

Service Manual

QUARTZ Synthesizer FM/AM Stereo Tuner



Free service manuals

Gratis schema's

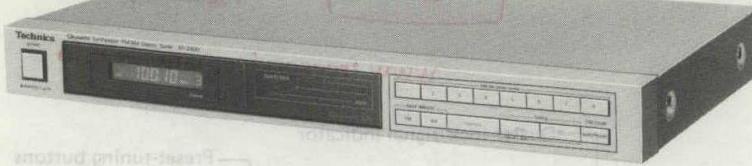
Digitized by

Tuner

ST-Z400

Color

(K)...Black Type
(S)...Silver Type



www.freeservicemanuals.info

Color	Area
(K)(S)	[EX]...Scandinavia and Switzerland.
(K)(S)	[EH]...Holland.
(K)(S)	[XA]...Asia, Latin America, Africa, Middle Near East and Oceania.
(K)(S)	[XL]...Australia.
(K)(S)	[PA]...Far East PX.
(K)(S)	[PE]...European Military.
(K)(S)	[PC]...European Audio Club.
(S)	[Ei]...Italy.

SPECIFICATION

(DIN 45 500)

■ FM TUNER SECTION

Frequency range 87.50~108.00 MHz

Sensitivity

S/N 30 dB 1.0 μ V (75 Ω)

S/N 26 dB 0.9 μ V (75 Ω)

S/N 20 dB 0.8 μ V (75 Ω)

IHF usable sensitivity 0.95 μ V (IHF '58)

IHF 46 dB stereo quieting sensitivity 22 μ V/75 Ω

Total harmonic distortion

MONO 0.15%

STEREO 0.3%

S/N

MONO 69 dB (75 dB, IHF)

STEREO 64 dB (70 dB, IHF)

Frequency response 5 Hz~18 kHz, +0.5 dB~-1.5 dB

Alternate channel selectivity

normal \pm 400 kHz 60 dB

Capture ratio 1.0 dB

Image rejection at 98 MHz 55 dB

IF rejection at 98 MHz 90 dB

Spurious response rejection at 98 MHz 80 dB

AM suppression 55 dB

Stereo separation

1 kHz 45 dB

10 kHz 30 dB

Carrier leak

19 kHz -40 dB (-45 dB, IHF)

38 kHz -40 dB (-45 dB, IHF)

Channel balance (250 Hz~6,300 Hz)

± 1 dB

Limiting point 1.0 μ V

Bandwidth

IF amplifier 180 kHz

FM demodulator 1000 kHz

Antenna terminals 75 Ω (unbalanced)

■ AM TUNER SECTION

Frequency range 522~1611 kHz (9 kHz step)

530~1620 kHz (10 kHz step)

Sensitivity (S/N 20 dB) at 999 kHz 20 μ V, 300 μ V/m

Selectivity (± 9 kHz) at 999 kHz 55 dB

Image rejection at 999 kHz 40 dB

IF rejection at 999 kHz 60 dB

■ GENERAL

Output voltage 0.4V

Power consumption 9W

Power supply

For Australia AC 50 Hz/60 Hz, 240V

For continental Europe AC 50 Hz/60 Hz, 220V

For others AC 50 Hz/60 Hz, 110V/120V/220V/240V

Dimensions (W×H×D) 430 × 53 × 240 mm

(16-15/16" × 2-3/32" × 9-7/16")

Weight 2.1 kg

(4.6 lb.)

(Specification are subject to change without notice for further improvement.)

Technics

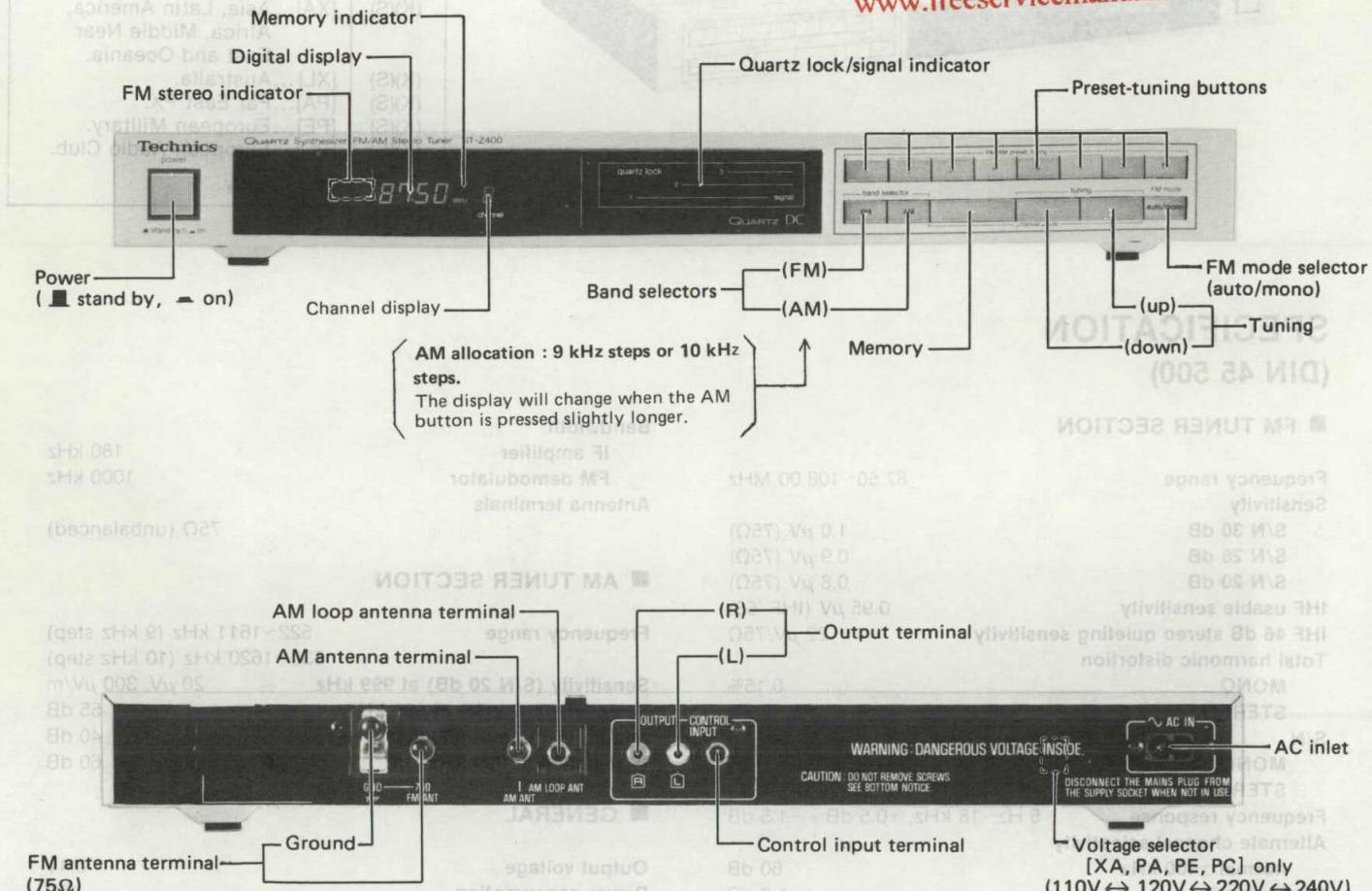
Panasonic Tokyo
Matsushita Electric Industrial Co., Ltd.
1-2, 1-chome, Shibakoen, Minato-ku, Tokyo 105 Japan

Matsushita Electric Trading Co., Ltd.
P.O. Box 288, Central Osaka Japan

■ CONTENTS

	Page
LOCATION OF CONTROLS	2
HOW TO PRESET RADIO BROADCAST	
FREQUENCIES	3, 4
DISASSEMBLY INSTRUCTIONS	5
BEFORE REPAIR	5
MEASUREMENTS AND ADJUSTMENTS	6, 7
CIRCUIT BOARD AND WIRING	
CONNECTION DIAGRAM	8, 9
FUNCTION OF TERMINAL (PLL controller IC901)	10
BLOCK DIAGRAM	11, 12
SCHEMATIC DIAGRAM	13 ~ 15
LIQUID CRYSTAL DISPLAY (LCD)	16
RESISTORS AND CAPACITORS	17
REPLACEMENT PARTS LIST	18
EXPLODED VIEW	19, 20

■ LOCATION OF CONTROLS



- The power supply for this unit varied depending upon the areas. Also, the parts used for power supply are different. So, refer to the circuit diagram and the replacement parts list.
- ★ 220V (50/60 Hz) for Continental Europe.
- ★ 240V (50/60 Hz) for Australia.
- ★ 110V/120V/220V/240V (50/60 Hz) for other areas.

