

TECHNICAL INFORMATION AND SERVICE DATA

MANUFACTURERS



SUPERVISED SERVICE

A.W.A. Transistor Car Radios Models 964A, 965A and 966A

These correspond to the Ford Falcon Radio Models
ARCODF-18805-A, ARCODF-18805-B and
ARCODF-18805-C respectively.

ISSUED BY
AMALGAMATED WIRELESS (AUSTRALASIA) LTD.

WARNING: These receivers are for 12 volt negative earth operation only. Connection of wrong polarity will cause damage to the receiver.

GENERAL DESCRIPTION

Model 964A is four valve and three transistor, press button permeability tuned car radio incorporating push-pull output stage.

Model 965A is a four valve and two transistor, press-button permeability tuned car radio.

Model 966A is a four valve and two transistor manual permeability tuned car radio.
All models are superheterodynes designed for the reception of the Medium Wave Band and operating directly from a 12 volt battery without a vibrator high voltage supply.

Features of design include:—

High gain i.f. transformers; permeability tuning unit with a high degree of electrical and mechanical stability; low drift oscillator circuit; transistor driver and output stages.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

Frequency Range 530-1650 Kc/s
(566-182 Metres)

Intermediate Frequency 455 Kc/s

Battery Voltage 12 volts

Battery Consumption 1.4 amps

Loudspeaker: 7" x 5" Permanent Magnet 21644

V/C Impedance 15 ohms at 400 c.p.s.

Loudspeaker Choke 38195A (965A)
38198 (966A)
50445 (964A)

Undistorted Power Output:

Model 964A 6 watts
Model 965A 3 watts
Model 966A 2 watts

Valves and Transistor Complement.

All Models:

Radiotron 12BL6 R.F. Amplifier
Radiotron 12AD6 Converter
Radiotron 12BL6 I.F. Amplifier
Radiotron 12FK6 Detector, A.V.C., Audio Amplifier

Models 965A, 966A:

AWV 2N591 Driver
AWV 2N301 Output

Model 964:

AWV 2N270 Driver
AWV 2N301 } Matched Pair
AWV 2N301 }

TWO SPEAKER OPERATION

The common practice of connecting a second speaker in parallel with the existing one can be tolerated in a receiver having a valve output stage.

Impedance matching is more important in a receiver having a transistor output stage and, in this case, any reduction in the correct loading of 15 ohms will result in considerable distortion.

If a second speaker is desired, it can be connected as shown in fig. 1, utilising a fader control.

For this purpose a special kit No. 34787 is available comprising a 6 inch 15 ohm speaker, baffle and fader control unit.

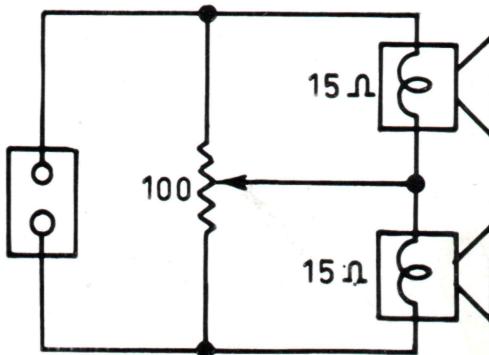


FIG. 1

SERVICE NOTES FOR TRANSISTOR RECEIVERS

General:

Whilst transistors, when used within the manufacturer's ratings, should give considerably longer life in service than vacuum tubes, the following precautions should be observed when servicing.

Transistors can be damaged when checking circuit continuity by the D.C. voltage present in an ohmmeter. To avoid damaging a transistor or getting a misleading resistance reading, the base and emitter leads to the transistor should be disconnected. However, an ohmmeter may be used with care to test a power transistor as described later.

The use of screwdrivers as a means of checking high tension is not only a waste of time but can permanently damage the transistors. Similarly the indiscriminate shorting to ground of the valve grids and particularly the output transistor base as a means of checking whether certain stages are operating will almost certainly have drastic results.

Get in the habit of using a good quality voltmeter and a signal tracer or generator with a series capacitor for all fault finding.

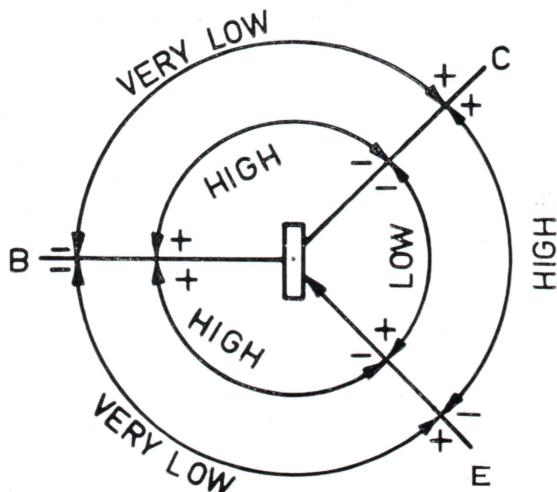
In general the transistors should be the last component to be suspected in a faulty receiver. However, if a receiver is faulty due to an open circuit speaker voice coil, then the power transistor should be checked for possible damage.

Power Transistor Test:

Power transistors can be readily checked for short or open circuit by carefully applying an ohmmeter check to determine the forward and reverse resistance of each junction as a diode.

An ohmmeter, either multimeter or vacuum tube type, having a small battery voltage of say 1.5 volts applied on the X1 range must be used. Check this with a voltmeter before using, as a higher voltage will cause damage. Also check the polarity of the meter leads in the ohmmeter position. Often this is the reverse of the polarity when used as a voltmeter or ammeter.

Fig. 2 shows the correct resistance readings between the junctions of the 2N301 power transistor with the + and - signs indicating the correct polarity of the applied ohmmeter leads. The base and emitter leads should be disconnected from a mounted transistor.



RESISTANCE DIAGRAM

FIG 2

Bias Adjustment for 965A, 966A:

Values for 966A in brackets thus [].

