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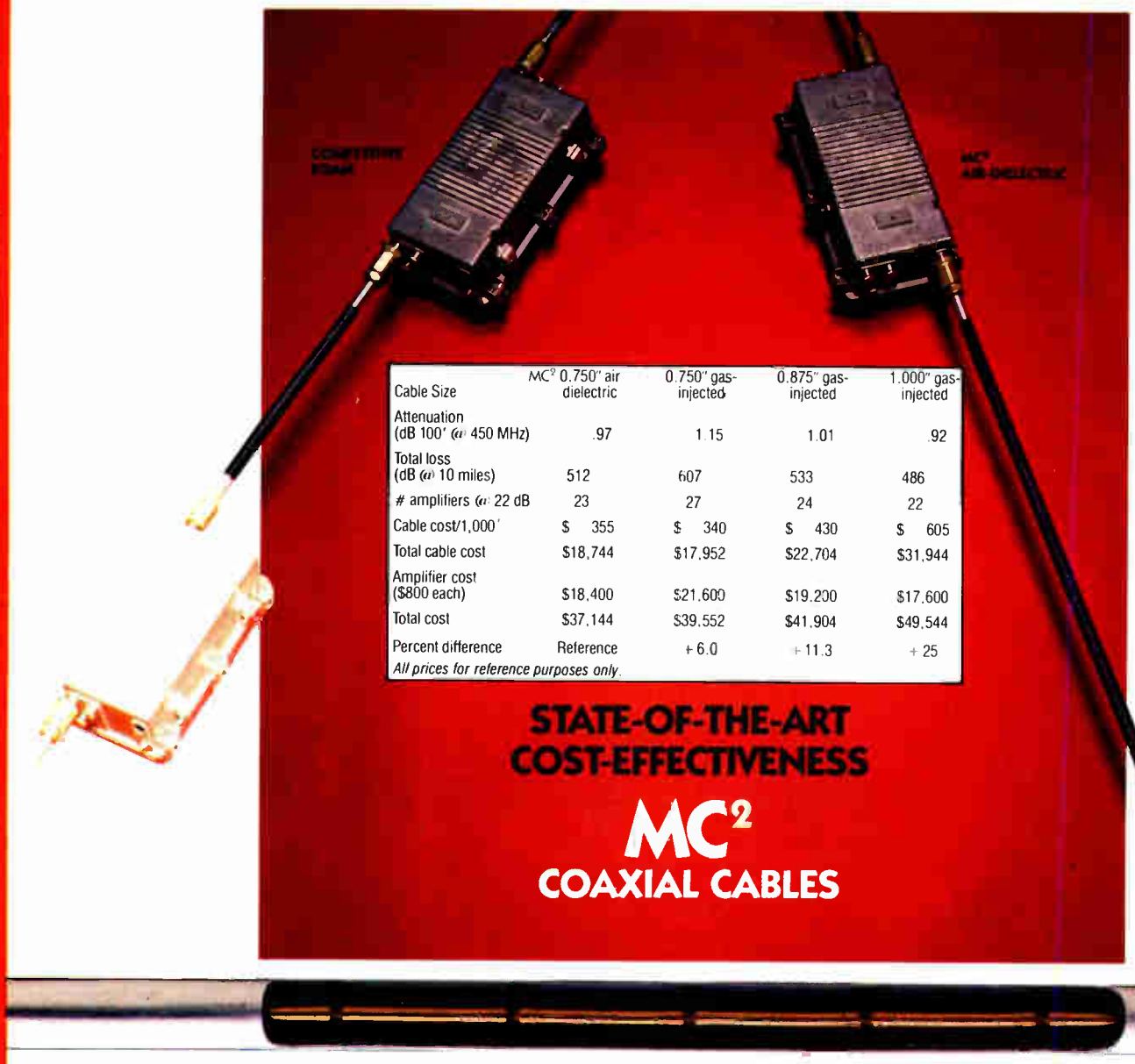

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About the cover
Media General Cable in Fairfax County, Va., is a dual-headend, dual-cable system with 11 AML receive sites. A total of 128 HPAs power the AML links, and the two headends contain about 700 active devices. Here is one of the arrays.

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Reader Service Number 3

Henry Arbeiter: passing of a cable pioneer

Henry Arbeiter, Jerrold's first employee, died in a car accident in Bucks County, Pa., February 21, 1986. Arbeiter, 64, was a pioneer of the cable industry, an original member of a team that helped shape and mold cable's beginning. He's also remembered as an expert in manufacturing, a tinkerer with a genuine talent for spotting and fixing equipment problems. His legacy is still to be found in the fittings and test equipment used by the industry today. Highly respected by his peers, Arbeiter's real gift—so much in demand by today's manufacturers—was process control. Getting a prototype ready is one thing, mass producing it is quite another.

"It actually was a beautiful team," says Ken Simons, long time friend and colleague of Arbeiter's. "We had four people on that team—Milt Shapp, Don Kirk, Henry Arbeiter and myself. Milt Shapp, the founder of Jerrold, was behind the three of us. Shapp was very forceful; he wanted to succeed. Kirk was the idea man; he dreamed up about 90 percent of what was done. I turned a good bit of it into things that would work, and Arbeiter made it happen. He put the fine touches on what the rest of us did."

The team started in 1948 in a basement on North Fifth Street in Philadelphia. The original product (and the financial beginning of Jerrold) was an amplifier booster, designed to put more gain in front of the receiver. The city's reception area for television was at best 25-30 miles, and Kirk felt a booster could be designed to reduce the poor reception. He worked out a design for the booster and, at this point, Arbeiter took over.

"There's a big difference between production and design," says Shapp. "Anybody can make one product easily. To make 1,000 of the same product is the difficult job. Arbeiter's job was to make the product into a reproducible form—something that was stable and in a form that could pass field tests. And it also had to be maintained easily by the customer. That was something Arbeiter insisted on."

At the time Arbeiter was hired, he was working as an instructor with the Technical Training Institute in Philadelphia.

After the booster sales, Jerrold began concentrating on the master antenna television business. "There were a lot of apartments and hotels with clusters of antennas on their roofs," says Shapp. "We decided to build MATV systems and started work on it. We were well ahead technically of everybody. While people in big companies were talking about what to do, we, in our small company, were out doing it."

"Arbeiter had absolutely superb expertise," says Simons. "I clearly remember the first instrument I took to him. It was called the 704 field strength meter, and to say it was a mess is flattery. It was built of roofing copper, a shiny copper and very bendable, so the thing was full of dents and bulges. I had a storage battery hung from it by a strap. Arbeiter took that and turned it into a workhorse—a piece of equipment that is still being used throughout America for testing cable level. That's the kind of thing Arbeiter did, and he did it better than anyone else."

Kirk agrees with Simons. "Arbeiter had a feel for what would work," he says. "Simons was the electrical father of the sweep generator, but Arbeiter was a major contributor. He worked on it for years. Arbeiter also was instrumental in developing cable fittings. At that time, fittings were fragile, hard to put together. Arbeiter headed up the business—he was the moving force in the design of new fittings."

"As Jerrold grew, Arbeiter held the whole organization together; he was the center of everything that went on inside our plant—the glue of the engineering department," says Shapp.

But Arbeiter's pride and joy was test equipment. He did the production design, as well as overseeing the actual production of such products as the 704 field strength meter, the 900 sweep, the FD30, the 601 sweep, the 1015 video sweep, the ATV attenuators, the TC-2 and TC-3 "flicker dickers," the fixed and variable bridges with their terminations, the LA-5100 Log-Amp, the SS300 sweep and the 727 field strength meter. He was also there for many of the cable products such as the first CL strips, the W strips, the JR amplifier, the ADOs, the 213, the UBC26, taps, pressure taps, directional couplers, traps, the Low-Low and the High-Low converters and the ALC unit.

"He had a vision," says Shapp. "He could look at equipment and tell at a glance what could go wrong. He had a sixth sense that made equipment work as well in the field as it did in the test lab."

"Arbeiter always wanted to work with his hands; he didn't want to do anything else," says Simons. "He received very little recognition from anybody except his peers. He was highly respected and loved by everybody—one of those genuine people. If you worked with him, you'd realize he had the kind of stuff that makes corporations go."

In 1962, Jerrold made the decision to quit manufacturing test equipment. By that time, Shapp had sold his share of Jerrold to General Instrument, and he later became governor of Pennsylvania. "Test equipment was Arbeiter's life, as it was mine, for about 10 years," says Simons. "When they dumped it, they lost both of us emotionally. I don't think I ever had as much interest in the corporation after that. I know Arbeiter didn't. But he was free to work and he did. He was a happy man; he knew who he was and what he could do."

—Kathy Berlin

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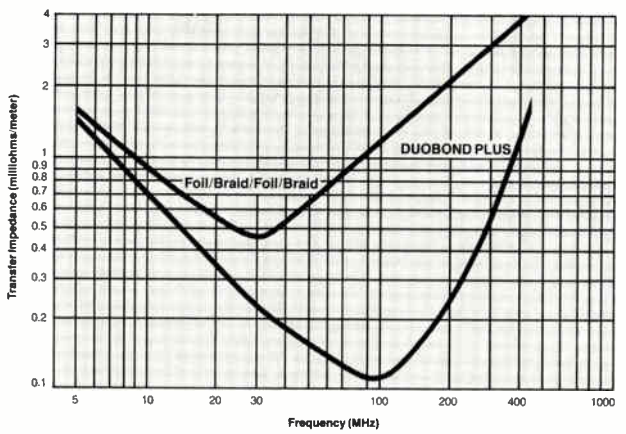

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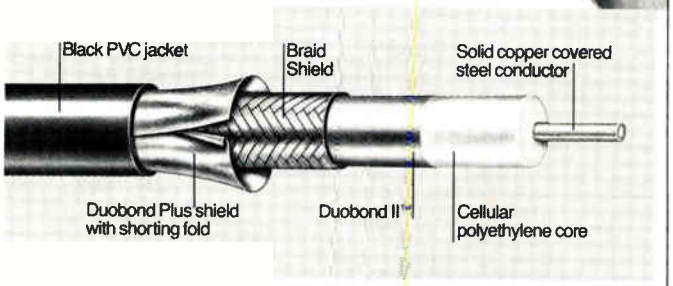

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Reader Service Number 4

COOPER INDUSTRIES **BELDEN**

Off-premises: a requiem

By Archer S. Taylor, Senior Vice President, Engineering, Malarkey-Taylor Associates Inc.

Conventional on-premises, set-top converters cost too much. They are subject to damage by careless smokers. Spilled coffee does them no particular good. Technical performance and reliability have improved markedly in recent years, but converters still represent something like a third of all customer trouble calls.

Four or five years ago, C-COR started the ball rolling toward placing the converter out in the alley, outside the house. Not only did this get the box out where we could watch it, repair it and recover it without access to the house, but we could protect our premium channels without scrambling the picture; i.e., deliberately degrading it. Times Fiber followed shortly with its Mini-Hub, a great idea. Texscan has provided its TRACS to more subscribers than either C-COR or Times Fiber. ATC and Toshiba worked to develop their own idea. Jerrold produced at least a brochure and a prototype.

Even before C-COR, the British Redifussion Co. had used a "switched system" from the earliest days of television and unsuccessfully promoted its "Dial-A-Program" with an installation at Dennisport on Cape Code. Ameco developed the Discade, which came pretty close to being a solid state Dial-A-Program, and installed it at Daly City near San Francisco. Siemens, at The Hague, Holland, and other European firms developed what they called Mini-star systems. Even the British Parliament actually wrote the "switched star" into law.

All of the off-premises and switched star systems delivered programs to subscribers one at a time, using low-frequency, narrow-band drop cables. Rediffusion even used a specially engineered pair of twisted pairs called "Qwist." To simplify the system, Toshiba and Sanyo succeeded in pursuading FCC to approve a one- or two-channel TV display device to be used with any of these off-premises or switched systems, as well as a VCR, PC or electronic game.

The idea had lots of merit. What happened?

The hostile outdoor environment was one problem. However, this seems to be solvable and already is well on the way to solution.

The extra outlets could not be provided so freely and with as much flexibility as the customer seemed to want. This was a real problem but might not have been fatal if good multiplexing designs had been forthcoming sooner.

Off-premises converters without descrambling could not be used in a system with scrambled premium channels, and the cost of off-premises descrambling would be a murderous addition to the cost of the off-premises converter and its on-premises control unit.

The cost of the switched systems and off-premises systems was much too high to be offset by the few advantages. This, combined with other problems, was a major cause of the moribund state of off-premises converters and switched stars.

But of all its afflictions, the coup de grace has to be recognized as the understandable determination of the TV receiver industry not to become a mere provider of "display devices" while others provided the channel selection, remote control, favorite channels, memory, decoding and other goodies now on the marketplace.

But all is not lost. Through the joint efforts of the NCTA and the EIA, a baseband (audio/video) interface standard connector has been developed. This proposed interim standard, known as IS-15, will take the converter off our backs and enable us to get on with the job we do best: delivering a wide range of TV programs to the public at the lowest possible cost. ■

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Reader Service Number 6

A new twist for in-home wiring

It's tough enough to ride the whipsaw consumer electronics market without being thrown, harder still to stay in the saddle when you've also got your spurs in CATV. But hold on to your hat. The bucking looks to get worse as two home wiring efforts move closer to completion. The Electronic Industries Association has a Consumer Electronics Bus ("Home Bus") committee looking at standards for a unified cabling/wiring scheme for power, telephone, audio, video, home security and telemetry in the home. And the National Association of Home Builders has a "Smart House" project running that seeks to redesign the residential electrical system, tying together all power and signaling cables to produce a single communications and appliance control system in the home.

What these efforts will produce is a home pre-wired for video in every room. So the big question at the moment is how existing cable systems will interface with the new customer premises wiring scheme. Some possible winners: Companies in favor of an open systems architecture for CATV. Companies prepared to serve as engineering contractors for the wiring/cabling of Smart House-compatible dwellings. Some losers: companies charging for second set attachments.

Although no decisions have been made on the video distribution systems in either Home Bus or Smart House projects, some ramifications already are clear. Operators may well find in-home-generated video signals being added to the spectrum delivered from the headend. That may require that certain channels be band-stopped.

And each Smart House-equipped home will have a headend of some kind. At a minimum, this may take the form of insertion of in-home video. In a more complicated form, descrambling and frequency conversion may be necessary.

