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SERVICE MANUAL 2220

marantz

model 2220

Stereophonic Receiver

marantz

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INTRODUCTION

This service manual was prepared for use by Authorized Warranty Stations and contains service information for Marantz Model 2220 Stereophonic Receiver.

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

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

1. Service Notes

As can be seen from the circuit diagram, the chassis of Model 2220 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 & AM Tuner . . . . . mounted on P.C. Board, P100
2. FM IF Amplifier, Detector, Muting Control and Meter Amplifier Unit . . . . . mounted on P.C. Board, P200
3. MPX Stereo Decoding Amplifier . . . . . mounted on P.C. Board, P300
4. Phono Amplifier . . . . . mounted on P.C. Board, P900
5. Tone Amplifier . . . . . mounted on P.C. Board, P500
6. Tone Control Volume Unit . . . . . mounted on P.C. Board, P650
7. Power Amplifier . . . . . mounted on P.C. Board, P700
8. Power Supply . . . . . mounted on P.C. Board, P800
9. Loudness, Muting, High and Low Filter Switch Unit . . . . . mounted on P.C. Board, P600

2. AM Tuner

All components except Tuning capacitor and ferrite bar antenna are mounted on a printed circuit board P100.

The AM signals induced in a ferrite bar antenna are applided to the base of Mixer transistor H102 through a capacitor of C109, while the local oscillator voltage is injected to the emitter of H102 through the capacitor C110. 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 L102 consisting of one ceramic filter and two tuned circuits.

The output of L102 is led to the transistor H103 which in turn apply its output to the transistor of next stage H104. The fully amplified IF output is then applied to the diode H108 to detect audible signal through the detector transformer L103. The detected audio signal is filtered and amplified and the final audio output is obtained from the collector of H105 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 H103 and H102 through the resistors R113 and R106 respectively. A part of IF signal output is also applied to the diode H109 through a capacitor C125 and rectified to obtain DC current for energizing the AM signal strength meter M001.

3. FM Tuner

The FM Tuner section of Model 2220 is divided into three functional blocks: FM front end, IF amplifier & Detector, Muting control and MPX stereo decoding circuit.

FM signals induced on a FM antenna are led to FM antenna coil L106. These signals are then applied to the FET RF amplifier which in turn applies its output to the next Transistor Mixer H112 through a high-Q tuned circuit. The Mixer convert its input signal into 10.7MHz intermediate frequency and amplifies it. The H111 is a local oscillator and its output is injected

into the base of Mixer transistor, the injection voltage is about 50mV. The 10.7MHz front end IF output is led to the next IF amplifier unit through a coaxial cable.

The IF amplifier unit consists of five stages of IF amplifiers. Two pieces of ceramic filters are used to obtain high selectivity a pair of symmetrical diode limiter is also employed for the best limiting characteristics, improved capture ratio and good AM suppression.

A part of IF amplifier H202 is rectified by the diodes H210 and H211 and its DC output is fed back to the gate of FET RF amplifier to decrease the gain of it with increased input signal strength.

3-1 Muting and Auto-Stereo Switching Circuits

The muting circuit consisting of all solid-state electrical switching has been incorporated in the Model 2220.

The DC voltage obtained by rectifing a part of IF output signal from the H204 is applied to the base of H207 and turns on it if the IF output is greater than predetermined level (muting threshold level). When the H207 is turned on, the H208 is turned off, thus allowing the emitter-collector resistance of the H208 increasing and the collector voltage rises about 8V. The increased collector voltage increases the base bias voltage and makes the switching transistor H209 turn on, thus decreasing the collector-emitter resistance to near zero ohm and allowing the power supply path to the H205 closed.

When the input signal is lower than the predetermined level, the DC output obtained is small and can not turn on the H207, thus the H207 keeps its turn-off state and this makes H208 turn on, decreasing the collector voltage and turning off H209. Thus no power is supplied to the H205 and signals below the threshold level are muted out. The muting threshold level can be varied by adjusting the trimming resistor R245.

The DC voltage developed at the collector of H208 is also used to make the Auto-Stereo switching transistor H304 turn on and off.

