COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

Fitting the pieces together
Page 20

'On the move' in Las Vegas
Page 10

June 1985

For high-speed data transmission on broadband coaxial cable networks . . .

ZETA MODEL ZT1 RF MODEMS OFFER EXCEPTIONAL PERFORMANCE!

ZETA Model ZT1 high-speed RF data modems are designed for point to point and multidrop data communications over broadband coaxial cable networks. Superior spectral efficiency results in increased data circuit density.

Since 1968, ZETA has been a leader in the design and manufacture of complex MIL Spec and commercial RF/microwave equipment. The superior performance and reliability of the Model ZT1 Modem are products of this experience.

FEATURES:

- Wide frequency coverage in a single unit
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- Local & remote control of digital loopback and carrier ON/OFF
- RS-449 & V.35 interfaces available
- Fast carrier lock-up time
- Low cost non-synthesized fixed frequency option
- Robust modulation for low error rates

Other Zeta Modems include 19.2 & 56 KBPS Models. Telephone (408) 727-6001, today!

ZETA LABORATORIES, INC.
A SUBSIDIARY OF CCT
3265 Scott Blvd., Santa Clara, California 95054
(408) 727-6001 TWX 910-338-7336
See us at the NCTA Show at Booth 1762.

Reader Service Number 1.

Behind every Panasonic® cable converter lies 25 years of cable know-how.

Cameras. Switchers. Monitors. Video recorders. You name it. For over two decades Panasonic has been supplying high-quality video components to both the broadcast and cable industries. In fact, we've been supplying CATV converter components for years.

But cable know-how is just one reason to install Panasonic CATV converters. There's also the reliability you and your subscribers expect from Panasonic.

For your subscribers who want remote control, there's a Panasonic converter with a full-function infra-red control unit that fits snugly on the converter when it's not in use. You can also give them 15-channel memory for easy tuning. Two-speed up and down channel scanning. Even an optional parental guidance key for controlling the channels children watch.

No matter which Panasonic converter you choose, you'll discover that it pays to buy CATV converters from Panasonic. After all, we've been cable ready for years.

Reader Service Number 2.

For more information, call Panasonic at (201) 392-4109 or contact one of these Panasonic CATV distributors.

Cable TV Supply Company
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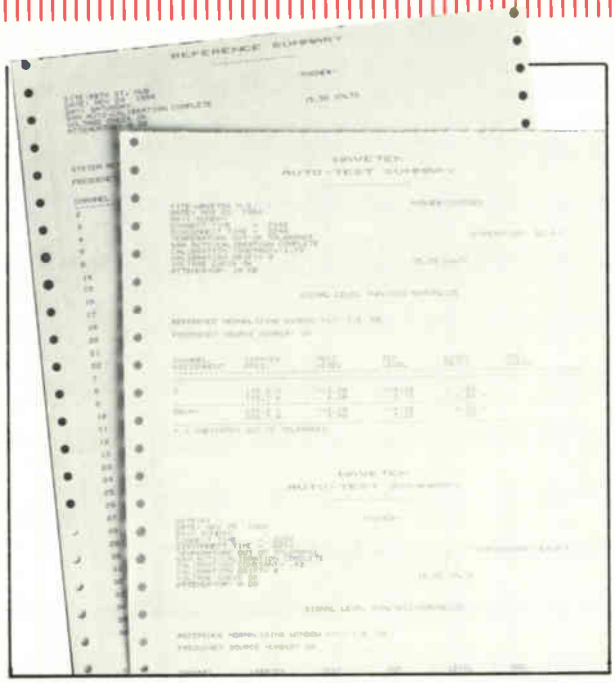
S.A.L. Communications
1-800-645-9062

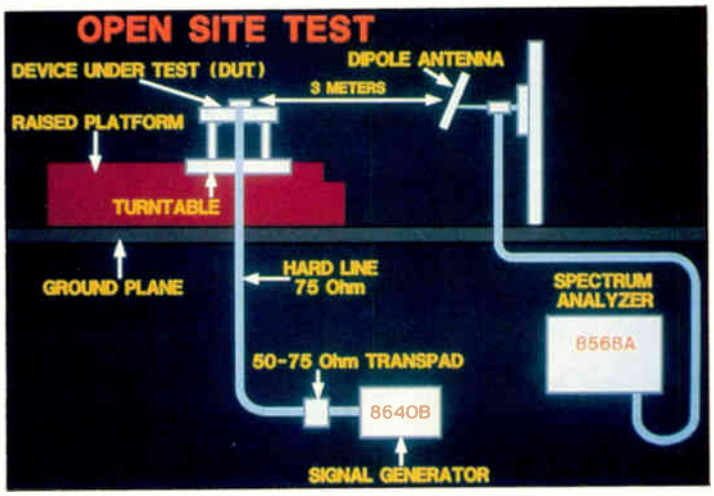
Panasonic
Industrial Company

SEE US AT NCTA BOOTH NO. 3535.

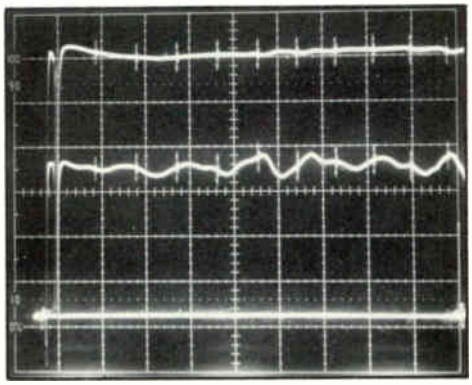
Departments



Automated testing 48



Egress/Ingress 88

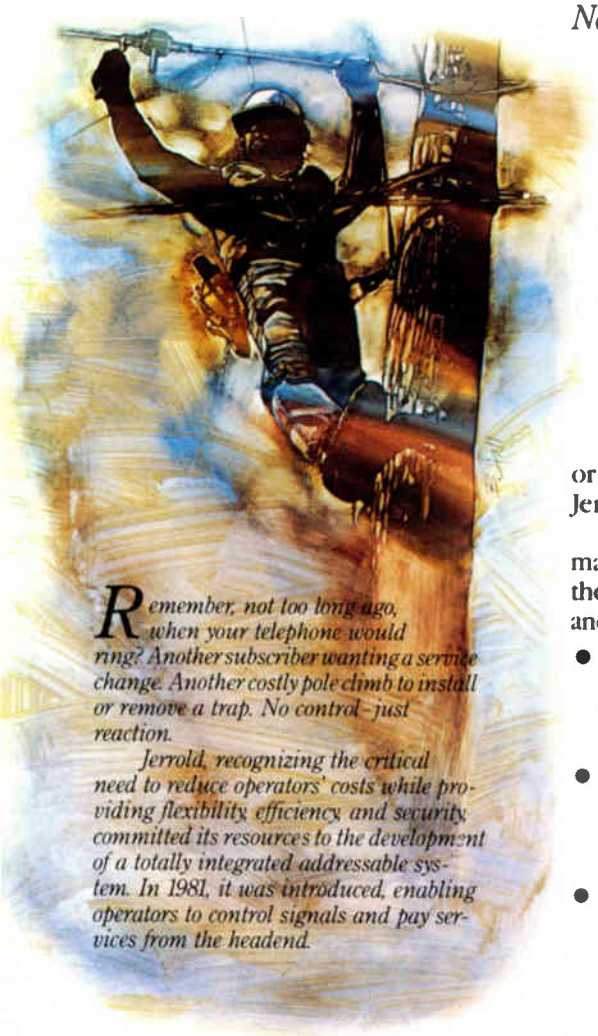


Bench sweeping 108

Features

Remember when traps were the industry standard in signal control? Now...

Jerrold/TOCOM Addressability. Unparalleled.



Remember, not too long ago, when your telephone would ring? Another subscriber wanting a service change. Another costly pole climb to install or remove a trap. No control—just reaction.

Jerrold, recognizing the critical need to reduce operators' costs while providing flexibility, efficiency and security, committed its resources to the development of a totally integrated addressable system. In 1981, it was introduced, enabling operators to control signals and pay services from the headend.

Whether your plans for your next addressable system call for baseband or RF, on-premises or off-premises, add-ons or state-of-the-art converters, Jerrold—and only Jerrold—can provide your choice.

With the broadest range of addressable systems and equipment on the market today, Jerrold can accommodate your specific system's design. We offer the systems, products, and services that assure maximum efficiency, flexibility and control:

- TWO-WAY UPGRADABILITY. Buy only what will pay off for you today. Jerrold converters can be upgraded to two-way addressability later. When you're ready, you can add on two-way capability to increase revenues with IPPV and other interactive services.
- DOWNLOADABILITY. Increase revenue protection, flexibility, and subscriber satisfaction. You can move Jerrold converters between your systems, downloading converter address, barker channel location, and all channel assignments.
- MIXED MODE. Only Jerrold makes it possible to mix an array of different equipment in the same system. Highly featured baseband converters for the high revenue areas, off-premises equipment for apartments, RF converters—even add-ons for other areas. You have the flexibility to do what *you* want to do.

Jerrold/TOCOM addressable systems. Quality and reliability backed by the largest service network in the industry. A decision that's right for tomorrow, no matter which you choose today.

For detailed information, call or write today. Jerrold Division, General Instrument Corporation, 2200 Byberry Road, Hatboro, PA 19040. (215) 674-4800.

JERROLD
You know we'll be there.

See us at the NCTA Show at Booth 2700.

GENERAL INSTRUMENT

Reader Service Number 3.

Behind the flatlands: A lesson in perspective

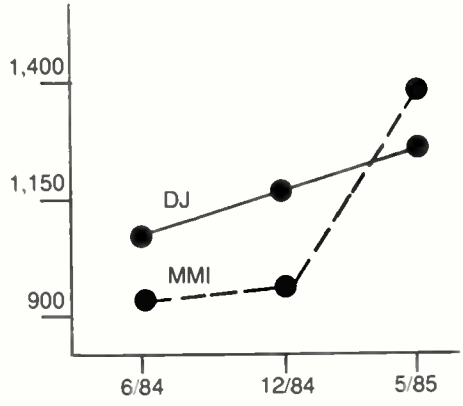
Have you heard that cable's on a plateau? It's a no-profit situation? The flatlands of the communications industry? Do you believe it? I'm not sure that I do.

When one looks at the economic viability of an industry, and in this case cable TV, an enormous number of factors come into play. Many of these factors are difficult, if not impossible, to identify, but they all come together creating the direction of the industry.

Cable TV, without a doubt, has had its ups and downs—remember the 1970s? Talk about your ups and downs. And the early '80s, weren't they great? But now, what about now? Is our industry as bleak as some think, or is it that perceptions have been so tainted by the past that a cloud of caution shadows our potential?

I don't pretend to have the answers. Nor do I know what lies ahead. What I do know is that perceptions can be wrong. Remember, at one time the world was perceived to be flat. Would you have believed it was round? Perhaps, perhaps not. The point is, some things are only as flat as you make them.

Flat or not?



Dow Jones Industrials and MMI (Multichannel Market Index) figures provided by *Multichannel News*.

Behind the scenes

In the process of preparing this magazine, we, like most publishing houses, make every effort to ensure the accuracy of our content. If updated or new information comes to our attention, we'll let you know. A recent example of this is our April construction cover photo. Have you any idea what company's crew was doing the construction? It was Kennedy Cable Construction's. Our (hard)hats are off to Kennedy.

Paul R. Levine

Remote Revenues

Simplicity. That's how you generate revenues with Texscan's Textop Converters. A remote control transmitter gives convenience to your customers and more cash to your system.

Aside from its simple, reliable operation, the Textop converter offers many features; Synthesized tuning eliminates the need for fine tuning, microprocessor controlled with virtually no mechanical parts to wear out.

Choose from two types. The Textop Ultra provides a 20-button, direct access, IR wireless remote transmitter. Its favorite channel memory is capable of storing up to 60 channels. Options include: AB cable selection for up to 120 channels, 36 to 60 channel roll over, SAW resonator output, and parental control.

The Textop Plus features 36 channels, expandable to 60. Its modular design allows additional features by simply adding plug-ins. The Plus' optional remote control is a 4 button wireless transmitter.

Texscan
CORPORATION

Texscan El Paso Division
10841 Pellicano Drive
El Paso, TX 79935
(915) 594-3555

Reader Service Number 5.

COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

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Pioneer's addressable converter gives cable operators exactly what they want...

and nothing they don't want.

The Pioneer BA-5000 is the most functionally advanced addressable converter available today —offering a wide range of standard features **plus** many profitable options and add-ons.

Every BA-5000 gives you downline-loadable frequency format, channel map and special channel designation. And with viewer diagnostics for trouble shooting, you cut down on in-house service calls.

By using combinations of variable gated sync and sine-wave suppression plus coded-key video scrambling, the BA-5000 is compatible with Jerrold, Oak and Hamlin scrambling methods.

Plus, the BA-5000 accepts add-ons for impulse-pay-per-view and MTS. An addressable cradle is also available for standard converter upgrade. You purchase the add-ons you want, nothing extra. That's another reason why the **overall value** of the Pioneer BA-5000 is the **best** in the industry.

For complete information and a demonstration of the BA-5000, call Pioneer toll-free 1-800-421-6450. (In Ohio, 614-876-0771.) And do it now.

Since the most reliable addressable converter in America gives you everything you want, why pay for more than you need?

PIONEER®
PIONEER COMMUNICATIONS OF AMERICA, INC.

The future of sound and vision

See us at NCTA—#2535

Reader Service Number 7.

NCTA show looks at the industry in 1985 and beyond

LAS VEGAS, Nev.—This year, the National Cable Television Association's annual convention will feature 49 panel discussions in nine tracks. The tracks, designed to increase attendees' knowledge and performance, are: finance, marketing, consumer electronics, law, management, corporate development, programming, technical issues and public policy.

This 34th annual convention will open (June 3) with an NCTA-commissioned study on the cable industry's financial outlook. Presented by Arthur D. Little Inc., the study will deal with the Cable Communications Policy Act of 1984.

Also speaking during the first session is NCTA Board Chairman Ed Allen and NCTA President James Mooney. Allen will address "The state of the industry"; Mooney will "set" the industry's agenda for the year.

The convention obviously will focus on more than the industry's new deregulated marketplace. Based on pre-registration projections, many conventioneers will turn out to learn more about the various related topics in their own areas of interest. The NCTA expects about 14,800 attendees this year. Here is a preliminary schedule of the convention's activities:

Sunday, June 2, 1985
12-7 p.m.—Registration open
6-8 p.m.—System Ace Awards Show
8-8:30 p.m.—Champagne reception

Monday, June 3
7:30 a.m.-6 p.m.—Registration open
7:15-8:45 a.m.—CABLEPAC breakfast (invitation only)
9-10:30 a.m.—Opening session
10:30 a.m.—Exhibit hall ribbon cutting
10:45-12 noon—Public policy sessions
12:30-2 p.m.—Luncheon
2-3:30 p.m.—Exclusive exhibit hours
3:30-5 p.m.—Track sessions

Tuesday, June 4
7:30 a.m.-6 p.m.—Registration open
9-10:15 a.m.—Track sessions
10:15a.m.-3:30p.m.—Exclusive exhibit hours
10:30-12 noon—Meet the FCC staff
3:30-5 p.m.—National Cable Programming Conference general session

Wednesday, June 5
7:30 a.m.-5 p.m.—Registration open
9-10:15 a.m.—Track sessions
10:15 a.m.- 3 p.m.—Exclusive exhibit hours
3-4:30 p.m.—Third general session
6:30 p.m.—Gala dinner dance and awards presentation

Warner Amex contracts Anixter

SKOKIE, Ill.—Anixter Bros. Inc. announced that Warner Amex, a joint venture between Warner Communications and American Express, has retained Anixter as materials manager for its cable TV operations in Houston and certain other cities.

Anixter, as materials manager, will perform a full range of inventory and distribution services for selected Warner Amex operations using Anixter's proprietary real-time order entry and inventory control system.

Under these materials management programs Anixter acts as a partner with its customers. "We help them utilize their inventories in the most efficient manner possible," said Alan Anixter, president.

GI divisions complete sales, installations

DALLAS—The TOCOM Division of General Instrument announced that it is completing installation of approximately $1 million worth of cable TV equipment in the Bryan/College Station, Texas, system of McCaw Cablevision. The installed equipment base includes TOCOM Plus 5503 baseband addressable converters with remote control, an ACS-1000 addressable control system and related video processing equipment.

McCaw, which purchased the system in November 1984, has consolidated two cable services serving the communities adjacent to Texas A&M University into one system. The system is being upgraded with addressable equipment and basic services are being expanded. Additional pay services also are being introduced to the system.

Installation of the TOCOM addressable converters in the Bryan/College Station system will continue through 1985. Gary Potter, McCaw director of purchasing, indicated that the Bellevue, Washington-based multiple system operator will place an additional 5503 orders with TOCOM for several other McCaw systems. The orders, he said, will be forthcoming during the next few months.

The Jerrold Division of General Instrument also made an announcement. It will supply Cox Cable Communications of Atlanta with cable electronics equipment valued at $15.75 million.

Under the terms of a contract, signed recently, Cox Cable will purchase approximately $1.25 million in distribution equipment and $4 million in subscriber terminal equipment each year for the next three years.

Continental buys S-A equipment

ATLANTA—Continental Cablevision of Massachusetts, a division of Continental Cablevision Inc., has ordered $2.7 million worth of addressable CATV products from Scientific-Atlanta Inc. The products will be installed at the operator's Boston-area franchises.

The new system will feature S-A's line of Series 8500 addressable hardware and software products, including Model 8550 addressable set-top terminals and remote controls, Model 8553 addressable transmitters, Model 8556 scrambling units and two addressable control computers, System Manager III and IV.

Illinois-Indiana group to move to capital

CENTRALIA, Ill.—The Illinois-Indiana Cable Television Association is planning to move from its current location in Centralia, Ill., to Springfield, Ill. This relocation is designed to allow the association to become more involved with the activities of the Illinois legislature and the Illinois Commerce Commission.

Regrettably, the current executive director, Shirley Watson, will be unable to make the move to Springfield due to personal commitments. The move should occur before the fourth quarter of 1985.

SCTE selects Phoenix for Cable-Tec Expo '86

WEST CHESTER, Pa.—The Society of Cable Television Engineers has selected Phoenix, Ariz., for the location of its 1986 annual convention, Cable-Tec Expo. It will be held June 12-15, 1986, at the Phoenix Convention Center. The decision was reached by the society's board of directors following an inspection and evaluation of four potential sites.

Influencing the decision were the results from a survey of both attendees and exhibitors at the SCTE's Expo '85 held recently in Washington. The survey indicated that: 1) next year's convention should be held in a western location, 2) room rates and other attendee expenses should be kept at a minimum, and 3) the site should have an attractive exhibit hall and a floor plan that is conducive to the numerous breakout technical workshops.

SPECTRUM 600

A New Face That Stands Out in the Crowd!

A signal level meter never looked so good! If you're in the market for a new meter, you've probably checked out our competition. But, the Spectrum 600 has no competition. Where else can you find a 5 to 600 MHz coverage at such a modest price? And, how about a level measurement accuracy of ±.75 dB to 450 and ±1 dB to 600 MHz. Add to that its good looks. The narrow profile of the Spectrum 600 allows for use in a bucket truck or directly in front of the user on the pole. A padded, soft shell carrying case provides an excellent weatherproof housing with a zip-up accessory pocket and handy carrying strap. All this, plus outstanding performance in a 7¾ pound package.

Rise above the crowd, look at a Texscan Spectrum 600 today.

Texscan Instruments
3169 N. Shadeland Ave.
Indianapolis, IN 46226
Phone: (317) 545-4196

Texscan
CORPORATION

See us at the NCTA Show, Booth 2900.

Reader Service Number 8.

An American Cablevision lineman lashes cables and strand together for the fiber-optic link between American and Indianapolis Cablevision.

Ad interconnect features fiber optics

INDIANAPOLIS—Fiber-optic cable now offers local and national advertisers an opportunity to reach nearly 126,000 television households in Indianapolis and Marion County.

A 7.9-mile, single-mode fiber-optic interconnect links the headends of American Cablevision of Indianapolis (a division of ATC) and Indianapolis Cablevision (an independent system), and allows commercial messages to be seen simultaneously on both systems. The interconnect offers advertisers commercial availabilities on eight cable networks.

Together, American Cablevision and Indianapolis Cablevision serve 45 percent of the 281,000 television households in Marion County. To develop the interconnect, American Cablevision and Indianapolis Cablevision, which are approximately equal in size, agreed to share costs and responsibilities for the project. American engineered, constructed and will maintain the interconnect, while Indianapolis took responsibility for selling commercial availabilities and inserting commercials on the system.

The nearly eight miles of repeaterless interconnect cable consists of four optical fibers with a steel strength member for support. Each fiber is now capable of delivering four channels of programming. Expansion options for the interconnect were designed into the system.

Belden supplied the single-mode fiber, and Catel provided the FM fiberoptic transportation equipment, which includes two laser transmitters and optical receivers. Both Adams Russell and Channelmatic switchers are being utilized in the interconnect, which began operation April 10.

CBS selects Newshawk

SCOTTSDALE, Ariz.—GEC McMichael announced that CBS Operations and Engineering have requested the first Newshawk "Fly-Away" satellite news gathering (SNG) system to be delivered for its Rapid Deployment Earth Terminal (RADET) program.

RADET will be a joint development based on the GEC McMichael SNG terminal known as Newshawk. The SNG terminal will be enhanced, as required, to meet the particular needs of CBS.

Essentially the SNG terminal is a transmit-only uplink to communications satellites that work in the 14.0 to 14.5 GHz band (although voice may be received also). From these satellites the news pictures and sound are received at the broadcasting network center on a larger fixed antenna. The CBS RADET system will have an independent voice/data channel for studio/field crew communications.

Pioneer receives $12.7 million commitment

COLUMBUS, Ohio—Pioneer Communications of America announced an agreement with Group W Cable Inc. to purchase Pioneer's new BA-5000 one-way addressable system. The agreement is for an anticipated $12.7 million through 1986.

Group W Cable will be installing the Pioneer BA-5000 series in its Chicago franchise. These

Reliable TV 60
904 Cubic Inches
of Hard-Working Space

The Competition, CPH 658
653.05 Cubic Inches
of Hard-to-Work Space

Reliable Electric/Utility Products' square-design CATV distribution closures give you more cubic inches of work area for your money.

When considering the purchase of CATV distribution closures, don't overlook the importance of design. Reliable's square-design closures provide maximum work area to install and maintain equipment. Because they feature larger housing capacities than comparable cylindrical models, they provide more mounting space for your dollar.

Another factor to consider is the solid durability built into every Reliable enclosure. While most cylindrical units are made of plastic, we construct our housings of heavy-gauge, mill-galvanized steel. We coat the pedestals with our unique nine-step finish to resist weathering and corrosion. With an engineering and manufacturing process this thorough, it's no wonder our pedestals have been known to stay on the job for a quarter century or more.

In addition to large capacity and durable design, Reliable's closures also feature the security of a padlock hasp—along with several other locking options—and the convenience of a removable upper cover. All can be stake-mounted, while some units can be wall-mounted or self-supported.

So for pedestals that offer spacious design—as well as solid construction, security and convenience—specify Reliable Electric/Utility Products' closures.

For more information, phone or write Reliable Electric/Utility Products or our nearest authorized distributor today.

Reliable Electric/Utility Products 11333 Addison Street/ Franklin Park, Illinois 60131 / (312) 455-8010 / TLX 728 393

Visit us at booth 2126 in Las Vegas

RELIANCE COMM/TEC

Reader Service Number 10.

two franchise areas encompass an estimated subscriber potential of 410,000 homes. Using an M3 system controller, the system is capable of managing 500,000 subscriber terminals.

NBC chooses Leaming

COSTA MESA, Calif.—Leaming Industries announced that NBC Radio has chosen the Leaming audio transmission system to connect NBC headquarters at Rockefeller Center to its new studios in Manhattan.

The design called for stereo audio channels to be multiplexed into New York telephone coaxial cable and delivered to and from the respective sites. This two-way system consists of a total of 57 channels: 26 low-band (5-15 MHz) and 31 high-band (88-108 MHz) channels. Among the factors contributing to the performance of the system is the integration of the new Telefunken High-Com companding process.

En Group picks Wegener

NORCROSS, Ga.—Wegener Communications has received an order from En Group Canada for audio and data satellite communications subcarrier equipment. En Group is Canada's broadcast industry-owned satellite distribution company. The company will provide this equipment to affiliates for the purpose of news gathering and data distribution.

The order for the first phase of the project is for 100 downlinks. Each downlink consists of two 15 kHz audio demodulators, two 7.5 kHz audio demodulators, one 115.2 kB QPSK data demodulator, a microprocessor-controlled network controller and two audio routing switches, as well as the redundant uplink hardware. The order was placed through Wegener's Canadian distributor, Sigmacom Systems Inc. of Toronto.

AM awarded CATV, railroad contracts

QUAKERTOWN, Pa.—AM Cable TV Industries has been awarded a communications contract from the Chessie System Railroads. AM is providing labor and equipment to install class 3, 50-foot antenna poles and building foundations at approximately 150 locations throughout Maryland, Pennsylvania, Ohio, New York, Indiana and Illinois. The project will take three months to complete.

When accomplished, this system will enable train engineers to be in constant voice communications contact with the railroad communications center.

AM Cable TV Industries also was awarded the construction contract for Hi-Desert Cable TV in Yucca Valley, Calif. The Hi-Desert project involves the construction of approximately 80 miles of plant. Commencement of the project began in late March and is estimated to be completed by the end of July.

Bytex announces new HQ

SOUTHBOROUGH, Mass.—Bytex Corp., manufacturer of electronic matrix switches (EMS), announced its relocation to an 80,000-square-foot world headquarters facility in the newly constructed Southborough Office Park. Bytex's 1984 sales were in excess of $10 million.

"Our new headquarters not only exemplifies our growth, but also serves as a testimony to the fast emergence and acceptance of electronic matrix switching in the data communications marketplace," said Steven Finn, president and co-founder of the 4-year-old firm.

New billing feature

OMAHA, Neb.—First Data Resources Inc. announced that it now offers cable systems the ability to pass on franchise and copyright fees directly to subscribers. Since March 1985, cable systems have had the option of displaying the fees on the subscriber's bill as a separate item.

Matt Gates, president of the Cable Services Division, said that FDR added this feature to its billing system in response to the Cable Act of 1984. According to the new legislation, operators have the right to pass along to subscribers the amount of any increase in franchise fees.

ATTENTION: CATV, SMATV and MDS Operators!

- **BYTEX** provides ideal access to the hotel market.
- **BYTEX** multiplies your profits and transforms a hotel cost into a hotel profit.
- Installed in 25,000 top hotel rooms internationally.

NEW order confirmation button

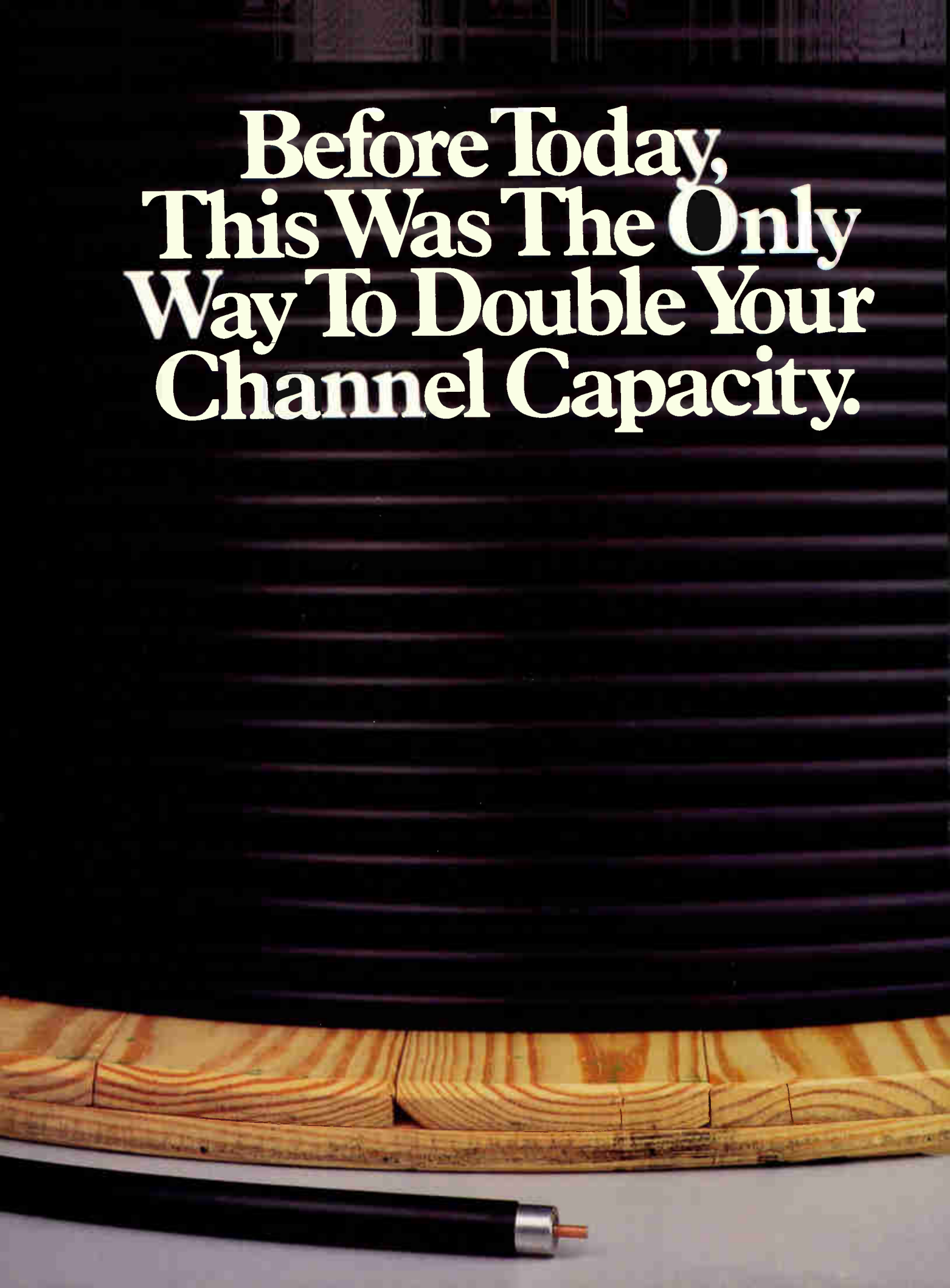
- 3 channels of premium pay entertainment.
- Pay per view or pay per day.
- For use with cable, tape or satellite origination.
- Automatic billing vouchers at front desk.
- Automatic preview time.
- Automatic return to standard TV.
- Billing computer controls up to 7 VCR's.
- Full hardware diagnostics.
- We supply complete systems customized to suit your requirements.

CALL: (818) 303-1511

BYTEX

1011 South Myrtle Avenue
Monrovia, California 91016

Reader Service Number 12.


Before Today,
This Was The Only
Way To Double Your
Channel Capacity.

Introducing The Alternative From General Electric.

Comband.™

After three years of extensive research, development and field testing, the Comband™ system is here.

Now, with this one system, you can double your channel capacity without laying another inch of cable. And, you get other revenue-generating features you've asked for.

Modular in design, the Comband system is flexible, stereo-ready and so secure it virtually eliminates any possibility of signal theft.

The converter itself contains a one-way addressable baseband system that's competitive with any product on the market. Add the Comband decoder and you can double part, or all, of your existing channel capacity in a matter of weeks.

The design of the Comband system allows you to control when, and to what extent, you upgrade your operation. You satisfy yourself, your subscribers and the franchising authorities without major construction expense or disruption. So you increase your revenues, lower your operating costs and get a much faster return on your investment, all in one step.

But to fully appreciate the Comband advantage, you have to see it in operation.

For a Comband Express demonstration, call Ron Polomsky at 1-800-GE-CABLE. Because, for the ultimate in flexibility and control, there is no alternative to the General Electric Comband system.

The System With Everything But Competition.

Reader Service Number 13.

"GE" is a registered trademark of General Electric Company.

See us at the NCTA Show at Booth 2519.

W&S Systems. Making history in cable television.

The formation of W&S Systems, a partnership involving Westinghouse and Sanyo, launched a new concept in cable equipment technology. Our combined energies have led to a dramatic breakthrough in stereo sound with the introduction of the SM 2001.

The most advanced stereo module available, it is compatible with virtually every converter for integration in cable systems.

Extremely versatile, the SM 2001 offers the following benefits:

- FM stereo from premium video/stereo channels
- FM stereo from audio/stereo channels
- Hi-fi sound from non-stereo TV channels
- Automatic video and audio tracking of monaural and stereo channels
- Second Audio Program (SAP)
- VCR audio stereo outputs

Channel mapping capability provides the cable operator with greater flexibility in TV and FM channel selection and programming. Use of an EEPROM gives the SM 2001 its impressive compatibility characteristics. The unit can be reprogrammed to tailor the system's mapped channels, and matching the converter output channel.

Among the outstanding functional features of the SM 2001 are:

- Separate right and left audio outputs
- Option of 2, 3 or 4 selection at the input of the unit from the converter
- Last channel memory
- FM/TV automatic audio level
- 1ST and 2ND TV audio channel

NCTA Exhibit Booth 1812

For more information on the SM 2001, contact:

W&S Systems Company
Westinghouse Building
Room 1880
11 Stanwix Street
Pittsburgh, PA 15222
1-800-323-9935

A Westinghouse Electric Division

Reader Service Number 14.

Law and the lawyers

By Isaac S. Blonder
Chairman of the Board, Blonder-Tongue Laboratories

Whether the engineer encourages the encroachment of the law in his workaday world or not, the collision with the law and lawyers is inevitable. The mysteries of natural science may be explored and decoded by anyone with intelligence and ingenuity; but the mysteries of legislators and the laws resulting from their deliberations are impenetrable to the scientist.

The following comments are on our present system of laws, and the lawyers who, under the ambiguous title of "Officers of the Court," are hired by clients (otherwise properly called victims) to guide us on the murky roads of justice. My comments come from 35 years of travail (mostly unsuccessful) with our beautiful, blinded goddess of justice.

Facets of the process

Judicial appointment: With the few exceptions where judges are elected by popular vote, the vast majority of judges are appointed by politicians from a list drawn up by the Bar Association. The result is a judge whose job is compromised by obligation to the party in power and to the lawyers who appear before him. Seems like a fertile bed for incest in our courts? Read on.

