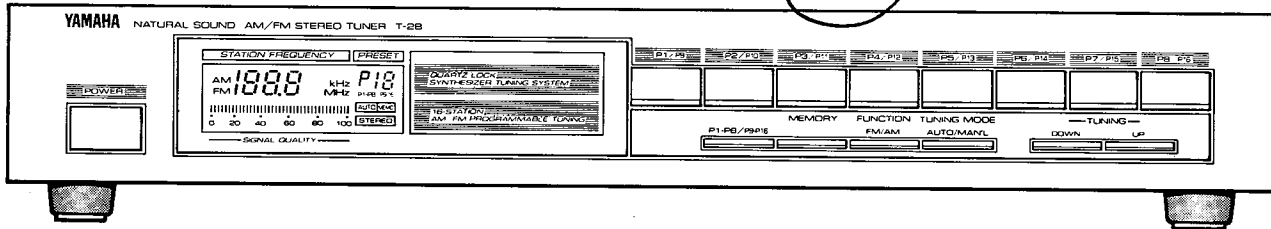


642

AM/FM STEREO TUNER T-28

T-28

SERVICE MANUAL



IMPORTANT NOTICE

This manual has been provided for the use of authorized Yamaha Retailers and their service personnel. It has been assumed that basic service procedures inherent to the industry, and more specifically Yamaha Products, are already known and understood by the users, and have therefore not been restated.

WARNING: Failure to follow appropriate service and safety procedures when servicing this product may result in personal injury, destruction of expensive components and failure of the product to perform as specified. For these reasons, we advise all Yamaha product owners that all service required should be performed by an authorized Yamaha Retailer or the appointed service representative.

IMPORTANT: The presentation or sale of this manual to any individual or firm does not constitute authorization, certification, recognition of any applicable technical capabilities, or establish a principle-agent relationship of any form.

The data provided is believed to be accurate and applicable to the unit(s) indicated on the cover. The research, engineering, and service departments of Yamaha are continually striving to improve Yamaha products. Modifications are, therefore, inevitable and changes in specification are subject to change without notice or obligation to retrofit. Should any discrepancy appear to exist, please contact the distributor's Service Division.

WARNING: Static discharges can destroy expensive components. Discharge any static electricity your body may have accumulated by grounding yourself to the ground buss in the unit (heavy gauge black wires connect to this buss).

IMPORTANT: Turn the unit OFF during disassembly and parts replacement. Recheck all work before you apply power to the unit.

CONTENTS

TO SERVICE PERSONNEL	1	IC BLOCK/CIRCUIT DATA	9 ~ 11
SPECIFICATIONS	1	PRINTED CIRCUIT BOARD	12 ~ 14
REAR PANELS	2	WIRING	14
INTERNAL VIEW	3	BLOCK DIAGRAM	15
DISASSEMBLY PROCEDURES	3	SCHEMATIC DIAGRAM	16
ADJUSTMENT	4 ~ 7	PARTS LIST	17 ~ 22
μ-COM DATA	8		

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SINCE 1887



YAMAHA

NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN

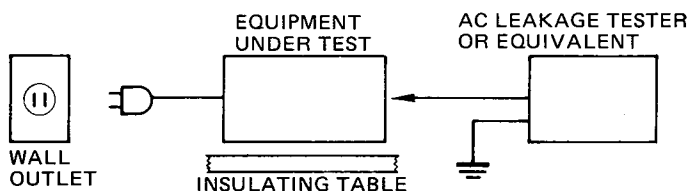
2.6K-933 Printed in Japan. '86.2

■ TO SERVICE PERSONNEL

1. Critical Components Information.
Components having special characteristics are marked Δ and must be replaced with parts having specifications equal to those originally installed.
2. Leakage Current Measurement (For 120V Model Only).
When service has been completed, it is imperative that you verify that all exposed conductive surfaces are properly insulated from supply circuits.
 - Meter impedance should be equivalent to 1500 ohm shunted by 0.15 μ F.
 - Leakage current must not exceed 0.5mA.
 - Be sure to test for leakage with the AC plug in both polarities.

● POLARIZATION

This tuner product is equipped with a polarized alternating-current line plug (a plug having one blade wider than the other). This plug will fit into the power outlet only one way. This is a safety feature.



■ SPECIFICATIONS

■ FM SECTION

Tuning Range	87.5 to 108.0MHz (G)(A)(B) 87.5 to 107.9MHz (U)(C) 87.5 to 108.0MHz or 87.5 to 107.9MHz (R)
50dB Quieting Sensitivity	
Mono, 75 Ω	1.6 μ V (15.3dBf)
Stereo, 75 Ω	21 μ V (37.7dBf)
Usable Sensitivity	
30dB S/N Quieting 75 Ω	0.8 μ V (9.3dBf) (U)(C)(A)(B)(R)
Usable Sensitivity (DIN)	
Mono (S/N 26dB), 75 Ω	1.4 μ V (G)
Stereo (S/N 46dB), 75 Ω	30 μ V (G)
Image Response Ratio	40dB (U)(C)(A)(B)(R) 75dB (G)
IF Response Ratio	90dB (U)(C)(A)(B)(R) 75dB (G)
Spurious Response Ratio	70dB
AM Suppression Ratio	55dB
Capture Ratio	1.5dB
Alternate Channel Selectivity	85dB (U)(C)(A)(B)(R)
Selectivity (two Signals)	
40kHz DEV. \pm 300kHz	70dB (G)
Signal to Noise Ratio	
Mono	82dB (U)(C)(A)(B)(R)
Stereo	76dB (U)(C)(A)(B)(R)
Signal to Noise Ratio (DIN-Weighted)	
40kHz DEV. Mono	75dB (G)
Stereo	70dB (G)
Harmonic Distortion	
Mono	1kHz 0.1%
Stereo	1kHz 0.2%
G model (40kHz DEV.)	
Mono	1kHz 0.1%
Stereo	1kHz 0.2%
Stereo Separation	1kHz 40dB
Frequency Response	
30Hz to 13kHz	0 \pm 0.5dB (G)
30Hz to 15kHz	0 \pm 0.5dB (U)(C)(A)(B)(R)

■ AM SECTION

Tuning Range	530 to 1610kHz (U)(C) 531 to 1611kHz (A)(B)(G) 530 to 1610kHz or 531 to 1611kHz (R)
Usable Sensitivity	300 μ V/m
Selectivity	24dB
Signal to Noise Ratio	50dB
Image Response Ratio	40dB
Spurious Response Ratio	50dB
Harmonic Distortion 400Hz	0.3%

■ AUDIO SECTION

Output Level/Impedance	
FM 100% MOD 1kHz	500mV/2.2k Ω (U)(C)(A)(B)(R)
FM 40kHz DEV. 1kHz	400mV/3.3k Ω (G)
AM 30% MOD 400Hz	150mV/2.2k Ω (U)(C)(A)(B)(R)
AM 30% MOD 400Hz	150mV/3.3k Ω (G)

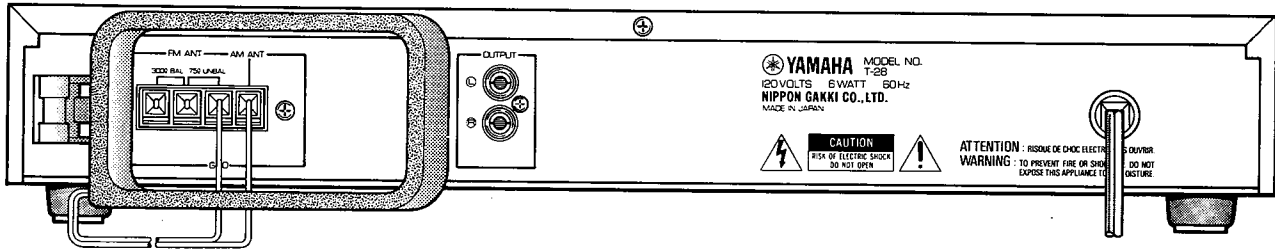
■ GENERAL

Power Supply	
U.S. & Canadian models	120V AC, 60Hz
European model	220V AC, 50Hz
British & Australian models	240V AC, 50Hz
Other model	110 – 130V AC/220 – 240V AC, 50/60Hz
Power Consumption	7W (A)(G)(B) 6W (U)(C)(R)
Dimensions (W x H x D)	435 x 72.5 x 236.5 mm (17-1/8 x 2-7/8 x 9-1/4")
Weight	2.3 kg (5 lbs. 1 oz)

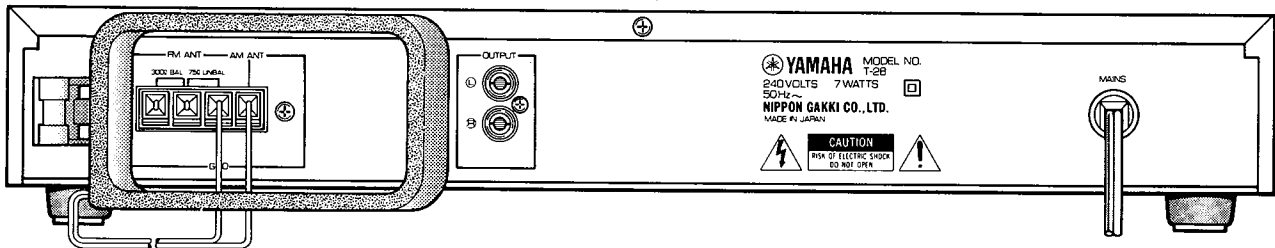
(U) U.S.A. model (G) European model
(C) Canadian model (B) British model
(A) Australian model (R) Other model
Specifications subject to change without notice.

