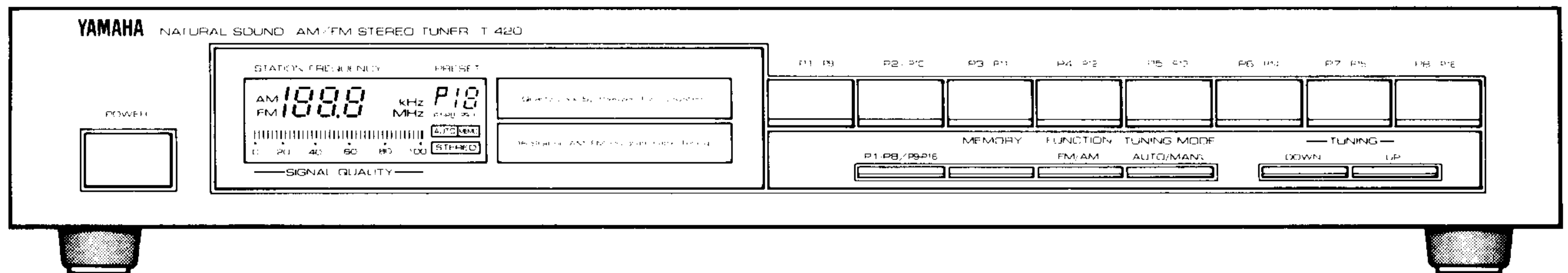


AM/FM STEREO TUNER T-420

SERVICE MANUAL



T-420

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 or 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 specifications 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.

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YAMAHA

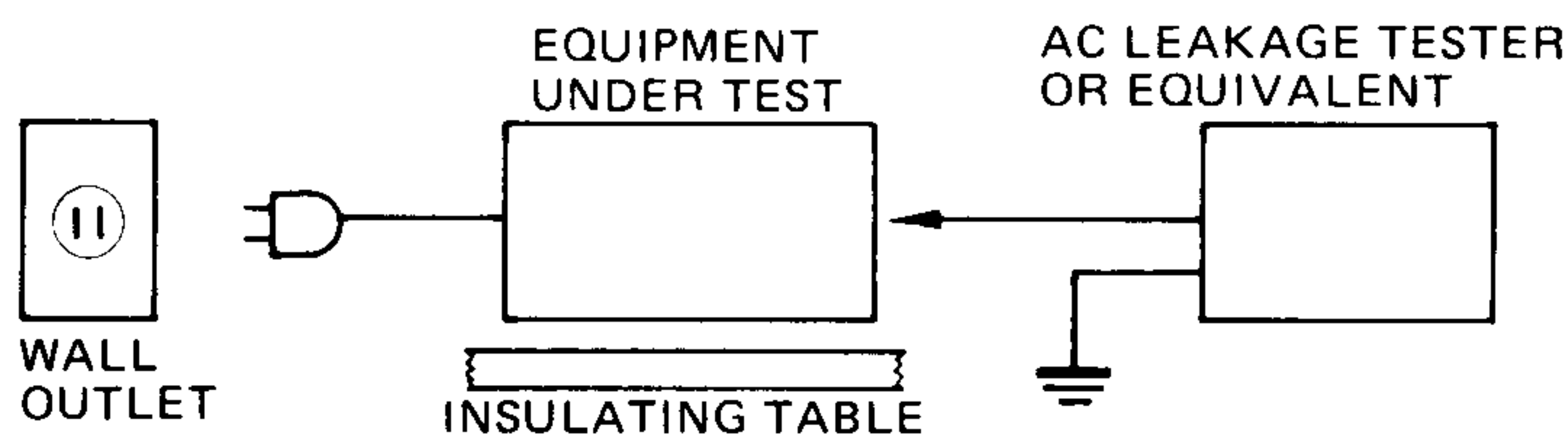
NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN
2.75K-093 ☐ © Printed in Japan '86.1

TO SERVICE PERSONNEL

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

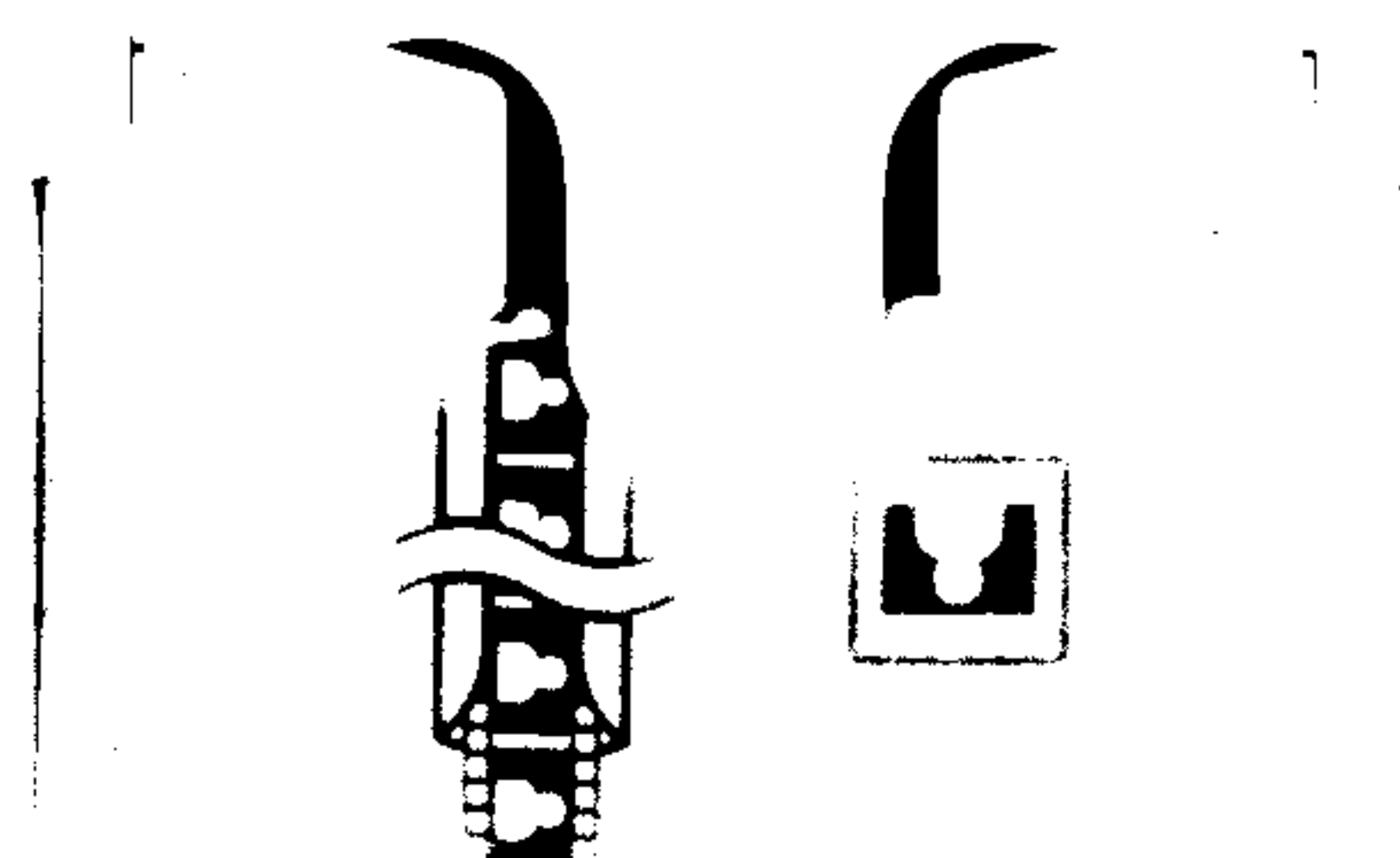
AUDIO SECTION

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

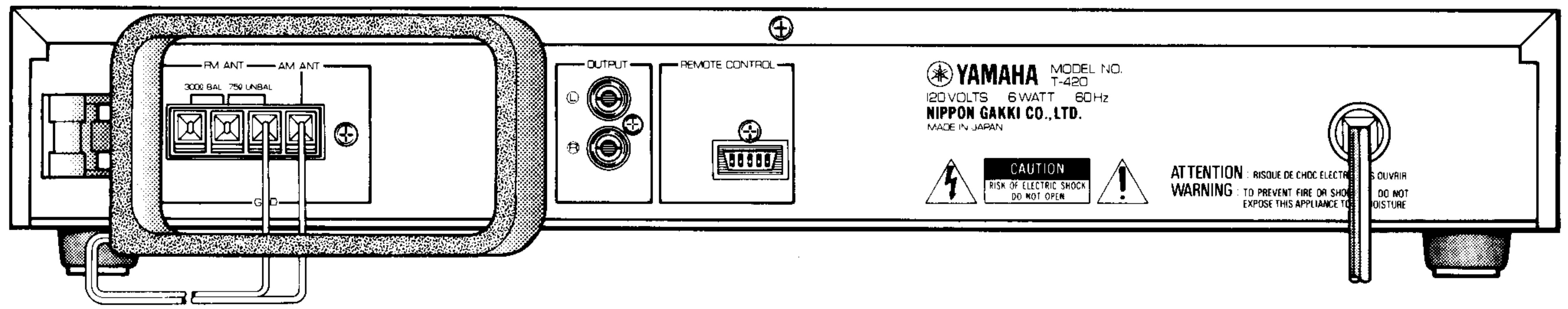
Power Supply	
U.S. & Canadian models	120V AC, 60Hz
European model	220V AC, 50Hz
British & Australian models	240V AC, 50Hz
Other model	110 – 130V AC/220 – 240V AC, 50/60Hz
Power Consumption	7W (A)(G)(B) 6W (U)(C)(R)
Dimensions (W x H x D)	435 x 72.5 x 236.5 (17-1/8 x 2-7/8 x 9-1/4")
Weight	2.3 kg (5 lbs.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