Jury selection: The concept of being judged by a jury of one's own peers is intriguing and popular but is it really fair? Instead of assigning jurors to the cases as they are called to duty, both the prosecution and the defense attorneys (with the aid of psychiatrists) attempt to select the segment of the population they believe will favor their respective causes. This selection process makes a mockery of the word "peers."

One outcome of this charade is to deny the rejected juror his rare opportunity to mold the law as he views it. I have never served on a jury and apparently never will, since I appear wearing a business suit and carrying a briefcase stuffed with homework.

The victim is the victim: The criminal views time in the courthouse as part of his lifestyle. As a veteran prison guard once commented to me, "Rehabilitation is a farce; the inmates regard their pattern of freedom and incarceration as financial and personally more rewarding than going straight." Thus the victim, who is bled financially and personally degraded by being forced to appear in court, has as an adversary a criminal to whom the whole procedure is routine and rewarding.

Time is of the essence: All will probably agree that our justice system is incredibly inefficient. In only one aspect is time judged inviolate—the appearance of the victim before the bench. And failure to do so results in an immediate negative verdict. But judges interrupt the trial with other duties, call recesses, adjourn early and appear uncommonly accommodating to obscure reasons for prolonging the proceedings.

Precedent law: Apparently the statutes as passed by legislative bodies require interpretation by the judiciary. The original objectives of said laws are layered over in one court case after another. In time, the legal opinions are more influential than the legislative language and one could argue that the judges have exceeded their constitutional limits. Where there is a contest between two parties, as in a patent case, the judge (or jury) may ignore who is the economically injured party and depend on the layered blankets of precedents to arrive at a patently unfair (in layman's terms) decision.

Plea bargaining: No subject illustrates the paralysis of our legal structure more than plea bargaining. When the prosecution admits that their case is too weak, or that they are overloaded, or out of funds, and have to accept a lesser indictment, we get the painful message; the criminal is not punished for his crimes and will be encouraged to continue his wicked ways.

Justice delayed is justice denied: To a layman, there seems to be an infinity between crime and the punishment. If the pockets are deep, the possibility is always there that the victim will be exhausted financially and mentally, and unable to contest another appeal. What could be more encouraging to the criminal than facing our slow, pliable and unbalanced attempt at criminal justice.

Contrast the American scene with the British. I was there. An eccentric individual who claimed to hear voices directing his life, stole a camera from a house in Scotland. Within a week he was charged, convicted and sent to jail for three months. No appeals, no plea of temporary insanity.

Characteristics of lawyers

Are lawyers people? Humility is not a garment worn comfortably by the legal profession. Perhaps the law schools should offer a one credit course on acting, so the attorney can appear humble and grateful to his client, and hide his true feelings of superiority and scorn for the poor victim who is obliged to hire him.

Morality: How does a lawyer view himself after he has successfully defended a criminal client and succeeded in turning him loose to continue his criminal career? With satisfaction at being a winner! I have queried many an attorney as to his responsibility for seeing justice triumphant and the reply is always that the opposing attorneys were inferior and that he deserved to win! So the lawyer sees it as a contest without any morality to cloud the issues. We, the public, suffer from the criminals let loose to prey on us, while the lawyers enjoy their profitable games in court.

Awakening nightmare

In conclusion, I recall a nightmare I experienced during a prolonged trial many years ago. As is often depicted in the *Twilight Zone* tales, the courtroom scene was frozen and only I could move. I rushed around to the judge, the jury, the prosecuting and defense attorneys, and pulled at their faces. In each case, the mask came away revealing the same grinning, sardonic devil enjoying his view of the victim—me! The truth was not far away from the nightmare; I had to fire two law firms before I found an out-of-state lawyer who would defy the local legal monopoly.

Test instrument applications to reduce activation cost

By Daniel M. O'Connor
Vital Signs Marketing Manager, Texscan Corp.

It is not necessary to remind you of the time and money required to activate a two-way cable plant. Construction deadlines and scheduled delivery of subscriber services can test the limits of employees and company alike. Franchise commitments, along with the current emphasis on ROI (return on investments), dictate that timely and cost-effective methods be employed for plant operations, including activation.

How can test instruments be used to reduce the costs of plant activation and alignment? One field-proven method that is often overlooked is that of using the status monitor as a testing, troubleshooting and management tool during turn-on and alignment activities. Although many system operators do not recognize the status monitor's capabilities and applications as a test instrument, it can be one of the most powerful tools available. After all, a status monitoring system integrates several applications-oriented devices into a system of automatic test equipment (ATE).

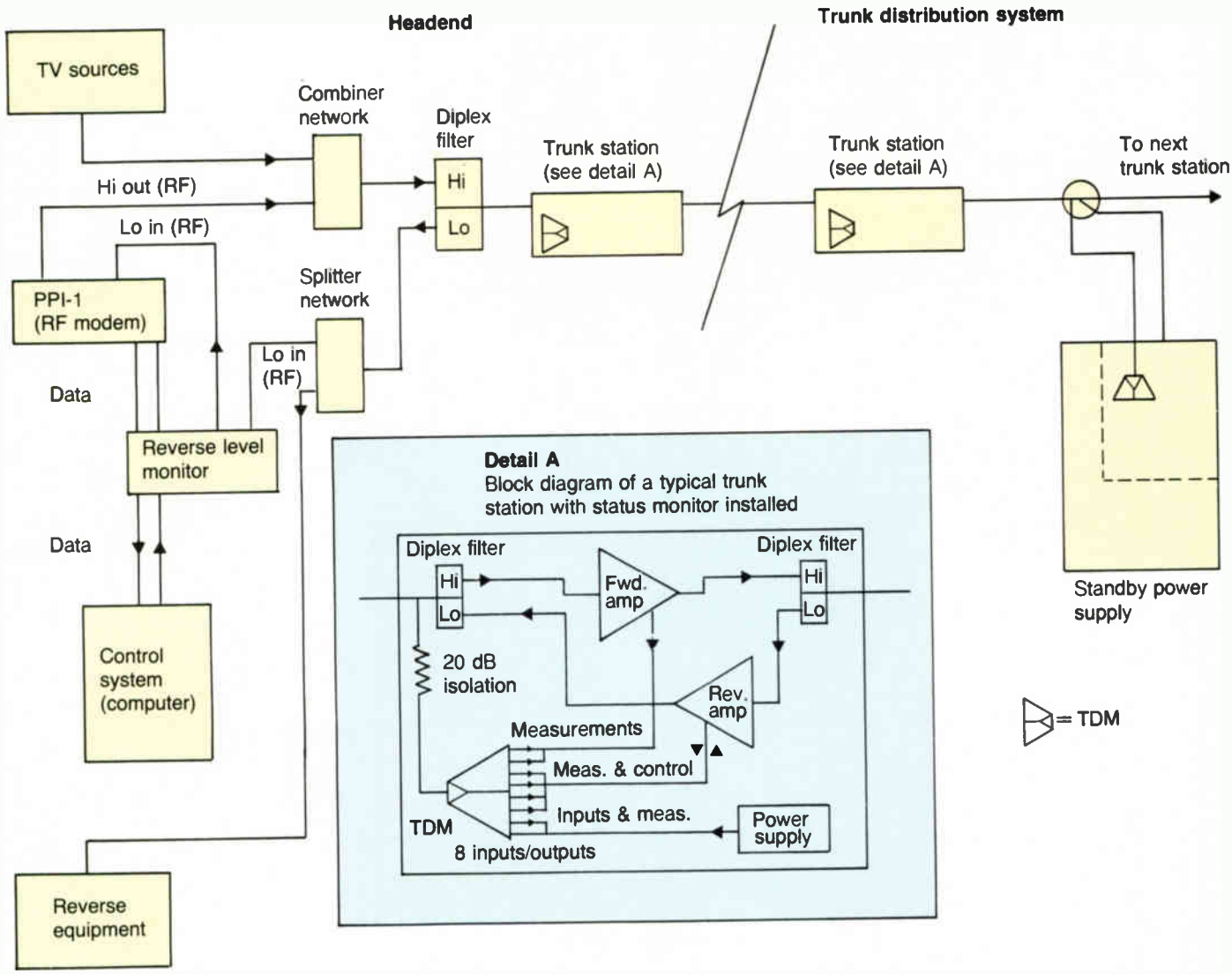
Status monitoring hardware is frequently left un-installed, or at least inactive, until the cable plant is up and running. However, there are significant benefits to be gained by using the status monitoring system to assist in plant activation.

There are three main areas of concern when turning on a new plant. These are: 1) the forward (downstream) RF transmission path, 2) the reverse (return or upstream) RF transmission path, and 3) system powering. The status monitor can be useful in all three of these areas. To see how the status monitor can be helpful in determining the presence and source of these types of problems, it will be useful to first discuss the functionality of a status monitoring system.

A typical installation and components

A simplified diagram of a typical installation is shown in Figure 1. There are two groups of equipment shown here—the headend equipment and the field-located hardware. The headend equipment consists of a computer, a special RF modem, and some auxili-

Figure 1: Typical status monitoring system installation



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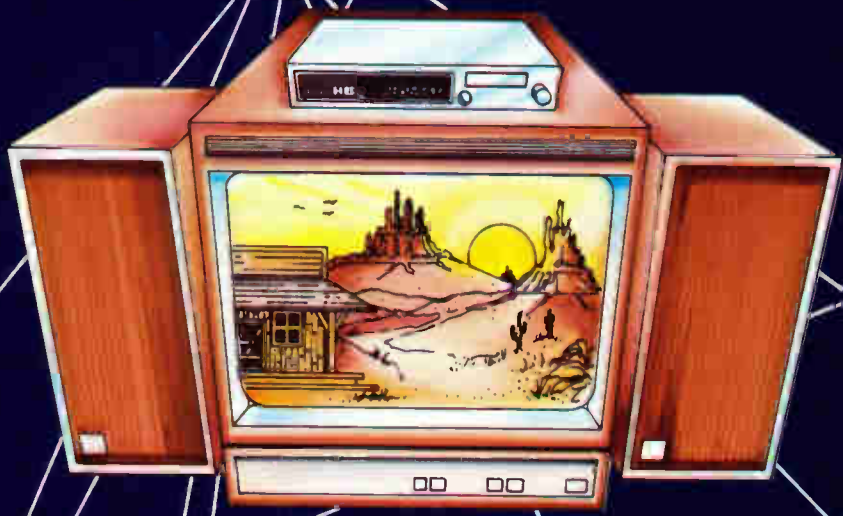

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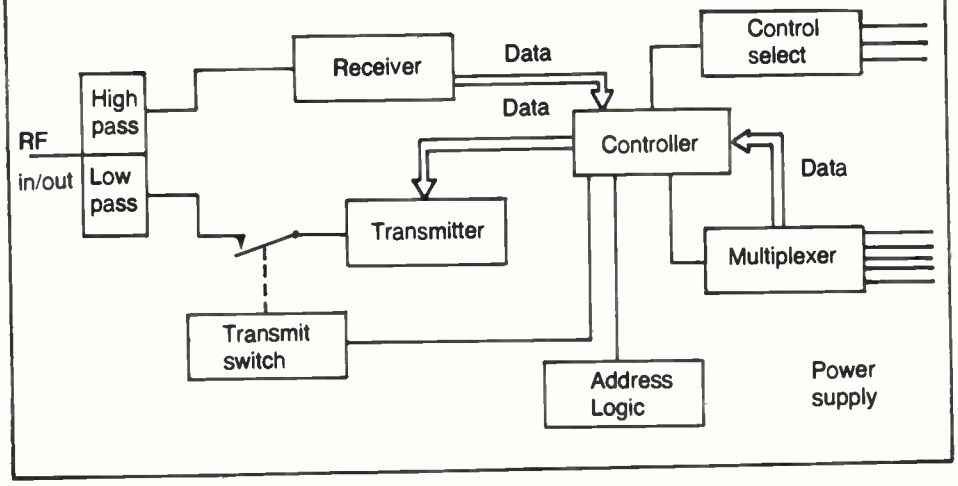
Figure 2: Transponder data module



ary measurement devices. The field hardware is a collection of many transponder data modules (TDMs), which are addressable transmitter/receivers designed to perform specific functions upon receipt of an interrogation.

The computer specifies a TDM and instructs it to perform an operation. When the operation is complete, the TDM will reply with data. The data returned by the TDM is a verification that the interrogation was received and acted upon. The response also includes test data from the measurement it performed. Since the transponder is the key element of the status monitoring system, a closer examination will be useful.

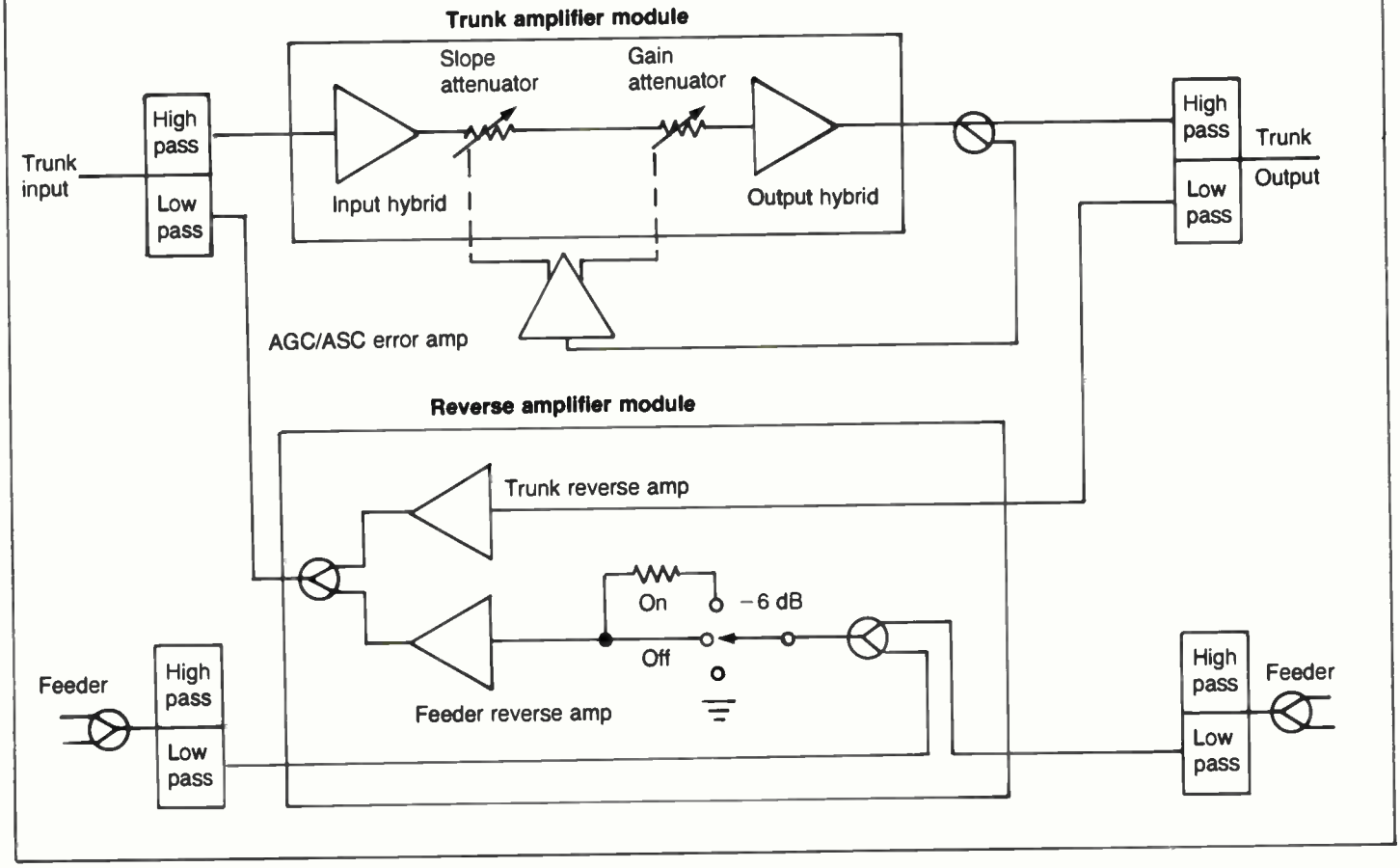
Figure 2 shows a functional block diagram of a transponder data module. The main components of the TDM are the power supply, receiver, transmitter, controller, analog-to-digital converter, and multiplexer sections. The normal (or default) mode of operation for the TDM is receive. Data transmitted from the computer through the RF modem consists of an address code plus a test command. The TDM will receive all interrogations transmitted on its frequency. It compares the received address with the address selected in the address logic section. If a match is not made, the TDM resets to the receive mode. When a match is made, the TDM decodes the test command and acts on the information contained in it.

This test command will be one of two possibilities. One is to make a measurement of a voltage present at the input to the prescaler. The other is to force one of the control lines to either the "on" or "off" state. When the requested sequence of events has been achieved, the TDM's transmitter is activated and the data resulting from the measurement or control is transmitted back to the computer. Having completed its full operational cycle, the TDM then defaults to the receive mode and awaits the next interrogation. By now it should begin to make sense that this measurement capability can save a great amount of time and energy. The problem now is how to cope with the requirement to make RF measurements.

Throw out the SLM?

All of the RF measurements required to set up a plant will still need to be made. There is just no way around the initial signal level readings and sweep measurements required to properly align the trunk system. However, when problems arise, it is not necessary for a technician to "leapfrog" down the trunk to locate them. That is the job of the chief technician and status monitoring system. When the chief tech, using the status monitor, has local-

Figure 3: Amplifier measurements



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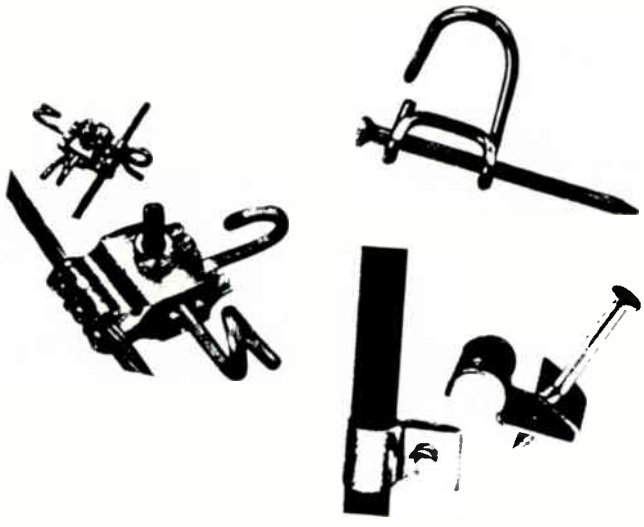

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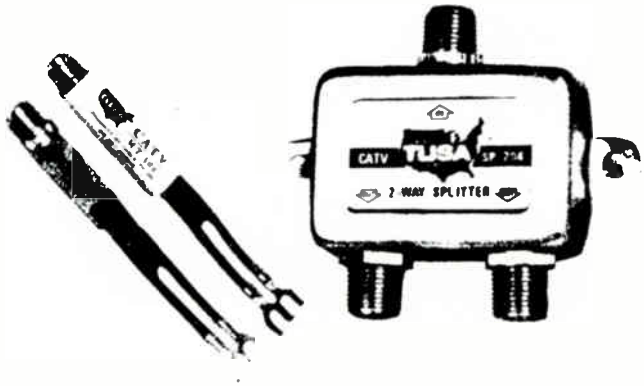

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ized the source of the problem (a matter of only minutes or even seconds), field technical personnel can be directed to the location to repair the fault. This application alone could save many hours each day during plant activation and alignment.

The actual troubleshooting process can be more easily understood by recognizing the importance of the types of data a TDM can supply about a trunk amplifier. Although there are several different configurations of the TDM, some are more common than others. The most typical configuration is one that allows the system to perform the measurements and controls listed here.

Amplifier measurements

A) AC input voltage
B) Power pack regulated output voltage
C) High pilot (AGC) control voltage
D) Low pilot (ASC) control voltage
E) Read the position of the feeder return switch

Amplifier controls

A) Connect the feeder return path
B) Disconnect the feeder return path
C) Attenuate the feeder return signals by 6 dB

Two of these measurements are much misunderstood and commonly not used to their fullest advantage. They are the "high pilot AGC control voltage" and the "low pilot ASC control voltage." The values of these "control" voltages tell the operator a great deal about the trunk station and the span of cable immediately preceding it. Reviewing Figure 3 will help in understanding these measurements.

If a technician were tracing an RF level problem and visited this station, he/she would measure the input and output levels. Armed with this information, it is then easy to determine whether the problem is associated with this station. If it is elsewhere, one would be able to determine if it is toward or away from the headend with respect to this station. Using this approach to system testing and troubleshooting is normal. The status monitor provides for methods to achieve the same end result but without the requirements to make RF measurements, which must be accurate to be useful. When you consider that the trunk station is exposed to a wide range of temperatures, the level measurement devices for the status monitor become quite expensive in order to make them stable over the temperature range. Is it really important to know these levels for purposes of troubleshooting? No. Let's examine the operation of the trunk station to see why this is true.

Refer again to Figure 3. For the sake of simplicity, assume that the normal input levels to the station are flat at +10 dBmV and the output is flat at +32 dBmV. With the station properly padded, equalized and aligned, the AGC/ASC module is operating in the center of its correction range and it generates a bias voltage for the interstage PIN attenuators. These attenuators are designed to provide a total of 8 dB of attenuation. With normal input levels, they are operating at 4 dB attenuation, or 4 dB less than maximum output. If the input signal levels vary by approximately ±4 dB, the AGC/ASC controls can maintain normal output levels by increasing or decreasing (as required) the levels to the trunk amp module's second stage.

This action occurs as a result of the AGC/ASC module monitoring the output levels and generating an error voltage if the levels try to change. This error voltage is then added to the bias voltage and applied to the attenuator(s). The effect is that the second stage receives more or less input and its output level changes correspondingly. This action then satisfies the requirement of the AGC/ASC module and the bias or "control" voltage will stabilize at this new level. It is now apparent that normal AGC and ASC voltages indicate immediately that both input and output levels are correct. What if the voltage is not normal?

Since the function of the AGC/ASC is to maintain constant output levels (within manufacturer's specifications), an abnormally high voltage indicates that the attenuators are being required to deliver more signal to the second amplifier stage. This implies that the station input levels are now lower than they originally were. A similar situation would occur if the station inputs increased, except the control voltage would be lower than normal so as to reduce the signal applied to the second amplifier stage. The only other possibilities are that someone has rebalanced the trunk and changed a pad or equalizer to compensate for

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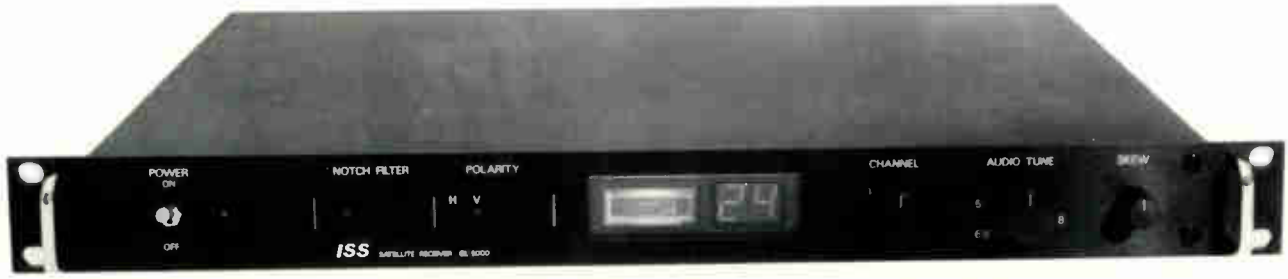

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another undetected problem, or the trunk station itself has gone sour. In any case, an abnormal control voltage will pinpoint a level-related problem to a section of plant consisting of one trunk amplifier station and the span of cable between it and the preceding amplifier.

Seasonal temperature changes will cause these voltages to change. This is normal. Otherwise, signal levels would vary outside acceptable limitations. However, with proper plant design, the changes will always be within the limitations of the AGC/ASC module's ability to alter the station's operational gain. The problem comes when inputs change excessively. If the levels are too low, say -6 dB, the AGC/ASC will only make up for 4 dB of the change. The next station must pick up the other 2 dB. This will also be apparent to the operator.

The AGC/ASC voltage should never be operating near either power supply rail (either 0 or +24 VDC). Therefore, if the station shows a voltage approaching 0 volts or +24 volts, you can bet that there is some sort of serious problem. The exact nature of the problem can be narrowed down to a few variables, based on the exact relationship of the slope and gain control voltages. Following are some examples of typical plant defects and the associated readings:

- Low frequency losses in the system will cause a larger increase of the slope control voltage with a slight increase of the gain control voltage.
- Increased flat losses will result in an increase of the gain control voltage and a small decrease of the slope control voltage.
- High frequency losses will cause the gain control voltage to increase while the slope control voltage will experience a large decrease.
- Hybrid failure will cause the gain control voltage to increase drastically (voltages greater than +22.5 VDC).

After the plant is fully activated, preventive maintenance crews can then use these readings to determine locations where levels are marginally high or low. Under these circumstances, degradation of RF performance is likely to occur. Repairs and rebalancing can then be performed before an outage actually occurs.

System reverse noise and levels

Another application for the status monitoring system is related to locating sources of noise ingress. Reverse noise ingress in a new plant must be eliminated as soon as detected. While activating the plant, it is important to keep a close eye on the levels of reverse noise. It can be an indicator of the integrity of plant construction.

Some sources of reverse noise ingress are: inadequately shielded drop cable; poor connectors (type "F") at subscriber and tap locations; unauthorized tampering at the subscriber and tap locations; improper torque on housing closure bolts; loose connectors in trunk and distribution runs; and bad splices in trunk and distribution cables. On the surface, most of these sources may seem to be insignificant. The difficulty comes to light when all of the reverse plant is activated and these sources funnel together into the headend.

The downstream signal and noise are being constantly split due to the nature of the tree-and-branch architecture used (upstream plant is another story). In the reverse plant, for instance, the noise ingress is constantly being combined and ultimately ends up at the headend and/or hub site. Reverse noise ingress funneling can cause the entire reverse plant to "crash." The noise levels can cause reverse signal-to-noise ratios to be anywhere from poor to unserviceable. Data communications equipment will be "swamped" by the excessively high noise levels and communications will be rendered practically impossible.

Although the headend/hub site architecture minimizes the problem, it does not eliminate it. If the system is plagued with excessive reverse noise, it can cost a small fortune to isolate the sources without a status monitoring system. Isolating reverse noise ingress is easily done from the headend by monitoring the reverse noise at the headend and simply disconnecting reverse feeder inputs to the trunk stations. All you need to do is connect a spectrum analyzer to the trunk reverse test point and sit down at the computer. From the keyboard you can sequentially open the switches until the noise level drops or decreases. The location of the trunk amp that affected the noise level is where the technician

must be sent to troubleshoot the distribution.

There are instances where the reverse path cannot be disconnected, even temporarily, due to security, data, impulse pay-per-view, etc. In these cases it is possible, instead, to attenuate the feeder reverse by only 6 dB. A 6 dB drop in signal level is significant enough to visibly affect the noise without disrupting critical reverse services.

In a new plant there will always be defective connections. If the seizure screws are not all tight, problems can arise that will run you in circles. Suckouts, tuneups, excessive voltage drops and low-end roll-off of RF signals can occur. Since a poor connection can represent a considerable impedance to a carrier at 5 MHz, it makes sense to monitor the level of the TDM's reverse carrier, which just happens to be in that frequency range. Note that the installation diagrammed in Figure 1 shows the "reverse level monitor." Any low-end roll-off will be pinpointed automatically by the system software and reported immediately.

The amplifiers are not the only area where a status monitoring system can be helpful. Monitoring the standby power supplies will prove to be most advantageous. The status monitor has several applications that are helpful to the preventive maintenance, service and activation groups.

Standby power supplies

Powering problems seem to be a major concern in both new and established plant. Of particular importance are the standby supplies. You may never know when utility power has been lost until the supply's batteries have been exhausted. Also, power on the trunk may be running somewhat lower than expected; is the supply output normal? It could be a defective passive. Why send a technician to the unit when the TDM can tell you in a few seconds?

Is the power supply cover closed? Someone may be at that location working on the unit or, worse yet, unauthorized individuals may be helping themselves to your batteries—yes, it really does happen. The status monitoring system can, again, be helpful in isolating many of the common powering problems associated with new plant. Here is a list of typical standby power supply measurement and control functions.

Standby power supply measurements

A) AC voltage output
B) Battery terminal voltage
C) AC output current
D) Operational status (Is the unit operating from utility input or in the standby mode?)
E) Ambient temperature
F) Case open indicator

Standby power supply controls

A) Force the unit to the standby mode
B) Return the unit to the utility mode

For the preventive maintenance crew, the capability to calculate available standby time is now available since temperature, supply loading, and battery terminal voltage can be remotely measured. Even the act of forcing the unit into standby for this purpose can be achieved from the comfort and convenience of the headend.

Conclusion

By using a status monitoring system, you can measure key operating parameters at any point in the CATV system where a TDM is located. From the computer terminal the operator can perform these measurements manually or the system software can automatically and continuously perform the tests at every location in the plant. When operating in the automatic test mode, the system software will record and report any abnormal changes in these parameters for both trunk amplifiers and standby power supplies. It's like having a technician permanently located at each trunk station and standby power supply.

But it is most important to remember that even though the status monitoring system will alert you to the fact that a section of plant has "crashed" and will allow you to make enough measurements to determine the probable cause and location of the fault, this is only a small portion of the total benefit that status monitoring can provide. The status monitoring system was designed to be a cost-effective management tool and a test instrument to aid in the process of plant troubleshooting, alignment and maintenance activities.

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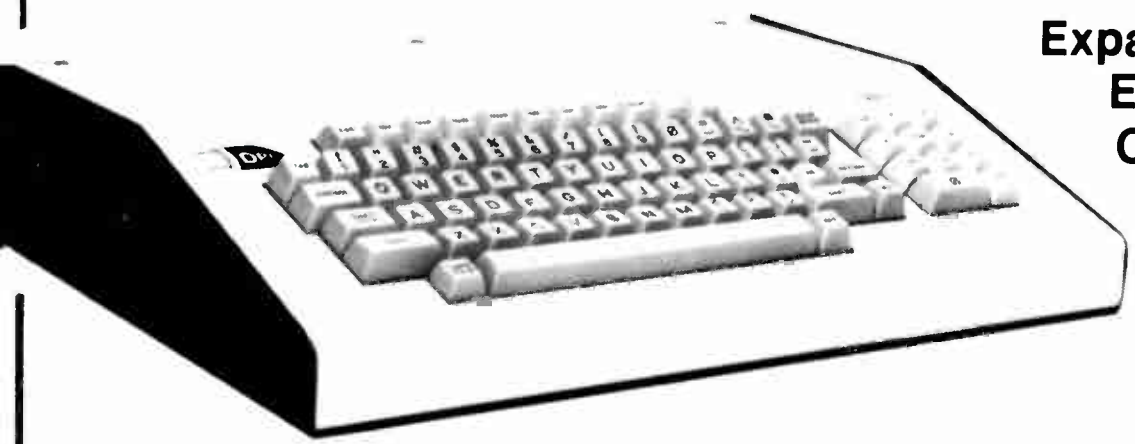

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first LO frequency is therefore 373.25 MHz plus 175.25 MHz or 548.5 MHz.

The first LO enters the mixer with the incoming frequency of channel 7 and the bi-directional mixer electronically does the subtraction and applies the difference frequency of 373.25 MHz to the bi-directional first IF bandpass filter. The IF frequency next enters the IF amplifier and then goes to the second mixer. The second mixer does another electronic subtraction of two RF signals. One is the IF RF signal of 373.25 MHz and the other is the RF signal of the second local oscillator. The frequency of the second LO is fixed, so the difference between it and the incoming IF signal of 373.25 MHz is the video carrier frequency of the desired output channel (usually 2, 3 or 4). I use a channel 3 box, so my second oscillator runs at 434.5 MHz (373.25 MHz plus 61.25 MHz). The signal continues through some bandpass circuitry and out the output port on channel 3. You also have a sound carrier, a color carrier, and the same scheme applies.

Theory of operation

You might wonder why I used the word bi-directional so much. Bi-directional means that RF signals can travel in either direction. The Oak FT35 converter's signal path is very easily "reversed" through these bi-directional devices (see Figure 1). If you sample the fixed second LO and apply it to the first mixer you can create a difference signal between it and the first LO that will output through the low-pass filter and the input port. If you did this without modifying the second local oscillator, the difference signal with the converter channel selector switch set at channel 7 would be: The first LO frequency of 548.5 MHz minus the second LO frequency of 434.5 MHz, or 114 MHz. This is not a very useful signal but if it were to correspond to the video carrier frequency of channel 7 it would be very useful indeed. You need to change the frequency of either the first or second LO to change the difference frequency. The fixed second LO is the obvious choice. If you *lower* the frequency of the second LO, you will *raise* the output signal's frequency. If you have a channel 3 output converter you lower the second LO by 61.25 MHz to 373.25 MHz. A channel 2 box would be lowered by 55.25 MHz to the same 373.25 MHz. As I have explained, 373.25 MHz is the video carrier IF frequency.

Follow the reversed signal path through Figure 1. The second LO is applied to the IF bandpass filter. It then goes to the first mixer where the 373.25 MHz second LO frequency is mixed with the normal channel 7 first LO frequency of 548.5 MHz. The difference frequency is 175.25 MHz, the video carrier frequency of channel 7. The difference signal proceeds through the low-pass filter where spurious responses and the first and second LO frequencies are rejected. Switch the channel selector to channel W. The first LO frequency is now 668.5 MHz. The difference between it and the 373.25 MHz second LO is 295.25 MHz, the video carrier of channel W. The math works the same for all other switch selected channels and the modified converter will output a clean video carrier frequency. The output level is about +40 dBmV, more than enough to drive the external marker input of most sweep generators.

Using the Magic Marker

Figure 2 shows the test arrangement for checking and tuning converters. If you don't have a sweep generator or an oscilloscope, they are available on the surplus market for less than $1,000. The test set requires a crystal oscillator on the video carrier frequency of the output channel of the particular converters you are testing. You also will need a post amplifier (a heepo cheepo works fine, about $10) with about 10 dB of gain. The 10 dB directional coupler is about $2. The variable attenuator is optional to control the size of the post marker display. Most cable companies will have everything but the crystal oscillator laying around somewhere. The display on the scope in Figure 2 shows two markers on the converter's output. One marker is the RF marker generated by Doug's Magic Marker and the other is the post marker generated by mixing the swept output of the converter under test with the fixed crystal source. This converter is out of tune! The object is to simply adjust the correct tuning pot in the converter under test

rear shaft of the tuning assembly. Oak made provisions on the FT35 converter to add a descrambler authorization switch to the rear shaft. But you can add a second pot board just as easily. The second pot board allows you to control the center frequency of many solid-state sweep generators with only minor modifications to your sweep equipment. Look at the schematic diagram of your particular sweep generator. See if it controls the center frequency of the sweep by either method 1 or 2 in Figure 4. If so, you can control it with the second pot board.

