

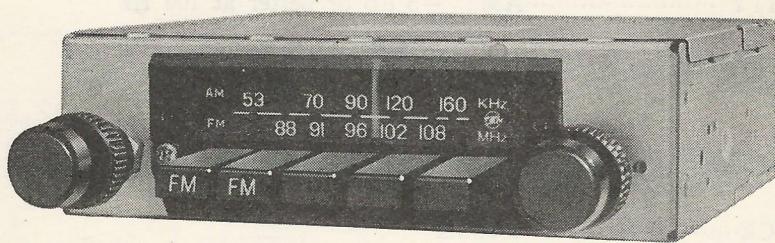


AUTO RADIO SERVICE MANUAL



AM/FM SOLID-STATE AUTO RADIO CUSTOM MADE FOR TOYOTA CELICA

TOYOTA PART NO. 86011-14150 (TM-2224)
00851-14070 (TM-2224-1)



GENERAL

All solid-state AM/FM auto radio TOYOTA Part No. 86011-14150 is designed exclusively for use in TOYOTA CELICA with negative ground system.

Containing 3 IC's, 7 transistors and 7 diodes, AM/FM 5-pushbutton auto radio is ensured for its stable performance.

AM or FM is easy to switch with the pre-set pushbutton.

TOYOTA MOTOR SALES CO., LTD.

COMPOSITION

86011-14150 (TM-2224)	00851-14070 (TM-2224-1)	TOYOTA Part No.	Description	Q'ty
○	○	FCC DATE 86120-14070	Tuner assembly, radio (AT-2224-5)	1
○	○	86160-14060	Speaker assembly, radio (SB-289)	1
○	○	86300-14080	Antenna assembly with holder (RN-EAU-D3-72)	1
○	○		Setting kit (CL-026)	1

NOTE: Model numbers in parenthesis denote FUJITSU TEN's numbers.

SPECIFICATIONS

TUNING RANGE	AM: 525 to 1605 kHz	FM: 88 to 108 MHz
INTERMEDIATE FREQUENCY	AM: 455 kHz	FM: 10.7 MHz
SENSITIVITY	AM: 26 dB or better (at 0.5 watt output) FM: 18 dB or better (at S/N 30 dB)	
ELECTRICAL FIDELITY	AM: -5 dB or better at 100 Hz -16 dB or better at 4 kHz FM: -5 dB or better at 100 Hz -24 dB or better at 10 kHz	
POWER OUTPUT	2.7 watts min. RMS (at T.H.D.=10%)	
SPEAKER IMPEDANCE	4 ohms	
POWER INPUT	12-volt battery, negative terminal to ground	
Voltage	13.2 VDC	
Current	Approx. 0.7 ampere (maximum)	
TRANSISTORS & IC's	7, plus 3 IC's and 7 diodes	
DIMENSIONS	160(W)×47(H)×137(D)mm (6 ¹⁵ / ₁₆ ", 1 ²⁷ / ₃₂ ", 5 ¹³ / ₃₂ ")	
WEIGHT	Radio tuner—1.15 kg (2.25 lbs.)	

