MANUFACTURERS AWA SUPERVISED SERVICE

A.W.A.

TRANSISTOR CAR RADIOS

MODELS 976A, 977A.

These models correspond to Ford Part No's XL-18805-B and XL-18805-C, used in the Ford Falcon

GENERAL DESCRIPTION

Model 976-A is a four valve and two transistor, press button permeability tuned superheterodyne car radio.
Model 977-A is a four valve and two transistor, manually tuned superheterodyne car radio.

ELECTRICAL AND MECHANICAL SPECIFICATION

Frequency Range .. 525-1650 Kc/s (570-182 metres)
Intermediate Frequency ..... 455 Kc/s
Battery Voltage ..... 12 volts, negative earth
Loudspeaker 50064W
plus cable 50660
plus fret cloth 50825
V.C. Impedance ..... 15 ohms at 400 c.p.s.
Loudspeaker Choke 38195A
Undistorted power output ..... 3 watts
Controls:
976-A ... Manual Tuning, Press Buttons, Off and Tuning (set of 5), Volume, Tone
977-A .... Manual Tuning, Volume, Power, Tone

Valve and Transistor Complement

Radiotron 12BL6—R.F. Amplifier
Radiotron 12AD6—Converter
Radiotron 12BL6—I.F. Amplifier
Radiotron 12FK6—Detector, A.G.C., Audio Amplifier.
AWV 2N591—Driver
AWV 2N301—Output

Radio Removal

To remove the radio receiver, proceed as follows:

1. Pull the radio rotary control knobs off and remove the nuts and washers retaining the radio to the instrument panel.
2. Disconnect the aerial lead from the receiver.
3. Disconnect the speaker lead from the receiver.
4. Disconnect the pilot lamp lead and the radio low tension lead at the fuse panel.
5. Remove the two nuts, plain washers and lock washers securing the right and left-hand brackets to the receiver.
6. Remove the radio assembly from the instrument panel.

Radio Replacement

To replace the radio receiver, reverse the procedure above. Check the radio operation and adjust the aerial trimmer if necessary.

Dial Lamp Replacement

First remove the receiver as detailed above. Access to the dial lamp is then obtained by removing the escutcheon and dial backing plate. In Model 977-A the lamp holder is movable; for correct illumination the lamp should be close to the dial backing plate without touching it.

Dial Cord Replacement (977-A)

The diagram shows cord assembly in centre of its range of travel, i.e., when the tuning spindle is turned 3 turns clockwise from its full anti-clockwise position, spring and pointer are then in their mid-position.

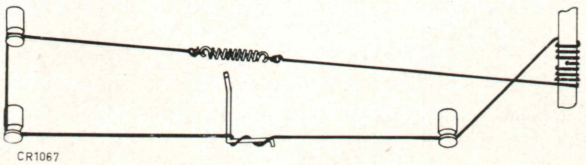


Fig. 1

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.

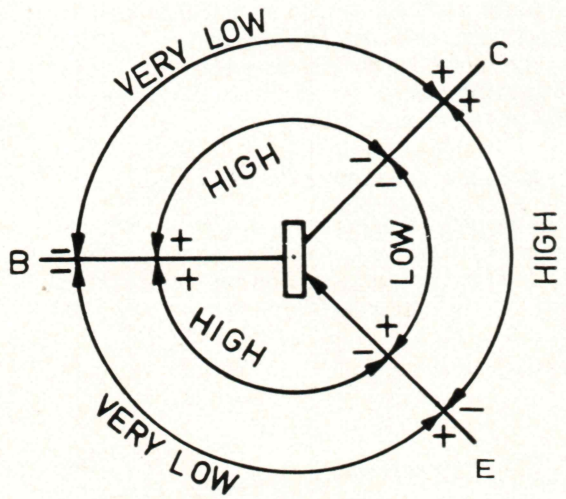
In general the power transistor should be the last component to be suspected in a faulty receiver. However, if a receiver is faulty due to an open circuit speaker voice coil, then the transistor should be checked for possible damage.

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 XI 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:

A variable control (RV3) 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 across the emitter resistance choke (R22).

(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.

or

(a) Connect an ammeter capable of accurately measuring 500 mA in the supply lead to the Output choke (L7).

(b) Adjust the battery input voltage to exactly 12.0 volts with the receiver operating.

(c) Adjust the bias control until the ammeter reads exactly 500 mA. In either case this will set the transistor collector current at 500 mA.

Transistor Mounting:

Power transistors are thermally connected to, but electrically insulated from, the heat sink.

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.

On no account must the old lead gasket or 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 is available in handy 8 oz. tubes.)

Place the mica insulator in position on the heat sink followed by the lead gasket and finally the transistor, Secure this assembly to the heat sink with two ¾" x No. 6 self-tapping screws.