As the EIA currently sees it, the cabling bundle found in each Home Bus-equipped dwelling would reserve space for three channels of video at the lowest service level. In addition to these three channels, space also is reserved for a voice quality audio channel, two telephone channels, one ISDN channel, one analog and one digital audio channel. The Home Bus group now says a few extra video channels could be added by dropping audio or ISDN channels. But it isn't clear whether CATV or antenna signals are seen as being carried on any of the Home Bus video channels in any case. One suggestion so far is to give the CATV industry its own cable in the bundle. That still leaves open the question of exactly how much bandwidth is on the single cable. Nor does the suggestion address dual cable systems, for example.

It's also been suggested that CATV signals might be decoded at some central point and relayed through one of the Home Bus video channels. That, of course, leaves the second set and tape recording issues unsolved. And some observers speculate that maybe the Home Bus would only carry VCR and off-the-air signals, in addition to security cameras.

EIA and Home Bus goals

In essence, the EIA seeks to reduce the cost and complexity of wiring a home, while simultaneously reducing the need for multiple remote controls in a single room. From the beginning, the Home Bus effort has emphasized simplicity and low cost; multiple media rather than a single cable; consumer ease of use and communication with existing outside networks like the telephone and CATV systems. The group's objective is common interface standards: protocols that allow diverse devices to share the bus without interference.

To date, three sub-groups have been at work. The power line bus committee wants a system to put a data stream on the power line for appliance control. The single room bus group seeks a unified remote control system, including both one-way infrared and wireless two-way communication between devices in a single room. Remote access to the power line and the separately wired bus is necessary as well. The wired bus currently is seen as including both coaxial cable and twisted pair wire. Coax would be used for video and audio, while twisted pair would suffice for power and telemetry.

At present, the Home Bus technical steering committee, chaired by Judson Hofmann of the Matsushita Technology Center, is working to define overall system architecture, including the cable bundle, addressing and command language. The power line subcommittee is testing hardware and looking for coding and modulation techniques. The wired bus subcommittee is working on channelization, minimum capabilities and consumer friendliness. The single room bus group is testing how the unified remote system can coexist with systems presently on the market.

The Smart House Project, now supported by vendors like General Electric, Honeywell, Whirlpool, du Pont, AT&T, Apple Computer, Edison Electric and the American Gas Association, is less a standards-setting effort like the EIA's, and more a product development group. It represents nothing less than a total redesign of the residential electrical system. And unlike the EIA's focus on standards for wiring and cabling, Smart House designers want communications-capable appliances and controllers. In short, home appliances that not only can be activated remotely, but also are capable of status monitoring and process control.

Another Smart House goal is safety. Should a child put his or her finger into a power outlet, all current will stop in milliseconds. Likewise, should an appliance fail, the status monitoring system will cut power immediately, preventing electrical fires. Like the Home Bus project, Smart House also seeks dwelling-wide distribution of video, audio and data signals. In common with Home Bus, the Smart House will emphasize a unified remote control system for in-home devices.

Although the goals of the two groups often seem duplicative at first glance, EIA really is limiting itself to technical standards. Smart House, on the other hand, wants to see products developed and put on the market by the mid-1988 time frame. Home Bus is a non-profit venture; Smart House clearly isn't. Member companies in Smart House will have exclusive licenses for the technology for three

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Reader Service Number 7

The pre-wired home is coming. Perhaps sooner than some would have anticipated.

years. After that time Smart House will sell the technology to them outright.

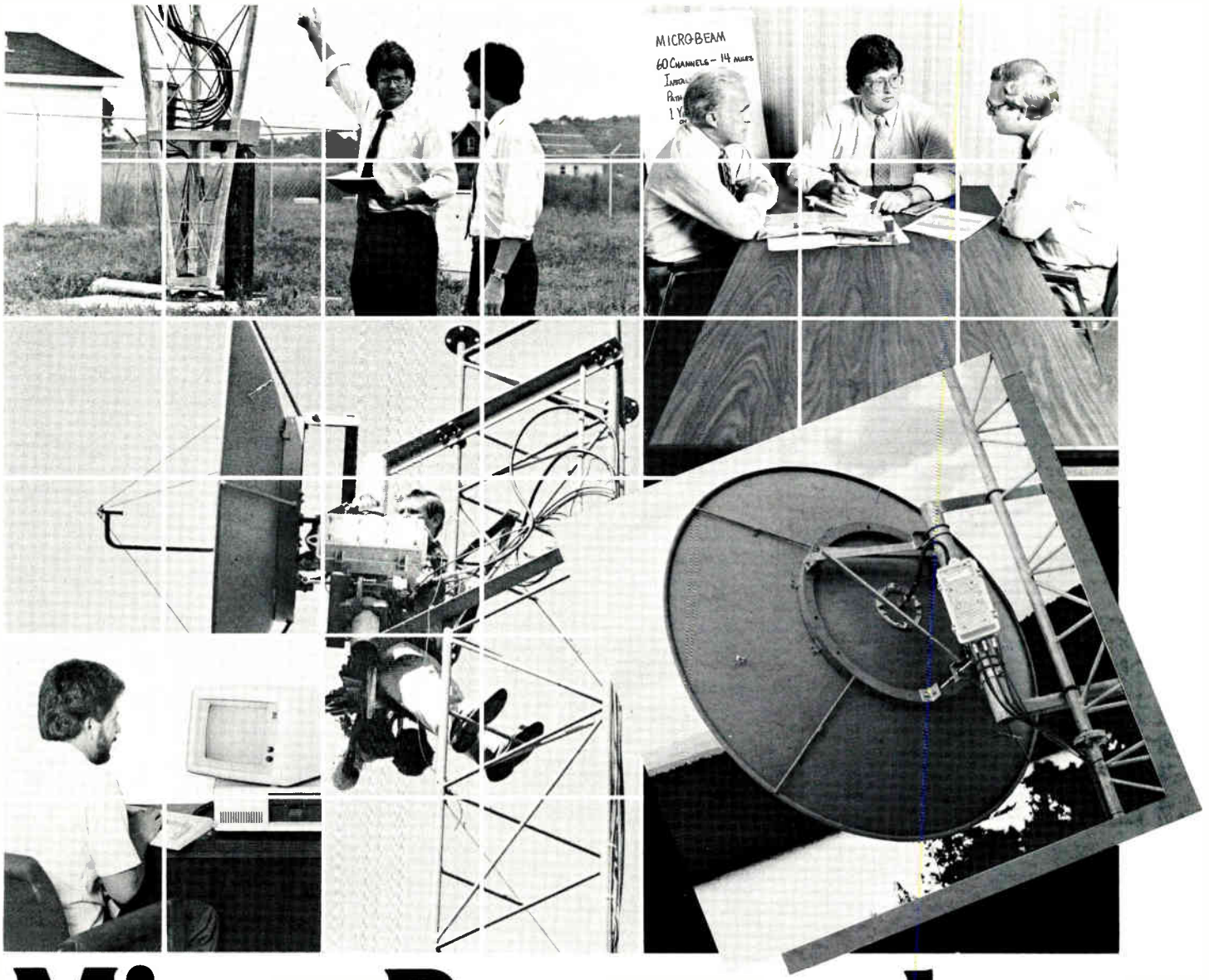
Smart House support

Initially at least, Smart House-compatibility will be sought for new "single-family" homes rather than multiple-dwelling units. The system will be heavily pushed by the NAHB, whose 130,000 or so builders represent some 85 percent of all new residential construction in the United States. NAHB also seems to have gotten recognition of the wiring and power distribution scheme by the National Electric Code, and plans to train several thousand builders and electrical subcontractors just prior to device commercialization in 1987, says Hank Levine, Smart House director of marketing. Given the project's support by real estate, utility, telephone and home electronics companies, it is prudent to assume the system has a good chance of commercial success. And the EIA's parallel work simply reinforces the likelihood.

The pre-wired home is coming. Perhaps sooner than some would have anticipated. It presents some challenges, will require some adjustments in how CATV operators think about their business and possibly could represent a new revenue stream. In essence, we are seeing a continuing evolution of the cable TV business toward a more open architecture, paralleling changes in the telephone industry and reflecting the same developments in the data communications world.

At one time, it was illegal for subscribers to attach any device not manufactured or owned by the Bell system to their in-home phone jacks. That changed with the Carterphone decision. Since then, deregulation has changed the customer premises wiring situation as well, clearly positioning telephone companies as transport providers whose responsibility for equipment and pathways ends at the port leading into the home. And the same trend toward openness is evident in the data world, where groups like the Corporation for Open Systems are pushing for international standardization of data communications protocols.

The pre-wired house is simply an extension of this move toward open architecture and customer ownership of in-home electronics and communication devices. The EIA's new IS-15 proposal for a baseband TV receiver interface to cable decoders fits right in with this trend. So while you're holding on to your hat, make sure you've got a good grip on the reins. Otherwise, you could get thrown for a bad fall.



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Reader Service Number 9

Antenna preamplifier design

This article presents the results of a study conducted as part of a preamplifier design project. It was considered important that the preamplifier designed be the best combination of performance to suit system operator requirements. These results also will aid the system operator in choosing a suitable preamplifier.

The emphasis was placed on system considerations—that is, how the performance of the preamplifier affects the overall performance of the system.

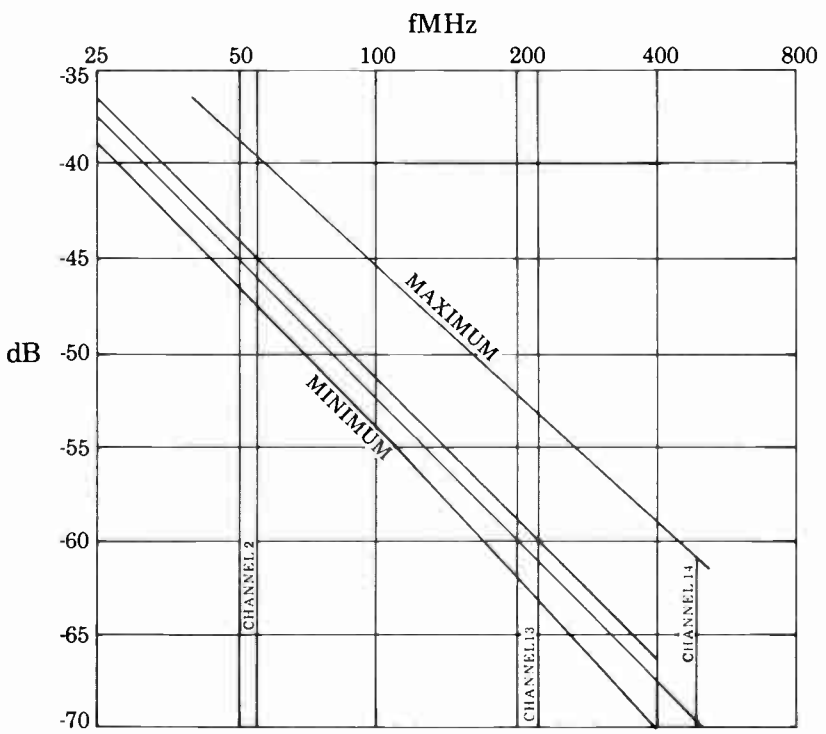
Antenna preamplifiers are used to improve the signal-to-noise ratio of weak signals. It is hoped that an overall improvement in signal-to-noise ratio will result for the entire system. The antenna preamplifiers can be characterized numerically by certain measurable parameters. These are: noise figure, overload capability, gain and match. Not as easily measured is reliability.

The characteristics of the preamplifier are not the only factors affecting a particular system performance parameter. The signal-to-noise ratio of the system is affected by noise received by the antenna plus the noise figure of the headend processor, and the noise figures and number of distribution amplifiers. Beat products and cross modulation can be generated by the antenna preamplifier and also any other active device of the cable system. For the purpose of our investigation, we have assumed values that we consider typical of the rest of the system.

By Frank Pennypacker, Director of Satellite Engineering, Cincinnati Microwave Inc., and Emanuele DiLecce, Director of Engineering, Scarboro Cable Communications
Reprinted with permission from the *1974 NCTA Technical Papers.*

It is a common misconception that a receiving antenna generates a noise level of -59 dBmV. Not so. The precise amount of noise depends on the pattern of the antenna and the direction in which the antenna is pointed. For low band channels, the noise figure of the preamplifier is relatively unimportant. Not so for the high band.

FIGURE 1
Cosmic noise level



Cable Classics

The availability today of so many satellite-delivered signals sometimes causes us to forget that reception of UHF and VHF broadcast television signals still is a vital function of most cable headends. In many cases signals still are received from distant transmitters, and antenna preamplifiers are used to improve the (otherwise poor) signal-to-noise ratio of weak signals.

Do you know that it is a common misconception that a receiving antenna generates a noise level of -59 dBmV? Did you know that cosmic noise is a significant factor in estimating the noise performance for reception of distant low-band channel signals? Do you know how to select a preamplifier with optimum gain and noise figure for a given situation? What about the trade-off between noise figure and overload performance?

This paper by Frank Pennypacker and Emanuele DiLecce helped lay the groundwork for much that we now take for granted in the design and application of this important system component.

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Vice President
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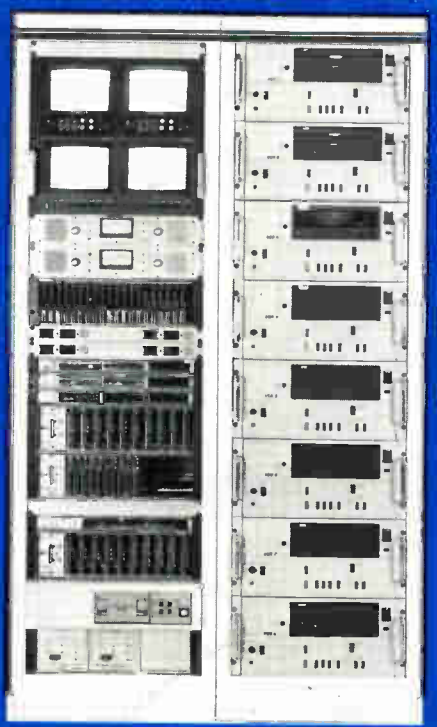

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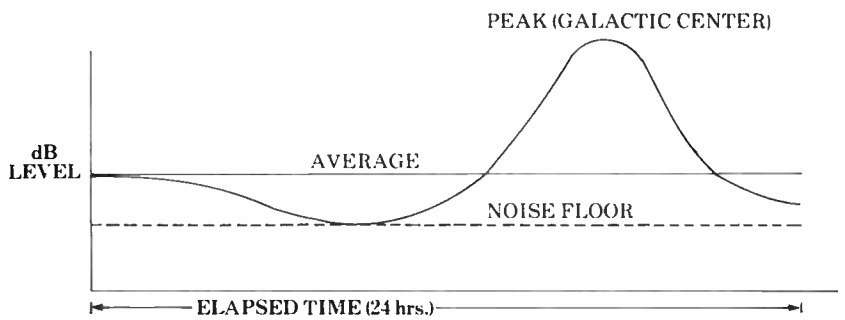
Noise is generated in any resistive device because of the random motions of the electrons caused by the heat contained in the device.

