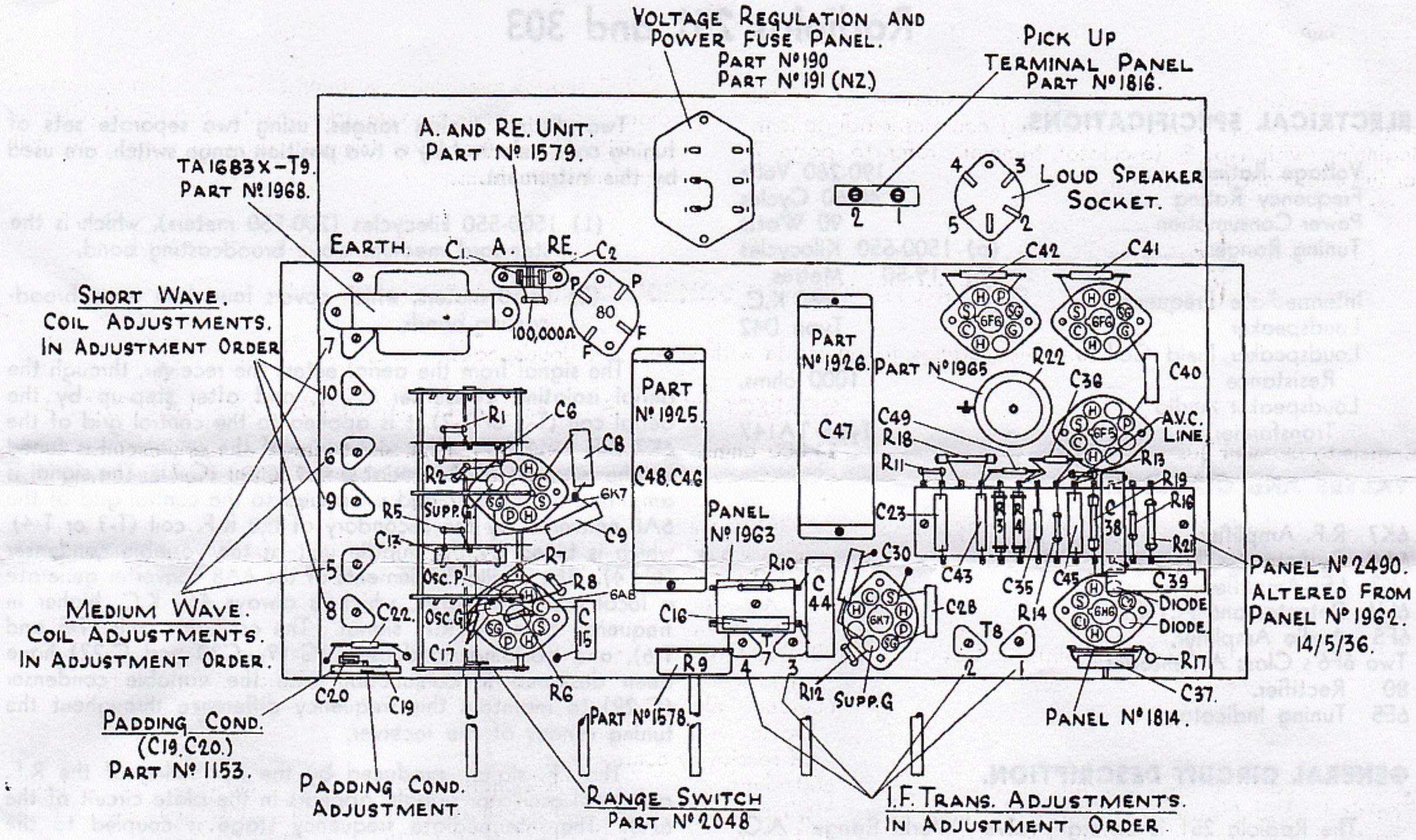
Radiola receivers of this model produced prior to 20.5.36 have the tone control connected between the control grids of the 6F6 output pentodes.

The sensitivity control (R-9) is a wire wound variable control connected in the cathode circuits of the 6A8 converter and the 6K7 I.F. amplifier. An additional resistor (R-8) is connected in this circuit by the range switch on medium waves; the short circuiting of this resistor on short waves boosts the sensitivity of the receiver.

