COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

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August 1989

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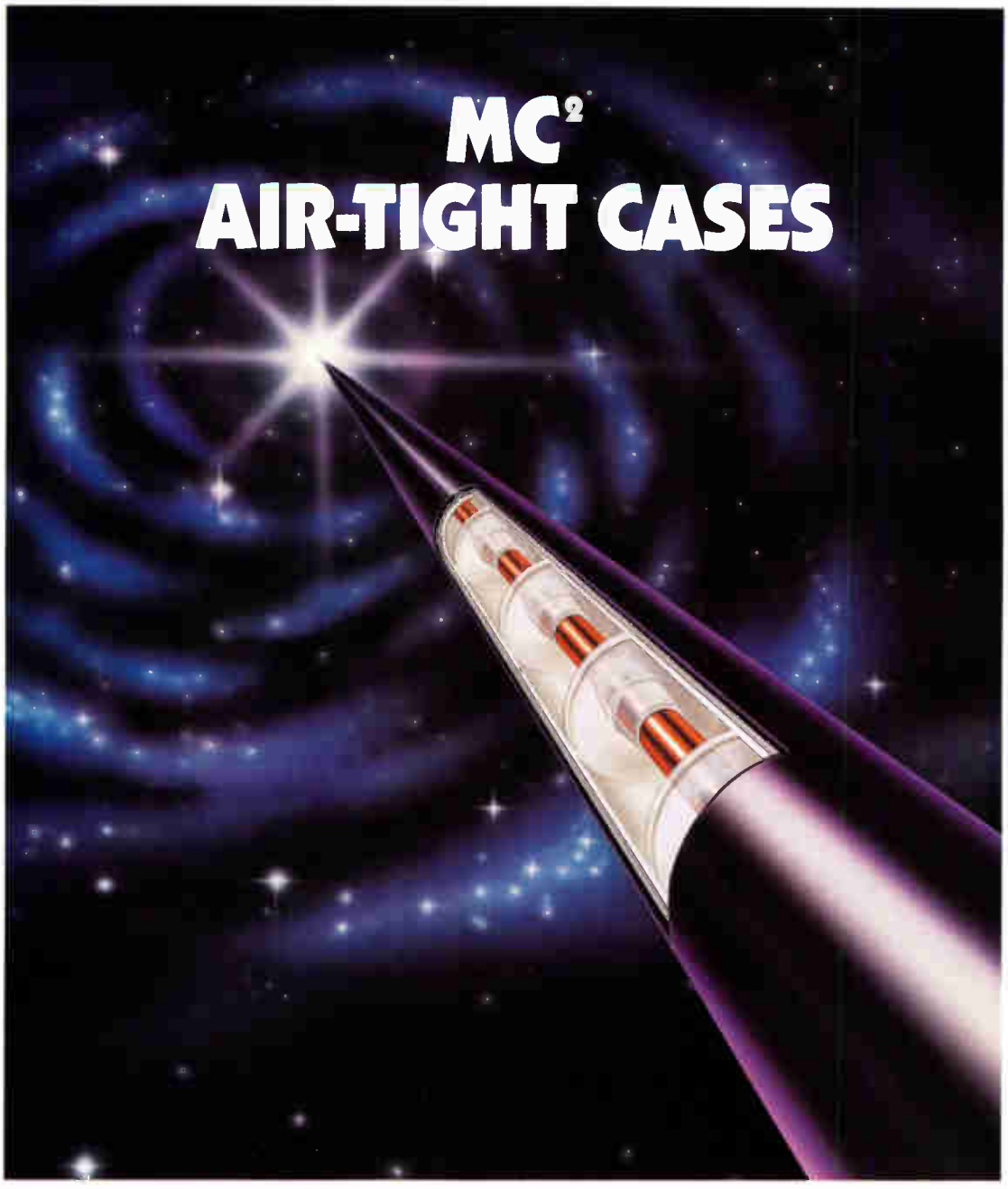

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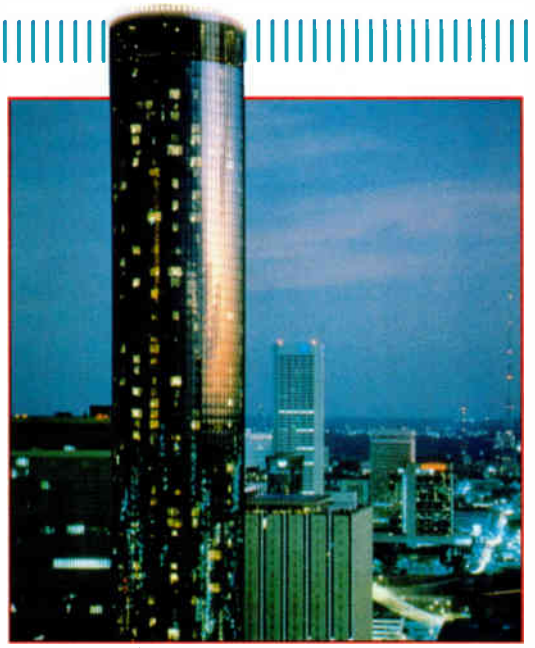

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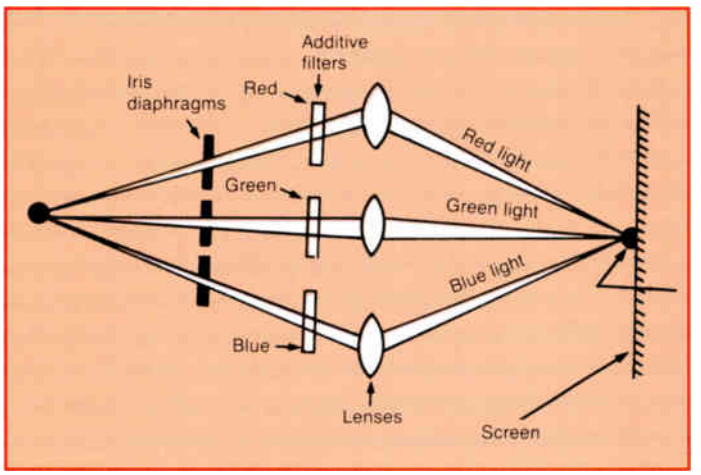

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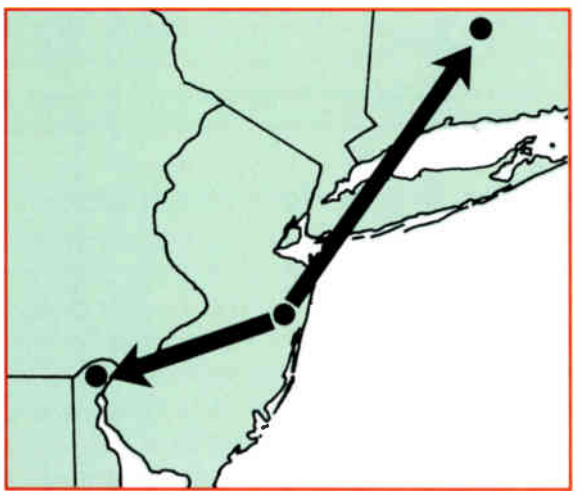

Tech Tips 82

Features

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AWESOME!

We recently asked our first ADCART customer what he thought of his new ad insertion system. His immediate reply was *"AWESOME!"* His was a typical reaction among those who've seen the ADCART in operation, especially after having grown accustomed to other manufacturer's systems.

The ADCART, when compared to the other systems available, *is* awesome. It is the result of years of research and development and the expenditure of over *one million dollars* in hardware and software engineering costs. It represents the ideas and wishes of all our ad insertion customers. . . and that is a huge group of talent. With over 4,500 channels in operation, our customer base is by far the largest in the ad insertion business. The ADCART also represents the dreams of probably the most talented and experienced group of engineers and management people in the ad insertion business; they are the primary reason Channelmatic *remains* the industry leader.

■ **ALL NEW DESIGN.** The ADCART is not one of your run-of-the-mill, me-too, Johnny-come-lately copies of some existing system. In fact, it is new from the bottom up, and it has virtually every worthwhile feature offered in any ad insertion system today. It's state-of-the-art software running on state-of-the-art hardware; the latest 16-bit CMOS microprocessors and real-time, multi-tasking software developed by experts in advanced traffic and scheduling concepts. Add to that a host of all-new features, combined with a low, low price, and you get a system that will knock even the best competition right on its tail.

■ **GREAT SOFTWARE.** With the ADCART, everything you need to easily set up and program a random-access schedule is integrated into the software. From the very first screen you'll see on the CRT terminal, plain language will guide you to the next logical step; simple English prompting natural program flow. Our tape-encoding and traffic and billing software flows just as naturally. The system's architecture was designed from the outset to simplify user-training and to make life easy for the operator.

Just imagine having up to 75 auto-prompting screens to assist your operator in programming, and up to 200 additional color screens designed to facilitate traffic and billing functions. Then add 35 more screens that direct the simplest tape encoding in the business. Your ad insertion people will love you. . . and so will your accountant.

■ **SUPER FLEXIBLE.** Flexibility is synonymous with ADCART. Insert on virtually any number of channels. Assign VCRs to fit your avails: two on two channels, four on one channel, or four VCRs between two channels. . . without overlapped avails. You'll even have an auto-record capability, which has already made the ADCART the de facto standard in new interconnect design.

■ **SMALL STUFF.** The ADCART has many other features, some of which you probably never thought about. To name a few: stereo audio, with computer-controlled audio-level matching; TBC-switching; stereo simulator inputs; super-capacitor memory backup; non-volatile memory for system configuration data; and premium plug-in interface connectors to simplify installation and maintenance. Add to this an award-winning electronics package and numerous other features and you have the best cost-benefit ratio in the business. . . *by far.*

■ **DON'T WAIT.** If you're thinking ad insertion, take a close look at ADCART before you buy. If you don't, you'll hate yourself once you see one operate. Even if you have a system now -- regardless of the brand -- you owe it to yourself to look at the ADCART. Looking doesn't cost you a cent, but relying on outdated equipment can cost you plenty.

Write or call today, and we'll send you literature, as well as two new technical papers on the ad insertion business or better yet, call us for a free demonstration!

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Reader Service Number 4.

EDITOR'S LETTER

You got a lot to learn

Bob Sullivan

Flanked by Paul Levine and Ron Hranac, recipients Bill and Anna Riker exhibit the first "CT" Service In Technology Award along with a check to the SCTE Tuition Assistance Program.

Of all the technical training opportunities available in the industry today, the SCTE's Cable-Tec Expo (incorporating the Annual Engineering Conference) is inarguably Number One. Tried and true, new and novel—you'll find everything in CATV technology right here. Plus, with the expo's emphasis on education, there's always something to enrich your knowledge and improve your skills.

Once again, this year's convention (June 15-18 in Orlando, Fla.) provided the best in engineering sessions, technical workshops and hands-on exhibits. And in an industry where most trade shows tend to remain steady (or decline) in the number of conferees and exhibitors, the expo consistently increases in quality and quantity of both events and attendees.

Part of the action

At Expo '89, *CT* was there not only to report the action for this month's wrap-up but also was honored to be part of it. During the membership luncheon, Paul Levine presented *CT*'s first Service In Technology Award to Bill and Anna Riker (see accompanying photo). In addition, a check was contributed in the Rikers' behalf to the SCTE Tuition Assistance Program.

Also—despite the ungrammatical nature of this letter's title—Ron Hranac, Jones Intercable senior staff engineer and SCTE immediate past president, and I presented a session called "Painless technical writing." It proved to be fast-fast-*fast* relief for those in the audience with sweaty palms when faced with a writing deadline. (If you missed the seminar, jot down an outline and call me in the morning.)

For those of you who just couldn't be in Orlando, as well as to provide a scrapbook for those who attended, our coverage of Expo '89 in words and pictures begins on page 92.

Congratulations go to Jack Trower and the other officers of '89- '90, the new senior members, Member of the Year Paul Beeman of Viacom Networks, Tom Hall, Glenn Jones and everyone else honored at the luncheon. Thanks go to the Rikers and the rest of the SCTE staff for yet another example of expert planning and smooth orchestration. Last but not least, a standing ovation goes to Expo '89 Chairman Richard Kirn and the program committee for the most exciting and educational industry event in recent memory.

The number has been changed

Have you heard the news? The MultiPort is no longer an interim standard but has become the official standard EIA-563. So change your "Support the IS-15" bumper stickers to reflect the correct designation. Of course, the MultiPort's new status is just part of the story. The important part lies in the renewed interest and activity by cable operators and converter manufacturers to satisfy a market that hopefully will take off like a rocket.

OK, so you're not sure what the MultiPort is or does or even what the fuss is all about. It could be that this is even the first time you've heard the word "MultiPort" uttered. So, in order to facilitate understanding, this issue features several articles about the MultiPort by some who were instrumental in promoting this technology to the industry.

We also begin in this issue a new department, "Technically Speaking," a one-on-one interview with an industry newsmaker discussing critical topics. This month leads off with TCI's Tom Elliot, on loan to Cable Television Laboratories.

Enjoy.

Rikki T. Lee

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You use the industry's first integrated receiver/descrambler—the 9650 IRD! With headend space at a premium, the 9650 IRD is the best way to beat today's rack space squeeze.

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You'll fit twice the channels in the same rack space with perfect compatibility. Add up the difference. The 9650 IRD — we do it right. Call or write Scientific-Atlanta Dept. AR P.O. Box 105027 Atlanta, GA 30348 1-800-722-2009.

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Reader Service Number 6.

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NIST establishes 75 ohm traceability

ORLANDO, Fla.—At its Annual Engineering Conference held here in June, the Society of Cable Television Engineers announced that 75 ohm traceability has been established at the National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards.

"The cable television industry and other users of 75 ohm equipment will benefit from traceability because it defines and sets standards for measurement accuracy," said Ron Hranac, senior staff engineer at Jones Intercable Inc. and immediate past president of the SCTE. "If the cable industry had not undertaken this task, it probably wouldn't have happened." Hranac commended Rex Ickes, lab supervisor at Gilbert Engineering, who shared in the responsibility for overseeing the traceability project.

Until now, NIST traceability existed primarily only in 50 ohms. Seventy-five ohm traceability will impact manufacturers and users of 75 ohm test equipment, cable, connectors, and active and passive devices. Long-term benefits to the cable industry will include improved transmission performance, especially as high definition television and data transmission become a larger part of the day-to-day operations of cable systems.

Bob Sullivan

Rex Ickes and Ron Hranac give a presentation on 75 ohm traceability at Expo '89.

This accomplishment began in late 1987 with research conducted by the National Cable Television Association's (NCTA) Ad Hoc 75 Ohm Standards Subcommittee chaired by Hranac. The efforts of the NCTA subcommittee indicated that establishing traceability at the then National Bureau of Standards would take five years at a cost of about $2 million. In 1988 the subcommittee's activities were moved to the Society of Cable Television Engineers' Interface Practices Committee.

Gilbert Engineering, a member of the SCTE Interface Practices Committee and a manufacturer of both cable television coaxial connectors and precision connectors for the metrology element of the U.S. electronics industry, submitted 75 ohm G 900 series product to NIST for certification. Under the direction of Ickes, products manufactured and submitted to NIST included a 30 cm airline, termination and fixed attenuator. These certified components are "secondary standards" that will be referred to in test data supplied with a new 75 ohm standards kit being manufactured by Gilbert.

According to Hranac and Ickes, establishing traceability was completed in just 1½ years, at a cost far below the original $2 million estimate. The SCTE committee is now working on 75 ohm power and noise measurement traceability.

Warner, S-A announce addressable testing

ORLANDO, Fla.—In a special press conference during the Cable-Tec Expo, Warner Cable Communications and Scientific-Atlanta announced that they will be field testing an off-premises addressable system in the MSO's Williamsburg, Va., operation. Warner and S-A selected Williamsburg for its proximity to their respective corporate offices, its high penetration of cable households and ability to isolate a small segment

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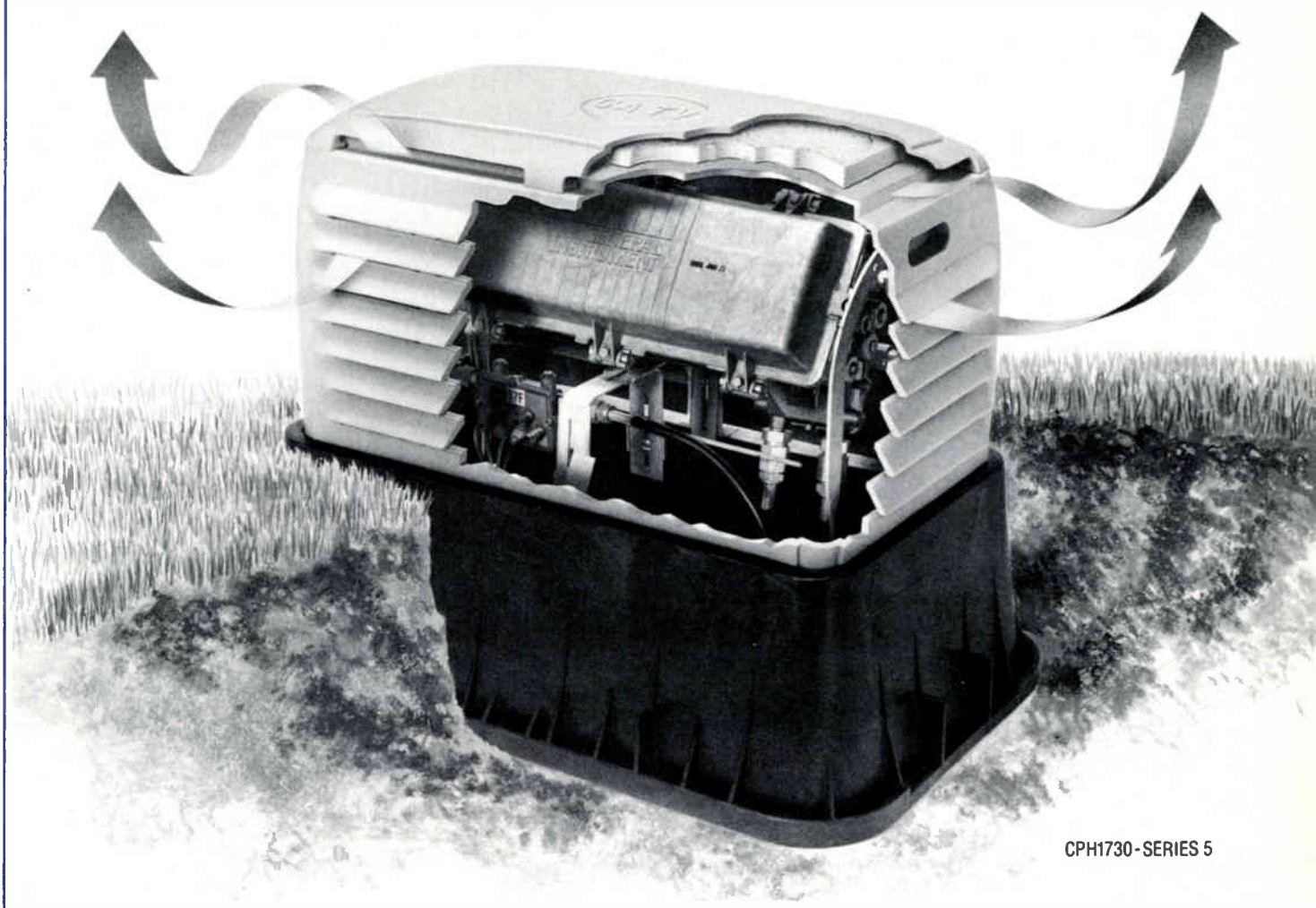

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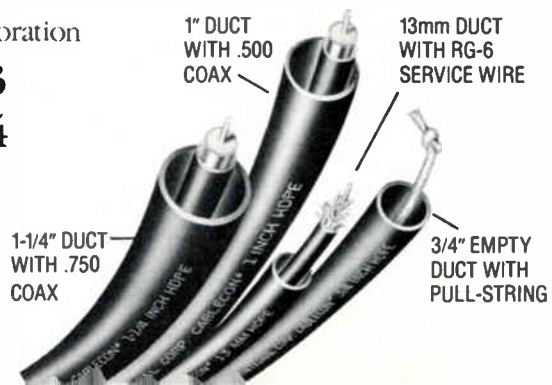

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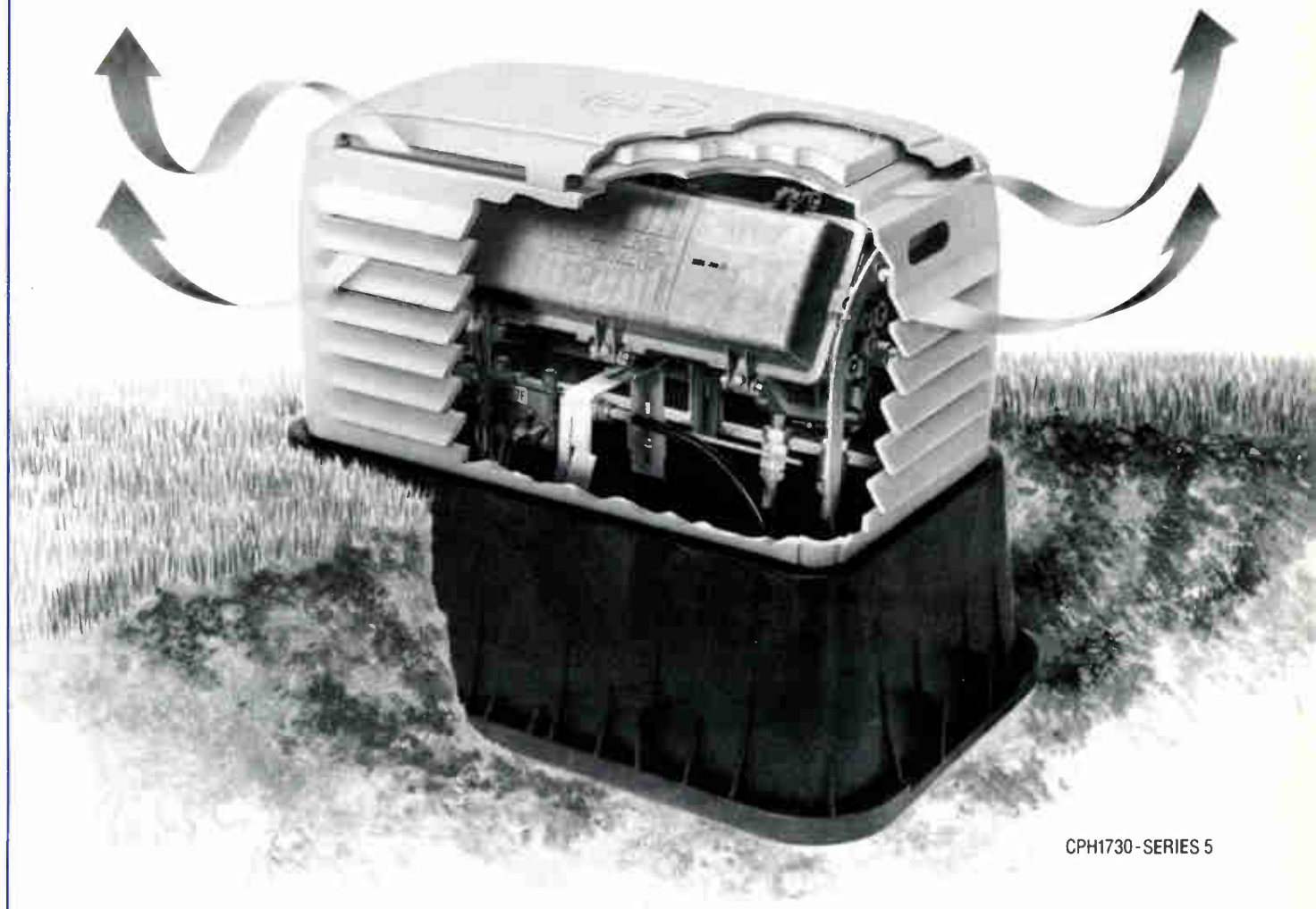

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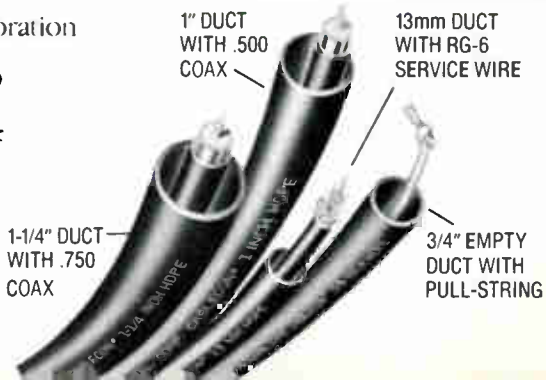
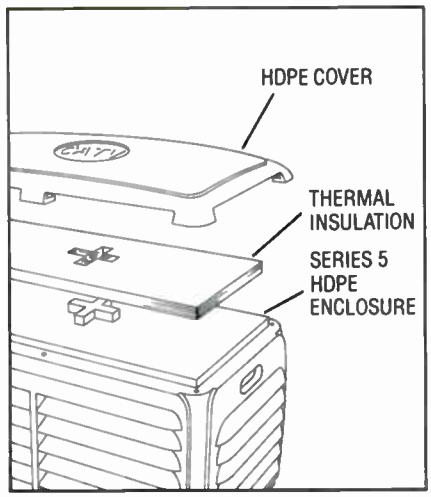


with Channell's on Covers (HDC™)!

Channell and Integral... Setting the standards for underground plant.

Have you considered what heat can do to your line extenders and trunk amplifiers after you splice them into pedestals? Excessive heat on CATV active devices is known to cause component reliability problems. It can keep your technicians busy in summer months responding to signal outages or necessary amplifier adjustments. That's why Channell has developed the ***new*** "Series 5" Heat Dissipation Covers (HDC).

These single insulated, dual cavity covers are 75% more efficient than metal in dramatically reducing temperature extremes



in your amplifiers, especially on the IC boards and power supplies. Independent field testing of "HDC" covers against competitive metal enclosures indicates this percentage could be even higher, depending upon the size of metal enclosure used in relationship to the amount of active and passive equipment spliced in it.

To prolong the life of your active equipment and increase system reliability, contact Channell today. Let us show you how our "HDC" covers can take the heat off your active devices, and assist you in preventing premature underground amplifier component degradation.

Put our high standards to work for you in your underground plant. Ask for information on Channell's complete family of above and below grade pedestals and enclosures, and Integral's full line of fiber and coax Cablecon® products.

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Reader Service Number 11.

Bob Sullivan

S-A's Jack Bryant discusses the off-premises addressable field test with Warner.

of the system. Approximately 250 households will be involved in the test.

According to S-A, the off-premises system provides an ideal solution for high penetration and high churn areas. Warner is currently conducting pre-test marketing research to help measure the new technology's impact, with special emphasis on its potential for targeting each customer's needs.

Transmedia becomes CTPC, Summit parent

GOLDEN, Colo.—Transmedia Partners-I, L.P. was recently formed and is now parent company of CT Publications Corp. (CTPC) and Summit Media International. In an agreement completed July 12, Summit, publisher of *Media Business*, *Media Business Review* and *Newspapers & Technology*, purchased CTPC, publisher of *Communications Technology*, *Installer/Technician* and *Cable Strategies* (which will be repositioned and relaunched as *MSO*).

Transmedia Partners-I, L.P. was formed for the purpose of acquiring and starting subscriber-based media businesses. It is an information company created to serve participants in the entertainment, media, communications and telecommunications industries.

Jones activates Cable Area Network

AUGUSTA, Ga.—With the activation of a rebuilt, nine-mile trunk line serving approximately 7,000 customers, Jones Intercable was the first in the CATV industry to deploy a combined FM and AM fiber technology along with traditional coaxial cable arranged in a Cable Area Network (CAN) architecture as the primary transmission mode to customers.

Kennedy Cable Construction

George Paschall, general manager of Jones Intercable's Augusta, Ga., system, and Bob Luff, Jones' group vice president of technology, dedicate a plaque commemorating the first AM/FM fiber Cable Area Network.

Initiated in January 1989, the Augusta project is scheduled for completion in the first quarter of 1990 and will involve a total of 17 AM links, six FM links and 1,200 fiber miles. According to Jones, its CAN design significantly reduces the number of trunk amplifiers between the customer and the system's headend at a cost comparable to traditional, coaxial-only designs. It also allows the coaxial cable to be used for usual distribution as well as for immediate backup to the adjacent CAN cell.

Jones awarded the contract to rebuild the underground plant in Augusta to Kennedy Cable Construction. Kennedy also will construct the 179-mile fiber-optic trunk line for Jones' Reidsville, Ga., system.

Jerrold cuts price of MultiPort decoder

HATBORO, Pa.—In order to help stimulate the use of the MultiPort standard in the CATV industry, the Jerrold Division of General Instrument recently announced that it is halving the price of its MultiPort decoder. Introduced at the National Show in May, the product was originally intended for Jerrold customers to test the MultiPort interface. It was a low-volume production run, so the company decided to sell the units at $275.

However, due to the tremendous response during and after the show, Jerrold decided to price the decoders at $140. According to Anthony Aukstikalnis, Jerrold Subscriber Systems Division vice president and general manager, "As volume productions increase, we believe that the prices will come down even further."

SCTE board elects officers for '89-'90

ORLANDO, Fla.—The board of directors of the Society of Cable Television Engineers elected a new slate of officers at its June 14 meeting held here in conjunction with Cable-Tec Expo '89. The Society's officers for the 1989-1990 term are President Jack Trower (WEHCO Video), Eastern Vice President Victor Gates (Metrovision), Western Vice President Richard Covell (General Instrument/Jerrold Division), Secretary Wendell Woody (Anixter Cable TV) and Treasurer Pete Petrovich (Petrovich & Associates).

The officers were announced at the membership luncheon June 15 in the Atrium of the Stouffer Orlando Resort.

CABLE'S HOTTEST TICKET

1989 Eastern Show sets tech sessions

ATLANTA—This year's Eastern Show, sponsored by the Southern Cable Television Association (SCTA), will offer technical sessions coordinated by the Society of Cable Television Engineers. With its theme "Cable's Hottest Ticket," the show will be held Aug. 27-29 at the Merchandise Mart/Peachtree Plaza Hotel in the Atlanta Market Center.

The technical sessions for the show have been tentatively scheduled as follows:

Monday, Aug. 28

8:30-9:15 a.m.—Power supplies
8:30-10 a.m.—"The fiber build: Augusta case study," featuring Bob Luff of Jones Intercable (concurrent session)
9:15-10 a.m.—Test equipment basics
10:15-11 a.m.—Bonding and grounding
11-11:45 a.m.—Safety around electrical conductors

Tuesday, Aug. 29

8:30 a.m.—BCT/E testing and tutorials (all categories)

Cable-Tec Expo notes

- Scientific-Atlanta is supplying fiber equipment to ATC's CableVision of Central Florida, both as hubs to supplement microwave links and as nodes to increase bandwidth in the operator's 3,000-mile Orlando, Fla., system. The initial equipment consists of 10 optoelectronic transmitters and 10 optoelectronic bridging amplifiers.
- Monroe Electronics announced a joint venture with Telecommunications Products Corp.

Now in stereo.

A stereo generator ought to do more than just light the MTS indicator on a subscriber's television set.

It ought to provide clear channel separation, a crisp audio signal, and reliable performance.

It ought to have advanced features like built-in commercial insertion, a 4.5 MHz output and an AGCL circuit.

And a real DBX® noise suppression system instead of an imitation.

It ought to save precious rack space. And it ought to save money.

Fortunately, one stereo generator does all that. And more. The new CSG-60 from Standard Communications.

The CSG-60 is almost half the cost of conventional units when you purchase them two at a time in the convenient side-by-side rack mount. It has features found only on much more expensive units. And because it's from Standard, you can count on set-it-and-forget-it reliability.

To get the full story on the CSG-60, contact the SATCOM Division for the Standard representative near you.

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Reader Service Number 12.

whereby the two companies are teaming up to provide a combined hardware/software solution to handle syndicated exclusivity requirements. Monroe is developing a "smart" switch, while TPC is developing the software, which the company says will easily create a switch schedule with minumum user input.

● The National Cable Television Institute is planning a series of new lessons covering installation troubleshooting, several new Installer course lessons and many Installer course lesson revisions. These enhancements are scheduled for the second half of 1989 and the first quarter of 1990. Between June 1989 and April 1990, NCTI plans to produce 13 new lessons for its Installer and Installer Technician courses and will enhance five areas of its Installer lessons.

● Tamaqua joined forces with All-Cable, a new sales rep organization led by Ralph Hillburn, formerly national sales manager at Times Fiber Communications.

● Times Fiber and Siecor Corp. formed a marketing agreement for the sale of fiber-optic cable and related products manufactured by Siecor into the domestic cable TV market.

● BradPTS is offering a new CATV amplifier and headend repair service, said to virtually eliminate connector intermittents. Under the program, all modules, headend units and distribution equipment sent to BradPTS for service will be returned with all RF fittings and connectors, complete with gold retention rings to reduce connector oxidation. In other news, BradPTS will hold its annual Cable Day at the Races Aug. 4 at Saratoga Race Track, Saratoga Springs, N.Y.

● Under a recent agreement with Anixter Cable TV, Texscan Corp. is authorized to market plug-in compatible Laser Link receivers in the Pathmaker Plus product line, in addition to manufacturing Laser Link receiver housings and RF components for Anixter.

● Cablevision Industries agreed to purchase $10 million worth of Jerrold converters over the next two years, including Jerrold Impulse 7000 impulse-capable addressable converters and DQN7 plain models. Cablevision will use the converters throughout its nationwide subscriber base.

● Midwest CATV and General Instrument entered into an agreement whereby Midwest will distribute Jerrold's full Cableoptics line of fiber-optic electronics, including fiber cable, connectors, test equipment and other related accessories.

● Aaron Communication Services recently opened its cable equipment repair service in Denver. Through the use a fully automated test procedure, all repaired equipment will be returned with a performance report that includes measurements of signal levels, frequency response, composite triple beat, carrier-to-noise, carrier-to-hum and distortion tests.

● An endowment was established at Reading Area Community College (RACC) in memory of Joseph Connolly Jr., former president of BerksCable/ATC Reading Division. BerksCable made a contribution of $25,000 to the endowment, with another $4,000 donated from the Reading business community. This will support RACC's Telecommunications and Electronics Engineering Technology programs, providing two scholarships annually and bringing in guest lecturers and equipment.

● Pioneer Communications of America sold standard converters worth approximately $1.3 million to ATC. The BC-4500 converters will be used in ATC's Fayetteville and Charlotte, N.C., division, while the BC-4600 converters will be used in its Jackson, Miss., system. In other news, Warner's Brooklyn Queens systems have ordered more than 275,000 Pioneer converters, including a recent order of 60,000 BA-6000 addressable converters.

● Conifer Corp., a Burlington, Iowa-based manufacturer of downconverters and antennas for the MMDS and ITFS industries, recently entered into an agreement with the David Sarnoff Research Center. Sarnoff will be involved in research and development, product and design audit, and assisting in Conifer's manufacturing operations.

● InterComm International, a consulting firm based in Denver, recently signed a $212,000 contract with Rogers Cablesystems of Toronto. According to the agreement, InterComm will design and produce a new interactive customer service/sales follow-up training program for all Rogers CSRs, retail salespeople and technicians. The program will consist of eight interactive video modules, a supervisory manual and a participant's workbook.

● USWest's Cable Communications Division recently finalized agreements with two U.S. CATV companies to build and develop cable systems in the United Kingdom. It agreed with United

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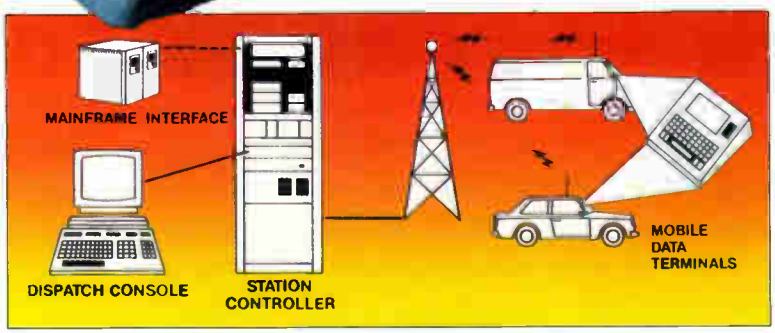

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Cable Television (London South) plc, a subsidiary of United Artists Entertainment, to invest in the London South Partnership; this partnership owns three cable franchises serving five London boroughs south of the Thames River. USWest also agreed with Comcast to invest in Cable London, which owns the franchise in Camden (a central London borough adjacent to the main business center). Each franchise will offer telephone, facsimile and data services along with CATV.

- Effective June 22, Robert Kopstein, president and co-founder of Salem, Va.,-based Optical Cable Corp. (a manufacturer of fiber cable for data and local area network applications), has acquired the company, which he previously owned jointly with Robert Thompson. The company will remain independent and not affiliated with any other organization; corporate offices and manufacturing facilities will remain in Salem.
- C-COR Electronics announced its fiscal year 1990 projections for sales and profitability levels. Net sales are estimated at $65 million; operating margins are stable with those reported in fiscal 1989.
- LPL Investment Group announced that its wholly owned subsidiary Times Fiber Communications (TFC) was recently awarded two contracts to supply coaxial cable to Israel. Cable Systems Media (CSM) Ltd. of Tel Aviv and Golden Channels and Co. of Ramat Gan began to take delivery of TFC's T6 and TX product lines. CSM operates systems in Bat Yam and Kiriat-Shmoneh; Golden Channels has franchises in Petach-Tiqva, Ramat-Gan and Jerusalem. TFC expects the value of these commitments to exceed $10 million over three years.
- A review of telco industry estimates compiled by the National Cable Television Association was recently released at the U.S. Conference of Mayors' annual meeting in Charleston, S.C. In its report, the NCTA stated that the telcos' drive to rewire the entire United States with fiber optics carries with it a price tag ranging from $450 billion to $900 billion. The NCTA also noted that this investment would at least double (and potentially quadruple) the telcos' existing rate base at the expense of phone customers.
- Irving Kahn, chairman of New York-based Choice Cable Corp., recently announced the withdrawal by his company from 11 CATV franchise applications encompassing 91,000 homes in the South Jersey area. Choice Cable proposed to overbuild and operate a state-of-the-art fiber-optic cable system throughout an area already served by NYT Cable.
- Diamond Communication Products, a manufacturer of pole line and drop installation hardware headquartered in Garwood, N.J., entered into an exclusive CATV distribution agreement with Anixter of Canada. Specific details were not disclosed.
- Microdyne Corp. of Ocala, Fla., announced the shipment of a transportable receive/transmit system to Philips Laboratories and a transportable receive-only system to Hughes Communications. These were designed by Microdyne for a satellite-delivered high definition TV testing project conducted jointly by Hughes and Philips.
- According to New York-based David Niles' 1125 Productiohs/ Captain of America Inc., the company recently designed and built the largest high definition TV imaging unit in the world. The mobile unit debuted at Lincoln Center June 3 and served as the high definition command center for the worldwide telecast of the HDTV concert special *Our Common Future*. This broadcast also marked the beginning of daily one-hour HDTV broadcasts by NHK (Japan Broadcasting Co.). The unit will be used throughout the United States and Canada to cover multicamera HDTV productions.
- BroadBand Technologies Inc. of Research Triangle Park, N.C., received $4.25 million in financing from venture capital firms TA Associates of Boston; Accel Partners of Princeton, N.J.; and Abacus Ventures of Greenwich, Conn. BroadBand will use the funds to continue the development and introduction of its BBT System, a fiber-optic transport system enabling telcos to deliver advanced voice, video and data services.

Correction

In the article "Interactive video: Touch your selection" in July *CT*, on page 65 the identifying words for "processing" and "storage" were inadvertently switched. We apologize for any confusion.

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Tom Elliot: Inside Cable Labs

Beginning with this issue, "CT" is featuring interviews with technical professionals discussing critical issues in the CATV industry. First up: Tom Elliot, on loan from Tele-Communications Inc. as vice president of science and technology for Cable Television Laboratories, talks about the role of Cable Labs.

Bob Sullivan

"I think our challenge is to quickly assess what the different areas of interest are, then try to put people to work on attacking each one of these areas."

CT: How did you become involved in Cable Labs?

Elliot: As you know, TCI and others in the industry have been supportive of the Labs from Day One. When Dick Leghorn and crew were trying to get it started, TCI was involved. And when Dick Green was selected as president, he approached us to see if it might be possible for me to join for a period of time and help get things off the ground and running. Which is exactly what happened. It worked out well for me and for the Labs.

CT: What do you intend for Cable Labs?

Elliot: There is the announced position of the Labs as a clearinghouse of technical information for the industry from a strategic standpoint. Clearly, one of the things this industry needs at the upper level of decision-making is an objective source of technical information and, to some extent, technical direction. For example, for most of us in the operating environment, it's hard to know if gallium arsenide is the next big breakthrough. We need a support group that can keep in touch with what's happening out there and evaluate it.

