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Rules of thumb
for... cable
attenuation,
operations,
BTSC



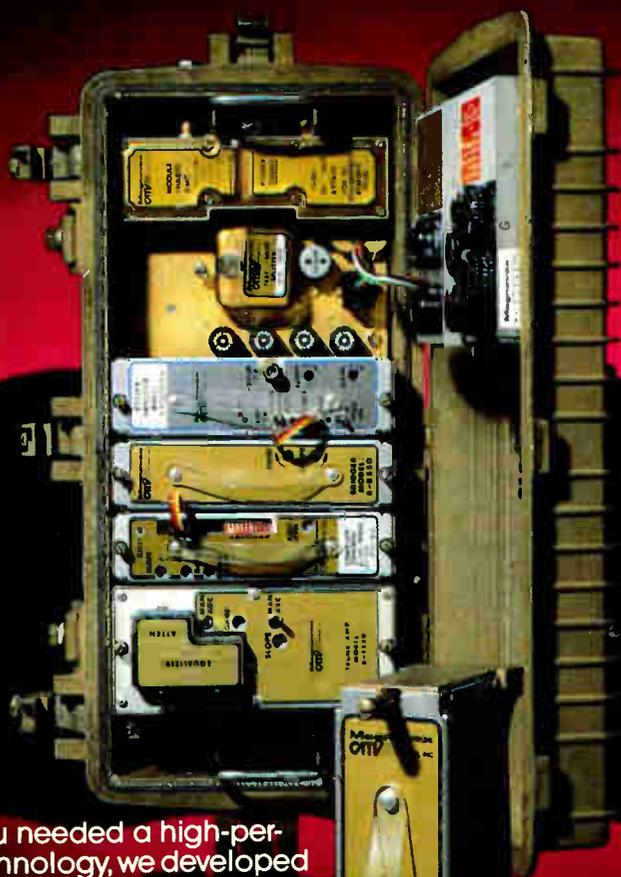
Watch for...
Fiber, MAP/TOP,
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Guide



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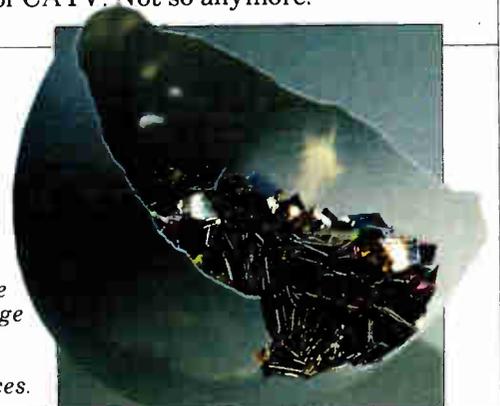
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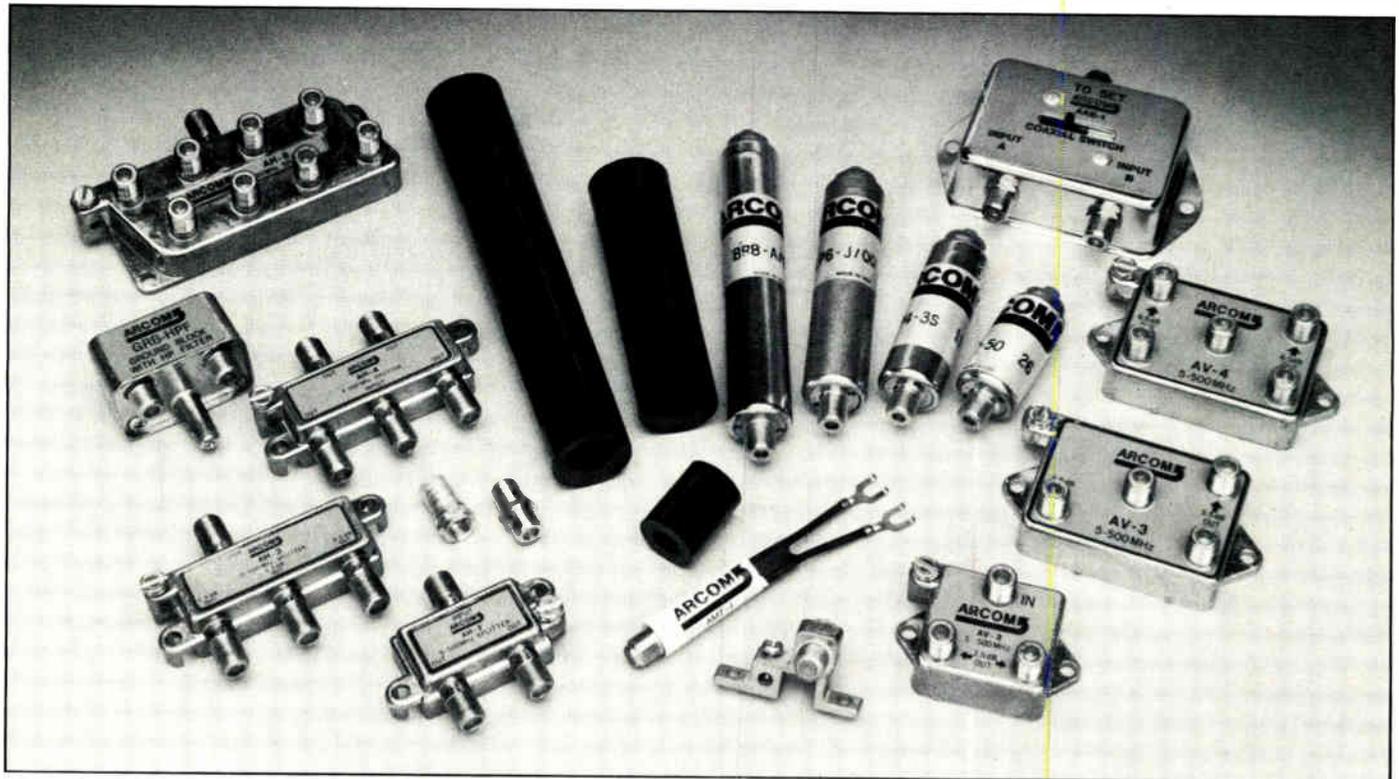
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About the cover

Tiny wafers of silicon are the seeds from which large electronic devices grow. Photo used courtesy of Boeing Computer Services.



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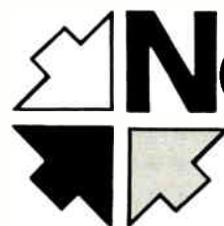
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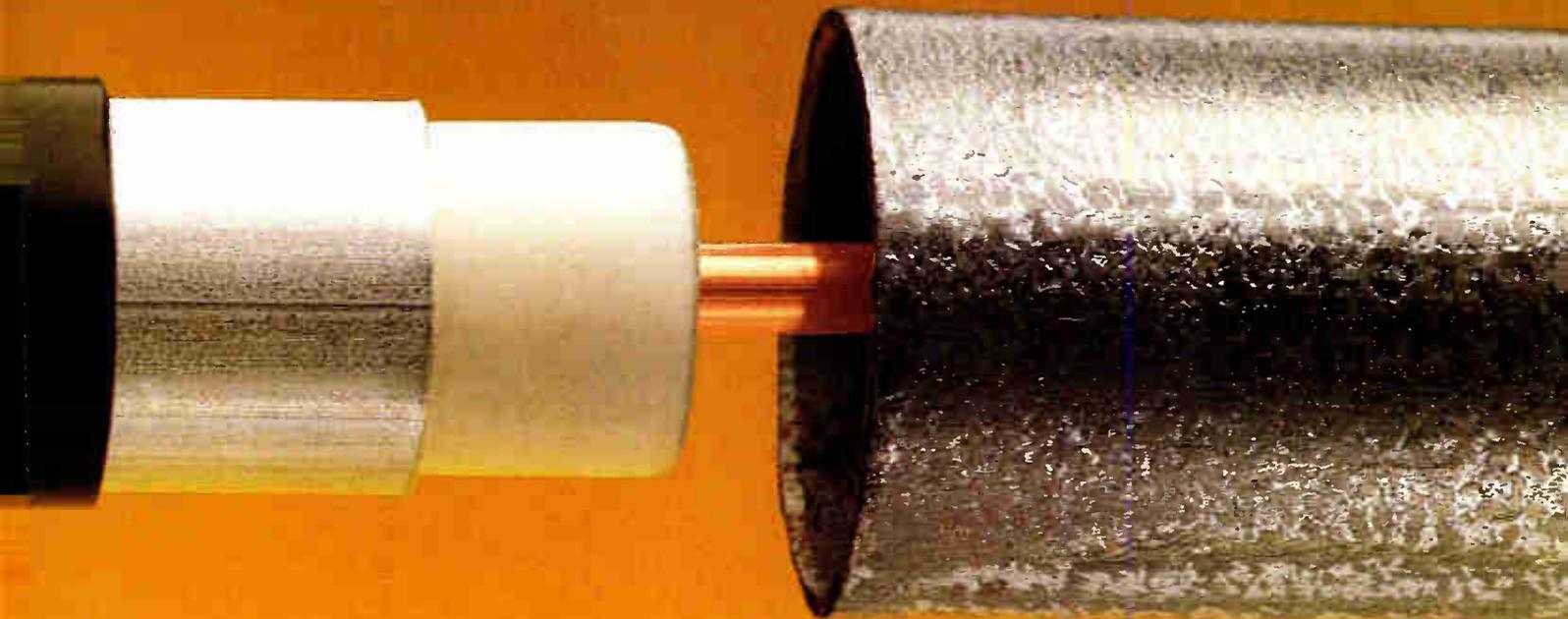
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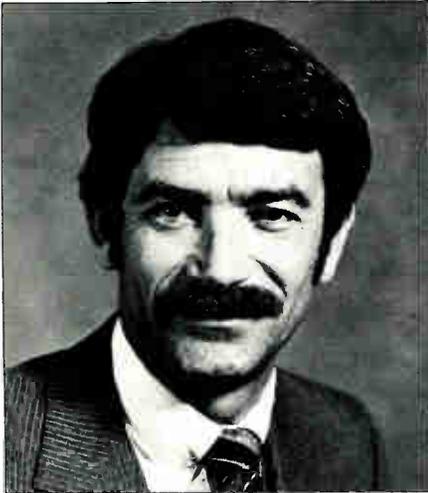
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Alan Kernes

Kernes: quality service key to industry's growth

"We are a service, we are not a necessity," warns Alan Kernes, vice president of engineering at Jones Interchange. "We as an industry need to always remember that. The subscriber is the one who pays our salaries."

Contained in that statement is the essence of Kernes' belief that providing quality and service to the customer—at any cost—is of paramount importance and a critical component of the industry's future growth potential.

For Kernes, who will shortly celebrate his fifth anniversary at Jones, the necessity of providing quality service to subscribers never becomes mired in the struggle to meet bottom-line projections. Rather, better service and higher quality are viewed as a long-term approach to enhance revenues and cash flows.

A case in point is Jones' preventive maintenance program, which is widely known and respected among industry observers. Kernes' preventive program is different than most because the volume of service calls received by each of the MSO's 57 systems in 22 states has been monitored for the past three years. Although the costs and logistics needed to carry out the program are enormous, the effects are profound.

Over the past year alone, Jones has seen the number of service calls reduced by one percentage point throughout the company. "If you think about a 700,000 subscriber base, one percentage point reduction (in truck rolls) is a considerable number of service calls that you would not have to do," Kernes says.

Although the initial costs associated with the program's start-up were prodigious, Kernes says those costs can be recouped over time through a reduction in the number of on-demand service calls and increased revenue generated from a more satisfied subscriber universe.

"Usually when somebody comes along and says, 'We need to have preventive maintenance,' everybody agrees until it comes time to pay for it," Kernes says. "You always get that 'What's it going to cost me?' and it's hard to easily show them that it's paid for by reduced service calls."

Armed with a BSEE degree from California State University in Long Beach, Kernes got his start in the cable industry in 1971 with Anaconda Electronics, an amplifier manufacturer based in southern California. Kernes recalls that, like so many other industry leaders, he never considered a career in cable prior to his first job offer.

"In '71, that's when aerospace was having all its problems and NASA had enormous layoffs down in Texas and engineers were a dime a dozen. I was very fortunate because I had three offers coming out of school and only 10 percent of my graduating class had a job," Kernes says. "The cable industry was not something I was aware of at that time but it struck me as novel and innovative and still had the luxury of free thought.

After five and a half years at Anaconda, as both a research and design engineer and supervisor of turnkey systems, Kernes moved on to become operations advisor at Southern Oregon Cable and then became a regional engineer for ATC in San Diego before moving to ATC's corporate headquarters in Denver to supervise new system engineering. In 1981, he moved over to Jones as director of engineering and was elected vice president of engineering just nine months later.

"The company's philosophy is my

philosophy, that's why I came here," says Kernes. "Our charge in engineering is to deliver high subjective quality, reliably. It's just that simple."

To meet that challenge, Jones now has two technical auditors who travel from system to system evaluating the performance of antennas, earth stations and headends.

Additionally, Jones has instituted a capital management system to closely scrutinize project spending. Kernes says the computer-based program has been launched in three systems and should be expanded to include 10 systems by the end of the year.

"You can start to get a better sense of your costs" with the program, Kernes says. And for a company like Jones, which operates its systems under a number of limited partnerships with hundreds of investors, being accountable is exceedingly important.

To add to Jones' own in-house efforts, the 42-year-old Kernes says hardware vendors are also doing more to assure that their products are reliable. "The most vivid area where that's true is with converters," he says. "There's no question that they have improved across the board. We still have the issue of people and the craftsmanship of an installation, but when you think of the nuts and bolts themselves, there's marked improvement in all products."

Achieving a high level of quality will play a major role in the future business development of cable, Kernes says. A tremendous revenue source, so far untapped, resides in the ability of coaxial cable to deliver high speed data for business use, he says. One area that seems ripe for exploitation is the development of point-to-multipoint communication so that databases can be tied together.

But for now, satisfying the customers already on line remains the first priority, Kernes says. Any substantial drop in customer satisfaction spells doom for the prospect of a rosey future. "With the alternative delivery systems that are becoming more prevalent, we must remember that the person who writes the check every month is making a choice," he says, "and he chooses to use our service, he doesn't have to."

—Roger Brown

TOCOM UNLOCKS THE FULL POTENTIAL OF VCRs



VCRs. Subscribers love 'em until they discover what they *can't* do: record multiple cable events while away or simultaneously record and watch different cable programs. Or easily connect a VCR to their converter. What should be a convenience becomes a chore that leaves subscribers frustrated, confused — and dissatisfied.

Now your subscribers can get the full benefit from VCRs and cable TV with the 5503-VIP baseband converter. Every 5503-VIP features a built-in 4-event, 7-day timer for unattended recording. There's no extra cost to you. Baseband audio/video outputs provide superior recording quality, and the TOCOM wireless remote with volume control offers full-featured convenience. Because the timer function and remote are addressably controlled from the headend, you have an important source of extra revenue.

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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**GENERAL
INSTRUMENT**



Industry shows support for IS-15

IS-15 has been approved for publication. IS-15 is an Interim Standard connector, developed jointly by Electronic Industries Association (EIA) and NCTA. The IS-15 connector is analogous to the RS-232 connector widely used to interconnect computers, peripherals, modems and other ancillary facilities.

The IS-15 connector would be used to connect the TV set to decoders for scrambled pay-TV on cable, MMDS, STV or backyard TVRO; to stereo and bilingual TV sound decoders; to teletext decoders; to the RGB or composite video output of VCRs, personal computers, video cameras; to data modems and even telephone lines. Converters would not be needed. A TV set equipped with an IS-15 connector would be truly "cable-ready."

Have you talked recently to subscribers who have just purchased the latest high tech, digital television receivers, capable of tuning 50 to 60 cable channels plus 70 UHF channels, with remote sound volume control, favorite channel memory, last channel recall, channel number superposition, display of a second picture within the main picture, freeze-frame capability, and other state-of-the-art features that keep tumbling out of the TV development labo-

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

ratories? How do you enjoy explaining to them the way it is?

- If you want our wonderful premium TV service, we will provide you with our latest model converter-descrambler, to sit on top of your "cable-ready" TV set.

- You will then tune your new \$1200 TV set to channel 3. Never tune to any other channel.

- Use *our* great hand-held, wireless remote control to select the channel you want to watch; don't use the one that came with the TV set. *Ours* costs you only \$3 a month! (we buy them for \$6 each). Unfortunately, you will probably not be able to turn on your set with *our* remote control; and when you turn it on with yours, it may come on to channel 2. If so, be sure you use *your* control to tune to channel 3. Then put *your* control away, and use *ours*.

- To control the loudness of the sound, we suggest using *your* remote control, or the volume control on the TV set. *Our* RF controller will not adjust the volume.

- If we are able to supply you with the type of remote control that is capable of adjusting sound volume, you must first set *our* control to maximum volume, then walk over to the TV set and adjust the sound to be just a little louder than you want it. Then you can go back to your chair and use *our* control to adjust the loudness to a comfortable level. (Incidentally, you may have to go through this procedure every time you turn on your TV set).

- To select one of our 50 to 100 channels of service, use *our* remote channel selector. (Be sure the TV display says channel 3, even if you are watching some other channel). Do not try to use *your* own remote control selector, or the key pad on the front of the receiver.

- We are really sorry *our* remote control does not provide favorite channel memory. We will consider this for our next purchase. Unfortunately, *your* remote channel memory will not work, since you must always tune your TV set to channel 3.

IS-15 could change all that. Receivers with IS-15 would not need a converter, even for premium channels. The descrambler you provide to subscribers with IS-15 TV sets would have no customer controls. It would be under

your control, to be programmed either on-site with a PROM, or by an addressable microprocessor in the descrambler. Subscribers could use all of the features provided in the TV set equipped with IS-15, just as the manufacturer intended.

You will still need to retrieve disconnected decoders; and IS-15 does not eliminate theft of service. However, the decoder will have no customer operated controls. If it is housed in a secure cabinet, and incorporates electronic security design techniques, RF or baseband, as effective as those now emerging, theft of service should be manageable.

The next step is up to us in the cable TV industry. We must help the TV dealers promote IS-15.

Why should anyone buy a TV set with IS-15? It will cost more, inherently, because of the more complex receiver circuits necessary to make the receiver work with either scrambled or unscrambled signals.

There are some advantages accruing to the TV set buyer:

- With IS-15, the cable subscriber will not need a converter on top of the TV set, or in any special location;

- The decoders used with IS-15 will have no operational controls, and can be placed out of sight, in a bookshelf, closet, cabinet, or even in the basement;

- With IS-15, all features, such as channel selection, volume control, and on-off control will function just as the manufacturer says in the owner's manual, either with or without a cable connection.

I submit, however, that unless the customer is offered a monetary advantage in addition, the extra cost of IS-15 may be a very hard sell. If the customers are not interested in IS-15, the dealers will not stock them. If the dealers do not demand IS-15, the manufacturers will stop offering, and continue to introduce new features incompatible with cable TV service.

I believe IS-15 is a remarkable breakthrough in long-needed cooperation between TV receiver manufacturers and cable TV operators. We have a great opportunity to move sharply toward a working partnership in consumer electronics. It is up to us to make it work.



OR



Incompatible scrambling between different brands of converters creates operational headaches. Just ask anyone who's trapped by one scrambling method. Or locked into one source of supply.

At times you feel like you're forced to haphazardly "patch" together several types of obsolete converters — just to offer your system the necessary functionality and scrambling compatibility.

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If you're dissatisfied with your converter, the reliable BA-5000 can be integrated into any system using a compatible scrambling method. And if you're managing more than one system, each using different scrambling, the BA-5000 becomes an immediate second source of supply for your entire business. Imagine the inventory reduction and operational consolidation that one single converter in all your systems can mean.

Call us today at 1-800-421-6450 and find out how quickly the BA-5000 works to improve your system performance.



Harrisburg, Flint, again?



In August 1980 an airliner flying at 20,000 feet enroute over Flint, Mich., encountered interference with its communications gear at 133.25 MHz. A badly damaged CATV system was the culprit, and an acrimonious debate soon erupted between the CATV industry and the Federal Aviation Agency. If the FAA had gotten its way, the CATV industry would today be barred from using any aeronautical or communications frequencies—period. The FAA lost. And as things stand now, the industry can use the 118-136, 225-328.6 MHz and 335.4-400 MHz, as well as the 108-118 MHz bands, so long as the frequencies are offset: 12.5 kHz in the communications bands and 25 kHz in the navigation bands.

Surprise, surprise

But on November 3, 1985, the industry got yet another reminder of the dangers of signal leakage. This time, an odd phase lock failure in an AML local oscillator triggered a monitor on an Air Force search and rescue satellite in polar orbit. Normally, when lock is lost, the oscillator initiates a frequency sweep to reacquire the pilot carrier. In this case, however, no sweep occurred. Instead, all frequencies

drifted up by about .25 MHz: enough to move Channel A from 121.25 to almost 121.5—the air signal distress band.

It should come as no surprise that the FCC is very concerned about the situation. "We don't want to see it again," says Sydney Bradfield, supervisory electronics engineer with the FCC's CATV branch. "The FAA is very sensitive to CATV interference." And remember that agency enforcement budgets have been increased. Bradfield's advice? "Monitor your frequencies more closely, especially at AML receive sites."

Every operator using aeronautical or communications bands should be checking the output carrier for all devices that could drift, including modulators, heterodyne processors and AML receivers. Also, remember that the FCC is being strict about its frequency tolerances, which are plus/minus five kHz.

There's a quid pro quo here. The FCC has eased up on some of the regulatory burdens it once required on the technical end of CATV. But, in return, it's expecting the industry to police itself. If you don't want a heavy regulatory hand grabbing your collar, you've got to act responsibly now. Keep those plants tight.

To the rescue

And here's some help. Jones Intercable has come up with a piece of software that makes Cumulative Leakage Index calculations and record keeping a snap. The CLI, in brief, is a figure of merit representing the integrity of cable plant. It won't be fully mandatory until 1990, but some systems already are covered by the requirement to do the CLI annually, and many CATV operators are using the CLI now to keep their operations clean.

The software runs on IBM PC and compatible machines, and assumes familiarity with Lotus 1-2-3. The Jones software does the calculations for you after you've keyed in your measurements, and additionally keeps your CLI log. It'll save you a lot of time and trouble. So why bother with CLI if

you're not required to right now? Since instituting a voluntary CLI program at its systems, Jones has experienced a marked decrease in service calls. And in the last six months, it's had five FCC inspections in Wisconsin alone. All five systems were using the program and none had any leakage problems.

Contact Bruce Catter or Phyllis Ghersi, Jones Intercable staff engineers, at (303) 792-3111, if you'd like to see the program.

Chiddix joins CED

Some of our long-time readers have seen articles by Jim Chiddix senior vice president, engineering, with Oceanic Cablevision (ATC) in *CED* before. He's one heck of a writer. Now you'll be seeing more of him. Jim's joined *CED*'s board of consulting engineers, and he'll also be starting a regular column with us in the near future. Look for it. We're happy to have him aboard and hope you'll enjoy his work as much as we do.

We'll also be adding another regular feature soon. We have for some time tried to focus attention on the leading technical issues facing the CATV industry today. We've tried to bring you the best writers and the top technical talent. Here's more.

Each year, a group of leading engineers is invited to join the NCTA's Engineering Committee. It meets about every two months, and ponders the key issues of the day. It also gives technical advice to the NCTA and serves as an industry bridge to other groups in the electronics world. The Engineering Committee will soon have its own column in *CED*. The writers and topics will vary, but the organizing theme will remain the same. There are things going on that you need to be aware of. Here they are and here's why they're important to your business. We hope you'll enjoy this new series.

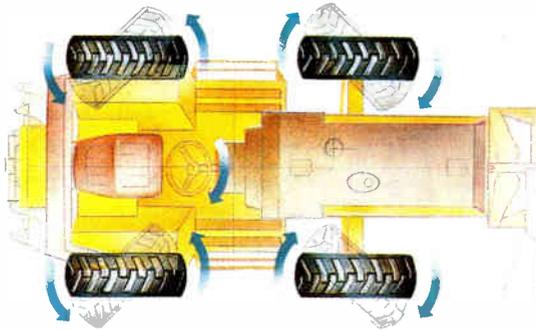
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Analysis of coaxial cable attenuation. . .

A thorough understanding of cable attenuation as a function of frequency and temperature is of prime importance to the user, as well as the manufacturer, of the cable. This paper describes measurements of attenuation conducted in an automated, computer-controlled test facility, suggests different ways to present the data and describes the analysis of the data by computer-aided mathematical techniques.

The analysis exposes the differences in the temperature behavior of different cables, and shows how to design an optimum equalization scheme (with fixed and thermal equalizers) for any particular type of cable. The results also indicate that the widely accepted analysis of approximating the frequency response by \sqrt{f} and f terms, is not always the correct way to separate the dielectric losses from the conductor losses.

Anyone who attempts to design a CATV system must have a thorough knowledge of the properties of coaxial cable. Most of the equipment that makes up the trunk and distribution lines is there only to compensate for the attenuation of the cable. It is therefore important to know, in full detail, how cable attenuation depends on various parameters, such as frequency and temperature.

Even if we restrict the analysis to variation with frequency and temperature, we are faced with a quite complex function of two variables. We have to consider three aspects of the problem:

1. How to get enough measured data to represent the function;
2. How to digest and present the data in a form that will lend itself to analysis and interpretation.
3. How to use the data in the design of a system.

In this paper we shall report on work done related to these aspects of studying the attenuation of coaxial cables.

The attenuation of the cables was measured by an automated sweep test facility, controlled by a NOVA 1200 minicomputer. A suitable sweep gener-

. . . in an automated, computer-controlled test facility.

ator, modified for digital control of frequency, was used as the primary signal source. The local oscillator of the receiver was another sweep generator at a fixed frequency difference, which allowed using a very narrow band IF amplifier for noise reduction and increased dynamic range. The final measurement of signal level was done by means of a Pacific Measurements Model 1036 (a logarithmic RF power meter, ± 0.02 dB accuracy). The results of the measurements were tabulated, stored in the minicomputer for further processing, or punched out on paper tape. The tape was used to transfer the data to a teletype terminal for analysis by various programs on GE Time-Sharing Mark III service.

Cables were furnished on reels (with the exception of one inch O.D. "Spirafil," received as a coil of 6 ft. diameter). After initial mechanical testing, and measurements of impedance, return loss, the attenuation at 70°F, each reel was placed in a large environmental-control van (which is normally used for system evaluation). The van temperature was successfully stabilized at -40°, -20°, 0°, 35°, 70°, 100°, 120° and 140°F, and the attenuation of the cable was measured at each of these temperatures. Before each measurement, the cable would dwell at the nominal temperature (within $\pm 5^\circ\text{F}$) for not less than four hours; total cycle for the measurements was 96 hours.

Cable attenuation data are of particular reportorial interest, since there are so many methods of presentation, depending on the specific technical interest to be served. Cable manufacturers may concentrate on dielectric material control; equipment suppliers may want to know how closely their various thermatic equalizers compensate a given cable; the system operator or designer focuses on changes in attenuation along the cable plant, and the consequent effects on subscriber set signal levels, signal distortion, etc.

The problem is, basically, how best to present a function of two variables on a two-dimensional sheet of paper.

This is usually done by a set of curves, with one variable plotted along the horizontal axis, and the other variable as a parameter defining the different curves in the set. We therefore have the choice of presenting dB vs. frequency for different temperatures, or dB vs. temperature for different frequencies.

This method of presentation, which is directly related to the frequency response of the cable system and its components, is the traditional method.

Such a graph would show the measurements on three different types of

Cable Classics

It is an accepted "rule of thumb" that cable attenuation varies as the square root of frequency. But did you know that this "rule" theoretically applies only to air-dielectric cable? Or that the dielectrics used in practical cables contribute an additional component to cable attenuation which is more directly proportional to frequency (not the square root of frequency)?

Another commonly accepted "rule of thumb" is that cable attenuation changes 1 percent for every 10°F change in temperature. Did you know that the rate of change of attenuation with temperature varies markedly with frequency, and also with temperature? That is, that attenuation is not necessarily a linear function of temperature.

To the cable system designer, equalization compensates for the variation of attenuation with frequency and temperature. The exact relationships between cable attenuation and frequency and temperature are thus of critical importance to both the designers and users of equalizers.

This article, written by Jacob Shekel and Eric Winston in 1976, details measurements of these parameters of a variety of cables, provides a mathematical model into which it is possible to fit a few variables to describe any one specific cable type—and shows how widely some cables can depart from those basic "rules of thumb"!

Graham S. Stubbs, Vice President, Science & Technology, Oak Communications Inc.

*By Jacob Shekel and Eric Winston, Jerrold Electronics Corp.
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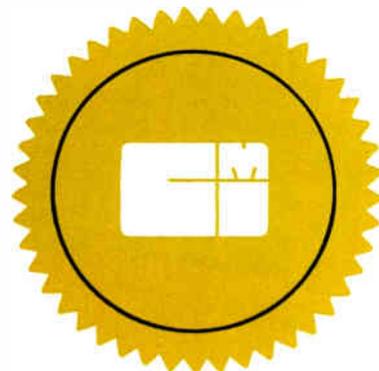
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An accepted rule of thumb is that attenuation of cable changes by 1 percent for every 10°F.

cable, plotted for three temperatures. The horizontal axis is conventionally drawn proportional to \sqrt{f} , resulting in less curvature of the plots (theoretically, a cable with no dielectric losses would be represented by a straight line in this presentation). For comparison, the measurements on each cable were normalized to a loss of 20 dB at 300 MHz and 70°F.

Even from this simple presentation, it is obvious that the cables do not behave in a similar manner when temperature or frequency is changed. But the different curves are all jumbled together, and it is not easy to find the difference (similarity) between different cables.

Attenuation vs. frequency

A presentation where the attenuation at any temperature is plotted relative to the attenuation at 70°F makes it much easier to study the effects of

temperature. The resulting curves indicate the thermal compensation needed, such as thermal equalizers, ALC, ASC. A presentation showing the attenuation of three different 1/2" polystyrene dielectric cables, for which the attenuation of a span (20 dB) at 300 MHz will increase by 1.4 dB at +140°F, and decrease by 2.8 dB at -40°F. Another graph can be shown using the same data for four cables with gas injected polyethylene foam dielectric; note the comparative similarity in low temperature performance, but the disparity at high temperatures. Still more striking are the data which shows fused-disc and "Spirafil" cables; the latter shows 3.5 dB increase at -40°F, compared with 2.5 dB for polyethylene foam. Clearly a thermal device optimized for one of these cables will be inadequate for the other.

This type of presentation could readily be utilized as a generic cable specification for system design, pre-

assigning attenuation limits for given temperature extremes.

There is an accepted rule of thumb in CATV system design, that the attenuation of cable changes by 1 percent (more precisely, 1.1 percent) for every 10°F. This implies that the plot of attenuation vs. temperature, at any frequency, would be a straight line.

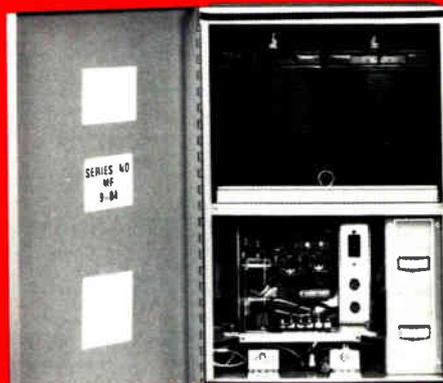
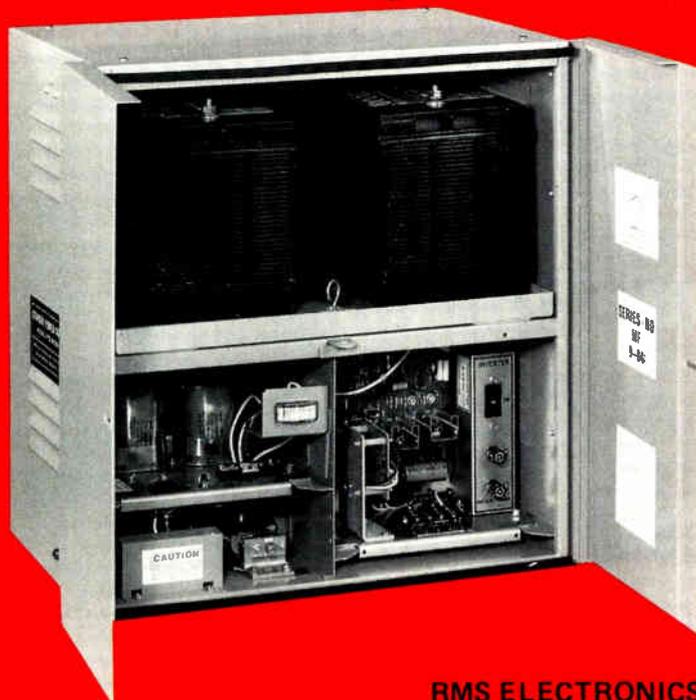
The attenuation of four types of cable, at 50 MHz and 300 MHz, when plotted against temperature, would show nearly straight lines, although the slope of the 50 MHz line is different from that of the 300 MHz line. Both are different from the 0.0011/°F coefficient.

Some lines, however, are noticeably curved. A careful examination of the "nearly straight" lines will show that they have different slopes at the two ends of the temperature scale.

For purposes of system design, the temperature range may conveniently be divided into two zones, arbitrarily

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Variation of attenuation with frequency and temperature is an effect best compensated for by equalization.

defined as high (70 to 140°F) and low (-40 to 70°F). Two temperature coefficients assigned to these zones, may be defined as follows:

$$C_H = \frac{A_{140} - A_{70}}{70 \times A_{70}}$$

$$C_L = \frac{A_{70} - A_{-40}}{110 \times A_{70}}$$

These represent attenuation change per degree F and are comparable to the theoretical value of .0011 derived for conductor loss (see Appendix A).

C_H and C_L values were calculated for all cables studied, and each cable was plotted as a point in C_H - C_L coordinates, using the values computed for 300 MHz. A cable with no dielectric loss would appear as a point at the intersection of the two lines at .0011 on each axis. It is evident that departure from this value must be due to the effect of the cable dielectric.

The C_H - C_L groupings, provide a means to examine and compare a large number of cable attenuation characteristics and may help in defining specifications for A vs. T limits for a given type of dielectric.

A three-dimensional approach

The data obtained from the measurements would be best represented as a surface in three dimensions. If the column and rows are considered as the horizontal and vertical axis (representing temperature and frequency), each entry (dB attenuation) is the elevation of the corresponding point above the horizontal base plane. The attenuation $A(f_i, t_k)$ at the frequency f_i and temperature t_k is a function of two variables, defined over a discrete set of points.

We may assume a continuous function $\bar{A}(f, t)$ to represent this continuous surface, of which we know only a discrete set of points. The function \bar{A} can be defined in an arbitrary manner, but it would be of any use only if it fits the measurements at the discrete set of frequency-temperature pairs. The error for each measured point is:

$$E(f_i, t_k) = A(f_i, t_k) - \bar{A}(f_i, t_k)$$

and the parameters of the function A are varied to minimize the expression

$$\sum_i \sum_k [E(f_i, t_k)]^2$$

resulting in a "least squares" fit. The function \bar{A} may be defined with five or six variable parameters, and the summation may involve about 200 measured points; the surface fitting, therefore, also will help to smooth out the errors contributed by any one measurement.

The choice of \bar{A} is, in principle, arbitrary. We shall see that different functions can be made to fit the same set of measured data equally well; the particular form of matching function \bar{A} should therefore be selected according to the purpose for which the approximation will be used.

To a system designer, the variation of attenuation with frequency and temperature is an effect to be compensated for by equalization. From this point of view, the cable attenuation can be represented by a function of the form:

$$\bar{A}(f, t) = P_1(f) + P_2(f)Q(t-70)$$

This represents the attenuation as a combination of three functions:

- $P_1(f)$ the attenuation of the cable at 70°F, to be compensated by a fixed equalizer;
- $P_2(f)$ the frequency response of a temperature-dependent equalizer;
- $Q(t-70)$ the amount of thermal equalization necessary at $t^\circ\text{F}$.

The formula assumes that the thermal equalizers, and the ASC network in the amplifiers, are Bode equalizers, whose frequency response is independent of temperature (except for a constant multiplier).

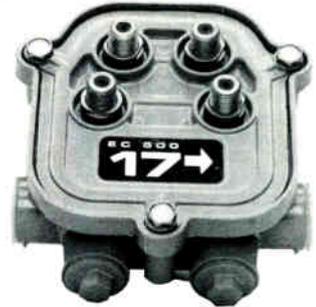
Assuming that, to a first approximation, attenuation varies linearly with temperature and with the square-root of frequency, we specify the functions as:

$$P_1(f) = a_1 \sqrt{f} + b_1 f$$

$$P_2(f) = a_2 \sqrt{f} + b_2 f$$

$$Q(t) = (t-70) \left[1 + c(t-70) \right]$$

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It is very important to separate the losses into conductor and dielectric losses: but how can it be done?

We have thus defined $\bar{A}(f, t)$ with five arbitrary parameters: a_1, b_1, a_2, b_2 and c .

Note that the values obtained for these parameters by curve fitting do not represent any intrinsic properties of the cable; they are only guides in the design of equalizers for the cable.

Table I shows the result of fitting the function to measured attenuation of three cables (all measurements normalized to an attenuation of 20 dB at 300 MHz and 70°F).