The power unit consists of a transformer (T-10), an 80 valve rectifier, and a smoothing circuit incorporating the loudspeaker field winding (1000 ohms) in conjunction with two high capacity condensers (C-47 and C-48).

I.F. ALIGNMENT.

This receiver uses one stage of I.F. amplification, which includes two I.F. transformers. Four condensers align these transformers to resonance (460 K.C.), and the condenser adjustments are found beneath the chassis in their adjustment order—1, 2, 3, 4. See fig. 41. Full I.F. alignment instructions appear on page 6.



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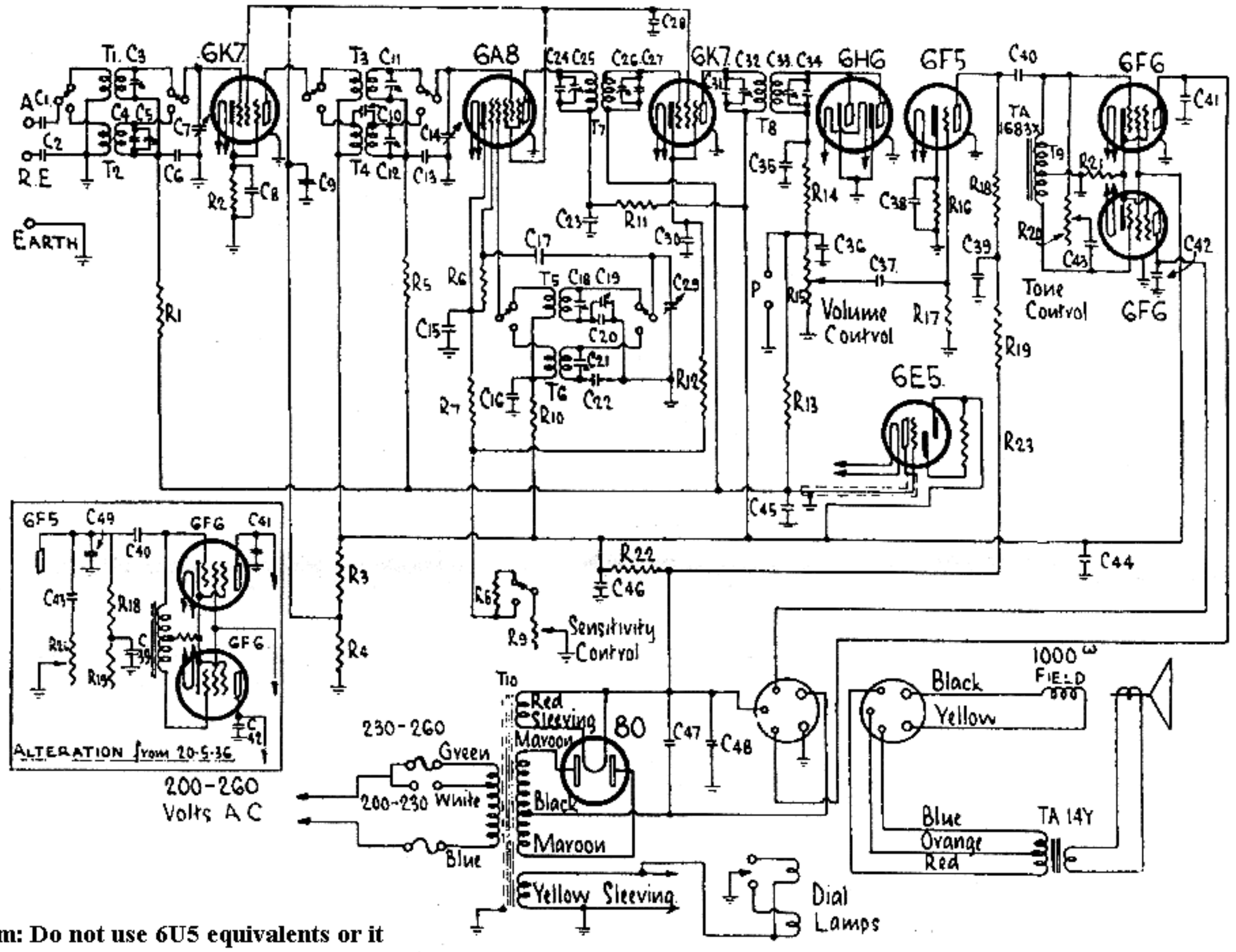
TEST BETWEEN.	CORRECT READING.	PROBABLE CAUSE OF IRREGULAR READING.
Filament 80 to plate oscillator section 6A8 converter in both positions of range switch.	22,000 ohms.	T-5 or T-6 primary open circuit. R-10, R-22 short circuit or open circuit. Range switch faulty.
Across filament 80.	Continuity.	T-10 filament winding open circuit. Wiring open circuit.
Across heaters 6A8 converter.	Continuity.	T-10 heater winding open circuit. Wiring open circuit.
Filament 80 to target contact of 6E5 tuning indicator (see fig. 40).	Continuity.	Wiring open circuit.
Filament 80 to plate 6E5 tuning indicator.	No reading (1 megohm).	R-23 short circuit or open circuit.
AVC line to No. 2 pick-up terminal (see fig. 41).	No reading. ($1\frac{3}{4}$ megohms.)	R-13 short circuit or open circuit.
AVC line to control grid clip 6K7 R.F. amplifier in both positions of range switch.	100,000 ohms.	T-1 or T-2 secondary open circuit. R-1 short circuit or open circuit. Range switch faulty.
