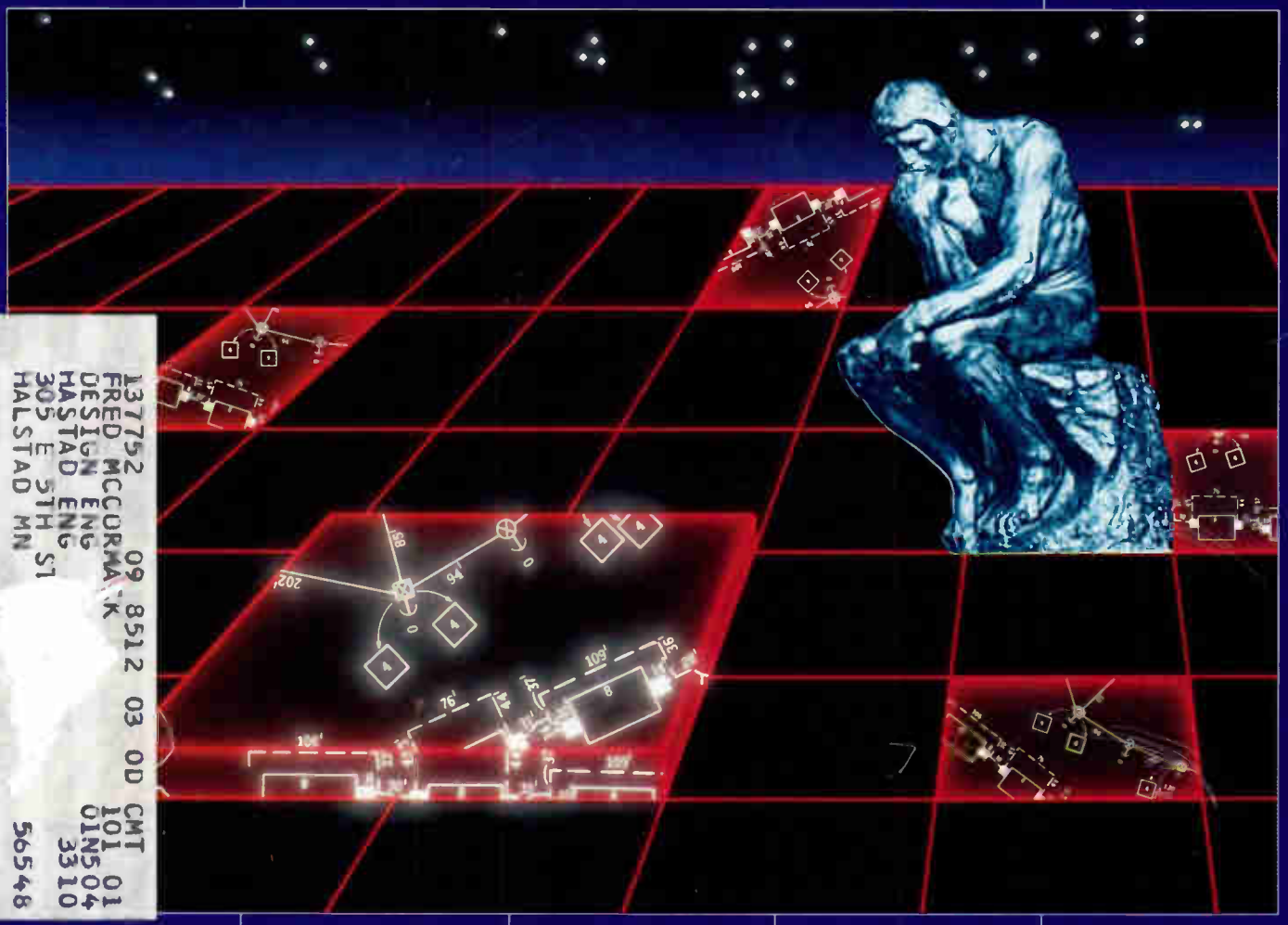
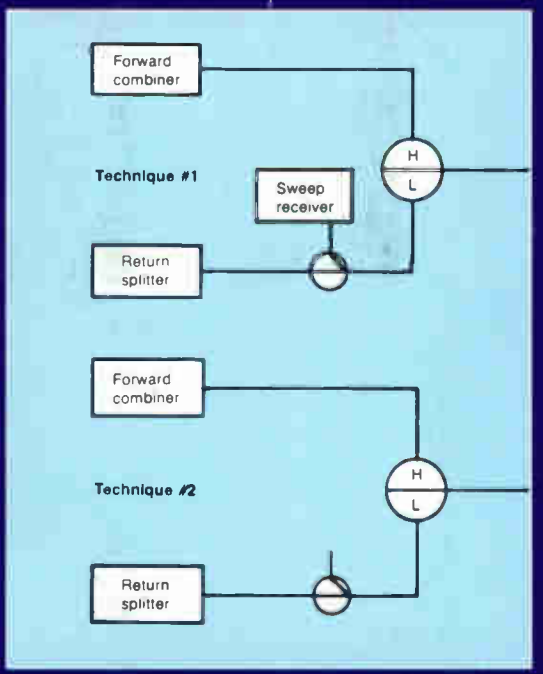
COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers



Purchasing decisions: A thinker's challenge



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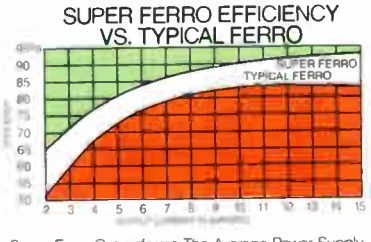

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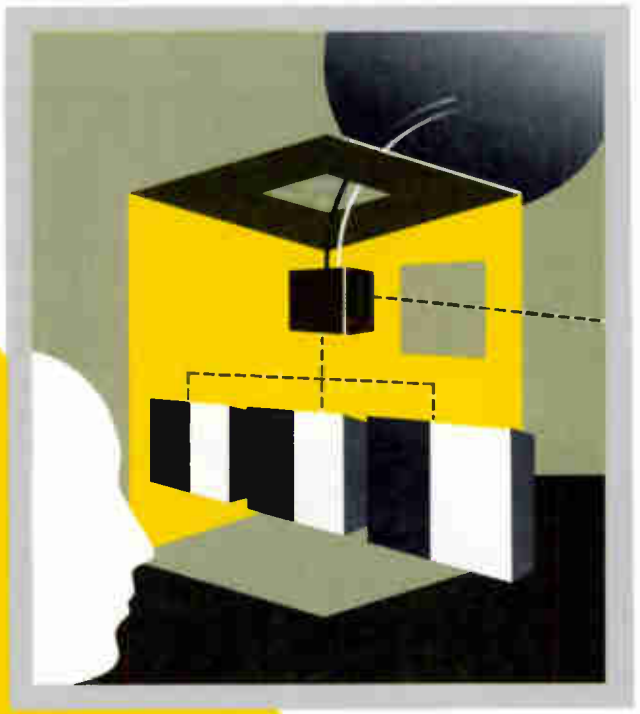

Stereo TV is quickly becoming an important part of the American home. Network and independent production of stereo programs is increasing rapidly and so is the number of Pay-TV services urging that their product be provided in stereo. All of this means that cable operators who want to take advantage of these marketing opportunities must implement ways of carrying the new stereo signals.

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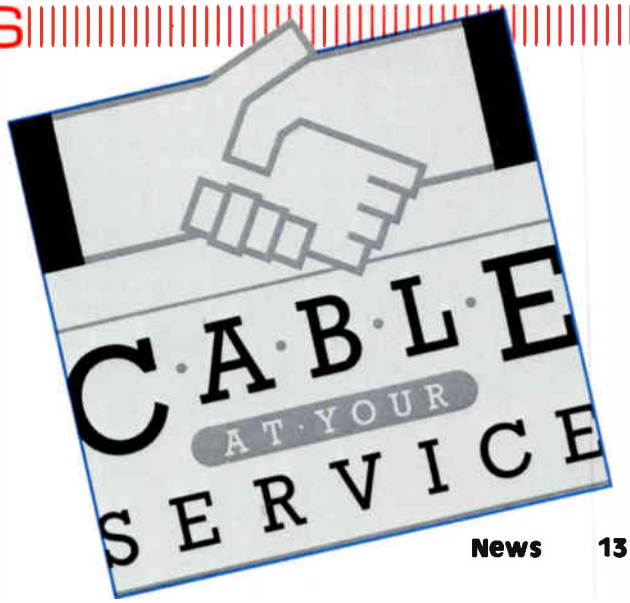

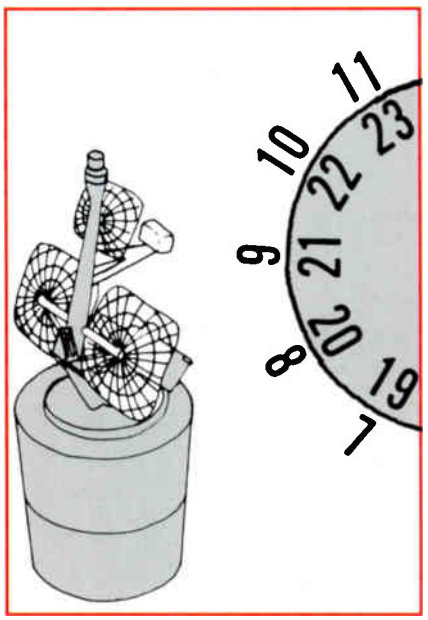

Features

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GENERAL INSTRUMENT

Common sense yields dollars

Would you shop for groceries blindfolded, or buy a used Lamborghini without checking under the hood? Of course not, but some in the cable industry involved in making purchasing decisions are no better prepared in their choices. So what does it take to make good buying decisions?

To find out, we asked several experts what guidelines they followed in making intelligent purchases. Dan Pike, vice president of engineering at Prime Cable, says, "Purchasing decisions in a cable company these days should be made on the basis of the greatest value to the company. Dynamics change from day to day, making it incredibly hard on the purchaser."

In an industry with often-changing standards and advancing technology, choices become more difficult as new products are introduced or technical breakthroughs announced. It's therefore important to make purchasing decisions that effectively meet the cable system's needs in the midst of the surrounding confusion.

Hindsight

No purchasing process should be attempted without some time spent in researching products. To quote David Willis, vice president, engineering for Tele-Communications Inc., "In purchasing procedures, what we initially do is qualify the technical reliability of the product by running it through an R&D evaluation. Then we look at the applicability as far as the system approach is concerned, then get into the analysis of cost, availability, etc."

Research involves studying the history and reputation of a company you might consider making a large purchase from, as well as asking customers of a particular product for information, be it testimonials, complaints or suggestions.

Another helpful area may be no further than your computer records and storage facility. Consult the data banks for previous purchases; search the shelves for inventory. Then, ask yourself questions that will lead you to better decision making next time. For example: Were too many products ordered? Was there already an earlier product gathering dust? Who was responsible for a purchase and were others consulted? To borrow a phrase, look before you leap.

Foresight

After doing exhaustive research for the purchase you are considering, look down the road and see if you can determine what lies ahead. You'll probably come to the realization that the road twists and turns and contains numerous bumps and potholes. If your plans are for an addressability upgrade in the near future, it probably wouldn't make sense to stock up on non-addressable converters to last you five or 10 years.

Decisions that take into account long-term goals are perhaps the most difficult. Ed Breen, vice president of marketing for the Jerrold Subscriber Systems Division of General Instrument, says, "Key factors in making decisions include purchasing equipment that's not going to be considered obsolete within a very short period of time. I guess behind that there is a lot of dynamics taking place in the market right now . . . Most product being shipped in the marketplace nowadays will be obsolete when a technology like IPPV takes hold in the very near future.

"So, if you're going to be making a big purchasing decision on equipment for any system, IPPV capability, at least in the converter, should be a very important consideration. Right on top of that is to have the capability to mix and match products to ensure a consumer-friendly approach. And overriding all this: Is your supplier going to be there a year from now, two years from now, four years from now, to support the product that you purchased from them? There's been a lot of shakeout recently; a lot of people have exited the business."

Insight

Once you have made your decision, what else needs to be done before executing it? Austin Coryell, vice president of engineering for American Television and Communications, states, "One thing in purchasing products is that you always should have an alternate source for any product that you buy. When you're dealing with millions of customers and have a product with no replacement, it can create a tremendous amount of problems in the future if that manufacturer goes out of business."

Finally, let others become involved in the final decision process. Many hands make light work and experience often is found in people who have little to do with the actual purchasing. Taking all of these into mind, it's easy to see that common sense in purchasing decisions equals dollars spent more wisely and saved more often.

Toni J. Barnett

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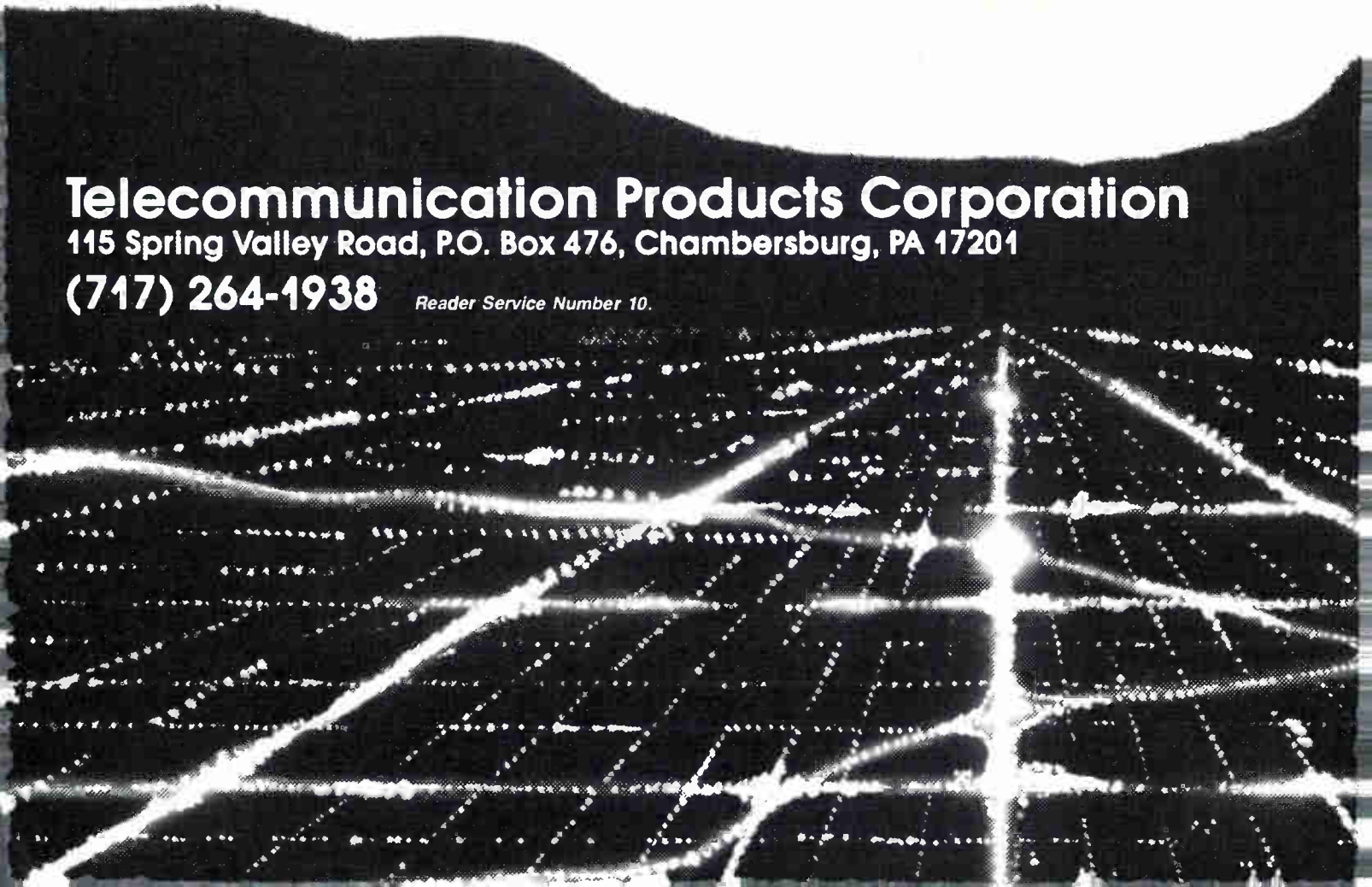

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Great Lakes Expo '86: 'Cable at your service'

COLUMBUS, Ohio — Touted as cable's largest convention in the Midwest, the 1986 Great Lakes Cable Expo is expected to draw record attendance when it meets Sept. 23-25. According to Dan Helmick, expo chairman, the show could attract nearly 2,000 operators, suppliers and others interested in the theme "Cable at Your Service."

Sponsored by the cable associations of Illinois, Indiana, Michigan and Ohio, the expo plans both marketing and technical seminars, as well as exhibits from over 100 companies.

The following expo agenda features Society of Cable Television Engineers-organized activities, as well as technical roundtables.

Tuesday, Sept. 23
8 a.m.-8 p.m. — Registration

12:30-1:30 p.m. — SCTE general session: "How Will Technical Deregulation Affect Your System?"

1:45-4 p.m. — SCTE breakout sessions: practical applications of fiber optics, local area networks, impulse pay-per-view, and video and audio signals and systems

4-6 p.m. — BCT/E Certification Program exams

5-7:30 p.m. — Grand opening of exhibit hall and Reception

7:30-8:30 p.m. — Buffet dinner

8:30-10 p.m. — Showtime/The Movie Channel presents comedian Jay Leno

Wednesday, Sept. 24
8 a.m.-7 p.m. — Registration

8:30-9:45 a.m. — Continental breakfast

9:45-10:15 a.m. — Keynote address by James Mooney, president, National Cable Television Association

10:15 a.m.-noon — Exhibit hall open

Noon-1:30 p.m. — Luncheon address by John Frazee Jr., president, Centel Corp.

1:30-4 p.m. — Technical roundtables. Each discussion will be 35 minutes long. Participants may choose any four from: "New frontiers in stereo: BTSC and MTS," "Commercial insertion: Hardware and software," "Advances in rebuild technology," "Transporting data and voice," "Emergency alert systems," "Preventive maintenance and quality control," "Training technical staff," "Audience monitoring: The technical side," "System sweep technology" and "VCR/cable compatibility."

3:30-7 p.m. — Exhibit hall open

5-7 p.m. — Reception

7-8:30 p.m. — Banquet

8:30-11 p.m. — Home Box Office presents "oldies" band Phil Dirt & The Dozers

Thursday, Sept. 25
8-10 a.m. — Registration

9-10:30 a.m. — Seminar: "Pay-per-view — The bottom line"

9-10:30 a.m. — Seminar: "VCRs, dishes and scrambling — Competition in the video marketplace"

10 a.m.-12:30 p.m. — Exhibit hall open

New test equipment company starts up

BEECH GROVE, Ind. — Applied Instruments Inc. announced its entry into the broadband test equipment arena. Founded by Doyle Haywood and Terry Bush, Applied Instruments focuses on the test and systems equipment needs of the local area network and cable TV industries.

Applied Instruments currently offers two multicarrier signal generators. These units provide an RF stimulus for both the inbound and outbound alignment of broadband local area networks. The Model 5112 covers 5-174 MHz and the Model 1645 covers 160-450 MHz. Applications include amplifier alignment, carrier-to-noise measurement, carrier-to-second/third order intermodulation testing and carrier-to-hum modulation testing.

The company also markets the Model RPS-4 remote programmable switch, which contains four SPDT switches and control circuitry for either manual or RS-232C remote operation. This switch is intended for general purpose and redundant network switching.

Applied Instruments Inc. can be contacted at 51 S. 16th Ave., Beech Grove, Ind. 46107, (317) 782-4331. Representing the firm in the Northeast is Cable Technology Associates, 2717 Bellevue Ave., Suite 6, Syracuse, N.Y. 13219, (315) 422-9012.

Equipment distributor announces regional reps

GREENFIELD, Ind. — A new test equipment distributor, Cable Communications Scientific Inc., has announced several representatives for its products. O.W. Lindberg has been named for the Southeast region, covering Florida, Alabama, North Carolina, South Carolina, Mississippi, Tennessee and Georgia. Com-Tek Inc. will serve the Western region, handling business in California, Nevada, Oregon, Washington, Idaho and Montana. R. Alan Communications has been given responsibility for the Great Lakes region, covering Illinois, Indiana, Michigan, Ohio, Kentucky and Missouri.

Among the products distributed by CCS are spectrum analyzers, leakage monitors, cable fault locators and signal generators. The company is located at 5011 Fortville Pike, Greenfield, Ind. 46140, (317) 326-2601.

Canada drops ban on aero frequencies

OTTAWA — The Canadian Department of Communications (DOC) has announced it has successfully negotiated an agreement with the Department of Transport to permit the cable industry the use of all channels corresponding to aeronautical frequencies. The longstanding prohibition on the use of mid-band Channels A-1 and A-2, as well as hyper-band Channels 4-1 and 4-2, has been lifted.

"This is a major victory for the cable industry," said Roger Poirier, Canadian Cable Television Association vice president, technology and planning. The agreement calls for much tighter controls on cable signal leakage, including regular DOC surveys to assess a system's cumulative leakage index (CLI). DOC's tougher stand on leakage already has been reflected in its regulations dealing with the use of the aeronautical frequencies.

