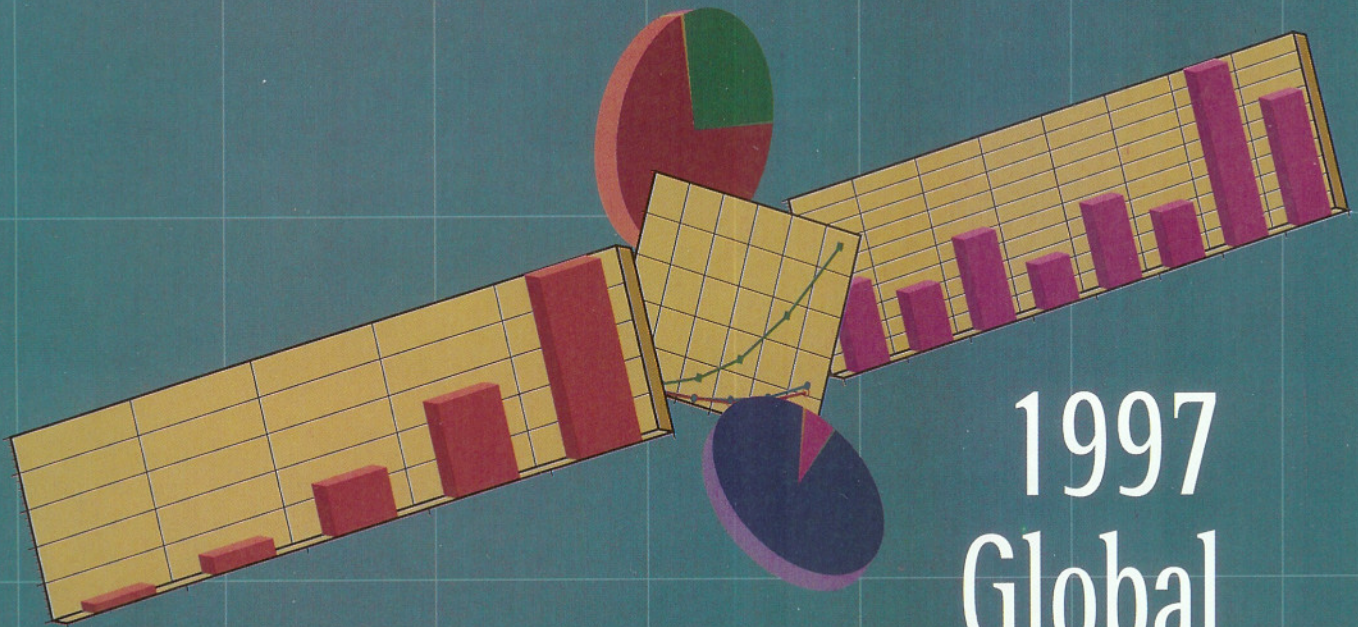




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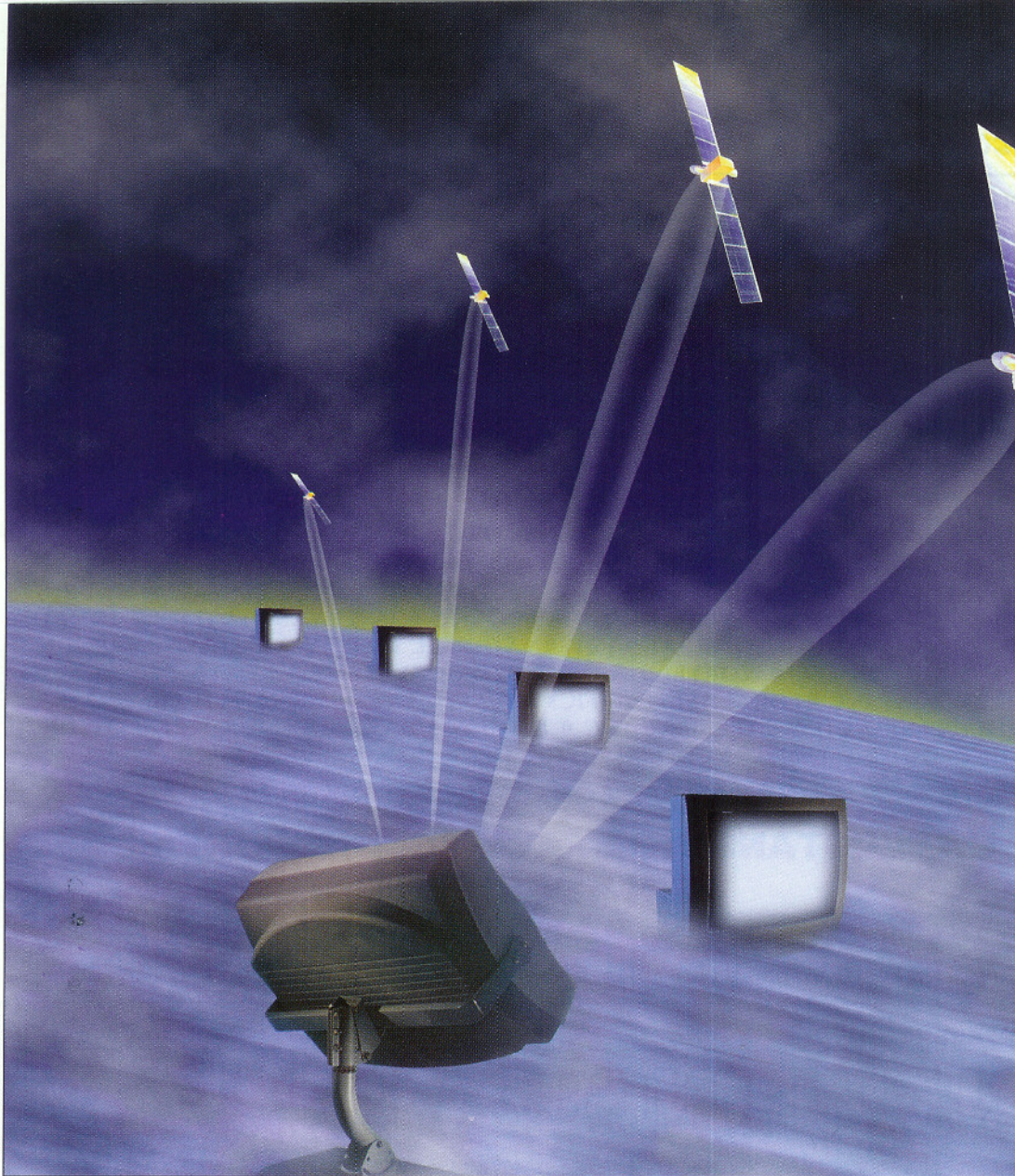
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Multi-beam DBS antenna technology, once thought of as a product for the distant future of the satellite industry, is now in pre-production thanks to the technical genius of the e*star design team.

Satellite Technology