BLOCK DIAGRAM

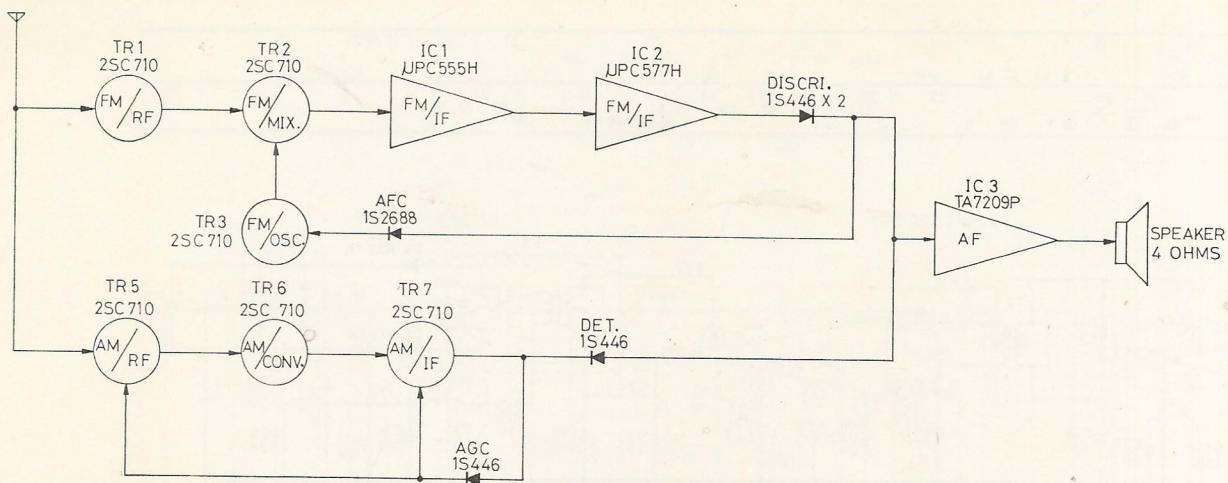


Fig. 1

PARTS LOCATION ON PC BOARD

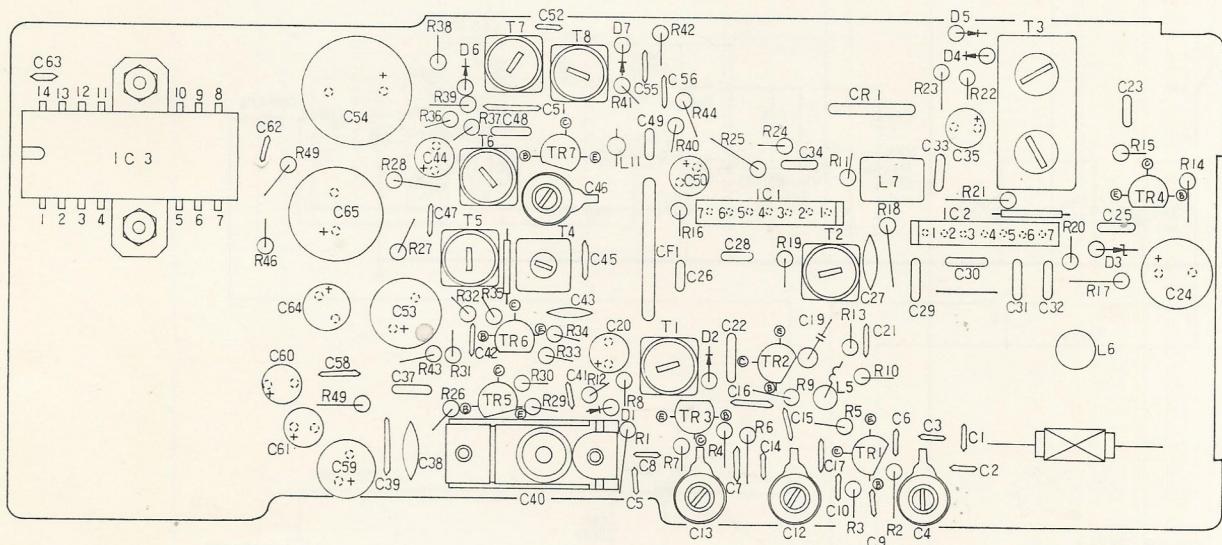


Fig. 2

CHECK POINTS ON PC BOARD

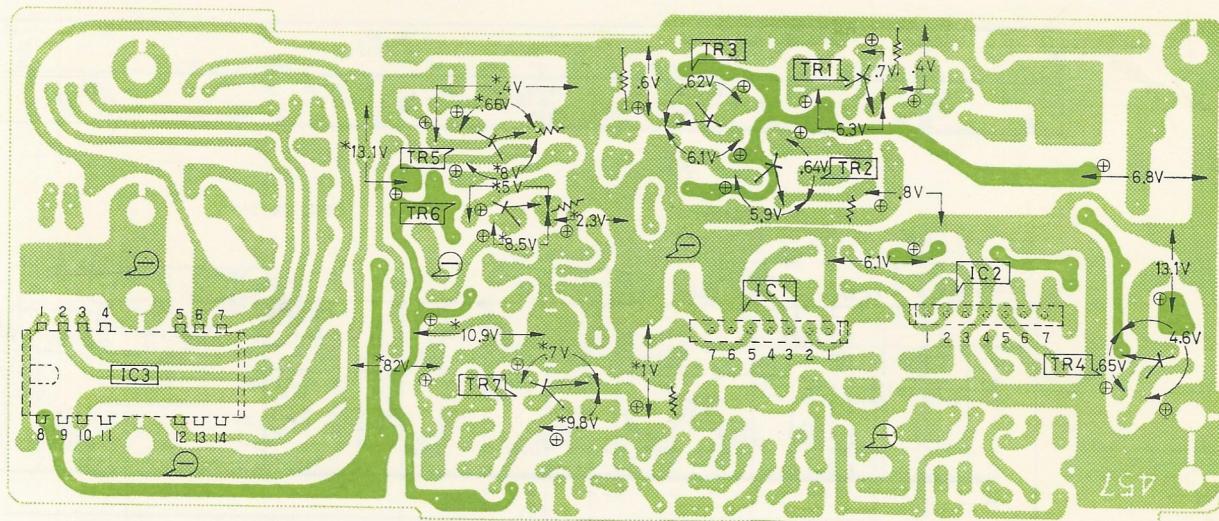


Fig. 3

IC	Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC 1		5.4V	5.7V	5.4V	—	1.5V	—	1.5V	—	—	—	—	—	—	—
IC 2		4.3V	1.6V	1.6V	—	5.2V	2.4V	5.2V	—	—	—	—	—	—	—
IC 3		7.8V	1.4V	11.2V	—	6.2V	6.3V	4.4V	—	—	—	—	6.4V	—	13.1V

- NOTES:
- DC voltages measured with 25,000 OHM per volt meter, power supply set at +13.2 VDC, no signal input.
 - ⊕ denotes positive polarity of the tester.
 - IC pin voltages measured with respect to chassis.
 - Asterisked voltages are measured in "AM" reception and no asterisked voltages in "FM" reception.

