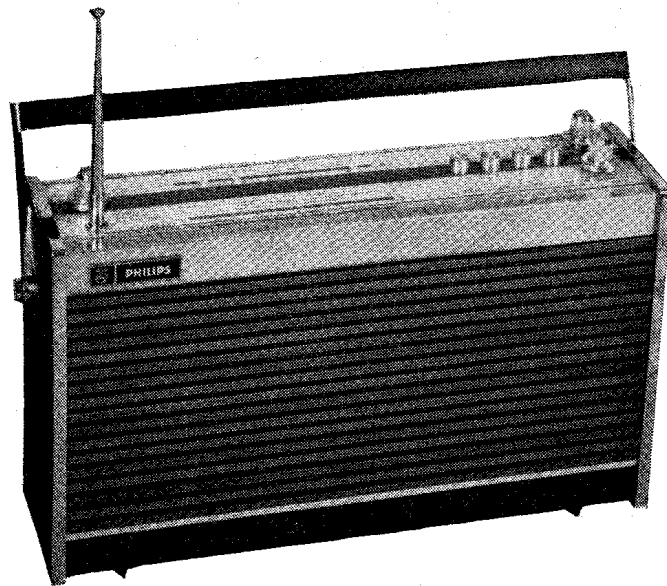


SERVICE INFORMATION FOR THE

PHILIPS

BR486

RADIO RECEIVER



CES

COMBINED ELECTRONIC SERVICES LIMITED

604 PURLEY WAY · WADDON · CROYDON · CR9 4DR

TELEPHONES:

Spare part orders: 01-686 3831

General service enquiries: 01-688 7722

After business hours: Recorded messages on both lines

Telex 262308

MAY, 1969

(Please quote CES 729 when ordering further copies)

CES 729

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INTRODUCTION

The 13RL486 is an A.M./F.M. transistor portable radio employing 9 transistors and 7 diodes, and is housed in a black moulded cabinet with simulated wood finish on the front and back and black padded end faces. The scale is white with black lettering and silver trim, matched with silver knobs and push-buttons. The receiver is powered by 6 SP2 (or equivalent) batteries, which are housed in the base of the cabinet and held in position by a quick-release cover. Switch operated automatic frequency control is provided on F.M. to facilitate accurate tuning.

SPECIFICATION

Transistor types	Function
T401 BF194B	F.M. R.F. amplifier
T402 BF195	F.M. Mixer/oscillator
T403 BF194	A.M. Mixer/oscillator (I.F. amplifier on F.M.)
T404 BF195C	I.F. amplifier
T405 BF195D	I.F. amplifier
T406 BC149	A.F. amplifier
T407 AC128	Driver
T408 AC187	Output (matched pair)
T409 AC188	

Diode types	Function
X411 AA119	I.F. damping A.M.
X412 AA119	Ratio detector
X413 AA119	
X414 AA119	
X415 BA114	Stabilisation
X417 BA102	F.M. A.F.C.
X418 AA119	I.F. damping F.M.

Batteries	Six SP2 cells, or equivalent
Battery life	160 hours approx.
Consumption	16mA on A.M., 18mA on F.M. (under "no signal" conditions)
Loudspeaker	7"×4", 8Ω impedance

Output	750mW
I.F. frequencies	A.M. 468kHz. F.M. 10.7MHz
Sockets:	
Skt 1	Earphone
Skt 2	5-pin DIN for tape recording
Skt 3	Battery eliminator
Skt 4	Car aerial
Dimensions	Width 14", height 8½", depth 3¼"
Weight (including batteries)	6 lbs.
Waveband ranges	M.W. 185—576 metres (1620—520kHz) L.W. 1154—2000 metres (260—150kHz) F.M. 87.5—104MHz

MAINTENANCE NOTES

1. Removing the cabinet back

Place the receiver face down on a protective surface and remove the batteries. Withdraw three counter-sunk screws from the cabinet back and loosen three screws in the base of the cabinet (one screw located in the battery compartment). The cabinet back may now be eased out. Reassemble in reverse order.

2. Removing the chassis

Remove the cabinet back as described in para. 1 above. Unsolder two leads from the car aerial socket, unscrew the carrying handle and the telescopic aerial. The chassis (still wired to the socket panel) may now be lifted clear of the cabinet. When refitting the chassis, care should be taken to ensure that the wires to the sockets are positioned well away from the space occupied by the telescopic aerial when fully retracted.

3. Replacing the station scale

Remove the chassis as described in para. 2 above. Unscrew the telescopic aerial and release three control knobs complete with moulded spindle supports. The scale may now be withdrawn from the chassis.

4. Replacing the push-buttons

Remove the retaining ring from the faulty push-button. **The button must be depressed before removal to ensure that when it is pulled off, the strain is taken by the mechanism instead of the switch body.** Avoid excessive bending of the switch operating shaft. Finally, place the retaining ring over the lower part of the new push-button and press the button onto the shaft (a snap-on action).

5. Replacing the tuning gang (C450)

When replacing the tuning gang, it should be mounted on the panel with the longest tag adjacent to C483 (see Fig. 3, point J).

6. Adjustment of R528 (see Fig. 3)

Connect a d.c. milli-ammeter in series with the collector of T409 (a solder link is provided on the print at point A to facilitate this measurement). Turn the volume control to minimum and adjust R528 to give a meter reading of $4.75\text{mA} \pm 0.25\text{mA}$.

