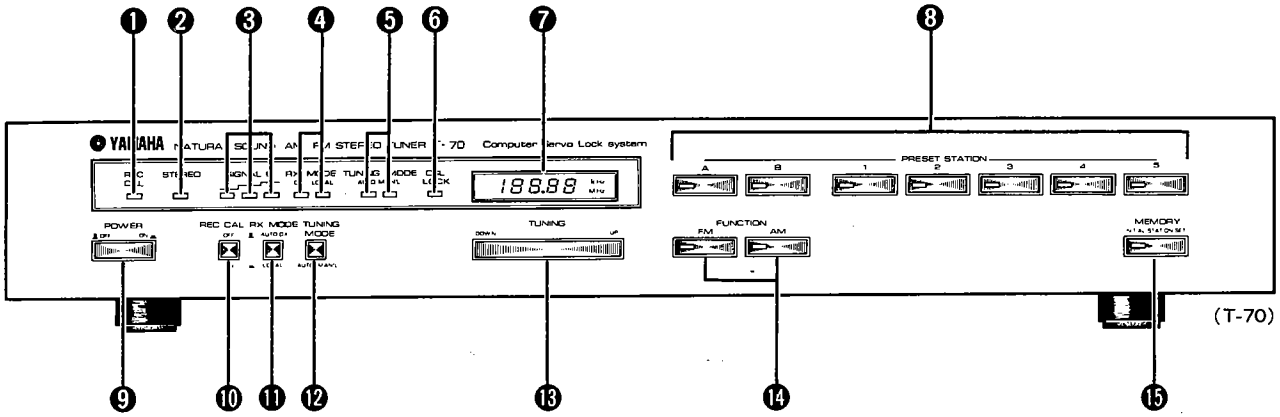
AM/FM STEREO TUNER

T-70/T-1060

SERVICE MANUAL

■ FRONT PANEL



❶ REC CAL INDICATOR
❷ STEREO INDICATOR
❸ SIGNAL QUALITY INDICATOR
❹ RX MODE INDICATOR
❺ TUNING MODE INDICATOR
❻ CSL LOCK INDICATOR
❼ DIGITAL FREQUENCY READOUT
❽ PRESET STATION BUTTON
❾ POWER SWITCH
❿ REC CAL SWITCH
⓫ RX MODE SWITCH
⓬ TUNING MODE SWITCH
⓭ TUNING BUTTON
⓮ FUNCTION BUTTON
⓯ MEMORY BUTTON

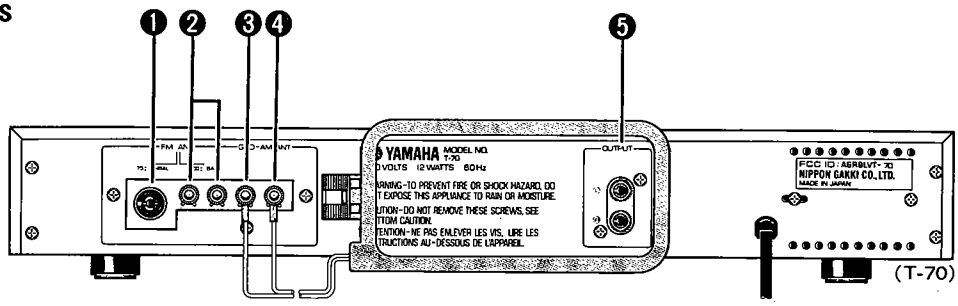
■ CONTENTS

004441

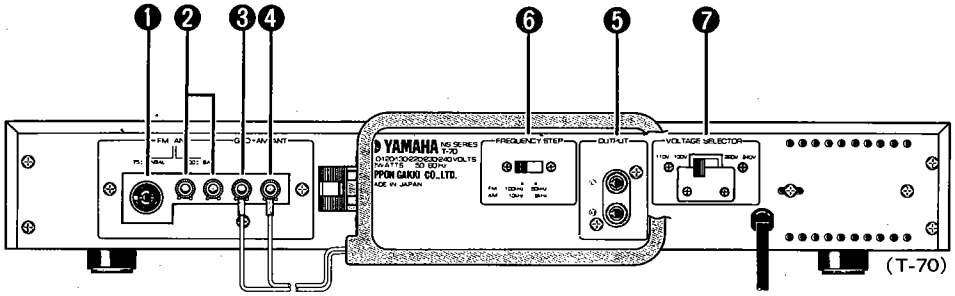
SINCE 1887 YAMAHA
NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN
Printed in Japan 11.81 2.55K

