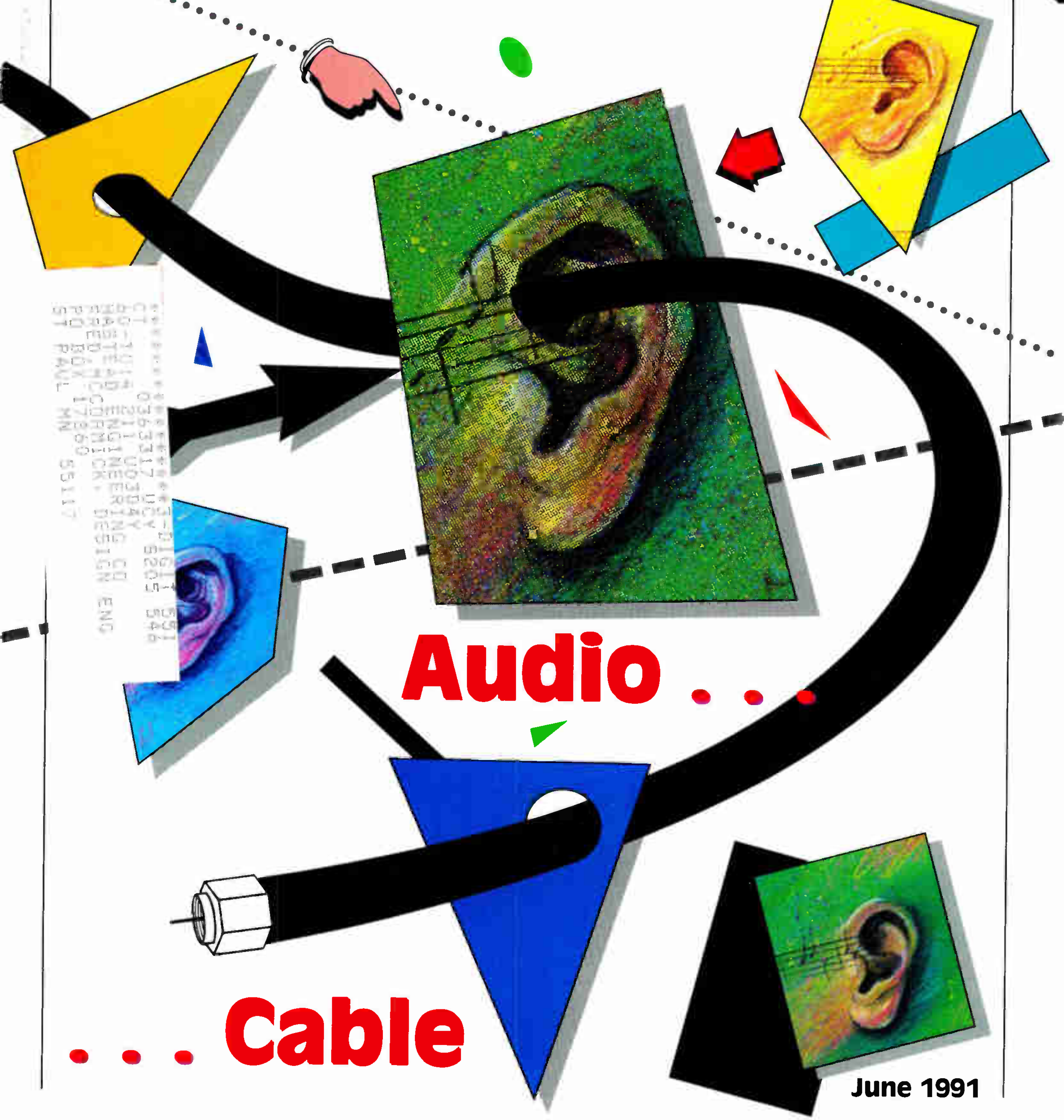
COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

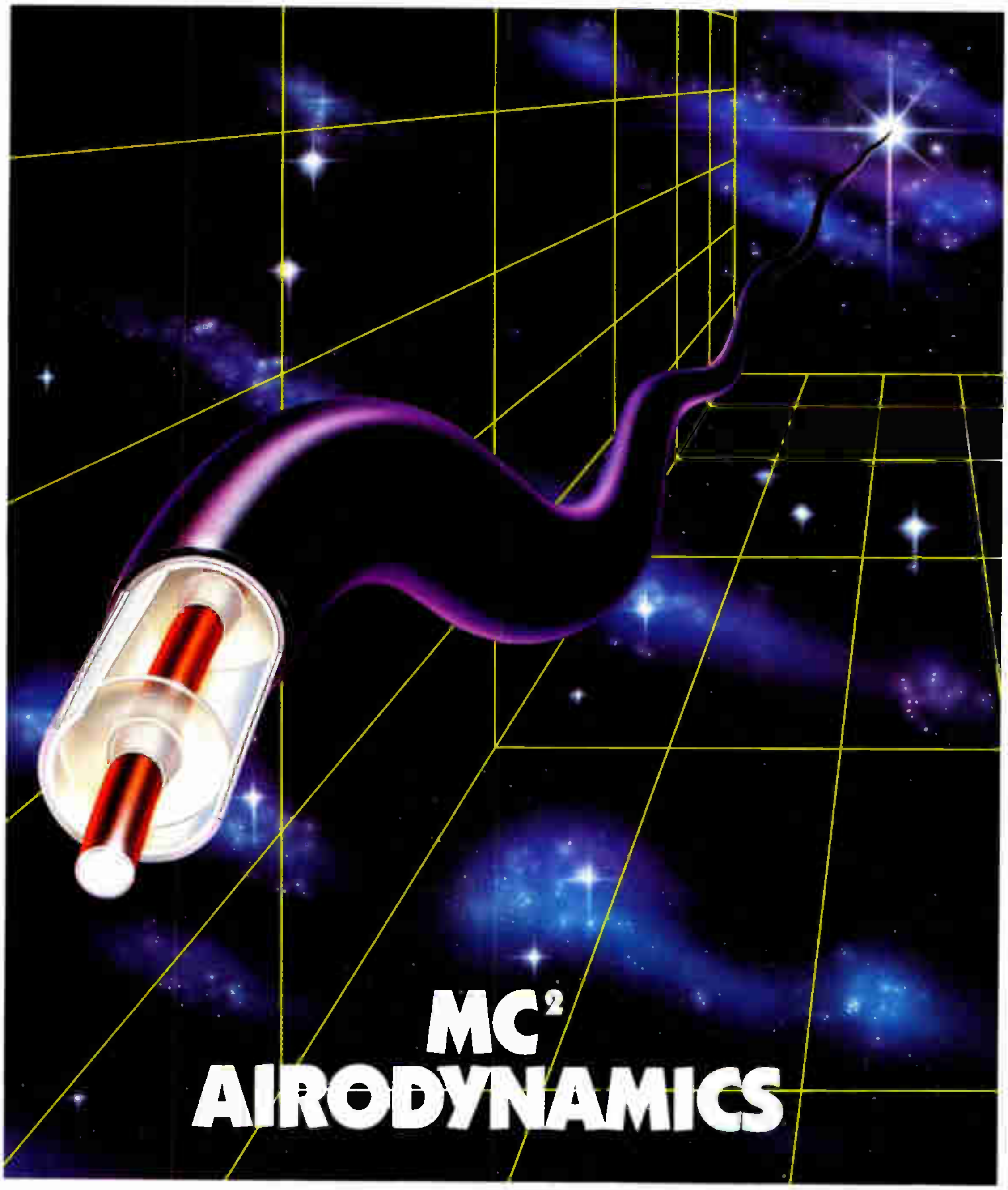
Pull-Out F-Fitting Chart



Audio . . .

. . . Cable

June 1991



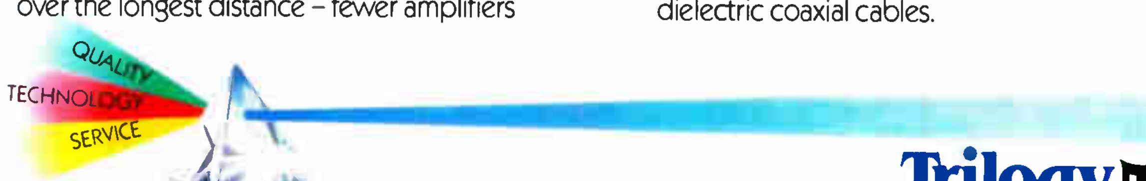
Perfection in Dielectrics.

Trilogy Communications built a better coaxial cable – MC² – and the CATV industry is letting us know about it.

The MC² air dielectric combines excellent product durability and flexibility with air-tight fully-bonded construction. Our 93% velocity of propagation provides the purest signal over the longest distance – fewer amplifiers means immediate savings.

All this plus the highly respected Trilogy program of delivery and service provides our customers with the attention and performance that are second to none.

Our most prized dynamics are your acceptance of our best effort so far – MC² air dielectric coaxial cables.



See us at the SCTE Cable-Tec Expo, Booth 932.

Reader Service Number 3

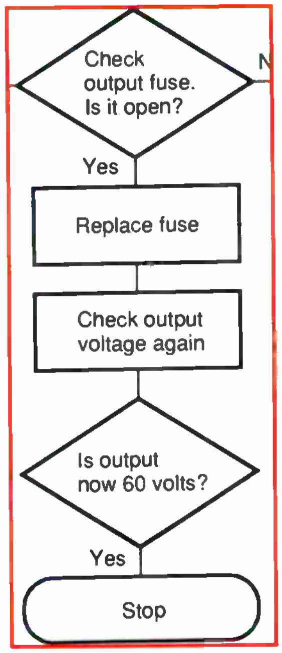
Trilogy
COMMUNICATIONS INC.

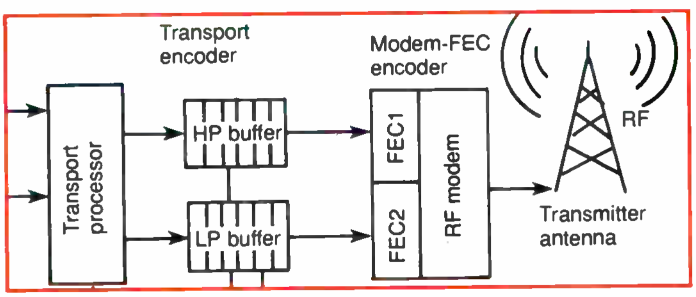
Call or write for our free sample and brochure: TRILOGY COMMUNICATIONS INC., 2910 Highway 80 East, Pearl, Mississippi 39208
800-874-5649 • 601-932-4461

CONTENTS JUNE 1991

Departments

Geri Saye





Features

©1991 by Communications Technology Publications Corp., a subsidiary of Transmedia Partners I-L.P. All rights reserved. *Communications Technology*™ (ISSN 0884-2272) is published monthly by Communications Technology Publications Corp., 50 S. Steele St., Suite 500, Denver, Colo. 80209, (303) 355-2101. June 1991, Volume 8, Number 4. Office of publication is 50 S. Steele St., Suite 500, Denver, Colo. 80209. Second-class postage paid at Denver, Colo. POSTMASTER: Please send address changes to *Communications Technology*, 50 S. Steele St., Suite 500, Denver, Colo. 80209.


Panasonic

COMMUNICATIONS TECHNOLOGY
Official trade journal of the Society of Cable Television Engineers

A Transmedia Publication

Two for training

A year has gone by since we last awarded the Service in Technology Award and in that time the cable industry has made technological strides to better the service we provide to our customers, whether it be through new fiber architectures, digital compression or some other innovation or improvement. However, to make these innovations work for us, our personnel need to know how to implement and utilize them. More important, they need a solid understanding of cable in general.

That's why this year's award goes to Byron Leech and Roland Hieb of the National Cable Television Institute. Through the NCTI's correspondence courses, installers, technicians and other cable personnel first learn how cable systems work, and then build on this knowledge with more complex information as their jobs become more complex. A recent course offering, "CATV Fiber Optics," and new lesson modules on drop troubleshooting and electronics keep pace with the new demands technical personnel are facing.

To make sure as many techs as possible have the opportunity to further their education, Hieb and Leech have put much time and effort into working with the SCTE's Scholarship Committee. For the last four years, NCTI has matched donations to the Technical Scholarship Program with an equal value in correspondence course training. For this dedication to training our personnel, we are proud to honor Byron and Roland. Congratulations!

Goodbyes

In recent months, the industry lost two notable veterans, and friends to many of us, Cliff Paul and Richard Schneider. In my 19 years in the industry, I've relied on each of these men for direction and innovation. They will be greatly missed. A memorial fund has been established in Richard Schneider's name by Benjamin Conroy Jr., Antoinette Conroy and E. Stratford Smith. Additional gifts to the fund may be sent to the Cable Center and Museum at 211 Mitchell Building, University Park, Pa. 16802. Call (814) 865-6535 for more information.

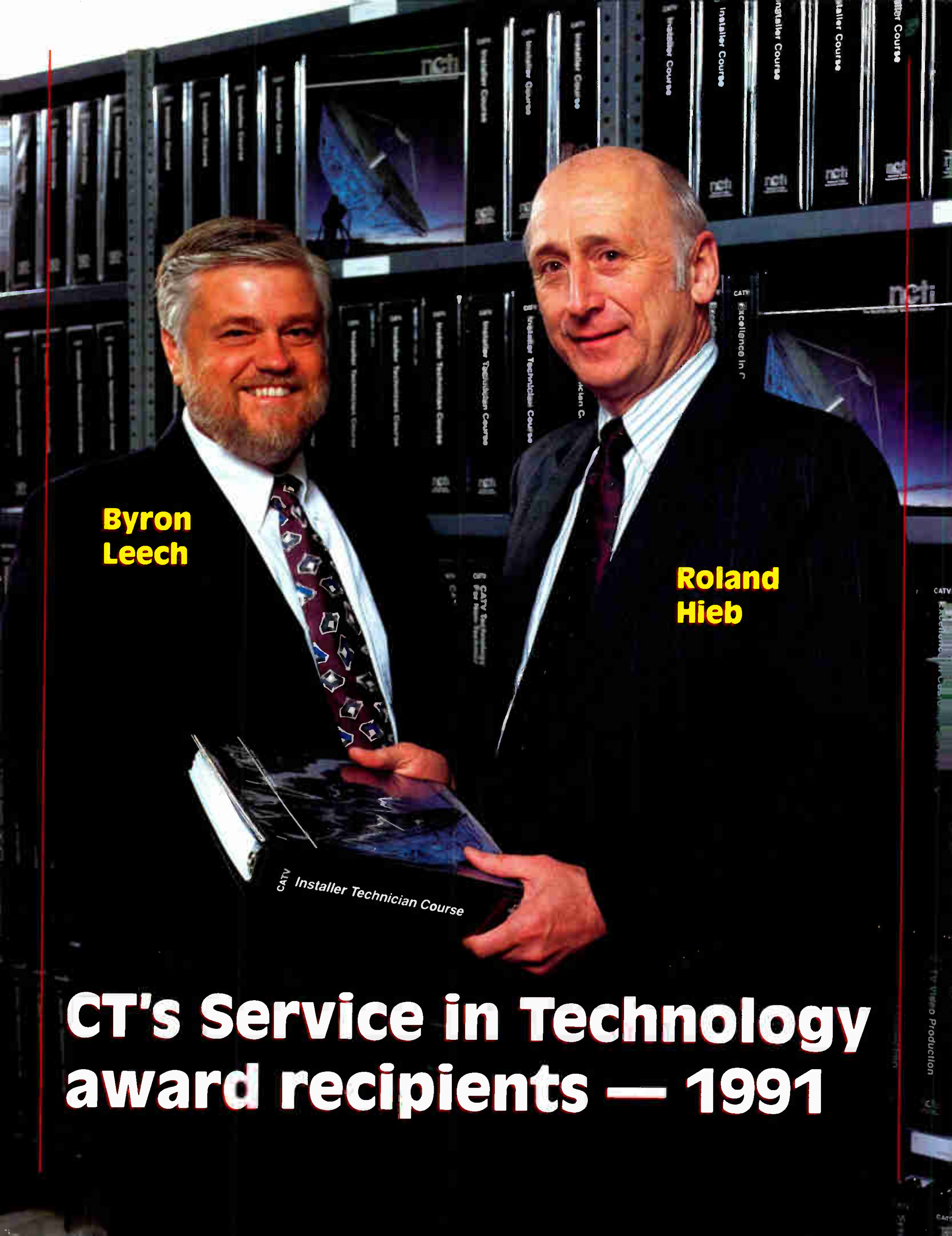
The name game

When is an RG-59 cable not *really* an RG-59 cable? According to the SCTE Interface Practices Committee, currently available drop cables no longer meet the requirements for RG designation, so it's proposed new alpha cable designations, like A, C E and G. What do you think about this? Voice (actually, write) your opinion on the survey form included in your Cable-Tec Expo registration packet and return it to the SCTE booth. The data will be collated and results reported at a later date.

After you take care of that bit of business, get down to the business of enjoying the expo!

On a final note, we at Transmedia want to wish Bob Diddlebock success with his new position as executive editor for *Cable World.*

Paul R. Levine
President/Group Publisher



CT's Service in Technology award recipients — 1991

EDITOR'S LETTER

Reading between the lines

I can understand our elected officials expressing concern when constituents complain of poor cable service and other problems. I would then expect that if the problems are for the most part solved, then the elected officials move on to more pressing matters. But apparently not so with Sen. Albert Gore (D-Tenn.).

Even after the very embarrassing cable problems in Tennessee settled down (you might remember the ridiculous rate hikes that occurred in several communities after their systems were acquired by new owners), Gore continues to be one of the leading cable bashers. I'll grant that we still have room for improvement, but I think the progress made in many areas has been pretty damn good. I don't pretend to understand the complexities of our nation's capital, but the reasons for Gore's ongoing dislike of our industry have eluded me. At least until just a few weeks ago.

I was reading "The Government Factor," a column in *Photonics Spectra* magazine. The April 1991 issue features an interesting discussion of Gore's so-called fiber-optic superhighway. According to the column, Gore is hopeful that "legislation mandating a national, high-capacity, digital fiber-optic computer network will be enacted into law this year." At the time the *Photonics Spectra* column was written, Gore had 17 co-sponsors. An effort to pass a similar bill last year failed when the proposed legislation stalled in the House.

As I read on, the idea of a nationwide fiber computer network sounded pretty good. Colleges, hospitals, national laboratories and other users comprising some 1,000 installations and over a million users would be linked together. In fact, the bulk of the column commented on the many advantages of such an "information superhighway" being able to provide access to "trillions of bits" of data for computers around the country. So far, so good.

But almost hidden in the middle of the discussion on computers and their ability to be tied together through a national fiber network (to be called the National Research and Education Network) was something that caught my eye. Gore was quoted as saying "the technology developed for the NREN will pave the way for high-speed networks to our homes." He went on with the usual blue sky stuff about providing consumers with access to volumes of electronic data, teleconferencing, etc., and how it could "deliver advanced digital TV programming that is even more sophisticated and stunning than HDTV available today."

Sounds to me a lot like cable TV! But NREN is a federally funded version that would have to face competition from an existing infrastructure. Of course, if that existing infrastructure were somehow stifled or maybe even regulated to death, then no problem, right?

So what do we have here? We have the cable industry's most vocal critic and big-time supporter of CATV reregulation backing federal legislation to fund a national fiber-optic network that will pave the way for fiber-to-the-home. Is this just a coincidence, or what?

On the surface the NREN sounds like a pretty decent idea. But buried in the rhetoric about computers, science, education and competing in the global marketplace is what appears to me to be a network of high-tech services for which there will little or no market. Remember all the blue sky promises of cable for similar stuff back in the heyday of franchising? Time will tell, but I have a funny feeling that the proposed legislation does not bode well for cable, let alone the taxpayers who would have to finance NREN. Maybe something serious like the deficit will get in the way of this year's bill and it, too, can join its predecessor as one of those that "stalled out."

Ronald J. Hranac
Senior Technical Editor

NF on 75-ohm equipment

I am an analog engineer and RF dilettante who has only recently begun to develop an interest in the cable television industry. *Communications Technology* and [Ron Hranac's] "Lab Report" have been very helpful. Thanks.

Please forgive me for attempting to take further advantage of your expertise. I've been asked a question for which I don't know the answer. What is the accepted method in the cable world of making noise figure measurements on 75-ohm equipment when all the neat NF meters seem to like 50 ohms? It feels a bit inelegant to assemble a cascade of a noisy old 50 to 75 ohm pad, the device under test and yet another pad, then dig out the desired NF from the overall measurement.

Thank you once again and best success to you and your publication.

DeWitt Harrison
Project Manager
Aztek Engineering Inc.

Editor's note: Noise figure measurements can best be performed with a noise figure meter available from companies such as Hewlett-Packard and Eaton. These are 50-ohm impedance instruments (with traceability to NIST), but to date no 75-ohm noise figure meters exist. As cumbersome as it may seem, there really is no alternative to matching the impedance of a 75-ohm device under test (DUT) to the 50-ohm impedance of the noise figure meter. Attempting to directly measure the noise figure of a 75-ohm DUT with the noise figure meter will result in inaccurate readings because of the input and output impedance mismatch.

I am most familiar with Hewlett-Packard's HP 8970A noise figure meter, and according to H-P personnel, the following procedure should be used to measure 75-ohm devices. First, using a network analyzer or similar instrument, measure the total insertion loss of two quality 50-ohm to 75-ohm minimum loss pads over the frequency range of interest. Divide by two; this will be the average insertion loss of each pad.

When you calibrate the HP 8970A, have both minimum loss pads in series with the noise source. (Use a source with a moderate noise output, in the 13 to 20 dB ENR range.) As part of the calibration process, you must correct for the presence of the external attenuation using the "loss compensation" mode of the noise figure meter, but only correct for the loss of one of the pads (before the DUT). After calibration is complete, connect the first pad to the input of the DUT and the other to its output. Proceed with the noise figure measurement. Increasing the meter's smoothing factor will result in the greatest accuracy. With low gain DUTs the noise figure meter's indicated gain term may drift a few tenths of a dB but the noise figure will still be valid.

Looking for quality

Regarding the increased sensitivity of component pricing and its impact on the reliability and safety of a completed project, I feel compelled to communicate my personal convictions as it relates to the telecommunications and CATV markets.

My opinion is that altogether too much emphasis is being placed on the initial purchase price of a product, often overlooking the installed cost or, more importantly, the component product quality and overall installed system reliability. Simply put, substituting lesser quality parts!

Hardware bolts have been the subject of intense discussions more recently due to inferior quality. If you cannot relate to a high voltage line descending upon your family's back yard due to a bolt failure, think of it as applied to a key component on a commercial airliner the next time your travels find you at 35,000 feet.

Is it not time for specifiers to become more involved in assuring that products comply with nationally accepted standards? And should we not, as manufacturers, distributors and installers, want to assure our common end-users that the best quality materials at the most reasonable cost have been used?

If we do not change the path on which we are proceeding, we could be replacing many of these installations before their planned useful life has been realized.

Roger Montambo
Director, Marketing and Sales
OEM & Telecommunications
American Electric

Outstanding "Lab Report"

Your "Lab Report" on the HP 8591A spectrum analyzer in the December issue of *Communications Technology* was outstanding. Comments that I have received from the members of the product team have been extremely positive. Well-written, thorough and accurate — I have heard each of these reactions more than once. The entire product team, especially John Cecil and I, want to thank you for providing such a fine report.

Joel Salzberg
Press Relations Specialist
Hewlett-Packard Co.

Adding a channel? Upgrading old receivers and modulators? Maybe looking to add BTSC stereo?

Plug into Standard.

Our Agile IRD II Receiver/Descrambler and TVM450 Modulator are perfectly matched to give you outstanding performance, utilizing a unique, precalibrated RF and video/audio level adjustment system. And all you have to do is plug 'em in.

Big performance, small package.

The Agile IRD II is a commercial C/Ku satellite TV receiver, designed to accept a VideoCipher® descrambler module —in a package only 1.75" tall.

As you'd expect from Standard, the Agile IRD II gives you solid 100 KHz PLL tuning, dual down-conversion to 70 MHz, and superb video specs. Intelligent design features include a 70 MHz IF loop-through for inserting TI filters, and an active 950-1450 MHz RF loop-through for expansion without signal splitters. You also get a familiar VideoCipher panel layout as well as a visual signal-strength alarm, and front-panel access to alignment controls, test points and the new VC II PLUS™ on-screen display.

Not just another modulator.

Need a modulator? Imagine a frequency-agile CATV modulator that rivals fixed-channel performance — and that's just for starters.

The TVM450's High Level Mixing method, among other engineering advances, all but eliminates out-of-band noise and spurious signals, so you can meet NCT-7 specs for the entire 450 MHz spectrum — without external bandpass filters. The TVM450's integrated CSG-60 BTSC generator puts stereo where it belongs — in the modulator. And whether you use stereo or mono, the TVM450's front-panel controls are factory-calibrated to radically simplify installation and set up, and so accurate you can even use a TVM450 to calibrate your receivers.

So advanced, they're simple.

There's more — much more — to the IRD II and TVM450 than we have room for here. We say they're so advanced that all you have to do to add a channel is plug 'em in, set 'em — and forget 'em.

But you don't have to take our word for it. Call Standard at 800/745-2445.

And we'll prove it.

Raise your standards.

Standard Communications

SATCOM Division
P.O. Box 92151
Los Angeles, CA 90009-2151
(213) 532-5300 • (800) 745-2445
FAX: (800) 722-2329 (USA)
FAX: (213) 532-0397 (Int'l and CA)

Represented in Canada By:
DGH Communications Systems Ltd.
Scarborough, Ontario • (416) 499-4746

Plug in a new channel.

See us at the SCTE Cable-Tec Expo, Booth 524. Reader Service Number 9

☛ **General Instrument**'s VideoCipher Division is shipping its VideoCipher II Plus descrambler modules that are covered by its Consumer Security Protection Program. Under the program, during the first three years of ownership, eligible, subscribing consumers will be protected against any migration to a new version of VideoCipher II Plus technology required by cable/satellite programmers.

☛ **Magnavox CATV Systems** and **Jones Intercable** will install Magnavox's AXIS addressable external interdiction system on a limited test basis in Jones' Albuquerque, N.M., system before the end of this month. In other news, Magnavox was chosen by **Colony Communications** and **Palmer Cablevision** to supply more than 1,000 miles of fiber-optic and cable distribution equipment to system locations in Naples, Eastern San Carlos, South Fort Myers, North Fort Myers, Fort Myers Beach, Bonita Springs, Sanibel Island, Marco Island and Collier County, Fla.

☛ **Scientific-Atlanta** subsidiary **Summit Technologies** and **MAAST** created a partnership for licensing fundamental and impulse pay-per-view patents. MAAST is owned by Robert Block, who was responsible for the development of the basic systems that form the foundation of PPV and IPPV for applications including cable and satellite transmissions. In other news, S-A will provide training to **Contec International**'s personnel for the repair of S-A addressable and non-addressable converters that are post-warranty.

☛ **Mind Extension Institute** is offering operators free, in-office demonstrations of its *Installer Training* and *General Safety* interactive video technical training programs. Call (800) 833-3472 for reservations.

☛ **United Artists Cable** unveiled its new Evaluation Engineering Lab in Denver, which combines equipment from United Cable's Denver and UA's New Jersey evaluation labs to allow testing of a wide variety of vendor products in one location. Other MSOs will be allowed to utilize the facility and UA hopes **CableLabs** will recognize the facility as a source of testing for the industry. Also, UA has developed software for automating spectrum analysis of cable headend signals.

☛ **Cablevision Systems Corp.** will be the first operator to test **Jerrold**'s Digicable digital compression system. Cablevision will use selected subscribers in its Long Island and Bronx/Brooklyn, N.Y., systems for the test later this year.

☛ **Zenith Electronics** will offer low-cost addressable pay-per-view cable decoders for the **NBC** and **Cablevision** Olympics TripleCast in 1992. The Pay-Master is a small add-on decoder that's compatible with most non-addressable cable converters.

☛ **SecaGraphics** and **CableData** are scheduled to begin beta testing SecaGraphics' Outage and Vehicle Location system this month. This follows an announcement made last fall to initially market OVL exclusively to CableData customers.

☛ According to a report by **Donaldson, Lufkin & Jenrette Securities Corp.**, global demand for fiber increased almost 30 percent in 1990, should expand at a similar rate this year and continue strong throughout the '90s. These gains have been fueled by growth in applications such as the telephone local loop and the cable TV and data communications markets. For a copy of the report, call (212) 504-3000.

Ham operators in the CATV industry

The following is a list (in alphabetical order) of amateur radio operators employed in the CATV industry, compiled by Steve Johnson of American Television and Communications Corp. (Please send any additions or corrections to Johnson, c/o ATC, 160 Inverness Dr. West, P.O. Box 6659, Englewood, Colo. 80155-6659.)

Name	Call	Company	City, State	Modes
Acevedo, Nelson	KP4FEN	CATV Noroeste	San Antonio, Puerto Rico	SSB,FM,CW
Adams, Mark	KA4WCB	S-A	Atlanta, Ga.	
Adel Sr., John	W5RR	Precision	Richardson, Texas	SSB
Alexander, Gary	KE5BS	Post-Newsweek	Altus, Okla.	2FM,SSB
Alfred, Arvid	KA7GFQ	Glacier Cablevision	Deming, Wash.	HF
Allen, Fred	KA0YAE	UAE	New Hope, Minn.	FM,SSB,Newsletter?
Almeyda Jr., William	KN4BX	Prestige Cable	Cartersville, Ga.	CW,SSB,FM
Amos, Alan	KN1O	Jerrold	Stow, Mass.	
Andrews, David	N1ESK	Storer	New Haven, Conn.	2FM,10FM
Atkins, Gary	W0CGR	CSU Tech Service	Fort Collins, Colo.	HF/CW
Bailey, Wendell	KC3BU	NCTA	Washington, D.C.	
Baker, James	N6WRV	USATEC	Jolon, Calif.	
Baker, Steven	KA1EX	Continental	St. Paul, Minn.	
Bannister, David	KK4FL	Fairfax County	Fairfax, Va.	
Barnes, Richard	W4IXN	S-A	Atlanta, Ga.	
Barnhart, Bill	AA5HH	Cadco	Garland, Texas	SSB
Bartlett, Dave	N0CQC	UAE	Englewood, Colo.	
Baur, Wayne	WB9HIE	TCI	Cahokia, Ill.	
Baxter, Frank	K2ZLA	Cable Mgmt. Svcs.	Schenectady, N.Y.	2FM,HF/SSB/CW
Beckham, Chuck	N4XZV	Voltex Batteries	Doraville, Ga.	VHF,HF
Beeman, Paul	KA2MUM	Viacom	Smithtown, N.Y.	
Bentley, Bill	KB5HOX	Times Mirror	Midland, Texas	HF,VHF,UHF, SSB,CW
Beuret, Kit	KH6JDE	ATC	Honolulu, Hawaii	
Blackstone, Larry	W8FZ	Dantron	Milton, Fla.	SSB/CW,80M-10M
Blanchard, David	KA0HIB	Municipal Utilities	Coon Rapids, Iowa	CW,SSB,QRP,2FM
Blumberg, David	N1HHI	ACS	Manchester, N.H.	
Blumsack, Harvey	W1VIK	Superior Optic	Marietta, Ga.	
Bohnhoff, Mark	WB9UOM	M. Bohnhoff	Wheeling, Ill.	
Borchert, Marshall	KD0DU	Riser-Bond	Aurora, Neb.	
Bourne, Dave	WB8TMP	Pioneer	Columbus, Ohio	HF20-10, SSB,Packet
Bowen, Todd	KB5OVM	Textel Cable	Austin, Texas	2FM,HF,SSB
Bowick, Chris	WD4C	S-A	Atlanta, Ga.	
Bowles, Tom	W7VA	King Video	Seattle, Wash.	
Boye, Greg	WB8NGA	ATC	Columbus, Ohio	
Bray, James R.	W0FBC	ATC	Kansas City, Mo.	HF/CW,SSB
Brillhart, Scott	N5JJZ	UAE	Tulsa, Okla.	
Brown, Bob	N0EUH	Westec	McLouth, Kan.	6M & above
Brown, Charles	(awaiting)	ATC	Greensboro, N.C.	
Brown, Philip	WA0ZFE	Sumner Cable TV	Wellington, Kan.	
Bryan, Tim 0.	WH6CAD	Jones	Hilo, Hawaii	HF
Burton, Jack S.	WB2CJS	Cablevision	Woodbury, N.Y.	2FM,440FM
Butts, John	N2JUG	MCTV	New York, N.Y.	
Bybee, Jerry	N7ESQ	TCI	Portland, Ore.	
Caci, Joe	KA2OCF	Magnavox	Manlius, N.Y.	
Cady, Jerry	KC4HPU	King Video	Tujunga, Calif.	
Cappe, Roger	WA4PEA	Cox	Gainesville, Fla.	2FM
Capron, John	WB2RUQ	Phillips	Manlius, N.Y.	
Carey, Bill	KC4BPK	ATC	Fayetteville, N.C.	
Carr, Mike	N4PON	Paragon	St. Petersburg, Fla.	2FM
Carr, Peter	WB3BQO	Montague Cable	Montague, N.J.	
Carvis, Timothy	WB9ULP	NYT Cable TV	Cherry Hill, N.J.	2M,440
Cerino, Charles	WB3HVH	Comcast	Philadelphia, Pa.	FM

New Horizons in Video Performance

The DIR-647 Integrated Receiver/Descrambler from DX. It represents the latest in field-proven technology delivering the clearest, sharpest pictures possible.

At DX, quality and reliability are always in sight. For over 30 years our success in building high performance products has put us at the forefront of the satellite communications industry. DX combines the finest research and manufacturing with state-of-the-art technology to meet the growing demands of large CATV operators.

So for the highest level of video performance, look no further than DX. To arrange a free demonstration, call or write DX Communications, Inc. today.

DX ANTENNA

DX COMMUNICATIONS, INC.
A subsidiary of C. Itoh & Co. (America) Inc.
10 Skyline Drive, Hawthorne, NY 10532 • (914) 347-4040
Manufactured by DX Antenna Co., Ltd., Japan

See us at the SCTE Cable-Tec Expo, Booth 620. Reader Service Number 10

Name	Call	Company	City, State	Modes
Checketts, Rick	KA0KZB	Jensen Tools	Phoenix, Ariz.	10M SSB,2FM
Chesney, Tom	WH6CED	ATC	Honolulu, Hawaii	
Ciciora, Walt	WB9FPW	ATC	Stamford, Conn.	
Clayton, Francis	AH6X	Kauai Cable	Kekaha, Hawaii	SSB,FM
Cohen, Jeff	N1ACQ	Harron	Bourne, Mass.	2M,CW40-8O
Colegrove, Tom	WA6QBQ	Lectro	Canyon Country, CA	220FM,2FM, 440FM,Packet
Colter, Dave	WA2ZCN	Block Island Cable	Block Island, R.I.	2FM,220,HF,ATV
Coombs, Gary	N4OJW	S-A	Atlanta Ga.	
Cordero, Francisco	KP4CJ	CATV Noroeste	Aguadilla, Puerto Rico	SSB,CW,FM
Crown, Ron	KH6JI	Kauai Cable	Kalaheo, Hawaii	HF-SSB,2FM,450FM
Danekind, John	WD8PXI	Charter Cable	Cincinnati, Ohio	@KC8TW.OH
Davis, Keith	N9IBS	Comcast	Paducah, Ky.	UHF/VHF,FM,Packet @W4NJA,HF
Dawkins, Al	K0FRP	ATC	Denver, Colo.	
Dean, Brad	K1KEK	TCI	S. Yarmouth, Mass.	FM,SSB,CW
Deierlein, Peter	KD2LN	Magnavox	Manlius, N.Y.	
DellaGuardia, Joe	WB2WLY	UAE	Baltimore, Md.	2FM,80-10AM, SSB,CW
Dickinson, Bob	W2CCE	Dovetail	Bethlehem, Pa.	HF/SSB,CW,VHF, Packet,AMSAT
Dickinson, Ed	WA2FAC	Dovetail	Bethlehem Pa.	
Dineen, Jim	WB7RIQ	TCI	Aberdeen, Wash.	10,15SSB
Ditlow, Doran A.	WA8EOW	UAE	Grand Rapids, Mich.	2FM,6SSB/CW, 80-10SSB/CW
Drydan, James	W6KIS	Buckeye Cable	Toledo, Ohio	
Dudziak, Ted	WA1GPC	EIP Microwave	San Jose, Calif.	2FM,HF/SSB,CW
Dusbabek, Lee	WB6KAJ	Cableware	Brea, Calif	80M-70CM,All modes
Ehman, Roy	VE6EV	Jones	Englewood, Colo.	
Eide, Joe	KB9R	ATC	Eau Claire, Wis.	CW,P,RTTY,AMTOR
Engleman, Paul	N6KZW	Continental	Stockton, Calif.	
Evanko, Steve	N2HCR	Blonder-Tongue	Old Bridge, N.J.	10M-80M CW/SSB,2FM
Evans Jr., Bernie	W6JMK	TeSCO	Topanga, Calif.	
Evanyk, Walt	W8KSW	Precision	Richardson, Texas	SSB,AM,FM,CW, FSTV,Packet
Everett, Chris	KB5GGY	Cox	Oklahoma City, Okla.	2FM
Faber, Randall	WA1NSL	American Cable	Beltsville, Md.	
Farmer, Jim	K4BSE	S-A	Atlanta, Ga.	
Farmer, Jim	N4IBW	Superior Telecomm.	Atlanta, Ga.	
Ferguson, Jan	W4REN	ATC	Cocoa, Fla.	SSB,FM,CW,Packet, VHF,UHF
Ferguson, Michael	KQ2K	Cable Tech	Syracuse, N.Y.	CW,SSB,FM
Figal, John	WB0CUC	UAE	Denver, Colo.	
Filipponi, Barry	N6OGE	Siskiyou Cable	Fort Jones, Calif.	2FM,10M
Fischer, Dave	W0MHS	Superior Cable	Atlanta, Ga.	
Fitch Jr., William A.	KA2AFG	New Channels	Troy, N.Y.	80-10,6,2
Flessner, Andy	KA9ARM	Multivision	Hendersonville, N.C.	2FM,Packet
Flynn, Mike	KA3DDQ	County Cable	Clarion, Pa.	40CW, 10 SSB
Foley, Red	KN4EZ	UAE	Fort Pierce, Fla.	80-10M SSB/2FM,Packet
Forbes, Celus	N4TDW	ATC	Raleigh, N.C.	2FM
Forrest, Mark	WB4HJG	S-A	Atlanta, Ga.	
Fournier, Ray	KA1ODQ	Continental	Concord, N.H.	
Friedman, Ken	WA1PIR	ALS	Wallingford, Conn.	2FM,80-10SSB
Friend, Neil	W2AMY	Magnavox	Manlius, N.Y.	
Gall, Don	N0CPN	ATC	Kansas City, Mo.	
Garner, Rodney	WB4ZWK	S-A	Atlanta, Ga.	
Geer, Jeff	N7GFR	Alpha	Bellingham, Wash.	HF, Packet,AMSAT
Genochio, Frank	W6RXU	Retired	Santa Clara, Calif.	CW/SSB/HF
Goldsworthy, Steven	KB6TMT	Crescenta Valley	La Crescenta, Calif.	2M/220
Gordon, Neal	WA1TDA	Continental	Portsmouth, N.H.	40,80CW,2-6SSB, 440SSB/CW
Graalman, Mark S.	WB8JKR	Buckeye Cable	Toledo, Ohio	160-2/SSB,CW,FM
Grant, Chris	W0LA	Wavetek	Indianapolis, Ind.	
Greco, Vincent	KD2TG	Magnavox	Manlius, N.Y	
Greene, Doug	NQ9I	Jones	Englewood, Colo.	2FM,ATV,Packet,HF
Grunewald, Peter B.	KA2ZHA	Cablevision	Hudson, Mass.	CW
Gunter, Kenneth S.	W5ZJ	Columbia	San Angelo, Texas	CW/SSB-40-20
Gur, Eugene A.	W4TFM	Central VA	Winchester, Va.	SSB,CW
Guth, Eric	WA6IGR	Advanced Cable	Denver, Colo.	440 FM
Hahn, Richard	KA2FXH	MCTV	New York, N.Y.	
Hamilton, Howard	N2ESK	Service Electric	Sparta, N.J.	
Hammond, Bill	KK4YQ	Cable Exchange	Signal Hill, Calif.	
Hampton, Jim	WA3YXX	Starview	Claymont, Del.	2M,10M,UHF,ATV
Hanneman, Jerry	WA1PCP	Wander Telecom.	San Francisco, CA	HF,VHF
Hansen, Tom	N8DGD	UAE	Grand Rapids, MI.	2FM,SSB,CW
Hanson, Ron	WA0OGS	S-A	Norcross, Ga.	
Harlin, Michael	WA7AID	TCI West	Bellevue, Wash.	HF/SSB,RTTY, Packet,2FM,40m
Harrington, Joel	N7KOJ	KBLCOM	Portland, Ore.	440,2M,Packet
Harris, Jerry	K7JPF	Tektronix	Beaverton, Ore.	
Harris, Michael G.	N6MH	Century Comm.	Brea, Calif.	HF,UHF
Hart, Gaylord	WB7ODD	Regal	Englewood, Colo.	
Hart, Jim	N4SV	S-A	Doraville, Ga.	CW
Hartson, Ted	WA8ULG	Post-Newsweek	Phoenix, Ariz.	
Hassler, Ed	N3HDS	Armstrong Utilities	Butler, Pa.	
Hatch, Earl	AB4AO	ATC	Melbourne, Fla.	HF-SSB,Packet,VHF,UHF
Hawks, Ros	WB0GKL	Hermosa Cablevision	Durango, Calif.	HF,2FM
Haworth, Jim	WA4QPP	ATC	Maitland, Fla.	2FM
Hayashi, Ichiharu	JA3ILI	DX Antenna	Kobe-City, Japan	20-10SSB/CW/Rtty, P,Amtor,AMSAT
Hayden, Joel	7J1AHJ	Coaxial International	Fukuoka, Japan	
Hayes, Al	WB6YIY	Continental	Stockton, Calif.	VHF
Haywood, Doyle T.	KC9FJ	Applied Instruments	Beech Grove, Ind.	CW,SSB,FM
Heim, Bob	K8HLH	Erie County	Sandusky, Ohio	SSB,FM,CW,Newsletter?

→

Name	Call	Company	City, State	Modes
Heimbach, Paul	WA2YHO	Viacom	New York, N.Y	
Hemmings, Brian	KA3CTP	Continental	St. Louis, Mo.	2M,440,ATV,All bands/modes
Henley, L. Lynn	KB4JXY	American Cable	Columbus, Ga.	
Henscheid, Bert L.	WA7CBO	Texscan	Phoenix, Ariz.	
Herman, Jim	WB7SFP	HCC	Bridgewater, N.J.	
Herrman, Tony	KD0ZE	ATC	Kansas City, Mo.	HF/CW,SSB
Hill, Tommy	KD4EN	Comcast	Meridian, Miss.	HF,VHF,Packet
Hochman, Mike	KX6F	Multimedia	Norman, Okla.	2FM
Hodge, Warren	KC4OOS	ATC	Rockledge, Fla.	
Hodges, Marsha	KA0UIN	ATC	Kansas City, Mo.	2M
Hoffman, Kurt	NT8T	Warner	Akron, Ohio	CW/HF
Hoffman, Hans	WA6CXN	Western Comm.	Monterey, Calif.	HF,220,2FM
Holmes, Fredrick W.	N1GIQ	NE Cablevision	Ayer, Mass.	SSB,CW,FM, RTTY,Packet,ATV
Honnold, Fred	W6YKM	King Video	Jackson, Calif.	
Hopengarten, Fred	K1VR	Lawyer	Lincoln, Mass.	HF
Horn, Ancel D.	W7DLQ	Satellite Systems	Falls Church, Va.	
Horvath, Robert	N8KPS	Continental	Findlay, Ohio	2FM,80/40M,CW
Hranac, Ron	N0IVN	Coaxial International	Denver, Colo.	ATV, Packet, 2M,6M,HF
Huf, Ted	K4NTA	Adelphia	Rivera Beach, Fla.	
Hunt, Bill	KC4ILF	Marion County Schools	Ocala, Fla.	
Idler, Steven	KA9UIE	S-A	Atlanta, Ga.	
Imbody, Don	N4PFS	Lectro	Jacksonville, Fla.	
Jackson, William G.	W8GHK	Cable America	Phoenix, Ariz.	
Johnson, Glenn	WB7UXS	ATC CARS	Emporia, Kan.	HF,2M
Johnson, Kenneth	WA7YHN	Cablevision	Moscow, Idaho	HF/SSB,2FM
Johnson, Rey	K8JCB	UAE	Denver, Colo.	2FM
Johnson, Steve	N0AYE	ATC	Englewood, Colo.	2FM,10SSB,Packet
Johnston, Bob	WB7AHL	TCI	Lander, Wyo.	SSB,FM,Packet
Jones, Herb	KA4NIF	ATC	Melbourne, Fla.	2FM
Jordan, Peter	KA2HIG	Magnavox	Manlius, NY.	
Jordan, Robert	KB5HPG	Times Mirror	Midland, Texas	HF,VHF
Joyner, John	KB2IPC	ATC	Albany, N.Y.	10M/CW,SSB,Packet
Jubon, Jan	K2HJ	Moffett, Larson	Falls Church, Va.	
Kallina, Henry	WA5VSG	ATC	Englewood, Colo.	
Karr, Randy	KC4IOT	Channel Master	Clayton, N.C.	HF,2M
Kasekamp, Marlon L.	KK3L	TCI	Cumberland, Md.	HF/SSB,VHF/UHF/ FM,10FM
Kaser, Gary F.	AB8Y	Adelphia Cable	Richland, Mich.	160-10/SSB/CW, 2FM
Kaylor, William	W9DSM	Phillips	Knoxville, Tenn.	HF/CW/SSB,2FM
Kean, Peter	K2AXI	Mystic Star	Rock Tavern, N.Y.	CW,SSB,FSK
Keller, Robert	KY3R	Fleischman & Walsh	Washington, D.C.	Packet@N4QQ
Kellough, Larry	WB9AZQ	Cox	Harahan, La.	80-10,SSB,CW,AM,FM
Kelsey, Charles	WB2EDV	Village of	Mayville, N.Y.	UHF/VHF/FM
Kessler, Steve	WA8ZMC	Cedardale Sat.	Springboro, Ohio	
King, R. Michael	WB0NCB	Circuit Doctor	Frisco, Colo.	
Kirby, Dave	N8JQX	Cablevision	Maple Heights, Ohio	
Kittelson, Jerry	KF0CL	Lakes Cable	Spirit Lake, Iowa	
Kline, Ron	WD7R	TCI	Boise, Idaho	
Knies, Mike	WB8MMR	ATC	Columbus,Ohio	HF,UHF,VHF
Kolins, Jerry	K2PFW	Professional Electric Co.	Schenectady, N.Y.	Voice,Data,Video
Kosek, Bill	WA2KXY	ATC	Albany, N.Y	SSB,AM,FM, CW,AMSAT
Kramer, Jonathan	KD6MR	Communications Support	Lake Forest, Calif.	2FM,Packet
Krebsbach, Ed	KF7KE	TCI	Klamath Falls, Ore.	HF/SSB,CW-2FM,Packet
Kujat, Matthew C.	WB3FNZ	CATV Service	Freeland, Pa.	SSB,CW,FM, 2M,432,6M
Kuzmanoff, Chris	WH6CEQ	ATC	Honolulu, Hawaii	
Lampman, Don	N9JEY	TCI	Madison, Wis.	
Langevin, Larry	K1GXU	Greater Media	Chicopee, Mass.	160-10 CW,SSB/2M CW,SSB
Large, David	WZ6V	Intermedia	Santa Clara, Calif.	75SSB,VHF,UHF
Lazzaro, Tom	VE3KZJ	Lindsay	Lindsay, Ontario	80-20 SSB/CW,2FM
Lemon, Gary	N0IZF	ATC	Gastonia, N.C.	
Levy, Bob	K2LET	NY Cable Commission	Albany, N.Y.	Silent key
Lewis, Jon	KH6MS	ATC	Honolulu, Hawaii	
Leyrer, David	K8HMF	Aero-Tec	Providence, R.I.	
Lies, Gene	NN5A	Jones	Albuquerque, N.M.	2FM
Lipoff, Stu	W1GRI	A.D. Little	Cambridge, Mass.	20mSSB,2FM, Packet@W1MX
Lloyd, Tom	K0CPI	Vantage	Kirksville, Mo.	
Lonn, Robert	WA6PHN	Cox	San Diego, Calif.	2FM,220,Packet
Louie, Dom	VE7CKL	Rogers	Vancouver, British Columbia	
Lozoro, Tom M.	VE7KJ		Lindsay, Ontario	
Luff, Bob	W3GAC	Jones	Englewood, Colo.	2FM,AMSAT
Mackenzie, Kevin	WB6BVW	J.D. McKay Corp.	Aloha, Ore.	
MacLeod, Doug	N8ASM	Comcast	St. Clair Shores, MI	2FM,80-10 SSB
MacPhedran, Don	WA2ZOZ	Cablevision	Cresskill, N.J.	CW,20/15
Maes, Craig	WD8NJS	Omnicomm	Plymouth, Mich.	
Malo, Butch	KK4CU	Adv. Satellite	Ormond Beach, Fla.	2FM
Malson, Tom	N6RLN	Western CATV	Torrance, Calif.	
Mannikko, Roy	WB9PKN	Cox	Macon, Ga.	
Marquart, Hugo	N0DYZ	Bismark-Mandan	Bismark, N.D.	80,40,15,10 CW/SSB
Marriam, Scott	KB2BDB	Magnavox	Manlius, N.Y.	
Marsh, Stephen	KB9DTC	Cable Exchange	Chicago, Ill.	

