SERVICE MANUAL

AM/FM STEREO TUNER

SANSUI TU-S5

Sansui

SANSUI ELECTRIC CO., LTD.

• SPECIFICATIONS

FM Section

Tuning range	88 to 108MHz
Usable sensitivity	
Mono IHF	10.5dBf (1.8μV: T100)
DIN	0.9μV
50dB quieting sensitivity	
Mono	14.5dBf
Stereo	36.5dBf
Signal to noise ratio at 65dBf	
Mono	84dB
Stereo	75dB
Distortion at 65dBf	
Mono	less than 0.06% at 100Hz
	less than 0.06% at 1,000Hz
	less than 0.06% at 6,000Hz
Stereo	less than 0.07% at 100Hz
	less than 0.07% at 1,000Hz
	less than 0.07% at 6,000Hz
Alternate channel selectivity (at 300kHz)	
	40dB
Capture ratio	1.0dB
Image response ratio	50dB (at 98MHz)
Spurious response ratio	75dB (at 98MHz)
	75dB (at 98MHz)
Stereo separation	38dB at 100Hz
	50dB at 1,000Hz
	33dB at 10,000Hz
Frequency response	
Stereo	30 to 15,000Hz
	+0.3dB, −1.0dB
Antenna input impedance	
	300 ohms balanced
	75 ohms unbalanced

AM Section

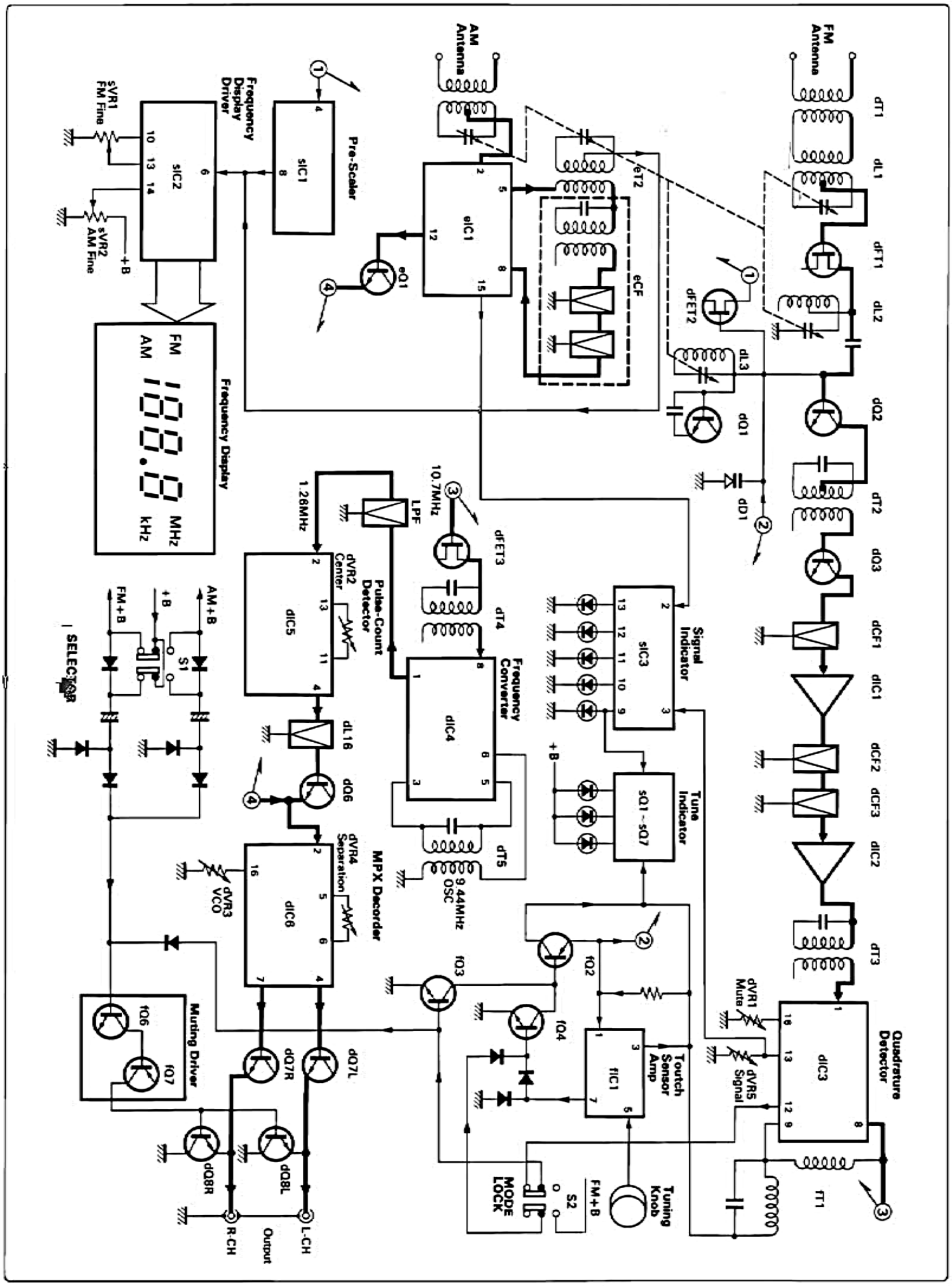
Tuning range	530 to 1,600kHz
Usable sensitivity	56dB/m
Selectivity (±9kHz)	35dB
Signal to noise ratio	46dB
Distortion (at 30% Modulation, 80dB/m)	
	less than 0.6%
Image response ratio	45dB at 1,000kHz
IF response ratio	35dB at 1,000kHz

Others

Output voltage and impedance	
OUTPUT	0.5V/2.2 kilohms
Power requirements	120, 220, 240V (50/60Hz)
For U.S.A. and Canada	
	120V (60Hz)
Power consumption	14W
Dimensions	430mm (16-15/16") W
	83mm (3-5/16") H
	324mm (12-13/16") D
Using rack mounting adaptors	
	480mm (18-15/16") W
	83mm (3-5/16") H
	324mm (12-13/16") D
Weight	
Silver panel type	4.2kg (9.3lbs) net
	5.1kg (11.2lbs) packed
Black panel type	4.3kg (9.5lbs) net
	5.2kg (11.5lbs) packed

* Design and specifications subject to changes without notice for improvements.