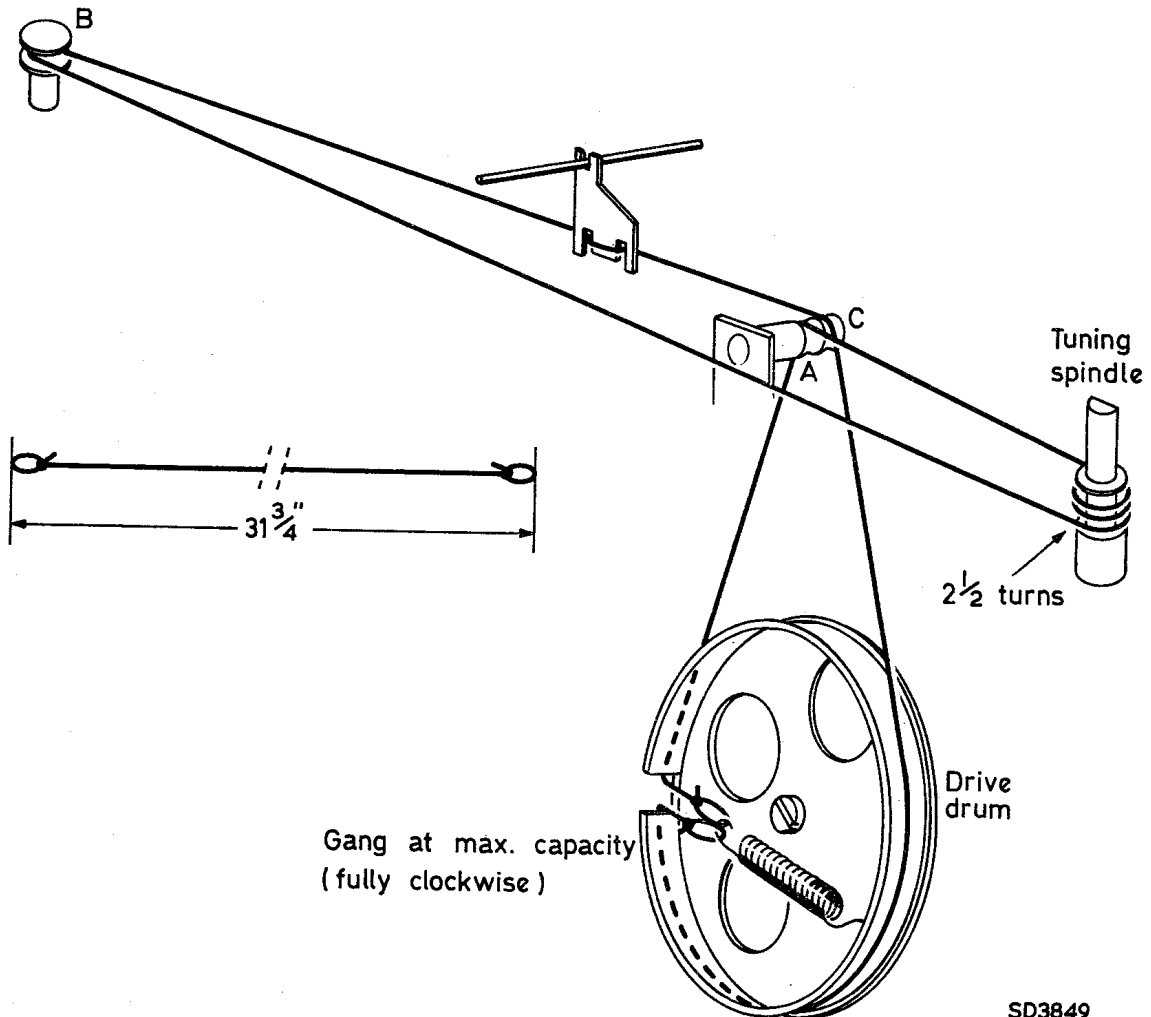
REPLACING THE DRIVE CORD (See Fig. 1)

Remove the chassis from the cabinet, detach the old cord and pointer, then make up the new cord as shown. Turn the gang to maximum capacity (fully clockwise), fit the tension spring in the

drive drum as shown and attach one end of the cord to the free end of the spring. Lead the cord out through the slot in the drum and pass it via pulley A, to the tuning spindle. Take the cord two and a half turns round the spindle, round pulley B and across to pulley C. Pass the cord over pulley C and half a turn clockwise round the drive drum. Finally, pass the free end of the cord in through the slot in the drum and hook it onto the tension spring.