Proposals requested for SCTE Expo '87

WEST CHESTER, Pa — The Society of Cable Television Engineers (SCTE) has called for proposals for technical papers and/or workshops to be presented at its Cable-Tec Expo '87, April 2-5, in Orlando, Fla., at the Hyatt Hotel. Papers for the annual Engineering Conference, as well as workshops for the expo, should be sent in abstract form no later than Oct. 30 to SCTE national headquarters, P.O. Box 2389, West Chester, Pa. 19380.

- A nationwide organization dedicated to distributing and consulting in the local area network (LAN) industry has been formed by six distributors. The LAN Group consists of Costa Distributing West, San Francisco; CPU Corp., Houston; Cache Data Products Inc., St. Louis; Tel-Matic Systems, Toledo, Ohio; Comtec Inc., Roanoke, Va.; and Microserv Technologies Corp., New York. The group will offer services in areas such as LANs, communications products, maintenance, consulting and training.
- C-COR Electronics Inc. has set up its Emergency Field Engineering Hotline, (814) 238-0427, to respond to emergency equipment and system repair needs. A trained field engineer consults with the cable operator and initiates the steps necessary to remedy the problem. Also instituted is a 48-hour emergency equipment repair service.
- Trilogy Communications Inc. marked its first anniversary Aug. 15. The company manufactures MC² coaxial cable and is located at 2910 Hwy. 80 East, Pearl, Miss. 39208.

Wealth and the work ethic

By Isaac S. Blonder
Chairman, Blonder-Tongue Laboratories Inc.

Wealth and well-being have many faces. There are countless religious and cultural codes of conduct undoubtedly satisfying to their adherents and destined, in most cases, to survive and even grow for the indefinite future. What I have to say springs from a desire to address the fundamental bases of work ethic and wealth, and should not be misconstrued as an attempt to denigrate or condemn other points of view. In my view, wealth has two components: A) nature's bounty, i.e., land, minerals, location; and B) man's ability to discover, use, modify and conserve "A."

The first facet of wealth is secured through the force of arms. Everyone, everywhere, possesses his or her share of the booty from a previous armed conflict and is only able to retain his or her place on earth by maintaining the means able to fend off the ever-present raider. The natural resources of the land, for as long as they exist, can be exploited to achieve a high standard of living without much effort by the inhabitants, other than the need to staff an army.

The second component, simply called *work ethic*, is the other road to wealth and is practiced by very few nations. There are legions of grasshoppers in the best of anthills, but only two countries have exemplary records in the preservation of their superior work ethic. A simplistic but valid measure of a country's wealth and work ethic is the rate of currency exchange. The same two high-scoring work ethic countries have the strongest currencies and the best work ethic, yet rank below average on natural resources.

Evaluating work ethic

The following activities either have a self-evident level of performance, or a figure is named as the achievable standard set by the aforementioned countries. On a scale of 1-100, score yourself in a contest of international work ethic measuring sticks.

Education. At the secondary level and beyond, classroom and study time rises to 10 hours daily. The total school hours are 50 percent longer than the U.S. average. One recent newspaper story observed that a top student is ranked by his or her peers as a four or a five. Four was the more distinguished, since it referred to the hours of sleep one needed! Hard science — math, physics, chemistry — two hours a day throughout the entire school experience. Honors and scholarships are awarded for academic achievement, not athletic prowess. Although tutors are common, students write their own papers and take their own exams. I did not read any story about a foreign president who hired a brain to take his exam (as one of our playboy presidents did . . .).

On the Job. Clean your workplace or desk daily. If the machinery or the methodology malfunctions, you do not leave until they return to normal. If the quality is not satisfactory, you call for help even if it exposes your own deficiencies. You accept and work hard at automation, although it may result in the elimination of your job. Should a co-worker fail to perform satisfactorily, you report your observations to your superiors. Throughout your entire employment, you are offered and accept education, pertinent to your work, on your own time — probably no less than an hour a day. Work comes before family and recreation. You strive to make your company grow to enhance your own career rather than by job-hopping.

Off the Job. A clean country is your country; you *don't* litter. The savings rate is 15 percent. Everyone is literate. You buy, even at a sacrifice, the products of your own manufacture. Children are cared for, educated, disciplined and actively encouraged to perpetuate the work ethic of their forebears.

Losing ground?

How does America rank in the field of work ethic? In my opinion, it is losing ground every day. Forget the drug culture, the flower children (if they still exist in their juvenile world) and the willfully unemployed. It is the research and intellectual work ethic that is going by the board. R&D is always the easy target of your average, ill-educated, cost-cutting company president. Three examples as reported in the press are: GM will manufacture and sell a car designed by Toyota; in its latest cost cutting maneuvers, ABC fired a greater percentage of its R&D employees than in the other departments; GE also will eliminate more R&D jobs proportionately in the absorption of RCA.

Overall, we are assuming the role of a consumer and service society dependent on the natural wealth of our land and the technology of other countries. The inevitable is visible: inflation now and poverty later. America, get back to work!

'A simplistic but valid measure of a country's wealth and work ethic is the rate of currency exchange'

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The company has grown on that foundation with innovative ideas and products, such as VideoCipher, converters, and video satellite systems, yet we have not lost sight of our basic commitment to excellence.

I would personally like to thank the industry for recognizing and supporting that philosophy over the last ten years, and reaffirm our commitment as we embark on a new and exciting period for our company and the CATV industry.

Thank you again and Happy Birthday Comm/Scope!!

Sincerely,

M/A-COM CABLE HOME GROUP

Frank M. Drendel
President

rg

Uninterruptible power supply: Luxury or necessity?

This article covers the processes used by Honolulu-based Oceanic Cablevision (a division of American Television and Communications) for the analysis, decision, selection, installation and operation of its computer powering and protection equipment.

By Garland R. Thomas
Oceanic Cablevision

The equipment needs for each application will change from situation to situation; only an analysis of your particular needs can solve the problem for you. Some of the areas that should be considered are:

1) What does a power outage do to your computer system?
2) What is the true cost of a power outage to your computer system and the company as a whole?
3) What is the effect of the computer downtime caused by the power outage after power is restored?
4) What is your equipment failure rate due to power line transients and surges?

In answering these questions, another must be considered: How long after power is restored does it take for your computer to be operational and how long does it take after a planned shutdown? The difference in these two times is the amount of time saved for all portions of the company that are dependent on the computer for their operations. The normal time for a mainframe computer to be operational after a planned shutdown is between 20 and 45 minutes. For an unplanned shutdown it will vary from two to 14 hours, depending on the size of the data base and the complexity of the programs.

Planning for outages

Our IBM System 38 takes 30 minutes to be operational after a planned shutdown. (We have 110 terminals attached to the computer. Sixty of these terminals are in the customer service and repair/dispatch areas.) At the time of our investigation into the feasibility of adding a UPS system, our downtime after an unplanned outage was three hours. We were in the midst of a complete system rewrite to speed up the response time to the users. It was estimated that, after the rewrite, the downtime due to unplanned shutdowns would be 12 to 14 hours.

Before our system rewrite there would be a loss of 2.5 man-hours per person for each power outage. When an outage occurs, the customer service and repair/dispatch employees are reduced to answering the phone and taking messages. They then call the customer back to schedule their service call, installation or to answer their questions on billing when the computer is operational.

One can figure the dollar amount lost simply by multiplying the average wage of $6 per hour by 150 man-hours, or $900 per outage. This figure would most likely have to be increased by 50 percent because the callbacks would have to be completed on overtime. This does not take into account the decreased productivity of the other 50 terminal users. In this computerized age, most employees who are used to computers doing their work would be lost without it. We did not include in our cost estimates any of the lost time for the other 50 computer terminal users.

One major area on which a cost has not been placed is the inconvenience and dissatisfaction of our customers and potential customers. There is no way of measuring the number of lost sales calls or the number of disconnects generated by this inability of the public to communicate with us and have their problems solved.

With our system rewrite the computer downtime would be increased by four times, so the direct cost and customer inconvenience would be increased proportionately. This would be approximately 11.5 hours per person per outage for 60 people, or a cost of $4,140 per outage (not including any overtime required).

We also would like to offer our customers uninterrupted service during times of power outages. To accomplish this, we would have to have some kind of standby power for lighting in both the customer service and repair/dispatch areas, our PBX telephone system, the computer terminals in both customer service and repair/dispatch areas, and the air conditioning for the UPS room or building and computer.

Types of equipment available

The different types of protection considered for power line abnormalities and power failures are:

- *Surge suppression equipment* — This is used only to protect equipment from power transients and surges. It provides protection from some equipment failures but no protection from power outages.
- *Standby switching power sources* — This type of unit normally provides some protection from power transients and surges. It also will provide power after a short outage (less than one second) for a reasonable time period (one to two hours). It will not normally switch fast enough to allow a computer system to continue operating without interruption.
- *Uninterruptible power supply* — This type of unit provides maximum protection from power transients and surges. The incoming power is always rectified from AC to DC, run across the battery packs and then changed back to AC. The battery packs then function as filters for the power transients and surges. There is no switching time, so the computer will have no interruption during power outages.

The drawbacks to a UPS-type of system are: 1) it is always carrying the full load and continually is stressing the components; and 2) the standby time is limited by the battery capacity. For example, in 60 kW system with the maximum of three battery packs installed under full output load of 60 kW results in 22 minutes of standby time.

- *Standby diesel generators* — When used alone, this type of system offers no protection from power transients and surges. It will not allow for continuous operation during power outages. It does have the longest standby time, being limited only by the amount of fuel available.

Table 1 is a quick reference chart of the suitability of the different types of equipment. You may find from your analysis that one or more of these systems is needed. If you suffer only from power surges and spikes, you may only need a surge suppression and voltage conditioning unit. If, on the other hand, you also need short-term protection from power outages, you may need an uninterruptible power supply. If you also need long-term power outage protection along with surge protection you would need both a UPS *and* a diesel generator.

In our analysis we decided that we immediately needed a UPS and, in the near future, we needed to add a diesel generator so that we could provide our customers with uninterrupted service.

Selection of system

The next step was to decide what size of UPS

Table 1: Comparison of power equipment

TYPES OF EQUIPMENT	SURGE PROTECTION	DURATION OF STANDBY	SWITCHING TIME	POWER INTERRUPT
Surge Suppression and Conditioning	GOOD	NONE	NO STANDBY POWER	YES
Standby Power Supplies	FAIR	1 to 4 HOURS	LESS THAN 1 SECOND	YES*
Uninterruptable Power Supplies	EXCELLENT	5 to 1 HOUR	NONE	NO
Diesel Motor Generators	NONE	LIMITED BY FUEL ONLY	1 to 5 MINUTES	YES

*Some newer units have power interrupts of less than 1 cycle

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and generator was required. In order to do this, several questions needed to be answered:

1) Which equipment must be provided with uninterruptible power?
2) Would the equipment, which has failed at a higher than normal rate from power surges, have to be on the UPS?
3) Does the equipment that needs line voltage conditioning and constant power also need to be on the UPS?
4) Could the equipment that does not fall into the previous category then be placed on the diesel generator?

We found that the equipment mentioned in the last question was the lighting for the customer service area, lighting for the repair/dispatch area and the air conditioning for the UPS building and the computer.

This information then is used to determine the load requirements of the UPS and the diesel generator. The power consumed by each piece of equipment was obtained from the equipment manuals. This was then double-checked by actually measuring the current draw with a clamp on current meter. The highest load factor plus 10 percent was used for determining the minimum size UPS required.

During this portion of the analysis, it was noted that most computer equipment was rated in kilowatts rather than kVA. UPS systems can be rated in either kVA or kilowatts. The difference between these two ratings is that kVA is the current draw multiplied by the voltage without taking into consideration the power factor of the equipment.

Power factor is the difference between real or dissipated power (measured in watts) and apparent power (measured in volt amps). A pure resistive load has a power factor of 100 percent, while a pure reactive load has a power factor of 0 percent. Since all equipment loads are a combination of these two loads, the power factor would be between 0 percent and 100 percent.

The formula for volt amps is $VA = V \times A$. The formula for power in watts is $W = I^2 \times R$. For example, with the following known you can figure the power factor:

Voltage = 250 volts
Current = 2 amps
Resistance = 75 ohms

With $W = I^2 \times R$, the real power in watts would be 2 times 2 times 75, or 4 times 75, or 300 watts. The apparent power with the formula of $VA = V \times A$ would be 250 times 2, or 500 volt amps. If you divide 500 into 300 (real power divided by apparent power) the power factor in this example would be 60 percent.

A common power factor that can be used for most UPS units is 80 percent. A unit that is rated at 50 kVA would be equivalent to a unit rated at 40 kW. (50 kVA multiplied by a power factor of .8 equals 40 kW). The reverse also is true — a 60 kW rating would be equivalent to a unit rated at 75 kVA (60 kW divided by a power factor of .8 equals 75 kVA). In using this for other equipment, you must know the power factor of the equipment.

The actual size of the UPS was determined by the load factor of the present equipment, the load factor of any future additions in equipment, and the length of time the standby must be on to provide for the orderly shutdown of the computer.

A worksheet (Table 2) was used to compute the load of the UPS in our application. We determined that our present equipment would have a load factor of 20 kilowatts; 10 kilowatts was added to this for future expansion and safety, for a total of 30 kilowatts. We also decided that 20 minutes of standby was needed to shut down the computer system.

The size of the generator was determined by the load of the UPS system under maximum output condition and maximum battery recharge, added to the maximum load of the lighting hooked only to the diesel generator. We then added 30 percent to this for future growth and safety margin.

Manufacturer and model selection

With these factors known, we then contacted all of the companies who could meet these requirements. Only those companies who had local representatives were considered. We arranged for price quotes and visits to local sites that had a similar unit installed. We found during this stage that most units of the size we required only could provide 15 to 30 minutes of standby power. The only two ways to obtain more standby time was to add an auxiliary generator

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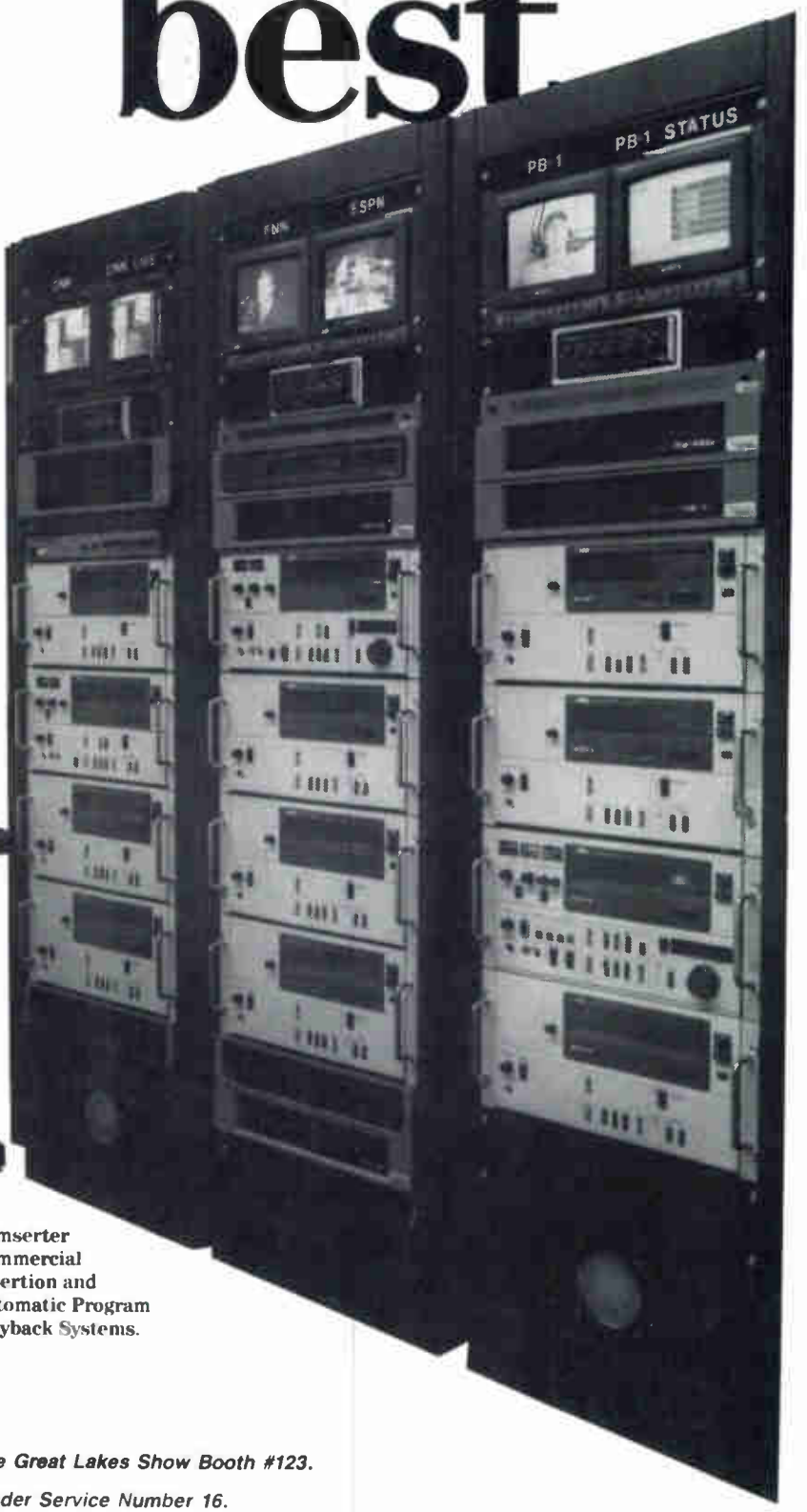

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Table 2: Assessment of total power load

(Sample load from calculations for illustration only)

EQUIPMENT	QUANTITY	MEASURED LOAD KW	MFG. SPEC. LOAD KW	TOTAL LOAD +10%
IBM System 38 Mainframe	1 0	5 6	5 8	6 4
IBM Mass Storage Unit	3 0	1 1	1 2	4 0
IBM Series 1	3 0	2 4	2 5	8 2
IBM Computer Terminals	5 0	0 1	0 1	0 6
VAX Micro Computer	1 0	0 2	0 25	0 28
Modems and Modem Eliminators	8 0	0 05	0 06	0 62
Addressable Control	2 0	0 34	0 36	0 79
			TOTAL	20.89

or to oversize the unit.

We were able, during the local site visits, to obtain first-hand knowledge of their reliability. Through this process we were able to select a supplier and model. The supplier and model selected was the System 4000 from Emergency Power Engineering Inc.

This particular unit was expandable in standby time by the addition of up to three battery packs. Each battery pack was capable of sustaining the standby time for 7.5 minutes at maximum-rated load conditions. Battery recharge for fully discharged batteries is 24 hours.

Without minimum standby time with present load of 20 minutes per outage and our desire to protect from two power outages in a 24 hour period, we decided to install a 60 kilowatt unit with two battery packs. This would provide for 45 minutes of standby time at 20 kilowatts of load. We also could add the third battery pack in the future as our load increased to the 30 kilowatt level and still maintain 45 minutes of standby time.

Space and environmental requirements

The next step in the process was to determine space and environmental requirements of the UPS system. The considerations for this were: noise of the UPS system, air conditioning required, security of the unit, physical size of the unit and battery packs, servicing area required, and installation requirements.

It was decided that, due to noise of the UPS (78 dB "A" weighting at four feet) and the unit's physical size and weight, an external building was desirable. For security reasons, the building should be of masonry construction. The weight of the UPS (3,100 pounds) and of the battery packs (2,625 pounds each) made double doors for entry to the unit necessary. A forklift was required to place the unit and battery packs in the proper location in the building. The area needed for the placement of the units and servicing space was 90 inches by 84 inches for the UPS and 78 inches by 42 inches for each battery pack. A building with an inside diameter of 10 feet by 9 feet was required.

The manufacturer's specifications set air-conditioning needs at 28,000 Btus for the System 4000. In order to provide as reliable air-conditioning service as possible, it was decided to install two air conditioners at 22,000 Btus each. If one unit failed, then an exhaust system was placed directly over the UPS upper exhaust vents to allow as much heat as possible to escape.

Electrical requirements

The incoming electrical requirements were determined by the specifications of the System 4000. The input power requirement was a three-phase 208 volt circuit at 288 amperes per phase. The high input requirements are necessary because the UPS must provide full output power and recharge the batteries at the same time. It was determined that the best way to achieve this would be by direct connection of a step-down transformer to the incoming 480 volt utility power.

This was accomplished by providing a dedicated circuit from the incoming utility line with a separate circuit breaker panel for the UPS only. The wiring for the computer room then was isolated from building power through its own circuit breaker panel. This allowed for control of all equipment connected to the UPS system.

After the building and electrical wiring was completed by local contractors, our own personnel placed the UPS unit and battery packs in the building. All electrical wiring was completed, except for the actual cut over at the circuit breaker panel in the computer room. The cut over to the UPS system was scheduled for 4 a.m., when the computer system was not in use. This allowed for completion and checkout during non-critical hours. It was accomplished without incident.

Ongoing operations

To provide maximum use of the UPS system, a procedure was set up for the orderly shutdown of the computer. This was accomplished with the main purpose being the reduction of the power load as fast as possible and then the orderly shut down of the System 38. A remote summary alarm panel was installed in the computer room with a sonic audible alarm. This would immediately alert the computer personnel of any power problems. The "power off" procedure then would start without delay.

A preventive maintenance procedure immediately was initiated, with weekly checks of the UPS system. All input and output parameters from the front panel are logged in a log book weekly and then compared with the previous week's readings. Any discrepancies immediately are investigated.

The UPS unit has performed flawlessly in the six months of operation to date and has averted 20 shutdowns of the computer. The total cost of the building, electrical wiring and UPS system was $100,000. At a minimum of $4,140 per shutdown, the system will pay for itself in less than one year. It is paying dividends on the investment without considering the benefits of improved customer service.

