Advent Model 500 SoundSpace® Control

MANUFACTURER'S SPECIFICATIONS

Rear Channels
Frequency Response: 20 Hz to 20 kHz.
Distortion: Less than 0.1 percent for 1.5 V output at 1 kHz.
Dynamic Range: 80 dB.
Input Sensitivity: 0.3, 1.0, or 3.0 V for rated output.
Bass Control: Baxendall type with varying corner frequency from 95 to 200 Hz with increasing rotation of control.
Treble Feed Control: 6 dB boost to infinite cut above 6 kHz.

Front Channels
Unity Gain: Straight wire bypass.

General Specifications
Power Requirements: 95 to 135 V a.c., 50/60 Hz, 30 watts.
Dimensions: 15¾ in. (40 cm) W x 3¼ in. (8.3 cm) H x 10¾ in. (27.3 cm) D.
Weight: 10½ lbs. (4.6 kg).
Price: $595.00.

Let me begin by stating, without reservations or qualifications, that Advent's Model 500, to my ears, offers the best and most realistic synthesis of a large listening space that I have yet heard from any of the electronic audio time-delay units that I have either heard or tested. Furthermore, the unit's control arrangement offers greater precision and variation of delayed and reverberant sound effects in a typical listening room than do those of any other time-delay units I have listened to at this date.

Once the unit has been installed (Advent suggests that its proper installation point is between preamp out and power amp inputs, so that the master gain control of your stereo system controls both front and rear sound amplitudes simultaneously, as opposed to using the tape-out jacks where rear levels would have to be adjusted each time front volume is changed), and input sensitivity is adjusted to prevent overload of the digital A/D conversion circuitry, you are in a position to select virtually any listening space size or acoustic characteristics.

Sensitivity, or proper input level, is indicated by left and right channel banks of LEDs, which should be adjusted so that the red LEDs only flash occasionally, on peak signals.
The window area housing these LEDs also have a numerical digital display which shows first-reflection delays from 0 to 99 milliseconds. This initial delay is varied by means of a toggle switch which is moved to the + or - position and held there until the desired delay time is dialed up on the display. Rotary controls along the face of the panel include a continuously variable reverberation control (which varies the "liveness" of the acoustic space created by the basic time delay), a volume control for the rear-positioned speakers, balance control, and bass and treble controls. A toggle switch near the right side of the panel selects direct sound to rear speakers (no delay), reverb (normal operation) or "off." A second switch enables the user to turn off the front channels and is useful if you simply want to hear what is coming out of the rear channels at any time.

The rear panel contains left and right input jacks, left and right front-channel output jacks (for connection to your main stereo power amplifier), and left and right rear-channel output jacks for connection to the secondary amplifier and speaker combination. Advent suggests that around 15 watts of power per rear channel will be adequate for most installations. They also recommend side-positioning of the rear speakers as well as placement above ear level. If speakers must be placed on the floor, aiming them upwards will give satisfactory results. As a further refinement, Advent suggests the use of two speakers per rear channel, rather than one, for a most consistent spread of sound throughout the listening area. Fortunately, as with most time-delay setups, the rear speakers need not be of the same wideband design or high power handling capacity as your primary front-positioned speaker array.

How The Model 500 Works

The circuitry of the SoundSpace control uses eight random access memory devices (RAMs) with 4,096 bits each, 57 digital ICs (mostly Schottky MSI TTL Logic), 15 integrated amplifiers, three integrated regulators, nine bi-polar transistors, 24 diodes, eight LEDs, and two monolithic numeric LED displays. Circuit device count is equivalent to more than 43,000 conventional transistors!

Each incoming audio signal passes through a variable gain buffer amplifier and is then filtered into high- and low-pass segments. The low-pass filtered signals are sampled every 62.5 microseconds, and each sample is converted into a 10-bit digital representation using a floating point technique which provides up to 80 dB of dynamic range. According to Advent, this technique treats every sample independently and avoids the hysteresis distortion which is typical of some forms of delta-modulation time-delay systems.

Conversion to digital signals takes place in two discrete operations. First, the sample is sized in 10-dB steps, thereby determining the value of the two floating point bits. Then the remainder of the sample is compared with a linear ramp and eight bits of continuous digitization are derived. The combined 10-bit representation is stored in random access memory to be recalled when needed by the 10-MHz, crystal-clock controlled logic.

At the appropriate time, each sample is retrieved from memory and converted into its analog equivalent by an operation which is the reciprocal of that by which it was digitized. The value the user selects by altering the "size" control on the front panel determines the time delay (in milliseconds) for the longest "early reflection" and provides an index of apparent room size.

