SANGEAN

Service Manual

ATS-803A

ATS-803A

AM/FM DIRECT ENTRY COMMUNICATIONS RECEIVER

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SPECIFICATIONS

SW ELECTRICAL PERFORMANCE

TEST ITEM		CONDITION	NOMINAL	LIMIT	UNIT
Tuning Range		Min.	2300		kHz
		Max.	26100		kHz
Intermediate Freq.		1st IF	55845	±1	kHz
		2nd IF	450	±1	kHz
Max.Sens.		2300kHz	8	14	dB
		15100kHz	8	14	dB
		25600kHz	8	14	dB
Useable Sens. (S/N 20dB)		2300KHz	20	26	dB
		15100kHz	18	24	dB
		25600kHz	18	24	dB
Audio Fidelity (−6dB)		15100kHz		180	Hz
		15100kHz		2200	Hz
Bandwidth 6dB @ Wide BW		15100kHz	6.5	4-9	kHz
T.H.D. (1mV)		15100kHz	2	4	%
A.G.C. F.O.M.		15100kHz		50	dB
Image Rejection		15100kHz		36	dB
I.F. Rejection (450kHz)		15100kHz		50	dB
Lowest Battery Voltage		15100kHz	4.8	5.4	V
Tuning Indicator Sens. (3rd LED ON)		15100kHz	20	26	dB
Auto Scanning Stop Sens.		15100kHz	20	26	dB
SSB/CW Sens. (S/N=10dB)		15100kHz	−3	+3	dB
Supply Voltage: DC 9V	R.O.: 50mW	Load: 8 ohm	Modulation:1kHz/30% Mod.		

FM ELECTRICAL PERFORMANCE

TEST ITEM		CONDITION	NOMINAL	LIMIT	UNIT
Tuning Range		Min.	87.5	---	MHz
		Max.	108	---	MHz
Intermediate Freq.			10.7	±0.05	MHz
Max. Sens.		90MHz	12	18	dB
		98MHz	12	18	dB
		106MHz	12	18	dB
Useable Sens. (S/N 30dB)		90MHz	18	24	dB
		98MHz	18	24	dB
		106MHz	18	24	dB
Audio Fidelity (−6dB)		98MHz		150	Hz
		98MHz		3.2K	Hz
3dB Limiting (10mV)		98MHz	24	30	dB
Image Rejection		106MHz	36	30	dB
I.F. Rejection		90MHz	60	50	dB
T.H.D. (75kHz dev.)		98MHz	2	4	%
Lowest Battery Voltage		98MHz	4.8	5.4	V
Output Power at 10% T.H.D.		98MHz	1200	900	mW
Stereo Indicator Sens.		98MHz	18	24	dB
Tuning Indicator Sens. (3rd LED ON)		98MHz	18	24	dB
Stereo Separation (1kHz)		98MHz	25	20	dB
Auto Scanning Stop Sens.		98MHz	18	24	dB
Am. Suppression		98MHz		30	dB
Min. Output		98MHz		10	mV
Bass Effect 100Hz		98MHz	±8	±6	dB
Treble Effect 10kHz		98MHz	±8	±6	dB
Supply Voltage: DC 9V	R.O.: 50mW	Load: 8 ohm	Modulation: 1kHz/22.5kHz Dev.		

MW ELECTRICAL PERFORMANCE

TEST ITEM		CONDITION	NOMINAL	LIMIT	UNIT
Tuning Range		Min.	520		kHz
		Max.	1620		kHz
Intermediate Freq.		1st IF	55845	±1	kHz
		2nd IF	450	±1	kHz
Max. Sens.		600kHz	48	54	dB
		1000kHz	46	52	dB
		1400kHz	46	52	dB
Useable Sens. (S/N 20dB)		600kHz	56	62	dB
		1000kHz	54	60	dB
		1400kHz	54	60	dB
Audio Fidelity (-6dB)		1000kHz		180	Hz
		1000kHz		2200	Hz
A.C.A. (1mV/m,±10kHz)		1000kHz		46	dB
Bandwidth 6dB	@ Wide BW	1000kHz	6.5	4-9	kHz
T.H.D. (5mV/m)		1000kHz	2	4	%
A.G.C. F.O.M.		1000kHz		40	dB
Image Rejection		1000kHz		36	dB
I.F. Rejection (450kHz)		1000kHz		46	dB
Whistle Modulation (5mV/m)		2IF/3IF	10	15	%
Lowest Battery Voltage		1000kHz	4.8	5.4	V
Tuning Indicator Sens. (3rd LED ON)		1000kHz	58	63	dB
Auto Scanning Stop Sens.		1000kHz	58	63	dB
Supply Voltage : DC 9V	R.O. : 50mW	Load : 8 ohm	Modulation : 1kHz/30% Mod.		

LW ELECTRICAL PERFORMANCE

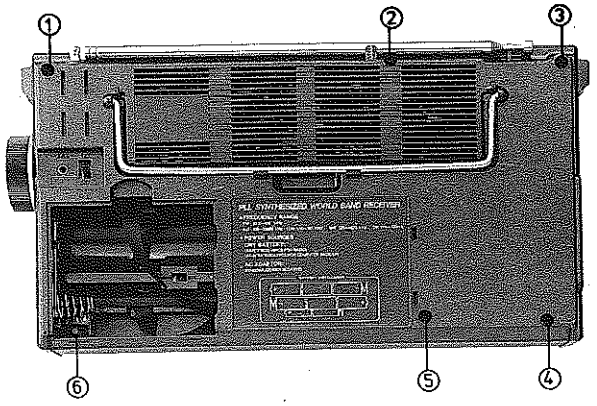
TEST ITEM		CONDITION	NOMINAL	LIMIT	UNIT
Tuning Range		Min.	150		kHz
		Max.	281		kHz
Intermediate Freq.		1st IF	55845	±1	kHz
		2nd IF	450	±1	kHz
Max. Sens.		170kHz	54	58	dB
		220kHz	50	54	dB
		280kHz	50	54	dB
Useable Sens. (S/N 20dB)		170kHz	64	70	dB
		220kHz	62	68	dB
		280kHz	62	68	dB
Audio Fidelity (-6dB)		220kHz		180	Hz
		220kHz		2200	Hz
A.C.A. (1mV)		220kHz		46	dB
Bandwidth 6dB	@ Wide BW	220kHz	6.5	4-9	kHz
T.H.D. (10mV/m)		220kHz	2	4	%
A.G.C. F.O.M.		220kHz		40	dB
Image Rejection		220kHz		32	dB
I.F. Rejection		220kHz		46	dB
Lowest Battery Voltage		220kHz	4.8	5.4	V
Tuning Indicator Sens.		220kHz	62	68	dB
Auto Scanning Stop Sens.		220kHz	62	68	dB
Supply Voltage : DC 9V	R.O. : 50mW	Load : 8 ohm	Modulation : 1kHz/30% Mod.		

NOTE: Nominal specs represent the design specs; all units should be able to approximate these – some will exceed and some may drop slightly below these specs. Limit specs represent the absolute worst condition that still might be considered acceptable; in no case should a unit perform to less than any limit spec.

DISASSEMBLY INSTRUCTIONS

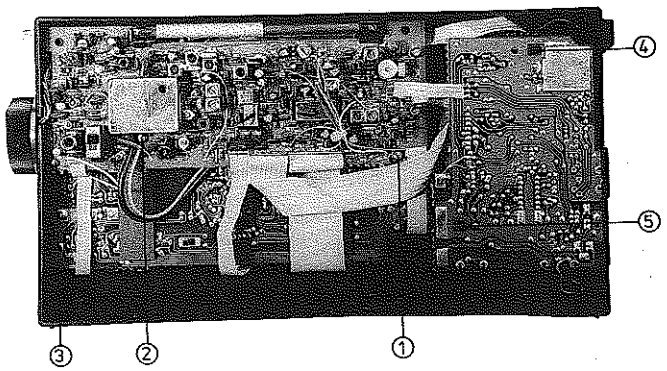
TO REMOVE BACK COVER

a. Unscrew ①~⑥ TP screws 2.6×12 .
b. Lift the back cabinet up.



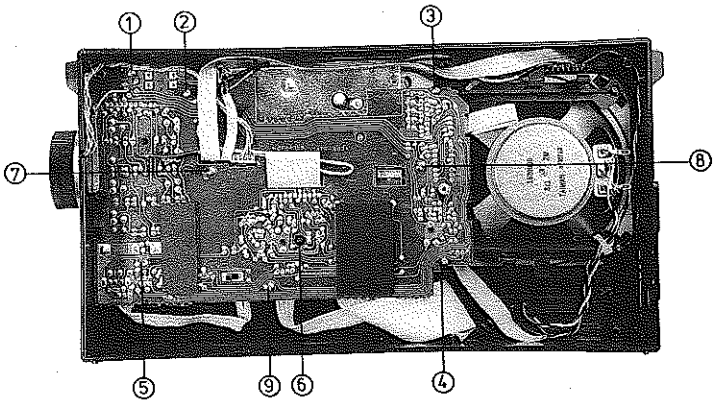
TO REMOVE PCB A-1 and PCB B

a. Unscrew ① M screw 2.6×4 PW and ②~③ TP screws 2.6×8 to remove PCB A-1.
b. Release PCB B from hooks ④~⑤ to remove it .

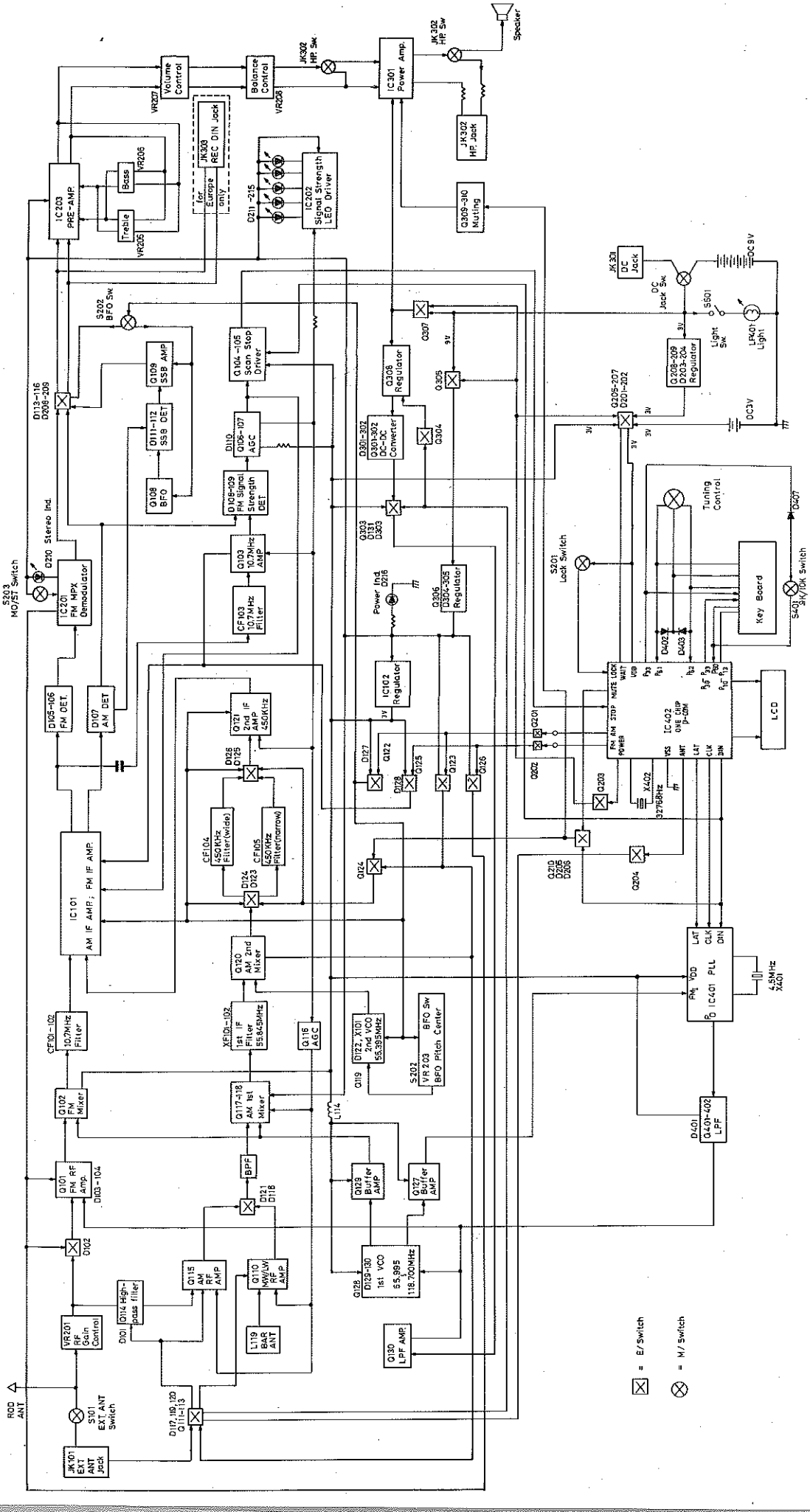


TO REMOVE PCB A-2 and PCB C

a. Unscrew ①~⑥ TP screws 2.6×8 to remove PCB A-2 and PCB C togather from front cabinet.
b. Unscrew ⑦ ~⑨ M screws 2.6×4 PW to remove PCB A-2.



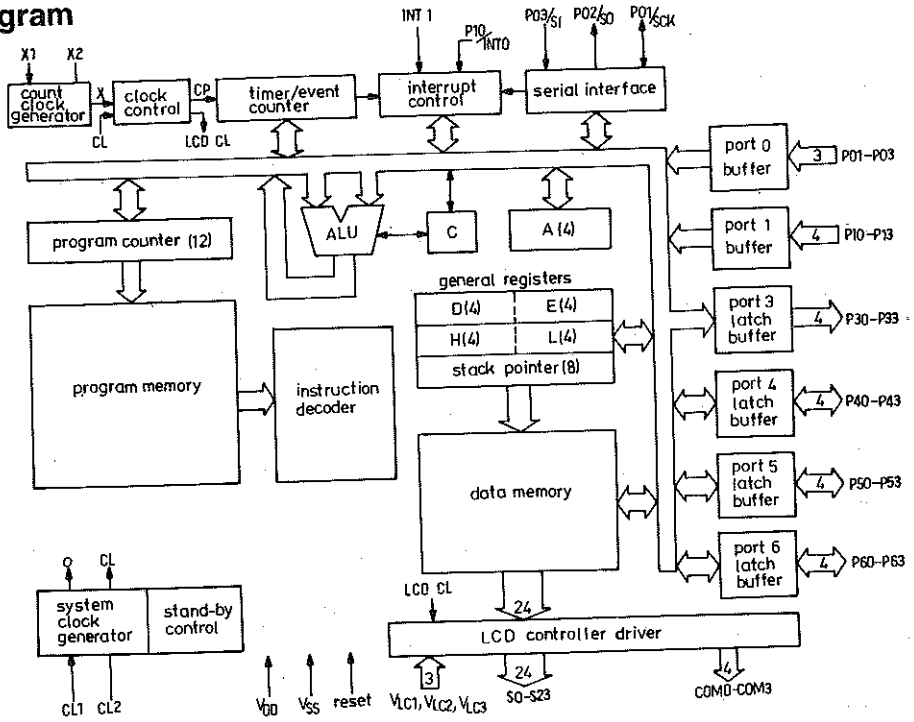
BLOCK DIAGRAM



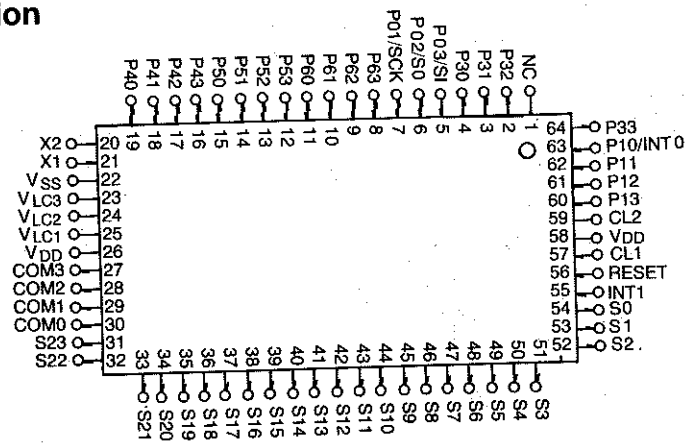
CIRCUIT DESCRIPTIONS

(1) IC402-μPD7503G-701 (One chip μ-Com.)

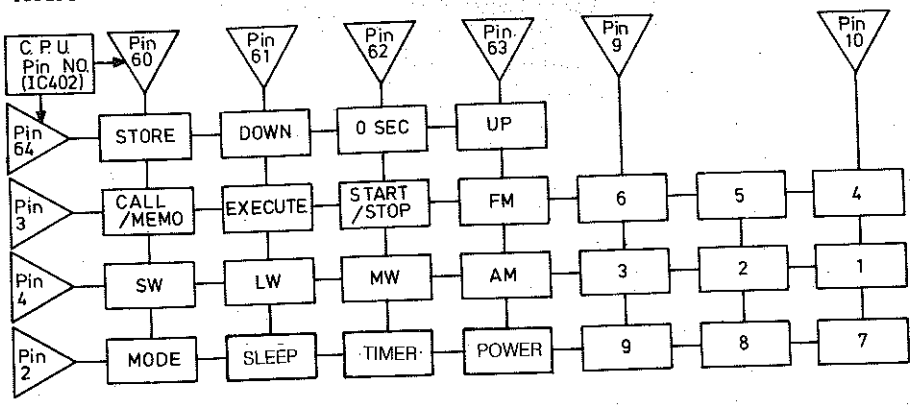
Block Diagram



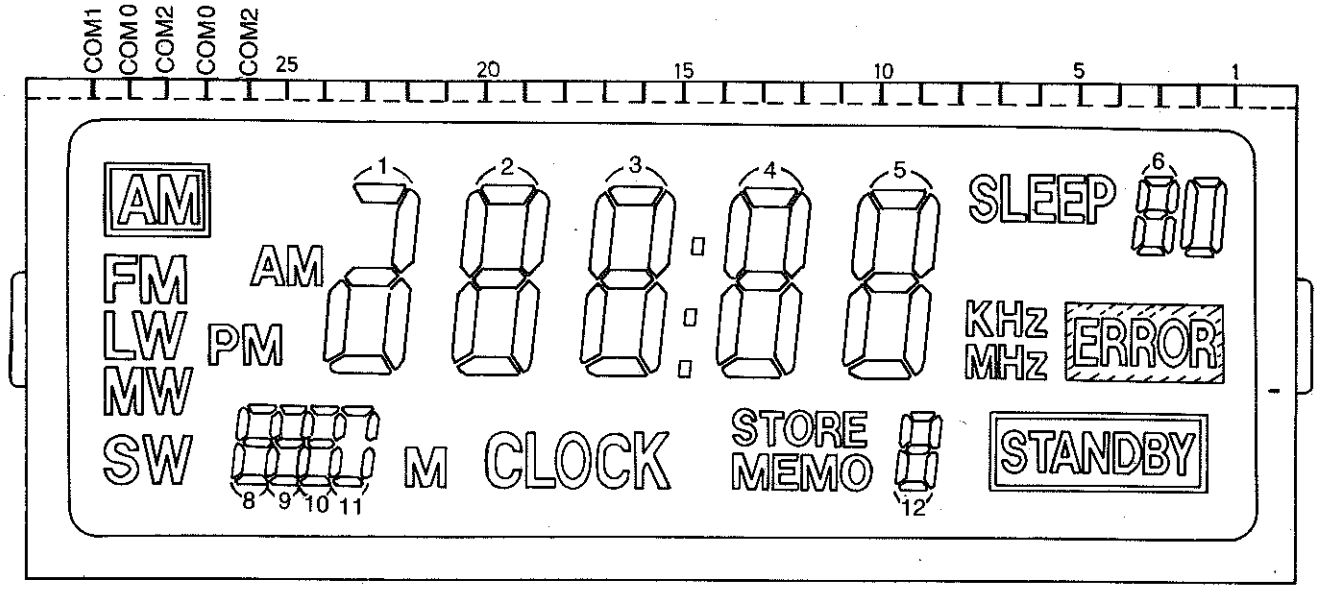
Pin Configuration

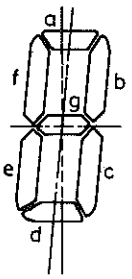


(2) Keyboard Matrix



(3) Liquid Crystal Display (LD-BU7140J)





Pin Connection

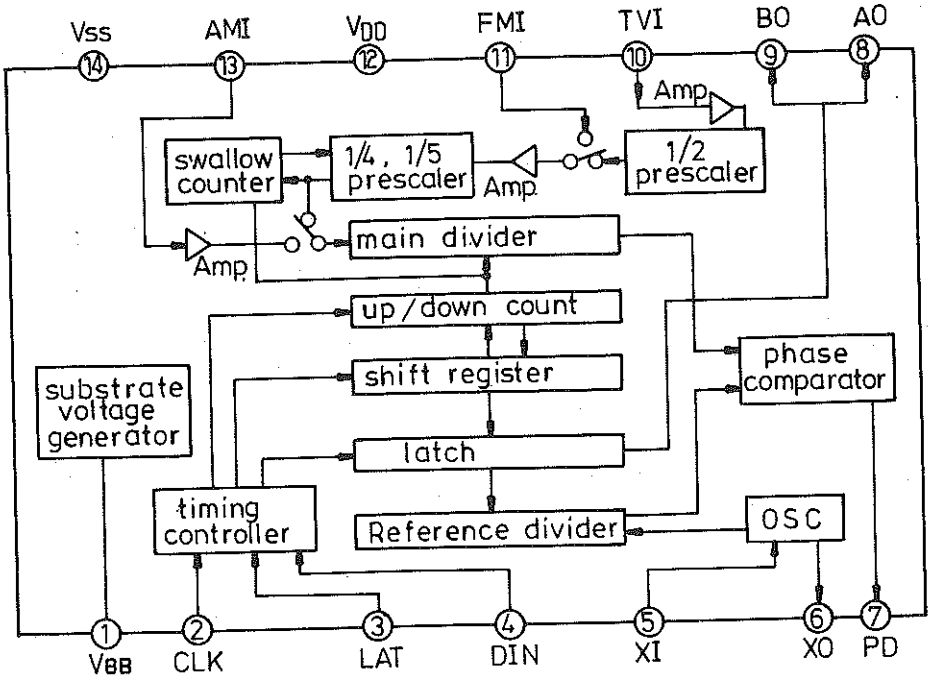
PIN NO IC402	28	29	30	PIN NO LCD
	COM 2	COM 1	COM 0	
54	12b	12c	Stand by	1
53	12a	12g	12d	2
52	12f	12e	MHz FM □ (Dot)	3
51	6b	6c	ERROR	4
50	6a	6g	6d	5
49	6f	6e	SLEEP □	6
48	5b	5c	kHz	7
47	5a	5g	5d	8
46	5f	5e	STORE	9
45	4b	4c	MEMO	10
44	4a	4g	4d	11
43	4f	4e	□ □ COLUMN	12

IC402-C.P.U. (μPD 7503G-701)

Pin NO IC402	28	29	30	Pin NO LCD
	COM 2	COM 1	COM 0	
42	3b	3c	LW	13
41	3a	3g	3d	14
40	3f	3e	MW	15
39	2b	2c	CLOCK	16
38	2a	2g	2d	17
37	2f	2e	1a 1d 1e 1g	18
36	1b	1c	(Time) AM	19
35	10f	11f	11a 11b 11c 11d 9a 9d 9g	20
34	8a	—	—	21
33	8g	8f	9f	22
34	—	8e	9e	23
32	8d	AM	PM	24
31	10a 10d 10g	11e SW M	10e	25

(4) IC401-CX-7961 A-1 (Frequency Synthesizer PLL)

Block Diagram



Pin Description

No.	Symbol	Description.
1	VBB	Substrate terminal (connect 0.01uF capacitor to the ground)
2	CLK	Clock input terminal for 20-bit serial (to be shifted with signal rise)
3	LAT	Latch signal input terminal for shift register input data (to be latched with signal rise) as well as the UP/DOWN clock input terminal (its state to be changed with signal rise)
4	DIN	Data input terminal as well as the UP/DOWN mode switching terminal (UP at "H" level, DOWN AT "L" level)
5	XI	Crystal oscillator connection terminal for the reference signal generation (7.2MHz max.; 4.0MHz standard)
6	XO	
7	PD	Phase comparator output terminal (3 states)
8	AO	External control (signal output terminal/unlock output teminal (E/E MOS push-pull)
9	BO	External control signal output terminal/data check terminal (E/E MOS push-pull)
10	TVI	High frequency signal input termianl (180MHz or 240MHz max.) 1/2 prescaler is built-in.
11	FMI	High frequency signal input terminal (90MHz or 125MHz max.)
12	VDD	Power supply (+3V)
13	AMI	High frequency signal input terminal (20MHz or 25MHz max.)
14	VSS	Ground terminal

Control Data Transmitted

Control data is always transmitted whenever the power is turned on or the reception frequency is varied.
The 40-bit datas including the reference divider and the programmable divider frequency division number are described in the following.