1. BLOCK DIAGRAM



2. OPERATIONS

There are many specifications to decide what is excellent Tuner. In specifications, both Signal to Noise Ratio (S/N) and Distortion can be the most important factors.
On conventional Tuner, RF and IF amplifier circuits occupy large factor to secure high S/N and low distortion. This means that these circuits must be all highly graded, and it concerns cost-up.
Sansui TU-S5 adopts new Pulse-count Detecting circuit. The adoption of this circuit minimizes the influence which RF and IF amplifier circuits exercise S/N and distortion. The values of these two specifications are mostly decided by the Pulse-count Detecting circuit. Therefore, even midium graded Tuner can prove high S/N and low distortion as high graded Tuner has.
The Pulse-count Detecting circuit comprises a frequency converter and a pulse-count detector.
The reason why the frequency converter is adopted to the pulse-count detector, is as follows.
The specifications of the pulse-count detector are decided by rise time and stability of pulse width, of generated pulse by one-shot multivibrator in the pulse-count detector. Therefore, if an input frequency to the multivibrator is too high, it is impossible to obtain high S/N and low distortion. To avoid this problem, the input frequency must be converted to a lower frequency which the multivibrator is able to follow it.
The followings are the circuit operations of the pulse-count detecting circuit on TU-S5.

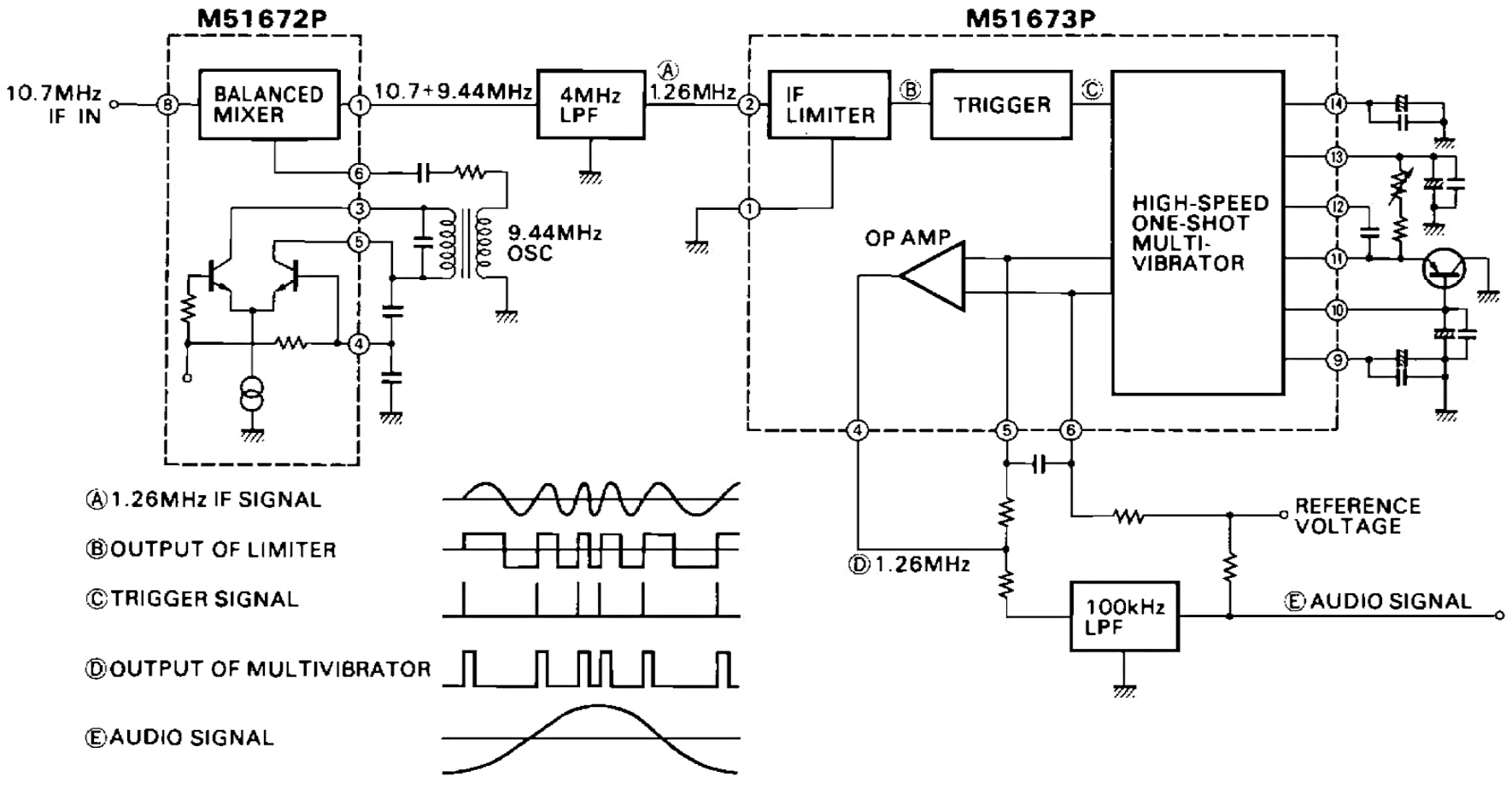
1. Frequency converter (M51672P)

