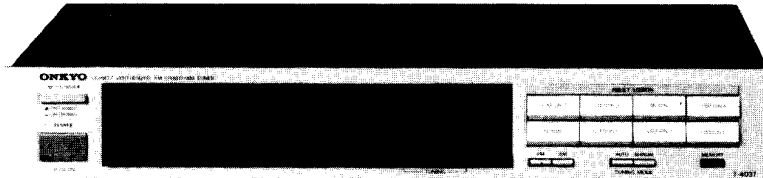




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# ONKYO SERVICE MANUAL

## SYNTHESIZED FM STEREO/AM TUNER MODEL T-4037



Silver and black models

UD, UDN, BUD, BUDN	120V AC, 60Hz
UG, BUG	220V AC, 50Hz
UW, BUW	120 or 220V AC, 50/60Hz
UQA, UQB	240V AC, 50Hz

### SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK  $\triangle$  ON THE SCHEMATIC DIAGRAM AND IN THE PARTS LIST ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE THESE COMPONENTS WITH ONKYO PARTS WHOSE PARTS NUMBERS APPEAR AS SHOWN IN THIS MANUAL.

MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

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**ONKYO**  
**AUDIO COMPONENTS**

## SPECIFICATIONS

	(D/W models)
<b>FM:</b>	
Tuning Range:	87.5 – 108.0MHz (100kHz steps) [D model] 87.5 – 108.0MHz (50kHz steps) [W model]
Usable Sensitivity:	Mono: 11.2dBf, 2.0 $\mu$ V, IHF Stereo: 17.2dBf, 4.0 $\mu$ V
50dB Quieting Sensitivity:	Mono: 16.1dBf, 3.5 $\mu$ V Stereo: 36.1dBf, 35 $\mu$ V
Capture Ratio:	1.5dB
Image Rejection Ratio:	40dB
IF Rejection Ratio:	90dB
Signal-to-Noise Ratio:	Mono: 73dB Stereo: 66dB
Alternate Channel Att:	55dB IHF ( $\pm$ 400kHz)
AM Suppression Ratio:	50dB
Total Harmonic Distortion:	Mono: 0.1% Stereo: 0.2%
Frequency Response:	30 – 15,000Hz $\pm$ 1.5dB
Stereo Separation:	40dB at 1kHz 30dB at 70 – 10,000Hz
Output Voltage:	0.5V
Muting Level:	17.2dBf, 4.0 $\mu$ V
<b>AM:</b>	
Tuning Range:	520 – 1,710kHz (10kHz steps) [D model] 522 – 1,611kHz or 520 – 1,710kHz (9kHz or 10kHz steps) [W model]
Usable Sensitivity:	25 $\mu$ V
Image Rejection Ratio:	40dB
IF Rejection Ratio:	30dB
Signal-to-Noise Ratio:	40dB
Total Harmonic Distortion:	0.8%
Output Voltage:	150mV
<b>General</b>	
Semiconductors:	FETs: 5 TR: 24 ICs: 7 Diodes: 38 LEDs: 13 [D model] FETs: 5 TR: 26 ICs: 7 Diodes: 40 LEDs: 13. [W model]
Dimensions (W x H x D):	435 x 73 x 265mm (17-1/8" x 2-7/8" x 10-7/16")
Weight:	3.4kg., 7.5lbs.

	(G/Q models)
<b>FM:</b>	
Tuning Range:	87.5 – 108.0 MHz (50 kHz steps)
Usable Sensitivity:	Mono: 11.2 dBf, 2.0 $\mu$ V IHF 0.9 $\mu$ V, 75 $\Omega$ DIN Stereo: 2.0 $\mu$ V, 75 $\Omega$
50 dB Quieting Sensitivity:	Mono: 1.7 $\mu$ V, 75 $\Omega$ Stereo: 17 $\mu$ V, 75 $\Omega$
Capture Ratio:	1.5 dB
Image Rejection Ratio:	80 dB
IF Rejection Ratio:	90 dB
Signal-to-Noise Ratio:	Mono: 73 dB Stereo: 66 dB
Selectivity:	55 dB DIN ( $\pm$ 300 kHz, 40 kHz dev.)
AM Suppression Ratio:	50 dB
Total Harmonic Distortion:	Mono: 0.1% Stereo: 0.2%
Frequency Response:	30 – 15,000 Hz $\pm$ 1.5 dB
Stereo Separation:	40 dB at 1 kHz 30 dB at 70–10,000 Hz
Output Voltage:	750 mV
Muting Level:	2.0 $\mu$ V
<b>AM:</b>	
Tuning Range:	522–1611 kHz (9 kHz steps)
Usable Sensitivity:	25 $\mu$ V
Image Rejection Ratio:	40 dB
IF Rejection Ratio:	30 dB
Signal-to-Noise Ratio:	40 dB
Total Harmonic Distortion:	0.8%
Output Voltage:	150 mV
<b>General</b>	
Semiconductors:	FETs: 5 TR: 28 ICs: 7 Diodes: 41 LEDs: 13
Dimensions (W x H x D):	435 x 73 x 265 mm (17-1/8" x 2-7/8" x 10-7/16")
Weight:	3.4 kg., 7.5 lbs.

Specifications and features are subject to change without notice.

## SERVICE PROCEDURES

### 1. Installation resistance measurement (only U.S. model)

Connect the insulating-resistance tester between the plug of power supply cable and the nickel screw on the back panel.

Specification; 3.3M $\Omega$   $\pm$  10% at 500V

### 2. Replacing the lamp

This unit uses the lamp listed below.

circuit no.	part no.	description
PL901	210064A	PL6.3V 250mA, dial plate illumination

**3. Voltage Selector (Back Panel)**

W models are equipped with a voltage selector to conform with local power supplies. Be sure to set this switch to match the voltage of the power supply in your area before turning the power switch on. This switch is set to 220V at the factory. Voltage is changed by sliding the groove in the switch with a screwdriver to the right or left. Confirm that the switch has been moved all the way to the right or left before turning the power switch on. Models without a voltage selector can only be used in areas where the power supply is the same as that of the unit.

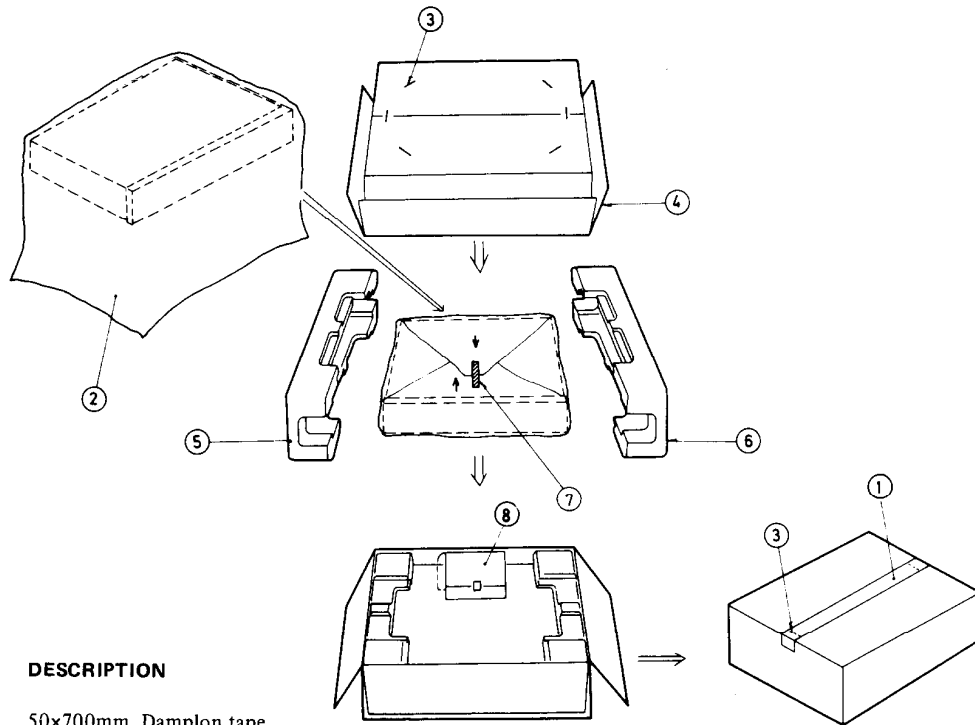
**4. Tuning Step Frequency Switch (Back Panel)**

W models are equipped with a switch for the AM (9kHz/10kHz) and FM (50kHz/100kHz) bands. The switch should be set to the proper steps for the radio broadcast frequencies in your area.

