

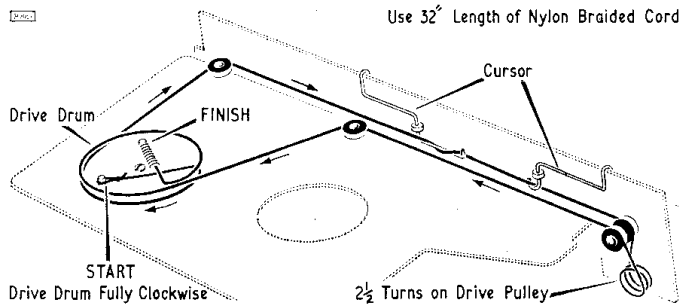
SERVICING NOTES

ACCESS FOR SERVICE

Slide open battery cover then disconnect and take out batteries. Complete access to the printed board may be gained by removing the cabinet back cover which is retained by three countersunk screws in the cabinet base.

For access to the drive cord and the copper side of the printed board, pull off control knobs and unsolder lead on telescopic aerial. Take out five screws and washers securing printed board, then unsolder leads on loudspeaker tag panel. The printed board may then be lifted out without further disconnection.

DRIVE CORD ARRANGEMENT



TAG CONNECTIONS

1. To tag 8 and S4A contact 6.
2. To S4A contact 5 and C23.
3. To S3A contact 3.
4. To S3A contact 1.
5. To C23.
6. To S4B contact 2.
7. To S3B contact 4.
8. To tag 1.
9. To S4B contact 4.
10. To L3.
11. To S4B contact 5.
12. To J1 contact 'c'.
13. To J1 contact 'a'.

HEAT SINK COMPONENTS

Whenever transistors (sleeved or unsleeved types) are used in heat sinks it is essential for the preservation of a low thermal resistance that there should be no air-space between the outside surface of the transistor and the inside of the heat sink. In the case of small transistors in cylindrical encapsulation, this air-space must be filled by the application of a suitable heat conducting grease and the transistor pushed fully into its sink.

Although the heat sink grease is applied during production it must always be reapplied by the engineer when replacing a transistor during servicing.

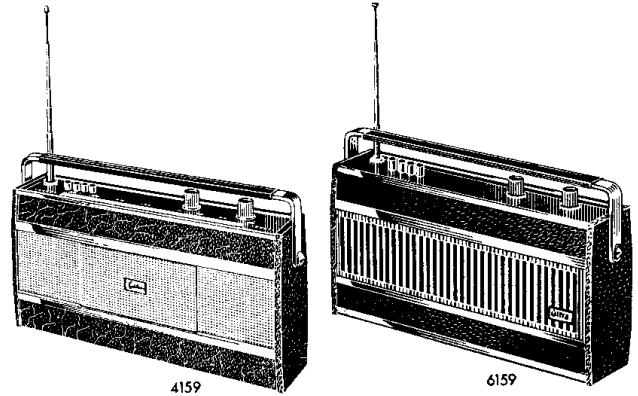
Heat Sink Compound DP2623, or Anti-Tracking Grease MS4, is suitable and marketed by Midland Silicones Ltd.

BRC

SERVICE MANUAL

Price: Two Shillings

MARCONIPHONE 4159 & ULTRA 6159



SPECIFICATION

BATTERIES: Two 9V Drydex DT7, Ever Ready PP7, Vidor VT7 or equivalents.

WAVERANGES:

Medium Wave: 190-566 metres (1579-530 kHz)

Bandspread: 185-216 metres (1621-1389 kHz)

Long Wave: 1120-2025 metres (268-148 kHz)

Short Wave: 17.6-50 metres (17-5.9 MHz)

AERIALS: MW and LW: 6 $\frac{1}{8}$ " long \times $\frac{3}{8}$ " dia. ferrite rod. SW: 8-section telescopic aerial.

EXTERNAL SOCKETS: Car aerial. Earphone (15 Ω minimum) or tape recorder socket.

LOUDSPEAKER: 5" round, 35 ohm impedance, PM moving coil.

POWER OUTPUT: 600mW.

