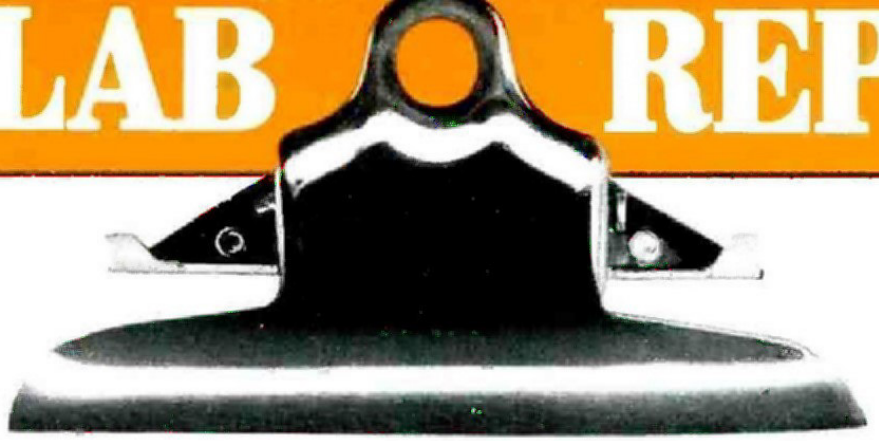

NORMAN EISENBERG AND LEN FELDMAN

Studer Revox B710 MK II Cassette Recorder

General Description: The B710 Mk II is a new cassette recorder from Studer-Revox, a name familiar to *MR&M* readers for its open-reel recorders. A three-head configuration is used, with the record and play heads sharing the same housing but electrically discrete so that off-the-tape monitoring is possible while recording. The B710's transport employs four motors of which the two used for the capstans are direct-drive and controlled individually by a common quartz frequency. No belts, slip clutches, friction wheels or mechanical brakes are used. Transport operations are microprocessor and logic-controlled, and complete fast-button options are available, including run-in recording directly from playback or from fast-forward or reverse wind. The deck also provides for front-panel mixing of mic and line inputs.

Tape type selection is made manually by three selector buttons for ferric oxide (IEC Type I), for chromium dioxide or chromium substitutes (IEC Type II) and for metal (IEC Type IV). In addition there is an "automatic" button which allows the deck to adjust itself according to the tab-coding found along the rear edge of cassettes. The selection made by any of these buttons handles both equalization and recording bias. A bias fine-adjust is included within the machine itself in keeping with the Studer philosophy that this adjustment need not be a regular or normal front-panel control.

The deck includes a built-in digital clock for automatic unattended record and play timing

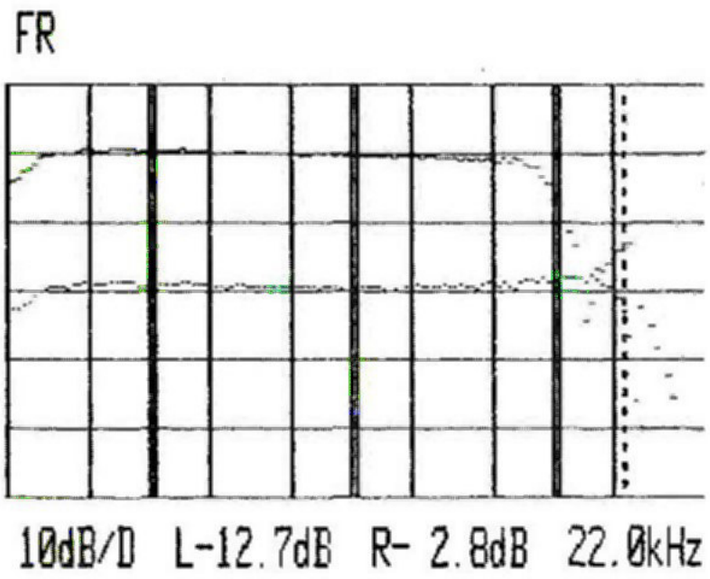

Fig. 1: Revox B-710 Mk II: Record/play frequency response at 0 dB and -20 dB using TDK tape.

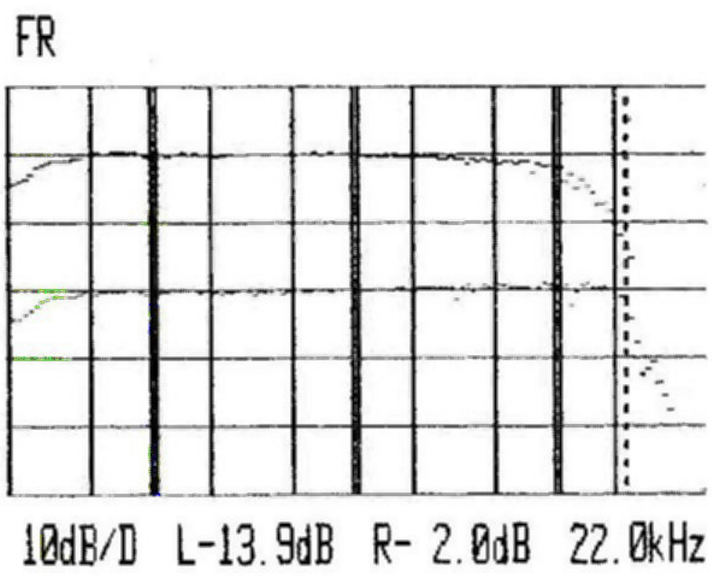

Fig. 2: Revox B-710 Mk II: Record/play response at 0 and -20 dB (TDK SAX tape).

