

# SERVICE MANUAL

**marantz**

**model 4230**

*Stereo 2 + Quadradial 4 Receiver*

**TABLE OF CONTENTS**

SECTION	PAGE
Introduction .....	1
Service Notes .....	1
AM Tuner .....	1
FM Tuner .....	2
Phono and Pre-Amplifier .....	3
Dolby Unit .....	4
400Hz Tone .....	4
Dolby Switch .....	4
Main Amplifier .....	6
BTL (Balanced Transformerless) Connection .....	6
Power Supply Unit .....	6
Audio Trouble Analysis .....	6
Test Equipment Required for Servicing .....	7
AM Alignment Procedure .....	7
FM Alignment Procedure .....	8
Audio Adjustment .....	9
Automatic Voltage Regulator Adjustment .....	9
Dolby Alignment Procedure .....	9
Alignment Procedures of Dolby FM Preset Level Control .....	10
Explanation of the Dolby Processing Chart .....	10
Parts List .....	25
Technical Specifications .....	38

**LIST OF ILLUSTRATIONS**

FIGURE	PAGE
1. Main Chassis Component Locations (Bottom View) .....	12
2. Front Panel Adjustment and Component Locations .....	12
3. Main Chassis Component Locations (Top View) .....	13
4. Rear Panel Adjustment and Component Locations .....	13
5. Dial Stringing .....	14
6. FM and AM Tuner Assembly P100 Component Locations .....	14
7. Phono Amplifier Assembly P400 Component Locations .....	15
8. Vari-Matrix Unit Assembly P500 Component Locations .....	15
9. Dolby Unit Assembly P600 Component Locations .....	16
10. Power Amplifier Assembly P700 Component Locations .....	16
11. Power Supply Assembly P800 Component Locations .....	17
12. FM De-emphasis Switch Unit Assembly PC01 Component Locations .....	17
13. Buffer Amplifier Assembly PD01 Component Locations .....	18
14. Tone Amplifier Assembly PE01 Component Locations .....	18
15. Tone Control Unit Assembly PF01 Component Locations .....	19
16. Balance Control Unit Assembly PG01 Component Locations .....	19
17. 400Hz Oscillator and Meter Driver Assembly PL01 Component Locations .....	19
18. Loudness, Hi Filter, Speaker and Power Switch Unit Assembly PS01 Component Locations ..	20
19. Tape Monitor Switch Unit Assembly PT01 Component Locations .....	20
20. Indicator Lamps Assembly PY01 Component Locations .....	20
21. Dial Lamps Assembly PZ01 Component Locations .....	20
22. Schematic Diagram .....	21, 22
23. Exploded Mechanical Diagram .....	23, 24

TABLE	PAGE
1. Test Equipment Required for Servicing .....	7
2. Dolby Processing Chart .....	11

## INTRODUCTION

This service manual was prepared for use by Authorized Warranty Stations and contains service information for Marantz Model 4230 Stereo 2 + Quadradial 4 Receiver.

Service 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 parts list 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 4230 consists of 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 and AM Tuner ..... mounted on P.W. Board, P100
2. Phono Amplifier ..... mounted on P.W. Board, P400
3. Vari-Matrix Unit ..... mounted on P.W. Board, P500
4. Dolby Unit ..... mounted on P.W. Board, P600
5. Power Amplifier ..... mounted on P.W. Board, P700
6. Power Supply ..... mounted on P.W. Board, P800
7. FM De-emphasis Switch Unit ..... mounted on P.W. Board, PC01
8. Buffer Amplifier ..... mounted on P.W. Board, PD01
9. Tone Amplifier ..... mounted on P.W. Board, PE01
10. Tone Control Unit ..... mounted on P.W. Board, PF01
11. Balance Control Unit ..... mounted on P.W. Board, PG01
12. 400Hz Oscillator and Meter Driver ..... mounted on P.W. Board, PL01
13. Loudness, Hi Filter, Speaker and Power Switch Unit ..... mounted on P.W. Board, PS01
14. Tape Monitor Switch Unit ..... mounted on P.W. Board, PT01
15. Indicator Lamps ..... mounted on P.W. Board, PY01
16. Dial Lamps ..... mounted on P.W. Board, PZ01

### 2. AM TUNER

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

The AM signals induced in a ferrite bar antenna are applied to the base of converter transistor H113 through a capacitor of C171, while the local oscillator voltage is injected to the emitter of H113 through a capacitor C172. 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 L116 consisting of one ceramic filter and two tuned circuits.