**5. Memory Preservation**

This unit does not require memory preservation batteries. A built-in memory power back-up system preserves contents of the memory during power failures and even when the unit is unplugged. The unit must be plugged in and the power switch turned on and off once in order to charge the back-up system. Note that since this is not a permanent memory, the power switch must be turned on and off a few times each month to keep the back-up system operable. The period of time during which memory contents are preserved after power has last been turned off varies depending on climate and the location and placement of the unit. On the average, memory contents are protected over a period of 3 to 4 weeks (a minimum of 2 weeks) after the last time power has been turned off. This period is shorter when the unit is exposed to very high humidity or used in an area with an extremely humid climate.

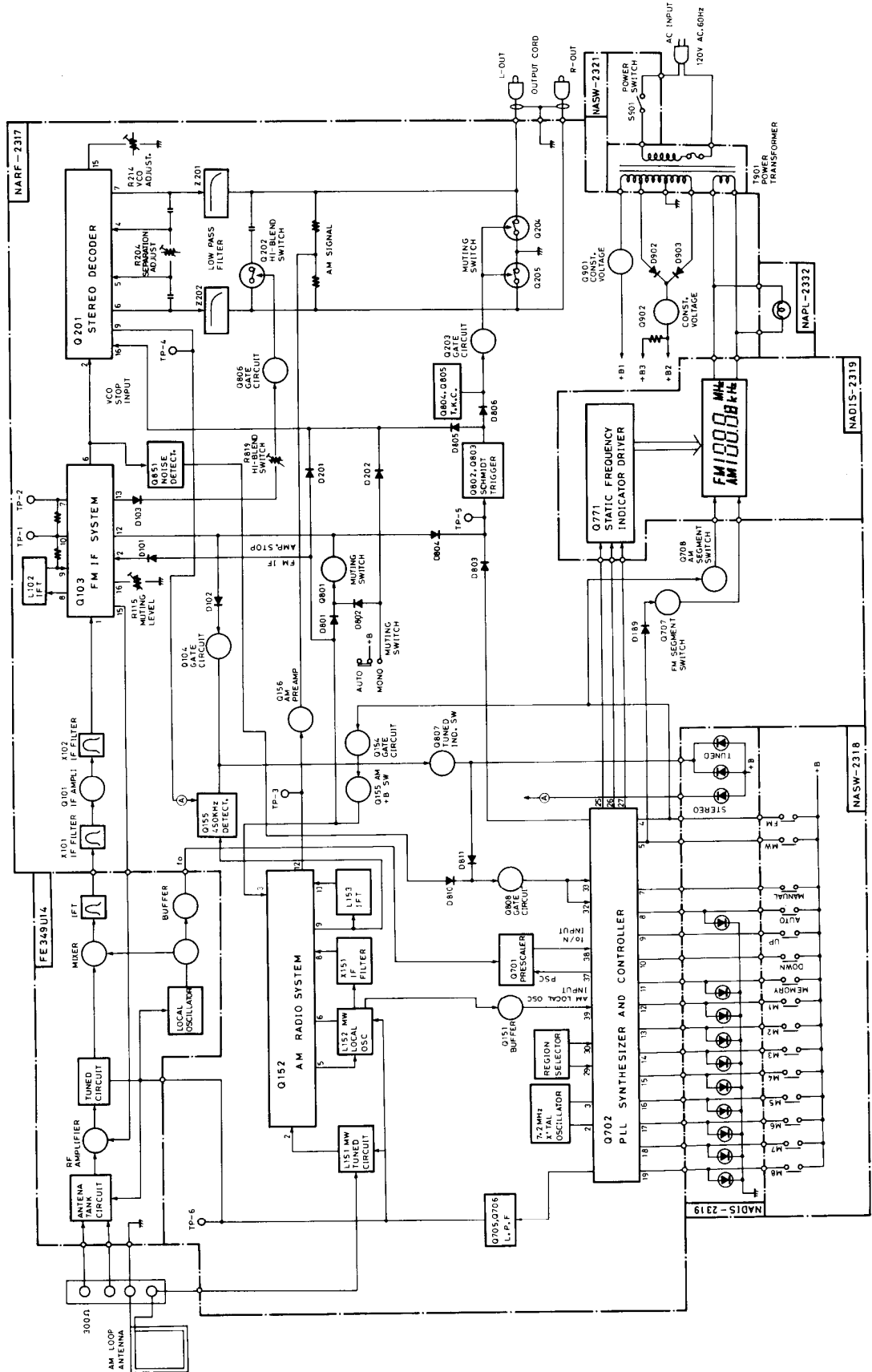
**PACKING VIEW**



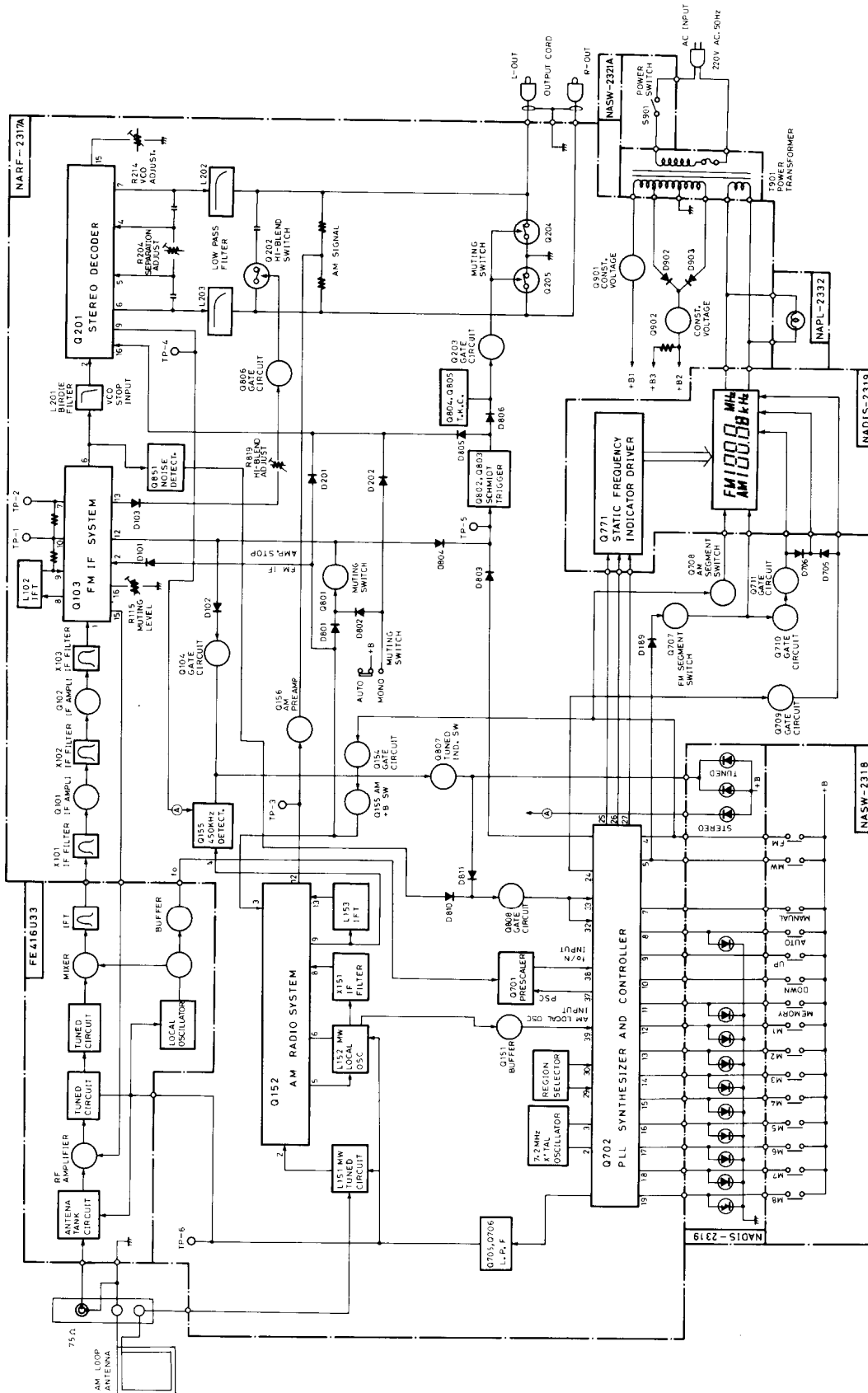
REF. NO.	PART NO.	DESCRIPTION
1	260012	50x700mm, Dampson tape
2	29100051	420x750mm, Poly-vinyl bag
3	282301	Sealing hook
4	29051114	Master carton box (Silver model)
	29051115	Master carton box (Black model)
5	29090532B	Pad R
6	29090533E	Pad L
7	29110032	W=15mm, Adhesive tape
8	Accessory bag ass'y	
	292064A	FM antenna (D/W)
	292092	FM antenna (G)
	29340875	Instruction manual (D)
	29340876	Instruction manual (G/W)
	25055040	CV-K-2, Conversion plug
	29365006-6	Warranty card (U.S. model)
	29358002B	Service station list (U.S. model)
	29100006A	350x250mm, Poly-vinyl bag

