

Optonica RT-6905 Stereo Cassette Deck



Manufacturer's Specifications

Frequency Response: 30 Hz to 16 kHz; with FeCr, 30 Hz to 19 kHz; with CrO₂, 30 Hz to 18 kHz; with metal tape, 30 Hz to 20 kHz.

S/N: 60 dB; with Dolby NR, 70 dB.

Input Sensitivity: Mike, 0.2 mV; line, 50 mV.

Output Level: Line, 1 V; headphone, 125 mV into 8 ohms.

Flutter: 0.038 percent W rms.

Timekeeping Accuracy: ±15 S per month.

Programming Capacity: 42 operations.

Dimensions: 17 in. (430 mm) W x 8³/₈ in. (211 mm) H x 14¹/₂ in. (371 mm) D.

Weight: 34.9 lbs. (15.8 kg).

Price: \$1,600.00.

One look at the front panel of the Optonica RT-6905 and the viewer has to conclude that this is not just another high-cost deck. There are over 60 push buttons, to say nothing about controls, meters, etc. Optonica calls the deck "computer controlled," and there are many things that can be programmed, some of them in conjunction with the attached timer-control unit. Immediately, the array of buttons and displays is rather overwhelming, but by considering one section at a time, there is a growth in confidence that the deck can be made to do *your* bidding.

The LCD panel at the upper left displays whether the unit is under control of counter memory, APMS (Automatic Programmable Music Selector), or is being programmed (flashing indication). Up to 15 selections on a tape may be programmed in any order with APMS, which requires four-sec-

ond blank spots for the system to find beginnings and endings. Inputs to the program memory are made with 10 buttons (0 to 9), entered with *Set* or removed if necessary with *Clear*. The same buttons make entries for *Counter Memory*, when in that mode. The *Direct Memory* mode permits entering the counter number displayed into memory, and small bar and "M" symbols above the mode selection buttons indicate status and whether entry has been made into a memory. Two digital displays show current address and next address for APMS and counter memory, as well as regular tape counter indications. To one side is a button selector for tone on/off to sound with any of the mode or entry buttons pushed; I found this helpful and left it on all the time. The associated tape motion controls are grouped under *Auto* and provide *Play*, which includes fast wind to the start point;

Repeat, which will repeat the program continuously, and *Cue*, which calls for fast wind and stop at the start of the program.

