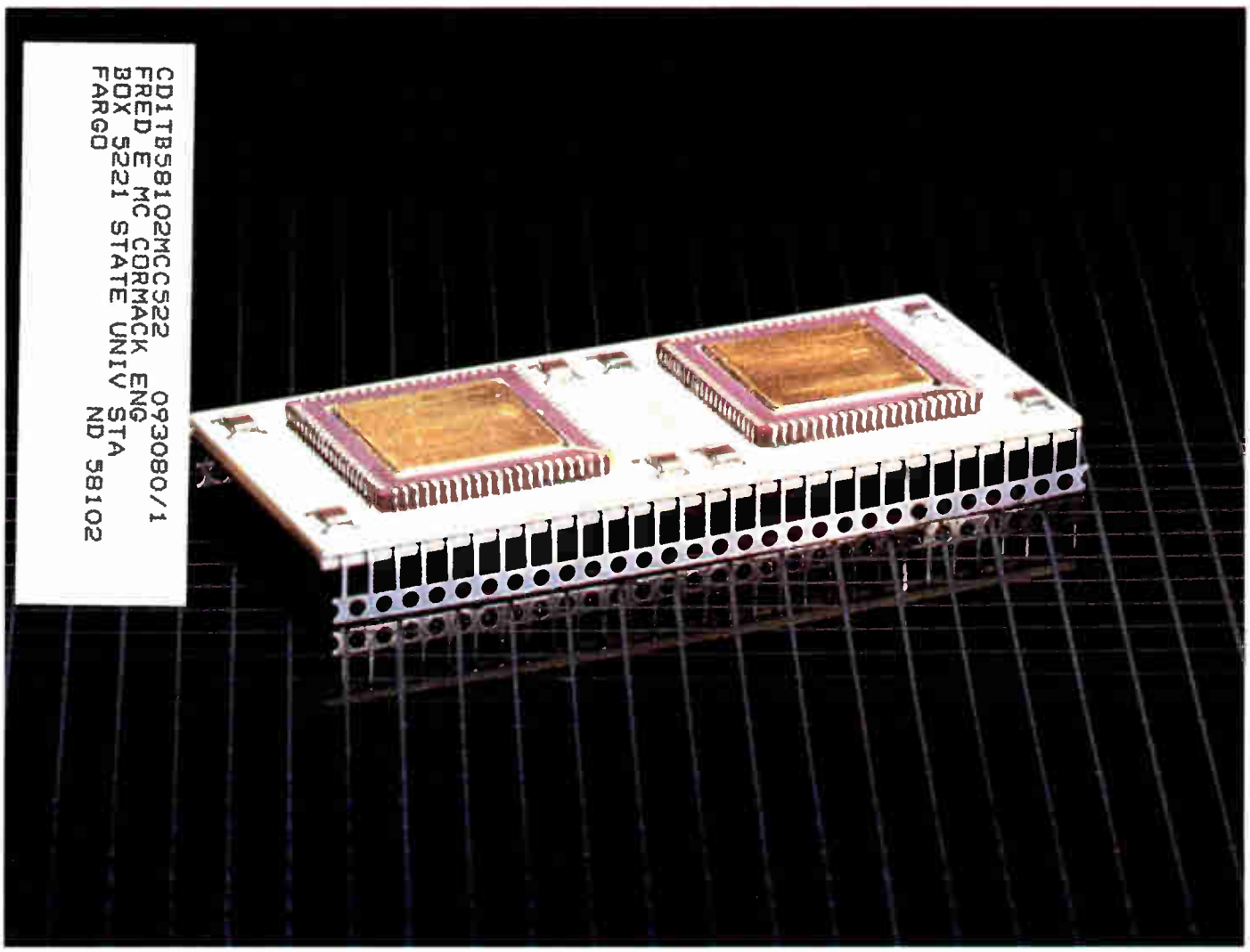
CED™

Communications Engineering Digest/The Magazine of Broadband Technology

TECH II
Aspects of strand mapping



May 1983

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WAVETEK

A. D. Little Recommends Jerrold for Philly System

BALA CYNWYD, PA—Noted research and consulting firm Arthur D. Little Inc. was hired by Comcast Corp. to recommend equipment vendors for Comcast's proposed Philadelphia cable system.

In a 136-page report, Little recommended Jerrold Division of General Instrument more often than any other company. According to the study, Little considered, in assessing each vendor's equipment:

- product features and capabilities;
- soundness of technical approach;
- compatibility with other system components;
- risk of unavailability of the product when needed by Comcast;
- ability to satisfy capacity requirements of a large subscriber population as projected in Philadelphia; and,
- estimated cost per subscriber.
- For two-way subscriber response (IPPV) services, deemed to be the most important facet, Little looked at Jerrold, Pioneer, Oak, Tocom and Zenith equipment. Recommended was Jerrold's "Starcom 450 addressable converters with the Starvue SV-A modular attachment for IPPV because of this system's technical elegance, low risk of unavailability and relatively low cost," the report said.

And while the research found one-way addressable converters from Jerrold, Oak, Scientific-Atlanta, Tocom and Zenith "were considered to be viable for Comcast's Philadelphia system," the company recommended use of Jerrold's Starcom 450 one-way addressable boxes because of the best integration of the recommended IPPV system with the one-way boxes.

E-Com, Jerrold and Tocom general purpose digital systems were considered, with Jerrold again getting the nod. The report found Jerrold's Communicom/Metronet system "qualified and attractive" because of its response to innovation, high capacity and flexibility to meet new needs.

Equipment from CableBus Systems, Jerrold, S-A and Tocom was evaluated for home monitoring services, with Little reporting "each of these vendor's systems would be well-qualified" in Comcast's Philly operation. But, Little added, Tocom, because of its experience and capability, would be the first choice to be used for both security and energy management. Apart from energy management, though, Little said Comcast should itself choose "among these home security system vendors based on its own judgment concerning features, cost and terms of purchase." □

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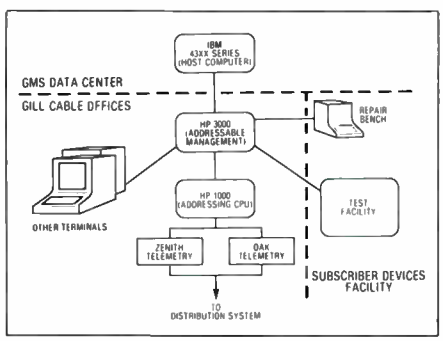

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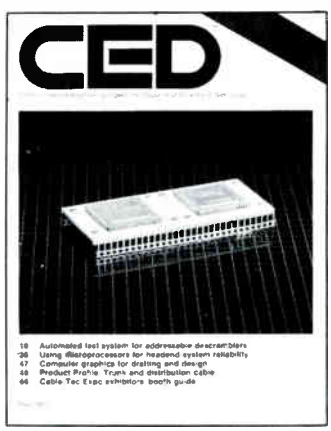

About the cover

Digital Equipment Corp.'s MICRO/J-11 16/32-bit microprocessor is fabricated in CMOS technology and puts the full functionality and capability of the DEC PDP-11/70 computer in one 60-pin package. Photo courtesy of Digital Equipment Corp.

 CED (USPS 300-510) is published monthly by Titsch Communications, Inc., 2500 Curtis, Suite 200, Denver, Colorado 80205. ©May, 1983, Volume 9, Number 5. Subscription Price: 1 year, $26.00; 2 years, $43.00; 3 years, $63.00. OUTSIDE USA 1 yr. $64.00; 2 yrs. $89.00. MUST BE PREPAID IN US FUNDS ONLY! Second-class postage paid at Denver, CO. *CED* is published on behalf of all parties, including the Society of Cable Television Engineers (SCTE). POSTMASTER: Please send address changes to P.O. Box 5727-TA, Denver, Colorado 80217-5727. BPA membership applied for May 1981.

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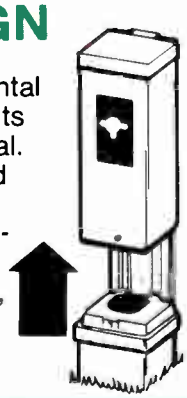

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Plans for 'Metro Tech' finalized

Plans to construct a $400 million telecommunications technology center at the base of the Brooklyn Bridge in Brooklyn, N.Y., have been finalized between the City of New York and the Polytechnic Institute of New York, a prominent U.S. engineering school. The purpose of the facility, to be called Metro Tech, is two-fold: first, to provide training and education in conjunction with some of the world's leading financial and information companies located in nearby Manhattan; and second, to act as a communications link between new telecommunications and data processing technology users and producers.

The center, which will be linked by fiberoptics and the Staten Island, N.Y.-based teleport planned by Merrill Lynch, Western Union and the Port Authority of New York and New Jersey, will allocate 1.7 million square feet to technology firms. While the Polytechnic Institute and the City of New York already have committed $42 million and $16 million, respectively, to the project, another $42 million is expected to come from private academic and corporate contributions. Polytechnic Institute predicts that the remaining $292 million needed to complete the center will come from those segments of the private business world, which stand to benefit most by the center. Construction of the center is scheduled to begin in 1985.

M/A-COM signs U.K. distribution deal

M/A-COM and BICC PLC, a London-based electronics company, have reached an agreement, which authorizes BICC PLC to distribute M/A-COM Comm/Scope's coaxial cable to cable systems operating within England. The agreement also permits BICC PLC to begin manufacturing the Comm/Scope product at some later date. According to a M/A-COM official, this arrangement was chosen by M/A-COMM because the alternative of doing its own foreign distribution was cost-prohibitive. The coaxial cable product M/A-COM has made available to BICC PLC was designed for use in 30-channel plus systems and offers applications for business data transmission and interactive services. Neither company has disclosed the dollar value of the contract.

Mead to offer patent retrieval service

Mead Data Central has announced that it will introduce Lexpat, a patent retrieval service, during the second quarter of this year. Customers will be able to search through all patents issued since 1975. The service will be available 23 hours each weekday and 14 hours daily on weekends. The service will be priced along the same lines as Lexis, a computer-assisted legal research service that charges customers on an hourly fee for connect time, which depends on monthly use, plus a usage charge for each "search unit" (25,000 occurrences of a word or its variations). Subscribers who use the service less than five hours a month will pay $90 per hour for connect time, while those who spend 10 hours will pay $75 an hour plus 55 cents per search unit.

TFC signs deal with U.K. conglomerate

Times Fiber Communications has announced a 10-year agreement with United Engineering Industries PLC of Andover, England, granting exclusive license to that company to manufacture Times Fiber's T4 coaxial cable in the United Kingdom and Ireland. The agreement allows United Engineering to market T4 gas-injected cable non-exclusively in the U.K., Ireland, Australia and New Zealand, and comes on the heels of a similar agreement between the two companies allowing for the marketing and distribution of Times Fiber's Mini-Hub fiberoptic distribution system. United Engineering is a conglomerate of electronic equipment and high performance engine companies that includes Link Electronics, which designs and manufactures color TV equipment for broadcasting.

Times Mirror offers videotex results

Times Mirror has released the results of a poll that queried participants on their reactions to a videotex field trial conducted last year in Rancho Palos Verdes and Mission Viejo, Calif. The trial spanned a nine-month period and was performed in conjunction with Videotex America, a joint venture between Times Mirror and Infomart of Toronto, Canada.

Poll results showed that, as a whole, consumers of the service expressed a preference for ordering merchandise, paying bills and making travel reservations through the service. More than half used their home terminals to order merchandise, with some using the service as much as 50 hours a week. Consumers ranked Gateway, the news service that offered access to 70,000 pages of information during the test period, third as a source of late-breaking news, directly behind network TV and radio. Fifty-one percent, however, rated videotex as a "valuable" late-breaking news source. In response to questions concerning the degree of privacy and security of the service, 87 percent said they did not fear a lack of security or privacy in their transactions.

Warner gets home security patent

Warner Amex Cable Communications has been issued patent no. 4361730 by the United States patent office for a computer-based electronic home security system used in conjunction with two-way interactive cable systems. The patent involves the use of cable in conjunction with telephone lines and allows a central computer to monitor sensors in subscriber homes every few seconds, 24-hours a day. The sensors can detect heat, smoke, fire and burglar intrusion and can be used to signal medical emergencies. The unique feature of the system is the continual monitoring from a central station via either telephone or cable lines, unlike other systems that use only phone lines to communicate with a security office and are dormant unless a sensor is activated. The Warner Amex system is in constant contact with sensors in the home to detect a defect or alarm from the subscribers system.

Oak adds personnel to tech center

Oak Industries recently added close to 10 new communications engineers and scientists to its technical divisions. They'll be joining more than 50 people from Oak's Crystal Lake, Ill., operations who have moved west to work at the company's newly consolidated technical center near San Diego, Calif. The new leased facility opened in January without any fanfare. The highly computerized center, acting as an operations lab for new developments in all areas of cable, satellite and subscription TV hardware technology, already has increased its work force to 130 people.

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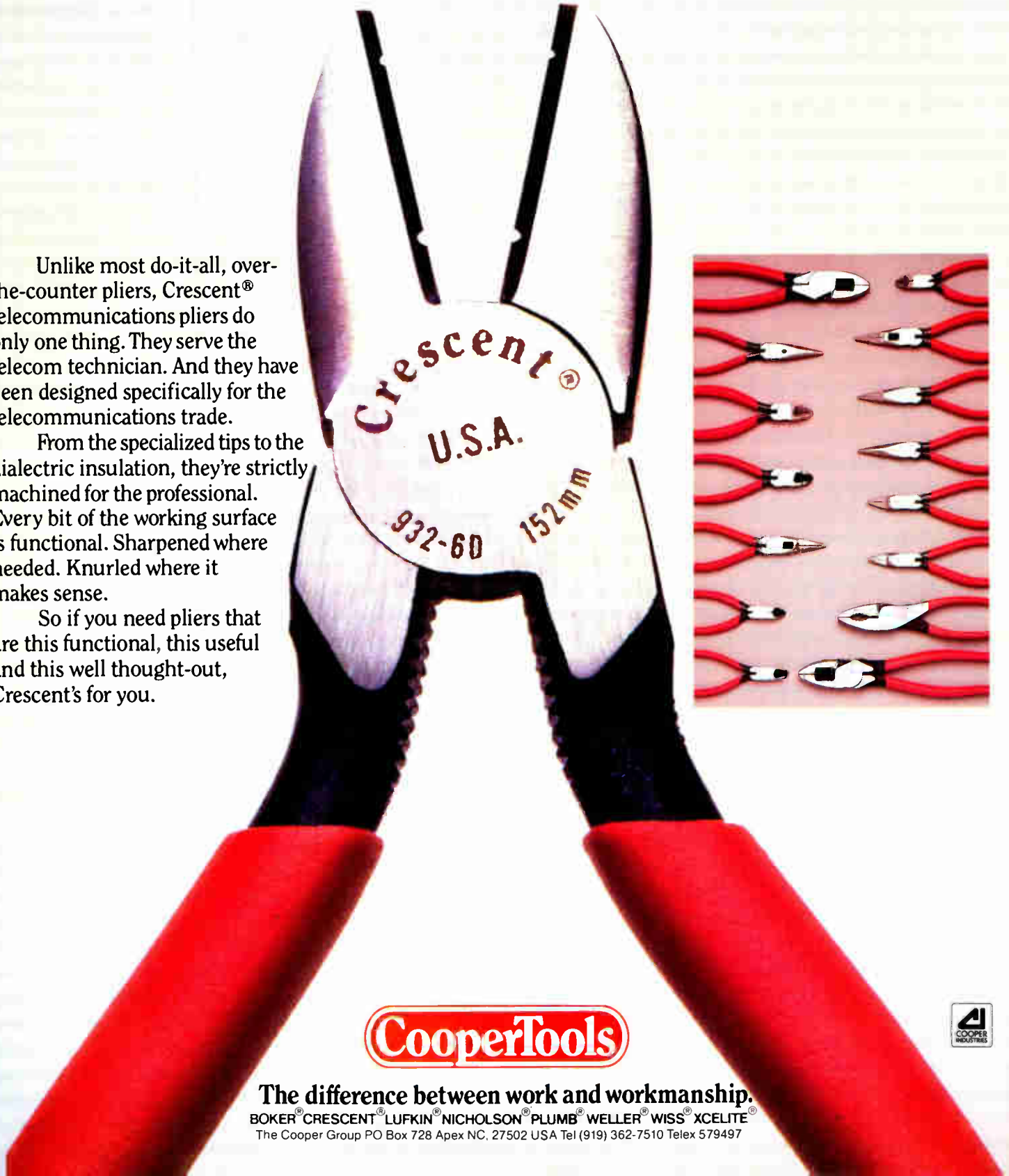

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Seminars

May

4-6: Magnavox CATV Systems will conduct a field training seminar with it's Mobile Training Center in Kansas City, Kan. Contact Laurie Venditti, (800) 448-5171; in New York, (800) 522-7464.

5: A seminar on addressability sponsored by **QV Publishing Inc.** will be held at Loew's Anatole in Dallas. Contact Patricia Bauer, (914) 472-7060.

6-8: The **Society of Cable Television Engineers** will hold its first cable TV hardware exposition, Cable-Tec Expo, at the Dallas Convention Center. Contact SCTE, (202) 293-7841.

9-11: Magnavox CATV Systems will conduct a field training seminar with the Mobile Training Center in Kansas City, Kan. Contact Laurie Vendetti, (800) 448-5171; in New York, (800) 328-9157.

10-12: ABC TeleTraining Inc. will hold a workshop on "CATV Management, Engineering and Operating Principles" in Chicago. Contact ABC TeleTraining, (312) 879-9000.

10-12: A **Jerrold** technical seminar will be held in Minneapolis. Contact Diane Bachman, (215) 674-4800.

10-12: The spring meeting of the **West Virginia Community Television Association** will be held at Canaan Valley State Park. Contact Raymond Chapman, (304) 846-2551.

10-12: The spring meeting of the **Maryland/Delaware Cable TV Association** will be held at the Hyatt Regency in Baltimore. Contact Howard Ross, (301) 332-4098.

10-12: "Cable '83," the international conference and exhibition on satellite and cable TV organized by **Online Conferences Ltd.**, will be held at the Wembley Conference Centre, Wembley, Middlesex, England. Contact Online, Nothwood (09274) 28211.

11: The spring conference of the **New England Cable Television Association** will be held at the Sheraton Tara in Nashua, N.H. Contact Gary Cain, (603) 224-3373.

16-19: The 26th annual convention of the **Canadian Cable Television Association** will be held at the Calgary Convention Centre in Calgary, Alberta. Contact the CCTA, (613) 232-2631.

17: A meeting of the **Southern California Cable Association**, with C-SPAN's Brian Lamb as speaker, will be held at the Proud Bird Restaurant in Los Angeles. Contact (213) 653-6187.

17-19: ABC TeleTraining Inc. will hold a workshop on the topic of "Introduction to Microwave Radio System Engineering" in San Francisco. Contact ABC TeleTraining Inc., (312) 879-9000.

24-25: A seminar on "Fiber Optics, Photonics and the Business User" sponsored by **Probe Research Inc.** will be held at the Plaza Hotel in New York. Contact (201) 285-1500.

24-26: Blonder-Tongue will conduct a MATV/CATV/LPTV/TVRO technical seminar in Gaithersburg, Md. Contact Brian Dolan, (301) 933-4965.

26-27: A course on "Antenna Systems Design and Applications" will be offered by **Telecommunications Consulting & Consulting Services** (TCCS) at the Sheraton Denver Tech Center and Hotel in Denver. Contact TCCS, (714) 738-6222.

