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Trader SERVICE SHEET

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3295

National Panasonic RF 1150LB

Portable radio

A five-band AM/FM portable radio for mains or battery operation, the National Panasonic R1150 LB covers long and medium wave bands on AM, using an externally-mounted ferrite aerial contained in a pivoted housing on the receiver top, with a circular degree scale allowing it to be used for simple direction-finding. The receiver also covers the 10 to 76m (3.9 to 30MHz) short-wave bands in two ranges and the FM broadcast band on VHF, using an external telescopic aerial.

Fine tuning (bandspread) is available as a separate control for medium and shortwave reception, and between-station muting can be switched in when listening on the FM band. A local/distant switch is incorporated for medium wave listening which also switches in AFC on FM. Sockets for connection of external AM and FM aerials are provided.

Features of the RF1150 LB include a switchable BFO for CW or SSB reception, a combined signal-strength/battery condition meter, "loudness" switch for compensating for loss of low frequencies at reduced volume levels, separate bass and treble tine controls, a dial lamp energised by a biased-off switch to conserve battery life, and a timer which can be preset to switch the receiver on or off for times up to 120 minutes.

Inputs available include those from a record player, external amplifier or tape recorder, and there are outputs for earphone or external loudspeaker.

Changeover from battery to a.c. mains operation is automatic on inserting the plug terminating the mains power lead supplied.

The complete RF1150 LB is housed in a rugged upright-mounting black plastics cabinet which has a detachable carrying strap. An earphone is supplied, housed in a storage space below the battery compartment.

The version described in this TRADER Service Sheet is the RF 1150LB(E), that available in the UK. It is also called the GX600M 3 band.

Brief Specification

Power supplies	Four HP2 (or equivalent) 1.5V batteries (6V d.c.) or 240V 50Hz a.c. mains
Consumption	8W approx (a.c. mains operation)
Fuse	800mA miniature cartridge
Wavebands	AM: LW 145 to 355kHz (845 to 2000m) MW 520 to 1610kHz (186 to 577m) SW1 3.9 to 12MHz (25 to 76.9m) SW2 12 to 30MHz (10 to 25m) FM: VHF 87.5 to 108MHz
Intermediate Frequencies	AM: 470kHz FM: 10.7MHz
Transistors	2SB173, 2SC829 (nine), 2SC828, 2SC945 (three), 2SC1359 (four), 2SC1568 (two), 2SK49 (two)
Diodes	OA90 (six), RVDSC-15, RVDVD1151M (three), RDVD1250M (three), RDVD1252M, RVD10E1LF (two), VA1
Audio output	3.5W maximum
Inputs	External aerial and earth (via terminals) Tape recorder or record player (via 5-pin DIN socket)
Outputs	Tape recorder or external amplifier (via 5-pin DIN socket) Earphone or external loudspeaker (via 3mm jack)
Loudspeaker	6½in (160mm) diameter round, impedance 8 ohms
Dimensions and weight	*Height* 9⅝in (237mm); *Width* 9¾in (246mm); *Depth* 4in (100mm); *Weight** 4lb 10oz (2.1kg) *less batteries
Manufacturer	Matsushita Electric Trading Co Ltd, Osaka, Japan
UK Distribution and Service	National Panasonic (UK) Ltd, Whitby Road, Slough, Berks SL1 3DR. Slough 34522

Dismantling

(see interior view diagram)

1. Remove battery compartment cover and batteries, disconnect mains lead (if in use).
2. The receiver cabinet is in three parts: a front cover, housing the loudspeaker, a back cover containing the batteries and the telescopic aerial, and a centre surround which houses the receiver itself in a plastics chassis. Access to all components therefore only requires removal of the front and back covers, as follows.
3. *Back cover.* Remove four long screws, three entering holes A (one accessible through the battery compartment), and a fourth entering hole B. The fourth screw completes the circuit for the telescopic aerial to the receiver input. With screws removed, lift off the cover and pull off the battery lead terminals from the positive and negative tags on the amplifier board.
4. *Front cover.* Remove volume, bass, treblem waveband, BFO, muting and FM AFC switch control knobs. It is NOT necessary at this stage to remove the main and fine tuning knobs.
   Ease off the front cover from the chassis, and pull off the terminals from the tags on the loudspeaker speech coil and chassis.
5. *Access to the ferrite aerial* is by lifting it from the chassis recess, then

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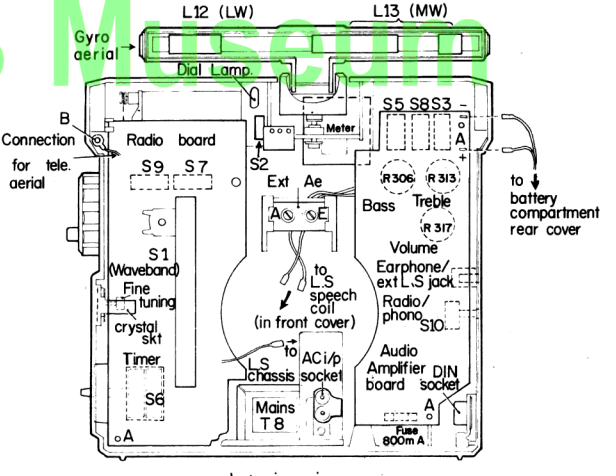
by inserting a screwdriver blade behind the slots in the gyro aerial housing ends, and prising off the aerial cover, which forms half of the tubular housing.

