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## NAD 6050C CASSETTE DECK

### Manufacturer's Specifications

**Frequency Response:** 40 Hz to 15 kHz; with metal tape, 40 Hz to 17 kHz.

**Harmonic Distortion:** One percent at 0 dB.

**S/N Ratio:** 56 dBA, 65 dBA with Dolby B NR and 70 dBA with Dolby C NR.

**Separation:** 40 dB.

**Erase:** 65 dB.

**Input Sensitivity:** Mike, 0.6 mV; line, 90 mV.

**Output Level:** Line, 580 mV; head-phone, 60 mV at 8 ohms.

**Flutter:** 0.06% W rms, 0.15% wtd. pk.

**Dimensions:** 16½ in. (420 mm) W x 4½ in. (110 mm) H x 9½ in. (230 mm) D.

**Weight:** 12½ lb. (5.7 kg).

**Price:** \$298.00.



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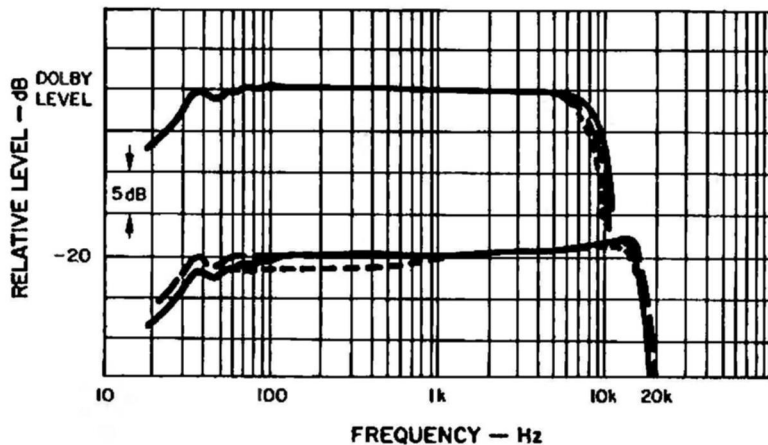


Fig. 1—NAD 6050C frequency responses using Maxell XL I-S tape with

Dolby C NR (solid line),  
Dolby B NR (---), and  
without NR (— · —).

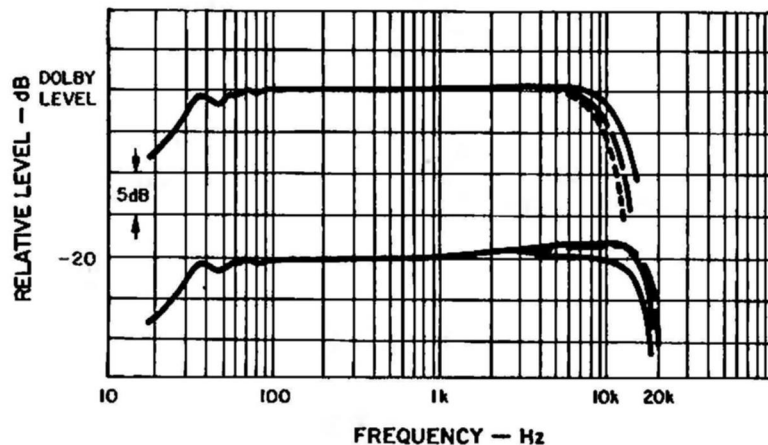


Fig. 2—Frequency responses using Maxell XL II-S tape with Dolby C NR (solid line) with

matching bias and maximum bias (see text), also with Dolby B (---) and without NR (— · —).