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) and the heat sink (should be greater than 1 megohm). For this check, connections to the transistor socket should be removed.

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.

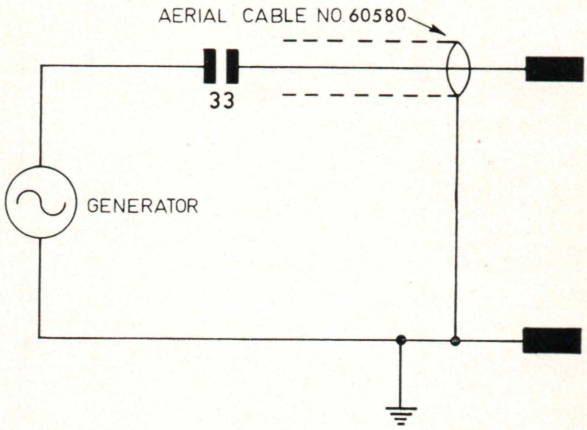
It is especially important that the adjustments should not be altered unless in association with the correct testing instruments listed below.

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).



DUMMY AERIAL

Fig. 3

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:**

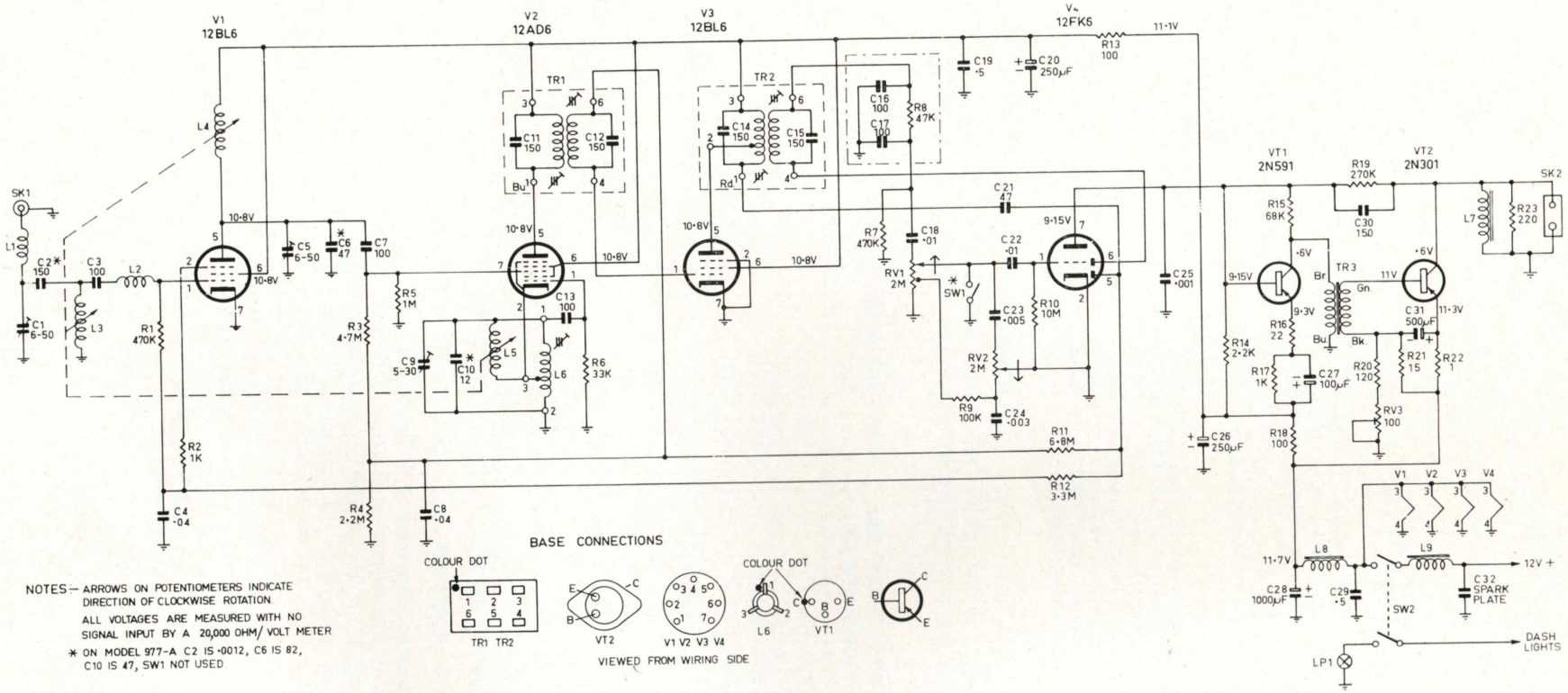
ALIGNMENT ORDER	CONNECT "HIGH" SIDE OF GENERATOR TO:	TUNE GENERATOR TO:	TUNE RECEIVER TO:	ADJUST FOR MAXIMUM PEAK OUTPUT:
1	12AD6 Pin 7*	455 Kc/s	L.F. Limit	TR2 Sec. Core (Top)
2	12AD6 Pin 7*	455 Kc/s	L.F. Limit	TR2 Prim. Core (Bottom)
3	12AD6 Pin 7*	455 Kc/s	L.F. Limit	TR1 Sec. Core (Top)
4	12AD6 Pin 7*	455 Kc/s	L.F. Limit	TR1 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. (C9)
6	Aerial Terminal via Dummy Aerial	1500 Kc/s	1500 Kc/s	H.F. R.F. Adj. (C5)
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.
On the 976-A, the pointer can be moved relative to the dial scale by turning the eccentric stud located underneath the rear end of the pointer arm.
On the 977-A, the pointer can be moved relative to the dial scale by sliding it along the cord.

