

# **A.G.Tannenbaum**

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## **Electronic Service Data**

P.O. Box 386, Ambler PA 19002

Phone 215 657 0106 Fax 215 657 0520

Web Page [www.agtannenbaum.com](http://www.agtannenbaum.com)

**SANSUI**

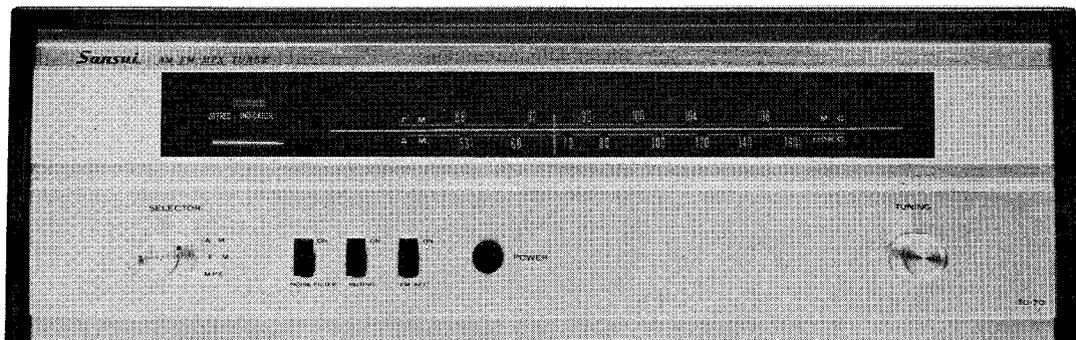
MODEL TU-70  
TUNER



# OPERATING INSTRUCTIONS & SERVICE MANUAL

AM/FM MULTIPLEX STEREO TUNER

SANSUI TU-70



*Sansui*

SANSUI ELECTRIC COMPANY LIMITED

One of the most important features in an advanced AM/FM multiplex tuner is silence. This TU-70 is provided with a noise component eliminator circuit. It shuts out violent noises like motor ignition, television and other disturbing waves. The two-stage RF amplifier with two Nuvistors and a three-gang variable capacitor gives you high sensitivity of IHFM standard 1.8 microvolts. This booklet explains the steps necessary for operating and caring for your new MODEL TU-70. Read all the instructions carefully and retain for future use.

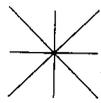
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# SANSUI

AM/FM MULTIPLEX  
STEREO TUNER



MODEL

# TU-70

# FEATURES SPECIFICATIONS CHARACTERISTICS

## FEATURES

### FM HIGHLY SENSITIVE TWO-STAGE RF AMPLIFIER USING TWO NUVISTORS AND THREE-GANG VARIABLE CONDENSER

This top-quality, super-sensitive tuner fully incorporates the best of Sansui's techniques as demonstrated by the RF amplifier consisting of two Nuvistors. Read these instructions carefully before you use the tuner for the first time. The TU-70 tuner has an extremely compact, high-gain RF amplifier for FM which uses two cascade-coupled, low-noise Nuvistor tubes with a three-gang variable condenser. Therefore, the tuner outperforms conventional single-stage grounded-grid RF amplifiers by 10 db in amplification and assures stable, high-selectivity, high fidelity reception.

The TU-70 tuner has sensitivity characteristics of 1.2 microvolts at 20-dB quieting 100% modulation and 1.8 microvolts at 30-dB quieting 100% modulation. Unwanted radio waves are so negligible that they do not interfere with TV and other receivers.

### DOUBLE-LIMITER SHUTS OUT NOISES

The TU-70 tuner is equipped with a two-stage noise limiter, which works effectively even where the field intensity is weak. It reliably eliminates a wide variety of noises such as annoying ignition sounds and other interference.

### MUTING SWITCH SUPPRESSES NOISE DURING CHANNEL SELECTION

Unlike conventional FM receivers, which produce loud noise in the absence of input because their limiters require a certain level of input voltage to perform their noise-limiting function, the TU-70 tuner produces no noise even when not tuned to any station. This is because it has a built-in

"muting switch" (squelch circuit) which disconnects the audio amplifier stage automatically when tuner input drops below a certain level.

### AMAZING CHANNEL SEPARATION OF 37DB AND MORE ENSURED BY ADVANCED FM MULTIPLEX CIRCUIT

The adoption of the most advanced switching matrix method for the multiplex circuit has amazingly improved the performance of the TU-70 tuner. Channel separation is minimum 37 dB at 1 kc and distortion is maximum 1% at 1 kc.

### FULL-FLEDGED AUTOMATIC FREQUENCY CONTROL (AFC)

The TU-70 has a full-fledged AFC, which can be switched off if you like. The AFC enables you to enjoy a stabilized reception of FM broadcasts for many hours once you have tuned to.

### EASY-TO-SEE FM MULTIPLEX STEREO INDICATOR

The FM Multiplex Stereo Indicator actuated by precision transistors helps you tune to FM stereo stations easily and reliably.

### AM SINGLE-STAGE RF AMPLIFIER WITH THREE-GANG VARIABLE CONDENSER

The addition of a single-stage RF amplifier to the AM tuner has improved its sensitivity remarkably. This makes it particularly useful for DX reception. Moreover, it has such an excellent image ratio that no beat is produced between your station and another neighboring station.

### BUILT-IN, HIGH-SENSITIVITY FERRITE ANTENNA

The built-in, high-sensitivity ferrite antenna adds to your listening pleasure by reducing noise to less than that of conventional tuners.

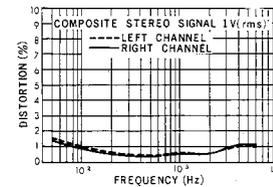
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## SPECIFICATIONS

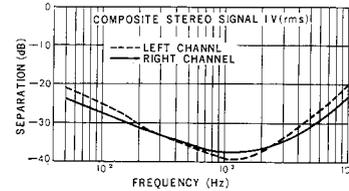
Tubes and Diodes (14 tubes and 13 diodes)	6CW4 (Nuvistor)×2, 6AQ8×3, 6AU6×2, 6BA6×3, 6BE6×1, 6BL8×1, 6R-E13×1, 12AU7×1, OA-81 (Ge diode)×10, MA-311 (VC)×1, SD-1B (Si diode)
FM Tuner	
Frequency range	88~108 Mc
Bandwidth	230 kc (-3 dB)
Intermediate frequency	10.7 Mc
Sensitivity	1.8 microvolts at 30-dB quieting IHFM 1.2 microvolts at 20-dB quieting 100% modulation (300 Ω) 1.1 microvolts at 30-dB quieting 100% modulation (75 Ω) min. 52 dB
Image ratio	
Frequency response characteristics	±2 dB, 30 cps—15 kc
Distortion	max. 1% at 100% modulation
AM Tuner	
Frequency range	535—1605 kc
Bandwidth	7 kc (-3 dB)
Intermediate frequency	455 kc
Sensitivity	6 microvolts at 20-dB S/N ratio, 30% modulation min. 75 dB
Image ratio	
FM Multiplex	
Frequency response characteristics	±2 dB, 30 cps—15 kc
Channel separation	37 dB at 1 kc
Distortion	max. 1% at 1 kc
Output Level	min. 1.2 volts at FM stereo and monaural input of 10 microvolts or over, 30% modulation
Accessory Circuits	
Noise filter	Can be switched on and off (-13.5 dB, 10 kc)
Muting circuit	Can be switched on and off
AFC circuit	Can be switched on and off
Indicators	FM stereo indicator (actuated by transistors), Tuning indicator
Power consumption	60 volt-amperes
Power requirements	AC 100, 117, 220 or 240 volts, 50/60 cps
Size	Width 405 mm (15'. 95") Depth 320 mm (12'. 60") Height 142 mm (5'. 59")
Weight	7.5 kg (16.5 lbs)

