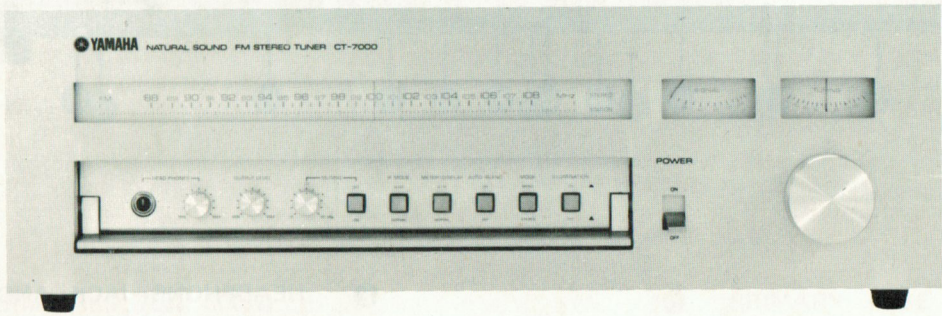
YAMAHA

Yamaha Hi-Fi Stereo

FM STEREO TUNER

CT-7000

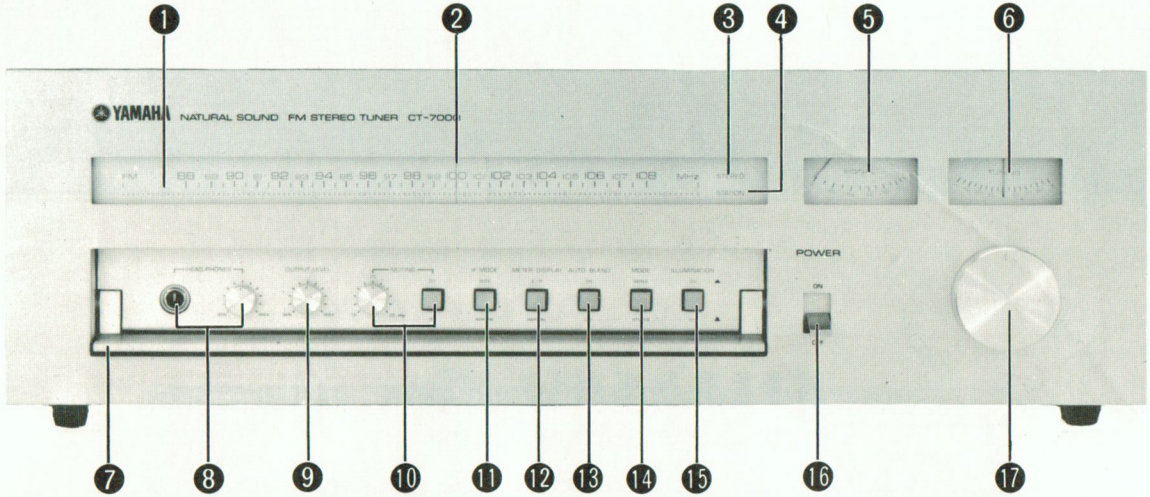
Owner's Manual



READ THIS FIRST!

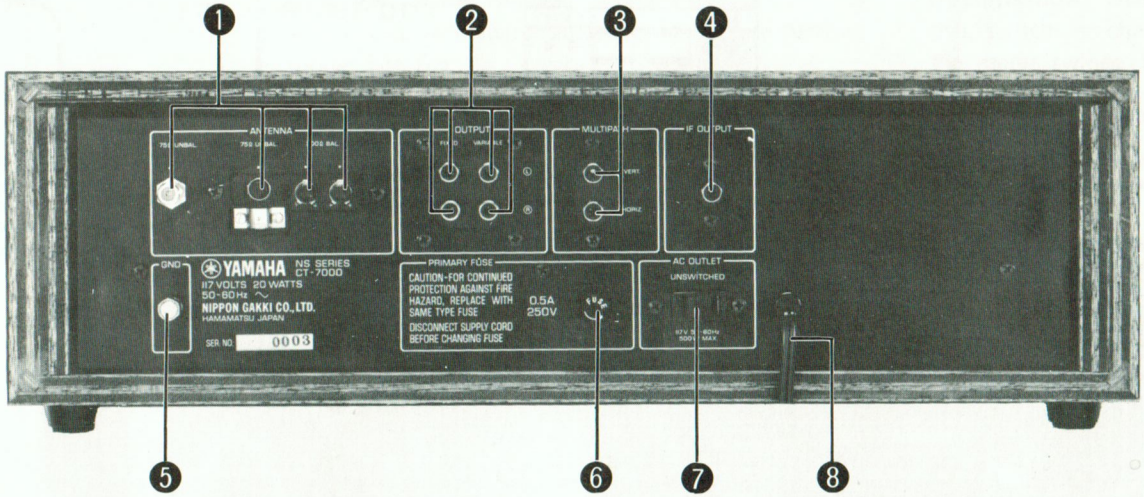
Be sure you are fully familiar with the instructions in this manual before attempting to operate your CT-7000. Most audio repairs are necessitated by faulty operation when the unit is first used, so avoid delay and disappointment by making sure all connections and adjustments are properly completed BEFORE you plug in the set or switch it on.