Pointer setting

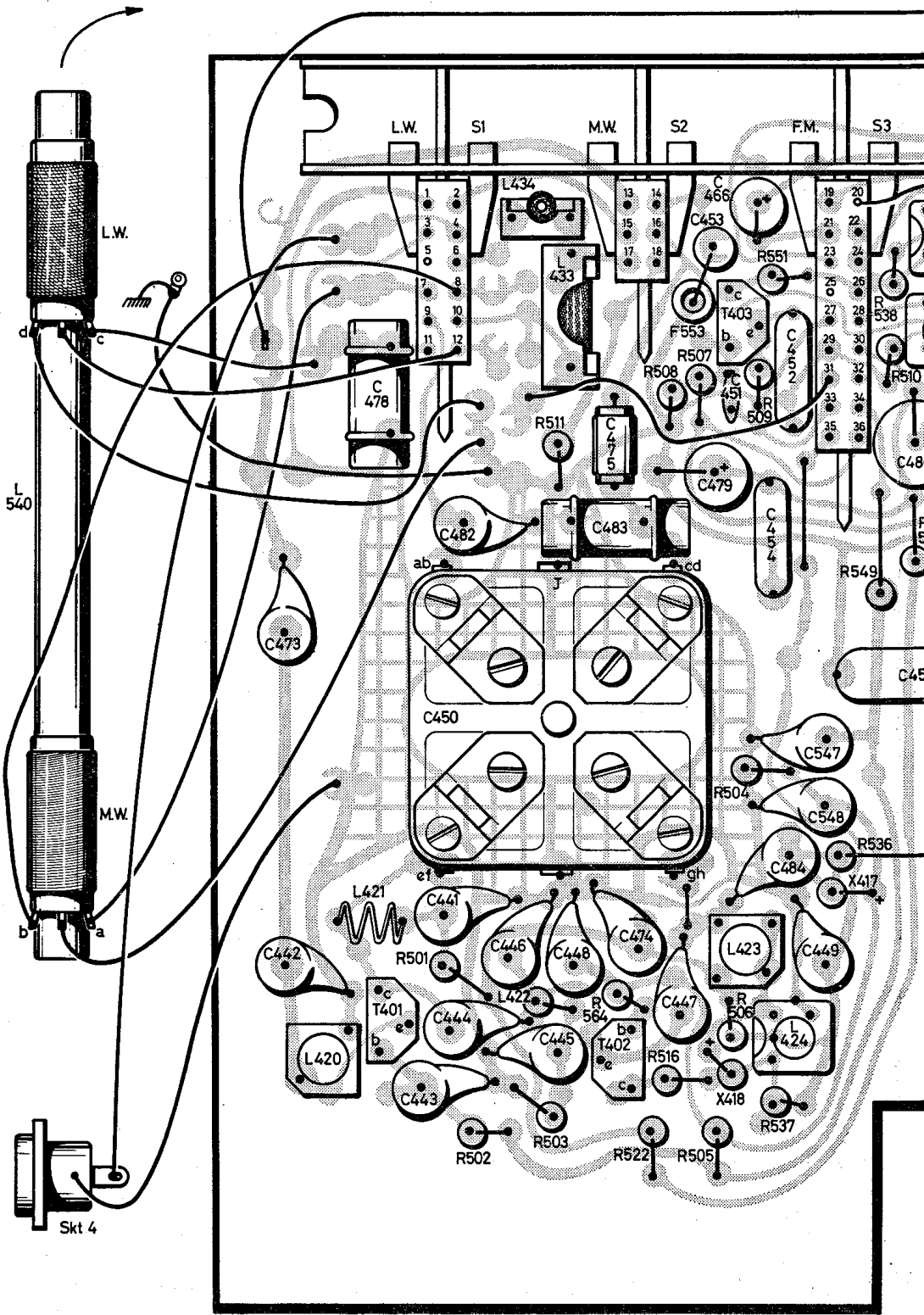
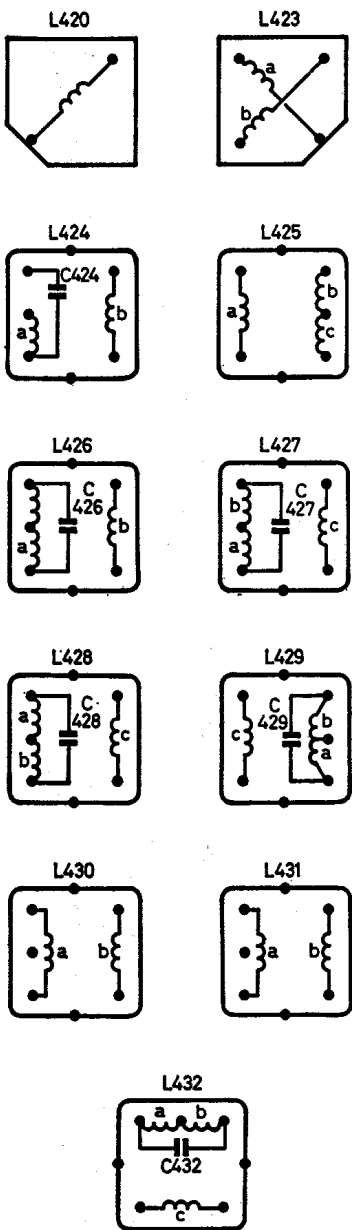
Attach the pointer to the drive cord as shown in Fig. 1. Turn the gang to maximum capacity and adjust the pointer to line up with the calibration mark at the L.F. end of the M.W. scale.



SD3849

Fig. 1 DRIVE CORD ASSEMBLY

L	540.	420.	421.	434.	433.	422.	423.	424.		
C		473.	478.	482.	450.	475.	466.	457.	480.	
R		442.	443.	444.	446.	448.	453.	454.	458.	459.
Misc.	Skt 4.			511.	501.	502.	503.	504.	505.	506.
				S1.			S2.	F553.	T403.	S3.
				T401.			T402.	X418.		X417.

