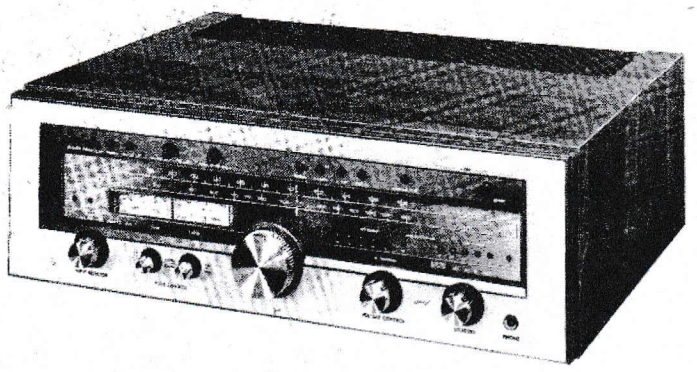
Equipment Test Reports
By Hirsch-Houck Laboratories



Luxman R-1120
AM/FM Stereo Receiver

THE Luxman R-1120 is that company's finest and most powerful receiver, rated to deliver up to 120 watts per channel to 8-ohm loads between 20 and 20,000 Hz with no more than 0.03 per cent total harmonic distortion. The front panel of the R-1120, satin finished in pale bronze, is mostly devoted to a large glass-covered dial area in which are the FM and AM scales, two illuminated tuning meters, and a number of LED's. Two rows of LED's, one for each channel, are peak-power indicators, lighting up at power levels of −18, −15, −12, −9, −6, and 0 dB (where 0 dB is the rated 120 watts into 8 ohms). A pushbutton switch increases their sensitivity by 12 dB, so that the 0-dB light comes on at 7.5 watts and the −18-dB light glows at a mere 120 milliwatts output. Two additional LED's indicate stereo-FM reception and operation of an optional Dolby-FM decoder, which can be internally installed. When the decoder is installed, turning it on also changes the receiver's FM de-emphasis time constant to the required 25 microseconds. A large tuning knob dominates the center of the panel.

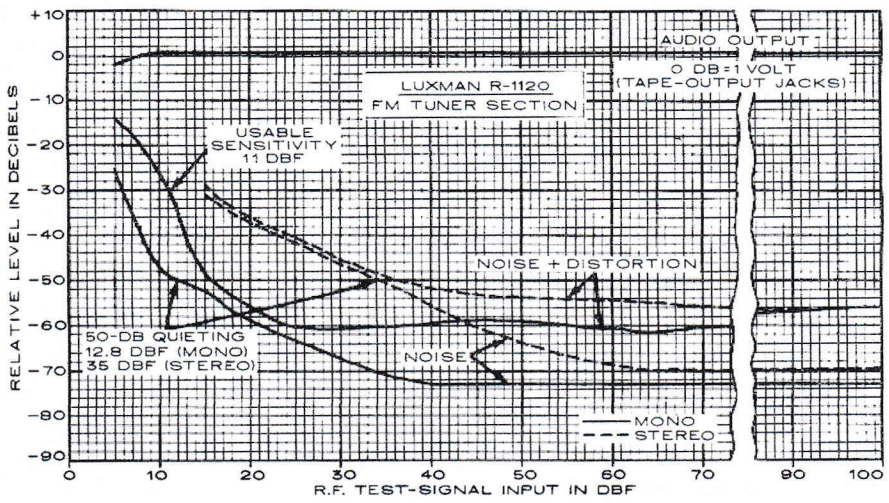
Across the top of the front panel, above the dial area, are a number of very small, unobtrusive controls. Three tiny pushbuttons turn on the Dolby system (when installed), turn off the FM muting, and set up the receiver to monitor the playback from a three-head tape deck (or simply to play back from any tape deck connected to its rear terminals). A fourth button selects the deck to be monitored from either of the two decks that the receiver can accommodate.

