

Service Manual

ST-50U

Stereo tuner

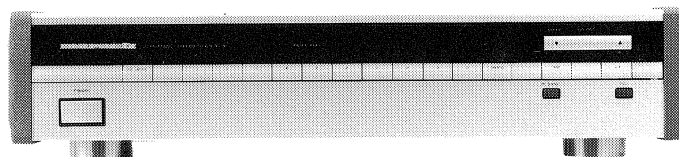


TABLE OF CONTENTS

SECTION	PAGE
◆ SHOCK, FIRE HAZARD SERVICE TEST	
1. TECHNICAL SPECIFICATIONS	1
2. BLOCK DIAGRAM	2
3. SCHEMATIC DIAGRAM AND PARTS LOCATIONS (Pattern side)	4
4. EXPLODED VIEW AND PARTS LIST	15
5. SERVICE PROGRAM	17
6. TUNER ALIGNMENT PROCEDURES	18
7. ALIGNMENT POINTS AND TEST POINTS	20
8. TUNER MICROPROCESSOR SPECIFICATIONS	21
9. ELECTRICAL PARTS LIST	26

marantz®

model ST-50

MARANTZ DESIGN AND SERVICE

Using superior design and selected high grade components, MARANTZ company has created the ultimate in stereo sound.

Only **original MARANTZ parts** can insure that your MARANTZ product will continue to perform to the specifications for which it is famous.

Parts for your MARANTZ equipment are generally available to our National Marantz Subsidiary or Agent.

ORDERING PARTS:

Parts can be ordered either by mail or by telex. In both cases, correct part number has to be specified. The following information must be supplied to eliminate delays in processing your order:

1. Complete address
2. Complete part numbers and quantities required
3. Description of parts
4. Model number for which part is required
5. Way of shipment
6. Signature: any order form or telex must be signed otherwise such part order will be considered as null and void.

MARANTZ INTERNATIONAL
Vestdijk 9
5600 MD Eindhoven
The Netherlands
Phone: +31/40.758290
Telefax: +31/40.75.82.99
Telex: 35000 PHTC NL routing IND NLMTFAT

MARANTZ USA
1150 FEEHANVILLE DR.
MOUNT PROSPECT, ILLNOIS 60056
U.S.A.
PHONE: 800-654-6633
FAX: 708-299-4005

SHOCK, FIRE HAZARD SERVICE TEST:

CAUTION: After servicing this appliance and prior to returning to customer, measure the resistance between either primary AC cord connector pins (with unit NOT connected to AC mains and its Power switch ON), and the face or Front Panel of product and controls and chassis bottom.

Any resistance measurement less than 1 Megohms should cause unit to be repaired or corrected before AC power is applied, and verified before return to user/customer. Ref. UL Standard NO. 1270. Para 74. 3. D (Mandatory Test after servicing Electrical Appliances, effective 7-1-83).

In case of difficulties, do not hesitate to contact the Technical Department at abovementioned address.

1. TECHNICAL SPECIFICATIONS

FM TUNER SECTION

Mono Usable Sensitivity	10.8 dBf
Sensitivity at 50 dB Quieting	
Mono	16.2 dBf
Stereo	37.0 dBf
Alternate Channel Selectivity	
Wide	35 dB
Narrow	75 dB
Capture Ratio	1.0 dB
Total Harmonic Distortion at 1 kHz	
Wide/Narrow Mono	0.05/0.2%
Stereo	0.08/0.4%
Signal-to-Noise Ratio at 1 kHz	
Mono	90 dB
Stereo	82 dB
Stereo Channel Separation at 1 kHz	55 dB
Frequency Response 20 Hz - 15 kHz	±0.5 dB
Image Rejection	80 dB
IF Rejection	100 dB
Output Level	940 mV
Output Impedance	1.5 kohms

AM TUNER SECTION

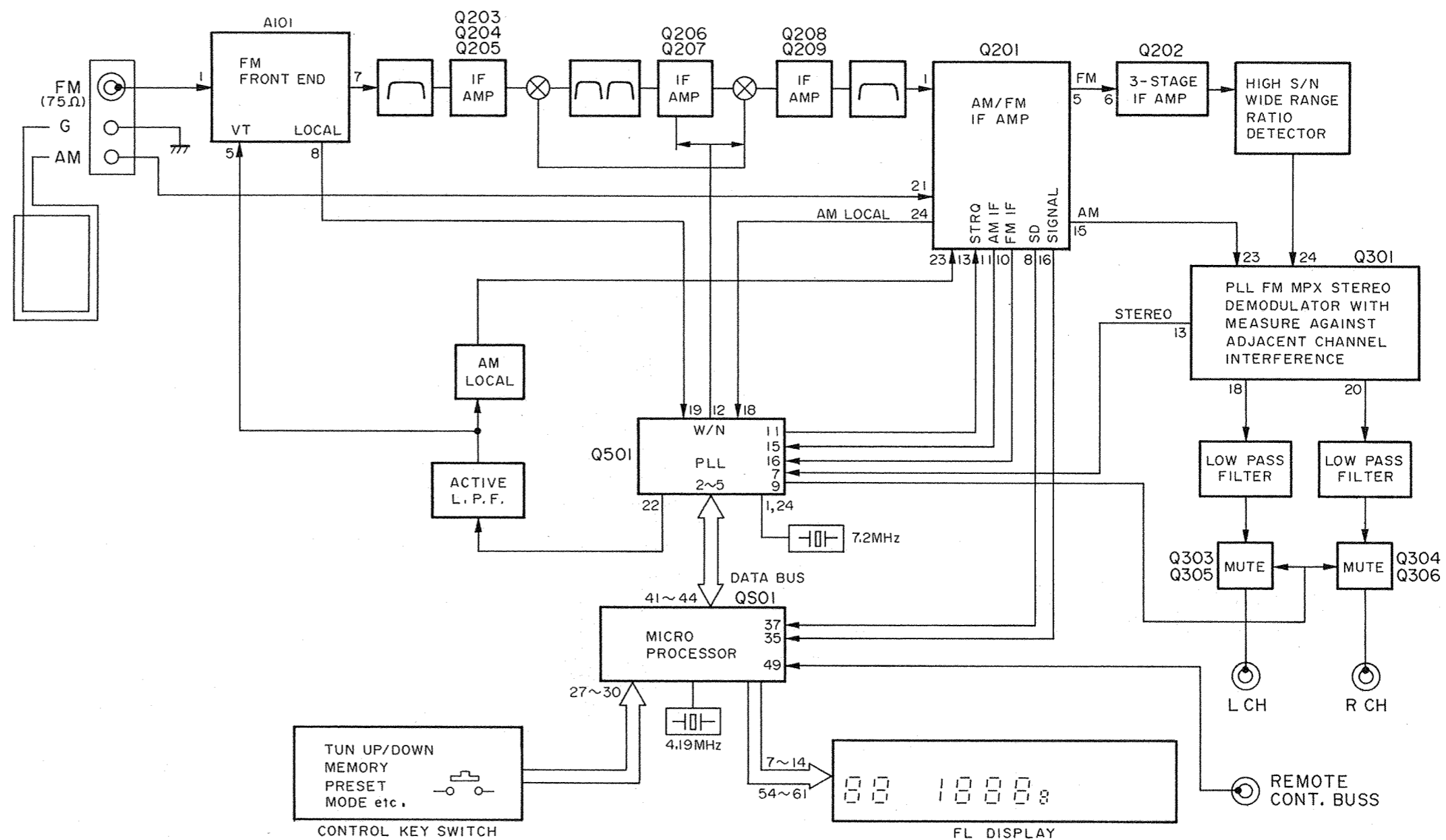
Usable Sensitivity	48 dB/m
Selectivity	30 dB
S/N Ratio at 500 Hz	54 dB
THD at 400 Hz	0.3%
Output Level	280 mV