CT: A think tank?

Elliot: Well, let's call it a practical group of guys that can take a real close look at what's happening. Let's assume Cable Labs was in business five years ago. We might have said, "We think fiber's coming a lot faster than some of you think it is." Or we might have commented on HDTV and what really is going to continue happening in the digital domain. These are very important issues to those who have to make investment decisions in our industry.

CT: Some are looking at Cable Labs as if it might be the savior of CATV research and development. So how can you keep the interest of the industry in what Cable Labs is doing, since it might take a while to come out with any information or recommendations?

Elliot: True, a lot of basic research takes many years. But I'm not sure that many people are expecting too much of Labs. All of the funding is from operators; by their nature, operators are a very realistic bunch of people. However, there is a wide divergence of interest in what they'd like to have Labs do for them. Some of the sponsors don't have a staff of strategic planners and yet feel like they need that. Obviously, they'd like to see Labs do it for them.

Other companies may like to see Labs help them decide what kind of technology really should take place right now. If you have all the choices available to you, which one will actually make the most sense? Would I pay a little more for this one than that one? Will that technology matter or not in the normal life cycle of the plant? Does it make sense or is the plant going to be changing anyway before that feature really matters? These are real-world decisions.

Another group of companies will need someone to bounce ideas off. We can suggest people who can help them. And there are a lot of other ways we can help. There's no question that we need to do that rather quickly. We don't want to lose momentum here. There is a danger in starting up a research group of taking too long for things to come out. We recognize that and so do most of our member supporters.

So I don't think there's too high an expectation. I think our challenge is to quickly assess what the different areas of interest are, then try to put people to work on attacking each one of these areas in a rational sort of manner consistent with the dollars we have.

CT: Do you expect there to be a UL type of product testing?

Elliot: You can certainly make a strong argument that people do things different depending upon their goal. I'm not sure that we can state a common set of parameters that matters to all of us. Some people think, "If I can just get to 400 MHz, that's plenty." Others think, "Why spend a nickel today? I want to build a 750-800 MHz plant." These are different issues that make it difficult to get into evaluation.

But there is one area I think is important: to communicate to the consumer that a particular product is a quality product and another one isn't when it is bought at the retail level. There's a lot of junk migrating its way into our cable systems simply because the consumer doesn't know. He goes out to an electronics store and buys a splitter, doesn't know whether it's any good or not. I'm firmly convinced if he knew he could buy a better splitter for twice the cost of a bad one, he'd buy the good one.

An important issue right now is that 50 percent of our trouble calls are problems from inside the house. There is a range of reasons, not the least

of which is that there's a lot more stuff being connected by the consumer inside the house—more TV sets, more VCRs. It raises the risk of leakage and other problems, with the result that the picture quality is not as good as it should be. This is an area that is changing relatively rapidly for the industry, and one I hope we can get interest in.

CT: There are other organizations currently involved in research (NCTA, EIA, etc.). How do you intend to work with them?

Elliot: There really are a lot of organizations. The NCTA from an engineering standpoint is largely a volunteer group. There are a few who work on engineering problems (Wendell Bailey and Brian James, for example), and they also help with the NCTA Engineering Committee and so on. But it's really not a research group. Cable Labs is the first time we've actually gotten paid staff to help the entire industry. So we can help and work directly with the NCTA Engineering Committee. As for the EIA, that is a group of electronics manufacturers. I hope we can help in that area, such as in the MultiPort issue. I don't see any competition; we can be cooperative.

Then there are the professional societies we can work with. The SCTE is one of the first that comes to mind. I think we can complement the Society; we can be good for the SCTE and the SCTE can be good for us. Fortunately, since Cable Labs is setting off to do something that hasn't been done before by the operators, we're really not in competition with anyone. We should be in cooperation with virtually everybody who has interests that coincide.

"One of the things this industry needs at the upper level of decision-making is an objective source of technical information."

CT: Would you like to see Cable Labs make the pace of progress go even faster or in the right direction?

Elliot: I don't think the cable industry should necessarily break ground in the basic research area, which is where a tremendous amount of the speed comes from. But we could be very effective to keep up with technology and make sure the CATV industry has its fair shot at applying this technology.

In some cases our charter is even specific about helping us actually take inventions or new technology right at that critical point in its life where it's not close enough that you'll find profit-making entities willing to risk anything on it. What I hope we could be good at is sitting right behind and understanding what's coming at us from a basic research perspective and help capture that new technology and move it forward to our advantage.

CT: How far into the future do you think Cable Labs will go?

Elliot: We in the United States sometimes give the Japanese a hard time with their 50 year, 200 year, 300 year business plan. But if you have a 2 percent growth rate compounded annually, what can you expect in 50 or 200 years? Some pretty amazing facts can come from this type of brainstorming. I hope that we'll do some of that by simply running the calculator, if you will. And say, for example, "This makes some sense to plan this type of approach." A lot of times some of the far forward-looking things are not that hard to do because you can do some benchmarking.

CT: You're on loan for only two years. What do you expect to have accomplished when you return to TCI?

Elliot: It's a very short period of time. I'd like to think we can lay some cornerstones for what matters in the next few years. There won't be a lack of work to do—just getting some things under way, getting some information back to our clients that is helpful to them. If I can get two or three things done to focus our efforts, I'll be pleased.

CT: How long will be the life span of Cable Labs?

Elliot: By design, it'll be around as long as the industry needs it. We would hope that if the Labs is successful, it'll have a long life span.

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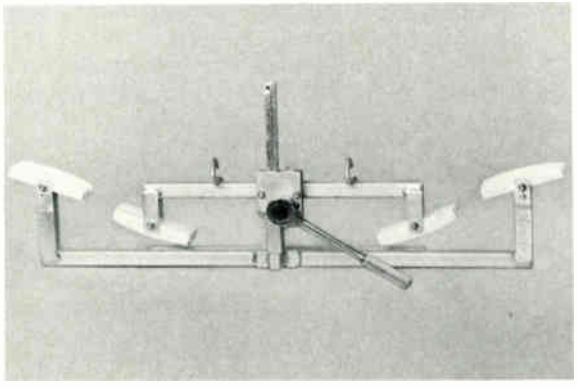

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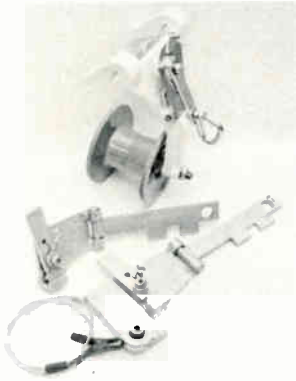

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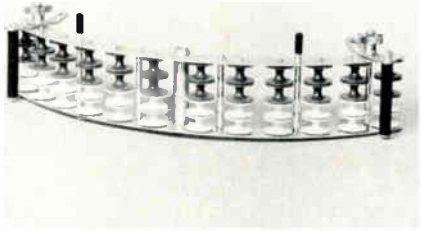

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En trois dimensions

By Isaac S. Blonder
President, Blonder Broadcasting Corp.

Back in April 1977, the first International Symposium on 3-D Film and Television was staged in Montreal by the Communication Studies Department of Concordia University. The current symposium, partially funded by a government grant, was ably hosted by charming Christine Davet, indefatigable Hal Thwaites and unflappable W.L. Gardiner—all members of Concordia. Twenty-one sponsors are listed in the catalog, along with 40 volunteers plus the appearance of many government officials and dignitaries. Canada supports its scientists!

Our northern neighbor has a long proud history of financing and pioneering key technologies. One stunning achievement was the first satellite carriage of cable programs in North America. Canadian government support for R&D in cable and TV, as I read their publications and attend the technical sessions, is generous and ongoing. Unfortunately, at home, we see a total official neglect of the civilian high tech marketplace. Unless we allocate more than the funds needed to meet the payroll of the Federal Communications Commission and enjoy some fortuitous spinoffs from the military efforts, our "brave new world" will look more like the waste dumps of other countries' bold strategies.

Imax and Omnimax are the finest motion picture systems in the world, owing to a film frame 10 times larger than 35mm, a six-channel sound system and 3-D. (Yes, the inventors and exhibitors are Canadians.) More than 20 million people enjoy watching over 60 films in 61 permanent theaters around the world. Where would Disneyland and the World's Fairs be without the giant screens and the polarized glasses?

So many subjects were presented at the recent 3-D Conference in June by world-famous scientists and producers that only a few highlights can be revealed. We heard lectures on the theory and history of 3-D, viewed screenings of early and late 3-D films, were challenged on the techniques for producing 3-D audio/visual systems, were introduced to the mysteries of holographies, marveled at the realism of Japan-designed alternating shutter 3-D home TV, were befuddled by the next dimension in computers—brain simulation—and finally attended workshops in holography, 3-D multi-image and 3-D TV.

Hudeo Kusaka, senior research engineer, NHK Laboratories, discussed the many problems in 3-D viewing yet to be solved. He said, "We must have a full grasp of the characteristics of the human visual apparatus as the ultimate receptor in the image communication system to ensure that information is exchanged appropriately between the display and our own visual system. This demands research and development of three-dimensional video displays that can be watched for long periods of time without causing fatigue and headaches and that do not require the use of special glasses. In other words, the key to success in the development of three-dimensional imaging techniques lies in whether or not a system can be developed that matches the human visual system."

"Our northern neighbor has a long proud history of financing and pioneering key technologies."

The 3-D Braun tube

Joji Hamasaki, University of Tokyo, presented a paper on an autostereoscopic 3-D Braun tube. The Braun tube is an extremely complex tube design (at least to my eyes), capable of generating very precisely located lines on its screen over which a lenticular lens is laid. This enables glassless viewing of scenes televised by an eight-lensed camera. I later asked him if his laboratory was planning to try the same lenticular technique with the liquid crystal display. The answer was that presently the Braun tube was capable of a much brighter picture than the liquid crystal and that the cost would be quite reasonable for sale to the home viewer.

One of the more controversial papers was delivered by Professor Porter McLaurin, University of South Carolina. He is one of the inventors of Visidep, which has had a reception almost as publicized as cold fusion. Visidep involves alternating a stereo pair of cameras at a rate of eight times per second. No glasses are needed and in the demonstrations we definitely could perceive a 3-D image with, of course, a jittery picture. McLaurin confessed he had to change his home phone to an unlisted status, the calls were so overwhelming. But he vowed to continue research and his method would eventually please everyone! If true, 3-D would be glassless, compatible and affordable with the good old NTSC in no more than 6 MHz.

It was a well-rounded symposium in which every speaker contributed knowledge and experience to an appreciative audience. Special mention has to be made of Murray Lerner, the director of *Magic Journeys*; Martin Sadoff, *Friday the 13th Part 3 in 3-D*; David McKay, Imax film maker; Rudy Bender, 3-D TV; Professor Nils Abramson, Sweden, holograms; Professor Stephen Benton, Massachusetts Institute of Technology, holograms; Professor Karl Pribram, Stanford, holomic perceptual theory; Chris Condon, stereovision.

The future of television hung heavy in those halls. We were all honored to be present.

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Time for the MultiPort

By David L. Franklin
Project Engineer, American Television and Communications Corp.

The IS-15 MultiPort (now also referred to as EIA-563) could well be one of the most important engineering efforts currently under way within the TV industry. Unfortunately, it also may be one of the least publicized, understood and appreciated endeavors of all time. The MultiPort doesn't have the glamour of high definition TV, lacks the immediacy of expanded bandwidth amplifiers and can't compete with the high tech aura that surrounds fiber optics. But in the arena of customer service and satisfaction this simple multipin, multipurpose interconnecting link between the customer's TV set and cable company's addressable converter has no equal, either now or in the foreseeable future.

The MultiPort interconnection is a cooperative development project between set manufacturers, signal scrambling product manufacturers and cable operators. The initial goal was to develop some means of giving total control back to the subscriber, where it really belongs. A committee formed under the auspices of the Electronic Industries Association determined that the most practical means of accomplishing the desired result would be to break TV signals into baseband video and audio paths, route these signals to the converter/decoder for decoding and then return the unscrambled signals to the set for final processing and display. It was believed that such an approach would readily accommodate the vast majority of the decoding devices then current and also would provide a standard fixture for future product development.

All of the parties involved agreed upon this approach and began to design prototype products that incorporated the MultiPort. After sufficient testing the feasibility of this method was firmly established. Some of the consumer equipment manufacturers were very quick in implementing this new feature and actually have had sets available to the public (in the high-priced end of their product range) for more than two years. For the first time these manufacturers could truthfully boast that they had "cable-ready" TVs.

However, the cable industry was not immediately prepared to tie in to these sets. Some converter/decoder manufacturers were much slower in their development and implementation of this feature. The first two production runs of MultiPort-equipped descramblers were completed during the first quarter of this year, one each by Zenith and Jerrold. Also, Scientific-Atlanta announced plans for a production run by early or mid-1990. Some manufacturers claim that they have had very few requests for MultiPort decoders and question the need to make them. (It should be noted that Zenith sold its entire production run by May 1, 1989, and began taking orders for the future.)

Not unfounded

The manufacturers' claim for weak MultiPort demand is not totally unfounded. The industry that publicly asserts its desire to provide consumer-friendly service quietly denies the public one of the most significant advances in that area. The obvious question is, "Why?" The answer depends upon who is asked—equipment manufacturers have one set of reasons, operators have another.

Some manufacturers that derive a major portion of revenues from set-tops are not overly anxious to see a significant portion of those revenues disappear. If the MultiPort is successful there will no longer be a need for the tuner portion of the set-top terminal/decoder and its associated features. The TV set/VCR will provide all of the customer convenience features currently found in our converters—remote, volume and parental controls, last channel recall, etc.

These features cost money and provide a large measure of profitability. Additionally, they provide a great degree of product differentiation; without these features, one set-top would be almost indistinguishable from another. Also, with a MultiPort set, the decoder is attached to the back of the set—out of sight, out of mind.

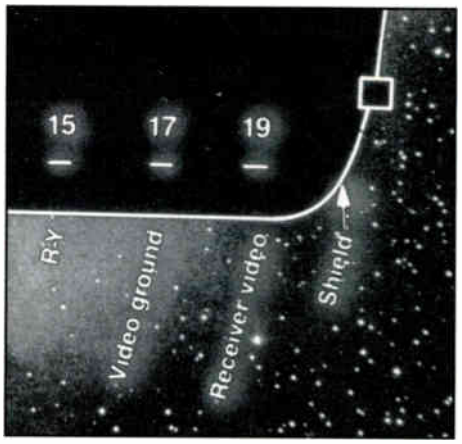
From the operators' point of view the reasons to oppose the MultiPort can be summed up in two words: remote revenues. There are many legitimate needs for the myriad devices that the cable industry provides; e.g., upgrading older sets that lack any remote capability, supplying remote volume control for those who never had it before, etc. However, in many instances our operational decisions have adversely affected our subscribers' range of options and freedom of choice. When we decide to implement a scrambled signal format we oblige the customers who want those scrambled services to use our addressable or programmable converter/descrambler. When we install our box the subscribers' remote becomes largely useless, so we kindly offer to provide one, often for an additional fee.

We have found a means of gaining additional income by selling customers something they already have. The revenues from this "service" have a pleasant surprise to many; they are fiercely protective of it, even to the point of ignoring the long-term benefits that will come with real customer service.

Overcoming roadblocks

What can we do to overcome these roadblocks? The first step is to understand the issues and assess their validity. Cable Labs has undertaken a study of the possible economic impact and benefits to be derived if the MultiPort is fully implemented throughout the cable industry. This will provide a clearer picture of the profit and loss concerns along with the possible increase in consumer acceptance of cable TV that could come with increased user-friendliness.

Many questions need to be answered; general questions concern the incorporation of the MultiPort into the home. How long will it take for the MultiPort standard to gain a significant percentage of the TV market? When will MultiPort-equipped VCRs be available? Will consumer equipment manufacturers begin to market this feature more effectively?



"We have found a means of gaining additional income by selling customers something they already have."

Cable operators have another set of questions. Will customers be more likely to keep subscribing if they aren't put through the converter hassle every time they want to watch television? Can the MultiPort be a useful tool to combat premium service revenues being lost to the competition of VCRs? Will universal remotes erode cable's revenues to the point where the remote is no longer an important issue? And what can the MultiPort do to increase acceptance of pay-per-view services? All of these questions and many others deserve careful consideration.

Every problem presents an opportunity. The cable industry has historically been very adept at taking full advantage of the opportunities it has had. The MultiPort problem is offering us an opportunity to provide true cable-ready service to our customers. In the long run, those services and devices that are in the best interest of our subscribers are always found to be in our best interest also. We didn't get where we are by finding excuses for not trying but rather by taking calculated risks in doing those things that were important. The risks in this venture are small, the potential gains are great. The time is well past for the cable industry to come to the support of the MultiPort.

Acknowledgments: I would be remiss in failing to acknowledge the thoughtful and much valued assistance that has been provided by my friends and fellow workers, Steve Johnson and Louis Williamson of ATC. They have both helped me greatly in many ways, not only with this article but also in other endeavors. Further, I thank ATC for giving me the opportunity to be involved in this and other important projects.

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Reader Service Number 21

A MultiPort solution

By Thomas R. Jokerst
Assistant Vice President and Director of Engineering
Continental Cablevision of Illinois/Iowa/Missouri

Perhaps this article should have been titled "the" rather than "a" MultiPort solution. However, we must stress the point that the EIA MultiPort should not be viewed as the only answer for all that ails our industry in terms of user-friendliness. Rather, it was designed to be *an* answer to this sticky interface problem. And it will solve the interface problems quite effectively. We should view the MultiPort as a working option; this option needs a commitment from our industry just as the off-premises systems do. Isn't it in the best interests of our industry to have several user-friendly interface options at our disposal?

Conversations about the MultiPort

Often, when people are discussing the MultiPort they inject into the conversation one or more "yeah, buts"; for example:

1) "Yeah, but there aren't any MultiPort decoders available."
2) "Yeah, but there aren't enough TV sets with the MultiPort plug."
3) "Yeah, but it isn't a standard yet."
4) "Yeah, but it doesn't support impulse pay-per-view."
5) "Yeah, but I'm waiting for off-premises technology."

Let's examine each of these.

Decoders: Today, Zenith has manufactured MultiPort decoders for its Z-TAC scrambling scheme. Jerrold has done likewise for its RF baseband schemes. These companies are taking orders and preparing deliveries. Zenith has sold over 1,400 decoders; Jerrold has manufactured 1,000 decoders. Each company is standing by for more orders.

TV sets: Some people think there aren't many MultiPort-equipped sets on the market. The accompanying table shows the various models currently being manufactured by Panasonic, RCA and others. RCA and Panasonic have done their part initially (over two years ago) to make the MultiPort available to consumers. These sets are in the marketplace now. Ask your installers and technicians if they encounter TV sets with the MultiPort plug; I'm sure some of them have.

TV/VCR manufacturers are now waiting for the cable operators to do their part in this start-up effort of implementing the MultiPort. If operators respond properly by supporting the MultiPort, the consumer electronics manufacturers will surely make more products with MultiPort capability. Yes, this will take some time, but this methodology has great potential. The end result will be more satisfied customers and a better cable industry. MultiPort-equipped VCRs can potentially make the greatest impact since they are replaced more frequently than TV sets.

Standards: As far as the standards issue goes, the EIA MultiPort interim standard (IS) 15A is now officially EIA standard 563. It is in the process of submission to the American National Standards Institute. Soon this will be approved and the standard will be known as EIA/ANSI 563.

Pay-per-view: The MultiPort does support pay-per-view (including impulse). In fact, provisions are in the EIA-563 standard to allow the TV set's hand-held IR remote control transmitter to send the IPPV signaling through the interface to the MultiPort decoder. Other PPV methods such as ANI can easily be supported by the MultiPort as well.

Off-premises: Off-premises technology has long been viewed as the most desirable and secure way to deliver services to the home. There is a considerable amount of effort directed toward these methods and manufacturers are making progress. However, off-premises systems still have certain technical, cost and implementation obstacles that need to be addressed. In time, hopefully these will all be overcome. The MultiPort is available today and can solve interface problems now. MultiPort supporters generally are also off-premises supporters. We simply want to get the issue of user-friendliness solved for the cable consumer regardless of the technology utilized. Again, it makes sense to have several viable options.

A MultiPort update

Much has changed over the last year with the MultiPort—the industry is making progress! As previously stated, it's now a full standard and production decoders are on the market. In addition:

- Several MSOs are beginning to field trial MultiPort decoders. Some operators are establishing a dialogue with local TV retailers who are interested in promoting the MultiPort.
- Scientific-Atlanta has committed to producing a MultiPort decoder for its addressable systems. Several other converter manufacturers are seriously considering MultiPort

TV models equipped with the MultiPort

Panasonic*	Quasar
CTV-2788R	TL9991CK
CTK-3190S	TL9998CK
CTK-3194S	
CTK-3196S	
CTL-3197S	
CTK-3198S	
CTL-3191S	
CTL-3199S	
PC-33S90S	
PC-33T91S	
PC-33T97S	
PC-33S98S	

All models are 27 or 31 inch.
*Models beginning with PC are for the Canadian market.

RCA	
685-4230P	G27340CK
F27100AK	G27350CP
F27101MM	GPR2740T
F27107EG	GPR2743E
F27110NG	GPR2747T
F27122TN	GPR2750P
F27123SB	GPR2751T
F27150BH	GPR2755H
F27155AK	GPR2758P
FPR2722N	GPR2760T
FPR2722T	GPR2790E
FPR2723E	GPR2798E
FPR2725G	J26750HP
G27140TN	RVM2050
G27143TN	RVM2630
G27149TK	RVM2650
G27250CP	RVM2730
G27251TN	RVM2731
G27255NP	RVM2750
G27259HP	RVM2769

All models are 20, 26 or 27 inch.

The MultiPort is also available on selected models from General Electric, Curtis-Mathes and JCPenney.

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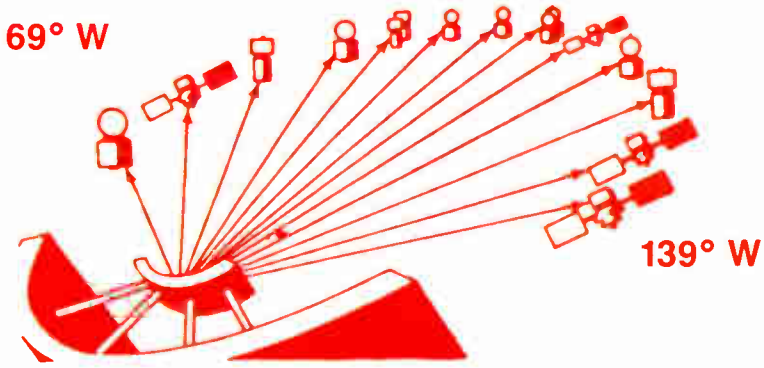

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Reader Service Number 22.

"Progress...can be made faster by cable operators and TV retailers working together."

decoder production.

- A prominent VCR manufacturer is giving serious consideration to adding the MultiPort to its VCR line. Also, Bang & Olufsen will introduce this fall a TV set and a VCR each having MultiPort capability.
- There is a renewed interest by operators, as demonstrated by the traffic at the MultiPort booth at the 1989 National Show and Cable-Tec Expo.
- Cable Labs is doing a comprehensive study to look at the MultiPort from a "big picture" perspective. Among other things this study will address is how the MultiPort can achieve its potential and what its overall benefit would be to subs and system operators.

How do we move forward from here with MultiPort? (Hint: We need more MultiPort-equipped products, especially VCRs.)

Although we are making progress, it can be made faster by cable operators and TV retailers working together. Interestingly enough, retailers have a problem with customer satisfaction similar to ours. This problem occurs when a retailer sells an expensive full-featured set to a customer who has cable services secured by scrambling. The retailer explains to the customer that the cable converter/decoder is still necessary for these premium services. The customer can't utilize those "extra" features they just purchased.

This is a serious problem for the retailers. Consequently, they want this interface situation resolved almost as badly as we do. The point of this is to illustrate what could be a win-win-win situation for retailers, operators and consumers. If we encourage retailers to promote MultiPort-equipped products to consumers the following things could occur:

1) It allows retailers to sell high-end products.
2) Retailers could help the operators promote premium services. There are endless marketing and sales opportunities here. Point-of-purchase demonstrations, cooperative special offers, etc.
3) Customers are happy. They have a TV set or VCR that is truly cable-compatible and works just fine with premium or PPV services. They receive their value from their full-featured equipment and the cable operator isn't taking something away from them by forcing a converter/decoder on them. Customers also get better picture quality, since there is less signal processing when utilizing MultiPort.
4) The cable operator is happier because customers can now subscribe to PPV and premium services without the box atop the TV set. The operator saves money due to lowered operational costs associated with the MultiPort.

If operators work closely with TV retailers to promote MultiPort-equipped products, another very important thing will happen: More TV and VCR manufacturers will have the incentive to make MultiPort-equipped products. The MultiPort will become even more popular and more available. This will allow the industry to satisfy even more customers. Success breeds success.

This scenario represents a winning combination, even for MultiPort decoder manufacturers. With the MultiPort concept fully deployed in the marketplace, manufacturers could be selling these decoders at levels in excess of current addressable converter sales. With the MultiPort widely available, there would not be a reason for any system to avoid adding addressability (as many systems are today).

MultiPort decoders could be very small, relatively inexpensive throw-away devices. This could reduce manufacturers product support requirements, etc., compared to today's converter support requirements with repair, repair parts, cosmetic parts, etc.

As most of us know, the MultiPort was developed as a joint industry effort between cable system operators, converter/decoder manufacturers and consumer electronics manufacturers. There is still organized dialogue occurring among these entities. These discussions are critical to the long-term success of both the MultiPort and off-premises approaches. This dialogue specifically discusses the issues of TV set performance on cable. IS-6 and IS-23 are a previous product of this effort. In order to make the MultiPort or off-premises really work in the long term, our industry must have cable-compatible TVs and VCRs with tuners that extend to state-of-the-art bandwidths and do so without the problems associated with tuner overload or direct pickup interference. It is critical that everyone work collectively to address and resolve these issues if we want the MultiPort and off-premises to represent a real and total interface solution for the long term.

What can you do to help? If you, as an operator, have addressable systems using scrambling, call your converter/decoder manufacturer to discuss the MultiPort. Try to arrange your own field trial to see first-hand how the decoders work. Establish a dialogue with your retailers; ask them for their opinion and support with the MultiPort. As an industry we can't afford to miss an opportunity to solve this user-friendliness issue. With everyone working together and pushing in the same direction, we can make it happen.

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Reader Service Number 24.

The MultiPort and how it works

By Dan Moloney
Product Director

And John Venner
Product Manager, Addressable Converters
Jerrold Subscriber Systems Division, General Instrument Corp.

Today's home video environment is rife with redundancy.

More than 50 percent of American homes have cable; most have at least one scrambled pay channel. To watch a pay channel, subscribers have a descrambler that also serves as a tuner. Of course, the TV set already has a tuner, so that adds up to two in-home TV tuners and, more than likely, two remotes. Then there's the VCR. It adds a third tuner and a third remote. And probably that VCR tuner is about as useful as the one on the TV set when it comes to recording pay channels.

The legendary "maze of wires," about which much has been written, connects these electronic components. All you need to make it work is an advanced degree in electronic engineering, persistence or just plain good luck.

Neither cable TV equipment manufacturers nor those who make consumer electronics are blameless for this situation. Lacking a readily available solution, both produce redundant equipment. To further confuse the matter, consumer electronics manufacturers incorrectly call their devices "cable-ready." This only serves to frustrate and befuddle the consumer.

Cable operators are caught in the middle of this controversy. They want to protect their investments by scrambling pay channels and securing unauthorized programming. To do this, they must place converter/descramblers in the home.

Viewer distaste for the ever growing pile of home entertainment equipment is of concern to everyone. For this reason, all the participants worked to come up with a standard that would serve as cable/consumer electronics interface. Such a standard, initially referred to as interim standard 15 (IS-15), has now been codified as the Electronic Industries Association MultiPort (or EIA-563).

CATV and consumer electronics manufacturers are now working to develop inexpensive devices that support this standard. This involves a standardized video and audio loop-through communication path between the MultiPort-equipped TV/VCR and descrambler.

How the MultiPort works

Now purely a descrambler equipped with the MultiPort, the cable company-supplied unit is devoid of consumer features found on most converters, including volume control, favorite/last channel recall, VCR timer, A/B switching and remote control. In addition, many operator features such as channel mapping and barker channels are no longer available. In a MultiPort scenario, the TV/VCR accomplishes all channel tuning—thus becoming truly cable-ready. It then delivers the tuned channels' baseband video and audio to the descrambler for descrambling.

The descrambler's control lock allows the TV set or VCR to use its output only when pay programming is being viewed. It can blank video and mute audio for an unauthorized channel or pass the scrambled signal through to the MultiPort-compatible device. The interface between the TV/VCR and descrambler is a 20-pin connector. This provides a baseband video and audio path to the descrambler with baseband video and left and right audio being fed back to the TV set.

The MultiPort also works in a Y/C interface environment. It significantly reduces the signal processing taking place in the home. In a MultiPort environment, the incoming signal no longer goes through the converter's demodulator and modulator. This removes a possible contributor to picture quality degradation.

In addition to A/V interface connections and associated grounding needs, the MultiPort allows for an eight-bit data communication format. The unit joins the communication port as support for impulse ordering. The port can be more broadly defined as the operator and subscriber link to the TV or VCR remote unit infrared code. Remote communication provides the subscriber with a path to the descrambler for impulse ordering authorization and purchase storage.

Going forward, the capability to communicate with the descrambler will permit the continued growth of interactive store-and-forward and real-time services. Unfortunately, most of today's MultiPort TV sets were manufactured before completion of the standard and do not contain this communication capability.

The exact in-home configuration of the MultiPort user's equipment depends on system design, the descrambler's capability and available consumer equipment. All addressable terminals require control and "tagging" or encoder data. Data transmission methods include out-of-band, delivery on the channel's audio carrier and in the vertical blanking interval (VBI). The current MultiPort standard allows for an envelope of the TV/descrambler audio path that does not permit the use of audio carrier data with many addressable systems. This leaves open the out-of-band and VBI data paths for descrambler operation.

An out-of-band data signal is required off the drop as well as the 20-pin MultiPort connector. Either splitting the drop and feeding the descrambler and TV/VCR directly or looping the drop through the descrambler, picking off the data stream and allowing the full cable TV spectrum to be output from the descrambler to the TV/VCR accomplishes this. VBI data will be, of course, delivered via the tuned channel. MultiPort standardization in no way restricts this.

"In a MultiPort environment, the TV/VCR accomplishes all channel tuning—thus becoming truly cable-ready."

The in-home configuration also will depend on the design of the descrambler itself. Baseband video and audio feeds would allow the consumer to use a MultiPort-equipped TV for the descrambler feed while feeding the VCR through the descrambler's A/V baseband outputs. In addition, in-home configuration and MultiPort needs will depend on the interconnective capabilities of the consumer equipment. Baseband audio and video output from the TV after the descrambling process also would greatly enhance the user's ability to simplify the system layout.

Improved customer satisfaction

The MultiPort should serve as a bridge to improved consumer satisfaction and higher revenue streams. Although it will take several years before MultiPort TV set penetration achieves significant levels, a strong push by all parties will minimize this delay.

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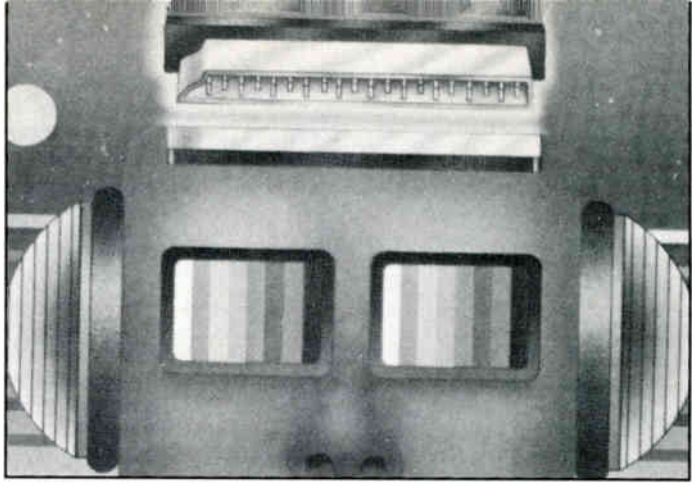
MultiPort and the converter upgrade



Geri Saye

By Anthony J. Wechselberger
Senior Vice President, Domestic Operations, Oak Communications Inc.

Much has been written over the past few years about the purpose and workings of the MultiPort interface. As an industry we have all been seeking a viable path from where we are to where we would like to be with the interface and associated TV and decoder hardware in the future. Many problems have been addressed along the way: mass compatibility, stereo, RGB-to-Y/C conversion, pay-per-view/impulse pay-per-view, etc. This article is directed toward the operator planning a set-top upgrade where an existing scrambling system is in place. Many times the decision for selecting new home terminal hardware is commensurate with many other upcoming tasks: plant upgrade and channel expansion, extent and strategy of fiber use, perhaps consolidation of remote hubs and/or scramblers and associated control computers. And always, the objective of net enhancement of consumer satisfaction is in mind: more feature-laden boxes, ease of use, improved reliability throughout the operation and higher quality pictures.

We find that "Are you doing the MultiPort?" is a frequently asked question by operators involved in upgrades, with all good intentions of being able to promote consumer convenience. And although the direct answer may be "yes," we also find that many operators don't recognize that their new box decision, in combination with upgrade plans and timing, may well preclude the use of the MultiPort for some period of time or even totally.

Backward compatibility

Most set-top manufacturers have for several years provided backward compatibility within their own evolving product lines with respect to scrambling technique and control equipment. This means that newer set-top equipment with new features is compatible with existing older equipment. We are in a situation today where most major metropolitan areas are cabled and have scrambling systems in place. In addition, much of this descrambling set-top hardware in use, both programmable and addressable, is several years old.

For hardware manufacturers, this means much of the new business opportunity lies on another vendor's turf. Hence, backward compatibility beyond one's own product line is an important and essential capability. Such multivendor compatibility is widespread today. So the incumbent supplier had better have a good track record with the customer to expect to vie for the new business. What this means to the operator is more flexibility and freedom in the next equipment selection.

But this freedom has hindered the adoption of the MultiPort. In the case of a box upgrade where the compatibility alternative has resulted in another vendor's equipment being selected, there will exist a rollout and turnover period during which the new boxes are going in and the old scrambling technique is still being used. The new system may not, in fact, completely come on-line for several years. So while a MultiPort decoder may be available for the new system, it probably cannot be used while operating

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in the "compatible mode."

The obvious next question is: "Why not build a compatible MultiPort?" One of the major goals of the MultiPort is to minimize hardware in the home; hence, small, inexpensive and simple are the objectives. Compatible-type decoders capable of descrambling multiple formats tend to go against this grain. If the scrambling approaches differ dramatically between the old and new systems, electronics to perform both kinds of descrambling must be present. This can get bulky, give rise to power supply/dissipation problems and get technically complex with respect to interface signals and AGC loops on the MultiPort interface with the TV set.

In addition, the concept of a compatible MultiPort complicates the manufacturing situation: What kinds do we build and how do we recoup the investment for such a temporary use? Here we're right back in a similar but distinct chicken-and-egg problem with respect to tool-up volume: Not only has the *total* MultiPort market requirement quantity for hardware vendors been a problem, but the question of compatible-type units further dilutes the numbers. While it is not the purpose of this article to discuss number justifications, the impact of model fragmentation is central to the theme.

In many cases the compatible-capable box also carries a price penalty for the operator. It's desirable to procure a minimum quantity of such units and get to the point where the "pure" new decoder need only be purchased. And in all cases, supporting compatible operation during vendor transition requires some degree of customizing or temporary change in old/new control system marriage, billing system, operations and/or box hardware because of a particular operator's requirement. These issues usually promote a desire for both the vendor and operator alike to get compatibility behind them if possible. Thus, the new box transition period is seen as a necessary evil but temporary condition. But as stated earlier, this may last several years.

The net result of a thorough analysis in preparation for a rebuild/upgrade—to the surprise and disappointment of the operator—may be that in the maelstrom of decision-making, buried within the tradeoffs was a de facto lid on MultiPort use for some period; i.e., the compatible operating mode period. This represents a chicken-and-egg situation for the operator. Compatibility may represent the preferred path into the future simply out of convenience, but not generally. In such a case, upgrading without compatibility by double-carrying scrambled channels, hub by hub or by massive box swapping (or some combination) may allow the new system to be quickly adopted and thereby open the door to MultiPort without delay.

But the need to avoid customer inconvenience, irritation and confusion is paramount, and many times compatibility is the only avenue available for a box upgrade. Channel capacity limitations and the age, value and sheer number of resident boxes also may force extended use of the existing system.

The answers here are no more easy than elsewhere in MultiPort use and availability. MultiPort decoders may be available for the outgoing system, but can operators justify buying what is for them dated technology and the built-in truck roll to get the new box installed later?

Putting the MultiPort into the equation

The purpose of this discussion is to prompt operators to recognize that in the course of a box upgrade impacting the scrambling system, from a MultiPort viewpoint, one must place the issue in the decision tree. After all the usual decisions have been made in planning such an upgrade, it's often too difficult or too late to back MultiPort into the equation. If as an industry we were not at such a critical point with respect to the (potentially) jaundiced eye of the TV set manufacturers, delay from the particular reasons previously discussed would be only through the compatibility period and thus temporary. But observations of the vast quantities of second generation addressable boxes going (or soon to go) into major metropolitan areas of this country undergoing some manner of compatible mode changeover shows the aggregate effect: delay of MultiPort rollout due to dilution of applicability at a critical time when that's the last thing we want.

Of course, the economics and operations impact behind an upgrade/rebuild situation are difficult enough without one more uncertain tradeoff to weigh. But we must at least acknowledge the effects of our decisions. Compatible operation *is* impacting MultiPort adoption; we should understand how and why.

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MultiPort strategic issues

By Walter S. Ciciora, Ph.D.
Vice President of Technology
American Television and Communications Corp.

Much has been written about the Electronic Industries Association (EIA) MultiPort. Very briefly, this plug on the back of selected consumer electronics products allows a descrambler to be plugged into the back of a MultiPort-equipped TV set or VCR. The principal advantage to subscribers is that they regain the use of the remote control purchased with the TV set or VCR. The use of the VCR's timer also is returned to the customer; as originally designed, the timer can not only turn the VCR on and off but also can control the channel being recorded.

As our industry contemplates a future with more (and more intensive) competition, it becomes critical to consider issues from a strategic perspective. Perhaps the least appreciated aspects of the MultiPort are its strategic advantages, which are described as follows:

1) *Customer satisfaction:* In a competitive environment, this is the most important strategic tool. It is a well-known marketing principle that satisfaction builds loyalty. This creates barriers to entry for would-be competitors. Not only are these barriers legal, they are also very effective. The first step to customer satisfaction is to eliminate those aspects of the service or product that frustrate and irritate the consumer. It is obvious to anyone who has tried to use a TV set and VCR on a scrambled cable system that the procedures are frustrating indeed. To those who have used the MultiPort approach, the increased ease of operation and the improved picture quality are a welcome relief.

2) *Low-cost provider:* Another strategy for dealing with competitors is to be the low-cost provider of comparable service. While there are many factors involved in the cost structure of a cable operation, the costs associated with in-home hardware are not insignificant. The MultiPort can be a help here, too. Since the plug-in module does not contain a tuner, remodulator, remote control circuitry or a channel display and does not require a pretty cabinet, its capital costs are considerably less.

Also, because of the significantly reduced complexity of the device, it is more reliable. Because heat is the main enemy of electronic components, the parts remaining in the module will be more reliable. They are not subjected to the heat normally generated by the parts that are non-essential (hence, removed). Repairs costs and truck rolls will be significantly reduced. At least two F-connectors are eliminated from each TV set and VCR served with a MultiPort unit. The service problems they cause also will be saved.

When the module is produced in volume, its costs may be low enough and reliability high enough that when an occasional failure does occur, the module can be thrown out. Since installation is simple, the subscriber may be willing to plug in a new one. From a longer term view, it may be possible for the subscriber to own the module once a secure enough scrambling technique is developed.

"It would be an unpardonable shame if the ATV receiver required a set-top."

3) *Competitive advantage:* The most important strategic aspect of the MultiPort is the fact that it allows a scrambled cable system to be truly consumer electronics-friendly. The cable can be directly connected to the TV set or VCR. Also, the cable provides the vestigial sideband/amplitude modulated (VSB/AM) signal the consumer electronics product was designed to accept. Direct broadcast satellite and digital telco video over fiber cannot do this. These require a set-top and all its consumer electronics interface difficulties. We must not squander this important strategic advantage we can have over our potential competitors.