Center frequency control

Now we will examine the remote center frequency control of the sweep generator using the second pot board. In Figure 4 we can see that the center frequency control of both methods 1 and 2 is by the use of a simple voltage divider. The pot board of the Oak FT35 is just a simple switch selectable voltage divider. You can consider it to be a switchable wiper potentiometer with each of the 35 positions controlling the "course" adjustment and each individual potentiometer controlling the "fine" adjustment of the voltage divider. The voltage ratio of the pot board is designed such that each channel position controls its "slice" of the total series voltage.

To determine a particular CATV channel's tuning voltage, you must know two things: the total voltage across the voltage divider, and the frequency ratio of a particular channel. To determine the frequency ratio of any given channel, divide its video carrier by the highest frequency of operation. Example: Find the correct tuning voltage for channel 3 on the Oak FT35. The highest frequency of operation is channel W, 295.25 MHz. The video carrier frequency of channel 3 is 61.25 MHz and the total voltage across the pot board is 23.4 volts. The correct tuning voltage for channel 3 is therefore 4.8 volts (61.25 MHz/295.25 MHz × 23.4 = 4.8 volts). This analysis assumes a linear relationship between the change in tuning voltage vs. the change in frequency of the voltage tuned oscillator ($\Delta V/\Delta F$). The $\Delta V/\Delta F$ relationship requires that you use a sweep generator that covers the same frequency range as your converter, so use a 300 MHz sweep generator.

This same frequency ratio applies to sweep generators using method 1 or 2, Figure 4. The voltages may be different depending upon the particular sweep generator but the ratios are the same. This relationship allows us to substitute the pot board assembly for the center frequency potentiometer of your sweep generator and automatically select the proper center frequency tuning voltage for the particular channel selected with the channel selector switch. Since the channel selector switch is also gauged to the marker frequency pot board, the selection of marker frequencies and center frequencies of the sweep generator is done automatically.

Second pot board modifications

You will need these parts:

- One pot board, Oak part #4-6471-348
- One 560 ohm resistor
- Six feet of three-conductor #22 stranded wire
- One DPDT toggle switch (optional)
- Two nylon spacers 3/16-inch with a #8 hole

You need to do a few things to the second pot board before you install it. First, bend all of

Proof of theory

Charts 1, 2 and 3 were made with a chart recorder and represent the actual swept response of an Oak FT35 converter under test on my work bench. These representations are exactly what you would see on your oscilloscope display as in Figure 2. They are an x-y plot with the vertical axis representing amplitude and the horizontal axis calibrated in frequency. The only thing different about these charts is that the lowest frequency starts on the right hand side of the chart and increases as you move to the left. On your oscilloscope the normal method of display is to have the frequency increase from left to right. Chart recorders reverse the frequency as far as left to right and right to left are concerned.

The pointer arrows on each chart point to the instantaneous frequency that the sweep generator is tuned to at the same moment that the instantaneous frequency of the swept output is at the desired video carrier frequency of the output channel of that particular converter. This is a channel 3 box that I am testing, so the post marker crystal source is tuned to the video carrier of channel 3—61.25 MHz. The post marker is beating against the swept output of the converter at the exact point in freqency that the converter's output equals 61.25 MHz. The RF marker that is being generated by Doug's Magic Marker shows the exact frequency of the sweep generator at the point in time it appears in the trace. The sweep generator I am using is extremely linear as far as frequency is concerned.

Let's examine Chart 1. I purposely turned the fine tuning control all the way to one side, which de-tuned the converter. From the chart we can see the converter is tuned too low in frequency. It would convert the incoming video carrier signal of channel 3 to 60.65 MHz as shown by the pointer arrow. In Chart 2, I turned the fine tuning control all the way in the other direction. From this chart you can see that the converter is tuned too high. Chart 3 shows the response and pointer when the converter is in tune. The pointer arrow points to the proper incoming frequency for channel 3. If I were to sweep channel 7 and chart it in the same manner, the pointer would point to the video carrier frequency of channel 7—175.25 MHz. Since these charts represent the actual response and I am asked frequently what the 3 dB bandwidth of a converter is, I included that and you can calculate it yourself.

Chart 1

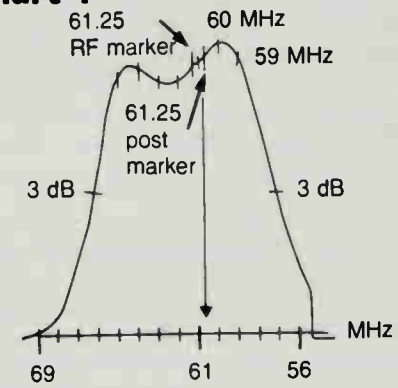


Chart 2

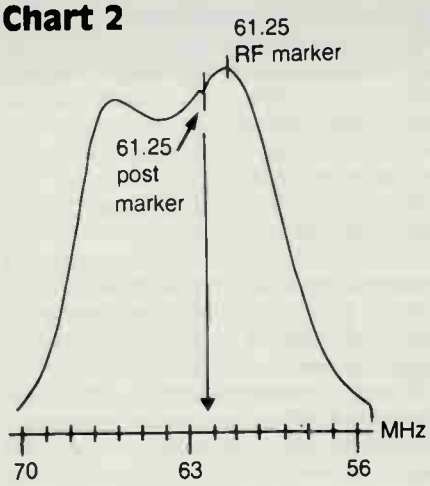
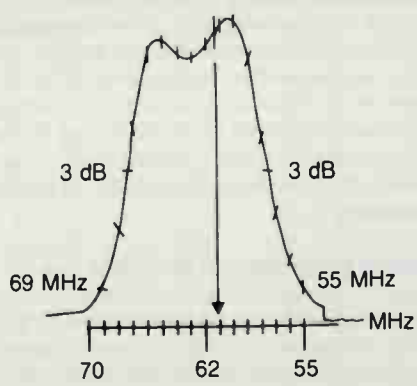


Chart 3



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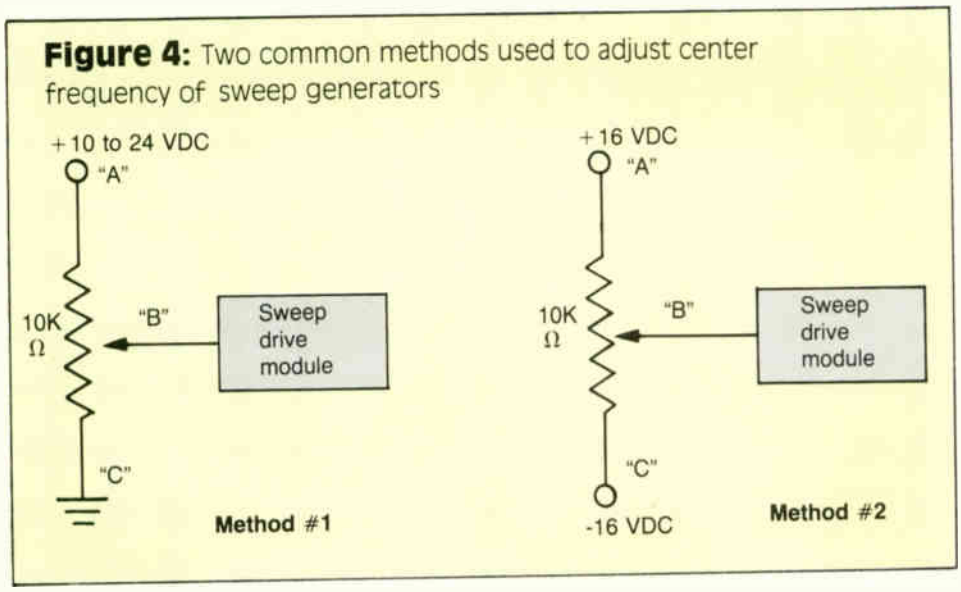

Figure 4: Two common methods used to adjust center frequency of sweep generators

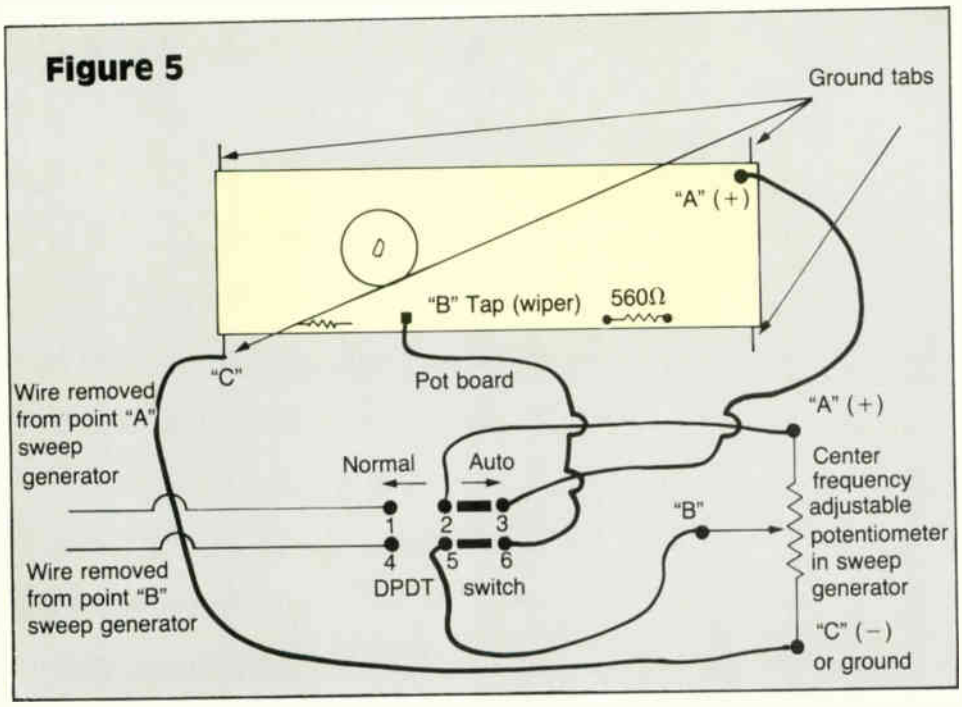

Figure 5

the ground tabs toward the rear of the PC board. Add a 560 ohm resistor across the same two points as you did in the Magic Marker modification. Connect the wires from your three-conductor cable to the points shown in Figure 5. Remove the four #6 sheet metal screws from the metal frame holding the Magic Marker assembly. It is not necessary to remove the wires but you may find it more convenient. Remove the nuts and washers holding the front pot board. Slide the nylon spacers over the two studs you removed the nuts from. Note the channel that the front pot board is tuned to. Look at the wiper on the one you are about to install and turn it to the same channel. Slip the pot board over the two studs and re-install the nuts and washers. Bend the ground tabs on the new pot board so that they don't touch anything, including ground. Jumper all the ground tabs on the new board only, to each other. (If the sweep generator you are using has method 2 in Figure 4, you must run a floating ground!) If you have removed the wires from the front pot board then re-install them.

The purpose of this modification is to substitute the second pot board for the center frequency control in your sweep generator. It makes no difference at this point whether your generator uses method 1 or 2. Figure 5 shows the interconnections between your generator and the second pot board. The DPDT switch allows you to select either normal or automatic operation of your sweep generator. As seen from the diagram, you must remove the wires from points A and B on your sweep generator center frequency control and reconnect them to the DPDT switch. Be sure to identify point A on the sweep generator control as the positive end. Wire the second pot board to the sweep generator (as shown in Figure 5) with a convenient length of three-conductor wire. If you run the wire very far you may need shielded cable.

Aligning the second pot board

At this point the Magic Marker has been tuned and the second pot board installed and hooked up to your sweep generator. To easily reach the second pot board controls, the pot board assembly should be mechanically separate from the RF section but still electronically connected. Hook up your test set as shown in Figure 2. It is not necessary to have a converter under test and you can leave the RF in and RF out ports on the sweep generator disconnected. Throw the normal/auto switch that you installed to normal. Turn on the sweep generator, scope and Magic Marker. Select channel 3 on the Magic Marker and adjust the sweep generator controls for display of the channel 3 marker. Adjust the bandwidth on the sweep generator for approximately 15 MHz of scope display, keeping the channel 3 marker in the center of the scope display. Throw the normal/auto switch to auto. Adjust the channel 3 potentiometer on the second pot board until the marker returns to the center of the display. Switch the Magic Marker to channel 2 and tune the channel 2 potentiometer on the second pot board until the marker is again displayed in the center of the screen. Continue this same procedure for the rest of the CATV channels.

Reconnect the pot board assembly bracket to the mainframe "RF module" and reassemble the Magic Marker. You are now ready to automatically tune your converters with the test set shown in Figure 2.

Conclusion

Other brands of converters can be modified in a similar manner. A frequency synthesized converter would be an excellent choice. The only problem with using another converter is that you can't have the "piggyback" pot board. You must continually reach up to the sweep generator to change its center frequency.

Over the years, due to my conservative nature, I have been able to adapt existing equipment to fit a specific need rather than buying expensive new test equipment. As a result I have become very familiar with unusual test applications and the internal design of test equipment. From my experience I can understand the need for cable companies to economically be able to check their converters on a "go" or "no go" basis. If converters only need tuning, that can be handled by untrained personnel; if they need repair, it should be done by a professional.

Editor's note: Modification of professionally designed test equipment may provide an advantage for a specific use; however, one must consider the value of one's time to make such changes, along with the oveall effect on the modified equipment (specifications, factory service, etc.). Anyone wishing to do their own modification and having difficulty obtaining the second pot board, crystal source, FT35 converter or any of the other parts and equipment, as well as a complete Magic Marker, can contact Independence Electronics in Independence, Missouri.

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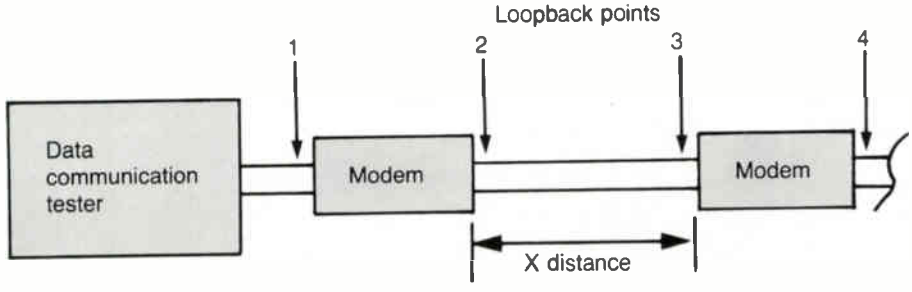
Figure 1: Bit error rate testing



'Solving data communications problems requires intelligence, which can reside either with the technician, the analyzer, or both'

Data communications system testing

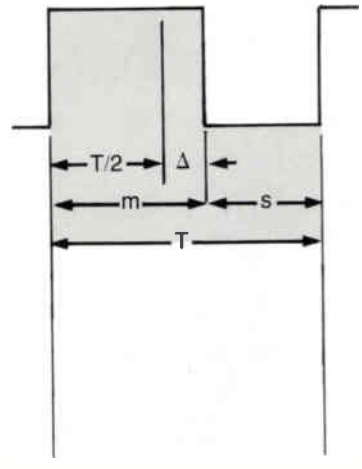
By Robert A. Cook
Marketing Services Manager
Communications Network Analyzers Division, Tektronix

Ten years ago, maintenance and service of computer systems were problems that were managed with relatively little difficulty. The installed base and geographic dispersion were limited. Trained technicians were in good supply with a significant number coming from the military.

Today, the situation is very different. It is estimated that only 320,000 technicians are maintaining an installed base of millions, and the trend continues. When the military draft ended, the supply of technicians began diminishing while the installed base is growing exponentially. Physical dispersion is now common with networks spanning the globe; to further complicate the service effort, protocols to support these networks have become complex.

Another situation that many support and service organizations must deal with is networks that consist of products from multiple

Figure 2: Bias distortion testing



T = Combined with mark-space width (nominal)
m = Mark width
s = Space width

$$\text{Bias} = \frac{\Delta}{T/2} = \frac{m\text{-}s}{T}$$

Figure 3: Windowing

The enable and disable actions can be used to form a window during which events will be recognized.

Window no event

Window event recognized

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Figure 4: Synchronous data control link

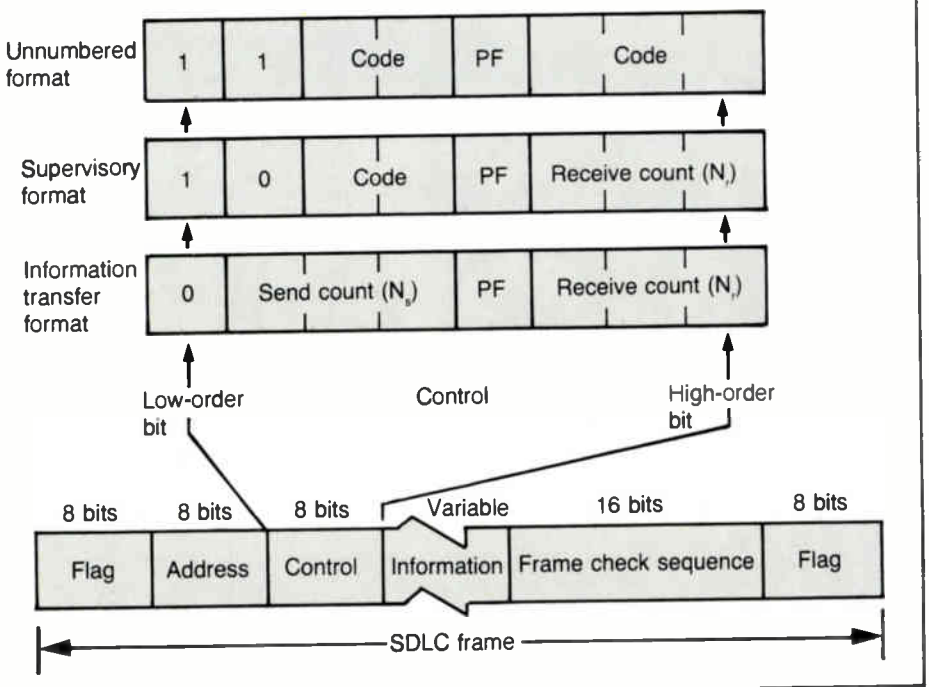
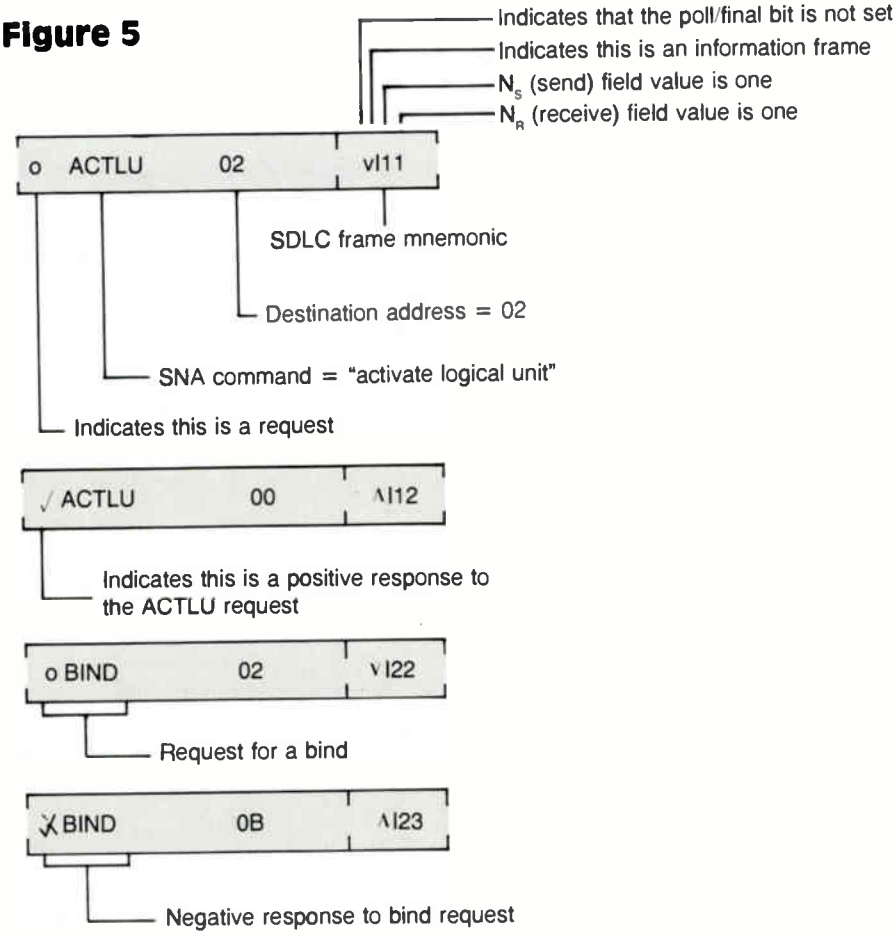


Figure 5



vendors. When a problem occurs, what is the cause? It could be a terminal, or part of the communications link, or even the host. And if that's not enough, what about the software? This situation often results in fingerpointing where each vendor believes that the problem is being caused by someone else's equipment. This can prove to be a difficult problem to resolve.

One commonly used approach to service is board swapping or shotgunning. This is where circuit boards are replaced either one by one or in groups until the problem disappears. This is often ineffective, especially with intermittent problems. Another burden associated with this approach to service is keeping track of the good and bad boards. If these get mixed or the faults can't be duplicated at the depot or factory, service can become much more difficult. Also, the inventory (of circuit boards) or board float is usually extensive and expensive.

Another and more successful technical support/service strategy utilizes programmable data communications analyzers, which allow pinpointing of network problems. Also, using an analyzer's simulation modes, system faults can be forced, fixes verified, and equipment repaired off-line without tying up the network. Selection of an analyzer should be a consideration at the time a system is being designed.

Analyzer function and features

One of the key features a data communications analyzer should have is the ability to be fully interactive. It should be able to analyze the data it receives and logically decide what action is required. This will range from simply noting the occurrence of an event, displaying a message to the user, or transmitting an appropriate response.

Programmability is essential in analyzers designed for use with modern networks. Whether from the keyboard or via selection of preprogrammed software from an extensive library, it is programmability that affords a data communications analyzer its extensive analytical power.

For technical support and service of networks with geographical dispersion, the ability to download programs from a remote location and upload captured data to a central location provides even greater versatility. For an analyzer to support your requirements today and in the future, it needs to be able to handle a wide range of environments such as asynchronous, synchronous, HDLC, X.25, SDLC, SNA, etc., and those to come.

Through programmability and the provision for a wide range of optional interfaces including those that are custom designs, your data communications analyzer can be expandable and adaptable to meet the ever changing needs created by continual advances in technology.

When speaking of "moving" technology, speed becomes a major issue. An analyzer must be able to handle the data transfer rates required by networks, which are continually increasing. If it doesn't, it's useless. To retain the security and advantages of expandability and adaptability, the analyzer must operate at

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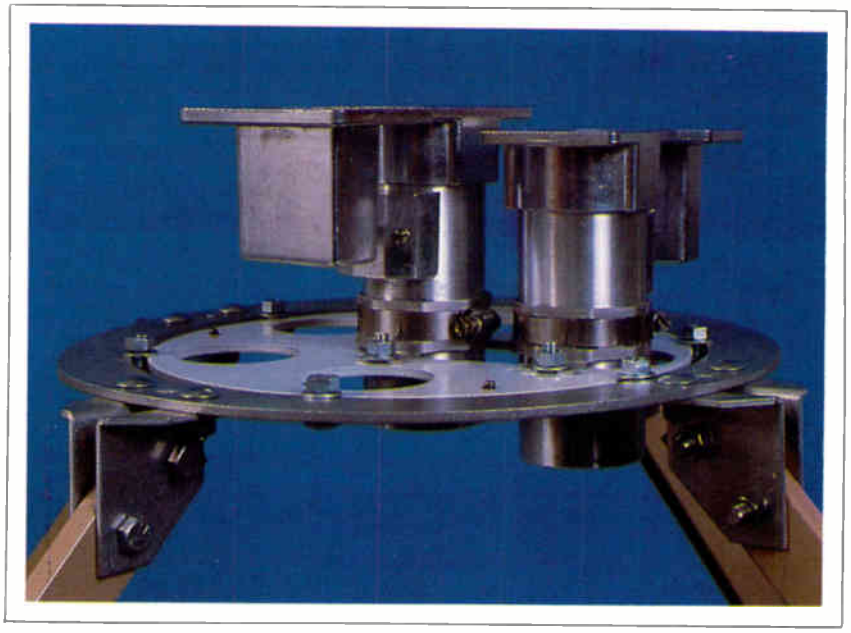

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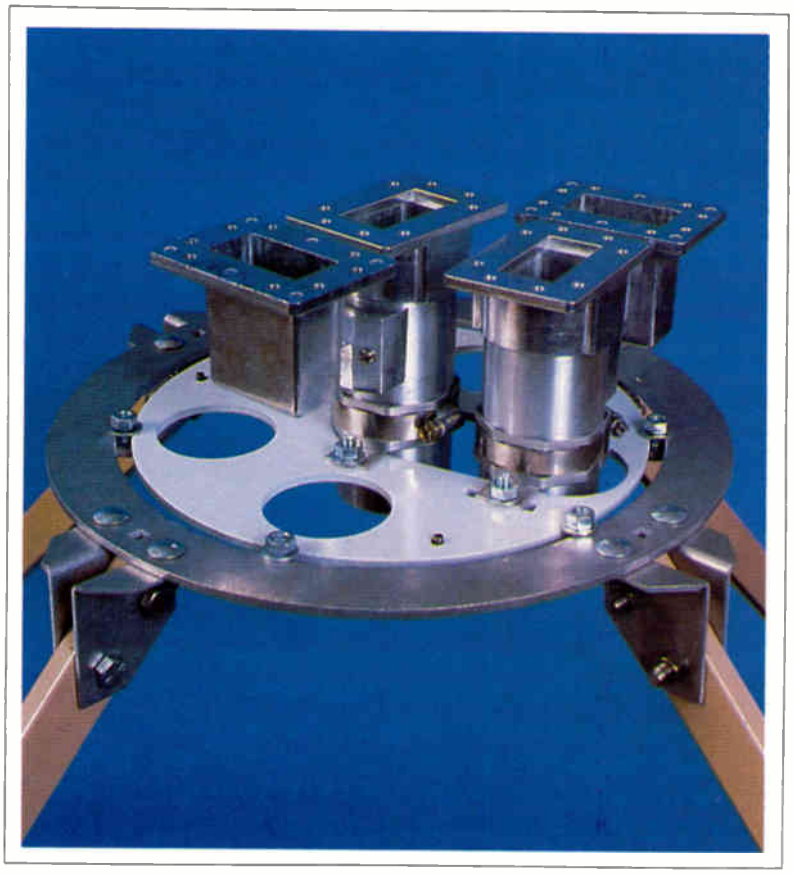

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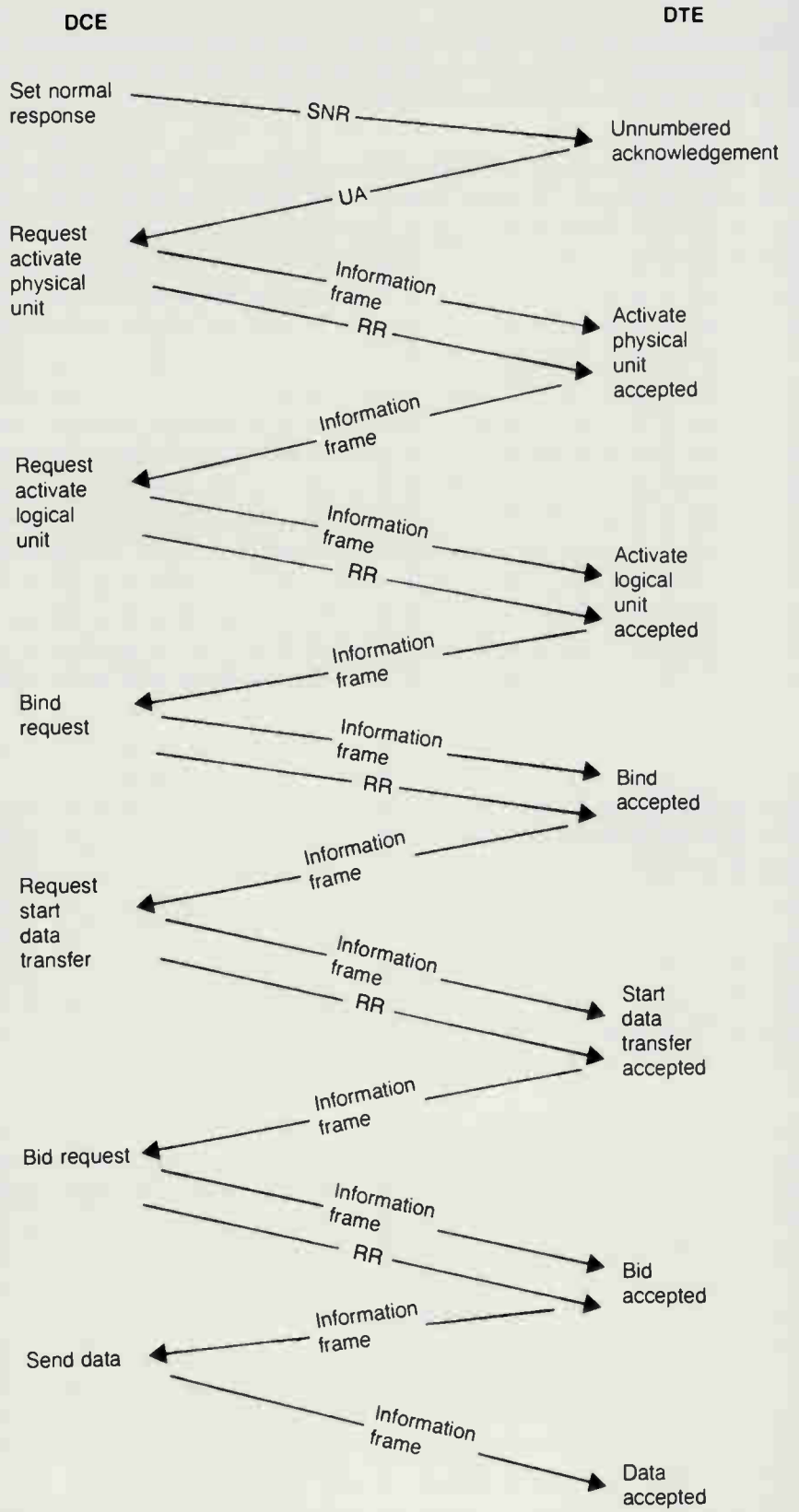
Figure 6



the higher speeds in all modes, not just a few that support specsmanship.

Solving data communications problems requires intelligence, which can reside either with the technician, the analyzer, or both. The ideal analyzer should be suitable for use by both highly skilled data communications personnel, who are accustomed to working with complex data, as well as by less experienced first-line service personnel, who rely to a large extent on automated analysis. In this context, the data communications analyzer, via its programmability, becomes the tool that brings the expertise of data communications gurus to bear on everyday support and service problems.

Modes of operation

There are several modes of operation for a data communications analyzer: self-test, bit error rate test, monitor, and simulation. For equipment that is often hauled from location to location and checked as baggage on airlines, a self-test mode that verifies the proper operation of the unit can be very reassuring. When you arrive to locate a problem in a network where many elements are suspect, the last thing you need to wonder about is whether your analyzer is functioning properly.

Bit error rate testing (BERT) is a mode used to determine the ability of the transparent parts of a network, such as telephone lines, modems, etc., to transport data without inducing errors. This is accomplished by transmitting a pseudo-random bit pattern through the link and looping it back at some point so that the bit stream is received by the sender (see Figure 1). By comparing the received bit stream with the transmitted bit stream, the analyzer can determine how many bits were "corrupted" by the link and can provide a statistical evaluation of the link's quality. Sequentially using several loopback points can determine what elements of the link are causing the problem.

Distortion tests (which are part of the BERT mode in the Tektronix 830 Series analyzers) provide additional analysis of the link. Bias distortion testing (Figure 2), for example, is typically used to align the FSK (frequency shift key) in asynchronous modems. It yields both the averaged distortion and the maximum distortion as a percent by which the mark width exceeds one-half the overall two-bit pattern width in an alternating mark-space pattern. If the space width exceeds the mark width, the value is negative.

Isochronous distortion testing is used to measure clock jitter in synchronous modems. It yields an unsigned percentage representing the difference between the highest and lowest values of individual distortion occurring over the test interval.

Start-stop distortion testing is used to verify signal timing in asynchronous terminals. Individual start-stop distortion testing measures the interval by which the leading edge of a single designated bit in a test character leads or lags its ideal instant with reference to the starting edge of the character. Gross start-stop distortion testing yields an unsigned per-

PICTURE PROOF.