6. To gain access to the components in the upper part of the radio board covered by the tuning scale, this assembly can be removed complete with care.
   Proceed as follows:
   a. Remove main tuning knob.
   b. Remove screw at top left hand side of scale assembly, and a second screw at right hand side of waveband indicator.
   c. Remove indicator and the exposed scale assembly locking nut.
   d. Remove muting switch bracket and after releasing bracket screw.
   e. Lift off scale assembly complete.

   To re-assemble:
   f. Turn main tuning and tuning gang shafts both fully anti-clockwise.
   g. Refit scale assembly complete, and refit muting bracket and screw.
   h. Set waveband switch to SW1, refit indicator, aligning it with waveband switch boss.



Interior view

Alignment

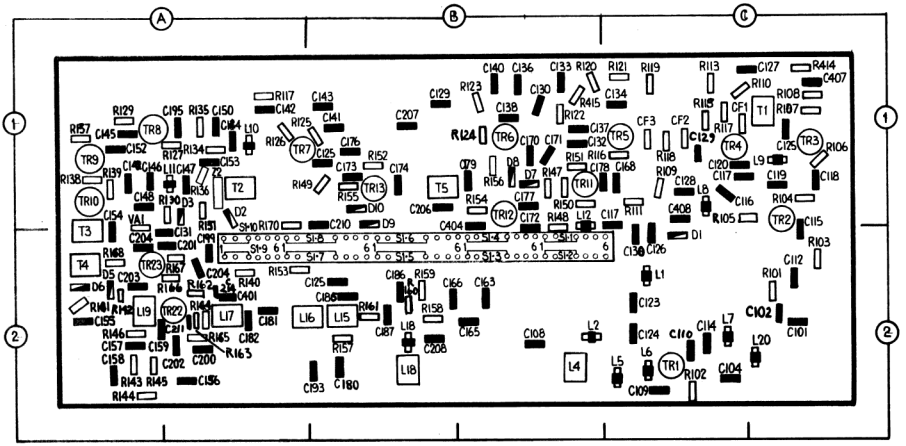
Equipment required
AM signal generator covering 145kHz to 30MHz, modulation 400Hz at 30 per cent.
FM signal generator covering 10.7MHz, 87 to 107MHz, modulation 400kHz, deviation ±22.5kHz.
Sweep marker generator, sweeping 10.7MHz ±100kHz, marker centred at 10.7MHz.
Oscilloscope.
Suitable output meter (Avo 8 or electronic).
Input matching components as detailed in test.

Preliminaries
Perform alignment using known good batteries or 6V d.c. source. Allow test equipment to warm up before starting alignment.
Set volume, bass and treble controls fully clockwise (maximum). Set LOUDNESS, BFO, FM muting switches to OFF, and fine tuning control to centre of trabel.
Progressively reduce signal input levels as circuits come into alignment, in order to prevent agc action on AM, "Limiting" on FM.
Remove gyro aerial cover to expose ferrite aerial.
For locations of coils and trimmers see radio tuner board layout diagram.

Procedure

AM
I.F. Stages (select "MW")
Inject 470kHz signal from AM generator, modulated, via inductive loop to ferrite aerial. Connect output meter across loudspeaker speech coil leads.
Tune receiver to a no-signal point on scale.
Adjust AM IFT's **T2** and **T5** (in that order) for maximum.

Radio board



R.F. Stages

Inject r.f. signals via inductive loop to ferrite aerial for LW and MW, and via 10pF capacitor to test point TP1 (telescopic aerial input) for SW bands. Connect output meter across loudspeaker speech coil leads.

LW (select "LW")

1. Tune signal generator and receiver to 145kHz. Adjust LW oscillator coil **L17** for maximum.
2. Retune generator and receiver to 350kHz. Adjust LW oscillator trimmer **C195** for maximum.
3. Repeat steps 1 and 2 for optimum result.
4. Tune signal generator and receiver to 145kHz. Adjust LW aerial coil **L12** (by sliding this along ferrite rod) for maximum.
5. Retune generator and receiver to 350kHz. Adjust LW aerial trimmer **C164** for maximum.
6. Repeat steps 4 and 5 for optimum result.