Industry Innovation in Practice

by Katie Schuerholz

As the satellite industry approaches its 40th anniversary, technological changes are occurring at an unprecedented rate. From the ground, up to the satellite, back down again, and into consumers' homes and offices, satellite technology is changing the way the world communicates, works and relaxes.

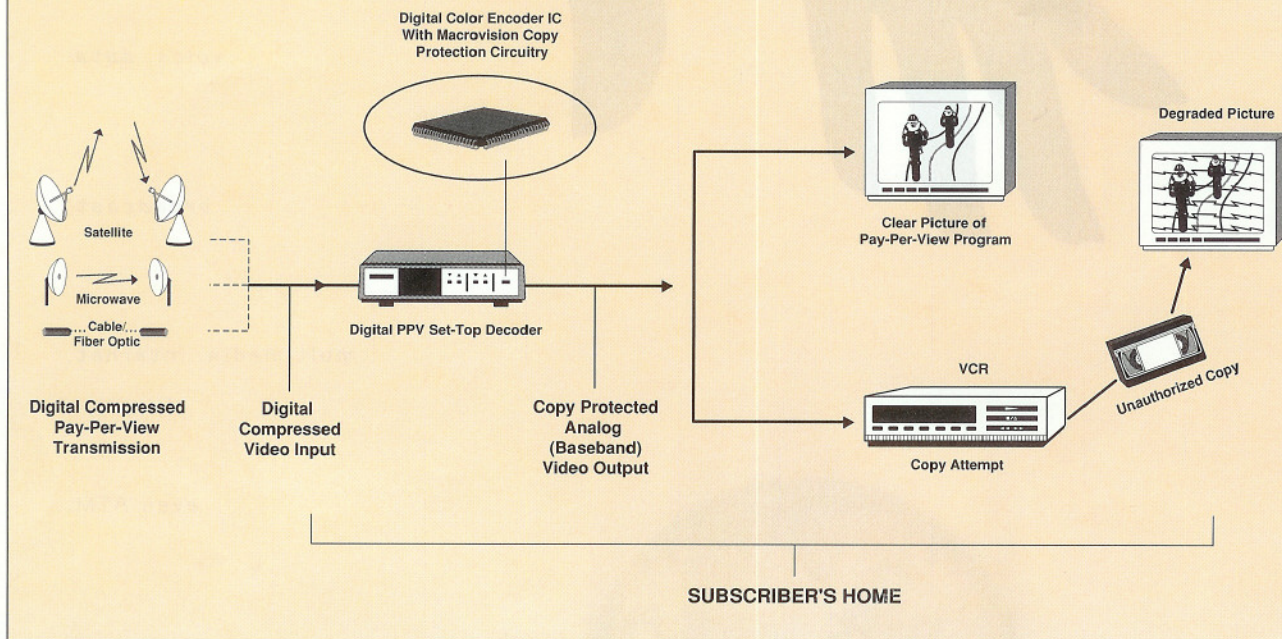
"IT'S TECHNICALLY IMPOSSIBLE"

