

SERVICE
MANUAL

ST521/ST521L

marantz®

model ST521/ST521L

Stereophonic Tuner

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2. Complete part numbers.
3. Complete description of parts.
4. Model number for which part is required (indicate MARANTZ).
5. Account number (for account customers only).

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EUROPE			
MARANTZ S.A. 326 Avenue Louise Bte 32 1050 Brussels Belgium	MARANTZ AUDIO U.K. LTD. Unit 15/16 Saxon Way Industrial Estate Motor Lane Harmondsworth UB7 OLW Great Britain	MARANTZ BELGIUM 45 Rue Auguste Van Zande 1080 Brussels Belgium	MARANTZ SVENSKA A.B. Svartviksvangen 56 Traneberg Box 12016 161 12 BROMMA SWEDEN
MARANTZ GERMANY GMBH Max-Planckstrasse 22 6072 Dreieich 1 West Germany	MARANTZ FRANCE 4 Rue Bernard Palissy 92600 Asnieres France	MARANTZ GMBH AUSTRIA Wiedner Hauptstrasse 98 1050 WIEN AUSTRIA	
	MARANTZ NORSKE A.S. Refstadalleen 13 Oslo 5 Norway	MARANTZ DENMARK Bregnerødvej 132b 3460 BIRKERØD DENMARK	

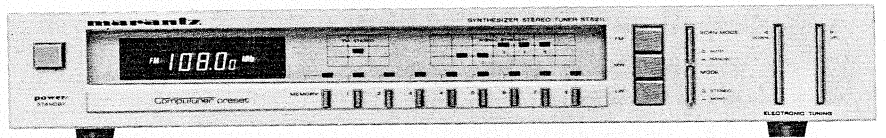
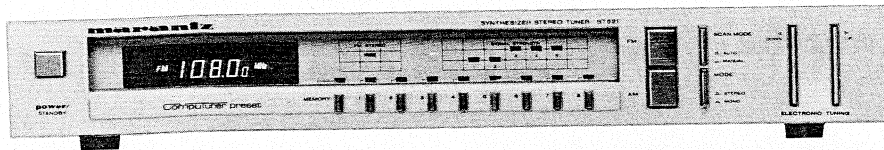
All of the above locations are fully equipped to take care of your total service needs. Because various countries have differing configuration requirements, it is necessary that you contact the service facility in your particular country. In the event that there is no service location listed for your country, please contact the nearest facility for the necessary assistance.

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TABLE OF CONTENTS

1. SHOCK FIRE HAZARD SERVICE TEST	1
2. P.W. BOARDS	1
3. TEST EQUIPMENT REQUIRED FOR SERVICING	2
4. TUNER ALIGNMENT PROCEDURES	2
4.1 FM Alignment Procedures	2
4.2 Multiplex Alignment Procedures	3
4.3 AM Alignment Procedures	3
5. ALIGNMENT POINT	4
6. VOLTAGE CONVERSION	5
7. CIRCUIT DESCRIPTION	5
8. BLOCK DIAGRAM	19
9. SCHEMATIC DIAGRAM AND COMPONENT LOCATIONS	20
9.1 Display Assembly (PR01) Schematic Diagram and Component Location	20
9.2 Power Switch Assembly (PS00) Schematic Diagram and Component Location	20
9.3 Key Switch (PY00) Schematic Diagram and Component Location	20
9.4 Scan Step Assembly (PT00) Schematic Diagram and Component Location	21
9.5 Scan Mode Assembly (PC00) Schematic Diagram and Component Location	21
9.6 Tuner Synthesizer Assembly (P100) Schematic Diagram and Component Location	22
9.7 Scan Step DE-Emphasis Switch Assembly (PC50) Schematic Diagram and Component Location	23
10. EXPLODED VIEW AND PARTS LIST	26
11. TECHNICAL SPECIFICATIONS	36
12. SCHEMATIC DIAGRAM	38

MODEL ST521/ST521L STEREOPHONIC TUNER



INTRODUCTION

This service manual was prepared for use by Authorized Warranty Stations and contains service information for Marantz Model ST521/ST521L Stereophonic Tuner.

Servicing information and voltage data included in this manual are intended for use by the knowledgeable and experienced technician only. All instructions should be read carefully. No attempt should be made to proceed without a good understanding of the operation of the Tuner.

The parts list furnishes information by which replacement parts may be ordered from the Marantz Company. A simple description is included for parts which can usually be obtained through local suppliers.

1. SHOCK FIRE HAZARD SERVICE TEST

CAUTION: After servicing this appliance and prior to returning to customer, 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. 66.3.D (Mandatory Test after Servicing Electrical Appliances, effective 7-1-83).

2. P.W. BOARDS

As can be seen from the circuit diagram the chassis of Model ST521/ST521L consists of the following units. Each unit mounted on a printed circuit board is described within the square enclosed by a bold dotted line on the circuit diagram.

1. Tuner mounted on P.W. Board P100
2. Display mounted on P.W. Board PR01
3. Key Switch mounted on P.W. Board PY00
4. Mode Switch mounted on P.W. Board PC00
5. Power Switch mounted on P.W. Board PS00
6. Scan Step Switch mounted on P.W. Board PT01
ST521 only.
7. Scan Step DE-Emphasis
Switch mounted on P.W. Board PC50
ST521 only.

3. TEST EQUIPMENT REQUIRED FOR SERVICING

This table lists the test equipment required for servicing the Model ST521/ST521L Tuner.

Item	Manufacturer and Model No.	Use
AM Signal Generator		Signal source for AM alignment
Test Loop		Use with AM Signal Generator
FM Signal Generator MPX Signal Generator	Sound Technology Model 1000A	Signal source for FM alignment Stereo separation alignment and trouble shooting
Distortion Analyzer Audio Oscillator AC VTVM	Sound Technology Model 1700A	Distortion measurements Sinewave and squarewave signal source Voltage measurements (AC)
Oscilloscope	Tektronix Model T932 Philips Model 3232	Waveform analysis and trouble shooting
Frequency Counter		MPX Oscillator adjustment (VCO)
Circuit Tester		Trouble shooting
DC VTVM	Fluke Model 8000 "Digital" Sompson Model 313, Triplet Model 801	Voltage measurements (DC)
AC Wattmeter	Simpson Model 1379	Monitors primary power to tuner
Line Voltmeter	Simpson Model 1359	Monitors potential of primary power to tuner
Variable Autotransformer	Superior Electronic Co., Powerstat Model 116B-10A	Adjusts level of primary power to tuner

4. TUNER ALIGNMENT PROCEDURES

A dummy resistor of 47 kohms must be connected across the tuner output terminals before alignment.

4.1 FM Alignment Procedures (Selector switch in the "FM" position, Mode switch in the MONO Position.)

1. FM RF Alignment

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Set the Digital Readout Frequency	Adjust:
1	RF generator to FM antenna terminals through matching network (300 ohms, balanced) Maintain RF level below limit.	98.0 MHz	VTVM to L or R channel output (J102)	98.0 MHz	FRONT END IFT L8 for maximum output and distortion.
2	RF generator 1 mV output to FM antenna terminals through matching network. (300 ohms, balanced)	98.0 MHz	"O" center meter or DC current meter in 100 μ A range between (J201 and J202)	98.0 MHz	L201 core so that the meter indicates its center or may read "O".
3	RF generator 1 mV output to FM antenna terminals through matching network. (300 ohms, balanced)	98.0 MHz	Distortion meter to L or R channel output (J102)	98.0 MHz	L202 core for minimum distortion.

4.2 Multiplex Alignment Procedures (Selector switch in the "FM" position/Mode switch in the STEREO position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Set the Digital Readout Frequency	Adjust:
1	RF generator to FM antenna terminals through matching network.	No modulation	Frequency counter to (J301)		R303 so that frequency may precisely read 76 kHz.
2	RF generator 12.5 μ V output to FM antenna terminal through matching network. (300 ohms, balanced)	98.0 MHz	VTVM to R or L channel output (J102)	98.0 MHz	R213 for 12.5 μ V threshold level. (During this adjustment turn the muting pushswitch "ON".)
3	RF generator to FM antenna terminals through matching network (300 ohms, balanced) with 1 mV FM stereo signal.	Pilot only	VTVM to right and left channel output (J102)		R307 so that minimum output should be the same in both channels.
4	RF generator to FM antenna terminals through matching network (300 ohms, balanced) with 1 mV FM stereo signal Modulation level. DIN 40kHz +8% pilot IHF 67.5 kHz +9% pilot	Stereo left (1,000 Hz)	VTVM to right channel output (J102)	98.0 MHz	R327 for same separation in both channels.
5		Stereo right (1,000 Hz)	VTVM to left channel output (J102)		
6	Repeat steps 4 and 5.				

4.3 AM Alignment Procedures

1. MW Local Oscillator Alignment (Selector switch in the "MW" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Set the Digital Readout Frequency	Adjust:
1			DC voltmeter in 3V range to (J205)	522 kHz	LA03 for 1.5V.

2. MW RF Alignment (Selector switch in the "MW" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Set the Digital Readout Frequency	Adjust:
1	Apply the signal to the AM loop antenna from the RF generator using the test loop. As per the Figure 1.	1,404 kHz	VTVM to L or R channel output (J102)	1,404 kHz	CA33-1 for maximum output.
2		603 kHz		603 kHz	LA02 for maximum output.
3	Repeat steps 1 and 2 as necessary to obtain maximum sensitivity.				

3. AM IF Alignment (Selector switch in the "MW" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Set the Digital Readout Frequency	Adjust:
1	Sweep generator to (J204).	450 kHz	Oscilloscope to (J203)	Quiet point on band	LA01 for maximum and symmetric response.

X

4. LW Local Oscillator Alignment (Selector switch in the "LW" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Set the Digital Readout Frequency	Adjust:
1			DC voltmeter in 12V range to (J205)	153 kHz	LA05 for 3.0V.

5. LW RF Alignment (Selector switch in the "LW" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Set the Digital Readout Frequency	Adjust:
1	Apply the signal to the AM loop antenna from the RF generator using the test loop. As per the Figure 1.	350 kHz	VTVM to L or R channel output (J102)	350 kHz	CA33-2 for maximum output.
2		170 kHz		170 kHz	LA04 for maximum output.
3	Repeat steps 1 and 2 as necessary to obtain maximum sensitivity.				

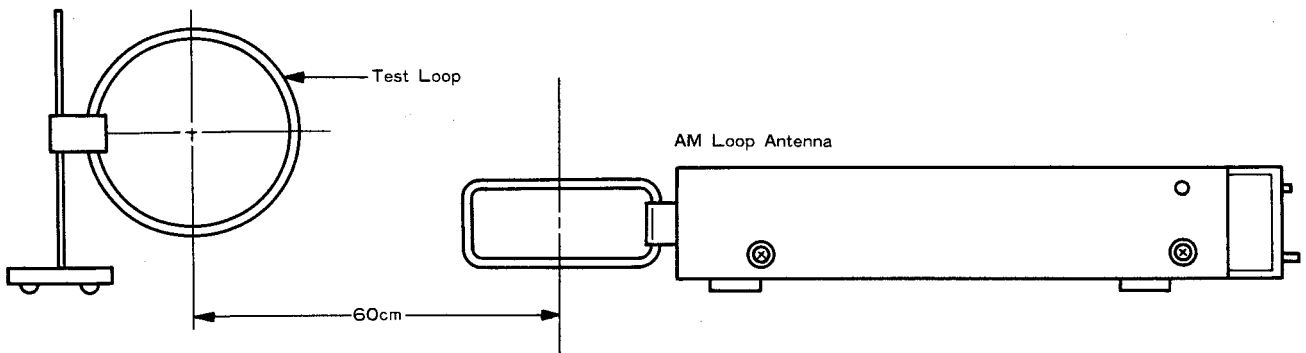
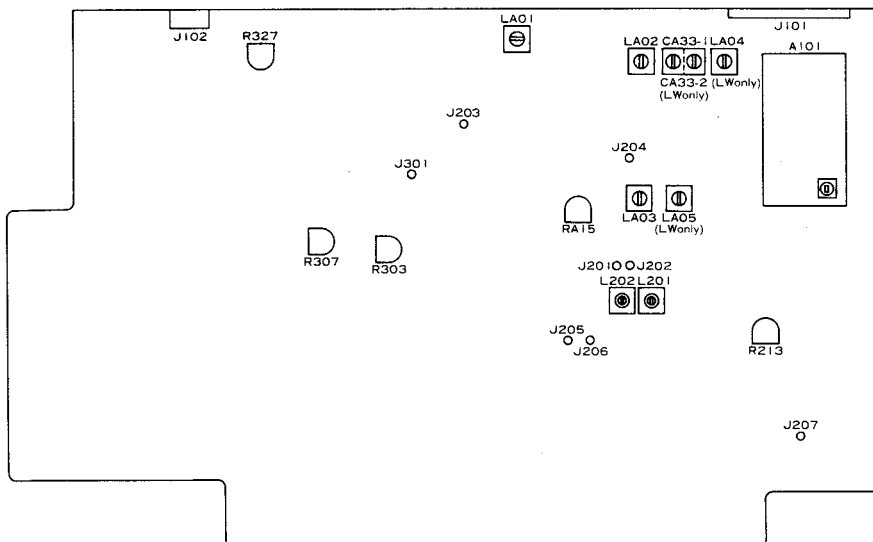


Figure 1. Application of AM Signal

5. ALIGNMENT POINTS

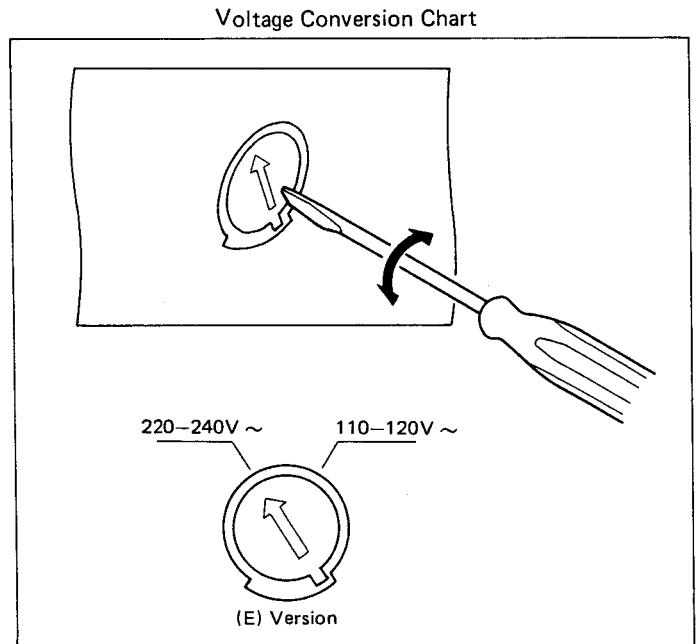


6. VOLTAGE CONVERSION

To convert the unit to a different power source voltage, change the position as illustrated in the drawing below.

CAUTION

DISCONNECT POWER SUPPLY CORD FROM AC OUTLET BEFORE CONVERTING VOLTAGE. DO NOT DISASSEMBLE THE VOLTAGE SELECTOR ABSOLUTELY.



NOTE ON SAFETY:

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

7. CIRCUIT DESCRIPTION

The Model ST521/ST521L is an LW/MW/FM digital frequency-synthesized tuner using a PLL frequency synthesizer designed for use in LW/MW/FM tuners in conjunction with a CMOS LSI controller.

7.1 LW/MW/FM Tuner PLL Frequency Synthesizer and Controller TC9147P (Q512)

● Maximum Ratings (Ta = 25°C)

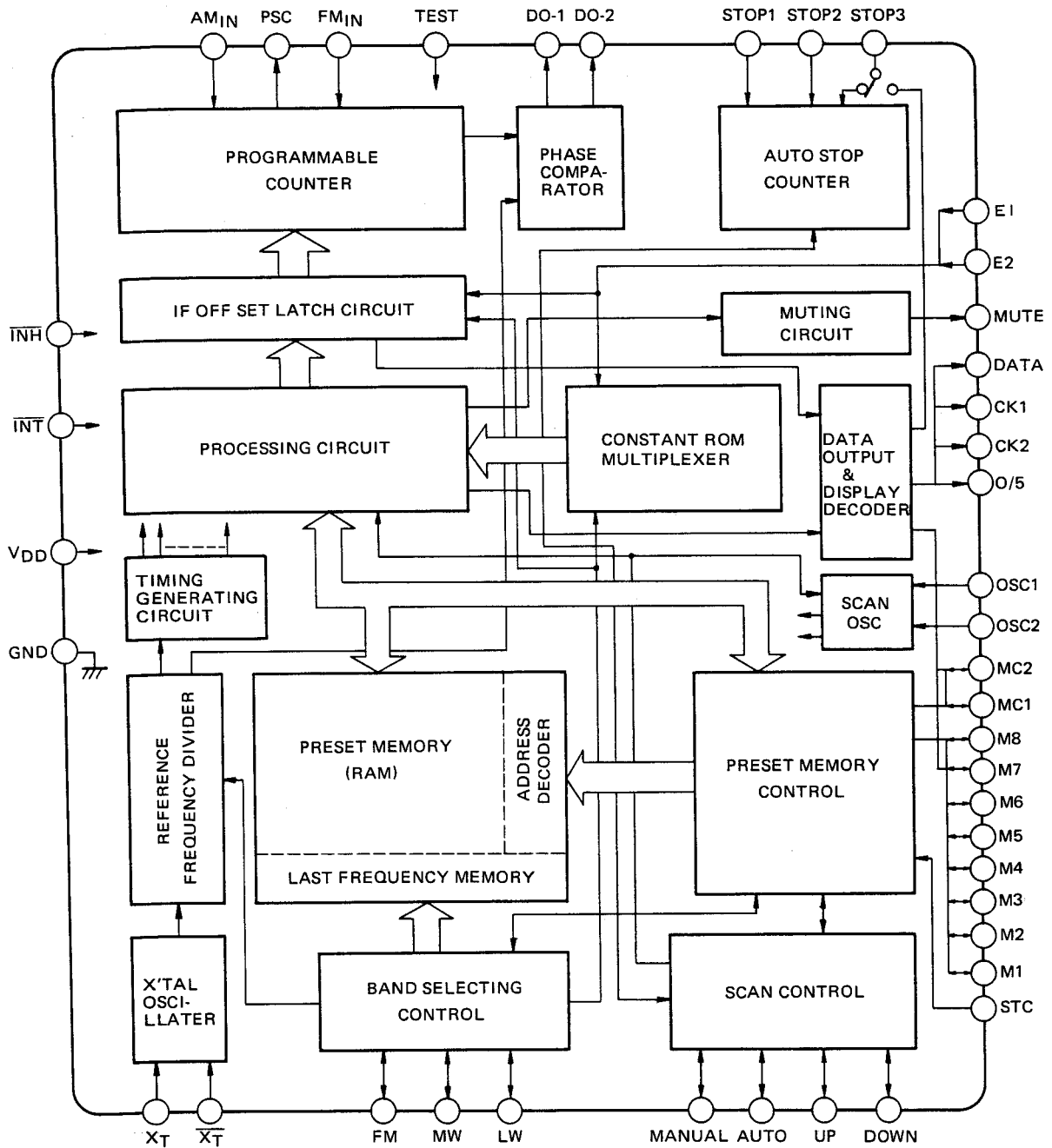
Characteristic	Symbol	Ratings	Unit
Supply Voltage	V _{DD}	0 ~ 6	V
Input Voltage	V _{IN}	-0.3 ~ V _{DD} + 0.3	V
Output Voltage	V _{OUT}	-0.3 ~ V _{DD} + 0.3	V
Output Current (Note)	I _{OUT}	30	mA
Power Dissipation	P _D	800	mW
Operating Temperature	T _{opr}	-30 ~ 75	°C
Storage Temperature	T _{stg}	-55 ~ 125	°C

(Note) Bipolar transistor output current.