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) On the 976-A, adjust the manual drive control until a 0.560" gauge can be slipped into the left rear slot in front of the carriage lug.
On the 977-A, adjust the manual drive control until a 0.560" gauge can be slipped between the core carriage and the front end of the slot in the tuner frame. 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. Adjust the oscillator core, then the aerial and R.F. cores until the maximum output is obtained.
(3) Proceed with adjustments 5, 6, 7 and 8 in Table "A" and then repeat adjustment 2 above, if necessary.
(4) Repeat step 3 as often as necessary until no further improvement is obtained.
(5) Seal the tuning core studs.



NOTES:— ARROWS ON POTENTIOMETERS INDICATE DIRECTION OF CLOCKWISE ROTATION.

ALL VOLTAGES ARE MEASURED WITH NO SIGNAL INPUT BY A 20,000 OHM/ VOLT METER

* ON MODEL 977-A C2 IS ·0012, C6 IS 82, C10 IS 47, SW1 NOT USED

Fig. 4

CIRCUIT CODE CAR RADIOS 976-A, 977-A

CODE No.	DESCRIPTION	PART No.
	RESISTORS	
	All resistors carbon unless otherwise stated.	
R1	470K ohms ± 10% ½ watt	617356
R2	1K ohms ± 10% ½ watt	604025
R3	4.7K ohms ± 10% ½ watt	618940
R4	2.2 Megohms ± 10% ½ watt	618484
R5	1 Megohm ± 10% ½ watt	618016
R6	33K ohms ± 10% ½ watt	614460
R7	470K ohms ± 10% ½ watt	617356
R8	47K ohms ± 10% ½ watt (in filter unit)	337012
R9	100K ohms ± 20% ½ watt	616019
R10	10 Megohms ± 10% ½ watt	619406
R11	6.8 Megohms ± 10% ½ watt	619150
R12	3.3 Megohms ± 10% ½ watt	618714
R13	100 ohms ± 10% ½ watt	604031
R14	2.2K ohms ± 10% ½ watt	609442
R15	68K ohms ± 10% ½ watt	615494
R16	22 ohms ± 10% ½ watt	602320
R17	1K ohms ± 10% ½ watt	608025
R18	100 ohms ± 10% ½ watt	604031
R19	270K ohms ± 10% ½ watt	616954
R20	120 ohms ± 10% 1 watt	604366
R21	15 ohms ± 10% ½ watt W.W.	602013
R22	1 ohm ± 5% W.W.	38702
R23	220 ohms ± 20% ½ watt	605256
	On 976-A only	
RV1	2 Megohms Log. Carbon, Volume	620974
RV2	2 Megohms Log. Carbon, Tone	
	On 977-A only	
RV1	2 Megohms Log. Carbon, Vol.—On/Off	620975
RV2	2 Megohms Log. Carbon, Tone	
RV3	100 ohms Linear Carbon, BIAS Adjust.	620000
	CAPACITORS	
C1	6—50pf Aerial Trimmer	35130
C2	150pf ± 10% 600VW Plastic Film (976-A)	222698
	0.0012μf ± 10% 600VW Plastic Film (977-A)	225303
C3	100pf ± 20% 600VW Plastic Film	222225
C4	0.04μf ± 20% 200VW Hunts W99	228750
C5	6—50pf R. F. Trimmer	31954
C6	47pf ± 10% N750 Tubular (976-A)	221434
	82pf ± 5% N750 Tubular (977-A)	222128
C7	100pf ± 20% 600VW Plastic Film	222225
C8	0.04μf ± 20% 200VW Hunts W99	228750
C9	5—30pf Oscillator Trimmer	231136
C10	12pf ± 5% N1500 500VW Disc (976-A)	220559