REAR PANELS

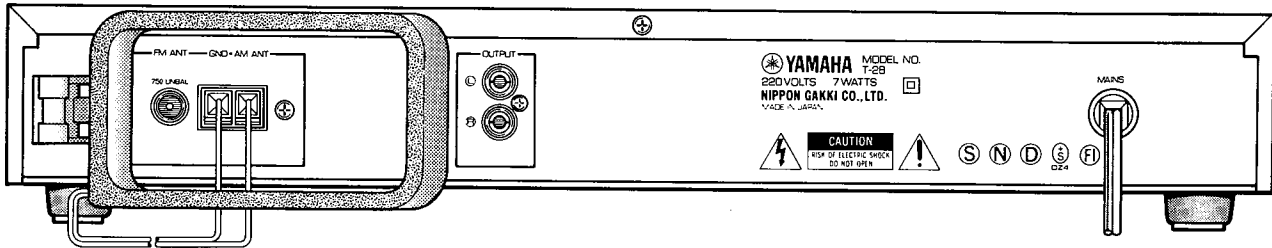
U.S.A. & Canadian models



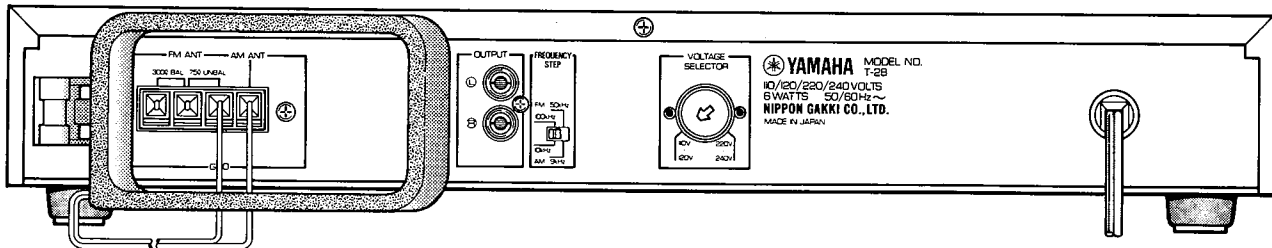
British & Australian models



European model

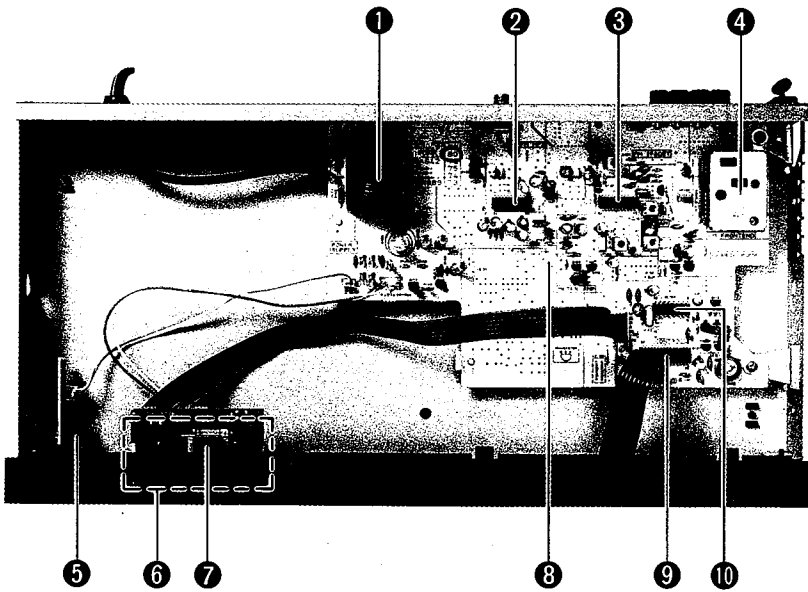


Other model



T-28

INTERNAL VIEW



- ① POWER TRANSFORMER
U, C models: GA693100
R, A, G, B models: GA693200
- ② MPX IC: LA3401
- ③ IF IC: LA1265
- ④ FRONT END PACK
- ⑤ POWER SWITCH
- ⑥ DISPLAY UNIT
- ⑦ LCD DRIVER: LC7580
- ⑧ TUNER CIRCUIT BOARD (1)
- ⑨ 4 BIT CPU: LC6523C-779
- ⑩ PLL IC: LM7001

DISASSEMBLY PROCEDURES

1. Removal of Top Cover

Remove 5 screws (①) in Fig. 1, and slide the Top Cover back.

2. Removal of Front Panel

Remove 4 screws (②) and 3 hooks in Fig. 1, and pull the Front Panel forward.

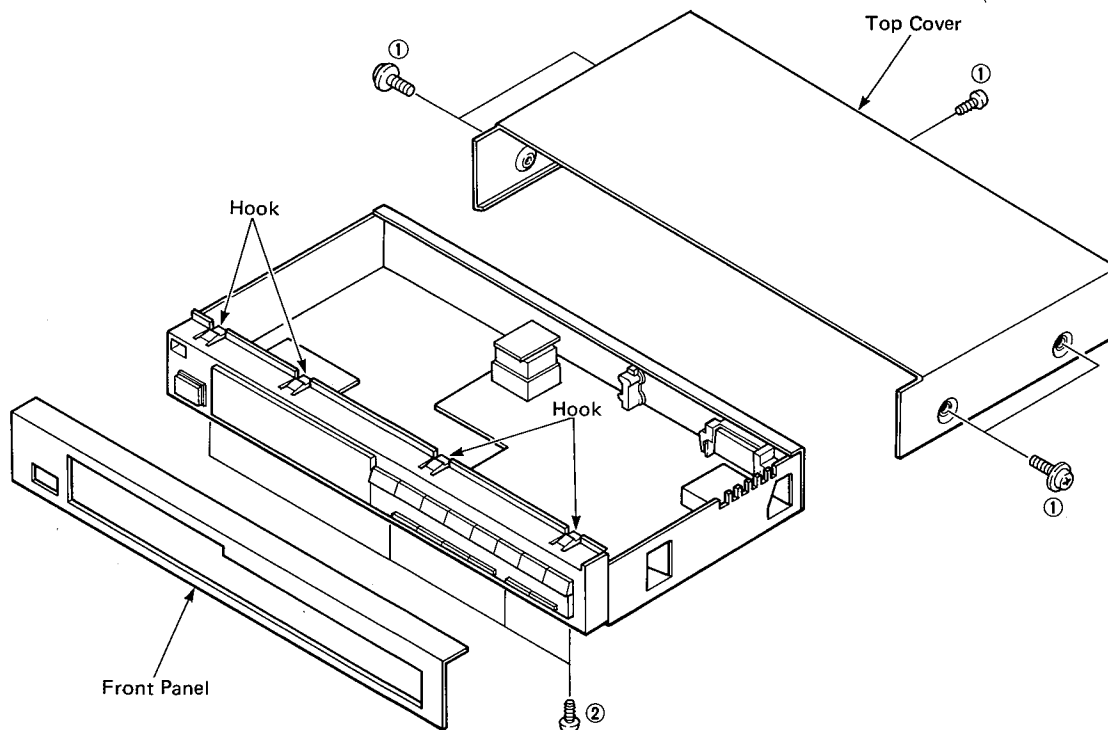


Fig. 1

ADJUSTMENTS

1. Before adjustment

- 1) After the power switch is pushed on, wait for 5 minutes before measuring, to be sure of the most stable operation.
- 2) Adjust the OSC coil and IFT with a nonferrous screw driver.
- 3) Set the switches to the following positions.
TUNING MODE AUTO
- 4) Proceed with the AM section adjustments after having finished the FM section adjustment.
- 5) $0dB\mu = 1\mu V$ Ex: $60dB\mu = 1mV$

2. Measuring instruments abbreviation

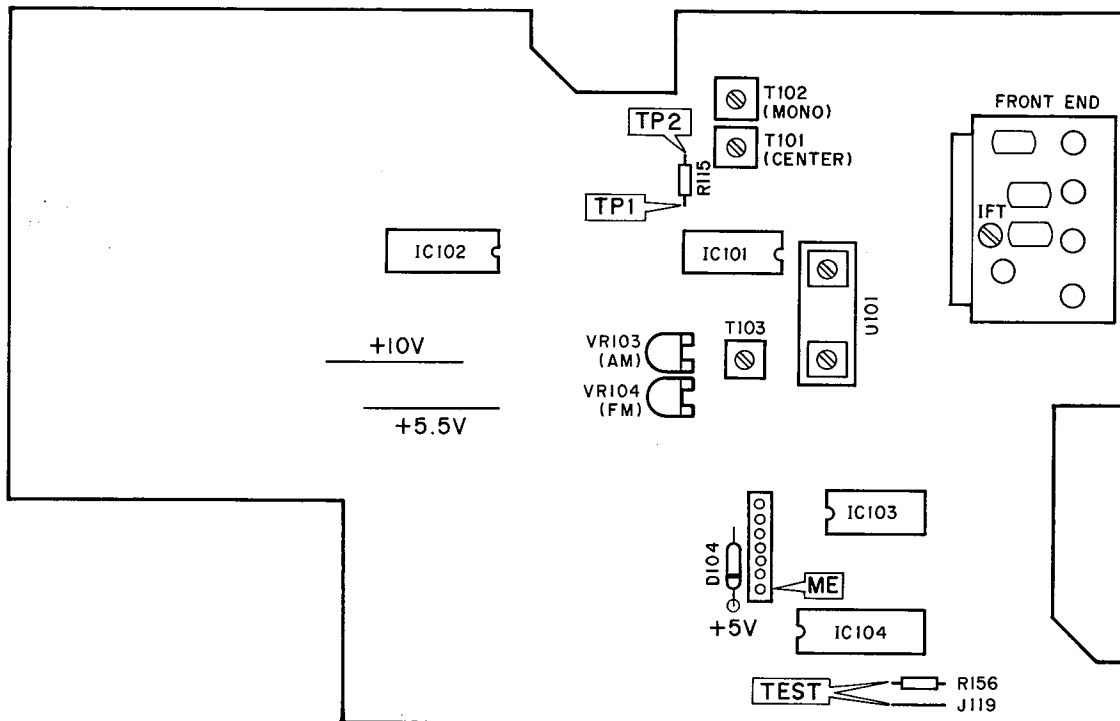
- FM SG : FM signal generator
- SSG : Stereo signal generator
- AM SG : AM signal generator
- DIST. M : Distortion meter
- FC : Frequency counter
- A C V M : AC voltmeter
- D C V M : DC voltmeter

< POWER SUPPLY CHECK >

Check that the following voltages are obtained respectively across each test point and ground on tuner circuit.

Test Point	Rating or standard	Remark								
+10V	$+10V \pm 0.5V$	Make sure that AC line voltage comes within <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Models</th> <th>AC line voltage</th> </tr> </thead> <tbody> <tr> <td>U, C</td> <td>$120V \pm 10\%$</td> </tr> <tr> <td>G</td> <td>$220V \pm 10\%$</td> </tr> <tr> <td>A, B</td> <td>$240V \pm 10\%$</td> </tr> </tbody> </table>	Models	AC line voltage	U, C	$120V \pm 10\%$	G	$220V \pm 10\%$	A, B	$240V \pm 10\%$
Models	AC line voltage									
U, C	$120V \pm 10\%$									
G	$220V \pm 10\%$									
A, B	$240V \pm 10\%$									
+5.5V	$+5.5V \pm 0.5V$									
+5V	$+5V \pm 0.25V$									

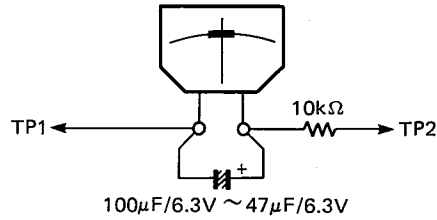
• TEST POINTS



< FM TUNER SECTION >

- Use 19kHz L.P.F. to measure the output.
- On step 1 and 8 connect the auxiliary center meter (ji00036 or similar) to confirm the best tuned point.
- 100% modulation means that the Frequency Deviation is 75kHz.

Auxiliary Center Meter



- Shorting TEST (R156 and J119 Before Fig. TEST POINT) while set at FM will result in automatic memory of each preset from P1/P9 to P9/P16 as given in the right table. This is convenient when making an adjustment.