4) *Advanced television:* As high definition TV and other forms of advanced TV begin to be considered, it is in our best interest that these devices be fully cable-compatible. It would be an unpardonable shame if the ATV receiver required a set-top. Being truly cable-compatible involves three things: 1) being able to tune all the cable channels, 2) being immune from direct pickup of broadcast signals and 3) not requiring a set-top. In scrambled systems, avoiding the set-top simply means having a MultiPort. No one has thought of a better way to accomplish this with scrambled signals.

5) *Single-source hardware providers:* The difficulties we have had in getting MultiPort modules from our traditional suppliers is evidence enough that an important future strategy with new scrambling systems is to avoid a single source for supply. Whether this means a scrambling standard or simply dual suppliers of hardware is not clear at this point. What is clear is that single-source supply can no longer be tolerated.

An investment in the future

While there are solid operational reasons to employ the MultiPort, there are the previously mentioned strategic reasons as well. All signs point to the MultiPort as an investment in the future.

AN OPEN LETTER TO THE MSO'S

Dear Mr. MSO:

After having recently returned from both the N.C.T.A. show in Dallas as well as the S.C.T.E. convention in Orlando, I am continually amazed at the number of engineers and construction personnel who are unaware that companies, such as ours, exist to handle their scrap cable and electronics. This is inexcusable particularly in light of the number of years we have been advertising, attending the trade shows and, more importantly, corresponding with the corporate and division offices of all the major MSO's.

Several basic factors contribute to this phenomenon. First, many of you are "decentralized." This usually means that the "buck" for deciding what to do with the scrap gets "passed" down the line to someone at the warehouse level. This brings up the next problem.

Unfortunately, many of the field level personnel who are responsible for the scrap are more likely to be found reading almost anything other than *Communications Technology*, *IT*, or any of the other trade publications. When the need arises to dispose of wreckout, partial reels of cable or other materials, these guys are naturally unfamiliar with whom to contact in this regard.

More often than not they wind up flipping through the Yellow Pages to find someone who is only going to charge the system to have these items removed. If they're smart they'll take bids on the materials. The problem then arises that the company they chose, based upon the highest bid rather than a check of their references, had either left their yard a mess or not paid for the materials they removed (some of which might not be scrap)!

The principal problem behind this entire issue seems to be that of money. As long as the MSO's are making lots and lots of money, who cares about a few tens of thousands of dollars of lost revenue from scrap...it's figured into the budget as "waste factor" anyway. With all the press that has been given to signal theft of the past few years, it's amazing what is continually overlooked in the field at every cable system everyday! Until individuals such as yourself, who read the trade publications, who do attend the cable shows and who should, therefore, know of the services and companies available, make a point of getting the word out to these guys in the field, you will continue to lose money. Until the corporate offices of the major MSO's, such as yours, take issue with the cable manufacturers' recent decision to discontinue handling recycled reels, your people in the field will continue to use their expensive labor to dismantle reels and then pay dearly to have them hauled to landfill (those that will still take them). Isn't it time to stop losing money, even if it's only a few thousand out of every million you make?!

Sincerely,

Tom Wood Jr.

Tom Wood
Owner/Resource Recovery Systems
Nationwide Purchasers of Scrap Coax & Electronics

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The consumer electronic bus and CATV

By James O. Farmer
Principal Engineer, Scientific-Atlanta

When I was growing up, our home was with the times. We had a ceiling light fixture and an electric outlet in every room, a telephone in the den and not one but two electric clocks. My kids are growing up in a house with more light fixtures than I can count, electric outlets every 10 to 12 feet, more phones than people and clocks I haven't discovered yet. The point is that we have become a people of many electronic conveniences to the point that our forebears would not recognize a modern house. Sometimes our own generation has trouble surviving in our electronic homes. No one knows this better than the CATV installer who has tried to explain how to use cable TV with an elaborate home entertainment setup.

A valiant attempt to improve the quality of our electronic life has been undertaken by the Electronic Industries Association (EIA), a trade organization composed of manufacturing companies and based in Washington, D.C. The activity, with the working name "CEbus" (a registered trademark), is under the auspices of the EIA's Consumer Electronics Group. The idea is a coordinated set of voluntary standards for communication between different devices made by diverse manufacturers. These allow various devices to "talk" to one another to coordinate (and we hope simplify) operation of the home.

For example, suitable CEbus devices would allow you to call your home from a touch-tone phone and tell your air conditioner the time it should have the house cool (it could then decide when to turn itself on), tell your microwave oven the time it should have the casserole ready, and tell your hot tub to be prepared before dinner. The hot tub will turn on the water heater (which has been off to save energy) at the appropriate time. You also could have your favorite relaxing music playing when you open the door.

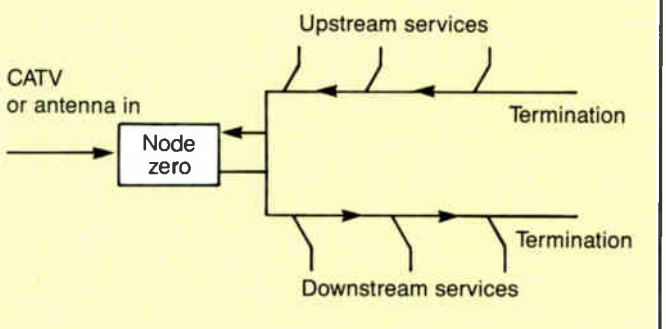
Perhaps this is a bit fanciful but it illustrates the nature of the CEbus activity. Before we talk about how the CEbus relates to CATV, we need to define what it is and is not. It is not a set of equipment specifications that define what a TV set, for example, does. It does not have the force of law but rather is a voluntary standard. The CEbus is intended to be broad enough to allow for orderly growth of functions as manufacturers feel the market needs. It does not require fancy equipment to be installed in a home, though some cabling and equipment may be required for use of some features. It is a complex standard intended to reduce the complexity of the lives of homeowners and give them features they don't have today. It is intended to do this while reducing energy consumption and increase safety.

The CEbus standard provides four major features:

1) the details of how to talk on five separate media
2) a method of talking between media automatically
3) a clearly defined language for use by each product using the CEbus
4) methods for conformance testing and future expansion

This article should be regarded as an interim report of the activities of the EIA committee. The standard is not yet cast in concrete (or rather the concrete has been poured but has not yet hardened), so changes are still possible. We'll refer to parts of the idea that are still in a state of flux. This is unnerving to some people but it is the way anything ultimately gets resolved.

Figure 1: CXbus physical architecture



Parts of the standard

The CEbus standard is divided into four parts or buses. Each can do some jobs better than the others but will share a common ability to communicate and coordinate activities. Each bus should be considered to consist of data channels and the control channel. The control channel is used for short messaging and to support each product's request to use one or more of the data channels. The buses are described briefly as follows:

1) *Power line (PL) bus*—This describes communication via power lines. The most common example today is the X-10 system of modules allowing you to remotely turn on and off lights and appliances through a controller that communicates over the power line. The CEbus specification will be a superset of the things that can be done today.
2) *RFbus*—This is of interest primarily to the people who manufacture garage door openers and wireless security systems. Of course, other applications can be added later.
3) *Single-room (SR) bus*—This defines a standard for communications via infrared energy (the common way we do remote control today). Today you can control home entertainment systems (including set-top converters) and even your ceiling fan. No doubt you have noticed that the consumer is confused by a plethora of incompatible remote controls. The EIA specification will allow any manufacturer to make a remote control transmitter that controls several devices. The manufacturer may choose what kind of devices to control.
4) *Wired (WI) bus*—This part of the standard defines communication via wired media and is today divided into the twisted pair (TP) bus and coaxial cable (CX) bus. In the future, fiber-optic cable can be expected to join the list. We will concentrate on the CXbus in this article, since this is the part of the standard, along with the SRbus, that most affects the CATV industry.

CXbus ground rules

The standard must accommodate not only the homeowner who wishes to distribute CATV signals throughout the home but also the homeowner without CATV service who wishes to distribute off-air or earth station signals. We also must accommodate in-home generated video (alphabet soup time once more: IHGV). Applications include transmitting VCR signals to other rooms and video monitors at (for example) the front door, nursery and pool. Transmission of digital quality audio and future high definition TV (HDTV) also have been contemplated.

The idea is to define a method of installation and materials such that installation can be successfully accomplished by someone with training similar to that of electricians. This precludes requirements that the system be custom designed. Electricians don't worry about the voltage drop in a particular circuit, nor do they worry about heating effects in a cable. Instead, they know that when installing a 20 ampere circuit they must use 12-gauge wire. The cable must meet certain specifications, but cable not meeting these specifications is generally not available to the installers. Someone has given a lot of thought to voltage drop, heating, abrasion resistance, pullability, long-term reliability, surge protection, release of toxic

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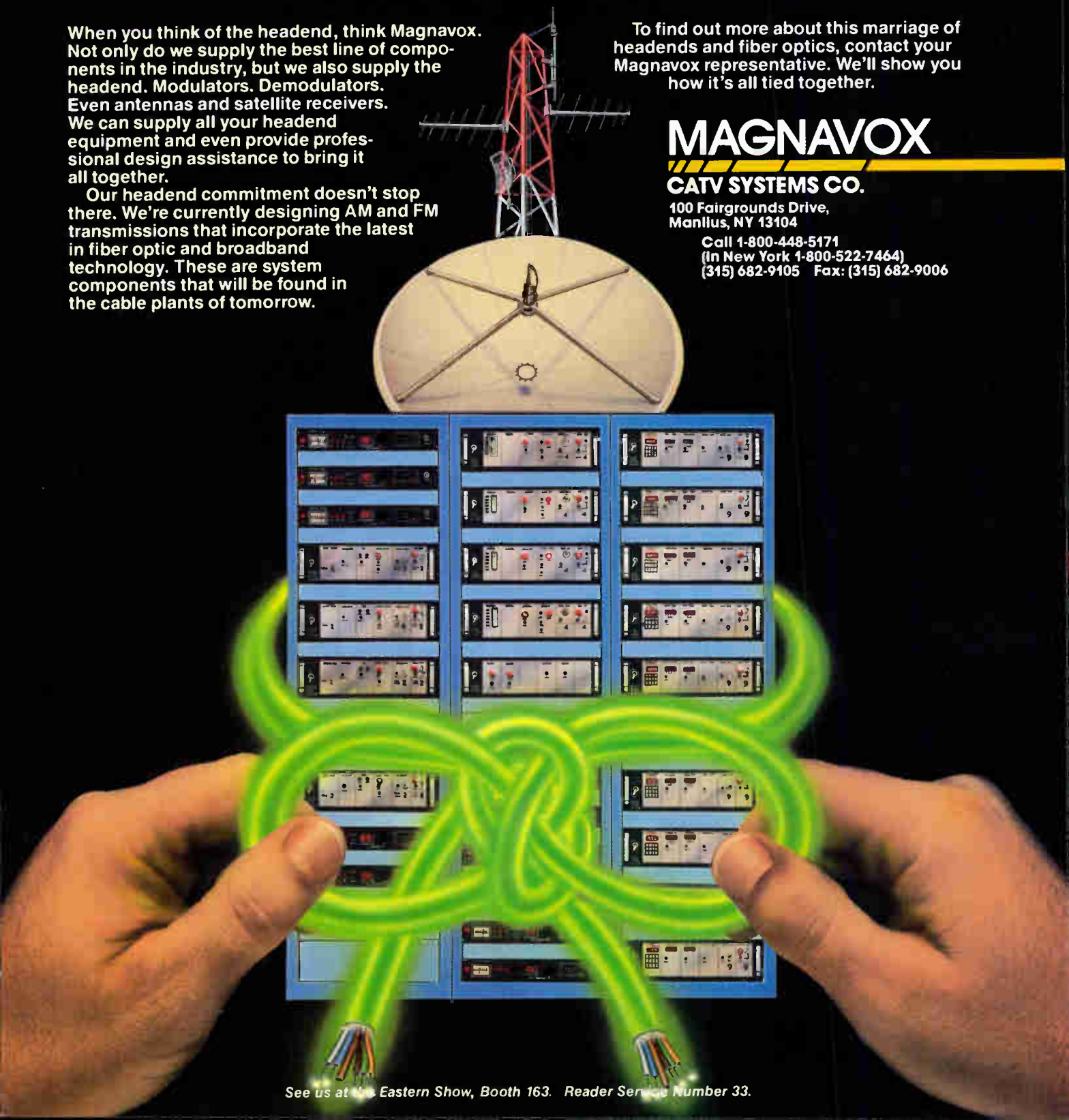

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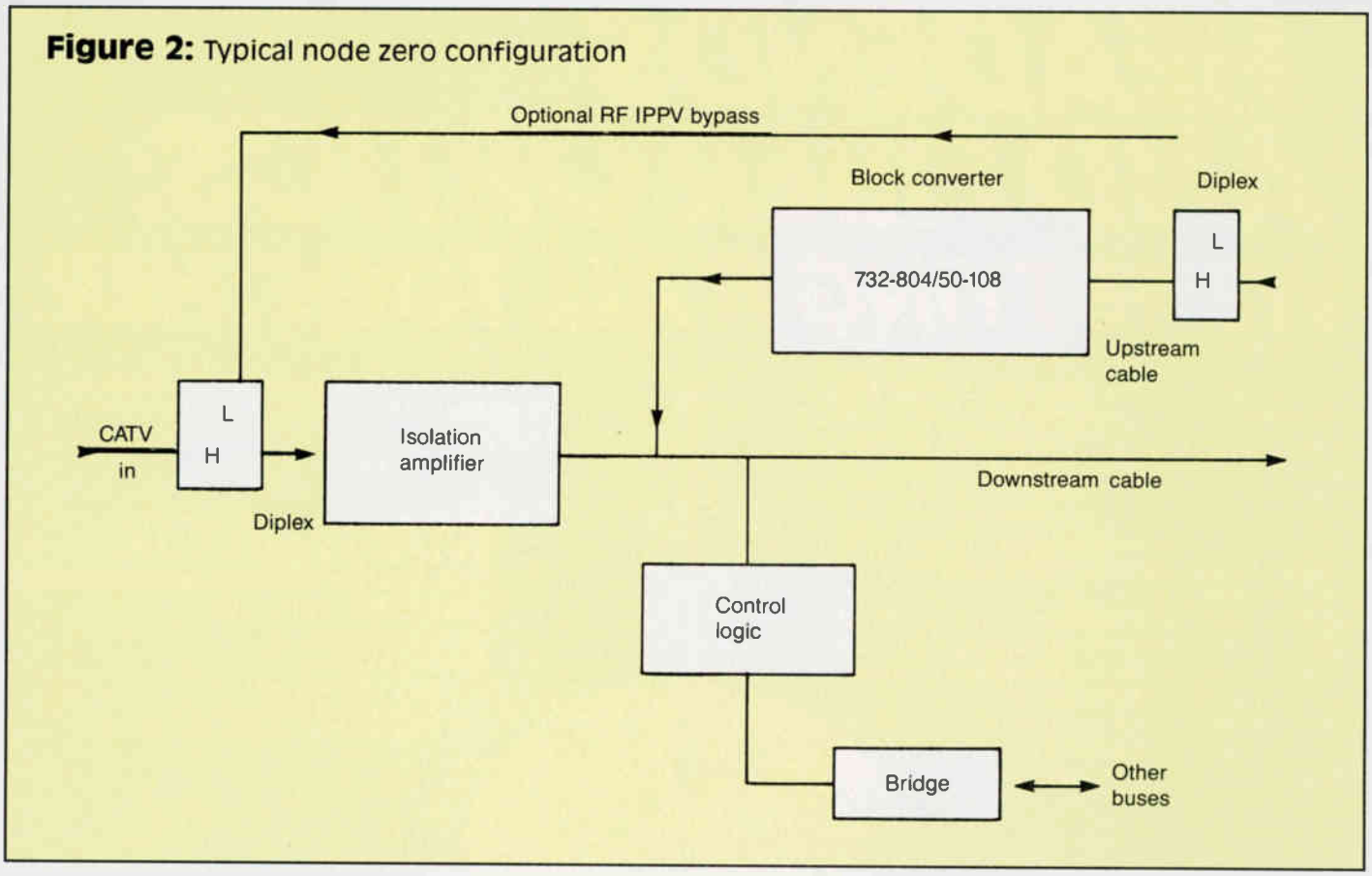
Figure 2: Typical node zero configuration



fumes in case of a fire and a lot of things I don't think of. But the person on the job is free to concentrate on doing an efficient installation.

Figure 1 shows the basic idea of the CXbus. It is a two-way system within the home, interfacing to either a one- or two-way plant or other video sources. The key feature is that the system is installed with multiple outlets. Homeowners may then plug in video equipment where they wish. They will not only have power outlets in each room and telephone jacks in many rooms, they also will have video jacks throughout the home. (We'll talk about the second outlet issue later.) At this time the system is planned to have up to 10 downstream and 10 upstream jacks without adding amplifiers. It may be extended with addition of an appropriately placed amp. The basic system accommodates up to 125 feet of RG-6 cable; this is adequate for most homes. Large installations may be expanded either by extending the upstream and downstream cables with amplifiers or by adding one or more additional runs from node zero.

The interface between the CXbus and the outside world (shown in Figure 1 as a CATV plant, the standard having been drafted by a CATV equipment supplier) is a device known as "node zero." I prefer to think of it as a home headend. Its function will change a bit from one installation to another as different functions are required. Incoming signals are amplified and isolated from the outside plant. At this time we do not anticipate correcting for tilt, though this could be done if required. Upstream signals from video sources within the house are turned around for transmission downstream. Power is added to support extension amplifiers. Some logic functions will reside in node zero.

Separate cables are used for the downstream and upstream paths. This architecture, rather than the CATV architecture of frequency diplexing on one cable, was chosen for simplicity and to permit use of current devices that do not meet CXbus standards.

Each outlet is a low-loss directional coupler. This was a key response to the restriction that the system should not be designed on the job. It was deemed unacceptable to require calculation of the value of a directional tap according to where in the system the tap was located. The cable is terminated at the far end of the run. Should system expansion be required either during initial installation or at a later date, an amplifier could be added at this termination.

Spectrum allocation

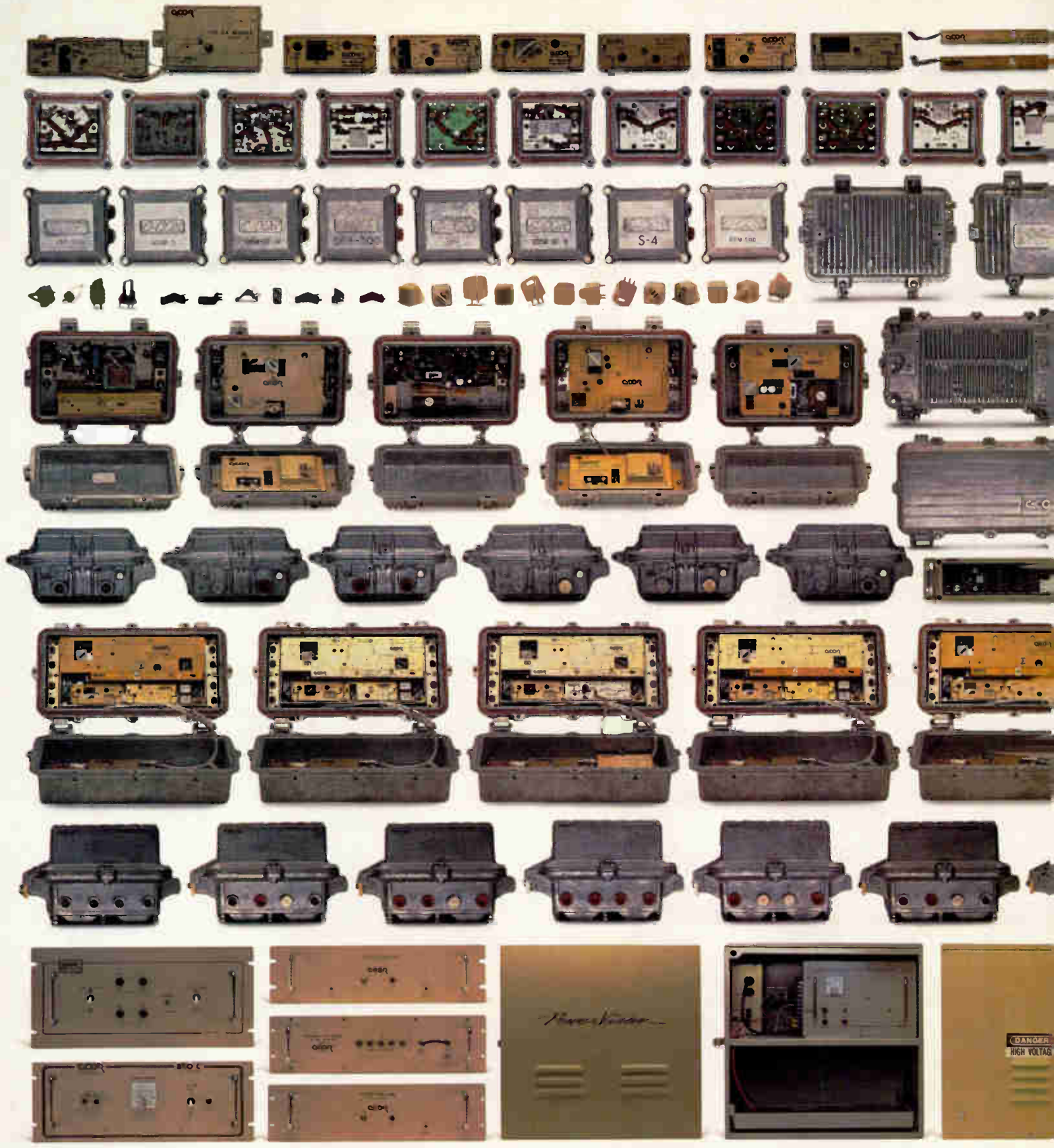
We cannot report the details of the spectrum allocation on the upstream and downstream cables because the committee has not completed work in this area. Generally, the idea is that power will be transmitted to downstream devices at DC. The CEbus control channel, which coordinates all users of the system, occupies the spectrum from 9 to 60 kHz. This control data appears not only on the CXbus but is bridged to and from other buses, such as the power line bus. Digital data is transmitted above this spectrum and can be used to send messages between CEbus devices. Data transmitted on the control channel coordinates use of the spectrum reserved for general data transmission.

IHGV is transmitted upstream on lower VHF frequencies. This was chosen to allow current products, such as VCRs with output on Ch. 3 or 4, to use the CXbus. At node zero, the video is translated to UHF for transmission downstream. Logic in the system will prevent use of UHF frequencies occupied by local broadcasters. Two channels are reserved for digital audio, though the format has not yet been determined.

The CATV sub-split spectrum is preserved to allow any signals from a set-top terminal or other device to be returned to the headend. A bypass diplexer in node zero allows the signals to pass to the CATV system. The cable operator may want to add a bandpass filter in node zero to prevent energy outside the required bandwidth from passing to the CATV system.

The standard acknowledges other video formats such as Super-VHS, which the homeowner may want to transmit in the future. Since standards do not exist, the format is left open so long as the signal occupies only frequencies reserved for video. The standard also anticipates high definition TV with the same restriction.

Figure 2 shows a typical node zero, configured for interfacing CATV signals to the CXbus. Signals from the CATV system are supplied to an isolation amplifier that boosts the level to that required on the CXbus and provides isolation to prevent IHGV from appearing on the drop. The IHGV, which appears on the upstream cable in the low VHF spectrum, is upconverted to above CATV distribution frequencies. It is amplified to match the level of signals from the CATV system, with possibly some extra level to compensate for higher cable loss at UHF. Then it is combined with the downstream signals. →



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A bypass for RF IPPV signals also is shown. This could be configured as a bandpass filter with amplifier or as a diplexer in the cable input. The gain in the in-home system will be approximately 0 dB.

Control logic provides system management, communicating in the band from about 10 Hz to 60 kHz. Information in this band appears on both upstream and downstream cables and appears on all other available bus media (e.g., PLbus). A bridge couples data between the CXbus and other buses; this is a device that transfers control channel messages from one bus to another. The control logic within each product performs such functions as assigning a talking device, such as a VCR, to an available channel on the upstream cable. A listening device, such as a TV set in another room, also is assigned to the appropriate channel to receive the transmission. Other listener devices might be told to not tune to this channel. Thus, the homeowner might instruct a CEbus VCR to send a program to a CEbus TV in the bedroom. The control logic would assign a channel to the VCR and would tell the appropriate TV set to tune to the corresponding downstream channel. The homeowner is thus relieved of the frequency coordinating task.

Downstream and upstream taps

Two variations on the downstream tap are being considered. In one variation, the tap is passive, consisting only of a 17 dB directional coupler configured to pass DC in the through-path. The data spectrum is transmitted in both directions from the coupler. Spectrum above 40 MHz is transmitted unidirectionally as in normal directional coupler applications. The TV signal level delivered should be at least 0 dBmV. This requires a level on the downstream cable of +17 dBmV at the end of 10 taps and 125 feet of coax. Allowing for 5 dB coupler loss and 9 dB cable loss, node zero must supply +31 dBmV.

The advantage of passive taps is that the tap cost is lower. Since only one amplifier (in node zero) is used, more money can be put into an amp with low distortion and noise figure. On the other hand, the signal level required on the cable is relatively high, though below +38.75 dBmV, as required by the Federal Communications Commission to avoid using offsets on distribution plant.

In the other variation of the downstream tap, an amp is placed at each tap. This allows a lower signal level to be carried on the downstream cable because the directional coupler can deliver a lower signal level, which is then amplified. Of course, the signal level cannot be too low or thermal noise will prevent delivery of a good carrier-to-noise ratio. In this case, the amp will not be required to handle much signal level—perhaps a maximum of +10 dBmV out—so distortion will not be a problem. On the other hand, low noise figure will be critical. In either event, the amp will have to handle a bandwidth of 40 to 800 MHz.

Similarly, the upstream tap can be either passive or active. If the tap is passive the output level from the device generating IHGV will have to exceed +9.5 dBmV, currently the FCC maximum. On the other hand, active taps in the upstream direction will require more amps in the system. However, only one upstream amp will be in any signal path. Noise funneling is a potential problem, but the number of active devices is still low compared with a reverse CATV system.

CXbus and the cable operator

So how does this affect the cable operator? The standard allows consistent pre-wiring of homes under construction in a much more consumer-friendly way than what we can do today. This can be expected to increase the interest in pre-wiring new homes, generating a good pre-wire business for operators who participate. As installers learn to pick locations for coax outlets, the issues of moving drops should virtually disappear. You will be able to install cable in a home, knowing that you will probably not have to add more outlets in the future.

Perhaps the greatest boon to the operator will be that homeowners will not be as tempted to do their own second set hookups, using zip cord or whatever they find. Thus, we should see a reduction in leakage from poorly installed extensions. Further, the CEbus concept truly allows the operator to provide services to the entire home instead of one or two places in the home.

A reservation sometimes expressed is that the increased size of the in-home distribution plant, compared with today's systems, will result in more leakage, beyond the control of the operator. Yet, according to FCC rules, the operator is responsible and must disconnect service if excessive customer-caused leakage is detected. On the other hand, today many homeowners are adding extension outlets themselves, using who-knows-what material and techniques. With CEbus, homeowners will not be as tempted to extend the cable because the extensions will already be in place. The installer will have had access to a coordinated set of materials that, when installed properly, can ensure trouble-free service. Thus, we expect that the incidence of leakage from inside the house could drop.

Some operators also are concerned that the CEbus will spell the end of extra outlet charges. This is true, but many operators are now adopting a philosophy of serving the entire home, as power and telephone companies do now.[1] Many years ago the phone company served one phone, which it supplied and connected. Now it delivers a dial tone to your home and what you do with it is your business, as long as you don't cause problems with the phone network.

Some regulatory issues must still be addressed before CEbus is completed. We are designing it to account for the known and feared leakage issues. We anticipate that we will be able to reach an accord with the FCC before the standard is finalized.

An earlier version of the CXbus had IHGV occupying a portion of the spectrum used for CATV transmission. This has now been dropped in favor of a frequency translation scheme at node zero, which preserves CATV transmission frequencies. RF impulse pay-per-view will work as it does now, with the upstream cable returning data to node zero, which can pass it to a two-way plant.

Some are concerned that the additional amplifiers will add excessive distortion, particularly in a system that is already marginal. In the downstream direction, only one additional amplifier is added; its operating level is low compared with levels in a distribution plant. Prototype specifications call for a system carrier-to-noise level of 52 dB minimum, which will reduce an incoming C/N of 46 dB by 1 dB. Composite triple beat is specified at 55 to 56 dB, which would degrade an incoming CTB of 50 dB by 1 dB.

Reference

[1]Karen Edlitz, "Prices May Fall for Additional Outlets," *Cable World*, May 22, 1989.

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The off-premises solution

By Joseph D. Rocci
Vice President of Engineering
AM Communications Products Division

When our industry began over 35 years ago, the market forces shaping its development were very different than they are today. In the early days, cable TV was a "signal fringe" phenomenon. TV sets were capable of receiving only 12 channels; most large population centers already had a few VHF off-air stations. The systems of the day were only capable of transporting a handful of channels anyway, so cable TV brought very little benefit to the masses who lived near the big cities. Consequently, our business had its roots in the outlying areas—the small mountain communities, the seashore resorts and other fringe areas.

In those early days, cable was very much a "basic only" service; the satellite delivery systems that spawned the modern CATV explosion were still a glimmer in the eyes of rocket scientists. Nonetheless, by the early 1960s, the information age was off and running and television had become part of the fabric of American home life. Communities that wished to participate in this new American dream allowed their streets and homes to be wired by companies that undoubtedly enjoyed a very high penetration rate for basic-only service. They probably had scattered cases of signal piracy even then, but these were isolated instances within a relatively stable subscriber base.

In the summer resort communities, though, a new kind of market force developed: churn. Every spring operators had to roll the whole fleet of trucks to do summer connects; every fall they rolled again for the winter disconnects. In this frenzy they often forgot to do some disconnects. This is how the "passive signal pirate" came into existence long before the age of pay services.

During the mid-1970s, a confluence of technical advances led to a major reshaping of market forces. Product development engineers had figured out how to push 20 and then 36 channels through one piece of coaxial cable. Rocket scientists had figured out how to reliably boost large communications satellites into high stationary orbit. Programmers based exclusively on the potential of this new technology appeared almost monthly. The age of multipay was born. In a frenzy of wiring, CATV with its skyrocketing revenues marched out of the back woods and into the growth plans of every U.S. community.

In the explosive growth that followed, many operators were realizing huge profits—not only due to subscription income but because of the phenomenal capital appreciation of their systems. Theft-of-service was acknowledged as a festering problem but it was largely overshadowed by escalating profits.

Winds of change

It's almost 1990 and the winds of change are blowing once again. The areas with the largest income-generating potential are either wired or will be within a few years. And where will incremental revenues come from? Most operators now realize that future revenue growth will spring from more efficient operation of existing plant. Plus smarter marketing, higher basic rates, better penetration, minimizing the costs of churn and spin as well as two very hot topics in the industry today: converting pirates into paying customers and maintaining customer satisfaction.

Over the years, the product development engineers have given us many different devices to secure our pay services. The lowly negative trap, one of the simplest, cheapest and most widely used devices, is also one of the first and most effective forms of off-premises security. Short of climbing the pole and tampering with the trap, there simply isn't anything a would-be pirate can do to receive a channel if it just is not there. Unfortunately, it has some shortcomings that make it less than desirable in a world of multitiered packaging and pay-per-view.

And so, in the mid- '70s, engineers came up with the idea of scrambling the pay channels and supplying these customers with a descrambling device that could be reprogrammed a little more conveniently than a trap. There were all kinds of scrambling: channel inversion, pulse sync suppression, sine sync suppression, three-level sync suppression, frame video inversion and random line video inversion.

Descrambling devices took many forms: one- and two-channel pole-mounted versions with set-top selectors, one- and two-channel set-top standalone versions and even baseboard-mounted versions with mousetrap springs to physically self-destruct in the event of tampering. Then there were the converter-based descramblers: converters with scratchboard programmable descramblers, with PROM programmable descramblers and even underconverter units.

While all this technology was developing, the industry was in an incredible growth phase. Where there is rapid growth, there is confusion. Where there is confusion, there are business opportunities. Many technically oriented subs could not resist the opportunity to tinker with these fascinating boxes in the privacy of their own homes. And it wasn't long before instructions for defeating each one of them appeared. Dealing in modified descramblers became a cottage industry plaguing us to this day.

In the 1980s, the marketing folks were swept completely off their feet by the concept of multitiering. The idea was that, if you could offer your pay services in tiers representing every possible permutation and combination, you should sell more pay services. At the same time, product engineers were swept off their feet by IC technology, convincing the marketers that every set-top should have a built-in microcomputer so that service could be controlled remotely. The addressable converter was born.

The only problem was that it was based on the same scrambling and descrambling technology that the signal pirates had already figured out. Nonetheless, the idea flourished and soon millions of American homes had little brown boxes atop their TV sets. Bootleg converter vendors were making money faster than they could take it to the bank.

So then came the idea for an off-premises converter. Product engineers said, "If we put a big box on the pole with converter components for, say, eight subscribers, there would be no way anyone could ever defeat it." Three companies launched a major effort to perfect this device; one even promised a fiber-optic drop. As a result, all three lost a lot of money on the off-premises converter in the next two years.

We have gone through many iterations of signal security technology in the past 15 years. Yet we do not have an addressable delivery system as secure as the trap we started with. And, on top of it all, the very concept of a set-top converter is being made obsolete by the large population of cable-compatible TV sets. A ground swell of subscriber resentment has developed because the set-top is now a hindrance to the subs' full enjoyment of their sophisticated TV sets and VCRs.

Off-premises addressability

Currently there is a great deal of interest in the development of off-premises addressable devices. These can take many forms, but the ultimate embodiment is probably the "smart tap." This is an addressable strand-mounted device that can, at the very least, turn the basic service

for individual drops on or off by remote control at the office. While this type of on/off service might not seem too exciting, it does go a long way toward eliminating connect/disconnect truck rolls, basic service piracy and "passive" pirates (in high churn areas).

Other kinds of addressable taps (either a trap or a jammer) offer a simple, definitive solution. The addressable trap is simply a tap-type device with built-in traps for each drop; the traps can be remotely turned on or off. The jammer, often called "interdiction," is a tap-type unit capable of providing interference on unauthorized channels on a drop by drop basis. Either of these devices provide effective security, but the jammer can be configured so that pay channels can be added or changed by remote control. Since it is mounted outside the home, there is very little that a pirate can do to defeat it.

All of the addressable tap varieties mentioned have the added advantage of being consumer-friendly. Subs can use the cable-compatible TV or VCR to the fullest of its potential.

New set of tradeoffs

But with this technology comes a new set of tradeoffs. In going off-premises, we have to concede that our business is basically a utility service. Hence, we have to think of our customers the same way that the other utilities do. This means that we bring controlled service up to the house; what subscribers do with it after that becomes their business. If they want to split it six ways, there's not much we can say about it. This spells the probable end of income from additional outlets.

We also have to concede a higher monthly electric bill to run all these little wonders. Yes, subscriber powering is possible, but it's loaded with technical pitfalls and, most imporantly, it puts you right back into the in-home equipment installation and maintenance business.

Pay-per-view is another issue that cannot be overlooked when considering off-premises equipment. Product engineers could easily develop some simple set-top keyboard unit to do the job, but why? Again, any in-home equipment completely negates the major advantages of off-premises delivery. Every home in the country already has the best data set in the world—the telephone. Using an ANI (automatic number identification) service offered by many phone companies, subscribers can participate in true impulse buying. You don't have to install a single piece of equipment to get it.

It should be recognized that no off-premises technology yet developed can co-exist with a cable system using scrambled signals. And a sorry but unavoidable fact is that the decision to invest in addressable converters is not something one can back out of gracefully. On the other hand, trap-based systems will find that off-premises technology can be easily phased in over any time frame desired. A hybrid system is not only feasible but already has been done.

Marketing personnel will want to know all the cost/benefit tradeoffs before making a decision about any new pay TV delivery system. They usually like to make comparisons to the addressable converter option and talk about things like up-front capital requirements, cash flow models and return on investment. Ideally, they'd like to incur the capital expenses on an as-needed basis yet have full flexibility to do what they call "creative marketing" from Day One.

Well, some new mindsets are going to be needed here, too. The good news is that addressable converters only need to be installed in homes of pay service subscribers. The bad news is that, at an average cost of about $100 per box and an average wired TV set population of 1.5 per household, the real cost of the converter is about $150 per subscribing home (1.5 × $100) and doesn't change much as penetration improves.

By comparison, the addressable tap averages about $100 per "installed port." But it really doesn't make much sense to install any less than one port per passing at the very outset. Assuming an average initial penetration rate of 60 percent, the up-front cost of the off-premises option then averages about $166 per sub and will tend toward $100 as penetration approaches 100 percent.

With today's penetration rates, the off-premises option is slightly more expensive on average. The up-front capital requirement could be almost twice as high because ports are installed for every passing. Of course, systems that are presently using negative traps can substantially reduce this "cash shock" by phasing in off-premises devices when traps are replaced. ■

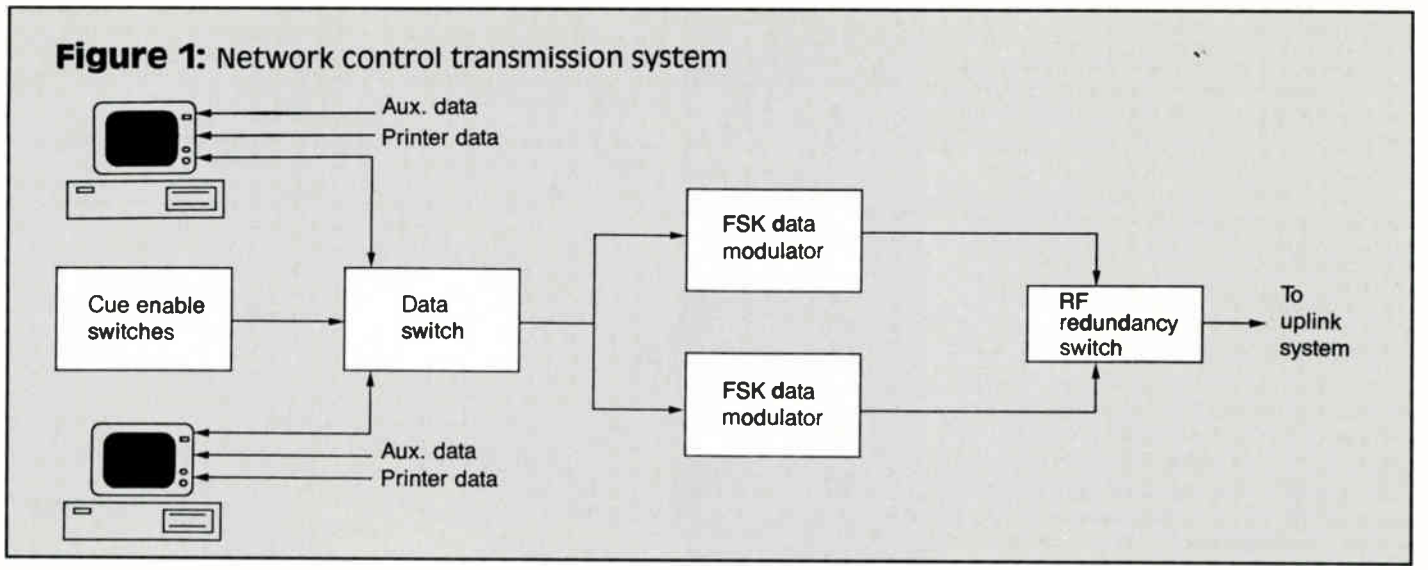


Figure 1: Network control transmission system

Network communications and control

By Steve Fox
Marketing Manager-Cable, Wegener Communications

As an increasing number of cable TV networks are providing local ad availabilities, network requirements have become increasingly complex. In the days of combined network/local ad insertion, networks needed only to transmit periodic cues to the headend to signal preroll and return to network switching times. They also sent their affiliates occasional information by mail. This still holds for many programmers.

Others have found, however, that their needs now go beyond basic cue transmission. These new requirements include the ability to generate multiple cue sequences, tiering of local avail opportunities, addressing and the delivery of real-time information to their affiliates. An increasing number of programmers will need to develop these additional capabilities as they further develop local ad insertion. The Network Communications and Control System (NCC) was developed by Wegener to provide networks with these capabilities. It is currently used by ESPN, CNN, Headline News, TNT and CNBC.

The NCC serves the programmer as a multiple function one-way network interface with affiliates. It consists of a network computer control subsystem with custom software written to accommodate the specific functions required by the network, digital subcarrier transmission components and headend demodulation equipment. The use of software control architecture allows the network to define and alter its capabilities as required and accommodates system expansion.