IC & TRANSISTOR BASING

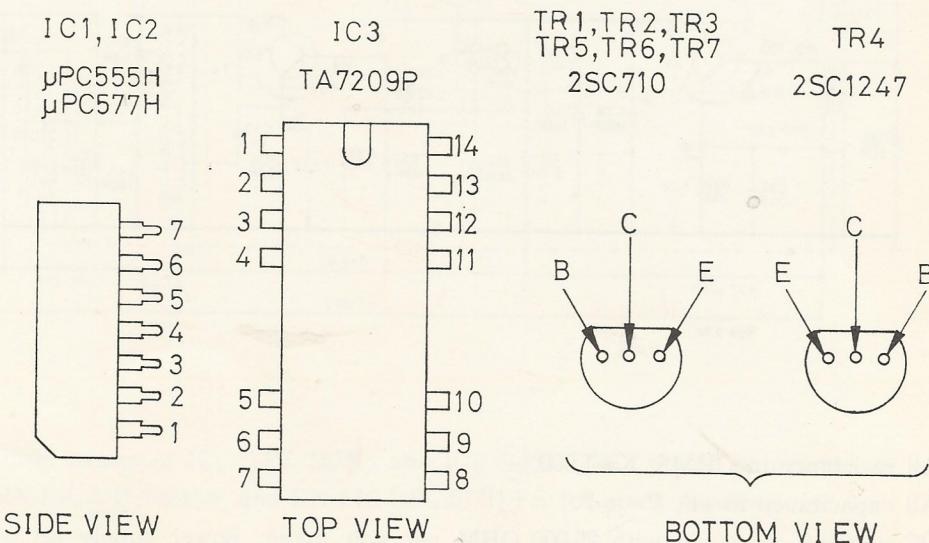


Fig. 4

ALIGNMENT PROCEDURE

AM ALIGNMENT

- ◎ Tracking alignment (Refer to Fig. 9 for "ADJUST" points.)

STEP	PURPOSE	ADJUST	PROCEDURE
1	Tuning frequency range	C ₄₆	1650 kHz must be received at right end of dial.
2	Tuning frequency range	T ₄	510 kHz must be received at left end of dial.
3	Repeat STEP 1 to 2.		
4	Tracking	C ₃₆ , C ₄₀	Top volume obtained at 1400 kHz.

Remarks: Always readjust antenna trimmer (C₃₆) with radio installed in car.

FM ALIGNMENT

- ◎ IF alignment (Refer to Fig. 9 for "ADJUST" points and Fig. 8 and 9 for connection of measuring instruments.)

As connected in Fig. 8, align as follows, observing S-curve on the oscilloscope.

STEP	PURPOSE	ADJUST	PROCEDURE
1	S-curve	T ₁ , T ₂ , T ₃ (primary side)	Adjust for full gain and length at linears.
2	S-curve	T ₃ (secondary side)	Keep S-curve straight at the center, and adjust waveform for best symmetry of S-curve against the axis. (Fig. 7)
3	Repeat STEP 1 to 2.		

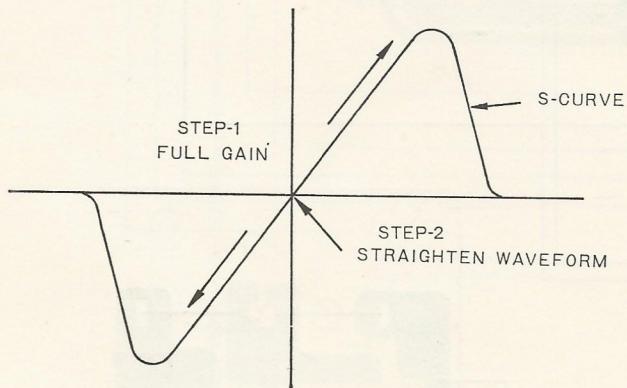


Fig. 7

- ◎ Tracking alignment (Refer to Fig. 9 for "ADJUST" points. For this alignment, SSG is needed.)
After setting frequency range to the specified frequency, align sensitivity.

STEP	PURPOSE	ADJUST	PROCEDURE
1	Tuning frequency range	C ₁₃	87.5 MHz must be received at left end of dial.
2			108 MHz must be received at right end of dial.
3	Tracking	C ₄ , C ₁₂	Top sensitivity obtained at 98 MHz.