The output of L116 is led to the transistor H104 which in turn apply its output to the transistor of next stage H105. The fully amplified IF output is then applied to the diode H123 to detect audible signal through the detector transformer L117. The detected audio signal is filtered and the final audio output is obtained from pin terminal J118 and applied to the audio amplifier section through the SELECTOR switch.

The DC component of the detected IF signal is used as a AGC voltage to control emitter current of H104 through the resistor R185. A part of IF signal output is also applied to the diode H124 through a capacitor C180 and rectified to obtain DC current for energizing the SIGNAL STRENGTH meter M004.

#### 2.1 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 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 L117. Next connect a oscilloscope to the pin terminal J118 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.

### 3. FM TUNER

All components are mounted on a printed circuit board P100.

FM signals induced by a FM antenna are led to FM antenna coil L101.

These signals are then applied to the FET RF amplifier which in turn applies its output to the next transistor mixer H102 through a high Q tuned circuit.

The 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 base of mixer transistor, the injection voltage is about 40mV.

The 10.7MHz front end output is led to the next IF section. The IF section consists of five stage of IF amplifier and one stage of sub IF amplifier. Two pieces of ceramic filters are also used to obtain high selectivity, a pair of symmetrical diode limiters are also employed for the best limiting characteristics, improved capture ratio and good AM suppression. A part of IF amplifier H105 output is rectified by the diode H115, H116 and its DC output is fed back to the gate of FET RF amplifier to decrease the gain with increased 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 4230.

The DC voltage obtained by rectifying the sub IF output signal from the H109 is applied to the base of H110 and turns on it, if the sub IF output is greater than predetermined level (muting threshold level).

When H110 turns on, the muting switch transistor H111 turned on, thus decreasing the emitter collector resistance to near zero ohm and allowing emitter current path to the final IF amplifier H108.

When the input signal is lower than the predetermined level, the DC output obtained is small and can not turn on the H110, thus the H110 keeps its turn off state and this makes the switch transistor H111 keep turn off, then no emitter current is supplied to the H108 and signals below threshold level are muted out.

The muting threshold level can be varied by adjusting the trimming resistor R153.

The DC voltage obtained is also used to make the Auto-Stereo switching transistor H112 turn on and off, and used to energizing the SIGNAL STRENGTH meter M004.

#### 3.2 MPX Stereo Decoding Circuit

A Non-equalized audio signal from the FM detector is applied through the phase adjuster network of C148 and R161 to input terminal pin ① on the MPX decoder IC H114. The MPX decoder IC consists of a stereo decoder and postamplifier for the output. The right and left channel signals decoded by the stereo decoder H114, appear at pin ⑩ (right channel) and pin ⑪ (left channel), respectively. These signals are passed through the low-pass filters and de-emphasis networks to eliminate undesirable residual switching signals and are then delivered to postamplifier input pin ⑤ (right channel) and pin ⑦ (left channel), respectively. The signals amplified in the postamplifiers to the required level (approximately 10dB) are delivered to pin ⑥ (right channel) and pin ⑧ (left channel), and are then passed through C169 and C168 to pin terminals J114 and J115, hence, through the SELECTOR switch to the audio amplifier section.

Pin ⑮ on the MPX IC H114 is connected through R163 to the collector of the autostereo switch transistor H112, which turns on or off according to the incoming FM signal strength, thereby automatically switching between the stereophonic and monaural operations. The H112 turns on or off in accordance with whether the FM signal strength is more or less than approximately  $25\mu V$ .

### **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 SIGNAL STRENGTH meter. If the SIGNAL STRENGTH meter deflects at several frequencies received, the tuner circuits preceding the discriminator circuit 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. When SIGNAL STRENGTH meter deflects but no sound is obtained, check audio circuits, using high sensitive oscilloscope.

#### **3.3.2 Symptom: No Stereo Separation**

Connect an 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 19 KHz pilot signal and 38 KHz switching signal, using an oscilloscope.

## **4. PHONO AND PRE-AMPLIFIER**

Signals from the PHONO jacks are applied to the phono-amplifier mounted on P400. The amplified and RIAA equalized phono signals and signals from the tuner section, CD-4/AUX and TAPE MONITOR IN jacks are applied to the SELECTOR switch which, in turn, leads the selected signals to the TAPE MON. switch and TAPE MONITOR OUT jacks. Applied to the other section of the TAPE MON. switch are signals from the TAPE MONITOR IN jacks. The TAPE MON. switch selects the signals from the SELECTOR switch or those from the TAPE MONITOR IN jacks and the selected signals go to the DOLBY and MODE switches. Signals are then mode processed by the MODE switch and its associated circuit and applied to the tone control amplifier through the buffer amplifier and BALANCE and VOLUME controls. The bass and treble controlled signals from the tone control amplifier pass through the hi filter before they reach the main amplifier.