A very welcome side effect of the UPS system has been the reduction of failures in the computer system and peripherals by 90 percent. The savings in this has not been included in the previous cost savings.

We have been investigating the addition of a 130 kilowatt diesel generator to this system. We then could connect our telephone PBX system to the UPS, along with the computer terminals in the customer service and dispatch/repair departments. This also allows us to connect the lighting in these two areas to the diesel generator, along with the UPS system and the air conditioner in the UPS building. We then will be able to continue operating during the time of power outages and would eliminate the need to shut down and restart the computer system with each power outage.

The man-hours saved during these times would pay for the $50,000 investment for the standby generator, transfer switch and electrical wiring in a relatively short time.

Our operations to date have shown the decision to install a UPS system was correct. This investment will be paid for in savings in one year or less. The savings over the projected life of only seven years will return dividends in excess of most other capital improvements. The question should be "What can we save by installing a UPS?", not "What will it cost us to install a UPS?"

Even the most conservative financial people would approve of this capital expenditure. Furthermore, every company with computer equipment should do this analysis. Unless you live in an unusual area where power outages and power surges do not exist, you will install some form of power protection equipment.

Acknowledgements

I would like to thank the following people for their help in the actual installation of the UPS and/or the preparation of this article: Jim Chiddix, Bonnie Scannell, Norman Santos, Eric Uptegrove, Larry Watanabe and my photographer Catherine Thomas.

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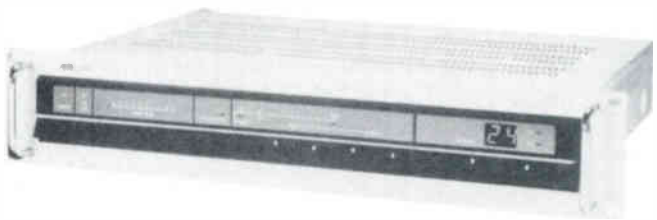

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Reader Service Number 21.

Implementing a commercial insertion system

By Don Rice
Project Engineer

Sam Martin
Engineering Technician

And Sonya Williamson
Marketing Administrator, Telecommunication Products Corp.

Purchasing a commercial insertion system can be a fairly straightforward task — if you understand what you are getting into beforehand. Failure to establish a set of objectives and educate yourself before evaluating equipment will make the process difficult and leave you confused.

Cable advertising and the associated insertion equipment technology is rapidly advancing. Many new manufacturers have entered the market with vast arrays of equipment, ranging from simple switchers to highly complex, totally automated systems, with prices varying according to the degree of sophistication. The more you know before you purchase, the better prepared you will be to make an intelligent decision.

Evaluate the market you will serve. Determine what network you will run commercials on. CNN, ESPN, MTV and USA have evolved as the "major four." Another network may be more suitable in your geographical location. Anticipate your volume on a per-network, per-day basis. Be sure to consider future volume. Equipment that meets your initial volume may not be able to handle your future volume.

Developing a sales strategy, or at least familiarizing yourself with the various sales strategies, will aid you in your purchasing decision. You may wish to secure sales info such as the Cable Advertising Bureau's interactive sales guide to aid you.

The three basic strategies are: run of schedule (ROS), spots placed in a rotation for air throughout the day without specifying a network, particular time or program; fixed position, spots sold during specific programs, sporting events or during prime time; and packaging, selling a group of avails from one or more networks and/or events.

There are advocates of all three methods. What works for one system might not work for another. Cable advertising's greatest asset is its ability to reach target markets. The sales strategy you utilize, the mode of the operation and the architecture of the commercial insertion equipment you choose will affect the advertiser's ability to reach the desired audience. For networks such as MTV, where most of the programming is basically the same, ROS would be appropriate. Fixed-position scheduling allows the advertiser to reach the desired audience on networks that have a variety of programming, such as ESPN or USA. Fixed positions command a higher price for premium events. ROS events can be run on sequential or random access insertion equipment, while fixed-position events should use random access equipment (due to the enormous amount of editing on sequential equipment).

Traffic and editing

Trafficking, which includes scheduling and verification, and editing the spots for air play consumes many man-hours; therefore, it would be advantageous to estimate these costs. Random access equipment requires less editing, so the man-hour savings may more than offset the higher initial cost. Videotape preparation determines the quality of the inserts and the image you project to the public. Improper editing causes the inserts to roll or switch on air too soon or too late. It is important to investigate this aspect when evaluating insertion hardware. Difficult tape preparation and equipment that requires an enormous amount of editing only will leave more room for error and cause personnel to become disgruntled.

Local insertion on multiple networks, at any volume, will make an automated administrative system very attractive. A computer and the appropriate software should be a one-time investment that would preclude the need for a large accounting and trafficking staff. Menu-driven software will allow a single operator, without prior experience, to perform the tasks of both. In a local- or remote-type operation (via cable or phone modem), an interactive administrative system that can communicate with the insertion hardware, by downloading programming data and retrieving verification information, will reduce the number of man-hours needed to maintain the operation.

The architecture of the equipment you are considering should be examined closely, regardless of the type. Check to see if the insertion equipment and the videotape recorders (VTRs) are dedicated to a specific network or time shared. Time sharing comes with inherent limitations. Equipment (audio/video switches, VTRs, tone decoders) common to two or more networks cannot perform simultaneous inserts; one network will have its avail pre-empted if control tones occur at the same time. Selling advertising around this limitation is fairly difficult. Sharing VTRs requires combining all the spots from each network onto one tape, thus reducing the number of spots you can place on the tape and on each network.

An important factor to consider is the procedure used to cue the VTRs. A VTR is not a random access device; it takes time to travel from spot to spot. This can be overcome by using fast-forward and rewind to search for the spots. Some systems must rewind to the beginning of the tape, then use play to reach the next scheduled spot or pod. This is time-consuming and causes premature tape wear and tape head clogging. Other systems are capable of fast-forwarding or rewinding from the present location to position itself for the next break. Wear and tear on VTRs and tapes is reduced, cue time also is speeded up appreciably. It also is best to choose equipment that requires no VTR modification, since any modification would void the manufacturer's warranty.

'The more you know before you purchase, the better prepared you will be to make an intelligent decision'

Operator-assisted hardware

Manual sequential (multiple VTR operation) — Manual control without using specific insertion hardware can be implemented by using multiple VTRs, a routing switcher and an operator to change and cue the tapes. The operator's duties include listening for the activation code from each network, pre-rolling the VTRs, and switching the video and audio signal from each VTR by entering the correct switch codes into the switcher. Proper playback must be noted and verified by the operator.

This type of operation allows the placement of spots on a network at a date and time specified by the customer. A higher rate then can be charged. Editing is limited to placing the spot in the proper time format. This reduces the time required for production and allows the rapid introduction of new spots into the system. The use of personnel is very inefficient because of the time spent waiting on the activation signal and trying to react fast enough to start the VTR and to switch from the primary video and audio source at the correct time. This must occur for each VTR in the system. Multiple channel insertion is hard to accommodate with this method. One can imagine the chaos if two or three networks give a break in close proximity of each other.

Semi-automatic sequential (multiple VTR operation) — This operation normally requires an operator to change tapes between breaks. A tape is loaded into each machine and cued. The actual insertion can be controlled by the hardware or, if needed, by the operator pressing a button. When activation occurs, the hardware controls the VTRs and the switching sequence automatically. Verification can be done by the hardware and/or the operator. This type of operation allows the placement of spots on a network at the time specified by the customer. A higher rate then can be charged.

Editing is not required for each spot that is needed or deleted, and is limited to placing the spot onto a tape in the proper time format. This reduces the time required for production and allows the rapid introduction of new spots into the system. An operator is needed to change tapes but does not have to control the switch

(Continued on page 30.)

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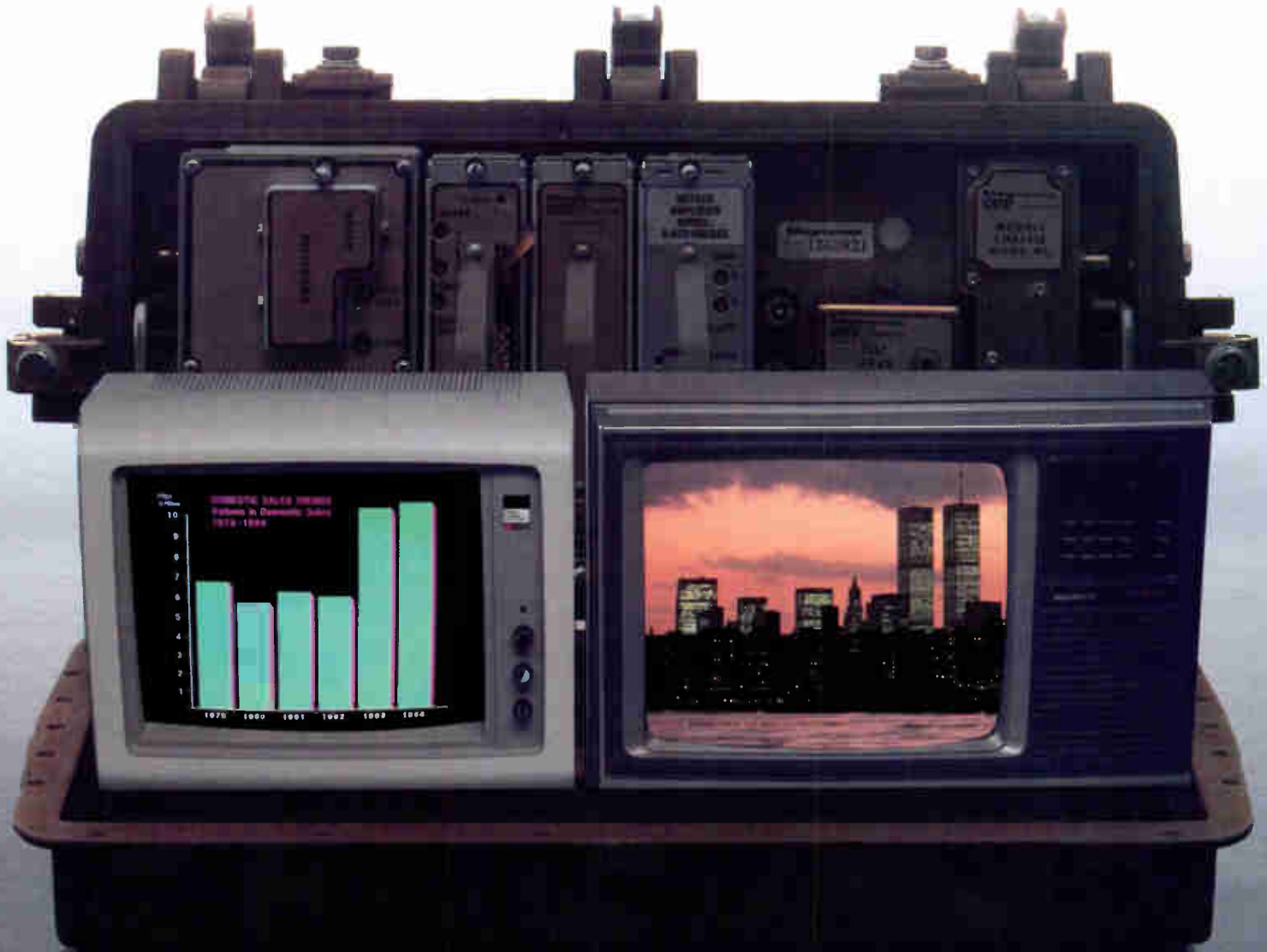

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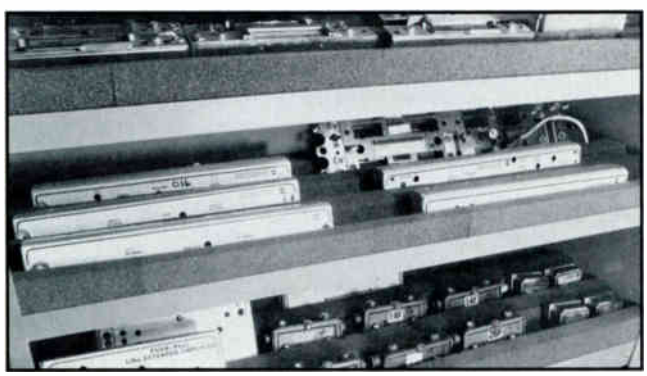

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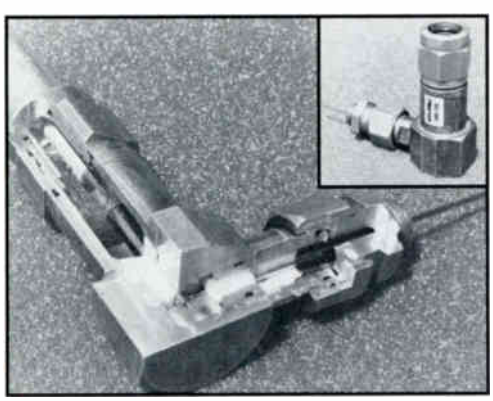

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Reader Service Number 24.

(Continued from page 24.)

between the different video and audio sources. This allows the operator to assume other responsibilities. Verification can be automatic or by the operator.

Automatic stand-alone systems

Pod sequential (single VTR operation) — Spots are grouped into a pod by break length in the order to be played. These pods are played consecutively until the end of the tape or until a rewind command is sensed on the tape. This format's lack of flexibility forces the cable operator to sell ROS spots, which gives the trafficking people the option of scheduling the spots when there is time available. If specific networks and times are required, then production personnel are forced to change the tapes to customize the pods. This does not guarantee the spot will run exactly when scheduled because of the network's expansion or compression of the avail window.

Editing the tapes to schedule a spot for a specific time is very time-consuming and not practical for day-to-day operation of a multiple network ad insert system. Spots must be added and deleted to ensure that only active spots are aired. Changes and make-goods are hard to accommodate with this method of insertion. The major advantage of this method is its lower cost; but its inherent lack of capability to schedule spots at a fixed position decreases the rate structure a system can expect to charge. The addition or deletion of spots from the tapes increases the work load on production personnel, and the repetition of the same spots back-to-back may cast an amateurish look on the whole operation.

Spot sequential (single VTR operation) — Spots are edited onto the tape one after the other with a park code at the beginning of each spot. A small interval of black is left between each spot to accommodate the switch back to primary for multiple length breaks. Upon activation the insertion hardware plays as many spots as the network allows time for, going back to primary on the return-to-network code. The unit then cues to the next spot on the tape. This type of system allows for insertion of multiple length breaks without editing the tapes with fixed length pods.

Pod random access (single VTR operation) — Any random-type system requires some form of programming to schedule the sequence of playback. This can range from a very basic system that uses codes and numbers to a microcomputer running an administrative software system. Spots to be played are grouped into a pod for the specific length of the break. Usually the first spot is revenue producing and the remainder are public service announcements (PSAs) or self-promotions. The cueing process requires each pod to have a unique address and a microcomputer to find the next scheduled spot.

Spot random access (multiple VTR operation) — To take full advantage of the revenue possible from selling advertising on a cable system, true random access insertion equipment with multiple VTRs are required. The advantage of using this type of system is its ability to automatically place the right spot on a network at the right time with professional looking quality. A microcomputer is at the heart of this system, controlling the cueing, playback of the programmed schedule in the correct format and, in some systems, the actual verification. Editing time is kept to a minimum and the ability to make last-minute changes make this type of system very flexible. To accommodate a full two-minute avail this equipment should provide 30-second spot random access to four VTRs.

Other equipment considerations

Activation — Signalling methods to activate the local avail time differ between networks. Most networks carry the DTMF (dual-tone multifrequency) control tones on the primary audio. Several networks transmit the control tones on a subcarrier, which requires the use of an external demodulator. Control tones can be detected by an analog or digital tone decoder. Digital decoders are more reliable and the network code can be changed more readily. MTV utilizes a 19 kHz pilot tone format that requires a stereo decoder; this provides a contact closure for use by the ad insert hardware.

Pre-roll — When investigating this aspect of insertion equipment, check to see if the network's pre-roll time is fixed or user selectable. A fixed pre-roll is set at the factory and more than likely requires returning the equipment to the factory to change it. This is not quite as

important now, since most networks have standardized on a six- or eight-second pre-roll. Also check to see if the VTRs are pre-rolled from the stop or pause mode. Pre-rolling from the pause mode places the VTR in pause after cueing. It remains in pause until the network control tones are received. This causes unnecessary tape and VTR head wear. Placing the VTR in a long pause mode requires VTR modification and does not significantly reduce head or tape wear.

Switching — The local commercial is the part of the ad insert system that the public views and responds to. The image you project partly is determined by the switch to and from the network and your local commercial. To prevent rolling on the transition, a vertical interval video switch is required in conjunction with a sync source in phase with the network video to each VTR. Some insertion hardware has the capability to strip network sync and distribute it to each VTR, while others may require optional equipment, such as a time base corrector.

The most relevant part of an ad insert operation is the network. If a tape jam occurs or the heads become clogged on any of the VTRs, the system automatically should switch back to the network.

A system that stores programming data in memory or contains a real-time clock should include some form of battery backup to preserve its integrity in the event of a power interruption or failure. Surge protection also should be included to protect the sensitive electronic components.

Verification is required to make any local ad insert system a viable operation. Verification systems range from those that literally assume the commercial runs as long as the network control tones are received, to the recording of the actual commercial as it airs. It is important to log the network, date, times the spot ran and some type of spot identification.

Traffic management systems

As ad insertion becomes more successful for the operator, a more efficient system of trafficking becomes essential. Once the spots are sold, many systems don't concern themselves with how they are handled after the sale. The most dependable and efficient administrative system is one that is totally interactive with the insertion equipment, a blending together of insertion hardware, a computer and software. Using an interactive system gives you the ability to download scheduling and retrieve verification data automatically. A non-interactive system requires that this be done manually.

A real-time administrative system requires a computer be dedicated to the hardware at all times and cannot be used for any other function. The most functional is the use of a non-dedicated computer linked by a communications device to the hardware. This enables the computer to be used for other office operations, such as word processing, graphics, etc.

Remote operation more easily is accommodated with an interactive system. The computer can be linked to the insertion equipment or the communications device via cable or phone modem. At the administering of a command, the scheduling and verification data can be transmitted to and from the software and hardware located several miles from each other. Multi-location operation is essentially the same as remote operation, with multiple headends all being controlled by a common computer and administrative system.

Vendor support

Maintenance, the warranty and the training offered by the manufacturer are other aspects to consider. Examine the operator's manual; is it written in plain English? If the manual is vague and difficult to understand, chances are the operation of the equipment will follow suit. A manufacturer who puts a lot of time and effort in a well-illustrated, easy-to-understand operator's manual more than likely will provide comprehensive training and back the equipment with a solid warranty.

If a software package is being purchased, check to see if a software maintenance contract is available. How are updates and changes handled? Not all cable systems' requirements are the same. Is the manufacturer willing to modify its software to meet your requirements? What changes would be involved? Is the manufacturer willing to install the equipment in your system and provide on-site training? If so, can it guarantee the system will be operational and running actual spots when its people leave? The best system money can buy is of not much use if the operator can't make it work and the manufacturer won't support it.

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System planning for stereo operation

'Like any other new technology, BTSC is best planned out in advance'

By Dennis Donnelly
Product Manager, Catel Telecommunications Inc.

During the past few months, the cable industry has been overwhelmed by technical articles and papers explaining, praising and complaining about the new MTS (multichannel television sound) signals, the principal interest for cable being BTSC stereo. Now that the initial shock of dealing with a new stereo format has been overcome (see Figure 1) and the technical problems examined, the conclusion is that BTSC stereo signals can be sent down the trunk and received on the subscriber's set.

Unfortunately, some of these articles, while technically correct, have either left confusion over how to get the BTSC stereo signal on the system or have dismissed the implementation of stereo with an all too simple "no problem." Like any other new technology, BTSC is best planned out in advance. A few minutes with a pad and pencil can save hours of headaches and possibly eliminate some of the dollars that have to be spent in the purchase of new equipment. It all begins when the operator decides that BTSC stereo is a must for the system. The question is "Where do we go from here?"

