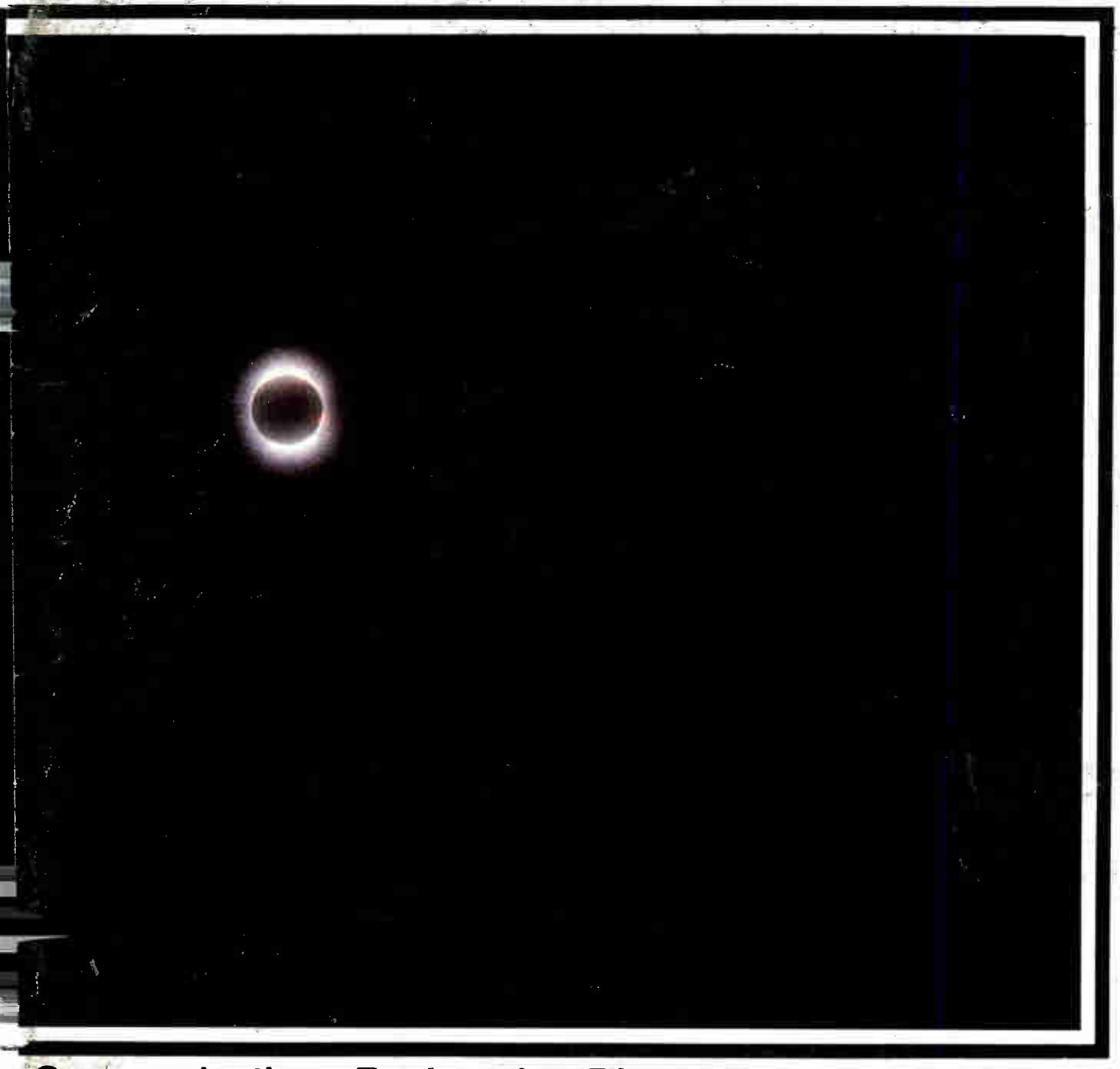
C-ED

Test Equipment
The "Blue Box"
The Alaskan Pioneers



Communications-Engineering Digest

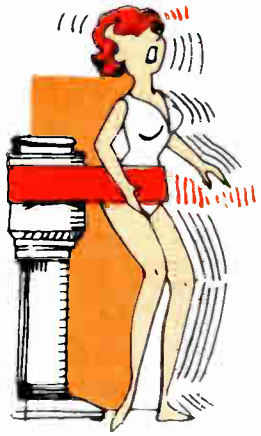
Reporting the Technologies of Broadband Engineering

April 1979
Volume 5, No. 4

New Oak Trimline FT Reduces Overhead ...Builds Performance

Trims hardware costs— not quality

Now you can trim your hardware costs without shaking loose from famous Oak quality and performance. Trimline FT, an economy 35 channel converter, with manual fine tuning, is a new addition to the high-quality Trimline converter series. Very high adjacent channel rejection and low noise figure ensure unmatched reception quality.



35 channel strength

Trimline FT allows for full 35 channel coverage, with accurate tracking for minimum customer fine-tuning. Each channel has its own tuning potentiometer and frequencies are factory set to assure channel selection accuracy. Even if you don't need 35 channel capability, Trimline FT allows room for growth.

Guaranteed fitness for all

All Oak products are warranted for one full year, no matter how much of a work-out they receive. We support our warranty with rapid repair turn-around. We can back our products better because all Oak products are designed, carefully built and inspected by Oak people in company owned facilities.

You're always a step ahead with Oak

Oak maintains one of the industry's most complete research and development facilities to ensure that our products reflect the best available technological improvements. That's always been our commitment to you and to the industry. The Trimline FT is another example of how Oak sets the pace to keep you a step ahead!

OAK Industries Inc.
CATV DIVISION/CRYSTAL LAKE, ILLINOIS 60014
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TO DISTRIBUTION

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- Storage Interface

Performs all FCC tests except system flatness

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TFC-7
- All Channel Performance
- Stripper/Preselector Integral
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- Accuracy 1 part in 10^6

BENCH SWEEP

SWEEP GENERATOR

VS-40Z
- 1-300 MHz
- ±0.25 Flatness
- +54 dBmV Output
- 7 Markers Available

DISPLAY SCOPE

DU-720 Large screen, 12" — AC or DC coupling P7 phosphor standard, 1 mV/div. sensitivity

ACCESSORIES

- ROTARY ATTENUATORS
- DC BLOCKS
- DETECTORS
- FIXED PADS
- REFLECTION BRIDGES

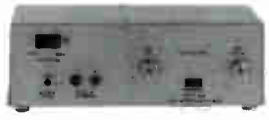
TEXSCAN'S PROOF PACKAGE!

RADIATION KIT

RADIATION DIPOLE

AFS-1

Radiation dipole kit contains antenna, fibreglass mast sections, calibration chart which includes downlead loss.



BROAD BAND AMPLIFIER

VSX-92

Preamp has 29 dB gain from 40 to 890 MHz, with 7 dB noise figure and flatness of ±1 dB. Operates from internal rechargeable battery.

TUNABLE BANDPASS FILTER

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Eliminate preamp overload with 3 or 5 section filters. Available with 3 or 5% bandwidth. Low insertion loss.

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- +60 dBmV Output
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C-ED News at a Glance

LAS VEGAS, NEVADA—FCC chairman Charles D. Ferris, speaking at the annual convention of the National Association of Television Program Executives, used children's shows as a prime example of why **programmers should look to new television markets made possible by satellite, cable, video-disc and videocassette development.** Ferris stressed he was not making another in an endless series of clarion calls to do more for children "out of noble and patriotic purpose." "My thesis is different," he said. **"There are new delivery systems to be explored.** Some are not based on advertising support. Others are or could be. You should no longer accept all the traditional ground rules of a three—network, over-the-air broadcasting system as limitations on your horizons for profit. The game is going to change. For the first time in memory, the technology, the society, the creative community, and the regulators seem to be moving in the same direction. The happy marriage of satellites and cable is quickly solving the spectrum scarcity bottleneck. With the number of potential channels greatly expanded, new creative concepts are needed to keep them alive."

WASHINGTON, D.C.—The Cable Satellite Public Affairs Network **(C-SPAN)** began **transmitting its signal of the live feed from the floor of the U.S. House of Representatives** via its uplink in nearby Fairfax County, Virginia. The signal is being transmitted on transponder 9 of RCA's Satcom I. C-SPAN's chief engineer, Don Houle, referred to the initial transmissions as still being in somewhat of a test mode and that the **official inauguration** of the C-SPAN service is **scheduled for April 3rd.** Since the first phase of C-SPAN's programming will consist of carriage of the House which frequently meets on a flexible schedule, **C-SPAN will be utilizing a tone cue system.** Systems with tone cue decoders can obtain C-SPAN module: 195*# from Monroe Electronics for $159.

WASHINGTON, D.C.—The Federal Communications Commission's Office of Plans and Policy has completed a report evaluating a model developed by the **Rand Corporation** which **projects** the **number of viable UHF television stations to grow from 97 in 1974, to 208 in 1990.** That growth is predicated upon no VHF drop-ins; no siphoning of conventional TV audiences; reduction of the technical and resultant economic disadvantages of UHF relative to VHF; and no major change in economic conditions.

The evaluation of the Rand model was initiated in 1977. It has been determined that in spite of certain shortcomings, the model is the best quantitative tool presently available for projecting the number of viable UHF stations and that the projections seem reasonable although they might be overtaken by unaccounted for policy and technological changes.

WASHINGTON, D.C.—The National Telecommunications and Information Administration's controversial **proposal to reduce AM channel spacing from 10 to 9 kHz** will be examined during a workshop at the NAB's broadcast engineering conference in Dallas, Texas, March 25-28.

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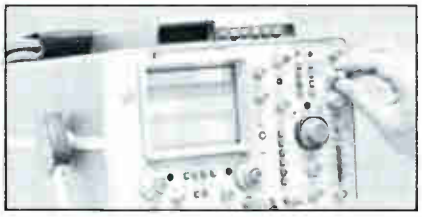

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DEPARTMENTS

OPINION

Cover: The eclipse of the sun. A collector's item for *C-ED* readers. Photo by Jean Sonntag.

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Editor's Letter

Before you go any further with this April issue of *C-ED*, we have a confession to make. Our cover has got nothing to do with cable. You probably have already realized that by now, but in the event some are still puzzled by the mysterious, illuminated circle on the cover, we'll let you in on the secret: it's a shot of the eclipse of the sun.

When I told Publisher Paul Levine and Managing Editor Toni Barnett about the cover, there was, to say the least, a slight pause. No. It was not a radiation leak from a cable system, I assured them. The unique cover would, however, serve as a possible collector's item, to be framed, pasted into a scrapbook, or simply filed away with other *C-ED*'s.

The total eclipse of the sun—so rare an event in North America or anywhere—was reason enough for us at *C-ED* to go a different route this time around. Jean Sonntag of Jefferson County, Colorado, "visited" the eclipse in Montana and came back with our April cover. We hope you enjoy it.

The *rest* of *C-ED* does have something to do with cable. Toni Barnett, in our special Test Equipment issue, traces the history and the evolution of test equipment and offers some advice on how to select that equipment. For "Test Equipment: What It Is and Where It's Going," please turn to page 30.

We also offer a special look at a new "blue box"—a universal addressable data terminal system that can provide security, energy control and entertainment services. "Security, Energy, and Pay-Per-View" is on page 16.

Finally, just a word or two about the SCTE Reliability Conference. Simply, it was a huge success. Congratulations go to Ken Gunter and Ralph Haimowitz for the "Member of the Year" Awards they both shared; to Bob Bilodeau, the outgoing president of SCTE; to Harold Null, the incoming president; and, of course, to Judy Baer for pulling together the best conference yet.

Paul A. FitzPatrick

An SCTE Special Report

The 1979 CATV Reliability Conference in Denver on February 27-28 was a resounding success. It was bigger and better than ever with nearly 200 industry technical and management people in attendance. The four panel moderators, Robert Luff, Tom Polis, Gerry Bahr and Mac Qurashi did an outstanding job of keeping on schedule and communicating with their individual panelists. Every session and event started and stopped on time and the meeting showed the professional approach that is growing within SCTE.

Many people who were seen in Denver were also in Phoenix in the next week for the SCTE technical meeting centering on CARS and Microwave, March 5-6. About 100 people registered for that meeting which was the first meeting SCTE has held in the southwest. While all the speakers were great, two deserve special mention for talks that were outstanding. Cliff Paul of the FCC brought much needed insight to the group as he explained the proper way to fill-out CARS applications, and Danny Cornett of Scientific-Atlanta did a bang-up job (with compliments galore from the floor) on his talk about the future of cable TV. Both of these talks will rank high in the 1979 "who said the most the best" competition for SCTE program participants.

Getting there is half the fun, or so some of the airline companies used to say. Well, getting to San Antonio for the Texas convention in early February and then to Savannah later, proved to be less than fun. SCTE participated in both meetings with Jim Stilwell chairing a session on Grounding and Bonding (with Hank Cicconi, Mark Thomason and Hugh Bramble) in Texas to an audience of about 100. Then, in Savannah, for the Georgia association meeting SCTE's executive director, Judith Baer, talked to management people about the importance of training and safety. More and more, SCTE programs are being included as a part of the overall management sessions at state and regional meetings instead of being set-up as separate "but equal" programs.

March saw SCTE in Columbus, Ohio for the Ohio CATV meeting and Bill LeDoux distributed material and answered questions on SCTE's behalf. Then in early April it's on to Toronto for the Canadian Cable TV Association convention with Mila Albertson standing booth duty. On April 23-24 SCTE will host an outstanding program on test equipment and measurements in Portland, Oregon. SCTE will also visit Minneapolis, Boston, Washington, D.C., and Hartford between now and late November, and will also host one special conference on fiberoptics before 1979 closes.

Other exciting things are going on as a result of a special meeting held in Denver just prior to the Reliability Conference. SCTE's technical training program proposal, to be developed in cooperation with the University of Wisconsin-Platteville, was discussed. Two committees have been formed to work with UW-Platteville's Jack O'Neill to get things going. Gerry Bahr, Bob Bilodeau, Hank Cicconi, Bill Ellis, Jim Grabenstein, Mike Jeffers, Bob Luff and Tom Polis are on the Senior Advisory Committee for this project. Glenn Chambers, Dick Covell, Larry Dolan, Jim Emerson, Neil McLain, Don Meinders, Dan Pike, Earl Willits and Eric Winston are on the Technical Review/Study Committee and will provide editorial support for O'Neill.

SCTE's board and officers will meet just before the NCTA convention in Las Vegas in late May. Items for discussion will include a "first class" membership (guaranteed first class mailings of SCTE materials for an additional sum over and above the regular dues), increasing staff requirements and plans for 1980 and beyond. Developing more membership programs will also be a topic of the meeting. Two guideline publications are expected for release during 1979 and progress will be reviewed by the board in May.

SCTE's highest current priorities include publication of the SCTE Cable Communications Style Guide and distribution of two training tapes along with continuing our successful round of technical meetings across the country and reviewing office procedures to speed up membership processing. As the first quarter of 1979 closes, SCTE can report that things are humming! SCTE is proving itself as THE cable communicator.

SCTE/IEEE Reliability Conference Comes on Strong

DENVER, COLORADO—On February 27, the Fourth Annual SCTE/IEEE Conference on Cable Television Reliability convened at Stouffer's Denver Inn in Denver, Colorado. The two-day seminar featured speakers, programs and "heavyweight" attendees that have surpassed any SCTE conference to date. Nearly 200 people, nationwide, attended the conference.

Tuesday morning featured panels and discussions on "Blue Sky" technologies. Robert Luff, vice president of Engineering for the National Cable Television Association, was the panel moderator that morning.

Ishwar D. Aggarwal, director of Optical Fiber R&D Communications Fiberoptics Division of Valtec Corporation, gave a basic overview of optical fibers.

Bob Luff, NCTA's vp of Engineering, was panel moderator on "Blue Sky" technology Tuesday morning.

Following Aggarwal was Paul DeBaylo, manager of Reliability and Quality Assurance for RCA American Communications.

The next panelist was Carl Schoeneberger, engineering manager for TOCOM. His paper, *Probable Two-Way Cable Applications of the Next Five Years*, identified services that Schoeneberger feels will be developed or further enhanced by the industry over the next five years.

The luncheon on Tuesday was an event in itself. The 1979 SCTE Member-of-the-Year Award was jointly presented to Kenneth S. Gunter, executive vice president of UA-Columbia Cablevision, and to Ralph A. Haimowitz, general manager and chief engineer of Indian River Cablevision and Palm Bay Cablevision. This was the first time in SCTE history in which the Member-of-the-Year Award was shared by two individuals. (See March *C-ED.)*

The luncheon address, "1984 Is Sooner Than We Think," was delivered by Anne W. Branscomb, chairman of Kalba Bowen Associates, Cambridge, Massachusetts. Branscomb is a communications attorney and she is also the author of numerous articles on emerging technologies, cable television and public broadcasting.

Anne W. Branscomb delivered the luncheon address on February 27.

The afternoon sessions on Tuesday dealt with real situations and reliability in CATV system design.

The panel moderator that afternoon was Tom Polis, director of Technical Services for Magnavox CATV.

The first speaker was David Emberson, manager of Technical Services for RF Communications Ltd. Emberson's paper, *Improving Reliability and Consistency of CATV Systems Using the TI-59 Programmable Calculator*, reviewed the problems encountered in CATV system design.

The last speaker on Tuesday afternoon was Barbara Lukens, manager, Design and Drafting for American Television and Communications Corporation. Her paper, *The Reliability of Computer Assisted Cable Television System Design,* presented the four basic factors determining reliable system design.

Tuesday evening featured a hospitality get-together at Stouffer's Denver Inn. The special guests of honor were the recipients of the 1979 SCTE Membership-of-the-Year Award.

On Wednesday morning, February 28, the topics for discussion were Manpower, Personnel Management and Training. The panel moderator for this session was Gerald Bahr, chief engineer for Trans Video Corporation.

Dr. Jack O'Neill, director of TV Services for the University of Wisconsin in Platteville, presented a paper on *The Cable Communications Institute at the University of Wisconsin - Platteville Campus.*

The second speaker was Joseph Van Loan, director of Engineering for Viacom Cablevision. Van Loan's paper, *Meeting Manpower Needs Through In-House Training,* discussed the needs for personnel to fill new positions in all levels of system operation.

Robert Vallerand, western regional engineer for American Television and Communications Corporation, presented an article on *Developing Training Concepts.*

The last speaker Wednesday morning was Paul Workman, technical trainer for Mission Cable Television. Workman's paper, *CATV Technician Training Programs,* provided an insight on the CATV technician programming progress at Mission Cable Television.

During Wednesday's luncheon several notable events occurred. The Eleventh Annual SCTE Membership Meeting took place, the 1979 SCTE officers and directors were introduced, and members promoted to Senior Member status were announced.

Wednesday afternoon's panel featured system construction by contractors, operators and suppliers.