Pin Connection

GND	1	42	V _{DD}
X _T	2	41	INT
X _T	3	40	INT
FM	4	39	AM _{IN}
MW	5	38	PSC
LW	6	37	FM _{IN}
MANUAL	7	36	TEST
AUTO	8	35	DDO-1
UP	9	34	DDO-2
DOWN	10	33	STOP1
STO	11	32	STOP2
M1	12	31	STOP3
M2	13	30	DE1
M3	14	29	DE2
M4	15	28	MUTE
M5	16	27	DATA
M6	17	26	CK1
M7	18	25	CK2
M8	19	24	Q/5
MC1	20	23	OSC1
MC2	21	22	OSC2

● Block Diagram



● Electrical Characteristics (Unless otherwise specified, Ta = 25°C, VDD = 5.0V)

Characteristic		Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Supply Voltage		VDD		— *	4.5	5.0	5.5	V
Supply Current		IDD		FM Band, fIN=4MHz, No-Load	—	4.0	7.0	mA
Memory Backup Voltage		VDD B		INH=0V *	2.0	~	5.5	V
Inhibit Supply Current		IDD I1		VDD=5.0V, INH=0V	—	—	15	μA
		IDD I2		VDD=2.0V, INH=0V	—	—	5	
X'tal Oscillation Frequency		fX'tal		— *	—	7.2	—	MHz
FMIN	Operating Frequency	fIN (FM)		VIN=0.5 Vp-p, AC coupled *	2.0	~	4.0	MHz
	Input Amplitude	VIN (FM)		fIN=2.0 ~ 4.0MHz, AC coupled *	0.5	~	VDD-0.5	Vp-p
AMIN	Operating Frequency	fIN (AM)		VIN=0.5 Vp-p, AC coupled *	0.5	~	2.2	MHz
	Input Amplitude	VIN (AM)		fIN=0.5 ~ 2.2 MHz, AC coupled *	0.5	~	VDD-0.5	Vp-p
STOP3 (IFIN)	Operating Frequency	fIN (IF)		VIN=0.5 Vp-p, AC coupled *	400	~	500	kHz
	Input Amplitude	VIN (IF)		fIN=400 ~ 500 kHz, AC coupled *	0.5	~	VDD-0.5	Vp-p
PSC	FMIN Propagation Delay Time	t _{pd}		CL=15pF, VIN=0.5 Vp-p	—	—	200	nS
	Max. Load Capacity	CL		— *	—	—	15	pF
INH INT	Input Voltage	"H" Level	VIH1	—	4.2	~	VDD	V
		"L" Level	VIL1	—	0	~	3.0	
Other All Input I/O Terminals	Input Voltage	"H" Level	VIH2	—	3.5	~	VDD	V
		"L" Level	VIL2	—	0	~	1.5	
UP, DOWN, TEST Input Pull-Down Resistance		RIN		—	15	30	60	kΩ
FMIN, AMIN, STOP3 Feedback Resistance		Rf		—	200	400	800	kΩ
F1, 2, STOP1, 2, INH INT Input Leak Current		IL		—	—	—	1.0	μA

FM, MW, LW, MANUAL, AUTO, STO (TC9147P: M1 ~ M8)

Output Current	"H" Level	IOH		VOH=4.0V	15	20	—	mA
	"L" Level	IOL		VOL=5.0V	70	140	280	μA

OSC, MUTE (TC9147P: DATA, CK1, 2, O/5)

Output Current	"H" Level	IOH		VOH=4.0V	0.6	1.0	—	mA
	"L" Level	IOL		VOL=1.0V	0.6	1.0	—	mA

DO-1, DO-2

Output Current	"H" Level	IOH		VOH=4.0V	0.6	1.0	—	mA
	"L" Level	IOL		VOL=1.0V	0.6	1.0	—	
Try state Leak Current		ITL		—	—	—	0.1	μA

MC1, MC2

Output Current	"H" Level	IOH		VOH=4.0V	0.6	1.0	—	mA
	"L" Level	IOL		VOL=5.0V	70	140	280	μA

Note: Parameters with * mark are guaranteed at all conditions of VDD = 4.5 ~ 5.5V, Ta = 30 ~ 75°C.



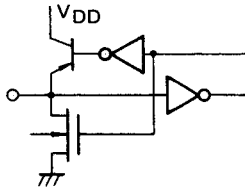
● Functional Explanation of Terminals

Pin No.	Symbol	Terminal Name	Function	Remarks
2	X _T	Crystal Oscillator terminal	Connect a 7.2 MHz crystal for reference frequency.	With a built in feed-back resistor.
3	$\overline{X_T}$			
4	FM	FM band designating input	Mutual reset type for selecting FM/MW/LW bands.	A
5	MW	MW band designating input		
6	LW	LW band designating input		
7	MANUAL	Manual tuning mode designating input	Mutual reset type for selecting manual and auto search operating modes at time of UP/DOWN tuning.	A
8	AUTO	Auto search tuning mode designating input		
9	UP	Up operating key input	For UP/DOWN tuning with the push key connected.	B
10	DOWN	DOWN operating key input		
11	STO	Memory store command input	The preset memory is set to write state by this input.	A
12 13 19	M1 ? M8	Preset memory channel designating input	In combination with MC1 and MC2 inputs, controls write/read of the internal 16 channel preset memory.	A
20	MC1	Memory control input	Used for setting the 16 channel preset memory either to FM/AM (MW+LW) 8 channel fixed system or FM+MW+LW 3 bands 16 channel random system.	C
21	MC2			
22	OSC2	AM oscillator terminal	C.R terminal for oscillator that decides SCAN speed at time of AM search.	—
23	OSC1	FM oscillator terminal	C.R terminal for oscillator that decides SCAN speed at time of FM search.	—
24	O/5	FM 50 kHz output for Europe	50 kHz step output in FM band in European region. Become "H" level at 50 kHz.	D
25	CK2	Receiving frequency data serial outputs	Transmits serial data and timing clock to be sent to Receiving Frequency Digital Display Driver TD6301AP. CK1 output also serves for pee sound transmission.	D
26	CK1			
27	DATA			
28	MUTE	Muting signal output	This terminal is placed at "H" level at time of muting output.	D
29	E2	Region Designating output	For designating Japan, U.S.A. and Europe.	E
30	E1			
31	STOP3	AM-IF signal input	Stops auto search by counting IF450 kHz signal at time of AM.	F
32	STOP2	Auto search stop signal input	When a "H" level signal is input under the state where a "H" level signal is being given to STOP1 Input, stops Auto search.	E
33	STOP1	SCAN speed slow input	When a "H" level signal is input, reduce auto search scan speed to 1/2.	E
34	DO-2	Phase Comparator output	2 try state buffers are transmitted parallelly from one phase comparator.	G
35	DO-1			
36	TEST	Test Terminal	When a "H" level signal is input, this terminal is placed at test mode.	B
37	FM _{IN}	FM Programmable counter input	Output from prescaler TD6104P is connected.	F
38	PSC	Prescaler control output	Controls selection of 1/30 and 1/32 division of prescaler TD6104P.	D

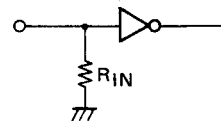
Pin No.	Symbol	Terminal Name	Function	Remarks
39	AM _{IN}	AM programmable counter input	AM local oscillation signal is applied.	F
40	$\overline{\text{INH}}$	Inhibit input	Normal operation at "H" level and inhibit status at "L" level.	E
41	$\overline{\text{INT}}$	Initialize input	Normal operation at "H" level, and internal state is initialized at "L" level.	E
42	V _{DD}	Power terminals	Apply 5 ± 0.5V. Backup is possible up to 2V.	—
1	GND			

● Input/Output Equivalent Circuit

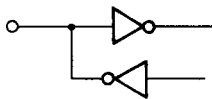
A. Bipolar Transistor LED Driver Built-in I/O.



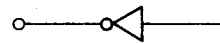
B. C-MOS Input with Pull-Down Resistor



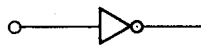
C. C-MOS I/O



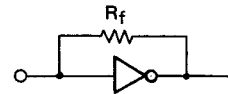
D. C-MOS Output



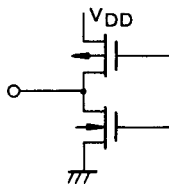
E. C-MOS Input (without Pull-up. Pull-Down Resistor)



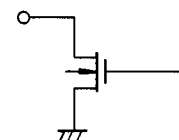
F. With Built-in Input Amplifier



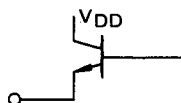
G. Try-state Output



H. Nch MOS LED Driver Output



I. Bipolar Transistor LED Driver Output





7.2 OUTLINE OF FUNCTIONS

● Receiving Bands

- 1) FM/MW/LW bands can be received in European region and FM/AM bands in Japan and U.S.A.
- 2) AM band for U.S.A. is able to receive up to 1710 kHz, and 9 kHz separation is also available.

Destination	Band Name	Range of Receiving Frequency	IF	Frequency Stop	Reference Frequency	Remarks
Europe	FM	37.50 ~ 108.00 MHz	+10.7 MHz	50 kHz	25 kHz	FM Europe 50 kHz separation
	MW	522 ~ 1611 MHz	+450 kHz	9 kHz	9 kHz	MW 9 kHz separation
	LW	153 ~ 360 kHz	+450 kHz	1 kHz	1 kHz	1 kHz separation
U.S.A.	FM	87.5 ~ 108.0 MHz	+10.7 MHz	100 kHz	25 kHz	FM U.S.A. band
	AM-1	520 ~ 1710 kHz	+450 kHz	10 kHz	10 kHz	MW U.S.A. 10 kHz separation
	AM-2	522 ~ 1710 kHz	+450 kHz	9 kHz	9 kHz	MW U.S.A. 9 kHz separation
Japan	FM	76.0 ~ 90.0 MHz	-10.7 MHz	100 kHz	25 kHz	FM JAPAN band
	AM	522 ~ 1611 kHz	+450 kHz	9 kHz	9 kHz	MW 9 kHz separation

7.3 EXPLANATION OF OPERATION

● PLL Unit

1. Reference Frequency and Crystal Oscillator

Oscillation frequency from the crystal oscillator is divided to generate reference frequency of 25 kHz at time of FM, 9 or 10 kHz at MW and 1 kHz at LW.

- Crystal oscillation frequency is 7.2 MHz.
- The crystal oscillator has a built-in self-bias amplifier and can be composed easily only by connecting a crystal and a capacitor. Further, oscillation is stopped under the inhibit state.

Mode	Reference Frequency	Remarks
FM	25 kHz	at FM band
MW9	9 kHz	at MW 9 kHz separation
MW10	10 kHz	at MW 10 kHz separation
LW	1 kHz	at LW band

2. Programmable Counter

The programmable counters for FM and AM (MW/LW) are in different circuit configuration.

1) FM Programmable Counter

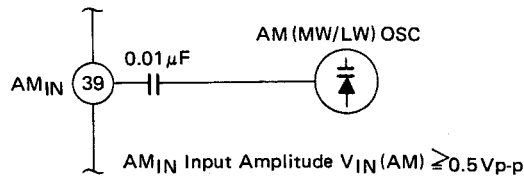
The FM programmable counter is of swallow count type in combination with TD6104P. As a result, reference frequency 25 kHz is obtained and performance is improved.

In this case, the transmission delay time of PSC output for controlling TD6104P is limited. PSC transmission delay time $t_d < 250$ ns.

2) AM Programmable Counter

The AM (MW/LW) programmable counter is of direct division type.

The signal transmitted from AM channel can be directly input to AM_{IN} terminal.

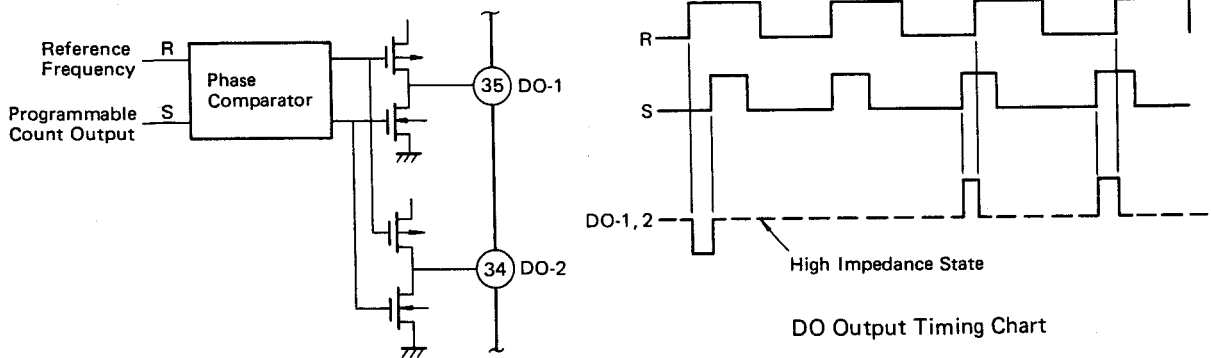


- As both FM_{IN} and AM_{IN} have a built-in input amplifier, a signal shall be applied with a capacitor connected.
- Under the inhibit state and at AM (MW/LW), PSC output is fixed at "L" level.
- IF offset has been provided in advance for frequency division by the programmable counter.

3. Phase Comparator

The phase comparator is a unit that compares phases of reference frequency and programmable counter output and controls V_{CO} through the low pass filter so that thus two signal frequencies and phases agree each other.

- Two tri-state buffers DO-1 and DO-2 are transmitted parallelly from one phase comparator. Because of this, two sets of low-pass filter can be used without necessity for switching them.
- Under the inhibit state, both DO-1 and DO-2 outputs are kept at "L" level.



● Control Unit

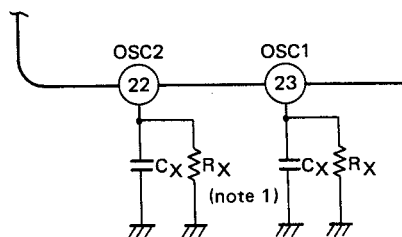
1. Determination of OSC1 and OSC2 Oscillation Frequency

OSC1 and OSC2 are C and R connecting terminals of a single terminal type oscillator. Scan speed at time of manual fast forward and auto search is decided by this frequency.

OSC1 is for FM and OSC2 is for AM and oscillation frequency can be set independently. Further, OSC1 oscillation frequency also serves for deciding manual fast forward pushing time, muting signal transmission time and store state automatic releasing time.

Both OSC1 and OSC2 stop oscillation unless it is required.

$$\text{Oscillation Frequency } F_{\text{OSC}} = \frac{1}{0.7 C_X R_X} \text{ (Hz) (Note 2)}$$



(Note 1) R_X = 10k ~ 100kΩ

Scan Speed (Fast FWD. Auto Search)	At FM	f_s (FM) = $1/2 f_{OSC1}$ (step/sec)	(One Example) When $f_{OSC} = 20$ Hz	10 (step/sec)
	At AM (MW/LW)	f_s (AM) = $1/2 f_{OSC2}$ (step/sec)		10 (step/sec)
Manual Fast FWD Push Time	$T_{SCAN} = 14/f_{OSC1}$ (sec)			0.7 (sec)
Store State Auto Release Time	$T_{STO} = 224/f_{OSC1}$ (sec)			11 (sec)
Muting Signal Output Time	Short	$T_{MUTE(S)} = 7/f_{OSC1}$ (sec)		0.35 (sec)
	Long	$T_{MUTE(L)} = 15/f_{OSC1}$ (sec)		0.75 (sec)

(Note) f_{OSC1} : OSC1 Oscillation Frequency, f_{OSC2} : OSC2 Oscillation Frequency

2. Designation of Destination by Japan, U.S.A. and Europe

Regional designation by Japan, U.S.A. and Europe is made by E1 and E2 terminals.

E1	E2	Destination	
0	0	Japan	
1	0	Europe	
0	1	U.S.A.	MW 9 kHz separation
1	1		MW 10 kHz separation

- For U.S.A. region designation, AM (MW) band 9 kHz/10 kHz separation can be selected.

(a) Method of auto stop signal input during normal auto search.

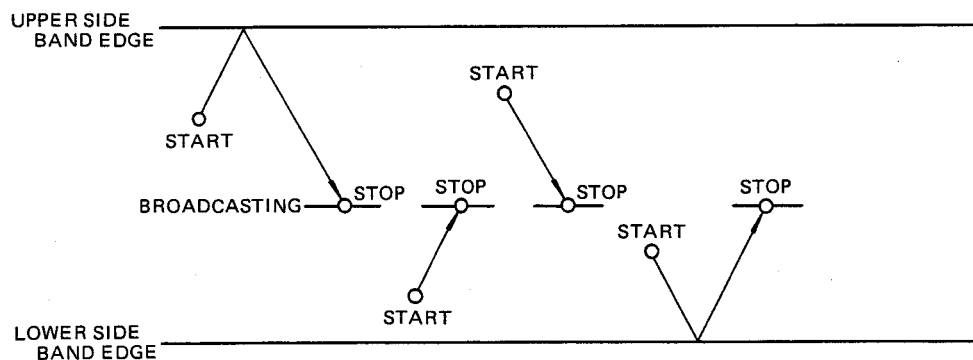
Input the auto stop signal to both STOP1 and STOP2 terminal, or with STOP2 terminal fixed at "H" level, apply the auto stop signal to STOP1 terminal.

(b) When ARI or Stereo Station only is searched.

Apply the normal auto stop signal to STOP1 terminal. Apply ARI or Stereo Station identification signal to STOP2 terminal ("H" level shows ARI of Stereo Station).

(c) When Auto Stops Signal is received (when there is a broadcasting station), Scan is stopped.