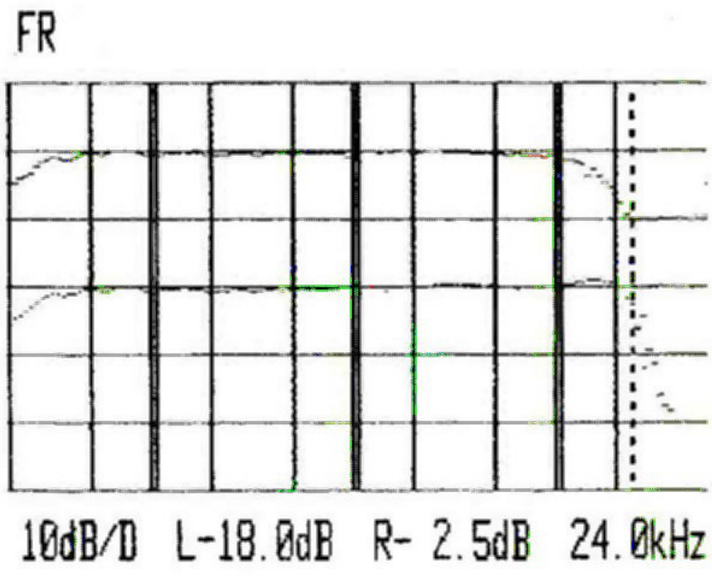

Fig. 3: Revox B-710 Mk II: Record/play response at 0 and -20 dB (TDK MA tape).

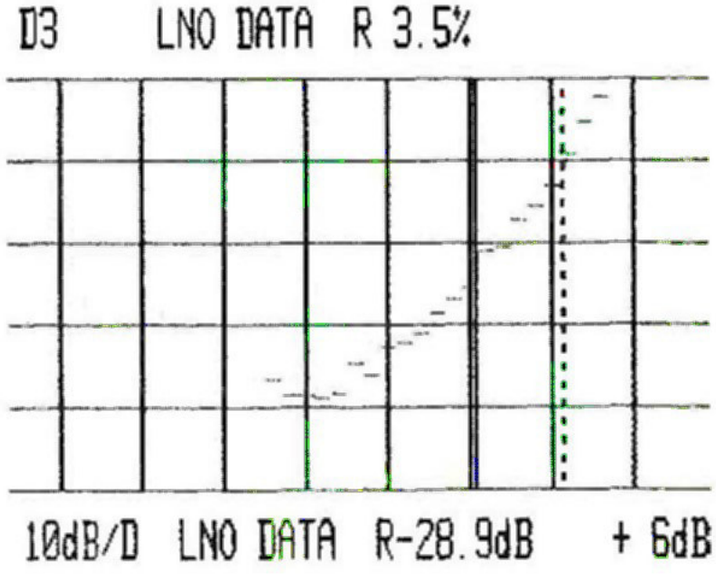

Fig. 4: Revox B-710 Mk II: Third-order distortion vs. record level (TDK-AD tape).

operations. The timing is displayed on a four-digit counter which also may be used to read the time of day. It also serves as the tape index counter. The microprocessor associated with this timing setup also handles memory location of preselected portions of recorded tape, and repeat play of desired sections of a tape or an entire cassette.

Both Dolby-B and Dolby-C noise reduction systems are included. The peak-reading meters are horizontal "bar graph" segments extending from just below -30 to +8 dB.

The cassette compartment occupies the center of the front panel. It is covered by a dark-tinted translucent panel that is readily slipped off or on. The cassette is loaded directly in place vertically, and is held securely when the deck is operated. It may be removed only when the deck is in "stop" or "pause" modes (the latter operational only during recording). With the cassette removed, there is complete access to heads and capstans.

There are three rows of controls to the left of this area. The top row contains buttons relating to the timer; next to them is the timing display itself. The second row contains the transport controls for pause, rewind, fast-forward, play, stop and record. In the record mode, an additional symbol lights up on the digital display readout. The third row contains switches for power off/on; tape/source monitor; and the Dolby B or C (or off) selection.

To the right of the panel are the signal meters, the input level (recording) controls; microphone jacks; headphone output jack; headphone volume control. The level controls are dual-concentric types permitting adjustment of both mic and line on each channel individually or simultaneously. The headphone volume control acts independently of line-level output.