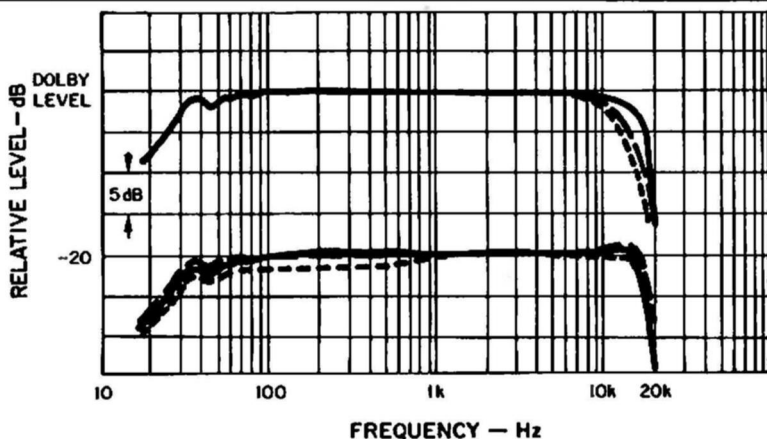
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The NAD Model 6050C cassette deck is one of the new breed that include the recently developed Dolby Type C for greater noise reduction. The results given later in this report will amply demonstrate that NAD has made a very successful implementation at an appealing price; their stated philosophy is to put emphasis on products with high performance, but without frills that are high in cost. It is not surprising, then, that the deck is a two-head unit and that the tape-motion controls are not part of a sophisticated logic system. The tape-motion pushbuttons give the impression that there is at least one solenoid being used because such a short push is needed for action. In fact, a cam is used to move heads and pinch roller, which takes about one second before latching occurs. The Play or Rec button must be held in this long when going into one of these modes or the unit drops back into Stop. It is possible to go into record mode with the use of just the one button. When in Play, the wind buttons obtain cue/review modes, which can accelerate finding the beginnings and ends of selections. A cassette is inserted very easily with just a slight push upwards and then pushing in the bottom over the spring retainers. Access for maintenance tasks is outstanding as there is no door or guide frame in the way. A snap-in dust cover is provided to minimize dust collection on the heads and moving parts.

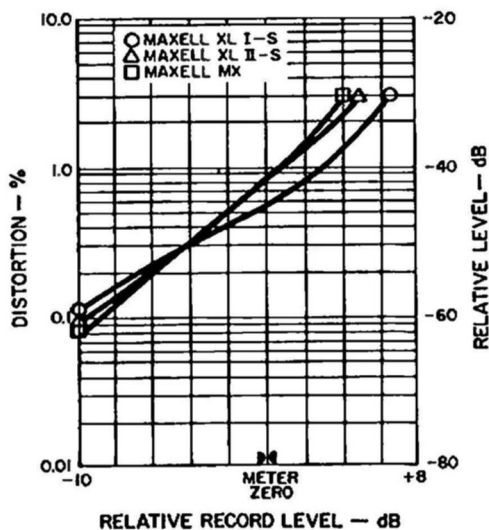
The level meters are peak-responding with horizontal LED bar graphs, yellow-green for "-18" to "0" and red for "+2" and "+4." There is a red LED at the bottom (left) of each bar graph, illuminated when the deck is turned on. Just to the left are similar indicators for Dolby B, Dolby C, and record mode. Below are the separate left and right record-level pots with medium-size, easily turned knobs. The Dolby NR rotary switch has positions for Off, B and C; the multiplex filter control has a separate push-button on/off switch. The tape-selector switch changes both bias and EQ and offers: I/Norm, II/CrO<sub>2</sub> and IV/Metal. NAD deserves at least a small plaudit for including the IEC tape-type reference designation — more manufacturers should do so. There is a bias-adjust pot with center detent for best tape-to-deck matching, an important feature.

The tape counter has a reset, but there is no memory

The flatness of the response with the 6050C was among the best ever seen for *any* recorder at *any* price.



**Fig. 3—Frequency responses using Maxell MX tape with Dolby C NR (solid line), with Dolby B (---) and without NR (—).**



**Fig. 4—Third harmonic distortion vs. level in Dolby mode (Dolby B or Dolby C) at 1 kHz using Maxell XL I-S, XL II-S, and MX tapes.**

scheme, so rewinding to zero requires watching the countdown. The left and right mike and headphones phone jacks and the pushbutton power switch complete the front panel. Line in/out connections are made on the back panel via phono jacks or a DIN socket. Removal of the steel side and top cover exposed one large p.c. board, with the great majority of the circuitry, installed foil side up. The soldering was excellent with no flux residue except at a few hand-wired points. Most of the adjustments were labeled, and parts were identified on the component side of the card. The transformer seemed small at first, but it was just warm to the touch after several hours of operation, so current drain was obviously low. The single-motor drive had a medium-size flywheel, and it was interesting to observe the rotation of the head-roller positioning cam with a push of either *Play* or *Rec*.