## CHARACTERISTICS

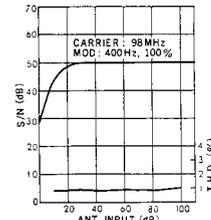
FM MPX DISTORTION CHARACTERISTICS



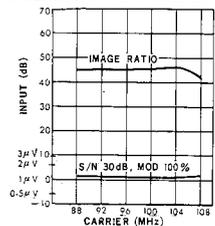
FM MPX CHANNEL SEPARATION



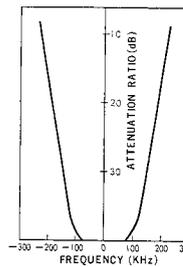
FM S/N RATIO & DISTORTION



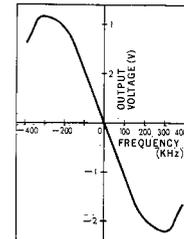
FM SENSITIVITY & IMAGE RATIO



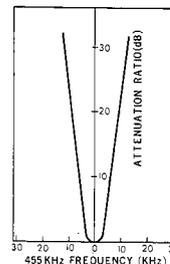
FM IFT CHARACTERISTICS



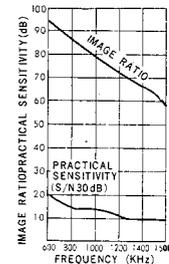
DISCRIMINATOR CHARACTERISTICS



AM IFT CHARACTERISTICS



PRACTICAL AM SENSITIVITY IMAGE RATIO



# CONNECTIONS

## ANTENNAS

### AM ANTENNA

As illustrated below, pull the ferrite bar antenna "A" toward you on the axis "b". Observing the tuning indicator, set this antenna for the best reception place. If it is not possible to get a reasonable reception, untighten one of the screws which are fastened to the chassis, and turn the whole antenna for the best reception. (Fig. 3) This ferrite antenna is designed to be good enough for all receptions, except when the station signal is extremely weak due to excessively long distance from your desired station, topography, etc. For the ferrite antenna inadequate to the weak radio reception, connect the AM antenna (PVC wire) to the terminal AM-A and a ground wire to AM-E. To install, support it horizontally

and apart from your building as shown in Fig. 2 and set it for the finest reception. Note that the antenna sensitivity depends largely on the position to which the antenna is installed. For safety reason, be sure to install a lightning arrester with the outdoor antenna.

### FM ANTENNA

Connect the FM antenna (fader wire) to the terminals FM-A1 and -A2. If you live near the station or the signal is strong, put it up like "T" in your room. If you live in a thick-wall building or far away from your desired station and if the signal is too weak to receive with the indoor antenna, install an outdoor antenna exclusively for FM reception as shown in Fig. 1. Remember that the proper height and direction (not length) of the antenna are vital to the best reception.

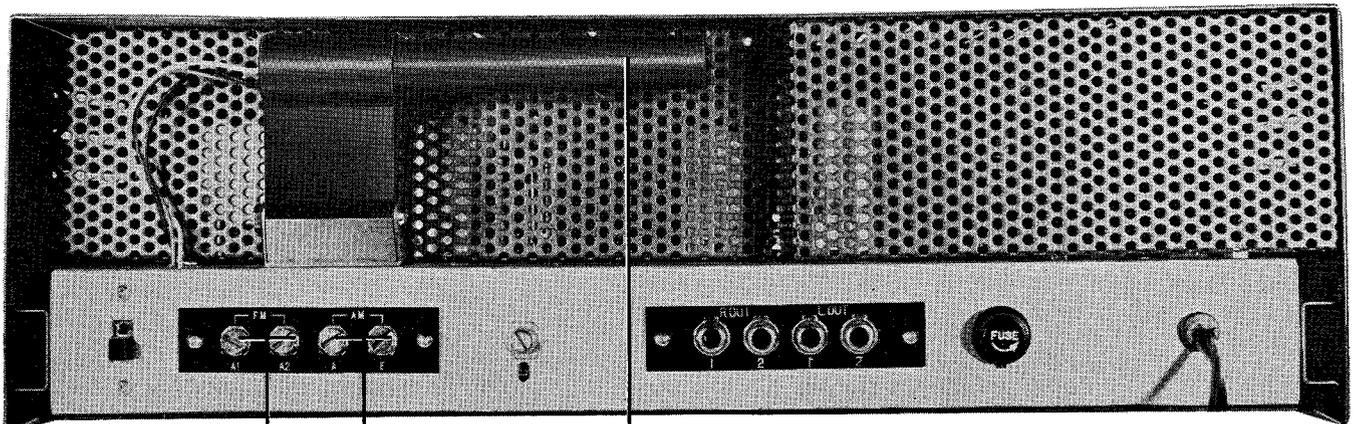
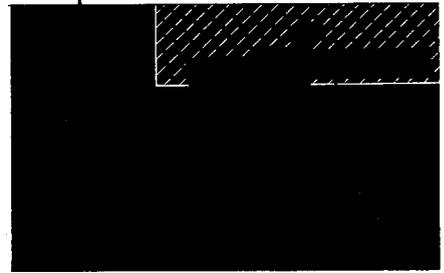
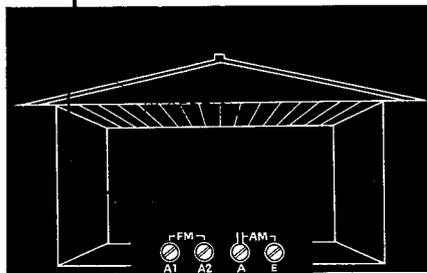
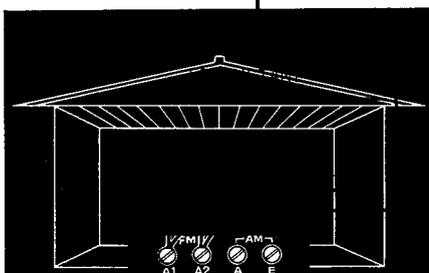


Fig. 1

Fig. 2

Fig. 3



## AMPLIFIER OR STEREO SET

This tuner alone cannot reproduce FM signals it receives. It must be connected to an amplifier, or a stereo set which has no FM or AM tuner.

### 1. Connecting to a Control Amplifier

Connect the "OUT" terminal of your TU-70 to the "TUNER" or "AUX" terminal of the preamp/power amplifier—e.g. Sansui AU-70—with a shieldwire.

### 2. Connecting to a Pre-amplifier

Connect the "OUT" terminal of your TU-70 tuner to the "TUNER" or "AUX" terminal of the pre-amplifier with a shieldwire. In this case, you have to connect a power amplifier to the pre-amplifier.

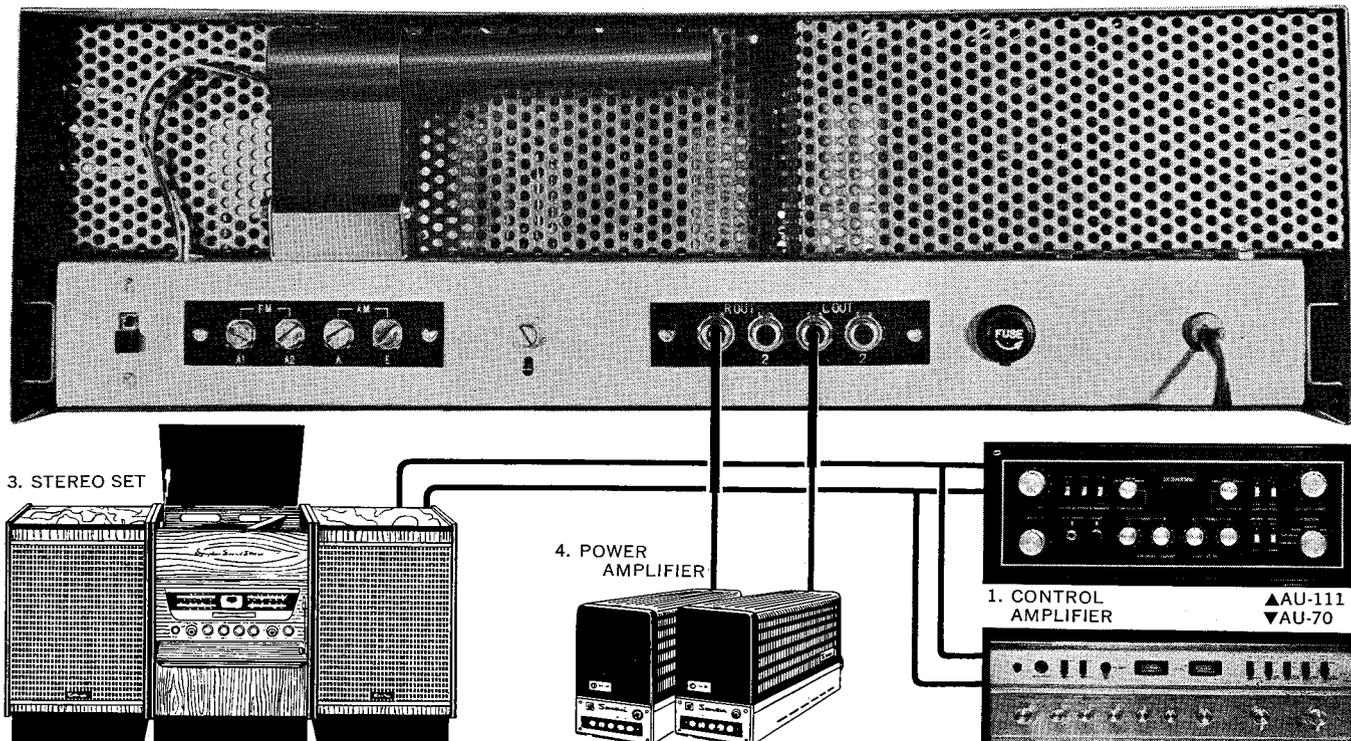
### 3. Connecting to a Stereo Set or Radio

Connect the "OUT" terminals of your TU-70 to the "AUX" or "TUNER" terminals of the stereo set with shieldwire. If the stereo set has neither "TUNER" nor "AUX" terminal, use the "PHONO" terminal (for crystal player input):

### 4. Connecting to a Power Amplifier

Connect the "OUT" terminal of your TU-70 tuner to the input terminal of the power amplifier (the pre-amplifier section which has no tone control circuit) e.g. Sansui Q-55—with a shieldwire.

