Equipment profiles

Luxman Model R-1120 Stereo AM/FM Receiver

MANUFACTURER'S SPECIFICATIONS
FM Tuner Section
Usable Sensitivity: Mono, 10.3 dBf (1.8 μV); Stereo, 17.2 dBf (4.0 μV).
50-dB Quieting: Mono, 14.1 dBf (2.8 μV); Stereo, 36.8 dBf (38 μV).
S/N: Mono, 74 dB; Stereo, 70 dB.
Selectivity: 80 dB.
THD: Mono, 0.1 per cent @ 100 Hz & 1 kHz, 0.2 per cent @ 6 kHz; Stereo, 0.2 per cent @ 100 Hz & 1 kHz, 0.4 per cent @ 6 kHz.
Frequency Response: 20 Hz to 15 kHz, +0.2 dB, −1.5 dB.
Capture Ratio: 1.3 dB.
Image Rejection: 80 dB.
I.f. Rejection: 85 dB.
AM Suppression: 55 dB.

When Lux Audio of America Ltd. first introduced the products of their parent company, Lux Corporation of Japan some three years ago they chose to do so with a line of high-end amplifiers, tuners, and preamplifiers which were designed for what was then deemed the ultimate in performance and quality. Lux Corporation, a 53-year old company by now, had for some time previously been marketing integrated receivers in other parts of the world in various price categories. It was only when they developed their latest receivers, about a year ago, that the company decided to sell them in the U.S., to complement the rest of their well-accepted line of audiophile products. Indeed, in an effort to get across the idea that these receivers are not just "me too" products, they have elected to call them tuner-amplifiers to convey the idea that their performance is as good as might be obtained from separate components.

All of the Lux receivers bear a family resemblance. Front panels are dominated by a large bronze-tinted dial area, the upper section of which is fitted with less often used controls and switches (all neatly camouflaged to avoid a cluttered look), while major controls are positioned on the light-colored lower section of the panel with ample physical separation between them. Upper, secondary controls include a Dolby FM switch (active only if one purchases the optional Dolby decoder board which plugs into an empty multiple-pin connector inside the chassis), a tape monitor switch (for up to two tape decks), tape-dubbing switch, mono/stereo mode switch, loudness switch, subsonic, low- and high-cut filter switches, power switch, and a sensitivity switch which governs the firing points of a series of LED power indicators located in the dial area (6 LEDs per channel, calibrated from −18 dB to 0 dB and responsive to power output peaks of from 120 mW to 120 W in two ranges).

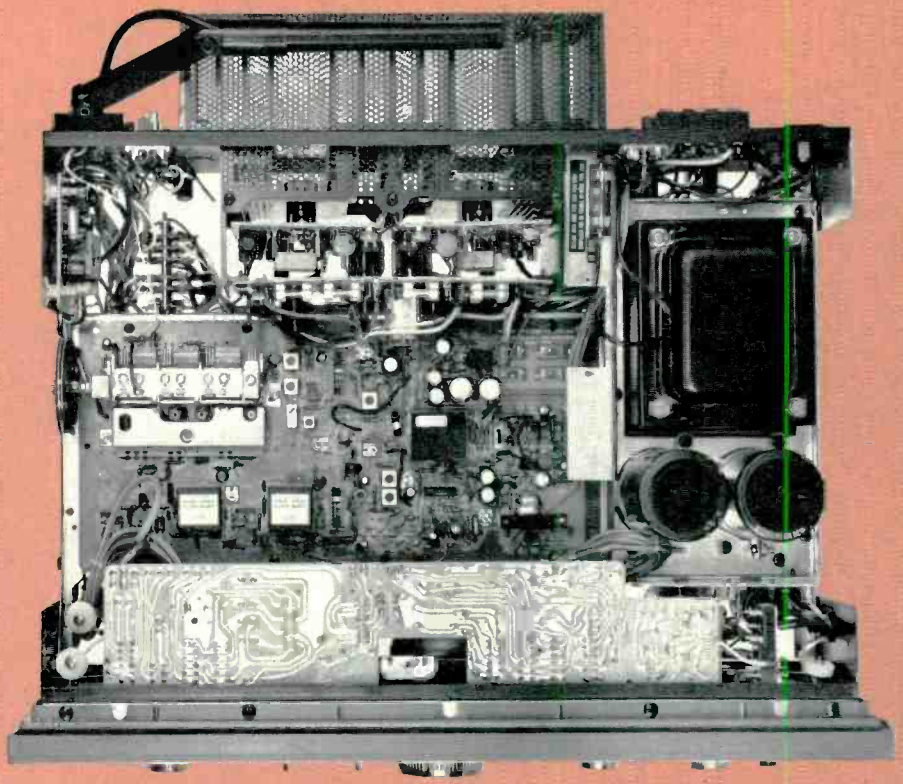
Linear FM and conventional AM frequency scales are positioned below these controls and are softly illuminated when power is applied. Below the dial scales, at the left, are indicator lights for Dolby and stereo FM plus illuminated signal-strength and center-of-channel meters. An additional LED serves as a power-on indicator and, when power is first applied, flashes intermittently until voltages have been stabilized, after which speakers are electrically connected to the output stages. This LED will also become illuminated if

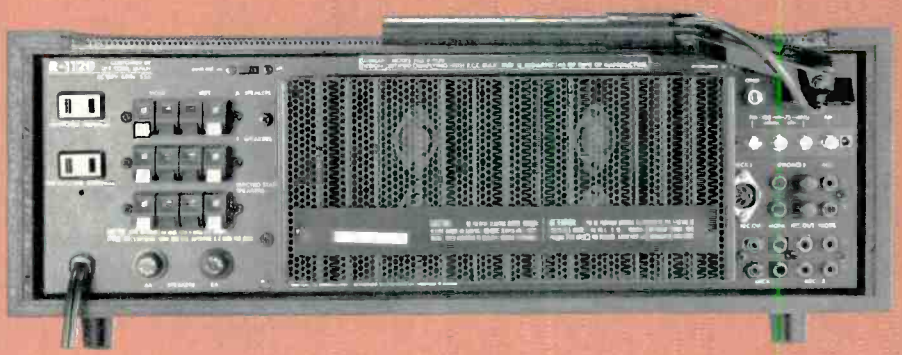
Stereo Separation: 45 dB @ 100 Hz, 48 dB @ 1 kHz, and 42 dB @ 6 kHz.
Sub-Carrier and SCA Rejection: 60 dB.