(A) Reference divider frequency division number (Ref. Fig.3, shown on page 10)

R0	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	P11	P12	A	B	T1	C1
LSB	division number in binary value												MSB	input selection		output mode		*1	*2
0	1	0	0	1	0	0	1	1	0	0	0	1	0	0	1	*3	*3	1	0

An offset component exists between the actual frequency division number and transmitted data. Their relationship is as follows. (Actual frequency division number)=(Transmitted data)+2
Reference frequency is always set in 1kHz and is not relevant to reception frequency or band on the DX-440
Therefore the transmitted division number will be assigned as follows:

$$\frac{4500\text{kHz}}{1\text{kHz}} - 2 = 4498$$

In binary value 4498 ⇒ 01000110010010 (LSB)

(B) Programmable divider frequency division number (Ref. Fig.3, shown on page 10)

N0	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	T2	C2
LSB	division number in binary value																MSB	*1	*2
						as example												0	1

The relationship between actual frequency division number (X) and the transmitted data (N) is as follows: X=N+8
Thus the transmitted division number will be assigned as,

$$N = \frac{\text{The 1st LOCAL OSC FREQUENCY}}{1\text{kHz}} - 8$$

NOTE:
* 1: Output mode selection code
* 2: Latch direction code
* 3: Do not care

For example (A), while FM 100MHz is setting:

(1) Frequency indicated on the LCD → 100MHz

(2) The 1st local frequency → 100MHz+10.7MHz
(in super heterodyne) =110.7MHz

(3) The transmitted division number

$$\rightarrow N = \frac{110700\text{kHz}}{1\text{kHz}} - 8 = 110692$$

(4) In binary value → N⇒01101100000110010 0 (LSB)

For example (B), while AM 10MHz is setting:

(1) Frequency indicated on the LCD → 10MHz

(2) The 1st local frequency → 10MHz+55.845MHz
=65.845MHz

(3) The transmitted division number

$$\rightarrow N = \frac{65845\text{kHz}}{1\text{kHz}} - 8 = 65837$$

(4) In binary value → N⇒0100000010010 1101 (LSB)

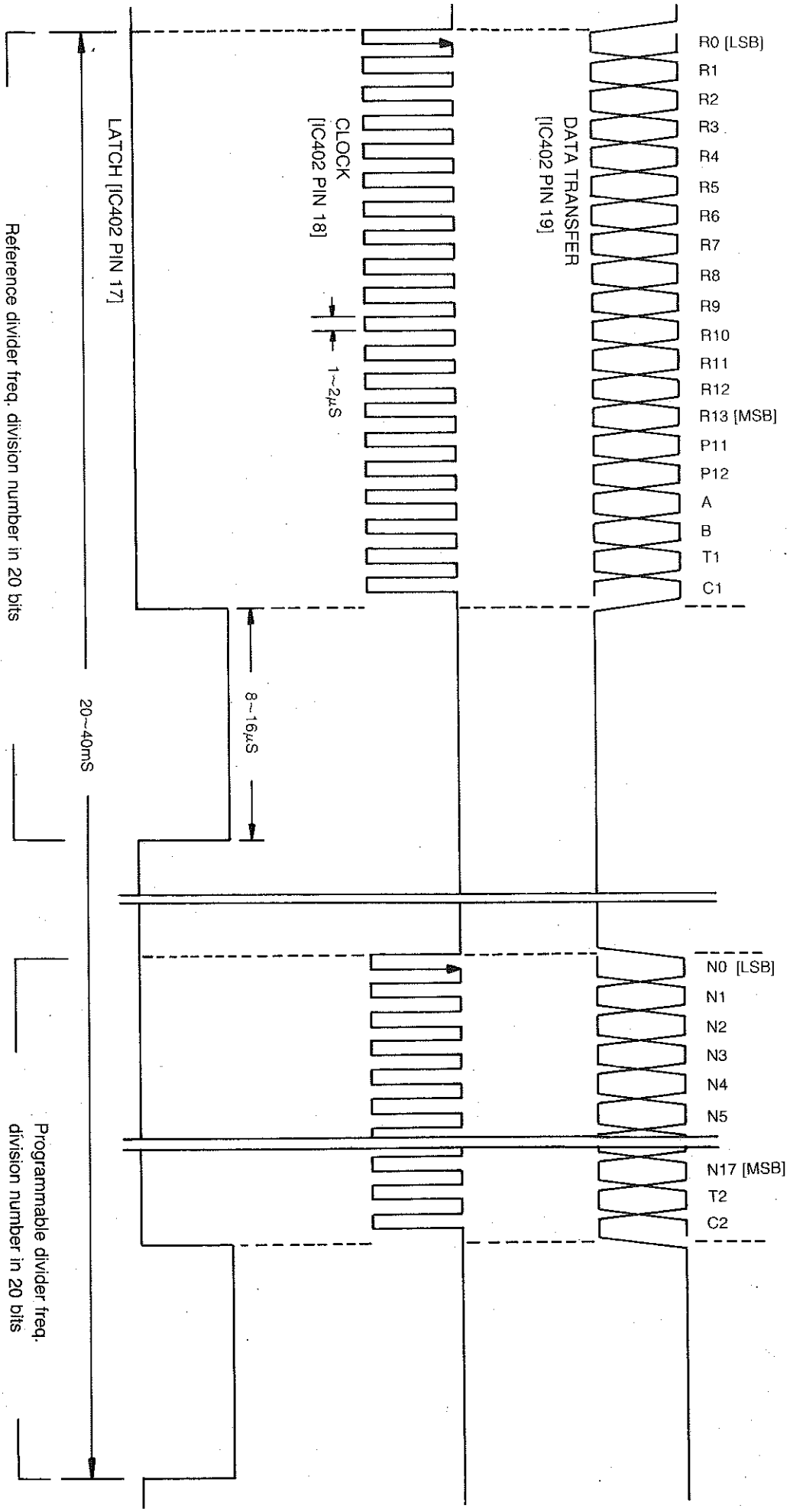
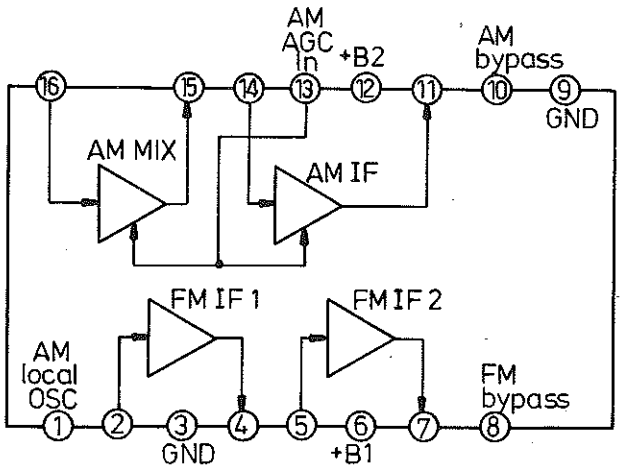
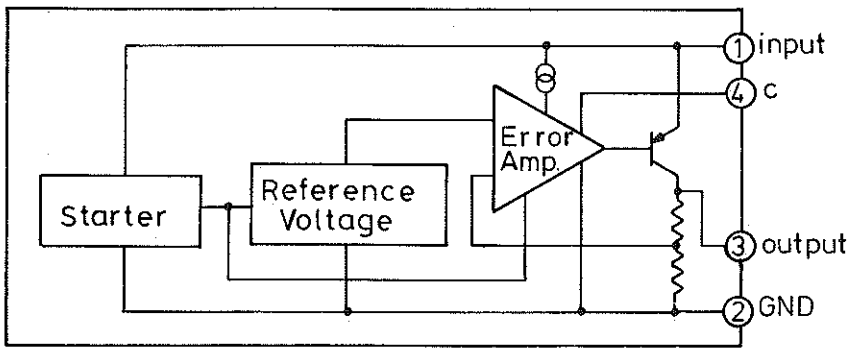

LATCH [IC402 PIN 17]
CLOCK [IC402 PIN 18]
DATA TRANSFER [IC402 PIN 19]
1~2μS
8~16μS
20~40mS
R0 [LSB]
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13 [MSB]
P11
P12
A
B
T1
C1
N0 [LSB]
N1
N2
N3
N4
N5
N17 [MSB]
T2
C2
Reference divider freq. division number in 20 bits
Programmable divider freq. division number in 20 bits

Fig.3

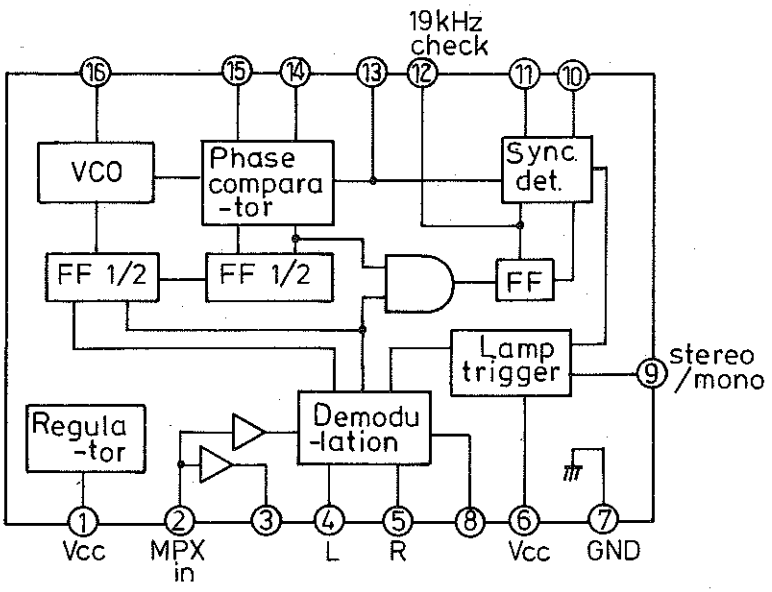
(5) IC101-μPC1018C (AM IF Amp, FM IF Amp.)



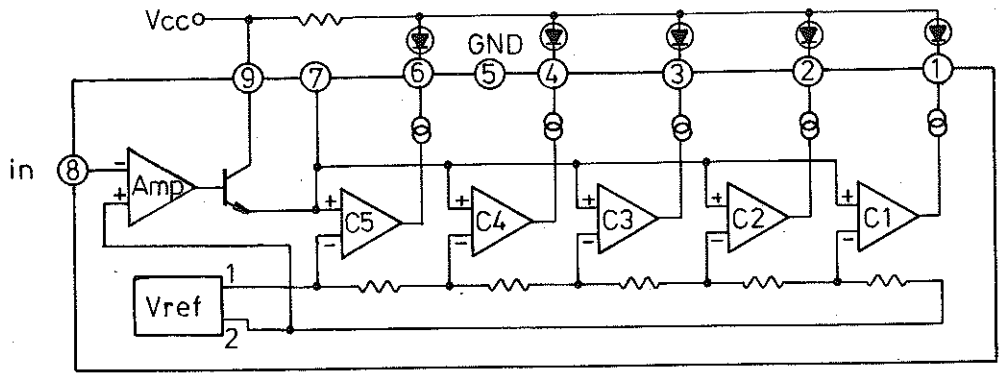
(6) IC102-LA5003 (Regulator)



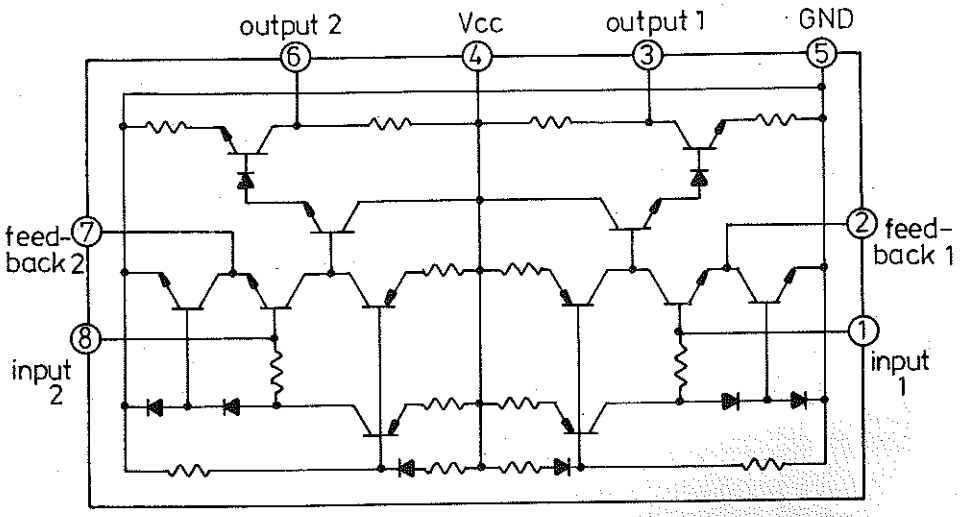
(7) IC201-LA3361 (FM MPX Demodulator)



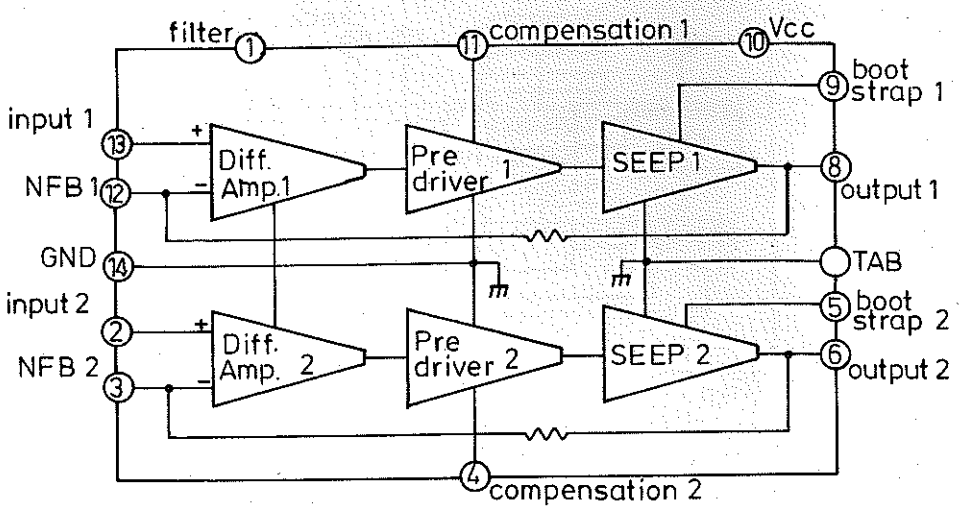
(8) IC202-TA7366P (Signal strength, LED driver)



(9) IC203-M51521L/AL (Pre-Amp.)



(10) IC301-μPC 1263C2/μPC1316C (Power Amp.)



ALIGNMENT INSTRUCTIONS

(1) ALIGNMENT FOR POWER SUPPLY VDD

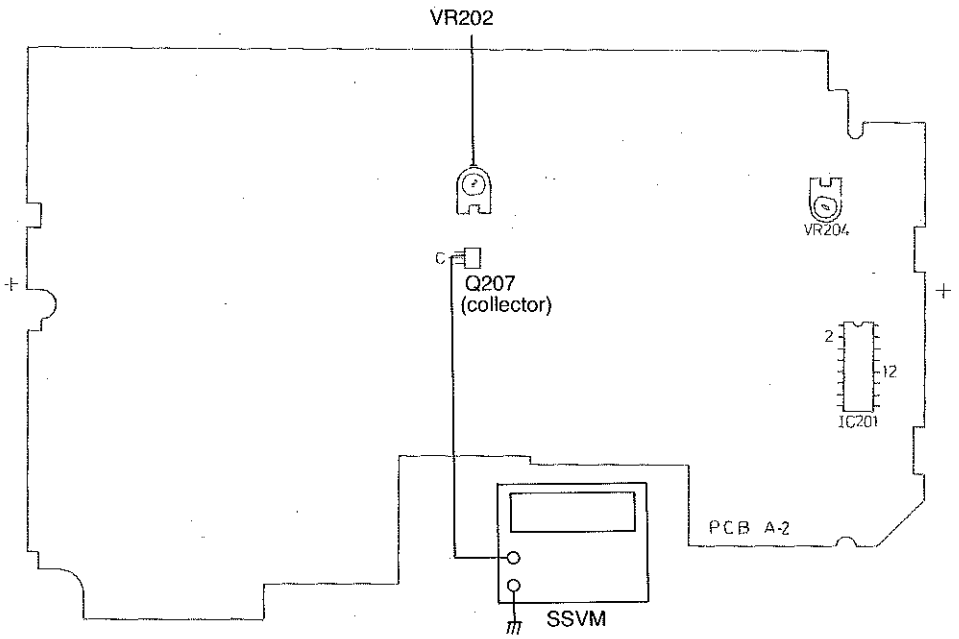
a. Required Instrument

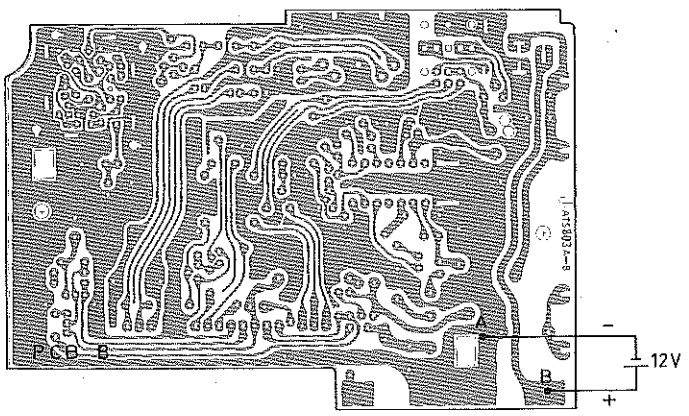
SSVM

b. Alignment Procedure

Adjustment	Procedure
VR202	(1) Set the power switch of the radio to OFF position. (2) Connect a power supply of 12V DC between point A and point B. (3) Connect test probes of the SSVM to the collector terminal of Q207 and ground. (4) Adjust VR202 to have a reading on SSVM between 2.95—3.05V.

c. Instrument Connection





(2) ALIGNMENT FOR CLOCK TIME ACCURACY

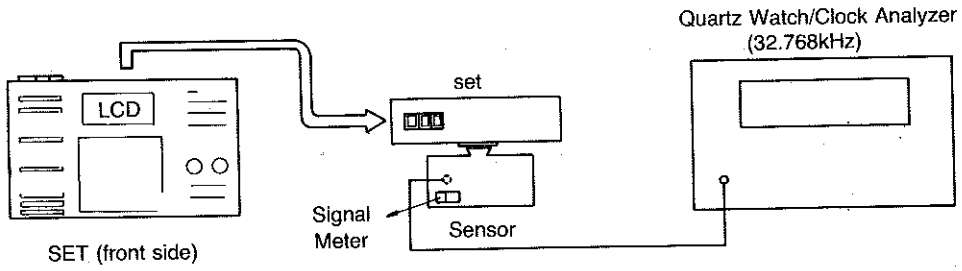
a. Required Instruments

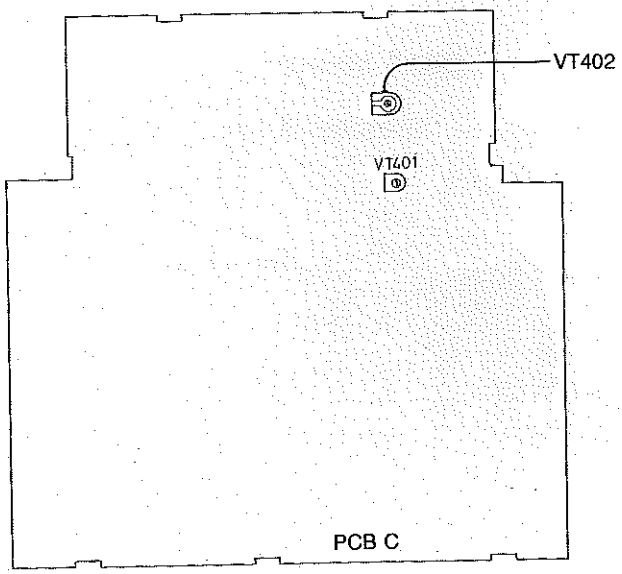
Quartz Watch/Clock Analyzer and Sensor

b. Alignment Procedure

Adjustment	Procedure
VT402	(1) Set the power switch of the radio to OFF position. (2) Put the LCD of the set near the Sensor of Quartz Watch/Clock Analyzer and move the set to the position where the max. signal is reached. (3) Adjust VT402 to reach the range of zero error(±7 PPM or ±20 sec/month) on Quartz Watch/Clock Analyzer.

c. Instrument Connection





(3) ALIGNMENT FOR VC01 VOLTAGE RANGE

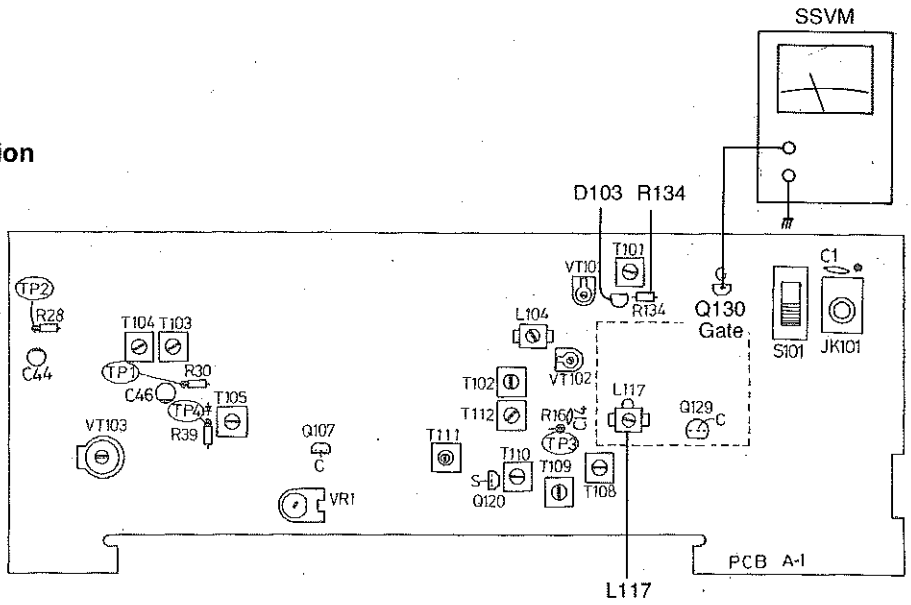
a. Required Instrument

SSVM

b. Alignment Procedure

Mode	Adjustment	Procedure
FM	L117	(1) Set the power switch to ON position. (2) Set "FM 108MHz". (3) Connect a SSVM to the gate of Q130. (4) Adjust L117 to have a reading on SSVM between 9.2V—9.5V (when D103 is FC-52M5 and R134 is 330K ohm).
	L117	(5) Adjust L117 to have a reading on SSVM between 10.3V—10.7V (when D103 is FC – 52M6 and R134 is 390K ohm).

