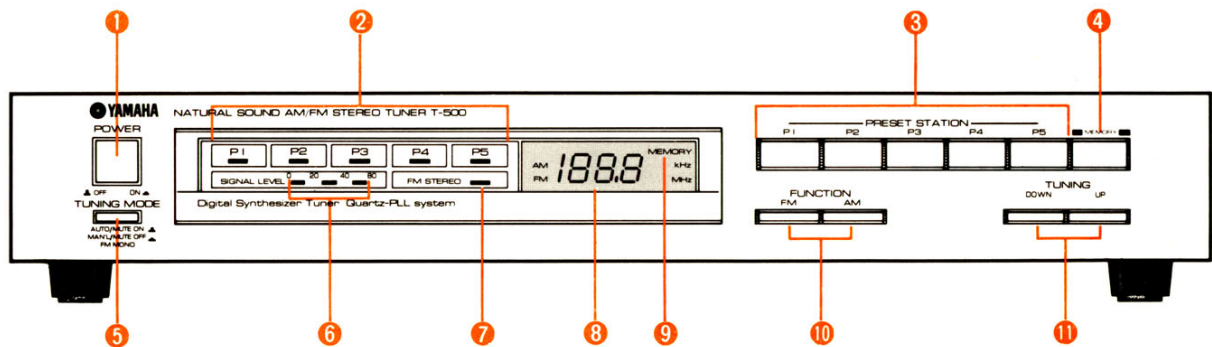


# STEREO TUNER

# T-500

# SERVICE MANUAL

## FRONT PANEL



- 1 POWER SWITCH
- 2 PRESET STATION INDICATOR
- 3 PRESET STATION BUTTONS
- 4 MEMORY BUTTONS
- 5 TUNING MODE BUTTONS
- 6 SIGNAL LEVEL INDICATOR

- 7 FM STEREO INDICATOR
- 8 DIGITAL FREQUENCY INDICATOR
- 9 MEMORY INDICATOR
- 10 BAND SELECT BUTTONS
- 11 TUNING BUTTONS

## CONTENTS

TO SERVICE PERSONNEL .....	1
SPECIFICATIONS .....	1
REAR PANELS .....	2
INTERNAL VIEW .....	3
DISASSEMBLY PROCEDURES .....	3
FOR POOR RECEPTION .....	5
ADJUSTMENTS .....	17
BLOCK DIAGRAM .....	6 ~ 17
PRINTED CIRCUIT BOARD (Pattern side) .....	18
WIRING DIAGRAM (Parts side) .....	19
SCHEMATIC DIAGRAM .....	20/21
PRINTED CIRCUIT BOARD (Pattern side) .....	22
WIRING DIAGRAM (Parts side) .....	23

004486

SINCE 1887



**YAMAHA**

NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN

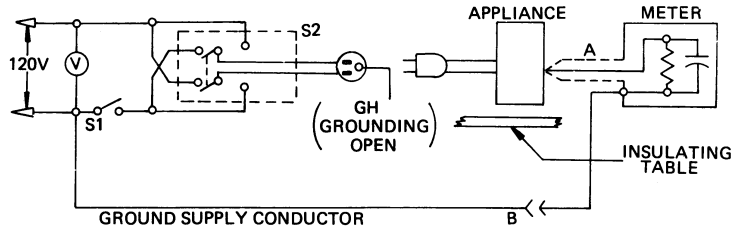
Printed in Japan 82.11.2.65k

## ■ TO SERVICE PERSONNEL

(Prepared in accordance with UL Standard 1270)

Before service of this appliance by you, please carefully read this service manual.

Please make Leakage-current or Resistance measurements by suitable meter to determine that exposed parts are acceptably insulated from the supply circuit before returning the appliance to the customer.



Appliance intended for connection to a 120 volt power supply.

- A PROBE WITH SHIELDED LEAD:
- B SEPARATED AND USED AS CLIP WHEN MEASURING CURRENTS FROM ONE PART OF APPLIANCE TO ANOTHER.

Confirm that the leakage current is not more than 0.5mA

## ■ SPECIFICATIONS

### ■ FM SECTION

<b>Tuning Range</b>	87.9 to 107.9MHz (U)(C) 87.5 to 108.0MHz (G)(A) (B)(R)
<b>50dB Quieting Sensitivity</b>	
Mono	3.1μV (15.1dBf)
Stereo	42μV (37.7dBf)
<b>Usable Sensitivity</b>	
Mono	0.8μV (75Ω) 9.3dBf
(30dB Quieting)	1.6μV (300Ω) 9.3dBf
DIN Mono (S/N 26dB)	1.2μV (G)(A)(B)(R)
DIN Stereo (S/N 46dB)	50μV (G)(A)(B)(R)
<b>Image Response Ratio (98MHz)</b>	40dB
<b>IF Response Ratio (98MHz)</b>	100dB
<b>Spurious Response Ratio (98MHz)</b>	80dB
<b>AM Suppression Ratio (IHF)</b>	55dB
<b>Capture Ratio (IHF)</b>	1.5dB
<b>Alternate Channel</b>	85dB
<b>Selectivity (two signals)</b>	70dB (G)(A)(B)
<b>Signal to Noise Ratio (at 85dBf)</b>	
Mono	81dB
Stereo	76dB
<b>Harmonic Distortion</b>	
Mono 1kHz	0.1%
Stereo 1kHz	0.2%
<b>Stereo Separation 1kHz</b>	40dB
<b>Frequency Response 50Hz to 10kHz</b>	0 ± 0.5dB
<b>Subcarrier Product Ratio</b>	48dB
<b>Muting Threshold</b>	10μV (25.2dBf)
<b>Meter Saturation Level</b>	100μV (45.2dBf)

### ■ AM SECTION

<b>Tuning Range</b>	530 to 1620kHz (U)(C) 522 to 1611kHz (G)(A)(B) 530 to 1620kHz or 522 to 1611kHz (R)
<b>Usable Sensitivity (IHF)</b>	10μV
<b>Selectivity</b>	24dB
<b>Signal to Noise Ratio</b>	50dB
<b>Image Response Ratio</b>	40dB
<b>Spurious Response Ratio</b>	Better than 50dB
<b>Distortion</b>	0.5%

### ■ LW SECTION (G)(B) models only

<b>Tuning Range</b>	155 to 353kHz 153 to 351kHz
<b>Usable Sensitivity (IHF)</b>	10μV
<b>Selectivity</b>	32dB
<b>Signal to Noise Ratio</b>	50dB
<b>Image Response Ratio</b>	30dB
<b>Spurious Response Ratio</b>	Better than 45dB
<b>Distortion (400Hz)</b>	0.5%

### ■ GENERAL

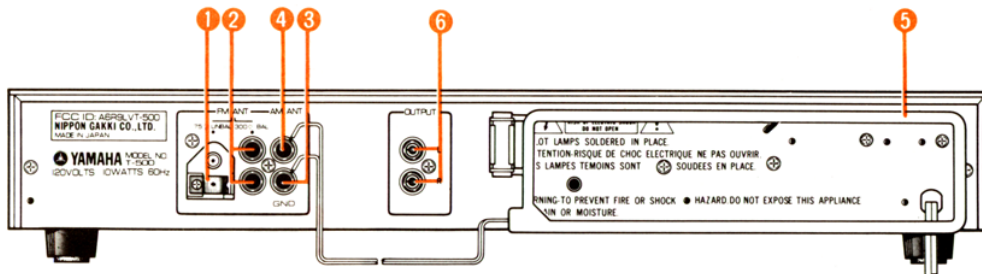
<b>Power Supply</b>	
U.S. & Canadian Models	120V, 60Hz
General Model	110–130V/220–240V
qq	50/60Hz
European Models	220V, 50Hz
British & Australian Models	240V, 50Hz
<b>Power Consumption</b>	10W
<b>Dimensions (W x H x D)</b>	435 x 102 x 325 mm (17-1/8x4-1/8x12-3/4)"
<b>Weight</b>	4.1 kg (9.1 lbs.)

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

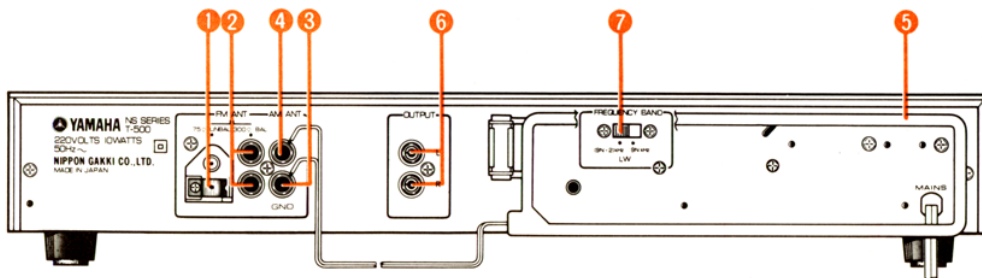
Specifications subject to change without notice.

## REAR PANELS

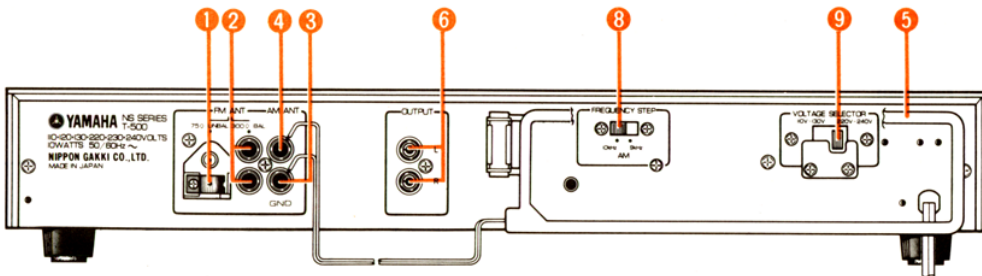
### US. & CANADIAN MODELS



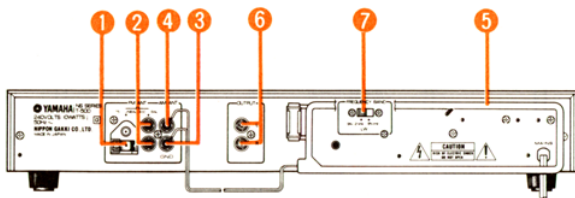
### EUROPEAN MODEL



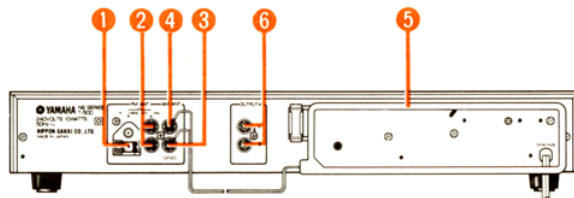
### GENERAL MODEL



### BRITISH MODEL



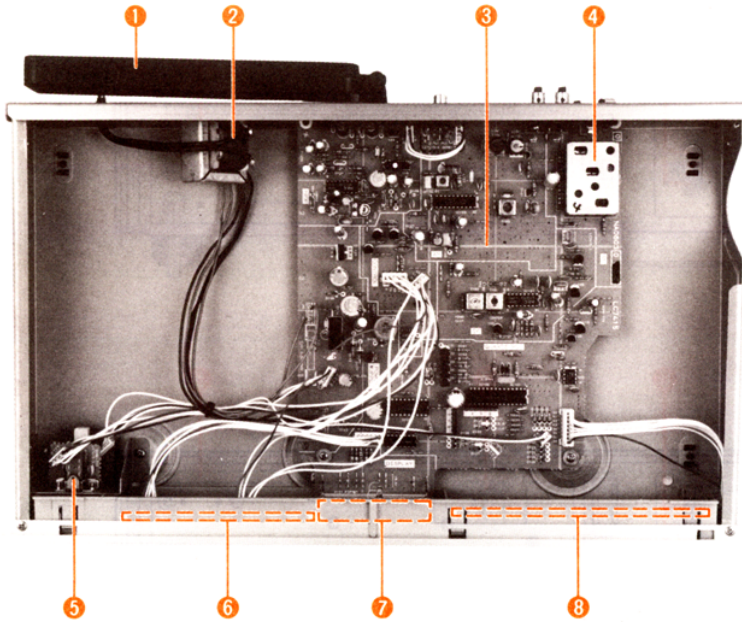
### AUSTRALIAN MODEL



- 1 FM ANTENNA TERMINAL (75Ω UNBAL)
- 2 FM ANTENNA TERMINAL (300Ω BAL)
- 3 GROUND TERMINAL
- 4 AM ANTENNA TERMINAL
- 5 AM LOOP ANTENNA