FRONT PANEL



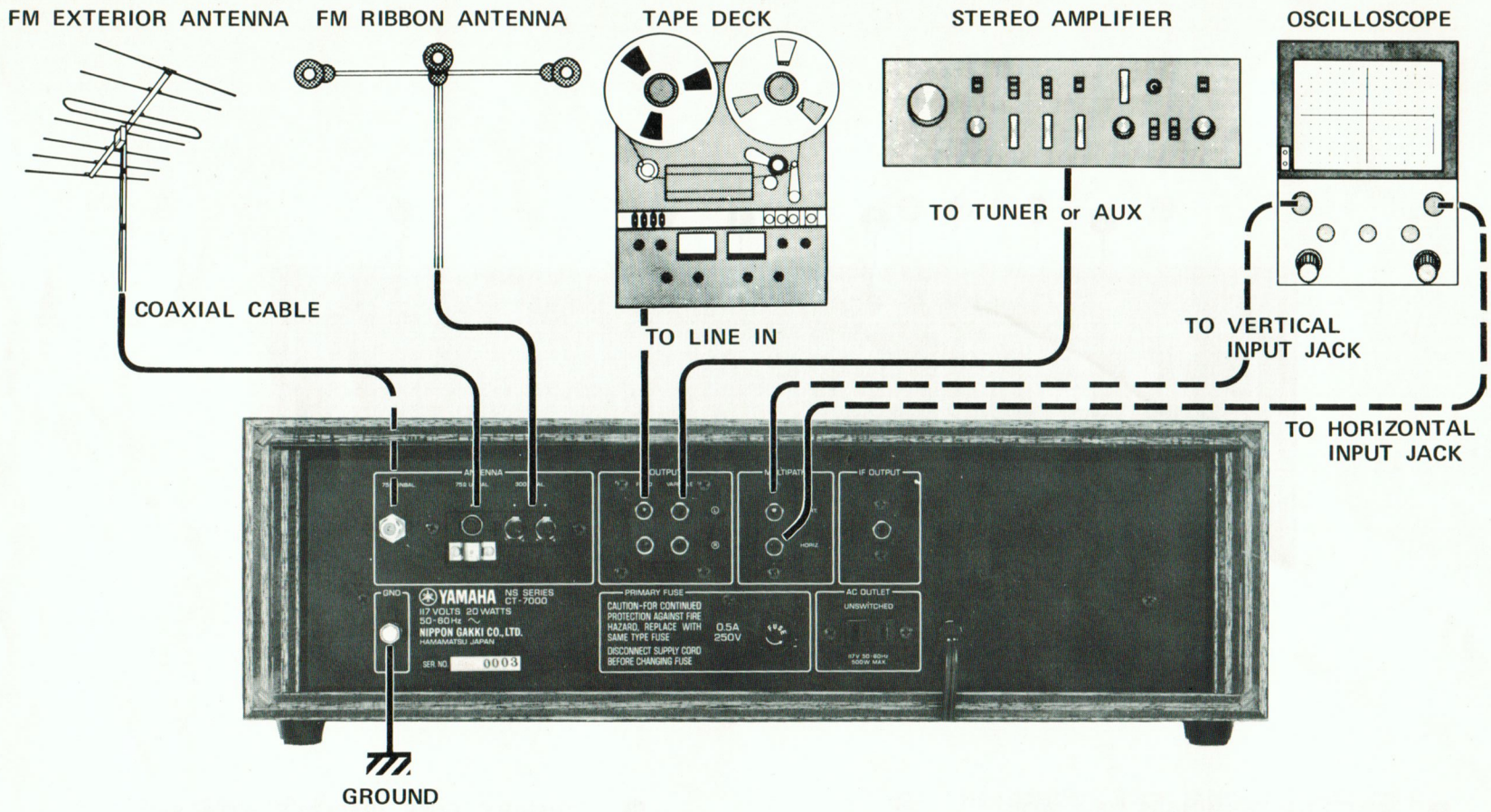
1. DIAL SCALE
2. DIAL INDICATOR
   THE RED LINE IN THE MIDDLE INDICATES THE FREQUENCY BEING RECEIVED.
3. FM STEREO INDICATOR
4. STATION INDICATOR
5. SIGNAL STRENGTH METER
6. TUNING METER
7. HINGED PANEL
8. HEADPHONE JACK AND VOLUME CONTROL
9. OUTPUT LEVEL CONTROL
10. MUTING LEVEL CONTROL AND SWITCH
11. IF MODE SWITCH
12. METER DISPLAY SELECTOR SWITCH
13. AUTO-BLEND SWITCH
14. MODE SWITCH
15. DIAL SCALE ILLUMINATION SWITCH
16. POWER SWITCH
17. TUNING KNOB

REAR PANEL



1. ANTENNA TERMINALS (75Ω, 300Ω)
2. OUTPUT TERMINALS (FIXED & VARIABLE)
3. MILTIPATH TERMINALS (VERTICAL & HORIZONTAL)
4. IF OUTPUT TERMINAL
5. GROUND TERMINAL
6. PRIMARY FUSE (REPLACE WITH SAME TYPE)
7. AC OUTLET (UNSWITCHED; 500W MAXIMUM LOAD)
8. POWER CORD
   VOLTAGE SELECTOR (EUROPEAN MODEL ONLY)

CONNECTION DIAGRAM



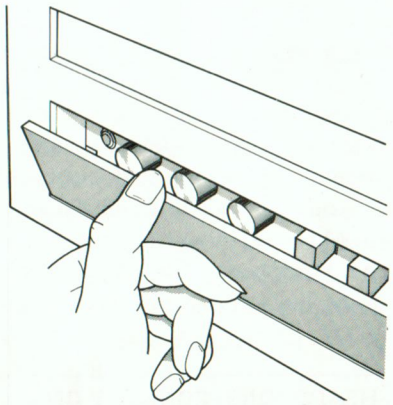
PRECAUTION

- Do not place the CT-7000 in a location exposed to direct sunlight, humidity or excessive heat (such as the top of a power amplifier).
- Be sure to operate all switches and connect all jacks and terminals as set forth in this manual.
- Do not connect any electric device which uses over 500W to the AC outlet on the rear panel.
- Do not clean the cabinet with thinner, or use thinner or insecticides near the set. If some such element does spill onto the cabinet by accident, be sure to clean it off immediately and thoroughly.
- The CT-7000 is one of the world's most sophisticated and complicated audio units. Refer all servicing problems to qualified Yamaha service personnel.

OPENING THE HINGED PANEL

Push on the bottom of the panel and the top will tilt out toward you. Pull it all the way down. The knobs and switches behind this panel are those which will need only infrequent adjustment once set. See Fig. 1.

Fig. 1 OPENING THE HINGED PANEL



IF MODE SWITCH

This switch permits you to choose between Normal and Wide intermediate frequency zones. For regular reception conditions, leave the switch at Normal, but set to Wide (pressed in) in unusually good reception areas in order to benefit from the reduced distortion of this mode.

In an area with many adjacent signals, use Normal mode. See Fig. 2.

MUTING SWITCH AND LEVEL CONTROL

The muting circuit cuts the unpleasant hissing noise heard between FM stations when tuning. However, the circuit can also cut out weak station signals in addition to the noise. For this reason the muting circuit in the CT-7000 can be adjusted to a level appropriate for the signal strength in your area. The Muting switch turns the muting circuit on and off, while the knob adjusts the muting level between 3μV and 30μV.