	47pf ± 10% N750 Tubular (977-A)	221434
C11	150pf ± 5% 600VW Plastic Film (in TR1)	222688
C12	150pf ± 5% 600VW Plastic Film (in TR1)	222688
C13	100pf ± 20% 600VW Plastic Film	222225
C14	150pf ± 5% 600VW Plastic Film (in TR2)	222688
C15	150pf ± 5% 600VW Plastic Film (in TR2)	222688
C16	100pf Hi-K Ceramic (in filter unit)	337012
C17	100pf Hi-K Ceramic (in filter unit)	337012
C18	0.01μf ± 20% 200VW Hunts W99	228609
C19	0.5μf ± 20% 200VW Hunts W48	229116
C20	250μf 18VW Electrolytic	229756
C21	47pf ± 10% N750 Tubular	221434
C22	0.01μf ± 20% 200VW Hunts W99	228609
C23	0.005μf ± 20% 200VW Hunts W99	226005
C24	0.003μf ± 20% 400VW Hunts W99	225791
C25	0.001μf ± 20% 500VW K2000	225039
C26	250μf 18VW Electrolytic	229756
C27	100μf 3VW Electrolytic	229706
C28	1000μf 18VW Electrolytic	229905
C29	0.5μf ± 20% 200VW Hunts W48	229116
C30	150pf ± 10% 600VW Plastic Film	222698
C31	500μf 3VW Electrolytic	229854
C32	Spark Plate	
	INDUCTORS	
	On 977-A only:—	
L1	Aerial Choke	34336
L2	Choke	38702
L3	Aerial Tuning Coil	51080E
L4	R.F. Tuning Coil	51080D
L5	Oscillator Tuning Coil	51080C
L6	Oscillator Padder Coil Ass'y	38768A
L7	Choke	38195A
L8	Filter Choke	50548B
L9	L.T. Choke	36926
	INDUCTORS	
	On 976-A only:—	
L1	Aerial Choke	34336
L2	Choke	38702
L3	Aerial Tuning Coil	34383
L4	R.F. Tuning Coil	34383
L5	Oscillator Tuning Coil	34383
L6	Oscillator Coil Ass'y	38768A
L7	Choke	38195A
L8	Filter Choke	50548B
L9	L.T. Choke	36926
	TRANSFORMERS	
TR1	1st I.F. Transformer	51016
TR2	2nd I.F. Transformer	51014
TR3	Coupling Transformer	50508C
	VALVES & TRANSISTORS	
V1	Radiotron 12BL6	
V2	Radiotron 12AD6	
V3	Radiotron 12BL6	
V4	Radiotron 12FK6	
VT1	AWV 2N591	
VT2	AWV 2N301	
	MISCELLANEOUS	
SW1	Muting Switch (on 976-A, on Tuner Ass'y)	
SW2	ON/OFF Switch (on RV1 in 977-A) (on P.B. Unit in 976-A)	
LP1	12V, 2.2W Pilot Lamp	428147
FS1	5 Amp Fuse	370062
LS1	7" x 5" Loudspeaker	50064W

MECHANICAL REPLACEMENT PARTS

MODEL 976-A

Reference to Figures 5 and 6

ITEM	DESCRIPTION	PART No.	CODE No.
1	Transistor Socket, VT2		793276
2	Knob, Tuning	39352	
3	Knob (2 off)	39350	
4	Press Buttons	62304	
5	Press Button (Printed OFF)	62873	
6	Knob Tone	39353	
7	Spacer Nut	61338	
8	Aerial Coil } Coil and Shield		
9	R.F. Coil } Assembly	62819	
10	Osc. Coil }		
11	Slide Assembly	62808	
12	Core	35102	
13	Cam	33924	
14	Drive Spindle	62813	
15	Pinion Drive Spindle	62810	
16	Paddle Plate	33951	
17	Forked Bracket		
18	Clutch Gear Bush Assembly	34688	
19	Aerial Socket		792975
20	Clutch Gate Tang		
21	Clutch Gate	33943	
22	Aerial Trimmer	35130	
23	Oscillator Trimmer		231136