June

5-7: The annual convention of **The Microwave Communications Association** "MCA '83: Opportunities in New Technologies," will be held at the Marriott Hotel in Washington. Contact Chris Selin, (914) 576-6622.

12-15: The annual convention of the **National Cable Television Association** will be held at the Astro Hall in Houston, Texas. Contact the NCTA, (202) 775-3550.

14-16: ABC TeleTraining Inc. will present a workshop on "Subscriber Loop Design, Installation and Maintenance," in Chicago. Contact ABC TeleTraining, (312) 879-9000.

19-24: The "Northeast Cable Television Technical Seminar" sponsored by the **New York State Commission on Cable Television** will be held at Camp Topridge near Saranac Lake, N.Y. Contact Bob Levy, (518) 474-1324.

20-23:A short course on "Modern Antennas" will be given by **Technology Service Corp.** in Ottawa, Canada. Contact Linda Billard, (800) 638-2628.

23-24: A course on "Antenna Systems and Applications" will be offered by **Telecommunications Consulting & Consulting Services** (TCCS) at the Sheraton Denver Tech Center and Hotel in Denver. Contact TCCS, (714) 738-6222.

28-30: A **Jerrold** technical seminar will be held in Hillside, Ill. Contact Diane Bachman, (215) 674-4800.

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21-23: The annual meeting of the **Montana Cable Television Association** will be held at the Outlaw Inn, Kalispell. Contact Tom Glendenning, (406) 586-1837.

August

16-18: The International Construction and Utility Equipment Exposition sponsored by the **Industrial and Construction Equipment Division of the Farm and Industrial Equipment Institute** will be held at the Fairfax Airport in Kansas City, Kan. Contact (312) 332-2037.

Looking ahead

June 27-29: Videotex '83, New York Hilton.
August 11-14: Community Antenna Television Association's CCOS-83, Arlington Hotel, Hot Springs, Ark.
September 7-9: Great Lakes Cable Conference, Indianapolis Convention and Exposition Center.
September 8-10: Eastern Show, Georgia World Congress Center, Atlanta.
September 11-14: The United Kingdom's first "International Cable and Satellite Television Exhibition and Conference, CAST 83," The National Exhibition Centre, Birmingham, England.
October 10-11: The Iowa Cable Television Association 1983 Cable Convention, Stouffers Five Seasons Hotel in Cedar Rapids, Iowa.
Nov. 1-3: Atlantic Cable Show, Atlantic City, N.J.

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Editorial

Confronting broadcast issues

We've just come from the National Association of Broadcasters 61st annual convention in Las Vegas where convention-goers were urged to capitalize on recent FCC decisions that allow broadcasters to participate in the explosion of information delivery services. FCC Chairman Mark Fowler noted that the commission recently decided that all multiplexed signals such as data, telemetry, and facsimile, can be carried over broadcast auxiliary stations. He said that such decisions, "recognized the value of spectrum for transmitting data and information," and that, "broadcasters have a role to play in the transmission market." He added that cellular radio and paging as well as public utilities load management are non-entertainment areas that broadcasters should consider entering.

As reported in the April 25 issue of *CableVision*, the NAB convention focused on the twin themes of deregulation and new business opportunities; yet the industry expressed mixed opinions about the FCC's pace and concept of deregulation. NAB President Edward Fritts took issue with actions bearing on systems standardization, localism and spectrum management. He specifically decried the commission's failure "to employ its technical expertise" in setting AM stereo and teletext standards, its introduction of "one item after another, weakening the localism provision of the Communications Act," and "ill conceived proposals to jam the spectrum" as reflected in the commission's plan to open the FM band to 1,500 new stations to "share broadcast auxiliary service spectrum with displaced occupants of the 12 GHz band."

Although much of the talk on the exhibit floor and in the meeting rooms dealt with new business opportunities in non-traditional broadcast areas, the overwhelming focus of activity on the exhibit floor was the profusion of new equipment and technologies for news gathering, remote production and signal processing essential to television and radio station operations. The convention center bulged with 587 exhibits covering 280,000 square feet, 2,800 of which was occupied by the Sony and RCA exhibits alone. Of particular interest to those in attendance was the proliferation of new digital-based audio and video production equipment, graphics display, electronic still store and frame storage devices, three-quarter-inch and half-inch post production equipment and lightweight portable camera/recorder units for ENG/EFP applications.

The plethora of advanced video imagery processing systems such as MCI/Quantel's MIRAGE with full paintbox and switching system and the Grass Valley 300 image production system makes clear the fact that television will soon be entering a new phase of futuristic, near Hollywood-quality image production that could greatly enhance the appeal of broadcast affiliate stations.

Now past the NAB, we look forward to the SCTE's first Cable-Tec Expo in Dallas, May 6-8 and of course the NCTA convention in Houston, June 12-15. The SCTE show promises to be something new on the convention circuit with emphasis on hardware and the back-to-basics approach developed for their CATV workshops. We hope to see old friends at both shows and welcome the opportunity to introduce ourselves to new friends in the industry. *CED* will be introducing a new editor, Fred Dawson, who has been with Titsch Communications in a variety of capacities, most recently as senior editor of *CableVision* and *Broadcast Week*, our weekly broadcast tabloid. Fred has written definitive pieces on virtually every aspect of cable television, including new urban market developments, advances in fiber optics and, most recently, business and data communications.

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Volume 9, No. 5

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1526PS • -21 VOLT DC POWER SUPPLY: The 1526 Power Supply delivers a regulated -21 volt DC at 40 ma. It is designed primarily for powering mast-mounted preamplifiers such as Blonder-Tongue's CMA, CMA-U, and CMA-b. It will also power up to three Mighty Mite UHF line reamplifiers. A capristor on the input line protects the unit from power line surges. Its small size, light weight and mounting flanges make it convenient to mount on any flat surface.

4415 • BPF-c VHF SINGLE CHANNEL BANDPASS FILTER: A high quality VHF single channel bandpass filter that provides extremely high rejection off band, even on adjacent channels. Utilizes five high-Q bandpass sections and two phase cancellation traps. The traps are normally aligned to reject the lower adjacent sound and the upper adjacent picture carriers, but can be touched up in the field to reject other nearby interfering carriers. Available for each Hi, Lo, Midband and Superband TV channel and also for FM band.

4454 • MCA-b 3 VOLT OUTPUT, VHF PROCESSOR SINGLE CHANNEL, AGC CONTROLLEO: The MCA-b channel processor is a 3-volt VHF TV strip amplifier with automatic gain control and all solid-state circuitry. It is intended to amplify and stabilize the level of a single VHF channel in MATV and CATV headend systems. Features interchangeable broadband amplifier board to facilitate maintenance, adjustable aural carrier control for lower distortion, lightning and line voltage surge protected, true peak detector AGC, wide Dynamic Range.

4928 • EARTH STATION MODULATOR: A high quality, vestigial sideband audio/video modulator with crystal controlled visual and aural carriers. Specifically designed for use with TVRO earth station satellite receivers where audio and video are provided as separate baseband signals. Video low pass filter to reject unwanted secondary subcarrier frequencies of satellites. Extremely accurate crystal controlled 4.5 visual to aural carrier spacing minimizes color beats and audio distortion.

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Dutch look to U.S. cable suppliers for $20 million project

WASHINGTON—The Netherlands is offering American suppliers of cable hardware and software a chance to sell their goods for a $20 million two-way cable television test project in Holland that is likely to result in a nationwide system backed by $70 million in Dutch investments.

The Netherlands Ministry of Economic Affairs is investing $20 million for a pilot project in the province of Limburg, a finger-shaped southeastern province bordered by Belgium and Germany. The government is hoping to reach approximately 90,000 subscribers with a system that will provide services such as electronic shopping, banking, security surveillance and satellite television programs, according to Robert Pollack, a Dutch project manager.

In hopes of attracting American business, Pollack gave details of the plan to U.S. Foreign Commercial Service officials at the American Embassy in The Hague. They sent a telegram to the U.S. Department of Commerce in Washington, which released the information last week. "We're looking to promote the export of U.S. goods," a department official said.

Pollack, in a telephone call from Maastricht, Netherlands, said, "It may be that what Dutch companies produce is not suitable for our needs. Many American companies have been in this business longer."

The telegram to the Commerce Department says, "Some form of two-way cable TV should spread to other provinces and eventually cover the country. Total investments in equipment, such as matrix switches, coders/decoders, subscriber keypad and security modems, connectors and software will involve $70 million dollars."

For companies that cannot manufacture according to European specifications, the Ministry of Economic Affairs offers "highly attractive facilities such as major government investments in a U.S. plant in the Netherlands," the communique says. The Netherlands is a free trade country.

About 40 to 50 percent of Dutch citizens are served by cable television, though it is purely to gain clearer reception of broadcast signals, according to The Netherlands Embassy. Pay cable services are not allowed under current regulations, but Pollack said the Minister of Culture recently made public statements that pay TV would be possible for the Limburg project. Dutch cable executives are said to be urging the government to allow pay cable nationwide.

The first two-way cable project in Holland is now serving a small town of about 3,000 subscribers, according to Pollack. The government initially authorized the larger-scale Limburg project about a year ago, he said.

The cable system will be owned by municipalities in Limburg and leased to operators, Pollack said.

Limburg established the Foundation New Services Limburg Ltd. to manage the cable project. Pollack serves as secretary of the organization. Marketing of the project is also being handled by Parts Bank International in Beek, Netherlands, and Limburg Investment Bank, which is backed by Parts and has a U.S. branch in Atlanta.

The Netherlands has approximately 5 million households of which about 4.2 million have registered television sets, according to the Dutch embassy. Most Limburg residents can receive Holland's two broadcast television stations as well as three German and two Belgian channels. The Netherlands has a population of approximately 14.2 million, of which 1.1 million reside in Limburg, according to 1982 figures.

TCI, Texscan announce earnings

DENVER—Tele-Communications Inc. announced that earnings in 1982 were flat despite substantial growth in revenues. Revenues increased 55 percent from $181 million to $282 million. According to the company, the substantial increase in revenues, "reflects new system construction, the expansion of existing systems and services and an aggressive acquisition effort." Net earnings for the year were $10.4 million or 46 cents per share, compared wtih $12.8 million or 48 cents per share in 1981.

Additionally, Texscan said it has achieved record results for a three-month period ended Jan. 31, with net sales of about $14 million, up 33 percent from last year, and net income of about $1.4 million, up 35 percent from the same period last year. Income per share was 22 cents, up 29 percent.

The cleaved coupled-cavity laser is a semiconductor laser cleaved into two nearly equal parts.

Bell Labs announces c3 laser

MURRAY HILL, N.J.—Bell Laboratories has announced the development of a cleaved coupled-cavity laser, which the company claims promises significant improvement in lightwave systems capacities, longer unboosted transmission distances and ultra-pure long-wavelength output. The c3 laser was actually patented at Bell Labs in 1965, but the work of Won-Tien Tsang, a member of Bell's Semiconductor Electronic Research Department, has helped to create the device, which couples two semiconductor cavities together at cleaved surfaces to produce an electronically tuneable single-frequency semiconductor laser capable of emitting pulses of ultra-pure light at a wide range of wavelengths.

The paired cavities are coupled optically but electrically independent so that the energy in each affects the other. Changing the electrical current through one part of the laser produces different patterns of cavity resonances, making it possible to tune the laser to several different wavelengths, one at a time. To date, the laser has been switched between 10 different wavelengths over a billion times a second. In February of this year, the c3 laser set a world record for unboosted transmission, traveling a distance of 119 kilometers—about 75 miles—error-free, while pulsing 420 million times per second.

Cable confronts regulatory issues

WASHINGTON—The cable industry battled on three fronts last month in the slow-moving campaign to achieve regulatory goals that remain as elusive as ever.

In late March, the Senate Commerce Committee postponed voting on the revised version of S.66, a legislative compromise reached between the National League of Cities (NLC) and the National Cable Television Association (NCTA). Approval of the legislation had been expected, but voting on the measure was upheld so that those Democrats who had been unable to review the bill could have the time to do so. The bill, which contains most components of the NLC/NCTA accord, includes franchise renewal provisions and a 5 percent fee ceiling, calls for a basic rate deregulation in any market served by four or more Grade B television signals and gives the federal government jurisdiction over cable without diminishing local control over the franchising process. The bill does not include provisions for SMATV systems, injunctive relief, penalties for theft of service, or a right of access to private property for cable operators and accompanying compensation to the property owner. Neither does the bill incorporate publicly owned or cooperatively owned utilities into the federal pole law. Sen. Ernest Hollings (D-S.C.) and other committee members opposing ratification of the bill expressed concern that the bill segments the market, impedes cable companies from entering the telephone business and requires telephone companies to enfranchise in order to provide video service.

In a related regulatory issue, in Quincy, Wash., the imposition of must-carry rules on cable systems is being challenged in the courts. Attorneys representing Quincy Cable TV, an independent operator that has filed suit against the FCC, have argued in a petition for review in the U.S. Court of Appeals, District of Columbia Circuit, that the must-carry rules violate the First and Fifth amendments. In a previous decision, the FCC issued a mandate to Quincy Cable, which serves areas in Spokane and Seattle, Wash., to carry Spokane's broadcast stations as well as the Seattle channels. When Quincy Cable refused to comply, the FCC fined the operator $5,000.

Another legal battle affecting the cable industry concerns rural cable system ownership by telephone companies. The National Cable Television Association (NCTA), after a respite of more than a year, has summoned up its forces to contend with the 1981 FCC rule-making proceeding in which the commission adopted an exemption allowing telcos to build and operate cable systems in those rural areas where it is not economically viable for cable companies to operate. The crux of the issue centers on the definition of what exactly constitutes a rural area. The FCC previously adopted the Census Bureau's definition of rural areas as those areas of 2,500 inhabitants, incorporated or unincorporated; and other territory, incorporated or unincorporated, included in urbanized areas. Attorneys for the NCTA maintain that the inhabitant figure set for the rural definition by the FCC was not mentioned anywhere in the rule-making proceeding and, furthermore, that telephone ownership should not be permitted unless independent cable operation is unfeasible in that area.

While none of these legal disputes has yet been resolved, and probably won't be for some time, it is safe to assume that similar challenges questioning the legal ramifications for cable regulation will continue, at least up until the time the FCC determines just how far it wants to take deregulation of the cable industry.

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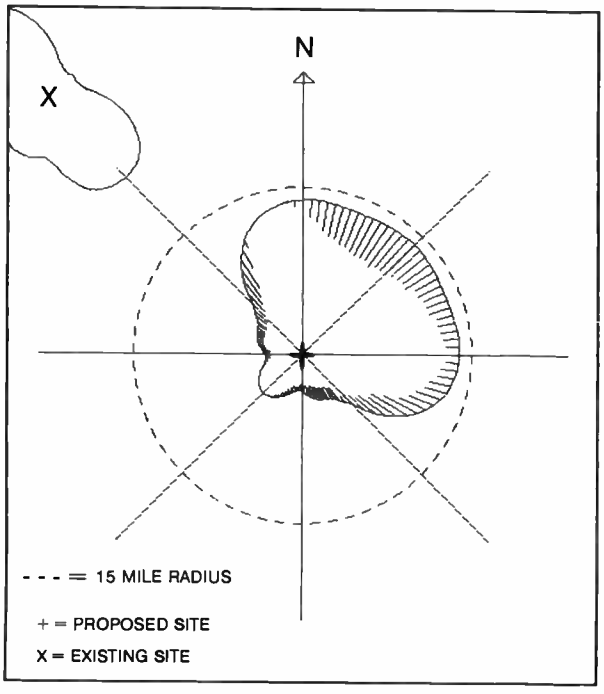

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Cable-Tec Expo set to open in Dallas

DALLAS—More than 500 engineers and technicians are expected to turn out for the Society of Cable Television Engineers' first Cable-Tec Expo, May 6-8. Featuring a program of "no-nonsense" technical workshops and a hardware exposition, the Cable-Tec Expo is unlike other cable shows in that there will be no software/programmer participants, and the 84 workshop segments are all technical, tutorial, classroom sessions; there will be no presentation of engineering papers. At *CED* presstime, approximately 120 exhibitors had lined up for booth space in the 22,000—square-foot Dallas Convention Center. For a complete booth guide, please turn to page 66.

Cable-Tec Expo workshops will address thirteen specific topics including signal level meters, system sweep, coaxial/fiber cable, converter repair, installation and customer service, point-to-point microwave and TVROs, strand mapping and design, cascade performance and construction practices, preventive maintenance, FCC compliance, bench sweeps and analyzer tests. A 14th workshop will feature a mix of topics, including techniques for system rebuild.

Each of the 13 workshops will be addressed in small groups of 60-80, in three one-hour segments, beginning with fundamentals, continuing with applications, and concluding with operational/advanced techniques. Registrants are free to select and attend any level of any topic. The SCTE also has scheduled learning centers that will be open during Expo afternoon hours and will address such topics as basic telephony, dBmV's, AML microwave principles, Ohm's law and AGC amplifiers. These sessions run for 45 minutes on a first-come basis.

Virtually all of the industry's major hardware suppliers will be in attendance, with the exception of the Jerrold division of General Instrument.

TOCOM receives $12.7 million order

DALLAS—TOCOM Inc. recently received the largest single order in its history from CommuniCom Inc., Culver City, Calif. CommuniCom ordered $12.7 million worth of TOCOM 55 PLUS addressable converters and related system equipment to be used in their Los Angeles area cable systems. According to a CommuniCom official, the 55 PLUS converters were chosen over those of other manufacturers because of their ability to prevent service theft by means of baseband video operation and because of the superior quality of their descrambled picture.

TCA Cable has placed a $350,000 dollar order for the same equipment for use in its Plainview, Texas, cable operation. Use of the equipment in Plainview will serve as a pilot project through which TCA hopes to determine the market and revenue potential of addressability for its small- to medium-sized CATV systems.

TOCOM also announced the successful private placement of 310,000 shares of its common stock and warrants to purchase an additional 77,500 shares of common stock with European institutional investors. The net proceeds of approximately $2.6 million from the equity offering will be used by TOCOM to reduce short-term debt and finance working capital requirements.

THE EDISON ADVOCATE

VOL. 2 NO. 1. MAY 1983

THE ONLY MULTICHANNEL TRAP FOR TODAY'S MULTI-PROBLEM ECONOMY.

Vitek's unique patented trap is more economical and effective than any other multichannel trap.

Edison, N.J.—Industry estimates indicate an alarming proportion of CATV revenues are being lost as a result of equipment tampering, converter theft and dishonest installers.

As always, many CATV systems are turning to Vitek multichannel traps as the inexpensive solution to this multitude of problems.

Vitek traps have a unique multichannel design.

Vitek traps are custom-made to match each cable system's individual channel alignment. Flexible design allows configurations of contiguous and non-contiguous channels, and even tiers to be combined into a single trap.

Vitek multichannel traps provide maximum security.

Located outside the home, Vitek traps make it impossible for subscribers to tamper with service. This makes the traps more effective than scrambled signals and keeps them more economical than addressability.

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Vitek multichannel traps are easy to install and priced so inexpensively, they pay for themselves almost from the moment they are put up. They can even be color-coded so you can tell the "haves" from the "have-nots" with a simple visual audit.

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A universal automated test system for addressable descramblers

By David Large
Vice President, Engineering
Gill Cable

The equipment and software described in this article allow a system operator to evaluate more than one brand of addressable descrambler in a fully automated test system. The test system is fully linked to a host computer inventory system that automatically records test results in that system, virtually eliminating manual record keeping chores. The design is based on Gill Cable's experience with an earlier configuration.