Mac Qurashi, president of AM Communications Corporation, was the afternoon panel moderator. Qurashi also delivered a paper entitled, *Construction Practices for Reliable Systems.* He analyzed the forces that influence the reliability of the mechanical components and what can be done to assure a reliable system.

George Taylor, division construction engineer for American Television and Communications Corporation, presented an article on *The Six Basic Steps to Constructing a Reliable CATV System.* Taylor described these six basic functions, their chronology and interactions.

Wrapping-up the two-day conference was Jerald Crusan, vice president of Engineering for Comcast Corporation. His paper on *Reliable and Cost Effective Construction* centered on provisions for maintaining adequate project control, generating an efficient design to reduce maintenance costs and down-time, and component selection and installation.

It happened every time I did a "measurement by comparison" check on the Test Bench. I'd hook together the most expensive gear in the lab, put the display on a scope, and there it'd be... tilt, notches and lumps! Generally about .5 to 1 dB worth.

Then I learned that Wavetek has put together a complete system for making measurements by comparison. It costs less than $1,250, plus another $545 for the 12" scope. But the best news is that Wavetek's system lets me eliminate enough RF tilt to get a correlation of 0.1 dB.

If you're interested, you really should call collect, write, or circle the reader service number, but I can tell you this much: The system has two parts, a Model 1067 Sweeper and a Model 1075 Comparator. The sweeper goes from 1 to 400 MHz with flatness better than 0.25 dB, and RF output calibrated from +57 to −13 dBmV. The comparator accepts power and timing signals from the sweeper so the known and unknown ports are always phased properly. Controls to adjust tilt for Channel A and tilt plus gain for Channel B compensate for most loss and tilt errors of the test bench cables and terminations. That's the part I like.) There is also a function t introduce "tilt loss" and "flat loss" to simulate cable.

To sum it up, next time you're running into problems with tilt, notches and lumps... I'd lean towards Wavetek. WAVETEK Indiana Incorporated, 66 North First Ave., Beech Grove, Indiana, P.O. Box 190, Beech Grove, Indiana 46107, Tel. (317) 783-3221, TWX 810-341-3226.

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Harvey Smith, CATV technician

Before

After

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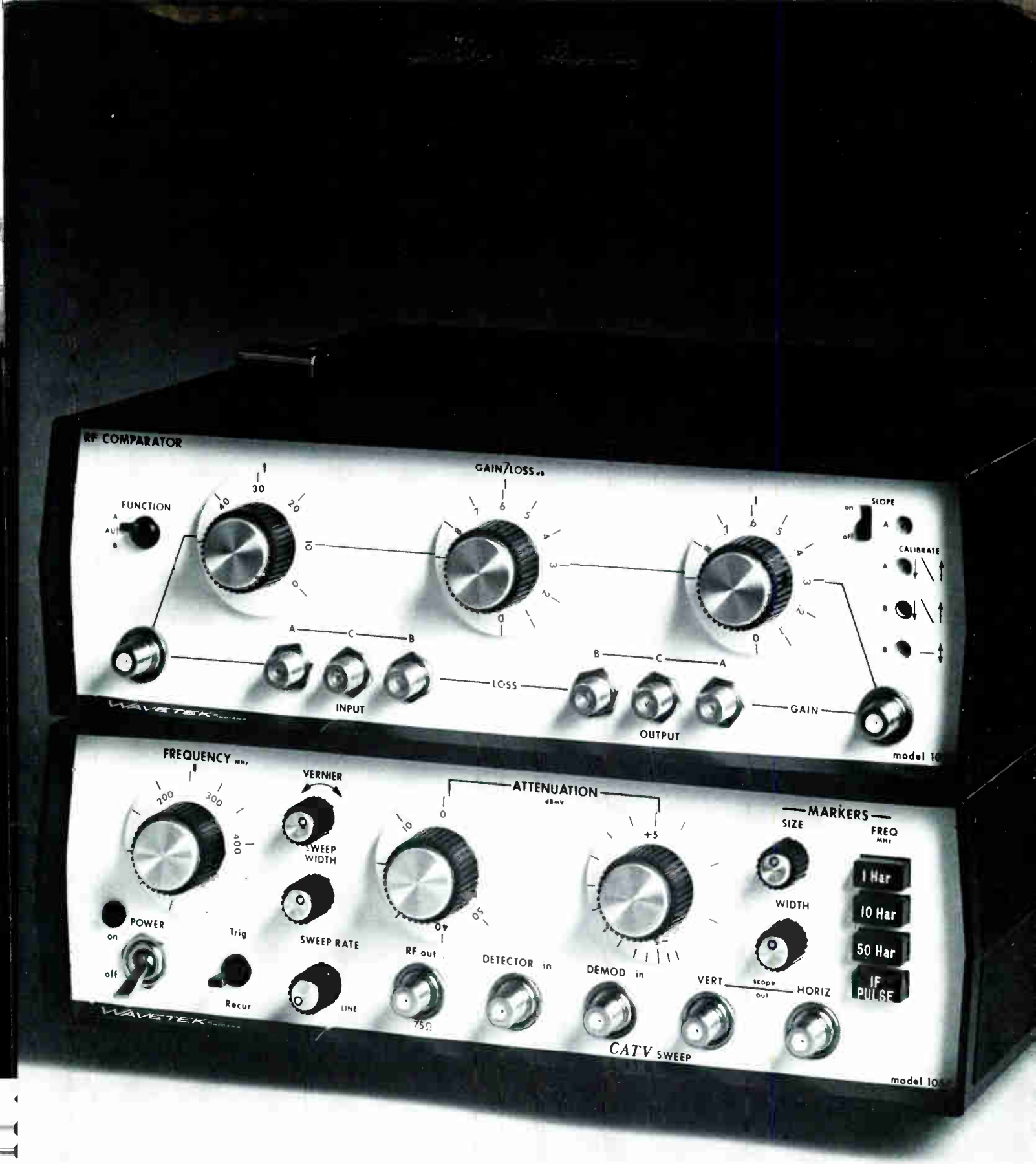
RF COMPARATOR
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off
Trig
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a much better way to carry and dispense cable

EZ Cable Dispensers

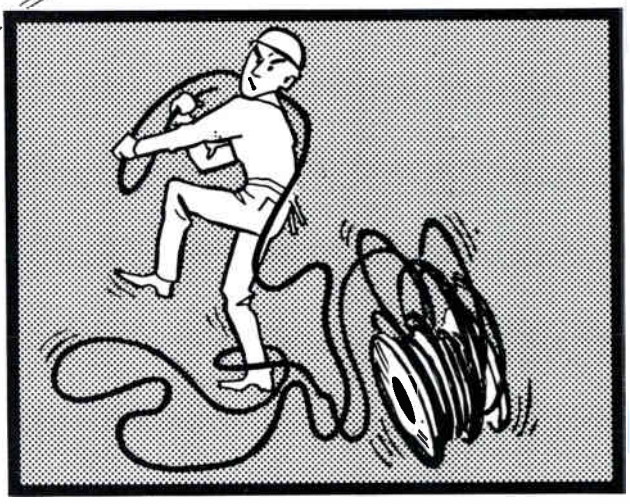
Spool or reel wound cable often means run-on, tangles, kinks, rolling out of position and even damaged cable. To say the least a cumbersome way to pack, carry and dispense cable that often times results in a lot of valuable time wasted.

Cerro now has a better answer. The EZ Cable Dispensers. They're stackable for compact loading and easier unloading. With immediate payout and virtually no setup time. Dispenser remains in place (no unreeling device needed here). Cable pulls out evenly without drag — and stops instantly when the pulling action stops. Plus encasing the cable protects it and keeps it clean.

two types of dispensers

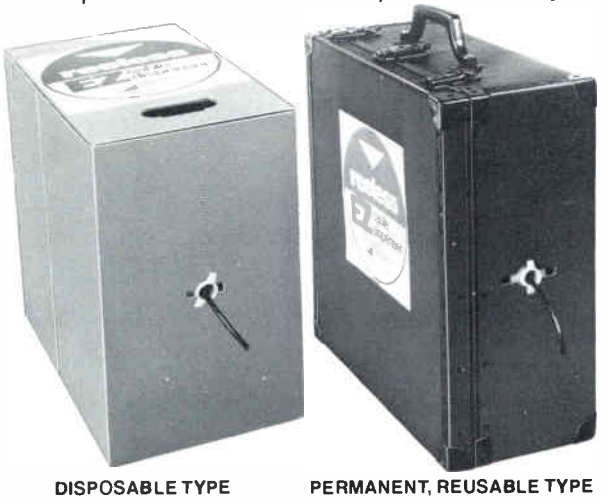
The disposable corrugated type has a double weight carry slot and cable viewing slot. It can be ordered plastic wrapped too for additional moisture protection. The permanent reusable dispenser is made of lightweight, durable plastic with steel corners and latches — with a luggage type carry handle. Both are available packed with RG-6, RG-59 as well as other CATV/electronic coaxial cable sizes.

When the disposable dispenser is empty it can be collapsed for disposal — the reusable dispenser is easily refilled.



free to cable purchasers

The Disposable EZ Cable Dispenser is available to customers as a no-charge option to spool and reels.



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RCA Americom Requests FCC Authority To Build Fourth Satellite

PISCATAWAY, NEW JERSEY—RCA American Communications, Inc. recently applied to the Federal Communications Commission for authority to construct a fourth communications satellite.

The fourth spacecraft will be used as a ground spare, available for launch in the event of failure of any operational satellite. If growth in traffic demand requires the additional capacity, the spare satellite could be launched as a fourth in-orbit satellite providing service to customers.

RCA Americom is also seeking FCC approval to obtain launch services from the National Aeronautics and Space Administration (NASA) in order to be prepared in case of need. For scheduling purposes, the company has asked NASA for an April 1981 launch date.

Satcom IV is expected to be placed in orbit by the Space Transportation System (Space Shuttle), but the spacecraft will be compatible with the Thor Delta launch vehicle.

The fourth satellite will be basically similar to Satcom I, and II and would include the enhancements planned for Satcom III, such as four on-board spare transponders and improved batteries.

Single ID System Adopted

WASHINGTON, D.C.—The FCC has adopted a single system of identification for all devices covered under its equipment authorization program. Under the provisions of the rules, certain transmitters, receivers and radio frequency devices must meet specified technical standards and be covered under a grant of equipment authorization (type approval, type acceptance or certification) before they may be marketed.

Currently, Parts 2, 15, 18 and 83 of the rules all contain requirements for equipment identification, with wide variation in the type of information to be listed on the equipment identification plates. Since it is not uncommon for a given device to be subject to two or more equipment authorization procedures, with different identification requirements for each, the FCC found this posed problems as to compliance for the grantee and for the commission with regard to indexing and listing the equipment.

The FCC said there was a definite need to reconcile the different identification requirements and to provide for a single system of identification suitable for computerized listing.

Canada Considers Satellites

OTTAWA, CANADA—A greater choice of television programming through access to various communications services carried on Canadian satellites will now be possible as a result of a new earth station licensing policy announced by Federal Communications officers. Canada's broadcasters, cable television systems, and telecommunications common carriers will now be permitted to own and operate receive-only terminals under the new policy. Previously, Telsat Canada had control over earth station ownership. Common carriers may now also apply for licenses for transmit-receive stations to be operated with Canada's new, higher-frequency Anik C satellite system, scheduled for start-up in 1981.

Additionally, a two-day telecommunications conference was held recently, at which the possibility of a multi-channel CATV programming package, carried by satellite, to be distributed across Canada was explored. Telecommunications experts attending the meeting discussed the range of TV channels which could be provided under such a plan, plus the regulatory, institutional, and financial considerations involved in inaugurating such a service. Reportedly, it was felt by many that the new earth station ownership policy would facilitate such a satellite program package.

A significant programming block discussed at the telecommunications meeting included pay-TV, independently produced programming, children's programming, multi-lingual programming, a third English and French national network, and a mix of programming from independent broad-

casters. Such a programming block is not presently on-line, but is apparently being discussed quite seriously. David Wright, of the Department of Communications information branch, called discussion of this type of programming a "high priority matter."

Federal Preemption Of Technical Standards?

WASHINGTON, D.C.—Two separate bills introduced in the Senate last week to amend the Communications Act of 1934 calls, for the most part, for federal preemption of technical standards prescribed for telecommunications carriers and cable television.

S.622, introduced by minority communications subcommittee members Barry Goldwater (R-AZ) and Harrison Schmitt (R-NM), contains language designed to "ensure that cable system operators conform to technical standards necessary to promote the compatibility and interoperability of the receivers or other terminal equipment connected to such systems by cable subscribers, and to prevent harmful interference to radio and television communications. No person shall manufacture, import, sell, offer for sale or lease, ship or use devices which fail to comply with regulations pursuant to this section."

S.611, introduced by subcommittee chairman Ernest Hollings (D-SC) and co-sponsored by Howard Cannon (D-NV), Commerce committee chairman, and Ted Stevens (R-AK), would set up a more complicated structure of communications carriers based on the degree of competition within categories. Within the bill are outlined "exchange areas" not to be larger than a standard metropolitan area. Presumably, some state and local control would be left to facilities which operate soley within the confines of an "exchange area." To the extent these facilities are interconnected with other exchange facilities or to interstate facilities, standards would be federally preempted.

The Hollings bill would also preempt signal carriage, pay cable and pole attachments. Elimination of telephone/cable crossownership restrictions in rural areas to stimulate service would require cable systems to set up "arms-length" subsidiaries to control programming.

Effros Forecasts Changes in CATV Structure

MINNEAPOLIS, MINNESOTA—The Federal government is developing a new approach toward cable television regulation that could result in a massive change in the way cable television systems serve subscribers, charged Steve Effros, executive director of the Community Antenna Television Association (CATA). His remarks were made in a luncheon address to the North Central CATV Association at their meeting in Minneapolis March 4-6.

Federal officials, Effros said, both at the FCC and on Capitol Hill, are presently seriously considering "structural" changes in the industry, instead of regulation of the industry as it exists today. He specifically pointed to two such possible changes:

- Allowing the telephone industry to provide broadband communication throughout the country; and
- NTIA's proposal for "retransmission consent" (see *CV*, 2/26/79, p. 14).

See our card on page 25.

TVRO Deregulation?

By Pat Gushman
Washington Bureau Chief

There are few, if any, technical considerations which should be allowed to stand in the way of the Federal Communications Commission deregulation of some of the stringent licensing requirements for smaller aperture television receive only domestic satellite earth stations. This is the consensus drawn from review of early filings in the FCC's TVRO Inquiry.

The primary objection to deregulating TVROs, or at least to eliminating the current licensing procedures, is the concern over lack of security which was understandably voiced by program producers.

"At the very least, the commission should continue to require earth station operators to obtain a license and to provide information identifying the location and ownership of earth stations, and the programming they are authorized to receive," contends the Motion Picture Association of America (MPAA). "Appropriate licensing procedures are necessary to inform earth station operators of their obligation to respect Section 605, and the ability to revoke earth station licenses arms the commission against unauthorized reception.

"Moreover, information identifying earth station location, ownership and authorized program sources is necessary to enable the commission as well as satellite users to police earth station operations and identify unauthorized program reception."

The MPAA included in its filing a photo copy (I wonder if they obtained permission) of the October 21, 1978, *TV Guide* article in which *CATJ* editor Bob Cooper guessed there are some 3,000 back-yard earth terminals being operated without a license. MPAA cited Cooper's number as an example of how "unauthorized reception of satellite signals is rapidly becoming a serious problem."

"If a TVRO terminal user receives unauthorized communications, he can do so whether he is licensed, registered, or simply builds a terminal without any notice to the commission," suggests the Community Antenna Television Association (CATA). 'The FCC, as it has already determined under its cable television rules, now has the authority to impose fines on violators of its rules and regulations whether they have a formal license or not."

CATA and the National Cable Television Association (NCTA) have recommended options for replacing the licensing procedure with a registration program where appropriate. The National Telecommunications and Information Agency has also recommended replacing licensing with a registration procedure which would not hinder the growth of satellite technology and its implementation.

NCTA maintains that applicants should be able to make the determination as to whether or not they need the coordination and frequency protection incumbent in a licensing system or if they choose to only register their operation.

The CATA proposal includes three tiers, rather than two, and calls for requirements that common carriers apply for and receive a license; cable systems would have the option of applying for a license or registering; and private and developmental users would be required to register, but would not receive a license and protection.

Both NCTA and CATA agree that those who choose to register their TVROs should be allowed to upgrade their status in the future after frequency coordination by applying for a license. This will eliminate what amounts to months in some cases, of the unnecessary delays in processing TVRO applications. Also, an aid to speeding things up would be the development of an application form.

So it seems that a registration program rather than strict licensing would be quicker, cheaper and still in the public interest since it is in the cable operator's interest to put out the best signal possible. The only hang-up is security. It is going to take some real selling to convince anyone that adherence to a strict licensing procedure can do anything more for enforcement than registration. Who you are, where you are and what you are authorized to carry, should do it.

SECURITY, ENERGY AND PAY-PER-VIEW

By Cliff Schrock
C.B. Schrock and Associates
Aloha, Oregon

A small planned community in Oregon may soon be the first such community in the world to have both on-line security and energy control services in addition to the entertainment services normally provided by cable. The system is the first nationally to utilize this controller. The first system serves to demonstrate the versatility of the universal/addressable data terminal (UADT) system that C.B. Schrock and Associates, Inc., Aloha, Oregon, is marketing.

We don't claim to know the magic ingredient for selling extra services and it well may come to pass that many different approaches are required for different communities. What we do have is a powerful data handling system that is low cost and easily adaptable for almost any of the blue sky services talked about by cable futurists.

The system is a microprocessor based controller that converts the cable to a data "bus" and then reads the bus back into the cable. Functional modules containing a minimum of hardware are then plugged onto this bus. Modules in production today include CATV, pay, security and energy. The capability for any other services such as polling of subscribers, utility demand reading, and sophisticated data services such as credit card verification and point of sale terminals are all easily accommodated with specialty modules.

Headend control and protocol (or language) of the system is also very basic. A major design goal was to provide a simple system so that a system operator could use and change operation easily, without hiring an expensive computer programmer. And simple it is: The ASC11 standard found on most teletype and home computers is used for all commands. To interrogate a box in the system, typing four ASC11 characters selects any box, two more characters select the module and a question mark (?) interrogates the status of the box. The sub-modules are also controlled (such as turning off lights or a furnace) with a two-character command.

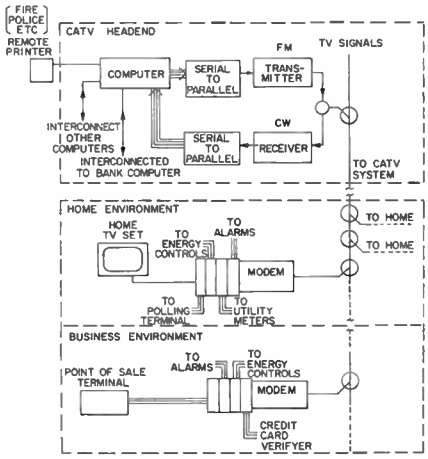
A number of systems have been proposed or are in use that utilize single direction or the bi-directional capability of the cable for alarms, tap control, subscriber polling, energy controls, and TV selection or rating. Each home or remote terminal usually houses what is felt to be an optimum configuration for the specialty service desired, and the data transmission format is chosen for the job. These systems are then polled or updated by a central computer in a repeated manner.