Frequency converter IC, M51672P has a differential amplifier and a balanced mixer as Fig. 2-1. The differential amplifier works as a local oscillator by connecting an external OSC coil, and the output signal of the local oscillator is supplied to the balanced mixer. This signal and IF signal from IF amplifier are mixed together in the balanced mixer, and this mixed signal is outputted to a low-pass filter. Then frequency conversion is completed after required frequency signal from the pulse-count detector is selected by the low-pass filter.
The frequency of the local oscillator is 9.44 MHz. And by mixing 10.7 MHz IF with it, two frequencies of 10.7 MHz ±9.44 MHz are outputted from the balanced mixer. However, only 1.26 MHz frequency is selected by the low-pass filter of which the cut-off frequency is 4 MHz, and applied to the pulse-count detector as 2nd IF.

2. Pulse-count Detector (M51673P)

Pulse-count detector IC, M51673P consists of a IF limiter, a trigger circuit and a high-speed one-shot multivibrator as Fig. 2-1.
The 2nd IF signal converted by the frequency converter is inputted first to the IF limiter, and limited its level to near square wave. Next it is converted to trigger pulse by the trigger circuit. By this trigger pulse, the one-shot multivibrator generates pulse signal which has equal pulse-width, and frequency corresponding to 2nd IF. Then it is passed through a low-pass filter of which the cut-off frequency is 100 kHz, and only audio signal comes out from the filter.

Fig. 2-1

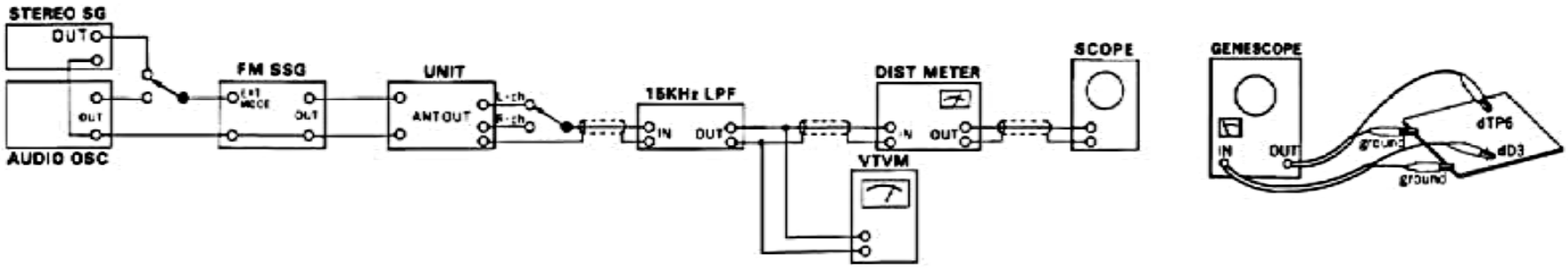


3. ADJUSTMENTS

3-1. FM Adjustment (See Parts Location on Page 4 & 5)

1) FM IF, RF Adjustment and Dial Calibration

Note: 1. Selector . . . . . FM 2. FM Mode . . . . . MONO



STEP	SUBJECT	FEED SIGNAL FROM	FEED SIGNAL TO	MEASURE OUTPUT	ADJUST	ADJUST FOR	REMARKS
1.	Frequency Display Adj.	98MHz ANT Input 65dBf (59.8dB) No MOD. FM SSG	ANT Terminal 300Ω	Frequency Display	sVR1 (F-3514)	No Blinking of the 2nd digit from right.	sTP1 has to be grounded on this adjustment.
2.	IF Coil Adj.	Output 60dB Genescope	dTP6 (F-3513)	Cathode terminal of dD3 (F-3513)	dT2 (F-3513)	Max. Waveform	
3.	Detector Adj.	98MHz ANT Input 65dBf (59.8dB) No MOD. FM SSG	ANT Terminal 300Ω	dTP1 (F-3513) Scope	dT4 (F-3513)	Max. Output	
				dTP1 (F-3513) Frequency Counter	dT5 (F-3513)	1.260MHz	
				dTP2 (F-3513) DC Volt Meter	dVR2 (F-3513)	Half of Pin No. 7 voltage (dIC5)	
4.	Dial Calibration	106MHz ANT Input 65dBf (59.8dB) 1kHz (100% MOD.) FM SSG	Same as above	Dial Pointer	Tuning Knob	106MHz	Repeat the adjustment a few times.
				Frequency Display	dTC3 (F-3513)	106.0MHz	
		90MHz ANT Input 65dBf (59.8dB) 1kHz (100% MOD.)	Same as above	Dial Pointer	Tuning Knob	90.0MHz	
				Frequency Display	dL3	90.0MHz	
5.	RF Adj.	106MHz ANT Input 65dBf (59.8dB) 1kHz (100% MOD.)	Same as above	Output L-CH or R-CH VTVM & Scope	dTC1, dTC2 (F-3513)	Max. Output	Repeat the adjustment a few times.
		90MHz ANT Input 65dBf (59.8dB) 1kHz (100% MOD.) FM SSG	Same as above	Output L-CH or R-CH VTVM & Scope	dL1, dL2 (F-3513)	Max. Output	
6.	Tuning LED Adj.	No Input	———	Between dTP4 & dTP5 (F-3513) DC Volt Meter	fT1 (F-3513)	0V	
7.	Signal Indicator Adj.	98MHz ANT Input 55dBf (49.8dB) 1kHz (100% MOD.) FM SSG	ANT Terminal 300Ω	Signal Indicator	dVR5 (F-3513)	5 LEDs come on.	
8.	Muting Level Adj.	98MHz ANT Input 15dBf (9.8dB) 1kHz (100% MOD.) FM SSG	Same as above	Output L-CH or R-CH VTVM & Scope	dVR1 (F-3513)	Rising Point	

•Abbreviations

Equipment
- AM FM Generator Oscilloscope . . . . . Genescope
- AM Standard Signal Generator . . . . . AM SSG
- FM Standard Signal Generator . . . . . FM SSG
- FM Stereo Generator . . . . . Stereo SG
- Oscilloscope . . . . . Scope
- Audio Oscillator . . . . . Audio Osc.
- Distortion Meter . . . . . Dist. Meter

Others
- Antenna . . . . . ANT.
- Modulation . . . . . MOD.
- Total Harmonic Distortion . . . . . T.H.D.