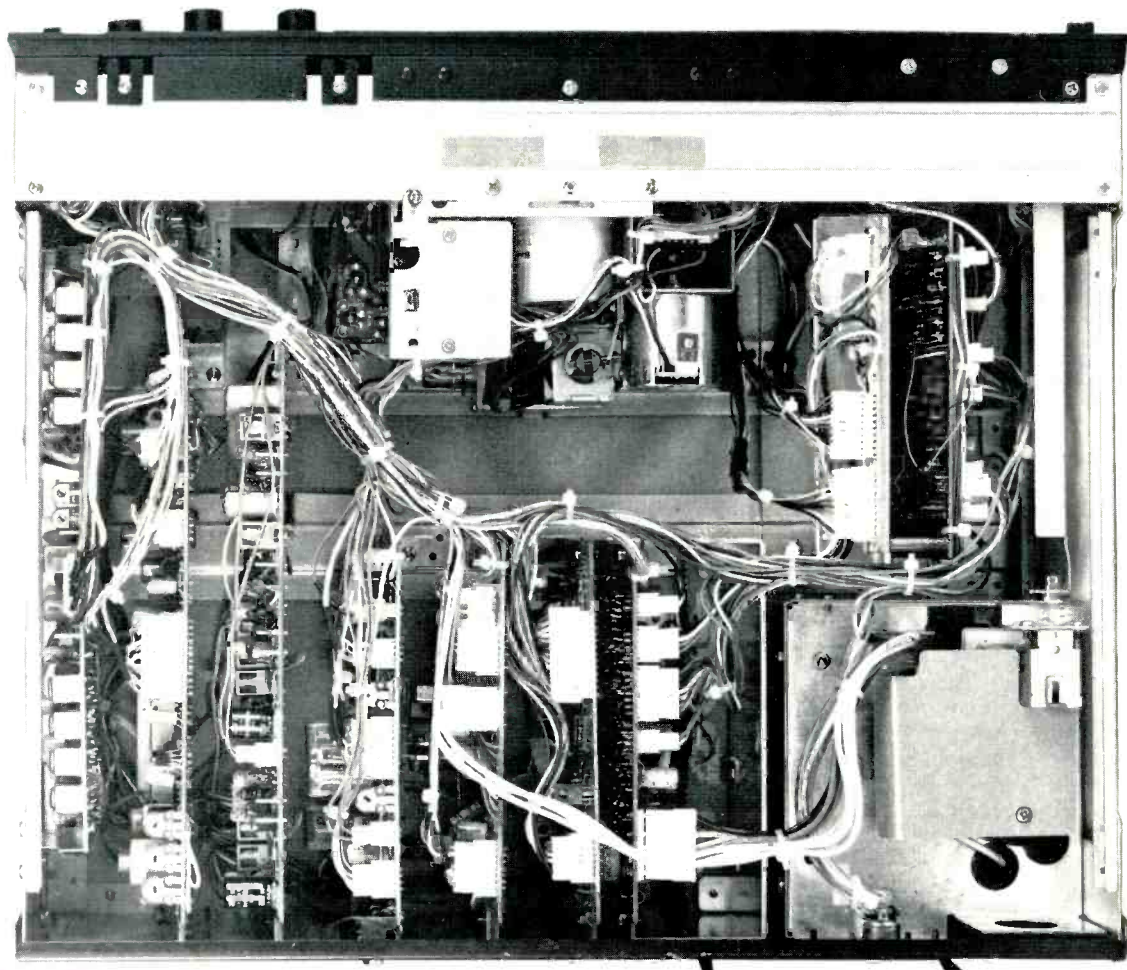
Just to the left is the receptor for the infrared remote control and the jack for headphones. The battery powered remote-control unit repeats all of the deck's light-touch tape motion switches, including *Auto Spacing* and APSS (Automatic Program Search System) reverse and forward. *Auto Spacing* automatically mutes the signal, records a blank space of five seconds for use with APMS (or APSS), and switches back to *Record/Pause*. APSS allows fast winding to the beginning or end of the selection being played, and switching to *Play* at that point. The status lights above each of the buttons (except *Stop*) can be easily seen across a room. Pushing any of the buttons on the remote control causes an indicator to turn on above the infrared receptor, confirming reception of the instruction. When using normal tape-motion control, the current address display operates as a three-digit tape counter. *Stop* is effective in all deck modes.

The fluorescent bar peak-level display is scaled from -20 to +8 dB. There are button switches for *Peak Hold* and *Auto Reset* on/off. With *Auto Reset* off, the highest peak will be held until *Peak Hold* is switched off. With *Auto Reset* on, any peak is held for about a second. Dual-concentric mike and line input pots provide mike/line mixing, of considerable value to some users. Friction between sections was slightly high for easy channel balancing, but the knob design is good for the purpose. It was nice to see a switchable limiter

included, particularly with the time-control features of this deck. Three-position rotary switches control Dolby modes and record calibration. The latter injects a 400-Hz tone for adjusting record sensitivity and an 8-kHz tone for setting bias, used in conjunction with the level display and the tape/source monitor switch. There are concentric trim pots for sensitivity and bias trim, both with worthwhile detents. Four button switches select among the tape types.

The mike input jacks are unusual in that plugging into the left jack only will feed the mike signal to both channels. This is quite a useful feature, for there are times when there is a vocal to be added, and the Optonica scheme automatically "centers" the mike. There is also a line-in stereo-type phone jack on the front panel; its use disconnects the line-in phono jacks on the rear panel.

The bottom part of the RT-6905 is the timer section, which is a rather sophisticated device all by itself. An array of button switches program the various modes of the timer: *Clock*, *Timer*, *Time Counter* and *Time Signal*. The clock can be operated in 12 or 24 hour modes, and a number of on and off operations of the two sets of outlets on the back can be programmed for every day in the week. The time counter can be synchronized with tape motion control with a cable between the two sections and an on/off switch. The display shows any of the time functions, the function being used, and what memories have entries. Setting the clock is very easy, and built-in batteries keep it on time even if a power failure should ever occur.