The manufacturers reserve the right to vary specifications or use alternative materials as may be deemed necessary or desirable at any time.

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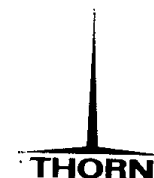
BRITISH RADIO CORPORATION LIMITED

SERVICE DEPOTS

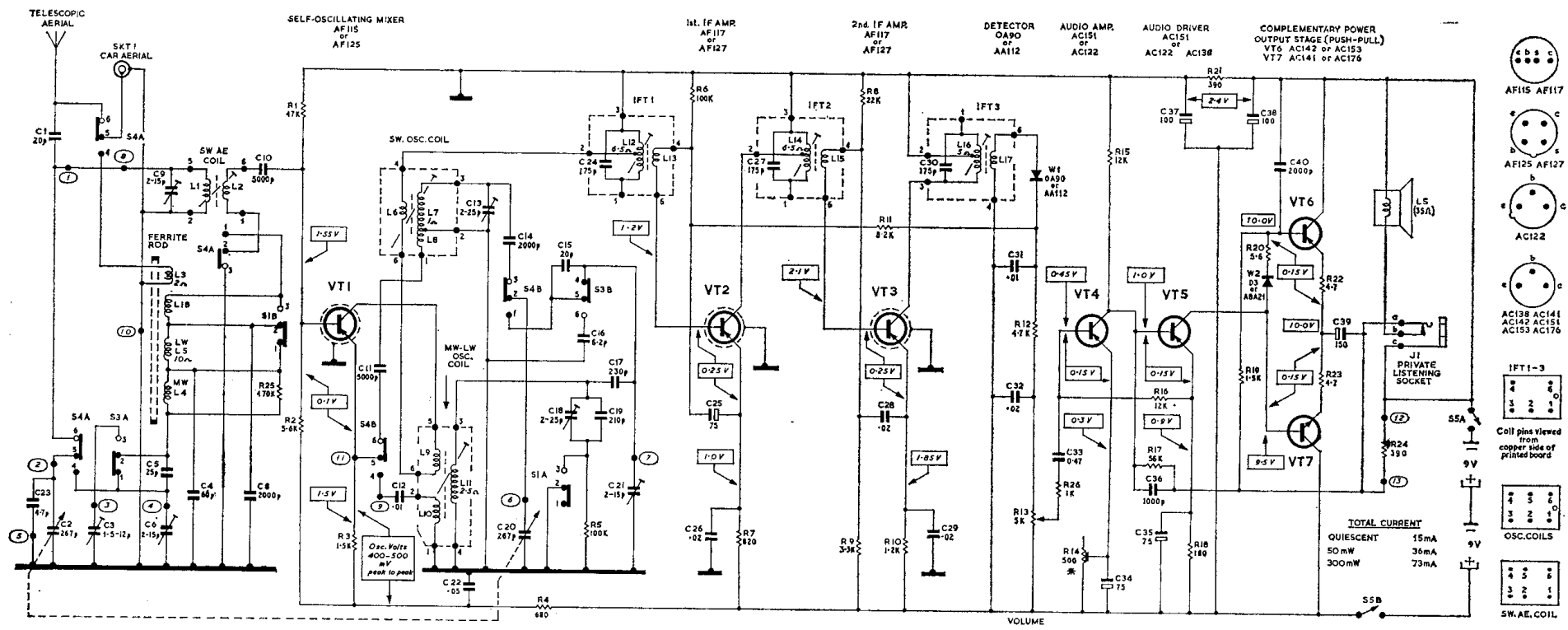
LONDON
P.O. Box No. 121, Eley's Estate, Angel Road, Edmonton N.18.
Tel. 01-807 3060 Ansafone Spares Service: Tel. 01-807 6332

BIRMINGHAM:
24 Sheepcote Street, 15. Tel. 021-643 9988

GLASGOW:
160/162 Battlefield Road, S.2.
Tel. Langside 9251/2/3/4



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CIRCUIT SHOWN WITH SW BUTTON DEPRESSED