### **4.1 Mode Switch**

MODE switch S002 has positions of MONO, 2 CH, DISCRETE, VARI-MATRIX, and SQ DECODER.

In the MONO position, all input signals are mixed together and delivered to all four channels.

In the 2 CH position, each pair of input signals right-front (RF) and right-rear (RR), and left-front (LF) and left-rear (LR) are mixed together. The resultant signals (RF + RR) and (LF + LR) are delivered to the pairs of RF and RR, and LF and LR channels, respectively.

In the DISCRETE position, each channel signal is separately routed to the corresponding channel.

In the VARI-MATRIX position, 2-channel stereo input signals are converted into quadraphonic signals through the vari-matrix circuit; the input right and left channel signals are fed directly to the LF and RF channels, while the signals to the LR and RR channels are synthesized from the 2-channel input signals under the control of the DIMENSION control. The LR and RR channel signal components are controlled by the DIMENSION control as shown below.

DIMENSION Control Setting	LR Output	RR Output
Minimum (FCCW)	LF + RF	RF + LF
Center	LF	RF
Maximum (FCW)	LF - RF	RF - LF

When the DIMENSION control is set to the minimum position the LR and RR channel signals become monophonic, to the center are stereophonic, and to the maximum are out of phase, thus providing vanished sound image positioning.

In the SQ DECODER position, signal sources encoded by the CBS SQ system are ideally decoded into 4-channel signals. Required for this operation is incorporation of the SQ Adaptor, Model SQA-1, into the Model 4230.

**4.2 Balance Control**

Signals from the buffer amplifiers are fed into the balance control circuit, in which the signals are controlled by three balancers: FRONT L-R, REAR L-R, and FRONT-REAR. By setting the FRONT-REAR balancer to the "FRONT" side and the FRONT L-R balancer to the "L" side, for example, only the front left channel is driven.

The balance control circuit is provided with the REMOTE CONTROL switch which makes the Model RC-4 Remote Control Box operative when set to the "REMOTE" position. In the "REMOTE" position the BALANCE and VOLUME controls on the Model 4230 become ineffective since signals are led to the Model RC-4. Balance and volume can be adjusted by the Model RC-4. Balanced and volume controlled signals are led to the tone control amplifier.

**5. DOLBY UNIT**

The Dolby unit built in Model 4230, which is a switchable processor, is inserted in each of both FRONT R and L channels. The attached "DOLBY PROCESSING CHART" will facilitate you to well understand the operation of the Dolby circuit.

An input signal coming to J601 is amplified by H601, and its output signal is led to the filter which cuts off the tape bias. The signal passed through the filter is further amplified and comes to the mixing circuit of resistors R623 and R625 and to the phase inverting circuit of H607 and H609. The output signal is fed out from J607.

In the recording mode of operation, the signal is fed out from J605 preceding the mixing circuit and applied at J611. The signal is then discriminated in the frequency and level by the dynamic filter consisting of H611, H613, H615 and H617, and is fed back to the mixing circuit.

In the playback mode of operation, a part of the output signal (at J607) is fed to J611 and discriminated in the frequency and level by the dynamic filter consisting of H611, H613, H615 and H617 and fed back to the mixing circuit.

**6. 400Hz TONE**

The 400Hz tone signal which is a 580mV, 400Hz sine wave is available at the FRONT and REAR TAPE MONITOR OUT terminals at any position of the DOLBY switch (with the exception of the RECORD II position) and the SELECTOR switch.

The output signal of the 400Hz oscillator consisting of HL01 and HL02 is fed to JL02 and JL03 through the emitter follower HL03. The output levels at JL02 and JL03 are adjusted to 580mV and approximately 25mV, respectively.

The signal fed from the Dolby P.W. Board (P600) comes to JL04 and is rectified through HL06. The rectified output at JL06 is led to the meter M004.

**7. DOLBY SWITCH**

This switch sets the Dolby noise-reduction circuit for record or playback and also switches the Meter Mode from AM or FM SIGNAL STRENGTH to DOLBY CAL LEVEL, or vice-versa.

With the DOLBY Switch placed in "OFF" position, the Meter will be used as a SIGNAL-STRENGTH meter; in all other positions as a DOLBY CAL LEVEL meter.