AM Tuner Section
Usable Sensitivity: Internal antenna, 200 μV/M.
S/N: 52 dB.
Image Rejection: 75 dB.
I.f. Rejection: 80 dB.
Selectivity: 32 dB.
THD: 0.5 per cent.

Amplifier Section
Power Output: 120 W/channel, 8 ohm loads, 20 Hz to 20 kHz.
Rated THD: 0.03 per cent.
Rated IM: 0.03 per cent.
Frequency Response: High level, 15 Hz to 60 kHz, −1 dB.
Input Sensitivity: Phono, 2.6 mV; High Level, 160 mV.
Phono Overload: 160 mV.
S/N: Phono, 72 dB (94 dB "A" weighted re: 10 mV input); High Level, 95 dB "A" weighted.
Treble Control Range: ±13 dB or ±8 dB @ 10 kHz (depending upon turnover setting).
Bass Control Range: ±11 dB or ±6 dB @ 100 Hz (depending upon turnover setting).
Filter Cut-off and Slope: Subsonic, 15 Hz, 12 dB/octave; Low, 70 Hz, 12 dB/octave; High Cut, 7 kHz, 12 dB/octave.

General Specifications
Power Consumption: 500 W @ rated output.
Dimensions: 19 5/16 in. (49 cm) W x 7 3/32 in. (18 cm) H x 16 21/32 in. (40.8 cm) D.
Weight: 37.4 lbs. (17 kg).
Price: $995.00.





the protection circuits of the amplifier section are activated for any reason.

Major controls include an input program selector (with two phono settings, AM, FM and AUX), bass and treble control knobs, which, when pulled outward provide alternate tone-control turnover frequencies, dual-concentric volume and balance controls, a speaker selector switch, headphone jack, and a centrally located, massive flywheel-coupled tuning knob.

The rear panel of the R-1120 is equipped with three sets of spring-loaded speaker terminals, two of which are for the connection of conventional speaker systems, while the third is specifically intended for use with electrostatic-speaker systems. Speaker-line fuses are located below the speaker terminals. To the right of the metal grille (which protects the output transistors mounted directly to protecting heat sinks) are four antenna terminals (for 75-ohm or 300-ohm FM, and external AM-antenna transmission lines), a chassis ground terminal, two sets of phono input jacks, AUX, tape-in and tape-out jacks, and a DIN multiple-pin connector which parallels the Tape-1 in and out jacks. An antenna-attenuator switch is also located in this section of the rear panel (for use when overly strong FM signals are received), as is a large AM ferrite-bar antenna which can be rotated away from the chassis for best reception.

A block diagram of the R-1120 circuit is shown in Fig. 1. The FM tuner section uses a four-gang tuning capacitor and a dual-gate MOS-FET r.f. stage in its front end. Linear-phase ceramic and block filters are used in the i.f. section to achieve sharp skirt selectivity while maintaining adequate bandwidth for low-distortion mono and stereo audio recovery. A quadrature detector/limiter circuit is incorporated in a single IC, and the composite audio signal recovered from this circuit is fed to an IC PLL decoder, followed in turn by an IC low-pass filter which suppresses subcarrier output. A modified form of AFC circuitry which Lux calls its "Closed Lock Loop Tuning System" locks in received signals but is limited to a locking range of only ±100 kHz to prevent "pulling" of adjacent strong-signal channels.

The AM tuner section of the R-1120 uses a three-gang tuning capacitor and an amplified form of AGC circuitry as well as a ceramic filter in its i.f. section.