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

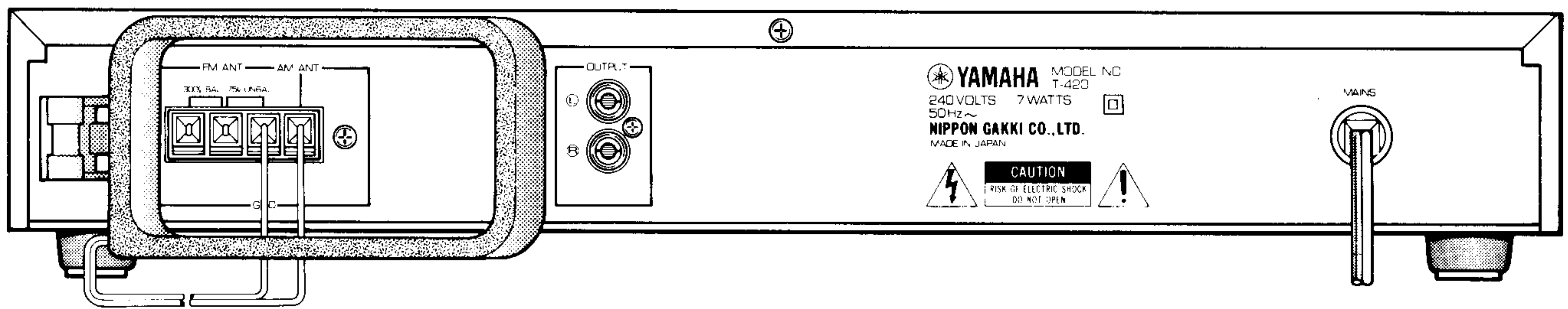


REAR PANELS

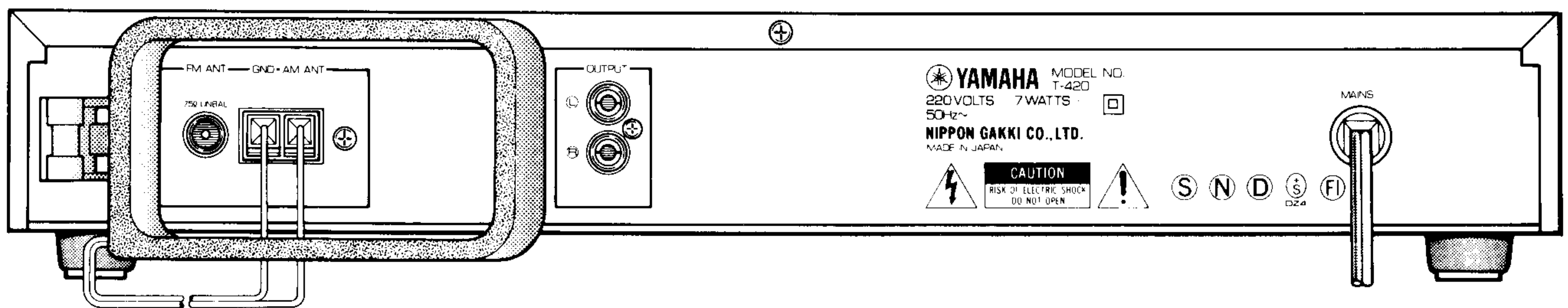
U.S.A. & Canadian models



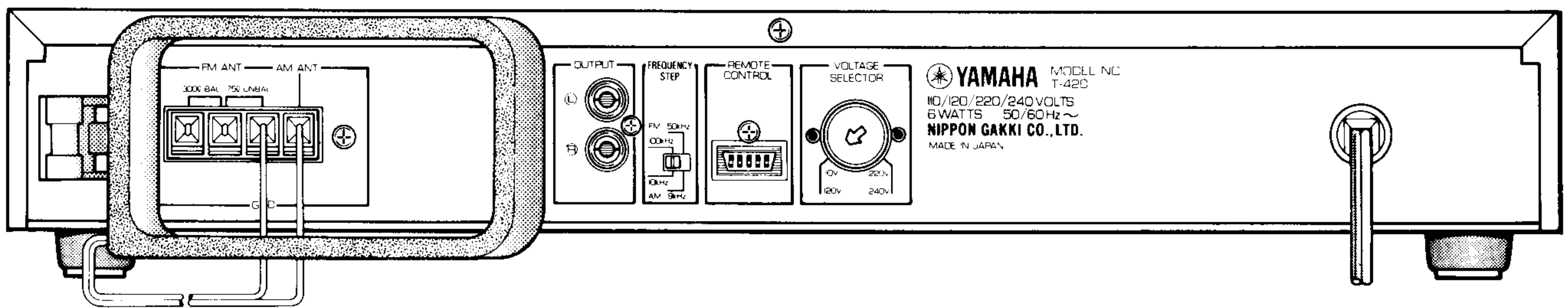
British & Australian models



European model

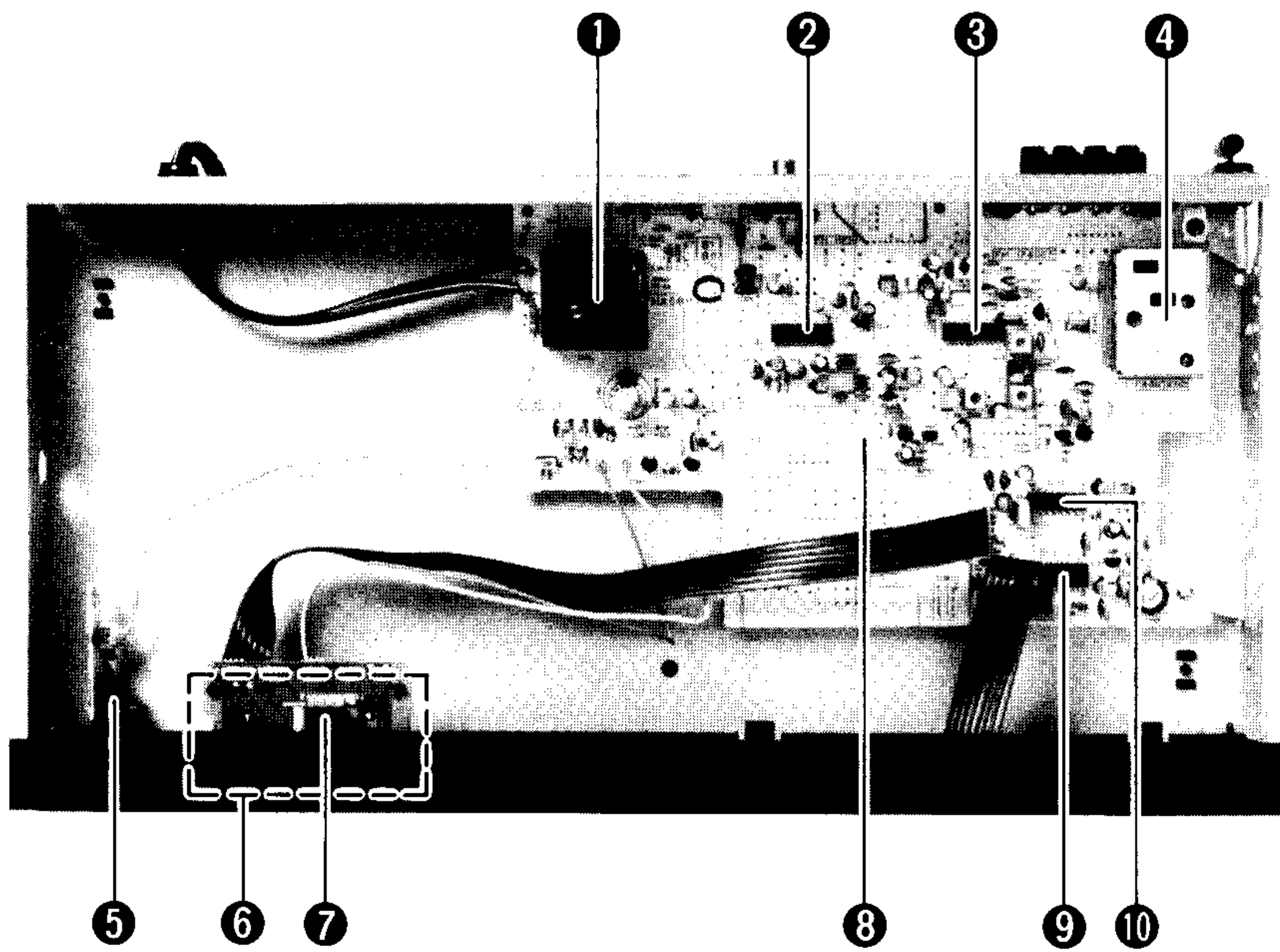


Other model



T-420

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.

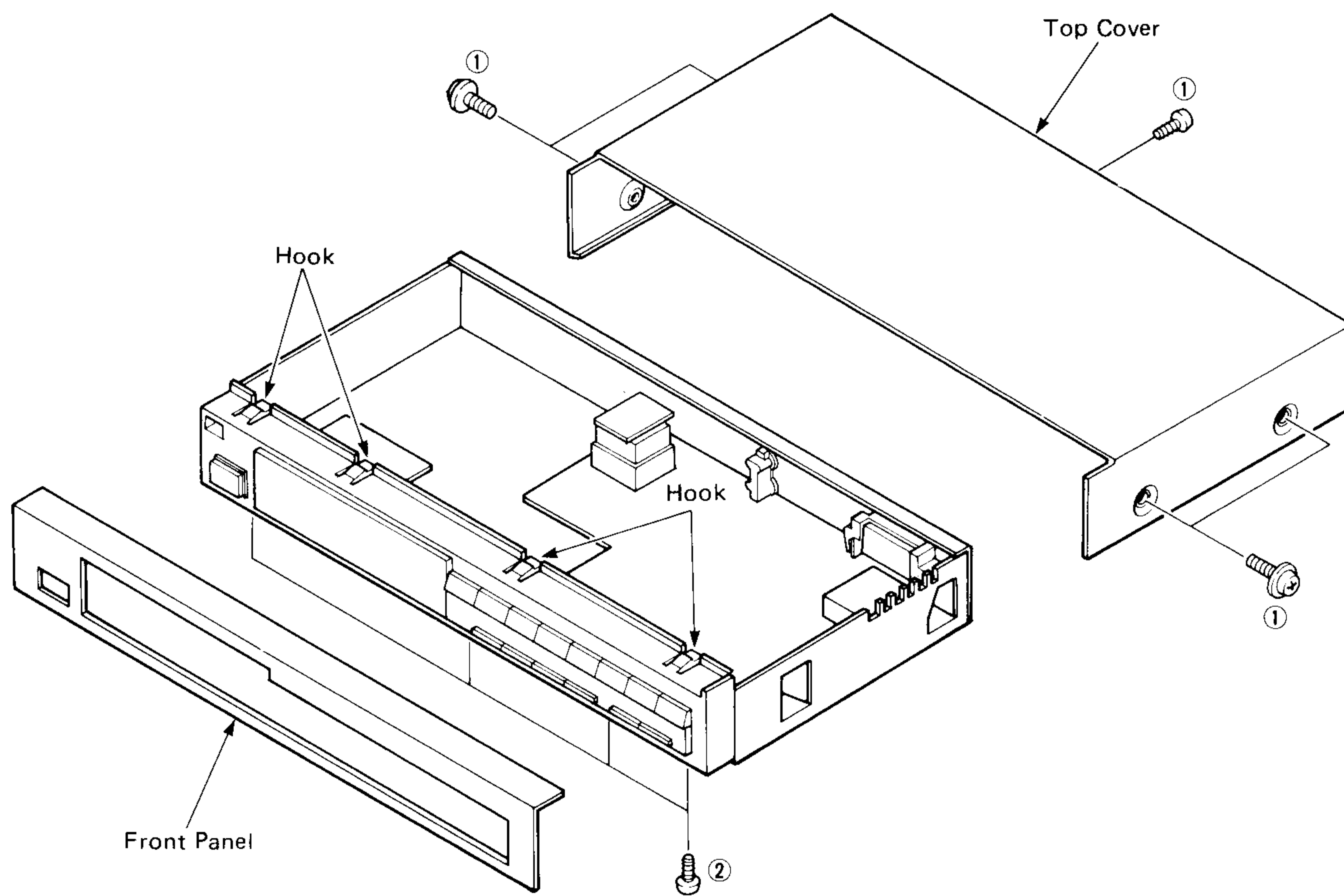


Fig. 1

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) $0\text{dB}\mu = 1\mu\text{V}$ Ex: $60\text{dB}\mu = 1\text{mV}$

2. Measuring instruments abbreviation

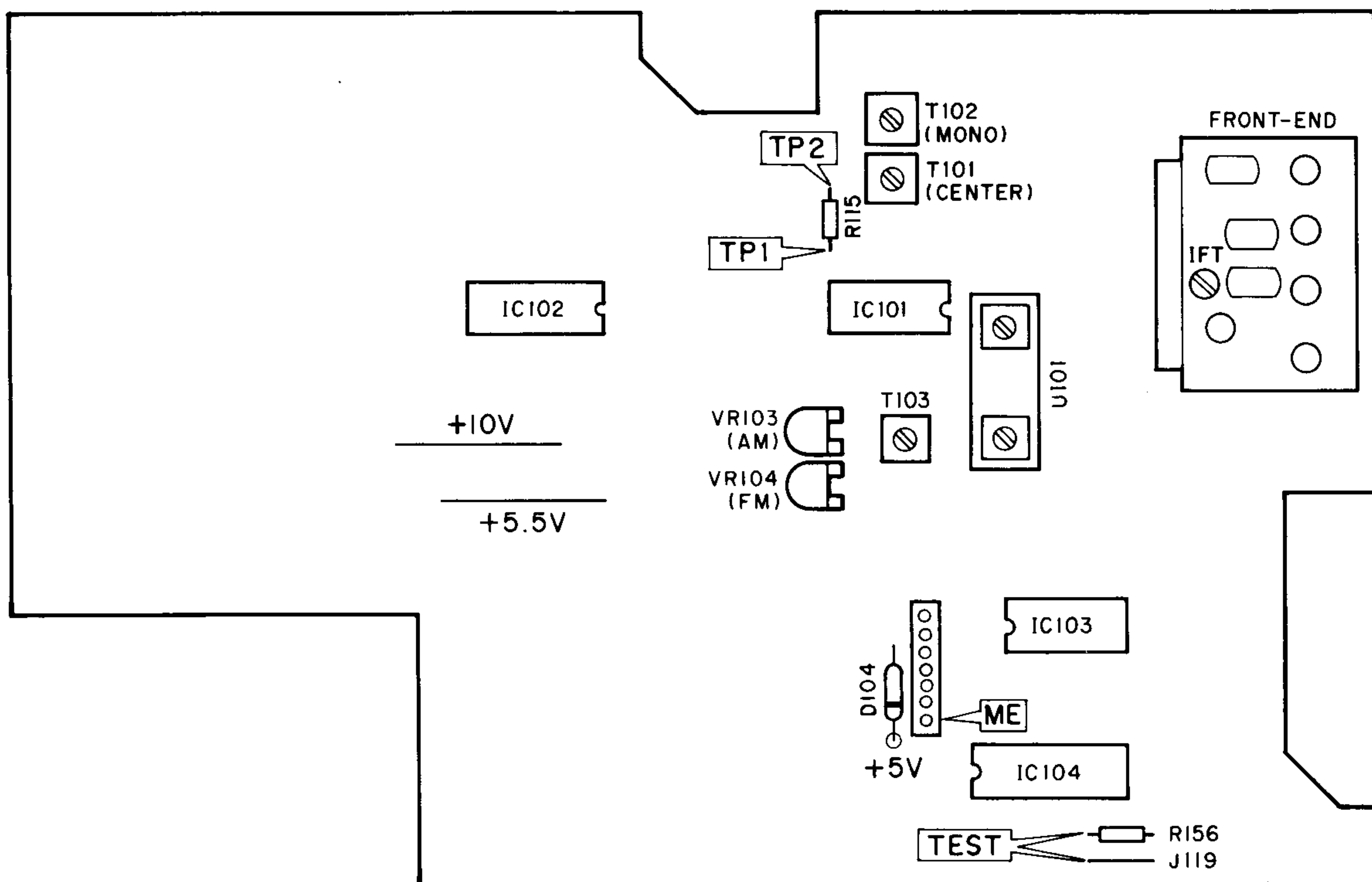
- FM SG : FM signal generator
- SSG : Stereo signal generator
- AM SG : AM signal generator
- DIST. M : Distortion meter
- FC : Frequency counter
- ACVM : AC voltmeter
- DCVM : DC voltmeter

