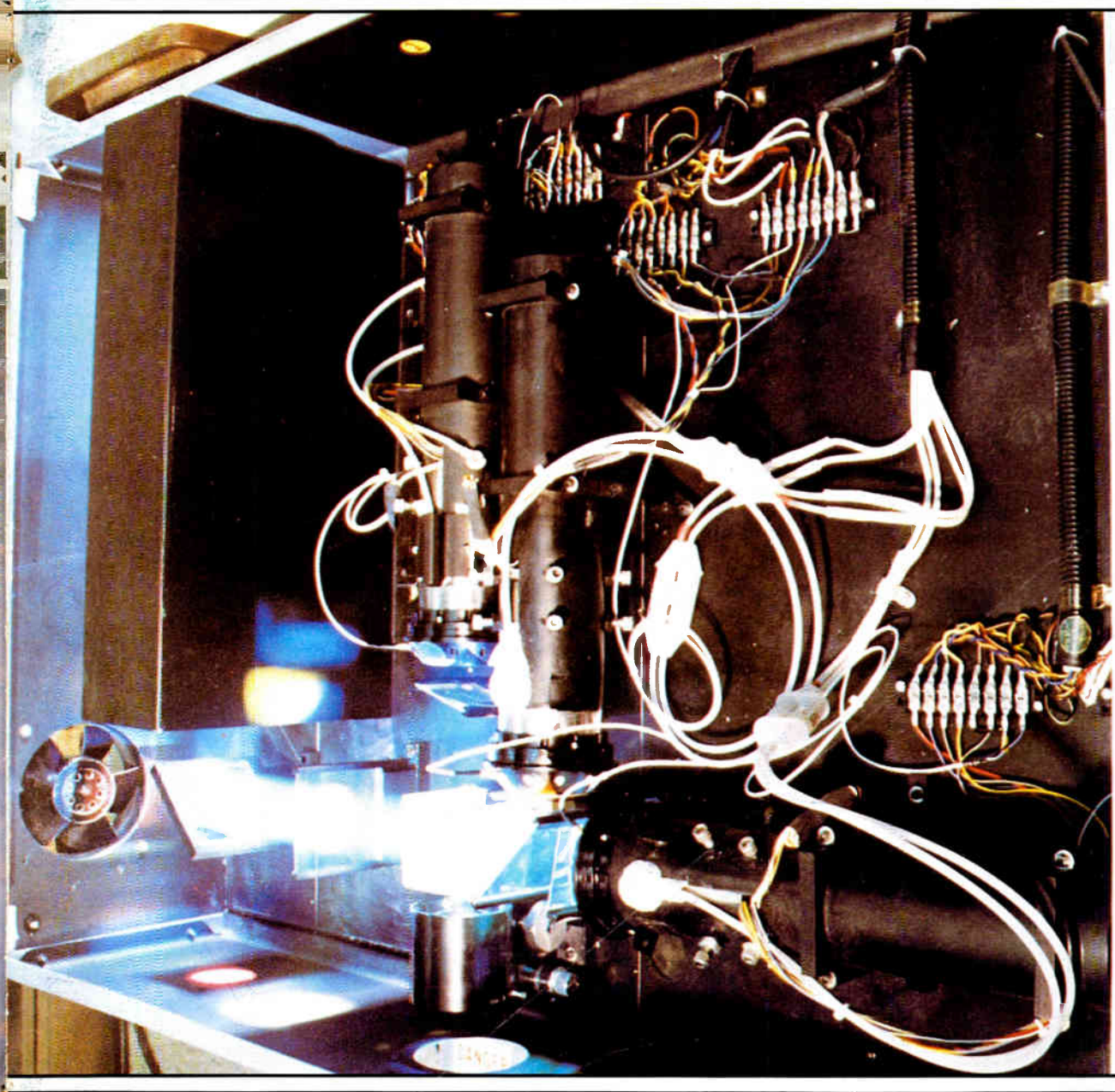
C-ED

Light Years Beyond the CRT
Video Technology in Stand-Alones
A Time Compression Multiplex System



Communications-Engineering Digest
Reporting the Technologies of Broadband Communications

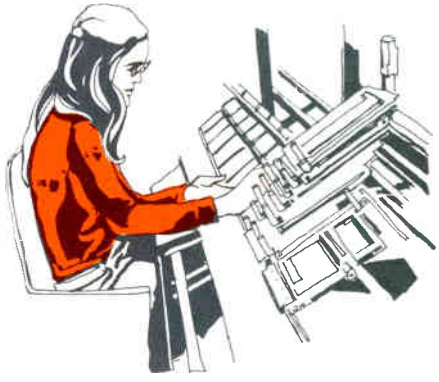
April 1978
Volume 4, No. 4

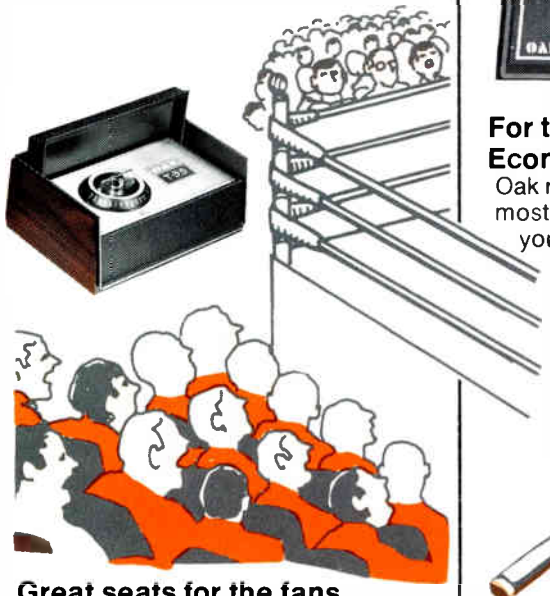
The Oak one-two punch... a knockout for profits!

This is the Trimline II— a champion 35-channel AFC converter.

It's a high quality unit with the toughness and versatility to meet the varying operational parameters of cable systems. It has wide dynamic range and high selectivity to defend against such opponents as cross-modulation and adjacent-channel interference—even at high input levels.

We build them in our plants. All Oak CATV products are made in company-owned facilities. We have a commitment to our customers and we back it up with prompt delivery and rapid service turnaround.



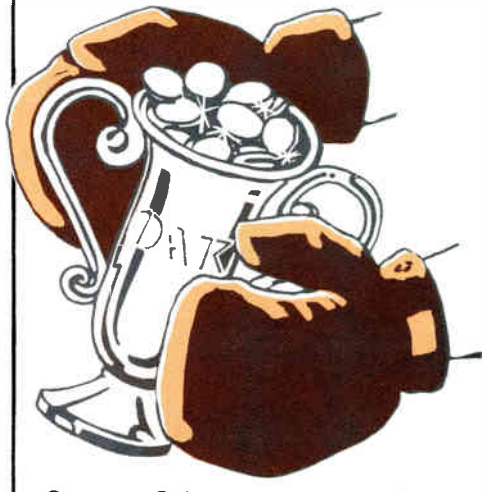


Great seats for the fans. You can offer your fans the convenience of set-top or remote "Jewel Case" operation. In either event, a built-in Automatic Frequency Control eliminates the fine tuning shuffle. The Trimline II is also available with an optional self-contained descrambler for premium programming with unbeatable security.

For the twelve rounders, Econobloc adds seven more. Oak ranks the Econobloc as the most economical way to expand your 12-channel system. Mid-band channels A to G convert to channels 7 to 13. Econobloc converters live up to their name by giving you a block of seven mid-band channels at an economical price.

The initial cost of a converter is only round one. Before you score the totals, ask yourself where and how the product is made, and by whom. Remember, reliability counts. The reliability of the Oak product stems from our control over the total production process.

The winner...Oak!



Compare Oak converters with all other contenders...but remember that there's more to the comparison than just the "black box." Market leadership and technological expertise are your assurance that the Oak Trimline II and Econobloc converters will go the distance. Oak converters are winners and your profit-wise choice.

OAK Industries Inc.

CATV DIVISION/CRYSTAL LAKE, ILLINOIS 60014

TELEPHONE: 815-459-5000 TWX: 910-634-3353

C-ED News at a Glance

WASHINGTON, D.C.—**NCTA maintains** the **"intuitive model" which has served as** the **Federal Communications Commission's basis of regulation is** an **"innaccurate** representation of the relationship between cable and broadcasting." See *C-ED* "NCTA Comments on FCC Economic Inquiry," on page 14.

WASHINGTON, D.C.—On April 11, Robert Powers of the **FCC** has **tentatively scheduled** a **meeting with** the **FCC, FAA and** the **cable industry** (NCTA), **to discuss** their joint research project on **cable signal leakage.**

WASHINGTON, D.C.—**NCTA will file a petition to delete** the present **rules requiring CARS microwave** facilities **to shut down** if a television station is not being broadcast. See *C-ED* page 14.

WASHINGTON, D.C.—The **date for** filing **comments on** the expansion of the **CARS allocations**, docket 21505, has been **extended to May 12.** NCTA is encouraging individuals to send their comments to Robert Luff, vice-president of engineering for NCTA.

WASHINGTON, D.C.—The **National Association of Broadcasters** has **urged** the **FCC to continue to require cable** television systems **to carry all local broadcast signals** and to consider waivers from these rules only on a case-by-case basis. See *C-ED* page 14.

WASHINGTON, D.C.—The rapid **growth of citizens band operators may cause** some **problems for cable operators** carrying channels 2, 5 and 6. A total of 12.2 million licensed citizen band operators at the end of 1977 was reported by the FCC's radio division. See *C-ED* page 16.

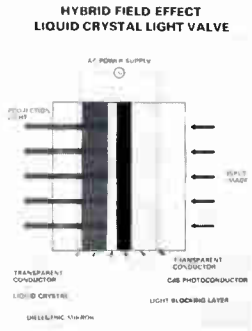
WASHINGTON, D.C.—The **NCTA board of directors** has **approved** the **addition of one staff person for** Robert Luff's **engineering department**. Luff, vp of NCTA, travels extensively across the country while contributing to almost every NCTA comment and legal action presented before the FCC. As *C-ED* goes to press, no selection has been made.

WASHINGTON, D.C.—**Cliff Paul** will try **to fill in the gap at the FCC** left by Ray Daly and Jim Goodwyn. Paul is now the only engineer in the FCC's microwave division.

Communications-Engineering Digest is published monthly for the Society of Cable Television Engineers by Titsch Publishing, Inc., 1139 Delaware Plaza, P.O. Box 4305, Denver, CO 80204© April 1978. Controlled circulation postage paid at Denver, Colorado

Inside C-ED

Page 7



Page 37

Page 40

FEATURES

DEPARTMENTS

OPINION

Cover: April's cover is a photograph of the liquid crystal light valve, provided courtesy of Dr. Alex Jacobson. His story on the LCLV is on page 32.

Titsch Publishing, Inc.
1139 Delaware Street
-or- P.O. Box 4305
Denver, Colorado 80204
(303) 573-1433

Washington Bureau
P.O. Box 19268
Washington, D.C. 20036
(202) 892-4200

New York Bureau
4 Duncan Road
Hohokus, New Jersey 07423
(201) 444-8929

Editor's Letter

This April issue offers a prelude to this month's National Cable Television Association convention in New Orleans. The technical sessions, which we've listed in our "News" department, shape up to be the best ever. And when combined with the efforts of Ken Gunter and NCTA engineering vice president Robert Luff to display cable artifacts from days way back when, well, it all portends an outstanding show for cable's 30th year.

C-ED this month also features several video developments. We'd like to thank Digital Communications for its paper on the exciting prospects of putting two video channels on a single satellite transponder. Part One can be found on page 22; the remainder of the paper will follow in our May issue. Also, we know you'll find the story by CRC Electronics' Jim Chiddix on cable system stand-alones very informative. And there's a fascinating piece by Dr. Alex Jacobson on the liquid crystal light valve. It starts on page 32.

Just a quick word about last month's SCTE/IEEE annual reliability conference in St. Louis . . . Hats off to Frank Bias and Archer Taylor, Bob Bilodeau and everyone else who put together one great conference. We can't wait for next year's show.

Finally . . . next month's *C-ED*, which will be our NCTA convention issue, holds some surprises for you. Be sure to get your copy early at the show. We're sure it will be a winner.

Paul A. FitzPatrick

Why Not UHF Distribution On Cable?

By Richard G. Covell
Manager. Technical Sales Support
GTE Sylvania
El Paso. Texas

Cable manufacturers will have to improve the return loss of their product at these higher UHF frequencies, but it wasn't too long ago I remember being severely chastised for painting large red "NFGs" on the sides of cable reels that couldn't meet a 26 dB return loss from 50 to 220 MHz! We've come a long way.

It will be more difficult to meet an 18 dB return loss (RL) for active and passive devices with our present method of interfacing with the cable; however, the higher cable attenuation for unit length will afford greater isolation between such devices and tend to lessen the effects of poor RL.

About the time I was artistically decorating the sides of cable reels, I envisioned cable attenuation at channel 83 as being something really high. I never attached a number to it, it was just "high" and therefore wasn't suitable to cable television. It did not matter that MATV systems had been carrying UHF channels on RG/59 for years.

Well, if the truth be known, attenuation of a coaxial cable at 890 MHz is less than twice that at 300 MHz, which is a lot less than those of us (namely, me) had assumed before we took the trouble to work it out. Sure, we'll need more amplification to cover a given distance with a given cable, but today we have FM modulators and demodulators to use with our present coax or fiberoptics (single channel per fiber), either of which will allow us to connect a headend to a hub with negligible effect on picture quality. The addition of hubs will allow us to keep the cascade of UHF amplifiers to an acceptable number, and to also achieve the greater reliability the multiple hub concept can offer.

Why would we want to consider moving from a typical 35 channel, 50 to 300 MHz to one at UHF frequencies? First of all, in some cases we may no longer use all 35 channels due to the potential of interference of aircraft navigation and voice frequencies. Another channel or two may be unusable due to direct pickup interference. With 70 channels available between 470 and 890 MHz, there is plenty of capacity to pick up the channels you want. There is no interference with aircraft frequencies and with less than one octave of bandwidth, not only is equalization and slope easier to control, tap level versus frequency remains flatter in all parts of the system.

Each channel in the UHF spectrum is spaced 6 MHz apart and HRC (Harmonically Related Carrier) operation is easier to institute, if desired.

This reasoning which really make this concept viable, provided the TV manufacturers improve the image rejection of their UHF tuners, is the operator's ability to provide 30, 40, 50, or more channels without the need to provide converters! That's an up-front savings of $2,000 per mile, a maintenance savings of $200 per mile per year, and another $200 per mile per year you did not lose with walk-aways.

Am I missing something or is that a good deal?

SCTE and NCTA To Co-Sponsor Hands-On Session At New Orleans Convention

NEW ORLEANS, LOUISIANA—A hands-on demonstration, chaired by Ralph Haimowitz of Indian River Cablevision, will be held Wednesday morning, May 3 from 8:15 am-11:45 am at the NCTA Convention. There will be a total of 19 applications where the attendees will have the opportunity to actually use the equipment under the guidance of an instructor.

Seven participating NCTA associates will speak on his particular piece of equipment—each piece of equipment being a different type. The associates and their topics will feature John Weeks, Avantek, "Time Delay Reflectometer"; Bob Welsh, Wavetek, "Systems Sweep Equipment"; Larry Dolan, Midstate, "Signal Level Meters"; Carl Hensley, Comsonics, "Radiation Leakage Detector"; Cliff Schrock, Tektronix, "Oscilloscopes"; Harry Sadel, Sadelco, "White Noise Calibrator"; and a representative from Texscan on "Spectrum Analyzers—Microwave Converters."

No Snow Job at SCTE/IEEE Conference

ST. LOUIS, MISSOURI—The Holiday Inn West in St. Louis, Missouri was completely sold out March 6-8. The reason: overwhelming registration for the third annual SCTE-IEEE Conference on CATV Reliability. Conference co-chairmen Archer Taylor and Frank Bias, representing IEEE and SCTE respectively, chose some of the most knowledgeable members of the CATV industry to participate in the technical sessions.

Participants were all ears during the two-day technical conference.

Moderators included such notables as Alex Best, Scientific-Atlanta; Gayheart Kleykamp, UA-Columbia Cablevision; Frank Bias, Viacom; James Stilwell, Communications Properties, Inc.; and Robert Bilodeau, Suburban Cablevision.

Topics ranged from *system design, components and reliability*, to *system reliability through redundancy and design, to plant reliability, aspects of bonding and grounding*. Panelists included Bill Ellias, Sangamo, Inc.; Joseph Preschutti, C-COR Electronics, Inc.; Don Peterson, GE Cablevision Corp.; Eric Winston, Jerrold Electronics Corp.; and James Stilwell, Communications Properties, Inc., just to name a few.

The highlight of the two-day conference was probably the tenth annual SCTE membership meeting held during lunch on March 8. Jim Grabenstein, chief engineer of Potomac Valley TV in Cumberland, Maryland received the 1978 SCTE "Member of the Year" award and SCTE's 77 charter members received plaques citing their continued support of that organization. Finally, the officers and directors of SCTE for 1978-79 were introduced.

Glenn Chambers, (right) 1976 SCTE Member of the Year, presents the 1978 Member of the Year award to Jim Grabenstein.

Historymaking in Canada

ONTARIO, CANADA—According to the Canadian Cable Television Association, one-third of all Canadian cable subscribers are receiving proceedings from the Canadian House of Commons either live or by tape delay. Four cable systems in the Ottowa region receive live coverage, 33 receive videotape and 21 additional systems are on the waiting list for coverage when additional VTR facilities are available.

Although Canada was the first country to launch a domestic communications satellite, CATV operators cannot privately own receive stations due to government regulations. Canada's position on that regulation seems to be changing. The CCTA is moving to take immediate advantage of any new developments and attitudes.

Michael Hind-Smith, president of the CCTA, has presented a proposal for the further expansion of coverage of the House of Commons using Canada's satellite system. CCTA proposes using the HERMES experimental satellite which is jointly owned by Canada's DOC and NASA, to add a million additional people in four large communities to the system.

The next phase is proposed to be the expansion of the ANIK B satellite scheduled for launch in November 1978 and operational by January 1979.

SCTE Members Get NCTA Rates For NCTA Convention

WASHINGTON, D.C.—Paid-in-full members of the Society of Cable Television Engineers can register for the NCTA New Orleans convention at NCTA member prices. NCTA/SCTE registration prices are $145 for advance reservations. Nonmembers pay $210 for the three-day meeting.

For additional information on registration for the NCTA convention, call NCTA at (202) 457-6700.

SCTE in Oklahoma

OKLAHOMA CITY, OKLAHOMA—As *C-ED* goes to press, we have learned that SCTE members have been invited to present the "SCTE story" at the Oklahoma State CATV Association meeting March 27-28 in Oklahoma City. SCTE members will explain what the organization is all about and where it's going.

Indiana-Illinois in June

SPRINGFIELD, ILLINOIS—A technical meeting, jointly sponsored by SCTE and the Indiana-Illinois CATV Association, will be conducted at the Forum 30 Hotel in Springfield on April 9-11. Major areas to be explored will include political grass roots, on-line computer systems, new programming ideas and FCC updates.