A variable control (R22) is provided to enable adjustment of the base — emitter bias voltage. This is set at the factory and should not need resetting unless a replacement transistor has been fitted. To set the bias, proceed as follows:

- (a) Connect a voltmeter capable of accurately measuring 0.5 volts [0.4 volts] across the emitter resistance choke (R24).
 - (b) Adjust the battery input voltage to exactly 12.0 volts with the receiver operating. Adjust the bias control until the voltmeter reads exactly 0.5 volts [0.4 volts].
or
 - (c) Connect an ammeter capable of accurately measuring 500 mA [400 mA] in the supply lead to the Output choke (L9).
 - (d) Adjust the battery input voltage to exactly 12.0 volts with the receiver operating.
 - (e) Adjust the bias control until the ammeter reads exactly 500 mA [400 mA].
- In either case this will set the transistor collector current at 500 mA [400 mA].

Bias on Model 964A

No adjustment of transistor bias is provided. Total collector current should be between 0.2 and 0.4 amps with 12 V supply and no signal input, rising to 0.8 amps at full output.

Transistor Mounting (Models 965A and 966A)

The transistor is thermally connected to, but electrically insulated from a heat sink mounted across the rear of the receiver.

If a transistor is removed from the heat sink or replaced for any reason, it is essential that the following method of mounting be carefully adopted.

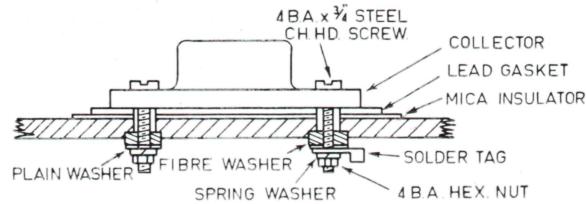


FIG 3

On no account must the old lead gasket and mica insulator be used again.

To mount the transistor, first liberally smear the relevant surfaces of the heat sink and the transistor, and both sides of the lead gasket and mica insulator with silicone grease. (MS4 silicone compound available in handy 8oz. tubes.)

Fit the fibre washers into the counter bored holes, place the mica insulator in position on the finned side followed by the lead gasket and finally the transistor.

Assemble the screws, plain washers, spring washers, solder tag and nuts as shown in fig. 3 and tighten the nuts progressively one at a time until the set is taken out of the spring washers.

Warning. Excessive tightening of these screws can distort the transistor base with the danger of rupture to the mica insulator.

Finally check with an ohmmeter the insulation between the collector (mounting flange) of the transistor and the heat sink (greater than 1 megohm).

Model 964A: Transistor mounting on Model 964 is the same as above except that self tapping screws are used to mount the transistor to a bakelite socket thus dispensing with the 4BA steel screws, nuts, spring washers and fibre washers.

ALIGNMENT PROCEDURE

Manufacturer's Setting of Adjustments:

The receiver is tested by the manufacturer with precision instruments and all adjusting screws, except the aerial trimmer, are sealed. Re-alignment should be necessary only when components in tuned circuits are repaired or replaced, or when it is found that the seals over the adjusting screws have been broken.

It is especially important that the adjustments should not be altered unless in association with the correct testing instruments listed below.

For all alignment operations connect the "low" side of the signal generator to the receiver chassis, and keep the generator output as low as possible to avoid A.V.C. action.

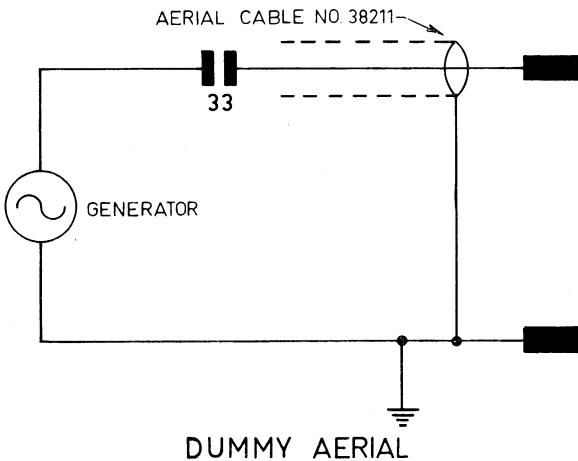
When the generator is connected to the aerial terminal, use the dummy aerial as shown in the diagram.

Testing Instruments:

- (1) A.W.A. Junior Signal Generator, Type 2R7003, or
- (2) A.W.A. Modulated Oscillator, Series J6726.

If the modulated oscillator is used, connect a 0.25 megohm non-inductive resistor across the output terminals.

- (3) A.W.A. Output Meter, type 2M8832 or
- (4) Marconi Receiver Tester, type TF888/3 (combined Signal Generator and Output Meter).



ALIGNMENT TABLE

NOTE: The replacement of any valve in the receiver will not affect the alignment of the tuned circuits in any way providing the recommended Radiotron type is used.

A General:

Alignment Order	Connect "High" side of Generator to:	Tune Generator to:	Tune Receiver to:	Adjust for maximum Peak Output:
1	12AD6 Pin 7*	455 Kc/s.	L.F. Limit	T2 Sec. Core (Top)
2	12AD6 Pin 7*	455 Kc/s.	L.F. Limit	T2 Prim. Core (Bottom)
3	12AD6 Pin 7*	455 Kc/s.	L.F. Limit	T1 Sec. Core (Top)
4	12AD6 Pin 7*	455 Kc/s.	L.F. Limit	T1 Prim. Core (Bottom)
Repeat the above adjustments until maximum output is obtained.				
5	Aerial Terminal via Dummy Aerial.	1650 Kc/s. (accurate)	H.F. Limit	H.F. Osc. Adj. (C10)
6	Aerial Terminal via Dummy Aerial.	1500 Kc/s.	1500 Kc/s.	H.F. R.F. Adj. (C6)
7	Aerial Terminal via Dummy Aerial.	1500 Kc/s.	1500 Kc/s.	H.F. Aer. Adj. (C1)
8	Aerial Terminal via Dummy Aerial.	600 Kc/s.	600 Kc/s.	L.F. Osc. Padder Adj. (L6) §
Repeat adjustments 5, 6, 7 and 8 until no further adjustment is possible.				
9	Calibration Alignment: With the receiver connected to an aerial, the dial scale calibration should now be checked and corrected if necessary. The pointer can be moved relative to the dial scale by turning the eccentric stud located underneath the rear end of the pointer arm.			