The present approach can, however, cause a number of problems. The hardware and the data length are fixed at the time of manufacture inhibiting subsequent expansion for individual cases and eliminating the capability for services which may not have been envisioned. The concept of polling individual subscribers in a rapid fashion necessary to detect changes (such as an alarm) is wasteful of the data transmission medium, especially when the probability of an alarm is very low.

The present two-way service devices en-mass also raise another major problem, that is the need for multiple headend computers, carrier frequencies and data formats, all of which are incompatable with each other.

The new system offers both hardware and software expandability. We consider that virtually all blue sky services are data services, so we have produced an efficient data handler. A mix and match system, using one of the international data standards is the only approach we can see that will not be obsolete before it becomes installed.

Accordingly, the microprocessor based controller uses a fast, accurate data format, and has a number of operating modes including a Simple mode for home alarms, a Complex mode for data services, and an All Call or Service request mode for alarms and interrupts. All modes are available in each controller and can co-exist on the same system carrier.



System block diagram.

The Central Headend Computer

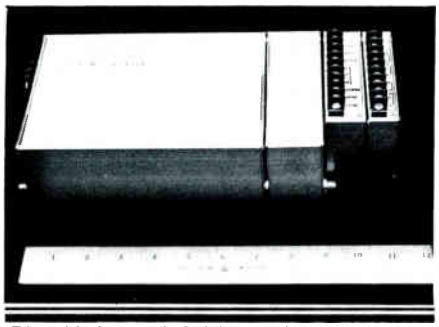
A central processor or computer can be located at the headend or at any other single location within the system. The interface unit provided by the company consists of data storage, serial to parallel converters, and the necessary RF transmitter and receiver to interface to the system. A single parallel standard plus (Centronics Standard) is provided for connection of the computer. Various computers can be chosen depending upon the number of subscribers and the task. In fact, anything from a simple TTY or Radio Shack home computer, to a complex commercial million dollar unit can be connected. This flexibility

allows an operator to start small, possibly experiment, then upgrade without having to buy new home terminals or a new headend interface.

The computer controller is outfitted with peripheral off the shelf devices such as remote printers (possibly located in a fire, police or dispatch location).

For larger systems, additional memory in the form of large core, disc, or tape can be connected so that information can be obtained on-line to aid in the dispatching of fire, police, energy and the non-specified functions.

Interconnection capability from the computer is provided to external sources or computers such as banks, utility company computers and information sources, as deemed desirable by the CATV system so that data originating in the CATV system, or desired in the system, can be freely transmitted bidirectionally from external sources to or from any point in the system.

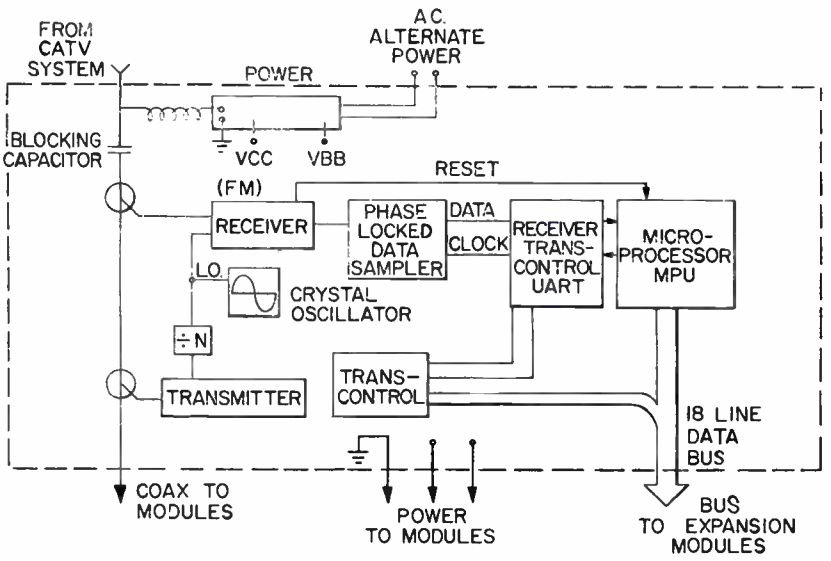


The Universal Addressable Data Terminal (UADT) is shown with a cable and premium module, security module and energy control module. RF and power are applied on the left hand connectors.

The entire headend interface "modem" is housed in a single rack, 3-1/2-inch high unit. It is supplied complete with a 24-hour real time clock, audible alarm and external outputs, and an RS-232 interface for remote or local printer use. Priced at $2,000, the unit provides all headend functions except for the actual computer. With the present home computers that are available, the entire headend for a small control system could be implemented for under $4,000.

How the System Works

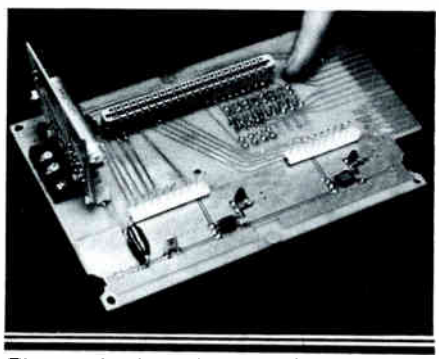
Serial data signals on an FM carrier, along with CATV television signals, enter the home UADT through a coax connector (74 or 118-136 MHz.) An inductor taps the incoming RF line



Block diagram of the home terminal (UADT). Shown is the interlaced receiver transmitter.

connecting the powering compartment so that cable powering of the device can be accomplished, if desired. A blocking capacitor isolates cable powering and an MOV device protects the box from transients, passing only RF signals. An RF stripline with directional couplers for the receiver and transmitter runs through the unit.

The receiver combines many special features to provide accurate data handling capacity and reliability with low cost. The receiver is a crystal controlled, super hetrodyne FM design

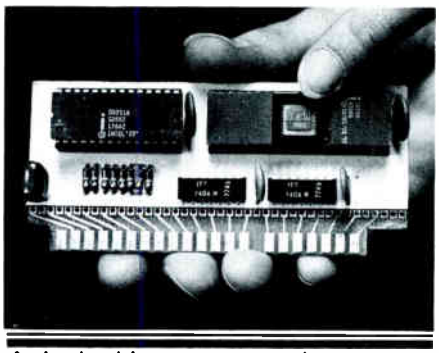


The motherboard has positions for the MPU, receiver, transmitter and the power supply. RF stripline carries cable through to the home with taps for the receiver and transmitter.

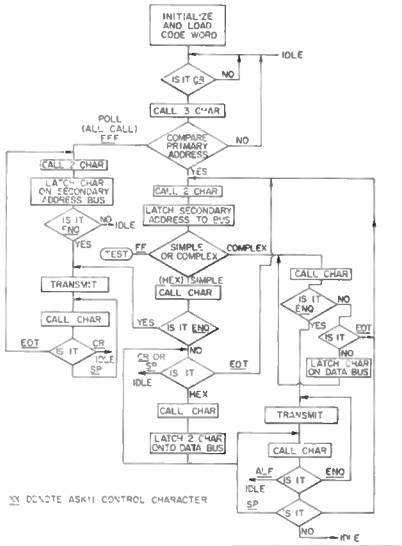
using very low parts count. The receiver consists of an input preselector, J-Fet mixer—amplifier, single crystal oscillator, and a ceramic filter IF. A single IC is the IF, detector and audio amplifier. A simple comparitor and DC restore circuit provide clean data for the MPU board.

The heart of the UADT is a microprocessor. By using a propriatary program, the microprocessor locks onto the incoming data stream and generates synchronous clocking. The header and address of incoming signals are compared to a diode matrix on the mother board until the address of the location is recognized. The MPU then latches the sub-address and message to the output bus of the data terminals. If commanded to read, the same sub-address and output bus is strobed in reverse, and the data is regenerated in a serial sequence and transmitted to the central controller.

The entire digital function of the UADT is performed using only a single chip MPU located on one circuit card that plugs onto the mother board. Two data speeds are being offered: an extremely low cost 2400 baud unit, or a 30k baud standard MPU.



A single chip computer and a programmable P/SART are the brain for the home terminal. Address recognition, control and self tests are supervised by this module.



Flowchart depicting program for single chip computer.

The transmitter is a simple keyed CW design using existing state of the art design followed by a harmonic LP filter. The transmitter has four failsafe systems to prevent accidental runaway, since this single defect could lock up the systems. The safetys are: MPU data checks to guard against continuous data being fed to the transmitter, power supply pulldown in event of continuous transmission, and an RF monitor point that is checked by the MPU. In event of all three failures, the UADT can, on command, blow a fuseable link powering the transmitter.

A unique feature of the receiver system is the clock regenerator. Rather than encode clock onto the data stream which requires additional bandwidth, the system idles between transmissions with half-rate clock signals. All messages are sent synchronously without header information on each bit. The clock is extracted directly from the data using a phase lock loop regenerator. The circuit consists of an edge finder, driving an error amplifier. Whenever a data transition occurs, it is compared to the internal, free running clock. If an error exists, a sample and hold voltage is applied to the oscillator. Because data or "idle" clock is continuously present, long time constants are chosen so that it takes many clock transitions to either drift or correct an error. This has proven to be effective for reliable data transmission and noise rejection.

Expandability is provided by establishing an intermediate bus. The bus consists of eight data lines and eight address lines, as well as read, write and simple control lines. Powering is also available on the bus terminals. A push on RF, coax connector is also a part of this bus. The bus was established to permit external modularity and expandability. Simple decoding to the bus for low cost services can be accomplished with a handful of parts. However, the design permits complex, or large numbers, or both to be accommodated. The RF portion of the bus can be continued for functions such as a CATV switching, then, using a narrower module that only fits over the data bus, functions such as alarms or energy controls not requiring RF can be accommodated.

The protocol of the system has a number of special features to allow for simple, low cost operation, with expandability to complex operations. Each UADT home terminal has the capability of 256 function modules. However, in the Simple mode, determined automatically by the commands received, each home box is limited to seven modules, which is adequate for most residences and apartments. The Complex mode can be software selec-

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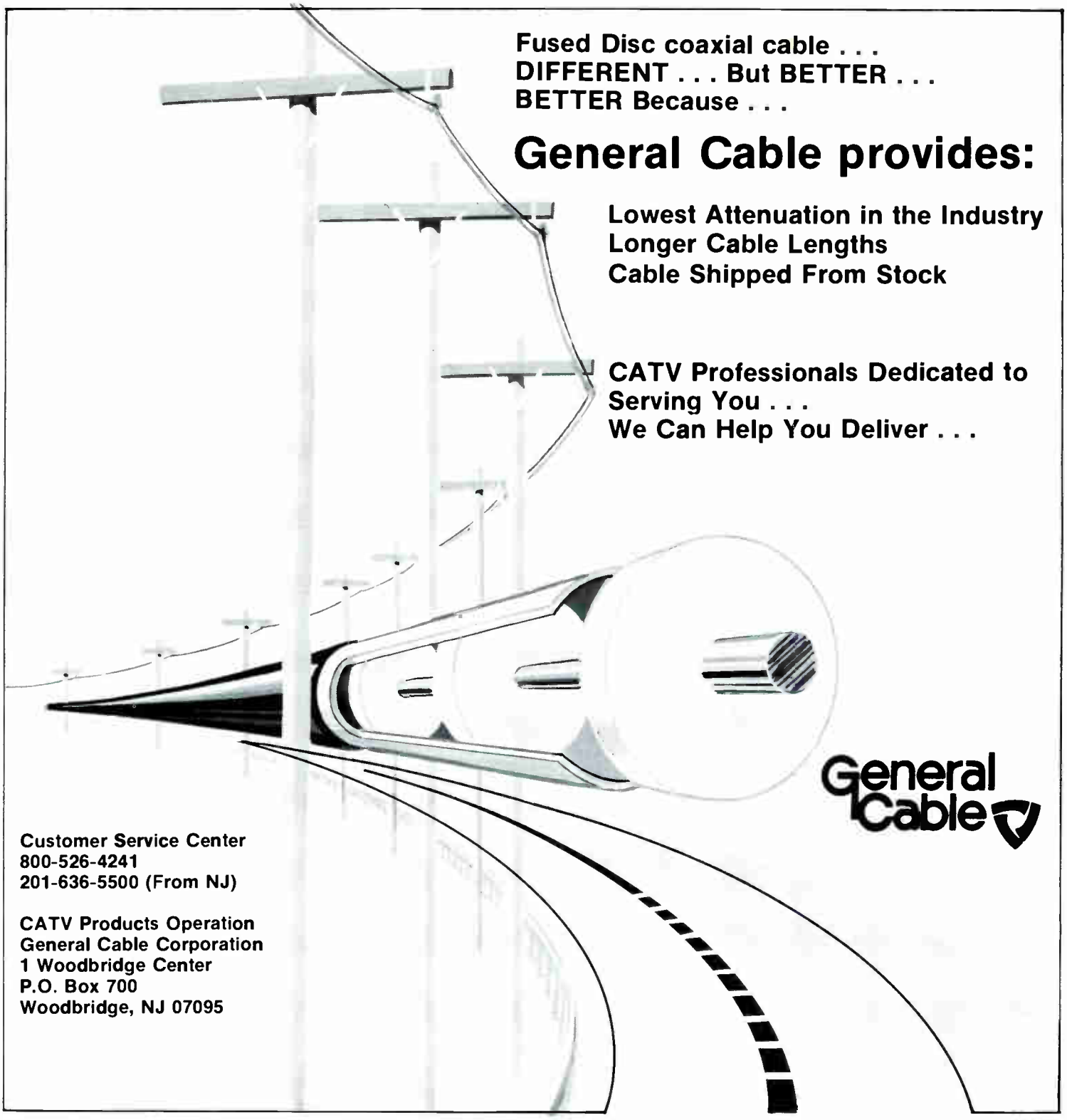

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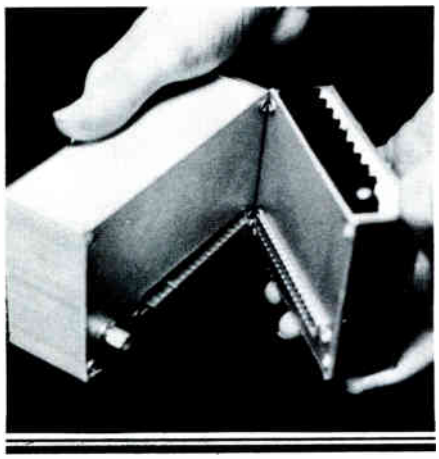

The bus is carried through all modules. The modules can be connected Daisy Chain fashion, and up to 256 modules can be stacked onto one UADT.

ted, and allows up to 256 modules or functions at each UADT. Mass interrogation of all critical functions such as alarms is accomplished every two seconds. If an alarm is detected, the address is located rapidly—using a binary tree sequence. Since most alarm functions occur only occasionally during the year, continual polling interrogation is not necessary.

Test routines are built into the system to allow for:

- Parity and check-sum on data as necessary,
- Command control and shut-down of transmitter,
- Continual verification of the status of all terminals,
- Transmitter, receiver and power supply status of terminals. A distress signal will be sent to the central computer by a box in event of tampering, power failure or other problems within the home unit.

Cost Reduction in Design

One of the features that achieves the low terminal cost is the use of a simple receiver. The FM receiver uses minimum parts count, a ceramic IF filter and a single FM chip IF discriminator. Receiver and transmitter can share a common crystal oscillator. An AM return channel transmission scheme is used for simplicity in the transmitter design, as well as decreasing the acquire time at the central receiver location.

However, the biggest cost reduction is due to the use of the single chip microcomputer. A crude version of the box was executed a few years ago requiring over 50 TTL packages but was not cost effective. The real breakthrough in design cost and flexibility came with the introduction of the single chip microcomputer. The basic home controller has been designed around the Intel 8048.

Low cost being a prime consideration, the terminals will be sold for $250 each in quantities of 1,000 with add-on modules for special services priced between $30 and $50 each.

An entire home system, fully loaded with four modules, (TV and pay-TV, security, energy and meter reading) can be installed for as little as $700 including all the hardware and labor involved. The cost of the system can be added to the price of a new home. Older homes can be easily retro-fitted for various services due to a unique kit approach to the energy and alarm controls. It might be that existing CATV installers could be adapted to perform the additional installations for the extra services.

The First System

The first commercial installation of the system is applications in a planned community and convention center in Oregon that will eventually have 980 residential units. The homes will each have their own UADT controllers, while the condominium-type dwellings will be served by four units per controller. All homeowners will have the choice of cable TV, movies from a satellite receive station, alarm service, energy conservation and meter reading (paid by the utility company). In addition, extra functions have been provided in the form of a message light system and TV theft alarm for all rentable units. The system will be in operation by the summer of 1979.

The developers of the planned community feel that the biggest advantage of this system over stand-alone home computers is the central reporting function. A large data base and computer can be located in the CATV headend. Alarms, for instance, are dispatched to the appropriate agency with complete information such as the location within the home, nearest fire hydrant, name of insurance company and any medical problems of the residents.

Energy controls are much more sophisticated than a stand-alone system, since the central computer can factor weather forecasts, ground moisture, outside temperature and total energy demand.

The CATV system will include the following services:

- Television and FM service—five local off-air TV stations, message channel, weather channel and channel 17 (via satellite).
- Premium Movie Service—pay per view (via satellite).
- Security—entry alarms, fire alarms, emergency alert panel (fire, police and medic), and a light cycling outlet. The costs are $400 installation and $11 per month.
- Energy Conservation—temperature turndown, waterheater control, night appliance start, outside lighting control, sprinkler controls and load leveling. These costs are $200 for installation and $6 per month.

Other services at the community utilizing the coax cable will be a message light system for rentable rooms, a TV theft alarm, holding tank alarms, and an extensive CCTV system covering the golf courses, tennis courts, swimming pools and night parking areas.

The data headend contains a dual DEC PDP-11-32 controller with remote printing terminals in the convention center and dispatch location: the entire CATV system, headend and home terminals will have a minimum of four hours stand-by power.

A Hint of the Future

In addition to the home features offered today, the box has infinite capabilities. The bus approach to modularity lets us put together almost any capability desired. The common denominator of all special services is data. We have a universal home data terminal! Already, the company has been asked to provide special modules for credit card verification, hotel room TV theft and message lights, system status monitoring, TTY loops and traffic signals.

What we have is basically a bus extension of a computer. Imagine a computer with the bus running through every home in town, for $250 per home, and that is what we are offering.