QUARTZ Synthesizer

FM/AM Stereo Tuner

ST-Z400

DEUTSCH

- This booklet includes the specifications and adjustment of Model ST-Z400 (Order No. HAD84062810C9) written in German, French and Spanish.
- File this booklet together with the service manual of Model ST-Z400.
- Dieses Büchlein umfaßt die technischen Daten und Justierungsanleitungen von Modell ST-Z400 (Bestell Nr. HAD84062810C9) in den Sprachen Deutsch, Französisch und Spanisch.
- Bewahren Sie dieses Büchlein zusammen mit dem Service-Handbuch von Modell ST-Z400 auf.
- Cette brochure comprend les spécifications et la mise au point du Modèle ST-Z400 (N° d'Ordre HAD84062810C9) écrites en allemand, en français et en espagnol.
- Classer cette brochure en même temps qu'avec le manuel de service du Modèle ST-Z400.
- Este librito incluye las especificaciones y ajuste de Modelo ST-Z400 (Pedido N° HAD84062810C9) escritas en alemán, francés y español.
- Guardar este librito juntamente con el manual servicio de Modelo ST-Z400.

DEUTSCH

■ TECHNISCHE DATEN

(DIN 45 500)

■ UKW-TUNERTEIL

Wellenbereich

87,50 ~ 108,00 MHz

Eingangsempfindlichkeit

1,0 μ V (75 Ω)

S/R 30 dB

0,9 μ V (75 Ω)

S/R 26 dB

0,8 μ V (75 Ω)

S/R 20 dB

0,95 μ V (nach IHF '58)

Nutzempfindlichkeit nach IHF

22 μ V/75 Ω

Stereoumschaltschwelle bei 46 dB nach IHF

522 ~ 1611 kHz (9-kHz-Schritte)

Gesamtklirrfaktor

530 ~ 1620 kHz (10-kHz-Schritte)

Mono

0,15%

Stereo

0,3%

Geräuschabstand

Mono

69 dB (75 dB nach IHF)

Stereo

64 dB (70 dB nach IHF)

Frequenzgang

5 Hz ~ 18 kHz (+0,5 dB ~ -1,5 dB)

Trennschärfe bei Störsender

normal \pm 400 kHz

60 dB

Einfangverhältnis

1,0 dB

55 dB

Spiegelfrequenz-Dämpfung bei 98 MHz

55 dB

90 dB

ZF-Dämpfung bei 98 MHz

80 dB

55 dB

Ansprechdämpfung auf Nebenfrequenzen bei 98 MHz

55 dB

Übersprechdämpfung

1 kHz

45 dB

10 kHz

30 dB

Trägerrest

19 kHz

-40 dB (-45 dB nach IHF)

38 kHz

-40 dB (-45 dB nach IHF)

Kanalabweichung (250 Hz ~ 6300 Hz)

 \pm 1 dB

■ MW-TUNERTEIL

Wellenbereiche

522 ~ 1611 kHz (9-kHz-Schritte)

530 ~ 1620 kHz (10-kHz-Schritte)

Eingangsempfindlichkeit (S/R 20 dB) bei 999 kHz

20 μ V, 300 μ V/m

Trennschärfe (\pm 9 kHz) bei 999 kHz

55 dB

Spiegelfrequenz-Dämpfung bei 999 kHz

40 dB

ZF-Dämpfung bei 999 kHz

60 dB

■ ALLGEMEINE DATEN

Ausgangsspannung

0,4 V

Leistungsaufnahme

9W

Netzspannung

Für Kontinentaleuropa

Wechselstrom 50 Hz/60 Hz, 220V

Für andere Länder

Wechselstrom 50 Hz/60 Hz,

110V/120V/220V/240V

Abmessungen (B \times H \times T)

430 \times 53 \times 240 mm

Gewicht

2,1 kg

(Die technischen Daten können infolge von Verbesserungen
ohne Ankündigung geändert werden.)

■ MESSUNGEN UND JUSTIERUNGEN

Anmerkung: Die AM-OSC-Spule (L203) und AM ZFT (T201) sind bereits justiert und benötigen daher keine Justierung.

AM (MW)-EINSTELLUNG

* Einstellungen und zu benutzende Geräte

1. Elektronisches Voltmeter für Wechsel- und Gleichstrom (EVM).
2. AM (MW)-Meßsender (AM-SG).
3. FM/AM-Wahlschalter in die "AM"-Position stellen.
(9 kHz-Schritt)
4. Netzspannung auf ihrem Sollwert halten.
5. Der Ausgang des Meßsenders darf nicht höher sein als unbedingt notwendig für eine gute Ablesung.
6. Einen nichtmetallischen Schraubenzieher für die Einstellungen verwenden.

AM (MW)-MESSENDER		ANZEIGE-FREQUENZ DURCH VOR-EINSTELLUNG	VORBEREITUNG	ABGLEICHSPUNKTE	ABGLEICHSVERFAHREN
ANSCHLUSS	FREQUENZ				

AM (MW)-HF-ABGLEICH

1	AM-MO über 200 pF-Kondensator an den AM-Antennenanschluß anschließen. Erdung an chassis. (Schwacher Eingang.)	612 kHz (400 Hz Modulat., 30%)	612 kHz	Wechselstrom-Voltmeter oder Oszilloskop über den Ausgang "OUTPUT" anschließen.	L202 (Ant. Spule)	1. Auf max. Ausgang abgleichen. 2. Den Ferritkern von L202 mit einem Schraubendreher justieren.
2		1503 kHz (400 Hz Modulat., 30%)	1503 kHz		CT201 (Ant. Trimmer)	1. Auf max. Ausgang abgleichen. 2. Die Schritte (1) und (2) wiederholen, bis die Frequenz genau mit der Skalenanzeige übereinstimmt.

FM (UKW)-EINSTELLUNG

* Einstellungen und zu benutzende Geräte

1. UKW-Meßsender (FM-SG)
2. Stereo-Modulator
3. Oszilloskop
4. Elektronische Voltmeter für Wechsel- und Gleichstrom (EVM).
5. Signalfrequenzmesser (meßbar für 19 kHz und 108 MHz).
6. Tiefpaßfilter (fc = 15 kHz ~ 19 kHz).
7. FM/AM-Wahlschalter in die "FM"-Position stellen.
8. Den UKW-Betriebsartenschalter in die "mono"-Position stellen.

* Vorbereitung am UKW-Messender (FM-SG)

1. SG-Ausgang über 75-Ohm-UKW-Kunstantenne an den Antenneneingang des Gerätes anschließen.
2. Der normale Eingang des Gerätes beträgt 60 dB (1 mV), 400 Hz, 100% Modulation. Wegen Verwendung der Kunstantenne muß der Signalausgang 12 dB (4 μ V) plus (ZHF) sein: d.h. beim Eingang von 60 dB (1 mV) soll der Signalausgang 72 dB (4 mV) sein.)

FM (UKW)-MESSENDER		ANZEIGE-FREQUENZ DURCH VOR-EINSTELLUNG	VORBEREITUNG	ABGLEICHSPUNKTE	ABGLEICHSVERFAHREN
ANSCHLUSS	FREQUENZ				

UKW-ZF-ABGLEICH

3	Meßsender über eine 75 Ω -UKW-Kunstantenne an den UKW-Antennen-eingang anschließen. (60 dB (1 mV) in den Antenneneingang leiten.)	100,1 MHz (400 Hz Modulat., 100%)	100,1 MHz	Ein Gleichstrom-Voltmeter (EVM) an TP101 (-) und TP102 (+) über eine Drosselspule verbinden. (Siehe Abb. 1)	T101 (Diskriminator ZFT)	Den Kern von T101 so justieren, daß die gemessene Spannung im signallosen Zustand 0 mV im 300 mV Bereich beträgt.
---	--	--------------------------------------	-----------	---	-----------------------------	---

UKW-STEREO-DEKODER-ABGLEICH

UNTER VERWENDUNG EINES ZÄHLERS			ALTERNATIVE MESSMETHODE		
1. Unmoduliertes Mono-Signal 100,1 MHz in das Gerät speisen.	2. UKW-Betriebsart-Schalter auf "auto" stellen.	3. Zähler über einen Widerstand von 100kOhm an TP301 anschließen. (Vgl. Abb. 2)	1. Stereosignal entweder von einem Meßsender, oder einem Stereosender in den Tuner speisen.	2. VR301 so einstellen, daß die Stereolampe aufleuchtet. Schleifer von VR301 sichern, wie in Abb. 3 gezeigt.	