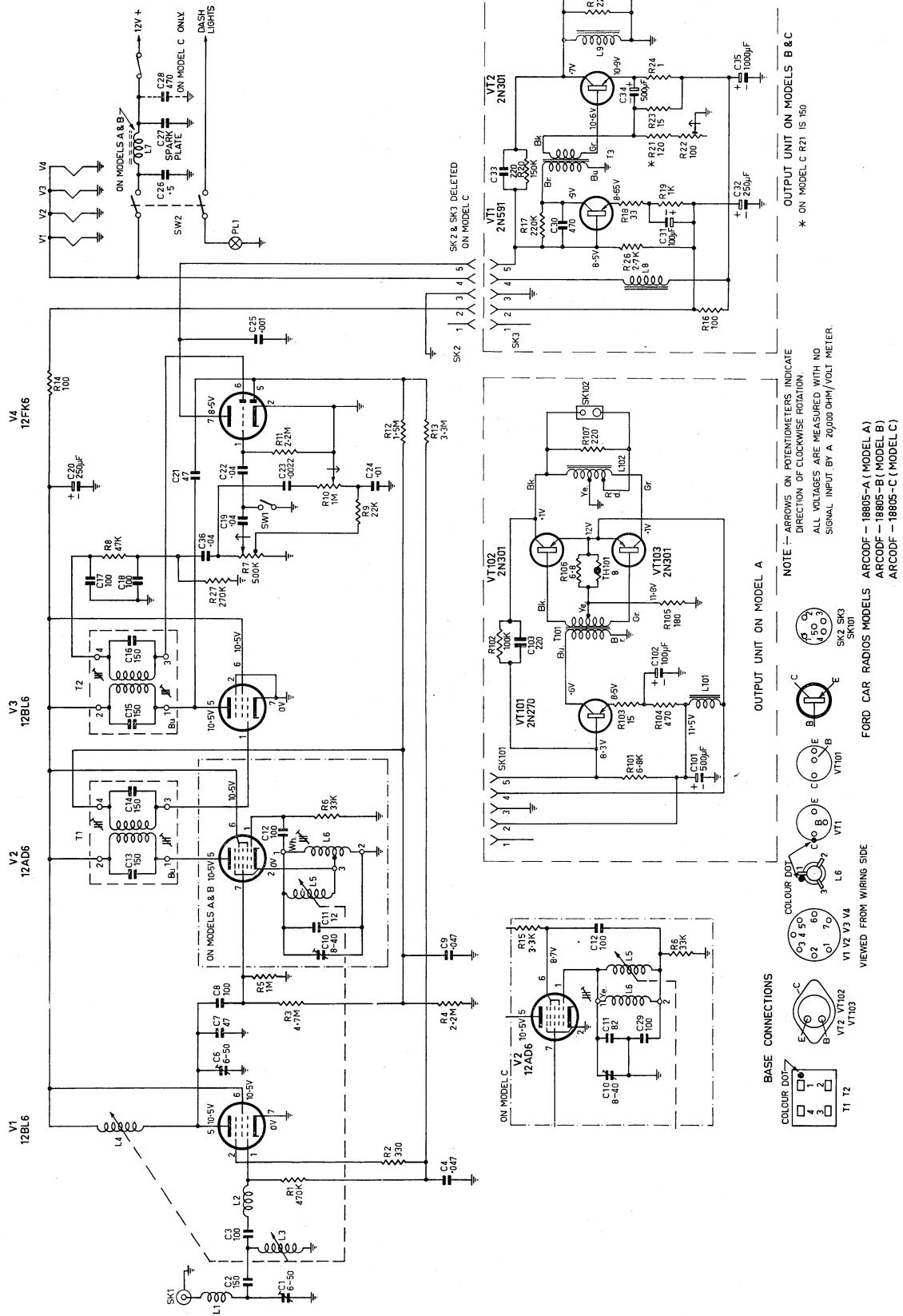
* A 0.01 μ F capacitor should be connected in series with the high side of the test instrument.

§ Rock the tuning control back and forth through the signal.

B. Tuner Alignment:

The adjustment of the three tuning cores will be necessary only if a tuning core or coil has been replaced. To make this adjustment proceed as follows:

- (1) Adjust the manual drive control until a 0.560" gauge can be slipped into the left rear slot in front of the carriage lug. Use the 0.560" gauge in the manner of a feeler gauge.
- (2) Tune the signal generator accurately to 1000 Kc/s. and connect it to the aerial terminal via the dummy aerial.
- (3) Adjust the oscillator core, then the aerial and R.F. cores until the maximum output is obtained.
- (4) Proceed with adjustments 5, 6 and 7 in Table "A" and then repeat adjustment 3 above, if necessary.
- (5) Seal the tuning core studs.



