Equipment profiles

Marantz Model 2500 Stereo FM/AM Receiver

MANUFACTURER'S SPECIFICATIONS

FM Tuner Section
IHF Usable Sensitivity: Mono, 8.75 dBf (1.5 μV).
50-dB Quieting: Mono, 12.1 dBf (2.2 μV); stereo, 33.2 dBf (25 μV).
S/N @ 65 dBf: Mono, 82 dB; stereo, 75 dB.
THD: Mono, 0.1 per cent @ 1 kHz, 0.15 @100 Hz and 6 kHz; stereo, 0.2 per cent @ 1 kHz, 0.35@ 100 Hz, and 0.3 @ 6 kHz.
THD @ 50-dB Quieting: Mono and stereo, 0.4 per cent.
Frequency Response: 30 Hz to 15 kHz, +0.2, −1.0 dB.
Capture Ratio: 1.0 dB.
Alternate Channel Selectivity: 85 dB.
Spurious, IF, and Image Rejection: 120 dB.
AM Suppression: 60 dB.
Subcarrier Rejection: 75 dB.
Stereo Separation: 50 dB @ 1 kHz, 45 dB @ 100 Hz, and 42 dB @ 10 kHz.

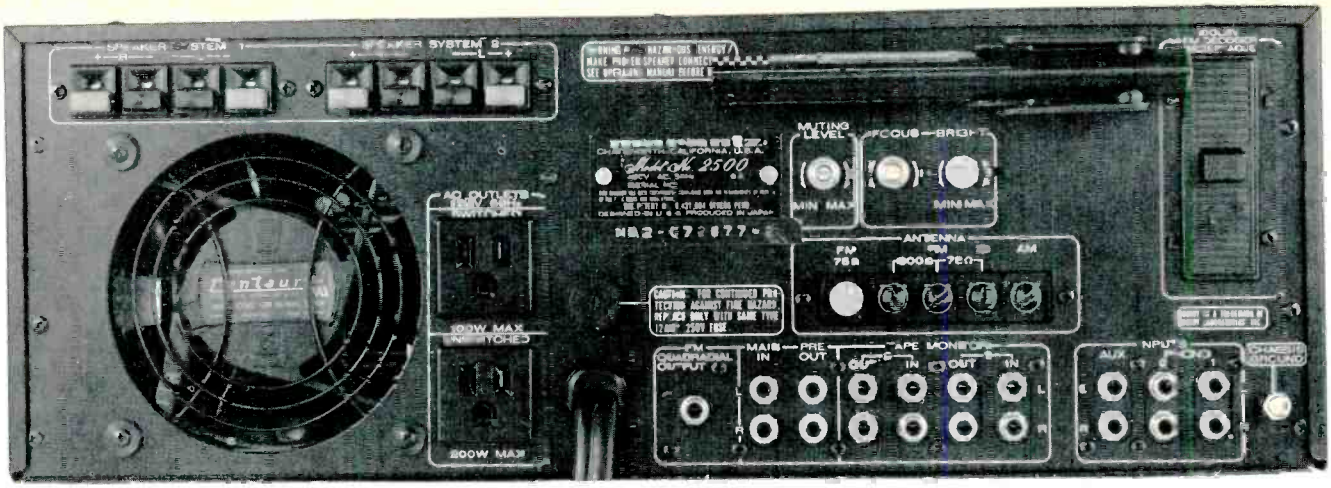
AM Tuner Section
Usable Sensitivity: 10 μV (external antenna).
S/N: 55 dB.
THD @ 30 Per Cent Modulation: 0.4 per cent.
Alternate Channel Selectivity: 50 dB.
Image, Spurious, and IF Rejection: 80 dB.

Amplifier Section
Power Output: 8 ohm loads, 250 watts continuous, 20 Hz to 20 kHz; 4 ohms, 330 watts, 20 Hz to 20 kHz per channel.
THD: 8 ohms, 0.05 per cent; 4 ohms, 0.08 per cent.
IM Distortion: 8 ohms, 0.05 per cent; 4 ohms, 0.08 per cent.
Damping Factor @ 20 Hz: 60.
Frequency Response: 20 Hz to 20 kHz, ±0.2 dB.

Preamplifier Section
Input Sensitivity: Phono, 1.8 mV, High Level, 180 mV.
S/N: Phono, 80 dB (re: 7.75 mV input); High Level, 98 dB (re: 0.775 V input).
Phono Input Overload @ 1 kHz: 200 mV.
Frequency Response: Phono, RIAA, 20 Hz to 20 kHz, ±0.2 dB.