P1/P9	P2/P10	P3/P11	P4/P12	P5/P13
AM 630kHz	AM 1080kHz	AM 1440kHz	FM 87.5MHz	FM 95.1MHz

P6/P14	P7/P15	P8/P16
FM 98.1MHz	FM 101.5MHz	FM 108.0MHz (A, B, G, R) FM 107.9MHz (U, C)

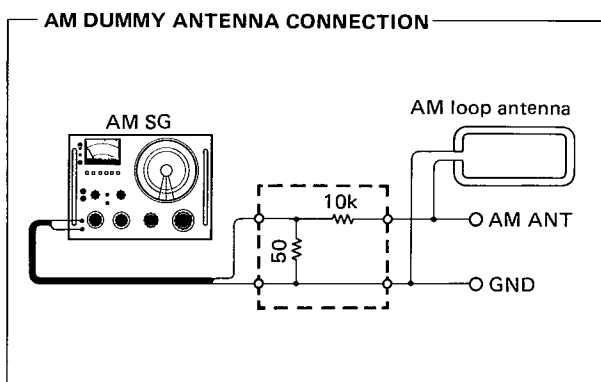
Step	Item to be Adjusted	Connection terminal	Instrument required	Adjustment locations	Adjustment method	Rating or standard	Remarks
1	Discriminator balance	75Ω FM ANT	FM SG [98.1MHz ± 1kHz 70dBμ (81.2dBf, 3.16mV/75Ω) MONO 1kHz 100% MOD	T101 (CENTER)	Adjust so that the pointer of the auxiliary center meter points to 0 when tuned to signal of FM SG.	0V ≤ ±50mV (DCVM)	
		TP1 ~ TP2	Auxiliary center meter or DCVM				
2	Monaural distortion	75Ω FM ANT	FM SG [98.1MHz ± 1kHz 70dBμ (81.2dBf, 3.16mV/75Ω) MONO 100Hz 100% MOD	T102 (MONO)	Reduce distortion to minimum.		
		OUTPUT L, R	DIST. M L.P.F.				
3	Stereo distortion	75Ω FM ANT	FM SG, SSG [98.1MHz ± 1kHz 70dBμ (81.2dBf, 3.16mV/75Ω) STEREO L, R 1kHz, 100% MOD]	IFT in Front-end	Same as step 2	Less than -33dB	Confirm that stereo indicator lights up.
		OUTPUT L, R	DIST. M L.P.F.				
4	Confirmation of monaural distortion	75Ω FM ANT	FM SG [98.1MHz ± 1kHz 70dBμ (81.2dBf, 3.16mV/75Ω) MONO 1kHz 100% MOD			Less than -41dB	
		OUTPUT L, R	DIST. M L.P.F.				
5	Confirmation of sensitivity	75Ω FM ANT	FM SG [98.1MHz ± 1kHz 70dBμ (81.2dBf, 3.16mV/75Ω) MONO 1kHz 100% MOD		Lower FM SG output level so that S/N becomes 30dB	Less than 4dBμ (15.2 dBf, 1.58μV/ 75Ω)	
		OUTPUT L, R	ACVM L.P.F.				
6	Confirmation of separation	75Ω FM ANT	FM SG SSG [98.1MHz ± 1kHz 70dBμ (81.2dBf, 3.16mV/75Ω) STEREO L, R 1kHz 100% MOD]			Less than 28dB	
		OUTPUT L, R	ACVM L.P.F.				

Step	Item to be Adjusted	Connection terminal	Instrument required	Adjustment locations	Adjustment method	Rating or standard	Remarks
7	Confirmation of discriminator balance	75Ω FM ANT	FM SG 98.1MHz ± 1kHz 70dBμ (81.2dBf, 3.16mV/75Ω) MONO 1kHz 100% MOD		Confirm that the auxiliary center meter deflects to 0 when tuned to signal of FM SG.	0V ≤ ±50mV (DCVM)	
		TP1 ~ TP2	Auxiliary center meter or DCVM				
8	Full-scale signal quality level	75Ω FM ANT	FM SG, SSG 98.1MHz ± 1kHz 70dBμ (81.2dBf, 3.16mV/75Ω) STEREO L, R 1kHz, 100% MOD	VR104 (FM)	2.6V ± 0.1V		Confirm that all signal quality indicators goes out at detuned point.
		75Ω ME ~ GND	DCVM				
9	Confirmation of auto search reception	300Ω FM ANT	FM SG 98.1MHz ± 1kHz 26dBμ (37.3dBf, 20μV/75Ω) MONO 1kHz 100% MOD			Confirm that auto search reception is possible with the tuning key.	Confirm that muting is performed at auto reception.

Note: X dBμ = x +5.2dBμf

< AM TUNER SECTION >

- Connect the AM loop antenna to the AM ANT terminals.
- Connect the AM dummy antenna for adjustment.



Step	Item to be Adjusted	Connection terminal	Instrument required	Adjustment locations	Adjustment method	Rating or standard
1	AM IFT	AM ANT	AM SG AM dummy antenna 630kHz ± 0.1kHz 50dBμ (61.2dBf, 316μV/75Ω) 400Hz, 30% MOD	T103	Adjust T103 to maximize detector output.	
		OUTPUT	ACVM			
2	Confirmation of sensitivity	AM ANT	AM SG AM dummy antenna 630kHz ± 0.1kHz 1080kHz ± 0.1kHz 1440kHz ± 0.1kHz 400Hz, 30% MOD		Obtain AM SG output level where distortion become 10%.	Less than 60dBμ (71.2dBf, 1mV/75Ω)
		OUTPUT	DIST. M.			
3	Full-scale signal quality level	AM ANT	AM SG. AM dummy antenna 1080kHz ± 0.1kHz 80dBμ (91.2dBf, 10mV/75Ω) 400Hz, 30% MOD	VR103 (AM)	2.6V ± 0.1V	Confirm that all signal quality indicators goes out at detuned point.
		ME ~ GND	DCVM			
4	Confirmation of auto search reception	AM ANT	AM SG AM dummy antenna 1080kHz ± 0.1kHz 65dBμ (76.3dBf, 1.78mV/75Ω) 400Hz, 30% MOD		Confirm the auto search reception with the tuning key	Confirm that muting is performed at auto reception.

< DIGITAL CONTROL SECTION >

Step	Confirmation item	Connection terminal	Instrument required	Operation key	Confirmation method
1	Preset memory	75Ω FM ANT	FM SG, SSG [98.1MHz ± 1kHz 70dBμ (81.2dBf, 3.16mV/75Ω) STEREO, L, R 1kHz, 100% MOD]	FUNCTION key TUNING MODE key TUNING key (UP or DOWN) MEMORY key PRESET STATION key	① Receive FM 98.1MHz by means of auto search. ② Set P1-P8 → P1-P8 indicator lights. ③ Press MEMORY key → MEMORY indicator flashes about 5 seconds. ④ Press P1 → MEMORY indicator goes OFF P1 of PRESET STATION indicator lights.
		AM ANT	AM SG AM dummy antenna [1080kHz ± 0.1kHz 80dBμ (91.2dBf, 10mV/75Ω) 400Hz, 30% MOD]	P1-P8/P9-P16	⑤ Receive AM 1080kHz ⑥ Press MEMORY key → MEMORY indicator flashes about 5 seconds. ⑦ Press P2 → MEMORY indicator goes OFF P2 of PRESET STATION indicator lights.
		75Ω FM ANT AM ANT	FM SG, SSG AM SG AM dummy antenna		⑧ Press P1 and P2 and check that content is read out. → P1 and P2 of PRESET STATION indicator lights. ⑨ Set P9-P16 → P9-P16 indicator flashes. ⑩ Press MEMORY key → MEMORY indicator flashes. ⑪ Press P9 → MEMORY indicator goes OFF. P9-P16 indicator lights. P9 indicator lights. ⑬ Press P9 and check that content is read out.
2	Tuning mode	Same as step 1	Same as step 1	FUNCTION key TUNING MODE key TUNING key (UP or DOWN) PRESET STATION key P1, P2	Tune to FM 98.1MHz and AM 1080kHz, and check that when receiving MAN'L/MONO, FM reception become forced mono AUTO indicator → Goes out STEREO indicator → Goes out
3	Last channel memory			POWER key	① Read out P1. ② Turn OFF POWER key. ③ Turn ON POWER key after 5 seconds. ④ P1 content should come on. P1 of PRESET STATION indicator lights.

μ-COM DATA

● IC104: LC6523C-779

1-chip type 4-bit microcomputer which incorporates 2048 x 8 bit ROM (for programming) and 128 x 4 bit RAM (for data memory)

Terminal No.	Discription	I/O	Function
1	PE ₃	OUT	Muting out. MUTE ON → "H"
2	VDD	IN	+5V
3	PF ₀ /SI	OUT	Key scan out. D1 D2 (Refer to table 1) D3 D4
4	PF ₁ /SO		
5	PF ₂ /SCK		
6	PF ₃ /INT		
7	PG ₀	IN	Key scan input. K1 K2 (Refer to table 1) K3 K4
8	PG ₁		
9	PG ₂		
10	PG ₃		
11	PA ₀	IN	Control signal input. REM0 REM1 (Refer to table 2)
12	PA ₁		
13	PA ₂	IN	Detection input for power down "L" → Back up mode
14	PA ₃	IN	TEST terminal ("H" in normal condition) TEST terminal is "L" while set will result in automatic memory of specific frequency.
15	OSC ₂	OUT	Terminal for clock oscillating circuit.
16	OSC ₁	IN	
17	TEST	IN	Gnd
18	V _{ss}	IN	Gnd
19	RES	IN	Reset input. "L" in reset mode.
20	PC ₀	OUT	Control data output. (LM7001, LC7580)
21	PC ₁	OUT	Forwarding clock of data.
22	PC ₂	OUT	Forwarding select of data. LM7001 ACTIVE → "H" LC7580 ACTIVE → "H"
23	PC ₃		
24	PD ₀	IN	Destination symbol.
25	PD ₁		
26	PD ₂		
27	PD ₃	OUT	Muting output for display.
28	PE ₀	IN	Prohibit search stop. "L" in stop mode.
29	PE ₁	IN	Destination MONO/STEREO. "L" in stereo mode.
30	PE ₂	OUT	Compulsion mono mode control. Compulsion mono → "H"

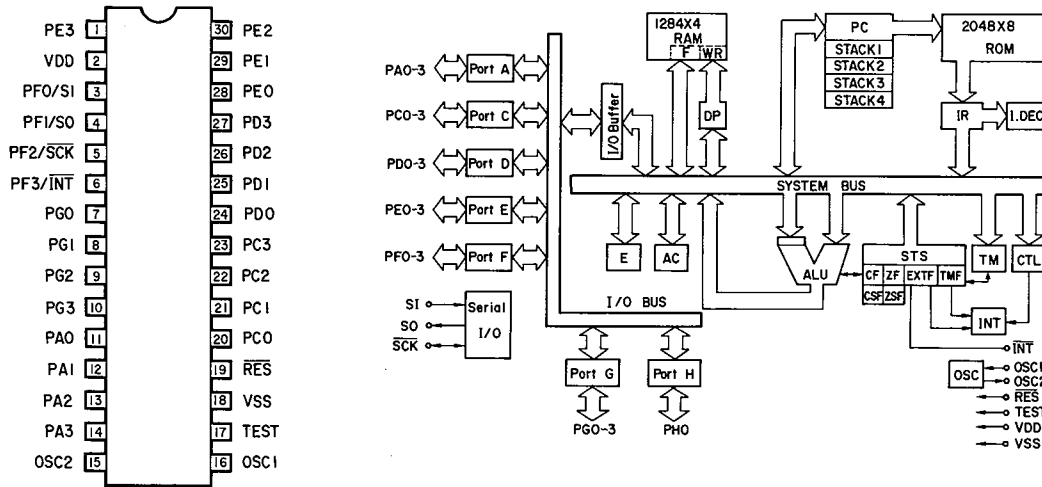
● KEY MATRIX

OUTPUT INPUT	D1 (Pin 3)	D2 (Pin 4)	D3 (Pin 5)	D4 (Pin 6)
K1 (Pin 7)	FM/AM (SW101)	UP (SW103)	P1/P9 (SW107)	P5/P13 (SW111)
K2 (Pin 8)	AUTO/MAN'L (SW102)	DOWN (SW104)	P2/P10 (SW108)	P6/P14 (SW112)
K3 (Pin 9)		P1-8/P9-16 (SW105)	P3/P11 (SW109)	P7/P15 (SW113)
K4 (Pin 10)		MEMORY (SW106)	P4/P12 (SW110)	P8/P16 (SW114)