#### **7.1 Dolby FM**

This position is used for listening to Dolbyized FM broadcasts. The Dolby FM level has been pre-adjusted at the factory.

#### **7.2 Play**

This position is used to play back a Dolbyized source (except FM).

#### **7.3 Off**

With this position, the Dolby circuit is by-passed and the input signals are directly applied to both TAPE MONITOR OUT jacks and amplifiers.

#### **7.4 Record I**

For making a Dolbyized recording from an in-coming "flat" (non-Dolbyized) signal. When the MONITOR switch is in the SOURCE (out) position, the "flat" signal will be heard. When the MONITOR switch is in the TAPE (in) position, the Dolbyized signal from the tape will be heard.

#### **7.5 Record II**

For making a "flat" (non-Dolbyized) recording from an in-coming Dolbyized signal. Regardless of the position of the MONITOR switch, a "flat" signal will be heard.

#### **8. RECORD LEVEL (L) (R)**

These knobs control the record level of the signals to be recorded through the Dolby unit. Adjust the knobs so that the Level Meter pointers of the tape recorder do not exceed the 0VU level.

#### **9. PLAY CAL. (L) (R)**

These knobs adjust the playback outputs from a tape deck to the proper Dolby level.

#### **10. DOLBY FM PRESET LEVEL CONTROLS**

These factory-adjusted controls govern FM output level to the Dolby circuit. These controls are for the use of a qualified technician only.

#### **11. 400Hz TONE SWITCH**

This is used for calibration of the record input level of the tape deck. When the switch is depressed, the built-in oscillator operates and a sine wave signal output of 580mV will be applied to the four TAPE MONITOR OUT jacks.

#### **12. FM DE-EMPHASIS SWITCH**

At present both normal and Dolbyized FM broadcast programs are being transmitted with pre-emphasis time constant of 75 microsecond.

However if the Dolbyized FM broadcasting is approved by F.C.C., this pre-emphasis time constant for Dolbyized FM broadcast will be changed to 25 microsecond. The FM DE-EMPHASIS switch provided on the rear of Model 4230 is used for switching the time constants. After the permission of Dolbyized FM broadcasting, set the switch to 25 $\mu$ S position. This automatically change the time constant to 75 $\mu$ S while the DOLBY switch is placed in other than DOLBY FM positions (namely normal FM broadcast position), thus, the de-emphasis time constant for each normal and Dolbyized FM reception will be correctly set.

### 13. MAIN AMPLIFIER

Transistor H702 is the pre-driver coupled to the transistor H704 through capacitor C712. The transistor H704 drives the inverter transistors H710 and H712 which, in turn, drive the power stage consisting of H001 and H003. Transistors H706 and H708 are current limiter operating as a power transistor protection circuit.

Excessive current flow in the power output stage is detected by the resistors R759 and R761 and the resultant variation is applied to the transistors H706 and H708 and make them turned on. This decreases the base biasing current for H710 and H712. In this way the current flow in the power output stage (H001 and H003) is restricted within a safe predetermined value.

### 14. BTL (Balanced Transformerless) CONNECTION

This power amplifier is designed to operate in either 2-channel or 4-channel modes, depending on the setting of the POWER MODE switch that incorporates phase-conversion and power switch for BTL connection.

With this switch placed in the 12Wx4 position, this unit operates as a 12W 4 channel amplifier. With the switch placed in the 35Wx2 position, the unit operate as a 35W 2 channel amplifier, in this case, the power output is obtained only from FRONT SPK terminals.

The transistor H701 convert the phase of 1 channel amplifier and 3 channel amplifier.

### 15. POWER SUPPLY UNIT

The power supply unit consisting of transistors H801, H802 and H803, which operates as an automatic voltage regulator provides +35V DC to all of the amplifiers except main amplifiers and +14V DC to the tuner section.

### 16. AUDIO TROUBLE ANALYSIS

1. Excessive line consumption
  - a. Check for shorted rectifiers H007.
  - b. Check for shorted transistors H001 through H004. Check L001 for short.
2. No line consumption or zero bias.
  - a. Check line cord, fuse, shorted H005 and H006, H718 & H719.
  - b. Check for open rectifiers H007, or open L001.
3. Excessive hum and noise level
  - a. Check filter capacitors C003, C707, & C708.
  - b. Check for shorted transistor H801 and H802.
4. Parastic oscillation
  - a. Check for defective capacitors, C710, C711, C714, C715, C728 & C729.
5. Improper clipping
  - a. Check for proper adjustment of R727 & R728.