Planning for the headend

In a system with only one headend, planning for stereo requires the operator to take a look at facilities (like adequate rack space) and check to see if the equipment currently in operation can handle the stereo signal. Not all equipment is capable of handling the BTSC

Figure 1: Multichannel television sound (MTS) signal

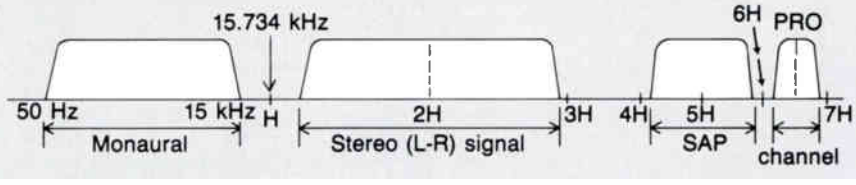


Figure 2: True FM stereo using a stereo modulator with decoded satellite signals

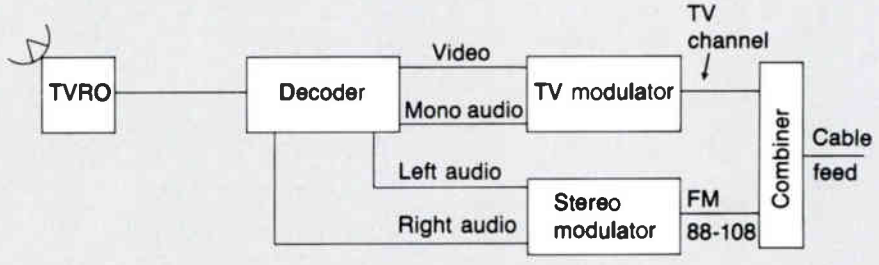


Figure 3: System configuration for baseband BTSC stereo generation with decoded satellite signals

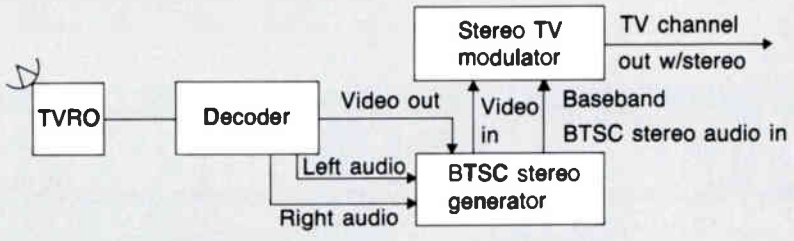
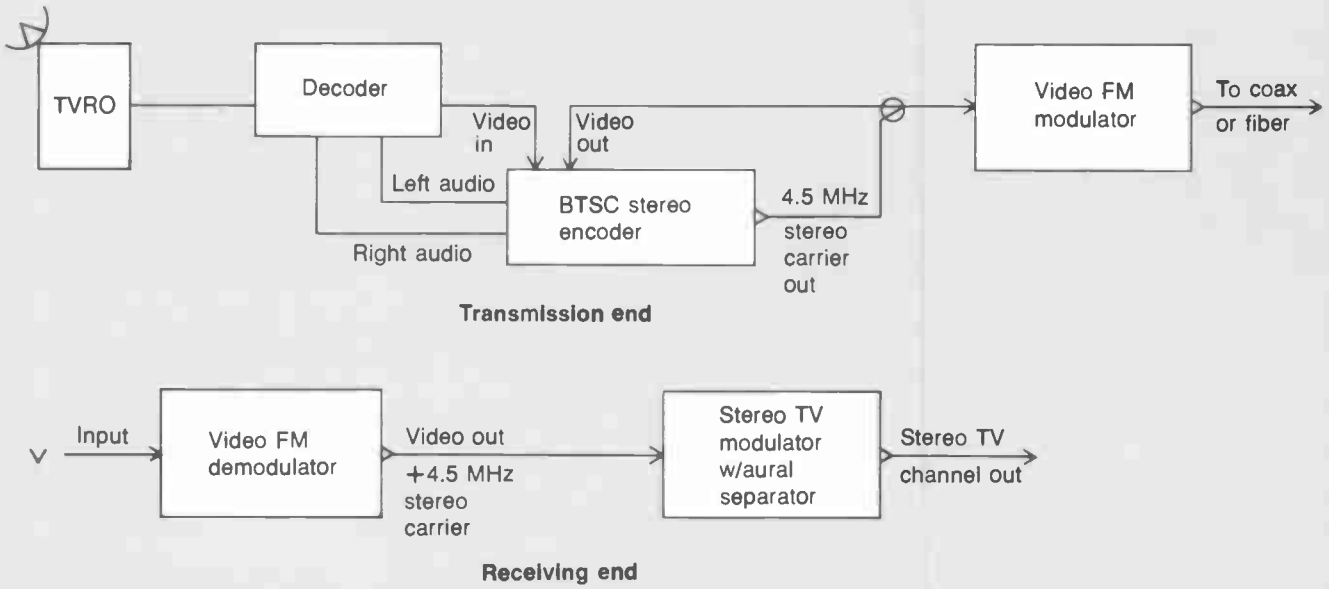


Figure 4: System configuration for transportation and transmission of 4.5 MHz stereo carrier

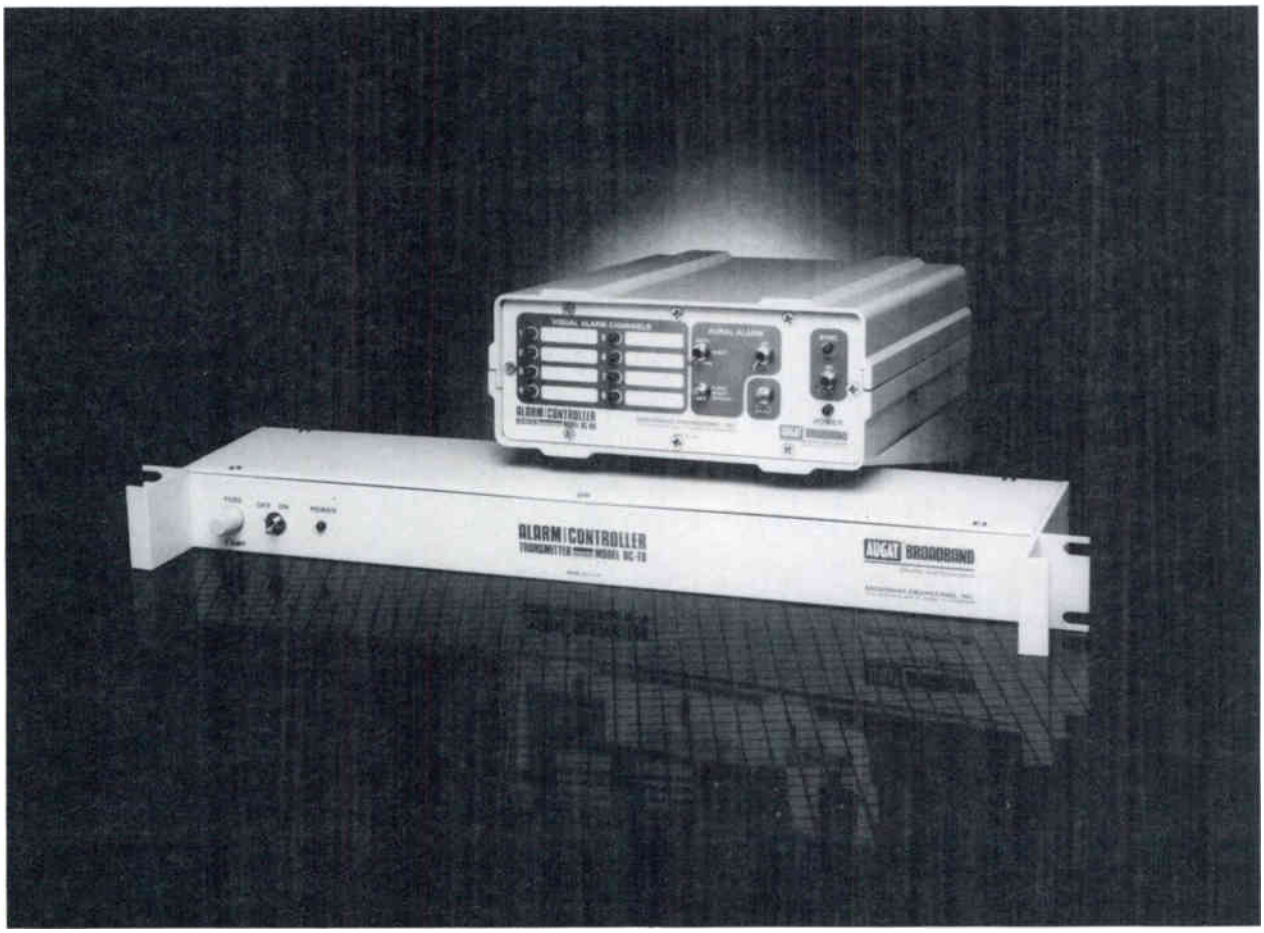


signal. Off-air signals processed with heterodyne signal processors should pass the stereo signals through without difficulty. When in doubt, contact the manufacturer to get information regarding the performance of your particular processor.

Systems using the demodulator/modulator system of handling off-air signals may have more difficulty. Most high-quality demodulators have a 4.5 MHz audio output that will pass the BTSC signal, but they do not have the capability to provide a baseband left and right audio output. A simple way of dealing with this problem is to modify the system by equipping the associated modulator with an aural separator circuit and feeding the signal to the modulator as a composite video plus 4.5 MHz audio signal. Most modulators will pass the 4.5 MHz stereo audio and the television signal fed to the system is full BTSC stereo.

If the system is receiving signals via microwave, the chances are the microwave output is already a video plus 4.5 MHz BTSC audio signal. In that case, there is no need to purchase any additional equipment.

The biggest difficulty is going to occur with satellite-delivered signals. In the past, these



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You can also turn test equipment or other electrical or electronic devices on and off from anywhere in a two-way cable system or downstream from the controlling location in a one-way system.

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signals either had monaural sound only or delivered the stereo signals via subcarriers. Many systems have been using satellite audio processors and processing the subcarriers for delivery as FM stereo. With the advent of scrambling, the technique has become a little more complex. The descrambler provides both a monaural signal and baseband left and right audio signals at its output.

If the system chooses to continue to carry the stereo simulcast in FM stereo, modifications may be required to the satellite audio processor. Many of the units can be field modified to accept the baseband signals. Some of the older processors require factory modifications to accomplish this, and a few of the very old units cannot be upgraded at all. A quick check with the manufacturer will let you know if you can modify or not.

If the system never carried signals in stereo before, it may decide to put them in the FM band instead of carrying them as part of the TV signal. In this case, an FM stereo generator/modulator is required to take the left and right audio from the descrambler and convert it into the FM stereo format. Figure 2 shows a typical system configuration for this application.

If the system has decided to carry all stereo audio as part of the television signal, the first piece of equipment the system requires is a BTSC stereo generator for each channel it wishes to carry in stereo. This unit converts the baseband left and right signals into the BTSC stereo format that then can be fed to the television modulator. The modulator does not generate the stereo signal. It only will accept the signal that is already in the BTSC format.

At this point, the system operator has to make another choice. Most of the BTSC stereo generators are available with either a baseband composite output or a 4.5 MHz modulated output. Some are equipped with both. The decision on whether to use baseband or 4.5 MHz format must be based on the way an operator wants the system to function in the future.

If the baseband method is chosen (because of the wider bandwidth and higher deviation required for the BTSC signal, and because the pre-emphasis network now is part of the BTSC stereo generator), a standard modulator probably will require modification or replacement of the existing audio module in order to accept a baseband encoded BTSC signal. Not all modulators can be modified and status should be verified with the manufacturer before a decision is made. The alternative is to equip the modulator with a 4.5 MHz aural separator circuit and operate the BTSC generator with a 4.5 MHz modulated output. This eliminates any modifications to the audio module itself.

While at this point in planning, the operator should be aware of the operational trade-off between these two modes. When operating in the baseband composite mode, the operator has control of the audio signal at the modulator. The audio module functions exactly as in monaural except the deviation is ±50 kHz instead of ±25 kHz. When operating in the 4.5 MHz mode, there is no control of the audio at the modulator. The levels and deviation are at the mercy of the BTSC generator.

This may not be a problem if all the equipment is located together, but it certainly should be a system consideration if the equipment is separated by some distance. According to broadcasters, stereo signals are a bit more tricky than monaural and will require more attention to detail. Figure 3 shows a typical interconnection of a satellite-received channel. The video signal also is required to loop through the BTSC generator to provide the horizontal line reference for locking the pilot carrier.

Many of the older modulators also do not have provisions for a 4.5 MHz circuit. Before going any further in the planning stage, a complete review of existing modulators should be made. If neither modification is available for the modulator now in service, then you should plan on buying a new modulator. BTSC simply cannot be "pushed" through an old modulator without one of these modifications. It may seem like a plot by the manufacturers to force you to buy new equipment, but sometimes the required modifications to an old product to make it pass BTSC would cost as much or more than the original price you paid for the product.

Transportation systems and hubs

In larger systems, where satellite receivers are separated from the headend or there is a

(Continued on page 46.)

Trilogy Communications Inc.

AN OPEN LETTER OF GRATITUDE

Dear Customers,

On August 15, 1986, Trilogy Communications, Inc. celebrated the anniversary of our first year in business. It was far more successful than our initial forecasts. In fact Trilogy was 27% above our crystal ball predictions. We were successful as a new company which acquired and markets MC_2, the technological leader in the coaxial cable market.

You, our customers recognized this up front and trusted Trilogy with these all-important first orders. As any new kid on the block, we had to prove ourselves—and we did. We busted our backsides to make it work for you—and us.

Now, we feel compelled to thank you publicly and privately, and frankly we would be proud to list your names. This would serve no purpose for you, and it certainly would appear self-serving for Trilogy.

However, the key personnel who sign this letter truly appreciate your trust in Trilogy and we promise to continue or even improve, where possible, our quality, delivery and service, resulting in an even more cost-efficient Customer/Trilogy relationship.

Many, many thanks.

Sincerely,

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Kevin J. Dunckel

Gene Faulkner

S. Shinn Lee

Gene Gough

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Danny Roberson

2910 Highway 80 East
Pearl, Mississippi 39208
601-932-4461

Time zone conversion

By Ron Hranac and Bruce Catter
Jones Intercable Inc.

The chart on the next page has been arranged to show time zones used in Hawaii, most of Alaska and Canada, and the continental United States. The relationship of those time zones to Coordinated Universal Time (UTC) also is shown. The terms Greenwich Mean Time (GMT) and Zulu (Z) generally are accepted as equivalents to Coordinated Universal Time.

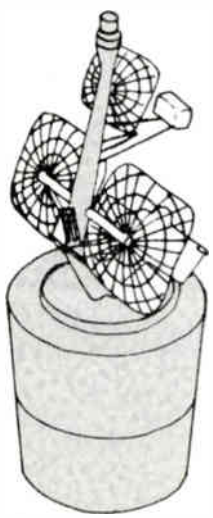
The chart is useful for determining the correct time in time zones other than your own, or relating local time to UTC. For example, a number of satellite control facilities provide pre-recorded telephone messages containing "bird-in-the-box" alignment information, often expressed in UTC. The time conversion chart will allow you to convert from UTC to local time at a glance.

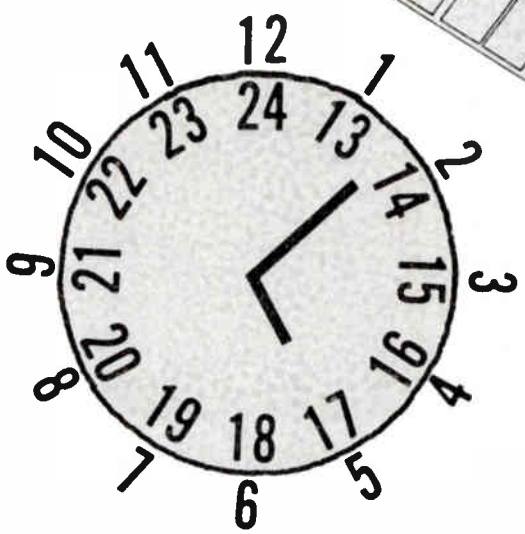
Coordinated Universal Time

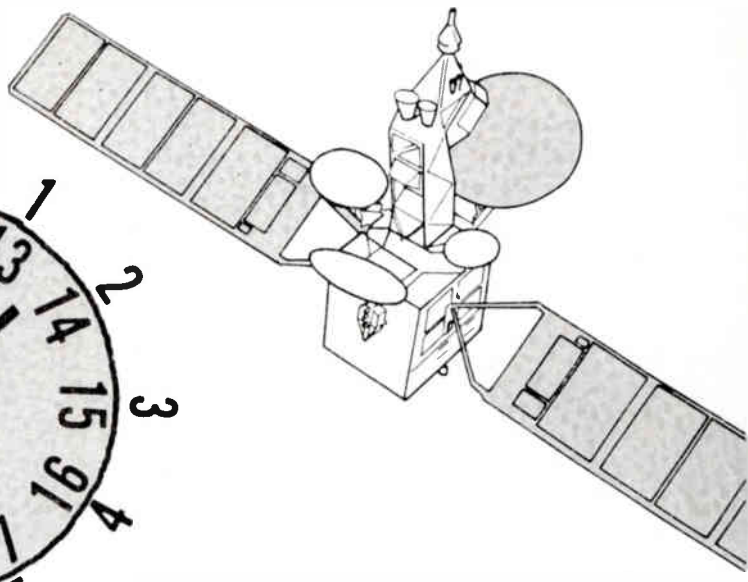
Worldwide time zones were established during an international conference in 1884. The meridian of longitude passing through the Greenwich Observatory in England was chosen as the starting point for the world's time zones. Twelve time zones west of the Greenwich, or prime, meridian and twelve to the east were created.

UTC is the mean solar time at the Greenwich meridian, expressed in 24-hour time. UTC has been adopted as an international reference in science, navigation and communications to avoid confusion among the different time zones.

The National Bureau of Standards broadcasts UTC time signals on shortwave stations WWV (Fort Collins, Colo.) and WWVH (Kekaha, Kauai, Hawaii), at 2.5 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz (WWV only). To differentiate the two stations, WWV voice time announcements are by a male, and WWVH announcements by a female. WWV and WWVH time measurements and transmitter frequencies are referenced to atomic standards for accuracy.







Standard Time	Hawaii	Alaska	Pacific	Mountain	Central	Eastern	Atlantic	—
Daylight Savings Time	—	—	**Alaska**	**Pacific**	**Mountain**	**Central**	**Eastern**	**Atlantic**
UTC								
0000*	2:00 p.m.	3:00 p.m.	4:00 p.m.	5:00 p.m.	6:00 p.m.	7:00 p.m.	8:00 p.m.	9:00 p.m.
0100	3:00 p.m.	4:00 p.m.	5:00 p.m.	6:00 p.m.	7:00 p.m.	8:00 p.m.	9:00 p.m.	10:00 p.m.
0200	4:00 p.m.	5:00 p.m.	6:00 p.m.	7:00 p.m.	8:00 p.m.	9:00 p.m.	10:00 p.m.	11:00 p.m.
0300	5:00 p.m.	6:00 p.m.	7:00 p.m.	8:00 p.m.	9:00 p.m.	10:00 p.m.	11:00 p.m.	Midnight
0400	6:00 p.m.	7:00 p.m.	8:00 p.m.	9:00 p.m.	10:00 p.m.	11:00 p.m.	Midnight	1:00 a.m.
0500	7:00 p.m.	8:00 p.m.	9:00 p.m.	10:00 p.m.	11:00 p.m.	Midnight	1:00 a.m.	2:00 a.m.
0600	8:00 p.m.	9:00 p.m.	10:00 p.m.	11:00 p.m.	Midnight	1:00 a.m.	2:00 a.m.	3:00 a.m.
0700	9:00 p.m.	10:00 p.m.	11:00 p.m.	Midnight	1:00 a.m.	2:00 a.m.	3:00 a.m.	4:00 a.m.
0800	10:00 p.m.	11:00 p.m.	Midnight	1:00 a.m.	2:00 a.m.	3:00 a.m.	4:00 a.m.	5:00 a.m.
0900	11:00 p.m.	Midnight	1:00 a.m.	2:00 a.m.	3:00 a.m.	4:00 a.m.	5:00 a.m.	6:00 a.m.
1000	Midnight	1:00 a.m.	2:00 a.m.	3:00 a.m.	4:00 a.m.	5:00 a.m.	6:00 a.m.	7:00 a.m.
1100	1:00 a.m.	2:00 a.m.	3:00 a.m.	4:00 a.m.	5:00 a.m.	6:00 a.m.	7:00 a.m.	8:00 a.m.
1200	2:00 a.m.	3:00 a.m.	4:00 a.m.	5:00 a.m.	6:00 a.m.	7:00 a.m.	8:00 a.m.	9:00 a.m.
1300	3:00 a.m.	4:00 a.m.	5:00 a.m.	6:00 a.m.	7:00 a.m.	8:00 a.m.	9:00 a.m.	10:00 a.m.
1400	4:00 a.m.	5:00 a.m.	6:00 a.m.	7:00 a.m.	8:00 a.m.	9:00 a.m.	10:00 a.m.	11:00 a.m.
1500	5:00 a.m.	6:00 a.m.	7:00 a.m.	8:00 a.m.	9:00 a.m.	10:00 a.m.	11:00 a.m.	Noon
1600	6:00 a.m.	7:00 a.m.	8:00 a.m.	9:00 a.m.	10:00 a.m.	11:00 a.m.	Noon	1:00 p.m.
1700	7:00 a.m.	8:00 a.m.	9:00 a.m.	10:00 a.m.	11:00 a.m.	Noon	1:00 p.m.	2:00 p.m.
1800	8:00 a.m.	9:00 a.m.	10:00 a.m.	11:00 a.m.	Noon	1:00 p.m.	2:00 p.m.	3:00 p.m.
1900	9:00 a.m.	10:00 a.m.	11:00 a.m.	Noon	1:00 p.m.	2:00 p.m.	3:00 p.m.	4:00 p.m.
2000	10:00 a.m.	11:00 a.m.	Noon	1:00 p.m.	2:00 p.m.	3:00 p.m.	4:00 p.m.	5:00 p.m.
2100	11:00 a.m.	Noon	1:00 p.m.	2:00 p.m.	3:00 p.m.	4:00 p.m.	5:00 p.m.	6:00 p.m.
2200	Noon	1:00 p.m.	2:00 p.m.	3:00 p.m.	4:00 p.m.	5:00 p.m.	6:00 p.m.	7:00 p.m.
2300	1:00 p.m.	2:00 p.m.	3:00 p.m.	4:00 p.m.	5:00 p.m.	6:00 p.m.	7:00 p.m.	8:00 p.m.
2400*	2:00 p.m.	3:00 p.m.	4:00 p.m.	5:00 p.m.	6:00 p.m.	7:00 p.m.	8:00 p.m.	9:00 p.m.