The first part of the cable shows the values of the five parameters for each cable, and the largest deviation from the measured value (the point of worst fit).

The fixed equalization is based on the function $P_1(f)$, and shows the value of equalizer attenuation at three frequencies (relative to 0 dB at 300 MHz). The numbers in parenthesis are the values of attenuation normalized to the attenuation at 50 MHz, and indi-

cate the frequency response of the equalizer. The numbers show that the different cables need equalizers with different frequency responses. The change of attenuation at 67.25 MHz (ALC pilot frequency) indicates that different cables place different requirements on the ALC system.

In particular, cable A varies much less in the high temperature region than in the temperatures below 70°F (compare the C_L-C_H groupings described in an earlier section).

Thermal equalization (whether by thermal equalizers or by automatic slope control) is specified in the last part of the table. The equalization is given per span and 100°F change, but it can be used as a guide to the frequency of placing equalizers of a similar frequency response. The normalized frequency response is shown by the numbers in parenthesis. The table indicates that the different cables need equalizers of different frequency re-

sponses; also that for each cable, the frequency response of the optimum thermal equalizer is different from the response of the optimum fixed equalizer for that cable.

Conductor and dielectric losses

For cable manufacturers, it is very important to separate the losses into conductor and dielectric losses. How can this be done?

Since the approximating formula has \sqrt{f} and f terms, it is very tempting to assume that they represent the conductor and dielectric contributions to the total attenuation. If we follow this assumption, then the ratio a_2/a_1 would be the temperature coefficient of the conductor losses. For the three cables in Table I, the ratio is .000731 and .000954 and .000825 respectively. The values for cables A and C are too far from the theoretical value of .00109 (see Appendix A); and why should this



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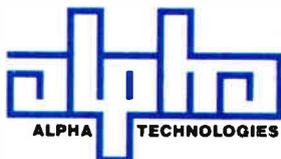
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Reader Service Number 13

In a cable with homogenous, low-loss dielectric, the dielectric losses are proportional to the frequency.

value change so much between the three cables that differ in their dielectric only, but have the same conductor structure?

There is a subtle point involved in the fitting of a continuous function to a discrete set of measured points. It is true that the attenuation contributed by the conductors would follow a \sqrt{f} function; but the converse is not true—the \sqrt{f} portion of an approximating function does not necessarily represent the conductor losses. Appendix B shows an example where the attenuation of a cable at one temperature is approximated by different functions, all of the form of a \sqrt{f} term paired with another function. The coefficient of the \sqrt{f} term in the approximation depends on the "other function" used, and the "goodness of fit" cannot be any guide in selecting the "correct" value of k_c .

One way to separate conductor from dielectric losses would be to compute the former from the cable dimensions and from the properties of the conduct-

ing materials (Appendix A). It is likely that the properties of drawn aluminum tubes and copper-clad aluminum wire are known in more detail and are more easily controlled than those of the various dielectrics used in cables. On the other hand, we must realize that low-loss cables, as used in CATV, are designed for minimal dielectric losses (in addition to the inevitable conductor loss).

In a cable with a homogenous, low-loss dielectric, the dielectric losses are proportional to the frequency. We can try to fit the measured attenuation to the function:

$$\bar{A}(f, t) = k_c \left[1 + \alpha_c (t-70) \right] \sqrt{f} + k_d \left[1 + \alpha_d (t-70) \right] f$$

which assumes linear temperature dependence of both components. Indeed, when this approximation is applied to cable B, the deviation of any measured point is less than 0.2 dB, and the coefficients for best match are:

$$k_c = 1.09 \quad \alpha_c = 0.00102$$

$$k_d = 0.00395 \quad \alpha_d = 0.00363$$

and the temperature coefficient of k_c is very close to the theoretical value. The same function applied to cable C, with a fit just as good, yields

$$k_c = 1.06 \quad \alpha_c = 0.000847$$

$$k_d = 0.00576 \quad \alpha_d = 0.00627$$

which seems very curious when the two cables are examined; cable C has much less dielectric than cable B, but its k_d contribution is much higher. The low value of α_c is another indication that the \sqrt{f} term, in this approximation, does not represent conductor losses.

Could it be that we used an improper "other function" for cable C? Indeed, if we assume the attenuation as a result of reflections from the supporting discs, rather than the dissipated energy within the dielectric, the loss ascribed to the dielectric should be proportional to f^2 (with added f^4 , f^6 , ... terms if needed for extra refinement). When the f term in $\bar{A}(f, t)$ is replaced by an f^2 term, the fit gives the following parameters:

$$k_c = 1.10 \quad \alpha_c = 0.00110$$

$$k_d = 0.0000101 \quad \alpha_d = 0.00610$$

The value of α_c is further assurance that we have selected the correct "other function" for the dielectric loss, and the k_c and k_d have a physical meaning.

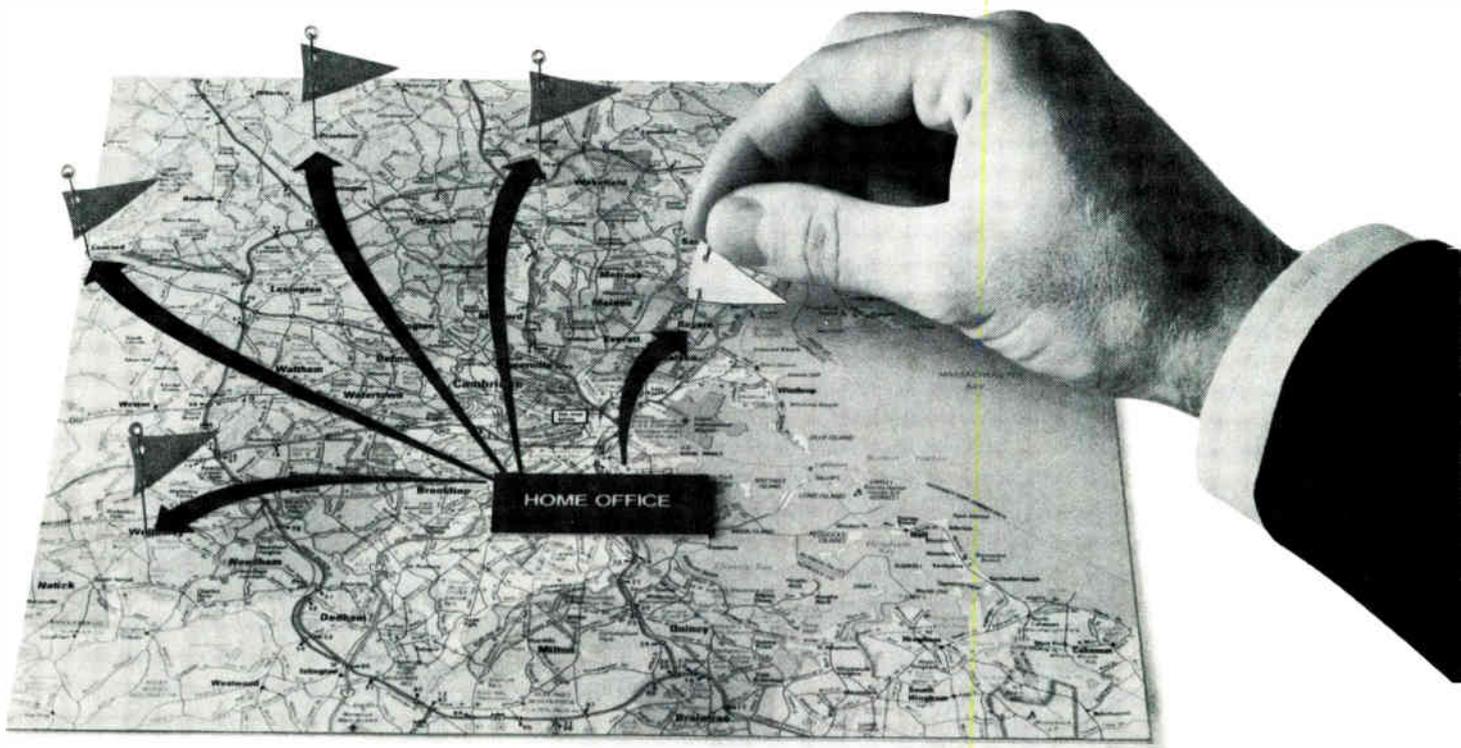
In summary, the fact that an assumed function provides a good fit to the measurements is not sufficient proof, by itself, that the various components of the function correspond to particular physical parameters in the cable. If the form of the function can be justified by a theoretical analysis then the values of the parameters can be derived by curve fitting. If there is no a priori justification for the selected functional form, one can use the derived value of known parameters as an indication that the function has physi-

TABLE I

SURFACE-FITTING FOR OPTIMUM EQUALIZATION

	Cable A	Cable B	Cable C
Dielectric type:	Polyethylene foam	Styrene foam	Polyethylene discs
Fitting function:			
a ₁	.976	1.09	1.05
b ₁	.0108	.00399	.00576
a ₂	.000707	.00104	.000891
b ₂	.0000184	.0000135	.000036
c	-.00555	-.00137	-.0000721
Maximum deviation dB/20 dB span	.2	.2	.2
Fixed Equalization, dB/20 dB span			
50 MHz	12.6 (1.000)	12.2 (1.000)	12.3 (1.000)
100 MHz	9.2 (0.733)	8.7 (0.721)	8.9 (0.724)
200 MHz	4.2 (0.329)	3.8 (0.318)	3.9 (0.321)
ALC control at 67.25 MHz, d20 dB span			
-40°F	-1.25	-1.20	-1.08
+140°F	+0.30	+0.60	+0.68
Thermal Equalization, dB/20 dB span/100°F			
50 MHz	.53 (1.000)	1.21 (1.000)	1.80 (1.000)
100 MHz	.39 (0.748)	.89 (0.735)	1.36 (0.757)
200 MHz	.18 (0.345)	.40 (0.332)	.64 (0.355)

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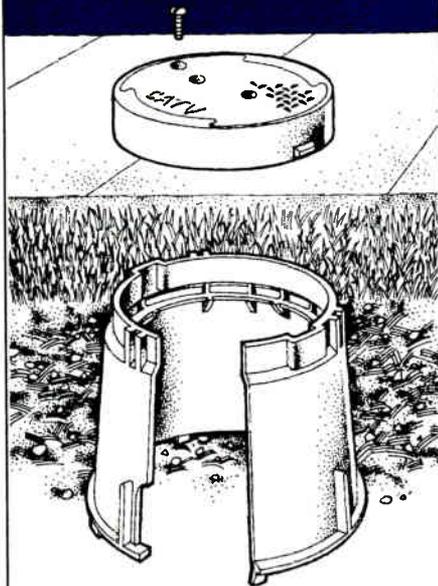


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Reader Service Number 15

A careful cable attenuation study is imperative to designers of CATV equipment and systems.

TABLE II

TEMP	-40	-20	0	35	70	100	120	140
FREQ								
50 MHz	7.32	7.60	7.82	8.24	8.68	8.93	9.05	9.12
60 MHz	7.99	8.31	8.56	9.03	9.51	9.78	9.93	9.98
70 MHz	8.70	9.04	9.33	9.85	10.39	10.68	10.83	10.90
80 MHz	9.29	9.69	9.99	10.55	11.14	11.47	11.61	11.67
90 MHz	9.92	10.33	10.66	11.30	11.93	12.27	12.41	12.47
100 MHz	10.43	10.88	11.22	11.90	12.58	12.94	13.10	13.16
110 MHz	10.98	11.47	11.84	12.53	13.25	13.66	13.84	13.89
120 MHz	11.52	12.04	12.44	13.19	13.96	14.38	14.55	14.58
130 MHz	11.99	12.55	12.96	13.76	14.57	15.01	15.18	15.23
140 MHz	12.49	13.06	13.52	14.37	15.21	15.67	15.85	15.87
150 MHz	10.96	13.56	14.02	14.89	15.82	16.27	16.44	16.48
160 MHz	13.44	14.07	14.54	15.45	16.39	16.88	17.09	17.14
170 MHz	13.84	14.50	15.00	15.95	16.90	17.46	17.65	17.67
180 MHz	14.25	14.94	15.48	16.51	17.48	18.04	18.21	18.22
190 MHz	14.79	15.52	16.05	17.09	18.15	18.69	18.89	18.91
200 MHz	15.11	15.85	16.43	17.52	18.58	19.18	19.36	19.35
210 MHz	15.55	16.32	16.91	18.04	19.17	19.74	19.93	19.95
220 MHz	15.98	16.77	17.36	18.49	19.66	20.26	20.49	20.51
230 MHz	16.28	17.11	17.71	18.89	20.08	20.72	20.93	20.95
240 MHz	16.78	17.62	18.26	19.50	20.70	21.37	21.58	21.57
250 MHz	17.15	18.01	18.69	19.94	21.22	21.86	22.07	22.08
260 MHz	17.57	18.47	19.14	20.43	21.71	22.44	22.63	22.62
270 MHz	17.96	18.86	19.55	20.89	22.23	22.91	23.10	23.14
280 MHz	18.26	19.20	19.90	21.29	22.63	23.33	23.52	23.53
290 MHz	18.66	19.58	20.31	21.69	23.11	23.81	23.99	24.01
300 MHz	19.04	20.03	20.79	22.20	23.66	24.38	24.59	24.57
310 MHz	19.39	20.39	21.13	22.59	24.07	24.85	25.02	25.04
320 MHz	19.80	20.84	21.62	23.13	24.62	25.38	25.59	25.54

cal meaning (or, at least, to reject a function as incorrect). We suggest that the temperature coefficient of the f term can be used as a guide to the possible correctness of the assumed function.

As an example, the measured attenuation of a spiral dielectric 1 inch cable was analyzed, with the following results:

sum of \sqrt{f} and f terms

$$k_c = 0.972 \alpha_c = 0.000703$$

$$k_d = 0.0105 \alpha_d = 0.00433$$

sum of \sqrt{f} and f^2 terms

$$k_c = 1.06 \alpha_c = 0.00101$$

$$k_d = 0.000018 \alpha_d = 0.00433$$

The value of α_c indicates that the second decomposition is likely to be the correct one, so that dielectric losses in this cable are proportional to f^2 (indicating that the loss mechanism is reflective rather than absorptive).

A meticulous study of cable attenuation is of extreme importance to the designers of CATV equipment and systems. We have described a measurement procedure that provides detailed attenuation vs. frequency and temper-

ature data, and presents it in a form that is easily transferred to a computer for analysis. The analysis results in logical definition and computation of various parameters useful in the design of cable systems. It shows that some cables can be clustered in closely related groups with similar properties; and that a system properly designed for a cable in one group may not operate properly if a cable of a different group is used in the same design.

Since the study was conducted on a limited number of samples, we strongly caution against interpreting the results as inherently representative of any type of cable or dielectric. In fact, cable manufacturers agree that incoming dielectric materials, particularly polyethylene, may be subject to certain variations—not yet fully understood—which influence the dielectric constant and power factor, with a resulting variation in attenuation. Furthermore, there is no certainty that the results, as presented here, are valid for an extended life period of a cable.

Acknowledgement

The study of cable attenuation was made possible, in part, by the contribution of sample reels from various cable manufacturers. This report is not in-

Caution is urged against interpreting results as inherently typical of any type of cable or dielectric.

tended to imply relative merit of one type of cable over another. The inclusion of any particular type was guided only by the desire to present the widest possible variety of data, and should not be interpreted in any other way.

Jacob Shekel received his Doctor of Science degree in Electrical Engineering from MIT in 1957. He was active in Cable TV equipment and system design from 1956 to 1978, first with Spencer Kennedy Laboratories in Boston, and later with Jerrold Electronics Corp. in Hatboro, Penn. Shekel is presently vice president of engineering with American Science and Engineering Inc. in Cambridge, Mass.

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**It may be assumed that the
RF current in the copper-clad
inner conductor is confined
to the copper skin.**

Appendix A**Conductor losses in coaxial cable**

The RF resistance of a cylindrical copper conductor of diameter d mils at a frequency of f MHz and a temperature of 20°C (68°F) is ⁽²⁾

$$R = 0.996 \sqrt{f}/d \text{ ohms}/100'$$

Let d mils denote the diameter of the center conductor of a coaxial cable, and D mils the inner diameter of the outer conductor. It may be assumed that the RF current in the copper-clad inner conductor is confined to the copper skin. The conductivity of the aluminum outer conductor is 61 percent of that of copper⁽³⁾, and the total RF resistance of the coaxial cable at f MHz is then:

$$R = (0.996/d + 1.276/D) \sqrt{f} \text{ ohms}/100'$$

The contribution of the conductor resistance of the cable attenuation at f MHz is ⁽⁴⁾:

$$A_c = 4.343 R/Z_0$$

which for 75-ohm cable, reduces to

$$A_{c2} = (5.771/d + 7.389/D) \sqrt{f} \text{ dB}/100' \\ = k_c \sqrt{f}$$

$$k_c = \frac{5.771/d + 7.389/D}{\sqrt{\text{MHz}}} \text{ dB}/100'$$

The temperature coefficient of the resistivity of copper and aluminum is the same⁽⁵⁾, $0.00393/^\circ\text{C}$, or $.00218/^\circ\text{F}$. The resistivity of the coaxial cable conductors at any temperature $t^\circ\text{F}$ is therefore:

$$\rho_t = \rho_{68} \left[1 + 0.00218 (t - 68) \right]$$

Because of skin-effect, the RF resistance is proportional to the square root of the resistivity⁽⁶⁾, therefore:

$$R_t = R_{68} \sqrt{1 + 0.00218 (t - 68)} \\ \cong R_{68} \left[1 + 0.00109 (t - 68) \right]$$

The k_c coefficient, which is proportional to the RF resistance, will have the same temperature coefficient, namely $0.00109/^\circ\text{F}$.

- (1) The material in this Appendix is abstracted from "Calculations relating to aluminum shielded cables," by K.A. Simons, Jerrold Electronics Corporation Memorandum, Oct. 22, 1975.
- (2) Reference Data for Radio Engineers, 5th Edition, ITT, 1972 printing; page 6-7.
- (3) Texas Instruments Bulletin 516-WP26-1070.

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At 300 MHz, the free-space wavelength is one meter, so both assumptions are valid.

- (4) Reference 2, page 13-22.
- (5) Reference 2, page 4-21.
- (6) Reference 2, page 5-6.

Appendix B

Dielectric loss in fused disc cable

In the following analysis, it is assumed that:

1. The thickness of the discs is very small compared to a wavelength, so the effect of a disc on the cable is that of a lumped capacitive loading.
2. The spacing between discs is small compared to half a wavelength, so that the periodic discontinuity will not result in a spike in the structural return loss.

At 300 MHz, the free-space wavelength is one meter, so that both assumptions are valid for a cable that has discs spaced about 1 inch apart.

Let each disc be represented by a capacity C, loading the cable by an admittance $j\omega C$. The reflection from a single discontinuity is:

$$r = \frac{-j\omega C}{2Y_0 + j\omega C}$$

and if the loading is small compared to the characteristic admittance Y_0 ,

$$r = -j\omega C / 2Y_0 = -jkf$$

where f is the frequency, and

$$k = \pi C / Y_0$$

The ratio of the power transmitted beyond the discontinuity to the incident power is:

$$1 - r^2 = 1 - k^2 f^2$$

If the span of cable (100', or 20 dB,

or whichever length is analyzed) contains n discs, the reflections from the discs will result in an out-put power of:

$$(1 - k^2 f^2)^n = 1 - nk^2 f^2 + \frac{n(n-1)}{2} k^4 f^4 - \dots$$

We can take the f^2 term for a first approximation, and higher terms (all in even powers of the frequency f) if further refinement is necessary.

The loss, expressed in dB, due to reflections from the discs, is:

$$\begin{aligned} A_d &= -10 \log(1 - nk^2 f^2) \\ &= -43.43 [1n(1 - nk^2 f^2)] \\ &\cong 43.43 nk^2 f^2 \end{aligned}$$

The last approximation is valid because $nk^2 f^2 < 1$. (In the example in the body of the paper, the coefficient of f^2 for the fused-disc cable is about 10^{-5}). ■

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Pro's and con's of BTSC stereo on CATV system

There has been much discussion in recent literature concerning the pros and cons of carrying BTSC Stereo on a CATV system. The discussions have primarily been associated with one of three subjects:

- 1) What is the BTSC format?
- 2) How will the CATV system impair stereo performance?
- 3) How will the BTSC audio signal impair CATV video performance?

While these discussions have been meaningful and in some cases helpful to the CATV operator's understanding of how the system works, they have often fallen short of addressing the practicality of setting up the headend once the operator knows that he will, in fact, be carrying stereo. In this paper, the importance of setting and maintaining correct audio modulation levels, especially with reference to the interface between the BTSC stereo encoder and the video modulator, will be discussed.

This interface is critical to the overall performance of the BTSC system. If the interface is handled incorrectly, stereo performance could be severely impaired, resulting in a multitude of service-related calls from a now "stereo-aware" public. No longer will the CATV engineer be able to treat audio as the unimportant portion of the television signal.

An increased awareness of audio quality by the public as well as improvements in the state-of-the-art in television stereo processing in the home (VCR's, stereo adapters, stereo TV's), will require that the CATV engineer exercise new levels of caution in the handling of audio information.

Throughout the history of television and certainly throughout the history of CATV, the audio information carried by a television signal has been considered by most to be a non-critical item. We simply haven't paid it much attention. After all, the limiting factor in audio quality has always been the consumer's own television set. Why should we be worrying about preserving audio quality in the CATV plant when the customer didn't need or even expect good audio performance out of his set? The answer in most cases is obvious as we have simply ignored au-

No longer will the CATV engineer be able to treat audio as the unimportant portion of the television signal.

dio and have concentrated on providing good quality video to the customer.

But recently, and for several reasons, customers have become much more aware of the benefits of good quality audio. The compact disc player, stereo or Hi-Fi VCR and now stereo TV with its associated barrage of consumer advertising have enlightened the CATV customer to the point that he is beginning to expect and in fact demand "good" stereo-audio performance.

This is especially true of the new stereo-TV owner. Because of this increased customer awareness, the CATV operator must begin to better understand what good audio quality really is and how it can be preserved as it passes through the CATV headend.

Our methods of processing a stereo signal in the CATV headend can make

the difference between the deliberate transmission of actual stereo or the inadvertant transmission of monaural audio. To make matters even worse, mishandling the stereo signal in the CATV headend can also create poor sounding monaural audio for the vast majority of our current customers who are non-stereo equipped.

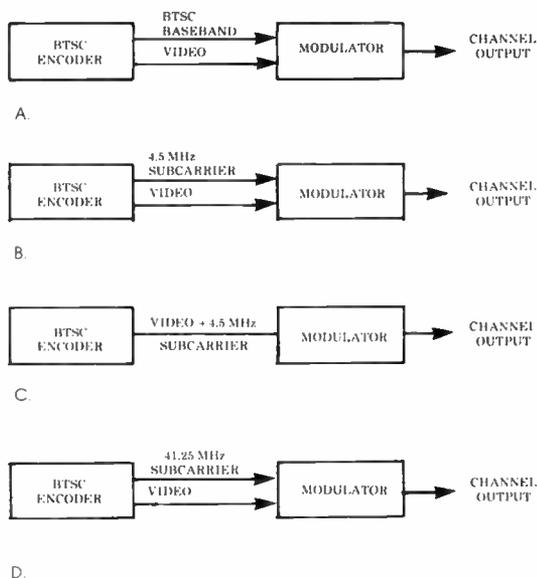
This paper, in addition to investigating the importance of modulation levels will outline other key areas of concern to the CATV operator to ensure preservation of the stereo signal.

Key headend interfaces

Headends which are configured to receive over-the-satellite stereo-audio broadcasters for subsequent processing and transmission in the BTSC format will require a variety of different equipment. In addition, the equipment may be configured in any of several different ways. Figure 1 outlines a few of the methods of interface between a satellite receiver and BTSC encoder while Figure 2 shows several methods of interface between the BTSC encoder and TV modulator.

The method of interface between a

FIGURE 1



By Chris Bowick, Engineering Manager, Scientific-Atlanta Inc.

With the advent of over-the-satellite encryption, left and right audio will be provided via a headend descrambler.

satellite receiver and BTSC encoder is dependent upon several factors including the use of uplink, encryption, narrow-band companding or any previously provided out-of-band (FM simulcast) stereo service. The most simple interface, shown in Figure 1A, is made by connecting the encoder and receiver together via the composite video output port of the receiver. In this case, a dual audio subcarrier demodulator within the BTSC encoder itself demodulates the two audio subcarriers to left and right audio for re-encoding into the BTSC format.

CATV systems which have previously been supplying out-of-band (FM simulcast) stereo signals to their subscribers will likely have access to left and right audio information out of an existing dual subcarrier demodulator. In the case of Figure 1B, the existing subcarrier demodulator and satellite receiver maintain their present interface via the composite video port of the receiver.

With the advent of over-the-satellite encryption, left and right audio will be provided via the headend descrambler as shown in Figure 1C. Of course in this scheme, subcarrier demodulators are no longer necessary. Each of the major manufacturer's encryption schemes provide these necessary stereo outputs.

Another very tempting but highly undesirable practice might be the use of a pair of subcarrier demodulators in a satellite receiver to provide L + R and L - R audio to the BTSC encoder. While L + R and L - R stereo information can certainly be provided by a typical satellite receiver containing two subcarrier demodulators (if the signals are wideband and not compressed like Disney, TMC, and MTV), this is not recommended due to the difficulty in optimizing BTSC stereo performance under these circumstances. This phenomenon is explained later in this paper.

Encoder-modulator interface

Figure 2 identifies several of the various methods of interfacing a stereo encoder with a TV modulator. As shown, the interface can be made at either BTSC composite baseband or at some audio subcarrier assignment

such as 4.5 MHz. This is a very key interface in the headend because of the importance of setting and maintaining the correct audio modulation level of the main subcarrier by the composite BTSC signal. Figure 2A indicates the

connection directly at composite baseband.

Here, the baseband BTSC signal, shown in Figure 3, is connected directly to the baseband audio input port of the TV modulator.

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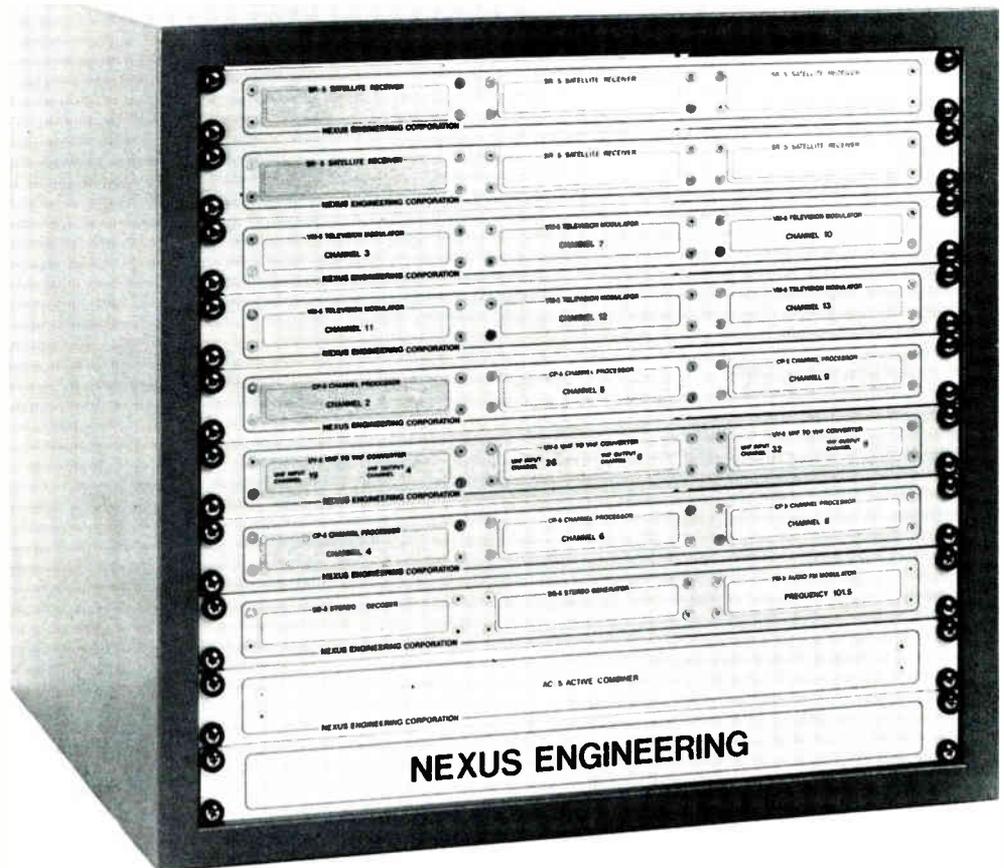
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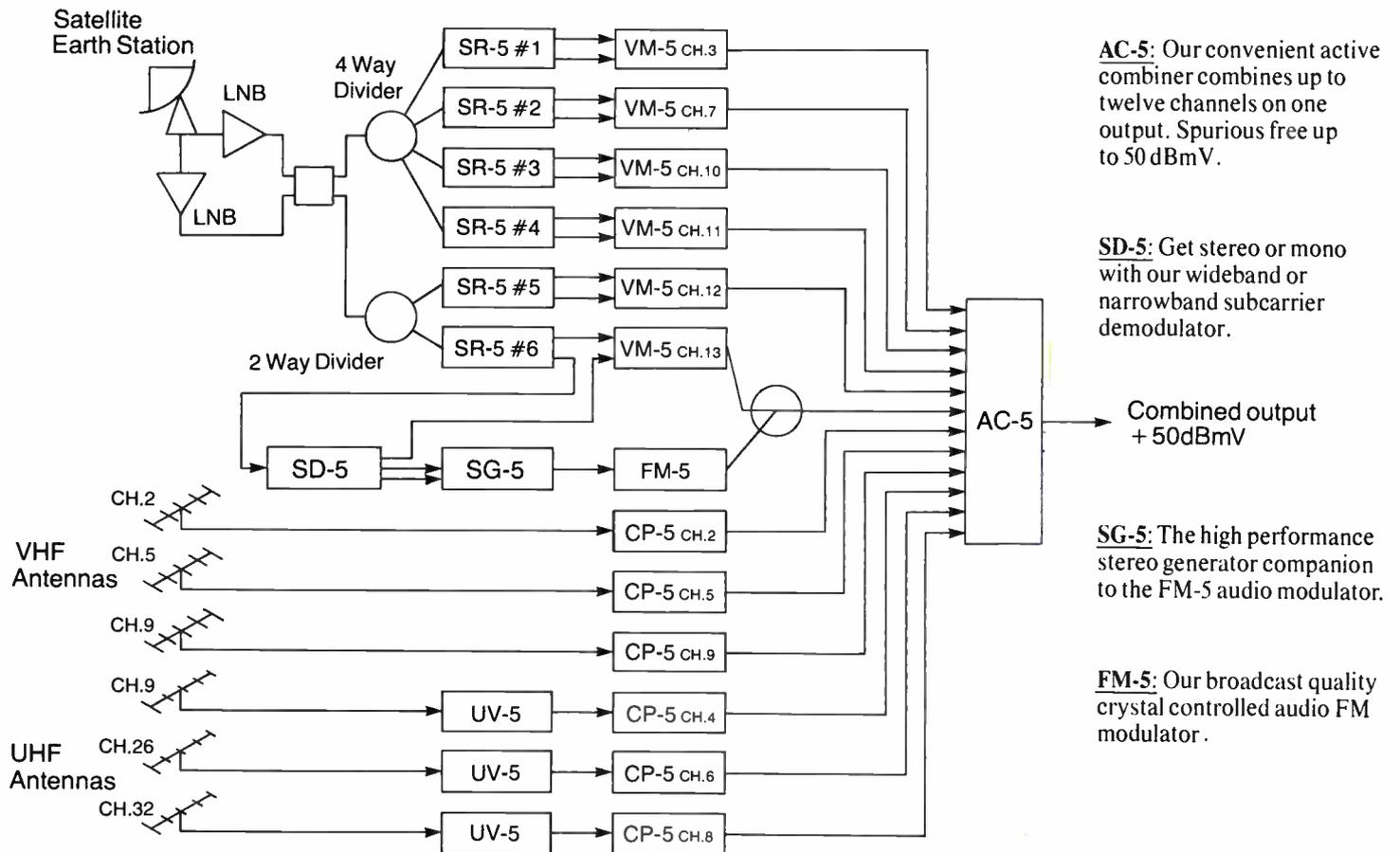


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CATV operators can help ensure the integrity of the stereo image.

In this application, the modulator's audio pre-emphasis must be disabled, and its baseband bandwidth and deviation capability must be compatible with BTSC signal requirements (100 kHz bandwidth and 73 kHz deviation). In addition, the modulator's overdeviation indicator circuitry must be compatible with the BTSC input or it will erroneously indicate overdeviation all of the time.

When interfacing the encoder and modulator at some audio subcarrier as in Figures 2B, 2C, and 2D, the requirements on the modulator are less stringent and simply require adequate bandwidth to ensure minimal degradation to the stereo signal.

While the CATV operator has no control over what goes on inside a manufacturer's piece of equipment and must instead rely on the respective manufacturer's knowledge of handling stereo signals, he does have control over his method of interfacing these

various products. As a result, he must understand and eliminate any potential problem area in these interfaces. Some of these potential problem areas with reference to both the stereo and mono signal are described in the following paragraphs.

Stereo by definition is the transmission of two separate though perhaps somewhat correlated channels of information. This correlation between left and right channel may range from zero in some program material to full correlation (mono) in other program material. Normally, most stereo program material does have some correlations between channels.

This signal, known as the common-mode signal because equal amounts are transmitted in each channel, may contain, for example, the lead vocal and/or a base guitar or drums. The remaining information in each channel would be uncorrelated and would contain the remainder of the stereo infor-

mation.

In order for the stereo signal to be accurately recovered at the subscriber's home, the transmission path, including the CATV headend, must not alter the frequency response, separation, special location, or depth perception of the sound as perceived by the subscriber. All of these parameters unfortunately can be disrupted through mishandling the stereo signal in the interfaces described in Figures 1 and 2. The CATV operator can help to ensure the integrity of the stereo image through his headend by understanding and adhering to a few simple rules:

1) When interfacing with sum (L+R) and difference (L-R) channels the amplitude (or gain) and the group delay of the sum channel path must be exactly equal to that of the different path.

2) When interfacing with left and right channel information, the gain and group delay of the left channel

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You must be extremely careful if the signal being processed is in the sum and difference format.

must equal that of the right channel.

3) Audio modulation levels especially with reference to the main audio subcarrier deviation must be set precisely.

Rule number one is precisely the reason that broadcasters typically do not process signals in the sum and difference format. This is also the reason that Figure 1D is not a recommended practice in interfacing receivers and encoders in a headend. Amplitude and phase errors in the two signal paths become very critical when trying to maintain optimum stereo separation.

This can be best understood by remembering that left and right channel information is derived from L + R and L - R information through a process called dematrixing. The accuracy of the dematrixing process is totally dependent upon the relative amplitude and phase of the sum and difference signals. This dependence is described by the following equation.

Separation (dB) = 20 log

$$\frac{(\cos \theta + K \cos \phi)^2 + (\sin \theta)^2}{(\cos \theta - K \cos \phi)^2 + (\sin \theta)^2}$$

When: K = Ratio of L - R to L + R signal level or gain
 θ = Phase difference between L + R and L - R
 ϕ = Subcarrier phase error

Note: For example, an amplitude error of as little as 1 dB results in stereo separation of no greater than 25 dB if everything else is perfect. Similarly, a 10 degree phase error results in no more than 20 dB of separation if everything else is perfect. Combining amplitude errors with phase errors will quickly erode stereo separation as shown in Figure 4.

What all of this means is that you must be extremely careful if the signal being processed is in the sum and difference format. The equipment being used to transport the signal, whether it be cabling, distribution amplitude, audio switches, etc., must minimize any differences in gain and group delay in the two signal paths. Now you can begin to understand the difficulty in trying to interface a receiver and encoder directly at baseband as shown in Figure 1D. With program audio, how

could you possibly set signal levels accurately enough to ensure optimum stereo performance? It becomes a virtually impossible task.

Rule number two is certainly applicable to most of us because in most

headends the stereo signal will be routed as left and right channel information; commonly referred to as the discrete format. It is interesting to note, however, that in this case, it is the monaural signal, not the stereo sig-

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Most CATV operators have no control over the amplitude or phase of the discrete or matrixed stereo channel paths.

nal that is in jeopardy due to the mishandling of the L and R signals.

Discrete format

While it is true that both the special location and depth perception of the sound is dependent upon both the amplitude and phase of the L and R signals and that upsetting either of these parameters will alter the stereo image, this is not nearly as critical to the stereo listener as it may be to the monaural listener. A 1 dB amplitude variation or a 10 degree phase variation between the two channels simply won't make much difference to the stereo signal.

In this case it is the monaural listener that will suffer. And remember, in the next few years it will be the monaural listener who will continue to be in the majority of our customer base. This degradation in the monaural signal occurs because prior to the transmission in the BTSC format, the left and right channel information must first be matrixed into an L + R or monaural signal to ensure compatibility with existing TV sets. If the two chan-

nels were completely uncorrelated (no common information between the two signals) then the relative amplitude or phase between the two channels would not create a problem in the L + R signal.

But since most stereo programming does have a common-mode component, any phase difference between the left and rights channels will result in a spectral comb-filter effect which will show up as "suck-outs" within the audio spectrum of monaural sum. In the limit, if the two channels were 180 degrees out of phase, then the common-mode signal would be completely eliminated. This comb-filtering effect can result in a monaural signal which sounds mushy or tinny to the customer.