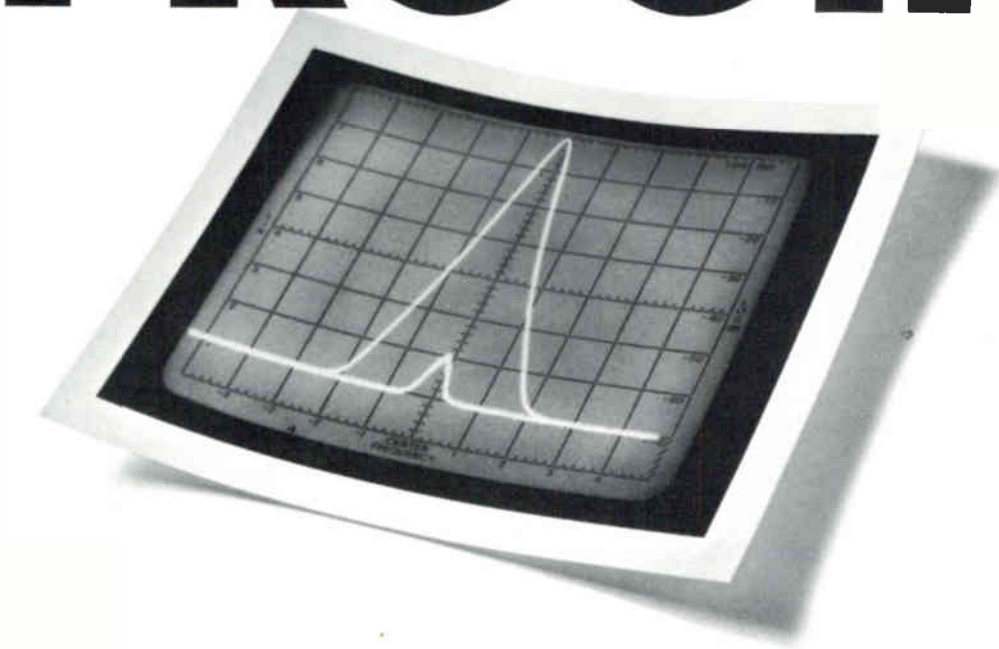


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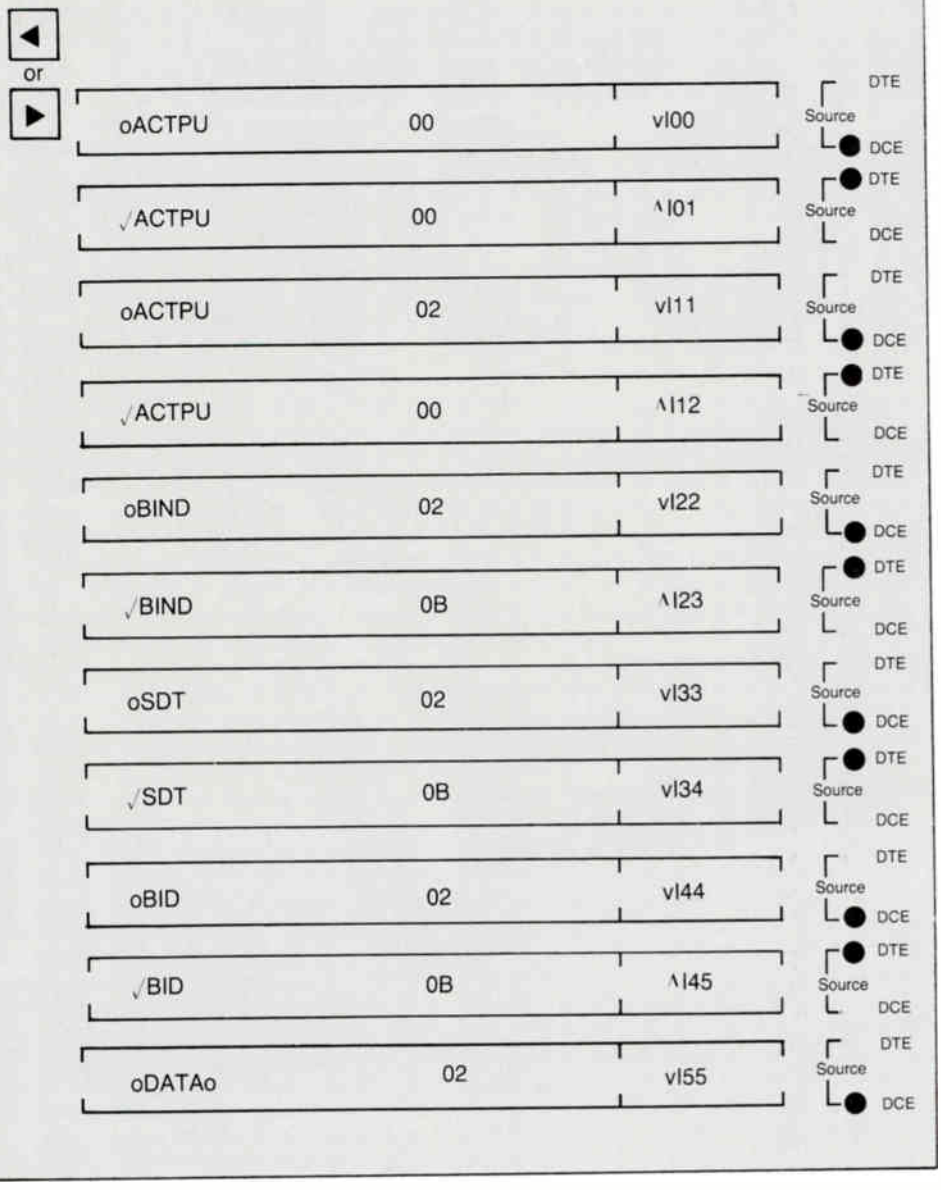
Figure 7



centage representing the greatest absolute value of individual start-stop distortion occurring in a single test character.

The monitor mode is used to passively analyze a network's communications. In this mode the analyzer is transparent to the network and functions as an observer. As vast amounts of data rush through the network, there is often special interest in particular events or occurrences that are suspected of contributing to a network's problem.

Multiple events—which can be a mix of selected control line changes, errors or message strings from either the data terminal equipment (terminal or computer) or the data communications equipment (modems, etc.)—can be designated occurrences to watch for. The strings also may be masked. This allows the user to define what particular parts of a message string are to be considered for comparison.

These events can be used to initiate a variety of associated actions, which include incrementing or decrementing specified counters, starting interval timers, enabling/disabling recognition of other events, and triggering the analyzer to capture and retain desired data. The enable and disable events are used for windowing (Figure 3). This is when an event will only be recognized in specified relationship to other events.

A common application for monitoring might be to determine why a particular network terminal is consistently slow to respond. The following are just a few of the tests that might be used to isolate this fault.

- Test for an abnormal number of negative acknowledgements associated with that terminal.
- Measure the time between polls to the terminal in question.
- Test for infrequent polling of the terminal in relation to polls to the other terminals.

Other applications may utilize a more sophisticated triggering capability to pinpoint a problem, for example:

- Trigger on a specified sequence of events.
- Trigger after an event has occurred a specified number of times.
- Trigger when the time between events exceeds a specified period.

The simulation mode is perhaps the most powerful function of a data communications analyzer. Unlike the monitor mode, where the analyzer is dependent on things occurring in the network, the analyzer becomes an interactive part of the network, often by substitution for an element within the network. The advantage of this is that the analyzer, as an active part of the network, can evoke the situations that surface or make problems visible.

In many situations a great deal of administrative overhead must be dealt with to accomplish the successful transmission of the user's information. Just the control field alone in a synchronous data control link (SDLC) frame contains a considerable amount of information (Figure 4) and that information varies in format depending on the type of frame. Keeping track of control information from received frames, updating the control field and assembling new frames to be transmitted is a necessary function for the analyzer to handle in support of true interactive simulation. Also, the analyzer, as well as displaying the actual data, analyzes the transactions and offers alternative displays, which are easy-to-read summaries of what has occurred.

For an example, let's look at the sequence that is required to set up a session in an SDLC/SNA (systems network architecture) environment. A basic overview of what occurs is illustrated in Figure 6. The analyzer offers the user a choice of working through the long streams of actual data or quickly stepping through the sequence using an easy-to-read summarized analysis.

Figure 5 is a portion of a sample session using SNA summaries where the session failed. Figure 7 is a successful session setup in which user data was actually sent.

Substantial benefits

Use of data communications analyzers increases technical support and service productivity significantly. In a recent field evaluation, 10 analyzers were deployed to determine the advantage of this approach to service. The results were faster isolation of faulty elements, dramatically fewer call-backs, and smoother installations through pre-installation checkout of network components.

The economic implications were dramatic. Service call times dropped on an average from 3.5 hours to 1.9 hours. What was even more significant was that because the analyzer could force and pinpoint problems through simulation, call-backs were reduced from 76 to 4 percent and the circuit board inventory was substantially reduced.

Another valuable, yet immeasurable, benefit emerged—customer satisfaction.

Analog, digital, addressable—no one comes close.

In 1984, more cable operators sent their converters to RTK's Converter Services Division than to any other independent converter repair facility.*

Today, the trend continues: all current repairs have a rapid turn-around, and come backed by RTK's six-month performance guarantee, the strongest in the business.

RTK can help you boost profits by increasing the life of your converters, which leads to lower maintenance and operating costs. Or we can *rebuild* and *upgrade* your converters at moderate cost, letting you keep pace with the technology while offering cable options that attract new subscribers and retain existing ones.

We have more experience with addressable unit repairs than any other independent. *We're equipped and capable of repairing Jerrold dynamic scrambling devices, and authorized to perform all Jerrold warranty services.*

Every operating mode is individually tested as it will actually function within your cable environment. Special care is taken to ensure that PROM parameters are correct for your system (i.e. geo, site, etc.) and that serial number/address integrity is maintained.

For quality, speed and assurance of repair, RTK leaves the competition far, far behind.

RT/Katek Communications Group not only *repairs* converters, we *install* cable—residential and commercial—and *construct and maintain* cable tv systems, as well. For information on our installation and construction services, see below.

To learn more about RTK converter servicing, call Lee Stump direct at

1-800-441-1334.**

*Wilson and Mason, Inc. 6/84.

PHOTO, LEFT TO RIGHT: *Bob Bilodeau*, Chairman – CEO, RT/Katek Communications Group; (from the Converter Services Division) *George Fenwick*, Executive VP; *Ron Katz*, President; and *Lee Stump*, Director of Sales.

RTK®

The cable industry's problem solvers.™

RT/KATEK COMMUNICATIONS GROUP

Converter Services Division
Ron Katz, President
****In PA, 717-534-1161**

Installation Services Division
Rick Thomas, President
201-678-2083

Communications Construction Division
George Tamasi, President
215-269-1946

Reader Service Number 35.

Figure 1: Reference summary report

```
SITE-LAB                                    PHONE#-9D7885966
DATE: APR 16  1985
DAY: TUESDAY
SAM AUTO-CALIBRATION COMPLETE
VOLTAGE CHECK OK                                    14.8 VOLTS
ATTENUATOR= 0 0B

SYSTEM REFERENCE LEVELS FROM LAB
FREQUENCY PLAN NUMBER: 4

CHANNEL        FREQ          LEVEL       (VIDEO-SOUND)
-------------------------------------------------------------------------------
2               55.2         +10.00
3               61.2         +10.00
4               67.2         +10.00
5               77.2         +10.00
6               83.2         +10.00
A              121.2          + 9.70
B              127.2         +10.00
C              133.2          + 9.70
D              139.2          + 9.70
E              145.2          + 9.70
F              151.2          + 9.70
G              156.0          + 9.40
H              163.2          + 9.70
I              169.2          + 9.70
7              175.2          + 9.40
8              181.2          + 9.40
10             193.2          + 9.00
11             199.2          + 9.40
12             205.2          + 9.40
13             211.2          + 9.40
J              217.2          + 9.40
K              223.2          + 9.40
L              229.2          + 9.40
M              235.2          + 9.40
N              241.2          + 9.40
O              247.2          + 9.40
P              253.2          + 9.70
Q              259.2          + 9.40
R              265.2          + 9.40
S              271.2          + 9.40
T              277.2          + 9.40
U              283.2          + 9.40
V              289.2          + 9.40
W              295.2          + 9.40

SIGNATURE: _____
```

The reference, which is from a SAM connected to a matrix generator, is stored on the disk for comparison throughout the 'autotest' sequence (normalized testing). In a normalized test, the measured level is compared to the reference level in memory.

"Automated testing saves time, is an aid to preventive maintenance, is functionally dependable and improves technical staff job satisfaction"

Automated testing of signal levels

By Steve Windel
Applications Engineer, Wavetek Indiana Inc.

Most people associated with the technical end of broadband communications systems are familiar with signal level meters. These instruments are considered one of the basic tools necessary to keep a system aligned. There are signal level meters available that not only read signal levels, but can be used to check carrier-to-noise, hum-modulation, percent modulation, frequency accuracy, system response, channel response, radiation, and even return loss. (Some of these tests require additional instrumentation.) There are signal level meters available that have these capabilities, and have the additional advantage of being remotely addressable via an RS232 port.

Many people have written their own programs, utilizing personal computers, to automatically test signal levels with these meters in remote locations. There are many advantages to applying automated testing technology to system signal level measurement. It has been found that automated testing saves time, is an

(Continued on page 64.)

Figure 3: Auto-test summary with no errors listed

```
SITE-LAB                                    PHONE#-9D7885966
DATE: APR 17  1985
DAY: WEDNESDAY
CONNECT TIME     =  912
DISCONNECT TIME  =  918
SAM AUTO-CALIBRATION COMPLETE
CALIBRATION CONSTANT=-1.22
CALIBRATION DRIFT=-.91
VOLTAGE CHECK OK                                    14.91 VOLTS
ATTENUATOR= 0 0B


                        SIGNAL LEVEL ANALYSIS-NORMALIZE


REFERENCE NORMALIZING WINDOW =+/- .5  0B

FREQUENCY PLAN NUMBER: 4

CHANNEL      CARRIER      TEST         REF          LEVEL        MOD.
ASSIGNMENT   FREQ.        LEVEL        LEVEL        DRIFT        CHECK
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
TEST SITE IS WITHIN TOLERANCE
```

This is a printout of the normalized test results taken from the Lab site. In this case the resultant differences calculated from test minus reference were less than the window, generating no error printout. This printout indicates that the test site is within the tolerance set by the operator for deviation from the stored reference.

Plug-in Broadcast Stereo

Another Innovation From The People At Wegener.

Wegener Communications, the people who pioneered satellite delivered stereo technology, have done it again.

Introducing TV stereo, the technology known as "broadcast multi-channel sound," that makes true high fidelity and bi-lingual audio a reality with the new stereo equipped TV sets now entering the marketplace.

For cable services, all it takes to start offering subscribers this exciting new audio format is a broadcast stereo modulator card that plugs into your Wegener 1600 Mainframe.

Reader Service Number 36.

Over 3,000 cable systems are already using our expandable 1600 Mainframe to provide FM delivered stereo services such as MTV and The Nashville Network. Now that plug-in broadcast TV stereo is also available, shouldn't you be talking to the stereo audio experts at Wegener, too?

Call today for more information.

WEGENER COMMUNICATIONS
150 TECHNOLOGY PARK/ATLANTA
NORCROSS, GEORGIA 30092
(404) 448-7288 TELEX 54-3634

See us at the NCTA Show Booth 2123.

n the beginning...
there was no Tech Almanac.

And the purchase of parts
and equipment created chaos
within the Cable Kingdom.

It was a time of clouded facts
and difficult decision.

Across the Land a cry was
heard from engineers, purchasing
agents and system operators.

Then from the Mind of
Communications Technology and
the Power of the Mighty Computer
came forth The 1985 Tech Almanac.

And it was Good.

the INTERVAL

SCTE

June 1985

SCTE Selects Phoenix for Cable-Tec Expo '86

By William W. Riker
Executive Vice President

The Society of Cable Television Engineers has selected the city of Phoenix, Ariz., to host its 1986 annual convention, Cable-Tec Expo. The decision was reached by the Society's Board of Directors following an inspection and evaluation of four potential properties.

Influencing the decision were the results from a survey of both attendees and exhibitors at the SCTE's highly successful Expo '85 held recently in Washington, D.C. The survey indicated that: 1) next year's convention should be held in a western location (especially since the NCTA convention will move to Dallas in 1986), 2) room rates and other attendee expenses should be kept at a minimum to better accommodate those on tight budgets, and 3) the site should have an attractive exhibit hall and a floor plan that is conducive to the numerous breakout technical workshops that are a major part of the Expo.

I am extremely pleased with the Board's decision and I am confident that we can put together an excellent program in Phoenix. Exhibitors are realizing that Cable-Tec Expo is unique in the cable industry with its 100 percent technical orientation where training and hands-on instruction replace traditional sales and marketing hype. The numerous cable manufacturers located in the Phoenix area will further enhance the Expo as we plan to include organized tours of their facilities.

Cable-Tec Expo '86 will be held June 12-15, 1986, at the Phoenix Convention Center. Additional details on the event will be released as plans are completed.

Sample certificate awarded to those successfully participating in the BCT/E certification program. Note the ribbon in upper right corner for 'Distribution Systems.'

BCT/E Certification Program Candidates Receive Certificates

Sixty-five candidates successfully completed the examination on "Distribution Systems" administered at Cable-Tec Expo '85. These industry engineers and technicians, who were mentioned in last month's *Interval*, recently received their professional designation certificates. Each certificate contains spaces around its perimeter for the seven different categories in the program. When each examination is passed, a ribbon acknowledging its completion will be awarded for that space. Once all categories are completed, a gold seal of completion also will be awarded, denoting full certification.

The technician level of the Certification Examination on Distribution Systems will be administered by Chapters and Meeting Groups whose officers have requested and scheduled it through SCTE National Headquarters. Should you wish to take this exam, please get in touch with the SCTE Chapter or Meeting Group nearest you by contacting the appropriate person listed in the Chapter and Meeting Group reports section of this newsletter.

Showtime/TMC Joins HBO In Supporting SCTE Tele-Seminars

Showtime/The Movie Channel will be donating unsold satellite transponder time to support the Society's "Satellite Tele-Seminar" technical training program. They will join Home Box Office, which has been providing transponder time to SCTE since the seminar's inception in October 1984. HBO also was instrumental in the development of the Tele-Seminar series, for which they received an award at SCTE's recent convention, Cable-Tec Expo.

We are pleased to see other programmers become involved in supporting this unique method of delivering educational and instructional programming to the cable industry's technical community. The Tele-Seminar series has rapidly become one of the most popular services that we have introduced for our members. Many manufacturers are planning the production of generic equipment training videotapes to be telecast during our programs.

Since SCTE is receiving transponder time that has not been sold to other users, the exact date, time, satellite and transponder may vary from month to month. However, the Tele-Seminars will be presented during the third week of the month, and announcements concerning topics and scheduling will be made prior to each program in the SCTE *Interval* newsletter and other trade press.

SCTE Satellite Tele-Seminar Dates

The next seminar, a much requested repeat of "dBs and dBmVs," will be telecast on June 18, 1985, from 5 to 7 p.m. EDT over Satcom IIIR, transponder 5. This program, which covers basic cable measurements including noise figure and carrier-to-noise ratios, was recorded at Denver University by Jones Intercable in association with the SCTE Rocky Mountain Meeting Group.

Tentative dates set for future Satellite Tele-Seminars include July 16, Aug. 20, Sept. 17 and Oct. 15.

Chapter and Meeting Group Reports

Copy for this section of the *Interval* must be received by or dictated to SCTE National Headquarters by the first day of the month preceding the month of issue. We urge each Chapter and Meeting Group to take advantage of this opportunity to publicize its activities, announce meeting dates and share ideas. All SCTE members are invited to submit articles directly to us, but they should be coordinated through the respective contacts listed below:

Appalachia Mid-America Chapter
Contact: Flint Firestone (301-252-1012)
Report By: Flint Firestone

A golf tournament will be held on July 25, 1985, tentatively at the Chambersburg Country Club. The next business meeting will be on Sept. 25, 1985. Details will be announced at a later date.

Delaware Valley Chapter
Contact: Bev Zane (215-674-4800)
Report By: John Kurpinski

The last meeting of the Delaware Valley Chapter was held on April 24, 1985. Fifty-five engineers and technicians were on hand to further their knowledge on Data Transmission and LANs. Installation of officers for the

upcoming year was held at the business meeting with outgoing President Bruce Furman receiving a plaque for his efforts in the past year. Plans are to hold Category IV (Distribution Systems) of the BCT/E Certification examination at our August meeting.

Upcoming meetings are as follows: June 19—Basic System Preventive Maintenance; Aug. 21—FCC Rule Update: How and When To Perform Tests; Oct. 16—Technical Management; and Dec. 18—Test Equipment: Field and Bench. All meetings will be held at the Fiesta Motor Inn in Willow Grove, Pa.

Golden Gate Chapter
Contact: Pete Petrovich (415-463-0870)
Report By: Pete Petrovich

The following Golden Gate Chapter meetings have been scheduled: June 26, 1985, "Microwave Theory and Technology," San Jose, Calif., and July 17, 1985, "S.A.—Scrambling Systems," South San Francisco, Calif.

On March 3, 1985, the Golden Gate Meeting Group became known as the Golden Gate Chapter because the group is now chartered. Therefore, as provided in the bylaws of the Chapter, six Directors will be elected to serve a one-year term and six Directors will be elected to serve a two-year term.

The elected Directors will serve as an Advisory Board for function of the Golden Gate Chapter as described in Section 4 of the bylaws and is restated as follows:

Section 4: Duties of Directors. The Board of Directors may: (1) hold meetings at such times and places it deems proper; (2) admit members and suspend or expel them by ballot; (3) appoint committees on particular subjects from the members of the board, or from other members of the Chapter; (4) approve and monitor the annual budget of the Chapter; (5) print and circulate documents and publish articles; (6) carry on correspondence and communicate with other associations interested in matters of concern to the Chapter; (7) invest and deal properly with funds and assets of the Chapter; (8) devise and execute such other measures as it deems proper and expedient to promote the objects of the Chapter and to best protect the interest and welfare of the members. Except in cases of fraud or bad faith, the directors and officers shall not be held personally liable for debts, obligations or liabilities of the Chapter or for their actions on behalf of the Chapter.

The responsibilities of a Director will require from four to six hours a month during normal business hours, to ensure the success of the new Chapter, and to encourage the increase and dissemination of operational and technical knowledge.

William Riker

Chattahoochee Meeting Group President Gary Donaldson and Regional Director Glyndell Moore join attendees for lunch during their last meeting.

Capitol Cities Meeting Group
Contact: Ed Milner (703-841-7723)
Report By: Tony Flores

The April 23 meeting consisted of a panel discussion among representatives from the Virginia Electric Power Co. (VEPCO), a representative from Alpha Power Supply and CATV operating company engineers and technicians.

The meeting opened with Messrs. David Frink and Wendell Austin of VEPCO describing their power system and practices. It became evident that cable technicians want to know about power company outages for

various reasons:

1) A CATV customer's signal is off, yet he still has power.

2) When power is off and it's later turned on, CATVers want to be prepared to observe their equipment to replace defective equipment, fuses, etc.

3) Standby power units can mask power outages and after a long period the batteries fail and service goes out.

One CATV company has status monitoring equipment on its power supplies for power outages. VEPCO urged the CATVers to promptly report the outages and not depend on others to report.

One important part of this meeting was that a dialogue was started between VEPCO and the Virginia CATVers about each other's problems. The dialogue continued into a discussion about how the two utilities could better communicate with each other so that the CATVers could reduce their downtime. Hopefully a better communication link is established as a result of this meeting.

Chattahoochee Meeting Group
Contact: Gary Donaldson (404-949-7370)
Report By: Bill Riker

A meeting was held on April 24 at the Holiday Inn, Airport South in Atlanta. The session topic was Multichannel Television Sound and its compatibility over cable systems. Approximately 50 area technicians and engineers were in attendance. Alex Best of Scientific-Atlanta and I discussed the technical considerations involved with carrying BTSC signals. Tom Matty of Westinghouse-Sanyo, Wegener Communication's Ned Mountain, and Larry Brown of Pioneer discussed their respective company's approach to the issue. FCC Field Engineer Chris Papas enhanced the meeting by bringing an FCC monitoring van and analyzing signals from a local televison station broadcasting in stereo.

Florida Meeting Group
Contact: Richard Kirn (813-924-8541)
Report By: Richard Kirn

A meeting was held on May 22, 1985, at the Holiday Inn in Palm Beach, Fla. The principal topic was Computer-Aided Testing.

The next meeting will be announced at a later date. Please contact me for further information.

Hudson Valley Meeting Group
Contact: Andy Healey (914-561-7880)
Report By: Andy Healey

An important purpose of this organization is to provide practical, low-cost technical information and professional training at a mutually convenient location. We are arranging to videotape the technical sessions and make them available on loan to members who may have to miss one or more sessions or for holding in-system seminars. More details in the next meeting notice.

In order to succeed in establishing this new regional chapter, we need the cooperation of cable engineers, their systems and suppliers. It is suggested that each supplier and system contribute $10 (more if you wish) as "seed money" to defray the many expenses of launching this project.

New England Meeting Group
Contact: Gene Bartlett (617-337-4100)

The New England Meeting Group held a meeting on May 1, 1985. Jon Ridley and Bill Beck, Applications Engineers with Jerrold Electronics Division of General Instrument Corp., spoke on distribution system preventative maintenance and preventative maintenance for headends.

North Central Texas Meeting Group
Contact: Lynn Watson (214-241-1421)
Report By: Lynn Watson

A group of SCTE members got

together on April 12, 1985, at the Summit Hotel in Dallas to initiate the formation of the North Central Texas Meeting Group. The Group elected officers as follows: Lynn Watson, Showtime/The Movie Channel, as President; Terry Walthall, Storer CATV, as First Vice President; Ken Leeder, Capitol Cities, as Second Vice President; and Tom Hall, Sammons, as Secretary/Treasurer. Committee Chairmen appointed were: Bill Karnes, Program Committee and Paul Brown, By-Laws Committee.

The first technical session will be held on July 17, 1985; the topic will be Signal Leakage and the CLI.

North Jersey Meeting Group
Contact: Bill Westerman (201-289-1234)

Rocky Mountain Meeting Group
Contact: Todd Acker (303-978-9770)
Report By: Todd Acker

Thursday, April 18, 1985, was the fourth one-day technical seminar put on by the Rocky Mountain Meeting Group. Many companies were represented by the 60-plus attendees. The opening speaker was Tom Polis, President of the national SCTE. Mr. Polis reviewed events at the Spring Engineering Conference and Cable-Tec Expo, held in Washington, D.C. He went on to detail the roll out of the BCT/E Certification Program. Afterwards, attendees were divided into four groups to visit separate workshops.

Workshop #1 was conducted by Ron Hranac of Jones Intercable and concerned the basics of preventive maintenance on cable systems. Workshop #2 was conducted by Bruce Catter of Jones Intercable and gave attendees the chance to build a preventive maintenance program for a theoretical system. Workshop #3 was conducted by Sally Kinsman of Kinsman Design Associates and concerned the basics of system design. Workshop #4 was conducted at the Magnavox Mobile Training Center by Christopher Frederick and Richard Haube. In this workshop, attendees received hands-on training in bench sweep techniques, field sweep techniques and distortion measurement. The Rocky Mountain Meeting Group would like to extend thanks to Eric Himes and Magnavox for donation of the meeting rooms and use of their Mobile Training Center.

The next seminar is scheduled for Wednesday, June 26, 1985. The first topic will be calculating system distortions by Bruce Catter. Attendees are encouraged to bring a calculator that will perform logarithmic functions, as a portion of this class will be hands-on. The second topic will be system design by Sally Kinsman. A portion of this class will give attendees a chance to do system design on two extensions.

South Central Texas Meeting Group
Contact: Larry Flaherty (512-648-4903)

South Lake Meeting Group
Contact: Scott Weber (219-464-2288)

Special Notice—Joe Girard is planning the formation of an SCTE Meeting Group in the Los Angeles area. Anyone wishing to assist Joe should contact him at (213) 208-2340.

Chapter and Meeting Group Exchange

During my travels to SCTE Chapters and Meeting Groups across the country, I have noticed a number of good ideas and valuable procedures used by some groups to enhance their technical sessions and increase local membership. The problem is that other groups do not hear of these concepts that could be applied in their own areas. Therefore, this new section

of *The Interval* has been created to aid in the exchange of ideas and procedures between SCTE Chapters and Meeting Groups.

Reprinted below are the minutes of the Golden Gate Meeting Group's last board of directors meeting prior to their officially becoming the Golden Gate Chapter of the SCTE. We hope it will assist other groups in conducting and reporting on their own respective meetings.

Golden Gate Meeting Group
Minutes of Meeting—Feb. 28, 1985

President Pete Petrovich called the meeting to order at 9 a.m. at United Scientific, 4800 Patrick Henry Dr., Santa Clara, Calif. Those present were:

George Campbell ..... Viacom
Tom Elliott .....Group W
Kevin Floyd..... Scientific-Atlanta
Al Johnson..... United Scientific
Norm Miller ... General Instrument
Pete Petrovich ..... Viacom
Walt Reames..... Gill Cable
Dick Rufer.....Lawrence Livermore
Wayne Sheldon... Coast Cablevision
Bob Vogel..... Raychem

The first order of business was to choose a winner for the trip to Cable-Tec Expo '85 in Washington, D.C. Eleven names were chosen and verified as to current status in the SCTE. Eve Lynch was drawn as the first place winner followed by Criss Cristianson, Don Wykoff, Forrest Flynn, Russell Salva, Tom Tantriella, Rawl Gelinas, Daniel Roberts, Gerard Zimmerman, Charly Fleshman and Bernard Quinonas.

Pete Petrovich presented a draft of the Chapter by-laws for the Board's review. The Golden Gate Meeting Group will become an official chapter of the SCTE on March 3, 1985.

Pete Petrovich gave a financial report. There is a current balance of $7,593.14 in the checking account.

A motion for nominations for officers was heard.

A letter will go out announcing the Meeting Group to Chapter move and also calling for general nominations for Board members. Out of the new Board members, officers will be chosen. A nomination committee was appointed: Norm Miller, Kevin Floyd and Tom Elliott. They will coordinate this year's election.

A suggestion was heard to make the ex-president a voting chairman of the Board. The members will comment at the next Board meeting.

The following seminars are tentatively scheduled. On March 20, FCC signal leakage, field measurements, 21006 will be the topics. On April 17, there will be a Jerrold seminar. The possible topics will be power doubling versus feedforward design. This will be coordinated by Norm Miller. On May 15 an underground construction seminar will be held. This will be coordinated by Wayne Sheldon. For the month of June it was decided to leave that month open. There is nothing scheduled for June at this time. On July 17, a tentative seminar with Scientific-Atlanta was discussed. Kevin Floyd will coordinate this seminar. August and September are still open. On the upcoming March 20 FCC seminar, it was decided that it would be held at the Holiday Inn in Burlingame. The entrance fee will be $15 for members and $35 for non-members. Tom Elliott will mail out the meeting notices. Bob Vogel will check on a possible seminar at one of the video uplink centers in the Bay Area, example Equatorial or Western Union. Pete Petrovich will contact Sutro Tower and see if a tour can be arranged. Walt Reames will check into a 18 GHz microwave seminar, June 26 or August.

It was decided to purchase a camera with a tripod for recording events.

The next meeting for the Board will be on April 11 at 9:30 a.m. in Santa Cruz at the Dream Inn.

The meeting was adjourned at 11:16 a.m.

Respectfully submitted,
George T. Campbell
Secretary

SCTE Expands Its Services To the Cable Television Industry

The following article was written as a response to FCC Bureau Chief James McKinney's keynote address at Cable-Tec Expo '85 (reprinted in the May "Interval"). Please see that your non-technical superiors read this article as it discusses how they can and should assist in the regulatory outcome of cable industry engineering issues.

William W. Riker

In 1984, the Society of Cable Television Engineers experienced a year of positive change. It introduced new programs and services, which, in turn, increased the size and level of participation of its membership. The primary objective of the Society—to increase the technical competency of each member for their own benefit as well as for the benefit of the cable operation that employs them—also was given added support last year.

The Society realized that the majority of its members are not in a position to travel to national educational seminars. The logical solution was to bring the training to the membership. The Chapter Development concept was implemented and seven new Meeting Groups working their way toward full SCTE Chapter status were formed across the country in 1984. These groups provide forums where people share knowledge and disseminate information. One group, from the San Francisco Bay area, achieved Chapter status in March, and new Meeting Groups have already been organized this year in Florida and Texas. Members can be kept advised of all Chapter and Meeting Group developments through this newsletter, the SCTE *Interval*.

Another program designed to disseminate technical knowledge at the local level is the Satellite Tele-Seminar series. A two-hour educational program, either recorded from SCTE Technical Seminars or produced by manufacturers, is telecast each month using satellite transponder time donated by HBO and other programmers.

Likewise, regional training seminars addressing important industry technical issues are currently in the planning stages now that we have just concluded a very successful national convention, Cable-Tec Expo. The Society's BCT/E Professional Certification program, created to recognize members of the industry for their demonstration of technical knowledge, was introduced at the Expo and applauded by FCC Mass Media Bureau Chief James McKinney as a much needed service to the cable television industry.

Mr. McKinney also called upon the Society to increase its visibility regarding regulatory issues, during his address to attendees at Expo '85. He informed us that the commission wishes to delete those rules governing the quality of communications services and concentrate its focus on issues concerning interference. He warned that with the removal of rules affecting not only our cable systems but the performance of equipment originating our programming, our industry must become concerned *and involved* with regulatory issues involving other forms of communications besides cable. The bureau chief urged the Society to become more active in cable policy matters, stating that the commission needs to hear first-hand from technical personnel in the field.

Having been a member of the National Cable Television Association staff prior to joining SCTE and having sat in Mr. McKinney's office on a number of occasions, I can only echo the importance of his statements. Years ago, it was very easy (if anything in this industry is easy) for me

as chief engineer of a cable system to read about FCC rules after they had been created, and then try to deal with them. I felt that these rules were implemented by governmental regulators, and there was nothing I could do about their existence (only about their compliance). It was not until I joined the NCTA that I came to the realization that *each* of us has an opportunity to influence commission decisions before they become law.

Wendell Bailey (NCTA vice president of Science and Technology) and the NCTA do an admirable job in interfacing with commission staffers. However, the FCC realizes that they are "hired hands" by the cable industry to lobby our positions. Written filings submitted to the commission generally contain policy arguments and overall financial impact studies, but do not always discuss technical "tradeoffs" concerning the issue. Since many FCC decisions are, in effect, compromises between opposing industries or markets, the commission staff needs a better understanding of our technical operation and its associated problems. John Wong, supervisory engineer for the FCC's Cable Bureau, and his technical staff are sharp individuals with a good overall comprehension of the industry, but not one has ever worked in a cable system. They need to gain a better understanding of the technical impact concerning proposed legislation, why it would be harmful to the industry, and what modifications to the proposal can be made to render it more palatable. This is critical because they must, in turn, communicate this understanding to the non-technical legislators who ultimately enact the rules.

The SCTE plans to support the NCTA in this area through a number of avenues. First, I will personally restore my visibility at the commission, working again with Wendell in meeting with the commission staff. Secondly, the Society will keep its members informed of upcoming regulatory issues and instruct our Chapters and Meeting Groups on the proper (and surprisingly simple) filing procedures. An SCTE seminar concerning technical deregulation and the cable engineer's role in this process is planned for this summer in Denver and will feature a live teleconference with key members of the commission. In addition, the Society will encourage increased interaction between FCC staffers and the cable industry's technical community by arranging personal meetings and providing forums for further exchange of concerns.

Riker

How can the cable operator assist in this critical process? By joining other Sustaining Members of the SCTE who contribute to the financial support of our activity and allowing technical staff members to spend some time communicating their company's concerns to the one entity that can do something about them.