■ REAR PANELS

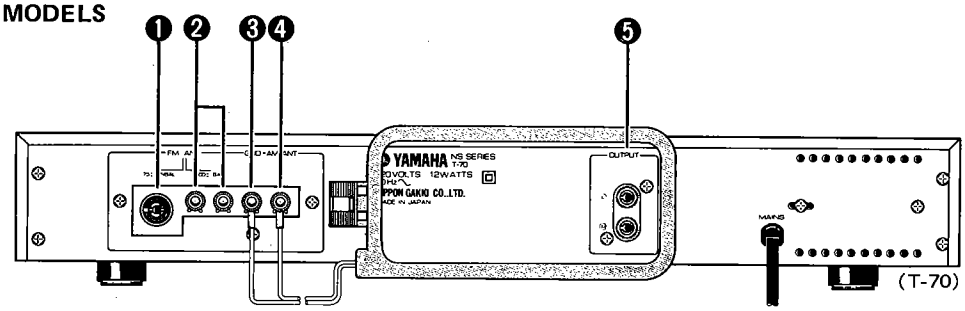
▼ U.S. & CANADIAN MODELS



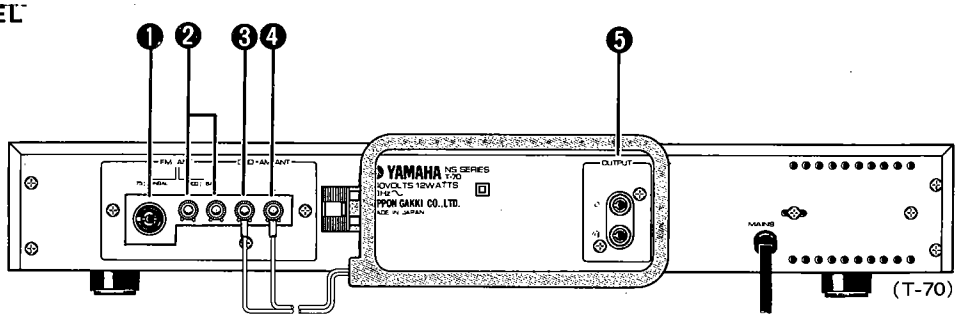
▼ GENERAL MODEL



▼ BRITISH & AUSTRALIAN MODELS



▼ NORTH EUROPEAN MODEL



❶FM ANTENNA TERMINAL (75Ω Unbalance)
❷FM ANTENNA TERMINAL (300Ω Balance)
❸GND (Ground) TERMINAL
❹AM ANTENNA TERMINAL
❺OUTPUT TERMINAL
❻FREQUENCY STEP SELECTOR
❼VOLTAGE SELECTOR

■ SPECIFICATIONS

■ FM SECTION

Tuning Range		87.8 to 108MHz (U)(C) 87.4 to 108.1MHz (G)(A)(B) 87.8 to 108 or 87.4 to 108.1 (R)
50dB Quieting Sensitivity		
Mono (IHF)		3μV (14.7dBf)
Stereo		32μV (35.3dBf)
Usable Sensitivity		
Mono		
(30dB Quieting)		1.2μV (300Ω) 6.8dBf 0.6μV (75Ω) 6.8dBf
DIN Mono (S/N 26dB)		1.2μV (G)(A)(B)
DIN Stereo (S/N 46dB)		35μV (G)(A)(B)
Image Response Ratio		
(98MHz)		85dB
IF Response Ratio		
(98MHz)		100dB
Spurious Response Ratio		
(98MHz)		100dB
AM Suppression Ratio		
(IHF)		65dB
Capture Ratio (IHF)		Local 1.2dB, DX2.5dB Local 2.5dB, DX2.5dB (G)(A)(B)
Alternate Channel		Local 25dB, DX85dB
Selectivity (two signals)		Local 15dB, DX70dB (G)(A)(B)
Signal to Noise Ratio		
(at 85dBf)		
Mono		88dB
Stereo		83dB
(DIN UN Weighted)		Mono 74dB (G)(A)(B)
		Stereo 72dB (G)(A)(B)
(DIN Weighted)		Mono 80dB (G)(A)(B)
		Stereo 76dB (G)(A)(B)
Distortion		
Mono	100Hz	Local 0.02%, DX 0.05%
	1kHz	Local 0.03%, DX 0.3%
	6kHz	Local 0.05%, DX 0.8%
Stereo	100Hz	Local 0.04%, DX 0.6%
	1kHz	Local 0.04%, DX 0.6%
	6kHz	Local 0.06%, DX 1.2%
(40kHz Dev.)	6.3kHz	Local 0.08%, (G)(A)(B)
Intermodulation Distortion (IHF)		
Mono		Local 0.03%, DX 0.3%
Stereo		Local 0.04%, DX 0.6%
Stereo Separation		
50Hz		Local 60dB, DX 28dB
1Hz		Local 60dB, DX 28dB
10kHz		Local 50dB, DX 25dB
Frequency Response		
50Hz to 10kHz		±0.3dB
30Hz to 15kHz		+0.3, −0.5dB
Subcarrier Product Ratio		65dB
Auto-DX Switching Threshold		40μV (37.3dBf)

■ AM SECTION

Tuning Range	516 to 1614kHz (U)(C) 518 to 1615kHz (G)(A)(B) 516 to 1614kHz or 518 to 1615kHz (R)
Usable Sensitivity (IHF)	10μV
Selectivity	Local 17dB, DX 27dB
Signal to Noise Ratio	50dB 48dB (G)(A)(B)
Image Response Ratio	45dB
Spurious Response Ratio	Better than 50dB
Distortion	0.3% 0.4% (G)(A)(B)

■ AUDIO SECTION

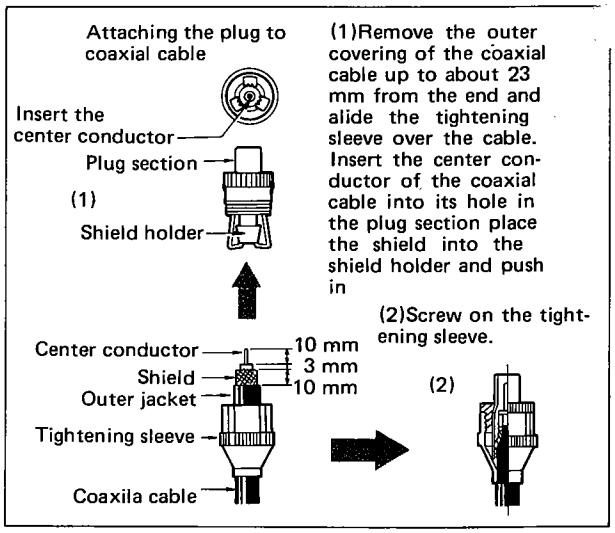
Output Level/Impedance	
FM (100% mod. 1kHz)	500mV/2.2kΩ
AM (30% mod. 1kHz)	150mV/2.2kΩ
Rec Cal Signal (333Hz: Corresponding to 50% FM modulation)	250mV/4.7kΩ

■ GENERAL

Semiconductors	74 Transistors, 16 ICs, 2 FETs, 25 Diodes, 1 Degital Display, 20 LEDs, 6 Varicap Diodes
Power Supply	
U.S. & Canadian Models	120V, 60Hz
General Model	110–130V/220–240V, 50/60Hz
North European Model	220V, 50Hz
British & Australian Models	240V, 50Hz
Power Consumption	12W
Dimensions (W x H x D)	435 x 72 x 320.5mm (17-1/8 x 2-7/8 x 12-5/8)"
Weight	4.0 kg (8 lbs.)