Across the top of the panel is a hinged cover which, when lowered, reveals additional controls. The group at the left relates to the timer and memory operations; the group at the right handles the multiplex filter and the tape selection.

At the rear are the line input and output jacks. The latter have individual output level adjustments. Also here are the recorder's power-line fuse; AC cord connector; an operating voltage switch; a remote-control socket for use with other Revox components; a second remote-control socket for the deck itself.

The owner's manual supplied with the B710 Mk II is printed in three languages—German, English and French—but each language occupies its own section with the illustrations, of which there are many, repeated in each section.

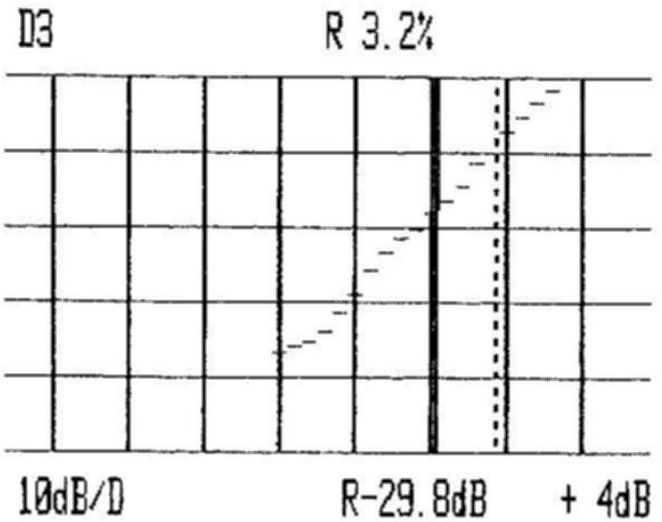

Fig. 5: Revox B-710 Mk II: Third-order distortion vs. record level (TDK SAX tape).

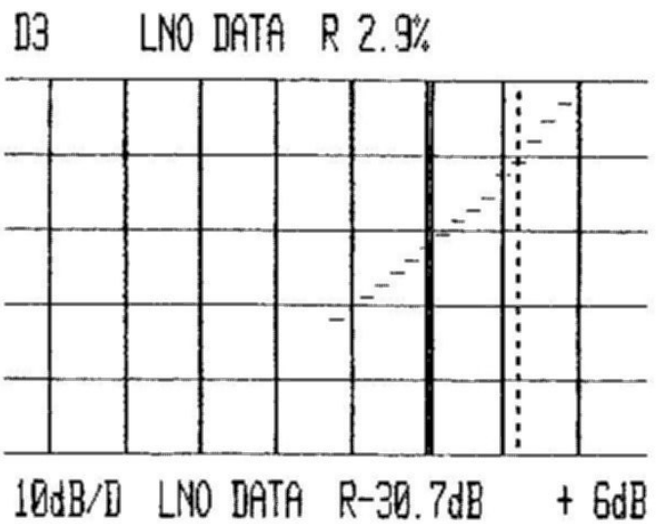

Fig. 6: Revox B-710 Mk II: Third-order distortion vs. record level (metal tape).

Test Results: Our sample deck had been calibrated for use with TDK tapes. Accordingly, in our tests we used TDK tapes: Type AD as the normal-bias or standard ferric-oxide sample; type SA-X for the high-bias sample; TDK MA for the metal tape. We were informed by Studer/Revox that if we insisted upon using other brands of tapes they would be happy to advise us as to how to realign the machine for them. We saw no reason to do so, however, and we went ahead with the TDK samples.

In all tests, the B710 Mk II met or exceeded published specifications. The results, as summarized in our "Vital Statistics" table, just about speak for themselves, but some additional comment is relevant here. To begin with, frequency response—as shown in the plots of *Figures 1, 2* and *3*—was consistently wider than claimed. In each case, the response was taken at the -20 dB record level referenced to the recorder's own "0 dB" meter marking. It is worth noting that "0 dB" for the Revox B-710 Mk II is set at 200 nWb/m, rather than at 165 nWb/m or even 145 nWb/m as is the case with so many home-type cassette decks, or Dolby level.

Plots of third-order harmonic distortion as a function of recording level are shown in *Figures 3, 4*

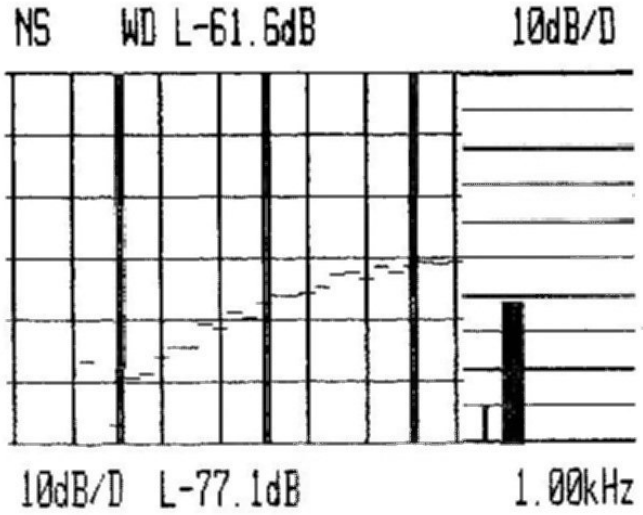

Fig. 7: Revox B-710 Mk II: S/N analysis, Dolby off, TDK AD tape.