In this case, you might not get satisfactory results when the output level of the TU-70 tuner does not match the input level of the amplifier. Moreover, an amplifier without a



# CONNECTIONS

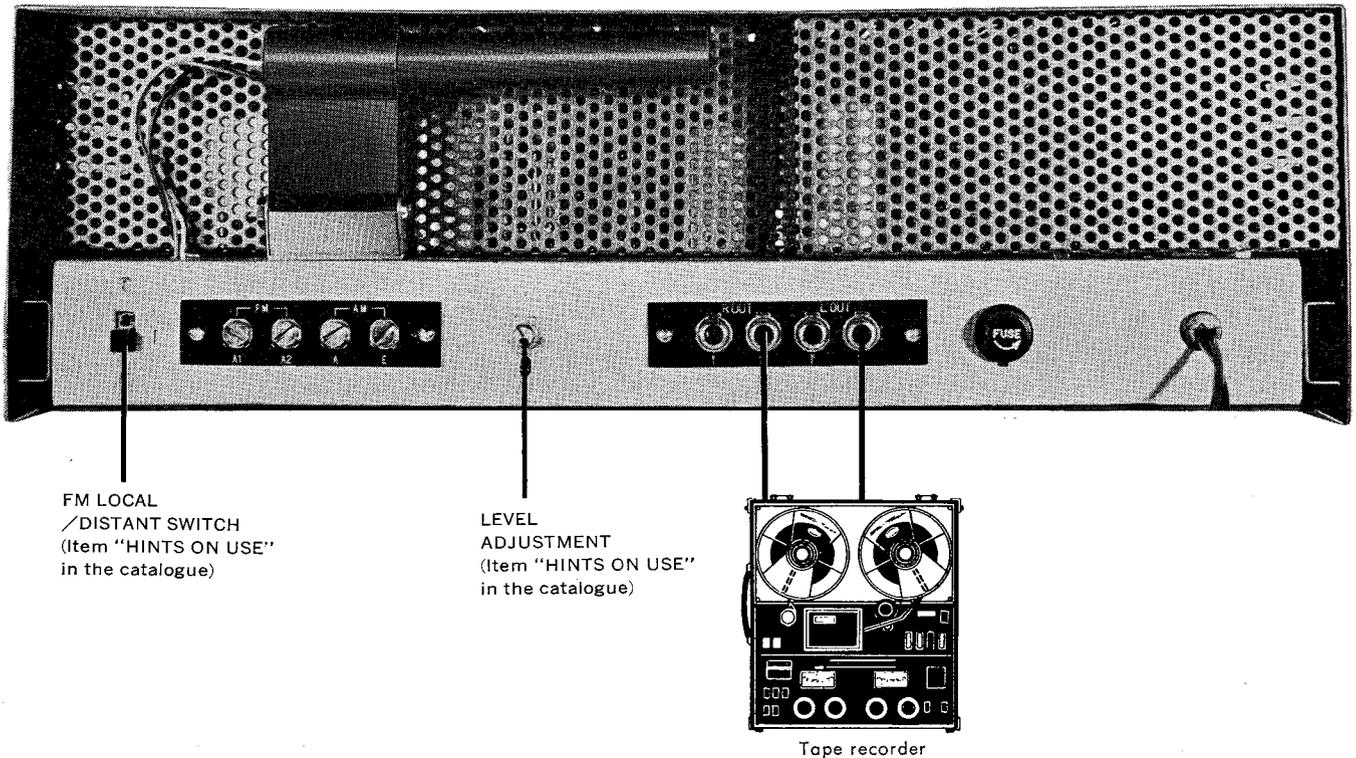
tone control or filter circuit might not be usable, particularly when the noise level is high. N.B.—Read the instructions for the stereo set, amplifier, or other equipment you use so that there can be no error in connection or operation.

If the input terminal of the stereo set or other equipment is not the pin-jack type, make the necessary connections as follows: Connect the conductor with the shieldwire to (+) of the input terminals or to the "PU" terminal. Connect the metal sheath of the shieldwire to (-) of the input terminals or to the "E" terminal. In case of monaural operation, you can use either L or R terminal for the connection.

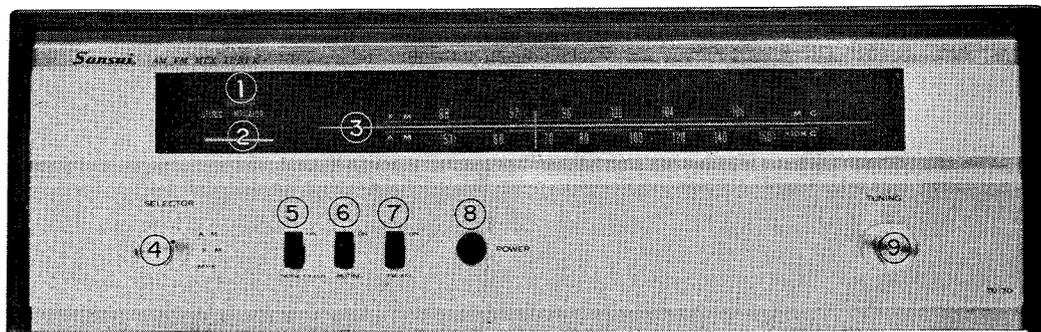
## CONNECTING TO A TAPE RECORDER

You can use the tuner for recording by connecting its output terminals to a tape recorder's input terminals. To do this, connect the output terminals of the TU-70 to the "LINE" inputs of a tape recorder.

With a monaural tape recorder, you can use either L or R terminal for the connection. With a stereo tape recorder, use both R and L terminals. In this case, you can get the same signals from both R and L even when tuned to a monaural broadcast.



# SWITCHES AND CONTROLS



## ① FM MULTIPLEX STEREO INDICATOR

When the tuner receives signals from an FM Station broadcasting multiplex, this indicator lights up to show that it is receiving a stereo broadcast. The indicator never lights when the tuner is receiving a monaural FM broadcast.

## ② TUNING INDICATOR

This closes when you have tuned to a station, whether FM or AM. Set the tuning dial at the point where the indicator closes as much as possible.

## ③ DIAL SCALE

The upper figures are for FM and the lower for AM. For tuning, turn the "TUNING" knob.

## ④ SELECTOR

Use this switch to set the tuner to the broadcast of your choice.

AM: for reception of medium-wave broadcasts.

FM: for reception of FM broadcasts.

MPX: for reception of FM multiplex stereo broadcasts.

## ⑤ NOISE FILTER

Turn this switch on to eliminate the noise when using your tuner in a ferroconcrete building, a block occupied by such buildings or an area of weak field intensity where you are likely to suffer from noise.

## ⑥ MUTING

Turn this switch on to eliminate the noise you hear when not tuned to any station. Keep it on while tuning.

However, if the muting switch is kept on when you receive weak signals, the sound may be distorted or reception may become impossible. In such a case, switch off the muting circuit.

## ⑦ FM-AFC

This prevents signals from an FM station from drifting. This is likely to happen because of the very high frequencies used. If it occurs, the tonal quality deteriorates or you cannot hear the program at all. To avoid this, switch on the FM-AFC after tuning in the station of your choice. If you switch on the FM-AFC before tuning, you may not be able to tune in accurately. If the FM-AFC is kept on even when there are a number of stations nearby, you may suffer from their interference. In such a case, switch off the FM-AFC.

## ⑧ POWER

This pushbutton is used to switch the tuner on and off. Push to switch on and push again to switch off.

## ⑨ TUNING

This knob is used to tune in FM or AM stations.

# OPERATIONS

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## AM BROADCAST RECEPTION

1. Set the "SELECTOR" switch at "AM".
2. Adjust the amplifier, stereo set or other equipment so that it can operate with the tuner.
3. Set the amplifier, stereo set or other equipment to monaural operation.
4. Tune to the station of your choice by means of the "TUNING" knob using the dial and the Tuning Indicator.
5. Use other switches according to your needs.