(G) ..... North European model
(A) ..... Australian model
(B) ..... British model
(U) ..... U.S.A. model
(C) ..... Canadian model
(R) ..... General model

Specifications ~~subject~~ to change without notice.

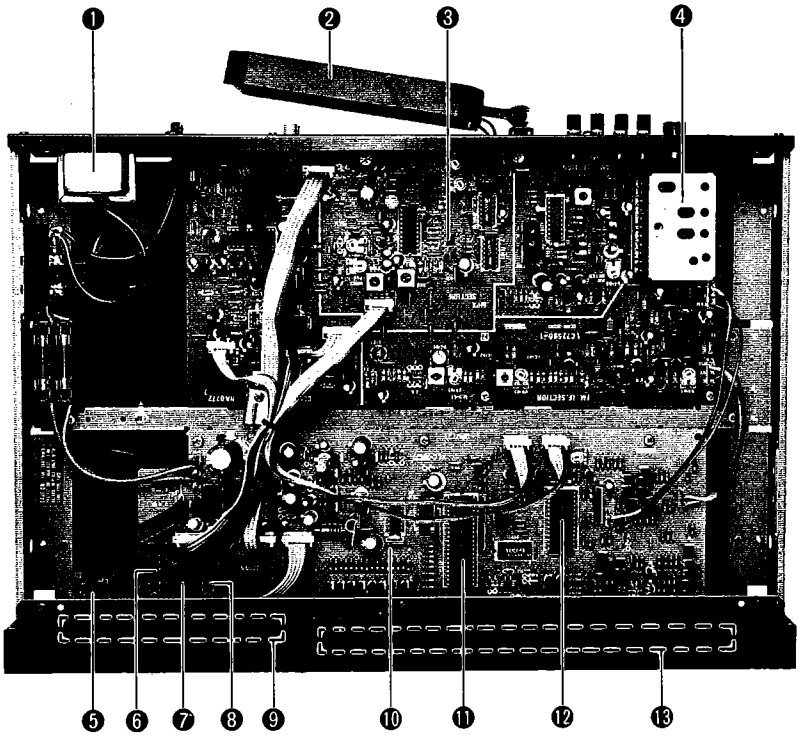


(1)Remove the outer covering of the coaxial cable up to about 23 mm from the end and alide the tightening sleeve over the cable. Insert the center conductor of the coaxial cable into its hole in the plug section place the shield into the shield holder and push in

(2)Screw on the tightening sleeve.

■ INTERNAL VIEW

▼ TOP VIEW



❶POWER TRANSFORMER
U.S.A. & Canadian models : GA6369
N. European model : GA6370
Australian & British models : GA6371
General model : GA6372
❷AM LOOP ANTENNA
(T-70: Mi07714 T-1060: Mi07415)
❸TUNER C. BOARD (1/3)
❹FRONT END PACK (PA00062)
❺POWER SWITCH (SW401)
❻REC CAL SWITCH (SW402-1)
❼RX MODE SWITCH (SW402-2)
❽TUNING MODE SWITCH (SW402-3)
❾TUNER C. BOARD (3/3)
❿CONTROL C. BOARD (1/2)
⓫IC405 (LM6402A : iG04900)
⓬IC402 (LC7210 : iG04910)
⓭DISPLAY C. BOARD

■ DISASSEMBLY PROCEDURES

1. Top cover removal

Detach the AM loop antenna from the antenna holder. Remove screws ① to ④ in Fig. 1 and then slide the top cover to the rear panel and remove it.

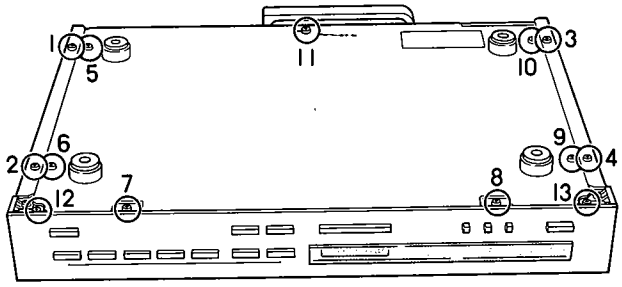


Fig. 1

2. Bottom Cover removal

Remove screws ⑤ to ⑪ in Fig. 1 and then remove the bottom cover.

3. Front panel removal

Remove screws ⑦, ⑧, ⑫ and ⑬ in Fig. 1 and screws ① to ③ in Fig. 2 and then remove the front panel.

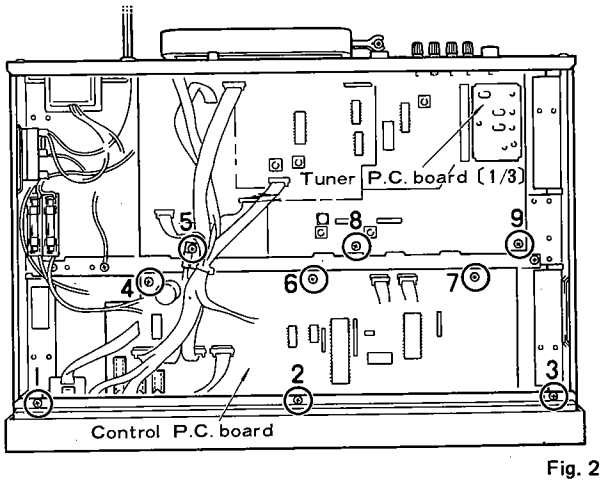


Fig. 2

4. Control p.c. board [1/2] and display p.c. board removal

a. Disconnect the wiring which are connected to the control p.c. board [1/2].
b. Remove the screw ① and plastic rivet ② in Fig. 3 and then remove the holder unit.
c. Remove screws ④ to ⑦ in Fig. 2 and screws ③ to ⑦ in Fig. 3 and then remove the control p.c. board [1/2] together with the display p.c. board.