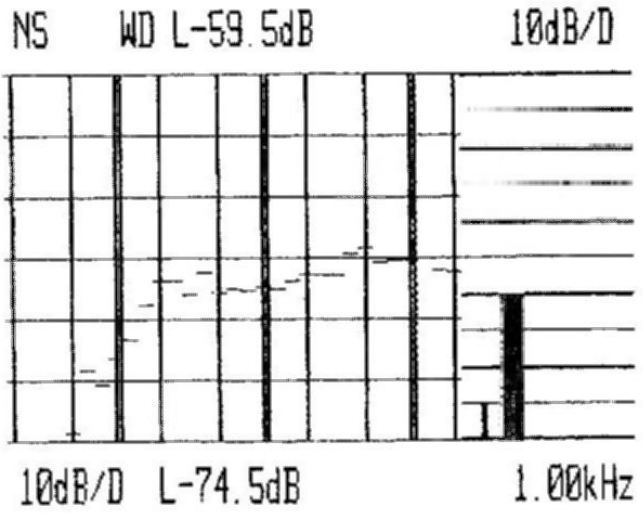

Fig. 8: Revox B-710 Mk II: S/N analysis, Dolby off, TDK SAX tape.

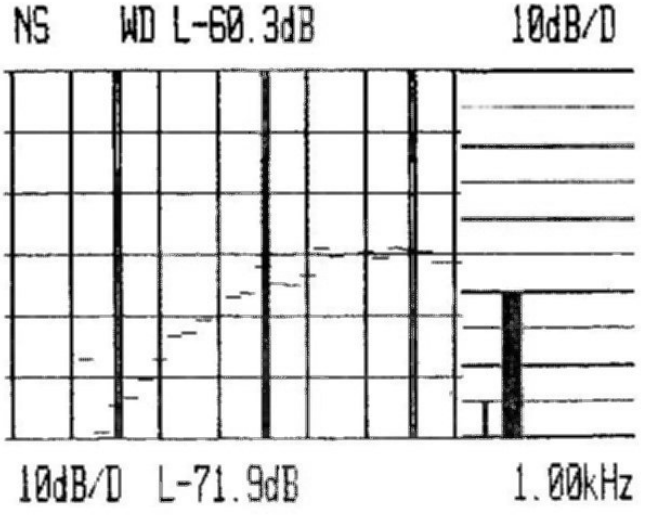

Fig. 9: Revox B-710 Mk II: S/N analysis, Dolby off, TDK MA metal tape.

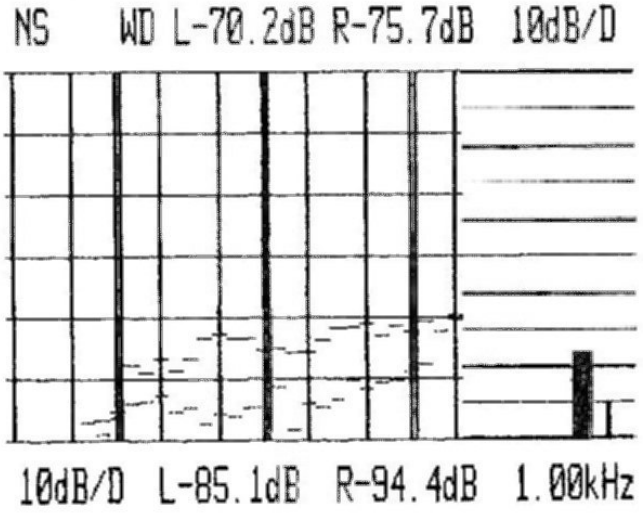

Fig. 10: Revox B-710 Mk II: S/N analysis, Dolby B/Dolby C, TDK AD tape.

and 5. In these graphs we have set the dotted-line "cursor" for each tape tested at the nearest "+dB above 0" level to the 3-percent third-order distortion point—for example, with the AD tape (normal bias) a +4 dB record level results in a third-order HD of 3.2 percent.

Using these +dB levels as reference levels, we measured S/N ratios and made spectral noise analyses for the three tapes. The results *without* Dolby are shown in *Figures 7, 8* and *9*. These readings are superb, among the best we ever have noted for these tapes without the use of any noise reduction. The test results here show, in our opinion, what can be done in optimizing parameters of a tape deck when you are willing to give up a bit on frequency response in return for the more important superior signal-to-noise results.