In areas where the signals are extremely strong, adjust the knob to the right from 20; in a weak-signal area, adjust to the left. If the FM signals in your area are extremely weak, tune with the Muting switch off. You will have to put up with the hiss in order to pick up such weak signals. See Fig. 3.

Fig. 2 IF MODE SWITCH

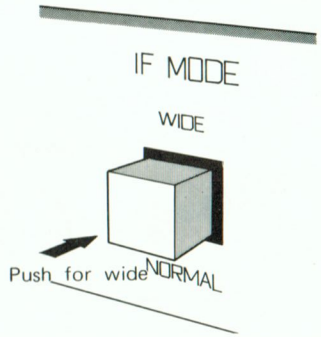
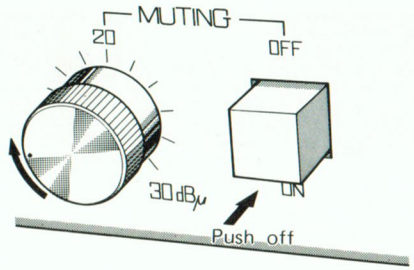


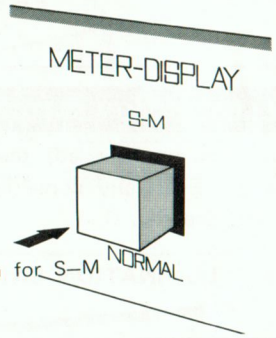
Fig. 3 MUTING LEVEL CONTROL & SWITCH



METER DISPLAY SWITCH

This switch changes the function of the Signal meter. In Normal position it shows the field strength of the signal being received. When it is pushed in (to the S-M position) the meter shows the same signal minus the multipath signal (in other words, it shows how "clean" the received signal is). When this switch is changed back and forth, the less the meter swings, the better the signal is (i.e., the less multipath elements there are). This meter is particularly useful for aiming an antenna in order to cut out as much multipath reception as possible. See Fig. 4.

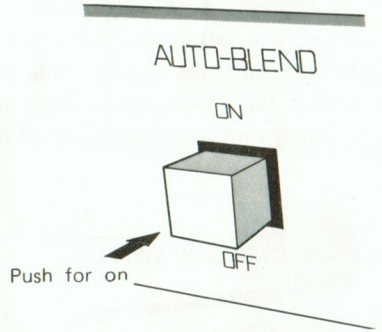
Fig. 4 METER DISPLAY SWITCH



AUTO-BLEND SWITCH

When this switch is set on (pressed) the circuit in the CT-7000 automatically senses the antenna input strength, then blends an appropriate portion of the left and right stereo signals to achieve the best possible signal-to-noise ratio. See Fig. 5.

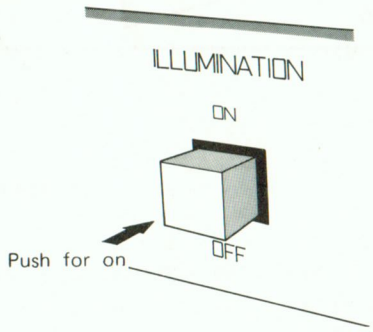
Fig. 5 AUTO - BLEND SWITCH



ILLUMINATION SWITCH

When this switch is on (pressed) the light in the dial scale goes on. Especially convenient in a dark room or at night. See Fig. 6.

Fig. 6 DIAL ILLUMINATION SWITCH



STEREO AMPLIFIER CONNECTION

The rear panel of the CT-7000 incorporates both Fixed and Variable output jacks. The Fixed jacks provide an output signal level of 774mV (0dBm), while the Variable jacks have their output level controlled by the Output Level knob on the front panel; this level can be varied between 60mV and 2V.

To connect either set of jacks to the Tuner (or Aux.) jacks on your stereo amplifier, use the connector cords provided with the CT-7000. See Fig. 7.

To adjust the CT-7000 output level in order to match that of other sound sources (turntable, tape deck, etc.) connected to the same amplifier, use the Variable jacks and adjust their level with the knob.

To record directly from the CT-7000 to a tape deck, connect the Fixed jacks to the deck's Line In jacks. Then adjust the recording level with the controls on the tape deck or recorder. See Fig. 8.

Fig. 7 STEREO AMPLIFIER CONNECTION

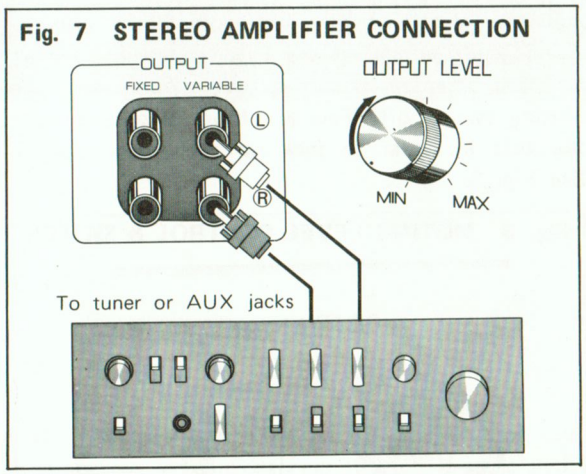
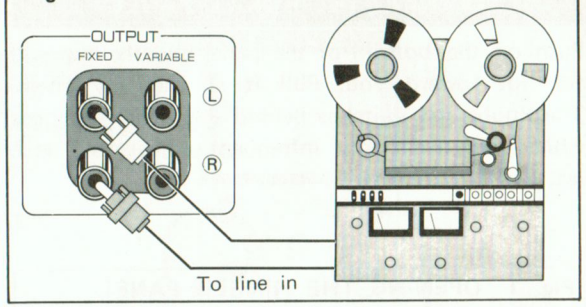


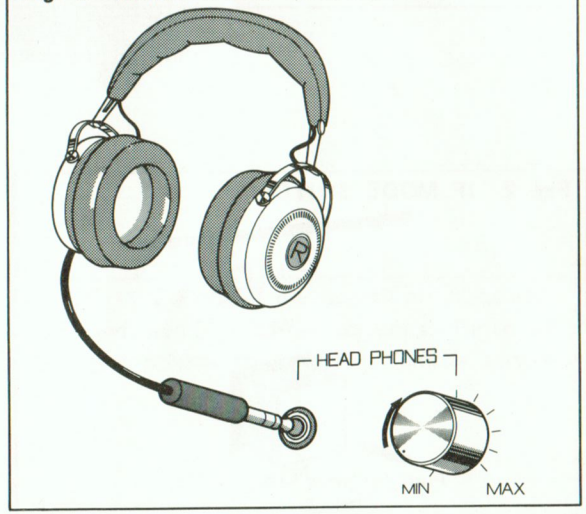
Fig. 8 TAPE DECK CONNECTION



HEADPHONE CONNECTION AND USE

Plug the headphone plug into the front panel Head Phones jack. The sound volume heard through the headphones can be adjusted independently of the main output volume by using the volume control knob. When listening to a stereo broadcast through the headphones, the side with the cord attached is for the left ear. See Fig. 9.