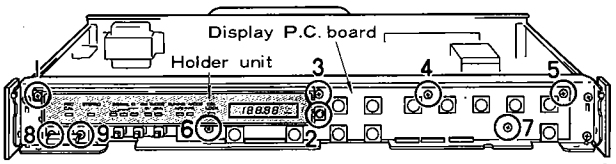


Fig. 3

5. Tuner p.c. board [3/3] removal

a. Remove the holder unit according to step 4 (b).

b. Remove plastic rivets ① and ② in Fig. 4 and then remove the tuner p.c. board [3/3].

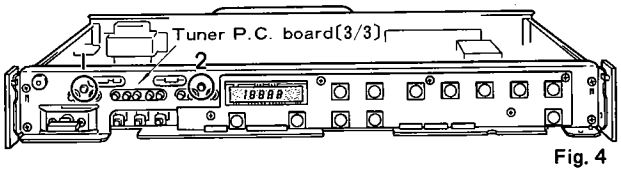


Fig. 4

6. Tuner p.c. board [1/3] removal

a. Disconnect the wiring which are connected to the tuner p.c. board [1/3].

b. Remove screws ⑤, ⑧ and ⑨ in Fig. 2 and screws ① to ⑤ in Fig. 5 and then remove the tuner p.c. board [1/3].

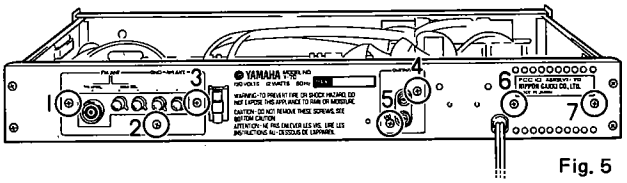


Fig. 5

7. Power transformer replacement

a. Disconnect the wiring of the power transformer.

b. Remove screws ⑥ and ⑦ in Fig. 5 and then remove the power transformer.

8. Power switch replacement

Remove screws ⑧ and ⑨ in Fig. 3 and then remove the power switch.

9. Power cord replacement

Hold the cord stopper between Ⓐ and Ⓑ the pliers and then push it out remove Power cord.

* When attaching Power cord, be sure that the length of lead wires from the cord stopper to the power transformer should be 120 mm. (U.S., North European and Canadian models)

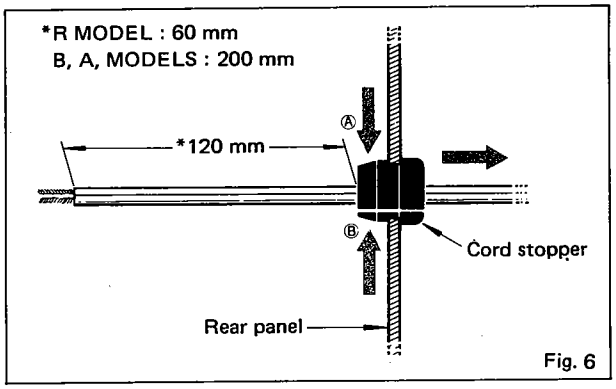


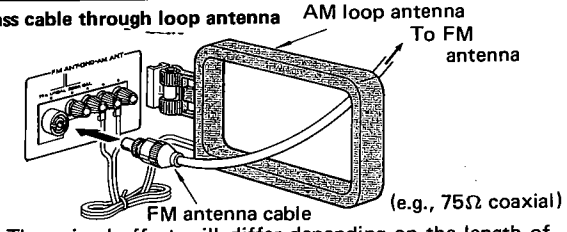
Fig. 6

■FOR POOR RECEPTION

- **MEASURES TO BE TAKEN FOR WEAK AM FIELDS**

If a outdoor FM antenna is being used, reception for AM broadcasts can be improved by passing an antenna cable (75Ω coaxial, or 300Ω balanced feeder) through the AM loop antenna and then connecting to the FM antenna terminal. (Refer to Fig. 7.) This will not cause any adverse effect to FM broadcasts.

Ex. 1 Pass cable through loop antenna



The gained effect will differ depending on the length of the FM antenna cable and on how it is routed. Generally, the longer the cable, the better the effect will be.
In the case a noise-generating object is present in the neighborhood of the cable, this method will adversely affect the SN ratio for AM. In the case noise mixes into broadcasts making listening unpleasant, this method should be avoid

Ex. 2 Wind cable several times around loop antenna.

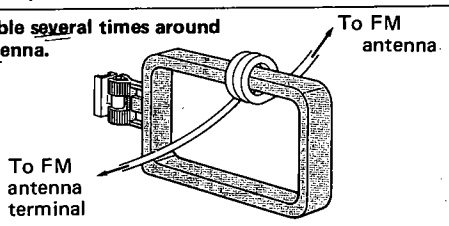


Fig. 7

- **CONDITIONS THAT INCAPACITATE RECEPTION**

Reception will be impossible under the following conditions.

1) Intensive Input to Antenna

Reception may be impossible when the antenna input is too strong as when an antenna is erected and a booster is used at a location close to an FM broadcasting station.

2) Weak Input Antenna

Stations with extremely weak signals (those that do not permit separation from noise) cannot be received. (Try adjusting the antenna height and direction.)

3) Adjoining station

When reception fails at the station which is next to a strong station and whose reception condition is unsatisfactory, receive at manual search mode.