< 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	$+10\text{V} \pm 0.5\text{V}$	Make sure that AC line voltage comes within <table border="1"> <thead> <tr> <th>Models</th> <th>AC line voltage</th> </tr> </thead> <tbody> <tr> <td>U, C</td> <td>$120\text{V} \pm 10\%$</td> </tr> <tr> <td>G</td> <td>$220\text{V} \pm 10\%$</td> </tr> <tr> <td>A, B</td> <td>$240\text{V} \pm 10\%$</td> </tr> </tbody> </table>	Models	AC line voltage	U, C	$120\text{V} \pm 10\%$	G	$220\text{V} \pm 10\%$	A, B	$240\text{V} \pm 10\%$
Models	AC line voltage									
U, C	$120\text{V} \pm 10\%$									
G	$220\text{V} \pm 10\%$									
A, B	$240\text{V} \pm 10\%$									
+5.5V	$+5.5\text{V} \pm 0.5\text{V}$									
+5V	$+5\text{V} \pm 0.25\text{V}$									

• TEST POINTS

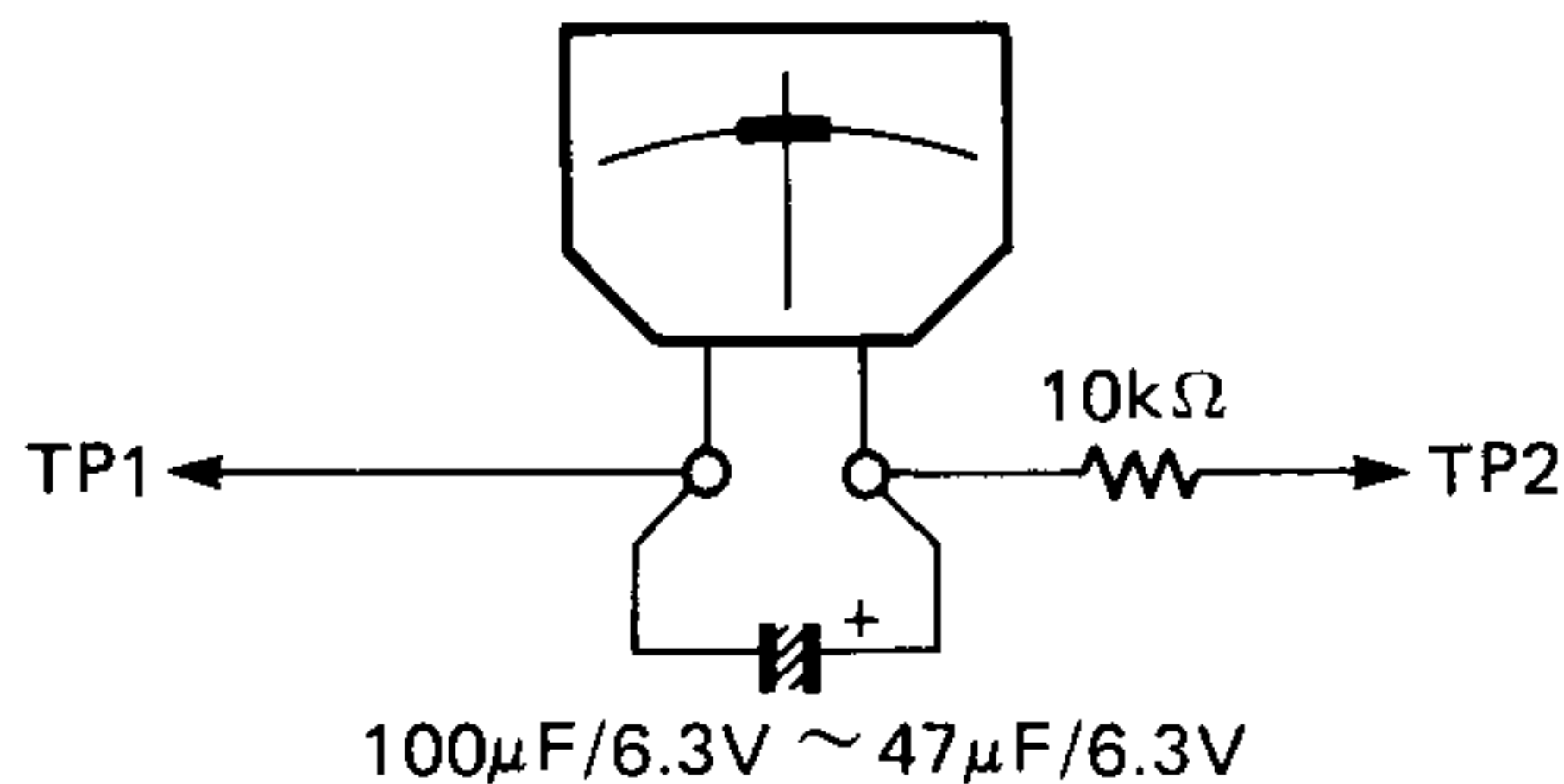


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< FM TUNER SECTION >

- 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

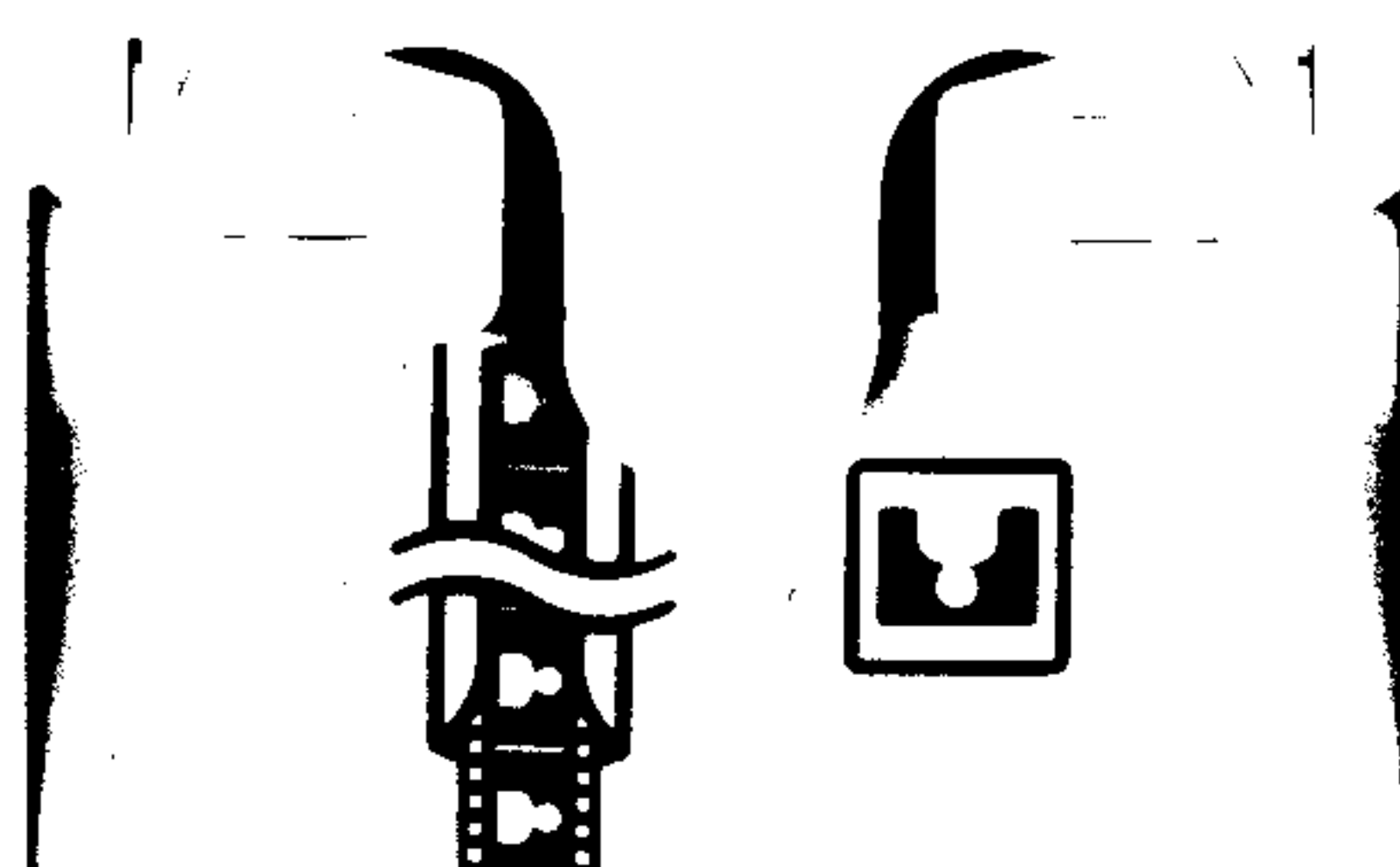


- Shorting TEST (R156 and J119 Before Fig. TEST POINT) while set at FM will result in automatic memory of each preset from P1/P9 to P9/P16 as given in the right table. This is convenient when making an adjustment.

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 (15.2dBf, 1.58μV/75Ω) G model only Less than 6dBμ (17.3dBf, 2μV/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.				

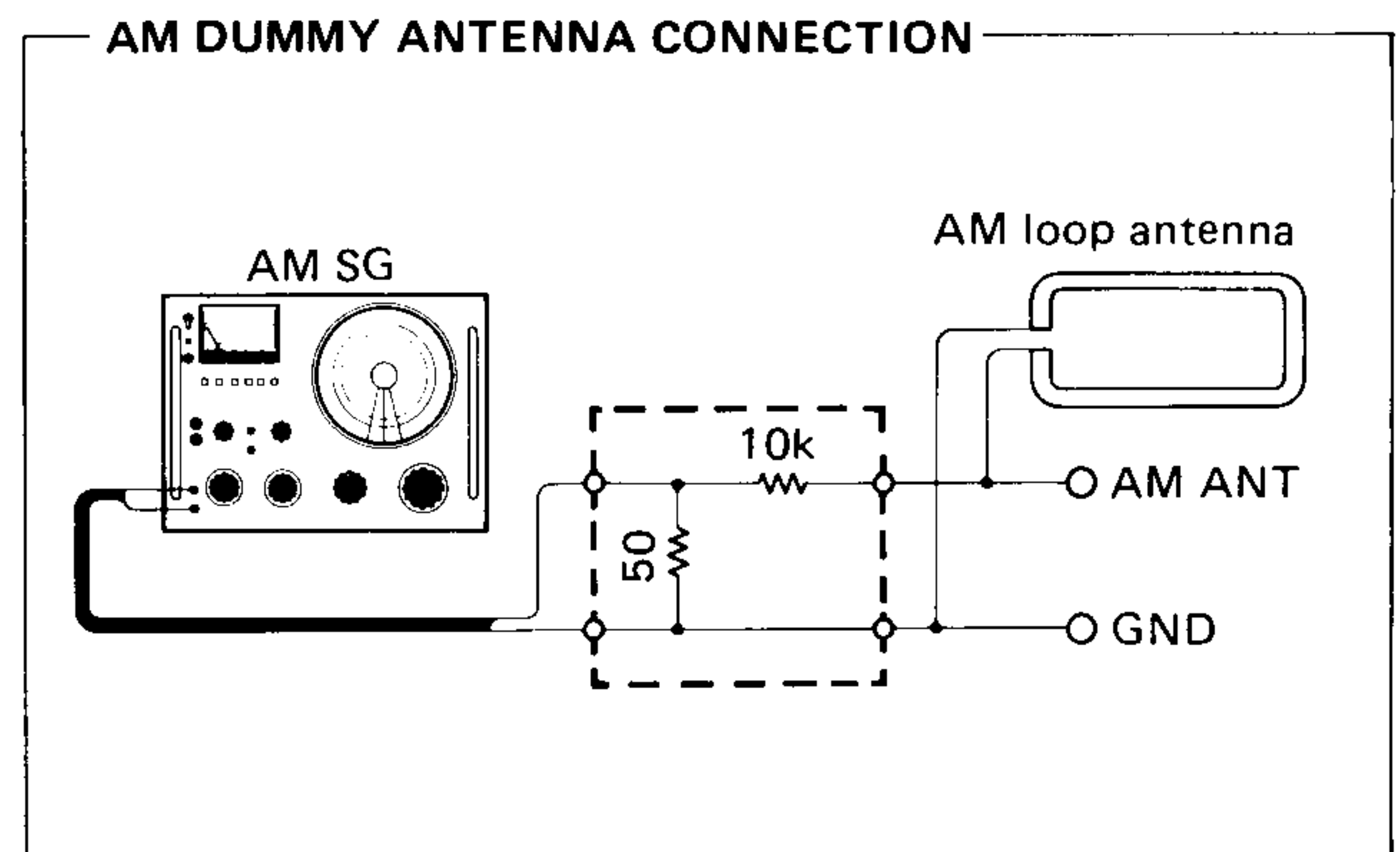


Step	Item to be Adjusted	Connection terminal	Instrument required	Adjustment locations	Adjustment method	Rating or standard	Remarks
7	Confirmation of discriminator balance	75Ω FM ANT	FM SG [98.1MHz ± 1kHz 70dBμ (81.2dBf, 3.16mV/75Ω) MONO 1kHz 100% MOD		Confirm that the auxiliary center meter deflects 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.