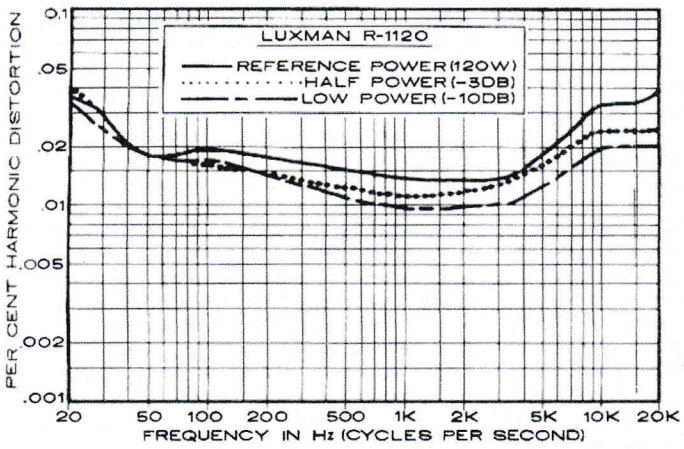
A small, knob-operated switch controls the recording inputs of the two recorders. It can select the receiver's normal program source or interconnect the two decks for dubbing from either one to the other. A similar switch selects normal or reversed stereo or the mono mode. To the right of these controls are five small pushbuttons for loudness compensation, the infrasonic, low-cut, and high-cut filters, and the LED power-display sensitivity increase. A larger button is the main a.c. power switch. Next to it is a tiny red LED signal light that blinks on and off at a 1-Hz rate for several seconds when the receiver is first turned on; when the operating voltages have stabilized, the outputs are connected to the speakers by a relay and the light goes out. If a d.c. voltage appears across the speaker outputs, whether due to a malfunction or to the amplifier's being overdriven, the speakers are instantly disconnected and the warning light comes on.

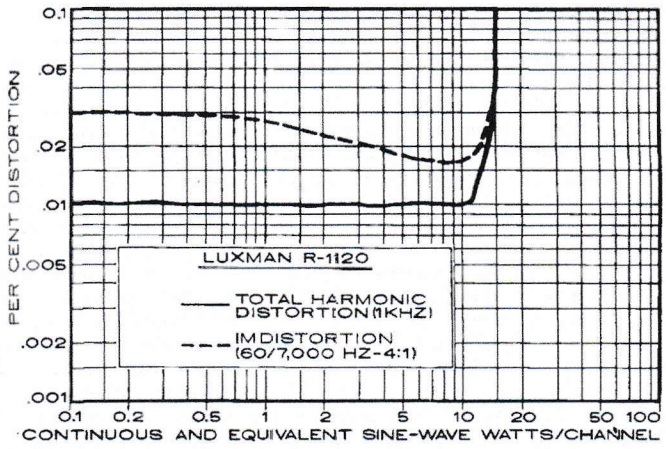
On the lower left of the panel is an input-selector switch with positions for AM, FM, two magnetic-phono cartridges, and a high-level AUX input, plus two small tone-control knobs. These last are unusually convenient to use, since pulling out either knob changes the turnover frequency (at which its action becomes effective) by an octave. The bass turnover frequencies are 200 and 400 Hz, and the treble frequencies are 2,000 and 4,000 Hz. Each of the controls is detented at its center (flat) setting.

On the lower right of the panel are the volume control, with a concentric balance ring (both are continuous adjustments, but the balance control has a center detent), and the speaker-selector switch, with positions for controlling up to three pairs of speakers. Two pairs can be driven either singly or together, or they can be shut off for headphone listening via the front-panel jack. The third speaker position is for use with electrostatic speakers; with this setting, the R-1120 drives the speakers through a resistance-capacitance network that is apparently intended to stabilize the amplifier when driving highly capacitive loads (there is no clarification of this feature in the instruction manual).

The speaker outputs, in the rear of the receiver, are through insulated spring-loaded terminals that grip the end of the connecting wire securely. Near them is a small slide switch that turns off the front-panel LED power display. There are two a.c. outlets, one of them switched. The power transistors and their heat-sink fins extend from the rear of the receiver, but they are protected by a perforated metal cage. Near the FM antenna terminals (for 75- and 300-ohm antennas) are a hinged, ferrite-rod AM antenna and a switch that attenuates the antenna input to the FM tuner; the latter is for use when one is close to a powerful FM station that could overload the front end. A DIN socket duplicates the functions of one of the two sets of tape-recorder connections. *(Continued on page 47)*







The Luxman R-1120 is housed in a handsome rosewood-veneer wooden cabinet. Its overall dimensions are approximately 19¼ inches wide, 16¾ inches deep, and 7⅛ inches high, and the weight is about 37½ pounds. The suggested retail price is $995. The Dolby decoder module is $55.