*0000 and 2400 UTC are interchangeable. 0000 is associated with the date of the day beginning, 2400 with the day just ending.

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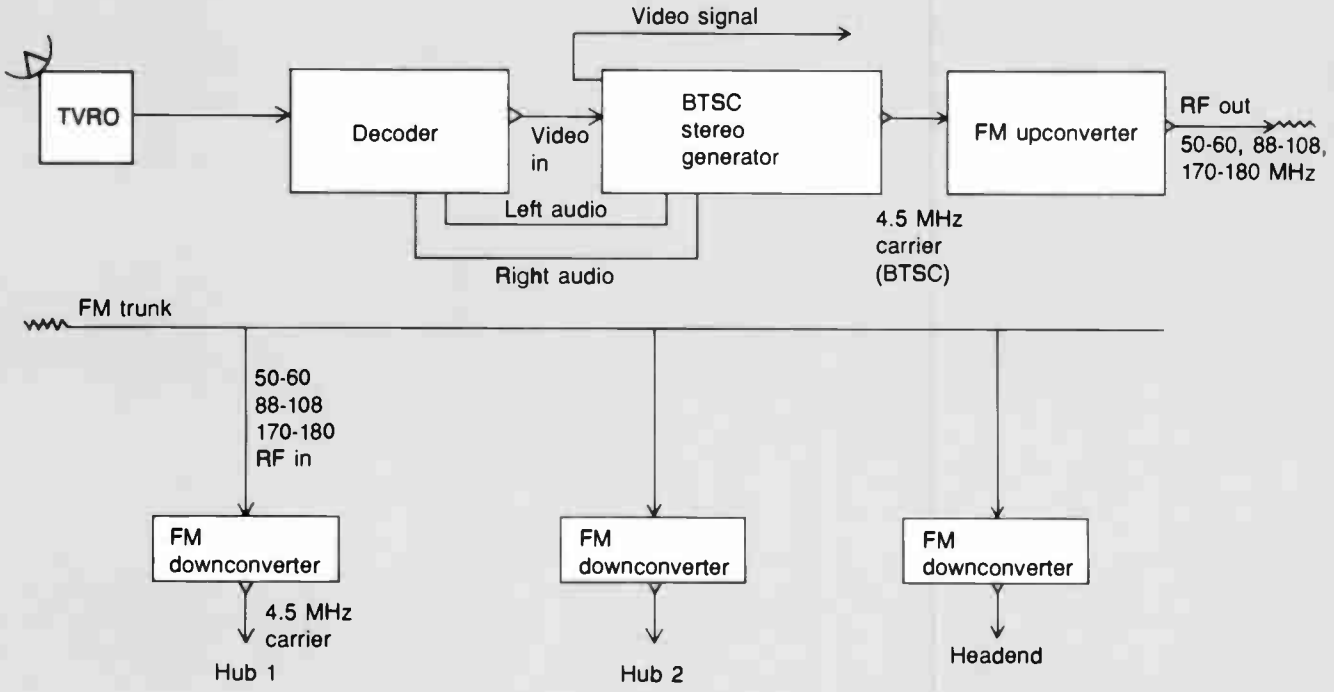
Figure 5: System for transportation of BTSC stereo carrier to multiple locations



(Continued from page 36.)

hub involved, the process of carrying the stereo signal can get very complicated. One way of handling these transportation problems is to use the BTSC generator to generate a 4.5 MHz modulated signal. Figure 4 illustrates a transportation system using FM equipment. Here, the 4.5 MHz signal is added directly to the video signal and the entire signal is applied to the video FM modulator. At the demodulator end of the transportation system,

the decoded video is applied directly to a modulator as if it were a microwave derived signal.

Figure 5 shows a way to transport the stereo signal discretely to several locations. The 4.5 MHz modulated BTSC signal is converted to a higher frequency for transportation and then downconverted at each point in the system where it is required. The output of the downconverter is the original 4.5 MHz signal that can be added to the modulator in the fashion described previously.

Another method of handling signals around the system is to FM modulate the baseband composite stereo signal and transport it to the point of usage. There it can be demodulated and applied to a modulator equipped with a BTSC stereo audio module. This may be desirable in systems using baseband scrambling systems, since the baseband encoders may have problems with video signals containing the 4.5 MHz aural subcarrier. Modifications will be available for FM equipment to allow it to handle baseband composite signals.

Careful planning pays off

Finally, a strong word of warning is issued to those who may want to provide all services, both simulcast over FM stereo and BTSC stereo television sound. There is no device on the market that will allow you to change from one format to the other. If you want to provide both services, you must plan your system very carefully so that you have baseband left and right audio available for the inputs to both devices. This may require design of the system so that discrete left and right audio are transported to one or several locations. If you are using FM transportation with an audio subcarrier, you will have to add a second subcarrier to the system. If you are transporting audio separately, you will have to add another audio channel.

There are as many solutions to the challenges created by BTSC stereo as the mind can imagine. By planning the best solution to your system in advance, you can avoid getting halfway through the conversion to stereo only to discover that one more piece of equipment is needed or the signal is at the right place but in the wrong format.

Considerations in implementing pay-per-view

This article will focus on one-way addressable systems and the merits of automatic number identification (ANI) technology (offered by AT&T and Pacific Bell), which requires advance ordering of pay-per-view (PPV) events, and store-and-forward technology (offered by Jerrold, TOCOM and Pioneer), which allows impulse ordering of PPV events.

By Jeremy Rosenberg
Product Manager, Pay-Per-View Programs
Jerrold Division, General Instrument

The first question a cable operator interested in implementing pay-per-view must answer is: "Do I want to implement pay-per-view for occasional special events (e.g., 'Wrestlemania') or as a routine service for subscribers on one or more channels?"

If PPV is limited to occasional special events, subscribers will be willing to place orders well in advance of the event's start. The high price of such an event will offset the equally high transaction costs of order processing.

PPV as a routine service for subscribers should be an extension of present viewing habits, with order placement as natural as "changing a channel." Additionally, the technology must accommodate a large number of low-cost events at correspondingly minimal transactional costs.

ANI vs. store-and-forward

ANI allows subscribers to use their home phones to place PPV orders. A telephone company (telco) uses its switching equipment to accept purchase requests. The telco computer identifies calling parties and programming orders and forwards the data to a billing system or the cable operator's computer. The operator's computer system cross-references a telephone number with a subscriber ID, checks credit, verifies personal identification data, records the purchase for invoicing and forwards an authorization to the subscriber over the one-way addressable system.

Store-and-forward refers to the storage of a subscriber's purchase activity with subsequent forwarding of this data to the cable operator for billing purposes. In this system, subscribers can authorize an event without any communication with the cable operator. The subscriber pushes event ordering buttons on the converter or a handheld remote-control unit and instantly is authorized. At that time a program and time stamp are stored in the converter's non-volatile memory. At the operator's convenience the addressable controller collects this purchase information for billing purposes.

When deciding between ANI and store-and-forward, the following factors should be evaluated:

- *Subscriber ease of use* — If pay-per-view is to be incorporated into everyday life as a routine service, ordering mechanisms should closely resemble present cable TV viewing patterns.

Jerrold's impulse PPV trial data reveals that over 45 percent of purchases for an event actually are made *after* the event starts. Subscribers are accustomed to scanning through channels, often deciding what programs to watch after these programs have begun. A subscriber has a natural preference for free programming — and we should expect subscribers to consider free events (including pay services to which they have subscribed to) prior to considering PPV events.

Advance ordering systems are predicated on subscriber willingness to forgo normal viewing patterns and plan viewing in advance. Focus group research from our PPV trials indicates subscribers do not want to order very far in advance of an event's start because their plans may change. There also is reluctance to deal with phone ordering because it interrupts other viewing and may be in conflict with other

household members' phone use. Peak residential phone use corresponds with prime-time television.

● *Transaction costs* — If an operator receives 50 percent of the revenue for a $4 movie, transaction costs must be covered by the remaining $2. Lower-priced events, with correspondingly smaller profit shares, leave even less revenue to cover transaction costs. A difference in transaction charges of as little as 50 cents could mean a difference in profit margins of more than 25 percent. For example, a 5 percent profit margin would improve to a 30 percent profit margin.

In an ANI advance ordering system, the operator is charged first by a telco for routing a subscriber request to the operator's billing system. The billing system then charges for verifying credit, recording purchase data, and invoicing and authorizing the converter. In a store-and-forward system the operator only is charged for recording data at the billing system.

● *Traffic limitations* — It is important that subscriber transactions be completed on the first attempt. Research indicates an unwillingness on the part of subscribers to deal with ordering impediments. While a store-and-forward system allows all subscribers to order at the same moment, an ANI system is based on having sufficient time to authorize requests. This forces pre-orders to be spread out to avoid overloading the telephone system's capacity, which has typically been designed to simultaneously handle less than 1 percent of the telephone subscribers in a given area.

● *Equipment expense* — All PPV approaches are predicated on addressable technology. ANI and store-and-forward also require a small capital investment for additional headend equipment and an addressable controller.

The difference in equipment expenses between approaches lies in the incremental investment to be made on a per-subscriber basis. For ANI there is no investment beyond an addressable converter and related system hardware. Facilitation of subscribers for store-and-forward impulse ordering is accomplished with add-on components to an impulse-upgradable addressable converter. Allowing for an equipment expense of $38 for the add-on unit and an incremental installation expense of as much as $22 to install this in the subscriber's home, a cost of $60 in addition to an upgradable addressable converter and related system hardware can be expected.

If the cable system isn't addressable, the operator has several methods of economically implementing it. The first, and most convenient method, would be a complete system change-out with appropriate headend and converter products. This change-out could be effected in a single step or during a phase-out period, when new addressable equipment could be phased in for interested subscribers. For operators who are part of MSOs, there is the potential that older, non-addressable or non-upgradable addressable product could be sold to related systems that have no immediate plans to implement pay-per-view.

The second method by which an operator can implement addressability is through a rebuild. While in the process of rebuilding and adding channels, the operator could upgrade to addressability with the impulse ordering capability.

In every instance there is a method whereby operators can amortize their equipment expenses. One method, used by several systems in PPV trials, is to charge a monthly "club fee" for subscribers using impulse equipment.

● *Third party dependence* — With the purchase of impulse ordering equipment, the operator gains complete control of the PPV ordering technology used within the cable system. With an ANI system the telco keeps control of the technology. The telco's control allows it to prioritize phone traffic and shut down ANI orders should they threaten system overload. Additionally, with ownership of ANI technology, a telco has the right to raise its per-transaction charge.

Knowing your needs

If an operator has no intention of ever implementing PPV as a routine service, ANI is an appropriate technology to consider. Implementation of PPV as a routine high-volume service requires the impulse ordering capability and low transaction costs of a store-and-forward approach. If the operator's decision on implementing PPV is set at some future time, those options can be increased by installing addressable converters that can be upgraded to utilize store-and-forward.

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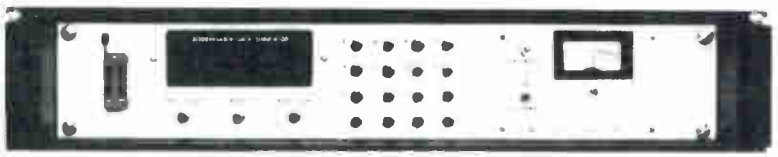

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Reader Service Number 38.

Field reliability rates and product quality

By Stephen K. Necessary
Marketing Manager, Subscriber and Distribution Products
Scientific-Atlanta Inc.

The perception of quality has been the basis for countless purchase decisions regarding cable TV equipment. But it is an imprecise ruler, with a scale that measures differently for different people. A significantly larger percentage of equipment buyers base their evaluation of quality on a product's reliability. Yet the value of quality can take on many dimensions.

It would be more appropriate to judge a vendor's quality through its investment in it. Mean time between failure (MTBF) rates are actually just a final reflection of the overall support a vendor gives to the product, from the beginning of its design stage through post-sale services and support. With the proper commitment of efforts, the value of a product's quality takes on a larger perspective. Reliability rates may help to quantify it, but a vendor's investment certainly shapes it.

When comparing the reliability of competitive equipment, one must understand the methodology used to measure it. Unfortunately, there are no industry standards, so vendor claims should be investigated as to the statistical methods applied.

Improving reliability

There are several vendors with reliable converters on the market today. Basic advances in semiconductor technology and component integration have provided the opportunity to significantly increase reliability and subscriber features over earlier offerings. S-A has experienced a two-fold improvement in its annual reliability rate with the introduction of its third-generation Series 8500 set-top terminals. This marked improvement is directly attributable to the integration of componentry and functions made possible through new applications of microelectronics.

Another contributing factor to reliability is

Choosing a converter

Converters represent a large capital investment for any CATV system. Because of the many different converters and the multitude of features they can offer, it is easy for the cable operator to become confused in the process of buying them.

The main purpose of the *mechanical-type* converter is to take the frequencies from the distribution system and process them to a frequency that the conventional TV set can receive. Typically, the converter can tune to 36 different channels, and because of its design, it is very economical and reliable. This type of converter is designed for systems using traps for security or outboard descramblers operating at the same output frequency of the converter. This basic converter does not include any subscriber features, and changing services for subscribers can be time-consuming.

There are some *programmable* converters that require a PROM (programmable read-only memory) chip to "hold" the channel authorizations and features, such as the use of remote control and parental guidance codes and channels. The chip is programmed by a PROM programmer that the converter manufacturer usually supplies. Even though the subscriber receives many features from these converters, the operator still has to do some tedious work programming the PROM chips and installing them inside each converter. When a change of service is needed, it usually means a lot of work to program and reinstall chips.

However, a new type of converter has been introduced to the market that has all of the advantages of the programmable converter but doesn't need the PROM chip. The converter can be placed directly into the subscriber's home without any initial preparation. If special parameters are used,

they can be programmed into a special device. Then an attached "wand" is aimed at the LED of the converter and the parameters are downloaded into the non-volatile memory of the converter via infrared transmission. This technology not only is less tedious to use, but it literally takes seconds to program one or more converters without the added cost of PROMs.

Programmable converters with descrambling capability are needed when the signals are encoded at the headend. This scrambling/descrambling method is another level of security for premium programming. Similar to the programmable converters previously described, there are converters available that do not need the PROM chip and can be programmed via infrared transmission with converter parameters along with the scrambling/descrambling capabilities.

The *addressable* converters are the most sophisticated, where the cable operator can transmit parameters over the cable to each converter from the office. The subscriber is offered even more features with an addressable converter than any of the others, while the operator has the advantage of controlling the converters from a remote site. Day-to-day operations, such as changing pay services, enabling/disabling the remote control, disconnecting converters for non-pay and reconnecting converters, can be done without much time or effort.

Addressability also is less trouble for subscribers, since they do not need to be home or return the converter every time they want to change service. The operator also feels secure in the knowledge that the subscribers are paying for the services that they are authorized for. Pay-per-view is another additional feature of the addressable converter.

After reading these descriptions, one can see why extensive research is needed to make a decision on what converter is the right one for a particular system. The cable operator must know the subscribers' needs as well as the system's. At times, it may be suitable to choose only one type of converter for a particular system. The operator may want a hybrid system and use a combination of converters. Many operators find that this is the most cost-effective way to operate their systems.

increased access to high-quality, high-volume electronics manufacturing techniques. Interestingly, the highest quality has come when American firms participate interactively with manufacturing partners in the design and production engineering of a product.

Conservative measurement

For reliability figures to be meaningful, they must be based on a large population size. Major manufacturers in the cable industry have field populations numbering in the millions.

To accurately measure reliability, a conservative approach must be used. Our basic methodology uses a running average of in-warranty converter repairs during the most recent six-month period and compares that to the estimated field population. This is the total number of converters shipped, less the most recent two months' shipments to account for time to place the units in service. This measurement method accounts for both in-service and "out-of-box" failures.

To measure failure rate, S-A employs bar coding to identify individual units, and service records are kept for each. As records are updated for returned units, an accurate percentage can be calculated that serves to quantify a failure rate for the entire population. The bar coding of subscriber products facilitates the quality control process.

Value of reliability

Purchasing agents and quality assurance engineers often measure a product's value by its "total life cost." This supports the concept that the product's total cost only partly is reflected by its initial purchase price. When the total cost for a product across its entire life is considered, it lends additional dimension to the value of quality, as measured by reliability. Completing the picture is the additional support a company gives its products in terms of servicing practices, warranties and guarantees of reliability.

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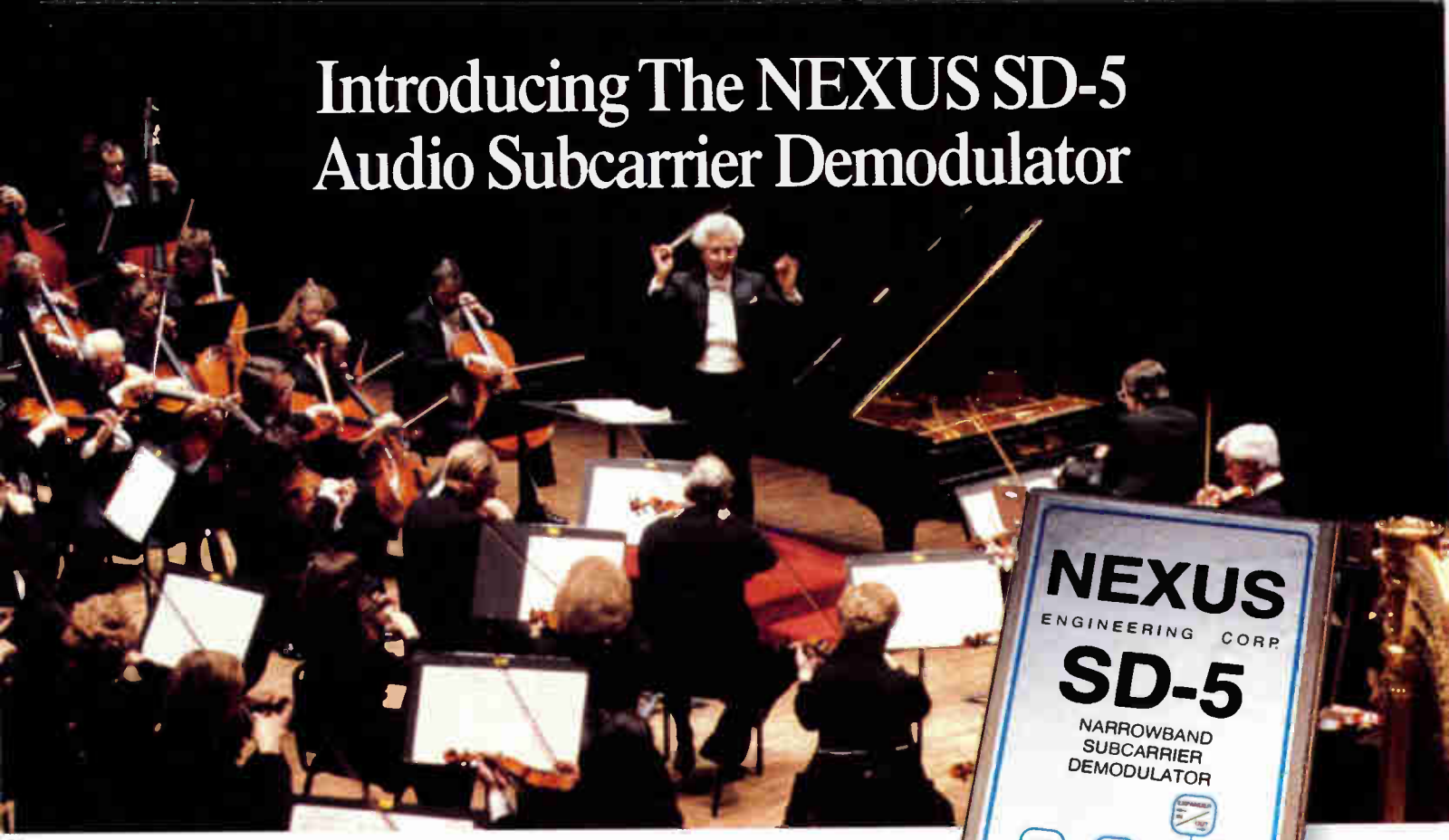

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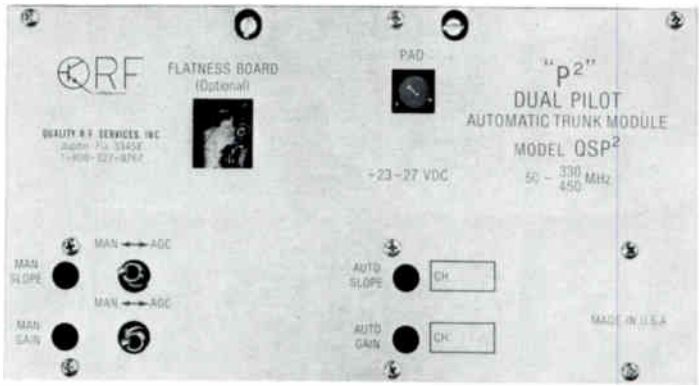

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Passband MHz	50-300	50-300	50-330	50-330	50-400	50-400	50-450	50-450
Flatness ± dB	0.2	0.2	0.2	0.2	0.25	0.25	0.25	0.25
Min. Full Gain dB	29 or 30	29 or 30	29 or 30	29 or 30	30	30	30	30
Gain Control Range dB	8	8	8	8	8	8	8	8
Slope Control Range dB	-1 to -7	-1 to -7	-1 to -7	-1 to -7	-2 to -8	-2 to -8	-2 to -8	-2 to -8
Control Pilots ASC: Turned to Ch.	"Q"	"Q"	"W"	"W"	"W"	"W"	"W"	"W"
Oper. Range dB	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable
AGC: Turned to Ch.	4	4	4	4	—	—	—	—
Oper. Range dB	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable
Return Loss dB	16	16	16	16	18	16	16	16
Noise Figure dB	6	6	6	6	6	6	6.5	6.5
Typical Oper. Level dBmV	34/30	34/30	34/30	34/30	35/30	35/30	35/30	35/30
Distortion at C/CTB	-93dB	-88dB	-92dB	-87dB	-91dB	-86dB	-89dB	-84dB
Typical Oper. XMod	-94dB	-89dB	-93dB	-88dB	-91dB	-86dB	-89dB	-84dB
levels 2nd order	-85dB	-82dB	-85dB	-82dB	-85dB	-82dB	-85dB	-82dB
DC Requirement mA at -23 VDC Note 1	630-730	420-500	630-730	420-500	650-750	430-500	650-750	430-500

Note 1: DC requirements are stated as typical to maximum.
Note 2: Specifications should be referenced to the modules, not the connector chassis.