Guest speakers will include Roy Mehlman of UPI, John Sie of Showtime, Rod Hansen of CableData and Pete Mobley of Gill Management.

WHY THE MCE NOVA ADDRESSABLE TWO-WAY TAP? BECAUSE IT IS HERE. NOW.

The NOVA Cap-Tap (Controlled Access Point and Tap) is a fact today. Practical. Proven in actual service. Saving money on both standard and premium TV systems with up to 65,000 subscribers. Here is what Hank Lockard, General Manager of Sammons Communication Company of Harrisburg, PA., has to say about this advanced product:

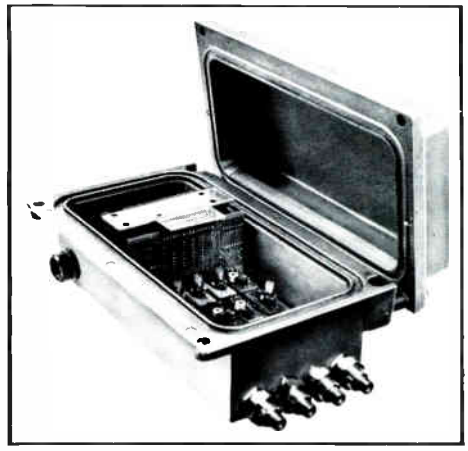
"The NOVA taps required no new hardware or special tools to install. In appearance, they're slightly larger than old-fashioned taps.

"Neither extreme temperatures nor lightning surges have affected their performance. In fact, in the six months since installation, no NOVA tap has required any service at all.

"The remote functions have worked perfectly, such as connect and disconnect; and Accounts Receivable has used conveniences

"We also have a better handle on piracy and illegal use of signal with the NOVA taps."

See our booth, 201-A, at the NCTA convention in New Orleans.



The all-new 5—300 MHz NOVA Cap Tap is useable with new and existing cable systems.

Address inquiries to:

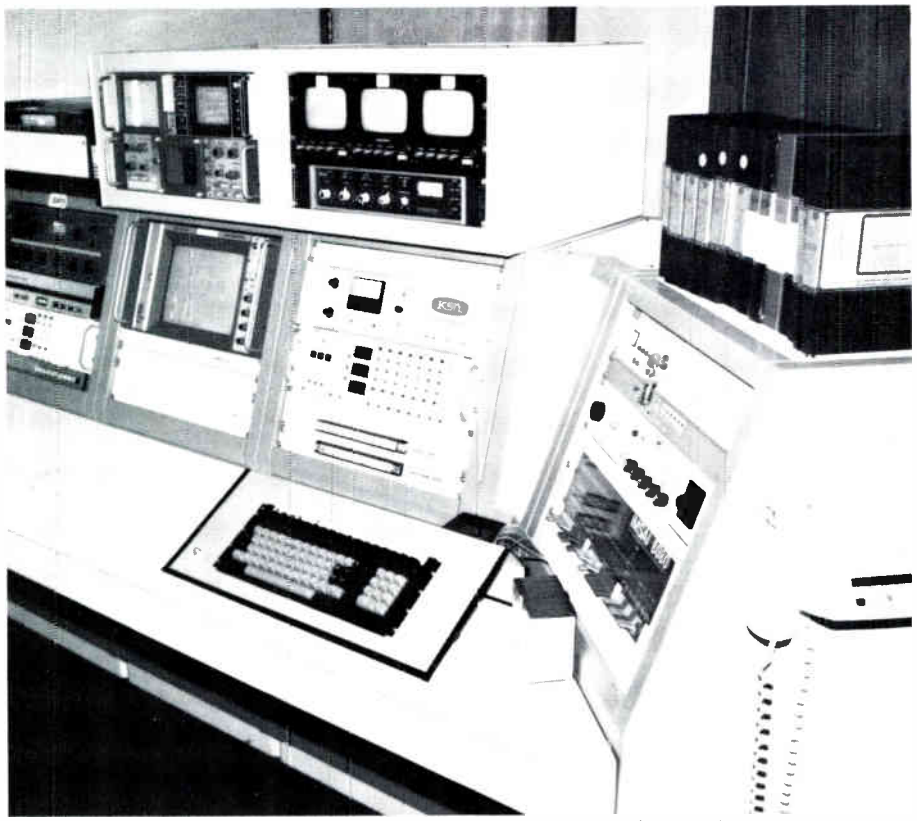
Merrill Cable Equipment Corp.

2949 West Osborn Road
P.O. Box 13741
Phoenix, Arizona 85002

Video Technology in Stand Alone Pay–Cable

By James Chiddix, president
CRC Electronics
Waianae, Hawaii

Over the last few years the emphasis on the application of video technology in CATV has shifted from locally produced origination programming to the origination of pay-cable and pre-recorded local origination signals. This is at least partially explained by the extremely high costs of local production when compared to the number of hours of programming which it yields, as opposed to the relative ease and economy of disseminating a substantial amount of special interest programming on videocassettes. Perhaps the strongest motivation for this use of video technology has been that pay-cable has proven that it *can* produce the revenues that materialize in very few "cablecasting" operations. In addition, there has been a growing number of sources of videocassette programming available at little or no cost to the CATV system, such as the Fourth Network, the now defunct Federal Broadcasting Company, the American Cable Network, the



This three-channel airing facility console incorporates a color monitor, vectorscope, wave form monitor and time base correctors.

PTL Club and 700 Club Cassette Networks.

Even with the advent of satellite distributed pay-cable network programming from HBO and Showtime, the stand-alone pay-cable concept has established a firm place for itself. With stand-alone programming, flexibility and responsiveness to local demands are maintained by the cable operator, and the booking and programming services which exist (for example, TPS, Cinemerica, Bestvision, and Showtime's continuing stand-alone operation), relieve the CATV operator from having to deal with every detail of booking films and arranging for the shipment of cassettes and promotional material. For the medium or large pay-cable system, stand-alone pay-cable may be substantially less expensive than the satellite pay services, since the fixed overhead of cassette duplication, shipping, and airing expenses may be spread over a number of pay subscribers.

The Airing Facility

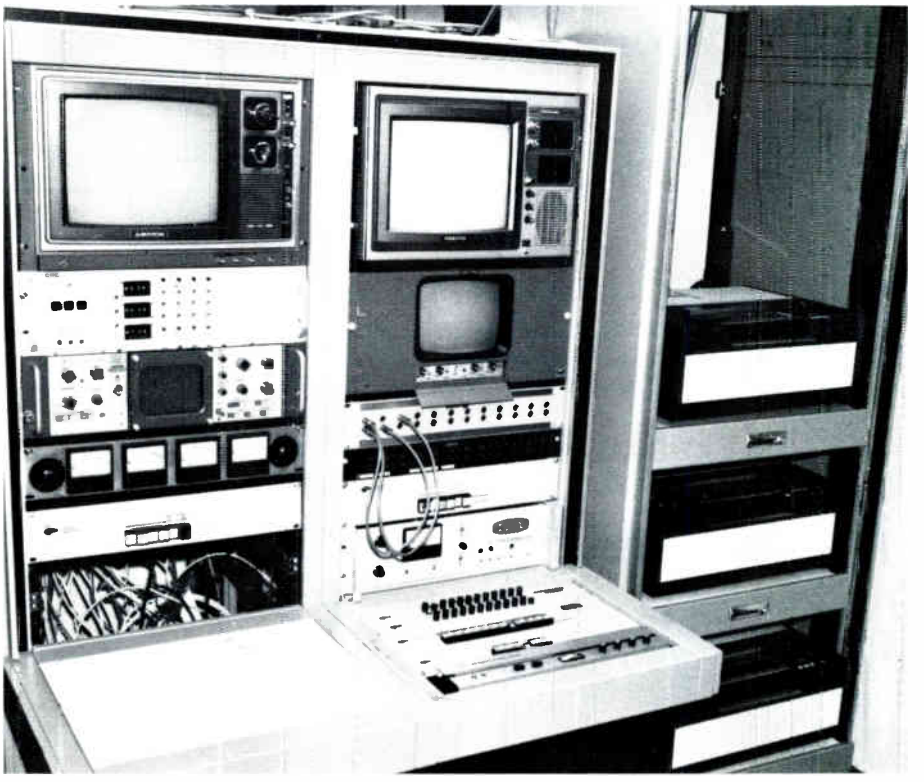
The concept central to the marriage of video equipment with the needs of stand-alone pay-cable systems has been the perception that an "airing facility" for the playback of cassette material is fundamentally different from a production studio control room, even though both types of facilities share much equipment in common. The airing facility is a "port" for the entry of signals to the headend, and thus the cable system, in the same sense as an antenna array and hetrodyne processor. While a production facility must be extremely flexible because of the wide variety of tasks undertaken in different types of production and editing, the videocassette airing facility is a system of videocassette playback machines, switchers and monitors. It is fully dedicated to performing the same tasks day in and day out, whether it be on one channel or many. That task is the smooth, scheduled playback of tapes to a home audience. In a production facility, errors and false starts may be eliminated in the editing process, but in an airing facility any mistakes or awkwardness of operation is viewed in the customer's home. Because of the level of sophistication attained by most television viewers after hundreds or thousands of hours of exposure to network television, a lack of continuity and flow in a cable videotape channel may give an amateurish appearance and produce a subconscious negative reaction on the part of the subscriber. This is especially detrimental to a pay-cable channel, where the customer's perception of quality must be maintained in order to justify his continuing patronage. Thus, an airing facility must allow operating personnel to concentrate fully on making sure the right material is being aired at the right time, and that the quality of that material is up to standards.

Equipment

Among the best investments in a videocassette airing facility is a set of

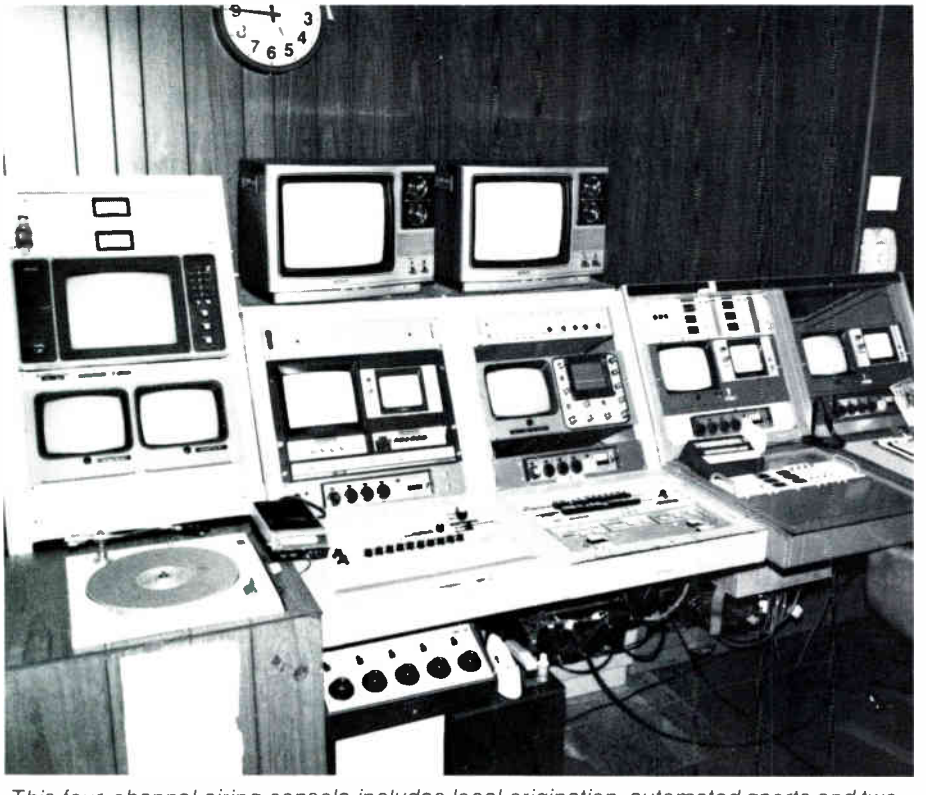
Videocassette machines on pullout shelves have convenient tape storage.

monitoring equipment which can be absolutely depended upon. This usually means at least one very high quality color monitor, hopefully one with pre-set controls which may be aligned against a color bar standard, and an accurate waveform monitor so that video levels may be maintained precisely. Videocassette playback decks themselves must either have servoed capstans, so that tape speed errors recorded on cassettes will be automatically compensated for, or else incoming cassettes must be carefully checked to assure that their tape speed is within spec. The horizontal frequency errors which can result from off-speed tapes in non-capstan servo machines may result in subscriber complaints that certain programs cause their sets to lose horizontal hold. This is to be avoided at all costs in a pay-cable operation. In addition, short term time base errors, primarily "hooking" from tension errors, and tape jitter, may be corrected by the installation of suitable time base correctors. The time base correctors used must be stable but need not have many of the features required of TBC's such as built-in sync generators and advanced vertical drive outputs. Also, electronic noise reduction techniques are gaining an important place in videocassette playback.



This compact automated pay-cable installation uses commercially available 24-inch racks for videocassette machines.

Many of the problems which are addressed by time base correction and capstan servo transports are invisible on the *majority* of the television receivers in any CATV systems. There are nonetheless, in any system, a significant number of receivers which will be susceptible to both the short and long-term time base distortions which are greatly improved by the use of this equipment. These distortions can be extremely severe in some receivers and can be, even in the absence of vocal feedback, the underlying cause behind a certain percentage of loss of pay subscribers.



This four-channel airing console includes local origination, automated sports and two automated pay channels.

Design

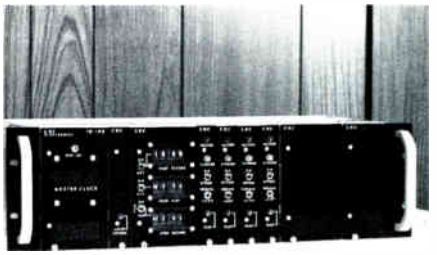
The electronic design of an airing facility should be entirely oriented around the basic functions being performed: playback, switching and monitoring. A multichannel airing facility is reasonably complex, and it is important that all wiring be fully documented and all cables clearly labeled so that future changes, maintenance, or expansion by technical personnel not on hand at the time of initial construction may be as simple as possible. This type of documentation is too often neglected, and over a period of time the almost inevitable result is a facility containing a mass of unbundled, unlabeled wiring with "temporary" jumpers which become permanent and eventually develop into intermittent maintenance headaches. Patching facilities for both video and audio signals are important to allow for re-routing of signals in the event that equipment is removed for maintenance. This also allows points for the injection of test signals during alignment or adjustment of the system. Test signals, such as color

bars, convergence patterns and audio tones should be available at the patching area to make tests simple. A fully documented interconnection diagram for both video and audio wiring, once developed, may be kept available for future reference and updated as equipment is added.

It is absolutely necessary that all video and audio connections in an airing faciity be made methodically according to initially established specifications. If care is taken in the assembly of these connections, there will be virtually no troublesome maintenance problems in the system except for the unavoidable frailties of the videocassette transports, and even these can be greatly minimized by a conscientious program of periodic maintenance.

The Role of Automation

Because an airing facility must allow operating personnel to concentrate fully on the quality and continuity of programming going out over the cable system, videocassette automation equipment can play a major role in removing the task of routine switching and cueing of tapes from the operator, allowing concentration on logs, schedules and monitors. This is particularly true in multi-channel systems, where several channels of cassette programming may be going out in addition to the pay-cable channel. Some pay-cable formats, such as that offered by Showtime, make use of a continuous flow of short subjects, promotional previews, and animated introductions to give the channel a broadcast-type continuity. Because of the continuous succession of videocassettes which must be loaded, cued, rolled, and switched, automation becomes a necessity, with the operator called upon only to load cassettes in the proper order.

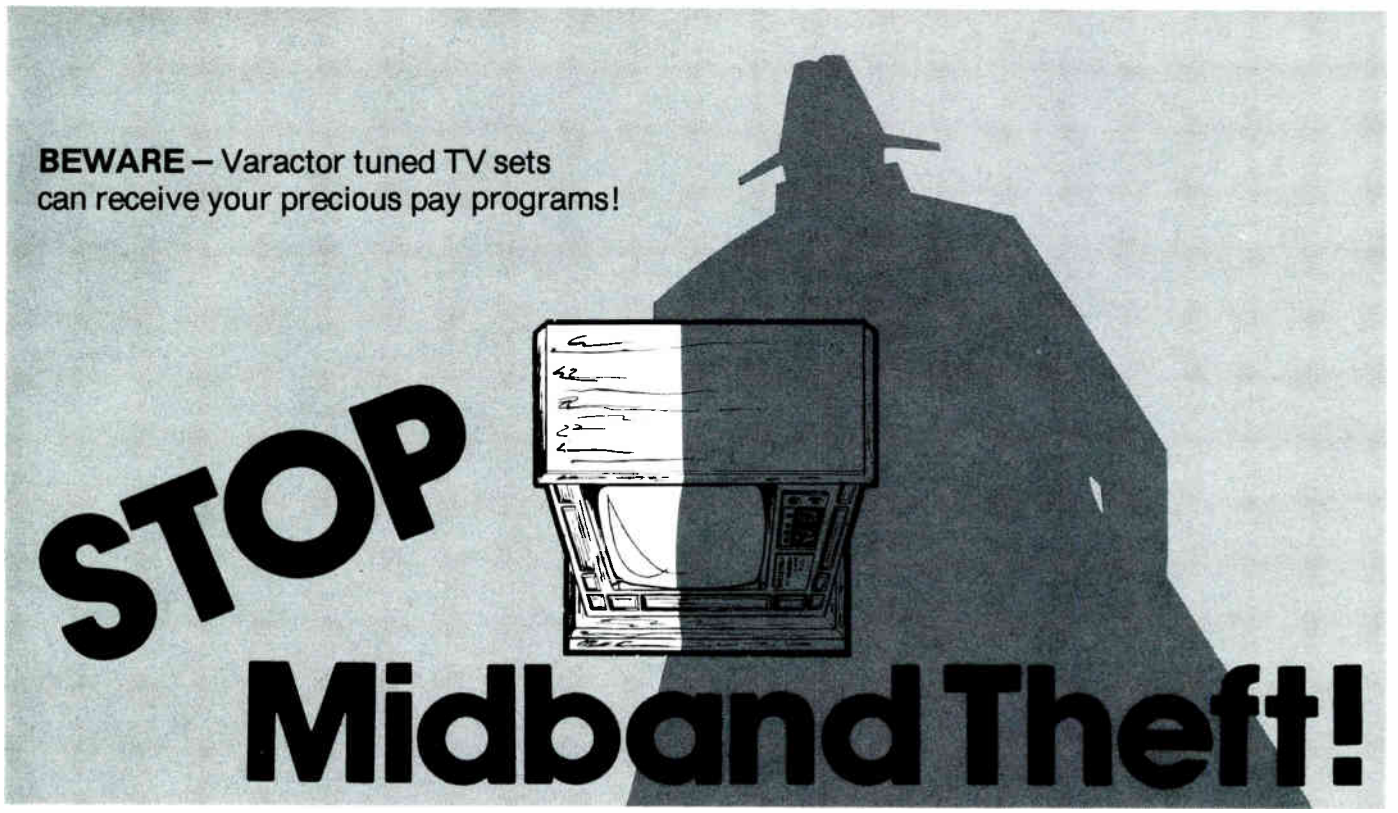


Pictured above is a patching bay with distribution amplifiers at the rear of the master control console.