## FM BROADCAST RECEPTION

1. Set the "SELECTOR" switch at "FM".
2. Adjust the amplifier, stereo set or other equipment so that it can operate with the tuner.
3. Set the amplifier, stereo set or other equipment to monaural operation.
4. Tune to the station of your choice by means of the "TUNING" knob using the dial and the Tuning Indicator.
5. Use other switches according to your needs.

## FM MPX STEREO RECEPTION

1. Set the "SELECTOR" switch at "MPX".
2. Adjust the amplifier, stereo set or other equipment so that it can operate with the tuner.
3. Set the amplifier, stereo set or other equipment to stereo operation.
4. Tune to the station of your choice by means of the "TUNING" knob using the dial and the Tuning Indicator.

The moment you are tuned to an FM stereo station, the FM Stereo Indicator lights up. It does not light up in other cases.

5. Use other switches according to your needs.  
N.B.—Read the instructions for the amplifier, stereo set or other equipment before you use it in combination with the tuner.

## TAPE RECORDING

When you use a tape recorder to record broadcasts, connect it to the tuner as described before. When you want to monitor the recording, connect earphones to the tuner in the same way. It is better to make recordings through the tuner than through the connected amplifier.

# HINTS ON USE

## HOW TO ELIMINATE UNPLEASANT RADIO NOISE

### A) AM BROADCASTS

An AM radio noise is often eliminated simply by replacing the antenna.

Usually the noise is heard in the area where the station signal is too weak due to topography, buildings etc. To eliminate it, connect PVC wire to the AM antenna terminal of this tuner and put it up on the wall of your listening room. If the noise is still heard or the sensitivity of the tuner is still poor, an outdoor antenna should be installed.

A noise may be heard depending time, frequency, station etc. To eliminate such a noise, ground the tuner or turn the power plug upside down.

### B) FM BROADCASTS

There are two trouble-sources in the FM radio noises: one is caused by the insufficient antenna input and the other is caused by other electrical appliances placed near the amplifier. The poor antenna input is due to badly installed antenna or remoteness from the station. In the latter case, set the FM sensitivity switch at "DISTANT". Change the height and direction of the FM antenna (supplied). If the noise is still heard, use an outdoor antenna exclusively for FM reception.

Note that an excessively long antenna may rather cause a noise.

The sensitivity of the tuner varies depend-

ing on the transmitting conditions of the station. It happens, therefore, that one station signal is well received but the other station signal is ill received.

### C) NOISE COMMON TO FM AND AM BROADCASTS

If you live in a closely built-in area, noises may be caused by some outside factors. To eliminate, install a noise arrester with the electrical appliances or the power source of the amplifier.

### D) FM MPX STEREO

When you are tuned to an FM multiplex program, you may notice a noise which does not accompany monaural FM broadcasts. This does not mean that your tuner is out of order. In such a case, turn on the noise filter. In some cases, you can eliminate the noise by setting the treble knob of the amplifier flat or lower.

### E) FM MPX STEREO ON MONO

When you receive FM multiplex stereo broadcasts monophonically—with the selector at "FM"—the sounds from both speakers mix into a monaural reproduction as if you are tuned to an ordinary monaural FM station. Use this method if you find too much noise when receiving an FM multiplex stereo broadcast because the waves, field intensity or input are inadequate.

# NINTS ON USE

Fig. 1

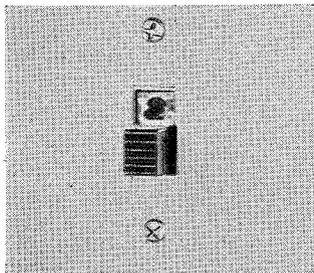


Fig. 2

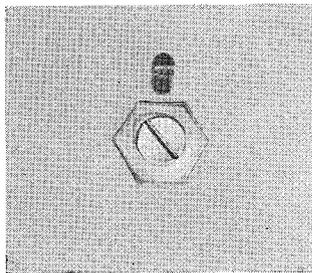
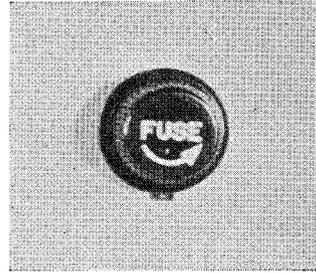


Fig. 3



## F) FM MONO ON MPX

In the areas where signals of the FM station are strong, set the selector switch to MPX for the reception of an FM monophonic broadcast. By this setting, when an FM multiplex stereo broadcast starts, you can enjoy it automatically without further setting with the tuner. However, the amplifier connected should have been set to STEREO for the reception.

## FM BROADCASTS

The FM broadcasts are characterized by more faithful reproduction of sound than the AM broadcasts. There is no noise and no jamming. One disadvantage in the FM is that the selected station is tuned off from time to time while listening. To prevent it, your MODEL TU-70 possesses a built-in FM-AFC circuit. Be sure to select your desired station and then turn on the FM-AFC switch.

There are two systems in the FM MPX stereo broadcasts: FCC system (AM-FM system) and FM-FM system.

In the FCC system, also called "single wave AM-FM system", the signal that contains the sum of the right and left stereo channels (L+R) is frequency-modulated in the main channel, while the signal that is the difference between the left and right channels (L-R) is amplitude-modulated in the sub-channel.

For easier demodulation, the FCC system employs the Compatible System of the composite signals in which a 19-kc pilot carrier and a 67-kc sub-signal of the SCA channel signal are added to

the Main signals of L+R and L-R. This system assures clear and noiseless Hi-Fi music.

Your MODEL TU-70 is designed to receive the FM stereo of the FCC system by the built-in FM Multiplexer.

## FUSE

If the amplifier does not function at all due to the blown fuse, remove its line cord from the outlet and then replace the fuse. Use a 3-ampere cartridge fuse. Never attempt to use a wire or a fuse with improper capacity. Before replacing, be sure to trace the trouble source and repair. (Fig. 3)

## VOLTAGE SELECTOR PLUG

The voltage selector plug allows you to use this amplifier at any of the four different supply voltages: 100, 117, 220 and 240 volts. If you'll move to the area where the supply voltage is not the same as before, pull out the plug and reset the arrow (→) marked on it to the figure of volts in the new area. (Fig. 5)

## LEVEL ADJUSTMENT

Use this knob to adjust the output level of the tuner for both AM and FM. To increase the output, turn it clockwise. To reduce the output, turn it counterclockwise. Make appropriate adjustments depending on the amplifier or stereo set you use with the tuner. (Fig. 2)

## FM LOCAL/DISTANCE SWITCH

This adjusts the tuner to the strength of FM waves. Set it to "DISTANT" if you live in an

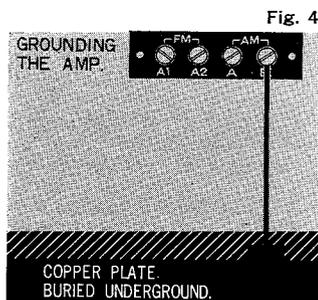


Fig. 4

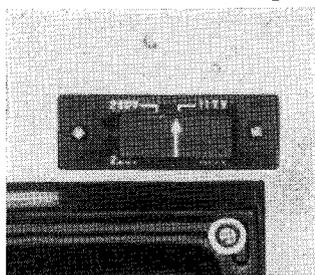


Fig. 5

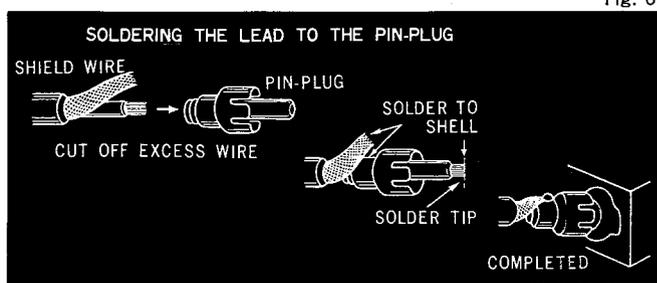


Fig. 6

area where FM signals are weak. If you live near broadcasting stations and there is the danger of interference from other stations, set the switch to "LOCAL". (Fig. 1)

## GROUNDING THE TUNER

Noise can sometimes be reduced by grounding the tuner. To do this, connect the "E" terminal on the antenna terminal board on the back of your tuner to a copper rod or plate buried deep in the ground. Use a vinyl or enamel wire to make the connection. (Fig. 4)

## OPERATION OF THE AMPLIFIER

Be sure to read carefully the instructions for the amplifier, stereo set, radio or other equipment you use with the tuner, so that you can avoid errors in operation. Adjust the output level to match the output gain. When you use a power amplifier, adjust its output level as well.