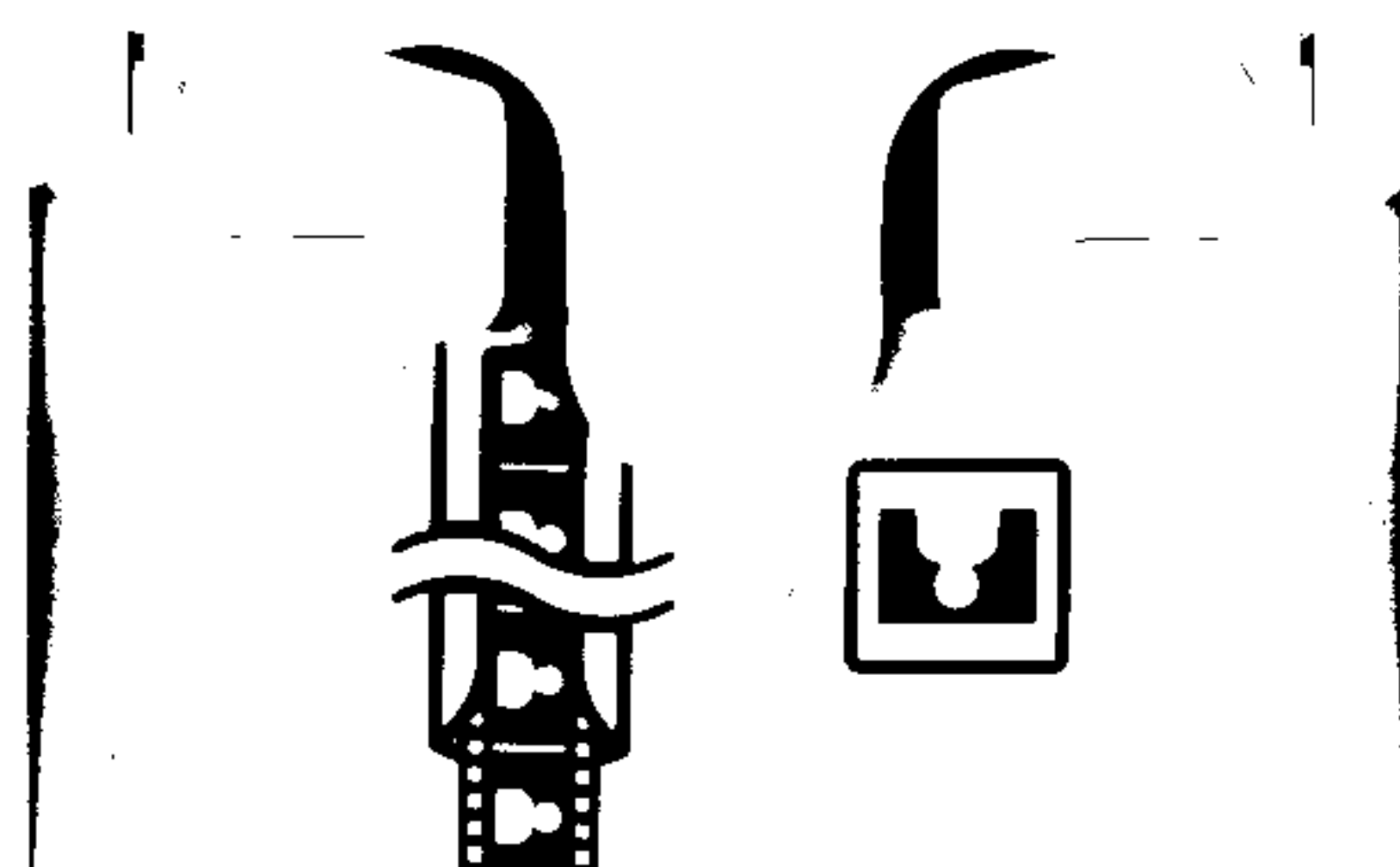
Note: X dBμ = x + 5.2dBμf

< AM TUNER SECTION >

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

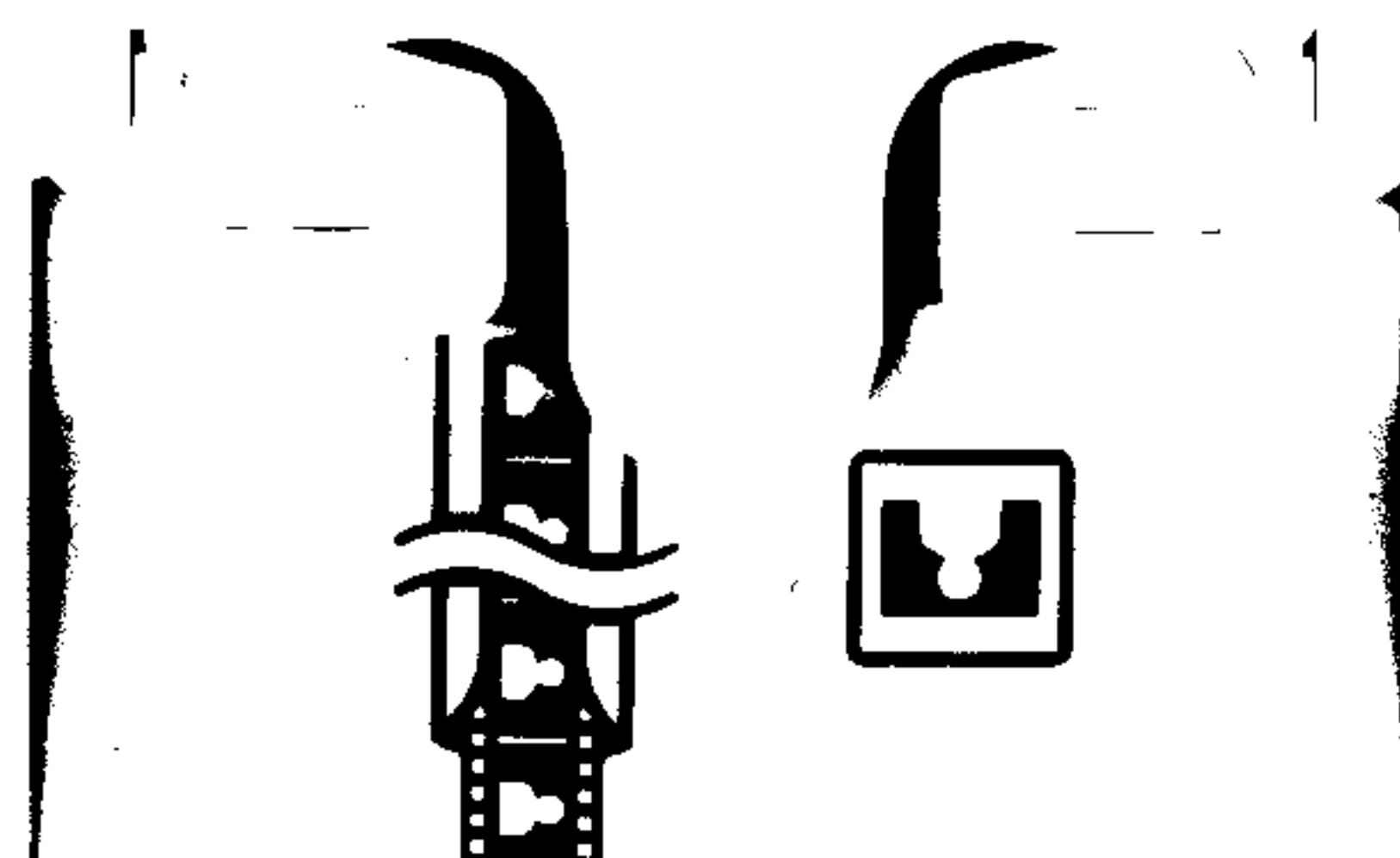


Step	Item to be Adjusted	Connection terminal	Instrument required	Adjustment locations	Adjustment method	Rating or standard
1	AM IFT	AM ANT	AM SG AM dummy antenna [630kHz ± 0.1kHz 50dBμ (61.2dBf, 316μV/75Ω) 400Hz, 30% MOD	T103	Adjust T103 to maximize detector output.	
		OUTPUT	ACVM			
2	Confirmation of 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 / $\overline{\text{SCK}}$		
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	$\overline{\text{RES}}$	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

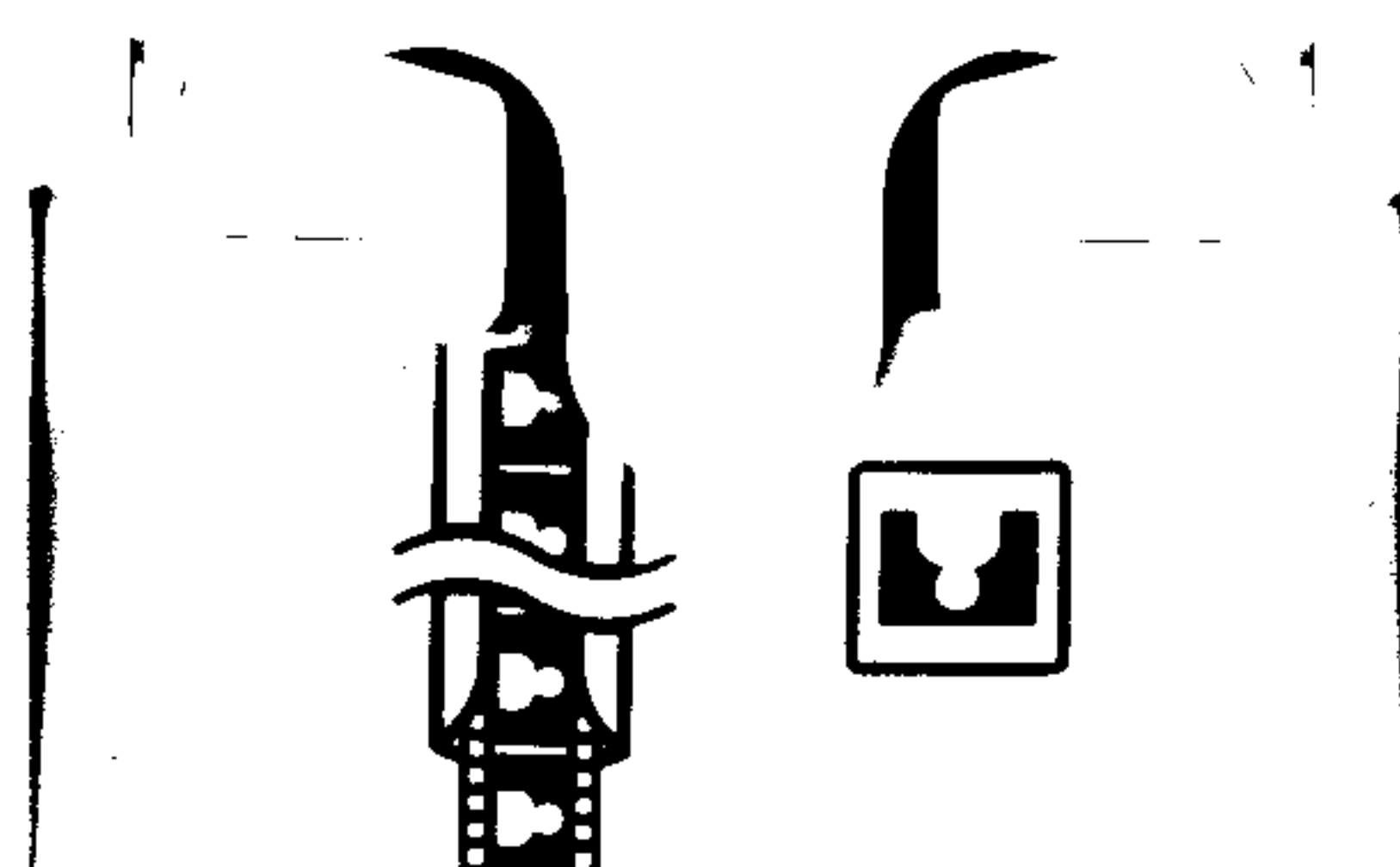
OUTPUT INPUT	D1 (Pin 3)	D2 (Pin 4)	D3 (Pin 5)	D4 (Pin 6)
K1 (Pin 7)	FM/AM (SW101)	UP (SW103)	P1/P9 (SW107)	P5/P13 (SW111)
K2 (Pin 8)	AUTO/MAN'L (SW102)	DOWN (SW104)	P2/P10 (SW108)	P6/P14 (SW112)
K3 (Pin 9)		P1-8/P9-16 (SW105)	P3/P11 (SW109)	P7/P15 (SW113)
K4 (Pin 10)		MEMORY (SW106)	P4/P12 (SW110)	P8/P16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