A single, large memory holds discrete information from both left and right channels, each sample having a distinct "address." Delayed information is purposely mixed, contoured, and multiply delayed in controlled proportions. Each output channel therefore contains delayed information from its corresponding input blended with signals from prior times and other spatial origins and becomes, in effect, a formulated time series corresponding to the sound field of a specific space. The front panel reverberation control determines the liveness of the various modeled "surfaces" of which sounds are being "reflected." In our listening tests we quickly discovered that the reverberation range is more limited when short time delays are selected than when longer early-reflection times are chosen as, indeed, it should be.

In addition to the processed low-pass signals, the Model 500 allows the user to add measured amounts of treble information present at the input. This treble information, whose amplitude is controlled by settings of the treble control, is
not delayed in time but, according to some experts, measured amounts of undelayed treble added to the delayed and processed rear channel sounds enhances spatial realism over a wide listening area and minimizes localization shift. In our tests we preferred minimal addition of such undelayed treble components, but that may well have been a function of our particular listening room acoustics.

**Test Bench Measurements**

There are, of course, few static measurements which are meaningful when it comes to evaluation of an electronic time-delay unit. With the treble control turned up, response was flat to within 1 dB from 40 Hz to 20 kHz. Without the “direct” addition of undelayed highs, response of the delayed rear channels is down 1 dB at 5.5 kHz. Distortion at mid-frequencies measured 0.05 percent for a 1 V output at 1 kHz. Signal-to-noise ratio (“A” weighted, referred to maximum input level before overload) measured 75 dB. Measured per the new IHF standards (0.5 V input, 0.5 volts output), the S/N was 73 dB.

Figure 1(a) and 1(b) are intended to show the precision with which Advent has calibrated the primary delay in their Model 500. For Fig. 1 (a) we “dialed up” a delay of 10 milliseconds, as indicated on the digital display. Our scope sweep was set for 10 milliseconds per horizontal division and, as you can see, the output (rear channel, lower ‘scope trace) is exactly one division away from the input, horizontally. Similarly, by setting the delay to 99 milliseconds, the delayed rear-channel output (lower trace of Fig. 1(b) ) appears to be just 10 divisions away from the input signal shown in the upper trace. Both of these photos were taken with the reverberation control set to minimum. With the delay still set for 99 milliseconds, we then added maximum reverberation by means of the separate reverb control, and the output is shown in the lower trace of Fig. 2. As you can see, a rather complex but carefully controlled series of lower-amplitude replicas of the original tone burst, displaced in time relative to the primary delayed rear-channel output (you are actually seeing secondary reflections of an ‘earlier’ tone burst output not visible on the ‘scope), in addition to the primary delayed signal that is related to the input burst seen at the left of the upper trace.

**Listening and Use Tests**

As with all electronic time delay setups with which we have had some experience, in setting up the Advent Model 500, if you can hear the rear channel speakers as sources of discrete sound, you've got too much signal coming from those rear speakers. The idea is to back off to the point where rear sounds are not obvious or obtrusive but do contribute to the spatial enlargement of the listening room. We found that settings of between 25 and 40 milliseconds gave us the sensation of being in a small intimate club space. Increasing the delay to around 50 or 60 milliseconds and adding a moderate amount of reverberation enabled us to simulate moderately sized auditoriums and was particularly effective when listening to small instrumental groups, including string quartets and three- or four-piece pop groups. Orchestral works sounded best when a delay of some 75 to 80 milliseconds was used, with the degree of reverberation dependent, in our case, not so much on our listening room acoustics as on the “dryness” or “liveness” of the original stereo recording.

Highest settings of delay were useful only for cathedral-type effects such as pipe organ recording reproduction and religious choral works, though we wouldn’t recommend the use of such extreme delays for any material containing soloists, either vocal or instrumental.

Subjectively, the Advent Model 500 suffers from none of the “twangy” effects with even moderate amounts of time delay which were present in other units we’ve tested. I did find that adding undelayed treble to the rear channel content tended to make it harder for me to keep the delayed rear channel sounds from becoming evident or even dominant, but that is a matter of taste, and some listeners may find this “mixed highs” approach very satisfying. In any case, Advent was wise enough to make it a user’s choice, since it is possible to work with only delayed or reverberant sound emanating from those rear speakers.

Speaker placement was not nearly as critical as Advent may seem to suggest. I used moderately priced two-way speaker systems (8-in. woofers, plus dome tweeters) for my rear channel “ambience” coupled with much higher priced three-way, floor-standing primary stereo speakers, and the overall effect was, to say the least, glorious. It has been said before, but I must say it again . . . once you have listened to stereo program sources enhanced by a well-designed time-delay system such as the Advent Model 500, it is very hard to return to ordinary stereo sound in a typical home listening room.

While the Advent 500 is competitively priced against several of the other popular time delay units currently available, I do feel that it does the job intended for it better than anything I have heard to date. The digital display of actual milliseconds of delay may be considered by some to be a bit of “overkill,” but I suspect that the added cost of this trill is minimal (what with the low cost of numeric readouts these days), as it represents only a small percentage of the total cost of this product and it does add a certain feeling of elegance to the unit.

Leonard Feldman