## USE OF THE "TAPE" TERMINAL

Because the output terminal "TAPE" gives you the same output level as the "OUT" terminal, you can use the "TAPE" terminal for connecting an additional amplifier or stereo set. By connecting earphones (crystal type) to the "TAPE" terminal, you can listen to the broadcast through them instead from the speakers.

## CONNECTIONS

When you connect the tuner to an amplifier, stereo set, radio or tape recorder, be sure to use a shieldwire (one like the attached output cord). If you use a twin-lead vinyl wire usually used for electric lamps, you will suffer from hum. For better results and trouble-free operation, shorten the output cord as far as possible.

When you use a radio which is not equipped with a pin-jack input terminal, follow the instructions given in the foregoing section on Connecting an Amplifier or Stereo Set so that you can avoid errors in connection.

When you use a power amplifier, make sure that its input level matches the output level of your tuner.

# SERVICE NOTE

When the power switch is pushed, electric supply will not be on.

Symptoms (1)	Symptoms (2)	Likely defective places
A. Poor power switch. B. Poor power cord. C. Poor plug contact.  D. Blown fuse.	(In case the fuse blows again upon fitting a new one)	Replace it. Replace it. Replace the plug or make the plug contact better. Replace it. Short-circuit rearing in the power transformer (T <sub>8</sub> ) or short-circuit of pass condenser (C <sub>85</sub> )

When the power switch is pushed, electric supply will be on.

Symptoms (1)	Symptoms (2)	Likely defective places
A. The tuner does not work at all.	1. Broken wires of vacuum tube heaters. 2. In case there is something wrong in the vacuum tube and voltage in resp. places	V <sub>1</sub> ~V <sub>14</sub> and silicon diodes. Check the places where there is something wrong in voltage.
B. Only the FM tuner does not work at all.	1. Broken wires of vacuum tube heaters in the FM system. 2. In case there is something wrong in the vacuum tube and voltage in resp. places in the FM system. 3. In case there is nothing wrong in resp. places in the FM system.	V <sub>1</sub> ~V <sub>4</sub> , V <sub>7</sub> ~V <sub>10</sub> Check the places where there is something wrong in voltage. Insufficient capacity of C <sub>24</sub> , C <sub>41</sub> , poor IFT (T <sub>1</sub> ~T <sub>5</sub> ) Short-circuit of C <sub>23</sub> , C <sub>40</sub> , Trouble in the local oscillating circuit of V <sub>3a</sub> (6AQ8)
C. Only the FM-MPX system does not work.	1. Broken wires of vacuum tube heaters in the multiplex system. 2. In case there is something wrong in the vacuum tube and voltage in resp. places in the multiplex system. 3. In case there is nothing wrong in the vacuum tube and voltage in the multiplex system.	If the FM tuner works normally, check V <sub>11</sub> ~V <sub>13</sub> . Check the places where there is something wrong in voltage. If the FM tuner works normally, it is caused by insufficient capacity of C <sub>43</sub> , C <sub>64</sub> , C <sub>65</sub> , C <sub>66</sub> , C <sub>67</sub> , and poor L <sub>14</sub> , L <sub>15</sub> , L <sub>16</sub> .
D. Only the AM tuner does not work	1. Broken wires of vacuum tube heaters in the AM tuner system. 2. In case there is something wrong in the vacuum tube and voltage in resp. places in the AM tuner system. 3. In case there is nothing wrong in the vacuum tube and voltage in resp. places in the AM tuner system.	V <sub>5</sub> , V <sub>6</sub> , V <sub>7</sub> Check the places where there is something wrong in voltage. Poor IFT (T <sub>6</sub> , T <sub>7</sub> ) and RF coil (L <sub>11</sub> ). Poor diode (OA-91). Short-circuit of C <sub>17</sub> and C <sub>18</sub>
A. In case of small FM broadcasting sounds with nothing wrong in voltage in resp. places.	1. Divergence in tracking regulation. 2. Divergence in IFT regulation. 3. Poor diode. 4. Drop in Q of coils etc. 5. Poor condensers. 6. Misregulation of the semi-fixed resistance. 7. Poor contact of the rotary switch.	Refer to the regulation method of the FM tuner. Refer to the regulation method of the FM tuner. Germanium diode (OA-91) L <sub>1</sub> , L <sub>5</sub> , L <sub>6</sub> Insufficient capacity of C <sub>10</sub> , C <sub>12</sub> , C <sub>14</sub> , C <sub>40</sub> , C <sub>41</sub> VR-1 S <sub>2b</sub>

Symptoms (1)	Symptoms (2)	Likely defective places
B. In case of small sounds of the FM multiplex stereo system with nothing wrong in voltage in resp. places.	<ol style="list-style-type: none"> <li>1. Insufficient capacity of the coupling condensers.</li> <li>2. Divergence in regulation of coils etc.</li> <li>3. Change in capacity of the condensers in the tank circuit.</li> <li>4. Deterioration of diode.</li> <li>5. Misregulation of the semi-fixed resistances.</li> <li>6. Poor contact of the rotary switch.</li> </ol>	<p>C<sub>45</sub>, C<sub>46</sub>, C<sub>53</sub>, C<sub>62</sub>, C<sub>64</sub>, C<sub>66</sub>, C<sub>67</sub></p> <p>L<sub>10</sub>, L<sub>12</sub>, L<sub>13</sub></p> <p>C<sub>49</sub>, C<sub>55</sub>, C<sub>56</sub></p> <p>Germanium diode OA-91</p> <p>VR-4, VR-5</p> <p>S<sub>2a</sub>, S<sub>2b</sub></p>
C. In case of small AM broadcasting sounds with nothing wrong in voltage in resp. places.	<ol style="list-style-type: none"> <li>1. Divergence in tracking regulation.</li> <li>2. Divergence in IFT regulation.</li> <li>3. Poor diode.</li> <li>4. Drop in Q of coils etc.</li> <li>5. Poor condensers.</li> <li>6. Poor contact of the rotary switch.</li> </ol>	<p>Refer to the regulation method of the AM tuner.</p> <p>Refer to the regulation method of the AM tuner.</p> <p>OA-91</p> <p>L<sub>7</sub>, L<sub>8</sub></p> <p>Insufficient capacity of C<sub>41</sub>, C<sub>31</sub>, R<sub>15</sub>, R<sub>16</sub></p> <p>S<sub>2a</sub>, S<sub>2b</sub></p>
A. In case the FM broadcasting sounds are distorted much.	<ol style="list-style-type: none"> <li>1. Poor condition and small input of the antenna.</li> <li>2. Divergence in tracking regulation.</li> <li>3. Divergence in regulation of IFT.</li> <li>4. Poor germanium diode.</li> <li>5. Insufficient capacity of the condensers in the FM tuner part.</li> </ol>	<p>Refer to the Item, ANTENNA, in this manual.</p> <p>Refer to the regulation method of FM.</p> <p>Refer to the regulation method of FM.</p> <p>OA-91</p> <p>C<sub>11</sub>, C<sub>13</sub>, C<sub>15</sub>, C<sub>19</sub>, C<sub>21</sub></p>
B. In case the sounds of the FM-multiplex stereo system are distorted much.	<ol style="list-style-type: none"> <li>1. Sounds distorted at FM tuner.</li> <li>2. Poor regulation of the multiplex coil.</li> <li>3. Poor germanium diode.</li> <li>4. Poor condensers.</li> <li>5. Poor fixed resistors.</li> </ol>	<p>Refer to the Item A.</p> <p>Refer to the regulation method of the multiplex adapter.</p> <p>OA-91</p> <p>Poor insulation of C<sub>65</sub>, C<sub>66</sub></p> <p>Broken wires of R<sub>48</sub>, R<sub>61</sub>, R<sub>67</sub>, R<sub>72</sub></p>
C. In case the AM broadcasting sounds are distorted much.	<ol style="list-style-type: none"> <li>1. Divergence in tracking regulation.</li> <li>2. Divergence in regulation of IFT.</li> <li>3. Poor germanium diode.</li> <li>4. Insufficient capacity of condenser and short-circuit.</li> </ol>	<p>Refer to the regulation method of AM.</p> <p>Refer to the regulation method of AM.</p> <p>OA-91</p> <p>Insufficient capacity of C<sub>34</sub>, C<sub>37</sub>, puncture of C<sub>38</sub></p>
A. In case of big humming in FM broadcasting.	<ol style="list-style-type: none"> <li>1. Hums generated when tuned to a channel.</li> <li>2. Inner touch of vacuum tubes.</li> </ol>	<p>Reverse connection of the power plug or poor earthing condition of the chassis.</p> <p>V<sub>1</sub>~V<sub>4</sub>, V<sub>7</sub>~V<sub>10</sub></p>
B. In case of big humming in the FM multiplex circuit system.	<ol style="list-style-type: none"> <li>1. Hums generated from the above-mentioned causes.</li> <li>2. Inner touch of vacuum tubes.</li> </ol>	<p>Reverse connection of the power plug or poor earthing condition of the chassis.</p> <p>V<sub>1</sub>~V<sub>4</sub>, V<sub>7</sub>~V<sub>13</sub></p>
C. In case of big humming in AM broadcasting.	<ol style="list-style-type: none"> <li>1. Hums generated when tuned to a channel.</li> <li>2. Inner touch of vacuum tubes.</li> </ol>	<p>Reverse connection of the power plug or poor earthing condition of the chassis.</p> <p>V<sub>5</sub>, V<sub>6</sub></p>