Taking the present rate of cable growth, coupled with the impetus that special services could provide, most of the country will be "wired" by 1990. Everyone is always talking about the wired city, the computer in the home, the Blue Sky of cable TV, and that's why I nicknamed my UADT home controller the "Blue Sky Box." We have designed-in capability to last many years. Our box will not be obsolete as long as we provide reliable service at a reasonable return on the investment. C-ED

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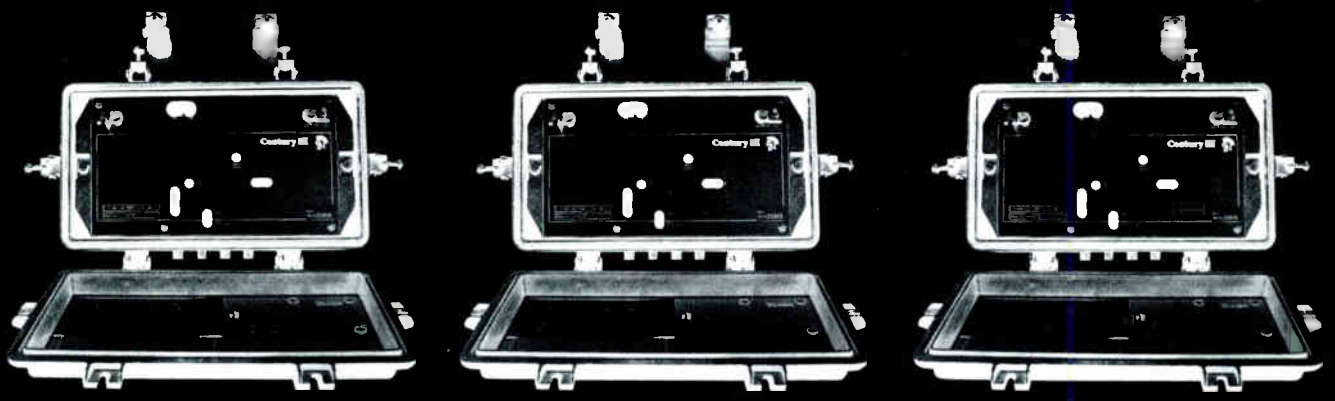

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2190B	AGC Station, Single Output

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See our card on page 27.

VISIONS

18 Months Later

A Staff Report

The past few years have seen the potential of subscription television increase by quantum leaps. The latest advances in technology, as well as increasing public acceptance of and demand for premium programming, signal the most revolutionary development in the TV industry since coast-to-coast coaxial cable was laid almost 30 years ago. One of the more unique aspects of this revolution has been the inauguration in December of 1977 and subsequent development of VISIONS, Ltd., the MDS pioneer in Anchorage, Alaska.

The Anchorage market—young, affluent, and highly receptive to new ideas—has proved to be a fertile test ground for innovative pay television concepts. From the beginning, VISIONS was committed to experimenting and expanding the limits of conventional pay TV practices. It was a policy born of survival, but the lessons learned, the experience gained, and the breakthroughs made in VISIONS' first year-and-a-half of existence have given the company a character and record of performance quite different from any other pay television operation. Little more than a dream two years ago, today VISIONS serves more than 11,000 single-family homes in Anchorage—roughly 20 percent of the market—and continues to develop and refine innovative concepts which it feels will have an important impact on the subscription television industry.

Geographically speaking, Anchorage is closer to Radio Moscow than to the FCC's offices in Washington, D.C. This means that things are often done differently there. For example, until the past year, almost all programming aired over the four local network affiliates in Anchorage (ABC, NBC, CBS, PBS) was shown on a one to three week videotape delayed basis. Even at present, Anchorage residents still listen to Johnny Carson tell Thanksgiving jokes at Christmas time. Realizing early that its market deserved better, VISIONS dedicated itself from the beginning to building its own earth station and programming via satellite, in addition to using videocassette stand-alone products.

This proved to be more difficult than it might seem to an operator located in the "Lower 48", as Alaskans call the rest of the country. For one thing, a normal parabolic dish TVRO could not be frequency coordinated at VISIONS' studio locale, and VISIONS had to use an Antennas for Communications 14-foot conical horn. At the time, this was the first 14-foot horn ever installed in the country. However, because of Anchorage's northerly location and the resultant low look angle for any earth station, the normal antenna mount for the horn was not usable and a special mounting apparatus had to be designed and manufactured, permitting it to be inverted.

Next, the combination of a small aperture antenna (the only kind of horn made) and the weak signal levels in Anchorage for most satellite sources off of RCA's Satcom I (magnified when RCA switched from the more northwesterly-oriented Satcom II) mandated use of

VISIONS' operations in Anchorage, Alaska.

a 13 degrees K cryogenic low noise amplifier at about 20 times the cost of what it would take to deliver the same quality picture from a 4.5 meter dish anyplace else in the continental U.S. On top of this, since no program supplier provides a satellite feed for the Anchorage time zone (two hours earlier than the Pacific coast), VISIONS had to provide tape delay capability to deliver programming to its subscribers at the right time of day. In sum, VISIONS' efforts to "go satellite" were quite a bit different than simply buying an inexpensive turnkey earth station package.

However, in the view of VISIONS' principals, all of this effort and expense has been well worth it from the standpoint of the quantity and quality of programming VISIONS can offer its subscribers on a single MDS channel. "Quite frankly," claims VISIONS' chairman, Bob Uchitel, "we believe we have the best single channel of pay television in the industry." And that's no idle boast considering the variety of programming that VISIONS utilizes. At present, VISIONS offers programming from Home Box Office, Fanfare, Madison Square Garden, Calliope, plus stand-alone product purchased directly from individual distributors. In addition to all of this, VISIONS rounds out its 24-hour program day with the best events culled from distant signals not otherwise available in the Anchorage market—WTCG, Atlanta; WSBK, Boston; WOR, New York; WGN, Chicago; KTTV, Los Angeles; and KTVU, Oakland. To bring in these distant signals was, again, not an easy task. In the first place, special FCC approval was needed for each signal to permit authorized use in Alaska as normal common carrier authorization covers only the contiguous 48 states. Furthermore, to permit maximum programming flexibiltiy, VISIONS had to modify its earth station to access all 24 transponders on RCA Satcom I and to also access additional satellites, specifically Westar II. This latter capability required motorizing the earth station mount.

Is all of this effort necessary? "That's difficult to judge," says VISIONS' president Bob Gould. "In one sense, we worry that our subscribers may not perceive the full value of what we are giving them, simply because they have no basis for comparison. But, on the other hand, the ability to mix and match programs from a variety of sources allows us to cater to a broad mixture of individual tastes and keeps our service constantly fresh and exciting. In my opinion, this capability has been responsible for a great measure of our success." Gould's point appears to be well taken. A recent independent market survey conducted among VISIONS' subscribers and non-subscribers alike found that most area viewers were willing to pay more for VISIONS than they would for basic cable combined with a single channel pay service.

VISIONS uses MDS receiving units from a number of suppliers: T.E.S.T., Magic Latern, Standard Communications and Winegard, with T.E.S.T. being by far its major supplier. It is working closely with T.E.S.T. to refine and eliminate most of the problems inherent in building a first generation, low cost microwave receiver. In fact, to gain greater feedback from the field, T.E.S.T. has sent one of its technicians to Anchorage to work full-time on improving the design and reliability of its product. "Any new piece of electronic equipment is going to have some problems," says Uchitel, "and certainly we have had our share of them here in Anchorage. However, they have not been abnormal considering the lack of field experience prior to our venture and the rigors of the Alaskan winter. Our interest in improving the state of the art of MDS hardware is obvious. There are probably only 20,000 single-family home antennas installed throughout the country, and we have over half of them here in Anchorage." Already projecting ahead to the next generation of MDS receivers, Uchitel would like to see individual unit addressability and additional security features added to make MDS receivers usable in all kinds of markets. "The technology is apparently there," Uchitel notes, "the only problem is the cost."

Horizons to Conquer

As fulfilling as the past year has been for VISIONS, the future holds even more horizons to be conquered. First and foremost is cable television in Anchorage. Having proved that Anchorage is a very good market for subscription television, VISIONS has applied to the Alaska Public Utilities Commision to construct a 35-channel cable system in that market in partnership with Daniels and Associates of Denver, and Doyon, Ltd., an Alaskan regional native corporation from Fairbanks. However, it is one of six applicants and the outcome could have a substantial impact on VISIONS' future. "Being the only applicant operating in the market, we obviously think we have an advantage over our competitors," Gould notes. "If we win, I think we will have proven that MDS can pave the way for, and be compatible with, cable. In addition, with 35 channels at our disposal, we will be able to amplify on our single channel programming expertise. If we lose, we'll find out how well MDS can compete against conventional cable. Either way we should see some interesting precedents being set."

A VISIONS' technician monitors programming in the control center.

Notwithstanding what happens in Anchorage, VISIONS is also looking to expand into additional markets elsewhere. "We very much believe in the concept of over-the-air pay television and think it has application in many other markets," Uchitel states. "Also, keep in mind that there are over 60,000,000 television households in the U.S. that are not presently passed by cable. That's a tremendous potential market that's simply not being adequately explored right now," Uchitel continues. Other cities contemplated by VISIONS for possible MDS expansion are San Francisco, Las Vegas and Burlington, Iowa, although Uchitel points out that nothing has been finalized for any of these locales. "Our concept," says Uchitel, "is to help create a 'fourth network'—one that would specifically cater to the over-the-air pay television operator."

If all this sounds pretty ambitious, Uchitel is quick to point out that the people at VISIONS were never known to lack initiative. Will it happen? The next 18 months should tell. **C-ED**

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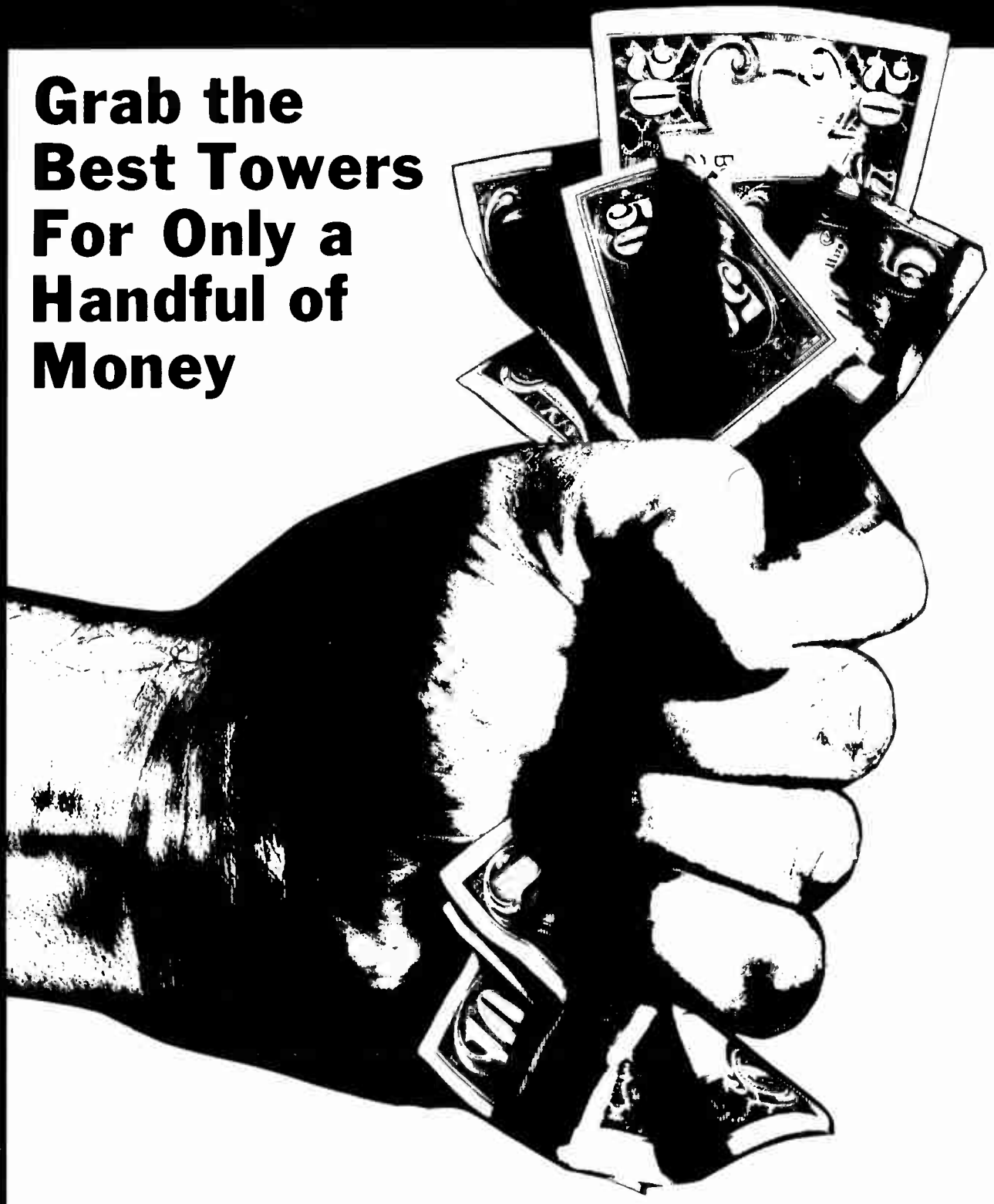

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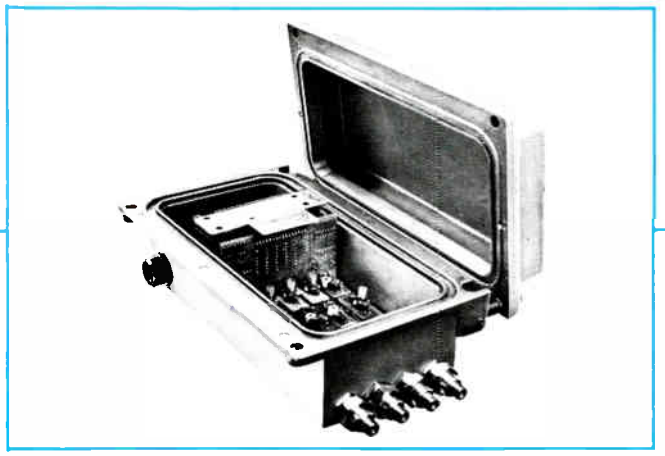

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Test Equipment— What It Is and Where It's Going

By Toni Barnett, Managing Editor

The first pieces of test equipment used in the cable television industry were field strength meters (FSMs). The early field strength meters were derived from TV tuners and originally built for home antenna installers.

Jerrold Pioneers Test Equipment

The first FSM was developed by Jerrold Electronics Corporation. The device consisted of a Philco television set with a voltmeter inserted into the television set's AGC circuitry. This method gave the technician the advantage of not only reading the signals, but he could see what the TV image looked like at the same time.

Jerrold also introduced the first FSM to be marketed to the cable industry. Ken Simons, who was one of Jerrold's guiding engineers, developed the 704 FSM in 1953. The 704, which used tubes, was the first piece of test equipment cable operators used as a basic mainstay to measure signal levels. The 704 remained in practically the same form until 1962, when Jerrold introduced the 727 FSM.

The 704 unit was powered by the field engineer's storage battery or car. The newer 727 device had a rechargeable self-contained battery and was designed for field engineers to carry with them. The 727 is now manufactured by Texscan Corporation; it remains a mainstay of the industry.

The next development in test equipment had its genesis in the growing need to sweep a broadband amplifier. *C-ED* asked I. Switzer of Switzer Engineering about sweep generators: "The early sweep generators," according to Switzer, "were called 'Wobbulators.' The Wobbulator used a motor driven rotating capacitor to provide a sweep signal. However, being electro-mechanical, these units weren't too reliable and not very broadband."

The first broadband sweep generator was developed by Kay Elemetrics and was sold mainly to manufacturers. This unit, called a Mega-Sweep, used two microwave klystrons and provided the first wideband VHF sweep.

It was Jerrold, however, who developed the first broadband sweep generator for the entire cable industry. In the 1950s, all sweep equipment was designed for, at the most, 6 MHz of bandwidth. Jerrold developed and marketed the 601 sweep generator that went in steps from 20 MHz to 225 MHz. That device covered the entire VHF band. The 601 was a portable piece of equipment for sweeping broadband equipment.

In 1958, Jerrold designed the 900A UHF/VHF sweep generator. This unit was a high quality broadband sweep generator incorporating both the UHF and VHF bands.

Len Ecker, one of Jerrold's foremost engineers, when asked about the advent of the sweep generator, remarked, "It became apparent that when a cable operator got into a broadband cable system of any length, it would be necessary to sweep the whole system. In sweeping the entire system," Ecker explained, "there was one major problem: if people

were watching television, sweeping the system would cause interference. Technicians basically had to sweep the system from 2 am to 6 am. Personnel objected, not only because it was difficult to get crews to work during those hours, but field personnel often got into trouble. Many technicians climbing utility poles outside of viewer's homes during the middle of the night were often 'interviewed' by local police," Ecker recalled.

"These problems prompted Jerrold to develop the 'Sleep Saver.' That unit was the first of the simultaneous sweep units which enabled an operator to sweep a cable system while viewers were watching, without TV interference."

In the late '50s, Jerrold continued to pioneer new techniques. Simons designed a system called measurements by comparison. This concept necessitated building a switching device that would switch RF circuits—allowing a technician to look at both the input and the output of an amplifier simultaneously. Jerrold's first comparator, the FD-30, used mercury-weathered relays. The device used coaxial relays to switch a display back and forth between a reference channel and the channel under test. The FD-30 made it much easier for the technician to make reasonably precise tests on cable television equipment.

In the late '50s, Jerrold also introduced the concept of return loss bridges for checking cable and equipment. However, that concept wasn't practical until the industry had widespread use of sweep generators.

The next major breakthrough in test equipment was the introduction of practical spectrum analyzers. The spectrum analyzer, which is used extensively in the cable industry, wasn't specifically designed for the cable industry and was in existence long before cable operators discovered them.

The first wideband spectrum analyzer used for cable applications was introduced by a firm called Nelson Ross in the early '60s.

Then, in 1971, Hewlett-Packard introduced its state-of-the-art precision wideband spectrum analyzer; and Tektronix followed with its 7L12 series of spectrum analyzers.

Another important breakthrough in test equipment technology was the introduction of the time domain reflectometer. The first practical one that could be used by cable was introduced by Hewlett-Packard in 1964. This device was, in effect, a pulse echo test set for finding and identifying faults in cable. That model has been refined and updated (transistorized and portable), but is still virtually the same as it was 15 years ago.

Innovations In Test Equipment

Signal level meters (SLMs) are a broad category of test

From left to right:

The Jerrold 727 field strength meter.

Mid State's SAM II signal level meter.

Avantek's SL-300 signal level meter.

The 500B signal level meter from Arvin.

equipment. Different SLMs have been designed for installers, technicians, lab units, etc. These SLMs range in price from $100-2,000. The big evolution in these pieces of test equipment is in the $900 and up category.

Previously, SLMs contained a technique very much like that found in a TV set—that is, the incoming signal was hetrodyne-bound to 45 MHz. That was the block diagram or the basic concept of the meter. In the past few years, the newer meters that have been developed—Mid State's SAM I and II, the Avantek SL-300 and the Arvin 500B meters—have been built with the design concept like the modern spectrum analyzer.