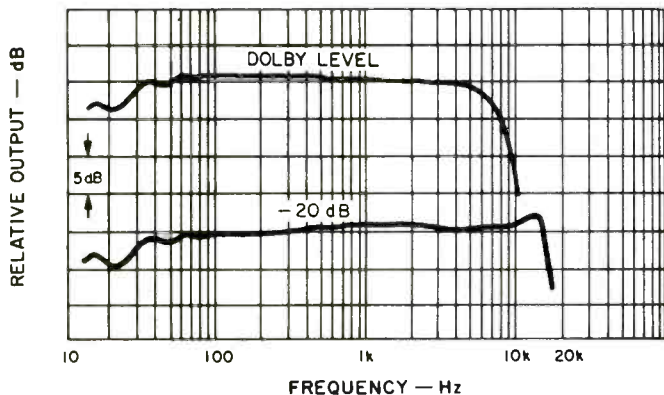


Fig. 1 — Frequency responses of the Optonica RT-6905 in Dolby mode with Maxell UD tape.

On the right side of the system are access holes to the basic adjustments for bias as well as sensitivity for the four tape types, with *L* and *R* pots in each case. The line in/out jacks, timed power outlets, and synchronization cable switch and connections are on the back panel, as indicated earlier. There is also a compartment for the two AA cells used for the clock in case of line power loss.

Removal of the top and side wraparound cover revealed the internal complexity of this unusual unit. There were nine large p.c.b.s in the deck portion, to say nothing of some smaller ones and the timer section p.c.b. Soldering was generally excellent with a few cases of flux residue. The boards were screwed to vertical brackets, and interconnections were made with multi-pin plugs. Adjustments were identified with part number, and all parts were identified on both sides of the p.c.b.s — a great plus if servicing is needed. The chassis was very rigid with girder construction. The dual-motor drive system appeared to promise long-term reliability, with two flywheels and two solenoids part of the rugged design.

Performance

The play responses of the RT-6905 were excellent at both equalizations, within a dB except for droop at 31.5 Hz with 70- μ S EQ. Playback of standard levels indicated correctly on the bar graphs. The record/playback responses were outstanding with the aid of some bias and sensitivity trimming. One channel was poorer than the results shown, but copies of the manufacturer's data led to the assessment: that an adjustment probably shifted during shipping. The pink noise/RTA checks showed that many formulations could be matched for excellent performance. Maxell UD and UDXL-II, Sony FeCr, and TDK MA were the reference tapes used by Optonica, and they did secure the best results. The swept-frequency plots were all run in Dolby NR (Figs. 1 to 4), and

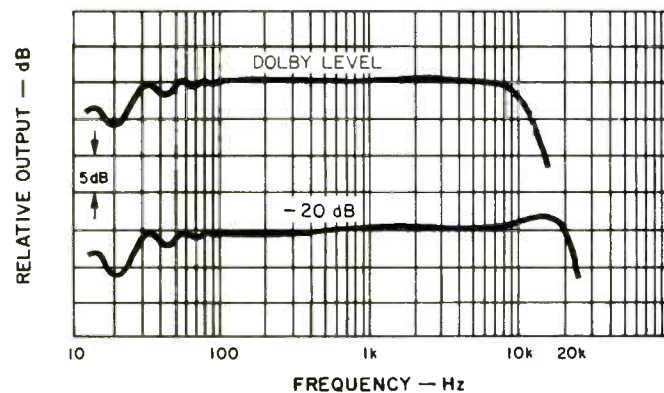


Fig. 2 — Frequency responses in Dolby mode with Sony FeCr tape; high-end response without Dolby NR indicated by (---).