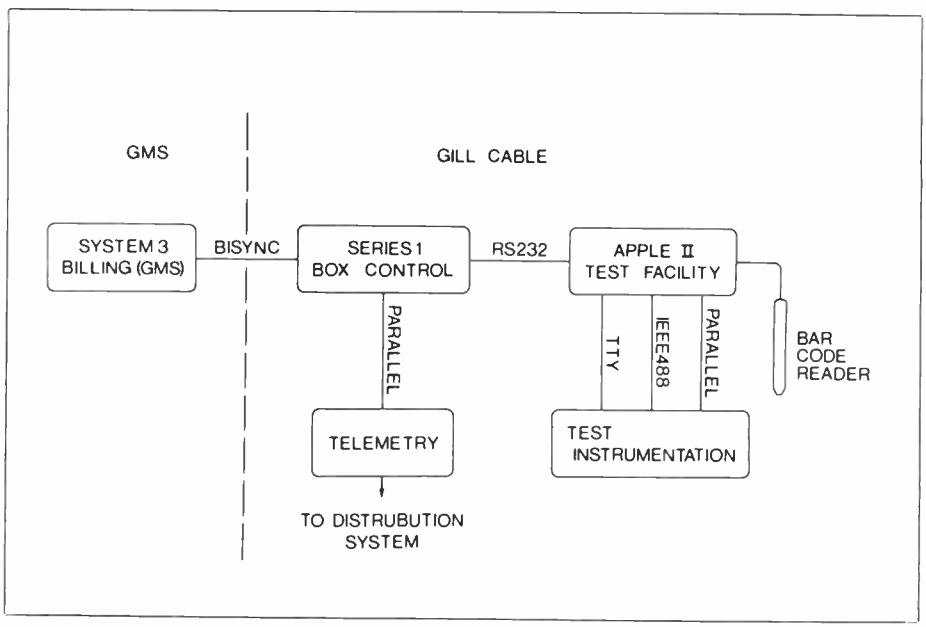

Figure 1 **Original computer configuration**

When Gill Cable personnel were planning for the introduction of addressable descramblers over four years ago, they opted for a completely unified approach. This meant that inventory management, control of addressable services, subscriber billing, order entry and hardware testing had to be designed as a single, distributed system. It was felt that dividing these functions among several independent systems was an invitation to disaster in a 90,000+ subscriber operation. Implementing that plan required the combined efforts of Gill and its sister company, Gill Management Services (GMS).

Integral to the design was an automated test facility for the Oak TC-35 descramblers then being installed. The instrumentation is controlled by an Apple II microcomputer and other processing is shared between it and the IBM Series 1 minicomputer, which also serves to generate telemetry for addressing boxes in the system. Figure 1 is a simplified block diagram of the computer configuration, including the IBM System 3 mainframe used for billing and interactive functions such as order entry, trouble call management and customer data base inquiry.

Several items were critical to the success of the testing operation:

1. Testing had to be truly automatic—right down to turning the channel selectors.
2. The test cycle was to be fairly comprehensive, covering all major specification areas.
3. Linkage to the host computer was such as to first verify the testability of each device, then record the test results by changing the device's status in the master data base.
4. The entire operation was to generate as little paperwork as necessary—achieved by printing test results in a coded form on adhesive labels to be attached to the bottom of each device.

In operation since June of 1980, this facility (Figure 2) has run nearly 200,000 test cycles of over 100 parameters each. Test time is under three minutes. We feel that the savings in time over manual testing plus the ultimate reduction in customer trouble calls has more than justified the original expense.

Recently, however, we decided to completely rebuild the test hardware. This decision was based on several factors:

1. A major upgrading of the GMS product, including changes in the computer configuration.
2. A requirement also to support testing of Zenith Z-TAC devices.
3. Age and reliability of the current test equipment.

Design concepts

The first goal that Gill set for the new configuration was that it should be, as much as possible, independent of the other computers. This allows the test system to be located at the warehouse, a central receiving and testing site or wherever. Communication to its host computer is limited to a single RS-232 asynchronous communications line that can be attached directly, through cable modems or via standard telco data lines and modems.

Communications to the host should be simple. An ideal transaction sequence would consist of verifying the testable state of a device, getting its previous test history and digital address, and, on

THE OPTION THAT KEEPS SUBSCRIBERS HOOKED ON CABLE

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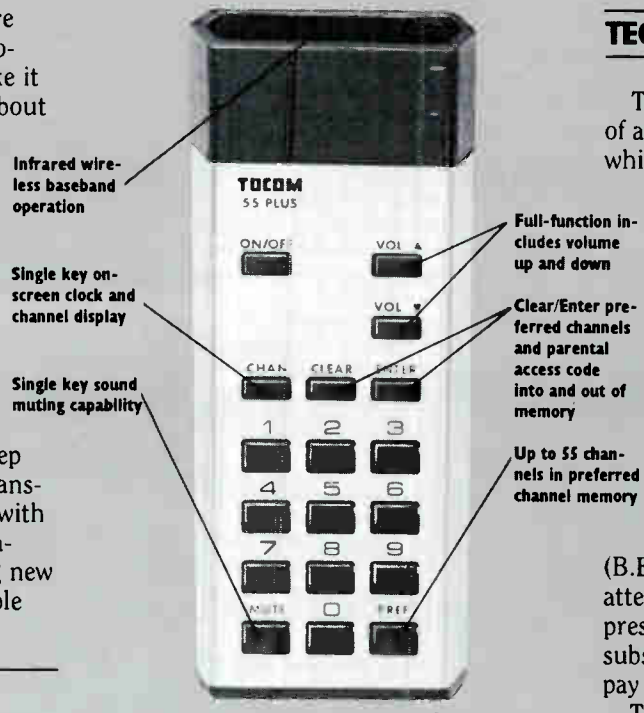
Every cable operator needs to find as many ways as possible to keep subscribers on cable month ... after month ... after month.

TOCOM's 55 PLUS full-function remote control is the smart enhancement that helps keep subscribers hooked on cable. It transforms any TV set into a super set with many excellent state-of-the-art features and provides an outstanding new marketing opportunity for the cable operator.



INSTANT TV UPGRADE

Subscribers who've never had a remote control for their TVs are quickly spoiled by the convenience of wireless control. Subscribers who have owned a remote are impressed with the 55 PLUS, rather than disappointed with a limited-function, no-volume-control RF unit for cable use.

Only baseband operation can provide a truly full-function wireless remote control. TOCOM's remote control has on and off, volume up and down, sound muting, a preferred channels memory and electronic A/B switch. With a touch of the remote's keypad, the subscriber has a digital clock and channel display on the TV screen. And a keypad code allows parental access to adult programs. Excluding the optional electronic A/B switch all of these are standard features with TOCOM's remote control.

TOCOM's two-way addressable systems also offer wireless remote control of interactive functions as well.

With so many superior features, the 55 PLUS remote control is easy to market. And once subscribers use it, they won't want to be without it. It's a genuine people pleaser that helps keep them hooked on cable.

On-screen clock and channel number display are standard features of TOCOM's one-way and two-way 55 PLUS addressable converters.

NEW REVENUE POTENTIAL

While subscribers are finding that TOCOM's remote control is a valuable enhancement to TV viewing enjoyment, cable operators are generating impressive new revenues.

Operators are selling remote controls for $45-$55 and/or leasing them for $4-$5 per month. Coupled with TOCOM's new lower prices, the margins are quite attractive. Subscribers find the baseband remote control an attractive bargain with a sale price of about half that of a remote control purchased with a new TV.

A TOCOM sales manager can develop a system cost/revenue analysis of baseband vs. RF addressability for you. He'd like the opportunity to show you how marketing TOCOM remote controls can pay the full cost of a 55 PLUS addressable control system equipped with one-way addressable converters in less than three years.

TECHNOLOGY UNSURPASSED

The 55 PLUS is a compatible family of addressable systems and equipment which deliver a wide range of services.

The 55 PLUS provides the most flexible pay packaging techniques in the cable industry. Channels and programs can be packaged in any conceivable configuration to fit subscriber demand and provide new pricing alternatives. And TOCOM's methods of one-way and two-way pay-per-view delivery are unsurpassed in the industry.

TOCOM's exclusive Baseband Encoded Scrambling Technique (B.E.S.T.) defeats theft of service attempts. And automatic sound suppression and blanked screen eliminate subscriber viewing on unauthorized pay channels.

TOCOM's 55 PLUS baseband design provides four models to choose from: the 5501 add-on addressable baseband decoder (without remote control), the 5504 one-way addressable converter and the completely compatible 5510, equipped either for one-way teletext or in a fully interactive two-way version that can accommodate both a full alphanumeric keyboard and a hard copy printer.

And now the 55 PLUS is the best priced baseband addressable converter system in the industry. For more information, contact Sid Prothro, National Sales Manager, TOCOM, P.O. Box 47066, Dallas, Texas 75247. (214) 438-7691.

TOCOM 55 PLUS—DESIGNED TO LAST

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completion of the test cycle, transmitting the new test information so that the device history and status can be modified.

The configuration should be as flexible as possible so as to allow testing of converters, scramblers using RF scrambling techniques and scramblers using baseband scrambling techniques.

The test itself should truly be automatic, including any channel changes that need to be made. The entire process should be prone to as little human error as possible, (e.g. bar code and/or OCR entry of serial numbers to eliminate numeric typing errors). In fact, elimination of the conventional keyboard except as a backup would be desirable.

Finally, the hardware should be physically rugged enough to stand up under the strain of continuous use in a decidedly non-optimum environment. That means elimination of the Apple II, for instance, in favor of a commercial instrument controller, and enclosure of all the custom circuitry in a rack-mounted card cage.

Computer environment

The new computer configuration is shown in Figure 3. The remote IBM host computer performs most of the functions of the original System 3. The on-site HP-3000 performs local addressable management functions and does pay-per-view processing. It also supports the various dispatcher functions related to addressability. The HP-1000 generates telemetry for the various types of descramblers.

Inventory files for each descrambler are mastered on the IBM host and complete slave files are maintained on the HP-3000. These files contain the complete device records including critical dates, test and repair history, status, location and immediate enabling.

In support of the testing and repair function, the record on each device contains a total of twelve numeric history fields. It was decided to use six of these to record the number of failures in various test categories (frequency tolerance, power level, addressability, etc.) and the other six to record repair categories (power supply, microprocessor, telemetry receiver, etc.). The test system is designed to access and display these at the beginning of test (along with other parameters) and to modify them at the end.

The test and repair center are supported from the HP-3000 via asynchronous communications lines. Note the use of two ports on the HP-3000, one for the test fixture and one for the repair bench. This allows simultaneous operation of these functions. If the testing and repair functions are co-located and remote from the HP-3000, then multiplexers on each end of the line will allow the use of a single data line.

Since complete equipment files are maintained on that machine, access to the host is not required. Test results are normally transmitted immediately to the host by the HP-3000. If the host is unavailable, however, the results are stored in a file for later transmittal. The result is that testing and repair can be performed at any time regardless of the state of the host or remote data line.

Control system

Central to the new development was the choice of the Fluke 1720A instrument controller as a processor (Figure 4). This is an industrial grade microcomputer based on the Texas Instruments 9900 microprocessor. It is housed in a rack mountable chassis and is well protected mechanically. Its most interesting feature is that the CRT screen is also a transparent keyboard! This allows menu choices to be selected by the operator by merely touching the appropriate area of the screen. The keyboard is detachable, if desired, or may be retained for backup purposes.

The computer comes standard with two RS-232 ASYNC ports, two IEEE-488 ports and 64k bytes of memory. Additionally, 128k bytes of battery supported memory

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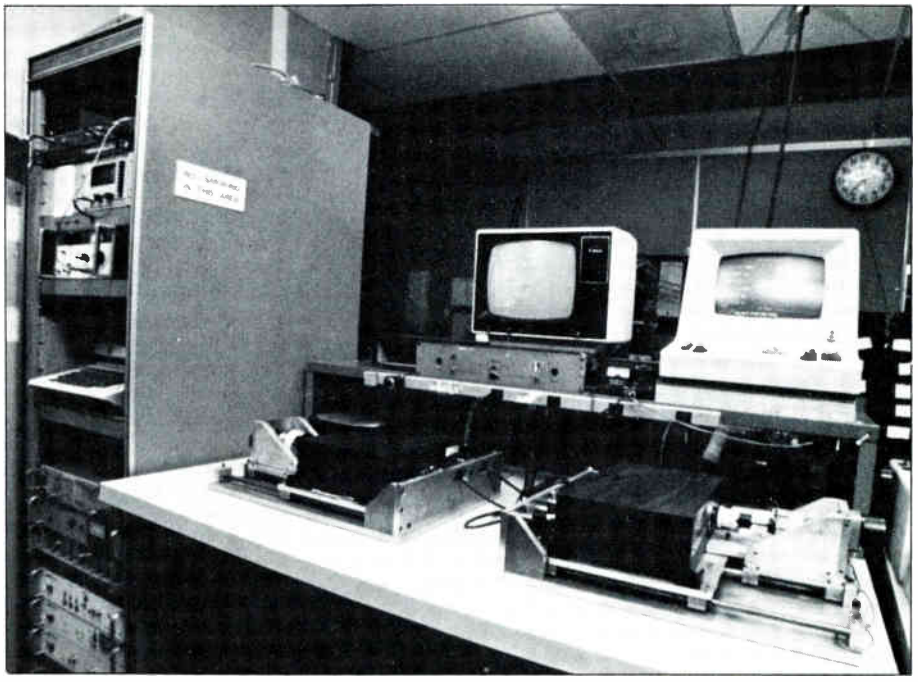

Figure 2 **Existing test center**

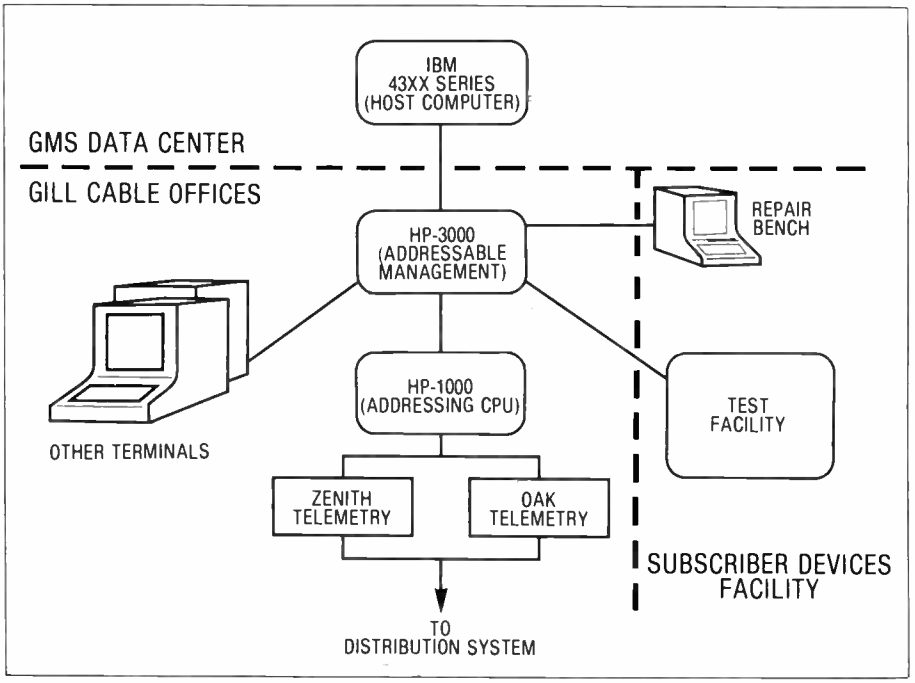

Figure 3 **New computer configuration**

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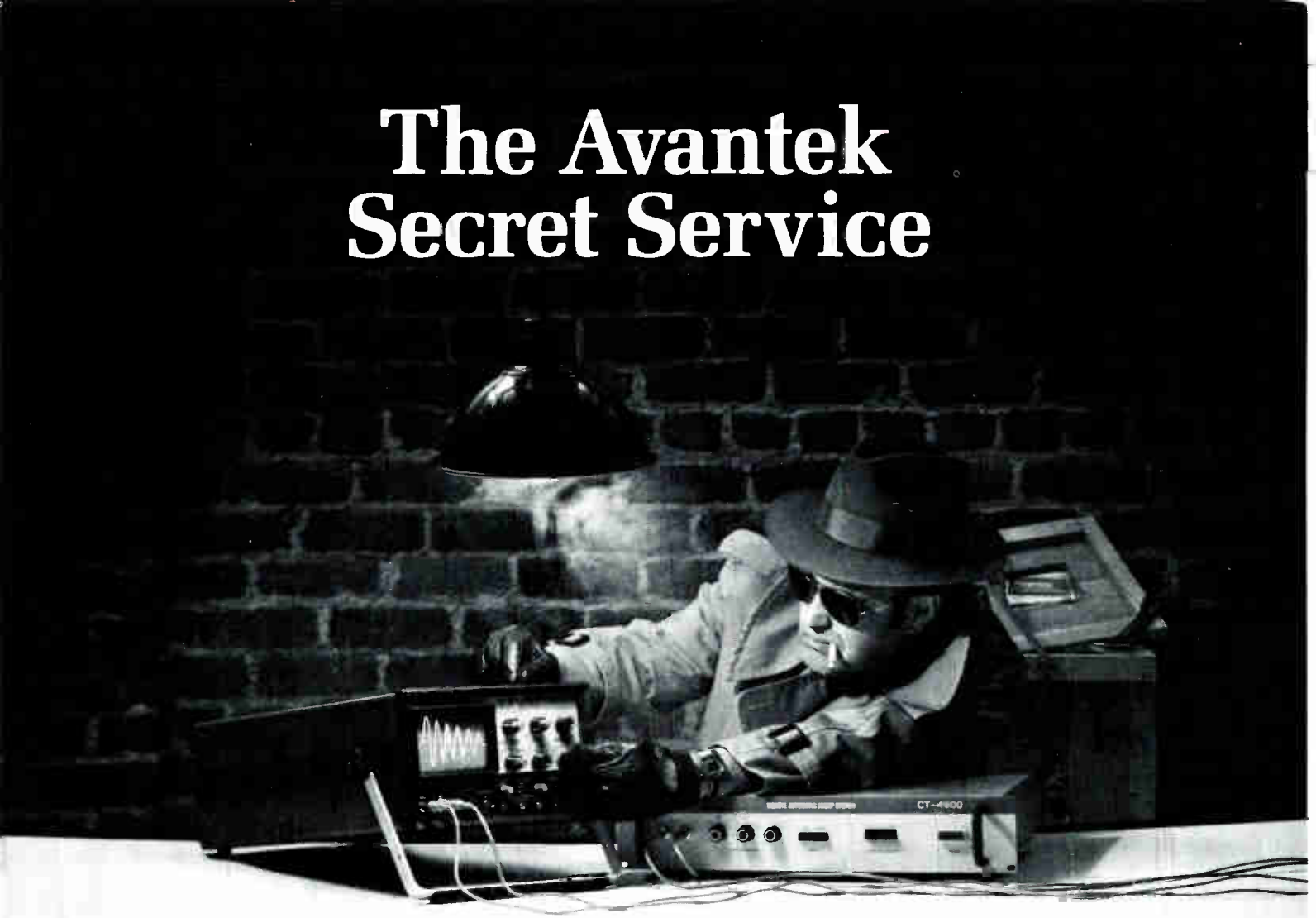

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continued from page 22
were added for nonvolatile storage.

Programming may be done in interpretive BASIC language, assembly or compiled FORTRAN. In this case it was judged that FORTRAN was the best choice with selected portions done in assembly where the function could not be performed in FORTRAN.