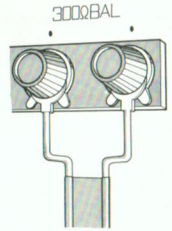
Fig. 9 HEADPHONE CONNECTION



FM ANTENNA CONNECTION

1. Connect the supplied FM ribbon antenna to the 300Ω antenna terminals on the rear panel.

Fig.10 FM RIBBON ANTENNA CONNECTION



2. Set the Meter Display switch to Normal, then switch on the set and tune in a strong station. Now hold the top part of the antenna horizontal as shown in Fig. 11 and rotate it 180° while watching the Signal meter needle deflection. The angle affording maximum deflection is the best position for the antenna to be fixed to the wall.

This ribbon antenna is sufficient in normal signal areas, but in a weak-signal area it will not provide a sufficiently strong signal. In this case a special FM exterior antenna should be used. See Fig. 12.

Fig.11

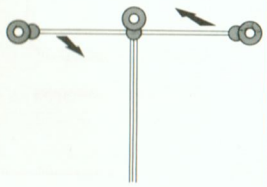


Fig.12 EXTERIOR FM ANTENNA

The exterior FM antenna should be connected via a coaxial shielded cable to either of the 75Ω antenna terminals for best possible reception and protection against interference, such as that from automobile and motorcycle ignitions, etc. If such a cable cannot be used, 300Ω balanced feeder can be employed. In this case connect to the 300Ω antenna terminals.

COAXIAL CABLE CONNECTION

1. When the coaxial cable is to be connected to the 75Ω clamp terminal, first strip the cable end as shown in Fig. 13.
2. Loosen the two screws fixing the cable clamp, then slip in the cable so that the shield mesh will touch the clamp, then retighten the clamp. See Fig. 13.
3. Loosen the upper terminal knob, wrap the center wire around the shaft and retighten the knob.
4. When the connector terminal is to be used, first attach an F type connector to the end of the cable. See Fig. 14.

Note: Use 3C2V or 5C2V coaxial cable. Make sure there is no short between the center cable and outer shield mesh during connection.

Fig.13 COAXIAL CABLE CONNECTION

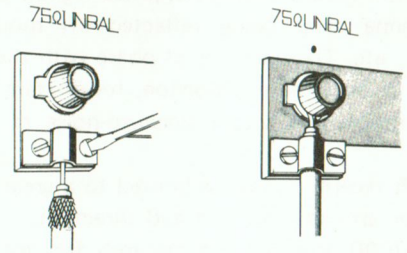
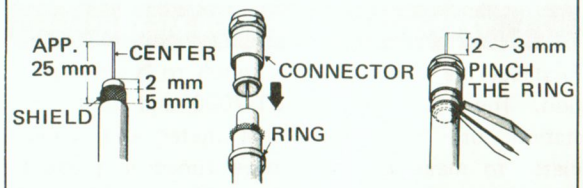


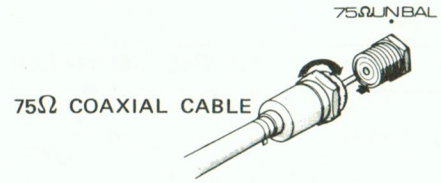
Fig.14 COAXIAL CABLE CONNECTION



① First strip the cable as shown above (if the center is a multi-strand construction, treat with solder).

② Slip on the ring, then spread the shield mesh and finally add the connector.

③ Cut away any excess shield mesh, then slip the ring over the end of the connector (the connector should be for enough down to leave 2 ~ 3 mm of center wire protruding) and pinch it tight.



MULTIPATH TESTING

"Multipath" means the out-of-phase signals entering the antenna after being reflected off mountains, buildings, etc. They are out of phase with the direct signal, and thus cause distortion, lower stereo channel separation and worse signal-to-noise ratio. See Fig. 15.

Multipath reception can be limited to a great extent by proper antenna location and direction.

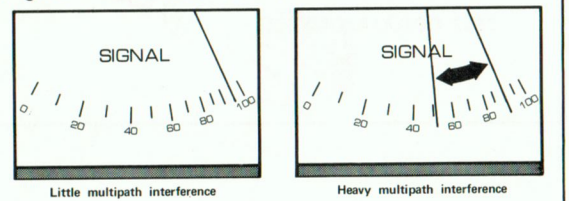
The CT-7000 provides two methods for testing the multipath, especially useful when choosing an antenna position: the S-M meter and the Multipath Out terminal.

TESTING WITH THE S-M METER

First set the Meter Display switch to Normal position. Then turn on the CT-7000 and tune in a station; use both the Signal meter and Tuning meter to make sure you have tuned in precisely on the station. Now note the position of the Signal meter needle.