The spectrum analyzer provides a visual display of the information on a CRT. The SLM gives basically the same information but on a meter. The spectrum analyzer, however, allows an operator to look at more information at a faster rate. Both the SLMs and spectrum analyzers are similar as far as obtaining accurate information, but there's a significant price differential.

The cost of analyzers range from $5,000 to $20,000; a good SLM is in the $900 to $1,500 range and will perform almost as many functions as the spectrum analyzer. For example, Mid State's SAM I and II and Avantek's SL-300 employ a new front-end technique that allows sweeping the meter and putting a scope on it to provide a spectrum display.

Regarding the improvements of SLMs, Larry Dolan of Mid State had these comments: "The major change in top-of-the-line SLMs is in the basic design concept. Additionally, several new features have been added that older designs don't have—for example, a built-in calibrator. Some of the newer meters feature a digital-type LED readout, but it doesn't provide better accuracy or basic capability. The LED readout is merely a different way of providing information.

"Aside from utilizing a built-in calibrator," Dolan continued, "the second most important feature available on the new generation SLM is its ability to make hum modulation measurements. Previously, in order to make hum modulation measurements, a field engineer would have to take a SLM and an oscilloscope into the field. The new SLM doesn't need any other accessories and it reduces troubleshooting for hum modulation. All of the modern SLMs are 4-300 MHz meters. The older SLMs went from 54-216 MHz, and adapters and accessories were needed to get the additional 300 MHz range."

The Seven Steps (or) How To Choose Test Equipment

1. How old is the system? Does the system have modern amplifiers; tube or transistor-type amplifiers; single ended or push-pull?
   Older equipment is more prone to problems of distortion and "beating" than the newer push-pull or hybrid equipment.
2. What type of headend is in use?
   Basically, there are three types of headends: strip amps, mod/demods and heterodyne processors. The strip headend and older hetrodyne processors will need the most attention, but not necessarily the most expensive test system.
3. How many channels are being carried and will more be added?
   The more channels carried, the more distortion products in the system and the more complicated the headend problems. The frequency range of any test equipment selected must be certain to cover the expanded range of the amplifiers in use.
4. Will your system perform its own equipment repair?
   If not, equipment requirements will differ. Doing your own repair mandates a complete test bench setup.
5. Will your system conduct its own proof-of-performance?
   This step may require more sophistication of equipment that any other.
6. What is the system cascade?
   The larger the number of amplifiers in series, the more stringent the requirement for measurement and equipment to perform these measurements.
7. Will your system utilize any UHF stations?
   Special equipment will be required to cover the UHF bands, if this is a parameter in your requirements.

A basic test package will consist of a field strength meter and a system simo sweep capability. With this type of equipment, day-to-day maintenance is possible. The field strength meter will monitor absolute levels and the system sweep will keep the system in reasonable shape.

Recent Developments

In the last two to three years, the designers of new generations of test equipment have incorporated microprocessors. The use of microprocessors doesn't permit the technician to make as many mistakes as with older models. The unit leads the operator through in a logical order and allows for considerable internal decisionmaking.

The newer spectrum analyzers that utilize microprocessors are self-calibrated. In older spectrum analyzers the units are calibrated in dBms, a unit not used in cable television. In CATV, technicians use dB relative to a millivolt—dBmV. When using older SLMs, a technician either had to make up a calibration table or spend time calculating it. Now, all a technician has to do is push a button if he wants dB millivolts, dB microvolts, etc.

Another important innovation has been Texscan's new microwave down-converter. This piece of test equipment covers the three microwave bands—MDS, TVRO and CARS. The down-converter also permits the use of the existing FSMs, spectrum analyzers, sweep generators, etc. at microwave frequencies.

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Selling Management

Regardless of the advances in test equipment technology there generally is a significant hurdle that must be crossed: system management is not always in the most favorable position to deal with the technical problems confronting engineers and technicians. Most managers have only limited knowledge of the highly technical aspects of broadband communications services.

We asked Bob Welsh of Wavetek about the problems of interfacing engineers and management. "Manufacturers need to not only have a sales sheet but it's the manufacturer's duty to give figures and statistics on time-saving, money-saving and performance-increase—so that they have a better case to present to management. I think it's the manufacturer," Welsh emphasized, "who really has a responsibility to the technical end of the cable industry to try to give them [management] all the statistics and facts to help justify test equipment expenditures."

Although two major problems are getting managment to recognize the value of high-quality precision equipment and pay the prices, many people in the CATV industry have learned the hard way there's not really a cheap and dirty way to make accurate measurements.

Mid State's Larry Dolan: "People are spending more money on test equipment. They [management] realize that by spending a little bit more you can save yourself a lot of time and future grief."

Raleigh Stelle of Texscan Corporation reminds the CATV industry, "Good test equipment is not necessarily high-priced. You can't judge the value to a cable system in purchase price," and Stelle continues, "there are alternate approaches which can be less expensive."

Future Technology

Test equipment is improving in large part because cable system operators are realizing that test equipment is a tool to improve the performance of the cable system—not just a new "toy" an engineer wants to play with. The cable industry has demonstrated that when a better instrument is created, the industry is willing to spend more money on it. **C-ED**

Test Equipment Manufacturers & Products

Avantek, Inc., 3175 Bowers Avenue, Santa Clara, California 95051, (408) 249-0700.
- Signal Level Meters
- Spectrum Analyzers
- Transistor Oscillators
- Transmitters

B&K Precision, 6460 W. Cortland Street, Chicago, Illinois 60635, (312) 889-9087.
- Chart Recorders
- Digital Multimeters
- Filters
- Frequency Counters
- Noise Level Analyzers
- Oscilloscopes
- Probes
- Sound Level Meters
- Sweep Generators

ComSonics, Inc., P.O. Box 1106, Harrisonburg, Virginia 22801, (703) 434-5965.
- Automatic Channel Monitor
- Low Noise Amplifier Power Source
- Radiation Detection System
- RF Coaxial Relay Switch
- Signal Level Monitor
- Surge Protection
- Sweep Insertion Device
- Video Sensing Coaxial Relay

Hewlett-Packard Company, 1507 Page Mill Road, Palo Alto, California 94304, (415) 856-1501.
- Analog Meters
- Analyzers
- Generators
- Microwave Frequency Counters
- Oscilloscopes
- Programmable Signal Source
- Sweepers

Kay Elemetrics Corporation, 12 Maple Avenue, Pine Brook, New Jersey 07058, (201) 227-2000.
- Attenuators

Mid State Communications, 174 South First, Beech Grove, Indiana 46107, (317) 787-9426.
- Frequency Measuring Equipment
- Meter Calibrators
- Radiation Detection and Measuring Equipment
- Signal Level Meters

PECA, Inc., 4957 Pearson Avenue, Philadelphia, Pennsylvana 19114, (215) 639-3545.
- Bridge Detector
- Professional Test Sets
- RF Amplifiers and Detectors
- RF Comparator
- Sweep Systems

Sadelco, Inc., 299 Park Avenue, Weehawken, New Jersey 07087, (201) 866-0912.
- RF Bridges
- Signal Level Meters
- Spectrum Calibrators

Tektronix, Inc., P.O. Box 500, Beaverton, Oregon 97077, (503) 644-0161.
- Analog-to-Digital Converters
- CATV Test Sets
- Digital Photometers/Radiometers
- Digital Testers
- Display Monitors
- Frequency Counters
- LSI Testers
- Oscilloscopes
- Probes
- Signal Generators
- Spectrum Analyzers
- Spectrum Generators
- Sweep Systems
- TV Demodulators
- Video Display

Texscan Corporation, 2446 N. Shadeland Avenue, Indianapolis, Indiana 46219, (317) 357-8781.
- Attenuators
- CATV Test Sets
- Display Oscilloscopes
- Filters
- Frequency Counters
- Marker Modules
- Notch Generators
- Reflection Bridges and Accessories
- RF Coaxial Switching Devices
- Signal Level Meters
- Spectrum Analyzers
- Sweep Generators
- Sweep Systems
- Test Probes
- Test Signal Source

Times Wire and Cable Company, 358 Hall Avenue, Wallingford, Connecticut 06492, (203) 265-2361.
- Optical Reflectometer
- RF Radiometer

Triple Crown Electronics, Inc., 42 Racine Road, Rexdale, Ontario, Canada M9W 2Z3, (416) 743-1481.
- Attenuators
- Band Selectors
- Non-Duplication RF Switcher
- Signal Processors
- Signal Source

Vitek Electronics, Inc., 200 Wood Avenue, Middlesex, New Jersey 08846, (201) 287-3200.
- Antenna-Mounted Diode Switch
- Calibrated Noise Source
- Chart Recorders
- Diode Switch
- Radiation Detectors
- Video Comb Generator

Wavetek Indiana, Inc., 66 N. First Avenue, Beech Grove, Indiana 46107, (317) 783-3221.
- Attenuators
- CATV Test Set
- Crystal Oscillator
- Filters
- Signal Generators
- Sweeper/Comparator
- Sweep/Signal Generator
- Sweep Recovery System

Wide Band Engineering Company, Inc., P.O. Box 21652, Phoenix, Arizona 85036, (602) 254-1570.
- Bridges
- Detectors
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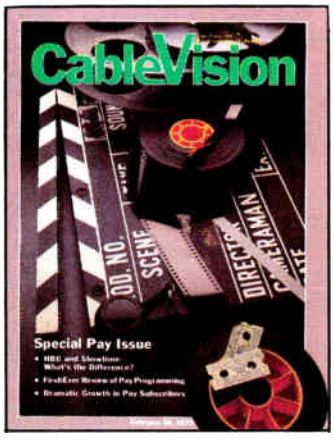

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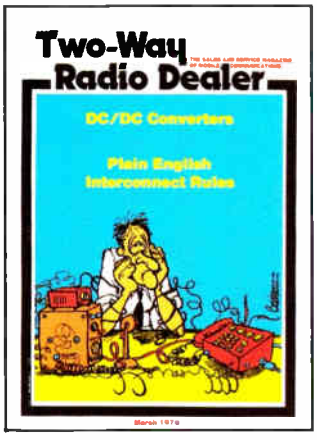

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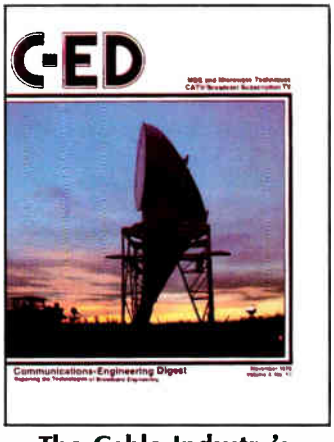

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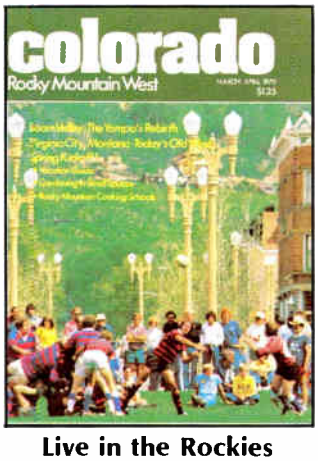

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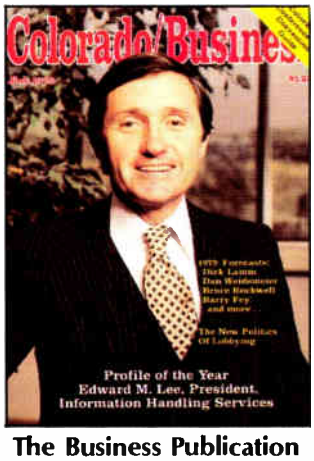

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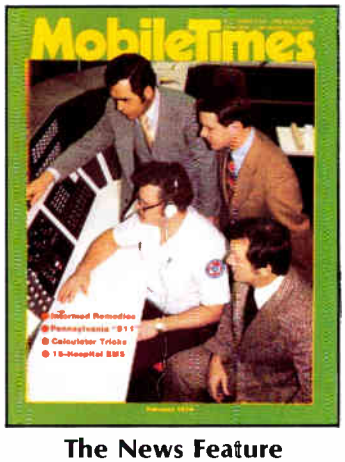

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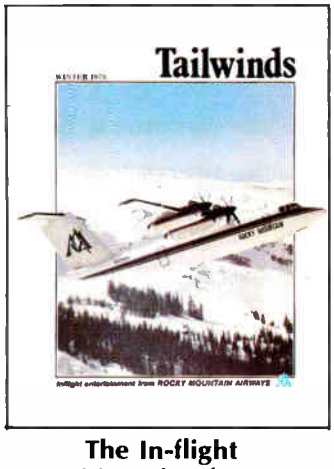

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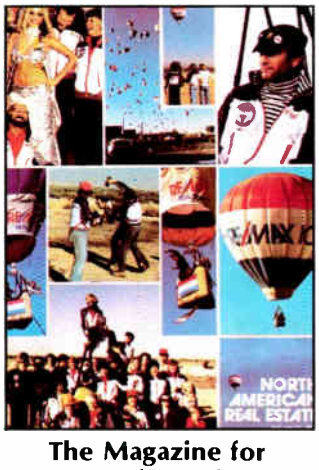

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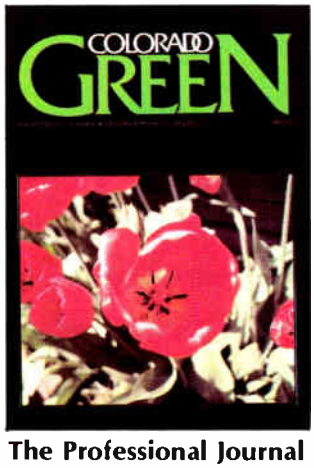

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Reproducible Measurement Of CATV System Shielding Integrity

By Warren L. Braun, P.E., President
ComSonics®, Inc.
Harrisonburg, Virginia

Effective radiation measurement requires a good working knowledge of radiation patterns and polarization of RF leaks. Optimum tools for locating such leaks will be discussed in this paper.

Cable television (CATV) systems are generally constructed with coaxial cable with a continuous external sheath, coupled with well shielded amplifiers and passive devices to assure a maximum isolation from the external electromagnetic environment. Unfortunately, the planned shielding integrity of the system is rarely achieved over the entire plant, even at completion of construction. Furthermore, the system's integrity deteriorates from then forward over a period of time due to known factors, some of which are not subject to the control of the system operator. Stated simply, CATV systems can radiate signals which they carry,

Warren L. Braun, president of ComSonics, Inc.

while still functioning in a normal fashion. While most of this radiation is of relatively low level and of little apparent consequence, there is a limit at which this radiation can become a source of interference. In the USA, FCC rule 76.605 (a) (12), specifically states that the system's radiation shall not exceed:

Frequencies	Radiation Limit (Microvolts/Meter)	Distance (Feet)
Up to and including 54 MHz.	15	100
Over 54 up to and including 216 MHz.	20	10
Over 216 MHz.	15	100

Consistent with our concern for efficient utilization of the electromagnetic spectrum, we should place a high priority on the detection and elimination of unauthorized radiation.

Should the system's radiation approach or exceed the previously stated FCC limits it is quite likely that some clever individuals will help themselves to free cable television service. Marginal radiation standards interfere with non-subscriber TV reception in fringe reception areas creating public relation problems for the system.

Via the system shielding flaws, the CATV system will receive varying degrees of interference with its own signal carriage. The sources of this interference are as manifold as the signals present in the external electromagnetic environment, including strong FM, TV, two-way radio and other signal transmission.

In addition, power line noise may ingress where the cable sheath current is high.[1] In two-way or sub-low systems, shortwave transmissions pose a serious ingress problem. From the foregoing we conclude:

- The CATV system shielding integrity must be such as to always meet the minimum regulatory radiation limit standard. This is mandatory.
- Such shielding integrity standards must be maintained plant-wide.
- To assure such plant-wide system shielding integrity, a surveillance program must be implemented, applicable to the entire plant.
- Plant shielding integrity should be checked at frequent intervals, preferably on a continuous basis, covering the entire plant.
- Such surveillance should be cost efficient, preferably utilizing non-technical personnel.

Although it has been indicated that any regulatory radiation standards are to be met as a minimum, good engineering practice will set shielding integrity standards at least 20 dB higher (greater isolation), for a variety of reasons, principally to deal adequately with ingress problems, even with one-way (downstream only) system operation. With two-way plant operation, this higher standard becomes mandatory.[2]

Beyond legal and interference standards, there is a pragmatic, sensible reason to determine each source of leakage, as almost all such system flaws provide a point of entry for moisture, leading to potentially serious long term damage to cable and equipment.

Some CATV system operators regard the legal requirement to measure system radiation a nuisance, and perform minimum perfunctory measurements.

These operators miss two very important points:

1) The operator has a legal requirement to assess and assure the shielding integrity of the entire plant.
2) There is sufficient economic justification to locate and fix sources of leakage to minimize the moisture damage to the plant.

For these reasons, there is a compelling need to devise the best possible shielding integrity analysis system, which can be field implemented easily on a cost efficient basis. It is recommended that such a system be capable of reliably detecting fields 20 dB lower than FCC standards to assist in location of system shielding flaws in their inception.[3]

Sources of Shielding Integrity Loss

There are a myriad of reasons for failure of the system's shielding integrity. The major causes are:

- Poor workmanship, primarily improperly fitted and installed connectors;
- Loose cable fittings, due in part to "connector swaging." Winston[4] has addressed this problem, concluding that connectors must have an internal sleeve to maintain good long term shielding efficiency;
- Physical damage to cable—Cable kinked on installation, leading to early failure of sheath integrity; tree limbs rubbing on sheath, causing sheath fracture; and human damage, including tree limb cutting and bullet holes;
- Warped or incorrectly tightened amplifier or device covers;
- Failure of "F" connectors to maintain adequate shielding usually associated with "cheap" connectors. Long ferrule connectors of the proper design greatly relieve this problem;
- Drop cable failure at connectors, due to improper makeup or wind flexing. Fracture of sheath at house due to mechanical configuration of cable seizure device, and at grounding block termination; and
- "Wedding Ring" (radial) cracks at cable expansion loops.[5]

All these flaws possess a common denominator. The radiating (coupling) aperture is highly variable, and often temperature sensitive. This aperture is coupled to an indeterminant length of external cable sheath, which, upon being excited, behaves very much like the unterminated long wire antenna it is, often many hundreds of wavelengths long, with a relatively small attenuation per wavelength.

The nature of this field pattern with its characteristic "standing waves" confuses the uninitiated individual attempting to locate the precise source of the leakage. This complicates the location of the flaw, and sharply constricts the acceptable methodology for locating such flaws.

Methodology For System Integrity Flaw Location

Shielding integrity flaws can be detected by either of two concepts. One can deliberately radiate an external signal from a mobile communications transmitter in the immediate vicinity of the cable, while a second operator notes the level of the signal at some convenient point in the system.

This method has been used quite successfuly to locate system flaws, although it is cumbersome and expensive to implement.

