

Equipment Profiles

This Month:

- Marantz Model 20 Stereo FM Tuner
- Astrocom/Marlux Model 407 Stereo Tape Deck
- Dual Model 1219 Automatic Turntable
- Pioneer Model CS-66 Speaker System
- Sansui Model 4000 Stereo FM/AM Receiver
- JBL Model C60 "Sovereign I" Speaker System

Marantz Model Twenty Stereo FM Tuner

Fig. 1



MANUFACTURER'S SPECIFICATIONS:

IHF Sensitivity: 2.8 μV or better. **Quieting Slope (S/N Ratio):** 70 dB @ 50 μV . **Output Level:** 1 V. rms. **Total Harmonic Distortion:** 0.15% max @ 400 Hz, 100% modulation. **I.F. Bandwidth:** 3 dB @ 230 kHz; 80 dB @ 880 kHz. **Frequency Response:** 75 $\mu\text{sec.}$ de-emphasis, ± 0.5 dB. **Multiplex Stereo Separation:** 40 dB @ 20 Hz, 45 dB @ 1000 Hz, 35 dB @ 10,000 Hz, 30 dB @ 15,000 Hz. **38-kHz Suppression:** 60 dB. **67-kHz Suppression:** 65 dB. **Total Spurious Rejection:** Better than 90 dB. **Image Rejection:** 60 dB. **Dimensions:** 15 $\frac{3}{8}$ " W x 6 $\frac{1}{8}$ " H x 14 $\frac{1}{8}$ " D. **Weight:** 25 pounds. **Price:** \$495.00 (optional walnut cabinet, \$29.50).

With the introduction of the new Marantz solid-state "Model 20" Stereo FM Tuner, that company has completed the slow transition from vacuum-tube equipment to "all" solid-state products. The "all" is in quotes because the now-famous cathode-ray tube used in the oscilloscope display of this model, its predecessor (the Model 10B), and the Model 18 receiver is, by all definitions, a vacuum tube and does require a high-voltage power supply not required for the balance of the circuitry.

A few revealing comparisons are in

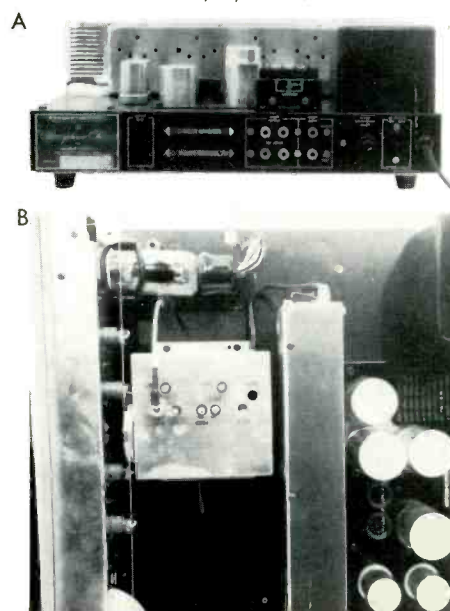
order between this new tuner and the all-vacuum tube Model 10B (\$750.00), which it most likely supplants in the Marantz line. For one thing, the price has come down by more than \$250.00! If performance is equal or better, this would certainly prove that transistorization does, finally, lead to more economical designs at no sacrifice in performance. Weight, too, has gone down. The new Model 20 tips the scales at 25 pounds against 36 pounds for the famous 10B! Published distortion figures (fully met, as we shall see presently) are actually lower (in both mono and stereo modes), while IHF sensitivity is stated as 2.8 μV as opposed to the 2.0 μV claimed for the 10B. In fact, our unit measured a bit better than 2.5 μV , so that the oft-published statement "or better" really takes on significance in the case of the Marantz Twenty!

Styling, to our way of thinking, is actually better on the Model 20, featuring the same "gyro-touch" tuning control (a horizontally mounted, heavy flywheel—the serrated edge of which the user actually spins with a fingertip) used in the Model 18 re-

ceiver reviewed previously in *AUDIO*, June 1968. The heavy (almost $\frac{1}{8}$ -in. thick), gold-anodized aluminum front panel, metal-turned knobs and black-framed dial glass area all provide a simple elegance of appearance in keeping with traditional Marantz design concepts. As shown in Fig. 1, there are four major controls besides the tuning flywheel previously mentioned. Starting at the left, the first of these is a "scope-display" function switch, with positions for external use of the scope for examining audio of other sound sources, an audio position for examining the tuner's audio output, an OFF position (which correctly presumes that the user may, at times, want to listen to the tuner *without* having to stare at the scope traces, however fascinating they may be), a tuning position for accurate center-of-channel selection and a "multipath" position enabling the user to judge the degree of multipath interference and adjust his antenna for its minimization.

