COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

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AML and fiber optics

March 1991

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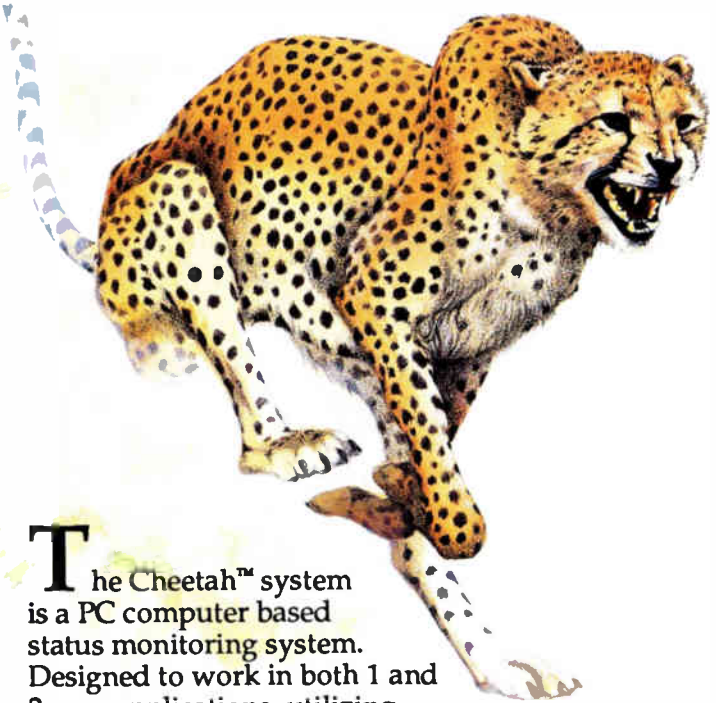

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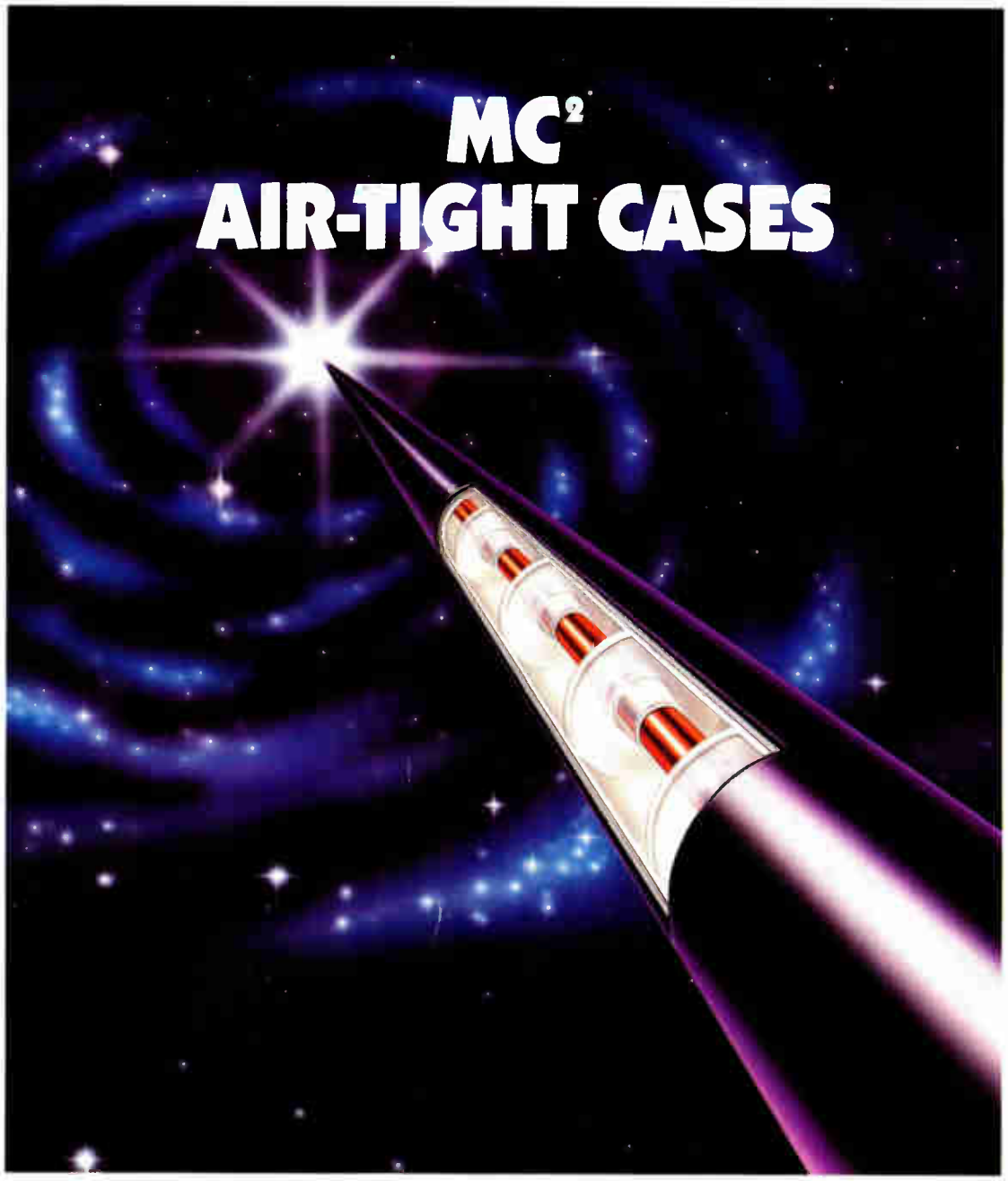

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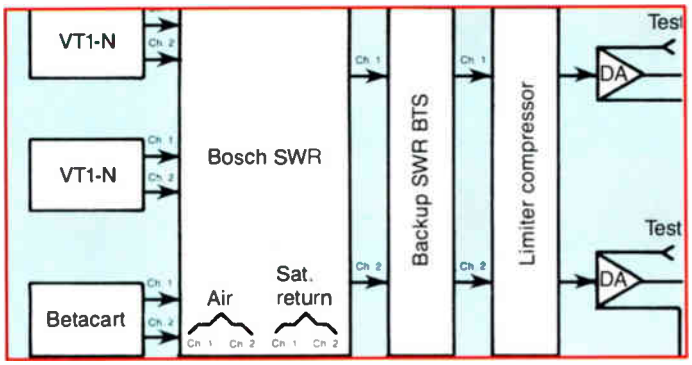

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Features

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To address the growing demands of today's subscriber systems, Magnavox has designed the Spectrum 2000 Amplifier System. It incorporates the very latest in electronic manufacturing, including Surface Mounted Devices (SMD), to help assure product integrity.

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Reader Service Number 5

Never say never

I often describe the cable industry as being a lot like the mischievous youngster who sneaks in the back door, opens the cookie jar, grabs a cookie and is out the door again before being caught by mom. Cable has not been encumbered by the bureaucracies that plague other industries, particularly when it comes to embracing new ideas and technologies. From this, it's become obvious to me that ours is an industry in which it doesn't pay to say "never."

I am aware of one very well-known and highly respected engineer who once said transistors would never replace tubes in CATV amplifiers because solid-state devices were too noisy to be used for RF applications (this was around 1960 when contemporary transistors were indeed noisy devices). While that statement was made several years before I joined the industry, I also recall reading an engineering paper written sometime in the '60s that stated it was impractical to consider using push-pull technology in broadband amplifiers. The author reasoned that push-pull circuitry could not be made to operate over wide bandwidths, therefore splitband amplifiers were the best choice for CATV.

Similarly, feedforward technology once was thought to be unusable over wide bandwidths because it wouldn't be possible to develop delay circuitry (a vital part of feedforward) that would provide relatively constant delay over a wide bandwidth and over the temperature ranges common in cable. As far as feedforward is concerned, the telcos had been using it in narrowband audio amplifiers for decades.

Remember when our bandwidths increased from 220 to 270 and then 300 MHz? Why, there was no way we could possibly use 36 channels! Then came 330, 400, 450 and 550 MHz. And while we've talked of 750 or 1,000 MHz bandwidths, it looks like that's just around the corner. Several manufacturers will probably be demonstrating preproduction samples of 750 MHz amplifiers at this year's NCTA (the necessary hybrids were just introduced), with off-the-shelf 750 MHz production expected in 1992. And how about 30 dB, 1,000 MHz coax or connectors?

A little over 10 years ago pundits scoffed at the idea of a 24-hour news channel, but today Mr. Turner is laughing all the way to the bank, and CNN is the standard by which TV news is judged. Heck, even the networks have been using CNN feeds during the Middle East crisis! For that matter, I remember the skeptics who suggested that HBO's bold move to distribute cable programming via satellite in the mid-70s was ill-conceived. Of course, there also were the claims that once said VideoCipher scrambling couldn't be compromised. (How many backyard dish owners supposedly have "rubber chip"-equipped setups?) I recall the various converter security schemes that were unbeatable, too. I once brought a modified Z-Tac from California (it had been confiscated from a clever customer) and surprised a few Mile-Hi cable folks as it unscrambled every channel on the system. As I recall, it surprised Zenith, too.

As long as I've been in the industry the doomsayers have been predicting the demise of cable. Proponents of MDS, DBS, MMDS, backyard dishes, VCRs and even conventional broadcasting (at least in cable's early years) all have predicted their favorite service would put "those cable scoundrels out of business." Backyard dishes and VCRs have made a few dents, but we're still alive and kicking.

And who would have imagined even three or four years ago today's widespread acceptance and use of AM fiber? Oh, yes, the skeptics then described our desire to put AM on fiber as a fantasy. (Remember when AML microwave was introduced?) What's next? Personal communication networks? Full digital transmission to the home? Video-on-demand? Residential telephony services provided by cable (or for that matter, cable services provided by the telcos)? Sen. Al Gore a supporter of the cable industry? Nah, that last one will *never* happen!

Ronald J. Hranac
Senior Technical Editor

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CT Publications Corp.
A subsidiary of Transmedia Partners-I, L.P.
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(303) 355-2101 FAX (303) 355-2144

Washington Bureau
1926 N St. N.W., Second Floor, Washington, D.C. 20036
(202) 223-0970 FAX (202) 223-0980

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The descrambler module mainframe can only be used by specifically approved SCC receivers.
VideoCipher is a registered trademark of General Video Instruments.

See the entire Standard line at the Texas Show, February 27-March 1, Booth 343.
Reader Service Number 10

CADD offerings expanded by NaCom

NaCom has expanded its computer-aided drafting and design capabilities to include both **Lynx** and **Lode Data** software services. Lynx is a fully integrated design and drafting package for strand mapping, underground routing, makeready survey, digitizing and RF design. Lode Data is a computerized interactive design program used for cable TV and LANs. Both services can generate a bill of materials report.

NEWS

Police arrest alleged cable thiefs

LAS CRUCES, N.M. — Four men were charged with illegal reception of cable services and conspiracy following an investigation by the Las Cruces police department and FBI investigators. The four allegedly rigged and sold decoder boxes to receive premium services here and in at least three other states.

Three of the men were released on their own recognizance; the fourth was released on $10,000 bond. If convicted, each of them face a maximum of a year in jail and up to $25,000 in fines.

People using altered decoders also may face charges. "We have equipment in place to identify those persons using unauthorized decoders," said John Christopher, president of **Las Cruces Cable TV**. "We would rather not pursue additional criminal or civil prosecutions, but we will if we feel that theft of our services is continuing."

Those with illegal decoders were offered a 30-day amnesty program where they could bring in the equipment with no questions asked. Also, a hotline was set up to answer questions about theft of cable service and allow those who know of someone stealing service to anonymously provide information.

The five-month investigation began when Christopher received a letter from a paying cable subscriber who complained about people buying the altered decoders. Evidence that the devices also were being shipped to New York, California and Texas was found.

Philips announces 750 MHz RF hybrids

BOULDER, Colo. — **Philips** has preproduction samples of RF hybrids capable of operating up to 750 MHz, which translates to carrying 112 cable TV channels, according to **Cable Laboratories Inc.** As reported in *Specs Technology* (CableLabs' monthly technological publication), key Philips technical and management personnel visited **Magnavox, Jerrold, Scientific-Atlanta, Texscan, C-COR** and **Triple Crown** to discuss the specifications of new push-pull and power-doubling engineering samples of hybrids for use in 750 MHz amplifiers.

At the same time, Philips delivered about 25 hybrid samples to its major original equipment manufacturing accounts. These were handmade, laboratory preproduction devices. Factory production and engineering runs were scheduled to start in January. Larger quantities of 750 MHz hybrid amplifiers from factory production engineering runs will be available to major CATV equipment manufacturers before the NCTA convention this month. Volume production is to start in June or July.

Tech sessions for Cable '91 announced

WASHINGTON, D.C. — A tentative schedule of technical sessions for Cable '91, to be held March 24-27 in New Orleans, was announced by the **National Cable Television Association**. They are as follows:

March 25

• 3-4:30 p.m. — "Fiber-optics performance," Room 43. Moderator: Alex Best.

• 3-4:30 p.m. — "Consumer interface," Room 44. Moderator: Tom Jokerst.

March 26

• 8-9:30 a.m. — "Fiber-optic components," Room 43. Moderator: Larry Nelson.

• 8-9:30 a.m. — "Picture quality testing," Room 44. Moderator: Ben Crutchfield.

• 3-4:30 p.m. — "Video compression," Room 43. Moderator: Craig Cuttner.

• 3-4:30 p.m. — "International cable," Room 44. Moderator: Joe Van Loan.

March 27

• 8-9:30 a.m. — "System operations," Room 43. Moderator: Larry Lehman.

• 8-9:30 a.m. — "Digital video technologies," Room 44. Moderator: Roger Pience.

• 11 a.m.-12:30 p.m. — "CableLabs staff update," Room 43. Moderator: Walt Ciciora.

• 11 a.m.-12:30 p.m. —"Exploring plant expansion," Room 44. Moderator: Mike Angi.

☛ **Toner Cable Equipment** signed an agreement with **Panasonic Communications and System Co.** to be an authorized stocking distributor for Panasonic's line of professional/industrial video equipment, including camcorders, cameras, tape decks, monitors and switching gear.

☛ **Trilogy Communications** completed the relocation of its coaxial drop manufacturing facility from Freehold, N.J., to Flowood, Miss. This gives the company a drop manufacturing plant close to its Pearl, Miss., site where MC^2 air dielectric cable is manufactured.

☛ **Augat** announced net income for 1990 increased 15 percent to $17.1 million. Net sales last year were $299 million compared with $307 million in 1989. Return on sales improved from 4.9 percent in 1989 to 5.7 percent in 1990.

☛ **Midwest CATV** announced an 8 percent increase in sales from 1989 to 1990. LAN sales were up 200 percent in 1990 and the Midwest LAN group will be doubled in size for 1991.

☛ **California Amplifier** reported sales for the quarter ending Dec. 1, 1990, were up 22 percent to $3.8 million, from $3.1 million for the same period in the prior year. The company reported a net loss for the quarter of $536,000 (including a one-time $700,000 charge relating to reserves established for the discontinued defense products business), compared to net earnings of $228,000 for the same period the prior year.

Expo '91 registration packages to be mailed to national members

Packages containing registration materials and information for the SCTE Cable-Tec Expo '91, to be held June 13-16 at the Reno-Sparks Convention Center in Reno, Nev., will be mailed to all active national members this month.

Upon receipt of the packet, national members will be able to register for the expo, the premier training and CATV hardware conference presented annually by SCTE. This packet also will contain a schedule of events planned for the expo and information on accommodations and services available to expo attendees.

SCTE has coordinated the event to make it comfortable to attendees. Registration rates for the expo have not changed since 1986, while sleeping room rates at the headquarters hotel, Bally's Resort, are $76 for single and double occupancy. Bus services to expo events will be available at nearby official expo hotels. The expo promises to be a well-attended event and the exhibit floor is rapidly selling out.

Cable-Tec Expo '91 is being planned by this year's Program Committee, which includes Bill Riker of SCTE and Steve Allen of Jones Intercable as co-chairmen, Ted Chesley of CDA Cablevision Inc., Sally Kinsman of Kinsman Design Associates, Paul Levine of CT Publications, B.J. Toner of Toner Cable Equipment and Dave Willis of TCI.

SCTE chapters hold vendor show

Three SCTE chapters based in northern California held their first joint Vendor Show Jan. 17-18 at the Party Palace Exhibition Center in Fairfield, Calif. This event was conceived by Steve Allen, engineering manager of Jones Intercable's Roseville, Calif., system and past president of the SCTE Sierra Chapter, which was instrumental in the coordination of the event with the full support of both the Golden Gate and Central California chapters. The officers of all three chapters contributed their time and effort to make this a very successful activity.

The purpose of the show was to expose local technical personnel, who may not get the opportunity to attend major state and regional shows, to the improvements that vendors have made to existing products, as well as to the new products that are now available in the cable industry.

A total of 53 vendors displayed their products to 307 technical attendees over the two-day period. The attendance was very pleasing to all who worked so hard to make the event a most successful one. In addition to displaying products, several of the vendors conducted one-hour technical presentations on topics that directly relate to the industry's everyday and future needs.

The show hours were 9 a.m.-5 p.m.

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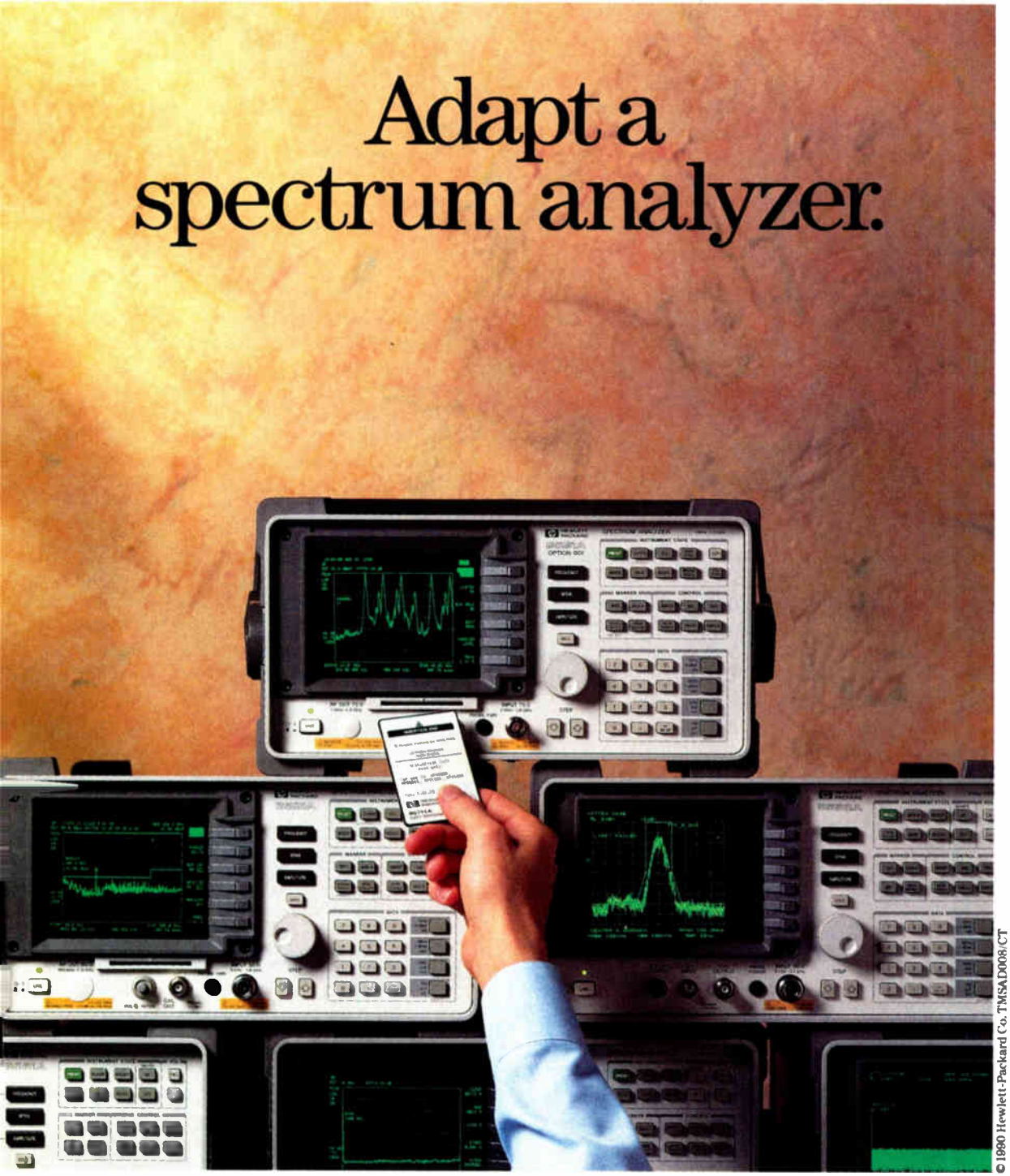

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on Thursday and 9 a.m.-6 p.m. on Friday. This was a "tabletop-only" display show and few active demonstrations were conducted by the many vendors in attendance.

Following this successful first show, attendees and chapter members active in its coordination commented that they were looking forward to next year's event, which promises to be larger and draw even higher attendance. Steve Allen commented, "It was well worth the effort that the members of the three chapters contributed to the preparation of the event, and we will start working on next year's event immediately."