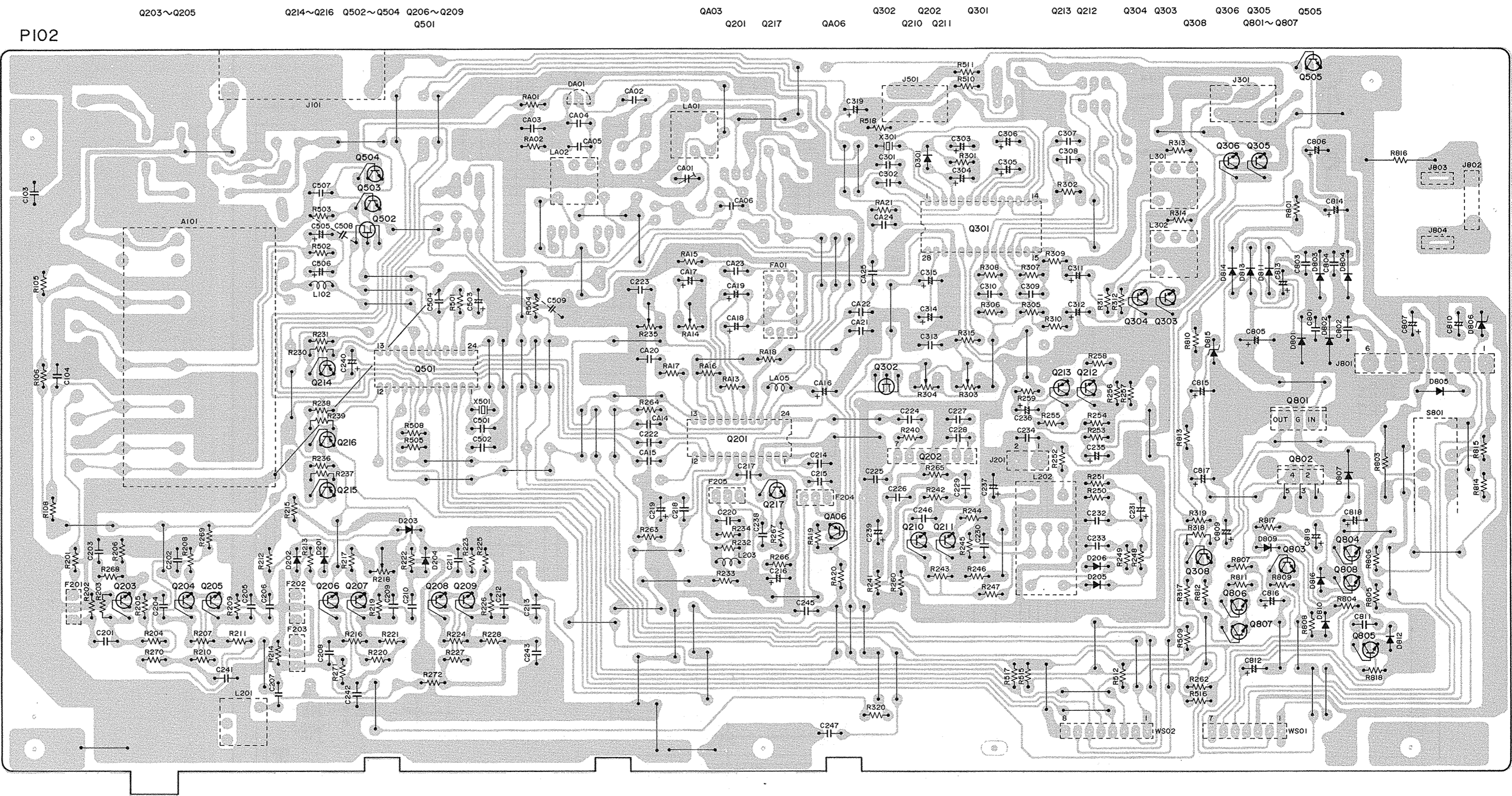
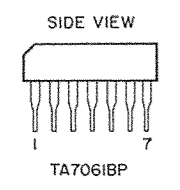
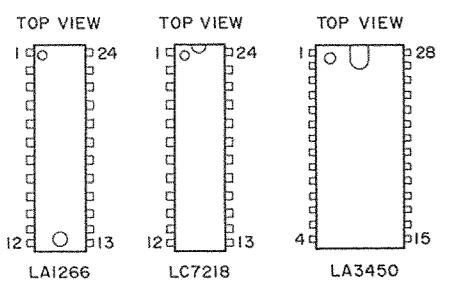
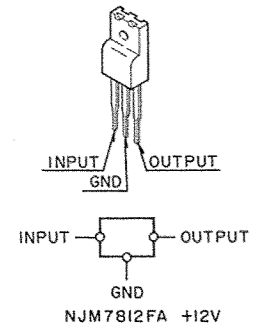
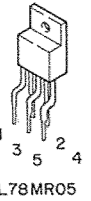
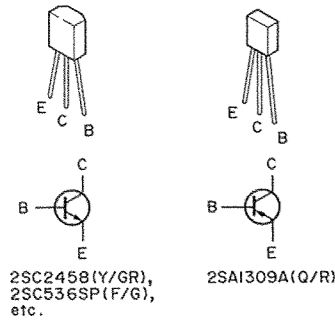
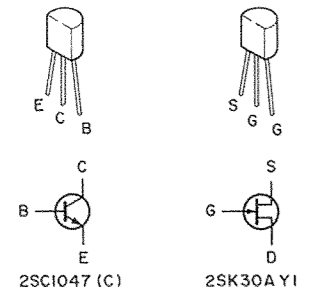
GENERAL