3-2 MPX Stereo Decoding Circuit

Non-equalized audio signals are applied to the first amplifier H301 which serves as a tuned amplifier for the pilot signal in the composite signals and as a buffer amplifier for the rest audio signals. The amplified 19KHz pilot signal is led to the second 19KHz amplifier H302 and further amplified if switching transistor H304 is turned on by the controlling DC signal as described above. The 19KHz pilot signal is rectified by the doubler circuit consisting of H312 and H313 to obtain synchronized 38KHz signal to drive the H303. The H303 is the 38KHz tuned amplifier and supplies its output to the switching matrix circuit consisting of four diodes. The composite signals are applied to the center tap of switching transformer L304 and decoded into left and right channel signals, then both channel signals are led to the crosstalk cancelling amplifier which utilizes complementary confuguration with NPN and PNP transistors through de-emphasiss networks. Transistors H310 and H311 are buffer amplifiers and their outputs are led to the function switch.

3.3 Suggestion for Trouble Shooting of FM Tuner

3.3.1 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 tuning meter. If the meter deflect at several frequencies received, the circuits preceding the IF amplifier H204 may have no failure. When no reading is obtained in the meter, 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 distributions in the FM circuits and compare them with those shown in the circuit diagram. When the tuning meter deflects but no sound is obtained, check audio circuits, using a high sensitive oscilloscope.

3.3.2 Symptom: No Stereo Separation

First check the "MONO" switch is 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 Pre-amplifier

Signals from the tuner and AUX jacks are applied to the selector switch. Signals from the PHONO jacks are applied to the phono-amplifier consisting of transistor H901, H903 and H905. The gain of the amplifier is 40 dB. The amplified and equalized phono-signals are, then, fed to other section of the selector switch which, in turn, applies output signals from the tuner, phono-amplifier and AUX jacks to the TAPE MONITOR switch and TAPE OUT jacks. The TAPE MONITOR switch applies the signals to the balance and volume controls.

The controlled signals are fed to the pre-amplifier consisting of H501, H503 and H505. Frequency response of the amplifier can be varied by BASS and TREBLE controls. The controlled output are then led to the main amplifier through high and low pass filter pushswitches.

5. Main Amplifier

Transistor H701 is a pre-driver coupled to the transistor H703 through capacitor C711. Transistor H703 drives the inverter transistors H709 and H710 which, in turn, drive the power stage consisting of H001 and H002. Transistors H705 and H709 are current limitters and operate as power protecting circuits.

Excessive currents flowing into the power stage are detected by the resistors R741 and R745 and the resultant variations are applied to the transistors H705 and H707 and make them turned on. This decreases the current flowing into the H709 and H710. In this way the currents flowing in the power stage (H001 and H002) are restricted within a safe value.

6. Audio Trouble Analysis

1. Excessive line consumption	a. Check for shorted rectifiers H007, H804, H805.
	b. Check for shorted transistors H001, H002, Check L002 for short.
2. No line consumption or zero bias.	a. Check line cord, fuse, shorted H005, H006, H713 & H714.
	b. Check for open rectifiers H007, H804, H805 or open L002.
3. High hum and noise level.	a. Check filter capacitors C006, C703, & C704.
4. Parastic oscillation	a. Check for defective capacitors, C705, C706, C713, C714, C723 & C724.
5. Improper clipping	a. Check for proper adjustment of 723 & 724.

7. Test Equipment Required for Servicing

Table 1 lists the test equipment required for servicing the Model 2220 Receiver.

Item	Manufacturer and Model No.	Use
AM Signal Generator		Signal source for AM alignment
Test Loop		Use with AM Signal generator
FM Signal Generator	Less than 0.3% distortion	Signal source for FM alignment
Stereo Modulator	Less than 0.3% distortion	Stereo Separation alignment and trouble shooting
Audio Oscillator	Weston Model CVO-100P, less than 0.02% residual distortion is required.	Sinewave and squarewave signal source.
Oscilloscope	High sensitivity with DC horizontal and vertical amplifiers.	Waveform analysis and Trouble Shooting, and ASO alignment.
VTVM	With AC, DC, RF range	Voltage measurements.
Circuit Tester		Trouble Shooting
AC Wattmeter	Simpson, Model 390	Monitors primary power to Amplifier.
AC Ammeter	Commercial Grade (1-10A)	Monitors amplifier output under short circuit condition.
Line Voltmeter	Commercial Grade (0-150VAC)	Monitors potential of primary power to amplifier
Variable Autotransformer (0-140VAC, 10 amps.)	Powerstat, Model 116B	Adjusts level of primary power to amplifier.
Shorting Plug	Use phono plug with 600 ohm across center pin and shell.	Shorts amplifier input to eliminate noise pickup.
Output Load (8 ohms, 0.5%, 100W)	Commercial Grade	Provides 8-ohm load for amplifier output termination.
Output Load (4 ohms, 0.5%, 100W)	Commercial Grade	Provides 4-ohm load for amplifier output termination.