SCTE conducts first Cable-Tec Games at Texas Cable Show

The Society presented the first in a series of Cable-Tec Games during last month's Texas Cable Show. The games for this show, sponsored by CT Publications and Anixter Cable TV, are based on the successful Cable Games competitions that have been held for the past two years at the Colorado Cable TV Association's annual convention. The original Cable Games, conceived by CT Publications, were coordinated by the Rocky Mountain Chapter.

Like the Cable Games, the Cable-Tec Games is a competition among system technical personnel centering around four tasks. After each event, points are awarded by the judges for each contestant based on speed, accuracy and performance parameters. (Due to the publication deadline for this issue of *CT*, the results of Texas games will be announced next month.)

Other Cable-Tec Games competitions are being proposed for regional shows, with the winners of the regional events to compete in a final Cable-Tec Games event.

BCT/E review materials available

The availability of the Broadband Communication Technician/Engineer review materials has proved to be very popular! For those who missed it the first time, here is the information again.

The assembled materials consist of approximately 90 percent of the periodicals, papers and articles recommended by SCTE, as well as some others deemed appropriate. The reference books are *not* included. The cost (which includes printing, binding and shipping) for the materials manuals by BCT/E category is as follows: Introduction to the BCT/E, $9.70; Category I, $24.90; II, $37.10; III, $23.30; IV, $25.60; V, $17.50; and VI, $29.20.

Requests for individual manuals should be made directly to J. Dyer & Associates at (303) 722-2526. J. Dyer will charge the company requesting the manual(s). Feel free to request an unbound copy, and photocopy your own for your company and chapter. By using the table of contents included with each category, you can easily insert your own tabs. But remember, *these materials cannot be sold!*

You have to be a national SCTE member to participate. Applications and additional information on BCT/E can be obtained from the "Introduction to the BCT/E" or by contacting SCTE national headquarters at (215) 363-6888. Also, national SCTE plans to update the outlines of all categories, for release in 1991. If you would like more information, please contact Pam Nobles, Jones Intercable, at (303) 792-3111.

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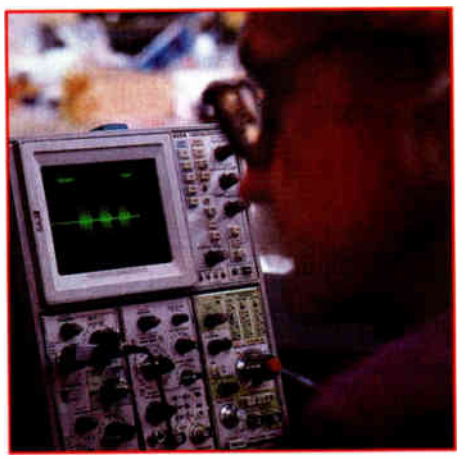
CATV program switching enhanced by cue tone use

By Roland L. Phillips
Applications Engineer, Monroe Electronics Inc.

More than 75 satellite-delivered networks use cue tone signals that appear at the beginning and end of programs, as well as in the middle of programs for local avails. Cue tones are used to control a variety of automated switching functions such as selecting a satellite channel, turning scramblers on/off, switching audio/video signals or starting a local avail. Before cue tone signaling was available, programs were switched manually or by program timers and local avails did not exist. The result is more accurate switching at lower cost.



A technician adjusts the timing duration for a cue tone.

A battery-powered DTMF encoder is used for troubleshooting cue tones.

Development

Cue tone signaling was developed by Monroe Electronics in cooperation with HBO in 1977 to provide a means for the cable program service to switch unattended headend equipment at the CATV system. Monroe maintains itself as custodian of the cue tone system. As such, it has chosen or approved the cue tone sequences used by the various organizations. This is to promote reliability of the cue tones and to prevent conflict in usage.

Cue tone signaling was specifically designed to allow the program services to place cues directly on the main program audio subcarrier, permitting simple headend decoding without the requirement for additional subcarrier demodulators. However, cues also can be placed on a separate subcarrier or may be generated by network controllers at a system.

An individual cue tone consists of a burst of four DTMF (dual-tone multifrequency) digits. The standard DTMF format was chosen because of its proven performance for reliable audio channel signaling. The use of a four-digit code prevents false operation caused by DTMF content present in the program audio or other signaling on the cue channel.

Standard DTMF tones are commonly known as Touch-Tone and have a frequency tolerance of ±0.5 percent.

Figure 1 shows the frequencies of each digit, which fall within the normal audio frequency range. For this reason, when DTMF digits are used for control in conjunction with audio, precautions must be taken to prevent faulty decoding. Program audio must be muted for the duration that the DTMF digit is present and must be a minimum of a three-digit sequence.

Each cue tone is a unique DTMF sequence assigned to a single program service and for only one switching function. Assignment of individual codes prevents unwanted interaction between automatic switching functions — especially when the program service cues are generated locally to duplicate or override the program source cues.

(Continued on page 32)

Figure 1: DTMF encoder frequency assignments for digits (in hertz)

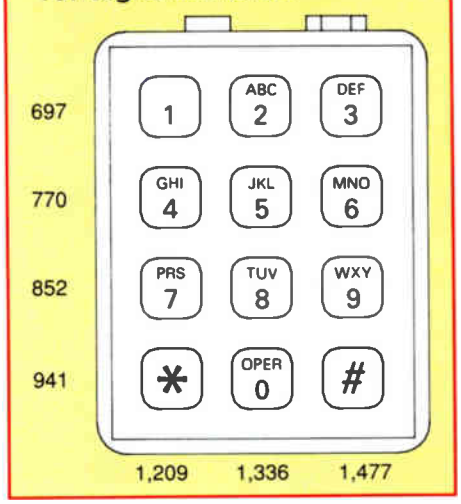
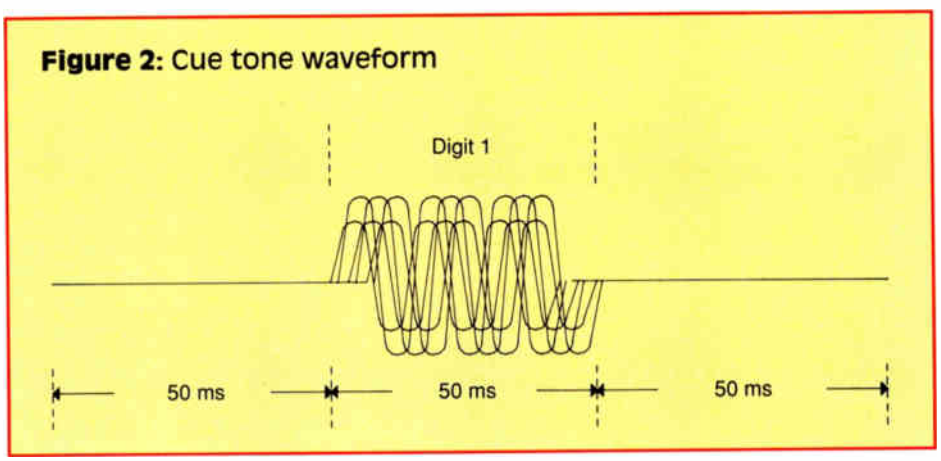


Figure 2: Cue tone waveform



Cue tone codes assigned to networks

*This is the latest listing of cue tones assigned to the networks. However, it is recommended that you first check with the network to see if it is actually being used. All codes are followed by * for on and # for off.*

Network	Use	Code
ABC	Spare	015
ABC	Comm.	807
ACTS	On/off	905
ACTS	Comm.	925
ACTS	L. orig.	935
ACTS	On/off	945
AETN	On/off	194
AETN	Spare	516
AMC	On/off	329
Amer. Value	On/off	086
ARTS	On/off	637
BET	On/off	406
Bravo	On/off	513
Cable V. Net.	On/off	135
Cable V. Net.	Comm.	286
Cable V. Sy.		256
Cable V. Sy.		381
CBN	Comm.	414
CBN	Comm.	568
CBN	Spare	715
CBN	Comm.	829
CMN	On/off	043
CMN	Comm.	867
CNN	Spare	017
CNN	Comm.	024
CNN Headline	Spare	541
CNN Headline	Main	635
Coll. Sports	Comm.	013
Country Music TV	Comm.	468
C-SPAN	On/off	195
Daytime	On/off	307
Discovery	On/off	491
Discovery	Comm.	826
Discovery (G/W)	On/off	164
Disney Ch.	On/off-E	617
Disney Ch.	On/off-W	834
DSI	On/off	498
Entert. Mktg.	On/off	420
ESPN	Comm.	048
ESPN BB	On/off	692
EWTN	On/off	762
Fashion Ch.	On/off	187
Fashion Ch.	Comm.	658
FNN	Comm.	401
FNN	On/off	738
FNN	Comm.	975
Galavision	Comm.	032
Galavision	On/off	453
HBO	On/off	729
HBO	Scramble	835
Hit Video	Comm.	316
Home Sp.	Dall./Sel.	092
Home Sp.	T/B Sin.	385
Home Sp.	On/off	392
Home Sp.	Spurs SW	604
Home Sp.	Rock. SW	943
Home Team Sp.	Comm.	632
Home Team Sp.	Comm.	740
HSE Alt. A	Comm.	156
HSN1	L. Comm.	075
HSN1	Spare	243
HSN1	Spare	421
HTN Plus	On/off	207
KBL	Comm.	159
KBL	On/off	168
Learning	On/off	192
Lifetime	Comm.	361
Ma. Ed. Canada	On/off	189
Midwest Sp.	PPV	179
Midwest Sp.	Comm.	813
Movietime (E!)	Comm.	386
Movietime (E!)	On/off	716
MSG	On/off	019
MSG	Comm.	767
MTV		152
MTV HA	On/off	947
Nashville	Spare	514
Nashville	Comm.	674
Nashville	Spare	743
Nashville	On/off	866
NC Sports	On/off	284
NCN	On/off	073
NCN	Spare	108
NESN	Special	103
NESN	On/off	472
News 12	Comm.	926
Nickelodeon	Comm.	749
Nostalgia	On/off	872
Ontario	On/off	306
Ontario	Spare	470
Pacific	On/off	487
Pacific	Comm.	587
Playboy Ch.	On/off	869
Prime Sp. NW	On/off	378
Prime Sp. NW	Spare	476
Prime Sp. NW	NW switch	483
Prime Sp.	On/off	087
Prime Sp.	Spare	509
Prime Sp.	MT/WY/SW	521
Prime Sp.	In/out	596
Prime Sp.	Comm.	634
Prime Sp.	KS/KB/SW	769
Prime Sp.	Pacific	896
Prime Sp.	Spare	917
Prime Sp.	Spare	928
Prime Ticket	On/off	125
Prime Ticket		786
Pro Am. Sp.	On/off	173
Rainbow	Spare	253
Rainbow	Comm.	389
Rainbow	On/off	458
Rainbow	Spare	647
SF Giants	On/off	182
SF Giants	Comm.	279
Select TV	Roll thru	539
Select TV	Spare	619
Select TV	12 hr. SW	721
Select TV	Adult	840
Showtime	Sports	186
Showtime	On/off	576
Showtime	On-line	679
Showtime	Off-line	753
Sky-Merchant	On/off	193
Sky-Merchant	Comm.	603
Spanish Intl.	Spare	624
Spanish Intl.	On/off	819
Sp. Ch. Ohio	Comm.	238
Sp. Ch. Ohio	On/off	364
Sp. Ch. Phil.	On/off	532
Sp. Ch. Phil.	Comm.	965
Sp. Ch. Amer. II	Comm.	236
Sp. Ch. Amer. II	On/off	572
Sp. Ch. LA	Comm.	318
Sp. Ch. Amer.	On/off	478
Sp. Ch. Amer.	Comm.	694
Sp. Ch. FL	Comm.	169
Sp. Ch. FL	On/off	450
Sp. Ch. FL	Blkout 2	745
Sp. Ch. FL	Blkout 1	908
Sp. Ch. NE	Comm.	038
Sp. Ch. NE	On/off	290
Sp. Ch. NE	On/off	523
Sp. Ch. NE	Spare	876
Sp. Ch. Plus	Comm.	536
Sp. Ch. Plus	On/off	983
Sports Ch.	On/off	143
Sportstime	Spare	904
Sportstime	Comm.	915
Sportstime	On/off	987
Sportsvision	Comm.	023
Sportsvision	On/off	205
Sportsvision	Spare	412
Sportsvision	Spare	756
SPN	Comm.	429
SPN	Spare	517
Sunshine	Comm.	069
Sunshine	On/off	271
Sunshine	Magic SW	435
Sunshine	Spare	912
Telemundo	Comm.	598
TNT	Comm. 2	093
TNT	Comm. 1	309
TNT	Spare	321
TNT	Blkout	404
Tulsa	Comm.	423
Tulsa	On/off	426
United Cbl. Ch.	Comm.	620
United Cbl. Ch.	On/off	719
Univ. Net.	Spare	579
Univ. Net.	Spare	777
Univ. Net.	Spare	895
Univ. Net.	Comm.	937
UPI	On/off	279
USA	Bl. on/off	295
USA	Spare	438
USA	Comm.	601
USA	Spare	706
USA	Test	168
Viacom	Spare	178
Viacom	Spare	830
Viewer Choice 1	On/off	105
Viewer Choice 2	On/off	261
Viewer Choice	Spare	341
Vision	On/off	569
Vision	Comm.	980
Vision/Can.	On/off	427
Warner	N/A East	311
Warner	N/A West	519
Weather Ch.	Comm.	350

Contest Rules: No purchase is necessary. Entries accepted from authorized representatives throughout the United States faxing their name, title and phone number and the phrase "Please enter us in the Midwest CATV Rose Bowl 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. No contest entries will be accepted if received by Midwest CATV after March 31, 1991. Total value of the prize is $2,070. Prize includes airfare from anywhere in the Continental United States to Los Angeles, CA, lodging for three nights, game tickets for two people, reserved grandstand parade seat, escorted game and parade transfers, continental breakfast New Year's Day, and a Universal Studios tour. 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 April 20, 1991.

Tackle a trip to the Rose Bowl courtesy of Midwest CATV.

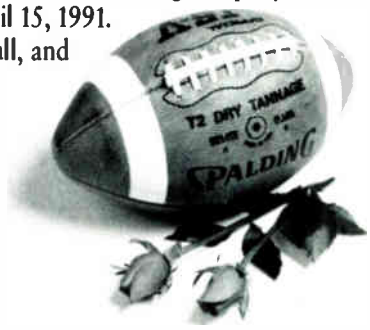
This month, the Midwest CATV Customer Incentive Contest is featuring a trip to the Rose Bowl! So, don't fumble your chance for some California sun, fun, and football.

You can enter the contest two ways. Option one is if you place your order for Florida Wire and Cable strand or hardware during March, your company is automatically entered. It's the best of both worlds. First, you get the highest quality strand made. Strand that's backed by 30 years of manufacturing experience, the industry's best warranty, and meets ASTM A-475 standards. Poleline hardware that conforms to ANSI C-135, NEMA and BELL specs. Products that have been hot dipped galvanized and made corrosion resistant. And, with a March order, you may win a trip to the Rose Bowl.

Option two for entering, is for you, the company's authorized representative, to fax us on company letterhead, via fax machine, your name, title, telephone number, and the phrase "Please enter me in the Midwest CATV Rose Bowl Contest." It's that easy!

Only one prize will be awarded. The prize includes roundtrip airfare from anywhere in the Continental U.S., lodging and tickets to the Rose Bowl in January, 1992. The winning company will be selected by April 15, 1991.

So get on the ball, and enter today!



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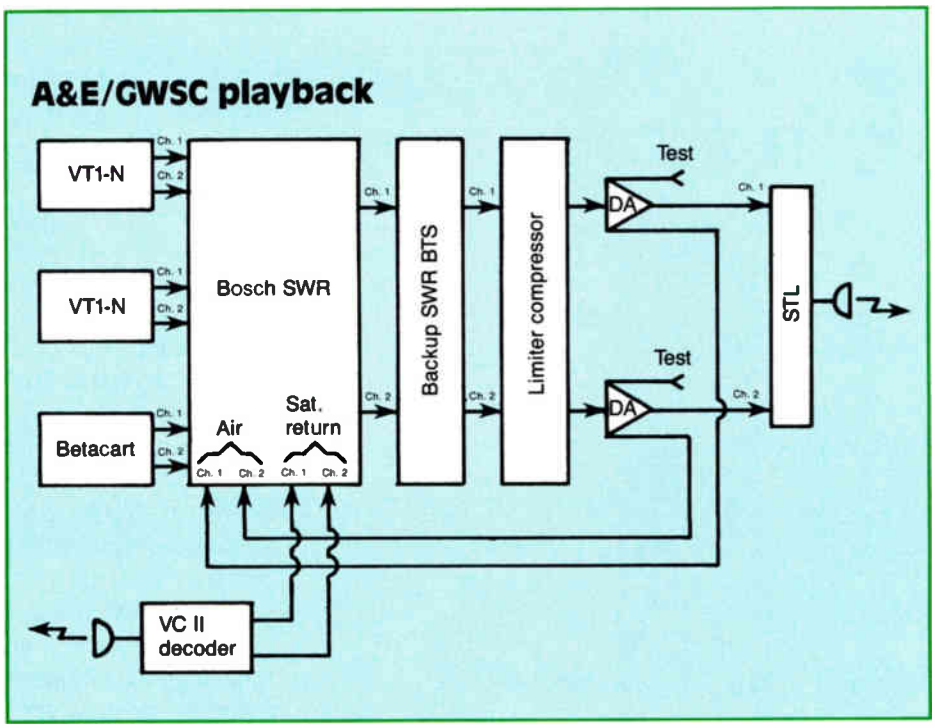
Network signal and local insertion compatibility

By Howard S. Zaremba
Senior Director Network Operations, Engineering
A&E Cable Network

The encryption of network program signals, the availability of multichannel random access insertion systems and automated switching control necessitate improved interactive system operations and procedures. These hardware and software developments are fueling local system revenue streams such as advertising spot sales, addressable pay-per-view and subscription services. Each requires a high degree of technical sophistication and the cooperation of the network and affiliate for efficient operation.

The industry goal is to ensure that the integration of network transmission signals and local spot inserts remain transparent to the end user, the viewer. A clean "seamless" program signal preserves the integrity of network programming and enhances the value of the local system advertising environment.



Local affiliate breaks

Local advertising sales adds important channel value for the operator. It is projected that over the next five years local ad sales revenue will increase at a faster rate than national ad sales (Table 1) and capital expenditures for insertion hardware will become one of the fastest growing segments of the headend equipment market (Table 2).

From an operational and technical standpoint, the cable networks encourage local ad efforts by formatting availabilities that support local sales strategies, such as the number and length of breaks per hour and the times at which they occur. The automated local environment requires that affiliate breaks fall as close as possible to the same time each hour. Insertion times are programmed for limited time periods. Once inside this window, the playback source, such as a VCR, will move into a "heads up" mode. The break is now ready to roll upon receiving the proper tone cue. If the tone is sent outside the window, some systems will not be activated and the break will be missed or rolled late, clipping a spot or a program.

Over the past 10 years insertion systems have evolved from a simple tone decoder, switcher and single VCR that rolled pre-edited fixed spot sequences. Today random access, microprocessor controlled systems offer on-line spot selection to multiple networks and provide post-air printouts and billing features.

Increasing ad revenues and expenditures on insertion hardware are some indication of the growth and importance of local sales to the system bottom line. The need to improve the overall local product and better satisfy client needs will continue to stress basic quality control, both as it relates to equipment purchasing decisions and system operations issues.

Signalling techniques

DTMF or dual-tone multifrequency control pulses were developed by the telcos and gained widespread acceptance by the CATV industry. While they have become a de facto standard for most insertion system operations, DTMF tones are susceptible to transmission noise and level disparities that must be carefully monitored for proper decoding.

Control tones are commonly transmitted via three primary signal paths: narrowband companded subcarriers, wideband subcarriers and as an encoded data stream. Each transmission format has its own technical characteristics and uplink and headend equipment requirements.

Most program networks have migrated to an inaudible tone format, which is more flexible and aesthetically less objectionable than the audible "beeps" within programming. Moving tones off program audio also results in system economies and better utilization of subcarrier bandwidth.

For example, A&E locates all network control tones on a wideband audio subcarrier located at 6.8 MHz. Local operators using A&E cue tones for spot insertion or blackouts bridge the subcarrier output off the satellite receiver to the DTMF input of the insertion system. Stereo and mono program audio are taken directly off the descrambler. The 6.8 MHz subcarrier also serves as a bypass default for program audio. During normal scrambled periods a barker message is transmitted notifying non-subscribers that A&E is scrambled.

(Continued on page 34)

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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.

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Company Name 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.:_____

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SIGNATURE FOR CHARGE AUTHORITY:_____

Applications without payment will be returned. Applications from outside U.S., enclose additional $20 (U.S.) to cover mailing expenses.

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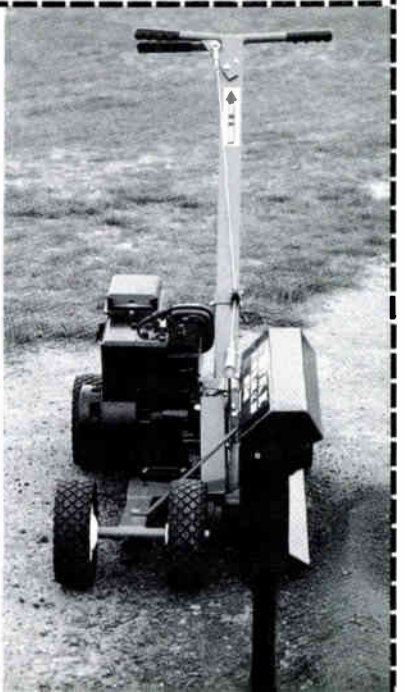

Integrated AML/FO systems

By Tom Straus
Chief Scientist, Hughes Microwave Products Division

AML and fiber optics are both used for transportation of CATV signals from a single transmitting point to one or more receiving points. In that sense they may be thought of as rivals but this need not necessarily be the case. Each has its advantages and disadvantages. In many cases these attributes can complement one another.