● ***Laboratory Measurements.*** The preconditioning period of operation at one-third rated power caused heating of the metal grille on top of the receiver's cabinet, but elsewhere the unit remained cool. The output into 8 ohms, with both channels driven at 1,000 Hz, clipped at 144 watts per channel (IHF clipping headroom was 0.8 dB), and the power at clipping into 4- and 16-ohm loads was 159 and 97.5 watts per channel, respectively.

At 1,000 Hz, the total harmonic distortion (THD) was 0.01 per cent or less up to more than 100 watts output. It was only 0.011 per cent at 120 watts and 0.02 per cent at 140 watts. The IM distortion dropped from about 0.03 per cent at 0.1 watt output to 0.017 per cent in the 120-watt range before rising to 0.04 per cent at 150 watts.

At rated output, the THD was less than 0.02 per cent from 40 to 6,000 Hz, reaching its maximum points of 0.036 and 0.04 per cent at 20 and 20,000 Hz. At half and one-tenth power the distortion characteristics were similar, with slightly lower numerical readings. Although the full-power distortion measurements at the frequency extremes were marginally higher than the rated 0.03 per cent, the difference at the low end can be accounted for by the 0.02 per cent residual distortion of our signal generator at that frequency. It should be noted that our amplifier gain settings (which can affect some test results) were in accordance with the new IHF standard A-202, and the ratings of the R-1120 were established long before the issuance of that standard.

The sensitivity of the R-1120 amplifier for a reference 1-watt output was 15.5 millivolts (mV) through the AUX input and 0.22 mV through a phono input. The signal-to-noise ratio (S/N) was identical for both inputs, measuring 61 dB (with A weighting) referred to 1 watt. The phono-input stage overloaded at 162 mV, approximately as rated (this was a "worst-case" measurement, made at 20,000 Hz and converted to the equivalent level at 1,000 Hz). The IHF slew factor was 2.21 (when the amplifier was driven to its rated power at 1,000 Hz, the frequency had to be increased to 44,200 Hz before amplifier distortion increased to 1 per cent). The IHF dynamic headroom was 2.13 dB, indicating that unclipped peak outputs of as much as 196 watts could be obtained during a tone burst of 20 milliseconds duration. The amplifier was stable with any capacitive load up to 2 microfarads in parallel with an 8-ohm resistive load (we did not, however, make any measurements through the electrostatic-speaker output terminals).

The power-output LED calibrations were sufficiently accurate for their purpose. The indications for both channels were identical, and the instantaneous response of the LED's (as compared with meters) made them an effective indication of the actual peak-power output used in music listening.

The tone-control response curves provided the maximum degree of frequency compensation desirable from a conventional bass-treble tone-control configuration. When the 200- and 4,000-Hz turnover frequencies were used, the frequency response at the ends of the audio band could be modified considerably without affecting the mid-range or the overall sound balance. With the 400- and 2,000-Hz turnovers, the tone controls had a more conventional effect.

The low- and high-cut filters were excellent, with 12-dB-per-octave slopes and −3-dB response frequencies of 45 and 6,000 Hz. The main effect of the infrasonic filter was in a range too low for it to be measured; in the audio range it was about 1 dB down at 20 Hz. The loudness compensation boosted both low and high frequencies, and we found the effect excessive. The RIAA phono equalization was accurate within +0, −1 dB from 50 to 20,000 Hz and was down 3 dB at 20 Hz. There was a very slight interaction of the phono equalization with phono-cartridge inductance, which boosted the output by about 0.6 dB between 5,000 and 20,000 Hz.

The FM tuner section of the R-1120 had a usable sensitivity of 11 dBf in mono and 15.7 dBf in stereo. The steep limiting curve gave a 50-dB quieting sensitivity of 12.8 dBf in mono and 35 dBf in stereo, with respective distortion readings of 1 and 0.35 per cent. At a 65-dBf input, the mono THD + Noise was about 0.09 per cent, with a S/N of 73 dB. In stereo, the distortion was 0.19 per cent and the S/N was 69.5 dB.

The stereo frequency response of the tuner section was within +0.6, −0.9 dB from 30 to 15,000 Hz. Channel separation was very uniform with frequency, about 42 dB from 30 to 500 Hz, slowly decreasing to 35 dB at 10,000 Hz and 32 dB at 15,000 Hz. At a 45-dBf input, the capture ratio was about 1.6 dB and the AM rejection was a good 66 dB. The image rejection was 86 dB, alternate-channel selectivity was 69 dB, and adjacent-channel selectivity was 6 dB. The muting and stereo thresholds were both at 14.8 dBf. In spite of the very flat audio-frequency response of the tuner section, the 19-kHz pilot carrier in its outputs was suppressed to a very low −78 dB. The hum level of the FM tuner section was also low at −72 dB.