c. Instrument Connection



(4) ALIGNMENT FOR PLL FREQUENCY

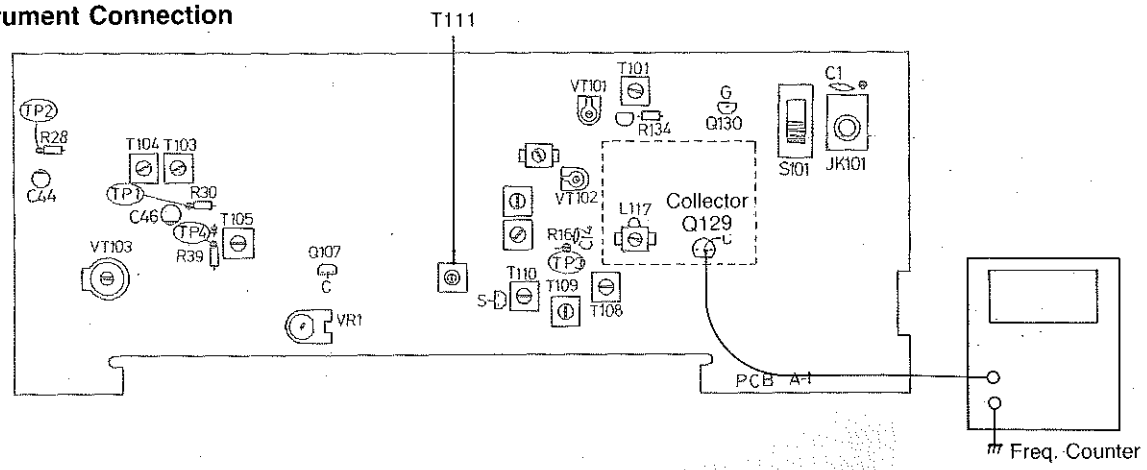
a. Required Instrument

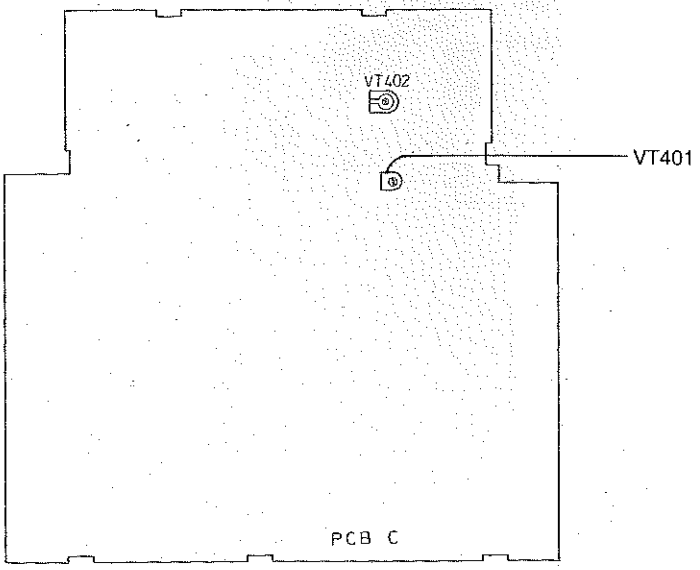
Frequency Counter

b. Alignment Procedure

Mode	Adjustment	Procedure
FM	VT401	(1) Set the power switch to ON position. (2) Select the tuner frequency at 108MHz. (3) Connect the test probes of frequency counter to the collector of Q129 and ground. The ground point should be as near as possible to the collector. (4) Adjust VT401 to have a reading of 118.7000MHz—118.7003MHz.

c. Instrument Connection





(5) ALIGNMENT FOR AM 2ND LOCAL OSC

a. Required Instrument

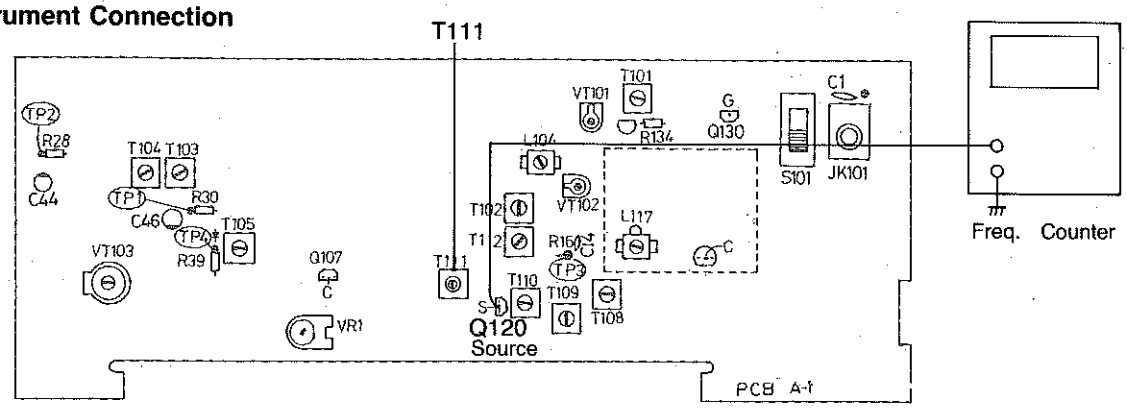
Frequency counter

b. Alignment Procedure

Mode	Adjustment	Procedure
AM (BFO switch OFF)	T111	(1) Set the power switch to ON position. (2) Connect the test probes of frequency counter to the source of Q120 and ground. (3) Adjust T111 to have a reading of 55.3953MHz—55.3961MHz.

CAUTION: A loading effect could emerge in the circuit due to the inserted test probe of frequency counter. A reasonable reading of the frequency counter in step 2 should be higher than 55.395MHz.

c. Instrument Connection



(6) ALIGNMENT FOR AM 2ND IF

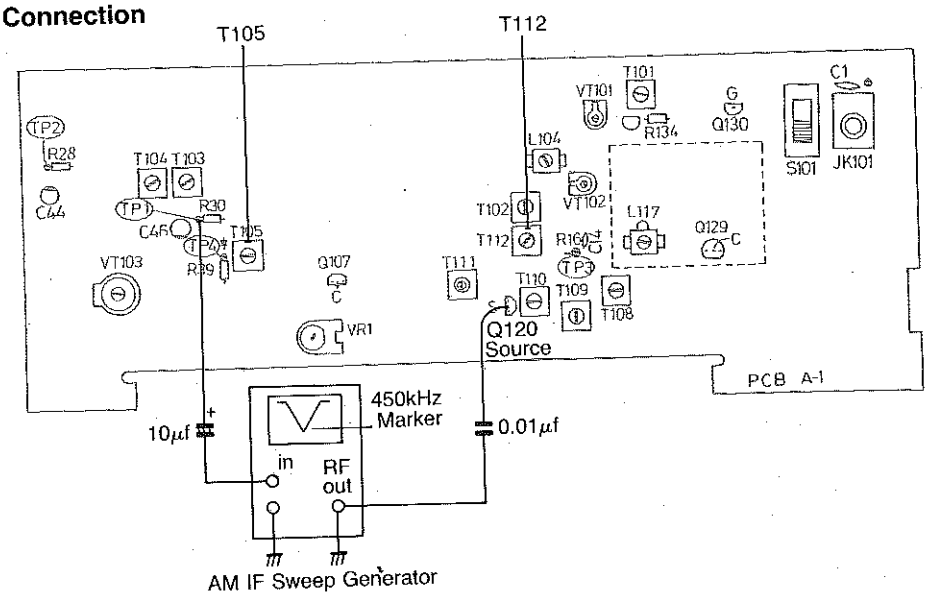
a. Required Instrument

AM IF Sweep Generator with scope

b. Alignment Procedure

Mode	Adjustment	Procedure
AM (BFO switch OFF)		(1) Set the power switch to ON position.
		(2) Connect the input terminal of AM IF sweep generator in series with a capacitor of 10μF to the test point C46(TP1) and R30.
		(3) Connect the RF output terminal of AM IF sweep generator in series with a capacitor 0.01μF to the source of Q120.
	T112	(4) Adjust T112 to have a max. output with a marker frequency of 450kHz on the sweep scope.
	T105	(5) Adjust T105 to have a max. output with a marker frequency of 450kHz on the sweep scope.
		(6) Repeat (4) and (5) until a max. 450kHz output is reached.

c. Instrument Connection



(7) ALIGNMENT FOR FM IF

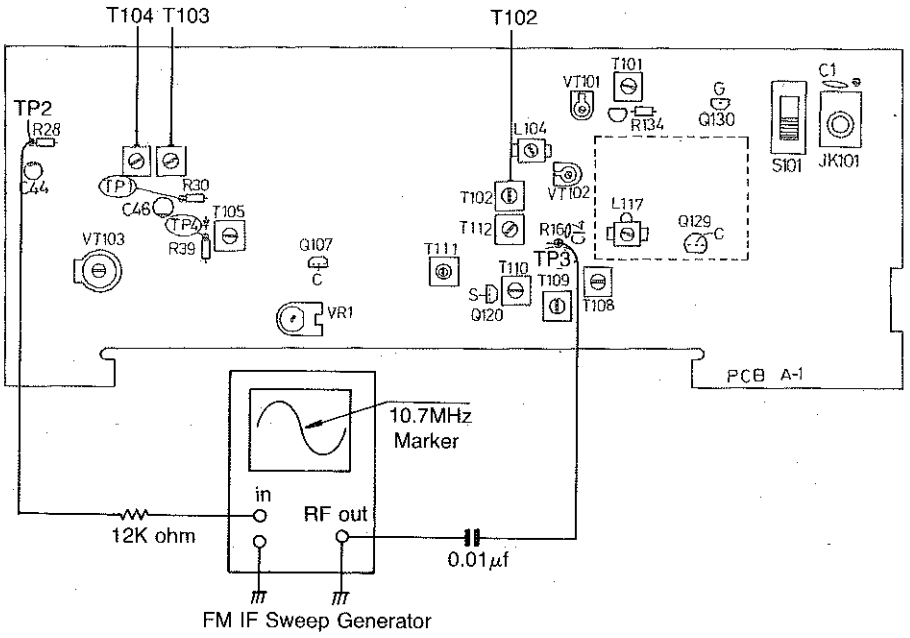
a. Required Instrument

FM IF Sweep Generator with Scope

b. Alignment Procedure

Mode	Adjustment	Procedure
FM	T102 T103 T104	(1) Set the power switch to ON position. (2) Connect the input of FM IF sweep generator in series with a resistor of 12K ohm to the test point between R28 and C44 (TP2). (3) Connect the RF output of FM IF sweep generator to the test point between C14 and R16 (TP3). (4) Adjust T102, T103, and T104 to have a max. output and best symmetrical S curve with respect to the center marker frequency of 10.7MHz.

c. Instrument Connection



(8) ALIGNMENT FOR AM SENSITIVITY

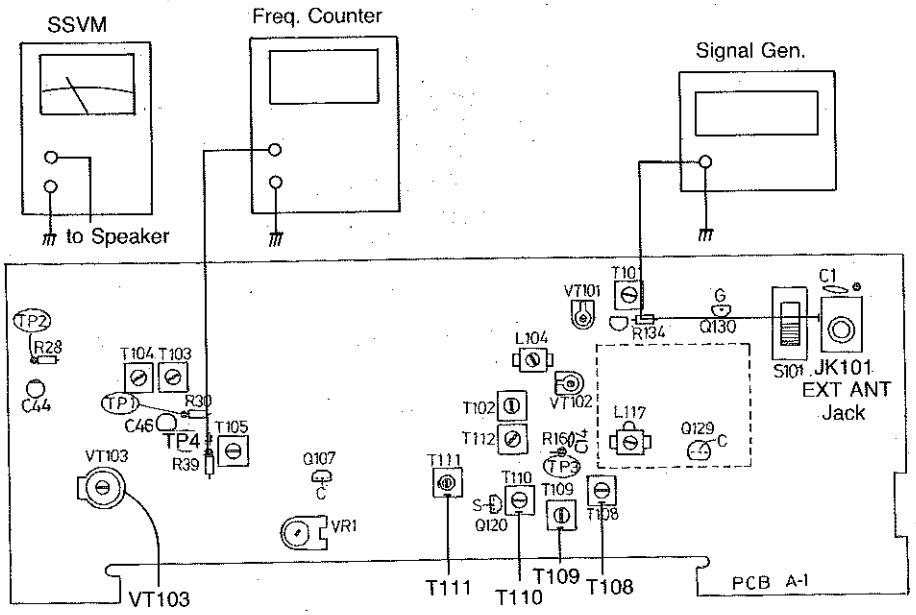
a. Required Instruments

Signal Generator
SSVM
Frequency counter

b. Alignment Procedure

Mode	Adjustment	Procedure
AM	T108,T109,T110	(1) Set the power switch to ON position. (2) Set the band to SW, BFO switch to OFF and ANT Switch to EXT position. (3) Feed a signal with modulation from signal generator output to EXT ANT jack, and connect a SSVM to speaker. (4) Tune the radio frequency exactly the same as that of signal generator. (5) Adjust T108 and T109, T110 to have a max. audio output. (6) Repeat processes (4) and (5) until a max. audio output is reached. (7) Connect the probe of frequency counter at the test point between R39 and D107 (TP4).
	T111	(8) Adjust T111 to meet the specification frequency 450kHz±0.2kHz.

c. Instrument Connection



(9) ALIGNMENT FOR BFO

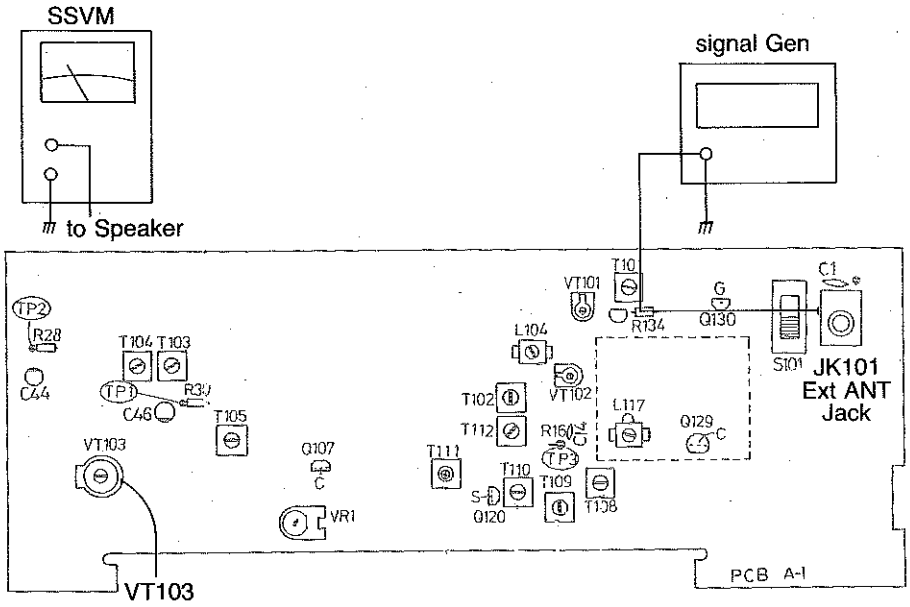
a. Required Instruments

Signal Generator
SSVM

b. Alignment Procedure

Mode	Adjustment	Procedure
AM	VT103	(1) Set the power switch to ON position. (2) Set the band to SW, BFO switch to ON and BFO pitch to center position. (3) Feed a signal without modulation from signal generator to EXT ANT jack, and connect a SSVM to the speaker. (4) Tune the radio frequency exactly the same as that of signal generator. (5) Adjust VT103 to have a minimum reading on SSVM.

c. Instrument Connection



(10) ALIGNMENT FOR SIGNAL LEVEL AND STOP LEVEL

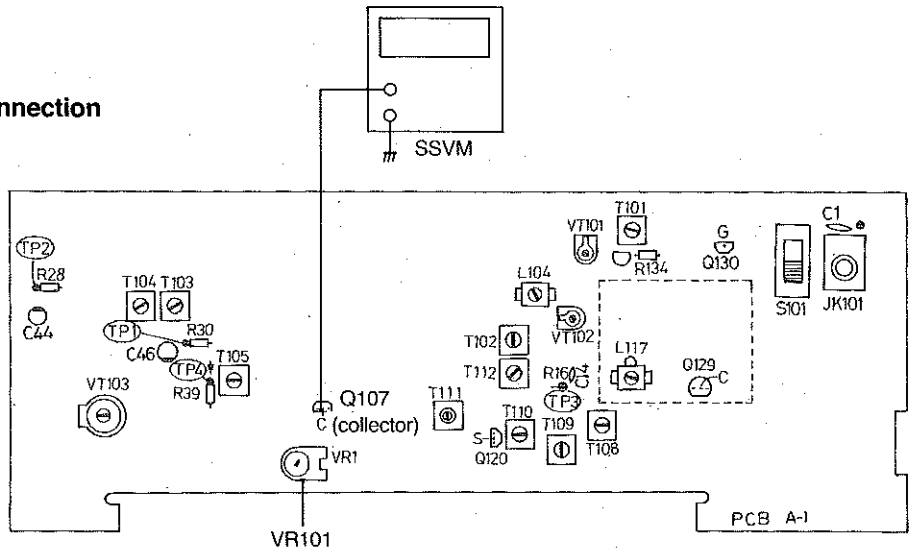
a. Required Instrument

SSVM

b. Alignment Procedure

Mode	Adjustment	Procedure
AM		(1) Set the power switch to ON position. (2) Set the band frequency to 26100kHz and BFO switch to OFF. (3) Connect the SSVM to the collector of Q107.
	VR101	(4) Adjust VR101 to have a reading of 1.95V—2.05 V.

c. Instrument Connection



(11) ALIGNMENT FOR MPX

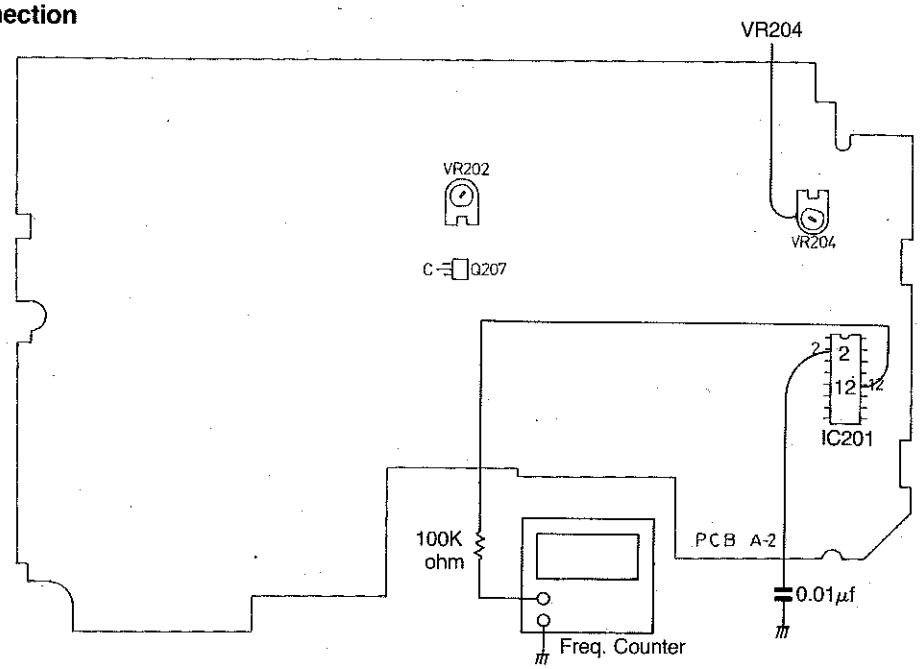
a. Required Instrument

Frequency Counter

b. Alignment Procedure

Mode	Adjustment	Procedure
FM	VR204	(1) Set the power switch to ON position. (2) Set the FM mode switch to STEREO position. (3) Connect the pin 2 of IC201 in series with a capacitor of 0.01μF to ground. (4) Connect a frequency counter in series with a resistor of 100K ohm to the pin 12 of IC201. (5) Adjust VR204 to have a reading of 19kHz on frequency counter.

c. Instrument Connection



(12) ALIGNMENT FOR FM SENSITIVITY

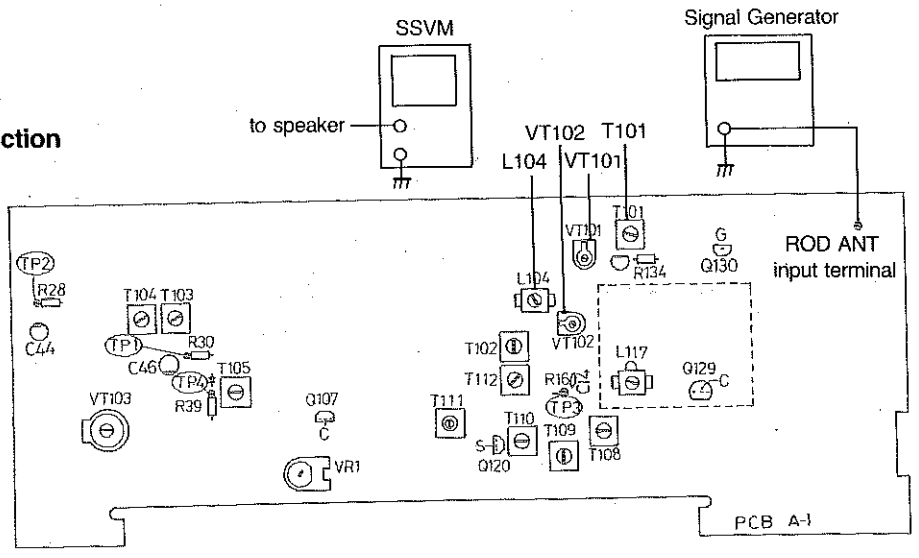
a. Required Instruments

Singal Generator
SSVM

b. Alignment Procedure

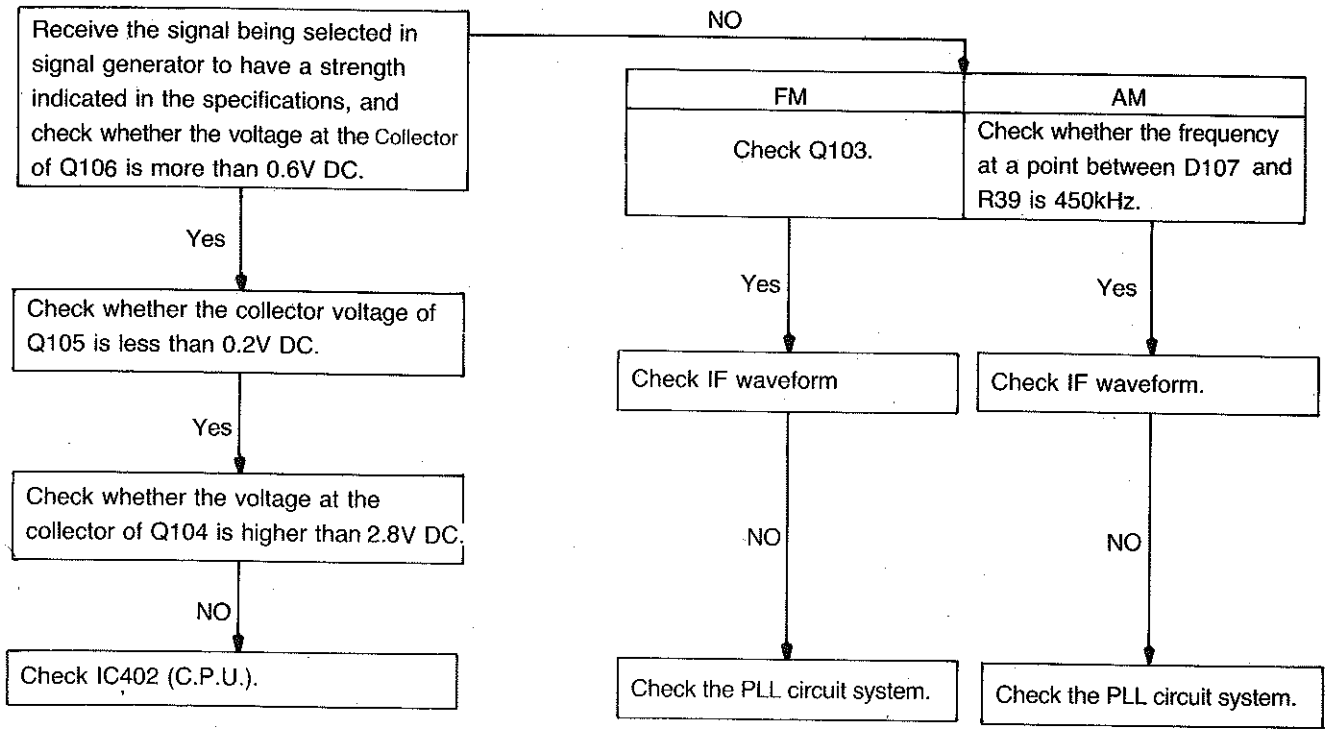
Mode	Adjustment	Procedure
FM	L104, T101 VT102 VT101	(1) Set the power switch to ON position. (2) Connect a SSVM to the speaker. (3) Connect a signal generator to the input terminal of Rod Ant. (4) Set the band to FM, RF Gain to MAX and frequency deviation to 22.5kHz with 1kHz modulation. (5) Tune the band frequency to 90MHz and adjust L104, T101 to have a max. reading on SSVM. (6) Return the band frequency to 106MHz and adjust VT102, VT101 to have a max. reading on SSVM. (7) Repeat (5) and (6) until a best sensitivity on these two frequencies are formed.