It is well-known that fiber-optic systems have made tremendous strides in the past few years. This is particularly true of systems that carry a multiplicity of VSB/AM (vestigal sideband/amplitude modulated) TV channels. The stringent requirements on carrier-to-noise (C/N) ratio and linearity imposed by this format are indeed a severe test. FM and digital modulation would be a lot more forgiving but the need to reprocess every channel at each receiving point is such a serious drawback that the primary interest, and one that this discussion will be limited to, remains transportation of VSB/AM signals.

Although perhaps not as widely known, the same remarks can otherwise be made with regard to AML microwave. In particular, in the area of relatively low-cost block upconversion and power amplification technology, an increase in power by a factor of 200 has been demonstrated within the last six years. Moreover, high power all solid-state channelized transmitters have been developed with which a microwave system C/N of 60 dB can be realized at ranges well in excess of 30 kilometers. Although FM and digital microwave have performance advantages just as with fiber, the same complexity and cost considerations greatly favor microwave VSB/AM carriage when a large number of channels is being carried by the system.

Table 1: System pros and cons

Microwave	Fiber optics
Speed of installation. Can generate immediate cash flow from "cherry-picked" locations.	Similar to cable construction but requires special skills for splicing.
Subject to temporary path fades.	Impervious to rain.
Possible path blockage with tree growth or new intervening construction.	Possible damage to fiber due to natural disasters, accidental cuts or sabotage.
Requires FCC license and frequency coordination.	No RF leakage from the fiber.
Line-of-sight required. Tower required if no existing structure available.	Requires right-of-way for cable installation, which may have to be underground.
Line-of-sight path is minimum distance.	Distance typically 30 percent greater than line-of-sight.
Ease of crossing rivers and similar terrain obstructions.	Must follow right-of-way.
May not be able to locate large antennas near residential areas.	May not be allowed to cross green belts.
Requires 18 GHz frequency division multiplexing with 13 GHz equipment to extend capacity beyond 80 channels.	With multiple fibers and/or wavelength division multiplexing (WDM) provides essentially unlimited bandwidth.
Two-way links implemented with addition of filter and circulator.	Multiple fibers in cable or WDM required for two-way links.
Usually lower overall system cost, especially for multiple paths.	Usually higher cost except for short distances.
A 60 dB C/N obtainable at distances exceeding 30 km; 56 dB C/N at >25 km with block conversion transmitter.	Performance limits set by Rayleigh backscatter in fiber and statistical waveform clipping by laser diode threshold; 55 dB at 20 km.

Microwave vs. fiber trade-offs

In comparing microwave systems with fiber-optic transportation, a large number of factors need to be considered. This greatly complicates the relative evaluation in the general case, but in specific cases not all of these factors need come into play. Thus the preferred choice usually can be readily identified. For the more general situation the best that can be done is to list the pros and cons of each technology. This is done in Table 1. In a specific case the applicable factors have to be evaluated in terms of performance and cost. In many cases a microwave link already exists and the trade-off then involves only an upgrade of the microwave. In any case, some attributes already can be seen to be generally complementary rather than competitive. For instance, heavy rain can affect the microwave but full performance is automatically restored when the storm passes. Properly installed fiber is unlikely to be affected, but if the cable is cut by a natural or man-made disaster, restoral of service is not so easy.

The comparisons made in Table 1 are generally self-explanatory. However, further comments may provide some clarification. The line-of-sight requirement for microwave sometimes can be circumvented through the use of repeaters. For this reason, as well as to extend range, a series of "boosters" have been developed. These devices are basically block amplifiers and their contribution to system noise and distortion must be taken into account just as is the case with optical amplifiers.

If the day comes when compressed video data decoders are made available to each subscriber, AML, coaxial cable and fiber-optic transportation systems will all benefit from the advantages of data format compared to VSB/AM. As well, the 80-channel 13 GHz CARS band limitation may no longer apply then. In the meantime, low-cost 18 GHz block conversion equipment is being developed.

(Continued on page 38)

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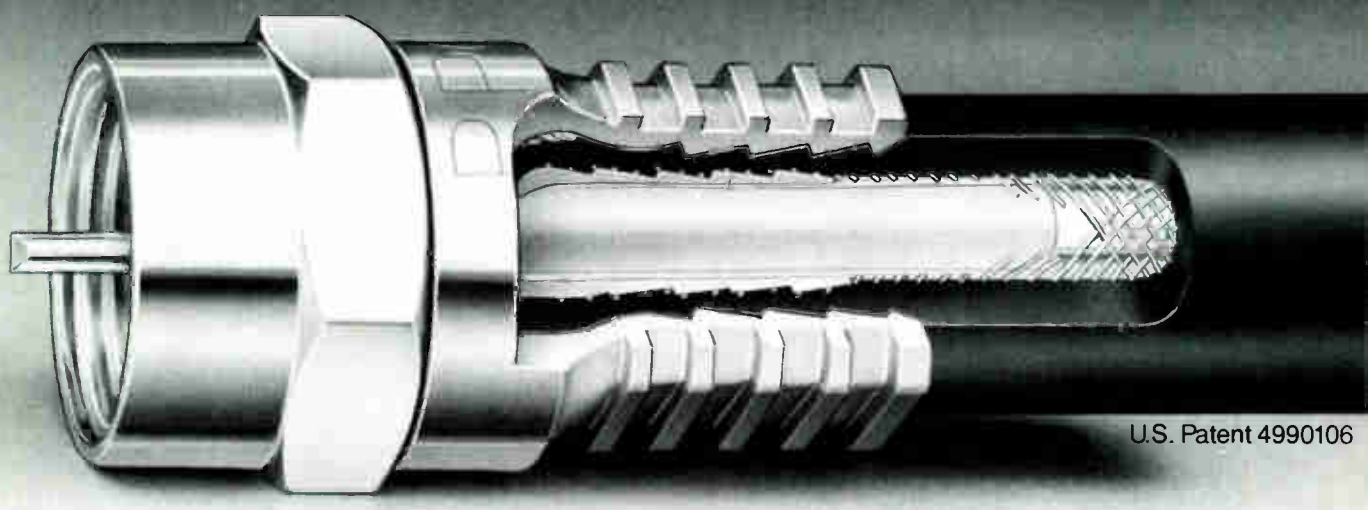

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A single connector for RG-6 or one for RG-59 accommodates a wide range of cable, from 40% through quad. Color coding the connectors (clear chromate conversion finish on the RG-6 and gold chromate conversion on the RG-59, along with individual identification,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

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CATV program switching enhanced by cue tone use

(Continued from page 20)

Signal operation

The first three tones of the four-digit DTMF cue tone are those that identify the unique address of the individual satellite network. The fourth tone identifies the specific function, where star (*) is used for start/on and pound (#) is used for stop/off. An example of a complete network cue tone would be shown as 138*/# (pronounced one thirty-eight star slash pound) and operates as 138* for on and 138# for off.

Duration, timing and amplitude of the cue tone are determined by the individual satellite network's cue tone encoder as shown in Figure 2. Individual tones are normally 50 milliseconds per digit pulse width with silence between tones nominally 50 ms. As shown in Figure 2, 50 ms of silence precedes the four-digit cue tone.

Timing of the start/stop programming cue tones is not as critical as beginning/end of local avails. Cue tones must be sent at a predetermined time in the program before the local avail is to occur, known as pre-roll. Pre-roll time varies from network to network, ranging from five to eight seconds. Pre-roll time is necessary to allow VCRs to thread-up and start playing. Cue tones are normally transmitted 8 dB below the average program level. We use 0 dBm at 1 kHz into a 600 Ω load as a reference of program level. This calculates to 0.775 V RMS (2.191 V peak-to-peak) as shown in the following equation.

$$P = E^2/R$$

$$0.001 = E^2/600$$
$$0.6 = E^2$$

E = 0.775 V RMS at 1 kHz.

Note: 0 dBm = 0.001 watts; R = 600 Ω

Cue tones transmitted at 8 dB below the reference audio level would therefore be 0.308 V RMS or 0.872 V peak-to-peak and, for most decoder manufacturers, is the accepted level.

Receiver function

A cue tone receiver monitors the baseband audio of the satellite service generating the tones, and if used for an audio/video AB switch it is connected to the normally open contacts of the AB switch. When configured as shown in Figure 3, normal programming is connected to the modulator until the start/on cue tone is received, connecting the alternate program source to the modulator. The AB switch remains in this position until the stop/off cue tone is received, which connects the normal program back to the modulator.

Troubleshooting

Generally speaking, there are few problems associated with receivers. Should one arise, it most likely would be that of no detection or intermittent detection of cue tones. This can be caused by too low or too high an audio level from the satellite receiver.

In either case, a good tool for troubleshooting is a portable DTMF encoder pad (which may be purchased for less than $100 from an electronics distributor or some of the more

"Cue tones are used to control a variety of automated switching functions such as selecting a satellite channel, turning scramblers on/off, switching audio/video signals or starting a local avail."

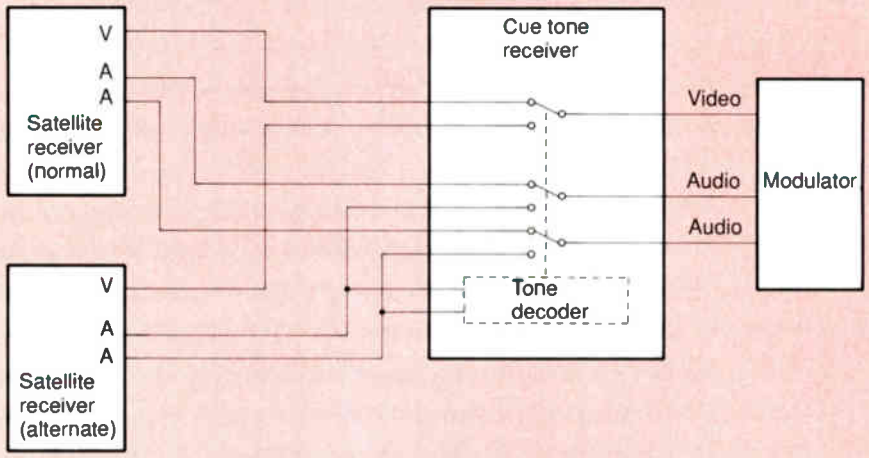
popular retail outlets). This simple hand-held, battery-powered device generates the 12 standard DTMF tones: zero through nine, the star (*) and pound (#). A standard miniature phone jack permits direct electrical connection to the audio input of a cue tone receiver. A speaker output allows acoustic coupling of the generator to a telephone handset or microphone or provides audible feedback to the operator. A level control switch permits selection of a high or low audio output.

With the tone decoder connected to the satellite receiver audio output, use an AC voltmeter or other audio measurement instrument and adjust the satellite receiver audio level output for an average 0 dBm level. If the problem persists:

- Remove the alternate satellite receiver's audio from the tone decoder input only.
- Connect the DTMF encoder to the tone decoder's input.
- Enter the four-digit start/on cue tone to the decoder.

Upon completion of entering the four-digit on code, the audio/video AB switch should energize. If it does not, either the tone decoder card is at fault or the wrong code was entered. With the audio/video switch energized, send the four-digit stop/off cue tone, verifying that your tone decoder is functioning at slow speeds. Contact the decoder manufacturer for repair of the tone decoder if intermittent operation continues. **CT**

Figure 3: Cue tone receiver configuration



Insertion capability

(Continued from page 24)

Automated headend control requires reliable signalling and addressability. Digital systems utilize more sophisticated control data sequences for customized insertion and automated operation. One such application utilizes a digital data stream transmitted along with the composite program signal and converted at the headend to DTMF control tones. Digital FSK data is less affected by satellite "noise" than analog DTMF transmission and may result in more reliable signal decoding and execution.

Signal encryption

The industrywide decision to implement a unified encryption format for network program services has had a positive impact on signal quality control and operating procedures. Improved headend design and closer signal monitoring, due in part to signal scrambling requirements, are helping to standardize system operations.

The encrypted program signal must be transmitted and received within tighter tolerances than the unscrambled signal to maintain proper descrambler authorization. This requires more accurate level metering and signal maintenance. The VideoCipher encryption system also utilizes a digital audio format that has improved program audio signal-to-noise from 56 to 70 dB and provides stereo and mixed mono options.

The addressable unit authorization scheme and program epic definitions allow for universal selectivity and control. Circular blackouts and increased security have aided in the development of regional program networks and increased the demands on system headends for more rack space and better design.

Finally, the VideoCipher system provides for a 19.2 kilobit data channel in the vertical blanking interval (VBI), which can be configured for a variety of system control and download uses. Several networks have already begun to use this data stream for advanced network control and affiliate updates.

Most local insertion systems consist of a vertical interval switcher, a tone decoder and a stand-alone VCR for source material playback. A well-designed system will perform glitch-free vertical interval switching between the insertion source and the satellite-delivered program network. As systems upgrade to take advantage of multiple network opportunities, more complex insertion capabilities are required. Some random access systems insert into multiple networks with non-overlapping local break placement. These systems can be programmed to cue, roll and insert spots into pre-selected networks, recue composite reels and provide post-air verification and billing. This level of automation requires a system design that can genlock several asynchronous signal sources and maintain proper sync and alignment with the CATV insertion channel.

The fast growing regional sports networks illustrate the complexity of the switching technologies necessary for smooth and efficient operation. Locally, systems must switch cleanly between multiple transponders and satellites. As blackout requirements increase, networks are becoming fully software driven with the uplink controlling and polling headend switching operations.

VCR playback machines

The most common use of DTMF tones transmitted via satellite by the program network is for rolling a VCR playback machine at the local headend. The master reel is advanced to a specified cue point

Table 1: Cable advertising revenues (in thousands of dollars)

	National spot	Local spot
1990	1,646	620
1991	1,862	769
1995	2,980	1,464
	+ 81 percent	+ 136 percent

Source: Paul Kagan Associates Inc.

Table 2: Insertion system hardware expenditures

	1990*
1,800	Systems inserting 1-6 chs.
× 3	Inserted channels (average)
5,400	Total inserted channels
× $6,000	Per channel (estimate)
$ 32,400,000	Total expenditures

	1995*
2,200	Systems inserting 6-12 chs.
× 6	Inserted channels (average)
13,200	Total inserted channels
× $6,000	Per channel (estimate)
$ 79,200,000	Total expenditures

* Systems with over 3,500 subs

Source: Channelmatic Inc.

and parked for playback. The programmed tone sequences and timing commands roll the VCR, insert the break and switch back to the primary program source.

Playback reels may be edited by break or be master spot reels for random access. Spot reels are then encoded for automated spot cueing. Accurate tape encoding with a reliable format (such as an SMPTE time code) is necessary to reduce miscues and other spot discrepancies.

System hardware must be properly aligned for proper insertion operation. Poor or infrequent VCR maintenance is the cause of many audio/video playback discrepancies such as video rolls, skewing and tearing. A VCR will begin to slip after continued jogging, shuttling and extended use. A miscue of only 20 frames may cause clipping of a commercial spot or program bumper.

Worn tape heads, transport damage and dirty pinch rollers cause tape creases and jamming and may lead to expensive repair bills if not corrected. Careful cleaning and handling and a planned schedule for routine, preventive maintenance will increase equipment reliability and performance. Other problems such as high humidity, extreme headend temperatures, static electricity and power line transients wreak havoc with internal microprocessors and compromise equipment operation. While plant climate control and power conditioning can be costly, they should be considered as part of any serious plant upgrade.

Network signals are continually monitored and evaluated by trained master control and earth station personnel. A satellite downlink and local system feed provide a full range of signal cross-check monitoring for stereo audio, tone decode verification, RF levels and composite video signals.

Each playback/uplink facility may utilize different house reference levels, depending on plant configuration, technical constraints and operating philosophy. A transmission standard should best represent the programming mix and be subject to extensive testing and evaluation throughout the entire signal path.

For the local operator, setting audio levels can be especially subjective. Programming with a wide dynamic range, when juxtaposed with spot materials that are highly compressed or synthesized,

"The network and local operator must provide source materials that meet high standards to ensure that technical problems do not interfere with ... program content."

creates subtle psychoacoustic disparities, which the ear may perceive unevenly when in fact the average levels are the same.

Most network facilities meet or exceed broadcast RS-170A baseband specifications and RS-250B transmission standards, which are a benchmark for evaluating audio and video signals. Proper test equipment and trained headend technicians are necessary for setting and maintaining proper levels.

The network and local operator must ensure that overall video/audio quality is balanced, clean, and free of audio "hiss" and video "sparkles." System operators should verify signal levels on a regular basis. For example, A&E transmits bars, reference tone and VITS for video measurement each morning (6:30-6:35 a.m. EST, Galaxy I, Transponder 12).

Most cable programmers operate with several levels of facility backup protection and monitoring redundancy to protect the network service. The satellite downlink is monitored with audio and video LED presence detectors, video sync detector alarms and ongoing audio/video quality checks. A failed or unauthorized descrambler at the local headend will throw the network signal into the scrambled mode. The VideoCipher descrambler provides a bypass contact closure for alarming purposes. Many networks and local operators utilize sync detector alarms to protect against an extended outage period. These alarm systems may also utilize remote dialup features for operators without full-time coverage.

Periodic system failures challenge every facility. Insertion system transients may result in missed breaks and lost revenue. On-site automated logging devices can be a valuable diagnostic tool to determine actual break roll times, tones received or not received and other critical system data. The A&E/Group W Satellite Communications complex is staffed 24 hours a day, providing network monitoring and a hotline for scrambling and affiliate technical support (see accompanying figure).

At a time when the consumer has access to CD quality audio and views first-run films on Super-VHS players, the cable industry must work harder to satisfy this hypercritical TV viewer. Before the promises of HDTV and other high end technologies can begin to pay off, basic concerns for systemwide quality control and performance must be met.

The network and local operator each deal with a wide range of program suppliers, whether they be program distributors or local commercial producers. Close evaluation of all tape materials and special care in dubbing and playback is important for maintaining consistent quality. The network and local operator must provide source materials that meet high standards to ensure that technical problems do not interfere with and obscure program content. Basic concerns such as the number of tape passes, excessive dropout, headclogs and faded picture quality detract from the cable product. Poor quality commercial insertion materials do not exhibit the local advertiser favorably nor encourage positive consumer response.

Interaction and accountability

Integrating sophisticated digital system control and source switching into the existing analog and baseband headend environment places a premium on training, quality control and preventive maintenance. The scrambled, addressable CATV universe requires more interaction and accountability between the network and local affiliate. Program signals have become more standardized and better managed in order to deliver quality audio/video to the viewer.

The next few years will see a marked increase in the variety and scope of audio/video programming and digital information downloaded locally, both as additional revenue streams and for affiliate marketing and technical support. Services such as affiliate E-Mail, premium pay-per-view and customized data/text/graphics offer new opportunities that will demand improved system technologies and operating imperatives. **CT**

Acknowledgements: Special thanks to GWSC O&EG for its assistance.