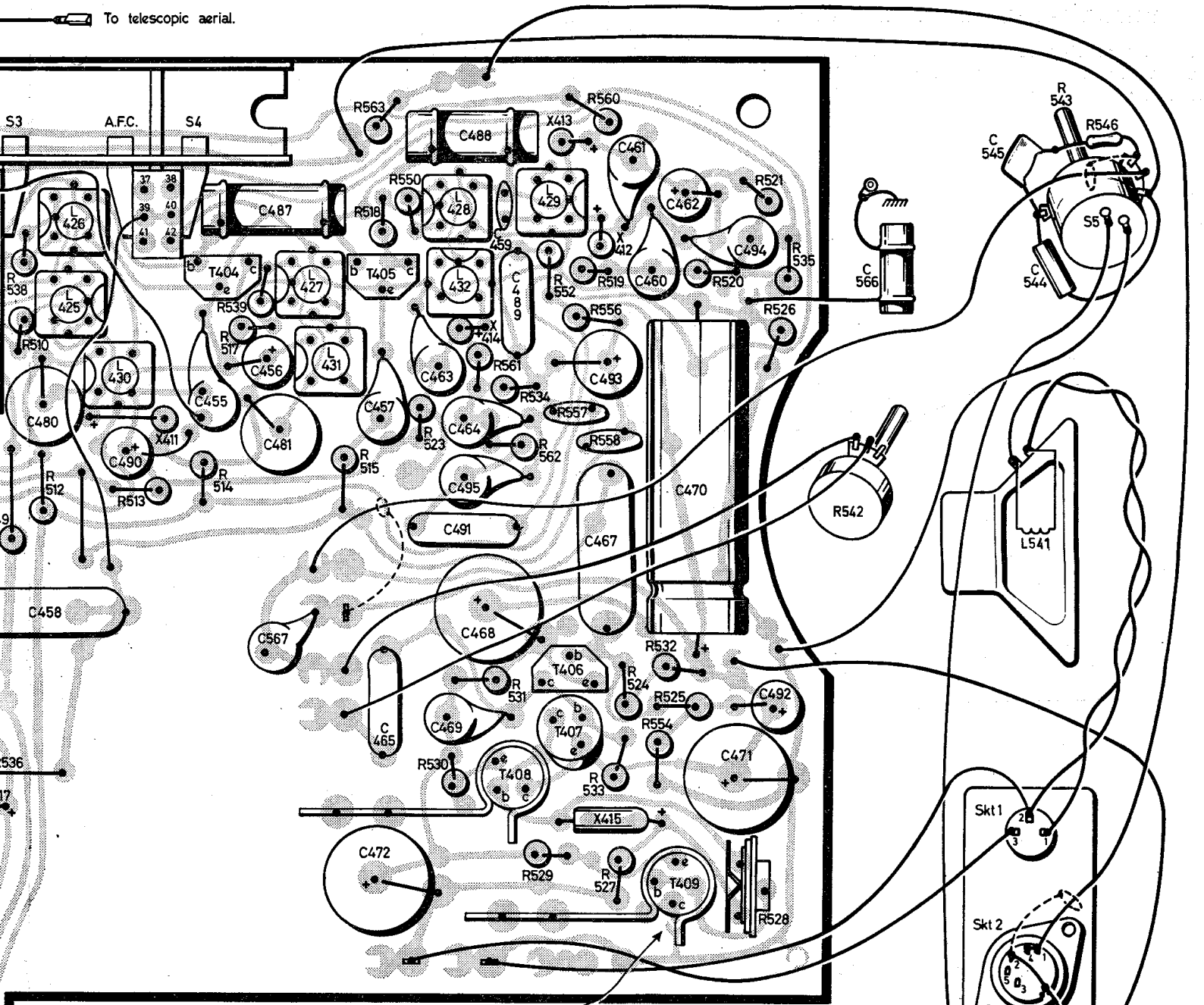


All sockets viewed on solder tags.

NOTE. On later versions, L433 is deleted from the print and a wire link is inserted in its place. A new type L433 is connected in series with Skt 4 (see Spare Parts List).

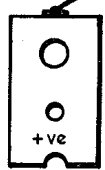
Fig. 3 PRINTED PANEL AN

426. 425.	430.	427. 431.	428. 432.	429.		541.	L
480. 458.	490.	455. 456. 567.481.	457. 472.465.	463.464.468.489. 469.495.491.	493.461. 460.470.	566. 545.544.	C
538. 510.512.	513. 514.	539. 517.	515.	553. 562.	557. 552. 556. 527.	521.535. 526. 542.	R
	X411. ^{S4} T404.		T405.	X414.	X413. T406. T407. X415.	Skt 1. Skt 2. Skt 3.	Misc.



SOLDER LINK "A"

D.C. Resistance of coils >1Ω			
Coil No.	Ohms	Coil No.	Ohms
L425b	4.5	L433	25
L432a	7	L434	28
L432b	5	L540a	2.6
L432c	3.3	L540c	4
		L541	6



SD3846

EL AND WIRING DIAGRAM

C	478	482	473	441	450a	451	450b	450e	444	450f	479	452	454	448	450d	475	426	480	426	453	450g	450h	456	490	458	
R					501		508	507	509	551	510	564	512	537	516	506	538			511	536		523	556	490	458
Misc.	L540	Skt 4		L434	L433	L421			T403	L422		T402	L425	L424	X411	X417	X418			F553	L423	L426	L423	L423	L423	L423