Figure 5 is a block diagram of the logic portion of the overall test system. The selection of the various pieces of test equipment was based on several things: the availability of computer interface ports (preferably IEEE-488), the ease of remote control and readout, reliability and cost.

In the case of several of the instruments (the Synchronous modulator and the Zenith and Oak scramblers), no useful remote facilities are provided, so Gill designed and installed simple IEEE-488 interface boards. Figure 6 shows the added board installed in the Synchronous unit.

Physically, all of the external control hardware is grouped in one of two housings. Those items directly involved in controlling the test cells are located adjacent to the cells and the Fluke computer. All other logic is located in the I/O expansion unit in the main rack.

The I/O expansion unit communicates via an RS-232 link to the Fluke and has its own 6502 microprocessor. This unit creates RS-232 and parallel ports as required. This was necessary because of the limited I/O capabilities of the Fluke. Figure 7 shows the two cards containing the processor and memory sections. The software for this was written and assembled on an Apple II, then burned into a Programmable Read Only Memory

Figure 4 **Fluke 1720A microcomputer**

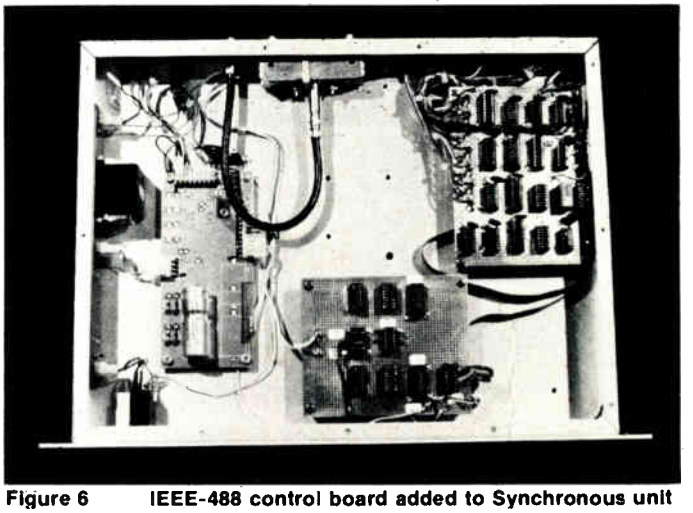

Figure 6 **IEEE-488 control board added to Synchronous unit**

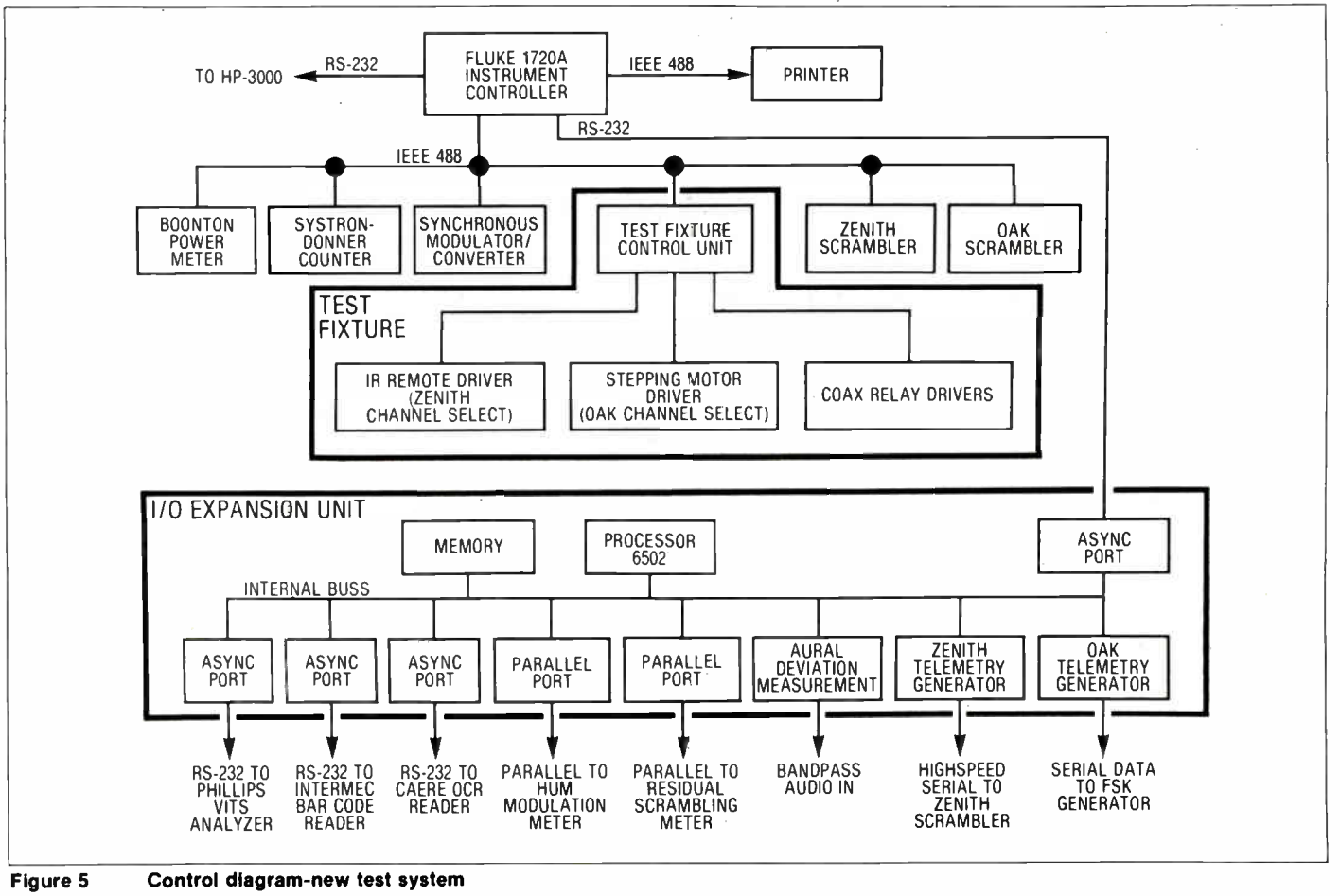

Figure 5 **Control diagram-new test system**

(PROM) using a special board in the Apple.

The I/O unit is housed in a Scanbe card cage, which uses no recognizable bus standards or pinouts. It was chosen because of cost and the availability of a tray that allows I/O cables to connect to the front of boards, yet be routed underneath to the rear of the unit (Figure 8). This provides the best combination of flexibility and access for repair. Figure 9 is an overall view of the rack containing the instrumentation.

Measurements

Measurements that need to be made fall into three categories: converter measurements, descrambler measurements and addressing verification. The first of these are the measurements that typically would apply to any set-top converter such as confirmation that all channels are operational and that output frequency and power are within specifications. The second are those device-specific tests that measure signal degradations unique to each scrambling method. The final tests confirm computer control over device enabling. Figure 10 shows the instrumentation and signal routing necessary to perform those tests.

Two test cells are provided for each converter type to be tested. This is so that a test may be performed on one device while the other cell is being unloaded and reloaded. Using this technique, the test equipment is being used to full capacity all the time.

Each test technique is detailed below.

Self-calibration

A high degree of self-calibration capability is built into the equipment. With the test cells jumpered, the power meter is used to check the programmable attenuator and signal paths. The video from the VITS generator is tested directly on the VITS analyzer, then a check is made through the shorted test cell of the modulator/demodulator back-to-back to check their accuracy. Finally, the Synchronous upconverter is periodically connected directly to the counter to check on its accuracy.

Basic functional test

The first information necessary on any converter is whether it is actually drawing power, and if so, is it within reasonable limits. This is accomplished by a simple homebrew AC current meter.

Given that, the device is addressed and commanded ON. Then the source and converter are sequenced through the entire range of channels and the output power and frequency are checked. This confirms not only that all channels are functional, but that the AGC and AFC circuits are working properly. In the case of a baseband device like Zenith, it confirms that the output modulator is accurately on channel and power setting. Additionally, the programmable attenuator is used on selected channels to check the AGC range on the descrambler.

Signal quality

Next, the demodulated signal from the Scientific-Atlanta demodulator is measured using the Phillips VITS analyzer. The various video measurements reveal a great deal of information:

1. Multiburst flatness translates directly into IF flatness.
2. Video signal-to-noise ratio directly translates into converter noise figure.
3. Chroma delay is a measure of the accuracy of the tuning of the device.
4. The remaining video tests (sync level, chroma level, pulse/bar ratio, etc.) are very important in a baseband descrambler as a measure of the accuracy of the demodulation and remodulation process.

Intercarrier frequency

Baseband descramblers generate internally the 4.5 MHz sound carrier. Since the FCC has a tight specification on that frequency, it is measured using an intercarrier detector and the counter.

Aural/visual carrier levels

The difference between aural and

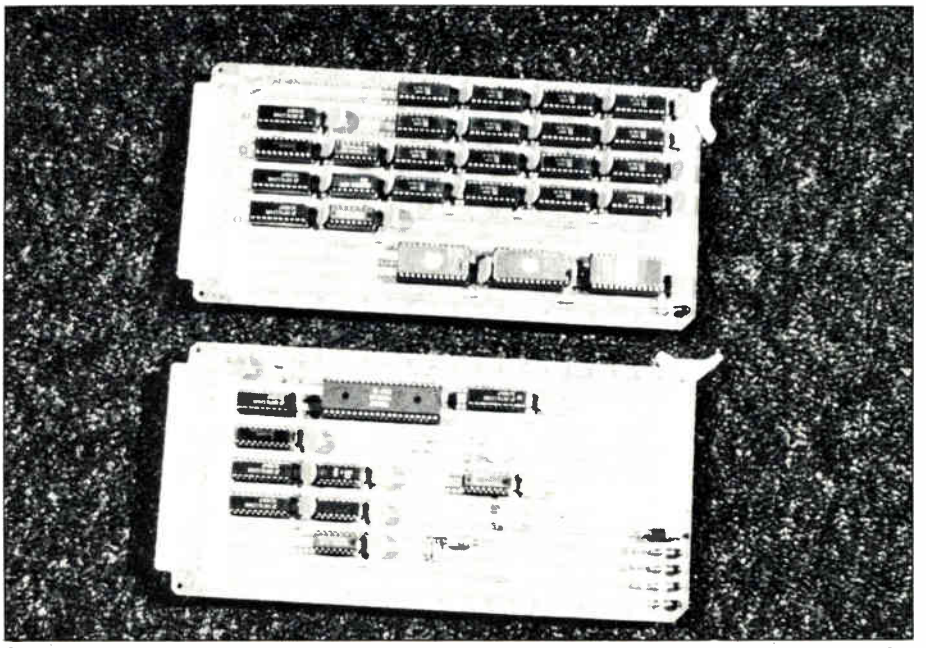

Figure 7 **Gill-manufactured boards containing 6502 microcomputer for I/O expansion unit**

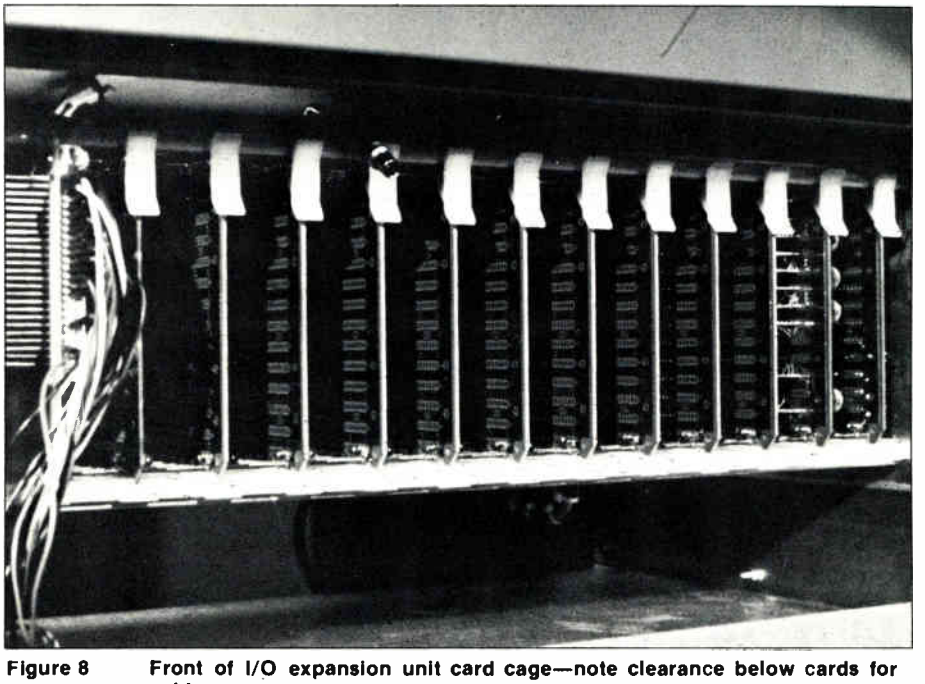

Figure 8 **Front of I/O expansion unit card cage—note clearance below cards for cables**

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Photomicrography reveals precise closed cell structure of new T4 ultra-hard cable. (above)

visual carrier levels is measured by separating them by narrow bandpass filters and then connecting each to a different input on the Boonton power meter.

Hum modulation

Hum modulation is often the best test for a faulty power supply in a unit. The technique used is similiar to that used in the Avantek SL-300 signal level meter. The modulator is set to generate a CW carrier, which then is detected in a linear RF detector. The DC component of the detected output is compared to the amplitude of the AC component in a logarithmic difference amplifier. Finally, the output is digitized by an 8-bit analog to digital converter. This all sounds more complicated than it is—actually it takes only a few integrated circuits.

Audio modulation

Baseband converters must remodulate the aural carrier. It is important that the remodulated level be right or audio distortion or unacceptable audio noise levels will result. This is measured simply by measuring the recovered audio level from the demodulator.

Residual scrambling

Sinewave sync suppression scrambling operates by superimposing a 15kHz sinewave on the active video signal. In the descrambling process the sinewave is cancelled, leaving only the original video. The accuracy with which it is removed is an important measure of signal quality. For this test, a scrambled signal is used whose active video is merely a black screen. Gill designed an instrument that measures the flatness of the black signal from the demodulator. The variation from a flat black line is directly translatable into residual scrambling.

Aural/visual cross modulation

If a sinewave sync suppression unit is improperly aligned, an unfortunate effect takes place whereby the picture is visibly modulated by the aural information. This is measurable by using a CW video carrier and a modulated sound carrier. A sensitive audio level meter is used to measure the resultant modulation transferred to the visual carrier at the demodulator output.

Addressable functions

The necessary data here confirms full computer control over the devices. In Gill's case, this consists of addressing the unit totally ON and totally OFF, then ON, with a predetermined set of enabled services. Confirmation of control makes use of the power meter for ON and OFF functions, the residual scrambling meter for Oak descrambling control and the VITS analyzer for Zenith descrambling control.

Conclusions

The specifics of Gill's solution to their testing requirements are obviously not universally applicable. On the other hand, many larger systems and MSO's handle similiar quantities of descramblers and the techniques described are quite general. For that matter, manufacturers producing these devices should have an interest in a more comprehensive testing program to improve average shipment quality.

As cable strives to improve its image of quality, it is necessary that we do more of our own testing and ask our customers to do less. CED

Acknowledgments

Bill Kostka, of Gill's staff, designed and constructed the first test facility. Rich Wayman now is completing construction of the new equipment. Gloria Cook prepared the artwork and Ozzie Abolin took the photographs for this article.