General Specifications
Power Consumption at Rated Output: 920 W, 120 V, 60 Hz.
Dimensions: 19¼ in (48.9 cm) W x 7 in. (17.8 cm) H x 17¼ in. (43.8 cm) D.
Weight: 59.4 lbs (27 kg).
Price: $1750.00

This year's title-holder in the receiver power race is unquestionably Marantz, with their Model 2500 AM/FM stereo receiver. Whether the introduction of a 250-watt-per-channel receiver (330 watts with 4-ohm loads) will end the competition for power once and for all remains to be seen, and we will discuss our thoughts regarding receiver power a bit later on. We should mention, at the outset, that in addition to ultra-high power, Marantz has succeeded in offering a feature-laden all-in-one piece of electronics that may be attractive even to the affluent audiophile who had been leaning towards separate components because of power requirements and control flexibility.


MUTING LEVEL
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200W MAX

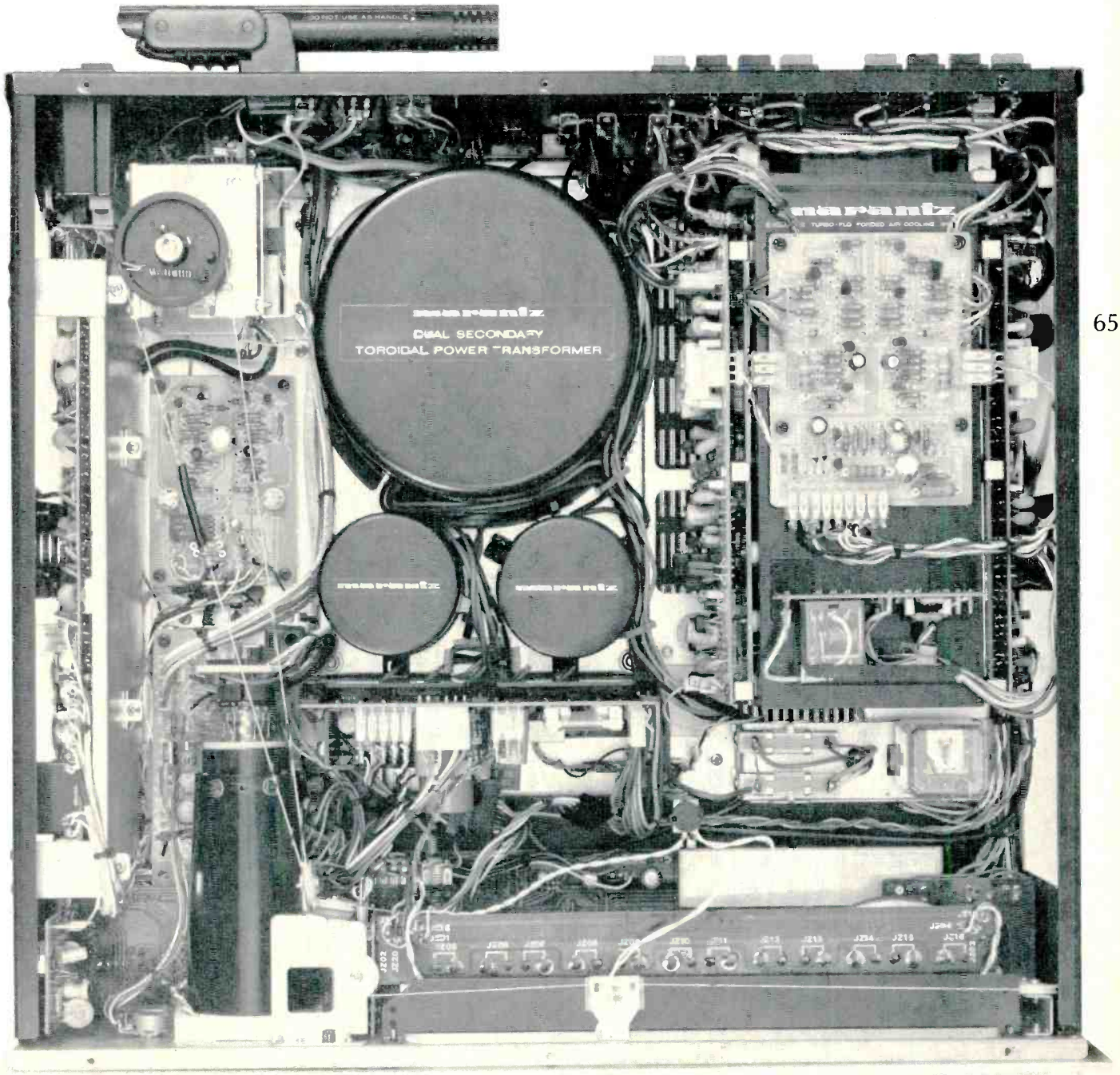
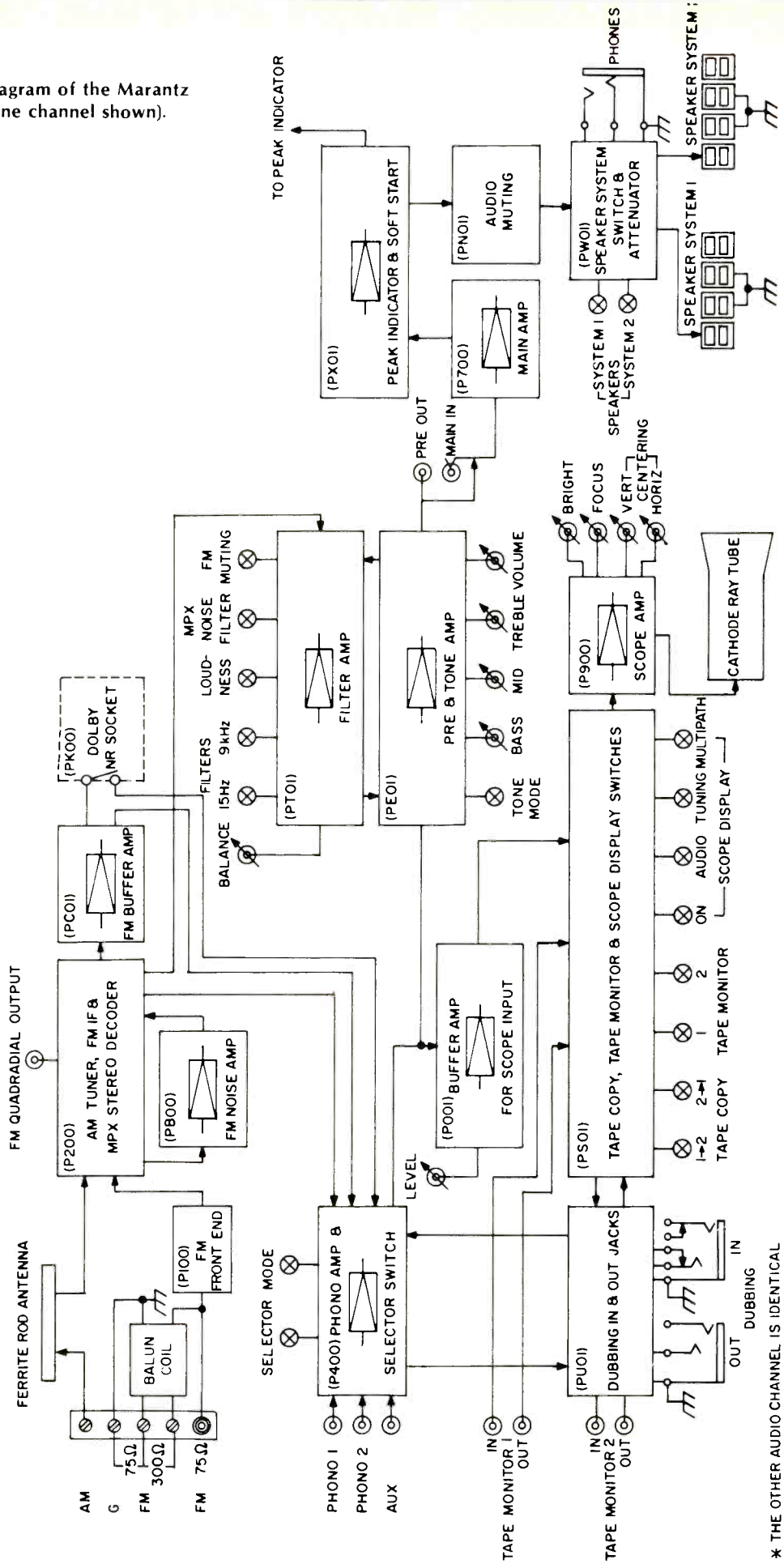