(D) : Only 120V model  
 (G) : Only 220V model  
 (W) : Only 120/220V model

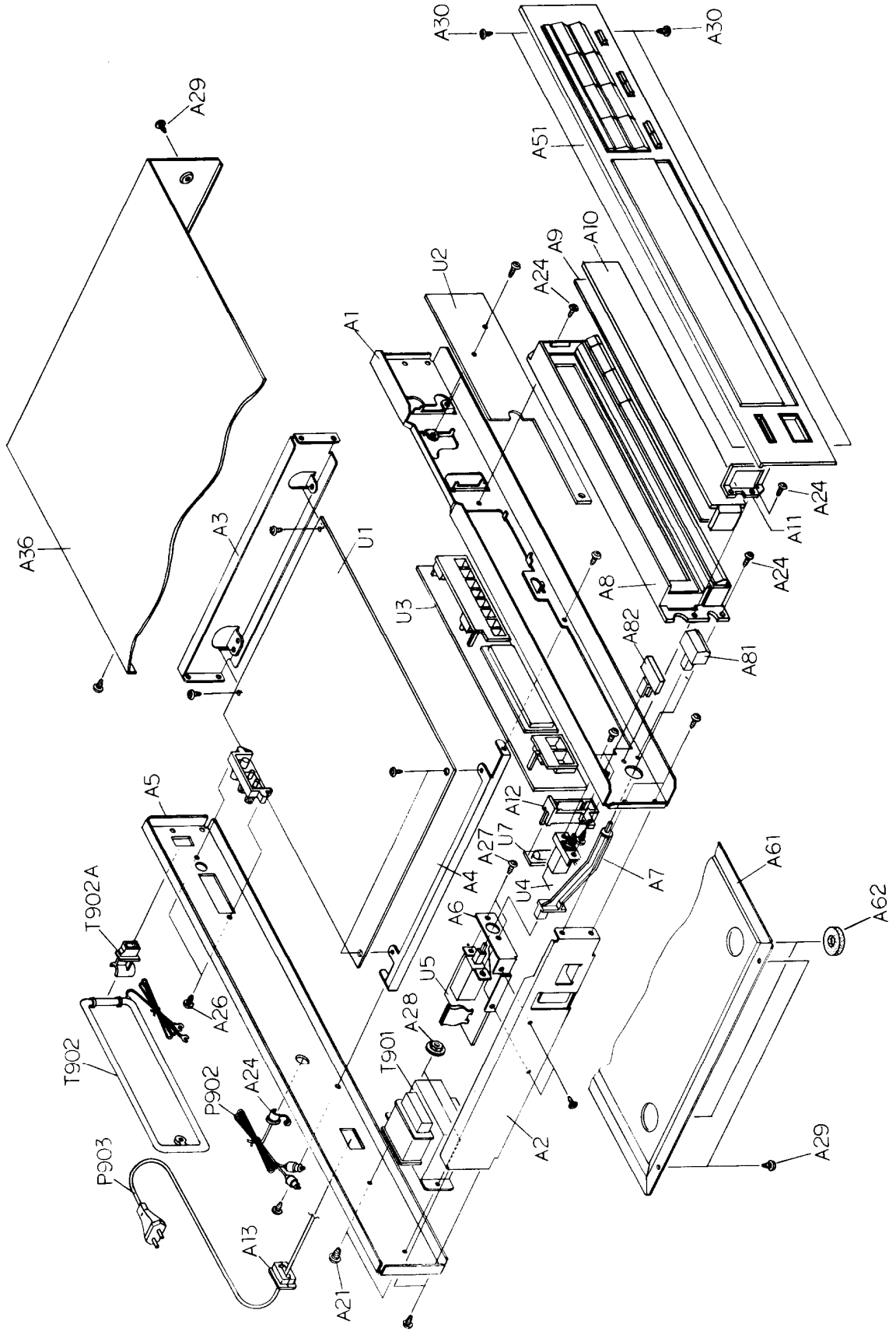
# BLOCK DIAGRAM D model



# BLOCK DIAGRAM G model



**EXPLODED VIEW**

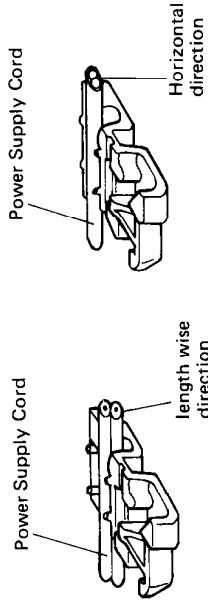


# PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
A1	27110247A	Front bracket	A51	18508121	Front panel ass'y (B)	U7	18488523	NAPL-2323, Edge light pc board ass'y (D)
A2	27115130E	Side bracket		28191302A	Clear plate		18494532	NAPL-2332, Edge light pc board ass'y (G/W)
A3	27115169	Side bracket R		27267389B	Guide, power			
A4	27130395	Bracket, pc board		27267418	Guide, mode			
A5	27120709	Back panel (D)	A61	28322069B	Knob ass'y, preset			
	27120710	Back panel (G)	A62	27170203A	Bottom board			
	27120711	Back panel (W)	A81	27175011C	Leg			
A6	27140990A	Bracket, power	A82	28321928	Knob, power (S)			
A7	27273030C	Joint L		28321905B	Knob, power (B)			
A8	28322046B	Knob ass'y, holder		28322093A	Knob, mode (S)			
A9	28133134B	Back plate	A82	28322094A	Knob, mode (B)			
A10	28130227A	Dial plate	P902	2010087A	PN-C, Connection cable			
A11	27190372B	Holder, dial	P903	253099B or	AS-UC-3, Power supply cord			
A12	27190373	Holder, lamp		253099C	(D)			
A13	27300750	Strainrelief		253127	AS-CEE, Power supply cord (G/W)			
A14	270025	SR-3P-4, Strainrelief	S902	25065123	NSS-1258P, Voltage selector switch (W)			
A21	838440089	4TTB+8C (BC), Tapping screw	T901	230885	NPT-879D, Power transformer (D)			
A22	834430068	3TTW+6B (BC), Tapping screw		230886	NPT-879G, Power transformer (G)			
A24	831430088	3TTW+8B (BC), Tapping screw		230887	NPT-879DG, Power transformer (W)			
A25	834230108	3TTS+10B (Ni), Nickel screw	T902	232085	NMA-3034, AM loop antenna			
A26	834430108	3TTS+10B (BC), Tapping screw	T902A	27190105	Holder, antenna			
A27	82143006	3P+6FN (BC), Pan head screw	U1	18488517	NARF-2317, Main circuit pc board ass'y (D)			
A28	86414010	FWN4x10FN, Flange nut		18494517A	NARF-2317A, Main circuit pc board ass'y (G)			
A29	834430068	3TTS+6B (BC), Tapping screw		18490517B	NARF-2317B, Main circuit pc board ass'y (W)			
A30	838430068	3TTB+6B (BC), Tapping screw	U2	18488518	NASW-2318, Function switch pc board ass'y			
A31	28140629	24x17x1.5, Cushion	U3	18488519	NADIA-2319, Display pc board ass'y			
A32	82143006	3P+6FN (BC), Pan head screw (W)	U4	18488520	NASW-2320, Muting switch pc board ass'y			
A33	82142604	2.6P+4FN (BC), Pan head screw (W)	U5	18488521	NASW-2321, Power switch pc board ass'y (D)			
A36	28184281	Top cover (S)		18494521A	NASW-2321A, Power switch pc board ass'y (G/W)			
	28184282	Top cover (B)	U6	18490522	NASW-2322, Band switch pc board ass'y (W)			
A51	18488121	Front panel ass'y (S)						
	28191302A	Clear plate						
	27267386B	Guide, power						
	27267417	Guide, mode						
	28322068B	Knob ass'y, preset						