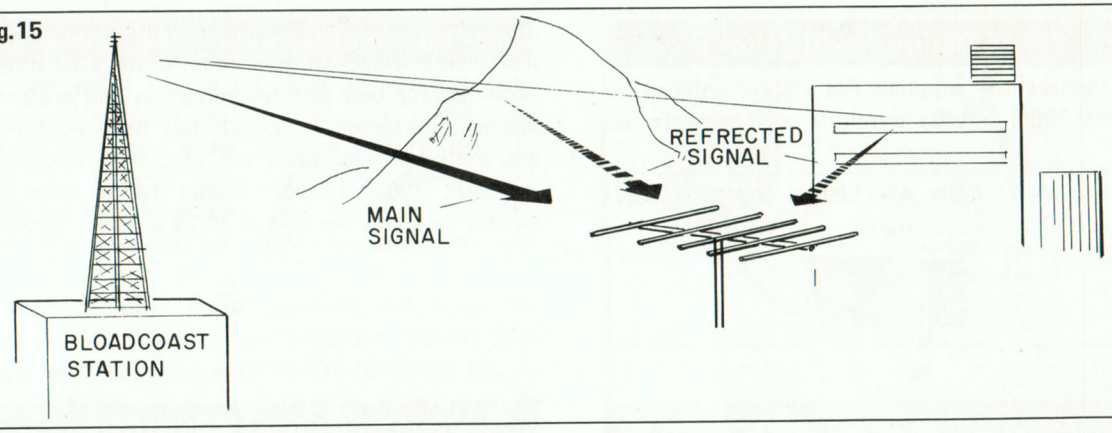
Next, set the Meter Display switch to S-M and watch how much the Signal meter needle swings back. The less it returns, the less multipath interference you have. Adjust the FM antenna position for a meter reading as close as possible to the original one (with the Meter Display switch set to Normal). See Fig. 16.

Fig.16 TESTING WITH THE S-M METER



Little multipath interference — Heavy multipath interference

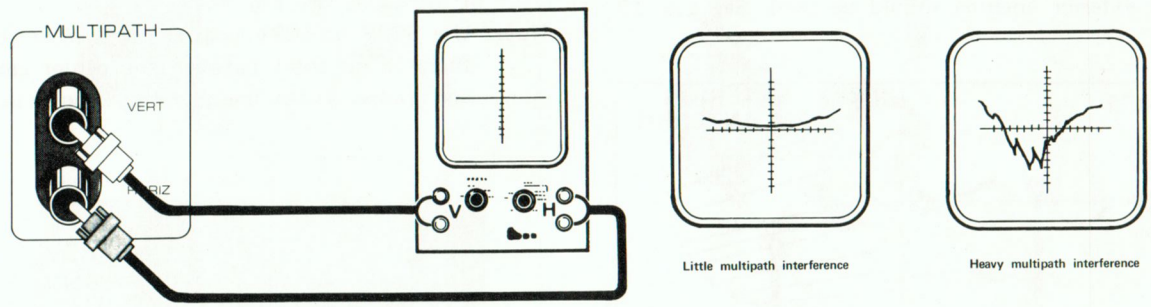
Fig.15



TESTING WITH AN OSCILLOSCOPE

1. Connect the oscilloscope vertical and horizontal input terminals to the vertical and horizontal jacks on the CT-7000 rear panel. See Fig. 17.
2. Tune in an FM station (watch the Signal and Tuning meters for perfect station alignment). Check that the waveform appears on the oscilloscope.
3. When there is little multipath the waveform should resemble a straight line; this line will be more and more distorted the more multipath interference there is. See Fig. 17. Adjust the FM antenna position so that the oscilloscope waveform is as close as possible to a straight line.

Fig.17



Little multipath interference — Heavy multipath interference

TUNING

1. As you turn the Tuning knob the Station indicator will light a bit when you approach an FM station frequency. The dial indicator will tell you which station you are near.
2. Tune first for maximum deflection of the Signal meter needle, then finish the tuning by centering the Tuning meter needle. See Fig. 18.
3. After the station is tuned in, release your hand from the Tuning knob. The Station indicator lamp will become even brighter, showing that the AFC circuit has come on automatically for steady, drift-free reception.
4. When a stereo broadcast is tuned in the Stereo indicator lamp will automatically light; it will automatically go out when switching to a monophonic broadcast.
5. In a weak signal area when excessive noise is being received along with an FM stereo broadcast, switch on the Auto-Blend. This will reduce the noise to a certain extent. However, if the noise is still too unpleasant, even with the Auto-Blend circuit functioning, as a last resort press the Mode switch for Mono setting. In this case stereo separation will be completely lost, but the noise will be significantly reduced. See Fig. 19.

Note: Difficult FM tuning and excessive noise are often caused by improper antenna positioning, so check the antenna and experiment with its location and direction if you have such problems.
Also check the Troubleshooting chart at the end of this manual.

Fig.18 SIGNAL, TUNING METERS

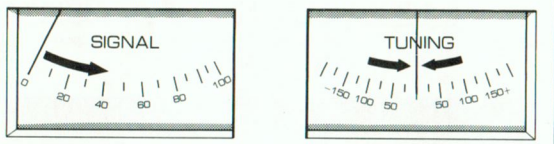
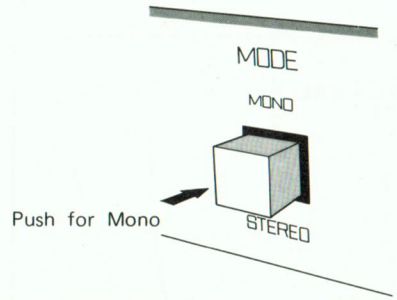


Fig.19 MODE SWITCH



NEWLY-DEVELOPED BLOCK FILTERS

One of the most important sections of a tuner is the IF stage.

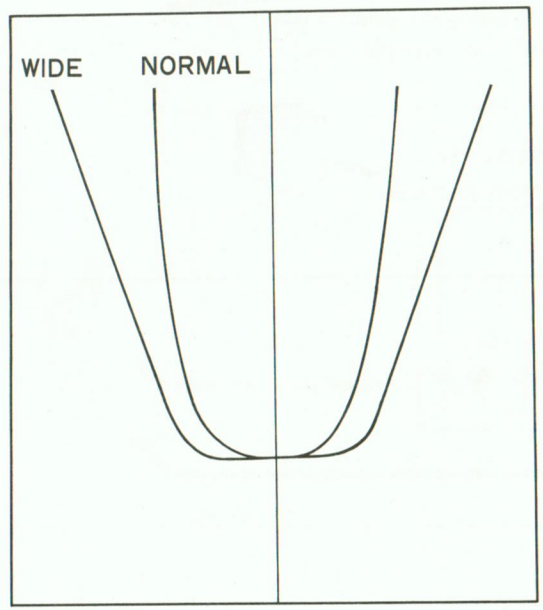
In the CT-7000 this section uses newly developed high-performance block ceramic filters for unparalleled performance characteristics. It is thanks to this new design that the CT-7000 exhibits such excellent distortion, separation, selectivity and capture ratio figures. These block ceramic filters yield the following special features

★ Reduced insertion loss, higher selectivity.
★ Better phase characteristics, lower distortion.
★ Better temperature resistance and stability.

