



JOOK LEUNG

## NAD MODEL 7600 RECEIVER

*Julian Hirsch, Hirsch-Houck Laboratories*

**N**AD describes the new Model 7600 Monitor Series stereo receiver as "the most powerful receiver" on the market. At a list price of \$1,498, it is also one of the most expensive. But as a single-unit equivalent of three top-of-the-line NAD components—the Model 2600 power amplifier, the 1300 preamplifier, and the 4300 tuner, which list for a total of \$1,844—the receiver could be considered economical. In addition, it comes with a wireless remote control that can be a complete system controller.

Like the Model 2600 power amplifier, the NAD 7600 employs a dual-voltage, signal-tracking power supply that makes possible an extremely high dynamic headroom (short-term power output) for a time far exceeding the 20 milliseconds of the standard dynamic power test. The amplifier section can deliver far more than its rated continuous output power for longer than 200 milliseconds, a period that NAD considers to be more representative of actual music requirements. NAD describes this charac-

teristic by means of a "Power Envelope" rating, a plot of maximum power versus time. The concept of the rating makes sense to us, although it has no official standing, and we run this test on all amplifiers.

The NAD 7600 receiver is rated to deliver 150 watts per channel continuously into 8-ohm loads from 20 to 20,000 Hz with no more than 0.03 percent total harmonic distortion. Although a couple of other receivers on today's market have similar or slightly higher ratings, NAD's claim to the power championship is based on its ability to deliver dynamic (20-ms) outputs of 400, 600, and 800 watts into loads of 8, 4, and 2 ohms, respectively. Furthermore, the two channels can be bridged to deliver continuous mono output of 480 watts into 8 ohms, with dynamic ratings of 1,200 and 1,400 watts into 8- or 4-ohm loads. In this mode, a separate Model 2600 power amplifier (also bridged) is used to drive the other channel with the same power capability. As NAD points out, a combination of the Models 7600 and 2600

can deliver nearly 3 kilowatts of dynamic power into a pair of 4-ohm speakers!

The receiver's preamplifier section features a switchable moving-magnet (MM) or moving-coil (MC) phono preamplifier with extremely low noise levels. Its bass and treble tone controls, which NAD describes as "semi-parametric," are fairly conventional center-detented knobs except that each control provides a boost or cut over a two-octave band centered at one of three selectable frequencies. The center frequencies were chosen for their usefulness in correcting for common response problems. The tone controls can be completely bypassed with a front-panel button. A switchable BASS EQ circuit provides a maximum 8-dB boost at 35 Hz, where most speakers need help, combined with a steep infrasonic cut that prevents overloading the amplifier or speakers at subaudible frequencies.

The receiver has high-level inputs for a CD player and a video sound source as well as full playback and recording facilities for two audio tape decks. Lever switches select tape-copying connections and the center frequencies for the tone controls. Small pushbuttons operate the other switching and selection functions as well as the balance control. Pressing the L or R button produces



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a smooth change of relative channel levels (a small light glows when the balance is centered). Each control button is clearly labeled to show its effect when pressed.

Its tuner specifications indicate that the Model 7600 is a top-quality product, with at least one superlative rating, an image rejection ex-

ceeding 120 dB. The tuner section has a switchable FM noise-reduction circuit (FMNR) that automatically blends the stereo channels over the full frequency range, instead of the more usual high-frequency blending, at low signal levels. Except for the very weakest signals, which would not be listenable in stereo in

any case, the sound maintains its basic stereo qualities, with some reduction in separation but a typical noise reduction of about 10 dB (roughly comparable to the performance of the Dolby B system in tape recording).

Although the receiver has a digital-synthesis tuner section, the control knob's tuning action is much like that of an analog tuner. But it has several major advantages. The tuning is always precise, and the tuned frequency is always visible on the large numeric display. When the tuning control is close to a station, arrows show the correct tuning direction; an amber light goes on when the station is tuned correctly.

The tuning knob does not actually vary anything in the receiver but merely turns a shaft encoder that sends digital pulses to the synthesizer circuit. The control is nearly frictionless, and a single spin will turn the knob for up to 10 seconds, time enough for the tuner to scan either radio band from end to end. The usual presets are provided, with each of the eight buttons assignable to one AM and one FM frequency.

The rear apron of the Model 7600 contains the usual input and output phono jacks, including preamplifier outputs and two sets of power-amplifier inputs, marked LAB and NORMAL. Removable jumpers between the preamp outputs and the power-amp inputs simplify the use of an external Model 2600 amplifier in bridged mode or of various signal-processing accessories. The normal amplifier inputs have 12-dB-per-octave rolloffs below 15 Hz and above 40,000 Hz. In addition to the switched infrasonic filter in the preamplifier, these built-in rolloffs safeguard the system against overload from signals outside the audio range. Through the LAB inputs, the bandwidth is 3 to 80,000 Hz.