→

Name	Call	Company	City, State	Modes
Martin, George E.	WD0FJH	S.W. Mo. CATV	Carthage, Mo.	SSB,CW,HF
Massey, Larry	KU7C	Cooke Cablevision	Tucson, Ariz.	2FM
Mauney, Bob	WB4RPM	Bell South	Atlanta, Ga.	
Maziarz, Joe	K8BIU	NASA Lewis	Cleveland, Ohio	FM,Packet
McArthur, Len	VE3KSU	Cablesystems	Don Mills, Ontario	
McCoy, Cecil	WB4CTF	Cox	Norfolk, Va.	
McDonald, Stan	WA4IZI	S-A	Atlanta, Ga.	
McDonough, Tom	N4YKK	ATC	Cocoa, Fla.	2FM,10M-SSB
McFadyen, Brian	N9HJR	MetroVision	Palos Hills, Ill.	2M FM
McMillan, John	KA4SSB	ATC	Lumberton, N.C.	
Mellring, Chuck	K3GDZ	Capital Cable	Columbus, Ohio	CW,AM,FM
Meyer, Ken	WB9YUY	Door Cablevision	Sturgeon Bay, Wis.	2FM/440FM/Packet
Michael, Tracy N.	AA9Z	TCI	Hartford City, Ind.	CW,SSB,FM,P,RTTY
Michaels, Joe	KA0GIB	ATC CARS	Emporia, Kan.	HF,2M,Packet
Midkiff, Randy	WB8ART	Continental	Kettering, Ohio	HF,VHF,UHF, SSB,CW,FM
Miller, Rick	WB4WPI	Storer	Sarasota, Fla.	2FM,10M
Miller, Ronald	K4NGQ	Frankfort Plant Bd.	Frankfort, Ky.	CW,SSB,RTTY,2FM
Milner, Ed	WA4OHW	Flight Trac	Glen Ellyn, Ill.	
Money, Marshall	N4SIO	Summit	Woodstock, Ga.	
Monroe, Jerry	KC2UT	Magnavox	Manlius, N.Y.	
Moore, Doug	KA0TQJ	ATC	Kansas City, Mo.	HF/CW,SSB
Moore, Marc	KB6HMO	King Video	Tujunga, Calif.	
Moore, Marcus	N4RYD	S-A	Atlanta, Ga.	
Mountain, Ned	WC4X	Wegner	Duluth, Ga.	
Mullan, John	KD2LQ	Magnavox	Manlius, N.Y.	
Mundy, David	N0MYU	Continental	Overland, Mo.	
Musser, Dennis	KA5GTM	ATC	Denver, Colo.	2M,10M,SSB,Packet
Myers, Ron	KH6JQP	Commband Tech.	Virginia Beach, Va.	
Nakashima, Ray	WH6CEO	ATC	Honolulu, Hawaii	
Nelson, Barry	KA9YIS	Warner	DeKalb, Ill.	2M,10M
Nelson, Jim	N5IZT	Power Control Tech.	San Antonio, Texas	
Newell, Steve	KA8USS		Owosso, Mich.	CW-80M, 2FM,440FM
Newlin, Jeff	N4UPS	Continental	Richmond, Va.	
Newton, John	KA2ZZL	Magnavox	Manlius, N.Y.	
Norman, Tom	WA7HFY	UWTV	Laramie, Wyo.	
Nusco, Fred F.	WA2DWO	ATC	San Diego, Calif.	80-20M/SSB,2FM
Nydegger, Charles	WA9HCU	Cardinal	Crawfordsville, Ind.	75SSB,2M,6M,FSTV
Obert, Paul	K8PO	Microwave Radio	Lowell, Mass.	160-10,2FM, 440,Packet
Orwen, John	KB0XE	Metrovision	Lincoln, Neb.	
Osterland, Derick	AH6KC	ATC	Honolulu, Hawaii	
Ottinger, Michael A.	NX9Q	TCI	Lebanon, Ind.	FM,AM,SSB,HF, VHF,UHF,P,RTTY
Oyama, Blaine	NH6FM	Jones	Hilo, Hawaii	2M
Panetta, Carlo	AG2C	Eagle	Clay, N.Y.	
Pangrac, Dave	WA0RNP	ATC	Englewood, Colo.	2FM,HF/SSB
Pangrac, Mike	N0GVW	Engineering Technologies	Aurora, Colo.	2FM,HF/SSB
Parmiter, Donald	N8LJF	TCI	Zanesville, Ohio	FM
Pastor, Tom	N8HUS	Continental	Painesville, Ohio	
Patrick, Al	WA4URT	S-A	Atlanta, Ga.	
Paul, Cliff	W2JEA	Consultant	Port St. Lucie, Fla.	2M/440/HF
Payne, Tim	N6DRA	Cox	San Diego, Calif.	
Pearce, Grant	K8BKT	UAE	Grand Rapids, Mich.	160-10,2FM,UHF FM
Perry, Buck	K4ITT	Moffet, Larson	Falls Church, Va.	
Peterson, Michael L.	KA0YAD	UAE	New Hope, Minn.	FM,SSB,Newsletter?
Peterson, Par	KC6QMM	Western Comm.	San Francisco, Calif.	
Phelps, Alan	KA4DXM	Jones	St. Leonard, Md.	
Piccolo, Tony	WD9GCJ	Texscan	El Paso, Texas	CW,SSB,2FM
Potter, Greg	NM2L	NewChannels	Syracuse, N.Y.	CW,DX,Contesting
Preston, Charles	N4SXM	N. Georgia Comm.	Norcross, Ga.	HF/SSB,V,U,P,ATV, SAT,AMTR,RTTY
Prince, Bradley	N3GMT	Adelphia Cable	Plymouth Meeting, Pa.	2M
Pringle Jr., J. Leon	W5NA	Pine Belt	Hattiesburg, Miss.	
Proctor, Ken	N2DQD	Mobile Diagnostics	Bricktown, N.J.	2FM,440
Pruitt, Michael	KC4FMJ	Cablevision Ind.	Danville, Va.	20M SSB/CW
Radzik, Jack	N2RK	LRC	Horseheads, N.Y.	75SSB
Raimondi, Steve	W2QUU	UAE	Englewood, Colo.	40SSB
Reed Jr., Oscar	W3FFQ	Reed Associates	Silver Springs, Md.	160-10,2M
Reihs, Warren A.	WB6QKA	ISS Comm.	Thousand Oaks, CA	2FM
Reynard, Rand	N0DYQ	Anixter	Englewood, Colo.	2FM,Packet,CAP
Rice, Charles	KD4SS	Glasgow EPB	Glasgow, Ky.	2FM,SSB,CW,VE,10
Richardson, Earl	W1NIC	Moosehead	Greenville, Maine	
Rivera, Phil	KM4OP	Gold Coast	Miami Beach, Fla.	HF,2M,UHF,ATV
Robertson, Bill	N6VLR	Continental	Lakewood, Calif.	2meter
Rodgers, Gregg	KJ9X	Trilithic	Indianapolis, Ind.	
Roman, Geoff	WA2DTL	Jerrold	Hatboro, Pa.	
Rosenberg, Eric	WA6YBT	C-SPAN	Washington, D.C.	VHF/Packet,AMSAT
Roush, Sam	KA8OOT	Rifkin	Point Pleasant, WV	SSB,DX,SSTV,FSTV
Runkle, Fred	K4KAZ	S-A	Atlanta, Ga.	
Rupert, J. Scott	N3DDZ	TCI	Apollo, Pa.	FM,SSB,2M,440
Sabraw, Martin F.	N8IWQ	Starion	Ada, Mich.	CW,SSB,FM, AFSK,ATV
Sambol, Don	K7CS	ATC	Englewood, Colo.	HF/CW
Sanchez, Nestor	N4UJZ	Storer	Miami, Calif.	2FM,10M,ATV, Packet,AMSAT
Schmidt, Bill	KF4CQ	Superior Telecomm.	Atlanta, Ga.	
Schmidt, Jim	WB9EPW	ATC	Appleton, Wis.	CW/HF →

Cliff Paul: Gone but not forgotten

Clifford Paul, the first inductee to the Society's Hall of Fame, passed away April 29. He was inducted into the SCTE Hall of Fame in 1988, formally presented the honor during the Annual Membership Meeting held during Cable-Tec Expo in San Francisco.

The SCTE Hall of Fame was established to recognize deserving individuals who have selflessly devoted their time and effort to sharing their knowledge and experience for the purpose of educating people in the broadband communications industry. Paul was an industry veteran who was recognized through his induction for his service to the Society and the industry at large.

Paul also was the 1982 recipient of the SCTE Member of the Year Award. He was a contributor to the Society's New Building Fund and an active participant in many of the Society's programs and services. In 1983 he retired from the FCC and settled in Florida. He subsequently wrote a series of articles for *The Interval* that explained the workings of the commission to SCTE members. His passing marked a sad day for all who knew him; he will be missed.

Cliff Paul was the first inductee into the SCTE's Hall of Fame.

Field Operations Award winners announced

The SCTE Field Operations Award Committee recently announced the winners of the Society's first ever Field Operations Award competition. Thomas Brown of Staten Island, N.Y., was the first place winner, with Randy Baker of Bartlett, Tenn., and James Hockin of Williamsburg, Mich., the second and third place winners respectively.

The Field Operations Award program was established to reward cable TV personnel for their development of any new concept or improvement that enhances field operations for cable TV systems. Entries were required to be original ideas, and were checked for their ability to work correctly. The idea had to be well-documented with descriptions, diagrams and illustrations or photographs.

Entries dealing with any field operation, such as installation, troubleshooting, construction, vehicle enhancement, or tool or equipment design, were considered for the award. All cable TV personnel doing any type of field operations — either system employees or contractors — were eligible for the award.

Brown won the award for his presentation on "Preventing Planned Outages." Baker dealt with an "Improved Line Tool" and Hockin concentrated on "Improved Stabilizer Bar on an Earth Station." →

 Reader Service Number 17

HOW TO TURN OLYMPICS PAY-PER-VIEW INTO PURE GOLD

If you're a non-addressable system, Zenith has a sure way to turn the 1992 Olympics Triplecast into pure gold.

The answer is the PayMaster add-on decoder. It upgrades any non-volume RF converter to addressability for less than $40. Combined with our new Event Center mini-headend for as low as $2500, PayMaster is clearly the most affordable way to tap into the Olympics PPV.

What's more, the gold will keep coming your way long after the Olympics flame is extinguished. That's because you can continue to use PayMaster for pay-per-view or subscription services and easily upgrade to a full, advanced PM2 system with 256 tag control.

There's never been a better time to go addressable. A favorable 48% split rate will be extended to new systems ordering PayMaster which significantly reduces the cost of adding addressability.*

For more information call (708) 391-7702 and we'll send you our brochure, "Know the facts. Adding addressability for the Olympics Triplecast."

With the Zenith PayMaster and Event Center, the Olympics pay-per-view is one golden opportunity you can't afford to miss.

ZENITH | cable products

*ORDER YOUR PAYMASTER DECODERS BEFORE DECEMBER 31, 1991 AND EARN AN ADDITIONAL 2% OPERATOR SPLIT RATE.

See us at the SCTE Cable-Tec Expo, Booth 732. Reader Service Number 28

As first prize winner, Brown was awarded with paid registration to Cable-Tec Expo '91 in Reno, Nev., transportation to the expo, hotel accommodations, $1,000 cash and a plaque to be presented at the expo.

Field Operations Award Committee Chair Victor Gates, who is also SCTE's Eastern vice president and Region 7 director, comments, "I would like to thank the committee members, the vendors who supported the award and Pete Mangone of Telecrafter Products for his concept of the award and his generous support."

Call for papers issued for "Fiber-Optics Plus"

The Society is currently seeking abstracts for "Fiber-Optics Plus," a three-day national SCTE conference on fiber optics and other important issues facing the cable industry. This conference is scheduled to be held Jan. 8-9, 1992, in San Diego. People interested in presenting technical papers at the conference should send submissions by Sept. 1 to: Fiber-Optics Plus 1992, c/o SCTE, 669 Exton Commons, Exton, Pa. 19341. Submissions should include an abstract of the proposed paper or presentation.

Prospective speakers should keep in mind that all papers accepted for the seminar will be printed in a proceedings book to be given to attendees of the seminar.

For further information on submissions for the fiber-optics conference, please contact SCTE national headquarters at (215) 363-6888.

First woman certified in BCT/E program

The Society of Cable Television Engineers (SCTE) salutes Vicki Marts, who became the first woman to be certified within the Broadband Communications Technician/Engineer Certification Program. A system technician with Multimedia Cablevision in Wichita, Kan., Marts is an active member of the Wheat State Chapter. She was certified in April at the technician level after passing examinations in the program's seven categories, and is currently pursuing certification at the engineer level.

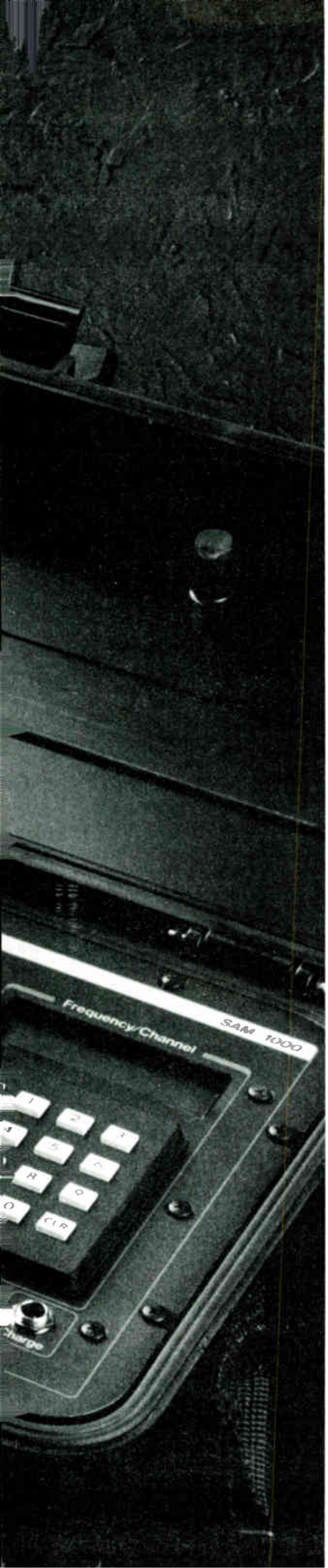
Society logo used on business cards

SCTE members of all grades now have the opportunity to indicate their membership status within the Society on their business cards.

An article that appeared in the February *Interval* offered information for utilizing the SCTE logo on the business cards of members certified in the Society's BCT/E or Installer Certification Programs. The SCTE board of directors has since adopted a policy that allows all SCTE members to proclaim their membership on their business cards in accordance with the following guidelines:

1) The SCTE logo must be accompanied by the ® symbol in all instances in which it is used.
2) The membership number, including the beginning letter indicating the member grade should appear underneath the logo.
3) Members can use the Society's name on the card, but it is recommended that they include personal information, such as position, employer's name and address, work phone and FAX numbers, and affiliation (office held or membership status) with a local SCTE chapter or meeting group.
4) The size of the logo and placement on the card are optional.

Contest Rules: No purchase is necessary. Entries accepted from authorized representatives throughout the United States faxing their names, title and phone number and the phrase "Please enter us in the Midwest CATV Waikiki contest" on his/her company letterhead to 1 303 643-4797. Contest entry is limited to cable television systems companies only. The prize will be awarded in the company name. The winning company will determine the individual to be given the prize. Midwest CATV, its suppliers, parent companies, subsidiaries and ad agency are not eligible. This contest is void where prohibited by law. Only one entry per company is permitted. The odds of winning will be determined by the number of entries received. Contest entries will not be accepted if received by Midwest CATV after June 30, 1991. Total value of the prize is $1,556. Prize includes airfare from anywhere in the Continental United States to Waikiki, Hawaii, hotel accommodations for three nights at The Outrigger Hobron and roundtrip transportation from and to the airport. Prices are based on low season travel, mid-week travel and availability. Certain restrictions apply. No cash or prize substitutions. For more information contact Midwest CATV at 1 800 MID-CATV or write: Midwest CATV Sweepstakes, Fairways II at Inverness, 94 Inverness Terrace East, Suite 310, Englewood, CO 80112. The winner's name may be obtained by writing Midwest CATV after July 20, 1991.



Win a Free Trip to Waikiki courtesy of Midwest CATV and Wavetek.

Aloha! This month's Midwest CATV Customer Incentive Contest is featuring a trip to Waikiki Beach, Hawaii.

You can enter the contest two ways. First, place your order for Wavetek equipment during June, and write the phrase "Please enter me in the Midwest CATV Waikiki Contest" on the bottom of your purchase order, and your company is entered. It's that easy!

Wavetek features a complete line of test equipment. The SAM 1000 with synthesized tuning from 50-550 MHz, reliable four position electronic attenuator, switch selectable video/audio tuning, and measures horizontal sync suppression scramble channels. The SAM 2000 with keyboard controlled synthesized frequency or channel tuning for quickness and accuracy, tuning and measurement result information displayed on an LCD with analog meter for peaking, auto-ranging or manual attenuator for quick, accurate measurements, and automated test functions, which permit efficient, time saving amplifier alignment.

The second way to enter the contest is for you, the company's authorized representative, to send us on company letterhead, via fax machine, your name, title, telephone number, and the phrase "Please enter me in the Midwest CATV Waikiki Contest," and your company is entered.

Only one prize will be awarded. The prize includes roundtrip airfare from anywhere in the U.S., three nights stay at The Outrigger Hobron and roundtrip transfers from hotel to airport. The winning company will be selected by July 20, 1991. So hurry and enter.

And catch a wave in Waikiki!

MIDWEST CATV

a UNR Industries Company

More than supplies. Solutions.

1 800 MID-CATV

Denver, CO • Clarksburg, WV • Dallas, TX • Lafayette, IN
Ocala, FL • Phoenix, AZ • Pottstown, PA

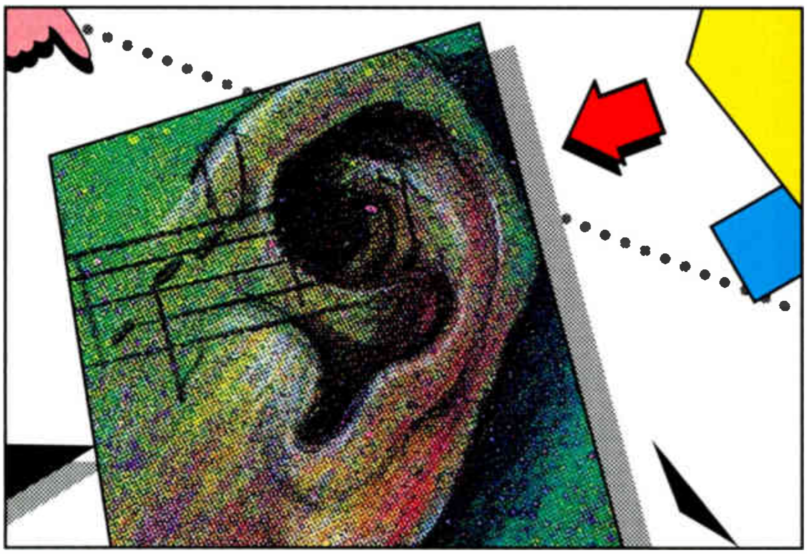
See us at the SCTE Cable-Tec Expo, Booth 414. Reader Service Number 21

Why is audio such a big problem?

By Ned L. Mountain
Vice President, Marketing, Wegener Communications Inc.

We in the signal distribution business are sticklers for detail! How "good" is that picture? Is there any way to improve the video? How many channels of high definition video can I get on that link?

Amazingly enough, we analyze, measure and generally make a big fuss over the video till the cows come home. Mention audio, however, and most battle crusted engineers resort to a frustrated, humorous snicker that basically says, "What a mess! But it isn't *my* problem. And nobody really cares about the sound anyway." They are partly right. It *is* a mess — and the problem is not all theirs. But subscribers *do* care. Fortunately, there is hope.



About one year ago, then NCTA Engineering Committee Chair Walt Ciciora expressed serious concern that the cable industry needed a structured effort to ensure that we would not be left out of any new significant advances with respect to audio as the home entertainment industry marches forward. I was honored to be selected as chair of the new Quality Sound Subcommittee. Ciciora and I initially felt that this would result in study and recommendations in areas such as "surround sound," "home theaters," "holographic sound," etc.

The engineer still kicking in me said, "Get some baseline data on where we as an industry stand today with respect to audio." This was done by myself and several others. Our studies led us to the same conclusion that we all know and joke about. Namely that we don't even do a very good job at maintaining consistent audio levels, let alone exotic stuff like holographic sound. Further data taken by the engineering staff at General Instrument demonstrated that a surprisingly large inconsistency exists among the various satellite programmers. Although this has been suspected, it is the first time I can recall a serious scientific attempt to quantify the problem.

The "problem" is really that nobody has complete ownership of it, and any solution will require that it be divided into manageable chunks and logically attacked. The overall problem of inconsistent audio levels has the following subsets:

1) There is no recommended operating practice for satellite programmers to follow with respect to audio levels.

2) There is no standard reference signal or test available to aid the cable operator to correctly adjust audio levels.

3) There are many different audio processing methods and philosophies in use at the studio and playback facilities of the various programmers.

4) Cable operators often "mix" audio sources on a given channel, such as when they insert local commercials in network feeds.

Combine and conquer

Since at least some of the problem involves programmers and satellite transmission issues, it was decided to have this subcommittee and the one on satellite practices under Norm Weinhouse join forces to attack the issues. The combined subcommittee effort currently is focusing on Items 1 and 2. If we as an industry at least define to ourselves a few guidelines, and provide a convenient regular satellite transmitted reference, we will have solved *some* of the problem. How much remains to be seen.

Our goal is to recommend a practice for programmers to follow with respect to reference 100 percent modulation of both VideoCipher II and FM subcarrier transmissions. Programmers may or may not adhere to this reference, but will respectfully be asked to inform the industry as to the exact dB difference between their feed and the recommended practice. An additional goal will be to begin a regularly scheduled transmission of a test signal that will enable cable operators to properly adjust their audio modulators and stereo encoders based upon measurement rather than guesswork.

It is the intention of the subcommittee to have this work completed and the process implemented by September 1991. At that time the other remaining pieces of the audio level "problem" will be discussed and attacked with vengeance until we kill this beast once and for all. It is only because of the existence of the NCTA Engineering Committee, the dedicated folks who make it tick, and their supportive employers that problems such as this can be investigated and resolved. **CT**

Author's note: Since the subcommittee represents a wide range of views, many of the opinions expressed in this document represent those of the subcommittee chair after working with the group for several months. Key subcommittee work is now going on that will determine our success in this endeavor.

Video's stepchild grows up

By Dom Stasi
President, Flight Trac Inc.

A hypothetical question: "By improving television's audio quality at both the production and exhibition points, is cable — as the conduit in the middle — perhaps verging on too much of a good thing?"

Sound has always taken second billing to pictures, even before they began to move. "A picture is worth a thousand words," pretty much sums it up. In fact when motion pictures were introduced, sound (as we all know) wasn't even part of the offering. Audiences, enthralled by the novelty of moving images on a screen, seemed to consider sound an extra to the experience and flocked to the theaters anyway.

That attitude didn't last.

The birth of talkies

Eventually audiences became frustrated by film actors' inability to communicate with them the way live stage actors could. The silent film actors had to be overly demonstrative, resorting to exaggerated gestures that compromised the dramatic effect of the already larger-than-life performance taking place on the screen. Silent films demanded a lot of extra work on the part of both actor and audience to get the message across. Talkies, therefore, came along none too soon; audio began to get some respect.

But, given the size and scope of the image the newly emergent sound was intended to enhance — to say nothing of the dimensions of the rooms in which it was intended to be exhibited — film audio needed to start out big and go on from there.

Quality was never a question; motion picture sound was to keep pace with the constant technological and artistic advances of image science. Simply stated: As the very imposing theatrical picture improved — i.e., color, wide aspect ratio, Cinemascope, Omnivision and the rest — its sound had to improve accordingly. Failing to do so was to risk being overwhelmed by the picture, which would result in an uncomfortable dichotomy — big picture, small sound. And audiences would soon find that as objectionable as no sound at all had been. That's one reason why motion picture audiences now enjoy Dolby processed, high-dynamic-range, quadriphonic surround sound.

The other reason is television.

TV sound — second rate?

TV audio, despite its perfectly adequate 25 kHz FM delivery system, has always been the product of the 3-inch cardboard speaker crammed into the corner (if not exiled to the side panel or bottom to make room for the CRT) of a receiver case. Movie exhibitors knew they had an advantage here and to this day they press that advantage over television. They press it hard: Television is a medium of convenience, they say, not quality. Could they be correct?

It's certainly a good bet that motion picture producers and exhibitors will be quick to incorporate any other tangible improvements that come down the acoustical trail. And this will happen while TV types and our overseers at the Federal Communications Commission are busy deciding upon standards that will be in the viewing public's best interest.

But if we accept the premise that TV sound is a second rate deal, we must at least recognize that it's not so for lack of trying.

The problem is that the medium doesn't readily lend itself to what we as engineers consider progressive change. Let's look at a single example: MTV.

MTV's commitment to sound

In 1981 MTV launched its round-the-clock service. As chief engineer at the fledgling network, I was enthusiastic about the project, but especially pleased by the commitment being made to sound quality in what would quickly become the quintessential video medium. From the outset, the network's engineers set their sights on high-quality audio.

There's nothing unusual about that. What was more significant was that the network's executives also were committed to high-quality sound, and willing to spend money promoting it. After all, what better way was there to entice musical artists and the organizations that manage their business affairs to submit to producing videos for exhibition?

As MTV's first decade comes to an end, it's tough to recall that its launch came at a time before stereo TV. Therefore, back in 1981 an interim high-fidelity sound system — a system capable of being utilized immediately by a majority of cable homes — was needed and needed fast.

It was learned that while no one in the United States had a stereo TV receiver, a full 63 percent of U.S. TV homes (and at least that percentage of cabled homes) contained one room wherein the TV set and some sort of stereo sound system were co-located. This, then, would be the conduit to bring high-quality "program audio" into the home.

Satellite delivery and cable distribution easily would support analog FM on carrier-to-the-drop. The rest is a simple architecture with which we're all familiar now: the stereo hookup. The pictures would appear on the screen and wideband, 75 kHz, multiplexed FM stereo sound — big sound — would readily be available from all those co-located stereo sets via the cable system's FM carriage.

Subs want their MTV ... and more

It's difficult to remember which came first, the launch of the service or the subscriber complaints:

- "How come all the channels aren't on the stereo?"
- "The stereo is louder than the TV set."
- "There's too much static."
- "The sound is too big for the picture."
- "The regular TV sound stinks now ..."

The list goes on but the last four are especially vexing. Through this early foray into quality program audio these four were the problems that emerged as a preview of things to come. They were a hint of what might be the knottiest audio problem facing us as our industry enters a period during which not only the look, but the *sound* of television will undergo a radical change.

(Continued on page 60)

The cable you're installing now may seem great today, but how's it going to hold up against tomorrow's heat? And the ever present gnawing by nature's pests? Install AT&T's fiber optic cable and you won't have to worry.

That's because all AT&T fiber optic cable is designed to withstand harsh temperatures, rodents, lightning, and a host of other environmental stresses.

Take a look at our LXE family of lightguide cable. Available in multiple sheath designs, each is made with a high-density polyethylene jacket to resist abrasions—making it easy to pull and inexpensive to install, too.

The LXE also allows for easy end-prep and midsheath entry. Rip cords lie beneath the jacket and armor, to allow for entry without damaging the fibers.

AT&T's fiber has the smallest mode field diameter of any standard single mode fiber available. Light stays more tightly confined to the fiber core, providing outstanding transmission performance—at both 1310 and 1550 nm.

And our D-LUX™ 100 coating offers excellent stripability, static fatigue performance, and aging characteristics, for superb splicing capabilities.

You'll find, too, that all our fiber optic cable is backed by the design expertise and technology of AT&T Bell Laboratories.

For more on cable that's at its best when the elements are at their worst, call AT&T at **1 800 344-0223, ext. 223.**

AT&T
Network Systems

Reader Service Number 23

Does your headend have "sound" audio?

What is audio?
a) Something that goes along with video.
b) Vocal and musical information in the 20 Hz to 20 kHz frequency range.
c) Half the experience of an exciting movie.

How does one take care of audio in a cable TV headend?
a) Tweak whenever the lights don't make pretty patterns.
b) Periodically make careful measurements and adjust as necessary.
c) Don't worry about it ... it'll take care of itself!

This article will discuss the right and wrong answers to these questions as well as provide insight into the maintenance and evaluation of "sound" audio.

By Kim Litchfield
Technical Sales, Leaming Industries

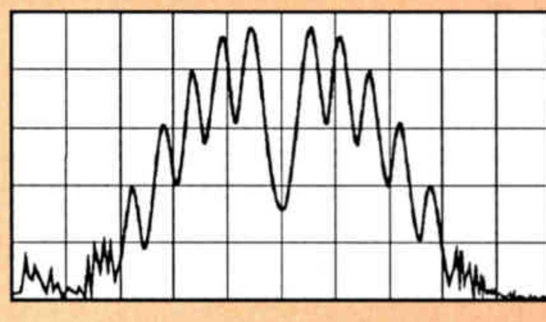
When evaluating an audio system, one must consider the individual characteristics of audio to determine its quality. For example, amplitude, relative loudness, frequency response, distortion, noise, phase and separation are common measurements used to characterize cable TV audio signals.

Amplitude

An amplitude measurement assigns a value relating to the size of an audio signal. Peak values represent the largest variation (either positive or negative) of an audio waveform. In an audio transmission system, the peak value defines the upper limit of acceptable modulation. Peak or peak-to-peak values can be observed on an oscilloscope. Since audio contains random waveforms, these values can be difficult to read. Therefore, it is helpful to use an oscilloscope with storage capabilities (e.g., a "peak-to-peak hold" function).

The peak value of an audio signal relates to a maximum. The root mean square (RMS) value, however, represents the energy content, which relates to loudness of the signal. The RMS value refers to how effective an AC signal will be in comparison with its peak value. The peak value of a sinusoidal AC signal is equal to 1.414 times the RMS value, or effective value:

Figure 1: Correct Bessel Null



$$E_{RMS} = [(E_1(t)^2 + E_2(t)^2 + \ldots + E_n(t)^2)/n)]^{1/2}$$

where E_1 through E_n are successive voltage level measurements over time (t) of a total of n samples.

Audio, however, does not usually resemble a pure sinusoid. In fact, the peak-to-RMS ratio of typical audio is generally quite a bit greater than that of a sinusoidal signal. The RMS value of an audio signal relates directly to program material density that relates directly to loudness. Therefore, the higher the RMS value, the louder the signal appears.

$$E_{avg} = [E_1(t) + E_2(t) + \ldots + E_n(t)]/n$$

Many operators try to minimize their peak-to-average ratios. That is, they transmit a higher average program level (APL) while still maintaining the same peak program level (PPL). In this case, they achieve a maximum perceived loudness while still falling within their allowed peak value. This is accomplished by using an audio processor that reduces the peak amplitudes relative to the average or RMS values.

Since it is difficult to measure an RMS value directly, most audio measurements are actually average, rather than RMS, with the instrument calibrated to display a calculated RMS value. Although RMS-reading meters are now available, they are neither inexpensive nor widespread.

Much of the audio equipment sold in the cable industry contains built-in metering to provide continuous level measurements. The most popular types of metering are the average-reading standard volume indicator (VU meter) and the peak program meter (PPM). In the past, the VU meter was more common in U.S. broadcast equipment, but peak-reading meters are now becoming more popular.

The VU meter is essentially an average responding device. It will not react to short duration program peaks. The PPM is designed to read nearly the full peak value of the audio signal. It uses a rectifier and an integrator to display a fast rise and slow fall effect.

In a cascaded transmission system (such as a cable TV system) gains, losses and levels usually are expressed in decibels (dB). Originally, the dB was a measure of change in power level:

$$dB = 10 \log(P_1/P_2)$$

where P_1 and P_2 are the two power values.

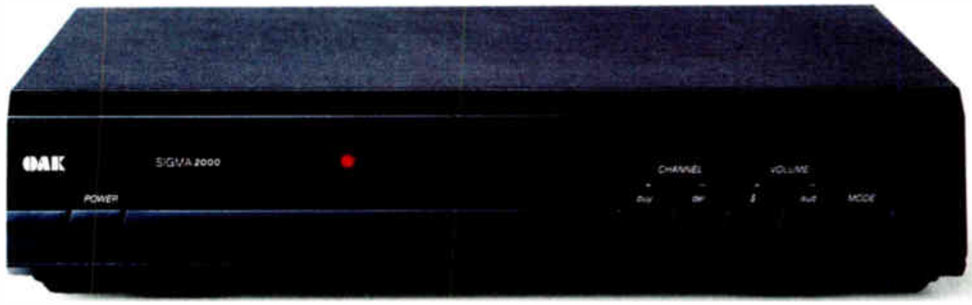
The decibel also may be determined from voltage measurements. By taking advantage of the fact that $P = E^2/R$, the original dB equation can be changed to:

$$dB = 10 \log[(E_1^2/R)/(E_2^2/R)]$$
$$= 10 \log(E_1^2/E_2^2) = 20 \log(E_1/E_2)$$

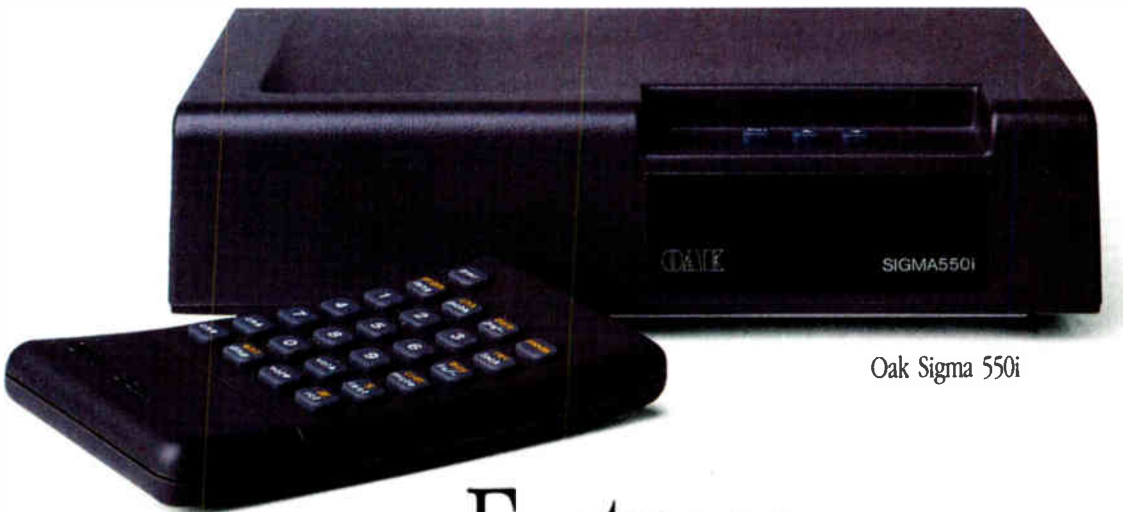
Note that in practice, when referring to voltage ratios, rather than power ratios, the impedances are irrelevant and typically ignored.

Since zero cannot be used as the divisor in a ratio, an arbitrary reference value must be selected to represent 0 dB. Various reference points have been defined as zero levels. Common

(Continued on page 64)



Oak Sigma 2000



Oak Sigma 550i

Features You Can Count On, Benefits You'll Love.

With the Oak Sigma, there's more to love. Through Oak's Advanced Control System (ACS), your Oak addressable equipment is software driven, not hardware limited. And that means more flexibility.

Oak's compatability allows gradual change-overs from competitors equipment, which lets you upgrade easily. Less complaints. More satisfied customers.

For more security than you ever thought possible, Oak offers the industry's most sophisticated audio encryption and video scrambling technologies available.

And with an attractive leasing program through Security Pacific Credit Corporation, the Sigma 2000 doesn't play hard to get. The Sigma 2000 and the Sigma 500i. A likable pair with more of what you want. For more information,on Oak Sigma, call us now at (619) 451-1500.

OAK

Oak Communications Inc.
16516 Via Esprillo,
Rancho Bernardo, CA 92127
(619) 451-1500

Reader Service Number 24

Superaudio: What's behind the sound

By Doug Greene
Senior Satellite/Video/Audio Engineer
Jones Intercable

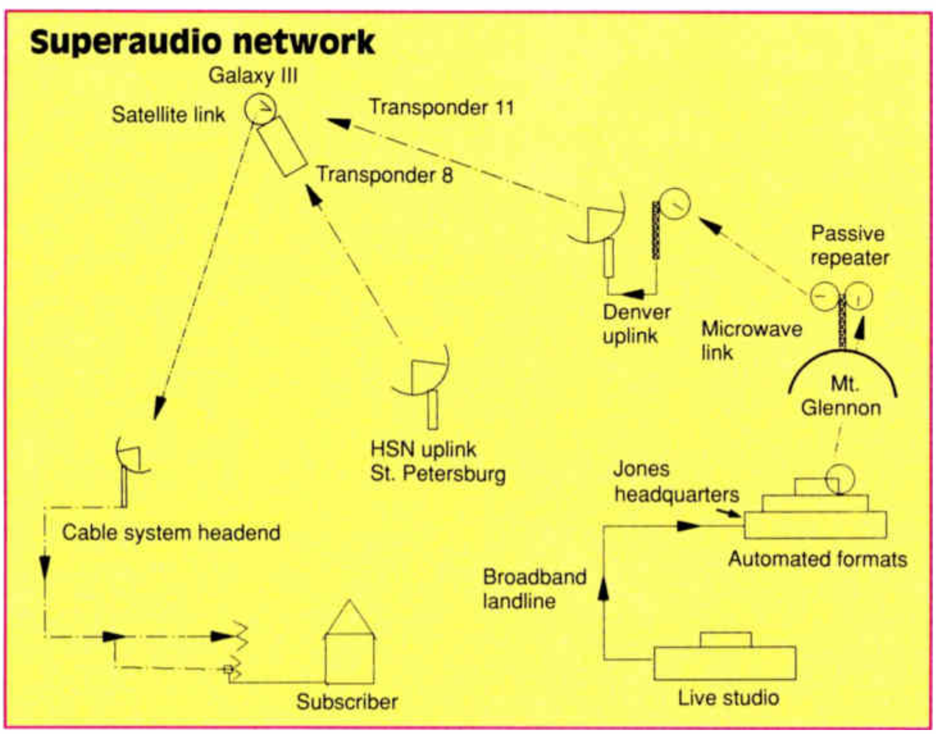
An automated playback system as well as live DJs are used for various Superaudio stereo formats.

Roy Ehman

Roy Ehman

Superaudio is a 24-hour cable audio service delivered via Galaxy III from Jones Intercable's headquarters in Englewood, Colo. There are six stereo music formats that can be found on Transponder 11 (which also carries The Mind Extension University). In addition to these six, there are three monaural non-music formats on Transponder 8 (also berth for the Home Shopping Network).

All of these are delivered by discrete subcarrier above video, ranging from 5.04 MHz to 8.238 MHz, and are narrowband analog FM signals. The video and audio subcarriers are modulated into one composite satellite signal that is transmitted to a satellite transponder for distribution to cable headends. A good quality satellite receiver with a flat baseband frequency response out past 8 MHz is recommended to receive these satellite subcarriers properly. The accompanying table lists all Superaudio formats and where they can be found on Galaxy III.



Superaudio network

Stereo formats

Three of the stereo formats originate from Jones' headquarters via an automated playback system, using Studer Revox reel-to-reel tape decks. These tape decks deliver a weighted signal-to-noise ratio of 66 dB over a flat audio frequency response of 20 Hz to 20 kHz. Personnel are on duty 24 hours a day to change the reels and to monitor the automated playback system's performance. In addition, periodic sound quality checks are made on all the formats.

The remaining three stereo formats originate from studios located approximately a half mile away from the Jones building and are delivered by broadband landlines, which have a flat frequency response from 20 Hz to 18 kHz.

At the studios, live talent (disc jockeys) play music from magnetic tapes and provide breaks between music sets. The studio facility has a full array of redundant electrical systems and

(Continued on page 76)

Freedom package.

Solve your antenna site location problems.

Ortel's new 10005A TVRO Fiberoptic Transmitter and Receiver give you the freedom to locate your satellite antenna where you want it without regard to the headend location…**anywhere up to 15 miles away!** The 10005A frees you from problems like terrestrial interference, line-of-sight obstructions and legal restrictions.

Installation is easy. The LNA or LNB output feeds directly into the transmitter, which delivers either one **or both** over a single optical fiber cable to the receiver, wherever you want it.

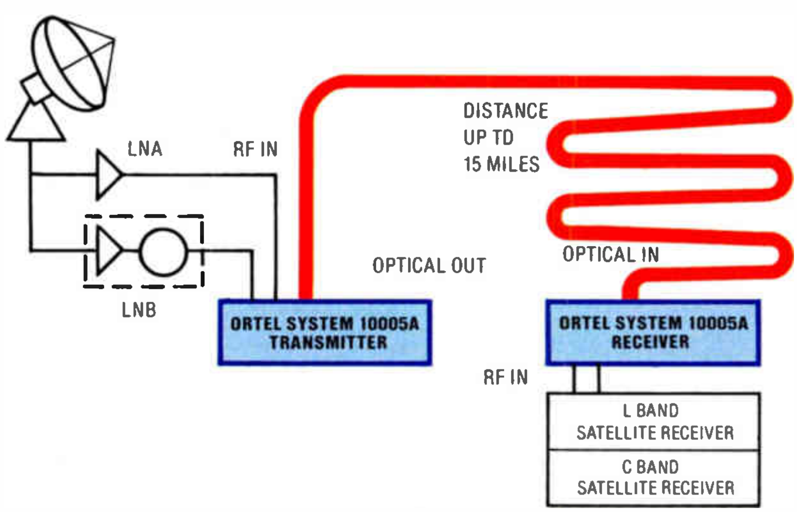
The modular design 10005A system uses a standard 19-inch rack mount incorporating dual, redundant power supplies for added reliability.

Modular design means you can expand the system to handle multiple polarizations. It also minimizes the cost of spares.

- *Passband: 950 — 1450 MHz*
  3.7 — 4.2 GHz
- *I/O gain adjustment range: 20dB*
- *Typical demodulated signal-to-noise ratio at 15 miles: 60dB*
- *Standard 19" rack mount x 5.25" high x 11.8" deep, houses four polarizations.*

Ortel is the leader in analog laser design and manufacture. You can count on impeccable performance and a total commitment to service from Ortel.

To get the whole story, simply call your Ortel sales representative today.



ORTEL™
CORPORATION

2015 West Chestnut Street
Alhambra, CA 91803
(818) 281-3636

*Making light **work** for you.*

Reader Service Number 25

Is your safety program alive and well?

By Ralph A. Haimowitz
Director of Chapter Development and Training
Society of Cable Television Engineers

Most of you probably have some sort of safety program within your company and some will certainly be better than others. Some of you probably have no existing safety program at all and in the worst of all possible circumstances, may not ever have one. The amount of success or failure your company has with safety depends upon the following factors:

• *How much support the safety program receives from upper level management.* If your CEO, president, vice presidents, regional or district managers and local managers do not understand or know about the safety requirements and training demanded by the Occupational Safety and Health Administration or — worse than that — do not feel that the safety of their employees is important and beneficial for the company, then you will never have an effective safety program and will live and work under the rule of "luck" (if we are lucky, nothing will happen).

• *How well your safety program is being conducted.* This means a conscientious safety coordinator who puts in the effort to see that you and the other employees receive *all* the safety training and safety refreshers that are needed to keep you aware of the dangers that exist in the work areas, as well as maintaining the required documentation and files.

• *How well the managers and safety coordinators sell safety consciousness to all employees.* Safety awareness and performance are essential to any safety program and the final key to success lies here. Understand that if the first two factors listed are not being accomplished properly or the program is only receiving "lip service," you will never achieve the third factor.

Excuses, excuses

The most common excuses for not having or properly supporting a comprehensive safety program are:

a) Safety is not really a priority item in our operation at this time.
b) We cannot afford it in our budget this year (see "a").
c) We can't afford the time for our people to spend on safety when we need them more on the job (see "a").

These excuses are usually preceded by the comment, "I know we need to do something about safety, but ... "

What are the real facts about safety programs? Are they beneficial or just another government nuisance that we have to live with? If we are going to have to have safety programs, just what should we be doing and how do we go about it?

Truthfully, good safety programs do far more than keep us out of trouble with the government agencies and avoid fines. They lower the number of accidents in both the workplace and the home. This reduces by a considerable amount the number of lost man hours due to medical treatment and recuperation periods that result from accidents. It reduces the number of sick days that employees normally take and use when they get hurt. It means we can have our full work force of trained and skilled employees on the job where they are needed instead of being at home or in a hospital. Then we don't have to dump their jobs as an additional workload on our healthy employees. It will lower the costs associated with the reporting and documentation of injuries and accidents. Insurance companies will tell you (if you just ask) that the hidden costs resulting from an accident may often be seven times the apparent costs of care and treatment.

Many major insurers of cable companies are now demanding that their clients have an effective operational safety program or face the threat of the insurance companies refusing to renew policies. Because our industry is clumped under the telecommunications heading (along with telephone, radio, television and others) there are no readily available facts and statistics to show how we rate as an industry other than those gathered by the major insurers of cable systems. According to their data, we are more than twice as bad as the rest of the telecommunications groups. This means that we can realize tremendous savings in money, manpower and materials if we begin to do things better.

Planning your program

Let's take a look at what we need to do to have an effective safety program. First, every system needs a safety coordinator. This is usually someone who is appointed by the system manager to oversee the safety program for the entire system. Most managers make the mistake of assuming it should be a technical supervisor (plant manager, chief tech, maintenance supervisor) because most of the safety hazards are in the field and they already know what the dangers are and how to handle them. This is not necessarily true.

In most cases it is far better to appoint someone working in the system offices as the safety coordinator. This person organizes the files, completes and files the forms, learns the OSHA safety requirements, coordinates with the safety trainers that are appointed in the other system sections, and closely monitors the safety education and training programs to see that they are being done properly.

Other specific steps you need to take to establish an effective safety program are:

1) Obtain the recommended publications and forms, read the appropriate sections that apply to cable TV companies and systems, and have them available in your files. (Note that companies with 11 or more employees must comply with the OSHA regulations). It is recommended you acquire the following:

• *OSHA CFR (Code of Federal Regulations) 29*, Parts 1901.1 to 1910
• *OSHA CFR 29*, Parts 1910 (1910.1000 to end)
• *OSHA CFR 29*, Part 1926
• *OSHA 2254 (Revised) — Training Requirements in OSHA*

(Continued on page 79)

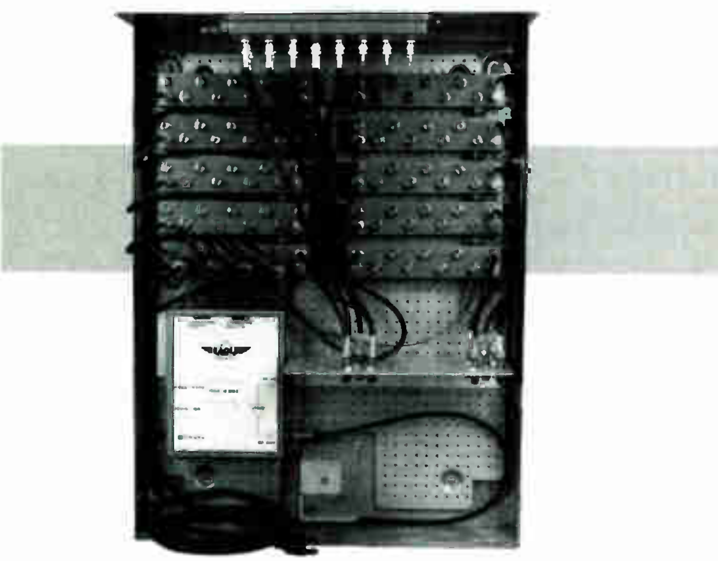
THE WORLD'S LEADING MANUFACTURER OF CABLE DISTRIBUTION AND SECURITY PRODUCTS.

EAGLE "ET" MICRO SERIES TRAPS

- Complete selection of single channel, multiple channel, low pass, high pass, decoding filters, and special filters using 4, 8, or 12 poles.
- Units available in standard, HRC, IRC, inverted, European and special frequencies.

EAGLE 2-4-8 WAY TAPS

- The industry's most consistent high quality tap.
- Each tap pressure checked to 20 psi.



