special report

# HDTV AND THE NEW DIGITAL TELEVISION

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▲ High-definition television image of sunlit flags [right] was a practice image given to the designers of the original prototype HDTV systems to use while developing their systems. The eight NTSC TV screens [left] display one of 50 images used at the Advanced Television Test Center, Alexandria, Va., to test those early prototypes as well as the Grand Alliance's HDTV system later.



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Black-and-white television broadcasts were first aired regularly in Britain in 1936 and in the United States in 1939, at the New York World's Fair. Starting in the early 1950s, standards for the transmission of color television signals were set—first, the National Television System Committee (NTSC) in the United States and Japan, then the phase-alternation line (PAL) and in 1966 the séquentiel couleur avec mémoire (Secam) systems in Europe.

All of these systems were necessarily analog, as digital technology had hardly left the starting blocks. Now, four decades later, the first digital television transmission standards are imminent. In the United States, one is being developed for broadcast high-definition television (HDTV) by a Grand Alliance of companies, which, if all goes well, will soon propose it to the Federal Communications Commission (FCC). The agency could pass on it as early as year-end. Meanwhile, Europe and Japan push inexorably toward digital television as well.

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Jumping the gun, the era of digital television has already started. In 1994 the first digital television services, broadcast via satellite, went on the air. Programming is being offered by three companies: PrimeStar Partners LP, Bala Cynwyd, Pa., whose signals are received by a satellite dish antenna 90 cm in diameter, and DirecTV Inc., El Segundo, Calif., and United States Satellite Broadcasting, St. Paul, Minn., whose signals are received on a dish half the size—the Digital Satellite Service (DSS) antenna—because a much higher-power satellite is used. DSS units have been flying off retailers' shelves, to the tune of more than 500 000 last year, according to its Indianapolis, Ind., manufacturer, Thomson Consumer Electronics Inc.

Digital television implies more than just a highly sophisticated method of sending and receiving higher-quality television broadcasts. Also implied are potent new twists on the service—movies on demand, for example, and interactive programs (such as game shows in which viewers can participate or movies for which viewers can change the plot), as well as telephone and computer services through the television transmission signal. Some even question whether high-definition TV itself will be a major use. FCC chairman Reed Hundt has recently begun to label the standardization effort DTV, for digital television, instead of HDTV, to emphasize the flexibility of the technology. To enable broadcasters to move to HDTV while still supplying NTSC, the FCC plans to allocate special transition channels to each. But while broadcasters do want the channels, they might not want them for HDTV programming. Instead, they see money-making opportunities in data transmission, paging systems, wireless telephony, or putting multiple television programs on one channel using the new digital technology.

Meanwhile, cable television providers and telephone companies have begun applying digital transmission technology to new interactive services, including movies on demand and home shopping. No one, though, can predict the "killer app," the application that will draw consumers to interactive TV in droves.

Launching interactive television calls for more than a bit stream, however. It requires new architectures for networks, network servers, new set-top boxes, and even new videocassette recorders.

In this special report, *IEEE Spectrum* looks at aspects of the new digital television. The status of standards comes first. The U.S. advanced television standard to be proposed to the FCC is presented here in an article by authors from all the organizations in the Grand Alliance: AT&T, General Instrument, the Massachusetts Institute of Technology, Philips Electronics North America, the David Sarnoff Research Center, Thomson Consumer Electronics, and Zenith [p. 36]. Prototype systems designed to that standard begin final testing this month, and *Spectrum* reports on a visit to those "test kitchens" [p. 46]. Next, authors in Europe and Japan explore the state of advanced television in their respective regions [p. 50 and p. 54].

Then, *Spectrum* looks at the components of a digital television system, first at the network architecture, as designed for cable television systems [p. 58], and also at the particular architectural requirements of video dial-tone systems envisioned by telephone companies [p. 64]. Next, various experts tackle the architecture of the network server as well as the set-top box that the consumer requires to receive the new television at home [p. 66]. Finally, the newly developed digital video recording standard is discussed [p. 76].

So dawns the brave new world of digital television, born of a technology that seems to expand almost daily. Witness the latest battle, well-reported in both the technical and general press, between consumer electronics giants, each eager to set the standard for a digital video disk—the digitization of the video world has only begun. ●

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