#### Measurements

The playback responses of this NAD deck with TDK and BASF test tapes were excellent — within a dB for both equalizations, with a few minor exceptions at the low end. Many high-

frequency points were within 0.4 dB, much better than many high-priced decks. Tape play speed was just 0.2% fast, a minor discrepancy. The playback level indication was very close, well within the resolution limits of the LED bar graph. The record/playback responses of the 6050C were checked with many different formulations of all types using pink noise as a source with the output on playback fed to a 1/3-octave RTA. The results were very good to excellent for most of the tapes, including Maxell XL I-S, XL II-S and MX which were used for setting up the deck by NAD. Best matching, after the Maxell tapes, was obtained with Ampex MPT, BASF Professional II, Fuji FX-II, Memorex HBII, Osawa MX, Scotch Master I, Sony SHF, and TDK SA, SA-X and MA-R.

**Table I—Record/playback 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 XL I-S	B 27	7.0	31	15.8	27	7.4	27	17.0
	C 27	8.6	31	16.0				
Maxell XL II-S	B 29	8.3	29	16.2	29	9.6	29	17.5
	C 29	10.9	29	16.4				
Maxell MX	B 29	10.9	29	16.1	29	12.1	28	17.5
	C 29	15.8	29	16.3				

**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	
	@ DL	HD=3%	@ DL	HD=3%	@ DL	HD=3%	@ DL	HD=3%
Maxell XL I-S	B 62.5	67.7	53.0	57.8	60.4	65.6	50.3	
	C 67.0	72.1			68.3	73.4		
Maxell XL II-S	B 64.8	68.9	55.5	58.4	62.9	67.0	51.6	54.5
	C 68.3	72.3			69.4	73.4		
Maxell MX	B 64.5	67.7	56.0	58.4	62.2	65.4	52.4	54.8
	C 69.5	72.8			70.5	73.8		

The record/playback responses were plotted at Dolby level and 20 dB below that for the Maxell tapes (Figs. 1 to 3) with both Dolby B and Dolby C and without any NR. The -3 dB response limits for all of these combinations are given in Table I. It can be seen that the Dolby C tracking was actually better than with Dolby B and that the headroom at the higher level was extended significantly with Dolby C, rather than reduced slightly as with Dolby B. The flatness of the response at Dolby level was among the best ever seen for *any* recorder at *any* price! There was a gentle rise in the higher frequencies at -20 dB with the XL I-S and XL II-S tapes, but not with the metal-particle MX. The relative droop in the lower frequencies (re: 1 kHz) with Dolby B and the Type I and IV tapes was not considered of much importance as the B mode is primarily for playing previously recorded and encoded tapes. Dolby C would and should be the mode to use for normal recording purposes. As readers may note, the high-end responses don't extend to 20 kHz, as with some other decks, but more design emphasis is given here to the overall smoothness of response which many listeners can detect more easily. The response plot with XL II-S (Fig. 2) has one trace at -20 dB which shows the effect of increasing bias from its matching point to the maximum setting. Setting the bias to minimum would have caused a relative rise of similar magnitude.

Phase discrepancies with the recording and playback of a 10-kHz tone were 20° or less and average phase jitter was 30°, both very good figures. The output polarity matched that of the input, whether during recording or playback of a single-polarity waveform. This characteristic maintains the basic nature of certain transients, provided they are well defined in the original recording. There was no measured high-frequency loss with repeated plays using tapes known to be sensitive to possible deck problems. The multiplex filter response was down 1 dB at 15.6 kHz and a good 30.3 dB at 19 kHz. No bias leak-through was observed in the output during recording. The separation at 1 kHz was 55 dB, and crosstalk was down more than 80 dB—both excellent figures. Erasure at 1 kHz was greater than 80 dB, and about 70 dB at 100 Hz with MX tape—two more excellent figures.