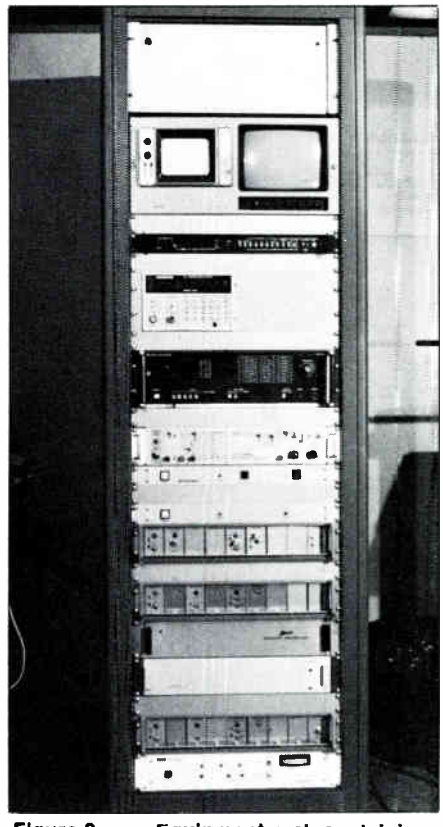

Figure 9 Equipment rack containing instruments

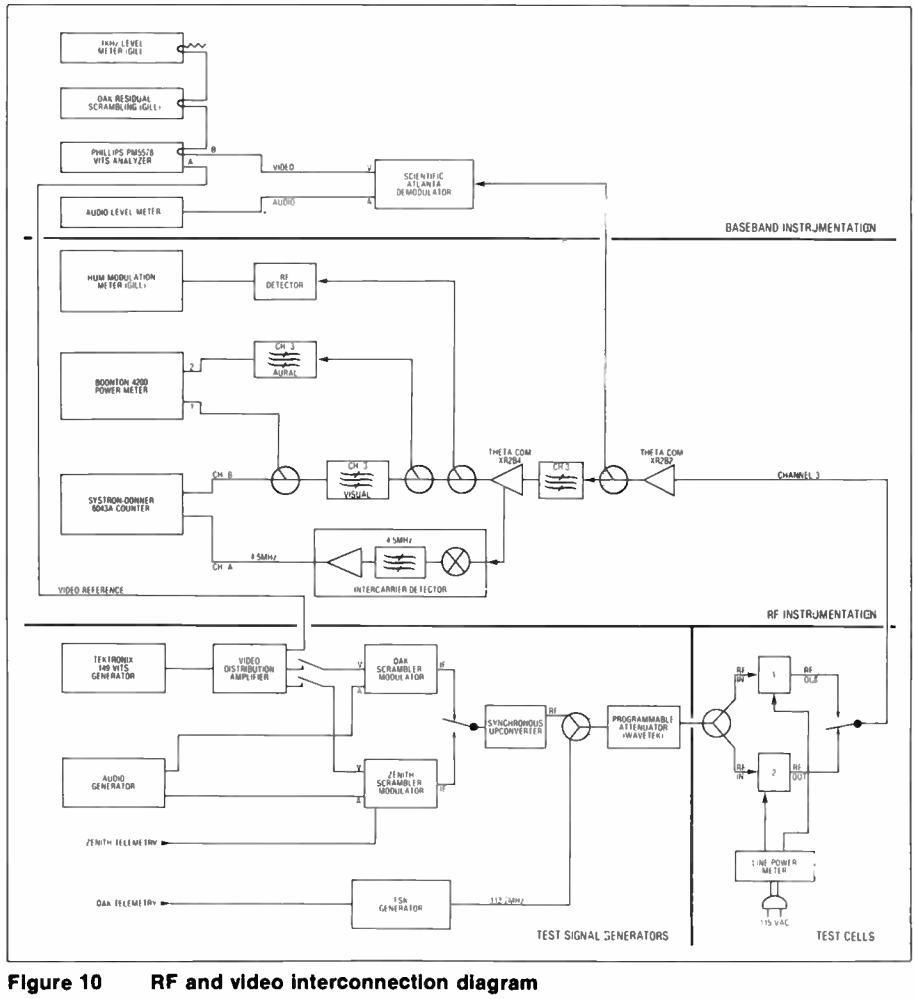

Figure 10 RF and video interconnection diagram

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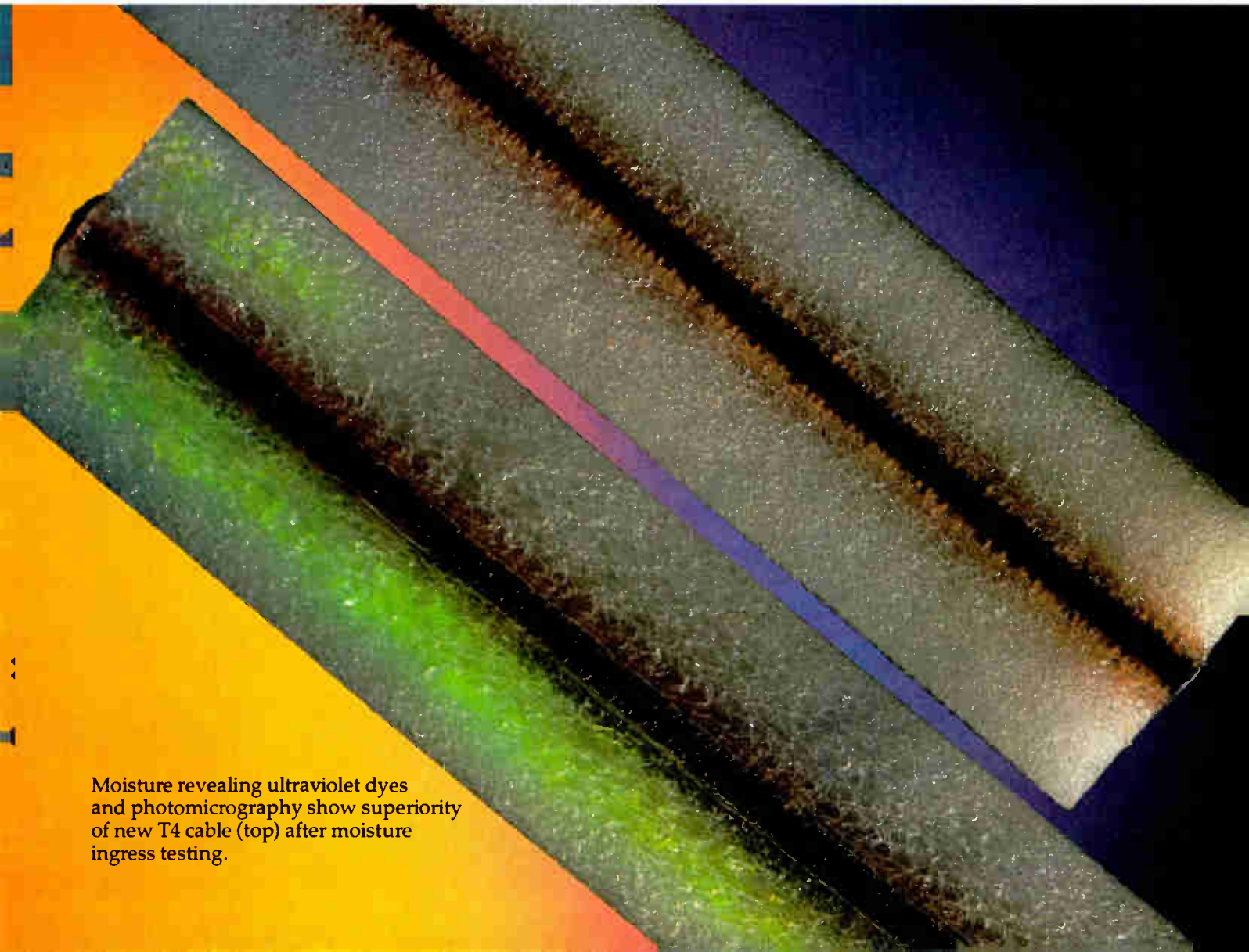

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Using microprocessors to improve headend and system reliability

Making design decisions that will eventually enhance system reliability is an important part of product planning and development. This article describes some of the decisions that must be considered in new product design, with emphasis on features, available in the next generation, that may contribute to system performance and reliability.

By Neil Rapoport
Principal Member of the Technical Staff
RCA Cablevision Systems

This is the age of the microprocessor and they are appearing in more new products than can be counted, ranging from home appliances and entertainment devices to spaceships and aircraft. This is also the age of cable television. So it should be no surprise that some new products for the cable TV market are including microprocessors in their design. The use of a micro in new products became inevitable when the cost of the device became equivalent to a handful of logic circuits. The micro can provide more function in a smaller space than the logic circuits it is capable of replacing.

This paper will use the RCA color television modulator (designated CTM20) as an example to show how these new capabilities can have a positive effect on system operation and reliability.

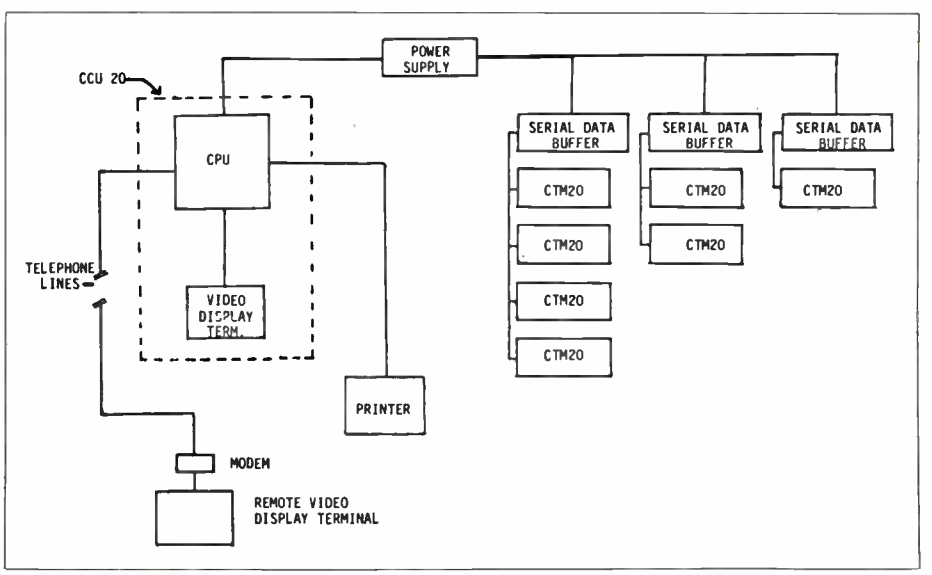
The inclusion of a microprocessor in a new product gives the design team flexibility that is hard to imagine. New features can be included without each change having a major impact on the cost of the product. The inclusion of a micro in a second-generation product at RCA has made an impact on the design. The new product now has features that allow the system to be monitored and controlled in a more flexible and efficient way than was possible in the past. The inclusion of the new features is expected to affect the way the product is used by the customer.

Project history

The project began as a need to design a cost-effective upgrade to an existing product. The major emphasis was on improved performance and additional features, if possible, without increased cost. The initial design concept did not include a microprocessor nor did it allow for remote monitoring or control of the new product.

The existing product had a mechanical meter on the front panel. We decided to investigate the replacement of the meter with a digital panel meter. Cost figures were obtained that showed the new panel meter would be less expensive. The front panel was designed to include the display of several status functions in the new product, and a prototype was built and tested.

The idea to include a microprocessor



was discussed when cost figures indicated that the microprocessor would cost no more than the panel meter. Once the microprocessor had been chosen and included in the new product, various ideas were discussed on how to utilize it more effectively. The design continued to evolve over a period of more than one year. By the time the design was finished, the microprocessor was given control of several new features. It also now allows for communication with an external computer. Ideas on how to utilize the external communication path also have evolved over the life of the project. And now the system design includes several automatic monitoring and control features.

New vs. old

A color television modulator is the device that a system operator would use to prepare a baseband video signal for transmission on the cable. This section will concentrate on the new features that enhance system reliability.

Figure 1 shows in a general way the increase in the number and type of features that are available in the new product. The new unit adds a lot of features and creates a very flexible machine. Most of the new features are options that can be selected when the machine is purchased or can be added in the field. The basic chassis is wired to accept all options so that upgrading can be accomplished by installing the appropriate circuit boards when needed.

The first nine features shown in figure 2 are controlled by the microprocessor. Although any of these features could have been included without the use of a microprocessor, the micro allowed all these features to be included without major hardware changes as the design evolved.

The new unit is capable of accepting either local or remote commands to select various inputs of video, audio and IF. Each video input has a video presence circuit and a display on the front panel. The remote control unit also can read the state of the video presence indicators. In fact, the remote control unit has access to any parameter that can be displayed locally and some, in addition, that are not available for local control or display.

Figure 1. Comparison of features

	CTM10	CTM20
Front Panel Indicators	3	4
Measurable Parameters (local control)	6	16
Measurable Parameters (from remote)	0	24
Controllable Parameters (local control)	4	4
Controllable Parameters (from remote)	0	3
Switchable Functions (local control)	1	3
Switchable Functions (remote control)	0	3
Alarms	1	Selectable

Figure 2. New features added to the CTM20

1. Switchable video source
2. Switchable audio source
3. Switchable IF source
4. Local monitoring of selected functions
5. Remote monitoring of functions
6. Local control of video/audio/IF selection
7. Remote control overrides local control of selections
8. Automatic switching upon loss of signal
9. Built-in self-test feature
10. Bar graph type audio and video modulation indicators
11. Surface acoustic wave IF filtering
12. Video automatic gain control (AGC) option
13. Audio compressor option
14. IF AGC option and IF source selection option are now field installable
15. Synthesized picture/sound IF carriers with one reference crystal
16. Solid state switching
17. Configured to interface readily with currently available scrambler hardware
18. Optional video message generator allows pre-programmed messages to be easily used by the system operator

Figure 3. New capabilities added by the central computer

1. Remote control of gain levels in video/audio/IF AGC
2. Automatic monitoring and logging of data
3. Automatic switching at predetermined times
4. Automatic notification of parameters reaching operator set limits—to allow notification before loss of function
5. Remote monitoring of unattended headend sites through use of telephone lines and standard computer terminals
6. Optional smart message generator allows any text message and some limited graphics to be displayed on the channel or to be overlayed on the incoming video signal whenever desired

The micro actually controls the selection of the video and audio source in response to inputs from either the local control (rear panel) or remote control (central computer). Loss of signal causes the micro to make a new selection automatically. Normally, the audio source follows the video source that is selected, but this is not required. Local control can select either no video or emergency video (special input). Remote control can command any audio source selection separate from the video source selection.

The micro allows for communication with a central computer for additional flexibility and it makes possible features that otherwise would not have been included. The new features that are possible through the use of a central control computer are summarized in figure 3.

The product is designed to utilize a simple serial communication protocol to the central computer that allows up to 126 modulators to share a three-conductor cable between them and the central computer. The central computer utilizes a common RS232 interface to communicate with the modulators.

The central computer allows a remote headend to communicate to a central point by utilizing a modem and the dial-up telephone lines. The central computer can be given the capability to answer or originate a call. If desired, the capability for voice output or input also can be included (possibly at a later date). The central control computer, when equipped with a local printer, can print periodic summaries of the status of the system and can maintain history information on diskette if desired.

The central control computer is equipped with a clock/calendar circuit that has its own battery backup to ensure that it always knows the date and the time of day. This feature allows the system operator to preset changes in operation that happen at certain times of certain days and program the equipment to change configuration. The system operator also can change the operation at any time from the terminal or from a remote terminal.

New features affect system reliability

Careful, conservative circuit design can ensure that a particular unit has a high "Mean Time Between Failures" (MTBF). Careful mechanical and electrical partitioning of a unit can aid in reducing the "Mean Time To Repair (MTTR). However, when the unit is a part of a chain of equipment in which all must function in order to ensure that the system operates properly, then other techniques are required to ensure reliable system operation. Two additional techniques become available because of the features designed into the CTM20. The microprocessor in the CTM20 and the central control computer help to make these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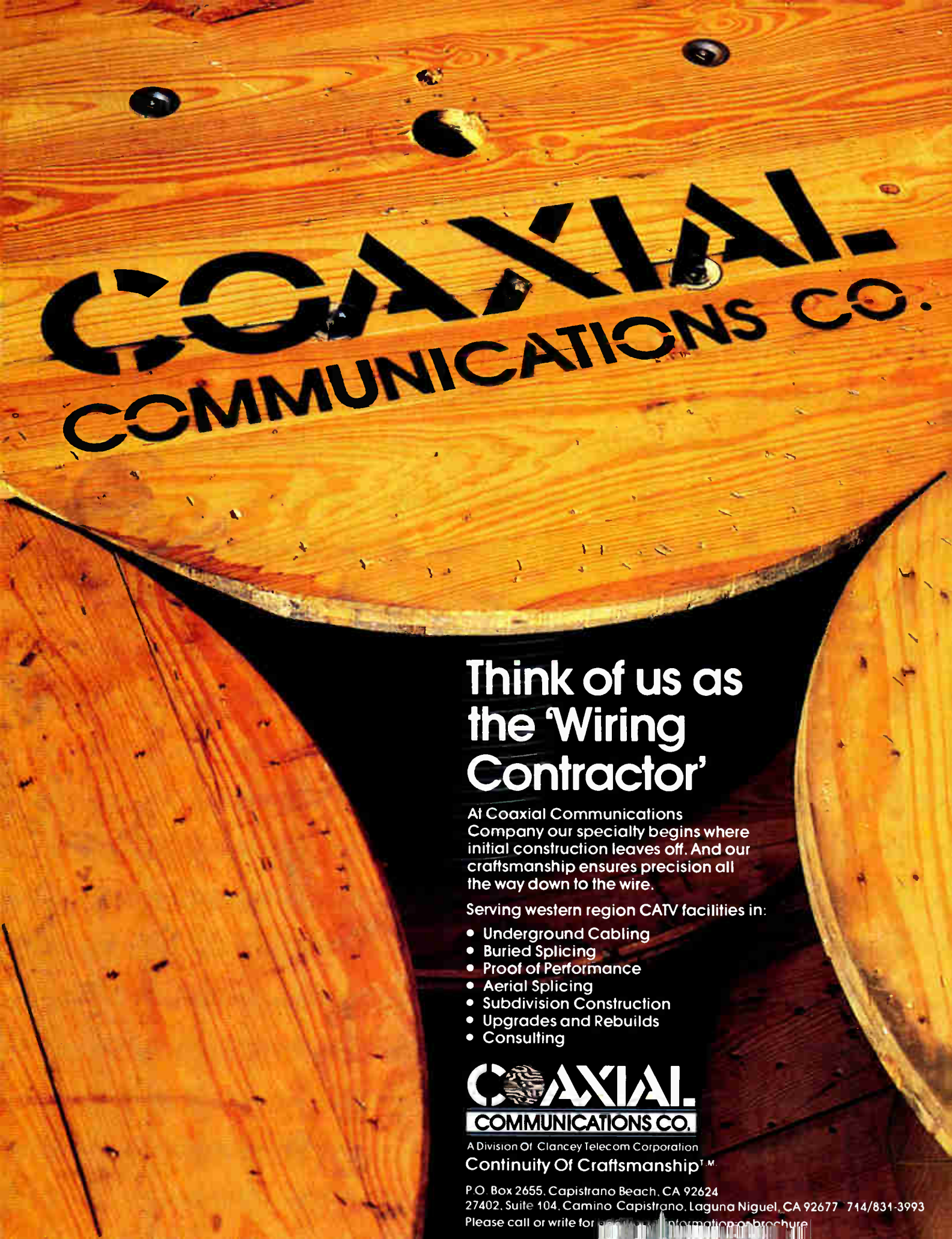

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features possible. The techniques that I am referring to are redundancy and early warning in case of possible trouble.

The redundancy that is available provides primarily for external failure. That is loss of incoming signal due to external factors. The CTM20 allows a new input signal source to be selected automatically upon detection of the loss of selected signal source. If no external signal is available, the CTM20 is capable of generating one of its own (the message generator option).

Early warning of possible failure can be obtained by using the automatic monitoring and data logging features available from the central control computer. Another form of early warning available is the built-in self-test feature. The self-test feature can be commanded from the local panel and also from the central control computer; it also is activated automatically when power is first applied to the unit. The self-test function monitors internal parameters and verifies that operation is within expected limits.

The new design will allow the system operator to monitor the operation of the equipment and create periodic reports on the operational characteristics of the equipment. The system operator now has a tool that allows him to overcome some types of equipment failure by using these new features.

Conclusion

The use of a microprocessor allows for both redundancy of signal input and early warning of possible trouble. The inclusion of self-test, remote control and monitoring capabilities help increase the system reliability markedly while making it convenient for the operator.

Examination of the project history shows that reliability was not chief among the reasons for selection of a microprocessor. However, because the microprocessor was included in the design, it has allowed system operators to buy a tool that will have a beneficial impact on the system operation. The operator will be capable of automatically monitoring the performance of a very important part of his system while controlling some aspects of the systems' operation both manually and automatically. In the event of equipment trouble, early warning will aid in reducing equipment downtime to a minimum. CED

Neil Rapoport is a graduate of the UCLA School of Engineering and a former Officer in the United States Navy. He has over 12 years of experience in the design and development of new electronic products in both aerospace and commercial environments. He also has had several years experience in the design of special purpose test equipment to support new products. He joined RCA in June 1981.