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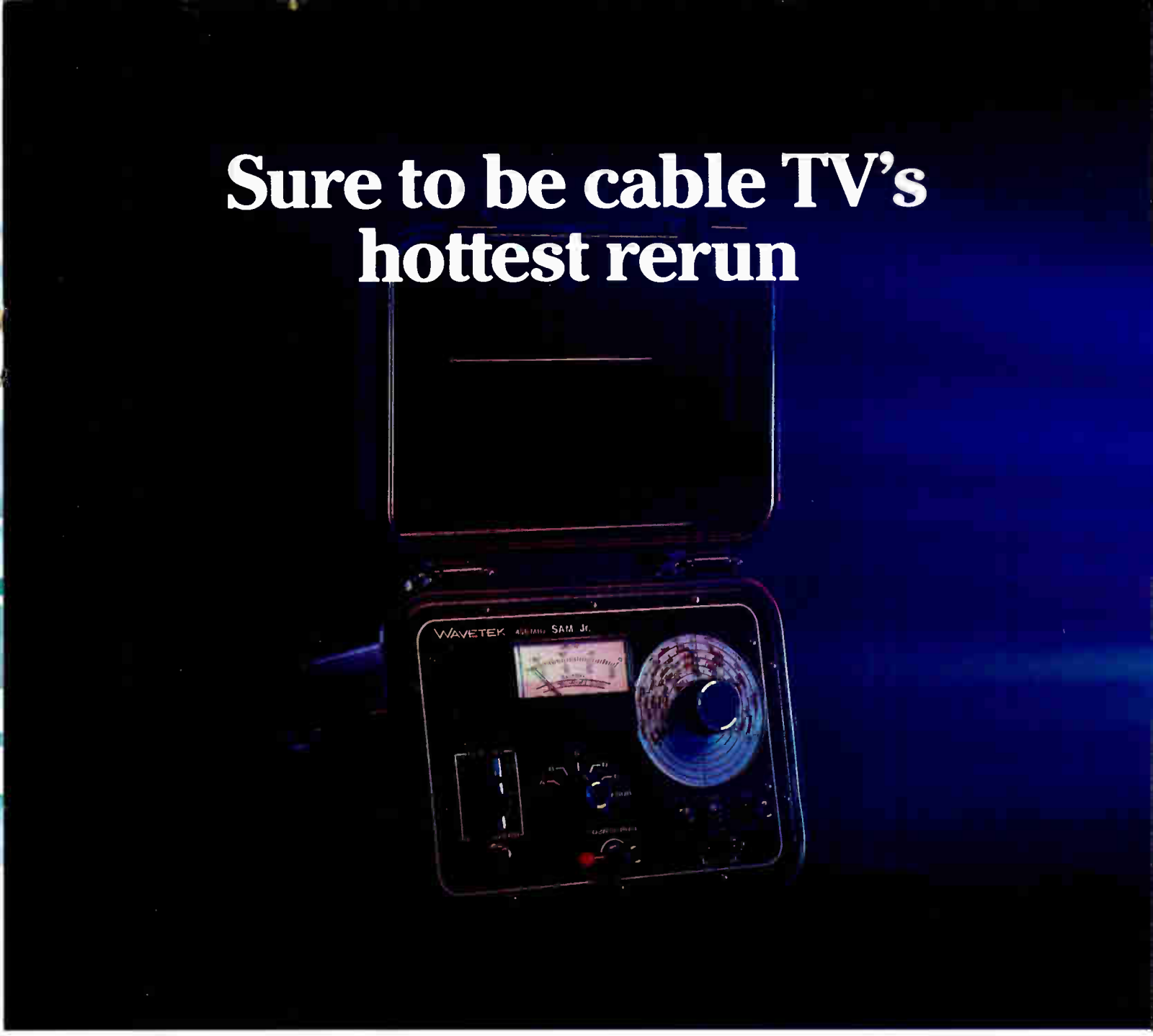

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AML/fiber systems

(Continued from page 30)

Cost is often one of the most important factors in determining the choice between microwave and fiber. With fiber, the biggest cost contributors are usually the cable and construction. This latter varies greatly depending on whether the situation calls simply for overlash, new aerial or underground installation.

In channelized AML systems the largest cost factor is usually the transmitter. If all of its capabilities are fully utilized this is also the most cost-effective solution. However, in many instances the power available at some output ports is either underutilized or not connected at all. In that case the much lower cost block conversion transmitter becomes the most cost-effective solution. Even here, the higher the power, the greater the cost effectiveness, as illustrated by comparison of the AML-IBBT-116 with the newer AML-HIBT-118. A 5 dB increase in power output capability will be associated with less than 2 dB increased cost. Both transmitters can be effectively matched to mid-size microwave system requirements. In the smallest systems, the compact outdoor transmitter (COT) series provides the optimum cost solution. In this case transmitter cost no longer dominates system cost.

Table 2

# of chs.	Power output per ch. (dBm)	C/N (dB)
12	20	66
21	18	64
35	15	61
60	12	58
80	11	57

The performance comparison made at the bottom of Table 1 assumes 40-channel loading with both composite triple beat (CTB) and composite second order (CSO) better than 65 dB when the measurement is made with CW carriers. Both microwave and fiber benefit when modulated carriers are utilized but most manufacturers stick with CW measurements since this provides a common yardstick and is not dependent on details of the modulation. Both fiber and microwave benefit as well when parallel paths are utilized to reduce channel loading. However, the distortion limitation for the microwave is usually CTB while with fiber CSO plays an important role.

Increasing channel loading to 80 channels in a microwave transmitter typically requires about 3 dB back-off in output power per channel as compared to 40-channel loading with the same 65 dB CTB limit. That is, for a large number of channels total power is roughly constant for constant CTB. By contrast, CSO in laser diode fiber systems degrades rapidly as channels are added to the high frequency end of the spectrum[1]. As a result multiple laser plans that avoid octave bandwidths are often employed.

Integrated systems

Integration of AML with fiber has previously been shown to be advantageous in a number of circumstances[2,3]. In particular, it is impractical to establish hundreds of receive sites in a microwave point-to-multipoint system even if the required line-of-sight were available for each path. The largest metropolitan area AML system employs only a little over 30 sites. Fiber on the other hand can penetrate

Table 3

Transmitter:
Modulation index/channel = 5 %t
Relative intensity noise = -155 dBc/Hz
Power into fiber = 4 mW

Receiver:
Response = 0.85 %
Noise equivalent current = 5 pA/√Hz

deeply into the trunk as in fiber backbone, or indeed all the way to the bridger. In such instances utilization of the combined microwave and fiber technologies can lead to both performance and cost advantages.

Consider for instance the range that can be reached when employing an AML-HIBT-118 transmitter. Table 2 summarizes the performance parameters of this equipment for 65 dB CTB and CSO. When combined with a 40-channel fiber-optic "tail" having the characteristics assumed in Table 3, the link will have an overall performance summarized in Table 4.

It is assumed in Table 4 that the microwave path utilizes 10-foot antennas, has 4 dB total waveguide loss, and is permitted to fade below 35 dB C/N for only one hour/year. These assumptions, and that of average multipath and rain (CCIR Zone D2), determine the microwave path length. In a more benign rain zone (CCIR Zone E) the microwave path distance increases to 31.7 km, and even to 45.4 km if the best multipath conditions prevail. These line-of-sight distances when added to the fiber tail length are significantly greater than what could be achieved with fiber alone with the same total link noise and distortion performance. Moreover, since the distance is large, the cost saving with microwave will in general also be very substantial.

As was previously pointed out, the mechanisms that can interrupt a microwave path are totally different from those that can cut a fiber transmission. Thus it is natural to consider the one a backup for the other if fully redundant transmission paths are desired. Since such a backup service would be expected to be infrequently needed, it also might be acceptable in the interest of cost saving that the quality of the backup need not be quite as high as the primary link. In this sense fiber could serve as a backup on longer links. Conversely, if fiber is the primary link, a lower cost microwave backup could be selected than would otherwise be the case. Since both equipment and path redundancy is thereby provided, with automatic switch-over at VHF being easily implemented, the overall reliability of the supertrunk will be orders of magnitude higher than without the redundancy. **CT**

Table 4

Microwave path length	25 km
Microwave C/N	56 dB
Microwave C/CTB	65 dB
Fiber tail length	16 km
Total link C/N	52 dB
Total link C/CTB	62 dB

References

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[2]T.M. Straus, "Integrated AML/fiber backbone systems," *NCTA Technical Papers*, 1989.

[3]T.M. Straus, R.T. Hsu and L.A. Kaufman, "New microwave and fiber-optic supertrunking system configurations," *NCTA Technical Papers,* 1990.

How to motivate your tech staff

By Rikki T. Lee
Consultant

If you're reading this column, then you certainly qualify as a member of the CATV technical community on the cutting edge. You're a born leader with great management skills. You'll go far in your career, since you're a natural at working with people.

I've just shamefully motivated you to read further. Wait — before you get mad about being manipulated, think about it. When was the last time your boss complimented *you* on something you did: writing a lab report, preparing last week's seminar, etc.? How did you feel about being recognized for your achievement? Most likely it boosted your spirits and maybe led you to share the compliment with others (a snowball effect for the ego).

Now consider your tech staff — those installers, technicians or engineers whom you supervise every day. Like many of today's managers, you might subscribe to the philosophy that "no news is good news." After all, if your techs ever did anything wrong or weren't on schedule, they'd hear about it. But if they completed their work according to standards set by the company, it's just what you expect; i.e., no comment (or compliment) needed.

In such an environment, the tide doesn't just turn against you — it ebbs, and for many of your employees. Job performance becomes uneven and might show a steady decline. High standards may suffer, replaced by the attitude of "let's do it quickly and get out of here." Mondays and Fridays become days of rest, one-hour lunches gradually build into two hours, and people complain about boredom. To set things right, you issue a Riot Act memo.

Enhancing self-esteem

A little bit of motivation early on will prevent a lot of headaches later. If everyone on your team practices self-motivation techniques, you're off the hook — but you're probably not so lucky. You must take the responsibility to motivate your staff yourself; enhance their self-confidence and self-esteem with your actions. The more confident that people feel about their work, the better they perform. This holds true for the greenest installer to the most seasoned MSEE and everyone in between.

The first step in building employee self-esteem consists of speaking with your staff as well as "actively" listening. Whatever you say to your people (and how you say it) can affect in a positive or negative way how they feel about their work and themselves. Rephrasing their comments and giving both visual and audible clues that show you're really listening can work wonders.

Instead of continually working behind a closed door, do some walking around staff offices at least once a day.

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Reader Service Number 34

In other words, spend a little more time in the trenches; it's called "schmoozing." But if you don't have time, make time. You could delegate one of your enjoyable tasks as a reward to a hard worker.

No one's too busy in the headend to hear "Hi, how are you?" No one's too preoccupied in the design room to be asked for their opinions about the new CADD software. No one's too laid back in the lounge to talk to a good listener about a work-related or family problem. To paraphrase an old cola slogan, positive personal communication is the pause that refreshes tired techs.

Of course, you'll achieve better results if you go beyond small talk. Thank your staff engineer for submitting a report on time (but don't add "finally"). Give praise for that excellent presentation at an SCTE seminar. Congratulate a tech for completing an NCTI course. Invite staff members for coffee while you express some constructive concerns about improving job practices.

Make motivation one of your main responsibilities as a manager. It's an ongoing task: When you agree with someone, say so. When a tech's right, say so. When you're wrong, say so. You'll gain respect because you'll show that you respect others. Still, by enhancing self-esteem, the aim should be to strengthen your staff's job performance, not to boost your popularity.

Setting goals

The award for most talked-about topic in technical management these days (envelope, please) goes to goal setting. The time for simply talking about setting goals should come to an end; it's time to set goals. To help motivate and give your staff that constant feeling of personal accomplishment on the job, you'll need more than a manual of performance standards, more than classroom training, more than an infrequent "thumbs up" gesture.

You can provide written individual goals for staff members whose jobs are predominantly task-oriented, such as installers and some technician levels. Also include group goals for interdependent tasks. But how do you set goals? Just follow these steps:

1) Compile specific tasks and on-the-job behaviors (e.g., preparing fiber-optic splices, testing return loss, etc.).

2) Specify by which method performance will be measured (demonstration, observation in the field, work orders, etc.).

3) Assess the level or standard of the behavior over a certain time span (e.g., connecting 10 leak-free drops in one day).

4) Establish a means of providing feedback as well as a variety of incentives or rewards (time off, bonuses, training, public recognition, letter in employee's personnel file, etc.).

5) Explain the goal-setting program and seek out employee commitment, to result in a signed agreement to participate. Assist staff members in setting personal or other professional goals. Disseminate performance goals in writing to the employee.

6) Provide initial training or follow-up instruction (if necessary) for meeting minimum performance standards.

7) Monitor the program regularly and perform any modifications to employee goals; communicate these changes in writing.

8) During employee performance appraisals, evaluate the success in attaining goals. Add more goals as job tasks increase. **CT**

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Testing viewers' great expectations

How clear a video image are cable viewers demanding today? How high will their expectations rise in the future — and how fast? These are two questions that have big-money implications for designers and owners of CATV systems. But hard data has been difficult to come by — until now.

In time for the late-March NCTA convention, a research group led by CableTelevision Laboratories Inc. (CableLabs), plans to publish a paper that begins to answer these questions. CableLabs, the research consortium funded by cable MSOs, designed the test and has worked with the Applied Media Lab of General Instrument's Jerrold Communications subsidiary, based in Hatboro, Pa., to create a test facility to host dozens of randomly selected viewers.

Viewers cast votes

Exposed to carefully controlled sequences of subtly distorted images, the viewers are asked to indicate their subjective reactions by setting a slide switch, with the entire sequence of stimulus and response being carefully recorded on test equipment. A partial model of the test bed, on display at the Western Cable Show in Anaheim, Calif., in November, attracted sizable crowds of onlookers.

The test's results, says Tom Elliot, CableLabs vice president of science and technology, will update data on viewers' video expectations that's now at least 10 years old. "What we do know," Elliot said, "is that a 'good' picture is a constantly moving target."

Among the reasons for viewers' rising expectations: better TV sets and monitors. These "give people a better microscope for seeing visual imperfections," said Elliot, who is on loan to CableLabs from his job as director of research and development at Tele-Communications Inc.

"The test's results ... will update data on viewer's video expectations."

Nearing a plateau?

Elliot predicts the Hatboro tests will reveal that viewers' rising expectations of picture quality may plateau in the future. The test should help determine the level of quality at which this occurs. It's clear these expectations are rising. In a 1958 test by the Television Allocations Study Organization, subjects defined a 28 dB signal-to-noise ratio (S/N) as their threshold of a "somewhat objectionable" TV picture. When the study was repeated in 1983, those sampled deemed a much better picture (one with a 38 dB S/N level) "somewhat objectionable." Elliot said he suspects viewers today would find an S/N of around 48 dB acceptable, noting that the design specs of a typical CATV system today also are probably "in the high 40s;" in other words, just keeping pace with expectations.

Many leading industry experts have visited the test bed at Jerrold's Hatboro facility, viewing its three racks of equipment and test instruments, and being briefed on the experiment. Elliot and the test's other key figures — Jerrold's Michael Jeffers and Bronwen Lindsay Jones, a leading expert on measuring human psychophysical reactions to audio/video stimuli — are working to gain these experts' advance approval of the test's methodology so the eventual findings will have widespread industry acceptance.

Breaking new ground

The primary impairments introduced into the TV pictures that affect CATV system design are noise (measured by a carrier-to-noise ratio, C/N) and intermodulation (reflected in a carrier-to-intermodulation figure, C/I). While reaction to some of the impairments has been gauged on test subjects before, the current test adds some new components — phase noise, microreflections (echoes) and chrominance-luminance delay inequality (envelope

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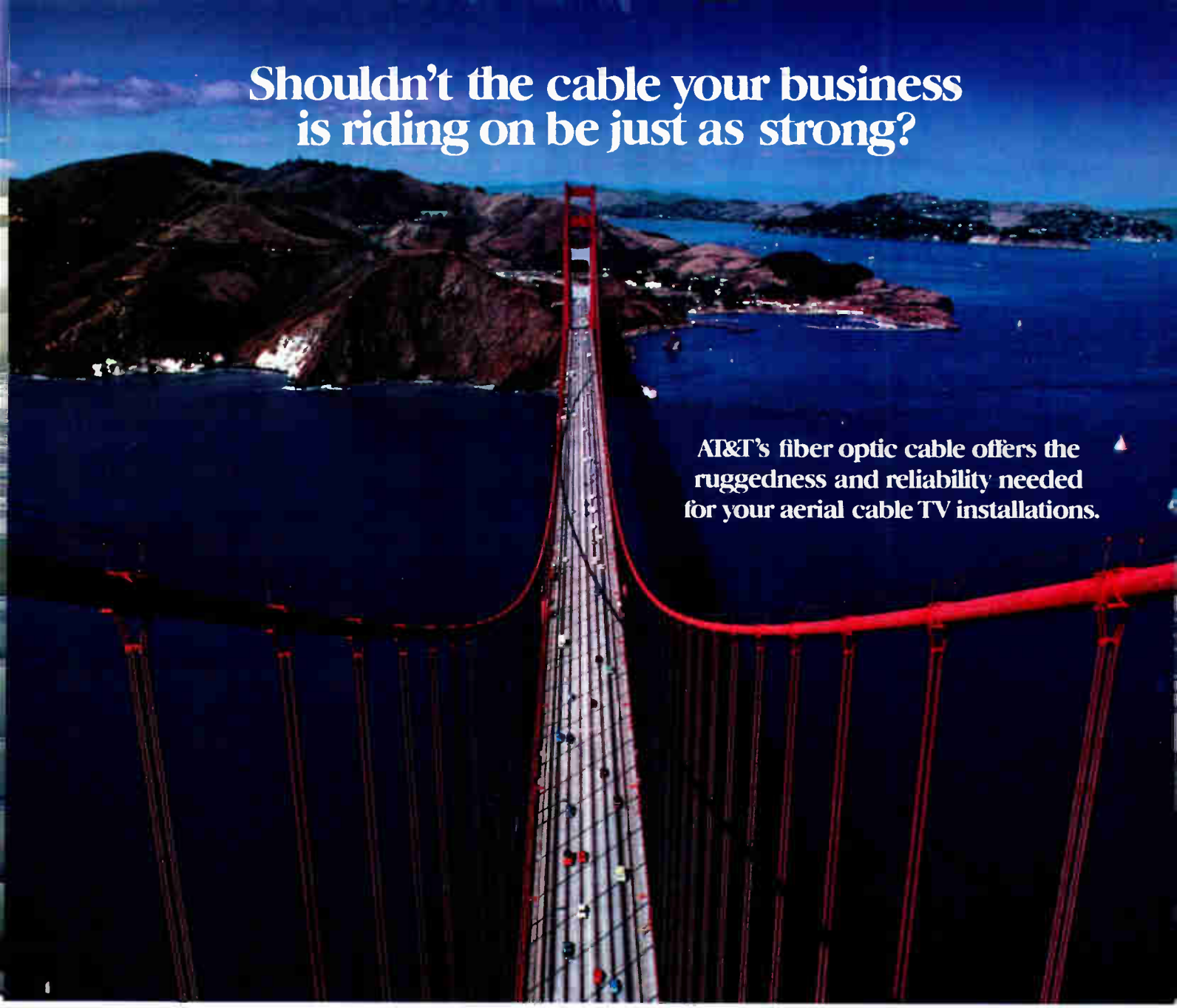

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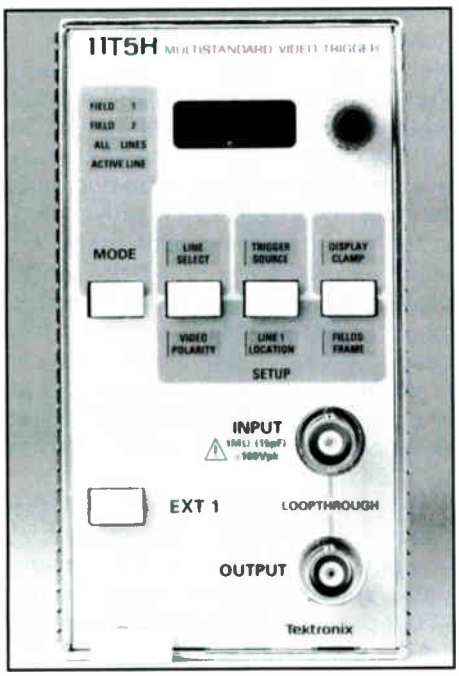
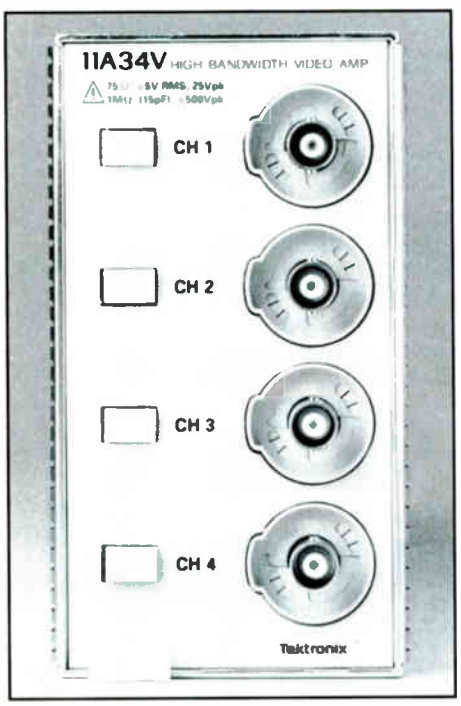
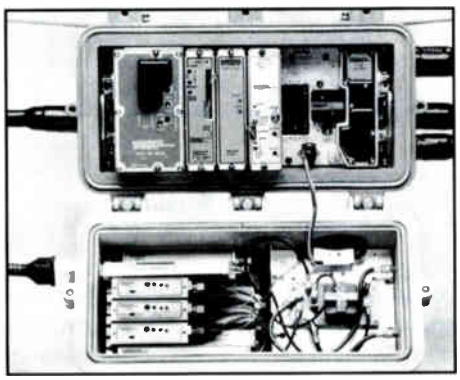


Video plug-ins

Tektronix has two new TV video plug-in modules for its 11000 Series oscilloscopes and DSA 600 Series signal analyzers. The 11T5H multistandard video trigger is a companion plug-in to the 11A34V high bandwidth video amplifier and triggers on all major TV standards, including HDTV. It handles line rates up to 1,280 lines per frame and can trigger on individual lines. The 11T5H is fully programmable via the IEEE-488 GPIB and has four modes of operation. The 11A34V has 75-ohm, 1 M-ohm switchable input impedance and, when used with the 11T5H, provides display clamping and trigger source signals. The unit has four 300 MHz channels, fast overdrive recovery, wide offset and dynamic range, plus a 1 mV/div. to 10 V/div. sensitivity.

Reader service #198





Optical mainstation

Magnavox's MagnaHub optical mainstation is for new-builds, rebuilds and upgrades of systems with no Magnavox Spectrum 2000 mainstations currently installed. It has an integral splice tray and accepts up to three optical receiver modules, each of which has RF output level adjustment, received optical level alarm threshold local and remote adjustment, DC power present LED indicator, optical power sensing/reporting, bandpass filters after each receiver and super FC/PC connectors.