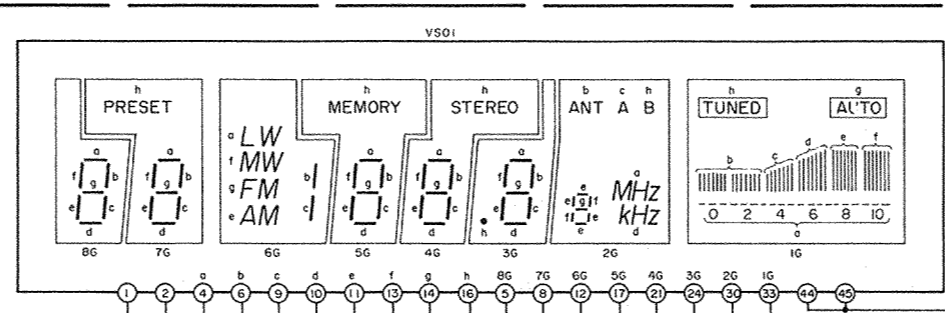
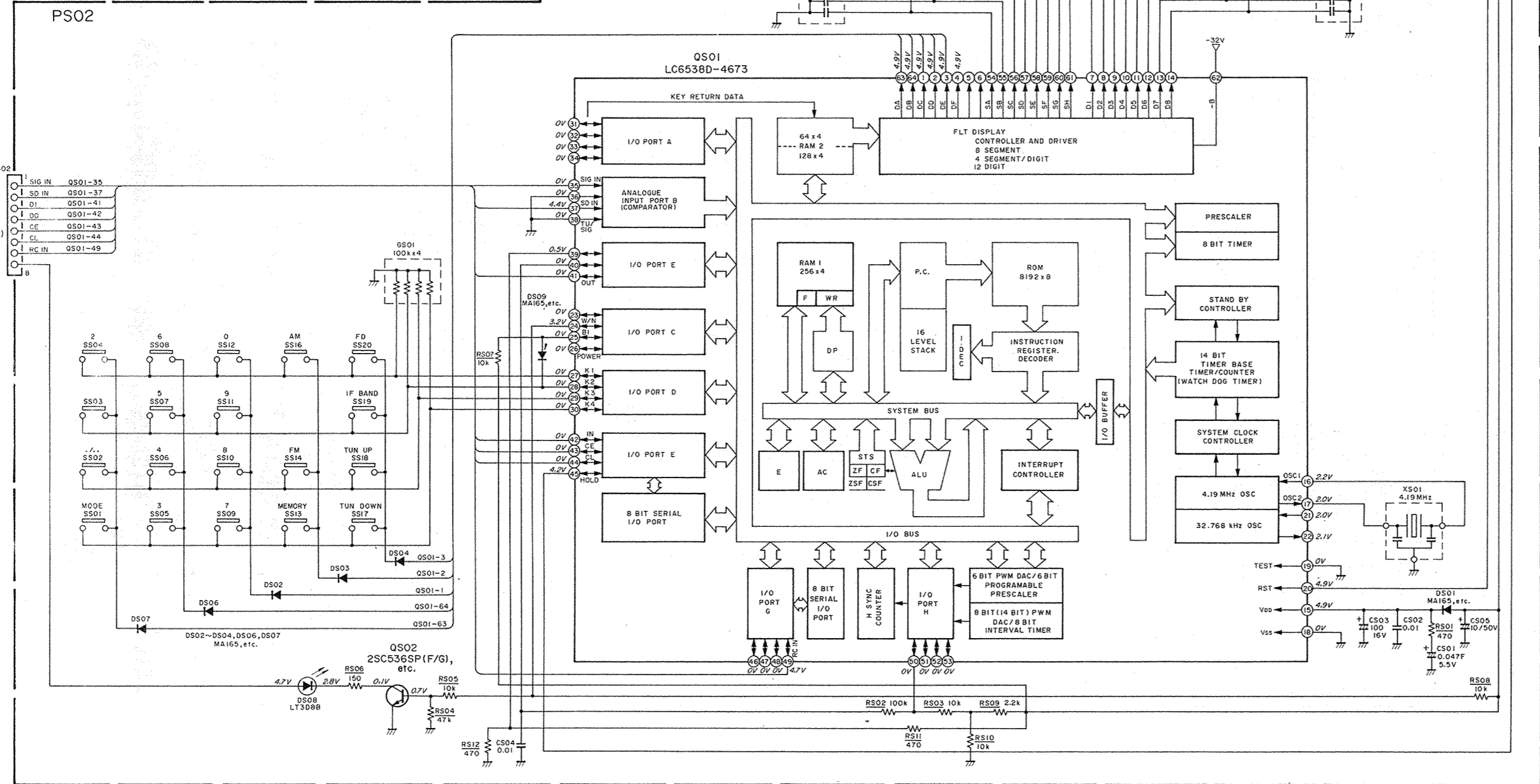
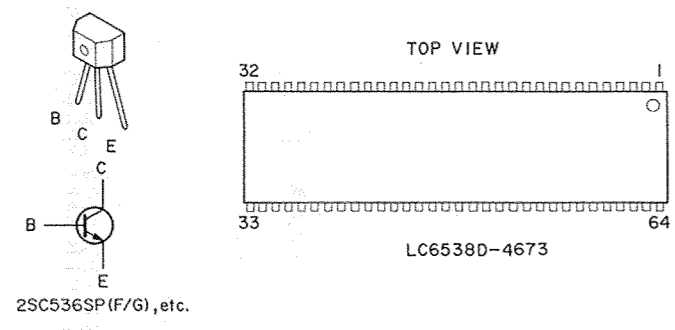
Power Requirements	120V AC, 60 Hz
Power Consumption	10W
Dimensions	
Width	17-7/8 inches (454 mm)
Height	3-3/8 inches (86 mm)
Depth	13-1/8 inches (334 mm)
Weight	14.5 lbs (6.6 kg)

Specifications subject to change without prior notice.