marantz
DUAL SECONDARY
TOROIDAL POWER TRANSFORMER

Fig. 1 — Block diagram of the Marantz 2500 receiver (one channel shown).



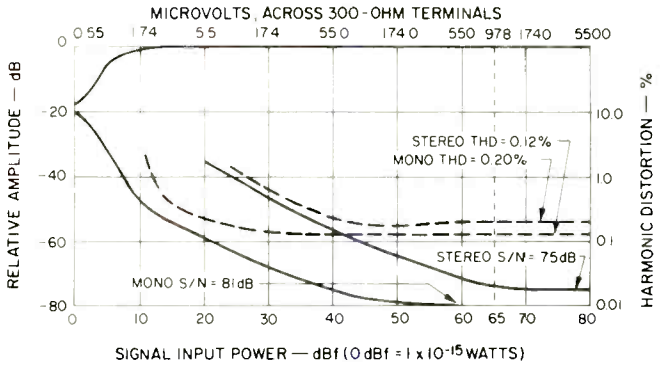


Fig. 2—Mono and stereo quieting and distortion characteristics for the FM section.

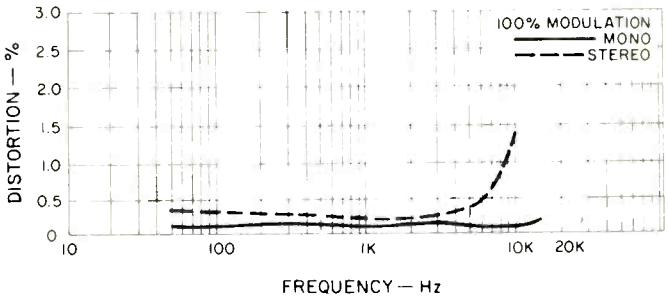


Fig. 3—Distortion vs. frequency for the FM section.

The dominating feature on the front panel of the 2500 receiver is, of course, the cathode ray oscilloscope which older Marantz fans will find reminiscent of the 'scope facilities contained in the original Marantz 10-B tuner. There are horizontal and vertical centering controls, as well as 'scope level or gain control. Pushbuttons below the 'scope tube area associated with CRT display include an *On* button as well as buttons for selecting audio display, tuning display, or multipath display. Depressing the tuning display button provides a vertical "blip" on the 'scope face which is useful for center-tuning and signal strength indications during both AM and FM listening.

Additional pushbuttons beneath the 'scope area include a pair of tape-copy switches (Tape 1 to Tape 2 and vice versa), and two tape monitor switches. A horizontally oriented slide-control serves as a channel balance control at mid-panel and to the right of it are a cluster of five more pushbuttons (high- and low-cut filters, loudness switch, MPX noise filter, and FM muting) and a separate pair of speaker selector switches. The FM and AM frequency scales are somewhat shortened because of the area required by the cathode ray tube display and its controls, but the FM scale is linearly calibrated with markings at every 200 kHz. The familiar stereo indicator light is located in the dial scale area.

Marantz's well executed "gyro touch tuning" knob is located at the right of the panel, beneath the dial scale area and, just to its left are a pair of peak indicator lights which will become illuminated if the amplifier sections are driven beyond overload. A series of indicator lights to the left of the peak indicators denote program source selection including tape.

The lower section of the panel features seven rotary controls for program selection, *Mode, Tone Mode, Bass,* mid-range, *Treble* and master *Volume*. The *Mode* control offers *Stereo, Reverse, L+R, L-only,* or *R-only* listening, while the tone-mode switch defeats the tone controls entirely or provides alternate bass and treble turnover frequencies of 100 Hz and 10 kHz, singly or together. The master volume control is a step-attenuator type calibrated over most of its range in 2-dB steps. The power *On/Off* switch, stereo phone jack, and tape out/tape in jacks which over-ride the rear panel tape 2 jacks.

Readers viewing our photograph of the rear panel of the Model 2500 may be surprised to learn that the circular vented area at the lower left is the exhaust area of a ventilating tunnel, which includes a ventilating fan built right into the unit. Not an uncommon feature of high-powered separate amplifiers, the presence of a cooling fan in a receiver is rather unusual. The two-speed cooling fan operates very quietly under normal use and is thermostatically switched to its higher, noisier speed only if dissipation causes temperatures to exceed safe limits. In the case of our sample unit, high speed fan operation only occurred during static, high-power testing and not under any musical listening conditions.

Above the fan exhaust area are piano-key, spring-loaded speaker terminals for the two sets of speakers which can be connected to the 2500. Alongside the fan area are switched and unswitched convenience a.c. outlets. Muting threshold level, 'scope focus, and brightness controls are located just beneath the pivotable ferrite AM external bar antenna at the right of the rear panel, while just below are screw terminals for 75-ohm, 300-ohm, and external AM antenna connections

Fig. 4.—Separation vs. frequency with the 75 μS de-emphasis.