The only measurement made of the AM tuner section was of its frquency response, which was very restricted. Although it had a better than average high-frequency response (down 6 dB at 5,500 Hz), the lows were inexplicably rolled off to −6 dB at 250 Hz.

● ***Comment.*** The instruction manual does not specifically say so anywhere, but the R-1120 has a non-defeatable AFC system as an aid to its FM tuning. Only in the functional block diagram is this alluded to (as "FM tuning lock"), with no hint of its function. At any rate, although we usually take a dim view of non-defeatable AFC, this one is so subtle in its action that one must actively look for it to detect its presence. Only when a station has been tuned so closely that the channel-center meter pointer begins to enter the "tuned" center segment of the scale does the AFC come into action, pulling the tuning accurately in to the center.

Also, when we first placed the receiver into

NEW TEST METHODS

● Hirsch-Houck Laboratories is now using the Institute of High Fidelity's new *Standard Methods of Measurement for Audio Amplifiers* (IHF-A-202 1978). For convenience in making comparisons with previously tested products, we will correlate the new measurement results, when appropriate, with measurements made using our previous techniques. Copies of the new standard are available for $7 from the Institute of High Fidelity, Dept. AS, 489 Fifth Avenue, New York, N.Y. 10017.

service, the power-level LED's did not operate. We assumed that they were defective until an examination of the receiver turned up a barely visible switch in the rear, marked "PEAK IND," which had been accidentally moved to its off position during unpacking of the unit. Although this switch is shown on the control identification picture in the manual, its purpose is barely mentioned in the text, with no hint provided as to why one might wish to blank the display.

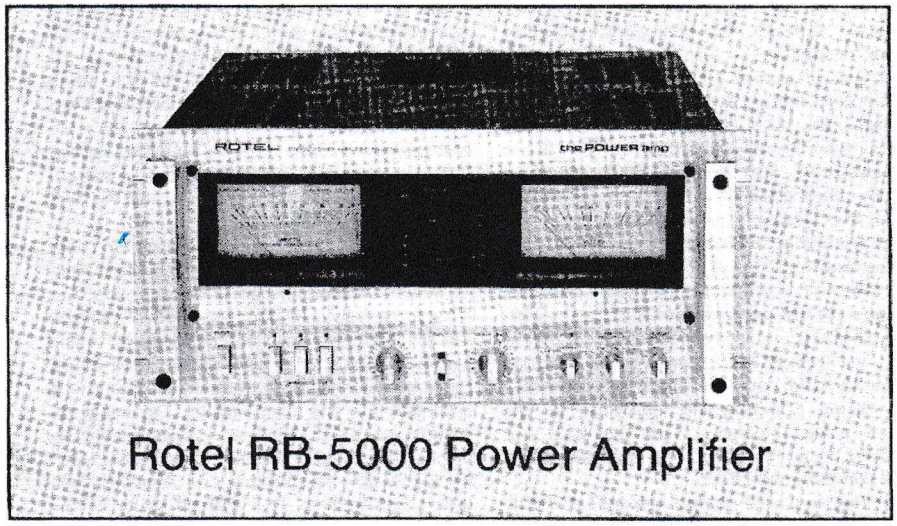
The only significant functional omission that we could find in the design of the R-1120 was the absence of separate preamplifier outputs and power-amplifier inputs, which we would have expected in a receiver of this quality and price.

We were impressed by the simplicity and functional beauty of the front-panel control layout, whose styling makes the little-used controls almost invisible except under close examination. Except for the power switch, the operation of the receiver will normally be restricted to the few knob controls along the lower edge of the panel. However, we would have appreciated greater visibility for the markings that show the settings of the input and speaker-selector switches.

Overall, we had a strongly favorable reaction to the appearance, "feel," and sound of the Luxman R-1120. It shares with all the other Luxman products we have used the smoothness, elegance, and basic good taste that distinguish this brand from most of its competition. From the silky feel of the tuning control to the rich rosewood grain of the cabinet finish, this is a receiver meant to be seen, heard, and enjoyed. It is expensive, to be sure, but one is buying really first-rate performance plus some less tangible properties.