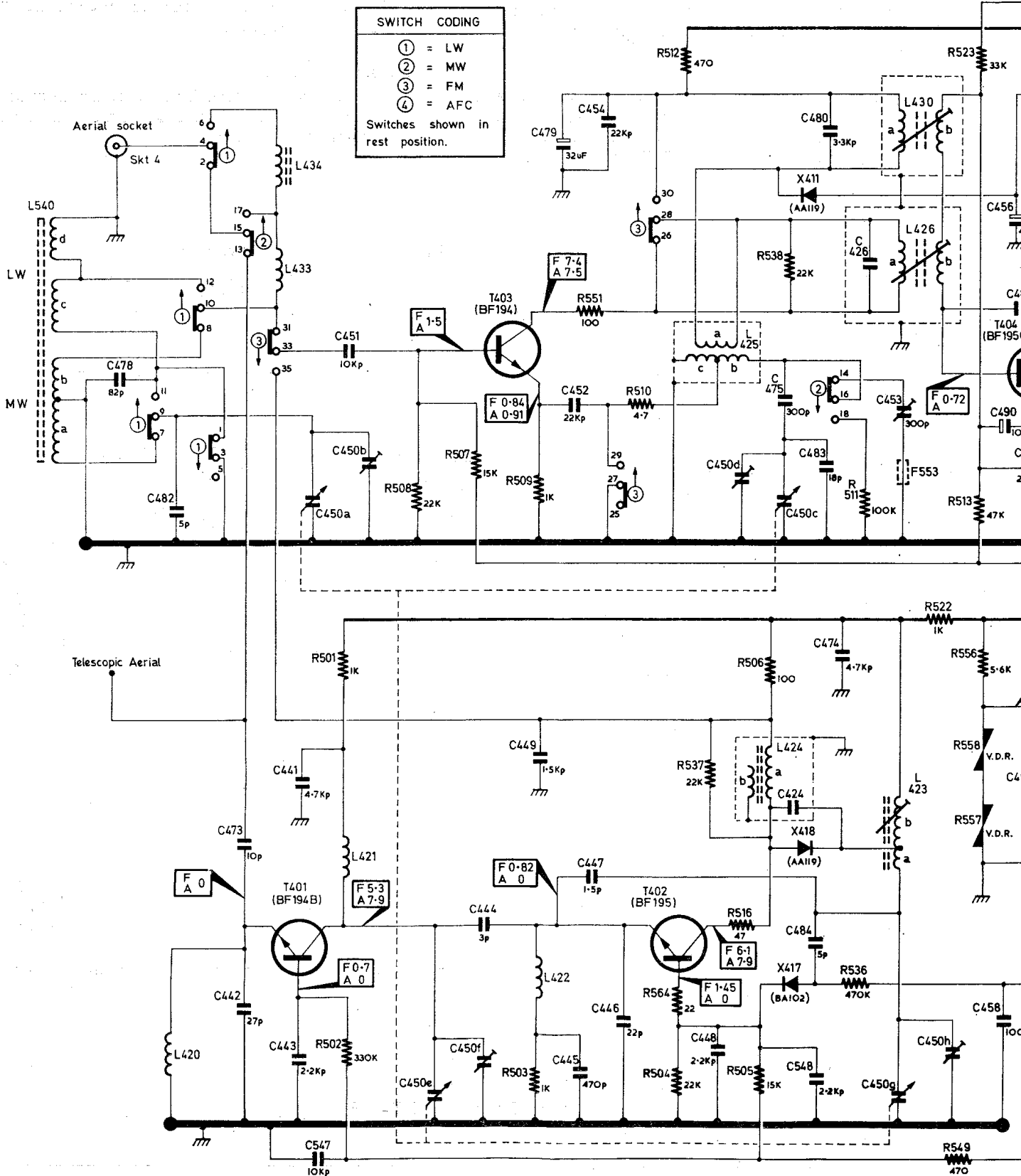
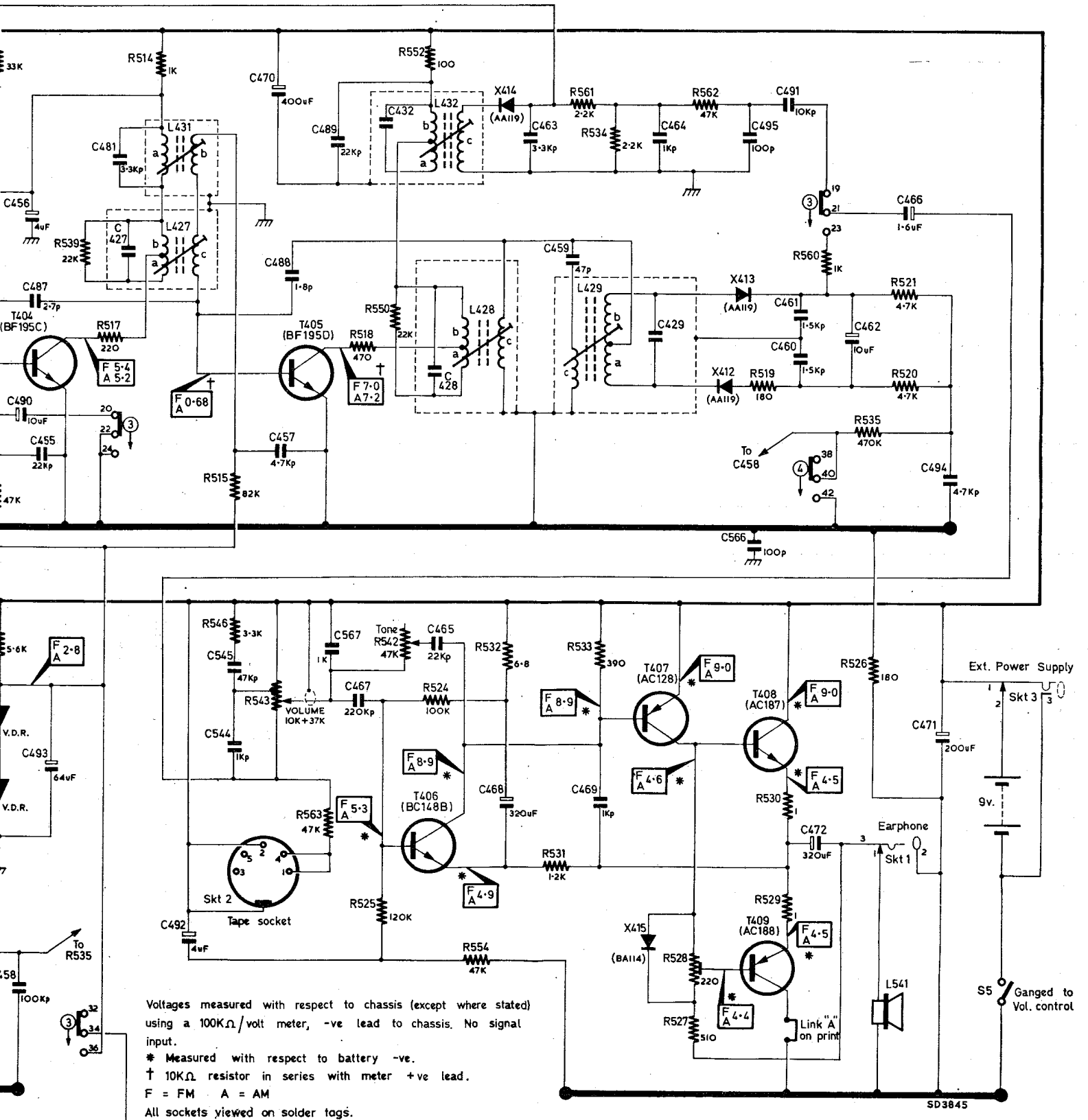


Fig. 4 CIRCUIT

456	487	481	492	545	470	489	432	463	459	464	491	461	462	494	C R Misc					
490	455	427	514	544	488	567	465	428	468	429	566	460	472	471						
458	493	539	517	515	543	563	550	524	531	533	562	530	526	521						
6																				
8																				
7																				
	T404	L431	L427	Skt 2	T405	T406	L432	X414	L428	L429	X415	X413	X412	T408	T409	Skt 1	L541	S5	Skt 3	Misc



CIRCUIT DIAGRAM

For alternative values/types of C446, C455, C473, C488, R551, T406, T408 and T409, see Spare Parts List.