2) FM STEREO Adjustment

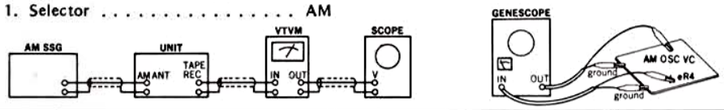
1) FM Mode . . . . . AUTO

STEP	SUBJECT	FEED SIGNAL FROM	FEED SIGNAL TO	MEASURE OUTPUT	ADJUST	ADJUST FOR	REMARKS
1.	PLL VCO Adj.	98MHz ANT Input 60dB (54.8dB) No MOD. FM SSG	ANT Terminal 300Ω	dTP3 (F-3513) Frequency Counter	dVR3 (F-3513)	76kHz ± 150Hz	
2.	Discriminator Adj.	98MHz ANT Input 65dBf (59.8dB) FM SSG Pilot 19kHz (9% MOD.) L MODE 1kHz + Pilot (100% MOD.) Stereo SG	Same as above	OUTPUT L-CH Dist. Meter, VTVM & Scope	dT2 & dT3	Min. Distortion	Before adjustment, turn dVR4 fully counter-clockwise.
3.	Separation Adj.	Same as abvoe	Same as above	Same as above	——	——	Read the indication on VTVM.
				OUTPUT R-CH VTVM & Scope	dVR4	−50dB from above reading.	
		98MHz ANT Input 65dBf (59.8dB) FM SSG Pilot 19kHz (9% MOD.) R MODE 1kHz + Pilot (100% MOD.) Stereo SG	Same as above	Same as above	——	——	Read the indication on VTVM.
				OUTPUT L-CH VTVM & Scope	——	——	Confirm the input is less than −45dB from above reading.

3-2. AM Adjustment (See Parts Location on Page 4 & 5)

1) AM IF Adjustment and Dial Calibration

Note: 1. Selector . . . . . AM



STEP	SUBJECT	FEED SIGNAL FROM	FEED SIGNAL TO	MEASURE OUTPUT	ADJUST	ADJUST FOR	REMARKS
1.	Frequency Display Adj.	950kHz ANT Input 60dB (400Hz (30% MOD.) AM SSG	ANT Terminal	Frequency Display	sVR2 (F-3514)	No blinking of 1kHz digit.	Before adjustment, perform the setting procedure under mentioned.
2.	IF Coil Adj.	Output 70dB Genescope	Terminal of AM OSC variable capacitor	eR4 (F-3513)	eCF1 (F-3513)	Synmetrical waveform	
					eL2 (F-3513)	Max. waveform	
3.	Dial Calibration	1400kHz ANT Input 60dB 400Hz (30% MOD.) AM SSG	ANT Terminal	Frequency Dial	Tuning Knob	1400kHz	Repeat the adjustment a few times.
				Frequency Display	Trimmer capacitor of OSC variable capacitor	1400kHz	
		600kHz ANT Input 60dB 400Hz (30% MOD.) AM SSG	Same as above	Frequency Dial	Tuning Knob	600kHz	
				Frequency Display	eT2 (F-3513)	600kHz	
4.	RF Adj.	1400kHz ANT Input 30dB 400Hz (30% MOD.) AM SSG	Same as above	OUTPUT L-CH or R-CH VTVM & Scope	Trimmer capacitor of RF Amp. variable capacitor	Max. Output	Repeat the adjustment a few times.
		600kHz ANT Input 30dB 400Hz (30% MOD.) AM SSG	Same as above	Same as above	eT1 (F-3513)	Max. Output	