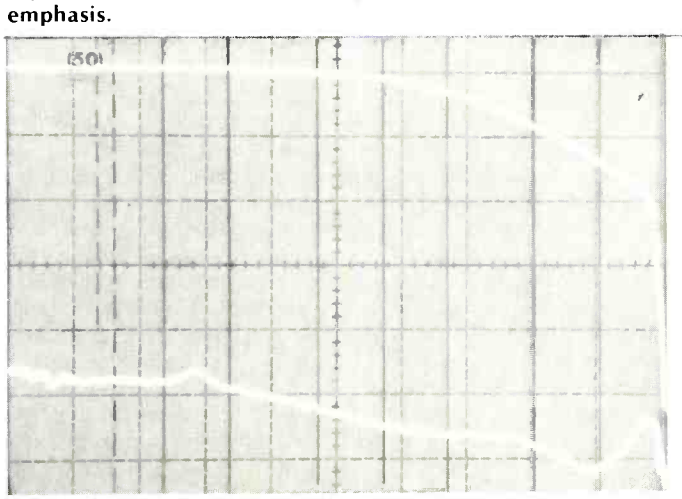
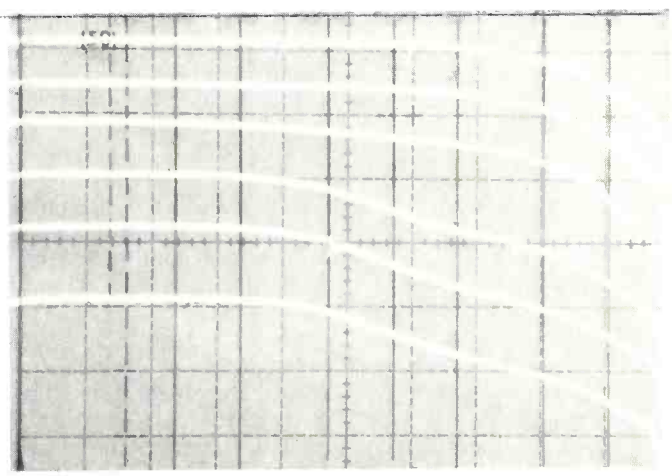


Fig. 5—Action of the optional Dolby FM decoder.



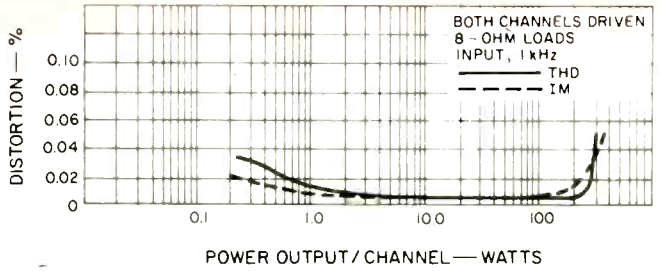


Fig. 6.— Harmonic and IM distortion characteristics with both channels driven into 8-ohm loads.

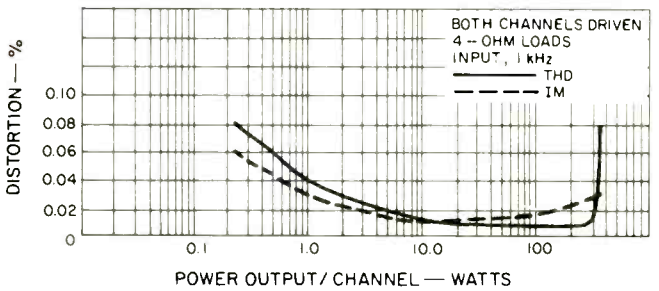


Fig. 7— Harmonic and IM distortion characteristics with both channels driven into 4-ohm loads.

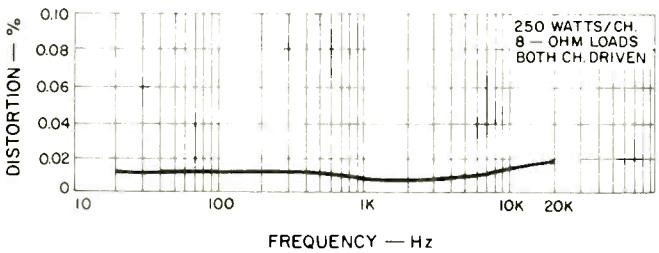


Fig. 8— Distortion vs. frequency with both channels driven into 8-ohm loads.

as well as a coaxial 75-ohm connector. Two pairs of phono inputs, aux inputs, tape in and out jacks, preamp-out/main amp in jacks, an FM detector output jack (which Marantz calls a "quadradial output" in anticipation of future four-channel applications), and a chassis ground terminal are located at the lower right of the rear panel. Just to the right of the AM bar antenna is a compartment, covered by a removable plastic plate, which is designed to accept a plug-in Dolby FM Module (Marantz Model DLB-1). When this module is used (our sample included the module), switching the front panel selector switch to the Dolby FM position (identified on the front panel as "FM 25 μS") introduces proper FM Dolby decoding as well as the required 25 microsecond de-emphasis characteristics. Without the separate module, this position provides 25 microsecond de-emphasis only and a separate outboard Dolby decoder can be used with the 2500.

Construction and Circuit Highlights

The huge toroidally wound power transformer, visible in the internal chassis photo of the Marantz 2500, features separate secondary windings for the power amplifier sections of each receiver channel.