- 6 OUTPUT JACKS
- 7 FREQUENCY BAND SELECTOR
- 8 FREQUENCY STEP SELECTOR
- 9 VOLTAGE SELECTOR

## INTERNAL VIEW



- ① AM LOOP ANTENNA
- ② POWER TRANSFORMER  
U.S.A. & Canadian models : GA64910  
European model : GA64930  
Australian & British models : GA64940  
General model : GA64920
- ③ TUNER CIRCUIT BOARD
- ④ FRONT END PACK
- ⑤ POWER SWITCH (SW102)
- ⑥ LED UNIT
- ⑦ FREQUENCY DISPLAY (VC101)
- ⑧ TACT SWITCH CIRCUIT BOARD

## DISASSEMBLY PROCEDURES

### 1. Top cover removal

Detach the AM loop antenna from the antennaholder. Remove screws ① and ② in Fig. 1 from both sides, and then remove the top cover.

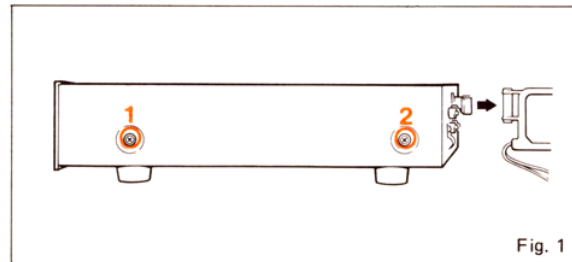


Fig. 1

### 2. Pannel Unit removal

- 1) Pull out connectors a, b and c in Fig. 2.
- 2) Remove screws ① and ② in Fig. 2. Remove screws ① and ② in Fig. 3 and then remove the pannel unit.

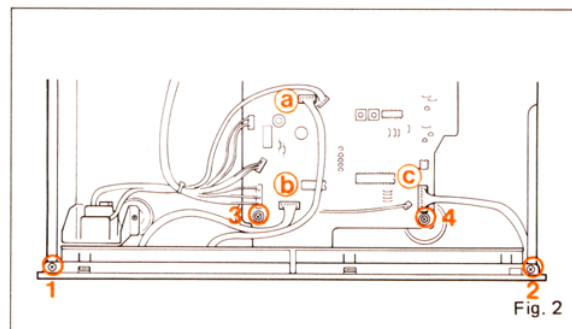


Fig. 2

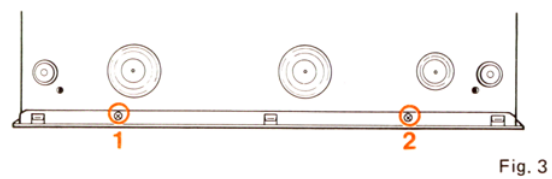


Fig. 3

**3. Tact Switch Circuit Board and LED Unit removal**

- 1) Remove screws ① through ⑤ in Fig. 4 and then remove the tact switch circuit board.
- 2) Remove plastic rivets ⑥ and ⑦ in Fig. 4 and then remove the LED unit.

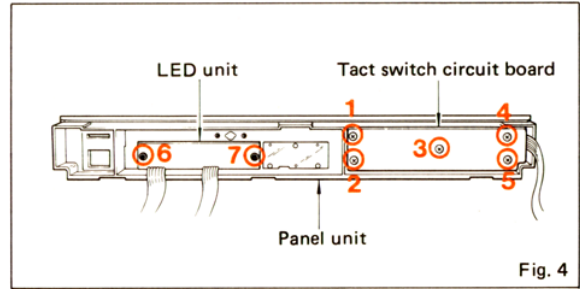


Fig. 4

**4. Tuner Circuit Board replacement**

- 1) Detach the transformer's lead wires connected to the tuner circuit board (1).
- 2) Remove the POWER and TUNING MODE buttons by using a  $\ominus$  driver or the like as shown in Fig. 5.

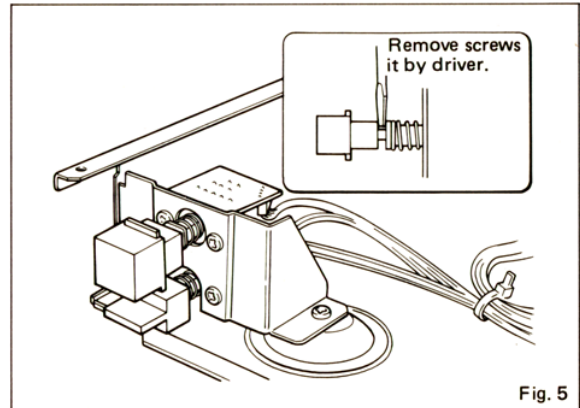


Fig. 5

- 3) Remove screws ① through ④ in Fig. 6, and then remove the tuner circuit boards (2) and (3).

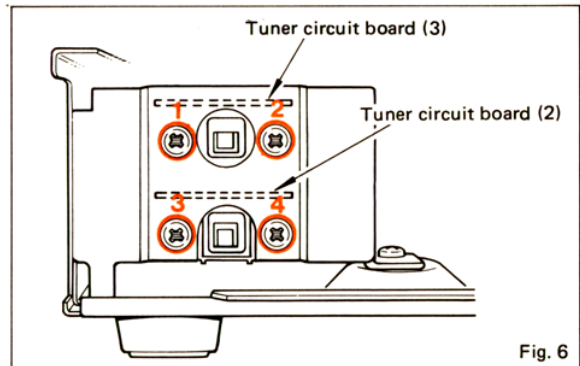


Fig. 6

- 4) Remove screws ③ and ④ in Fig. 2 and ① through ③ in Fig. 7. Remove plastic rivets ④ in Fig. 7, and then it is possible to replace the tuner circuit board.

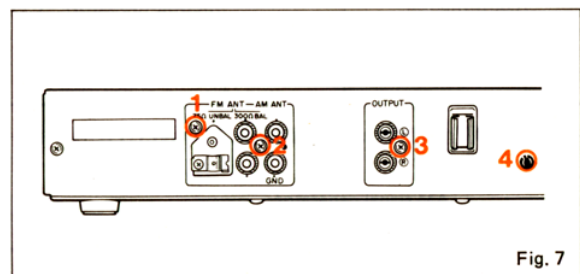


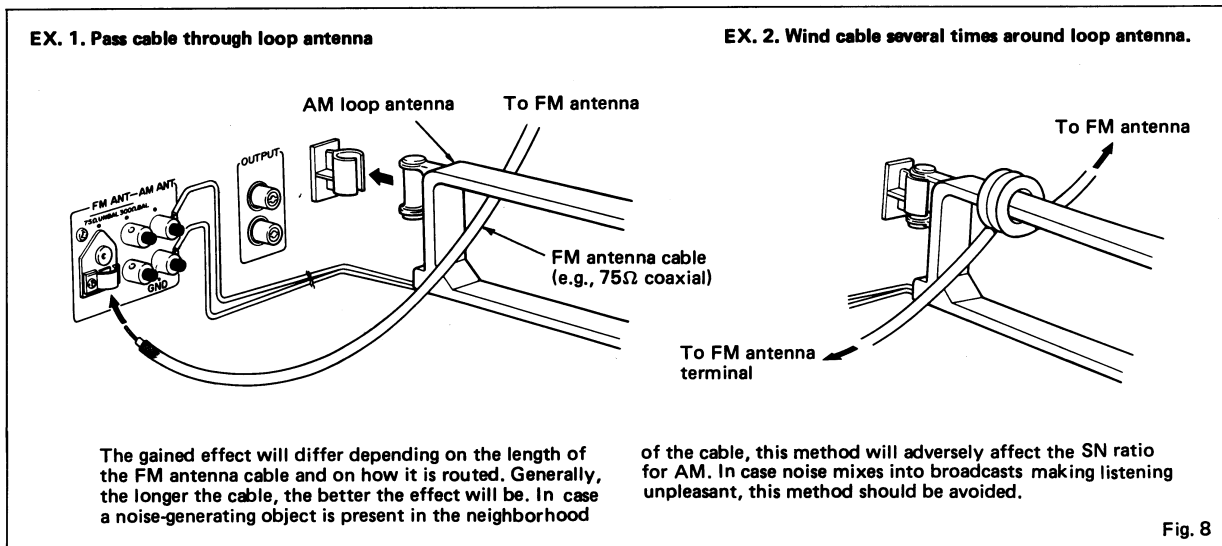
Fig. 7

## ■ FOR POOR RECEPTION

### ● MEASURES TO BE TAKEN FOR WEAK AM FIELDS

If an outdoor FM antenna is being used, the reception for AM broadcasts can be improved by passing an antenna cable ( $75\Omega$  coaxial, or  $300\Omega$  balanced

feeder) through the AM loop antenna and then connecting to the FM antenna terminal. (Refer to Fig. 8) This will not cause any adverse effect to FM broadcasts.



### ● 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 to 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 of a station which is next to a strong station and whose reception condition is unsatisfactory, try receiving in the manual search mode.