Currently available videocassette automation equipment is extremely reliable and flexible. It generally uses a straightforward system of cue tones, which provide beginning and ending references for program material on the cassettes. These cue tones may be placed on the unused audio channel of incoming videocassettes during their inspection and preview.

A highly desirable feature of an automated airing facility is its ability to be left in fully automated operation during off-peak viewing hours. A fully automated channel, repeating blocks of tape material of four or five hours duration, provides an extremely economical way to provide subscribers with programming viewable in the late hours or as counter-programming to daytime television. In small systems, automation provides a way to run cassette programming on a pay-channel without the hiring of additional personnel. The daily loading of videocassettes and programming of automation equipment for the appropriate times can be a small part of the duties of someone on the staff of the CATV company.

While satellite video transmission is full of promise for the CATV industry, the strength of a stand-alone videocassette airing facility lies in its ability to tailor the mix of pre-recorded programming to the needs of a specific CATV operation and the community which it serves. C-ED



■ PREVENT MIDBAND THEFT BY ADDING TEST™ SCRAMBLE SECURITY TO YOUR SYSTEM ■ OUR SYSTEM SCRAMBLES BOTH AUDIO AND VIDEO RECEPTION ■ THE TEST™ SCRAMBLE - DESCRAMBLE SECURITY SYSTEM IS ONE OF THE MOST ECONOMICAL APPROACHES AVAILABLE - APPROXIMATELY 1/2 THE COST OF MOST OTHER SCRAMBLING EQUIPMENT ■ USE THE TEST™ SYSTEM BECAUSE OF THE UNAUTHORIZED USE OF YOUR PAY SYSTEM BY VARACTOR TUNED TV SETS

NEW — TEST Encoder Generator, Model EC

Introducing our new rack and wall mount encoder generator designed specifically for CATV and apartment house use. The TEST Model EC can be easily turned on and off to promote your pay channel to non-subscribers. The rack mount front panel can easily be removed for wall mounting adaptability. It can be installed in any convenient area, for on location scrambling. New compact design, reliability, simple installation, and low cost makes this system one of the most attractive ones on the market today. Over 100 systems are in use.

TEST Decoder, Model DC This completely passive device requires no maintenance because there are no moving parts and no adjustments to be made by the subscriber. The unit installs out of sight - not on top of the TV set. Installation with a special tool arms an internal anti-theft device which renders the decoder inoperable if removed by unauthorized persons.

For more information contact:

TEST Inc.
16130 Stagg St., Van Nuys
California, 91409 - PHONE (213) 989-4535

TEST™

Self-Amortizing
Scramble Guard

NAB Requests FCC Requirements for Local Signals on Cable

WASHINGTON, D.C.—The National Association of Broadcasters has urged the FCC to continue to require cable television systems to carry all local broadcast signals and to consider waivers from the rules only on a case-by-case basis. It also asked that the FCC maintain the present priority for local carriage over distant signal and cable origination and access service.

In its filing, the NAB said that "permitting cable systems to forego carriage of broadcast stations within their local service areas would undermine and ultimately destroy the concept and reality of local service demanded by the public, envisioned by Congress and the commission, and engendered by the table of allocations." It pointed out that the benefits of local services are "real and substantial," and are essential to maintenance of life and property during severe weather and other emergencies and natural disasters.

NAB also said that cable systems are natural monopolies and must not be permitted to use their monopoly position to foreclose competition from local stations against their own program services. Noting that the commission has considered carriage of distant signals in lieu of local signals inherently anti-competitive, NAB said it is even more anti-competitive if the system deletes a local signal in order to place its own competitive program service on the system. Furthermore, added the NAB, the deletion of one of several local channels places the deleted station at an unfair competitive disadvantage with other local stations.

Regarding cable systems that are saturated by carriage of local signals and therefore unable to handle all the signals they are required to carry, NAB believes that the commission's present practice of granting waivers on a case-by-case basis should be retained. The problem, NAB noted, is not an overabundance of local signals but the lack of cannel capacity of some cable systems, and this could be solved by increasing the capacities. A waiver would be required only where cable systems can demonstrate their financial inability to comply with the rules.

NAB also maintained the commission has been reluctant to require cable systems to rebuild in order to satisfy the requirements of the mandatory carriage rules because reconstruction "might not be justified financially."

NCTA Comments on FCC Economic Inquiry

WASHINGTON, D.C.—The National Cable Television Association, Inc. has filed 91 pages of comments to the Federal Communications Commission in regard to the FCC's inquiry into the economic relationship between television broadcasting and cable television. Such comments were due at the commission by March 15 and will be used for an independent reassessment of the regulation of cable television. NCTA maintains the "intuitive model" which has served as the FCC's basis of regulation is an "inaccurate representation of the relationship between cable and broadcasting."

NCTA further found:

- Restriction of cable television development through regulation of signal carriage is completely unwarranted.
- There is no evidence that restriction on cable television is necessary to protect the broadcast or programming sectors or the public interest.
- Cable development, particularly in the major (top 100) television markets, has been seriously inhibited by the commission's regulatory program.
- Relaxation or elimination of restriction of signal importation would provide an environment conducive to cable development—both in new markets and through expansion in existing markets.

In view of such findings, NCTA claimed "elimination of all regulations serving to specify the number and type of signals (or programs) carried by cable television systems is warranted. Regulation must be based on hard economic evidence that absent such restriction, the public would be harmed. No such evidence exists and, as a result, current regulations of cable television harms broader public interest considerations."

NCTA to File Against Late-Night CARS Turnoff

WASHINGTON, D.C.—As C-*ED* goes to press, we have learned that the NCTA will file a petition to delete the present rules requiring CARS microwave facilities to shut down when the parent signal is absent. At present, when the television station an operator is relaying goes off-the-air, the rules require that he turn off his microwave relay link so that someone else can benefit by using the path that would otherwise be blocked. However the commission's experience has been that such TV signals are only off very late at night, and only for five or six hours. Thus, the turning off of unused CARS frequencies late at night has not resulted in increased spectral efficiency.

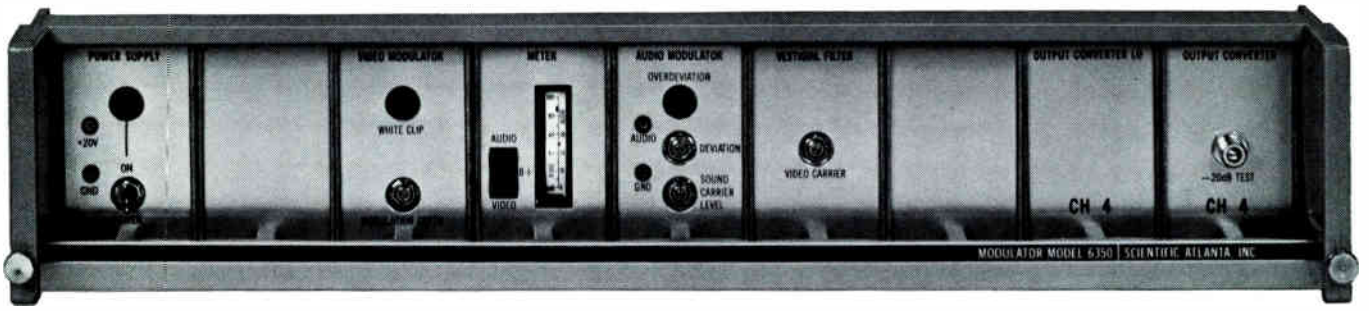
NCTA maintains that having to turn the microwave off and on is not only costly, but the timer would get off sync and not turn off or on at the right time.

Canada's No-Pay Setback

OTTAWA, CANADA—The Canadian Radio-Television and Telecommunications Commission has issued a preliminary report on the country's minister of communications' ruling against the early introduction of pay-television in Canada.

With more than 50 percent of Cana-

Our new Modulator. It can be what you want it to be.



Even when ordered without frills, our new 6350 Television Modulator outclasses units selling for more. Its Surface-Acoustic Wave (SAW) device as the vestigial sideband filter reduces out-of-band emission to a level unmatched in the cable industry. But when you choose any or all of the optional plug-in modules, it's then that the 6350 turns into the modulator you'd want to design yourself.

For instance, the Video Switching option detects loss of primary video and switches to alternate video output with front panel lamp indication. And has remote activation capability.

An Audio Switching module provides for selection of alternate audio source and also permits switching to emergency override audio. When override is used, the audio response is shaped to enhance voice intelligibility and reduce telephone line noise.

The IF Switching option enables composite (picture plus sound) IF to be interrupted at a point just before up-conversion to the output channel, and may be replaced by an alternate source of composite IF.

Or you can customize the 6350 with options for standby powering from positive or negative source. Audio modulation limiting. Phase lock. Video AGC and Alternate IF AGC control. Call Harry Banks at (404) 449-2000 or write us for your demonstration of the 6350. The modulator you've always wanted.

Scientific Atlanta

United States: 3845 Pleasantdale Road, Atlanta, Ga. 30340, Telephone 404-449-2000, TWX 810-766-4912, Telex 054-2898
Canada: 6511 Atlantic Drive, Mississauga, Ontario, L5T 1C8, Canada, Telephone 416-677-6555, Telex 06-983600
Europe: 1-7 Sunbury Cross Centre, Staines Road West, Sunbury on Thames, Middlesex TW16 7BB, England,
Telphone Sunbury on Thames 89751, Telex 896015

dian households hooked up to cable, the report came as a blow to the Canadian cable television industry. To date, pay-TV is available only in a limited number of hotels in Toronto and Vancouver. Canadian cable interests viewed the introduction of pay services as a viable area for expansion of the Canadian cable market.

While the commission maintained that the time for pay-television in Canada is not ripe, it did suggest a number of provisions in the event that pay-TV is introduced at a later date. The commission indicated that once instigated, pay-television should come under the operation of a single national network and that pay programming should be provided in both French and English. It further noted that 35 percent of all gross revenues derived from pay services should be fed back into Canadian programming production and that 50 percent of all pay programming carried on Canadian cable be of Canadian origin.

CATV Passes FCC Inspection

WASHINGTON, D.C.—The annual performance test documentation from several cable television operators was reviewed on March 16. "On the whole, the tests appear to be conscientiously performed," stated the FCC," with the test results indicating that the systems are operating within the commission's technical specifications." However, the commission observed some common problems which it felt should be brought to the attention of all cable television operators. In matters relating to the recording of measurements and good engineering practices, some occasional deficiencies were noted.

While the Canadian Association of Broadcasters supported the commission's stand on pay, the Canadian Cable Television Association took exception with the report, which it described as the "negative" stance the commission has maintained over the years toward pay-television. Terence McLaughlin, director of communications for CCTA, described the commission's findings as "premature" and indicated that the questionnaire presented to television viewers in the pay survey was "biased." The Canadian cable association is presently in the process of conducting a pay survey of its own and is particularly concerned with the pay programming limitations and revenue allotments stipulated by the CRTC.

As *C-ED* goes to press, we have learned that the Canadian Cable Television Association is looking ahead to March 29-30 when federal and provincial ministers are scheduled to meet in Charlottetown, Prince Edwards Island. McLaughlin expects cable and pay-cable to come under discussion at the meeting and CCTA president Michael Hind-Smith will be on hand on behalf of the Canadian cable industry. The cable association is hoping that the CRTC's decision will not be adopted but will be revised in the interest of more and better cable service in Canada.

FCC Finally Fills Microwave Gap

WASHINGTON, D.C.—The FCC has finally filled the gap in the cable bureau's microwave division left by the departure of Ray Daly and Jim Goodwyn. Cliff Paul, formerly with the New Jersey cable commission, is now the only engineer in the FCC's microwave division.

Because of these vacancies, much concern was raised by the NCTA and the cable industry in general. Spring brings a lot of new construction, and microwave is a big part of that construction.

Prior to Paul's appointment, Ken Gunter of UA-Columbia Cablevision and Robert Luff, NCTA's vice-president of engineering, both wrote letters of concern to the chairman and new chief of the cable bureau, Philip Verveer, expressing their concern over those vacancies. "A delay in that side could be very detrimental to cable systems overall construction plan," stated Robert Luff.

Continued CB Growth May Impact on Cable

WASHINGTON, D.C.—The FCC's radio division has reported a total of 12.2 million licensed CB operators at the end of 1977. This statistic should be of special interest to cable operators carrying channels 2, 5 and 6, because these channels are the second and third harmonic of the CB frequencies. If a CBer is operating illegally or, in some cases, operating within the limits of the commission's rules but near the headend of a cable system, there can be enough spurious harmonic energy to cause interference with distant channels 2 and 5.

To date, Texas leads the nation with more than a million licensed CBers. California, Florida, Illinois, Michigan, New York, Ohio and Pennsylvania each have more than half a million licensed CBers.

ADVANCE TECHNICAL NCTA PROGRAM

27TH ANNUAL CONVENTION NATIONAL CABLE TELEVISION ASSOCIATION

Rivergate Convention Center • New Orleans, Louisiana • April 30—May 3, 1978

Sunday, April 30	
11:00 am 1:00 pm	**Exhibits Open**
3:00 pm 7:00 pm	**Exhibits Open**
10:00 am 7:00 pm	**Registration** Concourse
1:00 pm	Opening—Olympic Marching Band
1:20 pm	**Chairman's Address** Beisswenger Award Presentation
1:40 pm	**Keynote Address** Tip O'Neill NCTA president Robert Schmidt to introduce: Philip Verveer, Chief, FCC Cable Bureau
2:30 pm	**Exhibit Hall Cable Cutting**
5:00 pm 6:00 pm	**Exhibitors' Reception**
Monday, May 1	
9:45 am 6:00 pm	**Exhibits Open**
7:00 am 6:00 pm	**Registration** Concourse
8:15 am 9:45 am	**Lead-Off Session** **Engineering Management** Co-Chairmen: Kenneth Gunter UA-Columbia Cablevision, Inc. San Angelo, Texas Robert A. Luff vice president—engineering National Cable Television Assn. Washington, D.C.
	NCTA Technical Up-Date NCTA Engineering Committee Chairman: Kenneth Gunter UA-Columbia Cablevision, Inc. San Angelo, Texas
10:15 am 11:45 am	**Fiber Optics** Chairman: James W. Stilwell Communications Properties, Inc. Jenkintown, Pennsylvania "A 4.2 km Operational Fiber Optic Communications System," Frederic N. Wilkenloh, Comm/Scope Company, Catawba, North Carolina; and Dr. Marshall C. Hudson, Valtec Corporation, W. Boylston, Massachusetts "Linear Laser for CATV Application," C.J. Hwang, General Optronics Corp., S. Plainfield, New Jersey "An Eight Kilometer Fiber Optic CATV Supertrunk System," Whitworth W. Cotten and Dr. C. Richard Patisaul, Harris Corporation, Melbourne, Florida; Donald G. Monteith, Cablesystems Engineering, London, Ontario, Canada "Optical Fiber Communications, Technology and Applications," Ira Jacobs, Holmdel, New Jersey, Bell Telephone Labs.
10:15 am 11:45 am	**Two-Way** Chairman: Kevin D. Gossman Teleprompter Corporation Rochester, Minnesota

	"Technical Considerations in the Design and Operation of a Two-Way CATV System in a Major Market Area," G.C. Kleykamp, UA-Columbia Cablevision, Inc., San Angelo, Texas "The Rockford Two-Way Cable Project: Existing and Projected Technology," James B. Wright, Rockford, Cablevision, Inc.; Dr. Martin P. Block and Robert E. Yadon, MSU-NSF-Rockford Two-Way Cable Project, Michigan State University, E. Lansing, Michigan "The New Urban Market: Paving the Way for Two-Way Telecommunications," John D. Fannetti, City of Syracuse, Syracuse, New York "Technical Aspects of Two-Way CATV Systems in Germany," F. Kraus and R.M. Schnee, Heinrich-Hertz-Institut, Berlin, Germany
12:00 noon	**Luncheon** Grand Salon New Orleans Hilton Speaker: Ernest F. Hollins M.C.: Dan Aaron Awards: Jerry Green and Outstanding Engineering Achievement Awards Head Table: Board and Convention Committee

Tuesday, May 2

9:45 am 6:00 pm	**Exhibits Open**
8:15 am 9:45 am	**Education and Training** Co-Sponsored with SCTE Moderator: Tom Polis Magnavox CATV Systems, Inc. Manlius, New York "A Crying Need—Training and Continuing Education," Fred E. Furnish, General Electric Cablevision Corp., Decatur, Illinois "Diagnosing Cable System Faults," Kenneth L. Foster, New York State, Commission on Cable Television, Albany, New York "Technical Personnel—Buy Them, Steal Them or Raise Your Own?" Glenn Chambers, American Television and Communications, Corp., Appleton, Wisconsin
8:15 am 9:45 am	**Advanced Techniques** Chairman: Frank Bias Tele-Vue Systems, Inc. Pleasanton, California "The Characterization of Video A/D and D/A Converters for Cable Television Applications," Bryan F. Smith, Computer Labs., Inc., Greensboro, North Carolina "Microprocessor for CATV Systems," Ernest O. Tunmann and James F. Roche, Tele-Engineering Corp., Framingham, Massachusetts "Application of SAW Technology to the CATV Industry," Alex Best, Scientific-Atlanta, Inc., Atlanta, Georgia and Tom A. Martin, Anderson Labs., Bloomfield, Connecticut
10:15 am 11:45 am	**Microwave and Earth Stations** Chairman: G.C. Kleykamp UA-Columbia Cablevision, Inc. San Angelo, Texas "From Satellite to Earth Station to Studio to S-T-L to MDS Transmitter to the Home; Pay Television Comes to Anchorage," Richard L. Vega, Telecommunications Systems, Inc., Baltimore, Maryland "A Time Compresion Multiplex System for Multiple Video and Data Distribution for Existing Satellite Channels," Donald Kirk, Jr., Digital Communications, Inc., St. Petersburg, Florida "Low Cost Microwave," Dana Atchley, Microwave Associates, Burlington, Massachusetts
10:15 am 11:45 am	**Testing and Maintenance** Chairman: Richard C. Hickman Cox Cable Communications, Inc. Atlanta, Georgia "A Reliable and Reproducing Technique for Evaluating the Shielding Effectiveness of CATV Apparatus," Warren L. Braun, P.E., ComSonics, Inc., Harrisonburg, Virginia "Improving Reliability of Drop Wire Connectors," John M. Hood, Cablesystems

If we didn't deliver extra-distance gas injected poly, someone else might be number one.