A slide switch on the rear apron bridges the amplifier, and another optimizes its power-supply voltages for operation either with "high" speaker load impedances (8 to 16 ohms) or for "normal" loads (4 to 8 ohms). Also on the rear is the switch to select either MM or MC mode for the single pair of phono-input jacks and another switch to connect a nominal capacitance of 100, 200, or

### FEATURES

- ☐ Rated for 150 watts per channel continuous output, bridgeable for 480 watts mono output
- ☐ Signal-controlled power supply for high dynamic power output
- ☐ Low-noise phono preamplifier switchable for MM or MC cartridge
- ☐ Phono input capacitance switchable to 100, 200, or 300 pF
- ☐ High-level inputs for CD player and one video sound source
- ☐ Connections for two audio tape decks with dubbing possible from either deck to the other independently of program being heard
- ☐ BASS EQ and infrasonic filtering
- ☐ Bass and treble tone controls with two-octave bands and switchable center frequencies (50, 120, or 250 Hz for bass; 3,000, 6,000 or 12,000 Hz for treble)
- ☐ Volume knob motor driven when used with remote control
- ☐ Digital frequency-synthesis AM/FM tuner with eight presets, each usable for both bands
- ☐ FM noise-reduction circuit (FMNR) to improve weak stereo reception
- ☐ Analog-like tuning knob
- ☐ 75-ohm coaxial FM antenna input
- ☐ Pivoted ferrite-rod AM antenna
- ☐ Wireless remote control for volume, balance, tuning, input selection, power on/off

### LABORATORY MEASUREMENTS

- ☐ **Tuner Section** (all figures for FM only except frequency response)
  - Usable sensitivity** (mono): 12 dBf (2.2  $\mu$ V)
  - 50-dB quieting sensitivity:** mono, 11.7 dBf (2.1  $\mu$ V); stereo, 33.5 dBf (26  $\mu$ V)
  - Signal-to-noise ratio** at 65 dBf: mono, 86 dB; stereo 75.7 dB
  - Harmonic distortion** (THD + noise) at 65 dBf: mono, 0.128%; stereo, 0.064%
  - Capture ratio** at 65 dBf: 1.85 dB
  - AM rejection** at 65 dBf: 72 dB
  - Image rejection:** greater than 140 dB
  - Selectivity:** alternate-channel, 74 dB; adjacent-channel, 4.5 dB
  - Stereo threshold:** 19 dBf (4.5  $\mu$ V); with FMNR, 44.5 dBf (92  $\mu$ V)
  - 19-kHz pilot-carrier leakage:** -70 dB
  - Hum:** -90 dB
  - Stereo channel separation** at 100, 1,000, and 10,000 Hz: 45, 45, and 35 dB
  - Frequency response:** FM, 30 to 15,000 Hz  $\pm 0.3$ , -0.2 dB; AM, -6 dB at 25 and 4,000 Hz
- ☐ **Amplifier Section**
  - 1,000-Hz output power at clipping:** 190 watts into 8 ohms, 255 watts into 4 ohms, 325 watts into 2 ohms
  - Clipping headroom** (relative to rated output): 1 dB (8 ohms)
  - Dynamic power output:** 480 watts into 8 ohms, 800 watts into 4 ohms, 1,000 watts into 2 ohms
  - Dynamic headroom:** 5.1 dB (8 ohms)
  - Harmonic distortion** (THD + noise) at 1,000 Hz into 8 ohms: 1 watt, 0.0034%; 10 watts, 0.0021%; 150 watts, 0.0067%
  - Maximum distortion** (20 to 20,000 Hz into 8 ohms): 0.016% at 150 watts (20,000 Hz)
  - Sensitivity** (1-watt output into 8 ohms): CD, 4.4 mV; phono (MM), 2.25 mV
  - Phono-input overload:** 183 to 222 mV
  - A-weighted noise** (referred to a 1-watt output): CD, -93.2 dB; phono (MM), -85.2 dB
  - Phono-input impedance:** 50,000 ohms in parallel with 118, 209, or 264 pF
  - RIAA equalization error:**  $\pm 0.15$  dB from 20 to 20,000 Hz
  - Tone-control range:**  $\pm 12$  dB



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300 picofarads (pF) across the fixed 47,000-ohm resistive input. In the MC mode, the input is 100 ohms in parallel with 1,000 pF.

The insulated spring-clip antenna inputs are designed for an external wire AM antenna, and the receiver also has an integral hinged ferrite-rod AM antenna. The only FM input is a 75-ohm coaxial connector, but a coupler is provided for use with the more common 300-ohm FM antenna systems. Two of the three AC convenience outlets are switched. The MASTER POWER rocker switch on the rear is normally left on so that the receiver can be turned on or off from the remote-control unit.

The remote control operates all the basic functions, omitting only the filters, tone controls, and tape-deck controls. It is designed to rest on a table or to be held in the hand, and its infrared output is emitted over a wide angle; in most cases there is no need to point the controller directly at the receiver.