Since the B710 Mk II incorporates both Dolby B and Dolby C noise reduction, we felt it would be informative to plot S/N and noise analysis for both noise-reduction systems on the same graph (for each type of tape). This would facilitate making valid comparisons of the two Dolby systems. Results are shown in *Figures 10, 11* and *12*. During these tests, "A" weighting curves were used.

The S/N readings next to the letter "L" at the top of each display are for Dolby B; the readings next to the "R" are for Dolby C. The readings below each graph apply only to the third-octave noise contribution about a center frequency of 1 kHz, and are only of secondary interest.

Our Sound Technology 1500A Tester was recently upgraded so that it is now possible to plot Maximum Output Level (MOL) at any desired test frequency. Essentially, MOL plots are input versus output level plots, and are very useful in showing how high-frequency saturation of tape affects its ability to record treble tones with the same linearity as mid-frequencies. Plots of MOL at two popular test frequencies (315 Hz and 10 kHz) are shown for the three tested tapes in *Figures 13, 14* and *15*. Since these curves may be new to readers of *MR&M*, some explanation is in order.

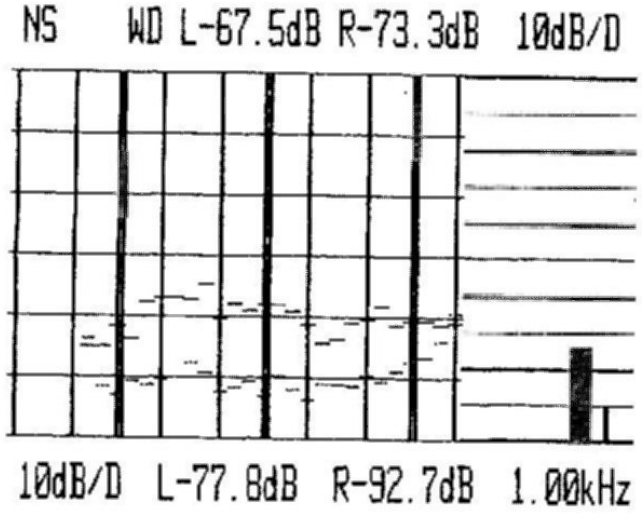

Fig. 11: Revox B-710 Mk II: S/N analysis, with Dolby B and Dolby C, TDK SAX tape.

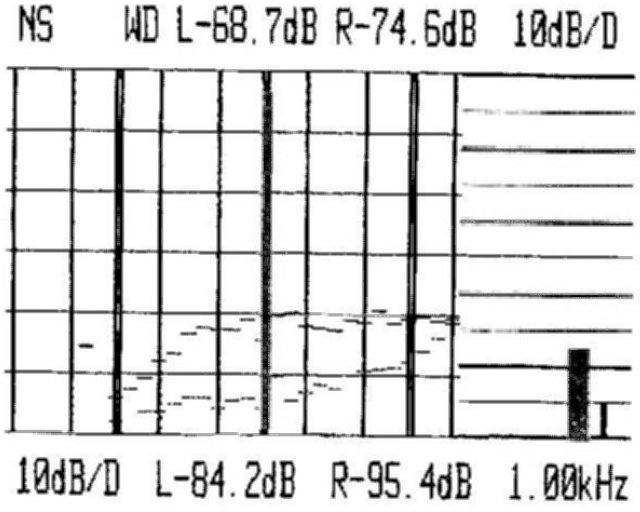

Fig. 12: Revox B-710 Mk II: S/N analysis, with Dolby B and Dolby C, TDK MA tape.

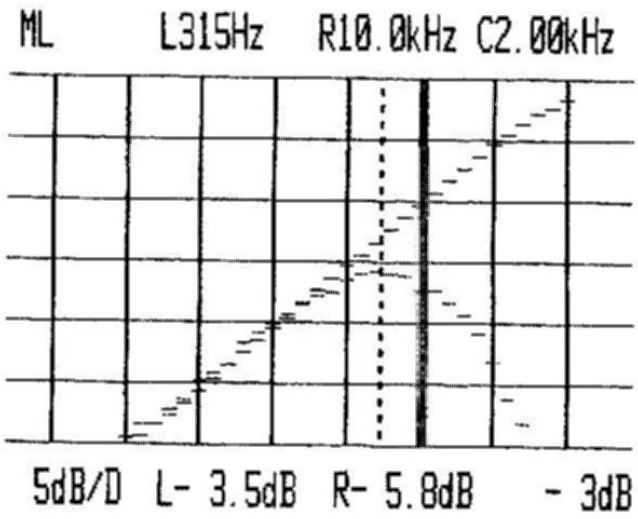

Fig. 13: Revox B-710 Mk II: MOL plots at 315 Hz and 10 kHz (input vs. output) using TDK AD tape.