FIGURE 2
Cosmic noise during a one-day period



Thermal noise

Before we launch into a detailed discussion of antennas, preamplifiers and noise figures, let us talk about thermal noise. Noise is generated in any resistive device because of the random motions of the electrons caused by the heat contained in the device. This noise power is proportional to the temperature in absolute degrees, the resistance and the bandwidth. It is a common misconception that a receiving antenna generates a noise level of -59 dBmV. This corresponds to the noise that would be generated by a 75 ohm resistor at room temperature. In the case of the antenna, the noise developed across its terminals is not being generated by the antenna but, rather, is a transformation of the electromagnetic fields received by that antenna. The antenna is composed of metallic elements with extremely low resistance and insulators with extremely low conductance.The impedance of the antenna is not associated with the actual elements of the antenna but, rather, with the space to which the antenna is coupled by the electromagnetic fields.

The noise received by an antenna is composed of a certain amount of radiation generated by the earth, which is at approximately room temperature, atmospheric noise and radiation from outer space. The amount of noise received will depend on the pattern of the antenna and the direction in which the antenna is pointed. An antenna pointed down will receive more radiation from the earth, and an antenna pointed up will receive less. The upward pointing antenna will, of course, receive more radiation from space. The closest source of radiation in space is our sun. The amount of radiation from the sun depends on the direction and time of day. In other words, the noise is greatest when the antenna is pointed more or less directly at the sun. In certain directions the radiation from outer space can be extremely low; the temperature of intergalactic space appears to be about 3° Kelvin. However, the center of our galaxy is an extremely strong source of energy, and the antenna pointed in that direction will receive a large amount of radiation.

Figure 1 shows graphically the relationship between noise level and fre-

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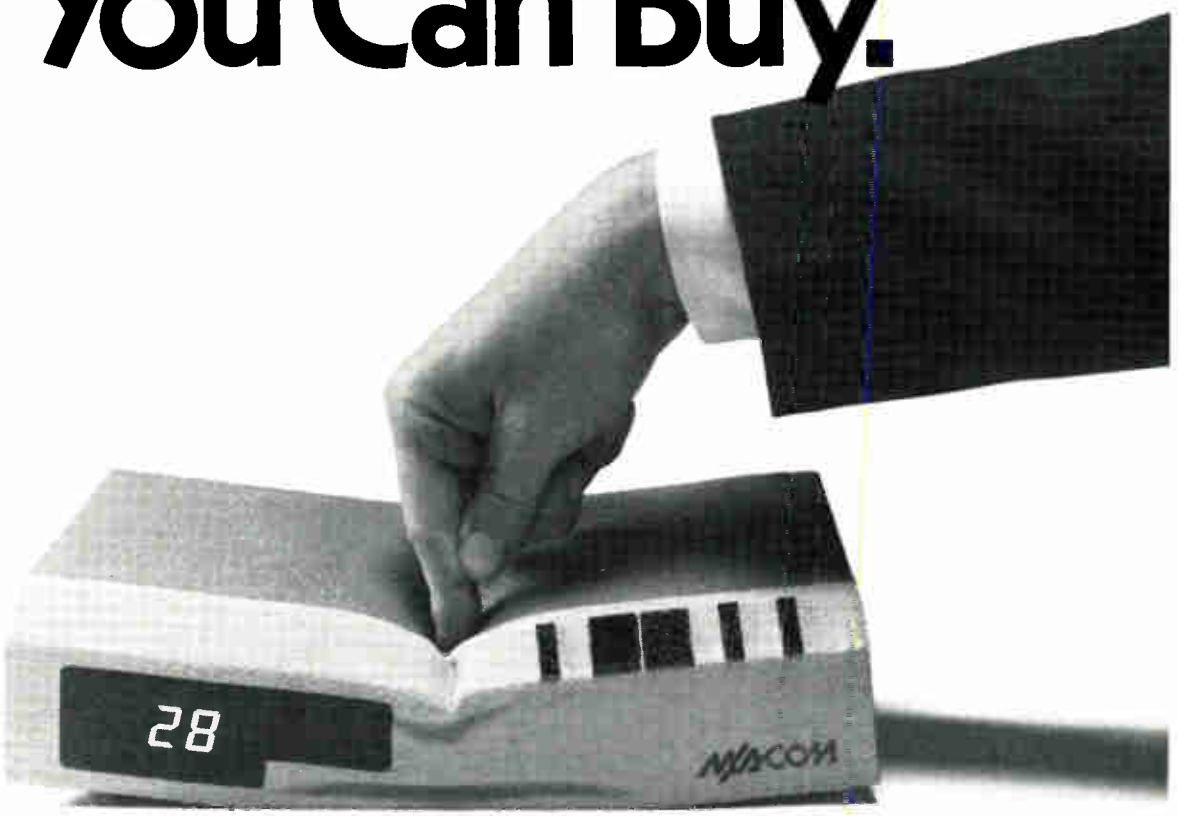

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Notice that the lower frequencies have a greater noise than higher frequencies.

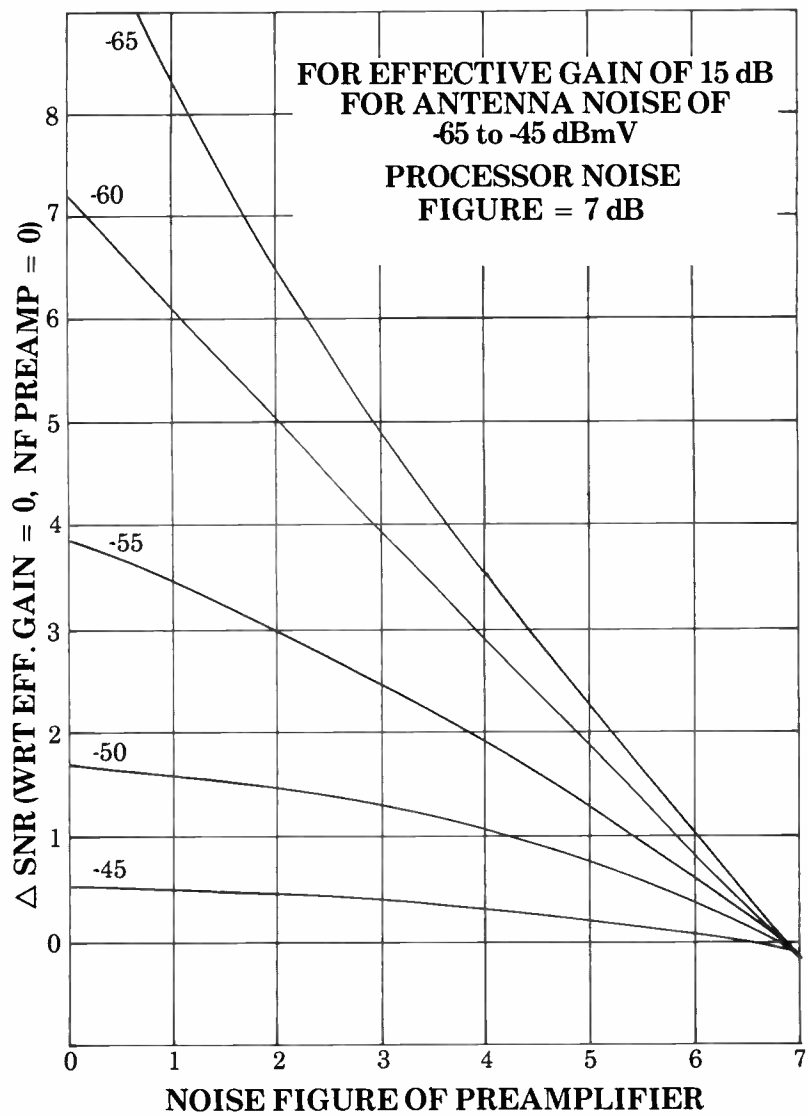
quency. Notice that the lower frequencies have a greater noise than higher frequencies. Especially note that the noise at the frequency of channel 2 is considerably larger than the often-quoted -59 dBmV. It often has been said that the low band is noisy. This is one reason why.

Figure 2 shows the noise received by an antenna pointed well above the horizon throughout a 24-hour period. The peak represents a time when the antenna is pointed at the center of our galaxy. The dip represents a time when the antenna is pointed at the very cold regions of intergalactic space. The height and width of the peaks will be affected by the beamwidth of the antenna. The antenna which has a narrower beamwidth will cause a higher, narrower peak.

The above does not take into consideration the affects of man-made noise. This can come from such sources as electric power distribution systems and ignition noise from vehicles. This is extremely variable and unpredictable, but we have a certain degree of control over it and can do something to reduce it.

FIGURE 3

△ SNR versus preamplifier noise figure



Delta S/N

As an aid to analysis and understanding, we are going to define a quantity called Delta signal-to-noise ratio and abbreviate it ΔSNR. This is a quantity which we will express in dB; it represents the improvement in signal-to-noise-ratio which will be realized by using a particular kind of preamplifier. We define 0 dB ΔSNR as the signal-to-noise ratio which would result if the antenna were directly connected to the input of the headend processor by a lossless cable. Thus, if the antenna is connected to the processor by an actual cable having a certain amount of loss, the Δ SNR will be negative and equal to the loss of the cable. For that reason the actual improvement realized by using the preamplifier will be equal to the ΔSNR with the preamplifier minus the ΔSNR without the preamplifier. Note that ΔSNR is the improvement of signal-to-noise ratio which will be realized at the processor output.

By comparing ΔSNR for various situations, we can determine how much improvement in signal-to-noise ratio has been made by changing system parameters. We can determine how closely we have approached the maximum possible signal-to-noise ratio and what must be done to approach it more closely. All this can be done with much less calculation and complexity than working with signal-to-noise ratio directly. After the system parameters are determined, the actual signal-to-noise ratio can be calculated by well-known techniques.

Figure 3 shows the relationship between noise figure and ΔSNR for various levels of received antenna noise. Note that for -65 dBmV received noise (about the best that will be encoun-

Ordinary People Doing Extraordinary Things

The QBS software development group is one of many teams behind the development of QuickData. Top: Dave Keener, Paul Danielson, and Paul Lockyer; Bottom: Susan Mathews, Laurie Smith, Peggy Adams-Russell, and Kathy Akers.

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This discussion would seem to indicate that for low band signals the preamplifier is of no use.

tered at channel 13) the affect of antenna preamplifier noise is quite large —much larger then one would expect, assuming that well-known -59 dBmV. The change in noise figure, 1 dB to 2 dB, results in more than 2 dB change in signal-to-noise ratio. For -60 dBmV received noise, which is almost equal to -59 dBmV, the change is almost 1 dB for 1 dB. Let us look at the case of -45 dBmV (which is about average for channel 2). Here the change from 0 dB noise figure to 4 dB noise figure results in only 0.3 dB change in signal-to-noise ratio. This is quite an insignificant amount.

We can conclude that for lowband channels, the noise figure of the preamplifier is relatively unimportant; but for high band channels it is of significant importance. This is a particularly unfortunate situation since low noise figures are much easier to achieve at lower frequencies.

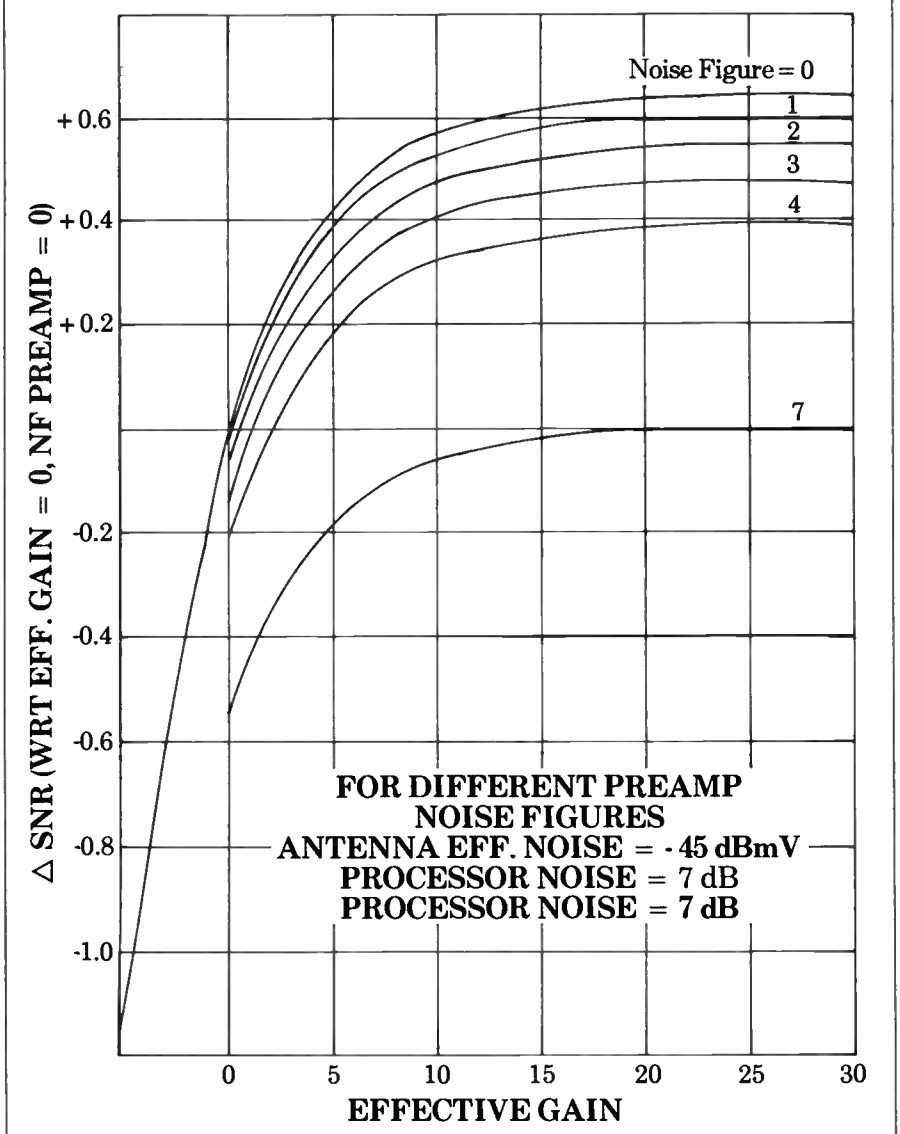
This discussion on noise figure would seem to indicate that for low band signals the preamplifier is of no use. Let us investigate the effect of not having gain at the antenna. Figure 4 is the relationship of gain to ΔSNR, for an antenna noise level of -45 dBmV. For 5 dB loss between the antenna and the processor, ΔSNR has a value of -1.2; for 4 dB noise figure and 15 dB of gain, ΔSNR is +0.4. The total change is 1.6 dB. To simplify calculations and presentation, we have subtracted the loss between the preamplifier output and the processor from the gain of the preamplifier and called it effective gain. It appears that an effective gain of 15 dB results in a negligible degradation in ΔSNR compared to what would be realized with infinite gain. Figure 5 shows the same relationship for an antenna received noise of -55 dBmV and a processor noise figure of 7 dB. Note that a 15 dB effective gain results in only about 0.3 dB worse signal-to-noise ratio than would result from 30 dB of gain. We consider this 0.3 dB to be insignificant Figure 6 shows the relationship for an antenna received noise of -65 dBmV.