AVC line to control grid clip 6K7 I.F. amplifier.	Continuity.	T-7 secondary open circuit.
AVC line to grid 6E5 tuning indicator.	Continuity.	Wiring open circuit.
AVC line to control grid clip 6A8 converter in both positions of range switch.	100,000 ohms.	T-3 or T-4 secondary open circuit. R-5 short circuit or open circuit. Range switch faulty.
Cathode 6A8 converter to grid oscillator section 6A8.	60,000 ohms.	R-6 short circuit or open circuit.
Diode plates 6H6 second detector to No. 2 pick-up terminal.	100,000 ohms.	R-14 short circuit or open circuit. T-8 secondary open circuit.
Fixed plates C-29 to coil end of padding condensers C-19 (C-20) and C-22 in both positions of range switch.	Continuity.	T-5 or T-6 secondary open circuit. Range switch faulty.
Across orange and black connections on aerial and radio earth unit in both positions of range swtich.	Continuity.	T-1 or T-2 primary open circuit.
Aerial terminal to radio earth terminal.	100,000 ohms.	100,000 ohms resistor short circuit or open circuit.
No. 4 loudspeaker socket (see fig. 41) to each plate 80 separately.	300 ohms.	T-10 secondary open circuit. Wiring open circuit.
Across power cable.	Continuity.	Power transformer T-10 primary open circuit. Power cable open circuit. Power fuse open circuit.
Orange wire to red and blue wires separately, of loudspeaker cable.	335-350 ohms (approx.).	T.A.14Y primary open circuit (loudspeaker transformer).
Yellow wire to black wire loudspeaker cable.	1000 ohms.	Loudspeaker field short circuit or open circuit.