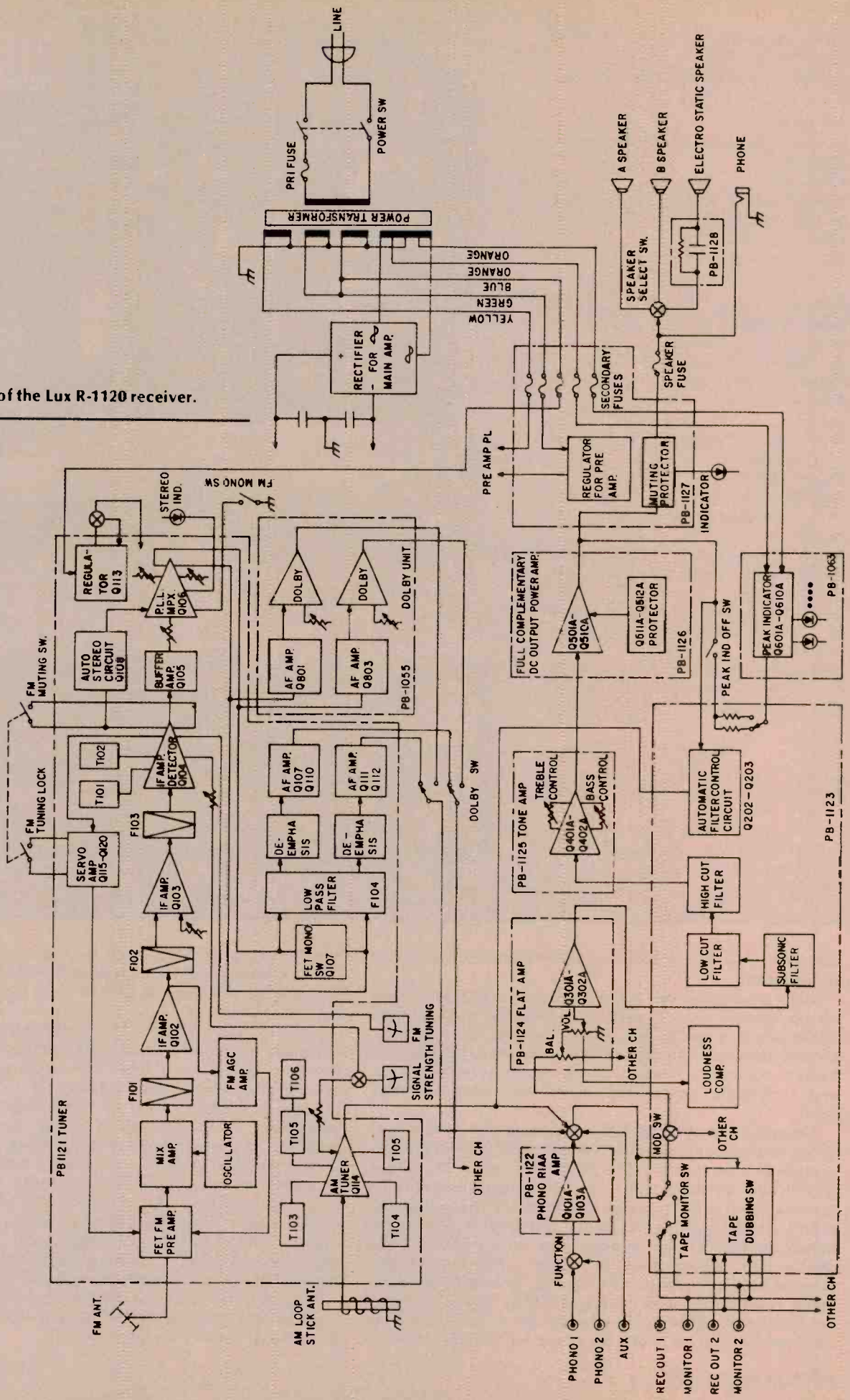


Fig. 1 —
Block diagram of the Lux R-1120 receiver.

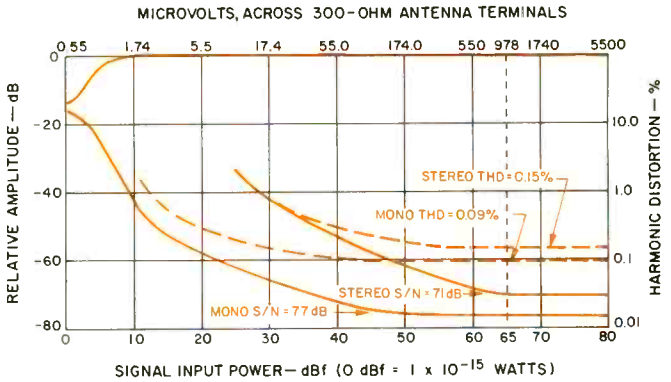


Fig. 2 — Mono and stereo quieting and distortion characteristics of the FM section.

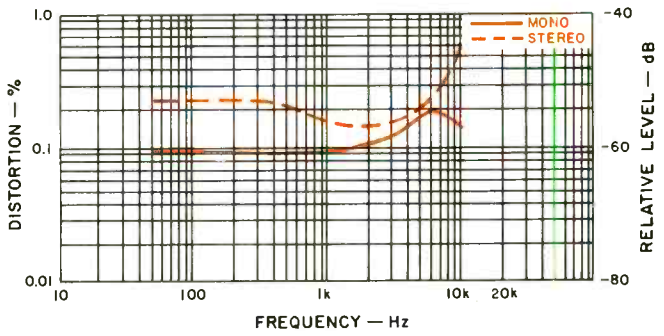


Fig. 3 — Distortion vs. frequency in the FM tuner section.

FM Tuner Section Measurements

Usable sensitivity in mono measured 10.3 dBf, exactly as claimed. In stereo, usable sensitivity was 22.1 dBf, being governed by the stereo switching threshold rather than by actual noise and distortion measurements (THD is down to 1.3 per cent by the time stereo mode is switched in automatically). The 50-dB quieting point required only 12.5 dBf of signal strength in mono and 36 dBf in stereo, both figures better than claimed by Lux. Best S/N in mono measured 77 dB, while for stereo the S/N for 65-dBf signal inputs was a high 71 dB. Harmonic distortion of 1 kHz measured 0.09 per cent in mono and 0.15 per cent in stereo, again exceeding published claims. All of these results are plotted graphically in Fig. 2, while in Fig. 3 we have plotted distortion versus frequency for both the mono and stereo modes.

Capture ratio measured 1.2 dB, while alternate channel selectivity was 83 dB. Image and i.f. rejection both measured 85 dB, and spurious response rejection was in excess of 90 dB. Sub-carrier and SCA rejection both measured in excess of 70 dB, exceeding published claims by far. There would be no need for an MPX filter on a tape deck when recording FM programs from this receiver. Muting threshold is ideally set at a level of 13.5 dBf. Frequency response for FM is plotted (including 75 microsecond de-emphasis) in Fig. 4, along with crosstalk into the undesired opposite stereo channel. Response was flat within −1.2 dB out to 15 kHz, and separation measured a high 51 dB at mid-frequencies, 48 dB at 100 Hz, and 38 dB at 10 kHz.

AM Section Performance

In response to many reader requests, we have begun to measure a few of the AM performance characteristics of stereo receivers. In the case of the Lux R-1120 (and nearly every other receiver we have tested recently), frequency response was not really something to rave about, as illustrated in the sweep-frequency display of Fig. 5. While other performance specifications such as S/N, THD, image, and i.f. rejection all met or exceeded their published ratings, Lux, like so many other receiver makers, chose to limit the bandwidth of the AM section with the results shown in Fig. 5. Perhaps the expected coming of stereo AM will prompt all manufacturers to take another look at their AM design philosophy. In the meanwhile, you'll have to search elsewhere if you want wide-response AM reception.

Amplifier and Control Section Measurements

The power amplifier section of the R-1120 is conservatively rated and delivered 150 watts per channel into 8-ohm loads at 1 kHz before the low rated THD of 0.03 per cent was reached. For a rated IM of 0.03 per cent, power output was even higher, with readings of 167 watts per channel, as shown in Fig. 6. Power bandwidth for rated output (120 watts per channel) extended from 15 Hz to just a bit over 20 kHz (extremes of frequency at which THD did not exceed 0.03 per cent), as illustrated in the graph of Fig. 7. Damping factor for the power amplifier section measured 52 at 50 Hz and referred to 8 ohms.