■ ADJUSTMENTS

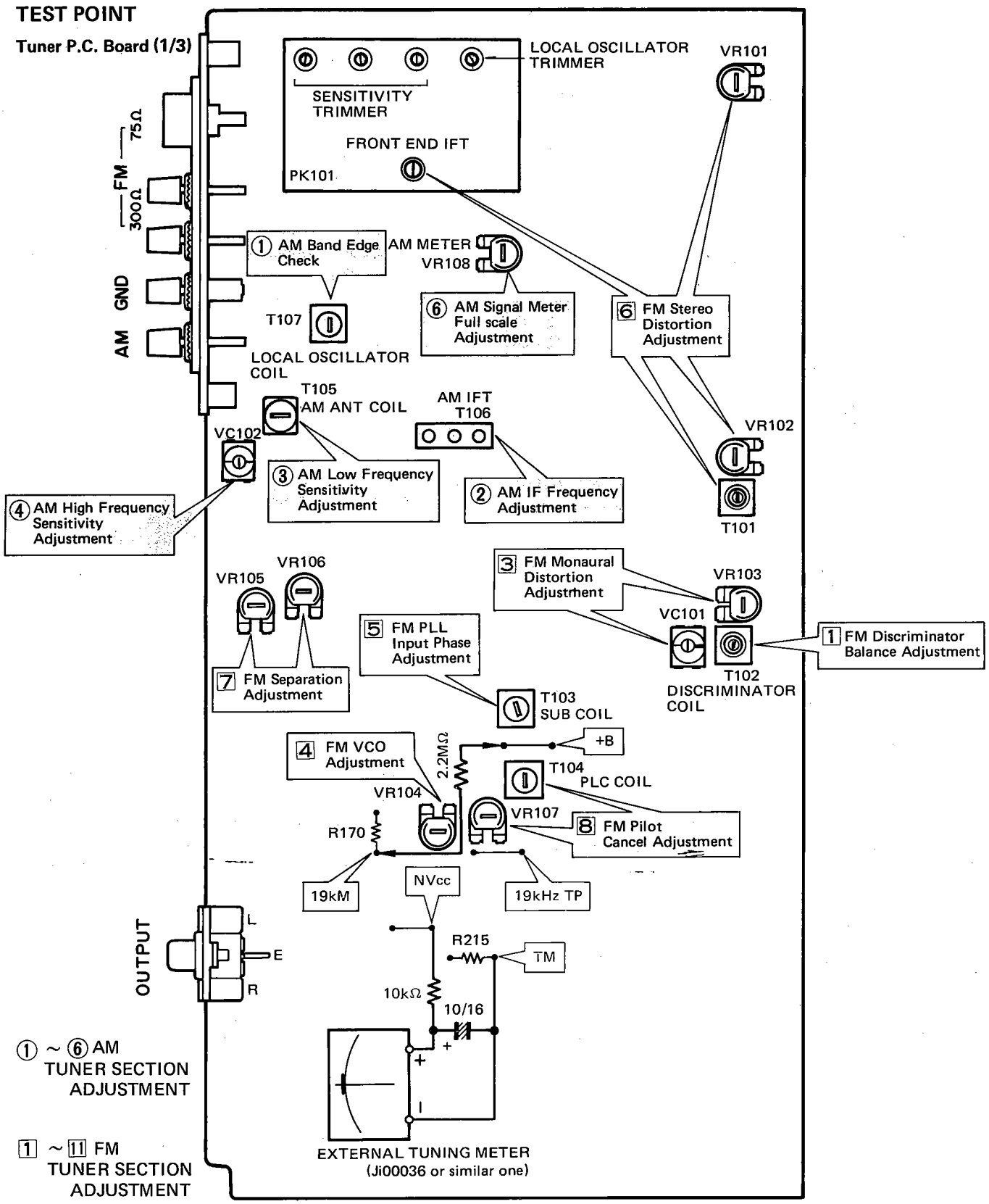


Fig. 8

1. AM TUNER SECTION

- Proceed with these adjustments before FM tuner section adjustments.
- Connect the AM loop antenna to the AM ANT terminals.
- Proceed with the adjustments about 5 minutes after the power has been switched on.
- Set the FUNCTION to AM.
- Measuring instrument abbreviation
  AM S.G.: AM signal generator (with 0.1kHz accuracy)

Step	Adjustment item	Terminals to be connected	Required instrument	Adjustment location	Adjustment method	Rating or standard	Remarks
1.	Band edge confirmation			T107 (local osc. coil)	Operate the tuning button.	Confirm coverage of AM band at indicators indicated frequency.	Tuning mode switch → AUTO
2.	IF frequency adjustment	Connect a dummy antenna to the AM S.Gs ANT terminals output L or R.	AM S.G. (450kHz 100dBμ ~ 120dBμ) Level meter	T106 (AM IFT) (three cores)	Adjust so that the detector output is at maximum.	Set the RX MODE switch to AUTO DX.	Tuning MODE switch → MAN'L detuned point.
3.	Sensitivity adjustment (low frequency range)	Same as step 2	AM S.G. (600kHz 50dBμ)	T105 (AM ANT coil)	Adjust for maximum sensitivity.		Recommended that preset be performed at 600kHz and 1450kHz in advance.
4.	Sensitivity adjustment (high frequency range)	Same as step 2	AM S.G. (1450kHz 50dBμ)	VC102	Same as step 3		
5.	Sensitivity difference adjustment	Adjust by repeating steps 3 and 4.					
6.	Signal indicator full scale adjustment	Same as step 2	AM S.G. (1450kHz 80dBμ)	VR108	Adjust so that all LEDs of the signal indicator light up. (Front panel)		Confirm that the signal indicator goes out when detuned.
7.	Auto search reception confirmation	Same as step 2	AM S.G. (600kHz 1450kHz 80dBμ)		Confirm the auto search reception with the tuning button.		Tuning MODE switch → AUTO
8.	IF frequency range switching confirmation (search levell switching)	Same as step 2	AM S.G. (60dBμ)	Tuning button RX MODE switch (search level)		Confirm that DX-LOCAL indicator switches. Comfirm that the frequency range switches at LOCAL position.	Confirm that auto search level switches.

2. FM TUNER SECTION

- Proceed with the FM section adjustments after having finished the AM section adjustments.
- Set the switches to the following positions.
  FUNCTION → FM
  REC CAL → OFF
- During adjustments, use a low pass filter.
- Do not forget to keep the bottom cover on.
- Measuring instrument abbreviations
  FM S.G. : FM signal generator
  SSG : Stereo signal generator
- During adjustments, connect the external tuning meter and confirm the optimum tuning point.