MW (select "MW")

7. Tune signal generator and receiver to 550kHz. Adjust MW oscillator coil **L16** for maximum.
8. Retune generator and receiver to 1500kHz. Adjust MW oscillator trimmer **C188** for maximum.
9. Repeat steps 7 and 8 for maximum.
10. Tune signal generator and receiver to 550kHz. Adjust MW aerial coil **L13** (on ferrite rod) for maximum.
11. Retune generator and receiver to 1500kHz. Adjust MW aerial trimmer **C209** for maximum.
12. Repeat steps 10 and 11 for optimum result.

SW1 (select "SW1")

13. Tune signal generator and receiver to 3.9MHz. Adjust SW1 oscillator coil **L15** for maximum.
14. Retune generator and receiver to 12MHz. Adjust SW1 oscillator trimmer **C189** for maximum.
15. Repeat steps 13 and 14 for optimum result.
16. Tune signal generator and receiver to 3.9MHz. Adjust SW1 aerial coil **L4** for maximum.

SW2 (select "SW2")

17. Tune signal generator and receiver to 12MHz. Adjust SW2 oscillator coil **L14** for maximum.
18. Retune generator and receiver to 28MHz. Adjust SW2 oscillator trimmer **C190** for maximum.
19. Repeat steps 17 and 18 for optimum result.
20. Tune signal generator and receiver to 12MHz. Adjust SW2 aerial coil **L5** for maximum.
21. Retune generator and receiver to 28MHz. Adjust SW2 aerial trimmer **C106** for maximum.
22. Repeat steps 20 and 21 for optimum result.

FM (select "FM")

I.F. Stages

Connect FM signal generator, tuned to 10.7MHz, via sweep marker generator sweeping 400kHz, 100kHz either side of 10.7 marker, via a 0.001μF capacitor to test point TP2 (**Tr3** base). Connect oscilloscope probe to test point TP4 (junction **R144, R145**). Tune receiver to a no-signal point on scale.

1. Adjust FM IFT's **T1** and **T3**, in that order, for maximum amplitude and linearity of response curve on display, between ±100kHz.
2. Adjust FM IFT **T4** (second FM i.f. secondary) until the straight part of the "S" curve cuts the zero base line at 10.7MHz.

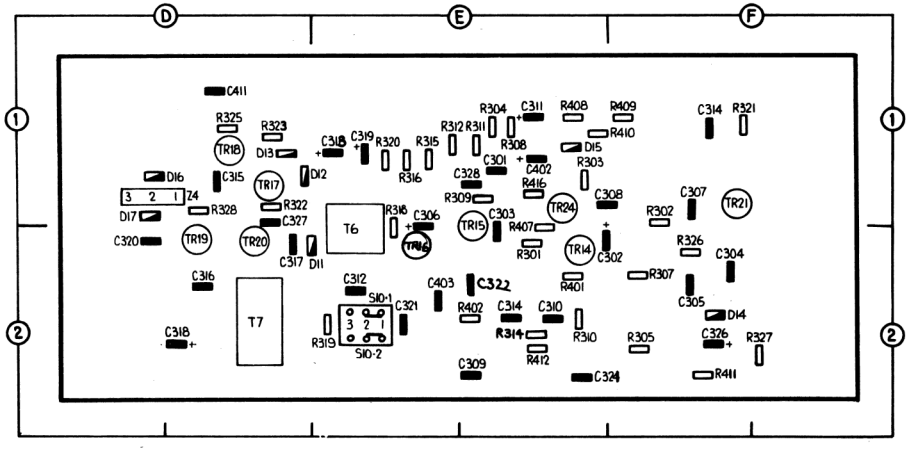
R.F. Stage

Connect FM signal generator via a dummy aerial to test point TP1 (telescopic aerial input). Connect output meter across loudspeaker speech coil leads. Inject modulated signals.

Note that each adjustment following can give three response peaks. The correct peak is the centre one in each case.

1. Tune signal generator to 87.2MHz, and receiver to low frequency end of scale. Adjust FM oscillator coil **L8** for maximum.
2. Retune generator to 90MHz. Tune receiver in to signal, and adjust FM mixer coil **L7** for maximum.
3. Retune signal generator and receiver to 108MHz. Adjust FM oscillator trimmer **C122** for maximum, and then mixer trimmer **C113** for maximum.
4. Repeat steps 1 to 3 for optimum result.