In the case of the preamplifier with 2 dB noise figure, the difference between 15 dB and 30 dB of gain represents a change-in-signal to noise ratio of 0.6 dB. These figures show that 15 dB effective gain is sufficient for the conditions just described. These conditions are typical for reception of VHF signals. If we allow for 5 dB of cable between the antenna and the processor and the use of a hybrid splitter to run two processors off one antenna, the preamplifier should have a minimum gain of 24 dB.

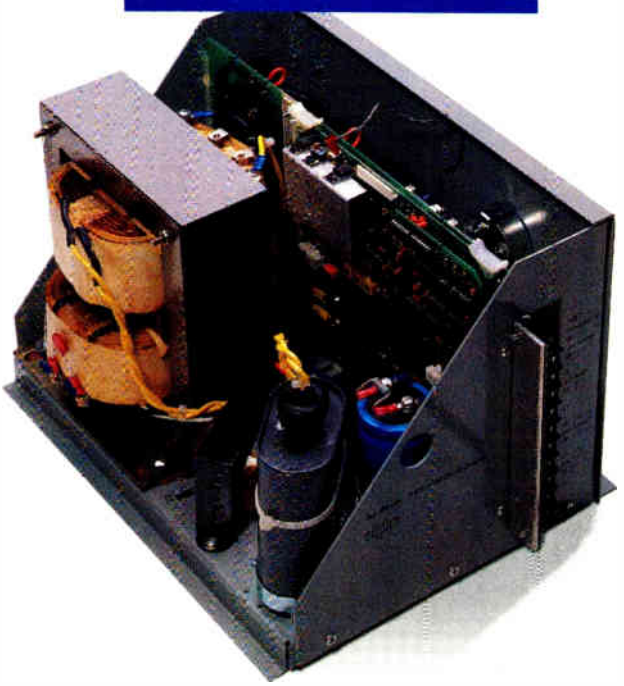
In the case of UHF reception, the preamplifier is the major source of noise. At these frequencies the present state-of-the-art transistors have much higher noise figures, and received antenna noise is much lower. We have assumed a received noise level of -65 dBmV and a processor noise figure of 14 dB. The results are presented in Figure 7. We again see that an effective gain of 15dB is adequate; allowing for a 10 dB down lead loss, we find that

FIGURE 4

Δ SNR versus effective gain



TO BE RELIABLE, YOU HAVE TO HAVE THE GUTS.



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If the designer ignores the problem, the man who uses the preamp and has to suffer with it can't.

25 dB is the minimum gain.

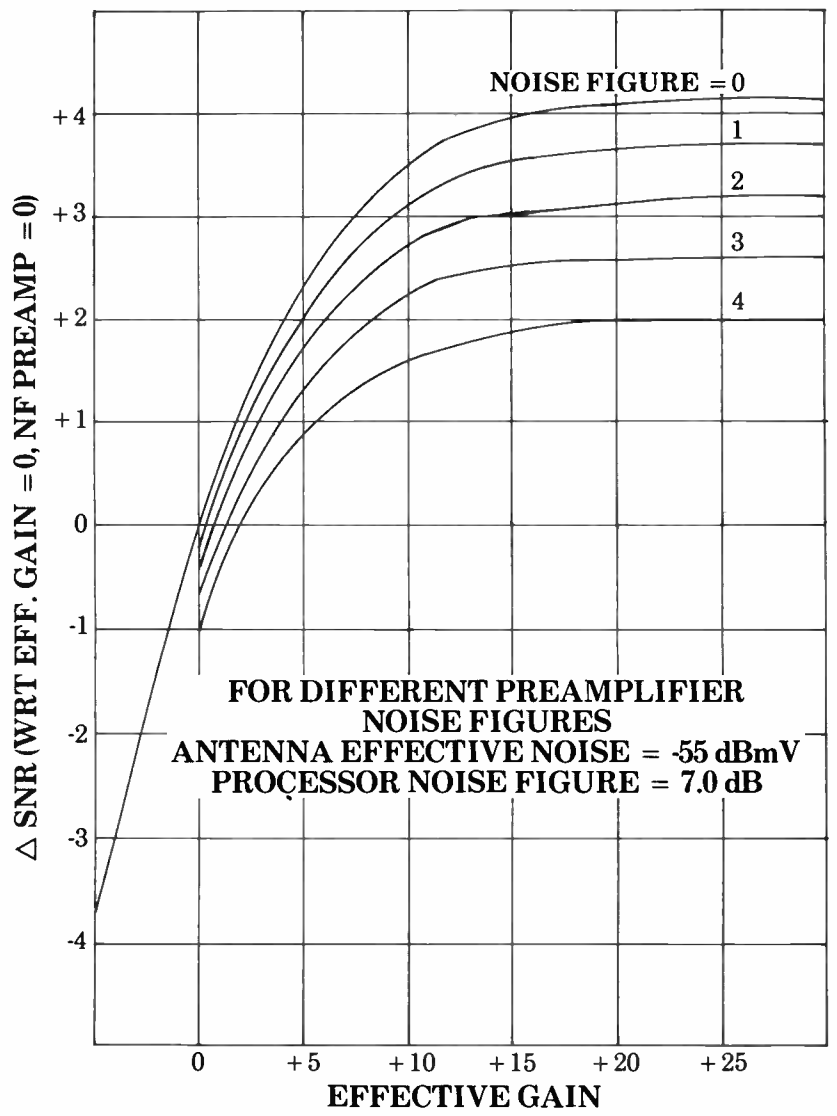
The problem of overload by high signal levels often has been ignored by preamplifier designers. If the designer ignores the problem, the man who uses the preamp and has to suffer with it can't. There are preamplifiers on the market with noise figures of 1 dB to 2 dB, which overload and produce noticeable cross modulation and beats with inputs of only 10 dBmV to 20 dBmV; inmany cases these amplifiers are not satisfactory. To determine what would be satisfactory, we have made a statistical study of the maximum levels encounteredin CATV headends. Figure 8 shows the results of this study. Here we have presented the probability of finding any particular signal level—for both high band and low band. Note that there really isn't much difference. The curves indicate that a preamplifier which will not overload with 26 dBmV input will handle 95 percent of the headend requirements; the preamplifier which will handle approximately 33 dBmV input without overloading will handle 99 percent of the requirements.

These curves were made by taking a sample of ten headends randomly selected throughout North America. For each headend the maximum signal level on the high band and the maximum signal on the low band was noted. We then assumed a normal distribution curve and computed a mean and standard deviation. It is from these values that the curves were generated. Admittedly, this is rather a small sample, but our experience in doing signal surveys of hundreds of headends indicates that the numbers are reasonable. In computing these curves no allowance was made for rejection of unwanted signals by phasing antennas or other such methods. Depending on relative angles of the wanted and unwanted signals, it may not be possible to create any rejection—or the rejection might be as high as 30 dB. The curves then represent a worst case situation.

We conclude that a preamplifier that will accept +40 dBmV inputs without overloading will handle virtually all signal conditions that normally would be encountered. In fact such a preamplifier will eliminate a considerable amount of trouble for the antenna installers by not forcing them to carefully phase the antennas to eliminate unwanted signals. In the case of a search antenna, which is a broadband antenna used for signal surveys or as a standby, it is imperative that the preamplifier be able to accept whatever input signals are present. This, we believe, will confirm the field experience of those who install the antennas and produce working headends.

FIGURE 5

△ SNR versus effective gain



Noise versus handling

There is, of course, a tradeoff between achievable noise figures and achievable signal handling capability. Figure 9 shows the tradeoff which is achievable with today's state of the art. As can be seen, +40 dBmV input

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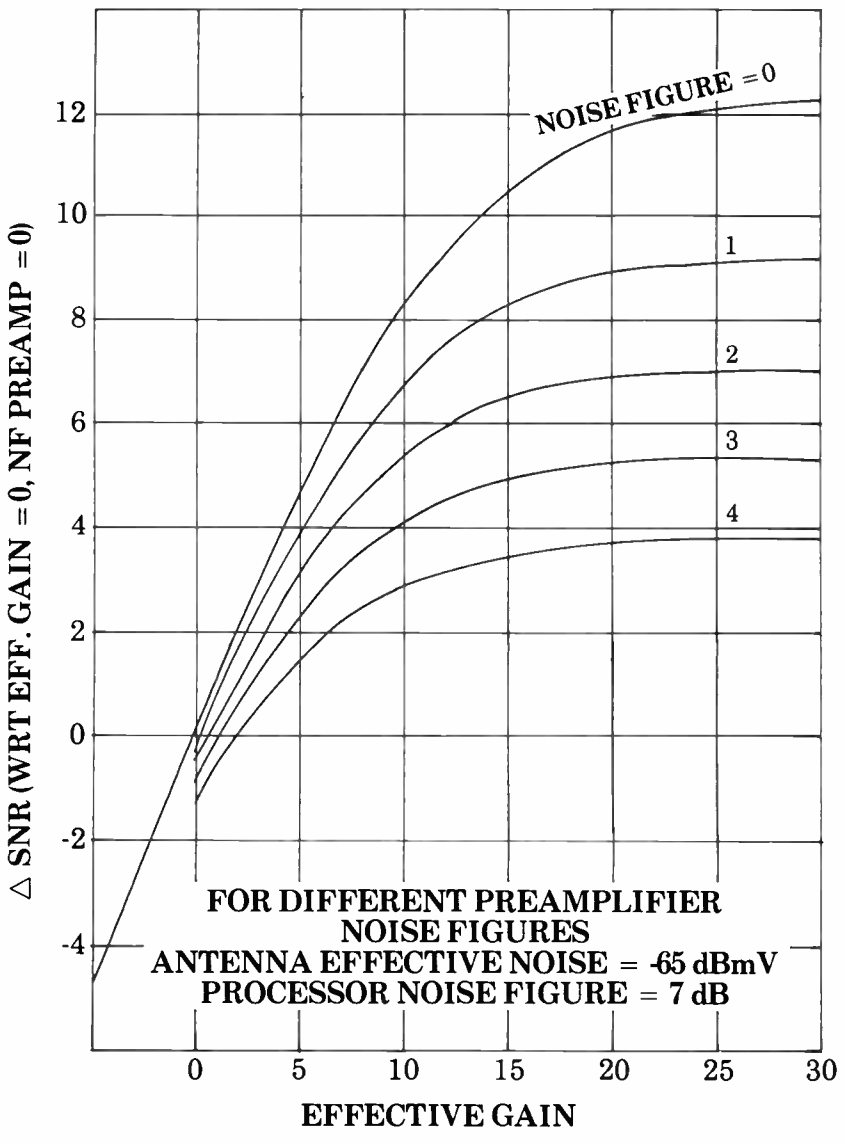
For the high band, it is questionable whether an extremely low noise preamplifier should be built.

capability will involve the loss of about 2 dB of noise figure. When extremely high levels are present, it is better to accept this small sacrifice in noise figure and have a bit more snow in the screen rather than have a herringbone pattern or visible cross modulation. For the low band, where the noise figure of the preamplifier is not so critical, there is no merit in building an extremely low noise figure preamplifier with poor overload characteristics. If you will recall from our previous discussion, a change in 1 dB of noise figure in the preamplifier resulted in a very small fraction of a dB change in noise figure for the entire system. We have encountered numerous cases of overload—which is quite a serious problem. For the high band, it is questionable whether an extremely low noise preamplifier should be built. For a preamplifier with a 3.5 dB noise figure, the system signal-to-noise ratio will be only about 2 dB better than for a preamplifier with a 1.5 dB noise figure. Again, we state that this 2 dB difference in signal-to-noise ratio will be invisible while overload distortion products will be quite visible.

For UHF channels the situation is somewhat different because of the much lower antenna noise level. In many cases there are no strong local UHF stations which would interfere with reception of more distant stations. Here, the lowest possible noise figure is called for. In other cases there are strong local stations which might interfere with distant stations. Because of the two possibilities, it appears that two different kinds of preamplifiers are required: an amplifier with high handling for cases in which there are strong local signals and a lower handling, lower noise figure amplifier for cases in which there are no strong local signals.

FIGURE 6

△ SNR versus effective gain



Return loss

In the interest of thoroughness, we also have looked into the matter of the minimum acceptable return loss. Figure 10 shows time delay versus the level of reflections. As is well known, for very short time delays the reflection can be much stronger without being visible. Superimposed on this curve showing minimum conditions is a curve of calculated conditions for what we consider typical worst case. We have assumed a processor with a 16 dB return loss on the input and a preamplifier with 16 dB return loss on its output; the cable is standard 0.412 diameter with 1.7 dB of attenuation at 216 MHz and 0.85 dB attenuation per hundred feet at 54 MHz. Relative velocity was assumed to be 81 percent. The worst case occurred with about 300 feet of cable. Here, there was still an 11 dB margin before a visible ghost would occur. Of course, for higher frequencies the cable attenuation would be much greater and the margin much greater also. From this we can conclude that with readily attainable levels of match, there should be no ghosting problem.

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In the case of UHF reception, the preamplifier is the major source of noise.