## ADJUSTMENTS

①~④ FM TUNER SECTION ADJUSTMENT

①~③ AM TUNER SECTION ADJUSTMENT

1.2 LW TUNER SECTION ADJUSTMENT ..... (G)(B) models only.

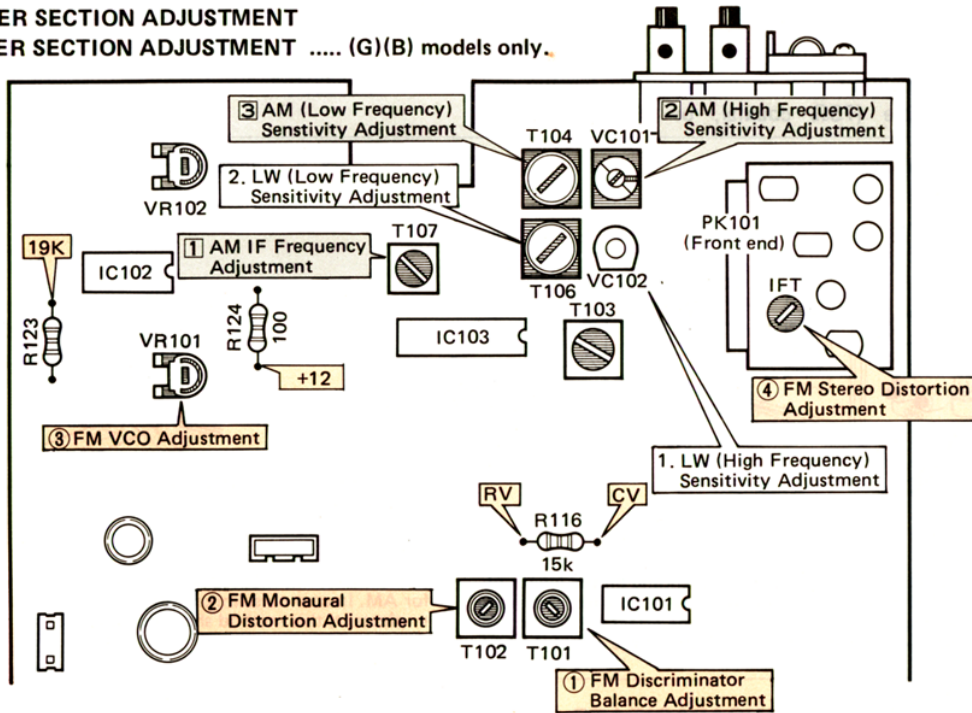


Fig. 9

### Step 1 FM DISCRIMINATOR BALANCE ADJUSTMENT

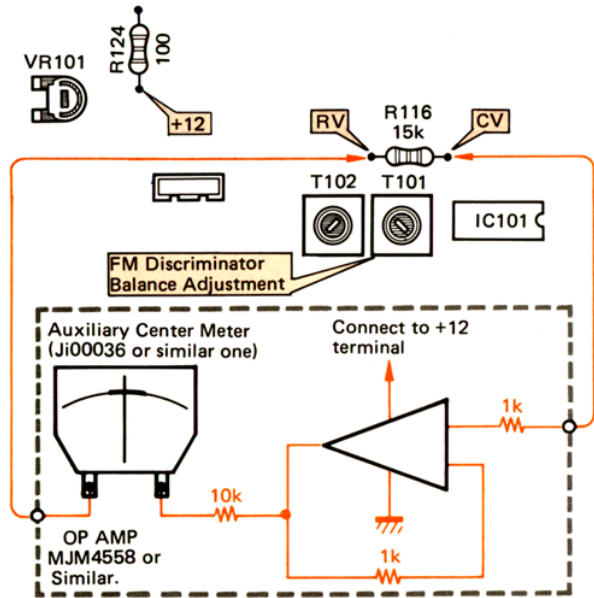


Fig. 10

### Step 3 VCO ADJUSTMENT

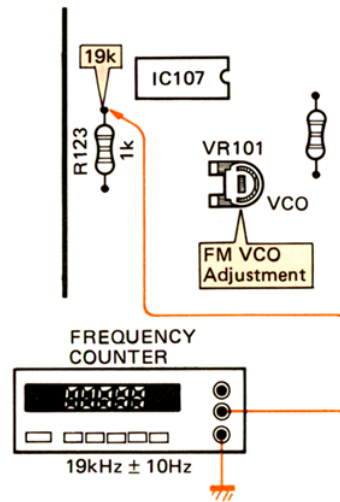


Fig. 11

\* TUNING MODE SWITCH → AUTO/MUTE ON.  
Tune to CW signal and adjust VR101 for  
19kHz ± 10Hz.

\* Connect the auxiliary center meter (Ji00036 or similar) between CV and RV, and adjust T101 for "0" (less than 0.1V DC)

Note 1) After the power switch is pushed on, wait for 5 minutes before measuring, to be sure of the most stable operation.

Note 2) Adjust the OSC coil and IFT with a nonferrous screw driver.

**FM TUNER SECTION**

- On step 1 connect the Auxiliary center meter. (Ji00036 or similar.)
- During adjustments of step 2, 4 and 5, use 200Hz to 15kHz Band Pass Filter.

Measuring instruments abbreviation  
 FM SG : FM signal generator  
 SSG : Stereo signal generator  
 BPF : Band pass filter

Step	Adjustment item	Test point	Instrument required	Adjustment location	Adjustment method	Rating or standard	Remarks
1	Discriminator balance	Between CV and RV	FM SG (98.1MHz ±1kHz 70dBμ (75.2dBf) MONO 1kHz 100% MOD. Auxiliary center meter	T101	Tune to the signal of FM SG and adjust so that the pointer of the auxiliary center meter points to the center.	Between CV and RV.. Less than 0.1V	Refer to Fig. 10.
2	Monaural distortion adjustment	OUTPUT L, R	FM SG (98.1MHz ±1kHz 70dBμ (75.2dBf), MONO 1kHz 100% MOD. Distortion meter BPF	T102	Reduce distortion to minimum.	Distortion Less than 0.5% Less than -46dB	Repeat measuring the ranges 2 or 3 times on step 1 and 2. Confirm that both ratings of step 1 and 2 are satisfactory.
3	VCO adjustment	19kHz test point	Frequency counter	VR101	Set the tuning mode switch to AUTO/MUTE ON position connect the frequency counter, set to 19kHz. Tune to FM SG in CW mode.	19kHz ± 20Hz	Refer to Fig. 11
4	Stereo distortion adjustment	Same as step 2	FM SG, SSG (98.1MHz ±1kHz 70dBμ (75.2dBf) STEREO L,R, 1kHz, 100% MOD. Distortion meter BPF	Front end IFT	Same as step 2	Less than 1.6% Less than -36dB	
5	Separation adjustment	Same as step 2	FM SG, SSG (98.1MHz ±1kHz 70dBμ (75.2dBf) STEREO L or R, 1kHz, 100% MOD.) Level meter BPF	VR102 (G) model only	Adjust so that the leakage level of the opposite channel is minimum. SSG (L or R)	Separation more than 30dB	
6	Auto search reception confirmation		FM SG (98.1MHz ±1kHz 30dBμ (35.2dBf)			Confirm that auto search reception is possible with the tuning button.	

**AM DUMMY ANTENNA CONNECTION**

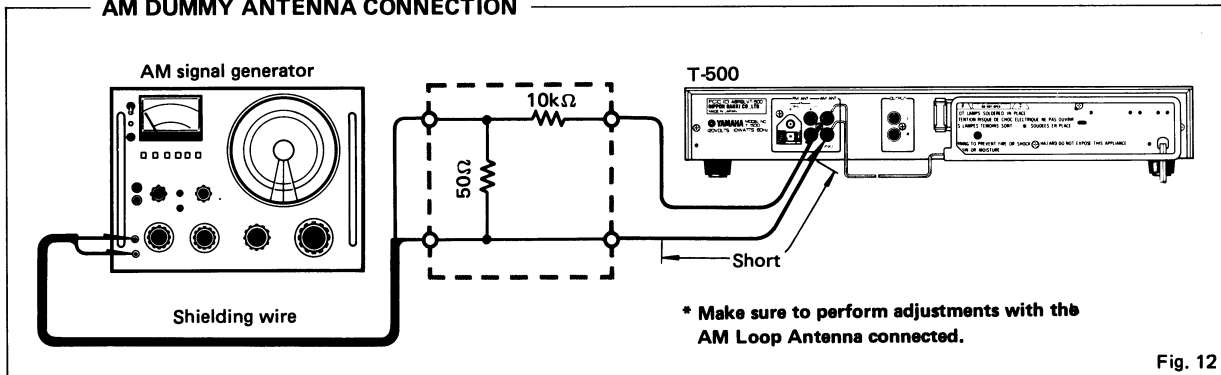


Fig. 12

**AM TUNER SECTION**

- Proceed with the AM section adjustments after having finished the FM section adjustment.
- Connect the AM loop antenna to the AM ANT terminals.

Measuring instrument abbreviation  
AM SG: AM signal generator

Step	Adjustment item	Test point	Instrument required	Adjustment location	Adjustment method	Rating or standard	Remarks
1	IF frequency adjustment	OUTPUT L, R	AM SG (1080kHz ± 0.1kHz) 60dBμ 400Hz 30% MOD.)	T107	Adjust so that the detector output is at maximum.	Sensitivity 60dBμ	If frequency; 450kHz
2	Sensitivity adjustment (High frequency range)	Same as step 1	AM SG (1440kHz ± 0.1kHz) 50dBμ 400Hz 30% MOD.)	VC101	Same as step 1	Sensitivity 60dBμ	
3	Sensitivity adjustment (Low frequency range)	Same as step 1	AM SG (630kHz ± 0.1kHz) 50dBμ 400Hz 30% MOD.)	T104	Same as step 1	Sensitivity 60dBμ	Repeat steps 1 to 3 and adjust so that each sensitivities are satisfactory repeatedly.
4	Signal level indicator confirmation	Signal level indicator	AM SG (1080kHz ± 0.1kHz) 80dBμ		All LEDs of the signal level indicator light up.		
5	Auto search reception confirmation		Same as step 1.			Confirm that auto search reception is possible with the tuning button.	

**LW TUNER SECTION ..... (G) (B) models only**

- Proceed with the LW section adjustments after having finished the AM section adjustment.

- Set the switches to the following positions.  
FUNCTION → LW  
FREQUENCY BAND → (9N + 2) kHz

Step	Adjustment item	Test point	Instrument required	Adjustment location	Adjustment method	Rating or standard	Remarks
1	Sensitivity adjustment (High frequency range)	OUTPUT L, R	AM SG (326kHz ± 0.1kHz) 50dBμ 400Hz 30% MOD.)	VC102	Same as step 1	Sensitivity 63dBμ	
2	Sensitivity adjustment (Low frequency range)	Same as step 1	AM SG (173kHz ± 0.1kHz) 50dBμ 400Hz 30% MOD.)	T106	Same as step 1	Sensitivity 63dBμ	Repeat steps 1 to 2 and adjust so that each sensitivities are satisfactory repeatedly.
3	Signal level indicator confirmation	Signal level indicator	AM SG (326kHz ± 0.1kHz) 80dBμ		All LEDs of the signal indicator light up.		
4	Auto search reception confirmation		Same as step 1.			Confirm that auto search reception is possible with the tuning button.	

DIGITAL CONTROL SECTION ADJUSTMENT

Step	Confirmation item	Confirmation method	Rating or standard	Remarks
1	Confirmation of receiving frequency band	Change the frequency from maximum to minimum using auto or manual search.	FM 87.9 ~ 107.9MHz (U)(C) 87.5 ~ 108.0MHz (A)(B)(G)(R) AM 522 ~ 1611kHz (A)(B)(G)(R) 530 ~ 1620kHz (U)(C)(R) LW ((G)(B) models only) 155 ~ 353kHz FREQUENCY BAND → (9N + 2)kHz 153 ~ 351kHz FREQUENCY BAND → 9kHz Manual FM 0.2MHz Step (U)(C) 0.05MHz Step (A)(B)(G)(R) AM 10kHz Step (U)(C)(R) 9kHz Step (A)(B)(G)(R) LW 9kHz Step (G)(B) models only	
2	Preset memory confirmation	① Receive a broadcast. ② Press the Memory button. ③ Press the Preset station button 1 while the Memory lamp lights. ④ Press Preset station button 1 after changing to another broadcast. ⑤ Press the preset station button 2 to 5 in order as well as button 1.	② Confirm that the Memory lamp lights about 5 seconds. ③ Confirm that LED of P1 lights. ④ Should be possible to receive the station that had been received first. ⑤ Should be possible to preset memory in P2 to P5 and to light each LEDs.	
3	Last channel memory confirmation	Turn the power switch off after receiving FM or AM and then after about 10 seconds turn the power switch back on.	Should be possible to receive the station that had been received before turning the power switch off.	Confirm that the frequency memorized last is called with the power ON unless the memory button is reset.