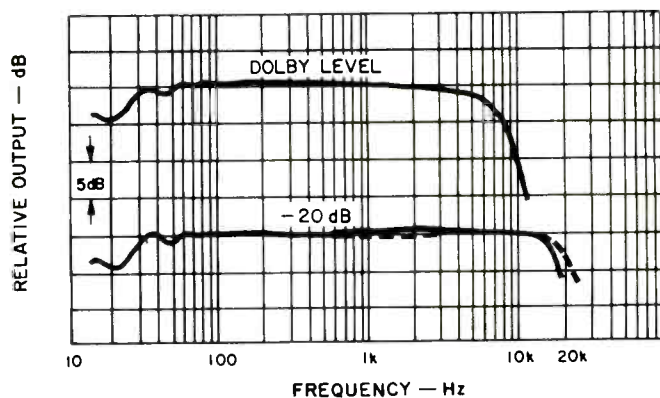
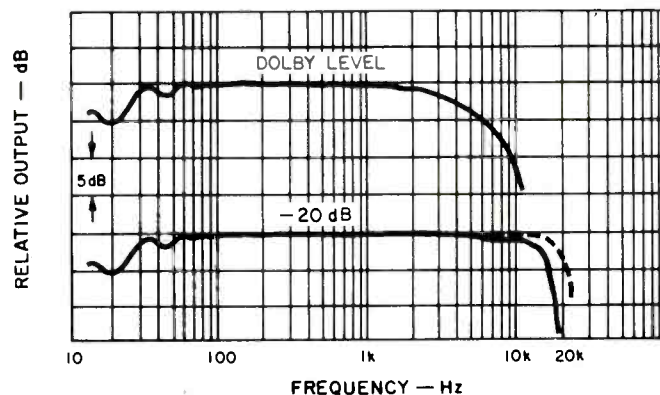


Fig. 3 — Frequency responses with and without (---) Dolby NR with Maxell UDXL-II tape.

Fig. 4 — Frequency responses in Dolby mode with TDK MA tape.

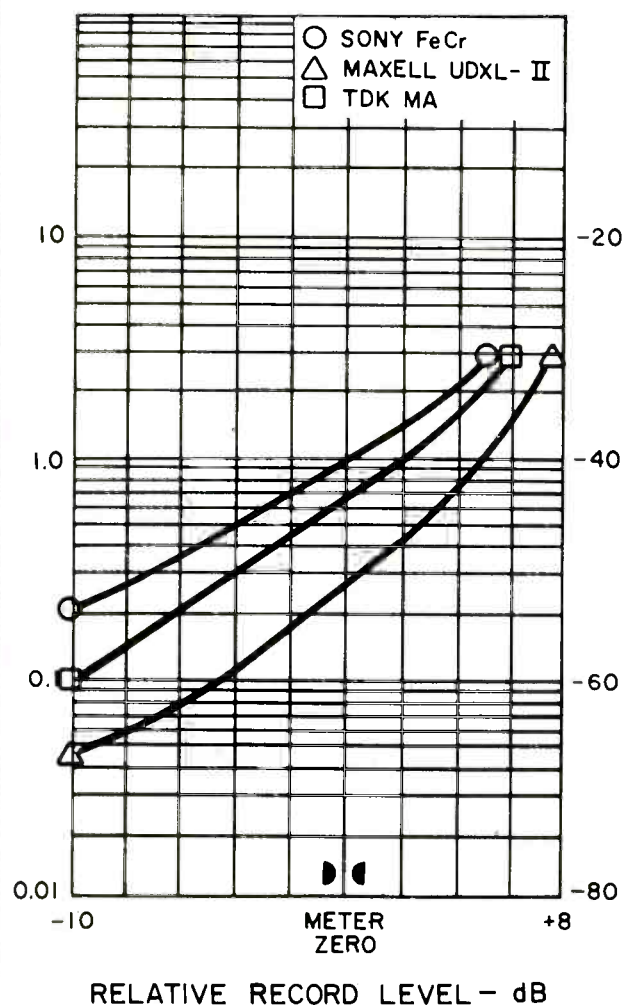


Fig. 5 — Third harmonic distortion vs. level in Dolby mode at 1 kHz with Sony FeCr, Maxell UDXL-II, and TDK MA tapes.

they were among the best ever seen in this mode. In particular, note the flatness between 50 Hz and 10 kHz at -20 dB. Without NR, the responses were even flatter and a bit more extended at the high end, as shown in two cases. The response limits at -3 dB are listed in Table I. The headroom with three of the tapes is not impressive, but the results with TDK MA are excellent.