2. BLOCK DIAGRAM



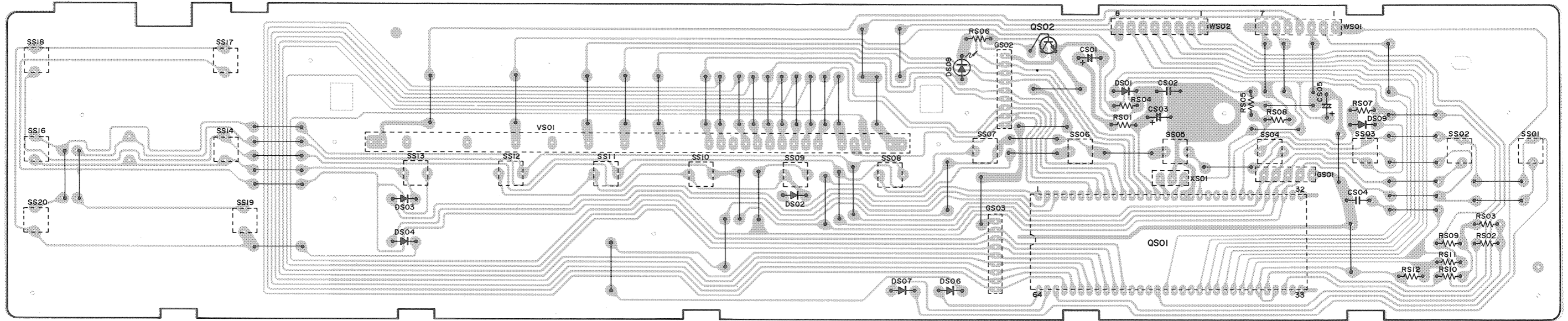




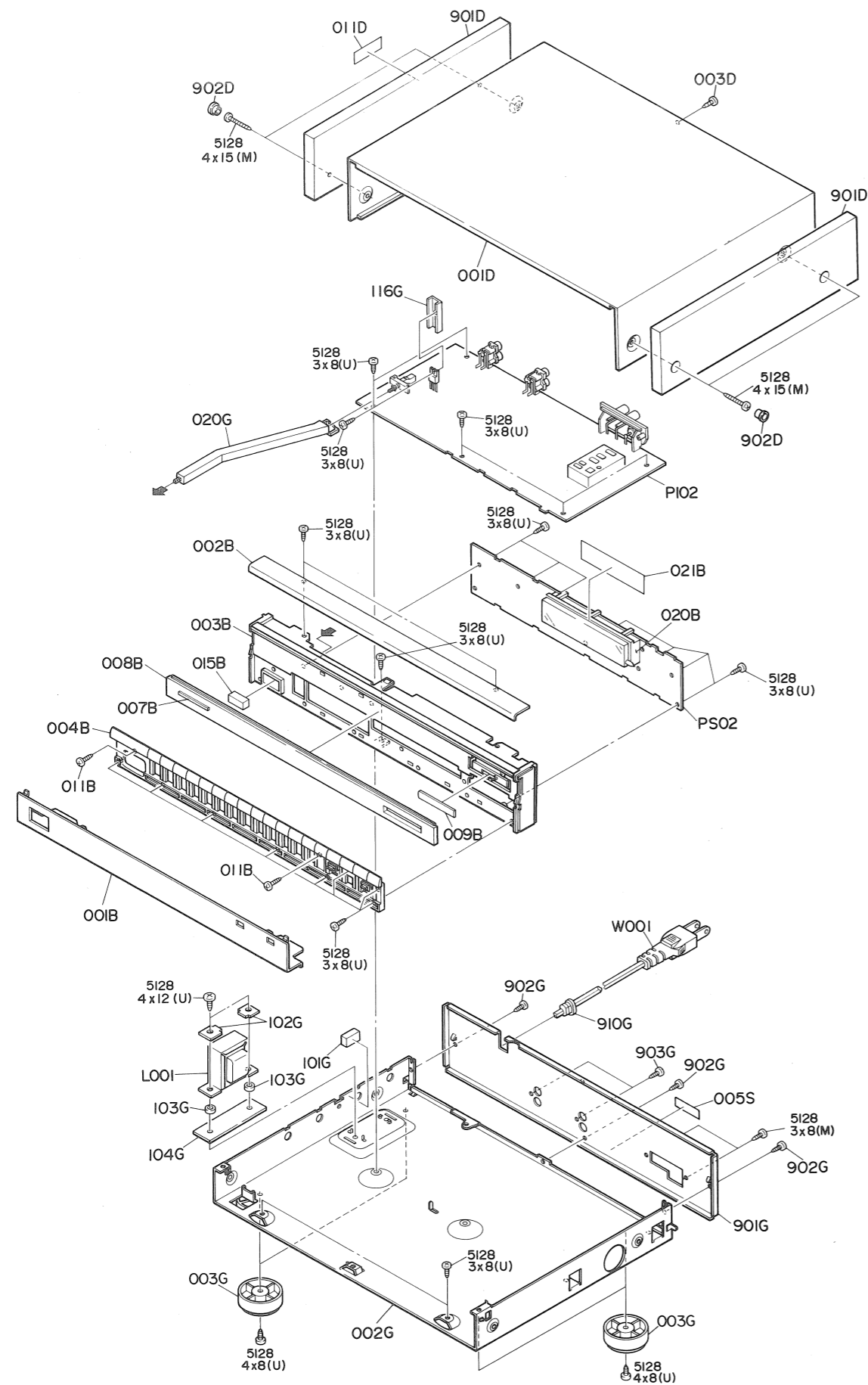
PS02

QS02

QS01



4. EXPLODED VIEW AND PARTS LIST



REF. DESIG.	PART NO.	DESCRIPTION
001B	066J248110	FRONT PANEL
002B	066J248230	FRONT PANEL
003B	066J105130	CHASSIS, FRONT MOLD
004B	066J270510	BUTTON
007B	274H251130	BADGE, MARANTZ
008B	066J158010	WINDOW
009B	415T270340	BUTTON, TUNING
011B	51260308U0	B.T.SCREW(W/W), 003B+004B
015B	415T270120	BUTTON, POWER
020B	066J271010	HOLDER, FL
021B	056J122020	STICKER, FL ADHESIVE
001D	066J257020	LID, TOP COVER
003D	237K010010	SCREW, TOP COVER REAR
011D	117H861020	LABEL, TOP COVER SIDE
901D	066J249010	SIDE PANEL
902D	198K067110	CAP, SIDE
002G	066J105020	CHASSIS, MAIN
003G	176H057570	LEG
020G	066J121010	LINK, POWER SWITCH
101G	066J056030	BUFFER
102G	066J160010	BRACKET
103G	066J055010	COLLAR
104G	066J056010	BUFFER
116G	001J267030	HEAT-SINK
901G	066J250110	REAR PANEL
902G	237K010010	SCREW, REAR PANEL + CHASSIS
903G	237K010010	SCREW
910G	450H259010	BUSHING, AC CORD
▲ L001	TS14808520	POWER TRANSFORMER
▲ W001	YC01800330	A.C.POWER CORD
001T	066J851250	USER MANUAL
Z001	LA00045020	AM LOOP ANT
Z002	ZA02000070	EXT.ANTENNA, FM
Z003	YP90000310	PLUG, ANT ADAPTOR
Z004	ZD01000330	CONNECTIVE CORD, OUTPUT

NOTE ON SAFETY :
 Symbol ▲ Fire or electrical shock hazard. Only original parts should be used to replace any part marked with symbol ▲ . Any other component substitution (other than original type), may increase risk of fire or electrical shock hazard.

5. SERVICE PROGRAM

1. T.R POINT ME (tracking point memory) mode.

From power OFF (backup mode), when the power switch is pressed ON while pressing the FM and AM band keys simultaneously, the T.R POINT ME mode is called.

		P1	P2	P3	P4	P5	P6	P7	P8	P9
FM	USA	90MHz	98MHz	106MHz						
AM	10kHz				600kHz	1000kHz	1400kHz	—	—	—

		P10	P11	P12 ~ P30
FM	USA			—
AM	10kHz	—	—	

—: Low end frequency of the FM and AM band.

2. Segment check mode

- 1) In the above situation, further press the FM and AM band keys simultaneously.
- 2) The muting signal is output and the service program is started. During the execution of the service program, muting remains ON.
- 3) The fluorescent display all goes out once, lighting is performed from segments 8G-a to 1G-h sequentially one after another at a rate of 0.3 second/segment. (A segment once lit does not go out as it stands.)
- 4) When all the segments light, the segment check mode is terminated with their lighting for 3 seconds as they are. (The band and frequency engaged right before the segment check mode are restored.)
During the lighting for 3 seconds, when the MEMORY key is pressed, all the segments continue lighting as they are.
When the MEMORY key is pressed once again, all the segments flicker for 3 seconds (at 1 Hz), with which the segment check mode is then terminated.

- 5) During the execution of the segment check mode, any other key than the MEMORY key is not accepted.
 - 6) In the state of 3), when the MEMORY key is pressed, the state that all the segments light is entered. Namely, by the pressure of the MEMORY key, it is possible to skip over the process that all segments light one after another in sequence.
- * During the execution of the service program, when the power is turned once OFF and then ON, the service program is canceled.

6. TUNER ALIGNMENT PROCEDURES

Set to T.R point ME mode of the service program.

(P2) to (P6) in the Digital Readout Frequency Setting column shows preset numbers for the above mode.

Before alignment, connect a dummy resistor of 47 kohms to the tuner output terminal.

6-1. FM Alignment Procedures

(Function switch at "FM" position and MODE switch at "MONAURAL" position)

● FM RF Alignment (IF BAND switch at "WIDE" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	FM signal generator to FM antenna terminal. Adjust the RF signal output so that slight noise occurs at the upper and lower sides of the output waveform.	98.0 MHz	AC VTVM to L- or R-channel output (J301)	98.0 MHz (P2)	Front end IFT for maximum output and minimum distortion.
2	FM signal generator 500 μ V output to FM antenna terminal (75-ohm).	98.0 MHz	"0" center meter or DC ammeter (100 μ A range) to J201.	98.0 MHz (P2)	L202 (primary winding) core so that the meter points to its center or reads "0".
3			Distortion meter to L- or R-channel output (J301)		L202 (secondary winding) core for minimum distortion.
4	Repeat steps 2 and 3 until distortion is minimized.				

● FM IF Alignment

(Function switch at "FM" position and MODE switch at "AUTO STEREO" position)

1) IF BAND switch at "WIDE" position

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	FM signal generator 500 μ V output modulated by MPX signal generator to FM antenna terminal (75-ohm). Modulation level: IHF 67.5 kHz +9 % pilot dev.	Stereo L-channel (1,000 Hz)	VTVM to L-channel output (J301 L-channel)	98.0 MHz (P2)	Front end IFT for minimum distortion.
2		Stereo R-channel (1,000 Hz)	VTVM to R-channel output (J301 R-channel)		

2) IF BAND switch at "NARROW" position

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	FM signal generator 500 μ V output modulated by MPX signal generator to FM antenna terminal (75-ohm). Modulation level: IHF 67.5 kHz +9 % pilot dev.	Stereo L-channel (1,000 Hz)	VTVM to R-channel output (J301 R-channel)	98.0 MHz (P2)	L201 for minimum distortion.
2		Stereo R-channel (1,000 Hz)	VTVM to L-channel output (J301 L-channel)		

● **Muting Level Alignment**

(Function switch at "FM" position and MODE switch at "AUTO STEREO" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	FM signal generator 6.3 μ V output to FM antenna terminal (75-ohm)	98.0 MHz	AC VTVM to L- or R-channel output (J301)	98.0 MHz (P2)	IF BAND WIDE R235/NARROW R218 to a point at which output appears.