IF MODE SWITCH

In an uncrowded signal area, the reduced distortion is a more crucial characteristic than selectivity, but as the number of stations increases, selectivity becomes relatively more important. The IF Mode switch on the CT-7000 lets the unit meet these different needs by providing a choice of which characteristic to stress. Although this IF stage is basically a high-selectivity, low-distortion design, it is possible to sacrifice a certain amount of selectivity for reduced distortion when there are not too many stations in the area. In this case set the switch to Wide. In an area where there are relatively many stations, leave the switch at Normal for maximum selectivity. See Fig. 20 and the performance charts.

Fig.20 IF MODE SWITCH

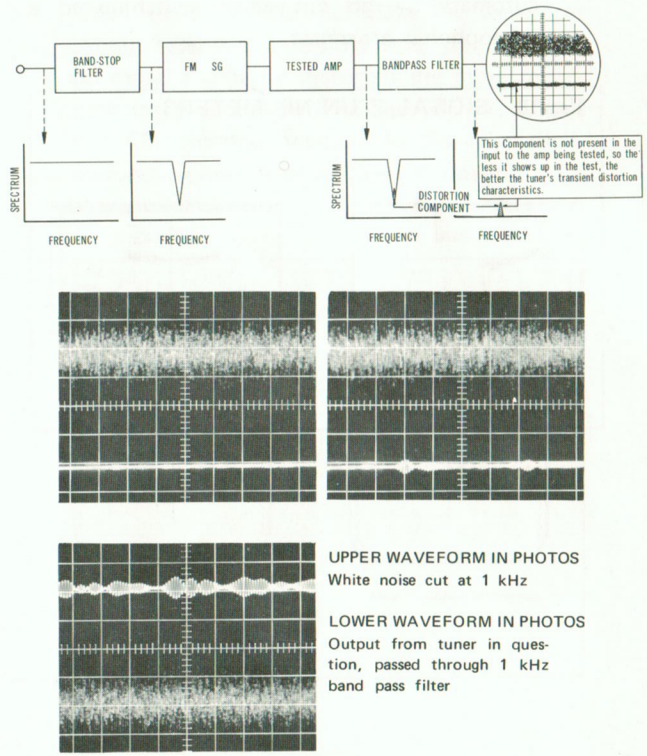


"NIKAIDO" TRANSIENT DISTORTION CHECK SYSTEM

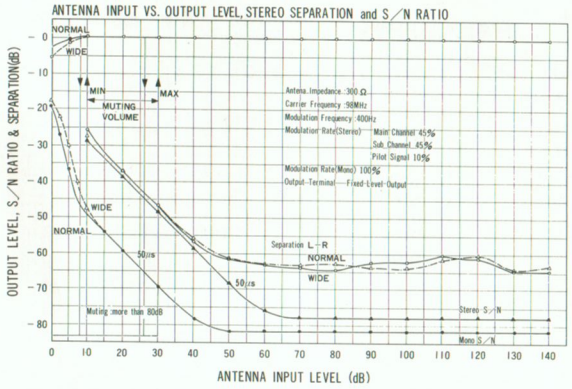
Harmonic and intermodulation distortion are normally tested with a simple sine wave, and the results are used to verify the tuner's distortion level.

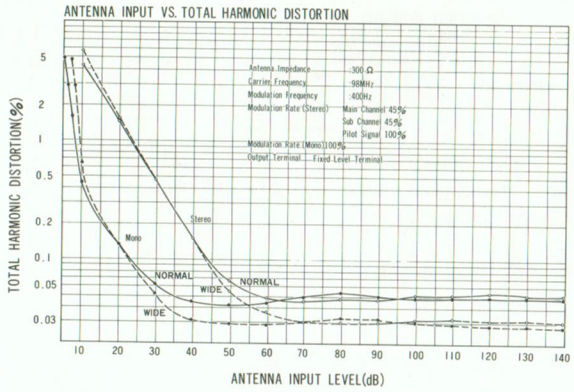
The transient distortion check, on the other hand, uses a signal similar to that encountered in actual music listening conditions – an entirely new method of testing for lowest possible distortion under operating conditions. See Fig. 21.