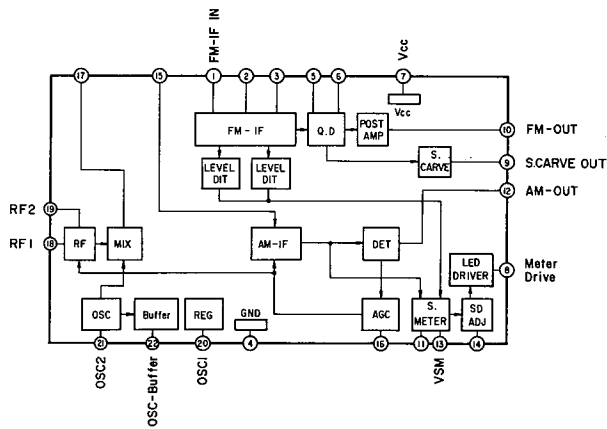
Table 1

IC BLOCK/CIRCUIT DATA

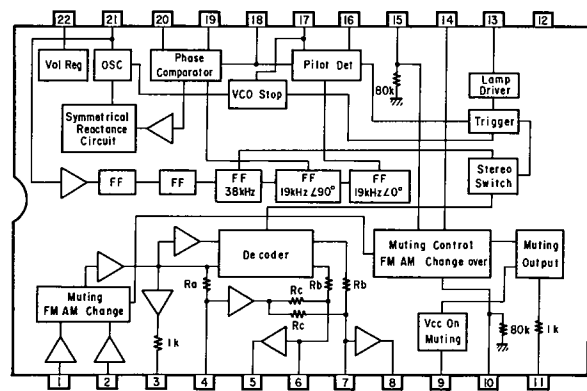
IC104: LC6523C-779



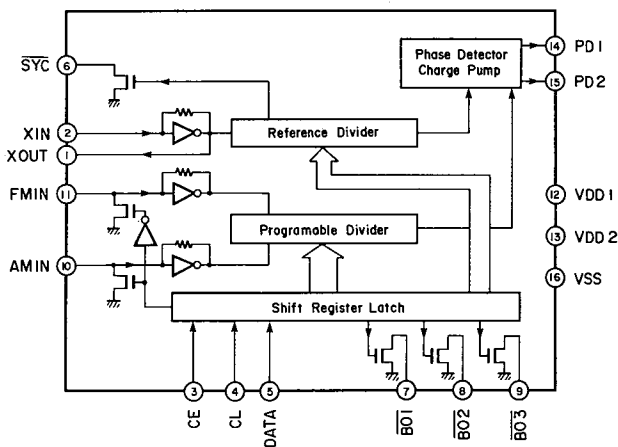
IC101: LA1265



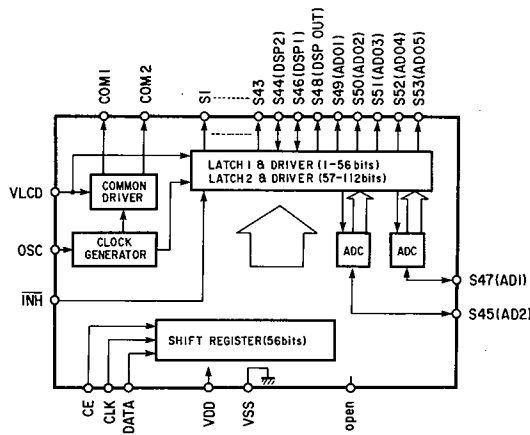
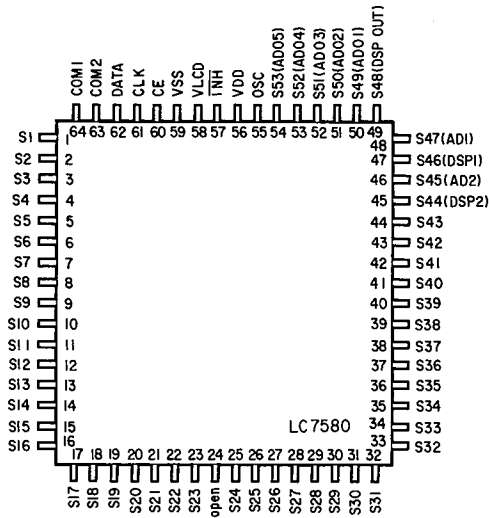
IC102: LA3401



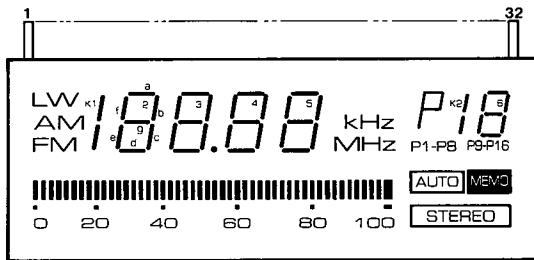
IC103: LM7001



IC301: LC7580



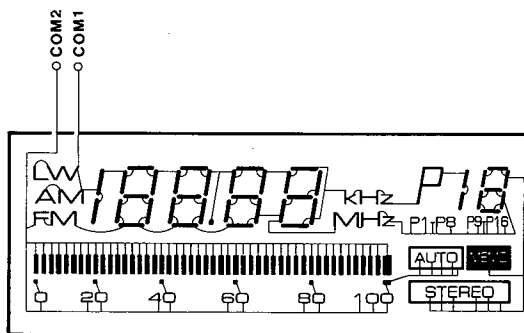
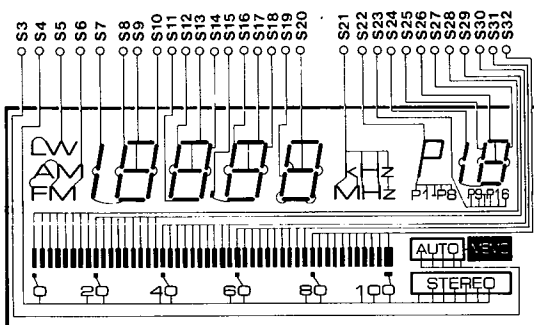
LCD9422P



LCD Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
IC301 Pin No.	63	64	2	3	1	4	5	6	7	8	9	10	11	12	13	14
COM1	—	COM1	MEMO	STEREO	LW	AM	K1	2f	2a	2b	—	3f	3a	3b	COL	4f
COM2	COM2	—	AUTO	0~100	—	FM	2d	2e	2g	2c	3d	3e	3g	3c	4d	4e
LCD Pin No.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
IC301 Pin No.	15	16	17	18	20	21	22	23	25	26	27	50	51	52	53	54
COM1	4a	4b	5c, d	5a, f	kHz	P	—	K2	6f	6a	6b	—	—	—	—	—
COM2	4g	4c	5b, e	5g	MHz	P1-P8	P9-P16	6d	6e	6g	6c	M1	M2	M3	M4	M5

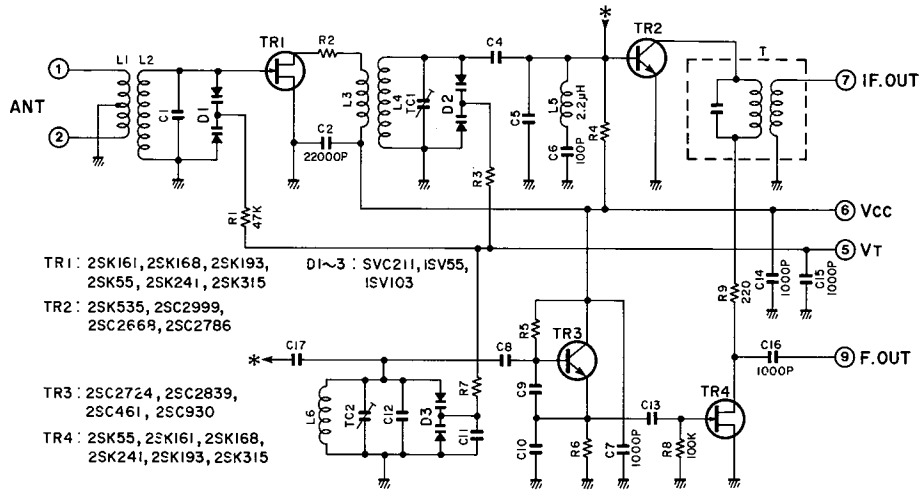
SEGMENT

COMMON

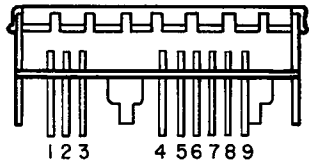
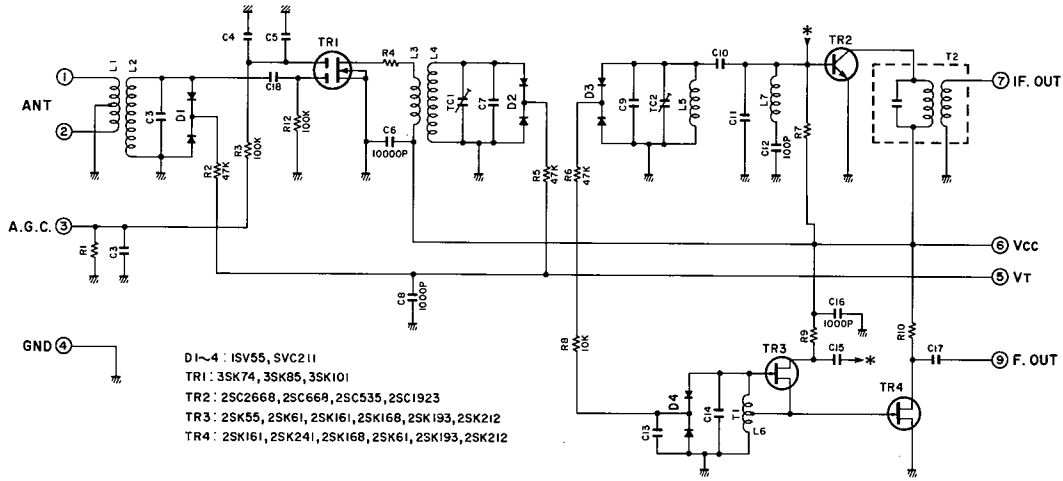


● FRONT END PACK (PK101)

R, U, C, A, B models (PA00081)



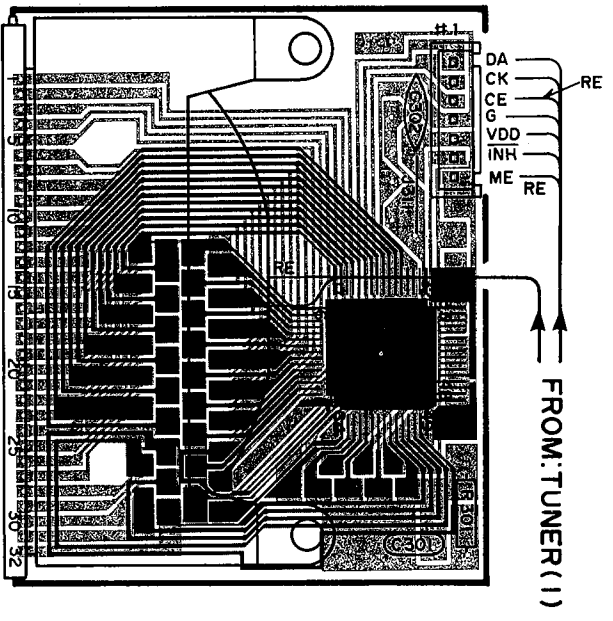
G model (VA76190)