Phono input sensitivity measured 2.8 mV for rated output, and overload was a very high 250 mV (at 1 kHz), as against the 160 mV claimed by the manufacturer. Signal-to-noise in phono measured 78 dB ("A" weighted) referred to actual input sensitivity, which translates to 86 dB referred to a 10 mV input. RIAA equalization was accurate to within ±0.3 dB, while frequency response measured through the high level in-

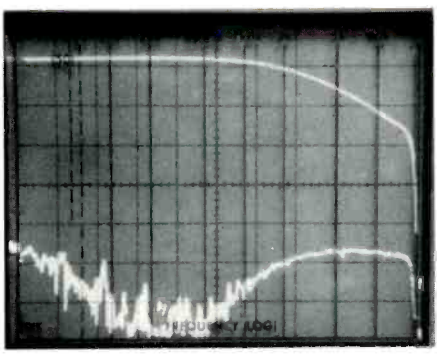


Fig. 4 — Frequency response and separation characteristics (including the 75 μS de-emphasis) of the tuner section. (Each vertical division in all 'scope photos is 10 dB per division.)

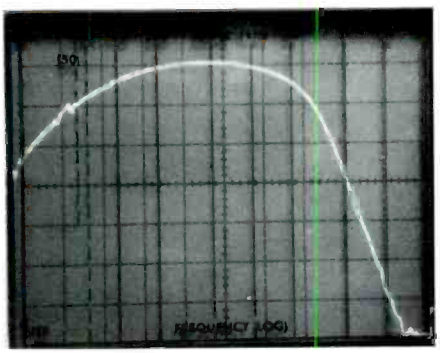


Fig. 5 — AM frequency response.

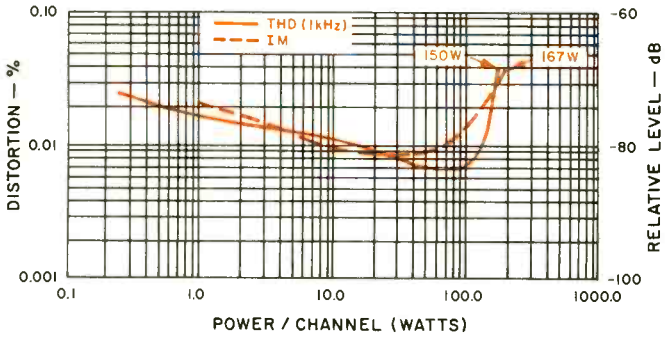


Fig. 6 — Distortion vs. power output.

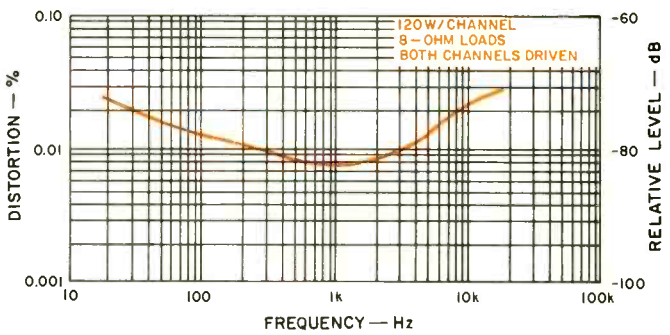


Fig. 7 — Distortion vs. frequency at rated output.

puts was flat from 4 Hz to 170 kHz for the −3 dB roll-off points (10 Hz to 65 kHz for a −1 dB roll-off). Hum and noise in high-level mode was 100 dB below rated output ("A" weighted), while residual noise was a bit lower still, with readings of 103 dB, "A" weighted.

Tone-control range with the bass and treble control knobs depressed (2 kHz and 400 Hz turnover) is plotted in the sweep-frequency 'scope photo of Fig. 8, while the range of control available with the alternate turnover settings (200 Hz and 4 kHz) is plotted in Fig. 9. The subsonic filter response was exactly −3 dB at 15 Hz as claimed but cannot be seen in Fig. 10, since the sweep rang in this presentation is from 20 Hz to 20 kHz. The alternate low-cut filter action as well as the high-cut filter response are clearly illustrated in Fig. 10, however, and exhibit their 12-dB/octave slope rates and specified cut-off points precisely.

Action of the loudness compensation circuitry is depicted in the multiple sweep 'scope photo of Fig. 11, and Lux chose to emphasize both bass and treble response in their loudness circuitry.

Use and Listening Tests

It has been often stated that bench measurements alone do not tell everything about an audio product. This is particularly true when it comes to products made by a few companies such as Lux. Certainly, this is not the most feature-laden receiver we have ever put through our lab, nor is it particularly "bargain priced." Yet, Lux seems to have the ability to produce product after product that just *sounds* better. This was particularly true of phono reproduction which was especially impressive when reproducing program sources having extreme musical transients. There was no hint of stridency at the high end and bass reproduction was tight and true. As for the FM tuner section, again, measured specifications do not tell the entire story. Certainly, there are tuners and receivers today which have lower measured distortion

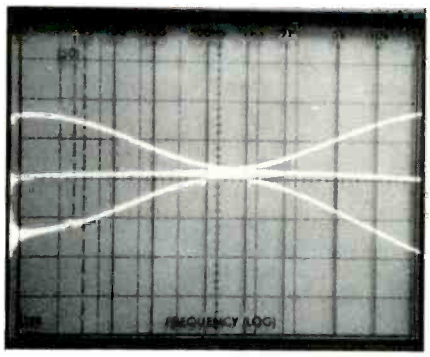


Fig. 8 — Bass and treble control range at the 400-Hz and 2-kHz turnover settings.

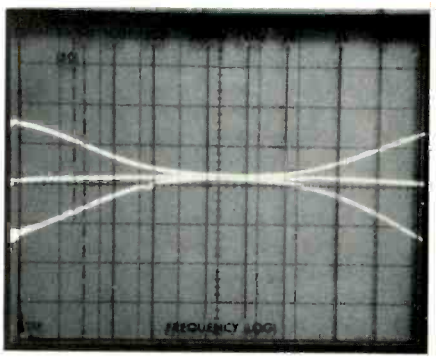


Fig. 9 — Bass and treble control range at the 200-Hz and 4-kHz turnover settings.