In reality, most CATV operators have no control over the amplitude or phase of either the discrete or matrixed stereo channel paths.

In the vast majority of circumstances, the signal path between the receiver and encoder, or between the encoder and modulator consists of nothing but a pair of shielded wires. Only rarely is some form of baseband

routing or switching utilized in a headend and it is in these cases that the operator must pay strict attention to these rules to ensure adequate performance.

There is, however, one interface which the CATV operator can directly control and which is absolutely crucial in order to maintain adequate stereo performance. I am referring to the need to precisely set and maintain audio modulation levels in the headend.

Precise modulation levels

As was shown in Figure 3, the accurate transmission of the BTSC signal requires that precise deviations of the main aural carrier be maintained. These deviations are: 25 kHz for the sum (L + R) signal, 50 kHz for the stereo difference (L - R) signal and 15 kHz for the second audio program. These are the deviations that any stereo decoder or stereo TV will be designed and factory set to receive. Any variation from nominal deviations will cause substantial degradation in channel separation in the stereo signal.

There are several ways to ensure that accurate modulation levels are maintained in the headend. One way is to rely on the CATV equipment manufacturer to produce a quality interface as shown in Figures 2B, 2C and 2D. Here, all modulation levels are set up within the encoder itself. All that is necessary is to provide left, right and SAP audio information to the encoder, and the encoder does all of the work for you, precisely setting the relative modulation depths on the main carrier (4.5 MHz) by the BTSC signal.

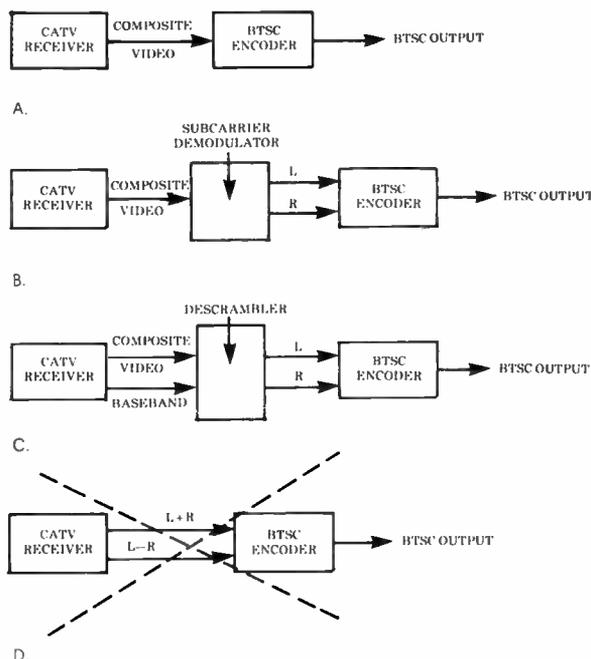
An alternative is to interface at baseband as was shown in Figure 2A and take it upon yourself to accurately set the precise deviation of the main audio carrier. While this approach is certainly feasible, unless the manufacturer has provided you with the necessary tools, it isn't a trivial task.

Figure 5 is a graph which plots errors in main carrier modulation level against stereo separation in an otherwise perfect system.

This graph clearly indicates the need to keep modulation levels to within +/- 5 percent of their optimum value or stereo separation will suffer tremen-

Continued on page 75

FIGURE 2



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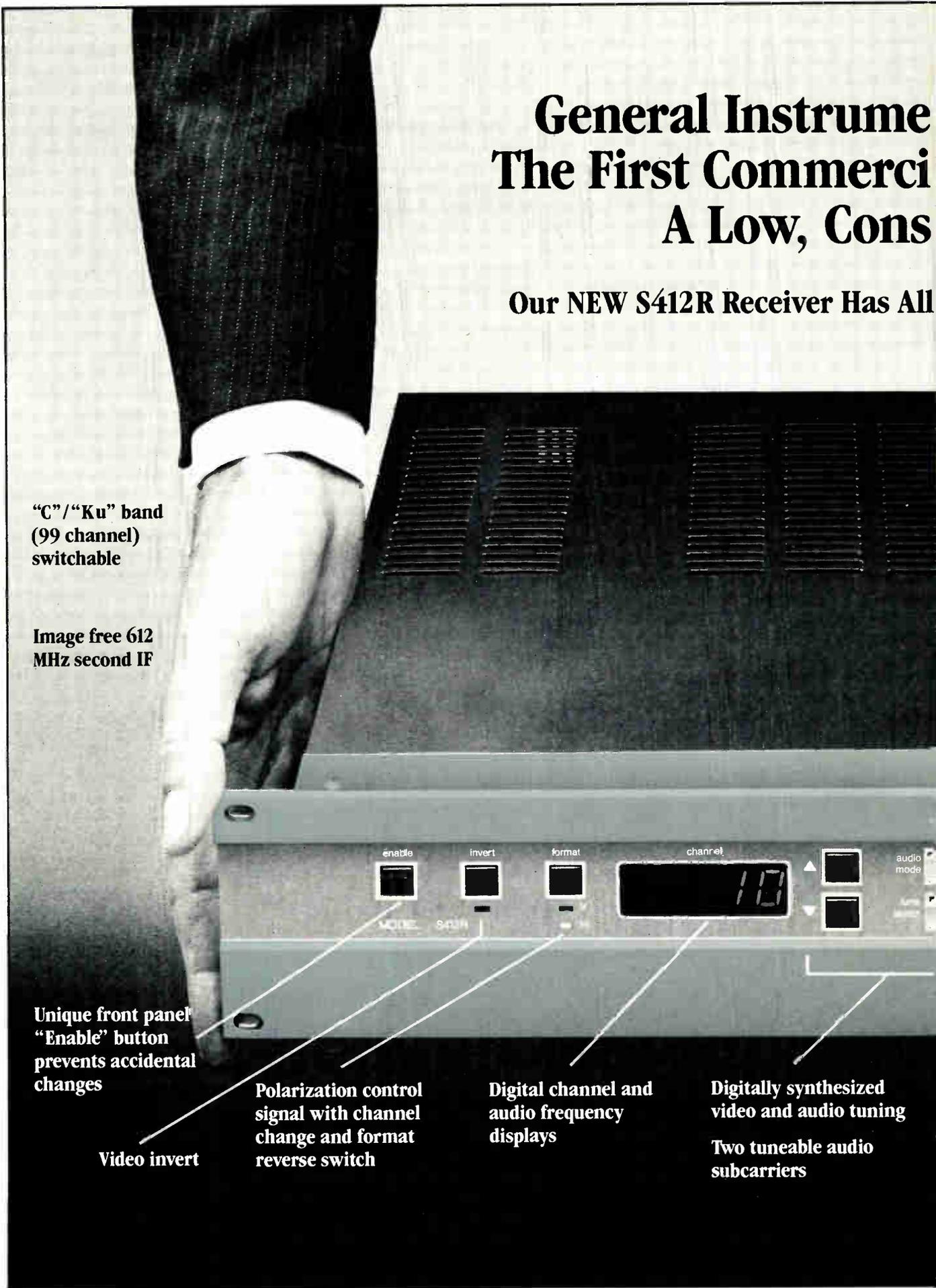
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"Enable" button
prevents accidental
changes

Video invert

Polarization control
signal with channel
change and format
reverse switch

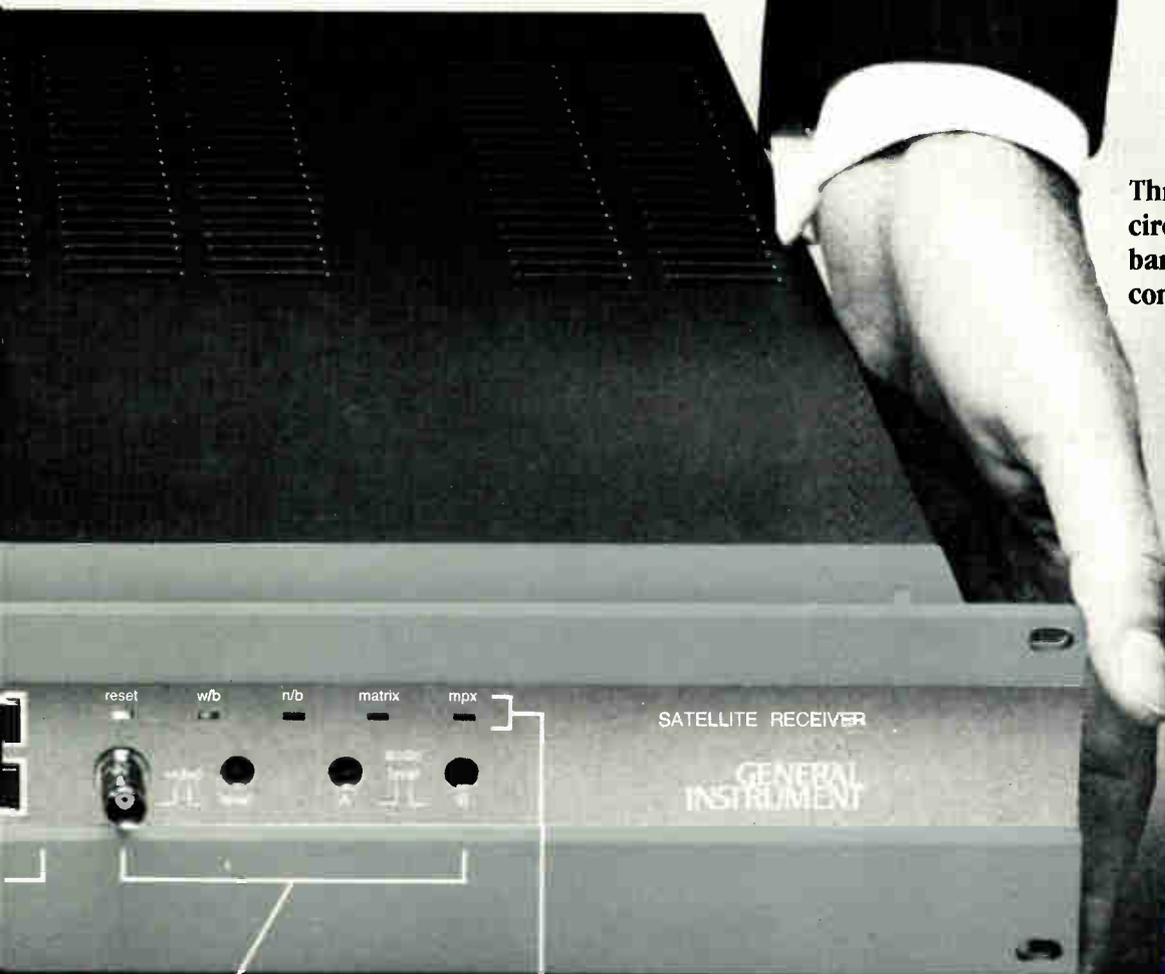
Digital channel and
audio frequency
displays

Digitally synthesized
video and audio tuning
Two tuneable audio
subcarriers



nt Proudly Presents al SMATV Receiver At umer Price!

The Features You Will Ever Need!



Threshold extension
circuitry without
bandwidth
compression

Non-volatile
memory

Front panel test
and adjustment

LED indications
for mono, matrix
or multiplex stereo
audio modes

GENERAL INSTRUMENT

For our complete catalog, write:
General Instrument Corporation
SMATV Systems/Jerrold Division
2200 Byberry Road/Hatboro, PA 19040
(215) 674-4800
Reader Service Number 28

buyers' guide

Temtron Electronics
Toner Cable Equipment Co.
Tulsat Corp.
TV Sports Scene Inc. (TVSS)
Tele-Wire Supply Corp.
Western CATV Distributors Inc.

Equipment

AD Systems Inc.
Abiqua International
Adams-Russell Co.
Adrian Steel Co.
American Overstock Exchange
COM TEK
Channematic Inc.
Cable Call Corp.
Cable Exchange
Cablevision Equipment Co.
Control-Com
Victor Duncan Inc.
General Instrument/Hardware
Hitachi Denshi America Ltd.
Jerrold Division—General Instrument
Leader Instruments Corp.
Leaming Industries
M/A-COM Mac Inc.
Micro-New Instrument Co. Inc.
Norsat International Inc.
Paar Industrial Electronics
Seven Systems
TL Systems
Vitek Electronics Inc.

Financial

Ansbacher, Henry Inc.
Boudreau & Associates
Communications Resources
Unlimited Inc.
Fanch Communications Inc.
Jamar-Rice Co.
Conrad Marns & Associates (C.M.A.)
Pat Thompson Co.

Law/Attorneys

Arter & Hadden
Blair, Joyce & Silva
Cordon & Kelley
Greydanus & Levine
Hardy & Popham
Keller & Heckman
Pellegrin & Levine Chartered
Rothman, Gordon, Foreman & Grouidine
Sullivan & Worchester
Joel Rothstein Watson

Management Information Systems/ Billing

Birchwind Infosystems Ltd.
Business Systems Inc.
CableData
Creative Management Systems Inc.
First Data Resources

Manufacturers

AVA Electronics Corp.
Aerowave Inc.
American Laser Systems Inc.
Andrew Antenna Co. Ltd.
Antenna Technology Corp.

Armex Cable Corp.
Augat/Broadband
Automation Techniques Licensed
Avcom of Virginia Inc.
Bennar-Nawman Inc.
Blonder-Tongue Lab Inc.
CADCO Inc.
CASAT Technology Inc.
CATEL Telecommunications Inc.
C-COR Electronics Inc.
Com SE
CWY Electronics
CZ Labs
Commercial Cable Inc.
Cable Power Inc.
Cable Security Systems Inc.
Cable Bus Systems Inc.
Comtech Antenna Corp.
Conifer Corp.
Control Technology Inc.
Converter Parts Inc.
Channel Master
Chanel One Inc.
Cummins-Allison Corp.
Cushcraft Corp.
Diamond Communications Products Inc.
ECA/Manufacturing Division
Electrohome Ltd.
Electroline Television Equipment Inc.
General Instrument/Tocom
Gilbert Engineering Co. Inc.
ICM Video
ISS Engineering Inc.
Independence Electronics Inc.
Inventionics Ltd.
JFW Industries Inc.
Kaul Engineering Inc.
LNR Communications Inc.
Lightening Eliminators & Consultants
Lightning Deterrent Corp.
Lindsay Specialty Products Ltd.
M/A-Com Cable Home Group
Mark Antenna Products Inc.
Mega Hertz Sales
Miralite
Nexus Engineering Corp.
North Park Electronics
North Tech Electronics Ltd.
Pico Products Inc.
Pow-R Devices Inc.
Power Guard Inc.
Qintar
R. Alan Comm. Inc.
R.D. Werner Co. Inc.
R.L. Drake Co.
Radyne Corp.
Ratelco Inc.
Rohn
Rycom Instruments Inc.
Sachs Canada
Sachs Communications Inc.
Sadelco Inc.
Sharp Electronics Corp.
Sitco Antennas
Spatial Communications Inc.
Superior Metal Products Inc.
Tape-Athon Corp.
Teledac Inc.
Texscan Communications Products Inc.
Texscan Instruments Division
Texscan MSI/Compuvid Corp.
Times Fiber Communications Inc.
Trans USA Corp.
Triple Crown Electronics Inc.

Trippe Lite (Trippe Manufacturing)
United Satellite Systems
Universal Electronics Inc.
Utility Tower Co.
Videotek Inc.
Vermeer Manufacturing
Wavetek Indiana Inc.
Weather Scan Inc.
Weldone Trading Co. Inc.
Wide Band Engineering Co. Inc.
World Video Library Inc.
Zenith Electronics Corp.

Marketing

Claire Stein Associates Inc.
Martin Roberts & Associates Inc.
McCullough Satellite Equipment Inc.

Power Supplies

Alpha Technologies
Electra-Motion Inc.
Seaman Parsons Corp.
Sola A Unit
Vibra-King Inc.

Production

Bytek Corp.
Cable Films
Cabletrax
Charisma Products Ltd.
Fries Distribution Co.
Nova Communications
Phasecom Corp.
Polycom Corp. of America
Rock Solid Productions Inc.
Rosner Television
Tri/Media Comm. Inc.
Visual Communications Inc.
Yale Video
Zenith Cable Products Division

Programming

Richard A. Blum & Associates
Cinemax/HBO
Cable Sportsline
Cable Sports Tracker
Camex Inc.
Corinth Films Inc.
EWTN-Eternal Word TV Network
Eastern Microwave Inc.
Feature Arts Unlimited
Home Sports Network
Home Theatre Network
KTVT, Texas Spirit
The Learning Channel
Moody Broadcasting Network
PKO Television Ltd.
PTL—The Inspirational Network
Production & Direction Services Inc.
Reel Movies International
Seeburg Music Satellite Network
Tele-techniques Inc.
WFMT
WGM The Chicago Superchannel
WPIX, New York Alive
WW Entertainment
Warner Bros. Domestic Pay
United Video
Universal Pay Television

buyers' guide

<p>Research Browne, Bartz & Coddington Inc. Kalba Bowen Associates Inc. Spectrum Planning Inc. Warren & Morris Ltd.</p> <p>Services/Repair Advance Microwave Advanced Satellite Systems American Comm. Installation American Earthstations Inc. Arena System Inc. Bose Associates Inc. Brad Cable Cable Terminal Services Inc. Commercial Satellite Services Comsearch Inc. Comsonics Inc. Contract Installers Dolt Communication (The) Head End NCS Industries Inc. OL Teletronics Prime Time Cable Progressive Electronics Inc. R.F. Analysts Inc. R & I. Communications Satellite Shop Inc. Tele-Measurements Inc. Tru-Level Inc. Video Sat Corp. Wiresat Corp.</p>	<p>Suppliers/Supplies Antsco Corp. Arrow Fastener Co. Inc. Bashlin Industries Cable TV Supply Co. Cable Catalog Inc. Carolina Galvanizing Corp. DX Communications Daburn Electronics & Cable Corp. Drop Shop Ltd. Inc. East Easley Equipment Co. Inc. Eagle Comtronics Inc. Electrovert Inc. Engineering Unlimited Inc. Federal Telecom Inc. Heyco Molded Products Inc. Info/Soft Inc. Interstate Dropline Installers Inc. Keystone Electronics Corp. Lectro Products Inc. Mannamedia Corp. Microwave Filter Co. Inc. Midwest Communications Corp. Nelson Electric Supply Co. Pico/Macom/UEM Sales Inc. Portac Inc. ProServ Television RMS Electronics Satellite Engineering Group Standard Communications Corp. Supra Products Inc. Supra Key Control Ltd. T.R. Pitts Co.</p>	<p>John Weeks Enterprises</p> <p>Miscellaneous AMC Sales Promotions Alacrity Cable Collections Corp. Burst Communications Inc. Clear-Com Intercom Systems Cable ADNet Inc. Cable Link Cable Publications Inc. Cable Search Associates Capitol Production Music EMCEE Broadcast Products EPG EPG, Jr. EEG Enterprises Inc. Eagle Satellite Film Video Communications General Electric Co. Ideal Onics Mycro-Tek National Satellite Cable Assoc. Perception Technology Corp. Q.C.C. Research Technology International Skyline Cablevision Inc. Spectradyne Inc. Tempo Data & Text Tower Specialties Inc. Virginia A. Ostendorf Inc. TV Cableguide Magazine Talkan Co. Inc. Tamaqua Cable Products Corp.</p>
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The Broadband Communications Buyers' Guide

What: A one-of-a-kind directory listing companies that manufacture or distribute equipment for; or design and install broadband local area networks.

When: November 1986 release.

Who gets it: Telecommunications managers at Fortune 500 corporations, military installations, universities and government agencies. Engineering consultants and contractors. Large OEMs building Manufacturing Automation Protocol compatibility into new product lines.

Why: All of this information is now available in one place, through one source. Who better to bring you what you need than *CED*, the leading journal on broadband communications.

Free Company Listings:

Contact Gary Kim at 303/860-0111.

For Advertising:

Contact Cathy Wilson at 303/860-0111.

ITCI P.O. Box 5208 T.A.
 Denver, CO 80217

buyers' guide

AD Systems Inc.

AD Systems Inc.(801) 263-1661
6138 S 380 West
Murray, UT 84107
PERSONNEL: Gerald Van Mondfrans,
President; Bob Hall, Vice President/Sales
Manager
DESCRIPTION: AD Systems manufactures and
markets a line of low cost titlers, character
generators and ad insertion equipment. The new
line of lower cost still store recorders and playback
units allows storage and instant access of up to
600 still pictures. AD Systems also sells a line of
video program switchers and controls used for
sports blackouts, emergency alerts and video loss
detection. Also available is the ad compiler, which
works with all major brands of ad insertion
equipment.

A.F. Trentacosta
& Associates(818) 999-0328
24550 Gardenstone Lane
West Hills, CA 91307
PERSONNEL: Andrew F. Trentacosta,
President; Carol R. Trentacosta, Vice President;
Elvera S. Rollins, Vice President
DESCRIPTION: Television programming
consultants. Research and recommendation
consultants for broadcast, cable and pay TV.
Available as "Expert Witness" re. television
programming litigation (San Francisco tax court
1984-85). Extensive Pay-Per-View programming
experience. Professional travel services for CATV
industry management.

AMC Sales Promotions(404) 953-9522
2130 Kingston Court
Ste. C
Marietta, GA 30067
PERSONNEL: Anna Messina Cunnane,
President
DESCRIPTION: Sales Awards, premiums,
incentives, promotional products, imprinted
merchandise, awards, gifts, wearables, plaques,
marketing programs and concepts, convention
specialties, premium catalog and fulfillment
programs.

AVA Electronics Corp.(215) 284-2500
4000 Bridge St.
Drexel Hill, PA 19026
PERSONNEL: Mario Rafalin, Ph.D. President;
William E. Cooper Jr., Sales Office Manager;
Michael Shore, Marketing Director
DESCRIPTION: Manufacturer of F, UHF, BNC,
TNC, Twinax, and N Connectors, Adaptors, and
cable assemblies.

Abiqua International(503) 873-2899
WATS (National)(800) 452-7007
417 N Water St.
PO Box 100
Silverton, OR 97381
PERSONNEL: Stu Rasmussen, Sales Manager
DESCRIPTION: Low cost ad insertion systems
and equipment for small and very small cable
systems.

Adams Russell

Adams-Russell Company(617) 890-5850
WATS (National)(800) 272-7847
300 Second St.
Waltham, MA 02154
PERSONNEL: John Lynch, President; William
Henchy, Corporate Vice President; John
Brockman, Vice President/Cable Services; Trevor
Lambert, Vice President/Video Information
Systems; Roger Strawbridge, Sales Manager/
Project Director
REGIONAL OFFICES: 2669 Forest Glen Dr.,
Marietta, GA 30066, (404) 926-4223; 9601
Irontdale Ave., Chatsworth, CA 91311, (818) 407-
0329
DESCRIPTION: Automated commercial
insertion equipment.

Adapt Communication
Supply Co. Inc.(516) 487-1780
WATS (National)(800) 232-7826
17 Barstow Road
Great Neck, NY 11021
PERSONNEL: Daniel Pelz, President; Andrea
Pelz, Vice President; Leonora Lemmiti, Sales
Representative
DESCRIPTION: Distributor of cable television
equipment, specializing in: connectors, drop
material, cable, enclosures, hardware and tools.
We are ADAPTive to your needs!!

Adrian Steel Co.(517) 265-6194
906 James St.
Adrian, MI 49221
PERSONNEL: Harley Westfall, President; Lynn
Baugh, Sales Manager
DESCRIPTION: Service van interior equipment,
safety/security partitions and ladder racks for full-
size vans, compact pickups and mini-vans. Adrian
also provides factory installation of the above
equipment on GM, Ford, and Chrysler vehicles.

Advance Microwave(919) 998-2556
Rte. 3
Box 151
Advance, NC 27006
PERSONNEL: Phillip Bolton, President/Sales
Manager
DESCRIPTION: Provides service and
installation to trailer parks, mobile home villages,
motels and hotels as well as residential.

Advanced Communications
Industries Inc.(813) 873-0660
4206 W Osborne
Tampa, FL 33614
PERSONNEL: Michael Johnson, President;
Richard J. Zahornacky, Vice President; Robert
Wilburn, Sales Manager-Texas; Debra Johnson,
Sales Manager-Connecticut
REGIONAL OFFICES: 200 Shaw Rd. N,
Branford, CT 06471, (203) 484-2877; 12290 49th
St. N, Clearwater, FL 33520; (813) 578-0932; 718
6th Ave. E, Bradenton, FL 33508, (813) 746-5893;

10 Second St. E Ye Olde Courthouse, Dover, NH
03820, (603) 749-1511; 259 Rose Meade Ave.,
Pasadena, CA 19030, (818) 793-2244; 100 E
N.A.S.A. Road, 1 Ste. 311, Webster, TX 77598,
(713) 338-2909; 13777 N Central Expressway,
Dallas, TX 75243, (214) 699-0188
DESCRIPTION: Full coverage of the cable TV
industry consulting, customer research, walk off,
design, construction. Specializing in multi-unit
and installations. Construction department with
full cable TV and telephone overhead and
underground services. Complete construction for
CATV telephone & interconnect services.

Advanced Satellite
Systems(609) 768-0606
Rte. 73
PO Box 174
Berlin, NJ 08009
PERSONNEL: Jim Thompson, President;
Patrick Haverkock, Vice President; Arnold Ghen,
Sales Manager
DESCRIPTION: Sales, service and installation
of home TVRO satellite systems. We install
commercial and residential systems and distribute
hospital TV systems.

Aerowave Inc.(303) 363-9024
1405 Florence
Unit D
Aurora, CO 80012
PERSONNEL: Dave Sullivan, President; Robert
Ducaj, Vice President; Al Baker, Sales Manager
DESCRIPTION: Three functions: 1) consulting
to manufacturers, 2) distribute commercial cable
equipment to general instruments, Jerrold,
Scientific Atlanta, among others, 3) system design
and installation.

Alacrity Cable
Collections Corp.(301) 721-2744
2125-10B Priest Bridge Business Pk.
PO Box 3093
Crofton, MD 21114
PERSONNEL: Susan K. Hayes, President
DESCRIPTION: Specializing in nationwide
recovery of converters, decoders, etc., and past
due accounts with very high success in securing
reconnections.

Albertson, Fred W.(305) 361-1614
310 Harbor Dr.
Key Biscayne, FL 33149
PERSONNEL: Fred W. Albertson, Attorney
DESCRIPTION: Telecommunications attorney.

Alpha Technologies(206) 647-2360
3767 Alpha Way
Bellingham, WA 98225
PERSONNEL: Fred Kaiser, President; Bob
Bridge, Sales Manager
REGIONAL OFFICES: 7033 Antrim Ave.,
Burnaby, BC Canada V5J 4M5, (604) 430-1476
DESCRIPTION: Manufacturer/Distributor of
CATV standby power supplies and status
monitoring systems, computer UPS, telephone
backup power conversion products.

American Cable
Contractors(303) 340-4620
WATS (State)(800) 521-9916
1700 Jasper St., Suite C
Aurora, CO 80011
PERSONNEL: Carl M. Occhionero, President;

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Automation Techniques Licensed

Carol J. Occhionero, Vice President; Michael Occhionero, Vice President
DESCRIPTION: Experts in all areas of maintenance, construction and programming for both SMATV and CATV systems. No job too large or too small.

American Communication
 Installation (ACI)(609) 227-3328
 1405 Chews Landing Road
 Laurel Springs, NJ 08021
PERSONNEL: Joseph M. Baker III, President; Frederick Deitrich, Vice President; Mark Wahalen, NE Regional Director
REGIONAL OFFICES: 2165 NW 17th Ave., Miami, FL 33142, (305) 326-0582; 190 N Dupont Hwy, #25, Airport Industrial Center, New Castle, DE 19720, (302) 322-0427
DESCRIPTION: ACI is a cable installation company, operating nationwide. It has a proven track record of excellence in the installation of CATV and SMATV systems. We do aerial and underground installations, as well as MDUs (Multiple Units). We are a company dedicated to professionalism and quality workmanship. We are dedicated to performance.

American Earthstations, Inc.(503) 222-6000
 0696 SW Bancroft St.
 Portland, OR 97201
PERSONNEL: Norman Hotz, President
DESCRIPTION: Sell, install, and service active cable systems and security systems for local area networks, microwave terrestrial and satellite communications.

American Laser Systems Inc.(805) 967-0423
 106 Fowler Road
 Goleta, CA 93117
PERSONNEL: Jackie Parker, President; Lorraine Shallenberger, Vice President/Sales Manager
DESCRIPTION: Manufacturer of optical infrared, (atmospheric) communication systems for the transmission of data/voice and video. Alternate technology to microwave, telephone lines, cable and fiber optics for short range. License-Free, low cost transmission.

American Overstock Exchange(505) 247-9549
 WATS (National)(800) 321-4669
 720 1st St. NW
 PO Box 2707
 Albuquerque, NM 87125
PERSONNEL: David M. Morgan, President
DESCRIPTION: Represents sellers of brand new, but overstocked materials, coordinates inter-company transfers, provides short-term warehousing/shipping services and publishes purchasing data base.

American Television Systems, Inc.(216) 425-7000
 1955 Midway Dr., #C
 Twinsburg, OH 44087
PERSONNEL: Joseph Smith, President/CEO; Ron Young, Vice President; Joe Swisshelm, Sales Manager
DESCRIPTION: Engineering and technical design in any area of RF distribution, from headend design to construction of SMATV systems and local area networks. Also stocking

distributor for a number of CATV, MATV, Broadcom and satellite TV manufacturers.

Andrew Antenna Co. Ltd.(416) 668-3348
 606 Beech St.
 Whitby, Ont. L1N 5S2
PERSONNEL: Hugh J. Swain, President; Dirk DeJong, Vice President; Alex R. Mackenzie, Sales Manager
REGIONAL OFFICES: 120 Holland Ave., Ste. 210, Ottawa, ONT, Canada, K1Y 0X6, (613) 728-7665
DESCRIPTION: Manufacture ESAs ranging in size from 1.2 to 12M dia in 4, 4/6 12, 12/14 GHz. Also special application ESAs as CATV units, tracking units, polar and transportable trailer units.

Anixter Communications(312) 677-2600
 WATS (National)(800) 323-8167
 4711 Golf Road
 Skokie, IL 60076
PERSONNEL: John Egan, President; Gordon Halverson, Vice President Sales/Marketing; Raymond Geraci, Vice President Advertising; Everett Hirsch, Regional Vice President; Gene Robinson, Regional Vice President; Tony Barclay, Regional Vice President; Julie Anixter, Contact Person; Jim Mitchell, Assistant Advertising Manager
REGIONAL OFFICES: 4303 Pleasantdale Road, Atlanta, GA 30340, (800) 282-8928; 1250 Champion Circle, Carrolltown, TX 75006, (214) 484-2933; 1301 Morse Ave., Alk Grove Village, IL 60007, (312) 640-1156; 1400 Allec St., Unit C, Anaheim, CA 92805, (714) 778-4414; 312 Richard Mine Road, Wharton, NJ 07885, (201) 328-0980; 4650 Lake Forest Dr., Blue Ash, OH 45242, (513) 733-9100; 14105 13th Ave. N, Plymouth, MN 55441, (612) 542-1804; 14402 E 33rd Pl., Aurora, CO 80011, (303) 373-5202
DESCRIPTION: Complete line of cable TV products including aerial construction materials, connectors, underground construction materials, subscriber materials, satellite receiving antennas, converters & Pay-TV products, headend distribution, & passive electronics, descramblers, coaxial cable, tools and safety equipment and splicing materials. Anixter also provides materials management services to the CATV industry.

Ansbacher, Henry Inc.(212) 688-5544
 277 Park Ave., 4th Floor
 New York, NY 10172
PERSONNEL: CJHMS, Deputy Chairman; Peter R. Kent, President; Richard Cohen, Sr. Vice President; Charles R. Martz, Sr. Vice President; William Whetzel, Sr. Vice President
REGIONAL OFFICES: Englewood, CO 80111, (303) 740-0888; London, EC3A 5AN, England.
DESCRIPTION: Mergers, acquisitions, and financial services in the areas of publishing, communications, media and high technology.

Antenna Technology Corp.(602) 264-7275
 1140 E Greenway St., #2
 Mesa, AZ 85203
PERSONNEL: Gary S. Hatch, President; Scott Grone, Vice President
DESCRIPTION: Manufacturer of the simulsat multi-beam antenna in 3.3m, 4.6m, 7m, 10m (capable of receiving 30 satellites simultaneously) versions and parabolic antennas from 1.2m to 32m

in assorted sizes. Distributors of over 200 satellite and cable related products worldwide. Complete turnkey satellite headend engineering, installation crews and MMDS System Design.

Antsco Corp.(818) 355-2510
 17 W Sierra Madre Blvd.
 PO Box 188
 Sierra Madre, CA 91024
PERSONNEL: Ed Rambeau, President/Sales Manager; A. Braun, Vice President
DESCRIPTION: Suppliers for MATV-CATV equipment, satellite TV terrestrial interference filters and traps.

Arena Systems Inc.(215) 630-0320
 2118 W Main St.
 Norristown, PA 19403
PERSONNEL: Wayne Arena, President
DESCRIPTION: Repair of CATV converters, headend equipment, line equipment. Buy and sell new and used CATV converters.

Armex Cable Corp.(313) 755-2030
 2700 E Nine Mile
 Warren, MI 48091
PERSONNEL: Day, President; William J. Orley, Vice President/Sales Manager
DESCRIPTION: Manufacturer of coaxial cable connectors. Distributor of drop hardware and drop cable.

Arrow Fastener Co. Inc.(201) 843-6900
 271 Mayhill St.
 Saddlebrook, NJ 07662
PERSONNEL: Allan Abrams, President; Barry Knispel, Vice President
DESCRIPTION: Stapling machines, consisting of staple guns, hammer tackers, plier-type staplers, desk staplers, and staples.

Arter & Hadden(202) 775-7100
 1919 Pennsylvania Ave. NW
 4th Fl.
 Washington, DC 20006
PERSONNEL: Howard M. Liberman, Attorney; Ernest T. Sanchez, Attorney; J. G. Bentley, Attorney
DESCRIPTION: All aspects of communications and entertainment law.

Augat/Broadband Engineering Inc.(305) 747-5000
 WATS (National)(800) 327-6690
 1311 Commerce Lane
 Jupiter, FL 33458
PERSONNEL: Bill Ellis, President; Chuck Wise, Vice President Engineering; Sherwood Holly, National Sales Manager
DESCRIPTION: Manufacturer of full line of one- and two-way house drop and apartment amplifiers and trunk amplifiers for CATV systems. Also manufactures line of one- and two-way data amplifiers. The leading manufacturer of replacement electronics for upgrading CATV system performance. CATV industries largest independent supplier of replacement components.

Automation Techniques Licensed(918) 836-2584
 (918) 836-8348
 1539 105th E Ave.
 Tulsa, OK 74116
PERSONNEL: Denise Thompson, Marketing

buyers' guide

Avcom of Virginia

Director
DESCRIPTION: Manufactures a complete line of satellite receivers and systems for the cable and TVRO industries.

Avcom of Virginia Inc.(804) 794-2500
WATS (Nat'l-Orders).....(800) 446-2500
 500 Southlake Blvd.
 Richmond, VA 23236
PERSONNEL: Andrew Hatfield, President;
 Linda Abshire, Sales Manager
DESCRIPTION: Manufacturers of satellite receivers, accessories, and test equipment for SMATV and TVRO.

Avpro Inc.(207) 985-3511
 PO Box 176
 Kennebunk, ME 04043
PERSONNEL: Lewis M. Marcy, President;
 James M. Marcy, Vice President
DESCRIPTION: Media broker and consultant.

Avtec Industries Inc.....(201) 882-9460
 5 Audrey Place
 Fairfield, NJ 07006
PERSONNEL: James Gore, President; Donald S. Jaquin, Sales Manager
DESCRIPTION: Avtec designs, engineers and provides full turnkey installations for A/V TV teleconferencing, and local area network systems. Also specializing in industrial, video and broadcast equipment sales.

Baker, Joseph E.....(213) 749-7120
 3500 S Figueroa St.
 Los Angeles, CA 90007
PERSONNEL: Joseph E Baker, President
DESCRIPTION: Telecommunications attorney.

Bashlin Industries(412) 458-8340
 119 W Pine St.
 PO Box 867
 Grove City, PA 16127
PERSONNEL: J. A. Schell, President; W. W. Schell, Vice President; D. B. Elliot, Sales Manager
DESCRIPTION: The following items are shown in our #580 and #821 Catalogs: Linemen's and industrial belts and harnesses, pole straps, lanyards, pole and tree climbers, straps and pads, linemen's and electrician's holsters, and many other items associated with linemen and construction workers who have to be secured in high places.

Belmont Satellite(512) 875-9211
 PO Box 1171
 Luling, TX 78648
PERSONNEL: David Moore, President; Stanley Biggs, Sales Manager
DESCRIPTION: Sales and construction of major brand equipment. Examples: Stardish, Chapparrel, DX, Triple Crown, Cadco, Jerrold, General Instruments, Norsat and SDS.