# SERVICE NOTE

Symptoms (1)	Symptoms (2)	Likely defective places
A. In case of a great many noise in FM broadcasting.	<ol style="list-style-type: none"> <li>1. Small input voltage and poor condition of the antenna.</li> <li>2. Poor vacuum tubes (high howling).</li> <li>3. Break rearing in the fixed resistance wires and touching of parts.</li> <li>4. Short-circuit of condensers and touch of parts.</li> </ol>	<p>Refer to the Item, ANTENNA, in this manual.</p> <p>V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub>  R<sub>4</sub>, R<sub>6</sub>, R<sub>8</sub>, R<sub>10</sub>, R<sub>11</sub>, R<sub>13</sub>, R<sub>18</sub>, R<sub>23</sub>  C<sub>3</sub>, C<sub>5</sub>, C<sub>11</sub>, C<sub>13</sub>, C<sub>15</sub>, C<sub>19</sub>, C<sub>21</sub></p>
B. In case of a great many noises in FM multiplex stereo system.	<ol style="list-style-type: none"> <li>1. Noises made by the above-mentioned causes.</li> <li>2. Break rearing in the multiplex coil wires.</li> <li>3. Break rearing in the fixed resistances.</li> <li>4. Short-circuit rearing in condensers.</li> <li>5. Poor vacuum tubes.</li> </ol>	<p>Refer to A.</p> <p>L<sub>14</sub>~L<sub>15</sub>  R<sub>49</sub>, R<sub>56</sub>, R<sub>65</sub>, R<sub>64</sub>, R<sub>66</sub>, R<sub>68</sub>  C<sub>43</sub>, C<sub>45</sub>, C<sub>53</sub>, C<sub>55</sub>, C<sub>64</sub>, C<sub>65</sub>, C<sub>66</sub>, C<sub>67</sub>  V<sub>11</sub>~V<sub>13</sub></p>
A. While the FM tuner is working normally.	<ol style="list-style-type: none"> <li>1. The tuning indicator does not work at all.</li> <li>2. The tuning indicator works slightly.</li> </ol>	<p>Poor V<sub>14</sub> and broken wire of R<sub>37</sub></p> <ul style="list-style-type: none"> <li>• It varies depending on the intensity of the electric field resulted from regional differences.</li> <li>• It is caused by poor condition of the FM antenna.</li> </ul>
B. While the AM tuner is working normally.	<ol style="list-style-type: none"> <li>1. The tuning indicator does not work at all.</li> <li>2. The tuning indicator works slightly.</li> </ol>	<p>Poor V<sub>14</sub> and broken wire of R<sub>17</sub></p> <ul style="list-style-type: none"> <li>• It varies depending on the intensity of the electric field resulted from regional differences.</li> </ul>
C. The stereo indicator is not lighted at the time of FM stereo reception.	<ol style="list-style-type: none"> <li>1. In case the multiplex adapter does not work normally.</li> <li>2. In case only the indicator does not work while the multiplex adapter working normally.</li> <li>3. The indicator is kept lighting while the multiplex adapter is working normally.</li> </ol>	<p>Refer to the Items of respective multiplex.</p> <p>Poor PL, broken wire of R<sub>91</sub>, and poor TR<sub>2</sub>, TR<sub>3</sub>.</p> <p>Poor IN-60 and poor regulation of VP-2, VR<sub>5</sub></p>
D. Poor separation at the time of FM stereo reception.	<ol style="list-style-type: none"> <li>1. In case the multiplex adapter works normally.</li> </ol>	<p>Poor regulation of VR-3 (Refer to the regulation method of multiplex).</p>

# PARTS LIST

Part No.	Nomenclature			
R1	330Ω	¼Watt	10%	Carbon Fixed Resistor
R2	330Ω	¼Watt	10%	Carbon Fixed Resistor
R3	47 KΩ	¼Watt	10%	Carbon Fixed Resistor
R4	33 KΩ	½Watt	10%	Carbon Fixed Resistor
R5	68Ω	¼Watt	10%	Carbon Fixed Resistor
R6	1 KΩ	½Watt	10%	Carbon Fixed Resistor
R7	1.8 KΩ	½Watt	10%	Carbon Fixed Resistor
R8	1 KΩ	½Watt	10%	Carbon Fixed Resistor
R9	68Ω	¼Watt	10%	Carbon Fixed Resistor
R10	680Ω	1 Watt	10%	Carbon Fixed Resistor
R11	1 KΩ	½Watt	10%	Carbon Fixed Resistor
R12	68Ω	¼Watt	10%	Carbon Fixed Resistor
R13	1 KΩ	½Watt	10%	Carbon Fixed Resistor
R14	50 KΩ	¼Watt	10%	Carbon Fixed Resistor
R15	50 KΩ	¼Watt	10%	Carbon Fixed Resistor
R16	100 KΩ	¼Watt	10%	Carbon Fixed Resistor
R17	2 MΩ	¼Watt	10%	Carbon Fixed Resistor
R18	15 KΩ	¼Watt	10%	Carbon Fixed Resistor
R19	10 KΩ	½Watt	10%	Carbon Fixed Resistor
R20	100 KΩ	¼Watt	10%	Carbon Fixed Resistor
R21	3 MΩ	¼Watt	10%	Carbon Fixed Resistor
R22	40 KΩ	¼Watt	10%	Carbon Fixed Resistor
R23	20 KΩ	½Watt	10%	Carbon Fixed Resistor
R24	50 KΩ	¼Watt	10%	Carbon Fixed Resistor
R25	50 KΩ	¼Watt	10%	Carbon Fixed Resistor
R26	2 MΩ	¼Watt	10%	Carbon Fixed Resistor
R27	500 KΩ	¼Watt	10%	Carbon Fixed Resistor
R28	22 MΩ	¼Watt	10%	Carbon Fixed Resistor
R29	100 KΩ	¼Watt	10%	Carbon Fixed Resistor
R30	10 KΩ	¼Watt	10%	Carbon Fixed Resistor
R31	1 MΩ	¼Watt	10%	Carbon Fixed Resistor
R32	100Ω	¼Watt	10%	Carbon Fixed Resistor
R33	20 KΩ	½Watt	10%	Carbon Fixed Resistor
R34	20 KΩ	¼Watt	10%	Carbon Fixed Resistor
R35	50 KΩ	¼Watt	10%	Carbon Fixed Resistor
R36	5 KΩ	½Watt	10%	Carbon Fixed Resistor
R37	2 MΩ	¼Watt	10%	Carbon Fixed Resistor
R38	2.2 MΩ	¼Watt	10%	Carbon Fixed Resistor
R39	100 KΩ	¼Watt	10%	Carbon Fixed Resistor
R40	10 KΩ	½Watt	10%	Carbon Fixed Resistor
R41	500 KΩ	¼Watt	10%	Carbon Fixed Resistor
R42	500 KΩ	¼Watt	10%	Carbon Fixed Resistor
R43	7 KΩ	¼Watt	10%	Carbon Fixed Resistor
R44	50 KΩ	½Watt	10%	Carbon Fixed Resistor
R45	50 KΩ	¼Watt	10%	Carbon Fixed Resistor
R46	75 KΩ	¼Watt	10%	Carbon Fixed Resistor
R47	2 MΩ	½Watt	10%	Carbon Fixed Resistor
R48	500 KΩ	¼Watt	10%	Carbon Fixed Resistor
R49	10 KΩ	½Watt	10%	Carbon Fixed Resistor