CIRCUIT CODE — CAR RADIOS — MODELS 964, 965, 966

Code No.	DESCRIPTION	Part No.	Fig. No.	Location	Fig. No.	Location	Part No.	Fig. No.	Location	Fig. No.	Location	Fig. No.	Location	
R1	470K ohms	617356	5	E7	7	D5	C19	0.04uf ± 20%	200VW	Hunts W99	P8	K4		
R2	330 ohms	605960	5	E7	7	E5	C20	250uf 18VW	Electrolytic			E5		
R3	4.7 Megohms	618936	5	L7	6	H5	C21	47pf ± 5%	N750	Tubular		P6		
R4	2.2 Megohms	618484	5	M7	6	G5	C22	0.0042uf ± 20%	200VW	Hunts W99 (964-965)		B9		
R5	1 Megohm	618016	5	L8	6	K5	C23	0.01uf ± 20%	400VW	Paper		C10		
R6	33K ohms	614455	5	J5	6	K5	C24	0.001uf ± 20%	200VW	Hunts W99		N13		
R7	500K ohms	37749	5	N12	6	K5	C25	0.001uf ± 20%	K2000	Disc		N10		
R8	47K ohms	337012	5	N7	6	F5	C26	0.5uf ± 20%	200VW	Hunts W48		C6		
R9	22K ohms	613646	5	N12	6	C9	C27	Spark	4.0pf ± 20%	K1200	Disc (966)		B7	
R10	1 Megohm	377249	5	N13	6	C11	C28	4.0pf ± 20%	NPO	Tubular (966)		K5		
R11	2.2 Megohms	618484	5	N10	6	B6	C29	100pf ± 5%	K1200	Tubular (965-966)		D5		
R12	1.5 Megohms	618258	5	M8	6	F5	C30	4.0pf ± 20%	K1200	Tubular (965-966)		G5		
R13	3.3 Megohms	618710	5	M8	6	F5	C31	100uf 3VW	Electrolytic (965-966)		229703	4		
R14	100 ohms	604031	4	F3	6	H5	C32	250uf 18VW	Electrolytic (965-966)		226818	4		
R15	3.3K ohms	610304	5	K6	8	B6	C33	220pf ± 10%	500VW	Mica (965-966)		G4		
R16	100 ohms	604031	4	F4	8	G8	C34	500uf 3VW	Electrolytic (965-966)		229854	4		
R17	220K ohms	616212	5	D5	8	F6	C35	1000uf 18VW	Electrolytic (965-966)		229905	4		
R18	33 ohms	602522	5	F6	8	K7	C36	0.04uf ± 20%	200VW	Hunts W99		M9		
R19	1K ohm	608022	5	G5	8	K8	C101	500uf 18VW	Electrolytic		229853	8		
R20	150K ohms	616426	4	G4	8	F5	C102	100uf 18VW	Electrolytic		229708	8		
R21	120 ohms	604362	5	G3	8	F5	C103	220pf ± 10%	500VW	Mica	226818	8		
R22	150 ohms	600665	5	G3	8	C3	L1	Aerial Choke			N6			
R23	100 ohms W.W. Bios Adjustment	388383	5	H3	8	C8	L2	R.F. Choke			C5			
R24	15 ohms	602008	4	G5	8	F6	L3	Tuning Coil, Aerial			J12			
R25	1 ohm	50% W.W. (965-966)	2065234	4	E3	8	B5	L4	Tuning Coil, R.F. Assembly			G2		
R26	220 ohms	605553	4	M4	8	M3	L5	Tuning Coil, Osc.			H12			
R27	2.7K ohms	601260	4	E4	8	E4	L6	Oscillator Padder Coil (964-965)			K3			
R28	270K ohms	616954	5	M7	6	C8	L7	Choke (964-965)			35471	5		
R29	6.8K ohms	601362	8	E13	8	G14	L8	Choke (965-966)			34337	5		
R30	100K ohms	618009	8	E14	8	G14	L9	Output Choke (965)			38133A	5		
R31	15 ohms	602008	8	E14	8	G14	L10	Output Choke (966)			38195A	4		
R32	470 ohms	606588	8	E16	8	E16	L101	Choke			38198	4		
R33	180 ohms	604911	8	D15	8	D15	L102	Output Choke			50448	8		
R34	6.8 ohms	610006	8	M11	8	M11					50445	8		
R35	220 ohms	6055253	8											
C1	6-50pf Trimmer (Aerial)	35130	4	M8	6	M3	T1	1st I.F. Transformer			L6			
C2	150pf ± 5% 500VW Mica	22296	4	M8	6	C5	T2	2nd I.F. Transformer			N7			
C3	100pf ± 20% 600VW Styroseal	22225	5	D8	7	B5	T3	Coupling Transformer (965)			K5			
C4	0.047uf ± 20% 200VW Paper	226834	5	M9	7	L5	T101	Coupling Transformer (966)			E3			
C5	Not used											K14		
C6	6-50pf Trimmer (R.F.)	35130	4	F10	7	G2								
C7	47pf ± 5% N750 Tubular	220554	5	E6	6	K3	V1	Radiotron 12BL6			D7			
C8	100pf ± 20% 600VW Styroseal	222225	5	K8	7	G4	V2	Radiotron 12AD6			L7			
C9	0.047uf ± 20% 200VW Paper	226834	5	L5	7	J4	V3	Radiotron 12BL6			N6			
C10	8-40pf Trimmer (Osc.)	231185	5	H6	7	H3	V4	Radiotron 12FK6			N9			
C11	12pf ± 5% N1500 Disc (964-965)	220559	5	K4	6	K4	VT1	AWV 2N591			F5			
C12	100pf ± 20% 600VW Styroseal	222128	5	K8	6	K5	VT2	AWV 2N301			4			
C13	150pf ± 5% Silvered Mica	226618	(in T1)				VT101	AWV 2N270			H16			
C14	150pf ± 5% Silvered Mica	226618	(in T1)				VT102	AWV 2N301			J3			
C15	150pf ± 5% Silvered Mica	226618	(in T2)				VT103	AWV 2N301			G15			
C16	150pf ± 5% Silvered Mica	226618	(in T2)								H6			
C17	100pf Hi-K Ceramic (in Filter Unit)	337012	5	N7	6	D6					D15			
C18	100pf Hi-K Ceramic (in Filter Unit)	337012	5	N7	6	D6					LS1	8		