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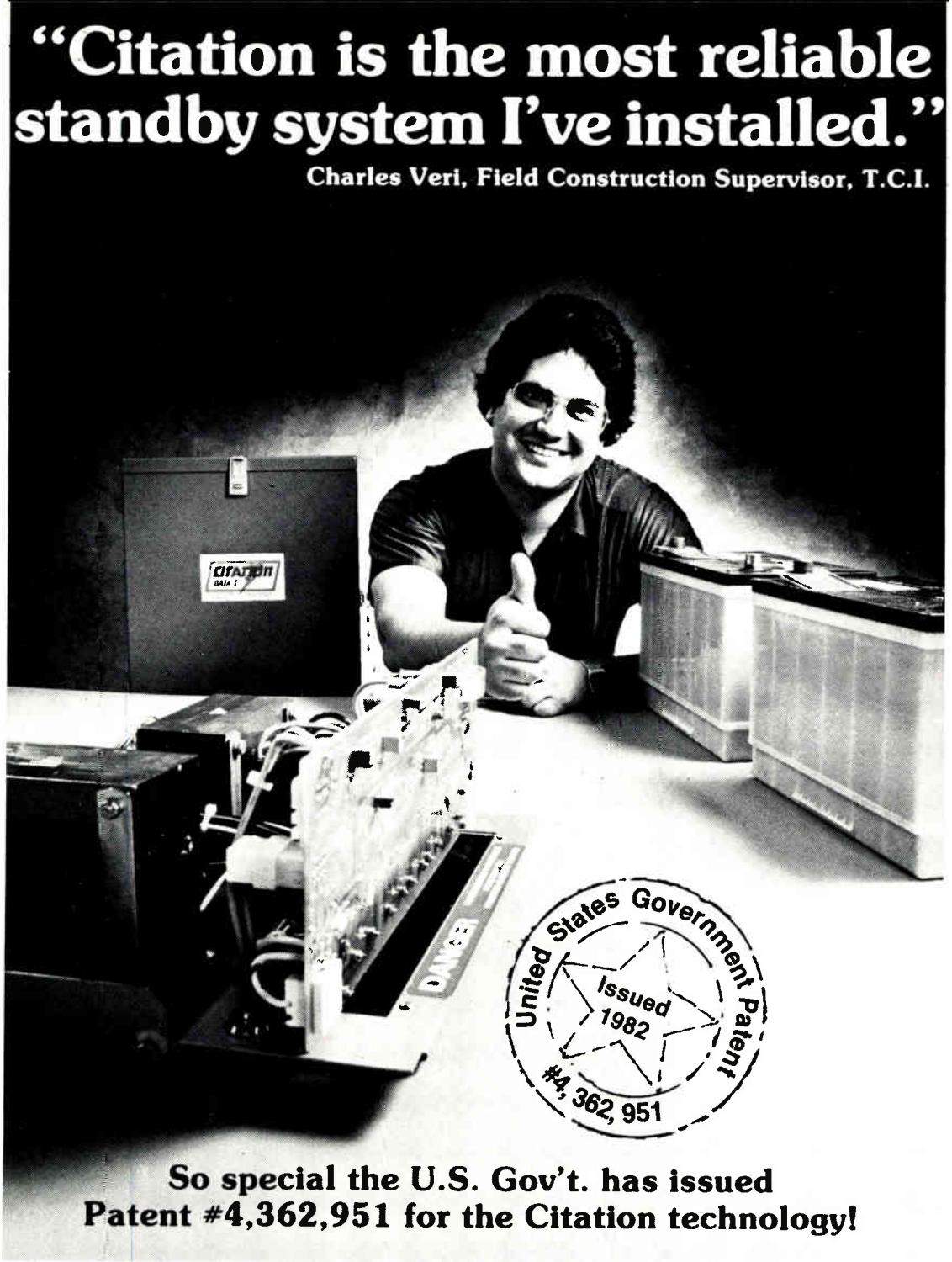

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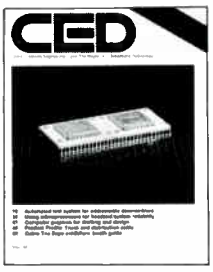

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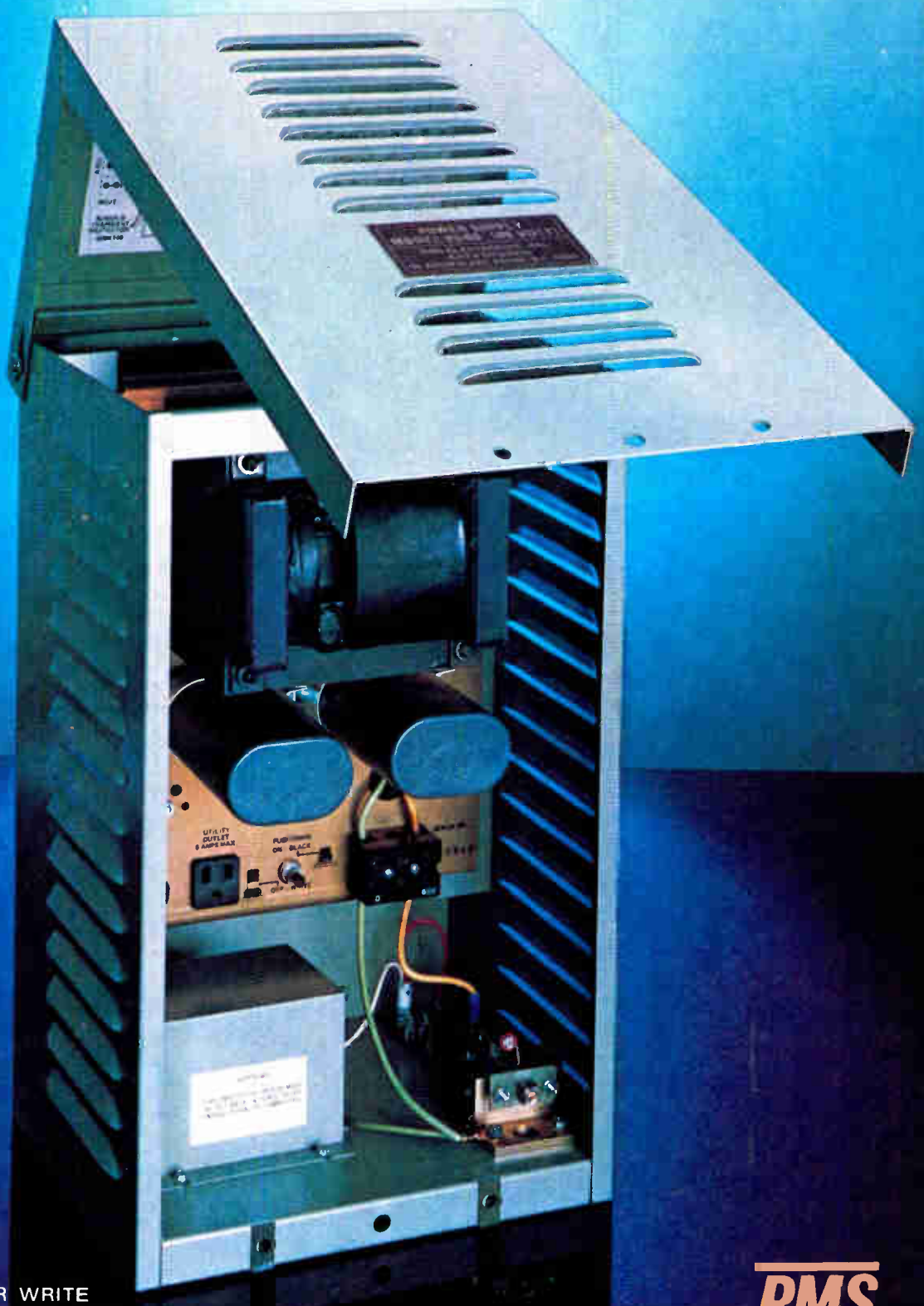

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Broadband network design

By Archer Taylor, P.E.
Malarkey-Taylor Associates

Cable TV system design has not changed significantly since directional couplers replaced pressure taps. Channel capacity has increased radically, over the years, from 3 channels to 60 or more, with little change in amplifier spacing or cascadability, as improvements in amplifier linearity and cable attenuation kept pace. Even the popular dual cable initiated in the 60's in San Jose, Reston and elsewhere is merely a clone of the old design.

Distribution hubs and innovative interconnecting facilities were introduced in the late 70's to avoid excessive cascades in large urban systems. Two-way capability, enshrined in the 1972 FCC Report and Order, has become the basis on which the industry hopes to enter the business of interactive telecommunications. But the original tree-and-branch network topology remains essentially unchanged.

Design changes take place either to accommodate new requirements or to overcome unsatisfactory features of old designs. Thus, the new 400 MHz hybrids were developed to meet a perceived need to outdo the competition for franchises by promising more channel capacity. The most conspicuous new requirement today seems to be the intriguing possibilities for pro viding enhanced, interactive services on cable.

In my opinion, new system designs may be required if we are to compete successfully for this business with other telecommunications industries. Our present sub-split design will only be capable of providing reliable interactive service if the terminal modems and software protocols are designed specifically to transmit messages reliably through a hostile transmission medium. Even the most meticulous design and maintenance procedures probably cannot permanently eliminate ingress interference in the 5 - 30 MHz band. High power international broadcasting, amateur radio stations, citizens band radio, and a host of marine and aviation radio stations tend to saturate the band with signals we do not want (see figure 1). While detailed spectrum

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Coax-Cablecon can be plowed-in or laid in open trench if soil will not accept cable plow. Either way, continuous one-piece Coax-Cablecon beats hand work required with metal or PVC duct.

If trench depth exceeds minimum bend radius of Coax-Cablecon, no sweeps or elbows are needed for easy, continuous duct termination. Transition fittings are available for joining to other systems.

Cablecon has been thoroughly proven since the 1960s in utility distribution, street and highway lighting applications. Coax-Cablecon is manufactured specifically for the CATV Industry.

5/83/CED

Integral Corporation Coax-Cablecon Sales Department
P.O. Box 11269 Dallas, Texas 75223, Phone: (214) 826-0590
Please send me information on Coax-Cablecon.

Name _____
Company/firm _____
Address _____
City/State/Zip _____
Phone _____
☐ single or ☐ dual cable system ☐ trunk ☐ feeder ☐ drop line

Integral Corporation
Telecommunications Division

analysis usually reveals some clear spots in the band, ingress noise from automobile ignition, electrical machinery and leaky electric power facilities are not so cooperative. Besides ingress, we also have to deal with internally generated upstream interference from common path intermodulation between the downstream TV carriers.

Notwithstanding the ingenuity of designers and technicians in developing techniques for locating and stopping ingress, the problem is simply overwhelming. By eliminating service drops, the situation probably could be made much more manageable, except for a rather serious lack of revenue. We have to live with service drops, yet they are the principal offenders, and they are scattered all over the place.

Several new design concepts come to mind to deal with this problem.

A standalone data carrier cable could be operated in a region of the spectrum less congested than 5 -30 MHz. Intermodulation could be controlled by light carrier loading and non-uniform carrier frequency separations. Noise accumulation could be reduced by limited and selective branching. As a matter of fact, recent proposals for institutional networks represent just such a system. Some operators already offer limited transmission of data and video on separate cables; others are planning to do so. According to Paul Kagan, a substantial portion of the home security business generated by cable TV operators utilizes the telephone network with digital dialers instead of coaxial cable. The upstream 5 -30 MHz band has too many undesirable features for satisfactory service with most of the existing modems.

Another design change that has apparently not yet been given serious consideration would be to allocate upstream transmission to the top end of the spectrum. Suppose that the duplexing, crossover filter guard band could be designed to use 54 - 350 MHz downstream, and 475 - 500 MHz upstream. Such a trade-off, of channel capacity for more dependable upstream transmission, might not be feasible for new single cable urban systems; but, what a great opportunity it would provide to use the large block of "future use" channels on dual cable systems to test the revenue potential of two-way services.

The most intriguing new design concept, however, is the so-called "star" distribution system, shown in figure 2. The advantages of this system design are highly attractive.

- Enhanced security without scrambling
- One-third as many active locations
- No costly equipment to be stolen or abused in subscriber's premises
- No converters to be recovered
- Switched control of interactive services, like the telephone switched network.
- Trunk distribution only: for better performance and enhanced flexibility for channel expansion and new services

Star distribution from more or less central switching facilities is the historic topology of the highly efficient telephone service. It was introduced in England for television distribution many years ago by the British Rediffusion Company, called "Dial-a-Program." In the early 70's, Earl Hickman, vice president of Ameco, introduced a similar system called "Discade," actually installed for field trials in Daly City, California. Dial-a-Program originally used magnetic reed switching; Discade was solid state from the start.

Three years ago, C-COR introduced the first "off-premises" converter, followed a couple of years later by Texscan and now others, including at least one Japanese entry. A single channel (channel 3 for example) is fed through 16 or more coaxial service drop cables from dedicated converters located outdoors at the hub of the star.

Two years ago, Times Fiber introduced its off-premises converter system

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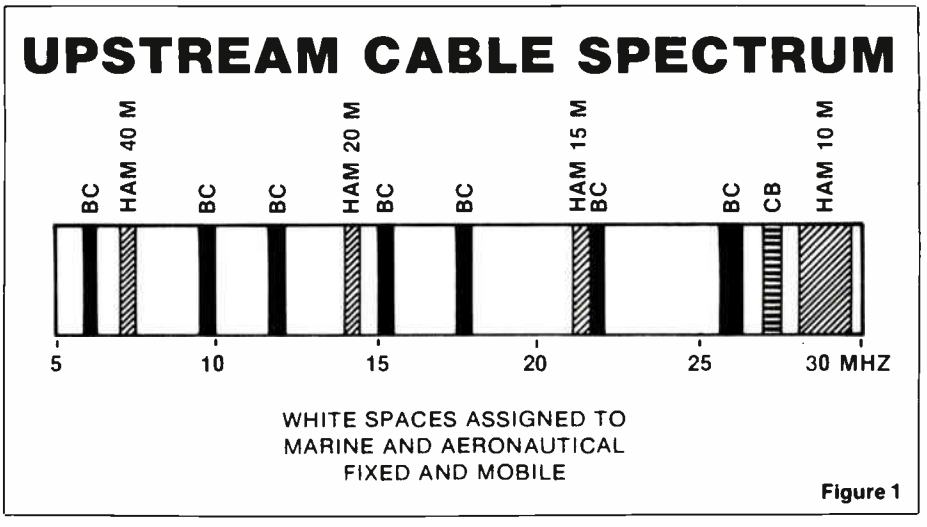

Figure 1

Trunk and distribution cable manufacturers

Capscan Cable Co.

Halls Mill Road
Adelphia, N.J. 07710
(800) 222-5388

Burnup & Sims acquired Capscan Cable in April 1982. During the twelve months that have transpired since that acquisition, Capscan has gained the number four position as a U.S. broadline supplier of coaxial cable. The company's establishment of strict quality control measures has been augmented by a continuous research program to foster technological innovation and product improvement. One of the effects of these procedures has been a 10 percent improvement in attenuation in the company's seamless aluminum sheath trunk and feeder cable products. Other technological advances have been made in the area of drop wire, with significant improvements being achieved in mean time to failure ratios. Capscan's research, development and product improvement program also has been working in the area of fiberoptics.

CCS Cable

5707 West Buckeye Road
P.O. Box 14710
Phoenix, Ariz. 85063
(602) 272-6855

In 1970, Kaiser CATV built the physical plant and other ancillary facilities that later became known as CCS Cable. Before falling under CCS Cable's proprietorship, however, Kaiser CATV sold the plant and its auxiliary facilities to the Theta-Com division of Hughes Aircraft Co. Not long thereafter, the operation was sold by Theta-Com to CCS Cable. CCS Cable is a division of CCX Inc., which formerly was referred to as Continental Copper and Steel Industries Inc. Located on the outskirts of Phoenix, Ariz., in a 24-acre facility, CCS Cable currently

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Product Profile

Model	Conductors	Dielectric	Maximum Attenuation	Capacitance	Velocity of Propagation	DC Resistance	Minimum Bending Radius	Maximum Pulling Tension
Capscan Cable Co.								
Capscan 4 CC-500 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-1.10 dB/100 ft. 300 MHz-1.32 dB/100 ft. 450 MHz-1.65 dB/100 ft.	15 pf/ft.	88%	@ 20°C inner conductor-1.21 ohms/1000 ft.	14 times cable O.D.	200 lbs.
CC-625 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.90 dB/100 ft. 300 MHz-1.08 dB/100 ft. 450 MHz-1.35 dB/100 ft.	15 pf/ft.	88%	@ 20°C inner conductor-0.76 ohms/1000 ft.	14 times cable O.D.	285 lbs.
CC-750 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.75 dB/100 ft. 300 MHz-0.91 dB/100 ft. 450 MHz-1.15 dB/100 ft.	15 pf/ft.	88%	@ 20°C inner conductor-0.53 ohms/1000 ft.	14 times cable O.D.	425 lbs.
CC-875 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.66 dB/100 ft. 300 MHz-0.80 dB/100 ft. 450 MHz-1.01 dB/100 ft.	15 pf/ft.	88%	@ 20°C inner conductor-0.38 ohms/1000 ft.	14 times cable O.D.	480 lbs.
CC-1000 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.59 dB/100 ft. 300 MHz-0.72 dB/100 ft. 450 MHz-0.92 dB/100 ft.	15 pf/ft.	88%	@ 20°C inner conductor-0.30 ohms/1000 ft.	14 times cable O.D.	580 lbs.
CCS Cable								
GID III .500 Series (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-1.10 dB/100 ft. 300 MHz-1.31 dB/100 ft. 450 MHz-1.63 dB/100 ft.	14.8 pf/ft.	90%	@ 20°C inner conductor-1.34 ohms/1000 ft.	16 times cable O.D.	200 lbs.
.625 Series (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.91 dB/100 ft. 300 MHz-1.08 dB/100 ft. 450 MHz-1.35 dB/100 ft.	14.8 pf/ft.	90%	@ 20°C inner conductor-0.81 ohms/1000 ft.	16 times cable O.D.	280 lbs.
.750 Series (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.77 dB/100 ft. 300 MHz-0.91 dB/100 ft. 450 MHz-1.14 dB/100 ft.	14.8 pf/ft.	90%	@ 20°C inner conductor-0.57 ohms/1000 ft.	16 times cable O.D.	420 lbs.
.875 Series (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.65 dB/100 ft. 300 MHz-0.78 dB/100 ft. 450 MHz-0.98 dB/100 ft.	14.8 pf/ft.	90%	@ 20°C inner conductor-0.42 ohms/1000 ft.	16 times cable O.D.	475 lbs.
1.000 Series (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.60 dB/100 ft. 300 MHz-0.72 dB/100 ft. 450 MHz-0.92 dB/100 ft.	14.8 pf/ft.	90%	@ 20°C inner conductor-0.32 ohms/1000 ft.	16 times cable O.D.	490 lbs.
Comm/Scope								
Parameter III 500 CA (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 211 MHz-1.09 dB/100 ft. 300 MHz-1.31 dB/100 ft. 450 MHz-1.63 dB/100 ft.	15.3 pf/ft.	87%	@ 20°C inner conductor-1.28 ohms/1000 ft.	16 times cable O.D.	200 lbs.
625 CA (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 211 MHz-0.92 dB/100 ft. 300 MHz-1.10 dB/100 ft. 450 MHz-1.35 dB/100 ft.	15.3 pf/ft.	87%	@ 20°C inner conductor-0.84 ohms/1000 ft.	14 times cable O.D.	295 lbs.
750 CA (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 211 MHz-0.74 dB/100 ft. 300 MHz-0.90 dB/100 ft. 450 MHz-1.12 dB/100 ft.	15.3 pf/ft.	87%	@ 20°C inner conductor-0.57 ohms/1000 ft.	14 times cable O.D.	420 lbs.
875 CA (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 211 MHz-0.66 dB/100 ft. 300 MHz-0.79 dB/100 ft. 450 MHz-0.98 dB/100 ft.	15.3 pf/ft.	87%	@ 20°C inner conductor-0.42 ohms/1000 ft.	15 times cable O.D.	435 lbs.
1.000 CA (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 211 MHz-0.62 dB/100 ft. 300 MHz-0.75 dB/100 ft. 450 MHz-0.92 dB/100 ft.	15.3 pf/ft.	87%	@ 20°C inner conductor-0.32 ohms/1000 ft.	15 times cable O.D.	490 lbs.
QR 500 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 211 MHz-1.35 dB/100 ft. 300 MHz-1.63 dB/100 ft. 450 MHz-2.05 dB/100 ft.	15 pf/ft.	88%	@ 20°C inner conductor-1.13 ohms/1000 ft.	8 times cable O.D.	200 lbs.
QR 860 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 211 MHz-0.66 dB/100 ft. 300 MHz-0.79 dB/100 ft. 450 MHz-0.99 dB/100 ft	15 pf/ft.	88%	@ 20°C inner conductor-0.37 ohms/1000 ft.	9 times cable O.D.	400 lbs.