### Replacement of power supply cord

There are two power supply cord outlets on the strainrelief. Insert them in prescribed direction to ensure safety. AS-UC-3 (UD<120V> model) should be inserted lengthwise and other types of cords should be inserted horizontally.



Note: (D): Only 120V model  
(G): Only 220V model  
(W): Only 120/220V model  
(S): Only silver model  
(B): Only black model

NOTE: THE COMPONENTS IDENTIFIED BY MARK  $\Delta$  ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PARTS NUMBER SPECIFIED.



## CIRCUIT DESCRIPTION

### 1. Synthesizer and controller operation

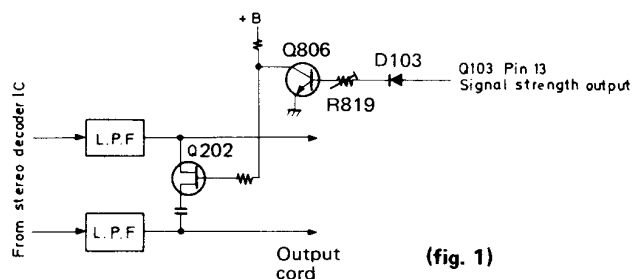
Pin No.	Symbol	Terminal	Description
1	GND	Ground	
2	XT	X'tal	Connected to the 7.2MHz crystal oscillator for the reference frequency.
3	XT		
4	FM	FM band specification input	Mutual reset type, performs switching of each band, FM/MW/LW.
5	MW	MW band specification input	
6	LW	LW band specification input	
7	MANUAL	Manual tuning mode specification input	Mutual reset type, performs auto search and manual operation mode switching during UP/DOWN tuning.
8	AUTO	Auto search tuning mode specification input	
9	UP	UP tuning key input	Connect the push key and perform UP/DOWN tuning.
10	DOWN	DOWN tuning key input	
11	STO	Memory store command input	The preset memory is set to the write mode when the key is pressed.
12-19	M1-M8	Preset memory channel specification input	Controls the write and read out of the internal 16-station preset memory along with the MC1 and MC2 input.
20	MC-1	Memory control input	Set the 16-station preset memory to the 8 FM/8 AM station mode or the FM/MW/LW 3-band 16-station random mode. The 8 FM/8 AM mode is used in this unit.
21	MC-2		
22	OSC2	AM oscillator terminal	CR connection terminal for the oscillator that determines the scan speed during the AM search mode.
23	OSC1	FM oscillator terminal	CR connection terminal for the oscillator that determines the scan speed during the FM search mode.
24	0/5	FM 50 kHz output	Output that represents the 50kHz FM band tuning step for European models. Goes to the high level for the 50 kHz setting.
25	CK2	Tuned frequency data output	Outputs the serial data and timing clock to the tuned frequency display driver.
26	CK1		
27	DATA		
28	MUTE	Muting signal output	Goes to the high level during muting output.
29	E2	Regin specification input	See table 1.
30	E1		
31	STOP 3	AM IF signal input	During AM reception, this counts the IF signal and stops auto search.
32	STOP 2	Auto search stop signal input	When the stop 1 input (pin 33) is at the high level and this terminal goes to the high level, auto search is stopped.
33	STOP 1	Scan speed slow input	When the high level is input at this terminal, the auto search speed is cut in half.

Pin No.	Symbol	Terminal	Description
34	DO1	Error output	Charge pump output of the phase detector which constitutes the PLL. High level is output when the divided oscillation frequency is high than the reference frequency. In the opposite case, low level is output. Floating occurs when the frequencies match. The output is applied to the variable capacitor diode in the front end through low pass filter Q705 and Q706. The output from both terminals is the same, but only DO1 is used.
35	DO2		
36	TEST	Test terminal	Test mode at the high level.
37	FM IN	FM programmable counter input	Connect to the prescaler output (Pin3 of Q701)
38	PSC	Pulse swallow control output	Output to the control the division ratio of the prescaler.
39	AM IN	AM local oscillator signal input	Terminal for input of AM broadcast signal.
40	$\overline{\text{INH}}$	Inhibit input	Operates normally at the high level. Inhibit status at the low level.
41	$\overline{\text{INT}}$	Initialize input	Operates normally at the high level. At the low level, the internal status is initialized.
42	V <sub>DD</sub>	Power supply	Device power terminal; supplies 5V during the normal operation and 2.5V from the super capacitor (C715) for memory preservation.

E1 (Pin 30)	E2 (Pin 29)	Region	Band	Frequency range	Intermediate frequency	Scan step	Reference frequency
0	1	U.S.A	FM	87.5 ~ 108.0 MHz	+10.7 MHz	100 kHz	25 kHz
			AM1	520 ~ 1 710 kHz	+450 kHz	10kHz	10 kHz
1	1	Europe	AM2	522 ~ 1 710 kHz	+450 kHz	9kHz	9kHz
1	0		FM	87.50 ~ 108.00 MHz	+10.7 MHz	50 kHz	25 kHz
			MW	522 ~ 1611 kHz	+450 kHz	9 kHz	9 kHz
0	0	Japan	LW	153 ~ 360 kHz	+450 kHz	1 kHz	1 kHz
			FM	76.0 ~ 90.0 MHz	-10.7 MHz	100 kHz	25 kHz
			AM	522 ~ 1611 kHz	+450 kHz	9 kHz	9 kHz

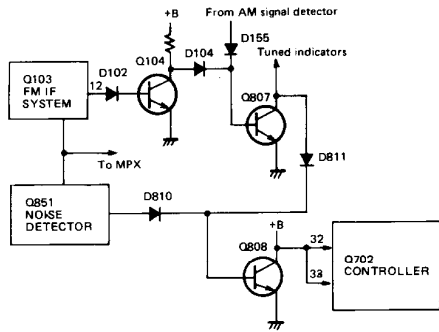
Table 1

## 2. Auto-Hi-Blend circuit

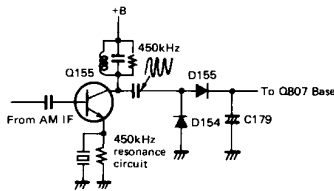


There is a 3-stage IF level detection circuit in the IC of Q103. A direct current voltage approximately proportional to the electrical field intensity is output from output pin 13. This is used to turn off Q806 and turn on Q202 when the electrical field is weak and, making use of the fact that the phase of noise components in the high range of stereo broadcasts is reversed left-right, the left and right channels are mixed in the high range to reduce noise.