Table 1

● REMOTO CONTROL SIGNAL

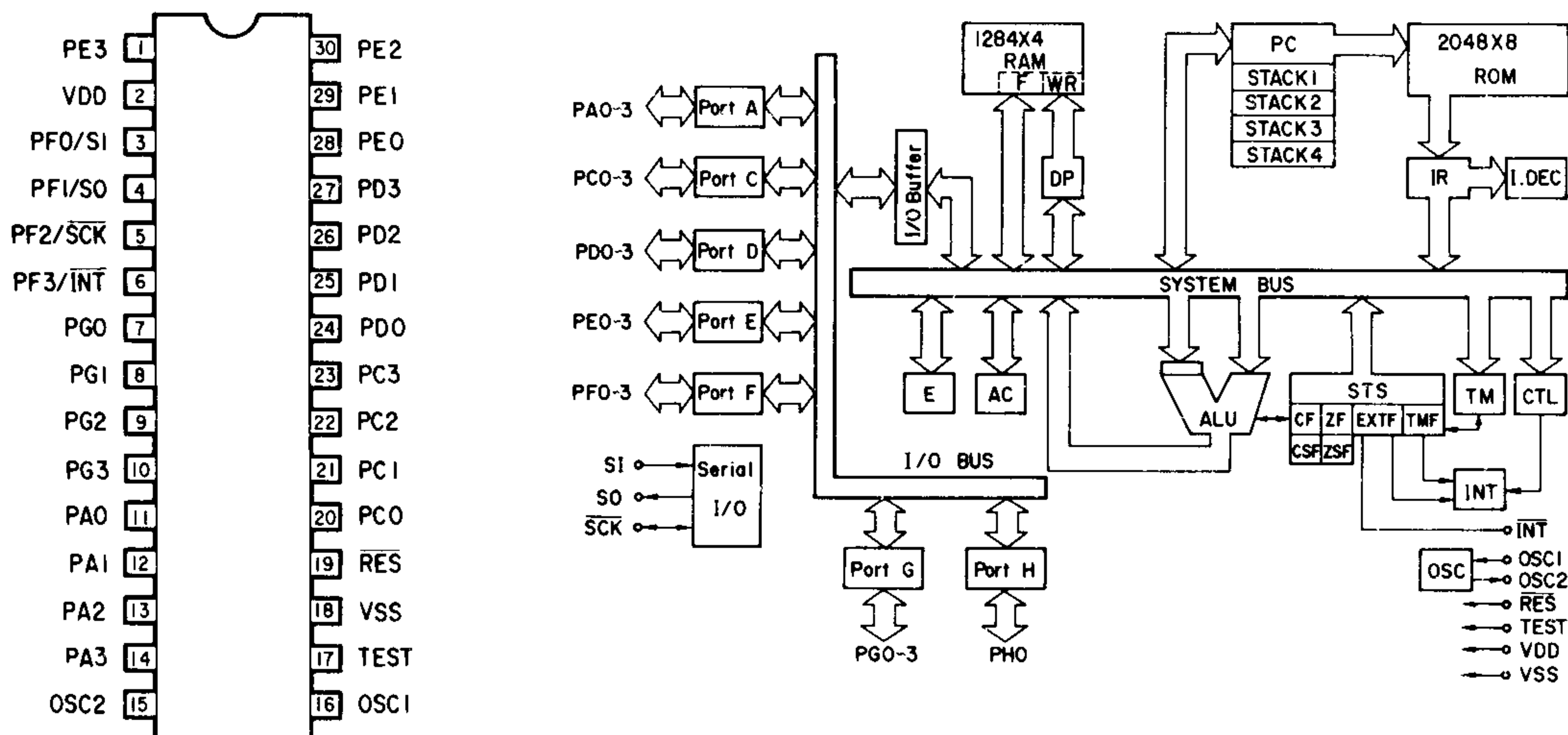
REM 0 (Pin 11)	REM 1 (Pin 12)	CONTROL
L	H	PRESET UP
H	L	PRESET DOWN
H	H	P1-P8/P9-P16