Amplifier board



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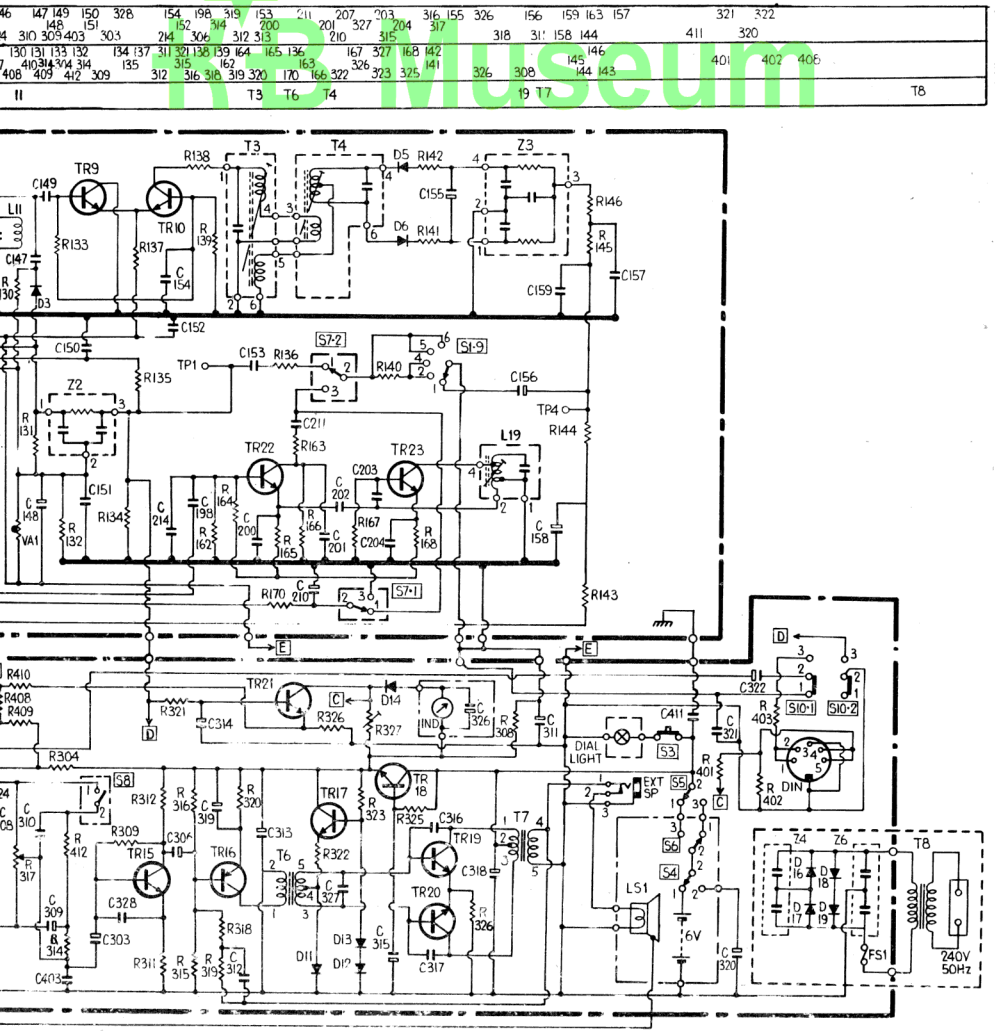

Diodes

D1	RVDSC15	A1
D2	OA90	A1
D3	OA90	A1
D4	VA1	A1
D5	OA90	A2
D6	OA90	A2
D7	OA90	B1
D8	OA90	B1
D9	RVDVD1250M	B1
D10	RVDVD1250M	B1
D11	RVDVD1151M	D2
D12	RVDVD1252L	D1
D13	RVDVD1151M	D1
D14	RVDVD1151M	F2
D15	RVDVD1250M	E1
D16	RVD10E1LF	D1
D17	RVD10E1LF	D1