If what I have just outlined does not motivate you into affirmative action, please consider this: Technical deregulation at the national level may, if not handled properly, result in the creation of 50 different sets of technical rules with which we must comply (one set for each state). Becoming involved in the regulatory process is as important to your industry's future as voting is to guiding our national government.

Powder Springs Field Operations Bureau Issues TVRO Advisory

The following is a handout written by SCTE member Chris Papas, who is an engineer for the FCC's Field Operations Bureau in Powder Springs, Ga. The bureau has issued this advisory in order to educate the public concerning the proper operation of TVROs.

The Federal Communications Commission is receiving an increasing number of complaints concerning interference to home satellite receiving systems. These systems are also known as TVRO (television receive-only) earth stations and usually consist of a dish-type antenna, a signal amplifier normally called an LNA, for low-noise amplifier, and the satellite receiver. The receiver converts the microwave satellite transmissions into signals that a typical home TV set can receive.

The following information is provided to help answer many commonly asked questions about TVRO earth stations.

- An FCC license is not required to operate a TVRO earth station.
- The FCC does not provide any interference protection to a TVRO earth station that has not been licensed. Although the FCC has an optional program for licensing TVRO earth stations, the typical home satellite antenna system would not meet the licensing requirements of FCC Rule Part 25 and could not be licensed.
- Interference to TVRO earth stations can come from many different sources and could affect any part of the receiving system. The most common source of interference is from common carrier microwave transmitters that operate in the same frequency range as the satellite receivers. Both operate in the 3.7 to 4.2 GHz frequency range, therefore, the need to check the actual TVRO antenna site before installation is important to avoid interference problems.

Chris Papas in his FCC test van.

- The satellite signals being received are very weak signals and a common carrier microwave transmitter nearby can sometimes make reception impossible. The best solution is to locate the TVRO antenna in a location free of any signals coming from a common carrier microwave transmitter.
- There are also other sources of interference that can affect satellite reception such as a strong local transmitter (that is not at the same receiver frequency) and interfering signals on the incoming power line. These could cause the interference to occur in other parts of the receiving system besides the antenna.
- There are different ways to eliminate or reduce interference in TVRO earth stations depending on the source of the interference. This includes shielding, filtering and grounding techniques that could be applied by a person knowledgeable in earth station systems.
- Although the FCC does not provide any protection against interference to unlicensed TVRO earth stations, there are private companies that do provide a service in helping the home consumer having TVRO reception problems.

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The 1985 Tech Almanac

Communications Technology's
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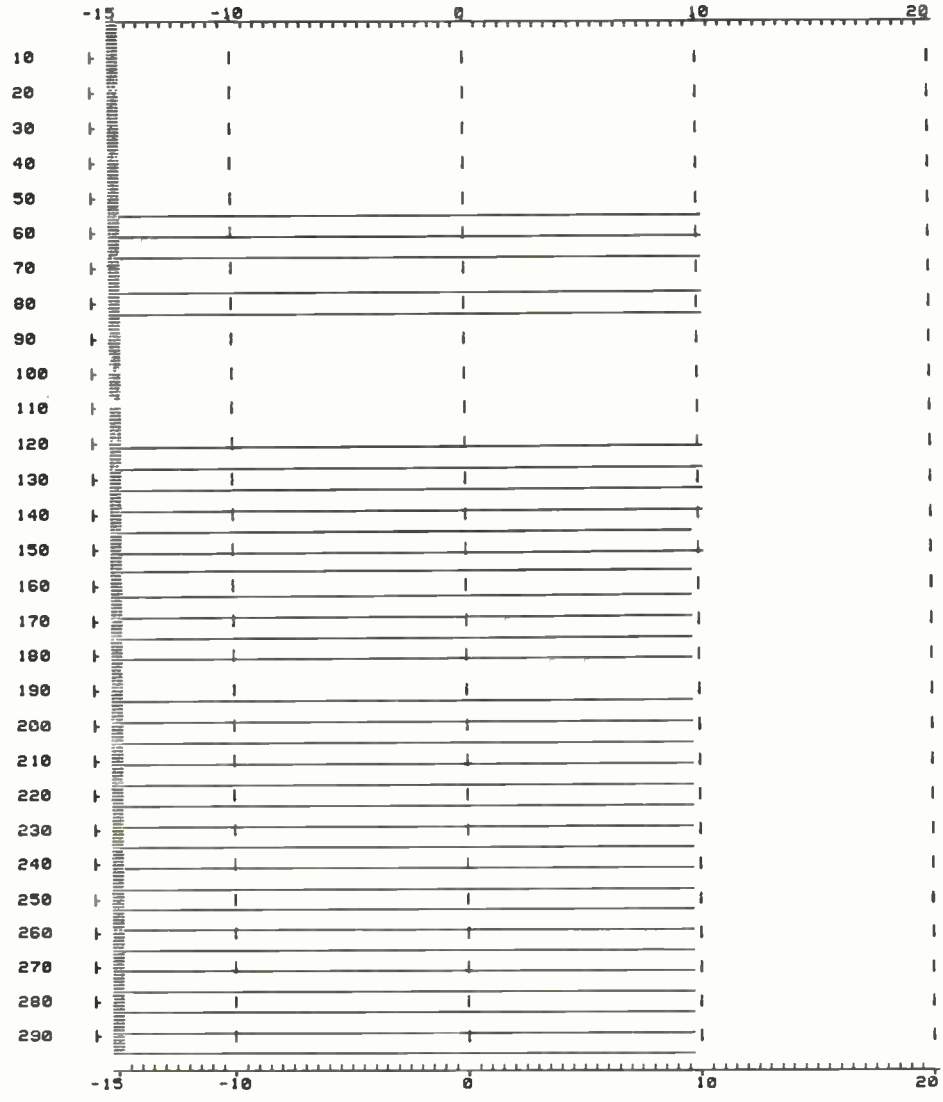
(Continued from page 48.)

Figure 2: Spectrum graph



SITE- LAB
TIME: 1055

DATE:APR 16 1985

DYNAMIC RANGE = 35 DB
FULL SCALE = 20 DBMV
RESOLUTION = .5 DB
ACCURACY =+/- .25 DB
FREQ. ACCURACY= 1MHZ
RESOLUTION B.W= 280KHZ
AMPLITUDE AND FREQ. ACCURACY MUST BE ADDED TO SAM SPEC.

●: INDICATED SIGNAL OVER DYNAMIC RANGE

This is the kind of graph that is printed when all data is requested. Notice that pertinent specifications are printed below the graph.

aid to preventive maintenance, is functionally dependable and improves technical staff job satisfaction.

Making the job easier

Automated testing can eliminate travel time to a remote headend or to hub sites, by making routine measurements automatically. Computer-controlled testing enables analysis of raw data according to user-defined tolerances, and print-out indication of only the tested parameters that are out of tolerance. A signal level meter that can be addressed via an RS232 connection makes possible instant access to different types of signal measurements.

As a preventive maintenance factor, automated testing allows performance of routine tests at the headend and hub sites that may ordinarily be sidelined for more urgent projects. The automated test system also can perform 24-hour proof tests, with the results printed on a form.

An automated system should be dependable and flexible, performing different tests at all hours of the day. It will print out the results and eliminate interpretational errors or transcription mistakes.

The technical staff has the satisfaction of knowing that their system is using dependable state-of-the-art instrumentation. They know that the system, which is their responsibility, is closely monitored and potential problems will be pointed out early. The automated system can be considered as another tool that makes the job easier. The ultimate result is subscriber satisfaction, because they are receiving the best possible signals from a system that is closely controlled.

There are very few applications of automated test concepts for broadband communication systems that test the signals transmitted on the system, instead of the system itself. The automated signal testing system is often compared to "status monitoring." There is a difference between the two concepts. One, the status monitoring system checks the highway, while the other, the automated signal testing system, checks the traffic on the highway. Status monitoring systems check amplifier status by keeping track of such things as: power supply voltages, high and low AGC pilots, housing lid closure and temperature. The automated signal testing system can look at each individual carrier on the system, measure levels, check for modulation, measure hum-modulation percentage, measure temperature, and store and analyze data. It can verify the operation of the remote signal level meter by checking battery status. And a calibration also is done at the beginning of each test—to ensure accurate readings—and at the end of each test—to check for calibration drift.

The AutoBite concept

The AutoBite (automatic built-in test equipment) system is an automated system utilizing the addressable SAM series signal level meters. The SAMs are placed in headend or hub sites, or even at a house drop. The communication between the SAM and the controller (RT-4) is made via telephone modem hook-up.

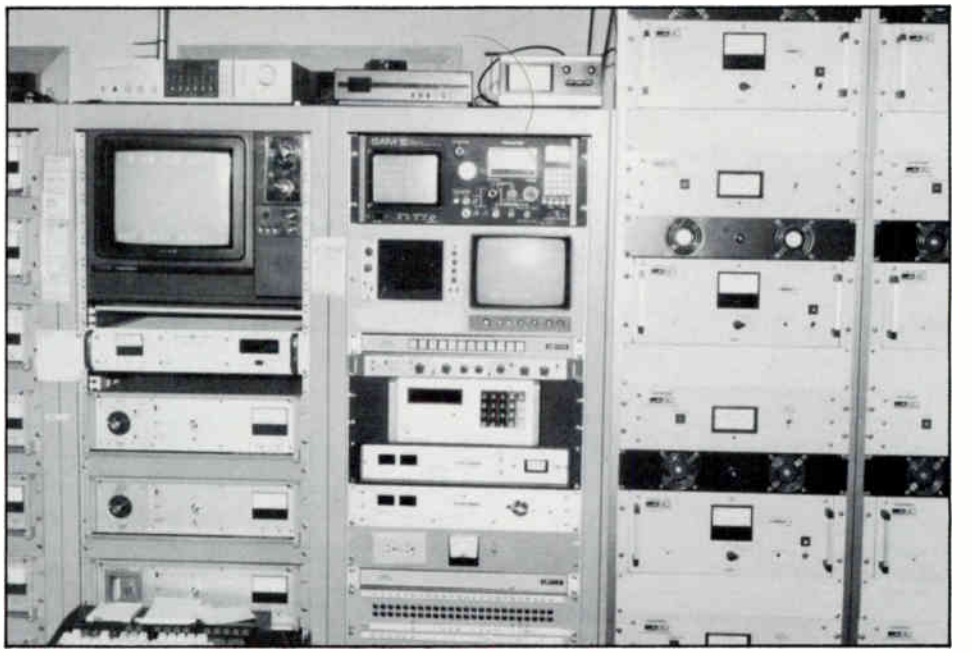
SAM addressable signal level meters are not limited to the control of the AutoBite system. These meters can be controlled by a computer and program of anyone's design. They communicate asynchronously (synchronization is included in the character information) with external devices. Each character consists of 10 bits: one "start" bit; two stop bits; seven character code (ASCII) bits; there are no parity bits. The data transfer rate is 300 baud (300 bits/second), or 30 characters/second. A logic level 0 is +3V; a logic level 1 is −3V.

The RT-4 (remote terminal) is the central processing unit for the system. It consists of a controller with a built-in monitor, disk drive, modem and switching interface. A dot matrix printer also is supplied, as well as program and back-up disks. This equipment can be located anywhere that is convenient for the

operator (office, headend, etc.). A modular telephone connection for the modem is required. An RS232 connection and cable for access to a local SAM (in the same location as the controller) is provided.

At the various test points in the field a signal level meter is required. This can be SAM IIID or IV, or the newer SAM IV Dx or SAM RACC (remote access computer-controlled). Although the SAM IIID and IV are suitable for an automated test system, the SAM IV Dx and the RACC have the following special modifications:

- *Modem*—Built-in, auto-answer type.
- *Hot Start*—We found, in development of the AutoBite, that the SAM calibrator level would change up to 1 dB in a short time immediately after the unit was accessed by the RT-4 (turned on). The Hot Start modification keeps the unit powered up, improving stability, and the microprocessor is reset whenever the modem in the unit is accessed.
- *Calibrator modification*—The calibrator is shifted to 47 MHz to keep it from being confused with other carriers on the system, and is crystal-controlled for improved frequency stability. The level has been changed to +10 dBmV to make it more comparable to the level of the rest of the carriers on the system.
- *Peak Detector*—The peak detector circuit has been modified to enable the reading of sync suppressed carriers more accurately and with less variation.



A SAM IV Dx mounted in headend rack.

The SAM RACC is actually a spin-off of the AutoBite project. It is a smaller size meter, built to fit in a rack, with SAM III features, but with no meter. The RACC is ideally suited for remote automatic testing. For measurements at the site an RT-1 (calculator-sized remote terminal) can be used. The RT-1 has an LCD display, and can perform most of the SAM test functions. It also can store data and print it out on a handy form.

System tests and measurements

The operator must first set a goal to achieve by system automatic testing. To do this one

Figure 4: Auto-test summary with errors listed

```
SITE-WAVETEK H.E.                          PHONE#-5983
DATE: NOV 28  1984
DAY: THURSDAY
CONNECT TIME     =  404
DISCONNECT TIME  =  407
TEMPERATURE CHECK OK                       TEMPERATURE= 77 F
SAM AUTO-CALIBRATION COMPLETE
CALIBRATION CONSTANT=-1.68
CALIBRATION DRIFT= 0
VOLTAGE CHECK OK                           15.56 VOLTS
ATTENUATOR- 10 DB

                SIGNAL LEVEL ANALYSIS-NORMALIZE

REFERENCE NORMALIZING WINDOW =+/- 1  DB
FREQUENCY SOURCE NUMBER: 7
```

CHANNEL ASSIGNMENT	CARRIER FREQ.	TEST LEVEL	REF LEVEL	LEVEL DRIFT	MOD. CHECK
2	55.2 V 59.7 A	+15.10 - 1.30	+13.60 - 2.26	+ 1.50 ← + .00	OK
4	67.2 V 71.7 A	+14.50 - 5.20	+12.70 - 6.70	+ 1.80 ← + 1.50 ←	OK
5	77.2 V 81.7 A	+15.10 -15.50	+13.30 - 5.00	+ 1.80 ← - 9.70 ←	NO←

← : INDICATES OUT OF TOLERANCE

All of the channels listed have amplitude violations. These are indicated by the arrow to the right of each reading in the 'level drift' column. (Although channel 2 audio carrier level changed .9 dB, the level drift column indicated no change because it was within tolerance.) The modulation check on channel 5 indicated that there is no modulation. Also, the level information indicates that the audio carrier has dropped out (this channel is a processed off-air signal, which terminates broadcast at 1 a.m.) The standby carrier is 1.8 dB higher than the channel 5 video carrier (reference).

must first decide how many test sites are desired and where they are; then what tests are appropriate for each site. In order to set the goal you should know the capabilities and limitations of the testing system.

Probably the most useful capability of the AutoBite system is its "autoscan" mode. With this mode, up to 25 remote test sites can be automatically tested, in addition to a local SAM (in the same location as the RT-4). Each test site can be tested up to 10 times per day. The operator can store many different frequency plans on the disk, and can use a different frequency plan at each test site if desired. Up to 70 channels or 140 different signals can be tested per site. The types of signal tests that can be performed in this mode include the following:

Signal level can be measured and the result given as an absolute level with a graph of amplitude vs. frequency, or the result can be compared to a reference stored on a disk and those signals that are out of the user-defined tolerance will be printed out showing the test level, the reference level, and the amount of deviation from the reference. This reference comparison can be printed on a "normalized" graph that indicates how far each signal has changed from the reference in a more visual format.

Presence of modulation on carriers can be verified during each test.

Hum-modulation can be checked on unmodulated carriers and measured up to 5

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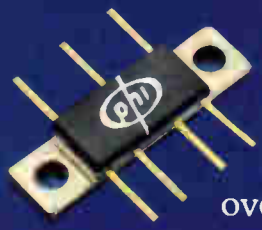

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FREQ. (MHz)	GAIN* (dB)	M/A-Com PHI P/N	MOTOROLA	TRW
300	17	PHA3017-11	MHW1171	CA2101
300	17	PHA3017-12	MHW1172	CA2201
300	17	PHA3017R-1	MHW1171R	CA2100R
300	17	PHA3017R-2	MHW1172R	CA2200R
330	17	PHA3317-11	MHW3171	CA3100
330	17	PHA3317-12	MHW3172	CA3200
330	18	PHA3318-11	MHW3181	—
330	18	PHA3318-12	MHW3182	—
400	17	PHA4017-11	MHW4171	CA4101
400	17	PHA4017-12	MHW4172	CA4201
450	17	PHA4517-11	MHW5171	—
450	17	PHA4517-12	MHW5172	—
450	18	PHA4518-11	MHW5181	CA5101
450	18	PHA4518-12	MHW5182	CA5201
450	18	PHA4518R-1	MHW5181R	CA5101R
450	18	PHA4518R-2	MHW5182R	CA5201R
550	17	PHA5517-11	—	CA6170
550	17	PHA5517-12	—	CA6270
550	18	PHA5518-11	MHW6181	CA6101
550	18	PHA5518-12	MHW6182	CA6201

*Gain at 50 MHz

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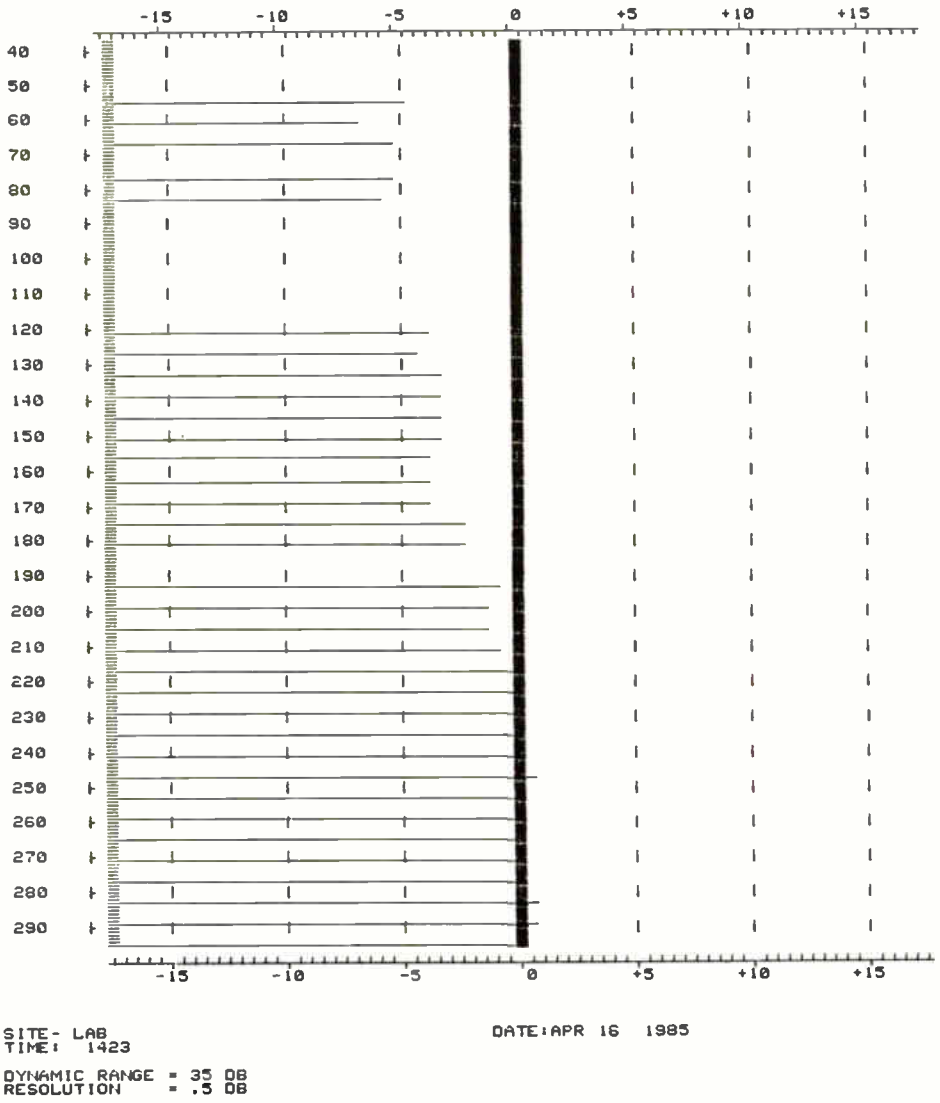
Figure 7: Frequency response using slope equalizer



This normalized graph is the result of inserting a 6 dB slope equalizer in series with the SAM RF input. Notice the attenuation of the low end signals.

This can be done to verify a questionable result on the print-out. The test parameters can be tailored to provide a more detailed look at a specific problem. The part of the single-site test that provides this flexibility is the "back-up site" mode. The following example will show the capability of this test.

At the main hub site, the autoscan test is set up with a frequency plan (#1) to test all of the system carriers. At the Walnut Street site, a building situated 21 amplifiers deep, the autoscan mode is set up to use frequency plan #2, which tests 10 carriers evenly spaced through the operating spectrum.

During a morning review of data from the Walnut Street site, the operator notices an increase in levels between 100-200 MHz. This makes the operator curious and he decides to take a closer look. He can do this by doing a "tailored" single-site test. In this test the operator may decide to use frequency plan #1 (all system carriers) to get an idea of the possible need for a system sweep test in this area. The results of the signal tests are displayed on the CRT and the operator decides how he wants it processed (all data or normalize) and printed. A normalized graph would probably give an explicit picture of the situation.

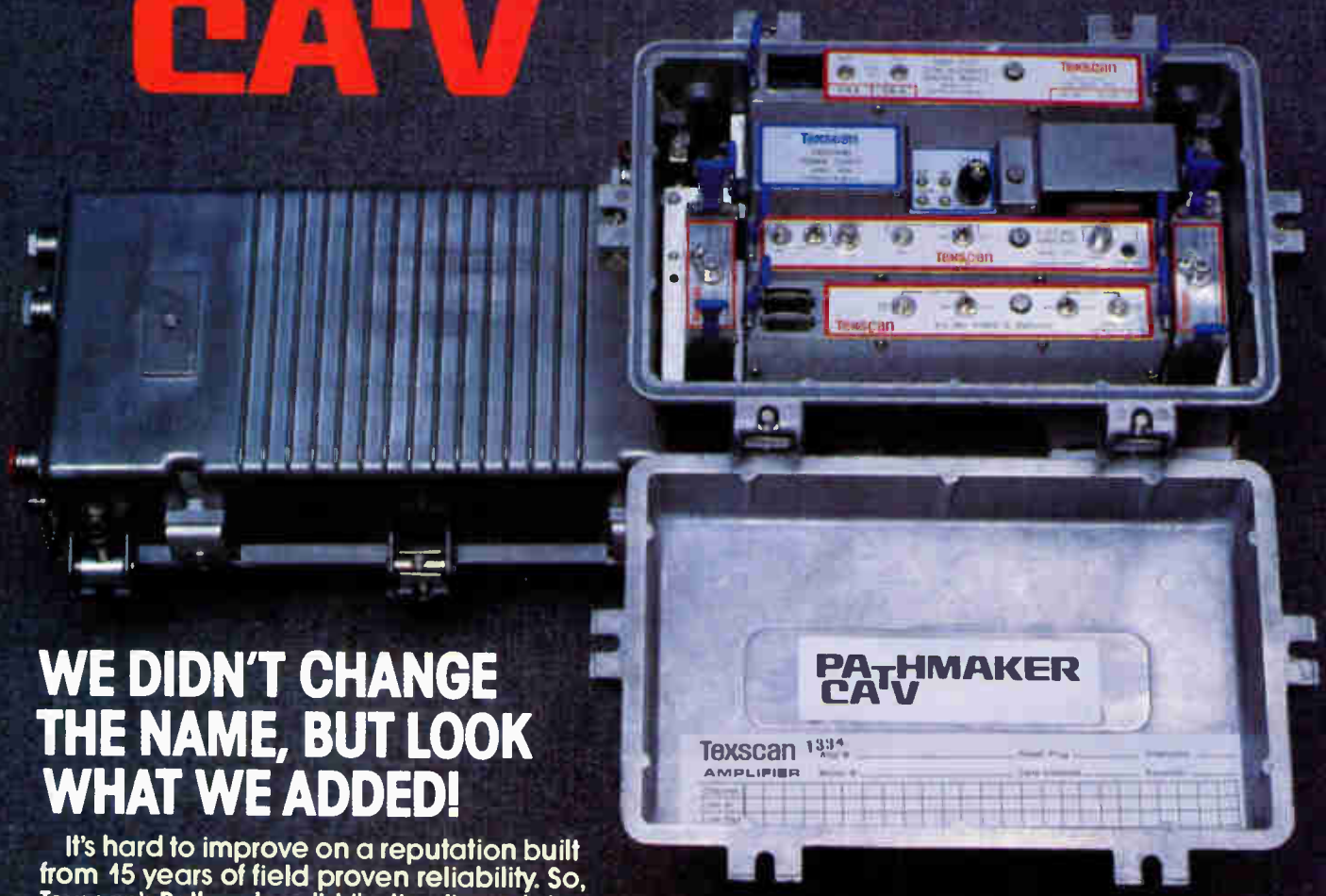
Set clock—This command allows the operator to reset the system clock.

Store system channel information—This is the command that provides for the storage of frequency plans. As seen in the previous example, the autoscan test can use a different frequency plan at each test site.

Conclusion

It seems obvious that the automated testing concept is ripe for even further development. As far as broadband communications technology is concerned, the capabilities have only begun to be explored. Other automated test systems, usually designed by an individual cable system engineer or technician, are in use, illustrating that automatic testing for cable systems is an affordable reality and one with many future possibilities.

Texscan PATHMAKER CATV



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Model 755 covering 5-210 MHz with 28 assigned channels 264-450 MHz with 31 assigned channels.

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Residential heating

There are only two practical ways to decrease heating costs by remote control.

- Turn down the thermostat.
- Shut off the furnace when outdoor temperature is above approximately 60-65 F (fossil fuel systems).

A remote system could affect sophisticated types of control such as boiler water adjustment with outdoor temperature. The device necessary to accomplish that control, however, would be more expensive than the oil/gas burner accessories that can be purchased and installed by burner servicemen.

A residential energy management system could be configured to turn down thermostats at night (or during the day). The problem with this is that homeowners already set their day and night temperatures where they want them (even if they are set too high). If they would like to introduce some automation, "programmable" thermostats are available for $100-$150. Compare this with a remote cable terminal for thermostat control at $200 installed.

Furnace shut-off can save some money but only if the furnace does not also supply hot water. Actually, even if furnace shut-off were practical, it could be done by a $25 outdoor thermostat rather than a $125 cable controller.

It also would be impractical to have the residential energy management system turn down the heat when the building is unoccupied since 1) a programmable thermostat could do this just as efficiently for regularly scheduled occupancy; 2) for unscheduled events a manual turn-down would be every bit as effective and more efficient than a telephone call to the residential energy management computer facility to adjust temperature; and 3) any remote system would have to have provisions for homeowner overrides—we expect that systems in most homes would be overridden most of the time and thereby rendered ineffective.

Air conditioning and fans

The comments about heating system control apply equally to air conditioners, both the central type and window type. In addition, so many factors affect air conditioning requirements (air temperature, humidity, personal heat tolerance, cloud cover, angle of incidence of sun's rays, tree shading, etc.) that it would be nearly impossible to determine air conditioner scheduling and temperature controls for computer programming for a specific building.

As well, the use of these fans does not lend itself to rigid scheduling. There is very little possibility for savings if the subscriber had to call the residential energy management facility and tell the computer operator when to turn a window or attic fan on or off. Actually, most attic fans are now (or can be) supplied with an inexpensive thermostat that turns them on only when necessary.

Refrigerator and freezer

The only way to reduce the operating cost of a particular refrigerator located in a particular place is to turn up the internal temperature (i.e., set the control to not keep the inside as cold). A control for this function is provided by all refrigerator manufacturers as standard equipment. There is no advantage to cable control.

As is the case with refrigerators, the only way to reduce the operating cost of a particular freezer located in a particular place is to turn up the internal temperature. A control for this function is provided by all freezer manufacturers as standard equipment.

Washing machine and dryer

There is no practical way to use remote control to reduce a washing machine's energy consumption, other than by not using it.

Likewise, the amount of energy necessary to evaporate a given amount of water from a given load of clothes depends on washer spin-dry cycle efficacy and clothes dryer efficiency. There is no practical way to improve either by remote control.

Lighting

Although lights do consume electricity, the quantity consumed is less than most people think. For instance, a 100 watt light bulb left on continually for an entire month would use:

100 watts x 30 days x 24 hrs./day x
1 kw/1,000 watts = 72 kwh

for a cost of:

72 kwh x $ .10/kwh = $7.20.

Here is an example of a typical situation:

Problem: Mr. Jones has estimated that at least 25 percent of the time, each of his three children leaves a 75 watt nightstand lamp on during the day when they go to school. The lights usually stay on from 7:30 a.m. to 3 p.m. before someone notices them and turns them off. Could a residential energy management system save Jones money?

Analysis: The amount of energy wasted per year is calculated as: 3 x 25% x 7.5 hrs./school day x 180 school days/year x 75 watts x 1 kw/1,000 watts = 75.9 kwh/year; for an annual cost of: 75.9 kwh x $ .10/kwh = $7.59 per year. Marginal installed cost of remote control equipment for the cable company: $125/point x 3 points = $375. Interest on $375 at 12 percent per year = $45.

Since the savings to Mr. Jones would not even pay the interest on the cable company's investment, we would have to conclude that this is not a viable business venture.

Television

If there is a practical way to use remote control to reduce a specific television's energy


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consumption by any means other than shutting it off, it has yet to be discovered.

Electric water heater

Although one would assume that electric water heater energy consumption could be reduced by shutting the heater off on a regular schedule while the occupants are away, this type of control, in actuality, is not cost-effective. Unfortunately, there is a rumor going around that installing a time clock on a water heater to shut it off evenings after everyone is in bed and daytimes when everyone is out of the house can save significant amounts of money. After observing many water heater/time clock installations, I suspect that the only one who benefits is the electrician who wires in the time clock.

Some people who have installed water heater time clocks have noticed a reduction in electrical bills, but I believe that these are prime examples of the self-fulfilling prophecy: The "water heater time clock believer" is more careful in his use of hot water and thereby effects a lowering of his electric bill and perpetuates the myth.

The following examines, in detail, the theoretical maximum savings possible by water heater time clock control.

Energy is transferred into an electric water heater by means of electric (I^2R) heating elements. Energy can leave a water heater by two routes: actual use of hot water, and heat loss through the insulating jacket.

It takes approximately 1 kilowatt hour's worth of electricity to heat 3.8 gallons of water from tap temperature (45 F) to use temperature (145 F). A bath that requires 20 gallons of hot water at 145 F costs:

20 gallons x 1 kwh/3.8 gallons x $ .10/kwh = $ .52

There is no way to save on this aspect of water heating other than taking your bath in colder water. Ditto for other uses of hot water. No "system" can help in this case.

The other way energy can leave the water heater is by heat loss through the walls. Water at 145 F will lose heat through the exposed surface area of the water heater, the ambient (room or cellar) temperature, and the insulation in the water heater jacket. The average heat loss from a typical 40-gallon water heater at 145 F is approximately 100 watts.

Another way to think of this is that if you don't use any hot water, the tank will require as much electrical energy as a 100 watt bulb to balance out the heat loss through its jacket. For example, if the electricity to a water heater is shut off for 12 hours (a generous estimation of the length of time for which a water heater time clock can be cycled "off"), the water will drop in temperature at a variable rate. It will immediately start to lose heat at the rate of 100 watts (0.1 kw) per hour, but as the temperature of the water begins to drop the rate of heat loss also drops, slowing the rate of temperature drop. A typical 40-gallon water heater will lose approximately 10 degrees in 12 hours for a total kwh loss of 0.13. If the water heater were left on during that period, it would have lost:

100 watts x 12 hours x1 kw/1,000 watts = 1.2 kwh,

so that the savings by time clock control would be the difference—1.20 kwh - 1.13 kwh = 0.07 kwh.

If this amount is saved every day for a month and electricity costs $ .10/kwh, the total savings would be:

0.07 kwh/day x 30 days/month x $ .10/kwh = $ .21/month,

hardly worth the trouble. The maximum savings attainable would occur if you used *all* the hot water *every* day and then shut off the tank for 12 hours *every* day. Savings would be:

0.1 kw x 12 hours x 30 days/month x $ .10/kwh = $3.60/month.

This is not a significant savings, but at least it is noticeable. Unfortunately, the probability of using all the hot water in the tank before shutting down the water heater *every* morning is near zero. Savings will be closer to $ .21 than $3.60 per month.

In analyzing several specific cases for an electric utility client I have found average savings to be $ .50 to $1 per month. Compare this to the cost of $100 for a time clock system or $125 for a cable-based system. Water heater control for the purpose of kilowatt hour reduction is not cost-effective. However, $20 worth of fiberglass insulation wrapped around a water heater can save as much as $20-$25 per year in heat loss. This would be a much wiser way to decrease water heating costs.

What's left for cable

As the examples have illustrated, although the idea of a residential energy management system sounds good, it may be difficult to find something to control, and those appliances such as a furnace that can be controlled are probably better off being equipped with a programmable home thermostat, rather than the more expensive and complicated cable system.

The only practical form of home energy management is in the form of peak load control presently practiced by electric utilities. This is a very cost-effective program, which typically results in simple payback periods of two years or less for the electric utility.

While most peak load management systems operate over one-way radio or low frequency power line carrier, there exists the opportunity for cable operators to provide spectrum (100 kHz is typical) where electric utilities have difficulty in securing FCC licensing or decide to implement two-way peak load management. There then exists a possibility for a mutually beneficial relationship between a cable operator and the local electric utility.

In conclusion, the only real business opportunity for a cable operator in home energy management is with an electric utility—not with the subscriber.