c. Instrument Connection

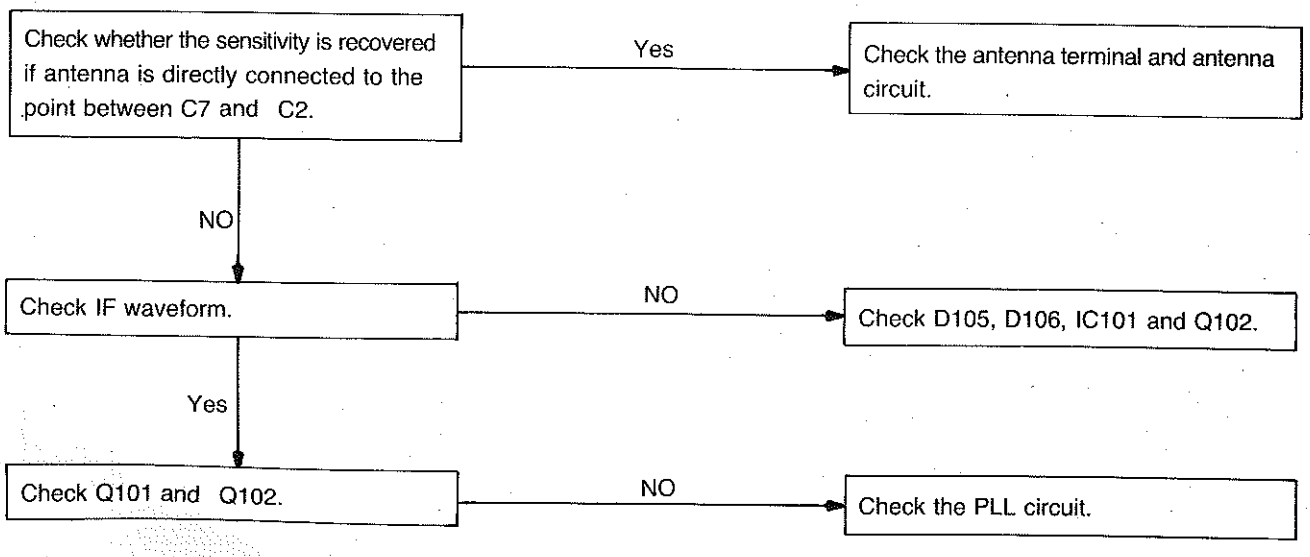


TROUBLESHOOTING FLOW CHART

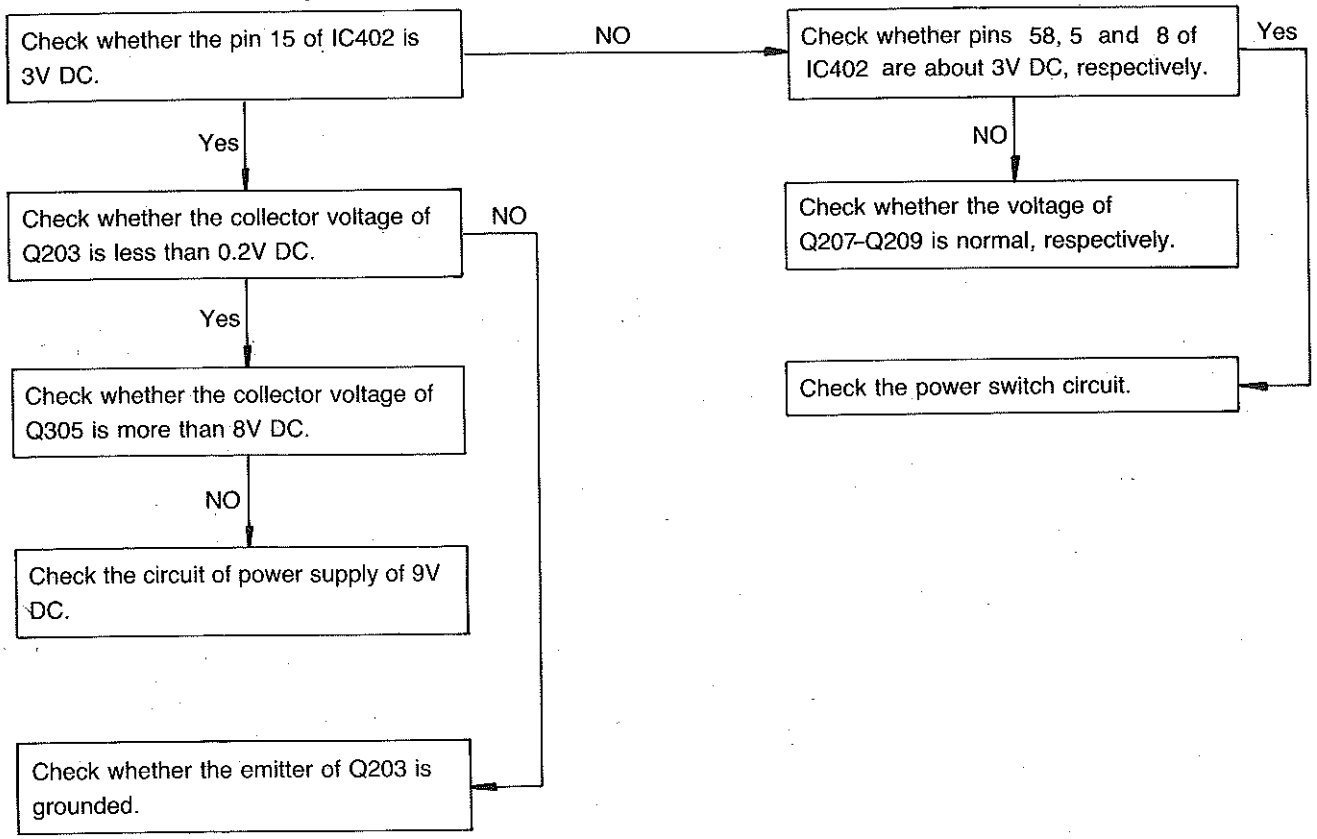
1. Scan auto stop does not work



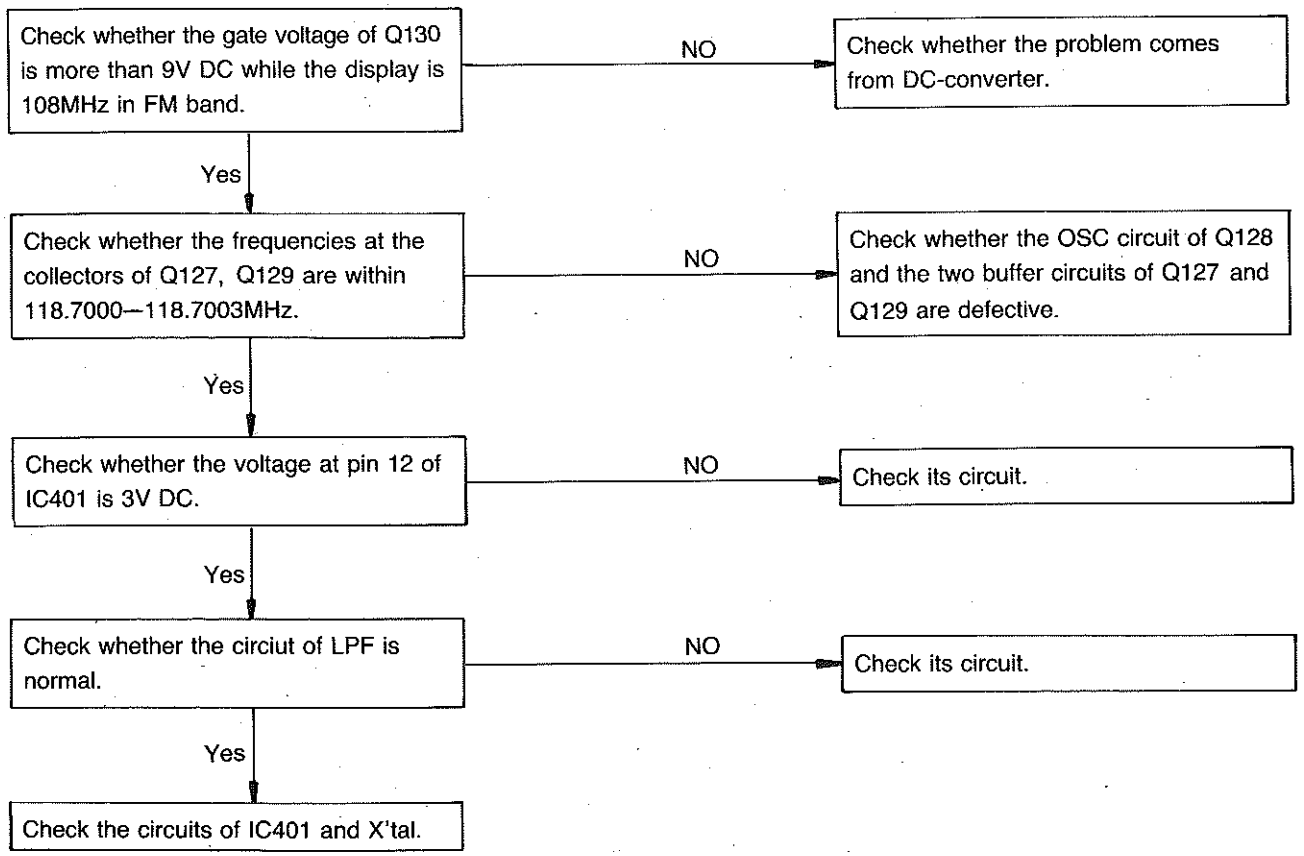
2. Weak sensitivity on FM mode



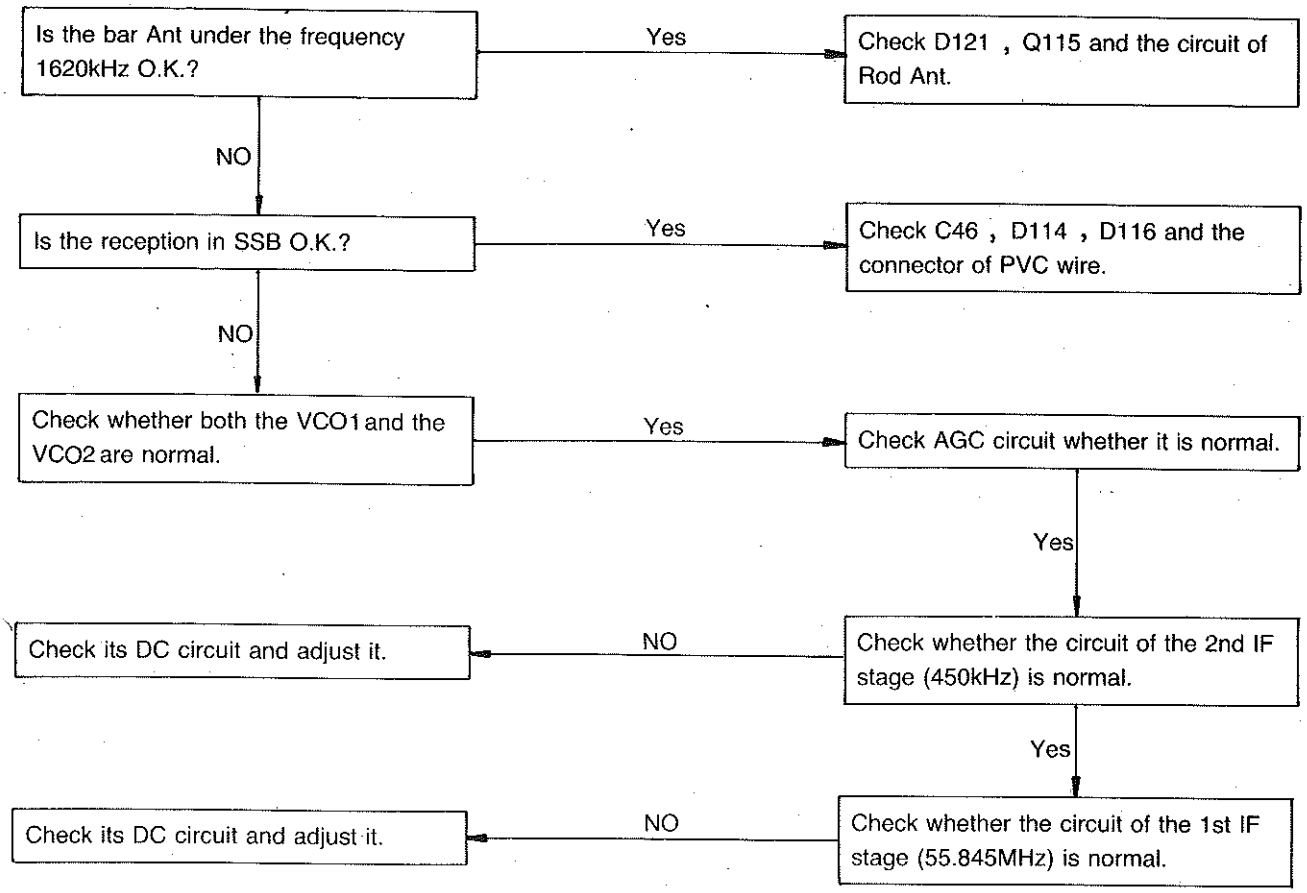
3. Power can not be turned on



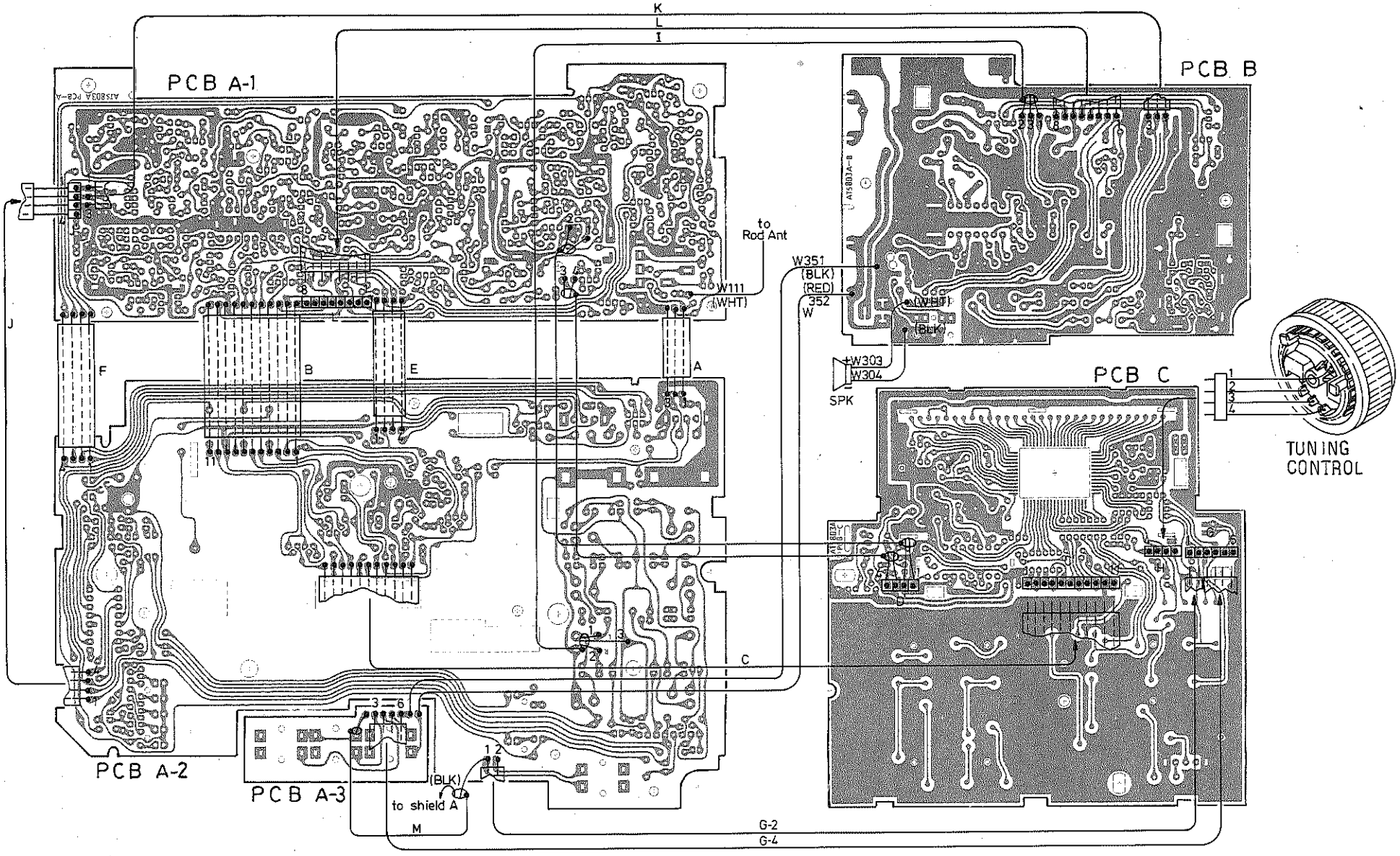
4. PLL does not work



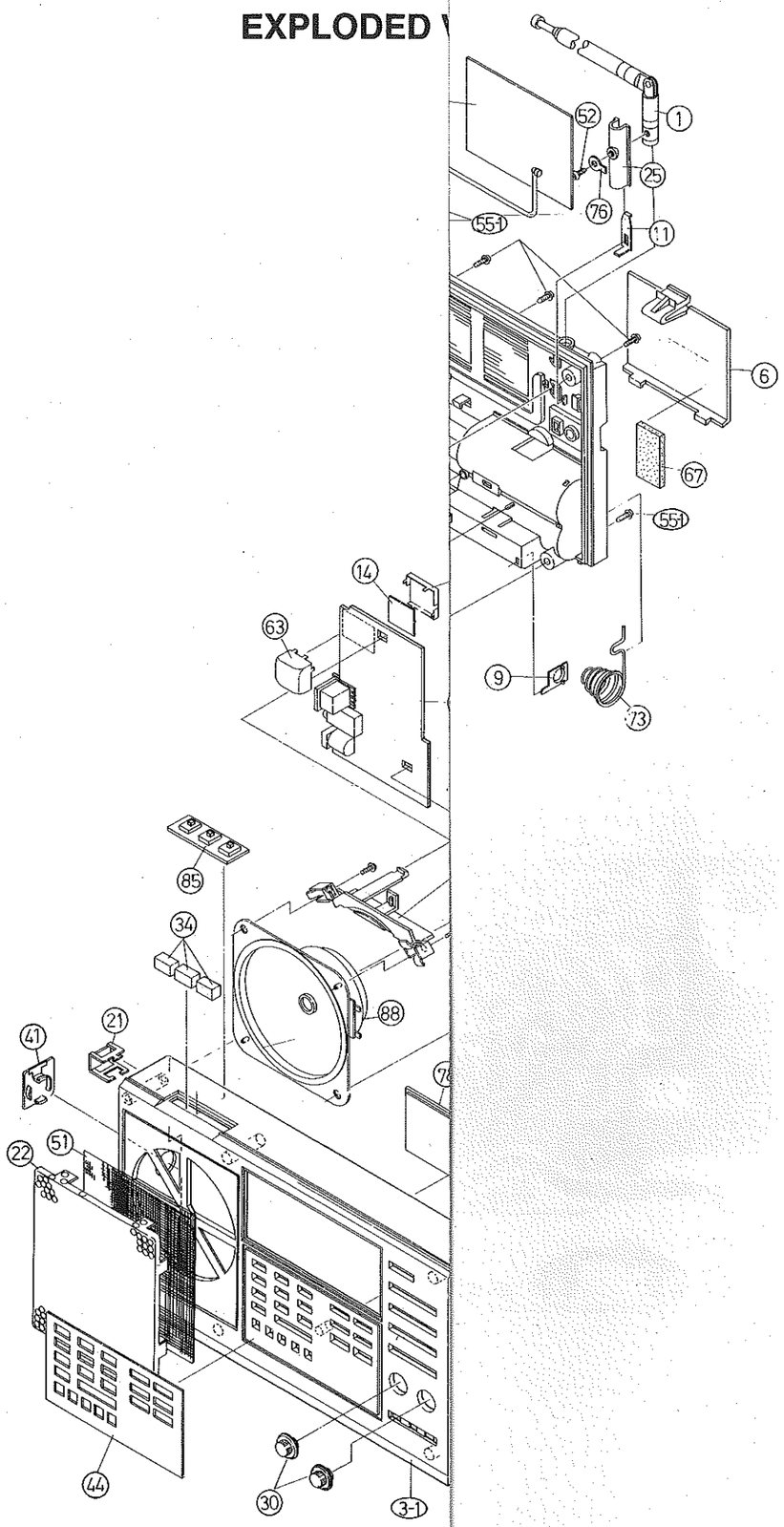
5. Weak sensitivity in AM band.