SETTING PROCEDURE for AM Adjustment Step 1

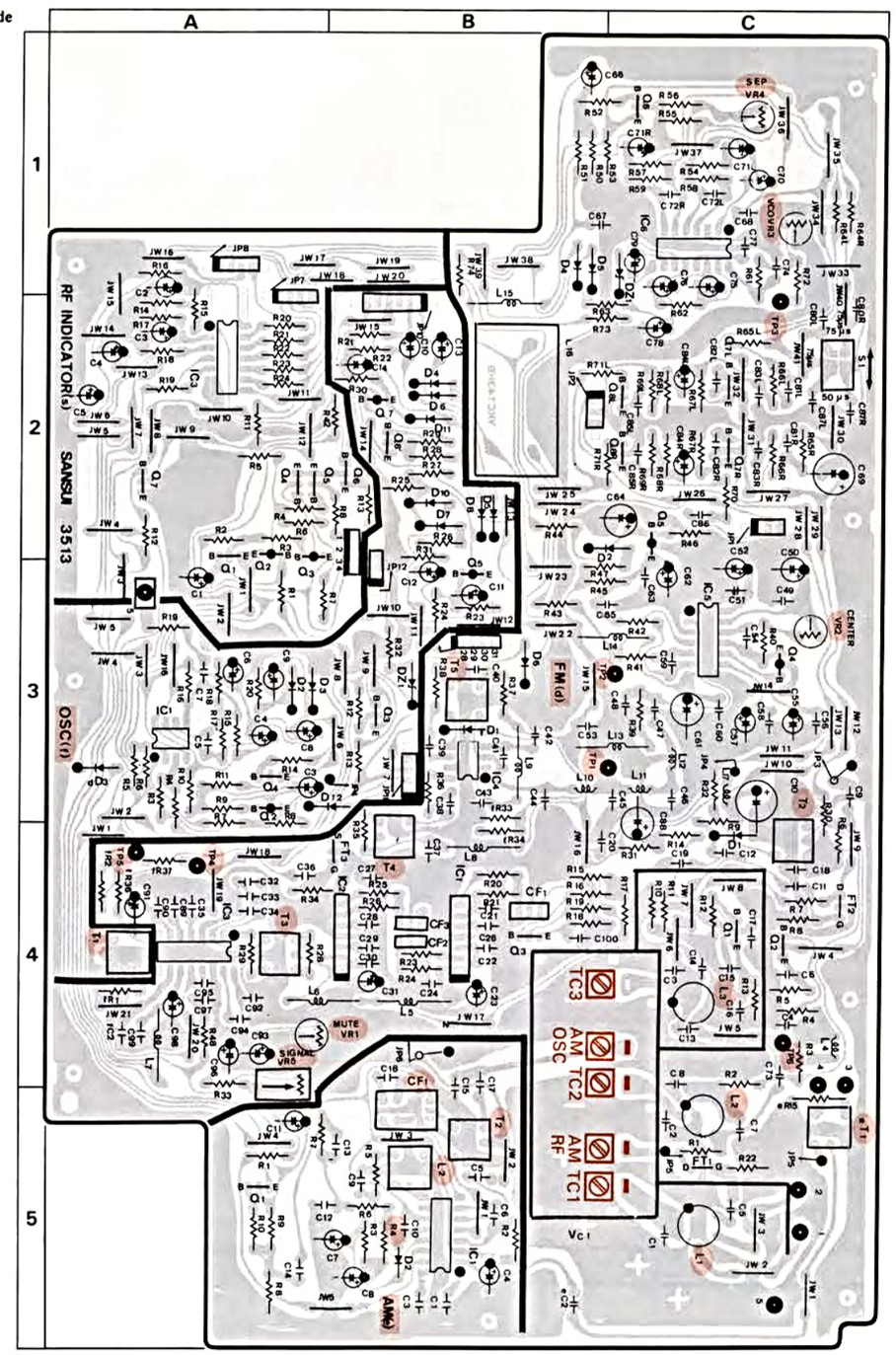
1. Connect sTP1 and sTP3 to the ground separately.
2. Connect sTP2 and sTP3 together.
3. Remove the connection between sTP3 and ground.
4. Then perform the AM Adjustment Step 1.

4. PARTS LOCATION & PARTS LIST

•Since some of capacitors and resistors are omitted from parts lists in this Service Manual, refer to the Common Parts List for capacitors & resistors, which was appended previously to Sansui Manual.

4-1. F-3513 Tuner Circuit Board (Stock No. 00642301)

Component Side



Parts List <F-3513>

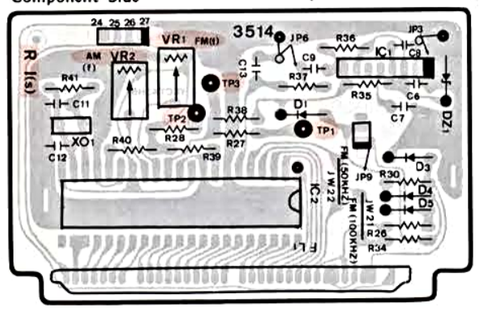
Parts No.	Stock No.	Description
•Transistor		
dQ1	03069501	2SC668
	03063401	2SC1674
dQ2	03063401	2SC1674
	03069501	2SC668
dQ3	03069501	2SC668
	03063401	2SC1674
dQ4	03010901	2SA992
	07299001	2SA970
dQ5	03030901	2SA992
dQ6	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
dQ7	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
dQ8	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
•FET		
dFT1	03703700, 1	2SK120-1, 2
dFT2	03703700, 1	2SK120-1, 2
dFT3	03703700, 1	2SK120-1, 2
•IC		
dIC1	03605400	μPC1163H
dIC2	03605400	μPC1163H
dIC3	46052600	μPC1208
dIC4	07229100	M51672P
dIC5	07229200	M51673P
dIC6	07299400	HA12016
•Diode		
dD1	07299300	1S2236
dD2 ~ 6	03111600	1S2473D
•Zener Diode		
dZD1	07178500	RD5.1E-B
dVC1	07271200	FM/AM Variable Capacitor
dCF1~3	07200400	Ceramic Filter SFE10.7 MLH-Z
dL1	42007200	FM RF Coil
dL2	42103400	FM RF Coil
dL3	42204000	FM OSC Coil
dL4	49001400	1μH Inductor
dL5~9	07250300	2.2μH Peaking Coil
dL10	07251300	91μH Inductor
dL11, 12	07251200	120μH Inductor