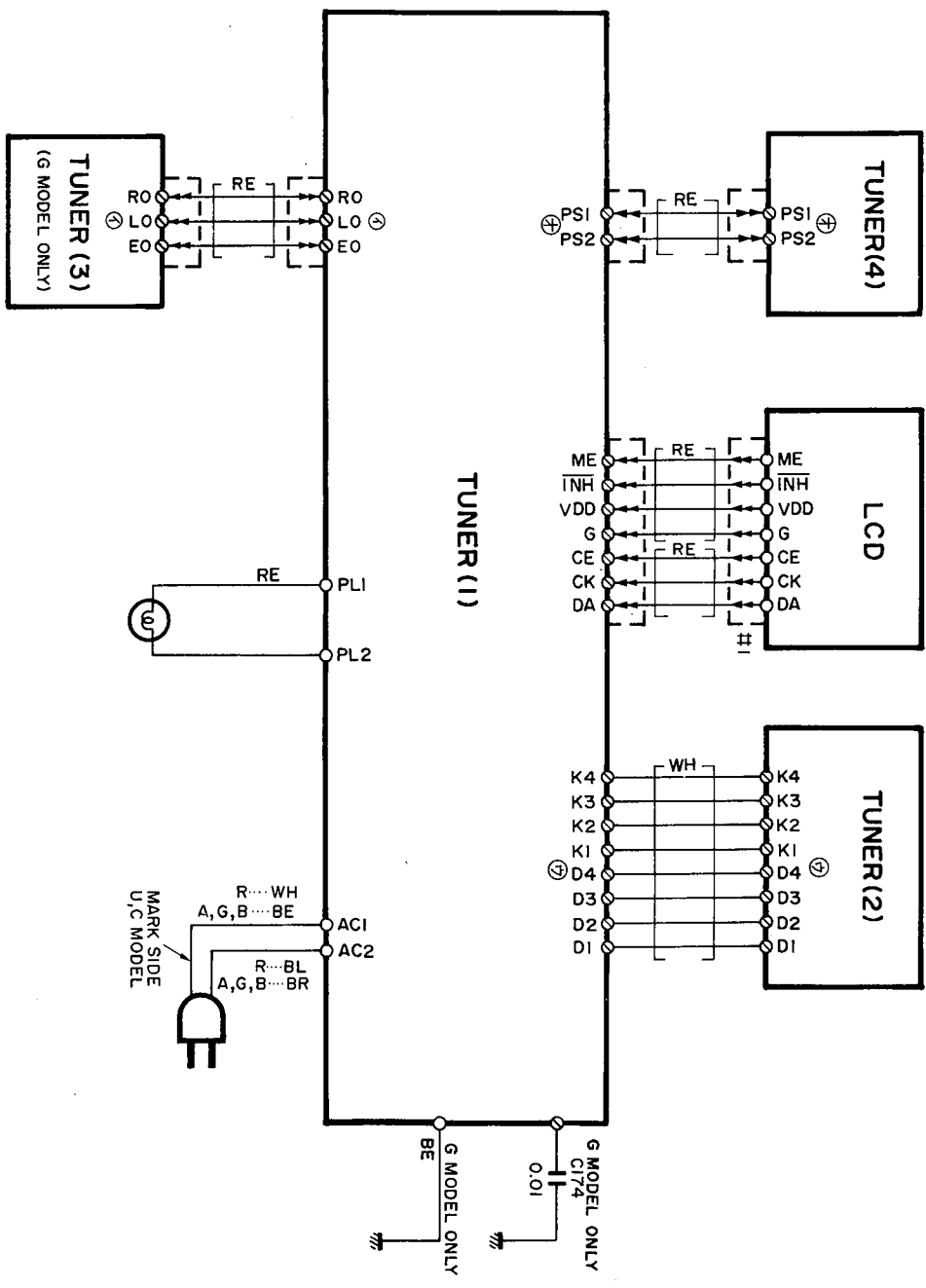
Pin No.	Name
1	ANT.
2	ANT.
3	A.G.C.
4	GND
5	VT (1.5 ~ 3V)
6	Vcc (12V)
7	IF OUT
8	GND
9	F OUT

PRINTED CIRCUIT BOARD (Pattern side)

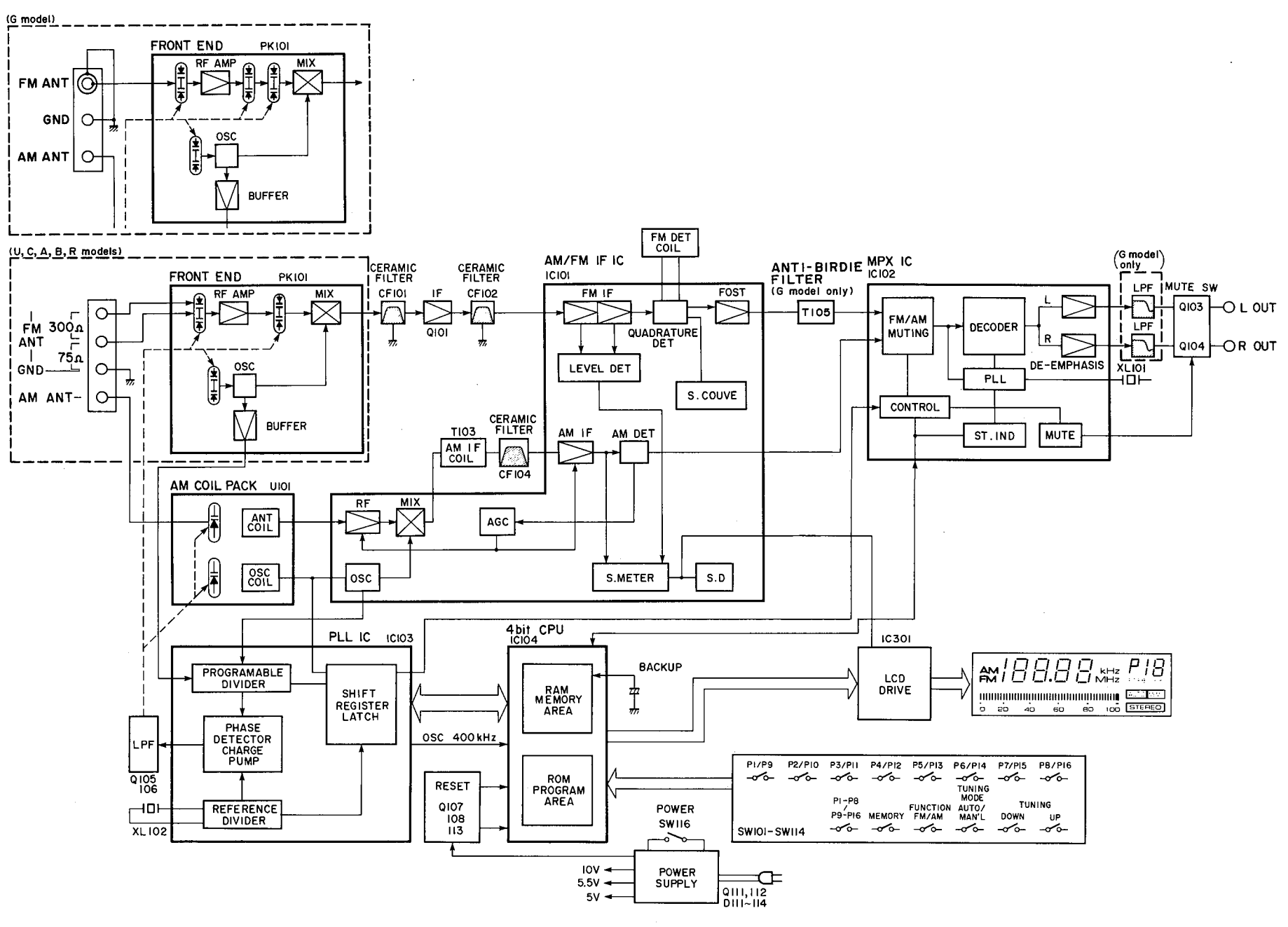
LCD



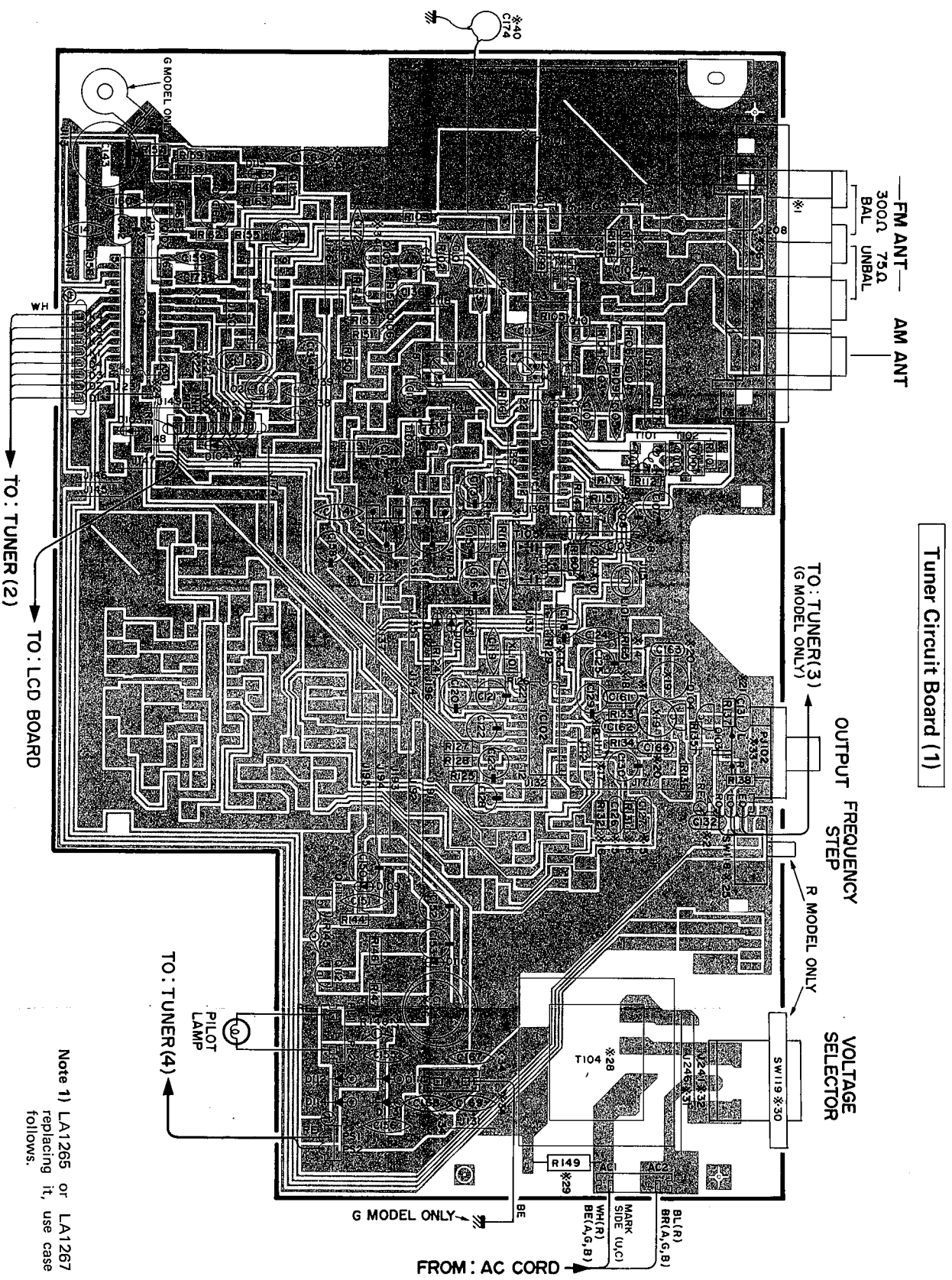
WIRING



BLOCK DIAGRAM



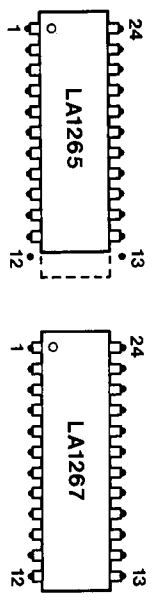
PRINTED CIRCUIT BOARD (Pattern side)