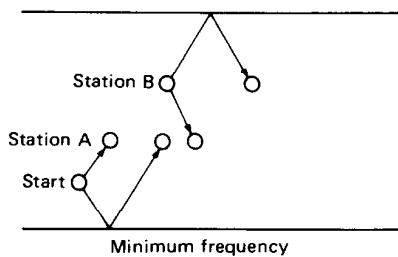
3. Auto-search tuning circuit



(fig. 2)

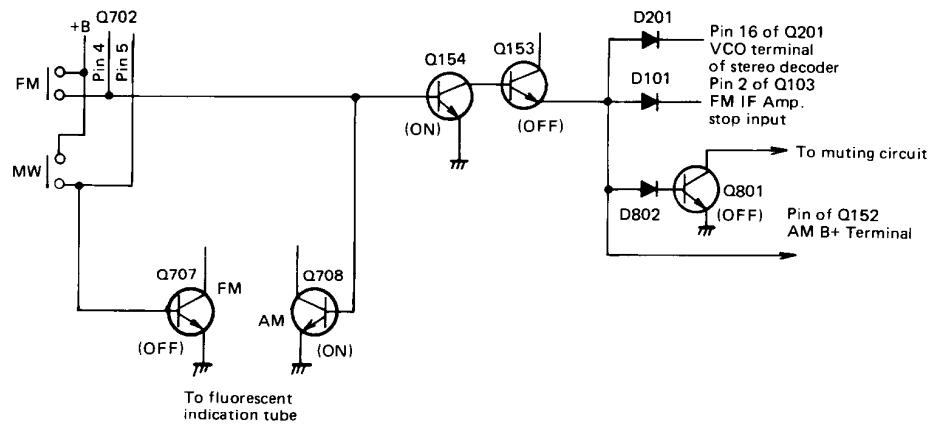


(fig. 3)



(fig. 4)

4. FM/AM selector circuit



(fig. 5)

The FM/AM selector circuit is shown in the diagram. fig. 5. Pins 4 and 5 of Q702 are of the mutual reset type. For FM, pin 4 is high and pin 5 is low; for AM, pin 4 is low and pin 5 is high. Because pin 5 is high and pin 4 is low during AM reception, Q707 goes to on and the AM, kHz segments of the fluorescent indicator tube are turned on. At the same time, Q154 is turned off and Q153 turned on, so +B is supplied to the power source terminal of the radio system pin 3 of Q152.

During FM reception, this is operated by the IF level detection and zero point detection circuits included in the FM IF system IC of Q103 and by the noise component detection circuit of Q851. When a station is tuned, the output of all outputs go to the low level so Q808 goes from on to off, causing pins 32 and 33 of the controller IC to go to the high level to complete auto search tuning.

During AM reception, the AM IF signal is taken by Q155 resonance circuit, this signal is changed to DC component by the D154 and D155 rectifier circuit and auto search tuning is completed when Q807 transistor turns on.

• Manual Tuning

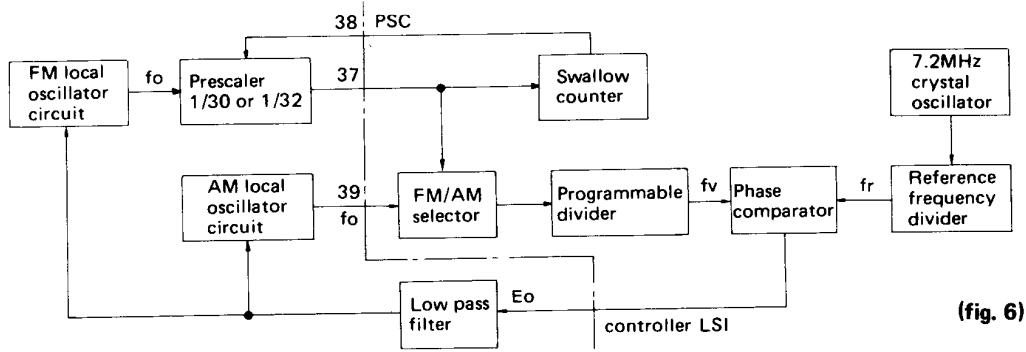
When the UP or DOWN key is pressed, the frequency goes up or down by one step. When either key is held down, the frequency rapidly increases or decreases (scans) and stops when the key is released. When either end of the tuning range is reached, key input will no longer be received and the frequency will stop at the highest or lowest frequency.

• Auto Tuning

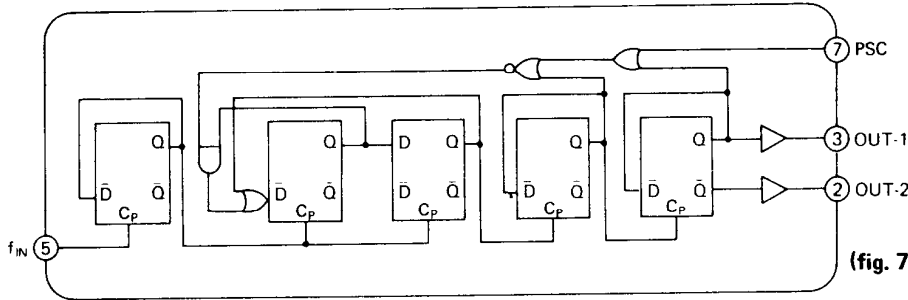
When the UP or DOWN key is pressed, scanning begins in the up or down direction, stopping where there is a radio station. Since auto scan is operated by a triangular wave, scanning is begun in the opposite direction the instant either end of the tuning range is reached. Also, if the UP or DOWN key is pressed when the tuned frequency is not at either end of the range, up or down scanning will begin.

Pin 16 of Q201 goes to the high level, the VCO oscillator stops, and pin 2 of Q103 goes to the high level so the FM IF amp is also switched off. Also, during AM reception, Q801 is turned on so the muting circuit is off. During FM reception, all of the switching transistors mentioned above perform the opposite operations to switch to the FM mode. Figures in parentheses indicate transistor operation during FM reception.

5. PLL tuned circuit



(fig. 6)



(fig. 7) TP6104P Block diagram

A block diagram of the tuned circuit of the PLL is shown in figer 6.

Operation during MW reception

The reception frequency is applied to the programmable divider where it is divided to 1/N and output as fv. This is applied to the phase comparator where it is compared with frequency reference fr (10kHz or 9kHz). If fr and fv differ, Eo equal to the difference in frequency is output. Since error output Eo is a pulse waveform, it is passed through the low pass filter to change it into DC voltage VD, which is applied to the variable capacitor diode in the front end to change the reception frequency. This continues until fv and fr are the same and Eo = 0.

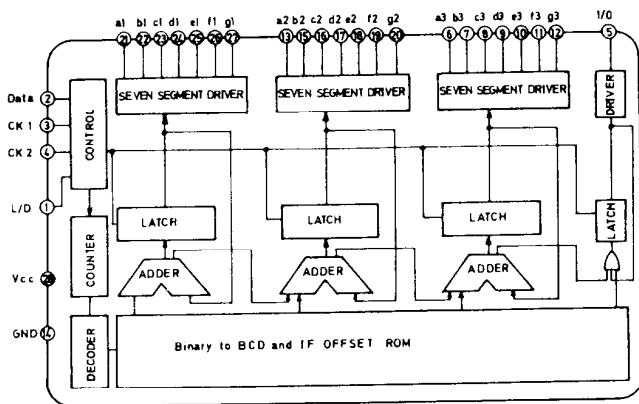
Operation during FM reception

The pulse swallow method is used in the prescaler of the this unit. In this type of prescaler, a supplementary number

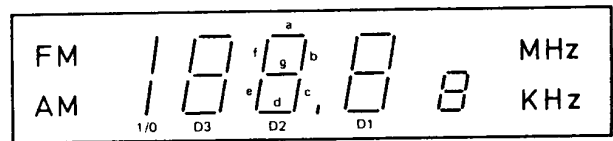
(changed according to the program code input) and the divided reception frequency from the prescaler are combined in the control counter and the prescaler's division factor is switched 1/30 or 1/32 according to external control (1/32 when the PSC terminal is "H" and 1/30 when it is "L"). The station oscillator frequency is applied ot the programmable divider, but the programmable divider has en upper frequency limit of only 30MHz, so the pulse swallow-type prescaler, which can be used up to 150 MHz, is inserted for division to 1/Np;

The signal is applied to the programmable divided and divided to 1/N. The result is compared with a 25kHz frequency reference in the phase detector and the error is output as Eo until a match is obtained as in MW operation.