OPERATING CONFIRMATION / TROUBLE SHOOTING

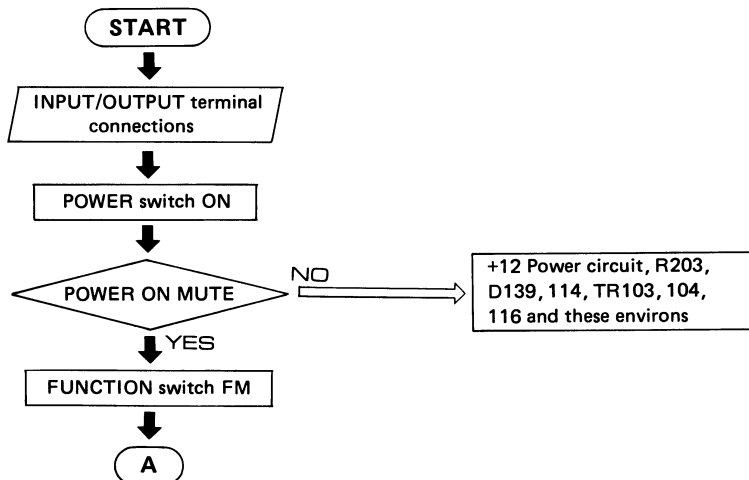
Proceed with this chart in order of FM section, AM section and Digital Control section. Do not move the adjustments if possible.  
 When you have no measuring instrument, jump over the check points which are not possible to check without using the instrument.

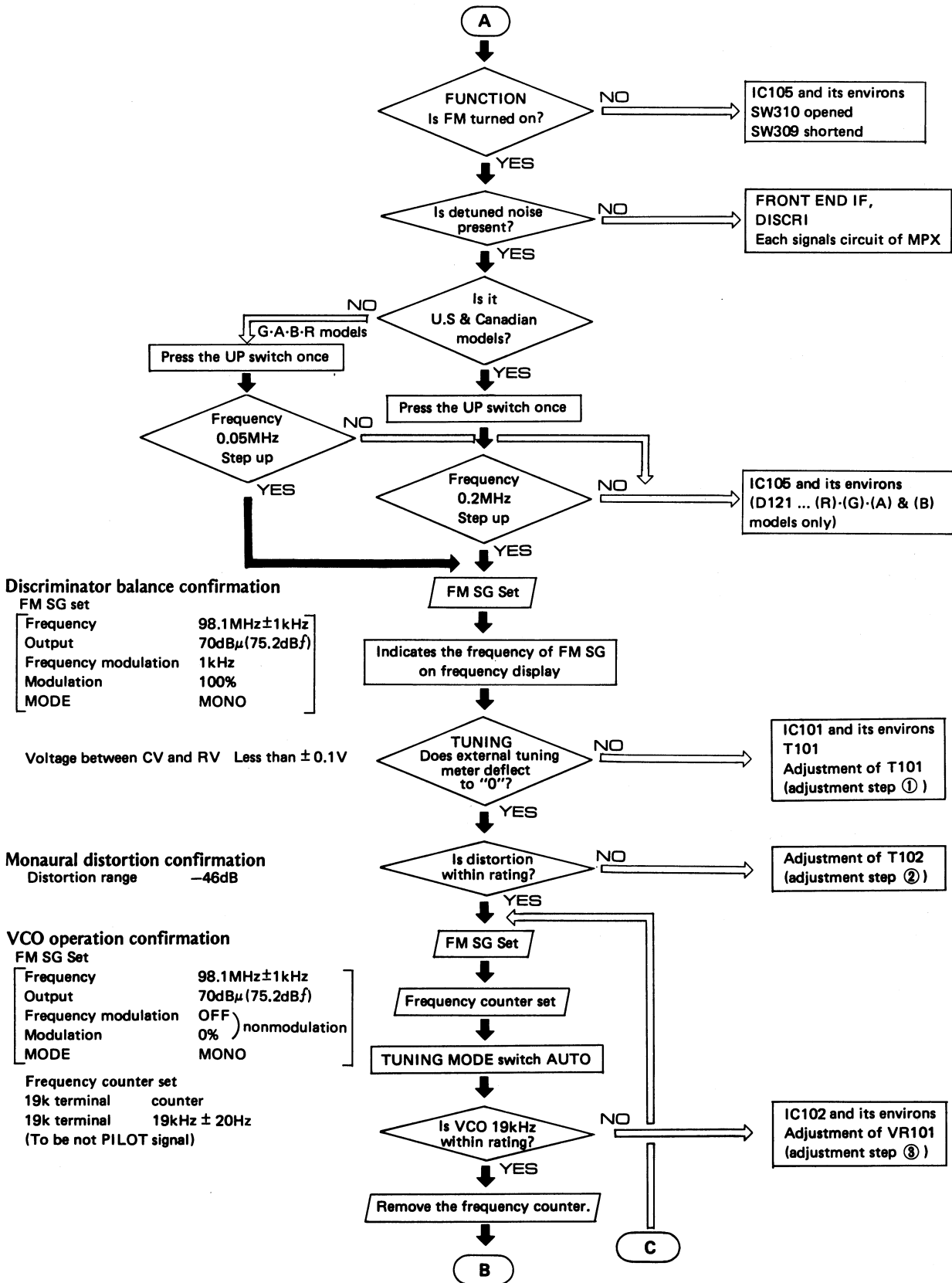
1. FM SECTION

FM ANT (300Ω) — FM SG  
 OUTPUT — Oscilloscope  
 — Distortion meter  
 CV,RV terminal — Auxiliary center  
 TUNING MODE Switch — MAN'L

Power on mute confirmation  
 MUTE time: about a second

Band edge confirmation





**Stereo distortion confirmation**

FM SG Set	
Frequency	98.1MHz±1kHz
Output	70dBμ (75.2dBf)
Frequency modulation	1kHz
Modulation	100%
MODE	STEREO

Distortion range -36dB

**Separation confirmation**

Separation 30dB

**SIGNAL LEVEL**

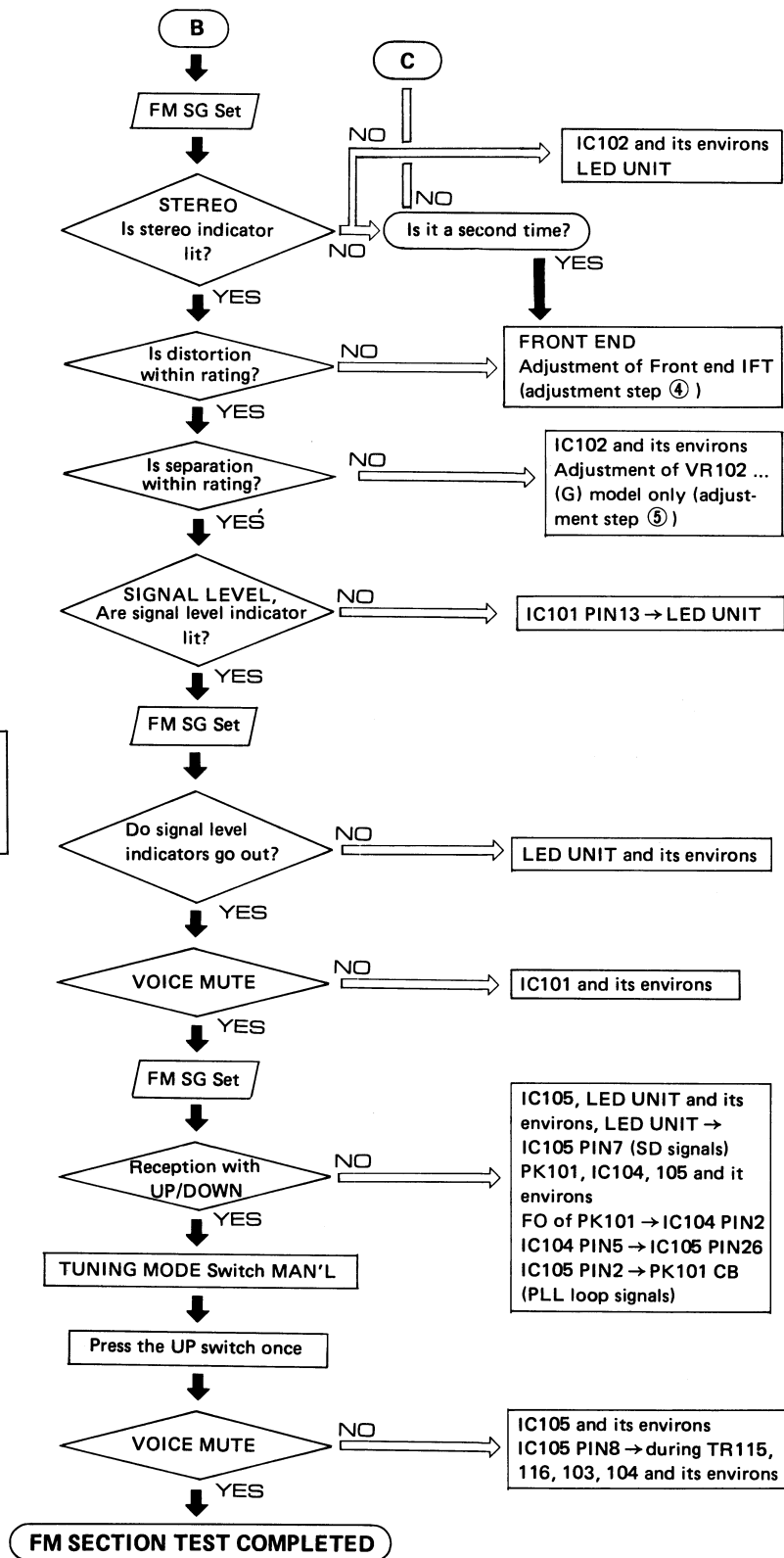
**Indicator operation confirmation**

FM SG Set	
Frequency	98.1MHz±1kHz
Output	-10dBμ (-4.8dBf)
Frequency modulation	1kHz
Modulation	100%
MODE	STEREO

**Auto tuning operation confirmation**

FM SG Set	
Frequency	98.1MHz±1kHz
Output	30dBμ (35.2dBf)
Frequency modulation	1kHz
Modulation	100%
MODE	STEREO
LED UNIT MUT	"H"
IC105 PIN7	"H"

**Control mute Operation confirmation**



2. AM SECTION

AM ANT — AM SG and Loop Antenna  
 OUTPUT — Oscilloscope, Distortion meter  
 TUNING MODE Switch — MAN'L  
 POWER Switch — ON