Table 2

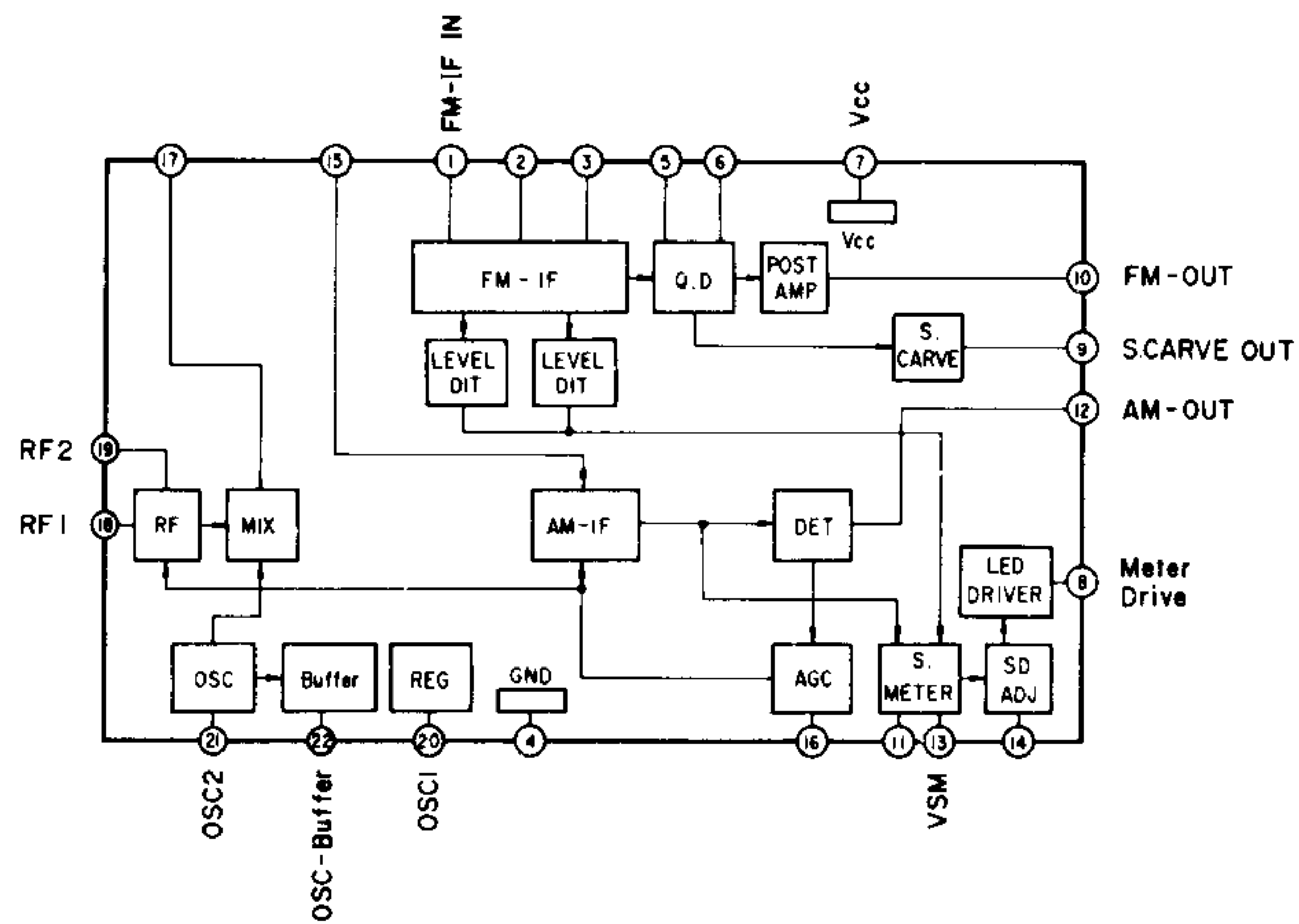


IC BLOCK CIRCUIT DATA

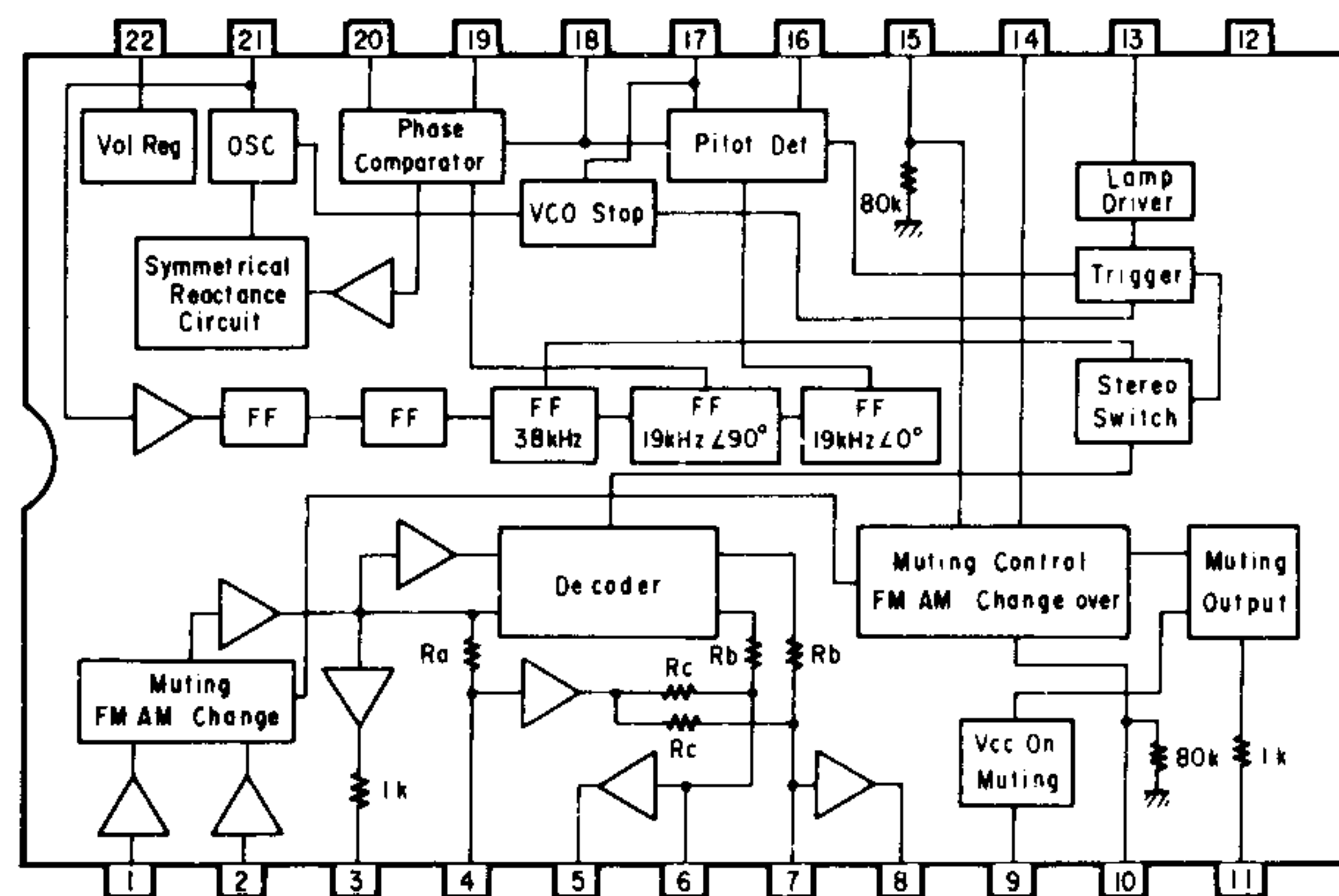
IC104: LC6523C-779



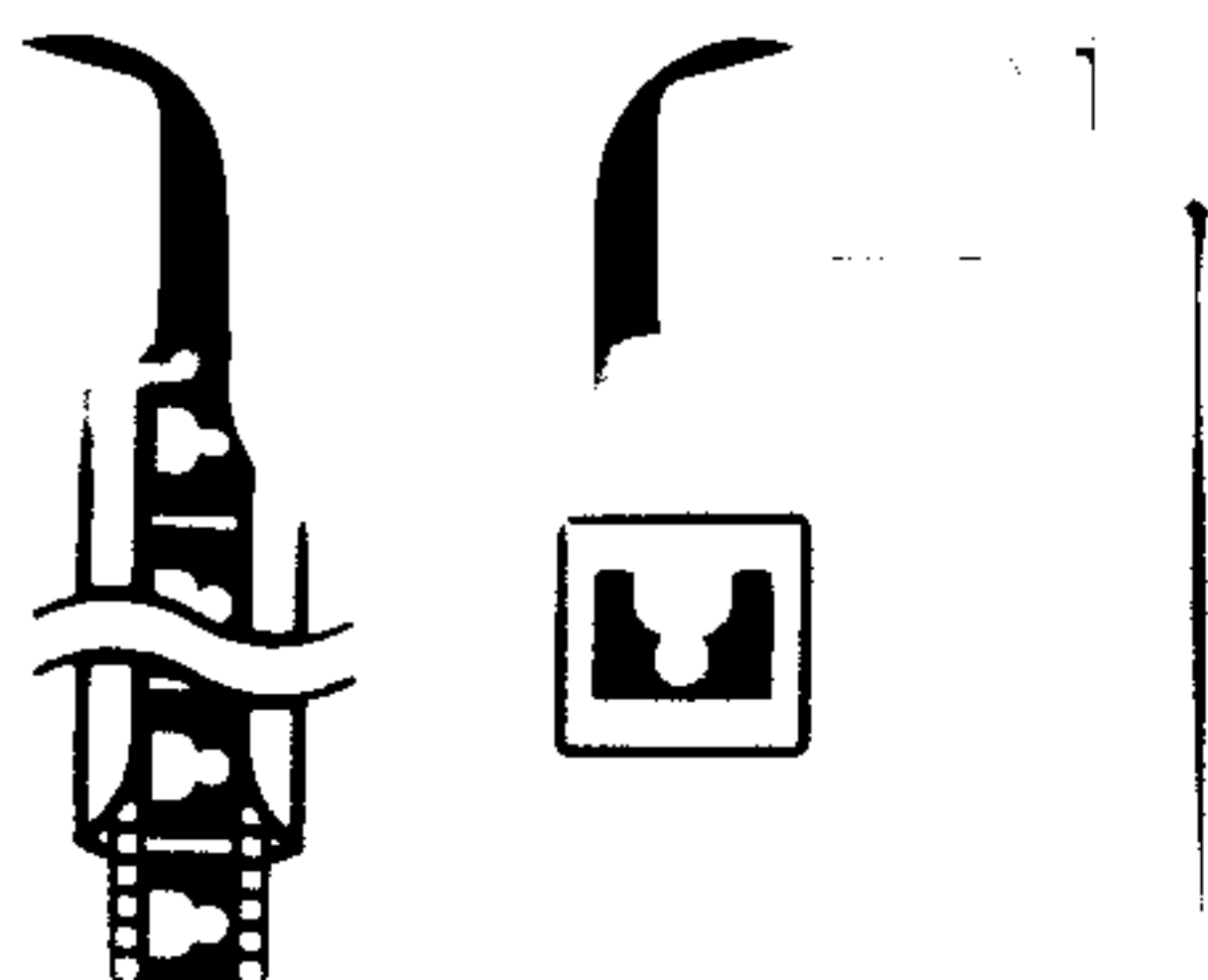