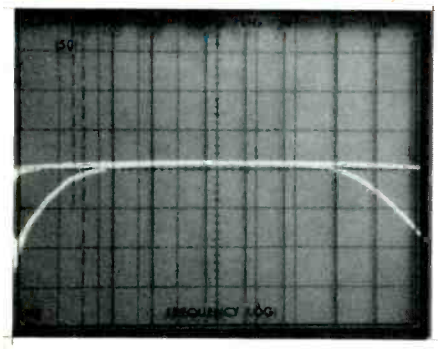


Fig. 10 — Low-cut and high-cut filter response.

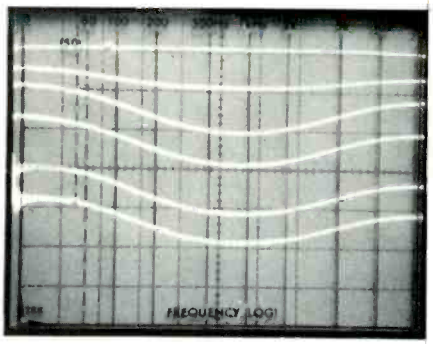


Fig. 11 — Loudness compensation, in 10 dB increments, of the volume control.

figures and even somewhat better 50-dB quieting figures, yet, when listening to FM over the Lux R-1120 one senses that the tuner is able to capture and hold signals that other tuners and receivers have trouble with (at least in our listening location) and it is equally obvious that tuner alignment has been carefully performed, so that center-of-channel indications correspond exactly to lowest distortion tuning points. Dial calibration, too, was perfect from 88 MHz to 108 MHz, and the inobtrusive "Closed Lock Loop Tuning" system keeps signals firmly locked yet did not prevent us from tuning to weak-signal stereo stations whose frequency was only 400 kHz away from some of our local "powerhouse" stations.

In short, the Lux R-1120 must not be judged on a simple watts-per-dollars basis but should be auditioned carefully and compared with other receivers in the same price category, regardless of their power output ratings. Its 120-watt plus power output capability should be ample for use with all but a few ultra-low sensitivity speakers and, speaking for ourselves at least, we would rather trade 3 or 4 dB of extra power for the sound quality and elegant design of the Lux R-1120. *Leonard Feldman*

Enter No. 90 on Reader Service Card

Sony Model TC-K7II Stereo Cassette Deck

MANUFACTURER'S SPECIFICATIONS

Frequency Response: 30 Hz to 16 kHz with FeCr tape, 30 Hz to 15 kHz with CrO_2 tape.
Harmonic Distortion: 1.3 per cent.
S/N Ratio: 60 dB with FeCr and 56 dB with CrO_2 at peak level.
Input Sensitivity: Mike, 0.2 mV; Line, 60 mV.
Output Level: Line, 775 mV.
Wow & Flutter: 0.045 per cent W rms.
FF & RWD Times: 70 seconds for C-60 cassettes.
Dimensions: 6¾ in. (17 cm) H x 18⅛ in. (46 cm) W x 12¼ in. (31 cm) D.
Weight: 24.3 lbs. (11 kg).
Price: $540.00.

Sony's latest front-loading cassette deck provides many useful features that should be of interest to an audiophile considering the purchase of a deck in this price range. On the left end of the front panel are the power switch, a three-position timer switch, a headphone level pot, and the associated jack. The timer switch will turn the unit on in either *Play* or *Record*, as desired, with a helpful status light for the latter. The cassette is inserted into the guides in the air-damped door, which has a large, clear plastic cover. The eject button is just to the right, below the counter and the memory switch, which can be set to *Off*, or for *Stop* or *Play* upon rewind to "000." The light-touch, logic-controlled tape-motion buttons below all have handy status lights, except for *Stop*. The logic configuration provides the capability for flying-start recording, just by holding in *Play* and touching *Record*, very nice. When the door is closed with a cassette in place, an inside light is turned on. Head accessibility is fairly good with the door in place and is excellent with it removed (a simple task).

The right side of the front panel includes the good-sized, well-illuminated level meters with peak level indicators to the left for 0, +4, and +8 VU. Just below are the Dolby switch, which offers the choice of multiplex filter in or out, the limiter switch, and the tape select switches, which offer three positions each for bias and EQ. The combinations permit matching various low-noise tapes as well as FeCr and CrO_2 types. The large, finely-knurled mike and line level pots are dual-section without friction clutching. As there is a small difference in diameter, however, both sections can be grasped and turned together. The record-mode status light is just above and between the pots. The mike phone jacks are below the associated pot which provides full mixing with the line input. There is a stereo line-in jack below its control pot. A momentary contact push-button allows muting of the record signal to prevent recording any undesired material, such as commercials. Use of this function does not remove the signal from metering or monitoring, facilitating its use. The line-out pot provides control of the level from maximum to 20 dB below that. The output, therefore, cannot be reduced to zero, but finer setting of level for matching is possible. This control has no effect on the level shown on the meters or on the drive to the headphone control, a useful feature that is of value many times.

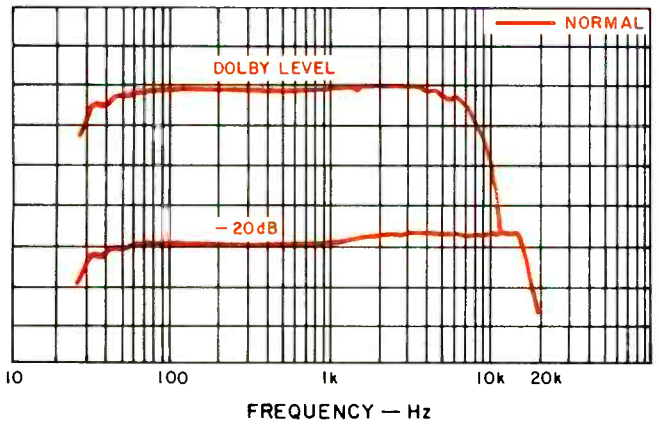


Fig. 1—Frequency response with Maxell LN tape in normal mode.