Band edge confirmation

IF frequency confirmation

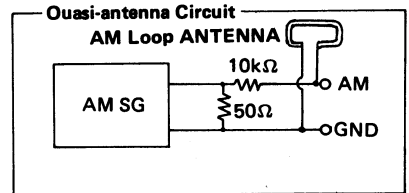
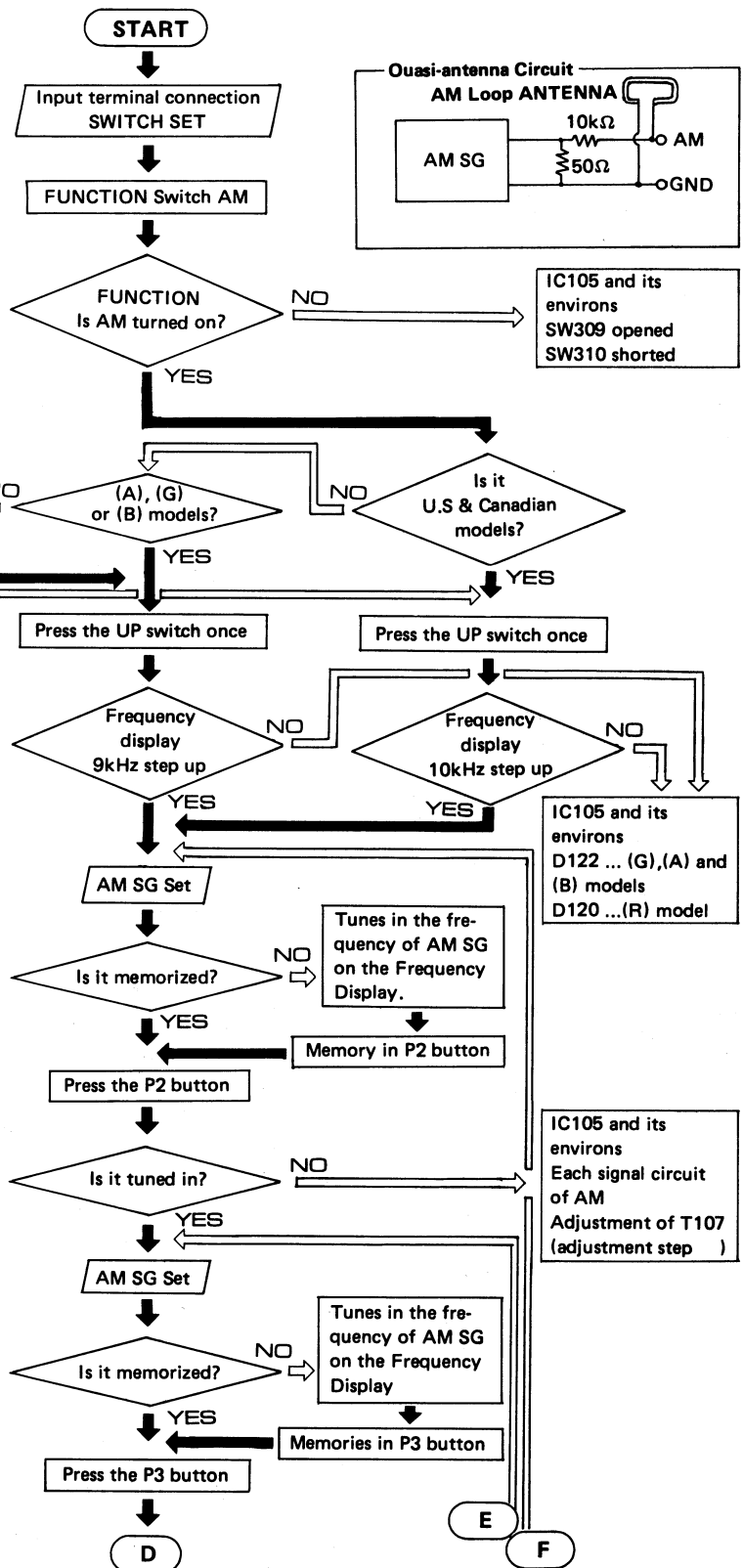
AM SG Set	
Frequency	1080kHz ±0.1kHz
Output	60dBμ
Frequency modulation	400Hz
Modulation	30%

\* "P" of P1 to P6 is abbreviation for "Preset Station button".

Sensitivity adjustment

(High frequency range) confirmation

AM SG Set	
Frequency	1440kHz ±0.1kHz
Output	50dBμ
Frequency modulation	400Hz
Modulation	30%



IC105 and its environs  
 SW309 opened  
 SW310 shorted

IC105 and its environs  
 D122 ... (G),(A) and (B) models  
 D120 ... (R) model

IC105 and its environs  
 Each signal circuit of AM  
 Adjustment of T107  
 (adjustment step )

**Sensitivity adjustment  
(Low frequency range) confirmation**

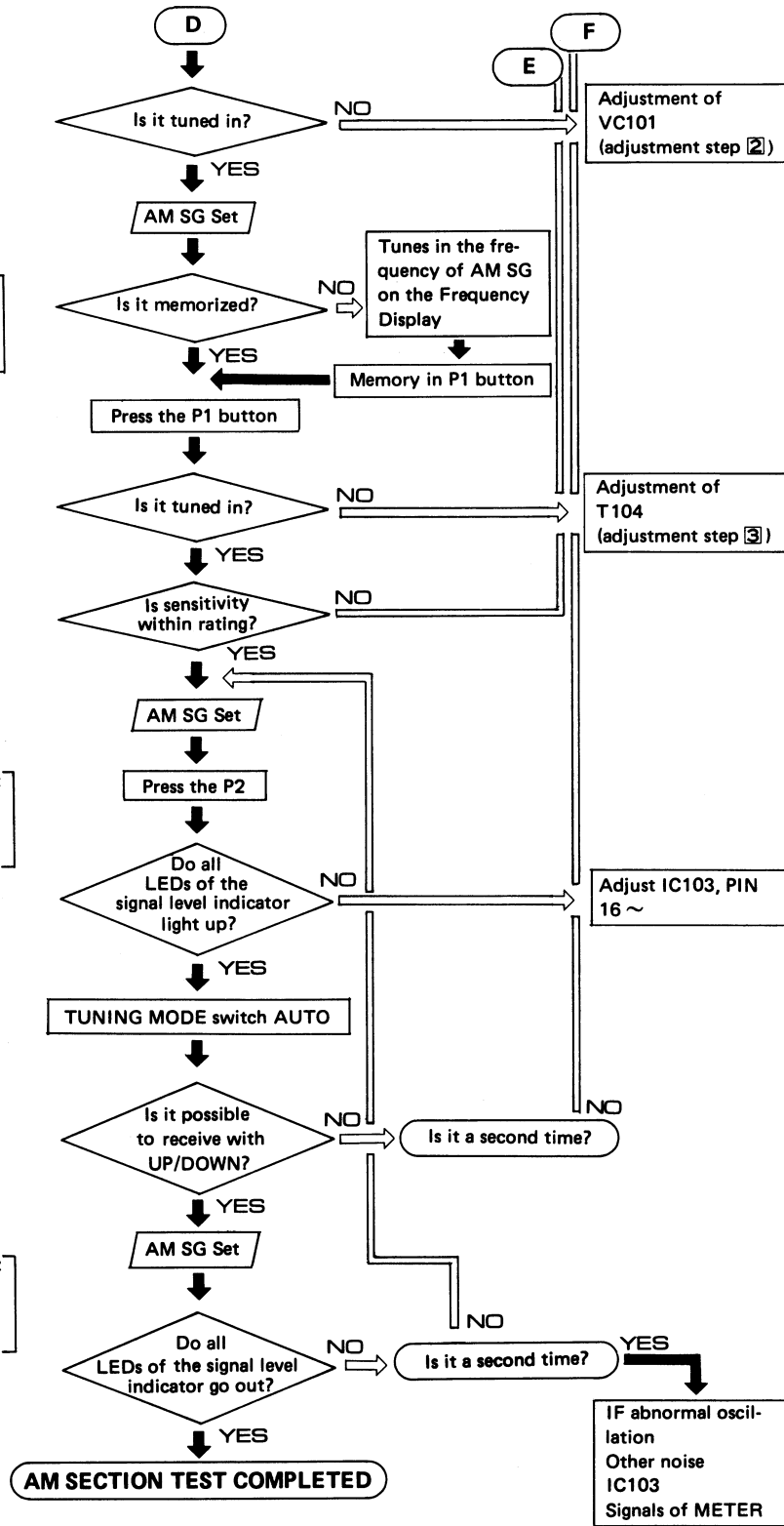
AM SG Set	
Frequency	630kHz ±0.1kHz
Output	50dBμ
Frequency modulation	400Hz
Modulation	30%

**SIGNAL LEVEL indicator**

Confirmation AM SG Set	
Frequency	1080kHz ±0.1kHz
Output	80dBμ
Frequency modulation	400Hz
Modulation	30%

**Auto tuning operating  
Confirmation**

AM SG Set	
Frequency	1080kHz ±0.1kHz
Output	0dBμ
Frequency modulation	400Hz
Modulation	30%



3. LW SECTION (G) (B) models only

Proceed with the LW section adjustments after having finished the AM section adjustment.

AM ANT — AM SG and Loop Antenna  
 OUTPUT — Oscilloscope. Distortion meter.

TUNING MODE Switch — MAN'L  
 FREQUENCY BAND Switch — (9N+2)kHz

Sensitivity adjustment  
 (High frequency range) confirmation

AM SG Set	
Frequency	326kHz±0.1kHz
Output	50dBμ
Frequency modulation	400Hz
Modulation	30%

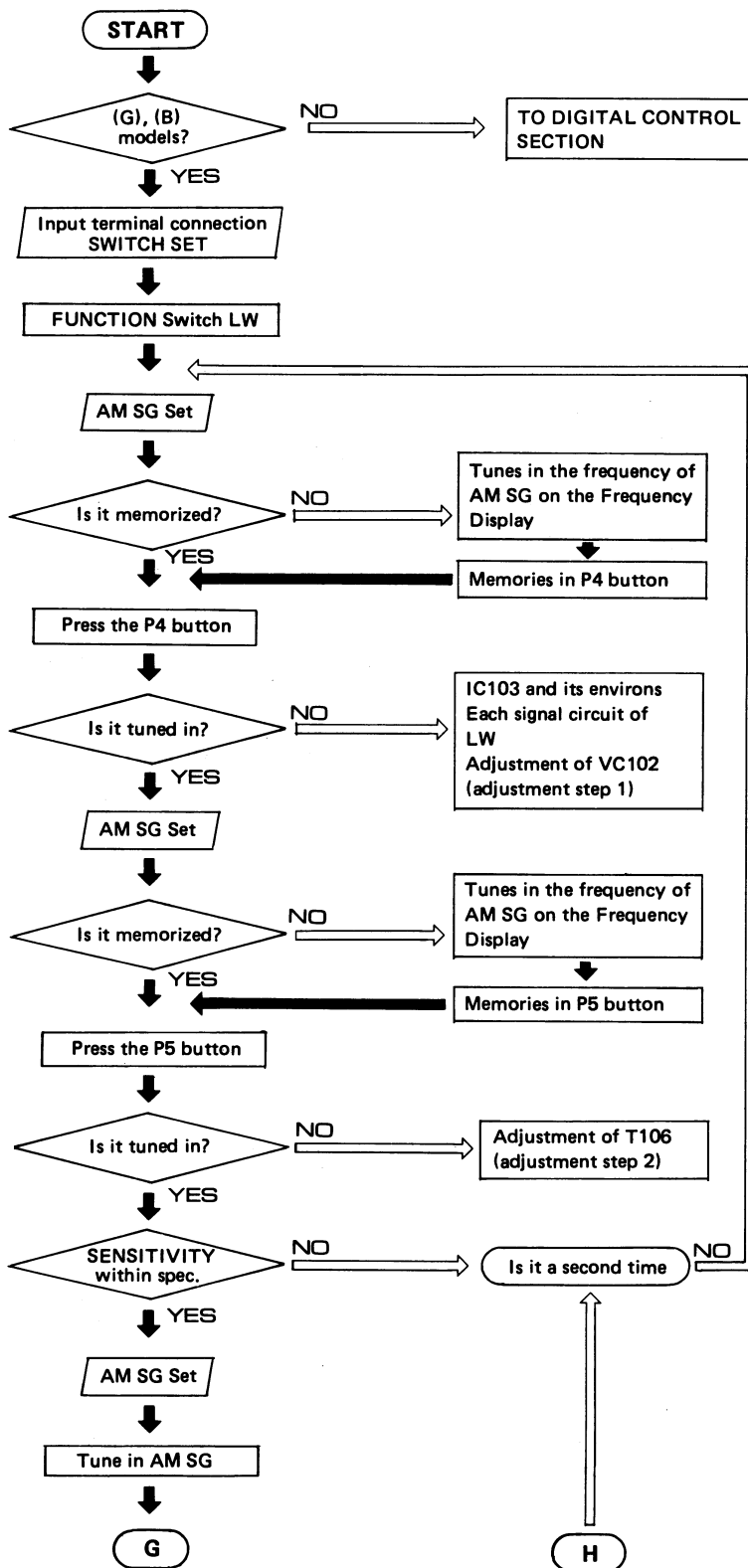
Sensitivity adjustment  
 (Low frequency range) confirmation