Benner-Nawman Inc.....(707) 746-0500
WATS (National).....(800) 851-4043
 3070 Bay Vista Court A-1
 Benicia, CA 94510
PERSONNEL: William O. McKenna, President;
 E. R. Kientz, Vice President; J. T. Keely, Sales Manager
REGIONAL OFFICES: 12375 SE Main,
 Portland, OR 97233, (503) 254-6447; 517 Pinewood Lane, Los Gatos, CA 95030, (408) 374-4933; 122 N

Arden Blvd., Los Angeles, CA 90004, (213) 466-5787; 95 Navaho Trail, Pine, CO 80407, (303) 838-4758; 210 N Sleight, Naperville, IL 60540, (312) 355-6777; PO Box 38, Point, TX 75472, (214) 447-2505; 1316 Sumar Rd., Birmingham, AL 35213, (205) 591-1459; 12260 Herold Dr., Northhuntingdon, PA 15642, (412) 864-0414; 310 N Greene Ave., Lindenhurst, NY 11757, (516) 884-6684.

DESCRIPTION: Benner-Nawman manufactures termination and distribution service cabinets and specialty tools. These products are sold through national CATV distributors.

Bill K. Webb, Inc.(214) 528-4820
 Two Turtle Creek Village
 Ste. 1128
 Dallas, TX 75219
PERSONNEL: Bill K. Webb, President; Brenda Collis, Sales Manager
DESCRIPTION: Complete insurance brokerage and consulting services. CATV insurance packages including bonds, workers' compensation, liability, automobile, CATV property floaters and employee benefits.

Birchwind
 Infosystems Ltd.(519) 925-3897
 RR4
 Shelburne, Ont. L0N 1S0
PERSONNEL: Keith Thompson, President
DESCRIPTION: Birchwind offers a number of data processing services. These include cable TV billing and A/R software, service bureau operations, systems consulting, records management, automated document image storage and retrieval.

Biro Engineering.....(609) 883-9866
 Box 2175
 Princeton, NJ 08543-2175
PERSONNEL: Steven I. Biro, President; Judith M. Biro, Vice President
DESCRIPTION: Consulting engineers for the CATV industry, performing engineering appraisals of CATV systems, annual FCC proof of performance tests and measurements, TVRO installation proofs and troubleshooting, on-site terrestrial microwave interference measurements and small earth-station placement, off-air TV signal surveys, computerized FM frequency coordination studies, computer printed-computer calculated antenna-array designs.

Blair, Joyce & Silva(202) 659-4230
 1825 K St. NW
 Washington, DC 20006
PERSONNEL: Forbes W. Blair, Partner
DESCRIPTION: Communications attorneys. Representation of cable companies before the Federal Communications Commission.



Blonder Tongue Laboratories Inc.(201) 679-4000

One Jake Brown Rd.
 Old Bridge, NJ 08857
PERSONNEL: Ben H. Tongue, President; Issac S. Blonder, Chairman of the Board; Daniel Altieri, Vice President; Anthony Bruno, Vice President; James F. Fitzpatrick, Vice President; Marin Siskel, Vice President; Glen Tongue, Vice President; Ed Curreri, Sales Manager, Chuck Fitzer, Sales Manager; Glenn Stawicki, Sales Manager
DESCRIPTION: Manufacturer of pre-fabricated headends, antennas, downconverters, earth station receivers, low noise amplifiers, channel converters, modulators, demodulators, power supplies, off-premise systems, scramblers, encoders, audio processors, signal processors.

Bonneville
 Satellite Corp.(801) 534-8030
 19 West South Temple
 3rd Fl.
 Salt Lake City, UT 84101
PERSONNEL: Bruce Hough, Vice President/
 General Manager
REGIONAL OFFICES: Washington, DC 20001, (202) 737-4440; Los Angeles, CA 90028, (213) 467-7082; San Diego, CA 92123, (619) 569-8451; 485 Madison Ave., 3rd Fl., New York, NY 10022, (212) 935-5150
DESCRIPTION: Provide distribution of news programming via satellite for numerous domestic and international broadcasters. Offer blend of production and distribution possibilities for broadcasters. Uplink, downlink services, microwave and engineering capabilities, also sell satellite hardware.

Bose Associates Inc.....(609) 429-3170
 422 Lavender Hill Dr.
 Cherry Hill, NJ 08003
PERSONNEL: Swapan K. Bose, President; D. Guha, Vice President
DESCRIPTION: Engineering & management services for the CATV & SMATV industry.

Boudreau
 and Associates(415) 326-5151
 1025 Harker Ave.
 Palo Alto, CA 94301
PERSONNEL: James Boudreau, CEO; James R. Corcoran Jr., Sr. Partner; Susan Legare, Partner
DESCRIPTION: System underwriting and brokerage, investment banking, new business development analysis, financial feasibility studies, strategic planning formulations, acquisition and merger analysis, lease and contract analysis, business plan and program support development. ITFS/MDS/MMDS/SMATV consolidations.

Brad Cable.....(800) 382-2723
 1023 State St.
 PO Box 739
 Schenectady, NY 12301
PERSONNEL: Ben E. Price, President; James F. D'Allaird, Vice President Operations; Robert R. Price, Senior Vice President/Sales Manager
REGIONAL OFFICES: 4630 Pacific Hwy. E, Ste. B-7, Fife, WA 98424, (206) 922-9011; 5906 Breckenridge Pkwy, Ste. I, Tampa, FL 33610, (813) 623-1721
DESCRIPTION: Converter service for most major brands including Jerrold and Oak addressable. CATV equipment repair. Converter sales of new and refurbished units.

buyers' guide

C-COR Electronics, Inc.

Broadband Engineering Inc.(305) 747-5000
WATS (National)(800) 327-6690
 1311 Commerce Lane
 Jupiter, FL 33458
PERSONNEL: William H. Ellis, President; Leo C. Wise, Vice President Engineering; Sherwood Holley, National Sales Manager; Don Donahue, Manufacturing Manager
DESCRIPTION: Manufacturer of apartment and house drop amplifiers, trunk amplifiers, headend amplifiers, line extenders, data network amplifiers. Replacement electronics for upgrading existing systems. Distributor of CATV replacement components.

Browne, Bortz & Coddington, Inc.(303) 321-2547
 155 S Madison
 Ste. 230
 Denver, CO 80209
PERSONNEL: Paul Bortz, Managing Director; Jack T. Pottle, Director
DESCRIPTION: Browne, Bortz and Coddington provides a wide range of research and consulting services to telecommunications industry clients including new business development analyses, financial feasibility studies, cable and broadcast property appraisals and strategic planning studies.

Budco

Budco Inc.(918) 252-3420
WATS (State)(800) 331-2246
Out of State Collect(918) 252-3420
 PO Box 3065
 Tulsa, OK 74101
 2004 N Yellowwood
 Broken Arrow, OK 74012
PERSONNEL: David Allen, Sales Manager
DESCRIPTION: Taplocks, single digit tags, panel tags, marking and identification products, barrel locks and retrofitting devices. Lemco distributor—Lemco is a manufacturer of construction and installation equipment for the CATV industry.



**BURNUP & SIMS
 CABLE PRODUCTS
 GROUP COMPANY**

Burnup & Sims Cable Comm. Inc.(404) 482-7612
 6440 Hillandale Dr.
 Lithonia, GA 30058
PERSONNEL: Robert S. Long, President; Larry E. Wallace, Senior Vice President; Phil McDonald, Vice President Eastern Operations; Mike Gepford, Vice President Western Operations
REGIONAL OFFICES: 900 Mariposite Lane,

Placerville, CA 95667, (916) 622-7762; PO Box 36, Adelphia, NJ 07710, (201) 462-8700; PO Box 537, Athens, GA 30603, (404) 353-1159
DESCRIPTION: National CATV construction. Whether you're building a new system, extending your plant, or planning a major turnkey rebuild, call the company that has installed more than 100,000 miles of quality CATV plant.

Burst Communications Inc.(303) 773-9499
 7310 S Alton Way
 Ste. C
 Englewood, CO 80112
PERSONNEL: John H. Burrell, President/Sales Manager/Personnel; Jeffrey H. Stanfield, Vice President/Sales Manager; Stanton D. Bennett, Vice President
DESCRIPTION: Television System Engineers—Products include IKEGAMI, Grass Valley Group, ABEKAS, and many others. We design and sell complete television production systems including studio facilities and mobile units.



Business Systems Inc.(803) 297-9290
WATS (National)(800) 424-0101
 One Marcus Dr.
 Greenville, SC 29615
PERSONNEL: Larry Edwards, President; Jack Sunderman, Vice President/Sales; Jann Ratts, Vice President/Communications
DESCRIPTION: In-house, real-time computerized billing and management system featuring an interface to addressable converters and taps. Also standalone pay-per-view automation system including complete ANI interface capabilities.

Bytex Corporation(602) 948-3702
 8711 Tinnacle Peak Rd.
 Scottsdale, AZ 85255
PERSONNEL: Svend Erik Kiel, President/Sales
DESCRIPTION: A pay-per-day and pay-per-view system for hotels, motels and hospitals.

CADCO Inc.(214) 271-3651
 2706 National Circle
 Garland, TX 75041
PERSONNEL: W. T. Barnhart, President; Jennett Magee, Vice President; Bill Smith, Sales Manager
DESCRIPTION: Manufacturer of headend equipment for both CATV and SMATV.

CASAT Technology, Inc.(603) 880-1833
 6 Northern Blvd.
 Unit 5
 Amherst, NH 03031
PERSONNEL: Hong Yu, President; Sai Kwok, Vice President



CASAT TECHNOLOGY, Inc.

DESCRIPTION: CASAT Technology, Inc. is an innovative telecommunications and data communications equipment manufacturer. Present products include splitters, frequency synthesized modulators, active combiners, hot-standby redundancy switch, solid state A/B switches and FM stereo block converters. CASAT Technology Inc. also provides OEM subcontracts.

CATEL Telecommunications, Inc.(415) 659-8988
 4050 Technology Place
 Fremont, CA 94537
PERSONNEL: Frank A. Genochio, Vice President; George Benton, Vice President/Sales; Wendell Woody, Field Sales Manager; Don Wyckoff, Western Regional Manager; Ron Jones, Eastern Sales Manager
REGIONAL OFFICES: 1900 Erie, Ste. 203, Kansas City, MO 64116, (816) 474-4289; 4 Wheeler Terrace, Marietta, NY 13110, (315) 636-8488
DESCRIPTION: CATEL is a leading manufacturer of TV modulators, demodulators, converters and FM transmission equipment for CATV, CCTV, TV Broadcast and similar applications. CATEL products include equipment, microwave subcarrier products and stereo modulators for local studio application.

CATV Design Associates, Inc.(512) 444-2461
 PO Box 33010
 Austin, TX 78764
DESCRIPTION: Computer aided new and rebuild design, as-built mapping, strand mapping drafting services, equipment evaluations, and on-site consultations.



CATV Subscriber Services, Inc.

CATV Subscriber Services, Inc.(919) 273-5553
 108 State St., #102
 Greensboro, NC 27408
PERSONNEL: Raymond L. Galtelli, President; Josephine R. Galtelli, Vice President; G. F. Haisman, General Manager, Construction Division; J. F. Robertson, Vice President/Operations
DESCRIPTION: Providing full-service capability for mapping, design/engineering, construction, marketing, installation and consultation on individual or turnkey contracts basis.

C-COR Electronics, Inc.(814) 238-2461
WATS (National)(800) 233-2267

buyers' guide

CE & S Collier Engineering

Cable Films

60 Decibel Rd.
State College, PA 16801
PERSONNEL: Richard E. Perry, President/
CEO; Jack B. Andrews, Vice President Finance/
Treasurer; Mark Robertson, Vice President
Operations & Manufacturing; John A. Hastings,
Manager Cable TV; Arthur B. (Mick) McGuire,
Vice President Sales & Marketing; C.J. Horton,
Product Manager/Data Distribution; Steve
Bulick, Product Manager/Cable TV; Jeffrey A.
Harrison, Marketing Manager/Power Products
REGIONAL OFFICES: 4938 Dana Dr.,
Kennesaw, GA 30144, (404) 928-6922; 509
Burgess St., Philadelphia, PA, 19116, (215) 934-
5654; 9024 Vena Ave., Arleta, CA 91331, (818)
767-3483; 1721 West Plano Pkwy., Ste. #201,
Plano, TX 75075 (214) 578-4758
DESCRIPTION: Manufacturer of distribution
amplifiers, main line passives, terminal products
and power supplies for cable TV systems and local
area networks.

CE&S Collier Engineering
and Support(301) 948-5931
PO Box 5086
Laytonsville, MD 20879
PERSONNEL: Richard K. Collier, President;
Terry H. Collier, Vice President
DESCRIPTION: Construction consultants
specializing in design for buildability and
construction supervision. Proof of Performance
Testing. RF Systems for CATV, SMATV and
Local Area Networks.

COM SE(404) 962-1020
WATS (National)(800) 241-1232
PO Box 645
Lawrenceville, GA 30246
PERSONNEL: Alice Weeks, President; John
Weeks, Vice President; Rebecca Thornton, Sales
Coordinator
REGIONAL OFFICES: 2102 Anne Ave.,
Panama City, FL 32407, (904) 234-2805; 6112
Eagles Nest Dr., Jupiter, FL 33458, (305) 747-
3647; 317 25th St. NW Fayette, AL 35555, (205)
932-7264
DESCRIPTION: Manufacturers' representative
in the Southeast United States for Wavetek,
Catel, Quality RF Services, Data Transmissions
Devices, Video Tape Systems, and
Telecommunications Products, Inc.

COM-TEK(415) 785-4790
28310 Industrial Blvd. #H
Hayward, CA 94545
PERSONNEL: Nick Ferolito, Owner/Sales;
Russell Brown, Owner/Sales; Darrell Rance, Sales;
Tom Robins, Sales
DESCRIPTION: COM-TEK buys and sells new
and used surplus equipment for CATV and
SMATV. Also are a complete repair facility.
Manufacturer's representative for Standard
Communications, Quality RF Services, ISS
Modulators, Multi-Link and others.

CWY Electronics Inc.(317) 448-1611
WATS (State)(800) 382-7526
WATS (National)(800) 428-7596
405 N Earl Ave.
PO Box 4519
Lafayette, IN 47903
PERSONNEL: William Whiteley, President;
Terry French, Vice President; Wendell Whitaker,
Sales Manager

REGIONAL OFFICES: 337 Norborne, Dearborn
Heights, MI 48127, (313) 562-4982; 5320 Lobo Dr.,
Indianapolis, IN 46237, (317) 786-8420
DESCRIPTION: Manufacturer of metal
products including equipment racks, security
enclosures, pedestals and accessories.
Distributors of electronic, mechanical components
and products to the industrial and cable type
industries. Manufacturers' representative for
select brands regional area.

CZ Labs(914) 947-1554
WATS (National)(800) 423-2322
55 Railroad Ave.
PO Box 95
Garnerville, NY 10923
PERSONNEL: Harry Zipkin, President; Steven
Zipkin, Vice President; Martin Higgins, Sales
Manager
DESCRIPTION: Since 1959, CZ Labs has been a
manufacturer of quality cable and connectors and
miscellaneous hardware for the CATV, SMATV
and other related industries. As a small
manufacturer, we try to provide materials at a
reasonable price for the small systems installer as
well as larger contractors.

Cable AdNet, Inc.(215) 296-9000
350 Technology Dr., Ste. #1
Malvern, PA 19355
PERSONNEL: Wayne J. Bullock, President;
Robert F. Bower, Jr., Vice President; David
Kelley, Sales Director; Frank Icona, Director of
Business Development
REGIONAL OFFICES: 3 Valley Square, Ste.
272, Blue Bell, PA 19422, (215) 628-8600; 602
Popular Way, Carnegie, PA 15106, (412) 276-7200;
1900 Embarcadero St., Ste. 206, Oakland, CA
94606, (415) 261-4900; 229 Woodlawn Pkwy., Ste.
100, St. Louis, MO 63146, (314) 997-3898; 6407
Idlewild Rd., Ste. 431, Charlotte, NC 28212, (704)
537-8000
DESCRIPTION: Independent Turnkey operator
representing over 125 systems and over 1.4 million
subscribers nationwide. Provides insertion
equipment, marketing and sales to MSO's and
single system operators. Local & regional
advertising sales.

CableBus[®] SYSTEMS CORPORATION

CableBus
Systems Corp.(503) 643-3329
7869 SW Nimbus Ave.
Beaverton, OR 97005
PERSONNEL: George Green, President
DESCRIPTION: Manufacturer of interactive
cable communications hardware and software for
addressable networking and security systems.

Cable Call Corp.(301) 363-3000
10324 S Dolfield Road
Owings Mills, MD 21117
PERSONNEL: Barry V. Dennis, President
DESCRIPTION: Security systems-wireless RF
systems for subscribers including master

receivers, transmitters and accessories-low cost
turnkey program for operators, monitored and
non-monitored. Video signal switchers-electronic
low-loss, high isolation-subscribers. Stereo
synthesizers/TV to stereo adapters for
subscribers. Amplifiers 10 db amplifiers including
power transformer for subscribers.

Cable Catalog Inc.(607) 770-1985
139 Grand Ave.
Johnson City, NY 13790
PERSONNEL: David T. Hamblett, President;
Bruce A. Taylor, Vice President
DESCRIPTION: Cable Catalog Inc., will supply
any cable system with one minute per inquiry
commercial to be run on any local avails. Cable
Catalog pays the cable system a 15% commission
on all sales.

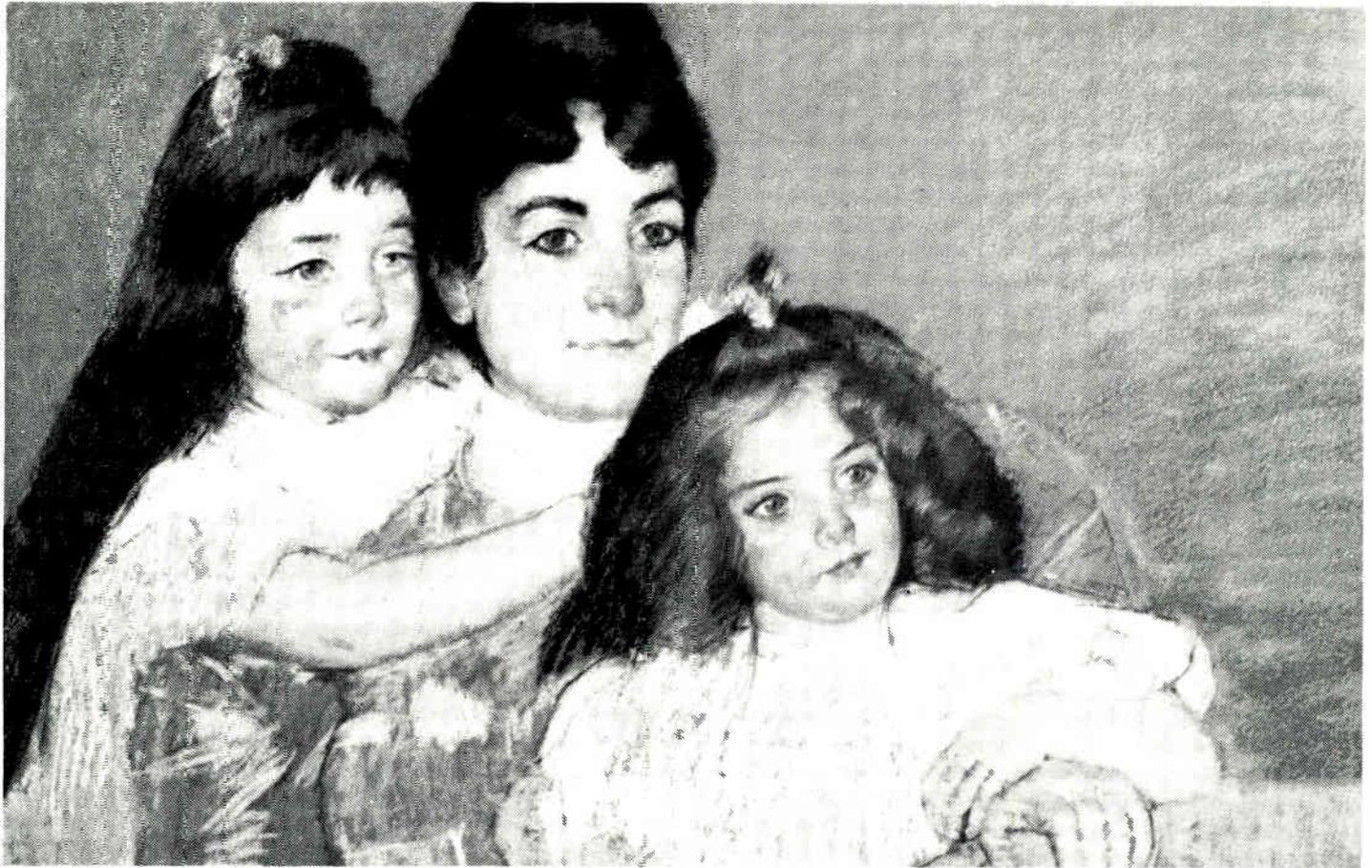
Cable Communications
Media, Inc.(215) 865-6600
203 E Broad St.
Bethlehem, PA 18018
PERSONNEL: Carl Kehler, President
DESCRIPTION: Publish specific, customized
cable program guides.

Cable Constructors Inc.(906) 774-6621
105 Kent St.
Iron Mountain, MI 49801
PERSONNEL: James Klungness, President;
James Brent, Vice President; John Jamar, Project
Engineer
DESCRIPTION: CATV CMATV construction,
engineering, design, mapping.

CableData(916) 636-4500
Sacramento, CA 95873
PERSONNEL: Robert J. Mathews, President;
Gerald S. Knapp, Sr. Vice President; David R.
Williams, Sr. Vice President; Maggie Wilderotter,
Vice President Sales & Marketing
REGIONAL OFFICES: 3781 NE Expressway,
#130, Atlanta, GA 30340, (404) 451-8200; 4950
Keller Spring Rd., Dallas, TX 75248, (214) 239-
8157; 1329 W 96th St., Indianapolis, IN 46260,
(317)844-0897; 390 Reed Rd., Broomall, PA 19008,
(215) 328-5000; 11020 Sun Center Dr., Rancho
Cordova, CA 95670, (916) 636-4666; 151 Amber
St., #1, Markham, Ontario, Canada L3R 3B3, (416)
477-3110; 35 Braintree Hill Park, Suite 106,
Braintree, MA 02184, 617-848-5100
DESCRIPTION: Leading provider of
management information systems for the cable
TV industry. Complete provider of the following
products and services: Software-DDP, Pay 80,
CableAccountant, Hardware-Tandem, QuickData;
bill processing and mailing; insert printing and
processing. Complete 24 hour customer support.

Cable Exchange(303) 694-6789
(303) 950-1088;
wait for tone—dial 222-539
PERSONNEL: Harold Bjorklund, President/Sales
Manager; Esther Lacy, Vice President
DESCRIPTION: Equipment and services
brokerage for new or used excess CATV,
broadcast or computer hardware or software.
VAR for ITT Personal Computer systems.
Authorized Jerrold distributor.

Cable Films(913) 362-2804
Country Club Station



Portrait Of Madame A.F. Alde And Her Two Daughters, 1899 — Mary Cassatt

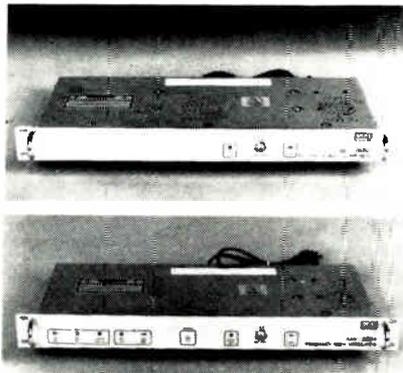
ARE YOU PAYING MUSEUM PRICES ONLY TO WAIT TO GET A PRODUCT THAT DOESN'T FIT YOUR PICTURE-PERFECT SYSTEM?

Casat Technology

provides the video modulation and combining equipment you need, when you need it, and at the price you want to pay for it.

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6 Northern Blvd., Unit 5, Amherst, NH 03031
To Order , Call (603) 880-1833

Reader Service Number 27

buyers' guide

Cable Link

Kansas City, MO 64113
PERSONNEL: Herbert Miller, Executive Vice President; Todd Randall, Operations Manager
DESCRIPTION: Established in 1976. Provides feature films, newsreels and documentaries for L/O, pay-cable, stand alone systems, PPV and satellite delivery. All programming available on 3/4" and 1" tape as well as 1/2" if desired, in all formats. Motion pictures available internationally on PAL or SECAM formats and 16mm prints. Dubbing facilities are available.

Cable Link(614) 221-3131
 280 Cozzins St.
 Columbus, OH 43215
PERSONNEL: E. Jack Davis, President; Bill Holehouse, Sales Manager; Linda Habig, Stan Smith, Scott Heeter, Fritz Juskalian, Sales Representatives.
DESCRIPTION: Sales of new and refurbished converters, distribution electronics, passive devices and hardware. Large, centrally located repair facility for converters, distribution electronics headend and test gear.

Cable Man, Inc.(601) 374-5832
 1213 E Sixth St.
 PO Box 393
 Biloxi, MS 39533
PERSONNEL: David A. Gary, President/Sales Manager; Walter J. Gary, Vice President/Sales Manager; Greg Eleuterius, Sales Manager
DESCRIPTION: Aerial construction; underground construction; drop installation; strand mapping; engineering; design; tap audits; marketing; multi-unit post or prewire; rebuilds; upgrades; turn-key construction; consulting on system acquisitions.

CABLE POWER INC.

A Time Crafted Product

Cable Power, Inc.(206) 882-2304
WATS (National)(800) 387-3205
 14860 NE 95th St.
 Redmond, WA 98052
PERSONNEL: Charles J. Evans, President; Werner Krajicek
REGIONAL OFFICES: 601 Fairway Dr., Deerfield Beach, FL 33442, (305) 429-0870
DESCRIPTION: Manufacturer of all types of power supplies.

Cable Publications Inc.

Cable Publications Inc. (CPI)(617) 574-9400
 332 Congress St.
 Boston, MA 02210

PERSONNEL: J. Robert Livingstone, President; James Ballard, Vice President, Sales/Marketing; Joel A. Berger, Vice President, Advertising Sales.
DESCRIPTION: Cable Publications Inc. is the second largest publisher of program guides in the industry. CPI currently publishes over 2.5 million totally customized guides each month. The company provides complete flexibility in format design.

Cable Search
 Associates(312) 369-2620
 PO Box 2347
 Naperville, IL 60566
PERSONNEL: Wick Kirby, President
DESCRIPTION: Executive search and placement firm specializing in areas of operations, engineering, marketing, franchising, and construction.

Cable Security
 Systems, Inc.(205) 821-0745
 621 Stage Rd.
 PO Box 2066
 Auburn, AL 36831
PERSONNEL: Curt B. Cope, President; Mike W. Springer, Sales Manager
DESCRIPTION: Manufacturers of The Beast TM high security apartment boxes—Eliminates theft of Service—reduces maintenance—OPTIONS: QUICK RACK: Organizes box by separating and identifying subscribers leads. PERFORATED MOUNTAINING PLATE: Restriction free installation—box mounts over plate after wiring. CONTRACTOR LOCK AND RESTRICTED KEYWAY: Complete key control. WE BUILT BETTER BOXES. Distributors of U-guard, Gould-GNB Batteries. Sell pad-locks.



Cable Services Company Inc.

Cable Services Co., Inc.(717) 323-8518
WATS (National)(800) 233-8452
WATS (State)(800) 332-8545
 2113 Marydale Ave.
 Williamsport, PA 17701-1498
PERSONNEL: John B. Roskowski, President; George Ferguson, Vice President; John T. Kurpinski, Director of Marketing; Harry Wahl, Turnkey Administrator; Barry Siegfried, Sales Manager
DESCRIPTION: Complete turnkey supply & construction including pole walking, strand mapping, design, engineering and installations both aerial and underground. Stocking distributor of most all major manufacturers, plus on premise repair facility.

Cable SportsLine(918) 665-6690
WATS (National)(800) 331-4806
 3801 S Sheridan
 Tulsa, OK 74145
PERSONNEL: Roy Bliss, Executive Vice President; Jeff Treeman, Vice President Sales and Mktg.; Chris Bourne, National Sales Manager; Reuben Gant, National Sales Director

DESCRIPTION: Cable SportsLine (on Galaxy I, Transponder 3, Sub-carrier) is a sports forecasting service that provides point spreads from Las Vegas for all major professional and college sports. It is available to systems carrying Cable SportsTracker.

Cable SportsTracker(918) 665-6690
WATS (National)(800) 331-4806
 3801 S Sheridan
 Tulsa, OK 74145
PERSONNEL: Roy Bliss, Executive Vice President; Jeff Treeman, Vice President Sales and Marketing; Chris Bourne, National Sales Manager; Reuben Gant, National Sales Director
DESCRIPTION: Cable SportsTracker (on Galaxy I, Transponder 3, Sub-carrier) is a 24 hour, satellite-delivered total sports information service. With Cable SportsTracker you can receive the most recent sports scores, news results from horse racing and schedules, even before the major networks do.

Cable System
 Survey Co.(302) 368-2436
 17 Peddler's Row
 Newark, DE 19702
PERSONNEL: Thomas N. Tetreault, President
DESCRIPTION: The company provides technical services to cable television operators, vendors and contractors seeking to build or rebuild CATV Systems. Some of the services the company provides includes strand mapping, make ready surveys, as built mapping, base map system, a full line of drafting and graphic services, computer aided design, house counts, tap audits and other specialized technical services and/or consultations.

Cable Terminal
 Services Inc.(512) 258-1606
 7208 McNeil Dr.
 Austin, TX 78729
PERSONNEL: Bill Jenkins, President; Jim Orwick, Vice President/Sales Manager
DESCRIPTION: We repair converters for cable systems throughout the United States. Authorized Jerrold Warranty service center, and authorized out of warranty for Hamlin converters.

Cable TV Contracting(816) 966-1736
 9321 Fairwood Dr.
 Kansas City, MO 64138
PERSONNEL: Ken Hathorn, President
DESCRIPTION: Design, construction, splicing activation, prewiring and postwiring.

Cable TV Supply Co.(213) 202-2700
 5922 Bowercroft St.
 Los Angeles, CA 90016
PERSONNEL: George Acker, Chairman; Mark Engler, President; William Kremasky, Vice President Sales; Fred Bergamo, Vice President Finance; Carl Richard, Sales Manager; Steve Brazil, Sales Manager; Terry Hill, Sales Manager; Jim Snow, Sales Manager; John Hogue, Sales Manager; Sam Elliott, Sales Manager; Tim Orzech, Sales Manager; Steve Egerer, Sales Manager; Bill Martin, Sales Manager; Paul Knitter, Sales Manager; Bob Foote, Sales Manager; Al Smith, Managing Director
REGIONAL OFFICES: 5922 Bowercroft St., Los Angeles, CA 90016, (213) 202-2700; 1420 N Post Oak Rd., Houston, TX 77055, (713) 681-6141; 250 Gerri Lane, Addison, IL 60101, (312) 543-9800;

buyers' guide

Cinemax/HBO

8060 Snowville Rd., Brecksville, OH 44141, (216) 526-0919; 1610 W Evans Ave., Unit H, Denver, CO 80110, (303) 922-4589; 5342 Morse Dr., Decatur, GA 30035, (404) 981-9220; 1200 Taylor Lane, Unit 1A-4, Cinnaminson, NJ 08077, (609) 829-0100; 1110 Ave. H E, Arlington, TX 76011, (817) 640-0912; 35 Industrial Pkwy, Woburn, MA 01801, (617) 938-1221; Springfield The Ridge, Epsom, Surrey, kt18 7et, England
DESCRIPTION: Leading national supplier of virtually all products used to build and maintain cable television systems. Ships quickly through nine strategically-located, computer-linked distribution centers. Also supplies products, systems and support to SMATV, home satellite markets, and other communications markets through sister companies. Manufactures some products. Has sales representation in the United Kingdom.

Cable West Corporation(303) 741-5000
 6767 S Spruce St.
 Ste. 100
 Englewood, CO 80112
PERSONNEL: Robert A. Krebs, President
DESCRIPTION: Cable West Corporation is a full service contractor with expertise in underground and aerial construction, MDU, postwire and drop installations, splicing and activation. We have built systems in a variety of terrains.

Cabletenna Corp.(201) 238-7660
 12-4 Edgeboro Rd.
 East Brunswick, NJ 08816
PERSONNEL: Andy Wang, President
DESCRIPTION: Cabletenna Corp. manufactures and supplies cable converters, splitters and matching transformers for CATV and MATV applications.

Cabletrax(516) 883-0121
 52 Main St.
 Port Washington, NY 11050
PERSONNEL: Douglas Wood, President; Kate Corrigan, Sales Manager
DESCRIPTION: Designed exclusively for cable systems, this new production music package provides the best in available music for all possible uses. The unique pricing of CABLETRAX makes quality music available to even the smallest of the cable systems. Available on either stereo album or tape. Prices include all clearances.

Cablevision Equipment Co.(214) 272-8551
 3838 Cavalier Dr.
 Garland, TX 75042
PERSONNEL: George Gunter, Owner; Dominick Sinopoli, Sales Manager
DESCRIPTION: Sales of CATV supplies and equipment repair of CATV equipment.

Cajon Cable Co., Inc.(602) 583-8746
 2-F
 Phoenix, AZ 85017
PERSONNEL: Dubea M. Kemp, President
DESCRIPTION: RDU installations from subscriber drop placement to full turnkey, including drop transfer, drop change-out, subscriber equipment change-out, trapping, system audit, pre/post wire (all facets), concrete and asphalt cutting (for subscriber drop),

underground construction, system maintenance, consulting and training.

Camex, Inc.(212) 682-8400
 489 Fifth Ave.
 New York, NY 10017
PERSONNEL: Victor Benedetto, President;
 Roger Raimond, Sales Manager
DESCRIPTION: Provide programming in all areas for basic, pay cable, subscription TV, DBS, and pay-per view.

Capitol Production Music(213) 461-2701
WATS (National)(800) 421-4163
 1750 N Vine St.
 Hollywood, CA 90028
PERSONNEL: Ole Georg, National Director;
 David Nelson, Marketing Representative
DESCRIPTION: Production Music Libraries.

Carolina Galvanizing Corp.(919) 944-2171
WATS (National)(800) 334-2156
WATS (State)(800) 682-8029
 PO Box 487
 Aberdeen, NC 28315
PERSONNEL: Richard Craven, President; Bob Knorr, Vice President Sales; Forrest M. Kirk, Sales Manager
DESCRIPTION: Manufacture galvanized and copper-bonded grounding rods and accessories.

Centel Supply Co.(402) 475-6622
 1033 O St.
 PO Box 82575
 Lincoln, NE 68501
PERSONNEL: Robert Nichols, President
REGIONAL OFFICES: 1342 Interstate 35E, Carrollton, TX 75006, (214) 242-1455; 16215 Marquardt Ave., Cerritos, CA 90701, (213) 9296-5911
DESCRIPTION: Distributor of a complete line of cable TV products—(cable, hardware, pedestals, connectors, taps and passives, line extenders, trunk amplifiers, satellite receivers, modulators, antennas, etc.).

Channel Master(919) 934-9711
 Industrial Park Dr.
 Smithfield, NC 27577
PERSONNEL: Sylvester Herlihy, President; Richard Deutsch, Vice President; Donald Berg, Vice President; Steve Dozier, Sales Manager
Micro-Beam: David Waddington, Sales Manager
DESCRIPTION: Manufacturers of Micro-Beam (TM) CARS-band multichannel microwave relay systems. Assistance with path feasibility studies, FCC compliance, path alignment and installation provided for clients. Also manufacturers of CATV satellite headend gear, including dishes, receivers, modulators, combiners, etc., as well as distribution equipment including wall taps, cable, connectors, directional couplers, apartment and house-drop amplifiers, and a complete line of MATV equipment and tools.

Channematic, Inc.(619) 445-2691
 821 Tavern Rd.
 Alpine, CA 92001
PERSONNEL: Bill Killion, President; Tom Walsh, Executive Vice President; Vern Bertrand, Sales Manager; Dwain Keller, Marketing Manager
REGIONAL OFFICES: 5200 Chicago Ave. Ste.

F-4, Riverside, CA 92507, (714) 686-8020; 6885 Xavier Circle #3, Arvada, CO 80003, (303) 650-5695; 549 Park Ave., Prairie Du Sac, WI 53578, (608) 643-2415, (800) 231-1618; 54 Harvard Road, Fair Haven, NJ 07701, (201) 747-5122; 6 Clarendon Place, Avondale Estates, GA 30002, (404) 289-4834
DESCRIPTION: Fully automatic random access and linear VCR commercial insert systems, programmable video cassette changer and multiple VCR playback systems for local origination, various standard modules to provide video switching, machine control and signal processing for custom systems. Complete turnkey installed systems are available.

Channel One, Inc.(617) 969-1113
 23 Farwell St.
 Newton, MA 02160
PERSONNEL: Fred Hopengarten, President; Norman Priebatsch, Vice President
DESCRIPTION: Retrofit motorization kit for Microdyne 5 meter antennas and Prodelin 5 meter antennas. Modification to M/A-COM VR Receivers for Video Cipher II.

Channel One Video Corp.(604) 421-2288
 2965 Bainbridge Ave.
 Burnaby, B.C. Canada V5A 2S9
PERSONNEL: Peter van der Gracht, President; Jerry Clarks-Ames, Sales Manager; Todd Carter, Marketing Manager; Calvin Corbett, Sales Rep.; Sid Copido, Sales Rep.; Marc Phillips, Vice President/Sales Manager
DESCRIPTION: Channel One is a leading distributor to the Cable Television Industry and a pioneer in CATV supply. We are committed to supplying the highest quality products and service. With four engineering technologists on staff and a technically trained sales team dedicated to excellent service, Channel One can supply all your needs in service, equipment and repair.