FIGURE 7

△ SNR versus effective gain

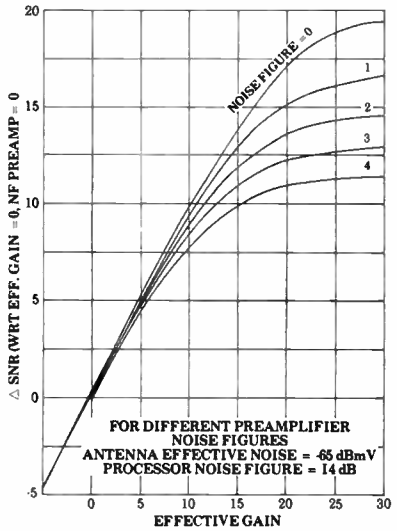
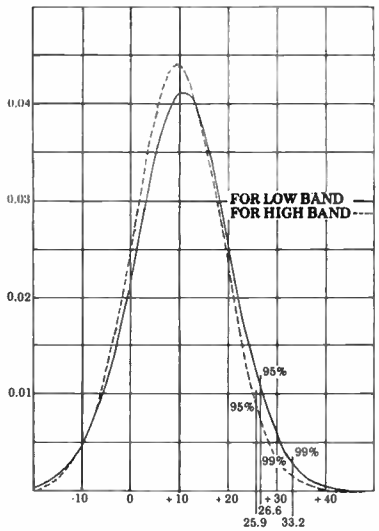


FIGURE 8

Probability of distribution



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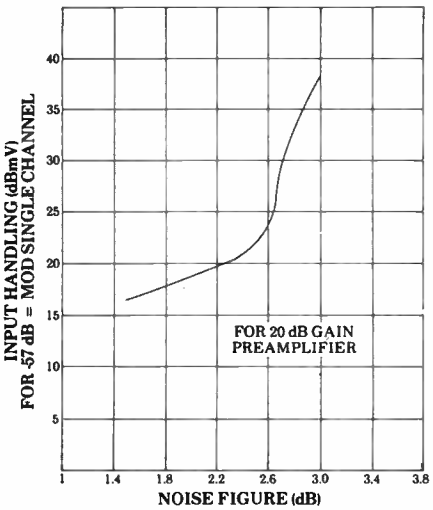
In order that the MTBF for the antenna system be less than three years, each preamp will need a MTBF of about 30 years.

FIGURE 9

Noise Figure versus input handling



*WITH TODAY'S (1986) IMPROVED STATE-OF-THE-ART TRANSISTORS, THIS DATA WOULD BE SOMEWHAT BETTER.

Reliability is not a matter which lends itself to a similar analysis. However, one would hope that the reliability would be such that the antenna system would not have more than one failure in several years. In order that the mean time between failures be less than three years, each preamplifier will need a mean time between failures of about 30 years. With proper design such a reliability level can be achieved. However, it is not easy to measure. The only practical course is to have a large number of preamplifiers in service for several years to evaluate their realiability. It should be possible to accelerate failures by such means as vibration and temperature cycling. However, it will not be possible to know the exact amount of acceleration.

Design principles

Preamplifiers should be designed with the maximum possible protection

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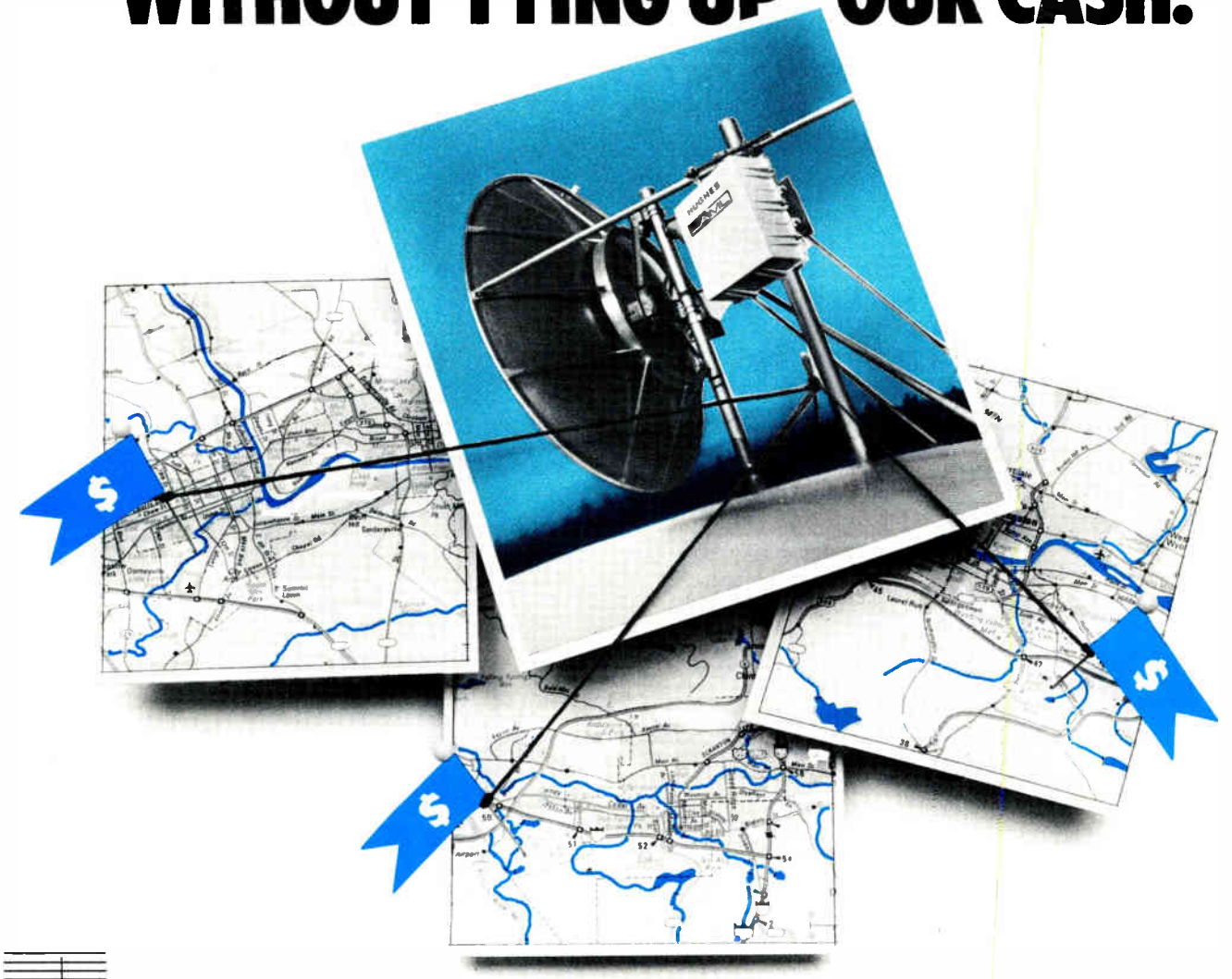

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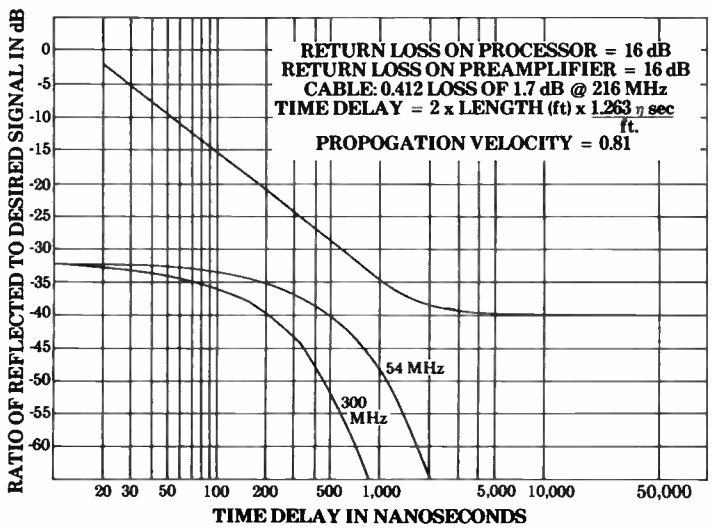
All components, of course, should operate at much less than their maximum ratings.

FIGURE 10
Return loss



from lightning by incorporating both gas discharge surge protectors and diodes to protect semiconductors. Since lightning energy is mainly low frequency, the preamplifiers should incorporate filters to admit only frequencies in the band of interest. Power supplies for preamplifiers should incorporate devices to prevent surges on the power line from entering the preamplifier. All components, of course, should operate at much less than their maximum ratings. It is recommended that a redundant power supply be used. Construction should be sturdy and rigid to withstand the effects of vibration, with tuning adjustments locked by some sort of adhesive to prevent detuning under vibration and temperature cycling. Although the user of the preamplifier cannot readily measure lifetime or mean time between failures of a preamplifier, he can examine them to determine if the above principles have been followed.

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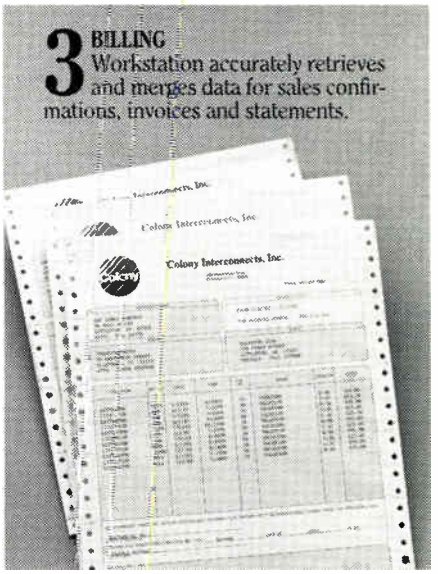

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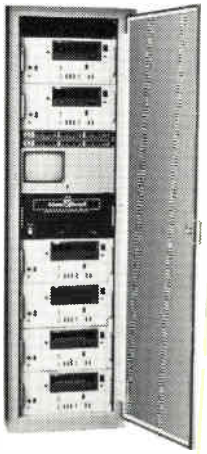

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Reader Service Number 23

Better, and getting better

Cue tones and pre-roll times once bedeviled commercial insertion efforts. Not so, anymore. But traffic and billing need work. And VTR and tape maintenance is critical.

For the most part, local commercial insertion efforts in the CATV industry aren't hampered by cue tone and signaling problems or tape pre-roll times. That wasn't always the case. But a joint NCTA-Cable Advertising Bureau technical subcommittee has been successful in standardizing audio tone levels and pre-rolls. And hardware reliability isn't really a major issue anymore—so long as proper maintenance procedures are followed.

That doesn't mean, however, that all issues are settled. Verification that spots have actually run—the traffic function—is increasingly important, and PC-based systems aren't foolproof. ATC's Paul Olivier worked on the CAB's technical committee, which spearheaded the standards effort. He says, "The biggest problem now is compatibility with billing and traffic systems. Some IBM PC compatibles, for example, won't run software designed for the PC. And you can't fault the manufacturers because everyone wants a slightly different reporting package. It's hard to do."

But, overall, it's a much better picture technically than two years ago," Oliver says. "The only real problem is for smaller systems, since commercial insertion is still fairly expensive: about $4,000 to $5,000 for a four-channel system. Bill Killion, president of Channelmatic, agrees. "A random access system is too darned expensive for a small system. They should join a soft interconnect." But the company also introduced a stripped-down version of its Spotmatic Jr. at the NCTA convention, dropping the cost per channel to $2,000 or so. Logging and verification capabilities aren't included, but it's a way to get equipment to a wider base of systems that, up until now, couldn't even think about local commercial insertion. And lower prices could be a trend in the coming year.

John Coiro of Southern Technologies, which distributes the Nyson system, thinks there's a potential for "drastic price reductions coming in the next year." And while most vendors are looking to sell four-channel systems, Coiro says most of his prospects are looking at two-channel gear. Nyson's sequential access approach is aimed at operators with 2,000 subscribers or more, and is now being tested at several systems, including the Comcast operation in Tupelo, Miss.

Weakest link

Operators and vendors agree that VTR and tape maintenance is critical. "The tape machine is the weakest link in the whole system," says Viacom System Engineer Joanne Banlow. "Watch your pinch rollers and maintain the tape path. If the tape is damaged, say on its edges, if it gets wrinkles, the control track—which is right on the edge—gets lost and video output is dropped." Robert Kozora, chief engineer at West Shore Cable TV in North Olmsted, Ohio, says you can't clean the heads often enough. "We clean ours every other day, and every two weeks go in and check the belts for wear."

Tape wear is another problem. "The video's only as good as the quality of the tape," says Roger Strawbridge of Adams Russell. And it's a good idea to avoid using any single tape too long, warns Don Rice, chief engineer at Telecommunication Products Corp. "Always note the start date when a tape is put into service, and stay within reasonable ranges for length of service." In most cases, when a customer calls with a technical problem, the tape or VTRs are the culprits, he adds.

Power surges or failures are other problem areas. Kozora says West Shore Cable treats the insertion gear just like the billing system computer: there's a line conditioner installed. Even battery backup might not keep the unit safe, he warns. "We've had momentary outages that erased the time memory even though there's battery backup." Tom Mogus, chief engineer at Massillon Cable TV in Massillon, Ohio, couldn't agree more. He points out that every once in a while his batteries do fail, emphasizing the need to maintain them. And sun outages sometimes kick the machines off.

Jim Thibodeaux, product manager with Video Media, gets around the battery backup problem by putting the reserve power sources right on the clock and calendar chips. "They're good for 21 years, and then you don't have to worry about the battery kicking in," he says.

It pays to be careful. "There are very wide variances in voltage drops from area to area, so we check power levels over time at all remote and hub sites before we actually install any gear," Strawbridge says. "We also use backup floppy disk storage, so we're not as concerned as some about the outage issue. But we've been running into the variable level problem a lot recently."

One of the most critical areas is the audio levels of the DTMF tones. "They clip if too high and can't be read by the inserter when they're too low," says Banlow. "I've seen some installations where you have unbalanced audio. That really causes problems." Tony Bollatino of Di-Tech agrees. "The most frequent complaint I hear is that the inserter missed tones. If you don't monitor it all the time, you don't know the tone was received."

The audio and video levels must be set closely to those of the satellite services, and operators probably ought to consider time base correctors and audio signal processing gear when a large market has to be served, Olivier says.

Some operators have found that PC-based systems have a few bugs. "Our Salem, Ore., insertion gear works fine, but the billing software wasn't set up to talk to the remote," Banlow says. "So we don't have invoicing and log functions working yet." Error recovery also seems to be a problem. "How the PC interrogates memory from the log isn't fully developed right now," she adds. In some cases, says Banlow, an operator may try to retrieve a log. The inserter may then clear the memory and put the data into the PC. "But suppose an hour later a second read of the inserter memory is attempted. The file is empty and may then overwrite the actual record stored in the PC, leaving you with no records."