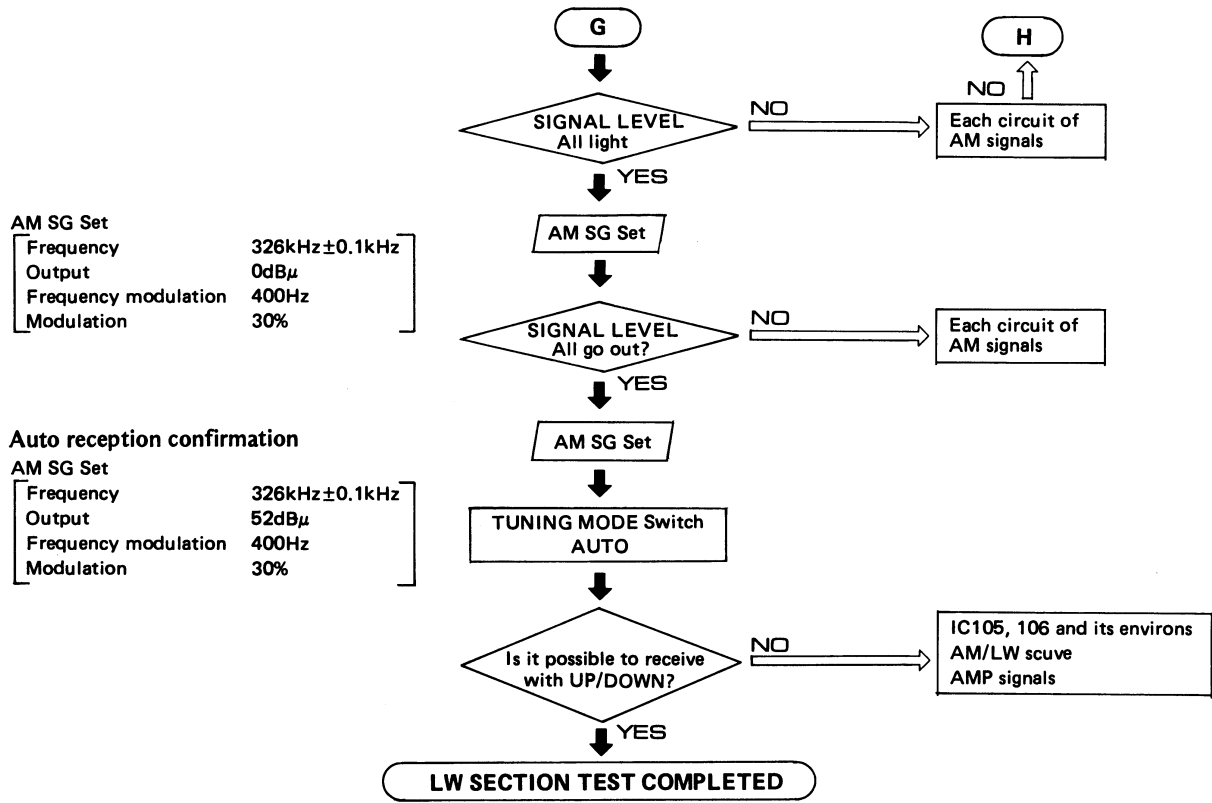
AM SG Set	
Frequency	173kHz±0.1kHz
Output	50dBμ
Frequency modulation	400Hz
Modulation	30%

Range of Sensitivity	
173kHz	63dBμ
245kHz	63dBμ
326kHz	63dBμ

SIGNAL LEVEL indicator  
 Confirmation

AM SG Set	
Frequency	326kHz±0.1kHz
Output	80dBμ
Frequency modulation	400Hz
Modulation	30%