Charisma Productions Ltd.(212) 832-3020
 32 E 57th St.
 New York, NY 10022
PERSONNEL: James W. Grau, President/Producer; Lorraine Hartigan, Vice President; James W. Barry Grau, Sales Manager
DESCRIPTION: A production/design company with the experience of six National Emmys, U.S. distributors of VIDDIOM/Synthavision, specializing in computer effects library, offering a wide range of custom production and first run programming.

Cinemax/HBO(212) 512-1000
 1100 Sixth Ave.
 New York, NY 10036
PERSONNEL: Joseph Collins, President
REGIONAL OFFICES: 12750 Merit Dr., L.B. 44, Dallas, TX 75251, (214) 387-8557; Century Pk. E., #4170, Los Angeles, CA (213) 201-9200; 630 Bruch St., San Francisco, CA 94108; (415) 986-3360; 380 1 E Florida Ave., Pi3, 242100, Denver, CO 80210, (303) 758-5700; 347 Lenox Rd. NE, Atlanta, GA 30326, (404) 233-2120; 9401 Indian Creek Pkwy., #900, Overland Park, KS, (913) 381-8065
DESCRIPTION: Commercial-free first run

buyers' guide

Claire Stern Associates Inc.

movies, exclusive entertainment specials, sports and theater presentations.

Claire Stern Associates Inc......(212) 719-4550
1466 Broadway
Ste. 1505
New York, NY 10036
PERSONNEL: Claire M. Stern, President
DESCRIPTION: Market studies, emphasis on needs and desires for entertainment and enhanced services; analysis of potential market, with recommendations for action; special expertise in translating technical language for non-technical persons, combining data supplied by marketing and engineering personnel; site-specific analysis of environmental impact, zoning, community attitudes and requirements of the FCC for microwave and satellite antennas.

Clear-Com Intercom Systems.....(415) 861-6666
1111 17th St.
San Francisco, CA 94107
PERSONNEL: Robert Cohen, President; Michael Goddard, Sales Manager
DESCRIPTION: Clear-Com is a distributed amplifier intercom system allowing hands-free, simultaneous, two-way (duplex) communication between all stations. Variety of main and remote stations available for permanent and portable uses with interfaces to other communication systems available.

Climate-Tel.....(414) 468-7300
1940 Berner St.
PO Box 8002
Greenbay, WI 54308
PERSONNEL: Gerald T. Schaetz, President
DESCRIPTION: We design and manufacture special air conditioning, heating and high efficiency air filter cleaning systems with built-in economizer for the Telecommunications Industry. The economizer utilizes (free cooling) outside air when outside temperature is below a given set point.

Cohen Insurance(212) 244-8075
225 W 34th St.
New York, NY 10001
PERSONNEL: Ron Cohen, President; Beryl Lenoff, Vice President; Michael Bennie, Vice President; Carolyn Norton, Sales Manager; Mary Savarese, Sales Manager (Los Angeles)
REGIONAL OFFICES: 1901 Avenue of the Stars, Los Angeles, CA 90067, (213) 277-6540
DESCRIPTION: Insurance brokers and consultants for the communications and entertainment industries.

Collier Corp.(301) 948-5931
PO Box 5086
Laytonsville, MD 20879
PERSONNEL: Richard Collier, President; Terry Collier, Vice President
DESCRIPTION: SMATV contractors specializing in turnkey or modified turnkey systems. Service includes: headends, underground plant, and apartment pre/postwiring.

Commercial Cable, Inc. (CCI).....(615) 894-2580
WATS (National)(800) 367-5742

7353 Lee Hwy.
Chattanooga, TN 37421
PERSONNEL: John J. Brady Jr., President; Richard D. Eidson, Vice President; Rhonda C. Boyd, Vice President; Lynn Brady, Secretary/Treasurer
DESCRIPTION: Commercial Cable Inc. manufactures a complete line of commercial insertion equipment as well as Automated Local Origination systems. Our speciality is computer control of videotape machines with very close tolerance vertical interval switching among machines and network sources. We also feature a very dependable verification system.

Commercial Electronics, Inc......(703) 386-9591
209 E Jackson St.
PO Box 484
Gate City, VA 24251
PERSONNEL: Robert G. Parsons, President; Archie Luther, Vice President/National Sales and Marketing Manager; V. Scott Shupe, Director of Engineering
REGIONAL OFFICES: 1810 Time Log Road, Aiken, NC 29801, (803) 649-6936; 4065 White Oak Lane, Lilburn, GA 30247, (404) 923-6274
DESCRIPTION: Commercial Electronics, Inc. offers engineering, system design and construction for SMATV and CATV systems. From feasibility studies to complete turnkey installations. Complete repair service for all associated equipment including video with a guaranteed three day turn around time.

Commercial Satellite Services, Inc......(608) 767-2542
WATS (State).....(800) 362-0777
WATS (National)(800) 424-6757
PO Box 446
Mazomanie, WI 53560
PERSONNEL: Douglas Schwartz, President; Laurel Schwartz, Vice President
DESCRIPTION: CSS provides complete commercial satellite system installations from feasibility studies to installation of equipment. Also a programming distributor for satellite entertainment in the hotel and motel industry. In business for 3-1/2 years.

Commercial Satellite Systems(415) 848-4331
2955 Russel St.
Berkeley, CA 94705
PERSONNEL: Rob Hurwich, President
DESCRIPTION: Distributes teleconferencing equipment and services. Provides SMATV consulting and development, video/RF equipment service and repair, on site microwave interference analysis and field engineering services. In addition to items listed above, CSS is a wholesale distributor of TVRO equipment and components.

Communications Design(609) 728-3418
1601 Black Horse Pike
Ste. 2
Turnersville, NJ 08012
PERSONNEL: Jeanne Held, President; Frank Held, Vice President
DESCRIPTION: Designers of CATV and SMATV systems. Also involved in MDUs (Multiple Dwelling Units).

Communication Resources Unlimited Inc......(918) 665-8484
6539 E 31st St., Ste. 6
Tulsa, OK 74145
PERSONNEL: Tom Belcher, President; Fileen Belcher, Vice President; Barbara Terry, Office Manager
DESCRIPTION: Telecommunications brokerage — acquisitions, mergers, financial placements for SMATV, CATV, radio and television stations.

Comsearch Inc.(703) 620-6300
11720 Sunrise Valley Dr.
Reston, VA 22091
DESCRIPTION: Engineering services for satellite earth stations. FCC licensing services, CARS band and 23 GHz services. Interference trouble-shooting and correction.

Comsonics Inc......(703) 434-5965
WATS (National)(800) 336-9681
1350 Port Republic Rd.
PO Box 1106
Harrisonburg, PA 22801
PERSONNEL: Warren L. Braun, President; Mark Barber, VP Repair Services; Glen Shomo, VP Product Development & Mfg.; Dick Shimp, VP Field Services; Dennis Zimmerman, Marketing; Wayne Bruffy, Sales/Marketing
REGIONAL OFFICES: Montreal, Quebec, Canada, (514) 322-5540
DESCRIPTION: Signal leakage detectors, field strength meters, coaxial relays, surge protectors, equipment repair service for: headend; TVRO and; test equipment field engineering services.

Comtech Antenna Corp......(305) 892-6111
3100 Communications Rd.
St. Cloud, FL 32769
PERSONNEL: Preston Windus Jr., President; Glenn Higgins, Vice President; Tom Christy, Sales Manager
DESCRIPTION: Comtech Antenna manufactures earth station antenna systems. SMATV antenna systems are available in 3.0, 3.8, 5.0 and 7.3 meters. Elevation over azimuth and polar mounts are available. Comtech also manufactures the offset antenna, a 2 degree spacing system for transmit applications. Transportable antenna systems are also available.

Conifer Corp......(319) 752-3607
1400 N Roosevelt
Burlington, IA 52601
PERSONNEL: John Von Harz, President; Gary Brotherson, Vice President; Jim Clark, Sales Manager
DESCRIPTION: Complete engineering and manufacturing of MDS, MMDS, ITFS, SMATV and TVRO receiving and distribution equipment.

Conley & Associates(914) 738-0196
784 Colonial Ave.
Pelham Manor, NY 10803
PERSONNEL: C. J. Conley, President
DESCRIPTION: Management consultants to the electronic media specializing in appraisals and valuations, strategic planning and feasibility studies; financial planning and financial restructuring; station/system management; operational evaluations/audits; marketing analysis and research; human resources development, executive recruitment and training; franchising/refranchising.

buyers' guide

DX Communications

Jerry Conn & Associates, Inc.

Jerry Conn & Associates, Inc......(717) 263-8258
WATS (National).....(800) 233-7600
WATS (State).....(800) 692-7370
 130 Industrial Dr.
 PO Box 444
 Chambersburg, PA 17201
PERSONNEL: Thomas P Carbaugh, President; David Showalter, Sales Manager; Sherri Nitterhouse, SMATV Sales Rep.
DESCRIPTION: Manufacturer's representative and distributor for many products in the CATV/SMATV industry, everything from drop materials to head-end electronics, and test equipment.

Connecticut CATV Construction & Maintenance.....(203) 342-1805
WATS (National).....(800) 222-2079
 14 Brownstone Ave.
 Portland, CT 06480
PERSONNEL: Charles Ferrara, President/Owner; Michael Ciaburri, Vice President
DESCRIPTION: Aerial and underground cable construction for CATV systems and telephone companies. SMATV, MATV and fiber optic installation.

Conrad Morris & Assoc. (C.M.A.).....(219) 563-8654
 35 W Market
 Wabash, IN 46992
PERSONNEL: Conrad Morris, President; Jon Morris, Vice President; Mike Higgs, Sales Manager
DESCRIPTION: A full service private staff. CATV brokering and consulting, management and marketing specialist. We offer services such as: market research, computer simulation, assistance in obtaining financing, business plans, united partnership assembled, project studies and financial analysis.

Contract Installers.....(414) 582-7087
 PO Box 1564
 Appleton, WI 54913
DESCRIPTION: Provide house installations (aerial-underground-rewire), apartment installations (prewire and postwire), install or remove traps and converters, tap audits and drop-change-over for system rebuilds.

Control-Com.....(404) 873-2298
 430 10th St., NW
 Dept. S-008
 Atlanta, GA 30318
PERSONNEL: Patrick H. Ryan, Jr., President; Donald A. Dufford, Vice President
DESCRIPTION: Builds equipment for off-premise addressability and hotel pay-per-view.

Control Technology Inc......(214) 272-5544
WATS (National).....(800) 527-1263
 1881 State St.
 Garland, TX 75042



PERSONNEL: Fred Ochsner, President; Tom Reed, Vice President; Stan Johnson, Sales Manager
DESCRIPTION: Manufactures and designs standby power supplies.

Converter Parts, Inc.(518) 875-6444
 PO Box 278, Rt. 20
 Esperance, NY 12066
PERSONNEL: Gary Rudolph, President; Peggy Rudolph, Vice President; Tom Johnson, Sales Manager
DESCRIPTION: Manufactures and sales converter parts.

Cooper-Rutler Associates Inc.....(609) 596-0057
 The Evesham Commons
 Ste. 200, 525 Rte. #73 S Route 1
 Marlton, NJ 08053
PERSONNEL: Edward T. Rutter, President; Howard D. Friedman, Vice President, General Counsel
DESCRIPTION: Cooper-Rutler Associates is a full service cable consulting company that provides financial, technical and franchising assistance.

Cordon and Kelly.....(202) 293-2300
 1920 N St. NW
 2nd Fl.
 Washington, DC 20036
PERSONNEL: Alfred C. Cordon, Partner; Dennis J. Kelly, Partner, Marie Riordan Kaplan, Associate
DESCRIPTION: Law firm providing service to AM, FM, TV and LPTV broadcasters. CATV, SMATV, MDS, MMDS and cellular clients.

Corinth Films Inc.....(212) 421-4770
WATS (National).....(800) 221-4720
 410 E 62nd St.
 New York, NY 10021
PERSONNEL: John M. Poole, President; Peter J. Meyer, Executive Vice President; Matthew Curtis, Vice President; Richard Evangelista, Vice President
DESCRIPTION: Corinth Television offers a wide variety of feature length (over 200 titles) and classic cartoons and comedy shorts (over 150); feature titles include foreign and American classic motion pictures, performing arts Ballet & Opera film; classic film adaptations of literary and dramatic classic.

Cra-Mac Cable Services, Inc.....(919) 764-2764
 PO Box 420
 Welcome, NC 27374
PERSONNEL: Gary W. Craven, President; Martha Craven, Vice President; Steve Stone, Vice President/Sales Manager.
DESCRIPTION: Complete construction services for aerial and underground, apartment wiring, installations and turnkey services.

Creative Management Systems Inc.(201) 341-6165
 PO Box 10
 213 Washington st.
 Toms River, NJ 08754
PERSONNEL: Morris Adler, President; Alan Meyer, Executive Vice-President; Gil Jacobs, Vice-President/Sales & Marketing; Richard Alfonso, Vice-President/Development; Ron Samuel, Vice-President/Customer Support; John Jonopulos, Western Region Sales Manager; George McQuire, Eastern Region Sales Manager
REGIONAL OFFICES: Western Regional Office: 1750 Montgomery St., San Francisco, CA 94111. (415) 954-8550, Eastern Regional Office: Park 80 West, Plaza II, Suite 200, Saddle Brook, NJ 07662. (201) 843-4889.
DESCRIPTION: CMS System 1-The easy to use, in-house, on-line subscriber management and billing system. System 1 automatically handles all customer service work, prints your bills, controls your addressable system, and provides marketing and management information in a timely manner. System 1 operates on the IBM System/36. CMS is an authorized value-added, re-marketer of the IBM System/36 family of computers.

Cummins-Allison Corp.
 Allison Div.(317) 244-2440
WATS (National).....(800) 245-8270
 PO Box 102
 Indianapolis, IN 46206
PERSONNEL: Robert I. Hofmann, President; Richard A. Lippitz, Vice President, John M. Mentzer, Vice President/Sales Manager
DESCRIPTION: Manufactures payment books for billing systems. Computer prepared MICR/OCR, perforated and HAND PUNCH, Books both stock and print-to-order. Company also manufactures check signing and endorsing equipment, shredders, document marking and coin and currency handling equipment.

Cushcraft Corp.....(603) 627-7877
WATS (National).....(800) 258-3860
 PO Box 4680
 48 Perimeter Road
 Manchester, NH 03108
PERSONNEL: Robert W. Cushman, President/Sales Manager
DESCRIPTION: Cut to channel yagi antennas for off-air reception. Available for all VHF and UHF channels. There are 5 and 10 element models in heavy duty and superweight versions for severe environments. Cantilever mounting plus phasing harnesses are available for increased gain.

DGH Communication Systems Ltd.(416) 499-4746
 3761 Victoria Park Ave.
 Ste. 5
 Scarborough, ONT., Canada M1W 3S2
PERSONNEL: Derek G. Henry, President
REGIONAL OFFICES: 7333 Des Roseraies, Ste. 100, Montreal, Quebec, Canada H1M 2X6. (514) 354-6263
DESCRIPTION: Complete service to CATV, SMATV, TVRO and broadcast industry.

DX Communications.....(914) 347-4040
 10 Skyline Dr.
 Hawthorne, NY 10532
PERSONNEL: Hiro Sugiyama, President; Dick Gonzalez, Vice President; Yoki Matsumoto, Director Commercial Product Marketing; Tom

buyers' guide

Daburn Electronics and Cable Corp.

Electrohome Ltd.

Sharpe, Sales Manager
REGIONAL OFFICES: 1020 Hamilton Court, Menlo Park, CA 94025, (415) 325-7517
DESCRIPTION: Satellite receivers and down converters, modulators for CATV/SMATV headend systems.

Daburn Electronics and Cable Corp.(201) 768-5400
70 Oak St.

Norwood, NJ 07648

PERSONNEL: Howard Danziger, President; Randy Hibshman, Sales Manager
DESCRIPTION: Daburn supplies a complete line of wire and cable, shrink tubing, electronic hardware, fastening devices, retractile cords, modular cords, plugs and jacks, shielded braid, lacing cord, insulations and test lead wire. Special constructions are run with small minimums. Most orders are shipped within 24 hours.

Diamond Communication Products, Inc.(201) 789-1400
500 North Ave.

Garwood, NJ 07027

DESCRIPTION: Manufacturers of pole line and drop installation hardware for the telecommunications and cable TV industries enclosure division manufactures pedestals and enclosures for the telecommunications and cable TV industries. OEM stamping, wire forming, and mechanical galvanizing.

Donley International(713) 956-2984
7720 Blankenship St.

Houston, TX 77055

PERSONNEL: J.D. Thomas, President; Larry Burgeson, Sales Manager; Vic Castro, Sales
DESCRIPTION: Distribution of satellite and cable television equipment. Your headend is in stock including descramblers and 23 GHz Video Microwave link.



Drop Shop Ltd., Inc. East(201) 241-9300
WATS (National)(800) 526-4100
(800) 227-0700

PO Box 284
Roselle, NJ 07203

PERSONNEL: Dan Parsont, President; David Wank, Vice President/Sales; Lewis J. Lubell, Vice President Western Region, Carlton Swick, Vice President, Finance
REGIONAL OFFICES: 25024 Viking St., PO Box 4771, Hayward, CA 94545 (415) 887-7474
DESCRIPTION: All drop materials, cordless drills, apartment boxes, splitters, cable marking devices, house amplifiers, tools and specialty items—distributor and consultant to cable TV, Pay TV, MDS and STV markets; specialize in prompt delivery, VCR & stereo hook-up kits.

ECA/Manufacturing Division(918) 786-5349

PO Box 2029
Grove, OK 74344
PERSONNEL: Tony R. Bickel, President
DESCRIPTION: Manufacturer of cable television headend equipment. Custom design and manufacturers of microwave systems and troposcatter systems. Consultant to the CATV industry.

EEG Enterprises, Inc.(516) 293-7472
One Rome St.

Farmingdale, NY 11735

PERSONNEL: Edward A. Murphy, President; William Jorden, Vice President; William Posner, Vice President.

DESCRIPTION: Parental control locks; vertical interval digital data transmission; closed captioning; teletext; network communications; private data transmission in the VBI.

EMCEE Broadcast Products(717) 443-9575

PO Box 68
White Haven, PA 18661

PERSONNEL: Frank Trainor, Marketing/Sales Manager

DESCRIPTION: Low power TV transmitters and translators. MDS and MMDS transmitters and down converters. Towers and antenna installation and services.

EPG(918) 665-6690
WATS (National)(800) 331-4806

3801 S Sheridan

Tulsa, OK 74145

PERSONNEL: Roy Bliss, Executive Vice President; Jeff Treeman, Vice President Sales and Mktg.; Chris Bourne, National Sales Manager
DESCRIPTION: Electronic program guide which provides all satellite programming & network listings, EPG is designed for systems with 5000 subscribers and up.

EPG, Jr.(918) 665-6690
WATS (National)(800) 331-4806

3801 S Sheridan

Tulsa, OK 74145

PERSONNEL: Roy Bliss, Executive Vice President; Jeff Treeman, Vice President Sales and Mktg.; Chris Bourne, National Sales Manager
DESCRIPTION: EPG, Jr. (on Galaxy 1, Transponder 3, Sub-carrier) is a low-cost alternative for smaller cable systems needing up-to-date program listings in an on-screen guide. Designed and priced for systems of 5000 and under, "Junior" provides many of the same advantages as The EPG, for as much as 70% less than the original for systems with minimum pricing.

EWTN-Eternal Word Television Network(205) 956-9537
5817 Old Leeds Rd.

Birmingham, AL 35210

DESCRIPTION: Catholic cable network offering six hours of religious and family entertainment programming. The service is offered free of charge to cable systems via Satcom IIIR. Satellite services are also available.

Eagle Comtronics, Inc.(315) 622-3402
WATS (National)(800) 448-7474

4562 Waterhouse Road

Clay, NY 13041

PERSONNEL: Alan Devendorf, President; Joseph J. Ostuni, Vice President/Sales & Marketing; Chester J. Syp, Manager/National Sales

DESCRIPTION: Super traps, decoding filters, taps, addressable and programmable descramblers, converters.

Eagle Satellite(406) 721-3662
2347 South Ave. W

Missoula, MT 59806

PERSONNEL: Pat Gordon, President

DESCRIPTION: Satellite TV retail; also we build SMATV systems (retail and wholesale).

Easley Equipment Co. Inc.(901) 362-7721
2807 Farrisview Blvd.

Memphis, TN 38118

PERSONNEL: Warren Easley, President;

Richard Easley, Vice President/Sales Manager

REGIONAL OFFICES: 1706 Rossville Ave., Chattanooga, TN 37408, (615) 756-0175; (601) 895-7454 Night Number

DESCRIPTION: Sells aerial buckets and all types of trucks and vans.

Eastern Microwave Inc.(315) 455-5955
WATS (National)(800) 448-3322

112 Northern Concourse

Syracuse, NY 13221

PERSONNEL: Gil Korta, National Marketing

Director

DESCRIPTION: Eastern Microwave carries

WRTV of New York which offers 24 hours of

independent sporting events, over 350 live

sporting events per year. Also offers 40 hours of

movies per week.

Electra-Motion, Inc.(818) 449-7917
40 N Daisy Ave.

Pasadena, CA 91107

PERSONNEL: Gerald J. Graydon, President/

Sales Manager; Dan L. Cartwright, Vice President

DESCRIPTION: CATV distribution power

supply 60 volt, 15 amp. Available in single or dual

configuration, pole mount or pedestal.

ELECTROHOME

Electrohome Ltd.(519) 744-7111
809 Wellington St. N

Kitchener, Ontario, Canada N2G 4J6

PERSONNEL: J. A. Pollock, President/

Chairman/CEO; H. H. LaPier, Vice President

Operations; W. A. Janci, Vice President Finance;

W. N. Nobbs, Group General Manager/Electronics

Division

REGIONAL OFFICES: Tonawanda, NY (716)

694-3332; Morristown, TN (615) 587-5250;

Ontario, CA (714) 983-5660

DESCRIPTION: Manufactures and/or

distributes a wide range of electronic equipment.

Video display, projection data/graphics and video

Direct Mail Works

Have you ever wished you could reach key decision makers at virtually every cable system in the United States with your marketing message? Now, you can!

Reach more than 6,000 cable systems directly with *CableFile Database* mailing lists.

Source: *CableFile/86* database.

Titles available: System name only or the following titles with personnel names included on over 95% of the labels:
System Manager, Chief Engineer, Marketing Director.

Cost: Lists are \$550 each, either by system name only or with personnel title/name included. Lists also available on floppy diskettes for \$1,500 each.

Method of Addressing: Four-up Cheshire labels, zip sort. Charge for PSLs (pressure sensitive labels) is \$7.

Terms: Net 30 days. Cancellations received prior to shipment are subject to a charge of \$50 for lists run. No cancellations accepted after shipment.

Delivery: All lists shipped within two weeks of receipt of order. Overnight delivery upon request. Lists are shipped directly to you and, thus, become your property. No bonded mailing house is required.

Contact: Kathy Berlin at (303) 860-0111.

ITCI INTERNATIONAL THOMSON COMMUNICATIONS INC.
600 GRANT, SUITE 600, DENVER, CO 80203

buyers' guide

Electroline Television

TV systems, commercial earth/satellite systems, videotex computer graphics equipment, single and double sided P.C. boards, contract design, engineering and manufacturing.

Electroline Television Equipment Inc......(514) 374-6335
8750 8th Avenue Ste. 2
Montreal, Que, Canada H1Z 2W4
PERSONNEL: Bram Appel, President; Mitchell Offman, Exec. Vice President; Henri Bertemes, Sales Manager.
DESCRIPTION: Electroline manufactures an Off-Premises Addressable System in addition to amplifiers, filters, directional couplers & custom made products for the CATV & MATV industry.

Electrovert, Inc......(914) 633-0222
466 Main St.
New Rochelle, NY 10801
PERSONNEL: Mark Drake, CEO/President; Tony Chiarello, Vice President General Manager; Carl Gruenberg, National Sales Manager
REGIONAL OFFICES: 3115 Gateway Dr., Ste. C, Norcross, Ga 30071, (404) 441-3644; 9996 Bryn Mawr Ave., Rosemont, Il 60018, (312) 678-5557; 10969 Shady Trail, Ste. 101, Dallas, TX 75220, (214) 353-9950; 1311 E. Chestnut Ave., Santa Ana, CA 92701, (714) 835-2033
DESCRIPTION: Wire/cable markers, harnesses, and harness accessories.

Engineering Unlimited, Inc......(612) 872-4144
2841 Dupont Ave. S
Minneapolis, MN 55408
PERSONNEL: Joseph J. Werner, President; Suzanne M. Werner, Vice President/Sales Manager
DESCRIPTION: Sterling rotary shackle padlocks have a unique design which actually adds to the strength of the shackle. Not sold in retail stores, the possibility of unauthorized persons having a key is remote. Combinations reserved in home & surrounding states with initial order of 60 or more locks. Call or write for literature or samples.

Entertainment Plus.....(714) 556-1666
3600 Segerstrom Ave.
Santa Ana, CA 92704
PERSONNEL: Don Ducharme, President/General Manager
DESCRIPTION: Prepackage commercial SMATV systems for apartments, mobile home parks, condos and hotels. We engineer and design both manual and fully addressable systems. Distributor for Miralite dishes and ISS receiver, modulators. We've installed systems nationwide and can provide programming, marketing and maintenance/management systems.

FM SYSTEMS, INC.

FM Systems, Inc......(714) 979-3355
WATS (National).....(800) 235-6960
3877 S Main St.

Santa Ana, CA 92707
PERSONNEL: Frank McClatchie, President; Joe Dean, Sales
DESCRIPTION: FM Systems, Inc. manufactures and markets the FMT 6335 stereo TV modulator (4.5 megahertz), and a device for transmitting MTS stereo through super trunks (FMU 618 MTS and FMD 618 MTS). Manufactures other stereo processors for MTV, HBO, Showtime, etc. FM Systems also manufactures a music distribution system—studio line process—MDS operator to transmit nine musical programs on one transmitter. Digital disc quality audio for distribution on MDS transmitters. Distributed in Canada through DGH Communications.

Fanch Communications Inc......(303) 333-3707
360 S Monroe St.
Ste. 330
Denver, CO 80209
DESCRIPTION: Financial Services including investment banking and appraisals.

Feature Arts Unlimited.....(213) 827-2365
PO Box 9126
Marina Del Rey, CA 90295
PERSONNEL: Max Zippo, Executive Producer; Mona Zippo, Production Chief
DESCRIPTION: Feature Arts produces original, low-cost, family television programming in addition to full organic advertising services. Our specialty is consulting to government, business and private clientele on counter-programming with an emphasis on advertising commercials, social marketing, and public affairs to include documentaries, news, and current affairs programs.

Federal Telecom Inc......(815) 338-6000
1000 Hart Road
Barrington, IL 60010
PERSONNEL: John Middlebrook, President; Ken Gentry, Production Manager.
DESCRIPTION: Federal Telecom Inc. is a leading supplier of Buried Plant Housings to the CATV Industry. C124 Series Polyped Housings: used to house and protect taps, splitters, line extenders, directional couplers & some amplifiers, as well as other components used by the CATV industry. C1230 Amplifier Polyped Housing: Used primarily to house & protect amplifiers.

Ferguson Communications Corp......(214) 854-2405
Rte. 1
Box 135-A
Laneville, TX 75667
DESCRIPTION: Design, engineering and installation services.

Film Video Communications.....(817) 265-0714
808 E Abram St.
Arlington, TX 76010
PERSONNEL: Jerry Corns, President
DESCRIPTION: Cable telemarketing services 48 states. Sell all cable services, HBO, Showtime, Disney, Basic, Security, Advertising and Country Music television. Communication installation specialists. Provide commercial satellite dish installation, data link and closed circuit TV

installation for sporting events and conventions.

First Data Resources Inc......(402) 399-7000
WATS (National).....(800) 228-9079
7301 Pacific St. C-41
Omaha, NE 68114
PERSONNEL: Bob Masterson, CEO; Bill Esping, Chairman of the Board; Jay Oxtton, Vice President/General Manager
DESCRIPTION: First Data Resources offers advanced management information and subscriber billing systems to providers of subscription and pay television services. FDR offers Micro Delivery Option, a personal computer based billing and reporting system to complement their on-line Cable Control System. FDR also offers Profitrack, a unique concept in cable information reporting for profit-minded MSOs.

Fries Distribution Co......(213) 859-9957
Telex.....378-1675 FDC
6922 Hollywood Blvd.
Los Angeles, CA 90028
PERSONNEL: Charles W. Fries, President/Chairman; Robert Lloyd, Executive Vice President/Worldwide Dist.; Larry Friedrichs, Senior Vice President/Foreign Television; Richard Askin, Vice President/Domestic Sales; Louis M. Wexner, Vice President/Advertising & Promotion; Bette Alofsin, Eastern Sales Manager; Don Golden, Western Sales Manager; Wendy Levin, S. Eastern Regional Sales Manager
REGIONAL OFFICES: 420 Madison Ave., 15th Fl., New York, NY 10017, (212) 593-2220; 3390 Peachtree Rd., NE, Suite 1000, Lenox Towers, Atlanta GA 30326 (404) 231-0119
DESCRIPTION: Production of domestic and foreign distribution for theater, home video, pay-TV and television.

Fusco Entertainment Inc......(212) 315-1400
850 Seventh Ave.
New York, NY 10019
PERSONNEL: Joseph Fusco Jr., President; Klaus J. Lehmann, International Sales; Don Joannes, West Coast Sales
REGIONAL OFFICE: 11340 West Olympic Blvd., Los Angeles, CA 90064
DESCRIPTION: Distributor of all-family programs for basic and pay cable.

GENERAL ELECTRIC

General Electric Co......(804) 483-5064
WATS (National).....(800) 432-2253
Comband Product Operations
Mail Drop #17
Portsmouth, VA 23705
PERSONNEL: Jim Harman, Manager Marketing Communications; Ron Polomsky, Manager Comband Product Operations; Doug Howe, National Sales Manager
DESCRIPTION: Comband systems—an addressable system which compresses pairs of video and audio program sources on a single 6

buyers' guide

ICM Video

mega hertz RF channel, providing carriage of up to twice the number of program sources. Systems available for MMDS and CATV applications.

GENERAL INSTRUMENT

General Instrument Corporation

Jerrold Division(215) 674-4800
WATS (National)(800) 523-6678
WATS (In PA)(800) 562-6963
 2200 Byberry Road
 Hatboro, PA 19040

PERSONNEL: George Safiol, Executive Vice President, Operations; Hal Krisbergh, Vice President & General Manager, Jerrold Subscriber Systems Division; Bill Lambert, Vice President & General Manager, Jerrold Distribution Systems Division; Larry Fry, Vice President of Sales
REGIONAL OFFICES: 31 W 34th St., New York, NY 10001, (212) 760-1700; 2611 Westgrove Road, Carrollton, TX 75006, (214) 248-7931; 7100 E Bellevue Ave., Suite 101, Englewood, CO 80111, (303) 740-6118

DESCRIPTION: Complete line of Cable Television electronic equipment and associated systems. Earth station equipment, scramblers, headend systems, amplifiers, distribution electronics, broadband data systems, converters, addressable systems, IPPV equipment, stereo decoders, VCR switchers and programmers. Complete SMATV headend and distribution systems and components.

General Instrument Corporation

Tocom Division(214) 438-7691
 PO Box 47066
 Dallas, TX 75247

PERSONNEL: Mike Corboy, President; Bill Flaherty, Executive Vice President; Sid Prothro, National Sales Manager; Tom Martin, Director of Research and Development
REGIONAL OFFICES: 31 W 34th Street, New York, NY 10001, (212) 760-1700; 2611 Westgrove Road, Carrollton, TX 75006, (214) 248-7931; 7100 E Bellevue Ave., Suite 101, Englewood, CO 80111, (303) 740-6118

DESCRIPTION: Manufacturer of a complete line of advanced communications systems for the CATV industry. Products include the TOCOM Plus line of baseband addressable set-top converters, decoders and headend control systems and home security products including home alarm terminals and alarm only terminals.

Gilbert Engineering Co. Inc.(602) 245-1050
WATS (National)(800) 528-0199
 PO Box 23189

Phoenix, AZ 85063
PERSONNEL: Robert Spann, President
DESCRIPTION: Gilbert Engineering manufactures a full line of coaxial connectors for trunk, distribution and drop cables including housing to housing, right angle F connectors, 90 degree connectors, and GSF-59-AHS/series, GSF-6-AHS/series sealed F connectors.

Greater Distributing Service Inc.(312) 998-0444
 2011 John's Dr.
 Glenview, IL 60025
PERSONNEL: Alan Schulman, President; Diane Cohen, Vice President; Michael Eccarius, Sales Manager
DESCRIPTION: Nationwide distributors of stand-by power batteries. Distributors of GNB (Gould), Watchman 1, Watchman 11 and Gelseal batteries.

Greydanus and Levine(517) 371-4550
 1306 Commerce Center Bldg.
 300 S Capital Ave.
 Lansing, MI 48933
DESCRIPTION: Attorneys-Representation before state and local administrative agencies throughout the State of Michigan.

HBO/Cinemax(212) 512-1000
 1100 Sixth Ave.
 New York, NY 10036
PERSONNEL: Joseph Collins, President
REGIONAL OFFICES: 12750 Merit Dr., L.B. 44, Dallas, TX 75251, (214) 387-8557; Century Pk. E., #4170, Los Angeles, CA, (213) 201-9200; 630 Brush St., San Francisco, CA 94108, (415) 986-3360; 3801 E Florida Ave., #100, Denver, CO 80210, (303) 758-5700; 347 Lenox Rd. NE, Atlanta, GA 30326, (404) 233-2120; 9401 Indian Creek Pkwy., #900, Overland Park, KS, (913) 381-8065.

DESCRIPTION: Commercial free first run movies, exclusive entertainment specials, sports and theater presentations.

Hardy and Popham(504) 528-9500
 700 Camp St.
 New Orleans, LA 70130
PERSONNEL: Ashton R. Hardy, Sr. Partner
 FCC Service
DESCRIPTION: Legal services to cable systems, satellite uplink & receive antenna owners & operators, SMATV & MATV owners.

The Head End(614) 766-0874
 2690 Sawbury Blvd.
 Worthington, OH 43085
PERSONNEL: Steve Schaefer, President; Denise Schaefer, Vice President; Tim Holzer, Sales Manager
DESCRIPTION: Specialize in turnkey headend installation, engineering and building of systems, also service and repair work.

Herbert Boyer Co.(212) 744-7558
 14 E 77th St.
 New York, NY 10021
PERSONNEL: Herbert Boyer, President; Donald Franz, Vice President; William Parsons, Vice President
DESCRIPTION: Engineering consulting, market research, investment consultants and executive searches. Clients are equipment manufacturers and MSOs.

Heyco Molded Products, Inc.(201) 245-0033
WATS (National)(800) 526-4182
 PO Box 160
 Kenilworth, NJ 07033
PERSONNEL: W.D. Jemison, President; Anthony Alicea, General Manager

DESCRIPTION: Nylon insulating, clamping, fastening and holding components; for wire and cable; bushings, less strain reliefs, cable clamps and wire connectors.

Hitachi Denshi America Ltd.(516) 921-7200
 175 Crossways Park Dr.
 Woodbury, NY 11797
PERSONNEL: Jay Tosaka, President; Bernard Munzelle, Vice President; Jack Breitenbucher, Sales Manager

REGIONAL OFFICES: 14169 Proton Road, Dallas, TX, (214) 233-7623; 3610 Clearview Pkwy., Doraville, GA, (404) 451-9453; 18005 S Adria Maru Lane, Carson, CA, (213) 538-4880; 250 E Devon Ave., Itasca, IL 60143, (312) 250-8050
DESCRIPTION: Professional broadcast equipment, visual products, test and measurement equipment.

Home Team Sports(202) 728-5300
 1111 18th St. NW
 Ste. 200
 Washington, DC 20036
PERSONNEL: Bill Aber, VP/General Manager; Jim Bates, HTS Director Affiliate Sales; Glenn Consor, Advertising Sales Manager; Jody Shapiro, Director Programming/Executive Prod.; Jeff Wagner, Marketing Director
DESCRIPTION: Regional sports network featuring live, exclusive coverage of Orioles baseball, Capitals hockey, Bullets basketball, Blast soccer plus many more professional and collegiate events of interest to fans in the Capital region (MD, VA, DC, and parts of NC, PA, and WVA).

Home Theatre Network(207) 774-0300
 465 Congress St.
 Portland, ME 04101
REGIONAL OFFICES: 41 Harbor Plaza Dr., PO Box 10210, Stamford, CT 06904, (203) 965-6026; 107 Greenfield Rd., Florence, AL 35630, (205) 767-6515; 845 Chicago Ave., Ste. 207, Evanston, ILL 60202 (312) 454-6997; 700 Larkspur Landing Circle, Ste. 109, Larkspur, CA 94939, (415) 461-4988; 1017 Woodhollow Dr., Marietta, GA 30067 (404) 952-0310
DESCRIPTION: Home Theater Network (HTN)-premium movie service featuring, PG, PG-13, and G-rated movies, entertainment specials, and travel programming.