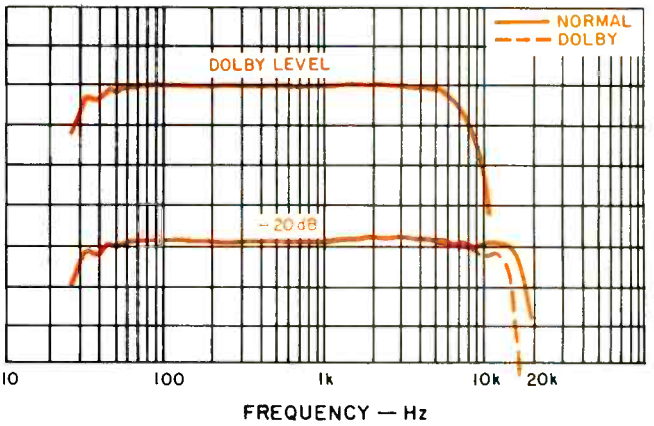


Fig. 2—Frequency response with BASF Studio tape in both normal and Dolby modes.

The back panel has the line-in and line-out phono jacks, a socket for the optional accessory remote control, and an unswitched a.c. outlet. Removal of the wood-grain end pieces permitted removal of the metal cover which has rows of slotted vents to prevent heat entrapment. The great majority of the circuitry is on two large PCBs, one of them for the logic. The soldering was excellent with very little flux residue. Parts identification was good, and there were helpful direction arrows for the adjustment pots. The power transformer is a hefty size, and the wire runs were neatly bundled. The two-motor drive appeared to be of rugged construction, with the FG servo-motor belt drive to the large-flywheel capstan of particular note.

Performance

The *Playback* response of the TC-K7II deck was within a couple dB over the entire range of both the 120- and 70-microsecond test tapes. Level indications on the meters were very close with these tapes and with a Dolby calibration tape. *Playback* speed was approximately 0.7 per cent fast. Using the pink-noise and 1/3-octave RTA combination, the *Record/Playback* response was checked with a number of tapes showing very good results: BASF Performance and Studio, Maxell LN and UD, Sony UHF, FeCr, and CrO_2, Nakamichi EXII, and Scotch Master II and Master III. Maxell LN showed a +2 dB plateau in the higher frequencies, dropping to −3 dB at 17 kHz (see Fig. 1). This data was obtained at a level 20 dB below that to obtain 200 nWb/m at 400 Hz in playback. With a *Record* level to match the Dolby reference (+2.5 dB on the meters), the headroom extended to 7.5 kHz. The response with BASF Studio (Fig. 2) had similar frequency limits, but had superior flatness over the entire range at both levels. There was some rolloff in the highest frequencies with Dolby, but the change was admirably small below 10 kHz. Sony FeCr tape (Fig. 3) obtained greater response at the highest frequencies, out to 20.7 kHz normal, 19.0 kHz with Dolby. The boost of 3 dB at 15 kHz seems just a bit much, but a slight increase in bias or a touch with a tone control could pull it down with substantially no effect on the response limit. The best headroom at the reference level was provided with Sony CrO_2 tape, out to 10.0 kHz (see Fig. 4). The response at the lower level reached 20.7 kHz. These *Record/Playback* responses evidence a flatness that is excellent by any standard. The multiplex filter notch was 3 dB down at 16.5 kHz and had its 32 dB notch at a measured 18.995 kHz, just 5 Hz from 19 kHz. The phase jitter in the playback of a recorded 10-kHz tone was 50 degrees, very good for a cassette deck.

Measurements of HDL_3 (relative level of the third harmonic) were made with a 1-kHz test signal with zero reference as before (see Fig. 5). With that reference, data was taken based upon changes in *Record* level. Some deviations from the expected straight-line functions were shown with

Fig. 3—Frequency response with Sony FeCr tape in both normal and Dolby modes.