We have limited tolerance for products that behave in unexpected or undesirable ways (such as noises when switching, noise bursts when tuning across the FM band, vague or downright inaccurate FM-dial calibrations, and so forth). We are happy to report that the Luxman R-1120 was completely free of such anomalies. In spite of its occasional concessions to styling (the dial is calibrated only at 1-MHz intervals, for example), function has not really been sacrificed. The FM tuning was so accurate that we had no difficulty reading the station frequencies to the nearest 200 kHz directly from the dial. The sound of the R-1120, from both FM and phono sources, was impeccable—essentially determined by the quality of the program source rather than by any property of the receiver itself.

Circle 105 on reader service card



Rotel RB-5000 Power Amplifier

Not long ago, power amplifiers capable of delivering more than 200 watts per channel were a rarity; today, they are almost commonplace. However, the ranks of the superpower amplifiers thin out rapidly above 300 watts or so, and there are only a few in the 500-watt class. One of the most impressive of these giants is the new Rotel RB-5000, rated to deliver 500 watts per channel to 8-ohm loads from 20 to 20,000 Hz with no more than 0.009 per cent total harmonic distortion.

The RB-5000 is as imposing physically as it is electrically. The 8¾ x 19-inch satin-gold-finish front panel, styled to match other Rotel audio components, is slotted for rack mounting and fitted with a pair of appropriately robust handles. On the panel are two large meters calibrated in watts from 0.5 to 1,000. Behind a "blackout" window between the meters are two vertical rows of LED peak-power indicators (the meters respond to average power levels). The lights are calibrated at 3-dB intervals from −18 to +3 dB (0 dB is the amplifier's rated output). Between these rows are other LED's indicating STANDBY (the interval after power is first applied, during which the outputs are muted to protect the speakers), PROTECTION (which lights when the amplifier's protective circuits are activated), and OVERLOAD (which indicates that the amplifier is being overdriven).

Across the bottom of the panel are a number of operating controls. Pushbuttons switch the power and connect the three pairs of speaker outputs (individually) through heavy-duty relays. Any two of the speaker buttons can be engaged simultaneously, but they are electrically interlocked so that pressing a third button will have no effect (a red LED above each button indicates that its speaker output is being driven). Under the center indicator panel are two level-control knobs and a lever switch that completely removes the input signal when it is operated. The level knobs, which are lightly detented, provide up to 21 dB of attenuation in 1-dB steps.

At the lower right of the panel are three knob controls. The FILTER switch has positions marked LAB TEST, NORMAL, and LOW FILTER. These provide three degrees of low-frequency rolloff for different applications. The METER SENSITIVITY switch increases the sensitivity of the meter (and LED) displays by ten or one hundred times (10 and 20 dB); in the latter position, the lowest reading on the meters is only 5 milliwatts and a full-scale reading corresponds to 10 watts. The last switch is the LIMITER, which reduces the maximum output capability of the amplifier to either 25 or 50 per cent of the normal 500 watts.

The active circuits of the RB-500 are completely symmetrical (push-pull) from input to output and are direct-coupled, with the exception of a single blocking capacitor. The internal negative-feedback loops are completely direct-coupled as well. The only exception to the DC design is in the special balanced-input stage used with the Cannon connectors in the rear of the amplifier for interface with professional equipment having balanced signal lines. The balanced input of the RB-500 is electronic, employing FET's, instead of being transformer coupled. When the standard phono-jack inputs are used (as in any home system), a switch in the rear of the amplifier removes the balanced-input stages from the circuit. (It is interesting to note that the phono jacks on the RB-5000 are gold plated for reliable, corrosion-free contacts.)

The output stages operate in class AB. At power outputs up to 3 watts, they are biased for class-A operation, giving the lowest distortion. As the power increases beyond 3 watts, the operating conditions make a smooth transition to class AB.

The Rotel RB-5000 is really a "dual-monophonic" amplifier in that each channel has its own power supply, including a large toroidal transformer (about 6½ inches in diameter) and extensive regulator circuits. In addition, there is a third completely separate power supply for the amplifier's elaborate protective and display circuits. The RB-5000 is cooled by a slow-running, silent fan that operates at all times, automatically speeding up to provide the necessary extra cooling if the output-transistor temperature should rise excessively.

As might be expected, the Rotel RB-5000 is a very large, heavy amplifier (most of its weight, as well as its bulk, is associated with

(Continued on page 49)