WIRING DIAGRAM- SOLDER SIDE



EXPLODED V

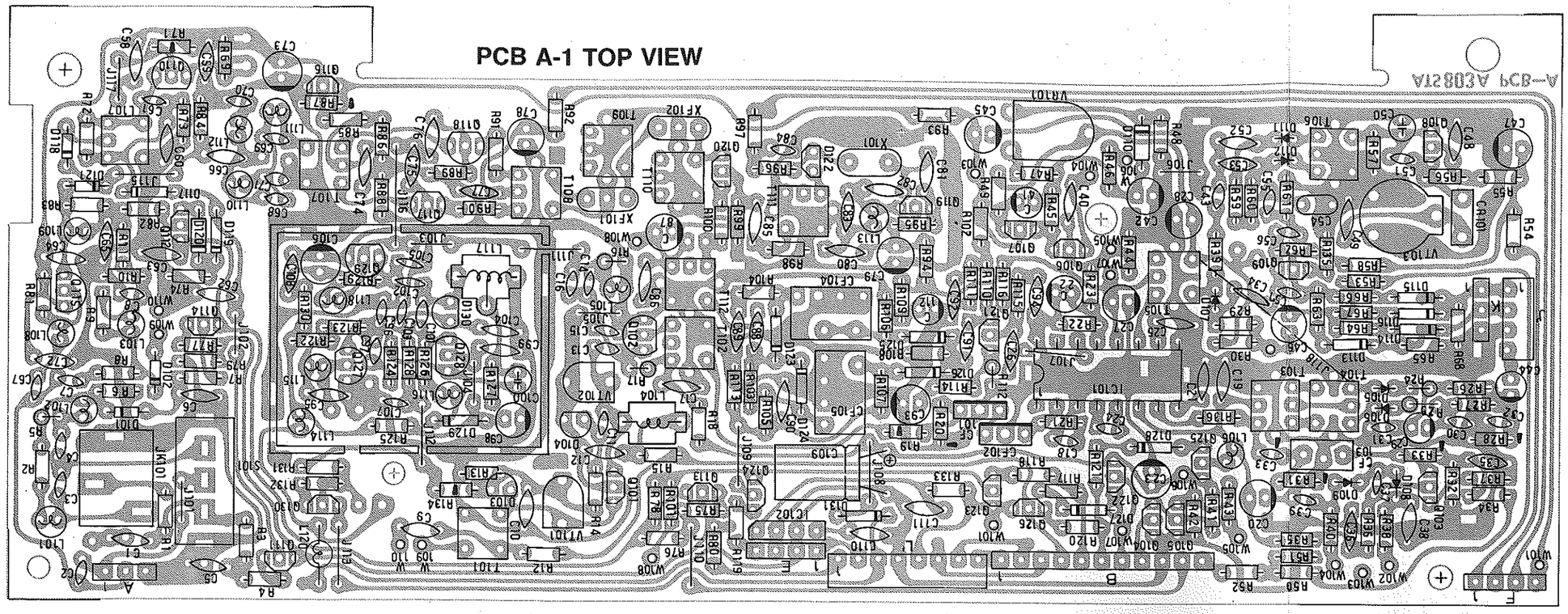


PARTS LIST FOR EXPLODED VIEW

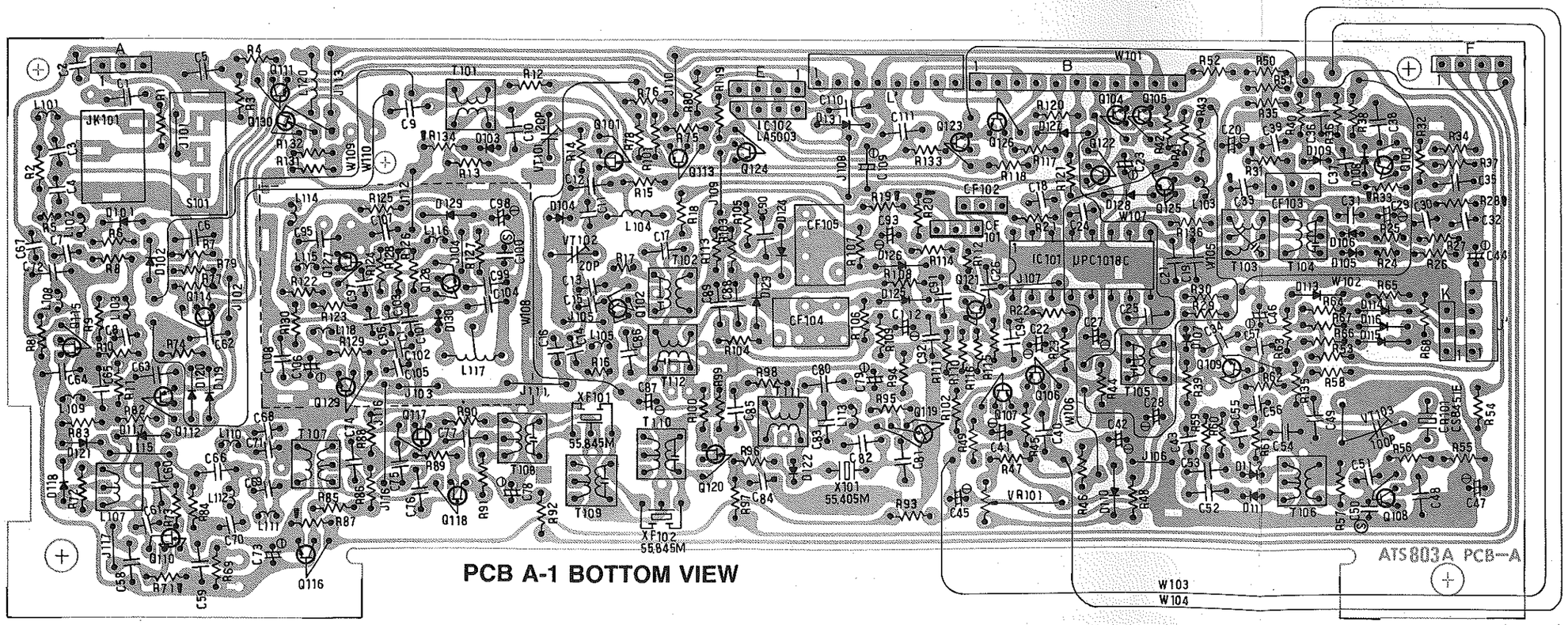
REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
1	Ant, Rod		2118000
2	Cabinet, Back, Plastic, Black		2018001
3-1,22,44 51,78	Cabinet, Front Ass'y		300000
3-1	Cabinet, Front, Plastic, Black		3011801
22	Grill, Speaker, Iron, Black		2118240
44	Plate, Function, Aluminum, Black		3211801
51	Salon, Net		2318040
78	Window, LCD, Clear, Acryl		2018120
4	Case, Battery, Plastic, Black		2018031
5	Chassis, Middle		2018020
6	Cover, Battery, Plastic, Black		2018010
7	Conductor, Battery ⊖		2118010
8	Conductor, Battery ⊕		2118200
9	Conductor, Battery A		2104030
10	Conductor, Battery C		2104050
11	Conductor, Rod Ant		2118040
12	Conductor, Power		2118050
13	Fiber, Shield (B)		2218010
14	Fiber, Shield (C)		2218020
15	Fiber, Shield (E)		2218030
16	Fiber, Shield (F)		2218040
17	Fiber, Shield (G)		2218050
18	Fiber, Display Holder		2218080
19	Fiber, Washer 2.6ø		9991026
20	Fixer, Speaker		2018050
21	Fixer, Strap		2118060
23	Holder, Ant Bar (L)		2018070
24	Holder, Ant Bar (R)		2018080
25	Holder, Rod Ant		2018100
26	Holder, Keyboard		2018040
27	Holder, LCD		2018061
28	Illuminator, LCD		2018110
29	Holder, Display		2118080
30	Knob, Adjustment (RF/BFO) (Dark Gray)		3101801
89	Knob, Execute (D. Gray)		3171801
31	Knob, Function (Band) (D. Gray)		3141800
32	Knob, Freq. UP-DOWN (D. Gray)		3151800
33	Knob, Mode/Store/Scan/Recall (D. Gray)		3161800
34	Knob, Light/Time/Sleep (D. Gray)		3131800
35	Knob, 0-9 (D. Gray)		3121800
36	Knob, Volume/Bal./Freq./Base (D. Gray)		3111800
37	Knob, BFO (OUT/IN) (D. Gray)		3091801
38	Knob, Stereo/Mono/Lock (D. Gray)		3081800
39	Knob, Power (D. Gray)		3181800
40	Latch, Tuning Knob (D. Gray)		2318030
94	LED EVA		2318060
41	Plate, DIN. Jack Dust Proof		3241800