I 2 3 4 5 6 7 8 9 10 II 12 13 14 15 16 17 18

A B C D E F G H J K L M N P Q

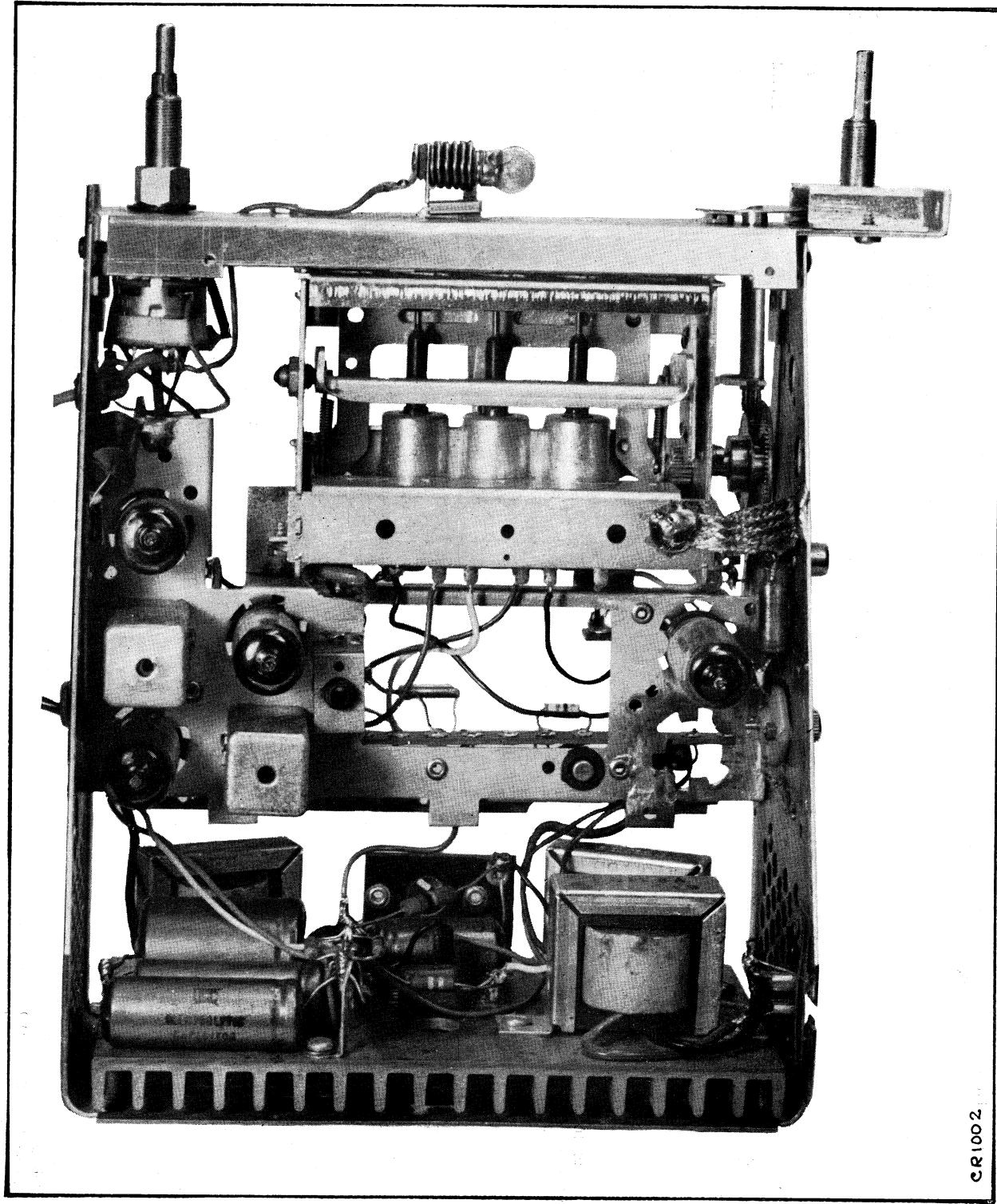


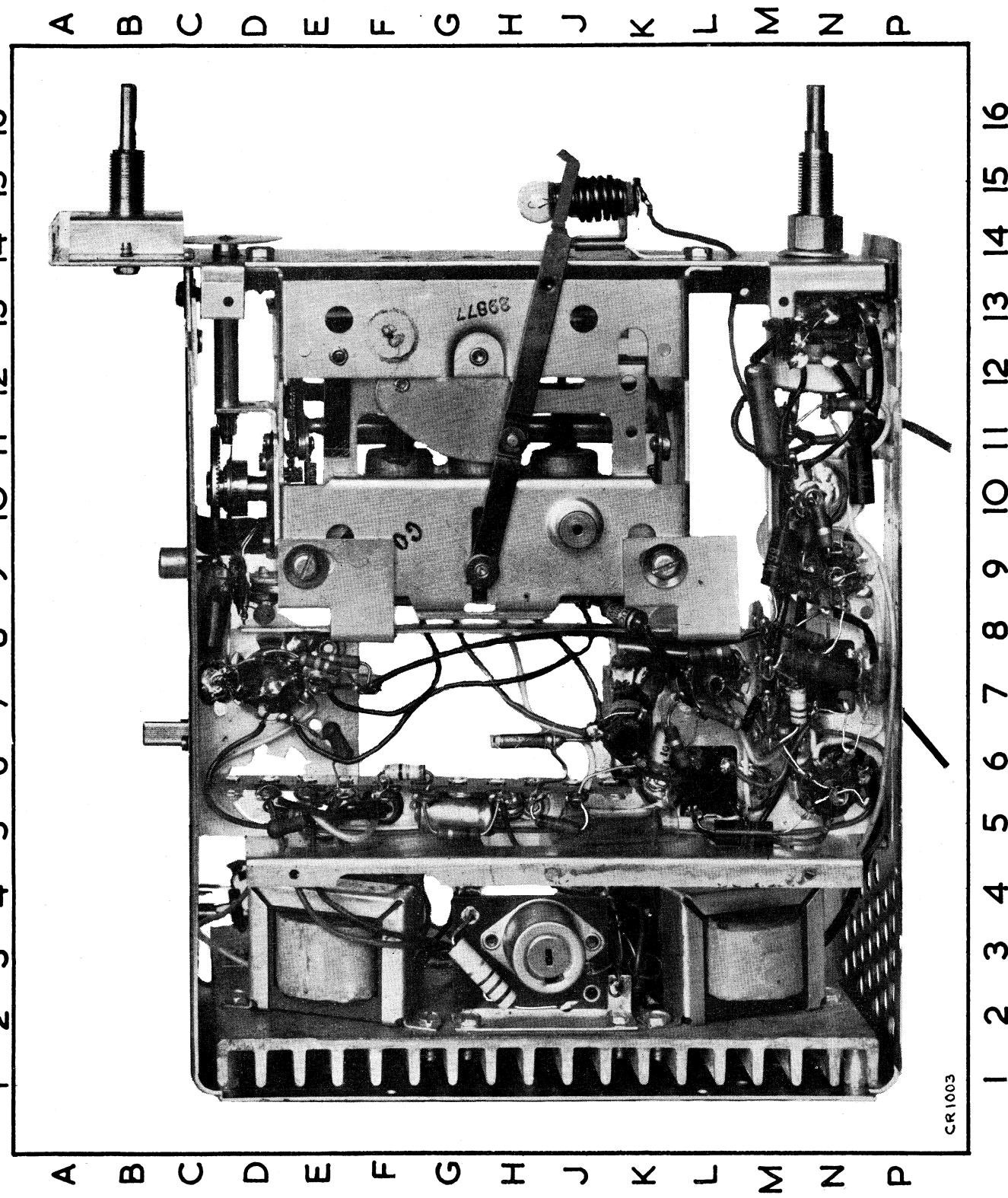
FIG. 4