- The auto search tuning scan system is in triangular waveform shape.
- When the **DOWN** key is pushed during the scanning in the up direction, the scanning is changed in the down direction. Similarly, when the **UP** key is pushed during the scanning in the down direction, the scanning is reversed in the up direction.



- The auto search scan speed is same as the fast forward scan speed f_s (FM) at FM, f_s (AM) at AM (MW/LW).

The auto search tuning is released when the following operation is mode:

- When the operating mode is changed to the manual scan mode.
- When a receiving band is changed.
- When the preset memory is read.
- When the status is changed to the inhibit state.
- When the **UP** or **DOWN** key is kept pushed during the auto search tuning, no auto stop signal is accepted. In addition, the band edge is reached, the auto search tuning is stopped.

3. Auto Stop

1) STOP1, STOP2 Terminals

- When a "H" level signal is applied to STOP1 input, auto search scan speed is reduced to 1/2 (Slow mode).
 - When a "H" level signal is applied to STOP2 terminal under the slow mode (STOP1 = at "H" level), the auto search tuning is stopped.
- Through the above operations, it is possible to stop the auto search after searching AR1 or Stereo station only.

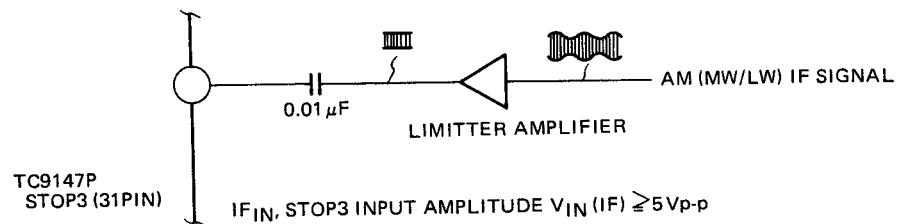
2) STOP3 Terminal

This terminal is the input of IF signal (=450 kHz) at time of AM (MW/LW). When this input frequency enters the specified range against 450 kHz, auto search tuning stops.

- As the input amplifier has been built in, apply IF signal with the capacitor connected.
- IF_{IN}, STOP3 input is not accepted at time of FM.
- Range of Auto Tuning stopping.

MW Band	450 kHz ± about 3 kHz
LW Band	450 kHz ± about 600 Hz

- Since IF signal has been amplitude modulated, it is adequate to apply it to IF_{IN}, STOP3 terminal through the limiter amplifier.



4. Memory Function

This is the function for tuning a desired channel by one-touch by constantly storing optional frequency data.

The terminals concerned with the memory are STO, M1 ~ M8, MC1, and MC2, a table of 11 terminals. Inputs are all "H" level active.

- STO and M1 ~ M8 terminal are of I/O type with a built-in bipolar transistor status display driver.
- MC1 and MC2 terminals control the built-in 16 channel preset memories as shown in the following table.

MC1	MC2	Allocation of 16 channel preset memories	Memory type
1	0	Memory addresses for 1 ~ 8 channels are assigned by M1 ~ M8 terminals.	16 channel random memory system.
0	1	Memory addresses for 9 ~ 16 channels are assigned by M1 ~ M8 terminals.	
1	1	No input is accepted. Memory allocation holds the previous status.	
0	0	Automatically allocated to 8 FM channels and 8 AM channels. Further, at time of AM, MW and LW band random system.	8 FM/AM channel fixed memory system.

- MC1 and MC2 Inputs are of mutual resetting I/O type with an internal latch circuit.
- (Note) MC1 and MC2 terminals are of C-MOS I/O type and has no built-in driver.

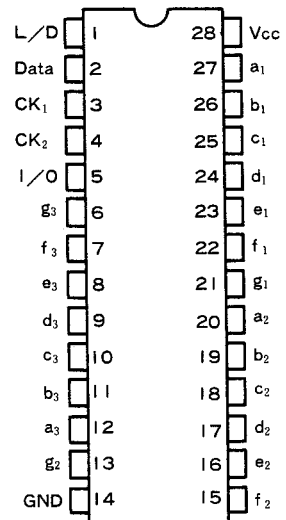
5. Receiving Frequency Display

The frequency display of TC9147P is explained here. The linear display of TC9146AP will be separately explained. Receiving frequency is displayed using the external static display driver TC6301AP.

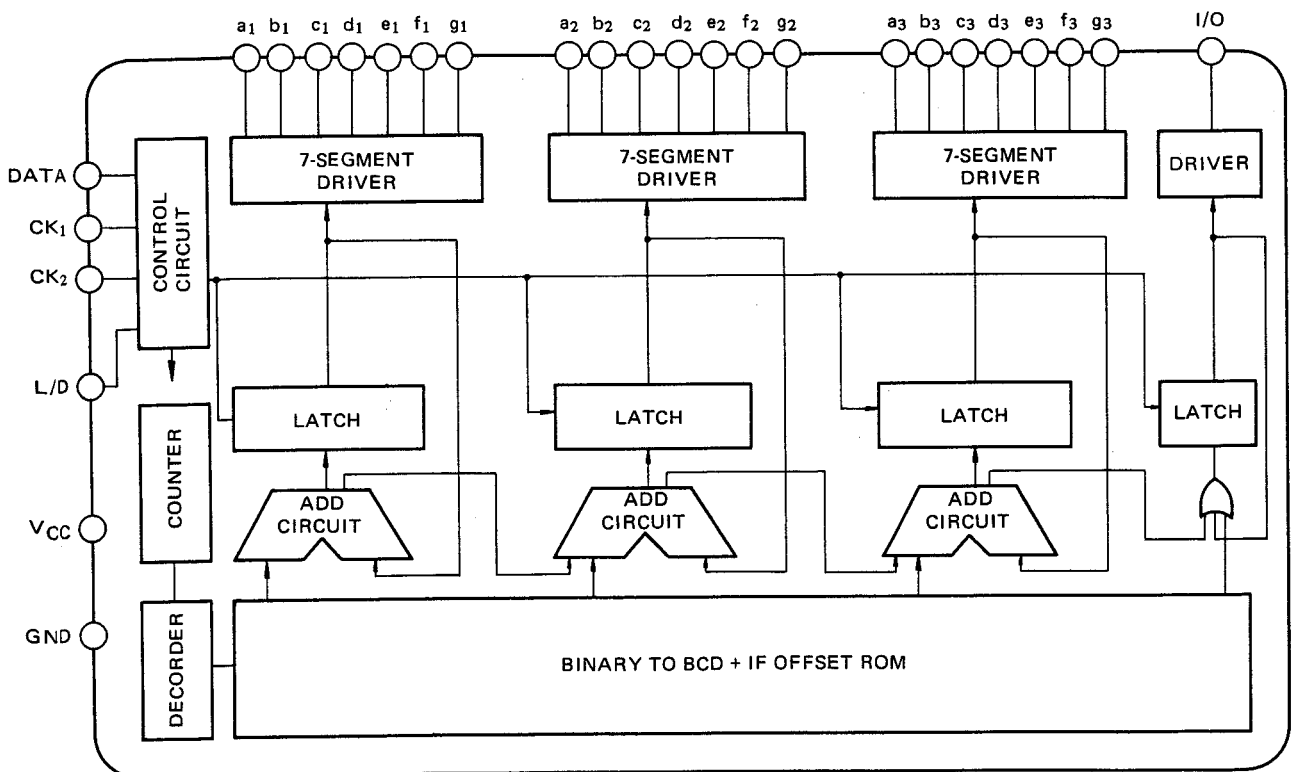
- Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{CC}	8	V
Input Voltage	V_{IN}	$-0.3 \sim V_{CC} + 0.3$	V
Output Current	$I_{OL} (MAX)$	20	mA
Output Voltage	$V_{OH} (MAX)$	20	V
Power Dissipation	P_D	1.0	W
Operating Temperature	T_{opr}	$-30 \sim 75$	$^\circ\text{C}$
Storage Temperature	T_{stg}	$-55 \sim 150$	$^\circ\text{C}$

Pin Connections



- Block Diagram



● Pin Description

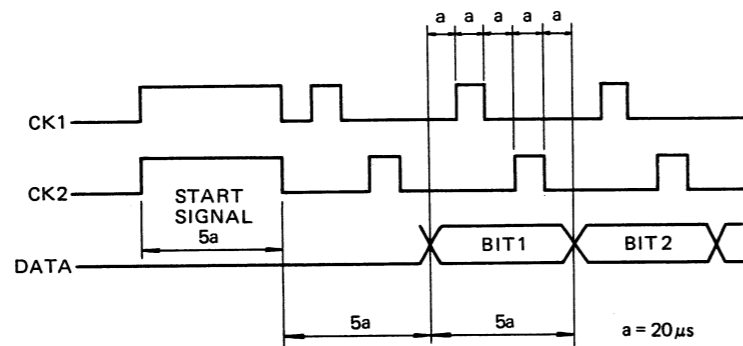
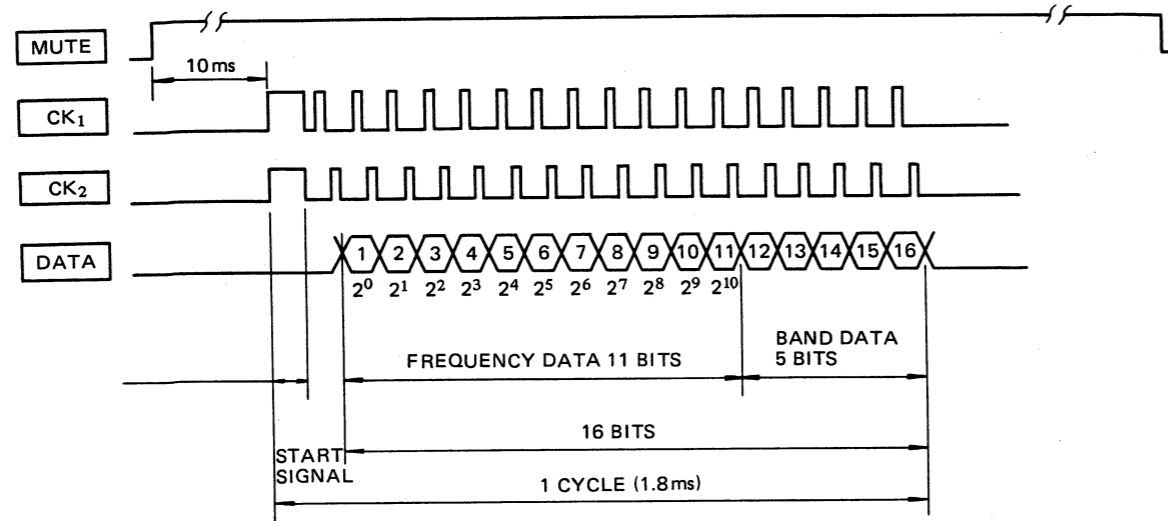
Pin No.	Name	Functional Description	Remarks
1	L/D	Output state switching signal input. Signal input for switching output state by displays (LED, FL and LCD).	
2	Data	Receiving frequency data signal input. Signal is input in serial from system controller.	
3, 4	CK ₁ , CK ₂	Timing clock signal input.	
5	1/0	Segment drive signal output. For FM the digit of 100 MHz and for AM that of 1000 kHz are displayed respectively. Since both FM and AM are 1 or 0, one pin only is sufficient for output.	With built-in transistors of high resisting voltage and large current flow.
6 ~ 12	a ₃ ~ g ₃	7-segment drive signal output. Digits of 10 MHz for FM and those of 100 kHz for AM are displayed, respectively	With built-in transistors of high resisting voltage and large current flow.
13, 15 ~ 20	a ₂ ~ g ₂	7-segment drive signal output. Digits of 1 MHz for FM and those of 10 kHz for AM and displayed, respectively.	With built-in transistors of high resisting voltage and large current flow.
21 ~ 27	a ₁ ~ g ₁	7-segment drive signal output. Digits of 100 kHz for AM and those of 1 kHz for AM are displayed, respectively.	With built-in transistors of high resisting voltage and large current flow.
14, 28	V _{CC} , GND	Power supply GND.	

● Electrical Characteristics (Unless otherwise specified, V_{CC} = 5V, T_a = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Operating Supply Voltage Range	V _{CC}		T _a = -30 ~ 75°C	4.5	5.0	5.5	V
Operating Supply Current	I _{CC}		No load	-	-	16	mA
Input Voltage	"H" Level	V _{IH}	Data, CK ₁ , CK ₂ , L/D	4.0	-	-	V
	"L" Level	V _{IL}	Data, CK ₁ , CK ₂ , L/D	-	-	1.0	V
Input Current	"H" Level	I _{IH}	Data, V _{IH} = 5V	-	-	0.6	mA
	"L" Level	I _{IL}	Data, V _{IL} = 0V	-0.1	-	-	mA
Output Current	I _O		a ₁ ~ g ₁ , a ₂ ~ g ₂ , a ₃ ~ g ₃ , 1/0	15	-	-	mA
Output Saturation Voltage	V _{CE (sat)}		a ₁ ~ g ₁ , a ₂ ~ g ₂ , a ₃ ~ g ₃ , 1/0, I _{OL} = 15 mA	-	-	1.2	V
Timing Input Operating Frequency	f _{opr}		Data, CK ₁ , CK ₂	-	-	120	kHz

Receiving frequency data in serially transferred to TD6301AP through DATA, CK1 and CK2 terminals.

- The Output timings of DATA, CK1 and CK2 terminal are shown in the following diagram.



- (1) DATA Output
Frequency data and band data are serially transmitted in 16 bits. 1 ~ 11 bits are frequency data and 12 ~ 16 bits are band data.

- Frequency Data
This is a value of receiving frequency minus the lower band edge of that band. This value is transmitted in binary 11 bits.
- Band data are as shown in the table.

bit 12	13	14	15	16	Band
1	0	0	0	0	LW Band
0	1	0	0	0	FM JAPAN Band
0	0	1	0	0	FM U.S.A./Europe Band
0	0	0	1	0	MW 9 kHz separation
0	0	0	0	1	MW 10 kHz separation

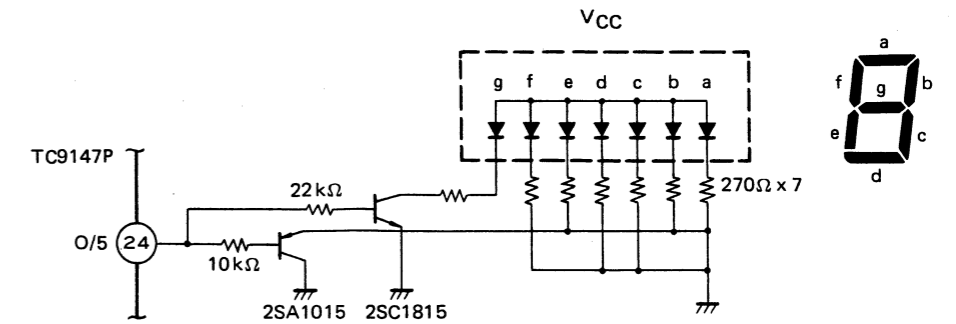
- (2) CK1, CK2 Output
These outputs are timing clocks for reading DATA output by TD6301AP. DATA, CK1 and CK2 outputs are transmitted by are cycle only in the following cases:

- When the inhibit state is released.
- When a band is changed.
- When the preset memory is read.
- At time of UP/DOWN tuning.

- (3) 50 kHz Frequency Display in FM Band for Europe
The 50 kHz display in FM Band for Europe is made at O/5 output.

- At time of 50 kHz, output will become "H" level. When other areas are assigned or at time of MW and LW bands, output is fixed at "L" level.

Example of Display by 7-Segment LED.



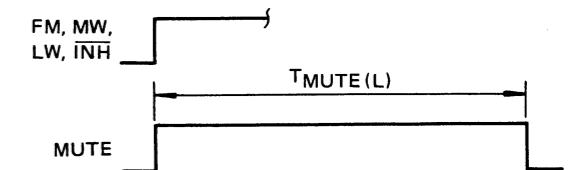
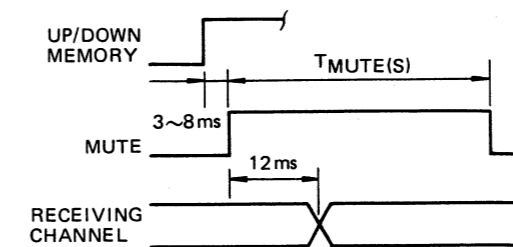
6. Muting Output

In order to prevent generation of abnormal sound at time of key operation, muting signal is transmitted from the MUTE terminal at the timings shown in the following diagrams.

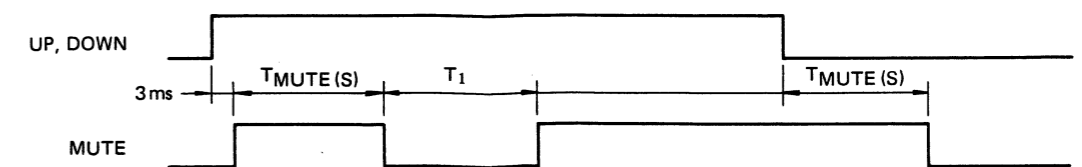
- Muting output time at time of restoration from the inhibit state or band switching is extended to about 2 times of that in normal cases. (This is also true when a band is changed according to the memory read in the random memory system.)
- When the multiple band input keys are pushed or during the fast forwarding or auto search tuning, muting output is kept at "H" level.
- The receiving channel (division of the programmable counter) changes 12 mS later after muting signal is transmitted. This will provide a margin to muting application time.