The r.f. FM tuner section uses dual gate MOS-FETs in the r.f. amplifier, r.f. interstage, and mixer stages. A five-gang tuning capacitor is employed. The i.f. amplifier consists of six stages of amplification—three discrete stages plus three multistage ICs, two of which serve as limiters. There are five dual-element filters, and a phase-locked-loop circuit is used in the MPX decoder section. The FM muting circuit consists of 10 transistors (including one FET) employed as d.c. amps, switches and comparators, plus a reed relay which serves as the actual muting switch.

The 2500 phono circuit has two complementary-input differential amplifiers and dual complementary drive to the second voltage-gain stage. The output stage is a complementary emitter-follower which isolates the gain stages from the RIAA equalization networks.

The power amplifier is a full complementary-symmetry, quadruple paralleled-array, direct-coupled circuit. Energy sensing protection circuitry is designed to protect the amplifiers and connected speakers without affecting audio signal quality. To further protect speakers, relay protection is used which also disconnects the speakers during turn-on stabilization periods. The relay will also disconnect if the d.c. offset at the output rises to too high a level or if high amplitude sub-sonic frequencies below 5 Hz appear at the speaker output terminals.

For all its high power capability, the Marantz 2500 is relatively light in weight. The output devices are mounted on the inside surface of the heat dissipation tunnel which is fan-cooled. Mounted onto each output transistor is an individual heat sink having a circular group of vertical fins. There are four thermostats in the heat sink tunnel; one pair controls fan speed and the other pair, activated at high temperatures, disconnects the speakers from the output transistors. When temperatures return to normal levels, normal operation is resumed automatically. A complete block diagram of the Marantz 2500 is shown in Fig. 1. Only one channel of audio is depicted in this diagram, since the other channel is identical.

FM Performance Measurements

Usable mono sensitivity was 10.3 dBf (1.8 μV), while stereo sensitivity was a function of the auto-switching which occurs at around 19.2 dBf (5.0 μV). The 50-dB quieting point occurred with an input signal of only 10.8 dBf (1.9μV) in mono; a very low 33.2 dBf (25 μV) in stereo. S/N in mono, at 65 dBf, reached 81 dB, while in stereo, S/N for the same signal strength was 75 dB, both as claimed. Distortion, at 1 kHz, decreased to 0.12 per cent in mono for strong signals, while in stereo, it measured 0.2 per cent at a 65-dBf level. We noted, however, that stronger signals, above the 65-dBf level, caused a further reduction in THD, down to a low of 0.14 per cent in stereo. These characteristics are all plotted in Fig. 2, while in Fig. 3 we have graphed the distortion of the FM mono and stereo tuner sections as a function of frequency. THD is extremely low and uniform in mono over the entire audio band; slightly higher in stereo, rising to 0.46 per cent at the 6 kHz high frequency test point. Figure 4 is a plot of desired-channel output and opposite channel separation in stereo FM, from 20 Hz to 20 kHz, using the normal 75-microsecond de-emphasis setting. Specific points measured disclosed a very high separation capability of 57 dB at 1 kHz, 50 dB at 100 Hz, and 40 dB at 10 kHz.

The curves of Fig. 5 illustrate the response of the FM section with 25-microsecond de-emphasis included and, in addition, the lower-level traces show the added treble attenuation introduced by the Dolby decoding section using the optional plug-in board. Muting level threshold was variable from 20 dBf (6.0 μV) to 39.2 dBf (50 μV). Sub-carrier product rejection was excellent, with readings of 75 dB. Capture ratio measured 1.0 dB as claimed while the three major forms of rejection capability i.f., image, and spurious) were all beyond the 100 dB limits of our test setup. Frequency response in stereo was off by 1.5 dB at 15 kHz, with reference to the standard 75- microsecond de-emphasis characteristic as against 1.0 dB claimed. Selectivity measured 87 dB, somewhat better than claimed, while AM suppression was exactly 60 dB as claimed.

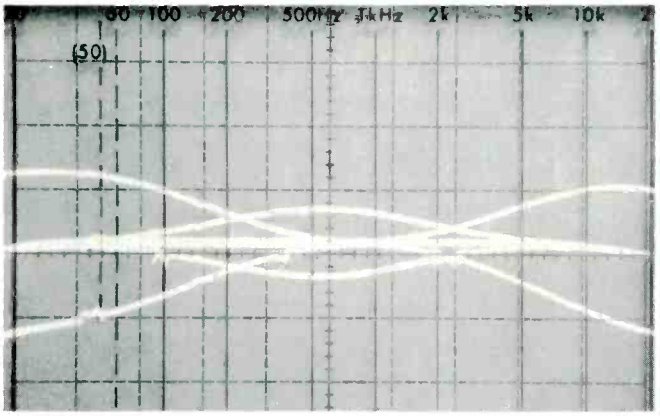


Fig. 9—Range of bass, treble, and midrange tone controls.