BALANCE ADJUSTMENT

Output transistors VT6 and VT7 are series connected across the 18V battery supply, and to ensure a balanced supply voltage to each an adjustment R14 is incorporated in emitter circuit of VT4. Adjustment of this resistor sets emitter potential and hence collector potential of VT4. It will, therefore, determine the base potential of driver VT5 which is directly coupled to VT4. This bias decides collector potential of VT5 which in turn controls base voltages of VT6 and VT7. Correct balance is obtained when potential of VT6/VT7 emitter junction is 10V with respect to positive line. The discrepancy from half-battery voltage is due to the emitter bias voltage developed across R18 which determines limit of negative signal excursion before bottoming of VT5 takes place.

An alternative method of balancing operating voltages of VT6 and VT7 is by visual observation, on an oscilloscope, of output waveform at maximum output when adjustment should be made for symmetry of both waveform and clipping at high outputs.

Circuit Diagram. Figures in rectangles indicate voltages measured with a 20,000 ohm/volt meter between positive line of each transistor and point shown, except where otherwise indicated. DC resistance readings are shown against inductors where these are 1 ohm or greater. Ringed figures show printed board tag connection points.

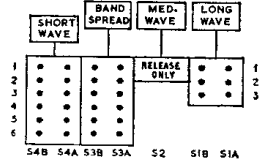
COMPLEMENTARY OUTPUT STAGE

PNP and NPN type transistors are used in conjunction with a stabilizing diode to provide a transformerless power stage giving an audio output of 600mW.

The audio signal developed across volume control R13 is applied via coupling capacitor C33 to the base of audio amplifier transistor VT4. The amplified signal appearing at the collector of VT4 is directly coupled to the base of driver transistor VT5. The output from VT5 simultaneously drives the bases of both output transistors VT6 and VT7. During positive half-cycles of the signal, NPN transistor (VT7) conducts, resulting in a fall in collector/emitter voltage of VT7. During negative half-cycles of the signal PNP transistor (VT6) conducts, resulting in an increase in collector/emitter voltage of VT7. The loudspeaker is fed via C39 and J1.

VT5 collector load R19 is returned to "live" side of the loudspeaker and, as this point is coupled to the emitters of VT6 and VT7 through C39, the input signal to the output stage is virtually applied between base and emitter of both VT6 and VT7

The diode is biased by VT5 collector current and acts as a variable resistance which is sensitive to voltage and temperature variations. The resistance value of W2 is small compared with R19 and the voltage developed across W2 equals the sum of the nominal output transistor (VT6 and VT7) base/emitter voltages and so determines the correct quiescent operating conditions. During low ambient temperature conditions the resistance of W2 increases thus compensating for falling current of the output transistors. This effect also takes place in the event of falling battery voltage. The diode W2 also assists thermal stability at high temperatures and opposes high current drain from the batteries.



TOTAL CURRENT

QUIESCIENT	15mA
50mW	36mA
300mW	73mA

* R14 TO BE ADJUSTED TO GIVE 10VOLTS AT JUNCTION OF R22 & R23 WITH RESPECT TO POSITIVE LINE OR TO GIVE EQUAL CLIPPING OF SINE WAVE WHEN LOOKED AT ON AN OSCILLOSCOPE.

ALIGNMENT PROCEDURE

Remove cabinet back cover only, then connect an output meter, set to 35Ω impedance, in place of loudspeaker via jack plug connection to J1. Alternatively, connect a Model 8 Avometer (10V AC range) across speech coil via tags 12 & 13 on printed board.

Set volume control to maximum but, during alignment, adjust signal generator output level to maintain receiver output at 50 mW.

IF CIRCUITS

Switch receiver to medium waveband and turn gang to maximum capacitance. Apply a 475 kHz (30% modulated) signal, via a $0.1\mu\text{F}$ blocking capacitor, across C2 (aerial section of gang) then adjust IFT3, IFT2 and IFT1 (in that order) for maximum output. Repeat until no further improvement results.

