



Four Audio-Video Receivers:

Covering the Basics, Present & Future

The AVR is the heart of the home-theater system. It gives you access to the experience lurking in the rest of the components, acting as controller for the source components as well as amplifier to the multichannel speakers. This one component lets you tailor your experience to your own tastes and needs. So it just may be the most important single choice you must make.

To get what you need, you can spend many thousands. But we don't think you have to. Here we give you a look at several models ranging in price from \$500 to \$3,200 and offering high performance, each in its own way.

An AV Receiver for Today and Tomorrow: Onkyo TX-DS989

The rapid advance of home-theater technology has been a double-edged sword. On the plus side, our home theaters have more sophisticated audio capabilities than at any time in history. And it seems to get better every day. But there is an unfortunate side effect: obsolescence. The products we buy can quickly become outdated as the music and movie industries drive forward with recording technologies. For example, just when you upgrade from Dolby Pro Logic to Dolby Digital, along comes THX Surround EX decoding.

One way to avoid getting stuck with soon-to-be-outdated products is to buy a modular AV controller that allows for software upgrades. The controller, which performs surround decoding, digital-to-analog conversion, volume control, and source switching, is where nearly all the technological changes are taking place.¹ (An AV receiver includes, in the same chassis, an AV controller and five power amplifiers.) The only problem is that modular, software-upgradable controllers typically start at about \$5,000.

Onkyo has changed that equation with its startling new \$3,200 TX-DS989, the first AV receiver to offer modular plug-in boards, along with an RS232 port for upgrading the decoding and operating software. Freedom from obsolescence is no longer the exclusive domain of expensive controllers.

Upgrades and Expansions
The RS-232 port allows the Onkyo TX-DS989 AV receiver to be controlled from customized remotes such as the Crestron (review this issue). More important, however, the port connects to a PC for downloading new software. When new decoding formats are introduced, for example, your dealer can simply connect his PC to your TX-DS989 and update your software.



Running more and more software requires computing horsepower to execute instructions. Specifically, the DSP chips need the speed and capacity to keep up. You can't just keep loading the receiver indefinitely with new software. Although the TX-DS989 cannot be upgraded with more DSP power, according to Onkyo, in its current configuration, the 989 uses only half of the on-board DSP power. In other words, the receiver has room to grow.

On the subject of growth, removing a small rear-panel plate reveals a socket for plugging in an internal circuit-board. The most obvious application of this expandability is to add IEEE1394 connections (see sidebar). IEEE1394, also called FireWire, is a high-speed digital interface that can carry digital audio, digital video, computer data, and control signals on one cable. If FireWire is the dominant interface format of the future, Onkyo's got it covered. If another interface format is adopted, Onkyo's still got it covered. Although the TX-DS989 has only one hardware expansion port, most of the electronics are on removable boards, suggesting that the TX-DS989 has even greater potential for hardware upgrades.

¹ See "What You Should Know . . . About Controllers," Issue 26, or on the web at www.theperfectvision.com.



Designed to accept software upgrades – some that can be downloaded into your unit via a dealer’s computer – and new technologies that are on the horizon, the Onkyo TX-DS989 also offers superior performance as the heart of your home-theater system.

Consider this likely scenario: Digital signals traveling down the FireWire interface will be encrypted with a copy-protection system called “5C.” The decryption key will reside in the AV receiver, which decodes the signal and converts digital audio to analog for listening. When DVD-Audio players become available with a digital output, that digital output will likely be transmitted over the FireWire interface and copy protected with 5C.² To incorporate this new technology, you would install the FireWire board in the TX-DS989, and load new software that includes 5C decryption and Meridian Lossless Packing decoding (part of the DVD-A spec). The TX-DS989 will now be ready for multichannel DVD-Audio.

This example isn’t idle speculation; such a scenario, says Onkyo, is possible with the TX-DS989.

An Embarrassment of Riches

In addition to this open architecture, the TX-DS989 is packed with the latest technologies and refinements. Indeed, it is the most sophisticated AV receiver I’ve seen. For example, incoming digital audio signals at 44.1 or 48 kHz are up-sampled to 88.2 or 96 kHz, respectively, before conversion to analog, a technique that improves sound quality. (Some audiophiles have bought \$5,000 external upsampling boxes.) The digital-to-analog converters for each channel are capable of converting digital signals that are up to 24 bits in word length and 192 kHz in sampling rate, which means you will be able to take full advantage of DVD-A when it arrives.

The TX-989 also features THX Surround EX decoding, along with seven channels of power amplification to drive seven loudspeakers in an EX system (a first). Typical AV receivers with Surround EX decoding have five channels of amplification, requiring you to add a separate two-channel amplifier. The Onkyo’s output power is rated at 130 watts per channel (all seven channels), and the receiver meets the rigorous THX Ultra certification requirements.