EAGLE ADDRESSABLE TRAP SWITCHES FOR MULTIPLE DWELLING UNITS/APARTMENTS WITH IMPULSE PAY PER VIEW CAPABILITIES

EAGLE ADDRESSABLE TRAP SWITCHES FOR SINGLE DWELLING UNITS WITH IMPULSE PAY PER VIEW CAPABILITIES

See us in Reno at the SCTE Cable-Tec Expo, Booth 902.

EAGLE
COMTRONICS INC.

Reader Service Number 52

NOW SERVING EUROPE
Belgium: Electro Service: 011-32-15-20-95-75 **England:** ABP Ltd: 0256-881525 **France:** Sachs France: 1-39-86-29-62
Norway: Cablecom AS: 011-47-34-67800 **West Germany:** Stodiek: 011-211-41-7010

WORLD HEADQUARTERS:
4262 Waterhouse Road Clay, New York 13041 (315) 622-3402 FAX: 315-622-3800 **In Canada:** Deskin Sales: 416-475-1412

OSHA: What you don't know can hurt you!

By Roger Keith
Director, Seminar Department
National Cable Television Institute

Picture this: It is a bright, sunny afternoon in October. Your secretary calls and informs you that a gentleman from the Department of Labor is here to see you. She says he is an OSHA (Occupational Safety and Health Administration) compliance officer and she wants to know if you are available to see him. What do you do? Chances are, sometime in your working life you will have to deal with a situation like this one.

Since its inception, OSHA has conducted thousands of on-site compliance visits. It doesn't matter how large or small your system is or where it is located, it most likely falls under the jurisdiction of the U.S. Department of Labor. If so, you must comply with the Occupational Safety and Health Act of 1970.

Who must comply and how?

Actually, there are a few exceptions. I know, you're just a small time cable TV operator in Horsehead Junction, Idaho, and you've never even heard of OSHA or know of anyone else who has. Still, just because you're off the beaten track does not mean you are exempt. The only employers who are exempt are: the federal government, state and local governments and their agencies and departments. Additionally, those individuals who are self-employed and family farms, on which only immediate family members are employed, are exempt.

Actually, your requirements under the act can be summed up quite simply with the following:

1) You must observe all OSHA standards that are applicable to your system.

2) You must keep those who work for you informed of their rights under the OSHA law.

3) You must cooperate with the OSHA compliance officer when he arrives at your system.

4) You must keep the required OSHA records and have them available for review by the OSHA compliance officer.

Just as there are requirements for the employer, there are also OSHA requirements for the employee. The employee also must comply with OSHA standards, including obeying all the rules, regulations and orders issued in connection with the act. The biggest difference between the requirements for employers and requirements for employees is that if employers fail to comply with OSHA standards, they may be fined or imprisoned—or both!

It is essential that the employer communicate to the employees their rights under the act. The simplest and best way to do this is to obtain a copy of the Labor Department's informational poster, "Safety and Health Protection on the Job" from the nearest regional OSHA office. Make sure it is prominently displayed so that your employees have ample opportunity to read the information on it. The display of this poster is an OSHA *requirement*.

It is the responsibility of the employer to know and comply with all of the OSHA standards that apply to your work environment. It is up to you to obtain copies of the pertinent OSHA standards, read them and determine what parts apply to you and your business. Copies of the standards are available from your regional OSHA office or you can write to: Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Ask for a copy of the *Code of Federal Regulations*, 29 parts 1900 to 1910 and 1910 to end.

"Each employer shall 'furnish ... a place of employment that is free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.' "

Recordkeeping, reporting

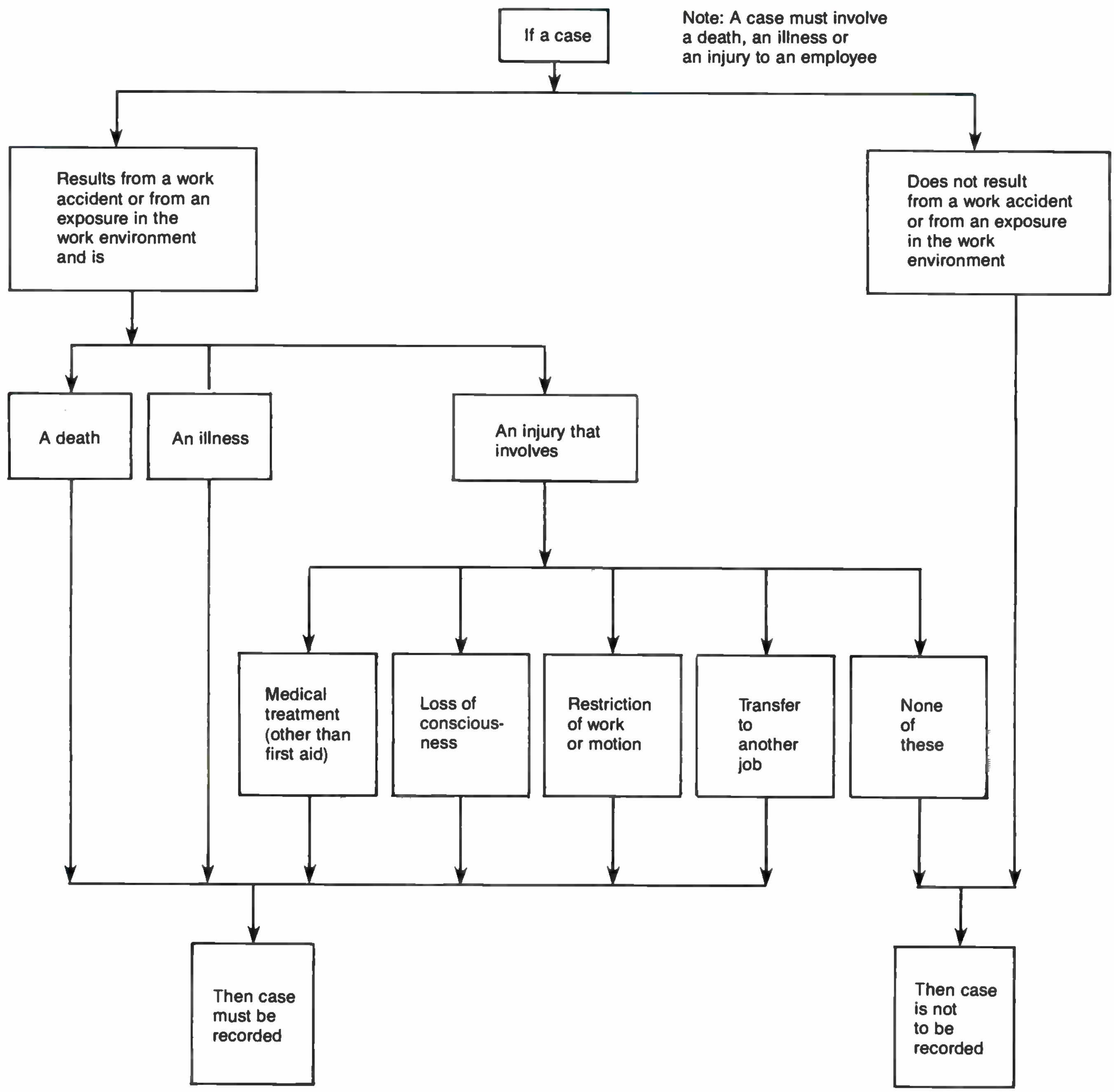
One of the most important requirements that you, the cable operator, must meet is that of establishing and maintaining OSHA injury records. These records must be kept if you have 11 or more employees.

A complete description of the requirements under the OSHA Act is covered in the booklet, *Recordkeeping Requirements Under OSHA*. In brief, you must:

- Maintain a record of all reportable injuries on OSHA Form 200. Form 200 must be kept updated and maintained in a location that is readily accessible to system management. Why so accessible? Because when an OSHA compliance officer asks to see it, you should be able to find it and provide it without delay.
- Log reportable accidents on Form 200 within six working days.
- Keep the OSHA Form 200 for five years, not including the current year.
- Notify the nearest OSHA area director within 48 hours of any accident or health hazard that results in one or more fatalities or the hospitalization of five or more people.

It is important that you or one of your

Guide to OSHA recordability of cases



employees become familiar with OSHA reporting and recordkeeping requirements. Failure to keep and maintain proper records will result in a citation and a fine.

Try as you might, you will find no direct OSHA references in the *Code of Federal Regulations* to cable or cable TV. You will, on the other hand, find a number of references to cable-related activities such as climbing, personal protective equipment, ladders, etc., under 1910.268 telecommunications.

It has never been the intention of OSHA to try to cover every aspect of every job in every industry. Realizing the futility of this OSHA devised the "general duty clause," which simply requires that you provide "a place of employment that is free from recognized hazards that are causing or are likely to cause death or serious physical harm." In real terms, if an OSHA compliance officer finds a poorly maintained bucket truck in use in your system, you would most likely be cited under the general duty clause.

The OSHA inspection

Since you will not receive any advance notice of the OSHA compliance officer's visit, it is important that you are prepared at all times. In most cases, the compliance officer will be visiting your office in response to a complaint that has been filed against your system charging some unsafe work condition or some infraction of an OSHA standard. Generally speaking, compliance officers do not just "drop by."

The visit by the compliance officer is actually quite routine. You should anticipate the following steps:

1) The OSHA officer will arrive unannounced during normal working hours

(Continued on page 80)

For safety's sake

By Al Dawkins
ATC National Training Center

Safety has become of great interest to all cable companies in the last few years — because accidents cost money.

The Occupational Safety and Health Administration plays an important role in the safety issue. Since the OSHA Act of 1970, it has the authority to enforce the Code of Federal Regulations (CFR). The cable industry must conform to these regulations; if not, heavy fines can be assessed. Another major OSHA concern is to do anything it can to reduce accidents and deaths on the job. One of the ways OSHA goes about doing this is through its printed guidelines.

The guidelines support the safety program approach as a important facet of a successful safety promotion. Hopefully, a safety program exists within your organization. If one does exist, the guidelines will help determine if it is a good program. If not, the guidelines will help in the development of a successful safety program. Writing or revising a safety program can be an enormous undertaking.

Let's first look at what the guidelines contain:

• Present a self-audit to evaluate your present program.
• Cover management commitment and employee responsibility and involvement.
• Tell how to conduct surveys, inspections and work-site analysis.
• Detail hazard protection and control, and include a "Hazard Communications Package."
• Offer pointers on conducting safety training and materials for safety meetings.
• Provide information and guidance on dealing with OSHA.

OSHA strongly recommends a written safety program. This program should clearly state policy when there is a question between safety and work production, and provide detailed safe work rules and practices. The written program should include four major sections:

1) *Management commitment and employee involvement* — Management provides the motivation and the employees develop and express their own commitment to safety and health protection.

2) *Work-site analysis* — Inspections to identify problem areas and hazards by a committee made up of a broad mix of management and workers. Once the hazards are discovered they can be eliminated or controlled where elimination is not feasible. (This analysis can work in conjunction with the hazard communications plan to identify and update hazardous materials.)

3) *Hazard prevention and control* — A result of locating current and potential hazards. Prevention or control of recognized hazards must be dealt with in a timely manner.

4) *Safety and health training* — Directed toward the entire work force. Training is a necessary means of communicating safety and health protection to all personnel. OSHA's guidelines list the seven steps of training that can be used to identify needs, conduct, evaluate and improve any training program. Other elements can be added to meet the individual needs, such as accident investigation and claims management (which can be handled within the safety department or by human resources).

Self-inspection

Upon completion of the written program or a revised plan, the next step is to inspect the work site. Some of the things to look for include:

• OSHA poster displayed in a prominent location.
• Location of the illness and injury records (OSHA Forms 200 and 101).
• Summary of illnesses and injuries posted from the first of the month to the first of the next month (e.g., May 1 to June 1).
• Employee awareness of interest in safety and health.
• Documented safety training.
• Known emergency plan and posted emergency phone numbers.
• Electrical hazards and compliance with NEC code.
• Building access and exits marked and free of obstructions, with emergency evacuation plan posted.
• Personnel protection with first aid, quick wash, protective equipment and no exposure to toxic materials in eating areas.
• Fire protection with extinguishers inspected and tagged and properly located. Alarm and sprinkler system in proper working order and inspected yearly.

This list contains OSHA priority categories; an expanded and more detailed list will result as inspections are made.

Hazard communication

An important part of any safety program is the Hazard Communication Standard — or the "right to know" law.

• The employer must inform employees of the toxic materials located within the workplace. Make available "Material Safety Data Sheets (MSDSs)," which list the properties and hazards of these toxic materials.
• The employer must provide information to employees, within the first 30 days of employment and once a year thereafter, of the effects of these toxic materials and what to do in case of an emergency. All materials must be labeled prominently to show hazards. These labels must be in good condition and replaced if necessary.
• Employees must know the toxic characteristics and read the MSDSs. Employees may refuse to work with these toxic substances if the MSDSs are not provided within five days of a request. (A toxic substance defined by OSHA is any chemical or toxic substance that is used in quantities that are greater than normal consumer use.)
• The written Hazard Communication Program must contain a complete list of all hazardous materials found in the workplace, methods used to train employees on reading labels and identify the responsible person for MSDS updates. This written program must be made available to all employees.

Training

In order to prevent accidents and protect employees, training is of the upmost importance. OSHA's seven-step system for training:

1) Determine if training is needed.
2) Identify training needs.
3) Identify goals and objectives.
4) Develop learning activities.
5) Conduct training.
6) Evaluate the program's effectiveness.
7) Improve the program.

The most important training target is

(Continued on page 82)

Maintenance planning for CATV power supplies

By Tom Osterman
Director of Research and Development
Alpha Technologies

Outage prevention always has been a high priority for cable system operators. Equipment for cable systems has become more sophisticated with advances in technology, and maintenance of this equipment also has become more challenging and important.

Preventive maintenance, troubleshooting and repair training are areas of increasing importance. This article addresses the maintenance and repair of cable TV power supplies.

Power supply design

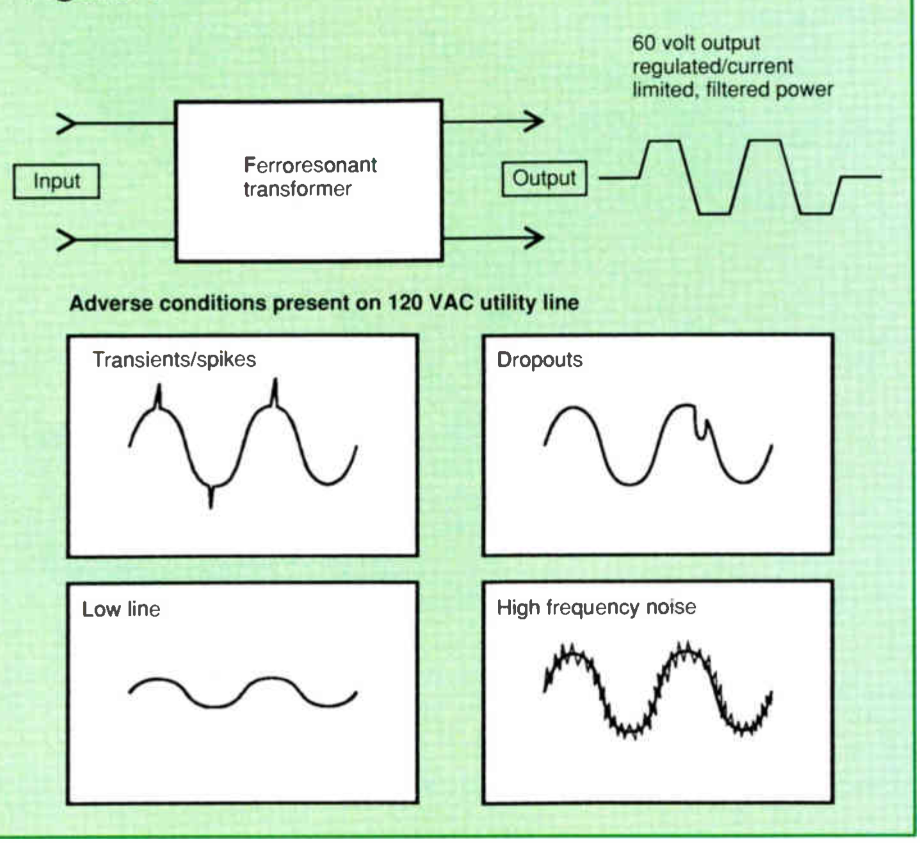
Most power supplies for use in cable systems are based upon the ferroresonant transformer design topology. The ferroresonant transformer provides many advantages appropriate for the cable TV powering application. The AC power supply is usually located in areas where there is extreme electrical and environmental stress. For example, the AC input to the power supply is connected to the secondary of the utility distribution transformer. There is very little line impedance in series with the AC input of the power supply to protect it from transients generated by lightning strikes or utility switching faults. This is unlike a location within a building that can have several ohms of wiring, circuit breaker and connector resistance as well as inductance (which will tend to limit the amplitude) and peak energy content of transients coming in from the utility feed.

One of the significant advantages of the ferroresonant transformer is its effectiveness at attenuating voltage spikes, transients and RF noise present at the input. (See Figure 1.) Common ferroresonant transformer performance in this area (primary-to-secondary) is 120 dB common mode attenuation, 60 dB normal mode, spike attenuation 1,000:1.

The ferroresonant transformer is unusual in its construction in that the primary and secondary windings are physically isolated from each other by up to an inch of steel lamination core. (See Figures 2 and 3.) This design significantly reduces capacitive coupling of spikes and RF noise primary to secondary, unlike a linear transformer where the primary and secondary windings are closely coupled and pass transients through with minimal attenuation.

Another unique advantage of the ferroresonant transformer is its ability to regulate its output voltage over changes in output loading and input voltage variations. Typical specifications are: output voltage variation ±3 to 5 percent with input voltage variation of ±15 percent of nominal (120 VAC) and output load variation from 20 to 100 percent. This characteristic is extreme-

Figure 1



ly useful in the cable TV application because it protects the active devices from damaging voltage fluctuations; e.g., brownouts and prolonged high and low line conditions. This feature also allows reliable operation of the cable system, even if the input voltage is consistently low.

Standby vs. non-standby

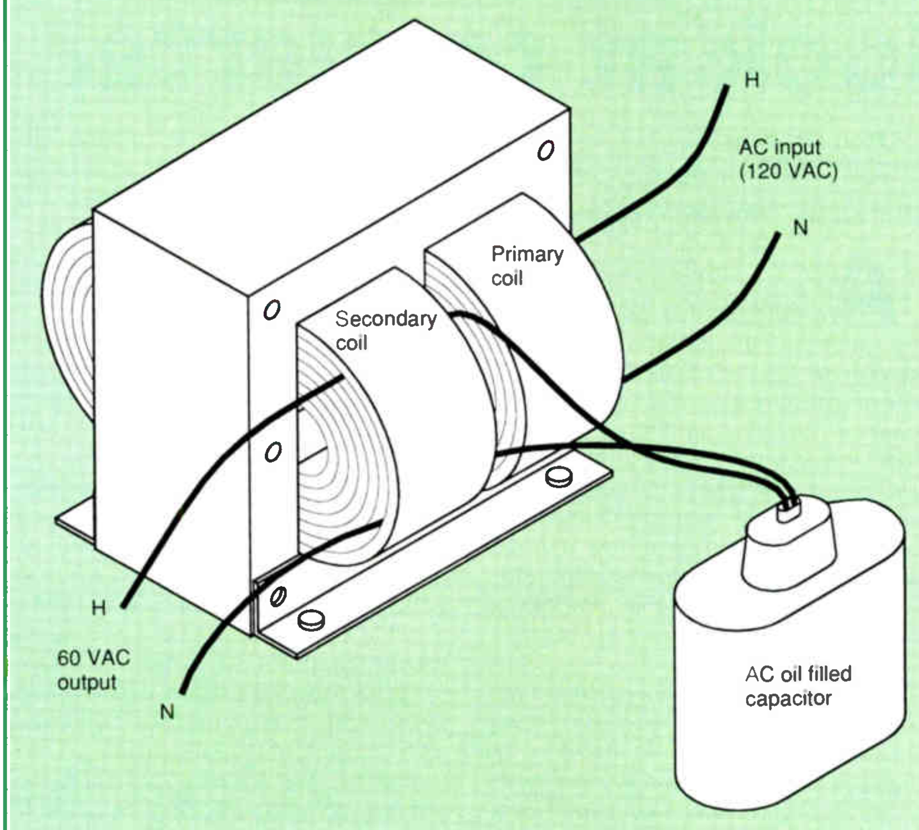
Most non-standby AC power supplies consist of the ferroresonant transformer (as previously described), AC capacitor, metal enclosure and input and output connectors. Optional features such as ammeters, voltmeters, pilot lamps, time delay relays, MOVs, Amp Clamps and avalanche diodes can be added to customize the basic power supply to suit the particular requirements of each cable system.

A standby power supply's major components

Standby power supplies include additional electrical components for the capability to provide 60 volt output to the cable plant while utility AC is not available (power outage) or when the utility voltage and/or frequency is out of tolerance.

One of the most effective standby power supply designs consists of a single ferroresonant transformer (with all of its aforementioned advantages for cable system protection) and the additional components that provide battery backup capability. A standby power supply requires a number of important circuit functions:

Figure 2: Ferroresonant power transformer



- *AC input circuit breaker:* Provides a "service disconnect feature" as well as overcurrent protection for the input of the power supply.
- *Transfer relay:* Provides a "positive disconnect" when the power supply is operating in inverter or standby mode. Prevents backfeed of AC power to the utility grid during a power outage.
- *Logic board:* Contains all control circuitry for inverter, battery charger, status monitoring interface, automatic performance monitoring. Monitors AC input and initiates transfer to standby mode if AC power fails. Also provides phase synchronization of inverter operation to utility input prior to retransfer.
- *Ferroresonant transformer:* Provides filtering, voltage regulation, current limited output. Two primary windings: 1) AC utility primary, 2) inverter primary. One secondary winding: 60 VAC square wave output. (Editor's note: The CATV ferroresonant power supply output waveform is not a true square wave but is actually a quasi- or pseudo-square wave.) Part of resonant circuit.
- *Resonant capacitor:* Connected to ferroresonant transformer as part of the resonant tank circuit. Provides resonant circuit function for voltage regulation.
- *Inverter circuit:* Contains power transistors and overcurrent protection components. Converts DC battery voltage into 60 Hz crystal-controlled AC square wave. Connected to inverter/charger primary winding on ferroresonant transformer. Controlled by logic board.
- *Charger circuit:* Draws power from the inverter/charger winding of the ferroresonant transformer when the power supply is operating on the utility AC input. AC voltage is rectified and filtered to provide a smooth DC voltage for charging the battery string. The charger circuit provides tightly regulated and current limited output to correctly float-charge the batteries. The charger voltage is adjusted slightly up or down to compensate for changes in battery temperature as recommended by the battery manufacturers.
- *Batteries:* Sealed, maintenance-free. Gelled electrolyte common. AGM type used as well. Three 12-volt batteries are connected in series to provide nominal 36 VDC to the inverter circuit. Commonly available are 55, 80 and 100 ampere hour (AH) capacities. The size required is determined by the amount of load on the power supply output and the amount of run time desired when in standby mode.
- *Battery fuse or circuit breaker:* Provides battery disconnect for service and overcurrent protection for inverter circuitry. Will also open if battery polarity is inadvertently reversed.
- *60-volt AC output fuse:* Provides protection for transformer output short circuit. Note: ferroresonant transformers have a unique current limiting characteristic. When the output is shorted, the output will "fold back," i.e., current limit. The maximum transformer output current will typically be 150 percent of the nameplate output current rating. Typically, the output fuse is a slow-blow time delay type and is sized to open if a prolonged short circuit occurs. (See Figure 4.)

There are several different standby power supply designs that have been

(Continued on page 85)

A behind-the-scenes look at converter repair

By Ron Hranac
Senior Technical Editor

Photos by Thomas Overbey

As long as I've been in cable I've been curious about how the components we use are manufactured and, when necessary, how they are repaired. Considering that most people in the industry don't have an opportunity to visit the factories, *CT* and its sister publications have from time to time featured articles that provide a peek behind-the-scenes. A few months after Contec took over Brad/PTS, we decided to pay a visit to its Tampa, Fla., converter repair facility.

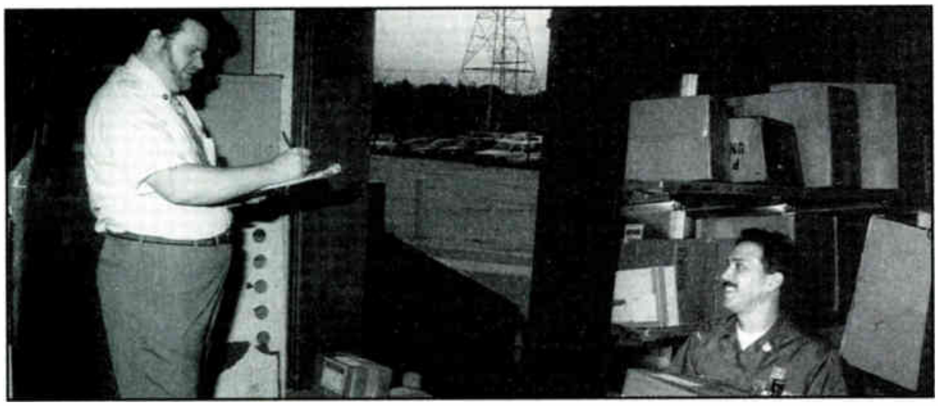
Have you ever wondered what happens to your converters after they leave the system to be fixed? You might be surprised at the level of complexity involved in a major repair center, particularly when just that one facility troubleshoots and repairs 300 to 400 converters *each* business day. Guiding us through the process were Contec's new corporate Chairman Danny Cachuela and Tampa Operations Manager John Beard.

The facility we visited is one of six operated by Contec. Others are located in Seattle, Wash., Longview, Texas, Bloomington, Ind., Fenton, Mich., West Columbia, S.C., and Schenectady, N.Y. Since Contec entered the picture, standardized companywide written procedures for repair, quality control (QC) and quality assurance (QA) have been adopted, and the company now repairs most converters except for some newer versions still covered by the original manufacturers' warranties. Mandatory manufacturers' upgrades also are performed if required.

I asked Beard about "no fault found" repairs, and he indicated that system operators are doing a much better job of eliminating those from their shipments. Two or three years ago it was common to find 25 to 40 percent of converters sent in with absolutely nothing wrong. Today that number is a more reasonable 5 to 10 percent. He did say that a lot of converters are still just labeled "not working," and noted that repair time can be reduced in some cases by as much as 75 percent if the trouble tags are more specific.

And like just about every other facet of our business, computers play a part in the repair process. Contec is about ready to implement a computerized bar code converter tracking system, and already has a data base containing customer profiles. That data base includes for each customer such things as billing and shipping information, system channelization (STD/HRC/IRC), converter output channel, as well as any special requirements for repair.

1) Contec Chairman Danny Cachuela and Tampa facility Operations Manager John Beard explain one of the test stations for baseband converters.



2) Cartons arrive by common carrier or in many cases by Contec's own regional pickup and delivery trucks. All incoming boxes are then labeled.

3) Everything that is received is logged on a daily receiving report and a tally sheet is filled out for each customer. The tally sheet includes a batch label from the computer along with a repair order. Two repair labels per converter are created, one for the converter and the second for the "travel" (repair) tag. All converters are checked in during this process and serial numbers, model numbers, etc., are recorded. Warranty stickers also are noted.

(Continued on page 92)

Status monitoring in fiber and coaxial systems

Status monitoring systems have been available for coaxial CATV distribution systems for over a decade. A background of the features of coaxial monitoring is presented as a basis for describing the first generation of monitoring for fiber-optic systems. The integration of an optical system status monitor into a hybrid coaxial and optical management system is described. The purpose of the integration is to provide the means to improve the system maintenance efficiency and enable the isolation of system degradations to their source.

By Jay Staiger
Product Manager, Magnavox CATV Systems

CATV operators are deploying fiber-optic technology to transport entertainment TV and other communications signals. Optical communications equipment is being applied to extend the distribution system reach, improve signal quality and service level to the subscriber and increase the system channel carrying capacity. The additional reach helps the operator distribute services over a greater coverage area from one centralized office or headend ultimately reducing capital and operating costs. Improved signal quality results in greater customer satisfaction and therefore a higher subscriber penetration can be maintained. The increased channel capacity allows the CATV operator to add more revenue-generating services. The investment in fiber technology is financially justified for these reasons.

Like any other operational system the equipment must be continuously maintained to support the benefits. A poorly maintained system will not provide the optimum return. Optical and coaxial distribution systems are integrated to form a hybrid. Maintenance will involve service to both coax and optical components. Time-consuming field troubleshooting to identify, locate and resolve problems will inevitably be required. Herein lies the reason to have a comprehensive network management system that provides status monitoring in the distribution system.

What is the purpose of a status monitoring system? This question is usually answered incorrectly. The usual answer is: to inform the system engineer of system failures. *Wrong!* You don't need status monitoring to tell you; your customers will. The *correct* answer is: to warn the maintenance staff of system degradations so a corrective action can be planned and implemented before a failure occurs and customers notice a problem. Please don't misunderstand this answer. Failures will inevitably occur and the management system will then help identify the location of the outage and minimize the mean time to repair.

There are status monitoring systems installed in coaxial systems. All too often, the maintenance staff doesn't heed the warning signs from status monitoring. If there is an alarm, something needs maintenance. Lots of times these signs are ignored or maintenance is postponed and the subscriber calls to complain of poor service.

However, when used to its fullest, greater customer and maintenance staff satisfaction are the results. Customers get better pictures and fewer outages, and the maintenance staff spends less time fighting fires. One comment from a satisfied status monitoring user was: "I thought I was going to miss the Super Bowl when I was paged to service an outage. It usually takes hours to locate and repair the outage. I remotely accessed the management system and it identified the area to troubleshoot for the outage. I drove directly from my house to the problem and I was back home watching the Super Bowl in a half hour."

"Status monitoring of the fiber system and the coaxial system should be integrated into one comprehensive management system."

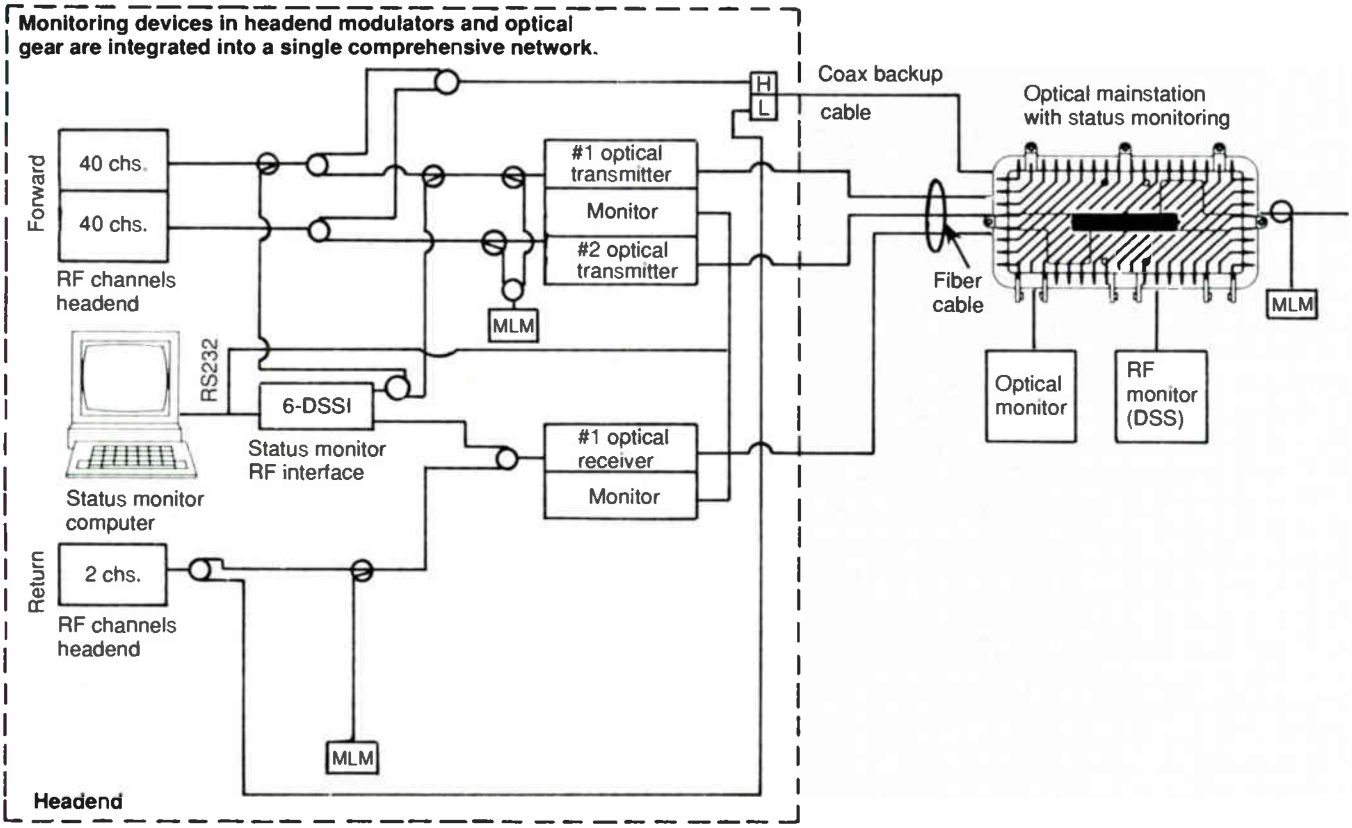
Complicated hybrid coax/fiber systems will benefit from an integrated status monitoring system. One central management computer can monitor the coaxial as well as the optical components of the system. Also, the maintenance staff can access the central computer from a remote location to determine system status. Using telephone modems, the central computer can be accessed from anywhere in the country.

Coaxial system hardware

There are various modules that have been designed to monitor system operating parameters. One example is the MTM (Magnavox Trunk Monitor) system. It reports forward and return signal levels, AGC and ASC control voltages, internal station temperature, power supply voltage, feedforward circuit condition, standby power supply status and bridger switching status. It also provides control for trunk and bridger switching, feedforward testing and standby power supply exercising and testing.

The MTM is a hardware monitor, meaning it checks the function of a piece of hardware like the trunk amplifier. Another component integrated into the management system is the MLM (Magnavox Line Monitor). This device is a stand-alone unit that can be positioned at any location in the CATV or LAN system. It monitors the signals carried on either the coaxial or optical plant and doesn't have to be associated with any piece of hardware. The

Status monitoring concept for fiber-to-the-node or fiber-to-the-feeder



most common locations are: output of headend combiner, input to optical transmitter, output of optical node, end of trunk cascades or feeder cascades. The MLM works in any system; even one-way plant. It can either communicate using the return signal path or standard dial-up phone line.

The MLM is unique because it can measure the amplitude of each and every channel carried on the system. It helps locate troublesome and very time-consuming problems such as suck outs and ingress. Did you ever try to isolate the location of an intermittent loose connector? It could take days or even weeks. MLM can minimize this time. The chief engineer can monitor the system's frequency response (peak-to-valley) and direct system sweep maintenance to the areas that need balancing. Sometimes routine sweeps can be eliminated when MLM reports a good response.

Optical system hardware

New optical hardware adds another segment to the cable system and therefore other critical parameters need to be monitored. At the optical node a special control card is installed to monitor critical parameters of each of three optical receivers and one optical transmitter. Receiver optical power, transmitter output optical power, and laser bias current are quantized and buffered in microprocessor memory waiting to be polled by the central management computer. Two redundancy switches, one for forward and one for return signal paths, are monitored and controlled. Thresholds for switching can be set locally or remotely. If thresholds are exceeded, then the microprocessor commands the switch to go to the backup signal path and report the actions to the management computer and sound an alarm.

Some optical nodes also include amplifier modules like a coaxial trunk station. Therefore, node monitoring also includes all the features as described for the MTM.

A control card also can be installed in rack-mount optical transmitters and receivers where laser temperature, bias current and optical power are monitored and reported to the management computer.

Integrated software

The foregoing described three elements of a distribution system management status monitoring system: 1) MTM trunk station monitor, 2) MLM stand-alone signal monitoring and 3) the optical control card. The subsystems must be integrated together into one cohesive reporting structure. This is done at the central management computer, which can be located in the headend or at another administrative center. The data accumulated at this facility also should be accessible from a remote terminal as well.

Polling of each monitoring device is managed by the computer. A data base containing a description of the device and alarm limits is stored. As information is fed back from the field monitoring devices a historical data base is logged for later recall and analysis.

For example: The MLM reports a good frequency response immediately after the field engineer finishes balancing the optical node. The computer stores this response. At some point in the future the chief engineer can recall the balance response and overlay it on the screen showing the currently measured response. If a large discrepancy is shown, he can take corrective action. Usually alarm limits are exceeded

(Continued on page 159)

SIGNAL LEVEL METER ACCURACY

VS.

Plant Performance

Signal level meter accuracy has profound effects on broadband (CATV) performance. Specifications on meter accuracy, however, can be unclear. Flatness is not an overall accuracy measure. It doesn't quantify the instrument's abilities at different levels, meter ranges or temperatures. Meter scaling, tracking or linearity is the ability to accurately track a change in input level at a given attenuator setting. Another specification is attenuator step-to-step accuracy, which is the ability to display correct levels across differing attenuator settings.

Signal level meter specifications can be listed separately, then added for overall accuracy. The accuracy stated may not give a true picture if specifications are omitted. Some manufacturers also specify accuracy by listing *overall* accuracy. The overall accuracy specification takes the above mentioned inaccuracies into account and provides one reliable number.

What does this mean to your system performance? For example, the meter used for system alignment has an overall accuracy specification of +/-3 dB, the carrier-to-noise and second order distortion performance will have a total window of 6 dB. The third order distortions (cross-modulation and composite triple beat) will have a window of 12 dB. These parameters may be further aggravated by temperature variations and channel loading. A system working well with 20 channels may produce substandard pictures with 30 channels. So the big roll-out of new channels turns into a service nightmare.

Trilithic's SP-1700* Digital Signal Level Meter gives you true +/- 0.75 dB accuracy** across the band, anywhere on the meter scale, at all attenuator ranges. If your system demands high performance, demand high performance from your signal level meter. Demand TRILITHIC.

Reader Service Number 29

TRILITHIC

9202 East 33rd Street
Indianapolis, IN 46236 USA
Telephone: (317) 895-3600

Toll Free: (800) 344-2412
FAX: (317) 895-3613

* Patent pending ** +/- 2.0 dB over temperature

See us at the SCTE Cable-Tec Expo, Booth 1106, 1108.

Pepito

Pulling the plug on lightning strikes

By Bruce A. Kaiser
President, Lightning Master Corp.

"The probability of any given structure or system being struck by lightning is directly proportional to its value (cost multiplied by the square of revenue lost and bad PR accrued due to down time)."

Sound all too true? How about its corollary: "If two structures or systems of equal value are located in close proximity, the one that will be struck is the one for which replacement parts are no longer available."

Seriously, why is a structure likely to be struck by lightning? More importantly, is there anything we can do to make a structure less likely to be struck?

The problem

In order to answer those questions, we need to take a look at the cause and propagation of the lightning strike. Various mechanisms within an electrical storm produce a stratified charge within the storm cloud, and result in an electrical charge at the base of the storm cloud. This cloud base charge induces on the surface of the earth beneath it a shadow of opposite charge commonly referred to as the ground charge.

As the charged storm cloud travels through the atmosphere, it drags its ground charge along beneath it on the surface of the earth. When the ground charge reaches a structure, the attraction of the cloud charge pulls it up onto the structure, and concentrates the ground charge on and around the structure. If, before it moves away, the charge on the cloud base manages to concentrate enough ground charge potential on and around the structure beneath it to overcome the dielectric of the intervening air, an arc or lightning strike occurs.

When the dielectric of the air is overcome and lightning is going to strike, the process begins with stepped leaders branching down from the cloud. These stepped leaders propagate in jumps of about 150 feet. The next set of stepped leaders propagate through the first set and jump another 150 feet, and so on toward the ground. These stepped leaders are the tendril-like branches extending down from the cloud that are visible in a photograph of a lightning strike.

When the stepped leaders are with-

Metal satellite dishes can by protected by installing a dissipator array directly on the frame at the top.

"Static dissipation technology attempts to reduce the incidence of strikes. However, a well-designed static dissipation system also makes the same provisions to handle any strikes that do occur in the same manner as the conventional system."

in 500 feet or so of the ground, the electric field intensity on the ground becomes so strong that objects and structures on the ground begin to break down electrically and respond by shooting off streamers up toward the stepped leaders. When a streamer connects with a stepped leader, the ionized path becomes the channel for the main lightning discharge. The other streamers and stepped leaders never mature.

For the purposes of this discussion, it is not critical whether the cloud base charge is positive or negative. Indeed, it can vary and the entire process can occur in the opposite direction.

A solution

Let's assume we want to influence the probability of a lightning strike to a particular structure. Given our current technology, there is nothing we can do to affect the cloud charge or to affect the formation or propagation of stepped leaders extending from the cloud charge. Therefore, we must do something about the ground charge and the formation of streamers from the structure we wish to protect.

What if we could reduce the buildup of the ground charge — not much, but just enough to keep it from reaching the critical flash point? Or, what if we could identify the points on the structure from which streamers are likely to originate, and slightly delay the formation or reduce the length (height) of the streamers so they would be unlikely to be the first to reach a stepped leader?

There is a technology that uses just this approach to enhance the structural lightning protection system: static dissipation technology. The top-most point of a structural lightning protection system is referred to as an air terminal (a lightning rod in the vernacular). To achieve these two objectives, the air terminal must be converted to a static dissipator or array of static dissipating elements.

Static dissipation technology employs the point-discharge principle to create a strong electric field intensity at the end of the air terminal. This phenomenon bleeds off some of the ground charge (which would otherwise accumulate) into the atmosphere surrounding the air terminal and retards the formation of streamers from the air terminal.

The following formulae relate to point-discharge phenomenon.

$$\varepsilon = \frac{Q}{4\pi \in r^2} \qquad \text{and} \qquad D = \frac{Q}{4\pi \in r}$$

where:

ε = electric field intensity
Q = charge (in coulombs)
$\in$ = permittivity of medium
r = radius of sphere
D = flux density

Point discharge theory holds that electrical discharge from the point of an electrode into a surrounding medium will follow predictable rules of behavior. The smaller the radius of a static dissipator electrode (actually, the smaller the radius of the sphere of the end of the electrode) the greater the discharge and resulting electric field intensity and flux density (or the greater the dissipation of the ground charge into the surrounding medium, which happens to be the atmosphere). As the dissipator electrode radius approaches zero, the electric field intensity approaches infinity. Under a high potential, that discharge creates a strong electric field around the electrode. This high electric field intensity and flux density retard the formation of streamers; i.e., it is difficult for the cloud charge or stepped leaders to pull a streamer through its intense corona.

A good illustration of this principle is found in the debate between the relative merits of a sharp lightning rod vs. a blunt lightning rod. Assume we have a sharp rod and a blunt rod side-by-side with the axis between them perpendicular to and directly facing an oncoming electrical storm. As the ground charge

(Continued on page 160)

Home satellite's high hopes

By Evie Maxwell

"Cable is gonna get its butt kicked."

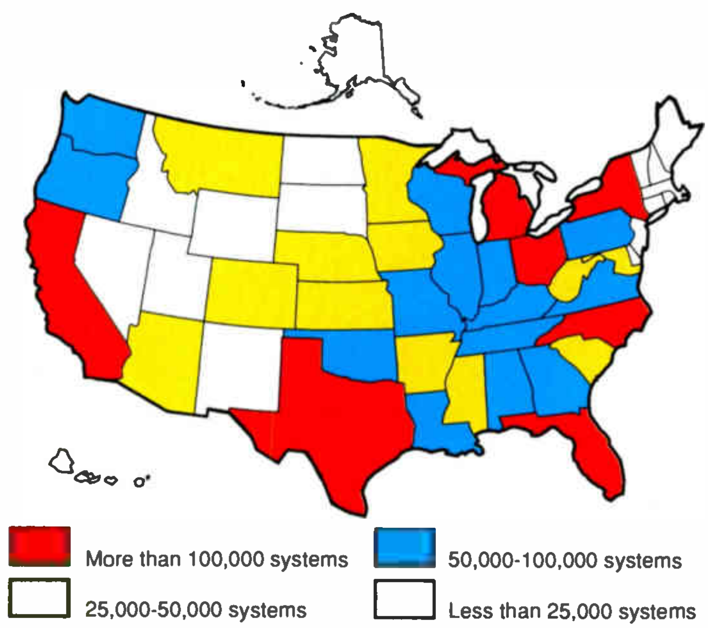
So says a home satellite dealer in his cluttered showroom outside Chicago. His sentiment is echoed — in frequently less polite terms — by home satellite dealers across the country. Certainly such statements contain a strong dose of hyperbole. However, a review of somewhat more sober observers does suggest that the home satellite business might be getting ready to take at least a small bite out of cable's hide.

To wit: Michael Meltzer, vice president of sales and marketing for General Instrument, says he sees a real possibility of home satellite becoming "a high volume business over the next few years." At Echostar, Marketing Director Kim Gordon says, "We expect that growth in the home satellite business will be explosive." And Bob Caird, vice president of HBO's Satellite Services and chairman of the Satellite Broadcasting and Communications Association (SBCA), simply says that home satellite markets "obviously will grow."

The questions, then, are how much and how soon.

The answer is — who knows? But a quick review of the past decade and a half does suggest that home satellite could be on the cusp of rapid growth.

Where the dishes are



Statistics from the SBCA.

The professor's parabola

The home satellite industry got its start back in 1976 when a Stanford University electrical engineering professor, H. Taylor Howard, rigged up the first home dish system. Using discards from a local telephone company, Howard pounded out a 15-foot parabola capable of picking up the signals that Home Box Office recently had begun bouncing off Satcom F1. Howard wrote to HBO, letting them know what he was doing. When he received no reply, he happily sold booklets on how to rig your own home system.

By 1985, according to the figures from SBCA, that first home dish had ballooned into an rapid-growth industry with more than 1.7 million home installations across the United States. In 1986, however, lightning struck: HBO took the unprecedented — and very unpopular — step of scrambling its satellite feeds. Other programmers followed suit. In the space of a year, home satellite dealers saw their business slashed by nearly 70 percent.

Since that time, home satellite sales slowly have crawled their way back up. By the start of 1991, SBCA figures show approximately 3 million home dishes dotting the U.S. landscape. Most of these installations are in rural areas, but some 42 percent are in areas passed by cable — and here's where the story starts to get really interesting, as home satellite's share of urban and suburban TV markets is widely expected to grow rapidly over the next decade.

Of course, compared to cable's close to 60 million subs, 3 million home dishes barely qualifies as a drop in the bucket. But it's a drop that a lot of very big names are interested in. For example, top cable companies like TCI, United Artists, Time Warner and Continental Cablevision all have investments in the home satellite business. The giant (though ailing) retailer Sears has been very pleased with the response to its TVRO dealer program. And such manufacturing mammoths as General Instrument, Toshiba, Scientific-Atlanta and Hughes all have big plans for home satellite.

DBS: The lure of the future

For many of these companies, the lure of home satellite comes in the form of an alphabet-soup promise known as direct broadcast satellite. Among other marvels, DBS generally is expected to be the first technology to offer ages are often the source of much jockeying, rumor-mongering and sometimes even creation, within the industry. (For example, when Turner wanted to create a programming package including Showtime, Showtime said no. Turner retaliated by refusing to sell CNN to Showtime for its package. That was said to have led Showtime to create the All News Channel.)

Subscription source #3: Cable companies

In 1986, HBO made sure that cable companies weren't cut out of the new programming pie when it gave them the right to sell home satellite programming in their local franchise areas. Over the years, however, surprisingly few cable companies have taken advantage of this.

"A lot of them still believe in exclusive franchises, even though technology has effectively voided that," one observer notes. However, those operators who have become involved in selling home satellite programming tend to be quite aggressive about it.

Chief among these is TCI (which should hardly come as a big surprise). Through its Netlink arm, TCI created a means to market home satellite programming for cable systems on a nationwide basis. Not content with this, the company also created Netlink Denver Five, made up of five Denver-based broadcast stations.

More recently, Jones and Cox have moved toward selling home satellite programming on a national basis as, at the same time, HBO and then Showtime have provided cable companies with national rights for distributing their programming.

Subscription source #4: National retailers

A final group selling programming to home satellite viewers is the national retailers or programming clearing houses. This group "emerged to take advantage of the rebates that we offer to home satellite dealers for selling our programming," Levy explains. "They simply built a business where new dish owners could contact them for programming and then they'd make their money from the rebates."

As the clearing houses have become more powerful (and respectable) programmers like HBO (again followed by Showtime) have responded by giving them the wholesale rates that cable operators received from the beginning.

Thus the home satellite programming maze grows. With DBS coming on line, the range of options for home dish owners can only continue to grow as DBS begins to transmit regular "cable" programming and, perhaps, some of its own. —*EM*

on a satellite becomes capable of transmitting not one channel but several. (The current upper limit for channels per transponder is said to be eight.)