TERNNUNGS-ABGLEICH

5	Meßsender über eine UKW-Kunstantenne an den UKW-Antenneneingang anschließen. (Stereo-Pilotensignal 10% moduliert.)	100,1 MHz (400 Hz Modulat., 100%) L oder R-Betriebsart.)	100,1 MHz	Wechselstrom-Voltmeter über Tiefpaßfilter (fc = 15 ~ 19 kHz) an Ausgangsanschlüsse (OUTPUT) des Gerätes anschließen.	VR302	1. Den UKW-Betriebsarten-schalter in die "auto"-Position stellen. 2. VR302 auf minimale Anzeige des R-Ausgangs bei Stereo-modulator in L-(L-Kanalmodulation) Modus, und auf minimale Anzeige des L-Ausgangs in R-Modus abgleichen.
---	--	---	-----------	--	-------	---

FRANÇAIS

CARACTÉRISTIQUES
(DIN 45 500)

SECTION SYNTONISATEUR FM

Gamme de fréquence 87,50~108,00 MHz

Sensibilité

S/B 30 dB

S/B 26 dB

S/B 20 dB

Sensibilité utilisable IHF

PROCEDEZ

Ajustez

ESPAÑOL

■ ESPECIFICACIONES

(DIN 45 500)

■ SECCION PARA SINTONIZADOR FM

Gama de frecuencias 87,50~108,00 MHz

Sensibilidad

Señal a ruido 30 dB

1,0 μ V (75 Ω)

Señal a ruido 26 dB

0,9 μ V (75 Ω)

Señal a ruido 20 dB

0,8 μ V (75 Ω)

Sensibilidad utilizable IHF

0,95 μ V (IHF '58)

Sensibilidad de acallamiento estíreo de 46 dB IHF

22 μ V/75 Ω

Distorsión armónica total

MONO. (MONO)

0,15%

ESTEREO (STEREO)

0,3%

Relación de señal a ruido

MONO. (MONO)

69 dB (75 dB, IHF)

ESTEREO (STEREO)

64 dB (70 dB, IHF)

Respuesta de frecuencia 5 Hz~18 kHz, +0,5 dB~ -1,5 dB

Selectividad alternada de canal

normal ±400 kHz

60 dB

Relación de captura

1,0 dB

Rechazo de imagen a 98 MHz

55 dB

Rechazo de F.I. a 98 MHz

90 dB

Rechazo de respuesta espuria a 98 MHz

80 dB

Supresión AM

55 dB

Separación estereofónica

1 kHz

45 dB

10 kHz

30 dB

Fuga de onda portadora

19 kHz

-40 dB (-45 dB, IHF)

38 kHz

-40 dB (-45 dB, IHF)

Equilibrio de canales 250 Hz~6 300 Hz

±1 dB

Punto de límite

1,0 μ V

Ancho de banda

180 kHz

Amplificador FI

1000 kHz

Demodulador FM

1000 kHz

Bornes de antena

75 Ω (no equilibrado)

■ SECCION PARA SINTONIZADOR AM

Gama de frecuencias

522~1611 kHz (9 kHz pasos)

530~1620 kHz (10 kHz pasos)

Sensibilidad (Relación de señal a ruido de 20 dB) a 999 kHz

20 μ V, 300 μ V/m

Selectividad (±9 kHz) a 999 kHz

55 dB

Rechazo de imagen a 999 kHz

40 dB

Rechazo de F.I. a 999 kHz

60 dB

■ GENERAL

Voltaje de salida

0,4V

Consumo de energía

9W

Alimentación de energía

Para Europa continental

CA 50 Hz/60 Hz, 220V

Para otros países

CA 50 Hz/60 Hz, 110V/120V/220V/240V

Dimensiones (An.×Al.×Prof.)

430 × 53 × 240 mm

Peso

2,1 kg

(Estas especificaciones están sujetas a cualquier cambio sin previo aviso.)

■ MEDICIONES Y AJUSTES

Nota: La bobina de OSC AM (L203) y AM IFT (T201) han sido ya ajustadas y no requieren ajuste.

AJUSTE DE AM

* Puesta y equipos usados

1. Voltímetros electrónicos de CA y CC (EVM).
2. Generador de señales AM (AM-SG).
3. Poner selector FM-AM en posición "AM". (Posición 9 kHz)

4. Mantener voltaje de línea a voltaje nominal.
5. La salida de generador de señales no debe ser mayor que la necesaria para obtener una lectura de salida.
6. Para el ajuste, usar un destornillador no metálico.

No.

GENERAL DE SEÑALES AM	A FRECUENCIA DE PRESENTACION	PREPARACIONES	PIEZAS AJUSTADAS	PROCEDIMIENTO DE AJUSTE
CONEXION	FRECUENCIA			

AJUSTE RF-AM				
1	Conectar AM-SG a terminal de antena AM a través de capacitor 200 pF. Común a chasis. (Entrada débil)	612 kHz (Mod. 30% con 400 Hz)	612 kHz	Conectar EVM de CA y osciloscopio a terminales de "OUTPUT".
2	1503 kHz (Mod. 30% con 400 Hz)	1503 kHz	CT201 (Trimmer de ANT.)	1. Ajustar para salida máxima. 2. Repetir pasos (1) y (2) hasta que la frecuencia se adapte correctamente a la escala del cuadrante.

AJUSTE DE FM

* Reglaje y equipos usados

1. Generador de señales FM (FM-SG).
2. Modulador estereofónico.
3. Osciloscopio.
4. Voltímetros electrónicos de CA y CC (EVM).
5. Frecuencímetro (19 kHz y 108 MHz medibles).
6. Filtro pasabajas (frec : 15 kHz ~ 19 kHz).
7. Poner selector FM-AM en posición "FM".
8. Poner el interruptor de modalidad FM en la posición "MONO".

* Preparación de generador de señales FM (FM-SG)

1. Aplicar salida SG a terminal de antena del aparato a través de antena ficticia de FM de 75 Ω .
2. La entrada standard del aparato es 60 dB (1 mV), modulación 100%, 400 Hz (Por el uso de antena ficticia, la salida de SG ha de ser 12 dB (4 μ V) más (IHF). Es decir, cuando entrada es 60 dB (1 mV), salida de SG ha de ser 72 dB (4 mV).
3. Conectar el modulador estereofónico a FM-SG.

No.	GENERAL DE SEÑALES FM	A FRECUENCIA DE PRESENTACION	PREPARACIONES	PIEZAS AJUSTADAS	PROCEDIMIENTO DE AJUSTE

3	Conectar FM-SG a terminal de antena FM a través de antena ficticia FM de 75 Ω . (Aplicar 60 dB (1 mV) a terminal de antena).	100,1 MHz (Mod. 100% con 400 Hz)	100,1 MHz	Conectar EVM CC entre terminal TP101 (-) y TP102 (+) a través de bobina de choque. (Ver Fig. 1)	T101 (Discri. IFT)	Ajustar núcleo de T101 de manera que voltaje medido en modalidad de señal sea 0 mV en gama de 300 mV.

AJUSTE DE V.C.O. MPX DE FM			USANDO UN FRECUENCIOMETRO			USANDO SISTEMA ALTERNATIVO		
1	1. Señal mono no modulada de 100,1 MHz, 60 dB aplicada al aparato.		1. Aplicar una señal estereofónica al sintonizador desde el generador o una emisora estereofónica.			1. Aplicar una señal mono no modulada de 100,1 MHz, 60 dB aplicada al aparato.		
4	2. Interruptor de modalidad FM a "auto".		2. Regular VR301 hasta que se encienda el indicador de estéreo.			2. Regular VR301 hasta que se encienda el indicador de estéreo.		
	3. Conectar frecuencímetro a TP301 a través de resistor (100k Ω). (Vea la Fig. 2).		3. Sujetar el brazo de VR301 como se muestra en la Fig. 3.			3. Sujetar el brazo de VR301 como se muestra en la Fig. 3.		
	4. Ajustar VR301 a 19 kHz ± 30 Hz.		4. Ajustar VR301 a 19 kHz ± 30 Hz.			4. Ajustar VR301 a 19 kHz ± 30 Hz.		