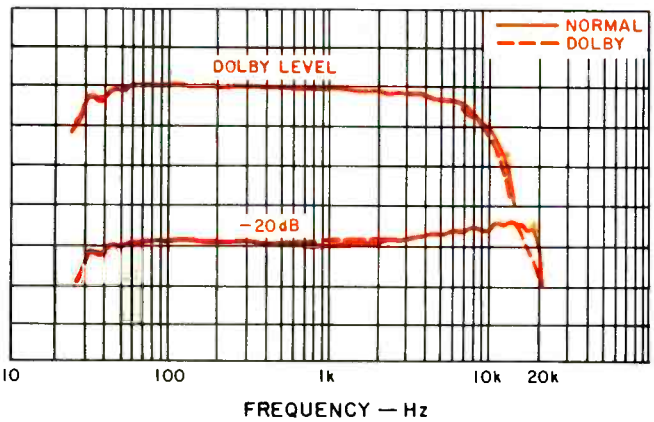
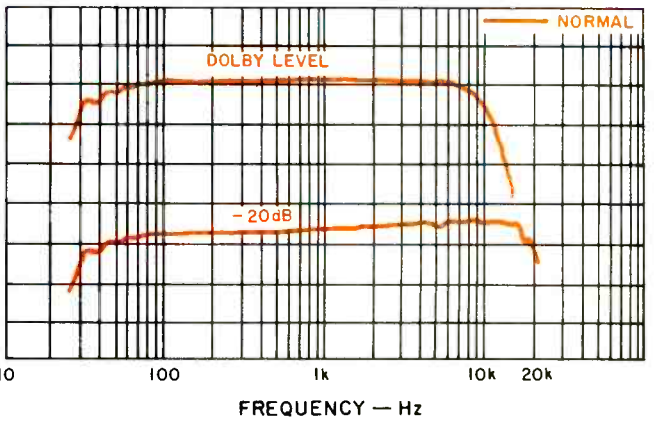
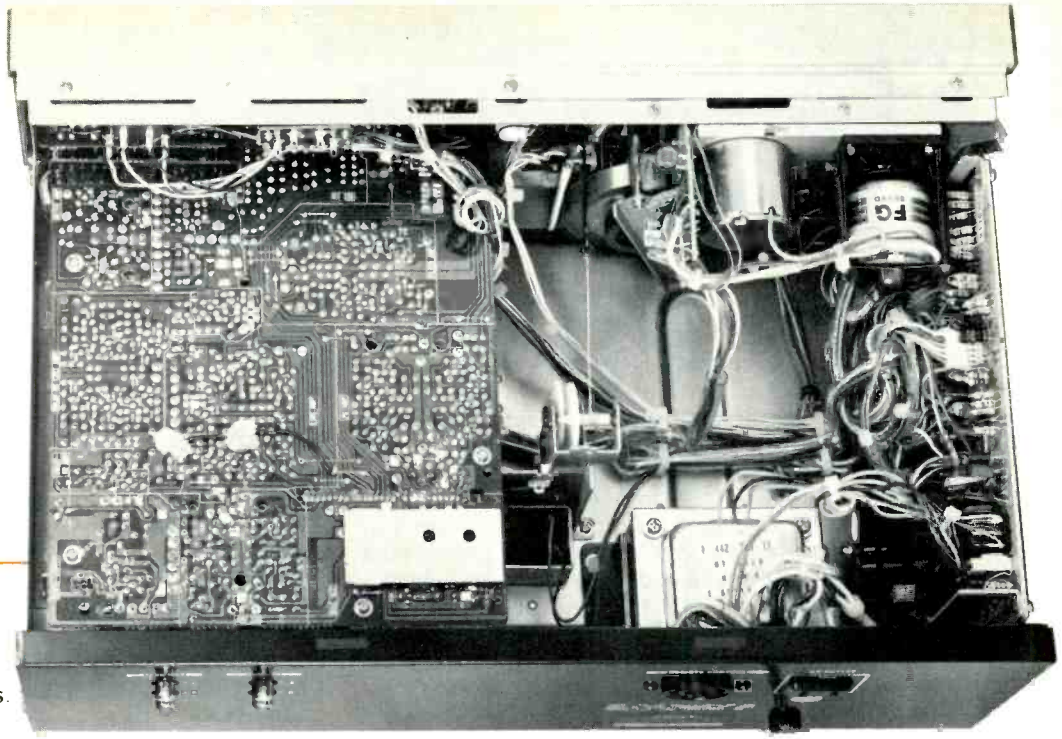


Fig. 4—Frequency response of the Sony CrO_2 tape in normal mode.





saturation effects at the highest levels and some contributions from distortion in the electronics at the lowest levels. The results for this deck with Sony FeCr were measurably better than with Maxell LN, and both had lower distortion than the CrO_2 tape. In general, HDL_5 was very low, always at least 20 dB lower than HDL_3. HDL_2 was more noticeable, but was never a significant contributor to the total distortion. Use of Dolby mode decreased the level of HDL_3 and HDL_5 at all levels and for all tapes. On the other hand, HDL_2 was increased, but its value was still typically less than 0.2 per cent. The plot of HDL_3 vs. frequency for Sony FeCr at 10 dB below reference level reached a peak of 0.6 per cent at about 5 kHz (Fig. 6). Below 100 Hz, HDL_3 was below the measurement-noise limit and was something less than 0.1 per cent at 30 Hz, excellent results. The distortion level in Dolby mode was always as low or lower than that shown in the figure.

Signal-to-noise tests were conducted using the same reference level, that was used for Dolby level in playback. In normal mode and IEC "A" weighting, the ratios were 51.0 dBA for Maxell LN and 53.2 dBA for Sony FeCr and Sony CrO_2. With Dolby, Maxell LN had a ratio of 58.8 dBA, and Sony FeCr and CrO_2 had 59.0 and 60.3, respectively. To determine the ratios for the 3 per cent HDL_3 point, the increase in the level in *Playback* relative to the reference level was measured. Because there is compression in the *Record/Playback* process at the highest levels, the true signal-to-noise ratio has to be related to the actual, relatively attenuated playback tone. With this criterion, Maxell LN had ratios of 51.8 dBA and 60.6 dBA with Dolby. Sony FeCr had

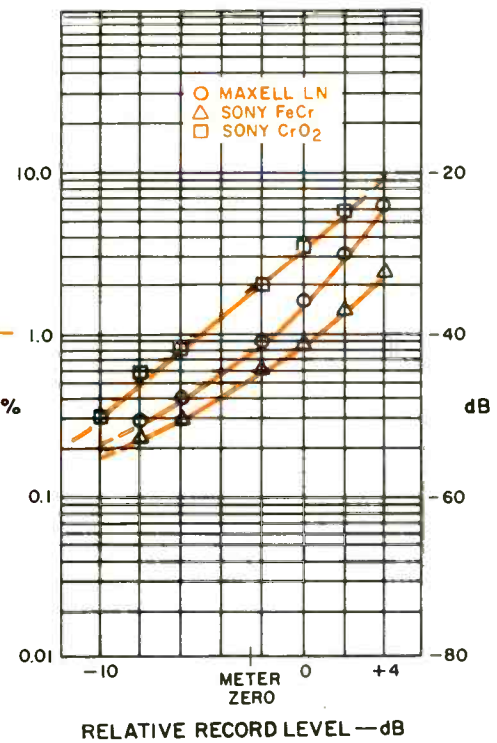
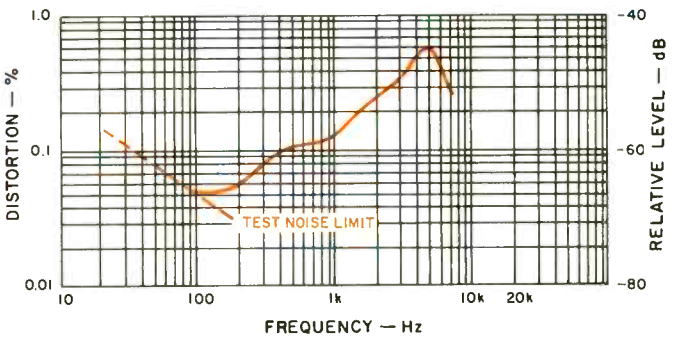
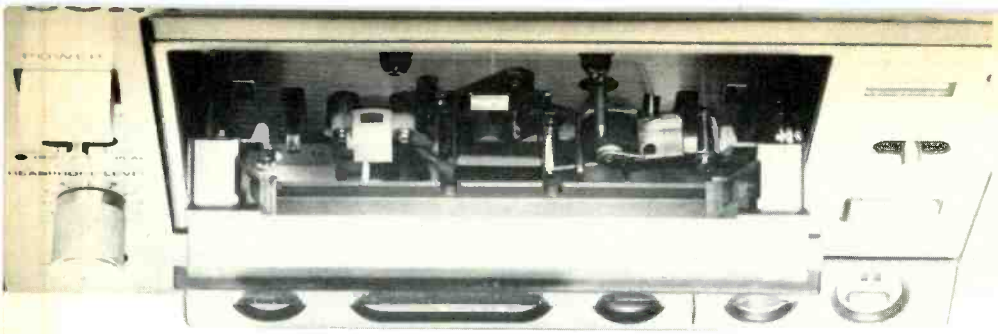