Figure 4 shows the results of measuring the third harmonic distortion (HDL<sub>3</sub>) at 1 kHz with record levels from -10 dB re Dolby level to the points at which HDL<sub>3</sub> reached 3%. All of the results were very good, with slight differences between Dolby B and Dolby C figures dependent upon the record level. Distortion without Dolby NR was about 30% higher over most of the level range. The curve shape for XL I-S was unusual, but it was repeatable, and the high-level performance was excellent indeed. Figure 5 shows HDL<sub>3</sub> vs. frequency in Dolby mode at -10 dB with Maxell MX tape. These results are excellent across the band, with superbly low distortion in midband, matching the best decks seen to date. The distortion at the frequency extremes was also very low, matching a number of higher priced decks.

The signal-to-noise ratios were measured for the three tapes without NR and with Dolby B and C, with both IEC A and CCIR/ARM weightings. Table II lists the data secured both at Dolby level and at the points where the distortion reached 3%. The figures include any effects of distortion reduction with Dolby mode and the compression at higher record levels. All of the figures are excellent, and with the current state of cassette recording, the Dolby C results must be classified as superb.

The input sensitivities were 0.58 mV for mike and 82 mV for line. The mike input is thus less sensitive than many units (0.2 to 0.3 mV), but it should be adequate for most users. The input overload points were 15 mV for mike (quite good) and at least 30 V for line (excellent). The input impedance varied with the setting of the level pots, but it was at least 36 kilohms midband for any pot setting. There was some lowering of this figure at 10 kHz and above. The line output was 630 mV open circuit, 585 mV with a 10-kilohm load. The output impedance was about 1.5 kilohms across the audio band. The headphone output was 78 mV (0.8 mW) into 8 ohms, and there was a very good level to all of the headphones tried with meter indications to 0 dB. The level was actually too high for comfort with one set, and there is no output level pot to reduce the level. It should be easy, however, to find a combination to match any personal preference in this regard. Most thresholds for the eight-segment bar graphs were within a dB of the designated levels. The dynamic responses met the requirements of the IEC peak-meter standard for charge time, reaching zero with any burst over 15 mS in duration. The 450-mS decay time, however, was shorter than the standard (1.7 ± 0.3 S). The 3-dB down points were at 41 Hz and 23.3 kHz, a bit restricted on the low end. All of the LEDs had a high brightness level which made for easy viewing. My immediate reaction to the display was that it should have more segments

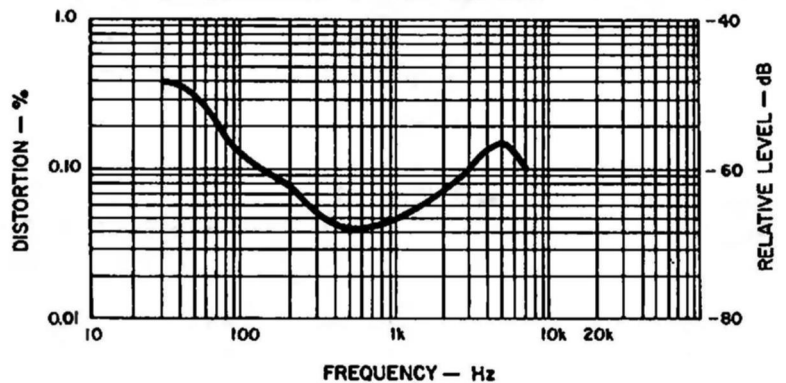


Fig. 5—Third harmonic distortion vs. frequency in Dolby C mode at 10 dB below Dolby level using Maxell MX tape.