● **Multiplex Alignment**

(Function switch at "FM" position and MODE switch at "AUTO STEREO" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	FM signal generator 500 μ V output modulated by MPX signal generator to FM antenna terminal (75-ohm) Modulation level: IHF 67.5 kHz +9 % pilot dev.	Stereo L-channel (1,000 Hz)	VTVM to R-channel output (J301 R-channel)	98.0 MHz (P2)	IF BAND WIDE R303/NARROW R304 so that channel separation is identical between both channels.
2		Stereo R-channel (1,000 Hz)	VTVM to L-channel output (J301 L-channel)		
3	Repeat steps 1 and 2.				

6-2. AM Alignment Procedures

(Function switch at "AM" position)

● **AM IF Alignment**

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	Sweep generator to AM antenna terminal	450 kHz	AC VTVM to L- or R-channel output (J301)	—	FA01 for maximum and symmetrical waveform.

● **AM RF Alignment**

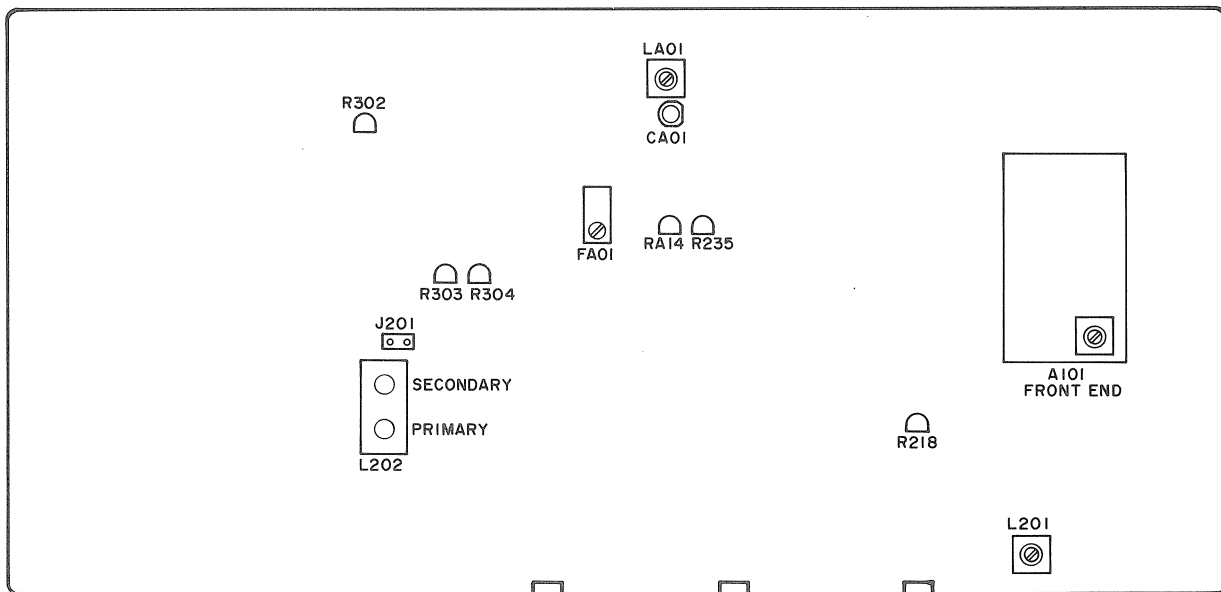
Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	AM signal generator to AM loop antenna in a test loop	600kHz	VTVM to L- or R-channel output (J301)	600kHz (P4)	LA01 for maximum output.
2		1400kHz		1400kHz (P6)	CA01 for maximum output.
3	Repeat steps 1 and 2 until sensitivity is maximized.				

● **AM Auto Stop Alignment** (Function switch at "AM" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	RF generator to AM loop antenna in a test loop (500 μ V/m)	1000kHz	—	1000kHz (P5)	RA14 so that the first unit of the signal indicator on the display tube lights.

7. ALIGNMENT POINTS AND TEST POINTS

PI02



8. TUNER MICROPROCESSOR SPECIFICATIONS

8-1. Receiving Frequency Range, Channel Space, Reference Frequency and Intermediate Frequency

		Receiving Frequency	Channel Space	Reference Frequency	Intermediate Frequency
Japan	FM	76.0~90 MHz	100 kHz	25 kHz	-10.7 MHz
	AM	531~1602 kHz	9 kHz	9kHz	+450 kHz
U.S.A.	FM	87.5~108.0 MHz	100 kHz	25 kHz	+10.7 MHz
	AM	520~1710 kHz	10 kHz	10 kHz	+450 kHz
Europe	FM	87.50~108.00 MHz	50 kHz	25 kHz	+10.7 MHz
	MW	531~1602 kHz	9 kHz	9 kHz	+450 kHz
	LW	152~282 kHz	1 kHz	1 kHz	+450 kHz

8-2. Tuning Function

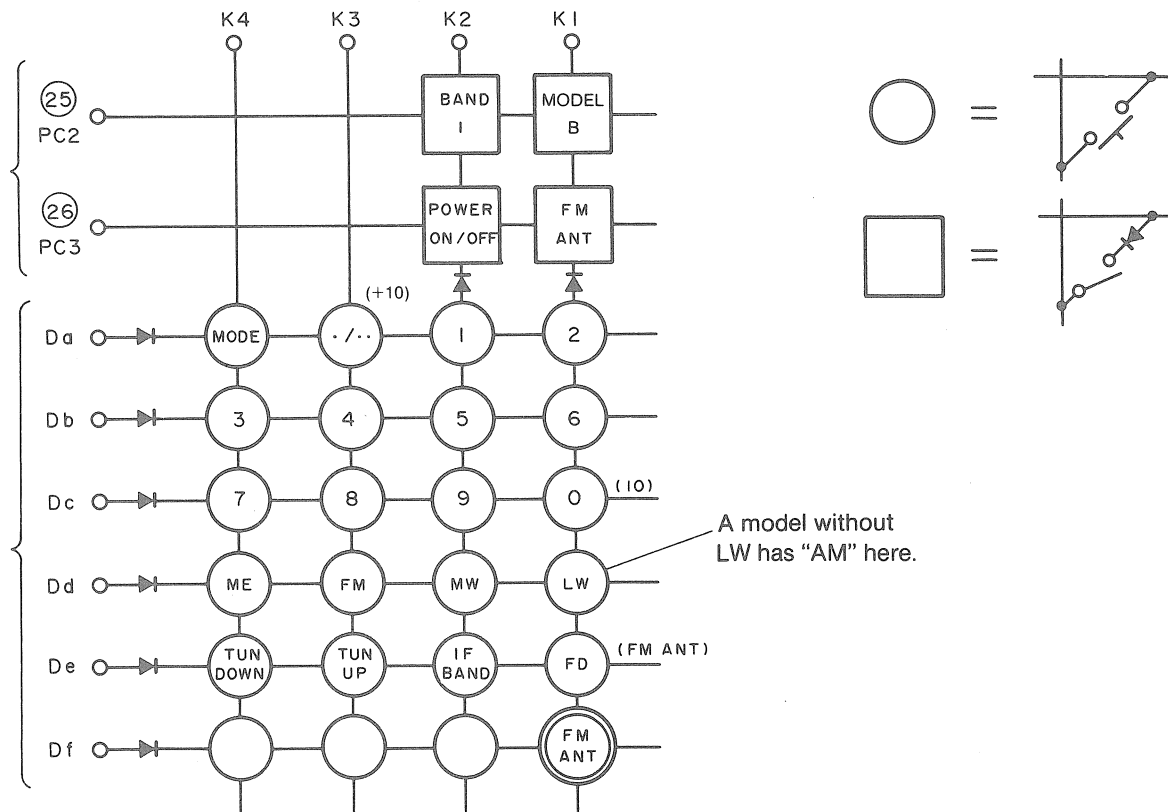
- 1) Automatic Up/Down Tuning (sawtooth wave mode)
- 2) Manual Up/Down Tuning

The tuning frequency varies steppedly when the momentary switch is pressed or rapidly at a rate of approximately 70 msec/step when the same switch is pressed continuously for more than 0.5 sec. In this situation, if the said switch is released from hand pressure, automatic tuning is performed.