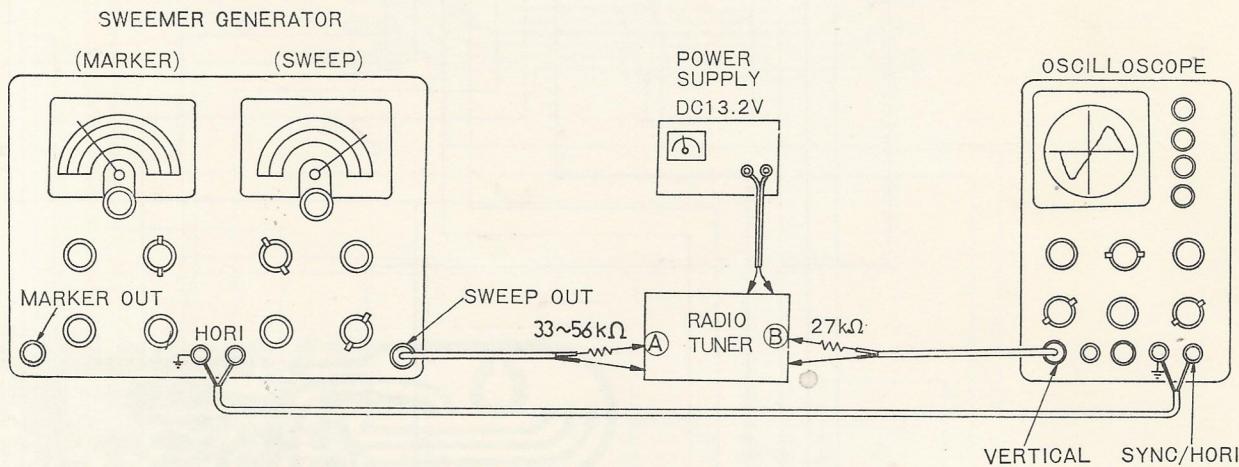


Fig. 8

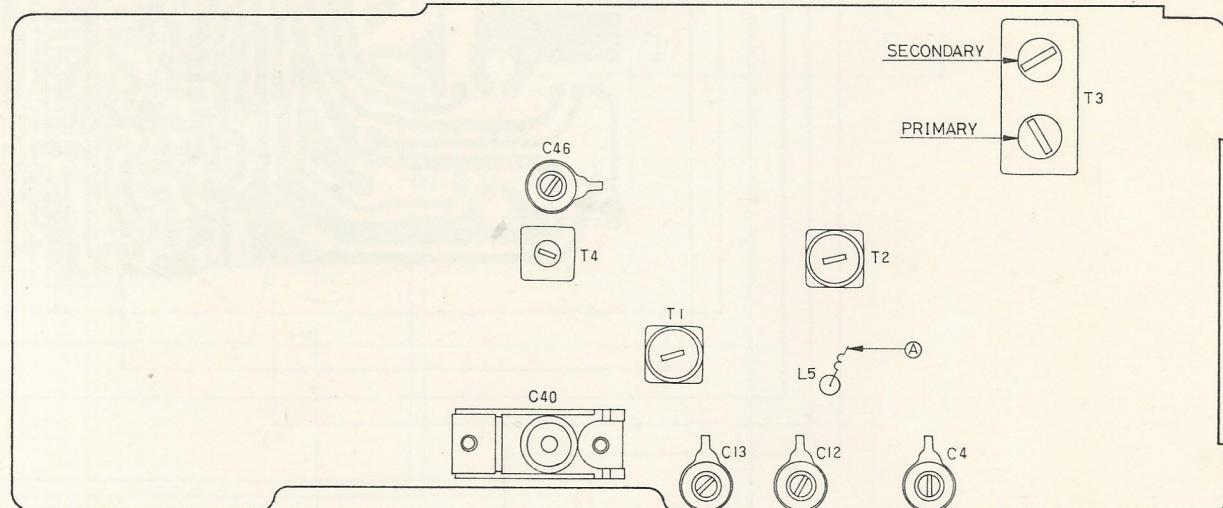


Fig. 9

NOTE: Connect point ⑧ to hot side of volume control (R₄₆).

REPLACEMENT PARTS LIST

Symbol No.	Stock No.	Description		
CAPACITORS				
C 1	RN-ECC-RS L200K	20 pf	50V	ceramic
C 2	RN-ECC-RS L400K	40 pf	50V	ceramic
C 3	RN-ECC-RS L100F	10 pf	50V	ceramic
C 4	RN-ECV-B20-18	20 pf		FM ANT. trimmer
C 5	RN-ECC-RS L080D	8 pf	50V	ceramic
C 6	RN-ECC-RS L020C	2 pf	50V	ceramic
C 7	RN-ECK-RYW222M	.0022 μ f	50V	ceramic
C 8	RN-ECC-RS L030C	3 pf	50V	ceramic
C 9	RN-ECK-RYW222M	.0022 μ f	50V	ceramic
C 10	RN-ECC-RS L100F	10 pf	50V	ceramic
C 12	RN-ECV-B20-18	20 pf		FM RF trimmer
C 13	RN-ECV-B10-17	10 pf		FM OSC. trimmer
C 14	RN-ECK-RYW222M	.0022 μ f	50V	ceramic
C 15	RN-ECC-RS L050D	5 pf	50V	ceramic
C 16	RN-ECC-RS L010C	1 pf	50V	ceramic
C 17	RN-ECK-RYW222M	.0022 μ f	50V	ceramic
C 18	RN-ECC-DVK080D	8 pf	50V	ceramic
C 19	CQ08S-2E-300R0-K03	300 pf	50V	styrol
C 20	RN-ECE-MR47V50	.47 μ f	50V	electrolytic
C 21	RN-ECK-RYW222M	.0022 μ f	50V	ceramic
C 22, C 23	RN-ECF-R473V50	.047 μ f	50V	mylar
C 24	RN-ECE-M221V10-1	220 μ f	10V	electrolytic
C 25, C 26	RN-ECF-R473V50	.047 μ f	50V	mylar
C 27	RN-ECK-DYR103M	.01 μ f	50V	ceramic
C 28-C 32	RN-ECF-R473V50	.047 μ f	50V	mylar
C 33	RN-ECF-R222V50	.0022 μ f	50V	mylar
C 34	RN-ECF-R223V50	.022 μ f	50V	mylar
C 35	RN-ECE-M100V16	10 μ f	16V	electrolytic
C 36	RN-ECT-S500-35	50 pf		AM ANT. trimmer
C 37	RN-ECF-R473V50	.047 μ f	50V	mylar
C 38	EN-ECB-DBC473E	.047 μ f	25V	ceramic
C 39	RN-ECC-RS L391K	390 pf	50V	ceramic
C 40	RN-ECT-N151-30	150 pf		AM RF trimmer
C 41	RN-ECF-R472V50	.0047 μ f	50V	mylar
C 42	RN-ECF-R103V50	.01 μ f	50V	mylar
C 43	RN-ECK-DYR103M	.01 μ f	50V	ceramic
C 44	RN-ECE-M100V16	10 μ f	16V	electrolytic
C 45	RN-ECC-R LH181K	180 pf	50V	ceramic
C 46	RN-ECV-B50-21	50 pf		AM OSC. trimmer
C 47	RN-ECC-RS L080D	8 pf	50V	ceramic
C 48, C 49	RN-ECF-R473V50	.047 μ f	50V	mylar
C 50	RN-ECE-M4R7V25	4.7 μ f	25V	electrolytic
C 51	RN-ECC-R TH201K	200 pf	50V	ceramic
C 52	RN-ECC-RS L100F	10 pf	50V	ceramic
C 53	RN-ECE-M221V16-1	220 μ f	16V	electrolytic
C 54	RN-ECE-M102V16-1	1000 μ f	16V	electrolytic
C 55, C 56	RN-ECK-RYW222M	.0022 μ f	50V	ceramic
C 57	RN-ECB-DBC104B	.1 μ f	12V	ceramic
C 58	RN-ECK-RYW222M	.0022 μ f	50V	ceramic
C 59	RN-ECE-M101V10-2	100 μ f	10V	electrolytic