Transmission is via a FSK (frequency shift keying) digital subcarrier above video on the network's satellite transponder (Figure 1). Although the system can use any subcarrier frequency in the 5.4 to 8 MHz spectrum, networks currently using NCC transmit at a frequency of 7.3575 MHz. As the resolution of this frequency implies, the NCC subcarrier is very narrow in bandwidth (occupying 32 kHz) and can be used on a scrambled or non-scrambled transponder. The transmitted data rate is 14.4 kilobits per second (kbps) and includes all data required to operate the system to its fullest capabilities.

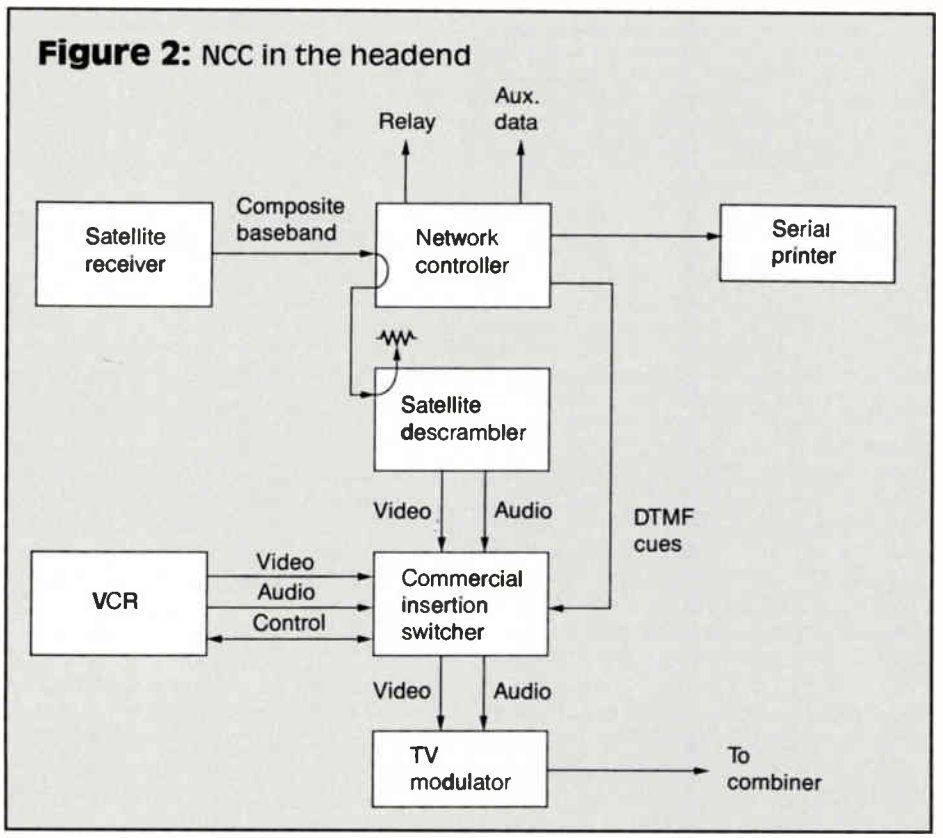


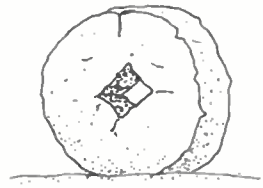
Figure 2: NCC in the headend

System capabilities

The capabilities used by a particular network are dependent upon the transmission system software package utilized but may include the following:

1) *DTMF cues*—The NCC is capable of generating at the local affiliate headend any number of DTMF (dual-tone multifrequency) tone sequences, allowing the network to generate a different cue for each function required. Examples of multiple functions include receiver switching between satellites or transponders, local ad insertion and tiered cueing. Tone frequencies, tone duration, pause duration between tones, preroll times and the number of tones in a DTMF cue string are all controlled through the transmitted data stream.

2) *Printer interface*—Since this is a digital system, data can be sent to local affiliate printers. This might include program updates, electronic mail or other information. It represents a cost savings to the programmer while allowing infor-



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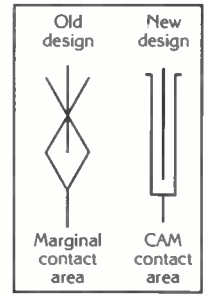

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mation to be delivered immediately to the affiliate. The printer may be in the headend or remotely located, ensuring the information is received by the cable system where it is needed.

3) *Relay*—A relay in the headend data demodulator can be energized upon command from the programmer for blackout switching, receiver switching or other requirements. This relay is locally configured for normally open or normally closed operation.

4) *Auxiliary data interface*—This is available to the network to send commands directly to the next generation of local ad insertion switching hardware. The protocols for this interface are currently being developed by the National Cable Television Association's Engineering Subcommittee on Advanced Signalling and Control.

5) *Addressing*—A powerful addressing scheme allows each function (DTMF, interfaces or relay) to be controlled independently from the uplink. Three types of addressing are incorporated: global, group and individual.

- With global addressing, one or more specific functions are transmitted to all affiliates simultaneously.
- In group addressing, a particular affiliate can be assigned to up to 4,096 individual groups. A group may consist of all affiliates of a specific MSO, all those receiving certain programming, everyone in the northeast, anyone who has or has not paid their affiliate fees or any other assignments defined by the programmer. To address a particular group, the command from the uplink is preceded by the group number. Groups are assigned or changed by command from the uplink and automatically stored in RAM by the demodulator. The network controller used in the affiliate headend includes an onboard battery to maintain addressing and other information in the event of a local power failure, eliminating the need for constant data refreshing by the programmer.
- In individual addressing, one or more specific functions may be addressed to a single affiliate location. The system will accommodate up to 1 million individual addresses.

6) *Additional software features*—Custom software functions available to the programmer include automatic refreshing, data base management and report generation, automatic command and schedule generation from internally stored tables, automatic interfacing with remote devices, and a multitask operating system.

Headend equipment

The network controller is used at the headend to receive the incoming data stream and provide the output signals required by the local system. It is a microprocessor-controlled data demodulator/demultiplexer and contains software to utilize all of the features of the NCC, regardless of which particular functions the programmer is capable of providing. This allows the network controller to be used to receive commands from any programmer using NCC or to be interchanged among programmers without modification.

The controller is installed in a Series 1600 mainframe, which provides power and input/output connections to external equipment (Figure 2). Composite baseband from the satellite receiver is terminated into the controller or is looped to the VideoCipher descrambler, if used. Locally generated DTMF is output to the ad insertion switcher, while data is provided to a local or remotely located printer. Other output interfaces are utilized as required.

The DTMF output is generated onboard the controller from data commands received from the uplink. Cue sequence, duration and other parameters are defined by the incoming data signal, eliminating the possibility of false triggers to the ad inserter. The controller includes a front panel potentiometer to adjust DTMF output level and LEDs to indicate normal and alarm conditions.

Data to the local printer is serial in format and at RS232 levels, allowing the use of a standard serial printer. Data is transmitted at 300 bps. The interface consists of data and ground only, with no handshaking required between the printer and the controller. A shielded twisted pair can be used in making the interface between these devices. The auxiliary data interface is also a serial RS232 signal with no handshaking required; the data rate is 9,600 bps.

The microprocessor onboard the controller includes software for local testing. When in the test mode, the controller will sequence through its DTMF output range, exercise the onboard relay and send messages to the printer interface. This ensures proper system installation and allows operational testing at any time.

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Reader Service Number 65.

Preventive maintenance of commercial insertion

By Doug Greene
Technical Supervisor, Jones Intercable Inc.

Since commercial insertion systems are integrated into the audio and video feeds of the headend, the chief engineer must be aware of the need for preventive maintenance (PM). In addition, advertising sales are a major source of revenue; if the ad insertion equipment is not dependable, it can result in losses for the cable operator.

For these reasons a regular PM program must be implemented to help guarantee reliability with minimal downtime. There are two major areas of PM we will discuss: controllers and videotape machines.

Today's controllers are very reliable and require a minimum amount of maintenance. However, some ad insertion systems use a backup battery (usually lithium) inside the controller. This battery can last up to 100 hours with no AC power applied to the unit. Depending on how often and how long power outages occur, the battery may need to be replaced every three or four years. If the headend is prone to several outages a year, it may be necessary to change the battery more frequently.

As with most microprocessor-based equipment, outages may cause a controller to lock. If the location of the ad insertion equipment is plagued with outages, brownouts and surges, it may be advantageous to invest in an uninterruptible power supply. But with this exception, controllers are generally maintenance-free.

PM for videotape machines

Unfortunately this is not the case with videotape machines. A good PM program is required due to the constant mechanical demands on the machine's parts. PM should be done on all videotape machines at least twice a year, depending on their operating hours (consult the manufacturer's manual for recommended PM schedule). Extensive maintenance usually cannot be done in-house due to the complexity and cost of the test equipment involved. However, the following are some guidelines that can be performed by staff:

1) *Observational checks*: The engineer should make visual checks weekly for worn pinch rollers, tape guides and heads. The wearing of rollers is visible by the cracking or deforming of their shape. Rollers that appear glazed over should be replaced. Watch for tape particles, which usually indicate a worn video head. Become familiar with the threading of the tape and note any abnormalities in the machine's operation.

2) *Cleaning*: The heads and rollers should be cleaned daily with liquid freon, denatured or anhydrous (containing no water) alcohol. When cleaning the heads, do not use a cotton swab that can fall apart or leave fibers behind, since this could cause a malfunction of the head or tape; a chamois can work equally well. Clean the head by moving the chamois only parallel to the heads' direction of travel; otherwise, the head could be damaged. And don't forget to clean the audio and control heads. Also, it is wise to clean the tape guides, stationary heads, drum and capstan shaft.

For other maintenance on videotape machines, a service center may be required. The following are some guidelines for the service personnel:

1) *Head degaussing*: It may not be necessary to degauss every time the machine is sent out for maintenance. However, if popping is heard in the audio track, degaussing should be done to remove residual magnetization.

2) *Tension and detector adjustment*: The forward back tension should be checked on the tape player every 1,000 hours. The proper positioning of the tape arm also should be checked. Sensors ensure that the correct tension is applied to the tape; these should be checked every 500 hours. If replaced, the sensors should be rechecked and adjusted.

3) *Head replacement and optimizing*: Most manufacturers recommend that heads be replaced every 1,000 hours. Occasionally the heads should be optimized due to aging and wearing; this includes equalization, playback RF levels and balance, and record currents (Y, chroma and erase—if the machine is a VTR). A recommended schedule for optimizing is 200, 500 and 750 hours.

4) *Belts*: Replacement of belts, such as for the threading and cassette motor, should be done every 2,000 hours.

5) *Pinch rollers*: The life of pinch rollers can vary, depending on how often the tape player is used and how often the rollers are cleaned. A good replacement schedule is every 1,000 hours.

6) *Bend assembly and brakes*: These should be replaced every 2,000 hours. A good indicator of wearing out occurs when forward back tension can no longer be adjusted or controlled properly.

As you deal with service centers, keep track of maintenance records; it is important that everything be documented. This will allow you to analyze what machines or parts are causing the most problems and will help in determining the operating cost of the system. Documentation may indicate repeated repairs or show consistent failure of machines after maintenance has been completed.

Environmental factors

If at all possible, operate the ad insertion equipment in an environmentally controlled area. To keep electronic failure to a minimum, adequate air-conditioning is a must. An electronic air cleaner can reduce dust and foreign particles in the air that fall onto the tape and machine heads.

Reference

NAB Engineering Handbook, Seventh Edition.

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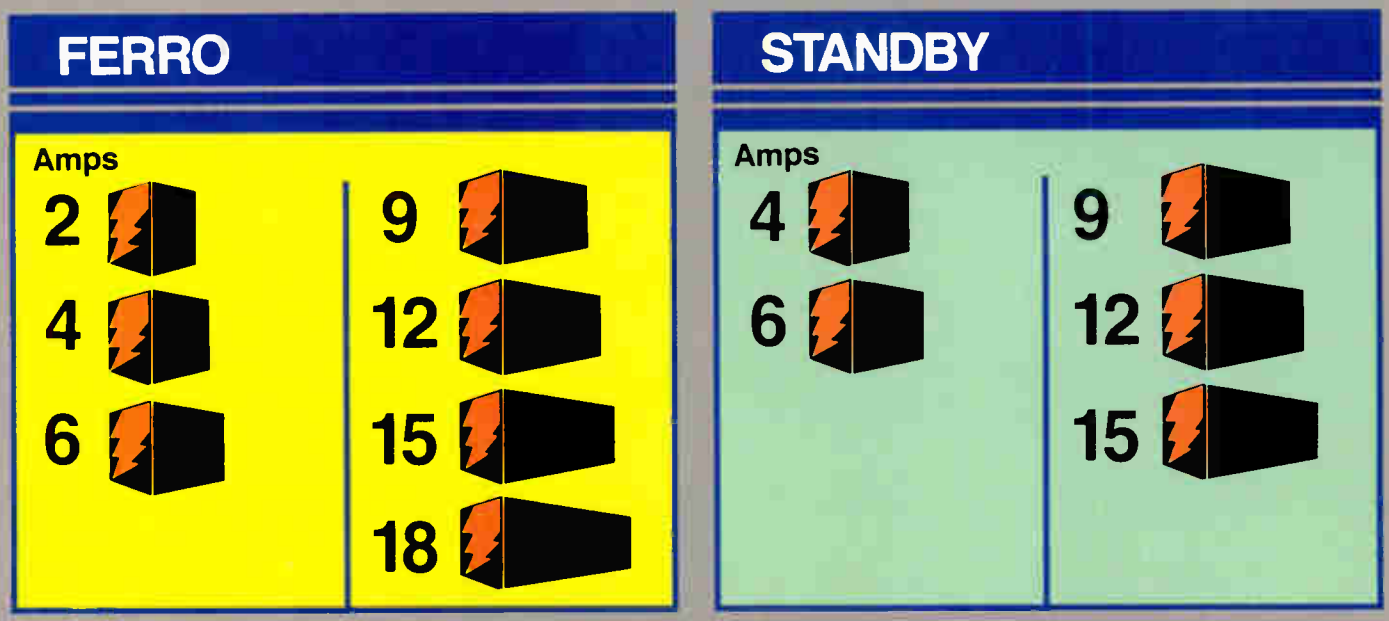

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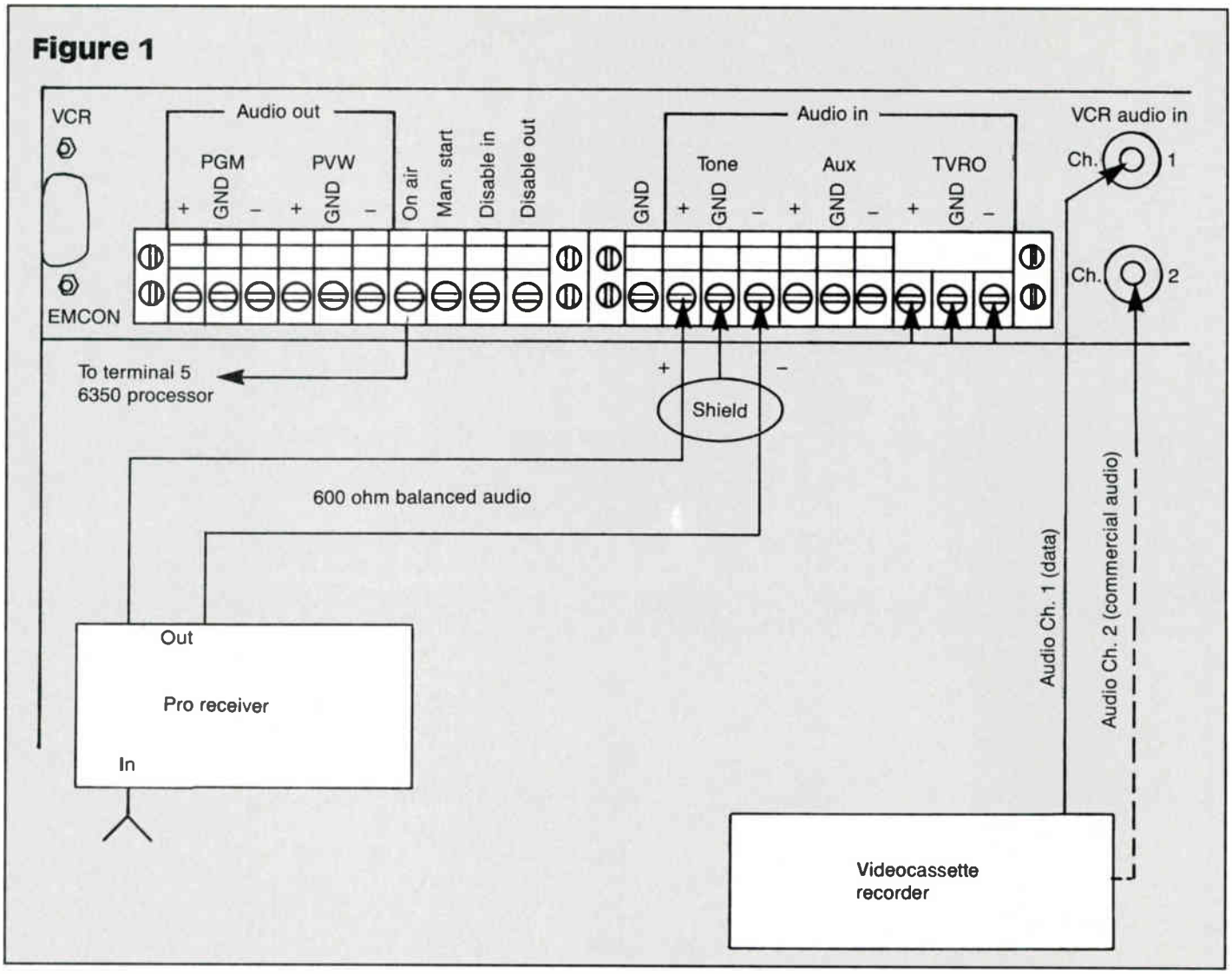
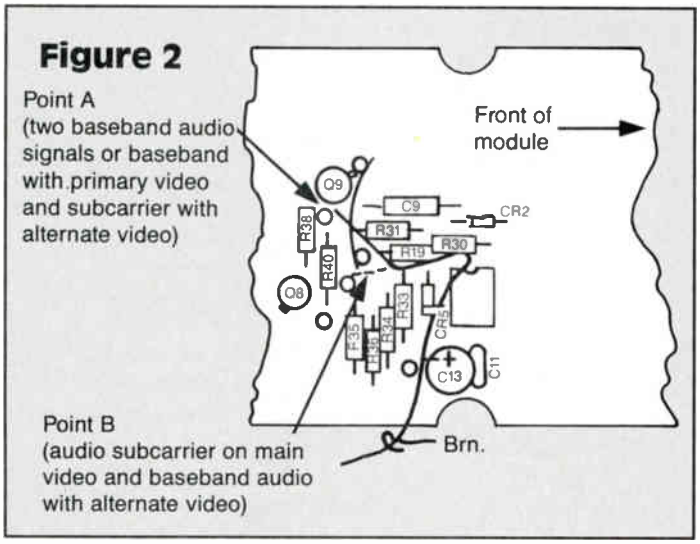
Figure 1



Ad insertion and the 4.5 MHz audio subcarrier

Figure 2



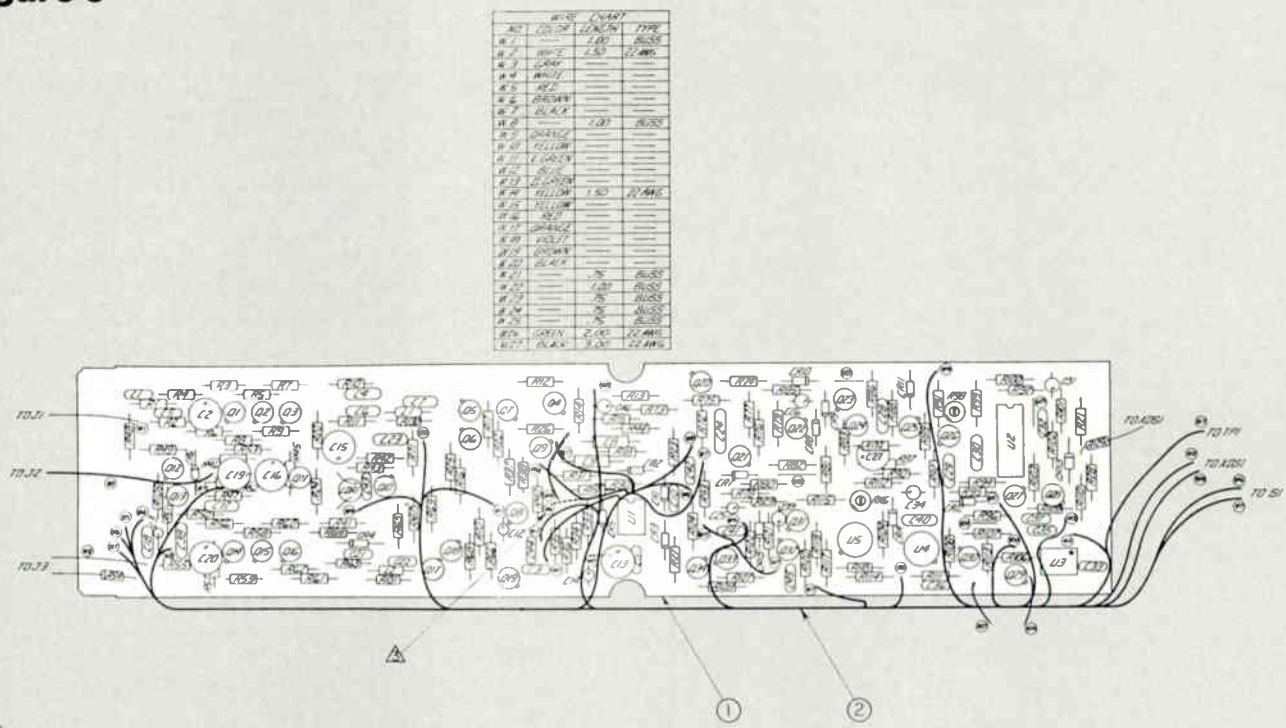
By Billy Williams
Line Technician, Cooke Cablevision

We were given permission to do local ad insertion on a network affiliate that we had brought in on microwave. The microwave receiver output video includes a 4.5 MHz audio subcarrier, so we do not lose the BTSC stereo that the network affiliate broadcasts. The cue tones for ad insertion are being sent on the BTSC professional (pro) channel.

The Scientific-Atlanta (S-A) 6350 modulator we are using has a video switch/AGC (automatic gain control) option in the chassis. To configure the modulator to accept 4.5 MHz audio subcarrier, Pin 13 on the rear chassis barrier strip has to be connected to Pin 16, which is ground. This enables the audio module to process 4.5 MHz audio subcarrier instead of baseband audio.

With this information, we obtained and installed a Johnson pro-channel receiver and a Channelmatic Spotmatic Jr. (Figure 1). S-A's instruction manual told us to reposition a wire in the video switch/AGC module from Point A to Point B, as shown in Figure 2. This changed the output on the barrier strip (Pin 6) from high to low. When a ground is applied to Pin 5 on the barrier strip by the Spotmatic Jr., Pin 6 on the barrier strip then will change from low to high. Then the jumper between Pins 13 and 16

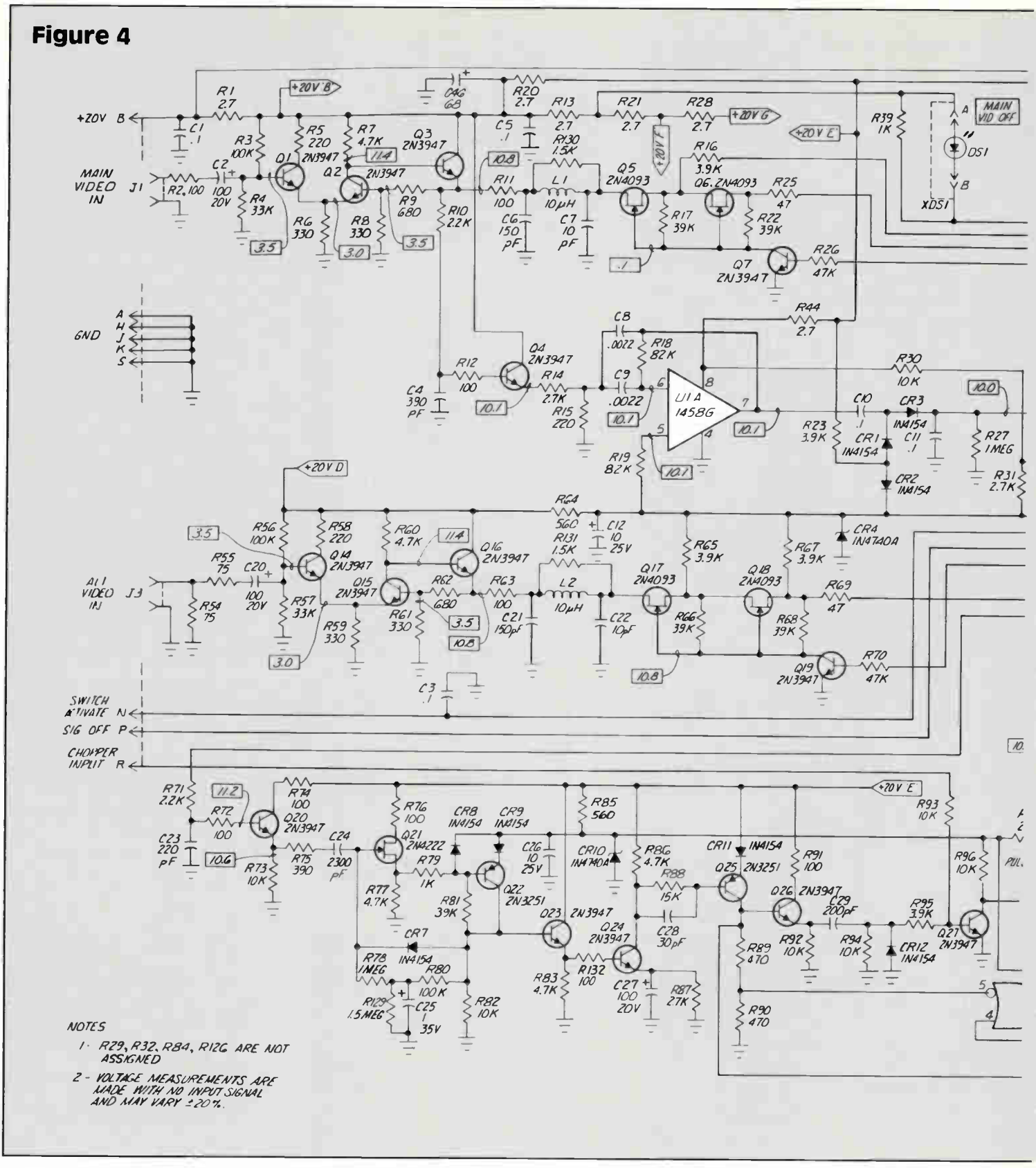
Figure 3



on the barrier strip can be replaced with a jumper from Pin 6 to Pin 13.

When a ground is applied to Pin 5 on the barrier strip, the video switch will remove the ground from Pin 13 on the barrier strip, which allows the broadband audio module to process baseband audio with the alternate video. However, the unswitched output from the video switch module is not a complete ground; it is the collector of Q8, which is connected to

Figure 4

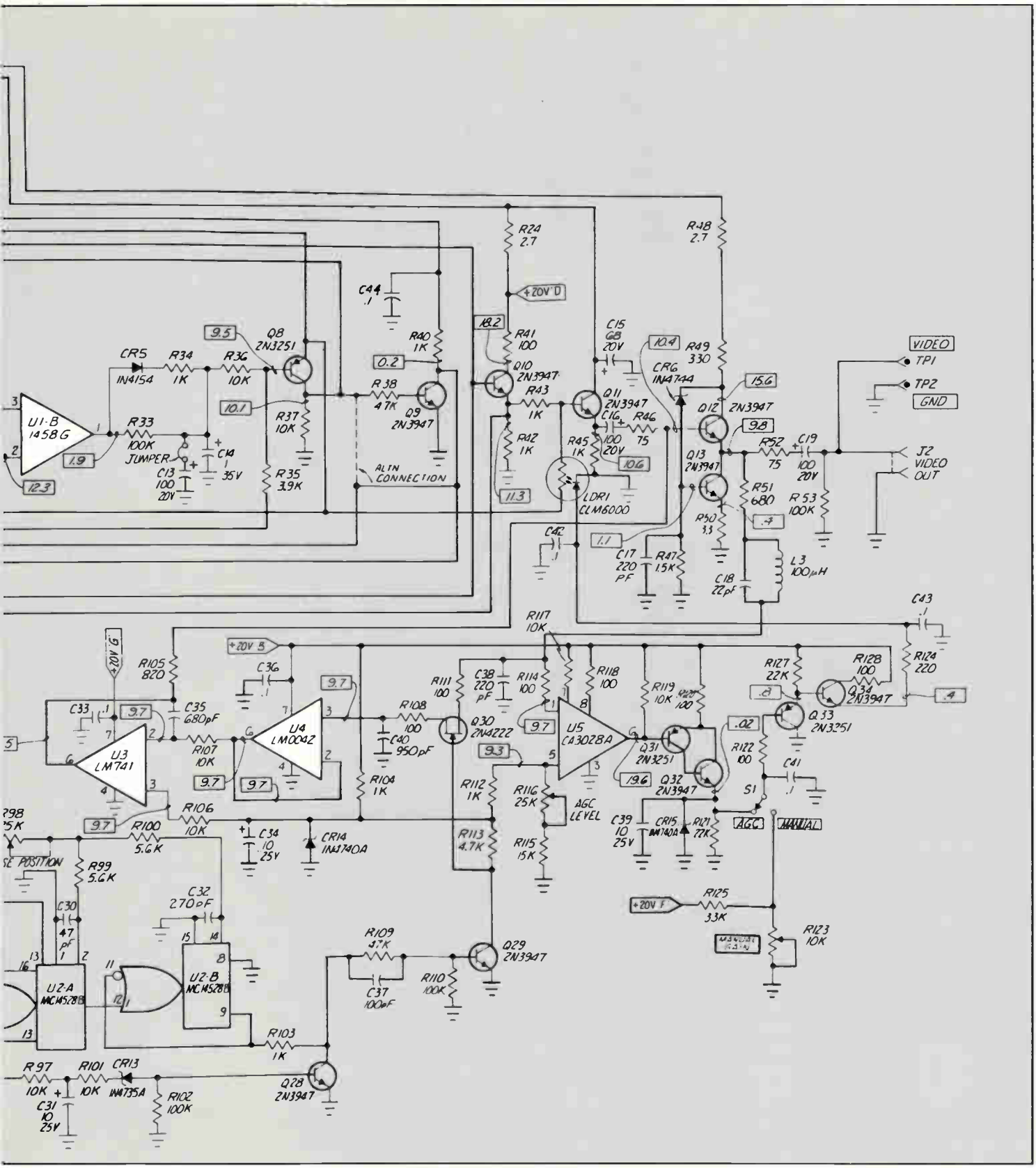


ground through a 10K ohm resistor. The result of this "almost ground" is that when using the 4.5 MHz audio in the unswitched mode, we lost the audio until the video switch was switched to the alternate source by the Spotmatic Jr.

Further testing showed that the broadband audio module would not switch out of the 4.5 subcarrier mode to handle baseband audio. Conversations with S-A revealed that we had an "interim" model broadband audio module with Part Number 342690, which would not work in this configuration. The new model, Part Number 371450, would work as described in the 6350 instruction manual.

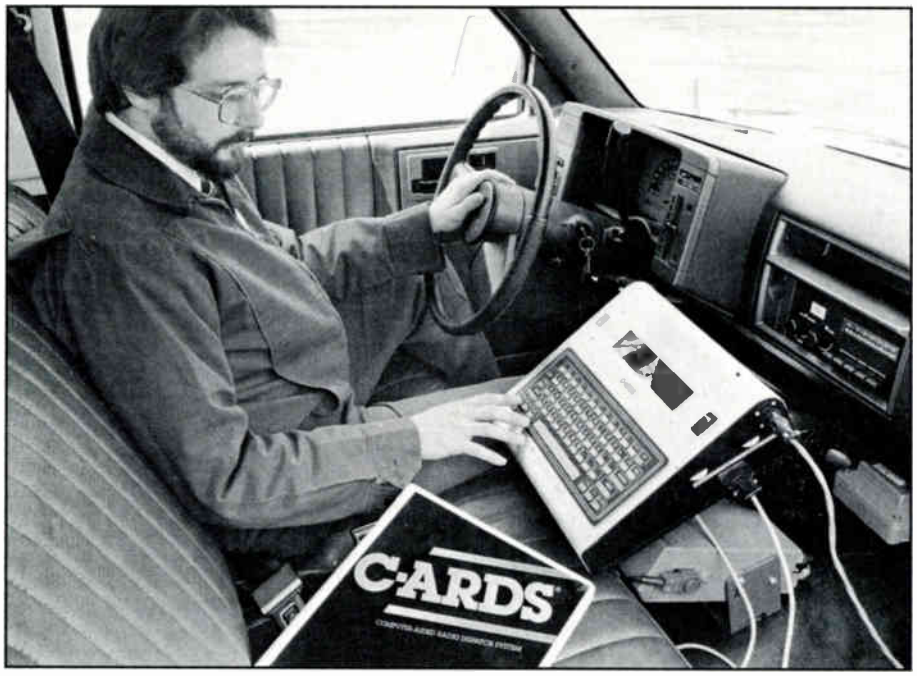
Modifying the video switch/AGC module

In order to use the interim model in this configuration, we would have to modify the video switch/AGC module. The modification consisted of

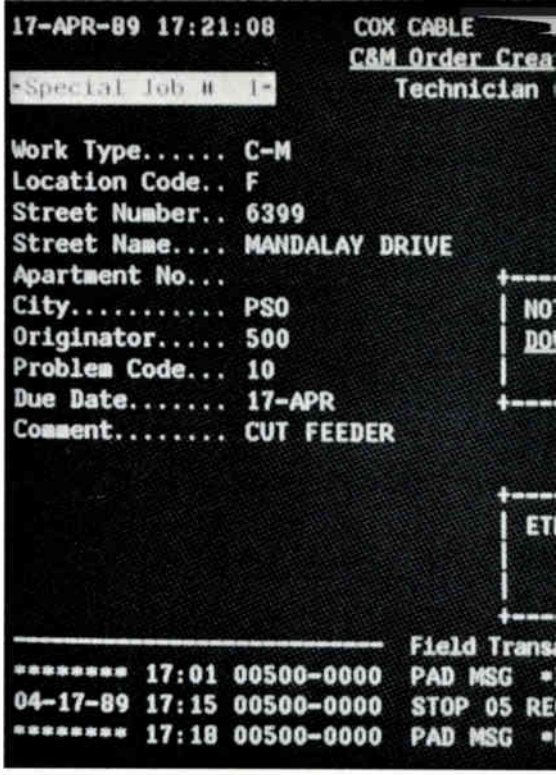


changing the value of resistors R37 and R33 and adding a 4.2 volt zener diode to the emitter of Q8. R37 and the collector of Q8 was changed from 10K ohms to 3.3K ohms and the 100K ohm resistor R33 on Pin 1 of U1-B was changed to 270K ohms. The printed circuit board plating between the emitter of Q8 and C12 was cut to remove the 10 volt source from Q8 and a 4.2 volt zener diode, Part Number 1N4732, was installed between the emitter of Q8 and the 20 volt source. (see Figures 3 and 4).

This modification allowed the output on Pin 6 of the barrier strip to go close enough to ground to hold the 4.5 MHz audio subcarrier select in until the Spotmatic Jr. activated the alternate source. This allowed us to get our ad insertion equipment in operation without undue delays while new broadband audio modules were obtained from S-A. The modification to the video switch/AGC module will not affect the operation in any of the other configurations.



The service tech completes a work order and sends a message via the C-ARDS terminal to dispatch.



The construction and maintenance (C&M) screen al dent of the billing system.

Computer-aided radio dispatch

By John Tidyman
President, J.H. Tidyman Associates

At Cox Cable in Cleveland, everything prior to last spring is considered B.C. or *before* C-ARDS (an acronym for the Computer-Aided Radio Dispatch System created by the Technical Products Division of CNG Energy Co. and developed by Systems Data Inc.). Dispatchers and service techs at Cox shared customer service problems common to cable systems across the country. These included a busy radio frequency that cost technicians and dispatchers valuable time every day, manual account processing with substantial paperwork, the lack of timely information about a tech's location and route progress—and customer satisfaction that was less than desirable. However, for Cox Cable's 32 radio-equipped service trucks serving 52,000 subscribers, these problems began to be solved following the implementation of C-ARDS.

This technology, already in use by other utilities, is an on-line, real-time communications system consisting of three primary components: dispatch console (with accompanying computer software), radio base station controller and vehicle-mounted mobile data terminals (MDTs). It works with an existing two-way radio dispatch.

Schedule for the day

Each Cox Cable service tech begins the day by entering a command into the MDT. This information is transmitted over the two-way radio to a computer, which sends back the tech's complete schedule for the day on the MDT display. A service order is selected; progress is communicated when the tech presses special keys labeled "next," "arrive" and "complete." These statuses are automatically time-stamped by the MDT and sent to the dispatcher.

When the order is completed, the terminal prompts for "fix" and "solution" codes as well as additional comments; it also validates the codes. Customer accounts are updated instantly rather than at the end of the day by a dispatch clerk entering data collected on paper or received over the radio.

En route to a subscriber, the Cox service tech commands the dispatch system to call ahead and find out if the sub is home. A recorded message is played when the sub answers the phone. Then the computer notifies the tech with a message on the MDT that the sub is waiting; the tech proceeds. If no one picks up the phone or the call is intercepted by an answering machine, the tech is notified and does not make a trip.

Other features of C-ARDS include:

1) a service tech request to the dispatcher to turn on (or off) an addressable converter.
2) the ability of the tech to make an on-line inquiry to the billing system for service history on an account. On the MDT appear dates and results of service requests for the last three visits to the sub.
3) access of up-to-the-minute credit history. Field collectors can request current balances as well as 30-, 60- and 90-day credit information that is instantly available to the MDT from the billing systems.

When the tech is beyond radio reception, C-ARDS stores all "completion," "fix" and "solution" codes. The MDT then automatically sends the stored data when the next transmission is acknowledged as the vehicle re-enters reception range.

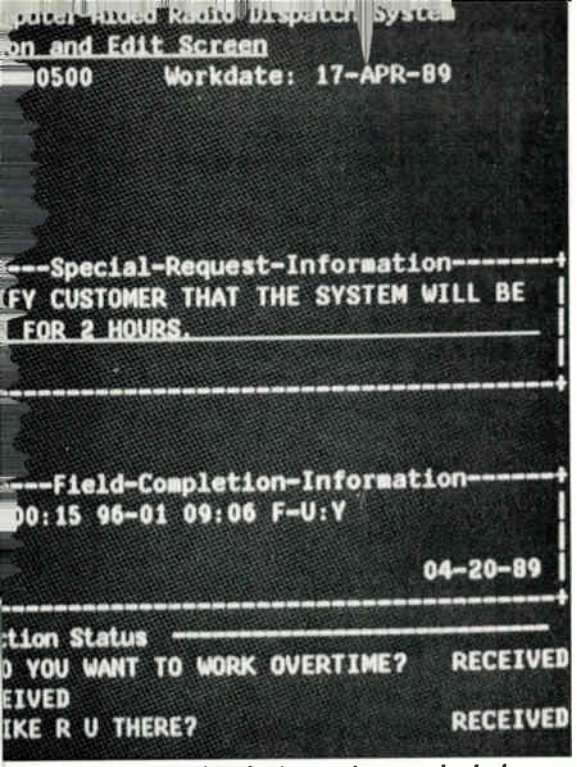
System description

C-ARDS components include the dispatch console, a Digital Equipment Corp. MicroPDP-11/52 with 4 megabyte (MB) memory, 400 kilobyte (kB) mini floppy disk and 30 MB Winchester hard disk. Operating system software is MicroRSX. The dispatch terminal is a color CRT; a second CRT is used for C-ARDS maintenance as well as monitoring all incoming and outgoing messages. A printer is used to generate an audit trail of events and for management reports.

Dispatch software programs are menu-driven and allow the dispatcher to communicate with MDTs for adding, deleting or moving orders and to monitor the progress of the service fleet. All programs are written in Fortran (except for the high-speed interface programs, written in MACRO assembler). MDT microprocessor software is written in MACRO assembler and resides in erasable-programmable read-only memory.

When and if growth demands, up to 75 MDTs can be operated from the dispatch computer. Specifically, the MDT is a back-lit LCD-type screen, measuring 4½ by 10¾ inches; it can display 160 characters per page (four lines at 40 characters per line). Its alphanumeric keyboard has 59 keys (full ASCII) with 11 special function keys. Capacities include a DEC 16 bit T-11 processor and memory of 16 kB expandable to 32 kB. Its control program is 16K EPROM, with transmission modulation at 1,200 bits per second FSK (frequency shift key).