SOCKET VOLTAGES.

Valve.	Chassis to Cathode (C) Volts	Chassis to Screen Grid (SG) Volts	Chassis to Plate (P) Volts	Plate Current M.A.	Heater Volts
6K7 R.F. Amplifier	3.0	100	225	6.0	6.3
6A8 Converter M.W.	6.0	100	225	3.0	6.3
S.W.	3.0	100	225	4.0	—
,, Oscillator	—	—	170	2.5	—
6K7 I.F. Amplifier					
M.W.	6.0	100	225	4.0	6.3
S.W.	3.0	100	225	6.0	—
6F5 Audio	2.0	—	100*	0.6	6.3
Each 6F6 Pentode	20	225	280	30.0	6.3
6E5 (Tuning Indicator)	0	—	225	1.0	6.3
80 Rectifier	720/360 volts 100 M.A. total current				5.0

* Cannot be measured accurately with ordinary voltmeter. Measured at 420 volts A.C. supply. No signal input. Controls in maximum clockwise position. D.C. voltmeter used as suggested on page 3.



Addendum: Do not use 6U5 equivalents or it it is less sensitive and the bias is different

Code.	Part. No.	COILS.
T1	1567	Aerial Coil 200-550 Metres
T2	1567	Aerial Coil 19-50 Metres
T3	1756	R.F. Coil 200-550 Metres
T4	1756	R.F. Coil 19-50 Metres
T5	1568	Osc. Coil 200-550 Metres
T6	1568	Osc. Coil 19-50 Metres
T7	1990	1st I.F. Transformer
T8	1991	2nd I.F. Transformer
T9	1968	Audio Choke TA1683X
T10	1953	Power Transformer
	2011	" " 110 volts

Code.	Part. No.	RESISTORS.
R1		100,000 ohms, ½ watt
R2		600 ohms, ½ watt
R3		11,000 ohms, 3 watt
R4		11,000 ohms, 3 watt
R5		100,000 ohms, ½ watt
R6		60,000 ohms, ½ watt
R7		300 ohms, ½ watt
R8		300 ohms, ½ watt
R9	1578	3,000 ohms, Sensitivity Con.
R10		20,000 ohms, ½ watt
R11		300 ohms, ½ watt
R12		600 ohms, ½ watt
R13		1¾ megohms, ½ watt
R14		100,000 ohms, ½ watt
R15	1668	300,000 ohms, Vol. Cont.
R16		3,000 ohms, ½ watt

Code	Part. No.	CONDENSERS.
C1		500 mmf. Mica Cond.
C2		500 mmf. Mica Cond.
C3		5-20 mmf. Mica Trimmer
C4		10 mmf. Mica Cond.
C5		5-20 mmf. Mica Trimmer
C6		.05 mf. Paper Cond.
C7	1754	Variable Condenser
C8		.1 mf. Paper Condenser
C9		.1 mf. Paper Condenser
C10		10 mmf. Mica Condenser
C11		5-20 mmf. Mica Trimmer
C12		5-20 mmf. Mica Trimmer
C13		.05 mf. Paper Cond.
C14	1754	Variable Condenser
C15		.1 mf. Paper Cond.
C16		.05 mf. Paper Cond.
C17		50 mmf. Mica Cond.
C18		5-20 mmf. Mica Trimmer
C19	1153	10-50 mmf. Mica Trimmer
C20	1153	390 mmf. Padding Cond.
C21		5-20 mmf. Mica Trimmer
C22		2800 mmf. Padding Cond.
C23		.1 mf. Paper Cond.
C24		50 mmf. Mica Cond.
C25		10-50 mmf. Mica Trimmer
C26		10-50 mmf. Mica Trimmer
C27		50 mmf. Mica Condenser
C28		.1 mf. Paper Cond.
C29	1754	Variable Condenser

Code.	Part. No.	CONDENSERS.
C30		.1 mf. Paper Cond.
C31		50 mmf. Mica Cond.
C32		10-50 mmf. Mica Trimmer
C33		10-50 mmf. Mica Trimmer
C34		50 mmf. Mica Cond.
C35		100 mmf. Mica Cond.
C36		100 mmf. Mica Cond.
C37		.05 mf. Paper Cond.
C38		5 mf. 25 V. Elect. Cond.
C39		.5 mf. Paper Cond.
C40		.05 mf. Paper Cond.
C41		.005 mf. Paper Cond.
C42		.005 mf. Paper Cond.
C43		.01 mf. Paper Cond.
C44		.5 mf. Paper Cond.
C45		.05 mf. Paper Cond.
C46		8 mf. 500 V. Elect. Cond.
C47	1926	16 mf. 500 V. Elect. Cond.
C48	1925	8 mf. 500 V. Elect. Cond.

Code.	Part. No.	RESISTORS.
R17		½ megohm, ½ watt
R18		250,000 ohms, 1 watt
R19		25,000 ohms, 1 watt
R20	1668	300,000 ohms, Tone Cont.
R21		400 ohms, 1 watt
R22	1965	2,000 ohms, Wire Wound
R23		1 megohm, ½ watt

Fig. 42.—Circuit data (251).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JAPAN
ROME MOSCOW LONDON PARIS
FIJI
BERLIN U.S.A. LONDON PARIS
M 50 45 40 35 30 25 20 M
AUSTRALASIAN STATIONS
QLD
TAS.
VIC.
SA. WA.
NSW
N.Z.
KC. 550 600 700 800 900 1000 1200 1500 KC.
6H6


MADE IN
AUSTRALIA
EARTH
PHILIPS
9497