Step	Adjustment item	Terminals to be connected	Required instruments	Adjustment locations	Adjustment method	Rating or standard	Remarks
1.	Discriminator balance	Connect a external tuning meter in series with 10kΩ between 300Ω ANT terminals and ut. NVcc-TM terminal output.	FM S.G. Distortion meter Oscilloscope	T102 (discriminator coil) Confirm that VR103 is about at center.	Confirm that the external tuning meter deflects to 0 at the detuned point.		Tuning MODE switch → MAN'L
2.	Tuning point adjustment	Same as step 1	FM S.G. antenna input; 70dBμ 90MHz	Tuning button	Confirm that the external tuning meter deflects to 0 and the set receives at LOCAL position.		Tuning MODE switch → AUTO
3.	Monaural distortion adjustment	Same as step 1	Same as step 2 Monaural 400Hz 100% modulation	VC101 VR103	Reduce distortion to minimum.	Less than −70dB	To be LOCAL mode
4.	VCO adjustment	FM ANT terminal output 19kHz T.P.	FM S.G. 98MHz nonmodulation frequency counter	VR104	Connect 2.2MΩ between 19kM and +B and force the set in stereo mode. Set to 19kHz. (Refer to Fig. 9)	19kHz ± 10Hz	To be LOCAL mode
5.	PLL input phase adjustment	FM ANT terminal output	FM S.G. SSG Antenna input; 70dBμ 98MHz Stereo L, R; 1kHz 100% modulation level meter	T103 SUB coil	Adjust for maximum output for L and R		To be LOCAL mode
6.	Stereo distortion adjustment	FM ANT terminal output	FM S.G. SSG Antenna input; 70dBμ 98MHz Stereo L, or R; 1kHz 100% modulation Oscilloscope Level meter Distortion meter	Front end IFT T101 VR101 VR102	Reduce distortion to minimum.	Less than −70dB	To be LOCAL mode
7.	Separation adjustment	Same as step 6	Same as step 6	VR105 (Lch) VR106 (Rch)	Adjust so that the leakage level of the opposite channel comes to minimum.	More than 55dB	To be LOCAL mode
8.	Pilot cancel adjustment	Same as step 6	Same as step 6 Pilot 9% modulation	T104 (PLC coil) VR107 (PLC)	Observe waveform on the oscilloscope and adjust for minimum level.	Less than −65dB	To be LOCAL mode
9.	Signal indicator confirmation	Same as step 6	Same as step 6 1kHz 30% modulation		Confirm that all LEDs of the signal indicator light up.		Confirm that LEDs go out at the detuned point.
10.	S curve offset confirmation	Same as step 1			Confirm that the external tuning meter to deflects 0.		If found to be off the specified range, adjust again.
11.	Frequency display adjustment	Same as step 2 Connect a diode to FM FINE terminals in the control p.c. board. (Refer to Fig. 10)	FM S.G. Antenna input; 70dBμ 98MHz Stereo frequency accuracy; less than ± 5kHz	Control p.c. board VR401	By connecting a diode to FM FINE terminals, the counter shifts by one digit, then adjust so that the lowest effective digit comes to 9, or 0. Example : 88.0MHz ➡ 80.0MHz When slifting ← This figure		
12.	Auto reception confirmation	Same as step 1	Same as step 1 98MHz 20dBμ 1kHz 100% modulation		Confirm that auto reception is possible with the TUNING button. AUTO DX Sw → AUTO		

3. CONFIRMATION OF REC CAL OUTPUT

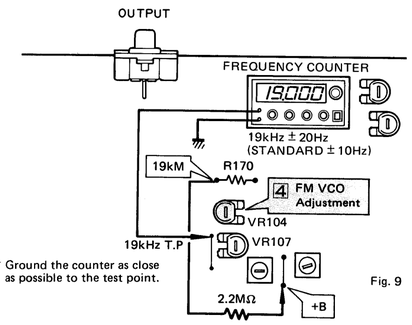
Step	Adjustment item	Terminals to be connected	Required instrument	Adjustment location	Adjustment method	Rating or standard	Remarks
1.	REC CAL output confirmation	Output L or R	Frequency counter Level meter			Frequency 333 ± 66Hz output −10 ± 2.5dBm.	Confirm that REC CAL indicator lights up.

4. DIGITAL CONTROL SECTION ADJUSTMENT

Step	Adjustment item	Terminals to be connected	Required instrument	Adjustment location	Adjustment method	Rating or standard	Remarks
1.	Confirmation of receiving frequency band	300Ω FM ANT terminal output L or R AM loop antenna	FM S.G. 70dBμ Oscilloscope Distortion meter	TUNING button TUNING MODE switch	1) AUTO search U.C.R models FM 87.9 ~ 107.9MHz 0.1MHz step AM 520 ~ 1610kHz 10kHz step G.B.A.R models FM 87.45 ~ 108.05MHz 0.05MHz step AM 522 ~ 1611kHz 9kHz step 2) Manual search U.C.R models FM 87.8 ~ 108.0MHz 0.1MHz step AM 516 ~ 1614kHz 1kHz step G.B.A.R models FM 87.4~108.1MHz 0.05MHz step AM 518 ~ 1615kHz 1kHz step		
2.	Preset confirmation	Same as step 1	FM/AM reception	MEMORY button PRESET STATION button	Receive with AUTO or MAN'L search and press the MEMORY button. Then within 1.5 second, press the PRESET STATION button.	Confirm that the display LED of the PRESET STATION button which was preset lights up. Confirm that the preset can be performed to all the PRESET STATION buttons.	
3.	Last memory channel indicator flashing confirmation	Same as step 1	Same as step 2	Repeat step 2 PRESET STATION button	Confirm that the display LED flashes at the channel preset last after the second presetting since the MEMORY button was pressed.		
4.	Memory A/B switching confirmation	Same as step 1	Same as step 2	A or B button	Press A and B buttons	Confirm that A-1 and B-1 channels are called.	
5.	Initial station set confirmation	Same as step 1	Same as step 2	MEMORY button	Press the MEMORY button until the indicator flashes (about 3 second) after having received a FM or AM reception with manual or preset of auto search.	Once set the power switch to OFF. → Again set the power switch to ON. Confirm that the frequency memorized as in the left column is called.	Confirm that the frequency as in the left column is always called with the power ON unless the MEMORY button is reset.
6.	CSL LOCK indicator confirmation	Same as step 1	Same as step 2		FM recepton . . . Confirm that the indicator goes out at the detuned point. AM reception . . . Confirm that the indicator goes out when each control switch is operated. (But it lights up even if no station is received.)		
7.	Muting confirmation	Same as step 1	Same as step 2		Confirm that muting is performed when the PRESET STATION buttons, band select buttons and the POWER switch are operated and that the CSL LOCK indicator and the signal quality indicator goes out during the above operation.		