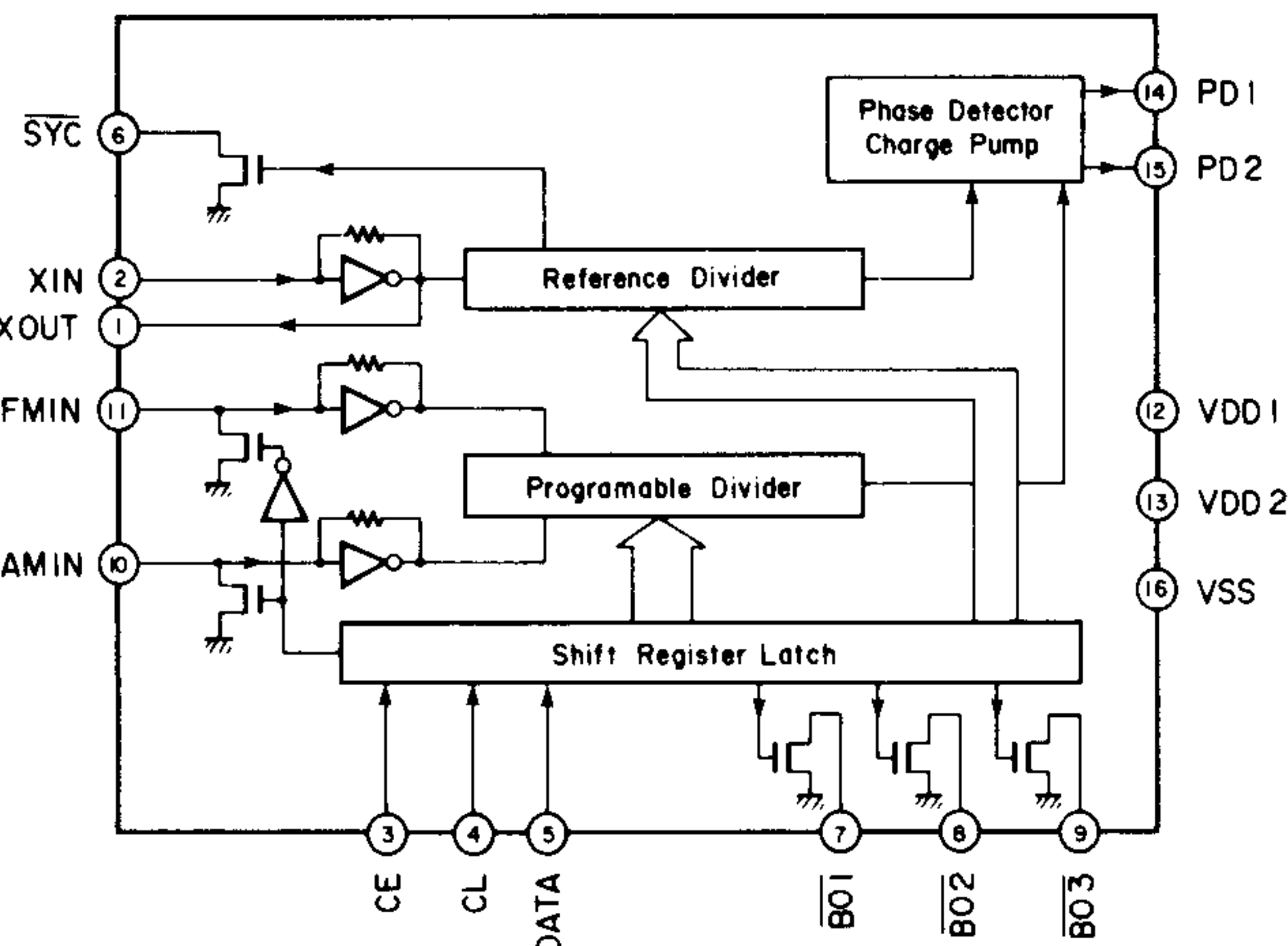
IC101: LA1265



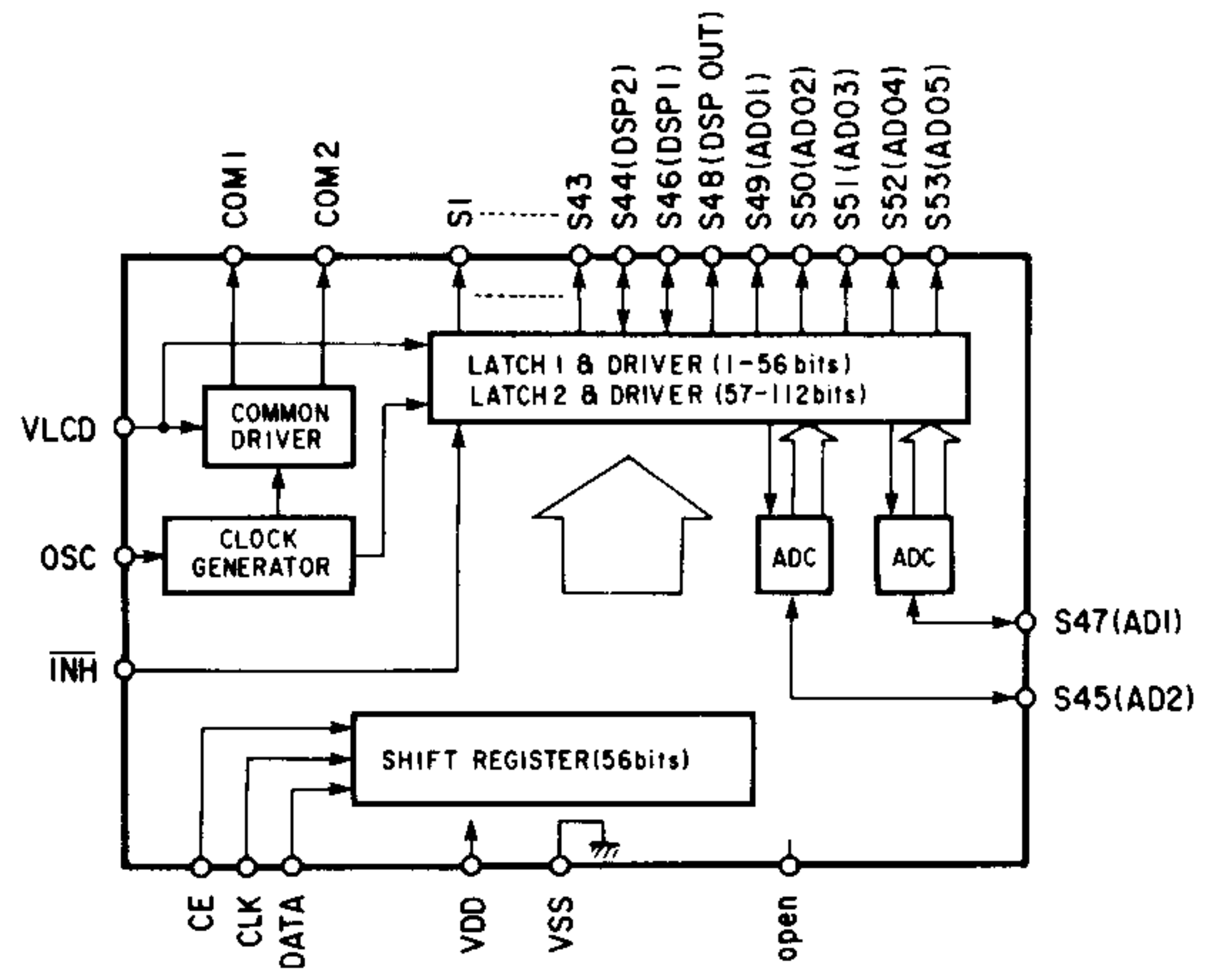
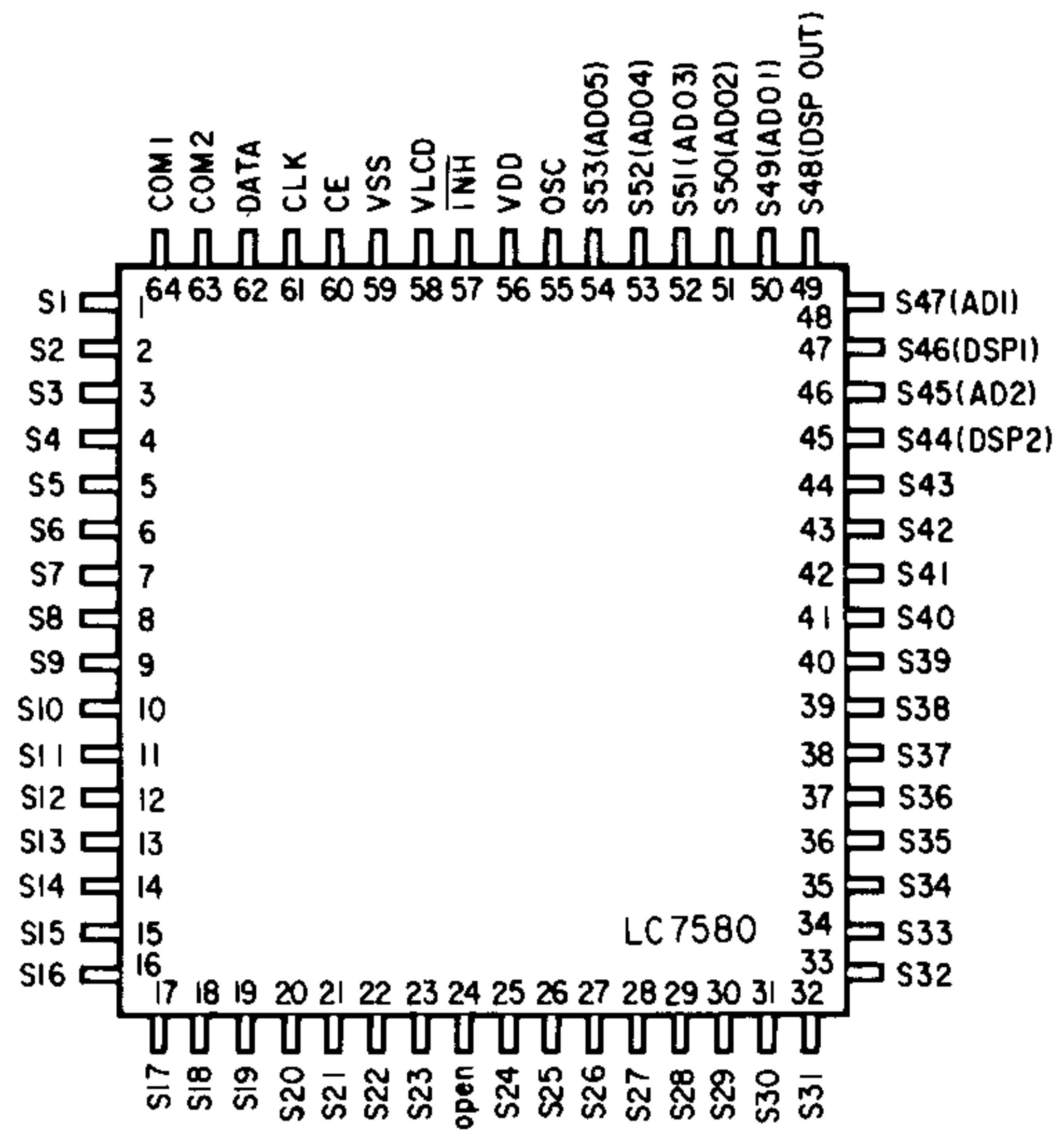
IC102: LA3401