Parts No.	Stock No.	Description
dL13~15	07250300	2.2μH Peaking Coil
dL16	07251500	Low Pass Filter BL-12BR
dL17	49001400	1μH Inductor
dT1	07203000	Balun
dT2~4	42359300	FM IF Coil
dT5	07251400	FM OSC Coil
dVR1	10351700	Semi Variable Resistor 47kΩ (B), Muting adj.
dVR2	10351000	Semi Variable Resistor 3.3kΩ (B), Center adj.
dVR3	10342500	Semi Variable Resistor 4.7kΩ (B), VCO adj.
dVR4	07241900	Semi Variable Resistor 1MΩ (B), Separation adj.
dVR5	07241500	Semi Variable Resistor 50kΩ (B), Signal meter adj.
dS1	07251100	Slide Switch, De-enphasis
•Transistor		
eQ1	03059501	2SC945
	07194801	2SC1815
•IC		
eIC1	03603900	HA1197
	03608000	LA1240
•Diode		
eD2	03401500	Varistor MV12
eCF1	07250500	455 kHz Ceramic Filter
eT1	46085900	AM RF Coil
eT2	42205900	AM OSC Coil
eL2	42306200	AM IF Coil
•Transistor		
fQ2	07197001	2SA733A
	07194701	2SA1015
	03012701	2SA999
fQ3	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320

Parts No.	Stock No.	Description
fQ4	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
fQ5	07197001	2SA733A
	07194701	2SA1015
	03012701	2SA999
fQ6	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
fQ7	07197001	2SA733A
	07194701	2SA1015
	03012701	2SA999
•IC		
fIC1	03607700	NJM4558D
•Diode		
fD1~12	03111600	1S2473D
•Zener Diode		
fZD1	07178500	RD5.1E-B
fT1	46077600	FM IF Coil
•Diode		
mD3	03117700	10E-2
•Transistor		
sQ1	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
sQ2	07197001	2SA733A
	07194701	2SA1015
	03012701	2SA999
sQ3	07197001	2SA733A
	07194701	2SA1015
	03012701	2SA999
sQ4	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
sQ5	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
sQ6	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
sQ7	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
•Diode		
sD1~5	03111600	1S2473D

4-2. F-3514 Digitally Display Circuit Board

Component Side (Stock No. 00642401)

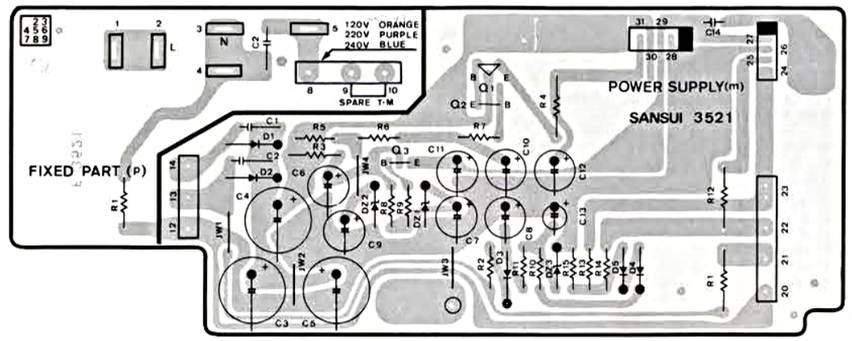


Parts List

Parts No.	Stock No.	Description
•IC		
sIC1	07233200	M54459L
sIC2	07205100	LC7258
sXO1	07225300	Quartz Element
•Zener Diode		
sZD1	07178500	RD5.1E-B
sFL1	07235300	FL Tube FIP7B8S
sVR1	07241300	Semi Variable Resistor 10kΩ (B), FM fine adj.
sVR2	07241300	Semi Variable Resistor 10kΩ (B), AM fine adj.

4-3. F-3521 Power Supply Circuit Board (Stock No. 00643001)

Component Side



Parts List

Parts No.	Stock No.	Description
•Transistor		
mQ1	03083901	2SD313AL
mQ2	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320
mQ3	03059501	2SC945
	07194801	2SC1815
	03068301	2SC2320

Parts No.	Stock No.	Description
•Diode		
mD1, 2	03117700	10E-2
mD4, 5	07176400	1S2473HS
•Zener Diode		
mZD1, 3	07179700	RD9.1E-B
mZD2	07180700	RD15E-B
mR1	00184300	68Ω 1W N.I.R.
pC2	08302100	4700pF 125V C.C.

• Note: The circuit board, F-3515, F-3516, F-3518, F-3520 are not supplied as the assembled. However, the individual parts on the circuit board are provided by orders.

4-4. F-3515 Selector Switch Board

Parts No.	Stock No.	Description
•Diode		
dD7	03117700	10E-2
eD1	03111600	1S2473D
oS1	46077900, 1	Push Switch, selector

4-5. F-3516 LED Indicator Board

Parts List

Parts No.	Stock No.	Description
	07581800	5P LED Holder
	07581900	1P LED Holder
•IC		
sIC3	03611600	LB1416
sLD1~5	03193700	LED SEL1110S
sLD6	07246200	LED SEL1710K