Since we must measure the system radiation for legal purposes, and since the same flaw applies to both ingress and egress mechanisms, this paper will analyze egress measurement technology exclusively.

In measuring egress of CATV signals from the system, it will be helpful to analyze the following chart of two terminal voltages to be measured from a dipole at FCC limits:

U.S. TV Channel	Dipole Reading in dBmV[6]
2 - 54-60 MHz	-35.2
6 -	-38.7
7 -	-45.2
13 -	-46.8

Conventional methods of measuring this signal are as follows:

1) CATV signal level meter, with minimum scale sensitivity of -30 dBmV, coupled with a preamplifier of known gain, utilizing a tuned dipole as a receiving antenna. Entire package requires calibration prior to use.
2) Specialized precision field strength meters, such as those manufactured by Stoddart, Empire Devices, and Nems-Clarke. Utilizing these devices with a calibrated dipole leads to very accurate measurements. All of these devices are cumbersome and expensive, requiring a trained operator.
3) Spectrum analyzers with preamps and calibrated dipole. Although this technology will work, it is quite evident that it will be even more expensive to implement than procedure number 2.

Each of these systems possess a distinct disadvantage, i.e., they cannot discriminate between an egress signal and one normal to the external electromagnetic environment. The spectrum analysis method fares a bit better in this regard, but in the very busy electromagnetic environment of most urban areas, this can be compared to the problem of visually selecting a particular yellow taxi in traffic full of them.

In addition to the discrete carriers in the external environment, there is the very real problem of moderate to severe power line noise[7] masking the signals to be measured.

Further, if we are to measure signals to a standard 20 dB lower than required by FCC standards, all of the prior technology becomes questionable.

Receiving systems with greater sensitivity requires smaller predetection bandwidths to achieve acceptable signal-to-noise ratios. These narrow receiver bandwidths are incompatible with the detection of the wide band signals carried on the CATV system. Furthermore, with variable tuned instruments, receiver tuning stability becomes a problem.

All these problems can be greatly alleviated by placing a special precoded carrier on the CATV system, coupling this with a fixed tuned receiving system to detect the egress of this signal. With fixed tuning, the receiver bandwidth can be made quite narrow, substantially reducing the power line noise masking problem,[8] assuring accurate detection of the egress signal.

An additional problem remains to be solved. As stated previously, the radiated field varies in a cyclic "standing wave" pattern, superimposed over the usual 1/D field versus distance relationship. The radiated field varying in both 1/D and cyclic fashion simultaneously, renders localization of system flaws difficult and tedious.

This difficulty can be improved to a substantial degree by a combination of near and far field detection technology. As is well known,[9] the near field of any radiant flux is composed of electric flux, magnetic flux and an electromagnetic radiation field. The radiation field becomes the dominant factor beyond a few wavelengths, decaying at a 1/D rate.

However, at closer distances, the electric and magnetic flux dominated increasing at a $1/D^2$ to $1/D^3$ rate, providing a greatly enhanced ability to detect the precise location of the RF leak in the cable system. Unfortunately, the usual dipole or other far field aperture is not well adapted to this task. The aperture best adapted to the detection in this near field region is the small aperture loop antenna ($R \leq 0.10$). With this tool, coupled with a receiving system of adequate sensitivity, the task of precise location of cable system shielding flaws becomes realistic, accurate and quite rapid.

Hardware Solution

The optimum hardware solution would incorporate at least the following features:

1) A CATV system compatible signal source, modulated in a unique fashion to permit immediate aural recognition of such modulation, i.e., modulation unique to the device, not duplicated in the external electromagnetic spectrum.
2) The receiving system to be utilized in conjunction with the signal source of 1), should possess the following properties as a minimum:

- the receiver should be fixed tuned, preferably crystal controlled to assure accurate detection of the egress signal.
- should have sharply limited predetection bandwidth to reduce the masking of power line noise, and improve detection sensitivity.
- the receiver should be equipped with a small loop antenna to facilitate induction[10] field discrimination for precise fault location.
- such receiver should be light weight and battery powered.

3) The system should be amplitude modulated to facilitate the easy discrimination of field strength changes. In addition, the inherent signal-to-noise of very weak signals is superior in the AM system. C-ED

Bibliographical References and Footnotes:

1. "Longitudinal Sheath Currents in CATV Systems," J.C. Herman and J. Sheckel - pp. 54-63. *IEEE Transactions on Broadcasting,* December 1975.
2. "Using Two-way Cable TV," James B. Wright, *Communications Engineering Digest,* February 1979, p. 31.
3. It has been pointed out that some older CATV plants would fail this test system wide. While this may be correct, such system measurement sensitivity will minimize such leakage and assist in correcting flaws.
4. "A study of Aluminum Cable-Connector Interfaces and Their Effect on CATV System RF Ingress," Eric Winston, Jerrold Electronics, 1973 NCTA Convention Proceedings, pp. 43-51.
5. This phenomenon can be minimized by utilizing large cable bending radii. See J.B. Wright, "Expansion Loop Revisited; A Look at Real Numbers"—March 1973, *Cable Tech* - pp. 10-12.
6. 0 dBmV = 1 millivolt across 65 ohms.
7. Caused by usually close proximity of overhead high tension lines.
8. Power line noise is essentially a continuous spectrum, therefore, reducing the predection bandwidth by a factor of 100 reduces peak power line noise by 40 dB, since these spectral components are quasi-coherent.
9. F.E. Terman-*Radio Engineers Handbook,* McGraw-Hill Publishing Co., 1943 - pp. 771-772.
10. Ibid. 8.

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A Satellite Primer

By Thomas J. Kelly, Applications Engineer
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Scientific-Atlanta, Inc.
Atlanta, Georgia

If you are familiar with satellites and how satellite communication systems work you can skip this paper. If you are getting acquainted, this paper, which covers the basics in lay terms, may be helpful.

The mechanics of synchronous or geostationary satellites have been recognized for a long time—probably by Galileo or Copernicus—but implementation had to wait until the last half of the twentieth century, when the huge launch vehicles required were available.

The possibility of using synchronous satellites as a platform for a radio repeater was investigated in the early 1900's but had to wait until highly directive antennas and supersensitive VHF and microwave receivers were developed.

The first communications satellite was launched in 1965. In the succeeding thirteen years satellite communications has become commonplace and today the globe is covered by the Intelsat system providing high quality voice data and television communications on a worldwide basis. There are several regional satellite communications systems. For example, RCA and Western Union have a total of four satellites providing message and TV service to the Continental U.S. and Hawaii. There are Comstar satellites starting message service to the same areas. The Canadians have been distributing TV by satellite for quite a few years via their Anik satellites. The Indonesian Palapa satellite has been in service for several years providing high quality voice communication and TV to the thousands of islands making up Indonesia. Other systems include the European Symphonie and the USSR satellites. In addition to the operating systems, dozens of other regional satellite systems are being discussed and planned.

Why has the art of satellite communication grown so much in such a short period of time? There is no one answer but several.

First, satellite communication is reliable and is not affected significantly by weather conditions, time of day, or sun spot activity as is the case with HF radio. Several times each year HF radio is useless for days for long distance communications because of sun spot activity, and even on the best of days is useable only for a few hours per day.

Secondly, there is no possibility of transmitting real time television by HF radio because of the bandwidths required and the serious selective fading experienced. At microwave frequencies the bandwidth is available for many TV channels and the fading problem is virtually non-existent.

Thirdly, satellites are by far the lowest cost means of communication over medium to long distances in comparison with terrestrial wire line, underseas cable, microwave and coaxial cable. This cost reduction is dramatic when a TV program is to be transmitted to many receiving stations spread over a broad area, for example, the continental U.S. One further benefit is that since only one microwave repeater is involved, which is on the satellite, the picture quality can be far superior to one going through hundreds of terrestrial repeaters.

Now that we know of the veritable revolution in communication wrought by satellites, one asks—how is it done—what is a geostationary satellite—what does it do?

Our whole universe is made up of heavenly bodies that rotate around other heavenly bodies that rotate around other heavenly bodies. The moon rotates around the earth, the earth rotates around the sun and its likely that the sun rotates around another sun, etc., etc. A man-made satellite is another moon and rotates around the earth. Gravitational laws, which control the universe, indicate that if a man-made satellite is closer to earth than a certain distance it will rotate around the earth faster than the earth rotates. Some meteorological satellites go around the earth in about 90 minutes. If the man-made satellite is located beyond a certain distance above the equator, it will rotate around the earth slower than the earth turns. For example our moon, which is more than 200,000 miles from the earth, requires over 28 days to make its rounds.

With this information it should be clear that if we could place a man-made satellite at the exact right distance from the earth, it would rotate at exactly the same speed as the earth, and if we could see it, it would appear to be fixed in the sky, and not move. The term synchronous satellite applies since the satellite is rotating around the earth in synchronism with the earth. The term geostationary relates to the fact that the satellite appears to be stationary in relation to a point on the earth. The distance above the equator where this phenomenon takes place is 22,300 statute miles. With todays rocket and guidance wizardry it is not difficult to precisely locate a satellite weighing a ton or more at a particular distance and location above the equator. Tiny jets in the satellite keep the satellite on its station.

If a microwave radio transmitter is put on the satellite with a broad beam antenna, called a global beam, slightly more than one-third of the earth's surface would be covered by the signal from the satellite. If three such satellites are equally spaced (120 degrees apart) around the equator the entire earth, except polar regions, would be covered.

Why a microwave transmitter? Only microwave systems have the available bandwidth to transmit thousands of voice circuits plus several TV channels. Also, microwaves are not affected significantly by local weather conditions, the ionosphere or sun spot activity.

If instead of putting a microwave transmitter on the satellite, we put two microwave repeaters, we can send up a signal to the satellite which will repeat it (on a different frequency) back to the earth. We can use broad beam antennas on the satellite and can originate and receive the signal over one-third of the earth's surface beneath the satellite. If we use narrower or shaped beam antennas on the satellite, coverages can be limited to certain areas such as the lower 48 states. Since we have two repeaters, or transponders as they are called, we can have two-way or duplex communication.

To reduce the earth station transmit power requirements and to permit reusing the microwave frequencies on other satellites spaced a few degrees away, earth stations typically use very high gain—narrow beam antennas. A ten-meter antenna, for example, reduces the transmitter power

requirement to about one-two-hundred-thousandths of that required by an antenna radiating in all directions. Since the beam width is less than one degree, an earth station antenna aimed at one satellite will not cause interference to another satellite spaced approximately 4 degrees away and operating on the same frequency.

The satellite antennas are shaped so that the desired coverage is obtained without wasting power by radiating it into space. This also provides some gain that reduces the satellite transmitter power to a few watts per channel. This is important since the satellite power is solar derived.

The high gain earth station antenna also collects the signal from the satellite which is nearly 100,000 times stronger than would be the case with a non-directional antenna. Even with this big boost, the satellite signal is very weak and must be amplified in a very special amplifier that adds virtually no noise to the signal. This amplifier is called a low noise amplifier or LNA and may be a transistor type usually called a Gas Fet (GaAs FET) or a parametric amplifier. The signal gets about a 100,000 times boost in the LNA and is then sent to the receiver where the signal is amplified more and is demodulated producing the information originally transmitted—voice, data or TV.

The foregoing is a very simplified expose of the mysteries of satellite communications. Naturally the art is far more complex than this and systems require sophisticated equipment, careful control of the satellite position, attitude and on-board housekeeping. Even with this complexity, suppliers have developed standard product earth stations that can be operated unattended, which continually tests themselves, instantaneously switch over to standby equipment in case of failure and summon help in case of trouble.

Where is satellite communications going? Due to the many advantages, particularly the demonstrated savings, it cannot help but grow and continue to take over circuits previously served by wire, coaxial cable, underseas cable, terrestrial microwave and HF radio. This is particularly true for medium to long distance and multiple destination systems. Thirteen years ago we had one tiny satellite capable of handling one TV program or several hundred telephone circuits. Today there are several dozen communications satellites, some capable of handling up to 48 TV programs plus up to thousands of telephone conversations.

Present commercial communications satellites are approaching saturation and new and higher capacity satellites are planned as additions and as next generation satellites.

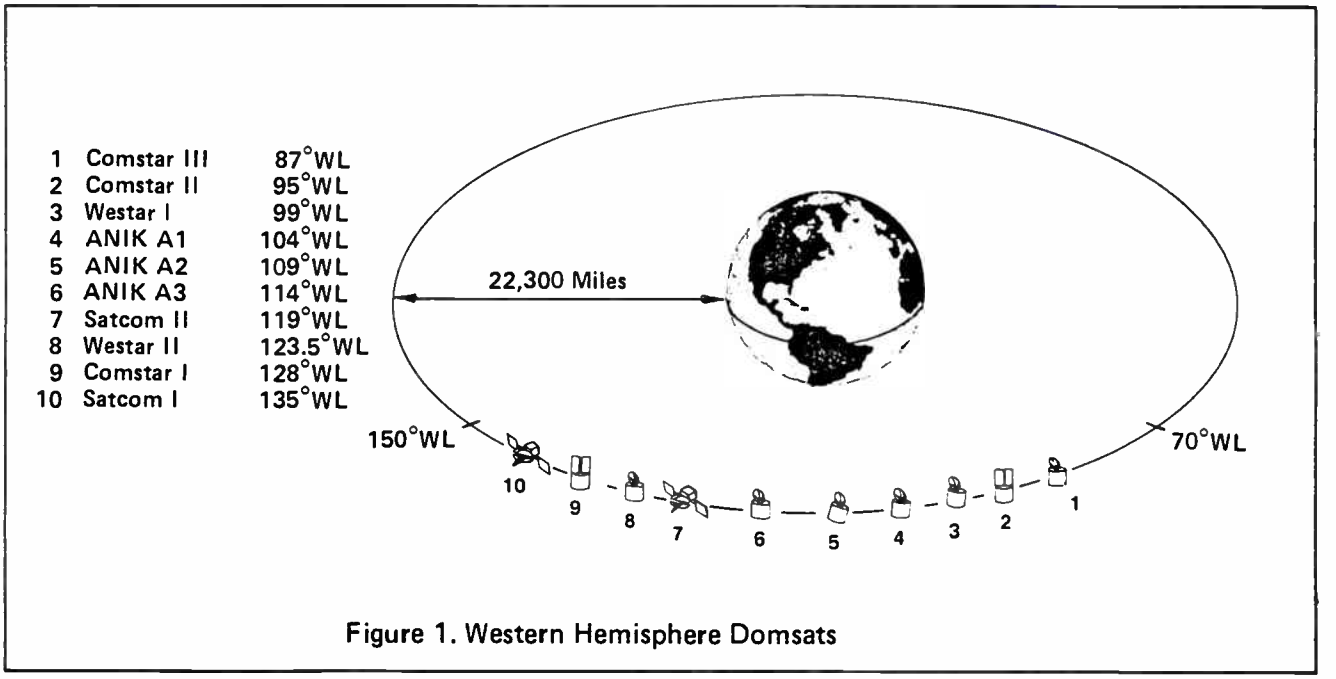

Figure 1. Western Hemisphere Domsats

Figure 1 shows the present distribution of commercial domestic satellites within the 70 degree to 150 degree equatorial arc assigned for Western Hemisphere usage. There are a few other non-commercial satellites within the same arc, some of which operate on the same frequency.

All of the satellites shown in Figure 1 operate on 4 and 6 GHz. It will be noted that by using the four degree separation standard, slots exists for 20 satellites. There are still quite a few slots available for more 4 and 6 GHz satellites.

There are other frequencies assigned for Domsat satellite work and the next to be used will be the 11 and 14 GHz bands such as for the SBS system. This will permit at least doubling the number of satellites occupying the 70 degree to 150 degree arc. Still other bands are available which will permit tripling or quadrupling the number of satellites that can be put into this 80 degree segment of the geostationary arc.

In addition to additional capacity available in unused slots and new frequencies, new techniques are available to more efficiently use the spectrum, thus putting more TV, voice and data channels on each satellite. Half transponder operation—a technique whereby two TV channels can be obtained in the bandwidth normally required by one TV channel—is being regularly used by Intelsat and in Alaska. This technique will most likely expand, particularly with the new computer enhancement techniques now in the experimental stages.

Most everything seems favorable for satellite communications—generally lower costs, it permits high quality communications over long distances without outages, plenty of space is available for years to come. Thus, we expect a continued rapid growth and new technological breakthroughs to make it an even lower cost and more effective medium.

Cable Programming for May

Signal	Day	Start/Stop	Alert Times	Satellite/ Transponders
C-SPAN (times approx.)		12 pm-6 (6:30) pm (Mon., Tues., & Fri.) 10 am-6:30 (7:30) pm (Wed. & Thurs.)	No	F1, #9
Callope		6:30 pm-7:30 pm (Mon., Tues., & Thurs.)	No	F1, #9
CBN		24 hrs.	No	F1, #8
Fanfare		Schedule unavailable at press time.	No	F1, #16
Front Row		2:30 pm-2:30 am		E,C F1, #12 P,M F1, #10
HBO (East)	1	6:30 pm-1:14 am	Before & after programming & promos.	F1, #24
(West)	2	6:30 pm-1:20 am		F1, #22
(TAKE 2)	3	6:30 pm-2.35 am		F1, #23
(Back-up)	4	5:30 pm-2:29 am		F1, #20
	5	3:30 pm-1:45 am		
	6	2 pm-2:05 am		
	7	6 pm-12:54 am		
	8	6 pm-2:14 am		
	9	6:30 pm-1:30 am		
	10	5 pm-1:44 am		
	11	6:30 pm-2:11 am		
	12	2:30 pm-1:54 am		
	13	3 pm-1:30 am		
	14	6 pm-2:14 am		
	15	6:30 pm-1 am		
	16	6 pm-1:08 am		
	17	6 pm-2:24 am		
	18	5 pm-2:13 am		
	19	3 pm-2:50 am		
	20	2:30 pm-12:49 am		
	21	6 pm-1:39 am		
	22	6:30 pm-12:50 am		
	23	6 pm-12:43 am		
	24	5 pm-1:11 am		
	25	6:30 pm-2:24 am		
	26	2 pm-1:43 am		
	27	2 pm-2:20 am		
	28	5:30 pm-12:38 am		
	29	6 pm-1 am		
	30	6 pm-1:30 am		
	31	6 pm-2:02 am		
HTN		8 pm-10 (11) pm	No	F1, #1
KPIX (time permitting)		2-4 hrs. per day	No	F1, #1
KTVU		7 am-10 am (Mon.-Fri.) 7 am-2 pm (weekends)	No	F1, #1
MSG Sports		Schedule unavailable at press time.	No	F1, #9

Signal	Day	Start/Stop	Alert Times	Satellite/ Transponders
Modern Cable Programs		12 pm-5 pm (weekdays) 7 am-12 pm (weekends)	No	F1, #22
Newstime		24 hrs.	No (tones only for local adv.)	F1, #6
Nickelodeon		10 am-11 pm (weekdays) 9 am-11 pm (weekends)	No	F1, #11
PTL		24 hrs.	No	F1, #2
Reuters		Not in use yet.	No	will use F1, #18
SPN		7 am-10 am (weekdays) 7 am-12 pm (weekends)	No	F1, #1
Showtime	E	5:30 pm-1:30 am (weekdays) 2 pm-1:30 am (weekends)	1 minute before and after programming.	F1, #12
	C	4:30 pm-12:30 am (weekdays) 1 pm-12:30 am (weekends)		F1, #12
	M	6:30 pm-2:30 am (weekdays) 3 pm-2:30 am (weekends)		F1, #10
	P	5:30 pm-1:30 am (weekdays) 2 pm-1:30 am (weekends)		F1, #10
SIN		2:30 pm-1 am (weekdays) 4 pm-12 am (Sat.) 11 am-11:15 pm (Sun.)	No	Westar II, #7
Star Channel		9 am-2 am	No	F1, #11
Trinity (KTBN)		24 hrs.	No	F1, #14
WGN		5:42 am-3 (3:30) am (Mon.-Thurs.) 24 hrs. Sat. & Sun. Ends 3 am on Sun.	No	F1, #3
WOR		6:55 am-2:30 am	No	Westar II, #1
WTCG		24 hrs.	No	F1, #6

E = eastern
C = central
M = mountain
P = pacific

All program times are listed for the eastern time zone, unless otherwise noted.