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Broadband LAN performance testing

This is the first in a series of articles on local area network (LAN) performance testing. The series will discuss the kinds of tests that should be performed, why they should be done and how they are implemented. This installment covers frequency response testing of a broadband LAN.

By Steve Windle
Applications Engineer, Wavetek Indiana Inc.

Data communication via broadband coaxial cable is convenient in that it involves the use of technology developed for CATV. The distribution of the data signals is done, in many cases, with typical CATV system designs. Testing often can be done with equipment designed for CATV applications. The major difference between a broadband local area network system design and most CATV system designs is that LANs must provide a means for two-way communication with a device connected at any point in the system. The tests performed and the test equipment designed for use in a LAN environment must consider this important aspect of the application.

The following are the tests and the corresponding equipment necessary for the verification of proper broadband LAN operation:

- *System frequency response* — Sweep generator, analyzer (or sweep recovery system).
- *Carrier-to-noise* — Signal level meter or system analyzer.
- *Hum modulation* — Signal level meter or system analyzer.
- *Intermodulation* — System analyzer, precision preselector.
- *Return loss* — Sweep generator, sweep comparator, sweep display oscilloscope (or sweep recovery system) and return loss bridge.
- *Tap isolation* — Sweep generator, sweep comparator, sweep display oscilloscope; or sweep recovery system.
- *Leakage* — Scanning signal receiver, signal generator, dipole antenna, signal level meter or system analyzer.
- *Group Delay* — Group delay analyzer, display oscilloscope, sweep generator, 20 dB low-noise amplifier, 75 ohm attenuator or network analyzer.

Those familiar with CATV system testing probably are also familiar with these tests and their importance to proper operation of the system. Since broadband LANs are a relatively new concept, a return to the basics of system testing may be helpful.

Frequency response testing

A system frequency response test portrays the RF amplitude versus frequency as it is affected by different components of the system. The system is made up of passive devices that influence the amplitude of the RF data signal relative to frequency. Active devices amplify the signals to return them to their original levels. The LAN is designed to maintain transparency, so that the originating signals are received at their destination at a strong enough level to maintain reliable communication. The system frequency response measurement provides information that allows the operator to verify that the system is working according to its design.

A system frequency response (or sweep) test is a valuable tool that may be used to certify new system performance and as a diagnostic aid in a preventive maintenance program. It can inform the technician about system flatness (unity gain), incorrect component placement, defective components, loop loss or signal reflection (impedance match characteristics).

Test techniques

Three basic methods for determining frequency response are available to the system operator. Each involves a "sweep and recovery" technique. The selection of the proper technique and the proper sweep/recovery test equipment should be based on the characteristics of the system to be tested. The major determining criteria, dictated by the system, are frequency resolution, amplitude resolution (sensitivity), ability to handle high-level transients, bandwidth and availability of space in the

Figure 1: Back-to-back connection

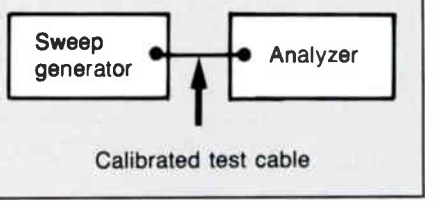


Figure 2: Back-to-back performance test

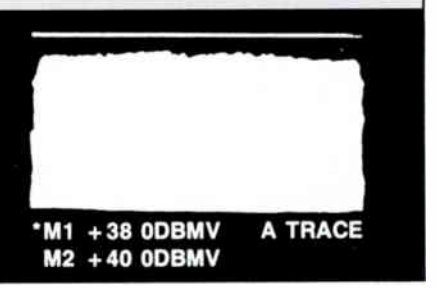


Figure 3: Outbound test set-up

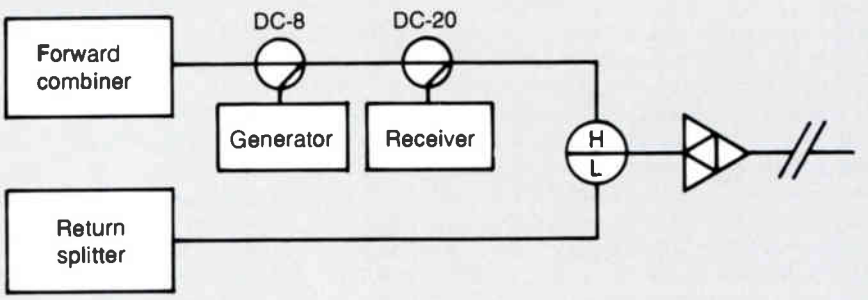


Figure 4: Response characteristics

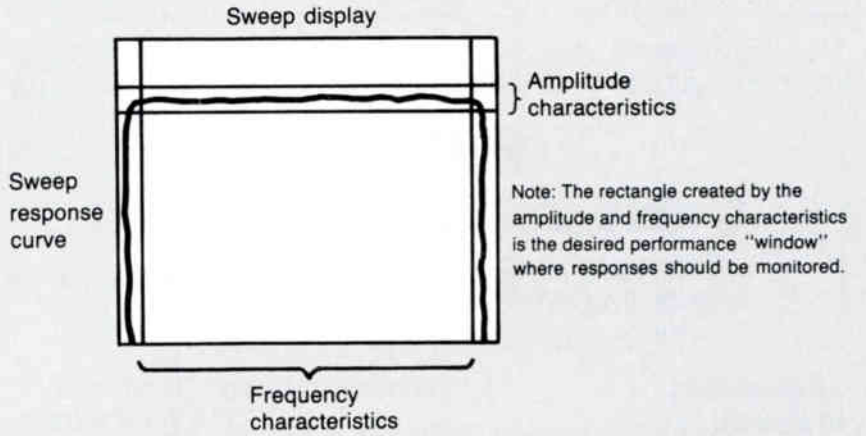
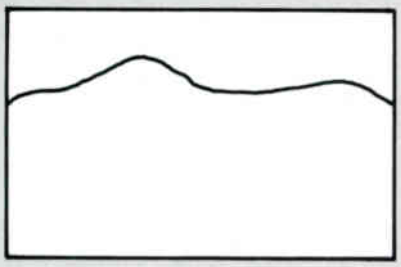


Figure 5: Signature build-up



spectrum to insert a pilot.

The three sweep/recovery techniques for system frequency response measurement are low-level synchronous (tracking) sweep, low-level asynchronous sweep and high-level synchronous sweep.

The low-level synchronous sweep approach uses a low-level tracking analyzer. The advantage of this technique is that the sweep stimulus is inserted 20 to 30 dB below the system carriers. This typically produces less system interference than the two other measurement approaches. The disadvantages are that there is a loss in resolution due to noise bandwidth characteristics and it requires a phase-locking pilot reference that may be inconvenient during signal return alignment (i.e., recovery).

Use of the low-level asynchronous sweep/recovery test system is very common in the industry. This test does not require a dedicated sweep/recovery system or the use of special pilots. To initiate the test, the operator connects a sweep generator at the appropriate system test point. (The outbound and inbound legs of the LAN are tested individually.) Center frequency and span settings are adjusted to match the band to be measured. The operator then connects a conventional spectrum analyzer at the appropriate test point to recover the sweep. Sweep recovery is accomplished by asynchronous (i.e., non-phase-locked) detection of the sweeping carrier. The sweep generator and spectrum analyzer constantly sweep and scan the measured spectrum, but they are not locked (i.e., do not track) and scan loss may occur. To avoid this problem, the sweep amplitude in the carrier wave (CW) mode should be measured first, then the detected sweep amplitude should correlate with this CW reference. Adjustments to the sweep time on the generator may be necessary. A spectrum analyzer with a long persistence phosphor CRT or with a peak hold function will make it easier to analyze the test results.

The high-level synchronous sweep measurement technique has the advantages of superior resolution and accuracy. The sweep carrier typically is inserted at 10 to 15 dB above the system signal levels, producing substantially better signal-to-noise performance upon detection. This method uses a broadband detector, as opposed to the narrow-band detection technique used in spectrum analyzers. The use of broadband technology is important because it is inherently easier to design and manufacture a precision broadband detector than to design and manufacture a precision multi-octave mixer network for the narrow-band detection scheme.

The disadvantage of using high-level sweep energy is that it may increase bit error rates. Because the energy of the sweeping carrier is substantially higher than any system carrier, data-destroying collisions may occur, causing the need for regeneration of some data bits. CSMA/CD (carrier sense multiple access with collision detection) systems generally are designed to be tolerant of this problem because it may occur naturally in this system format. Optional filters may be used to protect specific bands from high-level sweep energy interference.

Test procedure

Regardless of the technique used, the operator first should verify the "back-to-back" performance, or test the performance of the set when no elements are in the circuit between the set's transmitter and receiver units. Connect the transmitter to the receiver with a short coaxial cable as shown in Figure 1.

Set the transmitter sweep parameters slightly greater than the system band to be examined. The RF output level also should be adjusted to the required insertion level (discussed later in detail). Verify that the transmitter is sweeping through the proper frequency range and that the transmitter-to-receiver signal is sufficiently flat.

Figure 6: Standing waves (sweep response showing unterminated amp)

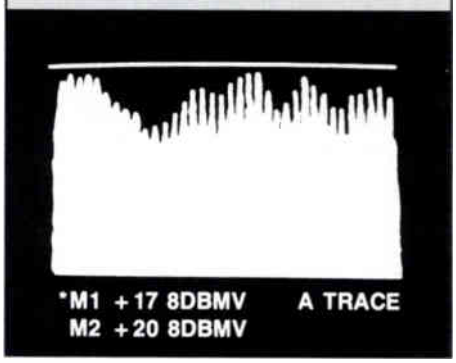


Figure 7: Amplifier test point

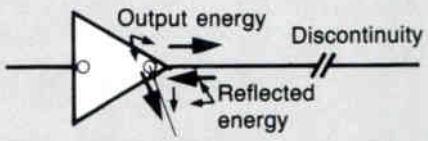


Figure 2 shows the flatness in the frequency response from a typical back-to-back performance test. As the transmitter frequency sweeps from F1 (the initial, low-end frequency) to F2 (the final, high-end frequency), the receiver trace level will vary. The peak-to-valley measurement across the top of the received or recovered signal must be within the range specified for the test set.

Other performance verification procedures may be needed, depending upon the particular test equipment. The operator should carefully read the operations manual for the test equipment before starting the field test. When the performance verification is completed, the operator can begin the system frequency response measurement. The transmitter should be connected to the headend test point as shown in Figure 3 to monitor the outbound (i.e., forward) response.

The insertion directional coupler is used to program the desired sweep level. In this example, the tap loss is 8 dB. The sweep system will have a system level range of 42 to 52 dBmV. If the headend levels after combining were 35 dBmV, a setting of 58 dBmV on the transmitter would produce the required level for system sweeping (52 dBmV minus 8 dB tap loss minus 35 dBmV carrier levels equals a 15 dB sweep/carrier ratio).

The test directional coupler, typically a 20 dB test point, allows inspection of the sweep after it is mixed with the system and provides minimum loss in outbound transmission. The operator should examine this response to verify simultaneous triggering of the transmitter and receiver units and to compensate for losses introduced by test cables.

After verification, the receiver is ready for

field operation. Connect the unit to the first amplifier input test point, and verify that the input response is as predicted by the design. Next, connect the receiver to the amplifier output test point. Evaluate the response and adjust the amplifier to produce the required frequency response. Refer to the operations manual for specific instrument operation. The output should be examined for response characteristics, signature buildup and standing waves.

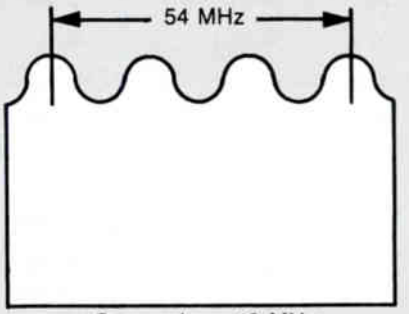
Response characteristics are the overall bandwidth variations, including the lower and higher filter roll-off points. This verifies that the cascade will amplify the desired band and disregard spectrum where amplification is not desired (Figure 4).

Signature buildup is an incremental "extra" contribution to gain in a particular portion of the spectrum (Figure 5). These signature "bumps" may be quite small per amplifier, but will grow in cascaded amplifiers. Consult the operating manual of the amplifier for corrective procedures, if needed.

Standing waves are the result of impedance mismatches located outbound of the amplifier (Figure 6). The majority of the amplifiers used in broadband systems use test points that exhibit little to no isolation of reflections. As a result, the operator can see the output response of the amplifier with reflected energy (i.e., standing waves) from a system fault (Figure 7). The standing waves may be useful in determining the distance to a defective component or system fault (Figure 8). In any case, the problem should be corrected before sweep efforts are continued.

Figure 8: Standing wave calculation, distance to fault

$$\frac{492 \times \text{velocity of propagation}}{\text{Frequency in MHz}}$$



One cycle = 18 MHz
.75 foam VP = 93%

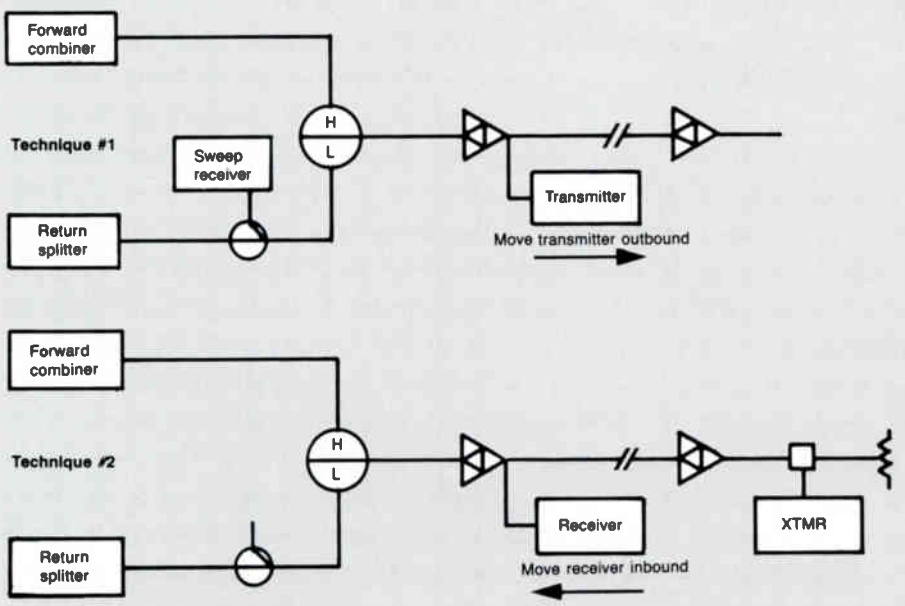
$$492 \times .93 = \frac{457.56}{18} = 25.42 \text{ feet}$$

Return sweeping

The return path requires similar examination, but the technique is different. In this case, the operator is sweeping *to* a point, instead of *away* from a point, as in the outbound. Two approaches are available, one requiring movement of the sweep source and the other requiring movement of the receiver (Figure 9). In either case, the sweep operator is adjusting an amplifier to a receive point, which requires some provision for correction feedback. This may involve a second technician, or a camera and modulator to return the results.

The result of verifying the frequency response performance of the LAN is knowledge of the RF transfer characteristics of the system, its capabilities and limitations. The person performing the analysis will know if the system is working according to design, and at what frequencies new data or video channels can be added.

Figure 9: Return sweep technique



Signal level meters

Sadelco Inc. introduced its Model 733C signal level meter, available in standard and upgraded models. According to the company, the upgraded model features an extruded aluminum case for optimum RFI protection and strength, automatic shut-off to conserve battery power, and circuitry to protect the regulator from battery polarity reversal.

The product's carrying case is made of water-resistant cordura nylon; it has one-inch foam padding all around with a metal plate built into the cover to protect controls. It also contains a zippered storage pocket.

For more information, contact Sadelco Inc., 75 W. Forest Ave., Englewood, N.J. 07631, (201) 569-3323; or circle #98 on the reader service card.

Fiber-optic assembly

The Brand-Rex Cable Systems Division of BRIntec Corp. announced fiber-optic cable assemblies using a 62.5 micron core. The product design is said to be favored for LANs because it has a greater bandwidth than 100/140 fiber. Its larger numercial aperture of 62.5/125 fiber compared to 50/125 fiber allows easier coupling of light into the fiber. It also features the 125 micron standard outer diameter.

According to the company, cables with loose and tight buffer configurations also are being offered, with fiber counts ranging from one to 12 fibers and lengths to 2 km. The cable is available with a variety of jackets, including polyurethane, neoprene, Tefzel, Teflon and others.

For more information, contact Brand-Rex Cable Systems Division, BRIntec Corp., 1600 W. Main St., Willimantic, Conn. 06226-1128, (203) 456-8000; or circle #96 on the reader service card.

Cable accessories

L-COM is offering a complete line of shielded GPIB cables having four twisted pairs in the inner circle and eight pairs in the outer circle, said to meet or exceed IEEE-488 requirements. Metal connectors and flexible cable with improved retention are said to guarantee useful life even when subjected to close radius bends.

Accessory devices include a one-inch extension and a bulkhead feedthrough adaptor to help shorten cable paths. A multi-tap accessory allows the mating of many cables on a horizontal plane. Two sockets also are available for use as replacement or for new production.

For more details, contact L-COM Data Products, 1755 Osgood St., North Andover, Mass. 01845, (617) 682-6936; or circle #94 on the reader service card.

VHF channel processor

Blonder-Tongue announced the availability of its MSCA 2-volt VHF channel processor for amplifying and stabilizing the level of a single VHF channel in MATV and SMATV headends. According to the company, a stable signal free of distortion is assured by the combination of a low-noise, high-gain amplifier with high output capability and a wide automatic gain control window.

An aural trap adjustment on the front panel is said to provide up to 10 dB of sound attenuation at the input to reduce distortion, without affecting color quality. The product is designed for standard rack or cabinet mounting.

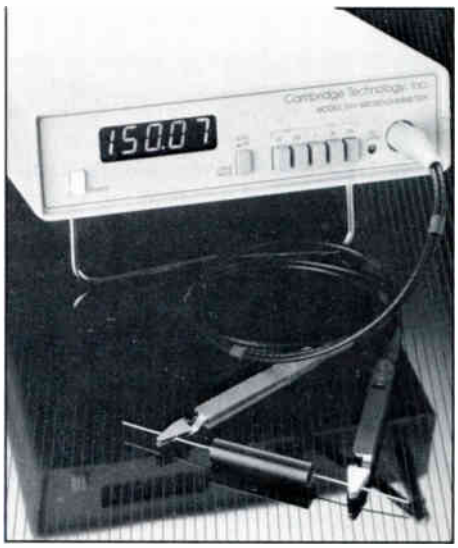
For more information, contact Blonder-Tongue Laboratories Inc., 1 Jake Brown Rd., Old Bridge, N.J. 08857, (201) 679-4000; or circle #92 on the reader service card.

Wire marker

The Rite-On tape dispenser from Tyton Corp. is said to be a flexible, compact system designed to identify electrical cable, conduit, CATV coaxial cable and large wire bundles to 1.75-inch O.D. The durable throw-away dispenser provides a flat surface for writing on the white background marker, which seals the legend under clear vinyl.

According to the company, the tape has high tack adhesive that resists flagging, dirt, oil, water, alcohol, fungus, abrasion and temperature extremes.

For more details, contact Tyton Corp., 7930 N. Faulkner Rd., Milwaukee, Wis. 53223, (414) 355-1130; or circle #89 on the reader service card.



Micro-ohmmeter

Cambridge Technology Inc. has introduced its Model 510, a 4½ digit micro-ohmmeter. It is said to determine the value of any low-resistance device or material, has five ranges (from 19.999 milliohms to 199.99 ohms), a full-scale 1 micro-ohm resolution and a basic accuracy of 0.02 percent.

Three measurement modes are provided. The continuous DC mode is used for making measurements on inductive components. The switched DC mode removes the effect of thermal voltages, said to be the largest source of error in low-resistance measurements. The pulsed mode is provided for thermally sensitive devices, such as fuses.

For further information, contact Cambridge Technology Inc., 2464 Massachusetts Ave., Cambridge, Mass. 02140, (617) 876-0891; or circle #91 on the reader service card.

Fiber-optic link

Synchronous Communications has developed a multichannel fiber-optic video link system. The FMVT-4001-40 wideband FM modulator is designed for use in long wavelength fiber-optic video links. As the standard frequency plan requires 40 MHz channel spacing, the modulator does not need excessive band limiting. The FMVR-4001-40 is a linear wideband FM demodulator that is said to produce excellent video specifications.