I 2 3 4 5 6 7 8 9 10 II 12 13 14 15 16 17 18

A B C D E F G H J K L M N P Q

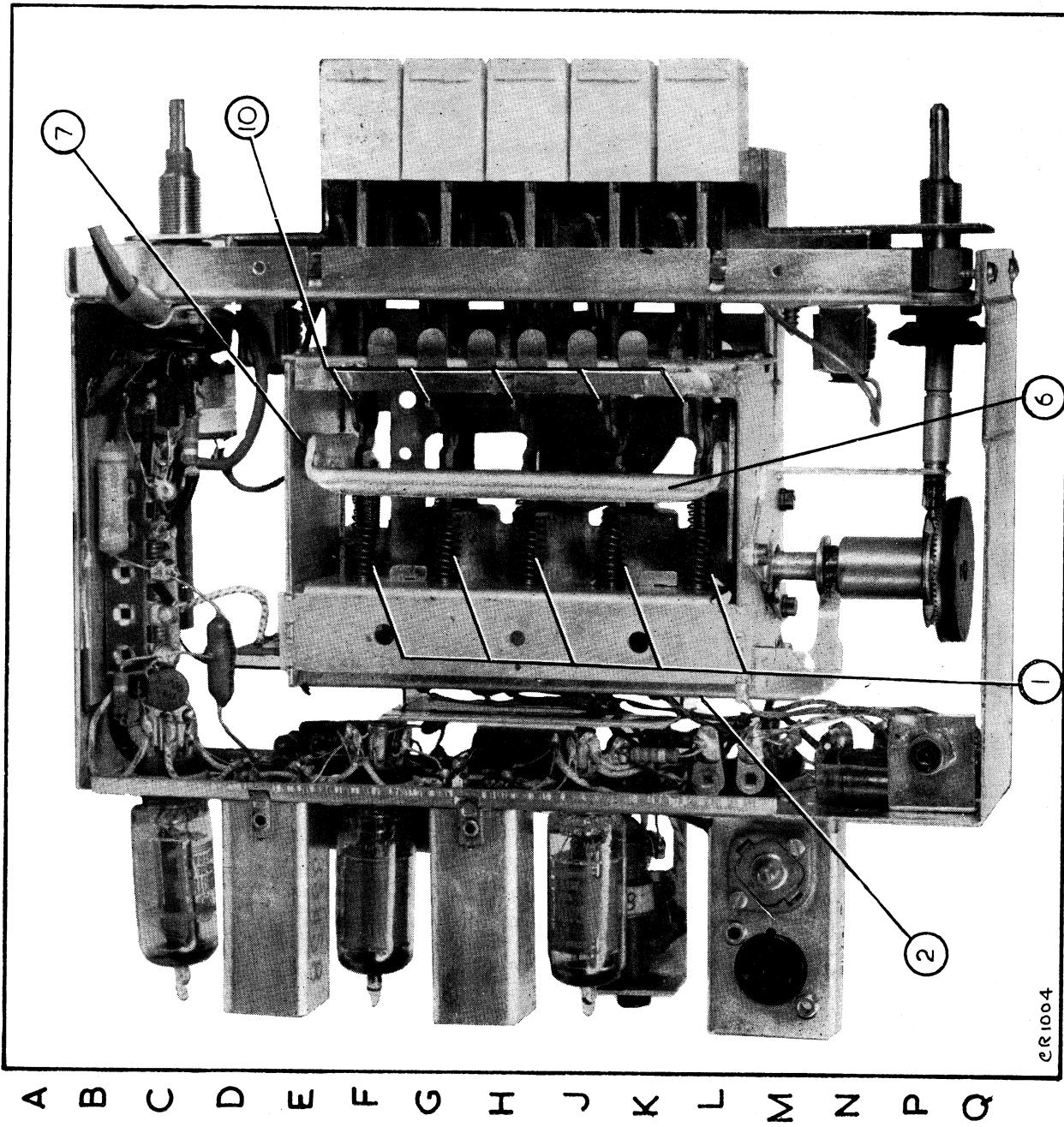
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FIG. 5