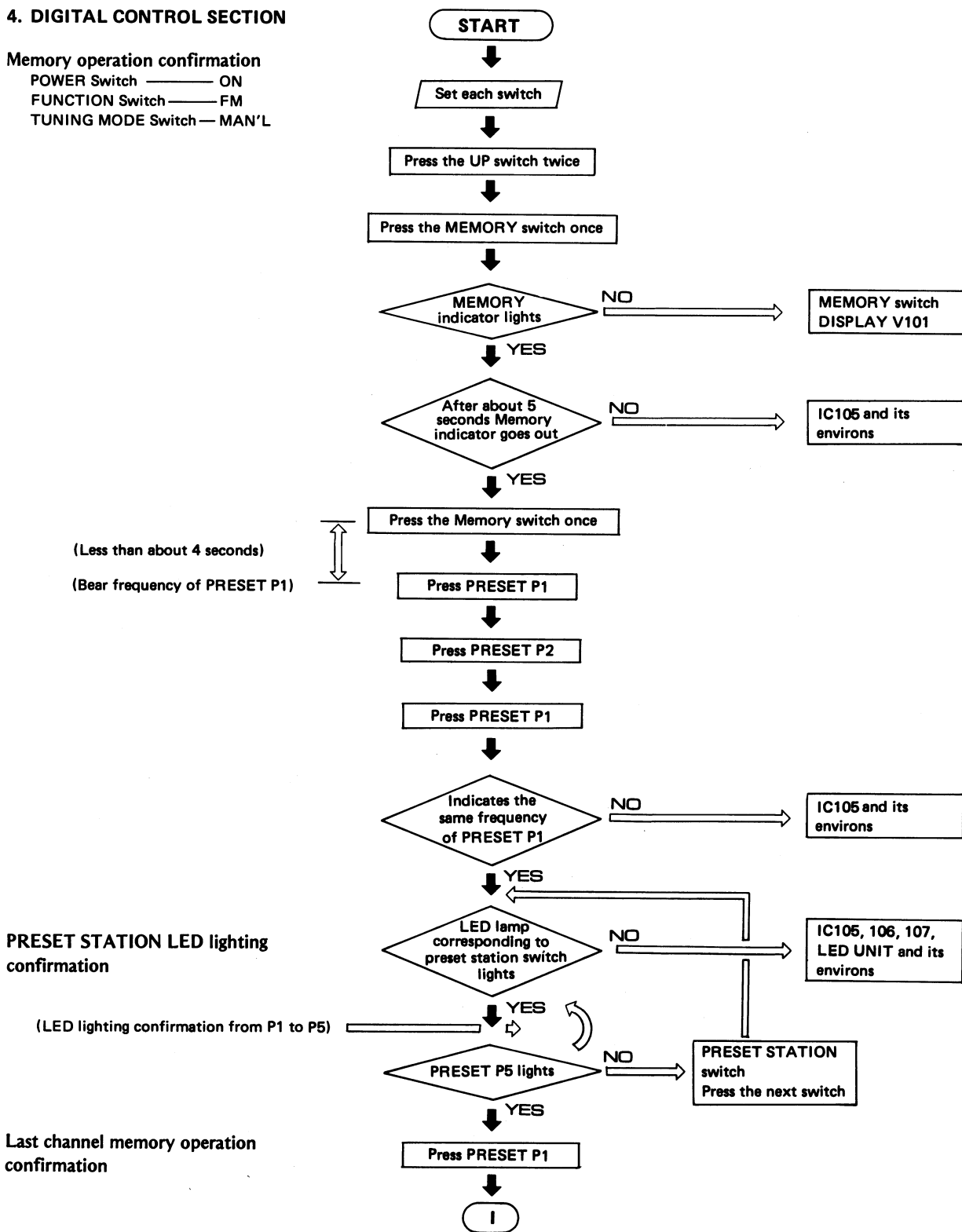


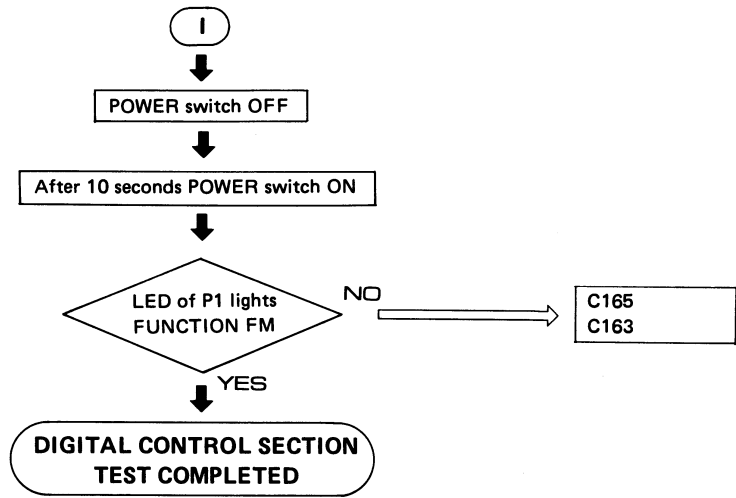


4. DIGITAL CONTROL SECTION

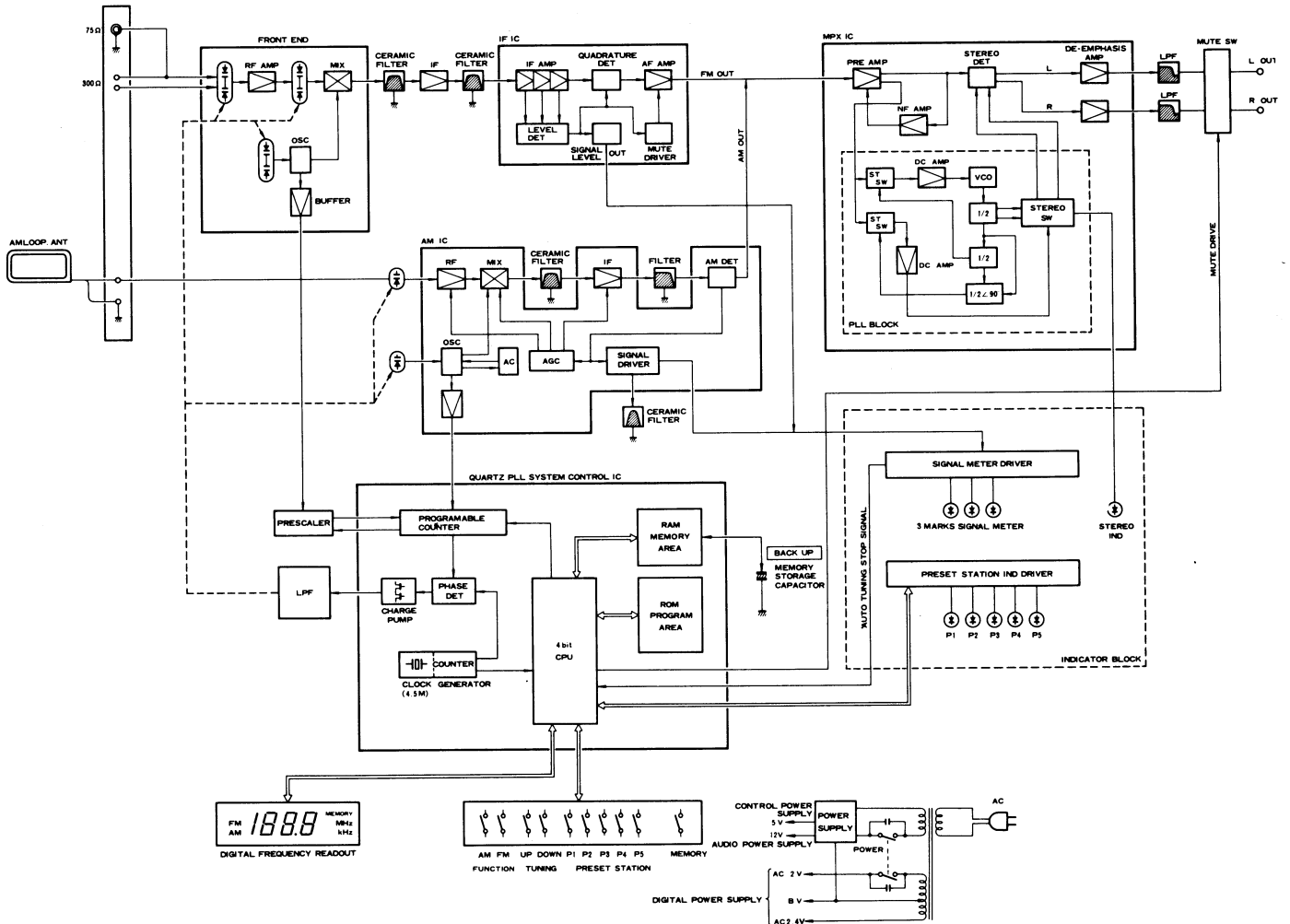
Memory operation confirmation

- POWER Switch — ON
- FUNCTION Switch — FM
- TUNING MODE Switch — MAN'L



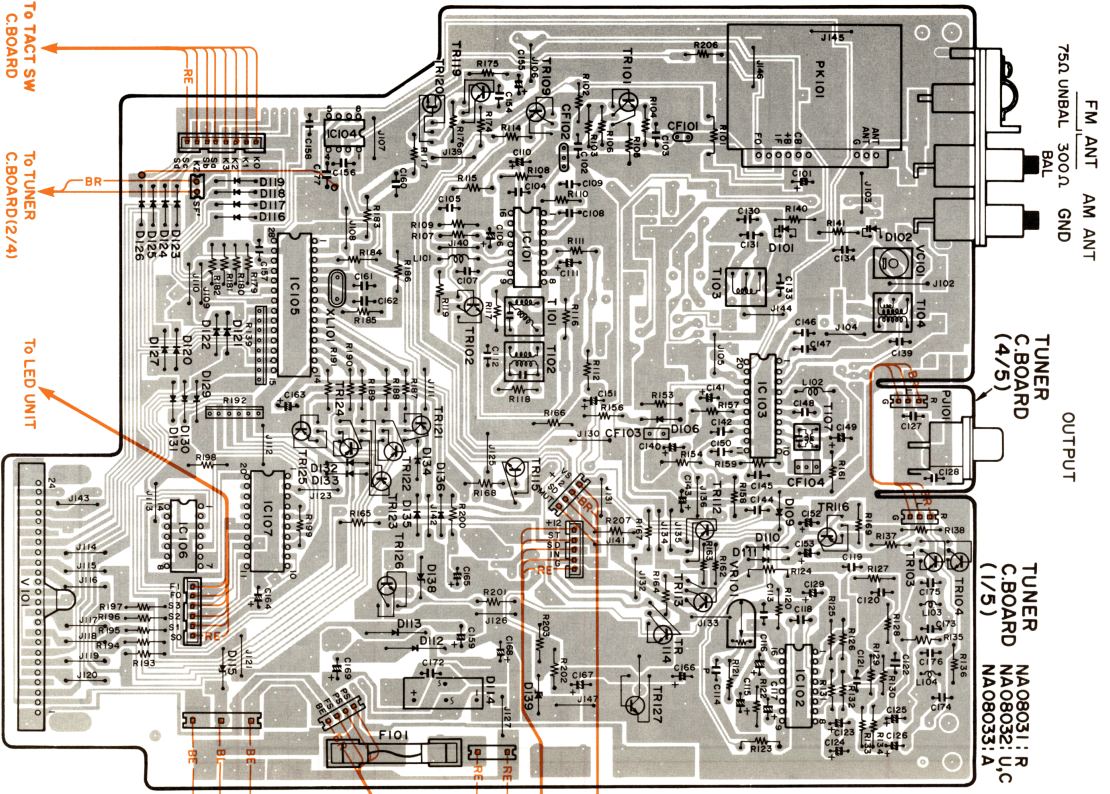


**■ BLOCK DIAGRAM**



PRINTED CIRCUIT BOARD (Pattern side)

U.C.A.R models



FM ANT AM ANT  
750 UNBAL 300Ω GND

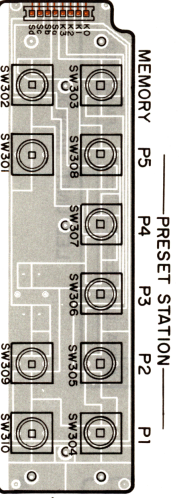
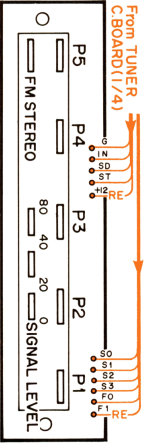
TUNER C-BOARD (4/5)  
OUTPUT

TUNER C-BOARD NA08031:R  
NA08032:U.C  
NA08033:A (1/5)

TUNER C-BOARD (5/5)  
FREQUENCY STEP

TUNER C-BOARD (2/5)  
POWER SW ON OFF

TUNER C-BOARD (3/5)  
TUNING MODE AUTO/MUTE ON MANTL/MUTE OFF FM MONO



	R	U.C	A
D120	Set		Set
D121	Set		Set
D122	Set		Set
J114	Set		Set
TUNER(S)	Set		Set
SW107	Set		Set

- WIRE COLOR ABBREVIATIONS
- BL ▶ Black
  - BR ▶ Brown
  - RE ▶ Red
  - OR ▶ Orange
  - YE ▶ Yellow
  - GR ▶ Green
  - BE ▶ Blue
  - VI ▶ Violet
  - GY ▶ Gray
  - WH ▶ White
  - GG ▶ Light Green
  - SB ▶ Light Blue
  - PK ▶ Pink

To TACT SW C-BOARD

To TUNER C-BOARD(2/4)

To LED UNIT

From TUNER C-BOARD(1/4)

From TUNER C-BOARD(1/4)

To TUNER C-BOARD(2/4)

To LED UNIT C-BOARD

From POWER TRANSFORMER

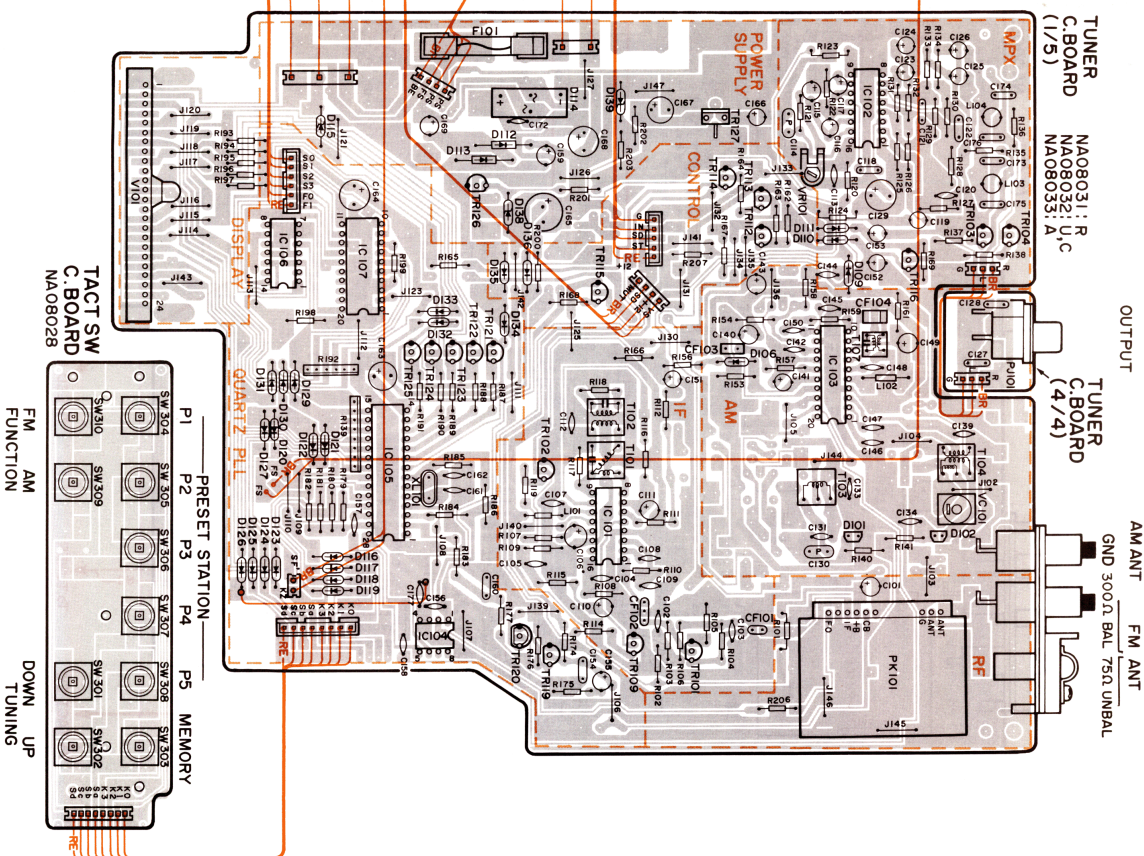
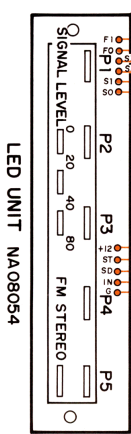
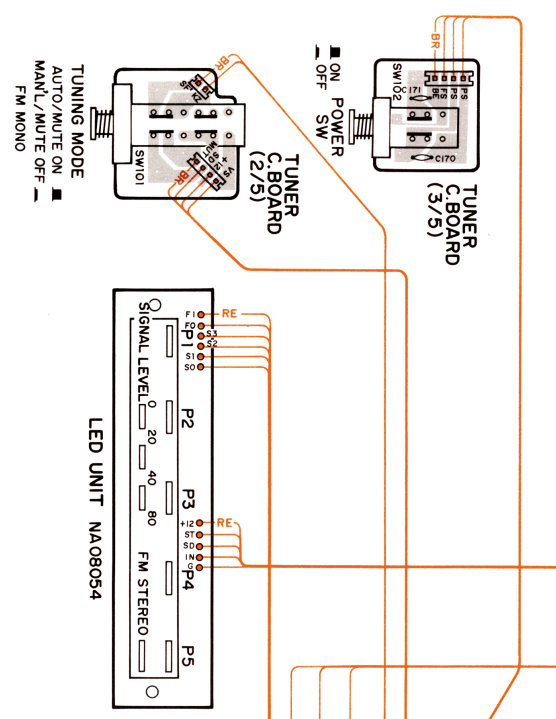
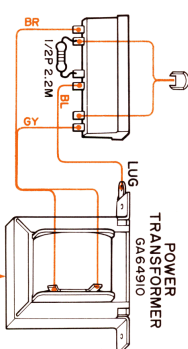
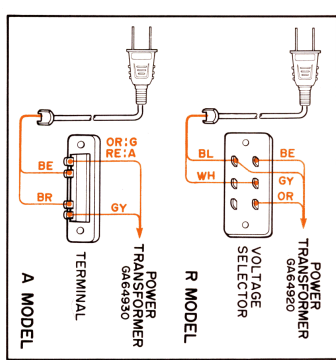
From TUNER C-BOARD(1/4)