RF CIRCUITS

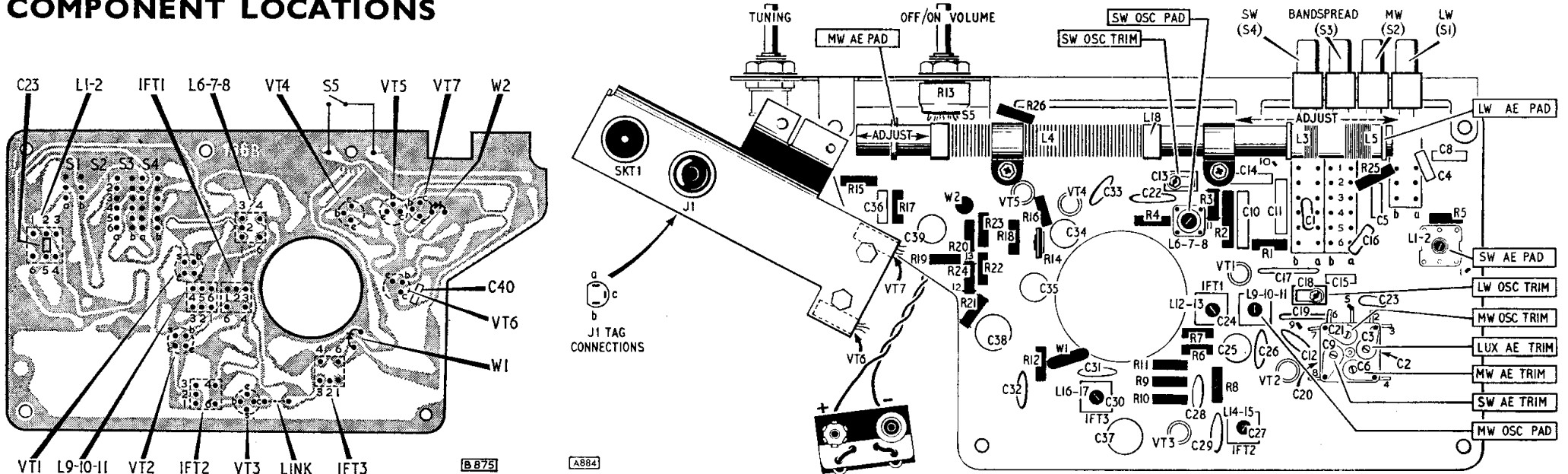
Inject MW and LW signals, via a loop loosely coupled to the ferrite rod aerial. On SW extend telescopic aerial and place signal generator lead nearby to provide a loose coupling. Check that, with tuning gang fully closed, the cursors coincide with the marker pip at right-hand end of MW and LW scales.

WAVERANGE	SIGNAL GENERATOR	TUNE TO	ADJUST
Medium Bandsread	600 kHz	500 metres	L11 L4*
Medium Bandsread	1500 kHz	200 metres	C21
Medium Bandsread	1500 kHz	Max. output at 200 metres	C6
Medium Bandsread	1500 kHz	200 metres	C3
Repeat as necessary for accurate calibration and maximum output.			
Long	200 Kc/s	1500 metres	C18 L5†
Short	7 MHz	7 MHz	L7 L1
Short	16 MHz	16 MHz	C13 C9‡
Repeat as necessary for accurate calibration and maximum output.			

* Adjust by sliding ring along ferrite rod
† Adjust by sliding coil former along ferrite rod.

‡ 'Pulling' which may occur whilst tuning C9 should be counteracted by 'rocking' the gang.