I 2 3 4 5 6 7 8 9 10 11 12 13 14 15

A B C D E F G H J K L M N P Q

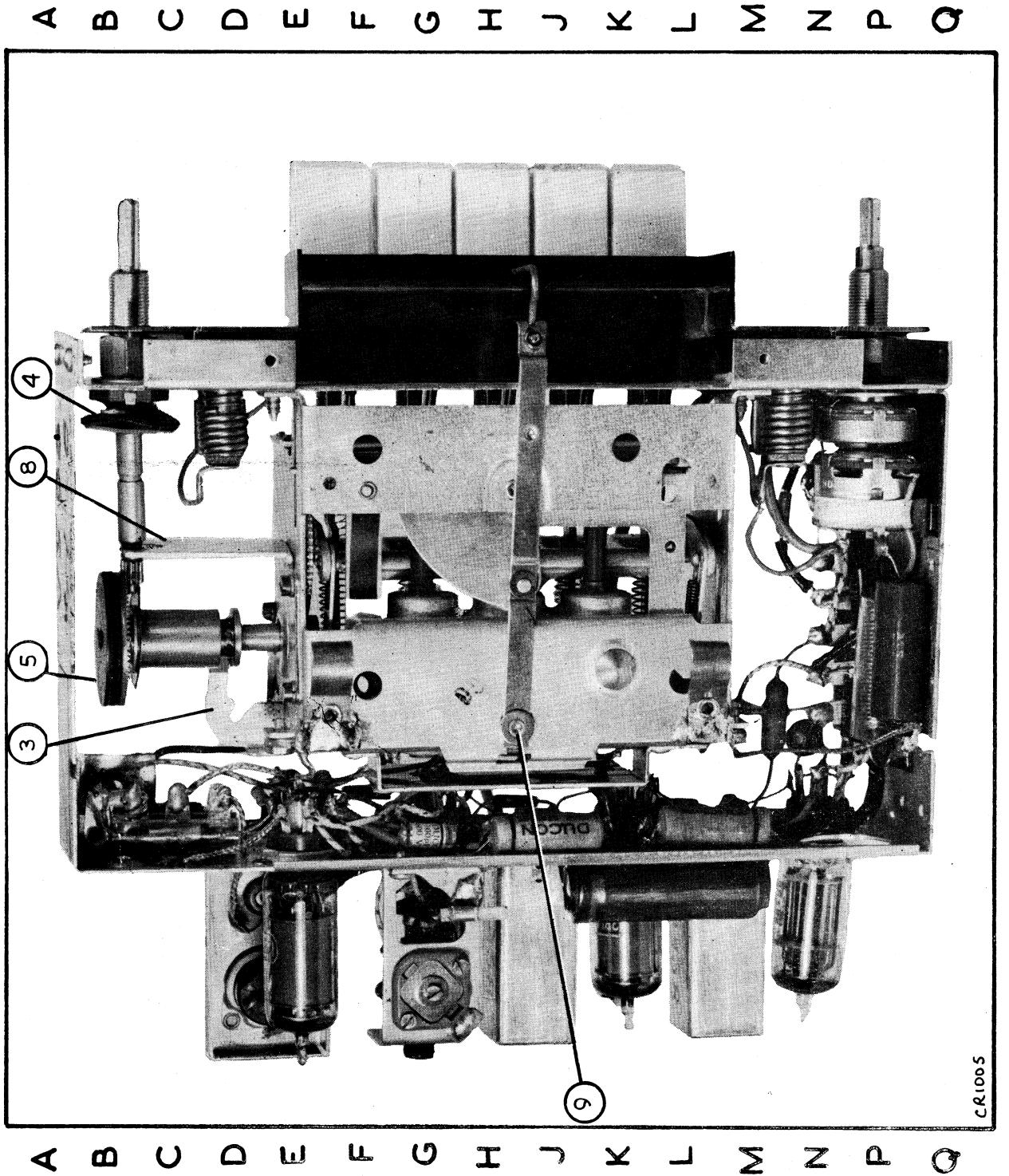


I 2 3 4 5 6 7 8 9 10 11 12 13 14 15

FIG. 6

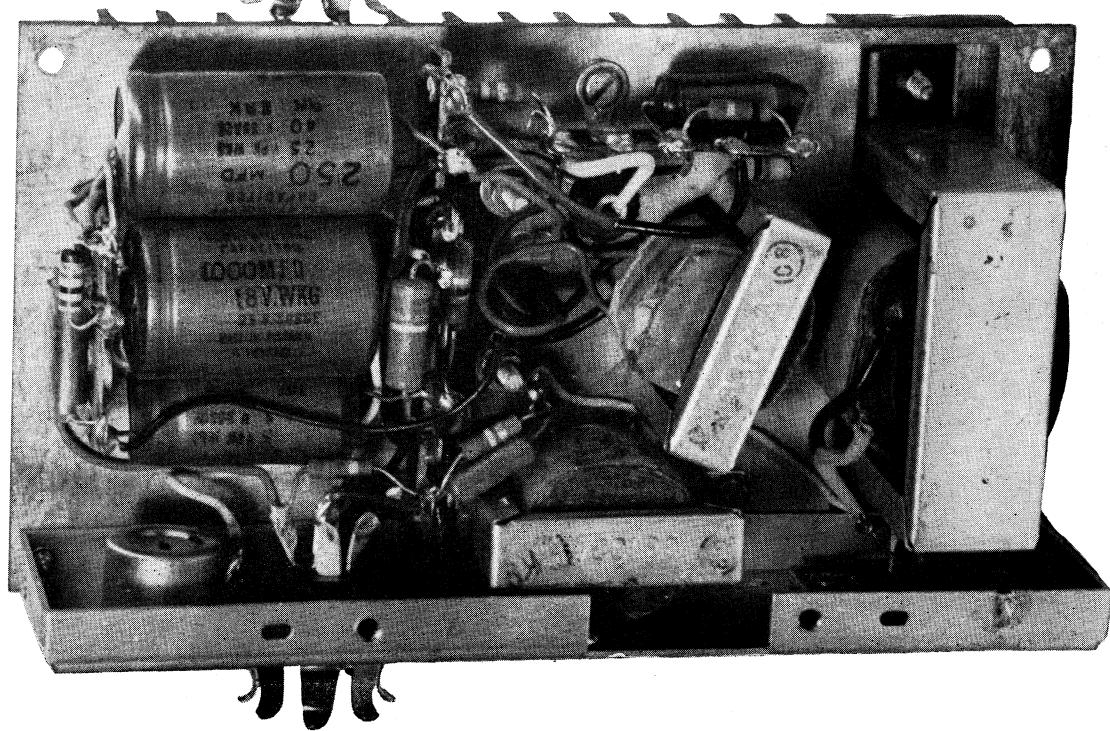
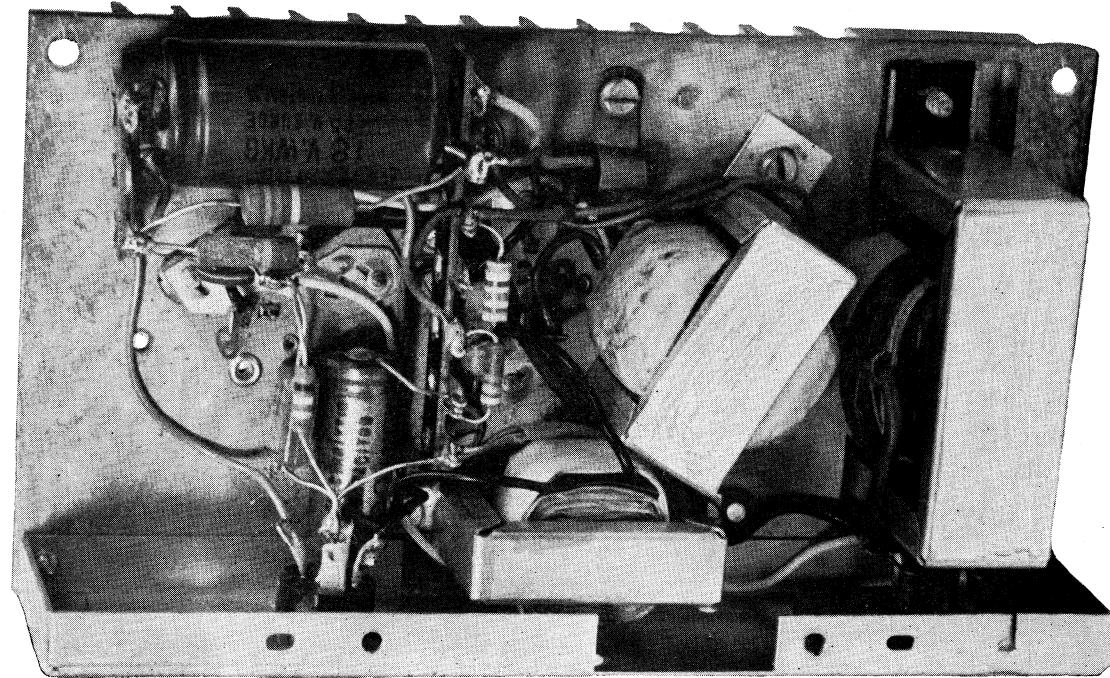
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FIG. 7