ICM Video(405) 232-5808
WATS (National)(800) 426-9825
 701 W Sheridan
 Oklahoma City, OK 73102
PERSONNEL: Royden Freeland, President; Mike Janko, Division Manager
REGIONAL FACTORY REPRESENTATIVES: Mike Schueder, San Dimas, CA, (714) 599-7763; Randy Steele, Carmel, IN, (317) 841-6189; Martin McAndrew, Briarcliff Manor, NY, (914) 941-7274
DESCRIPTION: ICM Video manufactures a line of 4 GHz and 950-1450 MHz block satellite receivers, satellite receiver accessories, video processing amplifiers and character generators. The company manufactures other high-tech components, including custom quartz crystals, and has been in business since 1950.

**Before Today,
The Only Way To Add Channels
Was To Go Through Channels.**



Now The Comband System Lets MMDS Operators Double Their Channel Capacity Overnight.



Forget about red tape. Because now you can take channel expansion into your own hands.

All it takes is the Comband® system from General Electric.

The Comband system is a necessity for all Multi-channel Multipoint Distribution Service operators and Instructional Television Fixed Service operators. Because its unique two-for-one technology lets you quickly double the channels within your allotted bandwidth.

The system also offers other features that will enable your operation to reap greater profits. It's flexible, stereo-ready and contains an unsurpassed one-way addressable baseband system. Plus the

Comband bandwidth compression process makes signal theft virtually impossible. Unauthorized programs cannot be seen or heard.

The modular design of the Comband system allows you to control when, and to what extent, you upgrade your operation. So whether you're planning to enter a market or planning to capture a larger share of one, you can do so with minimum time and expense with a Comband system.

Before you make any further plans, see the Comband system in action. Call Ron Polomsky at 1-800-432-2253 to arrange a Comband demonstration.

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Reader Service Number 26

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ISS Engineering, Inc.

<p>ISS Engineering Inc. (International Satellite Systems).....(415) 853-0833 WATS (National).....(800) 227-6288 104 Constitution Drive #4 Menlo Park, CA 94025 PERSONNEL: Norman Gillaspie, President; Lydia Gillaspie, Marketing Director; John Cioro, Eastern Regional Office REGIONAL OFFICES: 1749 A 6th Place, NW, Birmingham, AL 35215, (800) 351-4477 DESCRIPTION: ISS Engineering Inc. manufactures and imports commercial satellite receivers, CATV/SMATV modulators, frequency agile hyberband modulators, frequency agile processors and low noise amplifiers as well as most headend equipment needed for cable systems.</p>	<p>prewires and postwires, works turnkey if requested.</p> <p>Inventronics Ltd.(204) 728-2001 PO Box 1135 1420 Van Horne Ave. E Brandon, Manitoba, Canada R7A 6A4 PERSONNEL: J. W. Dalzell, President; Murray A. Boles, Sales Manager DESCRIPTION: Inventronics manufactures quality enclosures of galvanized steel construction with a baked-on polyester powder paint finish.</p> <p>JFW Industries, Inc.(317) 887-1340 5134 Commerce Square Dr. Indianapolis, IN 46237 PERSONNEL: Juetta Walker, President; Fred Walker, Vice President; Steve Manka, Sales Manager; Jacqueline Buescher, Sales Manager DESCRIPTION: Manufacturer of attenuators, fixed, pushbutton, variable, programmable, rotary, coaxial switches, terminations; detectors; 5, 10, 30, 50 and 100 watt fixed attenuators, RF fuse holders.</p>	<p>(303) 740-6118. DESCRIPTION: Complete line of Cable Television electronic equipment and associated systems. Earth station equipment, scramblers, headend systems, amplifiers, distribution electronics, broadband data systems, converters, addressable systems, IPPV equipment, stereo decoders, VCR switchers and programmers. Complete SMATV headend and distribution systems and components.</p> <p>Joel Rothstein Wolfson(202) 887-5623 Federal Bar Bldg. 1815 St NW #600 Washington, DC 20006 DESCRIPTION: Law practice with particular emphasis on regulatory and business problems in CATV & SMATV. Experience in all aspects of cable television regulation, including two-way common carrier services. Joel Wolfson holds a J.D. from Cornell University, is an affiliate member of IEEE, and a member of the Federal Communications Bar Association.</p>
<p>Idea/onics(701) 786-3904 Box 224 Mayville, ND 58257 PERSONNEL: Austin Kramer, Manager; Norman Bakken, Engineer DESCRIPTION: Emergency Alert Units for CATV & SMATV systems.</p>	<p>J.N. Wells & Company(312) 325-0901 210 W 22nd St. Ste. 125 Oak Brook, IL 60521 PERSONNEL: Joseph N. Wells, President; Charles C. Wells, Vice President; Jonathan P Wells, Vice President; Joseph P Tito, Vice President DESCRIPTION: Brokers and financial consultants to CATV and SMATV system owners. Appraisals and financing. Also deal in publishing, broadcasting, banks and financial institutions, and hotel and motel brokerage.</p>	<p>John Weeks Enterprises.....(404) 962-1020 WATS (National)(800) 241-1232 PO Box 645 Lawrenceville, GA 30246 PERSONNEL: Alice Weeks, President, John Weeks, Vice President; Rebecca Thornton, Sales Coordinator REGIONAL OFFICES: 2120 Anne Ave., Panama City, FL 32407, (904) 234-2805; 6112 Eagles Nest Dr., Jupiter, FL 33458, (305) 747-3647; 317 25th St. NW, Fayette, AL 35555, (205) 932-7264 DESCRIPTION: Complete line of CATV materials, installation and headend equipment.</p>
<p>Incospec Electronics.....(514) 322-5540 Eastern Canada(800) 361-3896 4651 Desgrandes Prairies Blvd. St. Leonard, Quebec, Canada H1R 1A5 PERSONNEL: Mario Sebastivani, President; Mike Steiner, Vice President; Doug Lawson, Marketing Manager/Sales DESCRIPTION: Full service distributor, complete design and repairs (full bench); CATV/ SMATV technical briefs and field engineering. Supply and service equipment.</p>	<p>Jamar-Rice Co.(512) 327-9570 110 Wild Basin Road Ste. 245 Austin, TX 78746 PERSONNEL: William Jamar, Partner/Sales Manager; William Rice, Partner/Sales Manager DESCRIPTION: Media brokerage and appraisal services.</p>	<p>Jones Spacelink of Florida Inc.....(305) 686-1581 5114 Okeechobee Blvd. Ste. 1-D West Palm Beach, FL 33417 PERSONNEL: Cecil C. Rush, President; Don Spears, General Manager; John Agonis, Director of Marketing REGIONAL OFFICES: Jones Spacelink of Florida is in the business of designing, building, owning and operating CATV and SMATV systems. Jones Spacelink of Florida has operating cable systems in Palm Beach County, Florida, in the Orlando, Tampa Bay areas, and the Lee County-Fort Myers area. Jones Spacelink of Florida is a Colorado corporation authorized to do business in Florida, and is a wholly owned subsidiary of Jones Spacelink Ltd., a Colorado corporation.</p>
<p>Independence Electronics Inc.(816) 836-1094 117 E Alton Independence, MO 64055 PERSONNEL: Douglas C. Jones, President; Colleen N. Jones, Vice President DESCRIPTION: Independence Electronics does converter repair, we also tune positive traps for cable systems. We manufacture and design test equipment for the converter repair business, such as a converter test set.</p>	<p>Jawitz Enterprises.....(818) 506-1361 11548 Magnolia Blvd. Ste. 113 North Hollywood, CA 91601 DESCRIPTION: Programming consultant to Pay-TV. Previously Director of Programming for pay-TV system, now involved in distribution. Excellent knowledge of Pay-TV from both sides of the fence if you're starting up a pay system, let an expert help you devise your system of operation.</p>	<p>KES (Klungness Electronics).....(800) 682-7140 WATS (National)(800) 338-9292 PO Box 885 107 Kent St. Iron Mountain, MI 49801 DESCRIPTION: Distributor of RF electronics cable hardware, antennas, tools, safety equipment, test, equipment, headend equipment, and earth stations.</p>
<p>Info/Soft Inc.....(206) 638-2670 12345 Lake City Way NE Seattle, WA 98125 PERSONNEL: Gloria Doyle, President; Ken Doyle, Vice President DESCRIPTION: Computer software products designed for character generation. Applications for local origination channels (community access) and cable advertising. Other software products include: cable TV guides, closed circuit displays, VCR controller, temperature display and addressable tap controller software, other software products currently under development.</p>	<p>Jerrold Division General Instrument(215) 674-4800 Wats (National).....(800) 523-6678 Wats (IN PA)(800) 562-6965 2200 Byberry Road Hatboro, PA 19040 PERSONNEL: George Safiol, Executive Vice President/Operations; Hal Krisbergh, Vice President & General Manager, Jerrold Subscriber Systems Division; Bill Lambert, Vice President & General Manager, Jerrold Distribution Systems Division; Larry Fry, Vice President of Sales REGIONAL OFFICES: 31 W. 34th St., New York, NY 10001, (212) 760-1700; 2611 Westgrove Road, Carrollton, TX 75006, (214) 248-7931; 7100 E Bellevue Ave., Ste. 101, Englewood, CO 80111,</p>	<p>KTVT, Texas Spirit(918) 655-6690 WATS (National)(800) 331-4806 3801 S Sheridan Tulsa, OK 74145 PERSONNEL: Roy Bliss, Executive Vice President; Jeff Treeman, Vice President Sales and</p>
<p>Interstate Dropline Installers, Inc.....(201) 536-9798 PO Box 128 Livingston, NJ 07039 PERSONNEL: Phillip W. Collins Sr., President; Howard Bradley, Vice President DESCRIPTION: Supplier of independent contract installers, also coordinates high volume subscriber installation activity through unique systems management, arranges for multi-unit</p>	<p>Jerrold Division General Instrument(215) 674-4800 Wats (National).....(800) 523-6678 Wats (IN PA)(800) 562-6965 2200 Byberry Road Hatboro, PA 19040 PERSONNEL: George Safiol, Executive Vice President/Operations; Hal Krisbergh, Vice President & General Manager, Jerrold Subscriber Systems Division; Bill Lambert, Vice President & General Manager, Jerrold Distribution Systems Division; Larry Fry, Vice President of Sales REGIONAL OFFICES: 31 W. 34th St., New York, NY 10001, (212) 760-1700; 2611 Westgrove Road, Carrollton, TX 75006, (214) 248-7931; 7100 E Bellevue Ave., Ste. 101, Englewood, CO 80111,</p>	<p>KTVT, Texas Spirit(918) 655-6690 WATS (National)(800) 331-4806 3801 S Sheridan Tulsa, OK 74145 PERSONNEL: Roy Bliss, Executive Vice President; Jeff Treeman, Vice President Sales and</p>

buyers' guide

Lindsay Specialty Products Ltd.

Marketing; Chris Bourne, National Sales Manager
DESCRIPTION: KTVT, Texas Spirit (on Telstar 303, Transponder 22) gives you live coverage of Texas Rangers baseball, Southwest Conference football and basketball, and championship rodeo competition KTVT features regional programming with the Southwest flair, as well as comedy, adventure, and movie favorites.

Kalba Bowen Associates, Inc.(617) 661-2624
 12 Arrow St.
 Cambridge, MA 02138
PERSONNEL: Kas Kalba, President; Weston Vivian, Vice President/Technology; Wilson Dizard, Vice President (Washington)
DESCRIPTION: Kalba Bowen Associates is a research and consulting firm that specializes in telecommunications, broadcasting, and the new media. The company has served a broad range of clients in areas such as programming markets and production, film and video facilities, cable and Pay TV, satellite communications, high definition TV, video-cassettes and discs, and educational broadcasting.

Kaul Tronics(608) 647-8903
WATS (National)(800) 826-5285
 PO Box 637, Rt. 2, Hwy 14E
 Richland Center, WI 53581
PERSONNEL: John Kaul, President; Mary Kaul, Vice President; Ross Halverson, Vice President; Jim Atkinson, Sales Manager
DESCRIPTION: Manufacture stainless steel dishes in sizes of 66, 90, 112 diameters. Manufacture mesh dishes (6, 8, 10 feet). Mapping & designing of distribution systems for apartments, hotels or cities. Distribute ISS equipment.

Keiser Engineering Inc.(703) 281-9582
 2046 Carrhill Road
 Vienna, VA 22180
PERSONNEL: Bernhard E. Keiser, President
DESCRIPTION: Keiser Engineering, Inc., provides consulting engineering and feasibility studies in wideband communication systems, including analog and digital video, both standard and high resolution, and high-speed data transmission. Work includes both fiber optic and coaxial cable transmission, as well as satellite links.

Keller & Heckman(202) 956-5600
 1150 17th St. NW
 Ste. 1000
 Washington, DC 20036
PERSONNEL: Jerome Heckman, Partner; Joseph Keller, Partner
DESCRIPTION: Law firm practicing in common carrier, private satellite, First amendment issues on both the state and federal levels.

Keystone Electronics Corp.(201) 753-4400
 246 E Second St.
 Plainfield, NJ 07060
PERSONNEL: Lewis Jaffe, President/Sales Manager; Bill W. Homer, Executive Vice President/Manufacturing; Pete Parikh, Executive Vice President/Engineering
DESCRIPTION: Keystone is a nine year old company with sixty years of experience serving Cable TV, SMATV, minicable. We supply Keylock

traps, Pay TV Traps, filters, unique 3 way FM splitter, passive equipment. Also provide consulting for system engineering, headend engineering and reliability engineering, etc.

Kinsman Design Associates Inc.(303) 793-0649
 8140 E Phillips Ave.
 Englewood, CO 80112
PERSONNEL: Sally L. Kinsman, President
DESCRIPTION: Consulting engineering company providing broadband electronic system design for cable television operators and manufacturers, plus SMATV and LAN systems. Utilize Wang MVP computer system with proprietary software. Capable of designing with any combination of frequency & equipment, and adapting to any drafting symbols. Also draft strand maps.

LNR Communications Inc.(516) 273-7111
 180 Marcus Blvd.
 Hauppauge, NY 11788
PERSONNEL: S. Okwit, President; F. Arams, Vice President/Marketing; E. Salamone, Vice President/Administration; P. Lombardo, Vice President/Engineering; H. Okean, Vice President/R&D; F. Kelly, Sales Manager
DESCRIPTION: Manufacturer of telecommunications equipment for satellite earth stations including low noise amplifiers, FM/FDM, video receivers and exciters, audio subcarriers, MODS/DEMOS, FM MODEMS, IF filters/equalizers, up/down converters, loop, test translators, and spacecraft communications subsystems.

Leader Instruments Corp.(516) 231-6900
WATS (National)(800) 645-5104
 380 Oser Ave.
 Hauppauge, NY 11788
PERSONNEL: S. Hirota, President; B. Storch, Vice President/Sales; R. Sparks, Director of Marketing
REGIONAL OFFICES: 20807 Higgins Court, Torrance, CA 90501, (213) 618-0695
DESCRIPTION: Electronic Test Instruments-CATV/MATV field level meter, oscilloscopes, digital storage oscilloscopes, color bar pattern generators, waveform monitors, frequency counters, sweep and function generators, vectoscopes (NTSC, PAL and SECAM), programmable video generator, instrument carts.

Leaming Industries(714) 979-4511
 180 McCormick Ave.
 Costa Mesa, CA 92626
PERSONNEL: James B. Leaming, President; Robert F. Leaming, Vice President; Stan J. Serafin, Marketing Agent
REGIONAL OFFICES: 5-3761 Victoria Park Ave., Toronto, Ontario Canada M1W 3S2, (416) 499-4746
DESCRIPTION: Audio transmission equipment for cable, satellite, and microwave. Stereo processors for all satellite TV & FM audio services, from MTV to WFMT. Stereo processors for use with videocipher systems for HBO, Cinemax, Showtime, TMC, and other scrambled services.

The Learning Channel(202) 331-8100
 1414 22nd NW, #200

Washington, DC 20037
PERSONNEL: Hal Morse, Chairman/CEO; Robert Shuman, President/Chief Operations Officer; Henry Schlenker, Senior Vice President/Chief Financial Officer; Judy Ballanger, Vice President/Public Affairs
REGIONAL OFFICES: 184 Commonwealth Ave., Mount Vernon, NY 10552, (914) 667-5598
DESCRIPTION: Information and learning related programming in the areas of business, hobbies, college courses and parenting. Effective September 1, 1986 expanding hours to 20 per day.

Lectro Products Inc.(404) 353-1159
WATS (National)(800) 551-3790
 PO Box 567
 Athens, GA 30603
PERSONNEL: Michael R. Silkens, General Manager; Steven Wagner, Vice President/Marketing
DESCRIPTION: Supplier of standby power supplies and ferroresonant power supplies for CATV and LAN distributions systems.

Lexco, Inc.(602) 997-6999
 2329 W. Miscal St. #306
 Phoenix, AZ 85029
PERSONNEL: Alexa S. Higashi, President/Chief Exec. Officer; Glenn D. Cox, Business Development
REGIONAL OFFICES: 20000 Kenricks Ave, Lakeville MN 55044 (612) 469-2800
DESCRIPTION: A minority-owned and operated (MBE and WBE) contractor providing full-service capability for mapping, design/engineering, construction, installation and consultation on an individual or turnkey contract basis. Serving the communications industry nationwide.

Lightning Eliminators & Consultants Inc.(213) 946-6886
 13007 Lakeland Road
 Santa Fe Springs, CA 90670
PERSONNEL: Roy B. Carpenter, President; E. Alvin Rich, Executive Vice President/Marketing and Sales
DESCRIPTION: Provides an engineering service (system designs, lightning protection, power conditioning and grounding systems). Also a manufacturer of lightning strike prevention systems, chemically activated ground rods and lightning and tornado warning systems. In addition, carry specialized forms of power protection and conditioning systems.

Lightning Deterrent Corp.(312) 434-7912
 5321 S Kedzie Ave.
 Chicago, IL 60632
PERSONNEL: Donald Hudalla, President
DESCRIPTION: Lightning Deterrent Corp. manufactures and services Verda lightning deterrent units for use on towers, antennas and buildings. It is the only one of several patented lightning deterrents which uses a set number of points, usually 40 or more per square inch.

Lindsay Specialty Products Ltd.(705) 324-2196
 50 Mary St. W
 Lindsay, ONT, Canada K9V 4S7
PERSONNEL: Roy Price, President; Dave Atman, Sales Manager
DESCRIPTION: Lindsay is a quality

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Lynn & Associates Ltd.

manufacturer of CATV equipment and has been established for over thirty years. We specialize in system requirements for small, medium and large builds and rebuilds. Systems benefit from our wide range of trunk amplifiers, line extenders, apartment amplifiers, system passives and directional multitaps. Connectors and drop material, coupled with full headend surveys and commercial antennas of superior quality, complete our line.

Lynn & Associates Ltd.(216) 274-3116
PO Box 370
Mantua, OH 44255
PERSONNEL: Lynn L. Westover, President
DESCRIPTION: CATV engineering consulting firm offering expertise in areas such as: system operations, new construction, system rebuilds, SMATV systems, turnkey services, system engineering and design, fiber optics, feasibility studies, system development and analysis, etc. Also an operating cable system.

M/A-COM
Cable Home Group(704) 324-2200
WATS (National)(800) 438-3331
PO Box 1729
Hickory, NC 28603
PERSONNEL: Frank M. Driendel, President; Jim Webb, Vice President/General Manager; Stan Lindsay, Vice President/Sales & Marketing
DESCRIPTION: Manufacturer of coaxial cable-trunks and distribution and dropwire; networking cables and converters-RF and baseband. Also available—satellite receivers, antenna systems and VideoCiper 11.

M/A-COM
MAC Inc.(617) 272-3100
5 Omni Way
Chelmsford, MA 01824
PERSONNEL: Yong T. Lee, President; Bob Morrill, Executive Vice President/Operations; Fred Collins, Executive Vice President/Engineering; Dave Erikson, National Sales Manager
DESCRIPTION: Microwave equipment and service point-to-point microwave importation systems, local origination, pick-ups and FM multi-channel microwave distribution systems.

MECUM
Enterprises Inc.(714) 598-1182
1135 Centre Dr.
Unit F
Walnut, CA 91789
PERSONNEL: Delbert Mecum, President; Jan Van Greuningen, Sr. Vice President Western Operations
REGIONAL OFFICES: 2568 Valleyview, Troy, MI 48098; (313) 641-7633
DESCRIPTION: We specialize in underground and aerial construction of all CATV systems, including new build and rebuilds. Our attention to detail is your guarantee for excellence.

Mannamedia Corp.(303) 980-8476
996 S Robb Way
Denver, CO 80226
PERSONNEL: John T. Loeffler, President; Carol A. Loeffler, Vice President; Lucie A. Wheeler, Sales Manager
DESCRIPTION: Production of computer software to predict solar outages for satellite earth

stations and interconnect situations plus other coordinate related computations and requirements.

Mark Antenna
Products Inc.(312) 298-9420
2180 S Wolf Road
Des Plaines, IL 60018
PERSONNEL: Richard E. Thomas, President; Robert L. Pevenstein, Vice President; Edward N. Lamarre, Sales Manager
DESCRIPTION: Manufacturers 3, 4, and 5 meter "C" band earth station antennas. 1.0 meter to 3.7 meter "KU Band" earth station antennas. Manufacturer of microwave point to point communications antennas.

Marmax Sales (Division of World
Products Inc.)(414) 272-4048
623 W Viet St.
Milwaukee, WI 53212
PERSONNEL: Steven Lees, President; Frank Zinner, General Manager
DESCRIPTION: Wholesale distributor of MDS-STV-CATV equipment.

Mastercom(301) 469-6688
12216 Parklawn Ave.
Rockville, MD 20852
PERSONNEL: O. D. Page, Owner
DESCRIPTION: Design, furnish, install and maintain CATV, SMATV, CCTV, security, communications systems. Local distributor for leading product lines, make-ready engineering, site surveys, rebuilds and up-grades.

McCullough Satellite
Equipment Inc.(501) 895-3167
Rte. 5 Box 97
Salem, AR 72576
PERSONNEL: John R. McCullough, President; Mary F. McCullough, Secretary/Treasurer; Brenda Smith, Sales Manager
DESCRIPTION: Market all McCullough Communications and McCullough Manufacturing, Inc. products. Includes single and dual conversion receivers, LNAs, feeds, antennas, mounts, controls, cable and connectors.

Mega Hertz Sales

Mega Hertz Sales(303) 779-1717
WATS (National)(800) 525-8386
6940 S Holly Circle, Ste. 200
Englewood, CO 80112
PERSONNEL: Steven Grossman, President/Sales Manager, Englewood, CO; Pierre Cubbage, Sales Manager, St. Louis, MO; M. Doug Sherar, Sales Manager, Bedford, TX
REGIONAL OFFICES: 12115 Lackland Road, Ste. 383, St. Louis, MO 63146, (314) 878-6881; 4001 Airport Freeway, Ste. 590, Bedford, TX 76021, (817) 267-2288

DESCRIPTION: Manufacturer's representative for: Broadband Engineering—Replacement CATV components and electronics; Cable Bus—CATV alarm, fire, police and emergency monitoring equipment; Control Technology—Standby power systems for CATV headends and cable lines; Coil-PVC pedestals and brackets; EEG Enterprises—RX lock, permits adult supervision of pay TV channels; LRC Electronics—Coaxial connectors for all CATV applications; PTS Electronics—Converter repair service; Standard Communications—Satellite receivers and antennas; Texscan—Commercial insertion and character generator equipment; Vitek Electronics—Pay TV traps and RF detection devices. Distribution sales of: Antennas—CATV log and yagis and satellite antennas; Blonder Tongue—Headend and satellite equipment; Cable—Low loss and trunk, distribution and drop cables; Catel—FM systems and modulators; Electronics—Broadband, CADCO, Jerrold, Scientific Atlanta and Triple Crown; Onan—Standby generators and auto-transfer switches; Honeywell—Portable electric generators; Tripp Lite—Inverters and standby power supplies; ComPedCo—Metal pedestals and brackets; Leaming and Wegener—Satellite stereo processors; Videotek—Color monitors and wave form monitors, and Subscriber products, batteries, Bud racks, LNA, cable molding and tap brackets.

Microflect Co. Inc.(503) 363-9267
3575 25th St. SE
PO Box 12985
Salem, OR 97309
PERSONNEL: Marketing Department
DESCRIPTION: Designs, fabricates, and installs microwave telecommunications antenna support structures, passive repeaters, and waveguide support systems. Microflect also designs, manufactures, and/or supplies helicopter concrete lift systems, manhole platform supports, tower accessories, and tower hardware.

Microwave
Filter Co. Inc.(315) 437-3953
6743 Kinne St.
East Syracuse, NY 13057
PERSONNEL: Glyn Bostick, President; Emily Bostick, Executive Vice President/Director of Sales-Marketing; Richard Jones, Vice President/Finance; William Johnson Vice President/Engineering; Alice Berry, Vice President/Personnel Development
DESCRIPTION: Microwave Filter Company supplies a wide variety of filters, traps and other passive components to combat interference in SMATV, cable TV, broadcast TV and general communications. Microwave Filter Company maintains a twelve person telephone group, which serves our 6,000 U.S. and 600 Canadian cable systems via field trips, publications and video tapes. Microwave Filter Company monthly handles 3,000 problems experienced by satellite distributors and dealers.

Micro-Now
Instrument Co. Inc.(312) 677-4700
8260 N Elmwood St.
PO Box 1488
Skokie, IL 60076
PERSONNEL: Clarence Arrow, President
DESCRIPTION: Downconverters for institutional TV. Service ITS.

buyers' guide

Mycro-Tek

Midwest Communications Corp.(606) 331-8990
 WATS (National)(800) 543-1584
 1 Sperti Dr.
 Edgewood, KY 41017
PERSONNEL: David Barnes, President; Jay Addrick, Director/Marketing; Chris Summi, Manager/System Sales
REGIONAL OFFICES: 8875 NW 23rd St., Miami, FL 33172, (305) 592-5355; 1395 Air Rail Ave., Virginia Beach, VA 23455, (804) 464-6256
DESCRIPTION: Midwest Communications Corporation is a complete supplier of CATV equipment including satellite, TVRO receivers, LNA's and all associating equipment; also line equipment, headend equipment and hardware. Midwest Communications Corporation is also the largest supplier of video equipment in the United States, and manufacturer of mobile video systems, production studios and individual components.



MIDWEST CORPORATION
 CATV/SMATV DIVISION

Midwest Corp. CATV Div.(800) 643-2288
 2697 International Pkwy., Ste. 128

Virginia Beach, VA 23452
PERSONNEL: Elijah Midkiff, Vice President
DESCRIPTION: Engineering services, equipment & supplies for SMATV/CATV systems.

Midwest Corp. CATV Div.(304) 622-4700
 WATS (National)(800) 532-2288
 414 N Fifth St.
 Clarksburg, WV 26301
PERSONNEL: Jerry Thompson, President; Jack Crouse, Vice President
DESCRIPTION: Engineering services, equipment & supplies for SMATV/CATV systems.

Miralite.....(714) 641-7000
 4050 Chandler Ave.
 Santa Ana, CA 92704
PERSONNEL: Fred Fourcher, President; Glenn Turner, General Manager; Dana Swancutt, National Sales Manager
DESCRIPTION: Manufacture satellite antennas including the new 5.0 meter offset and new 1.8 meter offset. As well as Miralite's well known 3.7 meter and the 78% efficient 2.4 meter.

Moody Broadcasting Network(312) 329-4433
 WATS (National)(800) 621-7031
 820 N LaSalle Dr.

Chicago, IL 60610
PERSONNEL: George Sweeting, President; Don Hescott, Executive Vice President; Robert Neff, Manager Broadcast Division; James Gwinn, Vice President of Public Ministries; Robert Norris, Administrator of Network Development
DESCRIPTION: Moody Broadcasting Network (MBN) provides religious music and educational programming through an audio programming service and international tape distribution networks.

Mucip Cable TV Services(203) 797-9464
 57 North St.
 Ste. 222
 Danbury, CT 06810
PERSONNEL: Paul Mucci, President; Robert Cipolla, Vice President; Terence Mahon, Sales Manager
DESCRIPTION: Contractor to the industry since 1973. Qualified crews for residential installation, trapping, audits, electronic design, system construction of apartment buildings, aerial and underground construction splicing.

Mycro-Tek(316) 681-0550
 9229 E 37th N
 Wichita, KS 67226
PERSONNEL: Jacob Sorg, President; Al Aulbach, Vice President; Rich Caldarola, Vice

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- S.M.A.T.V. Off-premise Addressability
- Stereo Transmission
- Local Ad-insertion System
- Headend Design

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 Call before 2 PM - Out by 4 PM



MIDWEST CORPORATION
 CATV/SMATV DIVISION

Reader Service Number 29

buyers' guide

NCS Electronics Inc.

President: Frank Golloway, Vice President: Dave Gilbert, Vice President
DESCRIPTION: The single channel Supra and dual-channel Supra Two provide 64K memory & up to 9 fonts online. Both have system-to-system communication and genlock. Max is a stand alone character generator with 32K RAM memory & a product life battery. Ernie, like Max, has a product life battery system and genlock capabilities.

NCS Electronics Inc.(312) 956-8000
 2201 Landmeier Rd.
 Elk Grove Village, IL 60007
PERSONNEL: Dominic Pocolambella, President; James Marx, Vice President/Marketing; Dean Ritchie, Vice President Engineering
DESCRIPTION: Manufacturer and servicer of company cable converters and cable tuners for converters.

NCS Industries Inc.(215) 657-4690
 WATS (National)(800) 523-2342
 WATS (State)(800) 492-2032
 2255 E Wyandotte Road
 Willow Grove, PA 19090
PERSONNEL: Dick Grasso, President; J. Bartholemew, Vice President Purchasing; W. Sugarman, Vice President Treasurer; Ted Mayo, Vice President Engineering, Jerry Quinn, Sales Manager; Bruce C. Furman, Marketing Manager
DESCRIPTION: Repair Service-headend, satellite receivers, test equipment, trunk and distribution all manufacturers. Authorized warranty repair center for Alpha Technologies, Wavetek, Phasecom and Catel/Tomco. Distributes-Jerrold, General Instrument, Catel/Tomco, Magnavox, Videotek and Portac. Mid Atlantic factory representative for-Wavetek, Alpha Technologies, Standard Communications and Tele-Engineering. Purchase and resale of refurbished CATV equipment.

National Satellite Cable Association (NSCA)(202) 659-2928
 888 16th St. NW
 Washington, DC 20006
PERSONNEL: Robert Swander, Chairman; Marni Shapiro, Administrator
DESCRIPTION: Association providing the following services to its members: legal & legislative work, monthly trade publication, annual convention, mailing list and directory.

National Satellite Programming Network(713) 342-9655
 1903 Ave. G.
 Rosenberg, TX 77471
PERSONNEL: Robert Vogelsang, President; Leslie H. Hill, Vice President; Diane Maruca, Director of Marketing
DESCRIPTION: Membership organization that represents SMATV, LPTV, MDS, MMDS and TVRO dealers nationwide. We provide programming and related marketing services to members.

Nelson Electric Supply Co.(214) 741-6341
 1123 Slocum St.
 Dallas, TX 75207
PERSONNEL: H. P. Campbell, President; Robert P. Nelson, Vice President

REGIONAL OFFICES: 2121 Baylor Dr., Lubbock, TX 79417, (806) 763-6006
DESCRIPTION: Wholesaler for a complete line of pole line hardware, test equipment, passives, headend electronics, cable equipment, and various amplifiers and antennas.

Nemal Electronics Inc.(305) 893-3924
 WATS (National)(800) 327-5999
 12240 NE 14th Ave.
 North Miami Beach, FL 33161
PERSONNEL: Benjamin L. Nemal, President; Ursula Hennessey, Sales Manager
DESCRIPTION: Nemal Electronics Inc., is a major distributor of coaxial cable, connectors, and SMATV products. Our lines include Blonder-Tongue, Belden, Times, Amphenol, Kings, and our own private label mil spec brand. All popular items are in stock available for immediate delivery worldwide.

Network Technologies (Division of AM Cable TV Industries Inc.(215) 536-1354
 PO Box 505
 Quakertown, PA 18951
PERSONNEL: Tom T. Saldi, President/Chief Operations Officer; Maqbool A. Qurashi, Board Chairman; Masood A. Qurashi, Vice President/Treasurer; Bill Ross, Vice President/General Manager Field Services Division; Joe Preschutti, Vice President/General Manager E-Com Products Division; Jim Emerson, General Sales Manager, E-Com products; Tom Burka, Regional Sales Manager, Field Services; Bill Stone, Regional Sales Manager, Field Services
REGIONAL OFFICES: 13428 Cronese Rd., Apple Valley, CA 92307, (619) 242-3495
DESCRIPTION: Full turnkey construction including aerial and underground systems engineering involvements—make ready engineering, subscriber installs and systems design. E-Com Products multiple addressable services, digital data communications systems, Tier Guard Off-premises, addressable Pay TV Control.



Nexus Engineering Corp.(604) 420-5322
 7000 Lougheed Hwy.
 Burnaby, BC Canada V5A 4K4
PERSONNEL: Peter VanderGracht, President; Dr. J. Basil Peters, Chairman, CEO; Lyle Horne, Sales Manager
DESCRIPTION: Manufacturer of complete lines of commercial headend equipment including television modulators, heterodyne signal processors, on-channel processors, block converters, satellite receivers, stereo generators, stereo decoders, active combiners, audio modulators and completely racked and tested headends. Products for non-NTSC television standards are also available.

North Park Electronics(416) 247-7468
 1040 Martingrove Road
 Unit 10
 Rexdale, ONT, Canada M9W 4W4
PERSONNEL: Mike Tomas, President; Larry Rampone, Vice President; Bruce Maccoomb, Purchasing Agent
DESCRIPTION: Service and sales—cable antennas. Security, industrial and commercial dealer for Panasonic.

North Tech Electronics Ltd.(705) 544-8253
 PO Box 990
 Englehart, ONT, Canada P0J 1H0
PERSONNEL: Boyd Woods, Owner/Sales Manager; Mr. Gauvreau, Vice President
DESCRIPTION: Satellite TV antennas—complete packages through two dealers.



Norsat International Inc.(604) 591-3334
WATS (Nat'l-Sales)(800) 663-8733
WATS (Nat'l-Service)(800) 663-8752
 302, 12886 78th Ave.
 Surry, BC Canada V3W 8E7
PERSONNEL: Gordon Skeene, President; Ian Power, Executive Vice President; Greg Pelt, Executive Vice President/Sales; Wayne Meadows, Vice President/Product Development
DESCRIPTION: Norsat provides receivers and accessory equipment for TVRO, SMATV and CATV installations.

Nova Communications(202) 298-9107
 1717 37th St NW
 Washington, DC 20007
PERSONNEL: Melaine S. Donahoe, President
DESCRIPTION: Producer of programming for television, cable and satellite. Programming produced includes: travel, food/cooking, women's, media, profiles of sports figures, news figures, political figures, religious, documentaries and children's (a limited amount of travel programming is available for lease).

OD Page PE-Professional Engineers & Consultants(301) 469-6688
 7536 Spring Lake Dr.
 Bethesda, MD 20817
PERSONNEL: O.D. Page, Owner
DESCRIPTION: Engineering and management consultants for CATV, MATV, SMATV, CCTV design, construction supervision and contract administration, appraisal franchising, analysis and evaluation siting.

OL Teletronics(518) 875-6444
 PO Box 278, Rte. 20
 Esperance, NY 12066
PERSONNEL: Gary Rudolph, President; Peggy Rudolph, Vice President; Tom Johnson, Sales Manager
DESCRIPTION: Repairs converters.

buyers' guide

Pioneer Communications of America, Inc.

PECA, Inc.(215) 245-1550
592 Winks Lane
Bensalem, PA 19020
PERSONNEL: Ralph G. Douglass, President;
Agnes E. Leckner, Vice President
DESCRIPTION: Speciality communications,
switching equipment, system design, installation
of electronics and proof of performance broadband
and baseband local area network equipment.

PKO Television Ltd.(212) 696-1221
WATS (National)(800) 824-2454
419 Park Ave. S
New York, NY 10016
PERSONNEL: Paul Klein, President; Jeff
Younger, Vice President; Gibi Brown, Director of
Affiliate Sales
DESCRIPTION: Pay-TV and Basic Channels
(American Extasy) movies and adult
programming (romance novels for TV).
Distribution and production pay-per-view
systems.

PTL—The
Inspirational Network(704) 542-6000
PTL Television Network
Charlotte, NC 28279
PERSONNEL: Rev. J. Bakker, President; Walter
Richardson, Vice President/Marketing; John
McEntee, Marketing Director
DESCRIPTION: PTL—The Inspirational
Network provides quality programming to all 50
states, 24 hours a day in stereo. Programming is
produced by almost 100 programmers nationwide,
representing most major denominations. Formats
include talk-variety, teaching, preaching, music &
music video, women, children, news-magazine, and
drama.

PTS EXPRESS CONVERTER SERVICE AND SALES

**PTS Corporation—National
Headquarters**(812) 824-9331
5233 S Hwy. 37
Bloomington, IN 47401
PERSONNEL: Jack Craig, President; Jeff
Hamilton, Vice President; Gary Wilson, Sales
Manager
DESCRIPTION: Re-manufacturer and
distributors of converters and cable/SMATV
related products.