Broadcasters generally have redundancy in all key systems; plenty of engineers, production people and money. CATV doesn't.

Another complicating factor is that commercial insertion in CATV is much more complex than in the broadcast world, generally speaking. "Broadcast is easy compared to CATV because they're only dealing with one channel," Thibodeaux says. "Also, not many people in CATV know lots about video, as opposed to RF transmission. So good maintenance techs can be hard to find." Also, broadcasters generally have redundancy in all key systems, plenty of engineers, production people and money, Killion adds. "CATV doesn't."

So it's not surprising that increased user friendliness is a big goal for Channelmatic. "Very few people really understand the technology, and there's such high turnover of personnel," Killion says. "We've constantly got one or two people on the road, doing training of one sort or another. Consequently, we're moving to computerization to reduce the number of switches and knobs required to run the systems." But it'll still be a relatively complex operation, "so long as you're trying to remotely control lots of mechanical devices at a distance," Banlow points out.

And the work on software never stops. Channelmatic has three to five people working on the overall software package all the time and tries to go as modular as possible, so screens and report forms can be changed at the site. Verification also has become increasingly important: advertisers often want detailed reports indicating when selected spots ran at certain times, on certain channels, in certain areas. Some methods include logging of the cue tone, changes in video or audio level, touch-tone or FSK data.

Ron Enas, chief engineer at American Cablevision of Indianapolis, has been wrestling with verification for a year. "On one of our systems, we can verify that a spot hit our headend, but we don't know whether video at the modulator actually changed." So one option he's looking at is sampling audio and seeing whether it changed. "But even if you know audio is present, there's still the question of whether video was present," he says. In any case, he'll probably turn to a third option. "We have subscriber video near our insertion site. So we'll probably run a subscriber cable with an A/B switch so our people can sight check things."

And complexity itself can be a problem sometimes. Large interconnects might have 50-60 active channels with hundreds of VTRs sitting at the end of phone lines, says Texscan's Ken Lawson. In these cases, error detection is a big issue. Also, with so many modems involved, it's possible that dip switches are improperly set. Sometimes heavy-duty printers are required. A single channel system with a single headend most likely can get by

CATV companies should look at fiber for the same reasons telephone companies do.

with an Epson 80 series printer, he says. And while opinions vary on the actual number of VTRs needed for each channel, most agree that for random access systems, operators should go with a VTR for each spot in a break: four machines if there are four 30-second spots.

By the way of comparison, the technology of hard interconnects is marvelously simple. The most common method is microwave. "You're basically looking at the same technical requirements you would for any video signal," says Steve Dozier of Channel Master. "Single-channel or broadband is the real question, and in some cases, where you're looking at carriage of 12 to 14 channels FM, the cost is about $12,000 to $15,000. At that price, 60-channel AML is interesting from a cost standpoint."

Abe Sonnenschein of Hughes Microwave says single-channel FM has one advantage: it provides more fading margin. "But that's not usually a limiting factor in an urban environment." Its disadvantages? "You need more spectrum, and the radio inputs and outputs must be at video baseband. That might mean demod/remod. With AML, you already have a VHF signal." When you've got to interconnect a lot of channels, multichannel makes the most sense, he argues. "In fact, sometimes it makes sense to get rid of headends altogether and bring all signals out to the hubs by microwave," Sonnenschein says.

Microwave is the traditional way to build an interconnect, but it's no longer the only way. Enas, for example, is running a fiber optic interconnect. "It's simple, and there are no real hang-ups," he says. We have no power supplies or amplifiers on the cable. As long as the analog lasers are working, we're in business." The decision to install fiber came after the company analyzed all costs to operate the link: first cost and the cost of maintenance. "It would have been $15,000 cheaper to put in an RF mid-split supertrunk, but over 10 years, factoring in the maintenance, power supply costs and so forth, fiber was cheaper.

George Benton at Catel agrees with Enas. "CATV companies should look at fiber for the same reasons telephone companies do. First cost isn't the way to go at it. Maintenance costs also have to be weighed." Although fiber is 8-10 percent higher in cost than microwave because of the need for optical conversion gear, there are cost savings over time because no amplifiers have to be balanced, Benton argues. "Up until now, first cost has been the most important consideration because everything has been RF." That could change.

—Gary Kim

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Billing software: a new tool for customer service?

Once narrowly designed for accounting applications, today's billing packages help ops cut trunk rolls and streamline many customer service tasks. For cutting costs and confusion, the right software could save the day—and the bottom line.

With subscriber churn rates running 30-35 percent as an industry average, few cable systems can afford to neglect customer service.

And as Viacom's Fritz Baker, regional director of engineering, says, "Good customer service must extend beyond answering inquiries and responding promptly. We must work at understanding the specific reasons why our subscribers call." Most billing systems can track service calls in general. Baker says it's also important to track those calls by employee, something the CableData package, for example, allows. "We were surprised that some representatives were scheduling calls for TV fine tuning at twice the rate of others on the same shift. Rather than retrain the whole group, we now are able to target specific individuals for training.

"Figure 1 is a sample of a report given to the phone service supervisor. This report lists the occurrence of calls scheduled by service representative No. 305, where a technician fixed the problem by fine tuning the customer's TV set. The end of the month report summarizes the department's phone activities and lists the number of service calls that were sent into the field by type and by each representative."

Baker also used the employee tracking feature to cross-train CSRs and technicians, with a resulting 10 percent drop in scheduled service calls. "When we started tracking performance by individual service technicians, call-backs ran 20 percent per month; they now run 5 percent.

"Figure 2 is a sample of a report given to the service repair supervisor. In this instance Mr. Kessler received a service call on the 26th of March. Technician No. 806 fixed a bad fitting. Mr. Kessler called back the same day complaining of flashing. We sent technician No. 806 back to the house where the final solution to the problem was to fine tune the TV set. Had the condition of the TV been noted on the first visit, the call-back could have been avoided. The month-end report summarizes the service technicians' activities. The supervisor noted that technician No. 806 had nearly three times the number of repeat visits for fine tuning than the other technicians."

Viacom also was shocked when one report indicated that of every 100 installs, 30 needed another service call within 30 days—and most of those came in the first 48 hours. What the tracking reports showed was that some employees had problems with low drops and fittings. So instead of training the entire service tech group, just those who needed the help got it.

"Figure 3," says Baker, "shows that Mr. Baker called for an install on March 21 and was installed on the 25th at 4 p.m. by installer No. 705. The following day he called at 9 a.m. and complained that his converter was slow to change channels. On the 27th, technician No. 806 found a poorly installed fitting inside the home and corrected the problem. At the end of the month, CableData summarizes these occurences in a report provided to the installation supervisor."

Baker also has used a program (Figure 4) that tracks converter problems: it pinpoints why a tech removed a converter from a home for each of the past six service calls. The report also explains what was fixed on the converter each time it was in the shop. As a result, the company has identified those converters that test okay coming off the bench but fail because other problems weren't identified.

Another aspect of using billing software for enhanced customer service is work scheduling. "You don't want to roll a truck when it can't generate revenue," says Jay Oxten, of First Data Resources. Many packages offer calendars and time allotments for the work order. Whether it's a new install, additional outlets or pays, actual time on the job is allotted according to subscriber history and environment. Also,

FIGURE 1

The customer service representative

Address	Customer Name, Phone	Account No.	Order-Time Complete	Phone Rep.	Problems	Fix Code
181 Elm	Miriam Loague 375-8888	33344-8	3/28/85:9 3/29/85:9	305	No Picture	Fine Tuned TV
321 Lake	Kathryn Rose 291-4006	13245-9	3/30/85:14 3/31/85:10	305	Flashing	Fine Tuned TV

FIGURE 2

Tracking a technician

Address	Customer Name, Phone	Account No.	Order-Time Complete	Phone Rep.	Problems	Fix Code
1876 Meadow	Robert Kessler 229-0000	611117-9	3/26/85:08 3/27/85:12	806	No Picture	Bad Fitting
1876 Meadow	Robert Kessler 229-0000	611117-9	3/27/85:13 3/28/85:09	806	Flashing	Fine Tuned TV

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Reader Service Number 28

New products at NCTA

For the most part, refinement, not risk, was the trend as new products and services were rolled out at NCTA. But there were some surprises, and Zenith gets the award for cleverness.

Zenith steals show

Zenith Electronics Corp. pulled a rabbit out of its hat at the NCTA show, making public a new, patented RF scrambling technology that is most clever. And up until now, most secret. The company apparently had been working on the system, which it calls PROCESS (phase reversal of carrier encrypted sync suppression), for about five years.

At the heart of the system are some new and proprietary SAW filters that dynamically modify both the phase and amplitude of the RF signal. The result: sync suppressed video and chroma inversion as well as a masking of the audio information. The system appears to be extremely rugged. The SAWs dynamically switch between A, B and C levels of the sub-strate, and operators don't need to make adjustments to the decoder section of the converter It is the SAW that has independent control of the phase and amplitude information; not the box. Also, encoding and decoding are based on phase, not the underlying video. Two custom VLSIs also form part of the new system.

Two-way communication is designed to be independent of the return path technology chosen (full two-way cable, auto-dialers or store-and-forward) and looks very robust. Company spokesmen say less than 1 percent throughput is needed to get messages through. Redundancy is built in to the multilevel communications protocol, which can operate even under extraordinary white and impulse noise. The second level of the protocol, for example, features a 100-to-1 redundancy.

No out-of-band data channel is needed, and the company says there's virtually no need for operator tweaking or aligning of the box. The addressing rate is the same as for Z-Tac. 10,000 boxes a minute. And it would appear an expensive encryption system for a pirate to break. In essence, a baseband decoder would have to be built. All data is dynamically encrypted going into and out of the decoder; and all data held in the box is in non-volatile, on-board memory in the chip itself. Additionally, all data decryption and storage is done on that single chip.

The decoder itself is totally transparent to either HRC or IRC, both of which are downloadable. The converter CPU address and address key are installed at the factory.

The company also was showing Pay-Mate, a decoder-only add-on box designed to work with any plain vanilla converter. Zenith promises "very aggressive" pricing on Pay-Mate. How aggressive? About $42 or less in reasonable quantities.

For more information, contact Zenith Electronics Corp., 312/699-2100.

Status monitoring from Alpha

Alpha Technologies, though, also had a few cards up its sleeve. It was showing a status monitoring system for one-way plant. Designed by Bill Gilbert, formerly with Texscan, it wasn't finalized until about "three hours before I got on the plane for NCTA," Gilbert says. The system uses a low-frequency carrier at 100 kHz for the return path; hence, no return path amplifiers are needed. At that frequency, "you can send an almost unattenuated signal about six amplifiers or passives until the signal gets lost," Gilbert says. So the system uses a repeater in each amp to decode and recode the data. Cable attenuation is virtually zero, and demod/remod is done by power inserters. In fact, there's virtually no system load added by the replacement of the power inserters, the company says.

For more information contact Alpha Technologies, 206/671-7703.

Sigma updates

Oak Communications was showing its EIA baseband interface-compatible version of the Sigma converter, as well as Sigma II with simpler electronics and a smaller footprint. Two stereo-compatible models of Sigma will be coming out, says Graham Stubbs, company vice president, engineering. They are the Sigma 3D, which has MTS encoded at RF, and the 3C, using baseband jacks for BTSC or scrambled formats. Both should be available in the second half of this year. Also shown was a programmable remote for the TC and Sigma converter lines, with 31-day memory. Sigma II should be in production by the third quarter of this year.

For more information, contact Oak Communications, 619/451-1500.

Measuring customer service

Westinghouse Electric Corp. was showing its CableTRAQ surveying system, which measures cable system performance in eight customer service areas. CableTRAQ uses telephone surveys and typically costs $3,000 to $5,000, the company says.

For more information, contact Westinghouse OnTRAQ, 412/374-7111.

Burnup & Sims protects power

Burnup & Sims Corp. introduced a new line of power protection devices for computer systems. The company is offering a free ITT Xtra personal computer with 256K RAM to all qualified buyers.

For more information, contact Burnup & Sims, 800/551-3790.

Regency restyles LC-32

Regency displayed its newly restyled LC-32 converter. The LC-32 incorporates a downloadable non-volatile memory with parental control and diagnostic features. Compatible with the Jerrold addressing systems, the LC-32 features dual level sync suppression RF scrambling and VBI interference jamming for audio scrambling.

The 54-450 MHz (550 MHz, optional) converter includes silent dual speed up and down channel scanning, anti-tampering and self-diagnostics. Dual mode random descrambling together with optional intercarrier audio jamming ensures optimum signal security to cable-ready or digital TVs.

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For expanded recording capability, TOCOM offers the VCR-Mate, an optional video adapter that fits easily and neatly on the back of the converter. The VCR-Mate allows limited simultaneous recording and viewing of different channels. Of course, the 5503-VIP is stereo and IPPV-ready, too. And to help you market these new services, TOCOM offers complete subscriber marketing support and promotional programs.

Solve the problem of VCR hookup, time-shifting and marketing with one economical package — the TOCOM 5503-VIP. Find out how it can unlock your revenue potential.

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Reader Service Number 33

GENERAL INSTRUMENT

Logging & verification, C/Ku-band satellite receiver, learning remote control. . .

nels, a machine interface for cue tone detection, individual tape segment cueing and overall real time control of machines and switchers, a sales and billing computer for advanced sales scheduling, conflict checking, invoice preparation and an embedded tape preparation system that identifies tapes and spots with SMPTE time code. Up to 240 commercial spots can be random-access positioned, allowing for unattended operation.

For more information, contact Grumman Corp., 516/575-3987.

Data-Logger, Workstation debut

Datalog Systems announced the Data-Logger and the Workstation, an integrated hardware and software system designed to provide ad verification logging and invoicing capabilities. The Data-Logger features a 19-inch rack mount unit with built-in 5¼-inch 170 K floppy disk drive, 64 K microcomputer and keyboard, and 5-inch color monitor. Its resident software, Auto-Log, is mounted at the insertion site and interfaces directly with the commercial insertion VCRs.

For more information, contact Data Log Systems, 414/722-3282.

Microdyne automates with M.A.T.

Microdyne Corp. introduced its Microdyne Automated Terminal satellite receiving system. Controlled via a key pad, M.A.T. selects satellite, polarity, video and audio frequency, and can be preprogrammed to re-orient at a specified time and to activate video recorders and other electronic equipment. C- and Ku-band compatible, M.A.T. features full or half transponder reception, programmable audio subcarrier, an RS-232 and parallel ports for remote computer interface, eight contact closures, self-diagnostic routine, battery back up, compatibility with VideoCipher and 200 programming presets.

