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C/P

SERVICE MANUAL **2270**



marantz

model 2270

Stereophonic Receiver

TABLE OF CONTENTS

	PAGE
Introduction	1
Service Notes	1
AM Tuner	1
FM Tuner	2
Phono and Tone Amplifiers	4
Power Amplifier	4
Power Protection Circuit	5
Speaker Protection Relay Circuit	5
Suggestion for Trouble Shooting of Power Amplifier	5
Voltage Conversion	6
Test Equipment Required for Servicing	8
AM Alignment Procedure	9
FM Alignment Procedure	9
Stereo Separation Alignment	9
Muting Circuit Alignment	10
Audio Adjustment	10
Parts List	23
Specifications	33

LIST OF ILLUSTRATIONS

FIGURE NO	PAGE
1. Remove the Terminal Cover	6
2. Voltage Conversion Chart	7
3. Lissajou Figure on Oscilloscope	11
4. Dial Stringing	11
5. Front Panel Adjustment and Component Locations	12
6. Main Chassis Component Locations (Top View)	12
7. Rear Panel Adjustment and Component Locations	13
8. Main Chassis Component Locations (Bottom View)	13
9. FM Front End Assembly P100 Component Locations	14
10. FM IF Amplifier Assembly P200 Component Locations	14
11. FM Detector Assembly P500 Component Locations	15
12. MPX Stereo Decoding Amplifier Assembly P300 Component Locations	15
13. Muting Control Amplifier Assembly P550 Component Locations	16
14. AM Tuner Unit Assembly P150 Component Locations	16
15. Phono Amplifier Assembly P700 Component Locations	17
16. Tone Amplifier Assembly P400 Component Locations	17
17. Tone Control Unit Assembly P450 Component Locations	18
18. Power Amplifier Assembly P750 Component Locations	19
19. Regulated Power Supply and Protection Relay Circuit Assembly P800 Component Locations	20
20. Mono, High and Low Filter Switch Unit Assembly P600 Component Locations	21
21. Loudness, Muting and Speakers Switch Assembly P650 Component Locations	21
22. Schematic Diagram	22

INTRODUCTION

This service manual was prepared for use by Authorized Warranty Stations and contains service information for Marantz Model 2270 Stereophonic Receiver.

Service information and voltage data included in this manual are intended for use by the knowledgeable and experienced technician only. All instructions should be read carefully. No attempt should be made to proceed without a good understanding of the operation in the receiver.

The parts list furnishes information by which replacement parts may be ordered from the Marantz Company. A simple description is included for parts which can usually be obtained through local suppliers.

1. Service Notes

As can be seen from the circuit diagram the chassis of Model 2270 consists of the following units. Each unit mounted on a printed circuit board is described within the square enclosed by a bold dotted line on the circuit diagram.

- | | |
|---|----------------------------|
| 1. FM Front End | mounted on P.C. Board P100 |
| 2. FM IF Amplifier | mounted on P.C. Board P200 |
| 3. FM Detector | mounted on P.C. Board P500 |
| 4. MPX Stereo Decoding Amplifier | mounted on P.C. Board P300 |
| 5. Muting Control Amplifier | mounted on P.C. Board P550 |
| 6. AM Tuner Unit | mounted on P.C. Board P150 |
| 7. Phono Amplifier | mounted on P.C. Board P700 |
| 8. Tone Amplifier | mounted on P.C. Board P400 |
| 9. Tone Control Unit | mounted on P.C. Board P450 |
| 10. Power Amplifier | mounted on P.C. Board P750 |
| 11. Regulated Power Supply and Protection Relay Circuit | mounted on P.C. Board P800 |
| 12. Mono, High and Low Filter Switch unit | mounted on P.C. Board P600 |
| 13. Loudness, Muting and Speakers Switch unit | mounted on P.C. Board P650 |

2. AM Tuner

All components except Tuning capacitor and ferrite bar antenna are mounted on a printed circuit board P150.

The AM signals induced in a ferrite bar antenna are applied to the base of RF amplifier transistor H151 through a capacitor of C151 and amplified to the level required for overcoming the conversion noises, thus giving good S/N performance. The tuned circuits inserted in both out-and-in put circuit of the RF amplifier assure very high image and spurious rejection performance. Thus amplified and selected AM signals are then applied to the base of converter transistor H152 through a coupling capacitor C156. While the local oscillator voltage is injected to the emitter of H152 through a capacitor C157. Both AM signals and oscillating voltage are mixed at the base-emitter junction and converted into 455KHz intermediate frequency. The resulting IF signal is applied to the first IF transformer L153 consisting of one ceramic filter and two tuned circuits.