The SMLT-1300 single-mode laser transmitter incorporates the latest in GaAs laser technology with a high modulation frequency response. The SMOR-1300 single-mode optical receiver uses a high-speed germanium avalanche photodiode with a cutoff frequency of more than 700 MHz. Other types of detectors also are available.

For more information, contact Synchronous Communications, 1701 Fortune Dr., Suite O, San Jose, Calif., (408) 262-0541; or circle #90 on the reader service card.

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Reader Service Number 45

KEEPING TRACK

Huston

Eagle Cable Inc. has named **Dane Huston** to the position of vice president of operations. He will be responsible for the daily operations of Eagle's nine Oklahoma cable TV systems. Huston comes to Eagle from Multimedia's Bixby, Okla., system, where he was system manager. Prior to this, he worked for Teleprompter of Santa Cruz, Calif., and for Cable Communications Corp. Contact: 3910 E. 51st St., Suite 5, Tulsa, Okla. 74135, (918) 744-6653.

Falcone International Inc. appointed **Allen Kirby** national sales manager. He will be responsible for the development and management of a nationwide dealer/representative organization and will serve on the company's product development committee. Contact: 1355 Marietta Pkwy., Suite 104, Marietta, Ga. 30092, (404) 427-9496.

First Data Resources Inc. announced the promotion of **Jay Oxton** to vice president and general manager for the Cable System Services division. Prior to this, he was director of national accounts, regional sales manager and sales representative.

First Data also announced the appointment of **Mark Borngrebe** to regional sales manager for its cable division. He will be responsible for sales of the company's cable control system and its micro delivery option (MDO). Before this, Borngrebe was the district sales manager for Airborne Express.

Finally, First Data promoted **Eric Petersen** and **Mike Carpino** to sales representatives for the cable division. Prior to this, Peterson was senior account representative. Carpino previously was a cable analyst and has been with First Data for over three years. Contact: 7301 Pacific St., Omaha, Neb. 68114-5497, (402) 399-7000.

Homa

Michael Homa Jr. has been promoted to vice president of manufacturing at **Tamaqua Cable Products Corp.** Homa joined the company as a machine operator in 1970, was named foreman (1972), quality control supervisor (1973), general foreman (1975), production manager (1976) and plant manager (1980). Contact: P.O. Box 347, Schuylkill Haven, Pa. 17972, (717) 385-4381.

Pioneer Communications of America Inc. announced the appointment of **James Williamson** as vice president, operations. He will be responsible for the company's repair facility, administration and human resources. Prior to joining the company, he was with Warner Cable as vice president and general manager of its security division.

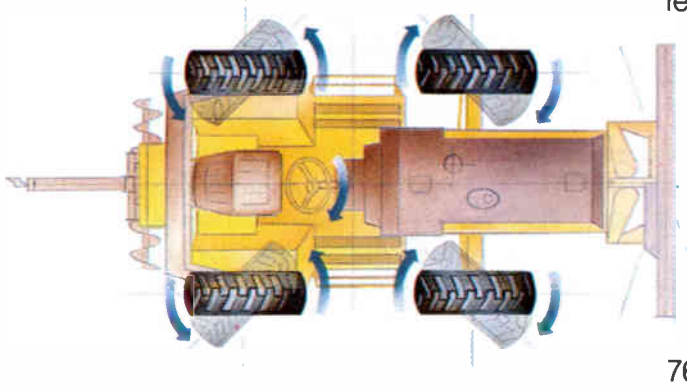
Also, Pioneer announced the appointment of **Jerry Nelson** as director of marketing and sales for the company's cable TV division. He will be responsible for managing the company's nationwide sales force and the division's marketing efforts. Prior to joining Pioneer, Nelson was marketing director for Parallex in Winston-Salem, N.C. Contact: 2200 Dividend Dr., Columbus, Ohio 43228, (614) 876-0771.

Your next trencher.

Here's what you'll miss if it isn't a *new* Case 760.

Exclusive four-wheel maneuverability.

Rigid-frame design and unique Case Four-Wheel Selective Steering give you extraordinary



maneuverability, with precision handling and excellent traction in three different steering modes. Front-wheel steering is perfect for trenching and roading. Crab steering puts each tire in a separate track for more gripping power on slopes. And our exclusive coordinated steering mode gives you tight, full-power turning. The steering wheel controls both front and rear wheel direction. When changing from coordinated to front-steer, the rear wheels automatically return to the straight-ahead position.

Minimal maintenance.

Only Case offers a trencher with *no* daily lubrication requirements. Just check the easy-to-read hydraulic oil sight gauge and engine oil level and you're ready to go. To further reduce maintenance needs, the planetary trencher drive is sealed in oil — another Case exclusive.

Easy operation.

A single-lever control raises, lowers, tilts and angles the backfill blade. The operator's platform is isolated from the mainframe to reduce vibration. And there's a comfortable, adjustable swivel seat. These are just a few of the ways the 760 can increase operator efficiency, with features available *only* from Case.

Greater maneuverability. Reduced maintenance. Easy operation. Three of the many good reasons to see your Case dealer soon and get the competitive edge in trenching.

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Reader Service Number 48.

Wavetek Report 1: LAN Sweeping

Frequency response changes can throw your whole LAN out of whack.

When a system frequency response changes, Local Area Network performance changes. When it doesn't conform to established parameters, LAN performance suffers. When carriers are transferred out of spec, LAN performance suffers.

Every data transmission system is open to response problems. It happens naturally. And it happens when you alter the system.

Inconspicuous in its early stages, it might only degrade certain bands. So it's not very critical if these bands are unused.

Left unchecked, though, it has the very real potential to take the system down.

With preventive maintenance testing, called *sweeping*, you can detect the problem before it affects performance.

Sweep testing can make the difference between your LAN working all right and your LAN not working at all.

A common misconception.

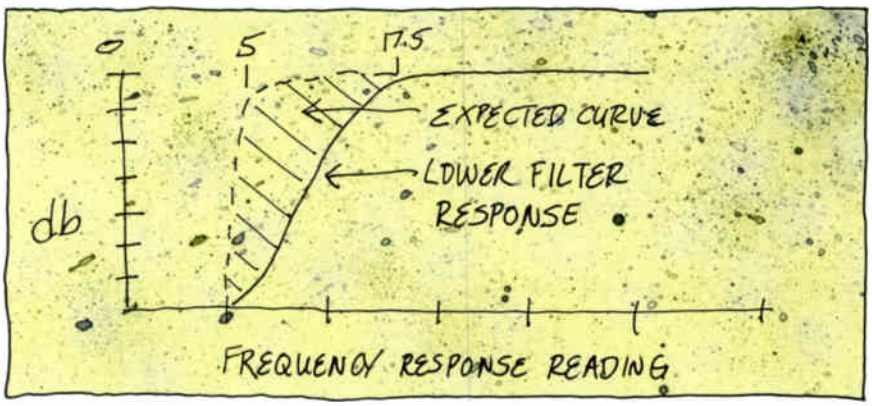
Contrary to popular belief, a signal level meter cannot perform adequate sweep testing.

Granted, a signal level meter measures amplitudes. Granted, too, it is perhaps the most versatile piece of testing gear, sort of a volt meter for LAN operators.

But for rapid, across-the-board carrier frequency response testing, a signal level meter isn't enough.

The proper instrument.

In the time it takes a signal level meter to make only incremental frequency interpretations across just one channel, a sweep generator and receiver can take almost infinite sample readings across the entire LAN band.



A truer LAN signature, quicker.

But a sweep generator and receiver alone won't do it. You need a concerted commitment to testing.

The cure: preventive testing.

Maintained properly, your LAN can perform reliably for years. Testing is a vital factor.

As with any LAN performance testing, sweeping should be part of a set maintenance routine. After all, transmission weakening and error rate increases are at stake.

Sweep verifies carrier frequency response performance within given parameters. It verifies if an amplifier is giving enough gain. It also gives interpretations that guide realignment.

Different sweep methods.

One word of caution. The wrong sweep method can be as detrimental as no sweep method. You run the risk of creating high-level distortion or carrier collision.

The proper sweep method depends upon your system.

That's where Wavetek can help.

We can analyze your LAN. Recommend the proper sweep response test: high level, low level or notched. We can supply you with the proper testing instruments: signal generators, receivers, signal level meters.

More than equipment, though, Wavetek provides support. Applications engineers man the phone for trouble-shooting. Technical writers publish applications papers. Sales engineers advise on-premise. A total commitment to your LAN performance.

You've established certain parameters for performance. Make your LAN abide by them.

For a more in-depth look at sweep testing or other broadband LAN performance testing, and for our free booklet, Testing LAN Performance, *write Wavetek Indiana, Inc., 5808 Churchman, P.O. Box 190, Beech Grove, Indiana 46107.*

Or call toll free 1 800 622-5515. In Indiana, 317 788-5965.

COMING NEXT: *Testing for LAN distortion.*

Dahl

Breen

Morse

Robert Dahl has been named vice president and chief financial and administrative officer for **Ungermann-Bass Inc.** He will be responsible for finance, administration and human resources. Before joining the company, Dahl spent seven years at Rolm Corp. as vice president, finance and chief financial officer (CFO). Prior to that, he was senior vice president of finance and CFO at Measurex Corp. Contact: 3900 Freedom Circle, Santa Clara, Calif. 95052-8030, (408) 496-0111.

Ed Breen has been appointed vice president of marketing for the **Jerrold Subscriber Systems** division of General Instrument. Formerly director of marketing programs, he has been with the company nine years, during which he also was Southeast region sales manager.

Also, **Paul Morse,** formerly vice president of marketing, has been named vice president of business development. With Jerrold for six years, he also served as director of planning and analysis, marketing manager for addressable systems, and product manager for computer-based systems.

Pete Wronski has rejoined the sales force of Jerrold as account manager for Times Mirror, Viacom and McCaw. Prior to this, he served as sales support for the Distribution Systems division. Previous to that, he was Western sales manager for Century III Electronics and account manager for United Artists Cablesystems.

Finally, **Mohsen Manoochehri,** previously responsible for Times Mirror, will assume territory and accounts for Oregon, Washington, California and Nevada. Prior to this, he was marketing manager for Jerrold addressable subscriber products. Contact: 2200 Byberry Rd., Hatboro, Pa. 19040, (215) 674-4800.

M/A-COM announced the appointment of **Stan Lindsay** to the position of vice president, sales and marketing, of the Comm/Scope division of the company's Cable Home Group. He has been in the cable industry for over 21 years, most recently with Comm/Scope as national sales manager. Contact: P.O. Box 1729, Hickory, N.C. 28603, (800) 438-3331.

Texscan MSI/Compuvid recently announced several promotions in its marketing department. **Dennis Gourley,** formerly CATV sales manager, has been appointed national accounts manager. **Dave Allen,** formerly Southern region sales manager, has assumed the post of national CATV sales manager. **K. Randy Wagner** has been named Eastern region sales manager. **Gary Hoffman,** previously Western region sales manager, has been appointed manager of marketing services. **Deanna Riccardi** has been promoted to sales services administrator. **Paula Lawson** has joined the staff as advertising and promotion administrator. Contact: 3855 South 500 West "P", Salt Lake City, Utah 84115, (801) 262-8475.

CATV product testing

By Chris Papas
The MITRE Corp.

In a maturing industry, as cable TV has become, the quality of its products is increasingly important. The "good old days" of 110 volt AC tube amplifiers built in a #10 can are gone. Most systems are beyond the stage of "we will put anything in the system just to get the thing running." They are now looking for the best quality for the price and hope the product is going to last until the next rebuild.

Unfortunately, some manufacturers are not adequately testing their products to know with a reasonable certainty that the equipment will last that long. Many firms start to work too late on quality, reliability and maintainability. These should be the responsibility of the design engineers from the start and not a special quality-control function to add "after-design fixes." Proper design and product testing avoids unplanned obsolescence. It also lowers the overall cost to cable systems over the life of the product.

A few manufacturers that grew up with the cable industry have had some horror stories along the way; e.g., products that should have worked and didn't, or products that were being operated in the real world far beyond design limits and failed. The industry was expanding so fast that there wasn't time to check everything, since the equipment was needed yesterday. The industry can and should spend a little time to do the testing needed to make sure its products will work properly and last. Although formal testing programs by cable manufacturers are not required, companies that plan to be around for a long time find that it is good business. Manufacturers just don't like their name dragged through the mud due to a bad product.

Inadequate testing of new equipment is like playing Russian roulette with the company's funds. It may work right; then again, it may not.

At a recent demonstration of a new portable computer built by a major manufacturer, the demonstration program wouldn't work because the key that started the program was broken. All the advanced capability of this machine didn't help when the prospective purchaser couldn't get it to start. Adequate testing of new products before consumers get hold of them avoids such surprises. The public relations staff shouldn't have to clean up the mess that the design engineers leave behind.

In the latest equipment ads, some manufacturers spend a great deal of time telling you about all the "gee-whiz" things the equipment will do but don't tell you if it's really going to work after you buy it, what conditions it will work under or if it will work in five years. They may not know.

When the military buys communications equipment, it requires a significant amount of testing to assure the quality of the product. Some of these areas include environmental testing, reliability testing, maintainability testing and a specialized burn-in procedure, environmental stress screening (ESS). Since these may be of interest to cable TV manufacturers and systems, a brief description of each area is provided.

Environmental testing

Environmental testing of equipment is conducted to ensure that the equipment will work properly in the varied climates and seasonal conditions encountered throughout the United States. The military has a standard test procedure for environmentally testing equipment, Military Standard 810D (MIL-STD-810D). Tests outlined in this document include high and low temperature, temperature shock, solar radiation (sunshine), rain, humidity, fungus, salt, fog, sand and dust, vibration, and a few other tests that should not apply here, like gunfire. →

SCTE TECHNICAL TUITION ASSISTANCE APPLICATION

SCTE
P.O. Box 2389
West Chester, Pa. 19380
(215) 363-6888

Name: Mr. / Mrs. / Ms. _____ (Last) (First) (Middle)

Telephone Numbers:

Mailing Address: _____

Home: ( ) _____

Work: ( ) _____

Date of Birth: ___/___/___ (mo. day yr.)

Social Security No. ___ - ___ - ___

SCTE STATUS:

Chapter or Meeting Group Member? _____ Yes _____ No

Nat'l Member? _____ Yes _____ No

Chapter or Meeting Group Name: _____

Member Number: _____

CURRENT EMPLOYMENT INFORMATION: Total No. of Years in the Cable Industry: _____

Company Name: _____

Telephone Number: ( ) _____

Address: _____

Present Supervisor: _____

Title/Position: _____

Duties: _____

Employment period: from _____ to _____

EMPLOYMENT HISTORY:

Employer: _____

Address: _____

Phone Number: ( ) _____

Title/Position: _____

Duties: _____

Immediate Supervisor: _____

Employed from: _____ to _____

Employer: _____

Address: _____

Phone Number: ( ) _____

Title/Position: _____

Duties: _____

Immediate Supervisor: _____

Employed from: _____ to _____

Professional Activities & Memberships:

Activity or membership: _____

Your most significant contribution:

Activity or membership: _____

Your most significant contribution:

Activity or membership: _____

Your most significant contribution:

Current SCTE BCT/E Certifications:

EDUCATIONAL HISTORY: (Attach all appropriate transcripts)

High School Level Completed: ☐ ☐ ☐ ☐
9 10 11 12

Names & Locations of Schools: (Attach additional page if necessary.)

Diploma Granted: _____ Yes _____ No _____ Date	Diploma Granted: _____ Yes _____ No _____ Date
Course of Study: _____	Course of Study: _____
GPA _____ Dates of Attendance: _____	GPA _____ Dates of Attendance: _____

College Level Completed: ☐ ☐ ☐ ☐ ☐ ☐
1 2 3 4 5 6

Names & Locations of Schools: (Attach additional page if necessary.)

Degree Granted: _____ Date: _____	Degree Granted: _____ Date: _____
Major: _____ GPA: _____	Major: _____ GPA: _____
Dates of Attendance: _____ to _____	Dates of Attendance: _____ to _____

Vocational/Military School:

Name & Location of School:	Course of Study: _____
	Dates of Attendance: _____ to _____
Graduated: _____ Yes _____ No _____ Date	Grade Point Average (4.0 scale): _____

Correspondence Courses:

Name and Location of Institution:	Course of Study: _____
	Dates of Attendance: _____ to _____
Diploma Granted: _____ Yes _____ No _____ Date	Grade Point Average (4.0 scale): _____

PERSONAL REFERENCES: (Industry-Related)

Name: _____	Name: _____
Title/Position: _____	Title/Position: _____
Company: _____	Company: _____
Address: _____	Address: _____
_____	_____
Telephone Number: ( ) _____	Telephone Number: ( ) _____

CONFIDENTIAL FINANCIAL DATA:

Gross Annual Income:* $_____

Net Taxable Income:* $_____

Number of Dependents: _____

*As reported to the IRS in last tax year; for married couples filing separately, include both incomes.

Explain why you should receive an SCTE Technical Tuition Assistance Grant and how it will benefit you (use additional page if necessary):

_____

_____

_____

_____

_____

_____

_____

_____

Please return completed form to:
Society of Cable Television Engineers
P.O. Box 2389
West Chester, PA 19380

Signature: _____

Date: _____

Now the question comes up: What does all this have to do with a cable TV system? If you were buying some equipment to hang on a pole in Fairbanks, Alaska, wouldn't you like to know if that equipment is going to work at 60 degrees below zero? Not, should it work, but will it work at that temperature? The same is true for a system in Florida. Will it work in a hot, humid climate without dying? And in a salty atmosphere without being corroded away to nothing? A little testing for such things ahead of time eliminates surprises at the worst possible time.

Since some manufacturers and most cable systems don't have environmental testing facilities, there are independent testing labs that do this kind of work. One lab in Florida has a chamber large enough to hold a B-52.

Reliability testing

The concept of reliability testing is simple but the implementation is somewhat complex. First, you have to decide how long the equipment should operate without any maintenance or failures and test it to determine if it meets that goal. Equipment usually is designed with an MTBF or mean time between failure in mind, and the testing is done to determine if it meets that time. If there isn't any predetermined MTBF for the equipment, then a lengthy discussion follows as to how reliable *is* reliable.

The military has a standard test procedure for reliability testing, Military Standard 781C (MIL-STD-781C). In addition to testing for the MTBF, it also specifies that the equipment should be stressed for its normal operating environment while the test is run. The different stresses listed are electrical, vibration, thermal and moisture. Although this standard does get complex in mathematical modeling, the basic premise is to make the test as realistic as possible in testing the entire system to the MTBF.

Reliability testing is of interest to cable systems since it is directly related to how long the equipment will operate without any failures. The longer the equipment will operate, the less downtime of the system will result and the less complaints will be received.

One interesting ad for an electronic component stated "calculated MTBF exceeds 50,000 h." Only half of the job was done here. Just because the company calculated the MTBF to exceed 50,000 hours and would *like* it to be 50,000 hours, that doesn't mean it *will* be. Many a good design has been ruined by poor quality parts or construction. This ad also does not tell what conditions it is expected to work under for 50,000 hours. It could mean sitting on the shelf without the power turned on. Since the time to verify 50,000 hours is very lengthy (much more than 50,000 hours), multiple units would be tested using the procedures in MIL-STD-781C to shorten the time that would have been required on a single unit.

The latest CATV equipment ads contain words like "dependable," "proven dependability," "reliable," "more reliable" and "reliable service" without any quantitative information to go with it. In this case, the word "reliable" can mean anything the manufacturer wants it to mean. An interesting approach was used in one ad. It tries to convince the reader that the company is

reliable, so the equipment is reliable. Maybe it is and maybe it isn't . . .

In addition to this type of testing, a reliability analysis of the product can be done by systems themselves even after the equipment is installed in the field. This is a simple test to determine how long the product will work in service without any failures. Any system with good maintenance records already may have the raw data available to come up with actual reliability times. This type of a test doesn't help the manufacturing process, but it does help systems decide what is "reliable" and what is not.

Environmental stress screening (ESS)

ESS, also known as burn in or pre-conditioning, is part of a total reliability test plan. The test is done on all parts, subassemblies or complete units after the manufacturing process has been completed. The purpose is to weed out bad units due to poor quality parts or workmanship defects. This includes bad solder joints, loose connections, etc. Screening the parts at the factory means fewer failures in the field.

The practice has been to require a 168-hour burn-in period with some temperature cycling of the equipment during that period. It recently has been determined that 10 minutes of random vibration followed by 50 hours of rapid temperature cycling eliminated a much higher percentage of early failures — in less time.

If many failures are found during the ESS process, then it is only a temporary fix to a deeper problem. Improvements to the manufacturing process are the only true fix.

Maintainability testing

Maintainability testing is another area that is simple in concept but somewhat complex in implementation. The basic idea is to set a time period and conditions for repairing various faults of the unit and test it to that specification. The maintainability test is conducted in an environment that simulates, as closely as practicable, the operational and maintenance environment planned for the item. In this case, the environment should be representative of the working conditions, tools, support, equipment, spares, facilities and technical publications that would be required during service. In addition to testing faults of the unit, there is a test for the time taken for preventive maintenance tasks.

The military has a standard test procedure for maintainability testing, Military Standard 471A (MIL-STD-471A). There are two times of concern: the mean time for corrective maintenance and the maximum corrective maintenance time. These are the test objectives. The standard does get into some complex mathematics, but the basic premise is to make a realistic test in determining maintainability.