Model	Conductors	Dielectric	Maximum Attenuation	Capacitance	Velocity of Propagation	DC Resistance	Minimum Bending Radius	Maximum Pulling Tension
General Cable, CATV Division								
Fused Disc Mill **13mm (500)** (plain or jacketed)	copper-clad aluminum, aluminum sheath	air and thermo-plastic discs	@ 20°C 211 MHz-0.96 dB/100 ft. 300 MHz-1.15 dB/100 ft. 450 MHz-1.41 dB/100 ft.	14.3 pf/ft.	95%	@ 20°C inner conductor- 1.47 ohms/1000 ft.	16 times cable O.D.	300 lbs.
14.5mm (570) (plain or jacketed)	copper-clad aluminum, aluminum sheath	air and thermo-plastic discs	@ 20°C 211 MHz-0.88 dB/100 ft. 300 MHz-1.06 dB/100 ft. 450 MHz-1.31 dB/100 ft.	14.3 pf/ft.	95%	@ 20°C inner conductor- 1.18 ohms/1000 ft.	16 times cable O.D.	400 lbs.
16.5mm (650) (plain or jacketed)	copper-clad aluminum, aluminum sheath	air and thermo-plastic discs	@ 20°C 211 MHz-0.74 dB/100 ft. 300 MHz-0.88 dB/100 ft. 450 MHz-1.10 dB/100 ft.	14.3 pf/ft.	95%	@ 20°C inner conductor- 0.85 ohms/1000 ft.	15 times cable O.D.	500 lbs.
19mm (750) (plain or jacketed)	copper-clad aluminum, aluminum sheath	air and thermo-plastic discs	@ 20°C 211 MHz-0.64 dB/100 ft. 300 MHz-0.77 dB/100 ft. 450 MHz-0.95 dB/100 ft.	14.3 pf/ft.	95%	@ 20°C inner conductor- 0.64 ohms/1000 ft.	13 times cable O.D.	700 lbs.
25mm (1.00) (plain or jacketed)	copper-clad aluminum, aluminum sheath	air and thermo-plastic discs	@ 20°C 211 MHz-0.51 dB/100 ft. 300 MHz-0.61 dB/100 ft. 450 MHz-0.76 dB/100 ft.	14.3 pf/ft.	95%	@ 20°C inner conductor- 0.38 ohms/1000 ft.	15 times cable O.D.	1,000 lbs.
Scientific-Atlanta								
GID-3 **32-500** (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-1.10 dB/100 ft. 300 MHz-1.32 dB/100 ft. 450 MHz-1.65 dB/100 ft.	15.5 pf/ft.	87%	@ 20°C inner conductor- 1.34 ohms/1000 ft.	16 times cable O.D.	200 lbs.
32-625 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.90 dB/100 ft. 300 MHz-1.08 dB/100 ft. 450 MHz-1.36 dB/100 ft.	15.5 pf/ft.	87%	@ 20°C inner conductor- 0.87 ohms/1000 ft.	16 times cable O.D.	300 lbs.
32-750 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.76 dB/100 ft. 300 MHz-0.91 dB/100 ft. 450 MHz-1.12 dB/100 ft.	15.5 pf/ft.	87%	@ 20°C inner conductor- 0.57 ohms/1000 ft.	16 times cable O.D.	420 lbs.
32-875 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.66 dB/100 ft. 300 MHz-0.79 dB/100 ft. 450 MHz-0.98 dB/100 ft.	15.5 pf/ft.	87%	@ 20°C inner conductor- 0.43 ohms/1000 ft.	16 times cable O.D.	480 lbs.
Cable Flex **32-500 CX** (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 211 MHz-1.08 dB/100 ft. 300 MHz-1.30 dB/100 ft. 450 MHz-1.62 dB/100 ft.	15.3 pf/ft.	87%	@ 20°C inner conductor- 1.34 ohms/1000 ft.	5 times cable O.D.	100 lbs.
32-875CX (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 211 MHz-0.64 dB/100 ft. 300 MHz-0.78 dB/100 ft. 450 MHz-0.97 dB/100 ft.	15.3 pf/ft.	87%	@ 20°C inner conductor- 0.43 ohms/1000 ft.	5 times cable O.D.	225 lbs.
Times Fiber Communications Inc.								
T4 4000 Series **T4500** (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-1.08 dB/100 ft. 300 MHz-1.29 dB/100 ft. 450 MHz-1.59 dB/100 ft.	15.3 pf/ft.	88%	@ 20°C inner conductor- 1.37 ohms/1000 ft.	14 times cable O.D.	200 lbs.
T4825 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.88 dB/100 ft. 300 MHz-1.05 dB/100 ft. 450 MHz-1.30 dB/100 ft.	15.3 pf/ft.	88%	@ 20°C inner conductor- 0.88 ohms/1000 ft.	14 times cable O.D.	280 lbs.
T4750 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.74 dB/100 ft. 300 MHz-0.88 dB/100 ft. 450 MHz-1.10 dB/100 ft.	15.3 pf/ft.	88%	@ 20°C inner conductor- 0.60 ohms/1000 ft.	14 times cable O.D.	425 lbs.
T4875 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.64 dB/100 ft. 300 MHz-0.77 dB/100 ft. 450 MHz-0.96 dB/100 ft.	15.3 pf/ft.	88%	@ 20°C inner conductor- 0.43 ohms/1000 ft.	14 times cable O.D.	475 lbs.
T41000 (plain or jacketed)	copper-clad aluminum, aluminum sheath	foam polyethylene	@ 20°C 216 MHz-0.59 dB/100 ft. 300 MHz-0.70 dB/100 ft. 450 MHz-0.89 dB/100 ft	15.3 pf/ft.	88%	@ 20°C inner conductor- 0.34 ohms/1000 ft.	14 times cable O.D.	575 lbs.

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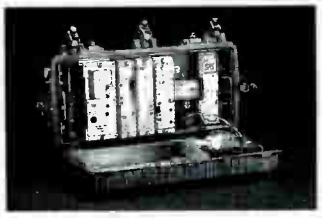
All the components of the Magna 440 system – including amplifiers, passives, subpassives, connectors, converters and our Digital System Sentry® line status monitoring system –are integrated for the same high channel capacity.



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A NORTH AMERICAN PHILIPS COMPANY
100 FAIRGROUNDS DR., MANLIUS, N.Y. 13104

The Leader With Commitment

Computer graphics for drafting and design

Coaxial Analysts Inc. has developed a Mapping And Graphic Integrated Computer (MAGIC) system specifically for the CATV industry, which helps to perfect electronic drafting and simplify design engineering and troubleshooting for both corporate and system engineers and drafters. It features a 19-inch or 13-inch high-resolution graphics display station from Tektronix, a low cost 8½ x 11 inch color plotter, an electronic drafting board with multi-button cursor and software features like key map/grid system management, fully integrated design functions including automated drafting of the cable and electronic devices, and fault tracing capabilities. The company will be introducing the MAGIC system at the NCTA convention in June.

By Terry Hulseberg
President, Engineering Services Div.
Coaxial Analysts Inc.

Computer graphics have been available for many years and recently the cable industry began to view computerized graphics capability in a more serious vein as an option for automated drafting. This is understandable, since the computer has made tremendous inroads into every facet of life via the "personal computer." I have been researching graphics technology for some eleven years and just now have been able to bring together all the essential equipment at a price affordable to corporate offices and cable systems alike.

There are many reasons why Coaxial chose to create it's own graphics system versus using one of the existing systems. There are a lot of problems with existing graphics systems:

1. Expensive hardware
2. Current systems designed primarily for architects and mechanical designers
3. Existing hardware limitations in dynamics of symbol manipulation
4. Software problems in database searches for specific items
5. Software, designed for "drafting," with no dimension for utilizing the system's capabilities to provide stored pictures in order to effect design engineering.

In order to illustrate some difficulties that architectural/mechanical systems (or any system not designed specifically for cable) face when adapted for use in our field, let me describe how a strand line would most likely be drafted on each system.

The initial problem encountered with the standard system is its lack of "keymapping" capability. This inability to match the maps together and display them simultaneously on the screen sets severe limitations when attempting to effect design.

With MAGIC, the group of maps needed can actually be selected from the keymap of the city displayed in its totality on the screen. A color-coded grid reflects the status of each map and full individual detail is available at the touch of a button on the keyboard.

MAGIC's most important capabilities to the systems designer are the integrated strand/drafting routines. MAGIC provides routines that flow from pole to strand to house counts as required by a cable designer. MAGIC also has dynamic symbol and text placement in which the cursor becomes the symbol or text allowing the designer to place items visually as opposed to estimating

angles, centerpoints and rotational degrees as with other systems. In comparison with other systems, the time savings in completing cable drafting with MAGIC is substantial.

Once selected, up to 9 maps can be transmitted to the graphic display for viewing. Local keys allow for a pan across all maps with selected zoom-in for fine detail. This zoom feature is a true zoom, not a pixel replication *and* it is accomplished in less than two seconds. Now, with the selected map(s) on the screen, drafting the strand can be initiated.

MAGIC, specifically designed for cable system drafting and design, offers fully integrated specialized routines intended to eliminate the need for time-consuming multiple routines necessitated by previous systems. In addition, MAGIC provides other dimensions of importance to the cable industry such as a specialized function called "check strand continuity" that can be activated at any time. This triggers MAGIC to perform a search on all poles/pedestals and to report on isolated runs. The report is noted to the user and displayed via varying colors of strand on the graphics screen.

In order to initiate design engineering, you simply display the required maps on the screen and request "select route." While you "trace" the desired cable route with the cursor device, MAGIC retrieves all house counts, apartments and footages and transmits them to the alphanumeric CRT which runs Coaxial's engineering programs for analysis. Once satisfied with the results and amplifier placement, the results may be retained in temporary storage or added to your maps. When the results are added to the maps each device is displayed in order so the user can then dynamically position it to the best drafting location. (Construction changes or as-built drawings use this dynamic placement editing feature to add/change/delete equipment.)

At any time, a "headend check" may be requested. This function performs an electronic analysis of all components by evaluating amplifier spacing, tap levels and other technical parameters and reports the problem areas by changing the color of the display to a predetermined error condition color.

Several interesting possibilities become feasible with this electronically intelligent graphic database in place. For instance, a pictorial request for service describing existing drops and their status, as well as new home wiring requirements (if a drop exists), can be provided to the installer. The potential for elimination of future installation problems, installation time-savings and a continuous tap audit seems unlimited.

Another very useful possibility of MAGIC would be to incorporate the functions of reporting outages and providing service route information. MAGIC is able to respond to a service call by providing a printout of every device from the headend to the customer. More importantly, MAGIC could compare multiple outage reports in seconds and report likely trouble spots. For systems with status monitoring, an outage report can be received by MAGIC, and MAGIC will respond with what/where status and an estimated time for repair for any service customers affected by known problems. No service call required!

MAGIC features many additional functions and capabilities not mentioned here (including a "merge city" function).

The cost? Firm pricing is not established yet. But, the price will be substantially less than any graphic system offered to the cable industry at this time, and that includes the full system design engineering capabilities as well as the advanced cable drafting software.

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Minneapolis, Minnesota
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Cable TV Services
Garland, Texas
TEL: 214-494-3348

In Canada:

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Pickering, Ontario
TEL: 416-839-5182
1-800-263-4655
TELEX: 06-981256

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called "Mini-Hub," using a pair of optical fibers (one upstream, one downstream) for service drops instead of coaxial cable. Originally offered only for essentially vertical distribution in apartment buildings, a horizontal distribution system is presently under construction for field tests in Alameda, California.

Cost comparisons with two-way interactive addressable coaxial-converter-descrambler systems are not unfavorable, considering also the advantages of concentrated maintenance, increased security, eliminating scrambling and taking the converter out of the home.

There are some disadvantages, of course. The most often cited problem is the psychological hazard of marketing a service which, like telephone service, requires a separate drop for each fully independent outlet. We do have an advantage in this respect over the telephone facility, however, in that it is technically feasible to multiplex two, and perhaps more, separate channels on either coaxial or fiber drops. In most places, for example, channels 3 and 6, or 3 and 5 are unassigned for broadcasting.

Fortunately, the technical problems

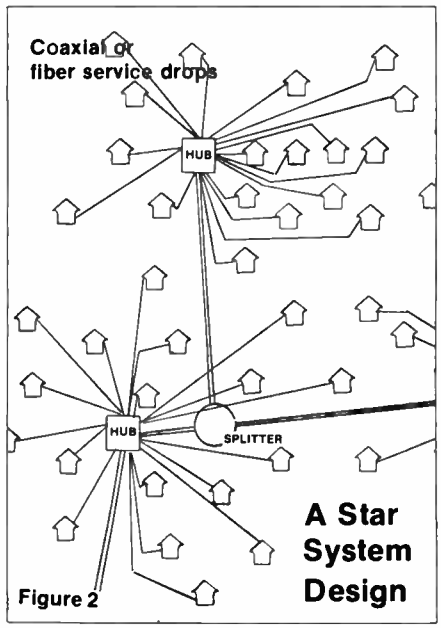

Figure 2

of splicing fiber, demountable connectors, dispersion, optical efficiency and others are rapidly being solved, particularly for such applications as the fiber star that requires only limited bandwidth, with drops only 1,500 - 3,000 feet in length. Costs are rapidly giving way to increased fabrication yields and growing demand. Optical splitters and switches may be available before long.

The beauty of the optical fiber star design is that it does not require high performance fiber, nor new technology.

Oddly enough, the most formidable obstacle to full development of the off-premises converter and switched star distribution concept may be the TV receiver industry. If the channel selection function were removed from the TV set and installed off-premises in a star hub, the TV receiver would be reduced to a mere display device. The receiver industry understandably prefers to go the other way by seeking a decryption system so secure, yet so low in cost, that it can be sold over the counter as a component of the receiver.

Whichever way it goes, I am convinced that we will only win a significant place in the interactive telecommunications business if we soon recognize and act on the need for different upstream design. Perhaps the fiber-star is not the way, but we must do more than apply 5 - 30 MHz band-aids, such as quad shield cable, integral crimp ferrules, and bridger switching. We need either new upstream system design, or modems and protocols that can get the message through quickly, efficiently and accurately in spite of the ingress and noise which will not go away.

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*A subsidiary of Pico Products, Inc.

continued from page 47

manufactures a complete line of coaxial cable for CATV applications and has been supplying extended bandwidth, low-attenuation trunk and distribution cable for quite some time. Not much more than a year ago, the company introduced its "quad" (two braids, two shields) drop cable. According to a CCS Cable official, the company has been supplying a significant amount of this type of cable to the CATV industry ever since its introduction. The company plans to establish a distribution center in Pennsylvania to service the eastern section of the U.S.

Comm/Scope

A M/A-COM Company
Route 1
P.O. Box 199A
Catawba, N.C. 28609
(800) 438-3331

Comm/Scope introduced its first coaxial cable in 1969. Called Coppergard, this coaxial cable product was designed with a dielectric instead of foam. One year after Coppergard's introduction, Comm/Scope developed the first gas-injected dielectric, Parameter I, which was succeded by Parameter II in 1974. At that time, Parameter II was marketed as the first low-loss polyethelene dielectric cable in the world. Technological advances that made a 20 percent reduction in loss over the Parameter II possible gave away to the Parameter III, which became available in 1978. Then, in 1979, in response to the well-recognized need for greater coaxial bandwidth, Comm/Scope unveiled PIII+. According to the company, this product set a precedent for the CATV industry, by offering 50 percent more signal-carrying capacity than any coaxial ever produced—going from 300 MHz specifications to more than 450 MHz performance.

Product growth has been complimented by physical expansion. During a four-year period, Comm/Scope enlarged its physical plant seven times and extended its production hours to 168-hour work weeks, 52 weeks per year. Plans for adding an aluminum extrusion facility and wooden-reel assembly plant currently are underway. In addition, the company owns a shipping fleet of more than 20 tractor-trailer trucks for delivery of products to CATV sites.

General Cable CATV Division

1 Woodbridge Center
P.O. Box 700
Woodbridge, N.J. 07095
(201) 636-5500

In 1927, six electrical wire and cable manufacturers merged to form General Cable Corp. As an electrical wire and cable manufacturer, General Cable was faced with many challenging opportunities during World War II, including the construction of an armored undersea pipe. Upon completion, General Cable's pipe measured 35 nautical miles and was used to transport petroleum products from Great Britain to France to the Allied forces during and directly following the Normandy invasion. Due to this and other accomplishments achieved during the war, General Cable emerged at the end of the war as a producer of battlefield communications wire and U.S. Navy power and communications cable.

The company first entered the CATV market in the 1960s with the introduction of Qualfoam conventional foam cable. In 1972, its first major design improvement in coaxial cable—the fused disc M-III—was announced.

Over the years, General Cable has grown to become a "Fortune 500" corporation and is now a unit of The Penn Central Corp., a large diversified company with more than $3.3 billion in sales. Today, General Cable's CATV division manufactures a broad range of wire and cable products and operates manufacturing facilities, research and development laboratories and sales offices throughout the U.S. The CATV division is headquartered in Woodbridge, N.J.

Scientific-Atlanta Inc.

One Technology Parkway
P.O. Box 105600
Atlanta, Ga. 30348
(404) 441-4000

Scientific-Atlanta's present-day Phoenix Coax division began as a separate company called Systems Wire and Cable.

Formed in 1969, Systems Wire and Cable began as a manufacturing company whose primary product line was coaxial cable and secondary product line was building wire, telephone cable and other special application wires. In 1971, Systems Wire expanded its coaxial cable product line to include drop cable. Shortly thereafter, in order to keep pace with the cable TV industry's rapid growth, the company gradually phased out its secondary wire products to increase its production of trunk, distribution and drop cables. After technological advances in product design and in the manufacturing process made it possible to replace chemically foamed dielectrics with gas injected dielectrics, the company introduced its current family of low-loss GID-3 T&D cables. Production of these cables began in 1979.

The Phoenix Coax division currently manufactures a broad range of coax products, including CableFlex, a patented coaxial cable designed for drawing through conduit and wrapping around tight bends, and GID-3 coaxial cable, for use in all broadband trunk and distribution applications. According to S-A officials, the Phoenix Coax division's objective is to supply high-quality coaxial cable products at competitive prices.

Times Wire & Cable Co.

A Division of Times Fiber
Communications Inc.
358 Hall Avenue
P.O. Box 384
Wallingford, Conn. 06492
(203) 265-8500

Times Wire and Cable was founded in 1948 by Lawrence DeGeorge and two other partners. In 1955, the company was acquired by Insilco Corp. and moved from its offices in New York City to Wallingford, Conn. Despite the acquisition, DeGeorge remained as general manager of the company. In 1966, DeGeorge became a director of Insilco and, in 1976, became vice president of its board of directors. In 1977, however, he retired from Insilco to resume a position as chairman and chief executive officer of Times Fiber Communications Inc. Bill Lynch, Times Fiber's current president and chief operating officer, began his career with Insilco and then transferred to Times Fiber.

In 1976, DeGeorge and Lynch reappraised the company and decided to move into the area of fiberoptics, then a burgeoning new field and technology. DeGeorge and Lynch saw fiberoptics not only as a technology that offered tremendous growth potential in the area of cable but also as a means to augment the company's revenues. One year later, in 1977, the company bought Fiber Communications Inc., demonstrating its commitment to this new technology. In 1980, a new facility devoted to the production of optical fibers and cable was completed. According to the company, Times Fiber Communications Inc. now is the leader in the CATV industry, having installed most of the fiberoptic systems.

The company's expansion has been reflected in the expansion of its production capabilities—from its original single plant in Wallingford, Conn., to the addition of two new manufacturing facilities in Chatham, Va., and Phoenix, Ariz. All three plants operate on a 24-hour basis. In addition, the Times Wire and Cable Division of TFC maintains a CATV field sales force, which offers customer support and engineering services to assist operations with special applications or installation problems. As a division of TFC, Times Wire & Cable is a public company.