- (1) Manual UP/DOWN, Memory Read

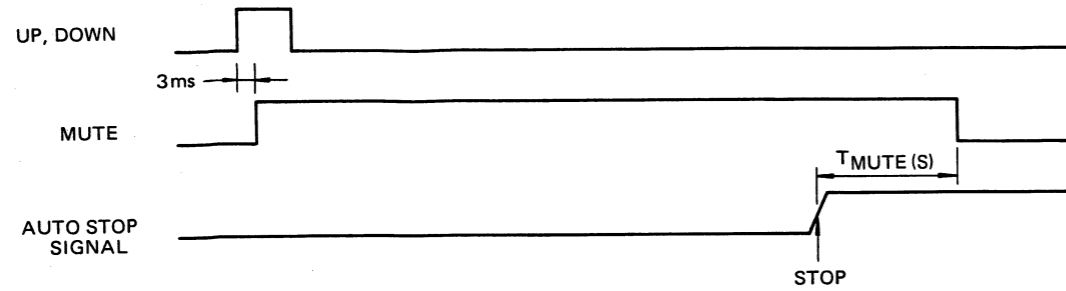
- (2) Restoration from Inhibit status, Band Switching



- (3) Manual Fast Forward



(4) Auto Search Tuning



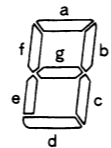
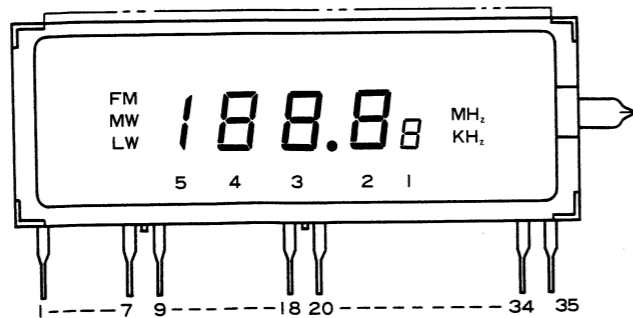
$$T_{MUTE(L)} = \frac{15}{f_{OSC1}} \text{ (sec) } (= 750 \text{ ms})$$

$$T_{MUTE(S)} = T_1 = \frac{7}{f_{OSC1}} \text{ (sec) } (= 350 \text{ ms}) \text{ (at } f_{OSC1} = 20 \text{ Hz)}$$

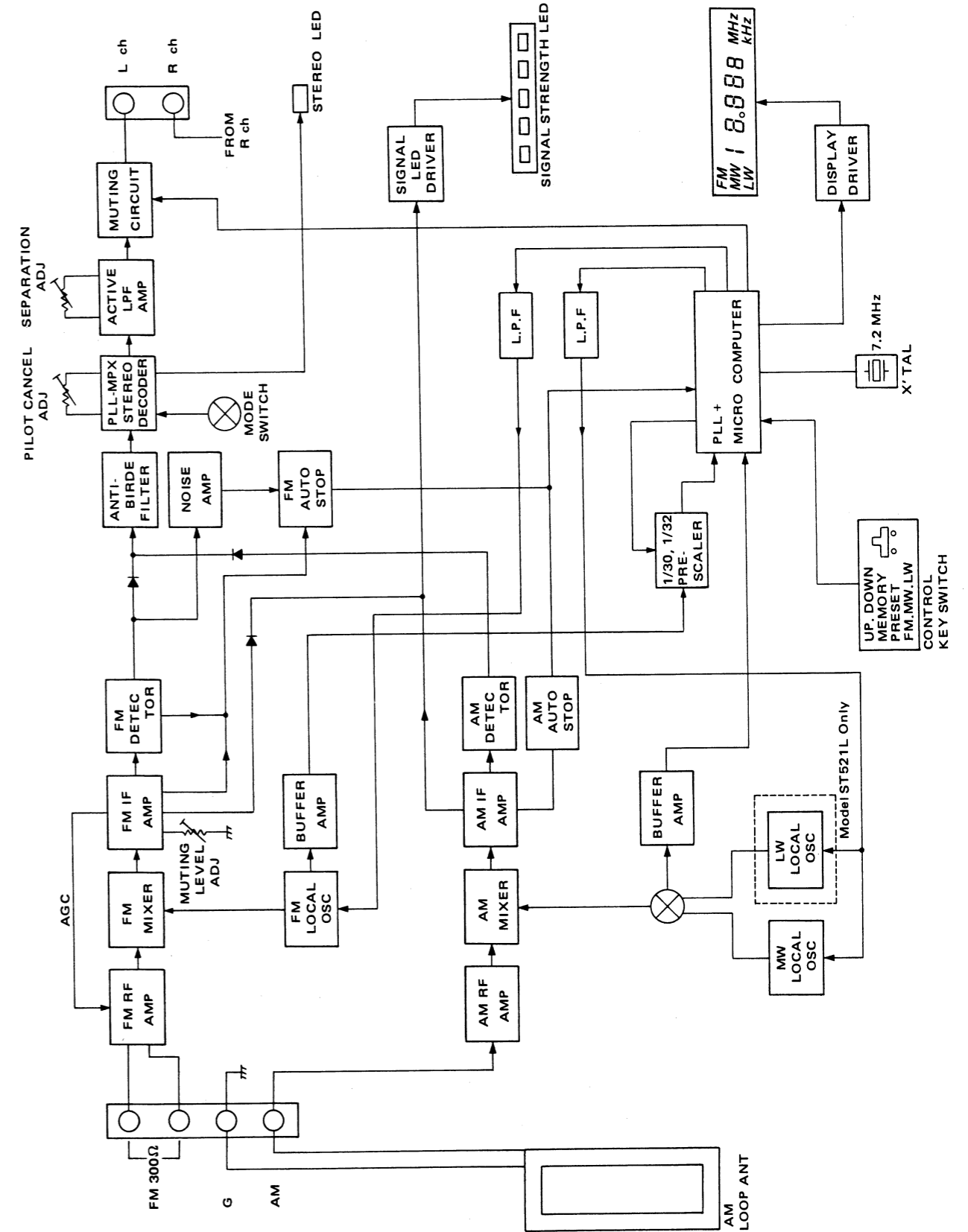
• Electrode Connection

PIN No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Electrode Connection	W/O LW	F	b ₅ c ₅	a ₄	f ₄	e ₄	d ₄	c ₄	IC	g ₄	b ₄	a ₃	f ₃	e ₃	d ₃	c ₃	g ₃	b ₃	a ₂
	W/ LW	F	b ₅ c ₅	a ₄	f ₄	e ₄	d ₄	c ₄	IC	g ₄	b ₄	a ₃	f ₃	e ₃	d ₃	c ₃	g ₃	b ₃	a ₂

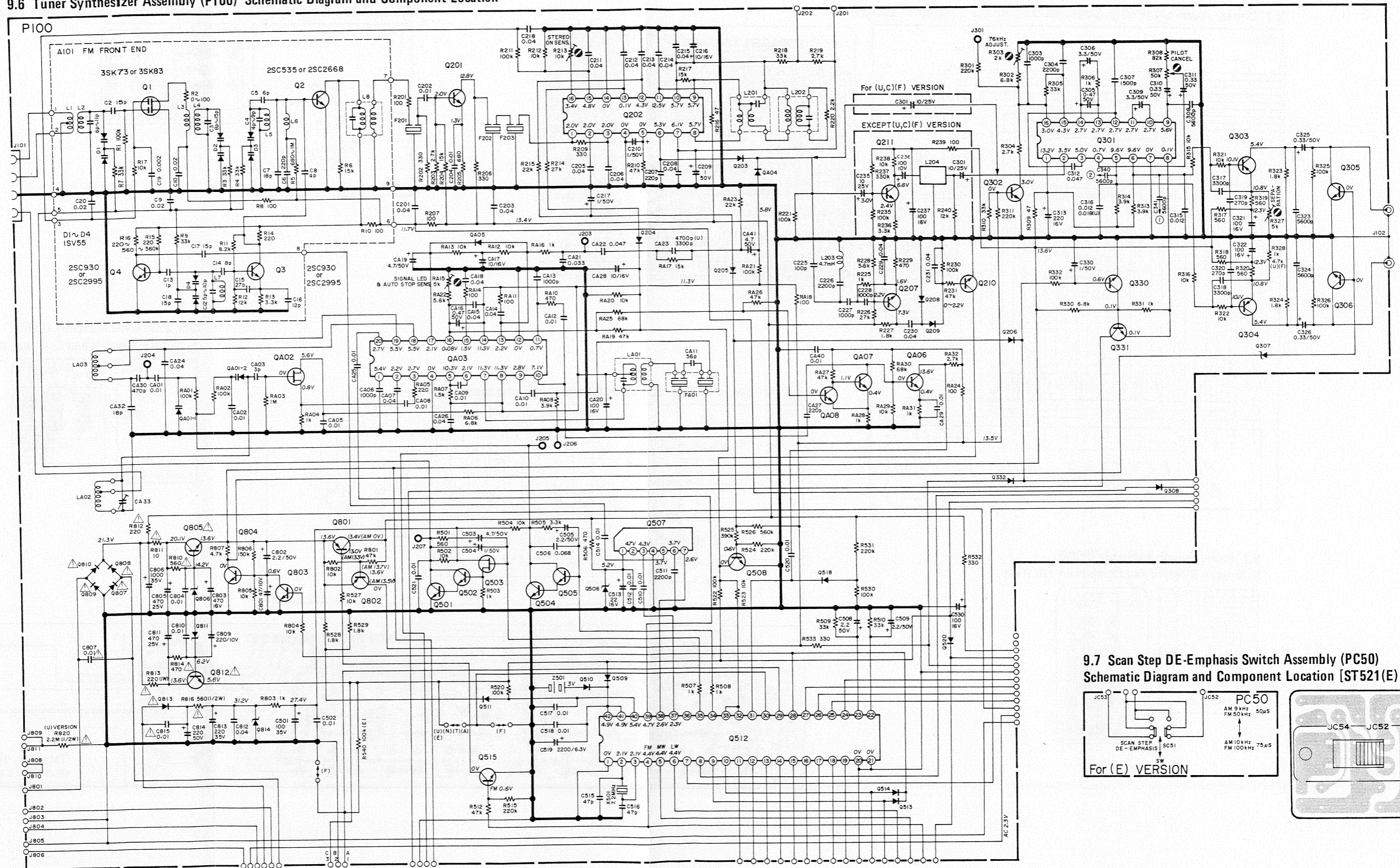
PIN No.		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Electrode Connection	W/O LW	IC	f ₂	e ₂	d ₂	c ₂	g ₂	b ₂	b ₁ e ₁	g ₁	kHz	MHz	FM Dp	AM	a ₁ d ₁ c ₁ f ₁	G	G	F
	W/ LW	IC	f ₂	e ₂	d ₂	c ₂	g ₂	b ₂	b ₁ e ₁	g ₁	kHz	MHz	FM Dp a ₁ c ₁ d ₁ f ₁	MW	LW	G	G	F



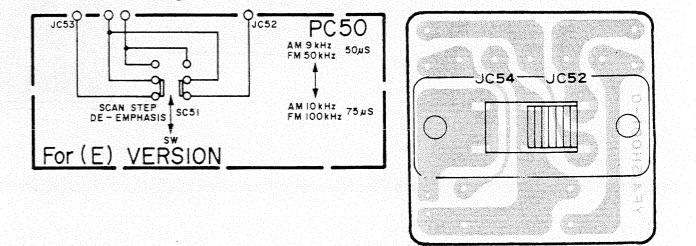
8. BLOCK DIAGRAM



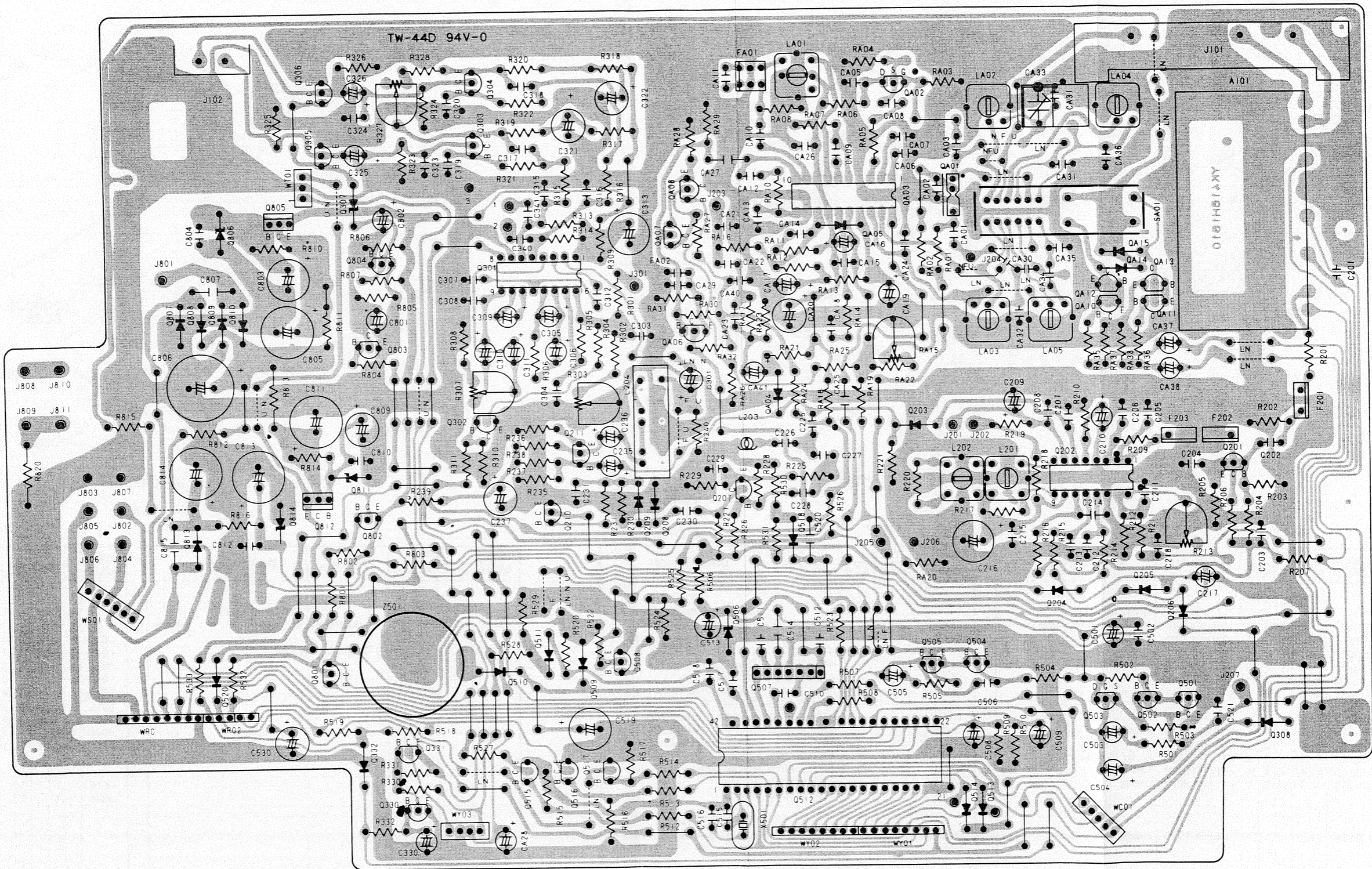
9.6 Tuner Synthesizer Assembly (P100) Schematic Diagram and Component Location



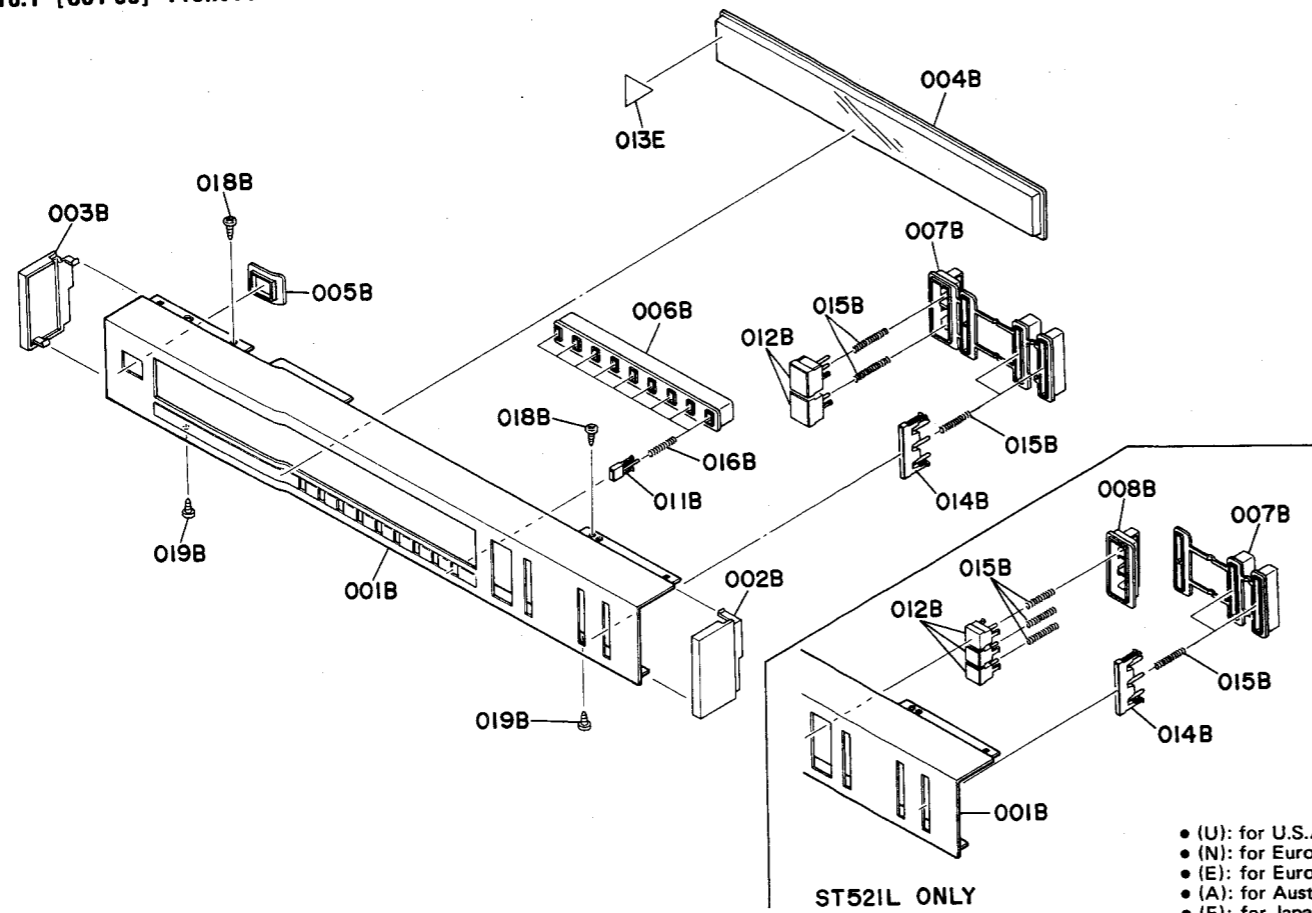
9.7 Scan Step DE-Emphasis Switch Assembly (PC50) Schematic Diagram and Component Location (ST521(E) Only)