Maintainability is of interest to cable systems since it is directly related to the amount of technician time spent in the field. The less time spent in repairing the equipment, the more equipment he or she can repair.

One CATV ad says the equipment is "maintainable"; another says "replacement is quick and downtime is short"; and yet another says "easy to maintain." The questions here are how maintainable is maintainable, how quick is quick, how short is short, and how easy is easy? Without any type of quantitative yardstick, they can mean anything the manufacturers want them to mean.

In it for the long run

The latest initiative of the Air Force is to "double the reliability and halve the maintainability" of any new equipment or new modifications to existing equipment. It has found that a few extra dollars spent up front in the design phase saves a lot more dollars when the equipment gets to the field. Analysis of the equipment's life cycle cost with all areas considered (such as initial cost, length of equipment's use, repair cost, technician training, spares on hand, warehouse expense, etc.) shows that the equipment actually costs far less in the long run. That doesn't sound like such a bad idea, does it?

Lengthy testing to military standards is not necessarily desirable if it's not required by a contract, but it does provide a starting point for a realistic test program. Several large MSOs, such as United Artists Cablesystems, have their own facilities to test equipment they have bought. This type of testing by the buyer of the equipment does little to correct any problems due to poor design or manufacture, but it does give the organization a basis for casting its dollar votes as to which equipment works. Cable systems that would go to such lengths in testing not only are interested in increasing profits but their reputations in the business as well.

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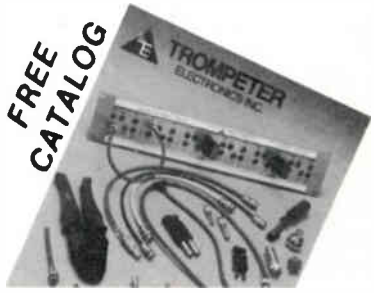

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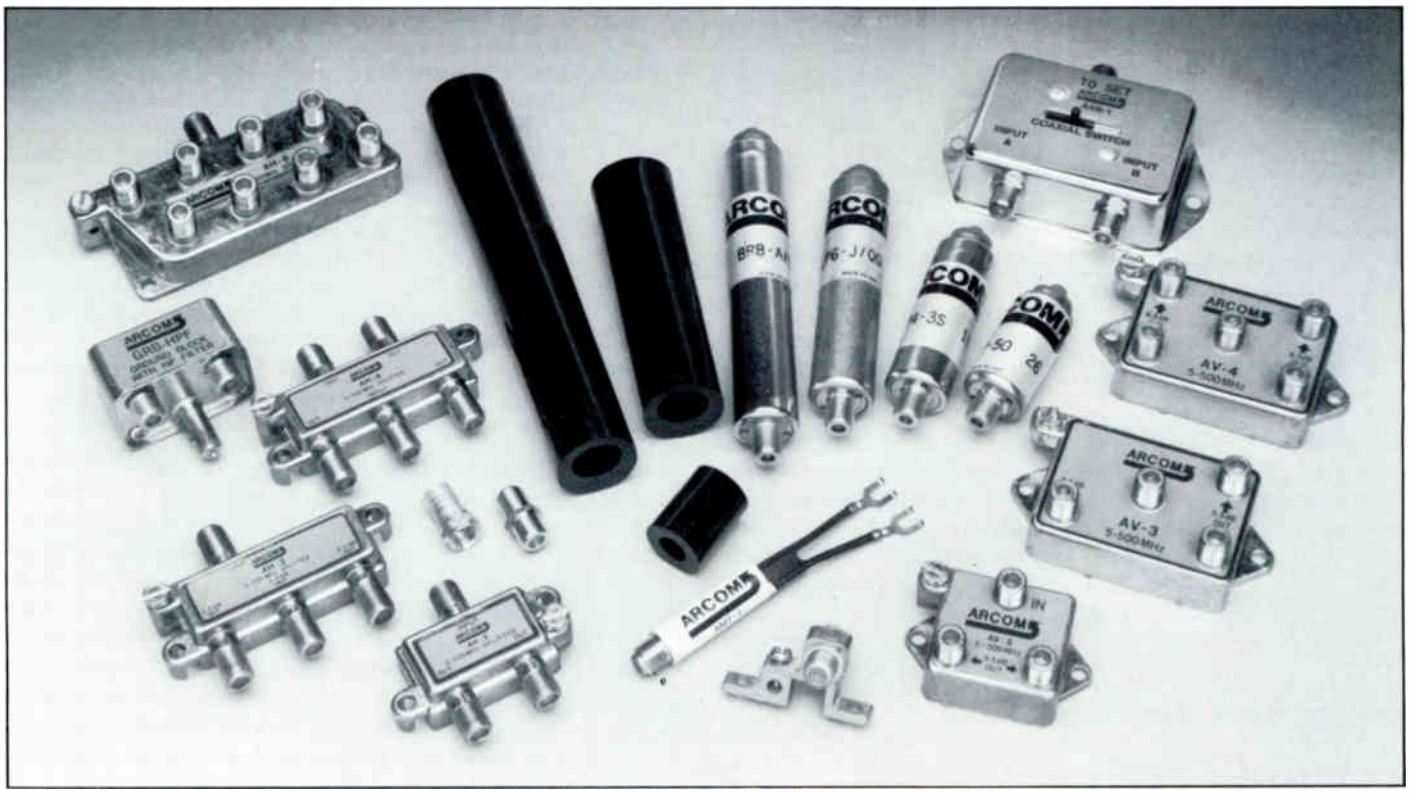

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CALENDAR

September

Sept. 12: Wavetek system sweeping seminar, the Wavetek factory, Beech Grove, Ind. Contact Steve Windle, (317) 788-5980.

Sept. 14-16: South Dakota Community Television Association annual convention, Sylvan Lake Resort, Custer, S.D. Contact Rich Davis, (605) 886-7990.

Sept. 16-18: Pacific Northwest Equipment Exposition, Clark County Fairgrounds. Vancouver, Wash. Contact (800) 624-2569.

Sept. 16-18: Alabama Cable Television Association annual convention, Radisson Admiral Semmes Hotel, Mobile, Ala. Contact (205) 288-1821.

Sept. 17-19: Magnavox CATV training seminar, Worcester, Mass. Contact Amy Costello, (800) 448-5171.

Sept. 18-19: IEEE Broadcast Technology Society's annual broadcast symposium, Washington Hotel, Washington, D.C. Contact John Kean, (202) 659-3707.

Sept. 20: SCTE Tip-o-Tex Meeting Group election of officers and seminar on distribution and sweeping, Alice National Bank Building, Alice, Texas. Contact Arnold Cisneros, (512) 425-9111.

Sept. 21-24: National Association of Telecommunications Officers and Advisors annual convention, Hershey Hotel, Philadelphia. Contact Catharine Rice, (202) 626-3250.

Sept. 22-24: Magnavox CATV training seminar, Worcester, Mass. Contact Amy Costello, (800) 448-5171.

Sept. 23-25: 1986 Great Lakes Cable Expo, Hyatt Regency Ohio Center, Columbus, Ohio. Contact (614) 461-4014.

Sept. 28-30: Pacific Northwest Cable Communications Association annual convention, Sheraton Hotel, Missoula, Mont. Contact Dawn Hill, (509) 765-6151.

Sept. 30: SCTE Florida Chapter seminar on signal measurement, Holiday Inn, Lakeland, Fla. Contact Richard Kirn, (813) 924-8541.

Sept. 30: SCTE Satellite Teleseminar, workshop from CableTec Expo '86, 1-2 p.m. (EDT) over Transponder 7 of Satcom IIIR. Contact (215) 363-6888.

Sept. 30-Oct. 2: Mid-America Cable Television Association 29th annual convention, Hyatt Regency Crown Center, Kansas City, Mo. Contact Rob Marshall, (913) 841-9241.

October

Oct. 5-7: Kentucky Cable Television Association annual convention, Hyatt Hotel, Lexington, Ky. Contact Patsy Judd, (502) 864-5352.

Oct. 6-10: The 10th International Fiber-Optic Communications and Local Area Networks Exposition (FOC/LAN '86), Orange County Civic Center, Orlando, Fla. Contact (617) 232-3111.

Oct. 7-9: Jerrold technical seminar, Atlanta. Contact Joan Thielen, (215) 674-4800.

Oct. 8: SCTE Rocky Mountain Chapter meeting on long-haul microwave and fiber optics. Contact Joe Thomas, (303) 978-9770.

Oct. 10: Wavetek system sweeping seminar, the Wavetek factory, Beech Grove, Ind. Contact Steve Windle, (317) 788-5980.

Oct. 13-17: George Washington University course on operation and maintenance of TDMA terminals for satellite systems, School of Engineering and Applied Science, Washington, D.C. Contact (202) 676-6106 or (800) 424-9773.

Oct. 14-17: Center for Personal Development seminar on antenna analysis, design and measurements, Arizona State University, Tempe, Ariz. Contact (602) 965-1470.

Oct. 15: SCTE Delaware Valley Chapter meeting on transportation systems with BCT/E exam on distribution systems, Williamson Restaurant, Horsham, Pa. Contact Bev Zane, (215) 674-4800.

Oct. 15-17: Magnavox CATV training seminar, Richmond, Va.

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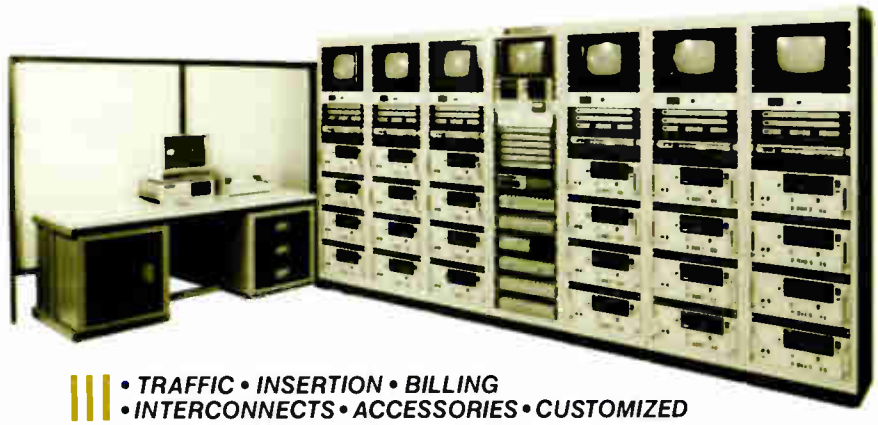

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CHANNELMATIC

Contact Amy Costello, (800) 448-5171.

Oct. 19-22: Intelevent Inc. Fifth International Telecommunications Conference, Hotel Bayerischer Hof, Munich, West Germany. Contact Marianne Berrigan, (202) 857-4612.

Oct. 20-22: Magnavox CATV training seminar, Richmond, Va. Contact Amy Costello, (800) 448-5171.

Oct. 21-23: C-COR Electronics technical seminar, Atlanta. Contact Debra Cree, (800) 233-2267 or (814) 238-2461.

Oct. 22-24: Hawaii Cable Television Association annual convention, Royal Sheraton Waikoloa, Hawaii. Contact Kit Beuret, (808) 834-4159.

Oct. 24-29: Society of Motion Picture and Television Engineers technical conference, Jacob Javits Convention Center, New York. Contact (914) 761-1100.

Oct. 28-30: Atlantic Show, Convention Hall, Atlantic City, N.J. Contact (609) 848-1000.

November

Nov. 4-6: C-COR Electronics technical seminar, Dallas. Contact Debra Cree, (800) 233-2267 or (814) 238-2461.

Nov. 11-13: Jerrold technical seminar, Hatboro, Pa. Contact Joan Thielen, (215) 674-4800.

Nov. 12-14: Magnavox CATV training seminar, Orlando, Fla. Contact Amy Costello, (800) 448-5171.

Nov. 12-14: Center for Personal Development seminar on semiconductor material and device characterization, Arizona State University, Tempe, Ariz. Contact (602) 965-1740.

Planning ahead

Oct. 28-30: Atlantic Show, Convention Hall, Atlantic City, N.J.

Dec. 3-5: Western Show, Convention Center, Anaheim, Calif.

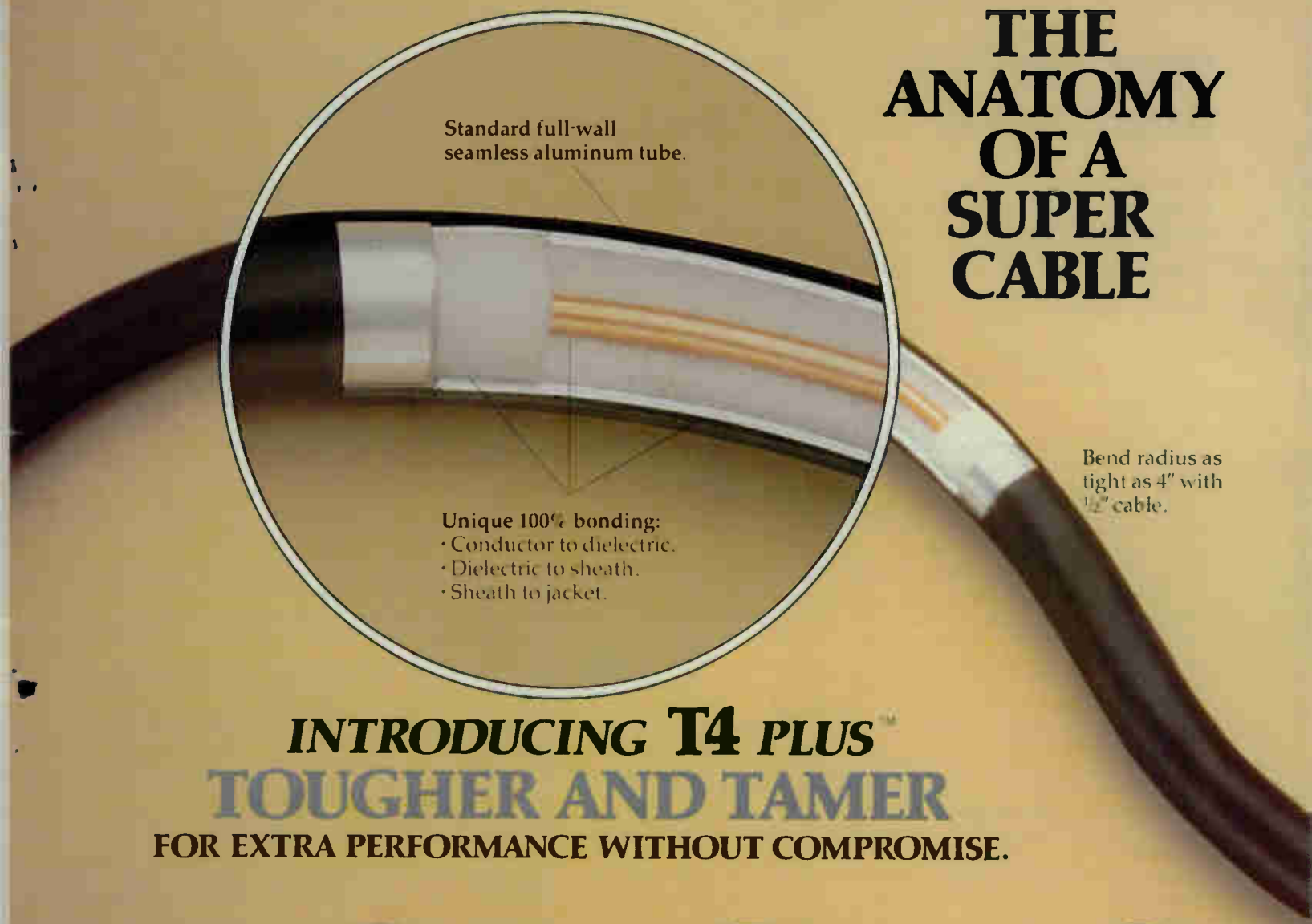
Feb. 18-20: Texas Show, Convention Center, San Antonio, Texas.

April 2-5: Cable-Tec Expo '87, Hyatt Hotel, Orlando, Fla.

May 17-20: NCTA annual convention, Convention Center, Las Vegas, Nev.

AD INDEX

THE ANATOMY OF A SUPER CABLE



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Reader Service Number 60.

Part III: Improving communications

Concluding this series is a discussion of various forms of media, including bulletin boards, suggestion boxes, printed matter and others.

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

The office bulletin board is well-known as the best method of posting the familiar EEO and Worker's Compensation notices required by most states. But the office bulletin board or, even better, a special technical department board can communicate both important bulletins (discussed in Part II) and any items of general interest to all employees, such as incentive award winners, progress charts on department goals, picnics, etc.

Generally, it is a good idea to divide the board into sections and place important notices in a specific location. It also is very important to keep all material neat and current. If your board gets a reputation of always being messy and containing old information, new, important notices will be ignored or their message will be reduced by their surroundings. While there often is room for personal car sales or used stereo equipment notices, you should require all notices to go to your bulletin board person for dating and posting. Left totally open, many boards become confused with used car ads tacked right over the latest important technical bulletin. A very useful trick is to put one person on the staff in charge of monitoring the board — often the department secretary. Also, date all items when they are placed on the board. This allows items to be automatically removed by the monitor after one or two weeks without confusion.

Suggestion box

Suggestion boxes date back to the beginnings of modern office communications, yet it is amazing how few can be found in CATV offices or technical departments. A very large part of being a good manager is having comments and suggestions from your staff. This is particularly difficult when both you and they are constantly out of the office most of the day. And what about the night shift and the new or quiet employees? Hence, the suggestion box is one of the best tools for your employees to give you their input.

Furthermore, the mere fact that you have a technical department suggestion box shows your employees that you care enough about them and the performance of the system to solicit their views and suggestions.

Of all the recommended communication tools, a suggestion box is the easiest to implement. It does not have to be fancy; any medium-sized cardboard box with a small slot will suffice. Once done, it is important always to recognize and thank either the specific employee (if identified) or the whole group (if not) for each suggestion or comment made. Always give credit to the person or the suggestion box process if changes are adopted. Continue to encourage more suggestions and comments.

Published articles

Cable technology continues to move at a fast pace. Technical articles from several of the industry's excellent publications, rather than yellowed textbooks, are the primary source of information on new technology, products and methods. Yet, too few managers fully utilize articles as an effective means to improve communications with the staff. To implement this, provide each employee with a copy of a published article on the subject. Then invite the employee to ask any questions after studying the material. This approach beats attempting to teach a new employee how to properly sweep and TDR a damaged reel of cable.

The manager should always be on the lookout for good, up-to-date articles. In addition to providing an excellent, easy means of communicating what needs to be done, it also reinforces a practice with your staff of going to well-written and accepted technical articles for answers.

Current coast-to-coast system projects like installing and maintaining BTSC stereo encoders in the headend, CLI programs, safety and underground construction techniques are fine examples of topics covered in published articles.

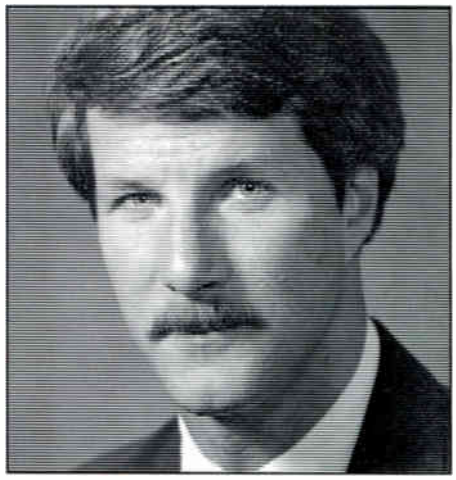
SCTE tapes

Closely related to published articles are Society of Cable Television Engineers (SCTE) technical and safety tapes. There are over 50 tapes on nearly every aspect of CATV technology available. Tapes add the important element of visual stimulation to the learning process and generally are better received and retained longer in the memory than similar time spent in a meeting or studying a book on the same material.

The natural classroom setting of watching SCTE tapes provides a good setting for questions from the staff. Furthermore, everyone is watching and learning from the same material. This way, all employees have the same instructions and are better able to help out one another. As questions arise or new employees enter the system, the tapes can be rerun with minimal involvement by the technical manager.

BCT/E certification

What does the Broadband Cable Technician/Engineer (BCT/E) certification have to do with



improving a manager's tools for better communication? A lot. If you let your employees know you personally endorse the BCT/E program, you are communicating more than you will ever know every day they come to work, every magazine they leaf through, every course they are taking or are about to take. You will be telling them that professional growth counts and that you care about their long-term career and improved on-the-job knowledge and performance.

It is important to guard against hollow words. You must develop an encouraging policy for BCT/E testing and think of some special reward for those who become certified. Or you will be sending out a message contrary to your stated BCT/E support.

Department newsletter

No technical department is too small to have a newsletter. It doesn't have to be a professionally printed, three-column masterpiece. Instead, one or two typewritten sheets should contain important department and personal happenings, like "CLI Lowest Ever," indicating the special efforts of several or all personnel, or "Chief Tech Chuck and Wife Have Baby Boy" (with all the particulars). Newsletters build department unity and morale, and tell your employees you really care about them and the technical team. If your department has its own or shared secretary, you may just have to outline the newsletter scope and provide the technical summaries.

Unique approaches

Effective communications is fundamental to any company or department's success to improve productivity, quality and morale, or to get things done. Technical departments offer unique problems to the classic letter, memo and meeting methods of employee communications. Most employees are without offices, in/out boxes or telephones, and are out of the office and usually unsupervised, with limited time for meetings and one-on-one discussions. The methods described in this series are better suited to the unique environments in which technical managers must work.

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