The output of L153 is led to the transistor H153 which in turn applies its output to the transistor of next stage H154. The fully amplified IF output is then applied to the diode H157 to detect audible signal through the detector transformer L154. The detected audio signal is filtered and amplified and the final audio output is obtained from the collector of H155 and applied: one to the tape out jacks through monitor switch on the front panel and the other to the function rotary switch.

The DC component of the detected IF signal is used as a AGC voltage to control emitter current of H153 which in turn controls the bias current of the RF amplifier through the resistor R179 and R151. A part of IF signal output is also applied to the diode H158 through a capacitor C167 and rectified to obtain DC current for energizing the AM signal strength meter M001.

2.2 Suggestions for AM Tuner trouble shooting

Check for broken AM bar antenna, next try to tune station by rotating fly-wheel tuning knob slowly and observe the AM signal strength meter whether it deflects or not. If the signal strength meter gives a deflection at several frequencies received, no failure may exist in the stages at least preceding final IF transformer L154. Next connect a oscilloscope to the pin terminal J162 or J157 and check for audio signals with the tuning meter deflected. If the signal strength meter does not deflect, check the local oscillator circuit. Normal oscillating voltage at the hot end of the oscillator tuning capacitor is about 2 or 3 volts, varying with tuning capacitor position. When measuring oscillating voltage use a RF VTVM, no circuit tester gives correct indication. If the local oscillator voltage is normal, check all voltage distribution in the AM circuits by using a DC VTVM and compare the measured values with those given in the schematic diagram.

3. FM TUNER

The FM Tuner section of Model 2270 is divided into five functional blocks: FM Front End, IF Amplifier, Detector, Muting Control and MPX Stereo Decoding Circuit.

FM signals induced by a FM antenna are led to FM antenna coil L101 through an attenuator switch and a balun coil. These signals are then applied to the FET RF amplifier which in turn applies its output to the next FET Mixer H102 through the triple tuned high selective circuits. The FET Mixer convert its input signal into 10.7MHz intermediate frequency and amplifies it at the same time. The H103 is a local oscillator and its output is injected into the source of the FET Mixer, the injection voltage is about 700mV. The 10.7MHz front end output is led to the next IF amplifier unit through a coaxial cable.

The IF amplifier unit consists of six stages of IF amplifier, one stage of AGC amplifier and two stages of multipath signal amplifiers. Eight pieces of ceramic filters are also used to obtain high selectivity three stages of symmetrical diode limiters are also employed for the best limiting characteristics, improved capture ratio and good AM suppression.

A part of FM Front End output is applied to the AGC amplifier H207 and rectified its output is fed back to the gate of FET RF amplifier to decrease the gain with increased signal strength.

The signals required for multipath indication are obtained from the three stages of IF amplifiers through coupling capacitors C234, C236 and C238 respectively and rectified by three pair of full wave diode circuits. Thus obtained AM components of the FM signal is amplified by the transistor H208 and H209 and its output is again rectified to obtain DC current required for actuating the Multipath indication meter.

The IF signal sufficiently amplified through every stage of IF amplifier is finally applied to the IC limiter on the Detector Unit. The detected audio output is led to the buffer amplifier H502 and its buffered output is led to; (a) noise amplifier H551 through resistor R551 and capacitor C551, (b) Quad Radial Jacks on the rear panel through resistor R564, (c) MPX stereo decoding circuit through R563.

The DC current caused at the third windings of the discriminator transformer is directly applied to the FM center tuning meter.

Audio Muting and Stereo mode auto-selecting circuit

The muting circuit consisting of all solid-state electrical switching has been incorporated in the Model 2270. Three inputs control the muting function. The first is related to signal strength, the second to the noise condition at the detector and the third is derived from the DC component of the detector output. These inputs are properly matrixed and gated to provide muting free from noise and transients.

The first input of DC voltage obtained by rectifying a part of IF output signal from the H206 is applied to the base of H306 and turns on it, if the IF output is greater than predetermined level (muting threshold level). When the H306 is turned on the H307 is turned off, allowing the emitter-collector resistance increasing and the collector voltage rises about 9.7V. The increased

collector voltage increases the gate bias voltage and turns on the switching FET H308, decreasing the source-drain resistance to near zero ohm and allowing the audio signal applied to the source to flow to the center of 38KHz switching transformer through the source-drain path.

When the input signal is lower than predetermined level, the DC output obtained is small and can not turn on the H306, thus the H306 keeps its turn-off state and this makes H307 turn on, decreasing the collector voltage and turning off H308. Thus no audio signals can pass through the FET. This is the fundamental principle of the muting operation but for more elaborate muting operation the second and the third inputs are necessary.