That's what an audience at **Satellite 96** was told by some direct broadcast satellites executives as to whether or not a

small multi-beam antenna could be built to look at more than one DBS satellite. Of course, the same was also said about the horseless carriage and sending a human being to the moon. And like these prognostications, advancements in technology are proving the naysayers wrong.

In fact, not only is a multiple-beam DBS antenna technically possible, it's in pre-production now. Earth Satellite Telecommunications Advanced Research Inc. (e*star), a small company formed by Nicholas Muhlhauser three years ago, has developed such an

MACROVISION PAY-PER-VIEW COPY PROTECTION SOLUTION DIGITAL SET-TOP DECODER APPLICATION



antenna for satellite television and general consumer communications. The antenna is now in pre-production and a prototype has been tested in the United States.

The antenna receives frequencies of 12.2 to 12.7 GHz for U.S. DBS and 10.7 to 12.7 GHz for both DBS, FSS and European DTH. Antenna gain is 33.6 dBi, equivalent to the performance of an 18-inch dish. Its maximum viewing angle is 24 degrees, with wider viewing angles and gain under development.

"The antenna can see a pretty wide arc in the sky," says Kenneth P. Cannizzaro, president of e*star. "For instance, the antenna could see a satellite at 91.8°W all the way over to 119°W. This would allow the consumer to easily see as many as 13 satellites."

In a recent test in Europe, the fixed antenna picked up five satellites simultaneously: Kopernicus at 25.3°E, Astra at 19.2°E, Eutelsat at 13°E, Sirius at 5°E and Telecom at 3°E. In addition to these technical feats, the antenna is capable of looking at a number of broadcast and FSS satellites as well as looking at satellites of linear and circular polarization in the same orbital slot, says Cannizzaro.

Not surprisingly, Muhlhauser and Cannizzaro say the antenna is generating lots of interest and raising eyebrows. The two expect the first consumers of the product will be DBS operators, followed by the consumer market, potentially in Europe and Asia.

COMBATTING PIRATES

One piece of technology that is increasing the value of satellite-delivered television is copy protection ware. Without such technology, techno-pirates can steal signals meant only for subscribers, thus devaluing the prod-

uct for legitimate users. As satellite-delivered information becomes increasingly important in today's global economy, the battle to stop piracy is critical for satellite operators to win. Copy protection technology is the best armament for satellite operators.

One company that is outfitting operators with anti-piracy products is Macrovision Corp. The organization has developed an integrated circuit-based technology, which is incorporated into 34 different brands of digital set-tops, that prevents a consumer from making a video-cassette copy of satellite-delivered, pay-per-view (PPV) or pay-television programming.

The technology is based on the same Macrovision product that currently prevents billions of videocassettes from being recorded. "It's really the evolution of Macrovision's copy protection technology for the video cassette industry," says Thomas H. Carroux, director of business development for PPV copy protection. More than 1.6 billion video cassettes have been encoded with the Macrovision process at video duplication facilities worldwide; more than 400 million video cassettes were encoded with Macrovision's technology in 1996 alone.

The company is seeing the same kind of success in the satellite industry with its anti-copy process. Thus far, two set-top manufacturers, General Instrument and Scientific-Atlanta, have developed digital video networks that offer the process as a turnkey feature, which means that not only is the integrated chip in the set-top, but the software platform has been written so that a command can be sent from the satellite uplink center to the consumer's set-top with instructions to "turn on" or "turn off" the anti-copy process, says Carroux.

The system works by exploiting the differences

between the way television sets and VCRs respond to video signals. Two components of the anti-copy process affect the automatic gain control (AGC) and the chrominance information on selected active video lines. The purpose of these two separate components is to modify the video signal in a manner that has no effect on a TV set, but which inhibits a recording VCR from making a watchable copy.