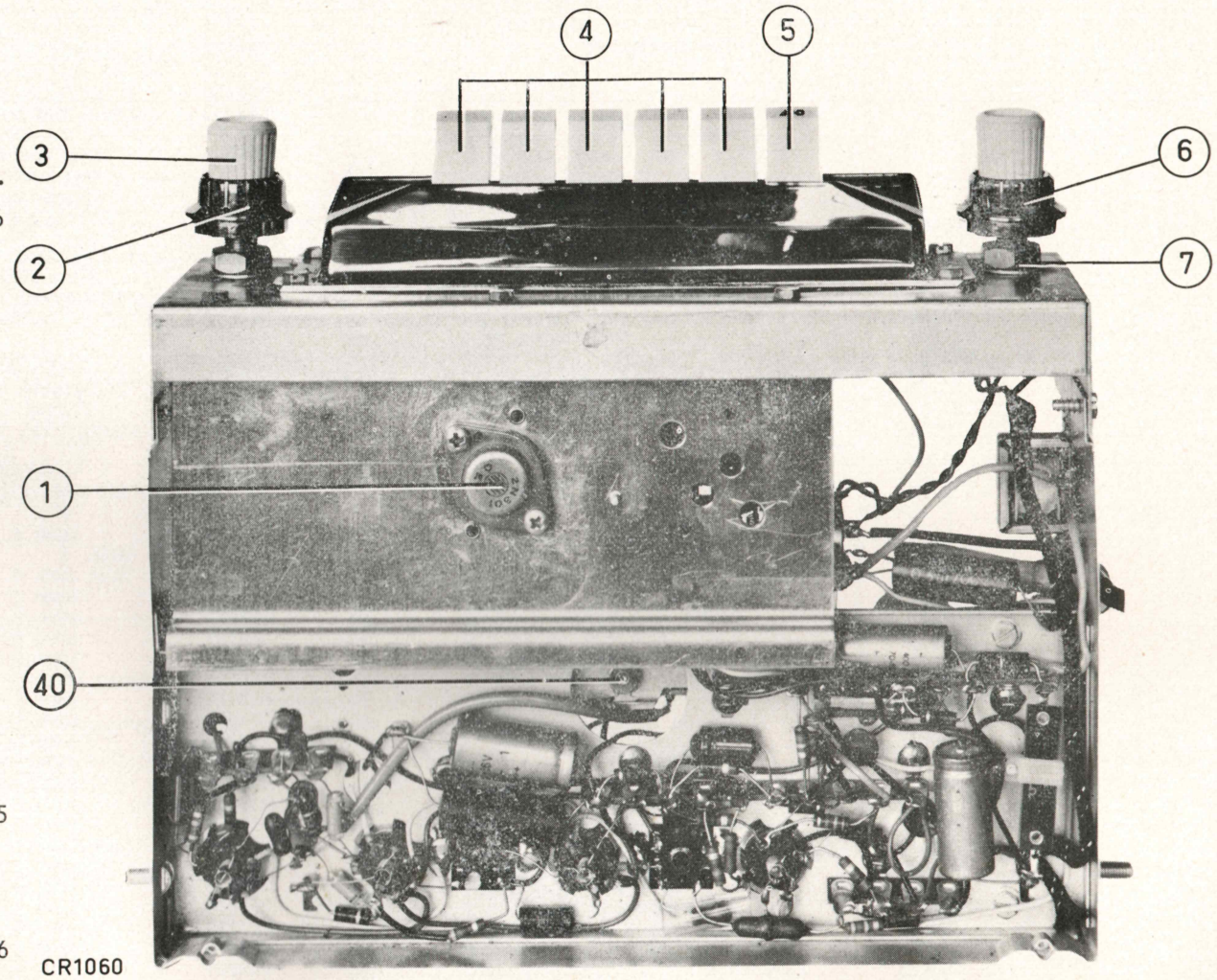


Fig. 5

24	12BL6 Valve V1		
25	R.F. Trimmer	31954	
26	12AD6 Valve, V2		
27	Oscillator Coil	51621	
28	1st I.F. Transformer	51016	
29	12BL6 Valve, V3		
30	2nd I.F. Transformer	51014	
31	12FK6 Valve, V4		
32	Output Socket		793038
33	Driver Transformer	50508C	
34	Output Choke	38195A	
35	Grommet D1, 2N591 Mounting		389000
36	Muting Switch	62805	
37	OFF Switch, IRC WF20-GJ11		
38	L.T. Choke	50548B	
39	Adjustment Screw	35763	
40	Nut Eccentric, Pointer Assembly		
Miscellaneous			
	Circlip	4885	
	Dial Scale	37960	
	Grommet, Coil Mounting	34116	
	Lamp, Pilot		428147