5	Con
---	-----

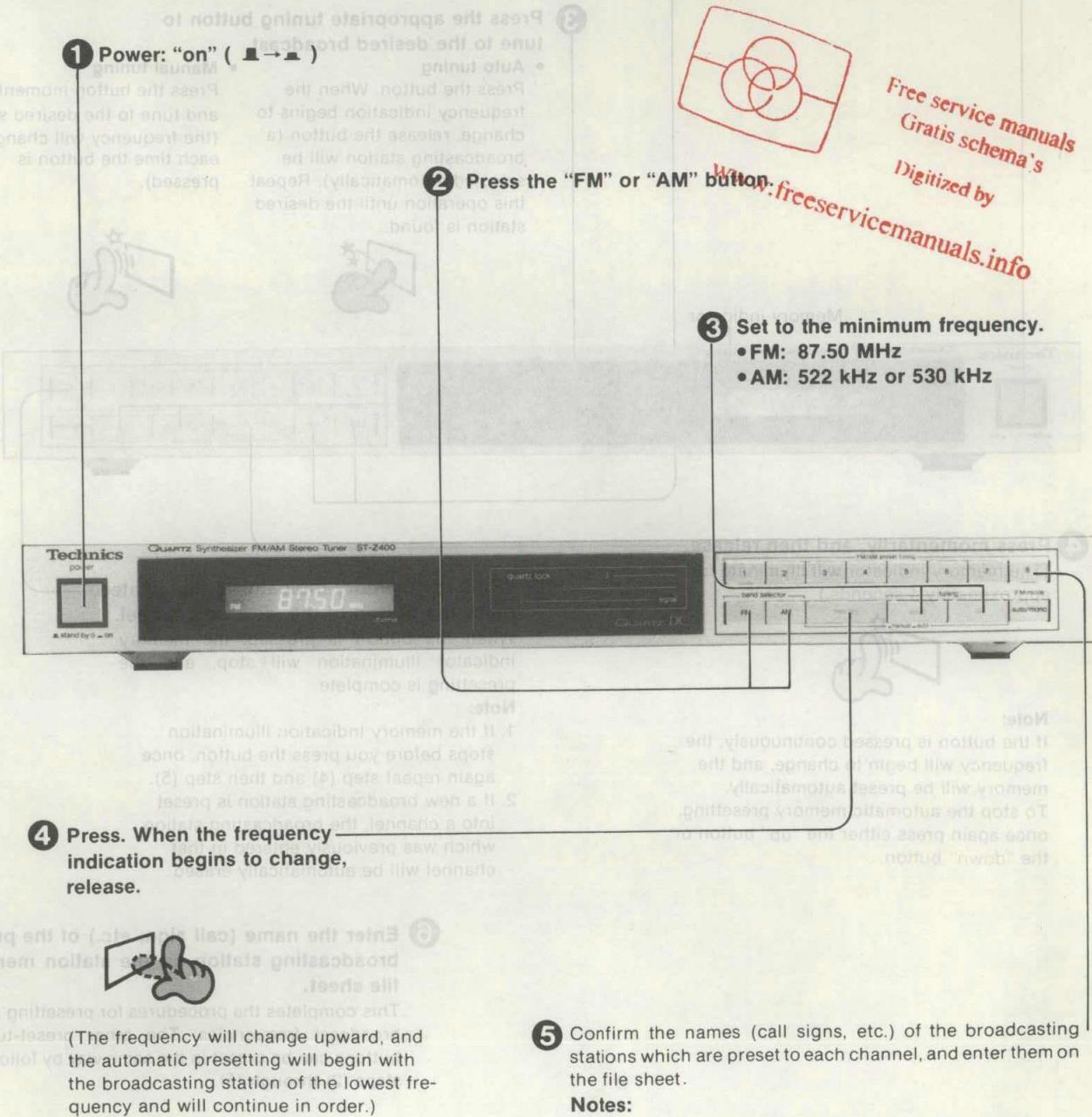
■ HOW TO PRESET RADIO BROADCAST FREQUENCIES

This unit can be used to preset as many as 16 radio broadcast frequencies: 8 FM and 8 AM. After broadcast frequencies have been preset as described below, any desired station can be quickly and easily selected by simply touching one button.

Automatic memory presetting

Beginning at the frequency indicated by the digital display, the broadcasting stations will be automatically preset to "channels" 1 through 8.

Note that in mountainous or remote areas, broadcasting stations which have weak broadcasting signals cannot be automatically preset into the memory.



5 Confirm the names (call signs, etc.) of the broadcasting stations which are preset to each channel, and enter them on the file sheet.

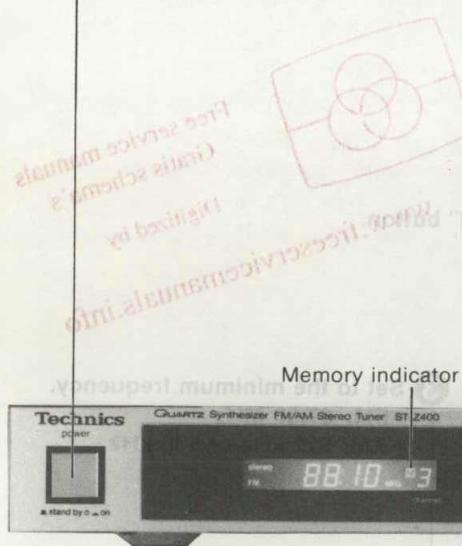
Notes:

1. In areas where there are less than 8 FM stations, the remaining channels (through channel 8) will be left empty. The empty channels can be filled by using manual memory presetting.
2. If a new broadcasting station is preset into a channel, the broadcasting station which was previously entered in that channel will be automatically erased.

Manual memory presetting

Stations can be freely preset to any desired channel.

1 Power: "on" (→)



2 Press the "FM" or "AM" button.

Automatic memory presetting

When the "FM" or "AM" button is pressed, the tuner will automatically search for stations and store them into the memory.

The stations will be stored in the order of frequency, starting from the lowest frequency.

The stations will be stored in the order of frequency, starting from the lowest frequency.

The stations will be stored in the order of frequency, starting from the lowest frequency.

3 Press the appropriate tuning button to tune to the desired broadcast.

• Auto tuning

Press the button. When the frequency indication begins to change, release the button (a broadcasting station will be selected automatically). Repeat this operation until the desired station is found.



• Manual tuning

Press the button momentarily and tune to the desired station (the frequency will change each time the button is pressed).



4 Press momentarily, and then release.

(The memory indicator will illuminate for approximately 4 seconds.)



Note:

If the button is pressed continuously, the frequency will begin to change, and the memory will be preset automatically. To stop the automatic memory presetting, once again press either the "up" button or the "down" button.

5 While the memory indicator is illuminated, press the button of the desired channel.

When the button is pressed, the memory indicator illumination will stop, and the presetting is complete.