The second input is used to protect the muting operation and MPX stereo beacon lamps from misoperation due to undesirable noises. The high frequency noises included in the detected audio signals are separated by a small capacitor C551 and amplified by the noise amplifier transistor H551 and its output is rectified by the two diodes. The rectified DC output is proportional to the noise components in the audio signals.

When there are excessive noises in the audio signals such as obtained with a station incorrectly tuned in, the rectified DC output turns on the transistor H522, decreasing the emitter-collector resistance to zero. This means the collector of H307 is short-circuited to the ground, therefore the H308 is turned off and any audio signals having excessive high frequency noises can not go through the FET's sourcedrain path.

The transistor H303 connected in series with the 19KHz pilot signal amplifier transistor H302 is also turned off (when the transistor H522 or H307 are turned on.) and no current flows in the H302, resulting in turning off the stereo beacon lamps. Thus misoperation due to undesirable noises is also avoided.

The third input is obtained from the FM discriminator circuit. The DC output so called "S" curve is applied to the gate of H558 through a resistor R523 and dividing network (R565 & R566). The DC output is zero with a station correctly tuned in, but will vary from negative to positive values or vice versa when the tuning point is deviated toward either plus or minus frequency from the correct tuning frequency.

When the DC output is increased to a greater level than that of predetermined, the increased source potential of H558 makes the transistor H561 turn on, and this makes the H306 turn off,....H307 turn on, H308 turn off, H303 turn off (this means no 19KHz pilot signal is amplified and no stereo beacon is turned on.) When the DC output is increased to the negative predetermined level, the decreased source potential turns off the H559 which in turn makes the H560 turn on and the H306 is turned off. The subsequent changes are exactly the same as that just described above.

Thus when the tuning is shifted or deviated to the certain frequencies in which undesirable noisy side-audio signals are produced, both muting and 19KHz switching transistors are operated automatically and open the circuits.

With the station correctly tuned in, the bias current of the FET H558 is adjusted so that both transistor H560 and H561 are not turned on, giving no effect on the transistor H306.

MPX Stereo Decoding Circuit

The buffered and non-equalized audio signals are applied to the first amplifier H301 which serve as a tuned amplifier for the pilot signal in the composite signals and as a buffer amplifier for the audio signals. The amplified 19KHz pilot signal is led to the second 19KHz amplifier H302 and further amplified if switching transistor H303 is turned on by the controlling DC signal as described in the preceding chapter. The final 19KHz pilot signal is rectified by the doubler circuit consisting of the H315 and H316 to obtain synchronized 38KHz amplifier driving signal.

The H304 is the 38KHz tuned amplifier and supplies its output to the switching matrix circuit consisting of four diodes. While the composite signals are applied to the center tap of switching transformer 1/2 L302. The right and left stereo signals decoded by the switching circuit are led to the crosstalk cancelling amplifier which utilizes complementary configuration with NPN and PNP

transistors through de-emphasis network consisting of C315 and R335, and C316 and R336. L305 is a low-pass filter networks having very sharp cut off characteristics and eliminates undesirable residual switching signals. Transistors H313 and H314 are buffer amplifiers and their outputs are led to the function switch.

3.2 Suggestion for Trouble Shooting of FM Tuner

3.2.1 Symptom: No FM Reception

First turn on the power switch and try to tune FM stations. Rotate the fly-wheel tuning knob slowly and observe the FM signal strength meter and FM center tuning meter. If the center tuning meter deflect at several frequencies received, the tuner circuits preceding the discriminator circuit may have no failure. If the signal strength meter deflect but no deflection is obtained on the center meter, there may be some defects around the detecting circuit consisting H501, L501, H503, H504, etc. When no reading is obtained in both meters, check FM local oscillator circuit, using a RF VTVM. The normal local oscillator voltage is one or two volts (rms) at the tuning capacitor, depending on the tuning capacitor position. If the local oscillator voltage is normal, next check all voltage distribution in the FM Front End and IF amplifier unit and compare them with those shown in the circuit diagram. When both meters deflect but no sound is obtained, check audio circuits, using high sensitive oscilloscope.

3.2.2 Symptom: No Stereo Separation

First check the "MONO" switches are in normal out. position. Connect a FM RF signal generator output modulated by a stereo modulator to the rear FM antenna terminals, and check the stereo beacon is turned on or not. If not turned on, check for 19KHz pilot signal and 38KHz switching signal, using an oscilloscope.