Note) * marked

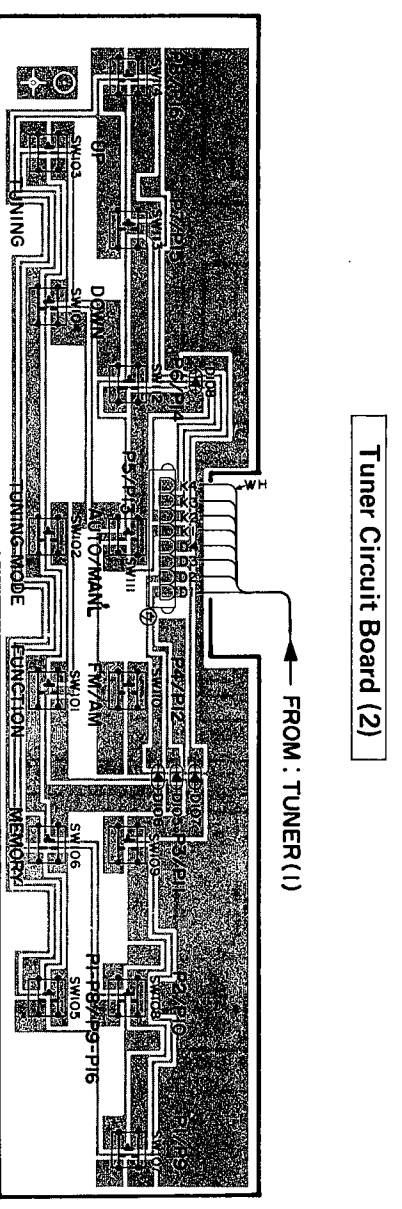
	R	U, C	A, B	G
1	Antenna Terminal	VA84590	VA84590	LA00580
2	R101	OPEN	OPEN	470K
3	PA00081	PA00081	PA00081	VA76190
7	C108	1/50	3.3/50	1/50
8	C109	100P	100P	OPEN
9	R115	47K	18K	47K
10	J201	SHORT	SHORT	OPEN
11	R160	OPEN	OPEN	4.7K
12	T105	OPEN	OPEN	GE20053
13	R129	10K	10K	22K
14	R165	33K	33K	18K
15	C126, 127	1200P	1200P	@750P/100 @390P/100
16	R131, 132	6.2K	6.2K	120K
17	R133, 134	2.2K	2.2K	3.3K
18	C161, 162	OPEN	OPEN	2700P
19	L103, 104	Jammer	Jammer	GE90185
20	C163, 164	OPEN	OPEN	1000P
21	C131, 132	1500P	1500P	OPEN
22	J221	OPEN	SHORT	OPEN
23	J211	OPEN	OPEN	SHORT
24	J231	SHORT	OPEN	OPEN
25	SW118	VA94530	OPEN	OPEN
26	C154	1000/25	1000/16	1000/16
27	R148	22	10	15
28	T104	GA69320	GA69310	GA69320
29	R149	OPEN	1/2P 2.2M	OPEN
30	SW119	LA00581	OPEN	OPEN
31	J246	OPEN	SHORT	SHORT
32	J241	SHORT	OPEN	SHORT
33	PJ102	LB20227	LB20227	OPEN
34	C166 ~ 169, 172, 173	OPEN	OPEN	0.01
35	R198	OPEN	OPEN	47K
36	J208, 209	OPEN	OPEN	SHORT
38	PJ102	OPEN	OPEN	VB29900
39	C131, 132	OPEN	OPEN	3900P
40	C174	OPEN	OPEN	0.01

Note 1) LA1265 or LA1267 is usable for IC101. When replacing it, use case for pin positions arranged as follows.



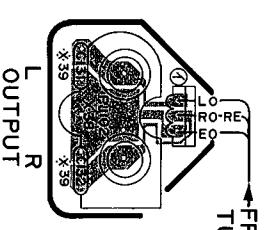
Note 2) 文字面: Component side

Tuner Circuit Board (4)

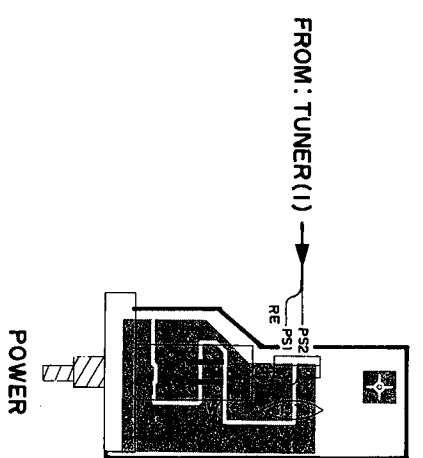


Tuner Circuit Board (2)

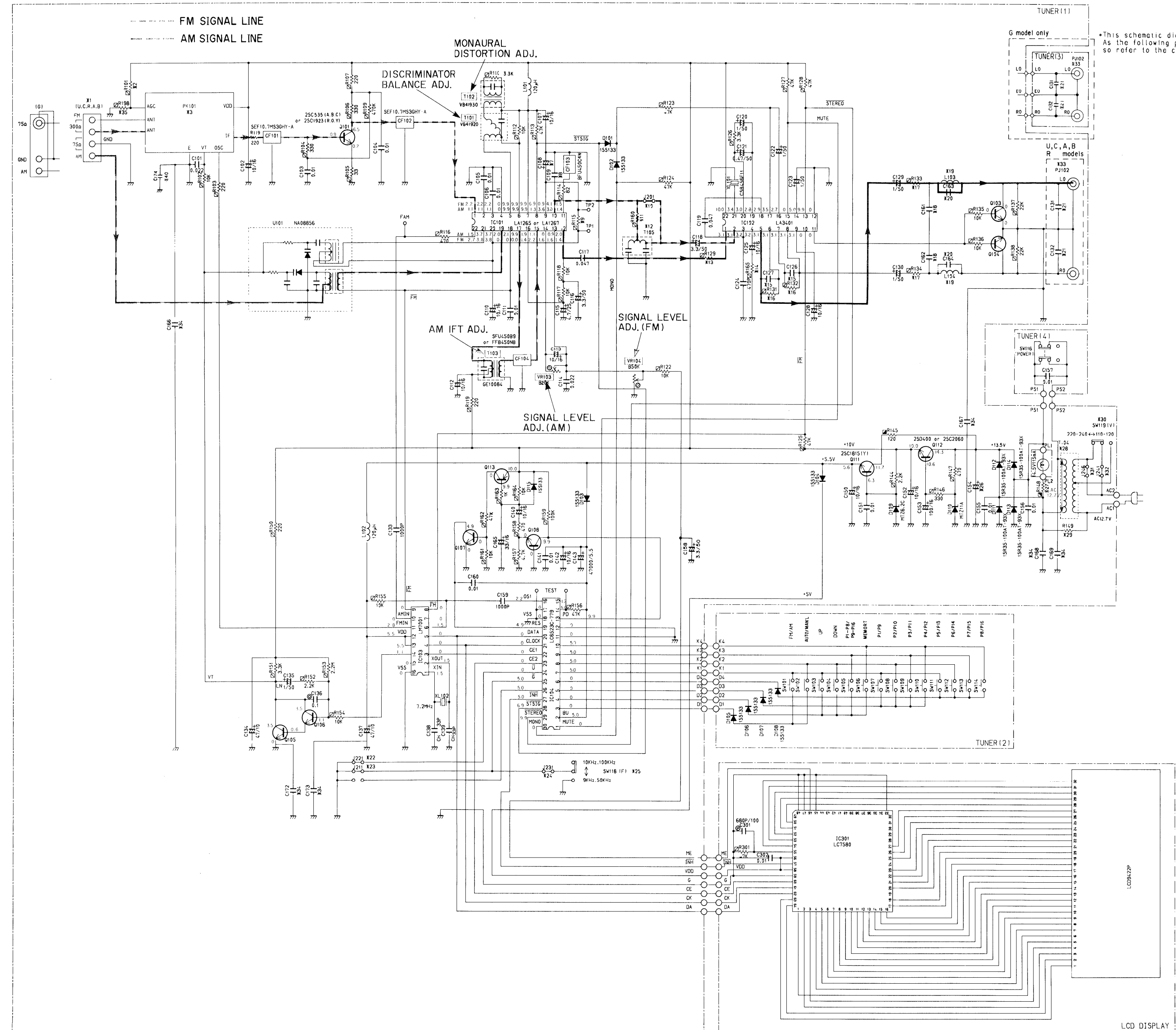
Tuner Circuit Board (3) (G model only)



Tuner Circuit Board (4)



SCHEMATIC DIAGRAM



NOTICE
 (U) U.S.A model
 (C) Canadian model
 (A) Australian model
 (E) European model
 (B) British model
 (R) Other model

*This schematic diagram is for U.S.A and Canadian models. As the following parts and values differ from each model, so refer to the corresponding column.
 (Note) X marked

Part No.	U.S.A	U.C.	A, B	C	J
X1	VAB4590			LB0580	VAB4590
X2	R101	OPEN		47K	OPEN
X3	PK101	PA20081		VA76190	PA00071
X4					
X5					
X6					
X7	C108	1/50	3.3/50	1/50	13/50
X8	C109	100P		OPEN	100P
X9	R115	27K	18K	33K	18K
X10	J201	SHORT		OPEN	SHORT
X11	R160	OPEN		4.7K	OPEN
X12	T105	OPEN		GE20053	OPEN
X13	R129	10K		22K	10K
X14	R165	33K		18K	33K
X15	C126,127	⊗120P	⊗7.50P/100	⊗390P/100	⊗750P/100
X16	R131,132	62K		120K	62K
X17	R133,134	2.2K		3.3K	2.2K
X18	C161,162	OPEN		⊗270P	OPEN
X19	L103,104	SHORT		GE90185	SHORT
X20	C163,164	OPEN		⊗1000P	OPEN
X21	C131,132	⊗1500P		⊗3900P	⊗1500P
X22	J221	OPEN	SHORT	OPEN	SHORT
X23	J211	OPEN		SHORT	SHORT
X24	J231	SHORT	OPEN		OPEN
X25	SW118	KAL4169	OPEN		OPEN
X26	C154	1000/25	1000/16	1000/25	1000/16
X27	R148	⊗22	⊗10	⊗27	⊗15
X28	T104	GA6932	GA6931	GA6932	GA69300
X29	R149	OPEN	1/2P2,2M	OPEN	
X30	SW119	LA20581	OPEN		
X31	J246	OPEN	SHORT		SHORT
X32	J241	SHORT	OPEN		OPEN
X33	P102	LB20227		LB29900	LB20227
X34	C124,125	OPEN		0.01	OPEN
X35	R198	OPEN		47K	OPEN
X36	J200-210	OPEN		SHORT	OPEN
X37					
X38					
X39	LB59071		OPEN		LB50071
X40	C174	OPEN		0.01	OPEN