According to the company, the unit allows for easy future expansion of channel capacity and has "one box" mechanical design for installability and serviceability. Configurations available are one-way, two-way, coaxial/fiber redundant, with or without optical/coaxial return, and with or without integral pigtail.

Reader service #197

Share switcher

Channelmatic's NSS-5A network share switcher (in concert with the CCU-232 channel control unit) expands two-channel insertion to eight channels using only two VCRs. The capabilities of the unit allow for options including insertion on a first-come first-served basis, on selected channels from an operator-supplied schedule, or on all channels for delivery of emergency or public service bulletins.

The unit can decode DTMF cue tones from four networks and either pass the cue tones through or serve as a road block, enabling ad interconnects to share avails. The NSS-5A also facilitates cross-channel promotions and allows operators to cherry-pick the best programs from a variety of networks. An auxiliary program output enables satellite-delivered spot reels to be recorded for later playback on any selected network.

Reader service #196

Ground system

PolyPhaser's PRM-25E chemical radial ground system attaches to a chemical PolyRod container to evenly distribute conductive electrolytes to lower soil resistance and reduce interconnecting inductance. The company says the PRM-25E achieves a good grounding system in poor or no soil conditions. Each unit is equipped with three 25-foot perforated 1/4-inch copper tubings and one distribution valve.

Reader service #209

Tie kit

Jensen's cable tie kit in a hip pouch is designed for greater cabling convenience and hands-free tool portability. It includes a production-quality cable tie tool, a tie cutter, 100 ties (50 large, 50 small) and a brown Cordura pouch with slots for each tool plus four compartments to keep ties of different sizes separate and organized. The pouch clips comfortably to any belt or waistband.

Reader service #208

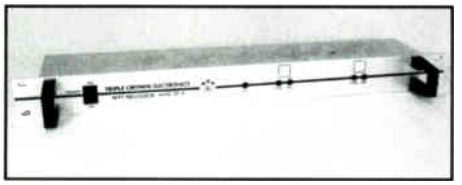
Microwave test set

Hughes Microwave Products Division introduced its AML-MTS-60 portable microwave test set. It can be utilized for checkout and alignment of existing AML systems, as well as for installation of new antenna paths. When configured in its broadband receiver mode, the unit can act as a field-portable transmit monitor that downconverts the microwave signal to VHF.

The lightweight, battery-powered test set can substitute for a microwave receiver during initial antenna alignment when power is not yet available at the site. Alternatively, if power is not yet available at the transmit site, the unit can easily be reconfigured to operate as a microwave pilot tone generator to perform antenna alignment or receiver checkout.

The battery provides a minimum of four hours continuous operation capability and can be recharged within eight hours. A set of microwave attenuators can be utilized to extend the calibration range.

Reader service #206



Message delivery

Triple Crown Electronics' Intellitext is a TV signal interception and message delivery system that functions as an add-on unit to enable existing TV distribution equipment to be addressed and remotely controlled. It can intercept and add to (or temporarily replace) a distributed TV program for purposes such as paging, message delivery, advertising and other business or personal announcements. The product can store and distribute as many as five pages of text each with six lines of 16 characters generated within a regular PC terminal.

Reader service #205

Network analyzer

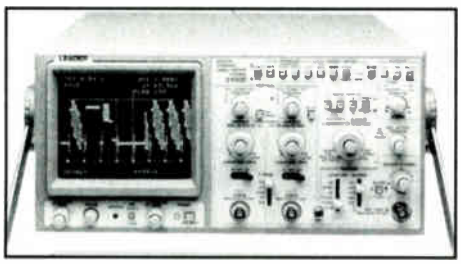
Hewlett-Packard introduced a network analyzer for testing CATV components, such as distribution amplifiers, filters, splitters, transformers and cables. The HP 8752B network analyzer measures amplitude, phase and group delay over a 300 kHz to 1.3 GHz (optional 30 GHz) frequency range. Also available is a time-domain analysis option that permits device response to be analyzed as a function of physical distance.

CATV components are designed to work in a 75-ohm characteristic impedance environment. The HP 8752B is the first network analyzer

from HP designed for 75 ohms. The unit includes a swept-synthesized signal source with 1 Hz frequency resolution, a tuned receiver with 100 dB dynamic range and 19-cm (7.5-inch) full-color display.

The unit doesn't require the premeasurement calibration typically needed with network analyzers. The user simply connects the device under test to the analyzer ports and makes a measurement. Test results can be sent directly to a printer or plotter by pushing a button.

Reader service #207



Oscilloscope

Leader Instruments announced its autoranging 100 MHz analog/digital oscilloscope, Model 3100D, which is equipped with separate 4K memories for both display and reference memories, 40-MS/s maximum sampling rate and 100-MS/s equivalent sampling. It offers CRT readouts with cursors of voltage, time, frequency, phase and ratios for voltage, time and dB along with additional comment lines. The results can be downloaded to computer via the standard GPIB interface or to HP-GL plotter for hard copy.

Up to four waveforms can be stored in memory. Waveform expansion of held information is possible from X1 to X100 with automatic interpolation. Held data from the display memories can be simultaneously displayed and overlaid onto stored data recalled from the reference memories for evaluation.

Other features include autoranging vertical and horizontal, selectable averaging from 2 to 256 bits, smoothing and pre-trigger view. The unit also has a dual timebase with calibrated delayed sweep plus alternate sweep, roll mode and trigger, and a universal power supply for 90 to 250 VAC.

Reader service #204

VCR controller

Nexus Display Systems added the option of VCR control to its ADmaster photo digital advertising system. Encompassing both new hardware and software, the VCR controller is completely integral to the current ADmaster system. Applications include supplementing photo classified channels with local origination programming, full motion infomercials and full video production advertisements.

Reader service #202

Converters

Panasonic Communications & Systems has two new series of non-addressable remote control cable converters that incorporate new FCC-mandated circuitry. The TZ-PC145 and TZ-PC175 incorporate the new automatic gain control circuitry required to meet FCC Part 15 output level requirements. Both units have a 550 MHz bandwidth and 85-channel tuning range.

Reader service #203

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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.

VideoCipher® is a registered trademark of General Instrument Corporation. Ownership or possession of the ESR1240 IRD with a VideoCipher® II Commercial Decoder does not entitle the owner or possessor to receive descrambled signals without authorization by the programmer.

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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.

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Lubricant pump

Polywater's lubricant pumps, Models LP-3 and LP-5, are hand-operated transfer pumps that mount on a five-gallon pail or 55-gallon drum of Polywater cable lubricant J, WJ, F, WF, G or A. The units are used to pump lubricant into conduit and onto cable during its installation. The elimination of hand application, messy pouring and lengthy clean-up during cable pulling saves time and effort according to the company. A soft foam, seal-off adaptor, which prevents lubricant backflow from small conduits, also is available.
Reader service #201

Multimeters

The 467 Series of digital multimeters from Simpson Electric permit easy hands-on meter reading in addition to benchtop use. An optional carrying case and neck strap keep the display in clear view when the unit is worn on the user's belt or from the neck.

Models 467-2 and 467-2T have Digilog display that combines precise digital readout with analog approximation by means of a bar graph. They also feature a differential peak hold function for simplifying work with transient voltages/currents, and a 50 microsecond pulse detector for digital troubleshooting.

All models have three low-power resistance ranges to allow in-circuit readings without damaging components or causing digital circuits to change states. They also have 3.5 digit accuracy for measuring the true RMS of non-sinusoidal waveforms and an audible tone for ease of continuity checking.
Reader service #199

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

If you're like most companies, your present field strength meter will allow you to check signal levels only, but many troubles in cable systems just don't affect the signal level! So how can you ensure your customers are receiving the absolute best signal? Sencore recommends the following **1, 2, 3** Go-No-Go testing!

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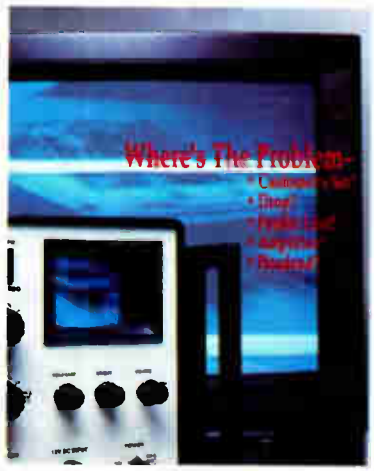

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Reader Service Number 43

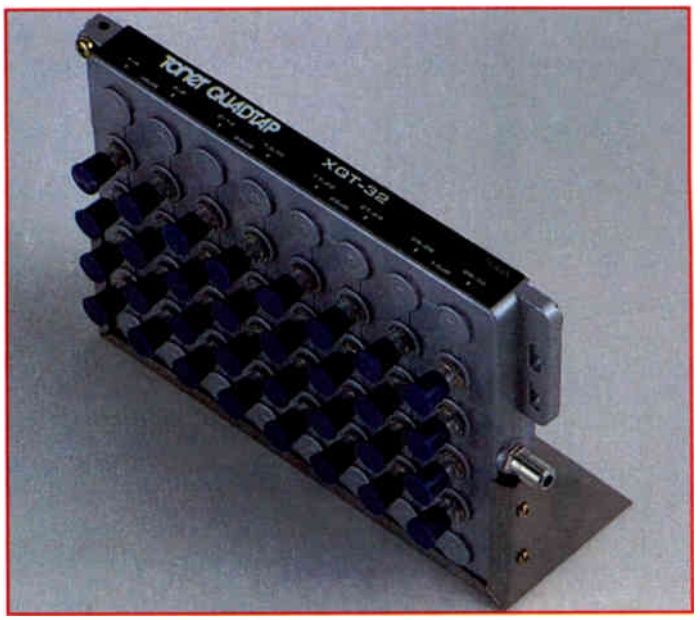
Toner's XQT-32 Quadtap

By Ron Hranac
Senior Technical Editor

If you've ever wired a multiple dwelling unit for cable, then no doubt you've spent the better part of many hours installing complicated arrays of splitters and jumpers, or even conventional taps connected together with housing-to-housing fittings. And no matter how well-intentioned your efforts were, the final result often looked — and performed — less than ideal.

In the United Kingdom, as cable operators developed architectures compatible with the extremely dense housing common in many of Britain's cities, tree-and-branch became tree-and-bush. But the same problem persisted: How does one provide a large number of service ports without creating the proverbial rat's nest?

United Artist International's Vice President of Engineering Jerry Crusan collaborated with Toner Cable Equipment to develop a solution. The result was the Quadtap, a line of multiple output passives now manufactured and marketed by Toner. We obtained a 32-output model and put it to the test.



"The Quadtap is a good solution to requirements for a large number of outlets in a relatively small space ... (working) well for apartments, hotels and other similar applications."

The product

Toner calls this product the Quadtap because it is electrically similar to four taps in one. The XQT-32, for example, is the equivalent of four eight-way taps in a single unit. All of the Quadtaps are in die-cast housings that measure 7-11/16 x 5-13/16 x 3/4 inches (not including connectors and mounting flanges). Overall dimensions are 8-3/4 x 5-13/16 x 1-1/2 inches, and the housings are painted for additional protection. The backing plate also is die-cast, and is press-fit before the application of an epoxy sealant.

The input and output connectors are plated brass F female (like those on conventional taps) and incorporate

Figure 1

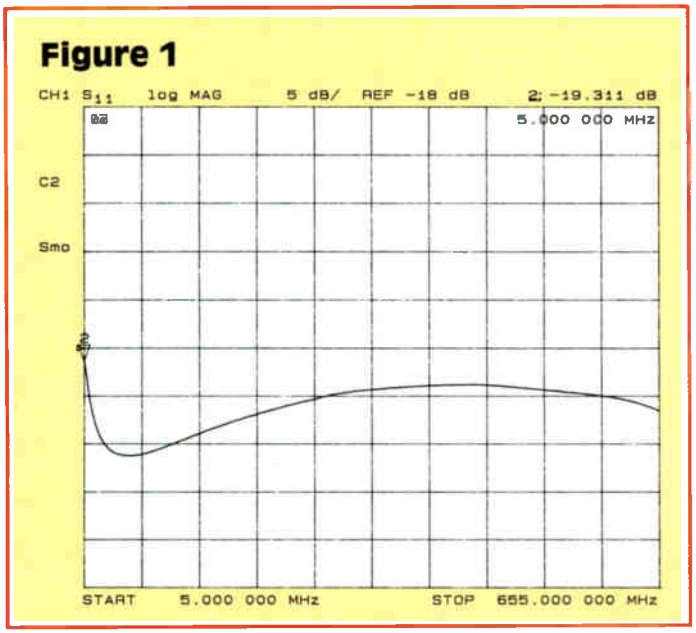
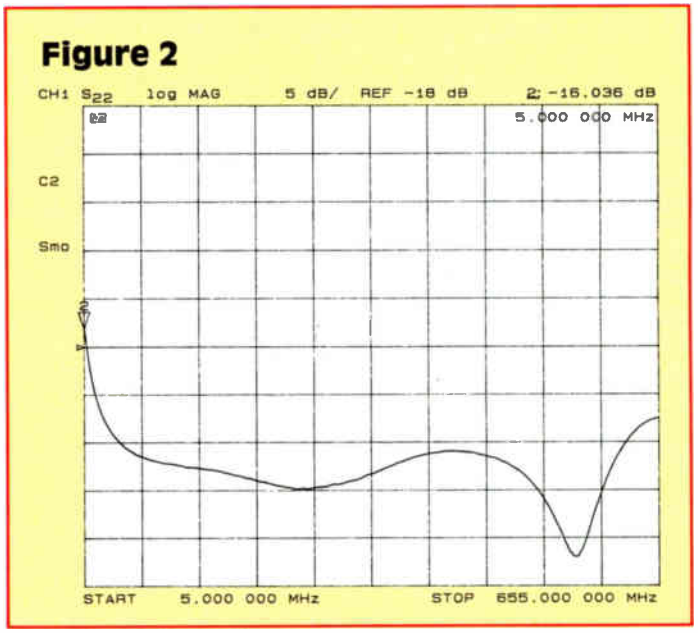


Figure 2



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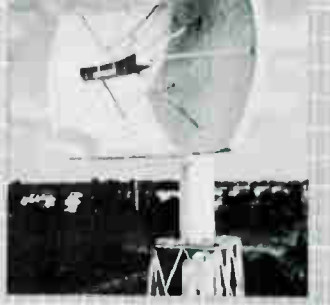

Tests conducted at Antenna Technology Corporation's range site demonstrate SIMULSAT's unique ability to simultaneously receive signals from all domestic satellites (Satcom IV at 83° west to Satcom IR at 139° west). In addition, range pattern tests show that carrier to interference isolation is sufficient for 2° C band spacing applications

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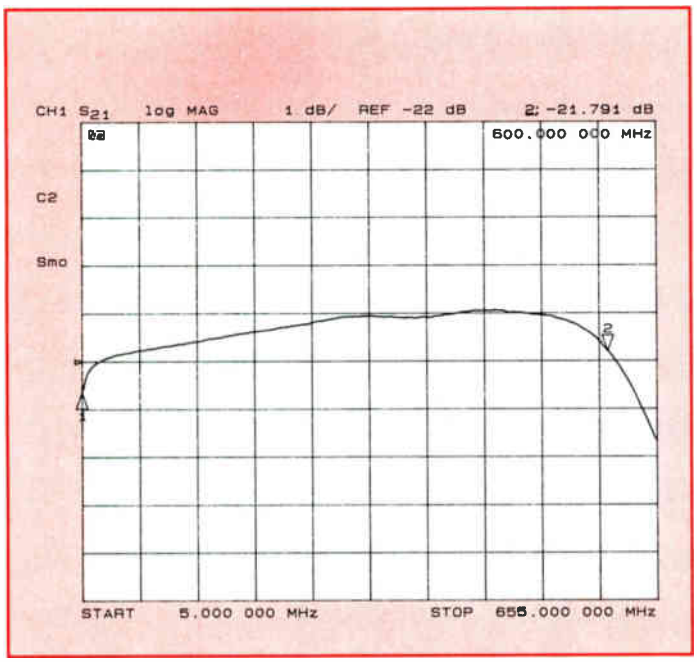

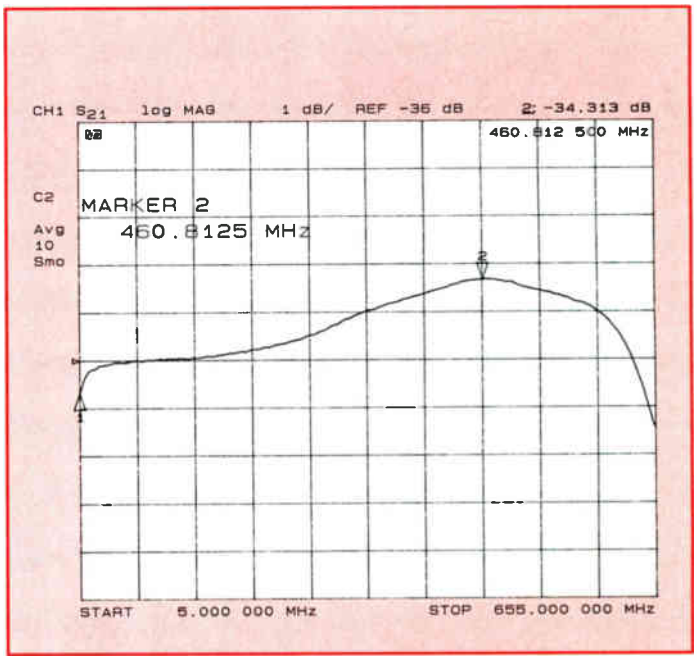

neoprene inserts to protect the center conductor pin vise. The threads and ends of the fittings are machined to provide a good interface. Center-to-center output connector spacing is 15/16 inch, leaving room for the installation of traps or locking terminators.

Even though the Quadtap resembles a large splitter (one input, multiple outputs, but no through leg), the internal circuitry is configured somewhat differently. Instead of all the outputs being of equal loss, the Quadtap provides four groups of outputs. The ports within a given group have equal loss, but the groups have different loss from one another. For example, the XQT-32 Quadtap has eight 14 dB ports, eight 22 dB ports, eight 29 dB ports and eight 36 dB ports. The XQT-48 (yes, that's 48 ports!) provides 12 outputs each at 15, 23, 30 and 36 dB. In a typical application, the low value ports would be used for long drops and the high value ports for short drops.

Toner has Quadtaps available in 32 and 48 output models; tap values other than those just described are available on special order. Standard specifications for all of the Quadtaps include a 5-600 MHz bandwidth, 75 ohm impedance, 22 dB isolation, 18 dB return loss (input and output) and RF shielding greater than -100 dB.

At the time of the evaluation, the list price of the XQT-32 was $80 and the XQT-48 was $92. A separate mounting bracket is included with each Quadtap.

Lab measurements

The electrical performance of the Quadtap was tested on a Hewlett-Packard HP 8753B network analyzer and 75 ohm S-parameter test set. Precision 75 ohm terminators were installed on all unused ports during the various measurements. The test bandwidth was 5-655 MHz (except for RF shielding, due to the 450 MHz upper limit of the post amplifier used with the RFI test chamber).

Figure 1 shows input return loss, which averaged greater than 20 dB to beyond 600 MHz. Figure 2 is representative of the output port return loss on all four groups of ports. In all cases, the output return loss was better than spec from just above about 7 MHz to past 600 MHz, although the 5 MHz return loss averaged 15.8 dB on all the ports tested.

Worst-case isolation among ports within the same group was in the 23-24 dB range, and when checked between groups of ports — for example, between the 14 and 36 dB ports — was 58 dB (that is not a typo)! Figure 3 shows typical tap port insertion loss and frequency response (1 dB per division); for the 22 dB port shown, flatness is -0.7 to +1.1 dB from 5-600 MHz. Port insertion loss was within the ±1.5 dB spec on all but the 36 dB ports (Figure 4); the cumulative effects of the internal coupler and splitter circuitry resulted in a response buildup near 460 MHz. Fortunately, it meant *less* rather than greater loss and a nominal value that missed spec by only 0.19 dB.

Because of the much more stringent signal leakage requirements in the United Kingdom, the Quadtap makes use of a pressed-in die-cast backing plate (the manufacturer uses a 12-ton press to install the back of the tap). The result is shielding performance that met or exceeded the -100 dB spec over the tested bandwidth.

Comments

The Quadtap is a good solution to requirements for a large number of outlets in a relatively small space. While its original intent was for the tree-and-bush architectures in the United Kingdom, it also will work well for apartments, hotels and other similar applications. The per-port cost of the Quadtap is equivalent to that of conventional taps, and probably less when you consider housing-to-housing connectors, jumpers, adapters and the labor to "do it yourself" with regular passives.

The sample tested met all of the manufacturer's specs except for output return loss near 5 MHz and the nominal tap value on the 36 dB ports. Even so, these are not significant enough to cause any problems, and are likely to still be quite a bit better than the usual combination of taps and splitters.

Two new developments should be available by the time you read this: You will be able to order the XQT-48 with either four groups of 12 ports or six groups of eight ports, and a tilted output will be an option on the low value output ports on both the XQT-32 and XQT-48 (for very long drops).