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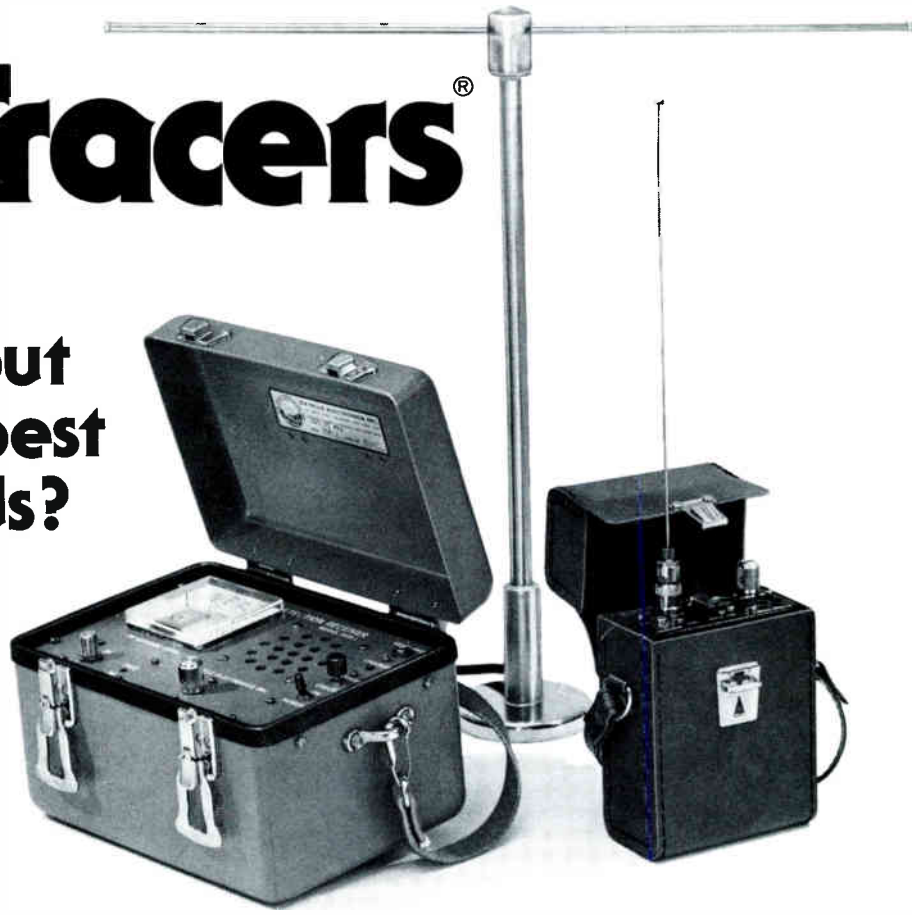
Both detect RF leakage, but which one is best for your needs?



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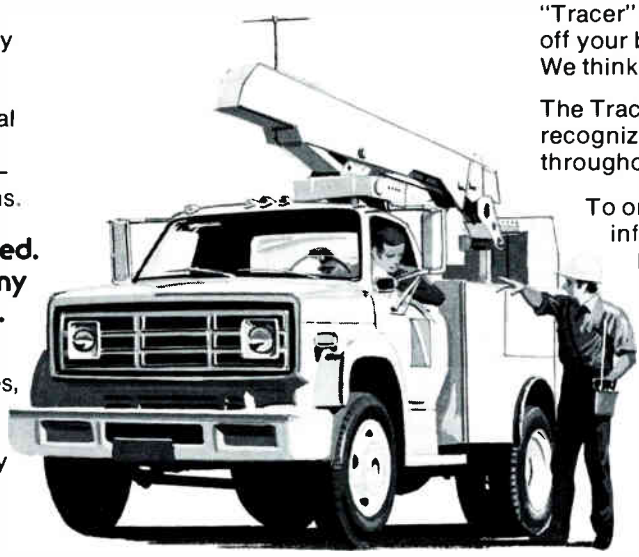
The system includes tuned dipole antenna with magnetic base, head phones and AC adapter/charger. Gell Cell batteries provide up to 50 hours of operation on a single charge. Weight: only 5 lbs.



The "Tracer" Model TR-2

is an economical field unit that can detect and locate RF leakage and can measure radiation with sufficient accuracy for general trouble shooting. Ni-Cad batteries provide up to 15 hours of use on a single charge. Includes AC adapter/charger. Weighs only 1.5 lbs.

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A portable, compact oscilloscope, the Gould OS253, is described in a new two-page, illustrated bulletin. The 12 MHz dual-trace scope is a versatile instrument for a broad range of industrial, educational and laboratory applications.

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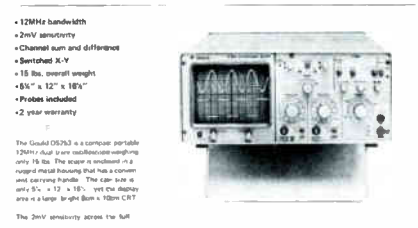
Bulletin 449-8 contains complete specifications of the Gould OS253. For a free copy, contact Marketing Services, Gould Inc., Instruments Division, 3631 Perkins Avenue, Cleveland, Ohio 44114, (216) 361-3315.



Gould bulletin on oscilloscopes.

B&K-Precision Test Instrument Catalog Available from Dynascan

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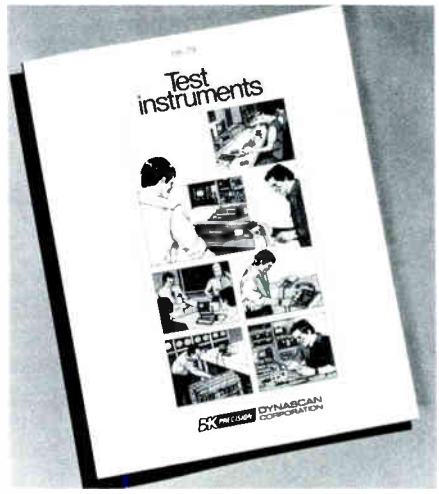


"BK-79" test instrument catalog.

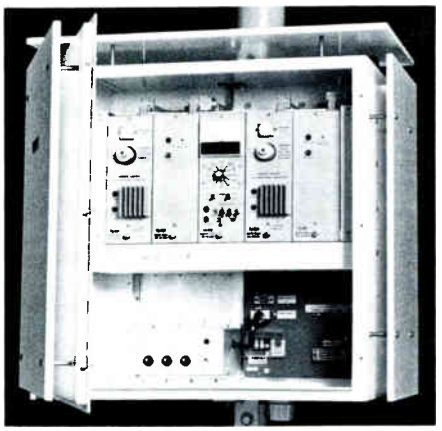
Microwave

Farinon Announces
New Digital Microwave Radio

Farinon Electric has announced a new 18 GHz digital microwave radio. Designated the DM18, the radio is designed for economical short haul systems for the business, industrial or common carrier communications user.

Digital modulation permits the use of low-cost channel banks for voice or voice/data communications. When used with the new generation of switching machines, interconnection is possible without using channel banks.

The DM18 has been designed to accept Bell Standard DS-1 or DS-2 line rates and is completely solid state. The outdoor weatherproof enclosure can hold two transmitters and two receivers for repeater or protected terminal applications. The enclosure is adaptable to a variety of mounting arrangements.



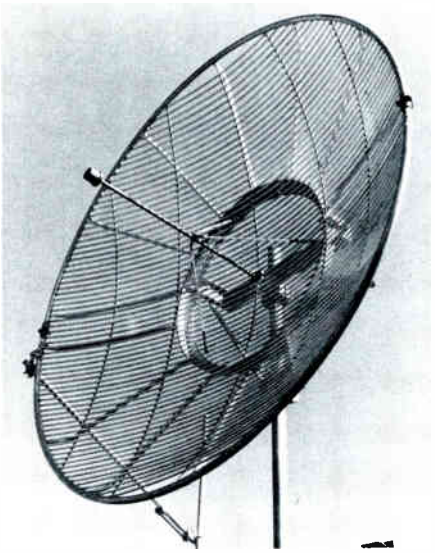
The DM18 Digital Radio is offered as a complete microwave communications system. Transmitters, receivers, enclosure, alarm system, antennas, multiplexers and installation are all available from Farinon.

For price and delivery information, contact Farinon Electric, 1691 Bayport Avenue, San Carlos, California 94070, (415) 592-4120.

Anixter-Mark's
Antenna in Demand

Anixter-Mark's 12-foot Grid Parabolic Antenna incorporates the latest features of other size ring-back grid antennas, plus a new three point mount (VMR - 60) designed specifically for this antenna to allow ease of installation.

Simplification of alignment is due to the fine azimuth adjust located on a stiff arm attached to the outside rim of the antenna.



In addition to installation and alignment ease, antenna efficiency is a minimum of 55 percent; cross polarization discrimination is typically at 35 to 40 dB at 0 degrees azimuth and windload characteristics are 25 percent (below 1000 MHz) and 40 percent (above 1000 MHz) of an equivalent solid parabola.

The multi-element Grid Parabola is available in both pressurized and non-pressurized versions with 7/8-inch EIA termination or type "N" female (non-pressurized only). Heated models are also available where de-icing is a requirement.

For further information, contact Edward N. Lamarre, Anixter-Mark, P.O. Box 123, Skokie, Illinois 60076, (312) 675-1500.

Extended Warranty on
AML Klystrons Offered by Hughes

Hughes Aircraft Company's microwave communications products is now offering an optional warranty extension on the klystron tubes used in its AML microwave local distribution system, doubling the duration of the warranty from one year to two.

A.H. Sonnenschein, AML manager at Hughes, said that the warranty extension has been made possible by the low failure rates for the klystrons experienced in the field. He stated that the current estimate for mean useful life of the all-metal-and-ceramic tube is more than eight years.

Sonnenschein pointed out that the tubes used in the AML equipment are produced in the same plant, using the same techniques and personnel, as Hughes' ultra-reliable space tubes widely employed in communications satellites. He added that as more statistics become available, further warranty extensions will probably be offered to AML users.

Cost of the new optional warranty extension will be ten percent of the cost of replacement tubes, and the option must be purchased prior to delivery of the original system or tube. AML multichannel transmitters employ one klystron tube for up to eight channels, while high-power transmitters employ one klystron per channel.

For more information, contact Hughes Aircraft Company, Microwave Communications Products, P.O. Box 2999, Torrance, California 90509, (213) 534-2146.

Miscellaneous

New Field Shop
Sets Up in Minutes

The new king size Ground Tent by Pensue Company will be displayed at the International Construction and Utility Equipment Exposition (ICUEE 79) in Olathe, Kansas August 28-30, 1979. The 18 foot x 18 foot x 18 foot giant field shop can be set up by four men in less than two minutes. The unit features heavy duty coated nylon fabric permanently attached to a unique snap-fold fiberglass frame. The unit also comes in 6 foot x 5 foot and 8 foot

x 8 foot models that can be set up by one man in seconds.

For more details, call David R. Creel at (312) 986-9402.

Wide Band
Features Fixed Bridges

Wide Band Engineering Company, Inc., has expanded its line of RF impedance bridges to include two fixed bridges with a range of 1-900 MHz. These devices are the A57U with RF In, RF Out, test, and reference ports and the A57TU which is internally terminated. All other specifications are identical to those for the A57 and A57T bridges. Impedance is 50 or 75 ohms with BNC connectors. The price is $295 with delivery four weeks ARO.

For more details, contact Wide Band Engineering Company, Inc., P.O. Box 21652, Phoenix, Arizona 85036, (602) 254-1570.

Video

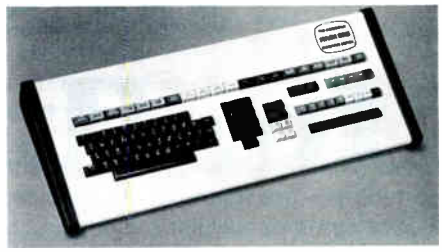
Mach One
Videotape Editing System

A computerized videotape editing system that provides a full range of editing capabilities previously unavailable in competitive systems has been introduced by Mach One Digital Systems, Inc.

The Mach One system performs off-line editing, on-line editing, text editing and assembly (autoedit) functions. This versatility allows the user complete flexibility of operation.

At the heart of the Mach One system is a DEC LSI-11 computer. This powerful processor is programmed to control nearly any configuration of switchers and two-inch quad, one-inch or three-fourths-inch videotape recorders. The single-rack-mounted electronics are instantly expandable to upgrade the system from a simple, two-VTR cuts only to a fully-equipped six VTR system.

The operator's control panel provides quick, accurate and convenient setup of audio and/or video transitions. The dedicated keyboard offers many one-button commands which eliminate non-essential computer

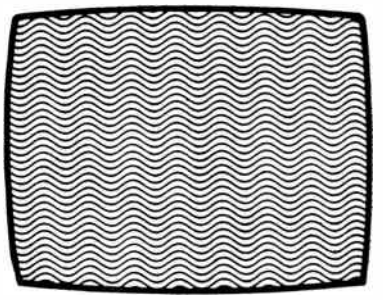


communication. Tentative edits are entered into a decision list for preview, modification or recording. Any list entry is instantly accessible for review or modification. Insertions or deletions may be made at any time with completely automatic recomputation of all record times and the total duration. System status, together with the complete decision list, is viewable at the operator's console monitor.

Complete technical information is available from Mach One Digital Systems, 3515 Cahuenga Blvd. West, Los Angeles, California 90068, (213) 851-3211.

K_U Satellite Band and Heat Shrinkable Tubing

Q I understand there is another band of frequencies for satellite use called the K_U band. Where is this band and and can I use my present earth station equipment to receive those signals?



A The band of frequencies you are probably referring to is in the K band, not the "u" subband, but rather the "p" subband and covers 11.45 GHz to 12.2 GHz.

Presently, CATV TVRO's are using 3.7 GHz to 4.2 GHz or the S_h and S_z bands. This band is also known as the C band.

The active components of your system are unuseable at those higher frequencies and would require replacement. The antenna, on the other hand, being the passive device it is, can function at all frequencies from sound to light. But, and this is a big but, irregularities in the antennas' reflecting surface may be so great as to cause phase distortions in the received K band signal, thereby distorting the demodulated signal.

The cable industry is a long way from using the K band, whereas the international satellites will start using it in a year or so. Look for a five-year wait for the cable industry's entry into the K band.

Q I have heard varying opinions on the use of heat shrinkable tubing's effectiveness in waterproofing connectors. I also have had some successes and some failures myself. How effective is this technique?

A Heat shrinkable tubing is very effective in preventing water contamination of connectors if it is installed properly. Most problems with failures of the tubing to prevent water intrusion are caused by improper installation, and the rest are caused by misjudging the source of water entrance. Heat shrinkable tubing must be shrunk evenly by applying heat uniformly around the entire tube. The mastic, or sealant, on the inside of the tubing should flow out of the end at the connector when the tubing is fully contracted. The thickness of the end of the tube should be uniform around the entire circumference.

If the tubing is not uniformly shrunk, as in diagram B, water may seep between the tubing and connector where the tubing is thin, or not fully contracted. If the tubing is shrunk evenly with the mastic flowing evenly around the entire circumference of the connector, it is virtually impossible for water to penetrate.

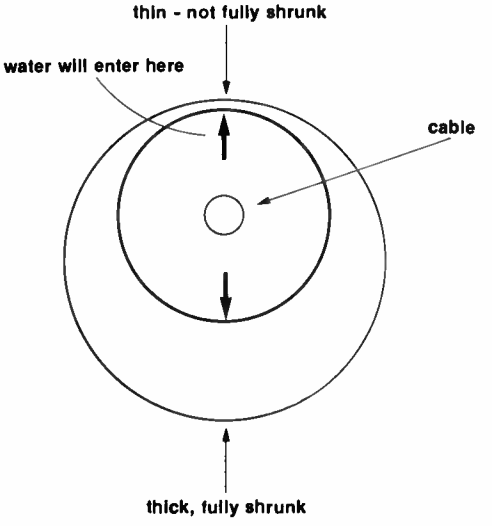


Diagram B

It is sometimes necessary to shrink the end of the tubing while holding the tube against the housing, letting it cool before finishing the job. This prevents slippage of the tube back down the connector, away from the housing.

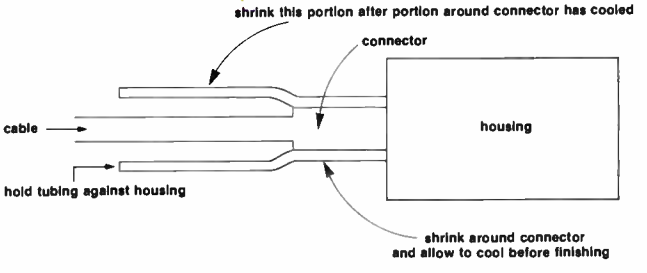


Diagram C

Water contamination has sometimes been blamed on shrink tubing failure where the water actually penetrated the connector via a housing or through cables such as polystyrene dielectric cable types which will pass water. This is simply a case of misjudging the source of contamination.

One word of caution—do not overheat the tubing. Take your time and shrink the tubing slowly and evenly, not allowing the heat to build up to the point where the cable dielectric is damaged. This is particularly important where polystyrene dielectric cables are used.

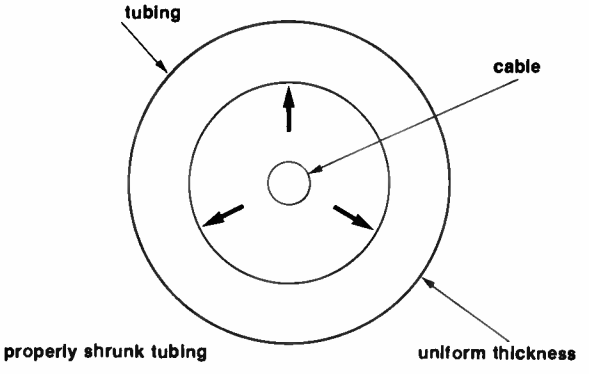


Diagram A.