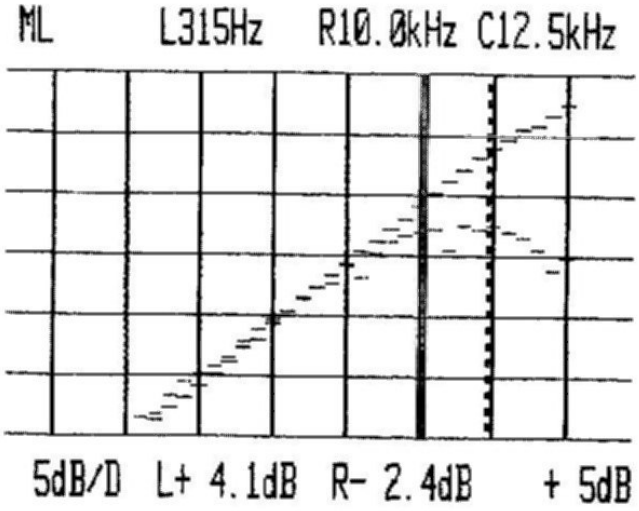

Fig. 14: Revox B-710 Mk II: MOL plots at 315 Hz and 10 kHz (input vs. output) using TDK SAX tape.

Consider *Fig. 13*, for example. At the top are the notations (next to the "L" and "R" designations) of 315 Hz and 10 kHz. These, of course, are the test frequencies we used. The virtually straight-line plot sloping upwards to the right is an output-versus-input plot for the 315 Hz tone. It remains linear to well above the 0-dB reference level (indicated by the double vertical line). The 10-kHz plot, however, shows a maximum output when the input level reaches -3 dB (the notation at the lower right). At that time, the 10-kHz output has only reached a level of -5.8 dB and is at its highest possible point, or the MOL. Trying to record 10-kHz signals at still higher levels results in lower rather than greater output.

The other MOL plots can be interpreted in the same manner. Note especially the results obtained for the metal tape—it exhibits virtually perfect linearity at 10 kHz even up to the 0-dB record level, and its ultimate MOL of +0.6 dB is much higher than that of either of the other two tapes tested. This, by the way, is one of the chief virtues of metal-particle tapes—they do not tend to become saturated at high frequencies nearly as early as do conventional (ferric-oxide or high-bias) tapes.

Yet another MOL plot is shown in *Figure 16*. Here, however, both plots were done at the 10-kHz test frequency. The reason: To confirm the claims made by Dolby Labs that, when properly used and calibrated, the new Dolby C noise reduction actually improves high-frequency headroom. Expecting that a deck such as the B710 Mk II not only would be properly calibrated but that any circuit refinements would be used to best advantage, we felt that this would be a good deck in which to check out this particular point. As may be seen from *Fig. 16*, the claim is fully confirmed. The upper curve (with Dolby C activated) clearly shows an improvement in MOL of more than 2 dB at 10 kHz as compared with the lower curve (Dolby off).

Published specs for the B710 Mk II were among the most "conservative" we have seen in a long time. Consider, for example, the wow-and-flutter spec, given as 0.1 percent (per DIN 45507). This DIN spec is a peak-reading weighted spec, whereas we normally

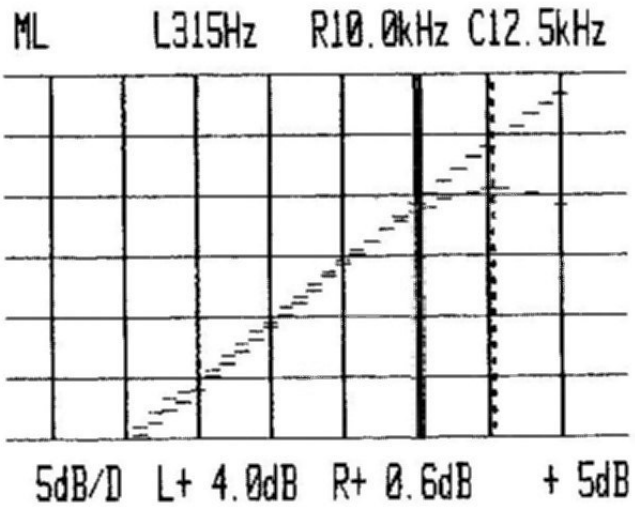

Fig. 15: Revox B-710 Mk II: MOL plots at 315 Hz and 10 kHz (input vs. output) using TDK MA metal tape.

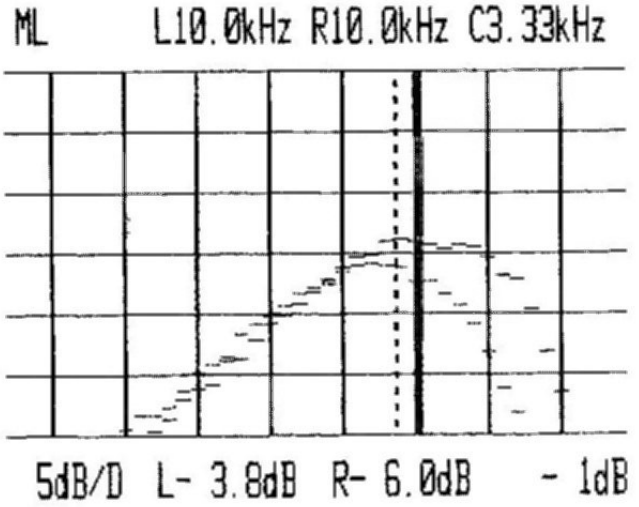

Fig. 16: Revox B-710 Mk II: Dual MOL plot at 10 kHz illustrates how Dolby C improves high-frequency headroom of any tape. Improvement in this case was 2.2 dB at 10 kHz (6.0-3.8).