RESISTOR

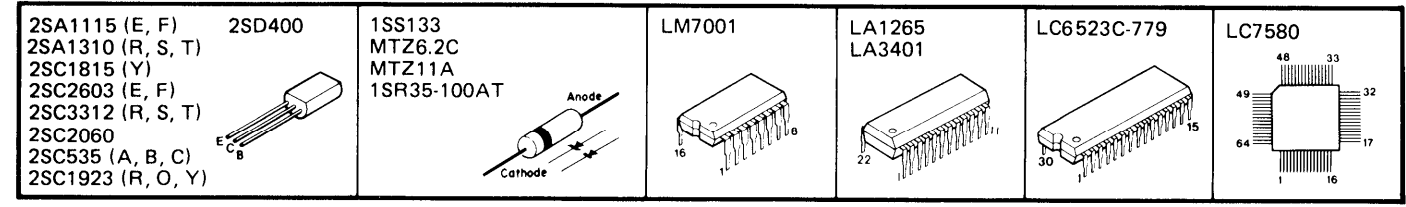
REMARKS	PARTS NAME
NO MARK	CARBON FILM RESISTOR
⊗	CARBON FILM RESISTOR (1/6W)
△	METAL OXIDE FILM RESISTOR
▲	METAL FILM RESISTOR
⊠	METAL PLATE RESISTOR
■	FIRE PROOF CARBON FILM RESISTOR
□	CEMENT MOLDED RESISTOR
⊙	SEMI VARIABLE RESISTOR

CAPACITOR

REMARKS	PARTS NAME
NO MARK	ELECTROLYTIC CAPACITOR
NO MARK	CERAMIC CAPACITOR
⊙	POLYESTER FILM CAPACITOR
○	POLYSTYRENE FILM CAPACITOR
⊖	MICA CAPACITOR
⊕	POLYPROPYLENE FILM CAPACITOR
●	SEMICONDUCTIVE CERAMIC CAPACITOR

UNLESS OTHERWISE SPECIFIED :
 PNP TRANSISTORS ARE 2SA1115(E,F) or 2SA1310(R,S,T)
 NPN TRANSISTORS ARE 2SC2603(E,F) or 2SC3312(R,S,T)

PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICs.



All voltages measured with a 10M Ω /DC electric volt meter.
 Components having special characteristics are marked Δ and must be replaced with parts having specifications equal to those originally installed.
 Schematic diagram is subject to change without notice.

PARTS LIST

■WARNING

Components having special characteristics are marked Δ and must be replaced with parts having specifications equal to those originally installed.

■ELECTRICAL PARTS

Ref. No.	Part No.	Description	部 品 名	Remarks	Common Model	Markets	ランク
※	NA 09 09 30	Tuner Circuit Board	チューナーシート			J	
※	NA 08 97 90	"	"			R	
※	NA 08 98 00	"	"			U,C	
※	NA 08 98 10	"	"			A,B	
※	NA 08 98 20	"	"			G	
	FG 21 13 30	Ceramic Cap. 33pF 50V	セラコン	C138,139			
	FG 21 21 00	" 100pF 50V	"	C109		J,R,U,A,C,B	
	FG 21 24 70	" 470pF 50V	"	C124			
	FG 21 31 00	" 1000pF 50V	"	C133,159			
	FG 24 41 00	" 0.01 μ F 50V	"	C103~106,111,141,151,155~157,160			
	FG 24 41 00	" 0.01 μ F 50V	"	C166~169,172~174		G	
	FG 24 42 20	" 0.022 μ F 50V	"	C101,114			
	FG 24 44 70	" 0.047 μ F 50V	"	C117,119			
	FZ 00 64 00	Electrolytic Cap. 47000 μ F 5.5V	スーパーキャパシタ	C143			
	UT 45 23 90	Polypropylene Film Cap. 390pF100V	ポリプロコン	C126,127		G	
	UT 45 27 50	" 750pF100V	"	"		J,A,B	
	FA 15 31 20	Mylar Cap. 1200pF 50V	マイラーコン	"		R,U,C	
	FA 15 31 00	" 1000pF 50V	"	C163,164		G	
	FA 15 31 50	" 1500pF 50V	"	C131,132		J,R,U,A,C,B	
	FA 15 33 90	" 3900pF 50V	"	"		G	
	FA 15 32 70	" 2700pF 50V	"	C161,162		G	
	FA 15 51 00	" 0.1 μ F 50V	"	C136			
	Ui 22 74 70	Electrolytic Cap. 47 μ F 10V	ケミコン	C134,137			
	Ui 23 71 00	" 10 μ F 16V	"	C102,107,110,112,113,125,128,140,142,150,152			
	UJ 13 73 30	" 33 μ F 16V	"	C165			
	UJ 13 81 00	" 100 μ F 16V	"	C153			
	Ui 24 64 70	" 4.7 μ F 25V	"	C115			
	Ui 26 54 70	" 0.47 μ F 50V	"	C121			
	Ui 36 61 00	" 1 μ F 50V	"	C120,122,123,129,130			
	Ui 36 61 00	" 1 μ F 50V	"	C108		R,A,G,B	
	UJ 46 63 30	" 3.3 μ F 50V	"	"		J,U,C	
	UJ 46 63 30	" 3.3 μ F 50V	"	C116,118,158			
	FZ 00 47 20	" 1000 μ F 16V	"	C154		J,U,G,C	
	UW 94 91 00	" 1000 μ F 25V	"	"		R,A,B	
	UL 46 61 00	" 1 μ F 50V	"	C135			
	GA 69 30 00	Power Transformer	電源トランス	T104		J	Δ
※	GA 69 31 00	"	"	"		U,C	Δ
※	GA 69 32 00	"	"	"		R,A,G,B	Δ
※	GE 10 08 40	AM IFT Coil 450kHz	AM IFT コイル	T103			
※	VB 41 92 00	FM DET Coil QU-7	F M 検波 コイル	T101		R,U,A,C,B	
※	VB 41 93 00	"	"	T102			
	GE 20 05 30	Anti-birdie Filter 114kHz	アンチバーディーフィルター	T105		G	
	GE 90 18 50	Inductor 39mH	固定インダクター	L103,104		G	
※	GE 90 19 80	RF Inductor 120 μ H	R F インダクター	L101,102			
	GG 00 05 50	AM Ceramic Filter BFU450C4N	AMセラミックフィルター	CF103			
	GG 00 06 60	" SFU450B9	"	CF104			
	GG 00 05 60	FM Ceramic Filter SFE10.7MS3GHY-A	FMセラミックフィルター	CF101,102			
※	GG 00 07 50	Ceramic Resonator CSB456F11	セラミック振動子	XL101			
	QU 00 38 00	Quartz Crystal Unit 7.2MHz	水晶振動子	XL102			

※ New Parts (新規部品)

Ref. No.	Part No.	Description	部 品 名	Remarks	Common Model	Markets	ランク
	HG 30 92 20	Carbon Resistor	2.2MΩ 1/2P	カーボン抵抗	R149	U,C	
	HV 45 41 00	Flame Proof Carbon Resistor	10Ω 1/4W	不燃化カーボン抵抗	R148	J,U,C	
	HV 45 41 50	"	15Ω 1/4W	"	"	G	
	HV 45 42 20	"	22Ω 1/4W	"	"	R	
	HV 45 42 70	"	27Ω 1/4W	"	"	A,B	
	HV 45 51 20	"	120Ω 1/4W	"	R145		
	HT 37 03 90	Pre-Set Potentiometer	B20kΩ	半固定抵抗	VR103		
	HT 37 04 10	"	B50kΩ	"	VR104		
	iA 11 15 10	Transistor	2SA1115 (E,F)	トランジスタ	Q113	} Inter-changeable	
	iX 60 31 70	"	2SA1310 (R,S,T)	"	"		
	iC 18 15 20	"	2SC1815 (Y)	"	Q111		
	iC 26 03 10	"	2SC2603 (E,F)	"	} Inter-changeable		
	iX 60 31 80	"	2SC3312 (R,S,T)	"		"	
	iC 20 60 00	"	2SC2060	"	} Inter-changeable		
	iD 04 00 10	"	2SD400	"		"	
	iC 05 35 40	"	2SC535(A,B,C)	"	} Inter-changeable		
	iC 19 23 00	"	2SC1923(R,O,Y)	"		"	
	iF 00 34 50	Diode	1SS133	ダイオード	D101~108,115		
	iF 00 84 80	"	1SR35-100AT	"	D111~114		
	iF 00 88 20	Zener Diode	MTZ11A	ツェナーダイオード	D110		
	iF 01 07 50	"	MTZ6.2C	"	D109		
※	iG 15 80 00	IC	LC6523C-779	I C	IC104		
※	iG 15 81 00	"	LA3401	"	IC102		
※	iG 15 82 00	"	LA1265	"	IC101		
※	iG 15 84 00	"	LM7001	"	IC103		
※	VA 94 53 00	Slide Switch		スライドスイッチ	SW118	R	
	KA 80 36 90	Push Switch		プッシュスイッチ	SW116		
	KA 90 63 80	Switch	5M EVQ-QRB-04M	ライトタッチスイッチ	SW101~114		
※	LA 00 58 10	Voltage Selector		電圧切換器	SW119		△
※	VB 29 90 00	Pin Jack	2P	ピンジャック	PJ102	G	
	LB 20 22 70	"	2P	"	"	R,V,A,C,B	
※	NA 08 85 60	AM Coil Pack		AM電子同調コイルパック	U101		
	PA 00 07 10	Front End Pack	BFE346J15	フロントエンドパック	PK101	J	
	PA 00 08 10	"	FE343U	"	"	R,U,A,C,B	
※	VA 76 19 00	"	TFFC2U100X	"	"	G	
	LA 00 20 00	Lapping Terminal	P=7.5 2P i-Type	i型ラッピング端子板			
	LA 00 38 70	"	P=10 2P WTM-Type	WTM型ラッピング端子板			
※	VA 84 59 00	Antenna Terminal	4P	アンテナ端子台		J,R,U,A,C,B	
※	LA 00 58 00	"		アンテナ端子		G	
※	VA 72 58 00	Holder Cable	8P	バラレルケーブルホルダー			
	BB 06 83 70	Ground Metal		アース金具			
	BB 06 62 90	Ground Washer		アースワッシャー		G	