The NAD Model 7600, finished in charcoal gray and black with white markings, measures about 17 inches wide, 15<sup>3</sup>/<sub>4</sub> inches deep, and 6<sup>1</sup>/<sub>4</sub> inches high. It weighs about 38 pounds. Price: \$1,498. NAD, Dept. SR, 575 University Ave., Norwood, MA 02062.

### Lab Tests

The FM tuner of the NAD 7600 had very good sensitivity, quieting, and distortion characteristics. The FMNR circuit performed as claimed, reducing stereo noise by about 14 dB at the stereo reception threshold of 19 dBf (4.5  $\mu$ V). The improvement gradually lessened to 6 to 8 dB at more useful signal levels and finally to zero at 65 dBf and beyond. There was a minimal stereo effect with very weak signals, but at any useful level the circuit worked as claimed. Applying our usual criterion for the stereo threshold of a tuner having signal-controlled channel blending, we found that the output level of an L-R modulated signal had decreased by 6 dB when the signal level was reduced to 44.5 dBf (92  $\mu$ V). The five signal-strength lights in the receiver's display window lit at levels of approximately 19, 32, 42, 63, and 72 dBf, so that unlike many such indicators, they

provided useful information about the received signal level.

The tuner distortion, in the range of 0.1 percent at fairly high signal levels, was roughly the same for stereo or mono signals. The quieting action was excellent, with the noise level measuring -86 dB in mono and -77 dB in stereo at high signal levels. The FM frequency response was flat within  $\pm 0.2$  dB from 30 to 15,000 Hz, and the channel separation, 45 to 50 dB from 30 to 5,000 Hz, decreased to 30 dB at 15,000 Hz. The AM tuner section's frequency response was flat from 100, to 2,500 Hz and down 6 dB at 25 and 4,000 Hz.

The other tuner performance parameters were all good or better. Two of them transcended our previous experience in tuner measurements. The hum level was an almost unmeasurable -90 dB, and the image rejection could not be measured at all because it exceeded our 140-dB measurement limits!

The BASS EQ response rise began below 100 Hz, reaching 7.5 to 8 dB at 36 Hz and falling 24 dB per octave below that frequency. The RIAA equalization was so accurate that we had to plot it on a ten-times-expanded scale to measure it. The response was flat within  $\pm 0.15$  dB from 20 to 20,000 Hz.

Because of our experience with the NAD 2200 amplifier, a junior relative of the Model 2600 used in this receiver, we were prepared for some impressive power measurements, and we were not disappointed. NAD recommended that we make our measurements with the HIGH load-impedance setting, at which the amplifier can operate safely into almost any reasonable speaker impedance. Into 8 ohms, the 1,000-Hz output clipped at 190 watts per channel (a clipping headroom of 1 dB). Dropping the impedance to 4 ohms, we measured 255 watts at the clipping point. We then switched to NORMAL (low) impedance, measuring maximum outputs into 8 and 4 ohms of 136 and 210 watts, respectively—still nothing to be ashamed of. We also loaded the amplifier with 2 ohms, measuring a potent 325 watts at clipping.

The standard dynamic headroom measurement, with a 20-ms burst

repeated twice per second, produced maximum outputs of 480 and 800 watts into loads of 8 and 4 ohms using HIGH impedance and 1,000 watts into 2 ohms at the NORMAL setting. The 8-ohm dynamic headroom was 5.1 dB. Power-envelope measurements resulted in outputs (with 200-ms bursts) of 375, 380, and 420 watts into loads of 8, 4, and 2 ohms, respectively.

### Comments

Not surprisingly, the sound quality from the NAD 7600 was as good as we have heard from any tuner, amplifier, or receiver. We were not tempted to test its almost limitless power reserves, out of consideration for our speakers and ears, but there was no doubt that in terms of power this receiver is exactly what NAD claims it to be!

Some of the most striking qualities of the Model 7600 had nothing to do with its sound. The tuning "feel" was extraordinary, so far superior to the usual pushbutton tuning or scanning systems that one wonders why more tuners don't have similar controls. The FMNR worked so well that we were not aware of its action except when switching it on or off.

It is probably stretching things a bit to call the tone controls on this receiver "semi-parametric," but the family of response curves they produced were reminiscent of a good graphic equalizer with exceptionally well-chosen center frequencies. Although we rarely use tone controls, the Model 7600's unconventional and highly effective system is much more flexible than most. As with any equalization system without a calibrated microphone, reaping its full benefits requires the operator to have a good ear for tonal changes, but the excellent instruction manual suggests settings for various corrective effects, and the results were pretty much as claimed.

The NAD 7600 must be used to be appreciated fully. Its features and performance make it not only the most powerful receiver on the market, but one of the very best you can buy at any price. If any compromises were made in its design, we didn't find them.

**Circle 143 on reader service card**