For more information, contact Microdyne Corp., 904/687-4633.

Intros and upgrades from S-A

Scientific-Atlanta introduced the Model 8535 set-top terminal, which provides compatibility with the company's patented dynamic scrambling technique and also those used by Jerrold, Hamlin, Sylvania and others. The 8535 is programmed through its infrared remote control receiver. Subscriber definition of parental control channels is a key feature of the unit.

The new Model 8550-375 learning remote control from S-A enables subscribers to control TVs, VCRs and other home electronics devices with a single remote unit. The Model 8550-

Monitoring, VCR hook-up, character generator, converters, frequency modulation, antennas. . .

channel while viewing a pay channel, or vise versa. It also allows for recording of an unscrambled channel while viewing a scrambled channel or vise versa.

Panasonic also launched a new 68-channel converter, the TZ-PC 120. It's an expanded bandwidth version of the company's TZ-PC110 converter, which handles 57 channels.

For more information, contact Panasonic Industrial Company, 201/392-4109.

Receiver/antenna positioner in one

DX Communications Inc. introduced a DSB-800 stereo satellite system, an all-in-one receiver/antenna positioner. After pre-programming, everything is automatic including dish positioning, selection of satellite types and numbers, channels, polarization information, stereo modes and frequencies. The DSB-800 is C- and Ku-Band compatible.

For more information, contact DX Communications Inc., 914/347-4040.

Frequency modulation

Pirelli Optronic Systems announced the 900 Series modulators for conversion of baseband video and audio input signals to frequency modulated (FM) output signal. The units are frequency agile with the output, front panel and switch selectable from 400-540 MHz in 1 MHz steps.

For more infformation, contact Pirelli Optronic Systems, 203/238-9665, 800/523-7893.

Network monitoring & control

Network Technologies, a division of AM Cable TV Industries Inc. offered the TMC-8000 Series broadband network monitoring and control system. Providing total monitoring capability, the system is compatible with all major configurations of broadband networks currently in use.

For more information, contact Network Technologies, 215/536-1354.

VCR hook-up from Viewsonics

Viewsonics Inc. demonstrated a VCR hook up kit providing four ways to hook up a VCR. The options available are basic hook up; watch 2-13, record any program; watch any program, record any other program and cable ready VCR hook up.

For more information, contact Viewsonics Inc., 516/921-2084.

CableTEK expands product line

CableTEK announced an expansion to its product line by the acquisition of Cogito Data Systems Inc. The transaction is expected to be completed in April, subject to shareholder approval. Cogito's product will provide cable operators with specific computing products for CATV parts inventory, plant maintenance and vehicle maintenance.

DH Satellite offers antenna line

DH Satellite TV is opening its line of antennas to the cable industry. A manufacturer of parabolic antennas, DH Satellite has offices located throughout the U.S. to assure quick delivery. For more information, contact DH Satellite TV, 608/326-6705, 608/326-8406.

Echosphere re-enters cable market

A major distributor for over 60 TVRO system manufacturers, **Echosphere** is re-entering the cable market. Echosphere offers six distribution centers, same-day shipping, 48-hour delivery and full technical service at each location. For more information, contact Echosphere, 214/630-8625.

Comband for MMDS

General Electric Co. was showing a version of its bandwidth compression system designed for MMDS use. The two-for-one system uses both frequency and time division multiplexing. Pending approval by the FCC, the system will be available by mid-year. For more information, contact General Electric Co., 800/526-4385.

Multi-vendor converter

Pioneer Communications displayed its BA-5000 converter, compatible with Oak, Jerrold and Hamlin scrambling modes. The box also features an IPPV add-on and an integral VCR timer. For more information, contact Pioneer Communications, 614/876-0771.

Economy character generator

Texscan MSI/Compuvid introduced an SGe character generator based on the Spectragen but offering fewer screen formats. The SGe offers four character heights and two widths; eight background colors; roll, crawl, bang and splash display modes; and programmable page events. Memory is 22 pages standard, expandable to 150. The price is $2,200 for rack-mount units. For more information, contact Texscan MSI/Compuvid, 801/262-6475.

$20 million more Videocipher descramblers

Anixter Communications has ordered another $20 million worth of Videocipher II-C units, and will be stocking the 2000E version as well. The new 2000E was designed for CATV operators selling programming to home TVRO customers. For more information, contact Anixter Bros., 800/672-6190.

Vanilla converter controls volume

Jerrold introduced the Starcom CSV, a plain converter with volume control and muting. The 450 MHz box also includes favoritie channel programming, last-channel recall, automatic fine tuning and a convenience outlet on back of the converter.

The company also announced its Starplan computerized analysis service, to be offered free to operators planning rebuilds and upgrades. It provides an economic model evaluating the benefits of each option. A nationwide distributor network to sell the company's subscriber and distribution equipment also has been formed. PTS in Bloomington, Ind., Cable TV Supply in Los Angeles and VueScan of Deerfield Beach, Fla., are now carrying Jerrold plain and pay converters and have access to addressable stock.

The company also announced that its basic charge for a complete two-way design, including bill of materials, will be $60 per mile.

For more information, contact Jerrold, 215/674-4800.

SCTE news, NCTA awards, ad insertion gear, control switch. . .

375 imitates the infrared codes of other units by switching into the "learn" mode. S-A's 8550-375 is compatible with its 8550 Series remote control and supports most TV and VCR remote controls currently available.

Also new from Scientific-Atlanta is the Model 6585 status monitoring/reverse switching system. The 6585 remotely identifies problems in trunk stations throughout the distribution system utilizing an IBM PC, a color monitor, printer and RF sub-system located at the headend and transponder modules for each trunk amplifier to be monitored.

In other news from S-A, all Model 6350 modulators are being shipped with BTSC stereo compatibility with baseband audio inputs as a standard feature.

For more information, contact Scientific-Atlanta Inc., 404/441-4000.

New releases from Channelmatic

Channelmatic announced production of the LiL Moneymaker, a self-contained local ad insertion system. The unit is a one-channel, one-VCR system featuring microcomputerized operation, digital DTMF tone decoding, programmable preroll delay, instantly changeable operating modes, automatic sports blackout transponder switching and auxiliary audio/video source fill for use with interconnects.

Channelmatic's new ALS-5A Logmatic is a four-channel automatic ad insertion logging system. The unit enables operators to log local ad inserts on four channels with printouts on a standard 80-column printer. Storage of 4,800 events before retrieval is possible.

Also new from Channelmatic, the Ad Analyzer is a sales tracking and invoicing software package that provides a sales management database and includes multi-report ad sales tracking, accounting and automatic invoicing.

The re-designed ALS-4A is a four-channel local ad insertion logging system which provides printouts of time, date and channel of local commercial insertions for up to four channels with encoded advertiser, spot number, rate code, agency and AE information. The unit features a built-in battery backup.

Rounding out Channelmatic's new product line is the ATS-1A automatic tone switcher. The ATS-1A switches channel audio and video to any one of four sources and can supply control signals to start VCRs into preroll at an exact time in advance of the switch. In addition to DTMF tone inputs, the ATS-1A accepts most forms of control signals as switch commands.

For more information, contact Channelmatic Inc., 619/445-2691.

Debuts from Pico Macom

Macom Industries, OEM Sales, and Pico Home Satellite West are now **Pico Macom Inc.** The newly-renamed company introduced a pay-per-view decoder (trap) designed for non-addressable systems. It can be used with standard encode/decode systems, with or without a converter. It's especially well-suited to hospital, hotel and motel operations, the company says. Pico Macom also introduced a parental control key lock trap.

For more information, contact Pico Products, 800/822-7420.

Panasonic's video control switch

Available from **Panasonic Industrial Company** is the VCS-1 video control switch, an active switching device allowing an interface between the cable system's plain, addressable or programmable decoder, while permitting subscribers to add other RF sources. The VCS-1 allows recording of a basic

SCTE appointments and news

The SCTE elected new officers for the coming year. They are: Bob Luff, president; John Kurpinski, eastern vice president; Sally Kinsman, western vice president and Andy Devereaux, secretary/treasurer. The entire Society membership voted on a new Board of Directors: Region 1, Bob Vogel, Sytek Inc.; Region 2, Sally Kinsman, Kinsman Design Associates; Region 3, Steve Bell, Video Cable Systesm Inc.; Region 4, Gerald Marnell, Tribune Cable Communications Inc.; Region 5, Glyndell Moore, Storer Communications Inc.; Region 6, Gary Selwitz, Warner Amex Cable Communications Inc.; Region 7, Andy Devereaux, American Cablesystems Corp.; At-large directors: Len Ecker, Consultant; John Kurpinski, Cable Services Co. Inc.; Bob Luff, United Artists Cablesystems; Tom Polis, R/T Katek Communications Group; and Dave Willis, Tele-Communications Inc.

Three new meeting groups were welcomed to the SCTE: the Blue Ridge Meeting Group, a Puerto Rico-based meeting group and the Great Lakes Meeting Group.

Scholarship funds are available from the SCTE in the amount of $6,000 for 1986. Twelve two-year technical correspondence courses are to be awarded to cable installers or technicians who show great potential for advancement. One course will be awarded each month; applications can be obtained from SCTE National Headquarters, 215/363-6888.

Using a $20,000 grant from the Council for Cable Information, the SCTE plans to develop a videotape and training manual geared to instruct installers and technicians on subscriber marketing and retention methods.

A promotional videotape illustrating the advantages of SCTE membership also was released at the show. The videotape is geared to management personnel considering SCTE membership for their technical employees.

NCTA National Awards

The National Cable Television Association presented its National Awards at the conclusion of the 35th annual convention in Dallas.

Joseph Van Loan, vice president of engineering, Viacom Cable, received the Science and Technology Award for his efforts against mandatory carriage for broadcast stereo sound.

The Associates Award, which recognizes the contribution of the industry's programmers and equipment suppliers, was awarded to Robert Wussler, executive vice president of Turner Broadcasting System and president of WTBS.

product profile

Commercial insertion gear

Company name	Model	Mode of operation	Number of channels	Number of VTRs	Events/ entries	Tone decoder
Abiqua International 503/873-4181	UB1/A	ROS	1	0	64 or 128	DTMF
Adams-Russell Video Information System Division 800/AR-ARVIS 800/272-7847	ARVIS 7240/7550	Random access	Standard: up to 4; 2 or more, optional	6 Sony 3/4-inch VP-5000s	Over 200 different 30-second spots	Cue tone, can interface with customer-supplied sub-carrier detection
Channelmatic 800/231-1618 619/445-2691	Spotmatic	Random access	Up to 32	Up to four per channel	100 commercials per tape	Digital tone decoder module
Commercial Cable Inc. 615/894-2580	ALO/CU-8 (Controller)	Programmable sequence of A/V sources	One per mainframe chassis	Up to eight Audio/Video sources plus one default	More than 2,400	N/A as standard
Di-Tech Inc. 516/667-6300	Comsert 1000	Random access	Up to 15	99	10,000 different spots	Satellite tone, contact closure
Falcone International Inc. 404/427-9496	Autoserter	Sequential or random access	1 to 8	1 to 8	7 day programmable	Digital decoder with optional custom sub-carrier detection
Microtime Inc. 203/242-4142	C-150	Sequential	1	4	100 30-second spots pm VTR	DTMF, cue tone, contact closure
Monroe Electronics 716/765-2254	3000R-14	ROS	2	1 per channel	N/A	Cue tone decoder, contact closure

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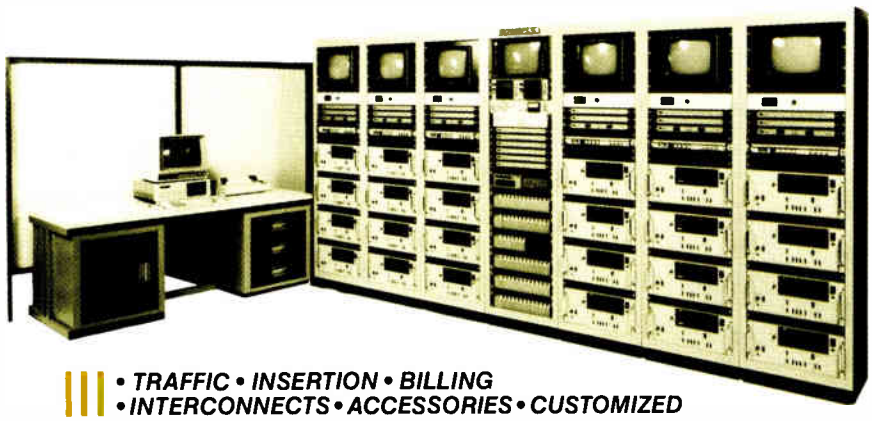

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THE LEADER IN COMMERCIAL INSERTION AUTOMATION

Reader Service Number 40

CHANNELMATIC

Commercial insertion gear

Company name	Programmable pre-roll	Video	Audio	Memory	Other features
Abiqua International	Yes	2 in, 1 out, 1 V, 75 ohms (loop-thru)	Passive, 2 PDT, (balanced or unbalanced), 0 dB nom.	Not required	Controller inserts char. generator or camera video automatically for $325/ channel. Designed for profitable ad insertion in small systems.
Adams-Russell Video Information System Division	Yes	(In/out) BNC type (x8) 1.0 ± 2 V p-p. 75 ohms, NTSC. compatible EIA-RS 170A	Audio level controls-limiter/ compressor, 50-15,000 Hz frequency optional stereo	Hard and floppy disc stored for 7 days of unattended operation	Remote communications diagnostic capability, automatic traffic & billing, automatic make-goods, sales management and accounting reports
Channelmatic	Programmable pre-roll delay	N/A	N/A	N/A	Automatic logging, optional remote communications, sales management, preview and automatic bypass
Commercial Cable Inc.	Determined by control tones placed on tape	NTSC standard, 1 V p-p. sync stripper circuitry	Program audio Ch. 2; control tones on Ch. 1	Battery protection of onboard clock and control computer memory	Interfaces with ½", ¾" or combination of VCRs. Programmable by time start or external source. Modem capable.
Di-Tech Inc.	Yes	1 V p-p, NTSC, V.I. switching	Stereo, balanced or unbalanced	Hard disc and RAM, 60 day future memory	External printers, 60 day past memory, logging and verification, alpha-numeric data entry
Falcone International Inc.	Can be set for each network independently	Input: 02.5 V p-p 1 V p-p normal. BNC Output: 1.4 V p-p adjustable NTSC type, BNC	Input: 100MV 5 V p-p. 0dB Output: 600 ohm 0 dB normal level	7 day program/ event storage, verification, merge by advertiser by day or week. Printout in affidavit format.	Complete traffic & billing system option, automatic by-pass, optional preview switcher, sequential system up-gradeable to spot random decoder, card accepts two codes.
Microtime Inc.	Yes	1 V p-p BNC input and output	10 K ohm unbalanced, 600 ohm balanced audio follow video	N/A	TBC interface provided, logging option available, automatic fail safe for loss of satellite to external slate input
Monroe Electronics	Yes	Integral AB switching	Integral AB switching, 600 ohms, balanced	N/A	Data logger, external printer, diagnostic self-test mode, remote override of program source cues