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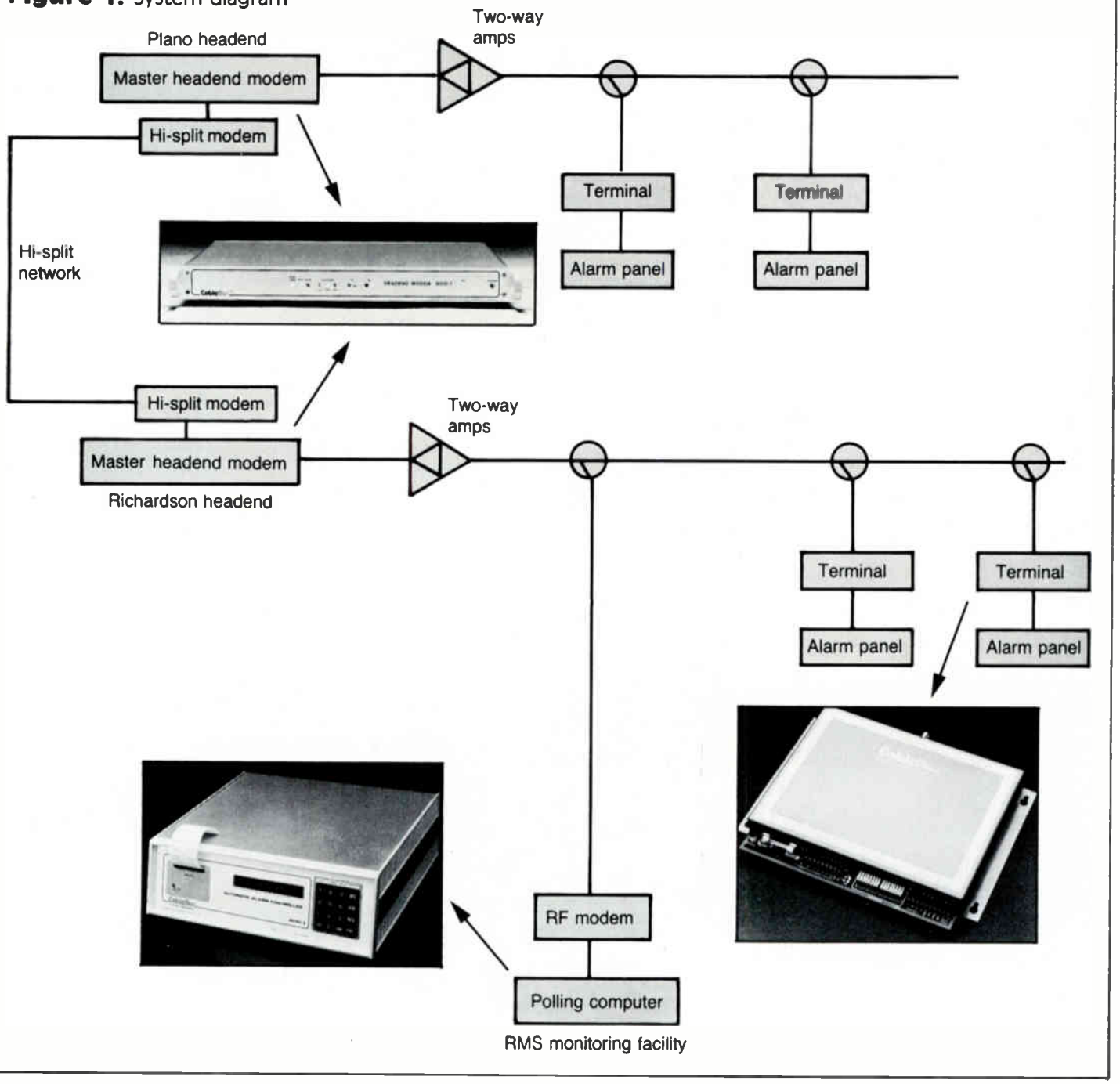
Figure 1: System diagram



Cable and security: Working together

By Pat Robison
Marketing Services Director, CableBus Systems Corp

Getting under way this month is a mass promotional effort by RMS Systems Inc., of Richardson, Texas, to successfully market the company's newest offering: a cable-based security service. The project is an agreement between RMS and TeleCable Corp. systems in Richardson and Plano, Texas, which permits RMS to use the cable systems' two-way capability in return for a share of the revenue.

RMS is an established alarm installer, service and monitoring company, having been in operation for over nine years in the Richardson area. The company to date has approximately 1,200 commercial and residential customers over traditional telco-based security systems. According to Stan Martin, president of RMS, his company has expanded to offer cable-based systems because, "We saw an opportunity to develop a market segment that, although diversified, directly coincides to the general business of RMS. It allows us to fill in market gaps with a new and unique addition to our business."

Recently, Martin moved the corporate offices of RMS to a new location in the area to accommodate projected company growth due to the new cable project, and to update its 24-hour-a-day monitoring facility.

RMS will market the new security service via a direct-mail campaign making residents aware of the system's availability, while also educating them as to its benefits. Time on the local cable channel will be used for the same purpose by RMS, as well as bi-monthly ads in the cable channel guide, circulated in the two Texas communities where the security service will be offered. Plano is a 36,000-household community, while Richardson encompasses 26,000 homes, making the project one of the largest security systems in the area.

TeleCable Corp., with headquarters based in Norfolk, Va., has completed the construction in Richardson and the Plano hub is approximately 80 percent accomplished. The bi-directional cable plant allows the system to be addressable by providing the two-way communication path for operation of the security system. Having two-way communication also permits TeleCable the option to offer additional services to subscribers, should it wish to do so. It has successfully tested pay-per-view on the system and is considering the possibility of adding videotex services some time in the future.

In TeleCable's franchise agreement, the cable company stated it would attempt to offer some type of security system to its subscribers. According to TeleCable of Plano General Manager J.T. Hendricks, "This (type of security offering) is another way of providing a service to the community."

RMS will act as an independent contractor, doing all the security installations, maintenance and monitoring of the cable-based security system. Due to its role in the project, the final decision on the brand of security hardware to be used was RMS's. After evaluation, CableBus Corp.'s equipment was chosen.

Security system components

The major security components supplied by CableBus consist of control terminals (the CDT-6/4), master headend modems (the Mod-1) and a polling computer. These components are connected to the two-way cable system in such a way that the polling computer sends a message along the forward cable path to the control terminal, and the terminal answers the message by sending its reply along the return path.

The control terminal, one located in each residence, interfaces the cable to the alarm sensing devices. This is achieved with a cable coming off a splitter from the user television set and into the control terminal. Alarm devices are then wired into the control terminal and, when polled by the main polling computer, the terminal has the "intelligence" to distinguish and report what alarm condition may be occurring or to report a malfunction or outage within the system.

Each control terminal contains a microprocessor that is given an individual, unique address. When a status report or alarm condition is reported, it is this address that allows the polling computer to signify the exact terminal reporting.

A master headend modem is installed at both the Richardson and Plano headends. The modem provides a serial data interface between the coaxial cable and the digital computer and terminals. Interfacing with the Plano and Richardson cable systems at preset frequencies of 73.5 MHz and 31.4 MHz, respectively, the master headend modem sends FSK (frequency shift keyed) modulated data. The master modem is installed at or near the headend, using standard "F" connectors and RG 59 coax.

In the RMS/TeleCable project (see Figure 1), the two headends are approximately six miles apart. The sites are tied together by a hi-split cable interlink, using a pair of hi-split cable modems.

The polling computer is located in RMS's monitoring facility. Instead of tying the polling computer to the master headend modem via an RS232 cable connection, the connection was modified by use of a newly designed CableBus RF repeater, which permits remoting the computer any distance on the cable plant without the use or expense of a telco interconnection.

The polling computer is a sophisticated polling and display device that allows monitoring of each subscriber location on a continual basis for a status update of each terminal. Because the computer is programmed to expect a response from each terminal, it will report out of service units or malfunctions within the cable plant in seconds. With this capability, the supervised alarm monitoring becomes a form of status monitoring for the TeleCable systems.

The basic polling computer provides a simplified print log of all reported conditions on the system, showing date, time, type of condition being reported, and the specially coded address signifying the subscriber. The polling computer is equipped with an additional RS232 port allowing it to be interfaced to various other brands of computers for demographics expansion. Although CableBus offers a color software expansion system utilizing an IBM XT computer, RMS chose to interface the basic polling computer to its Data General, Model 10, computer utilizing the Ademco "Caps" system software it presently uses in monitoring telco-based customers. To interface the cable-based system with the telco-based one, RMS had to design a special hardware/software connection.

RMS will offer potential cable security customers tier package systems. A minimum offering will consist of an emergency station alert for an installation fee under $200. For a basic system package offering simple intrusion and panic protection the installation will be under $1,000. A maximum package offering full intrusion, panic and fire coverage will range from an installation cost of $1,500 on up, depending on size and configuration of the system. RMS plans to charge a fee of $19.95 a month for 24-hour-a-day monitoring on any of the system installations.

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Reader Service Number 53.

Controlling theft of service

By Peter G. Mangone Jr.
Chairman of the Board Telecrafter Products Corp

The theft of the product from which we derive our livelihood is an area that we are particularly vulnerable in. It is also an area of significant opportunity. Almost every month one of the trade publications points to the hundreds of millions of dollars of lost revenues that our industry is sacrificing.

The most important aspect of theft of service (often in the direct dollars and cents involved, and always in the tone it sets for the organization's ability to deal with other aspects of theft) is also the most embarrassing, but the least expensive to correct. These are the lost revenues that arise from within the system as a direct result of attitudes, procedures or system designs. Unauthorized connections usually account for about one-half of the non-paying subscribers (56 percent in a recent Showtime survey) and usually can be traced to employee errors primarily relating to changes in service or disconnections.

These sources of illegal cable connections, because their roots are within the system, can be particularly unpleasant problems. If you have to wage a battle, it is much easier to attack "those thieves out there" rather than your own system's or organization's. Furthermore, in confronting "external" sources of theft of service, a well-trained and disciplined organization is needed to be a formidable enough foe to cause a surrender or two. This can be accomplished only by effectively addressing certain "internal" matters first.

A truly effective program to reduce cable theft must: 1) Have the unequivocable, high-profile, continuing support of senior management. There's quite a difference between proclaiming support for a program and actually demonstrating support by day-to-day actions, which clearly communicate that certain situations will not be tolerated. 2) Recognize that rabbits are not particularly effective at guarding cabbage patches. With these two thoughts in mind, the foundations of such a program should embrace the following six interrelated components.

Building blocks for an anti-theft program

Image—To many subscribers the cable system that brings them their programming is the drop and the service they receive on the drop installation. This gives your customers an image of you and your system and that image affects the manner in which they relate to you. Most subscribers never see more than a couple of fittings inside the house whatever is attached to the outside of the house and several yards of cable stretching back to the pole.

The value of a neat and clean installation cannot be overstated. To your employees, it confirms your attention to detail. Field employees who have pride in being an important part of a professional organization, consciously and unconsciously communicate these attitudes to fellow employees, to your subcribers and to prospects. They in turn communicate this to others. Attention to detail reaffirms your commitment to quality.

The finishing touch of placing the ground block, splitters and trapping devices in a professional, sealed enclosure is an extremely effective enhancement to your image that facilitates cost-effective service calls and audits, places temptation out of sight and provides visual evidence of theft should it be attempted. Furthermore, a well-mounted enclosure places your cable installation in the same category as other valued utilities, the tampering with which is a major event.

Administrative procedures—Simple procedures to account for inventories of equipment and supplies (so that their usage is verified against the work orders being processed) are a necessary part of any well-run cable system. These systems, however, are only as good as the follow-through to explain discrepancies.

Disconnect procedures—This is usually the single largest internal source of unauthorized cable reception. If every drop in every cable system employed a 9¢ serialized color-coded disconnect control tag, a major source of lost revenue would be regained. By asking field personnel to remove the disconnect control tag and attach this serialized tag to the work order, you are assured that the correct drop was serviced that day. Too great a portion of service downgrades and disconnects are not performed because it may not have been particularly convenient to visit the drop that day and there was no procedure to assure management that the task had been performed. Flagrant, premeditated actions against the economic well-being of the company are less common than employee non-performance due to the existence of an environment that allows the employee to not actually have to expend the required effort.

The occurence of uncompleted disconnects during any week or month may not be significant. However, they accumulate within the system and the effects are substantial. Also, the immediately measurable effects of such free service are magnified many times by the manner in which the image of the cable system suffers and the perceived value of the service declines.

'Theft of service has multiple origins and it will take a multiplicity of cost-effective solutions to reduce this problem to manageable levels'

Audits—Operating a cable system without a consistent auditing program is like posting speed limits for a highway but not having personnel available to issue summons to speeders. Soon the public learns whether or not they need comply.

A good auditing program is as necessary as the highway patrol. Furthermore, it must be consistent and reaffirm the adage that rabbits shouldn't guard cabbage patches. The percentage of drops (or service calls) audited each year is not as important as the commitment to an audit program and the consistent application of that commitment. This will not only affect subscribers, it will have significant effects on the system's image and employee attitudes, as discussed previously. The first people who will realize that you are serious about security are your employees. And, among other things, this will raise the success ratios of the disconnect procedures.

A series of articles could be written debating third-party auditing versus internal auditing. In general, internal auditing programs can work, but the probability of success diminishes substantially when in-house auditors must perform other tasks in addition to auditing. For example, it is easy to postpone an auditing task to temporarily assign that person to a function that produces immediate revenue such as helping an installation crew or performing disconnections of non-paying subscribers. Also, it is difficult enough for an internal auditor to point the finger at a friendly employee who missed a disconnect or is giving his girlfriend's mother free service. It is doubly difficult to so castigate fellow employees and periodically join their crews.

Most often the answer is to periodically engage an outside auditing firm. An independent audit is not only a revenue producer and a source of valuable information, it is an enhancement of the image and perceived value of the cable system.

Confronting illegals—Of course cable thieves ought to be prosecuted. But just as important as their prosecution, is the existence of an internal procedure to organize the approach to deal with the illegal connections that are uncovered in an audit. One such approach is to treat the first infraction as an accident and concentrate on adding that household to the list of paying subscribers (or of signing them up for their unauthorized upgrade). Success ratios of 20 to 60 percent have been achieved in converting these preconditioned prospects to paying subscribers.

In 60 to 90 days after the original audit, an audit of those previous illegals who didn't subscribe or upgrade their service is usually called for. Again, cable systems utilizing drop

Two-way addressability for enhancing cable TV plant

By The Technical Staff
NYT Cable

Extending plant life involves a multitude of maintenance processes. It means testing the electronics and ensuring that the system is tight before installation. It means having an ongoing preventive maintenance program as well as a demand maintenance approach. And it means dealing with redundance, alternative power supply, ingress and converter returns. While each of these factors can be considered separately, we must keep in mind the synergistic effect they have on one another, and the cumulative effect they have on extending plant life.

Reaping the benefits

NYT Cable, using Kanematsu-Gosho's Sprucer II two-way addressable converter, has had a modern two-way interactive addressable system in operation for over a year. NYT is now reaping the benefits that two-way operation produces by using maintenance procedures and techniques that have been adapted or developed to extend the life of the plant, significantly raise delivered picture quality and reduce downtime.

Much of what we have learned about two-way addressability has been through actual hands-on experience. We believe that a significant portion of the reduced disconnect rate, which has fallen from 2.5 percent to 1.7 percent, can be attributed to our current maintenance program. This program has enabled us to enhance the quality of our service to the subscriber. We are now able to minimize outages due to maintenance and accidents, offer enhanced picture quality, limit revenue-draining downtime as well as improve the efficiency of our technicians by precisely locating a problem and sending them directly to it. All these factors will have a positive impact on subscriber retention, which in turn has a positive effect on our bottom line.

Realistically, two-way has been an engineering challenge. It has created more maintenance demands. For instance, we now have twice as many active pieces of equipment. However, we haven't had to do twice the maintenance. Rather, this additional equipment places only incremental increases on demands already present in any CATV system. Having to maintain the return signal path has created new demands, but it also has eased the problem of locating outages and ingress because of the sophisticated ability to segment the return system by computer.

The decision to go addressable affected every department of our system, from marketing to customer service. But most of all, it affected the technical department. The unfamiliar technology, coupled with the newness of the equipment, required the development of new procedures and standards. As a need arose, we developed a suitable response. Our employees were on such unfamiliar ground that our engineers and service technicians all underwent intensive training.

We initially installed Sprucer equipment at the Fort Dix/McGuire Air Force Base franchise in southern New Jersey in January 1984. We tested the equipment for eight months and then began rolling it out systemwide. The entire process should take five years and, when complete, we will have 123,000 fully interactive subscribers.

Plant installation

The first step in the installation of the two-way operation was a massive maintenance upgrade before the plant was "fired-up." By upgrading (tightening or replacing fittings, terminating all unused ports, carefully checking for ingress, and increased grounding) we increased the reliability of the system.

We also swept and tested the system in both the forward and return directions. Where we found ingress, it was corrected. This allowed us to start with as clean a system as possible prior to actual two-way operation.

Ongoing maintenance

We divided our plant into zones, each with a lead technician and four trunk technicians responsible for 250 to 300 miles of plant and the service of 10,000 to 15,000 subscribers. The zone leader coordinates the maintenance program for each zone. Whenever our technicians climb a pole for any reason, they do certain things—tighten fittings, check for damage to the fittings or the housing, look for water, check the port covers, and look for kinks in the cable, of course. We also do regular rideouts with signal leakage detection gear.

If we run into a location where there are more than three splices between trunk amplifiers, we replace the cable. If we didn't do proper maintenance such as this, we would not only have poor picture quality, we also would have a shortened plant life. In a fully loaded system such as ours, maintenance is not an option; it is a must.

Demand maintenance

Our technicians always carry a sheet with them called an *unscheduled maintenance form*. If they come across a problem on the main plant in the course of their duties, they will repair it. If there are broken tap ports, loose fittings or whatever, they will make those repairs and indicate them on the form. If the technician can't make the repair then, he'll refer it to his lead technician, who will schedule the maintenance for a later time.

If we must interrupt a significant portion of trunk line affecting many subscribers at one time, we will send the technicians out at about 4 a.m. to perform the corrective action. When possible, we will inspect the entire trunk for this type of problem and perform all corrections in the early morning with multiple personnel if necessary.

Feedforward

NYT used feedforward supertrunks, in conjunction with the Sprucer system, running from our headend to hub sites, which were formerly fed by AML microwave only. These trunks have the capability of carrying signals in a return direction as well, in order to get the required two-way data back.

Unlike the AML microwave systems, the feedforward links are not subject to rain fade, temperature inversions or other weather conditions. Our engineering department felt that one reason AML return was not practical was that we would have needed a reverse AML transmitter—with a building to house it—at each of our hub sites.

Automatic switches

One of the new devices in our Sprucer system is a custom made redundance switch. This normally selects the feedforward supertrunk, but automatically switches to the AML backup in case of feedforward failure. It was developed in cooperation with the PECA Co. of Philadelphia. If we have to do maintenance on these supertrunks, it normally would require shutting down the plant in the early morning hours, but now we can switch to AML without inconveniencing the subscribers.

We also employ standby battery power supplies on the feedforward runs. This is to prevent power loss, especially during a PPV event where there could be a massive revenue loss. These standby supplies have proven valuable. Recently, we were able to keep the trunk line active and save the pictures of

'In a fully loaded system such as ours, maintenance is not an option; it is a must'

22,000 subscribers when there was a major power outage.

Bridger gate controllers

At NYT, we are employing BGCs that are unique adaptions of existing technology. We needed to develop a switch that would disconnect all return distribution from any bridger amplifier. The BGCs are computer controlled, and we can turn the switches off, either as a group or singly.

BGCs enable us to isolate distribution by trunk amplifier location. This ability enables us to locate and isolate sources of ingress or trunk amplifier failure quickly. We get a daily BGC status report, or, if an outage is indicated, we will ask the computer for an up-to-the-minute report, which tells us which BGCs are or are not answering. Using a map that shows BGC location, we can quickly isolate the location of the outage or ingress and send our crews out. BGCs have proven to be a boon, because now we can minimize time, expense and customer dissatisfaction by going directly to the source of the problem.

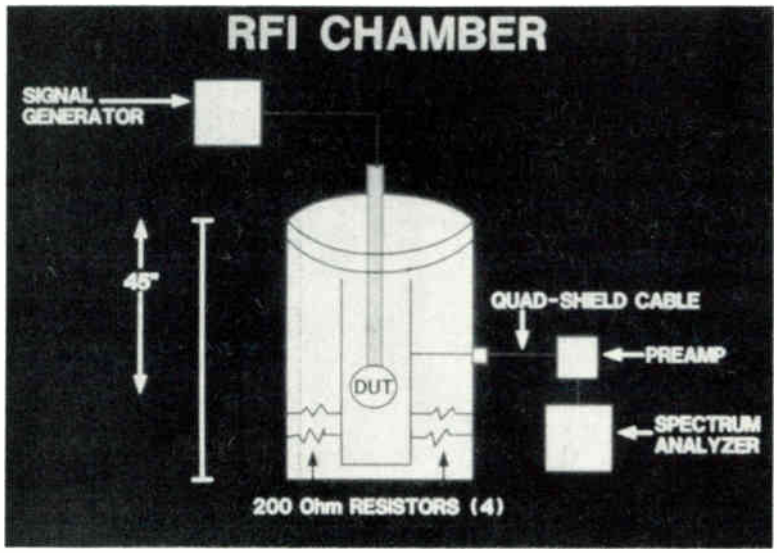
We also are now able to run a report each morning that shows what percentage of converters are answering from each trunk location. If we have a poor percentage of converters returning, we can locate them by amplifier and send a technician out to check for a problem in the distribution system. BGCs allow us to select each distribution area and the converter report gives us the exact location on feeder where no or few returns are occuring.

The future

As our plant becomes entirely two-way, we will be able to step through these programs daily. This will help us establish priorities. We also will be able to keep a regular maintenance program going, but instead of doing it on a section-by-section basis, we will now be able to set priorities by the area that has the worst ingress and needs preventive maintenance the most.

Two-way technology has placed increased demands on our technical staff, but one of the benefits of rigorously maintaining the return side, has been improved quality of service on the forward side. Careful, constant preventive maintenance helps to control costs while minimizing possible service interruptions, optimizing customer service and thus subscriber retention. Two-way operation helps us to achieve these goals by giving us additional technical tools with which to diagnose system problems and get faster reporting on system status.

Figure 1



'The reduction of the incidence of leakage will make the job of operating the cable system much easier by decreasing downtime . . . and prolonging equipment life'

Distribution system egress/ingress

The terms egress, ingress and radiation have received renewed interest with the Federal Communications Commission's recent issue of Docket 21006. This article looks at taps and how they contribute to the problems of ingress and egress from a design and applications standpoint. The related problem of water migration also will be addressed and methods will be discussed to minimize these problems simultaneously.

By Herb Longware
Product Manager, Amplifier Systems Magnavox CATV Systems Inc

Although it is difficult to make generalizations about cable systems, it is probably safe to say that the majority of ingress/egress problems occur on the distribution portion of the system. There are several reasons for this:

Figure 2

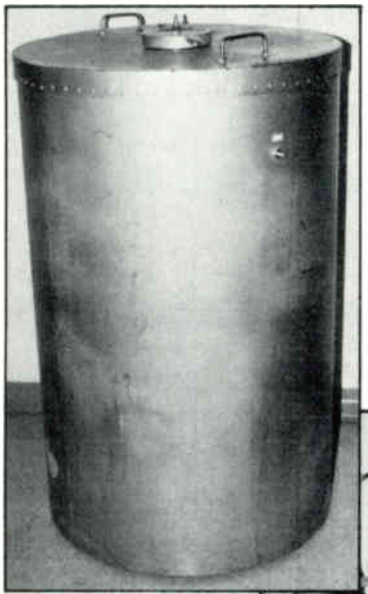
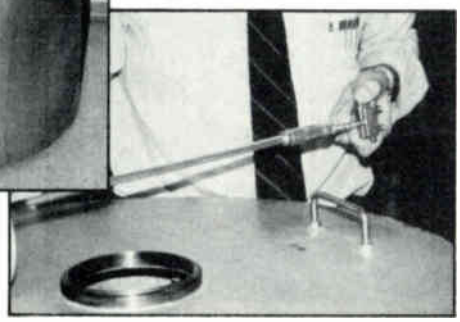


Figure 3



1) Higher distribution levels allow signals to emanate from marginal devices. This can be seeh in the new FCC docket, stating that levels below 38 dBmV on the system are not sufficient to cause objectionable radiation.

2) The distribution miles frequently outnumber the trunk miles. A 3:1 feeder-to-trunk ratio is typical of the modern cable system. By this ratio, a 400-mile system consists of 300 miles of feeder and 100 miles of trunk. Consequently, there is a lot more feeder in a system of this ratio to cause problems than the trunk portion.

3) The distribution portion of the system has many more devices than its trunk counterpart. Connectors appear at the input and output of each tap, creating locations where signal can get in or out. Taps and directional couplers also can cause signal problems if installed incorrectly. These problems can occur at the input and output ports or can stem from the method in which the taps are installed.

Many of the problems that cause signal leakage also cause mechanical problems, such as leaky housings. A number of reasons can now be given why it is important to maintain the integrity of the system: The system must be within FCC specifications for signal leakage; pictures must be delivered ingress-free to subscribers; and the reduction of the incidence of leakage will make the job of operating the cable system easier by decreasing downtime to the subscriber and prolonging equipment life.

Designed for success

The basis for a cable system to achieve minimum electrical and physical leakage begins with the design of the devices incorporated into that system. Evaluations are made using a number of different methods. The physical parameters can be tested by injecting air pressure into a device (tap) and submerging it under water to check for air bubbles. Corrosive environment testing can be done, most often with a salt spray chamber, subjecting the device to a 5 percent solution for 1,000 hours. Electrical performance can be checked with sweep equipment for insertion and port loss. Ingress and egress can be checked by two methods.

The first method utilizes calibrated reference equipment and an RFI chamber to provide an interference-free environment (see Figure 1). This chamber effectively reduces any outside interference so that only the signal being transmitted by the signal generator and radiating from the device under test will be amplified by the preamp and then sent to the spectrum analyzer. The response that is seen from this test is similar to the response seen when sweeping the cable system. The signal generator will be run from a low to a high frequency, and those frequen-

Figure 4

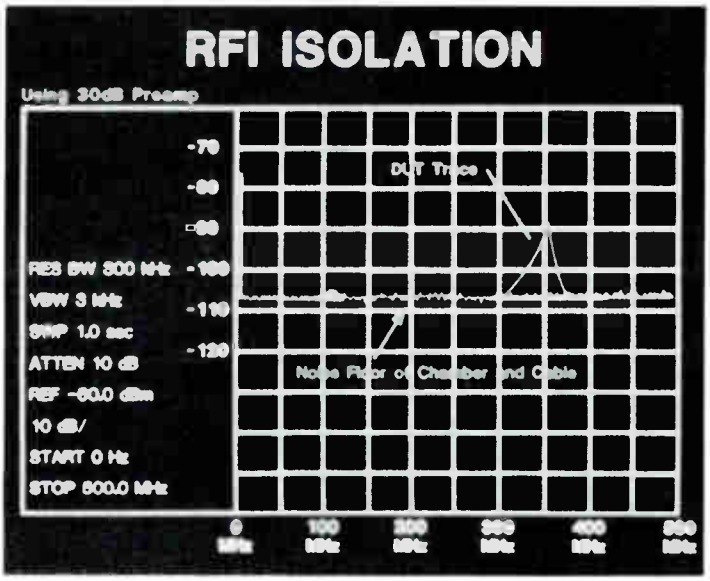
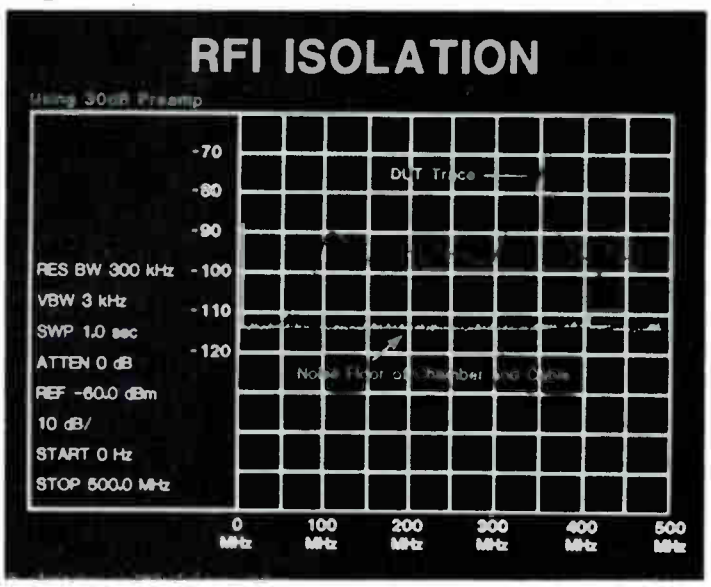


Figure 5



cies will be tracked on the spectrum analyzer. The RFI chamber used is a 50 ohm device. This can be seen by the use of four 200 ohm resistors in parallel. Appropriate matching transformers have been used where necessary to make the transition between 50 and 75 ohms. With this equipment, measurements can be made to a noise floor that is 110 dB down. This testing method allows a relative measurement but does not allow an absolute measurement to be made according to the FCC leakage criteria.

The RFI chamber is frequently used to compare one series of taps to another or to test the improvement that is made within a series of equipment with the inclusion of the additional RFI protection. A picture of this device is shown in Figure 2, with the input in the center of the top of the drum and the output about a quarter of the way down from the top on the side of the drum. The device under test (DUT) is placed in the RFI chamber as shown in Figure 3.

Any device may be placed in the chamber as long as it physically fits through the top opening. Note the use of hard line coax from the cover to the connector. Terminators will be placed on the ports of the two-way splitter before inserting it into the chamber. A tight electrical environment is essential to permit only one variable, the device under test.

Figure 4 demonstrates isolation levels of a two-way splitter vs. the noise floor of the test equipment. This particular device exhibits very good isolation. A spike occurs at approximately 360 MHz, seeming to

indicate a leaky device at this frequency. This spike is caused within the RFI chamber itself, and occurs at a resonant frequency.

A return loss measurement of the RFI chamber itself bears this out. If the maximum frequency were extended, additional spikes would occur at higher frequencies.

Figure 5 is the isolation of Brand X device vs. the noise floor of the test equipment. The resonant frequency again occurs at approximately 360 MHz. RF isolation measurements taken around these frequencies will probably be worst case because of the combination of isolation of the DUT and resonance of the chamber.

For FCC measurements (expressed in microvolts per meter) an open-air site is required to corroborate the tap performance to the present standard for leakage. Figure 6 shows an FCC-approved, open-air site. At this particular site, 3-meter testing is done indoors and 10- and 30-meter testing is done outdoors by attaching dipole antennas on telephone poles. One of these poles can be seen at the far left side of Figure 6. The device under test remains inside for the testing. The use of an open-air site is costly and very tedious. Physical adjustments to the reference dipole antenna and correction factors for the test cable and equipment over frequency range reserve this type of testing for final product evaluation. The indoor adjustable dipole antenna is shown in Figure 7.

Signal is pumped into the device under test, which is rotated to yield maximum signal at the dipole antenna. The output of the antenna is fitted to the spectrum analyzer and the measurement made. Measurements made with this system can be compared to the FCC criteria. Figures 8 and 9 are listings of test results from the 3-meter test.

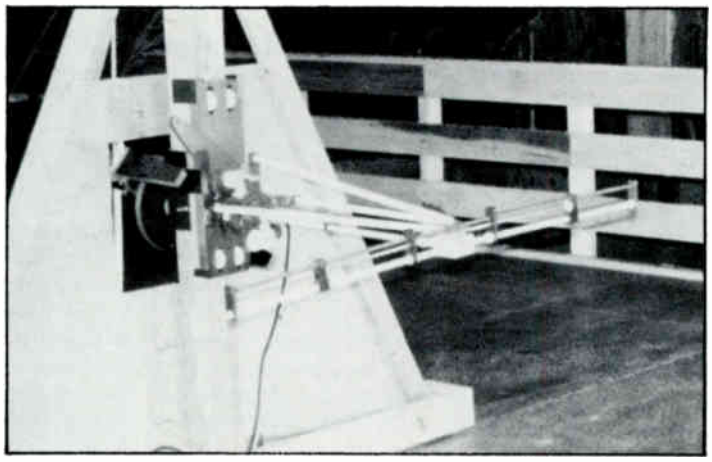
In Figure 8, there are measurements taken of the Brand X directional coupler without a wire mesh gasket between plate and housing. With an input to the device of 49 dBmV, the unit is out of FCC spec at a number of frequencies. Figure 9 is the same unit with a wire mesh gasket. It easily meets the specifications as prescribed by the FCC. High leakage levels also can be caused by improper installation, tap plates that have not been tightened down, port plugs that have not been replaced after installation, or tap ports that have not been terminated.

Figure 6

Minimizing leakage with proper installation

In the first part of this article, leakage has been approached from a manufacturing standpoint. The second section will give some instructions on tap installation as it pertains to minimizing electrical and physical leakage. The following guidelines are just some of the many ways to install taps. They have been made general enough as to be incorporated with any tap installation. Other methods may be employed in different areas to suit local conditions. All safety rules should be followed.

Figure 7



The placement of taps is usually after the expansion loop (if it is there). Taps are frequently installed on the forward input side of the pole. The taps should never be mounted on the expansion loop (sometimes called the drip loop). If it were mounted on the loop, water would collect at the entry of the connectors and tap, encouraging water to enter. This portion of the cable has been installed to flex with changes in temperature. Movement of the cable at the input to the connectors will result in a fracture of the outer sheath of the cable near the point of entry. Cable should be prepared for the use of feed-thru or pin-type fittings, following the manufacturer's instructions to the letter. The dielectric needs to be removed without nicking the solid copper or the copper-clad center conductor. If coring depths or center conductor lengths are not followed, the connector will not provide the mechanical and electrical contact that is required. In many instances connectors fail on a physical or electrical basis because of improper installation.

During this entire process, care should be taken not to kink or break the cable's outer sheath. Expansion loops should be formed with a bending fixture and be flat bottomed for maximum temperature cycling. Replacement of older connectors that do not have an internal RFI sleeve should be considered in the fight against ingress. The use of heatshrink will reduce the incidence of water ingress and give the cable physical support from lateral flexing that will cause cracking of the outer conductor. Heatshrink, at least four inches long, should be placed against the housing of the tap and extend out over the connector and

Figure 8: Directional coupler test without mesh gasket

Frequency (MHz)	36 dBmV at input (microvolts/meter)	49 dBmV at input (microvolts/meter)
30	NL	NL
54	NL	NL
125	NL	24.5
135	NL	26.3
185	NL	44.2
200	NL	48.1
216	NL	43.6
330	NL	70.2
450	NL	101.2
513	—	—
600	—	—
700	—	—
800	—	—
900	—	—

NL = Reading at or below noise level
— = No readings taken at this point

the cable. Heat is applied starting at the tap and moving out towards the cable. Be sure that the entire radius is covered with heat evenly to assure a good seal. Excessive heat is to be avoided.