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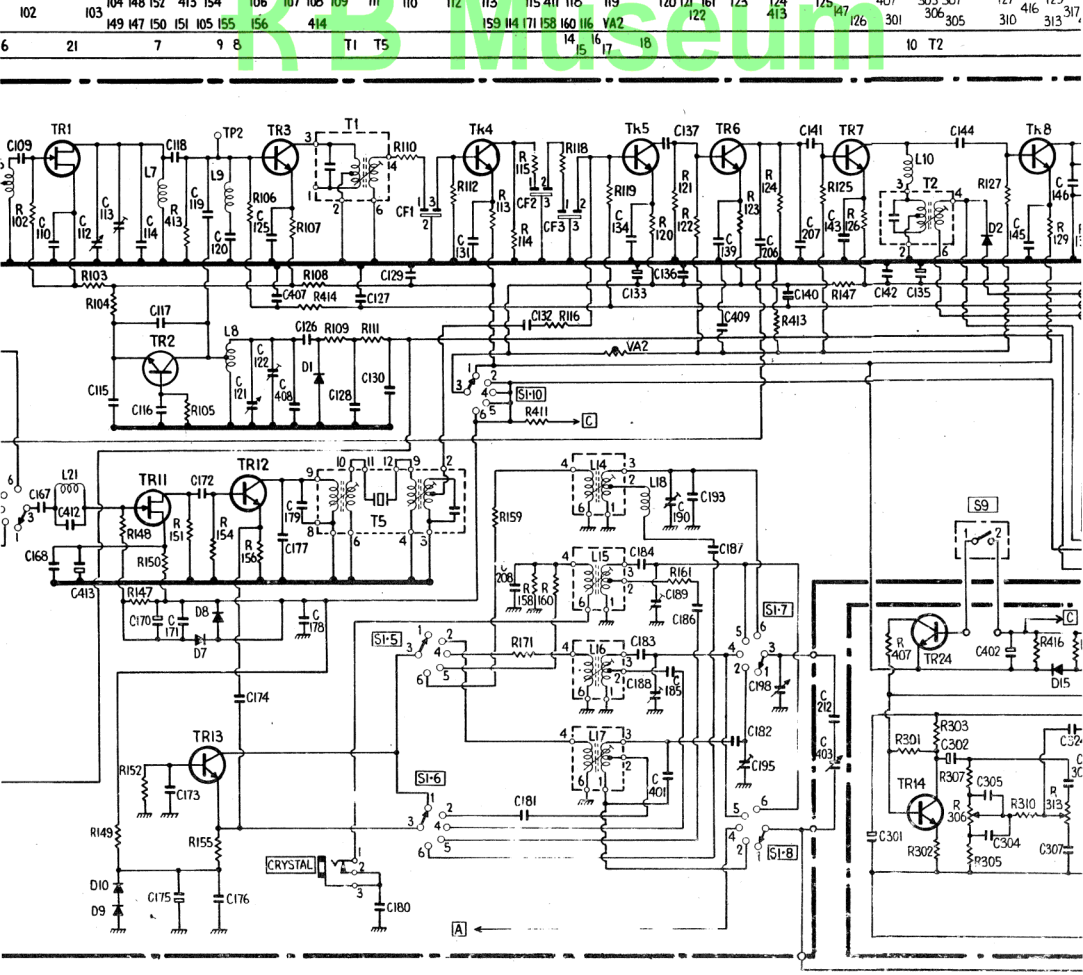

C303	1μF	E1
C304	0.047μF	F2
C305	0.015μF	F2
C306	10μF	E1
C307	0.033μF	F1
C308	0.01μF	E2
C309	1μF	E2
C310	0.0022μF	E2
C311	220μF	E1
C312	0.022μF	E2
C313	220μF	E1
C314	1μF	F1
C315	220μF	D1
C316	0.047μF	D2
C317	0.047μF	D2
C318	1000μF	D2
C319	100μF	E1
C320	1000μF	D2
C321	0.0022μF	E2
C322	1μF	E2
C326	100μF	F2
C327	0.01μF	D2
C328	180pF	E1
C401	56pF	A2
C402	1μF	E1
C403	0.015μF	E2
C404	0.01μF	B1
C407	0.01μF	C1
C408	5pF	C1
C409	0.022μF	C1
C411	180pF	D1

Transistors

Tr1	2SK49	C2
Tr2	2SC1359	C1
Tr3	2SC1359	C1
Tr4	2SC829	C1
Tr5	2SC829	C1
Tr6	2SC829	B1
Tr7	2SC829	A1
Tr8	2SC829	A1
Tr9	2SC829	A1
Tr10	2SC829	A1
Tr11	2SK49	B1
Tr12	2SC1359	B1
Tr13	2SC1359	B1
Tr14	2SC900	E2
Tr15	2SC945	E2
Tr16	2SB173	E2
Tr17	2SC945	D1
Tr18	2SC945	D1
Tr19	2SC1568	D2
Tr20	2SC1568	D2
Tr21	2SC828	F1
Tr22	2SC829	A2
Tr23	2SC829	A2
Tr24	2SC828	E1