X



10. EXPLODED VIEW AND PARTS LIST
10.1 [C01-99] Front Panel

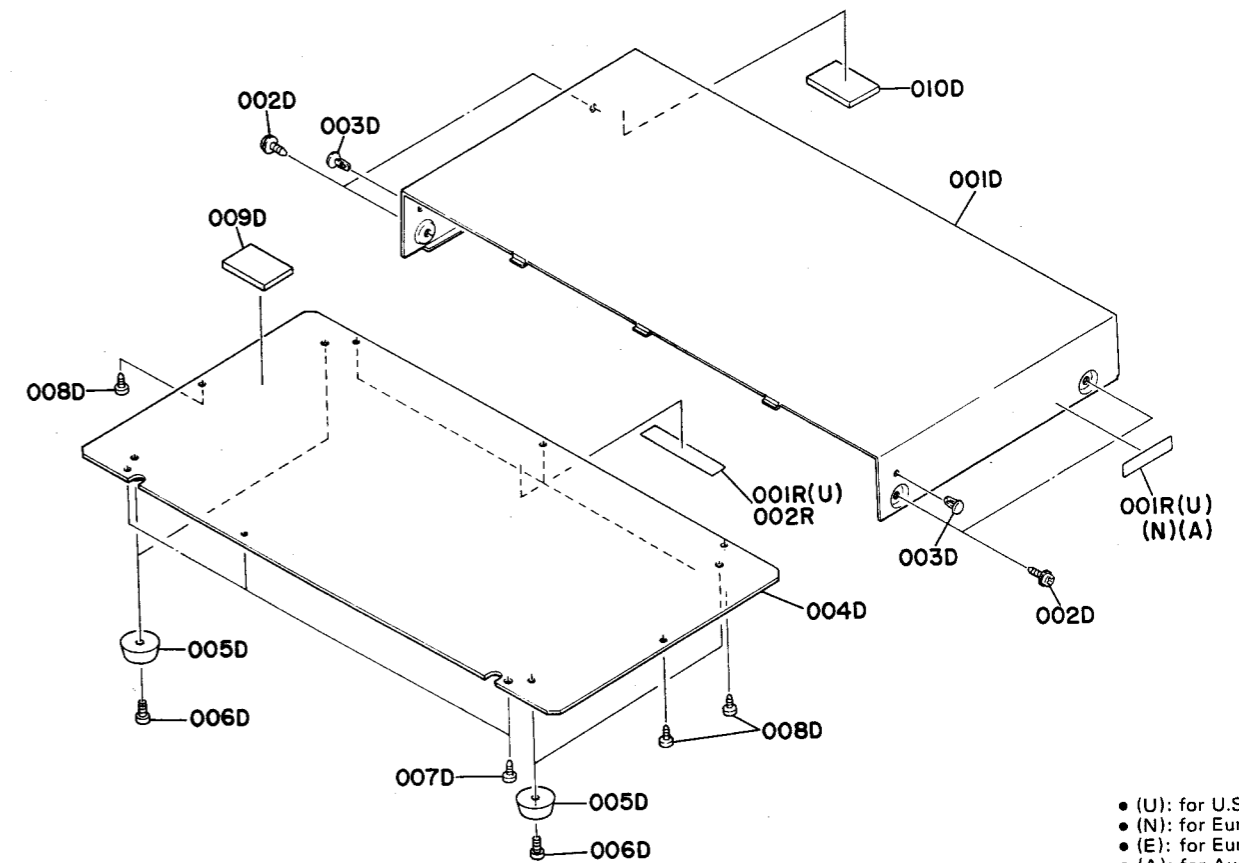


- (U): for U.S.A.
- (N): for Europe
- (E): for Europe
- (A): for Australia
- (F): for Japan

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
A	1	1	1	1	1	416H063400	(ST521, ONLY) Front Panel Assembly
001B	1	1	1	1	1	416H063010	Escutcheon, Front Panel
002B	1	1	1	1	1	415H067010	Cap, (R)
003B	1	1	1	1	1	415H067020	Cap, (L)
004B	1	1	1	1	1	416H158010	Window
005B	1	1	1	1	1	415H259010	Bushing, Power
006B	1	1	1	1	1	416H259010	Bushing, Preset
007B	1	1	1	1	1	416H259020	Bushing, Tuning/Mode
011B	9	9	9	9	9	416H154010	Knob, Preset Memory
012B	2	2	2	2	2	416H154020	Knob, FM/AM
014B	2	2	2	2	2	416H154030	Knob, Tuning
015B	4	4	4	4	4	416H115010	Spring
016B	9	9	9	9	9	416H115020	Spring
013E	1					105H861010	Label

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
A	1					420H063400	(ST521L, ONLY) Front Panel Assembly
001B	1					420H063010	Escutcheon, Front Panel
002B	1					415H067010	Cap, (R)
003B	1					415H067020	Cap, (L)
004B	1					416H158010	Window
005B	1					415H259010	Bushing, Power
006B	1					416H259010	Bushing, Preset
007B	1					416H259020	Bushing, Tuning/Mode
008B	1					420H259010	Bushing, FM/MW/LW
011B	9					416H154010	Knob, Preset Memory
012B	3					420H154010	Knob, FM/MW/LW
014B	2					416H154030	Knob, Tuning
015B	5					416H115010	Spring
016B	9					416H115020	Spring
018B	2	2	2	2	2	51300306B0	P.H. Tapped Screw P3 x 6
019B	2	2	2	2	2	51300306B0	P.H. Tapped Screw P3 x 6

10.2 [C02-99] LID (Top and Bottom Cover)

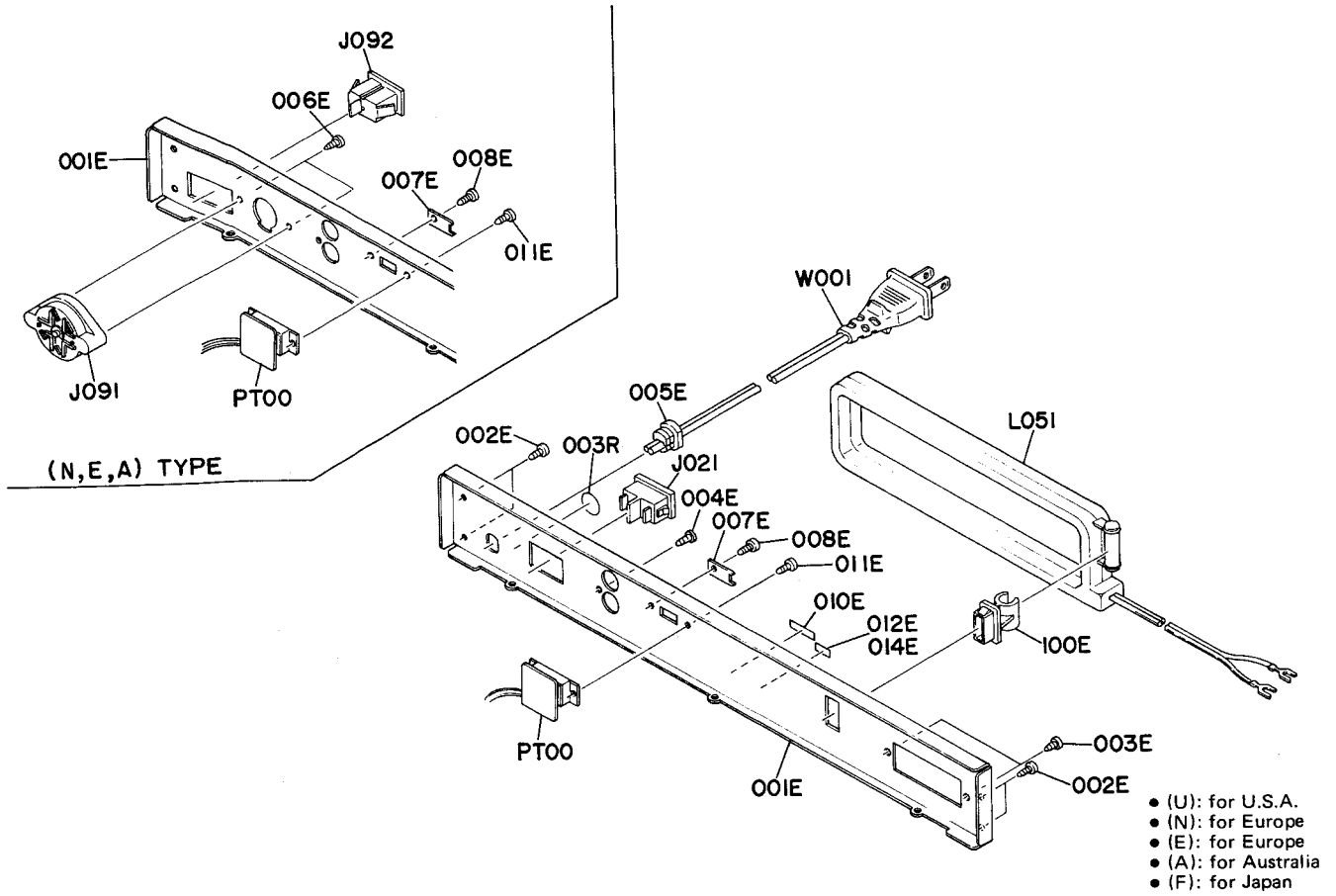


- (U): for U.S.A.
- (N): for Europe
- (E): for Europe
- (A): for Australia
- (F): for Japan

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
002D	4					51260408Z0	(ST521, ONLY) B.T. Screw B4 x 8
001R	2					117H861010	Label

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
001D	1	1	1	1	1	416H257010	(ST521/ST521L) Lid, Top Cover
002D	4	4	4	4	4	51260408U0	B.T. Screw B4 x 8
003D	2	2	2	2	2	2991259110	Bushing
004D	1	1	1	1	1	416H257020	Lid, Bottom Cover
005D	4	4	4	4	4	415H057010	Leg
006D	4	4	4	4	4	51570406B0	P. Taptite Screw P4 x 6
007D	3	3	3	3	3	51280308B0	B.H. Tapped Screw P3 x 8
008D	5	5	5	5	5	51280308B0	B.H. Tapped Screw P3 x 8
009D	1	1	1	1	1	2979056020	Buffer
010D	1	1	1	1	1	2979056020	Buffer
001R	1					2932861110	Label
002R	1					2578861010	Label

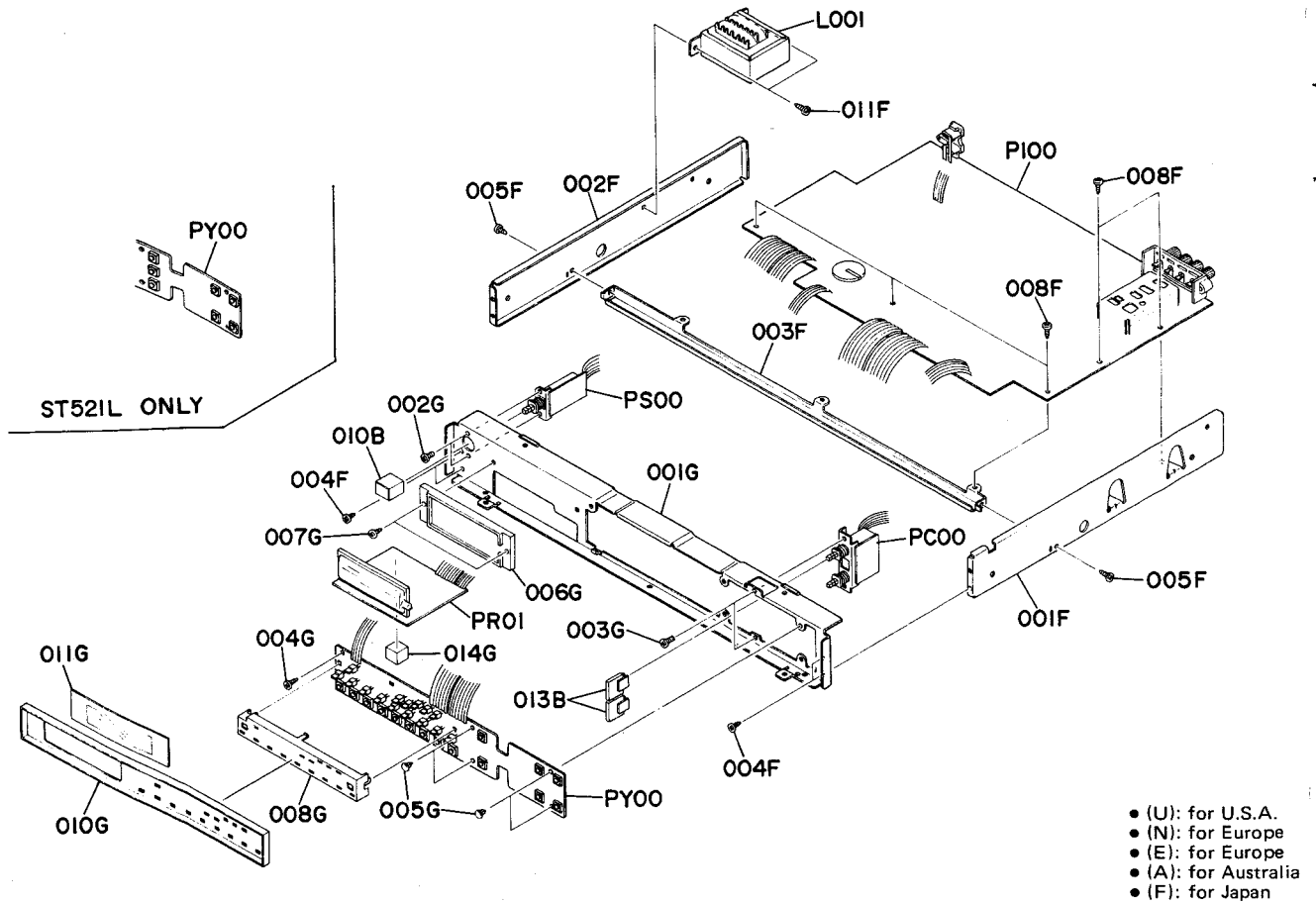
10.3 [C03-99] Rear Panel



REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
001E	1					416H160210	(ST521, ONLY) Bracket, Rear Panel
001E		1		1		416H160240	Bracket, Rear Panel
001E			1			416H160250	Bracket, Rear Panel
001E					1	416H160230	Bracket, Rear Panel
005E	1				1	1455259030	Bushing, AC Cord
006E			2			51280308B0	B.H. Tapped Screw B3 x 8
012E	1					2457861040	Label, CSA
003R	1					9511101070	Label, UL
ΔJ021	1					YJ04000910	Jack, AC Outlet
ΔJ091			1			BY05060060	Voltage Selector
ΔW001	1					YC01900070	A.C. Power Cord
ΔW001					1	YC01800190	A.C. Power Cord
001E		1				420H160210	(ST521L, ONLY) Bracket, Rear Panel

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
002E	4	4	4	4	4	51280308B0	(ST521/ST521L) B.H. Tapped Screw B3 x 8
003E	2	2	2	2	2	51280308B0	B.H. Tapped Screw B3 x 8
004E	1	1	1	1	1	51280308B0	B.H. Tapped Screw B3 x 8
007E	1	1	1	1	1	2137114010	Stopper, Scan
008E	1	1	1	1	1	51100306A9	B.H.M. Screw B3 x 6
010E	1	1	1	1	1	2112265010	Indicator
011E	1	1	1	1	1	51100306A9	B.H.M. Screw B3 x 6
014E		1	1	1	1	4581861010	Label, Made in japan
100E	1	1	1	1	1	417H271020	Holder, Loop Antenna
ΔJ092		1	1	1		YP04000580	Plug, AC Inlet
L051	1	1	1	1	1	LA00035010	Loop Antenna

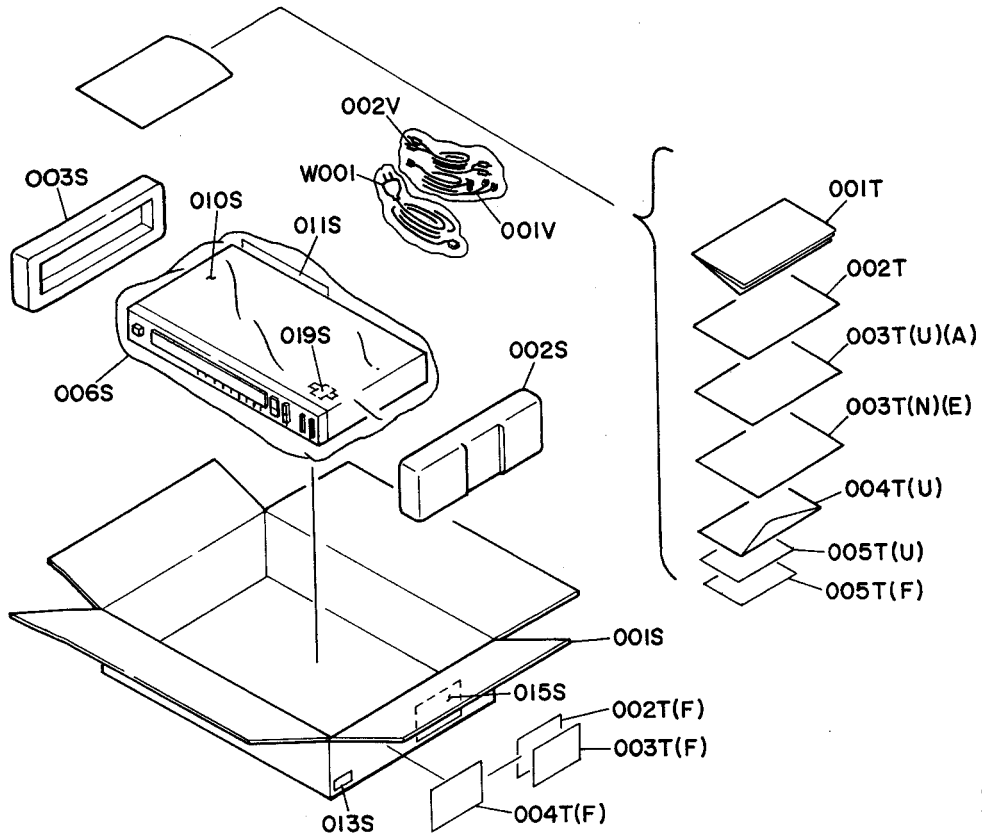
10.4 [P01-99] Front Chassis and General Parts



REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
							(ST521/ST521L)
010B	1	1	1	1	1	415H154010	Knob, Power
013B	2	2	2	2	2	415H154020	Knob, Mode Scan
001F	1	1	1	1	1	416H126010	Stay, (R)
002F	1	1	1	1	1	416H126020	Stay, (L)
003F	1	1	1	1	1	416H126030	Stay, Center
004F	4	4	4	4	4	51280308B0	B.H. Tapped Screw B3 x 8
005F	2	2	2	2	2	51280308B0	B.H. Tapped Screw B3 x 8
008F	5	5	5	5	5	51260308B0	B.T. Screw B3 x 8
011F	2	2	2	2	2	51280406B0	B.H. Tapped Screw B4 x 6
001G	1	1	1	1	1	416H160010	Bracket, Front Chassis
002G	2	2	2	2	2	51100306A9	B.H.M. Screw B3 x 6
003G	2	2	2	2	2	51100306A9	B.H.M. Screw B3 x 6
004G	1	1	1	1	1	51280308B0	B.H. Tapped Screw B3 x 8
005G	4	4	4	4	4	2276005050	Clamper
006G	1	1	1	1	1	416H259030	Bushing
007G	2	2	2	2	2	51260308B0	B.T. Screw B3 x 8
008G	1	1	1	1	1	416H118010	Spacer
010G	1	1	1	1	1	416H302010	Dial
011G	1	1	1	1	1	408H158020	Window
014G	1	1	1	1	1	4292056020	Buffer