6. Frequency indicator circuit

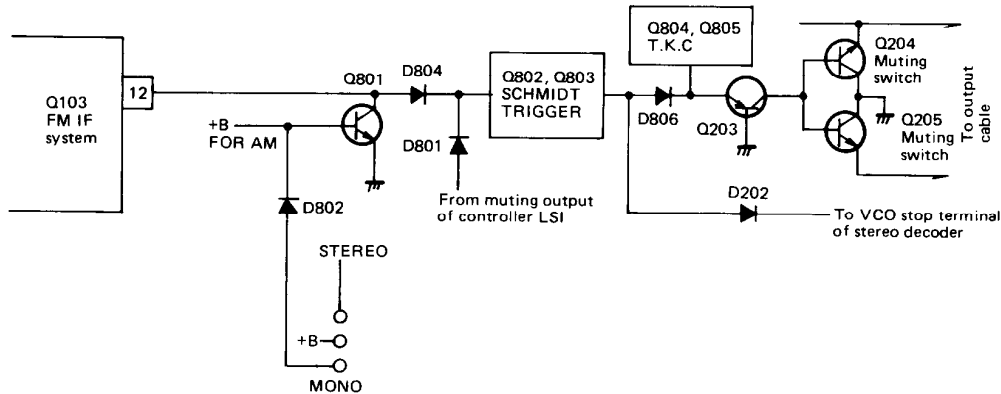


(fig. 8) TD6301AP Block diagram



Pin No.	Terminal	Description
1	L/D	Output indication switching input terminal: Fluorescent display at the low level, and LED display at the high level.
2	Data	Tuned frequency data input terminal: Input from the system controller LSI to the serial.
3,4	CK1, CK2	Tuned frequency data input control timing input terminal: Transferred simultaneously with data from the system controller LSI.
5	1/0	Segment drive output terminal: Sets the number of display digit for FM (100MHz) and AM (1,000kHz) reception.
6-12	a3-g3	Seven segment drive output terminals: Sets the number of display digit for FM(10MHz) and AM (100kHz) reception.
13, 15-20	a2-g2	Seven segment drive output terminals: Sets the number of display digit for FM (1MHz) and AM (10kHz) reception
21-27	a1-g1	Seven segment drive output terminals; set the number of display digit for FM (100kHz) and AM (1kHz) reception
14	V <sub>CC</sub>	Power source terminal
28	Gnd	Ground

### 7. Muting circuit



(fig. 9)

The muting circuit operates in the following cases.

1. When power is turned on, the charging current goes from B+ to R813 to C805, so Q805 is cut off and Q204 and Q205 are turned on. When the voltage at both ends of C805 is more than about 0.6V, Q805 is turned on so Q204 and Q205 are turned off and muting is opened.
2. When power is turned off, Q804 turns off, the discharging current goes from C802 to R812 to D808 to Q204 and Q205 so muting is closed.
3. While pin 28 of the controller IC outputs the high level, Q204 and Q205 are turned on and muting is closed in the following cases: (1) While the manual UP/DOWN switch is being held down, (2) When a station in the

memory is recalled, and (3) While a radio station is being received using auto search tuning.

4. When an FM station is not being received (and the muting switch is on).

The IF level in the FM IF system (set at R115 so muting is opened at 17 dBf) and zero point detection circuit (tuning point  $\pm 35\text{kHz}$ ) are output at pin 12 through the AND circuit. When a station is tuned, the output goes to the low level.

When output goes to the low level, Q802 is turned off, Q803 is turned on and Q204 and Q205 are turned off, so muting is opened;



## PRINTED CIRCUIT BOARD-PARTS LIST

### DISPLAY PC BOARD (NADIS-2319)

CIRCUIT NO.	PART NO.	DESCRIPTION
	<b>IC</b>	
Q771	222673	TD6301AP
	<b>Fluorescent indicator tube</b>	
Q772	212016	FIP7B8CS
	<b>L.E.Ds</b>	
D771-D778	225137CG,	SEL2413E
D780, D782	225137DG or	
D783	225137DY	
D779, D781	225141	SEL2213C
	<b>Resistors</b>	
R774-R782	49121333509	33k $\Omega$ x9, 1/8W, Network
R783-R795	49121333513	33k $\Omega$ x13, 1/8W, Network
	<b>Holders</b>	
	27190370	LED-3
	27190371	LED-10
	<b>Cushion</b>	
	28140593	40x10x3.5

### MUTING SWITCH PC BOARD (NASW-2320)

CIRCUIT NO.	PART NO.	DESCRIPTION
S801	25035372	NPS-122-L336, Push

### POWER SWITCH PC BOARD (NASW-2321/A)

CIRCUIT NO.	PART NO.	DESCRIPTION
C901	$\Delta$ 3500065A	DE7150FZ103PAC400V/125V, Capacitor IS
C901A	$\Delta$ 27300601	SB1925, Capacitor cover
R901	$\Delta$ 431523355	3.3M $\Omega$ , 1/2W, Solid resistor (D)
P901	$\Delta$ 25035295	NPS-111-L261P, Power switch

### EDGE LIGHT PC BOARD (NAPL-2323/2332)

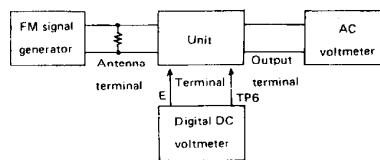
CIRCUIT NO.	PART NO.	DESCRIPTION
PL901	210064A	PL6.3V, 0.25A, Lamp

# ADJUSTMENT PROCEDURES

## FM Section

Item	Step	Connection of instrument	FM SG output	Stereo modulator output	Tuned frequency	Output indicator	Adjustment point	Adjust	Remarks
FM RF	1	Fig. 1			87.5 MHz	Digital DC voltmeter	T1	$1.5 \pm 0.4V$	Usually not necessary to adjust.
	2		108.0 MHz, 1 kHz 75 kHz devi.		108.0 MHz	AC voltmeter	C7, C9 (G) C3 (D/W)	Maximum	
FM IF	1	Fig. 2	99.0 MHz, 1 kHz 75 kHz devi. 65 dBf (60 dB $\mu$ )		99.0 MHz	DC voltmeter	L102 Pri. coil	OV	Muting switch to off. Repeat the steps 1 and 2 until no further adjustment is necessary.
	2			Distortion analyzer		L102 secondary coil	Minimum		
VCO		Fig. 3	99.0 MHz, 1 kHz 75 kHz devi. 65 dBf (60 dB $\mu$ )		99.0 MHz	Frequency counter	R214	$19,000 \pm 19Hz$	Muting switch to on.
Stereo Distortion		Fig. 4	99.0 MHz, Ext. modulation 65 dBf (60 dB $\mu$ )	L+R 1 kHz, 67.5 kHz devi. Pilot signal 7.5 kHz devi.	99.0 MHz	Distortion analyzer	T2 IF core on front end	Minimum	
Stereo Separation	1	Fig. 4	99.0 MHz, Ext. modulation 65 dBf (60 dB $\mu$ )	Lch. 1 kHz	99.0 MHz	Rch. output	R204	Minimum	Maximum and same separation at the channels left and right.
	2			Rch. 1 kHz		Lch. output		Minimum	
Muting Level	1	Fig. 2	99.0 MHz, 1 kHz 75 kHz devi. 17.2 dBf (12 dB $\mu$ )		99.0 MHz	Oscilloscope	R115	Signal	
	2		16.2 dBf (11 dB $\mu$ )	No signal					
Auto Hi-blend Level		Fig. 2	99.0MHz, 1kHz 75kHz devi. 43dBf (38dB $\mu$ )		99.0 MHz	DC voltmeter	R819	Low level	Connect the DC voltmeter to Q806 transistor collector.
			42dBf (37dB $\mu$ )	High level					