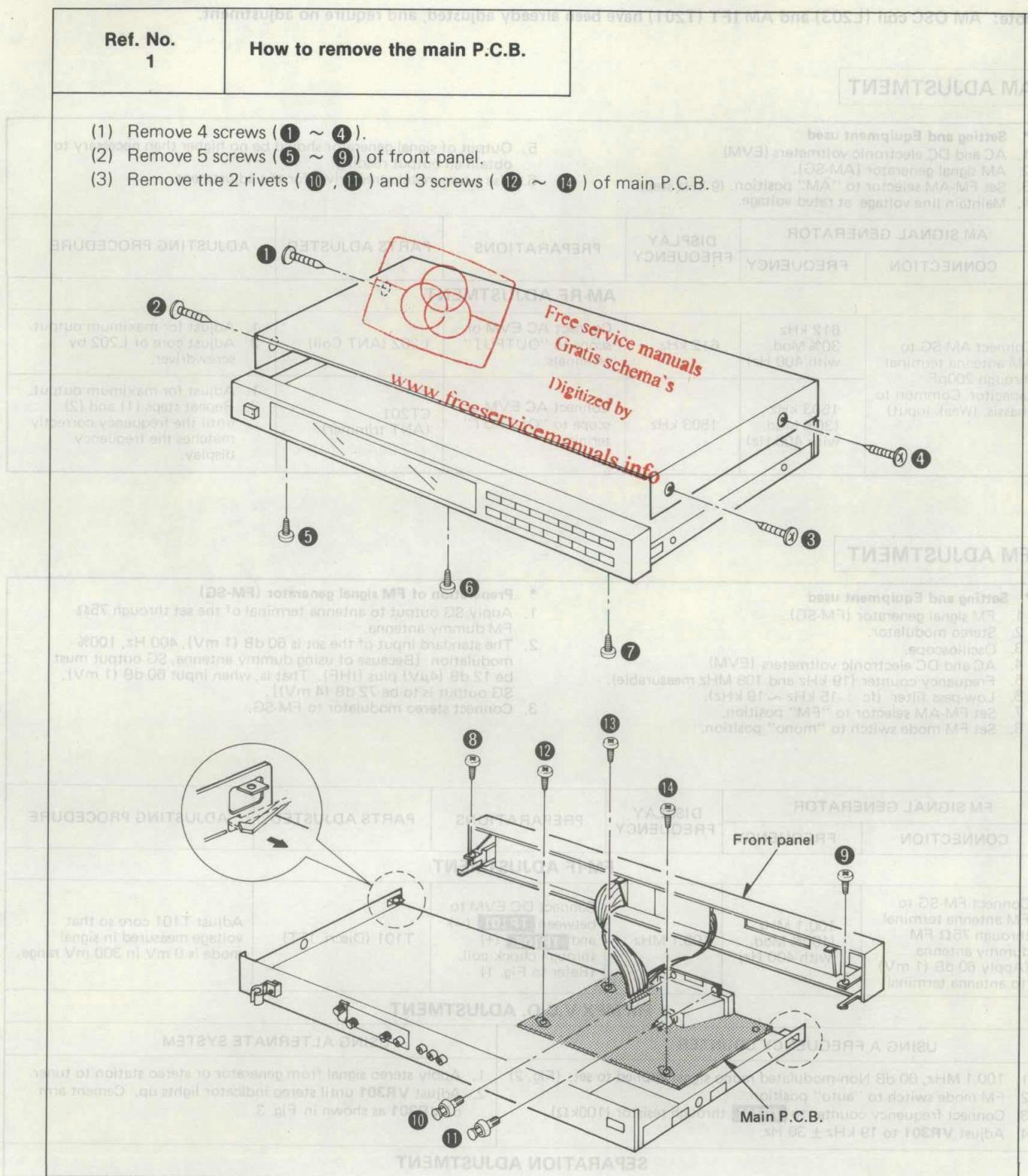
Note:

1. If the memory indication illumination stops before you press the button, once again repeat step (4) and then step (5).
2. If a new broadcasting station is preset into a channel, the broadcasting station which was previously entered in that channel will be automatically erased.

6 Enter the name (call sign, etc.) of the preset broadcasting station on the station memory file sheet.

This completes the procedures for presetting radio broadcast frequencies. The other preset-tuning buttons can be preset in the same way by following steps (2) through (5).

■ DISASSEMBLY INSTRUCTIONS



■ BEFORE REPAIR

The power switch of this unit is located on the secondary side of the power transformer. Be sure to disconnect the power cord from the socket before servicing. Also, do the following before repair of digital circuits.

- (1) Disconnect the power cord from the socket.
- (2) Using a 10Ω , 1W resistor, short circuit electrolytic "gold" capacitors C902 and C903 momentarily to discharge them.

MEASUREMENTS AND ADJUSTMENTS

Note: AM OSC coil (L203) and AM IFT (T201) have been already adjusted, and require no adjustment.

AM ADJUSTMENT

* Setting and Equipment used

1. AC and DC electronic voltmeters (EVM)
2. AM signal generator (AM-SG).
3. Set FM-AM selector to "AM" position. (9 kHz step)
4. Maintain line voltage at rated voltage.

5. Output of signal generator should be no higher than necessary to obtain an output reading.
6. Use a non-metal screwdriver for the adjustment.

Step No.	AM-RF ADJUSTMENT					
	AM SIGNAL GENERATOR CONNECTION	DISPLAY FREQUENCY FREQUENCY	PREPARATIONS	PARTS ADJUSTED	ADJUSTING PROCEDURE	
1	Connect AM-SG to AM antenna terminal through 200pF capacitor. Common to chassis. (Weak input)	612 kHz 30% Mod. with 400 Hz	612 kHz	Connect AC EVM or scope to "OUTPUT" terminals.	L202 (ANT Coil)	<ol style="list-style-type: none"> 1. Adjust for maximum output. 2. Adjust core of L202 by screwdriver.
2		1503 kHz (30% Mod. with 400 Hz)	1503 kHz	Connect AC EVM or scope to "OUTPUT" terminals.	CT201 (ANT trimmer)	<ol style="list-style-type: none"> 1. Adjust for maximum output. 2. Repeat steps (1) and (2) until the frequency correctly matches the frequency display.

FM ADJUSTMENT

* Setting and Equipment used

1. FM signal generator (FM-SG).
2. Stereo modulator.
3. Oscilloscope.
4. AC and DC electronic voltmeters (EVM)
5. Frequency counter (19 kHz and 108 MHz measurable).
6. Low-pass filter (fc : 15 kHz ~ 19 kHz).
7. Set FM-AM selector to "FM" position.
8. Set FM mode switch to "mono" position.

* Preparation of FM signal generator (FM-SG)

1. Apply SG output to antenna terminal of the set through 75Ω FM dummy antenna.
2. The standard input of the set is 60 dB (1 mV), 400 Hz, 100% modulation [Because of using dummy antenna, SG output must be 12 dB (4 μ V) plus (IHF). That is, when input 60 dB (1 mV), SG output is to be 72 dB (4 mV)].
3. Connect stereo modulator to FM-SG.

FM SIGNAL GENERATOR CONNECTION	DISPLAY FREQUENCY FREQUENCY		PREPARATIONS	PARTS ADJUSTED	ADJUSTING PROCEDURE

FM-IF ADJUSTMENT

3	Connect FM-SG to FM antenna terminal through 75Ω FM dummy antenna. (Apply 60 dB (1 mV) to antenna terminal)	100.1 MHz (100% Mod. with 400 Hz)	100.1 MHz	Connect DC EVM to between TP101 (-) and TP102 (+) through chock coil. (Refer to Fig. 1)	T101 (Discri. IFT)	Adjust T101 core so that voltage measured in signal mode is 0 mV in 300 mV range.
---	--	--------------------------------------	-----------	---	--------------------	---