The next control is simply a muting on-off switch. This is followed by a mode switch featuring mono, stereo and "hi-blend" positions. This last position mixes left and right channels at just the high-frequency end of the audio spectrum, thereby reducing noise encountered with weak signal stereo transmissions by out-of-phase noise can-

Fig. 2A—Rear-panel view of Marantz Model 20. Fig. 2B—Section of top of chassis shows fully shielded i.f. module and the r.f. front end (below the scope display tube).



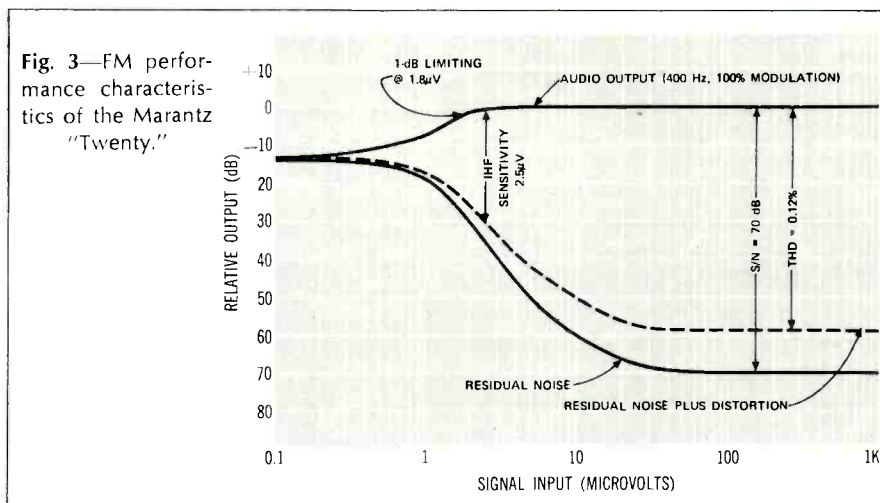
cellation. The last control at the right of the panel is the power on-off switch.

A pair of smaller controls located at the extreme left of the panel, below the scope display, are simply horizontal and vertical positioning controls for the 'scope display.

The rear of this tuner, shown in Fig. 2A (features an elevated antenna terminal strip with connections for either 75- or 300-ohm cable. An attenuator switch is also located on this raised structure, though in all our experiments we never found it necessary to activate this attenuator because of any overload problems. It is conceivable, however, that someone located within a stone's throw of the FM transmitter tower might find this feature useful. On the other hand, inadvertent activation of the attenuator might erroneously suggest poor sensitivity of the particular receiver. Output level controls (factory adjusted to provide precisely 1 volt rms from each channel output), dual output jacks for each channel, external 'scope input jacks, a line fuse, and an unswitched, unfused convenience outlet complete the back-panel layout.

Circuitry

The Marantz Model 20's circuitry follows techniques previously developed by that company in the Model 18 receiver. The passive front end, a completely sealed and shielded unit shown in Fig. 2B adjacent to the 'scope tube, feeds four stages of i. f. amplification which employ a modified Butterworth-type filter between each of the stages rather than transformer coupling. This system provides sharper cut-off slopes and a phase-linear response, an important requirement for good stereo separation in the circuits to follow. Four limiter amplifiers follow, and this section of the tuner also contains the unique photoelectrically operated muting circuits. Conventional but extremely linear discriminator FM demodulation is used. The multiplex decoder section has carefully tailored phase-correcting networks, a highly effective SCA rejection filter and such additional niceties as electronically triggered photo-electric stereo switching and interchannel muting. A dual line amplifier provides the necessary low impedance outputs for the tuner by using emitter-follower circuits. Vertical



and horizontal amplifiers for the scope display are also solid-state, as is the well-regulated power supply. In all, we counted 73 solid-state devices—30 bi-polar transistors, 7 FET's, 3 Zener diodes and 33 other diodes—in this beautifully designed and well-executed layout.

Measurements

The most important measurements relating to the performance of the Model 20 are shown, graphically, in Fig. 3. Note that IHF sensitivity exceeded claims, measuring $2.5 \mu\text{V}$. Total Harmonic Distortion (THD) measured a very minute 0.12%, which is lower than the 0.15% claimed. S/N was 70 dB, a number usually associated with amplifier performance, but seldom achieved in tuner design. Full ("1-dB") limiting was attained with a mere $1.8 \mu\text{V}$ signal input. The manner in which the S/N approaches its ultimate 70 dB value is extremely significant here. Unlike many products which attain their best signal-to-noise figure gradually, with increasing signal strength (often not reaching the final figure until a signal strength of 50 or even $100 \mu\text{V}$ is applied), this tuner's residual noise takes a mighty dip above $3 \mu\text{V}$, reaching a S/N figure of 60 dB at only $10 \mu\text{V}$ input. This fact alone renders normally "noisy" stations (deep-fringe) readily usable and totally listenable. It is this characteristic, perhaps more than just a good IHF sensitivity figure, which really makes the difference to the end user.