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Components

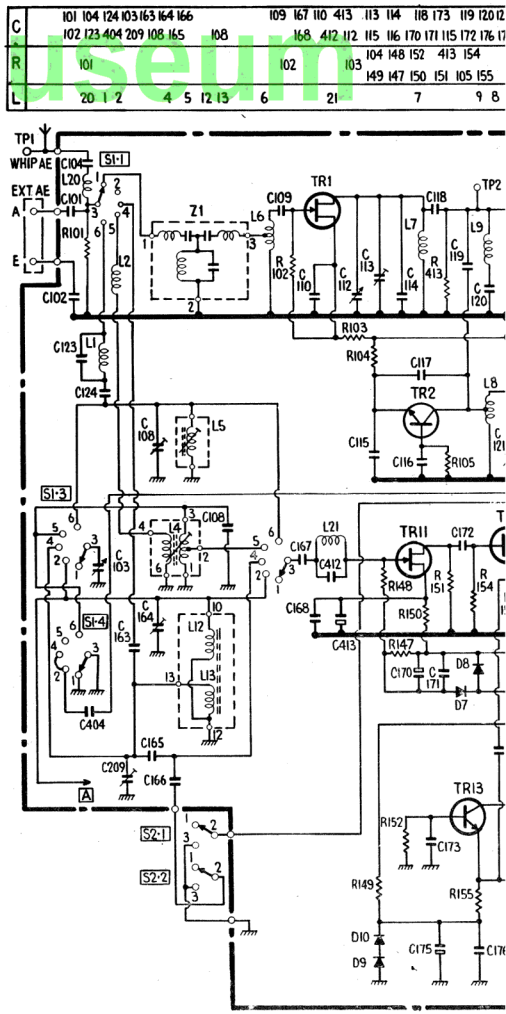
Resistors

R101	100kΩ	C2
R102	820kΩ	C2
R103	47Ω	C2
R104	4.7kΩ	C1
R105	220kΩ	C1
R106	1kΩ	C1
R107	820Ω	C1
R108	47Ω	C1
R109	100kΩ	C1
R110	220Ω	C1
R111	3.3kΩ	C1
R112	470kΩ	C1
R113	680Ω	C1
R114	2.2kΩ	C1
R115	220Ω	C1
R116	1kΩ	C1
R117	10Ω	A1
R118	220Ω	C1
R119	10kΩ	C1
R120	470Ω	B1
R121	1kΩ	C1
R122	10kΩ	B1
R123	390Ω	B1
R124	680Ω	B1
R125	10kΩ	A1
R126	390Ω	A1
R127	10kΩ	A1
R129	150Ω	A1
R130	1kΩ	A1
R131	10kΩ	A1
R132	2.2kΩ	A1
R133	820Ω	A1
R134	33kΩ	A1
R135	10kΩ	A1
R136	4.7kΩ	A1
R137	1.5kΩ	A1
R138	68Ω	A1
R139	100kΩ	A1
R140	33kΩ	A2
R141	1kΩ	A2
R142	1kΩ	A2
R143	10kΩ	A2
R144	470kΩ	A2
R145	1kΩ	A2
R146	1kΩ	A2
R147	560kΩ	B1
R148	330kΩ	B1
R149	330Ω	A1
R150	100Ω	B1
R151	330Ω	B1
R152	330kΩ	B1
R153	100Ω	A2
R154	1.5MΩ	B1
R155	470Ω	B1
R156	2.2kΩ	B1
R157	100Ω	A1
R158	1.2kΩ	B2
R159	15Ω	B2
R160	330Ω	B2
R161	10Ω	A2
R162	1MΩ	A2
R163	39kΩ	A2
R164	470kΩ	A2
R165	470Ω	A2
R166	330Ω	A2
R167	330kΩ	A2
R168	1.5kΩ	A2
R301	820kΩ	E2
R302	2.2kΩ	F1
R303	1.5kΩ	E1
R304	220Ω	E1
R305	2.2kΩ	F2
R306	50kΩ *int. view	
R307	6.8kΩ	F2
R308	22Ω	E1
R309	330kΩ	E1
R310	6.8kΩ	E1
R311	33Ω	E1
R312	1.5kΩ	E1
R313	50kΩ *int. view	
R314	6.8kΩ	E2
R315	15kΩ	E1
R316	2.7kΩ	E1
R317	50kΩ *int. view	
R318	15kΩ	E1
R319	100kΩ	E2
R320	68Ω	E1
R321	4.7kΩ	F1
R322	270Ω	D1
R323	2.2kΩ	D1
R325	3.3kΩ	D1
R326	220Ω	F2
R327	1kΩ	F2
R328	0.22Ω	D1
R402	120kΩ	E2
R407	10kΩ	E2
R408	12kΩ	E1
R409	22kΩ	F1
R410	3.3kΩ	E1
R412	6.8kΩ	E2
R414	15kΩ	E2
R416	15kΩ	E1