3) Preset Memory Call

- a. Random access to 24 FM and AM (MW+LW) stations (Except for model A for Japan)
Call by a numeral key + the single/double (./..) digit key + a numeral key where necessary
- b. Random access to 20 FM and AM stations (only for models for Japan)
Call by a numeral key + (+10 key where necessary).

Key Matrix



() : Japan version only

8-3. Description of Keys

0 ~ 9 : **Numeral keys**

Preset memory writing, call and direct access call

FM MW LW : **Band selection keys**

With a model without LW, the "LW" key falls invalid.

MODE : **Mono/stereo output selection key**

At FM, when this key is pressed, OUT1 of PLL IC LC7218 varies between "LOW" and "HIGH" cyclically. In synchronization with this variation, "AUTO" in the FL display flickers.

TUN UP TUN DOWN : **Tuning up/down keys**

The tuning frequency increases or decreases by 1 step at each pressure (for less than 0.5 second), and varies rapidly at a rate of approximately 70 msec/step when either is pressed continuously for 0.5 second or more. In this situation, when that key is released from hand pressure, auto tuning is performed.

ME : **Memory writing key**

When the key is pressed, "MEMORY" flickers (at 1 Hz) for approximately 5 seconds, thus indicating that the memory is capable of writing. The wanted number is input by means of a numeral key, the single/double (./..) digit key and a numeral key where necessary, in which way at the point of time when a digit of units order is input, the frequency then being received is memorized.

IF BAND : **FM IF WIDE/NARROW selection key**

At FM, when this key is pressed, the OUT3 signal of PLL IC LC7218 varies between "LOW" and "HIGH" in a cyclic manner.

./.. : **Single/double digit key (except for models for Japan)**

This key is used in calling one of preset station numbers P10 to P30. When the key is pressed, "PRESET" is displayed, the LED segment g of units order digits lights and that of tens order digit flickers.

Flickers (for 5 seconds at 1 Hz)

./.. : **Single/double digit key (only for models for Japan)**

This key is used in calling one of preset station numbers P10-P20. When the key is pressed, "PRESET" is displayed, and the LED segment g of units order digit flickers.

Flickers (for 5 seconds at 1 Hz)

FM ANT : **Antenna A/B selection key (only for models for Japan)**

At FM, when this key is pressed, OUT6 of PLL IC LC7218 varies between "LOW" and "HIGH" in a cyclic manner. In synchronization with this variation, "ANT A.B" on the FL display flickers.

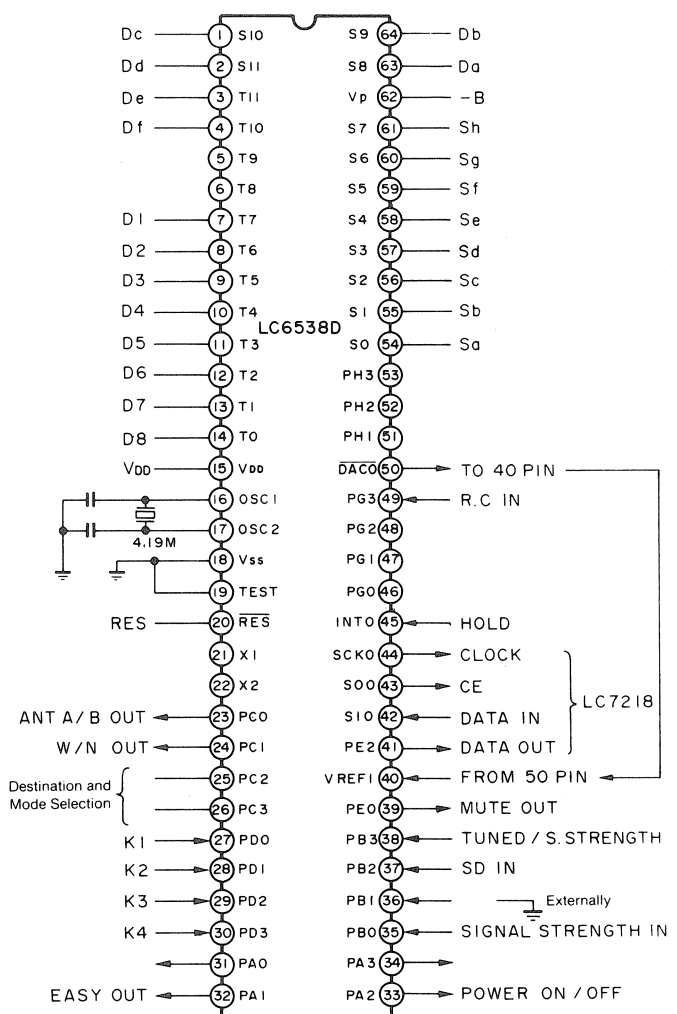
FD : **Frequency direct access tuning key (except for models for Japan)**

When this key is pressed, the direct access tuning mode is entered whether in FM or in AM.

FM ANT : **Same operation with FM ANT irrespective of any model whatever its destination.**

* This key depends on the initial diode setting.

Pin Connections



Pin Functions

Symbol	No. of pin(s)	I/O	Function	Output driver	Option	When resetting
V _{DD}	1	—	Power supply pin	—	—	—
V _{SS}	1	—				
TEST	1	I	LSI test pin, which should necessarily be connected V _{SS} for use.	—	—	—
RES	1	I	System reset input. Initial reset at RES="LOW"	—	—	—
OSC1	1	I	Pins to constitute the main system clock oscillation circuit.	—	—	—
OSC2	1	O	External clock is input to OSC1 with OSC2 opened. With built-in feedback resistor.			
X1	1	I	Pins to constitute the sub clock oscillation circuit.	—	—	—
X2	1	O	External clock is input to X1 with X2 opened. With built-in feedback resistor and damping resistor			
T0~T11	12	O	FL display tube digit exclusive output. Display RAM fixed address output for static mode.	P-ch high withstand voltage and large current type	Pull-down resistor existence/non-existence (bit-wise)	L
S8 ~S11	4	O	FL display tube digit/segment output. Display RAM fixed address output for static mode.	P-ch high withstand voltage and large current type	Pull-down resistor existence/non-existence (bit-wise)	L
S0~S7	8	O	FL display tube segment exclusive output. Display RAM fixed address output for static mode.	P-ch high withstand voltage and large current type	Pull-down resistor existence/non-existence (bit-wise)	L
V _P	1	—	FL display tube output pull-down resistor load power input.	—	—	—
PA ₀ ~PA ₃	4	I/O	I/O in units of bit or unit of 4 bits Input of key scan low-threshold type with a function to automatically read the key scan data into RAM.	+15 V withstand voltage and medium current type	PU or OD for each bit	H
PB ₀ ~PB ₃	4	I	Built-in comparator of 4 independent channels. Reference voltage selectable between external and internal. Input in units of bit or unit of 4 bits. At low-speed mode (1/32 mode, sub clock mode), input function is stopped.	—	—	Input function stopped
PC ₀ ~PC ₃	4	I/O	I/O in units of bit or unit of 4 bits	+15 V withstand voltage and large current type	● PU or OD for each bit ● Output when resetting	H/L (option)
PD ₀ ~PD ₃	4	I/O	I/O in units of bit or unit of 4 bits	+15 V withstand voltage and large current type	● PU or OD for each bit ● Output when resetting	H/L (option)
PE ₀ ~PE ₂	4	I/O	I/O in units of bit or unit of 3 bits PE ₀ /V _{REF0} Used with external reference input of PB1-PB3 PE ₁ /V _{REF1} Used with external reference input of PB0 PE ₂ /START Used with HALT control START	+15 V withstand voltage and medium current type only of PE2. Normal withstand voltage and medium current type of others.	PU or OD for each bit	H
PF ₀ ~PF ₃	4	I/O	I/O in units of bit or unit of 4 bits PF ₀ /SI0 Used with serial input S10 PF ₁ /SO0 Used with serial output SO0 PF ₂ /SCK0 Used with serial clock I/O SCK0 PF ₃ /INT0 Used with INT0 interrupt input	+15 V withstand voltage and medium current type	PU or OD for each bit	H
PG ₀ ~PG ₃	4	I/O	I/O in units of bit or unit of 4 bits PG ₀ /SI ₁ Used with serial input S11 PG ₁ /SO1 Used with serial output SO1 PG ₂ /SCK1 Used with serial clock I/O SCK1 PG ₃ /INT1 Used with INT1 interrupt input	+15 V withstand voltage and medium current type	PU or OD for each bit	H
PH ₀ ~PH ₃	4	I/O	I/O in units of bit or unit of 4 bits PH ₀ /DAC0 Used with 6-bit PWM D/A output PH ₁ /DAC1 Used with 8/14-bit PWM D/A output PH ₂ /SQR Used with square wave pulse output PH ₃ /HCNT Used with horizontal sync detection input	+15 V withstand voltage and medium current type	PU or OD for each bit	H