Unfortunately for DBS boosters, today's video compression technologies suffer from two major flaws. For one, while they work well for such video fare as movies, they have a tendency to turn the fast-action sequences of sporting events into blurs. Even more importantly, current compression schemes are very expensive. Thus, while some DBS proponents claim they'll have high-channel systems up and running in the near future, skeptics warn that such systems may not be viable for several years to come.

Does this mean that home satellite's rosy future might likewise be sometime away? Not necessarily. For even without DBS, the industry is expected to grow.

The programming advantage

Pit cable's programming scenario against that of home satellite and the differences are astounding. Today's average home dish owner receives many more channels, with significantly better picture quality and sound, at a price that is substantially less than that paid by the average cable subscriber. (See "The programming maze" on page 52.)

Furthermore, home satellite viewers also enjoy advantages in today's increasingly popular pay-per-view markets. Not only do they frequently have a wider choice of programming, they can order their programming instantly, with the push of a few buttons. Looking at the immediate future, Echostar's Gordon says, "We expect pay-per-view will be a powerful reason to get a satellite system."

In the next few years, the home satellite business not only expects to use programming as a major stepping

Prime) DBS venture — and it's DBS that, industry experts say, could propel the home satellite business into the big time.

In other words, while the home satellite business isn't much to brag about today, a lot of people are betting that it will be somewhere down the line. And they'd like to be there for the ride.

Which brings us back to cable. In many ways, the home satellite business is a natural for cable operators. It is, after all, just another means for selling video entertainment to consumers. And its key steps should sound very familiar. That is to say:

Marketing

It's the key to success, both for cable systems and home satellite. After all, if you can't sell it to consumers, you're not going make a business out of it. And in both cable and home satellite, the thing you sell is programming.

Here's where today's home satellite dealers have the edge. As they gleefully point out, for considerably lower monthly costs, the average home satellite system offers a lot more programming than cable with a picture quality that is often far superior.

What home satellite dealers are less happy to point out is that the home satellite system itself is a high-ticket item: Today's average system runs about $3,000. That cost, however, is shrinking, as is the size of the dish required for home satellite reception. And when the more exotic DBS systems come on line, home satellite dealers could be selling $600 to $800 systems offering 80-plus channels at a monthly subscription cost of about $25. For cable operators, with their years of experience in selling video, that could prove a lucrative market.

While smaller DBS dishes promise to ease home satellite's pricing problem, they should also eliminate the problem of zoning restrictions which now keep home satellite out of many communities. (In fact, before you even think about opening a home satellite dealership, you'd best check local zoning restrictions. If they're tough on big dishes, you'd better wait for DBS.)

One major point favoring cable operators who are interested in marketing home satellite systems: their image of legitimacy and stability.

Says Toby DeWeese, manager of business development with Netlink, "The industry needs to continue their efforts to create mainstream acceptance. Customers need to feel like their dealer will be there next month."

Installation

Once a home satellite system is sold, the actual installation should pose relatively few problems. With today's big dishes, the installation procedure generally requires three visits to the customer's home for 1) the site survey, 2) the site preparation and 3) setting the dish and tuning it. Then, all that's left is programming the receiver.

"The installer sets one far west position, one far east position and one or two in between and then pushes the autotrack button," says SBCA's Harry Thibedeau. The receiver does the rest. And while installers once had to spend hours teaching customers how to use the receivers, that too has become much easier with user-friendly units.

As higher powered satellites come on line and further advances are made with equipment, installation also will become far easier. This doesn't mean, however, that professional installers will go the way of the Dodo bird.

"There are millions of Americans who have the time flashing on the front of their VCRs because they don't know how to set it," Thibedeau points out. So no matter what equipment makers say about "ease of installation," you'd better plan on helping most customers out.

Service

Like the cable TV business, the home satellite business is service-intensive. According to Thibedeau, "Although the reliability of the equipment has increased greatly, this is still a service business. You've got to remember that the equipment is out in the environment, so there will be things to take care of."

The average system, he says, requires maintenance once a year — which, as more systems are installed, can grow to be a big part of the business. For example, one mid-sized West Coast dealer who's been in the business for nearly nine years, says his crews now spend two days a week on installations and three days on service.

These service requirements should come as no great shock to cable operators. Nor should the installation procedures or the marketing needs. The two businesses, in fact, fit rather neatly together.

Whether the future for home satellite will be as rosy as many experts say — well, who knows? But, just in case, you might want to start looking now at how to spread your bets. *—EM*

Of course, that's still a big dish and a hefty price tag — which certainly helps to explain why home satellite viewers still are outnumbered by cable viewers by about 20 to one. However, SBCA's Harry Thibedeau says, the shrinking of equipment is bound to continue. "As the next generation of C-band satellites go into service," he says, "we'll see a drop to an average 6-foot dish size nationwide."

The smaller dish is expected to lead to lower prices — and, of course, a bigger market share. "Every time the prices go down, more and more people purchase satellite systems," says Echostar's Gordon. GI's Meltzer adds that with smaller dishes and prices in the future, "We expect to see more penetration (of home satellite systems) in suburban areas." In other words, right smack into cable's backyard.

Cable's move

With smaller dishes and lower prices, the demise of pirates and the advent of DBS, the home satellite industry holds a good hand for the future. So what's a cable operator to do? Stick his head in the sand? Only if he wants his butt in the air. (See "Dealing cable ops in" on page 56.)

A more sensible course is, naturally, to keep a close eye on the home satellite business. Despite its plethora of opportunities, it's not expected to explode immediately. In fact, some observers expect 1991 to be a flat year for the industry, with the real growth opportunities starting in '92.

Thus, there'll be plenty of time to watch. And to look for good opportunities. As Caird puts it, "A smart cable operator recognizes that he or she must make sure the consumer has choices." And for the future, home satellite looks to be an increasingly important choice. **CT**

AM

Fiber optic transmission systems. Designed for the future. Available today.

Flexible enough for all AM architectures. Simple enough for installation by RF technicians - no special AM training required. Reliable enough to carry the C-COR name.

Call today for more information about C-COR's comprehensive fiber optic product line.

C-COR ELECTRONICS INC

A World of Advanced System Technology

C-COR Electronics, Inc. 60 Decibel Road State College, PA 16801-7580 USA
814-238-2461 / 800-233-2267 / FAX 814-238-4065

Video's stepchild

(Continued from page 30)

As with the introduction of "compatible color" in the '50s, high definition TV (HDTV) or enhanced definition TV (EDTV) or advanced TV (ATV), or whatever name it ultimately assumes, will herald a period during which some program fare will offer exquisitely produced sound and some will not. Some viewers will be exposed to a vastly improved TV offering some of the time and some will not. The differences will raise subscriber sensitivities to the already more apparent shortcomings of cable audio to which those last four complaints on the previous list refer: loudness, quietness, compatibility and "the regular TV sound stinks now." All of these were suddenly apparent even back at the launch of MTV as a result of some TV sound in the cable subscriber's environment being reproduced through high-compliance, high-fidelity components and some not. Its lessons remain valid as we see ever more emphasis by TV receiver manufacturers on very high-quality audio subsystems and a not-too-distant-future that will see the introduction of ATV and its attendant high-quality sound.

Let's look at the effects one at a time:

Loudness

Loudness variations, both perceived and real, are not unique to broadband distribution. But it is a condition that appears to be. Without the strict standards to which broadcasters are held, carrier and subcarrier injection levels between cable channels across the bands would be perceptible to subscribers as volume variations when subscribers zap channels, often leapfrogging huge chunks of spectrum as they go.

While a broadcast transmitter tech is responsible for only one channel modulator and is held to strict limits, a cable headend tech must oversee perhaps 40 or more of them. While a broadcaster is setting his levels to the output of one studio source, usually a well-controlled and defined baseband, the headend tech looks at a myriad of standards coming into the plant.

Satellite program audio subcarriers alone range from between 50 and 237 kHz of FM deviation, not to mention VC-II levels, to produce +10 VU on each of the channel modulators. The sole standard governing satellite distribution at this time is that which the programmers at the uplink points choose to set for themselves.

The baseband component of each of the incoming signals also might be the product of audio processing. This deliberate distortion is introduced by either the uplinker or the program's producers to create a sense of "presence." Sometimes it's done by both. So when we set up levels at the headend, the end result is still the occasional signal that sounds louder than any PPM or VU meter known to man will tell you it is.

These conditions, either separately or in concert, are capable of producing subscriber complaints about cable sound volume. It's all over the lot all too often and will become vastly more apparent when reproduced by a very high-quality TV receiver system.

Quietness

Quietness, or audio signal-to-noise ratio (S/N), is also a major contributor

to inequality among the channels of your distribution system. Since the majority of cable programs reach the system via satellite, let's concentrate our attention there.

Among satellite distribution sources, for a given main (video) carrier margin above threshold, audio S/N for analog signals can vary broadly. In a satellite-delivered signal, audio S/N (or S/Na) is a product of the radio link (EIRP, antenna gain, noise temperature). But, as with all analog FM, performance also is largely determined by the modulation parameters employed at the origination sources: the program providers. Those, as was mentioned earlier, are whatever they decide they should be. Modulation index and/or FM improvement varies accordingly. Consider the following:

$$C/N = C/T - K + E$$
$$= 10 \log 3/4 \, (x^2 Dfsc^2 / fa^3 fsc^2)$$

Where:
C/N = Audio carrier-to-noise ratio
C/T = Earth station carrier-to-temperature ratio
E = Audio pre/de-emphasis improvement
K = Boltzman's constant (-228.6)
x = Deviation of main carrier by subcarrier
Dfsc = Peak subcarrier deviation
fa = Highest audio frequency
fsc = Aural subcarrier frequency

It's apparent that when considering (as was mentioned earlier) the vast (±10 dB) range over which subcarrier deviations (Dfsc) are adjusted in transmission, and the various margins engineered into earth station design in reception ($C/T = G/T + EIRP - L_p$), broad differences in audio noise performance will be experienced.

To compound this, many satellite receive sights currently in service are designed with minimal margin based upon ideal parameters. Some rely on threshold extension and the high stability of C-band propagation to preclude fading. However, audio subcarriers are not protected in an extended threshold condition and in the absence of adequate margin will get noisy. This condition, when degraded further by distribution over long cascades and finally subjected to reproduction on high-quality equipment, will drive a subscriber out of the room.

Compatibility

To an even greater extent than technological limitations, compatibility — with both the video image it augments as well as with the room in which it is exhibited — seriously hamper television's opportunities to provide the kind of audio quality routinely available to today's consumers. Good sound overwhelms small pictures.

This is a hard pill to swallow. It certainly was for me back in 1981. But there's an overwhelming body of evidence to support the contention. Take it from someone who's heard the complaints — feature film audio is the worst because it's the best. It's replete with subtle underscoring intended for big room playback, which, until the living room audience acclimates, is too often grating in the context of a 24-inch panorama. And big film sounds, such as an airplane exploding against a mountainside, are wholly disconcerting when the airplane is 4 inches wide on the screen, while the speakers producing the sound of its demise are 24.

But most troubling of all is that when subscribers become routinely exposed to high-quality sound, probably first from their off-air ATV signals, then we'll be hearing how "the regular (cable) TV sound stinks now." **CT**

Sound audio

(Continued from page 32)

references are as follows: 1 mW across 50, 75 or 600 ohms; 1 mV; and 1 V. The term dBm signifies dB with a zero level of 1 mW measured across a certain impedance (e.g., 600 W for audio measurements; 50 W or 75 W for RF measurements; and 75 W for video measurements). In fact, when using the term dBm, the impedance should be part of the subscript. Therefore, the exact term for audio would be dBm_{600} The term dBmV signifies dB with respect to 1 mV as a zero reference.

$dBm_{600} = 20 \log(E/0.775)$

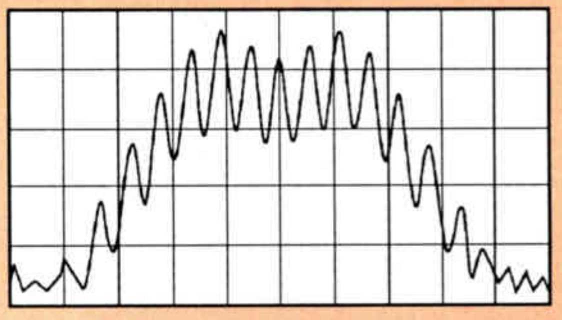
Relative loudness

Loudness is a hot topic these days. As you and your customers are aware, audio levels vary from channel to channel, from program to program and especially from program to commercial. Audio loudness changes are annoying.

As mentioned before, loudness relates to average program level (APL) rather than peak program level (PPL). Therefore, an LED meter (PPM) reading does not relate to loudness. How, then, can we measure loudness? For the answer to this question, please refer to the sidebar on page 69.

An audio automatic gain control (AGC) may be used to aid in the control of audio level variations. AGCs save time by reducing the necessity to readjust levels. AGCs adjust deviation by controlling the voltage level of the audio.

Figure 2: Incorrect Bessel Null



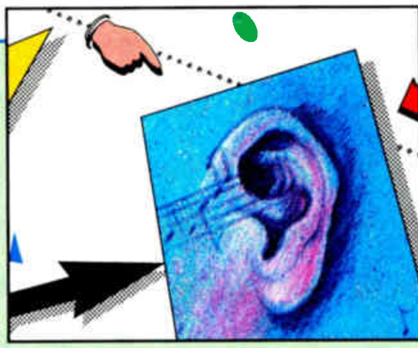
AGCs can be grouped into two major categories: multiband and single-band. As the names suggest, multiband units process individual bands separately (e.g., bass and treble) while single-band units process the entire frequency band (e.g., 20 Hz to 15 kHz) at one time. Multiband AGCs are used to increase the overall loudness of a signal. They do, however, alter the frequency response. To preserve the frequency response, a single-band AGC should be used.

Other aspects to consider with AGCs are attack and release times. The attack time should be quick, but not too quick. Too quick an attack time will react to short loud sounds such as a finger snap. Too slow an attack time, on the other hand, will allow over-modulation to be audibly clipped in the modulator. As for release times, too quick a release time will produce "breathing." That is, the background noise will go up and down. Too slow of a release time will not bring up the gain in a reasonable amount of time.

Frequency response

Audio frequency response is the capability of a device or system to pass or amplify equally all frequencies within a specified range. In the cable TV


AURORA ASM 100 Headend System
Good Things Come In Small Packages
So Small You Can Carry An 8-Channel System In The Palm Of Your Hands
The ASM 100, the world's smallest head-end, accommodates up to 16 modules in its 19" rack. The ASM 100 is a complete system for CATV, consisting of various modules (RECEIVERS, MODULATORS, HETERODYNE PROCESSORS etc.) plugging into a common base unit.
Aurora Communications, the recipients of Sweden's 1990 Manufacturer of the Year award, uses Surface Mount Assembly to enhance its outstanding reliability. The equipment has less than 1/4 of 1% failure rate with over 55,000 units in the field.
The flexibility and performance of the system is increased by its fully agile modules. The equipment is programmable for all standards; NTSC, PAL, MAC, and SECAM. Aurora's equipment has surpassed the World's most stringent CATV requirements, helping recognize Aurora as a world leader in headend design.
Imported by
DWR Cable TV Importers LTD.
Call Toll Free In US 1-800-667-0888
Unit #1, 1847 Duchess Avenue • West Vancouver, B.C. Canada V7V1R2 • (604) 926-0822 • FAX (604) 926-3299
See us at the SCTE Cable-Tec Expo, Booth 1406. Reader Service Number 43



ness monitor, an instrument that simultaneously displays the relationship between average and peak content in an audio waveform. Designed to provide a near real-time indication of perceived loudness, I found it also can be used to measure audio levels, whether test tones or program audio.

Dorrough manufactures several models of loudness monitors, but the one I have found to be useful for CATV is its Model 40-A. It features high impedance inputs and can handle either balanced or unbalanced sources. To use one for audio level measurements will require an initial calibration of the instrument to some known reference, but after that it can be used in a stand-alone configuration.

For best results, use the following procedure:

1) Connect a calibrated balanced 600-ohm audio source to the "L IN" terminal on the back of the loudness monitor. (For unbalanced audio operation, connect the monitor's "-" input terminal to the center chassis ground terminal.) Turn the "R" input gain control fully counterclockwise.

2) Set the audio signal generator to provide a 0 dBm, 1 kHz output.

3) Adjust the "L" input gain control until the front panel display reads 0 dB. (Note: a fixed test tone will cause the peak and average meter indication to be equal.)

4) The loudness monitor is now calibrated for measuring levels in the headend. Connect the source to be checked directly to the "L IN" terminal on the back of the monitor. (Don't bridge it in parallel with the source, since the calibration procedure was for a direct connection.)

5) The ideal way to set audio sources is so their peak levels do not exceed 0 dB on the front panel display. This way, if you have set modulator deviation to 25 kHz relative to a 0 dBm input, your peak deviation will not exceed 25 kHz on the loudest audio passages.

Unfortunately, after doing this, the apparent loudness will still probably vary from channel to channel (even though audio levels and deviation are correct). The proper solution to this problem is to use audio processing on each channel (audio automatic gain control or compressors/limiters) to obtain similar *loudness* on each channel.

If audio processing is not possible, the monitor also will allow you to set audio levels by perceived loudness. Even though the actual peak levels will then vary from channel to channel (as will the peak deviation), this procedure will do away with the loudness variations. The only place you should not use this second method is on BTSC channels; follow the stereo encoder manufacturer's instructions for setting levels and deviation.

mental frequency at the amp's output, then using a notch filter, filter the distorted output to remove the fundamental frequency. Using an RMS detector, measure this filtered output. This measurement divided by the fundamental frequency's amplitude will give you the THD ratio (plus noise). The noise may or may not be significant depending upon the relative levels of the noise and distortion.

Noise

When speaking of audio, noise may be defined as any undesired signal in the output, excluding distortion. The procedure for measuring a signal-to-noise ratio (S/N) is very similar to that used to measure THD %.

Choose an arbitrary 100 percent level for the test tone as previously done. Connect the oscillator to the device's input and apply the test tone. Remove the input from the device being measured. Using an RMS detector, measure the resulting signal. Take the ratio of the original test tone level (at the output) to this measured level and convert to dB. This will result in the signal plus noise-to-noise ratio of the device in dB. →

Phase

Absolute phase usually is not important to the human ear. However, in a multichannel system, relative phase is important because out-of-phase signals will lead to unintentional cancellations and summations. This will result in unnatural stereo imaging and frequency response. Therefore, care should be taken to preserve phase relationships.

An ordinary oscilloscope in the x-y mode can be used to monitor the phase of an audio signal. To observe a monaural signal, apply the L+R signal to both the x and y inputs of the scope. To observe a stereo signal, apply the L signal to the x input and the R signal to the y input. A monaural signal will produce a diagonal line. A stereo signal will produce a constantly changing pattern that resembles an oval ball of string (a Lissajous figure). With correctly phased audio, the scope will display the figure from southwest to northeast. An out-of-phase signal will produce a figure from southeast to northwest.

Separation

Separation is the ability to transmit information on one channel (in a multichannel system) without that information appearing in the other channel. Separation is expressed in dB.

Studies have determined that humans have a hard time discerning separation above about 15 dB in typical stereo material. As the signal travels from the headend, through the set-top converter, to the customer, the separation may be degraded. Although the goal of a cable system should be to deliver at least 15 dB of separation to its customers, as much separation as practical should be provided from the headend.

When performing separation measurements, care must be taken to choose a decoding device (e.g., FM tuner or BTSC decoder) that has significantly better separation than the device being measured. Using an oscillator, apply a reference tone at 100 percent to both the left and right channels. Record the level. Remove the tone from one channel. Read the residual output from that same channel. The difference (in dB) corresponds to the separation. Since left and right channel separation are not always equal, both channels should be measured.

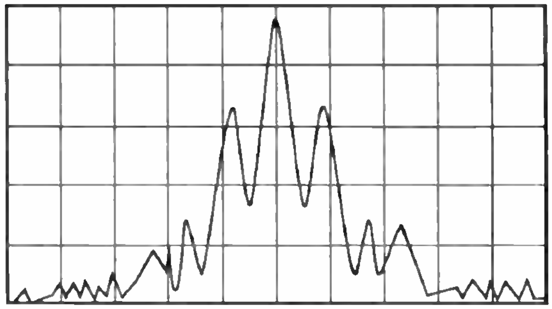
BTSC stereo audio

BTSC (stereo TV audio) was introduced five years ago. Since then, consumers have become much more aware of audio and expect better quality audio from their cable system. Therefore, obtaining and maintaining BTSC stereo audio is important.

Surround sound also is an important issue to consider; it is gaining in popularity. Sales of surround sound decoders have steadily increased. According to Dolby Laboratories, over the past few years any movie soundtrack mixed for Dolby stereo has Dolby Surround. As of April 1991, HBO began producing its original programming with surround sound. Whenever a cable system encodes a signal into BTSC stereo, any surround sound that is present will be passed on to its subscribers.

When evaluating the BTSC stereo signal, the audio characteristics discussed before can be measured. Decoding a BTSC signal for measurement is an expensive process. However, most BTSC manufacturers include these measurements in their specifications. Several in-depth evaluations have been performed at MSO corporate headquarters. The characteristics

Figure 3: Main audio carrier with pilot carrier sidebands



that should be considered when evaluating BTSC and that most directly affect the quality of the sound are THD, frequency response, separation and S/N ratio.

A primary concern in maintaining a BTSC stereo signal is to provide optimum stereo separation. As such, a proper deviation setting is critical. If the 4.5 MHz BTSC signal is interfaced with the TV modulator, the deviation has been preset by the BTSC manufacturer. If, however, the BTSC composite baseband signal is used, the TV modulator's aural carrier deviation must be adjusted.

A 10.396 kHz tone and a spectrum analyzer can be used to perform a Bessel Null to accurately set the deviation. As alternate methods, you may use either the meter or the peak modulation (+25 kHz) light on the TV modulator. To use the Bessel Null method, apply a 10.396 kHz tone (preferably built into the BTSC stereo generator). An external tone may be used, but level matching may be a difficult process as no standard exists for the 100 percent level in the dbx section. Using a spectrum analyzer, look at the audio carrier from the TV modulator (20 kHz to 50 kHz resolution per division is suggested). Using the front panel deviation control on the TV modulator, null the carrier (see Figures 1-3).

If the deviation is properly adjusted, the two sidebands should be 16 dB down from the carrier. If you are unable to null the carrier, or if the audio is scratchy with a lot of sibilance, chances are that the audio module in the TV modulator is either not set up for the stereo mode or is not BTSC-compatible. To pass a BTSC stereo signal at baseband, the TV modulator's pre-emphasis and any audio limiting, if present, must be removed and the modulator must have a wide audio bandwidth (approximately 100 kHz).

Please note that the TV modulator was originally designed for monaural audio with ±25 kHz deviation. Stereo, however, deviates as much as ±50 kHz. Therefore, the TV modulator's over-deviation light will (and should) flash during stereo programming.

BTSC stereo with SAP

In some cases, a second audio program (SAP) carrier may accompany the BTSC stereo signal. A few programmers, such as HBO and Cinemax, provide Spanish dubbing for some of their movies. Alternatively, the SAP channel may be used as a barker channel for pay services or to provide FM services (in mono). C-SPAN recently introduced a new SAP audio program that provides a 24-hour-a-day schedule of upcoming events for C-SPAN I and II.

Once a SAP channel has been installed, no routine maintenance is required. When installing the unit, it is important to first set the audio carrier deviation on the TV audio modulator, with the SAP carrier off (if composite stereo baseband, rather than 4.5 MHz, is being run from the BTSC stereo generator to the TV modulator). The SAP carrier level must be set at the SAP generator.

The correct SAP carrier level deviates the 4.5 MHz audio carrier ±15 kHz. Using a spectrum analyzer, view the main audio carrier. The SAP carrier sidebands should appear adjacent to (78.670 kHz above and below) the main audio carrier, each 20 dB below the main carrier.

Conclusion

It is important for headends to have "sound" audio. The days when audio was just something that went along for the ride with video are gone. Audio is an important entity on its own.

As we have seen, measuring and maintaining audio is not a difficult process, and some pieces of equipment can make this job easier. So, does your headend have sound audio? **CT**

References

1) National Association of Broadcasters, *Engineering Handbook*, Seventh Edition, 1985.
2) Rauch, Keith, technical guidance.

WHY CLONE AROUND. CHECK WHAT YOU GET FROM HUGHES FOR THE SAME PRICE.

	HUGHES	The Clone
Widest range of equipment and prices	✔	
Free proposals and applications engineering	✔	✔
Comprehensive hands-on training seminars	✔	
Maintenance manuals and schematics	✔	
Field upgradable equipment	✔	
Spare parts availability	✔	
Full systems warranty	✔	✔
24-hour service hotline	✔	✔
Customer serviceable equipment	✔	
Field service and sales personnel throughout US	✔	
Widest range of applications and performance	✔	
World leader in CATV systems for 24 years	✔	
Complete 3-hub system for $95,000	✔	✔

For about $95,000 you can buy a complete 3-hub microwave system from Hughes Aircraft Company... or you can buy a substitute without all the extras listed above.

With Hughes, you get to choose exactly the right system for your particular needs and budgets. And, when you select Hughes, the world leader in AML systems for over 20 years, you know you'll always have a source you can depend on.

So, if you'd like to get more than just a low price, call Hughes Aircraft Company, Microwave Communications Products: (800) 227-7359, ext. 6233. In California, call (213) 517-6233. In Canada, call COMLINK Systems Inc., Oshawa, Ontario, (416) 436-8888.

Hughes AML is more than hardware.

HUGHES

See us at the SCTE Cable-Tec Expo, Booth 1003, 1005.

Reader Service Number 54

Superaudio

(Continued from page 34)

electronics to keep it operating smoothly.

The studios and the automated formats are transported to the satellite subcarrier modulators located at Jones' building by either direct hardwire connections or by the landlines. The audio formats are then modulated to a narrowband FM signal and inserted above the video of The Mind Extension University, using the Wegener satellite subcarrier system. From the Jones building, the video and audio subcarriers are sent by a microwave frequency modulated link (FML) to Denver Uplink Teleport located behind Mount Glennon, a small foothill near Morrison, Colo. To get the microwave signal over Mount Glennon to the teleport, a passive repeater consisting of two 10-foot microwave antennas installed back-to-back is used. At the uplink the signal is received and transmitted to the satellite. The transportation electronics are fully redundant, including the electrical systems, satellite subcarrier modulators, microwave systems, satellite exciters and high-power amplifiers, giving the network the highest degree of reliability practical.

Mono formats

The three monaural formats (from New York, Colorado Springs, Colo., and Minneapolis) are backhauled by satellite to St. Petersburg, Fla., using either single-carrier-per-channel (SCPC) or discrete subcarrier technology. After being received, they are uplinked by Home Shopping Network's (HSN) teleport in St. Petersburg to Galaxy III. HSN has a state-of-the-art redundancy system, including several AC generators, uninterruptible power supplies, several exciters, high-power amplifiers and other uplinking electronics.

The Superaudio formats on Galaxy III

Transponder 11 stereo formats	Frequency of left/right channel (MHz)
America's Country Favorites	5.04/7.74
Classical Collection	6.30/6.48
Classic Hits	8.10/8.28
Light-N-Lively Rock	5.94/6.12
New Age Of Jazz	7.38/7.56
Soft Sounds	5.58/5.76

Transponder 8 mono formats	Frequency (MHz)
In-Touch	7.875
Business Radio Network	8.055
Minnesota Public Radio	8.235

At the cable system

At the cable system headend the satellite earth station receives the two composite video and subcarrier signals from the two Galaxy III transponders. The satellite receiver demodulates the composite satellite signals to a baseband video signal ranging from DC to 10 MHz. The output of the unfiltered video (from the satellite receiver containing the the Superaudio subcarriers) loops-through the subcarrier demodulator for each of the formats. The audio signal from the subcarrier demodulator unit is then put through an FM modulator and injected on a clear channel space in the cable system's FM band (88 MHz to 108 MHz).

Because the selectivity of some subscribers' FM receivers is not narrow enough to discriminate between adjacent FM stations spaced as close as 200 kHz, it is recommended that the individual formats not be spaced closer than 400 kHz to each other. Technicians especially should avoid placing any Superaudio format closer than 400 kHz to a strong off-air FM station that can interfere with the signal. (An FM survey should be done first by tuning through the FM band on the cable system and noting any clear channel spaces that may be used. To help with this task, Superaudio can provide a printout showing all the off-air FM stations/translators frequencies, call signs and a graphic representation of their signal strength for a radius of 70 miles from the headend.)

On to the sub

Finally, the Superaudio FM signal is distributed through the cable plant to the subscribers' homes where they can hook their FM receivers to the cable system to receive it. A word of caution here: It may be prudent to offer subscribers a quality FM hookup kit to eliminate signal leakage worries from poorly shielded FM receivers. **CT**

How our *national* commitment to cable solves your *local* supply needs

Take a look at Power & Tel's *national* commitment to the cable TV industry: a multi-million dollar inventory, dispersed into convenient regional warehouses; reliable restocking and customer delivery via a company-owned trucking fleet; the purchasing clout that only national distributors have when dealing with major suppliers.

Then take a look at our *local* commitment to customized problem solving for cable TV systems: local sales offices staffed by local salespeople who are attuned to local system needs; big-buy price advantages passed along to local customers; personalized attention from a sales rep who is, literally, your neighbor.

You needn't sacrifice the advantage of a big-distributor connection for the convenience of local distributor attention. Enjoy both — select Power and Telephone Supply as a committed partner in your cable system's future.

DO YOU KNOW YOUR LOCAL POWER & TEL REP?

CALL 1-800-238-7514

AND WE'LL GET YOU INTRODUCED!

Power & Telephone Supply Company

2701 Union Extended, Suite 300
Memphis, TN 38112-4417
901/324-6116 FAX 901/320-3082

See us at the SCTE Cable-Tec Expo, Booth 511, 513. Reader Service Number 57

Safety program

(Continued from page 36)

Standards and Training Guidelines

- *O.M.B. #1220-0029 — Record Keeping Guidelines for Occupational Injuries and Illness*
- *OSHA 2209 — OSHA Handbook for Small Businesses*
- *OSHA Form 200 — Log and Summary of Occupational Injuries and Illness*
- *OSHA Form 101 — Supplemental Record of Occupational Injuries and Illness*
- OSHA notice/poster (informs employees of the obligations and protections provided for by the OSHA Act). It must be posted on the employees' bulletin board at each establishment.

2) Establish the Hazardous Materials Communications (HAZCOM) Program as required by CFR 29, Part 1910.1200. This includes the following:

- Establish the "written program," which — at the least — describes how the criteria for warning labels, material safety data sheets (MSDS), and employee information and training is conducted or provided.
- Establish and maintain the MSDS file for *all* hazardous agents that the employees may encounter in their jobs.
- Obtain and use the hazardous material warning labels on all substances that could cause harm to employees.
- Establish an ongoing training program for all employees who may come in contact with any hazardous materials. This requires such training be given to new hires before they use any item containing such materials, training when new materials are introduced into the workplace, as well as periodic refresher training. Record keeping requires the use of a training file or folder to show the training that each employee has received and when it was given.

If you have some doubts as to what materials may need to be included in your MSDS file, it is a safe bet to include anything that has a warning label on it.

3) Conduct safety training in all areas of the workplace with all of your employees. Be sure to record this training on the employees' training records or folders. Training should include driver's training (for employees who drive company vehicles and all other licensed drivers), personal health (bending and lifting, posture, eyesight, etc.), technical area safety (pole and ladder climbing, protective clothing, electrical hazards, power and hand tools, insect bites, etc.), vehicle safety (vehicle inspection, first-aid kits, fire extinguishers, etc.), warehouse safety (storage facilities, hand trucks, fork lifts, etc.), fire safety (alarm systems, extinguishers and their use, halon systems, fire hose systems, fire drills, smoke and heat detectors, etc.), specific training (first aid, CPR, etc.), workplace safety (identification of hazards, keeping areas hazard-free, and reporting of hazardous conditions), and safety in the home environment.

Other safety sources

The previous listings are not all-inclusive as there are other areas and topics that you may consider for your program. As a general rule of thumb, provide training whenever or wherever a safety condition or problem may exist. Although this appears to be a monumental task, all of this training is meant to be spaced out over time. Most of the topics mentioned can be presented on a weekly or monthly basis by work section, with the training conducted by the section safety trainers.

"Good safety programs do more than keep us out of trouble and avoid fines. They lower the number of accidents in both the workplace and the home."

There are many sources of material and information available for use in accomplishing the goals of your safety program. Training in first aid and CPR may be obtained through local chapters of the American Red Cross, the National Safety Council or your fire department. Driver's safety programs can usually be obtained through the local chapter of the NSC or your local law enforcement organization. Fire safety can be obtained through your local fire department.

Another important source of materials and training may be your insurance company. It is usually more than willing to help in any way that it can. You can even receive help from OSHA by requesting a courtesy inspection from your local or area OSHA compliance inspector for telecommunications. OSHA will make a complete inspection of your facilities, programs and files, and give you a report of their findings noting those areas you need to correct or improve without an adverse effect to you or your system in any way.

Finally, keep the Society of Cable Television Engineers in mind as an excellent source for safety materials and information. Our local chapters and meeting groups frequently provided seminars on safety topics and we will be publishing a comprehensive safety training manual that will cover all aspects of cable system operations later this year. **CT**

OSHA visit

(Continued from page 39)

and ask to see the system manager. If the system manager is not in, he will ask to speak with the person who is in charge in his absence.

2) He will show his Department of Labor identification and introduce himself.

3) He will conduct an opening conference where he will explain the purpose of the visit and discuss the complaint.

4) He may ask for your records like Form 200, training files pertinent to the complaint, a copy of your written program complying with the Hazard Communication Standard, etc. They should be readily accessible.

5) He may want to visit the site of the accident or area specified in the complaint. You may accompany him on this inspection tour and you may select an employee to accompany him also.

6) He may speak with any employee relative to the details of the complaint. He also may question them about training and safety practices. He may take an employee aside and speak with him privately if he so desires.

7) He may take pictures, make notes or use sampling equipment as he goes through your facility or visits the worksite.

8) At the end of the site visit, he will conduct a closing conference with the system manager where he will discuss his findings. He will identify "possible" violations of OSHA standards and may make recommendations as to how they may be corrected. He will not issue citations or levy fines at this point.

9) The OSHA compliance officer will return to his office where he and his superiors will determine if citations will be issued and fines levied.

10) Any citations will be forwarded to you via registered mail. Fines, if any, will be revealed at that time. Also, a time limit will be established for correction of the problem.

11) Finally, you will be required to post the citation at or near the location of the violation for a period of three working days or until the problem is fixed, whichever is longer.

If the compliance officer that visits you does not follow the steps outlined above, you should contact your regional OSHA office immediately. Remember, a legitimate OSHA compliance officer will never cite you or fine you on the spot. Never give an OSHA compliance officer any money directly. If you have any suspicion about the validity of the compliance officer, call the nearest regional OSHA office for verification.

Fines

Yes, fines! OSHA is empowered under the act to levy fines for the following violation categories:

- *Other than serious violation.* This is a violation that has a direct relationship to job safety and health, but probably would not cause death or serious physical harm. Penalties range from $60 to $7,000 for each occurrence.
- *Serious violation.* This is a violation where there is a substantial probability that death or serious physical harm could result and that the employer knew, or should have known, of the hazard. A mandatory penalty of up to $7,000 for each violation is proposed.
- *Willful violation.* This is a violation that the cable operator intentionally and

knowingly commits. The cable operator either knew that what he was doing constituted a violation or was aware that a hazardous condition existed and made no reasonable effort to eliminate it. Penalties range up to $70,000 for each violation. If the operator is convicted of a willful violation that has resulted in the death of an employee, he also may face a six-month jail term in addition to the fine.

There are additional penalties for failure to correct a violation ($7,000 per day), falsifying records ($10,000), failure to post the OSHA poster in the workplace ($1,000) and interfering with a compliance officer ($5,000).

There is an appeals process that cable operators may utilize if they feel that citations were unfair or unwarranted. The cable operator has 15 working days from the time the citation and proposed penalty are received in which to notify the OSHA area director in writing.

Compliance

OSHA is very serious about compliance with its standards. Although cable TV is not generally thought of as a high risk, high accident industry, we are not exempt from inspections. In fact, it is important to note that although the compliance officer is in your system due to a specific complaint, he may cite you for any violation he finds while on your premises, including those observed while walking through your office. It is in your best interest to be prepared for an OSHA compliance officer to knock on your door on any given day.

The following are six simple steps to compliance, which are given as a general outline to help get you started:

1) Provide your employees a place of employment that is free from recognized hazards that are causing or are likely to cause death or serious physical harm.

2) Know, understand and comply with OSHA standards as they apply to your system.

3) Inform your employees about OSHA. Place the OSHA poster (OSHA #2203) in a location where employees gather.

4) Keep accurate records. OSHA Forms 200 and 101 are a must.

5) Train your employees in the safe operation of equipment. Use qualified trainers and keep accurate training records.

6) Cooperate with OSHA compliance officers when they visit.

It is important that you understand as a cable operator that OSHA compliance is not optional, but mandatory. Those who take OSHA seriously and make every effort to comply will most likely fare well during an OSHA inspection. Those who are lax in the area of safety, believing that OSHA is not concerned with them, will be the ones who will face the greatest amount of pain when the compliance officer comes calling. On the issue of OSHA compliance, the adage, "better safe than sorry," applies. **CT**

Recommended references, materials

1) *Code of Federal Regulations CFR 29*, Part 1900-1910, Part 1910 to end and Part 1926.
2) *Training Requirements in OSHA Standards and Training Guidelines*, OSHA 2254 (Revised).
3) *Recordkeeping Guidelines for Occupational Injuries and Illness*, O.M.B. No. 1220-0029.
4) *OSHA Handbook for Small Businesses*, OSHA 2209.
5) OSHA Act.
6) Form 200, OSHA #200.
7) Form 101, OSHA #101.

For safety's sake

(Continued from page 40)

the concentration on the CFR, Title 29, Telecommunications Section 1910.268, which applies to cable TV companies. Training must consist of on-the-job or classroom instruction. The subjects must be in written form and training records must be maintained and available for the duration of employment. The following is a list of the Title 29 training requirements.

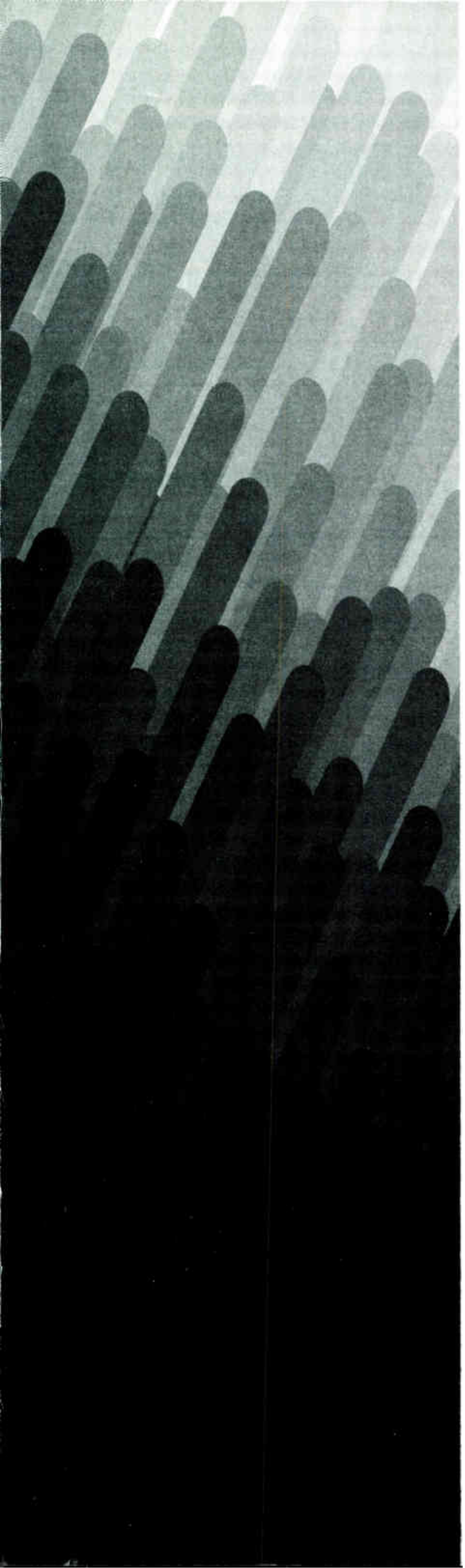
- Climbers (safety inspection). ATC recommends climbing skill certification.
- Ladders (safety inspection). ATC recommends ladder handling skill certification.
- Recognition, dangers and avoidance of animals, insects, plants and dangerous substances.
- First-aid (CPR).
- Emergency procedures.
- Vehicle brakes (start of each day or shift).
- Safety working around high voltages (see CFR for more details).
- First-aid trained personnel working in manholes.
- Personnel lifts shall be inspected within a 30-day interval.
- All hazardous material training according to the Hazard Communication Program.

These mandatory training subjects are only a start. A good source of training material is from OSHA or Business and Legal Reports, which publishes a manual called *Safety Meetings.* This manual contains numerous materials for successful training sessions.

Keeping records

All occupational illnesses must be recorded regardless of severity. An injury must be recorded if it results in death, one or more lost work days, restriction of work or motion, a job transfer or requires medical treatment. If an employee's death results from a job-related incident or five or more employees are hospitalized from a single accident, OSHA must be notified within 48 hours.

A recordable injury or illness must be recorded on Form 200 (or readable substitute) within six days of employer's knowledge. As well, Form 101, a detailed report of Form 200, must be completed within the same time frame. Insurance and workers comp forms can be substituted if the correct information is contained. **CT**



CATV power supplies

(Continued from page 43)

developed over the years for cable TV powering. Some utilize a ferroresonant transformer for AC operation and then switch the power supply output to a linear inverter transformer when in standby mode. Other designs have employed various inverter topologies using different DC voltages. It is imperative that system operators select the power supply equipment that is reliable and suits their specific requirements for plant powering. Like most active equipment in a cable plant, power supplies require preventive maintenance and periodic service over time.

Causes of problems in power supplies

Most cable systems have implemented outage reduction programs that place emphasis on equipment reliability, maintenance, quick repair or replacement, and protection of equipment from damage.

The reliability of power supply equipment is affected by several factors:

- *Lightning strikes affecting AC input or 60-volt AC output:* The ferroresonant transformer is the most effective and widely used design for protection from transient events; however, other devices are used in conjunction with the transformer to protect the active devices connected to the power supply output and to protect circuitry in the power supply as well.

It is a common practice to install MOVs (metal oxide varistors) as transient protection devices on the 120-volt input and 60-volt output. MOVs, which have limited response time and energy

Figure 3: Square wave ferroresonant transformer schematic diagram

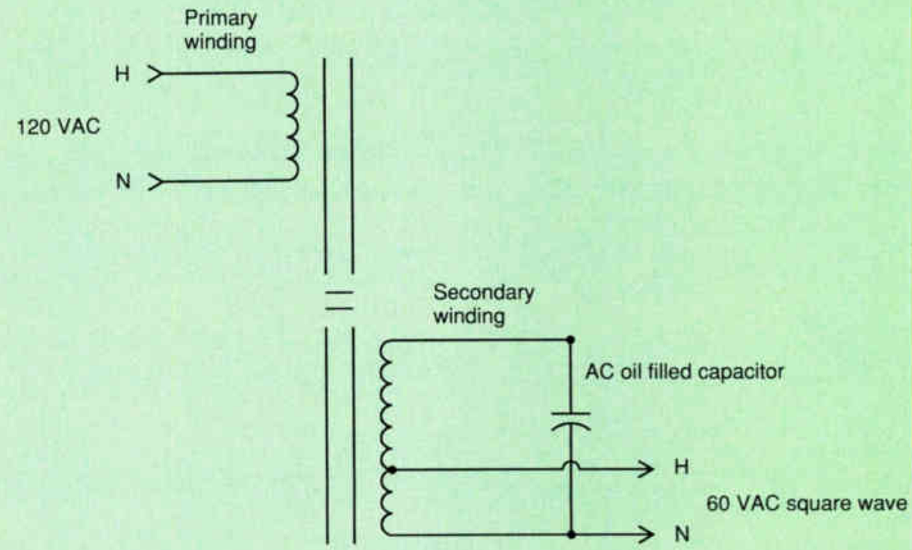
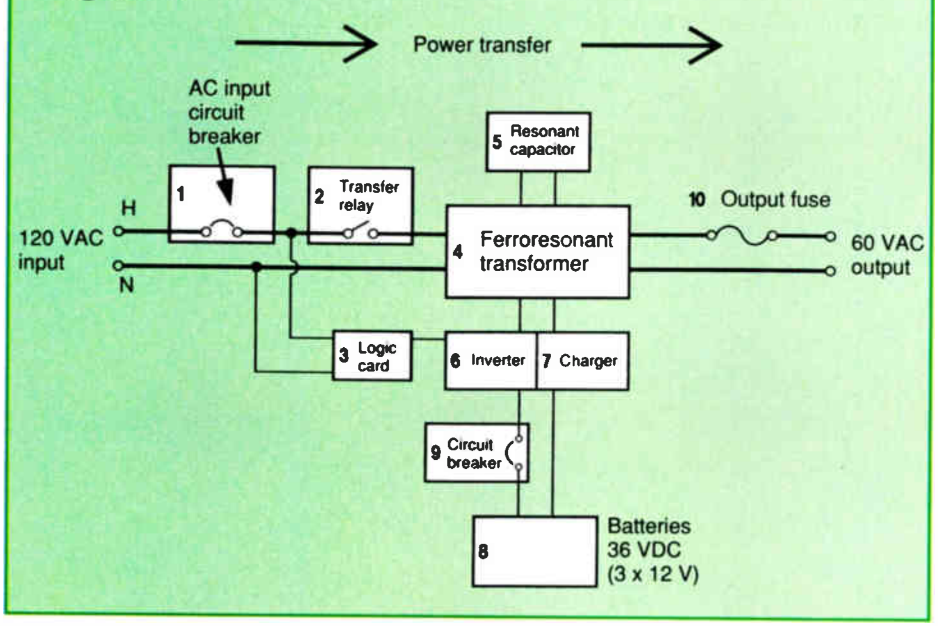


Figure 4



dissipation capability, are considered a routine maintenance item because they will deteriorate over time if subjected to frequent transient events.

Avalanche diodes are used on the 60-volt output in some designs. They respond quickly, but as with MOVs, they have limited energy dissipation capability.

Crowbar-type transient protectors are utilized on the 60-volt output of ferroresonant-based power supplies only. They have the advantages of fast response and high energy absorption capability because they trigger and provide a low impedance path to ground for surge currents as opposed to "clipping" the peak of a transient like MOVs or avalanche diodes, etc. When triggered, the crowbar is essentially a dead short from the center conductor to the sheath. Harmful surge currents and the 60-volt power supply output are short-circuited for a maximum of half cycle of the 60-cycle square wave (8 ms). This is why the crowbar devices work best with ferroresonant transformer power supplies. The transformer can tolerate momentary shorting of the output without sustaining damage or causing an outage.

• *Longitudinal sheath currents:* In many cable plants the grounding system has been installed more recently and is a more effective (low impedance) ground return than the utility company ground/neutral network. Consequently, utility switching operations or lightning strikes can cause utility return current to flow through the CATV coax sheath and ground network — thus the term "longitudinal sheath currents." When sheath currents flow through a section of conductor with a given resistance, then a voltage is present that can cause damage to surge protection devices as well as to amplifiers and other active or passive devices. Power supplies are usually not damaged, but the surge protection devices installed in the secondary circuit within the power supply enclosure may need repair or, most likely, replacement.

• *Premature electrical component failure:* Most professionally designed electrical equipment is engineered with no more than 80 percent electrical, thermal and mechanical stress applied to a given component under worst-case conditions. There is a small percentage of components that fail prematurely due to manufacturing defects. Capacitors and semiconductor devices exhibit this more often than other electrical components, such as resistors, etc. Thermal extremes tend to accelerate failures of marginal components. Most power supply manufacturers "burn in" their equipment for at least 12 hours and then retest prior to shipment. This practice usually weeds out all but a very small percentage of marginal components.

• *Temperature stress:* High temperatures can affect the reliability and operating lifetime of power supply equipment. Many power supplies utilize convection cooling of heat producing components or utilize fans to force air through the unit.

It is obviously important to ensure that cooling slots are not obstructed or that the fan is not damaged by dust and grit in the bearings. If a cooling fan stops operating, a thermal cutout is typically used to disconnect incoming AC power to the equipment. This will probably protect the power supply from damage but will result in an outage to the cable plant.

Several components are sensitive to over-temperature operation: the oil filled resonant capacitor is typically rated for 85° C. Well-designed ferroresonant transformers are manufactured with an Underwriters Laboratories recognized, Class H, 180° C insulation system. To ensure long life and reliable operation, the worst-case temperature rise for all critical components must be well under their temperature limits. Extreme low temperatures will affect battery discharge capacity, reducing standby time.

• *User neglect/lack of maintenance:* As with most electrical equipment, it is very important to understand the intended application and operating parameters of power supply equipment. It is equally important for power supply manufacturers to design equipment that is rugged, reliable and foolproof in the field. A good analogy is the automobile engine. Without proper maintenance of oil and coolant systems, lubrication and periodic tune-ups, an automobile engine will not provide optimum performance and long service life. If the engine is mistreated and the manufacturer's recommendations are not followed correctly, then the user has effectively reduced the performance and service life.