FM MPX V.C.O. ADJUSTMENT

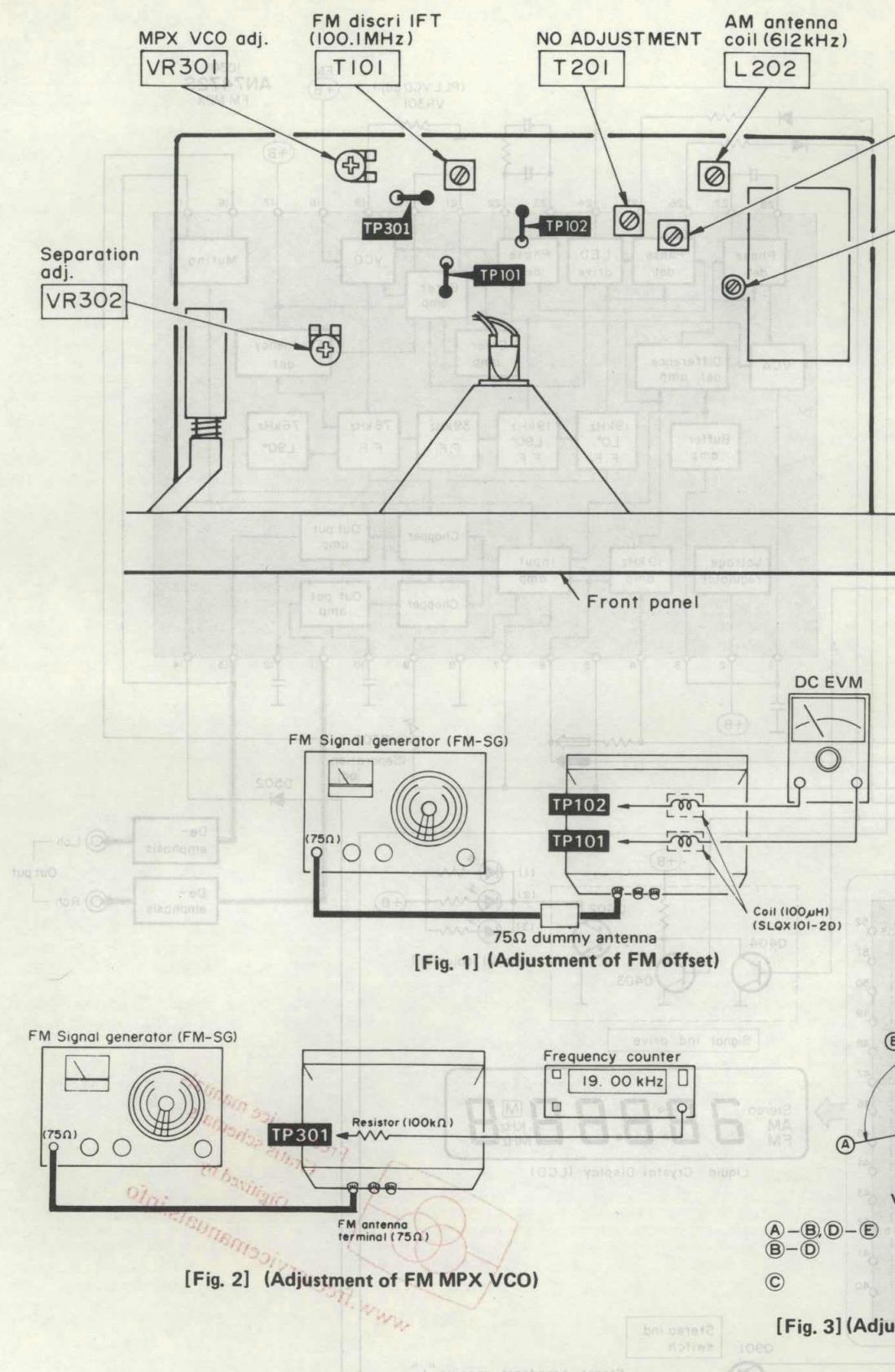
USING A FREQUENCY COUNTER			USING ALTERNATE SYSTEM		
<ol style="list-style-type: none"> 1. 100.1 MHz, 60 dB Non-modulated mono signal applied to set. (Fig. 2) 2. FM mode switch to "auto" position. 3. Connect frequency counter to TP301 through resistor (100kΩ). 4. Adjust VR301 to 19 kHz \pm 30 Hz. 			<ol style="list-style-type: none"> 1. Apply stereo signal from generator or stereo station to tuner. 2. Adjust VR301 until stereo indicator lights up. Cement arm of VR301 as shown in Fig. 3. 		

SEPARATION ADJUSTMENT

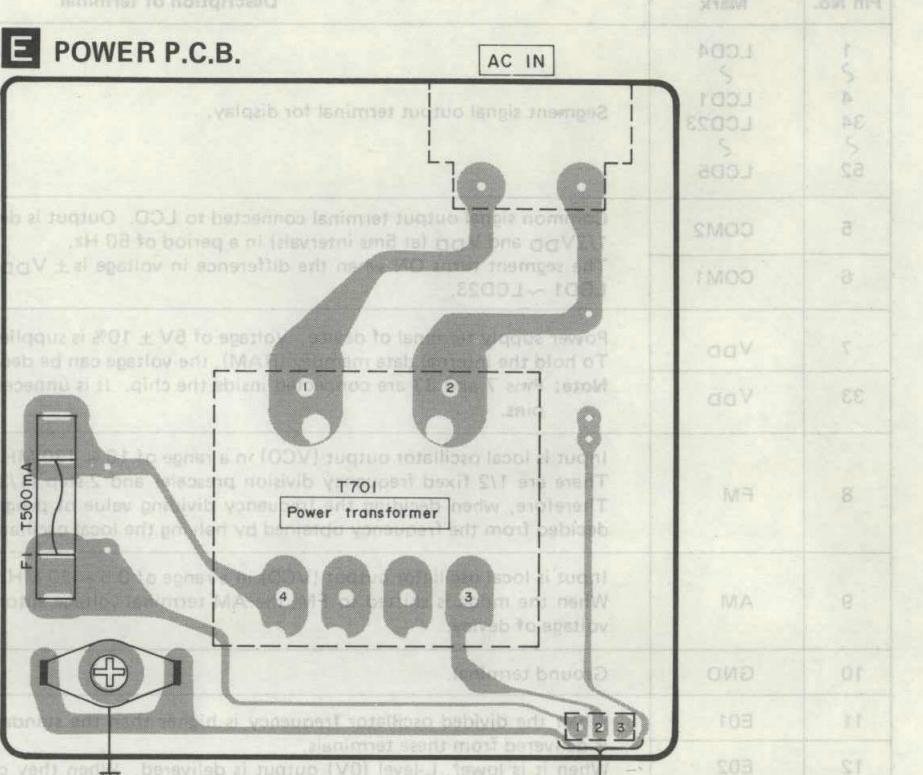
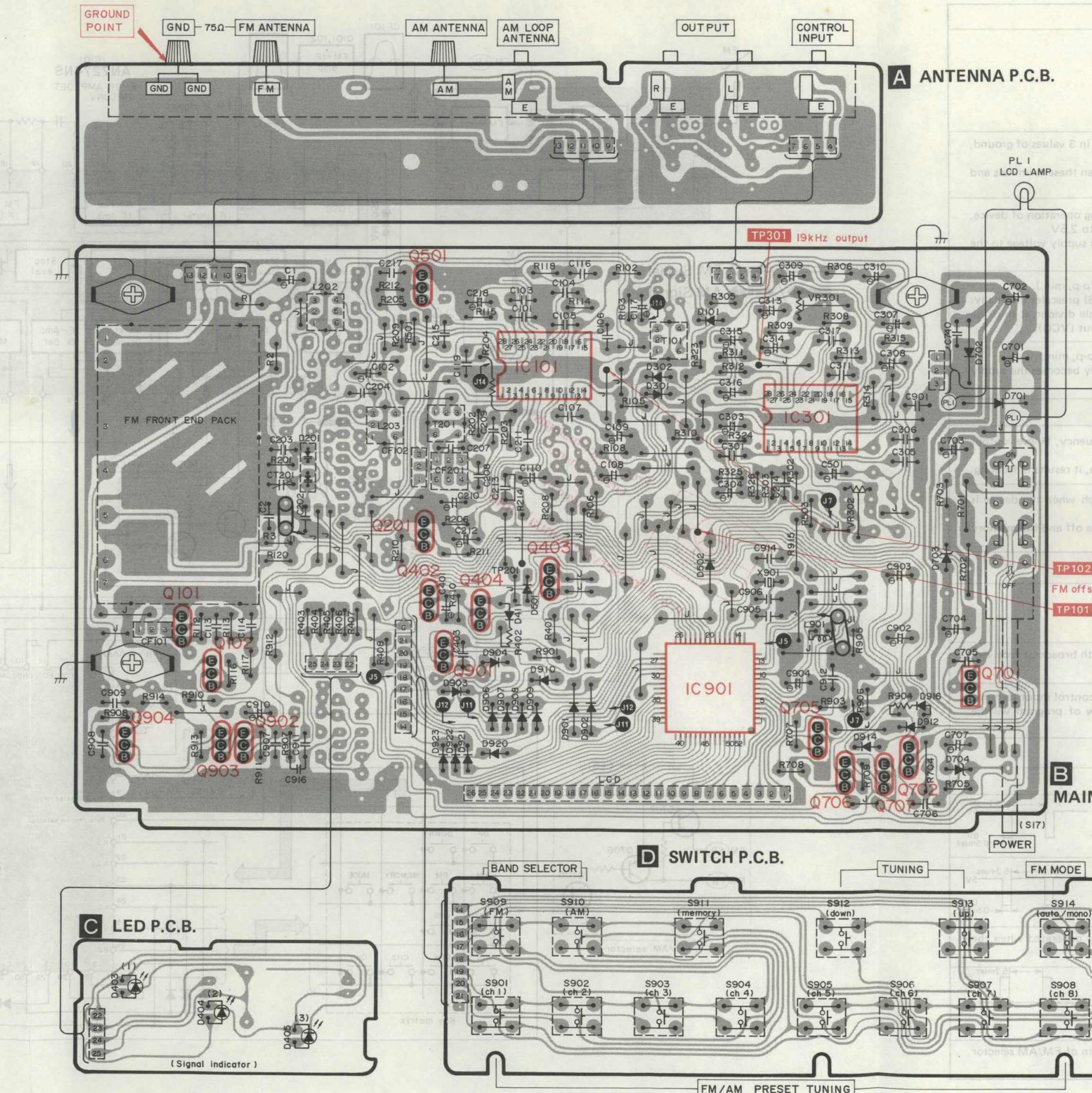
5	Connect FM-SG to FM antenna terminal through 75Ω FM dummy antenna. (Pilot 10% Mod. stereo signal)	100.1 MHz (90% Mod. with 1 kHz L or R mode)	100.1 MHz	Connect AC EVM to "OUTPUT" terminals of the set through low-pass filter. (fc = 15 kHz ~ 19 kHz)	VR302 (Separation)	<ol style="list-style-type: none"> 1. Set the FM mode switch to "auto". 2. Adjust VR302 so that R output is minimized when stereo modulator is in L (ch. modulation) mode and that L output is minimized in R mode.
---	--	--	-----------	---	--------------------	--