Paar Industrial
Electronics(403) 252-7100
D-116115 3rd St. SE
Calgary, AB T2H 2L2
PERSONNEL: William Armstrong, President;
D. J. Graham, Vice President; Jim Doucett, Sales
Manager
REGIONAL OFFICES: 6036 103rd St.,
Edmonton, AB T6H 2H6, Canada, (403) 436-4445;
3006 2nd Ave. N, Lethbridge, T1H 0C6, Canada,
(403) 327-1933
DESCRIPTION: Industrial electronics
distributor specializing in CATV and SMATV
satellite components and systems. Warehouses in
all three locations, over a million dollars inventory

per warehouse. Stock distributor for Amphol,
Andrews, Triple Crown, Electrahome and many
others.



Pat Thompson Co.

Pat Thompson Co.(303) 779-0880
5613 DTC Pkwy.
Ste. 700
Englewood, CO 80111
PERSONNEL: Pat Thompson, President; Joseph
R. Bruning, Executive Vice President; Thomas H.
Engel, Vice President; Marshall Hambric, Vice
President; James Kolstad, Vice President
DESCRIPTION: Communications brokerage
firm—cable TV, radio & paging systems—
brokerage, financing and appraisals.

Paul Kagan
Associates, Inc.(408) 624-1536
126 Clock Tower Place
Carmel, CA 93923
PERSONNEL: Paul Kagan, President; Sharon
Armbrust, Vice President Information Services;
Joe A. Barkalow, Vice President Administration/
Marketing; Judy Pinney, Circulation Manager
DESCRIPTION: Paul Kagan Associates, Inc., is
an independent research and consulting firm
specializing in cable and Pay TV, radio-TV
broadcasting, motion pictures and the VCR
industry. The company publishes more than 20
newsletters offering economic analyses of
communications business, as well as a number of
annual databooks, census publications, special
reports, appraisals and consulting services for
different segments of the communications
industry.

Pellegrin &
Levine Chartered(202) 293-3831
1140 Connecticut Ave. NW
Ste. 312
Washington, DC 20036
DESCRIPTION: Attorneys of communications,
copyright, trademark law.

Perception Technology
Corp.(617) 821-0320
40 Shawmut Road
Canton, MA 02021
PERSONNEL: Joseph W. Scally, President;
Leon A. Ferber, Executive Vice President; Frank
Tripi, Vice President/Sales; Daniel P. Matthews,
Vice President/Operations; Richard W. Grant,
Vice President/Finance
REGIONAL OFFICES: Hudson, OH, (216) 656-
4040; Marietta, GA, (404) 980-1215; Dallas, TX,
(214) 233-0320; Elk Grove, IL, (312) 640-0320
DESCRIPTION: Perception Technology
manufactures the BT-II, a data entry/voice
response peripheral which transforms any
telephone into a terminal. The BT-II can be used
with any host computer running pay-per-view
application software. A subscriber calls the pay-
per-view number, enters his account number, and
an event code. Voice response verifies and gives a
confirmation. Prices start at \$33,500, for an 8 line

system with 176 seconds of speech and also call
referral.

Phasecom Corp.(213) 641-3501
6365 Arizona Circle
Los Angeles, CA 90045
PERSONNEL: Bertram L. Rosenblum,
President; Harry Linden, Vice President/General
Manager; Stan Silverberg, Sales Manager,
Videocassette Changer (The Director)
DESCRIPTION: Phasecom Corp. manufactures
"The Director" model #12, programmable
videocassette changer.

Phoenix Cable/Lease(404) 872-2406
100 Colony Square
Atlanta, GA 30361
PERSONNEL: Ron Demer, Vice President
DESCRIPTION: Leasing and equipment
financing for CATV, SMATV and MMDS.

Pico Macom/
OEM Sales Inc.(818) 897-0028
WATS (National)(800) 421-6511
12500 Foothills Blvd.
Lakeview, CA 91342
PERSONNEL: Michael Holland, President;
Michael Spratlin, Sales Manager
DESCRIPTION: Receivers, modulators,
amplifiers, connectors and installation material for
completely assembled headends of separate
components.

Pico Products, Inc.(315) 451-7700
WATS (National)(800) 336-3363
103 Commerce Road
Liverpool, NY 13088
PERSONNEL: Bernard K. Hitchcock, Chairman
of the Board/CEO; George Knapp, President;
Danny O'Connell, Executive Vice President;
Ralph Yahn, Chief Financial Officer; Henry Cook,
Vice President/Marketing; Jim Mead, Sales
Manager; Jim Quigly, Sales Manager; Deb
Bulken, Sales Manager; Penny Garo, TVRO
Manufacturing Manager; Susan Ender, CATV
Marketing Manager
REGIONAL OFFICES: 2850 Delk Road, Apt 17-
1, Marietta, GA 30067, (404) 951-8619
DESCRIPTION: Pico Products Inc.
manufactures and markets a complete line of
system components for CATV, SMATV and
MATV including security devices, home satellite
systems and components, modulators, single
channel amplifiers, channel converters, wall taps,
preamps, and complete headends for TV signal
distribution in CATV, SMATV and STV.

Pioneer Communications
of America, Inc.(614) 876-0771
WATS (National)(800) 421-6450
2200 Dividend Dr.
Columbus, OH 43228
PERSONNEL: Pete Imamura, President; Jim
Williamson, Vice President/Administration; Jerry
Nelson, Director of Sales & Marketing; Yoshi
Furukawa, Treasurer; Larry S. Shredl, National
Sales Manager
REGIONAL OFFICES: 340 W Diversey Pkwy.,
Ste. 1118, Chicago, IL 60657, (312) 472-3621; 9745
E Hampden, #420, Denver, CO 80231, (303) 696-
1694; 762 Summer Dr., Acworth, GA 30101, (404)
928-6811; 3802 Lancershire Lane, Plano, TX
75023, (214) 519-0601
DESCRIPTION: Complete line of home
terminals and converters including standard,

buyers' guide

Polycom Corp. of America

tunable, one-way addressable, and two-way interactive. Also offers add-ons for MTS adaptor (stereo sound) and the PULSE adaptor for two-way communications. Three headend configurations available for all-size systems.

Polycom Corp.
of America.....(312) 337-6000
201 E Erie St.
Chicago, IL 60611
PERSONNEL: Joseph Hassen, CEO/Chairman;
David Bertz, Sales Manager; Carmen Trombetta,
Vice President
REGIONAL OFFICES: 1141 W Sixth St., Los
Angeles, CA, (213) 975-0075
DESCRIPTION: Polycom Corporation provides:
Hardware for broadcast, cable, teletext, videotext,
videodisc, home video, SMATV, satellite,
corporate voice, video and data systems,
microcomputer users. Polycom also produces,
distributes and markets home video, cable and
business TV programs.

Portac Inc.....(805) 685-2960
108 Aero Camino
Goleta, CA 93117
PERSONNEL: Brian E. Hooper, President;
Tracey Hooper, Sales Coordinator
DESCRIPTION: Time-managed electronic
message generator/controller systems that may
control up to 24 VTRs both 1/2" and 3/4". Multi-
channel systems via a single keyboard plus
telephone-coupled systems for easy access to
remote locations also available.

Power & Telephone
Supply Co. Inc.....(901) 324-6116
WATS (National).....(800) 235-7514
2668 Yale Ave.
Memphis, TN 38112
PERSONNEL: Laburn R. Dye, Vice President; J.
M. Pentecost, Executive Vice President; Tommy
Doddridge, Nat'l Communication Products
Manager; Mary Pentecost, Director/Marketing &
Advertising; Bill Rogers, Communications
Specialist; Don Pentecost, Director/Contractor
Sales
REGIONAL OFFICES: 539 Interchange Dr.
NW, Atlanta, GA 30336, (404) 691-6813; 2107 Old
Greensboro Road, N Lexington, NC 27292, (704)
249-0256; 3412 Ambrose, Nashville, TN 37207;
(615) 226-0321; Rt. 1, Hwy 75N, Huntsville, TX
77340; (409) 291-2218; 1645 N Parkway, Jackson,
TN 38303, (901) 423-0071; Rt. 272, Reamstown,
PA 17567, (215) 267-6991; 4149 N Clinton, Ft.
Wayne, IN 46805, (219) 484-9561; 3101 SW 61st
St., Des Moines, IA 50321, (515) 244-4375; 1075 W
Belt Dr. N Houston, TX 77279, (713) 461-8444;
2401 Brockton, Dr., San Antonio, TX 78217, (512)
824-0450
DESCRIPTION: Full line distributor for cable,
amplifiers, taps, strand, hardware, drop material,
headends, earth stations and all associated
equipment.

Pow-R Devices Inc.....(716) 741-2841
5940 Goodrich Road
Clarence Center, NY 14032
PERSONNEL: Lloyd S. Yoder, President
DESCRIPTION: The POW-R Mole Model PD-4
manufactured by POW-R Devices Inc. requires a
minimum of excavation for the installation of pipe
or cable under roadways. Designed to operate in a
trench as narrow as 6" wide and 48" long, and will

install up to 6" diameter pipe in most soil
conditions.



Power Guard Inc.(404) 354-8129
PO Box 549
Hull, GA 30646
PERSONNEL: Jerry Schultz, President; Mason
Hamilton, Executive Officer/Vice President;
Dwayne Hamilton, Customer Service Manager
DESCRIPTION: Manufacturers of standby and
non-standby power supplies and power grounding
devices. Represent various battery standby
manufacturers: Gould, Exide and Globe Union.



Premium Channels
Publishing Co. Inc.(516) 665-8800
1265 Sunrise Hwy.
Bay Shore, NY 11706
PERSONNEL: Richard Wilen, President; Steve
Goldmintz, Executive Vice President; Judi Gold,
Executive Vice President; John Diaz, Vice
President Sales/Eastern Region; Del Heintz,
Director Affiliate Sales
REGIONAL OFFICES: 18501 Mayall St.-B,
Northridge, CA 91324-1462, (818) 993-0452
DESCRIPTION: Premium Channels' multi-pay
guides are designed to deliver "in-the-bill" or
direct to subscribers. Premium Channels is the
cable industry's original independent national
guide and services over 1500 systems. Guides
have color graphics throughout.

Prime Time Cable.....(303) 860-1181
1 United Bank Bldg.
Denver, CO 80207
PERSONNEL: Paula Hertzmark, President;
Robert Simon, Executive Vice President; Bill
Fulmore, Vice President/Operations
REGIONAL OFFICES: Houston Prime Time
Cable, 2200 Central Parkway, Ste. D. Houston,
TX 77092, (713) 681-6591
DESCRIPTION: Provides private cable service
to MDS. Also provides MDU management service
to franchise cable operators. Currently serving
almost 50,000.

Production &
Direction Services Inc.(201) 736-5490
24 Hutton Ave.
#26
West Orange, NJ 07052
PERSONNEL: Albert D. Hecht, President
DESCRIPTION: Produces and distributes
children's programming. Animated feature length
"Adventures of Choppy and the Princess"

appearing on Showtime commencing June 1985.
Other features, children's programs and series are
also available including a soccer training series.
Releases are also available in home video.

Progressive
Electronics Inc.....(602) 966-2931
WATS (National).....(800) 528-8224
325 S El Dorado
Mesa, AZ 85202
PERSONNEL: Richard L. Anderson, President;
Douglas D. Anderson, Vice President; Steve
Youtsey, Marketing Director
DESCRIPTION: Tone generators, multipurpose.
Installation and repair test sets. Inductive
amplifier for electronic cable identification, cable
fault locators.

ProServ Television.....(214) 270-7601
1540 Eastgate Dr. #200
Garland, TX 75041
PERSONNEL: Robert A. Briner, President;
Dennis Spencer, Senior Vice President
REGIONAL OFFICES: 888 17th St., NW, Ste.
1200, Washington, DC 20006, (202) 457-8800
DESCRIPTION: ProServ Television supplies
series and special programming to a complete
range of delivery systems. ProServ Television's
weekly series include "Tennis Magazine Reports."
The company also produces a wide range of
sporting events and nationally syndicated specials
including "A Hard Road to Glory" and "Ireland
and the Irish."

Pyramid Cable
Services Inc.....(305) 729-8803
7805 Ellis Rd.
W Melbourne, FL 32904
PERSONNEL: Joseph W. McCool, President;
Douglas G. Cooper, Vice President
REGIONAL OFFICES: 760 Warehouse Dr.,
Unit E, Toledo, OH 43615, (419) 382-5152
DESCRIPTION: Complete turnkey contractor,
installations, pre-wiring, post-wiring,
underground and aerial construction, splicing,
headend set up, earth station and tower
construction.

Q.C.C.(817) 663-5216
1006 S Main
Quanah, TX 79252
REGIONAL OFFICES: 120 Erbbe NE,
Albuquerque, NM 87123
DESCRIPTION: Buy and sell new and used
converters and rebuild converters for customers.



Qintar(818) 706-1940
WATS (State).....(800) 572-6262
WATS (National).....(800) 252-7889
PO Box 6579
West Lake Village, CA 91359
PERSONNEL: Randall Tishkoff, President; John
Russell, Chief Engineer.
DESCRIPTION: Manufactures RF switches

buyers' guide

R.L. Drake Company

including 4 and 5 input 3 output switches. Custom labeling available. Also manufacturers or distributes amplifiers, connectors, jumper cables, splitters, tapoffs, bandpass filters, transformers, converters, coaxial drop cable and band separators. Also manufactures modular telephone accessories.

**R. Alan
Communications**

**R. Alan
Communications Inc.**.....(317) 849-7572
(In IN)Call collect
WATS (National)(800) 367-1450
8120 Knew Road, Ste. 106
Indianapolis, IN 46250
PERSONNEL: Randy Pattison, President; Scott Widaman, Sales Manager.
REGIONAL OFFICES: 543 West 130th St.,
Hinckley, OH 44233, (216) 273-6266.
DESCRIPTION: Manufacturer's representative for CATV, business and industrial communications equipment.

R and L
Communications(314) 668-8066
Hwy. 79
Winfield, MO 63389
PERSONNEL: Richard Taylor, CEO; Randy Kobian, Vice President/Engineering
DESCRIPTION: R and L Communications offer engineering and technical services for CATV and SMATV.

R Corporation(813) 921-7408
4000 S Tamiami Trail
Ste. 418
Sarasota, FL 33581
PERSONNEL: Rod Warner, President.
DESCRIPTION: Marketing, promotion, and programming consultants. Contract direct sales.

R.D. Werner Co. Inc.(412) 588-8600
PO Box 580
Greenville, PA 16125
PERSONNEL: R. L. Werner, President; R. I. Werner, Vice President; D. M. Werner, Vice President; H. L. Solot, Vice President, J. Kuspanan, General Sales Manager; R. Blakeman, Field Sales Manager, J. Thiel Jr., Field Sales Manager
REGIONAL OFFICES: 10800 W Belmont Ave., Franklin Park, IL 60131, (312) 455-9450; 5400 E Lindbergh Lane, Bell, CA 90201, (213) 269-8191
DESCRIPTION: Manufacturer of fiberglass step

and extension specialty ladders. Also manufacture aluminum ladders, stages, scaffolds and walk boards.

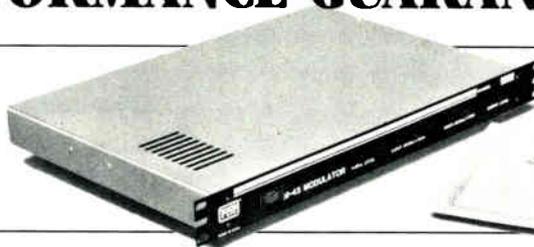
R.F. Analysts Inc.(313) 750-9341
112 E Ellen St.
Fenton, MI 48430
PERSONNEL: Deana Barcome, Marketing Director; Cheryl Shultz, Customer Service
REGIONAL OFFICES: 1255 Boston Ave., W Columbia, SC 29169, (803) 794-3910; 2245 Camino Vida Roble, Carlsbad, CA 92008, (619) 438-4405; 2010 Pine Terrace, Sarasota, FL 33581, (813) 922-1551
DESCRIPTION: R.F. Analysts does converter repair, satellite equipment repair, line equipment, headend gear, and test equipment repair.

RF Distribution
Systems(209) 239-3332
969 CA
Manteca, CA 95336
PERSONNEL: J.W. Jenkins, Owner
DESCRIPTION: RF Distribution Systems offer complete engineering and design services for CATV and SMATV systems. From site surveys to complete installation and maintenance. In business since 1965.

R.L. Drake Company(513) 866-2421
PO Box 112

TWO PERFORMANCE GUARANTEES from **MACOM**

1. The one you'll use every day—Macom's SMATV quality head-end M-45 Modulator



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Macom's M-45 Modulator delivers Quality Performance with high stability, and superior audio and visual resolution—that's guaranteed!

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- Encoder compatibility, via Macom's external IF loophrough, to accommodate pay-per-view and other scrambled signals;
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Reader Service Number 30

buyers' guide

RMS Electronics

Miamisburg, OH 45342
PERSONNEL: Ronald Wysong, President; Mike Brubaker, Vice President Sales; Merl Powell, Vice President Marketing; Steve Koogler, Vice President Engineering; Richard Renken, Sales Manager.
DESCRIPTION: The R.L. Drake Company is a manufacturer of commercial grade earth station receivers, modulators, low noise amplifiers and LNB's.



RMS Electronics(212) 892-1000
WATS (National)(800) 223-8312

50 Antin Place
 Bronx, NY 10462
PERSONNEL: Ray Perez, Vice President/CATV Div.; Harry Bogatch, Vice President/Finance; Dominick Padilla, Vice President/Plant Operations; Seymour Goldberg, Nat'l Sales Manager, Distribution/Video Division
REGIONAL OFFICES: 501 H St., Crescent City, CA 95531, (800) 624-2511 (CA), (800) 247-8435 (Nat'l)
DESCRIPTION: Standby, inverter & AC regulated power supplies, power passing line splitters, directional couplers & directional taps, indoor-outdoor hybrid splitters & directional couplers, matching transformers & filters, attenuators, aluminum & 'F' type connectors, apt. house boxes, pedestals, plastic and metal moulding duct, cable, heat shrink tubing, traps, grease & sealant, indoor amplifiers, hardware, ground blocks & rods and tools.



RMT Engineering Inc......(408) 733-4830

625 E Taylor Ave.
 Sunnyvale, CA 94086
PERSONNEL: Richard A. McLean, President; Patricia McLean, Vice President; Danny Friester, National Sales Manager
REGIONAL OFFICES: RMT II, 1129 Koster St., Eureka, CA 95501, (707) 444-9437
DESCRIPTION: Distributor of new and remanufactured electronics; manufacturer of field strength meter modifications; factory warranty repair facility; and a repair facility for distribution, head-end, satellite and test equipment.

Radyne Corp.(516) 567-8484
 170 Wilbur Pl.
 Bohemia, NY 11716
PERSONNEL: Howard Hirschman, President; Alan Enteman, Vice President; Robert Petrucelli,

Director/Marketing
DESCRIPTION: Radyne manufactures data modems for satellite, CATV and terrestrial communications.

Ratelco, Inc.(206) 624-7770
 1260 Mercer St.
 Seattle, WA 98109
PERSONNEL: Dennis Tepstra, Vice President/Sales & Marketing
DESCRIPTION: Manufacturer of D.C. power supplies and D.C. power distribution equipment.

Reel Movies
 International(214) 363-4400
 PO Box 7286
 Dallas, TX 75209
PERSONNEL: Tom T. Moore, President; Dena Moore, Vice President
DESCRIPTION: International marketing of films & programs.

Research Technology
 International(312) 677-3000
WATS (National)(800) 323-7520
 4700 Chase Ave.
 Lincolnwood, IL 60646
PERSONNEL: Ray L. Short, President; Tom Boyle, Vice President; Tom Tisch, Vice President.
DESCRIPTION: Video tape evaluation/cleaners. Film inspection, cleaning and editing machines. Video: film supplies and furniture.

Richard A. Blum
 & Associates(301) 565-9030
 2208 Washington Ave.
 #202
 Silver Spring, MD 20910
PERSONNEL: Richard A. Blum, President; Marc Giattini, Counsel
REGIONAL OFFICES: 2033 M St. NW, Washington, DC 20036, (202) 452-8200
DESCRIPTION: Develop and produce high quality programming for pay, basic, PBS and networks. Create program proposals, scripts, production packages for family specials, drama, comedy, sample project: National Video Time Capsule, with major entertainers, Kennedy Center (1986). In addition to writing, supervising, and selling new shows, we conduct seminars and workshops for management, professionals, educators and students (Harvard University, American Film Institute, U of Maryland, TelSat Teleconferences).

Rock Solid
 Productions, Inc.(818) 841-8220
 801 S Main St.
 Burbank, CA 91506
PERSONNEL: Geoffrey Leighton, President; Kurt Kamph, Sales Manager
DESCRIPTION: Rock Solid provides film and videotape production and post-production services as well as studio design and installation.

Roger Raimond Assoc.(212) 861-1771
 415 E 81st St.
 New York, NY 10028
PERSONNEL: Roger Raimond, President
DESCRIPTION: Distributor and producer of video productions. Specific needs filled. Areas with immediate productions available include: music-concerts; martial arts series; childrens series; variety; and movies.

Rohn(309) 697-4400
 PO Box 2000
 Peoria, IL 61656
PERSONNEL: Richard Kleine, Vice President/Sales; Ken Cordrey, Eastern Division; Larry Grimes, Central Division; Fred Hardy, Midwestern Region
REGIONAL OFFICES: PO Box 106, Worton, MD 21678, (301) 778-4441; 2631 Tarna St., Dallas, TX 75229, (214) 241-7791
DESCRIPTION: Manufacturer of towers and equipment shelters for broadcast, microwave, mobile radio; tower obstruction lighting and tower accessories.

Rosner Television
 System, Inc.(212) 246-2850
 250 W 57th St.
 New York, NY 10107-0001
PERSONNEL: I.S. Rosner, President; R. Rosner, Vice President; I. W. Washington, Sales manager.
DESCRIPTION: Engineering and technical services firm which provides production and post-production facility design, engineering and management consulting.

Rothman, Gordon
 Foreman, & Groudine(412) 281-0705
 300 Grant Bldg.
 Pittsburgh, PA 15219
PERSONNEL: Frederick A. Polner, Attorney
DESCRIPTION: Full service communications law firm: financing and acquisitions.

Rycom
 Instruments Inc.(816) 353-2100
WATS (National)(800) 851-7347
 9351 E 59th St.
 Raytown, MO 64133
PERSONNEL: E. E. Reitz, President; Charles Jasper, Sales Engineer
DESCRIPTION: Manufacturers of buried cable fault and pipe locators.

Sabre
 Communications(712) 258-6690
 918 Division St.
 PO Box 536
 Sioux City, IA 51102
PERSONNEL: D. Bailey Aalfs, President; Jerry Audus, Sales Manager.
DESCRIPTION: Sabre Communications specializes in the design, manufacture and installation of towers, antennas and preassembled equipment shelters, and provides turnkey installation.

Sachs Canada(514) 636-6560
WATS (National)(800) 361-3685
 2095 Chartier Ave.
 Dorval, Que, Canada H9P 1H3
PERSONNEL: Jack Sachs, President; Peter Hineson, Technical Manager, West Coast; Iam Wells, Technical Manager, Midwest/SE
REGIONAL OFFICES: 30 W Service Road, Champlain, NY 12919-9703, (800) 361-3685
DESCRIPTION: Sachs is a manufacturer of quality telecommunications hardware equipment, specializing in innovative and cost efficient suspension, fastening and grounding devices for construction and subscriber drop line installation. Such as: cable support straps, lashing wire clamps, span clamps, strand-tap brackets, drop clamps-for messengered or non-messengered coaxial cable, grounding blocks and straps.

buyers' guide

Space Age Video Distributors

fastening clips and hooks. Introducing: The "Saxxon," metal clip with a hardened cadmium plated nail.

Sachs

Communications Inc.(514) 636-6560
WATS (National)(800) 361-3685
30 W Service Rd.

Champlain, NY 12919

PERSONNEL: I. J. Sachs, President/Sales Manager

DESCRIPTION: A manufacturer of quality construction and subscriber drop line hardware, suspension, fastening and grounding devices that have been designed to meet the requirements of today's cable TV industry. Sachs quality equipment is security designed.

Sadelco Inc.(201) 569-3323
75 W Forest Ave.

Englewood, NJ 07631

PERSONNEL: Gerald Goldman, Vice President/Marketing

DESCRIPTION: Manufacturer of Super 900 4.5 to 600 MHz and 4.5 to 900 MHz signal level meters, spectrum calibrators 4.5 to 450 MHz and battery operated white noise bridges.

Satellite

Engineering Group(816) 921-1555
114 Hackberry

Lee's Summit, MO 64063

PERSONNEL: David Pool, President; Arthur Liebenthal, Vice President.

DESCRIPTION: Satellite Engineering Group is a supplier of equipment and an engineering and design firm for SMATV systems. Distributor of Panasonic, Standard Communications, Pico, MA/COM and Jerrold products.

Satellite Shop Inc.(613) 830-1121
8-1439 Youville Drive

Orleans, Ont. Canada K1C 4M8

PERSONNEL: Richard Srepel, President.

DESCRIPTION: Sales, installation and service for TVRO terminals for private, residential, SMATV and broadcast applications.

Scientific-Atlanta, Inc.(404) 441-4000
One Technology Pkwy.

Atlanta, GA 30348

PERSONNEL: Sidney Topol, Chairman of the Board/CEO; John H. Levergood, President/COO;

Harry Popliss Jr., Senior Vice President/Finance-Treasurer; James A. Hart, Vice President;

Samuel D. Davis, Vice President; Dr. H. Allen Ecker, Vice President; David Eggers, Vice

President/General Counsel-Secretary; Julian W.

Eidson, Vice President/Controller; Jules E.

Kadish, Vice President; Leo E. Ramsaver Jr., Vice

President; Dr. Sezer M. Soylemez, Vice President;

John R. Pekowitz, Vice President; Peggy Wilson

Jones, Assistant Secretary.

DESCRIPTION: Complete line of cable TV

products including earth stations and receivers,

low noise converter, headend electronics,

distribution products, taps and passives, coaxial

cable, set-top terminals, and status monitoring

system.

Seaman Parsons Corp.(414) 769-8900
147 E Becher St.

Milwaukee, WI 53207

PERSONNEL: Charles Read, President; Patrick Conerty, Sales Manager

DESCRIPTION: Self-propelled trenchers 7 to 95 HP. Cable plows 50 to 175 HP, compaction equipment.

Seeburg Music

Satellite Network(919) 851-5823

WATS (National)(800) 334-1561

WATS (State)(800) 662-7332

5706 New Chapel Hill Rd.

Raleigh, NC 27607

PERSONNEL: James F. Goodmon, President;

Stephen Grissom, Vice President; Bonnie

Sullivan, National Sales

DESCRIPTION: Provides, via Galaxy I, TRNS

3, 24 hours a day audio music services to the cable

industry. Two formats; Lifestyle Upbeat

Instrumental and Lifestyle AC, original adult

contemporary hits; to be used for graphics channel

enhancement, basic audio or FM band application

or commercial sales, telephone hold, office lobby.

Distributorships available in certain territories for

commercial customers. Rates \$40.00 minimum/

\$200.00 maximum monthly per system.

Showtime/TMC(212) 708-1600

1633 Broadway

New York, NY 10019

PERSONNEL: Neil Austrian, Chairman/CEO;

Ron Bernard, Executive Vice President/Finance;

Jack Heim, Executive Vice President/Business

Development, Sales & Affiliate Marketing; Ron

Bernard, Executive Vice President/Finance &

Administration; Peter Chernin, Executive Vice

President/Programming & Marketing; Scott

Kurnit, Executive Vice President/General

Manager—Pay-Per-View

REGIONAL OFFICES: 666 Old Country Road,

Garden City, NY 11530, (516) 222-0122; 1800

Century Blvd. NE, Atlanta, GA 30345, (404) 633-

4326; 303 E Wacker Dr., Ste. 2024, Chicago, IL

60606, (312) 993-0100; 4700 Ashwood Dr., Ste.

210, Cincinnati, OH 45241, (513) 489-0881; 1360

Post Oak Blvd., Houston, TX 77056, (713) 961-

0915; 6800 College Blvd., Ste. 275, Overland Park,

KS 66211, (913) 345-1646; 8000 E Prentice Ave.,

Bldg. D-8, Englewood, CO 80111, (303) 8500-7380;

10900 Wilshire Blvd., Los Angeles, CA 90024,

(213) 208-2340; 567 Sutter St., San Francisco, CA

94102, (415) 362-6555; ORBANCO Blvd., Ste.

1000, Offices 9-10, 101 SW Fifth Ave., Portland,

OR 97204, (503) 222-4311; 5000 Quorum Dr., Ste.

455, Luckbox 59, Dallas, TX 75240, (214) 241-

1421; 2200 W Commercial Blvd., Ste. 304, Ft.

Lauderdale, FL 33309, (305) 733-2300.

DESCRIPTION: Showtime, the nation's second

largest pay television service, offers a wide range

of programming in such categories as blockbuster

movies, comedy, drama, music, family, Broadway

and after-hours. The Movie Channel, the third-

largest pay service, is the nation's only 24 hours

all-movie service. Continuity programming in

entirely devoted to the movie world. As well as

innovative interstitial, programming all films are

rated as rated G, PG, or R.

Sigmacom(416) 666-1991

III Industrial Dr.

Unit #5

Whitby, ONT Canada L1N 5Z9

PERSONNEL: Randy Zedic, President; Mike

Taylor, Vice President; Al Smelko, Sales Manager.

DESCRIPTION: Cable MA-CATV-SMATV,

design, engineering, special audio up-and

downlinking, data carrier systems.

Signal Engineering

& Sales Inc.(205) 328-6431

PO Box 10167

Birmingham, AL 35202

PERSONNEL: Louis H. Pfau, President; Henry

Swindle, Systems Engineer

DESCRIPTION: Complete two-way system

design, upgrade design, data and security,

satellite uplink, downlink, microwave, telephone

bypass, fiber optic and local origination.

Broadcast, fiber optic and microwave, local area

networks. Operation training.

Sitco Antennas(503) 253-2000

10330 NE Marx

PO Box 20456

Portland, OR 97220

PERSONNEL: Gus Berliner, President; Markus

Burker, Chief Engineer

DESCRIPTION: Manufacturers of MATV,

CATV, SMATV, LPTV and systems and

translator antennas and antenna arrays. Custom

antennas built to order.

Skyline

Cablevision Inc.(303) 364-2870

WATS (State)(800) 521-9916

1700 Jasper St.

Ste. C

Aurora, CO 80011

PERSONNEL: Carl Occhionero, President; Carol

Occhionero, Vice President

DESCRIPTION: Skyline Cablevision offers a full

range of administrative services to the SMATV

operator including management, billing,

maintenance, contract administration, marketing,

programming and engineering. We would be

happy to discuss your systems and show you how

we could assist in providing the most professional

service available in the SMATV industry.

Sky Waver

Associates Ltd.(516) 473-1639

3 Country Club Court

Mt. Sianai, NY 11766

PERSONNEL: G.D. Jordon, President

DESCRIPTION: Consulting service in strand

mapping, make ready, marketing and finances.

Sola A Unit

of General Signal(312) 439-2800

1717 Busse Rd.

Elk Grove, IL 60007

PERSONNEL: John Hutson, President; James

Kimball, Vice President/Sales-Marketing; Fred

Lemke, Sales Manager

DESCRIPTION: Sola is a major supplier of

power conditioning, power supply and battery

backup equipment to all areas utilizing sensitive

electronics or critical applications.

Space Age

Video Distributors(408) 559-8812

2902 Almaden Expressway

San Jose, CA 95125

PERSONNEL: V. C. Dawson, President; P. K.

Dawson, Vice President; Sharon Weeks, Sales

Manager

DESCRIPTION: Founders and exclusive

distributors of "The F.U.N. Channel," and "The

buyers' guide

Spatial Communications, Inc.

Pay-Per-View Channel" W-5-24. Suppliers of encryption systems via satellite. Programming fees \$1.00 per sub.

Spatial

Communications Inc.(503) 639-4186
16280 SW Upper Boones Ferry Rd.
Portland, OR 97224

PERSONNEL: Keith Dunford, President; F. Steven McLean, Western Regional Sales Manager; Thomas M. Ferguson, Eastern Regional Sales Manager.

REGIONAL OFFICES: 1416 Olive St., Scranton, PA 18510, (717) 347-8997.

DESCRIPTION: Manufacture and market a re-broadcast "microtenna" antenna.

Spectradyn Inc.(214) 234-2721
1501 N Plano Rd.

Richardson, TX 75080-0775

PERSONNEL: Howard T. Buchnan, CEO; John N. O'Hougherty, VP/Sales; Sid Boyer, Vice President/Field Operations

DESCRIPTION: Nation's largest provider of video and data communications systems to the hotel and lodging industry. Providing pay-per-view, direct satellite distribution of HBO/ESPN and other satellite services as well as guest services interactive data communications to over 350,000 hotel rooms. Provides over 60% of all PPV. Thirty-six field offices in the U.S. and 4 offices in Canada. 1985 sales, \$60 million.

Spectrum Planning Inc.(214) 680-1000
PO Box 831360

Richardson, TX 75083-1360

PERSONNEL: Jerry Armes, President; Duncan McIntosh, Vice President; Lyman Bishop, Vice President/Marketing & New Business Development.

REGIONAL OFFICES: 1350 Old Bayshore Hwy., Ste. 620, Burlingame, CA 94010 (415) 375-1311; 428 National Press Bldg., Washington, DC 20045, (202) 662-7655.

DESCRIPTION: Spectrum Planning offers the cable industry a wide range of Communications Engineering and Marketing Research Services including Engineering services-earth station interference analysis and coordination, FCC license application preparation, RFI measurements, CARS band analysis and coordination, frequency protection services, site location and land acquisition; Marketing research services-periodic telecommunications industry analysis, GARD TM (communications analysis research data) reports, market share trend studies, expanding market opportunity reports, communications system demand estimates, support services for sales and marketing of communications systems.

Sprucer CATV Group(201) 271-7544
400 Cottontail Lane
Somerset, NY 08873

PERSONNEL: Y. Tanaka, President; Fred Baier, Vice President; Bertram Hoffman, Vice President; Ken Ogiso, Manager/Electronics; Neil DeCostanza, Manager Sales & Marketing; Kewn Akabana, Manager/Customer Service; K. Okamoto, Engineering/System Design

REGIONAL OFFICES: 333 S Hope St., Los Angeles, CA 90071, (213) 323-1134

DESCRIPTION: Sprucer Two-way addressable cable system consists of, baseband converter, modulators, encoders, FSK/PSK modems, system

computers, bridge gate controllers (BGC), printers, uninterrupted power supply, system operation and application software. **Warranty and maintenance provided.

Standard

Communications Corp.(213) 532-5300
WATS (National)(800) 421-2916
PO Box 92151

Los Angeles, CA 90009

PERSONNEL: Donald W. Thomas, President; Mark Thomas, Executive Vice President; R. M. Truluck, Telecomm. Marketing Manager, Dianne Hinte, National Sales Manager

DESCRIPTION: A complete line of antennas, low noise amplifier/block downconverters and receivers in both C and Ku Band is offered. The product line features commercial grade components, flexible operation utilizing 4 GHz or LNBC input, block downconversion, active loop thru design, temperature stabilized dielectric resonator oscillator, and the industry's strongest warranty and 5 year replacement program.

Stern Telecommunications

Corp.(212) 719-4555
50 W 40th St.

New York, NY 10018

PERSONNEL: Joseph L. Stern, President
DESCRIPTION: An engineering, consulting and development organization providing innovative and cost-effective application engineering in broadcasting, satellite transmission, cable television, data transmission, telephony and electronics. Services offered include operational studies, equipment evaluation, product planning, system design and development and venture analysis.

Stevens General

Contractor(601) 425-5145
PO Box 281

Laurel, MS 39441

PERSONNEL: Robert L. Stevens, President
DESCRIPTION: Tower manufacturer, erection, maintenance, painting.

Stevens Tower Co.(601) 425-5145
PO Box 281

Laurel, MS 39441

PERSONNEL: Robert L. Stevens, Owner
DESCRIPTION: Specializing in consulting maintenance and construction of CATV and MATV systems along with tower fabrication and erection and inspection of TV, Radio, (AM and FM) owners.

Sullivan & Worcester(202) 775-8190
1025 Connecticut Ave.

Ste. 806

Washington, DC 20036

PERSONNEL: William Fishman, telecommunications attorney.
DESCRIPTION: Legal assistance with licensing applications.

Superior

Communications(602) 327-0462
340 S Columbus Blvd.

Tucson, AZ 85711

PERSONNEL: Randy Campbell, President; Patricia Ezerski, Vice President; Rick Ivie, Sales Manager

REGIONAL OFFICES: 2211 Voorhes, Rendon Beach, CA 90278, (213) 542-0445

DESCRIPTION: Service—Provide contract door-to-door sales, telemarketing, homes passed audits, multi-dwelling unit acquisitions, and advertising sales. Also provide consultancy services for CATV, private cable systems and related industries in system and company management, operations, marketing, sales, programming, franchising, and public relations.

Superior Metal

Products Inc.(206) 455-9159
2120 100th & 16th Ave. NE
Bellevue, WA 98005

PERSONNEL: Joseph Bookter, President; Ray Bookter, Vice President; Fred Larsen, Sales Manager

DESCRIPTION: Takes great pride in offering a complete line of high quality custom constructed enclosures, special requirements of the CATV industry. Manufactures three major product categories; wall mounted enclosures, pedestal mounted above-ground enclosures, flush to-ground insulated vault enclosures.