Preventive maintenance

It is important to be aware of potential causes of malfunction in order to anticipate and head off problems before they result in a service outage. Each system engineer should establish a preventive maintenance schedule for both non-standby and standby power supplies.

Standby power supplies require more maintenance effort for two reasons. First, they have more active components to provide the inverter and battery charger functions. Second, they require batteries for standby operation.

A battery is an electrochemical device whose service life can be reduced by the following factors:

1) Incorrect type of battery for use in "float service" application. For example,

car batteries (lead acid/liquid electrolyte).
2) Overcharge.
3) Undercharge.
4) Miscalibrated battery charger. (Incorrect charge voltage setting.)
5) Charge voltage not adjusted or "compensated" for changes in battery temperature.
6) Over-discharge. Most 12 volt batteries should be disconnected from the inverter when they discharge to 10.5 VDC per battery under load. Discharge past this point can cause permanent loss of capacity.
7) Operation in extreme over- or under-temperature condition for prolonged periods of time.
8) Extended storage time without charging. Batteries must be charged at least every six months and preferably every three months while in storage in the warehouse prior to installation in the power supply.
9) Reverse polarity installation.
10) In series string connections, operation with batteries that have different voltages (greater than 0.5 VDC difference between adjacent battery voltages).

There are several different ways to implement a preventive maintenance system. The goal, of course, is to ensure that each standby supply is ready to give you what you paid for when you need it most.

"One of the most effective standby power supply designs consists of a single ferroresonant transformer ... and the additional components that provide battery backup capability."

Some systems use a log to track the installation date, battery voltages under load, output current, output voltage, battery charger calibration, and a check off for secure connections, tight battery cables and connections free of corrosion. Each power supply has its own ID number and its own log that is updated with each visit to the power supply every three to six months. A way to further automate this task is to use a hand-held data logger or a laptop computer in the truck to enter the preventive maintenance data in a consistent data base or spreadsheet format. This provides data that can be easily manipulated, presented in graph format, etc., on a personal computer.

The preventive maintenance system will pay for itself by ensuring that the standby capability is always ready when needed and that potential problems are corrected prior to causing damage to power supply components and/or the active and passive devices that are connected to the power supply output.

Troubleshooting power supplies

If a power supply does fail, there are several things to determine prior to taking action:

- Is the failure actually causing an outage or is it a failure of a secondary function, such as a pilot lamp or ammeter?
- Can the repair be made in the field, such as a battery or fuse replacement? Or does the unit need to be temporarily replaced while it is serviced in the repair shop or returned to the factory?
- Can the unit be replaced without

interrupting the flow of power to the plant?

• Is the failure caused by a temporary condition, such as blown or malfunctioning circuit breakers or fuses? Is there a temporary short circuit caused by a pinched cable or surge protection device (gas tube protector, etc.)?

The point of answering these questions is to decide how to proceed with correcting the problem in the most expedient manner and to minimize system down time and expense to the cable company.

Most power supplies are modular in their design, which facilitates removal of sub-assemblies or modules for quick replacement. This allows the failed component to be taken to the shop for repair where the proper tools and equipment are available. Obviously, it is not a good idea to hang on a pole in the middle of the night in the pouring rain with an oscilloscope, logic probe and soldering iron trying to repair the power supply!

Some power supplies have an auxiliary input to allow connection of a "service supply" so that, with the flip of a switch, the malfunctioning power supply is disconnected and the service supply picks up the load while the technician performs the repair. Other designs may unplug a module for replacement.

Service technicians should be trained in the operation and repair of the particular equipment that is used and should be equipped with the technical or service and repair manuals for each unit. One suggestion is to assemble a power supply repair "kit" for each truck. This could consist of a plastic tool box with the following items:

1) True RMS digital voltmeter with "clip-on" lead set
2) Instruction/repair manuals
3) Replacement fuses in bags labeled with amp rating
4) Replacement pilot lamps
5) Replacement MOVs or avalanche diodes
6) Battery load tester
7) Battery cable kit
8) Replacement input AC circuit breaker
9) Small flashlight to see in tight places
10) Alligator clip jumper wires (12 awg)
11) Wire brush for battery terminals
12) Miscellaneous tools such as screwdriver, pliers, etc.
13) Safety goggles and gloves for battery maintenance

Most of us pride ourselves on being able to assemble and operate equipment without so much as a glance at the instruction manual. However, it usually comes back to get you when you are under pressure to fix a problem and you cannot seem to get the unit to operate as you think it may have done in the past. (Or was that the older model?)

The idea is to become well-acquainted with the operation and "quirks" of the particular power supply so you can correctly maintain and quickly fix problems as they occur.

Troubleshooting is really a logical thought process that follows one end of a circuit to the other to verify that each sub-assembly or function is connected to the next and is providing the expected output signal. You can start at the input and work your way to the output or work in the reverse order. For power supply troubleshooting you must have a voltmeter. A worthwhile investment is the true RMS digital type. Some of the bells and whistles can really come in handy, such as backlighting for reading the LCD at night, a capacitance test function, continuity beeper and clamp-

Converter repair

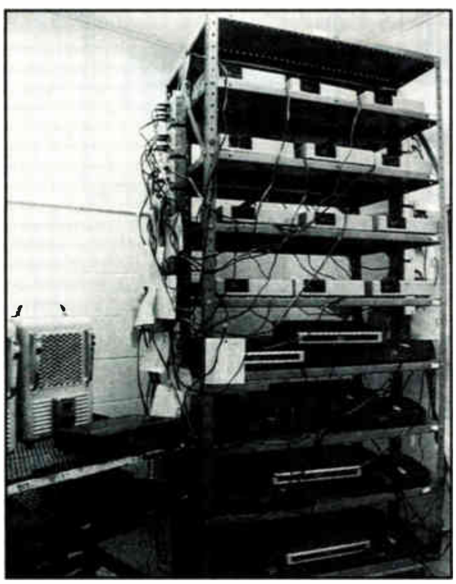
(Continued from page 44)

4) Converters are disassembled and any remaining paperwork filled out. From here they go to a repair staging area.

5) Before actual repair, all converters are placed on a pre-heat cart, where they have a chance to warm up for two to six hours before being looked at.

6) Repair, then back to the pre-heat cart.

7) Still at operating temperature, the repaired converters undergo full alignment and timing adjustments.



8) After alignment, all units spend a minimum of four hours at 105°F in the "burn room" while still plugged in and operating.

9) Following a 30-minute cool-down, all converters go through a rigorous QC inspection.

10) Cleaning, cosmetic work and reassembly are the next step.

11) Final QA tests and any necessary last-minute cosmetic touchups are performed.

12) Repaired and tested converters are packaged for shipment and returned to the customer. At this point 10 percent of packaged cartons are randomly selected for additional QC checks of the repair process. This is in addition to the normally thorough QC and QA procedures already in place.

13) Billing information is recorded for final invoicing. CT

Only The FS74A Allows You To See The Picture, Hear The Audio, Plus Measure The Critical Levels, Ratios, Hum And Noise In Just Seconds . . .

How can you ensure your customers are receiving the absolute best signal? Sencore recommends the following 1, 2, 3 Go-No-Go testing!

1 Sencore's New FS74A Channelizer Sr. allows you to measure signals all the way from the headend to the subscriber's tap, automatically and without any interpretations. Simply connect the signal and digitally tune through the channels in your system. You'll quickly read the video and audio levels of each and every channel from 5 to 890 MHz.

2 With the FS74A, hum and S/N tests are simple and error free. Simply tune to any RF channel, switch the function selector to either HUM or S/N and read the meter. There is no faster or more accurate method. (patented)

3 Use the F574A Channelizer Sr. to actually view the video on the exclusive built-in monitor. The F574A passes a full 4 MHz of video so you will see the beat, ingress, or ghosting problems on the video monitor. You simply step through your system while viewing the monitor.

Reader Service Number 71

Call 1-800-SENCORE! (736-2673)

For FREE Information, A FREE Video Demonstration, Or A FREE Technical Brochure!

Few of the world's monuments withstand the test of time and the ravages of the elements like the pyramids. And no standby power system lasts longer than Alpha Technologies' equipped with Dynasty gel batteries. The pyramids were built with one thing in mind: endurance. Just like Alpha power supplies and Dynasty batteries.

Dynasty gel batteries outlive the competition in the harsh environments of cable television because they are designed to last. Unlike liquid-acid or absorbent glass mat technology. Dynasty batteries have real staying power over a wide temperature range. Although they can be stored longer prior to use, you can avoid costly battery warehousing by using Alpha's shipping service to put fresh batteries on your doorstep right when you are ready for them. Let's face it: a quality battery that lasts year after year costs less over time than a bargain battery that needs replacement every 18 months.

No battery lasts forever, but Dynasty gel batteries pass the test of time like no others. And that can make a monumental difference in the reliability of your cable system.

DYNASTY
JOHNSON CONTROLS

alpha
ALPHA TECHNOLOGIES

3767 Alpha Way, Bellingham, WA 98226-8302
TELEPHONE: (206) 647-2360 FAX: (206) 671-4936

5700 Sidley St., Burnaby, B.C. V5J 5E5
TELEPHONE: (604) 430-1476 FAX: (604) 430-8908

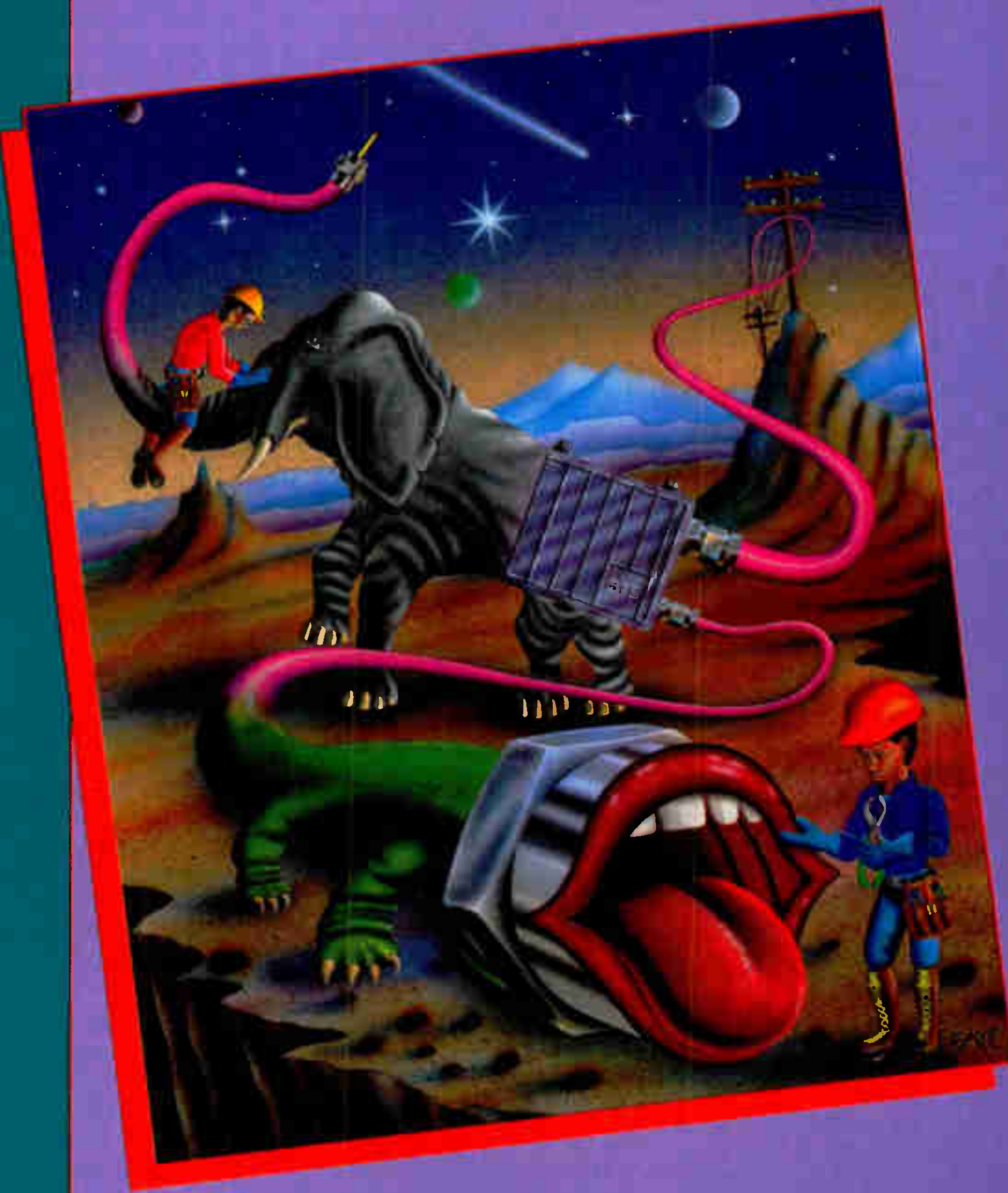
See us at the SCTE Cable-Tec Expo, Booth 903, 905. Reader Service Number 72

June 1991

Troubleshooting the trunk & feeder

BACK TO BASICS

The training and educational supplement to Communications Technology magazine.



Geri Saye

Table of Contents

Formerly Installer/Technician

Expansion loop considerations for coax in troublesome spans

Span lengths that are particularly long or subject to severe temperature changes may experience cable movement beyond the limits accommodated by conventional loop practices. This article discusses the various considerations of analyzing expansion loop needs when standard practices prove insufficient. Included are brief discussions of the factors affecting cable movement such as installation conditions, temperature change and cable construction. Several computer programs were created to calculate the impact of these factors and example tables of data are provided. Finally, precautionary measures are suggested for problem spans.

By Chris Story
Director, Research and Development
Comm/Scope Inc.

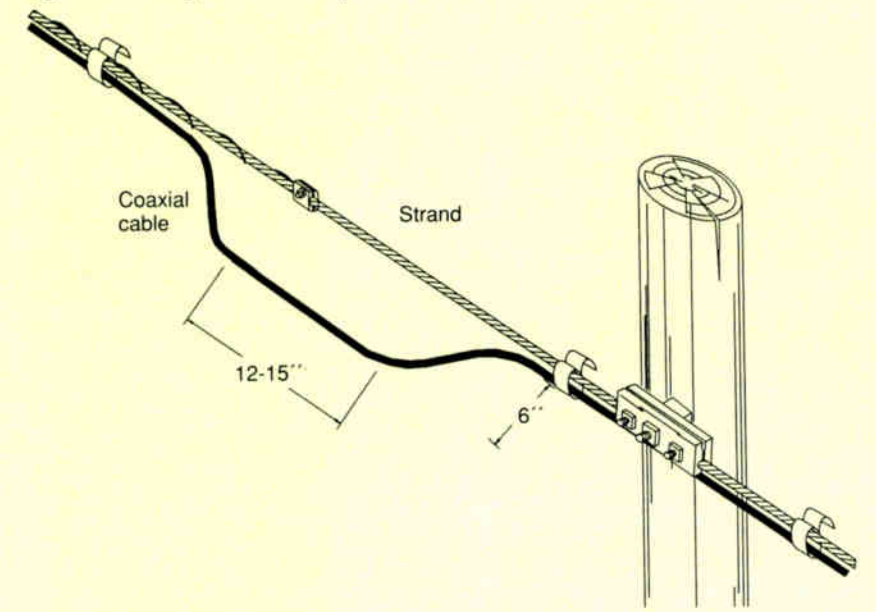
The difference in thermal expansion coefficients between coaxial cables and stranded steel messengers can result in movement of the cable relative to the strand as temperature changes occur in the outside plant. Standard recommendations for trunk cable are to place an expansion loop at each pole and at the input and output of all equipment. As temperatures drop, the expansion loop provides the additional cable length required to accommodate the faster shrinkage rate of the coax compared to the strand. As temperatures increase, the loop absorbs the increased length of coax.

Table 1: Thermal expansion coefficient for various cables and steel messenger

Cable type	Expansion coefficient (°C ^-1)	Expansion coefficient (°F ^-1)
GID 1/2" unjacketed	2.41 E-5	1.34 E-5
GID 1/2" jacketed	2.63 E-5	1.46 E-5
GID 3/4" unjacketed	2.42 E-5	1.34 E-5
GID 3/4" jacketed	2.59 E-5	1.44 E-5
GID 1" unjacketed	2.39 E-5	1.33 E-5
GID 1" jacketed	2.52 E-5	1.40 E-5
Steel messenger	1.21 E-5	0.67 E-5

The recommended design is a flat-bottom loop with a length of 12-15 inches and a depth of 6 inches (Figure 1), made using appropriate forming tools. The two most important considerations that have resulted in current expansion loop design are cable fatigue life and the amount of cable movement that must be accommodated for a particular span. The flat-bottom loop has been demonstrated to be superior in fatigue performance to round-bottom loops and, when using standard dimensions, can accommodate slightly over 2 inches of cable movement. Experience over the past 10-15 years has shown that this practice is suitable for the vast majority of cable plant. More details on loop forming and placement are available in various industry publications.[1, 2, 3]

Figure 1: Expansion loop with standard dimensions



Flat portion of loop is typically 12" for cables 0.75" in diameter and less, and 15" for cables 0.875" in diameter and greater.

In those circumstances where long spans and severe temperature swings are experienced, cable movement relative to the strand can be greater than the amount of excess cable provided by standard loops. The implications of an inadequate expansion loop are not easy to assess. Large stresses can quickly generate in the cable/strand system, creating some risk of damage to the cable and cable interfaces, such as broken lashing wire, core suckouts or damaged conductors. Although modern connector designs securely seize the conductors of the coax cables and withstand significant pulling forces, the safest practice is to provide adequate loops.

A short discussion of the considerations required to analyze troublesome spans where an excessive amount of cable movement has proven to be a problem follows. Failures in the first or second winter after installation can result, and in these cases a more in-depth analysis of the loop requirements may be required. Although the service temperature range for most coaxial trunk and distribution cable is -40 to 140°F, problems associated with low temperatures will be the primary focus here.

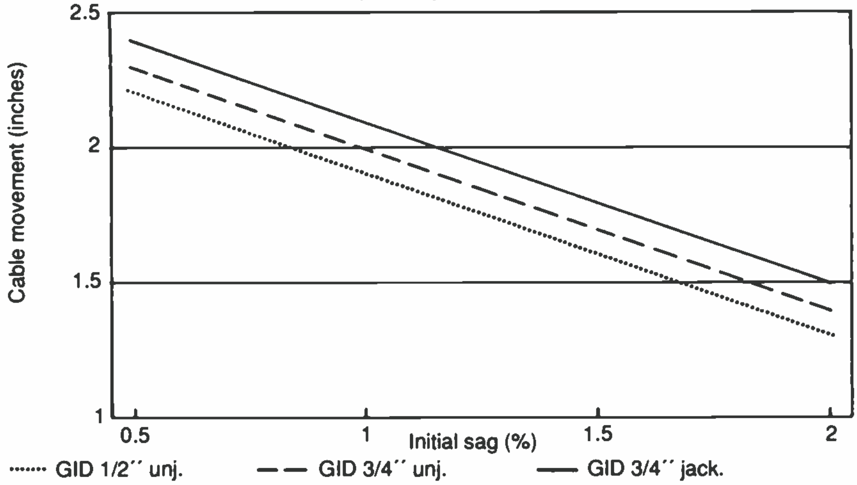
Expansion loop considerations

Several factors influence the amount of cable movement that can occur during cable service:

- Thermal expansion coefficient of the cable compared to the strand,
- Cable size and construction,

Figure 2: Cable movement for various cables as a function of initial installation sag

Temp. change = -108°F, 1/4'' EHS strand, span = 150 ft.



Curves represent movement for cables experiencing a temperature of -40°F after installation at 68°F.

Table 2: Length change (inches) for various products and spans for a temperature reduction of 72°F where the cable is free to move

	Cable span (feet)				
Product	**100**	**150**	**200**	**250**	**300**
Low loss 0.540''	1.2	1.7	2.3	2.9	3.5
Low loss 0.860''	1.3	1.9	2.5	3.2	3.8
Low loss 1.125''	1.2	1.7	2.3	2.9	3.5

Table 3: Cable length change (inches) for various products and spans for a temperature reduction of 108°F where the cable is free to move

	Cable span (feet)				
Product	**100**	**150**	**200**	**250**	**300**
GID 1/2'' unjacketed	1.7	2.6	3.5	4.3	5.2
GID 1/2'' jacketed	1.9	2.8	3.8	4.7	5.7
GID 3/4'' unjacketed	1.7	2.6	3.5	4.4	5.2
GID 3/4'' jacketed	1.9	2.8	3.7	4.7	5.6
GID 1'' unjacketed	1.7	2.6	3.4	4.3	5.2
GID 1'' jacketed	1.8	2.7	3.6	4.5	5.4

Table 4: Cable load bearing capacities for several cables

Product	**Load bearing capacity (E * A, lbs)**	**Maximum pulling force (lbs)**
GID 1/2'' unjacketed	480,000	200
GID 1/2'' jacketed	495,000	200
GID 3/4'' unjacketed	1,060,000	420
GID 3/4'' jacketed	1,080,000	420
GID 1'' unjacketed	2,060,000	490
GID 1'' jacketed	2,100,000	490

Note that load bearing capacity is a product of elastic modulus (E) and cross-sectional area (A) and is a different property from maximum pulling force.

- Temperature range experienced by the installed plant,
- Original installation conditions, i.e., span length, installation temperature, initial sag and tension, lashing conditions, strand size, etc.
- Ice or wind loading conditions.

Cable properties

Trunk cables are composed of aluminum and polyethylene plastic. The properties of the cable depend on the proportion of these components and the properties of the materials. The rule-of-mixtures can be used to calculate the effective cable properties.[4] Table 1 shows calculated thermal expansion coefficients for several products. All products referenced in this report use gas injected dielectric (GID) materials.

Tables 2 and 3 show the maximum cable length change for negative temperature changes of 108 and 72°F at various span lengths. These tables illustrate several factors that influence the amount of cable movement experienced in outside plant. First, note that the different cable designs exhibit different dimensional changes. Also, the importance of span length and temperature change is illustrated.

It's important to note that the data in Tables 2 and 3 are simple calculations of longitudinal cable dimensional change. The data assumes that the cable is allowed to freely move over the entire cable span. The validity of this assumption depends on the tightness of the lashing, span length and cable load bearing capacity. For longer spans lashed with conventional methods, the cable will not be free to move independently from the strand except near the ends of the strand. The load bearing capacity of a cable influences the cable movement simply because larger, stronger cables more easily overcome the restrictive forces of the lashing wire and friction with the strand. Table 4 shows the load bearing capacity of several products, reported as the product of the cable cross-sectional area and the effective cable modulus (E x A).

Because it is difficult to predict the true freedom of movement, common practice is to assume complete freedom that is worst-case. The real cable dimensional change will always be some degree less than the values shown in Tables 2 and 3.

Installation conditions

The strand itself contracts and expands with temperature changes, but not as much as the coaxial cable. The expansion coefficient of steel is given in Table 1 for comparison. The change in strand length with temperature reduces the amount of cable movement. The true dimensional change of the strand for a given change in temperature depends on the amount of sag in initial installation. →

Join us at the Cable-Tec Expo Booth 108

Introducing the first play-it-again SAM.

Meet new LINE SAM® from Wavetek.

The first signal level meter with "learn" and "repeat" modes for fully automated testing.

On cue, LINE SAM automatically runs a programmed sequence of tests—again and again. Saving you time—and money. You can even program for unattended, time-delayed testing.

Without missing a beat, the LINE SAM stores up to 80 sets of test point data for 100 channels. And downloads to a PC or printer for spectrum or tabular printout. Comparing amplifier specifications couldn't be easier or more accurate!

LINE SAM. Easy. Accurate. Cost-efficient. For field or headend testing, we're playing your song.

Call Wavetek today at 1-800-622-5515—in Indiana, 317-788-5965—and ask for LINE SAM. This could be the beginning of a beautiful friendship.

Reader Service Number 74

WAVETEK

Figure 2 shows the net amount of cable movement for a temperature change of -108°F after accounting for the strand dimensional change. Given this extreme temperature change, these curves illustrate that extra precautions may be necessary in severe climates even for spans of 150 feet. These curves also illustrate that greater sags can significantly reduce the amount of cable movement relative to the strand.

Table 5: Effect of wind loading on cable movement

Cable:	GID 3/4″ unjacketed
Span:	150 feet
Initial sag:	1.5%
Wind speed:	60 mph*
Temperature:	30°F
Cable movement due to wind loading: 0.75 inches	

*Wind speed and temperature are according to NESC guidelines for structures less than 60 feet tall in light loading districts. Corresponding loading is 9 lbs./sq. ft.

Ice and wind

Finally, true worst-case conditions must consider the additional stretching of the strand created by ice and wind loading. Wind loading will create more sag and will consume part of the excess cable available in the expansion loop. (See Table 5.) Ice loading also will create more sag and impact the expansion loop. However, the ice can act to securely bind the cable to the strand, preventing independent movement of the cable to the strand.

Possible remedies

Several additional precautions are available to accommodate excessive cable movement in extreme climates or long spans. These include:

- Use double loops, one on each side of a pole and at the input and output of all equipment.
- Double lash the cable in order to better mechanically couple the cable to the strand. It should be noted that if the cable is lashed too tightly to the strand, other problems can occur. At high temperatures, the cable expansion creates high stresses and can cause cable buckling or break the lashing wire.
- Use alternative expansion loop designs. Other designs have been experimented with and can accommodate more cable movement than the *standard* flat-bottom loop. These loop designs are more difficult to form and do not have the extensive field experience to back up the reliability. Included are deeper flat-bottom loops and helical loops.
- If possible, use greater sags to minimize cable movement.
- In very troublesome spans, poles can be added to reduce the span lengths. **CT**

References

[1] *CATV Cable Construction Manual*, 3rd Edition, Comm/Scope Inc., 1980.

[2] "Recommendations for Cable Installation," Comm/Scope Technical Bulletin #7, January 1990.

[3] *Construction Procedures*, Steve A. Willardson, Tele-Communications Inc., 1988.

[4] "The Effect of Temperature-Dependent Materials Properties on Fiber-Optic Cable Design," S.M. Cooper, K.L. Coupe, B.D. Zimmermann, 35th International Wire and Cable Symposium Proceedings, 1986, pp. 148-158.

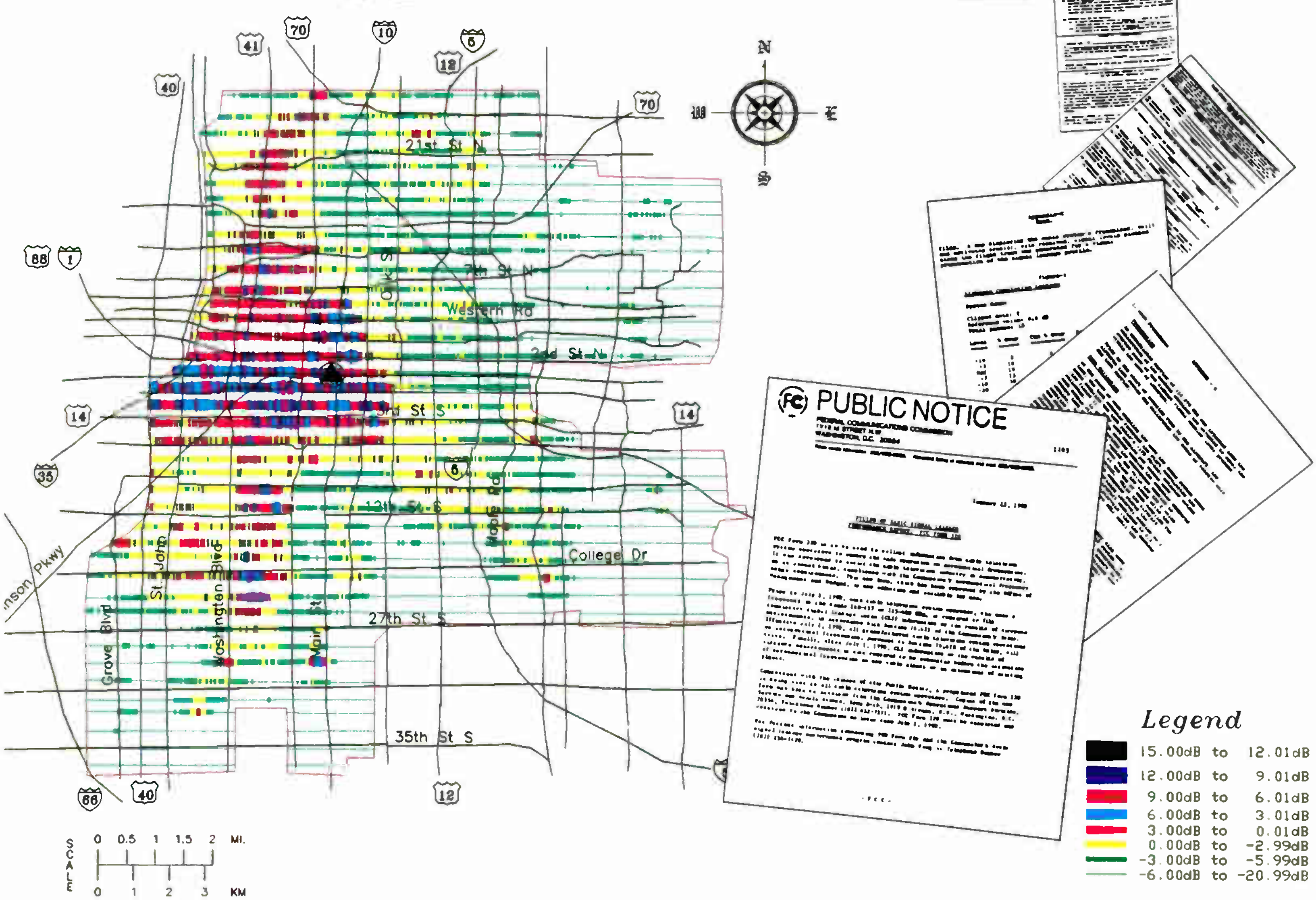
When the task is as critical as

Airborne CLI Testing...

Make Your Choice As Simple As 1, 2, 3...

1. Simply the most advanced technology: The "Rogers System".
2. Simply the most useful reports: 4 color on detailed franchise map.
3. Simply the most experience: 100,000 cable miles flown in 1990.

And all of it with never a missed deadline or additional fee. Ever!



So why fool around with unknown quantities? Simply call or write Barbara Kent for your free brochure today. It will simplify your life.

FLIGHT TRAC INC
An Alpha Technologies Company

478 Pennsylvania Ave.
Glen Ellyn, IL 60137

Phone: 708/790-2500
FAX: 708/790-2562

...We'll help you pass with flying colors.

See us at the SCTE Cable-Tec Expo, Booth 903, 905. Reader Service Number 76

Locating power-related TVI sources

By Jim Harris
Product Manager, Trilithic Inc.

Power-related TV interference (TVI) is an annoyance for most CATV systems and a serious problem for many. Headend sites are often hemmed in by power lines and somewhere among them there are likely to be a few bits of defective, TVI-producing hardware. Locating this offending hardware can be a long, tedious and often unsuccessful process because available techniques and instruments were not developed with the needs of the CATV operator in mind. Such TVI-location systems as now exist evolved in response to complaints of the off-air TV viewer. Since home antennas in urban areas are not very high, distant TVI sources are likely to be screened by ground obstructions. Consequently, the cause of the average viewer's complaint is probably within a few hundred yards of his antenna, so simple, on-foot search methods are usually effective.

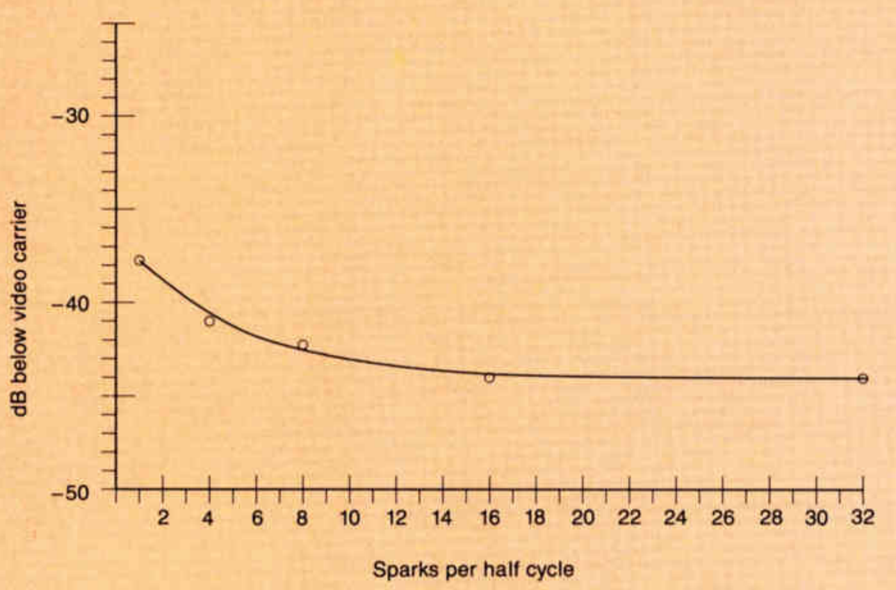
The CATV operator's problem is more complex. CATV antennas are mounted high on towers and can "see" TVI sources up to a mile away. When hunting down a TVI source, the CATV operator may have to search areas as large as a square mile — areas too large to be handled with on-foot methods. As a further complication, any area this size will contain dozens of power structures that generate some RF energy, and it is often difficult to identify the one or two sources causing the interference problem among the many others that are just part of the background.

An improved TVI-location system is needed for CATV applications, developed with the technical and resource realities of the CATV operating system in mind. This article outlines such a location system developed by Trilithic.

The nature of the problem

TVI is composed of very short pulses, or "spikes," occurring in bursts at the peaks of the AC sine wave. Usually these bursts occur 120 times per second, giving TVI its familiar, raspy "buzz" when heard in the TV audio. Each "spike" in the burst produces one dot of interference on the TV screen, and a given burst may contain from one to several hundred spikes. The "densest" bursts, containing many pulses, produce bands of interference on the TV screen that look like noise and are visible at about the same levels. The peak amplitude of bursts containing only one or two spikes must be about 8 dB stronger to be detectable by the average viewer (see Figure 1).

Figure 1: Power line interference limit of detectability



Nearly all power-related TVI is associated with high-voltage or "primary" power lines. RF energy is produced through the following three mechanisms:

- Corona or "brush" discharge, which occurs at points or along sharp edges of hardware in contact with the line. The high voltage potential ionizes the air at these sites, and since ionized air is conductive, a current flows into the surrounding atmosphere. As the individual air molecules charge and discharge, they generate RF energy. Corona is most commonly associated with lines operating at 46 kV and above.
- So-called "microgap" discharge, which occurs when the field around the primary line charges pieces of hardware that are separated by a narrow gap or a layer of corrosion. If the charge is large enough, sparks jump the gap, ionizing the intervening air and creating RF energy. Note that direct contact with the primary line is not necessary, so any loose pole hardware (and even the occasional rain gutter or chainlink fence) near the line can be a site for microgap discharge.
- Defective and dirty insulators, which are a common source of noise in older power distribution systems. Water and dirt enter cracks or thin spots in the ceramic glazing, setting up a thin path from line to ground. To the electrical current, the path "looks" like a series of microgaps and produces TVI with a similar pattern.

A system for locating power TVI

As any CATV operator who has hunted TVI already knows, an area of, say, a mile around the average headend contains dozens of power company structures that emit some level of RF energy. The real task is not so much to find a source of RF, but to tell which of many sources is strong enough and in the right spot to cause an interference problem. Obviously, at a given distance, a powerful source is a more likely candidate than a weak one, but should a weak source 475 feet away be more of a concern than a strong source 1,350 feet away?

The practical way to answer the question would be to actually measure the sources and grade them against some numerical standard. Unfortunately, the specialized equipment and techniques needed to do this have not been generally available to the CATV operator. The industry's all-purpose instrument (the CATV signal level meter) is designed to be insensitive to TVI, and CLI meters (because of their narrow IF bandwidth) are even less sensitive.

In contrast, specialized interference measurement receivers are designed to capture and measure the very short pulses that make up the TVI noise burst. Given a receiver that actually measures interference power, a few simple calculations are sufficient to locate the relevant TVI sources and to separate them from the irrelevant.

The procedure for tracking down TVI sources with a calibrated TVI meter has the following four general steps:

1) Estimate the minimum level of received TVI that could cause visible interference at the headend.
2) Calculate the power required of a TVI source at various distances from the headend to produce the level received at the headend.
3) Survey the area and identify TVI sources with levels equal to or greater than the levels calculated in Step 2.
4) Revisit these sources and pinpoint them to the nearest pole.

"Finding power-related TVI sources is a skill that improves with practice, but the learning curve can be shortened by using test equipment and search procedures designed for the task."

Step 1 — Estimate TVI power at headend

The first task is to estimate the minimum level of TVI power that could cause interference at the headend, then adjust this figure to the way an interference receiver would see it.

As noted, the observability of the TVI depends both on its amplitude and its "density." That is, the number of noise "spikes" per burst. For each degree of density, there is a minimum carrier-to-TVI ratio at which the interference becomes noticeable. It is possible to design a receiver that automatically assigns a weighting factor to its measurements so that regardless of the number of spikes per burst, the minimum observable TVI power can be represented by a single, weighted, value. The Trilithic interference receiver automatically assigns the value 40 dBc to the minimum observable carrier-to-TVI ratio.

Having estimated the approximate carrier-to-TVI ratio, we next convert it to an absolute power level by subtracting the TVI-to-noise ratio from the measured video carrier level. For example, if the video carrier level is measured at −5 dBmV and the estimated TVI-to-noise is 40 dB, the minimum absolute TVI power that could interfere with that carrier would be:

$$-5 \text{ dbmV} - 40 \text{ dB} = -45 \text{ dBmV}$$

In other words, if the video carrier could be removed and the TVI power measured at the carrier frequency, visible TVI must be stronger than −45 dBmV. Actually, some receivers operate at a fixed frequency, not necessarily at channel frequency, but a simple formula corrects for the difference in TVI levels and antenna factors.

Table 1 gives the pre-calculated "frequency factors" for a receiver that operates at 150 MHz for all low band channels, so that:

TVI power, corrected for frequency = TVI power at channel frequency − frequency factor from Table 1

The antenna used for vehicle surveys (described in Step 3) is a quarter-wave "whip." The particular whip described has a gain of 0 dB compared to a dipole. In contrast, the affected headend antenna will most likely have a gain of 6 to 10 dB. It is necessary to convert the TVI power

Figure 2: Single log periodic antenna

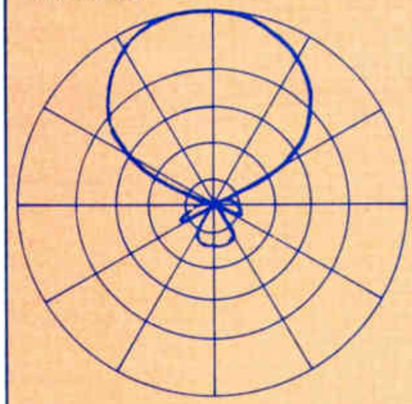
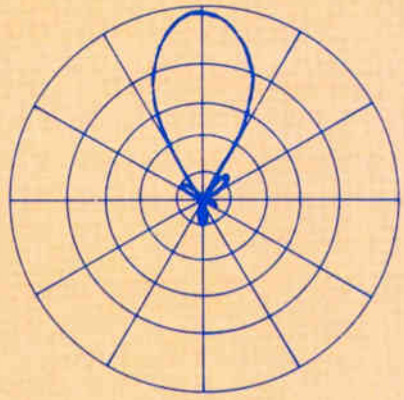


Figure 3: Quad log periodic antenna



to the level that would be obtained with a whip, which we accomplish by subtracting the gain of the headend antenna from the figure we just calculated:

TVI power measured with a "whip" = TVI power, corrected for frequency, as calculated previously – the gain of the headend antenna

We now have arrived at a figure that represents the minimum TVI power that could cause observable interference, compensated for the measurement characteristics of the TVI measurement receiver and its antenna. For convenience, we will call this figure the "headend TVI power."

Step 2 — Estimate power of TVI source

Knowing the approximate strength of the TVI power at the headend, we can predict what the power must be at the source. This will give us a standard by which we can evaluate the sources found in the field.

A distant source must be stronger than a nearby source to produce the same amount of TVI at the headend. This is because all types of radiant energy are naturally attenuated by distance at the rate of 20*log(distance). Using the path loss formula, we can see that a TVI source 2,000 feet away from the headend, for example, must be 6 dB stronger than one 1,000 feet away to be received at the same strength. The path loss formula also applies to the distance between the TVI source and the receiver's measurement antenna. Accurate TVI measurements must be taken at a known distance from the source. For simplicity's sake, the path loss for both the measurement distance and the headend distance can be accounted for in one formula:

Net path loss = 20*log(A/B)

where:
A = source-to-headend distance
B = source-to-measurement antenna distance

Practical measurements almost always are taken at one or two fixed, convenient distances — usually 30 or 50 feet. Tables 1 and 2 list the pre-calculated path losses for source-to-headend distances up to 5,000 feet. Table 2 assumes a source-to-measurement antenna distance of 30 feet and Table 3 assumes a distance of 50 feet.

To predict the minimum power of an offending TVI source in the main lobe of the headend antenna, we add the figure from

Table 1: Frequency correction factors for VHF channels

Frequency factor = 20*log(150 MHz/Ch. frq.)–20*log(.021*Ch. frq.)

Channel	Frequency (MHz)	Frequency factor (dB)
2	55.25	7.4
3	61.25	5.6
4	67.25	4.0
5	77.25	1.6
6	83.25	0.3
7	175.25	-12.7
8	181.25	-13.3
9	187.25	-13.8
10	193.25	-14.4
11	199.25	-14.9
12	205.25	-15.4
13	211.25	-15.9

Table 1 or 2 for the source's distance from the headend to the estimated headend TVI power from Step 1:

Main lobe TVI power at the source = headend TVI power from Step 1 + path loss value for the given distance from Table 1 or 2

This calculation is sufficient for sources found near the headend antenna's main lobe. Sources at more than ±20° to the main lobe are significantly attenuated by antenna directivity, which is why distant interference sources are more likely to be found at low angles. Strong nearby sources, however, can cause problems even at large angles, so it is necessary to have a procedure for dealing with them.

Figures 2 and 3 are polar plots showing the attenuation vs. angle, for typical one- and four-bay antennas. To cause interference, a source must be stonger than the sum of the attenuation for the angle at which it is found and the main lobe TVI power calculated previously:

Minimum TVI power for source at an angle = TVI source power from previous calculation + angular attenuation factor from Figure 2 or 3

Step 3 — Conducting a field search

There are two ways to organize a search. One is to simply cruise near primary lines and substations and jot down the locations and measured TVI power whenever readings pass through a peak. After the search, the operator evaluates each of these "hot-spots," using the calculations in Step 2 to decide which are of interest. Alternately, operators can pre-calculate the power levels they are looking for at various distances and angles and mark them on a map before starting the survey. This approach equips an operator to evaluate sources as they are found and reduces the amount of data that must be taken during the search.

Figure 4 shows a typical strand map with added notations for distance from the headend and angle from the main lobe. The minimum signal level of interest is indicated for each distance and at several angles. As the search proceeds, each identified source can quickly be located on the map and evaluated for power vs. distance and angle. If its power is found to be above the necessary minimum, it is marked on the map. After the survey, the operator returns to these spots to verify the measurements and to pinpoint the exact location of each source.

Before beginning a vehicle survey, it is necessary to verify that there are no significant TVI sources around the headend. Because of the small area involved — no more than 100 yards on all sides of the

Table 2: Path loss for 30 feet

Add to headend level (dB)	Feet from headend
0	30
4.4	50
7.4	70
10.5	100
16.5	200
20.0	300
22.5	400
24.4	500
26.0	600
27.4	700
28.5	800
29.5	900
30.5	1000
32.0	1200
33.4	1400
34.5	1600
35.6	1800
36.5	2000
38.1	2400
39.4	2800
40.6	3200
41.6	3600
42.5	4000
44.4	5000

Table 3: Path loss for 50 feet

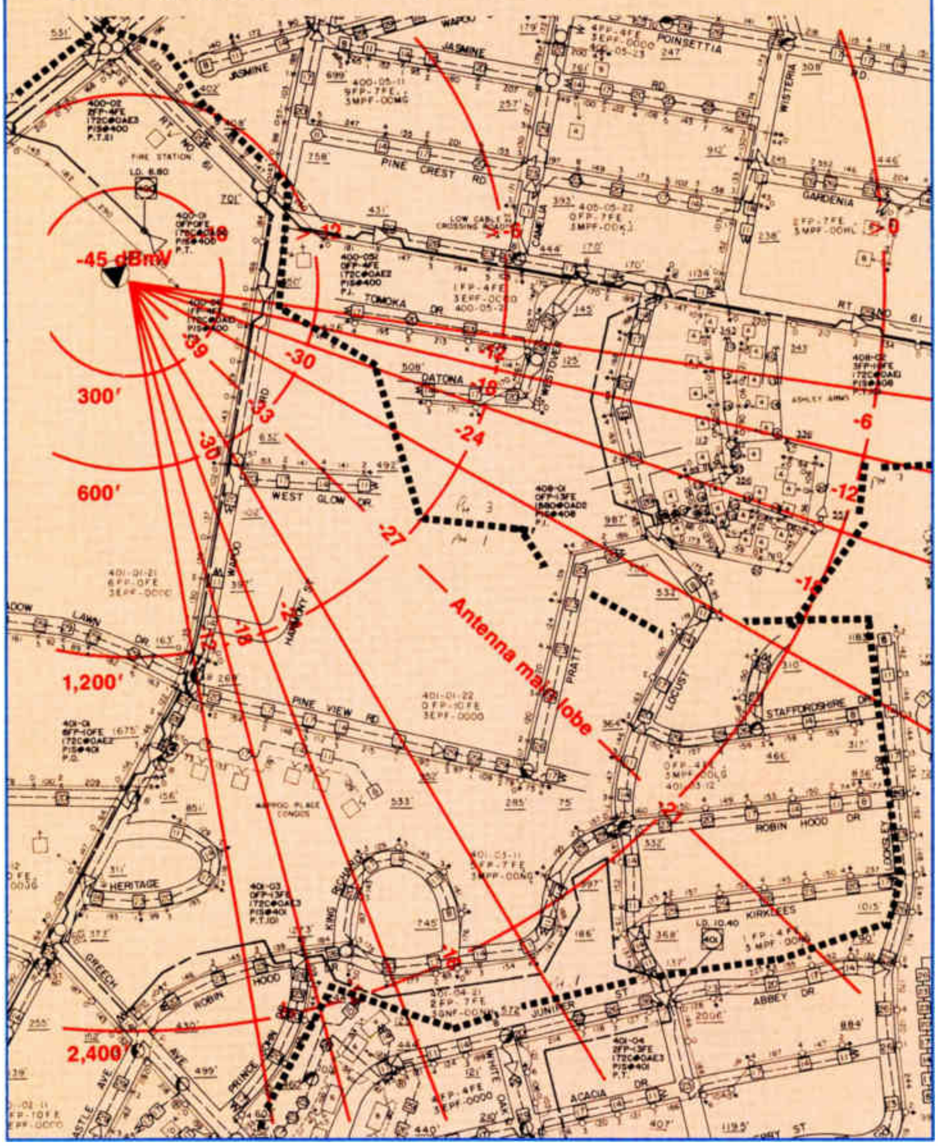
Add to headend level (dB)	Feet from headend
0	50
2.9	70
6.0	100
12.0	200
15.6	300
18.1	400
20.0	500
21.6	600
22.9	700
24.1	800
25.1	900
26.0	1000
27.6	1200
28.9	1400
30.1	1600
31.1	1800
32.0	2000
33.6	2400
35.0	2800
36.1	3200
37.1	3600
38.1	4000
40.0	5000

tower — the operator can cover the area on foot using the receiver with a dipole or directional antenna, cut to the receiver's operating frequency. A dipole will give readings similar to the whip antenna described previously, but the gain of the directional antenna will cause the receiver to read high. To correct for this, the antenna's gain is simply subtracted from the meter reading.

For the vehicle survey, the calibrated receiver is connected to the vehicle-mounted whip antenna discussed earlier. Since the whip is omni-directional, TVI sources are located by noting the points at which the meter indicates maximum TVI strength. The whip should be placed on the vehicle's roof at the point where ignition noise causes minimum interference to readings. Some experimentation will determine this point. Additional vehicle grounding may be needed in some cases.

The search area should be methodically surveyed to a distance from the headend that corresponds to a TVI power about 40 dB greater than the estimated headend TVI power. This distance will vary with the angle from the headend antenna's main lobe. Since TVI travels along the primary lines, TVI energy may first be detectable far from the point of origin and will rise in amplitude as the vehicle approaches the source. As the point of peak power is approached, VSWR effects in the primary lines may cause periodic fluctuations in the meter reading. Care should be taken so that these are not interpreted as peak readings. When recording a reading at the point of peak power, note the approximate distance between the primary lines and the vehicle antenna. It is usually possible to (safely) maneuver the vehicle so this distance is near 30 or 50 feet.