Part No.	Nomenclature			
R50	500Ω	¼Watt	10%	Carbon Fixed Resistor
R51	5 KΩ	¼Watt	10%	Carbon Fixed Resistor
R52	4 KΩ	¼Watt	10%	Carbon Fixed Resistor
R53	2 MΩ	¼Watt	10%	Carbon Fixed Resistor
R54	150 KΩ	¼Watt	10%	Carbon Fixed Resistor
R55	100 KΩ	¼Watt	10%	Carbon Fixed Resistor
R56	33 KΩ	¼Watt	10%	Carbon Fixed Resistor
R57	51 KΩ	¼Watt	10%	Carbon Fixed Resistor
R58	1 KΩ	¼Watt	10%	Carbon Fixed Resistor
R59	1 KΩ	¼Watt	10%	Carbon Fixed Resistor
R60	100 KΩ	½Watt	10%	Carbon Fixed Resistor
R61	500 KΩ	¼Watt	10%	Carbon Fixed Resistor
R62	40 KΩ	¼Watt	10%	Carbon Fixed Resistor
R63	50 KΩ	¼Watt	5%	Carbon Fixed Resistor
R64	50 KΩ	¼Watt	5%	Carbon Fixed Resistor
R65	50 KΩ	¼Watt	5%	Carbon Fixed Resistor
R66	50 KΩ	¼Watt	5%	Carbon Fixed Resistor
R67	10 MΩ	½Watt	10%	Carbon Fixed Resistor
R68	20 KΩ	½Watt	10%	Carbon Fixed Resistor
R69	15 KΩ	½Watt	10%	Carbon Fixed Resistor
R70	20 KΩ	½Watt	10%	Carbon Fixed Resistor
R71	15 KΩ	½Watt	10%	Carbon Fixed Resistor
R72	10 MΩ	½Watt	10%	Carbon Fixed Resistor
R73	20 KΩ	¼Watt	5%	Carbon Fixed Resistor
R74	20 KΩ	¼Watt	5%	Carbon Fixed Resistor
R75	10 KΩ	¼Watt	5%	Carbon Fixed Resistor
R76	20 KΩ	¼Watt	5%	Carbon Fixed Resistor
R77	20 KΩ	¼Watt	5%	Carbon Fixed Resistor
R78	10 KΩ	¼Watt	5%	Carbon Fixed Resistor
R79	50 KΩ	Enclosed in CR-SO1		
R80	50 KΩ	Enclosed in CR-SO1		
R81	50 KΩ	Enclosed in CR-SO1		
R82	50 KΩ	Enclosed in CR-SO1		
R83	50 KΩ	Enclosed in CR-SO1		
R84	50 KΩ	Enclosed in CR-SO1		
R85	500Ω	10Watt	wire wound Resistor	
R86	500Ω	10Watt	wire wound Resistor	
R87	1 KΩ	1 Watt	10%	Carbon Fixed Resistor
R88	600Ω	1 Watt	10%	Carbon Fixed Resistor
R89	10 KΩ	¼Watt	10%	Carbon Fixed Resistor
R90	5 KΩ	½Watt	10%	Carbon Fixed Resistor
R91	5 KΩ	½Watt	10%	Carbon Fixed Resistor
R92	100 KΩ	¼Watt	10%	Carbon Fixed Resistor
R93	100 KΩ	¼Watt	10%	Carbon Fixed Resistor
C1	10 pF	250WV	10%	Ceramic tubular
C2	50 pF	250WV	10%	Ceramic tubular
C3	0.002 μF	250WV	$\pm 100\%$	Ceramic tubular

# PARTS LIST

Part No.	Nomenclature			
C4	0.001 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C5	0.001 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C6	0.002 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C7	10 pF	250WV	10%	Ceramic tubular
C8	2 pF	250WV	10%	Ceramic tubular
C9	10 pF	250WV	10%	Ceramic tubular
C10	0.01 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C11	0.01 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C12	0.01 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C13	0.01 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C14	0.01 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C15	0.01 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C16	50 pF	250WV	10%	Ceramic tubular
C17	100 pF	250WV	10%	Ceramic tubular
C18	50 pF	250WV	10%	Ceramic tubular
C19	0.01 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C20	40 pF	250WV	10%	Ceramic tubular
C21	0.01 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C22	50 pF	250WV	10%	Ceramic tubular
C23	50 pF	250WV	10%	Ceramic tubular
C24	0.01 $\mu$ F	400WV	10%	oil tubular
C25	0.002 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C26	3 p	250WV	10%	Ceramic tubular
C27	0.002 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C28	20 pF	250WV	10%	Ceramic tubular
C29	100 pF	250WV	10%	Ceramic tubular
C30	100 pF	250WV	10%	Ceramic tubular
C31	0.02 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C32	0.02 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C33	100 pF	250WV	10%	Ceramic tubular
C34	0.05 $\mu$ F	400WV	10%	oil tubular
C35	400 pF	250WV	5%	Mica tubular
C36	50 pF	250WV	10%	Ceramic tubular
C37	0.01 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C38	0.05 $\mu$ F	50WV	10%	Ceramic tubular
C39	0.001 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C40	0.001 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C41	0.05 $\mu$ F	400WV	10%	oil tubular
C42	0.001 $\mu$ F	400WV	10%	oil tubular
C43	0.02 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C44	0.03 $\mu$ F	400WV	10%	oil tubular
C45	100 pF	250WV	10%	Ceramic tubular
C46	10 $\mu$ F	10WV	10%	electrolytic tubular
C47	0.002 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C48	0.002 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C49	3 $\mu$ F	150WV		electrolytic tubular
C50	2000 pF	250WV	5%	Mica tubular

Part No.	Nomenclature			
C51	1500 pF	250WV	5%	Mica tubular
C52	5 $\mu$ F	50WV		electrolytic tubular
C53	5 $\mu$ F	25WV		electrolytic tubular
C54	1 $\mu$ F	150WV		electrolytic tubular
C55	0.001 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C56	0.01 $\mu$ F	250WV	5%	Mica tubular
C57	20 $\mu$ F	300WV		electrolytic tubular
C58	3000 pF	250WV	10%	Mica tubular
C59	100 pF	250WV	10%	Ceramic tubular
C60	100 pF	250WV	10%	Ceramic tubular
C61	100 pF	250WV	10%	Ceramic tubular
C62	100 pF	250WV	10%	Ceramic tubular
C63	100 pF	250WV	10%	Ceramic tubular
C64	0.003 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C65	0.02 $\mu$ F	400WV	10%	oil tubular
C66	0.02 $\mu$ F	400WV	10%	oil tubular
C67	0.003 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C68	100 pF	250WV	10%	Ceramic tubular
C69	82 pF	50WV	5%	Mica tubular
C70	510 pF	50WV	5%	Mica tubular
C71	430 pF	50WV	5%	Mica tubular
C72	82 pF	50WV	5%	Mica tubular
C73	510 pF	50WV	5%	Mica tubular
C74	430 pF	50WV	5%	Mica tubular
C75	300 pF	Enclosed in CR-SO1		
C76	200 pF	Enclosed in CR-SO1		
C77	200 pF	Enclosed in CR-SO1		
C78	300 pF	Enclosed in CR-SO1		
C79	200 pF	Enclosed in CR-SO1		
C80	200 pF	Enclosed in CR-SO1		
C81	200 pF	250WV	10%	Ceramic tubular
C82	0.05 $\mu$ F	400WV	10%	oil tubular
C83	200 pF	250WV	10%	Ceramic tubular
C84	0.05 $\mu$ F	400WV	10%	oil tubular
C85	0.005 $\mu$ F	600WV	10%	oil tubular
C86	0.005 $\mu$ F	400WV	10%	oil tubular
C87	0.005 $\mu$ F	400WV	10%	oil tubular
C88	0.01 $\mu$ F	250WV	10%	Ceramic tubular
C89	20 $\mu$ F	300WV		electrolytic tubular
C90	20 $\mu$ F	300WV		electrolytic tubular
C91	40 $\mu$ F	300WV		electrolytic tubular
C92	20 $\mu$ F	300WV		electrolytic tubular
C93	0.01 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C94	0.002 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C95	0.002 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C96	0.002 $\mu$ F	250WV	$\pm 100_0\%$	Ceramic tubular
C97	20 $\mu$ F	300WV		electrolytic tubular
C98	5 $\mu$ F	150WV		electrolytic tubular