measure wow-and-flutter using the more common (and better looking) WRMS method of measurement. Using that method we came up with an incredibly low wow-and-flutter reading of only 0.025 percent (better than a good many open-reel decks we know of), as shown in *Fig. 17*. Even when we switched to the DIN method, wow-and-flutter still read a mere 0.053 percent, well below the Revox claim of 0.1 percent.

Finally, as shown in *Fig. 18*, we plotted speed accuracy for the first two minutes of the deck's operation. Speed error was insignificant at 0.259 percent, and since it was obvious that the speed was not going to fluctuate over an extended period of time, we discontinued this test after 120 seconds.

General Info: Dimensions are 17.8 inches wide; 6 inches high; 13.85 inches deep. Weight is 22 pounds. Price: $1999.

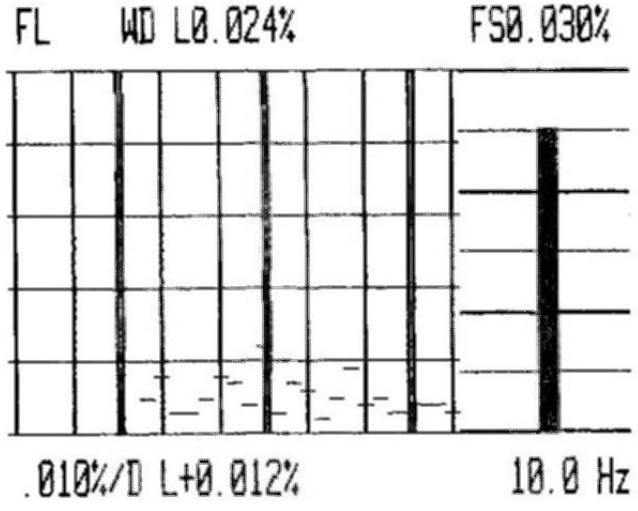

Fig. 17: Revox B-710 Mk II: Wow-and-flutter analysis (WRMS weighting).

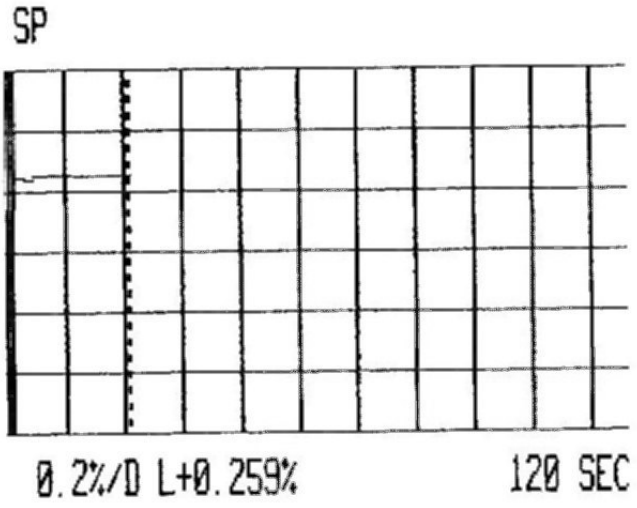

Fig. 18: Revox B-710 Mk II: Speed accuracy vs. time for first two minutes of operation of the unit.

Individual Comment by L. F.: If I had to characterize the new Studer-Revox B710 Mk II deck in a few words, the words I would choose are precision, elegance and no-nonsense. Having met the brilliant founder of the company that manufactures this and other high-technology consumer products under the Revox name, and professional audio products under the Studer name, I find it easy to relate the B710 Mk II to the man behind the product, Dr. Willi Studer. Both the man and the machine exude a similar sense of technical perfection. At the same time, both the man and the machine seem to reject useless frills and unnecessary gimmicks. Which probably is why the B710 Mk II does not feature such things as automatic bias and equalization adjustments, or "mindless" automatic rewind. By the same token, that's probably why this deck used four—yes, you read right, four—separate motors, and not a single belt or pulley that can wear out, stretch or alter position with time. It also is why the microprocessor in this deck has been used for such practical purposes as memory location of

preselected sections of tape, repeat play and the like, instead of the memorizing of bias and other tape deck operating parameters. Studer obviously believes that once a user has elected to go with a particular brand of tape, he or she should stick with it unless good reason is found to change to another brand or type.