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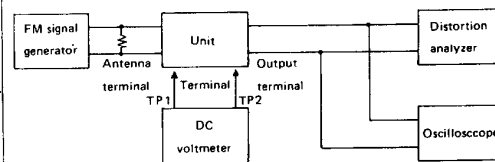


(fig. 1)

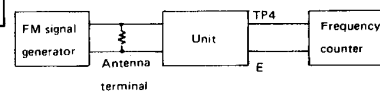
## AM Section

Step	AM SG output	Tuned frequency	Output indicator	Adjust. point	Adjust for	Remarks
1		522 kHz (520 kHz)	Digital DC voltmeter	L152	$1.2 \pm 0.1V$	Repeat the steps 1 and 2 until no further adjustment is necessary.
2		1611 kHz (1710 kHz)		C157	$9.5 \pm 0.1V$ ( $10.5 \pm 0.1V$ )	
3	603 kHz, 400 Hz 30% mod. 60 dB/m (600 kHz)	603 kHz (600 kHz)	AC voltmeter	L151	Maximum	Repeat the step 3 and 4 until no further adjustment is necessary.
4	1404kHz, 400 Hz 30% mod. 60 dB/m (1400 kHz)	1404 kHz (1400 kHz)		C152	Maximum	
5	999 kHz, 400 Hz 30% mod. 30dB/m (1000 kHz)	999 kHz (1000 kHz)		X151	Maximum	

( ): 10 kHz step model

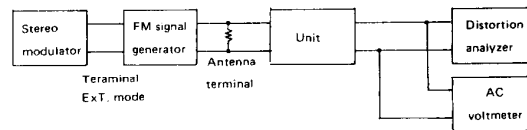
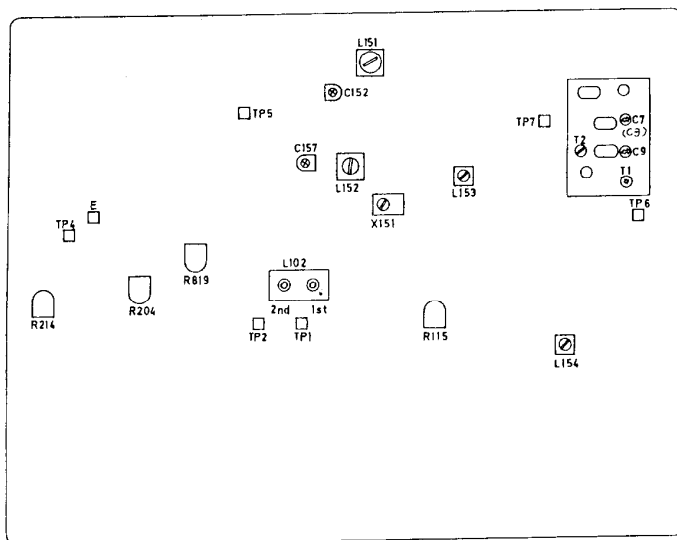


(fig.2)

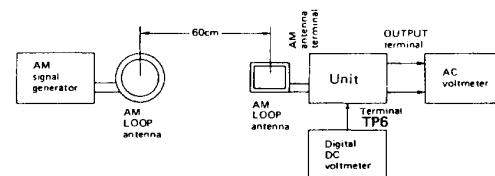


(fig. 3)

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(fig. 4)

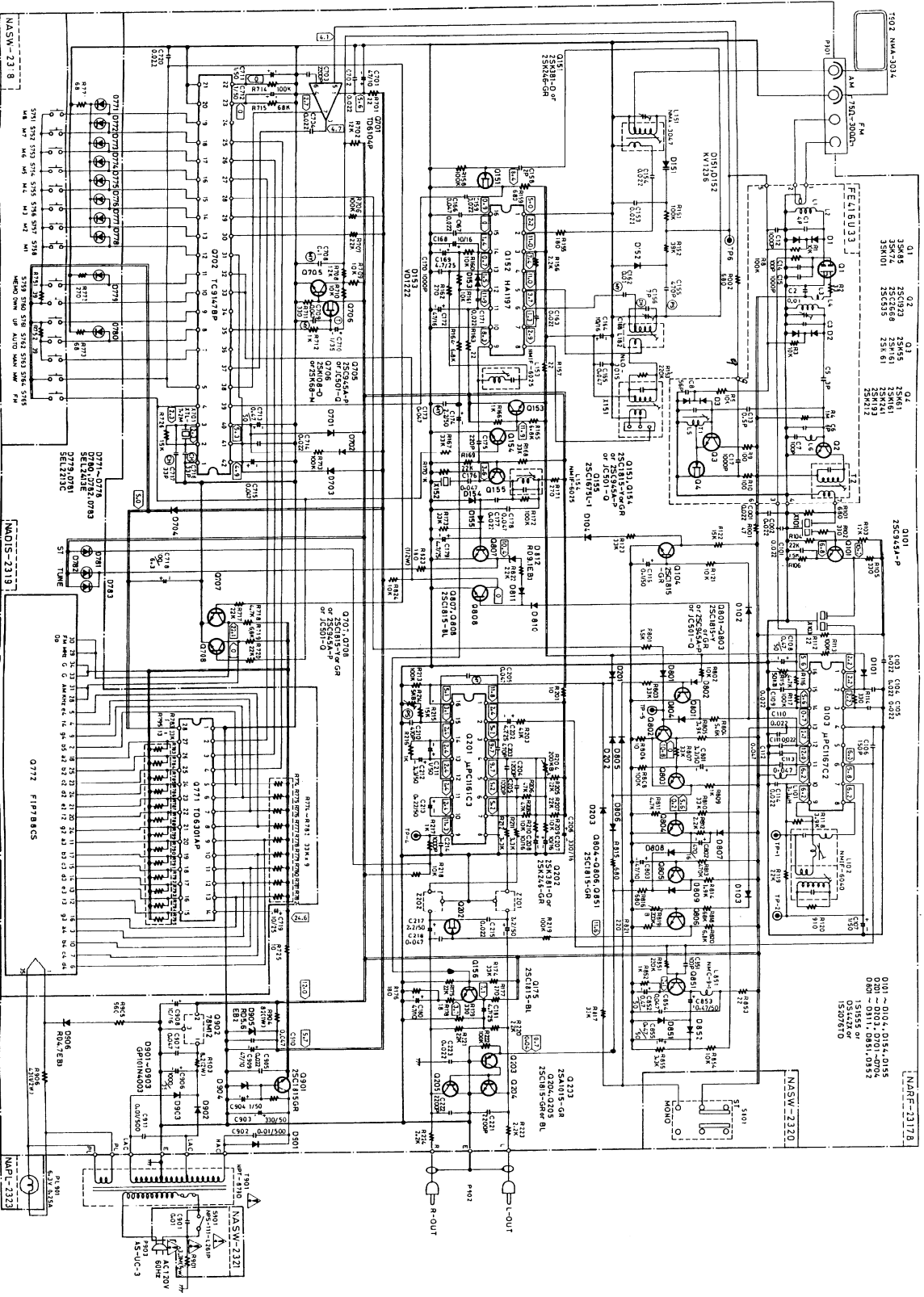


(fig. 5)



# SCHEMATIC DIAGRAM

## D model



NOTE: 1. ALL RESISTORS ARE IN OHMS UNLESS OTHERWISE SPECIFIED.  
 2. ALL CAPACITORS ARE IN P.F. UNLESS OTHERWISE SPECIFIED.  
 3. ALL TUBES ARE STANDARD LINEAR TUBES UNLESS OTHERWISE SPECIFIED.  
 4. ALL TRANSFORMERS ARE STANDARD LINEAR TRANSFORMERS UNLESS OTHERWISE SPECIFIED.  
 5. ALL RELAYS ARE STANDARD LINEAR RELAYS UNLESS OTHERWISE SPECIFIED.  
 6. ALL SWITCHES ARE STANDARD LINEAR SWITCHES UNLESS OTHERWISE SPECIFIED.  
 7. ALL COMPONENTS IDENTIFIED BY MARK ARE CRITICAL FOR SAFETY.