ALIGNMENT TABLE

Circuit	Switch to	Gang to	Generator frequency	Apply to	Trim	Output
A.M.-I.F.	M.W.	Min.	468kHz	Aerial side of C451 via 470KpF	L432 L431 L430	Max.
‡A.M.-Osc.	"	Max.	518kHz	"	L425	"
‡ "	"	Min.	1630kHz	"	C450d	"
‡Repeat both adjustments until no further improvement results.						
A.M.-Osc.	L.W.	Max.	148kHz	"	*C453	"
Pre-set position of L540ab $\frac{3}{8}$ " from end of rod, and C450b $\frac{1}{2}$ turn back from fully closed.						
A.M.-R.F.	L.W.	Tune in receiver	190kHz	Via loop	L540cd	"
‡ "	M.W.	"	550kHz	"	L540ab	"
‡ "	"	"	1500kHz	"	C450b	"
‡Repeat both adjustments until no further improvement results.						
F.M.-I.F.	F.M.	Min.	10.7MHz	T404 col. via 4.7KpF	L428	Max. across C462
"	"	"	"	"	L429	Zero at junction R520/535
"	"	"	"	T403 col. via 4.7KpF	L427	Max. across C462
"	"	"	"	T402 col. via 4.7KpF	L426	"
"	"	"	"	†T402 col. via 1pF	L424	"
F.M.-R.F. Short-circuit C458. Pre-set C450h $1\frac{1}{2}$ turns back from fully closed.						
F.M.-R.F.	F.M.	Max.	86.5MHz	Car aerial socket	L423	"
‡ "	"	Min.	105MHz	"	C450h-f	"
‡ "	"	Max.	86.5MHz	"	L423 *L421	"
‡Repeat both adjustments until no further improvement results.						

† Keep generator leads clear of I.F. part of the panel. Leads from the 1pF capacitor should be less than 5mm. long.

* Refer to trimming instructions.

TRIMMING INSTRUCTIONS

A.M.

With the volume control at maximum, output should be observed on an output meter set to 8Ω impedance, trimming level 50mW. maximum. Alternatively, the output can be observed on an a.c. voltmeter connected across the loudspeaker output, with an 8Ω load resistor replacing the loudspeaker. The trimming level should not exceed 1 volt a.c.

Throughout the A.M. trimming procedure, the signal generator should be modulated with an audio signal to a depth of 30%. During aerial trimming, the generator output should be loosely coupled to the aerial circuit. A suitable coupling may be obtained by making a loop from a length of wire placed near the receiver and connecting the ends of the loop to a low impedance output from the generator. Before alignment of the oscillator and aerial circuits, check the pointer setting, given under "Replacing the drive cord" (see page 3).

Adjustment of C453

To decrease the capacity of C453, carefully unwind the wire from the ceramic tube until the correct tuning point is reached, then cut off the surplus wire (capacity should not be increased by rewinding the wire). If more capacity is required, C453 must first be replaced with a new capacitor of the same type (see spare parts list). With C453 fully wound (max. capacity) proceed as above.

F.M.

Throughout the F.M. trimming procedure, the signal generator should be unmodulated. Output should be observed on a d.c. voltmeter with an impedance of not less than 20K Ω /volt, set to the 1 volt range and connected across C462 (reading not to exceed

0.5 volts). For L429 adjustment, connect the meter between the junction of R520/R535 and chassis, then trim for zero reading. When carrying out R.F. adjustments, short-circuit C458 to disable the A.F.C. circuit, turn the volume control to minimum and restrict the signal input to avoid overloading. Before alignment of R.F. circuits, check the pointer setting as given under "Replacing the drive cord" (see page 3).

Adjustment of L421

L421 is adjusted by compressing or stretching the turns of the coil. By leaving this adjustment until last, little or no bending of the turns should be necessary.