Fig. 5—Relative level of 1-kHz third harmonic distortion with Maxell LN, the Sony FeCr, and the Sony CrO_2 tapes. The 0 reference is Record level for Dolby level in playback.

Fig. 6—Third harmonic distortion vs. frequency @ 10 dB below the Dolby level with Sony FeCr tape.





ratios of 56.4 dBA, 64.0 dBA with Dolby; and Sony CrO_2 had 52.7 dBA, 59.8 dBA with Dolby. The ferrichrome tape provided the best performance in this respect and was also the winner with CCIR weighting. Erasure and crosstalk were both greater than 80 dB down, excellent results. Separation from one track to the other was 30 dB down, quite adequate but on the low side, relative to other measurements.

Mike input sensitivity was 0.13 mV, and that for line was 40 mV, both better than specified. Input clipping occurred at what would be +18 on the level meters. The pot sections tracked quite well, with the right one 0.5 dB low at −10 VU. The output levels for 0 VU in *Record* were close to 800 mV, while in *Playback* the average output was about 750 mV. The dynamic response of the meters showed that they truly deserved the VU label. The peak level response indicators were right on the nose with continuous wave (CW) signals, but required a dB or so more drive with a 10-mS burst. The meter scales were generally within a fraction of a dB. The limiter threshold was close to the Dolby level reference, with 1 dB of compression with a CW signal for a normal indication of +4.5 VU. The maximum indication was just above scale with severe overdriving. In a dynamic test, a 25-mS burst about 25 dB above threshold was reduced to +8 VU by the end of the burst. The first part was clipped/limited to about +12 VU. Signal levels lower than this very severe test would be reduced further.

The tape playback speed varied a total of 0.1 per cent at most with line power anywhere from 100 to 130 V. A 3000-Hz test signal was recorded at the beginning, middle, and end of a cassette, and plots were made of tape speed and wow and flutter. There was very little variation in tape speed at any of the three positions. With flutter, however, the results at the ends of the cassette were obviously poorer than in the middle. A second cassette was used (see Fig. 7), and a longer plot was made of flutter at the beginning of that cassette (top trace in the figure). The improvement in the results was indicative of problems associated with the first cassette used. The deck, therefore, appears capable of meeting its rather tight 0.045 per cent W rms specification the great majority of times with good quality cassettes. Fast forward and rewind times for a C-60 cassette were 73 seconds. Logic response time from *Fast Wind* to *Playback* was less than a second.

Listening and Use Tests

Cassette loading and unloading was very easy. Removal of the plastic door was easy and straightforward, making cleaning and demagnetization very convenient. The light-touch tape motion switches were really a joy to use with the logic control a definite benefit. No goofs were detected in trying to find a weakness in the system. The timer switching and record mute button worked as specified. The headphone level control, the memory play function, flying-start recording, and meter indications unaffected by the output pot were continually useful. The nice, open faces of the meters aided in their use, as did the peak indicators. The instruction book was very good with excellent text and illustrations. The discussion of various aspects of the deck flows very well, and there are good ties to the diagrams for specific tasks. There is a short list of recommended tapes, but no schematic.

The playback of various sources was most satisfactory and switching back and forth between Dolby and normal modes did not introduce any detectable shifts in response, even of a subtle nature. The limiter was used with music recording at a purposely high level, switching it in and out. In playback, the improvement it gained was obvious. The limiter would be especially useful for unattended recording, such as with timer start. All *Record, Pause,* and *Stop* clicks were of very low level, well into tape noise. The Sony TC-K711 offers very good performance, excellent in some areas, coupled with the flexibility of many useful features. *Howard A. Roberson*

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Fig. 7—Measurements of tape speed and wow & flutter with a 3-kHz test signal at the beginning, middle, and end of a cassette.

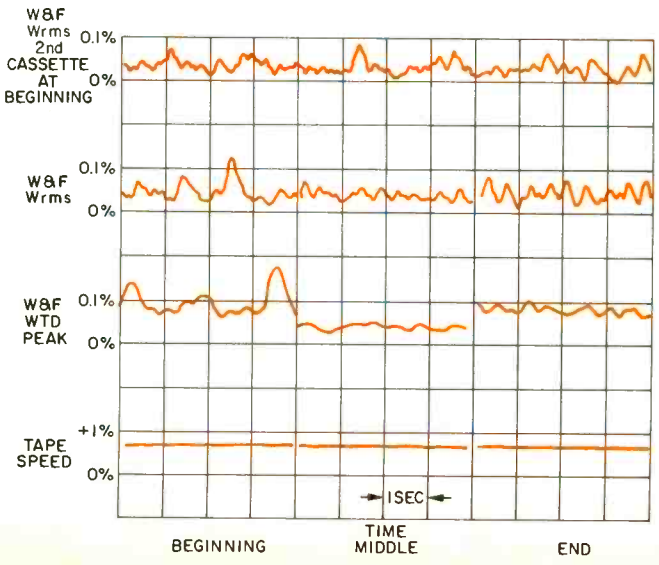

Fig. 8—Limiter action of the Sony TC-K711 cassette deck. (Each division equals 5 mS.)