The tap plate must fit snugly into the housing. Any foreign material that separates the two can cause loss of grounding and higher than normal levels of leakage. With most taps, the tap plate does not have to be removed during installation. The most frequent reason for removing the plate is to see if the center conductor or pin has been cut to the proper length to fit through the seizure assemblies. This can be avoided and time saved by measuring the center conductor or pin before installation into the tap. If the plate is removed, be sure that it is retightened according to specifications given for the product.

The use of pedestals is increasing, especially in suburban areas where the utilities are underground. The same installation practices apply regarding egress and water migration. Pedestal enclosures are not airtight or watertight and do tend to sweat during changes in temperature. This moisture can be transferred to the tap, causing corrosion. Pedestals are not RFI proof. Even with the use of metal enclosures, proper installation techniques should be followed to ensure that ingress does not occur. Tap ports should be terminated with cable or a terminator. Previously, systems might have been inclined to terminate just low value taps (14 dB or below) or to leave tap ports unterminated. This practice affects tap isolation, encourages water to enter through the ports, and negates positive steps that have been taken to reduce ingress and egress. The use of rubber "spark plug" boots with silicone or terminators with an 0 ring and silicone are recommended at the tap ports.

Figure 9: Directional coupler test with mesh gasket

Frequency (MHz)	36 dBmV at input (microvolts/meter)	49 dBmV at input (microvolts/meter)
30	NL	NL
54	NL	NL
125	NL	NL
135	NL	NL
185	NL	NL
200	NL	NL
215	NL	NL
330	NL	NL
450	NL	NL
513	—	—
600	—	—
700	—	—
800	—	—
900	—	—

NL = Reading at or below noise level
— = No readings taken at this point

Paying the piper

The challenge of signal ingress and water migration are very much related to each other. By following the steps given in this article, a system can be maintained for maximum life with minimum ingress and egress. At times, it can be difficult to justify the need for the above procedures. If so, keep them in mind the next time you do a disconnect and the tap port comes off with the fitting, when you are at an outage caused by a tap that is full of water, when you are troubleshooting intermittent ingress on one of your return channels, or when the FCC drops by to do some testing.

Author's note: Special appreciation to Sandy Livermore and Roy Schultz of Magnavox for their assistance in the writing of this article.

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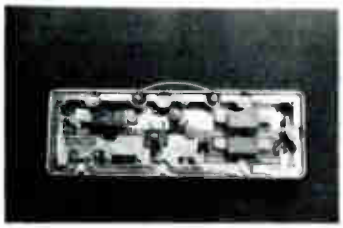
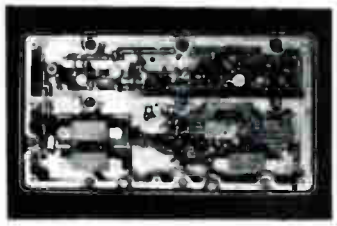
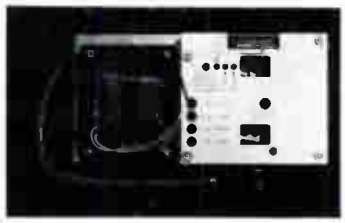
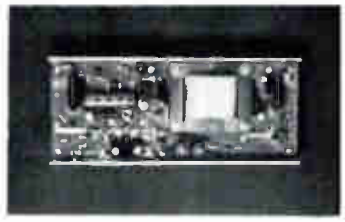

SPECIFICATIONS

STATION FUNCTION		TR. AMP W/ASC BR. AMP.	TR. AMP — BR. AMP.	TR. AMP W/ASC —	TR. AMP — —	TERM./INT. TR. BR. AMP.	LINE EXTENDER
STATION MODEL NUMBER AVAILABLE in P² OR PUSH PULL ONLY							
PASSBAND			50 to 330 MHz		50 to 400 MHz		
RESPONSE FLATNESS (See Note 1) Trunk Amplifier		±.2dB	± .2dB	±.2dB	±.2dB		
Bridger or Distribution Amplifier		±.5dB	±.5dB			±.5dB	±.5dB
MINIMUM FULL GAIN (See Note 2) Trunk Amplifier		29 or 31dB	30 or 32dB	29 or 31dB	30 or 32dB		
Bridger or Distribution Amplifier		30dB	30dB			44dB	28dB
RECOMMENDED OPERATING GAIN at 330 MHz, without equalizer Trunk IN to Trunk Out		26/22dB	26/22dB	26/22dB	26/22dB		
Trunk IN to Bridger (Distribution) OUT		40/34dB	40/34dB			38/32dB	26dB
TYPICAL OPERATING LEVELS for 40 channels, with equalizers IN		9dBmV	9dBmV	9dBmV	9dBmV	10dBmV	
Trunk OUT 330 MHz Linear TILT		34/30dBmV	34/30dBmV	34/30dBmV	34/30dBmV		
Trunk OUT 400 MHz Linear TILT		34/29dBmV	34/29dBmV	34/29dBmV	34/29dBmV		
Bridger (Distribution) OUT)		49/42dBmV	49/42dBmV			49/42dBmV	48/42dBmV
DISTORTION CHARACTERISTICS (typical for op. levels)							
2nd Order Beats, Chs. 2, 20(g), 13 Trunk Amplifiers		-84dB	-85dB	-84dB	-85dB		
Bridger or Distribution Amplifier		-72dB	-72dB			-70dB	-71dB
Composite Triple Beat	Trunk 330 MHz	-90dB	-91dB	-90dB	-91dB		
Trunk Amplifier	Trunk 400 MHz	-87dB	-88dB	-87dB	-88dB		
Bridger or Distribution Amplifier	330 MHz	-69dB	-69dB			-67dB	-69dB
Cross Modulation	400 MHz	-64dB	-64dB			-62dB	-65dB
HUM MODULATION (by 60 Hz line)				70dB ALL STATIONS			
MAXIMUM NOISE FIGURE, without equalizers	330 MHz	7.0dB	7.0dB	7.0dB	7.0dB	8.0dB	9.0dB
	400 MHz	7.5dB	7.5dB	7.5dB	7.5dB	9.0dB	9.5dB
MANUAL GAIN CONTROL RANGE, mimimum Trunk Amplifier		8dB	9dB	8dB	9dB		
Bridger or Distribution Amplifier		9dB	9dB			9dB	9dB
OPTIONAL INPUT LEVEL PADDING				AVAILABLE PLUG IN PADS S X PS			
MANUAL SLOPE CONTROL RANGE, minimum In Bridger or Distribution Amplifier (Ch. 2/36)		8dB	8dB			9dB	7dB
AUTOMATIC SLOPE AND GAIN CONTROL For changes in cable (ref. to 330 MHz)		+3/-3dB		+3/-3dB			
Amplifier output at pilot frequency holds at		±.5dB		±.5dB			
CONTROL CARRIERS AGC factory tuned to Ch.	AS REQUESTED			AS REQUESTED			
Operating Level, minimum/maximum dBmV				SELECTABLE PLUG IN PAD S X Ps			
THERMAL COMPENSATION for ambient changes in amplifier over °F.				AVAILABLE AS OPTION			
THERMAL MATCH at 75 ohm Impedance				16dB MINIMUM ALL PORTS			
POWER REQUIREMENT (In Station Housing) Using QRF-JPP2 60 V System	Watts	1.07A	1.02A	.650A	.590A	.590A	.505A
	Amps						
30 V System	Watts						
	Amps						
DC OPERATING VOLTAGE (AVAILABLE IN -27V, ALSO)		-23Vdc	-23Vdc	-23Vdc	-23Vdc	-23Vdc	-23Vdc

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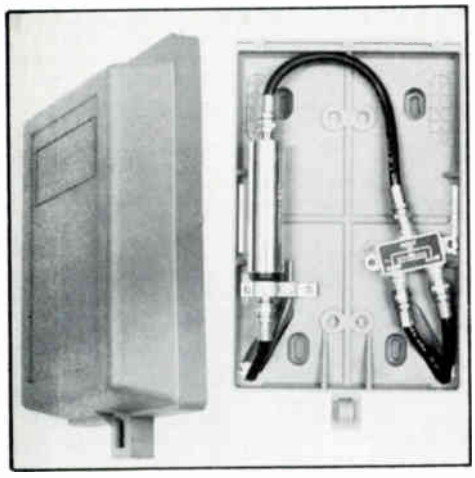
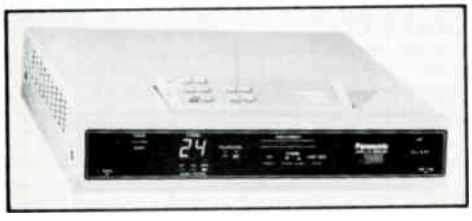


Residential enclosure

Telecrafter Products introduced the Drop Control Box. This water-resistant enclosure will weather protect and securely house ground blocks, traps, fittings, and splitters, according to the firm.

It is 7⅜" × 5" × 1⅝" in size, and is available in gray and beige.

For further information, contact Telecrafter, P.O. Box 30635, Billings, Mont. 59107, (406) 245-8200.



Satellite receivers

The Panasonic Industrial Co. introduced a satellite receiver capable of receiving both Ku-band and C-band signals. The Ku/C-6000 has 10-channel capacity and features front panel push buttons for instant selection of channels.

The satellite receiver has 10 potentiometers to set the individual frequency plan. The potentiometers are accessible via a trap door in the top cover. Simultaneous output of two audio subcarriers is possible with separate "A"-band and "B"-band audio tuning controls with "A" subcarrier wide/narrow IF bandwidth selection.

The Ku/C-6000 includes front panel features such as fine tuning control, AFC on/off push button, and LED signal strength indicator.

The rear panel layout includes switches for video polarity, channel ¾ output and video scan. The video baseband outputs have an adjustable level control on the rear panel. Other rear panel terminals include: IF in; baseband out; video out; audio in; video in; TV out; and AGC out. The Ku/C-6000 is fully compatible with the Panasonic Ku-band LNB-25P/PW and the C-band CI-LNB-100/85 low-noise block downconverters.

In addition, Panasonic introduced a remote control satellite receiver.

The receiver, Model C-2000, utilizes block downconversion and is fully compatible with all Panasonic C-band and Ku-band low-noise block downconverters. It features a wireless, 10-function infrared remote control for power, channel selection, volume setting, polarization, antenna control and audio preset. The C-2000 has automatic 6.8 MHz selection and is switchable to 6.2 MHz or auto seeking by remote control. Its baseband output is suitable for external decoders.

The unit includes a channel ¾ switchable remodulator and ultra-stable tuning circuitry to eliminate all manual fine tuning adjustments under normal signal condition. A terrestrial interference filter is available as an option.

The rear panel layout includes complete audio/video input/output terminals, polarization output terminals, IF input, TV ¾ output, video scan, video polarity and polarizor type switch.

For further information, contact Panasonic Industrial Co., 1 Panasonic Way, Secaucus, N.J. 07094, (800) 645-9062.

Satellite terminal, lightwave systems

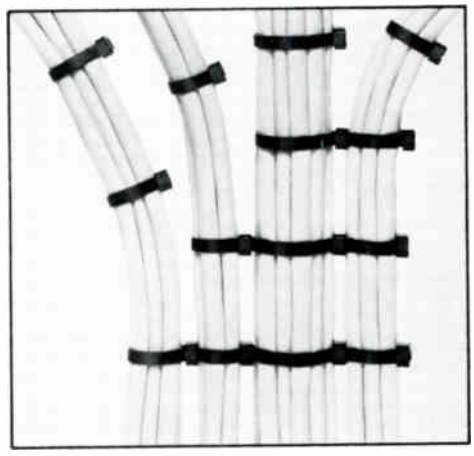
Avantek Inc. announced the introduction of the ASAT-1214 small aperture satellite communications terminal for use in business and industrial applications. This two-way terminal, designed primarily for voice and data transmission, is installed on the customer's premises, can transmit and receive at rates from 9.6 kbps to 1.544 Mbps, and features an antenna as small as 1.2 meters in diameter and less than 5 feet tall. With integrated electronics, it transmits up to 10 watts in the Ku-band between 14.0 and 14.5 GHz and receives between 11.7 and 12.2 GHz.

Avantek also announced Ametrocom™ ALW-600 and ALW-960 analog lightwave systems to complement its digital microwave radio product line. The Ametrocom ALW-600 transmits up to 600 channels of FDM voice or one video channel with signal quality in excess of 52 dB noise/power ratio (NPR). The Ametrocom ALW-960 can transmit up to 960 voice channels with comparable performance.

The Ametrocom ALW analog lightwave systems permit the extension of analog baseband voice or video signals over fiberoptic cable for repeaterless distances of over 25 kilometers. The systems can be configured to provide two 1:1 protected systems or four unprotected systems in a 19" equipment shelf. The shelf, which contains an integrated fuse panel and splice compartment, provides facilities for individual unit and major/minor shelf summary alarms and two optional orderwire channels.

Avantek lightwave systems also offer the Ametrocom DLW-2 digital lightwave system capable of transmitting up to eight DS-1 signals over fiberoptic cable for distances over 60 kilometers.

For more information, contact Avantek Inc., 481 Cottonwood Dr., Milpitas, Calif. 95035, (408) 943-4410.



Cable ties

Advanced Cable Electronics announced its new "Strap-Loc" continuous length cable ties. Strap-Loc allows cables and wires to be tied and spaced in a secure manner. It also allows wire bundles to lie flat and pass through narrow openings, providing more space for internal components or a reduction in total unit size. Spacing keeps groups of wires separate and organized for tracing and termination. Strap-Loc's "low insertion force" locking device gives assurance of strength and reliability, according to the company. A stainless steel grip locking device is recessed into the lock body to protect wires. Rounded edges on strapping prevents damage to wire insulation.

For more information, contact Advanced Cable Electronics Corp., P.O. Box 4264, Westboro, Mass. 01581, (617) 366-0669.

Status monitor

A stand-alone status monitor for broadband communications systems has been introduced by C-COR Electronics Inc.

Model SSM, stand-alone status monitor, provides monitoring of amplifiers and other devices that do not have integral status monitoring transponders. The self-contained SSM units can be installed at any location in an RF distribution system—at the ends of RF feeder or trunk lines, or at intermediate points in the trunk or feeder system.

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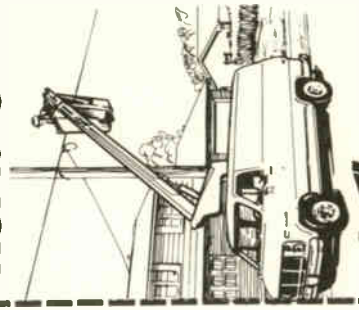

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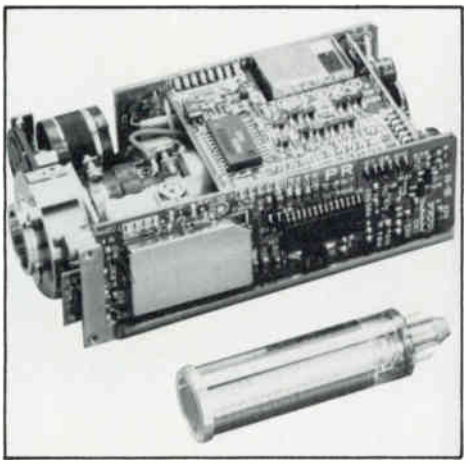
sponder, which is identical to those used in C-COR's Quick Alert amplifier status monitor system. The Model SSM units are polled by a central computer, pinpointing the exact location of malfunctioning equipment.

Contained in a weatherproof, RFI-shielded, die-cast aluminum housing, Model SSM can be strand, pedestal or bracket mounted. The unit measures 12.5" × 9.5" × 5.0" and weighs 12.5 lbs.

For more information, contact C-COR Electronics, 60 Decibel Rd., State College, Pa. 16801, (814) 238-2461.



Electrostatic camera

An electrostatic tube camera developed by Sony Corp. combines maneuverability with standard 525-line TV resolution. The new miniature camera is designed for a variety of security and diagnostic applications requiring the user to send pictures from the field via cable or telephone lines for off-site analysis.

The camera's reduced size makes it the first pick-up tube camera to fit into a shirt pocket, according to the firm. Engineers eliminated the magnetic coils used for beam resolution in conventional cameras. In place of the coils, Sony developed an electrostatic focusing and deflection mechanism that makes the camera compact, lighter and more energy-efficient than other video cameras. The camera weighs less than six ounces and requires less than 1 watt to transmit standard EIA signals.

The electrostatic camera incorporates several auto adjustment features. These include an auto iris control, and auto gain control and microcircuitry that allows auto panning when linked to programmed monitoring systems. In the field, the camera can be used in lighting as low as five luxes. Camera options include a bayonet mount for attaching specialized lenses and a microphone for integration into TV/telephone systems.

For more information, contact Sony Industries, 15 Essex Rd., Paramus, N.J. 07652, (201) 368-5001.

Earth stations

Scientific-Atlanta Inc. introduced the HS9000, a polar-mount 2.8-meter earth station antenna, with a redesigned mount. The new antenna, similar in design to S-A's Series 9000 antenna, includes features usually found only in antennas with more expensive mounts, according to the firm.

The antenna panels are manufactured using a die-stamping technique. The unique swing arm design of the polar mount allows full and continuous equatorial arc coverage after initial antenna alignment. The swing arm permits viewing of any satellite in the arc, from 59°W to 144°W longitude, from any location within the contiguous United States without additional manual antenna adjustments.

Other features of the HS9000 include manual adjustment for declination/polar angle and simplified installation and maintenance. Options available with the HS9000 are: extender panels for expansion to 3.2 meters, electronic polarization selection and motorized mount.

Scientific-Atlanta also introduced its television receive-only (TVRO) earth station designed for reception of Ku-band signals from the European Communications Satellites (ECS) and Intelsat V.

The new earth station consists of the Series 9000 antenna, with elevation over azimuth mount and dual polarized feed, the Model 6611 video receiver, and the Series 9370 low-noise block converter.

The Series 9000 2.8-meter antenna is for audio, video and data applications. The eight interchangeable reflector panels are manufactured using a die-stamping technique. Other features of the Series 9000 include full arc coverage; simplified installation, alignment and pointing; and ease of shipping.

The Model 6611 is a receiver that allows for selection of any satellite simply by choosing a frequency on the front panel. The 6611 is tuneable in 200 kHz increments to allow reception of any frequency in its operating range. The modular design of the receiver allows it to accept optional plug-in subcarrier printed circuit boards to fit a variety of applications or different satellite formats.

The Model 9370 LNB is a combination of a low-noise GaAs FET amplifier and a block converter. The LNB uses internal output isolation and an integral isolator to protect against antenna mismatch. The precision-cast housing protects the 9370 from exposure to harsh weather conditions.

Each earth station system includes installation and operating instructions.

For additional information, contact Scientific-Atlanta Inc., 1 Technology Pkwy., P.O. Box 105600, Atlanta, Ga. 30348, (404) 441-4000.

Status monitor

C-COR's new stand-alone status monitor for broadband communications systems makes status monitoring available with a minimum of installation effort, according to the firm.

Model SSM, stand-alone status monitor, provides monitoring of amplifiers and other devices that do not have integral status monitoring transponders. The units can be installed at any location in an RF distribution system, at the ends of RF feeder or trunk lines, or at intermediate points in the trunk or feeder system.

Control of the SSM is achieved by a transponder; the units are polled by a central computer, pinpointing the location of malfunctioning equipment.

Contained in a weatherproof, RFI-shielded, die-cast aluminum housing, the SSM can be strand, pedestal or bracket mounted. The unit measures 12.5" × 9.5" × 5.0" and weighs 12.5 lbs.

For more information, contact C-COR Electronics Inc., 60 Decibel Rd., State College, Pa. 16801, (800) 233-2267 or (814) 238-2461.

Broadband modem

EF Data Corp. announced the availability of the BCM-101 digital broadband modem. A proprietary digital detection technique called EFPLEX® cancels out translator, cable and synthesizer noise. This all-digital fully synthesized modem is available in data rates of 750 Kb/s and 1.544 Mb/s. Other data rates also are available. Typical error rate performance is 10^9 with spacing of .6 × data rate. Frequency range is 5 to 400 MHz with steps of 50 kHz.

For more information, contact EF Data Corp., 1233 N. Stadem Dr., Tempe, Ariz. 85281, (601) 968-0447.

Equipment protection systems

Cable Resources Inc., a recently formed company, announced two new products designed to protect electronic equipment from damage while it is being transported or stored.

The Terminal Control System provides organization and protection of CATV converters when they are in the field, at the warehouse or in repair. These vinyl-coated steel baskets come with up to 10 individual compartments.

Ampli/guard, a shelving system, provides protection for line electronics carried on a cable truck. It is adaptable to hold all types of equipment in existing truck interiors, according to the firm. The Ampli/guard is made of mold and mildew-resistant foam. The cell make-up is 40 percent closed, giving water resistance.

For more information, contact Cable Resources, 275 Circuit St., Hanover, Mass. 02339, (617) 871-6030.

COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

Upcoming editorial focus

July
- Microwave applications
- SMATV
- DBS

August
- Data applications
- Character generators
- Commercial insertion equipment

September
- Theft-of-service
- System upgrading
- Satellite security

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Space reservation deadline: 1st of month prior to insertion
Copy deadline: 10th of month prior to insertion

The art of pulling cable

Last month in part one of this three-part series, the task of placing strand was analyzed. This segment will concern itself with cable pulling and lashing operations.

By Anthony J. DeNigris
President, Nationwide CATV Services Inc

My personal feeling in the area of practices and procedures for many aspects of cable television work is, that there is a great need for refinement and standardization in the industry. It is true that many of the MSOs have developed specifications for their projects and that this tends to be a form of standardization in so far as a particular company is concerned; but as an experienced observer would discover in traveling throughout different projects under construction, many aspects of the job are done quite differently.

Except for geographical considerations, there should be no need for non-standard practices. I still see a serious lack of emphasis today, in the field, on how cable gets placed. This attitude seems to be fostered in the pressure to get things done by a certain deadline. This is not to say that system operators are not concerned with quality and procedures, because what they usually say at the same time is "naturally we expect the quality to be there." However, what happens in the field many times is somewhat different. The attitude out there usually ends up being: "Just get it up and working, as long as it looks decent."

Well, what all this translates to is that it's good to expect speed and quality, and safety as long as the people carrying out the task of making it happen are out there with the same attitude in mind. Speed must not become paramount to the crews and it must be kept that way from the top down. One might think that we (the cable television industry) have come far enough along by this point in time that pressures and deadlines shouldn't have to exist as they many times do. But this problem is only there because of a lack of planning and budgeting for projects in advance

Getting it

Some of the major points to be concerned with in laying out the mechanisms of a cable and lashing operation, in advance of the actual work being performed, are whether or not the area is tree saturated, what the makeready situation looks like, how congested the area is as far as traffic, housing (which translates into pedestrians and cars) and businesses present.

When cable is pulled out by the crew that is selected to do a particular run, the crew should already be aware of these conditions and they should somewhat govern how the task takes place. For example: In an area where a high percentage of treed spans exist, the cable crew should make sure that each span has been cleared of limbs of excessive size, which might bear down on the cable should it be lashed in place; and if the area hasn't been cleared either by a tree trimmer or by the strand crew if that was allowable, the run should not be placed in its present status.

Another example of a situation of concern is where there is a high concentration of housing and pedestrians. People will undoubtedly find the appearance of a cable crew decked out in line gear quite fascinating. And when this show is about to commence, the children (and some of the adults as well) are not going to want to miss it. This means there will be a lot of sideline interference if allowed. It could present a safety problem as well as a slowdown in production to the crews. What to do?

Common sense

When it comes to discussing how cable, or for that matter any aspect of the job has to take place, much of what I or anyone else could say, has already been said. What the situation previously described leads to is the necessity for using common sense, which in many situations doesn't happen. When a highly pedestrianized area is to be cabled, I think it is the systems duty to notify in advance, the homes on that particular street, informing the tenants as to the exact schedule and as to the potential hazards that may pose a threat to children and property in the area.

How many times have you heard of the system doing this to protect the customers from whom it will derive income? Or should it be the contractors' responsibility? I believe that it should not be on the contractors' shoulders. As for the actual task of placing and lashing cable, let's take a stab at it.

Necessary precautions

A cable crew would set up a trailer with reels of cable in the beginning of a particular run. The trailer should be positioned in such a manner as to not pose a hazard to people or traffic. It should have wheel chocks in place on the side towards the pull to help keep the trailer stationary while cable is being unwound from the reels. It also may need chocks on the opposite side of the wheels if there is a grade to contend with. The trailer should be set far enough back so as to allow for a smooth and shallow radius into the first set of rollers (a chute or 45 degree block set up as a chute).

I have seen a situation where cable breaks were not used and the cable reel unwound too much causing the cable to hang up on a part of the trailer. When the line crew down the road somewhere pulled the run out further, the trailer slid forward and rammed a parked car. Reel brakes should be used and adjusted at all times to such a degree as to not allow free spinning of the reels, which might develop from the momentum generated in the pulling out of the cables.

It is not enough to merely tighten the reel brake and expect it to work adequately. An abundance of cable rollers should be placed in areas where many pedestrians may congest along a run. the rollers should be absolutely locked down to prevent the haphazard pedestrian from having to wear a hard hat! The cable itself should be pulled out with extreme care and under tension at all times.

When the run is all pulled out, prior to lashing, it should be ridden back to the reel as with the stranding operation to check for any possible hang-ups and especially to pull back any excess slack in the run. It is this slack that develops into a raggedy looking section of lashed cable as it gets to be more profound near the beginning of the pull. The crew, when lashing back, finds itself dealing with a bunch of unwanted slack towards the last four or five spans near the set up. Hence, the opportunity exists for a kink to happen, "by accident of course." When the cable crew is lashing the cable, care must be exercised not to let the lasher get pulled other than in a strict horizontal position. What this means, is that the gate on the front of the lasher should be kept on (many linemen remove them because they get hung up in trees too easily).

The lashers (at least the more commonly used brand) have a three-ring pulling plate as part of the gate, and this allows the lasher to be pulled perfectly horizontally from almost any side angle. The lack of use of this gate many times causes "wee wahs" or the cable riding up to either side of the strand as it gets lashed. The rollers on the lasher should be set up to allow for a tight cable-to-strand configuration, which translates into tight lashing, but not too tight. Some of the more muscle-bound of the linemen like to boast that they are experts at speed-lashing. This is when a lineman receives a lasher on one side of the pole, opens the gate and picks it up to pass it to the other side of the pole without clamping the lashing wire. Any slippage in the direction the lasher came from, causes loose lashing in the previous span. All the so-called "pro" linemen will state that they do not allow any slippage when they do speed-lashing, but I say that unless they can prove that their arms absolutely lock in place when they do it, then the chance can't be taken.

The discussions that could take place from procedures in cable could be endless, however, as I have said before many times, and will surely say again many more times, "It all boils down to good old-fashioned common sense, a commodity that when possessed is quite valuable to this industry." Perhaps this article should be titled "The art of using your head"! (Next month, an analysis of underground pulling operations.)

Software HARD FACTS

When it's time to choose an ad sales software package for your cable system, you need hard facts, not sales talk. As pioneers in local ad sales – and the hardware and software that goes with it – CCI suggests you consider these points to help you make a sound decision:

Fact #1 **You can't adapt just any software program to fit your needs.** Local cable ad sales require special software programs for trafficking, billing and receivables.

Fact #2 **Experience is the best teacher;** and, at CCI, our years of experience have taught us volumes about cable requirements. We understand your needs and we meet them, with software programs custom-written for cable. After all, Cable is our middle name.

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Call us at CCI for more hard facts and straight talk about how the right software can make a big difference in your local ad sales picture.

Commercial Cable, Inc.
7353 Lee Hwy., Chattanooga, TN, (615)894-2580 (800)367-5742
Visit us at the NCTA Show, Booth 2162.

Reader Service Number 66.

Tanaka

Hitachi America Ltd. announced the appointment of **Tsuneo Tanaka** as president. Tanaka was general manager of the International Sales Division I of Hitachi Ltd. since 1981. Prior to that he was general manager of the International Sales Division II.

Tanaka joined Hitachi Ltd. in 1957, in the company's International Operations Group. In 1965 he joined the nuclear and thermal power department of the group where he was appointed section manager in 1968 and department manager in 1973. He was promoted to deputy general manager of the International Sales Division I in 1978. Contact: 6 E. 43rd St., 7th Floor, New York, N.Y. 10017, (212) 916-8500.

Wilderotter

Maggie Wilderotter, formerly director of national accounts, has been promoted to vice president of sales for **CableData**. Wilderotter joined CableData in 1980 as manager in the accounting department. Subsequently, she served as manager of regional support, marketing manager, marketing director, and director of national accounts. Prior to CableData, Wilderotter was employed by the Arizona Bank in Phoenix, Ariz., and Gorman Whitney Development Co. in Sacramento. Contact: 3200 Arden Way, Sacramento, Calif. 95825, (916) 636-4500.

GEC McMichael Ltd. announced the addition of **W. Vincent Walisko** as technical director to its U.S.-based operations. Walisko came to GEC McMichael from GTE Spacenet. He will be handling technical operations for GEC's satellite-based product line. Contact: 8260 E. Raintree, Scottsdale, Ariz. 85260, (602) 948-7255.

Steve Davidson has been named sales manager for the Network Technologies Division of **AM Cable**. Davidson formerly was regional sales manager, Data Products, with C-COR Electronics Inc. He also was a regional sales manager for Gardiner Communications and Cerro Communication, selling satellite communications equipment and coaxial cable.

In addition, **Marty Moran** has been named sales manager for the Field Services Division of AM Cable. With a background of nearly 25 years in CATV, Moran has held various sales/management postions with C.P.A. Inc., Toner Cable, Theta-Com and Jerrold Electronics. He is currently a member of the board of directors of Maryland-Delaware Cable TV Association, Philadelphia Cable Club Executive Committtee, and Pennsylvania Cable TV Association Public Relations Committee. Contact: P.O. Box 505, Quakertown, Pa. 18951, (215) 536-1354.

System members of the **National Cable Television Association** have re-elected three district directors to serve three-year terms on the association's 30-member board of directors. Members in Districts 5, 6 and 7 chose **F. Frederick Kennedy Jr.**, **John Evans** and **Myron Pattison**, respectively, by mail ballot.

Kennedy, general manager of Cablevision of North Augusta, S.C., has been president and director of the South Carolina and Southern cable TV associations and a director of the Georgia Cable TV Association. He represents District 5, which comprises Alabama, Florida, Georgia, Mississippi, North Carolina and South Carolina.

Evans is president of Arlington Cable Partners and the Washington Metropolitan Cable Club. He was a founder of C-SPAN and has been president of the Virginia Cable TV Association. He serves on the board of directors of both organizations and is chairman of NCTA's State/Local Government Committee. Evans represents District 6, which encompasses Kentucky, Tennessee, Virginia and West Virginia.

Pattison is president of Crawfordsville Community Cable Corp. He has been president of the Illinois-Indiana Cable TV Association and chairman of the Indiana Utility Relations Committee. District 7 includes Illinois, Indiana, Michigan, Ohio and Wisconsin. Contact: 1724 Massachusetts Ave., N.W., Washington, D.C. 20036, (202) 775-3629.

Steve Fox was promoted from sales engineer to the position of manager, customer applications for **Wegener Communications.** Fox will be responsible for the management of sales engineering, which includes pre-sale customer inquiries and order placement.

Joining Wegener's marketing staff is **Neil Kohrn** as sales engineer. Kohrn has been with Wegener since March 1982 in the customer service department. Contact: 150 Technology Park/ Atlanta, Norcross, Ga. 30092, (404) 448-7288.

At a recent banquet in Miami, the **JVC Professional Video Communications Division** honored five district sales managers. **Jim Turner**, **Mike Halbrook**, **Jim Klein** and **Bruce Morrison** were named "Regional DSMs-of-the-Year," while **George Doiron** captured the "National DSM-of-the-Year" award.

Turner, who won the regional award for the East Coast district, serves Pennsylvania and Delaware. In the Southwest region, Halbrook covers southern Texas. Klein won the award for the West Coast region. His territory covers southern California and Hawaii. Midwest winner Morrison covers Michigan and northern Indiana. Doiron, the "National DSM-of-the-Year," covers six New England states—Connecticut, Massachusetts, Rhode Island, New Hampshire, Maine and Vermont. Contact: 41 Slater Dr., Elmwood Park, N.J. 07407, (201) 794-3900.

Avantek Inc. announced the appointment of **Ron Atwater** to the position of eastern region field sales manager and acting central region field sales manager. Atwater joins Avantek from Hewlett-Packard, where for 15 years he was involved in sales and sales management for the Component Products Group.

Avantek also announced the appointment of **Charles Bellavia** to the position of western region field sales manager. Bellavia joins Avantek from his position as national sales manager for Thompson-CSF Components Corp., Semiconductor Division. Contact: 3175 Bowers Ave., Santa Clara, Calif. 95054-3292, (408) 727-0700.

Robert Allen, one of the original founders of **Technical Materials Inc.**, returned to the company as sales engineer. Allen is responsible for all sales and technical support for the company's southeastern sales regions, including Florida, North Carolina, South Carolina, Georgia and Alabama. Utilizing his 25 years of expertise in the metallurgical industry, Allen will work closely with TMI customers providing production and technical assistance for customer products. Contact: 5 Wellington Rd., Lincoln, R.I. 02865, (401) 333-1700.

First Data Resources Inc. announced the promotions of **Jim Coury**, **Bob Hall** and **Jim Perkins** to national account managers for the Cable Services Division. Prior to Coury's appointment he was the manager of corporate services. Perkins was the product manager of the Cable Services Division, and Hall was the regional sales manager in FDR's Transaction Services Division. Contact: 7301 Pacific St., Omaha, Neb. 68114-5497, (402) 399-7000.

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AD INDEX

CALENDAR

June

June 1-2: National Satellite Cable Association annual mid-year meeting, Riviera Hotel, Las Vegas, Nev. Contact Mickey Gorman, (202) 659-2928.

June 2-5: National Cable Television Association annual convention, Las Vegas (Nev.) Convention Center. Contact (202) 775-3629 or (202) 775-3606.

June 4-7: Continuing Education Institute course on satellite communications, Amfac Hotel, Los Angeles. Contact (213) 824-9545.

June 6: Information Gatekeepers seminar on testing/measurements for fiber optics, Logan Airport Hilton, Boston. Contact Danae Fasano, (617) 232-3111.

June 9-13: M/A-COM MAC training seminar, MAC training and convention center, Burlington, Mass. Contact Carolyn Calorio, (617) 272-3100.

June 11-13: Security Equipment Industry Association and **National Burglar & Fire Alarm Association** "ISC Expo 85," O'Hare Exposition Center, Chicago. Contact Ann Feltes or Bill Campeau, (818) 965-7454.