From TUNER C-BOARD(1/4)

● WIRING DIAGRAM (Parts side)  
● U.C.A.R models

D120	R	U.C	A
D121	Set	Set	Set
D122	Set	Set	Set
J114	Set	Set	Set
TUNER(S)	Set	Set	Set
SW107	Set	Set	Set

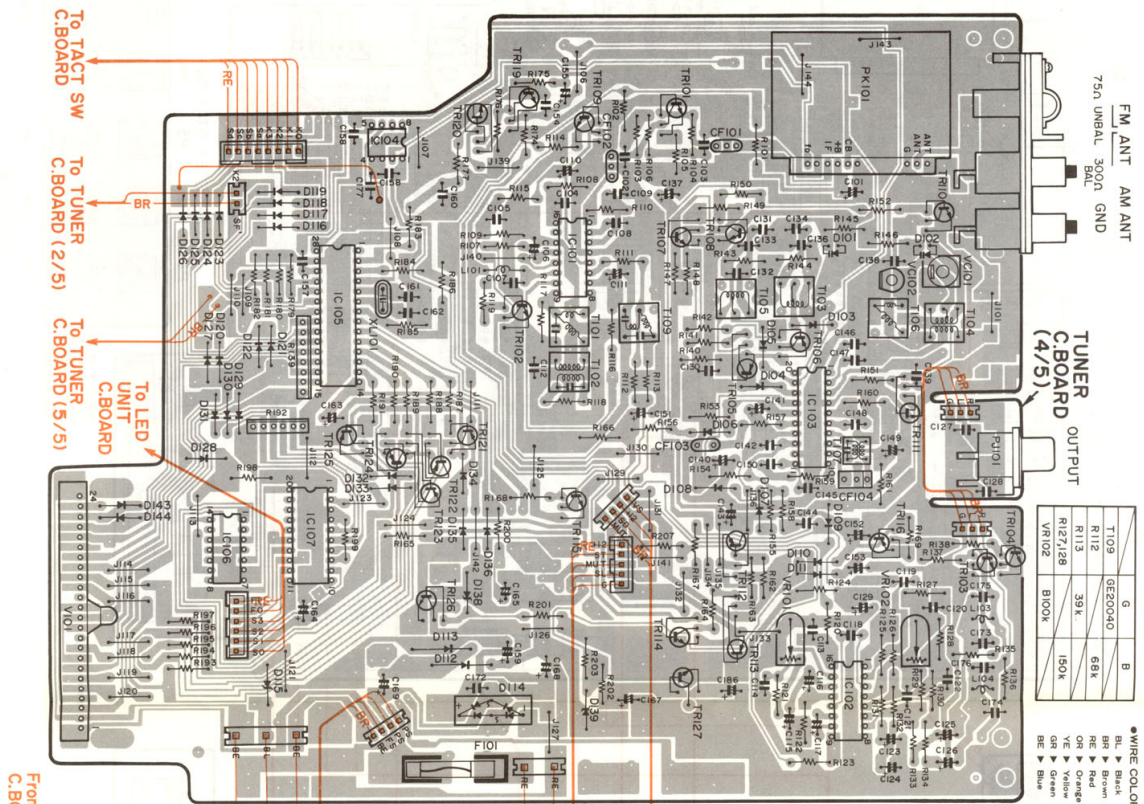
● WIRE COLOR ABBREVIATIONS  
 BL = Black    VI = Violet    WH = White  
 BR = Brown    GY = Gray    LG = Light Green  
 OR = Orange    BE = Blue    PK = Pink  
 YE = Yellow





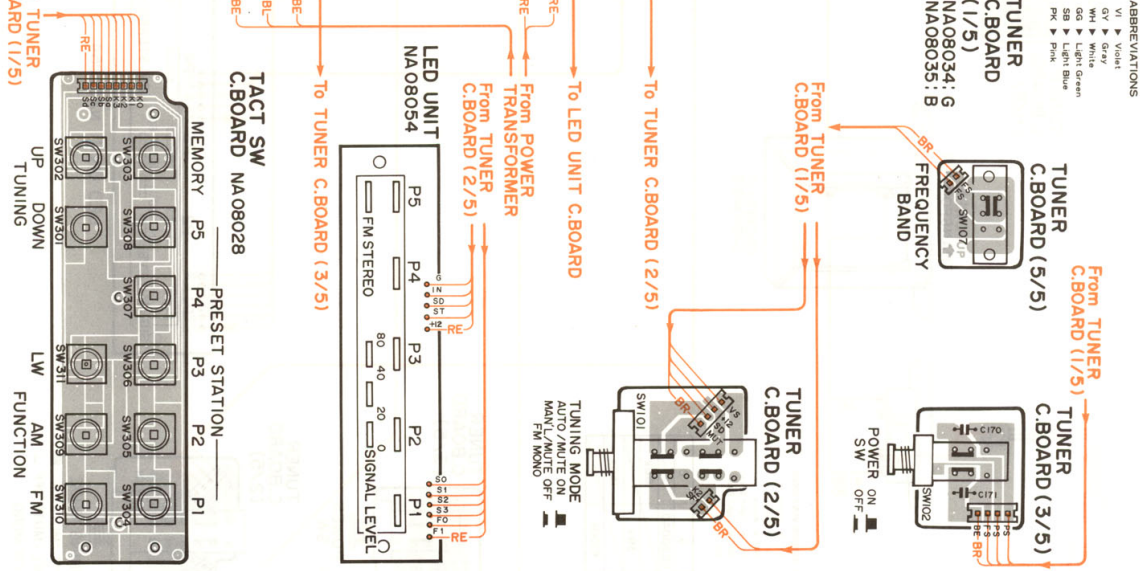


**PRINTED CIRCUIT BOARD (Pattern side)**  
 ● G,B models



	G	B
TI09	GE2020	68K
RI12	39K	150K
RI27,28	BOOK	
VA102		

- WIRE COLOR ABBREVIATIONS
- BL ▶ Black
  - BR ▶ Brown
  - BE ▶ Red
  - VE ▶ Yellow
  - GR ▶ Green
  - BE ▶ Blue
  - VI ▶ Violet
  - GV ▶ Gray
  - WH ▶ White
  - LG ▶ Light Green
  - VE ▶ Light Blue
  - PK ▶ Pink



1

2

3

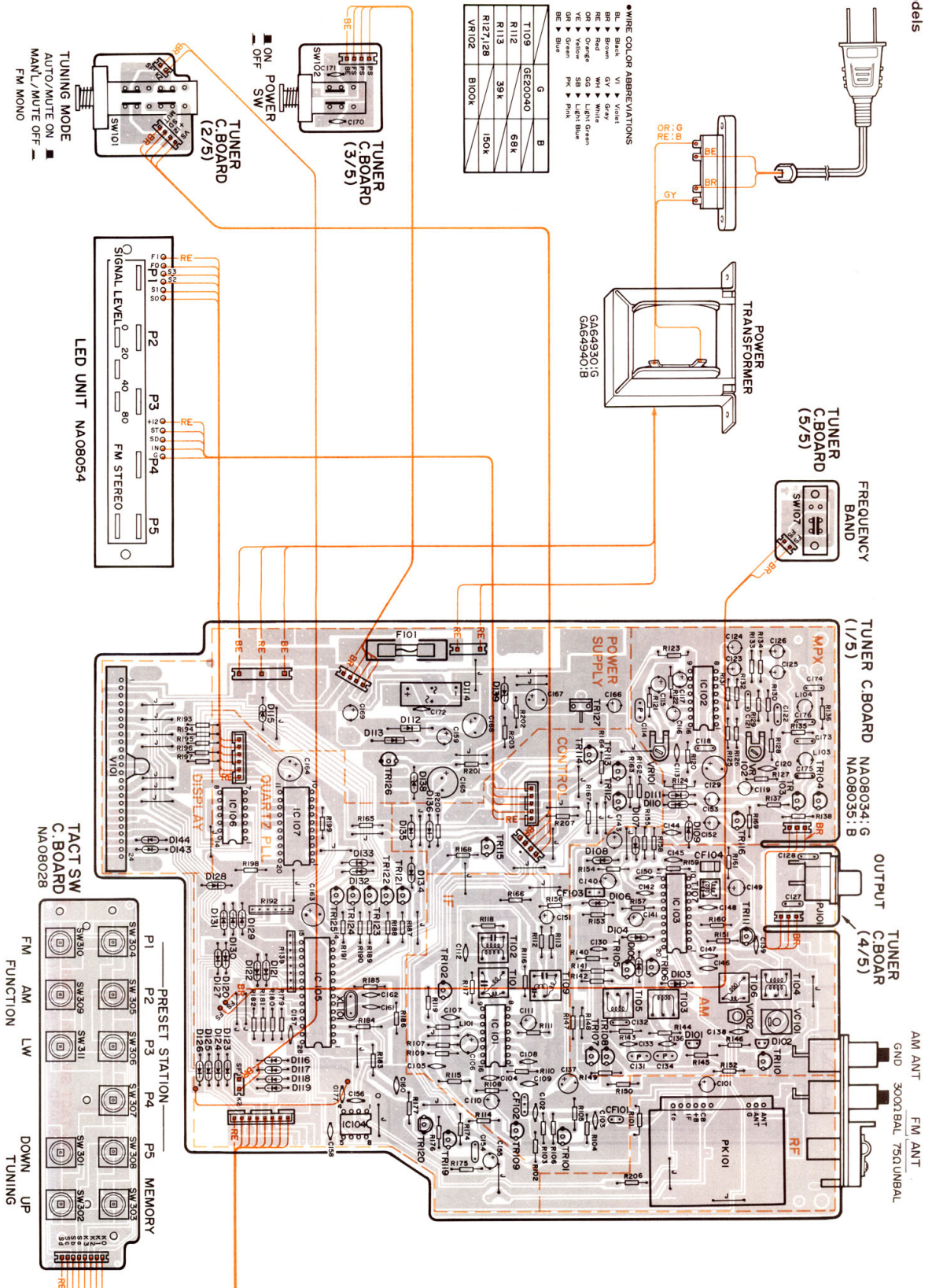
4

5

6

■ WIRING DIAGRAM (Parts side)

● G,B models



- WIRE COLOR ABBREVIATIONS
- Blk ▶ Black
  - BR ▶ Brown
  - RE ▶ Red
  - OR ▶ Orange
  - GR ▶ Green
  - BE ▶ Blue
  - VI ▶ Violet
  - GY ▶ Gray
  - WH ▶ White
  - LG ▶ Light Green
  - Lk ▶ Pink

T109	G	B
GE20040	68K	
R112	39K	
R113	150K	
R127/28	B100K	
VR102		