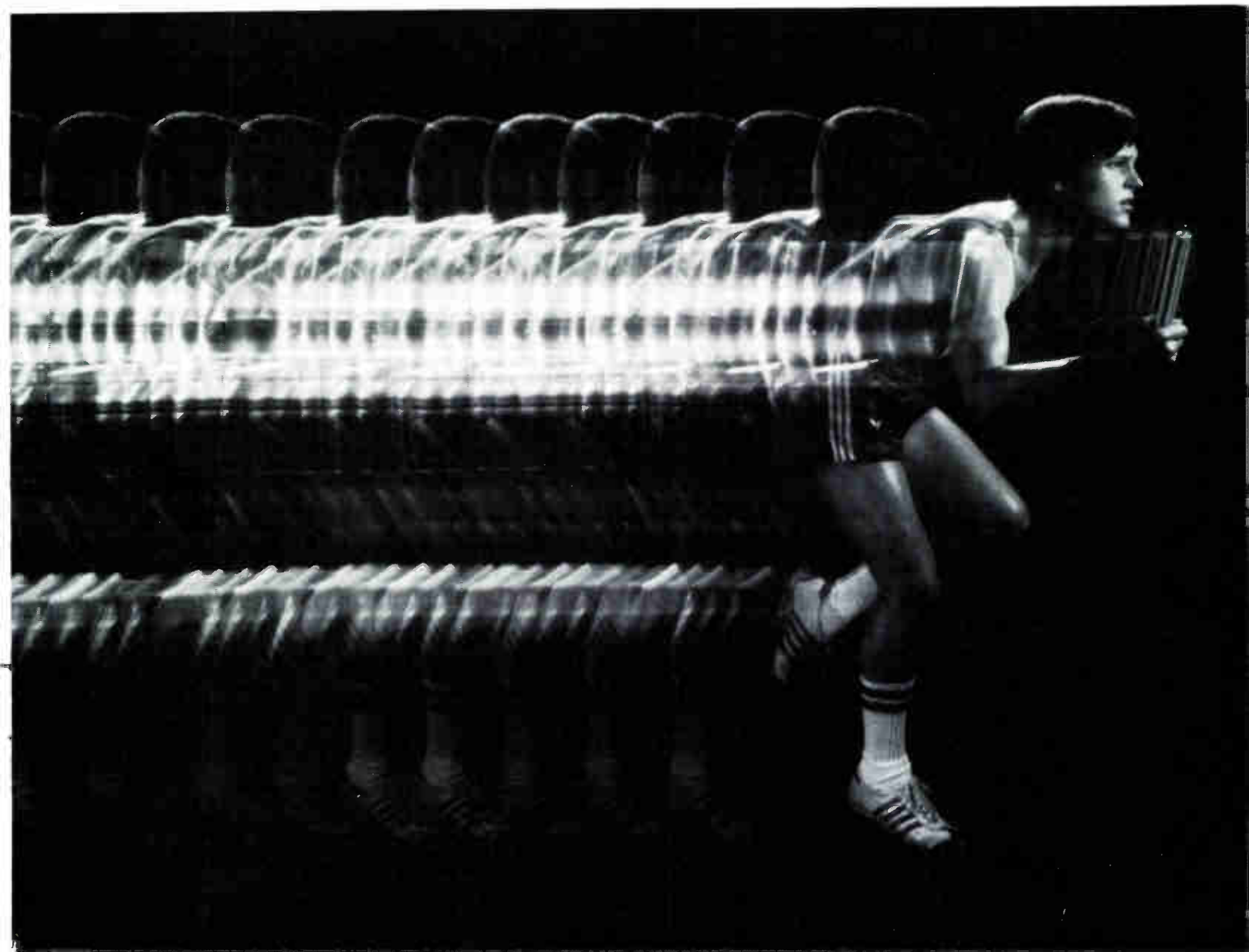
Introducing One Inch 'Lumifoam III.

Unlike other companies who merely talk about super low loss cable, Times delivers. Here is One Inch 'Lumifoam III with attenuation of .720 db/100 max @ 300 MHz. This is the inch that translates into many more yards between amplifiers.

You wanted this premier size in 'Lumifoam III so we perfected it, coupling the best electricals in the business to the proven mechanical characteristics of smaller sized 'Lumifoam III. A construction which makes it easier to strip, while maintaining immunity to moisture migration.

Call us for as much One Inch 'Lumifoam III as you want. Nobody works harder to stay number one than the company that is number one.

Times Wire & Cable
The #1 Coaxial Cable Company
358 Hall Avenue, Wallingford, CT 06492
(203) 265-2361, TWX: 710-476-0763
In Canada: 5215 Rue De La Savane St. Montreal, Que (514) 341-7440
DIVISION OF TIMES FIBER COMMUNICATIONS, INC.



	Engineering, London, Ontario, Canada "Channel Response Measurements Made Easy," Gerald L. Bahr, Mission Cable TV, Inc., San Diego, California "Cable Television Inspections by FOB Field Engineers," John Hudak, Federal Communications Commission, Washington, D.C.
12:00 noon	**Luncheon** Grand Salon, New Orleans Luncheon Speaker: FCC Chairman, Charles Ferris M.C.: Bob Schmidt Head Table: State/Regional Presidents
6:30 pm	**Reception**
7:30 pm	**NCTA Annual Banquet** Fairmont Hotel Entertainment: Frank Gorshin, Entertainer and Impressionist Awards: Larry Boggs, Idel Kaitz, and the IEEE Delmer C. Ports Award

Wednesday, May 3

9:45 am 12:00 noon	**Exhibits Open**
7:00 am 12:00 noon	**Registration** Concourse
8:15 am 11:45 am	**Systems Operation** Chairman: Nick Worth Telecable Corporation Norfolk, Virginia "Interphasing Cable Television and Broadcast Subscription Television," Early D. Monroe, Jr., Federal Communications Commission, Washington, D.C. "AGC/ASC Design," Bert Arnold, RCA/Community Television Systems, N. Hollywood, California "Co-Channel Protection Limitations of the Circularly Polarized (CP) Antenna-Array," Steven I. Biro, Biro Engineering, Princeton, New Jersey "Developmental Approaches for an Existing Cable System," Fred Ciccone and Dean Adrian, Manhattan Cable TV, New York, New York "Basic Acoustics for the Cable Television Studio," W. Sherwood Campbell, P.E., American Television and Communications Corp., Englewood, Colorado "Low-Cost System Status Monitoring," D. Stevens McVoy, Broadband Technologies, Inc., Columbus, Ohio
8:15 am 11:45 am	**Hands-On Demonstration** Co-Sponsored with SCTE Chairman: Ralph Haimowitz Indian River and Palm Bay Cablevision Sebastian, Florida Participating Associates: John Weeks Avantek Inc. Santa Clara, California Bob Welsh Wavetek Indiana Inc. Beech Grove, Indiana Raleigh Stelle Texscan Corporation Indianapolis, Indiana Cliff Schrock Tektronix, Inc. Beaverton, Oregon Harry Sadel Sadelco Inc. Weehawken, New Jersey Larry Dolan Mid State Communications Beech Grove, Indiana Carl Hensley ComSonics, Inc. Harrisonburg, Virginia
12:00 noon	**Luncheon** Grand Salon New Orleans Hilton Luncheon Speaker: Lionel Van Deerlin, Chairman of the House Communications Subcommittee Awards: Outstanding Committee Chairmen Head Table: Newly-elected Officers, Board and Committee Chairmen

THE WORLD'S LONGEST RUN

In 1929, Johnny Salo was the winner of the longest race ever staged, a Transcontinental Race (3,665 miles) from New York City to Los Angeles. Over 79 days from March 31 to June 17, his elapsed time of 525 hours 57 minutes 20 seconds gave a running average of 6.97 m.p.h. Now, that was a long run.

In 1978, Comm/Scope's Parameter II cable continues to prove itself the low-loss distance champ over the long run. With less signal loss than most other cable, Parameter II requires fewer amplifiers thereby reducing costs and maintenance.

Parameter II. An exclusive low-loss expanded polyethylene dielectric. All the resiliency of conventional polyethylene. Plus permanent moisture resistance.

When it comes to cable technology, Comm/Scope gives you the unmistakable performance of a front runner.

So if you want to end up in the winner's circle, run with the leader in low-loss cable. Comm/Scope.

Write or call:
Rt. 1, 199-A, Catawba, N.C., 28609
Telephone (704) 241-3142
Telex 80-0521

Comm/Scope Company
Light years ahead in cable innovation

A Time Compression Multiplex System

(Part one in a series of two)

By Donald Kirk, Jr., chief engineer
Digital Communications, Inc.
St. Petersburg, Florida

In this paper a multiplex system is described in which sequential segments of two video signals are time compressed and interleaved in analog form for transmission over a satellite transponder. Channel information rate and S/N are considered. The Time Compression Multiplex approach is extended to data plus video and two-way video cases. A signal enhancement system for S/N improvement is proposed.

Starting with WESTAR I in April 1974, four domestic satellites have been placed in geostationary orbit to serve miscellaneous customers in the continental United States. They make available a total of 72 transponder channels, each of 36 megacycles bandwidth, for transmission of various kinds of signals. A number of services including multi-channel telephone and high rate digital data transmission have developed to use these channels.

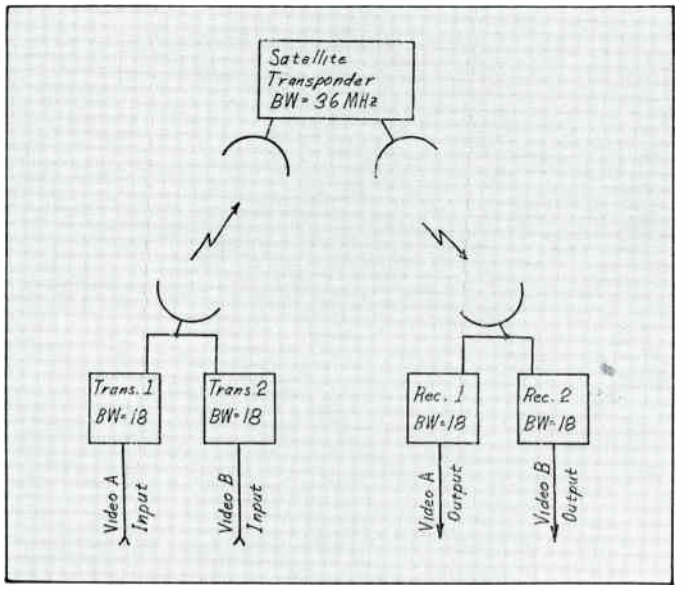


Figure 1. Frequency division multiple access

present, one of the fastest growing users of satellite channels is the CATV industry with its need for color video transmission.

Because of the high cost of satellite transponder channels it is natural that we should question the efficiency with which they are used. For multi-channel audio or data the efficiency of time bandwidth utilization controls the selection of the multiplex method chosen to assemble the various signals for transmission through a common path. A number of such multiplex systems are described in the literature I researched.[1]

The situation for video transmission is more complex. Several systems which can transmit two video signals over one transponder channel are suggested in some literature,[2] but none of them are in widespread use. It is the purpose of this paper to propose another system called Time Compression Multiplex which may overcome some of the problems encountered by the earlier systems.

The permissible cost of a multiplex system can be examined by considering the case of an operator who is currently delivering one channel of video via one satellite transponder to N earth stations. To deliver a second channel he may lease a second transponder and provide a second receiver at each earth station. The cost per earth station C is then:

$C = R + \frac{T}{N}$, where R is the cost of a receiver and T is the present value of a transponder channel. A useful multiplex system should have a receiving terminal cost of less than C which is in the range of $\$1.7 \times 10^4$ to $\$4.4 \times 10^4$ as N varies from 300 to 100. (Assuming $R = 4 \times 10^3$ and $T = 4 \times 10^6$.) If a value is assigned to spectrum conservation as well as to hardware the allowable terminal cost would be considerably larger.

We've cut power consumption 18 watts without cutting corners!

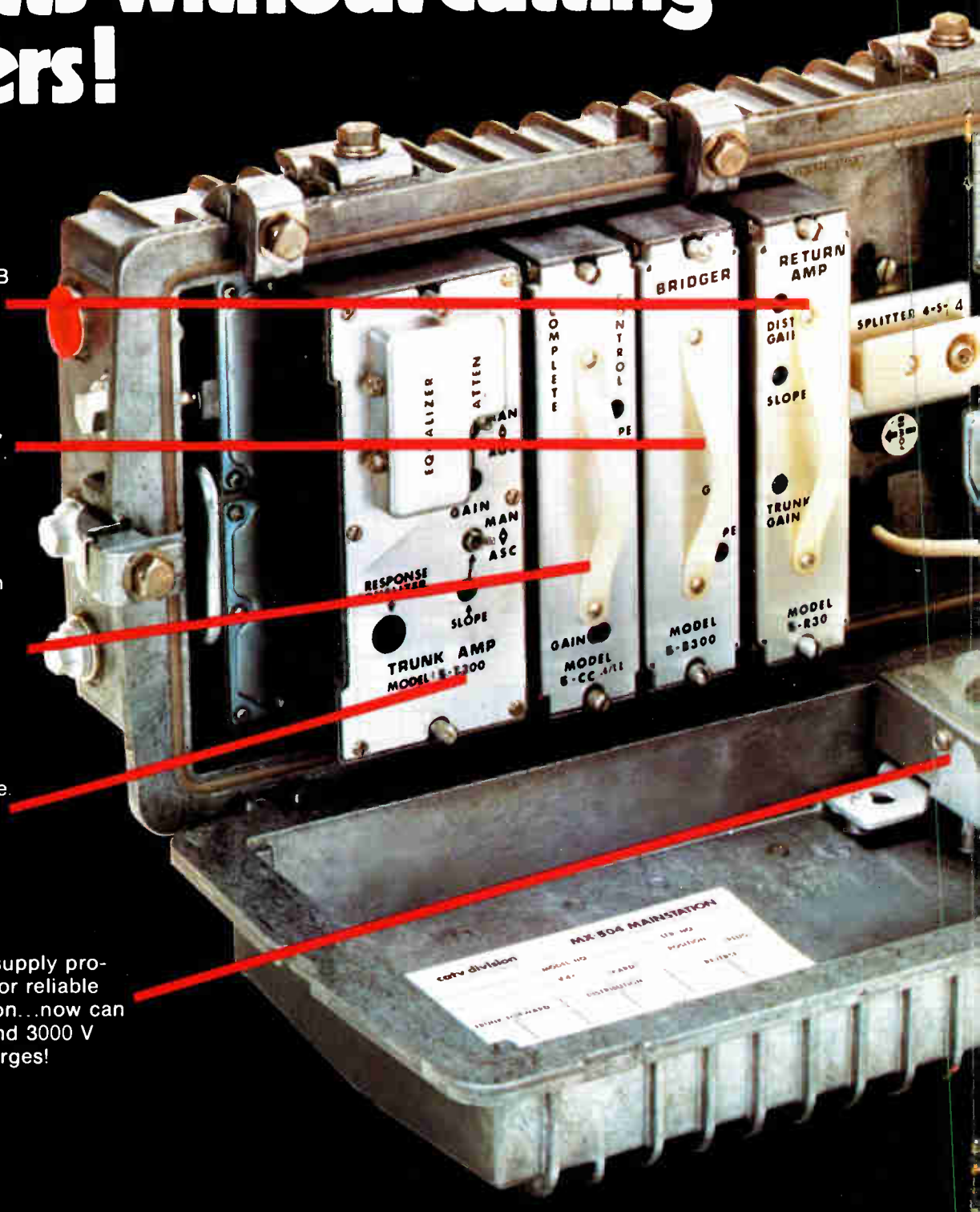
Second order is 83 dB @ 36 dB out...2 to 7 dB better than competition!

At a 51 dBmV output, a -76 dB third order... 3 to 5 dB better than competition!

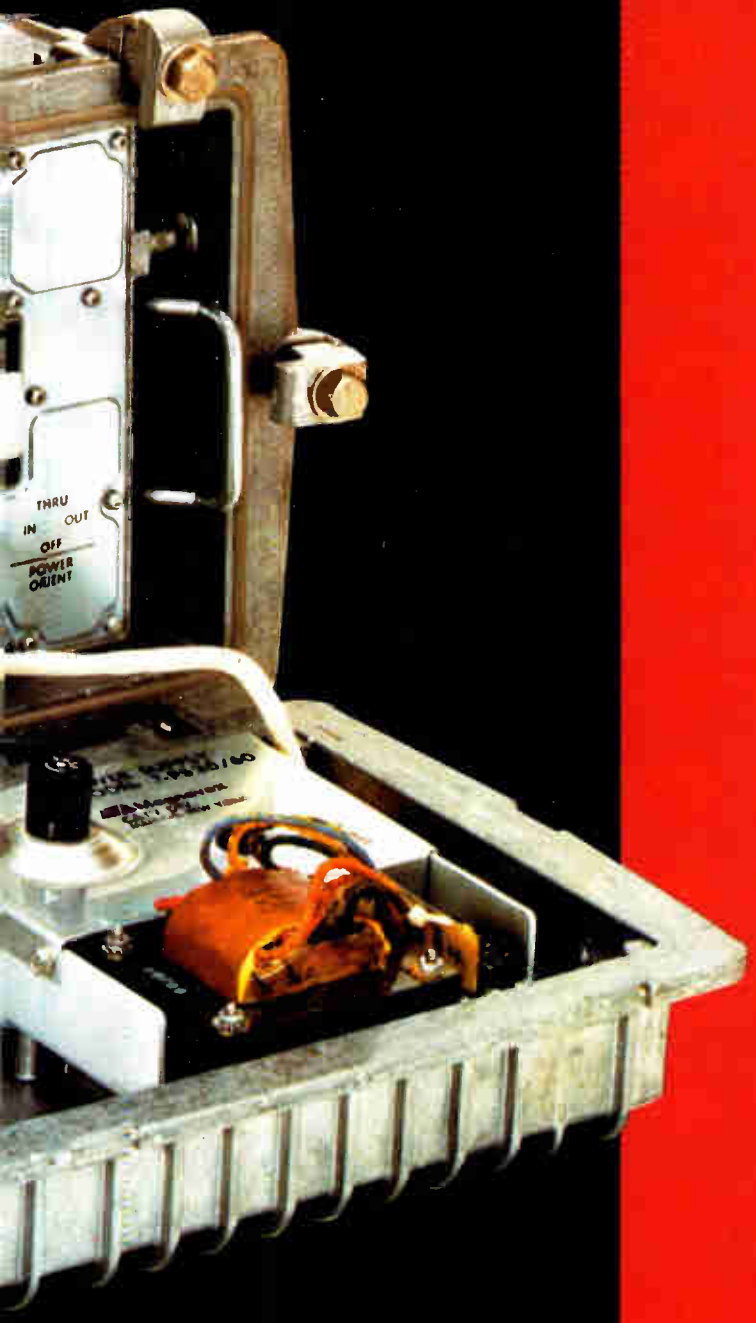
No deviation between modulated and un-modulated carriers, because of unique design of peak detection circuitry!

Improved noise figure. Without equalization this is now 7.5 dB... 1 dB better than competition!

Power supply protected for reliable operation...now can withstand 3000 V peak surges!



to



The New MAGNAVOX MX-504 Mainstation Amplifier

You can cut mainstation power needs up to 35%—and get even better performance—with the new Magnavox MX-504 Series Mainstation Amplifier. It needs only 18 watts in trunk service—and with proven Magnavox dependability!