The MDT has an internal lithium battery for backing up the RAM chip. Cable connectors are nine-pin miniature for radio interface and MS series twist-lock for power supply from the vehicle battery. Operating voltage is 10 to 14.7 VDC and operating current is 1.4 amperes when the back light is on. Storage temperature ranges are −40 to 90°C, with operating temperatures at −20 to 70°C.



ws dispatchers and techs to create an order indepen-

The dispatcher at the Cox Cable office receives the message from the tech and transmits a new work order.

Observation period

In a four-week observation of the pilot installation for Cox Cable in Cleveland, savings measured in minutes were compiled and analyzed for service techs, dispatchers, supervisors and managers. What follows are some of the findings:

1) Information required to complete a service call is stored in the MDT and completion information entered into the terminals without any conversation with the dispatcher. Hence, standby time waiting for new orders, additional information and job clearance is eliminated. The actual time that the radio frequency is used is reduced. Before implementation, the average time necessary to stand by, receive data and pass completion information was four minutes per stop. The average time spent writing customer account and completion information was one minute per stop. After implementation, the total savings per person per day is expected to be 60 minutes.

2) The system also eliminates standby time waiting for dispatcher recognition and completion of calling ahead to the subscriber. The phone-ahead feature completes the function in 20 seconds, compared to 100 seconds required by voice. With an average number of 12 stops per day, 20 minutes per person per day are saved.

3) The average standby time for dispatcher recognition, in order to pass on information or a message, is 30 seconds and repeated about six times per day. By using the MDT to send a message, three minutes in standby time are saved. The employee need not be in the vehicle to receive the information, so messages are not missed.

4) There is less travel time and fewer wasted trips resulting from effective use of the phone-ahead feature, which notifies the tech when the sub is not home. In some cases, a sub who was going to leave did remain after receiving the call and hearing the recorded message. During the pilot study, the sub was not home on the first-call attempt 21 percent of the time; a conservative estimate of times that the wasted trip is avoided is 40 percent.

"Standby time waiting for new orders, additional information and job clearance is eliminated."

The average trip lasts 10 minutes. The phone-ahead feature saved 1.08 trips per day on average, or 11 minutes per person per day. Due to more accountability for location and status, improved scheduling and better workload planning, an estimated improvement in productivity per person per day saved an additional five minutes.

Total service tech savings totalled 97 minutes per day; for 20 techs, 1,940 minutes per day.

5) For the dispatcher, the savings measured in minutes are more dramatic. With C-ARDS, the average time necessary to communicate data for a service call and completion information is 30 seconds. It is done without any voice conversation between dispatcher and tech. For an average of 240 stops per day, 120 minutes are saved per day.

6) Use of the phone-ahead feature means the dispatcher no longer has to make the calls. With an average number of 240 stops per day, an additional 240 minutes are saved per day.

7) Because a dispatcher can now send a message to an MDT whether the tech is in the vehicle or not, average standby time of 30 seconds is eliminated. With an average of 20 such messages per day, 10 minutes are saved. Also, the dispatcher no longer has to update the billing system with completion information for each work order. C-ARDS automatically passes through the billing system interface the completion information and account comments received from the field. By eliminating the need for manual data entry, this saves another 90 minutes per day.

8) An estimated 10 minutes per day are saved due to improved productivity, a result of reduced stress and better working atmosphere without voice traffic. Dispatchers know the location and status of each service tech. All incoming messages are printed and therefore unlikely to be missed.

9) For supervisors, 30 minutes are saved because accounting and productivity programs will monitor employee effectiveness and compute commissions. This reduces the time the service supervisors spend performing these procedures. Also, the supervisor's MDT shows the location and status of each employee, allowing supervisors to perform their job more efficiently.

10) Savings for managers are difficult to compute in minutes. However, with more timely and accurate reports on employees and division performance, the ability to make informed personnel and operations decisions is enhanced.

Higher level of service

This complete mobile digital communications system has helped Cox Cable of Cleveland provide a higher level of service to its subscribers, which can equate to a higher level of subscriber satisfaction throughout its service territory.

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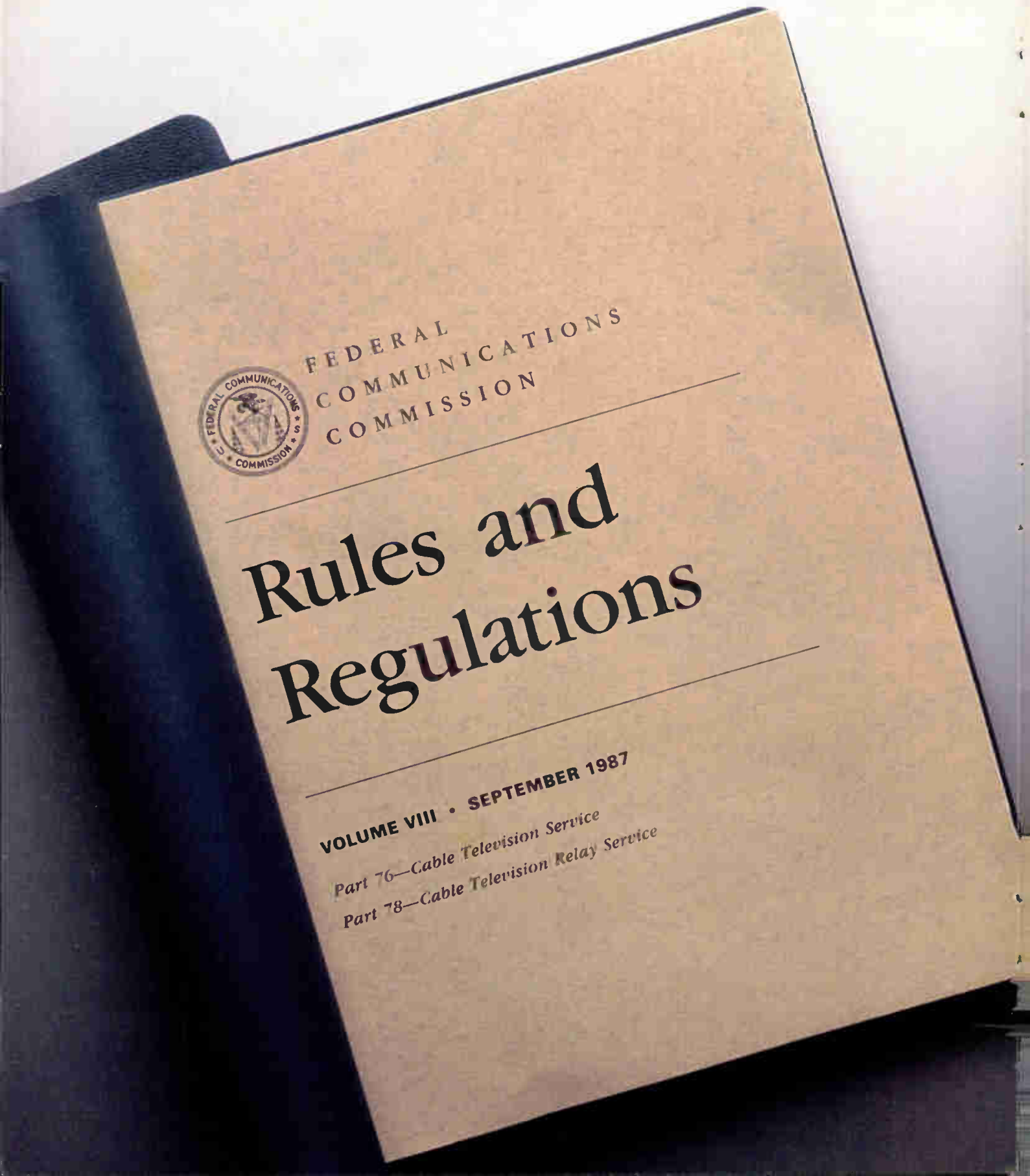

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Reader Service Number 43.

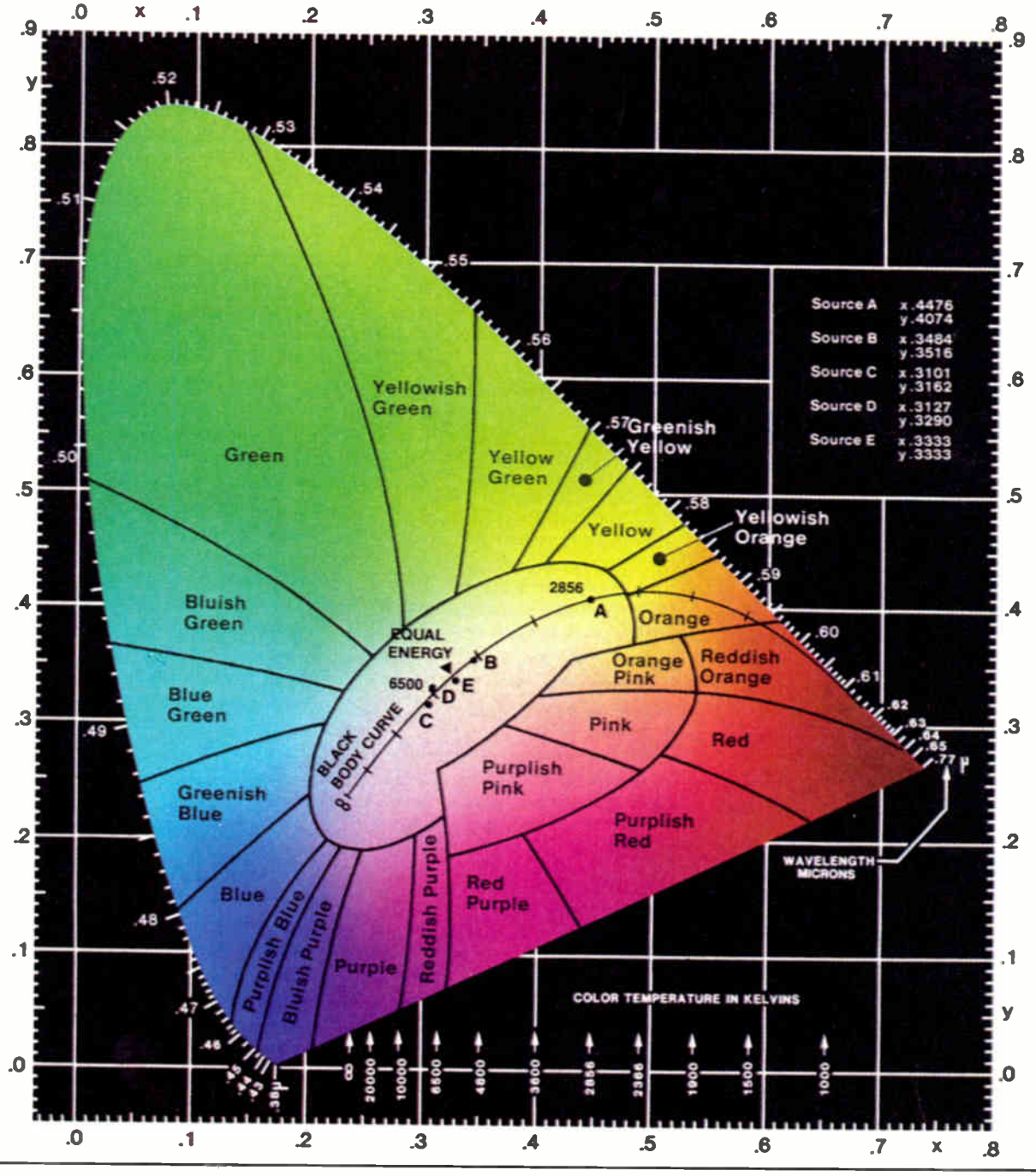
The CIE chromaticity diagram

As noted in a previous column ("CT," May 1989), noise in an HDTV (high definition TV) system—and probably IDTV (improved definition TV) also—will be defined by measurements related to the noise that appears to the human observer from the display. Measurement techniques, also based on human observers' perception, will be used for determination of HDTV/IDTV color presentation capabilities. Such analyses are particularly important because, since most of the HDTV and IDTV transmission schemes do not suffer from the limitations of NTSC color transmission, they produce colors that are often referred to as "richer, truer," etc.

Light, including the spectrum that is visible, can be treated quite reasonably and thoroughly by the physical laws of electromagnetic radiation. But add the concept of color and confusion enters the picture. This is because the human has entered the loop. If color perception is thought of in an information theory context, the disturbing element becomes apparent. The transmitter is the source of light, with possibly some frequencies more dominant than others, the transmission channel is usually air only (although obviously other factors can disturb the channel; i.e., glass) and the receiver is the human being. And that is the problem. The receiver—the final transducer—does not obey any neat set of concise mathematical laws of physics that we presently know. Therefore, the main source of data about color vision is largely empirical. Multitudinous test data is the foundation for visual colorimetry.

It is at this point that the CIE chromaticity diagram enters the picture as an international standard for colorimetry specified by the "Commission Internationale de l'Eclairage" (CIE). This diagram, properly used, is an indispensible tool

Figure 1: CIE chromaticity diagram



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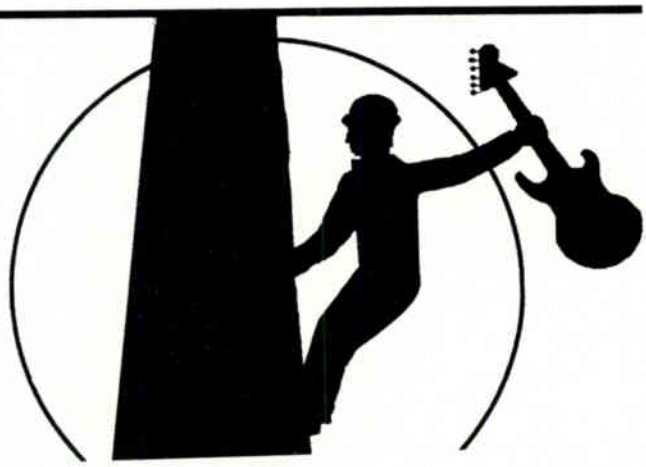

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Reader Service Number 1.

in the field of colorimetry. This article outlines its history, its derivation and its applications.

This is the first of four parts.

By Lawrence W. Lockwood
Principal Scientist-Video Technologies, Contel Corp.
East Coast Correspondent

What is the CIE chromaticity diagram and how can it be used? These questions and others will be examined.

It has long been known that any perceivable color requires three independent variables to define it: hue, saturation and brightness. *Hue* is the frequency and conversely the wavelength of the electromagnetic energy of the light. *Saturation* is the amount or lack of white light mixed with the hue—the more white light, the less saturated. An example: A vivid, royal scarlet and a faint pink might be of the same hue, the difference being that the scarlet had no white light mixed with the hue and the pink contained a large proportion of white light mixed with the hue. Finally, the *brightness* of the light is required to completely define the color.

The CIE chromaticity diagram (Figure 1) presents a color as specified by hue and saturation and, properly used, is a valuable tool since it provides quantitative capabilities in colorimetry.

Physical nature of color

The physical nature of color phenomena is conveniently introduced by a description of the spectrum of colors formed by the dispersion of a beam of light. When a beam of white light (e.g., sunlight) is passed through a prism (Figure 2), the beam is separated into a spectrum according to the wavelengths of the radiation. The dispersion of the light results from the fact that light of short wavelength travels slower in glass than does light of longer wavelength.

Inspection of the spectrum reveals that waves of different wavelength display different hues. In order of decreasing wavelength, the hues are red, orange, yellow, green, blue and violet. If the light source is an incandescent solid, the colors in the spectrum appear to blend one into the next in continuous fashion. If the light source is an excited gas or vapor, the spectrum is a discontinuous assemblage of colored lines or bands. The limits of the visible spectrum are commonly taken as 380 to 780 nm (1 nm = 10^{-7} cm). The range of practical interest is from 400 to 700 nm. Figure 3 shows the relationship between color, frequency and wavelength of the spectrum.

If a narrow portion of the spectrum is passed through a slit (Figure 4), light of one hue may be separated from the others. Light so obtained is known as "monochromatic light." It might be expected that the sensation associated with a given spectral hue could be excited only by monochromatic light so derived from a spectrum. But such is far from the case. The sensation of monochromatic orange, for example, can be caused by viewing a combination of monochromatic red and monochromatic yellow.

The technique of securing monochromatic light from a spectrum provides sources of color that can be combined in various intensities. When monochromatic lights are so combined, it is found that a great variety of other colors can be formed. One group of such mixture colors comprises the so-called "desaturated colors," that is, colors having a dominant hue mixed with white light. There are also mixtures that appear to take on simultaneously two hues such as bluish red, greenish yellow and greenish blue.

Thus far we have been considering colored lights of the monochromatic type only, obtained by blocking off all but part of a spectrum. It is equally feasible to use sources that radiate an extended distribution of energy with a prominent peak of energy in the visible region. As might be expected, such a source displays a hue that closely approximates the monochromatic hue corresponding to the peak of the spectral distribution curve (Figure 5). Examples of such sources are a white light fitted with a colored glass or colored gelatine filter and phosphors excited by electrons. These extended sources are evidently more easily set up and manipulated than are monochromatic sources. Monochromatic sources are of interest, in fact, only because

Figure 2: Spectrum formed by passage of white light through refracting prism

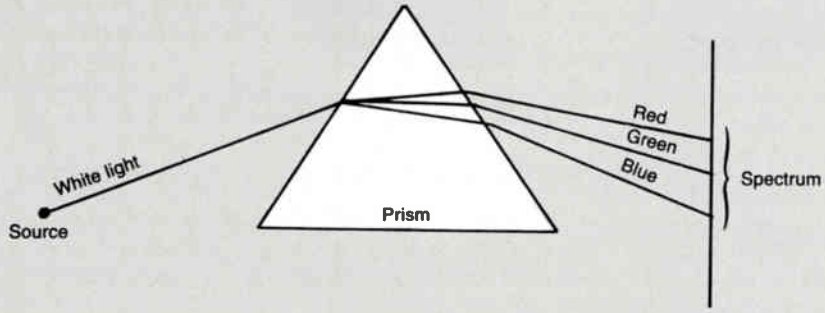


Figure 3: Relationship of color sensation, wavelength and frequency

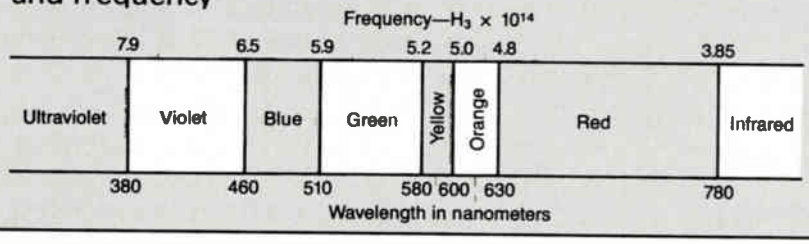
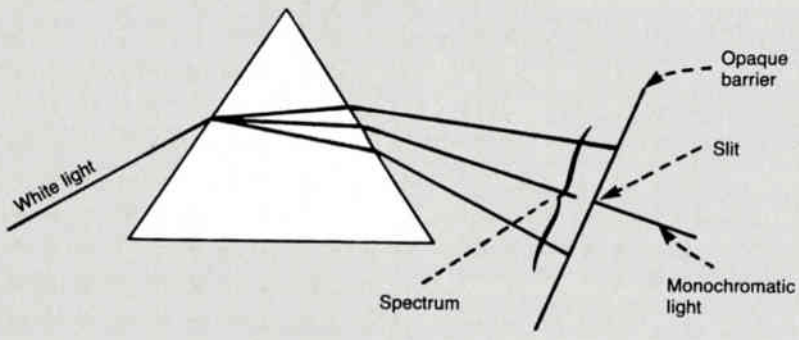


Figure 4: Formation of monochromatic light by the passage of a portion of spectrum through a slit



they provide light whose properties are easily defined and calibrated. Once the calibration is performed, extended sources producing the same sensation may usually be substituted for the monochromatic sources.

The trichromatic nature of vision

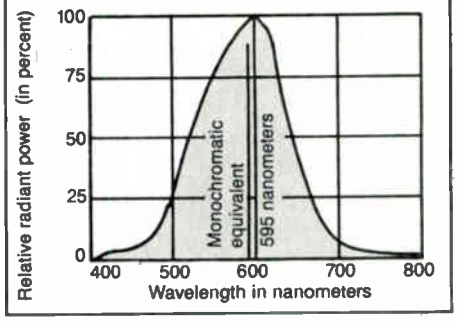
Early in the study of light it became clear that any given color can be matched very closely by a combination of three primary colors. To match the widest possible range of colors, the primary colors should be chosen in widely separated regions of the spectrum (i.e., those at the two ends of the spectrum—red and blue—and that at the center—green) and they should be highly saturated, i.e., having little or no admixture of white light.

To match colors with primary colors, it is necessary to provide a means of varying the apparent brightness of each primary color independently and to combine the three colors so that they cover the same area. Then, by adjusting the relative brightness of the three primaries, it is possible to match a very wide range of hues with any degree of saturation. By adjusting the absolute level of brightness of the primaries, keeping their proportion unchanged, it is possible to match not only the hue and saturation of a given color but also its absolute brightness.

The fact that three primary colors suitably combined can match virtually any color is rather difficult to explain on physiological grounds. Consider two monochromatic sources, a red of frequency 4.6×10^{14} Hz (wavelength, 650 nm) and a yellow of frequency 5.2×10^{14} Hz (wavelength, 580 nm). On the assumption that the eye reacts in some manner to the *frequency* of visible radiation, it might be expected either that both colors would be seen or that the response should bear some relationship to the sum or difference of the two frequencies. But the fact is that neither color is seen as such. Instead, an orange hue appears. If the red and yellow have equal intensities, the orange corresponds to a wavelength of about 600 nm or a frequency of 5.0×10^{14} Hz. The frequency associated with the mixture color, orange, has no observable relationship to the two frequencies of the red and yellow stimuli that excite the sensation. Moreover, as the intensity of the red is varied relative to that of the yellow, the mixture color ranges over the whole range of hues from red to yellow and the equivalent frequency of the mixture color changes correspondingly, while the frequencies of the sources remain fixed. Evidently, then, the eye is not a frequency-sensitive device.

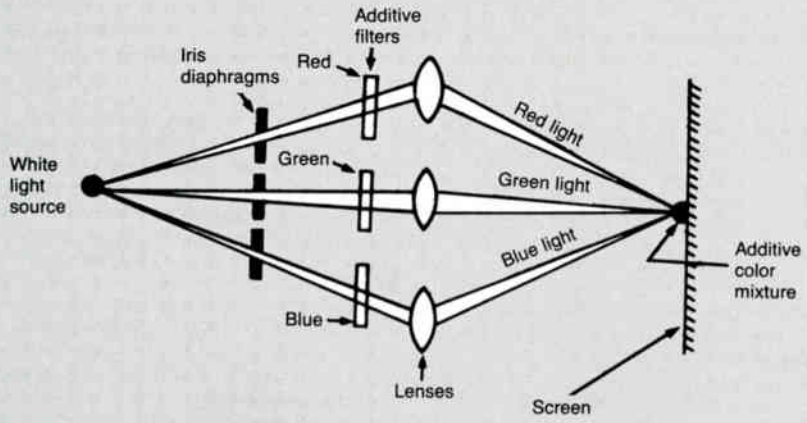
As of the present, the physical nature of the seat of the color perception properties of the eye is unknown. It is commonly supposed that the retina contains three color receptors associated with each foveal cone in the retina. Each type of receptor responds over the full range of visible wavelengths but has a peak of response in a particular region of the spectrum; that is, there are red-sensitive, green-sensitive and blue-sensitive receptors, each of which passes nerve impulses to the optic nerve. When a monochromatic source is viewed, it excites the three types of receptors in proportion to their sensitivity to the particular wavelength present. The resultant nerve impulses are a combination of three types that induce the sensation corresponding to the monochromatic stimulus. If two monochromatic stimuli are presented in different regions of the spectrum, they may excite an identical combination of nerve impulses and thus create the same sensation. The fact that substantially all monochromatic sensations may be matched by three primary colors is evidence that at least three types of receptors, having overlapping spectral responses, are present.

Figure 5: Extended distribution curve of a color source and equivalent monochromatic source



The physiological mechanism by which the eye perceives color is of little practical importance, since the properties of color vision can be

Figure 6: Additive mixture of primary colors used in color TV receivers



expressed simply in an empirical way. The empirical approach leads to a coherent expression of color values, embodied in the chromaticity diagram, which expresses color-matching problems on a numerical basis.

Additive and subtractive color matching

The color combinations referred to previously may be formed in two different ways: the *additive* and the *subtractive* method. In the additive method, the primary colors exist as separate entities, produced by sources (spectral slits, filters, etc.) located side by side. The colored lights from the three sources fall on the same surface (Figure 6). It is not essential that the colored lights fall on the surface continuously. If they illuminate the surface in rapid sequence, persistence of vision produces the appearance of simultaneous illumination by all the sources, and the color sensation is the same as if the sources were active continuously.

All color TV systems use this additive principle of combining colors. In the simultaneous color TV receiver, for example, the three primary-color images exist side by side and are either projected one over another on a viewing screen or are combined in a tricolor screen so that they fall, one superimposed on another, in the retina of the eye. In the sequential color systems, only one primary color is present at any instant of time, but the three primary colors are presented in such rapid sequence that the effect is the same as that of continuous illumination by all colors.

The primary colors used in the additive system of color reproduction are red, green and blue. These are the hues previously identified as being located at the two ends and at the center of the spectrum. Let us consider first combinations of two primaries. When combined in the additive manner, red and green produce the intermediate hues of orange and yellow. Green and blue so combined produce the green-blue hues. Red and blue so combined produce the purples.

When the three primaries are combined additively in appropriate amounts, white light is produced. This white light, if its intensity is less than that of the other light present, appears gray, and the gray so produced may have any intensity from black to white. If the three primaries are combined in unequal proportions, the white light is tinged by the hue of the predominant primary or primaries. In this manner, a particular primary hue may become "desaturated" (diluted with white light) by adding appropriate amounts of the other two primaries. Finally, a hue intermediate to two primaries may be desaturated by adding an appropriate amount of the third primary.

Those unfamiliar with additive color matching will object that the additive primaries—red, green and blue—are not the primary colors with which they are familiar. The primary colors used in painting, color printing and photography are the subtractive primaries. As named in common usage, they are red, blue and yellow. Actually the subtractive primary colors are a bluish red (magenta), a bluish green (cyan) and a greenish yellow (lemon yellow).

These designations, as well as the appearance of the subtractive primaries, indicate that each is a mixture. The mixture is produced by the process of subtracting a particular hue from white light, leaving the remaining hues of the spectrum, which in combination produce the sensation of a complex mixture color (Figure 7). Thus the magenta subtractive primary is formed by removing green light from white light. A magenta pigment or dye is, in fact, one that absorbs green light strongly so that white light passing through it takes on a bluish red appearance. Similarly, cyan is produced by removing red light from white light and lemon yellow by removing blue light from white light.

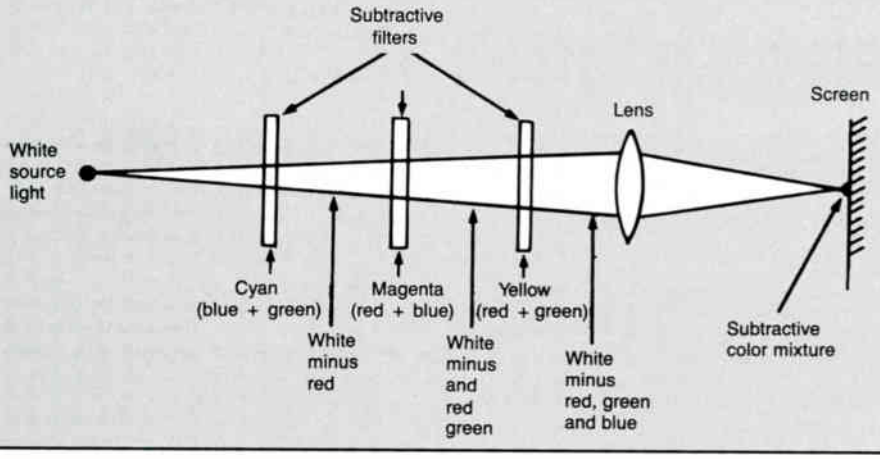
Subtractive primaries are combined by placing the pigments, dyes or filters one on top of the other and passing white light through them in succession. A typical example is the Kodachrome photographic transparency.

By so combining the subtractive primaries, it is possible to subtract from white light any portion of the visible spectrum and leave the equivalent of a spectral hue. By thus manipulating the absorption of hues from white light, the resultant may be made equivalent to any combination of spectral hues, and the whole range of hues and saturations may be matched, substantially as if additive primaries had been used.

What, then, is the relative advantage of the additive vs. the subtractive process of color reproduction? The choice depends on the manner in which the primary colors are produced. If the three primary color sources are self-luminous, exist as separate entities and hence can be combined only by adding one to another, the additive system must be used to match the full gamut of colors. But if the three primaries are formed by passing white light in succession through three layers of colored material—one on top of the other—with the materials absorbing part of the spectrum as the light passes through them, then the subtractive primaries must be used to match the full gamut of colors.

The outstanding example of the additive type of color reproduction is that performed in color TV receivers in which the primaries are self-luminous and separate. Examples of the subtractive method are painting, color printing and color photography, in which superimposed layers of dye or pigment are traversed in succession by white light and in which the unabsorbed portion of the white light affects the retina of the eye.

Figure 7: Subtractive mixture of primary colors used in color photography and printing



(Continued on page 146)

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Co-channel, adjacent channel interference

In conjunction with his column "Biro Co-Channel Locator Maps," the author is providing a two-part series designed to show applications of the locator maps. This is the second installment; Part I discussed use of filters, traps and antennas.

By Steven I. Biro
President, Biro Engineering

A computerized TV reception study (Figure 1) is a prerequisite for any phased array design. Only a computer run can provide the exact azimuth angles of the desired and undesired stations, as well as to obtain precise horizontal stacking dimensions. Follow the efficient application of the phased array concept in Neptune, N.J., protecting the reception of distant Ch. 61 (Wilmington, Del.) against a co-channel offender, as well as Ch. 57 (Philadelphia) against a strong adjacent channel video carrier.

Undesired Ch. 61 (Hartford, Conn.) is less than 121 miles from Neptune—a distance only 1.59 times greater than the 75.72 miles of the desired station. The 5,000 kW effective radiated power of Hartford represents a 1.67:1 advantage over Wilmington's output. Hartford's 1,691-foot antenna tower is 77 percent higher than the Wilmington radiator.

All things considered, the computer predicted an undesired Hartford signal to be 35 dB weaker than the desired. This was in sharp contrast to the findings of the on-site tests and measurements. A signal survey confirmed that in the early morning and late evening hours the difference was as little as 5 dB. The map of Figure 2 provides the explanation. The path from Farmingdale, N.J., to Hartford includes two over-water segments, of which the first one is a significant 23-mile stretch. Early morning and late evening temperature inversions over water usually result in irregular wave propagation conditions.

Ch. 61 phased array calculations: relative angle between the desired and undesired: θ = 148.8°. Ch. 61 video carrier frequency: f = 753.25 MHz. H, the required horizontal spacing (in inches) also can be calculated with the following equation:

$$H = \frac{5{,}900}{f \times \sin\theta} = 15.12 \text{ inches}$$

Should the 15.12-inch horizontal spacing prove impractical, the reflector screens of the zigzag antennas touch each other, tower leg obstruction or other matters, the spacing should be increased

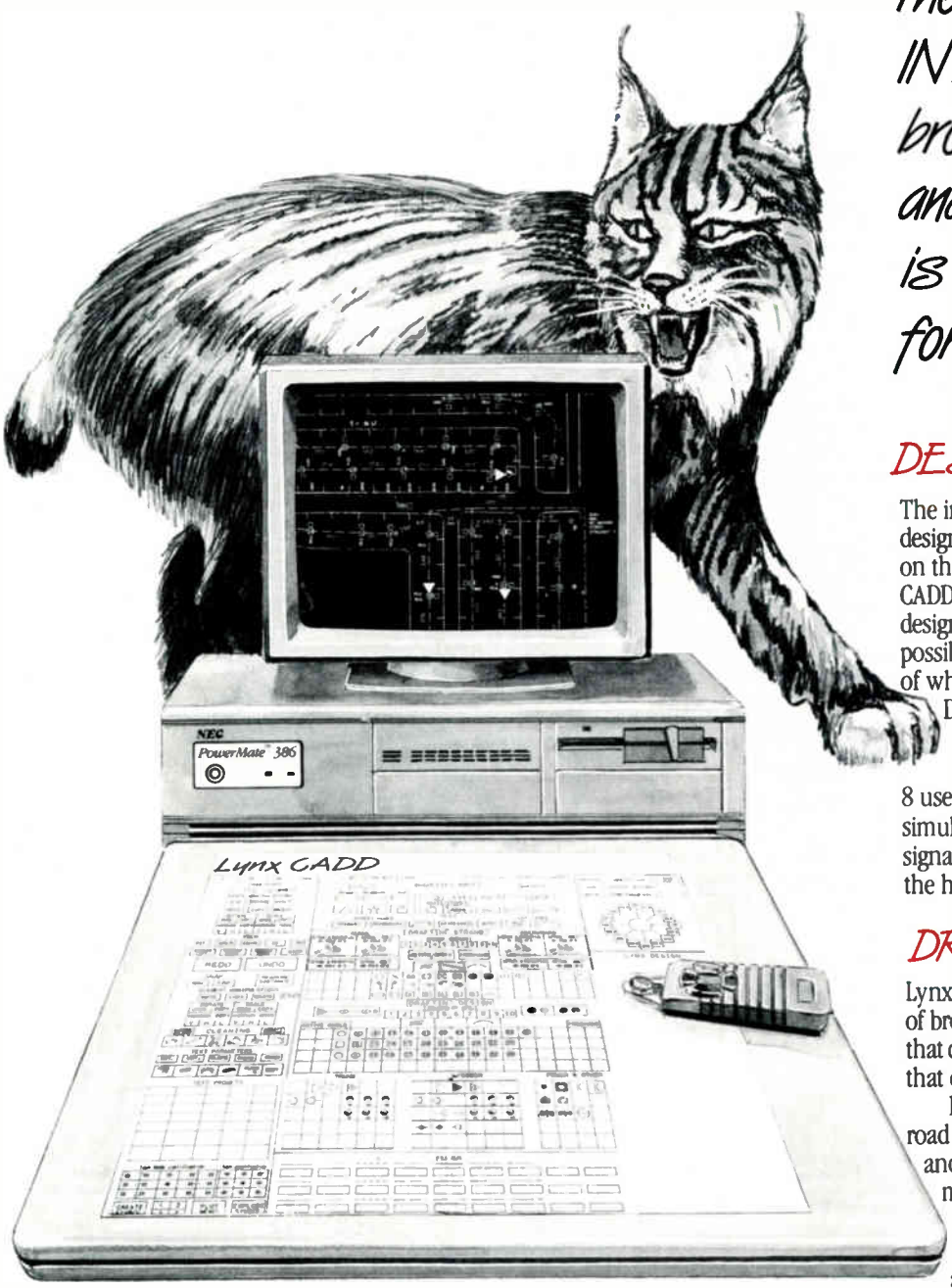
Figure 1: Computer-aided TV reception study

SITE : NEPTUNE, N.J.

COORDINATES : 40/12/50 74/ 2/ 17

CHANNEL	CALL	LOCATION	STATE	NTWK	POWER	OFST	HAAT	DISTANCE	AZIMUTH	REL. ANGLE	CC SPACING
PREFERRED STATION											
57	WGBS	PHILADELPHIA	PA.	IND	5000.	0	1160.	64.44 MI	259.6		
CO-CHANNEL CALCULATION										REL. ANGLE	CC SPACING
57	WGBY	SPRINGFIELD	MA.	ED	1200.	+	1000.	157.48 MI	26.8	127.2	3H= 30.5
57	WCVW	RICHMOND	VA.	ED	1020.	-	880.	267.24 MI	226.9	32.7	H= 15.0
57	WCFE	PLATTSBURGH	N.Y.	ED	762.	0	2427.	309.22 MI	1.4	101.8	3H= 24.8
57	CITY	TORONTO	ONT	IND	280.	0	1650.	362.37 MI	312.5	52.9	3H= 30.5
PREFERRED STATION											
58	WNJB	NEW BRUNSWICK	N.J.	ED	1320.	0	726.	37.31 MI	319.1		
CO-CHANNEL CALCULATION										REL. ANGLE	CC SPACING
58	WCVX	VINEYARD HAVEN	MA.	IND	1190.	+	439.	217.72 MI	60.9	101.8	3H= 24.6
PREFERRED STATION											
60	WGOT	MERRIMACK	N.H.	IND	1403.	+	1011.	229.20 MI	32.7		
PREFERRED STATION											
61	WTGI	WILMINGTON	DE.	SP	3000.	0	958.	75.72 MI	242.2		
CO-CHANNEL CALCULATION										REL. ANGLE	CC SPACING
61	WTIC	HARTFORD	CT.	FOX	5000.	+	1691.	120.54 MI	31.0	148.9	H= 15.2

Run with the Lynx!



Featuring the NEC PowerMate 386.

The most powerful INTEGRATED broadband design and drafting package is now available for your PC . . .

DESIGN . . .

The intelligence of Lynx CADD gives the designer the power to calculate design right on the map. Simply specify the area and Lynx CADD automatically calculates the optimum design for you. Or, explore alternate design possibilities simply and quickly for any type of what-if situation.

Detailed Bill of Materials are produced automatically.

With Lynx CADD, up to 8 user-specified frequencies are tracked simultaneously. And it is possible to monitor signal from a subscriber's house back to the headend.

DRAFTING . . .

Lynx CADD has taken the basic functions of broadband drafting and created features that dramatically increase the number of miles that can be mapped in a day.

For **base** mapping, Lynx CADD has a road command with easy intersection cleaning and a MAP/CUT command which will automatically divide a topo, utility or tax map into the individually desired maps.

For posting **strand**, commands are available for automatic placement of text for footages, house counts, addresses and pole numbers.

If **design** is posted manually, the SCTE standard symbols are included for your use.

Call (404) 448-0977 or (800) 333-LCAD today for more information on this powerful PC-based system for broadband design and drafting.

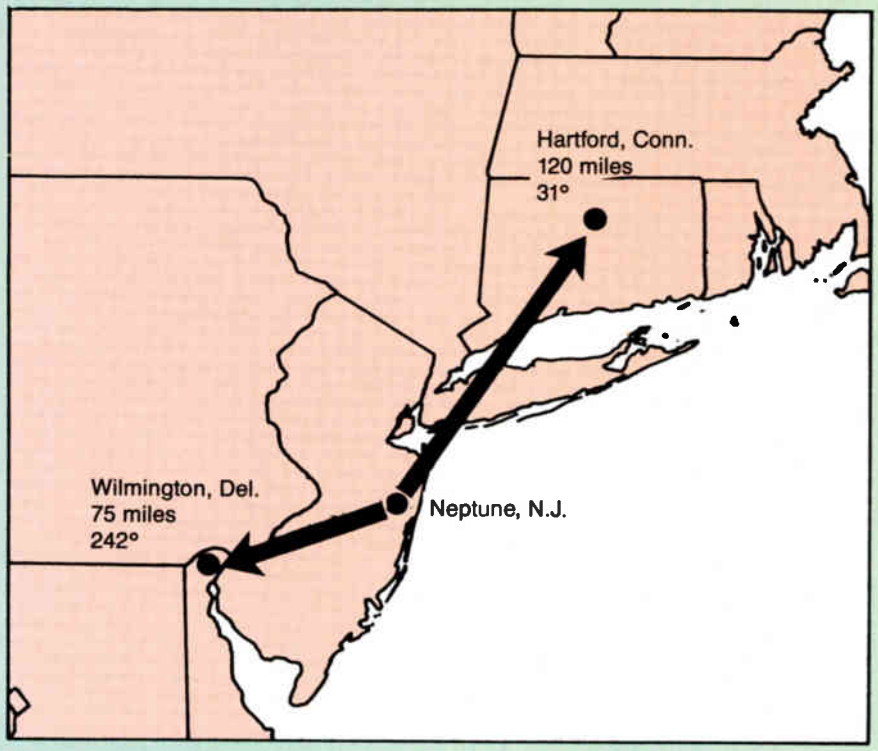
See us at the Eastern Show, Booth 513.

A.D.S.
Automated Drawing Systems, Inc.

3150 Gateway Drive, Suite 700
Norcross, GA 30071

Reader Service Number 46.