The record-sensitivity test tone (417 Hz actual) had an adjustment range of +4/-2.5 dB with Maxell UD. The bias test tone (8482 Hz actual) range was ± 4 dB at that frequency with Maxell UD. Both tones had good waveforms. The alignment between the play and record heads, which are in the same structure, was excellent — very close to zero-degree phase difference with a 10-kHz test tone. Phase jitter was about 35 degrees, better than the average deck. The multiplex filter was 3 dB down at 15.5 kHz and 39 dB down at 19 kHz, with the notch almost exactly aligned. Bias in the output during recording was very low.

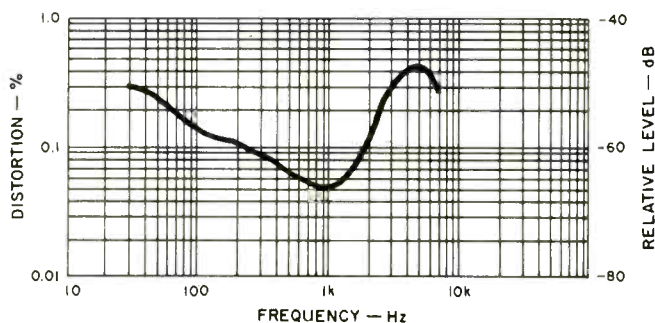
HDL₃ vs. level was measured with a 1-kHz tone using Sony FeCr, Maxell UDXL-II and TDK MA, all in Dolby mode. The results were very good, as shown in Fig. 5, with the performance with Maxell UDXL-II particularly noteworthy. Tests of HDL₃ vs. frequency covered from 30 Hz to 7 kHz and were

conducted with Maxell UDXL-II (Fig. 6). The results were excellent, superior to most cassette decks. Other harmonics were satisfactorily low in all of the distortion tests. Without Dolby NR, most figures increased about 30 percent. Table II lists the signal-to-noise ratios with the same three tapes with both IEC "A" and CCIR/ARM weighting. The results are excellent for all of the tapes, even though slightly below spec with Dolby NR. Separation was outstanding: Greater than 57 dB. Crosstalk was way down, more than 82 dB. Erasure of metal tape was over 80 dB at 1 kHz and 67 dB at 100 Hz, excellent for this low frequency.

Mike sensitivity at 0.24 mV and line sensitivity at 62 mV were over spec, but considered quite acceptable. Mike input overload was 14.1 mV, not as high as many units, although line input overload at 30 V was the highest measured to date. The output clipped at a level equivalent to +15 on the meter. The sections of the input pots tracked within a dB from maximum down 45 dB. The limiter gain reduction started at 0 dB on the meter, with high-level inputs limited to +2. Response was smooth and had a time constant of about 10 mS. The line output was 0.9 V, and the headphone drive to 8 ohms was 120 mV, which generated very high levels in all phones tried. The output pot sections tracked within a dB from maximum down 35 dB.

The frequency response of the level indicators was down 3 dB at 25 Hz and 19.4 kHz, slightly restricted. Response time was very fast, reaching zero dB with a 15-mS tone burst. This and other data indicated that they met the requirements of IEC Standard 268-10, with the exception that the one-second decay time was too fast. Scales were accurate down to -10, yet read high below that. The display was easy to read in dim to medium illumination but seemed faint in bright room light. The 5-dB steps below 10 dB were judged to be too large for easy reading of lower level signals. The red boxes at zero dB and above aided in setting maximum record levels. Tape

Fig. 6 — Third harmonic distortion vs. frequency in Dolby mode at 10 dB below Dolby level with Maxell UDXL-II tape.