Symbol No.	Stock No.	Description			
C ₆₀	RN-ECE-MR47V50	.47 μ f	50V	electrolytic	
C ₆₁	RN-ECE-M4R7V25	4.7 μ f	25V	electrolytic	
C ₆₂	RN-ECC-RSL500K	50 pf	50V	ceramic	
C ₆₃	RN-ECK-RYW471K	470 pf	50V	ceramic	
C ₆₄	RN-ECE-M470V6R3	47 μ f	6.3V	electrolytic	
C ₆₅	RN-ECE-M471V16-1	470 μ f	16V	electrolytic	
C ₆₆ , C ₆₇	RN-ECZ-1B102-13	1000 pf		feed thru	
C ₆₈ , C ₆₉	RN-ECK-RYW222M	.0022 μ f	50V	ceramic	
C ₇₀	RN-ECF-R473V50	.047 μ f	50V	mylar	
RESISTORS & CONTROL					
R ₁	RN-ERD-DC102 J	1k ohm	1/8W	5%	carbon
R ₂	RN-ERD-DC471 J	470 ohm	1/8W	5%	carbon
R ₃	RN-ERD-DC562 J	5.6k ohm	1/8W	5%	carbon
R ₄	RN-ERD-DC472 J	4.7k ohm	1/8W	5%	carbon
R ₅	RN-ERD-DC273 J	27k ohm	1/8W	5%	carbon
R ₆	RN-ERD-DC102 J	1k ohm	1/8W	5%	carbon
R ₇	RN-ERD-DC332 J	3.3k ohm	1/8W	5%	carbon
R ₈	RN-ERD-DC104 J	100k ohm	1/8W	5%	carbon
R ₉	RN-ERD-DC562 J	5.6k ohm	1/8W	5%	carbon
R ₁₀	RN-ERD-DC152 J	1.5k ohm	1/8W	5%	carbon
R ₁₁	RN-ERD-DC334 J	330k ohm	1/8W	5%	carbon
R ₁₂	RN-ERD-DC473 J	47k ohm	1/8W	5%	carbon
R ₁₃	RN-ERD-DC102 J	1k ohm	1/8W	5%	carbon
R ₁₄	RN-ERD-DC101 J	100 ohm	1/8W	5%	carbon
R ₁₅	RN-ERD-DC102 J	1k ohm	1/8W	5%	carbon
R ₁₆	RN-ERD-DC331 J	330 ohm	1/8W	5%	carbon
R ₁₇	RN-ERD-DC560 J	56 ohm	1/8W	5%	carbon
R ₁₈	RN-ERD-DC101 J	100 ohm	1/8W	5%	carbon
R ₁₉	RN-ERD-DC332 J	3.3k ohm	1/8W	5%	carbon
R ₂₀	RN-ERD-DC101 J	100 ohm	1/8W	5%	carbon
R ₂₁	RN-ERD-DC151 J	150 ohm	1/8W	5%	carbon
R ₂₂ , R ₂₃	RN-ERD-DC102 J	1k ohm	1/8W	5%	carbon
R ₂₄	RN-ERD-DC393 J	39k ohm	1/8W	5%	carbon
R ₂₅	RN-ERD-AC332 J	3.3k ohm	1/8W	5%	carbon
R ₂₆	RN-ERD-DC101 J	100 ohm	1/8W	5%	carbon
R ₂₇	RN-ERD-DC474 J	470k ohm	1/8W	5%	carbon
R ₂₈	RN-ERD-DC392 J	3.9k ohm	1/8W	5%	carbon
R ₂₉	RN-ERD-DC331 J	330 ohm	1/8W	5%	carbon
R ₃₀	RN-ERD-AC153 J	15k ohm	1/8W	5%	carbon
R ₃₁	RN-ERD-DC222 J	2.2k ohm	1/8W	5%	carbon
R ₃₂	RN-ERD-DC393 J	39k ohm	1/8W	5%	carbon
R ₃₃	RN-ERD-DC153 J	15k ohm	1/8W	5%	carbon
R ₃₄	RN-ERD-DC332 J	3.3k ohm	1/8W	5%	carbon
R ₃₅	RN-ERD-DC182 J	1.8k ohm	1/8W	5%	carbon
R ₃₆ , R ₃₇	RN-ERD-DC473 J	47k onm	1/8W	5%	carbon
R ₃₈	RN-ERD-DC124 J	120k ohm	1/8W	5%	carbon
R ₃₉	RN-ERD-DC393 J	39k ohm	1/8W	5%	carbon
R ₄₀	RN-ERD-DC221 J	220 ohm	1/8W	5%	carbon
R ₄₁	RN-ERD-DC103 J	10k ohm	1/8W	5%	carbon
R ₄₂	RN-ERD-DC222 J	2.2k ohm	1/8W	5%	carbon