Figure 2: Wave propagation conditions on Atlantic Coast



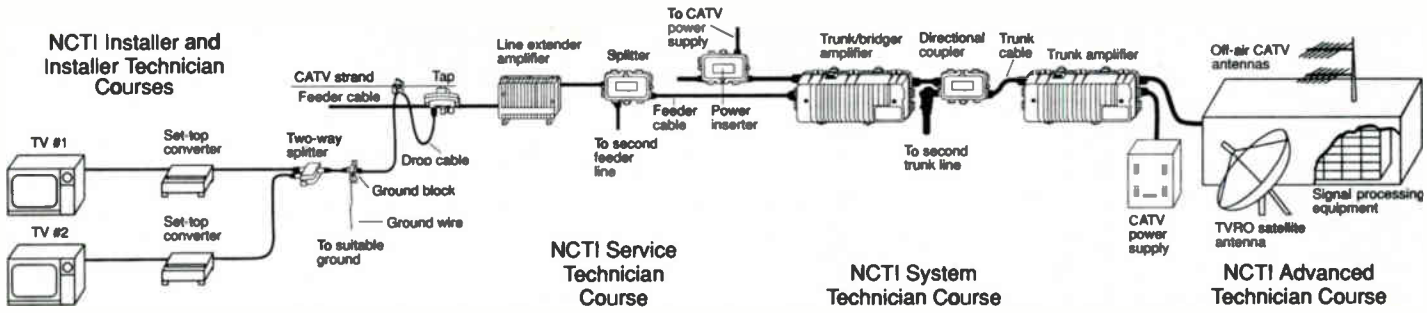
to 3H. The deep radiation pattern null will still fall into the proper (148.8°) relative angle, but a little reduction in antenna gain, as well as some increase in side lobe levels must be taken into account.

Analyzing Ch. 57 (Philadelphia) reception conditions, the computer run tells us that the strong adjacent Ch. 58 (New Brunswick, N.J.) is 72.7 percent closer than the desired station. The installation of a two-bay, horizontally stacked phased array provided the necessary protection against the strong Ch. 58 video carrier, without affecting the frequency response of Ch. 57.

Ch. 57 phased array calculations: relative angle between the desired and undesired: θ = 59.5°; Ch. 58 video carrier frequency: f = 735.25 MHz; required horizontal spacing: H = 9.313 inches. A more practical 3H = 27.94-inch horizontal spacing was successfully applied in protecting the Ch. 57 (Philadelphia) reception against the strong adjacent channel video carrier.

Even computer-designed phased arrays cannot deliver the expected UHF interference protection if unmatched antennas or low quality passive components are used, if the array is not adequately tested on the ground or the tower-mounted array is incorrectly oriented. Tower crews may very well be qualified to erect a tower, lift the gates and attach the antenna arrays. However, efficient co-channel and adjacent channel protection on UHF requires more than good equipment and a hard working tower crew. The full attention and close supervision of an experienced engineering team is mandatory.

From Headend to Drop



NCTI is the industry's technical training source

Where is your technical training need?

At the installer level? Continuing education for your Chief Tech? Technical insight for your Customer Service Reps? No matter what level of technical training your operation needs, NCTI has courses to offer.

For more than 21 years NCTI has been providing the technical training cable industry professionals need to ensure engineering excellence. Why has NCTI become the industry's technical training source?

Technical Excellence

NCTI lessons are authored by experts and reviewed by a Board of Technical Advisors which includes some of the industry's most experienced engineers and technicians.

Up To Date

NCTI lessons have been undergoing an intensive updating process. Material is carefully screened and changed to reflect the rapid advancement in technology and techniques.

Comprehensive

From F-connectors to satellite receivers, from modulators to set-top converters, NCTI covers the full range of cable industry technical issues.

Self Paced

NCTI's courses are designed to allow students to progress at their own pace, and to study when and where they are most comfortable. As a result, NCTI students complete a far greater proportion of courses than most like training programs.

Easy To Administer

NCTI takes the pain out of your technical training. We make it simple to enroll students and monitor their progress. Each time a student submits an exam, a grade report is promptly returned. And, each quarter management receives a Progress Report showing the status of each student in their system.

Our goal is to provide the industry's best training materials and to produce qualified technicians and engineers equipped to construct and operate first class cable television systems.

To learn how you can put NCTI training to work in your system, or how to enroll, call us at (303) 761-8554, or return the coupon. **Do it today!**

Send For Your FREE Training Kit Today!

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Title_____

Company_____

MSO affiliation_____

Address_____

City_____ State____ Zip_____

Phone_____

Mail this form to:

NATIONAL CABLE TELEVISION INSTITUTE

P.O. Box 27277, Denver, CO 80227

(303) 761-8554

CT 8/89

Reader Service Number 49.

Boring system

Charles Machine Works introduced the True Trac extended-range guided boring system. The system is designed for trenchless installation of utility lines in a wide variety of soil conditions including solid rock. It is said to be ideal for boring work in highly congested or landscaped areas where conventional excavation methods are not feasible or desirable. According to the company, the True Trac can be used to install new or replace existing lines with minimal soil disturbance.

For further details, contact Charles Machine Works Inc., P.O. Box 66, Perry, Okla. 73077-0066, (405) 336-4402; or circle #111 on the reader service card.

Mounting post

Champion Metal Products universal mounting post is designed for the installation of protectors, subscriber interfaces and various other mountings at trailers, manufactured homes, metal buildings and other structures without continuous foundations. The unit consists of a heavy gauge (.068) stake and a fence plate and can be adjusted to heights of 3, 3½ and 4 feet.

To receive more information, contact Champion Metal Products, Route 1, P.O. Box 422, Strafford, Mo. 65757, (417) 736-2135; or circle #138 on the reader service card.

Drop connectors

Cable Connector Corp. introduced its XLF Series of drop cable connectors designed to help CATV systems meet the CLI requirements of July 1990. According to the company, the connectors grip as strongly as the tensile strength of the cable itself using standard cable preparation techniques; installation can be accomplished without the use of a crimping tool. Solid nut construction, metal-to-metal contacts and uninterrupted dielectric and center conductor feedthrough features are designed to minimize signal radiation and reflection.

For further information, contact Cable Connector Corp. of America, P.O. Box 87, Atkinson, N.H. 03855, (800) 343-8234; or circle #139 on the reader service card.

Graphics receiver

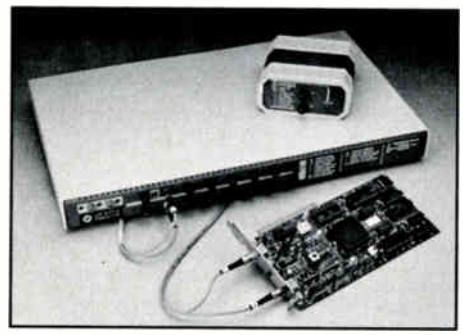
Wegener Communications is introducing the Series 1800, an asynchronous addressable data receiver that allows display and processing of high-resolution graphics and sound. The color graphics can be overlaid onto NTSC video with the combined output provided to both an NTSC monitor and an analog RGB monitor. Computer-generated sound can be combined with an external audio source.

For more information, contact Wegener Communications, Technology Park/Johns Creek, 11350 Technology Circle, Duluth, Ga. 30136, (404) 623-0096; or circle #132 on the reader service card.

Design software

ADS Inc. announced its Lynx CADD software, an integrated design and drafting package for broadband. This PC-based system allows the user to design directly on the map. According to the company, the product automatically calculates the optimum design for any specified area. It produces a detailed bill of materials, and up to eight user-specified frequencies are tracked simultaneously. For base mapping, the software has a road command with intersection cleaning with a "map/cut" command that will divide a topo, utility or tax map into individuals maps.

For additional details, contact Automated Drawing Systems Inc., 3150 Gateway Dr., Suite 700, Norcross, Ga. 30071, (404) 448-0977; or circle #141 on the reader service card.



LAN system

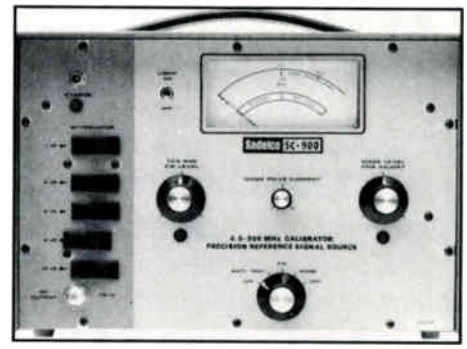
Zenith announced the FiberStar system as an addition to its Z-LAN product line. The system utilizes fiber-optic Ethernet technology and is said to provide the ability to span 4 km on a single network without magnetic or radio interference from outside electrical sources. The system provides full 10 megabit per second Ethernet services with 100 percent collision detection. Because the fiber-optic transceiver is built directly on the adaptor card, implementation of external transceivers and interfaces is not required.

For more details, contact Zenith Communications Products, 1000 Milwaukee Ave., Glenview, Ill. 60025, (312) 391-8181; or circle #106 on the reader service card.

Video printer

Eastman Kodak introduced a second generation color video printer, the Model SV6510. Combining continuous tone thermal print technology with other features including a wired remote connector, a capability for printing multiple copies of individual images, switchable full-color/black-and-white printing and a single image/quad image selector switch, the product accepts both standard NTSC and RGB video signals and provides users with a hard copy of video or digital images.

For more information, contact Eastman Kodak Co., 343 State St., Rochester, N.Y. 14650, (716) 724-4816; or circle #109 on the reader service card.



Signal generators

Sadelco introduced two reference signal generators, the Models SC-900 and SC-600. Designed as a source of reference signals used for SLM calibration and sweeping cable systems, the units both feature a flat white noise generator coupled to a patented crystal-controlled CW generator. The Model SC-900 covers the frequency range from 4.5 to 900 MHz while the SC-600 has a frequency range of 4.5 to 600 MHz, both exhibiting a ±¼ dB accuracy.

For additional information, contact Sadelco Inc., 75 W. Forest Ave., Englewood, N.J. 07631, (201) 569-3323; or circle #110 on the reader service card.

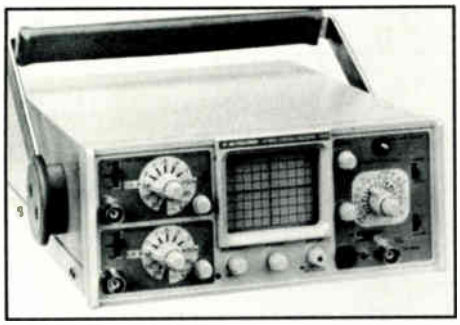
FO hardware

Anixter Cable TV's Rotary Splice is said to exhibit reflection perfomance comparable to that of fusion splices. The ARS features a polishing tool that introduces a 10 degree angle to the ends of the fiber-optic cable being spliced. According to Anixter, these angles practically eliminate any

splice reflections (previously only achieved through fusion splicing) while maintaining splice losses as low as those for the AT&T Rotary Mechanical Splice. Performance characteristics are permanently stable over a wide range of ambient temperatures and humidity ranges, and reflection levels are at −58 dB and below. (For more information on the ARS, circle #129 on the reader service card.)

The Sync Link FM Fiber-Optic System manufactured for Anixter by Synchronous Communications carries scrambled channels over FM fiber with a signal-to-noise ratio of better than 60 dB. This system uses one encoder per scrambled channel and works equally well with baseband or sync suppression scrambling schemes. The encoded signals are converted to TV IF format for distribution at the hub site. (For more information on the Sync Link, circle #128 on the reader service card.)

For more details, contact Anixter Cable TV, 4711 Golf Rd., 1 Concourse Plaza, Skokie, Ill. 60076, (312) 677-2600.



Oscilloscope

Now available from B&K-Precision is the Model 1422 portable dual-trace oscilloscope. The AC, DC or battery powered scope offers 20 MHz response, 10 mV/division vertical sensitivity, a high-brightness rectangular CRT and front panel X-Y operation. Eighteen sweep ranges span from 1 μV/division to 0.5 seconds/division in a 1/2/5 sequence, variable between ranges. Sweep magnification is 10 times, extending the maximum sweep rate to 100 ns/division.

For further information, contact B&K-Precision, Maxtec International Corp., 6470 W. Cortland St., Chicago, Ill. 60635, (312) 889-9087; or circle #107 on the reader service card.

Ad insertion

Channelmatic released a new Adcart system component in its line of ad insertion equipment. Designed for the random pod sequential user, the CCU-202A can control one or two VCRs on one channel or one VCR on each of two channels simultaneousiy. The unit can also perform full random access on one channel using two VCRs to fill a one-minute avail length network.

For additional information, contact Channelmatic Inc., 821 Tavern Rd., Alpine, Calif. 92001, (619) 455-2691; or circle #123 on the reader service card.

A/V modulator

Now available from R.L. Drake Co., the Model VM2310 is a frequency agile, medium-powered audio/video modulator designed for use in small- to medium-sized CATV and SMATV systems. It is a vestigial sideband unit with an output level of +45 dBmV and access to 23 channels (12 VHF and 11 cable) from 54 to 216 MHz. The unit has a low noise floor for multiple modulator installations and IF loop-throughs that permit operation with various types of scrambling encoders and IF stereo processors.

For additional details, contact R.L. Drake Co., P.O. Box 112, Miamisburg, Ohio 45342, (513) 866-2421; or circle #125 on the reader service card.

Insulating sleeves

Insulation Systems Inc. introduced its line of air shrinkable insulating sieeves. These are pre-expanded and sealed in a foil package. Once opened and installed on a cable shrinking occurs automatically that, according to the company, produces a 100 percent uniform covering and environmental seal. The coverings can withstand heat ranges of −35 to 105°C and provide protection against abrasion as well as chemical corrosion.

For more details, contact Insulation Systems Inc., 461 Nelo St., Santa Clara, Calif. 95054, (408) 986-8444; or circle #124 on the reader service card.

Headend cable

Times Fiber announced the development of its MI 2240V quad headend cable. The 59-type cable has a foam dielectric that surrounds a silver-plated, copper-clad steel 40 percent conductivity center conductor. Outer conductors, the Quadshield, consist of bonded laminated APA tape, aluminum braid 95 percent coverage, laminated APA tape and other aluminum braid 95 percent coverage. The cable is housed in an NEC- and UL-listed CATV PVC jacket.

For more information, contact Times Fiber, 358 Hall Ave., P.O. Box 384, Wallingford, Conn. 06492-0384, (203) 265-8500; or circle #126 on the reader service card.

1 GHz amplifiers

C-COR Electronics announced its new Extended Bandwidth 1 GHz amplifier product line. The products are designed as an interface between fiber backbone systems and CATV cable distribution systems. They allow expansion of channel capacity as well as the addition of high definition TV, data and video services and other standard TV channels. The products are of modular design, capable of two-way operation and take full advantage of current extended bandwidth hybrid technology.

The first phase of the product line includes trunk and line extender housings that operate up to 1 GHz and are fully compatible with the company's present distribution equipment. C-COR is in the process of developing 1 GHz amplifiers as well as main line passives.

For more information, contact C-COR Electronics, 60 Decibel Rd., State College, Pa. 16801, (814) 238-2461; or circle #115 on the reader service card.

Pre-wire boxes

Moore Diversified Products introduced a new line of pre-wire security boxes designed to address the needs of the CATV industry. Sized to provide an attractive flush finish and maximize the use of wall space, the depth and width are fixed by the standard wall dimensions while the box height can be altered to meet specific requirements.

Boxes are manufactured from heavy gauge aluminized steel and finished in a tough powder applied polyester coating. The lid is flanged and supported by a sturdy continuous hinge. Both the lid and body are fully welded. The pre-wire box can be outfitted with a variety of racks and locks, with the size, location and number of knockouts user-specified.

For further information, contact Moore Diversified Products, 1441 Sunshine Lane, Lexington, Ky. 40505, (606) 299-6288; or circle #114 on the reader service card.

Converter

Philips ECG introduced the Model TV-1100 to its line of cable converters. The unit upgrades any standard TV set to cable-ready status and provides infrared remote control capability as well. The product converts VHF Chs. 2-13 and cable Chs. 14-76 to a switch selectable output Ch. 2 or 3. Other features include scan up/down or direct channel access, a sleep timer remote control option, favorite 10 channels memory and last channel recall.

For additional details, contact Philips ECG Inc., 1000 First Ave., Waltham, Mass. 02254, (617) 890-6107, or circle #108 on the reader service card.

Step attenuator

Viewsonics is offering its Model VSSA-42 pocket-sized step attenuator, with dimensions of 4¾ × 1¾ × 1¾ inches and a weight of 8 ounces. The RF sealed die cast zinc housing with gold irridite is said to be corrosion free and ingress/egress resistant. The product has an attenuation of 0 to 42 dB in 1 dB steps. It has a 75 ohm impedance; frequency range from DC-1,000 MHz; accuracy per pad of +0.3 dB; insertion loss of 0.5 dB maximum (DC- 600 MHz), 1.5 dB maximum 600-1,000 MHz; return loss of 19 dB minimum (DC-600 MHz), 15 dB minimum 600-1,000 MHz; maximum input power of 0.5 watts; and an RFI of 100 dB.

For more details, contact Viewsonics, 170 Eileen Way, Syosset, N.Y. 11791, (516) 921-7080; or circle #121 on the reader service number.

Leakage software

ComSonics is offering its Sniffware software designed to support CLI (cumulative leakage index) requirements of July 1, 1990. It allows for logging of leakage locations and strength of leaks in decibel-millivolts or microvolts per meter. In addition, it performs all calculations needed to obtain a CLI figure of merit. Also included in the software is a leakage report form with location of leak, date, grid location, suspected cause, action taken and other pertinent data.

For further details, contact ComSonics, P.O. Box 1106, Harrisonburg, Va. 22801, (703) 434-5965; or circle #116 on the reader service card.

Agile modulator

Now available from Finline Technologies, the Model SM-550 frequency agile modulator features full tuning range of 50 to 550 MHz with standard and HRC operation. The unit incorporates dual IF loops with access to both visual and aural carriers. The SM-550 offers full compatibility with the BTSC format with both composite audio and direct 4.5 MHz input.

For further information, contact Finline Technologies Ltd., 440 Phillip St., Waterloo, Ontario, Canada N2L 5R9, (519) 746-1023; or circle #112 on the reader service card.

Lab standards kit

Gilbert Engineering introduced a 75 ohm laboratory standards kit. It includes a 75 ohm (30 cm) reference airline with G-874 locking collar interface; this airline may be used as an impedance standard, spacing stub or other element of a coaxial system. The kit also contains a 75 ohm precision fixed termination with G-874 interface for use as a reference termination to establish conditions in a coax system; a G-874 open circuit and a short circuit to establish 100 percent reflection standards for test equipment calibration; two precision 75 ohm fixed attenuators (6 and 10 dB) with G-874 interface for attenuation, isolation, insertion loss measurement or matching in 75 ohm coax system; and three precision between-series adaptors (G-874 to type N, G-874 to BNC and G-874 to type F) for connection to test equipment utilizing these types of interfaces.

For more information, contact Gilbert Engineering Co. Inc., P.O. Box 23189, Phoenix, Ariz. 85063-3189, (602) 245-1050; or circle #140 on the reader service card.

Laser sources

Fotec introduced four fiber-optic laser sources for use in testing single-mode fiber cables used in CATV installations. These sources are available in two models, with either dual outputs (1,300 and 1,550 nm) or on a single output with wavelength division multiplexing. In addition, they are available in either standard portable cases or a weathersealed case for outside plant applications.

With optical outputs of −10 dBm and stability of better than 0.1 dB per day, all units meet Bellcore requirements for stabilized optical sources presented in technical advisory TA-TSY-000887. The units come with any common single-mode fiber-optic connector.

For more information, contact Fotec Inc., The Schrafft Center, 529 Main St., P.O. Box 246, Boston, Mass. 02129, (617) 241-7810; or circle #117 on the reader service card.

When your customers are relying on you to get the job done, you need reliable and accurate test results . . . without having to worry about calculations that can add errors and time to your system tests.

The FS74 CHANNELIZER SR. eliminates errors and saves you time with 100% automatic and exclusive tests you can trust.

- All Channel DIGITAL tuner (5-890 MHz) covers all Sub-band, VHF, UHF, FM Cable Channels.
- Exclusive Frequency offset readout alerts you to carrier shifts.
- Integrated Wide-band monitor lets you see the system problems your customer sees that regular TVs don't.
- 5uV sensitivity (-46dB) with autoranged attenuators make CLI tests a snap.
- Automatic S/N and Hum tests on any IN-USE channel.
- Built-in DVM tests AC/DC Voltage and resistance.

The FS74 CHANNELIZER SR. gives you one integrated CATV and MATV troubleshooting and performance testing system that you can rely on to get the job done . . . fast.

Reader Service Number 50.

Call 1-800-843-3338 or write for a 10 Day Video Preview on the FS74!
(In Canada, call 1-800-851-8866)

SENCORE

3200 Sencore Drive Sioux Falls, South Dakota 57107

Launching a successful year

By Jack Trower
President, Society of Cable Television Engineers

First, I want to tell you how honored I am to have been elected president of the Society of Cable Television Engineers for the coming year. The Society means a great deal to me; I can assure you that it is not a job that will be taken lightly. The title of president is just that—a title. The real job of guiding the Society rests with the 15 individuals elected to the board of directors and with the national staff who ensure that the guidelines of the members and board are followed.

At this point I would like to thank Bill Riker and his staff for their excellent job at Cable-Tec Expo '89. Seeing some of the many crises that occur during an event of this size and the professional way they were handled gives me great confidence in our staff's abilities. It was a job well done.

This year's board is a group that any president would want to have. I feel very fortunate that I will be working with them during my term in office. There is a unique blend of talent on this board. We have people who are visionaries; who are detail oriented; and who have large company experience, small company experience, national scope, international scope, grass roots and all the other levels that are present in the membership. It is truly a cross-section of the Society. I intend to the best of my ability to use as much of this talent as well as that of the members who told me, "Call me if you need me" to work on the present and future programs of the Society.

Tremendous strides

In the past five years we as a Society have made tremendous strides in our membership and the programs that have been started. We are at the forefront of the cable industry in addressing the need to be competitive in the future. During the next year I want to continue this forward progress. But at the same time we should strengthen all of our existing programs to prepare a solid foundation for our next giant step into the future.

We have built our membership to over 5,400 members, but we are also reaching many, many more through our chapter and meeting group programs. We influence them but have not yet succeeded in convincing them to be members. Why? What do we have to do to bring them aboard? The new Installer Certification Program may be one of the answers, but are there others?

I feel that there are other answers to these questions out there but we haven't heard them yet. I promised to listen to the membership when I was elected as president and I intend to keep that promise. Of course, I do not have all the answers but will try to find them with your help. With this in mind, my address is: WEHCO Video Inc., P.O. Box 2221, Little Rock, Ark. 72203; my phone number is (501) 378-3529. I'll not always be in, but my secretary will get the message to me and I'll get back to you. Please remember to tell her it's about SCTE business.

Again, thank you for your confidence and support. I look forward to a successful year with all of your help.

Psssst...

Rumor has it that the best kept secret for testing Broadband Networks is

OUT of the BAG!

The Calan 1776/1777 Sweep/Analyzer System

Unique in the industry, the Calan 1776/1777 is the only synchronized receiver/transmitter with a built-in spectrum analyzer that provides a true sweep response and non-interference to data or video.

In addition, it offers a portable, lightweight design and the reputation of being the **Most Reliable** sweep/analyzer system ever designed for broadband test and measurement requirements.

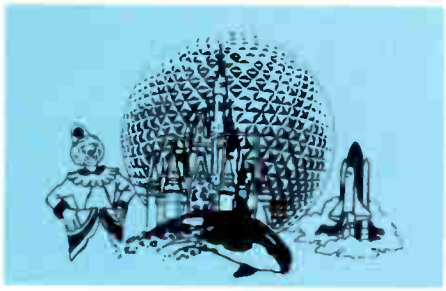
If you have a Broadband Network and don't have the Calan 1776/1777 Sweep/Analyzer System, you can **Pounce** on one by calling a Calan representative for a demonstration in your system.

CALAN

CABLE AND LOCAL AREA NETWORKS

CALAN, Inc.
R.R. 1, Box 86T
Dingmans Ferry, PA 18328
800-544-3392 • In PA: 717-828-2356

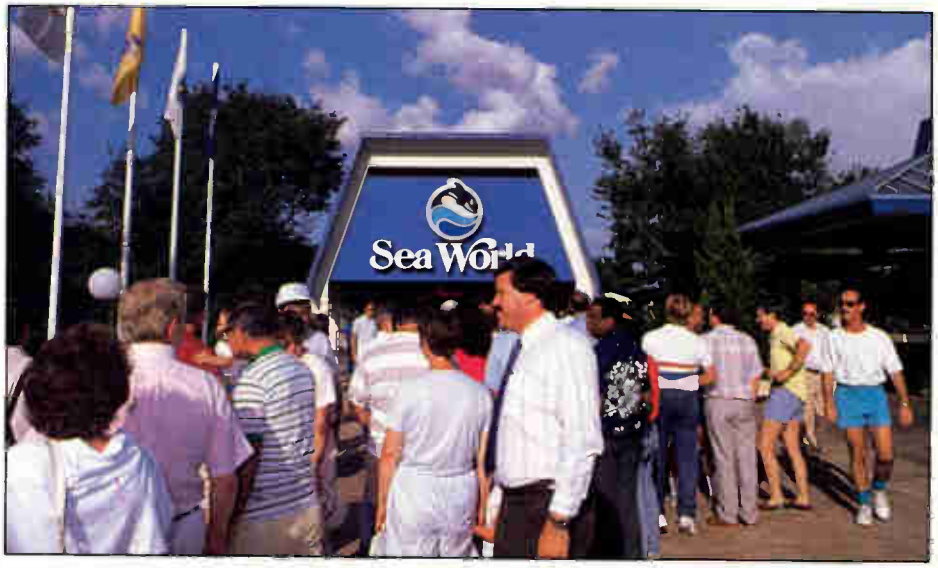
Reader Service Number 52.



Cable-Tec Expo '89:

By Rikki T. Lee Photos by Bob Sullivan

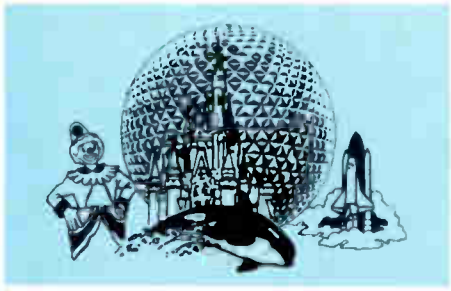
Time: Mid-June 1989. Place: Orlando/Orange County, Fla. Major Attractions: Epcot Center, Walt DisneyWorld, Cape Canaveral, Sea World, Disney/MGM Studios Theme Park and perpetual gridlock on I-4 en route to these locales. Meanwhile, with little fanfare, the Society



Sea World (top right), this year's site for Expo Evening, provided the backdrop for the Society's 20th anniversary celebration, which included a hearty feast complete with entertainment (below right). During Jerrold Night, Church Street Station (above) helped create a festive mood for attendees to relax and enjoy some of the local color, such as street juggling (above right).

An SCTE theme park

The Cable-Tec Expo and Annual Engineering Conference were officially kicked off with opening remarks by Bill Riker (center). The well-received keynote speaker was Paul Weitz (below) of the Johnson Space Center, whose address complemented the high-tech atmosphere of the sessions, which began with HDTV (bottom). Adding to the feeling of teamwork were the synchronized swimmers at the welcome reception sponsored by Anixter, AT&T, Raychem, the SCTE Florida Chapter and the Florida Cable Television Association. At Scientific-Atlanta's party, in addition to music, dancing and food, Steve Havey emceed a drawing for prizes, with help from Pat Cheval.



During the membership and awards luncheon (top right), Glenn Jones of Jones Intercable was presented one of the Special Recognition Awards by Pete Petrovich (center), Paul Beeman received the Member of the Year Award (above) and Immediate Past President Ron Hranac gave his farewell address (top left).

of Cable Television Engineers held its Annual Engineering Conference (Thursday, June 15 at the Stouffer Orlando Resort) and Cable-Tec Expo (Friday and Saturday at the Orange County Convention/Civic Center). But rumor has it that the Engineering Conference, technical workshops, exhibit floor, Expo Evening (celebrating the SCTE's 20th anniversary), etc., made one well-known rodent couple rather envious.

Statistically, this was by far the largest expo to date. For raw numbers, over 1,500 registered (13 percent increase from last year) and more than 125 exhibits filled the hall. On the training side, there were six hours of engineering sessions with 11 speakers, 11 expo workshops and eight technical demonstrations. Finally, over 150 sat for BCT/E and Installer Certification exams.

The action started in earnest at the Stouffer on Wednesday, with meetings of the NCTA Engineering Committee and the SCTE Interface Practices Committee (celebrating its first anniversary). That evening, Wavetek sponsored a welcome reception. At the gathering, Wavetek's Larry Dolan and Ray Sokola presented a $5,000 check to kick off the SCTE's second building fund. The fund, with $145,000 as its goal, was established to eliminate the mortgage for the Society's national headquarters, which recently doubled in size. Pete Petrovich, chairman of the SCTE's building fund, with assistance from TCI's

One of the highlights of the luncheon were the remarks by Jack Trower (above), the Society's new president, in which he promised to be "on call" to all members. Other events included the presentation of a Special Recognition Award to Tom Hall of the U.K. SCTE by Bob Luff (below right) and Byron Leech's acceptance of the President's Award on behalf of the NCTI from Ron Hranac (below left). More than 125 exhibits in the Orange County Convention/Civic Center (left and bottom right facing page) gave attendees the opportunity to peruse the latest in hardware and technical services.

Dave Willis (who is also on the Building Fund Committee) accepted the check on behalf of the Society.

I want my SCTE

On Thursday morning, before the Engineering Conference began, attendees caught the premiere of the Society's promotional rock video. Based on "The SCTE Theme"—a song written by Howard Whitman, the Society's manager of editorial and promotion, and originally performed at last year's Expo Evening by The SCTE Band—it featured Executive Vice President Bill Riker on drums and Whitman on guitar. The video was shot at the Orange, N.J., offices of Suburban Cablevision and The Ritz Theater in Elizabeth, N.J. First stanza: "Banging on the back of my TV set 'cause my picture wasn't right. Hitting the selector and I'm getting upset 'cause I wanna catch some cable tonight. A technician came to see me, said he passed the BCT/E. Got my picture right—now it's clear and bright, 'cause they trained him right." (Dick Clark gave it a 92.)

To begin the conference, Riker welcomed the attendees and featured highlights of the first meeting of the Society 20 years ago. He also covered the events of the first six expos and other programs started by the Society. Riker's remarks concluded with a schedule of the expo and local attractions.

Expo '89 Conference Chairman Richard Kirn of Wire Tele-View Corp. introduced the members of this year's Program Committee and described several workshops of special interest. After that, the engineering sessions—"High definition television," "Digital video: A future alternative," "Cable

The exhibit area beckoned for attendees to explore.

Engineering Conference: Future technologies today

By Rikki T. Lee

HDTV, digital video, telco competition, fiber—topics best left to worry about until tomorrow? Quite the contrary, as attendees of this year's Annual Engineering Conference discovered: Each one of these has already (or almost) arrived, with not too much time remaining to take decisive action for cable's survival. In most cases, speakers led the audience on glimpses of possible and not-too-distant futures, with telcos and other competitors overshadowing CATV every step of the way. However, as Expo '89 Conference Chairman Dick Kirn pointed out in his opening remarks, there's always been the uncertainty of competition, but "we're still here and still thriving."

High definition TV

To begin the "High definition television" session, Walt Ciciora, vice president of technology for American Television and Communications Corp., presented his agenda for "Cable's advanced TV system priorities." Despite a terrestrial broadcast standard not expected until late 1992 as well as slow penetration of HDTV sets (taking seven years to approach 1 percent penetration), Ciciora stated, "Cable involvement in advanced TV is critical."

He urged that CATV become strategically (that is, only slightly) in the lead of HDTV activity:

1) to counter telco propaganda and convince regulators that cable is the proper and best provider of HDTV;
2) to be able to live with the HDTV standard for at least 50 years (a time frame similar to NTSC, which will remain for several more decades because subscribers will have only one large-screen HDTV set); and
3) to rebuild and upgrade our plants so they will be ready for HDTV when it becomes commercially significant.

Ciciora also warned of competition from prerecorded media, citing the Mitsubishi 20 MHz VCR soon to be available.

Then, Norman Hurst, associate member of the technical staff of the David Sarnoff Research Center, gave an overview of his company's Advanced Compatible Television (ACTV, an enhanced definition TV system displayed at this year's National Show). First, however, Hurst discounted the threat of DBS (direct broadcast satellite) in the United States, contrasting this country against Japan and Europe. DBS would be difficult for the United States—a wide geographical area where there were large, privately owned broadcast and cable industries with big investments in NTSC.

He described the two phases of the system, ACTV-I and -II. The first phase is a 6 MHz NTSC-compatible channel containing 1,050 scan lines per frame and digital audio while eliminating NTSC artifacts. ACTV-II is a 6 MHz augmentation channel with 700 horizontal and 750 vertical lines per picture height as well as compact disc quality audio. According to Hurst, implementation of the ACTV system is possible today due to the relatively small investment (about $1 million) necessary for start-up.

Finally, Wayne Luplow, executive director of electronic systems R&D and engineering services for Zenith, explained his company's Spectrum-Compatible HDTV format. Zenith's system begins with a 6 MHz channel that is not NTSC-based; processing includes the removal of low frequency information and its placement in a digitized data format in the vertical blanking interval. A separate 6 MHz signal (compressed from 30 MHz) is simulcast on a currently unused VHF or UHF channel. The system is said to be compatible with CATV, satellite delivery and VCRs.

According to Luplow, the SC-HDTV format is "the only system that deviates from NTSC as its base.... In order to really improve signal-to-noise, you have to get away from NTSC." Receivers for the Zenith system will have considerable digital signal processing. In this regard, Zenith is currently in partnership with the Microelectronics Division of Bell Labs to manufacture integrated circuits for the SC-HDTV receivers.

Digital video

In perhaps the most intriguing session of the conference, Steffen Rasmussen, president of ABL Engineering (a manufacturer of switches, codecs and other digital equipment), gave his presentation on "Digital video: A future alternative." Rasmussen began with a basic description of the makeup of digital signals and listed the advantages of digital: low cost transmission, high reliability, immunity to noise and perfect regeneration of signals over long distances.

He continued with an examination of ISDN (integrated digital services network) over fiber to the home. Incorporating voice, data and video services (including video on demand), ISDN is currently in long-range planning by the telcos. Yet the speaker hinted that CATV can offer this approach in the future. This all-digital system would employ fiber-optic waveguides, digital video/audio technology, time division multiplexing and synchronous digital switching.

Cable vs. telco

In the third session, moderated by consultant Gary Kim, Steve Wilkerson (Florida Cable TV Association president) listed alleged anti-competitive strategies by telcos. Through their legislative efforts and public relations campaigns, according to Wilkerson, the telcos plan to bring the United States into the new Information Age

vs. the telcos" and "Fiber-optic technology"—got under way. (For a detailed account of each of the four sessions, see the accompanying sidebar.)

Following the second session, attendees took their seats in the Atrium for the SCTE's membership luncheon and awards ceremony. Bill Riker began by announcing the current board as well as introducing the new slate of officers for 1989-90: president—Jack Trower, WEHCO Video; Western vice president—Richard Covell, Jerrold; Eastern vice president—Victor Gates, Metrovision; secretary—Wendell Woody, Anixter Cable TV; and treasurer—Pete Petrovich, Petrovich & Associates. Two outgoing directors, Mike Aloisi and Gary Selwitz, received plaques in appreciation of their service to the Society.

In other awards, the SCTE honored seminar coordinators for the Texas Show, Great Lakes Expo, Eastern Show and Western Show. Kirn presented plaques to Expo '89 Program Committee members Aloisi, Paul Levine, Wayne Sheldon, John Walsh and Scott Weber. Five meeting groups were elevated to chapter status: Inland Empire, Michiana, Mount Rainier, Southern California and Upstate New York.

Also during the ceremony, seven new senior members were named—Tom Elliot, Mark Harrigan, James Lollar, Herman Holland, Richard Amell, John Wong and Petrovich. Austin Coryell, on behalf of the SCTE Scholarship Committee, was presented a check from Texscan's Bert Henscheid. And instead of presenting outstanding achievement awards, Jim Stilwell handed the responsibility of selecting nominees to each chapter and meeting group, with criteria to be announced at a later date.

In his farewell address, Immediate Past President Ron Hranac pointed to some of the Society's achievements during the past year. He then gave the President's Award to the National Cable Television Institute; Byron Leech accepted the award. Hranac then took a detour from the agenda and introduced Levine, who presented the first Service in Technology Award from *CT* to Bill and Anna Riker. In addition, Levine donated a check on the Rikers' behalf to the SCTE Tuition Assistance Program.

Hranac turned over his gavel to Trower, incoming president. In his address, Trower cited his grass-roots background and promised to be "on call" to the membership. Following this, Special Recognition Awards were given to Tom Hall, secretary of the U.K. SCTE; and Glenn Jones, CEO of Jones Intercable, for his gift of the *Jones Dictionary of Cable TV Terminology* to all U.S. and U.K. SCTE members. Finally, Paul Beeman of Viacom Networks was honored with the Member of the Year Award in recognition (among other things) for his many presentations to chapters and meeting groups.

Before the afternoon engineering sessions, Paul Weitz, deputy director of the Johnson Space Center and former shuttle commander, launched

via "one wire"; i.e., total distribution of telephone, information and video services to the home. "What they want to do is to take over the video business," Wilkerson decried.

However, he continued, there are "clouds" on the horizon for the telcos. These obstacles include opposition from telco competitors as well as consumer advocacy groups, problems of cross-subsidization and cost. About cost, Wilkerson quoted estimates from a 1989 Bellcore study citing $5,000-$10,000 per home. He said, "If the Congress said yes (to telco TV), if the state public service commission said yes, if everybody said yes, go to it—build all the fiber and bring us the Information Age, bring us that one wire—it would cost one hell of a lot to do it."

Representing the telco side of the debate was Mark Balmes, operations manager for transmission products at Southern Bell. In remarks of a defensive nature, he admitted that telcos are indeed aggressively involved in fiber optics, HDTV transmission and other services. However, according to Balmes, these programs are being pursued "not to threaten CATV but to realize the efficiencies of fiber transport."

Balmes insisted that telcos need to be postured to provide these services. Yet he stressed that telcos are still heavily regulated and also claimed there exists much competition from others including voice circuit and local area network providers. He predicted the completion of the telcos' ubiquitous fiber-optic network by 2011.

The final speaker in this panel was Gary Moore, CEO of Southern Energy Consultants. He remarked, "Those of you who feel the U.S. Congress is going to protect the CATV industry and keep the phone companies and electric companies out of video services to the home ought to start buying your plane tickets back to Kansas with Alice and Toto." Moore summarized the recent flurry of fiber activity by telcos and their intentions toward all-digital services.

He maintained that digital transmission of video on fiber (being pursued by telcos) is a practical and cost-effective method, while analog on fiber (the CATV domain) is not. On HDTV, he claimed that, contrary to popular belief, a worldwide standard (1,125/60) does exist and can be transmitted digitally over fiber.

Fiber optics

In the final session, "Fiber-optic technology," Scott Esty, marketing development supervisor for Corning Glass Works' Telecommunications Products Division, began with a basic description of the characteristics of fiber. This included myths and benefits, intrinsic and extrinsic parameters, the differences between single-mode and multimode fiber, and micro and macro bending. He advised against bending the fiber greater than the recommended minimum bend radius.

On the subject of fiber splicing (mechanical vs. fusion), Esty said,

Hats off to Dick Kirn, Expo '89 conference chairman.

"Fusion splicing seems to have some inherent advantages, particularly with AM transmission and reflections, although mechanical splicing has been perfected recently." He concluded with a discussion of outside vapor deposition, the fifth generation of fiber manufacture.

Jim Chiddix, senior vice president of engineering and technology for ATC, ended the conference with a look into CATV's future—one that stressed improving quality of service, product and pricing. And fiber will play an essential role. By implementing a fiber/coax hybrid system and reducing amplifier cascades, the problems of the lossy characteristic of coax can be minimized.

The prime motivator for using fiber, Chiddix said, is not improved reliability or signal quality but increased channel capacity. "We have a history as an industry of running out of channel capacity for purposes of refranchising, rate increases and improved value of product. As competition increases, the more channels we have the better we fare." Finally, he described the ongoing fiber backboning of the MSO's Orlando, Fla., system.