4. Phono and Tone Amplifiers

Program source signals from the PHONO jacks on the rear panel are supplied to the input circuit of the Phono Amplifier through the selector switch and the output of the Phono Amplifier is applied to another section of the selector switch. This amplifier provides a gain of 40dB.

All signals selected by the function switch (S002-3F, 4F) are led to the balance and volume controls through the MONO(L,R) and Hi-Blend switches.

Signals properly attenuated by the volume control are applied to the tone amplifier and subjected to the tone control networks such as bass, mid, treble control and high and low cut filters.

Thus controlled audio signals are then led to the PRE OUT jacks on the rear panel.

5. Power Amplifier

The signal from the tone amplifier is applied to the differential amplifier (base of H751) through the coupling capacitor C751. The differential amplifier provides very high input impedance and its collector output (H752) is applied to the base of H753 which in turn applies its output to the next stage; to the H756 through the network R766, C762 and R771, and to the H757 through the network R776, C763 and R772. The outputs of H756 and H757 are applied to the H758 and H757 respectively. H001 and H002 are power transistors used in complementary symmetry configuration and mounted on the heat sink.

To maintain overall amplifier stability and linearity, degenerative feed back is utilized throughout the amplifier. This feed back is also necessary to reduce distortion to within specified limit. The RC network R775 and C756 condition the feed back signal for the audio signals. R759 and C755 are also a feed back loop provided to obtain a stable zero DC off set voltage at the speaker output terminals. The R762 is a trimming resistor to adjust the DC offset voltage.

Dynamic bias is applied to the base of driver transistors H758 and H757. This dynamic bias circuit is comprised of H761, H760 and R763. This provides a variable base bias for driver

transistors that automatically maintains the proper base voltage with temperature change. The temperature sensitive biasing components of the dynamic circuit are thermally coupled through a heatsink to the power amplifier transistors.

6. Power Protection Circuit

Protection circuit for the amplifier is provided by sensing resistor networks and two switching transistors. When the output transistors are over-driven, the current increase through the power output transistor causes an increased current flow through R789 (or R788) and the potential across the R789 will be increased. This increased voltage potential is applied to the base of H755 through the resistor R783 and turns on the H755. Since the collector of H755 is directly connected to the base of H757, this means that the base of H757 is by-passed to the ground through emitter-collector path of H755. Thus the input signal to the H757 is restricted to the value which maintains the operation of power transistor within the safety area. A resistor network R777 and R781 also works as a sensing network. When the center voltage (collector voltage of power transistors) is excessively increased to a positive value by certain troubles, the voltage applied to the base of H755 makes the H755 turn on, making bypass circuit, and protects the power transistor. For the other half cycle of driving signal, the same operating principle is applied provided.

7. Speaker Protector Relay circuit

The speaker protection circuit, consisting of H808, H809, H810, etc protects the speaker systems against any loud "pop" sound developed. This circuit is so designed that no sound is heard for the first three or five seconds after the power switch is turned on by the time constant circuit consisting of C807 and R816. This circuit also protects the speaker systems against some troubles due to DC off balance between the speaker system terminals by instantly operating the relay and cut off the speaker systems from the circuit. When DC off balance voltage (positive) is developed between speaker terminals by possible defects such as broken power transistor, short-circuits, or broken potentiometer R762, as the base of H808 is connected to the speaker terminal, the transistor H808 is turned on by this offset voltage developed and this makes the transistor H809 and H810 turn off, thus cutting off the relay and disconnecting the speaker from the output circuit. When negative offset voltage is developed, this voltage directly turns off the H809 and H810, thus speaker is cut off from the circuit and protected.

The circuit also protects the speaker systems from the possible damage when the amplifier is over-driven by very low frequencies such as 7 or lower cycles.

8. Suggestions for Trouble Shooting of Power Amplifier

8.1 Excessive line consumption

- a. Check for shorted rectifiers H005; also check C007 and C008.
- b. Check for shorted transistors H758 and H759, H001 and H002, or check H760. Check for open control R763, and bias diode H761. Check L004 for short.

CAUTION: BECAUSE THE DRIVER AND OUTPUT STAGES ARE DIRECT COUPLED COMPONENTS MAY FAIL AS A DIRECT RESULT OF AN INITIAL COMPONENT FAILURE. IF A SHORTED TRANSISTOR OR ZENER DIODE IS FOUND, OR CONTROL OR BIAS DIODE, BE SURE TO CHECK THE REMAINING DRIVER AND OUTPUT COMPONENTS FOR SHORT OR OPEN CIRCUIT BEFORE RE-ENERGIZING THE AMPLIFIER.