PCB TOP AND BOTTOM VIEWS

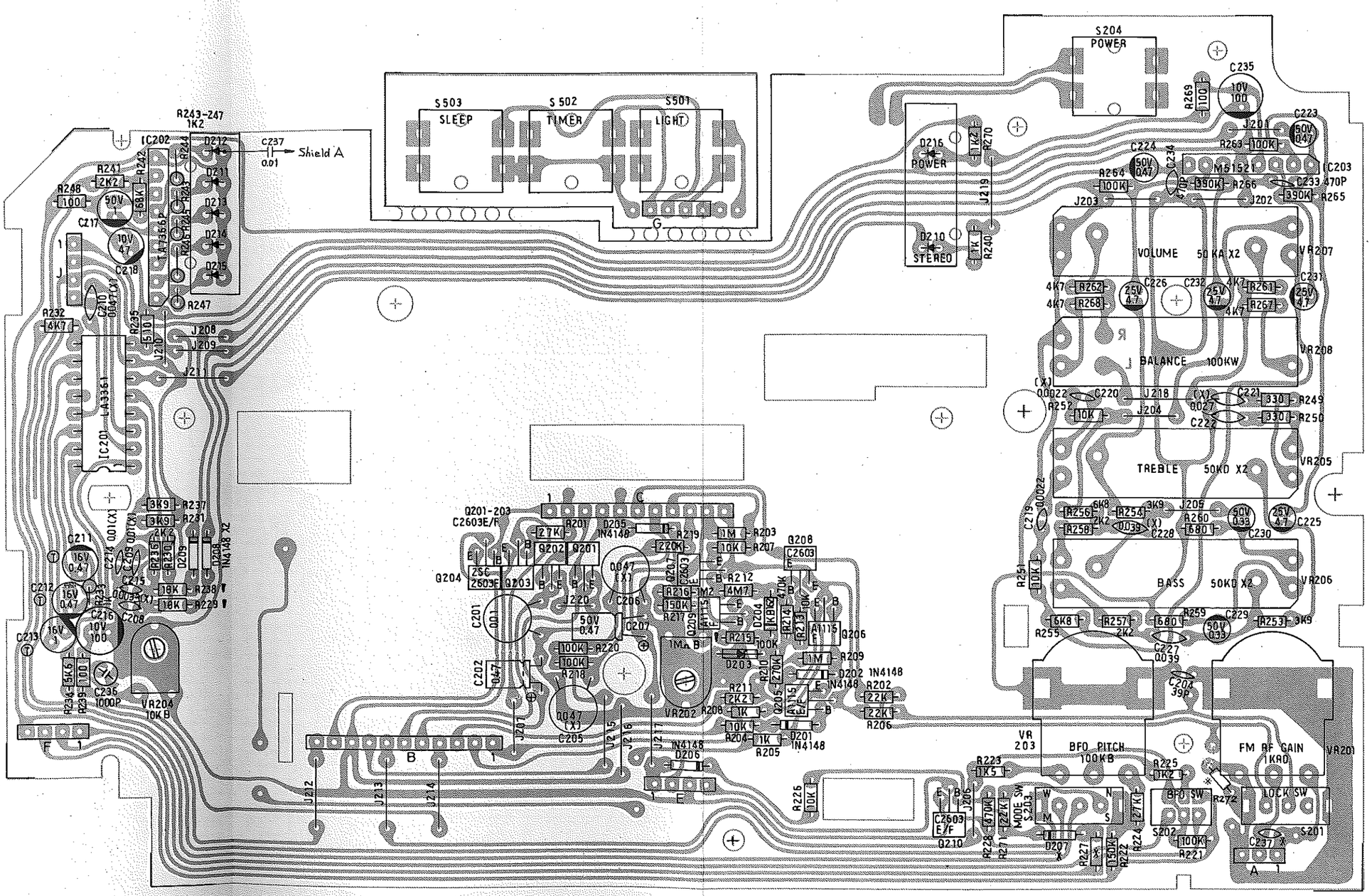
PCB A-1 TOP VIEW



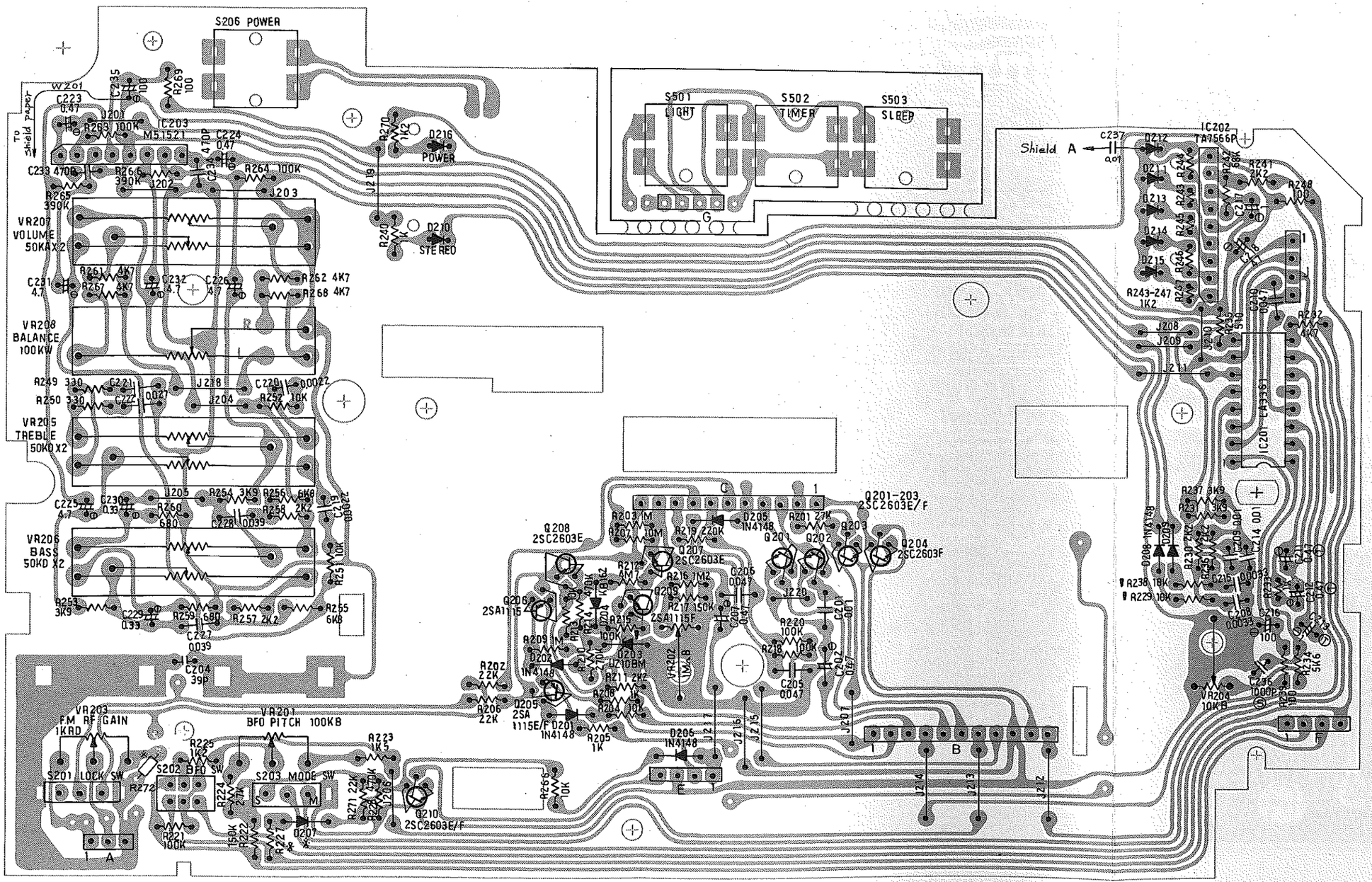
PCB A-1 BOTTOM VIEW



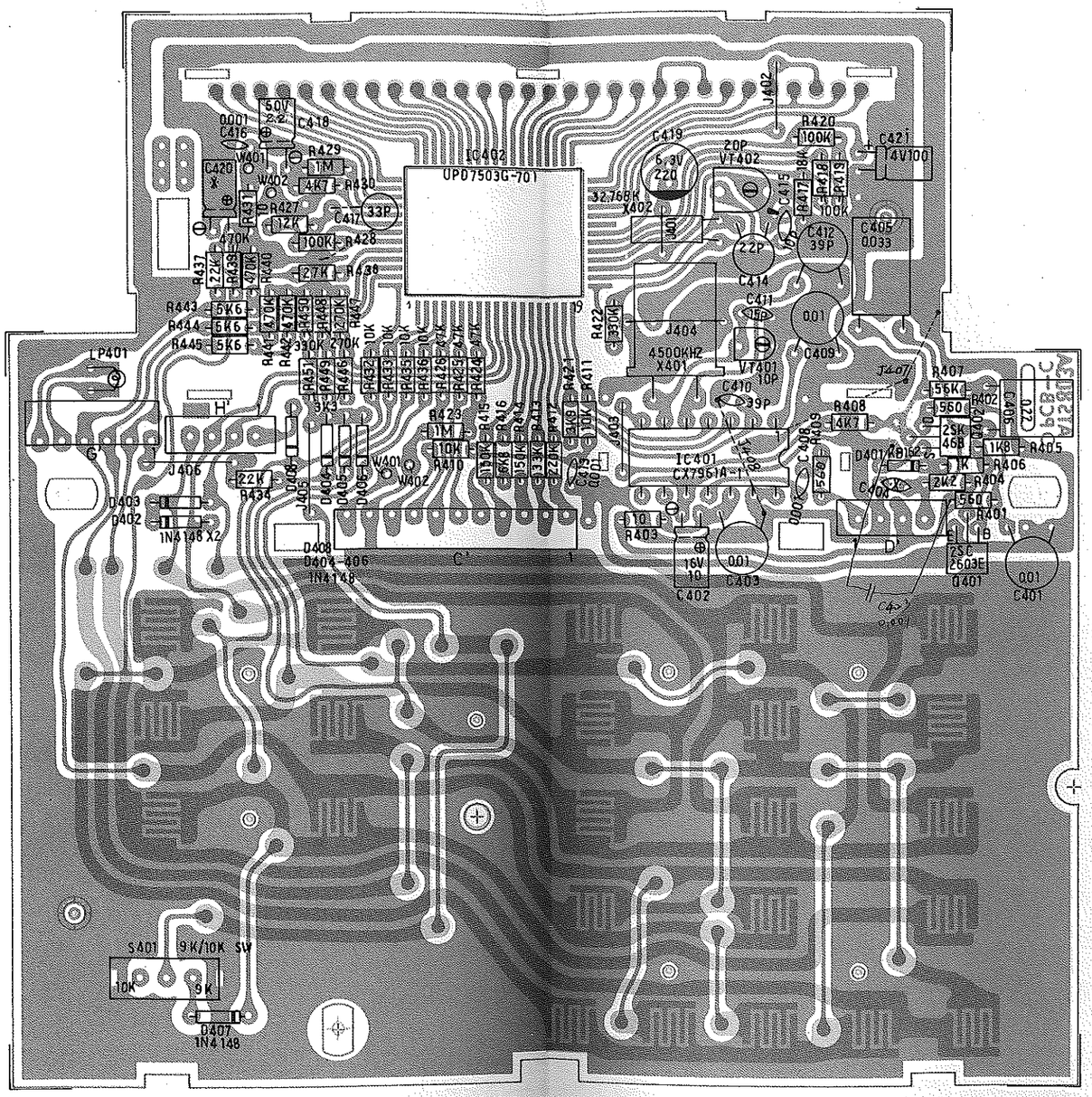
PCB A-2 & A-3 TOP VIEWS



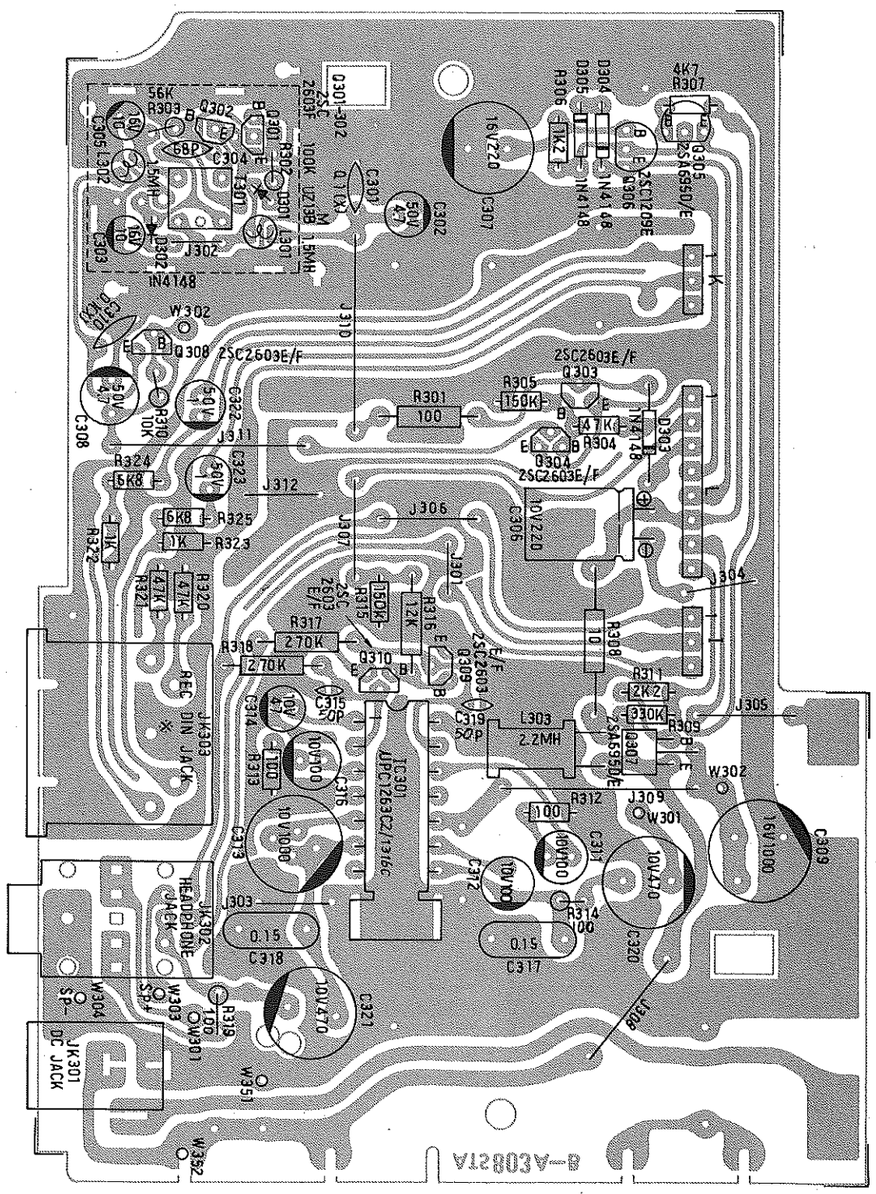
PCB A-2 & A-3 BOTTOM VIEWS



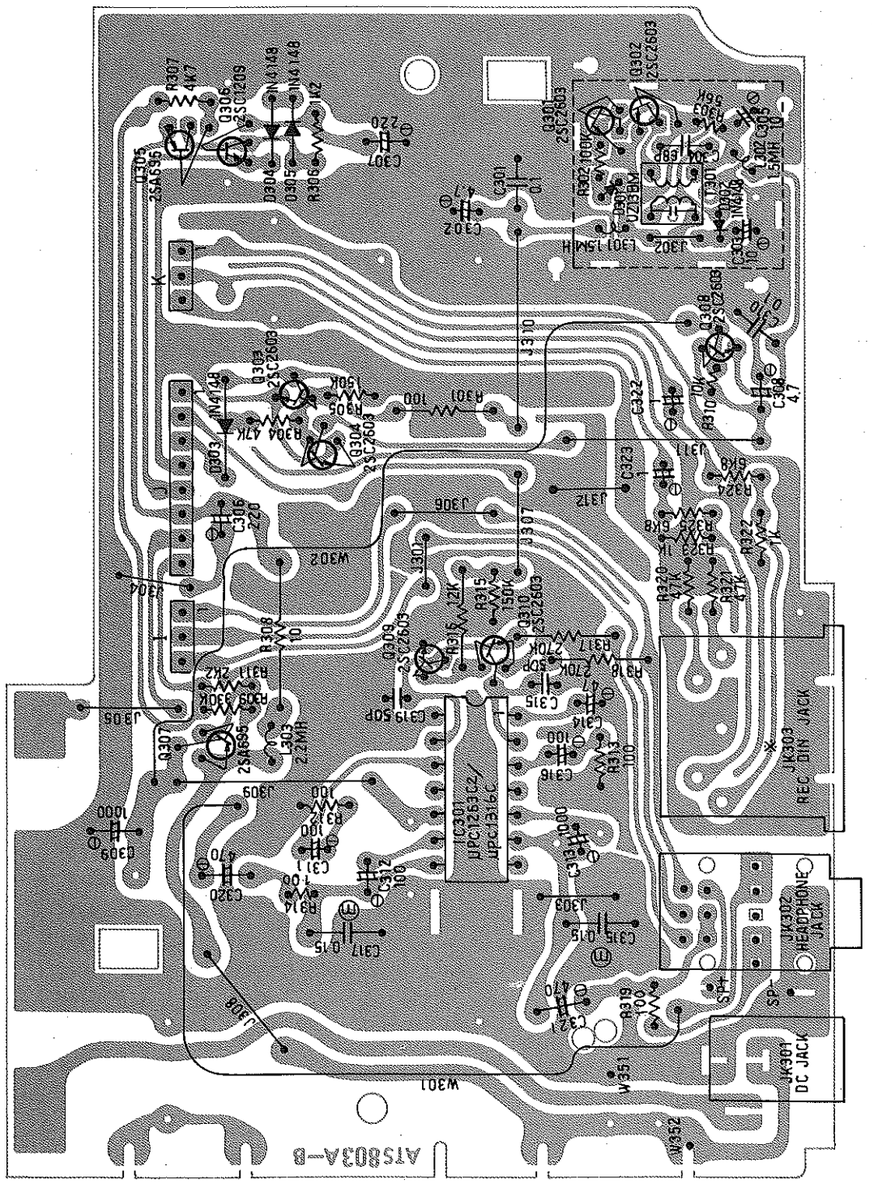
PCB C TOP VIEW



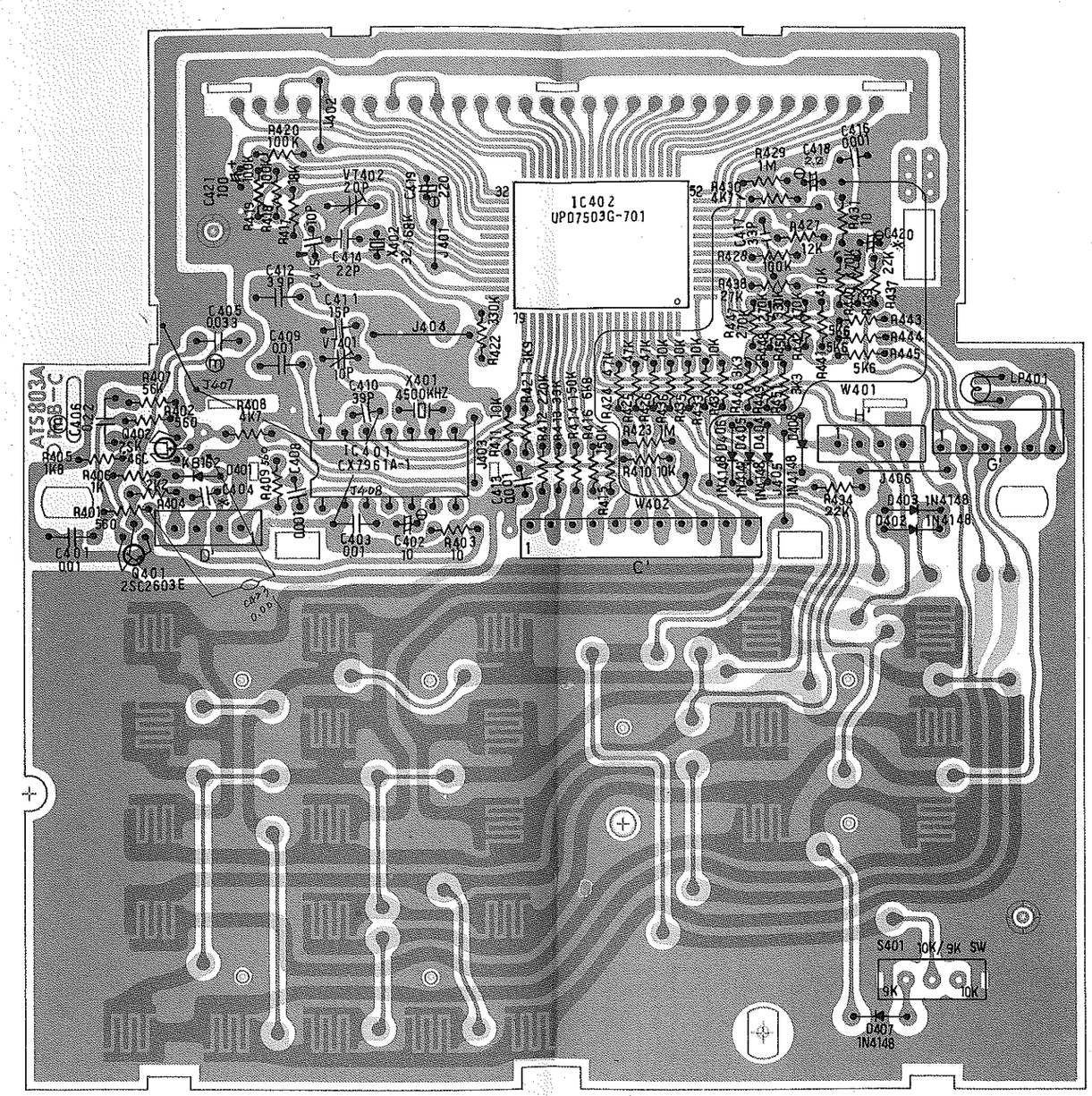
PCB B TOP VIEW



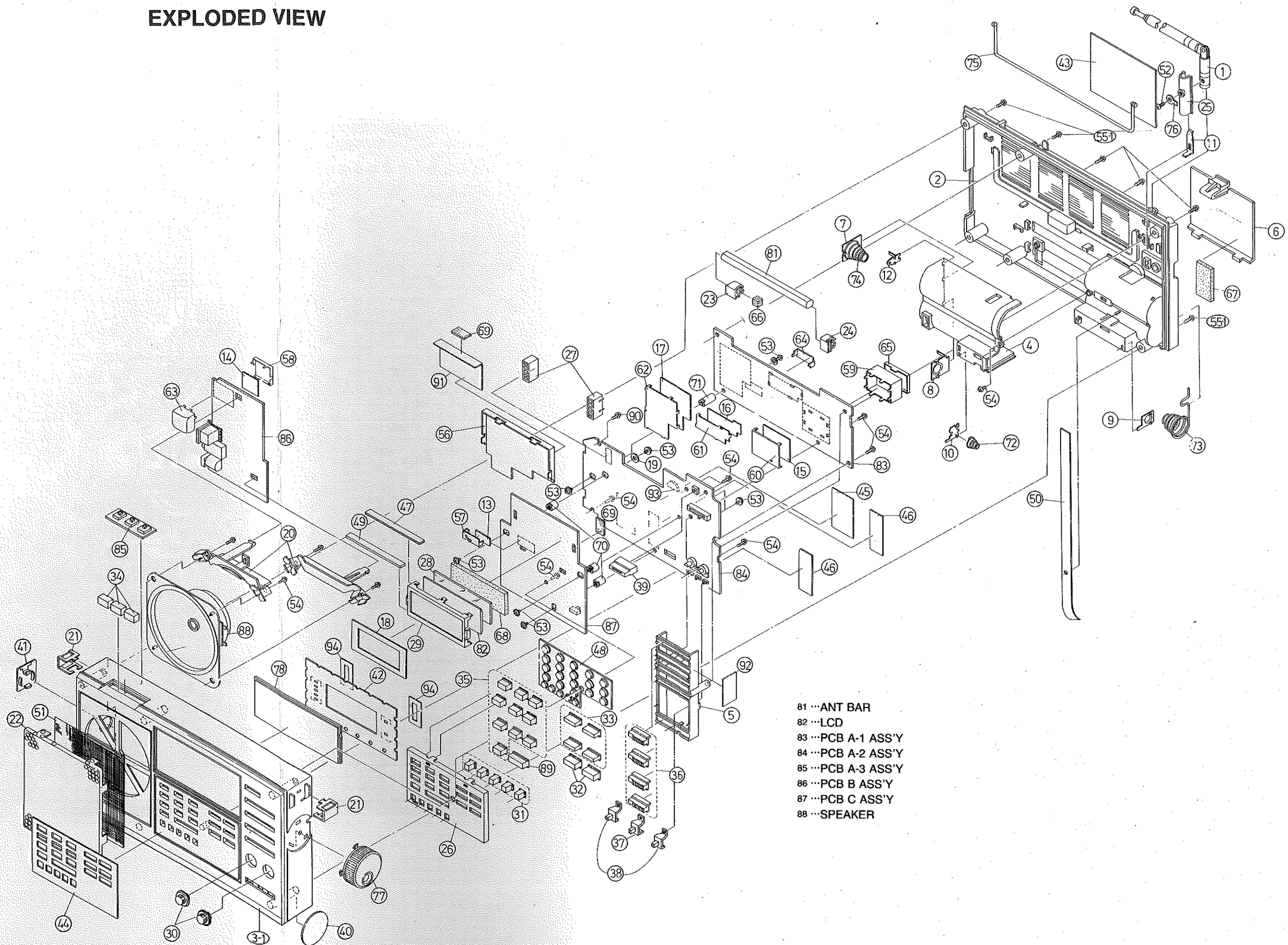
PCB B BOTTOM VIEW



PCB C BOTTOM VIEW



EXPLODED VIEW



81 ···ANT BAR
82 ···LCD
83 ···PCB A-1 ASS'Y
84 ···PCB A-2 ASS'Y
85 ···PCB A-3 ASS'Y
86 ···PCB B ASS'Y
87 ···PCB C ASS'Y
88 ···SPEAKER

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
42	Plate, Dial, Aluminum		3231801
43	Plate, Rating Label , USA		3221800
	Plate, Rating Label, CANADA		3221801
	Plate, Rating Label, UK/AUST		3221802
45	Plate, Insulator PVC A		2218061
46	Plate, Insulator PVC B		2218071
47	Rubber, Conduct		2418010
48	Rubber, Keyboard		2418000
49	Rubber, Spacer		2418020
50	Ribbon, Battery		2218000
52	Screw, M 3×6 P Ni		9020306
53	Screw, M 2.6×4 PW Ni		9025204
54	Screw, TP 2.6×8 P Ni		9120208
55	External Hardware Kit		9120213
55-1	Screw, TP 2.6×12 P Ni		9120212
90	Screw, TP 2.6×8 B		9202208
91	Sheet, Shield		2218090
56	Shield (A)		2118091
57	Shield (B)		2118101
58	Shield (C)		2118110
59	Shield (D) Ass'y		2118250
60	Shield (E)		2118130
61	Shield (F)		2118141
62	Shield (G)		2118150
63	Shield, DC Conductor		2118160
64	Shield, IC		2118170
65	Shield, Cap.		2118230
92	Shield, Paper		2118270
66	Sponge, Ant Bar Fixed		2318000
93	Spacer, EVA ½		2338070
67	Spacer, Battery		2318010
68	Sponge, LCD		2318020
69	Sponge, Lamp		2318050
70	Spacer, PCB (5.4)		2118180
71	Spacer, PCB (12.4)		2118190
72	Spring, Battery		2104010
73	Spring, Battery		2118030
74	Spring. Battery Θ		2118260
75	Supporter		2118070
76	Terminal, Ant		2118220
77	Knob, Tuning 3 Speed Ass'y		2518001
	Shoulder Strap (Not Shown)		3751800
	Instruction Book, USA		3781800
	Instruction Book, CANADA		3781801
	Instruction Book, UK/AUST		3781802
	Gift Box, USA		3901801
	Gift Box, CANADA		3901802
	Gift Box, UK/AUST		3901803

BEFORE ELECTRICAL PARTS LIST

Some of the parts in the Elec. Parts List have alternative values. The following is a guidance for choice upon repairing.

Repair Parts	Page	Associated Parts	Page
CF103 SFA10.7MF5K	41	C33 3pf (CK)	38
		R31 470 ohm R33 680 ohm	42
IC101 μPC 1018C	41	R19 560 ohm R20 none	42
IC201 LA3361	46	R28 12K ohm	42
		R229 18K ohm R238 18K ohm	47
D130 FC52M-5	41	R134 330K ohm	44
D204 KB162	46	R215 100K ohm	46
X402 32.768kHz	50	C415 15pf (CH)	50
Q110 2SK152-2	44	R71 220 ohm	43
Q110 Q115 2SK152 Q117–118	44 45	R87 47K ohm	43

Explanation :

1. If CF103 is demaged and changed, the associated parts, C33, R31, and R33 should be changed accordingly at the same time, their values should be subject to the values described above.

2. If C33 is demaged when its spec. is 7pf, it has to be replaced with another new 7pf. CF103, R31 and R33 remain unchanged.

3. If any one of Q110, Q115, Q117 or Q118 is demaged and changed, the associated part R87 should be replaced with 47K ohm accordingly at the same time.

4. If only R87 is demaged, replace it only with same value as original. Q110, Q115, Q117 and Q118 remain unchanged.

ELECTRICAL PARTS LIST

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
	PCB A (A-1, A-2) Ass'y		800001
	PCB A (A-1, A-2) ,Blank		700001
	PCB A-1 Ass'y		800003
	PCB A-2 Ass'y		800004
	PCB A-1 ,Blank		700003
	PCB A-2 ,Blank		700004
	PCB A-1 Ass'y (Including following)		
	CAPACITORS		
The following code indicated variation of capacitors against temperature: F= +80% −20% (−25 to +85°C), B= +10% −10% (−25 to 85°C), CK= 0±60ppm/°C (−25 to 85°C) SL= +350ppm/°C to −1000ppm/°C			
C1	Ceramic 0.01μF 50V +80% −20% F		4110315
C2	Not Used		
C3	Ceramic 470pF 50V +−10% B		4147114
C4	Ceramic 680pF 50V +−10% B		4168114
C5	Ceramic 0.01μF 50V +80% −20% F		4110315
C6	Ceramic 0.022μF 50V +80% −20% F		4122315
C7	Ceramic 0.001μF 50V +80% −20% F		4110215
C8	Ceramic 220pF 50V +−10% B		4122114
C9 −10	Ceramic 0.01μF 50V +80% −20% F		4110315
C11	Ceramic 0.001μF 50V +80% −20% F		4110215
C12	Ceramic 0.022μF 50V +80% −20% F		4122315
C13	Ceramic 5pF 50V +−0.25pF CH		4105002
C14	Ceramic 220pF 50V +−10% B		4122114
C15	Not Used		
C16	Ceramic 2pF 50V +−0.25pF CK		4102000
C17	Ceramic 0.01μF 50V +80% −20% F		4110315
C18	Ceramic 0.001μF 50V +80% −20% F		4110215
C19	Semiconductor (UZE) 0.1μF 25V +−20%		4110416
C20	Elect. 22μF 16V +−20%		4422610
C21	Ceramic 0.01μF 50V +80% −20% F		4110315
C22	Elect. 47μF 10V +−20%		4447610
C23	Elect. 10μF 16V +−20%		4410610
C24	Ceramic 0.001μF 50V +80% −20% F		4110215
C25	Semiconductor (UZE) 0.047μF 25V +−20%		4147316
C26	Ceramic 0.01μF 50V +80% −20% F		4110315
C27 −28	Elect. 47μF 10V +−20%		4447610
C29	Elect. 10μF 16V +−20%		4410600
C30 −32	Ceramic 220pF 50V +−10% B		4122114
C33	Ceramic 3pF 50V +−0.25pF CK (or 7pF 50V +−0.25pF CH)		4103000 4107002

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
C34	Semiconductor (UZE) 0.047μF 25V +−20%		4147316
C35 −36	Ceramic 0.01μF 50V +80% −20% F		4110315
C37	Ceramic 0.0047μF 50V +80% −20% F		4147215
C38	Ceramic 0.01μF 50V +80% −20% F		4110315
C39	Semiconductor (UZE) 0.0022μF 16V +−10%		4122227
C40	Ceramic 0.01μF 50V +80% −20% F		4110315
C41	Elect. 2.2μF 50V +−20%		4422500
C42	Elect. 47μF 10V +−20%		4447610
C43	Ceramic 33pF 50V +−5% SL		4133013
C44	Elect. 0.1μF 50V +−20%		4410400
C45	Elect. 47μF 10V +−20%		4447610
C46	Elect. 0.1μF 50V +−20%		4410400
C47	Elect. 10μF 16V +−20%		4410610
C48	Ceramic 0.01μF 50V +80% −20% F		4110315
C49	Ceramic 47pF 50V +−5% CH		4147002
C50	Polystyrene 0.001μF 50V +−5%		4510200
C51	Semiconductor (UZE) 0.0022μF 25V +−10%		4122228
C52 −53	Ceramic 0.01μF 50V +80% −20% F		4110315
C54	Mylar * 0.0056μF 50V +−5%		4656200
C55 −56	Semiconductor (UZE) 0.01μF 16V +−10%		4110327
C57	Ceramic 220pF 50V +−10% B		4122114
C58	Semiconductor (UZE) 0.047μF 25V +−20%		4147316
C59 −60	Ceramic 0.01μF 50V +80% −20% F		4110315
C61	Ceramic 220pF 50V +−10% B		4122114
C62 −66	Ceramic 0.01μF 50V +80% −20% F		4110315
C67	Ceramic 0.001μF 50V +80% −20% F		4110215
C68	Ceramic 5pF 50V +−0.25pF SL		4105013
C69	Ceramic 1pF 50V +−0.25pF SL		4101013
C70	Not Used		
C71	Ceramic 27pF 50V +−5% SL		4127013
C72	Semiconductor (UZE) 0.1μF 16V +−20%		4110426
C73	Elect. 47μF 10V +−20%		4447610
C74 −77	Ceramic 0.01μF 50V +80% −20% F		4110315
C78	Elect. 47μF 10V +−20%		4447610
C79	Elect. 10μF 16V +−20%		4410610
C80	Ceramic 0.01μF 50V +80% −20% F		4110315
C81	Ceramic 56pF 50V +−5% CH		4156002
C82	Ceramic 47pF 50V +−5% CH		4147002
C83	Ceramic 56pF 50V +−5% CH		4156002
C84	Ceramic 0.001μF 50V +80% −20% F		4110215
C85 −86	Ceramic 0.01μF 50V +80% −20% F		4110315
C87	Elect. 47μF 10V +−20%		4447610

* Mylar is a registered trade mark of DU PONT de Nemours and Company.

REF. NO.	DESCRIPTIONS				RS LOCATION NO.	MFR. PART NO.
C88 –92	Ceramic	0.01μF	50V +80% –20%	F		4110315
C93	Elect.	4.7μF	50V +–20%			4447510
C94 –95	Ceramic	0.01μ	50V +80% –20%	F		4110315
C96	Not Used					
C97	Ceramic	2pF	50V +–0.25pF	CK		4102000
C98	Elect.	4.7μF	50V +–20%			4447510
C99	Ceramic	0.01μF	50V +80% –20%	F		4110315
C100	Polystyrene	220pF	50V +–5%			4522100
C101	Ceramic	10pF	50V +–0.5pF	CH		4110002
C102	Ceramic	2pF	50V +–0.25pF	CK		4102000
C103	Not Used					
C104	Ceramic	0.022μF	50V +80% –20%	F		4122315
C105	Ceramic	5pF	50V +–0.25pF	CH		4105002
C106	Elect.	10μF	16V +–20%			4410610
C107	Ceramic	470pF	50V +–10%	B		4147114
C108	Ceramic	0.01μF	50V +80% –20%	F		4110315
C109	Elect.	220μF	10V +–20%			4422710
C110	Ceramic	0.01μF	50V +80% –20%	F		4110315
C111	Semiconductor (UZE)	0.047μF	25V +–20%			4147316
C112	Elect.	10μF	16V +–20%			4410600
	COILS					
L101	Inductor Coil	4.7μH				1130020
L102	Inductor Coil	18μ H				1130040
L103	Inductor Coil	47μH				1130180
L104	Adjustment Coil	1030				1121030
L105	Inductor Coil	1μH				1130010
L106	Inductor Coil	47μH				1130180
L107	Inductor Coil	10mH				1130120
L108	Inductor Coil	0.39μH				1130130
L109	Inductor Coil	470μH				1130070
L110 –111	Inductor Coil	2.2μH				1130111
L112	Not Used					
L113	Inductor Coil	0.39μH				1130130
L114	Inductor Coil	8.2μH				1130170
L115	Inductor Coil	2.2μH				1130111
L116	Inductor Coil	8.2μH				1130170
L117	Adjustment Coil	1040				1121040
L118	Inductor Coil	2.2μH				1130111
L119	Bar Antenna Coil					1110131
L120	Inductor Coil	1μH				1130010
T101	Adjustment Coil	1020				1121020
T102	Adjustment Coil	0110				1120110

REF. NO.	DESCRIPTIONS		RS LOCATION NO.	MFR. PART NO.
T103	Adjustment Coil	1010		1121010
T104	Adjustment Coil	1000		1121000
T105	Adjustment Coil	0990		1120990
T106	Adjustment Coil	0950		1120950
T107	Toroid Coil	720μH		1150000
T108 −110	Adjustment Coil	0970		1120970
T111	Adjustment Coil	0960		1120960
T112	Adjustment Coil	1340		1121340
	CONNECTORS			
J'	Connector Housing 4 Pin			1700020
L'	Connector Housing 8 Pin			1700080
	CRYSTALS			
X101	Crystal	55.405MHz		1650020
XF101-102	Crystal	55.845MHz		1650040
CR101	Resonator	451kHz		1650061
	DIODES			
D101 −102	Diode	1S2222		1040100
D103 −104	Diode	FC52M-5/-6		1040151/2
D105 −106	Diode	1N60P		1040121
D107	Diode	1N60		1040120
D108 −109	Diode	1N60P		1040121
D110	Diode	KB262		1040050
D111 −112	Diode	1N60P		1040121
D113 −117	Diode	1N4148		1040020
D118	Diode	1S2222		1040100
D119	Diode	1N4148		1040020
D120	Diode	KB262		1040050
D121	Diode	1S2222		1040100
D122	Diode	SVC-201SP		1040090
D123 −129	Diode	1N4148		1040020
D130	Diode	FC52M-5/-6		1040151/2
D131	Diode	1N4148		1040020
	FILTERS			
CF101-102	Ceramic Filter SFE10.7MA8-A			1660080
CF103	Ceramic Filter SFA10.7MF5K			1660090
CF104	Ceramic Filter SFP450I			1660170
CF105	Ceramic Filter SFR450K			1660120
	INTEGRATED CIRCUITS			
IC101	IC μPC1018C,AM/FM IF Amp.	NEC		1010340
IC102	IC LA5003, Regulator	Sanyo		1010140
	JACK			
JK101	EXT ANT Jack (RCA Type)			1649010
	RESISTORS (All carbon film 1/8W +−5% unless noted otherwise)			
R1	1K	ohm		6010536
R2	33	ohm		6010518
R3 −4	47K	ohm		6010556
R5	820	ohm		6010135

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
R6	1.2K ohm		6010537
R7	4.7K ohm		6010544
R8	3.9 ohm		6010507
R9 −10	5.6K ohm		6010545
R11	10K ohm		6010548
R12	8.2K ohm		6010547
R13	1M ohm		6010572
R14	100K ohm		6010560
R15	470 ohm		6010532
R16	1K ohm		6010136
R17	270K ohm		6010165
R18	2.2K ohm		6010540
R19	560 ohm		6010533
	(or 33 ohm)		6010518
R20	Not Used		
	(or 560 ohm)		6010533
R21	330 ohm		6010530
R22 −23	22K ohm		6010552
R24 −25	1K ohm		6010136
R26 −27	6.8K ohm		6010546
R28	12K ohm		6010549
	(or 4.7K ohm)		6010544
R29	470 ohm		6010532
R30	1.2K ohm		6010537
R31	470 ohm		6010532
	(or 330 ohm)		6010530
R32	33K ohm		6010554
R33	680 ohm		6010534
	(or 330 ohm)		6010530
R34	27K ohm		6010553
R35	270 ohm		6010529
R36	470 ohm		6010532
R37	120 ohm		6010525
R38	3.9 ohm		6010507
R39	39K ohm		6010555
R40	22K ohm		6010552
R41	10K ohm		6010548
R42	1M ohm		6010572
R43	100K ohm		6010560
R44	3.9K ohm		6010543
R45	470 ohm		6010532
R46	33 ohm		6010518
R47	2.7K ohm		6010541
R48	1.8K ohm		6010539
R49	3.9K ohm		6010543
R50	820 ohm		6010535
R51	2.7K ohm		6010541
R52	6.8K ohm		6010546
R53	22K ohm		6010552