Symbol No.	Stock No.	Description				
R ₄₃	RN-E RD-DC391 J	390 ohm	1/8W	5%	carbon	
R ₄₄	RN-E RD-DC273 J	27k ohm	1/8W	5%	carbon	
R ₄₅ , R ₄₆ , S ₂	RN-E RV-2P2-130	Control, tone 50k ohm	volume 50k ohm		variable resistor	
R ₄₇	RN-E RD-DC471 J	470 ohm	1/8W	5%	carbon	
R ₄₈ , R ₄₉	RN-E RD-DC104 J	100k ohm	1/8W	5%	carbon	
IC's, TRANSISTORS & DIODES						
I C ₁	RN-E I C-UP C555H-F	FM-IF amp., linear-monolithic				
I C ₂	RN-E I C-UP C577H-F E	FM-IF amp., linear-monolithic				
I C ₃	RN-E I C-TA7209 P	Driver and power output, linear-monolithic				
TR ₁	RN-E VS-2S C710-B	FM-RF amp., silicon				
TR ₂	RN-E VS-2S C710-C	FM-mixer, silicon				
TR ₃	RN-E VS-2S C710-C	FM-oscillator, silicon				
TR ₄	2SC-1247A-V S	Regulator, silicon				
TR ₅	RN-E VS-2S C710-D	AM-RF amp., silicon				
TR ₆	RN-E VS-2S C710-C	AM-converter, silicon				
TR ₇	RN-E VS-2S C710-D	AM-IF amp., silicon				
D ₁	RN-EDC-1S2688-3	AFC, variable capacitance, silicon				
D ₂	RN-EDS-1S1555	Silicon				
D ₃	RN-EDT-MZ207-1	Regulator, zener				
D ₄ , D ₅	RN-EDG-1S446-D	FM detector, germanium				
D ₆	RN-EDG-1S446	AGC, germanium				
D ₇	RN-EDG-1S446	AM detector, germanium				
COILS & TRANSFORMERS						
L ₁	RN-E LH-B6R2-1	Choke, 6.2 μ H (antenna isolation)				
L ₂ , L ₃ , L ₄		Coil assy., parts of tuner assembly (FM)				
L ₅	RN-E LH-BR74	Choke, 0.74 μ H				
L ₆	RN-E LH-C6R2	Choke, 6.2 μ H				
L ₇	RN-E LH-C6R2-1	Choke, 6.2 μ H				
L ₈ , L ₉ , L ₁₀		Coil assy., parts of tuner assembly (AM)				
L ₁₁	RN-E LH-B7R5	Coil, AM-oscillator series, 7.5 μ H				
L ₁₂	RN-E LL-205	Choke, filter, 3 mH				
L ₁₃	RN-E LH-BR74	Choke, 0.74 μ H				
L ₁₄	RN-E LL-209	Choke, filter, 50 μ H				
T ₁ , T ₂	RN-E TF-131	Transformer, FM-IF, 10.7 MHz				
T ₃	RN-E TD-112	Transformer, discriminator, 10.7 MHz				
T ₄	RN-E TH-206	Transformer, AM oscillator				
T ₅ , T ₆	RN-E TA-129	Transformer, AM-IF, 455 kHz				
T ₇ , T ₈	RN-E TA-130	Transformer, AM-IF, 455 kHz				
CF ₁	RN-E FC-F4-109	Ceramic filter, 455 kHz				
CR PACKAGED ELECTRONIC COMPONENTS						
CR ₁	RN-E CR-2	Module assembly, FM detector				
MISCELLANEOUS ELECTRICAL						
F ₁	RN-E FG-B02	Fuse, 2 amperes				
	RN-E FH-22	Holder, fuse				
J ₁	RN-E JA-107	Receptacle, antenna				
PL ₁	RN-E PL-54-2	Lamp, FM				
PL ₂	RN-E PL-54-3	Lamp, AM				

Symbol No.	Stock No.	Description
PL ₃	RN-E PM-11	Lamp assy., assembly of following three parts
	RN-E PL-33	Lamp, dial light
	RN-EXL-103	Lamp socket
	RN-MLF-50	Filter, lamp
	RN-ETB-2L-148	Pushbutton μ tuner assembly (includes coil assy. and AM/FM changing switch (S ₁))
	RN-E PP-418-A T-2224-5	PC board assy., main
	RN-E JU-S05V239	Connector, 5P, power and speaker
	RN-MPM-432	PC board, line filter
	RN-MPM-456	PC board, PL ₁ and PL ₂

Stock No.	Description	Q'ty
MISCELLANEOUS MECHANICAL		
RN-MTD-187A	Chassis (inclus. top cover)	1
RN-MHE-436	Sub chassis, back cover	1
RN-MNM-299	Dialplate calibrated	1
RN-MBP-9	Backplate	1
RN-MIB-50	Pointer, dialplate	1
RN-MHE-418	Holder, backplate	1
RN-MHE-420	Holder, lamp (PL ₃)	1
RN-MCE-106	Clamp, antenna cord	1
RN-MLC-99	Supporter, PL ₁ and PL ₂ , rubber	1
RN-MRU-67A	Radiator, IC ₃	1
F6-SNA-2.6×6S	Screw, 2.6×6mm, backplate mounting	1
F6-SBD-3×4S	Screw, 3×4mm	2
F6-SBD-3×6S	Screw, 3×6mm	21
F6-SSA-3×6S	Screw, 3×6mm	1
F6-SNA-3×8S	Screw, 3×8mm, IC ₃ mounting	3
F6-SBD-3×10S	Screw, 3×10mm, fuse holder mounting	1
F6-WB-3S	Washer, 3mm, IC ₃ mounting	3
F6-N1-3S	Nut, 3mm, IC ₃ mounting	3
F6-N1-3BS	Nut, 3mm, fuse holder mounting	1
RN-MSN-7	Nut, 9mm, tune and volume shaft mounting	2