June 16-18: New York State Cable Commission annual "Northeast Cable Television Technical Seminar," Lake George, N.Y. Contact Bob Levy, (518) 474-1324. SCTE endorsed.

June 17-19: Community Antenna Television Association annual convention, CCOS '85, The Opryland Hotel, Nashville, Tenn. Contact Ruth Williams, (703) 823-6522.

June 18-20: Jerrold technical seminar, Dallas. Contact Beth Schaefer, (215) 674-4800.

June 19: SCTE Delaware Valley Chapter meeting on basic system preventive maintenance. Boston Sea Party, Willow Grove, Pa. Contact Bev Zane, (215) 674-4800.

June 21: The Government Law Center of Albany Law School's northeast regional conference on "Regulating Cable TV: The Changing Picture," Albany Law School, Albany, N.Y. Contact Barbara Mabel, (518) 445-2327.

June 24-26: Online Conferences' Videotex '85 conference and exhibition, New York Hilton. Contact Online, (212) 279-8890.

Planning ahead

Aug. 25-27: The Eastern Show, Congress World Center, Atlanta.
Sept. 18-20: Atlantic Show, Atlantic City, N.J.
Sept. 25-27: Great Lakes Expo, Convention Center, Indianapolis.
Dec. 4-6: Western Show, Convention Center, Anaheim, Calif.

June 26: SCTE Rocky Mountain Meeting Group seminar on distortion calculations and system design calculations, Denver University. Contact Joe Thomas, (303) 466-7376.

June 26: SCTE Golden Gate Chapter meeting on microwave licensing, San Jose, Calif. Contact Pete Petrovich, (415) 463-0870.

June 27-29: Michigan Cable Television Association annual summer meeting, Holiday Inn, Traverse City, Mich. Contact John Liskey, (517) 351-5800.

July

July 9-11: Online Conferences Inc. satellite and cable TV conference, "The Cable '85 Exhibition," the Brighton Metropole, U.K. Contact (212) 279-8890.

July 9-11: Jerrold technical seminar, Portland, Ore. Contact Beth Schaefer, (215) 674-4800.

July 10-12: Magnavox CATV training seminar, Detroit. Contact Laurie Mancini, (800) 448-5171; in New York, (800) 522-7464.

July 11-13: Montana Cable Television Association annual meeting and convention, Village Red Lion Motor Inn, Missoula, Mont. Contact Tom Glendenning, (406) 586-1837.

July 15-17: New England Cable Television Association annual convention, Dunfey Hyannis Hotel, Hyannis, Mass. Contact William Durand, (617) 843-3418.

July 15-18: American Federation of Information Processing Societies' National Computer Conference, "Technology's Expanding Horizons," McCormick Place, Chicago. Contact Helen Mugnier, (703) 620-8926 or (800) NCC-1985.

Keeping the power on

By Johan Dooyeweerd
Marketing Manager, Alpha Technologies Inc

Since their introduction to the CATV industry almost two decades ago, standby power supplies have become a standard feature of many of today's cable systems. Although the function of such products is to provide emergency backup power in case of a localized utility outage, these same power supplies may become the source of such an outage if they are not properly designed, installed or maintained.

There are three basic areas of concern in preventive maintenance of a standby supply:

- The batteries
- Protective devices (fuses, breakers, "lightning arrestors," indicators, etc.)
- Adjustments

Batteries

It is imperative that the batteries are subjected to an individual check *before* they are installed to ensure proper operation and full service life. This is because most, if not all, battery chargers in today's standby supplies use a "string" charging method. Two or more batteries are placed in series and the same charge current is flowing through each one.

Should, at the outset, one battery be 50 percent charged and the other 80 percent, the string voltage, which is the combined terminal voltage of both batteries, would indicate an average 65 percent charge ([80 + 50]/2). The charger would overcharge the 80 percent charged battery to perhaps 120 percent while leaving the other battery only 80 percent charged when cut-off or trickle would commence. When three batteries or more are employed, simply calculate the average charge like so: (80 + 50 + 60)/3 = 63.3 percent.

Over time, with a number of charges and discharges, a balanced condition may be established or things could go the other way, leaving certain batteries severely overcharged, and others undercharged.

While the latter condition results in backup time of perhaps only a few minutes, the former causes shortened battery life. To add to the problem, detection of this last condition is difficult without time consuming tests. The foregoing demonstrates dramatically the importance of pre-installation checks.

Check the manufacturer's specifications for each type of battery. A reading of 12.75 volts or higher generally indicates full charge (but not necessarily full capacity). The battery should have been disconnected from a charger for at least five minutes before this test.

Capacity can not be easily tested for, without the aid of special equipment, and may be assumed to be at peak when the battery is subjected to the above test a short time after purchase.

The date code is another important check. This code is usually in the form of a set of three or four numbers or a letter/number combination and indicates the month and year (or vice versa) of manufacturer. It is generally located on the top or side of the battery.

For example H2 would indicate August 1982. (H is the 8th letter in the alphabet, August the 8th month). The letter I is generally skipped as it can be confused with the number 1. Another example using numbers only is 412. This indicates 1984 December (12th month). January 1982 would be shown by 201, etc.

When wet-cell batteries are to be installed, check that the date code corresponds to a manufacture date of not more than three months prior, unless there is evidence that the batteries were charged in the interim. Wet-cell batteries that have been in storage for more than three months without recharge should be considered suspect and not used until further testing can be done.

Other meaningful tests cannot be done in the field on gelled or so-called starved electrolyte batteries owing to their sealed construction.

Wet-cell batteries can, however, be checked for both specific gravity and electrolyte level and may be replenished if filler caps are incorporated. A specific gravity tester, commonly available in automotive retail stores, can be used for this purpose.

Visual inspection of the electrolyte ("water") level may call for the addition of distilled water. This always should be followed by an "equalize" charge for approximately 2-3 hours (some standby supplies are equipped with automatic time-out of the equalize function) to properly mix electrolyte and water.

Electrolyte levels should be checked at least once every two months to maintain full function of the standby supply. In addition, a six-month interval check for corrosion, loose connections, etc., should be performed regardless of the battery type. Corrosive build-up can be neutralized by an alkali solution of baking soda. Cover the terminals with a petroleum jelly after cleaning.

When replacing bad batteries, do not mix types, and preferably replace them in strings, i.e., two or three batteries at a time. By matching date codes (within three months), older batteries that are left over from the broken string may be used to form new ones, albeit with lower capacity. Do not reuse batteries that have been in service for more than four years.

Protective devices

Naturally, before installation of a standby power supply, all fuses, breakers, indicator lights and movistors or gas discharge tubes (lightning arrestors), should be at least visually inspected for continuity and/or discoloration, indicating overload or shorts.

'Standby power supplies may become the source of an outage if they are not properly designed, installed or maintained'

Once installed, the power supply should be subjected to a simple but effective operational check: Pull the line-cord or disconnect the utility in some other fashion. Most fuses, indicators and breakers will be tested in this manner. Some standby power supplies are equipped with automatic self-test features that can be activated through a switch or even remotely. If the power supplies are not fitted with these handy aids, manual testing of the unit, as outlined above, is a must in any preventive maintenance program. The recommended minimum interval for these tests is two months.

Surge protectors generally are somewhat more difficult to test in the field without special equipment. Movistors generally fail in a shorted mode, causing either the input breaker or the output breaker or fuse to trip or blow. A visual check for discoloration or burn marks on these parts will tell the story most of the time.

Indicator lights should be replaced when defective as they provide an important visual aid in establishing operational status. Also check for fuses and/or breakers not located on the front panel. When these are blown or tripped, a catastrophic failure probably has occured. Do not replace these without consulting the manual or the factory.

Adjustments

Simply stated, *leave standby power supplies alone unless you are convinced that they have been "played" with by unauthorized personnel.* Should a different voltage setting for a new type battery need to be set up for the charger, or a longer time-out cycle chosen, carefully consult the instruction manual for adjustment procedures. Many adjustments may not show any immediate result but may affect correct operation of the charger or inverter. Most manufacturers will use a sealing lacquer to cover pre-adjusted potentiometers and a broken seal is a good indication of tampering.

If the preceding checks and procedures are followed, as well as keeping complete records of your maintenance activities, standby power supply malfunctions can be substantially reduced—resulting in a more satisfied customer.

Getting the most out of your bench sweep

Part I of this series (CT, May 1985) outlined the economy of effective bench sweep testing and discussed the basic components of a typical bench sweep system. The remainder of this series will focus on the application of common measurement techniques and some of the measurement errors that can affect the accuracy of your bench sweep testing.

By Ron Hranac
Corporate Engineer Jones Intercable Inc

This information is intended to be used as a general guideline; an explanation of the steps involved in bench sweeping. You should refer to the instructions provided by the manufacturer of your particular sweep equipment for specific operating procedures.

Gain measurements

The gain of an amplifier is basically measured by inserting a variable reference attenuator in series with the device under test (Figure 1). After setting up the RF sweep generator for the required bandwidth and RF level, the bench sweep system is calibrated by setting the reference attenuator(s) to 0 dB, and connecting the test leads together with a suitable barrel. Then the equipment is adjusted to match the reference and test traces on the display oscilloscope (Photo 1). If an external power inserter will be used to provide power to the amplifier, it should be included in the test loop (power removed) when calibrating the equipment. Now adjust the reference attenuator(s) for maximum attenuation.

Remove the barrel and connect the amplifier in its place; being careful not to allow voltage to reach the detector, reference attenuators, or feed back to reach the RF sweep generator. Apply operating voltage to the amplifier. With jumpers installed in place of the amplifier's pads and equalizers, and amplifier gain set at maximum, reduce attenuation in the reference attenuator(s) until the test and reference traces match again. Some adjustment of amplifier's slope probably will be necessary to achieve this.

The amount of attenuation in series with the amplifier is now "equal" to the maximum gain of the amplifier (see Photo 2).

A second method of checking amplifier gain involves the use of "reference" cable in the test loop (Figure 2). This method requires that an appropriate equalizer be installed in the amplifier. The measurement is similar to the first method, except that the gain of the amplifier is equivalent to the combined losses of the "reference" cable, equalizer, and reference attenuation required to match the test and reference traces.

With either method, in addition to gain, bandwidth and flatness also can be mea-

Figure 1: Measuring amplifier gain with the variable reference attenuator

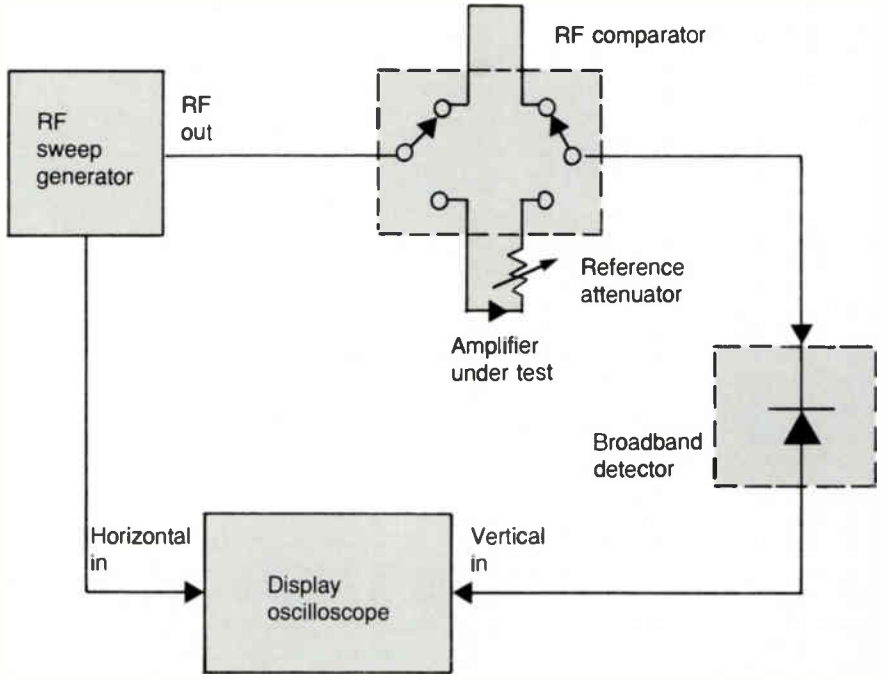
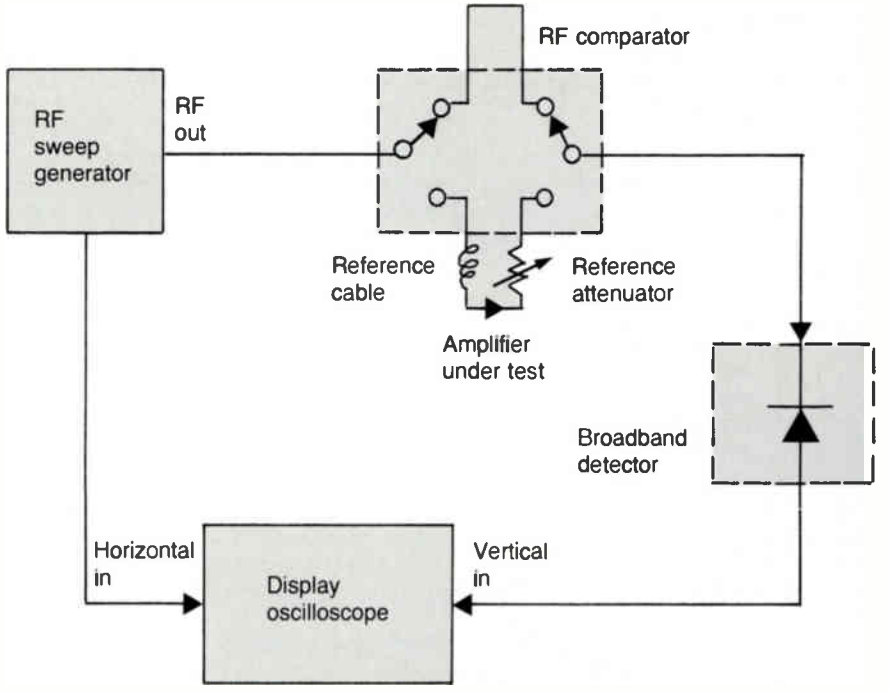


Figure 2: Checking amplifier gain using reference cable in the test loop



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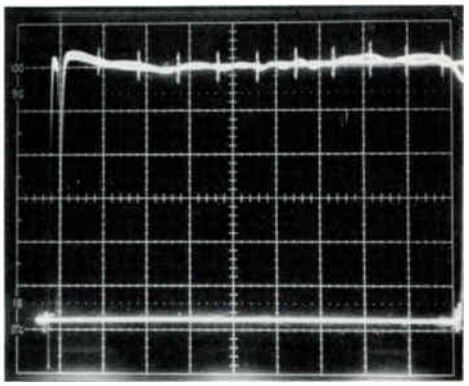
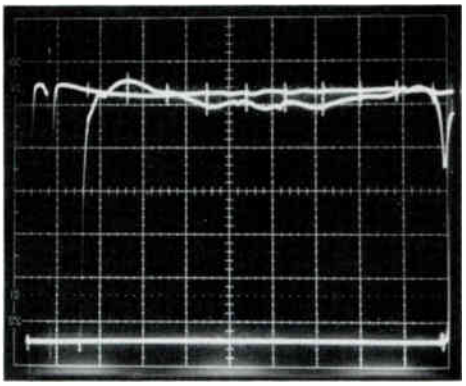
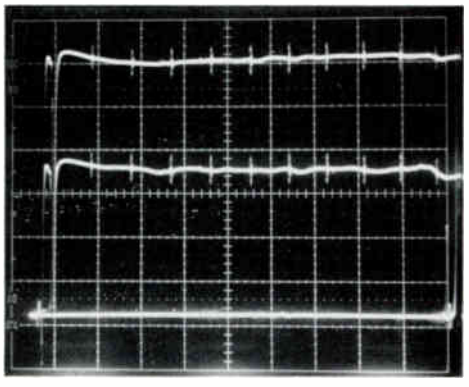
sured. Frequency markers provided by the RF sweep generator allow easy identification of points of interest on the displayed oscilloscope traces. Flatness can be determined by moving the test trace relative to the reference trace using 0.1 dB or 1 dB increments of the reference attenuator(s), and observing the difference, in dB, between peaks and valleys in the test trace. Remember when checking flatness, the amplifiers should be set at the manufacturer's recommended gain and slope, and your test set should be accurate within 0.1 dB. (A tenth of a dB error aligned into each amplifier due to a test set up error will give a 1 dB system peak to valley after a cascade of 10.)



1) The bench sweep is calibrated when the test and reference traces line up. Note the frequency markers, which are spaced 50 MHz apart.



2) When the gain of the amplifier is equal to the loss in the reference attenuators, the test and reference traces will line up again.



3) The test trace is below the reference trace due to the insertion loss of the device under test. The amount of attenuation required to line up the traces again is equal to the loss of the device being measured.

Loss measurements

Insertion loss, bandpass, bandwidth, isolation and flatness can all be measured using the equipment configuration shown in Figure 3. (Return loss measurements will be discussed in Part III of this series.)

The RF sweep generator is adjusted for the desired bandwidth and operating level; with the reference attenuator(s) set at 0 dB, the test leads are connected with a suitable barrel. The equipment is adjusted to match the test and reference traces on the display oscilloscope (Photo 1).

The barrel is removed, and the test leads connected to the device under test. It is important that any unused ports on devices such as splitters, taps and directional couplers, be terminated during measurement. Failure to do so will produce an erroneous display on the oscilloscope.

The test trace will have moved lower on the display oscilloscope (Photo 3) because of the insertion loss of the device under test. Now adjust the reference attenuator until the two traces line up again. The amount of attenuation required to do this equals the insertion loss of the devices under test.

Measuring isolation of, say, a two-way splitter, can be done with the same equipment configuration. Terminate the input port of the splitter and connect the test leads of the bench sweep (after checking calibration with the barrel and 0 dB attenuation) to the two output ports of the splitter. Adjust the reference attenuation until the reference and test traces line up again. The amount of attenuation in the reference attenuator now equals the isolation of the splitter.

A four-way splitter would be measured the same way. Just remember to terminate all unused ports before making the measurement.

Checking the isolation of a directional coupler would be done by connecting the test leads to the tap port and output (thru) port, and terminating the input port.

As with gain measurements, flatness and bandwidth of the device under test can be interpreted from the displayed traces on the oscilloscope by using the frequency markers and reference attenuator(s).

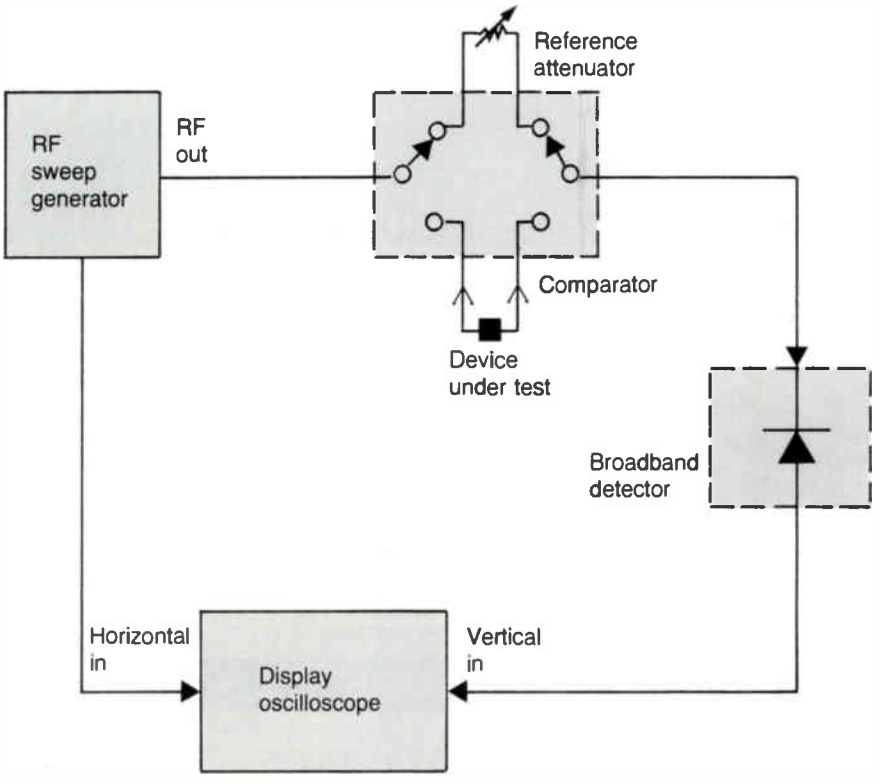
The bandpass of devices such as filters and traps, as well as their insertion loss and flatness, can be checked with this configuration, as well.

Measurement errors

Any test procedure is susceptible to measurement uncertainty and bench sweep testing is no exception. Two of the most common sources of inaccuracy in bench sweep measurements are detector risetime error and impedance mismatches.

Detector error is the inability of the broadband detector to accurately track the risetime

Figure 3: Equipment configuration for loss measurements



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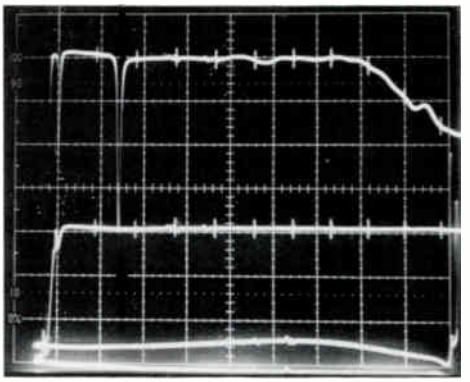
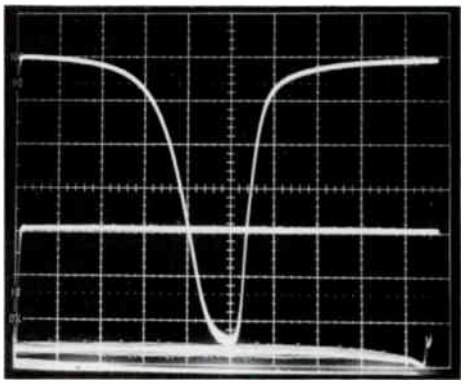
of the actual response of a circuit. That is, the sharp skirts of a device such as a filter or trap have a certain real risetime that can exceed the risetime of the broadband detector. When this happens, the detector's DC voltage output does not track the actual response of the device under test as it is being swept.

A good example of detector error occurs when measuring the notch depth (insertion loss) of a trap. Photo 4 shows the bandpass of a 77.25 MHz trap, and the apparent insertion loss is 15 dB. But when the sweep rate of the RF signal generator is slowed down, or the swept bandwidth is reduced, the broadband detector will more accurately track the response of the device under test. Photo 5 shows the same trap under these conditions. Note that the apparent insertion loss has increased. This is a more accurate representation of the actual response of the trap. When in doubt, reduce the sweep rate and/or the swept bandwidth!

Impedance mismatch occurs when any part of the RF signal path deviates from its intended impedance. When this happens, some of the RF energy is reflected back toward its source. Obviously, if 100 percent of the RF signal does not make it through the circuit, unwanted signal losses have occurred. Depending on the phase relationship of the signals reflected by the mismatch, some cancellation of the main signal can result.



4) The apparent depth of the notch at 77.25 MHz is 15 dB.



5) The same notch from Photo 4. Here the sweep rate and swept bandwidth have been reduced. Note that the notch has moved below the -15 dB reference trace, indicating greater notch depth than shown in Photo 4.

Ideally, the impedance of a CATV bench sweep system and its components should be 75 ohms. Manufacturing tolerances, physical defects and other problems all contribute to slight variations in the actual impedance, which can add error to the measurements being made with the equipment.

Measurement errors due to mismatches can be reduced by using precision lab-type connectors and adapters to interface the equipment. Your percentage of accuracy also can be increased by installing a 6 dB pad at the end of each test lead where the connection to the equipment being measured is made. To compensate for the additional 12 dB of loss in the test loop, 12 dB of attenuation also will have to be added to the reference loop of the comparator. These attenuators will reduce the amplitude of reflected signals caused by impedance mismatches.

Another source of mismatch error is the failure to terminate unused ports of splitters, couplers and taps. If those ports are not terminated, measurement inaccuracy will result. Photo 3 shows the response characteristics of a splitter with its extra ports terminated.

The moral of the story

Effective use of a bench sweep system can make it a versatile tool in day-to-day cable TV operations. Next month we will look at return loss measurements using both fixed and variable return loss bridges.

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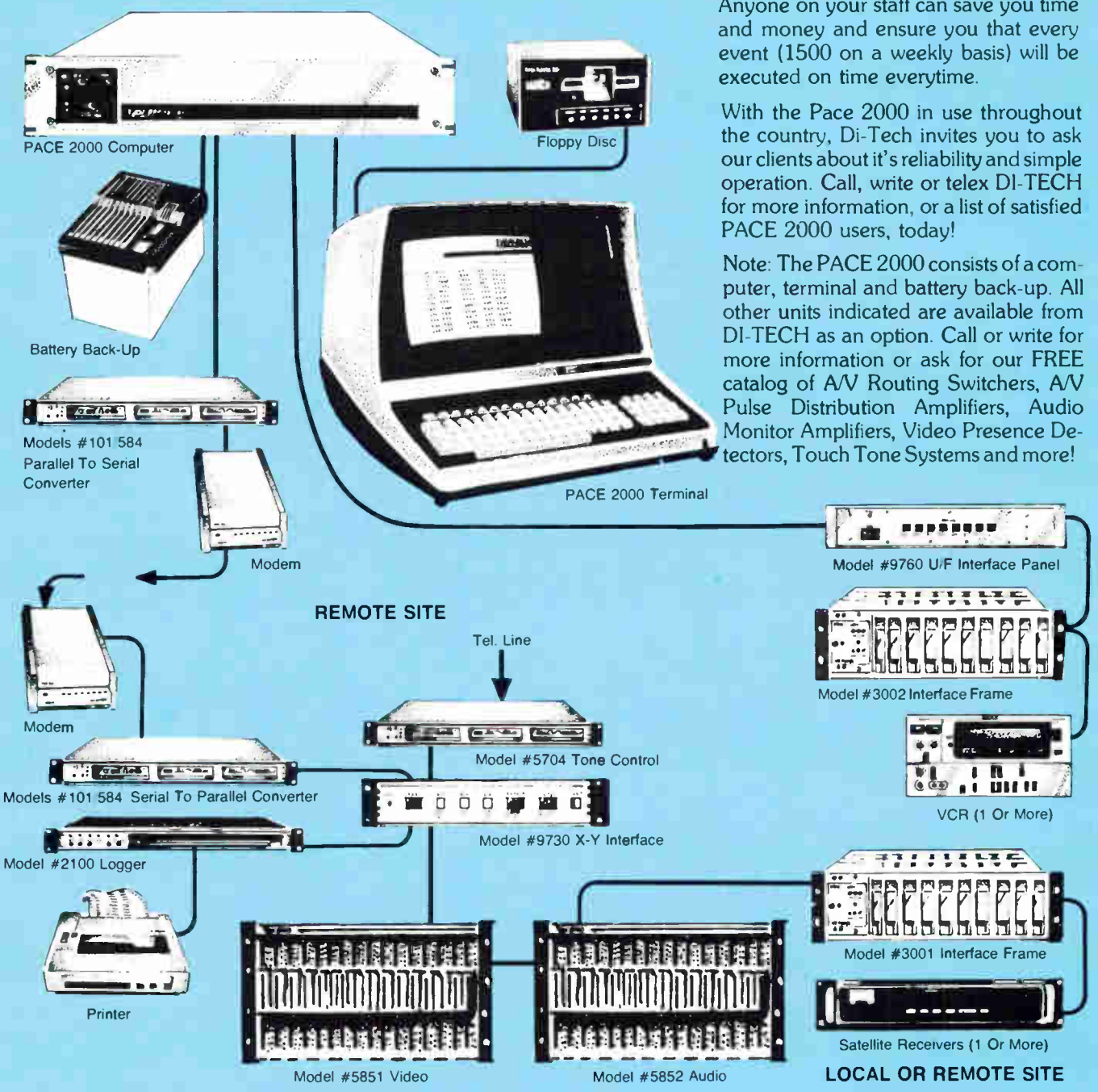

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Reader Service Number 71.

Installers beware

By Robert A. Luff
Senior Vice President, Engineering
United Artists Cablesystems Corp

Somewhere in Texas an installer knocked on the door of a previous new-install female subscriber at 4:30 a.m. Recognizing him as the trustworthy CATV installer, she opened the door, and minutes later with a knife, she was dead.

Somewhere in Arizona, an installer unlatched a second floor patio door during a trouble call and returned that night. With climbers he spiked his way up a pole adjacent to the patio and burglarized the house.

And far from last, somewhere in the south one chilly morning, an installer noticed the lady attempting to light a gas heater and running out of matches after several tries. When she returned a while later, he realized the room reeked of gas just as she was about to strike a new match. (Oh yes, she was still in her bathrobe.) He jumped up, turned, tripped and fell onto the lady. The bathrobe became undone, she screamed, and the husband who worked nightshifts came running in the front door.

High risk group

What do these and all other CATV installers have in common? They are all part of a high risk group—high risk of becoming involved in something neither the cable company, the subscriber, nor the installer ultimately bargains for or wants. These high risk, unwanted involvements can range from schemes to steal CATV service or devices, burglary, assault or worse.

Are all CATV installers destined to be thieves and crooks? Certainly not. But by national standards, CATV installers fall into a wide group of service occupations with a much higher than average potential for becoming involved with their "clients" in a way that eventually benefits neither party. To make matters worse, cable companies do all they can to keep such situations out of the press, out of convention sessions, out of their own coffee room discussions, because of the understandable negative connotations. But, by concealing these high risk problem situations rather than addressing the causes and cures, others may unsuspectingly, or worse, intentionally, walk into this volatile web.

No one knows for sure, but it is believed that the abundance of unsupervised time, ready access to the subscriber's home, and familiarity with their jobs and subscribers may be the roots of potential danger for these high risk installers. Consider the following: On the average in just six months, a CATV installer enters about 1,000 homes or apartments. As one installer told me, "You can tell more about a person during a routine install than you normally can on a first date."

To illustrate, the following is an account from a single, male installer who has been assigned a new-connect for Jane Doe.

"You begin forming impressions as soon as you look at the work order. From the type of work order, if it is a new-install, the subscriber is either new in town or recently separated. A non-pay disconnect or reconnect conveys different information. From the address, you know what section of town and average cost of homes or apartments. The phone number gives away whether they have special features like call-forwarding or just the basics. If a relatively expensive house has call-forwarding, chances are good that there will be expensive 'toys,' VCRs, top-of-the-line color TV monitors, stereos and so forth.

"As you drive up to the house, you can almost immediately tell if there are pets and kids from the driveway and front yard. If there is a car in the driveway, what make, year, body style, color is it? These provide clues to personality. Does it have any bumper stickers revealing special interests? Does it have a company or college parking lot sticker? By now, you may know where Jane Doe works, where she parks, what her hours are, and likely arrival time home from work. What does the yard look like? Is it neat or overgrown? Is there any sign of a husband or boyfriend?

"But all this is nothing compared to what you learn after you ring the doorbell. Most of the time it is the lady of the house that is home or stays home from work on CATV installation day, so CATV installers get used to being greeted by a woman. Greeted by so many women (possibly over 1,000 in six months), this first interaction can conceivably determine the pattern for the rest of the visit. Some are shy, some are overly friendly, some are strickly business, some are cautious. How they are dressed is all-revealing too: working attire, shorts, jeans, bathrobe and curlers.

"As you are invited in and led to the TV, you learn a great deal about Jane Doe. How does the place look? Usually, after just a few steps you notice smells. Does it smell fresh and nice, like burnt toast, or pets? It only takes a few seconds to glance around and capture the high points—new or old furniture, pictures on the wall and clues to interests and people relationships.

Would a teller at a bank window know this much about a depositor? Does your doctor or minister know this much about you? I doubt it. But now, what if Jane Doe was not home, leaving a note to go on in? What if the only person at home when you got there was her 15-year-old-daughter? What if Jane Doe answered the door in a bathrobe or less? What if during the span of the install, say while you were in her bedroom, Jane Doe asked you to help her with her dress or made obvious flirtations toward you?

This exposure is why installers are in the high risk classification—these things *do* actually happen. Most of the time they are perfectly harmless. But each confrontation has the potential of becoming an explosive situation that could ruin a job, career and/or marriage.

Loose system subscriber data

Of course, the information gained about a subscriber during an install goes beyond the examples already covered. But, for the seasoned installer considerable more data is available back at the office, if he is so inclined. Nearly all installers interviewed said that they have ready access—no questions asked—to all subscriber records, even though their managers were confident that "the system maintains subscriber data under lock and key."

What can you learn from system subscriber records? A lot! An installer took out a "personal ad" in local paper for a female companion to join him, all expenses paid, to Hawaii. He was able to narrow the field from over 50 to just two applicants from the system subscriber data and the R.L. Polk telephone/address cross-reference book published for nearly every city and town in the United States.

System billing data shows the payment history of these two subscribers in the run-off for the Hawaiian trip. And, the amount they paid provides some insight to their income. In addition, whether they are subscribing to Disney or Playboy provides important data for our installer friend. The data also shows past addresses, employer, position from which salary can be approximated. By looking up all other subscribers with the same last name and checking against his potential dates' previous addresses, the installer is able to guess if the subscribers are single, divorced, live alone or with family. Is this data useful? I understand he had a wonderful time in Hawaii.

Although the above account is a harmless use of system records, suppose an installer develops an abnormal hostility to harrass or physically harm single women, living alone, with no relatives in town. Loose system records then become deadly serious.

Protect yourself

Installers should familiarize themselves carefully with company policies regarding when not to enter a home or when to call for a "back-up." Installers should be on the alert for "too familiar" conversations and move them back to business-only or neutral topics.

Next month, we'll look at some needed company programs that should help diminish this problem.

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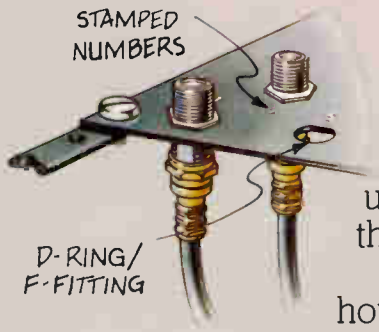

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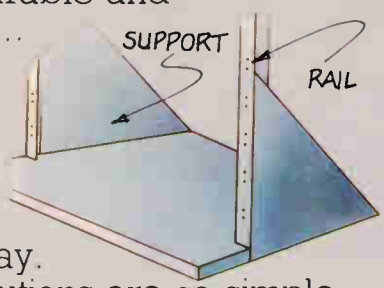

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