Figure 4: Typical strand map with added distance notations



Often two or more sources will be close enough to be received simultaneously. Individual sources can be differentiated by listening to the sound each produces in the receiver's audio. The sound of a source depends on its spike density, and it is unlikely that two sources that are close enough to overlap will sound the same. As each source is approached, the sound "signature" for that source will dominate. (For operators who prefer to work with a

Affordable Masterpiece

No specifications equal those of the Signal Vision Directional Tap. It is, mechanically and electronically speaking, a work of art.

High art commands a high price, right? *Wrong.* The price for this tap is a value *any* critic would admire.

So you don't have to be an art expert to make your own appraisal. The Signal Vision Directional Tap is nothing less than a masterpiece.

Call Signal Vision for price and information about our new Directional Tap or for a catalog of our entire product line.

SIGNAL VISION, INC.

We Make The Connection

27002 Vista Terrace • Lake Forest, CA 92630

714 / 586-3196

PRODUCT SPECIFICATIONS

MODELS: SVT-20 SVT-40 SVT-80

Features:

True performance to 600 MHz and beyond • Machined brass F ports • Corrosion resistant 360 aluminum alloy housing and protective epoxy coating • Aluminum gasket for maximum RFI integrity • Stainless steel spring loaded clutch • Tapered entry for center conductor • Neoprene weather-proof gasket • Aerial or pedestal mounting without changing center seizure screws • Center pin stop in seizure block • Plastic PC board housing cover • Excellent insertion loss to 600 MHz.

Specifications:

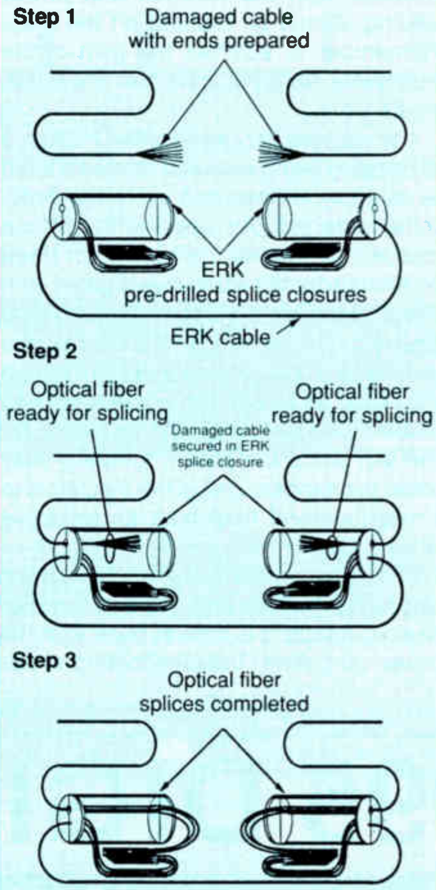
Bandwidth:	5-600 MHz	**Tap loss:**	1 db of assigned value
Tap-to-Tap isolation:	30db	**Impedance:**	75 OHMS
Return loss:	20 db minimum all ports 18 db 5 MHz tap port	**RFI:**	-100 db
		Input/Output ports:	5/8 female
Power passing:	6 Amp AC/DC	**Subscriber ports:**	F-Type female (brass)

Reader Service Number 81

Fiber restoration planning saves

By J. David Johnson
Sales Manger-SCC/Utilities/CATV
And Michael J. Ott
Product Supervisor, Siecor Corp.

Cable system repair with an ERK



In general, emergency restoration of a cable TV system's fiber-optic cable plant can be done quickly and efficiently if sufficient up-front preparation and planning has been done. Typically, the amount of preparation and planning is in proportion to the amount of financial risk involved should an outage occur.

The target for most restoration crews is to restore the system within 20 minutes of having access to the damaged cable. Access is defined as the capability to prepare cable ends for splicing.

The target for completion of fault location is typically less than two hours. Fault location includes troubleshooting the fiber with an optical time domain reflectometer (OTDR) and travel time to the trouble site. Physical fault location may include hand-over-hand inspection of an aerial cable plant, or digging up a buried cable if no cause is readily apparent.

These target times are readily achieved if sufficient preparation has been done. This requires keeping an up-to-date maintenance and emergency restoration plan, staff training, personnel organization and material maintenance.

The physical plan

There are two planning phases to consider for proper maintenance and reliability of the fiber system: pre-installation and post-installation.

Although the system's equipment and materials are not always considered a part of the plan, the selection of system products can have a long-term effect. The operator should choose products that meet industry standards to ensure that the installed system will perform consistently over its expected life and provide the reliability needed. Standards for optical fiber, cable and associated products have been developed and used in the telecommunications industry for over 10 years. Most of these standards[1,2,3] are readily accessible and should be used by the CATV industry.

System design can have a major impact on the system reliability. Such features include advanced monitoring and control systems, fatigue- and abrasion-resistant optical fibers, backup coaxial systems/AML systems, diverse optical cable routes and 1 x N laser protection with optical switches.

Once the system is designed and installed, there are other factors that need to be addressed by the operator. These are included in the system's maintenance and restoration plan. A detailed plan clearly defining the actions required by all emergency personnel should be kept current. The plan should indicate exactly who is responsible for troubleshooting the system, temporarily restoring the system, and making permanent repairs. The priority of restoring fibers in a multifiber cable should be documented. The adequacy of the plan should be checked during mock emergency restoration drills with any flaws corrected immediately.

The predetermined plan for emergency restoration may include:

1) key personnel notification procedures,
2) location of and access to necessary materials,
3) step-by-step sequence of troubleshooting procedures,
4) use of emergency restoration equipment,
5) critical fiber sequence to designate priority channels,
6) method of permanent repair,
7) system testing and documentation, and
8) an after-action report to evaluate the cause of the failure, future preventive measures and the emergency restoration procedure.

Training

The importance of practice and training cannot be overemphasized. Initial training of experienced and new restoration personnel should include safety, use of splices and hardware, use of OTDR and OTDR plotter/printer, operation of an optical power meter, fiber handling and installation, use and care of optical connectors, maintenance plan design and purpose, individual responsibility, system monitoring and documentation, actions to be taken if fault is noted, and troubleshooting and restoration.

Once the initial training is completed and system records are in place, it is highly advisable for emergency restoration crews to frequently practice the skills needed to perform restoration work. Quarterly training is advised. These skills must remain sharp, particularly if crews do not regularly use the designated restoration equipment.

Refresher training can be accomplished during internal quarterly and external semi-annual monitored training sessions. Sessions should include re-familiarizing OTDR operators with splice loss measurement, distance determination, hands-on splice training, and restoration drills. Mock emergency restoration drills can be conducted using spare reels in stockyards and splicing hardware set aside specifically for training.

Personnel organization

The most highly trained and skilled personnel are of no use if they cannot be summoned to the job at a moment's notice. An updated emergency call list

See us at the SCTE Cable-Tec Expo, Booth 617.

Reader Service Number 84

should be maintained and the effectiveness of a "call in" should be checked prior to an actual emergency.

Alternate means for communication with restoration personnel should be examined. For example, personnel might be assigned to a duty restoration crew equipped with pagers and mobile phones.

Personnel should be given specific assignments, whether by geographic area or task. Assignments should be given for test equipment maintenance, emergency supply accountability, record keeping, training and refresher training, liaison for cable and equipment suppliers, system monitoring, troubleshooting and fault locating, notifying appropriate personnel, determining restoration method, and the actual restoration of the cable system.

Materials maintenance

A stock of materials for use only during restorations should be maintained. The most important part of this stock is a kit containing pre-assembled closures and spare fiber, sometimes called an emergency restoration kit (ERK). See the accompanying figure for information on how to use it. These kits are commercially available. Mechanical splices also are necessary for rapid restoration. Equipment and materials that should be dedicated solely for restoration purposes include the following: mechanical splices, splice trays, splicing tools and materials, OTDR, optical power meter, access jumpers and interconnection sleeves, ERK (cable and closures), closure tool kit, and spare cable. Miscellaneous supplies include pigtails, attenuators, closure re-entry kits, spare connector protective caps, isopropyl alcohol and cotton swabs, compressed air, splice location access equipment, standard safety equipment, two-way communications equipment (such as an optical talk set), and other accessories. A splice tent or splice van and a truck with a radio for adequate communication also are required and should be kept in proper working order.

Of course, troubleshooting equipment should be stored in good working order. Equipment and materials should be inspected monthly to ensure proper and adequate operation. Supplies should be accounted for regularly and stored in a designated location.

Records should be kept for each site inspection to ensure accountability and to avoid oversights. As-built documentation of the systems must be accurate, well-organized and readily available to the troubleshooting crews. Accurate records are instrumental in isolating problems, by comparing "before" and "after" system records. It is wise to maintain a duplicate set of records in a central location, in case the original set is lost or damaged.

Crews following these guidelines have restored system service in a matter of hours, and in many cases much more quickly than similar crews can restore service over a copper cable system. **CT**

References

[1] Bellcore TR-20, *Generic Requirements for Optical Fibers and Optical Fiber Cable,* Bellcore Customer Service, 60 New England Ave., Room 1B252, Piscataway, N.J. 08854-4196.

[2] REA PE-90, *REA Specifications for Totally Filled Fiber-Optic Cable,* Telecommunications Staff Division, Rural Electrification Administration, Washington, D.C. 20250.

[3] EIA 472, *Generic Specifications for Fiber-Optic Cables,* Telecommunication Industries Association, Engineering Dept., 2001 Eye St. N.W., Washington, D.C. 20006.

Reader Service Number 120

Troubleshooting S-A Series 6800 power supplies

By Jud Williams
Owner, Performance Technological Products

Scientific-Atlanta's Series 6800 switch mode (switching) power supplies are used in the company's feed-forward sub-split trunk stations. Although I previously discussed switching power supplies, judging from the number of calls I received, there still remains an aura of mystery about troubleshooting them. (For a review of switching power supplies, see "Hands On," September 1990 *CT*.)

Take a look

As with all equipment being worked on, a visual inspection is always the first step to discover burned, broken or loose components. Once these are dealt with, a systematic troubleshooting procedure should be followed. Since the modules are powered by 60 volts AC, such a source should be available.

Also, a DC bench supply certainly makes life a lot easier. My favorite instrument for delving into the various stages of a power supply is a DC oscilloscope. It allows you to measure DC voltage levels quickly and easily, as well as see any significant waveforms.

As we proceed through the various stages of the power supply, refer to the accompanying figures.

Examining the schematic (Figure 1) from left to right, you can see the first area is the rectifier/filter section. The full wave rectifier is easily tested using an ohmmeter set to the 2K range; measure across each of the rectifiers and note that a good device has low resistance one direction and high the other. The second component of concern is the 1,000 microfarad electrolytic. If it's defective, it's usually shorted, which would more than likely blow the input fuse.

Reference voltage

The next section of the power supply is the reference voltage for powering the IC chip. It is made up of a simple emitter follower transistor configuration with a 30 V zener in its base. The voltage on the transistor's emitter will be around 28 V and connects to Pin 12 of the IC.

The IC in turn puts out another reference voltage on Pin 14 measuring between 4.5 and 6 V. If this voltage is present, in all likelihood the chip is okay. However, a final check of Pin 5 with its sawtooth waveform may be made if a scope is available.

The next section, the regulator circuit, contains a pair of power MOSFETs. These transistors are easily tested with an ohmmeter set on the 2K range.

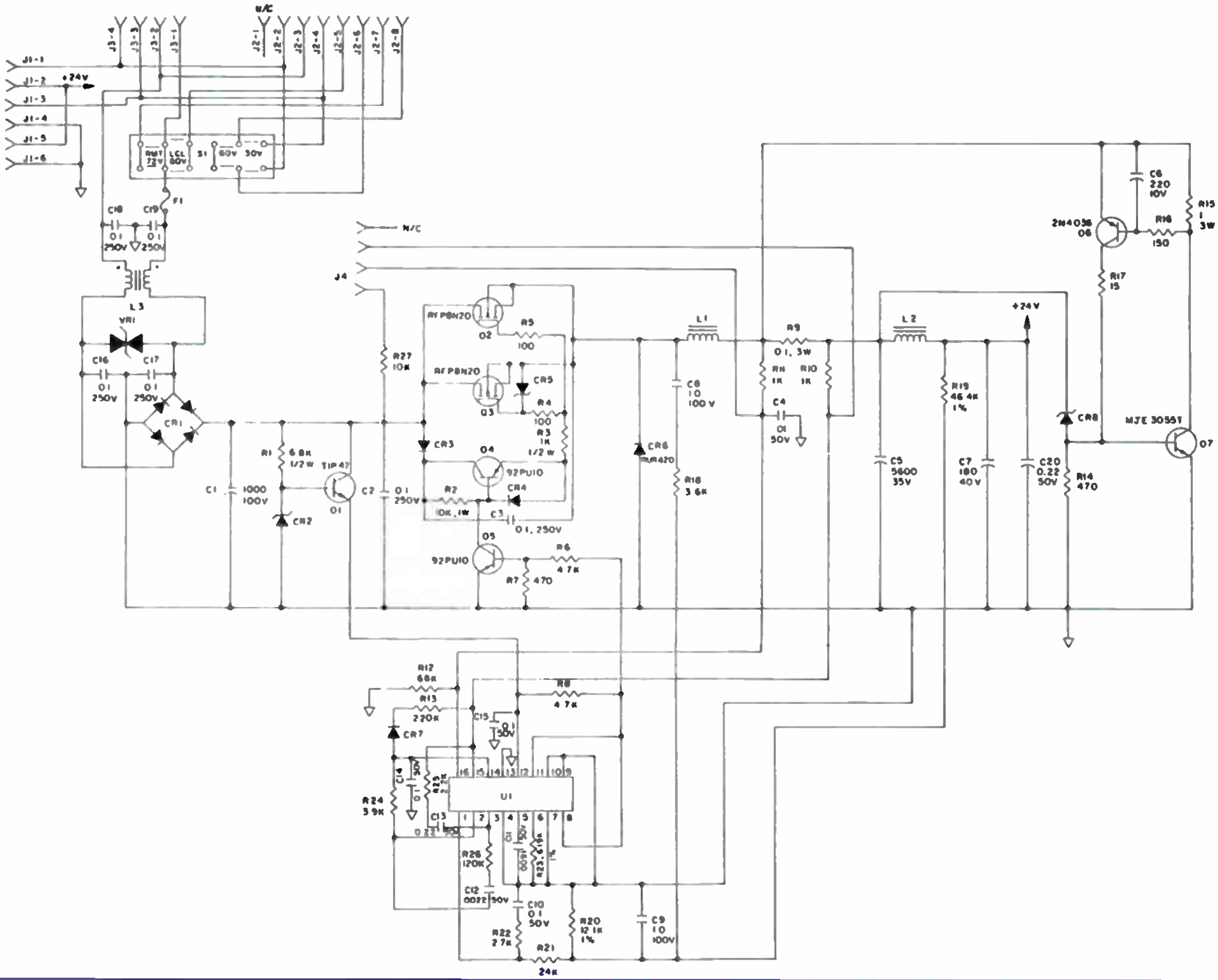
While viewing the transistors from the front, touch your meter's red lead to the center pin of the device and the black lead to the one to its right. A bad FET will indicate a shorted condition while a good one will read open. Any MOSFET rated at 200 V, 0.4 ohm drain resistance, capable of handling 4 amps and 75 watts, and packaged in a TO-220 case may be used as a replacement. Note that on the schematic the transistor is identified as an RFP8N20. The same device made by another manufacturer may be called a MTP8N20. They're both the same; it's the 8N20 part of the numbering system that counts.

As you progress across the schematic you will pass through the LC output filter, which may occasionally suffer from a shorted electrolytic capacitor or an inductor that has broken loose from the PC board.

The final section on the right hand side of the schematic is the overvoltage protection circuit. It also may be referred to as a crowbar circuit. This is the area of most concern, because it seems to be the cause of most failures in the product.

Overvoltage protection can be very desirable when properly implemented. I have always felt that the circuit should work with a fuse located immediately adjacent to it. In this scheme, the only fuse is at the input of the entire power

Figure 1: Series 6800 power supply schematic diagram

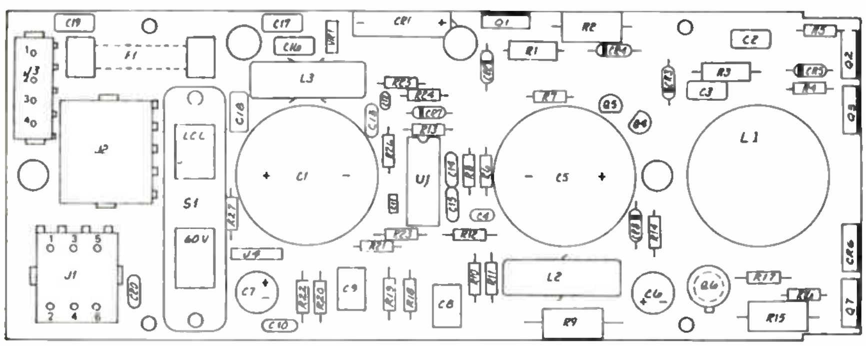


Courtesy Scientific-Atlanta

supply, which means that anything between the fuse and the crowbar are put under stress while the fuse takes time to blow. The result is that the circuitry making up the overvoltage protection often burns up, frequently making quite a mess of the board.

Since the power supply functions normally without the crowbar, its elimination may be a consideration for greater reliability. I frankly would like to keep the crowbar but with a modification to incorporate a fuse between Inductor L1 and Resistor R9. If you decide to remove the circuit, the following components should be clipped out: CR8, C6, R14, R15, R16, R17, Q6 and Q7. The power supply may return to normal operation after clipping out these scorched components.

Figure 2: Series 6800 power supply PWB assembly



Courtesy Scientific-Atlanta

Other considerations

One thing to be aware of when working with these modules is that the ground plane or common sections of foil on the PC board are separated into three individual areas. They are interconnected only when mounted in the chassis. Once removed, the PC board must be mounted onto a jig that will simulate the chassis by tying these foil areas together. I use a jig made from an aluminum sheet measuring 7 1/2 inches by 3 inches, with four 1/2-inch metal spacers mounted so they are aligned with the PC board's mounting holes.

Also remember that when the modules have been subjected to water damage, it's wise to remove the boards from the chassis, and and clean the mounting holes and chassis of corrosion. Always make sure the mounting screws are firmly in place to avoid future grounding problems.

Readers wishing to ask questions or discuss the contents of this article are invited to call me at (404) 475-3192 or write to P.O. Box 947, Roswell, Ga. 30077. **CT**

See us at the SCTE Cable-Tec Expo, Booth 1102. Reader Service Number 90

The tech code of conduct

By Rikki T. Lee
Consultant

We present the commencement address given to the 13th graduating class of Asynchrónous University, delivered last April 1 by Dr. A.C. Voltz, dean of the technical communication department.

Welcome — parents, creditors, friends — to this great day at Async U. To our largest graduating class ever, congratulations both of you. You graduates soon will face the real world of CATV. It will be cruel. The industry will threaten you with training and standards; supervisors will judge you by your performance.

We didn't tell you this bad news in class, since we needed your tuition. But now I give you the technical code of conduct to help you survive. Please trun your attention to the blackboard, which the AV department has donated along with a piece of chalk.

1. Let your memo be your mouthpiece

You'll be too busy thinking in your office or roaming about the cable plant to waste time talking on the phone. (By the way, you should lose the beeper that rules your life.) So here's where the all-purpose memo enters: Jot down everything you'd say on the phone, beginning with "Hi, it's me" and ending with "Adios, amigo." Then distribute copies to everyone. Also, never return phone calls. If it's important, they'll keep calling you. So use the time you save to write more memos.

2. When in doubt, nod

If you think you understand the vendor's instructions for installing a laser diode, then you do. Say so. But if you're sure you don't understand, still say you do. Then, when the vendor leaves, practice grabbing, tossing and catching the diode. (I call this the "hands on brains off" exercise.) But asking questions for clarification muddies the already oil-slicked waters.

3. Take jokes seriously and vice versa

Being mentally out of sync with your co-workers gives you an air of invincibility; no one can touch you. For example, when your supervisor stops by and tells you the one about the rabbi, the priest and the chief tech, say "Really?" then ask for supporting data. On the other hand, when attending an SCTE chapter seminar on powering, lead a sing-along of "I fought Ohm's law and Ohm's law won."

4. Don't disturb the minor details

If you can't get out of writing a tech report, think of your readers. Ask, "Would they get the meaning if I left out punctuation marks, correct spelling, accurate facts, paragraph breaks and standard terminology?" Nine times out of 10 the answer's "yes"; the 10th time, they're too busy to read. So forget the outline, forget the rewrite — a slapdash draft will do fine. Slip in a chart here, a schematic there and color everywhere: it's all people look at, anyway. If you're asked to write for a trade magazine, you're in luck: Editors get paid to make you look good.

5. Machines may replace you, so imitate one

When was the last time your spectrum analyzer printed out "I'm sorry, user; I goofed"? Never ever! So, act as if your mistakes only influence those co-workers who must correct them. And when you screamed and swore at the TDR, did it run outside for a good cry? Not once! Therefore, consider the criticism of your job performance to be the problem only of the person badmouthing you. It shouldn't bother you, since as an outdated model you don't come equipped with that new self-improvement option.

6. Put time on your side and keep it there

If your supervisor inquires about the status of that design project due on Monday (but you haven't started it), don't say, "Whoops, forgot about it." A good response is: "I'm on it as we speak." Even better: "It's all taken care of." At this point, you should suddenly remember a meeting you're late for, then walk the other way. As the deadline approaches, either put the project on your co-workers' desks or else extend the deadline.

7. Always nonplus the non-tech

Confusion of the uninitiated comes easily to every tech person. And why not — non-techs naturally fear your superior knowledge about electronics theory, splitters and amplifier modules. But some of you might still need help to mystify the marketeers, baffle the billing department or humiliate the human resources staff. So when you meet known non-techs, ask for their preference in modulators: frequency-agile or not (and why). But if you're not sure of their job title, just mumble if spoken to.

8. Speak softly and fake the rest

Giving tech seminars needn't be terrifying for you. As for your students — that's their problem. So make sure that you read verbatim from your small-print, out-of-focus overheads. Forget handouts; they take too long to prepare. Maintain a smooth monotone while you evade all eyes. This is technical stuff, so enthusiasm won't work. Whenever students stop you with a question, just say: "I intend to cover that later." They usually forget about it.

9. Don't let words clog up your ears

When others speak, that's a signal for you to plan what to say next. But nod once in a while, just to give them the impression that you're really listening. On the other hand, use your springboards for target practice: Explain your great idea for the OSHA bulletin board to a few industrious co-workers. If they like it, ask them to implement the idea "as a favor." If they don't, express disdain for some tacky piece of clothing they're wearing.

10. When compiling lists, use round numbers

Well, that's it. Again, congratulations! Thank you for coming and good luck — you'll need it. **CT**

Author's note: Really now, no one would be caught dead with such poor communication skills.

ATRC's all-digital HDTV proposal

By Lawrence W. Lockwood
President, TeleResources
East Coast Correspondent

In this month's column we examine the third all-digital HDTV proposal of the four to be tested for Federal Communications Commission evaluation (see my columns: "General Instrument's HDTV proposal," August 1990, and "The Zenith/AT&T all-digital HDTV proposal," May 1991). This system has been submitted by the Advanced Television Research Consortium (ATRC) composed of the David Sarnoff Research Center, NBC, North American Philips and Thomson Consumer Electronics. The compression scheme was demonstrated at the April NAB (National Association of Broadcasters) meeting in Las Vegas by the Philips' North American Group; it is often referred to as the Philips' proposal but here it is referred to in the same manner that the ATRC submitted it to the Federal Communications Commission — as the "Advanced Digital Television" (ADTV) proposal.

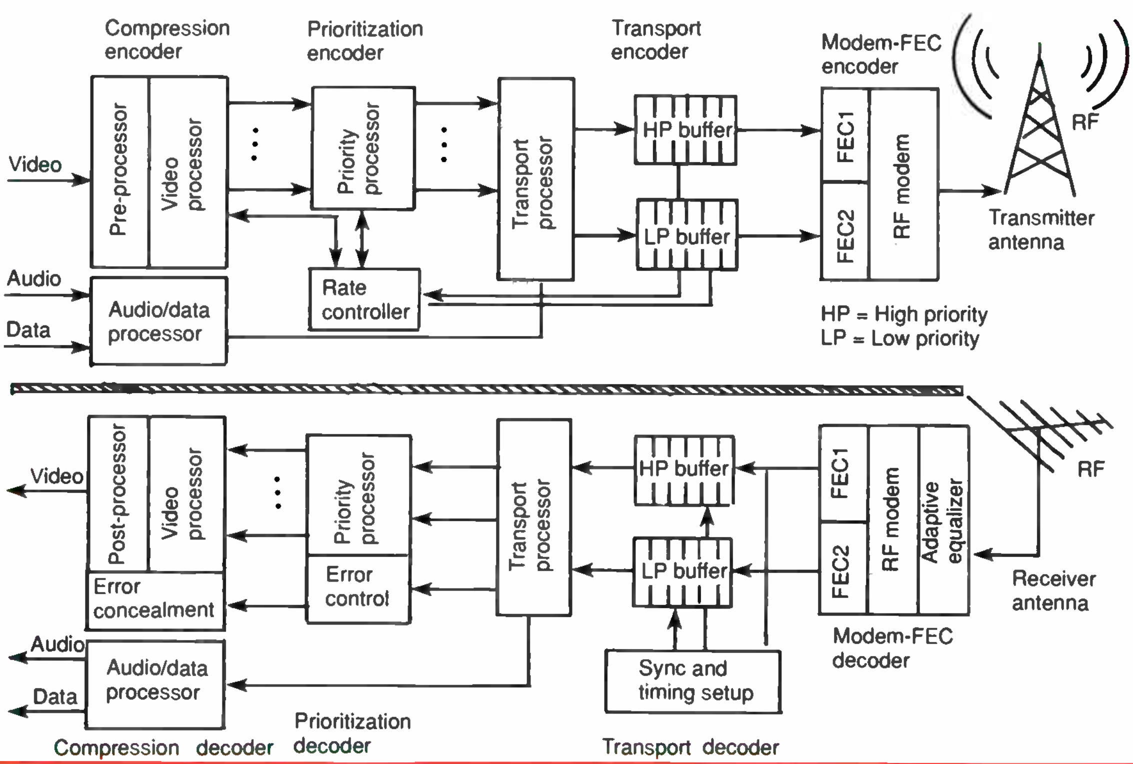
In this brief look at the ADTV scheme as in all the previous reviews of the other HDTV proposals, the technical material presented is from their formal proposals to the FCC — with some occasional explanatory additions.

ADTV system overview

As I have emphasized in previous columns on all-digital HDTV proposals, a most important observation must be noted: All HDTV systems under consideration whether classified analog or digital are — every single one — all-digital in the picture compression. The differentiation — analog or digital — really applies only to the signal transmitted. In some cases — the analog systems — the compressed HDTV picture in digital format is transformed into analog for transmission. In other cases — the digital systems — the compressed HDTV picture in digital format is transmitted as a digital signal.

With that caveat firmly in mind the ADTV scheme may be examined. ADTV is a simulcast scheme (as are all the digital HDTV proposals) and can use a "taboo" channel. Taboo channels are the channels left empty between current TV broadcast stations to prevent adjacent channel interference. All the digital methods propose that they can use these channels with no interference to (or from) the current TV stations because the digital transmission requires much less power. ADTV has a "noise like spectrum without specular components" and in one case analyzed, ATRC claims "the ATV transmitter peak power can be 6 dB lower than the peak power of the NTSC transmitter." →

Figure 1: Block diagram ADTV system overview (transmitter to receiver)



Digital video processing — MPEG

A block diagram of the transmission end and the receiver of the ADTV system is shown in Figure 1. ADTV uses a 2:1 interlaced format with 1,050 lines at a frame rate of 29.97 frames per second. ADTV provides up to four digital audio channels of CD-quality sound (i.e., two stereo pairs) by audio compression, which follows closely a standard for broadcast digital audio adopted by the Motion Picture Experts Group (MPEG) called MUSICAM (masking-pattern-adapted universal subband integrated coding and multiplexing).

The video compression in the ATRC system is based on the MPEG compression and the transmission uses 16-QAM modulation (more about 16-QAM later). MPEG is a committee within the International Standards Organization (ISO) that is currently working on a standard for the compression and decompression of motion video. MPEG has yet to agree on even a draft level of digital compression of audio and video encoding at a below normal TV quality and it is estimated to be two years away from being ratified. (MPEG was developed for decompression from storage media that have a 1 to 1.5 Mb/s data transfer rate such as CD-ROM — compact disk read-only memory — DAT — digital audiotape — etc.) MPEG is a collection of compression methods including motion estimation, motion compensated predictive coding, adaptive DCT (discrete cosine transform) quantization, and variable length coding and decoding.

The details of the digital techniques used in TV signal compression are beyond the scope of this short column. A good descriptive paper on MPEG is included in the *1991 NCTA Technical Papers*.[1] In addition there are general texts and a number of recent papers addressing some of the latest procedures applied specifically to HDTV (and to NTSC) compression.[2, 3, 4] Suffice it to say they all use various methods of taking advantage of redundancy in any TV signal. There is a good deal of repetition of pixel (picture element) values within a frame and, of course, a great deal of repetition from frame to frame.

The key parameters of the ADTV system are listed in the accompanying table. The ATRC has pegged its proposed design for compression on a method of boosting what it expects MPEG to be and calls its extension of MPEG to HDTV levels "MPEG++." Part of the ATRC extension of MPEG for HDTV is what it calls a prioritized data transport (PDT) scheme, which is claimed will provide for graceful signal degradation for the digital transmission similar to the gradual degradation of analog TV transmission. MPEG++ is designed to burden the transmitter, rather than the receiver with the most complex video compression circuitry, freeing the consumer from having to bear the brunt of the system's expense (similar efforts are made by the other digital HDTV proposals).

One possible advantage of MPEG that ATRC may be anticipating is that its use might very well assist in any future accord with the computer world. However, as seen in the table, a picture of 1,440 active pixels by 960 active lines produces non-square pixels, which is a significant disadvantage in the computer world.

In the compression process MPEG++ uses information from previous frames and also makes predictions about future frames — it's said to "look backward and forward." This is shown in Figure 2.

The process of looking backward and forward produces a "pipeline" of video information. When this pipeline is broken, such as when switching channels, a highly undesirable artifact is

ADTV system parameters

Video	
Raster format	1,050/2:1 interlace
Aspect ratio	16:9
Frame rate	29.97 frames/s
Bandwidth	27 MHz
Sample rate	54 MHz
Active video	
Luminance	1,440 (H) x 960 (V)
Chrominance	720 (H) x 480 (V)
Horizontal resolution	
Static and dynamic	810 TVL per picture height
Total data rate	21.00 Mb/s
Video	14.98 Mb/s
Audio	1.02 Mb/s
Data (max.)	0.04 Mb/s
Overhead (mostly error correction) percentage of total rate	23.6%

"Terrestrial broadcast is a much tougher transmission medium for a digital signal than others that may be used for HDTV; i.e., cable or DBS."

produced — it takes an objectionably long period of time for the new picture to be built. Although presently longer, ATRC is shooting for a goal of 1/4 to 1/2 second for the update. Even if this goal is achieved, serious problems remain — especially with live programming. In fast program switching such as sports — say a fast basketball game — each radically new picture presents the same problems as channel switching.

Since there is much similarity in the basics of all the digital proposals, this occurs to varying degrees (amounts yet to be determined) in all the systems. As an example, GI, in using its compression methodology (DigiCipher) on NTSC video, claims that it can compress only two NTSC live program sources into one NTSC transmission channel, whereas if the program source were motion picture film, the compression could fit five sources into one NTSC transmission channel. This is due to many factors involving storage and other elements, but a large part is due to the different frame rates. Instead of converting the 24 frames/s film rate to 60 frames/s using conventional TV film projection methods and then compressing the 60 frames/s, only the original 24 frames/s are compressed and transmitted. At the receiver the 24 frames/s is decompressed and converted by logic (using conventional film-to-video conversion principles) to the 60 frames/s display rate.

Error correction

ADTV uses powerful forward error correction (FEC) — as do all the other digital systems. It is interesting to note that all the digital HDTV proposals, after compression, end up with nearly the same data rate — approximately 20 Mb/s. Error rates in digital transmission are specified as a power of 10 — e.g., 10^{-6} or 10^{-8} or 10^{-10} — that is one error in 10^6 bits, 10^8 bits, 10^{10} bits and so on. In these three examples of error rates (typical of good data transmission) it would mean at a 20 Mb/s transmission rate 20 errors every second, one error every five seconds or one error every 8.33 minutes respectively for the example error rates.

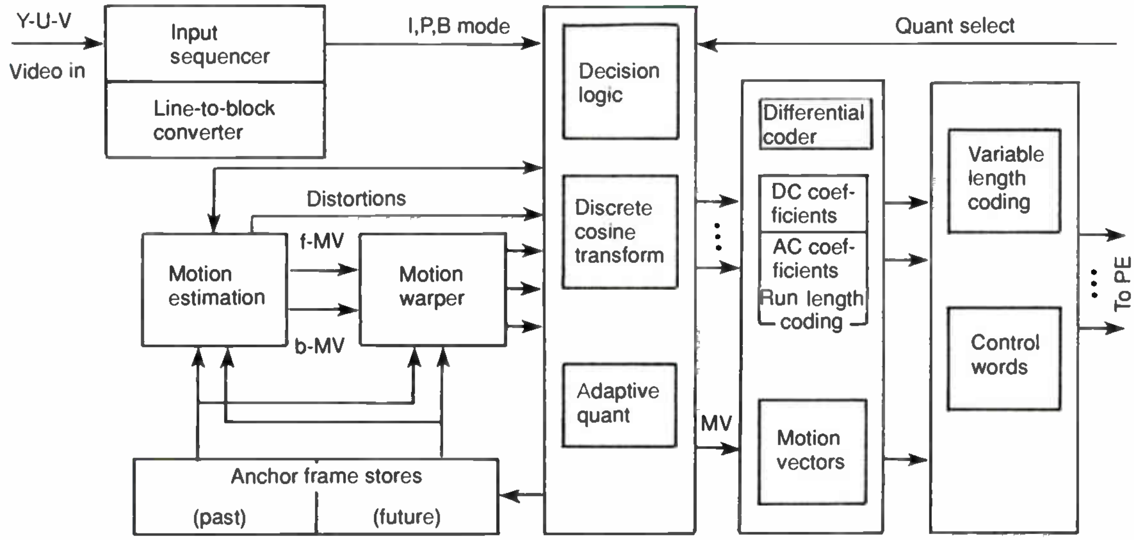
In ADTV error correction constitutes about 23 percent of the total transmitted data rate. In addition to error correction another method is used to combat errors in transmission called error concealment. When FEC cannot correct the data error the error concealment works in various manners similar to techniques such as videotape dropout compensation (pulling the pixel from the preceding TV line to replace the missing one) or by filling in the missing pixel with a pixel interpolated from the preceding and succeeding pixels.

Digital transmission

The modulation selected for digital transmission is 16-QAM. The ADTV system uses spectrum shaping techniques that are designed to avoid mutual interference with co-channel NTSC channels; ATRC calls its 16-QAM modulation SS-QAM. The 16-QAM modulation is a significant portion of the total compression required to transmit the digital HDTV signal in the 6 MHz RF channel. As shown in the table, the digital compression of the HDTV signal achieves a total data rate of 21.00 Mb/s for transmission. This 21.00 Mb/s must be transmitted in a 6 MHz RF channel so a digital modulation technique used in many data transmission schemes (telephone transmission among others) called 16-QAM is used. QAM stands for quadrature amplitude modulation. In this technique two binary AM signals are modulated in quadrature. (See Figure 3.)

Quadrature modulation is the same type of modulation used in NTSC TV for chroma modulation of the 3.58 MHz color subcarrier. In it a carrier is shifted 90° to obtain the second carrier (the quadrature carrier). In 16-QAM a different four-level signal is modulated on each carrier. A four-level signal can be represented by 2 bits. Thus in a data period each carrier can transmit 2 bits each, totalling 4 bits for each period, or a transmission data rate reduction of four times. Such a signal is often represented in a plot called a signal constellation as shown in Figure 4. For more detailed treatments of QAM see References 5, 6 and 7. →

Figure 2: Video compression encoder



f-MV = Forward motion vectors b-MV = Backward motion vectors

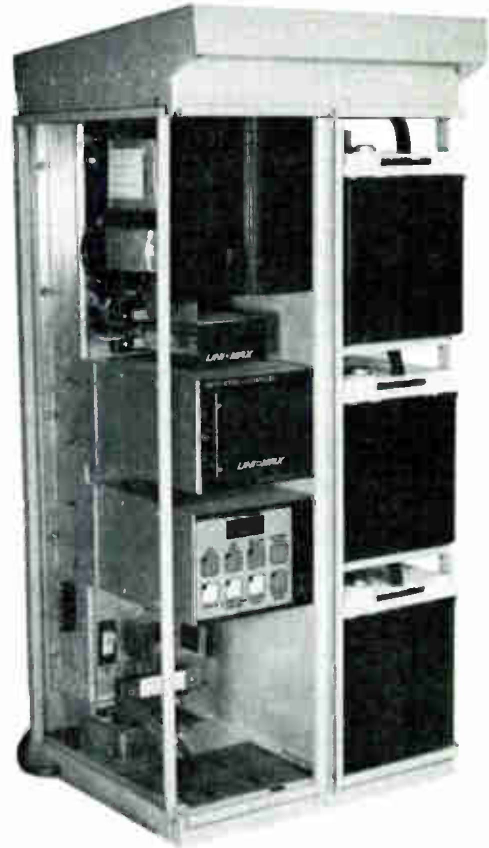
An interesting view on terrestrial broadcast transmission — analog or digital — is presented in a letter from Professor (emeritus) Schreiber of MIT included in an article "The Challenges of Digital HDTV" by R. Jurgen in the April 1991 issue of the *IEEE Spectrum*. Schreiber has long argued for analog transmission of HDTV for terrestrial broadcast. Discussing the future interoperability of computer imaging requirements and entertainment HDTV he makes a telling point: "All proposed HDTV encoders and decoders are entirely digital; it is only the terrestrial transmission format that might be hybrid. Conversion from it directly to non-broadcast formats will occur only rarely. Conversion will be done to computer workstation format, for example, primarily from the production or international exchange formats."

Conclusions

Here is a submission of an all-digital HDTV system to the FCC from a prestigious consortium of companies, of which some have contributed significantly to the history of development of television and others that currently are leading manufacturers of TV equipment. However, as noted in previous columns, now that there are four all-digital HDTV schemes in the hopper, comparisons are inevitable — even required. But the task of comparisons faces insurmountable obstacles at this stage of the affair. At this point we have no hardware to test — only somewhat skimpy system outlines given in rather glowing descriptions (the ADTV system in somewhat less design-specific terms than either the DigiCipher or DSC-HDTV proposals).

Two main areas of each system that must be compared are 1) picture compression — how good is it? and 2) the transmission method — how good is it?

Computer people talk of "lossless" compression. FAX transmission of text is an excellent example. Since the only portions of the "video" of the FAX scan are the black parts of the text, run length coding can be used (a technique used to compress scan line information by storing *counts* of the number of *identical consecutive* pixels until a pixel change). Thus, all the data scanned is reproduced with no loss in a compressed transmission. However, compression of TV frames at a rate of either 1/60 or even 1/30 of a second is much more difficult and cannot be achieved in a totally lossless manner. Television can have enormous detail coupled with large gray scale variations



(typically at least 256 levels) — not to mention color requirements. Thus, in whatever compression scheme is used some of the original picture information will be discarded and or "massaged." "Lossy" compression will result in picture "artifacts," i.e., little differences in the displayed picture compared with the original before compression. It is impossible to predict, for all artifacts, how objectionable they will be to a human viewer. Ultimately *any* TV compression scheme must be evaluated subjectively — i.e., by having a great number of people evaluate it under controlled conditions (these tests are part of the planned tests of the systems for FCC evaluation).

Thus, with only the information available now, comparisons of the picture compression schemes cannot be definitive.

Evaluating the efficacy of the transmission schemes presents equally formidable obstacles. We have no body of experience with terrestrial broadcast of high digital data rates. Several of the submissions (including ADTV) have presented theoretical analyses of coverage, interference, ghosting, etc. However, experience in the real world of transmission amply reveals that nasty, unexpected conditions occur in abundance enough to invalidate a total reliance on an exclusively theoretical analysis not guided by experience in the areas of interest.

It is a safe prediction that the only credible evaluations will be in hardware testing, subjective testing and especially field testing.

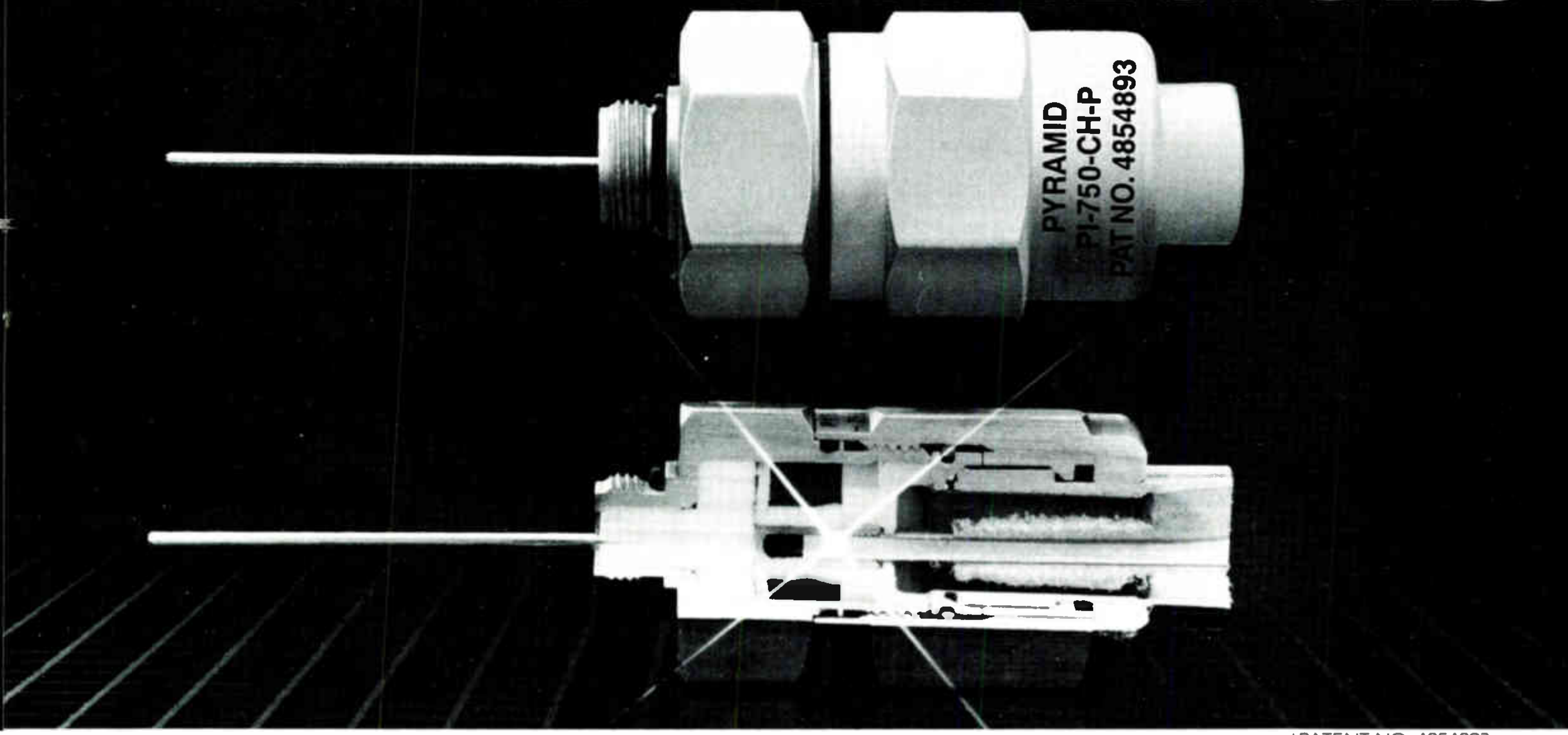
A concern requiring close examination in testing, particularly field testing, is the performance of the 16-QAM modulation especially in terrestrial broadcast. QAM is sensitive to noise (gaussian, impulse and multipath) and phase changes. Digital transmission has many advantages over analog transmission but in the presence of noise it does not degrade gradually as in AM but at a given point tends to fail abruptly and unfortunately very badly. Terrestrial broadcast is a *much* tougher transmission medium for a digital signal than others that may be used for HDTV; i.e., cable or DBS. The interference problems in terrestrial (noise, multipath, phase complications, etc.) are significant concerns in maintaining the integrity of the transmission.

In ADTV the PDP scheme is aimed at some of these problems — additionally, their adaptive equalizer in the ADTV receiver is claimed to be able to cancel single and multiple ghosts up to 16 ms (1/2 of picture width) — it is hoped that this range of ghost canceling may be extended to 40 ms.

Parenthetically it is interesting to note that for satellite transmission, the ATRC proposes a different coding of the bits into symbols, wider transmission bandwidths and data rates — three ADTV channels in a C or Ku bandwidth of 36 MHz and a data rate of 60 Mb/s — two ADTV channels at a DBS bandwidth of 24 MHz and a data rate of 40 Mb/s (all using QPSK modulation).

Apparently some of these compression schemes face application in the marketplace long before the possible advent of HDTV. Already two of the digital HDTV proposers have plans to apply their compression to NTSC first in the cable world and possibly further. As previously noted North American Philips demonstrated the ADTV compression at the NAB convention in Las Vegas. GI had an extensive system demonstration of DigiCipher compression applied to NTSC at the March NCTA convention in New Orleans

Pi SERIES* CONNECTORS



*PATENT NO. 4854893

The First Three Piece Connector In A Two Piece Design.

Join the growing list of MSOs using Pyramid Industries patented two piece connector. The Pi Series has quickly established itself as the hardline connector of the future. It's acceptance by our best salesmen, (the splicers and technicians), has confirmed that Pi Series connectors are truly the connector of the future.

Pi SERIES FEATURES:

- Two piece construction.
- 75 ohm impedance; 30 db return loss to 1 GHz.
- Machined 6262-T6 aluminum body; Irridite finish for maximum weather resistance.
- Teflon and Delrin insulators; machined brass contact.
- Captive Stainless Steel Sleeve located and protected within nut sub-assembly; protects sleeve from damage or removal. Provides optimum impedance match.
- Low-end torque required during wrenching operation; metal to metal positive stop.
- Standard 2" pins.
- Cable jacket is sealed by means of an O-ring located in nut sub-assembly; provides weather seal.
- Visual alignment of center conductor into seizing mechanism; ensures connection.
- Captive sleeve and cable gripping mechanism "float" within restrictions of nut sub-assembly; eases cable insertion.
- Lightweight design reduces shipping costs; eases handling.
- Part number on assembly; simplifies reordering and connector to cable match-ups.
- Rugged design considerations for maximum durability.
- High level of mechanical and electrical integrity; provides consistent performance, reliability and long life.

Call Pyramid Industries today for your free sample of Pi Interface excellence.

PYRAMID
INDUSTRIES, INC.

DISTRIBUTED BY: TONER CABLE: 1-215-675-2053, SIGNAL VISION: 1-714-586-3196, POWER & TELEPHONE SUPPLY: 1-800-238-7514, WESTERN CATV: 1-800-551-2288, REYCOM CORP: 1-512-494-3328, DF COUNTRYMAN: 1-800-328-6820, WEEKS ENTERPRISES: 1-404-963-7870, RMS ELECTRONICS: 1-800-223-8312.

800-829-4529

3700 NORTH 36TH AVENUE
P.O. BOX 23169
PHOENIX, ARIZONA 85063
(602) 269-6431 FAX (602) 272-7372

See us at the SCTE Cable-Tec Expo, Booth 405. Reader Service Number 100

Figure 3: Block diagram of 16-QAM modulator/demodulator

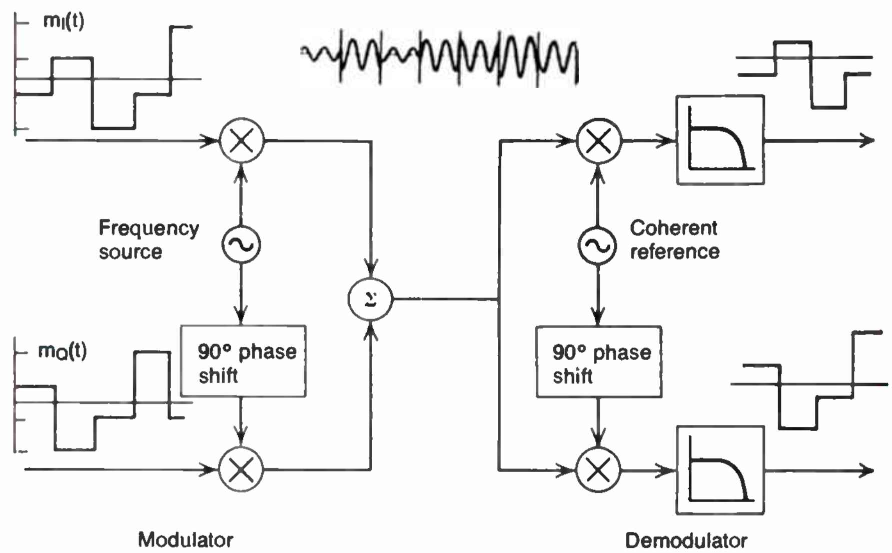
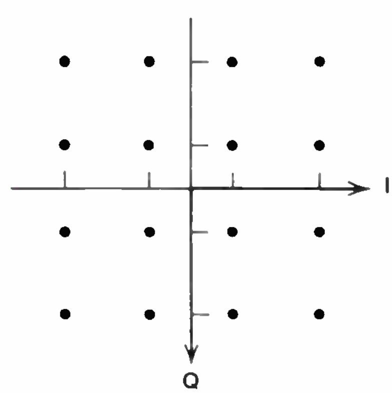


Figure 4: Signal constellation of 16-QAM modulation showing I (in phase) and Q (quadrature)



where it incorporated satellite and cable transmission in its exhibit.