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
R54	100 ohm		6010524
R55	4.7K ohm		6010544
R56	270K ohm		6010565
R57	1.8K ohm		6010539
R58	2.7K ohm		6010541
R59 –60	6.8K ohm		6010546
R61	68K ohm		6010558
R62	680K ohm		6010570
R63	39K ohm		6010555
R64	15K ohm		6010550
R65	22K ohm		6010552
R66	39K ohm		6010555
R67	15K ohm		6010550
R68	22K ohm		6010552
R69	560K ohm		6010569
R70	Not Used		
R71	220 ohm		6010528
	(or 390 ohm)		6010531
R72	33K ohm		6010554
R73	470K ohm		6010568
R74	22K ohm		6010552
R75	47K ohm		6010556
R76 –77	150K ohm		6010562
R78	220 ohm		6010528
R79	12K ohm		6010549
R80	8.2K ohm		6010547
R81	330 ohm		6010530
R82	100 ohm		6010524
R83	1K ohm (or 2KΩ)		6010536
R84	15K ohm		6010550
R85	100K ohm		6010560
R86	180K ohm		6010563
R87	47K ohm		6010556
	(or 33K ohm)		6010554
R88 –89	3.3K ohm		6010542
R90 –91	100 ohm		6010524
R92	2.7K ohm		6010541
R93	22K ohm		6010552
R94	1.5K ohm		6010538
R95	68K ohm		6010558
R96	100K ohm		6010560
R97	22K ohm		6010552
R98	100 ohm		6010524
R99	3.9K ohm		6010543
R100	100 ohm		6010524
R101	2.7K ohm		6010541
R102	39K ohm		6010555
R103	47K ohm		6010556
R104 –105	8.2K ohm		6010547

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
R106 –107	5.6K ohm		6010545
R108	27K ohm		6010553
R109	1K ohm		6010536
R110	8.2K ohm		6010547
R111	33K ohm		6010554
R112	3.3K ohm		6010142
R113	470K ohm		6010568
R114	100 ohm		6010524
R115	3.9K ohm		6010543
R116	330 ohm		6010530
R117	10K ohm		6010548
R118	18K ohm		6010551
R119	22K ohm		6010552
R120	27K ohm		6010553
R121	10K ohm		6010548
R122	330 ohm		6010530
R123	56K ohm		6010557
R124	1K ohm		6010536
R125	1.2K ohm (or 820Ω)		6010537
R126	220 ohm		6010528
R127	680 ohm		6010534
R128	1K ohm		6010536
R129	56K ohm		6010557
R130	100 ohm		6010524
R131	3.3K ohm		6010542
R132	1K ohm (or 680Ω)		6010536
R133	3.9 ohm		6010507
R134	330K ohm		6010566
	(or 390K ohm)		6010567
R135	330 ohm		6010530
R136	270 ohm		6010529
	SWITCH		
S101	Switch 1Pole 2 Position , EXT. ANT Switch		1630240
	TRANSISTORS		
Q101	FET 2SK212E		1030001
Q102	Transistor 2SC763C		1020090
Q103	Transistor 2SC2724D		1020141
Q104 –105	Transistor 2SC2603E		1020130
Q106 –107	Transistor 2SA1115E		1020030
Q108	Transistor 2SC2724C/D		1020140/1
Q109	Transistor 2SC2603E/F		1020130/1
Q110	FET 2SK152-2/-3		1030030/1
	(or 2SK291Q)		1030060
Q111 –112	Transistor 2SA1115E/F		1020030/1
Q113	Transistor 2SA1115F		1020031
Q114	Transistor 2SA1115E/F		1020030/1
Q115	FET 2SK152-3		1030031
	(or 2SK291R)		1030061

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
Q116	Transistor 2SC2603E		1020130
Q117 –118	FET 2SK152-1/-2 (or 2SK291Q)		1030032/0 1030060
Q119	Transistor 2SC2724D		1020141
Q120	FET 2SK212E		1030001
Q121	Transistor 2SC2724D		1020141
Q122 –126	Transistor 2SA1115E/F		1020030/1
Q127 –129	Transistor 2SC763D		1020091
Q130	FET 2SK46A / 2SK381A		1030040
	TRIMMERS		
VT101-102	Trimmer 20P		1210020
VT103	Trimmer 100P		1210030
	VARIABLE RESISTOR		
VR101	Semi-Fixed 500B		1320050
	WIRES		
W101	PVC Wire 100(10+10)mm RED		8170562
W102	PVC Wire 80(10+10)mm WHITE		8170549
W103	PVC Wire 110(10+10)mm SKY BLUE		8170579
W104	PVC Wire 100(10+10)mm BLUE		8170566
W105	PVC Wire 80(10+10)mm BROWN		8170541
W106	PVC Wire 80(10+10)mm ORANGE		8170543
W107	PVC Wire 80(10+10)mm YELLOW		8170544
W108	PVC Wire 90(10+10)mm PINK		8170583
W109 –110	PVC Wire 80(10+10)mm GREEN		8590005
W111	PVC Wire 150(10+5)mm WHITE		8150339
W01	PVC Wire 240(5+5)mm RED		8150102
W02	PVC Wire 120(5+5)mm BLACK		8150080
	JUMP WIRES		
J101 –106	Jump Wire 5mm 0.6ø		8000010
J107 –113	Jump Wire 7.5mm 0.6ø		8000030
J114	Not Used		
J115	Jump Wire 7.5mm 0.6ø		8000030
J116	Jump Wire 12.5mm 0.6ø		8000050
J117	Jump Wire 5mm 0.6ø		8000010
J118	Jump Wire 25mm 0.6ø		8000140
	END OF PCB A-1		
	PCB A-2 Ass'y (Including following)		
	CAPACITORS		
C201	Ceramic 0.01μF 50V +80% –20% F		4110315
C202	Elect. 0.47μF 50V +–20%		4447400
C203	Not Used		
C204	Ceramic 39pF 50V +–5% SL		4139013
C205 –206	Semiconductor (UZE) 0.047μF 50V +–20%		4147316
C207	Elect. 0.47μF 50V +–20%		4447400
C208	Semiconductor (UZE) 0.0033μF 16V +–10%		4133227
C209	Semiconductor (UZE) 0.01μF 16V +–10%		4110327
C210	Semiconductor (UZE) 0.047μF 25V +–20%		4147316
C211 –212	Tantalum 0.47μF 16V +–20%		4347400
C213	Tantalum 1μF 16V +–20%		4310500
C214	Semiconductor (UZE) 0.01μF 16V +–10%		4110327

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
C215	Semiconductor (UZE) 0.0033μF 16V +−10%		4133227
C216	Elect. 100μF 10V +−20%		4410710
C217	Elect. 1μF 50V +−10%		4410510
C218	Elect. 47μF 10V +−20%		4447610
C219 −220	Semiconductor (UZE) 0.0022μF 16V +−10%		4122227
C221 −222	Semiconductor (UZE) 0.027μF 16V +−10%		4127327
C223 −224	Elect. 0.47μF 50V +−20%		4447400
C225 −226	Elect. 4.7μF 25V +−20%		4447500
C227 −228	Semiconductor (UZE) 0.039μF 25V +−20%		4139316
C229 −230	Elect. 0.33μF 50V +−20%		4433400
C231 −232	Elect. 4.7μF 25V +−20%		4447500
C233 −234	Ceramic 470pF 50V +−10% B		4147114
C235	Elect. 100μF 10V +−20%		4410710
C236	Polystyrence 0.001μF 50V +−5%		4510200
C237	Ceramic 0.01μF 50V +80% −20% F		4110315
	DIODES		
D201 −202	Diode 1N4148		1040020
D203	Diode UZ-10BM		1041020
D204	Diode KB162		1040140
D205 −206	Diode 1N4148		1040020
D207	Not Used		
D208 −209	Diode 1N4148		1040020
D210	LED 2mm×5mm GREEN		1053040
D211 −216	LED 2mm×5mm RED		1050080
	INTEGRATED CIRCUITS		
IC201	IC LA3361, FM MPX Demodulator Sanyo		1010110
IC202	IC TA7366P, Signal Strength, LED driver Toshiba		1010270
IC203	IC M51521AL/L, Pre-Amp Mitsubish		1001460/1
	RESISTORS (All Carbon film ⅛W +−5% unless noted otherwise)		
R201	27K ohm		6010553
R202	22K ohm		6010552
R203	1M ohm		6010572
R204	10K ohm		6010548
R205	1K ohm		6010536
R206	22K ohm		6010552
R207	10K ohm		6010548
R208	1K ohm		6010536
R209	1M ohm		6010572
R210	270K ohm		6010565
R211	2.2K ohm		6010540
R212	4.7M ohm		6010580
R213	10K ohm		6010548
R214	470K ohm		6010568
R215	100K ohm		6010560
	(or 150K ohm)		6010562
R216	1.2M ohm		6010573
R217	150K ohm		6010562
R218	100K ohm		6010560

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
R219	220K ohm		6010564
R220 –221	100K ohm		6010560
R222	150K ohm		6010562
R223	1.5K ohm		6010538
R224	27K ohm		6010553
R225	1.2K ohm		6010537
R226	10K ohm		6010548
R227	Not Used		
R228	470K ohm		6010568
R229	10K ohm		6010548
	(or 18K ohm)		6010551
R230	2.2K ohm		6010540
R231	3.9K ohm		6010543
R232	4.7K ohm		6010544
R233	1K ohm		6010136
R234	5.6K ohm		6010545
R235	510 ohm		6010598
R236	2.2K ohm		6010540
R237	3.9K ohm		6010543
R238	10K ohm		6010548
	(or 18K ohm)		6010551
R239	100 ohm		6010524
R240	1K ohm		6010536
R241	2.2K ohm		6010540
R242	68K ohm		6010558
R243 –247	1.2K ohm		6010137
R248	100 ohm		6010524
R249 –250	330 ohm		6010530
R251 –252	10K ohm		6010548
R253 –254	3.9K ohm		6010543
R255 –256	6.8K ohm		6010546
R257 –258	2.2K ohm		6010540
R259 –260	680 ohm		6010534
R261 –262	4.7K ohm		6010544
R263 –264	100K ohm		6010560
R265 –266	390K ohm		6010567
R267 –268	4.7K ohm		6010544
R269	100 ohm		6010524
R270	1.2K ohm		6010537
R271	22K ohm		6010552
	SWITCHES		
S201	Switch 1 Pole 2 Position, Lock Switch		1630010
S202	Switch 2 Pole 2 Position, BFO Switch		1630070
S203	Switch 1 Pole 2 Position, Mode Switch		1630010
S204	Switch 1 Pole 1 Position, Power Switch		1630230
	TRANSISTORS		
Q201 –203	Transistor 2SC2603E/F		1020130/1
Q204	Transistor 2SC2603F		1020131
Q205	Transistor 2SA1115E/F		1020030/1

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
Q206	Transistor 2SA1115F		1020031
Q207 −208	Transistor 2SC2603E		1020130
Q209	Transistor 2SA1115F		1020031
Q210	Transistor 2SC2603E/F		1020130/1
	VARIABLE RESISTORS		
VR201	Rotary VR 1KRD, RF Gain Control		1310060
VR202	Semi-Fixed VR 1MB		1320070
VR203	Rotary VR 100KB, BFO PITCH Control		1310050
VR204	Semi-Fixed VR 10KB		1320000
VR205−206	Slide VR 50KD×2, Trable/Base		1300050
VR207	Slide VR 50KA×2, Volume		1300020
VR208	Slide VR 100KW, Balance		1300040
	WIRE		
W201	PVC wire 30(3+3) WHT		8170139
	JUMP WIRES		
J201 −210	Jump Wire 7.5mm 0.6ø		8000030
J211 −219	Jump Wire 10mm 0.6ø		8000040
J220	Jump Wire 5mm 0.6ø		8000010
	END OF PCB A-2		
	PCB A-3 Ass'y		800002
	PCB A-3 ,Blank		700002
	SWITCH		
S501 −503	Switch 1 Pole 1 Position, Light/Sleep/Timer		1630230
	END OF PCB A-3		
	PCB B Ass'y		810001
	PCB B ,Blank		1610182
	PCB B Ass'y (Including following)		
	CAPACITORS		
C301	Semiconductor (UZE) 0.1μF 25V +−20%		4110416
C302	Elect. 4.7μF 50V +−20%		4447510
C303	Elect. 10μF 16V +−20%		4410600
C304	Ceramic 68pF 50V +−5% SL		4168013
C305	Elect. 10μF 16V +−20%		4410600
C306	Elect. 220μF 10V +−20%		4422710
C307	Elect. 220μF 16V +−20%		4422713
C308	Elect. 4.7μF 50V +−20%		4447510
C309	Elect. 1000μF 16V +−20%		4410813
C310	Semiconductor (UZE) 0.1μF 25V +−20%		4110416
C311 −312	Elect. 100μF 10V +−20%		4410710
C313	Elect. 1000μF 10V +−20%		4410812
C314	Elect. 47μF 10V +−20%		4447610
C315	Ceramic 50pF 50V +−5% SL		4150013
C316	Elect. 100μF 10V +−20%		4410710
C317 −318	Mylar 0.15μF 50V +−5%		4615400
C319	Ceamic 50pF 50V +−5% SL		4150013
C320 −321	Elect. 470μF 10V +−20%		4447711
C322 −323	Elect. 1μF 50V +−20%		4410510

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
	COILS		
L301 –302	Inductor Coil 1.5mH		1130090
L303	Inductor Coil 2.2mH		1130100
T301	Adjustment Coil 0100		1120100
	DIODES		
D301	Diode UZ-13BM		1041030
D302 –305	Diode 1N4148		1040020
	INTEGRATED CIRCUIT		
IC301	IC μPC1263C2/μPC 1316C, Power Amp NEC		1010350
	JACKS		
JK301	DC Jack		1647000
JK302	Headphone Jack 3.5mm		1640040
	RESISTORS (All Carbon film ⅛W +–5% unless noted otherwise)		
R301	100 ohm 1/4W		6020424
R302	100K ohm		6010160
R303	56K ohm		6010157
R304	47K ohm (or 27kΩ)		6010556
R305	150K ohm		6010562
R306	1.2K ohm		6010537
R307	4.7K ohm		6010544
R308	10 ohm 1/4W		6020012
R309	330K ohm		6010566
R310	10K ohm		6010148
R311	2.2K ohm		6010540
R312 –313	100 ohm		6010524
R314	100 ohm		6010124
R315	150K ohm		6010562
R316	12K ohm 1/4W		6020449
R317 –318	270K ohm		6020465
R319	100 ohm		6010124
R320 –321	47K ohm		6010556
R322 –323	1K ohm		6010536
R324 –325	6.8K ohm		6010546
	TRANSISTORS		
Q301 –302	Transistor 2SC2603F		1020131
Q303 –304	Transistor 2SC2603E/F		1020130/1
Q305	Transistor 2SA695D/E		1020020/1
Q306	Transistor 2SC1209E		1020111
Q307	Transistor 2SA695D/E		1020020/1
Q308 –310	Transistor 2SC2603E/F		1020130/1
	WIRES		
W301	PVC Wire 100(10+10)mm WHITE		8170569
W302	PVC Wire 110(10+10)mm RED		8170572
W303	PVC Wire 140(5+5)mm WHITE		8150099
W304	PVC Wire 120(5+5)mm BLACK		8150080

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
	JUMP WIRES		
J301 −302	Jump Wire 5mm 0.6ø		8000010
J303 −304	Jump Wire 7.5mm 0.6ø		8000030
J305 −307	Jump Wire 10mm 0.6ø		8000040
J308	Jump Wire 12.5mm 0.6ø		8000050
J309 −311	Jump Wire 20mm 0.6ø		8000061
J312	Jump Wire 7.5mm 0.6ø		8000030
	END OF PCB B		
	PCB C Ass'y		820001
	PCB C ,Blank		1610192
	PCB C Ass'y (Including following)		
	CAPACITORS		
C401	Ceramic 0.01μF 50V +−20% F		4110315
C402	Elect. 10μF 16V +−20%		4410600
C403	Ceramic 0.01μF 50V +80% −20% F		4110315
C404	Not Used		
C405	Mylar 0.033μF 50V +−5%		4633300
C406	Metal. Poly. 0.22μF 50V +−10%		4822400
C407	Not Used		
C408	Ceramic 0.001μF 50V +80% −20% F		4110215
C409	Ceramic 0.01μF 50V +80% −20% F		4110315
C410	Ceramic 39pF 50V +−5% SL		4139013
C411	Ceramic 15pF 50V +−5% CH		4115002
C412	Ceramic 39pF 50V +−5% CH		4139002
C413	Ceramic 0.001μF 50V +80% −20% F		4110215
C414	Ceramic 22pF 50V +−5% CH		4122002
C415	Ceramic 10pF 50V +−0.5pF CH (or 15pF 50V +−0.5pF CH)		4110002 4115002
C416	Ceramic 0.001μF 50V +80% −20% F		4110215
C417	Ceramic 33pF 50V +−5% CH		4133002
C418	Elect. 2.2μF 50V +−20%		4422500
C419	Elect. 220pF 6.3V +−20%		4422712
C420	Not Used		
C421	Elect. 100μF 4V +−20%		4410700
C423	Ceramic 0.001μF 50V +80% −20% F		4110215
	CONNECTORS		
C'	Connector Housing 11 Pin		1700050
D'	Connector Housing 4 Pin		1702050
G'	Connector Housing 6 Pin		1700040
H'	Connector Housing 4 Pin		1702050
	CRYSTALS		
X401	Crystal 4500kHz		1650030
X402	Crystal 32.768kHz		1650050
	DIODES		
D401	Diode KB162		1040140
D402 −403	Diode 1N4148		1040020
D404	Diode 1N4148 (26100K)		1040020
D405	Not Used		
D406	Not Used		
D407 −408	Diode 1N4148		1040020

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
	INTEGRATED CIRCUITS		
IC401	IC CX7961A-1, Frequency Synthesizer PLL Sony		1010401
IC402	LSI μPD7503G-701, One chip μ-Com NEC or μPD7503G-A65		1000011
	LAMP		
LP401	Lamp 3ø×6.35 50mA 8V		1680010
	LCD		
	LCD-803		1600020
	RESISTORS (All carbon film ⅛W, ±5% unless noted otherwise)		
R401 –402	560 ohm		6010533
R403	10 ohm		6010512
R404	2.2K ohm		6010540
R405	1.8K ohm		6010539
R406	1K ohm		6010536
R407	56K ohm		6010557
R408	4.7K ohm		6010544
R409	560 ohm (or 150Ω)		6010533
R410 –411	10K ohm		6010548
R412	220K ohm		6010564
R413	33K ohm		6010554
R414 –415	150K ohm		6010562
R416	6.8K ohm		6010546
R417	18K ohm		6010551
R418 –420	100K ohm		6010560
R421	3.9K ohm		6010543
R422	330K ohm		6010566
R423	1M ohm		6010572
R424 –426	47K ohm		6010556
R427	12K ohm		6010549
R428	100K ohm		6010560
R429	1M ohm		6010572
R430	4.7K ohm		6010544
R431	10 ohm		6010512
R432 –433	10K ohm		6010548
R434	22K ohm		6010552
R435 –436	10K ohm		6010548
R437	22K ohm		6010552
R438	27K ohm		6010553
R439 –442	470K ohm		6010568
R443 –445	5.6K ohm		6010545
R446	3.3K ohm		6010542
R447 –448	270K ohm (or 220KΩ)		6010565
R449	3.3K ohm		6010542
R450	330K ohm		6010566
R451	3.3K ohm		6010542
	SWITCH		
S401	Switch 1 Pole 2 Position, 9K/10K Switch		1630010

REF. NO.	DESCRIPTIONS	RS LOCATION NO.	MFR. PART NO.
	TRANSISTORS		
Q401	Transistor 2SC2603E		1020130
Q402	Transistor 2SK46B /2sk381B		1030041
	TRIMMERS		
VT401	Trimmer 10P		1210003
VT402	Trimmer 20P		1210020
	PVC WIRES		
W401 −402	PVC Wire 70(10+10)mm RED		8590062
W351	PVC Wire 240(5+10)mm BLACK		8150340
W352	PVC Wire 240(5+10)mm RED		8150342
	JUMP WIRES		
J401	Jump Wire 5mm 0.6ø		8000010
J402 −403	Jump Wire 7.5mm 0.6ø		8000030
J404 −406	Jump Wire 10mm 0.6ø		8000040
J407 −408	Jump Wire 25mm 0.6ø		8000140
	END OF PCB C		
	MULTIFORM WIRES		
A	3/Wires 110(10+10)mm		8610190
B	11/Wires 130(10+10)mm		8610210
C	11/Wires 55(10+5)mm		8610230
D'	CNT Wire Ass'y 803-K		1703110
E	4/Wires 120(10+10)mm		8610170
F	4/Wires 90(10+10)mm		8610180
G'-1	1/Shield Wire 207mm		8600020
G'-1&2	2/Wires 48(5+3)mm		8610020
G'-3&4&5&6	4/Wires 260(5+5)mm		8610070
H'	CNT Wire Ass'y 803-J		1703100
I	2/Shield Wires 250mm		8600010
J	4/Wires 80(10+5)mm		8610200
K	3/Wires 65(10+3)mm		8610220
L	8/Wires 170(5+5)mm		8610110
	SPEAKER		
	Speaker 4" 8 ohm 2W		1620080
	OTHERS		
	Cable Tie/100mm		8510000
on speaker	Jump Wire 20 (0) 0.6ø		8000060

TABLES OF ICS' and TRANSISTORS' VOLTAGE LIST

IC101

PIN NO	FM	AM	SSB/CW
1	0.09	1.75	1.75
2	0.71	0.04	0.04
3	0	0	0
4	1.45	0.07	0.07
5	1.85	0	0
6	2.96	0.02	0.02
7	2.48	0.02	0.02
8	1.85	0	0
9	0	0	0
10	0.01	0.75	0.75
11	0.06	2.96	2.96
12	0.06	2.96	2.96
13	0.31	0.31	0.31
14	0.01	0.71	0.71
15	0.09	2.18	2.18
16	0	0	0

IC102

PIN NO	FM	AM	SSB/CW
1	6.74	6.89	6.9
2	0	0	0
3	3.07	3.07	3.07
4	6.09	6.24	6.24

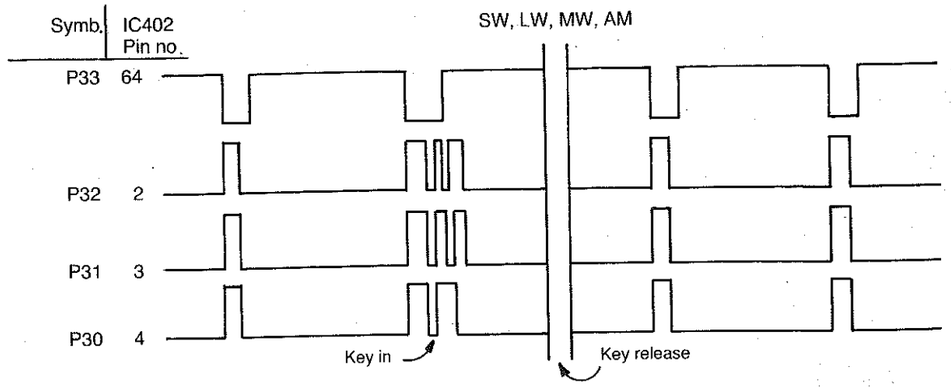
IC201

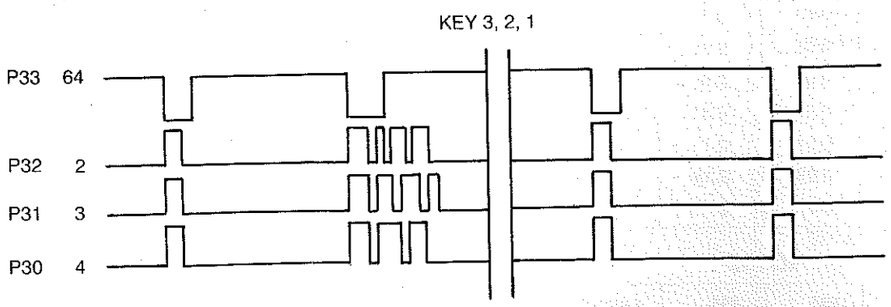
PIN NO	FM	AM	SSB/CW
1	5.96	0.01	0.01
2	2.36	0.01	0.02
3	1.7	0.01	0.01
4	1.76	0.01	0.01
5	1.76	0.01	0.05
6	5.37	5.54	5.52
7	0	0	0
8	0.49	0.01	0.01
9	0.06	0.03	0.04
10	1.36	0	0.04
11	1.36	0	0
12	1.02	0.01	0.01
13	1.36	0	0
14	1.36	0	0
15	1.36	0	0.01
16	0.82	0	0.01