For more information, contact Toner Cable Equipment, 969 Horsham Road, Horsham, Pa. 19044; (215) 675-2053. **CT**

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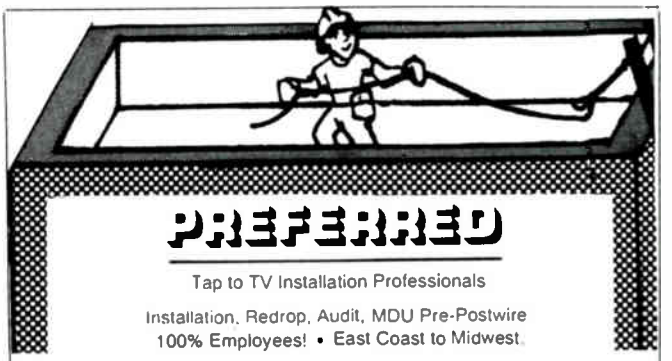

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March 1991

System powering

BACK TO BASICS

The training and educational supplement to Communications Technology magazine

Geri Saye

Formerly Installer/Technician

Table of Contents

A program for power grids

By Timothy J. Pastor
Line Technician, Continental Cablevision of Ohio

When I think about CATV powering, I think about one of the most important parts of the overall system. This may sound like a simple statement to many of you, but a couple of years ago I took powering for granted. Power was just there or, at times, not there — it was as simple as that.

In the system I work in, we've been changing out many of our standard power supplies to standby units. While on the surface this seemed to be a good idea, it has turned out to be quite a learning experience. Becoming familiar with the standby units in conjunction with their installation, care, maintenance and placement has really impressed on me the importance of powering, not only in the field but also in the planning and calculating end. The words "power grid" (system powering schematic) have become a part of the staff's daily vocabulary.

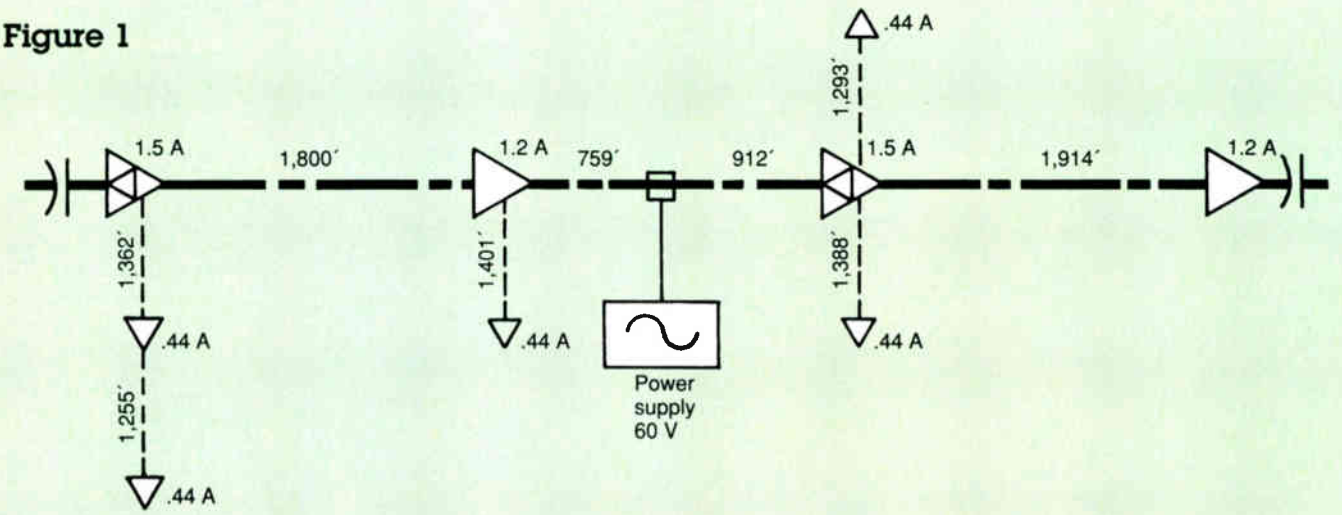
What I've said so far isn't a revelation. It's not the purpose of this article to discuss powering per se. What I would like to discuss is power grids and their importance.

A valuable tool

Power grids are a very valuable tool to the technician. When designing or constructing a new area these grids can provide vital powering information at a glance. I certainly encourage all systems not only to keep a set of grids on hand, but to keep them updated as well. This will make your techs' lives much easier and possibly save your system from unnecessary downtime or the dreaded "O-word" — outages.

To help make my life easier next year, along with those of my fellow employees, I wrote a computer program in BASIC to assist me in making literally hundreds of power grids. I will briefly explain how a grid is done and how the program can help you save time in making one. →

Figure 1



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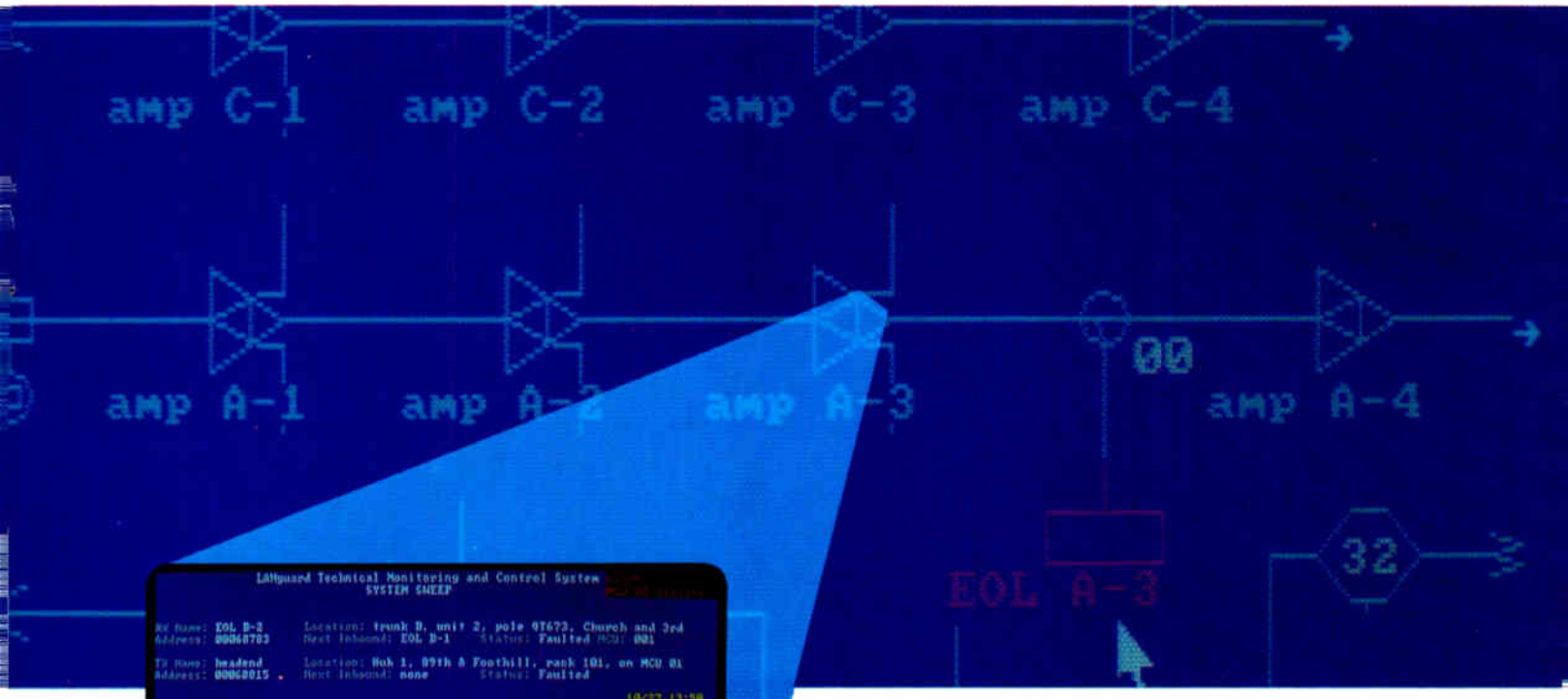

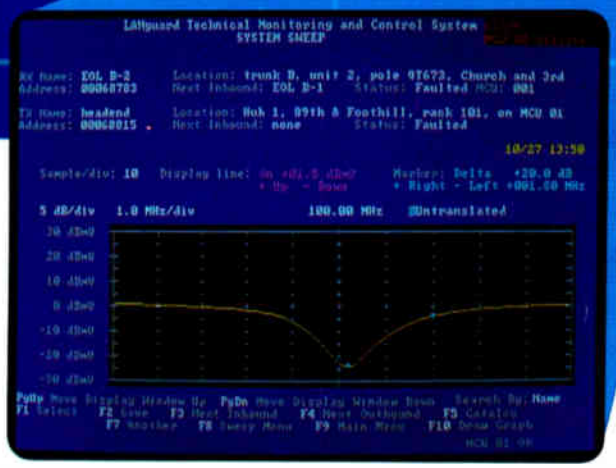

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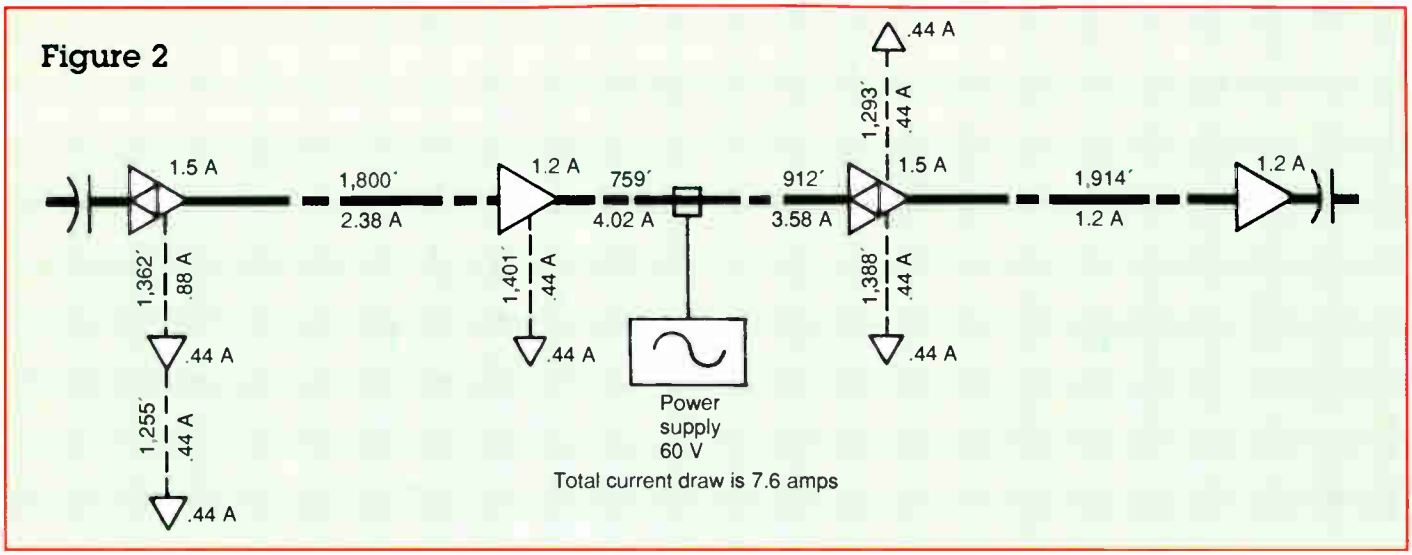
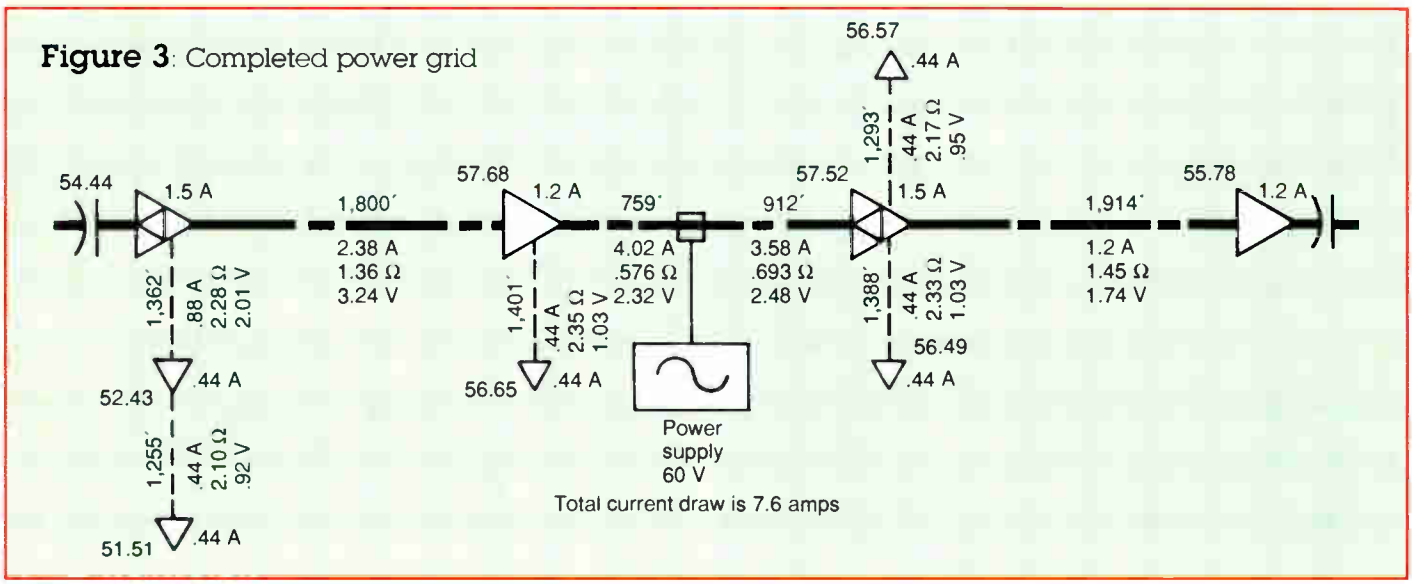




First, draw out the basic grid on paper, then write in each active device's current draw next to the active itself (Figure 1). Next, start at the most distant part of the grid and begin to add together the current draws that would be drawn through each piece of cable; write these numbers below or next to the cable itself. You'll want to work toward the power supply (Figure 2).

At this point my program takes over. By hand, you normally would next have to figure the DC loop resistance for each span of cable. Then you would figure out the voltage drop of each span using Ohm's law. Finally, you would subtract the voltage drops from the starting voltage, starting from the supply and working away, then figure out the voltage at each piece of equipment. This amounts to a lot of calculation, a blister on the index finger and bloodshot eyes.

My program simplifies all this and almost makes doing a grid a pleasure. It certainly makes it easier. The program first asks you to input the loop resistances for each type of cable. The program supports .412, .500, .625, .750, .875 and 1.0 cable. If you don't use a specific cable size, just hit enter when this information is requested; it will set it to 0 and move you on. These loop resistances need to be entered in ohms per 100 feet. Manufacturers normally specify loop resistance in ohms

per 1,000 feet; simply divide that number by 10 to determine ohms per 100 feet. For example, the loop resistance for .500 may be .168 per 100 feet, so you would enter ".168." Do this for all the cable sizes your system uses. As long as the program runs uninterrupted, these parameters will stay put unless you change them.

Ready to start

Now you're ready to start a grid. Remember, start at the supply and work a run to its end, then go back and catch the splits later. First, enter the starting voltage; this would be the output voltage of your supply. Ours happens to be 60 V, so I would enter "60."

The next entry is for the first footage. Using Figures 1 and 2, 912 would be the first footage; enter "912." Next, the computer will ask for the current draw through that piece of cable. Our examples show that 3.58 amps is the draw here; enter "3.58." Now the only information the computer needs is what size the cable is. It provides you with a menu to choose from: 1 = .412, 2 = .500, 3 = .625, 4 = .750, 5 = .875 and 6 = 1.0. Let's say it's .750 cable; you would enter "4."

That's it. The computer screen will clear and all the information you need will be there. Loop resistance for that span, current draw and voltage drop are all listed together for you to copy down on the grid. AC voltage at this point appears a few lines down.

You can keep going on a run as long as you want; the computer keeps track of the AC voltage as long as you keep going on the same run. When you're ready to begin a split or new run, choose the proper number on the menu; you can enter in the new start voltage and move on.

The result is a finished power grid that can be kept on file for future reference (Figure 3). Believe me, these come in handy when considering an amp relocate, new-build or redesign.

Another feature of the program is that since it keeps track of your voltages as you go, should you reach 40 volts or lower, a warning message appears and an audible beep sounds. This lets you know you're getting to the "pay attention to voltage zone."

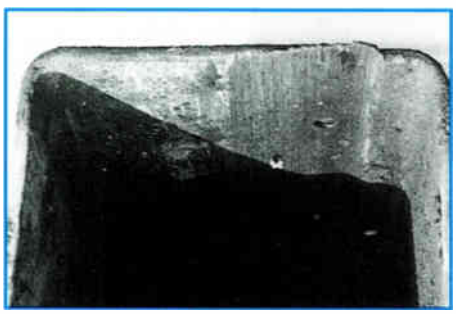
The program takes about 20 minutes to enter in and will save you much more time then that over the years. I encourage you to enter it in *exactly* as shown in Figure 4. After you get it running you can alter it to your liking. **CT**

Figure 4: Power grid program

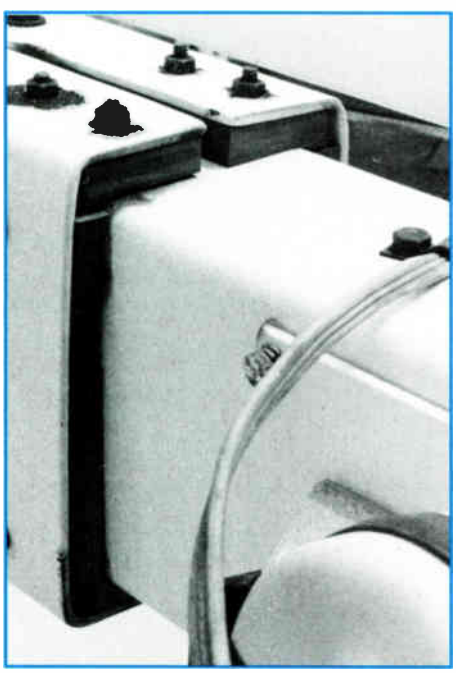
```
10 CLS
20 PRINT:PRINT:BEEP
30 PRINT"       ************************************************************"
40 PRINT"       **                                                        **"
41 PRINT"       **                  POWER GRID ASSISTANT                  **"
42 PRINT"       **                  --------------------                  **"
43 PRINT"       **                                                        **"
44 PRINT"       **                   <<  WRITTEN BY  >>                   **"
45 PRINT"       **                   TIMOTHY  J. PASTOR                   **"
46 PRINT"       **                                                        **"
47 PRINT"       **                A #FEW# SUGGESTIONS BY                  **"
48 PRINT"       **           MARK MILLER & JIM 'god' BATTAGLIA            **"
49 PRINT"       **                                                        **"
50 PRINT"       ************************************************************"
51 PRINT"         ********************************************************"
52 PRINT"           ****************************************************"
53 PRINT"             ************************************************"
54 PRINT"               ********************************"
230 PRINT:PRINT:PRINT
240 PRINT"                  ANY SUGGESTIONS ARE CERTAINLY WELCOMED"
250 FOR A=1 TO 10000:NEXT A
260 CLS
352 CLS:INPUT" DO YOU NEED TO INPUT LOOP RESISTANCES ?  (Y OR N)";Z$
354 IF Z$="Y" THEN GOTO 358
356 IF Z$="N" THEN GOTO 451
358 CLS
359 PRINT"        ** PLEASE ENTER LOOP RESISTANCES PER 100 FT **
360 PRINT:INPUT"TYPE IN .412 LOOP RESISTANCES =    ";A
370 PRINT" .412 LOOP RESISTANCE IS SET TO....";A
375 PRINT
380 INPUT"TYPE IN .500 LOOP RESISTANCE =     ";B
390 PRINT" .500 LOOP RESISTANCE IS SET TO....";B
396 PRINT
400 INPUT"TYPE IN .625 LOOP RESISTANCE =     ";C
405 PRINT" .625 LOOP RESISTANCE IS SET TO....";C
410 PRINT
415 INPUT"TYPE IN .750 LOOP RESISTANCE =     ";D
420 PRINT" .750 LOOP RESISTANCE IS SET TO....";D
425 PRINT
430 INPUT"TYPE IN .875 LOOP RESISTANCE =     ";E
435 PRINT" .875 LOOP RESISTANCE IS SET TO....";E
440 PRINT
445 INPUT"TYPE IN 1.00 LOOP RESISTANCE =     ";F
450 PRINT" 1.00 LOOP RESISTANCE IS SET TO....";F
451 PRINT:PRINT:PRINT"                          ***< PLEASE WAIT >***"
458 FOR Z= 1 TO 10000:NEXT Z
459 CLS
460 PRINT"  AND AWAY WE GO................."
470 FOR Z=1 TO 5000:NEXT Z
600 CLS
605 INPUT"ENTER START VOLTAGE.........";SV
610 INPUT"ENTER FOOTAGE...............";FT
620 INPUT"ENTER CURRENT DRAW..........";CU
640 PRINT:PRINT:PRINT
650 PRINT"WHAT TYPE OF CABLE IS BEING USED ?  "
660 PRINT" <1>= .412 ,  <2>= .500 ,  <3>=.625"
661 INPUT" <4>= .750 ,  <5>= .875 ,  <6>=1.00      ",N
670 IF N=1 THEN X=A
675 IF N=2 THEN X=B
680 IF N=3 THEN X=C
685 IF N=4 THEN X=D
690 IF N=5 THEN X=E
695 IF N=6 THEN X=F
710 CR=FT/100
720 CRS=CR*X
730 VD=CRS*CU
740 ACV=SV-VD
790 CLS
800 PRINT"THE CABLE RESISTANCE IS.................";CRS
810 PRINT"THE CURRENT DRAW IS.....................";CU
820 PRINT"THE VOLTAGE DROP IS.....................";VD
823 PRINT:PRINT:PRINT
825 PRINT"THE AC VOLTAGE AT THIS POINT IS.....**<";ACV;">**"
826 PRINT:PRINT
827 IF ACV <40 THEN PRINT"                  --<< WARNING >>-- AC VOLTAGE TOO LOW"
828 IF ACV <40 THEN GOTO 1000
830 SV=ACV
835 PRINT:PRINT:PRINT
840 PRINT"**** HIT <ENTER> TO CONTINUE RUN ****"
845 PRINT:PRINT
850 PRINT"HIT <1> TO CHANGE LOOP RESISTANCES"
860 PRINT"HIT <2> TO END PROGRAM"
865 PRINT"HIT <3> TO START NEW RUN"
870 INPUT Q$
880 IF Q$="" THEN CLS:GOTO 610
890 IF Q$="1" THEN GOTO 352
900 IF Q$="2" THEN CLS:END
910 IF Q$="3" THEN GOTO 600
1000 FOR P=1 TO 3
1010 BEEP
1015 FOR TI=1 TO 1000:NEXT TI
1017 IF P=3 THEN 835
1020 NEXT P
1040 GOTO 1010
```

The bucket truck: A very versatile tool (Part 2)

This is the second in a series of articles on bucket trucks and will cover maintenance and routine servicing. Part 1 appeared in the February issue and covered the uses and benefits of bucket trucks.