Analogue input signals can be routed to the output without going through sonically degrading (and unnecessary) analog-to-digital and digital-to-analog conversions. The volume control operates on analog signals to reduce the sonic degradation imposed by digital volume control. And in anticipation of the wide-bandwidth signals available from DVD-Audio and Super Audio CD, the TX-DS989’s preamp and power-amp circuitry has a bandwidth of 100 kHz. The power supply uses large, custom capacitors that reportedly provide greater energy storage than those used in other receivers. In addition, the internal heat sinks, made from extruded aluminum, look more at home in a high-end power amplifier than an AV receiver.

The TX-DS989’s User Preferences menu allows you to configure the receiver differently for each source or surround mode. For example, if you have full-range left and right speakers, you may want your subwoofer engaged for film but not music. Selecting Stereo disengages the subwoofer, if you choose. The TX-DS989 even includes a feature I’ve seen only on the \$16,000 Meridian 861 controller: an audio lip-sync adjustment. Many laserdiscs and DVDs don’t have perfect synchronization between picture and sound; the 989 lets you delay the audio to match the picture. It’s amazing how getting the sync perfect increases immersion in a movie. Until you’ve seen this adjustment in action, it’s hard to appreciate how valuable it is. An “Academy” audio filter can be engaged on older mono films to reduce excessive brightness. DSP modes include all the usual settings, plus an “Enhanced 7” mode for playing 5.1-channel sources through a 7.1-channel loudspeaker system. That’s quite a feature set, and one expected on a high-end controller, not an AV receiver.

Finally, the Onkyo provides control for multiple zones in your house, meaning that it can run two separate two-channel systems at the same time, playing different source material in each zone. (You will need additional amplification for the second zone.)

² See “Digital on the Eve of the Millennium,” Issue 24, for a discussion of DVD-A technology, and “Bits That Go Bump In The Night,” Issue 25, on copy protection.



Making All the Right Connections
The TX-DS989 is also loaded with inputs and outputs. Inputs include a moving-magnet phono input (for turntable users), one analog input, two analog tape loops, a digital tape loop, six video inputs (with two AV loops), and eight digital inputs (five coaxial, three optical). In addition to the six video inputs are three component-video (YPbPr) inputs for connecting DVD players with component-video output and high-definition sources such as an HD DirecTV receiver. Onkyo specs list 40 MHz bandwidth through the video-switching path. And for those of us who still enjoy laserdiscs, the TX-DS989 includes an integral RF demodulator (see *Jargon-Busters*, page 89).

Preamp-out jacks are provided for all channels (letting you turn the TX-DS989 into a controller), and input jacks connected directly the left, center, and right channel amplifiers (letting you turn the Onkyo into a three-channel amp). Dual subwoofer outputs are also included – a nice touch. A six-channel analog input is provided for connecting a multichannel Super Audio CD or DVD-Audio player.

FireWire and HAVi

The TX-DS989 will accept a plug-in board and software download to make it compatible with the coming FireWire and HAVi (Home Audio Video Interoperability) standards. FireWire is a bi-directional interface that can carry multichannel digital audio, digital video, and control information in a single cable (actually three twisted pairs within the same outer jacket). Home-theater components in the future will have just two FireWire jacks and an AC cord; the days of products with rows of RCA connectors are numbered.

An advanced implementation of the FireWire interface is HAVi, which lets each component in your home-theater system “talk” to all the other components. Instead of a bunch of “dumb” boxes sitting there, each controlled by its own remote, a HAVi-enabled system operates as a single entity. You control the system simply by clicking on icons displayed on your video monitor.

Let’s take the example of adding a new DVD player to your system. You connect the player via the single FireWire cable. There is no input or output, and you can plug the FireWire cable into any other component; there are no special signal-flow requirements to worry about. As soon as you turn on the DVD player, all the other components recognize that a new component has joined the “collective.” The DVD player icon appears on your video display; clicking on the icon brings up the DVD player controls on the screen. Clicking on the Play “button” automatically selects the correct video input on your video display and the correct audio input on your receiver or controller, engages the appropriate surround-decoding mode, and a host of other functions. HAVi will make operating a home-theater system vastly easier, and revolutionize the way we interact with our home electronics.