The B710 Mk II, in my opinion, is the kind of cassette deck that will appeal to the professional recordist who needs a cassette machine whose performance has not been compromised in any way in the interest of cost saving or fancy features that do not contribute anything to ultimate recorded sound quality. With our sample deck we were also sent a spare transport mechanism to examine, and all I can say is that while the Swiss may have lost dominance in precision watchmaking to Oriental competition, that same skill and craftsmanship are still very much in evidence in such products as the Revox B710 Mk II stereo cassette deck.

Individual Comment by N. E.: Having seen something of the Revox B710 at the Chicago C.E.S. in June, and having read its specifications and glanced through the owner's manual, I could hardly wait to unpack the test sample and get my hands on it. I was not disappointed one whit. The B710 Mk II is one sweet cassette machine, a joy to use for both recording and playback. It does exactly what you expect of it, and with a deck of this caliber those expectations can be pretty high indeed.

It provides, to begin with, excellent performance both in audio terms and on all mechanical counts. It is built to run, and to last. Everything about it—from its outer case and controls, the entire head assembly, the innards and all parts—is splendidly crafted of high-grade materials, and the whole product obviously has been designed and put together with consummate care and skill. The B710 also has features—the kind that I feel really count in serious audio use and which are cannily planned and executed to make things easier and/or better functioning for the serious user.

Speaking of which raises the obvious question of tape selection and the lack of a bias fine-adjust control on the front panel which just about every other brand of cassette deck does have. The three buttons at the top of the panel do set bias and EQ for three IEC tape types individually, while the fourth button will do so as per the "coding" on the edge of a cassette. There is, of course, a bias fine-adjust inside the deck, as there is on a pro open-reel deck. Our own experience with cassette decks and tapes over the years indicates that between

REVOX B710 Mk II CASSETTE RECORDER: Vital Statistics

PERFORMANCE CHARACTERISTICS	MANUFACTURER'S SPEC	LAB MEASUREMENT
Frequency response		
normal tape	±3 dB, 30 Hz to 18 kHz	±3 dB, 20 Hz to 22 kHz
hi-bias tape	±3 dB, 30 Hz to 20 kHz	±3 dB, 20 Hz to 23 kHz
metal tape	±3 dB, 30 Hz to 20 kHz	±3 dB, 25 Hz to 24 kHz
Signal-to-noise ratio w/o Dolby re 3% 3rd order HD		
normal tape	NA	61.6 dB
hi-bias tape	NA	59.5 dB
metal tape	NA	60.3 dB
Signal-to-noise ratio re 3% 3rd order HD with Dolby B; Dolby C		
normal tape	NA; 72 dB	70.2 dB; 75.7 dB
hi-bias tape	NA; 72 dB	67.5 dB; 73.3 dB
metal tape	NA; 72 dB	68.7 dB; 74.6 dB
Record level for 3% 3rd order HD (0 dB =200 nWb/m)		
normal tape	NA	+6 dB
hi-bias tape	NA	+4 dB
metal tape	NA	+6 dB
THD at 0 dB record level		
normal tape	0.8%	0.54%
hi-bias tape	1.5%	1.20%
metal tape	1.5%	0.78%
Wow-and-flutter	0.1% (DIN 45507)	0.053% (DIN) 0.024% (WRMS)
Line output at 0 dB	0.775V	0.775V
Headphone output at 0 dB	2.45V (200 to 600 ohms)	Confirmed
Mic input sensitivity for 0 dB	0.35 mV	0.35 mV
Line input sensitivity for 0 dB	35 mV	35 mV
Fast-wind time, C-60	45 seconds	43 seconds
Bias frequency	105 kHz	105 kHz
Power consumption	50 watts	53 watts

batches of the same brand and type of cassette tape there are insignificant differences and moreover that the bias fine-adjustments do not consistently work out in terms of optimizing all parameters for a given tape. Between different brands of tape, yes—there often are significant differences, and so if you do not want to use the particular brand of tape for which Revox has optimized this deck, you can readjust by going inside the deck and following their instructions. As it happens I did experiment with several well-known brands of cassette tape (other than TDK) in making recordings and dubs on the B710, and I found no problems or lessening of audible performance with those tapes (without bothering to go inside and readjust).

Among the three types of tape we tested on the B710 Mk II we found the usual minor differences in specific parameters with the differences in this case being really minor. In other words, the B710 performs beautifully with any of the tape types. If the cost of tapes concerns you, note the fine results obtained with normal-bias tape which scored higher than the other two tapes on most counts except for a little response above 22 kHz, and for MOL. More important here, of course, is what Dolby C does—achieving signal-to-noise ratios significantly better than 70 dB with any of the tapes tested.

Incidentally, on the mix option—you can add voice via the mic inputs without giving up either stereo channel on the line inputs. If you voice-over through the "left/mono" mic input, your voice will ride on both channels together with whatever else is coming in on the stereo line inputs. If you voice-over on the right mic channel, the voice will appear only on that channel but again without upsetting left or right line inputs.