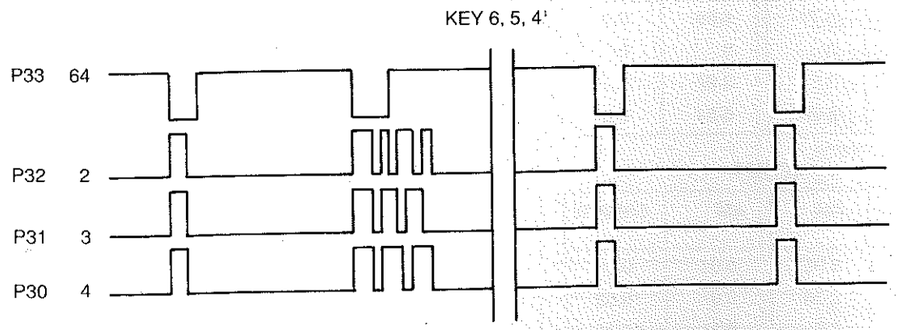
UNIT OF VOLTAGE: V

IC402

PIN NO	FM	AM	SSB/CW
1	NC	NC	NC
2 3 4	OUTPUT PORTS (APPENDIX FIGURE 4)		
5	2.9	2.9	2.9
6	0	0	0
7	2.9	2.9	2.9
8	2.9	2.9	2.9
9	2.9	2.9	2.9
10	2.9	2.9	2.9
11	2.9	2.9	2.9
12	0	2.9	2.9
13	0.1	0.1	0.1
14	2.9	0	0
15	2.9	2.9	2.9
16	0	150K-1620kHz: 2.9 1621K-29999kHz: 0	
17	0.1	0.1	0.1
18	2.9	2.9	2.9
19	2.9	2.9	2.9
20	1.5	1.5	1.5
21	1.5	1.5	1.5
22	0	0	0
23	0.15	0.15	0.15
24	1.1	1.1	1.1
25	2.0	2.0	2.0
26	2.9	2.9	2.9
27	NC	NC	NC
28 29 30	COM2 COM1 COM0		
31 ≀ 54	LCD SEGMENT		
55	0	0	0
56	0	0	0
57	1.5	1.5	1.5
58	2.9	2.9	2.9
59	1.5	1.5	1.5
60	2.8	2.8	2.8
61	2.8	2.8	2.8
62	2.8	2.8	2.8
63	2.8	2.8	2.8
64	OUTPUT PORTS (APPENDIX FIGURE 4)		


Symb.
IC402
Pin no.
SW, LW, MW, AM
P33 64
P32 2
P31 3
P30 4
Key in
Key release


KEY 3, 2, 1
P33 64
P32 2
P31 3
P30 4


KEY 6, 5, 4
P33 64
P32 2
P31 3
P30 4

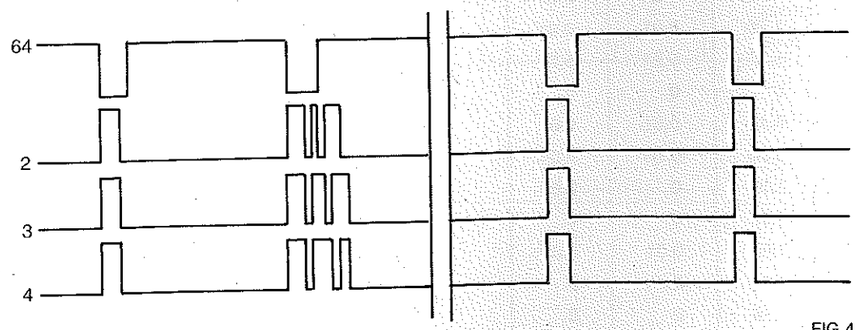
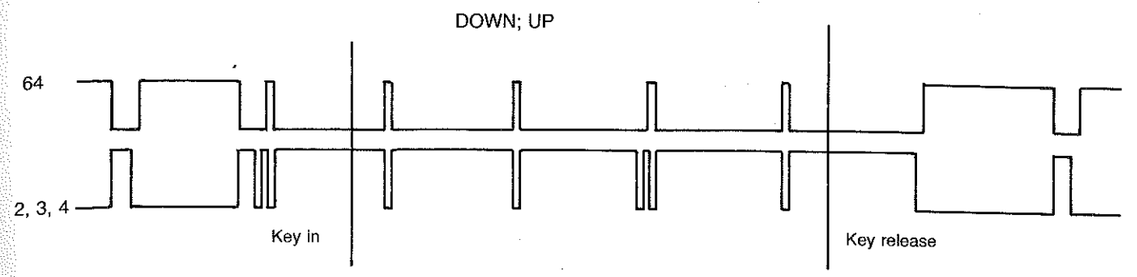
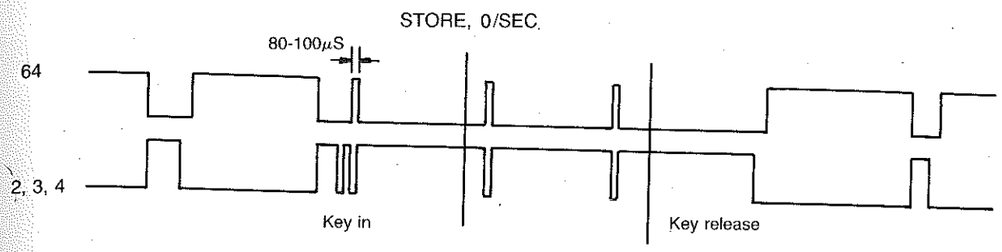
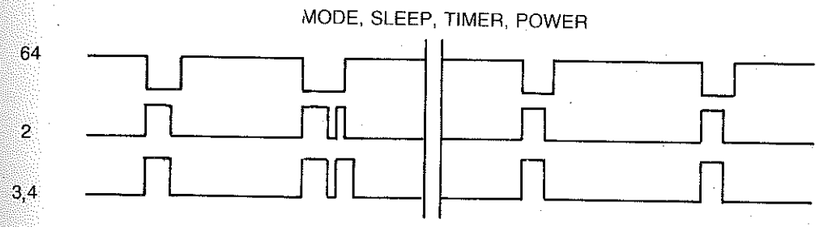

KEY 9, 8, 7
64
2
3
4

FIG. 4


DOWN; UP
64
2, 3, 4
Key in
Key release


STORE, 0/SEC.
80-100μS
64
2, 3, 4
Key in
Key release


MODE, SLEEP, TIMER, POWER
64
2
3,4

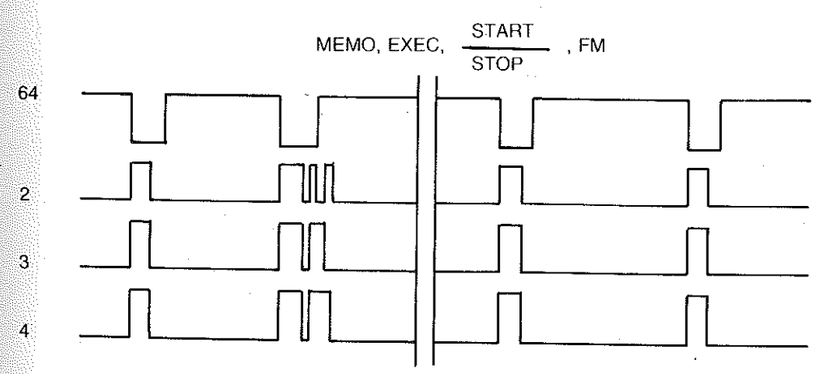

MEMO, EXEC, START/STOP, FM
64
2
3
4

FIG. 4

IC202

PIN NO	FM	AM	SSB/CW
1	5.33	5.33	5.332
2	5.26	5.26	5.26
3	5.25	5.25	5.25
4	5.24	5.24	5.24
5	0	0	0
6	5.24	5.24	5.24
7	1.43	1.43	1.43
8	1.44	1.44	1.44
9	6.67	6.67	6.67

IC203

PIN NO	FM	AM	SSB/CW
1	1.24	1.24	1.24
2	0.71	0.71	0.71
3	2.63	2.64	2.64
4	6.53	6.53	6.53
5	0	0	0
6	2.56	2.57	2.57
7	0.71	0.71	0.71
8	1.24	1.24	1.24

UNIT OF VOLTAGE: V

IC401

PIN NO	FM	AM	SSB/CW
1	-1.53	-1.55	-1.53
2	0.01	0.01	0.01
3	0.01	0.01	0.01
4	3.04	3.04	3.04
5	1.27	1.27	1.27
6	1.31	1.32	1.31
7	1.09	1.09	1.09
8	0.01	0	0
9	0.01	2.31	2.31
10	0	0	0
11	1.61	1.62	1.62
12	2.95	2.96	2.95
13	0	0	0
14	0	0	0

Transistors

		FM	AM	SSB/CW
Q101	G	0.01	0.01	0.01
	D	5.0	0.01	0.01
	S	0	0	0
Q102	B	0.7	0.7	0.7
	C	2.08	2.08	2.08
	E	0	0	0
Q103	B	0.92	0.64	0.64
	C	1.60	0.02	0.02
	E	0.23	0	0
Q104	B	0.66	0.66	0.66
	C	0.01	0.01	0.01
	E	0	0	0
Q105	B	0.49	0.50	0.49
	C	0.66	0.66	0.66
	E	0	0	0
Q106	B	2.00	2.00	2.01
	C	0.57	0.58	0.57
	E	2.58	2.58	2.58
Q107	B	1.96	1.96	1.97
	C	2.07	2.05	2.05
	E	2.58	2.58	2.58
Q108	B	0.05	0.51	0.5
	C	0.06	1.31	1.31
	E	0	0	0
Q109	B	0.05	0.72	0.72
	C	0.06	1.86	1.86
	E	0	0.012	0.012
Q110	G	0.04	1.04	0.11
	D	0.04	4.84	0.11
	S	0.04	0.87	0.11
Q111	B	0.01	5.18	0.34
	C	0	5.75	0.01
	E	0.01	5.84	0.38
Q112	B	0.07	5.35	5.26
	C	0.1	0.12	5.87
	E	0.01	5.92	5.93
Q113	B	0.07	5.26	5.82
	C	0.06	5.84	0.38
	E	0.01	5.92	5.93

		FM	AM	SSB/CW
Q114	B	0.01	5.75	5.32
	C	0	0	5.88
	E	0.01	5.92	5.94
Q115	G	0.04	0.11	0.11
	D	0.10	0.11	5.51
	S	0.09	0.11	1.06
Q116	B	0.62	0.68	0.68
	C	0.04	0.11	0.11
	E	0	0	0
Q117	G	0.03	0.08	0.07
	D	4.94	5.15	5.16
	S	1.18	1.15	1.15
Q118	G	0.03	0.08	0.07
	D	4.94	5.15	5.16
	S	1.18	1.15	1.15
Q119	B	0.06	0.68	0.68
	C	0.06	1.36	1.36
	E	0	0.01	0.01
Q120	G	0.01	0.01	0.01
	D	0.01	6.20	6.21
	S	0.01	1.04	1.04
Q121	B	0.64	0.91	0.91
	C	0.06	2.57	2.57
	E	0.05	0.32	0.32
Q122	B	3.69	2.37	2.37
	C	0.06	2.96	2.96
	E	3.07	3.07	3.07
Q123	B	6.29	6.32	6.34
	C	0.01	6.95	6.97
	E	6.86	7.01	7.03
Q124	B	0.01	6.32	6.33
	C	0	6.94	6.95
	E	0.01	6.95	6.97
Q125	B	2.37	3.30	3.32
	C	2.97	0.02	0.02
	E	3.07	3.07	3.07
Q126	B	6.15	6.45	6.46
	C	6.76	0.01	0.01
	E	6.86	7.01	7.03

NOTE: B—BASE , C—COLLECTOR , E—EMITTER; G—GATE,D—DRAIN,S—SOURCE
UNIT of VOLTAGE: V

Transistors

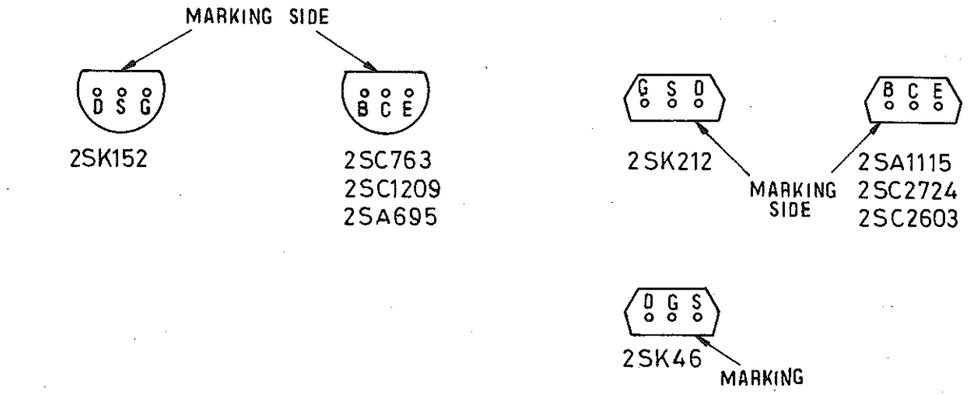
		FM	AM	SSB/CW
Q127	B	0.75	0.75	0.75
	C	2.14	2.14	2.14
	E	0	0	0
Q128	B	1.42	1.43	1.43
	C	1.73	1.78	1.78
	E	0.76	0.74	0.74
Q129	B	0.75	0.75	0.75
	C	2.59	2.58	2.58
	E	0	0	0
Q130	G	(5.17)	(1.74)	(1.95)
	D	13.49	2.53	13.56
	S	(5.4)	(1.96)	(2.19)
Q201	B	0.03	0.62	0.63
	C	0.03	0.09	0.09
	E	0	0	0
Q202	B	0	0.01	0.01
	C	0.01	6.43	6.44
	E	0	0	0
Q203	B	0	0.69	0.69
	C	8.71	0.15	0.15
	E	0	0	0
Q204	B	0.55	0.59	0.01
	C	0.01	0.06	5.84
	E	0	0	0
Q205	B	2.43	2.43	2.44
	C	3.04	3.05	3.06
	E	3.04	3.05	3.06
Q206	B	5.23	5.27	5.28
	C	3.04	3.05	3.06
	E	0	0	0
Q207	B	2.46	2.46	2.48
	C	3.04	3.05	3.06
	E	2.96	2.96	2.97
Q208	B	3.63	3.63	3.64
	C	7.24	7.3	7.31
	E	3.04	3.05	3.06
Q209	B	2.99	2.74	2.77
	C	0	0	0
	E	3.63	3.63	3.64

		FM	AM	SSB/CW
Q210	B	0.66	0.67	0.67
	C	0.01	0.02	0.02
	E	0	0	0
Q301	B	0.61	0	0.61
	C	(-2.07)	0	(-2.28)
	E	0	0	0
Q302	B	(-2.07)	0	(-2.28)
	C	7.89	0.88	7.86
	E	0	0	0
Q303	B	0.01	0.63	0.28
	C	14.09	0.03	14.09
	E	0	0	0
Q304	B	0.01	0.63	0.28
	C	8.59	1.57	8.59
	E	0	0	0
Q305	B	7.27	7.38	7.37
	C	7.93	8.04	8.04
	E	8.00	8.11	8.10
Q306	B	7.58	7.73	7.72
	C	7.93	8.04	8.04
	E	6.88	7.05	7.03
Q307	B	8.21	8.21	8.21
	C	8.92	8.93	8.92
	E	8.94	8.95	8.94
Q308	B	8.59	1.57	8.59
	C	8.92	8.93	8.92
	E	7.91	0.93	7.92
Q309	B	1.45	0.93	3.21
	C	0	0	0
	E	0	0	0
Q310	B	1.45	0.93	3.21
	C	0	0	0
	E	0	0	0
Q401	B	0.51	0.51	0.51
	C	(5.17)	(1.74)	(1.95)
	E	0	0	0
Q402	G	1.09	1.09	0.02
	D	2.7	2.7	2.99
	S	1.25	1.25	1.25

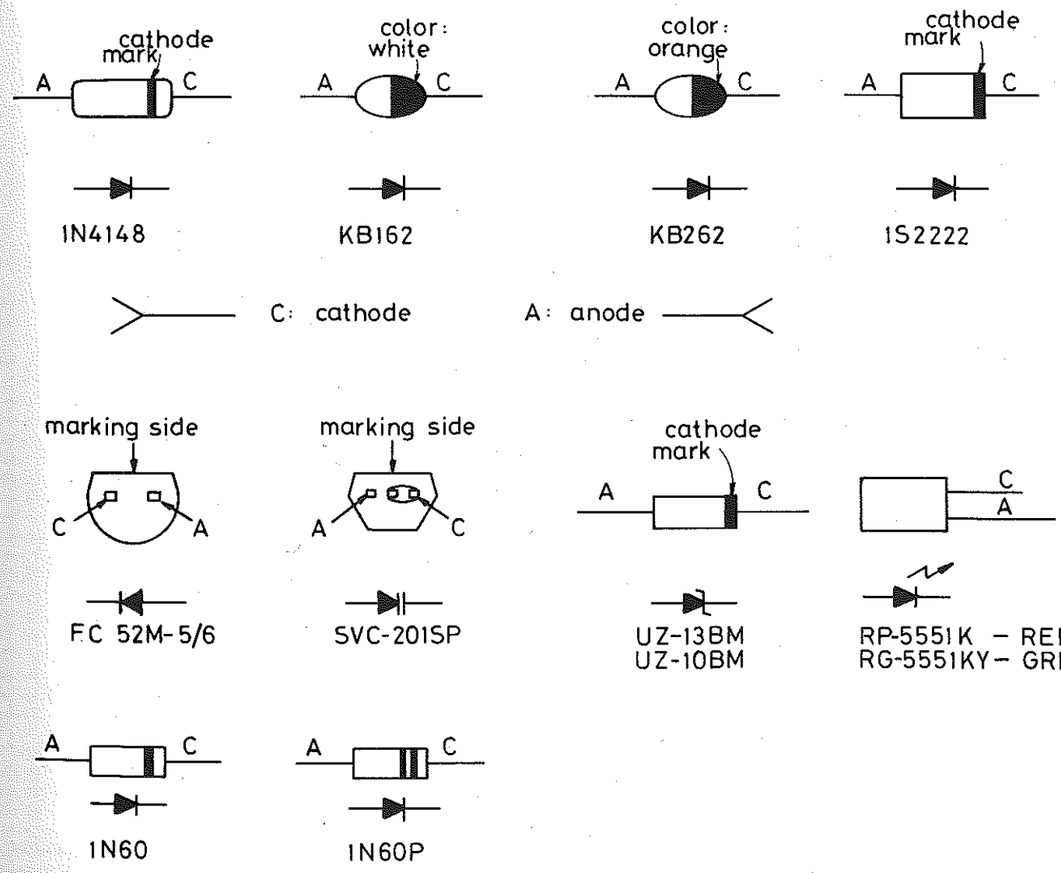
NOTE: B — BASE, C — COLLECTOR, E — EMITTER; G — GATE, D — DRAIN, S — SOURCE
UNIT of VOLTAGE: V

SEMICONDUCTOR LEAD IDENTIFICATIONS

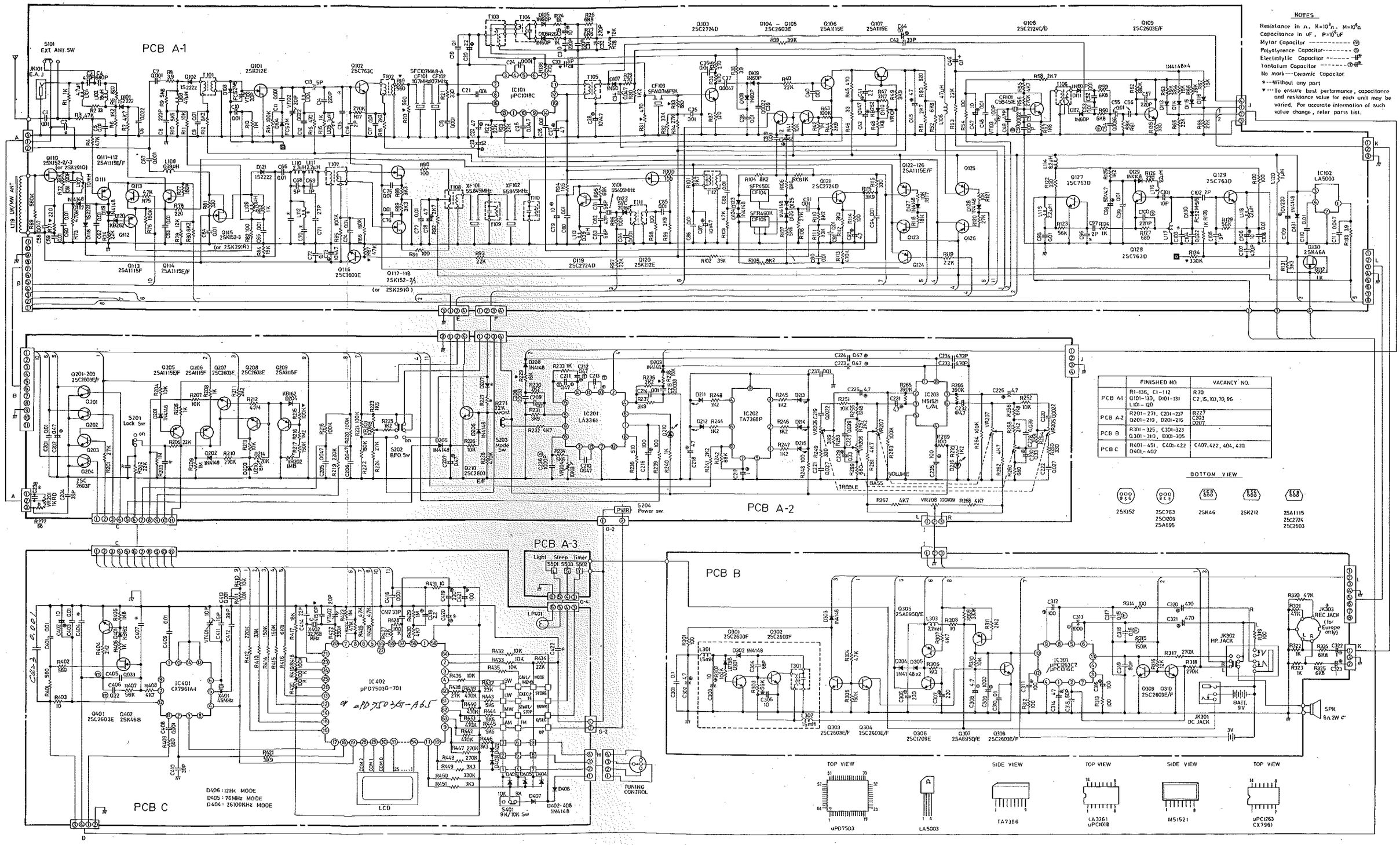
Transistors



Diodes



SCHEMATIC DIAGRAM



	FINISHED NO.	VACANCY NO.
PCB A-1	R1-136, C1-112 Q101-130, D101-131 L101-120	R70 C2,15,103,70,96
PCB A-2	R201-271, C201-237 Q201-210, D201-216	R227 C203 D207
PCB B	R301-325, C301-323 Q301-309, D301-305	
PCB C	R401-451, C401-422 Q401-402	C407,422, 404, 420