Still, HAVi is nearly two years away, and it’s not certain that all manufacturers will accept it as a standard. In addition, competing technologies may force manufacturers (and consumers) to sit on the sidelines until a universally accepted interoperable interface becomes available. — RH

Fire It Up and Let It Play

The TX-DS989 delivered sound quality that was a cut above most AV receivers and competitive with the best-sounding receiver I’ve auditioned – the Denon AVR-5700 (review, Issue 27). When reproducing music, the Onkyo wasn’t quite as smooth, refined, or spacious as my reference receiver. Its sound was characterized by a bit of mid-bass heaviness that added weight to the presentation, but at the expense of pitch definition. For example, Christian McBride’s fabulous acoustic bass work on the Diana Krall CD *Love Scenes* was reproduced with fullness and body, but the subtle dynamic shadings of his playing were somewhat muted compared to the Denon and to my reference Classé SSP-75 controller and Theta Dreadnaught power amplifier. Bass extension, though, was superb; the TX-DS989 reproduced the bottom octave with solidity and authority. The overall sense of dynamic impact was also first class; even the most dynamic musical passages were reproduced with no hint of strain, thinning of the sound, or congestion. In this regard, the TX-DS989 performed more like a separate multichannel power amplifier than an AV receiver.

The overall sound tended to be a bit laid-back in the midrange, and timbres were overlaid with a trace of grain. The ability to resolve the depth, spaciousness, and low-level ambient detail on naturally miked acoustic recordings was good, although not quite up to the standards set by the Denon AVR-5700.

Moving to film soundtracks, the TX-DS989’s sense of power and dynamic impact infused movies with a feeling of excitement and drive. In fact, no other receiver I’ve auditioned matched its massive dynamic impact, punch, and transient attack. Listen, for example, to the

Remote Operations

I was greatly impressed by the remote control and general friendliness of the user interface. Commonly used controls fall naturally beneath the thumb, including a rocking cursor-control disc. Related controls are adequately grouped and identified, and the back-lighting feature makes it easy to find specific controls in the dark. Some buttons are marked with legends on the remote body itself, making back-lighting of those buttons useless unless you have memorized their functions. The remote is a “learning” remote, meaning that you can set it up to control other components in your system. To let you know which component the remote is controlling, a small LCD display reads “Audio,” “DVD,” or “TV,” and so on. Finally, the remote allows you to easily tweak individual channel levels during a film without the intrusion of the test noise or an on-screen display. I’ve used this feature when dialog is hard to hear; you just boost the center-channel level by 1 or 2 dB. An alternative on the TX-DS989 is to engage the “Dialog Enhance,” which boosts the midrange in the center channel to make dialog easier to hear. I prefer to keep the center-channel frequency response unchanged and bring up the level. A rule of thumb is that the front three speakers should be as similar as possible in frequency response and dispersion. The TX-DS989’s user interface is among the best I’ve seen in a controller or AV receiver – an important factor when choosing the central component in a home theater. — RH



exploding bolts in *Das Boot* (Chapters 16, 17, 18 – on single-disc edition; see “Ten DVDs For Evaluating Home-Theater Audio,” this issue). The sound of the bolts is a revealing test of the transient dynamic capabilities of an audio system. Through the Onkyo, the sound had remarkable transient zip and a sense of suddenness that fostered a deeper sense of dread at the events unfolding on the screen.

The ability to correctly reproduce dynamic contrasts with a feeling of suddenness is crucial to the home-theater experience. Watching movies that have a dynamic soundtrack becomes more involving and exciting through the TX-DS989. Receivers without the Onkyo's wide dynamics can sound a little bland by comparison.

Surround performance was also excellent, with good envelopment and resolution of detail in the surround channels. I found that turning on the Surround Back speakers (the additional speakers required of THX Surround EX, mounted on the rear wall behind the listener) enhanced the sense of envelopment, even with conventional DTS and Dolby Digital sources. Although the TX-DS989 lets you turn on the Surround Back channels in nearly every DSP mode, the receiver lacks a DSP algorithm to extract Surround Back information from the existing Surround Left and Surround Right signals. Instead, the Onkyo sends the Surround Left and Right signals to their respective Surround Back channels. Nevertheless, the Onkyo's Enhanced 7 mode seemed to do a better job than the others of cre-

ating a continuous soundfield behind me. Note, however, that ridiculous levels of front-channel processing and reverb plague the stock Enhanced 7 mode. You can modify the stock Enhanced 7 processing: Go to the Listening Mode Setup and turn off Front Effect, set Reverb Level to minimum, Reflect Level to minimum, and room size to Small.