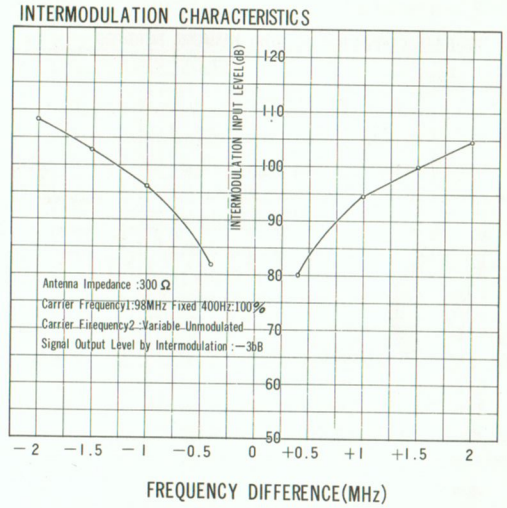
Fig.21 NIKAIDO TRANSIENT DISTORTION

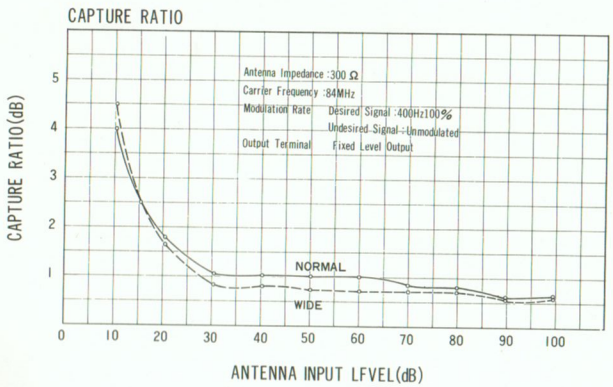


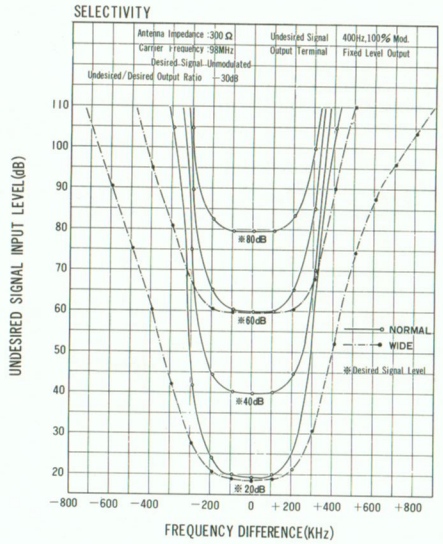
PERFORMANCE CHARTS

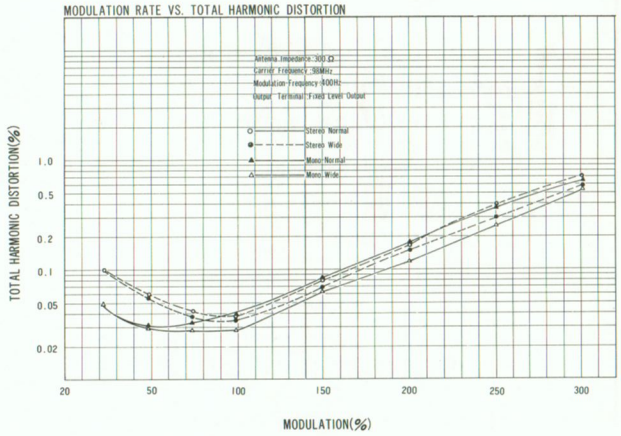




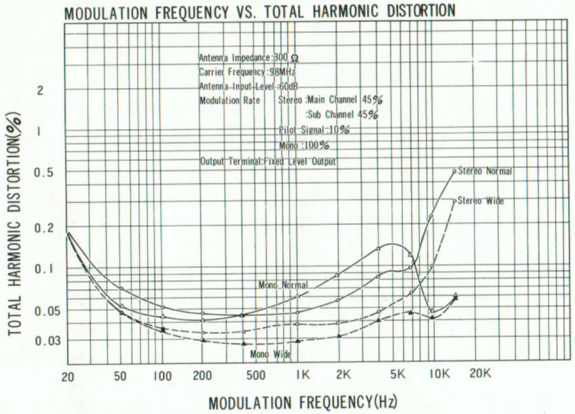


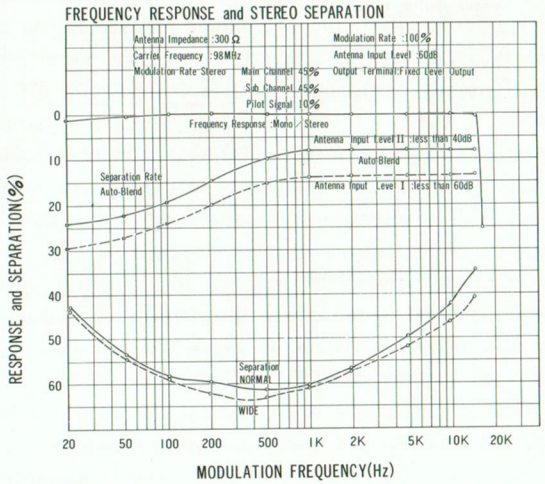


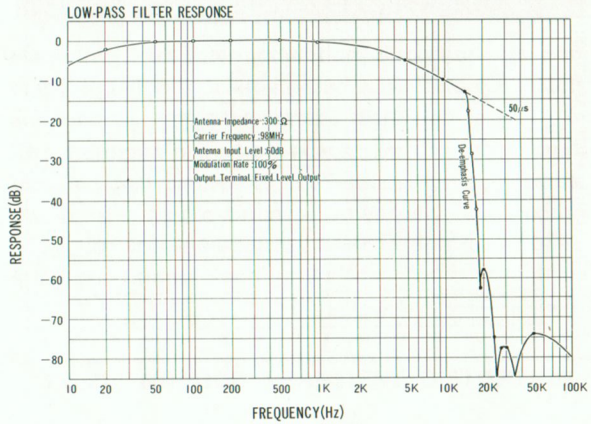


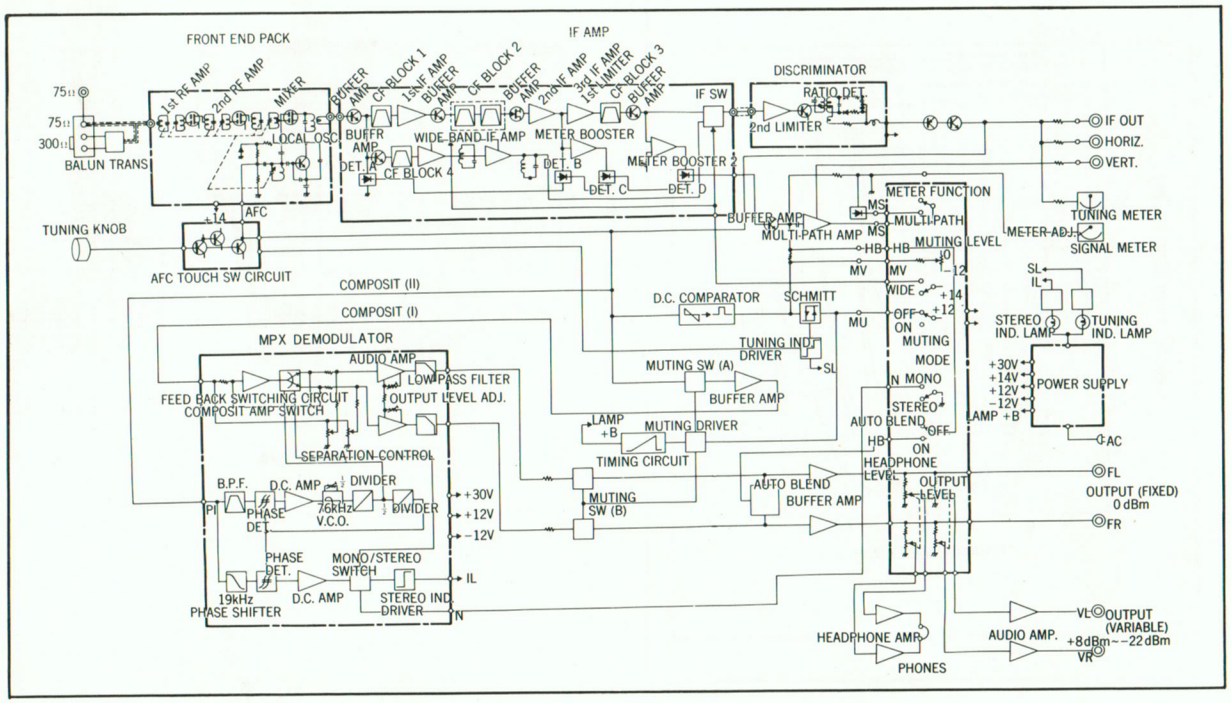


PERFORMANCE CHARTS • BLOCK DIAGRAM









SPECIFICATIONS

FM Tuner Section

Tuning Range			88 ~ 108MHz
Usable Sensitivity	(IHF)		Normal: 2.5μV
			Wide: 3.2μV
	(DIN)		Normal: 1.6μV
			Wide: 2.5μV
Quieting Level (at S/N 50dB)		Mono	Normal: 4μV
			Wide: 4μV
		Stereo	Normal: 50μV
			Wide: 50μV
Signal-to-Noise Ratio		Mono	78dB
		Stereo	75dB
Image Freq. Rejection			120dB
IF Rejection			120dB
Spurious Resp. Rejection			120dB
AM Rejection	(IHF)		60dB
Capture Ratio	(10μV)		Normal: 2.0dB
			Wide: 3.0dB
	(1mV)		Normal: 1.3dB
			Wide: 1.0dB
	(100mV)		Normal: 1.0dB
			Wide: 1.0dB
Usable Selectivity	(IHF)		Normal: 80dB
			Wide: 18dB
Intermodulation Rejection (2MHz)			100 dB
Harmonic Distortion		Mono 400Hz	Normal: 0.08%
			Wide: 0.08%
		50 ~ 10kHz	Normal: 0.3%
			Wide: 0.15%
		Stereo 400Hz	Normal: 0.08%
			Wide: 0.08%
		50 ~ 10kHz	Normal: 0.5%
			Wide: 0.2%
Stereo Separation		400Hz	Normal: 50dB
			Wide: 50dB
		50 ~ 10kHz	Normal: 35dB
			Wide: 40dB
Frequency Response			50 ~ 10kHz ± 0.3dB
			30 ~ 15kHz + 0.5dB, −1.0dB
Frequency Drift		(on 2 mins.)	± 10kHz
		(over 2 mins.)	± 5kHz
		(± 30 °C)	± 15kHz
Carrier Leak			70dB
SCA Rejection			70dB
IF Harmonic Rejection (when 50dBμ =300μV)			60dB
Muting Level			3μ ~ 30μV adjustable
Stereo Level			3μ ~ 30μV adjustable
Auto-Blend Level			I: 100μV, II: 1mV
Antenna Input Impedance			300Ω balanced
			75Ω unbalanced
Maximum Input Capacity		300Ω	146dB (20Vrms)
		75Ω	140dB (10Vrms)
Output Level		Fixed	775mV
		Variable	50mV ~ 2V adjustable

Functions & Controls

Muting (adjustable), Auto-Blend (2-stage operation), AFC (Auto-Touch), IF Mode Switch, Mode Switch, Meter Display Switch, Headphone Jack

General

Solid State Devices	Transistors:	108
	FETs:	12
	ICs:	7
	Diodes:	33
	Zener Diodes:	9
Power Consumption	Illum. on:	23W
	Illum. off:	13W
Power Source		AC 110, 117, 130, 220, 240V
Operating Temperature Range		−5°C to 55°C
Dimensions (W x H x D)		436 (17⅛") x 144 (5⅔") x 352mm (13⅞")

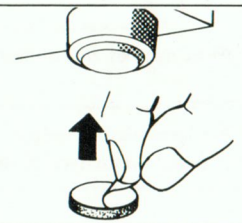
Accessories

Fuse	1
Service Pads	1
FM Ribbon Antenna	1
Connector Cord	1

Specifications subject to change without notice.

SERVICE PADS