Stock No.	TOYOTA Part No.	Description	Q'ty
SETTING KIT (CL-026)			
RN-MYD-59	86124-12010	Knob, tone and tuning control	2
RN-MYN-130	86125-12011	Knob, volume and tuning control	2
RN-MBL-328	86215-14050	Bracket, tuner, front (upper)	1
RN-MBE-165	86215-14060	Bracket, tuner (left and right)	2
RN-ECNR-SR50F-45	90980-04010	Capacitor, regulator	2
RN-MNR-D5S	90179-05095	Nut, lock, speaker mounting, 5mm	2
RN-MET-143	90159-50159	Special screw, bracket mounting	4
RN-MCW-B5×8S	93319-15008	Screw with washer, tuner mounting, 5×8mm	6
RN-MSN-7	90170-09167	Nut, 9mm, tuning and volume shaft	2
RN-MWS-2	90201-09365	Washer, 9mm, tuning and volume shaft	2
ANTENNA ASSEMBLY WITH HOLDER (RN-EAU-D3-72)			
RN-EAE-109	86309-12052	Pole sub assembly, pillar antenna	1
RN-EWF-38	86101-14030	Cord sub assembly, antenna	1
RN-EAS-104	86391-14030	Holder, antenna	1
	90167-40015	Screw, pan tapping	1
	93510-14016	Screw, tapping	2
	90159-40198	Screw with washer	1

NOTE: Specifications subject to change without prior notice

SCHEMATIC

R	26	1	2	3	4	5	6	30	31	7	32	33	34	8	9	10	11	12	13	35	14	36	15	37	38	39	40	21	22	23	24	25								
C	36	1	2	3	4	5	6	37	38	7	39	40	11	12	13	41	42	14	15	16	17	30	31	32	33	34	35	43	44	45	46	47	48	49	20	21	22	23	24	25