If the viewer tries to copy a protected program, the copy protection process "confuses" the recording VCR in two ways. First, the AGC of the recording VCR reduces the level of the recorded video signal in response to the Macrovision anti-copy waveform. Second, the recording VCR will write incorrect chrominance information on certain lines as a result of the colorstripe process. These copy protection components, working in concert with each other, result in a degraded copy which shows one or more of the following characteristics: dim, noisy pictures; partial or complete loss of color; over-saturated color; a loss of vertical or horizontal lock and severe horizontal stripes that are overlaid across the picture.

Although Macrovision boasts an impressive list of satellite customers such as DirecTV, Kirch Gruppe and Sky Latin America, which have licensed or specified the technology, as we went to press only PerfectTV in Japan had turned on the service. Macrovision's anti-copy process, which went into effect in October 1996, currently protects five of PerfectTV's PPV and adult channels. Carroux explains that in the United States, the technology "is available to be turned on and as the number of digital set-top boxes increases, it will become increasingly important."

And it's not just the big operators that are interested in securing their signals. Small operators need to do so as well. Tadiran Scopus, an Israeli company, has developed

a conditional access system (CAS) for small subscriber-base cable or satellite TV headends.

"Previously there was no existing alternative CAS for small systems only," says Ovadia Cohen, vice president of marketing for Tadiran Scopus. "Operators with a subscriber base of less than 10,000 had to choose multimillion-dollar mainframe solutions to address the problems of illegal access. We are offering a plug-in answer for an affordable price."

CASs are penetrating new layers of the satellite broadcasting market with the release of affordable products like the CAS-500 from Tadiran Scopus.

The Codico CAS-500, part of the Tadiran Scopus' Codico video compression line, offers secured and addressed distribution of the TV signal. The Codico CAS-500 includes security levels based upon scrambling of the data information and the encryption (that can be constantly upgraded) of access information.

The SCPC (single channel per carrier) model is designed for distance-learning or business-TV applications that provide a single program, which contains video, audio and data. The CAS-500 manages the data-

base of the subscribers and determines which subscribers should have access to view the encoded and scrambled program.

The MCPC (multiple channel per carrier) model is designed for applications that provide multiple programs. It manages the database of the subscribers and bouquets and determines the authorization privileges, i.e., which subscribers should have access to which bouquets at a given time.

"Small operators have learned that they need to protect themselves too, but they have to do so at a feasible price," says Cohen. "That can only be achieved by minimizing scrambling overhead," by using such products as the Codico CAS-500.

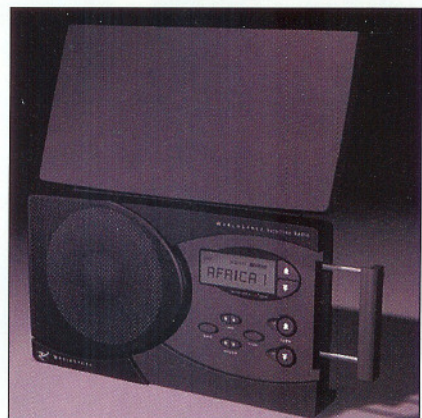
A BOOM BOX FOR THE WORLD

While digital radio struggles to become a reality in the United States, Worldspace is moving full-speed ahead with its satellite-based, consumer digital radio system. The company, which has a 20 percent minority investment in U.S.-based American Mobile Radio Corp., plans to reach 4 billion people in developing countries via three satellites: Asiastar (105°E), Afristar (21°E) and Caribstar (95°W). Critical to the company's success is the satellite receiver.

Expected to be priced at less than \$100, the portable Worldspace receiver uses several technologies to achieve the company's objectives of cost, size and reliability. The receiver consists of the antenna, Starman chipset, audio amplifier, speakers, monitor and serial interface.

The radios will receive high-quality monophonic and near CD-standard stereo radio programs transmitted in L-band (1467 to 1492 MHz) via Worldspace's three communications satellites. The use of digital transmission technology allows other services to be offered, including text, fax, e-mail and message paging services. A business-card sized antenna inside the receiver will receive the satellite signals. In addition, the receivers will be equipped for standard AM, FM and shortwave broadcasts.

In terms of actual distribution and marketing of these receivers, the selected approach will try to match local conditions in individual markets. Currently, discussions are occurring with a few receiver manufacturers who will use Worldspace technology. Local assembly in several key markets is also envisioned.



Satellite radio broadcasts to handheld receivers such as this unit designed for the Worldspace system will reinforce the concept of a global community.

Photo courtesy of Worldspace.

Photo courtesy of Tadiran Scopus.