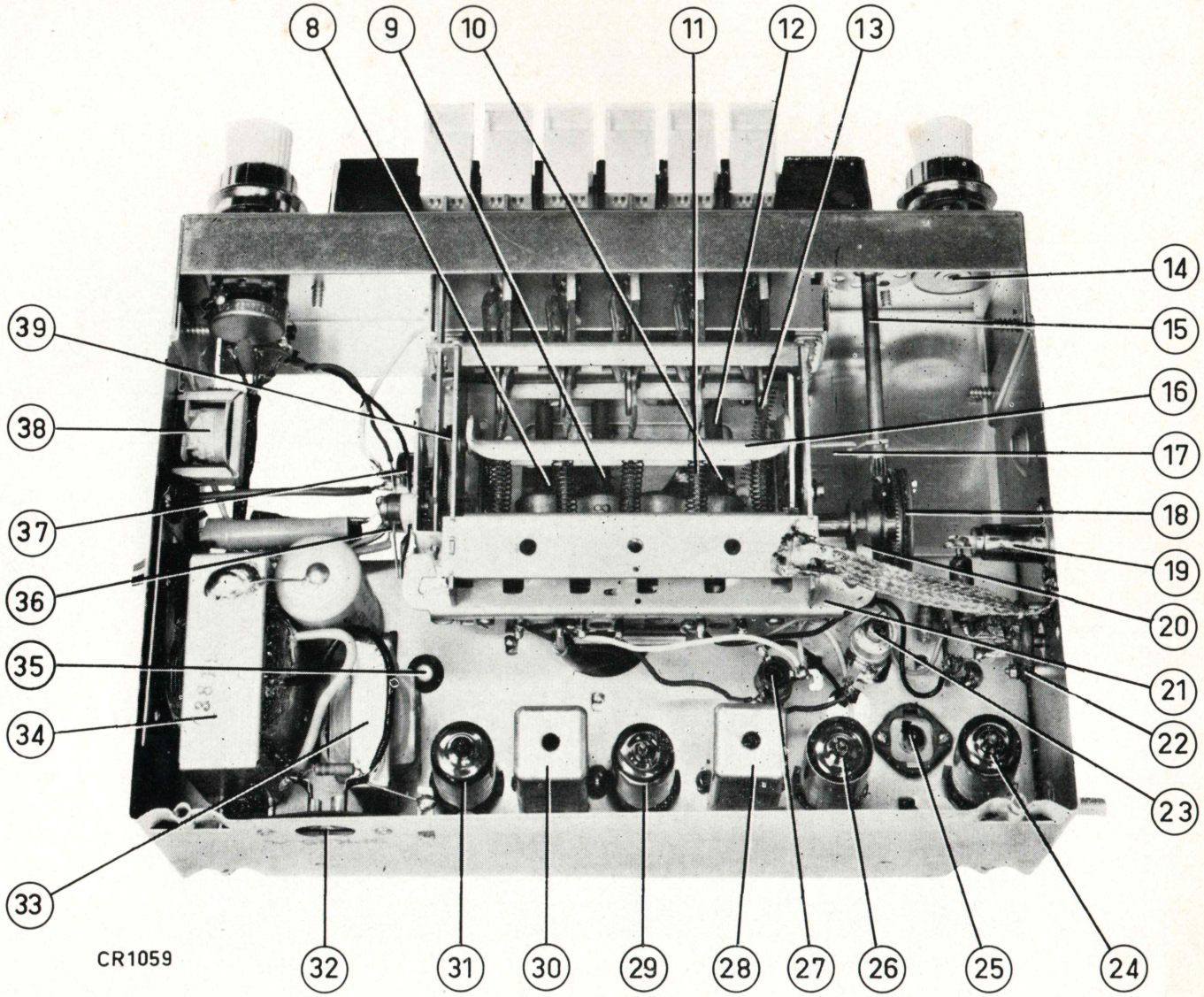


Fig. 6

MECHANICAL REPLACEMENT PARTS

MODEL 977-A

Reference to Figures 7 and 8

ITEM	DESCRIPTION		PART No.	CODE No.
1	Spring, Drive Cord		60717	
2	Dial Lamp			428147
3	Socket, Pilot Lamp		4194	
4	Pointer		62861	
5	Aerial Coil Tuning	Frame and Coil Assembly	51080E	
6	R.F. Coil Tuning	Frame and Coil Assembly	51080D	
7	Osc. Coil Tuning	Frame and Coil Assembly	51080C	
8	Aerial Socket			792975
9	Oscillator Coil		51070	
10	Oscillator Trimmer			231136
11	Aerial Trimmer		35130	
12	12BL6, V1			
13	R.F. Trimmer		31954	
14	12AD6, V2			
15	1st I.F. Transformer		51016	
16	12BL6, V3			
17	2nd I.F. Transformer		51014	
18	12FK6, V4			
19	Driver Transformer		50508C	
20	Output Socket			793038