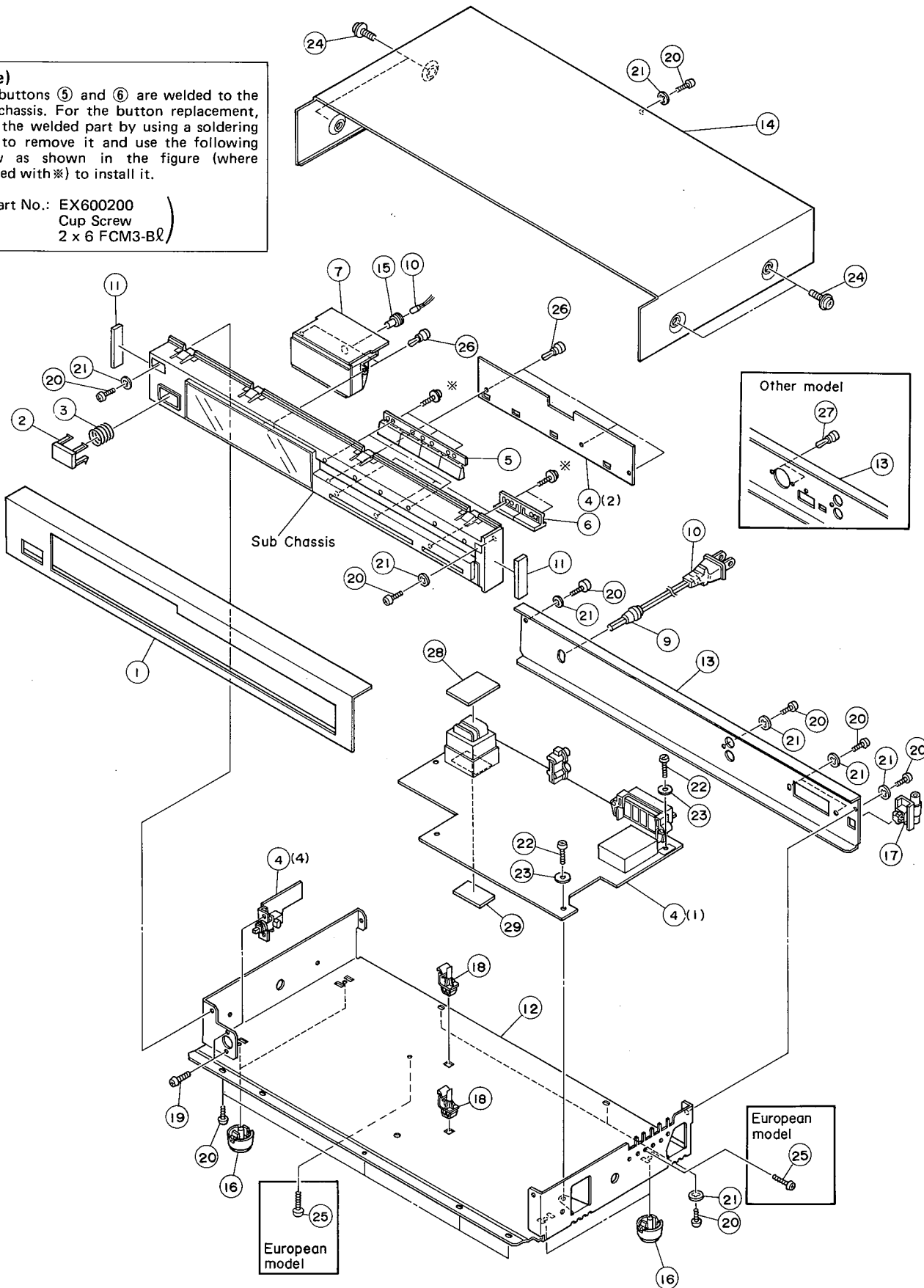
※New Parts (新規部品)

EXPLODED VIEW

Note)

The buttons ⑤ and ⑥ are welded to the sub chassis. For the button replacement, heat the welded part by using a soldering iron to remove it and use the following screw as shown in the figure (where marked with※) to install it.

(Part No.: EX600200
Cup Screw
2 x 6 FCM3-BL)



MECHANISM PARTS

Ref. No.	Part No.	Description	部 品 名	Remarks	Common Model	Markets	ランク
※ 1	VA 95:97:00	Front Panel	フ ロ ン ト パ ネ ル				
2	CB 63:51:10	Button	ボ タ ン	Power			
3	AA 61:78:80	Spring	バ ネ				
※ 4	NA 08:97:90	Tuner Circuit Board	チ ュ ー ナ ー シ ー ト			R	
※ "	NA 08:98:00	"	"			U,C	
※ "	NA 08:98:10	"	"			A,B	
※ "	NA 08:98:20	"	"			G	
※ "	NA 09:09:30	"	"			J	
5	VA 71:89:00	Button	ボ タ ン	4P			
6	VA 71:90:00	"	"	2P			
※ 7	NA 09:00:70	LCD Circuit Board	L C D 表 示 シ ー ト		T-30		
※ 8	VA 73:96:00	Lamp	ラ ン プ	115mA 14.5V			
9	CB 62:01:90	Cord Stopper	コ ー ド ス ト ッ パ ー	CM-22B		J,R,A,G,B	
"	CB 62:02:00	"	"	CM-22C		U,C	
10	MG 00:16:30	Power Cord	電 源 コ ー ド	6A 250V 2m		R	△
"	MG 00:22:20	"	"	10A 125V 1.98m		U,C	△
"	MG 00:09:20	"	"	7.5A 250V 2.5m	Inter-changeable	A	△
"	MG 00:14:90	"	"	7.5A 250V 2.5m		A	△
※ "	MG 00:23:10	"	"	7.5A 250V 2m	Inter-changeable	A	△
"	MG 00:09:60	"	"	2.5A 250V 2m		G	△
"	MG 00:16:20	"	"	2.5A 250V 2m	Inter-changeable	G	△
※ "	MG 00:23:20	"	"	2.5A 250V 2m		G	△
"	MG 00:18:60	"	"	2.5A 250V 2m	Inter-changeable	B	△
"	MG 00:22:90	"	"	7A 125V 2m		J	△
"	MG 00:18:10	"	"	7A 125V 2.2m	J	J	△
11	VB 27:31:00	Damper	ダ ン パ ー				
※ 12	VA 95:98:00	Chassis	シ ャ ー シ		T-420		
※ 13	VA 96:10:00	Rear Panel	リ ア パ ネ ル			R	
※ "	VA 96:11:00	"	"			U,C	
※ "	VA 96:12:00	"	"			G	
※ "	VA 96:13:00	"	"			A,B	
※ "	VB 42:14:00	"	"			J	
※ 14	VA 77:16:00	Top Cover	ト ッ プ カ バ ー		T-420		
15	CB 63:07:50	Lamp Cap.	ラ ン プ キ ャ ッ プ		M-80		
16	CB 61:03:90	Leg	ト ラ ン レ ッ グ				
17	CB 60:74:70	Antenna Holder	ア ン テ ナ ホ ル ダ ー		T-960II		
18	VA 77:29:00	Support	基 板 サ ポ ー ト				
19	ED 33:00:66	Binding Head Screw	バ イ ン ド 小 ネ ジ	3×6 FCRM3-BI	PACK		
20	Ei 33:00:86	Binding Head Tapping Screw	バ イ ン ド タ ッ ピ ン グ ネ ジ	3×8 FCRM3-BI	PACK		
21	EV 43:00:36	Toothed Lock Washer	歯 付 座 金	φ3 ZMC2-Y	PACK		
22	ED 33:01:06	Binding Head Tapping Screw	バ イ ン ド タ ッ ピ ン グ ネ ジ	3×10 FCRM3-BI	PACK		
23	EV 20:30:36	Flat Washer	平 座 金	φ3 FCRM3-BI	PACK		
24	EK 96:60:70	BW Head Tapping Screw	BWヘッドタッピングネジ	4×8 ZMC2-BI			
25	Ei 33:01:26	Binding Head Tapping Screw	バ イ ン ド タ ッ ピ ン グ ネ ジ	3×12 ZMC2-BI	PACK	G	
26	CB 60:56:20	Plastic Rivet	プ ラ ス チ ャ ッ ク リ ヴ ェ ッ ト				
27	CB 60:92:60	"	"			R	
28	VB 27:29:00	Cushion A	ク ッ シ ョ ン A				
29	VB 27:30:00	" B	" B				
	CB 06:92:50	Binding Tie	イ ン シ ュ ロ ッ ク タイ	BK-1		G	
		Accessories	付 属 品				
	Mi 06:44:00	FMQ-matching Antenna	FMQ マッチアンテナ	FM			
	Mi 08:87:90	Pin Plug Cord	出 力 コ ー ド	1m			
	Mi 08:29:10	Loop Antenna	ル ー プ ア ン テ ナ	AM			
	LB 60:59:30	Matching Transformer	整 合 器	FM(300Ω→75Ω)		G,B	

※New Parts (新規部品)

Part List for Carbon Resistor

Value	1/4W Type Part No.	1/6W Type Part No.	Value	1/4W Type Part No.	1/6W Type Part No.
1.0 Ω	HJ353100	※	12K Ω	HJ357120	HF857120
1.8 "	HJ353180	※	15 "	HJ357150	HF857150
2.2 "	HJ353220	HF853220	18 "	HJ357180	HF857180
3.3 "	HJ353330	HF853330	22 "	HJ357220	HF857220
4.7 "	HJ353470	HF853470	27 "	HJ357270	HF857270
5.6 "	HJ353560	HF853560	33 "	HJ357330	HF857330
10 "	HJ354100	HF854100	39 "	HJ357390	HF857390
15 "	HJ354150	HF854150	47 "	HJ357470	HF857470
22 "	HJ354220	HF854220	56 "	HJ357560	HF857560
27 "	HJ354270	HF854270	68 "	HJ357680	HF857680
33 "	HJ354330	HF854330	82 "	HJ357820	HF857820
39 "	HJ354390	HF854390	91 "	HJ357910	HF857910
47 "	HJ354470	HF854470	100 "	HJ358100	HF858100
56 "	HJ354560	HF854560	120 "	HJ358120	HF858120
68 "	HJ354680	HF854680	150 "	HJ358150	HF858150
82 "	HJ354820	HF854820	180 "	HJ358180	HF858180
100 "	HJ355100	HF855100	220 "	HJ358220	HF858220
110 "	HJ355110	HF855110	270 "	HJ358270	HF858270
120 "	HJ355120	HF855120	330 "	HJ358330	HF858330
150 "	HJ355150	HF855150	390 "	HJ358390	HF858390
160 "	HJ355160	※	470 "	HJ358470	HF858470
180 "	HJ355180	HF855180	560 "	HJ358560	HF858560
220 "	HJ355220	HF855220	680 "	HJ358680	HF858680
270 "	HJ355270	HF855270	820 "	HJ358820	HF858820
330 "	HJ355330	HF855330	1.0M Ω	HJ359100	HF859100
390 "	HJ355390	HF855390	1.2 "	HJ359120	※
470 "	HJ355470	HF855470	1.5 "	HJ359150	HF859150
510 "	※	HF855510	1.8 "	HJ359180	HF859180
560 "	HJ355560	HF855560	2.2 "	HJ359220	HF859220
680 "	HJ355680	HF855680	3.3 "	HJ359330	HF859330
820 "	HJ355820	HF855820	3.9 "	HJ359390	※
910 "	HJ355910	HF855910	4.7 "	HJ359470	※
1.0K Ω	HJ356100	HF856100			
1.2 "	HJ356120	HF856120			
1.5 "	HJ356150	HF856150			
1.8 "	HJ356180	HF856180			
2.0 "	HJ356200	HF856200			
2.2 "	HJ356220	HF856220			
2.4 "	HJ356240	HF856240			
2.7 "	HJ356270	HF856270			
3.0 "	HJ356300	HF856300			
3.3 "	HJ356330	HF856330			
3.6 "	HJ356360	HF856360			
3.9 "	HJ356390	HF856390			
4.7 "	HJ356470	HF856470			
5.1 "	HJ356510	HF856510			
5.6 "	HJ356560	HF856560			
6.8 "	HJ356680	HF856680			
8.2 "	HJ356820	HF856820			
9.1 "	HJ356910	HF856910			
10 "	HJ357100	HF857100			