A further indication of the significance of compressed NTSC is apparent in a recent announcement by CableLabs of the formation of a consortium consisting of it, GI and Scientific-Atlanta to direct their "efforts toward two key areas: the distribution of compressed, digitally transmitted NTSC signals on cable TV systems and cable TV delivery of HDTV."

Dr. Walt Ciciora discussed these digitally compressed NTSC applications in a presentation of an interesting paper[8] on the subject at the NCTA convention. He concluded that "the biggest problem with video compression is that there are so many choices. Some of the choices can be practically realized in the short term, others require patience."

Whatever HDTV system eventually is approved by the FCC it is abundantly apparent that we will have real world applications of some of the digital compression methodologies applied to NTSC long before the arrival of that great judgement day — vel caeco appareat. **CT**

References

[1] "An Overview of the JPEG and MPEG Video Compression Specifications," W. Woodward, *1991 NCTA Technical Papers*.
[2] *Digital Television*, R. Stafford, Wiley, 1980.
[3] *Digital Coding of Waveforms*, N. Jayant, P. Noll, Prentice-Hall, 1984.
[4] *Advanced Digital Communications, Systems and Signal Processing Techniques*, K. Feher, Prentice-Hall, 1987.
[5] *Information Transmission, Modulation and Noise*, M. Schwartz, McGraw-Hill, 1980.
[6] *Digital Telephony*, J. Bellamy, Wiley, 1982.
[7] *Digital Communications: Microwave Applications*, K. Feher, Prentice-Hall, 1981.
[8] "Scenarios for Compressed Video in Cable Practice," W. Ciciora, *1991 NCTA Technical Papers*.

Amphenol® 59 Series Environmental Connector

Amphenol® 6 Series Environmental Connector

THE CONNECTOR

Amphenol's® new design features three separate seals to protect against signal and environmental leakage — more than any other connector on the market. Its unique round crimp eliminates the six "water channels" found in traditional hex crimp connectors. An O-ring helps prevent corrosion and an inner gasket effectively seals the interface to dramatically decrease drop-related service calls. The connector's innovative one-piece design is easy to install — no lost pieces or cumbersome boots and grease. All three seals in one easy piece!

THE CABLE

Times Fiber® has recently introduced T-10 drop cable, the perfect complement to Amphenol's triple-sealed connector. T-10 drop cable features 1GHz capacity and comes with Times Fiber's own lifeTime™, the original corrosion-inhibiting, nonflowing, aerial flooding agent.

THE SYSTEM

The Amphenol Connector, used with Times Fiber's T-10 lifeTime drop cable, provides the maximum corrosion protection in today's market. It's an environmentally sealed system. But there's more.

The Amphenol T-10 Connection can:

- Potentially save up to ⅓ the installation time
- Help prevent costly CLI fines
- Prepare your cable system *today* for the technological needs of tomorrow.

For more information on The Environmental Connection, ask your TFC representative or call 1-800-TFC-CATV.

The Amphenol Connector and 1GHz T-10 with lifeTime — your answer to corrosion and leakage — your Environmental Connection.

TFC TIMES FIBER COMMUNICATIONS, INC.®
a company of
LPL Technologies, Inc.

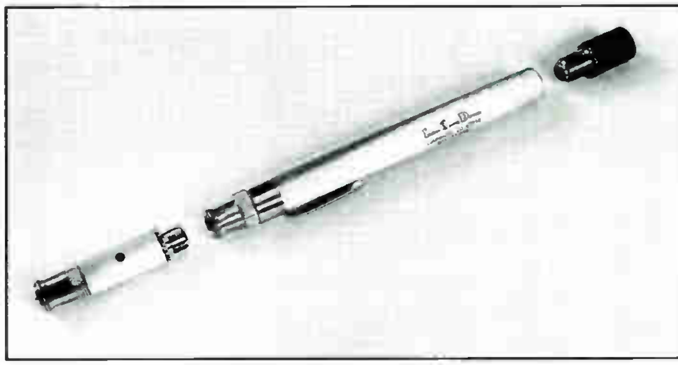
358 Hall Ave. • P.O. Box 384 • Wallingford, CT 06492

TFC...*Where technology meets the bottom line.*

See us at the SCTE Cable-Tec Expo, Booth 1014. Reader Service Number 102

Labor Saving Devices' PCT1 pocket cable tester

By Ron Hranac
Senior Technical Editor



I was thumbing through the most recent card deck that *Communications Technology* mails out a couple times each year and ran across an information request card for a low-cost pocket cable tester. I phoned the distributor, MAB Corp., and requested one for evaluation.

Installers and technicians have used a variety of techniques over the years for identifying individual cables in a group. Everything from simple multimeters to sophisticated instruments have been used. But as far as simplicity and ease of operation are concerned, the PCT1 pocket cable tester from Labor Saving Devices is one of the more convenient ideas to come along in a while.

Physically similar to an oversized pen that will fit in your shirt pocket, the PCT1 works in principle like a battery and lightbulb that can be used to determine which cable is which. Connect the battery to one end of a cable, and take the lightbulb to the other end and try it on various cables until it lights up. That's your drop! →

"As far as simplicity and ease of operation are concerned, the PCT1 pocket cable tester from Labor Saving Devices is one of the more convenient ideas to come along in a while."

BROADCAST PREMIER.

Presenting the Drake ESR 1240 Integrated Receiver/Decoder.

Drake has been in business long enough to know what you demand in an IRD.

The Drake ESR1240 IRD delivers high performance in an affordable, compact unit that combines a commercial grade satellite receiver with an integrated VideoCipher® II Commercial Descrambler Module.

The ESR1240 IRD uses a new low noise 70 MHz IF with threshold extension to provide the best possible picture and low data error rates under weak signal conditions.

Convenient front panel access.

The ESR1240 IRD's front panel design allows easy access to the descrambler module without having to remove the unit from its rack mounted position.

Two front panel LEDs show sync and authorization status of the descrambler module. A two-digit LED display indicates C band channel selection. Channels 1-24 can be tuned in by the ESR1240 IRD's front panel channel selection switch and fine tuning control.

Complete video and audio reception control.

When a signal is received, video output is automatically switched between descrambled video and normal clamped video, providing crisp, clear video from either scrambled or unscrambled signals. Also, digital stereo audio is available with a choice of balanced or unbalanced outputs for left and right channels. The subcarrier audio demodulator is tunable from the front panel.

Famous Drake quality.

Backed by a one-year limited warranty, the Drake ESR1240 IRD complies with and exceeds the latest industry standards. All in a highly reliable, efficient and affordable unit designed with you, the cable operator, in mind.

Because Drake has made its business on knowing your business.

Contact us for the name of your nearest Drake distributor.

DRAKE®

R. L. Drake Company
P.O. Box 112, Miamisburg, Ohio 45342 U.S.A.
Sales: (513) 866-2421, Fax: (513) 866-0806
In Canada: (705) 742-3122
Service and Parts: (513) 866-3211

Made in America by Drake . . . a world leader in communication products since 1943.

The PCT1 works much like this, and for added versatility also will tell you if a splitter or anything resembling a short circuit is present in the line. After the evaluation sample arrived, we put it through its paces in the lab and a subscriber environment.

The product

Labor Savings Devices' pocket cable tester is a three-piece device that is 1/2 inch in diameter by 7-13/16 inches overall length. The main body, or *power pack*, is 1/2 inch by 5-1/16 inches, and includes two AAA batteries for a power source. The power pack section also has a male push-on F-connector on one end, a threaded (same threads as a standard F-connector) female receptacle on the other end and a pen-style clip for your pocket. The power pack is brushed aluminum, except for the push-on F-connector and pocket clip.

The second section is called the *ID cap*, and threads into the receptacle on the end of the power pack for convenient storage. The ID cap is 1/2 inch by 1-3/16 inches, although only 7/8 inch of it is exposed when it is stored in the end of the power pack. The threaded portion of the ID cap is half of an F-81 barrel connector, and the remainder is black plastic with a red LED in the end (more on this later).

The third section is called the *bandit*, and is 1/2 inch by 2-3/16 inches. A small red LED is located on the side of the bandit. One end of the bandit is equipped with a male push-on F-connector and the other end a female (barrel) F-connector. During storage and some applications, the bandit's barrel connector is plugged in to the power pack's push-on connector.

To use the PCT1 to test for a splitter in the line, the power pack with the bandit attached is connected to the cable in question using the push-on connector on the end of the bandit. If the red LED on the side of the bandit glows, then either a splitter or short circuit are present. If the LED does not glow, you can proceed to the cable identification step. (Note: The manufacturer recommends testing each cable to see if a splitter is present first, since any DC-type short or low resistance may prematurely drain the batteries in the power pack.)

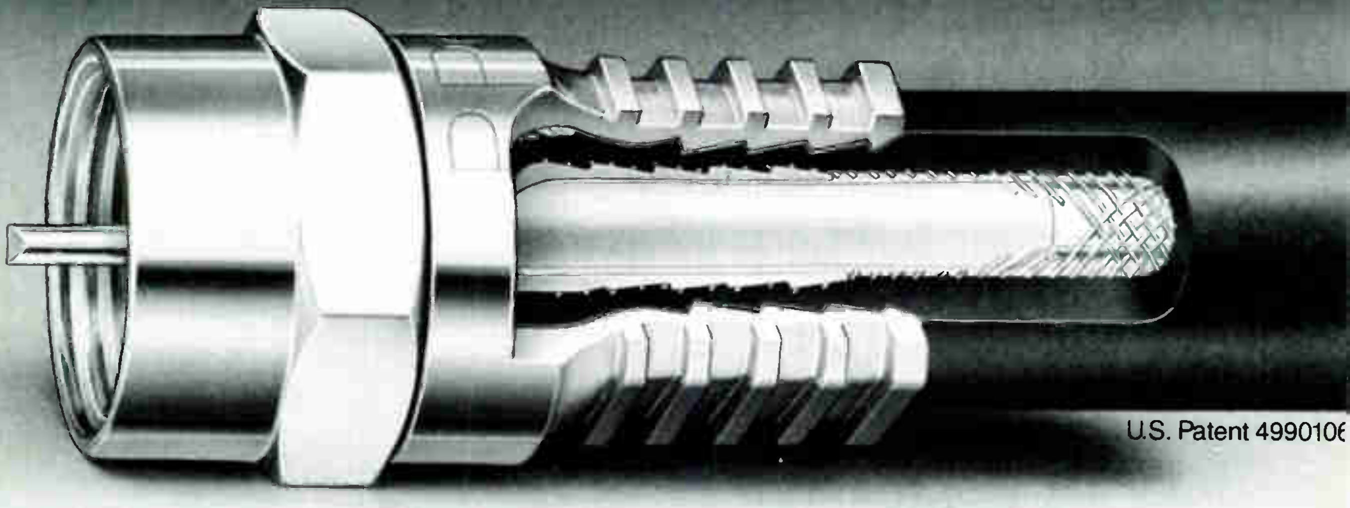
To use the pocket cable tester to identify unknown cables, first remove the bandit from the power pack. Connect the power pack's push-on connector to one end of the cable in question — for example, an outlet in an apartment — and unscrew the ID cap from the end of the power pack. Take the ID cap to the cable home run location and connect it to the unknown cables one at a time until its red LED lights up. The cable in question is now identified. Repeat this procedure as needed for other cables.

The PCT1 includes batteries already installed in the power pack, has a lifetime warranty and at the time of the evaluation cost $29.95.

Lab test

This is one of those devices that doesn't require an expensive network analyzer or automatic video measurement system to evaluate. We used a Hewlett-Packard E2378A digital multimeter to check the voltages generated by the PCT1's batteries, power pack and bandit. Beyond that, the evaluation consisted of testing the bandit/power pack combination with a variety of passive devices and other

THE NEW PPC SERIES OF UNIVERSAL "F" CONNECTORS



PPC gives you a better grip on the future!

Unique "Tite-Bite" inner teeth design firmly grasps and surrounds the braid and jacket during crimping for a 360° seal that does **not** squash or damage the dielectric. The new design virtually eliminates RF leakage and offers improved weatherproofing and better performance over current state of the art connectors.

A single connector for RG-6 or one for RG-59 accommodates a wide range of cable, from 40% through quad. Color coding the connectors (clear chromate conversion finish on the RG-6 and gold chromate conversion on the RG-59, along with individual identification, stamping of each connector) helps simplify and assure "consistency" throughout your drop cable installations.

See us at the SCTE Cable-Tec Expo, Booth 1002.
Reader Service Number 107

For Information Call Today!
1-800-468-2288

PRODUCTION PRODUCTS COMPANY
Division of John Mezzalingua Associates Inc.
One Mezzy Lane, Manlius, NY 13104

in-line components, as well as actually identifying unknown cables in a multiple drop installation in the field.

The two AAA batteries in series produced an unloaded DC voltage of 3.163 volts, the same that was measured at the power pack's push-on F-connector. With the bandit attached to the power pack, the unloaded DC voltage at the bandit's push-on connector was 1.898 volts.

A DC short or moderately low resistance is supposed to cause the LED on the side of the bandit to glow to indicate the presence of a splitter. We found that even up to 1 megohm (1 million ohms) would cause the LED to glow, although not nearly as brightly as a dead short.

Several types of drop splitters were connected to the bandit/power pack and all illuminated the LED. The same was true for miniature in-line directional couplers and subscriber tap drop ports. Various values of in-line drop attenuators also illuminated the bandit's LED. A DC block, as expected, did not illuminate the LED.

We then checked the bandit/power pack on several set-top converters' input and output connectors. Depending on the brand of converter and which port was checked, we got a variety of results. Some would not illuminate the LED at all, some lit it brightly, and some caused it to glow at varying brightness.

From this it is apparent the PCT1, when used in the splitter identification mode, will indicate the presence of many conditions other than a completely open line. By itself, the fact that the bandit's LED glows during such a test does not guarantee that a splitter is the cause. A short in the cable or any number of devices will result in the same indication.

The use of the ID cap and power pack for identifying unknown cables worked as claimed and was very straightforward, although the presence of any condition or device that would cause the bandit's LED to glow may prevent proper use of the ID cap. Thus, if cables you want to test are connected to a splitter or similar device, they should be disconnected before proceeding with the cable identification test.

Comments

The PCT1 pocket cable tester is a device that should save time identifying unknown cables, particularly in MDU and other multiple outlet situations. Given its low cost, the limitations we found during testing are reasonable, and it's easier than many other methods.

The instruction sheet that accompanies the cable tester does little more than describe the two main test procedures the PCT1 is designed for. It makes no mention of detailed applications or the possible limitations that may be encountered — short circuits instead of splitters, for example. The sheet does not even include information on replacing the power pack's batteries. (Access to the battery compartment is made by unscrewing the receptacle end of the power pack.)

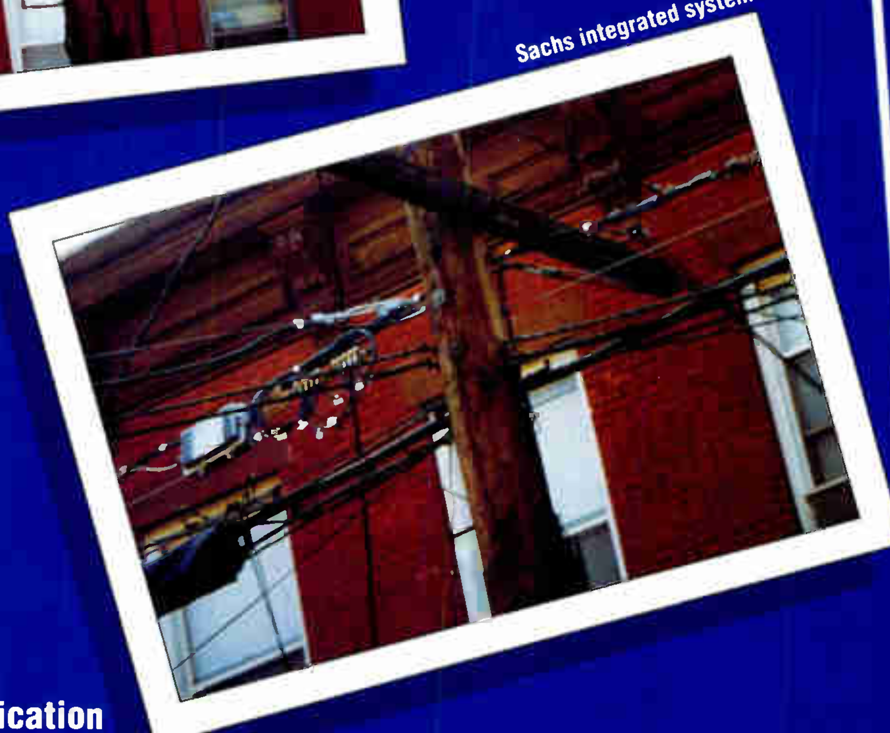
In spite of this, the PCT1 is still a useful tool, and its compact size will make it a favorite. I would recommend some care with it, though, since I found that the power pack's push-on connector loosened a bit after repeated use, and it would not hold the bandit as firmly as I would like.

For more information, contact MAB Corp., P.O. Box 14, Horrum & Elm, Dix, Neb. 69133, telephone (800) 535-2850 or (308) 682-5391. **CT**

Standardize your installation

Before

Sachs integrated system



The SACHS SYSTEM provides:

- Quality products with excellent corrosion resistance
- UL and CSA approved grounding
- Products that meet today's cable system's needs
- Seminar on techniques and specifications
- Training on method and application
- On site inspection on application
- Custom design products

MORE THAN 17 YEARS OF INNOVATION AND SOLUTIONS FOR YOUR CABLE SYSTEM PERFORMANCE

SACHS®

Reader Service Number 109

Sachs Canada Inc. (CORPORATE OFFICE)
745, Avoca Avenue, Dorval (Quebec) H9P 1G4
Tel.: (514) 636-6560 / Fax: (514) 636-0794

Sachs Communications Inc. (CORPORATE SALES OFFICE)
9200, East Mineral Avenue, Englewood, Colorado 80112
Tel.: 1-800-829-SACHS / Fax: (303) 790-7343

Digitizing scopes

Tektronix announced its TDS series oscilloscopes, the two-channel TDS 520 and the four-channel TDS 540. They have 500 MHz bandwidth at 1 MΩ and 50 Ω, sampling rates to 1 GS/s and record lengths to 50,000 points (that are combined with true 8-bit vertical resolution), fast overdrive recovery, calibrated DC offset, 1 mV/division sensitivity, and internal calibration to ensure high fidelity waveform acquisitions.

An amplifier circuit produces gain changes with minimal effect on bandwidth and the same circuit also contains switchable anti-alias/bandwidth limit filters for the user's convenience. The scopes can recover from overdrive to within 1 percent in 20 ns.

Reader service #141

Interference locator

Trilithic unveiled its PLI-150 power line interference locator system designed for TVI problems of the CATV operator. It includes a receiver optimized for TVI measurement and a mobile antenna and vehicle mount for drive-through surveys.

The system also features a portable directional antenna for pinpointing the TVI source to the nearest pole. A step-by-step procedure for finding power-related TVI sources also is included with the product.

Reader service #142

Surge protector

Variations on the basic design of the Amp Clamp by Alpha Technologies were announced. The changes allow the use of circuitry couplers and splitters, which allows operators to extend power protection further into distribution portions of a plant.

Versions also are being offered for amplifiers that use the power circuitry within the amplifier housing. Operators are invited to contact the company on any special Amp Clamp requirements they may have and it will develop new versions on a first-come, first-served basis.

Reader service #144

Amplifiers

The second in the QDA series, a high gain indoor distribution amplifier, was introduced by Quality RF Services. Now available in the higher gains of 40 and 45 dB, standard features include separate gain and tilt controls,

Hex Crimpers*

Ben Hughes/Cable Prep

Part Number	Minor Hex	Hex	Major Hex
HCT-659	.262		.324
HCT-USA			.360
HCT-611	.324		.410
HCT-6QS	.324		.360
HCT-660	.324		.384
HCT-986	.324		.360
HCT-669	.262	.324	.384
HCT-214	.162		.470
HCT-911	.262		.410
HCT-902	.475	.324	.100

LRC

Part Number	Minor Hex	Hex	Major Hex
CT-601	.260		.324
CT-596	.262		.324
HCT-6QS	.324		.360
CT-611-QS	.360		.470

Ripley/Cablematic

Part Number	Minor Hex	Hex	Major Hex
CR-596-B	.262		.324
CR-596-Q	.324		.384
CR-596-QR	.324		.384
CR-596-11	.324		.410
CR-596-QL2	.068	.324	.360
CR-360			.360
CR-360-R	.324		.360
CR-596-QL	.324		.360
CR-596-QLR	.096		.360
CR-211-CX	.100		.475
CR-611-Q	.324		.475
CR-611-Q2	.100	.324	.475
CR-611-QL	.324		.470

Gilbert

Part Number	Minor Hex	Hex	Major Hex
G-CRT-659	.262		.324
G-CRT-660	.324		.384
G-CRT-804	.262	.324	.384
G-CRT-986	.324		.360
G-CRT-USA			.360

Lemco

Part Number	Minor Hex	Hex	Major Hex
R-731	.262	.324	.384
R-953	.324		.360
R-842	.324		.360

PPC

Part Number	Minor Hex	Hex	Major Hex
HCT-659	.262		.324
HCT-911	.262		.410
HCT-660	.324		.384
HCT-611	.324		.410
HCT-360-U			.360

Sargent/Rostra

Part Number	Minor Hex	Hex	Major Hex
3150-CCT	.262	.324	.384
3152-CCT	.068	.178	.324
3154-CCT	.324		.360
3350-CCT	.262	.324	.384
3354-CCT	.324		.360
4158-CCT	.068/.100	.324	.360
6158-CCT	.068/.100	.324	.360

* Identify the fittings and hex crimp sizes you need, then find the appropriate tool from the above list.

Round Crimpers

Amphenol

Part Number	Minor Crimp	Major Crimp
65-1432	.276	.325
227-1432	.276	.325

SCTE

Interface Practices Committee

COMM
TECHN

Official trade journal

E

Foam Dielectric, APA Bonde

59 Series

Braid Coverage	Part Number	Gilbert Fitting	Gilbert Crimp	Fitting
53% Braid	9102 9103 9067	GF-59-AHS-290 GF-59-AHS-USA	.324 .360	F-59-C AMF-5
67% Braid	9104 9105	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-C AMF-5
95% Braid	9108 9109	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-C AMF-5
Tri-Shield (53%)	9110 9111	GF-59-AHS-290 GF-59-AHS-USA	.324 .360	F-59-C AMF-5
(77%)	9052 9053 9063	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-C AMF-5
(95%)	9054 9055	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-C AMF-5

6 Series

Braid Coverage	Part Number	Gilbert Fitting	Gilbert Crimp	Fitting
61% Braid	9116 9117 9066	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-C AMF-6
Tri-Shield (61%)	9056 9057	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-C AMF-6
(77%)	9058 9059 9062	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-C AMF-6
(95%)	9060 9061	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-C AMF-6

T

Foam Dielectric, APA

59 Series

Braid Coverage	Part Number	Gilbert Fitting	Gilbert Crimp	Fitting
53% Braid	5900 5901 5902	GF-59-AHS-290 GF-59-AHS-USA	.324 .360	F-59-C AMF-5
67% Braid	5910 5911 5912	GF-59-AHS-290 GF-59-AHS-USA	.324 .360	F-59-C AMF-5
95% Braid	5960 5961 5962	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-H AMF-5
Tri-Shield (67%)	5970 5971 5972	GF-59-AHS-290 GF-59-AHS-USA	.324 .360	F-59-C AMF-5
(95%)	5990 5991 5992	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-H AMF-5
Quad-Shield	5950 5951 5952	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-C AMF-5

6 Series

Braid Coverage	Part Number	Gilbert Fitting	Gilbert Crimp	Fitting
60% Braid	6000 6001 6002	GF-6-AHS-322 GF-6-AHS-USA	.324 .360	F-56-C AMF-6
90% Braid	6060 6061 6062	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-C AMF-6
Tri-Shield (60%)	6070 6071 6072	GF-6-AHS-312 GF-6-AHS-USA	.324 .360	F-56-C AMF-6
(90%)	6090 6091 6092	GF-6-AHS-322 GF-6-AHS-USA	.324 .360	F-56-C AMF-6
Quad-Shield	6050 6051 6052	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-Q AMF-6

Compiled by Barry Smith, Times Fib

Pull-out Wall Chart

COMMUNICATIONS TECHNOLOGY'S

F-FITTING CROSS-REFERENCE CHART

NOTICE OF DISCLAIMER

The following manufacturers and the SCTE Interface Practices Committee make no representation or warranty, expressed or implied with respect to the sufficiency, accuracy or utility of any information or opinion contained herein. The SCTE Interface Practices Committee expressly advises that any use of or reliance on said information or opinion is at the risk of the user. The manufacturers and the SCTE Interface Practices Committee shall not be liable for any damage or injury incurred by any person arising out of the sufficiency, accuracy or utility of any information or opinion herein. Transcription, duplication, reproduction or disclosure of this information without the inclusion of this notice is unauthorized.

While the connectors listed are the manufacturers' recommendations based on various parameters such as pull strength, esthetics, ease of assembly and cable trim specifications, etc., it is not a negative recommendation if manufacturers and connectors are not included. This tabulation is a starting point for the proper selection of a cable and connector combination.

When publishing data of this nature, problems of a remarkably short useful life occur almost immediately. Therefore the SCTE Interface Practices Committee recommends contacting the appropriate manufacturer for the most current information available. Another way to determine an acceptable connector and cable combination is to send samples of the cable along with requirements to your connector supplier.

Amphenol Corp./Times Fiber ....(800) 832-2288
Belden Electronic Wire and Cable ....(800) 235-3362
Ben Hughes/Cable Prep ....(203) 526-4337
Cablematic/Ripley Co. Inc. ....(203) 635-2200
Comm/Scope Inc. ....(800) 982-1708
Gilbert Engineering ....(800) 528-0199
Lemco Tool Corp. ....(800) 233-8713
LRC Electronics Inc. ....(800) 332-8428
Production Products Co. ....(800) 468-2288
Pyramid Industries Inc. ....(800) 829-4529
QF/Signal Vision ....(714) 586-3196
Sargent/Rostra Tool Co. ....(203) 488-8665
Times Fiber Communications Inc. ....(800) 832-2288
Trilogy Communications Inc. ....(800) 874-5649

Non-Sealed F-Fitting

BELDEN

d Foil Tape, includes CATVX and CATV (UL)
May require special cable prep dimensions and/or tools.

LRC		PPC		Pyramid		QF	Raychem
	Crimp	Fitting	Crimp	Fitting	Crimp	Fitting	Fitting
H 9	.324 .360	CFS-59-UV	.360	F-59-ALM	.324	QF-59-RNS	EZ Twist-59
H 9	.324 .360	CFS-59-UV	.360	F-59-ALM F-59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
S 9	.324 .360	CFS-59-UV	.360	F-59-S F-59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
H	.324 .360	CFS-59-UV	.360	F-59-ALM F-59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
H 9	.324 .360	CFS-59-UV	.360	F-59-ALM F-59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
S 9	.324 .360	CFS-59-UV	.360	F-59-S F-59-UNI	.324 .360	QF-59-RNS	EZ Twist-59

LRC		PPC		Pyramid		QF	Raychem
	Crimp	Fitting	Crimp	Fitting	Crimp	Fitting	Fitting
H	.324 .360	CFS-56-UV	.360	F-56-ALM F-56-UNI	.324 .360	QF-56-RNS	EZ Twist-6
H	.324 .360	CFS-56-UV	.360	F-56-ALS F-56-UNI	.360 .360	QF-56-RNS	EZ Twist-6
H	.324 .360	CFS-56-UV	.360	F-56-ALS F-56-UNI	.360 .360	QF-56-RNS	EZ Twist-6
H	.324 .360	CFS-56-UV	.360	F-56-ALS F-56-UNI	.360 .360	QF-56-RNS	EZ Twist-6

COMM/SCOPE

Foam Dielectric, APA Bonded Foil Tape, includes CATVX and C
May require s

59 Series

Braid Coverage	Part Number	Gilbert		LRC		PPC	
		Fitting	Crimp	Fitting	Crimp	Fitting	Crimp
53% Braid	F5953BV F5953BVM F5953BEF	GF-59-AHS-290 GF-59-AHS-USA	.324 .360	F-59-CH AMF-59	.324 .360	CFS-59-UV	.360
67% Braid	F5967BV F5967BVM F5967BEF	GF-59-AHS-290 GF-59-AHS-USA	.324 .360	F-59-CH AMF-59	.324 .360	CFS-59-UV	.360
95% Braid	F5995BV F5995BVM F5995BEF	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-HB AMF-59	.324 .360	CFS-59-UV	.360
Tri- (67%) Shield	F59TSV F59TSVM	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-HB AMF-59	.324 .360	CFS-59-UV	.360
Quad-Shield	F59SSV F59SSVM F59SSEF	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-QS AMF-59	.324 .360	CFS-59-UV	.360

6 Series

Braid Coverage	Part Number	Gilbert		LRC		PPC	
		Fitting	Crimp	Fitting	Crimp	Fitting	Crimp
60% Braid	F660BV F660BVM F660BEF	GF-6-AHS-322 GF-6-AHS-USA	.324 .360	F-56-CH AMF-6	.324 .360	CFS-56-UV	.360
90% Braid	F690BV F690BVM F690BEF	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-CH AMF-6	.324 .360	CFS-56-UV	.360
Tri- (60%) Shield	F6TSV F6TSVM	GF-6-AHS-322 GF-6-AHS-USA	.324 .360	F-56-CH AMF-6	.324 .360	CFS-56-UV	.360
Quad-Shield	F6SSV F6SSVM F6SSEF	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-QS AMF-6	.360 .360	CFS-56-UV	.360

TRILOGY

Bonded Foil Tape, includes CATV (UL)
May require special cable prep dimensions and/or tools.

LRC		PPC		Pyramid		QF	Raychem
	Crimp	Fitting	Crimp	Fitting	Crimp	Fitting	Fitting
H	.324 .360	CFS-59-UV	.360	F-59-ALM	.324	QF-59-RNS	EZ Twist-59
H	.324 .360	CFS-59-UV	.360	F-59-ALM F-59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
B	.324 .360	CFS-59-UV	.360	F-59-S F-59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
H	.324 .360	CFS-59-UV	.360	F-59-ALM F-59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
B	.324 .360	CFS-59-UV	.360	F-59-ALM F-59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
S	.324 .360	CFS-59-UV	.360	F-59-S F-59-UNI	.324 .360	QF-59-RNS-QD	EZ Twist-59

LRC		PPC		Pyramid		QF	Raychem
	Crimp	Fitting	Crimp	Fitting	Crimp	Fitting	Fitting
H	.324 .360	CFS-56-UV	.360	F-56-ALM F-56-UNI	.324 .360	QF-56-RNS	EZ Twist-6
H	.324 .360	CFS-56-UV	.360	F-56-ALS F-56-UNI	.360 .360	QF-56-RNS	EZ Twist-6
H	.324 .360	CFS-56-UV	.360	F-56-ALM F-56-UNI	.324 .360	QF-56-RNS	EZ Twist-6
H	.324 .360	CFS-56-UV	.360	F-56-ALS F-56-UNI	.360 .360	QF-56-RNS	EZ Twist-6
S	.360 .360	CFS-56-UV	.360	F-56-ALS F-56-UNI	.360 .360	QF-56-RNS-QD	EZ Twist-6

TIMES FIBER

Foam Dielectric, APA Bonded Foil Tape, includes CATV
May require

59 Series

Braid Coverage	Part Number	Gilbert		LRC		PPC		
		Fitting	Crimp	Fitting	Crimp	Fitting	Crimp	
53% Braid	2345 2347 2374	GF-59-AHS-290 GF-59-AHS-USA	.324 .360	F-59-CH AMF-59	.324 .360	CFS-59-UV	.360	F-5
67% Braid	2183 2185 2186	GF-59-AHS-290 GF-59-AHS-USA	.324 .360	F-59-CH AMF-59	.324 .360	CFS-59-UV	.360	F-59 F-59
95% Braid	2545 2547 2574	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-HB AMF-59	.324 .360	CFS-59-UV	.369	F-59 F-5
Tri- (53%) Shield	2602 2603 2604	GF-59-AHS-290 GF-59-AHS-USA	.324 .360	F-59-CH AMF-59	.324 .360	CFS-59-UV	.360	F-59 F-5
(80%)	2607 2608 2609	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-HB AMF-59	.324 .360	CFS-59-UV	.360	F-5 F-5
Quad-Shield	2245 2247 2274	GF-59-AHS-312 GF-59-AHS-USA	.324 .360	F-59-QS AMF-59	.324 .360	CFS-59-UV	.360	F- F-

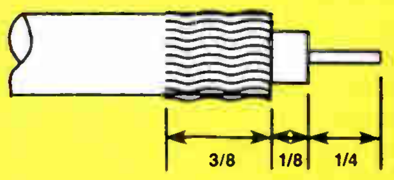
6 Series

Braid Coverage	Part Number	Gilbert		LRC		PPC	
		Fitting	Crimp	Fitting	Crimp	Fitting	Crimp
60% Braid	2360 2364 2386	GF-6-AHS-322 GF-6-AHS-USA	.324 .360	F-56-CH AMF-6	.324 .360	CFS-56-UV	.360
90% Braid	2560 2564 2586	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-CH AMF-6	.324 .360	CFS-56-UV	.360
Tri- (53%) Shield	2622 2623 2624	GF-6-AHS-322 GF-6-AHS-USA	.324 .360	F-56-CH AMF-6	.324 .360	CFS-56-UV	.360
(80%)	2627 2628 2629	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-CH AMF-6	.324 .360	CFS-56-UV	.360
Quad-Shield	2260 2264 2286	GF-6-AHS-342 GF-6-AHS-USA	.324 .360	F-56-QS AMF-6	.360 .360	CFS-56-UV	.360

er Communications

ITTING REFERENCE

Conventional Prep



ATV (UL)
pecial cable prep dimensions and/or tools.

Pyramid		QF	Raychem
itting	Crimp	Fitting	Fitting
-59-ALM	.324	QF-59-RNS	EZ Twist-59
-59-ALM -59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
-59-S -59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
-59-S -59-UNI	.324 .360	QF-59-RNS	EZ Twist-59
-59-S -59-UNI	.324 .360	QF-59-RNS-QD	EZ Twist-59

Pyramid		QF	Raychem
itting	Crimp	Fitting	Fitting
-56-ALM -56-UNI	.324 .360	QF-56-RNS	EZ Twist-6
-56-ALS -56-UNI	.360 .360	QF-56-RNS	EZ Twist-6
-56-ALM -56-UNI	.324 .360	QF-56-RNS	EZ Twist-6
-56-ALS -56-UNI	.360 .360	QF-56-RNS-QD	EZ Twist-6

(UL)
special cable prep dimensions and/or tools.

Pyramid		QF	Raychem
ing	Crimp	Fitting	Fitting
-ALM	.324	QF-59-RNS	EZ Twist-59
-ALM UNI	.324 .360	QF-59-RNS	EZ Twist-59
-S -UNI	.324 .360	QF-59-RNS	EZ Twist-59
ALM -UNI	.324 .360	QF-59-RNS	EZ Twist-59
9-S 9-UNI	.324 .360	QF-59-RNS	EZ Twist-59
i9-S 59-UNI	.324 .360	QF-59-RNS-QD	EZ Twist-59

Pyramid		QF	Raychem
itting	Crimp	Fitting	Fitting
-56-ALM -56-UNI	.324 .360	QF-56-RNS	EZ Twist-6
-56-ALS -56-UNI	.360 .360	QF-56-RNS	EZ Twist-6
-56-ALM -56-UNI	.324 .360	QF-56-RNS	EZ Twist-6
-56-ALS -56-UNI	.360 .360	QF-56-RNS	EZ Twist-6
-56-ALS -56-UNI	.360 .360	QF-56-RNS-QD	EZ Twist-6

Environmentall

BELDEN

Foam Dielectric, APA Bonded Foil Tape, Includes CATVX and CATV (UL)
May require special cable prep dimensions and/or tool

59 Series

Braid Coverage	Part Number	Amphenol		Gilbert		LRC	PPC		Raychem
		Fitting	Crimp	Fitting	Crimp	Fitting	Fitting	Crimp	Fitting
53% Braid	9102 9103 9067	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
67% Braid	9104 9105	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
95% Braid	9108 9109	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
Tri- (53%) Shield	9110 9111	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
(77%)	9052 9053 9063	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
(95%)	9054 9055	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59

6 Series

Braid Coverage	Part Number	Amphenol		Gilbert		LRC	PPC		Raychem
		Fitting	Crimp	Fitting	Crimp	Fitting	Fitting	Crimp	Fitting
61% Braid	9116 9117 9066	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
Tri- (61%) Shield	9056 9057	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
(77%)	9058 9059 9062	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
(95%)	9060 9061	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6

TRILOGY

Foam Dielectric, APA Bonded Foil Tape, Includes CATV (UL)
May require special cable prep dimensions and/or tool

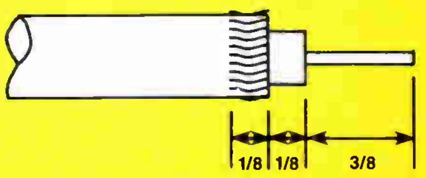
59 Series

Braid Coverage	Part Number	Amphenol		Gilbert		LRC	PPC		Raychem
		Fitting	Crimp	Fitting	Crimp	Fitting	Fitting	Crimp	Fitting
53% Braid	5900 5901 5902	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
67% Braid	5910 5911 5912	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
95% Braid	5960 5961 5962	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
Tri- (67%) Shield	5970 5971 5972	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
(95%)	5990 5991 5992	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
Quad- Shield	5950 5951 5952	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59QS-NS	CFS-59-SUV	.360	EZF-59

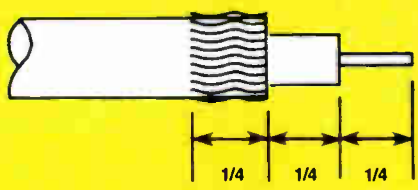
6 Series

Braid Coverage	Part Number	Amphenol		Gilbert		LRC	PPC		Raychem
		Fitting	Crimp	Fitting	Crimp	Fitting	Fitting	Crimp	Fitting
60% Braid	6000 6001 6002	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
90% Braid	6060 6061 6062	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
Tri- (60%) Shield	6070 6071 6072	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
(90%)	6090 6091 6092	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
Quad- Shield	6050 6051 6052	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6QS-NS	CFS-56-SUV	.360	EZF-6

Raychem EZF Prep



Gilbert USA, LRC SNS, Amphenol Prep



y Sealed F-Fitting

COMM/SCOPE

Foam Dielectric, APA Bonded Foil Tape, includes CATVX and CATV (UL)

May require special cable prep dimensions and/or tools.

59 Series

Braid Coverage	Part Number	Amphenol		Gilbert		LRC	PPC		Raychem
		Fitting	Crimp	Fitting	Crimp	Fitting	Fitting	Crimp	Fitting
53% Braid	F5953BV F5953BVM F5953BEF	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
67% Braid	F5967BV F5967BVM F5967BEF	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
95% Braid	F5995BV F5995BVM F5995BEF	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
Tri- (67%) Shield	F59TSV F59TSVM	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
Quad-Shield	F59SSV F59SSVM F59SSEF	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59QS-NS	CFS-59-SUV	.360	EZF-59

6 Series

Braid Coverage	Part Number	Amphenol		Gilbert		LRC	PPC		Raychem
		Fitting	Crimp	Fitting	Crimp	Fitting	Fitting	Crimp	Fitting
60% Braid	F660BV F660BVM F660BEF	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
90% Braid	F690BV F690BVM F690BEF	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
Tri- (60%) Shield	F6TSV F6TSVM	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
Quad-Shield	F6SSV F6SSVM F6SSEF	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6QS-NS	CFS-56-SUV	.360	EZF-6

TIMES FIBER

Foam Dielectric, APA Bonded Foil Tape, includes CATV (UL)

May require special cable prep dimensions and/or tools.

59 Series

Braid Coverage	Part Number	Amphenol		Gilbert		LRC	PPC		Raychem
		Fitting	Crimp	Fitting	Crimp	Fitting	Fitting	Crimp	Fitting
53% Braid	2345 2347 2374	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
67% Braid	2183 2185 2186	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
95% Braid	2545 2547 2574	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
Tri- (53%) Shield	2602 2603 2604	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
(80%)	2607 2608 2609	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59-NS	CFS-59-SUV	.360	EZF-59
Quad-Shield	2245 2247 2274	6531-59	.276R	GFWL59-AHS-USA	.360	SNS-59QS-NS	CFS-59-SUV	.360	EZF-59

6 Series

Braid Coverage	Part Number	Amphenol		Gilbert		LRC	PPC		Raychem
		Fitting	Crimp	Fitting	Crimp	Fitting	Fitting	Crimp	Fitting
60% Braid	2360 2364 2386	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
90% Braid	2560 2564 2586	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
Tri- (53%) Shield	2622 2623 2624	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
(80%)	2627 2628 2629	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6-NS	CFS-56-SUV	.360	EZF-6
Quad-Shield	2260 2264 2286	6531-6	.325R	GFWL6-AHS-USA	.360	SNS-6QS-NS	CFS-56-SUV	.360	EZF-6

cations Corp., 50 S. Steele St., Suite 500, Denver, Colo. 80209, (303) 355-2101.

Q: Why did you join SCTE?

Andy Skop, Sales Representative
Anixter Cable TV, Manville, N.J.
"There is a lot going on in (the New York City area). There is a real need for education in its systems, which are very large and very busy. This is where SCTE comes in."

Dave Franklin, Project Engineer
ATC, Englewood, Colo.
"There has been an increase in management and engineering skills. I am really thrilled at having been instrumental in that process through my participation in the Society."

Ed Pickett, Project Engineer
Greater Rochester Cablevision, Rochester, N.Y.
"You need to keep up on the latest technology. Cable personnel need to know how to handle the problems they encounter in their systems. SCTE does a great job of making training available."

Marco Reyes, Regional Technical Engineer
Karnack Cable, Eagle Pass, Texas
"The Society's seminars offer very beneficial technical information. I am really interested in training through passing on what I learn to new people who are joing the cable industry."

Here are some additional reasons:

1) BCT/E Certification Program
2) Installer Certification Program
3) National technical seminars
4) Local technical seminars
5) Cable-Tec Expo
6) Satellite Tele-Seminar Program
7) SCTE publications
8) SCTE videotapes

SCTE® is the answer.

Want to learn more? Contact SCTE at (215) 363-6888, or write: SCTE, 669 Exton Commons, Exton, PA 19341.

Reader Service Number 1

selectable equalization and UL-approved powering. With 450 MHz standard (optional 550 MHz) bandwidth, the products are available in various gains. For CLI needs, connectors can either be standard F or 5/8-inch entry adapters at the input and output.
Reader service #143

Hasp replacement

According to Moore Diversified Products, it is no longer necessary to discard existing metal pedestals because the hasp has broken off. The company's pedestal hasp replacement is installed by slipping it over the metal edge and tightening the bolt with no drilling or adapting.
Reader service #135

CATV data modems

C-COR's C-Series broadband data modems for CATV applications include the C10, C20 and C60 models. The C10 is a slow speed 9,600 baud unit for simple telemetry and data applications. The C20 has synchronous data communications at speeds up to 19,200 baud and the C60 is for high speed synchronous applications at speeds to 64 K baud.

The C20 and C60 offer programmable setup, allowing the modems to be configured through a hand-held programmer. The menu-driven programmer enables users to configure the modems without having to use rotary or DIP switches.
Reader service #145

Power supply

Magnavox announced its 6-LPS Series non-standby line power supply. It is said to be 90 percent efficient. It comes in a specially finned, cast aluminum housing ready for strand or wall mounting. An optional kit is available to convert the unit for pole mounting.

It measures 6 x 8 x 12.5 inches and weighs 36 pounds. Current models are available in 60 V and 5 and 15 ampere domestic and international versions. Options include a time-delay circuit, in/output surge protection and a breaker box assembly with auxiliary outlet.
Reader service #146

Fiber-optic test kits

Optical Networks International is selling two fiber-optic test kits manufactured by Fotec. They were specifically developed for the testing needs of CATV applications. In particular, the high optical power typical of CATV transmitters cannot be accurately measured by standard fiber power meters.

This high power level saturates a detector causing measurement errors and, in some cases, damage to the detector's assembly has been found. The meters use a special detector assembly to allow measurements at very high power levels with excellent accuracy, according to the company. The T725 includes a fiber power meter, connector adapters and case, and the T738 includes the power meter and a 1,300 nm laser source, which also is used to measure cable plant loss.
Reader service #139

In-line monitor

AM Communication's Model TMC-9015 in-line monitor is a level measurement transponder with a range of 40 to 550 MHz designed for installation in the trunk or feeder of a CATV system. With the product, it is possible to make hum, intermod and carrier-to-noise measurements.

Remote spectrum analysis and system sweep measurements are standard product features and an optional

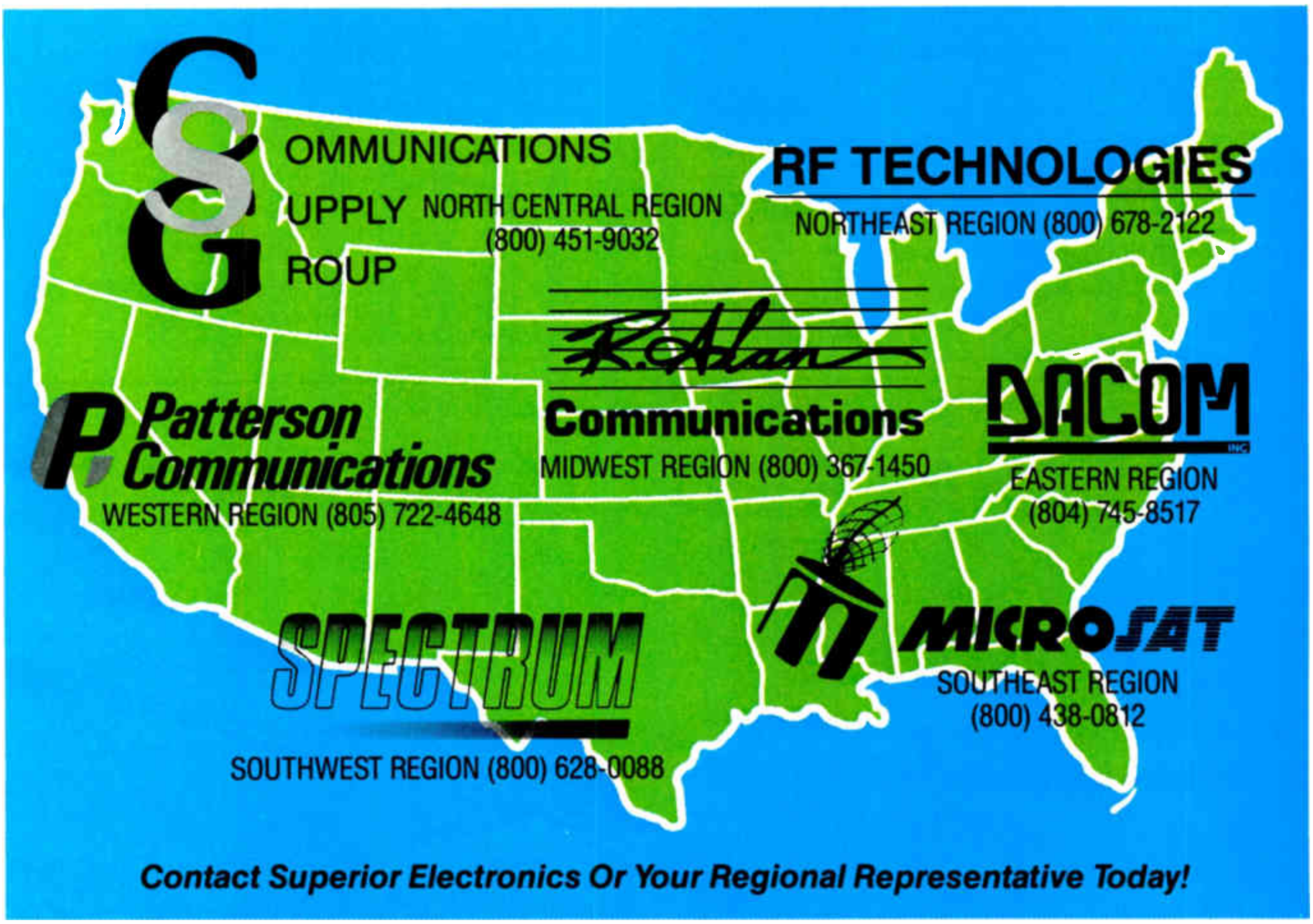
Superior Electronics Group, Inc.

proudly announces

that the following companies

will represent the Cheetah™ system

in the continental United States.