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
ΔL001	1					TS14808360	Power Transformer
ΔL001		1				TS14808400	Power Transformer
ΔL001			1			TS14808370	Power Transformer
ΔL001					1	TS14808380	Power Transformer

10.5 [H01-99] Packing Material



- (U): for U.S.A.
- (N): for Europe
- (E): for Europe
- (A): for Australia
- (F): for Japan

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
001S	1					416H801010	(ST521, ONLY) Packing Case
001S		1	1	1		416H801020	Packing Case
001S					1	416H801030	Packing Case
011S	1					2918107390	Sheet
015S	2					9510901020	Label
003T	1					103H854010	Guarantee Card
003T		1	1			416H856010	Circuit Diagram
003T				1		9631000090	Guarantee Card
003T					1	2976851040	Instructions, Spec
004T	1					2225813010	Envelope
004T					1	2976813020	Envelope
005T	1					9560000100	Hang Tag
005T					1	9650000030	S. Station Card
001S		1				420H801010	(ST521L, ONLY) Packing Case
003T		1				420H856010	Circuit Diagram

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
002S	1	1	1	1	1	416H809010	(ST521/ST521L) Cushion, (R)
003S	1	1	1	1	1	416H809020	Cushion, (L)
006S	1	1	1	1	1	9090909030	Polyethylene Sheet
010S	1	1	1	1	1	2918107350	Sheet
013S	2					9526019010	Serial No. Card
013S		4	4			9526019060	Serial No. Card
013S				4		9526019030	Serial No. Card
013S					4	9526019040	Serial No. Card
019S	1	1				2731821010	Silicagel
001T	1					416H851210	Instructions
001T		1	1	1		416H851310	Instructions
001T					1	416H851110	Instructions
002T	1					416H851220	Instructions, Spec
002T		1	1	1		416H851320	Instructions, Spec
002T					1	9631000110	Guarantee Card
V001	1	1	1	1	1	ZA02000070	EXT. Antenna
V002	1	1	1	1	1	ZD01000170	Connective Cord
ΔW001		1	1			ZC01805010	A.C. Power Cord
ΔW001					1	ZC02006020	A.C. Power Cord

- (U): for U.S.A.
- (N): for Europe
- (E): for Europe
- (A): for Australia
- (F): for Japan

10.6 ELECTRICAL PARTS LIST

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
P100	1	1	1	1	1	YK416H1610	(ST521, ONLY) P.W. Board, Tuner Synthesizer
	1		1			ZZ416H1610	P.W. Board Assembly
			1			ZZ416H8610	P.W. Board Assembly
				1		ZZ416H7610	P.W. Board Assembly
P100	1					YK416H1610	(ST521L, ONLY) P.W. Board, Tuner Synthesizer
	1					ZZ420H8610	P.W. Board Assembly
P100-CAPACITORS							
CA01	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
CA02	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
CA03	1	1	1	1	1	DD10030370	Ceramic 3pF \pm 0.25pF
CA05	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
CA06	1	1	1	1	1	DK16102300	Ceramic 1000pF \pm 10%
CA07	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
CA08	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
CA09	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
CA10	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
CA11	1	1	1	1	1	DD15560370	Ceramic 56pF \pm 5%
CA12	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
CA13	1	1	1	1	1	DK16102300	Ceramic 1000pF \pm 10%
CA14	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
CA15	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
CA16	1	1	1	1	1	EA47405030	Elect 0.47 μ F 50V
CA17	1	1	1	1	1	EA10601630	Elect 10 μ F 16V
CA18	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
CA19	1	1	1	1	1	EA47505030	Elect 4.7 μ F 50V
CA20	1	1	1	1	1	EA10701630	Elect 100 μ F 16V
CA21	1	1	1	1	1	DF15333300	Film 0.033 μ F \pm 5%
CA22	1	1	1	1	1	DF15473300	Film 0.047 μ F \pm 5%
CA23	1	1	1	1	1	DF15472300	Film 4700pF \pm 5%
CA23	1	1	1	1	1	DF15332300	Film 3300pF \pm 5%
CA24	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
CA25	1	1	1	1	1	DA17103010	Ceramic 0.01 μ F \pm 20%
CA26	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
CA27	1	1	1	1	1	DD15221370	Ceramic 220pF \pm 5%
CA28	1	1	1	1	1	EA10601630	Elect 10 μ F 16V
CA29	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
(ST521, ONLY)							
CA30	1	1	1	1	1	DF55471090	Film 470pF \pm 5%
CA32	1	1	1	1	1	DD15180370	Ceramic 18pF \pm 5%
CA33	1	1	1	1	1	CT10800040	Trimming 8pF
(ST521, ONLY)							
CA40	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
(ST521, ONLY)							
CA41	1	1	1	1	1	EA47505030	Elect 4.7 μ F 50V
(ST521, ONLY)							
C201	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C202	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
C203	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C204	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
C205	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C206	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C207	1	1	1	1	1	DD15221370	Ceramic 220pF \pm 5%
C208	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C209	1	1	1	1	1	EA10505030	Elect 1 μ F 50V
C210	1	1	1	1	1	EA10505030	Elect 1 μ F 50V

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
C211	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C212	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C213	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C214	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C215	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C216	1	1	1	1	1	EA10701630	Elect 100 μ F 16V
C217	1	1	1	1	1	EA10505030	Elect 1 μ F 50V
C218	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C225	1	1	1	1	1	DD15101370	Ceramic 100pF \pm 5%
C226	1	1	1	1	1	DK16222300	Ceramic 2200pF \pm 10%
C227	1	1	1	1	1	DK16102300	Ceramic 1000pF \pm 10%
C228	1	1	1	1	1	DK16102300	Ceramic 1000pF \pm 10%
C229	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C230	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C231	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C235	1	1	1	1	1	EA10602530	Elect 10 μ F 25V
C236	1	1	1	1	1	EA10701030	Elect 100 μ F 10V
C237	1	1	1	1	1	EA10701030	Elect 100 μ F 10V
C301	1	1	1	1	1	EA10602530	Elect 10 μ F 25V
C303	1	1	1	1	1	DF55102090	Film 1000pF \pm 5%
C304	1	1	1	1	1	DK16222300	Ceramic 2200pF \pm 10%
C305	1	1	1	1	1	EA47405030	Elect 0.47 μ F 50V
C306	1	1	1	1	1	EA33505030	Elect 3.3 μ F 50V
C307	1	1	1	1	1	DF17152300	Film 1500pF \pm 20%
C308	1	1	1	1	1	DF17682300	Film 6800pF \pm 20%
C309	1	1	1	1	1	EA33505030	Elect 3.3 μ F 50V
C310	1	1	1	1	1	EA33405030	Elect 0.33 μ F 50V
C311	1	1	1	1	1	EA33405030	Elect 0.33 μ F 50V
C312	1	1	1	1	1	DF17473300	Film 0.047 μ F \pm 20%
C313	1	1	1	1	1	EA22701630	Elect 220 μ F 16V
C315	1	1	1	1	1	DF15183300	Film 0.018 μ F \pm 5%
C315	1	1	1	1	1	DF15123300	Film 0.012 μ F \pm 5%
C316	1	1	1	1	1	DF15183300	Film 0.015 μ F \pm 5%
C316	1	1	1	1	1	DF15123300	Film 0.012 μ F \pm 5%
C317	1	1	1	1	1	DF15332300	Film 3300pF \pm 5%
C318	1	1	1	1	1	DF15332300	Film 3300pF \pm 5%
C319	1	1	1	1	1	DD15271370	Ceramic 270pF \pm 5%
C320	1	1	1	1	1	DD15271370	Ceramic 270pF \pm 5%
C321	1	1	1	1	1	EA10701630	Elect 100 μ F 16V
C322	1	1	1	1	1	EA10701630	Elect 100 μ F 16V
C323	1	1	1	1	1	DF15562300	Film 5600pF \pm 5%
C324	1	1	1	1	1	DF15562300	Film 5600pF \pm 5%
C325	1	1	1	1	1	EA33405030	Elect 0.33 μ F 50V
C326	1	1	1	1	1	EA33405030	Elect 0.33 μ F 50V
C330	1	1	1	1	1	EA10505030	Elect 1 μ F 50V
C501	1	1	1	1	1	EA10703530	Elect 100 μ F 35V
C502	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
C503	1	1	1	1	1	EA47505030	Elect 4.7 μ F 50V
C504	1	1	1	1	1	EA10505030	Elect 1 μ F 50V
C505	1	1	1	1	1	EA22505030	Elect 2.3 μ F 50V
C506	1	1	1	1	1	DF15683350	Film 0.068 μ F \pm 5%
C508	1	1	1	1	1	EA22505030	Elect 2.2 μ F 50V
C509	1	1	1	1	1	EA22505030	Elect 2.2 μ F 50V
C510	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
C511	1	1	1	1	1	DK16222300	Ceramic 2200pF \pm 10%

- (U): for U.S.A.
- (N): for Europe
- (E): for Europe
- (A): for Australia
- (F): for Japan

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
C512	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
C513	1	1	1	1	1	EA22601630	Elect 22 μ F 16V
C514	1	1	1	1	1	DA17103010	Ceramic 0.01 μ F \pm 20%
C515	1	1	1	1	1	DD15470300	Ceramic 47pF \pm 5%
C516	1	1	1	1	1	DD15470300	Ceramic 47pF \pm 5%
C517	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
C518	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
C519	1	1	1	1	1	EA47701030	Elect 470 μ F 10V
C520	1	1	1	1	1	DA17103010	Ceramic 0.01 μ F \pm 20%
C521	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
C530	1	1	1	1	1	EA10701630	Elect 100 μ F 16V
C801	1	1	1	1	1	EA47601030	Elect 47 μ F 10V
C802	1	1	1	1	1	EA22505030	Elect 2.2 μ F 50V
C803	1	1	1	1	1	EA47701630	Elect 470 μ F 16V
C804	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
C805	1	1	1	1	1	EA47702530	Elect 470 μ F 25V
C806	1	1	1	1	1	EA10803530	Elect 1000 μ F 35V
ΔC807	1	1	1	1	1	DK18103560	Ceramic 0.01 μ F
C809	1	1	1	1	1	EA22701030	Elect 220 μ F 10V
C810	1	1	1	1	1	DK18103310	Ceramic 0.01 μ F
C811	1	1	1	1	1	EA47702530	Elect 470 μ F 25V
C812	1	1	1	1	1	DK18403320	Ceramic 0.04 μ F
C813	1	1	1	1	1	EA22703530	Elect 220 μ F 35V
C814	1	1	1	1	1	EA22705030	Elect 220 μ F 50V
C815	1	1	1	1	1	DK18103560	Ceramic 0.01 μ F
(ST521L, ONLY)							
CA33	1					CT21600020	Trimming
CA34	1					DF55151090	Film 150pF \pm 5%
CA35	1					DD15560370	Ceramic 56pF \pm 5%
CA36	1					DD15150370	Ceramic 15pF \pm 5%
CA37	1					EA47405030	Elect 0.47 μ F 50V
CA38	1					EA47405030	Elect 0.47 μ F 50V
P100-RESISTORS (All Resistors are \pm 5% & 1/4W)							
RA01	1	1	1	1	1	GD05104140	100K Ω
RA02	1	1	1	1	1	GD05104140	100K Ω
RA03	1	1	1	1	1	GD05105140	1M Ω
RA04	1	1	1	1	1	GD05102140	1K Ω
RA05	1	1	1	1	1	GD05221140	220 Ω
RA06	1	1	1	1	1	GD05682140	6.8K Ω
RA07	1	1	1	1	1	GD05152140	1.5K Ω
RA08	1	1	1	1	1	GD05392140	3.9K Ω
RA10	1	1	1	1	1	GD05471140	470 Ω
RA11	1	1	1	1	1	GD05101140	100 Ω
RA12	1	1	1	1	1	GD05103140	10K Ω
RA13	1	1	1	1	1	GD05103140	10K Ω
RA14	1	1	1	1	1	GD05101140	100 Ω
RA15	1	1	1	1	1	RA05020800	5K Ω , Trimming
RA16	1	1	1	1	1	GD05102140	1K Ω
RA17	1	1	1	1	1	GD05153140	15K Ω
RA18	1	1	1	1	1	GD05101140	100 Ω
RA19	1	1	1	1	1	GD05473140	47K Ω
RA20	1	1	1	1	1	GD05103140	10K Ω
RA21	1	1	1	1	1	GD05104140	100K Ω

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
RA22	1	1	1	1	1	GD05562140	5.6K Ω
RA23	1	1	1	1	1	GD05223140	22K Ω
RA24	1	1	1	1	1	GD05101140	100 Ω
RA25	1	1	1	1	1	GD05683140	68K Ω
RA26	1	1	1	1	1	GD05473140	47K Ω
RA27	1	1	1	1	1	GD05473140	47K Ω
RA28	1	1	1	1	1	GD05102140	1K Ω
RA29	1	1	1	1	1	GD05103140	10K Ω
RA30	1	1	1	1	1	GD05683140	68K Ω
RA31	1	1	1	1	1	GD05102140	1K Ω
RA32	1	1	1	1	1	GD05272140	2.7K Ω
R201	1	1	1	1	1	GD05101140	100 Ω
R202	1	1	1	1	1	GD05331140	330 Ω
R203	1	1	1	1	1	GD05272140	2.7K Ω
R204	1	1	1	1	1	GD05153140	15K Ω
R205	1	1	1	1	1	GD05681140	680 Ω
R206	1	1	1	1	1	GD05331140	330 Ω
R207	1	1	1	1	1	GD05101140	100 Ω
R209	1	1	1	1	1	GD05331140	330 Ω
R210	1	1	1	1	1	GD05473140	47K Ω
R211	1	1	1	1	1	GD05104140	100K Ω
R212	1	1	1	1	1	GD05103140	10K Ω
R213	1	1	1	1	1	RA01030800	10K Ω , Trimming
R214	1	1	1	1	1	GD05273140	27K Ω
R215	1	1	1	1	1	GD05223140	22K Ω
R216	1	1	1	1	1	GD05470140	47 Ω
R217	1	1	1	1	1	GD05153140	15K Ω
R218	1	1	1	1	1	GD05333140	33K Ω
R219	1	1	1	1	1	GD05821140	820 Ω
R220	1	1	1	1	1	GD05222140	2.2K Ω
R221	1	1	1	1	1	GD05104140	100K Ω
R225	1	1	1	1	1	GD05102140	1K Ω
R226	1	1	1	1	1	GD05273140	27K Ω
R227	1	1	1	1	1	GD05182140	1.8K Ω
R228	1	1	1	1	1	GD05562140	5.6K Ω
R229	1	1	1	1	1	GD05471140	470 Ω
R230	1	1	1	1	1	GD05104140	100K Ω
R231	1	1	1	1	1	GD05473140	47K Ω
R235	1					GD05104140	100K Ω
R236	1					GD05332140	3.3K Ω
R237	1					GD05334140	330K Ω
R238	1					GD05103140	10K Ω
R239	1					GD05101140	100 Ω
R240	1					GD05123140	12K Ω
R301	1	1	1	1	1	GD05224140	220K Ω
R302	1	1	1	1	1	GD05682140	6.8K Ω
R303	1	1	1	1	1	RA02020800	2K Ω , Trimming
R304	1	1	1	1	1	GD05272140	2.7K Ω
R305	1	1	1	1	1	GD05333140	33K Ω
R306	1	1	1	1	1	GD05102140	1K Ω
R307	1	1	1	1	1	RA05030800	50K Ω , Trimming
R308	1	1	1	1	1	GD05823140	82K Ω
R309	1	1	1	1	1	GD05470140	47 Ω
R310	1	1	1	1	1	GD05333140	33K Ω

- (U): for U.S.A.
- (N): for Europe
- (E): for Europe
- (A): for Australia
- (F): for Japan

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
R311	1	1	1	1	1	GD05224140	220K Ω
R313	1	1	1	1	1	GD05392140	3.9K Ω
R314	1	1	1	1	1	GD05392140	3.9K Ω
R315	1	1	1	1	1	GD05103140	10K Ω
R316	1	1	1	1	1	GD05103140	10K Ω
R317	1	1	1	1	1	GD05561140	560 Ω
R318	1	1	1	1	1	GD05561140	560 Ω
R319	1	1	1	1	1	GD05561140	560 Ω
R320	1	1	1	1	1	GD05561140	560 Ω
R321	1	1	1	1	1	GD05103140	10K Ω
R322	1	1	1	1	1	GD05103140	10K Ω
R323	1	1	1	1	1	GD05182140	1.8K Ω
R324	1	1	1	1	1	GD05182140	1.8K Ω
R325	1	1	1	1	1	GD05104140	100K Ω
R326	1	1	1	1	1	GD05104140	100K Ω
R327	1	1	1	1	1	RA05020800	5K Ω , Trimming
R328	1	1	1	1	1	GD05472140	4.7K Ω
R328	1	1	1	1	1	GD05102140	1K Ω
R330	1	1	1	1	1	GD05682140	6.8K Ω
R331	1	1	1	1	1	GD05102140	1K Ω
R332	1	1	1	1	1	GD05104140	100K Ω
R501	1	1	1	1	1	GD05561140	560 Ω
R502	1	1	1	1	1	GD05103140	10K Ω
R503	1	1	1	1	1	GD05102140	1K Ω
R504	1	1	1	1	1	GD05103140	10K Ω
R505	1	1	1	1	1	GD05332140	3.3K Ω
R506	1	1	1	1	1	GD05471140	470 Ω
R507	1	1	1	1	1	GD05102140	1K Ω
R508	1	1	1	1	1	GD05102140	1K Ω
R509	1	1	1	1	1	GD05333140	33K Ω
R510	1	1	1	1	1	GD05333140	33K Ω
R512	1	1	1	1	1	GD05473140	47K Ω
R515	1	1	1	1	1	GD05224140	220K Ω
R520	1	1	1	1	1	GD05104140	100K Ω
R522	1	1	1	1	1	GD05104140	100K Ω
R523	1	1	1	1	1	GD05103140	10K Ω
R524	1	1	1	1	1	GD05224140	220K Ω
R525	1	1	1	1	1	GD05394140	390K Ω
R526	1	1	1	1	1	GD05564140	560K Ω
R527	1	1	1	1	1	GD05103140	10K Ω
R528	1	1	1	1	1	GD05182140	1.8K Ω
R529	1	1	1	1	1	GD05182140	1.8K Ω
R530	1	1	1	1	1	GD05104140	100K Ω
R531	1	1	1	1	1	GD05224140	220K Ω
R532	1	1	1	1	1	GD05331140	330 Ω
R533	1	1	1	1	1	GD05331140	330 Ω
R801	1	1	1	1	1	GD05473140	47K Ω
R802	1	1	1	1	1	GD05103140	10K Ω
R803	1	1	1	1	1	GD05102140	1K Ω
R804	1	1	1	1	1	GD05103140	10K Ω
R805	1	1	1	1	1	GD05103140	10K Ω
R806	1	1	1	1	1	GD05154140	150K Ω
R807	1	1	1	1	1	GD05472140	4.7K Ω
Δ R810	1	1	1	1	1	GD05561140	560 Ω
Δ R811	1	1	1	1	1	GG05100140	10 Ω
Δ R812	1	1	1	1	1	GG05221140	220 Ω