4-6. F-3518 Lock Indicator Board

Parts List

Parts No.	Stock No.	Description
fLD1	46085200	LED LD-702

4-7. F-3520 Power Switch Board

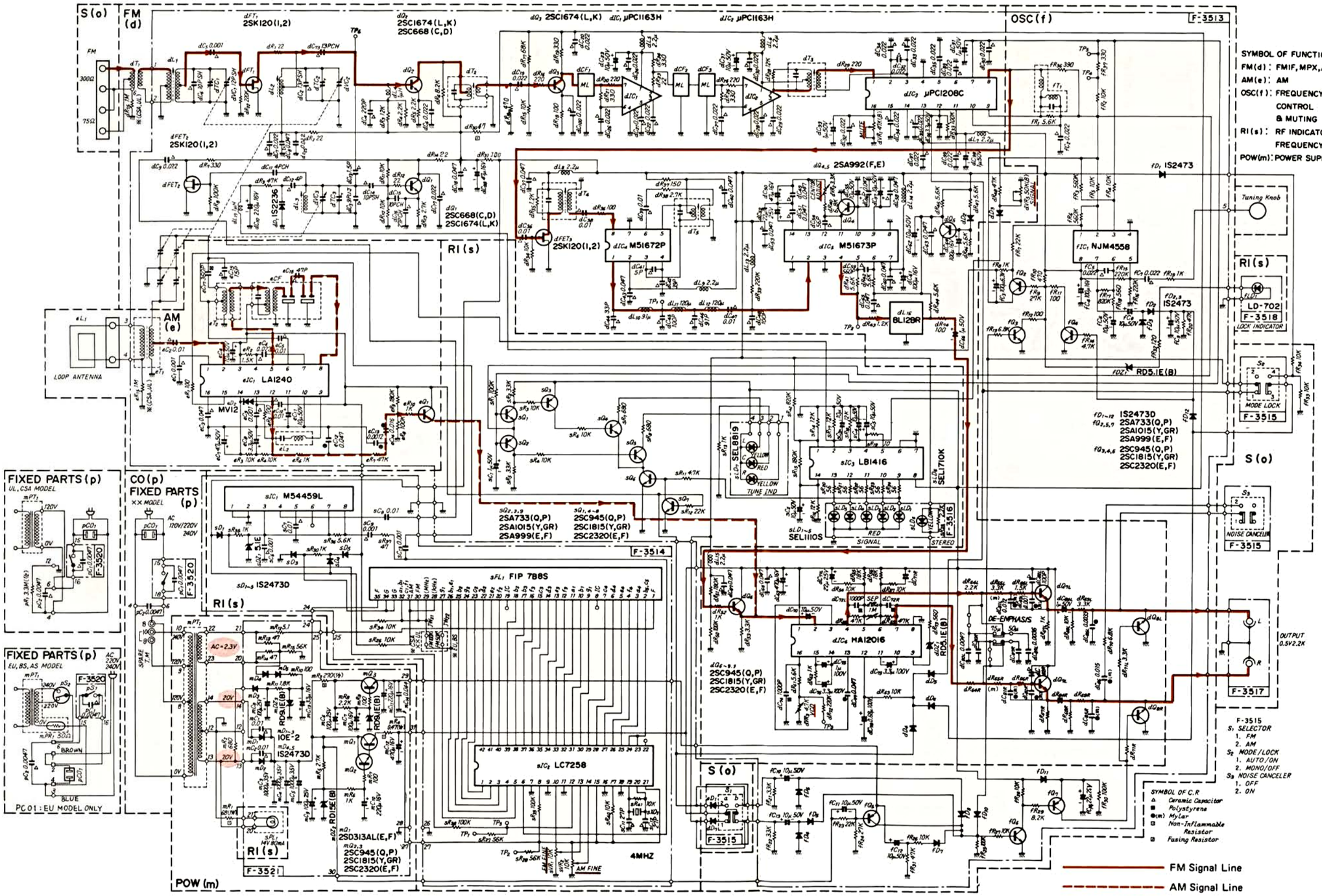
Parts List

Parts No.	Stock No.	Description
pC1	08302100	4700pF 125V C.C.
pS1	46085800	Power Switch

• Abbreviations

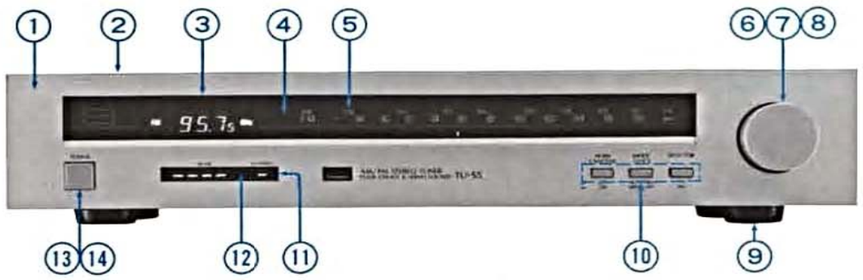
C.R. . . . . Carbon Resistor
S.R. . . . . Solid Resistor
Ce.R. . . . . Cement Resistor
M.R. . . . . Metal Film Resistor
F.R. . . . . Fusing Resistor
N.I.R. . . . . Non-Inflammable Resistor
C.C. . . . . Ceramic Capacitor
C.T. . . . . Ceramic Capacitor, Temperature Compensation
E.C. . . . . Electrolytic Capacitor
E.L. . . . . Low Leak Electrolytic Capacitor
E.B. . . . . Bi-Polar Electrolytic Capacitor
E.BL. . . . Low Leak Bi-Polar Electrolytic Capacitor
Ta.C. . . . . Tantalum Capacitor
F.C. . . . . Film Capacitor
M.P. . . . . Metalized Paper Capacitor
P.C. . . . . Polystyrene Capacitor
G.C. . . . . Gimmic Capacitor