VCO ADJUSTMENT

Tuner P.C. Board [1/3]



* Ground the counter as close as possible to the test point.

Fig. 9

FM FREQUENCY ADJUSTMENT

Control P.C. Board [1/2]

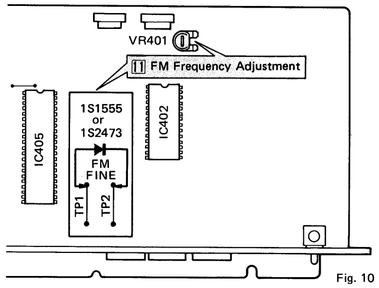
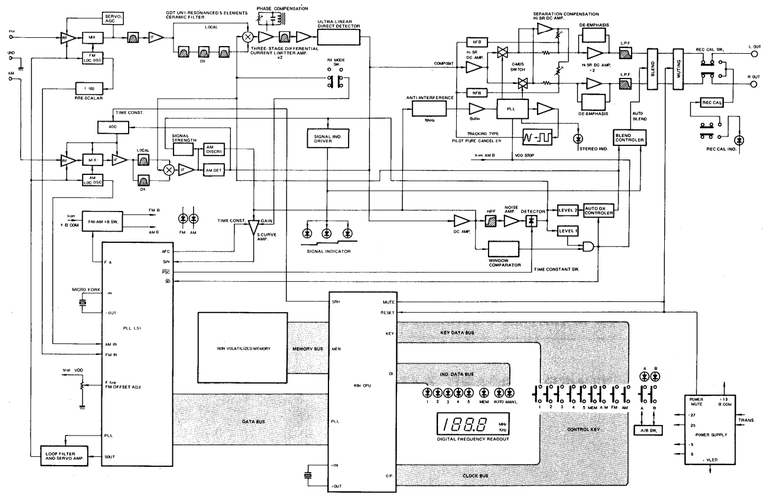
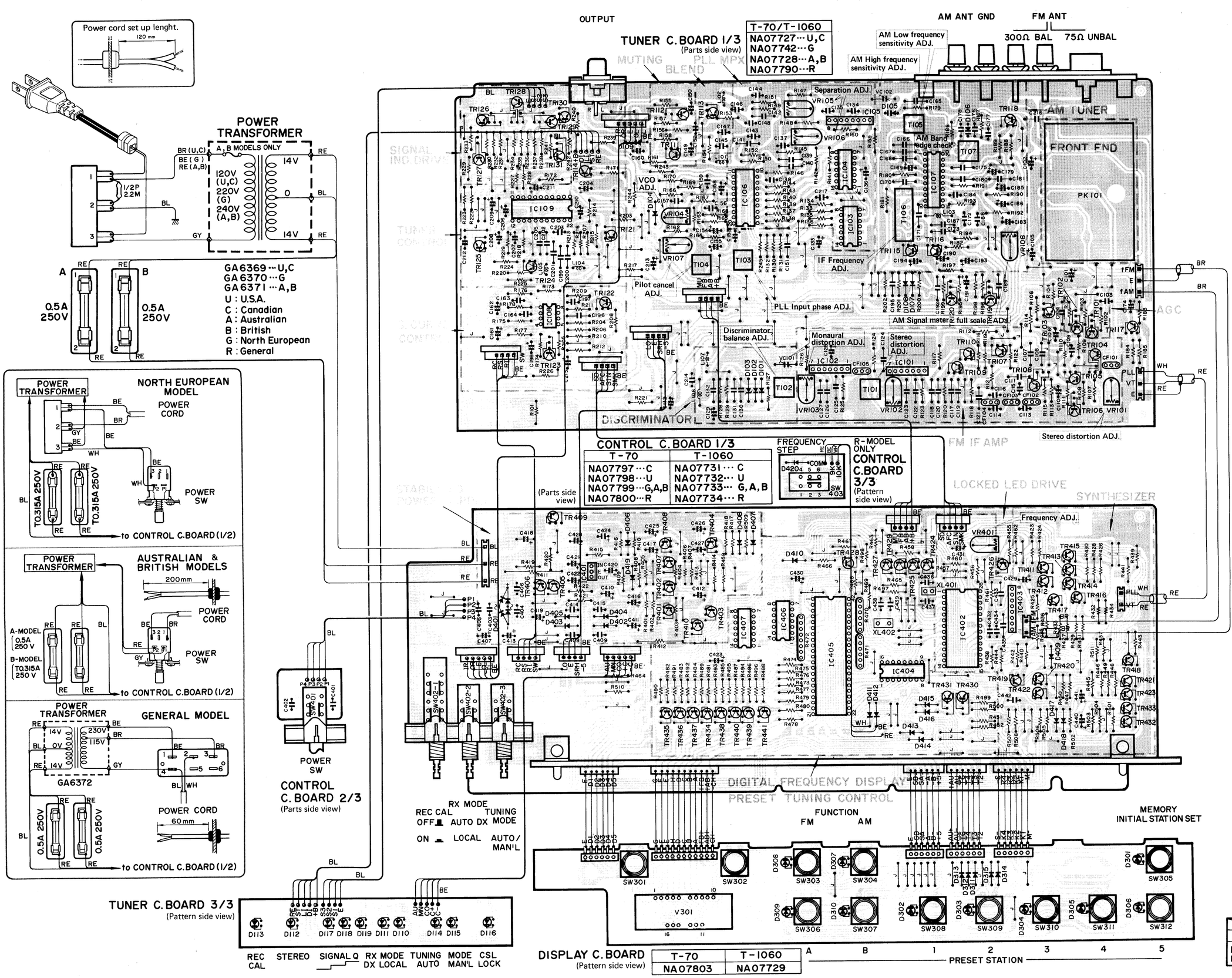