Abnormal boom wear caused by worn pads.



Replaceable pads on extension boom to prevent metal-to-metal contact.

By Pat Bartol
Technical Representative, Mobile Lifts Inc.

You have taken delivery of your spanking new bucket truck. It has been completely and expertly outfitted by technicians. Gleaming new storage bins, tool boxes, a strobe light, 120-volt power source and other necessities have been installed. Your company logo and name are emblazoned on the sides by a professional sign painter. Your chief technician is handed the keys and the grin on his face is so wide it barely fits into the truck cab with him. You admonish him to properly care for the vehicle and he, of course, assures you that he will.

For the first six to 12 months, or until the "newness" wears off and the truck really starts to get worked in earnest, strict attention usually is paid to the maintenance details for the truck and lift. This also is the period when the least attention is required since everything is new and has been factory and dealer prepped.

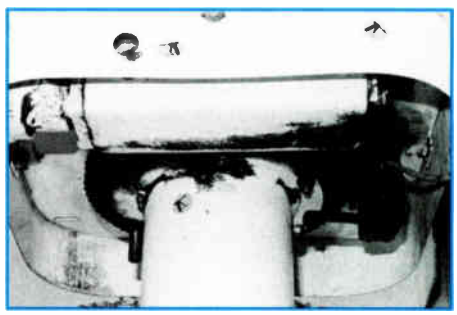
Slack maintenance

As the vehicle grows older, however, you assume that it will continue to function well (probably because it's working so smoothly). Maintenance starts to slack off on the truck. Oil is not changed as often nor is the truck regularly lubed and cleaned out, the tires checked or the engine tuned up. The lift, however, even suffers much worse for attention. In many cases there is no maintenance or even safety checks until the lift has completely broken down.

We often see lifts working that are in poor condition from abuse and misuse. There are frequently hydraulic leaks and the tech working the bucket must regularly readjust his position as the bucket keeps sinking. The poor guy is paying more attention to staying up there than he is to his work, resulting in poor work quality and putting him in potentially dangerous situations as well. The hydraulic bucket stabilizers or shock absorber bucket snubbers are worn out or damaged and the bucket is easily tipped, possibly causing the tech to fall out (if he is so careless of his own safety as not to wear a safety belt) or at best making him spill some of his tools and equipment to the ground.

Joystick, switch or button controls are either damaged and falling out or have loose and corroded wires causing them to work jerkily or intermittently. Rewiring by the local garage mechanic

Ring gear with enclosed box for worm gear and oil bath.



Underside of ring gear cover with enclosed worm gear and oil bath, and grease gun decals.

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has been known to end in some strange results such as all controls now function opposite of their labeled purpose (that is, those that still do function at all) — up is down, down is up, left is right, right is now left, etc. If it were not so serious it actually could be humorous. Buckets are cracked and/or broken from being slammed into poles or someone backing the bucket into an immovable, unforgiving object.

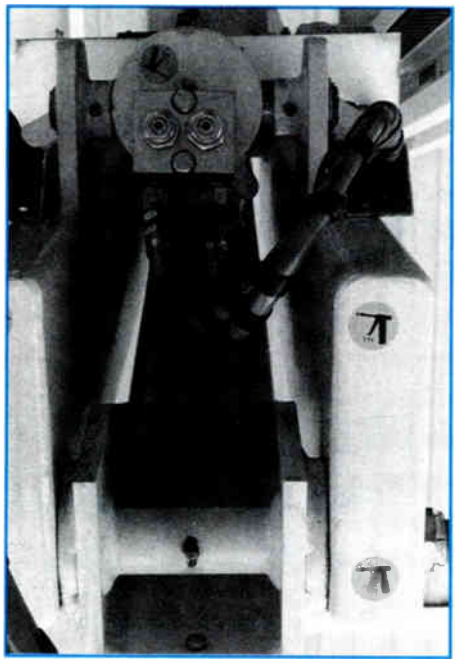
These, then, are some of the more obvious hazardous and undesirable conditions. There also may be *unnoticed* defects present. A trained lift truck mechanic (not a local gas station or garage attendant) or even your own in-house technician with bucket truck experience will know what to look for and how to detect when possibly hazardous conditions are developing. Also, he'll know how to resolve them, thereby preventing injuries and more expensive repair jobs.

The following are a sample of possible problem areas resulting from lack of proper maintenance and/or simple abuse of the lift. Although we are mainly discussing the Dur-A-Lift or ArmLift here, these maintenance procedures apply equally to all lifts regardless of the manufacturer.

Lift types and features

There are basically two types of lifts. One is the extension boom, which extends the bucket out any distance required to reach the working height. In cable TV this is usually a 26-foot to 30-foot maximum extension measured to the bottom of the bucket. Rarely, if ever, is the bucket vertically extended straight up but rather at some angle to the vehicle or ground as the truck is parked on a roadway and the pole line is set back some distance. Horizontal movement is possible by means of a rotation ring gear and worm drive that allows 360° rotation of the bucket. This type of lift often is mounted on a van-type vehicle, although it also can be mounted on a one-ton pickup.

The second type is the articulating arm or, as it is sometimes called, the elbow or scissors. Working height is similar to the extension boom lift, the difference being the method of lifting and extending the bucket. Ordinarily, this is done by unfolding the two short arms first to get near the required working height, then moving the bucket horizontally, again by means of a ring gear, to get in line with the work. The boom now can be extended from the upper arm to a comfortable position from which to work.



Back end of lift showing hinge pin with grease fittings and grease gun decals.

Abnormal wear of hinge pin due to lack of regular lubrication.

New replacement hinge pin and leveling lever arm.

Extension and vertical movement of the booms is accomplished by means of hydraulic cylinders. Hydraulic oil is forced in or out of the cylinders by a pump that is powered electrically from a battery source (rechargeable from the truck alternator) or sometimes an auxiliary pony motor. Some people don't like auxiliary engines because you now have an additional engine to worry about for cold weather starting and maintenance.

Probably the most dependable (although more expensive) method of pumping the hydraulic oil is via a power take-off (PTO) mechanism operated directly by the truck engine. The PTO pump arrangement is designed for heavy, continuous use when otherwise the DC pump would get overheated or run down the batteries. When operating from the battery on a DC unit, we recommend that you give the pump a seven-minute rest after three minutes of continuous use. That's just a rule of thumb, but over the years it has proved to be very sensible. Horizontal movements are made by means of a rotation ring gear and worm drive on all of our units. These also are hydraulically operated by the same power source as the other devices.

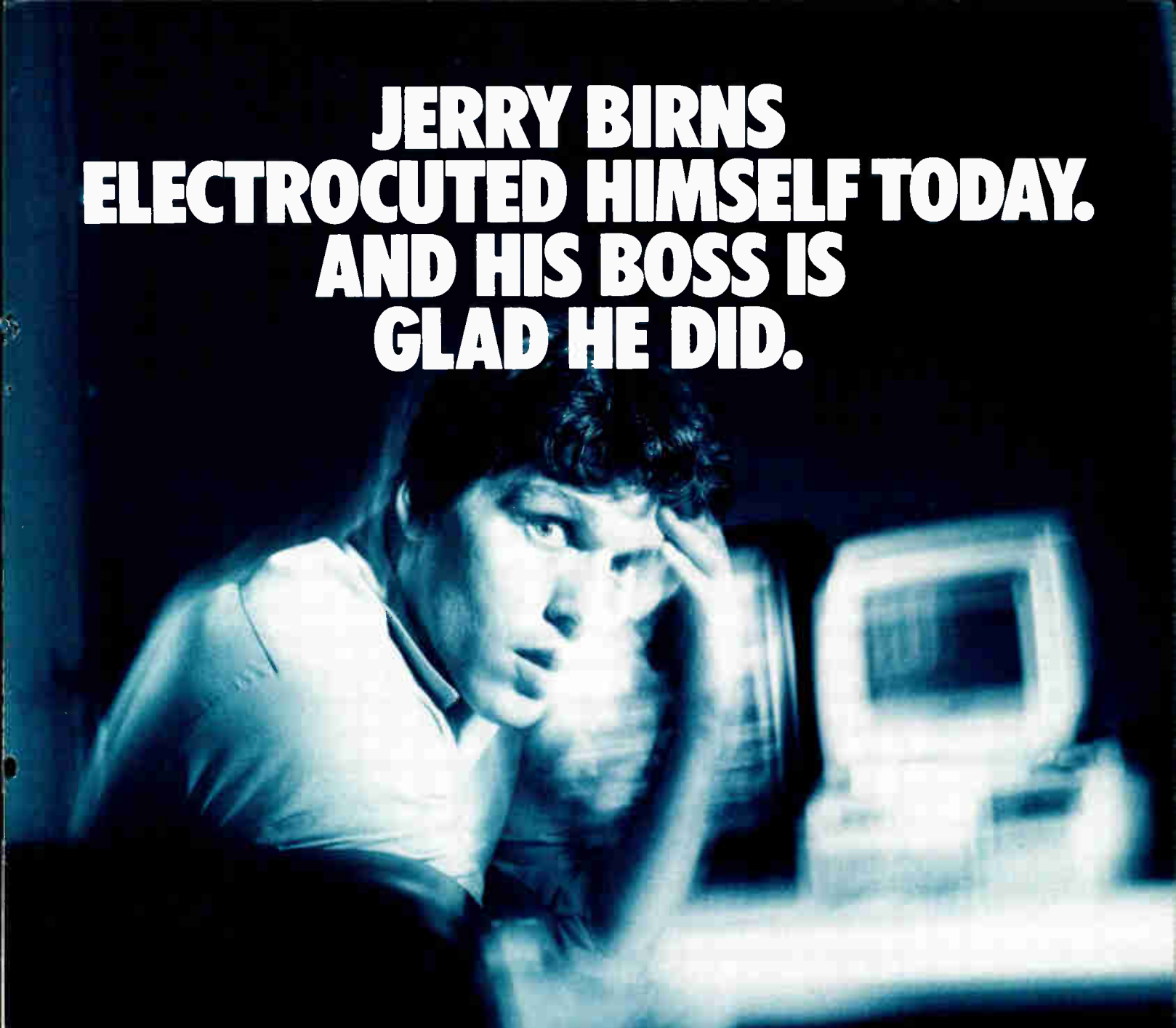
Automatic bucket leveling and sudden movement of the bucket is prevented by pneumatic shock absorbers or a mechanical arrangement via sprocket wheels and a leveling chain. Bucket controls such as in, out, up, down, left, right, fold and unfold are electric and controlled by switch activated solenoids. We also have fiber-optic controls for super high lifts, which actuate instantaneously. This is nice, but probably an unacceptably costly add-on not worth the expense if your boom is less than 65 feet from the ground to the bottom of the bucket.

Usually there is a two-speed mode for these functions, fast and slow, and they can be activated from the ground as well as the bucket. The switches may be two-position, push-to-make toggle switches, a joystick or push-to-make button switches and are weather proofed with rubber seals over the switch toggles.

Another control usually found is the "dead man" switch. This is a switch that must be activated and held in position to permit any other switch to function. It is a safety device to prevent accidental movement by bumping the switches. Also, should a tech become disabled and loosen his grip on the switch, the bucket would immediately stop rather than continue further movement on its own and possibly further endanger the tech. We try to put in as many safety devices as are reasonable and useful.

All of these booms ride on hard plastic pads to prevent metal-to-metal contact when they are extended or retracted. Also, they are brought to rest

JERRY BIRNS ELECTROCUTED HIMSELF TODAY. AND HIS BOSS IS GLAD HE DID.



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Typical well-worn stabilizer shock and control switches.

for storage on rubber shock pads, again preventing metal-to-metal contact when the lift is brought down and when the truck is in transit to any other location. The fact that the booms pivot on steel hinge pins and rotate via ring and worm gears, of course, means that these parts are subject to wear and stress.

Things to look for

A partial, but by no means complete list of things to look and care for are as follows:

• *Hinge pins.* There are a number of grease fittings on each lift and, depending on the frequency of lift use, they should be greased on a regular basis. With some trucks this may only be a monthly requirement, with others a weekly need. Grease should be forced into the fittings until it can be seen coming out at some points around the area being greased. If the pins and sprocket wheels for the bucket leveling devices are not properly greased uneven wear can result in a cracked pin.

The pin may still continue to function somewhat normally and the crack may not be obvious because it is hidden. You usually can detect this condition because of loss of bucket stabilization on the articulating arm lift, which has two of these pins. If the bucket is very loose, either the pin or the stabilizing chain could be broken. On extension arm buckets (even though the pin is not involved in bucket leveling) wear can result due to poor lubrication. When the hinge pin does fail it is usually at the weld on the lever arm due to excessive stresses.

"In many cases there is no maintenance or even safety checks until the lift has completely broken down."

On Dur-A-Lift buckets the grease fittings are made obvious on the lifts by black and bright yellow grease gun decals at each grease fitting whether inside the van or outside in the box. The decals really stand out and should be a reasonable reminder. ArmLift has similar note points.

• *Rotation ring gear.* Two types of rotation ring gears are in use. On the newest models the ring gear passes through an enclosed housing that contains the worm gear. Inside this housing, it's submerged in an oil bath and, therefore, additional lubrication is not necessary. On older models however, the ring and worm gears are exposed and require a regular spray of graphite lubricant on a weekly basis to the entire ring gear.

Extension lifts on a van have two bearings inside the truck below the roof. A grease fitting is located on the pedestal inside to service these bearings and should not be forgotten. On older lifts grease should be pumped in while rotating the lift 360° and back to be sure to get the entire bearing. On newer lifts, grease is forced in while it rotates 180° in each direction. This is necessary because of the limit switches on the lift. If these bearings and ring gears are not regularly and properly maintained, excessive and unnecessary wear to the gears will result; teeth can even break off due to stress. This is an expensive repair job since it is necessary to pull the lift from the truck to repair the damage.

• *Wear pads.* On extension boom models the plastic pads on which the extension boom rests as it slides in and out should be carefully monitored for wear. When these pads start showing signs of wear it is a relatively inexpensive and simple job to replace them. If they are not replaced and continue to wear, the boom will start to twist and metal-to-metal contact will grind and score the booms beyond normal repair. Now you really will have an expensive overhaul job and a long downtime. As well, it will be necessary to remove them from the truck to repair.

The shock absorbing pads in the boom cradle on which the boom is brought to rest when stored are another source of possible boom damage that's easily avoidable. It's very obvious when they're missing since they simply aren't there. Continually bringing the boom down in metal-to-metal contact

here, especially at fast speed, will cause scoring and beating down of the surfaces in contact. Vibration when the vehicle is in transit also will contribute to the damage. This is another simple and inexpensive repair job that, if not done in time, can have much more damaging effects.

• *Bucket and bucket leveling.* As previously mentioned, the principal malfunction of articulating arm lifts are the hinge pins. The sprocket wheels, which affect the self-leveling, also must be watched for wear and cracked welds, as well as the leveling chain. When they start showing the first signs of excessive wear they should be replaced. Again, proper lubrication will greatly extend their lives.

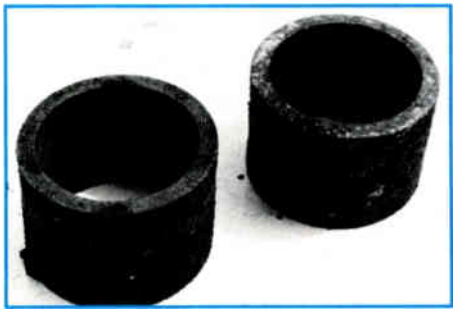
Extension arm lifts usually have a pneumatic shock absorber (or bucket snubbers) that checks sudden movements or shifts of the bucket. This shock absorber should be replaced from time to time since it is apt to receive a lot of wear or may be damaged or missing entirely because of rough handling and contact between the bucket and trees or poles.

The bucket locking device, which prevents any bucket shifting or movement whatever, should always be maintained in good working condition. On a Dur-A-Lift, this is a circular disc with holes in it that is attached to the bucket pin and allows a spring-loaded locking pin to pass through one of the holes to lock the bucket into a certain position. Rather than wear, these are usually damaged through abusive handling. In the interest of safety, when damaged it should be replaced as soon as possible. ArmLift has a friction-type brake that also requires occasional adjusting.

The lift should be mounted to the truck with Grade 8 bolts. Older lifts are apt to be mounted with Grade 5 bolts and these appear to have worked fine for a number of years. However, now the manufacturer recommends Grade 8 for additional strength.

It's a good idea to check around the lift mount for corrosion, rot and buckling especially on older vehicles. Up north, after a few years, some of a vehicle's frame may be getting eaten away by road salt from severe winters. If this does occur, new reinforcing plates or beams can be added and welded in place for new support to prevent a mishap.

• *Electrical.* Controls, switches, solenoids, wire connections and batteries should be inspected for looseness and corrosion from road salt or salt air. They should be cleaned until shiny and sprayed with a dielectric coating. Broken switches should be replaced, and solenoids checked for corrosion and sprayed as well. Wires should be checked to be sure they aren't rubbing anywhere, and that bare spots and possible shorts aren't starting to form. The battery charging system should be checked to ensure it's adequate, that the electrolyte levels are proper or that water isn't needed.



Worn bushings, rusted from lack of grease.

Most battery failure is premature and occurs because of a misunderstanding of batteries. Often a truck and lift are used all day in the middle of winter and the batteries are not permitted to recharge properly before quitting time. In this discharged state, the truck is parked overnight in sub-freezing temperatures causing some permanent damage to the battery. If the batteries cannot be nearly fully recharged then an effort should be made to park the vehicle out of the weather.

Here's why it's so important that the charging system be in perfect working order. The alternator must be at least 63 amperes; an 80-ampere alternator is recommended to allow the batteries to properly recharge. On occasion the local garage mechanic has been known to replace an 80-amp alternator with a standard 40-amp alternator. This simply is not enough to do the job, especially in the winter. **CT**

"The bucket locking device, which prevents any bucket shifting or movement whatever, should always be maintained in good working condition."

Troubleshooting Lectro standby power supplies, Part 2

This series of articles explores troubleshooting techniques for Lectro Versatile standby power supplies. Last month we dealt with the charger section of the battery charger module. This article will delve into the time delay section.

By Jud Williams
Owner, Performance Technological Products

Many believe it's necessary to delay the transition from standby to ferro operation following the return of utility power after an outage. The reasoning is that it allows surges that may be caused during restoration of power to settle down before the supply is reconnected to the utility. The time delay circuit serves that purpose.

Lectro's circuit essentially consists of three sections. The first is a fixed voltage regulator maintaining 24 volts at its output. The second section is an IC timer that actuates a reed relay, which is the third section. Reed relay closure allows current to reach the transfer relay coil to bring the unit out of standby once the power is restored.

Troubleshooting should begin with the reed relay, the last stage of the circuit. The contacts of the relay normally are open and are situated outside of the rest of the timer circuitry as shown in the figure accompanying Part 1 last month. The contact is connected near the input of the battery charger regulator so that when AC power is applied to the module, 28 to 30 volts (V) should appear on the high side of the relay. This same voltage should be present on the open side of the contact when there is closure.

If there is no closure as indicated by the absence of voltage on the open side, several possibilities exist as to the cause: 1) The contacts are burned. 2) The reed relay coil is open. 3) The timing IC has failed. 4) The regulator or the components leading up to it have failed.

Having started the troubleshooting process at the final stage of the circuit, it is now necessary to return to the beginning and examine each component in sequence. Assuming that the battery charger is functioning properly, use a meter to trace the voltages beginning with the bridge rectifier's output, where it should read 28 to 30 V.

Proceed to the 10-ohm resistor where it will be about 0.1 V less than the previous reading. If an oscilloscope is being used for these measurements, it would be seen that pulsating DC is what is being measured.