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
Δ R813	1	1	1	1	1	GA05221010	220 Ω 1W
Δ R814	1	1	1	1	1	GD05471140	470 Ω
Δ R816	1	1	1	1	1	GG05561120	560 Ω $\frac{1}{2}$ W
Δ R820	1	1	1	1	1	RC10225120	2.2M Ω $\pm 10\%$ $\frac{1}{2}$ W
RA35	1	1	1	1	1	GD05103140	10K Ω
RA36	1	1	1	1	1	GD05103140	10K Ω
RA37	1	1	1	1	1	GD05104140	100K Ω
RA38	1	1	1	1	1	GD05104140	100K Ω
R513	1	1	1	1	1	GD05103140	10K Ω
R514	1	1	1	1	1	GD05103140	10K Ω
R516	1	1	1	1	1	GD05104140	100K Ω
R517	1	1	1	1	1	GD05104140	100K Ω
R518	1	1	1	1	1	GD05152140	1.5K Ω
R519	1	1	1	1	1	GD05152140	1.5K Ω
R815	1	1	1	1	1	GG05220140	22 Ω
(ST521L, ONLY)							
P100-SEMICONDUCTORS							
QA01	1	1	1	1	1	HD40002420	Varicap KV-1226
QA02	1	1	1	1	1	HF200551D0	F.E.T. 2SK55D
QA03	1	1	1	1	1	HC10058030	IC LA1245
QA04	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
QA05	1	1	1	1	1	HV00006120	Varistor MV-203
QA06	1	1	1	1	1	HT308292A0	Transistor 2SC829(B or C)
QA07	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
QA08	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q201	1	1	1	1	1	HT310471C0	Transistor 2SC1047(C)
Q202	1	1	1	1	1	HC10033010	IC HA11225
Q203	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q204	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q205	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q206	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q207	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q208	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q209	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q210	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q211	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q301	1	1	1	1	1	HC10029010	IC HA11223W
Q302	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q303	1	1	1	1	1	HT110162A0	Transistor 2SA1016(F or G)
Q304	1	1	1	1	1	HT110162A0	Transistor 2SA1016(F or G)
Q305	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q306	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q307	1	1	1	1	1	HD30033090	Zener WZ052
Q308	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q330	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q331	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q332	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q501	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q502	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q503	1	1	1	1	1	HF200300B0	F.E.T. 2SK30A
Q504	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q505	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q506	1	1	1	1	1	HD30033090	Zener WZ052
Q507	1	1	1	1	1	HC10072050	IC TD6104P
Q508	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q509	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q510	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555

- (U): for U.S.A.
- (N): for Europe
- (E): for Europe
- (A): for Australia
- (F): for Japan

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
Q511	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q512	1	1	1	1	1	HC10070050	IC TC9147P
Q513	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q514	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q515	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q518	1	1	1	1	1	HD20001000	Diode 1S2473 or 1S1555
Q520	1	1	1	1	1	HD20015030	Diode DS135D
Q801	1	1	1	1	1	HT107332A0	Transistor 2SA733(P or Q)
Q802	1	1	1	1	1	HT107332A0	Transistor 2SA733(P or Q)
Q803	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
Q804	1	1	1	1	1	HT305362C0	Transistor 2SC536(F or G)
△Q805	1	1	1	1	1	HT403131D0	Transistor 2SD313(D)
Q806	1	1	1	1	1	HD30021090	Zener BZ140
△Q807	1	1	1	1	1	HD20015030	Diode DS135D
△Q808	1	1	1	1	1	HD20015030	Diode DS135D
△Q809	1	1	1	1	1	HD20015030	Diode DS135D
△Q810	1	1	1	1	1	HD20015030	Diode DS135D
Q811	1	1	1	1	1	HD30009060	Zener RD6.2EB
△Q812	1	1	1	1	1	HT403131D0	Transistor 2SD313(D)
Q813	1	1	1	1	1	HD20015030	Diode DS135D
Q814	1	1	1	1	1	HD30045090	Zener WZ310
QA10	1					HT305362C0	Transistor 2SC536(F or G)
QA11	1					HT305362C0	Transistor 2SC536(F or G)
QA12	1					HT408631B0	Transistor 2SD863(E)
QA13	1					HT408631B0	Transistor 2SD863(E)
QA14	1					HD20015030	Diode DS135D
QA15	1					HD20015030	Diode DS135D
Q516	1					HT305362C0	Transistor 2SC536(F or G)
Q517	1					HT305362C0	Transistor 2SC536(F or G)
A101	1	1	1	1		AV01202120	V.H.F. Tuner
A101					1	AV01201040	V.H.F. Tuner
FA01	1	1	1	1	1	FG450302B0	Ceramic Filter SFZ450B
F201	1	1	1	1	1	FF11070530	Ceramic Filter SFE10.7MD-1
F202	1	1	1	1	1	FF11070530	Ceramic Filter SFE10.7MD-1
F202	1	1	1	1	1	FF11070570	Ceramic Filter SFE10.7MS3G
F203	1	1	1	1	1	FF11070530	Ceramic Filter SFE10.7MD-1
F203	1	1	1	1	1	FF11070570	Ceramic Filter SFE10.7MS3G
J101	1	1	1	1	1	YT01040290	Terminal, (4P) Ant.
J102	1	1	1	1	1	YT02020290	Terminal, (2P) Output
J102	1	1	1	1	1	YT02020280	Terminal, (2P) Output
LA01	1	1	1	1	1	LI10013210	I.F.T. Coil, AM
LA02	1	1	1	1	1	LA10295070	Ant. Coil, MW
LA03	1	1	1	1	1	LO10013170	OSC Coil, MW
L201	1	1	1	1	1	LI10159040	I.F.T. Coil, FM DET.
L202	1	1	1	1	1	LI10159050	I.F.T. Coil, FM DET.
L203	1	1	1	1	1	LC24750600	Choke Coil, 4.7mH
L204	1	1	1	1	1	LS27025010	M.P.X. Coil
X501	1	1	1	1	1	XB115001L2	Crystal 7.2MHz
Z501	1	1	1	1	1	ZB09010010	Battery 3A 200mA/H

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
FA02	1					FF10045270	(ST521L, ONLY) Ceramic Filter BFU-450C
LA04	1					LA10295080	Ant. Coil, LW
LA05	1					LO10013180	OSC Coil, LW
SA01	1					SZ04240010	Solenoid Switch, Remote
PC00	1	1	1	1	1	YK416H1640 ZZ416H1640	(ST521/ST521L) PC00-SCAN MODE CIRCUIT BOARD P.W. Board, Scan Mode P.W. Board Assembly
SC01	1	1	1	1	1	SP02020600	Push Switch
WC01	1	1	1	1	1	YU05080260	Jumper Lead, (5P)
PR01	1	1	1	1	1	YK416H1630 ZZ416H1630 ZZ416H8630	(ST521, ONLY) PR01-DISPLAY CIRCUIT BOARD P.W. Board, Display P.W. Board Assembly P.W. Board Assembly
PR02	1					YK416H1630 ZZ420H8630	(ST521L, ONLY) P.W. Board, Display P.W. Board Assembly
CR01	1	1	1	1	1	DK18103310	PR01-CAPACITOR Ceramic 0.01μF
GR01	1	1	1	1	1	BW10103050	PR01-RESISTORS 10KΩ x 7, Compo.
GR02	1	1	1	1	1	BW10103050	10KΩ x 7, Compo.
GR03	1	1	1	1	1	BW10103050	10KΩ x 7, Compo.
RR01	1	1	1			GD05103140	10KΩ ±5% ¼W
RR02	1	1	1			GD05104140	100KΩ ±5% ¼W
RR03	1	1	1			GD05152140	1.5KΩ ±5% ¼W
RR04	1	1	1			GD05103140	10KΩ ±5% ¼W
RR05	1	1	1			GD05222140	2.2KΩ ±5% ¼W
RR06	1	1	1	1	1	GD05103140	10KΩ ±5% ¼W
QR01	1	1	1			HT305362C0	PR01-SEMICONDUCTORS Transistor 2SC536(F or G)
QR02	1	1	1			HT305362C0	Transistor 2SC536(F or G)
QR03	1	1	1	1	1	HC10071050	IC TD6301AP
VR01	1	1	1	1	1	HQ30902060	PR01-MISCELLANEOUS Display Unit (ST521, ONLY)
VR01	1					HQ31001060	Display Unit (ST521L, ONLY)
WR01	1	1	1	1	1	YU08080260	Jumper Lead, (8P)
WR02	1	1				YU05080260	Jumper Lead, (5P)
PC50				1		YF415H0010	(ST521, ONLY) PC50-SCAN STEP DE-EMPHASIS SW CIRCUIT BOARD P.W. Board Scan Step DE-Emphasis SW
SC51				1		ZZ416H0010 SS02020380	P.W. Board Assembly Slide Switch Scan Step

- (U): for U.S.A.
- (N): for Europe
- (E): for Europe
- (A): for Australia
- (F): for Japan

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
							(ST521/ST521L) PS00-POWER SWITCH CIRCUIT BOARD
PS00	1	1	1	1	1	YK416H1650	P.W. Board, Power Switch
	1	1	1	1	1	ZZ416H1650	P.W. Board Assembly
SS01	1	1	1	1	1	SP04010400	Push Switch, Power
WS01	1	1	1	1	1	YU06140260	Jumper Lead
							(ST521/ST521L) PT00-SCAN STEP CIRCUIT BOARD
PT00	1	1		1		YK416H1660	P.W. Board, Scan Step
	1	1		1		ZZ416H1660	P.W. Board Assembly
ST01	1	1		1		SS02020380	Slide Switch, Scan Step
WT01	1	1		1		YU03080260	Jumper Lead, (3P)
							(ST521, ONLY) PY00-KEY SWITCH CIRCUIT BOARD
PY00	1	1	1	1	1	YK416H1620	P.W. Board, Key Switch
	1	1	1	1	1	ZZ416H1620	P.W. Board Assembly
PY00		1				YK416H1620	P.W. Board, Key Switch
		1				ZZ420H8620	P.W. Board Assembly
							PY00-RESISTORS (All Resistors are ±5% & ¼W)
RY01	1	1	1	1	1	GD05221140	220Ω
RY02	1	1	1	1	1	GD05221140	220Ω
RY03	1	1	1	1	1	GD05102140	1KΩ
RY04	1	1	1	1	1	GD05102140	1KΩ
RY05	1	1	1	1	1	GD05102140	1KΩ
RY06	1	1	1	1	1	GD05391140	390Ω
RY07	1	1	1	1	1	GD05391140	390Ω
RY08	1	1	1	1	1	GD05391140	390Ω
							PY00-SEMICONDUCTORS
QY01	1	1	1	1	1	HC10008370	IC TL-489
QY02	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY03	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY04	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY05	1	1	1	1	1	HI10031020	L.E.D. LN324GP(GRN)
QY06	1	1	1	1	1	HI10031020	L.E.D. LN324GP(GRN)
QY07	1	1	1	1	1	HI10031020	L.E.D. LN324GP(GRN)
QY08	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY09	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY10	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY11	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY12	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY13	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY14	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY15	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)
QY16	1	1	1	1	1	HI10030020	L.E.D. LN224RP(RED)

REF. DESIG.	Q'TY					PART NO.	DESCRIPTION
	U	N	E	A	F		
							PY00-SWITCHES
SY01	1	1	1	1	1	SP01010580	Push Switch, Memory
SY02	1	1	1	1	1	SP01010580	Push Switch, Ch. 1
SY03	1	1	1	1	1	SP01010580	Push Switch, Ch. 2
SY04	1	1	1	1	1	SP01010580	Push Switch, Ch. 3
SY05	1	1	1	1	1	SP01010580	Push Switch, Ch. 4
SY06	1	1	1	1	1	SP01010580	Push Switch, Ch. 5
SY07	1	1	1	1	1	SP01010580	Push Switch, Ch. 6
SY08	1	1	1	1	1	SP01010580	Push Switch, Ch. 7
SY09	1	1	1	1	1	SP01010580	Push Switch, Ch. 8
SY10	1	1	1	1	1	SP01010580	Push Switch, FM
SY11	1	1	1	1	1	SP01010580	Push Switch, MW
SY12	1	1	1	1	1	SP01010580	Push Switch, Down
SY13	1	1	1	1	1	SP01010580	Push Switch, Down
SY14	1	1	1	1	1	SP01010580	Push Switch, Up
SY15	1	1	1	1	1	SP01010580	Push Switch, Up
SY16		1				SP01010580	Push Switch, LW (ST521L, ONLY)
							PY00-MISCELLANEOUS
WY01	1	1	1	1	1	YU08120260	Jumper Lead, (8P)
WY02	1	1	1	1	1	YU08120260	Jumper Lead, (8P)
WY03	1	1	1	1	1	YU04120260	Jumper Lead, (4P)

(W01-99)	Assembly and Wiring
(T01-99)	Adjustment
(X01-00)	Correction

11. TECHNICAL SPECIFICATIONS

FM TUNER SECTION

Frequency Range	87.5 ~ 108 MHz
Usable Sensitivity	1.4 μ V
Mono S/N 26 dB, 300 ohms	40 μ V
Stereo S/N 46 dB, 300 ohms	70 dB
Alternate Channel Selectivity 98 MHz	78 dB
Image Response Rejection	90 dB
IF Rejection	95 dB
Spurious Response Rejection	50 dB
AM Suppression	
Signal-to-Noise Ratio	
Unweighted Mono	70 dB
Stereo	63 dB
Weighted Mono	76 dB
Stereo	68 dB
Pilot Signal & Subcarrier Rejection	
19 kHz	65 dB
38 kHz	65 dB
Total Harmonic Distortion	
Mono	0.1%
Stereo	0.2%
Frequency Response	
30 Hz ~ 15 kHz	+0 dB, -1 dB
Separation	
Stereo	45 dB
Channel Balance	0.2 dB

MW TUNER SECTION

Frequency Range	522 ~ 1611 kHz
Usable Sensitivity 20 dB S/N 30% Mod.	10 μ V
Selectivity 999 kHz, \pm 9 kHz	40 dB
Image Rejection, 999 kHz	45 dB
IF Rejection, 999 kHz	70 dB
Signal-to-Noise Ratio, 999 kHz	54 dB
Total Harmonic Distortion, 999 kHz	0.3%

LW TUNER SECTION

Frequency Range	153 ~ 360 kHz
Usable Sensitivity 20 dB S/N 30% Mod., 250 kHz	100 μ V
Image Rejection, 250 kHz	46 dB
IF Rejection, 250 kHz	55 dB
Signal-to-Noise Ratio, 250 kHz	54 dB

GENERAL

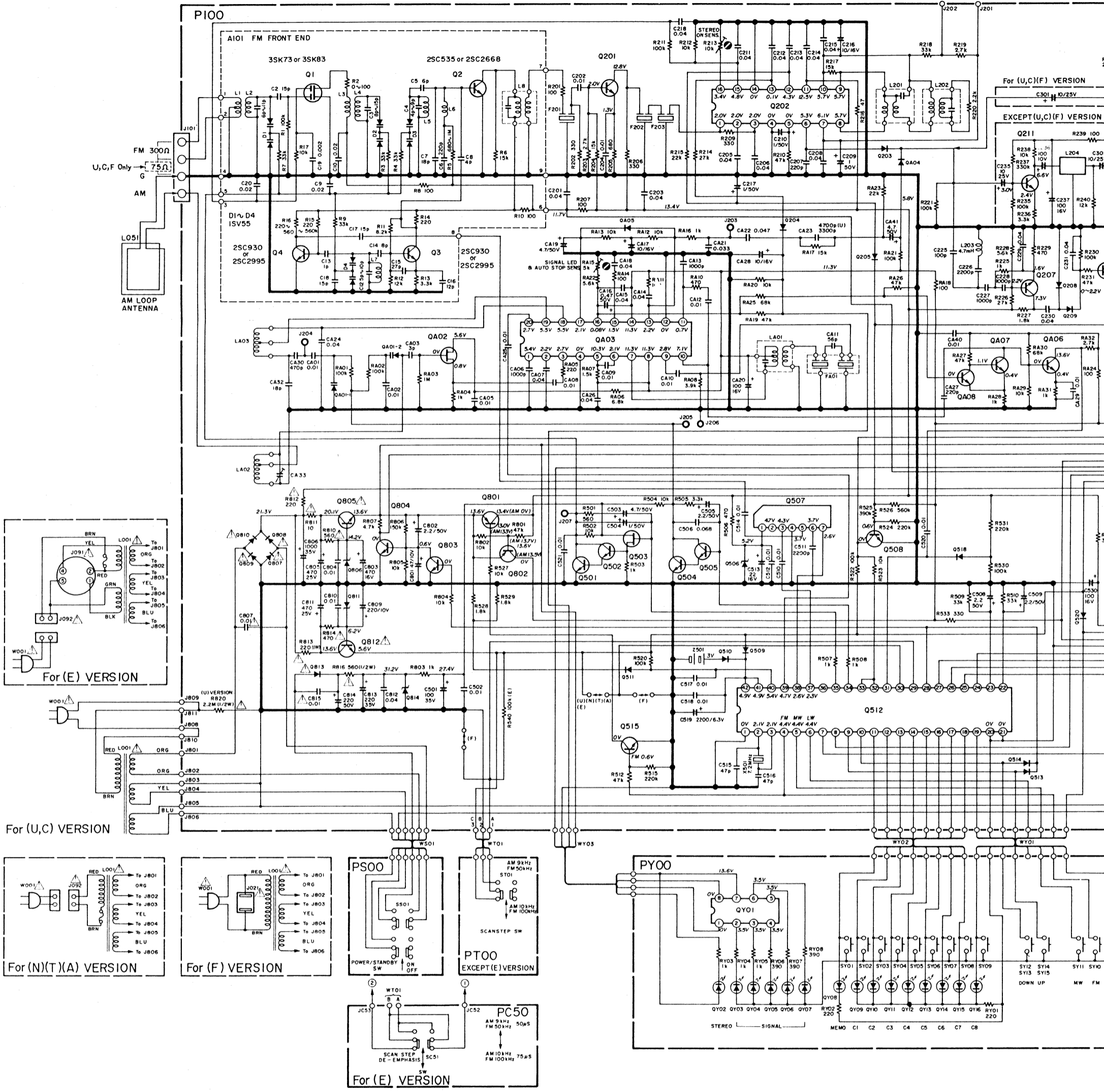
Power Requirements	
N version	220/240V AC, 50/60 Hz
T version	220/240V AC, 50/60 Hz
E version	110/120/220/240V AC, 50/60 Hz
Power Consumption	9W
Dimensions	
Panel Width	416 mm
Panel Height	55 mm
Depth	300 mm
Weight	
Unit Alone	2.95 kg