Fig. 10

■BLOCK DIAGRAM

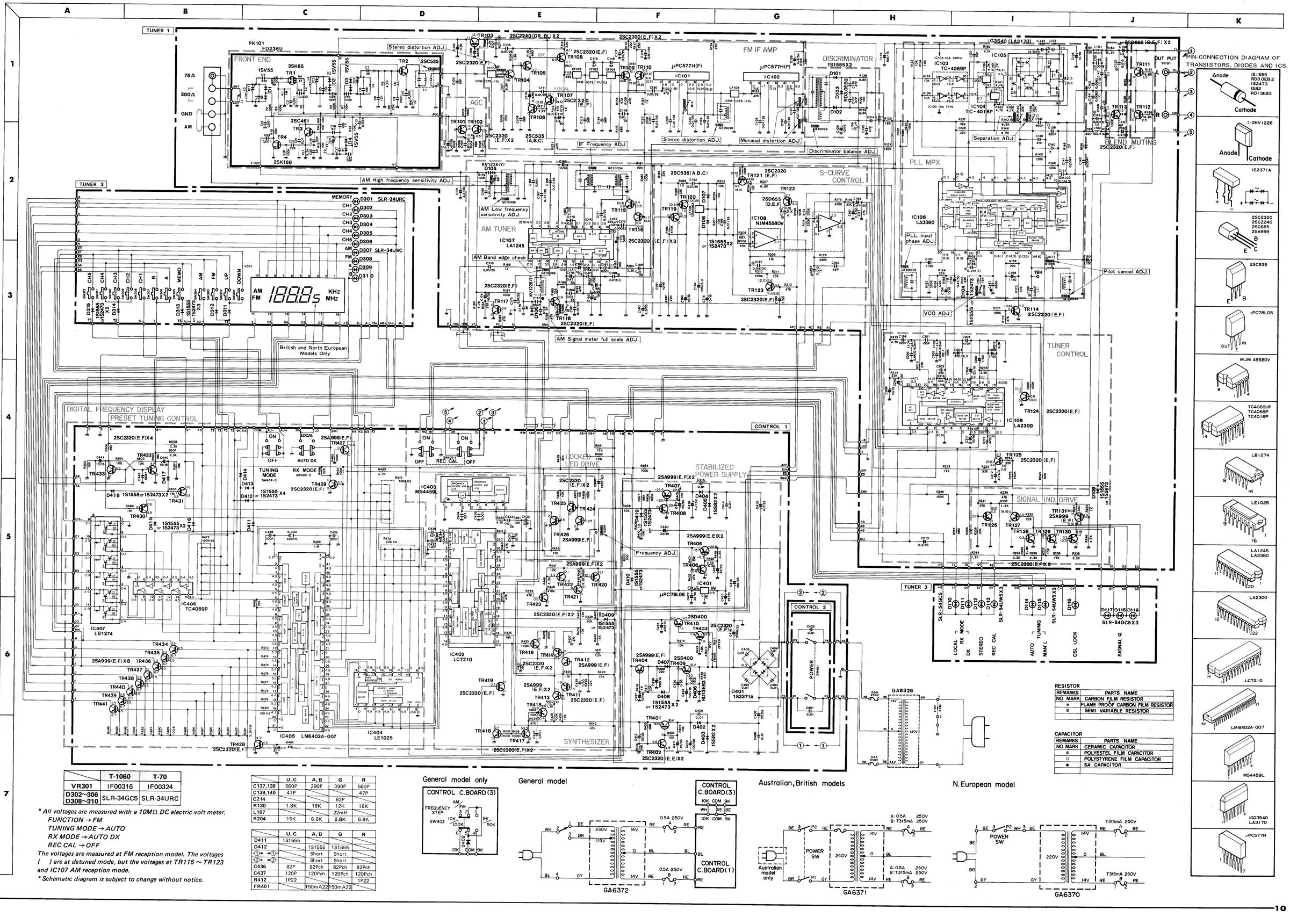


■WIRING DIAGRAM



	T-70	T-1060
V301	IF00324	IF00316
D302~306 D308~310	SLR-34URC	SLR-34GC5

■SCHEMATIC DIAGRAM



	T-1060	T-70
VR301	IF00316	IF00324
D302~306 D308~310	SLR-34GC5	SLR-34URC

** All voltages are measured with a 10MΩ DC electric volt meter.*
FUNCTION → FM
TUNING MODE → AUTO
RX MODE → AUTO DX
REC CAL → OFF
The voltages are measured at FM reception model. The voltages ( ) are at detuned mode, but the voltages at TR115 ~ TR123 and IC107 AM reception mode.
** Schematic diagram is subject to change without notice.*

	U, C	A, B	G	R
C137, 138	560P	390P	390P	560P
C139, 140	47P			47P
C214			82P	
R130	1.8K	18K	12K	18K
L107			22mH	
R204	15K	6.8K	6.8K	6.8K

	U, C	A, B	G	R
D411	1S1555			
D412		1S1555	1S1555	
①→①		Short	Short	
②→②		Short	Short	
C436	82P	82Pch	82Pch	82Pch
C437	120P	120Pch	120Pch	120Pch
R412	1P22			1P22
FR401		150mA22	150mA22	

General model only

General model

Australian, British models

N. European model

RESISTOR

REMARKS	PARTS NAME
NO MARK	CARBON FILM RESISTOR
⊕	FLAME PROOF CARBON FILM RESISTOR
■	SEMI VARIABLE RESISTOR

CAPACITOR

REMARKS	PARTS NAME
NO MARK	CERAMIC CAPACITOR
⊕	POLYESTEL FILM CAPACITOR
○	POLYSTYRENE FILM CAPACITOR
●	SA CAPACITOR