*potentiometers

Capacitors

C101	15000pF	C2
C102	0.01μF	C2
C103	Tuning	C2
C104	0.01μF	C2
C106	Trimmer	C2
C108	2pF	B2
C109	0.001μF	C2
C110	0.001μF	C2
C112	Tuning	C1
C113	Trimmer	C2
C114	15pF	C2
C115	27pF	C1
C116	0.001μF	C1
C117	12pF	C1
C118	4pF	C1
C119	1.5pF	C1
C120	330pF	C1
C121	Tuning	C1
C122	Trimmer	C2
C123	4pF	C2
C124	56pF	C2
C125	0.01μF	C1
C126	10pF	C1
C127	0.01μF	C1
C128	0.01μF	C1
C129	0.01μF	C1
C130	0.01μF	B1
C131	0.01μF	B1
C132	0.01μF	B1
C133	100μF	B1
C134	0.022μF	C1
C135	0.022μF	C1
C136	0.02μF	C2
C137	0.01μF	B1
C138	0.022μF	B1
C140	10μF	B1
C141	0.01μF	B1
C142	0.022μF	A1
C143	0.022μF	B1
C144	0.001μF	A1
C145	0.01μF	A1
C146	180pF	A1
C147	33pF	A1
C148	47μF	A1
C149	27pF	A1
C150	0.01μF	A1
C151	0.022μF	A1
C152	0.01μF	A1
C153	0.01μF	A1
C154	0.01μF	A1
C155	4.7μF	A2
C156	1μF	A2
C157	100pF	A2
C158	0.22μF	A2
C159	100pF	A2
C163	1pF	B2
C164	Trimmer	A2
C165	7pF	B2
C166	330pF	B2
C167	0.01μF	B2
C169	0.022μF	B2
C170	1μF	B1
C171	0.01μF	B1
C172	0.01μF	B1
C173	0.01μF	B1
C174	0.0047μF	B1
C175	10μF	B1
C176	0.01μF	B1
C177	56pF	B1
C178	0.022μF	B1
C179	1500pF	B1
C180	0.01μF	B2
C181	0.022μF	A2
C182	180pF	A2
C183	360pF	B2
C184	2700pF	B2
C185	0.01μF	B2
C186	0.001μF	B2
C187	0.001μF	B2
C188	Trimmer	B2
C189	Trimmer	B2
C190	Trimmer	C2
C193	22pF	B2
C195	Trimmer	A1
C198	Tuning	
C199	100pF	A2
C200	0.001μF	A2
C201	0.022μF	A2
C202	0.022μF	A2
C203	0.001μF	A2
C204	0.01μF	A2
C206	0.0033μF	B1
C207	330pF	B1
C208	5pF	B2
C210	6.3μF	B1
C214	330pF	A2
C301	100μF	E1
C302	1μF	E2



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Components

Resistors

R101	100kΩ	C2	R325	3.3kΩ	D1
R102	820kΩ	C2	R326	220Ω	F2
R103	47Ω	C2	R327	1kΩ	F2
R104	4.7kΩ	C1	R328	0.22Ω	D1
R105	220kΩ	C1	R402	120kΩ	E2
R106	1kΩ	C1	R407	10kΩ	E2
R107	820Ω	C1	R408	12kΩ	E1
R108	47Ω	C1	R409	22kΩ	F1
R109	100kΩ	C1	R410	3.3kΩ	E1
R110	220Ω	C1	R412	6.8kΩ	E2
R111	3.3kΩ	C1	R414	15kΩ	E2
R112	470kΩ	C1	R416	15kΩ	E1
R113	680Ω	C1	*potentiometers		
R114	2.2kΩ	C1			
R115	220Ω	C1	**Capacitors**		
R116	1kΩ	C1	C101	15000pF	C2
R117	10Ω	A1	C102	0.01μF	C2
R118	220Ω	C1	C103	Tuning	C2
R119	10kΩ	C1	C104	0.01μF	C2
R120	470Ω	B1	C106	Trimmer	C2
R121	1kΩ	C1	C108	2pF	B2
R122	10kΩ	B1	C109	0.001μF	C2
R123	390Ω	B1	C110	0.001μF	C2
R124	680Ω	B1	C112	Tuning	C1
R125	10kΩ	A1	C113	Trimmer	C2
R126	390Ω	A1	C114	15pF	C2
R127	10kΩ	A1	C115	27pF	C1
R129	150Ω	A1	C116	0.001μF	C1
R130	1kΩ	A1	C117	12pF	C1
R131	10kΩ	A1	C118	4pF	C1
R132	2.2kΩ	A1	C119	1.5pF	C1
R133	820Ω	A1	C120	330pF	C1
R134	33kΩ	A1	C121	Tuning	C1
R135	10kΩ	A1	C122	Trimmer	C2
R136	4.7kΩ	A1	C123	4pF	C2
R137	1.5kΩ	A1	C124	56pF	C2
R138	68Ω	A1	C125	0.01μF	C1
R139	100kΩ	A1	C126	10pF	C1
R140	33kΩ	A2	C127	0.01μF	C1
R141	1kΩ	A2	C128	0.01μF	C1
R142	1kΩ	A2	C129	0.01μF	C1
R143	10kΩ	A2	C130	0.01μF	B1
R144	470kΩ	A2	C131	0.01μF	B1
R145	1kΩ	A2	C132	0.01μF	B1
R146	1kΩ	A2	C133	100μF	B1
R147	560kΩ	B1	C134	0.022μF	C1
R148	330kΩ	B1	C135	0.022μF	C1
R149	330Ω	A1	C136	0.02μF	C2
R150	100Ω	B1	C137	0.01μF	B1
R151	330Ω	B1	C138	0.022μF	B1
R152	330kΩ	B1	C140	10μF	B1
R153	100Ω	A2	C141	0.01μF	B1
R154	1.5MΩ	B1	C142	0.022μF	A1
R155	470Ω	B1	C143	0.022μF	B1
R156	2.2kΩ	B1	C144	0.001μF	A1
R157	100Ω	A1	C145	0.01μF	A1
R158	1.2kΩ	B2	C146	180pF	A1
R159	15Ω	B2	C147	33pF	A1
R160	330Ω	B2	C148	47μF	A1
R161	10Ω	A2	C149	27pF	A1
R162	1MΩ	A2	C150	0.01μF	A1
R163	39kΩ	A2	C151	0.022μF	A1
R164	470kΩ	A2	C152	0.01μF	A1
R165	470Ω	A2	C153	0.01μF	A1
R166	330Ω	A2	C154	0.01μF	A1
R167	330kΩ	A2	C155	4.7μF	A2
R168	1.5kΩ	A2	C156	1μF	A2
R301	820kΩ	E2	C157	100pF	A2
R302	2.2kΩ	F1	C158	0.22μF	A2
R303	1.5kΩ	E1	C159	100pF	A2
R304	220Ω	E1	C163	1pF	B2
R305	2.2kΩ	F2	C164	Trimmer	A2
R306	50kΩ		C165	7pF	B2
	*int. view		C166	330pF	B2
R307	6.8kΩ	F2	C167	0.01μF	B2
R308	22Ω	E1	C169	0.022μF	B2
R309	330kΩ	E1	C170	1μF	B1
R310	6.8kΩ	E1	C171	0.01μF	B1
R311	33Ω	E1	C172	0.01μF	B1
R312	1.5kΩ	E1	C173	0.01μF	B1
R313	50kΩ		C174	0.0047μF	B1
	*int. view		C175	10μF	B1
R314	6.8kΩ	E2	C176	0.01μF	B1
R315	15kΩ	E1	C177	56pF	B1
R316	2.7kΩ	E1	C178	0.022μF	B1
R317	50kΩ		C179	1500pF	B1
	*int. view		C180	0.01μF	B2
R318	15kΩ	E1	C181	0.022μF	A2
R319	100kΩ	E2	C182	180pF	A2
R320	68Ω	E1	C183	360pF	B2
R321	4.7kΩ	F1	C184	2700pF	B2
R322	270Ω	D1	C185	0.01μF	B2
R323	2.2kΩ	D1	C186	0.001μF	B2
			C187	0.001μF	B2