COMPONENT LOCATIONS



CAPACITORS

Ref.	Value	Tol.	Rating	Function	Part No.
C1	20pF	5%	750V	SW aerial coupling	4M24
C2	267pF	Variable		Aerial tuning	*
C3	2-15pF		Bandsread aerial trimmer	*	
C4	60pF	2½%	120V	LW aerial tracking	4M10
C5	25pF	2½%	750V	Bandsread aerial trimmer	8M47
C6	2-15pF			MW aerial trimmer	*
C8	2000pF	10%	500V	MW aerial trimmer	7M25
C9	2-15pF			L1 tuning	*
C10	5000pF	20%	500V	VT1 base bias decoupling	2M27
C11	5000pF	20%	500V	VT1 emitter coupling (SW)	2M27
C12	.01 µF	20%	500V	VT1 emitter coupling (MW & LW)	7M82
C13	2-25pF	Preset		SW oscillator trimmer	3E4-015
C14	2000pF	10%	500V	SW oscillator padder	4M13
C15	20pF	5%	750V	Bandsread oscillator padder	8M50
C16	6-2pF	±.25pF	750V	Bandsread oscillator trimmer	8M48
C17	210pF	2%	350V	MW fixed oscillator padder	7M60
C18	2-25pF	Preset		LW oscillator trimmer	3E4-015
C19†	210pF	2%	350V	LW oscillator trimmer	7M60
C20	267pF	Variable		Oscillator tuning	*
C21	2-15pF		MW oscillator trimmer	*	
C22	.05 µF	+80-50%	50V	VT1 decoupling	7M84
C23	4-7pF	±0.5pF	750V	Part aerial tuning	8M49
C24	175pF			L12 tuning	7M08
C25	75 µF	Elec	9V	AGC decoupling	0E0-228/04
C26	.02 µF	+80-20%	50V	VT2 emitter bypass	7M83
C27	175pF			L14 tuning	7M83
C28	.02 µF	+80-20%	50V	VT3 base bias decoupling	7M83
C29	.02 µF	+80-20%	50V	VT3 emitter bypass	7M83
C30	175pF			L16 tuning	7M83
C31	.01 µF	20%	50V	Part IF filter	7M82
C32	.02 µF	+80-20%	50V		7M83
C33	.47 µF	+100-0%	3V	Audio coupling	7M08
C34	75 µF	Elec	9V	VT4 emitter bypass	0E0-228/04
C35	75 µF	Elec	9V	VT5 emitter bypass	0E0-228/04
C36	1000pF	20%	500V	Part negative feedback	6M61
C37	100 µF	Elec	25V	Supply line decoupling	0E0-229/12
C38	100 µF	Elec	25V		0E0-229/12
C39	150 µF	Elec	9V	VT6/VT7 emitter coupling	0E0-229/11
C40	2000pF	20%	500V	VT6 tone correction	7M66

* Gang assembly Part No. 3E4-036
† 222pF, Part No. 1025 in some models

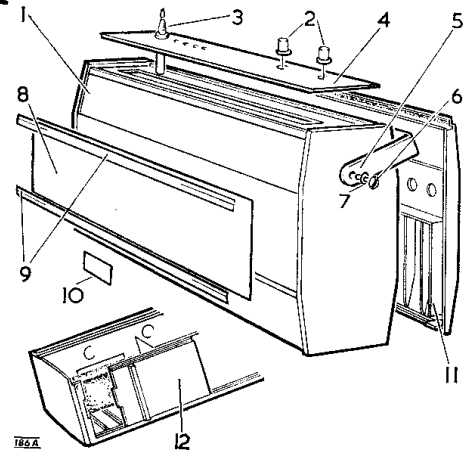
INDUCTORS AND TRANSFORMERS

Ref.	Description	Part No.
L1-L2	SW aerial coil	3D1-065
L3	Car aerial coupling	
L4	MW aerial coil	
L5	LW aerial coil	
L6-L7-L8	SW oscillator coil	
L9-L10-L11	MW-LW oscillator coil	3D1-070
L12-L13	1st AM IFT	3D0-036
L14-L15	2nd AM IFT	3D0-037
L16-L17	3rd AM IFT	3D0-038
L18	Base coupling coil (fitted to ferrite rod aerial assembly)	