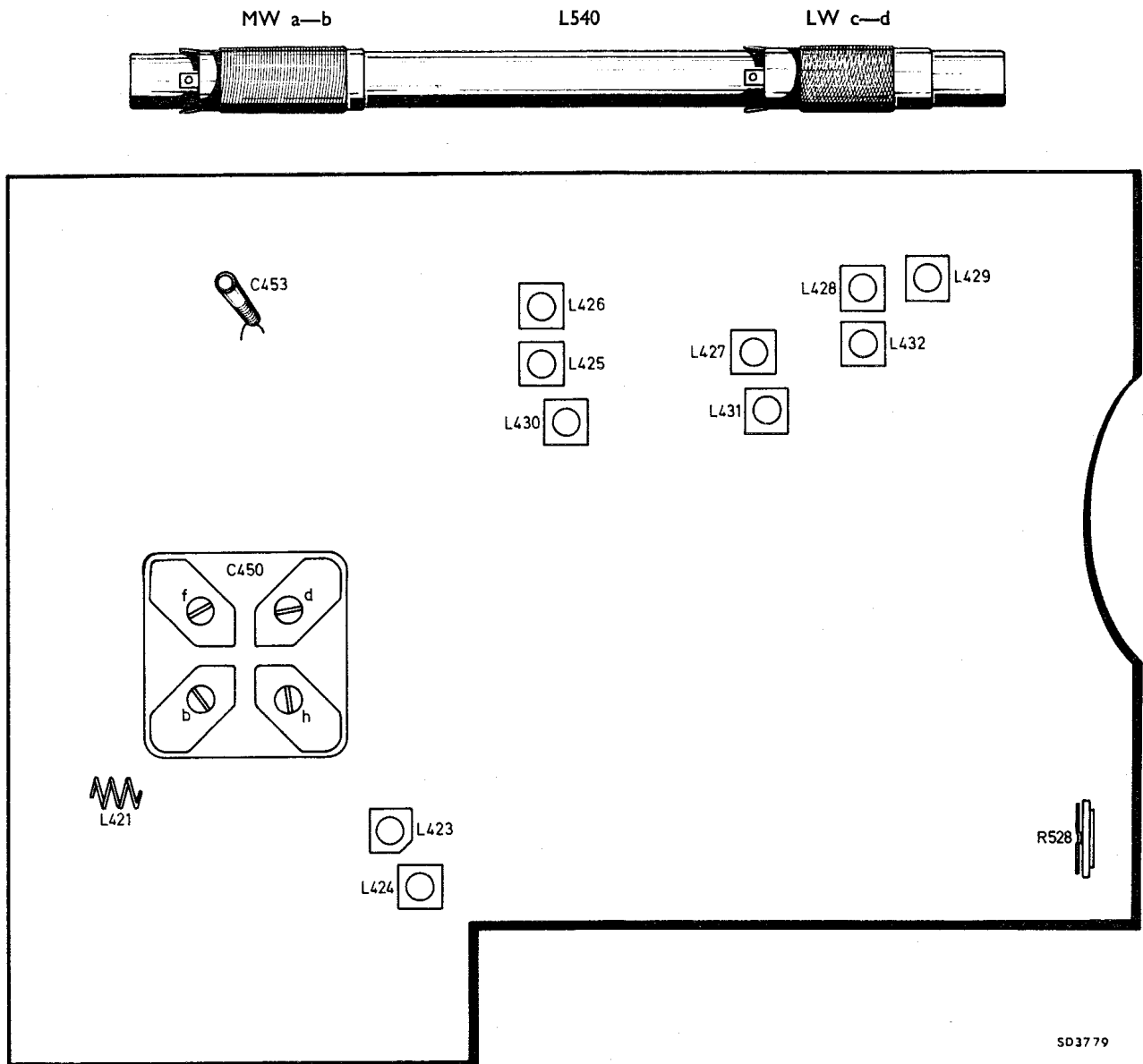


Fig. 5 TRIM PLAN

SPARE PARTS LIST

SUPPLY OF SPARE PARTS: To ensure correct interpretation of requirements please include the following information on orders for spare parts.

1. The full type number recorded on the type number plate, including any suffix. **Do not use the commercial abbreviation which may be misleading.**
2. Whenever possible, quote the serial number of the receiver. In some receivers the components have been changed during production.
3. **Always give a brief description and colour where applicable.**
4. Quote part number.

If it is necessary to return components, always include full identification on the accompanying advice note.

CABINET ASSEMBLY

Cabinet—moulded	...	...	...	420.57001
Cabinet end—L.H.	...	...	...	423.27003
Cabinet end—R.H.	...	...	...	423.27004
Clips for above (2)	...	...	...	492.67003
Cabinet back	...	...	...	422.57002
Flat nuts (3)	...	...	...	MK.927.49
Screws, upper, countersunk (3)	} for above	...	...	502.17012
Screws, lower (3)		...	...	B.037.BD/3 x 8.5
Battery cover	...	...	...	423.47004
Lock	...	...	...	3113.104.06130
Circlip	} for above	...	...	530.70126
Foam strip (2)		...	...	466.67019
Battery contact (link)	...	...	...	3113.101.01420
Battery contact (negative)	...	...	...	3113.101.01410
Battery contact (positive)	...	...	...	3113.101.61790
Screws for loudspeaker (4)	...	...	...	502.10694
Washers for above (4)	...	...	...	B.050CD/4
Nameplate	...	...	...	459.17011
Rubber cushions for printed panel (6)	...	...	...	3113.104.05960

HANDLE ASSEMBLY

Clips for handle grip (2)	...	...	...	492.67004
Spacers (2)	...	...	...	532.17004
Spring washer (2)	...	...	...	986/6
Fixing screw (2)	...	...	...	3113.101.61770

CONTROL KNOBS

Control knobs (3)	...	...	...	413.47005
Felt washer (3)	} for above	...	...	532.57005
Retaining ring (3)		...	...	532.10284
Push buttons (4)	...	...	...	3113.108.14860
Retaining ring for above (4)	...	...	...	3113.101.01760

SCALE ASSEMBLY

Station scale	...	...	...	333.57001
Spindle support cups for above (3)	...	...	...	532.67003
Scale backing plate	...	...	...	466.77003
Spring clip (2)	} for above	...	...	3113.101.01400
Screw (2)		...	...	B.054.ED/3 x 4
Nut (2)	...	...	...	B.020.ED/3

POINTER DRIVE ASSEMBLY

Pointer	...	...	...	450.87005
Pointer carrier	...	...	...	466.77004
Drive cord	...	...	...	K299ZZ/923
Tension spring	...	...	...	3113.101.01440
Tuning spindle assembly	...	...	...	3113.108.14840
Plain washer	} for above	...	...	3113.101.25170
Spring washer		...	...	B.046.AF/4
Circlip	...	...	...	530.70043
Pulley (2)	...	...	...	3122.996.80020
Circlip for above	...	...	...	B.108.AF/1.9
Drive drum	...	...	...	3113.104.06170
Screw	} for above	...	...	B.054ED/2.6 x 6
Washer	

CHASSIS MISCELLANEOUS

Support for rod aerial (2)	...	...	...	466.97007
Solder tag (2)	...	...	...	B.201.AF/3
Lockwasher for solder tag	...	...	...	B.053BD/3
Telescopic aerial	...	...	...	303.37002
Moulded mounting	} for above	...	...	3113.104.06260
Retaining screw	
Threaded plate	...	...	...	3113.101.25070

PUSH BUTTON UNIT COMPLETE

Cover for switch (2)	...	...	...	276.47001
	...	...	...	3122.993.31290

PRINTED PANEL ASSEMBLY

Retaining screws (3)	...	...	...	B.054.ED/3 x 8
Lockwasher (3)	...	...	...	B.053AD/3
Washer (3)	...	...	...	B.050CE/3
Grommet (3)	...	...	...	2422.015.09004
Threaded bush (3)	...	...	...	3113.101.61780
Screw for C450 (2)	...	...	...	B.054ED/2.6 x 3
Washer for C450 (2)	...	...	...	4222.010.0014
Solder tag for printed panel (4)	...	...	...	3122.100.20360
Heat sink for transistors (2)	...	...	...	3113.101.61800

SOCKETS AND PLUGS

Tape socket	...	...	...	267.40039
Plug for above	...	...	...	264.40023
L.T. socket	...	...	...	265.20051
Plug for above	...	...	...	266.20014
Aerial socket	...	...	...	267.30035
Escutcheon	} for above	...	...	454.17003
Retaining clip	
Plug	...	...	...	264.20003
Socket earphone	...	...	...	MK.967.67
Nut	} for above	...	...	MK.927.56
Washer	
Plug	...	...	...	HY.129.70