C188	Trimmer	B2
C189	Trimmer	B2
C190	Trimmer	C2
C193	22pF	B2
C195	Trimmer	A1
C198	Tuning	
C199	100pF	A2
C200	0.001μF	A2
C201	0.022μF	A2
C202	0.022μF	A2
C203	0.001μF	A2
C204	0.01μF	A2
C206	0.0033μF	B1
C207	330pF	B1
C208	5pF	B2
C210	6.3μF	B1
C214	330pF	A2
C301	100μF	E1
C302	1μF	E2
C303	1μF	E1
C304	0.047μF	F2
C305	0.015μF	F2
C306	10μF	E1
C307	0.033μF	F1
C308	0.01μF	E2
C309	1μF	E2
C310	0.0022μF	E2
C311	220μF	E1
C312	0.022μF	E2
C313	220μF	E1
C314	1μF	F1
C315	220μF	D1
C316	0.047μF	D2
C317	0.047μF	D2
C318	1000μF	D2
C319	100μF	E1
C320	1000μF	D2
C321	0.0022μF	E2
C322	1μF	E2
C326	100μF	F2
C327	0.01μF	D2
C328	180pF	E1
C401	56pF	A2
C402	1μF	E1
C403	0.015μF	E2
C404	0.01μF	B1
C407	0.01μF	C1
C408	5pF	C1
C409	0.022μF	C1
C411	180pF	D1

Transistors

Tr1	2SK49	C2
Tr2	2SC1359	C1
Tr3	2SC1359	C1
Tr4	2SC829	C1
Tr5	2SC829	C1
Tr6	2SC829	B1
Tr7	2SC829	A1
Tr8	2SC829	A1
Tr9	2SC829	A1
Tr10	2SC829	A1
Tr11	2SK49	B1
Tr12	2SC1359	B1
Tr13	2SC1359	B1
Tr14	2SC900	E2
Tr15	2SC945	E2
Tr16	2SB173	E2
Tr17	2SC945	D1
Tr18	2SC945	D1
Tr19	2SC1568	D2
Tr20	2SC1568	D2
Tr21	2SC828	F1
Tr22	2SC829	A2
Tr23	2SC829	A2
Tr24	2SC828	E1

Diodes

D1	RVDSC15	A1
D2	OA90	A1
D3	OA90	A1
D4	VA1	A1
D5	OA90	A2
D6	OA90	A2
D7	OA90	B1
D8	OA90	B1
D9	RVDVD1250M	B1
D10	RVDVD1250M	B1
D11	RVDVD1151M	D2
D12	RVDVD1252L	D1
D13	RVDVD1151M	D1
D14	RVDVD1151M	F2
D15	RVDVD1250M	E1
D16	RVD10E1LF	D1
D17	RVD10E1LF	D1

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