Employment Oppt.

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We are an employer-paid personnel service organization maintaining data on positions and personnel available nationwide. Call or write for our free "Top Job Candidates" or "Job Opportunities" bulletins. Confidential services. Licensed by the California Bureau of Employment Agencies.

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PERSONNEL SERVICE
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CHALLENGING OPPORTUNITY CHIEF TECHNICIAN

Small growing independently owned cable TV company seeking chief technician with microwave experience in beautiful Playa-Del-Rey, California to aid in construction and maintenance of entirely new system. Candidate should have at least 3 years experience, prefer 2nd Class FCC license. Send resume and salary requirements to:

B.E. Czarnecki
7949 Ramsgate Avenue
Los Angeles, CA 90045

CONTRACT INSTALLERS

Needed in Texas area. Must have own tools and truck. Contact:

Herb Jackson
Cable Tech Services, Inc.
802 Brown Building
Austin, TX 78701
512-478-1476

TECHNICAL ENGINEER

Experienced cable operator is desirous of adding an experienced technical supervisor to a progressive management team. This individual must possess strong technical and management qualities. This top 50 CATV market is in a desirable Northeast location. Salary and excellent benefit package available to qualified individuals.

Send resumes with salary requirements to Box CED-0479-1, c/o C-ED, 1139 Delaware Plaza, Denver, CO 80204.

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REGIONAL ENGINEER

Travel in the Midwest. Assist new and existing systems, including FCC proofs. Some microwave and earth station work which requires FCC license. Construction knowledge important. Immediate opening. Call or write:

Art Hutzler
515-245-7585
Heritage Communications, Inc.
2195 Ingersoll Avenue
Des Moines, IA 50312
E.O. E. M/F

SYSTEM ENGINEERS

Fast growing cable television system near Princeton, New Jersey, needs experienced technicians to supervise construction of cable plant and microwave/satellite installation. Responsibilities will include on-site system inspections. Salary commensurate with experience. Please call or write J.F. McCarthy, Princeton Cablevision, Inc., P.O. Box 2329, Princeton, NJ 08540 (609) 924-1199.

CATV CIRCUIT DESIGNER

Theta-Com CATV is looking for a few good designers to enjoy the warm sunshine and design state-of-the-art CATV equipment including fiberoptics, digital switching, VHF and microwave innovations. Prefer 3 to 5 years experience in CATV and related fields. Salary commensurate with experience. Send resume to:

Employer Relations
Theta-Com
P.O. Box 27548
Phoenix, AZ 85061

MICROWAVE/MAINTENANCE TECH WANTED

Need experience person to maintain (2) headends and perform preventive maintenance on 280 mile system. FCC 2nd class license a must. Contact:

Elliot C. Roskow
Coastal Cable TV
791 Long Hill Road
Groton, CT 06340
203-445-8116

CHALLENGING OPPORTUNITIES AVAILABLE

Young and very aggressive MSO located in Tennessee, Kentucky and Virginia area has positions for aggressive self-starters desiring career advancement.

***SYSTEM TECHS**-Responsibilities to include customer services, trunk and distribution operations, some tower and small in-house extensions. Craftsmanship a must.

***INSTALLERS**-Contract and permanent positions available. Detail and thoroughness a must. Consistent and coordinated work.

Excellent benefits and quality working conditions. Opportunity for excellent compensation based on your contribution to company growth. Send resume with salary history, call today:

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VICE-PRESIDENT, OPERATIONS
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COME TO BALTIMORE ON THE CHESAPEAKE BAY

Locally owned company just starting to build a 2000 mile modern two-way system. Ground floor opportunities.

Needed: Installer Techs; Service Techs; Maintenance Techs; Chief Techs; Specialists in underground and/or apartment house installation.

If you are a self-starter, are proud of your abilities, like to work, and are at a "dead-end" where you are—we'd like to hear from you.

Send detailed resume to me. Mark "PERSONAL." Information will be kept confidential.

James B. Wright, Engr. Mgr.
Calvert TeleCommunications Corp.
7148 Ambassador Road
Baltimore, Maryland 21207

DESIGNER—CATV

Rapidly expanding communications firm has an opening for a CATV system designer.

Individual should have at least one year of CATV system design experience and have the ability to rapidly analyze the various factors in a design situation. Any experience with computer aided design would be very helpful but not required.

A comprehensive benefits package, excellent working conditions, and an opportunity to work with top professionals are offered. Send resume, including salary history and requirements to:

Personnel Department
AMERICAN TELEVISION & COMMUNICATIONS CORP.
#20 Inverness Place East
Englewood, Colorado 80112

Equal Opportunity Employer M/F

EXPERIENCED CATV PERSONNEL

UA-Columbia Cablevision of Texas, Inc. has immediate openings in San Antonio, Texas for experienced CATV personnel. If you would like to get in on the ground floor of a new 3,000 mile, 35 channel, bi-directional system offering an exciting opportunity for advancement and growth, we are interested in hearing from you. Good salary and excellent benefit package.

Positions available:

District Engineers
Microwave Engineers
Senior Technicians
Construction and Installation Foremen

Experienced personnel should send resume to:

Personnel Director,
UA-Columbia Cablevision of Texas, Inc.
203 South Broadway
San Antonio, Texas 78205

CATV INSTALLERS

Largest New Jersey contractor seeks reliable and industrious craftsmen. $12.00 per drop and high completion incentive plus foul weather pay equals the best subcontractor package in the area. Immediate openings. Send resume in confidence to:

Superior CATV Installers
11 Forest Street
Livingston, NJ 07039

CONSTRUCTION COORDINATOR

Enjoy beautiful weather, educational opportunities, career advancement with North Carolina's largest MSO. Cablevision of Greensboro is looking for a construction coordinator to supervise and coordinate approximately 250 miles of construction to be completed by 1982. Good salary and excellent benefit package. Send resume and salary requirements to:

Cablevision of Greensboro
P.O. Box 5487
Greensboro, NC 27403
Attn: David Miller

CONSTRUCTION

American Television and Communications is organizing its own construction division and needs linemen and splicers. We are a major MSO offering competitive salaries and an excellent benefits package. Work will be steady, with no down time. Applicants must be willing to travel and relocate frequently. Please send resume, salary history and salary requirements to:

Personnel Department
American Television and Communications Corp.
20 Inverness Place East
Englewood, CO 80112

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CONSTRUCTION PERSONNEL

Springtime in the Rockies, we need good construction people for several turnkey projects. Pay will match ability. Call 406-722-4855. Kable Constructers Company in Alberton, Montana, 59820

Equipment For Sale

FOR SALE

1 each Weather Scan III, 3 years old, consists of wind direction and velocity clock, barometric pressure, temperature, 4 card inserts. 2 each Sony AVC-1400 cameras. 1 each Data Media Model 70 color character generator, dual channel with remotable CRT keyboard, 3 years old. 1 each CATEL WRX-200 weather receiver, rack mounted with 162.55 mega hertz crystal installed, 2 years old. All of the above equipment in excellent condition , operational and will be sold separately or as a total package. Contact:

Chief Engineer
Valparaiso Communications System
44 S. View Avenue
Valpariso, FL 32580
904-678-2922

FOR SALE

Used RH Tyler weather scans with cameras. Contact Purchasing, 303-770-7500.

FOR SALE

NEW 60 VOLT AC, 14 AMP, REMOTE POWER SUPPLY CLOSE OUT UNITS

Keystone 60 VAC Remote Power Supply provides 14 Amp square wave output. The power supply can be pole or cross-arm mounted. The internal duplexer permits inline installation, or an external power duplexer can be employed. The power supply can accommodate a Time Delay Relay to delay the application of primary power until all transients and surges have ceased or have decayed to a low level. The removable front panel allows access to circuit breaker, convenience outlet and current test point. External test point monitors the output voltage.

Call Keystone Electronics Corp.
(201) 869-3679

FOR SALE

Sony VO-1600 VTR, excellent condition with tuner/amplifier. 6 tapes. $650.00. Call 616-947-0805.

Business Directory

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Payable in advance. Visa, Master Charge, check or money order will be accepted. (Billing charge $1.00 additional.)

When placing an ad, indicate the exact category desired: Help Wanted, Position Wanted, Professional Services, Business Directory, etc. If this information is omitted, we will determine the appropriate category according to the copy.

Deadline is two weeks prior to cover date. Orders will be accepted by written confirmation or taken over the phone.

Replies with Blind Box numbers should be addressed to (Box Number) c/o C-ED Magazine, 1139 Delaware Denver, Colorado 80204.

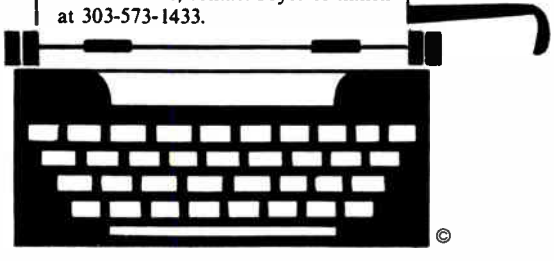
Rates: $25.00 per column inch. Minimum order one inch.

For further information or to place your classified advertisement, contact Joyce Hemmen at (303) 573-1433.

Ad Index

TO: The Cable Television Industry
FROM: C-ED Magazine
SUBJECT: Prepayment of Classified Advertising

We are pleased to announce a new easier method to prepay for classified advertising. Effective immediately you can use your Master Charge or Visa cards to pay for this service. All classifieds must be prepaid in advance. Of course, check or money order will still be accepted. For further details, contact Joyce Hemmen at 303-573-1433.



WE CAN NOW SUPPLY INTELLIGENT TAPS FOR HOME RUN, LOOP THROUGH OR PAY ONLY SERVICES

Loop through systems choose IT-1

Wall mounted IT-1s each have a unique address, programmed prior to installation, enabling the service to be controlled from one central location. Each IT-1 can be monitored to verify correct operation, allowing detection of units which have been removed or tampered with. Mechanical security is offered using tamper proof screws. One cable carries signal, power and control signals.

- **Requires only one cable for operation**
- **Individual control on loop system without access problems**
- **Fits any single gang electrical box**
- **Stainless steel plate**
- **Tamper detection circuitry**
- **Compatible with pay services**
- **3 remote control options to suit any operational requirement**
- **Standby memory power maintains system conditions during AC power outages**

Pay only systems choose IT-1G

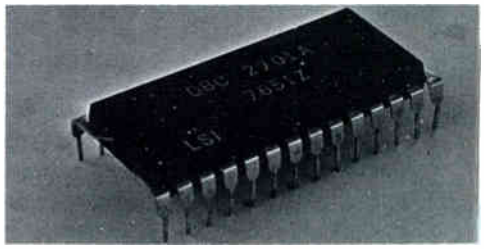
These tap offs provide switching of one pay channel within a wall plate. Basic service is passed uninterrupted. The IT-1G is ideal for MDS, hotels and motels, where basic service is optional. Other features are identical to those of the IT-1.

- **Requires only one cable for operation**
- **Designed for hotel and motel loop through systems**
- **Basic service uninterrupted**
- **One switchable pay channel**
- **Other features similar to our field proven IT-1**

Home run systems choose IT-6

The IT-6 provides six indepentdently switchable outputs from one common input. Multi-input options are available. Designed for home run apartment distribution and pay systems. Each port has a unique address. Combine IT-6s to provide an unlimited number of pay channels or multi-tier services. Control existing home run systems by installing our IT6-6 in series with existing wiring. Contol two services to one customer with our IT6-3.

- **Remote or local control of multi-tier systems**
- **Each output fully addressable**
- **Pay service options**
- **Lowpower consumption**
- **Combine units to provide unlimited pay or multi-tier service**
- **Standby memory power maintains system condition during AC power outages**



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★ Edward J. Holton, president and general manager of **General Cable Corporation's Wire and Cable Division,** has announced the appointment of **Irving Kolodny** as vice president - Research and Technical Services, of the Division's Communications Products Operation. Kolodny most recently served as the Operation's vice president - director of Application Engineering. He joined the Application Engineering group of the company in 1947, and has since held various engineering and communications management positions.

★ **Frank J. Bias** has been named vice president-Science and Technology by the Office of the Chief Executive of **Viacom International Inc.** Bias, in reporting to the Office of the Chief Executive, will be responsible for all aspects of technological research, development, engineering and planning for Viacom and will also assist the company's operating entities in all technical areas of broadcasting, cable television, pay cable and television program production and distribution. Prior to his appointment, Bias was vice president-Engineering, Viacom Communications, the company's cable television division. Bias joined Viacom in 1971 at inception as director of Transmission Engineering. He was named vice president-Engineering in July, 1977.

Frank J. Bias

★ **Gene Swithenbank** of Chico, California, has been promoted to western regional sales manager for the **Comm/Scope Company**, a major manufacturer of coaxial cable for the CATV industry. Swithenbank will also continue to serve as sales manager for the states of California, Utah, Arizona, Nevada and Hawaii. He has an educational background in electronics and formerly worked as a senior technician, superintendent of underground plant, overhead supervisor and field operations manager for a number of cable TV companies.

Gene Swithenbank

★ **R. Martin Eggerts** has been appointed to the position of product planning manager by **Blonder-Tongue Laboratories, Inc.**, Old Bridge, New Jersey. Eggerts joined the company in 1963 as senior electronic technician and has held several technical and product development positions prior to his most recent promotion.

★ **Frank Brown** has been named manager of Engineering for **Sony Video Products Company's Broadcast Division.** Brown, in his new post, will be responsible for the development of an engineering group for Sony Broadcast and the management of national parts distribution. Prior to his appointment, Brown served 18 years with Ampex Corporation, where most recently he was manager of Sustaining Engineering. Brown will be based in Sony's Palo Alto headquarters.

Frank Brown

CCTA Technical Paper Abstracts

The 22nd Annual Canadian Cable Television Association convention, trade show and videotheque will be held April 2-5 at the Sheraton-Centre Hotel in Toronto, Canada.

The following abstracts are from technical papers that will be presented at the convention.

"Teletext/Videotex—Additional New Services for Cable" by Sammy F.H. Ting, Cablesystems Engineering.

Teletext and Videotex are new information services for home and business. Developed only a few years ago, they have attained widespread attention in many countries, especially in Europe.

This paper attempts to draw a wider interest in these potentially prominent cable services, yet practically unknown to many cable operators.

"An Advanced Microprocessor Based CATV Status Monitor System" by E.S. Walker, T.M. Alldread, Manitoba Telephone System.

The conventional methods of troubleshooting CATV trunk plant and monitoring system levels have, to date, been less than optimum; requiring a considerable amount of field testing and dependence on subscriber trouble reports. The need exists for an automated status monitoring system on a large CATV system to readily pinpoint fault conditions and maintain a continuous and accurate record of transmission performance.

This paper describes a sophisticated microprocessor based status monitor developed for the Manitoba Telephone System for use on their medium haul intercity broadband network for CATV delivery.

"Installation and Operation of the BCN Fibreoptic Link in London, Ontario" by Donald G. Monteith, Cableystems Engineering and Joseph W. Proctor, Canstar Communications.

A description of the installation and operation of the BCN fiberoptic supertrunk is presented.

The link has the capacity to transmit 15 TV channels and 12 FM stereo broadcast signals employing digital modulation at 322 Mbit/sec.

Emphasis is placed, with the aid of a videotape presentation, on describing cable installation practices, splicing and connectorization techniques and field maintenance procedures. Technical performance and reliability data of the link are also presented.

"CATV Service for Rural Canada With Integrated Distribution Systems" by Keith Y. Chang, Arne Lillemark and George Cormack, Department of Communications.

In this paper, it is shown that the penetration of CATV service into rural areas could be significantly increased with the use of a single integrated coaxial cable or fiberoptic distribution system.

"An Optoelectronic Crosspoint Switch for Centrally Switched Distribution of Television Signals" by Elmer H. Hara and R. Ian MacDonald, Department of Communications.

A crosspoint switch using a PIN photodiode is described and its performance reported. The switch has a broad frequency response extending up to and beyond 245 MHz, and has an isolation better than 80 dB. Application of the switch to centrally switched systems for delivery of analog and digital communications signals is discussed.

"The Design of Satellite Receive Terminals for CATV Use" by Howard A. Grant, SED Systems Ltd.

Specifications appropriate to CATV distribution by satellite are presented. These specifications are compared to traditional earth station specifications and the effect of the specifications on the cost is examined.

Earth terminal configuration for multi-channel operation are presented with their advantages and disadvantages. The system, which is considered as the optimum configuration, is described in some detail.

"Required Signal-to-Noise Ratio for Satellite Feed to Cable Television Systems" by Norman P. Weinhouse, Hughes Aircraft Company.

This paper makes an analysis of the situation and presents recommendations based on present day standards, available test equipment and practical measurement methods.

"Delivery of TV Via Satellite—The Canadian Reality" by A.D.D. Miller, Miller Communications Systems Ltd.

This paper explores the developing Canadian satellite systems offering commercial service with a view to exposing the delivery system options for distribution of a multi-signal package of TV signals. The paper also examines the tradeoffs between space and ground sector costs and comments on system configuration options.

"Headend Signal Switching Techniques" by James O. Farmer, Scientific-Atlanta Inc.

Several methods exist for actuating a switching operation, ranging from manual to automatic detection of program coincidence, to activation upon loss of one input. A number of case histories are examined to illustrate differing switching designs.

"Gold in Those Walls: A Myth Destroyed" by C. Boeyen, C.Bowing and Y. Fortier.

The classical and split concepts for conduit are explained. Some costs to the owner and cable operator are provided for these concepts. The need for boxes and distribution point are also detailed.

"Cross-Modulation in the Time and Frequency Domains" by Paul K. Wong, Department of Communications.

This paper reviews the definitions of amplitude cross-modulation in the time and frequency domains with respect to modulation depths of the video carrier.

BRAIN BOX

We can put up to 40 channels right in the palm of your subscriber's hand.

With a simple 12-button keyboard he can select the channel of his choice and see his selection on an LED display. He can program up to 10 channels in the memory system and recall them at the touch of a button.

The sealed-touch keyboard solves the problems of mechanical contacts, and a crystal-controlled frequency synthesizer eliminates fine-tuning circuitry and converter drift.

There's an on/off remote option — and more important to you — there's a hard-security option that gives up to three channels of tiered, premium programming.

And the hand-held remote control unit is rugged. It can survive drops and jolts that could send it to the repair shop. Even the tough detachable control cord can be easily replaced by the subscriber. There's less need for service calls.

Our box is an easy way to expand your service and revenue. All you have to do is use our brains.

To find out how, contact your area salesman, or call toll free (800) 351-6010 within the continental United States except Texas. From Alaska, Hawaii or Texas, dial (915) 544-7550. Ask for Ray Pawley.

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