BEYOND STATUS MONITORING

WE MEASURE THE BEST!™

Cheetah™

SUPERIOR ELECTRONICS GROUP, INC.
2237 Industrial Boulevard, Sarasota, Florida 34234
Telephone (813) 351-6700 • Fax (813) 351-9193

See us at the SCTE Cable-Tec Expo, Booth 819. Reader Service Number 119

5-40 MHz sweep transmitter also is available. It is capable of operating in either a one- or two-way cable system and future add-on options will be available for extending the bandwidth, according to the company.
Reader service #133

Attenuator

Fotec introduced its Model A455 FDDI Mirror loopback attenuator. It is used to allow FDDI stations to self-test under simulated operating conditions. The user can determine if problems are in the station equipment or the cable plant, which according to the company, greatly reduces troubleshooting time, expense and system downtime.

The product gives a fixed 11 dB loss optical path between the transmitter and receiver in an FDDI station, which simulates the maximum loss specified for an FDDI link. It is contained completely within the shell of a standard FDDI MIC (media interface connector).
Reader service #131

Multimeter info

Simpson Electric made available its two-page, four-color bulletin describing the company's 260-8Xi and 260-8XPi analog multimeters that offer increased durability and scale visibility, plus a highly visible yellow ABS plastic case for harsh environments. The brochure describes product features and includes complete product specifications and a list of accessories that include an optional "Grab-N-Go" padded carrying case.
Reader service #132

Lockout tags

Compliance with the recent Occupational Safety and Health Association's "lockout/tagout" rules (in which repair or maintenance workers must lock or tag equipment they are working on to ensure personal safety) is possible using Panduit's new line of lockout/tagout products. The line includes laminated steel padlocks, vinyl coated plated steel lockouts, safety tags, photo tags, safety signs and marking pens and equipment.

Padlocks are available with six different color bumpers to permit use for identification purposes. Lockouts, with 1- or 1.5-inch diameters jaws, accept six padlocks and cannot be opened until all locks have been removed.
Reader service #153

Reader Service Number 112

Status monitoring

(Continued from page 47)

when large discrepancies exist and the attention of the chief engineer is automatically called.

The software also should have a graphical overview of the health of the entire system. Some systems show a map identifying the cable system topography and connectivity of each device. Color coding is used to indicate if minor or major faults exist. This feature allows the engineer to quickly localize the source of the problem.

Other features provide tools for trend analysis. These facilities provide a representation of the system's performance over time. For example, a graph can show the change in AGC level as time changes. On the same graph the temperature can be overlaid. If temperature is changing, the AGC voltage should be compensating. Sometimes, after field maintenance, AGC levels are reset. If set improperly they can run out of range. When this occurs improper levels in the system may cause degraded picture quality. The chief engineer can identify this and direct corrective action.

Integrated optical monitoring

All of the previously described management system components are used to form the system shown in the accompanying figure. The focus of the system is the computer (IBM-compatible personal computer). It runs the management system software communicating through the RS232 ports to several devices in the headend. One of these devices is the RF interface, which is an intelligent modem. It launches communication signals through fiber transmitters or coaxial cable that command each device to perform certain monitoring and control functions. It also receives the response information from each device, demodulates signals and forwards the data to the computer where it is checked against the limits in the data base and then displayed.

In the headend, MLM stand-alone signal monitors are positioned immediately prior to the input of the optical transmitters. The purpose of these is to verify the broadband signal performance is within the operating range for the optical transmitters. This will help isolate problems that occur before the optical system. Sometimes poor performance of the optical link could be caused by something external to the link. Also, MLMs are positioned at the output of the optical receivers. With MLMs at the input and output, problems can be isolated to the optical link.

The optical control card in the headend transmitters and receivers is connected directly to the RS232 port. Each control card has a unique address and reports levels and status of optical parameters when polled by the computer. Degraded condition will cause an alarm that is displayed on the computer screen.

At the optical node in the field, the monitoring modules receive command signals from the computer via the outbound fiber or from the coaxial cable if the redundancy switch is in the backup position. The optical station status is reported back to the computer via the inbound fiber and optical transmitter or through the coaxial cable if in the backup mode. This hardware monitoring is followed up by the MLM, which can be installed directly on the RF output of the optical node.

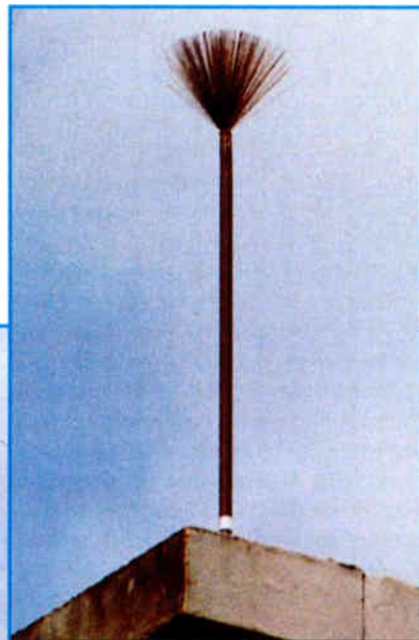
Summary

Fiber optics now deployed can be monitored for optimum performance. Proper use of the management system will result in more efficient use of technical staff and provide a more reliable and better performing system, ultimately resulting in more satisfied customers and higher penetrations being maintained.

Both headend and field electronics contain special communications, control and monitoring circuits that are designed to monitor critical parameters of both RF and optical components. CATV systems are being implemented as a hybrid of coaxial and fiber cable and it is not just the fiber system that determines the performance delivered to the subscriber. Therefore, status monitoring of the fiber system and the coaxial system should be integrated into one comprehensive management system. Isolation and localization of the causes of the degradations will not be as efficient if the fiber monitoring was implemented independently. The engineer should be able to determine the source of the degradations. A question such as, "Is it in the optics or in the coax plant?" will be difficult to answer without the proper integration of fiber and coax monitoring. **CT**

Lightning strikes

(Continued from page 50)



Buildings can be protected by with conventional Underwriters Laboratories 96A systems, substituting UL-listed static dissipating air terminals in place of conventional lighting rods.

reaches the two rods the potential rises on both. The sharp rod will tend to break down into corona under a relatively low potential. The blunt rod will hold out, with ions accumulating on the blunt point.

As the ground potential builds, the corona builds around the sharp rod, while the blunt rod still tends to hold its charge. When the ground potential becomes very high, such as when the stepped leaders are on their way down from the cloud, the corona will build in density and elevation around the pointed rod. When the blunt rod finally breaks down, it breaks down catastrophically, and the accumulated charge jumps off of the blunt rod in a streamer extending well upward toward the stepped leaders.

Since the object on the ground that throws off the best streamer is the one most likely to be struck, the blunt rod is more likely to trigger a strike than is a sharp rod. A static dissipator is merely an air terminal or series of air terminals in which the radius of the points is reduced as close to zero as possible without compromising their structural integrity.

If this technique is valid for retarding the formation of lightning-completing streamers, how do we apply it to a given structure? All objects on the ground dissipate naturally to some extent. The manner in which they dissipate also is related to the point-discharge principle. The ground charge is first drawn to the top of the object (the ultimate point) and then to the corners or other points from which it bleeds off into the atmosphere.

These natural charge accumulation points also tend to be the points from which streamers originate. How does one identify these points? Perhaps an oversimplified method is to imagine taking the object, turning it upside down and dipping it into syrup. When you lift the inverted object from the syrup, the points from which the syrup drips will be the charge accumulation and streamer formation points. Application of static dissipating air terminals or arrays to these points will reduce the accumulation of charge at, and retard

"A static dissipator is merely an air terminal or series of air terminals in which the radius of the points is reduced as close to zero as possible without compromising their structural integrity."

the formation of streamers from, those points.

Cable TV facilities

At a cable TV headend, the obvious lightning targets are the tower, satellite dishes and buildings.

- The tower can be protected by installing a dissipation array on the top of it, and a dissipator set on each top-mounted DC grounded antenna.
- The satellite dishes can be protected by installing a dissipator array directly on the frame at the top of metal dishes, or by installing a dissipator array on a bracket with a bonding wire to ground on non-metallic dishes.
- The buildings can be protected with conventional Underwriters Laboratories 96A systems, substituting UL-listed static dissipating air terminals in place of the conventional lightning rods. (A copy of this standard may be obtained from Underwriters Labs in Northbrook, Ill.)

In the case of the tower and the metal frame satellite dish, the metal structure serves as the down conductor path to ground, and the existing ground system serves as ground. In the case of the non-metal frame satellite dish or the building, the down conductor must bond to an adequate grounding system. (UL 96A specifies an adequate grounding system.)

Is this technique valid for protecting cable TV facilities? Don Dellinger is chief engineer at American Cablevision Services in Kissimmee, Fla., right in the heart of the lightning belt. Last spring, he installed a static dissipation system on the system's 200-foot tower. "We had suffered an average of two direct lightning strikes per year over the six years I have been here. It had reached the point where we had to do something. I heard about static dissipation technology from Bill McClain of FM Associates in Orlando, a manufacturer's rep who also had helped us with power problems.

"The approach makes sense. If you remove its path, lightning doesn't strike. Obviously, if the lightning gods decide you are going to get hit, nothing will stop it. But static dissipation technology certainly decreases the odds of getting hit. So, I bought the dissipator and installed it myself on our tower.

"I have often found that a simple way is the best way. The dissipator itself is a simple device. It has no moving parts and requires no power. The price was right, well within what we could live with. And, best of all, it works.

"Since the installation, we have gone through our first ever lightning season without at least one hit. No more 3 a.m. calls to replace mods."

The choice is yours

• At one end of the air terminal spectrum are the air terminals designed to attract lightning and convey the energy of the strike through a low-impedance path to a low resistance ground. This technology is generically referred to as early streamer-emitting air terminal technology.

The tower can be protected by installing a dissipation array on the top, and a dissipator set on each top-mounted DC ground antenna.

• In the middle of the spectrum is the conventional air terminal designed to intercept any strike that occurs in the vicinity, and to convey the energy to ground through a conventional down conductor and grounding system.

• At the other end of the spectrum is static dissipation technology, or the streamer-retarding air terminal (to coin a phrase).

The choice of technologies is based on your philosophy of lightning protection. The first two approaches assume the inevitability of a strike and attempt to handle it with the minimum amount of damage. Static dissipation technology attempts to reduce the incidence of strikes. However, a well-designed static dissipation system also makes the same provisions to handle any strikes that do occur in the same manner as the conventional system.

So, if your philosophy is to limit lightning damage by attempting to limit the incidence of strikes, yet to take all of the conventional precautions to handle any strikes that manage to occur, you may want to take a closer look at static dissipation technology for protecting your cable TV facilities from direct lightning strikes. **CT**

AD INDEX

It's so simple! To obtain additional information from any of the display advertisers appearing in this issue of ***Communications Technology,*** please use one of the **Reader Service Cards** on the facing page (pass the others along). The ad index below has been expanded to include not only the page number of each advertiser, but also each corresponding reader service number to be circled on the Reader Service Card.

Back to Basics

COMMERCIAL ELECTRONICS, INC.
CATV ENGINEERING SERVICES

CATV EQUIPMENT REPAIRS

Hybrid Sales — Meter Calibrations
Equipment Upgrading — Headend Alignment
Performance Measurements — FCC Offsets

Free Pick-up Service in Certain Geographic Areas
800-247-5883 or in Virginia 800-345-6834
209 E. Jackson St. P.O. Box 484 Gate City, VA. 24251

DANIEL E. BROOKS
PRESIDENT

(212) 294-3107

BROOKS COMMUNICATIONS, INC.
"CATV CONTRACTOR"

MDU CONSTRUCTION
NEW INSTALLATION
PRE POST WIRING
REBUILDING SYSTEM
OFFICE/HOME
APARTMENT/CONDO

1831 Bathgate Ave.
Bronx, N.Y. 10453

CCI **CABLE CONSTRUCTORS, INC.**
COMPLETE TURNKEY CONSTRUCTION 1-800-338-9299

COAX & FIBER
MAPPING - DESIGN - CONSTRUCTION - ENGINEERING
COMPLETE PROJECT MANAGEMENT

quality service performed on a timely basis

KES Klungness Electronic Supply
CATV SYSTEMS AND SUPPLIES 1-800-338-9292

Great Lakes Cable TV Services, Inc.
24030 Roosevelt Rd. South Bend, IN 46614

USED & SURPLUS CABLE TV ELECTRONICS
THETA-COM JERROLD SLYVANIA
C-COR S-A MAGNAVOX & MORE

DOMESTIC AND INTERNATIONAL SALES

U.S. TOLL-FREE — **FAX**
1-800-383-8046 **219-234-8662** **219-232-1562**

QCI

Installations, Audits
CLI Drop Replacements
Pre/Post Wire MDU

Quality Cable Installation
P.O. Box 964, Eau Claire, WI 54702-0964 (715) 839-2733

INET
Technologies

Guaranteed CLI Passing

Catv-CLI
Service Known Industry Wide

Toll Free Nation Wide and Canada
1-800-253-7760

AERIAL
NEW BUILDS
EXTENSIONS
SPLICING
ACTIVATION

UNDERGROUND
REBUILDS
TRAP & AUDITS
INSTALLS
STORM DAMAGE

State Wide CABLE Contractors, Inc.

WALKERVILLE, MICHIGAN 49459

OFFICE (616) 873-4744
FAX (616) 873-0202

Robert Zack — William Zack

CONTRACT CABLE TV INSTALLERS

CONTRACT INSTALLERS, INC.
UHF Radio Equipped Trucks • Uniformed Installers

HOUSE INSTALLATIONS
Aerial — Underground — Pre-wire
APARTMENT INSTALLATIONS
Post wire — Pre-wire — Commercial Building
Tap Audits

Install or Remove Traps and/or Converters
Drop change over for System Rebuilds

LENNY FISCHER
P.O. Box 1564
Appleton, Wisconsin 54913-1564
(414) 582-7087

MONTIE FISCHER
P.O. Box 1058
Fort Walton Beach, Florida 32549-1058
(904) 651-5154

Help Wanted

WANTED
Sales/Engineer
Work Southern California
Send resume to: Box #13
Transmedia Partners
Suite 500, 50 S. Steele
Denver, CO. 80209

Line Technician
Riverview Cablevision is looking for an experienced line technician, 2 years experience, and a valid driver's license. Excellent compensation and full benefits available. Apply in person or mail resume to:
Riverview Cablevision Associates, L.P.
4007 Park Avenue
Union City, N.J. 07087
M/F/EOE

FED UP WITH COLD WINTERS?

Palmer CableVision in sunny southern California is looking for experienced Maintenance and Service Technicians to work in our 1,200 mile, 74,000 subscriber cable TV system located in this resort community. At least one year CATV technical experience and a good driving record is required. Great compensation and benefits. No phone calls please. Send resumé to:

Palmer CableVision
Human Resources t
41-725 Cook Street - Box 368
Palm Desert, CA 92261

EEO

SERVICE TECHNICIAN

Friendship Cable, a subsidiary of Buford Television, Inc., has openings for Service Technicians in Texas, Missouri, North Carolina, South Carolina, Arkansas and Florida. Applicants must have previous cable television experience, a valid driver's license, and a good driving record.

We offer a competitive salary and a generous benefits package. Please send resume or call for an application to:

Buford Television, Inc.
P.O. Box 9090
Tyler, TX. 75711
903-561-4411

Leader in the placement of Cable Television Professionals
Call Toll Free 800-433-2160: In Texas call 817-599-7623: FAX 817-599-4483

TECHNICAL MANAGEMENT		TECHNICIANS
TCH MGR, E, 55K	PL MGR, W, 45K	TCH MGR, S, 28K
TCH OPS, MW, 55K	TCH TRNR, SW, 45K	LN TCH, W,12/HR
R&D ENG, W, 60K	PL MGR,E, 40K	VIDEO TCH, E, 30K
PL MGR, E, 38K	TCH MGR, SE, 40K	HDEND TCH, SE, 30K
TCH MGR, SE, 40K	CH TCH, E,36K	SERV TCH-MULTI LTGS
CH ENG, MW,40K	SYS ENG, SE, 30K	SW TCH, NE, 12/HR
CH ENG, W, 42K	SERV MGR, W, 45K	HDEND/MICRO E, 30K
TCH TRNR, E, 35K	RF DESIGN, TX, 50K	LN TCH, TX, 11/HR
PL MGR, SW, 35K	MGR/CH TCH, E, 28K	SW TCH, SW, 13/HR
INSTALL MGR, S, 30K	CH TCH, E, 35K	LN TCH, MW, l0/HR

JIM YOUNG & ASSOCIATES
One Young Plaza 1235 Ranger Highway Weatherford, TX 76086
Call for information about these and many other opportunities nationwide

Cable TV Franchise Solicitation For Competition

Aiken County Council is soliciting sealed proposals from parties interested in obtaining a nonexclusive cable television franchise to erect, maintain and operate transmissions and service distribution facilities in direct competition with existing cable television systems in the unincorporated areas of Aiken County. Sealed proposals will be accepted until Thursday, August 1, 1991 at 2:00 p.m.

Information concerning this proposal and invitation to submit a proposal may be obtained from the Aiken County Central Procurement Division, Room 216, 828 Richland Avenue, West, Aiken, South Carolina 29801, 8:30 a.m. until 5:00 p.m., Monday through Friday. (803) 642-1542.

Galaxy
cablevision

is seeking accomplished CATV TECHNICIANS for several areas in the TX & LA. Qualified applicants should have:

- Successful experience at the line tech level.
- Ability to work with minimum supervision.
- A desire to learn CATV from the sub scribers set through the headend.
- Ability to present a favorable image to our customers.

We can offer:

- Competitive wages and benefits.
- Opportunities for development and advancement.
- Small town/rural work environment.

Please send a brief description of your experience and qualifications to:

1220 N. Main
Sikeston, MO 63801
Attention: Mark Anderson
1-314-471-3080

EOE
Pre-employment drug screen required

ComSonics, Inc.

Regional Sales Manager

ComSonics, Inc., an employee owned company and a leader in CATV technology products and services, has an immediate opening for a **Regional Sales Manager**. This individual will be responsible for direct sales of ComSonics products and services to the cable television industry and alternative markets in the Northeast region of the United States.

The successful candidate will possess thorough technical knopwledge of the CATV industry, with a minimum of five years of direct sales experience.

This unique challenging position offers high earnings potential and an excellent benefits package.

Please mail resume and salary requirements in confidence (no phone calls please) to:

ComSonics, Inc.
P.O. Box 1106
Harrisonburg, VA. 22801
Attn: John W. Dickle

An Equal Opportunity Employer

Equipment For Sale

ANTHONY'S
MANUFACTURING SERVICE

PLOW BLADES
Irrigation/Wire/Combination
For Any Machine-For Any Application
(800) 383-PLOW
(719) 475-PLOW (7569)
P.O. Box 17701
Colorado Springs, CO 80935

AERIAL BUCKET TRUCKS
Large selection geared for CATV
STANDARD TRUCK & EQUIPMENT CO.
1155 Hill St. S.E.
Atlanta GA 30315
Phone: 1-800-241-9357

BUCKET TRUCKS

COAST CATV SUPPLY

WANTED
USED & EXCESS

IN STOCK
SA, Jerrold, Magnavox, PathMaker
300,330,400 MHZ

Call Nick Meko
714-272-6822 Fax 714-272-3032

LIQUIDATION SALE
Oak M35B Offline $5.00
Reconditioned $10.00
Hamlin MCC 3000 as is 50¢ each
Reconditioned $10.00
WANTED
Jerrold DRX-3-DIC
Oak N12 ch 2 Or 3
SA 8550 & 8580
Zenith Encoders
Pioneer Encoders
CABLE EQUIPMENT BROKERAGE CO.
818-709-3724
FAX 818-709-7565

Emergency Alert Systems
BY
Idea/onics

69 Channels
14 day delivery
Compatible with all headends
Affordable
24 & 88 Channel units also available
(701) 786-3904
Fax: (701) 786-4294

REFURBISHED
Magnavox 5-330 Trunks complete w/EQ/feedermaker $350.00
5LE 330 w/housing $75.00
3700-5900 Taps $3.00
Pioneer 2002 Ch. 2 $9.00
Jerrold DRZ $21.00
Eagle Traps $1.00
Call for complete inventory list
90 day Warranty
We service what we sell
ARENA SERVICES INC.
2118 W. Main St.
Jeffersonville, Pa. 19403
215-630-0320
FAX No. 630-8202

The following is a listing of videotapes available by mail through the Society of Cable Television Engineers. The prices listed are for SCTE members; non-members must add 20 percent.

☛ *Diagnosing Common Cable Faults* — Shows basic FCC and CRTC standards for proper cable system operation levels on various distortions. Distortions are identified and explained. (30 min.) Order #T-1001, $35. **B-I**

☛ *CATV Signal Level Meter Basics* — Basic definitions, design techniques, features, limitations, controls and functions of the SLM. Detailed discussion focuses on tuned RF, superheterodyne-downconvert and upconvert-downconvert. Explains signal reception and effects of the SLM. Accuracy, visual/color, types and amount of frequency and amplitude modulation are discussed. (30 min.) Order #T-1005, $35. **I/T**

☛ *CATV Signal Level Meters: Errors and Accuracy* — Graphics and discussion cover linearity, calibration, measurement range and increments, resolving power capabilities, attenuator steps and peak detector error. Demonstrations show proper use of meter scale. Program covers gain changes, temperature and calibration, shape factors and intermediate frequency (IF) bandwidth. (30 min.) Order #T-1006, $35. **B-IV**

☛ *Video Test Signals* — Program concentrates on evaluation of video testing techniques. Presentations examine frequency domain, baseband video signals and IRE unit scales. Common video waveforms are defined, including multiburst, sine pulse, window, line time distortion, modulated stair step/differential gain and phase, luminance non-linearity, modulated 12 1/2T, modulated pedestal, field rate square wave and vertical interval reference. (30 min.) Order #T-1007, $35. **B-II**

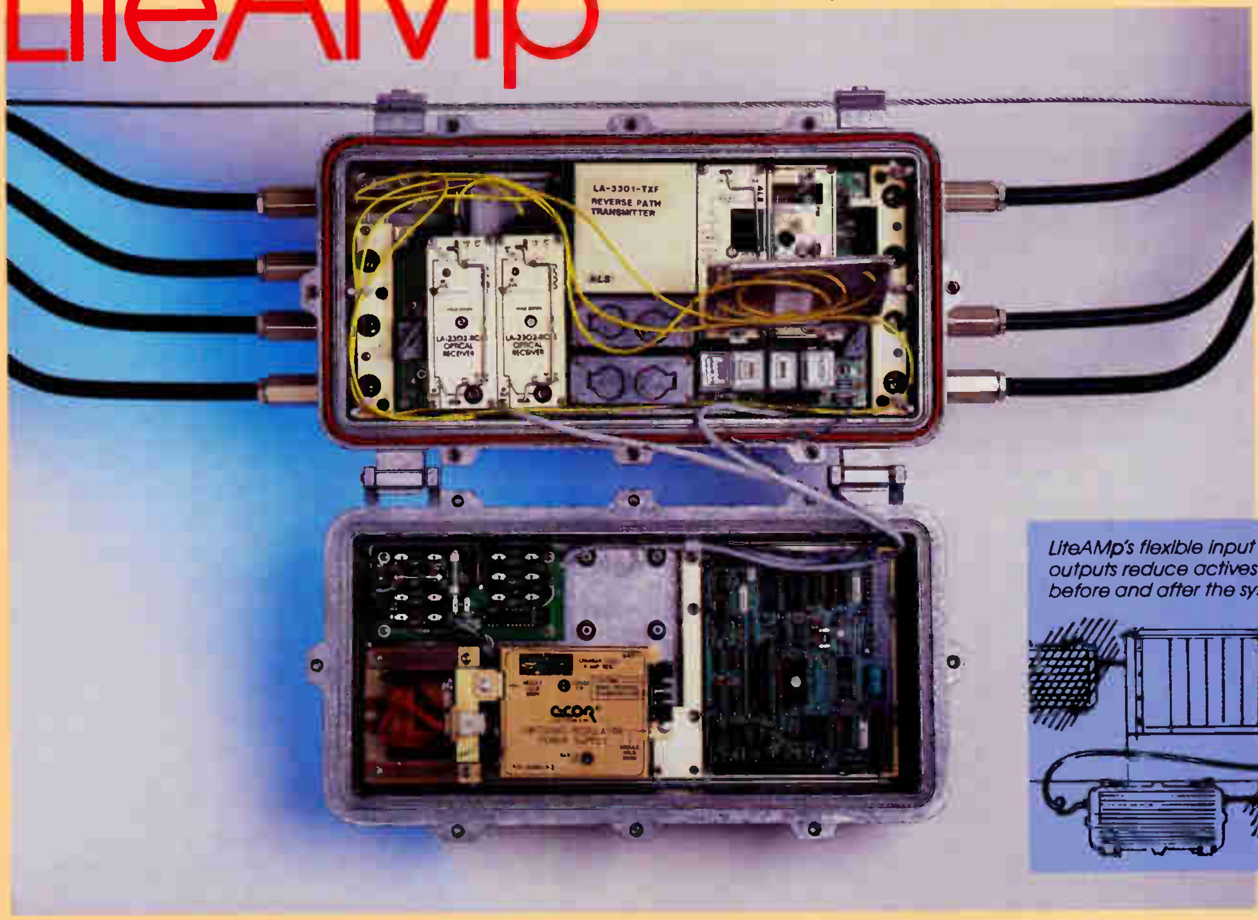
Note: The appearance of a **B-** indicates a tape relating to the BCT/E Certification Program; the Roman numeral designates which category. Videotapes relating to the Installer Certification Program are noted by an I/T. All videotapes listed were produced in 1981, are in color and available in 1/2" VHS format only.

Shipping: Tapes are shipped approximately three weeks after receipt of order via UPS (no PO boxes). SCTE pays surface charges within the continental U.S. Orders to Canada or Mexico add $5 (U.S.) for each tape. Orders to Europe, Africa, Asia or South America: SCTE will invoice the recipient for additional air or surface charges (please specify). "Rush" orders: a $15 surcharge will be added in addition to air shipping cost.

To order: All orders must be prepaid. All prices are in U.S. dollars. SCTE accepts MasterCard and Visa. To qualify for SCTE member prices, a valid SCTE ID number is required, or a complete membership application with dues payment must accompany your order. Orders without full and proper payment will be returned. Send orders to: SCTE, 669 Exton Commons, Exton, Pa. 19341 or FAX with credit card information to (215) 363-5898.

LiteAMp™

INNOVATIVE DESIGN, PROVEN AM TECHNOLOGY from the company that specializes in fiber transmission systems



LiteAMp's flexible input and outputs reduce actives before and after the system.

FOUR REASONS TO SWITCH FROM COAX TRUNK AMPLIFIERS TO LiteAMp™ AM FIBER SYSTEMS TODAY

Group W Satellite looks to ALS for critical reliability fiber video links.

ALS

AMERICAN LIGHTWAVE SYSTEMS, INC.

a subsidiary of ADC Telecommunications, Inc.
358 Hall Avenue, P.O. Box 1549
Wallingford, CT 06492-1149
203/265-8880, FAX 203/265-8801

1 LiteAMp AM FIBER SYSTEMS NOW BEAT COAXIAL TRUNK AMPS IN PRICE AND PERFORMANCE

For rebuild and system extension applications, LiteAMp costs less than coaxial trunk amplifier runs. Fewer actives translates to better performance and reliability at the tap where it counts.

2 LiteAMp ELIMINATES THE COMPLEXITIES OF OTHER AM FIBER OPTIC SYSTEMS

LiteAMp looks and feels like a standard trunk amplifier, eliminating the need for retraining of field personnel. No special optical test equipment or optical matching is required. LiteAMp's modular architecture is designed for "plug and play" installation and maintenance.

3 LiteAMp SAVES AMPLIFIERS COMPARED TO OTHER AM FIBER SYSTEMS

LiteAMp requires as little as +10dBmV input for 80 channel operation, which is 15–25 dB lower than other systems. At the node, output levels from trunk to multiple high level (+50 dBmV) bridgers are available, insuring you maximum reach with minimum electronics cost.

4 LiteAMp PRODUCT EXCELLENCE IS BACKED BY ALS CUSTOMER SUPPORT

In addition to CATV applications, ALS fiber systems are used extensively for critical reliability applications such as missile launch control, and network broadcasting. No CATV fiber systems supplier understands reliability and customer support better than ALS.

See us at the SCTE Cable-Tec Expo, Booth 629, 631. Reader Service Number 111

June

June 3-6: The George Washington University short course on digital transmission systems, Washington, D.C. Contact (202) 994-6106.

June 3-7: Hughes training seminar on AML microwave equipment for local signal distribution (broadband), Torrance, Calif. Contact Microwave Products Division, (213) 517-6233.

June 4: SCTE Greater Chicago Chapter testing session, BCT/E exams to be administered. Contact Bill Whicher, (708) 438-4423.

June 4: National Cable Television Institute seminar on fundamentals of supervision for CATV personnel, Atlanta. Contact Michael Wais, (303) 761-8554.

June 4-7: Siecor seminar on fiber-optic installation and splicing for LAN, building and campus applications, Hickory, N.C. Contact Lynn Earle, (704) 327-5539.

June 5: SCTE Ark-La-Tex Chapter seminar on technical management and safety. Contact Robert Hagan, (214) 758-9991.

June 5: SCTE Delaware Valley Chapter seminar on baseband video and audio — theory and maintenance for headends, Williamson's Restaurant, Bala Cynwyd, Pa. Contact Robert Lauer, (215) 853-2200.

June 5-6: National Cable Television Institute seminar on OSHA compliance for CATV operators, Atlanta. Contact Michael Wais, (303) 761-8554.

June 6: SCTE Wheat State Chapter testing session. Contact Mark Wilson, (316) 262-4270.

June 6: SCTE Upper Valley Meeting Group seminar on fiber optics. Contact Matthew Alldredge, (802) 885-9317.

June 9-12: Cable TV Association of Maryland, Delaware and the District of Columbia annual meeting. Ocean City, Md. Contact Wayne O'Dell or Patricia Rodriguez, (301) 266-9111.

June 9-12: Canadian Cable TV Association Convention/Expo, Ottawa, Canada. Contact (613) 232-2631.

June 10: SCTE Satellite Tele-Seminar Program on *Cable's Weakest Link — Tap to TV (Part One).* To air from 1-2 p.m. ET on Transponder 6 of Galaxy I.

June 10-12: Siecor seminar on network cabling design for LAN, building and campus applications, Hickory, N.C. Contact Lynn Earle, (704) 327-5539.

June 10-12: Fiber Optic Communications conference, Sunnyvale Hilton, Sunnyvale, Calif. Contact (602) 965-1740.

June 11-13: C-COR seminar on basic theory, installation and maintenance of cable TV systems, Harrisburg, Pa. Contact Kelly Jo Kerstetter, (800) 233-2267.

June 13-16: SCTE Cable-Tec Expo '91, Reno/Sparks Convention Center, Reno, Nev. Contact SCTE national headquarters, (215) 363-6888.

June 17-20: Siecor seminar on fiber-optic installation and splicing for LAN, building and campus applications, Hickory, N.C. Contact Lynn Earle, (704) 327-5539.

June 18-21: Siecor seminar on fiber-optic installation and splicing for LAN, building and campus applications, Keller, Texas. Contact Lynn Earle, (704) 327-5539.

June 19: SCTE Golden Gate Chapter seminar on BCT/E Category VII. Contact Mark Harrigan, (415) 785-6077.

June 19: SCTE Great Plains Chapter testing session. Contact Jennifer Hays, (402) 333-6484.

June 19: SCTE North Central Texas Chapter seminar on towers and headends, and grounding and lightning protection. Contact Jennifer Hays, (402) 333-6484.

June 20-21: The George Washington University short course on local area networks: design and installation of networks that support data, voice and video applications, Washington, D.C. Contact (202) 994-6106.

June 25-27: The George Washington University short course on fiber-optics technology for communications, Washington, D.C. Contact (202) 994-6106.

June 26: SCTE New Jersey Chapter seminar on NCTA standards, N.J. performance requirements, distortion measurements, headend measurements and sweeping. Contact Jim Miller, (201) 446-3612.

June 26: SCTE San Diego Meeting Group seminar on safety, first aid and CPR, Elks Lodge, Oceanside, Calif. Contact Frank Gates, (714) 492-4606.

July

July 3: SCTE Gateway Chapter tech seminar. Contact Kenneth Gage, (314) 576-4446.

July 8: SCTE Satellite Tele-Seminar Program on *Cable's Weakest Link — Tap to TV (Part 2)* plus *Signal Leakage Equipment Calibration.* To air from 1-2 p.m. ET on Transponder 6 of Galaxy 1.

July 9: SCTE Chattahoochee Chapter seminar on surge suppression and preventive maintenance, Calhoun, Ga. Contact John Williamson Jr., (404) 376-5259.

July 9: National Cable Television Institute training course on fundamentals of supervision for CATV personnel, Seattle. Contact Michael Wais, (303) 761-8554.

July 9-11: Idaho Cable Television Association summer convention, Templin's Resort, Post Falls, Idaho. Contact Shirley Chambers, (208) 345-0362.

July 9-12: Siecor seminar on fiber-optic installation, splicing, maintenance and restoration, Hickory, N.C. Contact Lynn Earle, (704) 327-5539.

July 10-11: National Cable Television Institute training course on OSHA compliance, Seattle. Contact Michael Wais, (303) 761-8554.

July 13: SCTE Cascade Range Chapter, BCT/E testing in Categories III, IV, V and VII. Contact Tom Hansen, (503) 265-2263.

July 17: SCTE Penn-Ohio Meeting Group seminar on new business technologies in CATV, Cranberry Motor Lodge, Warrendale, Pa. Contact Rich Flanders, (716) 664-7310.

Planning ahead

August 25-27: Eastern Show, Inforum Exhibit Hall, Atlanta. Contact Nancy Horne, (404) 255-1608.

September 24-26: Great Lakes Cable Expo, Cobolt Hall, Detroit. Contact (517) 484-4954.

October 1-3: Atlantic Cable Show, Convention Center, Atlantic City, N.J. Contact (609) 848-1000, ext. 304.

October 8-10: Mid-America Show, Hilton Plaza Inn, Kansas City, Mo. Contact (913) 841-9241.

MEMBERSHIP APPLICATION

Make check payable to SCTE.
Mail To:

SCTE
SCTE
669 Exton Commons
Exton, PA 19341

☐ I hereby apply for membership in the Society of Cable Television Engineers, Inc., and agree to abide by its bylaws. Additional member material will be mailed to me within 45 days. Payment in U.S. funds is enclosed. I understand dues are billed annually.

☐ Please send me further information on the Society of Cable Television Engineers, Inc.

SCTE is a 501 (c) (6) non-profit professional membership organization. Your dues may be tax deductible. Consult your local IRS office or your tax advisor.

APPLYING FOR: ☐ INDIVIDUAL @ $40 ☐ SUSTAINING @ $250

Please print or type information. Data will be used exactly as it is submitted here.

☐ MR. ☐ MRS. ☐ MS. TITLE:__________

NAME:__________ (First / Initial / Last) TEL. #:__________ (Area Code-Number)

EMPLOYER:__________ (Company Name) FAX #:__________ (Area Code-Number)

CO. ADDRESS:__________ (Street/PO / City / State / Zip)

USE HOME ADDRESS?__________ (Street/PO / City / State / Zip)

YOUR SIGNATURE:__________ DATE:__________

Complete the information. Enclose full payment or charge to MasterCard/VISA shown below.

NAME ON CARD:__________ EXP.:__________

MASTERCARD NO.:__________ IB No.:__________

VISA NO.:__________

SIGNATURE FOR CHARGE AUTHORITY:__________

Applications without payment will be returned. Applications from outside U.S., enclose additional $20 (U.S.) to cover mailing expenses.

CT 6/91

SCTE is technical training

By Wendell Woody
President, Society of Cable Television Engineers

Now in our 22nd year, the primary goal of the Society remains that of training cable TV installers, technicians and engineers. Many programs have been developed to support SCTE training and to help the industry maintain the highest standards of quality through education and training.

Installer Certification Program

This certification program is designed for installers and installer/techs, both in-house and contract personnel. Utilizing a special manual, training is provided through local SCTE chapters and meeting groups. A written exam is given to determine each applicant's level of knowledge in the performance of house drop installations. Practical training and performance exams are given in drop cable preparation and fitting installation and signal level meter reading.

One outstanding feature of this program is that it can be presented in-house by individual companies with the approval of the local SCTE chapter or meeting group. Another great feature is cost. A mere $25 covers a special Installer membership in the Society, the *Installer Training Manual* and all testing.

BCT/E Certification Program

The Broadband Communications Technician/Engineer Professional Designation Certification Program is the only program in our industry that tests and evaluates the technical knowledge and skills of techs and engineers, and certifies their abilities in seven categories. Individuals must be national SCTE members to participate. This program is a valuable tool in assisting individuals and their employers in the evaluation of job knowledge — but most significant is the personal satisfaction, pride and developmental growth for the individual.

• Training Committee: So important is training to our Society that this year's board made one of the five new major managing committees dedicated solely to training. Chairman Dr. Walt Ciciora, current board member Richard Covell and three other professional trainers comprise this vital committee. They have been dedicated to a year-long, complete re-evaluation and updating of all SCTE training materials and programs. The BCT/E program is being made stronger with improved study material guidelines and updated testing.

• CableLabs: Under the direction of Tom Elliot, TCI, CableLabs is developing and producing a new training tape for the BCT/E Category VII, "Engineering Management and Professionalism." This tape will be available this fall. New case study test questions also will be ready to accompany this training tape.

Satellite Tele-Seminars

The Society provides one hour of training via satellite each month that can be downlinked and videotaped for use at the system level. Scheduled times are announced regularly in the Society's monthly newsletter, *Interval.*

Local chapters/meeting groups

One of the most important services the Society offers the industry is the training available through its 66 local chapters/meeting groups. This is the lowest cost training available anywhere. Most groups offer full-day seminars approximately six times a year on specific subjects that are vital to the improved technical operation of cable systems.

Videotapes and publications

The Society is the industry's main source for technical training videotapes and publications at very reasonable prices. Its catalog is packed with materials that are needed in every cable system.

• Publication and Videotape Development Subcommittee: This new subcommittee is chaired by Ciciora and served by the following members: Tom Brooksher, Bill Williams, Ron Wolfe, Ralph Haimowitz, Gary Selwitz and new board member Rick Henkemeyer. This group is reviewing the original series of videotapes produced in 1980 and making recommendations for updating this material. In the long term, the subcommittee will monitor broadband communications technology and continue to suggest the development of additional training materials.

Trade show seminars

SCTE provides technical seminars and workshops, as well as BCT/E testing, at most state and regional trade shows. These events provide cable systems with excellent opportunities to obtain training for their staff.

Scholarship funds

The Society has two scholarship funds available. The first works in conjunction with the National Cable Television Institute to provide correspondence school training for those installers and techs whose company does not provide such opportunities, and who cannot afford to pay for their own schooling. The second fund provides scholarships for other types of educational advancement such as trade school electronics or college level courses.

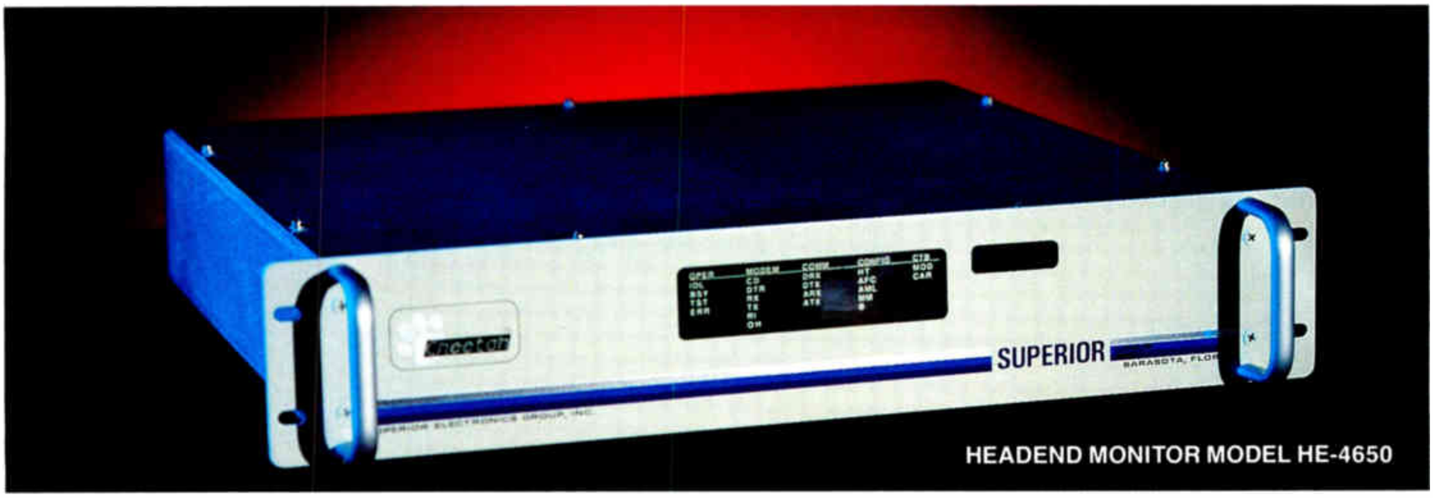
Cable-Tec Expo

The Society combines its annual engineering conference with two days of technical workshops and exhibits to form a three-day program called Cable-Tec Expo. This show, the industry's only strictly technical national trade show and conference, is presented each year at a new location to make it easier for members to attend. Those who have attended past expos feel they have received more than their money's worth.

Meeting the members

Many of the MSOs schedule regional and national engineering conferences; these are vital meetings for the operating companies. It is most pleasing when they include SCTE as part of their programs, as did Adelphia Cable recently. Kudos to their technical management Dan Liberatore and Abe Naghibi and all those present at the Coudersport, Pa., meeting.

While at the SCTE headquarters last month, it was gratifying to observe the enthusiasm and spirit of the staff working on so many membership-supporting projects. The staff now numbers nine full-time employees — and they are all "pleasantly professional" at their duties. **CT**



Cheetah™ Saves!

Every time you use it, you save...

TIME

Cheetah™ allows the operator to analyze system performance in seconds without ever leaving the office. With AUTO READ and AUTO ALARM the Cheetah™ System can provide unattended performance monitoring 24 hours a day.

MONEY

Cheetah™ will reduce unnecessary truck rolls, target problems and independently evaluate the performance of your equipment. Utilize Cheetah™ to cut today's expenses and manage your budget effectively for tomorrow's growth.

INFORMATION

Cheetah™ measurements are repeatable, accurate, consistent and will become the standard of your operation. Past and present data gathered from remotely accessed units is stored for printing and review. This information allows Cheetah™ to project tomorrow's developing trends today.

SUBSCRIBERS

Cheetah™ improves your Service Standards. Your subscribers will enjoy a higher level of quality with less down time. No longer will the subscriber be your status monitoring system. Cheetah™ saves subscribers.

Contact Superior Electronics Or Your Regional Representative Today!

BEYOND STATUS MONITORING™

WE MEASURE THE BEST!™

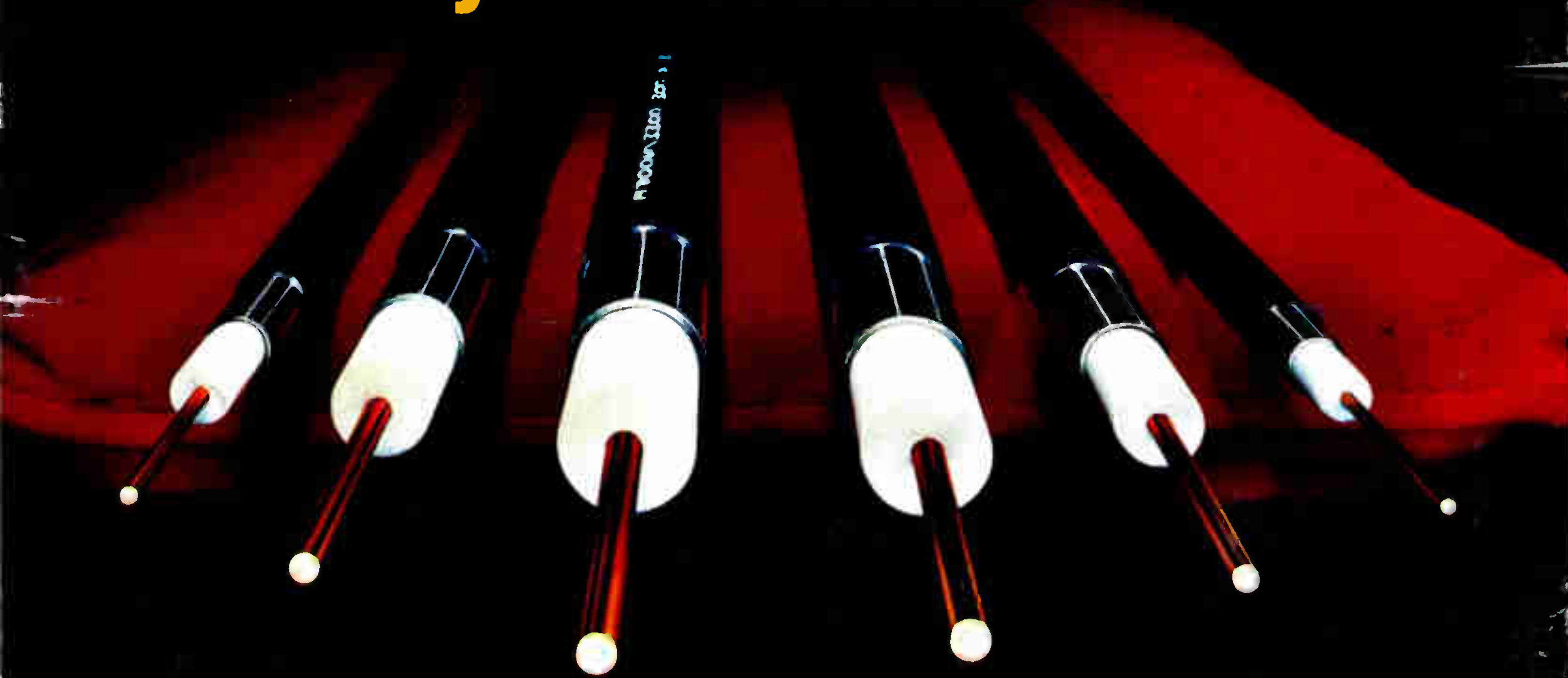
Cheetah™

SUPERIOR ELECTRONICS GROUP, INC.
2237 Industrial Boulevard, Sarasota, Florida 34234
Telephone (813) 351-6700 • Fax (813) 351-9193

Visit Booth 819 at Cable-Tec Expo '91

Reader Service Number 117

Now Anixter puts Comm/Scope Coaxial Cable even closer to your next rebuild!



...That's because we've added additional stock to all of our on-line computer linked distribution centers located throughout North America.

Anixter has a "just-in-time" delivery service that puts your rebuild trunk, distribution and drop cable at the job site where and when you need it. So don't buy more cable for rebuilds than you need.

Remember, at Anixter, Service is our Technology.

ANIXTER
CABLE TV

WEST-ANAHEIM: (714) 779-0500, (800) 854-0443; **DENVER:** (303) 740-8949, (800) 841-1531; **SEATTLE:** (206) 251-6760, (800) 426-7665; **MIDWEST-CHICAGO:** (708) 350-7788, (800) 544-5368; **CLEVELAND:** (216) 526-0919, (800) 321-8068; **DALLAS:** (214) 446-CATV, (800) 231-5006; **IRON MOUNTAIN, MI:** (906) 774-4111, (800) 624-8358; **SKOKIE, IL HDQTRS:** (708) 677-2600; **EAST-ATLANTA:** (404) 840-7901, (800) 242-1181; **NEW JERSEY:** (201) 328-0980, (800) 631-9603; **CANADA-CALGARY:** (403) 250-9646; **MONTREAL:** (514) 636-3636; **TORONTO:** (416) 568-8999; **VANCOUVER:** (604) 276-0366; **INTERNATIONAL-LONDON:** 011-44-81-848-9894.

In an emergency, weekends and holidays or after 5 P.M. call toll free 1 (800) 323-8166.
CORPORATE OFFICES, ANIXTER CABLE TV, 4711 Golf Road, Skokie, IL 60076, (708) 677-2600

See us at the SCTE Cable-Tec Expo, Booth 624.
Reader Service Number 118