- **Adjustment locations**

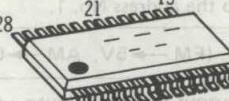
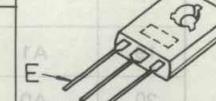
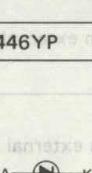
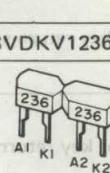
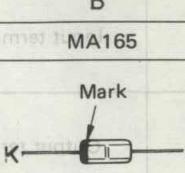
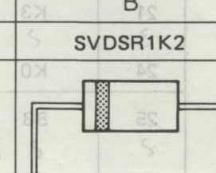
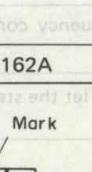
Note: AM OSC coil (L203) and AM IFT (T201) have been already adjusted, and require no adjustment.



■ CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM



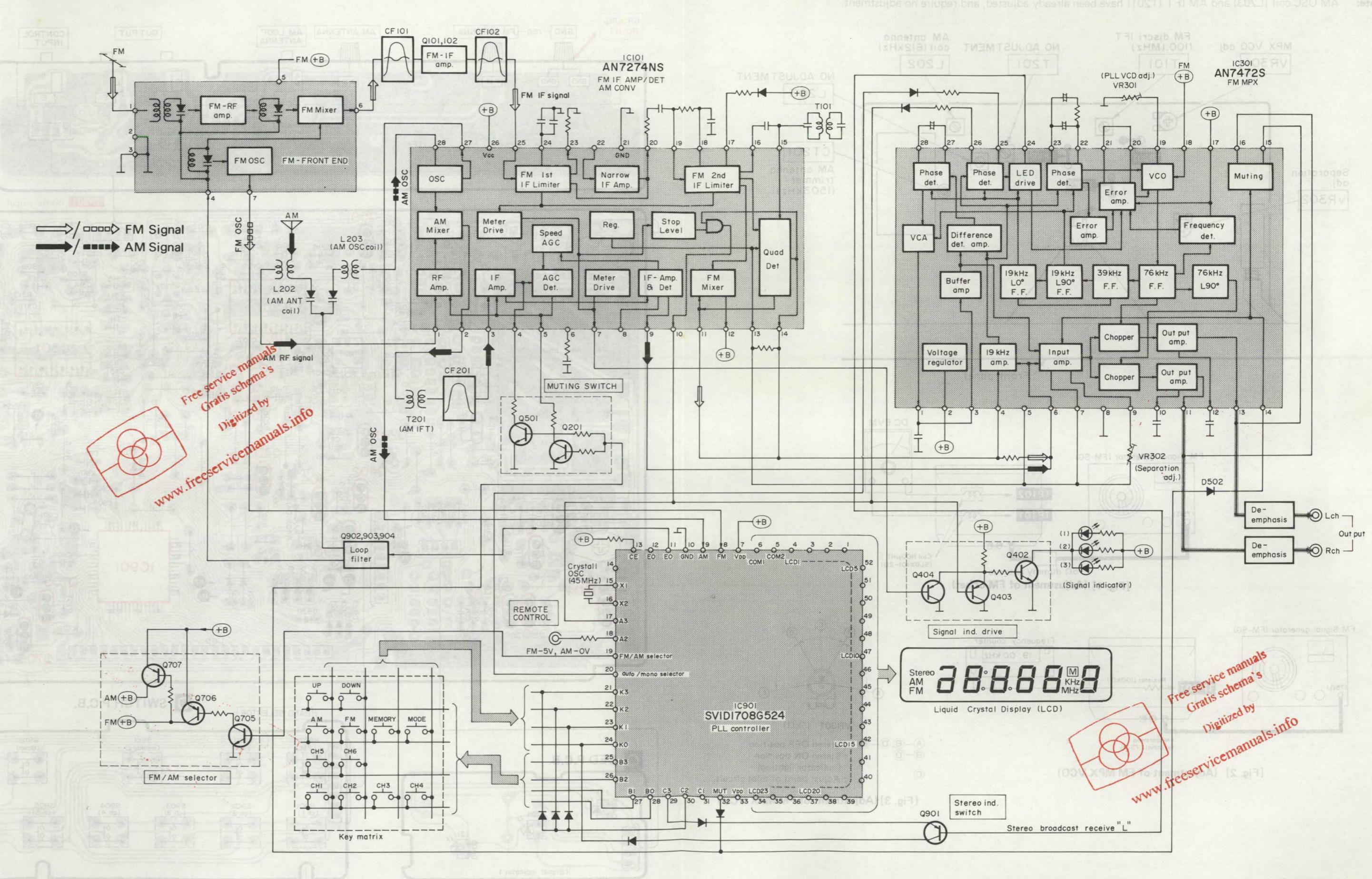
• Terminal guide of transistors, IC's and diodes

AN7274NS, AN7472S		2SA564A 2SA1015, 2SC1815, 2SC945 2SC1675 2SC1685	2SD793
			
LN446YP	SVDKV1236Z	MA165	SVDSR1K2
			
MA162A	MA4150M, MA4162M	SVID1708G524	
			

■ FUNCTION OF TERMINAL (PLL controller IC901)

Pin No.	Mark	Description of terminal
1 ~ 4	LCD4 ~ LCD1	Segment signal output terminal for display.
34 ~ 52	LCD23 ~ LCD5	
5	COM2	Common signal output terminal connected to LCD. Output is delivered in 3 values of ground, $1/2V_{DD}$ and V_{DD} (at 5ms intervals) in a period of 50 Hz.
6	COM1	The segment turns ON when the difference in voltage is $\pm V_{DD}$ between these terminals and LCD1 ~ LCD23.
7	V _{DD}	Power supply terminal of device. Voltage of $5V \pm 10\%$ is supplied during operation of device. To hold the internal data memory (RAM), the voltage can be decreased to 2.5V.
33	V _{DD}	Note: Pins 7 and 33 are connected inside the chip. It is unnecessary to supply voltage to the pins.
8	FM	Input is local oscillator output (VCO) in a range of 10 ~ 130 MHz (0.3V _{p-p} , min.). There are 1/2 fixed frequency division prescaler and 2-step (1/32, 1/33) prescaler internally. Therefore, when deciding the frequency dividing value of programmable divider, it must be decided from the frequency obtained by halving the local oscillator output (VCO).
9	AM	Input is local oscillator output (VCO) in a range of 0.5 ~ 20 MHz (0.1V _{p-p} , min.). When the mode is shifted to FM, the AM terminal voltage automatically becomes the supply voltage of device.
10	GND	Ground terminal.
11	E01	When the divided oscillator frequency is higher than the standard frequency, H-level output is delivered from these terminals.
12	E02	When it is lower, L-level (0V) output is delivered. When they coincide, it results in floating.
13	CE	Device selection signal input terminal. The signal level should be high when the device is operated, and low when not operated. With this terminal shifted to low level, LCD (liquid crystal display) turns off and the memory is held.
14	NC	Not used in this unit.
15	X1	Connecting terminal for crystal oscillator. The crystal connected is 4.5 MHz.
16	X2	
17	A3 (SD)	Terminal to put in stop signal during auto tuning. The voltage is 5V with broadcast received, and 0V without broadcast received.
18	A2	This is the interrupt demand signal input terminal. The signal from the control input terminal is put into this terminal, demanding for interruption, then the flow of program will be unconditionally shifted to the address No. 1.
19	A1	FM/AM output terminal. (FM \rightarrow 5V, AM \rightarrow 0V)
20	A0	Auto/mono changeover output terminal. (auto \rightarrow 0V, mono \rightarrow 5V)
21 ~ 24	K3 ~ K0	Input terminal for key return signal from external key matrix.
25 ~ 28	B3 ~ B0	Output terminal for key return signal to external key matrix.
29	C3	Terminal for FM IF ceramic filter frequency compensation. A pulse is generated when the voltage of terminal 13 rises.
30	C2	Output terminal for key return signal to let the stereo indicator light up.
31	C1	Nut used in this unit.
32	C0	Muting signal output terminal. Muting signal is delivered during operation of FM/AM selector switch and tuning switch. (4V during muting)