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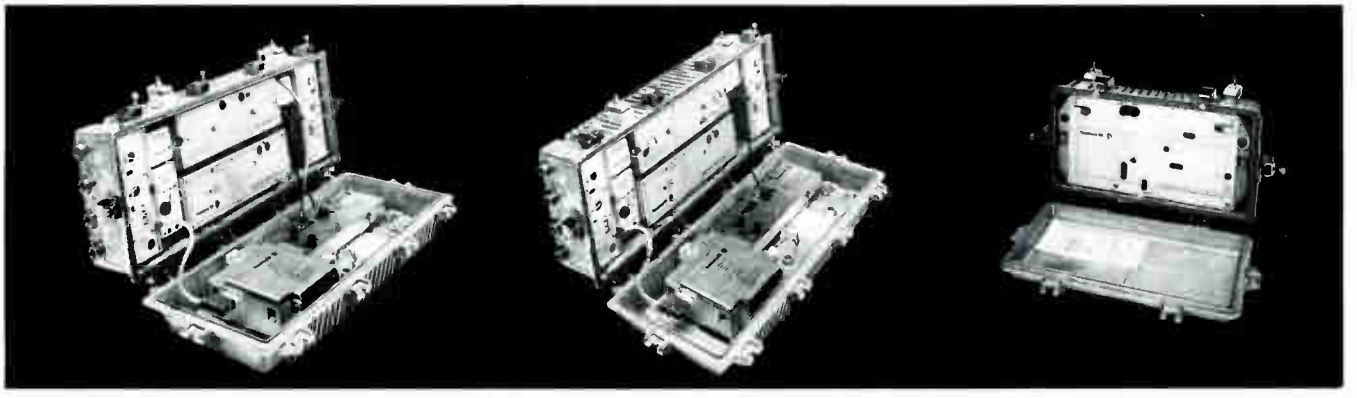

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	Composite Triple Beat	−74dB	−70dB	−70dB	
	Cross Modulation	−74dB	−70dB	−70dB	
Line Extender	Output Level	+47dBmV	+49dBmV	+49dBmV	
	Composite Triple Beat	−74dB	−70dB	−70dB	
	Cross Modulation	−74dB	−70dB	−70dB	

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People News

■ **Texscan Corp.** has added **David Keller** to its corporate staff. As director of quality assurance for Texscan, Keller will be responsible for maintaining the quality, reliability and product safety of the company's various product lines. Keller brings to Texscan six years of experience as manager of quality control in the consumer electronics division of RCA.

■ **Craig McCrystal**, **John Neal** and **Aubrey Miller**, have been assigned new positions within **American Television and Communications Corp.** (ATC). McCrystal, who joined ATC in December 1980, has been named head of American Cablevision of Kansas City, Mo.; Neal, manager of Capitol Cablevision of Jackson, Miss.; and Miller, director of operations.

McCrystal came to ATC from Omega Communications where he was vice president.

Neal, on the otherhand, had been city manager of El Reno, Okla., and assistant to the city manager of Oklahoma City, before joining ATC.

Miller joined ATC in 1978 as assistant manager of the company's Birmingham, Ala.,ion. He became division manager the following year. In 1980, he was named general manager of the Jackson system.

■ **Diane Hughes** has been named president of **Ben Hughes Communication Products Co.** Hughes has been with the company since it was founded and now replaces her father, the late Benjamin Hughes, Jr., as president. Prior to her promotion, she had been operations manager of the company. Hughes began her business career in 1977 as an office manager at Merrill Lynch Corp.

■ **George Sell** has joined **Durborow Associates/Cable Marketing Management** as director of communications for both companies. Among other responsibilities, Sell is in charge of house public relations, communications and marketing communications. Sell's previous work experience includes: editor of *CED* magazine; technical editor of *CableVision* magazine; assistant to technical director of the physics history department, American Institute of Physics; and other research-related positions.

■ **Linda Arnold** has been named product manager by **Pioneer Communications of America Inc.** Her responsibilities in this new position include planning and product management for Pioneer's line of converter and addressable equipment. Arnold comes to Pioneer from General Telephone and Electronics Corp., where she was market planning manager of the CATV Division for the past three years. Prior to that, she was employed at GTE's corporate headquarters in Stamford, Conn., as a marketing associate from 1978 to 1980.

Classifieds

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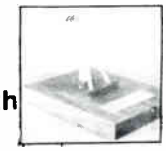

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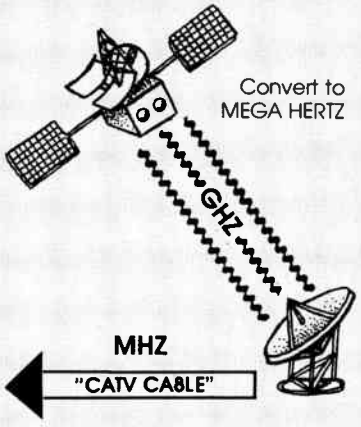

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Ad Index

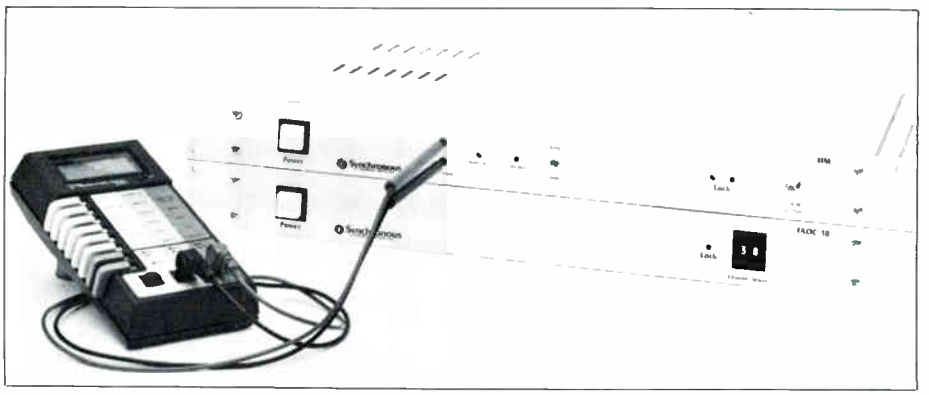
Product News

The 38- and 68-channel systems

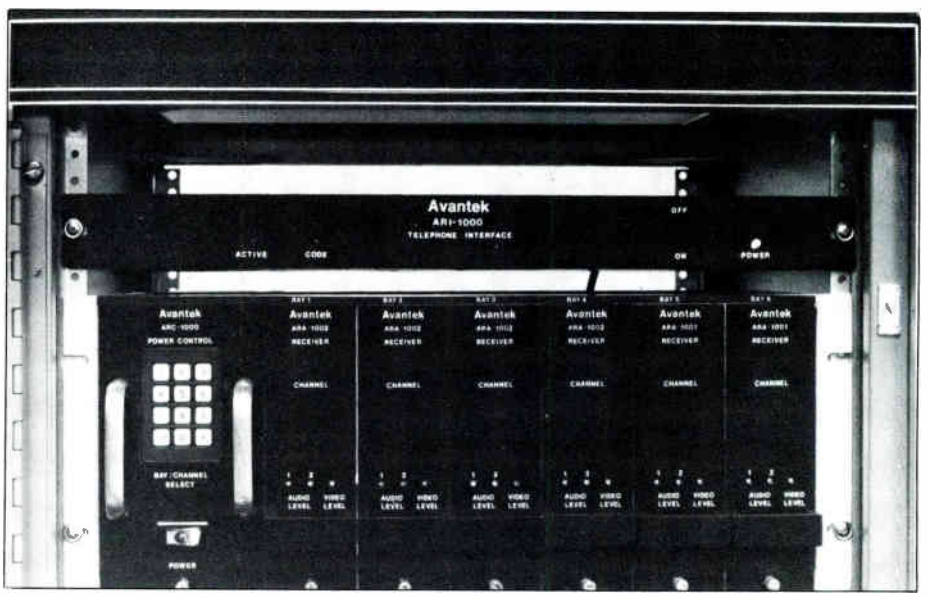
Synchronous Communications named its two new frequency agile standby modulator systems the IFM/FAOC-38 and IFM/FAOC-68 for their respective 38-channel and 68-channel capabilities. Both units feature an IF modulator that can be used in conjunction with the company's standard frequency agile output converters.

In addition, five new design concepts are incorporated into each unit. One of these concepts is the phase-locking of the audio and video carriers to the same 6.000 MHz reference crystal. According to the company, this design ensures extremely stable carriers and any inter-carrier difference of 4.5 MHz ±Hz. The audio modulator also is capable of ±100 KHz stereo audio.

For more information, contact Synchronous Communications Inc., 1701 Fortune Drive, Suite O, San Jose, Calif. 95141, (408) 262-0541.



Synchronous IFM/FAOC-38 modulator system



The ARI-1000 telephone interface

Comtech expands product lines

Comtech Antenna Corp. has expanded its antenna product line to include a 7.3-meter dual axis polar mounted antenna. Through the use of an optional motorized drive and microprocessor controls, the system's dual axis polar mount can cover the full satellite arc from any location in the continental U.S. The main reflector consists of twenty close-tolerance, high-strength panels. These panels are mounted to aluminum radial supports, which are attached to a central hub. According to the company, efficient performance, with mid-band gain of 48 dB, is achieved through use of a high efficiency cassegrain feed system. The unit will be available for delivery in mid-July.

In addition to the 7.3-meter dual axis polar-mounted antenna, Comtech has added an up/down converter to its product line. Referred to as the CD 250, this dual conversion up/down converter was designed for data and analog transmissions via satellite. The unit operates in the 3.7 - 4.2 GHz and 5.925 - 6.425 GHz frequency bands. Available either as an up converter, down converter or duplex, the CD250 comes with various options including Intelsat equalizations independent transmit-receive functions, redundant switching and higher stability oscillators.

Comtech also has introduced a pre-packaged MATV satellite headend, which can be integrated with systems that already have been installed in apartment complexes, condominiums, hotels, motels, trailer parks and other small cable systems. The headend is comprised of Comtech's RCV 550 24-channel frequency agile receiver; its CDM 1160 fixed frequency modulator; and a combiner, which combines off-air channels and satellite channels. Assembled on a rack, the system is tested and shipped as a complete assembly.

For more information, contact Comtech Data Corp., 350 North Hayden Road, Scottsdale, Ariz. 85257, (602) 949-1155.

The AR1000 video system

Through the use of either one mainframe and one LNA/downconverter or four mainframes and two LNA/downconverters, the AR1000 Simulchannel™ earth station video receiving system from Avantek can receive up to six separate channels simultaneously. The system can be configured to meet various user needs through the combination of various LNAs, downconverters, power dividers, line amplifiers, a remote telephone interface and other related components. LNAs are offered with noise temperatures as low as 80 K with 48 dB of gain. Downconversion may be at either the antenna or the receiver sites. In addition, the system's modular design makes it particularly suitable for retrofitting or for expanding existing systems.

For more information, contact Avantek Inc., (408) 496-6710.

The Kavco SMART FRAME™

Kavco Inc. has introduced the SMART FRAME™, an intelligent microprocessor control for commercial insertion applications. According to the company, SMART FRAME is fully upgradable to the most advanced and sophisticated controller system presently available.

For more information, contact Kavco Inc., 3931 Image Drive, Dayton, Ohio 45414, (513) 898-2003.

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(919) 247-2548

American Technology, Booth 470
4902 Tollview Dr.
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Anixter Communications, Booths 360, 380, 359, 379
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Skokie, Ill. 60076
(312) 677-2600

Arvin/Diamond, Booth 553
P.O. Box 200
Lancaster, Ohio 43130
(614) 756-9222

Augat CATV Products, Booth 500
P.O. Box 111
Horseheads, N.Y. 14845
(607) 739-1786

Avtek Inc., Booth 860
1001 12th St.-Box 188
Aurora, Neb. 68818
(402) 694-5201

—B—

Belden Corp., Booth 954
2000 S. Batavia Ave.
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(312) 232-8900

Ben Hughes Communication Products, Booth 855
304 Boston Post Rd.-P.O. Box AS
Old Saybrook, Conn. 06475
(203) 388-3559

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313 South Hancock
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Brad Cable Electronics Inc., Booth 474
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C-2 Utility Contractors-Texas, Booth 770
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Houston, Texas 77043
(713) 465-7550

C-COR Electronics Inc., Booth 205
60 Decibel Rd.
State College, Pa. 16801
(814) 238-2461

Cable Power Inc., Booth 330
14860 NE 95th St.
Redmond, Wash. 98052
(206) 882-2304

Cable Product News, Booth 254
P.O. Box 2772
Palm Springs, Calif. 92263
(714) 323-2000

Cable Services Co. Inc., Booth 200
2113 Marydale Ave.
Williamsport, Pa. 17701
(717) 323-8518

Cable Text Instr. Div. of Telpar, Booth 872
P.O. Box 796, 4132 Billy Mitchell
Addison, Texas 75001
(214) 233-6631

Cable TV Services Inc., Booth 858
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Garland, Texas 75042
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Elyria, Ohio 44035
(216) 365-2487

Control Technology Inc., Booth 856
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Garland, Texas 75042
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CWY Electronics, Booth 373
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Lafayette, Ind. 47904
(317) 448-1611

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Garwood, N.J. 07027
(201) 789-1400

Durnell Engineering Inc., Booth 810
Highway 4 South
Emmetsburg, Iowa 50536
(712) 852-2611

—E—

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Clay, N.Y. 13041
(315) 622-3402

Elephant Industries Inc., Booth 376
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North Fort Myers, Fla. 33903
(813) 995-7383

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Gardiner Communications, Booth 510
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Houston, Texas 77056
(713) 961-7348

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Westminster, Colo. 80030
(303) 427-3700

General Cable Co.-CATV Div., Booth 573
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Torrance, Calif. 90509
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Dallas, Texas 75223
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Clifton, N.J. 07014
(201) 471-2212

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Denton, Texas 76201
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(714) 979-4511

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5/83/CED

In Orbit

Signal	Day	Start/ Stop	Alert Tone	Trans-ponder
Satcom 3R				
ASCN-The Learning Channel	Weekdays Weekends	6 a.m./4 p.m. 6 a.m./1 p.m.	192°/#	**16**
ARTS	Daily	9 p.m./12 a.m.	311°/# (E,C,M) 519°/#(P)	**1**
Cable Health Network		24 hrs.	361°/#	**17**
CBN		24 hrs.	None	**8**
Cinemax		24 hrs.	None	**20 (E,C) 23 (M,P)**
CNN		24 hrs.	024°/#	**14**
CNN Headline News		24 hrs.	635°/# 541°/#	**15**
C-SPAN		24 hrs.	195°/#	**19**
Daytime	Weekdays	1 p.m./5 p.m.	None	**22**
ESPN		24 hrs.	048°/#	**7**
Eternal World Television Network	Daily	8 p.m./12 p.m.	762°/#	**18**
HBO		24 hrs.	Program 729°/# Scramble 835°/# Duplication 940°/#	**24 (E,C) 13, 22 (M,P)**
HTN Plus	Daily	4 p.m./4 a.m.	207°/#	**16**

Major Communications Satellites Serving North America

Location: Degrees West Longitude	Satellite: Present	Satellite: Future
66		Sat com 2R (Dec. 83)
70		Southern Pacific-2 (Oct. 84)**
74		Galaxy-2 (Mid 84)
79		Advanced Westar-2** (Mid 83)
83	Satcom-4	
87	Comstar-D3	Telstar-2 (1984)
91	Westar-3	Advanced Westar-1**
94	SBS-3**	
95	Comstar-D2 & D1	Telstar-1 (Mid 83)
97	SBS-2*	
99	Westar-4	
100	SBS-1*	
103		GTE-1* (1984)
104.5	Anik D-1	
106		GTE-2* (1984)
108.5	Anik C-1	
109	Anik-B**	
114	Anik A-3	Anik D-2 (1984)
116		Anik C-2 (Mid 83)
117.5	Anik C-3	
119	Satcom-2	Southern Pacific-1 (Feb. 84)**
123	Westar-5	
123.5	Westar 2	
127	Comstar-D4	Telstar-3 (1986)
131	Satcom-3R	
135		Galaxy-1 (Mid 83)
136	Satcom-1	
139		Satcom-1R (Mid 83)
143	Satcom 5	

*Ku Band
**Dual Ku/C Band

Orbital slots and launch dates often change without notice

Signal	Day	Start/ Stop	Alert Tone	Trans-ponder
The Movie Channel		24 hrs.	None	**5**
Modern Satellite Network	Weekdays	10 a.m./1 p.m.	243°/# 421°/#	**22**
MTV: Music Television		24 hrs.	None	**11**
National Jewish Television	Sundays	1 p.m./4 p.m.	None	**16**
Nickelodeon	Daily	8 p.m./9 p.m.	311°/# (E,M,C) 519°/# (P)	**1**
PTL		24 hrs.	None	**2**
Reuters	Weekdays	4 a.m./8 p.m.	None	**18**
Showtime		24 hrs.	576°/#	**12 (E,C) 10 (M,P)**
Spotlight		24 hrs.	None	**4**
USA Blackout Network		O/V after 5 p.m.	295°#	**22**
USA Cable Network		24 hrs.	438°/#	**9**
WGN		24 hrs.	None	**3**
WTBS		24 hrs.	None	**6**
The Weather Channel		24 hrs.	None	**21**
Satcom 4				
The American Network	Daily	5 p.m./5 a.m.	None	**19**
BizNet	Weekdays	9 a.m./2 p.m.	None	**15**
Bravo	Daily	8 p.m./6 a.m.	None	**6**
The Entertainment Channel		24 hrs.	None	**8**
HBO	Mon-Fri Saturday Sunday	5:30 a.m./12 p.m. 6:30 a.m./5:20 a.m. 6:15 a.m./1 a.m.	729°/#	**18**
The Playboy Channel		8 p.m./6 a.m.		**7**
National Christian Network		6 a.m./8 p.m.	073°/#	**7**
Trinity Broadcasting Network		24 hrs.	None	**17**
Westar 4				
Eros	Thurs-Sat	11 p.m./2 a.m.		**10D**
Financial News Network	Weekdays	10 a.m./5 p.m.	975°/# 738°/#	**9X**
GalaVision	Weekdays Weekends	4 p.m./4 a.m. 24 hrs.		**12X**
SelecTV	Weekdays Weekends	8 p.m./4 a.m. 2 p.m./4 a.m.		**9X**
SIN		24 hrs.	None	**8X**
SPN		24 hrs.	429°/#	**11X**
Westar 5				
BET	Daily	8 p.m./2 a.m.	406°/#	**12X**
CBS Cable	Weekdays Weekends	4:30 p.m./4:30 a.m. 5 p.m./5 a.m.	524°/# 531°/#	**4D**
Satellite News Channel		24 hrs.	None	**4X, 6D 7X, 8X, 9X**
The Nashville Network	Daily	9 a.m./3 a.m.	866°/#	**9D**
WOR		24 hrs.	None	**2D**

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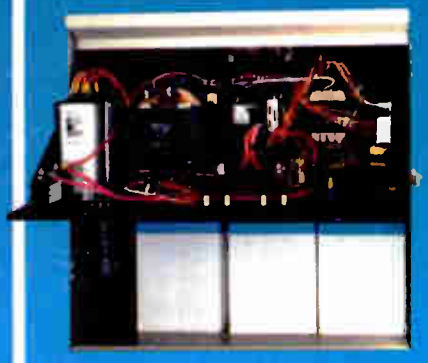

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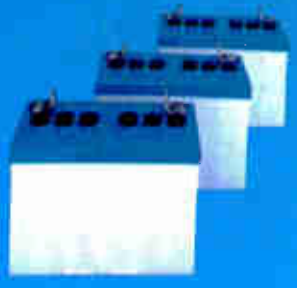

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