8. AM Alignment Procedure

AM IF Alignment

1. Connect a sweep generator to the J102 and an alignment scope to the resistor R121(out side) .
2. Rotate each core of IF transformers L102 and L103 for the maximum height and flat top symmetrical response.

AM Frequency Range and Tracking Alignment

1. Set AM signal generator to 525 KHz. Turn the tuning capacitor fully closed (place the tuning pointer at the low end) and adjust the oscillator coil L101 for maximum audio output.
2. Set the signal generator to 1650 KHz. Place the tuning pointer in the high frequency end and adjust the trimming capacitor CA-2 for maximum audio output.

3. Repeat step 1 and 2 until no further adjustment is necessary.
4. Set the generator to 600 KHz, tune the receiver to the same frequency and adjust a slug core of AM ferrite rod antenna for maximum output.
5. Set the generator to 1400 KHz and tune the receiver to the same frequency and adjust the trimming capacitor CA-1 for maximum output.
6. Repeat procedures 4 and 5 until no further adjustment is necessary.

Note: During tracking alignment reduce the signal generator output as necessary to avoid AGC action.

9. FM Alignment Procedure

1. Connect a FM signal generator to the FM antenna terminals and an oscilloscope and an audio distortion analyzer to the tape output jack on the rear panel.
2. Set the FM SG to 87.5 MHz and provide about 3 to 5μV. Place the tuning pointer at the low frequency end by rotating the tuning knob and adjust the core of oscillator coil L108 to obtain maximum audio output.
3. Set the FM SG to 108.5 MHz and provide about 3 to 5μV. Rotate the tuning knob and place the tuning pointer at the high frequency end and adjust the trimming capacitor C152 for maximum output.
4. Repeat steps 2 and 3 until no further adjustment is necessary.
5. Set the FM SG to 90 MHz and tune the receiver to the same frequency. Decrease signal generator output until the audio output level decreases with the decreasing generator output. Adjust the RF coil L107 and antenna coil L106 and IF transformer L109 for minimum audio distortion.
6. Set the FM SG to 106 MHz and tune the receiver to the same frequency. Decrease the signal generator output until the audio output level decreases with the decreasing generator output. Adjust the trimming capacitor CF-1 and CF-2 for minimum distortion.
7. Repeat steps 5 and 6 until no further adjustment is necessary.
8. Connect a DC VTVM with 1 V range selected to the resistor R237 (inside) and adjust the secondary core (black) of discriminator transformer L201 so that no voltage reading is obtained on the VTVM at no signal. Next set the FM SG to 98 MHz and increase the output level 1 KμV, then tune the receiver to the same frequency so that no deflection is obtained on the VTVM. Adjust primary core (pink) of L201 for minimum distortion.

10. Stereo Separation Alignment

1. Set the FM SG to provide 1 KμV at 98 MHz. Tune the receiver to the same frequency so that the VTVM connected to the Resistor R237 (inside) will give no readings.
2. Modulate the FM SG with 67 KHz audio frequency. Connect an oscilloscope to the R315. Adjust the core of L303 for minimum height of the 67 KHz signal on the scope.
3. Modulate the FM SG output with stereo composite signal consisting of subchannel signal only (of course, a pilot signal must be included). Adjust the core of L304 for maximum audio output, then modulate the signal generator output with a stereo composite signal consisting of L channel signal only and again adjust the core of L304 for maximum audio output.
4. Adjust the trimming resistor R329 for maximum and same separation in both channels.

11. Muting Threshold Adjustment

1. Set the FM SG output to provide 12.5μV (IHF) at 98 MHz and tune receiver to the same frequency. Adjust the trimming resistor R245 for the threshold level of 12.5μV. (During this adjustment turn the MUTING pushswitch "on".)