Magnavox pioneered in all-IC mainstation amplifiers. We were first to offer them in large-scale production. That's because IC suppliers designed to Magnavox specifications, and delivered!

Now, the suppliers have met today's new Magnavox specifications for advanced IC's with dramatically lower power needs—and even better performance.

Put Magnavox lower power and higher performance to work for your bottom line. Call us today. Magnavox CATV Systems, Inc., 133 West Seneca St., Manlius, N.Y. 13104. Toll-free, East of the Mississippi: 800-448-9121. West: 800-448-5171. Also: 315-682-9105.

Magnavox

Frequency division multiplex, or frequency division multiple access as it is called in satellite circles, has been widely used for transmitting a large number of telephone signals over a single transponder channel. Figure 1 is a block diagram showing how this technique might be used to carry two video channels with one transponder. Unfortunately, when two independent signals are passed through the satellite channel, the average power output must be reduced by 6 dB to reduce the intermodulation products to acceptable values. In addition, the FM deviation must be reduced by about 8 dB because of the reduction in available bandwidth. For performance comparable to a single channel system with a 15-foot dish, a two channel system would require an antenna of over 50 feet in diameter.

Other approaches to frequency division multiple access experience the same signal to noise ratio problem. For example, let the proposal be to use two 6 MHz AM channels instead of the 18 MHz FM paths. The noise bandwidth of the receiver is now less, but there is no FM improvement, and the back-off in satellite power must be greater to prevent intermodulation problems.

The intermodulation problems of frequency division multiple access can be eliminated by going to some time division system in which the two information streams do not use the transmission path simultaneously. In order to examine the available Time Division Multiplex possibilities we need to first establish the data rates invoved.

Channel Capacity

Conventional sampling of a 5 MHz video channel and use of an eight bit PCM code yields a data rate of 80 Megabits/sec. or 160 Megabits for two video channels.

Application of Shannon's Theorem for a band limited channel in the presence of white noise:

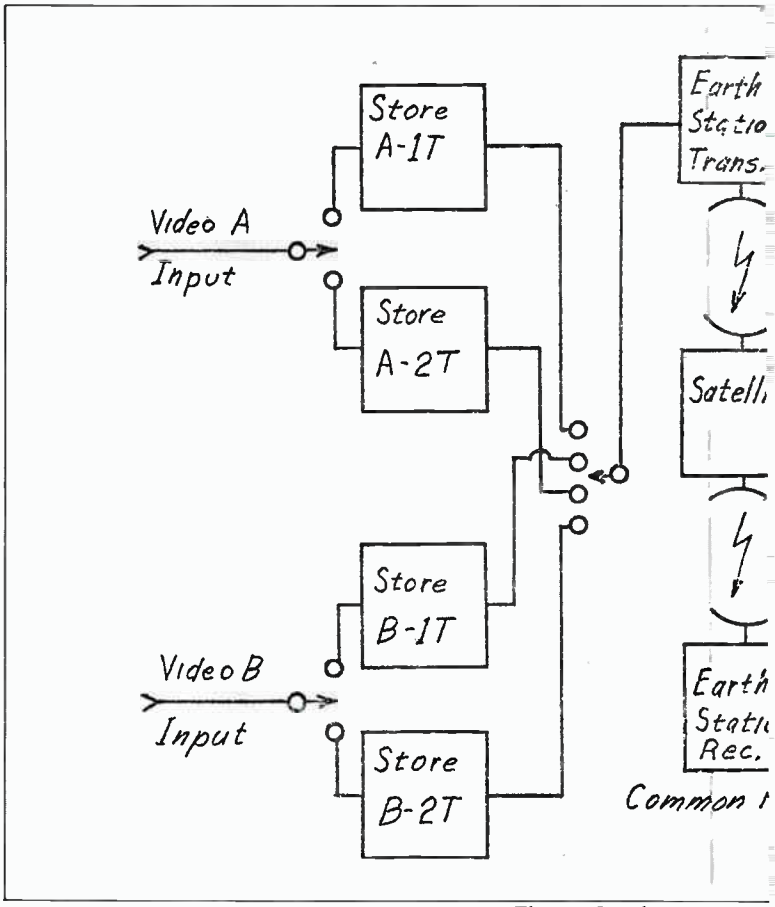


Figure 2. Time compre

(1) $R = B \log_2 (1 + S/N)$ bits/sec.

to a satellite down-link of bandwidth

$B = 36$ MHz

and a carrier to noise ratio

$S/N = 12$ dB

yields a limit for the information rate of

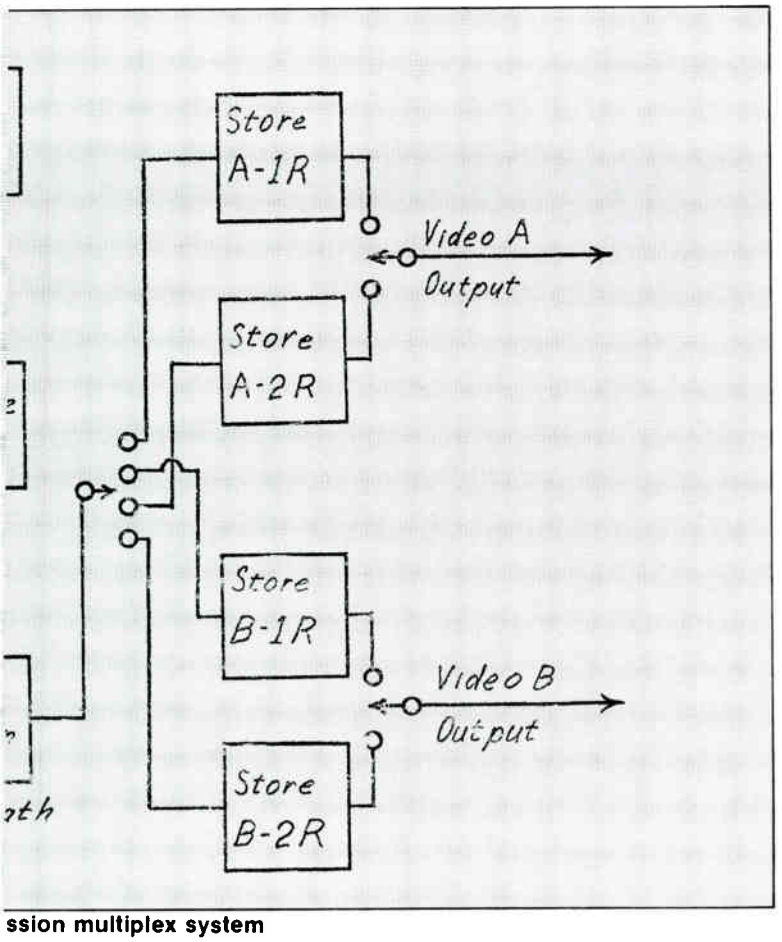
$R = 146.7$ Megabits/sec.

Clearly, two signals requiring a total data rate of 160 Mb/sec cannot pass through this channel.

Let us examine the video channel more closely to see whether the conventional PCM encoding approach was efficient. We know that a usable video signal can be passed through a circuit of about 4.2 MHz bandwidth with a delivered signal to noise ratio of about 46 dB P-P/rms. Reducing this to an rms/rms value of 37 dB and using equation (1) we find that the greatest data rate which the video channel can have is 51.6 Megabits/sec.

Two different approaches have been reported in the search for a more efficient method for encoding a video channel. In one approach the video signal is stored and examined at the transmitting end of the system. To the greatest extent possible, redundancy is removed from the signal, and what is left is encoded and transmitted.

In the second approach alternate frames of each video signal are deleted at the transmitting terminal and the remaining frames are time interleaved for transmission on a common path. At the



ssion multiplex system

receiving end the incoming data is stored and made available to a computer which is programmed to predict what the missing frames probably were.

Using the first system, good picture quality has been reported with data rates of 33 to 43 Megabits per channel. Two channel operation over a single transponder with a 15-foot receive dish has been demonstrated. Some picture degradation is reported with the second approach. With each of these systems some costly storage and computational hardware is required.

The TCM System

If the second system is modified somewhat we can avoid the necessity for omitting part of the incoming data at the transmitting terminal and predicting its probable value at the receiver. Figure 2 shows an arrangement in which alternate blocks of data from a video input, A, are stored in two stores A-1T and A-2T. The same treatment is given a second signal, B. The stores are read sequentially into a common path, time is apparently compressed to half its real value, and spectral components of the incoming signals are doubled in frequency.

At the receiving terminal the process is reversed. The signals are read into the stores at high speed and read out into separate lines in real time. We will call this complete process Time Compression Multiplex (TCM).

To investigate the ability of a satellite channel to carry the TCM signal, recall that the signal to noise ratio of the FM channel is related to its carrier to noise ratio by:

$$(2)\quad \frac{S_{rms}}{N_{rms}} = \frac{C}{N}\left[3\left(\frac{\Delta f}{f_m}\right)^2 \frac{B}{f_m}\right]\left[\frac{(2\pi f_m T)^2}{3}\right]$$

where Δf is the peak deviation
fm is the highest modulating frequency
B is the I F bandwidth and
T is the de-emphasis time constant

For our example, let fmT = 1.25; in which case the third factor, giving the effect of use of pre- and de-emphasis, is 13.1 dB.

Let the deviation and the highest base band frequency be related to the bandwidth by Carson's rule:

$$(3)\quad B = 2(\Delta f + f_m)$$

Using equations (1), (2), and (3) we can plot the information capacity of an FM channel as a function of highest modulating frequency. This has been done in Figure 3. For the single channel case where fm = 4.2 MHz, we have an excess channel capacity of about 17 Megabits. For the dual channel case, assuming fm of 8.4 MHz, the excess channel capacity is about zerc. (In both cases we are assuming that the required data rate for the analog channel is 51.6 Mb/sec. as previously calculated.)

For S/N 1, we may restate Shannon's Threorem, (1), as

$$R_1 = B \log_2 (S/N)_1 \quad \text{and}$$

$$R_2 = B \log_2 (S/N)_2$$

By subtraction

$$\frac{\Delta R}{B} = \log_2 \left[\frac{S/N_1}{S/N_2}\right], \text{ where } R_1 - R_2 = \Delta R.$$

Then

$$\frac{\Delta R}{B}\ 10 \log_{10} 2 = \Delta\ S/N \text{ in dB,}$$

is the relation between excess channel capacity expressed as bit rate and available noise margin expressed as S/N in dB.

Unless the data rate of the two channel TCM system can be somehow reduced, the system will have no noise performance margin.

The previous computation which indicated that a video channel could represent a data rate of as much as 51.6 Mb/sec. assumed that all times were equally important in the video signal. This is not necessarily true. The active portion of the video scanning line occupies only

$\frac{108}{130}$ ths of the total time. The remaining

$\frac{22}{130}$ ths of the time is used for horizontal synchronizing signal which has very low information content. If we can save most of this time we can reduce the data stream by:

$$2 \times 51.6 \times \frac{22}{130} = 17.5 \text{ Megabits/sec.}$$

Using this reduction in data rate for an 8.4 MHz channel in equation (4) indicates that we may be able to achieve a 6 dB

improvement in signal to noise ratio. All of this improvement will not be realized in the design of a system because some of the available data rate must be assigned to the audio channels and to synchronization.

Application of TCM to Two Video Channels

Before proceeding to a sample system design consider again the block diagram of the TCM system in Figure 2. The signals going into the storage units are analog in character. Those coming out into the common line are also analog, but they occupy half as much time, and their spectral components are doubled in frequency. The stores are not necessarily analog. They could be digital shift registers preceeded by an A/D converter and followed by a D/A converter. Recently there have become available some Charge Coupled Devices (CCD) sometimes called "Bucket Brigade Delay Lines" which can perform the storage function without the requirement for the A/D and D/A conversions. In these devices an amount of charge proportional to the analog input voltage is shifted through the cells of the device in response to a clock signal. When this charge eventually flows through an output resistor it reproduces the analog input voltage but delayed in time. By having available two clock frequencies one may place a line of video in store at one rate and read it out of store at a different rate.

For either the digital or the analog the data is acquired by a sampling process, and the time between samples can be no greater than the Nyquist interval or T = ½ fm sec.

There is no requirement that samples of the input signal be taken all the time. During the sync interval the value of the signal is known, and no samples need be taken. This reduces the total number of samples to be transmitted and thus reduces the maximum frequency in the common line.

There is no requirement that the two clock rates be related by a 2:1 factor. The clock which reads information out of store and into the common line is chosen to be fast enough to move the required number of samples in the available time, leaving enough time to insert a small data stream containing the two sound channels, system sync, etc.

The common line of Figure 2 corresponds to the earth station transmitter—satellite transponder—earth station receiver of a satellite relay system. In this line, the highest frequency necessarily present would be:

$$f_m = \frac{1}{2} \frac{\text{Total number of Samples from two video lines + DIGITAL}}{\text{Time of one horizontal line}}$$

The digital group representing sync and sound channels would be treated as a frequency shift keyed signal of either Binary or M'ary type.

In the common line we need to be concerned with the time of transition from one of the analog signals to the other. In general, it is limitations arising in this transition time which have restricted the usefulness of Pulse Amplitude Modulation Systems to which the TCM system may be compared. Limitations in the phase response of the common line can cause a sudden amplitude transition to be accompanied by a precursor or tail (ringing or overshoot). By this mechanism, cross-talk between channels is created.

We can avoid half of the problems of this cross-talk by making the transition from one analog signal to the other during the sync interval of one of the signals. At the receive end of the system, we will generate and reinsert clean sync in this channel. Thus, the effects of the cross-talk will be removed.

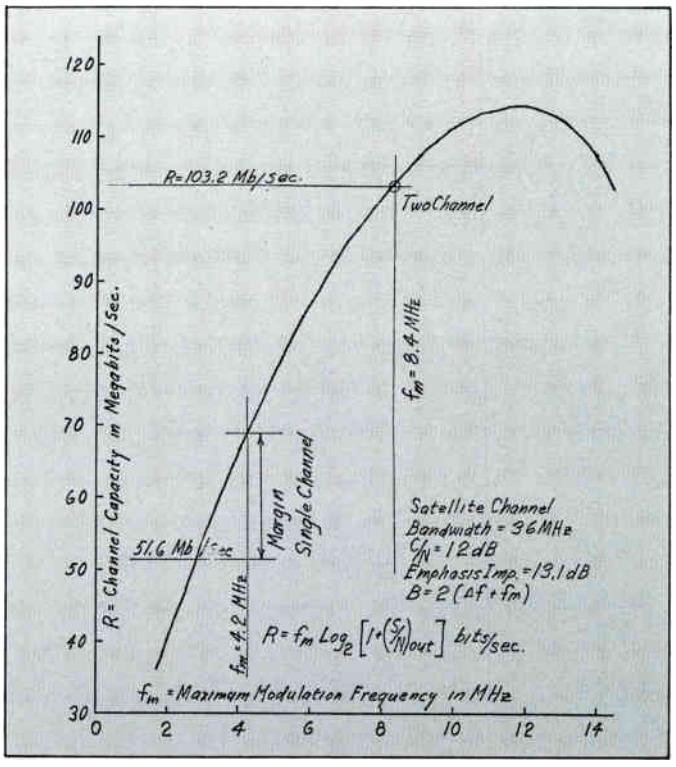


Figure 3. Information rate vs. modulation frequency

In the general case the two video signals will have no fixed relation between their sync times. Thus, while the above fix works for one master channel (to which system sync is keyed), it is of no help for the slave channel. For the slave channel the problem may be avoided by transmission of a small amount of additional information.

In Figure 2, let the samples stored in Store A-IT be taken from channel A video starting and ending during A blanking. Then add a few samples of B video taken from the B line just preceeding the samples used to fill Store B-IT from the B line (with a pause in loading during B sync time). Load a few extra samples of B video after the complete line is loaded. (These samples will be duplicates of the first few samples in B-2T.)

When read into the common line there will be no channel transition at the time when loading of B-1R or B-2R starts or stops because the common line is carrying B information on both sides of these points. Let us make a trial system design based on a video channel of about 4.2 MHz bandwidth and a store which can hold 455 samples. For NTSC video all of the frequencies and intervals are related to a master frequency, FM = 14.31818 MHz. The time building block is:

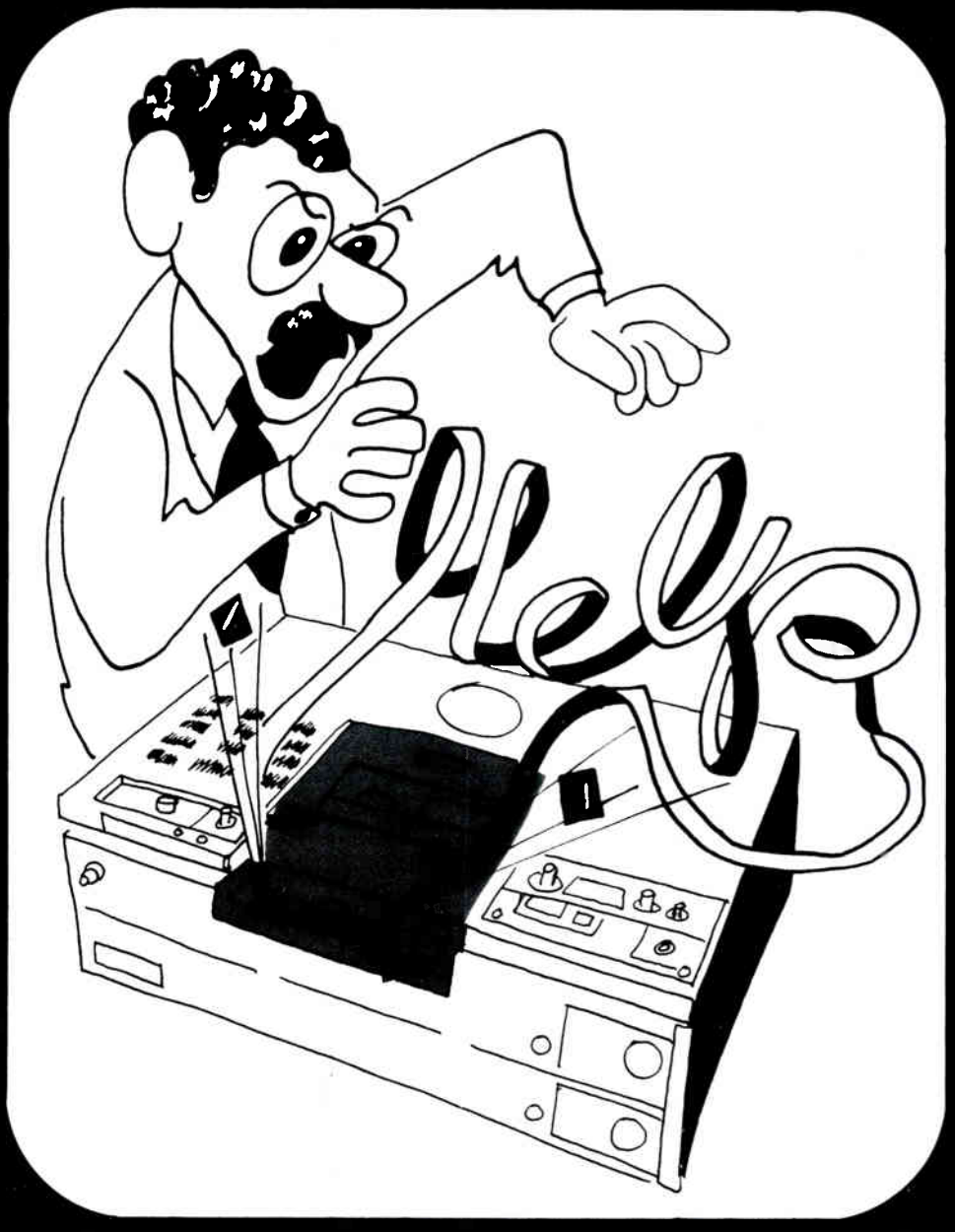
$$T_A = \frac{7}{F_M}$$

The horizontal line time is 130 TA, and this becomes the time in which we must read out both video stores plus the digital store. In loading the store let this horizontal line time be equal to 532 sample times, (TSI). Then, the maximum base band frequency we can handle is:

$$f_m = \frac{1}{2\ T_{SI}} = \frac{532}{2 \times 130\ T_A} = \frac{532\ F_M}{2x7x130} = 4.19\ \text{MHz}$$

The active portion of the video line is 108TA long which

VIDEO EQUIPMENT PROBLEMS??