TRANSISTORS AND DIODES

T401 Transistor	...	...	...	BF194B
T402	...	...	...	BF195
T403	...	...	...	BF194
T404	...	...	...	BF195C
T405	...	...	...	BF195D
T406	...	...	...	BC149
T407	...	...	...	AC128
T408/9 Matched pair AC187/AC188	...	...	...	9330.031.60112
or T408/9 Matched pair AC176/AC128	...	...	...	9330.031.40112
X411 Diode	...	...	...	AA119
X412	...	...	...	AA119
X413	...	...	...	AA119
X414	AA119
X415	BA114
X417	BA102
X418	AA119

FERROXCUBE BEAD

F553	4322.020.34420
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COILS AND TRANSFORMERS

L420 Aerial coil FM	3113.108.23040	L429 F.M. detector secondary coil	3122.108.20560
L421 R.F. coil FM	3113.108.23050	L430 1st AM and IF coil	3122.108.20860
L422 I.F. filter coil	3122.994.96480	L431 2nd AM and IF coil	3122.108.20860
L423 Osc. coil FM	3113.108.23150	L432 3rd AM and IF coil	3122.108.91510
L424 1st FM I.F. coil	3122.108.22850	L433 Aerial choke MW—early version } see note on circuit	3113.108.21361
L425 AM Osc. coil	3113.108.23030	or L433 Aerial Filter coil—later version }	3113.108.23790
L426 2nd FM I.F. coil	3122.108.20560	L434 Aerial choke LV	3113.108.21571
L427 3rd FM I.F. coil	3122.108.20570	L540 Rod aerial assy.	3113.108.23110
L428 F.M. detector primary coil	3122.108.20550	L541 Loudspeaker	240.27006

CAPACITORS

	Value pF	Tol.		Value pF	Tol.	
C426			In L426	C466 Electrolytic	1.6uF	124.20202
C427			In L427	C467 Placo	220K	±10% 2222.342.45224
C428			In L428	C468 Electrolytic	320uF	124.20117
C429			In L429	C469 Ceramic	1K	20% 120.11107
C432			In L432	C470 Electrolytic	400uF	124.20074
C441 Ceramic	4.7K	-20%+50%	120.11125	C471 Electrolytic	200uF	124.20072
C442 Ceramic	27	±20%	120.11065	C472 Electrolytic	320uF	124.20117
C443 Ceramic	2.2K	-20%+50%	120.11116	C473 Ceramic	22	120.11063
C444 Ceramic	3	±1pF	904/P3E	C474 Ceramic	4.7K	-20%+50% 120.11125
C445 Ceramic	470	±20%	120.11098	C475 Foil	300	1% 2012.303.00637
C446 Ceramic	22	±20%	120.11063	C478 Ceramic	82	5% 120.11078
or C446 Ceramic	33	±20%	120.11067	C479 Electrolytic	32uF	124.20273
C447 Ceramic	1.5	±1pF	120.11032	C480 Foil	3.3K	5% 2012.303.00509
C448 Ceramic	2.2K	-20%+50%	120.11116	C481 Foil	3.3K	5% 2012.303.00509
C449 Ceramic	1.5K		120.11112	C482 Ceramic	5	904/P5E
C450 Gang with trimmers... ..			2222.807.10076	C483 Ceramic	18	120.11061
C451 Ceramic	10K		120.11134	C484 Ceramic	5	904/P5E
C452 Placo	22K	10%	2222.342.90438	C487 Ceramic	2.7	2222.555.56278
C453 Trimmer	300		907/60-300E	C488 Ceramic	2.7	2222.555.56278
C454 Placo	22K	20%	2222.342.90405	C489 Placo	22K	20% 2222.342.90405
C455 Placo	22K	10%	2222.342.90438	C490 Electrolytic	10uF	124.20272
or C455 Pin-up	1K		120.20107	C491 Placo	10K	10% 2222.342.90434
C456 Electrolytic	4uF		909/X4	C492 Electrolytic	4uF	124.20205
C457 Ceramic	4.7K	-20%+50%	120.11125	C493 Electrolytic	64uF	124.20274
C458 Placo	100K	10%	2222.342.90447	C494 Ceramic	4.7K	-20%+50% 120.11125
C459 Ceramic	47		120.11072	C495 Ceramic	100	20% 120.11081
C460 Ceramic	1.5K	20%	120.11112	C544 Polyester	1K	120.40107
C461 Ceramic	1.5K	20%	120.11112	C545 Placo	47K	2222.342.45473
C462 Electrolytic	10uF		124.20077	C547 Ceramic	10K	2222.565.01103
C463 Ceramic	3.3K	20%	904/P3K3	C548 Ceramic	2.2K	2222.563.03222
C464 Ceramic	1K	20%	120.11107	C566 Ceramic	100	2222.555.55101
C465 Placo	22K		2222.342.90438	C567 Pin-up	1K	120.21107

RESISTORS

	Value Ω		Value Ω	
R501	1K	902/A1K	R529	1
R502	330K	2322.101.33334	R530	1
R503	1K	902/A1K	R531	1.2K
R504	22K	902/A22K	R532	6.8
R505	15K	902/A15K	R533	390
R506	100	902/A100E	R534	22K
R507	15K	902/A15K	R535	470K
R508	22K	902/A22K	R536	470K
R509	1K	902/A1K	R537	22K
R510	4.7K	902/A4K7	R538	22K
R511	100K	902/A100K	R539	22K
R512	470	902/A470E	R542 Tone	47K
R513	47K	110.61152	R543 On/off volume	10K+37K
R514	1K	902/A1K	R546	3K3
R515	82K	902/A82K	R549	470
R516	47	902/A47E	R550	22K
R517	220	902/A220E	R551	220
R518	470	902/A470E	R552	100
R519	180	902/A180E	R554	47K
R520	4.7K	902/A4K7	R556	5.6K
R521	4.7K	902/A4K7	R557 V.D.R.	
R522	1K	902/A1K	R558 V.D.R.	
R523	33K	902/A33K	R560	1K
R524	100K	902/A100K	R561	2.2K
R525	120K	902/A120K	R562	47K
R526	180	902/A180E	R563	47K
R527	510	2322.101.33511	R564	22
R528 Pre-set	220	100.11026		

All fixed resistors 1/8 watt 5% Tol. except R529-30 which are 1/8 watt 10% Tol