Part No.	Nomenclature
C99	0.05 $\mu$ F 50WV 10% Ceramic tubular
C100	1000 $\mu$ F 10WV electrolytic tubular
C101	100 pF 250WV 10% Ceramic tubular
C102	100 pF 250WV 10% Ceramic tubular
VR1	5 K $\Omega$ (B) Variable Resistor Driver type
VR2	10 K $\Omega$ (B) Variable Resistor Driver type
VR3	100 K $\Omega$ (B) Variable Resistor Driver type
VR4	500 K $\Omega$ (B) Variable Resistor 24 $\phi$ type
VR5	10 K $\Omega$ (B) Variable Resistor Driver type
VC1	6~18 pF Variable capacitor (FM ANT Tuning)
VC2	6~18 pF Variable capacitor (FM RF Tuning)
VC3	6~18 pF Variable capacitor (FM OSC Tuning)
VC4	8.8~328 pF Variable capacitor (AM ANT Tuning)
VC5	8.8~328 pF Variable capacitor (AM RF Tuning)
VC6	8.8~328 pF Variable capacitor (AM OSC Tuning)
TC1	10 pF trimer condenser
TC2	10 pF trimer condenser
TC3	10 pF trimer condenser
TC4	15 pF trimer condenser
TC5	15 pF trimer condenser
TC6	15 pF trimer condenser
V1	6CW4 FM RF Amp
V2	6CW4 FM RF Amp
V3	6AQ8(ECC84) FM oscillator & Mixer
V4	6BA6(EF93) FM 1st. IF. Amp
V5	6BA6(EF93) FM. RF. Amp
V6	6BE6(EK90) AM. convertor
V7	6BA6(EF93) AM. FM. 2nd IF. Amp
V8	6AU6(EF94) 1st limiter
V9	6AU6(EF94) 2nd limiter
V10	6AQ8(ECC85) Muting Amp
V11	6AQ8(ECC85) MPX. Amp & Indicator Amp
V12	6BL8(ECF80) 19 KC amp & doublar
V13	12AU7(ECC82) Dual, out & deemphasis
V14	6R-E13 tuning indicator
T1	1st FM. IFT 10.7 Mc/s
T2	2nd FM. IFT 10.7 Mc/s
T3	3rd FM. IFT 10.7 Mc/s
T4	4th FM. IFT 10.7 Mc/s

Part No.	Nomenclature
T5	FM Discriminator transformer
T6	1st AM. IFT 455 Kc/s
T7	2nd AM. IFT 455 Kc/s
T8	Power transformer
PU1	Power Adjustment for 100V/117V/220V/240V
PL	Pilot Lamp 6.3V 0.15A FUSE type. 6.3V 0.3A
F	Fuse 2A
S1	Band Selector
S2	Noise filter
S3	Muting Switch
S4	FM. AFC Switch
S5	Power Switch
S6	ANTENNA Switch
S7, 8	Micro Switch
TR-1,2	Transistor 2SC-402
TR3	Transistor 2SB-324
OA-91	Ge, diode VP=90V I <sub>D</sub> =50 mA -55°C~75°C
SD-1B	Si, diode AC(RMS) 180V, I <sub>D</sub> 500 mA. -65°C~100°C
SE-05-02	Si, diode AC(RMS) 30V, I <sub>D</sub> =500 mA -65°C~100°C
MA-311	Variable capacitor (FM. AFC)
IN-60	Ge, diode VP=30V I <sub>D</sub> =50 mA
L1	FM. ANT coil
L2	FM. RF coil 3.5 $\mu$ H
L3	FM. RF coil 1 $\mu$ H
L4	FM. RF coil 3.5 $\mu$ H
L5	FM. Tuning coil
L6	FM. oscillator coil
L7	Filter coil
L8	Filter coil
L9	Filter coil
L10	AM. Loop Stick Antenna coil
L11	AM. RF coil
L12	AM. Oscillator coil
L13	MPX. coil MFC-5B
L14	MPX. coil MFC-5A
L15	MPX. coil MPT-4A
L16	MPX. coil MPT-4B
L17	Heater choke
L18	Heater choke
L19	Heater choke

# ALIGNMENT

## FM ALIGNMENT PROCEDURE

1. AFC-OFF

2. Turn tuning gang fully, center carrier wave.

3. Set pointer at reference mark.

STEP	ALIGN	GENERATOR	FEED SIGNAL	OUTPUT INDICATOR	DIAL SETTING	ADJUST	ADJUST FOR
1.	IF Transformer	10.7 MC ±400 KC	V <sub>8</sub> Pin 1 6AU6	oscilloscope at ①		4th IFT (T <sub>4</sub> ) Primary & secondary	Best IFT Wave form
		10.7 MC ±400 KC	V <sub>7</sub> Pin 1 6BA6	oscilloscope at ①		3rd IFT (T <sub>3</sub> ) Primary & secondary	Best IFT Wave form
		10.7 MC ±400 KC	V <sub>4</sub> Pin 1 6BA6	oscilloscope at ①		2nd IFT (T <sub>2</sub> ) primary & Secondary	Best IFT Wave form
		10.7 MC ±400 KC	Couple Sweep Signal by a round tube V <sub>3</sub> 6AQ8	oscilloscope at ①		1st IFT (T <sub>1</sub> ) Primary & Secondary	Best IFT Wave form
2.	Discriminator	10.7 MC ±400 KC	Couple Sweep Signal by a round tube V <sub>3</sub> 6AQ8	oscilloscope at ②		5th IFT (T <sub>5</sub> ) Discriminator Transformer	S Curve
3.	OSC.	90 MC 400 c/s 100% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at oscillo load	90 MC	OSC. coil L <sub>6</sub>	Maximum
4.	OSC.	106 MC 400 c/s 100% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at oscillo load	106 MC	OSC. Trimmer TC <sub>3</sub>	Maximum
5.		Reiterate 3, 4					
6.	RF Amp.	90 MC 400 c/s 100% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at oscillo load	90 MC	RF Amp. coil L <sub>5</sub>	Maximum
7.	Antenna circuit	90 MC 400 c/s 100% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at oscillo load	90 MC	Antenna coil L <sub>1</sub>	Maximum
8.	RF Amp.	106 MC 400 c/s 100% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at oscillo load	106 MC	RF. Amp Trimmer TC <sub>2</sub>	Maximum
9.	Antenna circuit	106 MC 400 c/s 100% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at oscillo load	106 MC	Antenna circuit Trimmer TC <sub>1</sub>	Maximum
10.		Reiterate 6, 7, 8, 9					

STEP	ALIGN	GENERATOR	FEED SIGNAL	OUTPUT INDICATOR	DIAL SETTING	ADJUST	ADJUST FOR
1.	IF Trans-former	455 KC ±30 KC sweep-generator	Pin 7 6BE6	Sweep input at ③		1st IFT (T <sub>6</sub> ) Primary & secondary & 2nd IFT (T <sub>7</sub> ) Primary secondary	Best IFT Wave form
2.	OSC.	AM-OSCILLATOR 600 KC 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at output load	600 KC	OSC. coil L <sub>12</sub>	Maximum
3.	OSC.	1400 KC 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at output load	1400 KC	OSC. Trimmer TC <sub>6</sub>	Maximum
4.		Reiterate 2, 3					
5.	RF Amp.	600 KC 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at output load	600 KC	RF coil L <sub>11</sub>	Maximum
6.	RF Amp.	1400 KC 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at output load	1400 KC	RF Trimmer TC <sub>5</sub>	Maximum
7.		Reiterate 5, 6					
8.	Antenna circuit	600 KC 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T, V.M. at output load	600 KC	Ferrite Loop Antenna at coil L <sub>10</sub>	Maximum
9.	Antenna	1400 KC 400 c/s 30% Modulation		oscilloscope & V.T, V.M. at output load	1400 KC	Antenna circuit at Trimmer TC-4	Maximum
10.		Reiterate 8, 9					

1. Do not attempt to align the Multiplex Circuit unless the following equipment is available:

- a. Multiplex Stereo Generator      b. FM Signal Generator      c. Oscilloscope  
d. Sweep Generator                    e. AC V.T, V.M.                    f. Audio oscillator

STEP	ALIGN	GENERATOR	FEED SIGNAL	OUTPUT INDICATOR	ADJUST	ADJUST FOR
1.	67 KC Trap	67 KC Audio Signal	Connect to T.P ④	V.T, V.M. at T.P ⑤	L <sub>13</sub>	Minimum
2.	19 KC coil Transformer	FM Signal Gen. Modulated 30% by Stereo gen. sub-Channel	Antenna Terminals Tune to signal	V.T, V.M. & Oscilloscope at output load	L <sub>14</sub>	Maximum
3.	19 KC coil	Same	Same	Same	L <sub>15</sub>	Maximum
4.	38 KC Doubler	Same	Same	Same	L <sub>16</sub>	Maximum
5.	Separation VR	FM Signal Gen. Modulated 30% by Stereo Signal Gen. Channel-L	Same	V.T, V.M. & Oscilloscope at output load Channel-R	Separation VR <sub>3</sub>	Channel-R Minimum







*Sansui*<sup>®</sup>



SANSUI ELECTRIC COMPANY LIMITED



Head Office; 14-1, 2-chome, Izumi, Suginami-ku, Tokyo, Japan. TEL. 323-1111

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