We Repair

Cameras	Sync Generators	Monitors
Video Tape Recorders Players	Switcher Faders	Oscilloscopes
Special Effects Generators	Time Base Correctors	Test Signal Generators

Call us about any test equipment repair calibration requirements
Ph (703) 434 5965

COMSONICS, INC.

• P O BOX 1106 • HARRISONBURG, VIRGINIA 22801

ComSonics is an employee owned corporation

corresponds to approximately 442 TSI. A typical load for an A Store would then be:

4 samples of A Blanking level	
442 samples of A active video	
4 samples of A Blanking video	
5 samples of B video for cross talk prevention	
455 Total samples	

For the B Stores the load would be the same except that the 8 samples of blanking would come somewhere in the middle of the Store, and there would be a pause during loading in response to B sync.

When the samples are read out into the common line, let us use the following sample assignment:

455 samples from A-1T	
455 samples from B-1T	
32 sample times for Master sync.	
10 sample times for A/B Sync difference	
16 sample times for A audio PCM	
16 sample times for B audio PCM	
16 sample times - Spare at this time	
1,000 Total sample times	

The sample time into the output common line is:

$$T_{SO} = \frac{130\ T_A}{1000}$$

We can now calculate the maximum base band video frequency which must be transmitted over the satellite as:

$$f_m = \frac{1}{2\ T_{SO}} = \frac{1000}{2x130T_A} = \frac{1000\ F_M}{2x7x130} = 7.87\ \text{MHz}$$

One may well object to a system design which calls for sampling at the Nyquist interval. Note, however, that this is an internal problem which may be resolved by using a larger number of cells in the store. The ratio of the top frequency in the video input to the highest frequency presented to the satellite transmitter base band is:

$$\frac{f_{m\ \text{video}}}{f_{m\ \text{B-B}}} = \frac{532}{1000} = \frac{4.19\ \text{MHz}}{7.87\ \text{MHz}}$$

If a Store with 910 rather than 455 cells had been used this ratio would have stayed the same. Sampling rates within the multiplex equipment would have doubled and the digital samples would have been twice as long in terms of sample times but the same length in real time.

The numbers chosen for the example come from an attempt to design around an existing CCD storage device of 455 cells which may be driven at sampling rates as high as 16 Mega-samples/sec.

Let us compare the noise performance of this two channel TCM system with that of a conventional single video channel over a satellite transponder. The path of interest is the downlink and we will use a carrier to noise ratio of 12 dB for the TCM system. For the single channel system, the C/N will be increased to 12.8 dB to take into account the fact that a receiver of 30 rather than 36 MHz bandwidth is often used in current practice.

A relationship frequently used is:

$$(5)\ \frac{S_{p\text{-}p}}{N_{rms}} = \frac{C}{N} + 20\ \text{Log}\ \Delta f + 10\ \text{Log}\ B - 30\ \text{Log}\ f_m + 10\ \text{Log}\ 6 + EW$$

Where the emphasis weighting factor is 13.1 dB

For the single channel case where

Δf = 10.5 MHz peak deviation and
f_m = 4.2 MHz highest base band frequency

the result is S/N = 50.2 dB

For the two channel TCM system the applicable factors are:

f = 10.13 MHz,
f_m = 7.87 MHz,

and the result is S/N = 41.7 dB

The single channel system would normally transmit video with sync having a maximum amplitude of 160 IRE units (including maximum color signal). In the TCM system the sync signal would be regenerated and added at the receiving end. Thus, the maximum P-P value for its video would be 140 IRE units. A 1.2 dB improvement in S/N can be realized by taking advantage of this. In addition, a portion of the transmitter deviation in the single channel case was attributable to the sound subcarrier which is not needed in the TCM case. If a 1.5 dB adjustment is made for this the result is:

single channel	two channel
S/N = 50.2 dB	S/N = 44.4

References

( ) *"Digital Communications by Satellite"*
J.J. Spilker, Jr., PhD
1977, Prentice-Hall, Inc.
Englewood Cliffs, New Jersey

( ) *"Communication Satellite Systems: An Overview of the Technology"*
Edited by: R.G. Gould and Y.F. Lum
1975, IEEE Press
New York, New York

Part two of Digital's article will be presented in May, C-ED's convention issue. The conclusion of the article will feature S/N enhancement, video and data application and two-way application.

THE ONLY TAP OF ITS KIND

MOISTURE SEALED & CORROSION RESISTANT

AND ONLY $7.25 (5.50*)

No other tap provides this protection:

- Baked-on, Polyurethane Finish plus a Totally Water Sealed Assembly
- Patented Non-Shearing Center Seizure Mechanism • Modular • 5-300 MHz
- Eye-level Center Seizure Connections • *With a standard irridite finish

ARVIN/CATV

ARVIN SYSTEMS, INC. An Arvin industries Subsidiary
P.O. Box 200, Lancaster, Ohio 43130 • 614/756-9222

For Delivery–Call

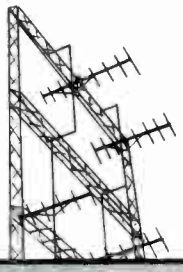
Cablevision Equipment Company
Garland, TX 75042
214-272-8551

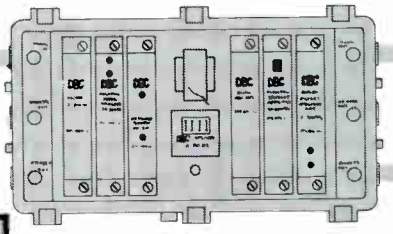
Signal Vision, Inc.
El Toro, CA 92630
714-586-3196

Comm-Plex Electronics
Montreal, Quebec CANADA H4P1V4
514-341-7440

Emjay Electronics
Drexel Hill, PA 19026
215-284-6338

John Weeks & Assoc.
Lawrenceville, GA 30245
404-963-7870



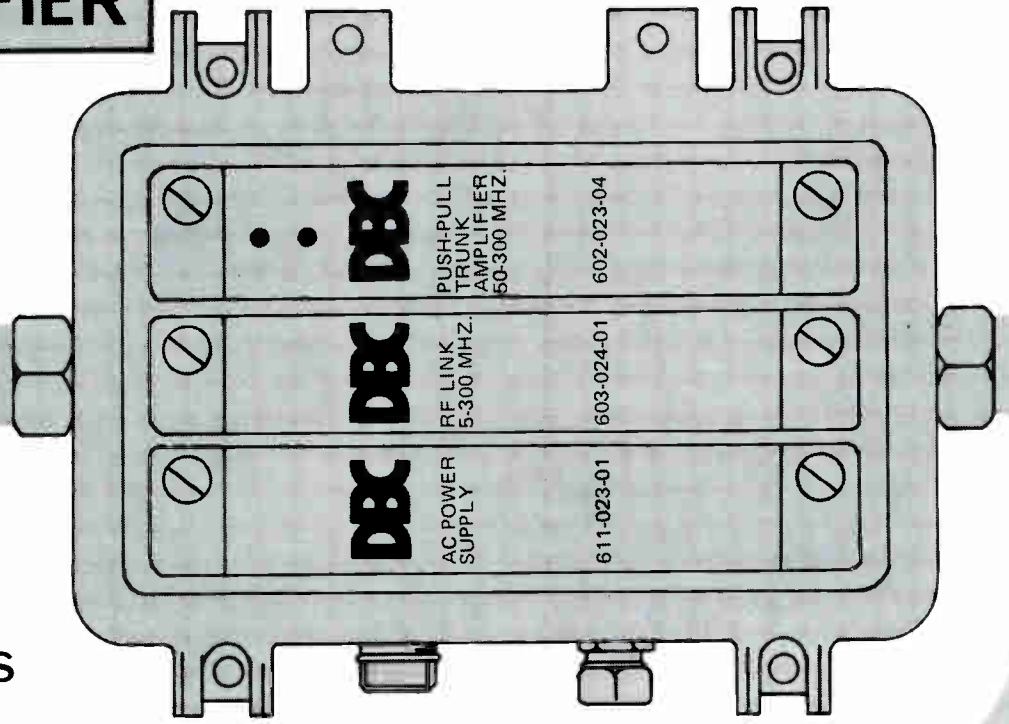


CASCADE 300

CELECOM

DISTRIBUTION LINE AMPLIFIER

TRUNK QUALITY IN A LINE EXTENDER BY USING TRUNK AMPLIFIER MODULES IN A SMALL HOUSING



CAPABILITIES

INCLUDE:

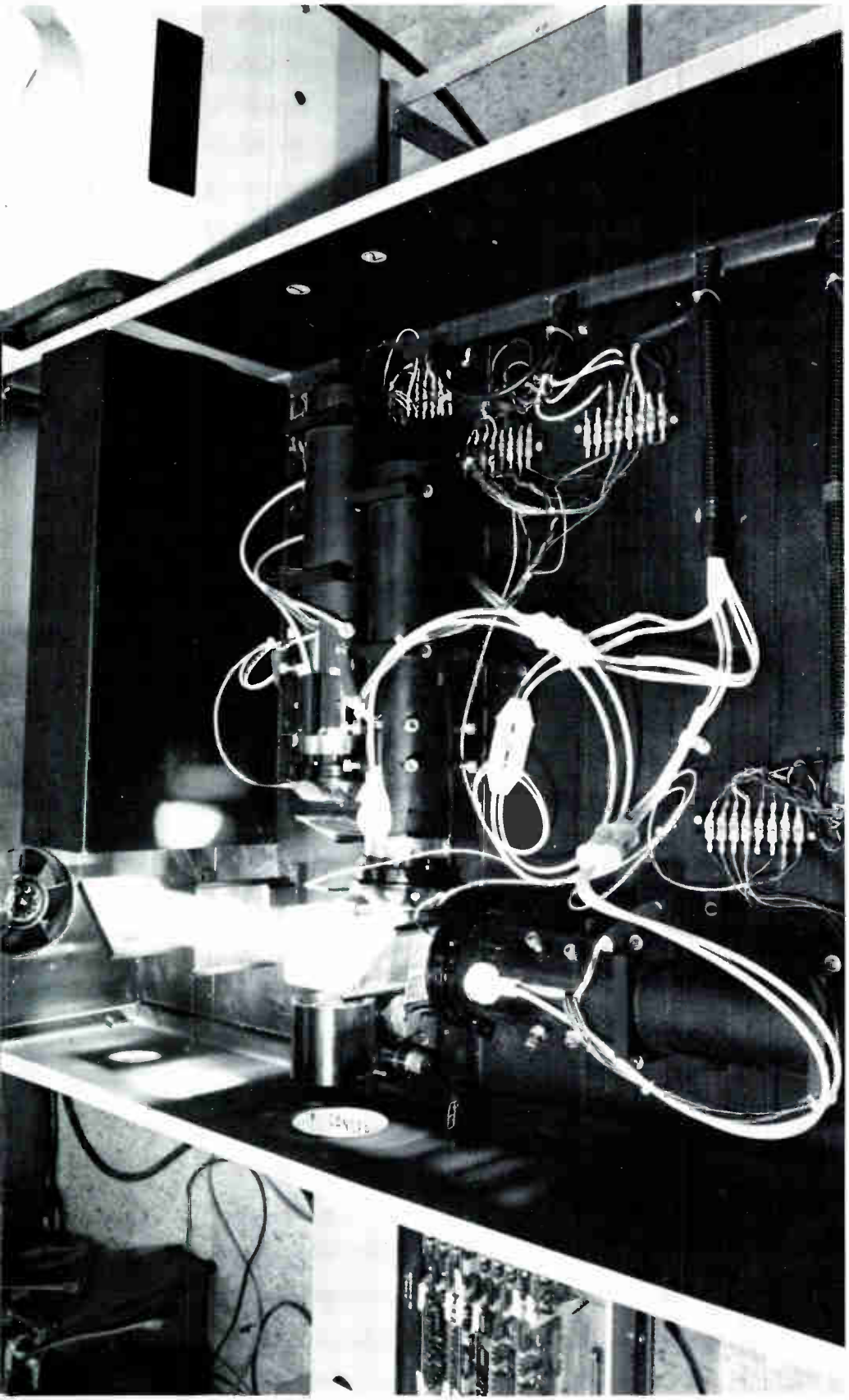
- ALC OR MANUAL CONTROL
- LO AND HI-GAIN OPTIONS
- REMOVEABLE MOTHERBOARD
- 30/60 VOLT POWER SUPPLY
- POWER INSERTION
- TWO-WAY OPTION
- TRUNK INTERCHANGEABILITY

DELTA·BENCO·CASCADE

124 Belfield Road, Rexdale, Ontario, Canada M9W 1G1
Telephone (416) 241-2651 Telex 06-965552

CALL OR WRITE TO YOUR NEAREST OFFICE: Philip Allman, 4913-205th Street, Langley, B.C. V3A 5T7. Tel. (604) 534-3710: Ken Jones, R.D. 1, Box 69, Beaver Springs, Pa 17812, Tel. (717) 658-2282: Gene Wampler, 1544 Warpath Drive, Kingsport, Tenn., Tel. (615) 246-6579: Bob Ward, Route 1, Box 233, Clatskanie, Ore. 97016, (503) 728-3042: REPRESENTATIVES: Bruce Martin, Cablevision Equipment Co. Inc., 3838 Cavalier Drive, Garland, Tex. 75042, Tel. (214) 272-8551: Neil Phillips, Signal Vision Inc., 23932 Jarrow Lane, El Toro, Cal. 92630, Tel. (714) 586-3196: U.S. WATTS LINE (800) 828-1016

Light Years Beyond The CRT



By Dr. Alex Jacobson, technical expert formerly with Hughes Aircraft Company

The Liquid Crystal Light Value (LCLV) is a new light addressable electro-optic device that provides the means for creating large screen display of video information and images. This method combines an ac driven photoconductor/dielectric mirror substrate with a nematic liquid crystal operated in a patented configuration, called the hybrid field effect mode. The light valve is capable of dynamically displaying symbols and graphics as well as full color continuous tone images of conventional broadcast or cable television. The following article describes the construction and operation of the LCLV and how it is used to create large screen video imagery.

A cross section schematic of the ac photoactivated light valve is shown in Figure 1. The device is fabricated as a sandwich of thin films or glass substrates. This is followed by a reactively sputtered cadmium sulfide (CdS) photo-sensitive film that has its maximum sensitivity at 525 nm. Next, a thin film of cadmium telluride (CdTe) is thermally evaporated to block visible light. This is followed by a broadband (silver) dielectric mirror that consists of alternative high and low refractive index films of sputtered titanium dioxide (Ti02) and silicon dioxide (Si02). The dielectric mirror is coated with a final layer of sputtered Si02 to provide an electro-chemically inert surface upon which to spread the liquid crystal. This completes one side of the light valve. The other side consists of a glass substrate evaporated by an indium-tin-oxide transparent electrode. This layer is covered with a layer of Si02 to protect the electrode from the liquid crystal. Finally, a spacer of Si0x is thermally deposited around the rim of the glass to serve as a means for maintaining a uniform thickness of liquid crystal. The device is assembled by spreading a thin layer of nematic (byphenyl) liquid crystal on the Si02 surface of the substrate (the half of the device that contains the CdS photosensor), and adroitly laying the counter-electrode (the other half of the device) over the liquid crystal to create a thin, uniform layer of liquid crystal whose thickness is determined by the spacer on the counter-electrode. The glass assembly is then enclosed in a metal holder to fasten it together permanently.

In operation a low voltage (5-10V RMS) ac voltage source (5-20 kHz) is connected across the two indium-tin-oxide transparent electrodes. The thin films are designed so that when no light falls on the CdS photosensor, the bulk of this voltage falls across the substrate and very little falls across the liquid crystal. In this way the liquid crystal is maintained quiescent in the absence of a light signal input. Then, when light falls on the CdS, the impedence of the CdS drops, thereby

The liquid crystal light valve is a new electro-optic television projector display device. It uses liquid crystal chemicals and thin film, solid state electronics to permit the projection of television images onto a large screen.

LIQUID CRYSTAL LIGHT VALVE COLOR TV PROJECTOR

The cabinets in the LCLV color television projector contain the television electronics. The projection lamp, projection optics and light valves are located on top of the electronics.

"...accurate, functional and a pleasure to use... almost too good to be true." *TV Communications* September 1977

It's true.

The Avantek SL-300 Signal Level Meter.

The Optimum Combination — Digital Frequency Display, Analog Level Display
Indicates frequency from 4.5 to 300 MHz on a 3 digit LED display — no confusion. Indicates signal levels from -40 to +60 dBmV on a 20 dB true logarithmic meter scale — easy to see slow level variations.

No Compromise Sync Peak/CW Level Detector
A unique sample-and-hold detector actually locks onto video sync peaks or CW carrier levels — accurate to ±1 dB and unaffected by video content.

Built-In Calibrator
On a frosty morning or blazing afternoon, readings are always consistent, repeatable and accurate. The SL-300 can be calibrated in a few moments in the field or on the bench and the internal calibrator is accurate within ±0.1 dB, -10 to +120 °F.

Built-In Hum Level Meter
Measures 0.1% to 10% system hum level directly without additional equipment or special set-up — ±1 dB overall accuracy.

Delivery of the SL-300 is stock to 30 days.

The SL-300 is a professional instrument packaged in a weatherproof field case and powered from its internal rechargeable battery pack or any external 12 VDC source. To extend the SL-300 capabilities, interchangeable plug-in modules are available, including:

AC-DC Voltmeter	Calibrated for sine or square-wave AC (RMS) for measuring system power, and for DC to check amplifier test points.
Spectrum Analyzer	Displays any portion of the CATV spectrum on a service scope, and includes front-panel sweep width and scan rate controls.
Stability Monitor	Drives a chart recorder to produce a permanent record of system signal levels. A built-in timer can make unattended periodic measurements at 15 minute to 4 hour intervals.
UHF Converter	Adds full 470 to 890 MHz coverage, channels 14 through 83.