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Art Breyfogle
MPTV, Sales Manager

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Reader Service Number 41

Commercial insertion gear

Company name	Model	Mode of operation	Number of channels	Number of VTRs	Events/ entries	Tone decoder
Nyson 803/882-0022	IC-4	ROS	2, 3 or 4	1 per channel	Up to 120 per channel	DTMF
H.A. Solutec 514/522-8960	SOL-6800	Can mix VTR formats, with 1 spot on 1 cassette	Multichannel	8 or more	250 events/ day/channel	DTMF
Strata Comm Industries 800/533-8092 800/642-2384	Ad-Vantage	ROS, automatic insertion	1	1	Up to 120	Programmable DMFT, contact closure
Telecommunication Products Corp. 717/263-8258	NEXUS I/ Administrator	Random access to spot 30 second	2 channels per chassis	3 per channel	255 per channel, four 30-second spots each	Built-in tones (contact, closure or manual)
Tele-Engineering Corp. 800/832-8353 800/832-TELE	AD-CUE 1000	Random access	Up to 100	Up to 2 per channel	200 per channel	Digital with AGC
Texscan MSI/ Compuvid Corp. 801/262-8475	CSR 94 ComSerter	Random access	16 channels per headend; on practical limit on number of centrally controlled headends	Up to 4 per channel	16 event lists with 1000 events each; total 16,000 programmable events	DTMF, contact closure subcarrier
Videomedia 408/745-1700	Q-Star II	Auto, manual, external real-time clock	Up to 255	18 per channel	500 events with 6 levels of user-programmable sub-routines	N/A

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On March 16th at the NCTA in Dallas, Texas, the NYSON Company formally introduced both the product and the system to allow virtually all cable TV operators of systems of 2,000 subscribers and up to realize what has been called one of the last remaining profit centers. **The Product**, field tested for 2 years in MSO systems for total quality assurance and performance. **The System**, designed by professionals to make commercial insertion a profitable reality instead of a grim spectre of additional equipment and massive frustration. With NYSON you can finally replace rhetoric with reality, and add a new profit center to your operation without massive capital expenditures.

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Commercial insertion gear

Company name	Programmable pre-roll	Video	Audio	Memory	Other features
Nyson	Yes, network specs	Inputs: 1 V p-p Peak white: 100 IRE	Inputs: screw terminals, 2-cond. w/shield, balanced 0 dBm into 600 ohm load level	Verifier	Complete ad avail marketing training & financing supplied w/equipment.
H.A. Solutec	Yes, from 3 seconds and up	Inputs: 12 max. Outputs: 2 of 75 ohms each	Inputs: 12 max. Outputs: 2 balanced +4 or +8 dB, 600 ohms w/transformer	32 K	Status monitoring, real-time & multiprogrammed, document database, automatic logging, component switching, VTR recording mode, message ID, stereo compatible.
Strata Comm Industries	5, 6 & 8 seconds, plus fine adjustment	1 V p-p, BNC connections, 75 ohm	TVRO input: 600 ohms balanced VTR input: Hi Z unbalanced Output: 600 ohm balanced	Non-volatile re-settable tape run display	Override switch, manual insert, automatic bypass & reset, automatic return to network, computer interface, vertical interval switching, upgradeable to random access, ½" & ¾" VTR compatible.
Telecommunication Products Corp.	Yes	Input and output: BNC type NTSC standard video format	Input: selectable 600 ohm balanced or high impedance unbalanced; output: 600 ohm balanced	32 K, C-MOS, RAM/ROM	3 levels of commercial verification, 5-hour memory backup, automatic bypass to network in case of VTR failure, vertical interval switching
Tele-Engineering Corp.	Field selectable pre-roll	N/A	Balanced, 600 ohm with VCR level adjustment	54 K of user-allocatable RAM, 12 K ROM, can store 7 days of programming	Modular design, log memory capable of retaining 3,200 spots, remote programming, standby power supply, vertical interval switching
Texscan MSI/ Compuvid Corp.	Yes	BNC connectors, 1.0 V p-p, negative sync, RS-170A compatible with switchable 75 ohm terminators. 6 video inputs, 2 program channel outputs.	0dBm, 600 ohm stereo inputs, single ended, with AGC on satellite and VCRs. Two stereo single ended low impedance outputs.	64K RAM, 48K EPROM solid state. Critical data interfaces to floppy or Winchester disk systems for archive.	Selectable end-of-break priorities; video sensing log verification; automatic VCR pre-roll time averating; stereo audio switching; CRT terminal operation; optional traffic and billing systems, remote operation and control of VCR playback.
Videomedia	Yes	2 outputs, in and out, BNC, 10 x 1, option: 18 x 1	AFV stereo, 600 ohm balanced	Non-volatile, option: floppy disks	Upgradeable; single-coax distributed intelligent interfaces; traffic control, log fail & tracking database; editing system interface; commercial verification; stereo audio; random access

Reader Service Number 43

classifieds

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Signal level testing, boring gear, measuring customer service, new PC network. . .

Continued from page 54

verse, and steerable outboard planetary axles in the front and rear. Available options: a hydrostatic drive trencher, six-way backfill blade and spill guard, 80,000 or 110,000 lb. chain with cupped teeth and a hydra-borer.

For more information, contact JI Case, 414/636-6011.

Low-cost character generator

ICM Video unveiled the specs for its CG-7000P character generator. The color-capable unit can genlock to virtually any source, features very high resolution, a crystal-controlled sync generator, multiple fonts, character and page information, program and preview outputs, four-speed vertical scroll, centering, flashing, drop shadow and full editing capability. Cost of the unit is $1995.

For more information, contact ICM Video, 800/426-9825.

Measurement tool

The first computer-controlled signal-level testing system for broadband cable was released by **Wavetek Indiana Inc.** Using conventional telephone lines, the AutoBite tests and measures signal levels, presence of modulation, hum and other FCC-specification prerequisites at the headend, hub and LAN translator. Any single parameter at a specific test site may be selectively analyzed via the unit's main menu.

For more information, contact Wavetek Indiana Inc., 800/622-5515.

Accupunch 425 pin-points boring

New from **Vibra King Inc.** is the AccuPunch425. This 4¼-inch soil-displacement hammer bores under roads, railways and lawns, incorporating a spring load, reciprocating chisel head assembly. By means of the adjustable starting cradle, the direction of the bore can be pin-pointed before boring begins.

For more information, contact Vibra King Inc., 507/387-6574.

Magnavox software, SPS, manual

Magnavox released new status monitoring software for its Digital System Sentry. The SOFT/DSS-1 software displays a map showing the location of system faults up to 25 trunk/feeder line configurations.

Also new from Magnavox is the AP660-14MA standby power supply. Consisting of a ferro-resonant regulator, a battery charger, inverter, transfer switch, line monitor and space for three batteries, the unit is available in either pole- or pedestal-mount versions.

The company also has released a new technical manual on 440 MHz mid-split distribution system operation and maintenance; a spec sheet on its 8000 series tap; and the 1986 mobile training center brochure with seminar locations and dates.

For more information, contact Magnavox CATV Systems Inc., 800/448-5171.

Measuring customer service

Westinghouse Electric Corp. was showing its CableTRAQ surveying system, which measures cable system performance in eight customer service areas. CableTRAQ uses telephone surveys and typically costs $3,000 to $5,000, the company says.

For more information, contact Westinghouse OnTRAQ, 412/374-7111.

Burnup & Sims protects power

Burnup & Sims Corp. introduced a new line of power protection devices for computer systems. The company is offering a free ITT Xtra personal computer with 256K RAM to all qualified buyers.

For more information, contact Burnup & Sims, 800/551-3790.

Sytek unveils new PC net

Sytek has the contract to supply network adapter cards for the IBM PC Network. But the company has announced its own adapter product and gateway to network as many as 1,000 PCs over a five kilometer distance. The 6140 InterNetwork Bridge allows communication between IBM PCs and IBM 3270 mainframes over Sytek's broadband LAN systems. The 6120 Network Adapter Card is an upgrade of the IBM interface, offering an increase in throughput of 50 percent at the session layer. Sytek is projecting April delivery of the card. The gateway should be out in the third quarter of 1986, the company says.

For more information, contact Sytek, 415/966-7400.

LanTel signs S-A vp

H. Raymond Eckman, formerly vice president/operations at Scientific-Atlanta, is the new president and CEO of **LanTel**, a Norcross, Ga.-based company that designs and markets broadband coaxial cable networks. Eckman was with S-A for 27 years, during which time he held many key engineering and operations management roles. He also was an S-A officer for 16 years.

MAP moves by Concord Data Systems

Concord Data Systems, a leader in broadband coaxial cable networks using the Manufacturing Automation Protocol, announces successful testing of its headend remodulator and Allen Bradley modems. The company also reports a successful test of carrier-band interfacing between its interface modules and Motorola token bus controllers.

The company also is promising June 1986 delivery of its 5 Mbps carrier-band version and 10 Mbps broadband version of its MAPserver/Plus interface modules. A 5 Mbps broadband version is available now.

For more information contact Concord Data Systems, 617/890-1394.

C-COR PC net translator

C-COR Electronics has introduced a translator that supports up to 1,000 nodes on an IBM PC Network. The Model 5141 frequency translator is designed to compete with Sytek's 6050 translator at less cost. C-COR's unit is priced at $1,090—considerably lower than anything else on the market. The unit is ready for immediate delivery and features adjacent channel rejection and propagation time better than the Sytek unit, according to Dick Faulkner, marketing manager.

For more information, contact C-COR Electronics, 800/233-2267. ■

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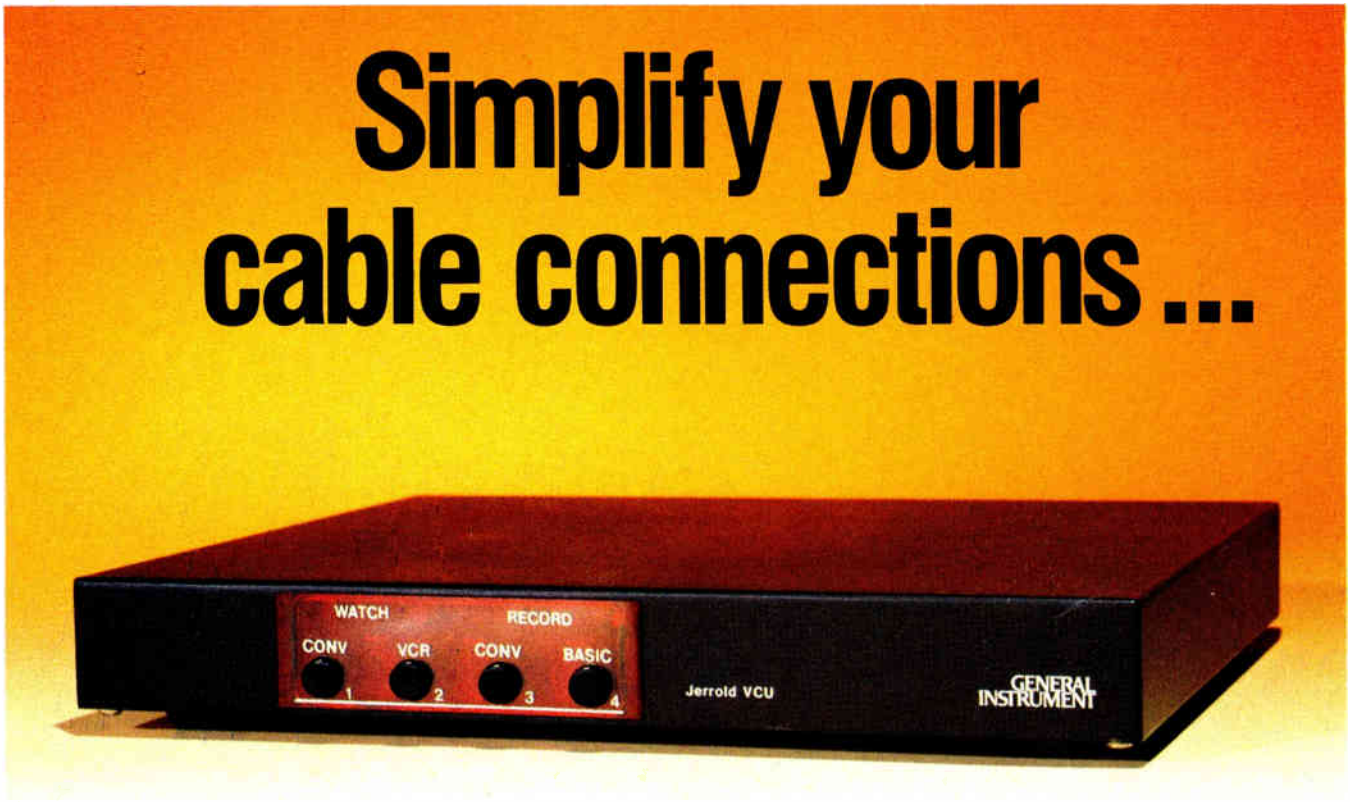
Reader Service Number 44

Simplify your cable connections...



...with Jerrold's V.C.U.
(VCR CONTROL UNIT)

Jerrold's V.C.U. gives your subscribers added convenience in *connecting* and *controlling* their home video entertainment equipment. Your subscribers no longer need to use splitters and A/B switches to interface their video equipment.

The user friendly design allows for subscriber SELF-INSTALLATION and guarantees user satisfaction. The pleasant appearance of the V.C.U. makes it a welcome addition to your subscribers home video entertainment center.

Look at these important *consumer* features:

- **LOW COST**
- **SWITCHABLE AMPLIFIER**
- **TWO CONVENIENCE OUTLETS**
- **LED DISPLAY**
- **EASY INSTALLATION**
- **2 YEAR CONSUMER WARRANTY**
- **IMMEDIATE AVAILABILITY**


Clearly labeled connections

Call our toll-free "Hot Line" 1(800)323-0436

ANIXTER® COMMUNICATIONS

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