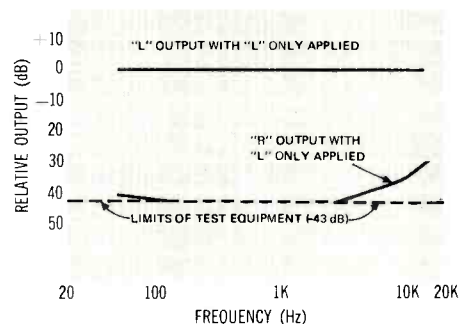
Figure 4 plots stereo FM separation, It was particularly remarkable at the high end, where it is extremely

difficult to maintain high figures of separation. Extra care and phase-correction circuits, as noted, make the difference here. As has happened with other Marantz equipment reviewed here, the claim of -45 dB stereo FM separation at 1000 Hz could not be fully substantiated—because our test equipment was only capable of producing a test signal having a "built in" separation capability of 43 dB! From all appearances of the curve of Fig. 4 (made up of those points which we were able to measure), it is obvious that this amazing separation figure (at mid-band) is not only achieved, but probably exceeded.

Another important fact about this stereo circuitry is that the THD in stereo mode is as good as it is in mono: 0.12%! Most manufacturers omit this important specification and, for some unknown reason, so did Marantz. They certainly need not have.

As a matter of record, automatic switchover to stereo (about the smoothest we've encountered) takes place at a signal strength of approximately 5 to 10 microvolts.

Fig. 4—Stereo FM separation of the Marantz "Twenty" FM tuner.



Performance

The Marantz Model 20 performs exactly the way a super-tuner should. To begin with, calibration is absolutely "on the button" from 88 to 108 MHz. In logging stations, we found 43 acceptable ones with just an indoor dipole. With an outdoor 6-element Yagi (at a distance of about 20 miles from the center of New York City), the number of usable stations increased to 52. Eighteen satisfactory stereo transmissions were recorded. With the muting control activated, some of the weaker stations "disappeared," reducing the number to 32 (indoor dipole again). Since muting is defeated at very low signal strengths, this only proves that some of the "satisfactory" signals thus lost must have been received at signal strengths of 10 μ V or lower—and yet they were quite listenable.

Tuning to center of channel using the 'scope display feature is certainly the most foolproof method ever conceived. When that little vertical trace is centered from left to right on the face of the 1" cathode ray tube you *know* you're perfectly tuned in. By

switching the scope display switch to the "multipath" position, it becomes possible to orient your antenna for the least multipath disturbance. This is particularly important in stereo listening, and we found it necessary to re-orient our antennas (both the indoor and outdoor) on fully *half* of the stereo stations received. As the re-orientation is accomplished, observing the patterns on the scope, we heard a significant improvement in separation and noted a distinct reduction in distortion (particularly at the high end of the audio spectrum).

Satisfied that we were properly tuned in and oriented in the right direction, we proceeded to use still another function of the 'scope display—observation of the audio itself, displayed on the horizontal and vertical axes of the scope face. A "left only" signal will cause vertical movement of the scope trace, while a "right only" signal causes side-to-side motion of the trace. Monophonic transmission, therefore, causes the trace to move diagonally from lower left to upper right, while stereo material having a great deal of separation causes the trace to appear just about everywhere

at once, creating a visual display that is both fascinating and highly informative. We will not here publicly chastise the several stations we observed that clearly were supposed to be broadcasting in stereo (the stereo light was lit, in no uncertain terms) and in fact were using monophonic recorded material. Happily, we caught no stations with their "stereo out of phase"—but had there been any, this multi-purpose scope display would have picked it up and denoted it in unmistakable manner.

Even if this worthy tuner didn't have a 'scope, its absolute clarity of reception, its selectivity, its craftsman-like construction and obvious durability, and use of the very best component parts would make it a worthwhile investment for those who really want FM reception in their homes as near to perfection as the present state-of-the art permits—and have \$495.00 (plus \$29.50 for the walnut cabinet if one plans to place the tuner "in the open") they're willing to part with to achieve these ends. We're delighted to say that the tuner is worth every cent of it.