For a technical data sheet and a copy of the TVC staff feature which describes how the SL-300 performed in their actual field tests, write or call Avantek or your closest representative.

Avantek Representatives

Complete CATV Engineering Services
Mo., KS, IL, IN, IA, AR, TX, OK, CO, N.M., WY, — (314) 227-3212

Com Se Sales Corporation
GA, N.C., S.C., AL, MS, TN, LA — (404) 963-7870. FL — (813) 371-3444

Jerry Conn Associates
Pa, OH, W.V., Va., Md., DE — (717) 263-8258

Dynacomm
N.Y., N.J., CT, MA, R.I., N.H. — (914) 699-0990

CATV Services Company
CA, NV, — (415) 651-4331

Avantek 3175 Bowers Avenue, Santa Clara, CA 95051 (408) 249-0700

ENGINEERS PERFORMANCE TEST

		Yes	No
1.	*Does customer service know if an address is serviceable? Can they commit to scheduled appointment? Will it be kept?*	☐	☐
2.	*Can customer service answer billing questions immediately? Can they trust the information at hand, or are there "blind spots?"*	☐	☐
3.	*Is your installation department consistently scheduled with a full day's work? Are the appointments confirmed?*	☐	☐
4.	*Is an installation productivity report readily available to you?*	☐	☐
5.	*Can you tell how many installations you have made in the last 9 days?*	☐	☐
6.	*Can you tell how many cancellations you have had in the last 9 days and for what reason?*	☐	☐
7.	*Can your dispatcher retrieve a two-year history of repair orders instantaneously?*	☐	☐
8.	*Is your technical department consistently scheduled with a full day's work? Are the appointments confirmed?*	☐	☐
9.	*Are the trouble calls scheduled and are they automatically assigned to a predefined work area?*	☐	☐

If you can answer yes to only three of the above questions, come by and see us at Booth 405 at the NCTA Show in New Orleans.

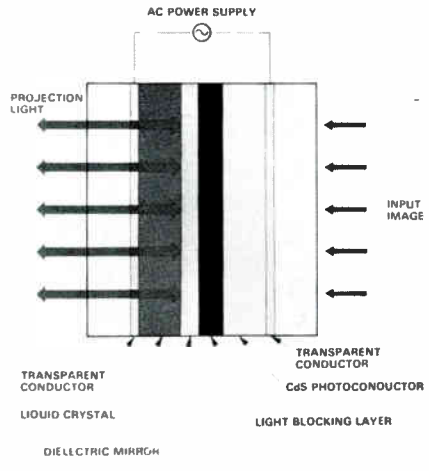
GMS

Gill Management Services
2025 Gateway Place
San Jose, CA 95110
(408) 998-8078

switching voltage to the liquid crystal. This photo-switched voltage activates the liquid crystal, thereby turning the device "on." Thus, the CdS acts like a light-activated voltage gate. Moreover, this light activation is a local phenomenon. That is, if a small spot of light (as small as 1 mil in diameter) falls on the CdS, only a corresponding spot (i.e., 1 mil in diameter) of the liquid crystal is activated. Thus, if a highly complex continuous tone image is input to the CdS, the LCLV will convert it into an exactly equivalent high resolution continuous tone electro-optic image in the liquid crystal layer.

This process can be repeated at television rates to permit the device to be used with conventional video signals. The dielectric mirror and the light blocking layer are used to separate the CdS photosensor from the projection light beam that is used (as described below) to read out the electro-optic image in the liquid crystal. This is a major design feature of the LCLV. It permits simultaneous "writing" (input) and "reading" (output) of the device without regard to the spectral composition of the two light beams. Furthermore, the dielectric mirror prevents the flow of dc current through the liquid crystal. This greatly enhances the durability of the device.

HYBRID FIELD EFFECT LIQUID CRYSTAL LIGHT VALVE



Pictured above is a diagram of the hybrid field effect on the liquid crystal light valve.

Application of the Device to Projection TV

The liquid crystal is designed to operate in the hybrid field effect mode. This mode of operation modulates the polarization (rather than the intensity) of an incident projection light beam. Thus, to use the LCLV, it is necessary first to polarize the light from the projection lamp. The LCLV then modulates the polarization of the projection beam by means of the electro-optic image contained in the liquid crystal layer. This means that after emerging from the LCLV, the polarization of the projection beam varies from point-to-point in direct measure with the variation in the light image that was impressed upon the CdS to activate the device. To make this polarization modulation visible to the naked eye, the modulated projection beam is first passed through a polarization analyzer—a device that converts polarization variations into equivalent intensity variations—and then through the projection lens and onto the screen. A system for implementing this operation is shown in Figure 2.

The system uses three light valves, one each for the red, blue and the green components of the color TV picture. The light valves are driven by conventional CRTs (P-1 phosphor) to which they are coupled optically by means of relay lenses. Thus, with this technology, the light valve and its associated CRT primary display are physically separate (unlike the General Electric and Eidophor light

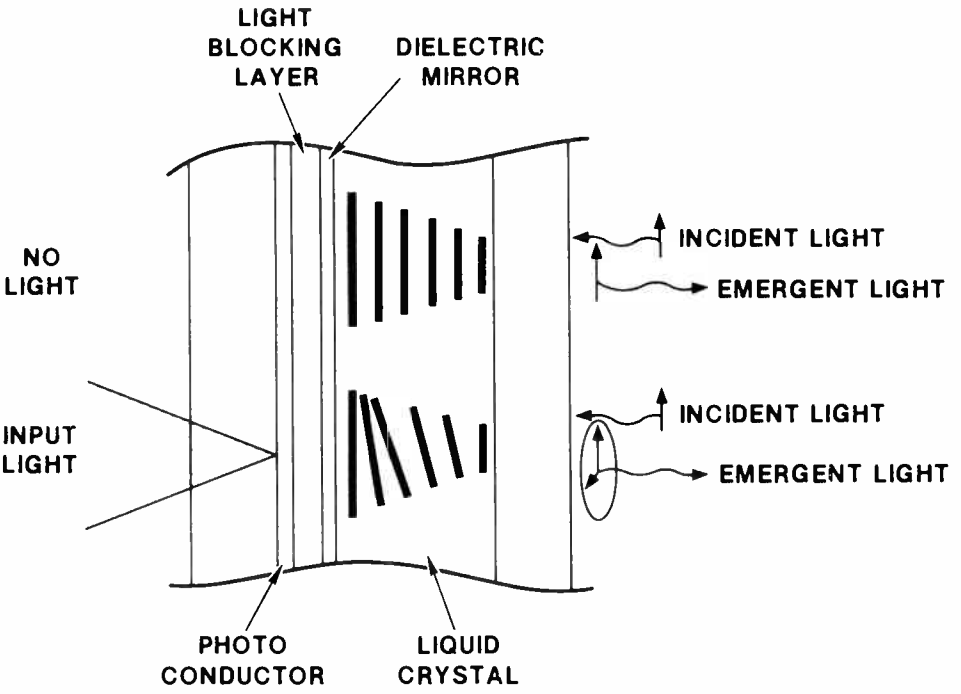


Figure 1: Functional diagram of the hybrid field effect liquid crystal light valve.

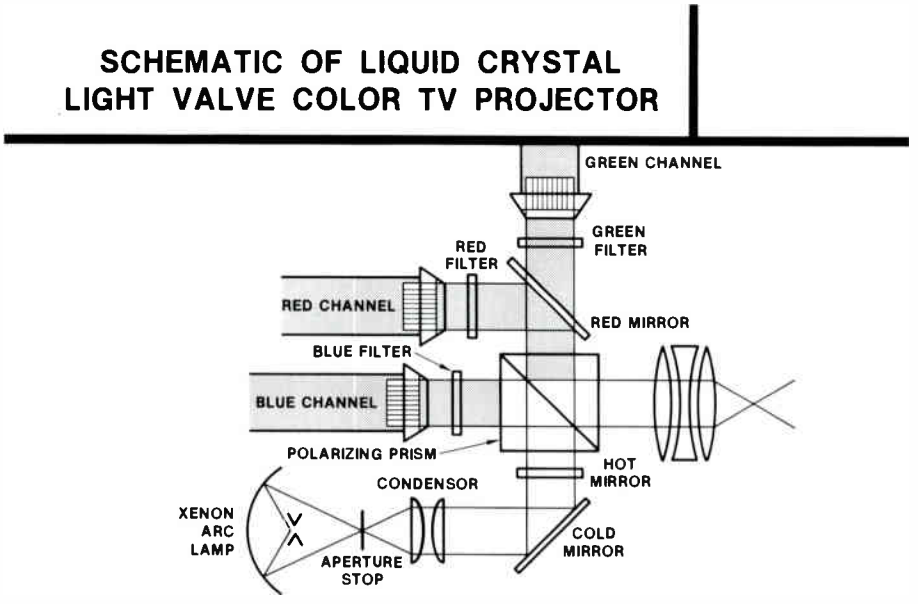


Figure 2: Schematic of liquid crystal light valve color TV projector.

valves).

The polarization optical system is built around a MacNeill polarizing prism. Basically, the MacNeill prism is a thin film polarizing beam splitter that is designed to polarize white light. The system incorporates thin film dichroic filters and a thin film dielectric mirror to separate the spectrum of the projection lamp. These components divide the light into blue, red and green projection beams and, after modulation by the light valves, they recombine the beams into a full color beam for projection to the screen. A xenon arc lamp is used for the projection light source. The optical system shown in Figure 2 analyzes both the spectrum and the polarization of the light from the lamp. Apart from performing this double function, the optical system has two major advantages: 1) it requires only one projection lens and one projection lamp; and 2) it forms all optical images on a common optical axis, thereby permitting changes in screen size without reconverging the system. C-ED

Or...

How to sell much more by offering much more without paying much more!

It stands to reason that if you could offer Multi-Pay (a choice of two or more) services to each home passed, you'd have a much better chance of selling one or more of the services for a substantial increase in penetration of homes passed.

If you could do it without appreciably increasing your costs . . . would you? Of course you would . . . but *can* you? Of course you can!

VITEK's New Multi-Channel Traps are the answer for both new and existing systems. You already know VITEK's Cable Traps (the industry standard) are the best for Pay TV Security. They prevent theft of Pay TV Service *at the pole*. . . .

Now, with VITEK's Multi-Channel Traps, you have the recognized advantage of having cable-traps on the pole plus the added advantage of being able to offer Multi-Pay service.

Plan your installation with VITEK's Multi-Channel Traps and offer 2 or more levels of pay-service. If you're offering three levels of pay-service and you sell one of the three . . . replace the "Multi" with a "Dual-Channel Trap" and pass the selected service *only*. If you sell two out of three, replace with a Single-Channel Trap and pass the other two. If you can sell 'em all three, remove the Trap and that's all there is to it. *You'll smile all the way to the bank.*

Typically, the cost of installing VITEK Dual or Single Channel Traps are written off in a few months against income. And, remember . . . All VITEK Cable Traps look like regular drop cable, have superior environmental stability, durability and are maintenance-free.

For additional information on Multi-Level Service, or an analysis of costs for a system being planned, or to upgrade a present system, call or write: Paul Ellman

VITEK Electronics, Inc.
200 Wood Avenue . Middlesex, N.J. 08846
Tel: (201) 469-9400

VITEK

Video Technology

CRC Electronics New Cassette Controller

CRC Electronics, Inc. has announced the introduction of the TD-100 Time Delay Cassette Controller. The TD-100 represents the application of digital technology to the flexible control of recording and playback in modern videocassette machines, including the revolutionary Sony Betamax machines. The TD-100 is designed to provide any delay from one hour up, in one-minute increments, for any program source, whether it is of a specific duration, or is a 24-hour feed. It provides for resumption of operation after VTR's have been stopped by power failure, as the TD100's logic is battery protected. Used in conjunction with a suitable array of machines, the TD-100 becomes essentially an "Extended Delay Line" with program material emerging from the system at the desired interval after entering.

For further information, contact Jim Chiddix, CRC Electronics, P.O. Box 855, Waianae, Hawaii 96792, (808) 668-1227.

Datamedia Introduces Communications-Oriented Video Terminal

A new, low-cost, microprocessor-based, communications-oriented video terminal, designed to provide a "new level of reliability" in a range of transaction processing and inquiry response applications, was announced by Datamedia Corporation. The product is the first in a new family of microprocessor-based video terminals from the company.

The newest Datamedia video terminal—the Elite 3025A—is a buffered Teletype®-compatible CRT terminal with a single-page video memory that displays 1920 alphanumeric characters in a 24-line/80-character format.

The unit provides broad versatility in communications with a data processing system, minicomputer, or other peripherals, accomodating a standard RS-232C or optional 20mA current loop interface, and supporting full or half duplex, two- or four-wire, internally or externally clocked, asynchronous communications.

For more information, contact Datamedia Corporation, 7300 N. Crescent Blvd., Pennsauken, New Jersey 08110, (609) 665-2382.

Digital Channel Programmer From Arvin

The Arvin Digital Channel Programmer, with non-duplication and multiple channel switching, incorporates the latest in long-life solid state photo-optic scanning and integrated circuit logic. Non-duplication and multiple channel switching is accomplished via simplified programming of a plexiglass disc with 30-minute intervals for a total of seven days.

For additional information, contact Arvin Systems Inc., 1771 Springfield St., Dayton, Ohio 45403, (513) 258-2181.

Chyron Introduces New 3/4-Inch Videocassette Cleaner and Evaluator

The Chyron cassette cleaner and evaluator, CCE model U-1, is a completely automatic, self-contained unit which cleans and evaluates 3/4-inch videocassette tape at a rate ten times faster than real time without altering the pre-recorded signal. The unit removes dirt and embedded particles from tape surfaces, and detects surface and edge damage which may cause VTR head clog and video dropout. A thirty-minute cassette can be processed easily and safely in less than three minutes.

The CCE model U-1 has three modes of operation. The unit can be made to automatically stop on major tape damage only, stop on minor tape damage only, or continue until the entire playing surface of the tape has been cleaned and evaluated. Two LED numeric counters on the front panel indicate the actual tape length in minutes and tenths to 99.9 minutes, and provide a count of accumulated major and minor tape damage. Eight message lamps reflect the tape and system status at each stage of the operation.

For additional information, write to Chyron Corporation, Video Products Division, 223 Newtown Road, Plainview, New York 11803, (516) 249-5202.

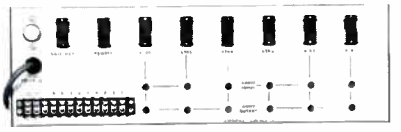
VMC-100 Sequencing System From Videomedia

The Videomedia VMC-100 sequencing system was designed specifically as a professional approach to sequencing 3/4-inch video tape machines in broadcast situations.

The versatile VMC-100 sequencer is a rugged, dependable, low cost control system that interfaces to any capstan servoed helical-scan video cassette machine for precise cueing and vertical interval switching of program material.

The system derives its accuracy from counting control track pulses on standard, unmodified video tapes, obviating the need for expensive time codes.

For further information, contact Videomedia, 250 N. Wolfe Rd., Sunnyvale, California 94086, (408) 733-6500.



Tomco Offers Automatic Non-Duplication Switcher

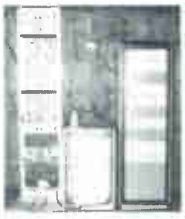
Tomco Communications has introduced its model ADS-1000 automatic non-duplication switcher. The unit is available with RF or I.F. switch and one or two optional VHF tuners. No manual adjustment is necessary for delay resulting from path length difference.

For further information, contact Tomco Communications Inc., 1077 Independence Ave., Mtn. View, California 94043, (415) 969-3042.

Texscan-Your Test Equipment Company

HERE'S PROOF!

FROM HEADEND

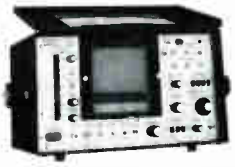


TO TRUNK

TO DISTRIBUTION

TO BENCH

SPECTRUM ANALYZER



VSM-5A
- 4-350 MHz
- −50 dBmV Sensitivity
- Phase Lock
- Storage Interface

Performs all FCC tests except system flatness

FREQUENCY COUNT

TFC-7
- All Channel Performance
- Stripper/Preselector Integral
- −5 dBmV Sensitivity
- 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

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

VF Series

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

SIMULTANEOUS SWEEP

SWEEP TRANSMITTER

9550T
- +60 dBmV Output
- ±0.25 dB Flat
- Low Spurious Output
- Rack Mount in Headend

SWEEP RECEIVER

9550R
- Battery Operated
- Portable
- Long Persistence Phosphor
- High Resolution

ACCESSORIES

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

Texscan

For More Proof — Write
Texscan Corp.
2446 N. Shadeland Ave.
Indianapolis, IN 46219
(317) 357-8781

For Your CATV Distribution Needs:
Theta-Com Div. Texscan Corp.
2960 Grand Ave.
Phoenix, AZ 85017
(602) 252-5021 or 800-528-4066

Overseas
Texscan
Northbridge Rd.
Berkhamstead
Hertfordshire
England, UK

Two Eyes on the Bird

By Ralph M. Dorris, director of engineering
Owensboro Cablevision
Owensboro, Kentucky

Owensboro Cablevision, a subsidiary of Owensboro On The Air, Inc., is the first cable television system in the nation to have two operating earth stations at the same location. Its headquarters, including studio facilities and headend, is located adjacent to the corporation's two radio stations, WVJS (AM) and WSTO (FM).

The receivers were built in the "split" configuration, allowing for the location of down converters at the antenna site. The IF demodulators are situated approximately 1,500 feet from the headend. By interconnecting the receiver units at the 70 MHz IF frequency, RF interference has been completely avoided.

Owensboro Cablevision's current earth receiving station equipment includes two antennas, four LNA's and six receivers. The system uses two antennas produced by Andrew Corporation—one 10 meter and one 4.5 meter antenna. These antennas provide the capability of receiving two satellite signals simultaneously. The larger dish is used for programming from Atlanta, CBN, Madison Square Garden and HBO (on Satcom II), while the smaller dish is used for selected programming from SIN (Spanish International Network) on Westar II.

Another feature that we feel is unique is the output transition on the 10 meter antenna. This unit has two output (receive) ports, one for horizontal and one for vertical polarization, thus providing reception of all transponders on the Satcom 24 channel satellites.