8-4. Pin Description

Sa~Sh: Fluorescent display segment signals

D1~D8: Fluorescent display digit signals and key return signals

Da~Dr: Key return signals

K1~K4: Key input, diode matrix input

CLOCK, CE, DATA IN, DATA OUT: Signals transferred to PLL IC LC7218

SD IN: Station detector signal input

When the SD IN pin becomes "LOW" as regards a frequency band, the STRQ pin (LC7218 OUT2) becomes "HIGH" so that PLL IC performs IF counting. As a result of this, when FM 10.7 MHz \pm 10 kHz, MW 450 kHz \pm 3 kHz or LW 450 kHz \pm 0.6 kHz is obtained, "TUNED" lights, while when in the auto tuning mode, the station scanning stops.

S.STRENGTH IN: FM/AM signal strength input

The DC voltage from the tuner is input to make the 5-dot segment signal strength indicator light.

MUTE OUT: Audio mute output (active "LOW")

Exactly the same output as OUT0 of PLL IC LC7218

W/N OUT: WIDE/NARROW indicator output

Exactly the same output as OUT3 of PLL IC LC7218

ANT A/B OUT: Antenna A/B indicator output (only for models for Japan)

Exactly the same output as OUT6 of PLL IC LC7218

TUNED/SIGNAL STRENGTH: Determines the fluorescent display ON/OFF.

* When this pin is at "0", "TUNED" (D8-Sh) is not lit independent of the "LOW"/"HIGH" state of SD.

* When this pin is at "1", D8 and Sa-Sf are not lit independent of the "LOW"/"HIGH" state of SD or the DC input of SIGNAL STRENGTH IN.

Due to the "LOW"/"HIGH" operation of this pin, some models have the fluorescent display ON/OFF determined.

"0" (LOW): Signal strength indicator lights.

"1" (HIGH): "TUNED" lights.

- Sa~Sh
- D1-D8
- FM MONO, W/N OUT, ANT A/B OUT, POWER On/OFF OUT

Any above pin becomes "HIGH" from "LOW" after holding and starts output 0.5 second after.

BAND 1: Destination selection initial setting diode
[combined with port 8 of PLL IC LC7218 (Q501)]

	USA	JAPAN	EUROPE without LW	EUROPE with LW
BAND 1	1	0	1	0
IN 1 (PLL IC)	1	1	0	0

BAND 1

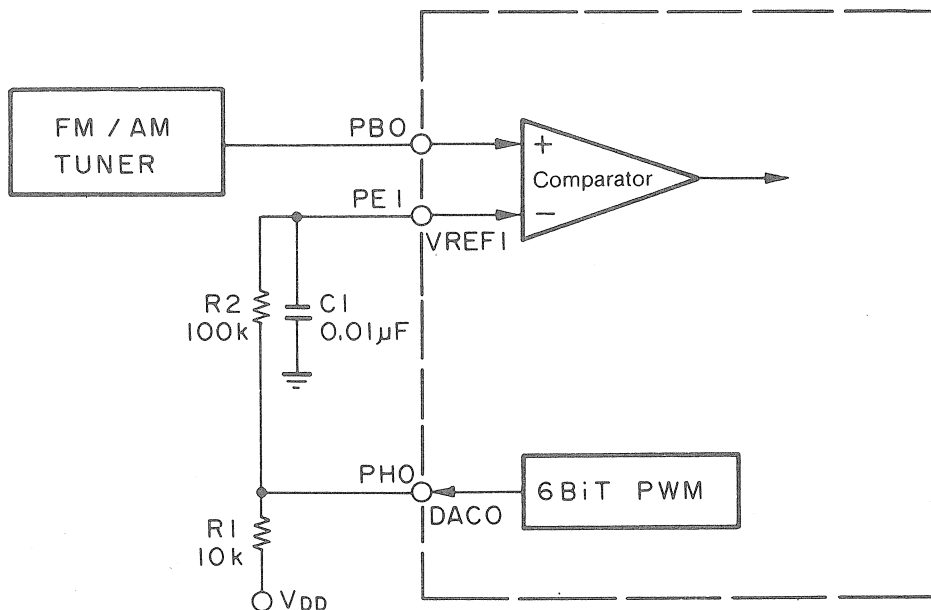
1: With diode (DS09)

0: Without diode

IN 1

1: "HIGH", 0: "LOW"

8-5. 5-dot Signal Strength Indicator:



		SIGNAL STRENGTH INPUT VOLTAGE V_{Bo} (DC.V)				
		DOT 1 (Sb)	DOT 2 (Sc)	DOT 3 (Sd)	DOT 4 (Se)	DOT 5 (Sf)
FM	ON	*	1.3	1.7	2.1	≥ 2.5
	OFF		1.25	1.65	2.05	≤ 2.45
AM	ON	*	1.3	1.7	2.1	≥ 2.5
	OFF		1.25	1.65	2.05	≤ 2.45

LC7218 Port Assignment:
 OUT0: \overline{MUT} , mute output
 OUT1: FM MONO output
 OUT2: STRQ output

OUT3: W/N output, FM WIDE/NARROW
 OUT4: \overline{FM} , FM band selection
 OUT5: \overline{AM} , AM (MW) band selection
 OUT6: \overline{LW} , LW band selection/FM ANT A.B

	OUT 0 PIN ⑨	OUT 1 PIN ⑩	OUT 2 PIN ⑪	OUT 3 PIN ⑫	OUT 4 PIN ⑬	OUT 5 PIN ⑭	OUT 6 PIN ⑰		
	MUT OUT	FM MONO	STRQ	W/N OUT	\overline{FM}	\overline{AM}	\overline{LW}	FM ANT A.B	
FM	1/0	1/0	1/0	1/0	0	1	1	1/0	
AM (MW)						1	0	1	1/0 (Note)
LW		1			0	1	1	0	

IN 0: STEREO IN (PIN ⑦)
 IN 1: Destination selection (PIN ⑧)

Note: The FM mode given just prior stays as it is.