If a filter capacitor were present, the potential would be nearly 20 percent higher. I mention this because on the other side of Rectifier D4 there is a filter capacitor and the voltage increases to around 35 V on the meter. The reason for this, of course, is that a meter reads pulsating DC differently than filtered DC. The regulator circuit is tested next by merely checking that its output is about 24 V.

Knowing the pins

The LM3905 timer is the next portion of the circuit to consider. Prior to describing the troubleshooting procedure, I will review the pin arrangement. The IC is an eight-pin dual in-line package, popularly called a DIP. The pin sequence is viewed from the top of the chip with the locating notch turned so it's away from the viewer. Pin 1 is to the left of the notch. The rest of the pins run down that side, then cross over the IC at the end opposite the notch and continue up the other side.

"To deal with an IC chip one must be familiar with certain significant pins without being confused by all the rest."

The last pin (Pin 8) is to the right of the notch. The IC is, of course, being viewed from the component side of the PC board.

To deal with an IC chip one must be familiar with certain significant pins without being confused by all the rest. Also, one must be aware of any external components having an effect on the functioning of the device. As an example, there is a 10-megohm resistor and 50-microfarad capacitor serving as an R/C time constant to establish the time delay. The capacitor may fail, keeping the IC from functioning and should be taken into consideration.

Pins 1 and 2 are the significant functioning pins. One side of the relay coil is tied to Pin 1 while the other is attached to B+ (24 V). Initially, Pin 1 has a potential of nearly 24 V, so there is no voltage across the relay coil. Upon the completion of the timing cycle, the voltage drops to nearly zero resulting in 24 V developing across the relay coil that actuates it. Pin 2 (called V-ref) normally has 3.2 V on it and the IC should be considered faulty if it is absent. The reed relay coil should have a resistance of about 4,000 ohms.

Next month I will discuss the inverter card. Meanwhile, readers wishing to discuss this article are invited to call me at (404) 475-3192. **CT**

Leakage measurements

By James J. Tardibuono
Corporate Quality Assurance Engineer
United Artists Cable

The following are a few hints and instructions on taking ground-based signal leakage measurements for use in cumulative leakage index (CLI) calculations.

Do create a calibrated leak of 20 μV/m (microvolts per meter) at 3 meters.

Don't create a large leak and mark off an area where the leak measures 20 μV/m. Creating a larger than necessary leak, even if only for calibration, can cause problems in the aeronatical bands.

Do use a bandpass filter if you are using the system to create a leak. Not using a bandpass filter will emit more signals into the air than necessary.

Do calibrate your meter and/or detector and check battery for a full charge every day.

Do check your detector frequency against other signals on your system each day to ensure that the level is not too low.

Making measurements

Do check the length of the dipole antenna used in making measurements. A simple formula for the length of each leg of the dipole is: 11,811/frequency (MHz) ÷ 4 = length of each leg in inches (quarter wavelength).

Don't drive faster than 15 mph while riding out your system. Driving too fast can cause you to pass a leak without your detector reacting fast enough.

Do measure all leaks above 20 μV/m. The only accurate measurement can be made with a dipole antenna and meter by walking around the leak area. Remember, a large leak emanating from a house may only measure small while driving in the street.

Don't park your vehicle in the vicinity of the leak to be measured. Leaving your vehicle near the leak will result in erroneous readings caused by reflections of the signal off of the vehicle.

Do rotate the dipole antenna for the highest reading. The leak is not always perpendicular to the strand.

Do place the antenna in the center of the vehicle's roof. If using a dipole antenna to monitor, run in a lead perpendicular to the antenna.

Do repair all large leaks immediately.

Do ride out 100 percent of the system. This allows you to use a multiplier of one in your CLI calculations.

Do use a detector frequency between 108 and 137 MHz. Measurements made outside these frequencies have to be correlated back to the VHF aeronautical band.

Do keep a record of the areas covered each day. It is a good idea to mark which streets have been checked on a map and keep these on file.

Do make sure all your FCC general and technical files are complete and easily accessible. An FCC inspection of your signal leakage also will include an inspection of your files.

Do maintain a good quarterly monitoring program. New leaks are occurring everyday. **CT**

Psychophysics — Fact or fiction?

By Issac S. Blonder
President, Blonder Broadcasting Corp.

In the '30s, outside of the few aberrant students who mounted soapboxes and proclaimed "comes the revolution," one entered college to find a world of choices for learning and careers. The first college year, every course was labeled "Introduction to ..." and, as a sophomore, you were importuned to choose a major subject in which you would duly emerge with a degree proclaiming your expertise. Superior students were invited into the department heads' inner sanctum to be urged to major in their specialties, with rosy projections of a good life forever.

From shunned to popular

It also seems that besides the potential after-school income, an aura hung over each discipline inversely proportional to its academic ranking. Physics topped the list of shunned subjects, followed by the sciences, down to the arts and the studies of the human psyche. Psychology was universally popular, debatable and stuffed with ringing declarations of mankind's potential and future directions, springing from the untested vaporings of self-proclaimed experts. A course in applied psychology, which I endured, touched on the subjects of testing and poll-taking, and made it obvious that no poll or test could be made free from error or challenge.

Physics is based on the study of the fundamental principles of the forces governing nature in the most precise manner conceivable by man. Three independent laboratories staffed by recognized scientists, preferably located in different countries, must agree substantially on the proposition before it appears in the textbook as dogma. Having achieved the status of a law of nature does not ensure its continued survival. Einstein's laws of relativity, conceived theoretically and proven many times in varied and excellent test procedures, is periodically challenged by yet another physicist with yet another variant of nature apparently governed by those laws.

The nature of the human visual system, so absolutely vital to the design of a matching electronic delivery system of sight and sound to the human senses, is being investigated and codified under the banner of the title "psychophysics." If ever there was a shotgun marriage of two incompatible fields, physics and psychology have to be the greatest mismatch.

Indeed, although psychophysics is mentioned constantly in the literature as having been thoroughly investigated before the engineer has come up with yet one more ingenious scheme for reducing the bandwidth, it is my considered opinion that a physicist would condemn the methodology. In fact, I couldn't even find that word in my pile of dictionaries!

Certainly even in the most prestigious laboratories the physics formula for acceptability is ignored and, what is even more suspect, the scientists or their associates are the "impartial" viewers whose human visual systems determine the picture quality standards for all of mankind. In reading many of the psycho studies, I speculated that they may have been conducted under a hypnotic spell, unconsciously cast by the "psychophysicist."

A negligible difference

The one area I am particularly distressed about is the aspect ratio. None of the published studies seem credible to me. At the normal viewing distances in the home the difference in subtended angle to the eye between 4:3 or 16:9 ratio is negligible, but the effect on the consumer pocketbook is enormous, plus the added burden on the design engineer is equally unconscionable.

We should take a lesson from the stage where a truly wide scene is presented. As soon as the action is shifted to the two protagonists, the rest of the performers must freeze in their tracks. Similarly, in a typical TV presentation, a 4:3 scene is all that is needed for 90 percent of the drama (my guess) and I believe the home viewer would vote with his money if he had the choice of screen size.

Next, the letterbox: At a recent trade show, I had the opportunity to participate in a charade conducted by the most respected psychophysics team in North America. I found myself in a dark room confronted by a 27-inch TV set that presented the same scene alternately in either letterbox or normal TV aspect ratio. You had to mark on a scale of 0 to 100 your opinion of the quality of the presentation.

I have never before had such an unfocused problem to consider! Quality compared to what? Whether I liked the artistic merits of the scene, or how it compared to my own TV picture, or perhaps I should compare letterbox against 4:3 when I had to depend on my memory as to which one gave me a greater thrill?

My own conclusion was that the smaller size of the actors in the letterbox was less interesting but so what; in speaking to the staff, the foregone conclusion favored letterbox. Is this the kind of scientific quality the FCC will rely on for the final, perhaps fatal, choice for an HDTV format?

Finally, my experience on the Broadcast TV Systems Committee (BTSC) 1980-85: The committee produced a marvelously studied and documented treatise that the FCC adopted over my written petition to the commission not to approve such an obsolete and inferior system. How was I able to oppose the recommendations of such a prestigious body? Two reasons: 1) I had witnessed a demonstration of the BBC digital stereo sound system in Brighton, England. 2) At that very moment, six pay TV stations were on the air in the United States with the Blonder-Tongue BTVision system employing a scrambled sound technique so similar to the BTSC proposal that their receiver would decode our sound. I am distressed to report that our sound quality was worse than the TV sound, similar to the BTSC standards, and markedly inferior to BBC digital. I prophesied that the U.S. public would expend billions on TV receivers destined to be obsolete before their time.

How does this sad tale relate to HDTV and psychophysics? There is still no one out there listening to the voices of opposition. **CT**

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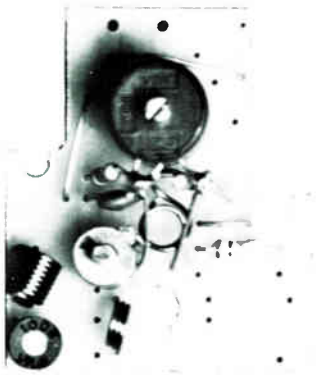

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BOOKSHELF

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- *Test Form: 24-Hour System Variations* (50/pad) — Loose-leaf binder forms for testing system variations. Order #TF-2. Member: $7, non-member: $9.
- *Test Form: Subscriber Tests Data* (50/pad) — Loose-leaf binder forms for recording data from subscriber tests. Order #TF-3. Member: $7, non-member: $9.
- *Test Form: Headend Tests Data* (50/pad) — Loose-leaf binder forms for recording data from headend tests. Order #TF-4. Member: $7, non-member: $9.
- *Test Form: System Test Data* (50/pad) — Loose-leaf binder forms for recording data from system tests. Order #TF-5. Member: $7, non-member: $9.
- *Signal Leakage Log Sheets* (50/pad) — Forms for the periodic logging of signal leakage. Order #TF-6. Member: $7, non-member: $9.
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- *2-1/2´´ Loose-Leaf Binder: Subscriber Tests* — Holds forms listed as TF-3. Order #NB-3. Member: $10, non-member: $15.
- *2-1/2´´ Loose-Leaf Binder: Headend Tests* — Holds forms listed as TF-4. Order #NB-4. Member: $10, non-member: $15.
- *The Interval Loose-Leaf Binder* — This special binder will hold your collection of *The Interval*, the official SCTE monthly newsletter. A perfect way to catalog the Society's events. Copies of *The Interval* not included. Order #NB-5. Member: $8, non-member: $12.
- *CATV Health and Safety Compendium* — A concise compendium of proper safety practices to be utilized in the operation of CATV systems. Order #HS-2. Member: $12, non-member: $18.
- **Special Reprint!** *FCC Advisory Committee: Signal Leakage* — By popular demand, SCTE has reprinted this comprehensive 1980 report on signal leakage. A must-read for those wishing to understand this vital issue. Order #TR-2. Member: $18, non-member: $25.

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CALENDAR

March

March 10-11: SCTE Old Dominion Chapter technical seminar, Holiday Inn, Richmond, Va. Contact Margaret Davison-Harvey, (703) 248-3400.

March 11-15 Fiber Communications Corp. fiber-optic splicing and termination workshop, Sturbridge, Mass. Contact (800) 776-0518.

March 12: SCTE Chatahoochee Chapter technical seminar on digital fiber-optic technology for audio and video applications. Contact John Williamson Jr., (404) 376-5259.

March 12: SCTE Florida Chapter, South Florida Meeting Area technical seminar. Contact (407) 844-7227.

March 12-13: NCTI seminar on OSHA compliance for CATV operators, Dallas. Contact Michael Wais, (303) 761-8554.

March 13: SCTE Oklahoma Chapter technical seminar. Contact Arturo Amaton, (405) 353-2250

March 13: SCTE Smokey Mountain Meeting Group technical seminar. Contact Grant Evans, (615) 247-2183.

March 13: SCTE South Jersey Meeting Group technical seminar on OSHA regulations and recordkeeping, safety products, safety training and ladder safety, Ramada Inn, Vineland, N.J. Contact Kevin Hewitt, (607) 886-728.

March 13-14: SCTE Big Sky Chapter consecutive meetings for installers to be held March 13, Ramada Inn, Billings, Mont.; and March 14, Colonial Inn, Helena, Mont. Contact Marla DeShaw, (406) 632-4300.

March 13-15: George Washington University Continuing Engineering Education Program course on microwave radio systems, Washington, D.C. Contact (800) 424-9773 or (800) 535-4567 (in Canada).

March 14: NCTI seminar on fundamentals of supervision for CATV personnel, Dallas. Contact Michael Wais, (303) 761-8554.

March 14: SCTE Tennessee Chapter technical seminar on installation troubleshooting, Airport Hilton, Memphis, Tenn. Contact Don Shackelford, (901) 365-1770.

March 14: SCTE Wheat State Chapter technical seminar, Red Coach Inn, Wichita, Kan. Contact Mark Wilson, (316) 262-4270.

March 16: SCTE Cactus Chapter technical seminar on signal leakage and frequency offsets. Contact Harold Mackey Jr., (602) 866-0072, x282.

March 18: SCTE Satellite Tele-Seminar Programs, "CLI Ninjas (Part 2)" and "SCTE Installer Certification Program." To air 1-2 p.m. ET on Transponder 6 of Galaxy I.

March 19: SCTE New York City Meeting Group technical seminar. Contact Rich Fevola, (516) 678-7200.

March 20: SCTE Golden Gate Chapter technical seminar on BCT/E Category IV, "Distribution Systems." Contact Mark Harrigan, (415) 785-6077.

Planning ahead

March 24-27: National Show, New Orleans Convention Center. Contact (202) 775-3669.

June 13-16: SCTE Cable-Tec Expo, Convention Center and Bally's Hotel, Reno, Nev. Contact (215) 363-6888.

August 25-27: Eastern Show, Inforum Exhibit Hall, Atlanta. Contact Nancy Horne, (404) 255-1608.

Positive fusion

By Wendell Woody
President, Society of Cable Television Engineers

Our society has performed an excellent function in melting together all segments of the industry into one growing and unified coalition toward advancing engineering professionalism. First, we have the membership. It is a blending of people from cable operations, equipment suppliers, government agencies, consulting groups and the trade press. They in turn are supported by their companies, which have sustaining memberships in our society. Even with different political and business motivations, the fusing of these groups provides synergism.

Advancing professionalism

The programs of the Society are the vehicle for advancing engineering professionalism. It's participation by the membership that makes the programs successful. Some of the key programs are the Cable-Tec Expo, the annual fiber seminar, the BCT/E testing and certification program, and the SCTE chapter and meeting group development program.

• The 1991 Cable-Tec Expo in Reno, Nev., is developing noteworthy and extraordinary achievements. During this economical downturn period in our industry, and with most trade shows reporting reductions of 10 percent or greater in exhibitors and attendance, I'm proud to report this is not true for the expo. In fact, we have expanded the exhibit space considerably since last year and it no doubt will be a sell out again. Preregistrations are being logged in at an advanced rate; interest from the international CATV markets is a new boom. Of course, Canada has always been a great supporter of the expo with excellent attendance and Canadian manufacturers exhibiting.

Each year, the expo Program Committee outdoes itself in selecting and obtaining dynamic industry leaders for the Annual Engineering Conference panels and lectures, and this year is no exception. The same also is true for the following two days of hands-on and technical workshops. This year's committee is co-chaired by Steve Allen of Jones Intercable and Bill Riker, and consists of Paul Levine, CT Publications; Dave Willis, TCI; Ted Chesley, CDA Cablevision; B.J. Toner, Toner Cable Equipment; and Sally Kinsman, Kinsman Design Associates Inc.

• The annual SCTE fiber-optics seminar has become a predominant program for industry technological exchange as well as the introduction and documentation of new leading fiber technologies. For the past two years, Jim Chiddix of ATC has contributed significantly to the growth, professionalism and success of the seminars.

The positive fusion of the various seminar presentations generated a union of documented information. This is now available as the *Fiber Optics 1991 Proceedings Manual* for $35 a copy. It may be ordered from SCTE headquarters in Exton, Pa., at (215) 363-6888.

• The BCT/E program was established to help SCTE members raise their professional status through education, training and qualification testing accompanying a certification program. It allows recognition of those individuals demonstrating the knowledge, experience and ethics required of a professional. The program encourages the continued technical development of its members. Here again, the BCT/E program was developed by melting together the contributions of many industry leaders and engineers. That positive fusion has supported the SCTE's goal to improve the CATV technical community.

• The true supporting foundation of the Society has been the establishment and expansion of the network of SCTE chapters and meeting groups. This union across our nation has provided a means to develop professionalism from the grass roots of our industry upward. Now, during our SCTE national elections, we often will hear candidates say, "If elected, I will start lots of new SCTE meeting groups." Certainly it is true there are many geographical locations where no meeting groups exist. However, my greatest concern is the quality of chapters and not the quantity of new meeting groups.

Meeting groups need to be well-thought out and planned. They should not be established just on the whims of

a few people who want to be officers. Consequently, some meeting groups never make it, others require reorganizing and still others need a very long span of time to achieve chapter status. Here are two important questions to ask yourself when establishing a new meeting group: 1) Are you located at the nucleus of a geographical pool of people that can adequately support your new organization? (Support means attending your meetings.) 2) Do you have leaders available who will not only initiate the development of your new group, but also have the dedication and stamina to help your group move in a normal and professional manner toward chapter status? If you answer yes to both of these questions, you have the positive fusion to blend and unite another outstanding SCTE chapter! You should be in contact with Chapter Development Director Ralph Haimowitz. Telephone him at (704) 297-5423.

Keeping chapters strong

All chapter officers are aware of the importance of keeping their chapters strong. We have two people on the national staff with chapter support responsibilities and each regional director on the national board devotes a significant amount of time toward chapter development. Keeping chapters strong is so consequential that next month's message will be devoted totally to the subject.

Another reminder: Plan now to attend this year's SCTE Cable-Tec Expo at the Reno Convention Center, June 13-16. Plan your vacation around the expo — drive to Reno and make use of the recreational vehicle and camper park adjoining Bally's Resort, the SCTE headquarters hotel. Hope to see you in "The Biggest Little City in the World" in June. **CT**

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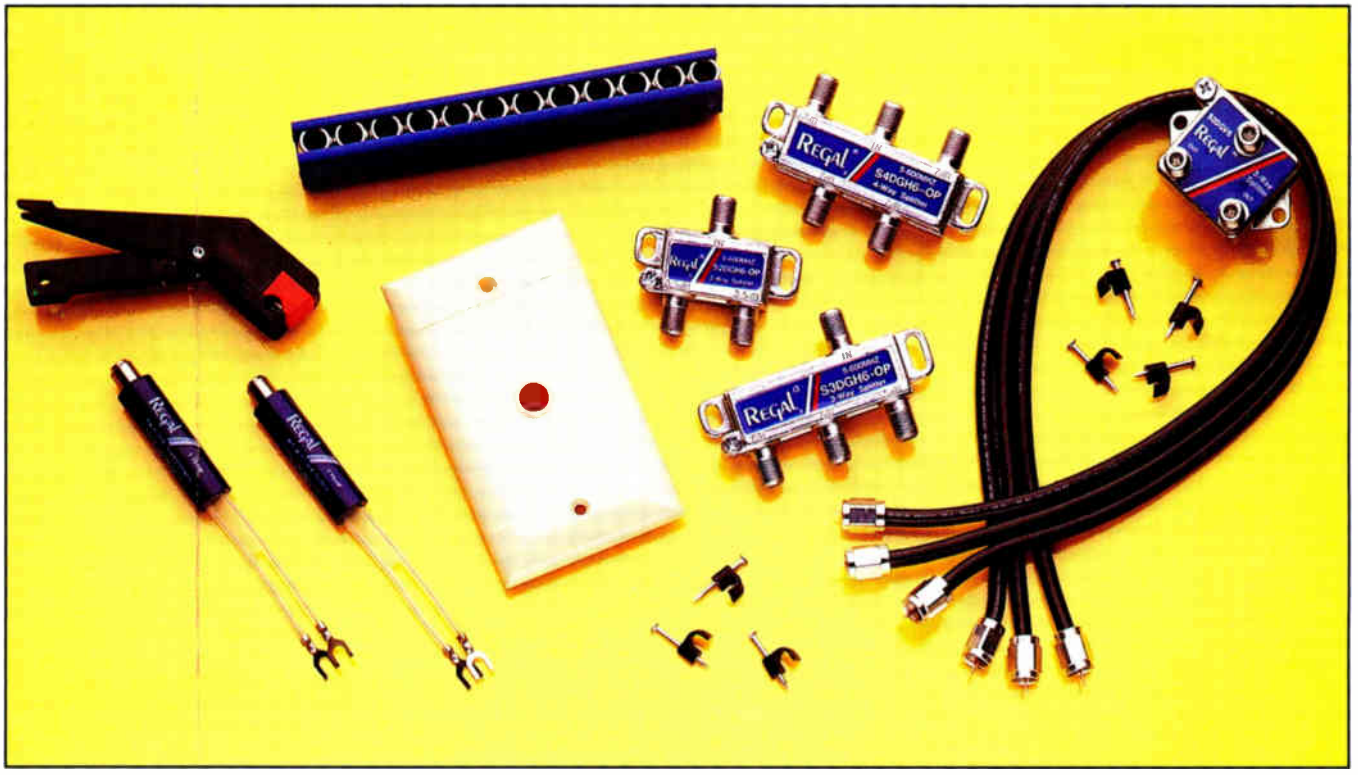

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