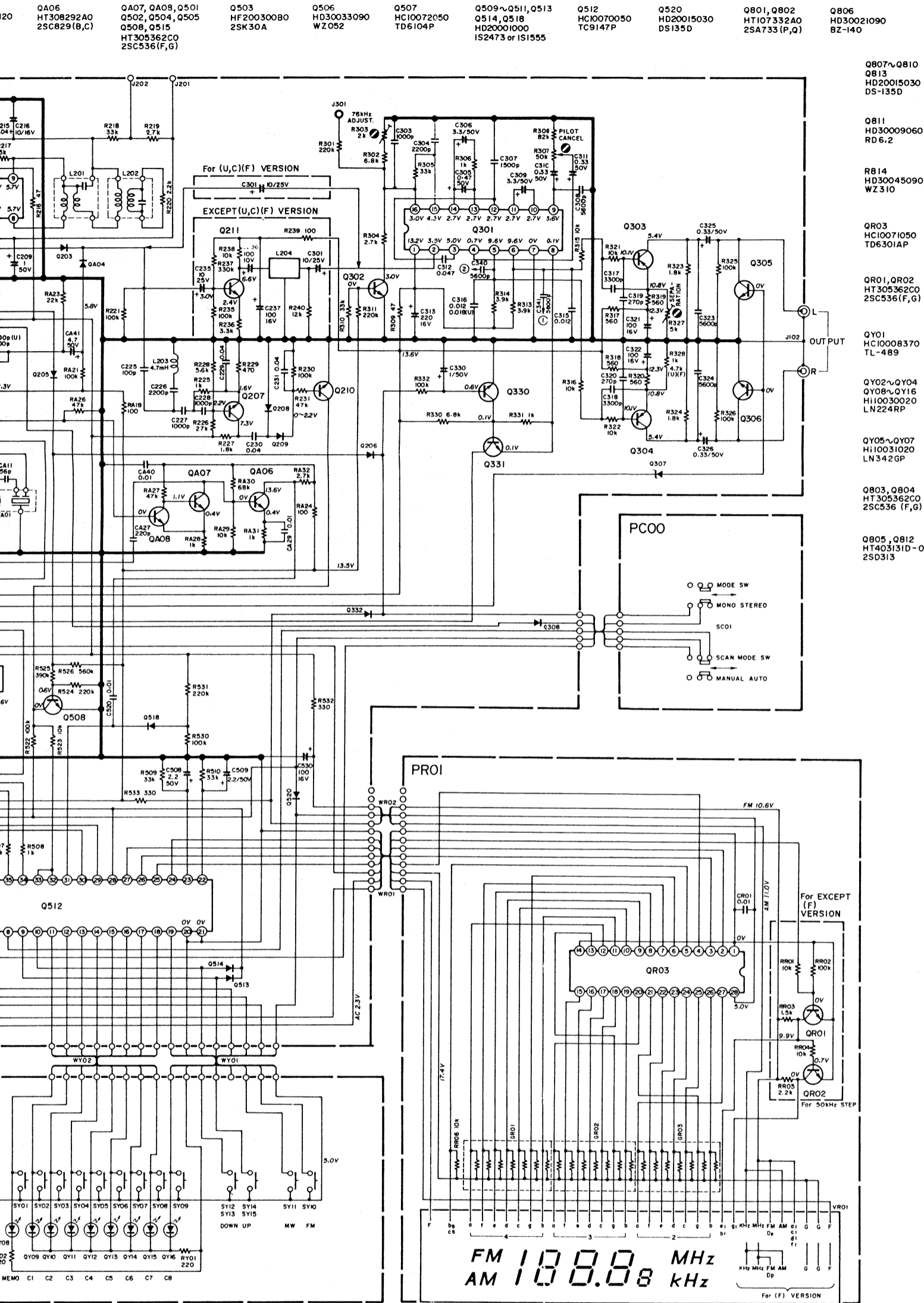
Specifications and appearance are subject to change for modification without notice.

MEMORANDUM

12. SCHEMATIC DIAGRAM

Q201 HT310471C0 25C1047C	Q202 HC10033010 HA11225	Q207, Q210, Q211 Q302, Q305, Q306 Q330, Q331 HT305362C0 25C536(F, G)	Q203~Q206, Q332 Q208~Q210 Q308, QA04 HD20001000 IS2473 or IS1555	Q301 HC10029010 HA11223W	Q303, Q304 HT110162A0 25A1016(F, G)	Q307 HD30076090 WZ038	QA01 HD40002420 KV-1226	QA02 HF200551D0 25K55D	QA03 HC10058030 LA1245	QA05 HV0006120 MV-203	QA06 HT308292A0 25C829(B, C)	QA07, QA08, Q501 Q502, Q504, Q505 Q508, Q515 HT305362C0 25C536(F, G)	Q503 HF200300B0 25K30A	Q504 H	Q505 W
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Q807~Q810
Q813
HD20015030
DS-135D

Q811
HD30009060
RD 6.2

R814
HD30045090
WZ 310

QR03
HC10071050
TD6301AP

QR01, QR02
HT305362C0
2SC536(F,G)

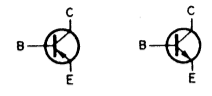
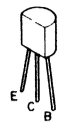
QY01
HC10008370
TL-489

QY02~QY04
QY08~QY16
HI10030020
LN224RP

QY05~QY07
HI10031020
LN342GP

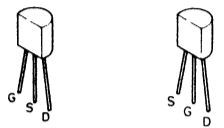
QB03, QB04
HT305362C0
2SC536(F,G)

Q805, Q812
HT403131D-0
2SD313



2SA1016
2SA733(P,Q)
2SC1047C
Q303, Q304
Q801, Q802

2SC2688
2SC2995
2SC1047C
2SC536(F,G)
2SC829(B,C)
2SD863(E)



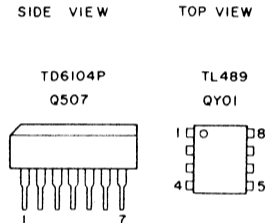
2SK55D
QA02

2SK30A
Q503



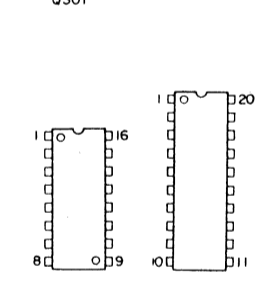
2SD313
Q805, Q812

3SK73
3SK83



TOP VIEW
TOP VIEW

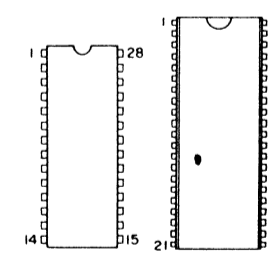
HA11225
HA11223W
Q202
Q301



TOP VIEW
TOP VIEW

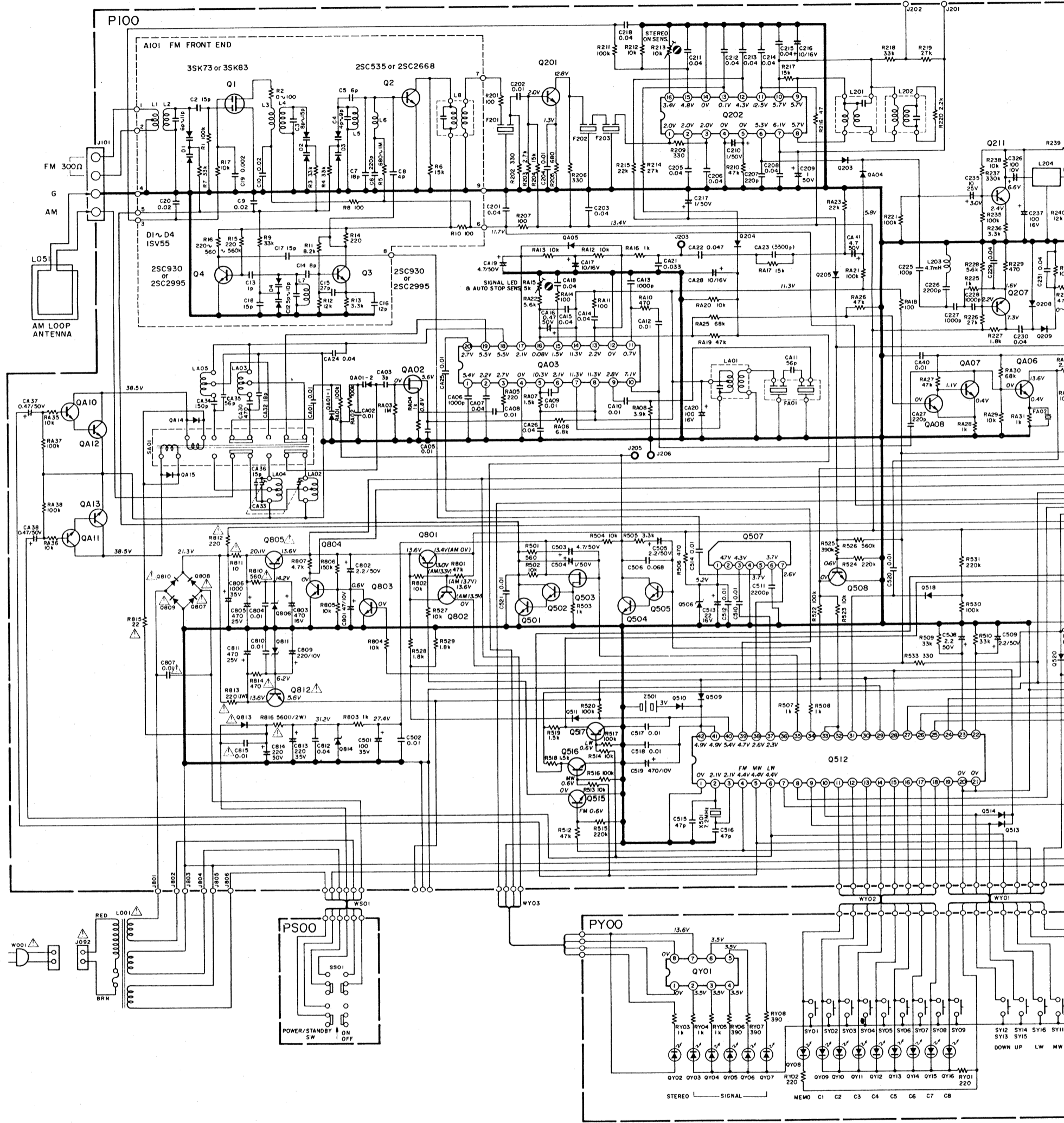
TD6301AP
QR03

TC9147P
Q512



Components and wiring are subject to change for modification without notice.

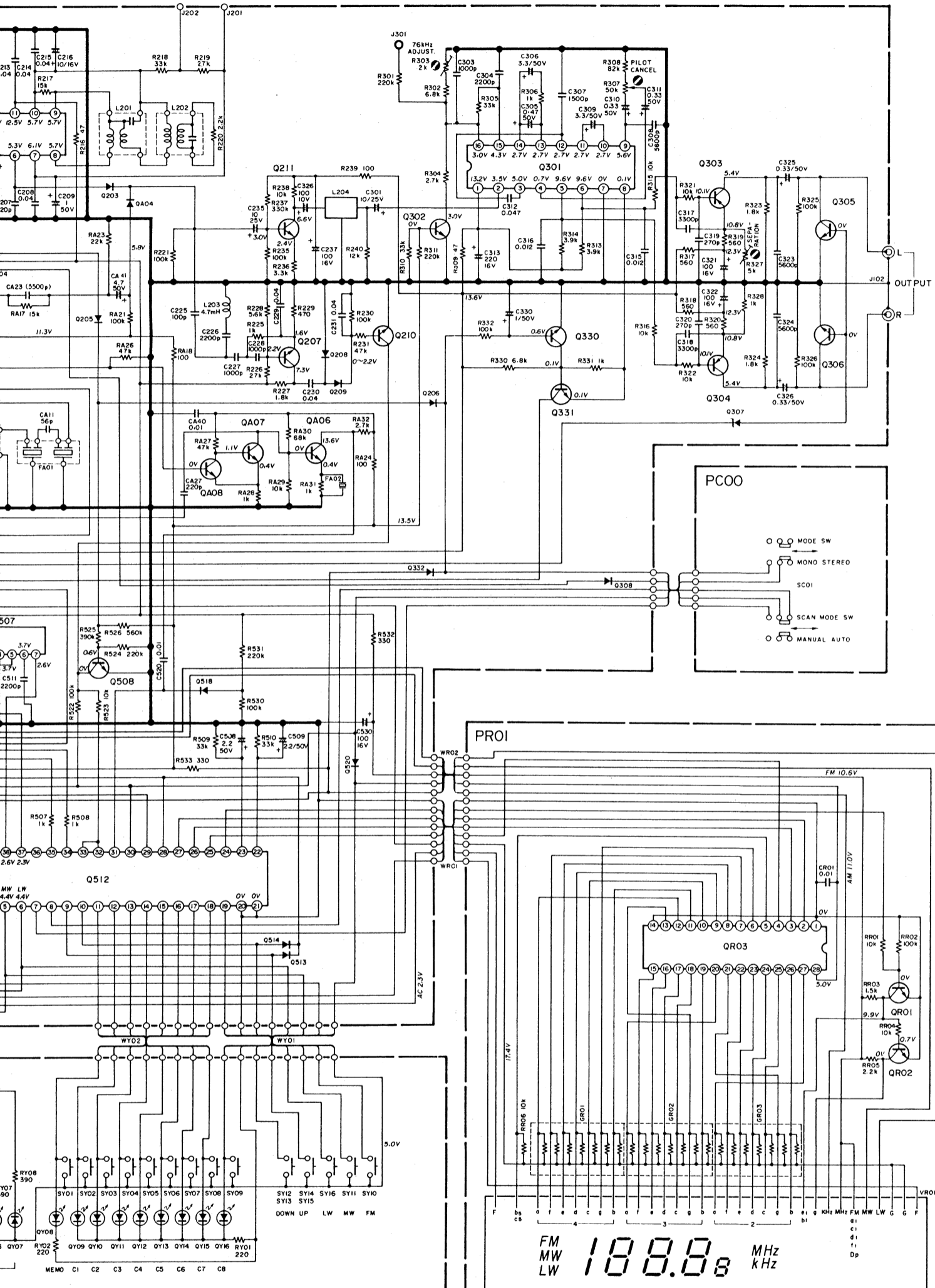
Q201 HT310471C0 25C1047C	Q202 HC10033010 HA11225	Q207, Q210, Q211 Q302, Q305, Q306 Q330, Q331 HT305362C0 25C536(F, G)	Q203~Q206, Q332 Q208~Q210 Q308, Q404 HD20001000 IS2473 or IS1555	Q301 HC10029010 HA11223W	Q303, Q304 HT110162A0 2SA1016(F, G)	Q307 HD30033090 WZ052	Q401 HD40002420 KV-1226	Q402 HF200551D0 2SK55D	Q403 HC10058030 LA1245	Q405 HV00006120 MV-203	Q406 HT308292A0 25C829(B, C)	Q407, Q408, Q501 Q502, Q504, Q505 Q508, Q515~Q517 HT305362C0 25C536(F, G)	Q503 HF200300B0 2SK30A
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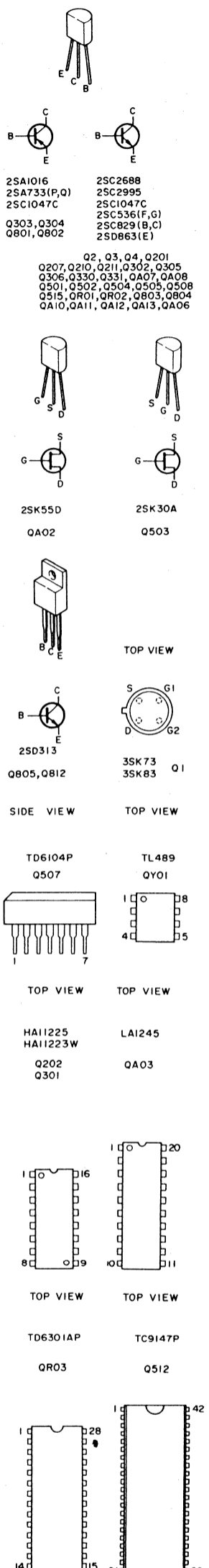
NOTE ON SAFETY:
 Symbol Δ Fire or electrical shock hazard. Only original parts should be used to replace any part marked with symbol Δ . Any other component substitution (other than original type), may increase risk of fire or electrical shock hazard.

Model ST521L

- | | | | | | | | | | | |
|-----------------------------|-----------------------------------|--|------------------------------|-----------------------------|-------------------------------|---|-------------------------------|------------------------------|---|------------------------------|
| QA05
HV0006120
MV-203 | QA06
HT308292A0
2SC829(B,C) | QA07, QA08, Q501
Q502, Q504, Q505
Q508, Q515~Q517
HT305362C0
2SC536(F,G) | Q503
HF200300B0
2SK30A | Q506
HD30033090
WZ052 | Q507
HC10072050
TD6104P | Q509~Q511, Q513
Q514, Q518
HD20001000
IS2473 or IS1555 | Q512
HC10070050
TC9147P | Q520
HD20015030
DS135D | Q801, Q802
HT107332A0
2SA733(P,Q) | Q806
HD30021090
BZ-140 |
|-----------------------------|-----------------------------------|--|------------------------------|-----------------------------|-------------------------------|---|-------------------------------|------------------------------|---|------------------------------|



- Q807~Q810
Q813
HD20015030
DS-135D
- Q811
HD30009060
RD 6.2
- RB14
HD30045090
WZ310
- QR03
HC10071050
TD6301AP
- QR01, QR02
HT305362C0
2SC536(F,G)
- QY01
HC10008370
TL-489
- QY02~QY04
QY08~QY16
HI10030020
LN224RP
- QY05~QY07
HI10031020
LN342GP
- Q803, Q804
HT305362C0
2SC536(F,G)
- Q805, Q812
HT403131D-0
2SD313
- QA10, QA11
HT305362C0
2SC536(F,G)
- QA12, QA13
HT408631B0
2SD863E
- QA14, QA15
HD20015030
DS135D



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