If an amplifier or turntable is used on top of the CT-7000, protect the cabinet finish by using these pads on the feet of the other unit. Each pad is self-adhesive: just peel off the paper and stick to the foot of the other unit.



PROBLEM	CAUSE	SOLUTION
Sharp, cracking noise, especially in weak signal area, from time to time.	Automobile or motorcycle ignition noise.	Install a special FM antenna, as high as possible and as far from the road as possible. Use coaxial cable for the antenna connection.
	Noise from a machine with a thermostat.	Install noise suppressors on the machine.
Excessive noise during stereo reception.	Occurs because of weak antenna input (due to weak or distant FM station).	Install a special FM antenna.
		Change to a multi-element FM antenna.
		Switch the Auto-Blend on.
During stereo broadcast, FM stereo indicator flickers and intermittent noise occurs.	Insufficient antenna input.	Install an antenna proper for your signal area.
	Tuning not precise.	Retune, using both meters as explained above.
Performance worse after FM antenna installed.	Multipath interference due to signal reflected off of nearby buildings, etc.	Select a better antenna location and direction by finding the position which affords least multipath interference. See the explanations in the manual above.
During reception of test stereo signal, some left-channel sound heard through right channel.	This is cross-talk. A slight amount is normal.	If the sound leaking to the right channel is considerably lower than the level heard through the left speaker, this is normal and cannot be corrected.
Signal meter needle moves but no sound heard.	Improper muting level adjustment.	Turn the muting level knob to the left, or switch it off.
	Improper signal cord connection.	Check and reconnect.
No stereo sound during stereo broadcast. Stereo indicator lamp does not light.	Signal too weak.	If the ribbon antenna is being used, switch to an exterior type. If an exterior type is already being used, select a better location.
	Mode switch set to Mono.	Reset to Stereo.
Hum occurs.	Improper cord connection.	Check and reconnect.
Shock received from cabinet on stormy day.	Exterior antenna picking up static electricity.	Be sure the GND terminal is connected to a solid ground.
After tuning with the Mode switch set to Normal, additional station heard when switch set to Wide.	Strong nearby station interfering.	Reset switch to Normal and listen with it in that position.

SINCE 1887

YAMAHA

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