REF. DESIG.	PART NO.	DESCRIPTION
C218	DK18223310	CERAMIC 0.022μF +80% -20% 50V
C220	DA15150110	CERAMIC 15PF ± 5% 50V
C222	DA15680110	CERAMIC 68PF ± 5% 50V
C223	DK18223310	CERAMIC 0.022μF +80% -20% 50V
C224	DK18103310	CERAMIC 0.01μF +80% -20% 50V
C225	DK18103310	CERAMIC 0.01μF +80% -20% 50V
C226	DK18473310	CERAMIC 0.047μF +80% -20% 50V
C227	?	
?	DK18103310	CERAMIC 0.01μF +80% -20% 50V
C230		
C231	OA10605020	ELECT 10μF 50V
C232	DA16221110	CERAMIC 220PF ±10% 50V
C233	DA16221110	CERAMIC 220PF ±10% 50V
C234	DA16101110	CERAMIC 100PF ±10% 50V
C235	OA10605020	ELECT 10μF 50V
C236	OA22601620	ELECT 22μF 16V
C237	OA10701620	ELECT 100μF 16V
C238	DK18103310	CERAMIC 0.01μF +80% -20% 50V
C239	OA10605020	ELECT 10μF 50V
C240	OA10605020	ELECT 10μF 50V
C241	?	
?	DK18103310	CERAMIC 0.01μF +80% -20% 50V
C243		
C245	?	
?	DK18103310	CERAMIC 0.01μF +80% -20% 50V
C247		
C301	DA16101110	CERAMIC 100PF ±10% 50V
C309	DA16331110	CERAMIC 330PF ±10% 50V
C310	DA16331110	CERAMIC 330PF ±10% 50V
C311	OA33505020	ELECT 3.3μF 50V
C312	OA33505020	ELECT 3.3μF 50V
C313	DA16221110	CERAMIC 220PF ±10% 50V
C314	OA10701620	ELECT 100μF 16V
C315	OA10701620	ELECT 100μF 16V
C501	DA15470110	CERAMIC 47PF ± 5% 50V
C502	DA15470110	CERAMIC 47PF ± 5% 50V
C503	OA10701620	ELECT 100μF 16V
C504	DK18103310	CERAMIC 0.01μF +80% -20% 50V
C507	?	
?	DK18103310	CERAMIC 0.01μF +80% -20% 50V
C509		
C801	?	
?	DK18103310	CERAMIC 0.01μF +80% -20% 50V
C804		
C805	OA22803520	ELECT 2200μF 35V
C810	OA10605020	ELECT 10μF 50V
C811	DK18223310	CERAMIC 0.022μF +80% -20% 50V
C813	OA10605020	ELECT 10μF 50V
C819	OA33505020	ELECT 3.3μF 50V
RA14	RA02230780	P102-RESISTORS 22K Ω TRIMMING
▲R108	GG05101140	100 Ω ± 5% 1/4W
R218	RA01020780	1K Ω TRIMMING
▲R233	GG05151160	150 Ω ± 5% 1/6W
R235	RA04730780	47K Ω TRIMMING
▲R241	GG05101140	100 Ω ± 5% 1/4W
▲R260	GG05101140	100 Ω ± 5% 1/4W
R303	RA02240780	220K Ω TRIMMING
R304	RA02240780	220K Ω TRIMMING
▲R801	NF02100140	10 Ω 1/4W FUSIBLE
R803	GA05102010	1K Ω ± 5% 1W
▲R816	RC10225920	2.2M Ω 1/2W
DA01	HD40009030	P102-SEMICONDUCTORS VARICAP, SVC342
D201	?	
?	HD20002000	DIODE, 1SS133, 1SS176, MA165, ETC.
D206		

REF. DESIG.	PART NO.	DESCRIPTION
D301	HD20002000	DIODE, 1SS133, 1SS176, MA165, ETC.
▲D801	?	
?	HD20003000	DIODE, DSF10C, RL103E
▲D805		
D806	HD32201000	ZENER DIODE, 22V
D807	HD20003000	DIODE, DSF10C, RL103E
D809	HD20002000	DIODE, 1SS133, 1SS176, MA165, ETC.
D810	HD20002000	DIODE, 1SS133, 1SS176, MA165, ETC.
▲D811	HD20003000	DIODE, DSF10C, RL103E
D812	HD20002000	DIODE, 1SS133, 1SS176, MA165, ETC.
▲D813	HD20003000	DIODE, DSF10C, RL103E
▲D814	HD20003000	DIODE, DSF10C, RL103E
D815	HD32401000	ZENER DIODE, 24V
D816	HD20002000	DIODE, 1SS133, 1SS176, MA165, ETC.
QA06	HT113092C0	TRANSISTOR 2SA1309A (Q, R)
Q201	HC10222030	IC LA1266
Q202	HC10251050	IC TA7061BP
Q203	HT318091P0	TRANSISTOR 2SC1809S (P)
Q204	?	
?	HT30001000	TRANSISTOR 2SC536SP (F, G) 2SC2458 (Y, GR) ETC.
Q209		
Q210	HT318091P0	TRANSISTOR 2SC1809S (P)
Q211	HT318091P0	TRANSISTOR 2SC1809S (P)
Q212	HT30001000	TRANSISTOR 2SC536SP (F, G) 2SC2458 (Y, GR) ETC.
Q213	?	
?	HT113092C0	TRANSISTOR 2SA1309A (Q, R)
Q216		
Q217	HT30001000	TRANSISTOR 2SC536SP (F, G) 2SC2458 (Y, GR) ETC.
Q301	HC10248030	IC LA3450
Q302	HF200300B0	F.E.T. 2SK30A (Y)
Q303	?	
?	HT30001000	TRANSISTOR 2SC536SP (F, G) 2SC2458 (Y, GR) ETC.
Q306		
Q308	HT113092C0	TRANSISTOR 2SA1309A (Q, R)
Q501	HC10221030	IC LC7218
Q502	HF200300B0	F.E.T. 2SK30A (Y)
Q503	?	
?	HT30001000	TRANSISTOR 2SC536SP (F, G) 2SC2458 (Y, GR) ETC.
Q505		
▲Q801	HC3891209F	IC NJM7812FA
▲Q802	HC10205030	IC L78MR05
Q803	?	
?	HT30001000	TRANSISTOR 2SC536SP (F, G) 2SC2458 (Y, GR) ETC.
Q808		
A101	AV01202140	P102-MISCELLANEOUS V.H.F. TUNER, FRONT END
FA01	FF10045330	CERAMIC FILTER, AM IF
F201	FF11070660	CERAMIC FILTER SFE10.7MX2-A
F202	FF11070620	CERAMIC FILTER SFE10.7MS3-A
F203	FF11070610	CERAMIC FILTER SFE10.7MA8-A
F204	FF11070660	CERAMIC FILTER SFE10.7MX2-A
F205	FH10750010	DISCRI. CERAMIC CDA10.7MA18-A
J101	BY04030030	TERMINAL, FM/AM ANT
J301	YT02020720	TERMINAL, OUTPUT
J501	YT02020550	TERMINAL, REMOTE CONTROL
LA01	LA10295140	ANT COIL, AM
LA02	LO10013400	OSC COIL, AM
LA05	LC23960710	CHOKE COIL, 39MH
L102	LC16810140	CHOKE COIL, 0.68μH
L201	LI10016010	I.F.T, FM
L202	LI14030030	I.F.T, FM DET
L203	LC13320140	CHOKE COIL, 3.3UH
L301	LS10293010	M.P.X.COIL, 19/38KHZ

REF. DESIG.	PART NO.	DESCRIPTION
L302	LS10293010	M.P.X.COIL, 19/38KHZ
▲S801	SP02011000	PUSH SWITCH, POWER/STANDAY
X301	FQ04563010	SERAMIC VIB, CSB465F11
X501	JX07001260	X'TAL, 7.2MHZ

NOTE ON SAFETY :

Symbol ▲ Fire or electrical shock hazard. Only original parts should be used to replace any part marked with symbol ▲ . Any other component substitution (other than original type), may increase risk of fire or electrical shock hazard.