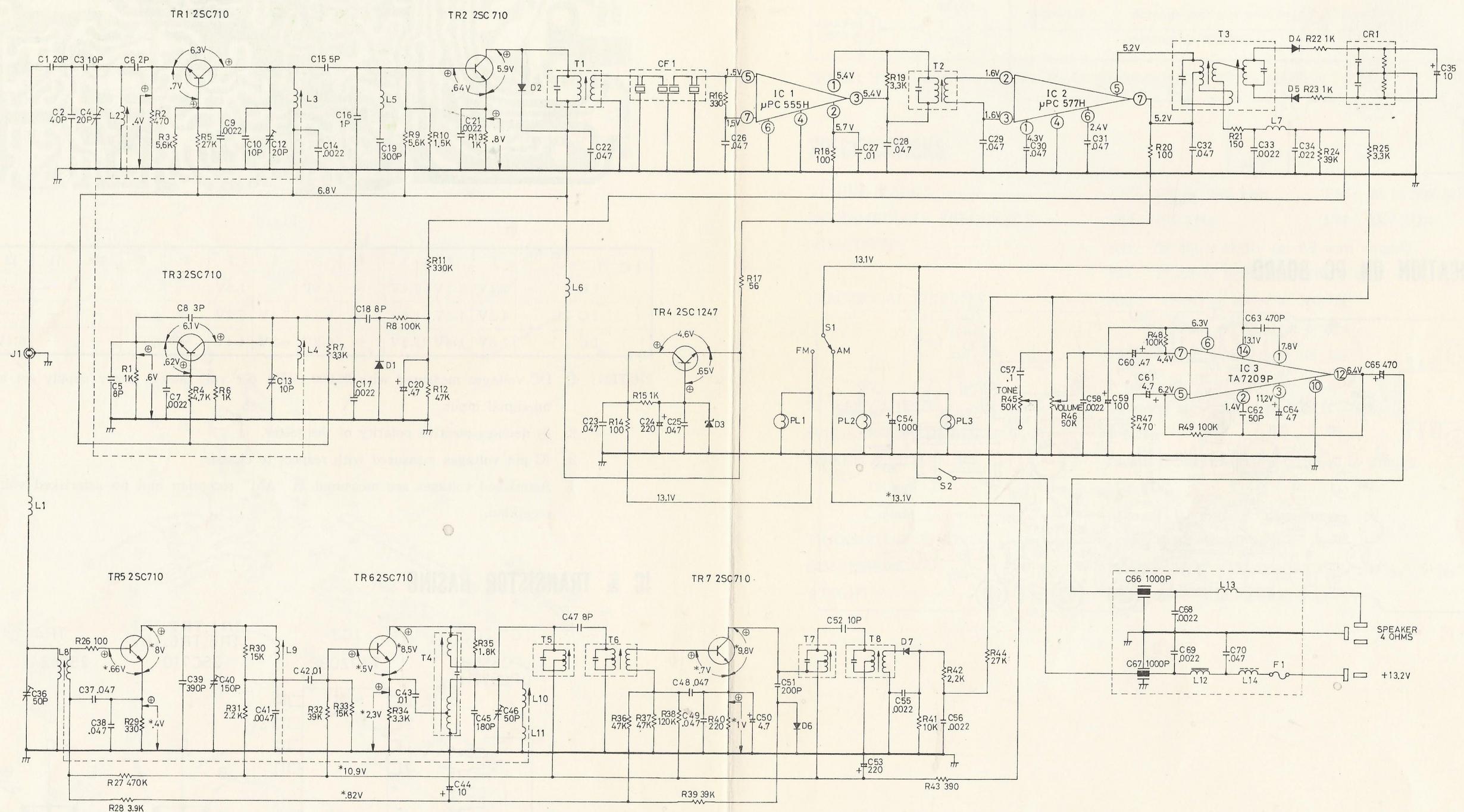


Fig. 5

- NOTES:
- All resistance in OHMS, K=1,000.
 - All capacitance in μF , P= $\mu\mu\text{F}$.
 - DC voltages measured with 25,000 OHM per volt meter, power supply set at +13.2 VDC, no signal input.
 - Asterisked voltages are measured in "AM" reception and no asterisked voltages in "FM" reeeption.

- Parts names of IC₁ ($\mu\text{PC } 555\text{H}$) and IC₂ ($\mu\text{PC } 577\text{H}$) should be ordered as RN-EIC-UPC555H-F and RN-EIC-UPC-577H-FE for stock numbers.

WIRING ON PC BOARD

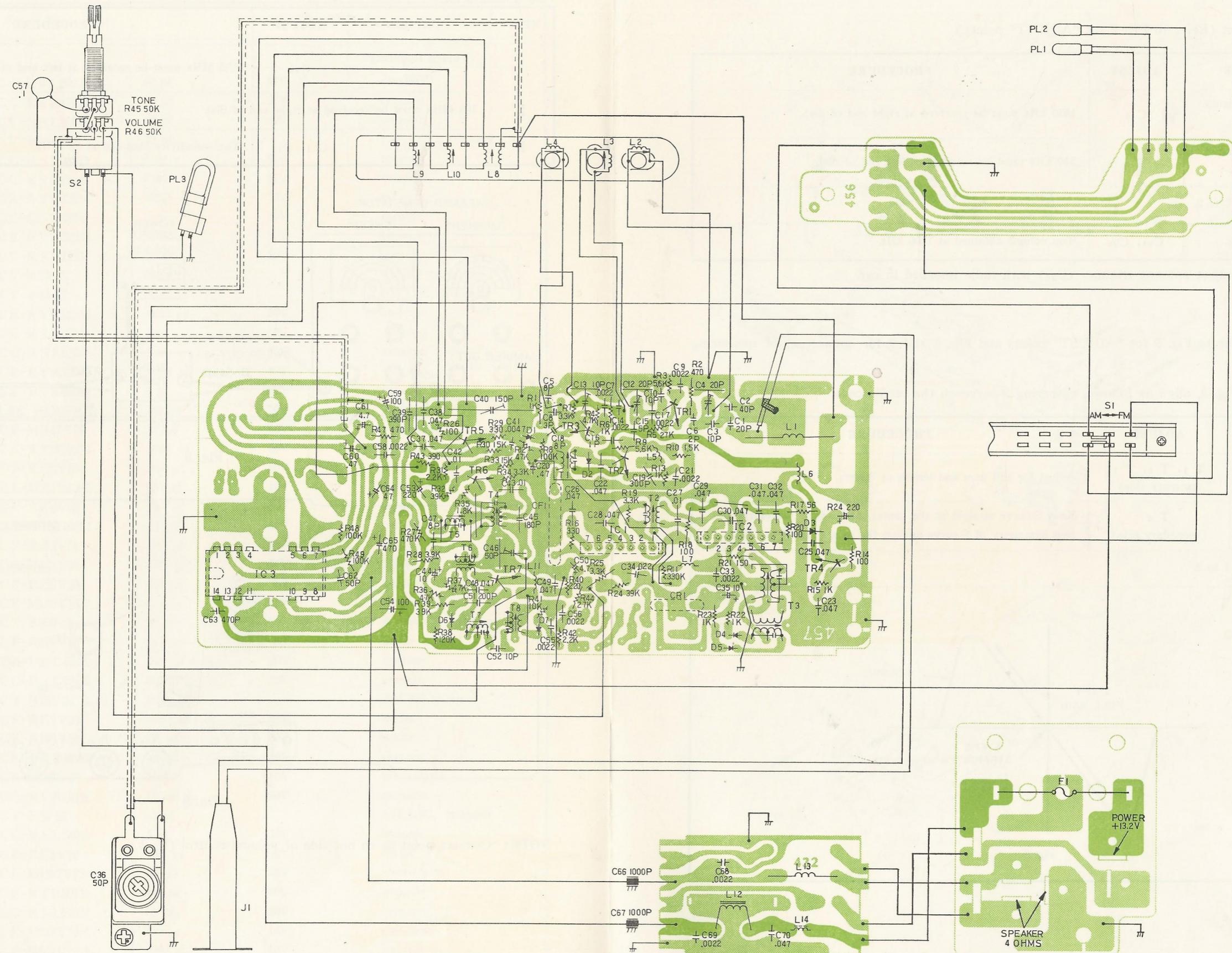


Fig. 6

- NOTES: 1. All resistance in OHMS, K=1,000.
2. All capacitance in μF , P= $\mu\mu\text{F}$.