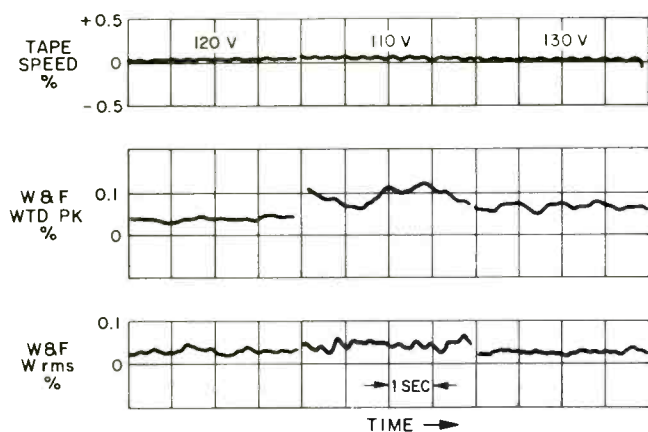


Fig. 7 — Tape play speed vs. line voltage and weighted peak and W rms flutter (three trials each).

Table I—Record/payback responses (-3 dB limits).

Tape Type	With Dolby NR				Without Dolby NR			
	Dolby Lvl		-20 dB		Dolby Lvl		-20 dB	
	Hz	kHz	Hz	kHz	Hz	kHz	Hz	kHz
Maxell UD	25	6.5	28	13.7	25	6.6	25	15.9
Sony FeCr	24	4.2	26	17.3	24	4.3	25	19.8
Maxell UDXL-II	25	6.6	25	16.8	25	6.7	25	18.6
TDK MA	26	12.5	27	23.2	26	13.0	26	24.2

Table II—Signal/noise ratios with IEC "A" and CCIR/ARM weightings.

Tape Type	IEC "A" Wtd. (dBA)				CCIR/ARM (dB)			
	W/Dolby NR		Without NR		W/Dolby NR		Without NR	
	At DL	HD=3%	At DL	HD=3%	At DL	HD=3%	At DL	HD=3%
Sony FeCr	62.2	67.5	54.4	59.4	61.5	66.8	52.2	57.2
Maxell UDXL-II	61.1	68.6	55.2	60.7	60.9	68.4	52.3	58.8
TDK MA	61.9	67.9	54.0	59.6	61.0	67.0	51.9	57.3

speed was about 0.5 percent fast. Average tape play speed was affected very little with any changes in line voltage, but a small ripple in speed appeared with offsets from 120 V. There was some variability in the flutter from one trial to the next, but the typical results were excellent: 0.030 percent W rms and 0.060 percent weighted peak. Wind time for a C-60 cassette was 105 seconds, rather slow, but it was smooth. The RT-6905 includes a loose-loop take-up, a worthwhile feature that should be part of all premium-priced decks. Upon loading, the counter is set to "000," there is a second of fast forward, and then the tape is wound at a slower speed back to "000." Logic response time was a second or less.

In-Use Tests

Loading and unloading and all maintenance tasks were easily accomplished. Eject required more force than expected, perhaps because the button used is quite small. Everything worked completely reliably, and I cannot fault the deck for some of the programming mistakes I made. It did take quite awhile to learn to operate all functions of the RT-6905 system, and patience is recommended to those who use this recorder/timer for the first time. I would have liked the inclusion of flying-start recording, but there are lots of other features it does have. The calibration scheme was easy to use and worked well in obtaining good results. The meters were

also easy to use in setting levels, but a higher brightness level and a slower decay time would have been helpful. All uses of the APMS, APSS, and counter and timer functions worked consistently well. I think that I would have preferred the counter not resetting with ejection, but longer usage could have changed that opinion.

The instruction book is a detailed 64 pages, generally well written. There are many illustrations, but some are perhaps too close up — a picture of a single switch is not as helpful as one of a section including the switch. Sources recorded included *The Great Organ* with Michael Murray and Mike Auldridge's *Blues and Blue Grass*. The playback was mighty fine in all cases, with the exception that there was a little lacking in the lowest notes on the organ. The results with the limiter in use were very good, with the sound remaining quite clear even with several dB of limiting. Record, pause and stop clicks were all in tape noise, barely detectable.

The Optonica RT-6905 computer-controlled deck is not for everyone, but not just because of the premium price. The use of all the features, not covered here completely even with the detail above, requires time and attention. For those who can use and want these functions, this unusual cassette deck does them very well and offers mechanical and electrical performance matching any other deck tested to date.

Howard A. Roberson