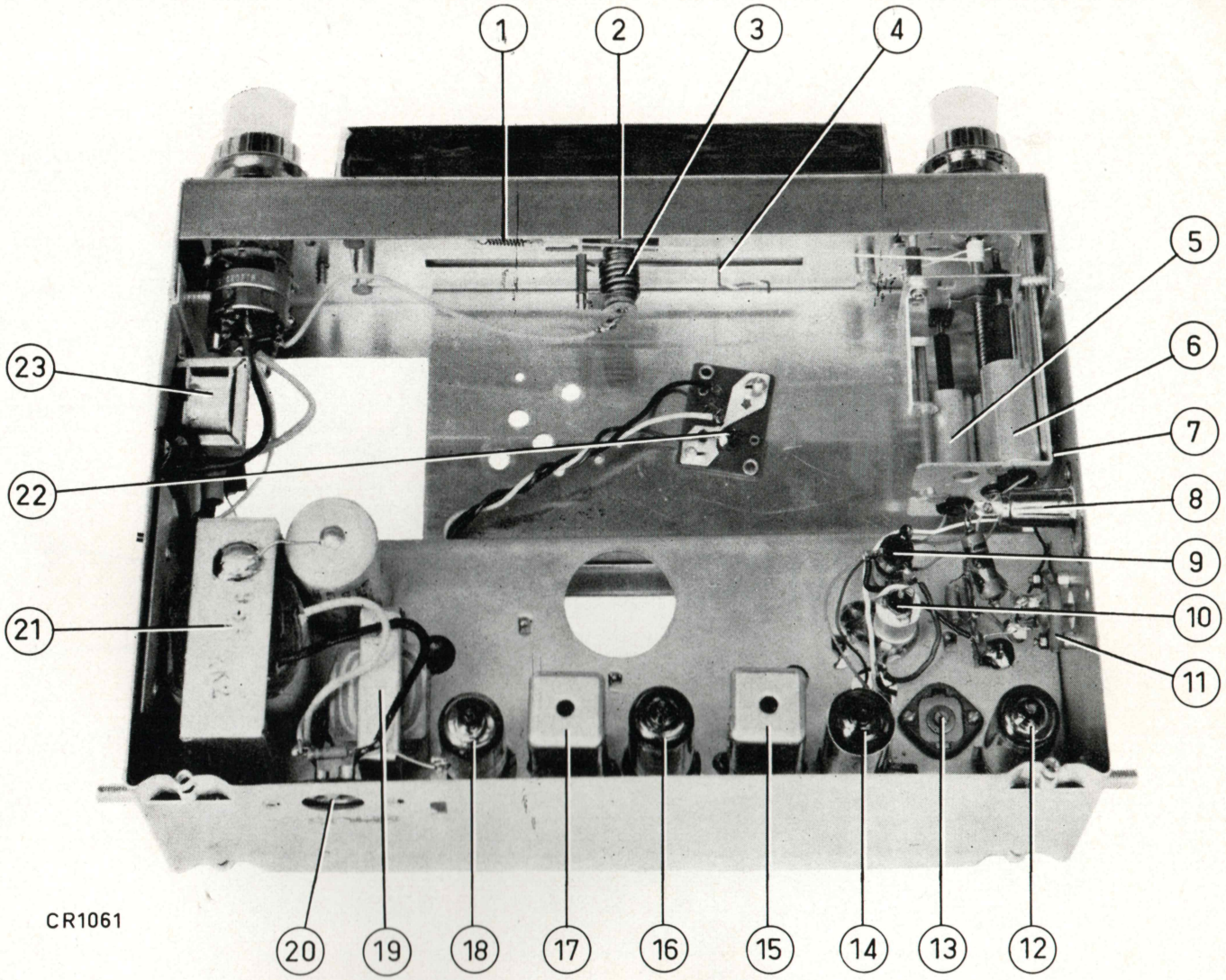


Fig. 7

21	Output Choke	38195A	
22	Transistor Socket		793276
23	L.T. Choke	50548B	
24	Transistor 2N301, VT2		
25	Spacer Nut	61338	
26	Knob, Tuning	39352	
27	Knob (two off)	39350	
28	Knob, Tone	39353	
29	Transistor 2N591		

Miscellaneous

Cord, Drive		250007
Circlip (on Tuner Assembly)	4885	
Dial Scale	37961	
Frame and Coil Assembly	62864	
Washer, Felt	20235	