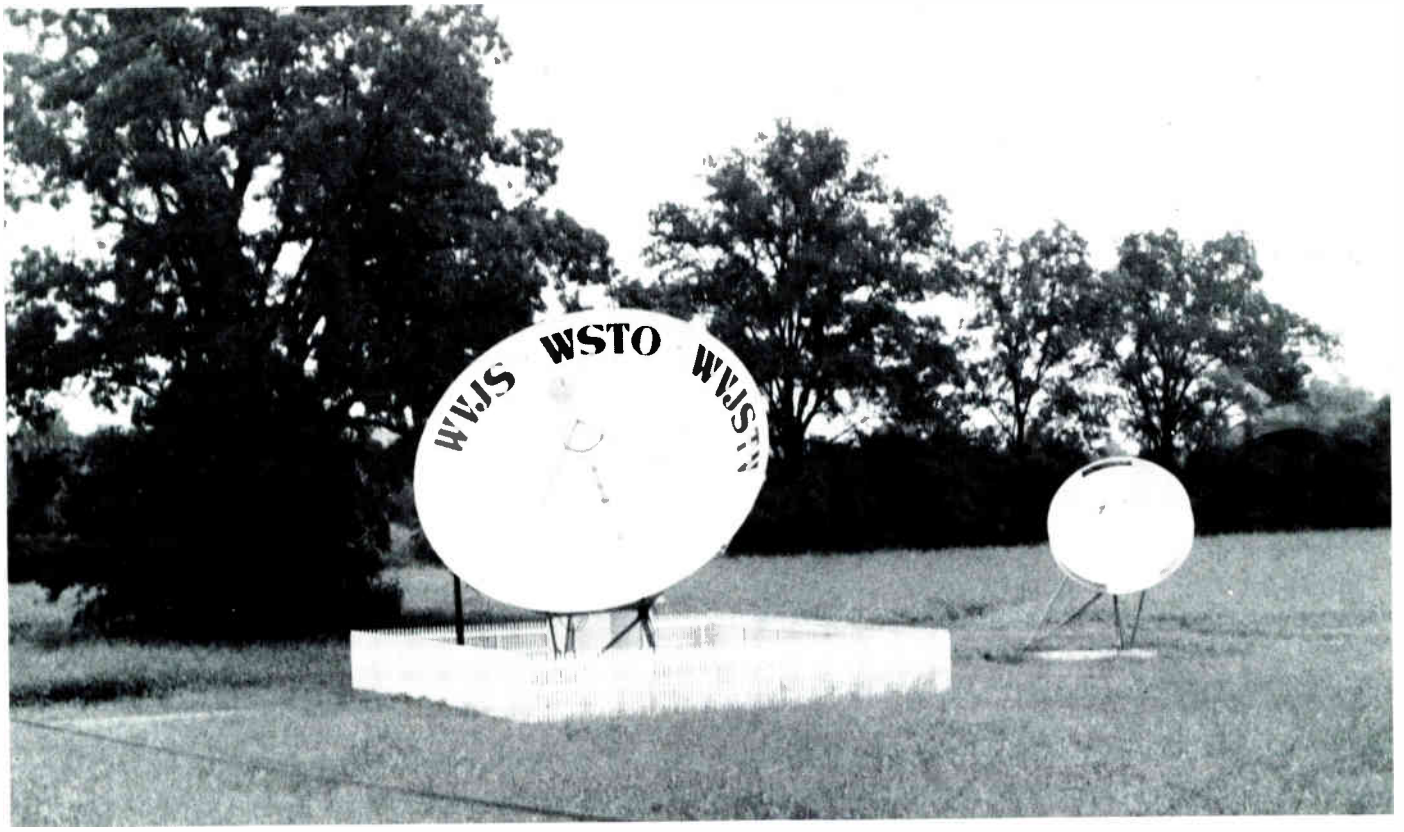
The LNA's used in the system are Amplica GaSfet units. Two of these devices have noise temperatures of 225 degrees K and are used on the 10 meter dish. A 120 degree K unit is used on the 4.5 meter dish, and a 190 degree K unit is available for emergency use.

The six receivers we have are from Microdyne. Three of the units are model 1100-VTR(VT)s which are 24 channel, fully tunable with remote control capability. The other three receivers are model 1100 FCCs which are crystal tuned.

We needed the second dish because Owensboro Cablevision not only has a reputation of being very progressive, but more important, we have faith in this industry. We want to be prepared to grow and to play a viable roll in the impending communications revolution.

SIN—A Three-Month Experiment

SIN, the Spanish International Network, is a three-month experimental project implemented by Owensboro Cablevision. Signals are imported from Mexico City via the Westar II satellite and the 4.5 meter dish. These programs, although in Spanish, are sports and variety shows. Owensboro Cablevision feels that sports and music are international and that language is not a barrier. The experiment will continue for two more months.



FREQUENCY COORDINATION.

The first thing you need for an earth station . . . The last thing you need to worry about.

Every year the microwave environment becomes more complex. What can you do to sort out your potential interference conflicts? Call COMSEARCH.

COMSEARCH provides the full range of coordination services—interference analysis, earth station siting, frequency coordination, RFI measurements—in the United States and every corner of the globe. Our filing package is all you'll need for compliance with the FCC coordination rules.

We take a personal interest in your earth station project. Let us worry about all your frequency coordination problems.

For more information about our comprehensive coordination services, call or write Harry Stemple or Ken Tanck at: 2936 Chain Bridge Road, Oakton, VA 22124. (703) 281-5550.

Booth 207 at the NCTA

Technical Activities In Canada

By Kenneth Hancock, director of engineering, CCTA

Convention month is perhaps a good time to review some of the recent technical happenings in Canada. As usual, the activity is fast and furious, and it's only when writing a column like this that you get to sit back and see how much has been happening.

The CCTA, in a similar manner to NCTA, interfaces with its members and with the government through a technical committee. The CCTA technical committee has a slightly different organization from NCTA's in that a technical executive committee consists of a chairman, a staff secretary and representatives from each of the five regions in Canada. The function of the technical executive is to review the technical needs of members and to set up subcommittees to deal with these specific needs. The subcommittees have specific objectives and terms of reference with their own chairman, members and budget. The activities of the subcommittees are monitored by the executive, and the guidelines change from time to time as needed. The vast amount of activity on the technical and regulatory front in Canada is reflected by the fact that there are currently fifteen technical subcommittees.

In Canada, the main regulatory technical documents are Broadcast Procedures 23 and 24, or to give them full names, "Technical Standards and the Procedures for Cable Television Systems" and "Proof of Performance Procedures for Cable Television Systems." These two documents define the standards to which all Canadian cable television systems must be designed and maintained and the methods of testing the systems to ensure that they meet the required technical standards.

To provide an interface with the Canadian Department of Communications, and to ensure that the needs of our members are met, we have a standing BP 23/24 review subcommittee. Right now this committee is extremely active. The Department of Communications is planning to issue a number of new forms related to proof of performance, progress in constructing new systems and applications for technical construction and operating certificates. The CCTA interfaces with the DOC in the drafting and production of these documents. A real effort is being made by both sides to ensure that when the documents are finally released, they'll meet the needs of the licensee as well as the requirements of the government.

The technical standards and procedures themselves are being updated and reviewed on a more or less continuous basis, and this standing committee submits comments on the various draft changes that the Department of Communications produces.

A further area of activity is that of spectrum policy, specifically the allocation, or rather re-allocation of the spectrum between 406 to 960 MHz. A technical subcommittee works with the Department of Communications on this matter to ensure that the needs of cable licensees are taken into account in the policy making.

A never-ending job is the planning and implementation of the technical program for the CCTA Convention. This includes the production of a "Call for Papers," the evaluation of the technical papers and the production of the technical records, as well as the actual organization of the technical program at the convention. The convention program and technical digest subcommittee really starts its work when a convention is finished and continues through the end of the following convention.

We have been fortunate over the past few years in obtaining a higher and higher level of technical papers from a very wide range of sources, both inside and outside of the industry.

Another subcommittee that has been very busy recently is the converter and cable TV receiver standards subcommittee. During 1977, the Canadian Department of Communications gazetted a draft regulation covering standard TV receivers, cable TV compatible receivers and converters. The CCTA's subcommittee has been extremely active in responding to this document in the hope that it will be modified to meet the best interests of subscribers, manufacturers and cable licensees alike.

Reflecting the new trends in our industry, the fiber optics subcommittee was established approximately a year ago and has been working hard ever since. Of major interest to Canadians is the new seven kilometer, 14 TV channel and 12 FM channel fiber optic trunk being installed in London, Ontario.

To ensure that Canadian members have the benefit of cable TV developments on a world-wide basis, the international activities subcommittee was convened. In addition to providing inputs to the International Electrotechnical Commission on international standards, this subcommittee interfaces with cable television organizations on a world-wide basis, both receiving and providing information.

As with the United States, the joint use of poles and conduits is of major interest to Canadian cable television licensees. To address this situation we have the joint use interface subcommittee that provides a "resource pool" of information on pole rental contracts and standards for Canadian members coast-to-coast.

For the last three years, Canada has been in the process of metric conversion. To interface with the government metric commission, we have a metric conversion subcommittee, which has been extremely active, with the result that metric conversion is now proceeding in the Canadian cable television industry smoothly and on schedule.

Another very busy committee, both in interfacing with government standards and advising members, is the microwave subcommittee. Recently a great deal of its work entails the standards on very high capacity microwave, the Canadian equivalent of the CARS band. It has been most successful in ensuring that the needs of members are met by the new standards.

The safety subcommittee is yet another active committee, providing up-to-date information and recommendations to all members on the important matters of safety in our industry.

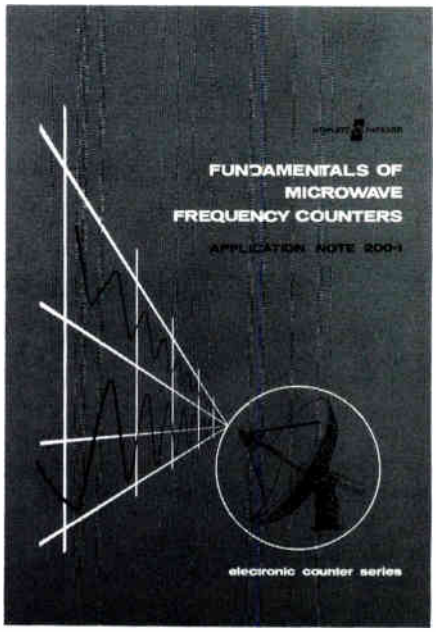
The final CCTA subcommittee deals with that old bugbear "training." This group has been tackling the thorny problem of attempting to provide guidelines for training for the wide range of needs within the industry.

As new technical break-throughs are made, and as government authorities devise more and more operating standards, the technical horizon of the cable industry must expand for us to remain viable. In Canada we hope that by the enthusiastic activities of these subcommittees we can do just that.

Fundamentals of Microwave Frequency Counters

This new thirteen-page applications note from Hewlett-Packard discusses the four principal down conversion techniques for extending the frequency range of counters into the microwave region. The first section of the note details the techniques of prescaling, heterodyne down-conversion, transfer oscillators and the harmonic heterodyne converter. Measurement speed, accuracy, sensitivity and dynamic range, signal-to-noise ratio, AM and FM tolerance and amplitude discrimination of the four techniques are compared. Some factors to be considered in selecting a microwave counter and several applications are also included.

AN 200-1, "Fundamentals of Microwave Frequency Counters" is available from Hewlett-Packard free of charge by mailing requests to the Inquiries Manager, Hewlett-Packard Company, 1507 Page Mill Road, Palo Alto, California 94304.



Hewlett-Packard note discusses down conversion techniques.

Catalog of Video Supplies and Accessories

WIDL Video, has announced a new third edition of "The Catalog of Video Supplies and Accessories."

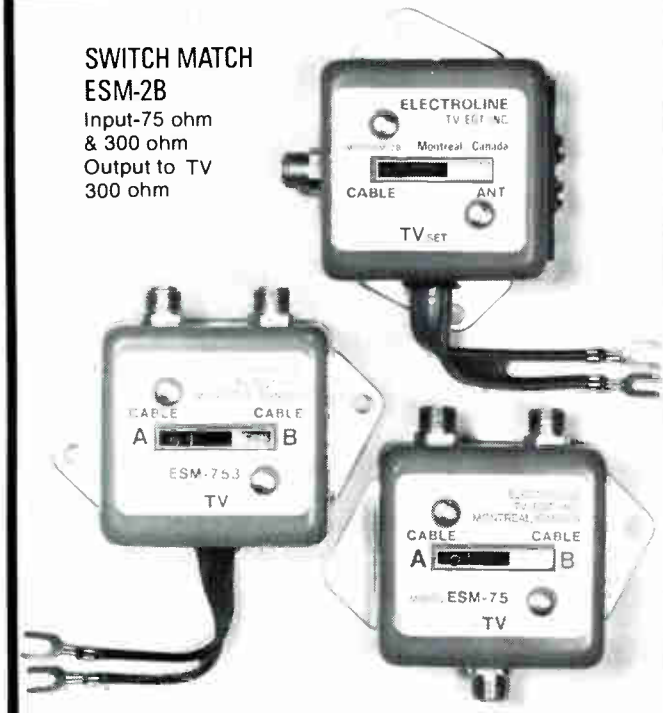
The new 1978 catalog contains over 500 helpful items that video users often have trouble locating. It's loaded with items like video tape, audio cassettes, tape labels, microphones, video cables, audio cables, hard-to-find connectors and adaptors and a complete assortment of printed video forms. The catalog also introduces new products like "The Storyboard System" and a new selection of custom video 'abels.

WIDL specializes in video accessories featuring quality brand names like Memorex, Switchcraft, Belden and Amphenol. The catalog is useful to all facets of the video market including schools and colleges, medical facilities, business and industry, cable companies, government video facilities and the broadcast industry.

For further information and a free copy of the catalog, write to WIDL Video, 5325 N. Lincoln, Chicago, Illinois 60625, (312) 271-4629.

Electroline SWITCH MATCH Transformers & Dual Cable Switch

Cable operators, who want satisfied customers, are switching to Electroline switch-transformers and cable switches which are of ***very high isolation.*** Protect yourself against outages caused by power failures, cable breaks, labor problems, customer-installed contraptions. Electroline equipment is tested for reliability and durability — and installation is so easy.



SWITCH MATCH
ESM-2B
Input-75 ohm
& 300 ohm
Output to TV
300 ohm

SWITCH MATCH
ESM-753
Inputs, 75 ohm
Output, 300 ohm

CABLE SWITCH
ESM-75
All ports — 75 ohm
Excellent match
Isolation — 80 db

- ☐ SPECIAL AMPLIFIERS
- ☐ COUPLERS
- ☐ FILTERS
- ☐ SPLITTERS
- ☐ TAPS
- ☐ TEST ADAPTORS
- ☐ SWITCH-TRANSFORMERS

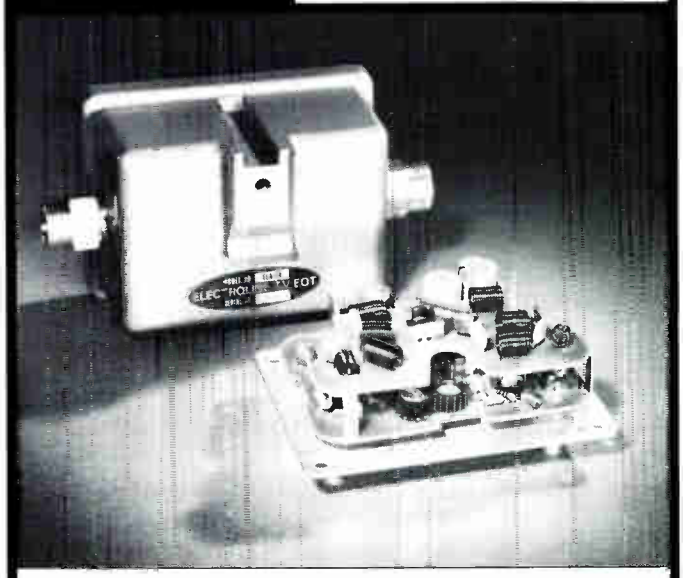
ELECTROLINE Television Equipment Inc.

8762, 8th Avenue
Ville St-Michel
Montreal, Que. H1Z 2W4
or phone collect
(514) 725-2471

Representatives across Canada and the U.S.A.
Offering a line of quality equipment for the cable industry.

Electroline ELA-14 Bi-directional Push-pull Amplifier

Whether you are upgrading or expanding your present system, or planning a new, 30-channel cable system, you should consider the many positive features which Electroline's ELA-14 push-pull line extender offers you.



- ■ *Bi-directional capabilities to 300 MHz*
- ■ *Compatibility with 30 or 60 volt systems*
- ■ *A module that is easily accessible*
- ■ *Power from either input or output, can be power-blocked at output*
- ■ *Universal ⅝ — 24 entry fitting*
- ■ *Economical price*

Manufactured by Electroline and quality designed to meet the high standards required for a 30-channel cable system.

- ☐ SPECIAL AMPLIFIERS
- ☐ COUPLERS
- ☐ FILTERS
- ☐ SPLITTERS
- ☐ TAPS
- ☐ TEST ADAPTORS
- ☐ SWITCH-TRANSFORMERS

ELECTROLINE Television Equipment Inc.

8762, 8th Avenue
Ville St-Michel
Montreal, Que. H1Z 2W4
or phone collect
(514) 725-2471

Representatives across Canada and the U.S.A.
Offering a line of quality equipment for the cable industry.

Help Wanted

SYSTEM CHIEF TECH

Supervise all electronics during construction and operation. Head End experience, system turn-on, and proof of performance. Minimum 2nd class FCC. Large Northeast system start-up. Send resume and salary requirements to:

General Manager
UA-Columbia-Westchester
1415 Boston Post Road
Larchmont, NY 10538
Equal Opportunity Employer

MICROWAVE AND HEADEND SPECIALIST

TM Communications, a dynamic growing MSO, is seeking a Microwave and Headend Specialist with proven productivity and excellence of performance in CATV, AML and FM Microwave, Headends, and Base Band Video. A first class Radio/Telephone license is a prerequisite. The successful candidate will be responsible for facilities in Southern California. This position offers an excellent compensation and benefit program. Interested individual should contact:

Mr. Gilbert L. Tash
Vice President, Egineering
TM Communications Co.
P.O. Box 2320
Costa Mesa, California 92626
Equal Opportunity Employer

IMMEDIATE OPENINGS FOR TECHNICIANS

Must have minimum of 3 years experience and should have 2nd Class FCC. Union wages and benefits. Equal opportunity employer. Send resume to:

J.H. Hofmann, Chief Tech
Monterey Peninsula TV Cable
P.O. Box 1711
Monterey, CA 93940

CONSTRUCTION/TECHNICAL PERSONNEL

Experienced construction/technical people are needed for underground and aerial work. Travel is necessary. The salary is commensurate with your experience and ability. Phone: (904) 653-8822.

CATV TECHNICIANS

Century Cable is seeking experienced technicians for rapidly growing California systems. Troubleshooting, repair and field maintenance background required. Good salary and opportunity for growth. Send confidential resume and salary requirements to:

Mike Harris
P.O. Box 473
Redondo Beach, CA 90277
(213) 376-7934

C-ED Classified Hot Line
Call Toll Free
(800) 525-6370

Business Directory

SYSTEM TECHS

New, small systems. Highest quality plant. Small and very aggressive MSO. Located in east Tennessee area. Excellent potential for self-starters. Send resume with salary requirements to:

Dave Norcutt
Matrix Enterprises
Box 219
Lenoir City, TN 37771
(615) 986-7062

Replies held in strictest confidence.

Ad Index

Superfit™ for a King

RMS CATV DIVISION
ELECTRONICS, INC.

See us at Booth 605
at the NCTA Convention

RMS ELECTRONICS, INC.
50 ANTIN PLACE
BRONX, N.Y. 10462
CALL COLLECT (212) 892-1000