8.2 No Line Consumption or Zero Bias

- a. Check line cord, fuse, transistors H760, H001, H002, H003 and H004, bias diode H761.
- b. Check for open rectifier H005, or open L004.

8.3 No DC Balance

- a. Check R762 and Zener diodes H762 and H763.

9. Voltage Conversion

This model is equipped with a universal power transformer to permit operation at 100, 120, 220 and 240 V AC 50 to 60Hz.

To convert the Model 2270 to the required voltage perform the following steps:

- (1) Remove the top cover.
- (2) Remove the Transformer Wire Connection Terminal Cover, loosen two Cover mounting screws on the rear panel, see Fig. 1
- (3) Change the jumper wires as illustrated in Fig. 2 for the required AC voltage and replace the fuse as instructed.

CAUTION: DISCONNECT POWER SUPPLY CORD FROM AC OUTLET BEFORE CONVERTING VOLTAGE.

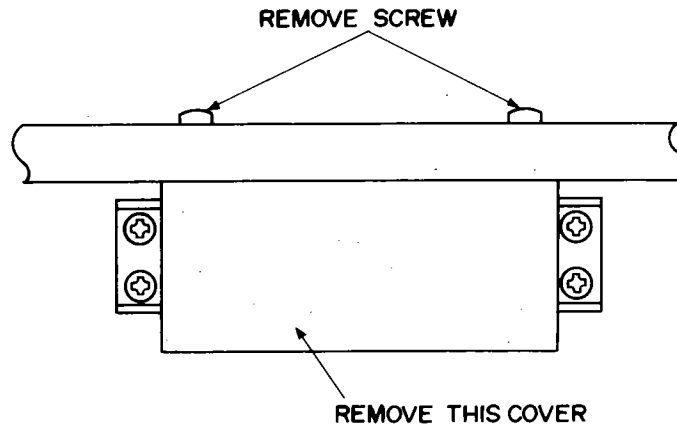
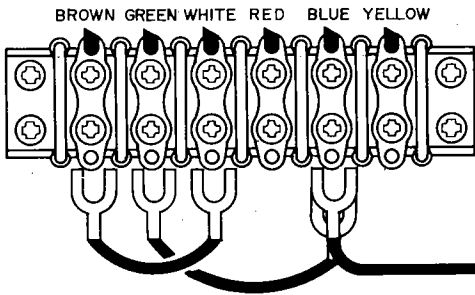
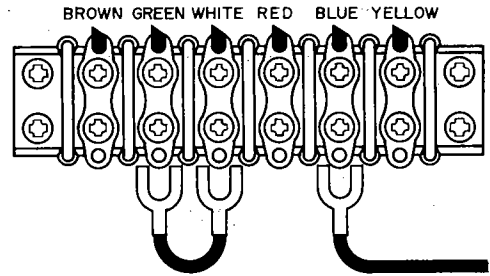


Figure 1 Remove the Terminal Cover

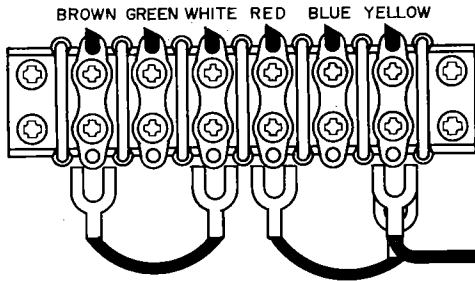
For 100 V Operation
(Use 5A Fuse)



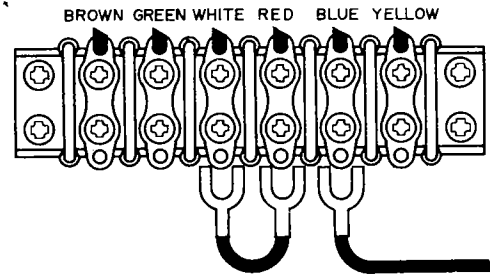
For 200V Operation
(Use 3A Fuse)



For 120 V Operation
(Use 4A Fuse)



For 220V Operation
(Use 3A Fuse)



For 240V Operation
(Use 3A Fuse)

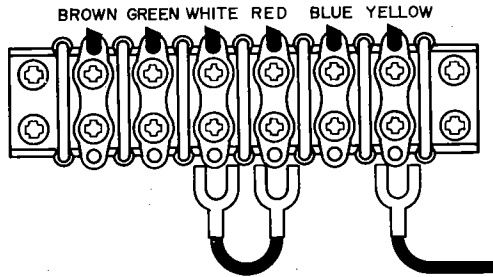


Figure 2 Voltage Conversion Chart