RESISTORS

All ½ watt carbon 10% tolerance unless otherwise stated

Ref.	Value	Tol.	Function	Part No.
R1	47K Ω		VT1 base bias	5A56
R2	5-6K Ω		potential divider	2A43
R3	1-5K Ω		VT1 emitter stabilizing	2B51
R4	680 Ω		Supply decoupling	3A45
R5	100K Ω		MW oscillator damping	2A28
R6	100K Ω		VT2 base bias	8A26
R7	820 Ω		VT2 emitter stabilizing	7A40
R8	22K Ω		VT3 base bias potential	4A92
R9	3-3K Ω		divider	1B50
R10	1-2K Ω		VT3 emitter stabilizing	7A54
R11	8-2K Ω		AGC decoupling	7A42
R12	4-7K Ω		Part IF filter	2A27
R13	5K Ω	Log. pot.	Volume control	3E1-052
R14	500 Ω	Preset pot.	Output balance control	3E5-002/2
R15	12K Ω		VT4/VT5 coupling	1A89
R16	12K Ω		VT4 base bias	1A94
R17	56K Ω		Part negative feedback	8A10
R18	180 Ω		VT5 emitter stabilizing	2B50
R19	1-5K Ω		VT5 collector load	1B14
R20	5-6 Ω		Bias stabilizer load	2A43
R21	390 Ω		DC dropper and decoupling	7A84
R22	4-7 Ω	±0.5 Ω	VT6 emitter stabilizing	1B83
R23	4-7 Ω	±0.5 Ω	VT7 emitter stabilizing	1B83
R24	390 Ω		Tape recorder load	7A84
R25	470K Ω		MW aerial damping	2B49
R26	1K Ω		Part audio coupling	1B99



REPLACEMENT PARTS

Cabinet Assemblies

	4159	6159
1. Cabinet front inc. 4, 5 and 8-10	3M4-842	3M4-833
2. Control knob	3C0-141/001	3C0-141
Clip	3L3-100	3L3-100
Felt washer	3L6-066	3L6-066
3. Telescopic aerial	3F0-060-001	3F0-060/001
4. Scale (Twinstick 3P8-012)	3A7-405	3A7-402
Gasket	3B4-161	3B4-161
5. Handle	3A9-058	3A9-058
6. Handle fixing screw	3B3-086	3B3-086
7. Spring washer	3L6-003	3L6-003
Nut	NFHB04	NFHB04
SP Washer	WSPB04	WSPB04
Washer	WPLB04	WPLB04
8. Speaker grille	3A4-122/001	3B4-195
9. Speaker grille trim	3A2-172	3A2-172
10. Emblem	3A6-034/001	3A6-034/002
11. Cabinet back	3M4-873	3M4-872
Screw	SZ06KP06/C	SZ06KP06/C
Back securing clip	3L4-167	3L4-167
12. Battery door	3C8-069/005	3C8-069/004
Battery compartment division	3A3-002	3A3-002
Foam pad	3P9-024	3P9-024

Chassis Assembly (either model)

Printed circuit board (screw SZ04HP04)	0V6-166
Chassis retaining screw	SB04HH06
Washer	WSPB04
Chassis retaining screw	SB04TP20
Washer	WSPB04
Scale backing bracket assembly	3M1-092
Screw	SZ06HP04
Drive drum	3F5-012
Drive cord tension spring	0B5-068
Drive cord pulley, large	3C8-001
Spindle	0B3-081/002
Spacer	0L7-004/013
Drive cord pulley, small	3C8-006
Spindle	0B3-081/017
Pillar fitted to scale bracket	3B3-084
Tuning drive shaft	3B3-080
Circlip	3L3-004
Tuning drive bush	3B3-005/004
Nut	3L6-009
Washer	WSPA06
Cursor—Model 4159	3B5-059/2
—Model 6159	3B5-059
Car aerial and earphone socket bracket assembly	3M4-525
Transistor heat sink	3C5-002
Screw	SZ06HH05
Wavechange push-button	3C0-142
Ferrite rod aerial retaining cleat	3L3-084
Ferrite rod aerial mounting pillar	3L7-007/005
Screw	SB06HP04
Battery connector	3F6-042

MISCELLANEOUS

Ref.	Description	Part No.
J1	Private listening socket (push-on-fix 3L2-101)	3F6-037
	Plug	3F6-053
LS	Loudspeaker (push-on-clip 3L2-073, washer 3L6-017)	3E3-033
S1-S4	Push-button switch assembly	3M4-526
S5	ON-OFF switch	with R13
SKT1	Car aerial socket (push-on-fix 3L2-089)	3F6-025/002