# PRINTED CIRCUIT BOARD PARTS LIST

## MAIN CIRCUIT PC BOARD (NARF-2317/A/B)

CIRCUIT NO.	PART NO.	DESCRIPTION	CIRCUIT NO.	PART NO.	DESCRIPTION
TU001	<b>Front end</b>				
	240059	FE416U33 (G)	L001	233312	NFA-3051 (G)
	240061	FE349U14 (W/D)	L101	233105 or	NCH-1005 or
	<b>Transistors</b>			233024	NCCH-1501
Q101	2210746	2SC945A (P)	L151	232111	NMA-3047
Q102	2211723	2SC1923 (O) (G)	L152	232084	NMO-2018
Q104, Q153	2211254,	2SC1815 (Y),	L201	233236	NMC-6027 (G)
Q154, Q705	2211255,	2SC1815 (GR),	L202, L203	233294	NMC-5040 (G)
Q707, Q708	2210746 or	2SC945A (P) or	L851	233031	NMC-9-1
Q801-Q803	2212485	JC501 (Q)			
Q709, Q710	2211254,	2SC1815 (Y),			
	2211255,	2SC1815 (GR),			
	2210746 or	2SC945A (P) or	L102	233270	NFIF-6040
	2212485	JC501 (Q) (G/W)	L153, L154	232095	NMIF-6025
Q151, Q202	2212304 or	2SK381 (D) or			
	2211945	2SK246 (GR)			
Q155	2210823	2SC1675 (L-1)	X101-X103	3010043	SFE10.7MM (G)
Q156	2211256	2SC1815 (BL)	X101, X103	3010071	SFE10.7MA5 (D/W)
Q203	2211455	2SA1015 (GR)	X151	3010075	SFL450B3
Q204, Q205	2211255 or	2SC1815 (GR) or	X152	3010076	BFU450C
	2211256	2SC1815 (BL)			
Q706	2211293 or	2SK68 (M) or	X701	3010073	XTL7.2M
	2212294	2SK108 (D)			
Q711	2211455	2SA1015 (GR) (G/W)	Z201, Z202	3020016	B3xN4123-32N (D/W)
Q804-Q806	2211255	2SC1815 (GR)			
Q807, Q808	2211256	2SC1815 (BL)			
Q851, Q901	2211255	2SC1815 (GR)			
	<b>ICs</b>				
Q103	222608	$\mu$ PC1167C2			
Q152	222626	HA1197			
Q201	222678	$\mu$ PC1161C3			
Q701	222675	TD6104P			
Q702	222674	TC9147BP			
Q902	222780122	78M12			
	<b>Diodes</b>				
D101-D104	223105,	1S1555,	C107	352780109	1 $\mu$ F, 50V, Elect.
D154, D155	223133,	DS442X,	C108	352784799	0.47 $\mu$ F, 50V, Elect.
D201-D203	223145 or	1S2076TD or	C116	352781099	0.1 $\mu$ F, 50V, Elect.
	223150	US1040	C152, C157	3060010	NTC-20P-09, Trimmer
D701-D704	223105,	1S1555,	C155	370134714	470pF $\pm$ 5%, 100V, APS
D801, D802	223133,	DS442X	C164, C168	352741009	10 $\mu$ F, 16V, Elect.
D804-D811	223145 or	1S2076TD or	C169	352750479	4.7 $\mu$ F, 25V, Elect.
D851-D852	223150	US1040	C174	352780229	2.2 $\mu$ F, 50V, Elect.
D705, D706	223105,	1S1555,	C179, C181	352750479	4.7 $\mu$ F, 25V, Elect.
	223133,	DS442X,	C180	352721019	100 $\mu$ F, 6.3V, Elect.
	223145 or	1S2076TD or	C202	352750479	4.7 $\mu$ F, 25V, Elect.
	223150	US1040 (G/W)	C206	352743319	330 $\mu$ F, 16V, Elect.
D151, D152	223157	KV1236Z	C207, C208	352741009	10 $\mu$ F, 16V, Elect.
D153	4000068	VD1222	C210	370134714	470pF $\pm$ 5%, 100V, APS
D812	2241052 or	GZA9. 1Y or	C211	352780109	1 $\mu$ F, 50V, Elect.
	2239573	RD9. 1EB3	C212	352780339	3.3 $\mu$ F, 50V, Elect.
D901-D903	223880	GP101N4003	C213	352782299	0.22 $\mu$ F, 50V, Elect.
D904	2243011 or	EQA02-25A or	C216, C217	352780229	2.2 $\mu$ F, 50V, Elect.
	2239791	RD27EB1	C701	352734709	47 $\mu$ F, 10V, Elect.
D905	2243152,	MTZ5. 6B,	C710	395160107	1 $\mu$ F, 35V, Tantalum
	2242844 or	EQA02-06A or	C711, C712	352780109	1 $\mu$ F, 50V, Elect.
	2239472	RD5. 6EB2	C713	352784799	0.47 $\mu$ F, 50V, Elect.
D906	2243133,	MTZ4. 7C,	C715	3020018	0.047F, 5V, Super
	2242835 or	EQA02-05B or	C718	352721019	100 $\mu$ F, 6.3V, Elect.
	2239433	RD4. 7EB3	C719	352751009	10 $\mu$ F, 25V, Elect.
			C801	352780339	3.3 $\mu$ F, 50V, Elect.
			C802	352744719	470 $\mu$ F, 16V, Elect.
			C803	352734709	47 $\mu$ F, 10V, Elect.
			C852, C853	352784799	0.47 $\mu$ F, 50V, Elect.
			C855	352784799	0.47 $\mu$ F, 50V, Elect.
			C903	352783319	330 $\mu$ F, 50V, Elect.
			C904	352780109	1 $\mu$ F, 50V, Elect.
			C906	352761029	1,000 $\mu$ F, 35V, Elect.
			C908	352741009	10 $\mu$ F, 16V, Elect.
			C909	352734709	47 $\mu$ F, 10V, Elect.

CIRCUIT NO.	PART NO.	DESCRIPTION
<b>Resistors</b>		
R115	5215046	N08H50KBC, Semi-fixed
R204	5215048	N08HR200KBC, Semi-fixed
R214	5215044	N08HR5KBC, Semi-fixed
R819	5215048	N08HR200KBC, Semi-fixed
R903	441720824	8.2Ω, 2W, Metal oxide film
R904	441628204	82Ω, 1W, Metal oxide film
R906	441524304	43Ω, 1/2W, Metal oxide film
<b>Terminal</b>		
P901	25060087	NTM-2PDMN31, Antenna (G)
	25060085	NTM-4PDMN29, Antenna (W/D)
<b>Radiator</b>		
	27160011A	RAD-05
<b>Screws</b>		
	82143008	3P+8F (BC), Pan head
	834430068	3STS+6B (BC), Tapping
<b>Nut</b>		
	863430	N-3F-N (BC)

**FUNCTION SWITCH PC BOARD (NASW-2318)**

CIRCUIT NO.	PART NO.	DESCRIPTION
S751-S765	25035389	NPS-111-S353, Push switches

**BAND SWITCH PC BOARD (NASW-2322)  
(Only W model)**

CIRCUIT NO.	PART NO.	DESCRIPTION
S701	250142	NSS-2225, Band selector switch

(D): Only 120V model (G): Only 220V model (W): Only Universal model
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