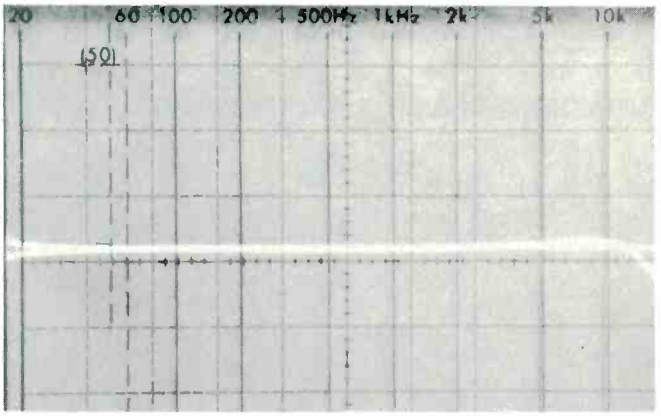


Fig. 11—Response of the high-cut filter (sub-sonic filter is below range of this sweep).

AM Tuner Section Measurements

Usable sensitivity of the AM section measured 15 μV at 1 MHz using an external dummy antenna connection while with signal injected into the internal antenna via a standard loop, sensitivity was 330 μV/meter. Best signal-to-noise ratio obtained was 53 dB while THD, for 30 per cent modulation, was a comparatively low 0.5 per cent. Listening tests conducted later confirmed that the tuner's AM section was of higher-than-usual quality and the good alternate channel selectivity of the circuit (which, incidentally, uses a 3-section tuning capacitor) makes the AM worth listening to

Power Amplifier Section

Since Marantz chose to rate the power output of this receiver for both 8- and 4-ohm loads (most manufacturers refrain from making 4-ohm power claims because of problems encountered during FTC one-third power output preconditioning), we measured power output capabilities for both load conditions as well. With a 1-kHz test signal and 8-ohm loads the amplifier delivered just over 300 watts per channel before THD rose to rated 0.05 per cent. Rated IM Distortion of 0.05 per cent occurred with a power output of 330 watts per channel. At rated output of 250 watts per channel (8-ohm loads), THD measured 0.0045 per cent while IM distortion was 0.014 per cent. These results are plotted in Fig 6.

With 4-ohm loads, for a rated THD of 0.08 per cent, the amplifier produced 341 watts per channel; 356 for a rated IMD of 0.08 per cent. Power versus THD and IM using 4-ohm loads is plotted in Fig. 7. Distortion versus frequency was measured at several test frequencies for the 8-ohm load condition. We refrained from making these extended measurements using 4-ohm loads because of a cautionary note provided by Marantz regarding such extended static tests using the lower impedance loads—a condition which Marantz correctly points out would not be likely to occur under actual music listening conditions. Results of the 8-ohm load distortion versus frequency tests for rated output (250 watts per channel, both channels driven) are plotted in Fig 8. Even at the frequency extremes, THD remains well below the rated 0.05 per cent—in itself an impressively low rated-THD figure. In fact, Marantz might well have rated the power output of the 2500 as 292 watts per channel and still conformed with FTC power rules, had they chosen to be less conservative. On the basis of the 250-watt-per-channel rating, power bandwidth extended all the way from below 10 Hz to 32 kHz, as compared to the 20 Hz to 20 kHz power band claimed.

Preamplifier Section Measurements

Phono sensitivity of the Marantz 2500, for both sets of phono inputs, was 1.7 mV and overload capability was 220 mV, or 20 mV better than claimed. Marantz quotes their signal-to-noise specifications in rather an odd way. They refer the low level S/N measurements to 7.5 mV (*not* actual rated input sensitivity and *not* the more commonly used 10 mV). In any event, referred to actual sensitivity, the phono S/N

Fig. 10—Action of bass and treble controls when set to alternate (100 Hz and 10 kHz) turnover frequencies.