■ BLOCK DIAGRAM



■ RESISTORS AND CAPACITORS

Notes: 1. Part numbers are indicated on most mechanical parts. Please use this part number for parts order.
 2. Important safety notice.
 Components identified by Δ mark have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.
 3. The "S" mark is service standard parts and may differ from production parts.
 4. The unit of resistance is OHM (Ω). $K = 1000\Omega$ $M = 1000k\Omega$
 5. The unit of capacitance is MICROFARAD (μF). $P = 10^{-6} \mu F$

Numbering System of Resistor

Example		ERD			F		J		101	
Type	25	Wattage	Shape	J	Tolerance	Value	F			
ERD : Carbon	25	: 1/4W	J	: $\pm 5\%$						
S2 : 1/4W										

Numbering System of Capacitor

Example		ECKD		1H		102		Z		F	
Type	ECKD	Type	Voltage	Value	Tolerance	Value	Tolerance	Special use	R		
ECEA	50	M		R47							
Type	Voltage	Peculiarity	use	Value							

Resistor Type		Wattage		Tolerance	
ERD : Carbon	25	: 1/4W	J	: $\pm 5\%$	
S2	1/4W				
Capacitor Type		Voltage		Tolerance	
ECEA : Electrolytic	0J	: 6.3V	1H	: 50V DC	C : $\pm 0.25\mu F$
ECCD : Ceramic	1A	: 10V	2H	: 500V DC	J : $\pm 5\%$
ECKD : Ceramic	1C	: 16V	2R3	: 2.3V DC	K : $\pm 10\%$
ECQM : Polyester	1E	: 25V			Z : $+80\% - 20\%$
ECQP : Polypropylene	1H	: 50V			
ECCW : Liquid electrolyte double layer capacitor	25	: 25V			

• RESISTORS

Ref. No.	Part No.	Value
R1	ERDS2TJ104	100K
R2	ERDS2TJ273	27K
R3	ERDS2TJ151	150
R102	ERDS2TJ334	330K
R103	ERDS2TJ222	2.2K
R105	ERDS2TJ474	470K
R106	ERDS2TJ471	470
R108	ERDS2TJ823	82K
R112	ERDS2TJ564	560K
R113	ERDS2TJ681	680
R114	ERDS2TJ101	100
R115	ERDS2TJ392	3.9K
R116	ERDS2TJ684	680K
R117	ERDS2TJ471	470
R119	ERDS2TJ221	220
R120	ERDS2TJ332	3.3K
R201	ERDS2TJ104	100K
R202	ERDS2TJ222	2.2K
R203	ERDS2TJ124	120K
R204	ERDS2TJ473	47K
R205	ERDS2TJ104	100K
R206	ERDS2TJ101	100
R208	ERDS2TJ393	39K
R209	ERDS2TJ102	1K
R210	ERDS2TJ104	100K
R211	ERDS2TJ682	6.8K
R212	ERDS2TJ823	82K
R214	ERDS2TJ473	47K
R302	ERDS2TJ104	100K
R303	ERDS2TJ473	47K
R305,306	ERDS2TJ104	100K
R308	ERDS2TJ153	15K
R309	ERDS2TJ102	1K
R310	ERDS2TJ473	47K
R311	ERDS2TJ474	470K
R312	ERDS2TJ104	100K
R313	ERDS2TJ392	3.9K

• CAPACITORS

Ref. No.	Part No.	Value
R314,315	ERDS2TJ684	680K
R323	ERDS2TJ334	3.3K
R324	ERDS2TJ684	680K
R325,326	ERDS2TJ273	27K
C1	ECEA1EU3R3	3.3
C2	ECKD1H103ZF	0.01
C101	ECQM1H223Z	0.022
C102	ECAE0JU101	100
C103	ECQM1H103JZ	0.01
C104,105	ECKD1H103ZF	0.01
C106	ECCD1H050CC	5P
C107	ECCD1H101K	100P
C108	ECAE1CU100	0.47
C109	ECAE1HUR22	0.22
C305,306	ECEA1EU3R3	3.3
C305,306	ECEA1HUR22	0.22
C310	ECEA1EU3R3	3.3
C309,310	ECEA1HUR22	0.22
C311	ECEA1HUR22	0.22
C312	ECEA1CU100	10
C313	ECCD1H680K	68P
C314	ECKD1H103ZF	0.01
C315	ECCD1H330K	33P
C316	ECAE0JU101	100
C317	ECAE1HUR22	0.22
C318	ECEA1HUR1	0.1
C319	ECEA1HUR1	0.1
C320	ECEA1HUR1	0.1
C321	ECEA1HUR1	0.1
C322	ECEA1HUR1	0.1
C323	ECEA1HUR1	0.1
C324	ECEA1HUR1	0.1
C325	ECEA1HUR1	0.1
C326	ECEA1HUR1	0.1
C327	ECEA1HUR1	0.1
C328	ECEA1HUR1	0.1
C329	ECEA1HUR1	0.1
C330	ECEA1HUR1	0.1
C331	ECEA1HUR1	0.1
C332	ECEA1HUR1	0.1
C333	ECEA1HUR1	0.1
C334	ECEA1HUR1	0.1
C335	ECEA1HUR1	0.1
C336	ECEA1HUR1	0.1
C337	ECEA1HUR1	0.1
C338	ECEA1HUR1	0.1
C339	ECEA1HUR1	0.1
C340	ECEA1HUR1	0.1
C341	ECEA1HUR1	0.1
C342	ECEA1HUR1	0.1
C343	ECEA1HUR1	0.1
C344	ECEA1HUR1	0.1
C345	ECEA1HUR1	0.1
C346	ECEA1HUR1	0.1
C347	ECEA1HUR1	0.1
C348	ECEA1HUR1	0.1
C349	ECEA1HUR1	0.1
C350	ECEA1HUR1	0.1
C351	ECEA1HUR1	0.1
C352	ECEA1HUR1	0.1
C353	ECEA1HUR1	0.1
C354	ECEA1HUR1	0.1
C355	ECEA1HUR1	0.1
C356	ECEA1HUR1	0.1
C357	ECEA1HUR1	0.1
C358	ECEA1HUR1	0.1
C359	ECEA1HUR1	0.1
C360	ECEA1HUR1	0.1
C361	ECEA1HUR1	0.1
C362	ECEA1HUR1	0.1
C363	ECEA1HUR1	0.1
C364	ECEA1HUR1	0.1
C365	ECEA1HUR1	0.1
C366	ECEA1HUR1	0.1
C367	ECEA1HUR1	0.1
C368	ECEA1HUR1	0.1
C369	ECEA1HUR1	0.1
C370	ECEA1HUR1	0.1
C371	ECEA1HUR1	0.1
C372	ECEA1HUR1	0.1
C373	ECEA1HUR1	0.1
C374	ECEA1HUR1	0.1
C375	ECEA1HUR1	0.1
C376	ECEA1HUR1	0.1
C377	ECEA1HUR1	0.1
C378	ECEA1HUR1	0.1
C379	ECEA1HUR1	0.1
C380	ECEA1HUR1	0.1
C381	ECEA1HUR1	0.1
C382	ECEA1HUR1	0.1
C383	ECEA1HUR1	0.1
C384	ECEA1HUR1	0.1
C385	ECEA1HUR1	0.1
C386	ECEA1HUR1	0.1
C387	ECEA1HUR1	0.1
C388	ECEA1HUR1	0.1
C389	ECEA1HUR1	0.1
C390	ECEA1HUR1	0.1
C391	ECEA1HUR1	0.1
C392	ECEA1HUR1	0.1
C393	ECEA1HUR1	0.1
C394	ECEA1HUR1	0.1
C395	ECEA	