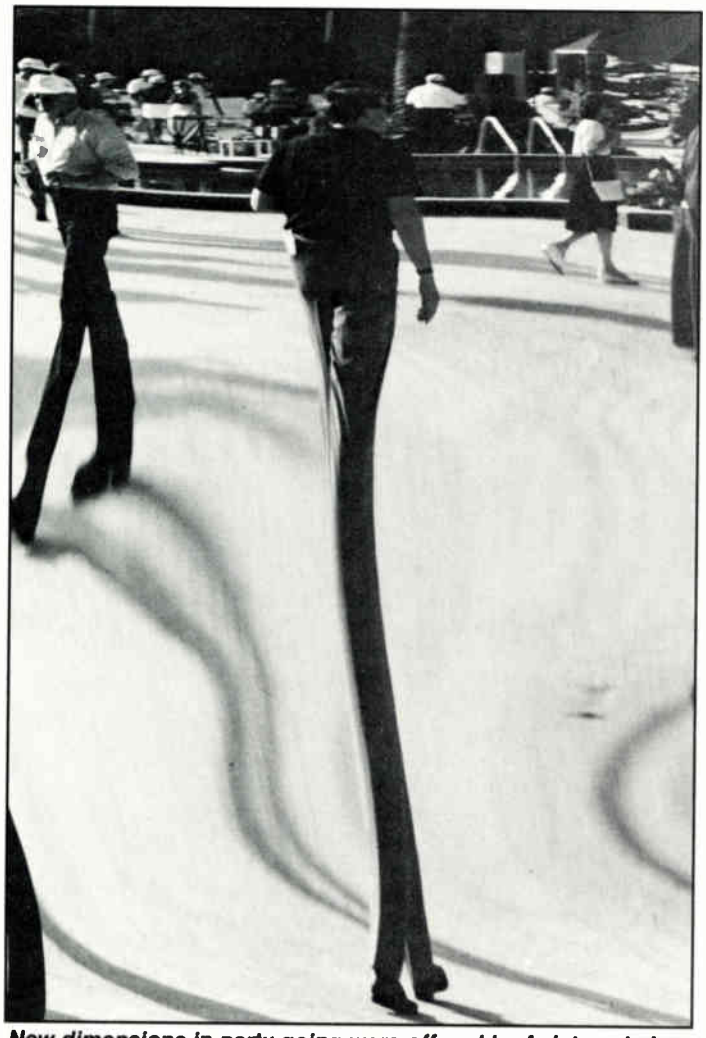
To summarize the engineering conference: Look out—tomorrow is sooner than you think.

On behalf of the SCTE, Pete Petrovich (center) with support from TCI's Dave Willis (left), thanked Wavetek for its $5,000 contribution to the building fund, presented by Larry Dolan (right) during Wavetek's preshow get-together.

his keynote speech. As expected, the Crystal Ballroom was filled to capacity, with space (the final frontier) at a premium. In his out-of-this-world slide presentation, Weitz took the attendees into orbit with a history of the shuttle program and warped into the future for upcoming missions.

Technical sessions

The following day, activity moved to the Convention Center. So did the registration booths, with lines several deep for expo- or Saturday-onlys. Dozens of prospective BCT/E and Installer Certification exam takers fought the deadline to sign up. And who could resist a souvenir T-shirt, lapel pin or just saying "hi" to SCTE headquarters personnel, Florida Chapter members and national directors staffing the booths.



New dimensions in party going were offered by Anixter, et al.

In the morning, nine expo workshops (75 minutes long) were offered three times each on Friday and Saturday. And in an approach different from previous expos, two special all-morning workshops ("Remote automated system testing" on Friday and "Basic spectrum analyzer theory and operation" on Saturday) gave attendees a more in-depth look at this equipment.

"AM fiber-optic transmission" with Wes Schick (Anixter Cable TV), Clive Holborow (AT&T Bell Labs) and J.R. Anderson (Anixter) outlined the current types of plant architecture (supertrunking, backbone and redundant backup). The speakers also discussed distributed feedback and Fabry-Perot lasers; loss due to fiber attenuation and mechanical/fusion splicing; fiber design symbols; and AM, FM and digital transmission over fiber.

"Fiber-optic test measurements" with Todd Jennings of Siecor and Norm Elsasser of 3M Photodyne described types of apparatus needed for installation and maintenance of fiber plant. Other topics included equipment and methods for measuring attenuation, return and splice losses and fault location using an optical time domain reflectometer; and techniques in bidirectional testing and splicing with the Fibrlok.

Jones Intercable's Ron Hranac teamed up with Wavetek's Steve Windle in "Signal level meter basics and alternative measurement techniques." The two engineers showed how to measure video carrier frequency accuracy and testing return loss, splitters and taps. Through demonstrations, attendees were shown alternative techniques for measuring hum, depth-of-modulation and carrier-to-noise using an SLM and an oscilloscope.

With only a year to go in filing your cumulative leakage index (CLI) reports, the "Signal leakage, CLI and the FCC" workshop was usually packed. FCC's John Wong warned attendees what might happen during a surprise visit from an inspector, while Brian James of the NCTA discussed offset requirements on aeronautical frequencies. Also, Dovetail Systems' Bob Dickinson provided tips on conducting a flyover.

The "Data transmission techniques" BCT/E review course, featuring Andy Paff, Don Patton and Tom Schatz of Anixter Cable TV, examined the telcos' DS hierarchy and data topologies. Also discussed were practical applications for digital technology and CATV entrance into the data market. They stressed that although to date no major revenue in CATV has been derived from high-speed data, the future holds great promise.

In the expo's only non-technical workshop, Dr. Bill Brown of Rollins University revealed how to improve "Supervisory and management skills." He drew from lessons learned in the automobile industry about working with people. Enlisting the help of attendees, Brown illustrated useful techniques: enhancing communication and listening skills, lacing criticism with praise, and managing by walking around and "schmoozing."

"Installer certification: Assuring quality performance" was presented by Ralph Haimowitz of the SCTE and Richard Covell of Jerrold. This workshop signaled the launching of the Installer Certification Program; the first exams for the program were administered Sunday morning. Haimowitz gave an overview of areas the program will cover; Covell described the development of the manual, allowing the attendees a glance at the latest draft.

ATC's Jim Haworth, RF Superior's Dwayne Lipp and Magnavox CATV's Jay Staiger discussed "Remote automated system testing" (Friday's all-morning workshop). The features of the Magnavox Line Monitor and RF Superior's CAT system were demonstrated in detail. The speakers echoed the belief that 1990s will be the era of monitoring; engineers will be able to remotely adjust modulators, deviation levels, etc.

Hewlett-Packard's John Cecil was on hand for "Basic spectrum analyzer theory and operation." In Saturday's all-morning session, Cecil covered applications for the headend and trunk, proof-of-performance testing, and analyzer controls and functions. He also highlighted microwave analyzers, amplitude measurement range, convenience features, and CATV functions and tests.

"Installing fiber-optic cable" featured a slide and videotape presentation narrated by Larry Nelson of Comm/Scope and Ken Carter of Cablevision of Central Florida. Footage of the Orlando system upgrade illustrated the difference between coax and fiber, construction techniques and route engineering. Howard Kemp of AT&T Bell Labs discussed rules and precautions for span engineering.

Finally, Jay Dorman of MPCS Video Industries and Lenny Melamedas

Many of the workshops were videotaped for future Satellite Tele-Seminar presentations.

Over 1,500 registrants made this year's expo the most well-attended SCTE confab to date.

of UA Columbia Cablevision of New Jersey presented "Local origination equipment and its use" (a BCT/E review course). For example, the discussion on cameras centered around equipment types, resolution, signal-to-noise and pixel count. Speakers stressed that application and quality are the determining factors in equipment selection.

On the exhibit floor

The best place to tweak, crimp, splice or do anything else in a CATV vein is on the expo's exhibit floor. This year's floor (sold out, then expanded, then sold out again) provided attendees a glimpse at today's and tomorrow's technology—from anchors and addressable taps to software and "sweepless" sweeps. Of course, the aisles and the exhibits were crowded; you always ran into people you knew—or didn't know. Many asked questions about the fabled and fabulous MultiPort, making its appearance at the expo for the first time as the official standard EIA-563.

Meanwhile, just down the corridor, the exhibitor training center offered vendors and others an opportunity to provide formal presentation of their products and services. In Friday's tech demo "Bench sweeps," Kalun's Paul Wong discussed the basic components and new features of his company's sweep generator. Terry Bush examined "Leakage testing" with Trilithic's Searcher Plus detection receiver. Mike Kelly of Anixter provided a detailed analysis of planning and implementing "Fiber optics." In "Time domain reflectometers," Riser-Bond's Marshall Borchert described the importance of loss of propagation and cursor replacement. Ted Hibben and Tom Quinlan presented Cable Connector Corp. of America's new "XLF drop connectors," outlining characteristics and benefits.

In Saturday's tech demo, Loctite Corp. representatives displayed its Block Aid "RFI shielding and sealant," a conductive rubber-based coating designed to reduce leakage. Then Jones Intercable's Ron Hranac and I showed how "Technical writing" could be accomplished without pain (or the need for anesthesia). In the final demo, Harry Long of Long Systems rang the bells and blew the whistles of his company's "Leakage Evaluation System" CLI software.

Across the hall, an active amplifier cascade was set up on Friday and Saturday for test equipment vendors to demonstrate their products in practical applications. Among the devices on display were signal level meters, spectrum analyzers, frequency counters and sweeps.

It's party time

As a reward for hard work during the day, the expo provided its share of social events during the balmy nights. After the Engineering Conference on Thursday, a welcome reception poolside was sponsored by Anixter, AT&T, Raychem, the SCTE Florida Chapter and the Florida Cable Television Association. Taking into account the good weather, great eats and aquatic acrobats (accompanied by a live band), you could say the party made a splash. After, Jerrold sponsored some '90s-style (that's 1890s) hospitality at Church Street Station. As expo-goers arrived at Rosie O'Grady's Good Time Emporium for further culinary delights, a UV hand stamp allowed all to sample the other shops and saloons.

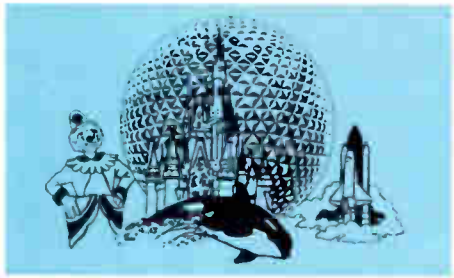
On Friday night, the SCTE celebrated its 20th anniversary at Sea World, complete with souvenir pins as well as towels for the event (and subsequent downpour). Hundreds chowed down on barbecued ribs, chicken and beans. During the dinner, Bill Riker awarded first SCTE President Ron Cotten a commemorative plate. Later, attendees could be found hobnobbing with sea lions, otters and sharks. But most returned to Shamu Stadium for a spectacular laser light show and fireworks.

Saturday night, the SCTE sponsored an amateur radio operators reception at the Stouffer's Coral Room; hams from all over matched call letters with faces in this social CQ. To round out the evening, posh was the word at the Scientific-Atlanta party in the Crystal Ballroom. With succulent hors d'oeuvres and danceable music, this was the primo place to unwind after an event-packed expo. And, as usual, S-A hospitality proved peerless.

On Sunday morning, attendees embarked on the Cablevision of Central Florida tour, sponsored by S-A; the system is currently replacing its AML microwave network with an AM fiber interconnect. The tour began with a slide presentation and included a visit to the master headend, inspection of the fiber plant and examination of picture quality at the system office.

Thus wraps up another successful Cable-Tec Expo. Next year's expo will be held June 20-24 in Nashville, Tenn. And now, as you reflect on expos past and future, enjoy the following pages of photos of this expo.

The exhibit floor was actually sold out, then expanded and sold out a second time.



Membership/awards luncheon

Outgoing board members Mike Aloisi (center) and Gary Selwitz (right) received awards from Bill Riker for their efforts to the Society over the last year.

Bill Riker checking the award plaques one last time before the presentations.

Expo '89 Program Committee members—Bill Riker, Mike Aloisi, Paul Levine, Scott Weber and John Walsh—were presented plaques for their work putting together this year's show. Also receiving plaques but not pictured were Dick Kirn (chairman) and Wayne Sheldon.

SCTE Director Vic Gates presented Tom White a plaque on behalf of the Michiana group achieving chapter status.

New senior members (the highest membership level attainable) honored included Tom Elliot, John Wong, Pete Petrovich and Dick Amell. Also named but not pictured were James Lollar, Mike Harrigan and Herman Holland.

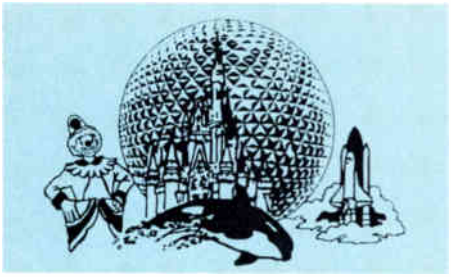
Texscan's Bert Henscheid made a special presentation during the luncheon of $500 to the SCTE Scholarship Fund.

Society Director Ted Chesley presented two groups with plaques commemorating their new chapter status. Accepting for Mt. Rainier were Sally Kinsman and Jack Dyste; with Randy Melius accepting for Inland Empire.

Presented a plaque from Pete Petrovich (center) on behalf of the Southern California group being elevated to a chapter were Frank Maldonado, Ed Johnson, George Stetson and Dave Massaglia.

Tom Foster (right) received a plaque from SCTE's Ralph Haimowitz on behalf of the Upstate New York group being elevated to chapter status.

Bill Riker presented plaques to Les Read, Vic Gates, Ralph Haimowitz, Dan Pike, Mike Aloisi and Pete Petrovich for their individual efforts in coordinating technical programs at regional cable conventions.



Engineering conference

The "Cable vs. the telcos" session provided some lively volleys from participants (beginning second from left) Steve Wilkerson, Florida Cable TV Association, Gary Moore, Southern Energy Consultants, and Mark Balmes, Southern Bell. Gary Kim (left), Focus Communications, was the discussion leader.

The session on "HDTV" opened with an overview by ATC's Walt Ciciora, which was followed by Norman Hurst, David Sarnoff Research Center, and Wayne Luplow, Zenith, each talking about his respective company's advanced TV systems.

The myths and benefits surrounding fiber were offered by Scott Esty of Corning during the "Fiber-optic technology" session.

"Cable involvement in advanced TV is critical," stated Walt Ciciora, ATC, in the "HDTV" session.

The advantages of digital transmission and its relationship to ISDN were examined by Steffen Rasmussen, ABL Engineering, in the session on "Digital video."

Expo workshops

Norman Elsasser, 3M Photodyne, covered some of the finer points of "Fiber-optic test measurements" during that workshop.

Christies Photographic Studios

In the "AM fiber-optic transmission" workshop Anixter's J.R. Anderson offered details on current architecture schemes.

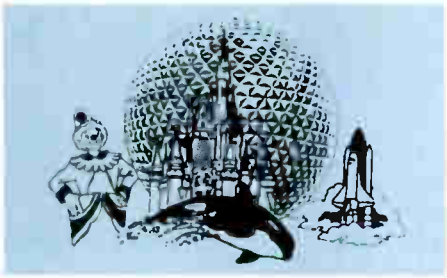
Clive Holborow, AT&T Bell Labs, fielding a question during the workshop on "AM fiber-optic transmission."

Christies Photographic Studios

Specifics for maintaining fiber plant were offered in the "Fiber-optic test measurements" workshop by Siecor's Todd Jennings.

Christies Photographic Studios

The "AM fiber-optic transmission" workshop included a discussion on fiber backbones by Wes Schick of Anixter.



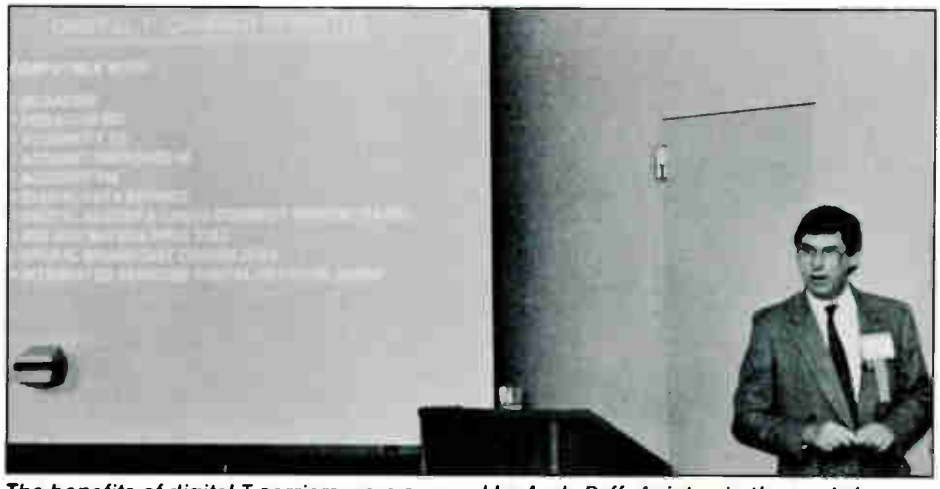
Expo workshops

Brian James, NCTA, John Wong, FCC, and Bob Dickinson, Dovetail Systems, left no stone unturned during the "Signal leakage, CLI and the FCC" workshop.

The use of modems in the "Data transmission techniques" workshop was explained by Don Patton of Anixter.

"Local origination equipment and its use" were covered in detail by Jay Dorman, MPCS Video, and Lenny Melamedas, UA Columbia Cablevision.

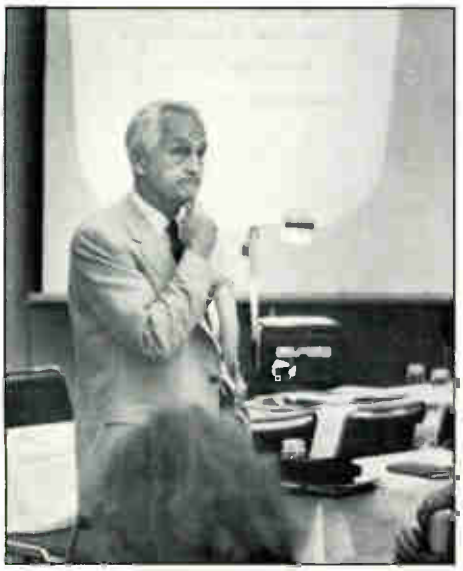
Magnavox's Jay Staiger explained his company's MLM system in the "Remote automated system testing" workshop.



The benefits of digital T carriers were covered by Andy Paff, Anixter, in the workshop on "Data transmission techniques."

The CAT system and what it does were explained by Dwayne Lipp, Superior Electronics, during the workshop on "Remote automated system testing."

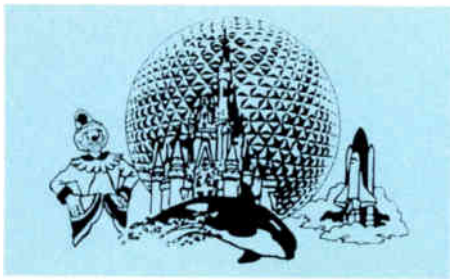
The ins and outs of "SLM basics and alternative measurement techniques" were examined by Steve Windle, Wavetek, and Ron Hranac, Jones Intercable.



"Supervisory and management skills" were discussed by Dr. Bill Brown of Rollins University in the only non-technical workshop.

Richard Covell, Jerrold, and Ralph Haimowitz, SCTE, explained the Society's newest certification program in the workshop on "Installer Certification: Assuring quality performance."

Overlashing existing plant with fiber was examined by Comm/Scope's Larry Nelson during the "Installing fiber-optic cable" workshop.



Exhibitor training center

At a test equipment demo room using an operating amplifier cascade, Tim Mooney of C-COR and Ron Boyer of CaLan discussed sweep systems with two attendees.

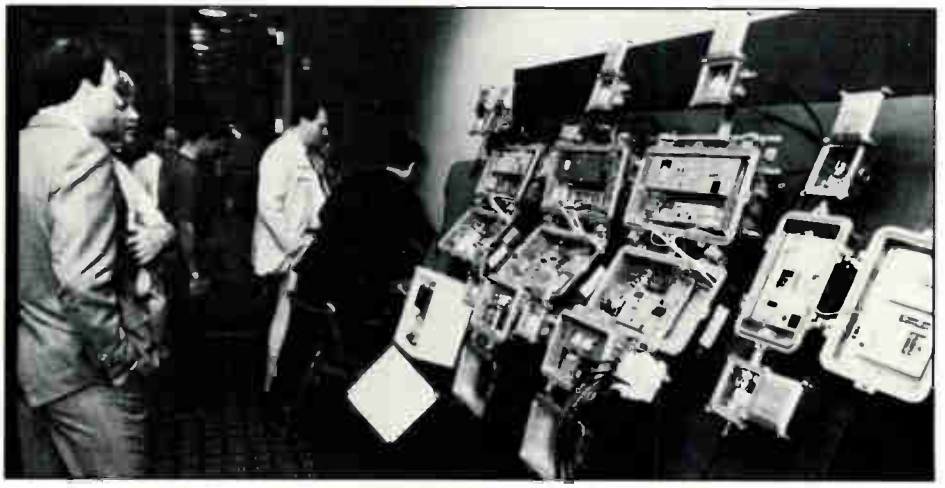
Ted Hibben, Cable Connector Corp. of America, demonstrated his company's XLF drop connectors.

Christies Photographic Studios

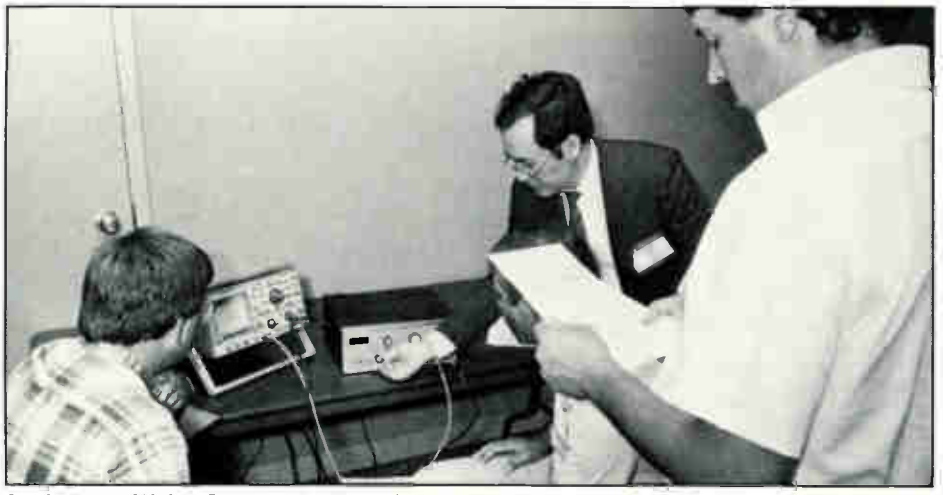
Mike Kelly of Anixter Cable TV addressed a group on planning and implementation of fiber-optic plant.

Anixter Cable TV's Dean DeBiase reviewed the company's cooperation with other vendors in providing fiber-optic technology.

Rikki Lee of "CT" and Ron Hranac of Jones Intercable fielded questions following their "Painless technical writing" workshop.



An active amplifier cascade was set up near the Exhibitor Training Center to allow test equipment vendors the opportunity to demonstrate their wares.



Paul Wong of Kalun Communications demonstrated a bench sweep in the amplifier cascade room.

Christies Photographic Studios

Trilithic's Terry Bush provided helpful hints in his workshop on signal leakage testing.

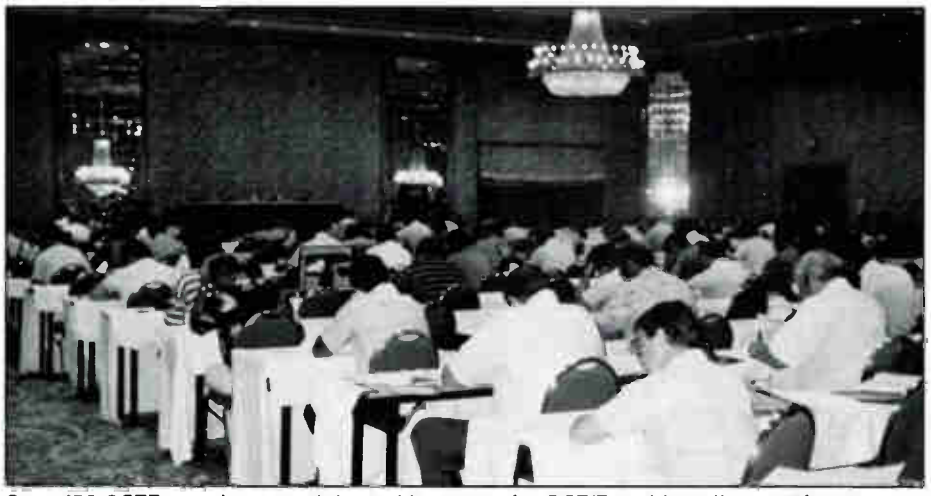
Glenn LeBlanc described the qualities of Loctite Corp.'s RFI shielding and sealant material.

Special events, etc.

The NCTI provided two "rest stations" with coffee and tea for attendees to perk their spirits and converse with associates.

Booths offering information on SCTE's membership services were popular with many expo-goers.

SCTE executives and board members gathered for a brief introduction at Wavetek's reception during the presentation by Wavetek of a $5,000 check for the Society's second building fund.



Paul Levine

Over 150 SCTE members participated in exams for BCT/E and installer certifications.

The Society's first president—Ron Cotton—received a plate commemorating his tenure at the helm from newly elected President Jack Trower, with assistance from Bill Riker.

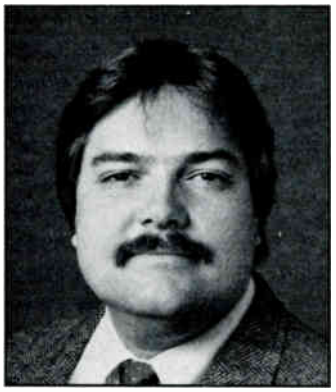
SCTE staffers Pat Zelenka, Anna Riker and Howard Whitman were instrumental in keeping the expo running smoothly.

The SCTE's Florida Chapter was well-represented at the expo.

Directors Ted Chesley and Bob Luff show off the latest in casual wear—the special Cable-Tec Expo '89 T-shirt.

The tranquillity of cool water (below) and a poolside sextet provided a calm in the sea of expo activity during the welcome reception sponsored by Anixter, AT&T, Raychem, the SCTE Florida Chapter and the Florida Cable TV Association.

KEEPING TRACK



Davis

Standard Communications promoted **Warren Davis Jr.** to national product manager of its Satellite Communications Division. Previously, he was product support specialist.

Greg Brown was named product support technician for the division. Prior to this, he worked in Standard's repair lab.

Ertha Sims was appointed customer service administrator. She recently graduated from the Community College of the Air Force. Contact: P.O. Box 92151, Los Angeles, Calif. 90009, (213) 532-5300.

ComSonics named **Wendy Springer** customer service representative for the Northeast region. She was formerly a sales clerk for the company. Contact: 1350 Port Republic Rd., P.O. Box 1106, Harrisonburg, Va. 22801, (703) 434-5965.

Bruce Lane joined **Texscan Corp.** as Eastern national accounts manager. Prior to this, he held management positions with Jerrold and Trilogy. Contact: 10841 Pellicano Dr., El Paso, Texas 79935, (915) 594-3555.

Greg Castelli joined **NCS Industries** as regional sales engineer for Pennsylvania, northern New Jersey and northern West Virginia. He has a background in CATV and military electronics engineering and sales. Contact: 2255-E Wyandotte Rd., Willow Grove, Pa. 19090, (215) 657-4690.

Bill Riker was appointed to the board of directors of the **National Cable Television Center and Museum** at Pennsylvania State University. He is currently executive vice president of the Society of Cable Television Engineers.

Also named a director, **Michael Rigas** is presently vice president of Adelphia Communications Corp. Contact: Mitchell Building, Pennsylvania State University, University Park, Pa. 16802, (814) 863-4011.

Thomas Elliot will serve as vice president of science and technology for **Cable Television Laboratories.** He is currently director of research and development for Tele-Communications Inc.

Craig Tanner was named vice president of advanced television projects. Prior to this, he was vice president of planning for the engineering and development department at CBS Inc.

Claude Baggett was appointed director of systems engineering projects. He was previously with American Television and Communications Corp. as director of engineering and technology. Contact: 124 Mt. Auburn St., Suite 200, Cambridge, Mass. 02138, (617) 576-5754.

Egnoto

Jerrold named **Horatio Egnoto** vice president of European operations. Prior to this, he was director of Canadian operations.

John Dalquist was appointed director of international business programs. Most recently, he was director of European cable operations.

Dale Frew was promoted to director of Canadian operations. Formerly, he was director of sales and marketing for the Canadian operation.

Dan Sutorius was named project manager of fiber-optic distribution, in the Cableoptics business unit. Before this, he was manager of international treasury operations.

John Burke was appointed product manager for Jerrold's Subscriber Systems Division marketing department. He was previously a new business planner.

Thomas Schulte was named account executive for Kansas, Nebraska, Missouri, Oklahoma and Arkansas. Before joining the company, he was district sales manager for General Electric's Mobile Communications Division. Contact: 2200 Byberry Rd., Hatboro, Pa. 19040, (215) 674-4800.

Power Guard hired **Richard Simile** as Northeastern sales manager. He has 14 years of cable experience ranging from plant construction to system management. Contact: P.O. Box 2796, Opelika, Ala. 36801, (205) 742-0055.

Jacob

Tektronix named **Laura Jacob** marketing services manager for its Television Division. Prior to this, she was public relations manager and video producer.

Austin Basso was promoted to sales and marketing manager for the division. Previously, he was Gulf Coast region sales manager for Television Division products. Contact: P.O. Box 500, Beaverton, Ore. 97077, (503) 627-2230.

W. Sherwood Campbell joined **Malarkey-Taylor Associates** as vice president of engineering. He was most recently with ASTRA in Luxembourg. Contact: 1130 Connecticut Ave., N.W., Suite 700, Washington, D.C. 20036, (202) 835-7800.

Midwest CATV named **Mitch McGaughey** to handle inside sales for its Dallas office. Before this, he was sales manager for Donley International in Houston. Contact: P.O. Box 271, Charleston, W. Va. 25321, (304) 343-8874.

Cable Link promoted **Steve Ries** to product manager for its headend and line gear facilities. He was previously shipping supervisor.

Lucy Espinoza was named sales representative for the Southwestern United States. She has 24 years of sales and management experience. Contact: 280 Cozzins St., Columbus, Ohio 43215, (614) 221-3131.

Dubuc

Norm Dubuc was appointed manager of **Qintar**'s CATV sales division. Before this, he was regional manager for Charter Cable in West Virginia. Contact: P.O. Box 8060, Moorpark, Calif. 93020-8060, (800) 252-7889.

Dennis Enright was appointed vice president of **3M**'s TelComm Products Division. Previously, he was vice president of the Electronic Products Division.

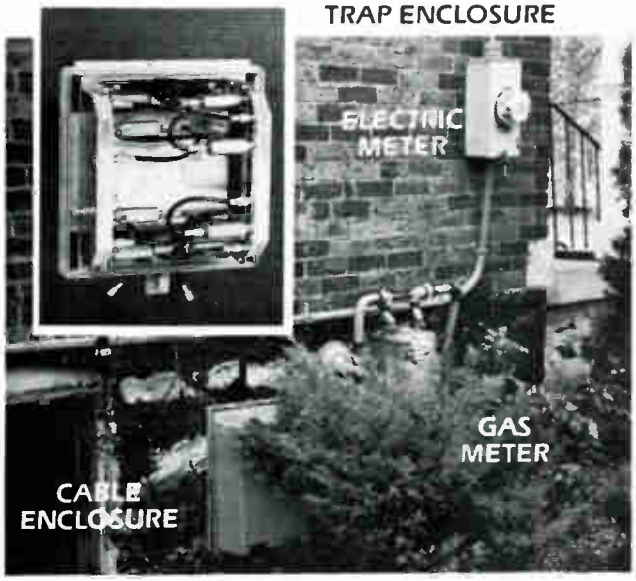
Donald Campbell was named general manager of 3M Photodyne, a subsidiary of 3M reporting through the Dynatel Systems Division. He was formerly technical director of the Electro-Tel Laboratory in Hamburg, Germany. Contact: P.O. Box 2963, Austin, Texas 78769-2963.

Greg Petherbridge was named field sales administrator for **Allied**. He was formerly customer service supervisor and district manager coordinator.

Roni Bobnar was promoted to customer service supervisor. Before this, she was group leader of order entry and customer service. Contact: 5800 Harper Rd., Solon, Ohio 44139, (216) 248-2600.

EAGLE'S OUTDOOR ADDRESSABLE TRAP SYSTEM AN ALTERNATIVE TO SET TOP DESCRAMBLERS FINALLY: CONSUMER FRIENDLINESS WITH IMPULSE PPV

TRAP ENCLOSURE



TYPICAL INSTALLATION

OPTIONAL REMOTE UNIT

Addressable Trap System eliminates many of the consumer unfriendly characteristics of present day converter descramblers. **Eagle's Addressable Trap System** provides:

(A) Ability to record a premium channel while watching a different premium channel.
(B) A converter descrambler is not required for each TV.
(C) TV and VCR remote controls can be used.
(D) Cable ready sets can use their extra channel capacity possibly eliminating a converter.
(E) Picture and sound distortions are minimized.
(F) Switch boxes or complicated wirings are not required.

A trapped system is very friendly since all subscribed to channels are present at each TV set simultaneously in an unscrambled mode. Only undesired channels are removed. When addressability and Impulse pay-per-view are added, as with **Eagle's Addressable Trap System**, consumer friendliness, versatility, and economy for today's system operator are the result. The control box in which the traps are located is outside the home similar to electric, gas or water meters, eliminating the need for customer change of service or repair scheduling.

One hundred million traps used in cable systems testify to their reliability, simplicity, and economics for controlling premium channels. Adding **Addressability** and IPPV to basic traps, will extend their use many years into the future.

FEATURES

- 4 or 8 tiers of negative, positive or multichannel addressable filters; 256 combinations selectable.
- Consumer friendly with VCRs, cable ready sets, and remote controlled TVs.
- Controls signal delivery to multiple TV sets from one trap switch enclosure.
- Uses your present negative or positive traps.
- Powered from the home; cable system powering changes not required.
- All service disconnect capability; over 80 dB isolation.
- Non-volatile memory protects data during power outages.
- Automatic scheduling of events & previews.
- No need to enter home for audits.
- Automatic shut-down after time out.
- IBM PC or compatible computer control.
- Billing program; compatible with billing systems.
- Transparent to other scrambling technology.
- Compatible with non-attended remote headends.
- Ground block.
- Non-interrupted test points.

OPTIONAL REMOTE UNITS

- Subscribe to premium programming without need to call the cable system; order IPPV by event number.
- Auto-dialer transmits customer usage back to the system operator, using store and forward techniques.
- Pre-authorize customers for limited amounts of pre-paid programming.
- Parental Control of premiums or all service.

EAGLE
COMTRONICS INC.

MADE IN U.S.A.

4562 Waterhouse Road, Clay, NY 13041 (315) 622-3402 TOLL FREE 800-448-7474
In Canada: Deskin Sales • Montreal • Toronto • Vancouver • 416-475-1412
In Europe: Electro Service • Belgium • 011-32-15-20-95-75
• Cablecom AS • Norway • 011-47-34-67800 • Stodiek • W. Germany • 011-211-41-7010

2/1/89

CALENDAR

August

Aug. 6-8: Cable Television Laboratories fiber-optics planning seminar, Clarion Hotel, Boulder, Colo. Contact (303) 939-8500.

Aug. 7-10: Siecor Corp. technical seminar on fiber-optic installation and splicing for LAN, building and campus applications, Hickory, N.C. Contact (704) 327-5539.

Aug. 8: SCTE Cascade Range Chapter technical seminar, Wilsonville Holiday Inn, Portland, Ore. Contact Peter Rumble, (503) 779-1814.

Aug. 10: SCTE Chesapeake Chapter technical seminar on terminal devices, Holiday Inn, Columbia, Md. Contact Tom Gorman, (301) 252-1012.

Aug. 10-13: North Carolina Cable Television Association annual meeting, Pinehurst Hotel and Country Club, Pinehurst, N.C. Contact (919) 821-4711.

Aug. 16: SCTE Ohio Chapter technical seminar on fiber optics, Cleveland. Contact Bill Ricker, (614) 236-0523.

Aug. 16: SCTE Golden Gate Chapter technical seminar on CLI, Pleasanton Fairgrounds, Pleasanton, Calif. Contact John Parker, (408) 437-7600.

Aug. 17: SCTE New England Chapter technical seminar, Boxborough Sheraton, Boxborough, Mass. Contact Jeffery Piotter, (508) 685-0258.

Aug. 17: SCTE Ohio Valley Chapter technical seminar, Cincinnati. Contact Bill Ricker, (614) 236-1292.

Aug. 18: SCTE Miss/Lou Chapter technical seminar, Baton Rouge, La. Contact Charles Thibodeaux, (504) 641-9251.

Aug. 19: SCTE Razorback Chapter installer seminar, Days Inn, Little Rock, Ark. Contact Jim Dickerson, (501) 777-4684.

Aug. 20-23: New Mexico Cable Television Association annual convention, The Lodge, Cloudcroft, N.M. Contact Ray Davenport, (505) 983-5885.

Aug. 21-23: Siecor Corp. technical seminar for management and supervisory personnel on fiber optics for LAN, building and campus applications, Hickory, N.C. Contact (704) 327-5539.

Aug. 23: SCTE Rocky Mountain Chapter technical seminar on transportation systems and BCT/E testing. Contact Rikki Lee, (303) 792-0023.

Aug. 23: SCTE Florida Chapter's South Florida Group technical seminar, Holiday Inn, Fort Lauderdale, Fla. Contact Denise Turner, (813) 626-7115.

Aug. 24: SCTE Florida Chapter's First Coast Group technical seminar, Holiday Inn Airport, Jax, Fla. Contact Denise Turner, (813) 626-7115.

Aug. 24: SCTE Upstate New York Chapter technical seminar, Rochester, N.Y. Contact Ed Pickett, (716) 325-1111.

Aug. 27-29: Southern Cable Television Association's Eastern Cable Show, Merchandise Mart, Atlanta. Contact (404) 252-2454.

Aug. 29: SCTE Satellite Tele-Seminar Program, "High definition television technology (Part II)," 12-1 p.m. ET on Transponder 2 of Galaxy III. Contact (215) 363-6888.

Aug. 29-Sept. 1: Missouri Cable Television Association annual convention, Lodge of the Four Seasons, Lake of the Ozarks, Mo. Contact (816) 453-3392.

Aug. 31-Sept. 1: SCTE Heart of America Chapter technical seminar and BCT/E testing, Lodge of the Four Seasons, Lake of the Ozarks, Mo. Contact Wayne Hall, (816) 942-3715.

September

Sept. 6: SCTE North Country Chapter technical seminar on signal processing centers, Sheraton Midway Hotel, St. Paul, Minn. Contact Doug Ceballos, (612) 522-5200.

Sept. 6-9: Hawaii Cable Television Association annual convention, Hyatt Regency, Waikoloa, Hawaii. Contact Kit Beuret, (808) 834-4159.

Sept. 9-12: Pacific Northwest Cable Communications Association annual convention, Cavanaugh's Inn at the Park, Spokane, Wash. Contact Dawn Nielsen, (509) 765-6151.

Sept. 10-12: SCTE Dakota Territories Meeting Group technical seminar on CLI, Sylvia Lake Lodge, Hills City, S.D. Contact A.J. VandeKamp, (605) 339-3339.

Sept. 11-12: Wisconsin Cable Communications Association annual convention, Concourse Hotel, Madison, Wis. Contact Lynne Walrath, (608) 256-1683.

Sept. 11-13: Wireless Cable Association convention, Hyatt Crystal City, Arlington, Va. Contact (202) 452-7283.

Sept. 11-14: Siecor Corp. technical seminar on fiber-optic installation and splicing for LAN, building and campus applications, Hickory, N.C. Contact (704) 327-5539.

Sept. 12: SCTE Florida Chapter's Central Florida Group technical seminar, Holiday Inn North, Lakeland, Fla. Contact Denise Turner, (813) 626-7115.

Sept. 12-14: Magnavox CATV technical seminar, Columbus, Ohio. Contact Amy Costello Haube, (800) 448-5171.

Sept. 13: SCTE Florida Chapter's Gulf Coast Group technical seminar. Contact Denise Turner, (813) 626-7115.

Sept. 14: SCTE Golden Gate Chapter seminar on equal employment issues, Italian Gardens Restaurant, San Jose, Calif. Contact John Parker, (408) 437-7600.

Sept. 16: SCTE Cactus Chapter technical seminar. Contact Harold Mackey Jr., (602) 866-0072.

Sept. 17-19: Kentucky Cable Television Association annual convention, Marriott Resort, Lexington, Ky. Contact Randa Wright, (502) 864-5352.

Sept. 18-20: Magnavox CATV technical seminar, Detroit. Contact Amy Costello Haube, (800) 448-5171.

Sept. 19-21: C-COR Electronics technical seminar, Dallas. Contact Binky Lush, (814) 238-2461.

Sept. 20: SCTE North Country Chapter BCT/E testing. Contact Douglas Ceballos, (612) 522-5200.

Sept. 20: SCTE Razorback Chapter technical seminar, Days Inn, Little Rock, Ark. Contact Jim Dickerson, (501) 777-4684.