5. SCHEMATIC DIAGRAM

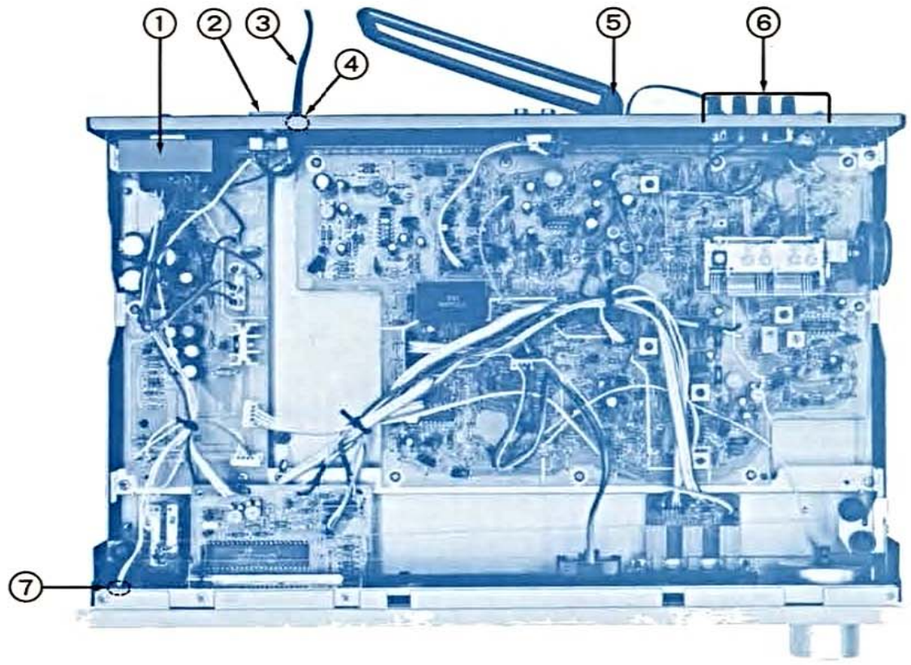


6. OTHER PARTS

6-1. Front View



6-2. Top View



Parts List <Front View>

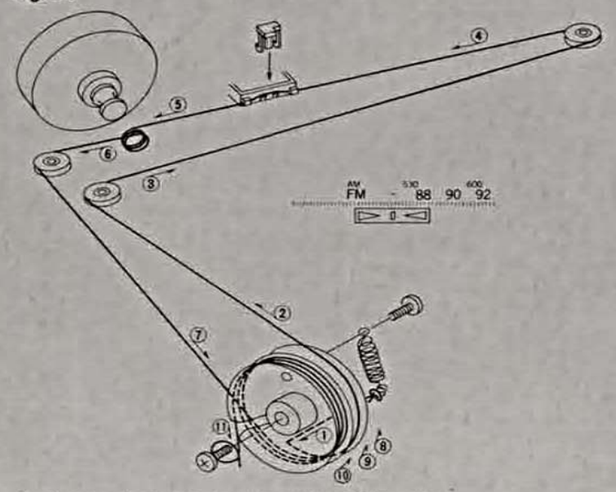
Parts No.	Stock No.	Description
•Silver Model Only		
1	07755600	Front Panel Ass'y
2	07562310	Bonnet
3	07753200	Dial Window
7	07778800	Tuning Knob
10	07553900	Push Knob Ass'y, selector etc.
13	53195000	Push Knob, power
14	59560800	Push Knob Guide, power
•Black Model Only		
1	07755700	Front Panel Ass'y
2	07715600	Bonnet
3	07753300	Dial Window
7	07738400	Tuning Knob
10	07554100	Push Knob Ass'y, selector etc.
13	53196500	Push Knob, power
14	59560900	Push Knob Guide, power
•Common Parts		
4	07755800	Masking Plate Ass'y
5	07753100	Dial Scale
6	07752710	Tuning Unit
8	50485300	Masking Sheet, tuning knob
9	07662900	Leg
11	07752800	Signal Indicator Window
12	07753000	Signal Indicator Plate Ass'y

Parts List <Top View>

Parts No.	Stock No.	Description
1	15003601	Power Transformer
2	07189600	AC Outlet
3	38004700	Power Cord
4	39106000	Strain Relief
5	07193200	Loop Antenna Holder
6	22104000	Antenna Terminal
7	07267600	Illumination Lamp 14V 80mA

7. THREADING OF DIAL CORD

Fig. 7-1



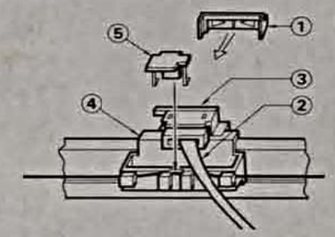
1. Knot one end of dial cord to spring of dial pulley.
2. Turn the dial pulley fully counterclockwise to open the variable capacitor.
3. Thread the dial cord in numerical order from 1 to 11 as Fig. 7-1.
4. Tie the other end of the dial cord to pulley fixing screw in trying to put enough tension to the dial cord.
5. After tighten the screw, lock both knots of the dial cord with paint.

Dial Pulley . . . . . Stock No. 07759600
Dial Cord (0.5mm) . . . . . Stock No. 60360500

8. ATTACHMENT OF DIAL POINTER

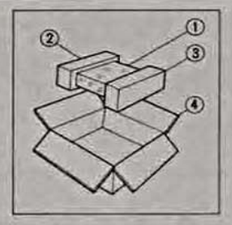
1. Close the variable capacitor completely.
2. Set the dial pointer to the start point, the line at the left end of the dial scale. (Fig. 7-1)
3. Hook the dial cord on the dial pointer, and fix it with clip.
4. Confirm that the dial pointer runs smoothly on the dial scale by turning the tuning shaft.

Parts No.	Stock No.	Description
1	07647810	Dial Pointer Cap
2	07264700	Tuning Indicator LED
3	07654700	Wire Holder
4	07654810	Dial Pointer Holder
5	07654600	Clip, dial pointer holder



9. PACKING LIST

Part No.	Stock No.	Description
1	91167610	Vinyl Bag
2	07561900	Styrofoam Packing (Left)
3	07562000	Styrofoam Packing (Right)
4	07755900	Carton Case (Silber Model)
	07756000	Carton Case (Black Model)



10. ACCESSORY LIST

Stock No.	Description
07198900	AM Loop Antenna
07563000	Loop Antenna Holder
46051700	FM Antenna
07193400	Pin to Pin Cord
07756100	Operating Instruction
07726700	Rack Mount Adaptor (each) (Black Model Only)

Sansui

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