I encountered one problem with the TX-DS989 that may or may not affect you. When playing passages containing sustained low bass sounds at high volume, the Onkyo shut off. My guess is that a protection circuit in the power supply (rather than in the output stage) shuts down the receiver when too much current is drawn from the power transformer. It is extremely disconcerting to have the picture and sound stop instantly. I should add that the TX-DS989 never shut down while I was watching a film all the way through at loud, but not excessive, levels. The shutdown occurred while playing clips to test the system's maximum-output capability and also to discover the limitations of the Genesis G-928 subwoofer (reviewed, this issue). The clips were the *Apollo 13* lift-off (a classic bass test), a DTS ES-encoded clip from *The Haunting*, and the T. Rex footsteps in *Jurassic Park* (also DTS encoded). The scenes were played at higher than normal, but not at deafening, levels. The TX-DS989 even shut down once while playing music in two-channel mode; that disc was the massively dynamic CD by bassist Dean Peer *Think . . . It's All That* [Turtle Records]. *The Haunting*, which has the lowest bass in my DVD col-



lection, made the TX-DS989 shut down at exactly the same spot in the film when played at THX reference level, or 1 dB below reference. The Onkyo did not shut off at 2 dB below reference level. When I directed all the system's bass to the subwoofer (by selecting Small for all seven loudspeakers), the TX-DS989 did not shut off. Onkyo sent a second sample that behaved identically to the first.

Whether the TX-DS989's shutdown problem will affect you depends on many variables. The first is loudspeaker sensitivity and impedance (I was using the Revel Ultima Studio for front left and right). Loudspeaker sensitivity is a measure of how much sound a speaker produces for a given amount of amplifier power. A loudspeaker with low sensitivity can draw more than ten times the power required by a higher sensitivity speaker. A speaker's impedance (resistance to current flow) affects how much current the speaker demands from the amplifier. A low-impedance speaker puts much more strain on an amplifier than a high-impedance speaker.



Jargon-Busters

THX Surround EX: Surround-sound format that matrix-encodes a third surround channel into the existing left and right surround channels in a Dolby Digital signal. The third surround channel, extracted from the Dolby Digital signal during playback, drives a loudspeaker or loudspeakers located directly behind the listener. Called Dolby Digital EX in movie theaters.

DTS ES: Digital Theater Systems' answer to THX Surround EX. DTS ES adds a third surround channel to the left and right surround channels in a DTS-encoded signal. Two versions are available: DTS ES matrix-encodes the third surround signal into the existing left and right surround signals in a 5.1-channel source. DTS ES Discrete is an entirely new format that adds a separate third surround channel.

Matrix encoding: A technique of storing more than two audio channels on a two-channel medium or transmission format. Dolby Surround is an example; the center and surround channel are electronically "folded" into the left and right channels of a stereo signal. On playback, the center and surround channel are extracted from the left and right signals, and reproduced by the center and surround speakers, respectively. This technique is contrasted with discrete surround sound, in which the individual channels are never combined.

RF demodulator: A circuit that converts the RF-modulated Dolby Digital signal recorded on laserdisc into a bitstream, which can then be decoded by the controller or receiver. The Dolby Digital signal on DVD is already recorded as a bitstream, and needs no demodulation. RF-modulating a Dolby Digital signal was a temporary measure required to put discrete, 5.1-channel digital surround sound on laserdisc.

next variable is how loudly you listen to film soundtracks; the louder you listen, the more amplifier power you need. The third variable is your room size; a larger room requires more amplifier power to achieve the same listening level, all other factors being equal. (My room is a moderate 2,740 cubic feet.) Finally, how the system's bass management is set will affect how hard your receiver must work. If you use small left and right speakers, and direct bass from all five channels to the subwoofer, your receiver will cruise right along because the burden of driving the bass falls on the subwoofer's amplifier.


I should add that the Revel system is more expensive, and perhaps harder to drive, than loudspeaker systems likely to be used with the TX-DS989. The Revel Studios have a nominal impedance of 6 ohms, with a minimum impedance of 3 ohms. Sensitivity is rated at 87 dB.

Conclusion

The Onkyo TX-DS989 is the most technologically sophisticated AV receiver on the market today. It is not only packed with the latest features and technologies, it also is an open platform for incorporating future advancements. In this regard, it has no peer.

The TX-DS989's user interface and ease of operation also impressed me (see sidebar). Despite its complexity, the Onkyo was relatively simple to set up and use on a daily basis. This aspect of receiver performance is crucial to owner satisfaction, and one that consumers often overlook before making a purchasing decision.

The Onkyo's sound quality was competitive with the best AV receivers available, and even outperformed lower-end separates. On a purely sonic basis, my reference receiver had a smoother and more spacious presentation. Still, the Onkyo's sound was good enough to make it the centerpiece of a high-end home theater, and a tempting alternative to more expensive and cumbersome separates. The only drawback I experienced was the TX-DS989's tendency to shut down when pushed very hard, at least when driving the Revel loudspeakers. Whether you will have this problem depends on your loudspeakers, room size, and how loudly you play film soundtracks. In a traditional five-speaker and subwoofer setup, the TX-DS989 should perform flawlessly.

The Onkyo TX-DS989 has earned a strong recommendation for its unique combination of expandability, superb user interface, technical sophistication, and sonic performance. Moreover, you'll be able to enjoy your TX-DS989 long after technical advancements have left other receivers in the dust. 

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