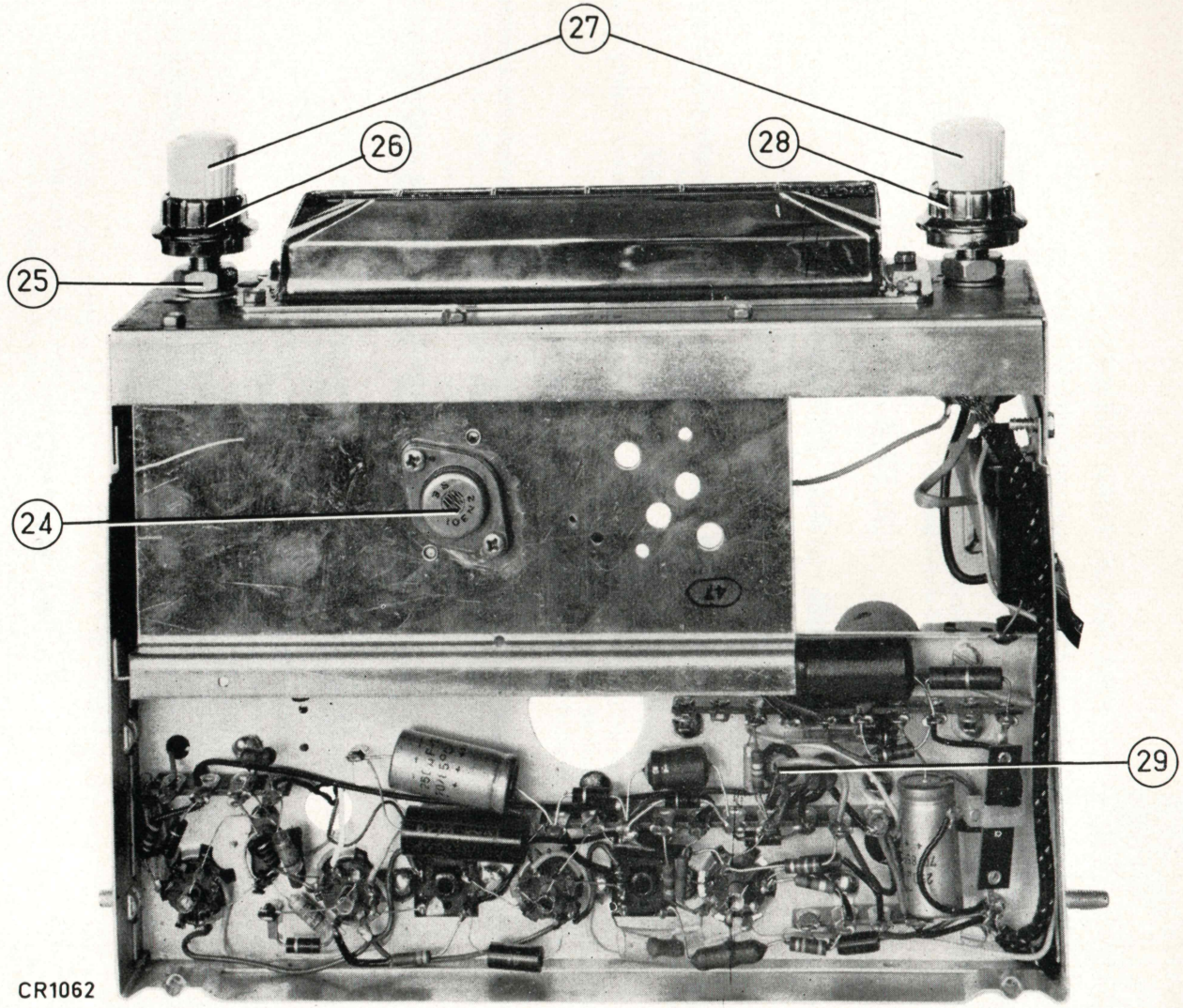


Fig. 8

PUSH BUTTON TUNER ASSEMBLY

Possible faults and adjustment procedure. (Refer to Figs. 5 and 6.)

FAULT	CAUSE	REMEDY
Manual drive slipping.	1. Lack of clearance between slide (11) and clutch gate (21).	Bend tang (20) 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.
	2. Loose riveting of friction coupling (14, 15) or clutch plate (18) to pinion shaft.	Replace manual drive shaft assembly. Replace clutch assembly.
Station is detuned when locking button.	Paddle plate (16) loose.	Loosen locknut and tighten adjusting screw (39). Retighten locknut.
Button sticking in.	Insufficient clearance of manual drive shaft in forked bracket (17).	Adjust by bending bracket slightly to widen the slot.
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.	Adjust by bending the pointer arm slightly.
	2. Pointer touching dial diffusion plate.	
	3. Adjusting stud (40) at rear of pointer arm binding in slot in tuner frame.	
Station setting moves after button is used a few times.	Cam (13) on slide (11) not locking securely.	Replace tuner. It is not possible to repair in the field.

D.C. RESISTANCES

WINDING	D.C. RESISTANCE IN OHMS
Aerial Choke, L1	1
R.F. Choke, L2	1
Tuning Coils, L3, L4, L5	9
Oscillator Padder Coil, L6	19
Output Choke, L7	1.3
Filter Choke, L8	*
L.T. Choke, L9	*
I.F. Transformers TR1 and TR2	16
Coupling Transformer TR3	
Primary	300
Secondary	6

*Less than one 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.