I 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

A B C D E F G H J K L M N P



A B C D E F G H J K L M N P

FIG. 8

c&ion6

I 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

PUSH BUTTON TUNER ASSEMBLY

Possible faults and adjustment procedure (Refer to Figs. 6 and 7)

Fault	Cause	Remedy
Manual Drive slipping.	1. Lack of clearance between slide (1) and clutch gate (2). 2. Loose riveting of universal coupling (4) or clutch plate (5) to Pinion shaft.	Bend tang (3) of clutch gate outwards to give minimum clearance of .010" on all slides. Avoid bending too far as this will result in clutch not disengaging when button is depressed. Replace manual drive shaft assembly. Replace clutch assembly.
Station is detuned when locking button.	Paddle plate (6) loose.	Loosen locknut and tighten adjusting screw (7). Retighten locknut.
Button sticking in.	1. Insufficient clearance of manual drive shaft in forked bracket (8). 2. Button or slide touching light shield or front moulding.	Adjust by bending bracket slightly to widen the slot. Loosen nuts behind the knobs, move the shield or moulding to give clearance and retighten the nuts.
Backlash in manual drive.	Excessive clearance of manual drive shaft in forked bracket.	Bend the bracket to reduce the clearance in the slot.
Pointer sticking or jumpy.	1. Pointer arm touching the case. 2. Pointer touching dial diffusion plate. 3. Adjusting stud (9) at rear of pointer arm binding in slot in tuner frame.	Adjust by bending the pointer arm slightly. Replace tuner.
Station setting moves after button is used a few times.	Cam (10) on slide (1) not locking securely.	Replace tuner. It is not possible to repair in the field.

D.C. RESISTANCE OF WINDINGS

Winding	D.C. Resistance in ohms
Aerial Choke L1	1
R.F. Choke L2	1
Tuning Coils L3, L4 and L5	9
Oscillator Padder Coil L6	19
Choke L7	*
Choke L8	*
Output Choke L9	1.3
Choke L101	*
Output Choke L102	*
I.F. Transformer Windings T1 and T2	16
Coupling Transformer T3:	
Primary	550
Secondary	1.8
Driver Transformer T101:	
Primary	100
Secondary	4.7

* Less than 1 ohm.

The above readings were taken on a standard chassis, but substitution of materials during manufacture may cause variations and it should not be assumed that a component is faulty if a slightly different reading is obtained.

MECHANICAL REPLACEMENT PARTS

Tuning Unit:

Crown Gear and Spindle Ass'y (966A)	39881
Crown Gear Bush Ass'y (964A, 965A)	39379
Coil and Shield Ass'y	38585
Knobs, Press Button (964A, 965A)	34320
Manual Drive Bracket (964A, 965A)	39360
Pointer Arm (964A, 965A)	39366
Pointer Arm (966A)	39899
Pointer	39351
Slug Tuning	35102
Spindle Ass'y Drive (964A, 965A)	39368
Spindle Ass'y Drive (966A)	39888
Spindle Ass'y Driver (966A)	39885
Switch Ass'y Muting (964A, 965A)	35101
Tuner Ass'y (964A, 965A)	39358
Tuner Ass'y (966A)	39877

Chassis:

Dial Backing (966A)	39896
Dial Lamp Lead Ass'y	50617
Gasket Lead, Transistor Mounting	38569
Gasket Mica, Transistor Mounting	38568
Interconnecting Screened Cable (964A, 965A)	38780
Power Cable	50613
Shield, Light (964A, 965A)	39359
Socket, Aerial	793249
Socket, 7 Pin	794577
Socket, 5 Pin	794563
Socket, Transistor (964A)	793276

Miscellaneous:

Cable Ass'y Aerial	38211
Escutcheon Ass'y (964A, 965A)	39354
Escutcheon Ass'y (966A)	39774
Knob, Small Concentric	39350
Knob Ass'y, Tone	39353
Knob Ass'y, Tuning	39352

Aerial, Top Cowl:

Aerial Ass'y	39773
Bush Insulator	27660
Earth Connector	27674
Gasket, Shallow	24584
Insulator, Stand-off	25338
Stud Ass'y	27695
Telescopic Ass'y	27650
Washer, Bakelite	27699