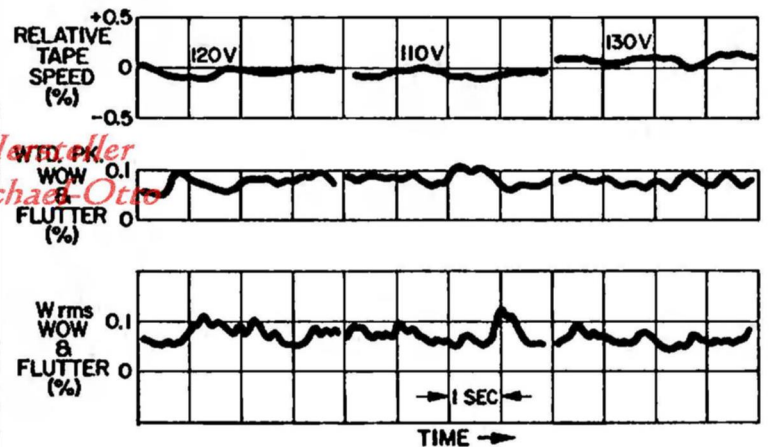
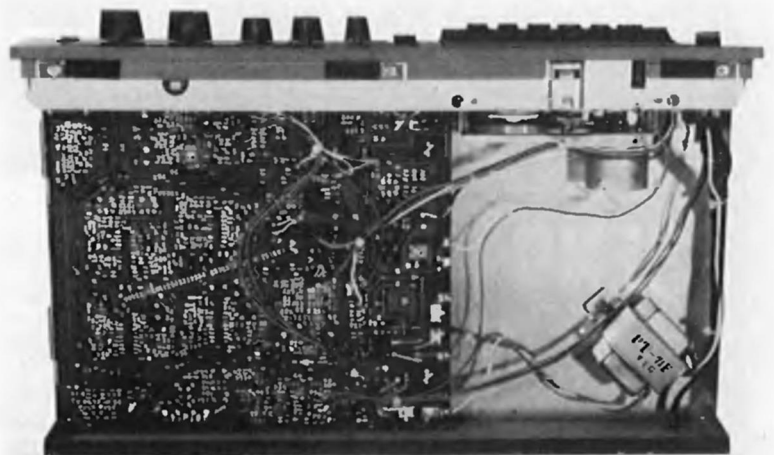


Fig. 6—Relative tape play speed vs. time and line voltage; wtd. pk. and W rms flutter vs. time (three trials each).



**NAD has produced a cassette deck with excellent performance for a most attractive price.**

for final steps near 0 dB, but final judgment was reserved for the in-use tests.

There was quite a small effect on the average tape play speed with changes in line voltage. With time, the play speed wandered up to 0.05%, which is a small amount, but it might have some significance to critical users. Typical flutter for the 6050C was  $\pm 0.08\%$  on a weighted peak basis, which is quite good. The  $W_{rms}$  figure was 0.07% which seemed a bit high, mostly because the typical deck has  $W_{rms}$  figures that are about one-half the weighted-peak results. The wind times were 93 seconds with a C-60, slower than most decks. Run-out to stop was about two seconds for either wind or play mode.

#### **Use and Listening Tests**

A little care was needed to snap cassettes in and out, but it actually was very easy, as were all maintenance tasks because of the excellent access. In general, all controls and switches were completely reliable. Occasionally, however, latching did not occur when using just the record button. Using both record and play buttons, the normal practice on most decks, was always successful. The bias-adjust pot was continually of use for improving tape-to-deck matching. The fast response of the bargraph meters aided setting levels quickly and accurately. Additional LED segments for finer resolution would have helped but slightly, as the varying intensity of the top-most LED provided good clues on the exact peak level. The review and cue modes

worked well and without malfunction, although there were some tape loops generated within the cassette at times. The instruction manual (provided to me in draft form) had excellent text with a number of sections that included tutorial aids for the user. One discussion cross-tied the related factors of the tape itself, bias, and performance with Dolby NR. Overall, one of the best manuals seen to date.

Listening tests were run with each of the Maxell tapes and several others that matched the deck particularly well. Sources included pink noise, the Mobile Fidelity version of Holst's *The Planets* with Solti and the London Philharmonic, and the dbx-encoded *Boy with Goldfish* with Holdridge and the London Symphony Orchestra. It was apparent with a bit of care in listening that there was a relative loss in the low end with Dolby B and the XL I-S and MX tapes. The matches were much closer and without fault with Dolby C, which should be considered the normal mode for this deck. The Dolby C results approached the original dbx-encoded discs with just a slight change in the highest frequencies noted. The deck took a little overloading very well, illustrative of the fine high-level responses of the unit. There were no record or pause clicks detected, and stop sounds were well down in tape noise. The 6050C does not have the convenience features of quite a few other decks, but NAD has produced a deck that has excellent performance for a most attractive price.

Howard A. Roberson

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