Sept. 20: SCTE Dairyland Meeting Group technical seminar. Contact Bruce Wasleske, (715) 842-3910.

Sept. 20-22: Great Lakes Expo, Convention Center, Columbus, Ohio. Contact Dixie Russell, (614) 272-0860.

Sept. 22: SCTE Caribbean Chapter technical seminar on fiber optics, Cable TV Co. of San Juan, San Juan, Puerto Rico. Contact Jerry Fitz, (809) 799-4665.

Sept. 25-27: Magnavox CATV technical seminar, Indianapolis. Contact Amy Costello Haube, (800) 448-5171.

Sept. 25-28: Siecor Corp. technical seminar on fiber-optic installation and splicing for LAN, building and campus applications, Hickory, N.C. Contact (704) 327-5539.

Sept. 26: SCTE Satellite Tele-Seminar Program, "Tech marketing training tape" and SCTE music video, 12-1 p.m. ET on Transponder 2 of Galaxy III. Contact (215) 363-6888.

Sept. 26-28: International Construction and Utility Equipment Exposition, Kentucky Fair and Exposition Center, Louisville, Ky. Contact (312) 321-1470.

Sept. 27: SCTE Piedmont Chapter technical seminar on fiber-optic technology. Contact Rick Hollowell, (919) 968-4631.

Planning ahead

Sept. 20-22: Great Lakes Expo, Convention Center, Columbus, Ohio.

Oct. 3-5: Atlantic Show, Convention Center, Atlantic City, N.J.

Oct. 17-19: Mid-America Show, Hilton Plaza Inn, Kansas City, Mo.

Dec. 13-15: Western Show, Convention Center, Anaheim, Calif.

Feb. 21-23: Texas Show, Convention Center, San Antonio.

May 20-23: National Show, Convention Center, Atlanta.

June 20-24: Cable-Tec Expo, Nashville, Tenn.

October

Oct. 2-4: Magnavox CATV technical seminar, Atlanta. Contact Amy Costello Haube, (800) 448-5171.

Oct. 2-6: George Washington University course on video transmission and broadcasting via satellite, Washington, D.C. Contact (202) 994-6106.

ATLANTIC CABLE SHOW

Oct. 3-5: Atlantic Show, Convention Center, Atlantic City, N.J. Contact (609) 848-1000.

Oct. 5-8: Society of Broadcast Engineers annual convention, Kansas City, Mo. Contact (800) 225-8183.

Antenna distance correction

By Ron Hranac
Jones Intercable Inc.

The Federal Communications Commission requires that signal leakage measurements be made at a distance of 10 feet from the CATV plant. Physical limitations sometimes prevent a measurement exactly at 10 feet; the following tables summarize signal level corrections (in dB) to add to measurements made at distances other than 10 feet. These are free space correction factors and will enable you to determine the theoretical signal level at 10 feet when you know the leakage level at a distance other than 10 feet. These correction factors do not take into account errors caused by reflections from the ground or nearby objects.

The following formula was used to create the tables and examples of its use are on the next page.

Correction (dB) = $20\log_{10}$(new distance/reference distance)

Table 1
(1 to 60 feet in 1-foot increments)

Distance (feet)	Correction (dB)	Distance (feet)	Correction (dB)
1	−20	31	9.83
2	−13.98	32	10.10
3	−10.46	33	10.37
4	− 7.96	34	10.63
5	− 6.02	35	10.88
6	− 4.44	36	11.13
7	− 3.10	37	11.36
8	− 1.94	38	11.60
9	− 0.92	39	11.82
10	0	40	12.04
11	0.83	41	12.26
12	1.58	42	12.46
13	2.28	43	12.67
14	2.92	44	12.87
15	3.52	45	13.06
16	4.08	46	13.26
17	4.61	47	13.44
18	5.11	48	13.62
19	5.58	49	13.80
20	6.02	50	13.98
21	6.44	51	14.15
22	6.85	52	14.32
23	7.23	53	14.49
24	7.60	54	14.65
25	7.96	55	14.81
26	8.30	56	14.96
27	8.63	57	15.12
28	8.94	58	15.27
29	9.25	59	15.42
30	9.54	60	15.56

Table 2
(65 to 300 feet in 5-foot increments)

Distance (feet)	Correction (dB)	Distance (feet)	Correction (dB)
65	16.26	185	25.34
70	16.90	190	25.58
75	17.50	195	25.80
80	18.06	200	26.02
85	18.59	205	26.24
90	19.08	210	26.44
95	19.55	215	26.65
100	20	220	26.85
105	20.42	225	27.04
110	20.83	230	27.23
115	21.21	235	27.42
120	21.58	240	27.60
125	21.94	245	27.78
130	22.28	250	27.96
135	22.61	255	28.13
140	22.92	260	28.30
145	23.23	265	28.46
150	23.52	270	28.63
155	23.81	275	28.79
160	24.08	280	28.94
165	24.35	285	29.10
170	24.61	290	29.25
175	24.86	295	29.40
180	25.11	300	29.55

Examples

Problem: You have just measured a leak 75 feet from a feeder cable, and its amplitude at that distance is −47.5 dBmV. What would the leak's amplitude be 10 feet from the cable?

Solution:

$$\begin{aligned}\text{Correction (dB)} &= 20\log_{10}(\text{new distance/reference distance})\\ &= 20\log_{10}(75\text{ feet}/10\text{ feet})\\ &= 20\log_{10}(7.50)\\ &= 20(0.88)\\ &= 17.50\text{ dB}\end{aligned}$$

Add the correction (in dB) to the original measured level: −47.5 + 17.5 = −30. The calculated level of the leak 10 feet from the cable is −30 dBmV.

Problem: The amplitude of a leak seven feet from a line extender is −38 dBmV. What would the leak's amplitude be at 10 feet?

Solution:

$$\begin{aligned}\text{Correction (dB)} &= 20\log_{10}(7\text{ feet}/10\text{ feet})\\ &= 20\log_{10}(0.70)\\ &= 20(-0.15)\\ &= -3.10\text{ dB}\end{aligned}$$

Add the correction to the original measured level: −38 + (−3.10) = −41.1. The calculated amplitude of the leak 10 feet from the line extender is −41.1 dBmV.

Problem: You have just measured a leak on Ch. A (121.2625 MHz) 15 feet from the cable. The leak's amplitude at that distance is 10 μV/m. Does that leak exceed the FCC maximum of 20 μV/m at 10 feet?

Solution: You must first convert the microvolt per meter reading to microvolts:

$$\begin{aligned}\text{Microvolts} &= \text{microvolts per meter}/0.021/\text{frequency in MHz}\\ &= 10/0.021/121.2625\\ &= 3.93\ \mu\text{V}\end{aligned}$$

Then change microvolts to dBmV:

$$\begin{aligned}\text{dBmV} &= 20\log_{10}(\text{microvolts}/1000)\\ &= 20\log_{10}(3.93/1000)\\ &= 20\log_{10}(0.00393)\\ &= 20(-2.40595)\\ &= -48.12\text{ dBmV}\end{aligned}$$

From Table 1, a measurement distance of 15 feet requires that you add 3.52 dB to the leak level: −48.12 + 3.52 = −44.6. Converting −44.6 dBmV to microvolts per meter will tell you if you exceed the FCC 10-foot limit of 20 μV/m:

$$\begin{aligned}\text{microvolts per meter} &= \left(10^{\frac{\text{dBmV}}{20}}\right) \times 1{,}000 \times 0.021 \times \text{F(MHz)}\\ &= \left(10^{\frac{-44.6}{20}}\right) \times 1{,}000 \times 0.021 \times 121.2625\\ &= (10^{-2.23}) \times 2546.51\\ &= 0.0059 \times 2546.51\\ &= 14.995\ \mu\text{V/m}\end{aligned}$$

Cable Exchange

PHASECOM
- 7170-05, MODULATOR, COHERENT, CH 5
- 7170-06, MODULATOR, COHERENT, CH 6
- 7170-07, MODULATOR, COHERENT, CH 7
- 7170-08, MODULATOR, COHERENT, CH 8
- 7170-09, MODULATOR, COHERENT, CH 9
- 7170-10, MODULATOR, COHERENT, CH 10
- 7170-11, MODULATOR, COHERENT, CH 11
- 7170-12, MODULATOR, COHERENT, CH 12
- 7170-13, MODULATOR, COHERENT, CH 13
- 7260-06, DEMODULATOR, TV, CH 6
- 7360-02, PROCESSOR, HETRODYNE, CH 2
- 7360-03, PROCESSOR, HETRODYNE, CH 3
- 7360-04, PROCESSOR, HETRODYNE, CH 4
- 7360-05, PROCESSOR, HETRODYNE, CH 5
- 7360-06, PROCESSOR, HETRODYNE, CH 6
- 7360-07, PROCESSOR, HETRODYNE, CH 7
- 7360-08, PROCESSOR, HETRODYNE, CH 8
- 7360-10, PROCESSOR, HETRODYNE, CH 10
- 7360-11, PROCESSOR, HETRODYNE, CH 11
- 7360-12, PROCESSOR, HETRODYNE, CH 12
- 7360-13, PROCESSOR, HETRODYNE, CH 13
- 7360-F, PROCESSOR, HETRODYNE, CH F
- 7500-02, INPUT CONVERTER, CH 2
- 7760-02, INPUT CONVERTER, CH 2
- 7760-03, INPUT CONVERTER, CH 3
- 7760-04, INPUT CONVERTER, CH 4
- 7760-06, INPUT CONVERTER, CH 6
- 7760-07, INPUT CONVERTER, CH 7
- 7760-08, INPUT CONVERTER, CH 8
- 7760-10, INPUT CONVERTER, CH 10
- 7760-11, INPUT CONVERTER, CH 11
- 7760-13, INPUT CONVERTER, CH 13
- 7780-11, INPUT CONVERTER, CH 11
- 7780-12, INPUT CONVERTER, CH 12
- 7780-22, INPUT CONVERTER, CH 22
- 7780-24, INPUT CONVERTER, CH 24
- 7780-29, INPUT CONVERTER, CH 29
- 7780-35, INPUT CONVERTER, CH 35

PICO
- XUV-H, XTAL CONTROL CONV

PIONEER
- BC2001, CONVERTER
- BC3300, CONVERTER

RAYCHEM
- TF-500-C, THERMOCRIMP CONNECTOR
- TP-500-C, THERMOCRIMP CONNECTOR
- TP-750-C, THERMOCRIMP CONNECTOR
- TP-875-C, THERMOCRIMP CONNECTOR
- TS-500-C, THERMOCRIMP CONNECTOR
- TS-750-C, THERMOCRIMP CONNECTOR
- TX-750-C, THERMOCRIMP CONNECTOR

SCIENTIFIC ATLANTA
- C230250, SPECTRUM INVERTER FOR 6350

STANDARD COMPONENTS
- CS PLUS-2, CONVERTER

STURGEON BAY
- CC-1005, ROKA CLIP
- CC-1010, ROKA CLIP
- CC-1020, ROKA CLIP

TEXSCAN
- EQ-08/250, EQUALIZER, 250MHZ/8DB
- EQ-08/300, EQUALIZER, 300MHZ/8DB
- EQ-12/300, EQUALIZER, 300MHZ/12DB
- KCMG, MANUAL GAIN BRIDGER
- PCAB-1, TRUNK BRIDGER AGC
- PCAD-1D, TRUNK BRIDGER AGC
- PCAD-1H, HOUSING FOR PCAD-1D
- PCMD-2, TRUNK BRIDGER
- PCMB-2H, HOUSING FOR PCMB-2
- PCM-4, TRUNK AMP
- PCM-4H, HOUSING FOR PCM-4
- PCRA, RETURN AMP
- PCSPL-1, SPLITTER
- PCSPL-2, SPLITTER
- PCSPL-3, SPLITTER
- PCSPL-4, SPLITTER
- PCTB-6, TRUNK TERMINATING BRIDGER
- PD-0, PAD
- PD-3, PAD
- PD-6, PAD
- PD-9, PAD
- PH, HOUSING — P SERIES
- PPLUG, POWER PLUG
- T3LE, LINE EXTENDER
- T4BDC-8, PAD
- T4BDL-12, PAD
- T4CM, CONTINUITY MODULE
- T4SPL, PAD
- TFAV, TRUNK AMP AGC
- TFM, TRUNK AMP MGC
- TFPS, POWER SUPPLY
- TH, HOUSING FOR T SERIES
- VEQ-12/250, EQUALIZER
- VEQ-12/300, EQUALIZER
- VEQ-8/300, EQUALIZER
- XH, HOUSING FOR X SERIES
- XR2A, FORWARD MOD AGC
- XR2B, BRIDGER MOD INTERMEDIATE
- XR2B-2, BRIDGER 2 OUTPUT
- XR2B-4, BRIDGER 4 OUTPUT
- XR2DA, DIST AMP HYBRID AGC
- XR2DM, DIST AMP HYBRID MGC
- XR2F-1, INPUT MOD
- XR2F-13, INPUT MOD
- XR2F-14, OUTPUT MOD
- XR2F-19, OUTPUT MOD
- XR2F-3/110, INPUT MOD
- XR2F-4, INPUT MOD
- XR2F-5, OUTPUT MOD
- XR2F-7/110, OUTPUT MOD
- XRF2-8, OUTPUT MOD
- XR2HA, LINE AMP HYBRID HRC
- XR2HM, LINE AMP HYBRID HRC
- XR2LAF-1, POWER INPUT MOD
- XR2LAF-2, POWER INPUT MOD
- XR2LAF-3, POWER OUTPUT MOD
- XR2LAF-4, POWER OUTPUT MOD
- XR2LARA, REVERSE AMP MOD
- XR2LA-PS, POWER SUPPLY
- XR2LS-3, LINE EXT
- XR2M, FORWARD MGC MOD
- XR2PS, POWER SUPPLY
- XR2RHA110, REVERSE AGC MOD
- XR2SPH, HOUSING FOR XR2PS
- XR2-13, TAP, 4 WAY
- XRBI, INTERMEDIATE BRIDGER
- XRCE-3, LINE EXT
- XRCE-6, LINE EXT
- XRDC-16, LINE EXT
- XRDC-8, LINE EXT
- XRLA, LINE AMP
- XRLS-2, LINE EXT
- XRLS-3, LINE EXT
- XRPG-3, PILOT CARRIER GENERATOR
- XRPR, POWER SUPPLY
- XRRP, LINE EXT
- XRSP, LINE EXT

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Reader Service Number 53.

CLASSIFIEDS/BUSINESS DIRECTORY

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See us at the Eastern Show, Booth 102.
Reader Service Number 54.

DMV

Subscriber value in ATV

By Walter S. Ciciora, Ph.D.
Vice President of Technology
American Television and Communications Corp.

As the cable business matures, further increases in penetration and profitability will be made only if subscribers are well-served. For the technologist, this usually means quality video and audio and reliable service. But increasingly it also means cost-effectiveness. Providing the highest quality video and audio at the highest cost will lose subscribers just as certainly as will poor quality signals. The right balance of signal quality and cost-effectiveness yields a perception of value.

It is important to understand that the balance that creates value changes with time. A few years ago when consumer electronics equipment had lower resolution, less signal processing and more distortion, a balance point with high signal quality would produce poor value. The costs would not justify the result. Subscribers couldn't use that level of signal quality because their equipment couldn't provide that level of picture and sound quality. The costs would be objectionable and subs would have been ill-served. Now, when nearly all TV receivers can reproduce pictures better than NTSC can deliver, the balance point has shifted. Now it is important to provide better quality signals. But cost remains an important part of the value equation.

There is an important lesson in this as we consider advanced television (ATV) systems. While TV screens are relatively small, money spent on full ATV quality will result in a loss of cost-effectiveness and a corresponding loss in the perception of value. But as TV screens become larger, more attention will have to be paid to noise and distortion in cable systems if the balance that yields value is to be maintained.

Knowing what consumers want in time to cost-effectively provide it is both difficult and key to providing value. When it comes to ATV, we must recognize that we don't know what consumers want. A few examples will help make the point.

The Coke experience

I recommend the book *The Real Coke, The Real Story* by Thomas Oliver (Random House, 1986) for two reasons. First, it's an interesting story all by itself. More importantly, it teaches the difficulty in determining what consumers want. The Coca-Cola Co. has a large staff devoted to consumer monitoring and analysis, possibly larger than its counterpart in the entire cable industry. It has a sincere interest in providing what the consumers want. In spite of this, Coca-Cola made a major, costly error when it tried to change the taste of Coke.

The testing evidence seemed to indicate that this is what the consumers wanted. It is possible that the consumers really didn't know what they wanted until the options were made available. Only then did the consumers determine that the original product was the more desirable; this came after Coca-Cola had spent a fortune on making the change.

Two who should know about video

The two proponents of ATV systems in this example are very experienced entities in the U.S. TV market. Each has had market shares in the 20 percent and higher range for several decades. Both have had sizable, experienced staff measuring and testing consumer perceptions and desires. Yet they have come to remarkably different conclusions on what they feel consumers want from ATV.

Zenith offers an ATV system intended to provide substantially increased vertical and horizontal resolution. It is designed to accommodate a range of aspect ratios (the ratio of picture height to width). At least one Zenith spokesperson has repeatedly claimed that consumers would be quite pleased to remain with the existing 4:3 aspect ratio. Further, this spokesperson feels that picture tubes will be an important part of the ATV market. Going to the new 16:9 aspect ratio would be a waste, in this opinion.

On the other hand, Sarnoff Research Center, the former R&D unit of RCA, proposes a system that features a wide screen, only a modest improvement in resolution and relatively low cost. Sarnoff talks about large projection displays.

It is truly amazing that these two highly competent, experienced and respected organizations have come to nearly opposite conclusions on what they believe consumers want.

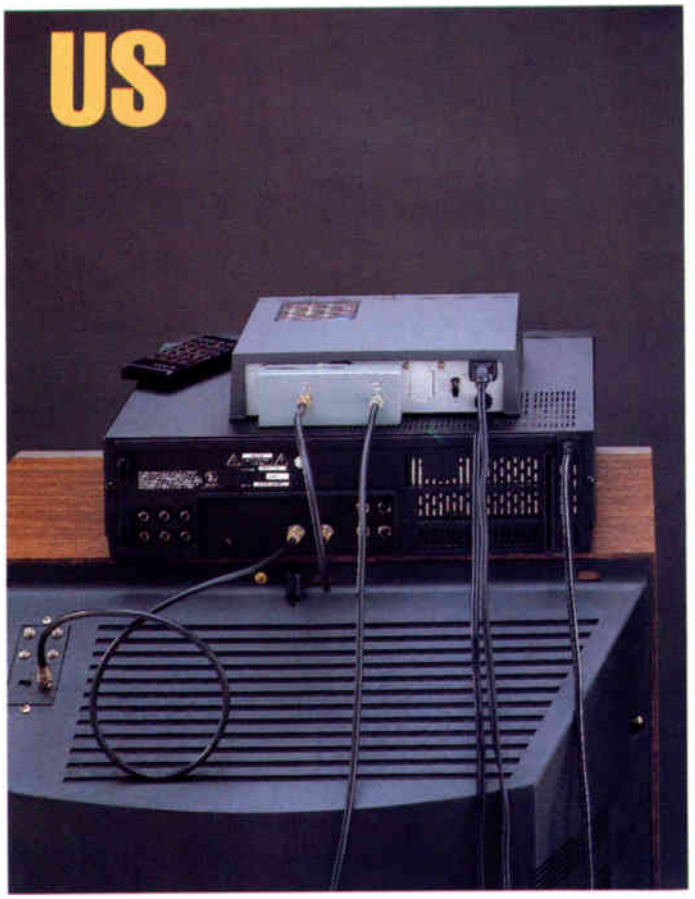
If we take the lessons learned from the Coke experience and add to this the divergent opinions as to what consumers want as interpreted by Zenith and Sarnoff, we can't help but want to be very cautious. It would be arrogant of us to think we could do better.

Prudence demands that we be careful. We must not assume we know what subscribers want and spend large sums of money to provide it. This could seriously unbalance the value equation. Instead, we must strive to find ways to learn what subscribers want and provide it in a cost-effective way.

One of the more difficult ATV decisions will be over timing. Clearly, subscribers who own no ATV equipment do not want ATV signals. More importantly, they don't want to pay for ATV signal delivery. Additionally, they don't want existing NTSC signals to be impaired because of ATV signals carried for someone else. But subscribers who have purchased ATV equipment will want to be served. Balancing the needs of these two groups will be a challenge. Both have their own concept of what value means.

AD INDEX

Consumer Interface



A picture is worth a thousand words.

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Reader Service Number 55.

Off-air Ch. 8

By Steven I. Biro
President, Biro Engineering

This is the seventh in a series of maps with technical and program parameter listings for off-air Channels 2-69, designed to be used when the cable system experiences co-channel interference. With this information, the headend technician can pinpoint the closest (i.e., the most probable) offenders, determine their directions and start the verification process with the rotor-mounted search antenna. Based on the tabulated technical information, the search can be concentrated on the most powerful stations or those that have the highest transmitting antenna towers.

The computer program for the maps was developed and data for the listings was collected by the staff of Biro Engineering, Princeton, N.J. The information is accurate as of Sept. 1, 1988.

Key to listing

Call letters: Ch. 8 station identification

City: Station location or the area served by the station

Network affiliation:

C/A	CBS and ABC programming
C/N	CBS and NBC programming
A/N	ABC and NBC programming
ACN	ABC, CBS and NBC programming
ED	Educational station (PBS)
IND	Independent station
CBC	Canadian Broadcasting Corp.
CTV	Canadian Television Network
RRQ	Reseau Radio Quebec

Power: The effective visual radiated output power (in kilowatts)

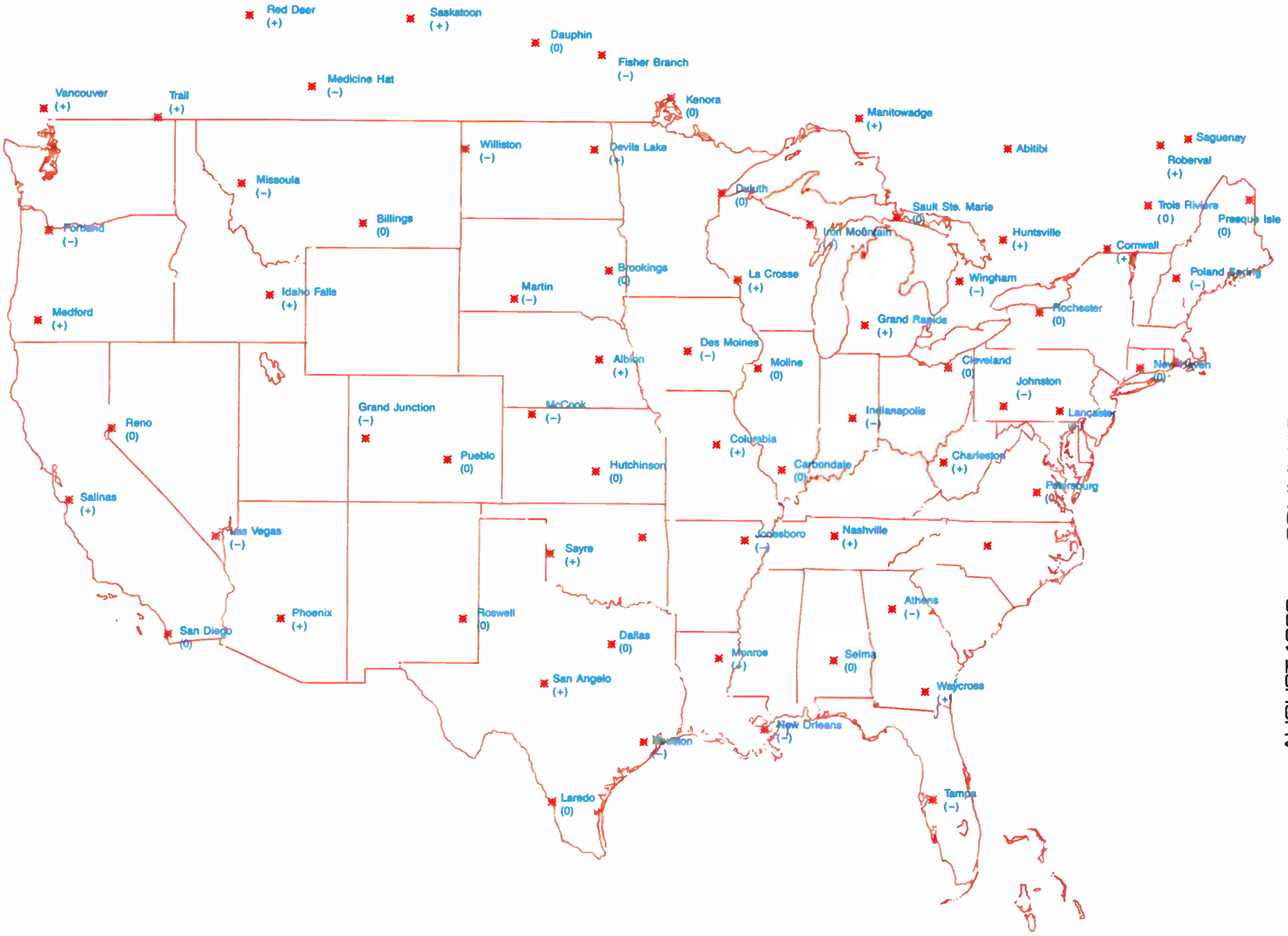
Offset: The offset frequency of the station

0	No offset
–	–10 kHz offset
+	+10 kHz offset

HAAT: Transmitting antenna height above average terrain (in feet)

Call letters	City	Network affiliation	Power	Offset	HAAT
WAKA	Selma, Ala.	CBS	316	0	1757
KJUD	Juneau, Alaska	A/N	1	0	1
KAET	Phoenix	ED	316	+	1756
KAIT	Jonesboro, Ark.	ABC	316	–	1750
KSBW	Salinas, Calif.	NBC	158	+	2934
KFMB	San Diego	CBS	316	0	740
KJCT	Grand Junction, Colo.	ABC	120	–	2720
KTSC	Pueblo, Colo.	ED	316	0	1224
WTNH	New Haven, Conn.	ABC	166	0	1210
WXFL	Tampa, Fla.	NBC	316	–	1550
WPBS	Athens, Ga.	ED	316	–	1080
WXGA	Waycross, Ga.	ED	316	+	1030
KIFI	Idaho Falls, Idaho	NBC	316	+	1520
WSIU	Carbondale, Ill.	ED	316	0	890
WQAD	Moline, Ill.	ABC	309	0	1010
WISH	Indianapolis	CBS	316	–	990
KCCI	Des Moines, Iowa	CBS	316	–	1953
KPTS	Hutchinson, Kan.	ED	302	0	800
KNOE	Monroe, La.	CBS	316	+	1890

Call letters	City	Network affiliation	Power	Offset	HAAT
WVUE	New Orleans	ABC	316	–	990
WMTW	Poland Spring, Maine	ABC	105	–	3871
WAGM	Presque Isle, Maine	ACN	59	0	355
WOTV	Grand Rapids, Mich.	NBC	316	+	970
WIIM	Iron Mountain, Mich.	IND	32	–	556
WGTQ	Sault Ste. Marie, Mich.	ABC	316	0	978
WDSE	Duluth, Minn.	ED	316	0	950
KOMU	Columbia, Mo.	NBC	288	+	790
KULR	Billings, Mont.	NBC	316	0	750
KPAX	Missoula, Mont.	CBS	275	–	2150
KBGT	Albion, Neb.	IND	316	+	2000
KSNK	McCook, Neb.	NBC	295	–	710
KLAS	Las Vegas	CBS	316	–	2000
KOLO	Reno, Nev.	ABC	166	0	2930
KOBR	Roswell, N.M.	NBC	316	0	1760
WROC	Rochester, N.Y.	NBC	316	0	505
WGHP	High Point, N.C.	ABC	316	–	1269
WDAZ	Devils Lake, N.D.	ABC	316	+	1480
KUMV	Williston, N.D.	NBC	166	–	1060
WJW	Cleveland	CBS	316	0	1000
KVIJ	Sayre, Okla.	ABC	132	+	580
KTUL	Tulsa, Okla.	ABC	316	–	1880
KSYS	Medford, Ore.	ED	60	+	2668
KGW	Portland, Ore.	NBC	316	–	1770
WWCP	Johnston, Pa.	IND	166	–	1208
WGAL	Lancaster, Pa.	NBC	112	+	1360
KESD	Brookings, S.D.	ED	245	0	750
KZSD	Martin, S.D.	ED	279	–	870
WDCN	Nashville, Tenn.	ED	316	+	1280
WFAA	Dallas	ABC	316	0	1680
KUHT	Houston	ED	316	–	1850
KGNS	Laredo, Texas	NBC	316	0	1020
KLST	San Angelo, Texas	CBS	316	+	1450
WXEX	Petersburg, Va.	ABC	269	0	1052
WCHS	Charleston, W. Va.	CBS	158	+	1236
WKBT	La Crosse, Wis.	CBS	316	+	1540
CFCN	Medicine Hat, Alberta	CTV	7	–	341
CFRN	Red Deer, Alberta	CTV	58	+	882
CKTN	Trail, British Columbia	CTV	18	+	1544
CHAN	Vancouver, British Columbia	CTV	250	+	2315
CBWS	Dauphin, Manitoba	CBC	300	0	1147
CKYA	Fisher Branch, Manitoba	CTV	62	–	449
CKCW	Charlottetown, Maritime Provinces	CBC	29	+	490
CBYT	Cowhead, Newfoundland	CBC	4	–	206
CFLA	Goosebay, Newfoundland	CBC	1	0	650
CBNT	St. Johns, Newfoundland	CBC	196	+	855
CBYT	Stephenville, Newfoundland	CBC	12	0	1231
CJOH	Cornwall, Ontario	CTV	260	+	615
CKUR	Huntsville, Ontario	IND	1	+	4850
CBWA	Kenora, Ontario	CBC	16	0	433
CBLA	Manitowadge, Ontario	CBC	40	+	599
CKNX	Wingham, Ontario	CBC	260	–	793
CIVA	Abitibi, Quebec	RRQ	299		763
CBGA	Chandler, Quebec	CBC	1	–	1
CKRS	Roberval, Quebec	CBC	4	+	532
CBGA	Ste. Anne des Monts, Quebec	CBC	179	–	1410
CIVV	Saguenay, Quebec	RRQ	278		1984
CHEM	Trois Riviere, Quebec	IND	13	0	651
CFQC	Saskatoon, Saskatchewan	CTV	325	+	866
WSVI	Christiansted, Puerto Rico	ABC	200	+	1141


Red Deer (+)
Saskatoon (+)
Dauphin (0)
Fisher Branch (-)
Medicine Hat (-)
Vancouver (+)
Trail (+)
Kenora (0)
Manitowadge (+)
Abitibi
Saguenay
Roberval (+)
Williston (-)
Devils Lake (+)
Missoula (-)
Billings (0)
Duluth (0)
Sault Ste. Marie (0)
Iron Mountain (0)
Huntsville (+)
Trois Rivieres (0)
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Cornwall (+)
Portland (-)
Brookings (0)
La Crosse (+)
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Idaho Falls (+)
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Reno (0)
Columbia (+)
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COMMUNICATIONS TECHNOLOGY
AUGUST 1989

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- ☐ 2. Cable TV Contractor
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- ☐ 4. SMATV or DBS Operator
- ☐ 5. MDS, STV, or LPTV Operator
- ☐ 6. Microwave or Telephone Company
- ☐ 7. Commercial Television Broadcaster
- ☐ 8. Cable TV Component Manufacturer
- ☐ 9. Cable TV Investor
- ☐ 10. Financial Institution, Broker, Consultant
- ☐ 11. Law Firm or Government Agency
- ☐ 12. Program Producer or Distributor
- ☐ 13. Advertising Agency
- ☐ 14. Educational TV Station, School or Library
- ☐ 15. Other _____
(please describe)

CT 8/89

Nothing ventured, nothing gained

By Archer S. Taylor
Senior Vice President of Engineering, Malarkey-Taylor Associates

Given enough time, money and challenging motivation, engineers can do anything.

Well, almost anything. We must, of course, work within the constraints of natural law, i.e., the laws of physics. However, compliance with the immutable law of gravity, for example, did not mean that we would forever be imprisoned on planet Earth. The Wright brothers learned how to combine the force of gravity with other forces to achieve a lifting resultant. Engineers and physicists can now fly to the moon or send a robot to Mars or Venus because they have learned how to take advantage of gravitational forces to place a space vehicle in orbit or to steer a new course. The geostationary orbital satellites used to relay cable TV programs are in effect gravity-defying "balloons."

Mystery and excitement

This is what lends mystery and excitement to projecting future technology. What barriers will be hurdled in the years ahead? What fundamental laws of the universe will be harnessed to achieve the seemingly impossible?

From the work of Sir Isaac Newton and others in the 17th and 18th centuries were derived the fundamental laws of thermodynamics and the conservation of energy; i.e., "there is no free lunch." Yet inventors keep on trying to create perpetual motion machines. In 1927, Dr. Werner Heisenberg proclaimed that it is not possible to know precisely and simultaneously both the speed of a moving object and its location. Notwithstanding such a profound principle of uncertainty, the patent office is still in business. And shortly after World War II, Dr. C.E. Shannon and others at Bell Telephone Laboratories formulated fundamental theorems defining the limitations imposed by natural law on the transfer of information.

This is the challenge that drives scientists and inventors: Maybe they can find a footnote to the basic laws of the universe that will point the way toward a loophole. Maybe there are new ways to engage these natural limits as the Wright brothers and the space scientists have engaged the law of gravity.

Is it possible to squeeze a high definition digital TV signal into a 6 MHz straitjacket? Conventional wisdom cites Shannon, et al., and says, "no." We know that much, perhaps most of the information content in each picture frame is redundant and unnecessary. Therefore, by deleting the redundancy, the remaining essential information can be transferred with reduced bandwidth. For true high definition, however, much less of the available information is redundant. Bandwidth compression by eliminating redundancy is therefore more likely to degrade HDTV. Perhaps the question should ask how much information is really needed to qualify as "high definition."

Perhaps Dale Hatfield and John Sie are right in predicting that a 6 MHz processed digital signal can be derived that will be so much better than current television as to be perceived by the public as if it were high definition TV without actually meeting the engineering goals for HDTV. But with bandwidth compression of 90:1 as well as the enormously complex and sophisticated modulation and error correction schemes proposed, can the result truly be called "HDTV"? At what cost? Surely, one has a right to a certain amount of skepticism.

Yet, who would have predicted 10 years ago the dramatic increases in personal computer power and equally dramatic cost reductions that have still not reached their limits?

A nagging doubt

In HDTV, as in other technological developments, there often is a nagging doubt whether it is worth doing. Is there a public demand for HDTV or can demand be stimulated as Steve Jobs stimulated demand for a product that was not at first perceived to be needed? As it turned out, the Apple personal computer was clearly the right product at the right time to stimulate an enormous market, with all sorts of spinoffs.

On the other hand, the dream of bypassing commuter traffic jams with a personal airplane or helicopter has long seemed to have unlimited market appeal but has never been realized. In the years since I started reading *Popular Mechanics* and *Popular Science* there have been scores of attempts to supply this market. Remember the Bensen helicopter ads, in which a salesman in a business suit carries a briefcase while sitting in an open vehicle that looks more like a child's tricycle than a helicopter? Yet there he was, with rotors whirring overhead, well above the steamy, stalled traffic below.

There were also the "flying cars," some with folding or demountable wings to fit in the garage, developed by one inventor after another for a thankless public and designed with the intention of leaping over massive traffic jams in a single bound. The Waterman Arrowbile in 1937, the Fulton Airphibian and ConVairCar in 1946-47, and the Taylor certificated Aerocars dating from 1949 right up to the present may have appeared in James Bond movies but have yet to play any kind of role in real life.

That market never developed and I do not need to explain why. Yet why did the developers—budding entrepreneurs as well as some established corporations—proceed in the face of obvious hurdles having nothing to do with technology?

Is there really a market out there for HDTV? Will the new, wide-screen TV become as pervasive some day as color? Or will it be limited to the rec rooms of the affluent? Will higher definition and truer color make any difference to the viewing public who spend eight to 10 hours a day watching? Is it possible even that higher definition could stimulate interest in better programming?

Questions like these make life fascinating for observers and nerve-wracking for investors.

Chromaticity

(Continued from page 80)

An additive primary-color filter absorbs, from white light passing through it, all the light but that of the primary color. Mixture colors are obtained by light passing through other additive filters and combining the colored light. The action of the subtractive color filter is the complement of the corresponding additive filter, that is, the subtractive filter absorbs the energy that the additive filter passes. For example, the additive red filter absorbs blue and green, passing red. The subtractive cyan filter absorbs only red, passing blue and green. In general, therefore, the absorption of subtractive filters is lower than that of the additive filters. Hence, for a given amount of white light the subtractive process produces a somewhat brighter color reproduction, which would weigh in its favor for color TV. Unfortunately this fact is overruled by the mechanics of the reproduction process, which requires the additive process to be used whenever the primary images are separate, self-luminous entities as they are in present-day color TV systems.

In the remainder of this article we shall confine our attention to the additive primaries and the additive method of color matching.

Views expressed here are the author's and do not necessarily reflect those of Contel.

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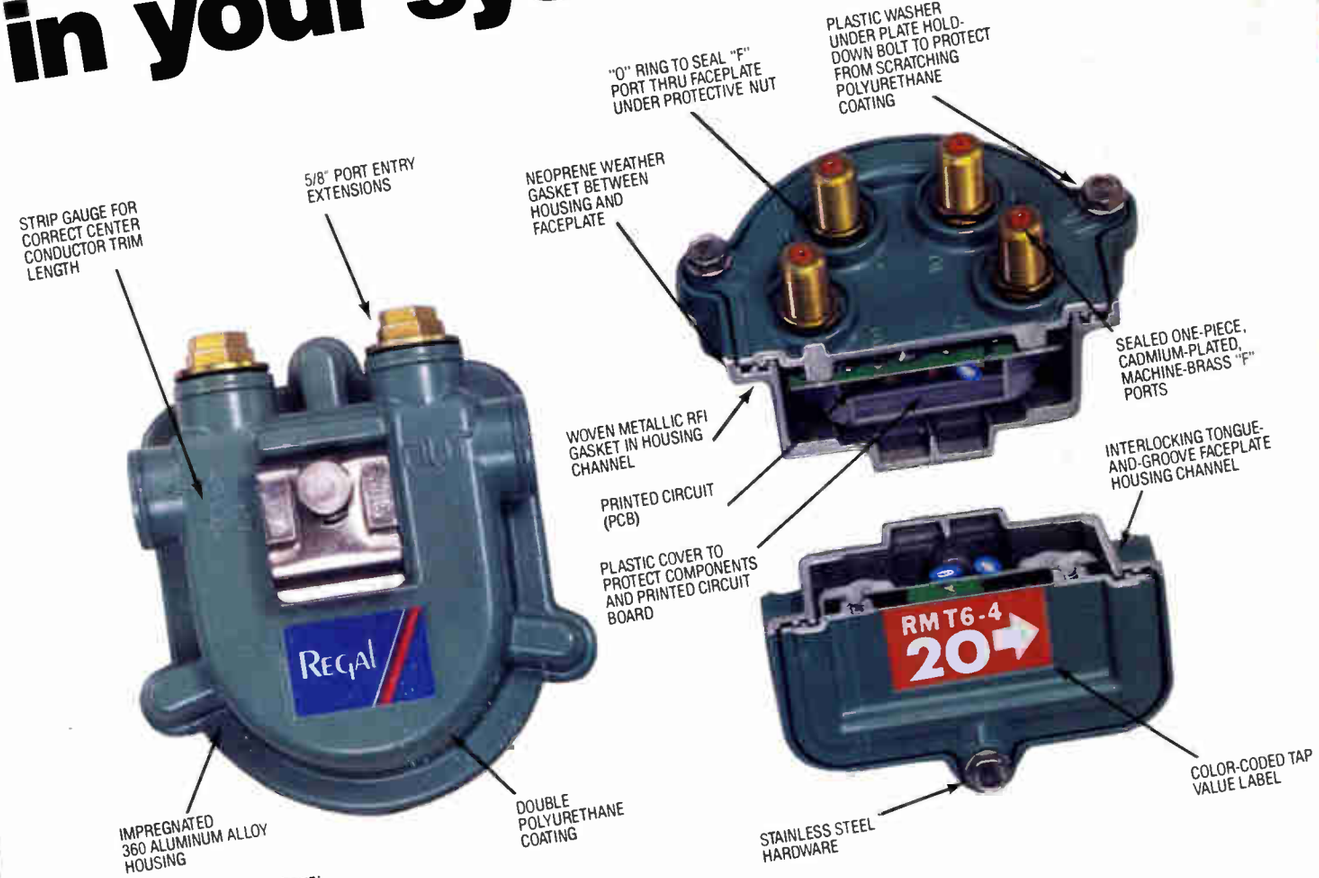

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