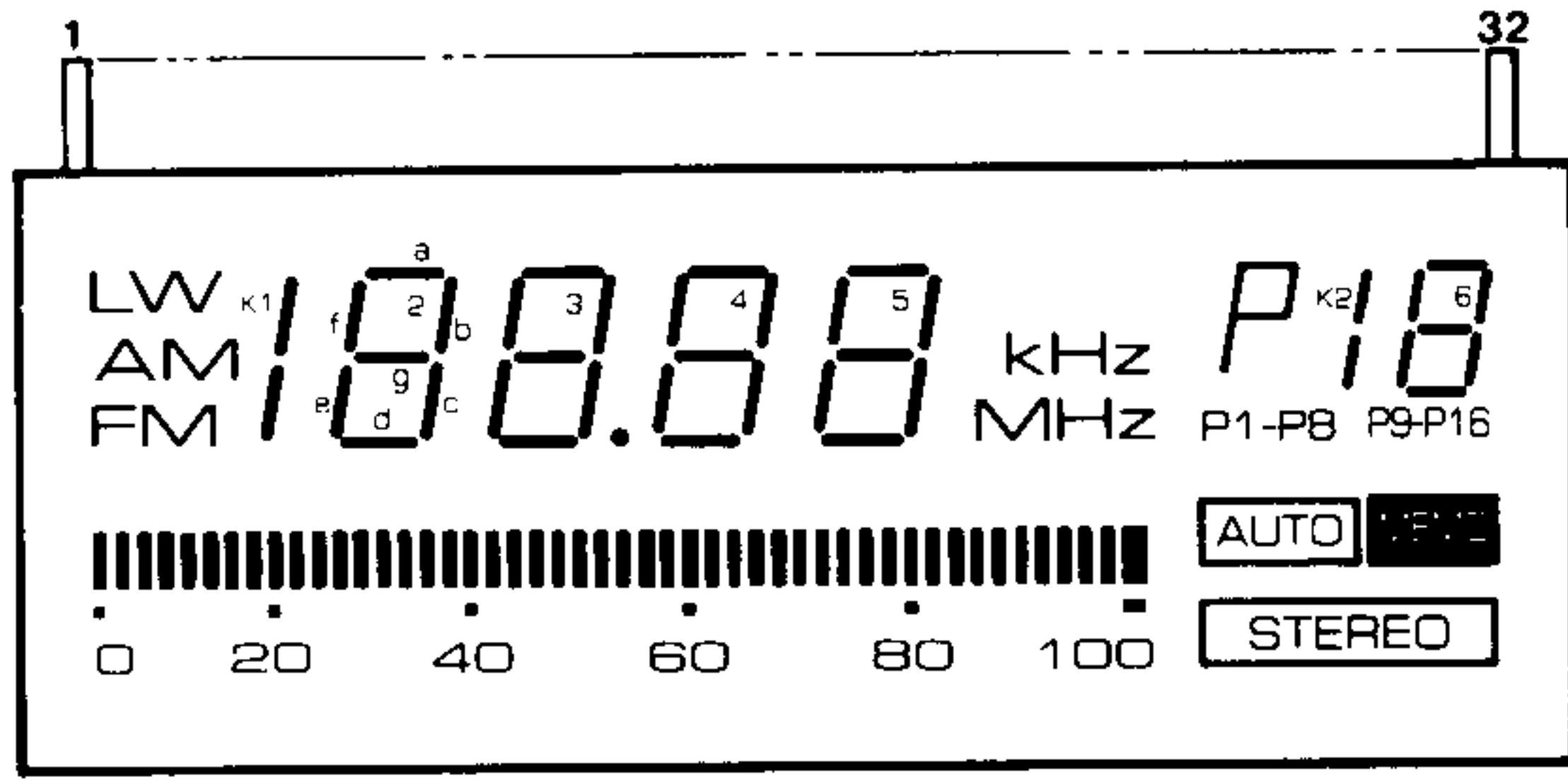
IC103: LM7001



IC301: LC7580

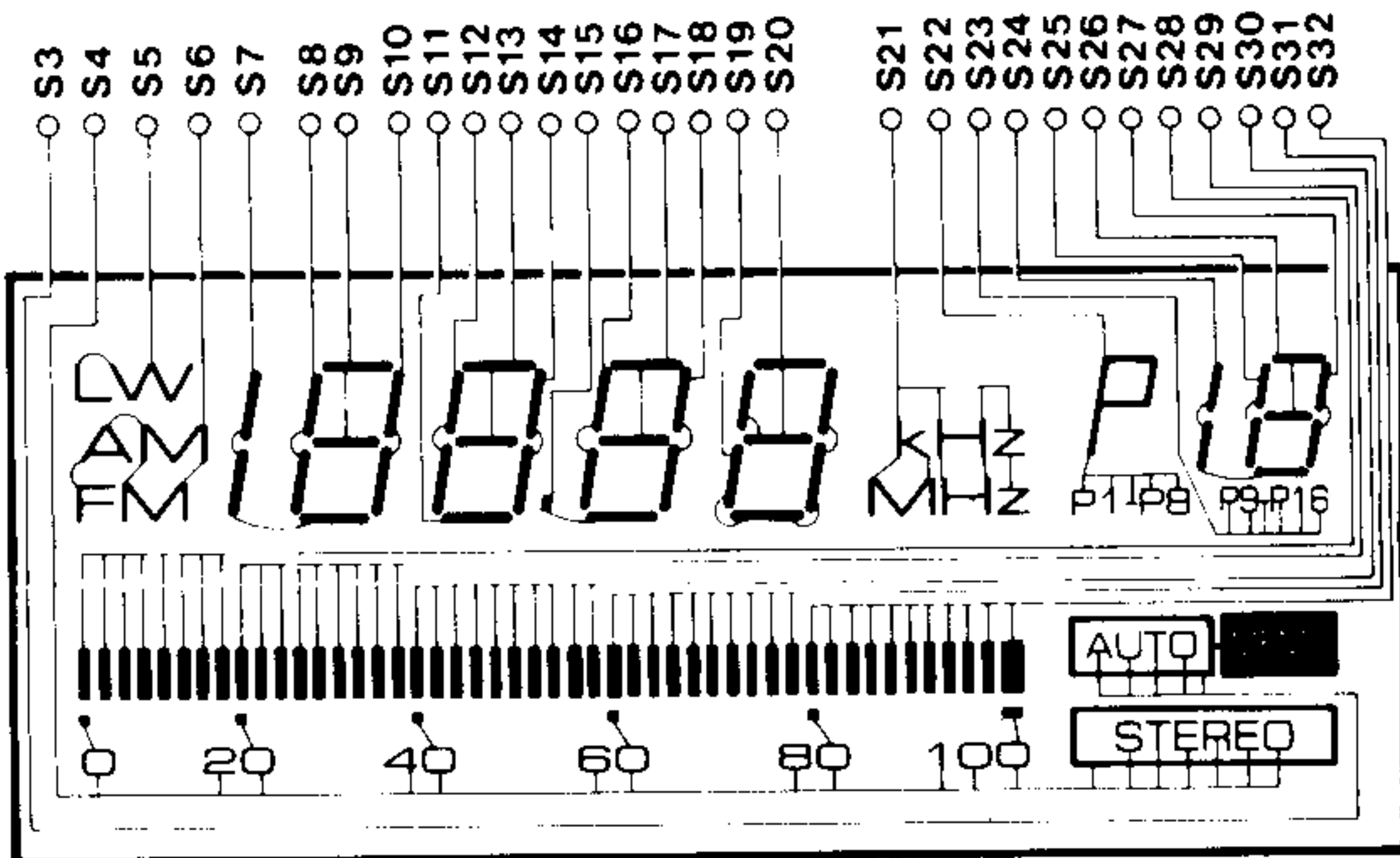


LCD9422P

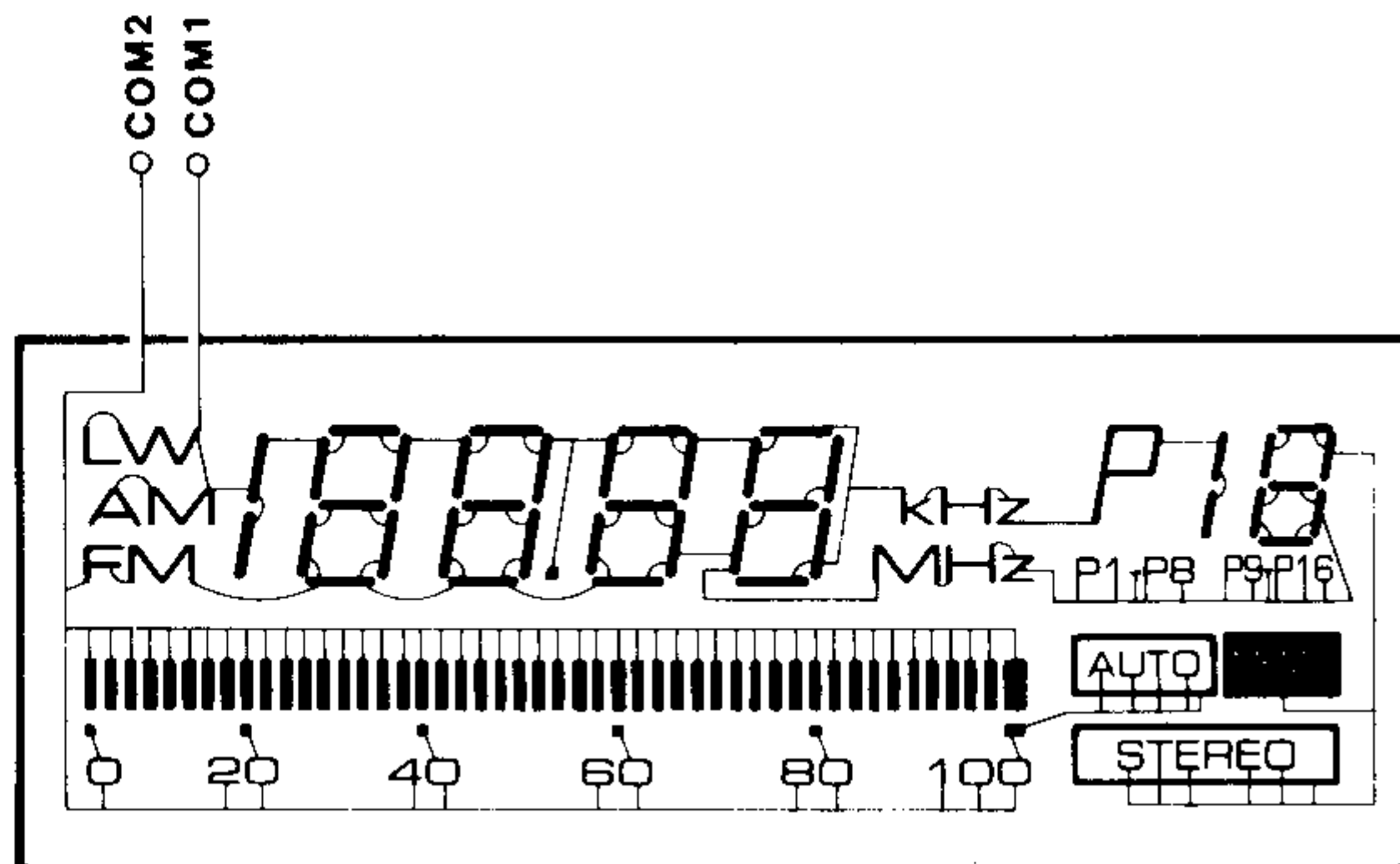


LCD Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
IC301 Pin No.	63	64	2	3	1	4	5	6	7	8	9	10	11	12	13	14
COM1	—	COM1	MEMO	STEREO	LW	AM	K1	2f	2a	2b	—	3f	3a	3b	COL	4f
COM2	COM2	—	AUTO	0 ~ 100	—	FM	2d	2e	2g	2c	3d	3e	3g	3c	4d	4e
LCD Pin No.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
IC301 Pin No.	15	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

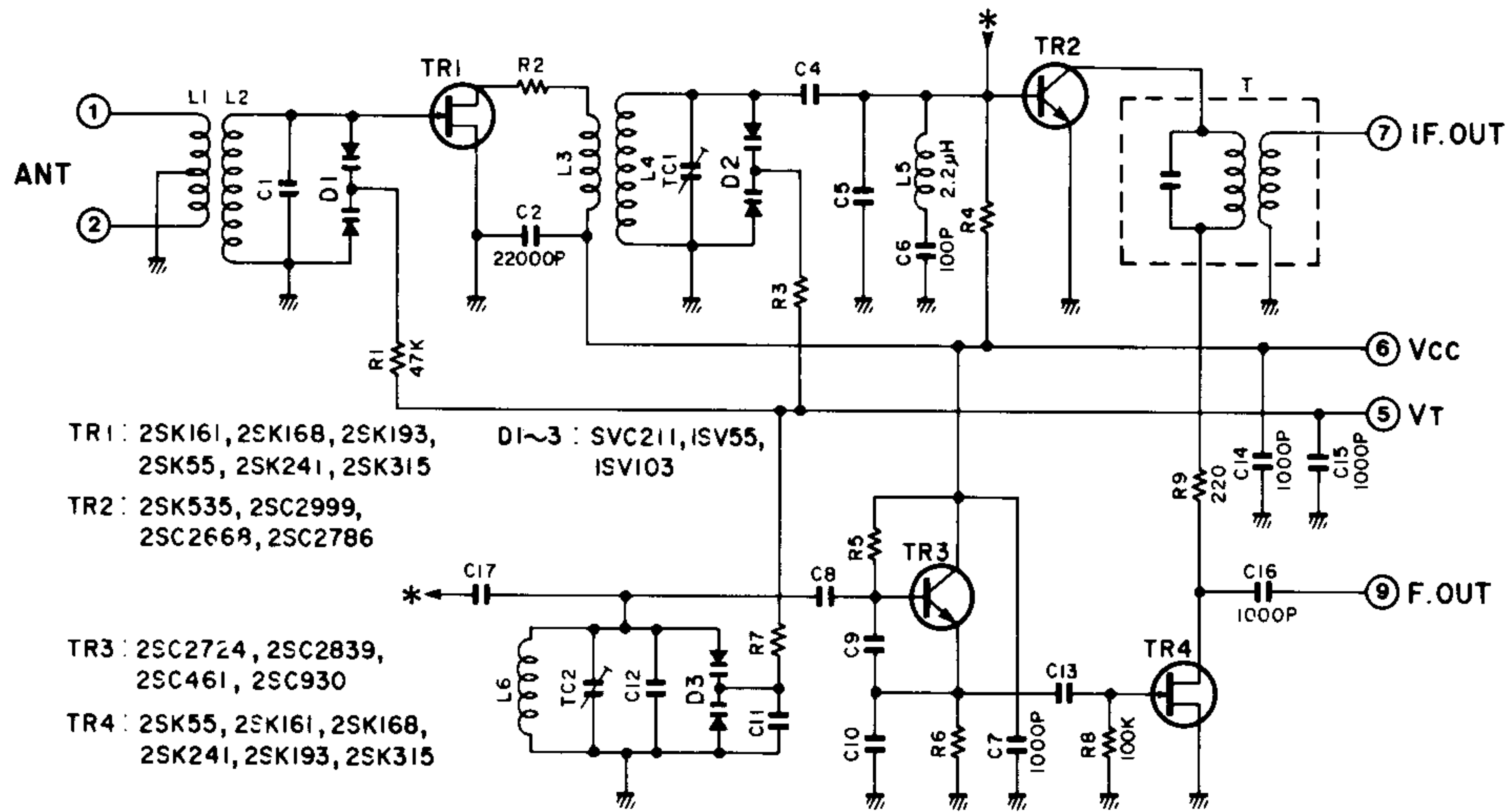


COMMON



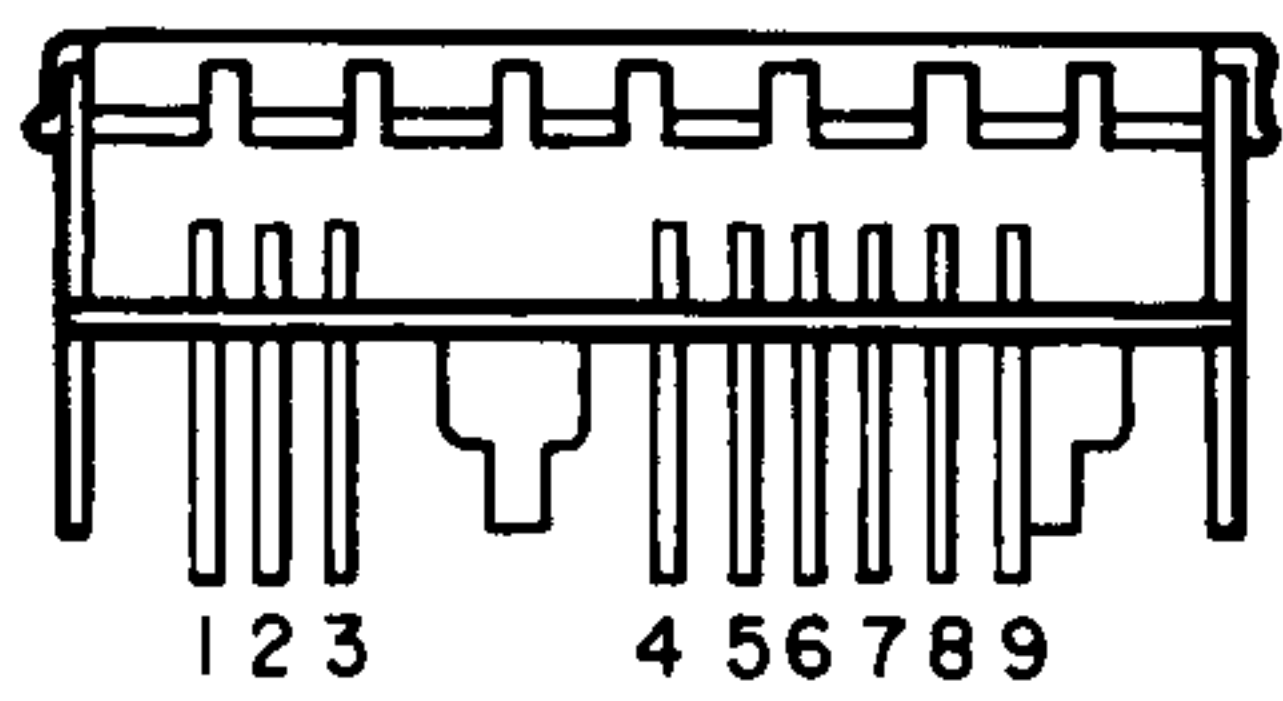
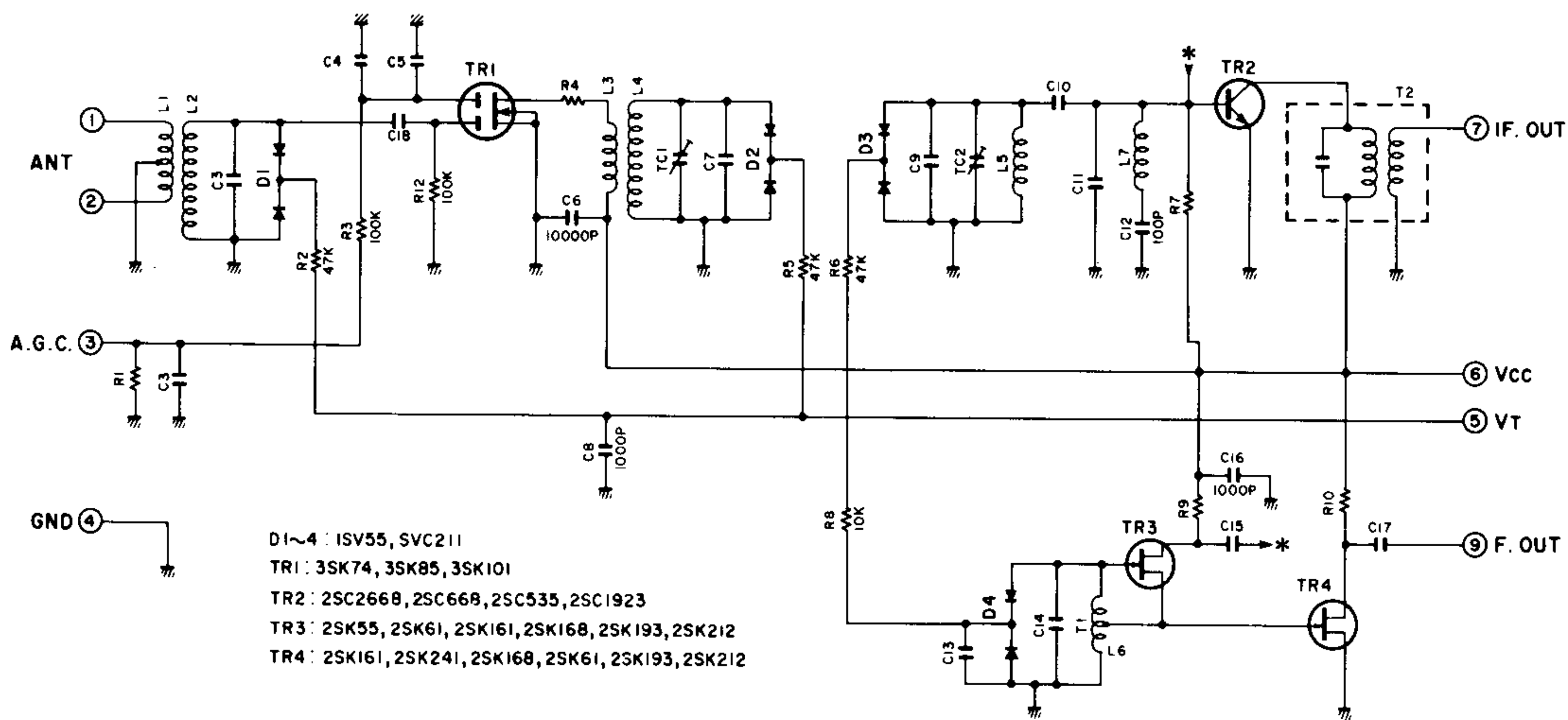
● FRONT END PACK (PK101)

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



T-420

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