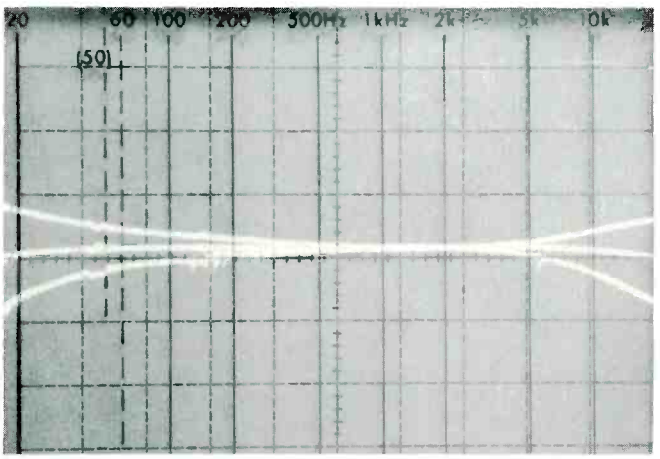
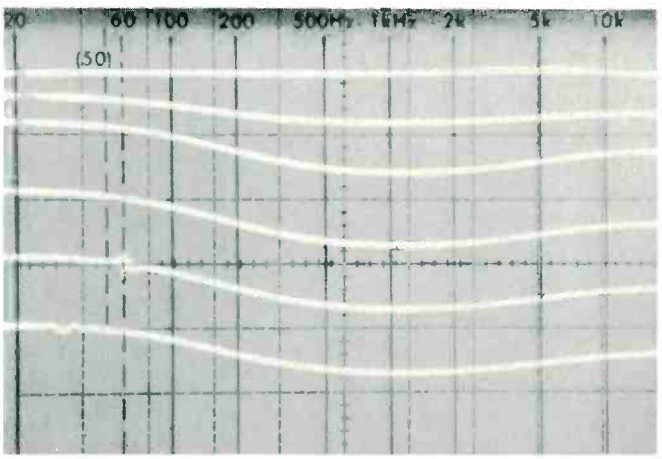


Fig. 12—Response at various settings of master volume control with the loudness switch activated.



(unweighted) measured 68 dB—a figure which translates to 81 dB using the 7.5 mV reference—and a bit better than claimed. In the case of the high level inputs, they chose to refer the hum and noise to a 0.775 volt input, or nearly 13 dB higher inputs than the actual input sensitivity which we measured as 175 mV. Be that as it may, we obtained a superb S/N of 95 dB referred to actual input sensitivity and if you want to add 13 dB more to that to do it the same way that Marantz does, feel free to do so.

RIAA equalization was extremely accurate, deviating by no more than 0.2 dB from 30 Hz to 15 kHz.

Figure 9 is a composite 'scope photo illustrating the range of the bass, treble, and mid-range controls, when the bass and treble controls are set to operate at their conventional "hinge points." The useful mid-range control provided on the 2500 has been wisely restricted in its action to approximately ±5.0 dB, with maximum boost or cut occurring at around 500 Hz (a bit too low for good presence control, in our opinion). Flexibility of the bass and treble controls is enhanced with the inclusion of alternate turnover settings and, when these are selected, mid-frequency response is unaffected by these controls whose range then becomes restricted to the frequency extremes, as shown in the 'scope of Fig. 10.

The sub-sonic filter of the Model 2500 provides attenuation below 15 Hz and its action was therefore not evident in the sweep-frequency scope photo of Fig. 11 (which only extends from 20 Hz to 20 kHz). The action of the 12 dB/octave high-cut filter is clearly discernible, however, with attenuation beginning at around 10 kHz—perhaps a bit on the high side for effective scratch and hiss removal. Figure 12 depicts the usual non-calibratable loudness compensation curves introduced at various settings of the master volume control.

Summary, Listening Tests, and Comments

The FM tuner section of the Marantz 2500 performed very well and we still feel that the oscilloscope display, as an aid in tuning, is the next best thing to full frequency synthesis. In terms of multipath minimization, there is nothing that beats the scope observation method. The Dolby module is a clever approach in that it does not penalize the purchaser of the receiver if he or she has no Dolby FM broadcasts presently available. Background noise in FM is extremely low, and the steep quieting slope of the tuner section makes weak-signal reception listenable for a number of stations that are otherwise unsatisfactorily received in our listening region.

The enormous power capability of the 2500 is, happily, *not* of the "brute force" type which, in many competitive products, offers lots of watts without regard to musical accuracy, transient response, and the more subtle aspects of high SPL reproduction. The amplifier is extremely stable, even when subjected to some of our trickier load conditions, and musical reproduction was open and tight, even at levels approaching clipping. The peak indicators, in our listening test, were a bit of frosting on the cake, since we were not able to make them flash at *any* listening levels with any of the speaker systems employed, though there are, no doubt, some very low efficiency speakers which would justify the peak as well as the power indicators incorporated in the Model 2500. Marantz has, quite obviously, incorporated the most- wanted control features on this top-of-the-line receiver, and certainly, they did not trade off features for power in the 2500.

In the last analysis, we must confess that if a 250-watt- per-channel receiver is what the world is after, we are happy that a company like Marantz took up the challenge, rather than some company who might have sacrificed basic good performance for sheer high power. *Leonard Feldman*