Supra Products Inc.(503) 581-9101
WATS (National)(800) 547-0252
PO Box 3167

Salem, OR 97302

PERSONNEL: Iral Barrett, President; Phil Barrett, Sales Manager; Ross Carey, Sales Manager

DESCRIPTION: Specializing in key and lock systems for Cable TV pedestals, equipment boxes, and fleet vehicle maintenance needs. We have serviced the industry for the past ten years.

Supra Key Control Ltd.(613) 523-1280
Box 8963

Ottawa, Ontario, K1G 3J2

PERSONNEL: Iral Barrett, President; Preston Davis, Operations Manager

DESCRIPTION: Supplying a complete line of Key Control products to the CATV industry for over 30 years. Supra's lock boxes, locking wallplates and cabinet/pedestal locks allow your servicemen and technicians immediate access to locked customer's locations with our one "title key." The only entry system you need.

TL Systems(619) 320-8006
762 Vella Rd.

Palm Springs, CA 92264

PERSONNEL: Ted Lafleur, President/Sales Manager

DESCRIPTION: Headend equipment consisting of satellite receivers, TV modulators. UHF/VHF processors; Model 7682-BLK block converted satellite receivers; Model 7682-LPM-satellite receiver with built-in TV modulators; Model 7610-LPM low cost TV modulators; Model 7610-UHF/VHF UHF to VHF or F to VHF processors.

T.R. Pitts Co.(507) 452-2629
WATS (State)(800) 642-2384

WATS (National)(800) 533-8092

PERSONNEL: T.R. Pitts, President; Marian Gamney, Sales Manager; Bill Brookhis, Sales Manager; Don Thompson, Sales Manager

REGIONAL OFFICES: 701B Stephenson Ave., Iron Mountain, MI 49801, (800) 772-9431; 249 Wilson Pike Circle, Brentwood, TN 37027, (615) 373-5171; 12703 NE 129th Court, Kirkland, WA 98034, (206) 821-9709

DESCRIPTION: CATV-SMATV materials and

buyers' guide

Teledac Inc.

supplies, headends, cable, antennas, line and distribution materials and supplies amplifiers, origination, tools, test and drop equipment and supplies, commercial insertion equipment, marking flags and paint, corrosion inhibitors, and many regular and specialty items.

TV Cableguide Magazine.....(314) 946-5111
210 First Capitol Plaza
St. Charles, MO 63301
PERSONNEL: Frank Brooks, President; Annette Brooks, Sales Manager
DESCRIPTION: TV Cableguide Magazine is a weekly, bi-weekly, or monthly magazine which comes in many price ranges with 24-hour listings, customized or generic, cable and network, grids, editorials, promotions and revenue streams. The oldest TV publication in the Midwest, TV Cableguide can customize a magazine to your specific cable system and increase penetration. Call 314-946-5611.

TV Sports Scene Inc. (TVSS)(612) 925-9661
5804 Ayrshire Blvd.
Minneapolis, MN 55436
PERSONNEL: Donald L. Herrick, President; Robert C. Bruce, Vice President; Phil Hennessey, Local Regional Sales Manager; Don Herrick, National Sales Manager
DESCRIPTION: Provides programming as a

distributor to TV stations; Cable stations and networks; national distribution, international distribution.

Talkan Co., Inc......(913) 841-5538
PO Box 3327
Lawrence, KS 66046
PERSONNEL: Shu Wu, President, Ching Wang, Vice President/Sales Manager
DESCRIPTION: CATV/MATV passive and active devices, including converters.



Tamaqua Cable Products Corp.(717) 385-4381
PO Box 347
Schuylkill Haven, PA 17972
PERSONNEL: William H. Combs III, President; John K. Dutton, Sr. Vice President; Andrew L. Paulick, Vice President/Finance; George M. Combs, Sales Manager
DESCRIPTION: Coaxial or fiberoptic cable (from the manufacturer of your choice) pre-installed in

flexible high density polyethylene duct in continuous lengths up to 6.3 kilometers (19.200).

Tape-Athon Corp......(213) 676-6752
13633 Crenshaw Blvd.
Hawthorn, CA 90250
PERSONNEL: Leon E. Tate, President; Rubert Mayfield, Sales Manager
DESCRIPTION: Manufacturer of audio amplifiers, reel-to-reel and cassette transports, message repeaters, multi-transport systems, background and foreground music mono and stereo.

Teledac Inc......(514) 671-7762
661 Pine St.
St. Lambert, QUE, Canada J4P 2P4
PERSONNEL: Martin Chouinard, President; Jean Louis Chouinard, Vice President; Martin Chouinard, Sales Manager
REGIONAL OFFICES: 61 Sarah Lane, Unit No. 24, Oaygilbe Ont, Canada L6L 3Z2 (416) 837-0065, 1150 Burnaby St., Ste. 1607, Vancouver, BC, Canada, (604) 687-5575
DESCRIPTION: Manufacturer of character generators. Models T-1300 for multi-user applications and T-1016 series for low cost standalone message display. On screen premium channel guide with our PROMOGUIDE and PROMOCYCLE systems. We specialize in TV Listings.

10,580* proven purchasers

Waiting to learn about your company's equipment, software, design & construction services. Reach them loud & clear with a boldface listing, logo or display advertisement in the **CATV Buyers' Guide**.

Available only in the September 1986 issue of *CED*, the **CATV Buyers' Guide** is a thorough, accurate directory of companies providing hardware or technical services to the cable industry.

For your **FREE** listing, contact Kathy Berlin.

For advertising space reservations, contact your *CED* representative today or call Cathy Wilson.

** According to data gathered by the Harvey Research Organization, 95 percent of CED's subscribers have actually purchased or recommended the purchase of CATV products or services because of advertising or editorial coverage in CED.*



600 Grant Street, Suite 600
Denver, CO 80203
303/860-0111

buyers' guide

Tele-Measurements, Inc.

Tele-Measurements Inc.(201) 473-8822
145 Main Ave.
Clifton, NJ 07014
PERSONNEL: William E. Endress, President; Douglas W. Cook, Vice President/Sales; Carl R. Ceragno, Vice President/Engineering
DESCRIPTION: Sales and service, project engineering, broadcast and industrial TV, local area network/data distribution, teleconferencing/graphic presentation, video surveillance/access control.

Tele-techniques, Inc.(212) 206-1475
One W 19th St.
New York, NY 10011
PERSONNEL: Michael Temmer, President
DESCRIPTION: Programming for cable.
Facilitates: consulting, design and installation.



Tele-Wire Supply Corp.(516) 293-7788
Seven Michael Ave.
East Farmingdale, NY 11735
PERSONNEL: Sy Guttenplan, President; Jim Ruh, Vice President; Marty Ingram, Sales Manager/Sat Electronics Division
REGIONAL OFFICES: 614 Ave K E, Grand Prairie, TX 75050, (214) 988-3226; 1289 Porter Way, Sarasota, FL 34240 (813) 371-3447; 701 B Stephenson, Iron Mountain, MI 49801 (906) 774-4111
DESCRIPTION: Full stocking distribution of CATV, SMATV, LPTV, DBS, SCPC radio equipment, tele-communications equipment. Tele-wire can design and supply the complete system of anyone of the above listed industries. Stock, electronics, constructions material, tools, safety equipment, test equipment, satellite electronic.

Telecrafter Products Corp.(406) 245-8200
WATS (National)(800) 548-7243
PO Box 21475
Billings, MT 59104-1475
PERSONNEL: Dorit C. Herman, President
DESCRIPTION: Makers of Universal cable markets, audit control box, drop control box, Theft control lock and seal system. Converter Warden security seat, the RB-2 clip gun and RB-2 cable clips.

Tempo Data and Text(404) 949-6600
3530 Bomar Rd.
Douglasville, GA 30135
PERSONNEL: Stephen Taylor, Vice President; Coleman Breland, Data Systems Manager.
DESCRIPTION: Data services unlinked on the vertical blanking interval of WTBS, Galaxy I Transponder 18 includes headend decoded services. "AP Cable News, Dow Jones Cable News, Program Information Network." Decoder at sub's home or office. BEETS data systems.

Electra is a unique Tempo service decoded at subs TV set—it is a national satellite magazine which viewers can read at their leisure. Features include sports, weather, stock quotes, recipes and new items. Viewers can choose which pages of the magazine they want to read when they want to read it using a remote controlled handset. Information is continuously updated on a 24 hour period.

Tempo Enterprises(918) 481-0881
6918 S Yorktown
Tulsa, OK 74136
PERSONNEL: Edward L. Taylor, President; Richard B. Smith, Executive Vice President; Selman M. Kramer, Vice President
DESCRIPTION: Tempo Enterprises is a distributor of both entertainment and information via satellite. The company concentrates in three major areas, transmission of Superstation WTBS Programming, and distribution of Tempo Television.; distributor of Tempo Sound, the industry's first package of premium audio services; and the ownership and management of cable television system services.

Temtron Electronics Ltd.(516) 599-6400
WATS (National)(800) 645-2300
15 Main St.
East Rockaway, NY 11518
PERSONNEL: Sid Sussman, President; Glen Haimes, CATV Sales Manager.
DESCRIPTION: Distributor of CATV replacement parts and equipment, microwave tubes, TWT's, klystrons, camera tubes, surge arrestors, capacitors, transistors of all types, integrated circuits, RF hybrids—all types, and drop and line supplies. Also available: Jerrold equipment, plug in pads, stage and studio lamps, and all types of commercial lighting.



Texscan Communication Products Division(915) 594-3555
WATS (National)(800) 351-2345
10841 Pellicano Dr.
El Paso, TX 79935
PERSONNEL: Charles Auer, Vice-President, Sales/Mktg.; G. Bickley Remmey, Director of Marketing
DESCRIPTION: Manufacturer of CATV distribution equipment including T-series and Pathmaker, main line passes, directional taps, power suppliers, converters and MMDS reception equipment.

Texscan Instruments Division(317) 545-4196
3169 N Shadeland Ave.
Indianapolis, IN 46226
PERSONNEL: Gary Gerehold, Division/General Manager; Ron Adamson, Sales Manager
DESCRIPTION: Manufacturer of 75 ohm test equipment including signal level meters, spectrum

analyzers, sweep systems, leakage detection equipment and a variety of components.



Texscan MSI/ Compuvid Corp.(801) 262-8475
WATS (National)(800) 367-6011
3855 South 500 W, Ste. S
Sage Lake City, Utah 84115
PERSONNEL: David Keller, Division/General Manager; Ken Lawson, Director of Marketing
DESCRIPTION: This division of Texscan is responsible for manufacturing automated program origination systems including character generators, teletext displays, commercial insertion and VCR program playback.

Times Fiber Communication Inc.(203) 265-8500
358 Hall Ave.
Wallingford, CT 06492
PERSONNEL: John Forde, President; Rex Porter, Vice President.
DESCRIPTION: Manufacturers of coaxial cables, trunk and feeder cable and drop cable for CATV, MATV, CCTV and STV. RF Transmission line cable.

TOCOM Division General Instrument Corp.(214) 438-7691
PO Box 47066
Dallas, TX 75247
PERSONNEL: Mike Corboy, President; Bill Flaherty, Executive Vice President; Sid Prothro, National Sales Manager; Tom Martin, Director of Research and Development
REGIONAL OFFICES: 31 W 34th Street, New York, NY 10001, (212) 760-1700; 2611 Westgrove Road, Carrollton, TX 75006, (214) 248-7931; 7100 E Belleview Avenue, Ste. 101, Englewood, CO 80111, (303) 740-6118.
DESCRIPTION: Manufacturer of a complete line of advanced communications systems for the CATV industry. Products include the TOCOM Plus line of baseband addressable set-top converters, decoders and headend control systems and home security products including home alarm terminals and alarm only terminals.

Toner Cable Equipment Co.(215) 675-2053
WATS (National)(800) 523-5947
WATS (State-PA)(800) 492-2512
969 Horsham Rd.
Horsham, PA 19044
PERSONNEL: Robert L. Toner, President/Sales Manager
DESCRIPTION: Distributor of CATV headend electronics, computer billing systems, distribution and installation equipment. Cable converter interfaces.

Tower Specialties Inc.(912) 285-2133
PO Box 649
Waycross, GA 31502

buyers' guide

Tri/Media Communications, Inc.

PERSONNEL: Shirley Balwanz, President; Robert Balwanz, Vice President/Secretary-Treasurer; Grant Balwanz, Chairman; Frank Balwanz, Sales Manager; Carol Balwanz, Office Manager
DESCRIPTION: Fabrication, erection, painting and maintenance of towers.

Transcomm Inc.(703) 532-3160
 6521 Arlington Blvd.
 Ste. 214

Falls Church, VA 22042

PERSONNEL: Norman Lerner, President
DESCRIPTION: Special consulting in financial and economic aspects of telecommunications and publishing. Activities include investment/venture analysis, price and rate development, financial analysis, market research, regulatory/expert witness presentations.

Trans USA Corp.(201) 254-3020
 PO Box 548

E Brunswick, NJ 08816

PERSONNEL: Lee Liaw, President; Joe Chang, Vice President; Steve Kovacs, National Sales Manager

DESCRIPTION: Trans USA Corp. manufactures distribution amplifiers, taps, splitters, matching transformers, filters, connectors, poleline hardware and converters. Products are imported from Taiwan, with maximum savings for cable companies. Serving the industry since 1975.

Trilogy Communications.....(601) 932-4461
 2910 Hwy 80 East
 Pearl, MS 39208

PERSONNEL: Steven Hallock, President; John Kaye, Executive Vice President/Engineering and Manufacturing; Shinn Lee, Executive Vice President/Finance; Bill Kloss, National Sales Manager

DESCRIPTION: Manufacturer of 75 and 50 ohm coaxial cables along with UL approved plenum cables.

Trippe Lite
 (Trippe Mfg.).....(312) 329-1777
 500 N Orleans St.

Chicago, IL 60610

PERSONNEL: Keelin Wyman, Sales Manager

DESCRIPTION: Manufacturers of AC to DC inverters, DC converters, DC power supplies, brown out protectors, noise and spike suppressors.

and black out protectors/emergency power systems. Available for purchase through distributors throughout the United States, Canada and overseas export.

Tri/Media
 Communications Inc.....(208) 344-5145
 2511 N 31st St.



PAY TV can be a profitable experience for Hotels, Hospitals, Apartments and Cable TV systems. With flexible Triple Crown equipment for building wiring of all types, be it Loop-Thru wall plates, off premise Home Run taps, or impulse two way interactive convertors, Pay Television could generate an impressive extra income for you.

Pay per view, per day or per stay, with options from call down manual ordering, touch tone automatic, impulse full convertor, we offer the correct system for your needs. Triple Crown addressables also offer remote access by your office business computer via cable or phone modem through the area processor which constantly refreshes the system. We can even save you money through the use of remote control disconnects.

To get a clearer view of the many ways Triple Crown addressables can make PAY TV more profitable for you, call us first, because we are!



Triple Crown Electronics Inc.(416) 629-1111
 4560 Fieldgate Dr.

Mississauga, ONT, Canada L4W 3W6

PERSONNEL: Charles J. Evans, President; P. Ayiotis, Vice President; A. Kleopa, Vice President; K. Poirier, Vice President; David Emberson, Director of Marketing; David Fear, Director of Marketing; E. Russell, Sales Manager.

REGIONAL OFFICES: 601 Fairway Dr.,

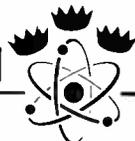
Deerfield Beach, FL 33442 (305) 429-0870

DESCRIPTION: Triple Crown Electronics manufactures satellite receivers for 4 and 12 GHz, TV and FM modulators, processors and demodulators, indoor and line amplifiers (300 & 450 MHz), DBC Addressable products, low power rebroadcast transmitters and Cable Power Inc. standby power supplies.

TRIPLE CROWN ELECTRONICS

4560 Fieldgate Drive
 Mississauga, Ontario L4W 3W6

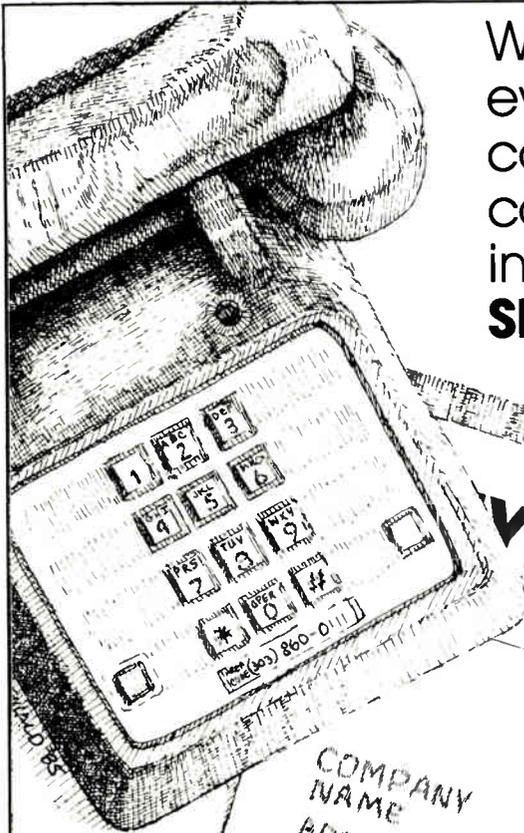
(416) 629-1111



601 Fairway Dr.
 Deerfield Beach, Florida 33442

(305) 429-0870/1-800-824-4332

Reader Service Number 54



We have made every effort to contact your company for inclusion in the **SMATV Buyers' Guide**.

SMATV BUYERS' GUIDE

COMPANY NAME
ADDRESS
CITY
TELEPHONE

- UNABLE TO REACH
- NO ANSWER
- NUMBER NOT AVAILABLE
- LINE BUSY

No listing in SMATV Buyers' Guide

However, if your company or personnel, or someone you know, was not listed, and should be in the September issue of the **CATV Buyers' Guide**, please contact us.

You are one of the sources available for accurate, up-to-date information in this important reference tool.

buyers' guide

Tru-Level, Inc.

PO Box 5124
Boise, ID 83705
PERSONNEL: Tom Hotchkiss, Executive Producer; Coral Hotchkiss, Associate Producer
REGIONAL OFFICES: PO Box 2502, Tauranga, New Zealand.
DESCRIPTION: Producer of special programs from foreign locales. Operates international film unit active in South America, Africa and Asia.

Tru-Level, Inc.(602) 924-1083
925 N Stapley
Ste. C
Mesa, AZ 85203
PERSONNEL: Steven W. Holtman, President
DESCRIPTION: Tru-Level Inc. is a well diversified company that handles all jobs from engineering to pre-wiring and installation of cable, and installation of customer to audit systems.

Tulsat Corp.(918) 836-8348
WATS (National)(800) 331-5997
1839 N 105th E Ave.
Tulsa, OK 74116
DESCRIPTION: Distributor for Automation Techniques and service center. For SMATV, modifications to make receivers compatible with descramblers.

United
Satellite Systems(218) 681-5616
Rte. One
St. Hilaire, MN 56754
PERSONNEL: Doug Dehnert, President, Richard Anderson, Sales Manager
DESCRIPTION: USS manufactures equipment for CATV headends. We manufacture satellite antennas from 3.8 to 7.6 meters. The satellite antennas are constructed of durable fiberglass and backed by rugged, galvanized mounts. Our headend products include the SRA-500 satellite receiver and MD450 Output Frequency Tunable Modulator.

United Video(918) 665-6690
WATS (State)(800) 331-4806
3801 S Sheridan
Tulsa, OK 74145
PERSONNEL: Roy Bliss, Executive Vice President; Jeff Treeman, Vice President Sales and Marketing; Chris Bourne, National Sales Manager
DESCRIPTION: Distributes and sells basic cable entertainment and video text services. Three independent satellite services offered: (audio & text), WGN/Chicago, WPIX/New York, KTVT/Dallas, Ft. Worth.

Universal
Electronics Inc.(614) 866-4605
4555 Groves Rd.
Ste. 13
Columbus, OH 43232
PERSONNEL: Thomas P. Harrington, President; Tim Harrington, Vice President; S. Cohen, Sales Manager
DESCRIPTION: Manufacturer and distributor

CED

International Thomson
Communications Inc.
P.O. Box 5208 T.A., Denver, CO 80217
(303) 860-0111

buyers' guide

WPIX, New York Alive

Coax-Seal products. Coax-Seal is a new pliable plastic connector sealant used in microwave, satellite, SMATV, CATV installations. Products are used to waterproof coaxial connectors and all other types of RF equipment hook-ups from the largest to the smallest. Basically is known as a cable sealant—154 cable sealant, 222 sealant tape.

Universal
Pay Television.....(818) 777-4300
70 Universal City Plaza
Universal City, CA 91608
PERSONNEL: Gene F. Giaquinto, President; Ned Nalle, Vice President; Amy Shapiro, Vice President; Jerry Hartman, Vice President.
DESCRIPTION: Motion pictures from Universal Pictures and Paramount (pre-1948 only) series, specials.

U.S. Antenna Inc.(718) 442-4772
2096 Clove Rd.
Staten Island, NY 10305
PERSONNEL: Edith Gaughan, President; Jess Brown, Sales Manager
REGIONAL OFFICES: 20946 Corsair Blvd., Hayward, CA 94545, (415) 887-2775; 1921 Peyton Ave., Ste. P, Burbank, CA 91504, (818) 954-9793
DESCRIPTION: Cable TV contracting services for multi-unit pre and post wiring and residential installations. We are a woman-owned business enterprise and are certified as such. We operate nationwide, including the East, Midwest and California areas.

Utility Tower Co.(405) 946-5551
3200 NW 38th
PO Box 12369
Oklahoma City, OK 73157
DESCRIPTION: Manufacturer and installer of AM, FM, CATV, MW, guyed and self-supporting tower. Installation or replacement of antennas.

Vibra-King Inc.(507) 387-6574
WATS(National).....(800) 533-2077
Box 247
Mankato, MN 56001
PERSONNEL: C. J. Brahrer Jr., Vice President; Dave Holcomb, Sales Manager
REGIONAL OFFICES: 707 Ocean Blvd., Apt. C, Seal Beach, CA 90740, (213) 430-6934; Rte. #3, Box 1132A Busbe, Gaston, SC 29053, (803) 755-2303
DESCRIPTION: Accupunch is a pneumatic underground piercing tool for making bores under streets and driveways. Our machines are extremely accurate, and have the ability to pull pipe. Recently available is our new 1 3/4" machine just for the cable TV market.

Videotek Inc.(215) 327-2292
243 Shoemaker Rd.
Pottstown, PA 19464
PERSONNEL: Philip G. Steyaert, President; Peter H. Choi, Vice President/Sales
DESCRIPTION: Videotek manufacturers a comprehensive line of: color receiver/monitors; professional rackmount color monitors; waveform monitor; vectorscope; distribution amplifiers for video, audio, pulse and subcarrier signals; routing switchers; demodulators; and audio program monitors.

VideoProbeIndex, Inc.(704) 658-0526
PO Box 575

Weaverville, NC 28787
PERSONNEL: Robert Schultz, President; Gloria Mamber, Vice President
DESCRIPTION: Cable's first research company since 1971. Custom surveys and consulting for cable, broadcaster and communications attorneys. Significant Viewing Surveys have certified many distant signals before FCC. Expert witness. Now emphasizing focus group moderating for new electronic media by Bob Schultz.

Victor Duncan, Inc.(214) 869-0200
6305 N O'Connor Rd.
#100
Irving, TX 75039
PERSONNEL: Lee A. Duncan, President; Victor Duncan, Vice President; Frank Marasco, Vice President; Bill Riter, Sales Manager/Dallas; Ginny Hart, General Manager/Detroit; Kirk Paulsen, General Manager/Chicago
REGIONAL OFFICES: 32380 Howard St., Madison Heights, MI 48071, (313) 589-1900; 661 N LaSalle St., Chicago, IL 60610, (312) 943-7300
DESCRIPTION: Sales (through Dallas office only), rentals & service (available in all three offices) of broadcast video and audio equipment, backed up by a highly qualified technical services team.

Video Data Systems(516) 231-4400
205 Oser Ave.
Hauppauge, NY 11787
PERSONNEL: Stephen Seiden, President
DESCRIPTION: Manufacturers of computer managed multiple display systems, digital weather systems, automated newswire display systems for, UPI, AP, Reuters and Dow Jones; program guides and DIP automated program guides; TV production titling systems, vertical interval transmission, link encoder/decoder (transparent communication system utilizing a standard television signal), Data Bridges and Teletext Test generators.

Virginia A.
Ostendorf, Inc.(303) 797-3131
PO Box 2896
Littleton, CO 80161
PERSONNEL: Virginia A. Ostendorf, President; Ronald Ostendorf, Vice President
DESCRIPTION: Publishers of the Downlink Directory 1985-86, a reference guide to more than 2,000 domestic receive earth stations, both C-band and Ku-band; also publish the Uplink Directory 1986 which lists more than 300 earth stations in the U.S. which are available for outside public use. Both include fixed and transportable systems. Firm consultants also conduct teleconference training and teleconference implementation support. Also offers a new series of corporate training delivered by teleconference.

Vitek Electronics Inc.(607) 796-2611
901 South Ave.
PO Box 111
Horseheads, NY 14845
PERSONNEL: John McQuaid, General Manager/Vice President; Edwin Eshliman, Marketing Manager; Leonard DeRenzo, Sales Manager
DESCRIPTION: Pay TV security devices and test equipment; Narrow notch, audio and signal through multi-channel traps; jumper traps, tracers (RF Leakage Detectors), and noise calibrator.

Vermeer Manufacturing(515) 628-3141
PO Box 200
New Sharon Rd.
Pella, IA 50219
PERSONNEL: Stan Vermeer, President; Bob Vermeer, Vice President; Mary Vermeer Andringa, Vice President; Pat Weiler, Director of Engineering; Paul Hugen, Sales Manager
DESCRIPTION: Manufacturer of Industrial Equipment; trencher, cable plows, concrete cutters, asphalt cutters, backhoes and boring tools.

Visual Communications
Group, Inc.(303) 443-6003
3300 Mitchell Lane
Ste. 393
Boulder, CO 80301
PERSONNEL: Fred Hull, President/Technical Director; Shoni Ogier-Hubatka, Vice President/Producer
DESCRIPTION: The Visual Communications Group Inc. of Boulder is a video and multi-image production company, specializing in productions for business and high technology communication purposes. VCG also offers 1/2", 3/4", and 1" editing facilities, audio sweetening, 1/2" and 3/4" dubbing capabilities and equipment rental.

VideoSat Corporation(914) 241-7063
40 Radio Circle
Mount Kisco, NY 10549
PERSONNEL: Dean Roseti, President
DESCRIPTION: We do commercial satellite installation, downlinking and video teleconferencing. Also sales, service, installation of satellite. We upgrade older systems and provide consulting services.

WFMT(918) 665-6690
WATS (National)(800) 331-4806
3801 S Sheridan
Tulsa, OK 74145
PERSONNEL: Roy Bliss, Executive Vice President; Jeff Treeman, Vice President Sales and Marketing; Chris Bourne, National Sales Manager
DESCRIPTION: WFMT (on Galaxy 1, Transponder 3, Sub-carrier) is the nation's first super radio station. WFMT delivers fine arts, classical FM music live from Chicago. Over one million listeners nationwide now enjoy WFMT.

WGN, The Chicago
SuperChannel.....(918) 665-6690
WATS (National)(800) 331-4806
3801 S Sheridan
Tulsa, OK 74145
PERSONNEL: Roy Bliss, Executive Vice President; Jeff Treeman, Vice President Sales and Marketing; Chris Bourne, National Sales Manager
DESCRIPTION: WGN, The Chicago SuperChannel (on Galaxy 1, Transponder 3), offers you exciting sports coverage featuring Cubs baseball and pro and NCAA basketball. Over 60 hours of blockbuster movies are shown each week, in addition to a solid line-up of hit series. Children's programming features Bozo the Clown, with over 20 hours of action weekly for kids to watch.

WPIX, New York Alive.....(918) 665-6690
WATS(National).....(800) 331-4806
3801 S Sheridan

buyers' guide

WW Entertainment

Tulsa, OK 74145
PERSONNEL: Roy Bliss, Executive Vice President; Jeff Treeman, Vice President Sales and Marketing; Chris Bourne, National Sales Manager
DESCRIPTION: WPIX, New York Alive (on Satcom 4, Transponder 19) brings you unbeatable sports including New York Yankees baseball, pro and NCAA football, and Big East basketball. New York's #1 independent also features a movie library of over 5,000 titles; action-packed suspense and comedy series; and INN News.

WW Entertainment.....(212) 661-3350
 205 E 42nd St.
 New York, NY 10017
PERSONNEL: George Hankoff, President; Louis S. Israel, Senior Vice President; Sylvia Delia, Director of Sales/Cable and Home Video
DESCRIPTION: Black Belt Theatre-martial arts pictures. Also action/adventure and art films such as "Ice," "Whirlpool," and "The Twisted Detective," starring Alain Delon, "Bad Timing," starring Art Garfunkel and "Bread and Chocolate" with Nino Manfred.

Walter S. Wydro
 Consultants.....(215) 860-2288
 Four Terry Dr., The Atrium
 Ste. 10
 Newtown, PA 18940
PERSONNEL: Walter S. Wydro, President; Alicia A. Wydro, Vice President; Barry Nuss, Senior Staff Engineer
DESCRIPTION: CATV and telecommunications services of financial management and review, engineering, franchise application and review, litigation representation, interactive systems, special subscriber services, pay cable, municipal services, laboratory measurements, LAN/Voice-Data/Video, system design and planning.

Warner Bros. Domestic Pay-TV
 & Network Feature
 Film Sales.....(212) 484-6307
 75 Rockefeller Plaza
 New York, NY 10019
PERSONNEL: Edward Bleier, President; Stanley Solson, Vice President/Sales and Administration; Eric D. Frankel, Vice President/
Marketing
DESCRIPTION: The film industry's leading studio for two consecutive years, Warner Bros. features films including: "The Color Purple," "Wildcats," "Police Academy 3: Back In Training," and "Cobra," available to Pay-Per-View, Pay-TV and basic cable outlets. A library containing hundreds of older movies as well as some non-theatrical material (e.g., "Life on Earth" series) is also available.

Warren & Morris Ltd.(619) 481-3388
 2190 Carmel Valley Rd.
 Del Mar, CA 92014
PERSONNEL: Charles C. Morris, President; Scott C. Warren, Vice President; Thomas J. Pezman, Account Representative
DESCRIPTION: Services include: executive search and recruitment, interview centers; outplacement; collegiate recruiting and selection; salary surveys; and resume preparation, utilizing our extensive network of contacts and the most complete, computerized personnel data base in the industry. Our resources also include E.E.O. consulting, management and labor relations seminars.

WAVETEK®

Wavetek Indiana, Inc.(317) 788-5965
WATS (National)(800) 622-5515
 5808 Churchman Ave.
 PO Box 190
 Beech Grove, IN 46107
PERSONNEL: Jim Walcutt, General Manager; Jack Webb, Sales Manager
DESCRIPTION: Full line manufacturer of broadband cable test equipment including analyzers, signal level meters, signal leakage detectors, automatic test equipment, signal generators, system sweep, bench sweep, TVRO/bench, set top converter test, accessories and components.

Weather Scan Inc.....(817) 564-5688
 Loop 132 and Hwy. 79
 Olney, TX 76374
PERSONNEL: R.H. Tyler, President/Sales Manager; Bill R. Tyler, Vice President/Sales Manager
DESCRIPTION: Manufacturers of Weather Scan and distributors of Blonder-Tongue, RMS, ISS, Catel, Capscan, Eagle Comtronics, Cablewave and MACOM CATV Equipment.

Weldone
 Trading Co., Inc.(514) 381-8861
 1401 Legendre W
 #106
 Montreal, PB Canada H4N 2S2
PERSONNEL: Murray Shenkman, President/
Sales Manager
DESCRIPTION: Manufactures tower cable clips — sizes to fit all cables including Quad and double shielded coaxial for single and dual systems. Available in black and white. Plated, hardened steel masonry nails. Pre-assembled ready for use. Sure-fit for quick simple installation. Sold by most leading distributors.

Western CATV
 Distributors Inc.(213) 539-8030
 3430 Fujita Ave.
 Torrance, CA 90505
PERSONNEL: William Ewing, President; Allen Lipp, Vice President; Dave Massaglia, Vice President; Dave Herman, Vice President
DESCRIPTION: A complete line of CATV, SMATV equipment. Distributor of products for key manufacturers in the cable TV industry and stock facility. Complete repair facility for all electronic products and converters.

Wide Band
 Engineering Co., Inc.(602) 254-1570
 PO Box 21652
 Phoenix, AZ 85036
PERSONNEL: S. Ticknor, President; M. Ticknor, Sales Manager
DESCRIPTION: Manufacturers of 1-900 MHz RF test instruments, including sweep amplifiers, comparators, impedance bridges, terminations, directional couplers, hybrid power divider/combiners, RF switches, filters, RF detectors, impedance transformers, DC blocks, etc.

Zenith Electronics

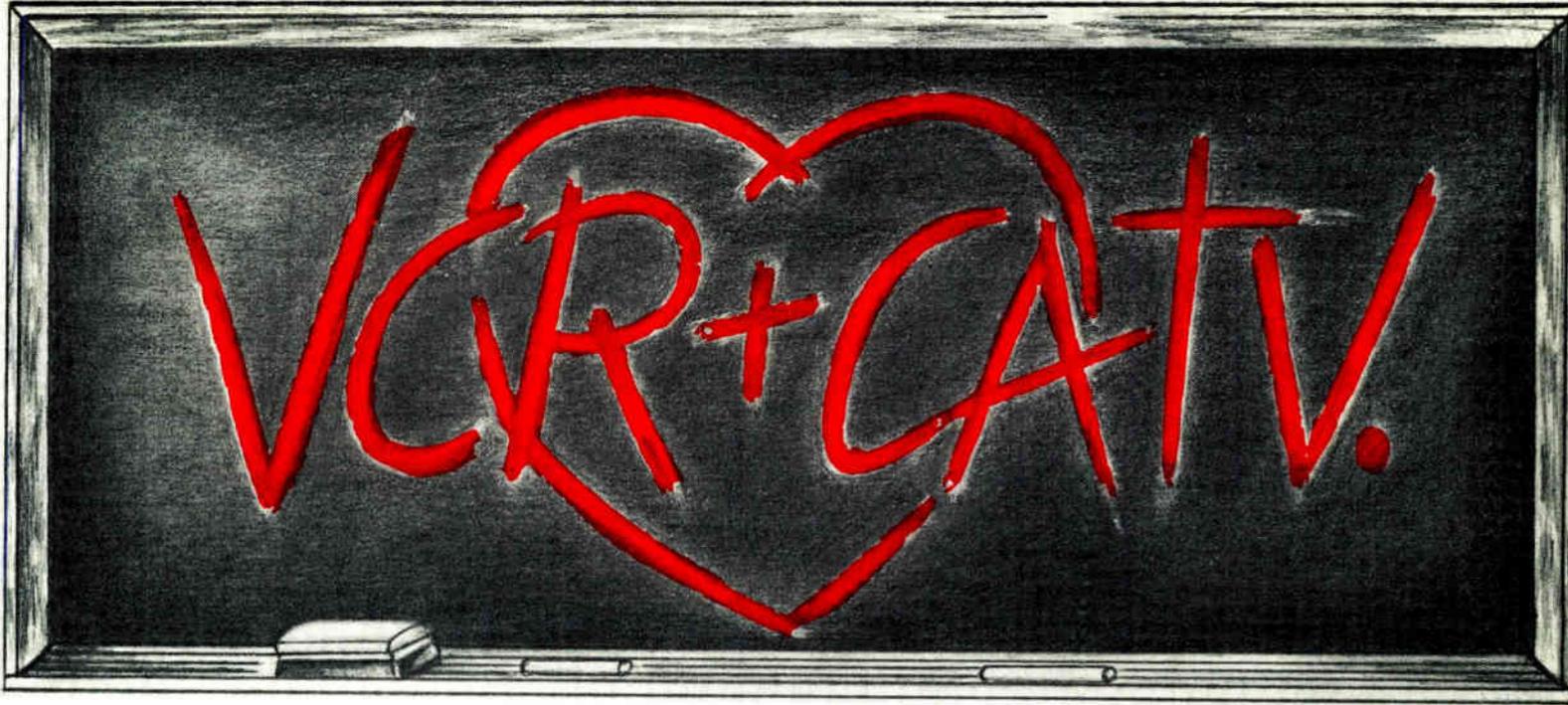
Wiresat Corp.(904) 237-6241
 5960 SW First Lane
 Ocala, FL 32674
PERSONNEL: Frederick Yeaton, President; James R. George, Vice President
DESCRIPTION: Owner/operator private cable operating systems, including full management/maintenance service.

World Video Library, Inc.(817) 831-3811
 2747 Airport Freeway
 Fort Worth, TX 76111
PERSONNEL: John W. Raliff, President; Joseph M. Sigler, Vice President Operations; Gerry D. Jordan, Senior Vice President/Programming; Wayne Burress, Marketing Director
DESCRIPTION: Manufacturer, distributor and service representative of the "Impulser" system which provides pay-per-view equipment and software. The "Impulser" upgrades one way addressable systems to impulse pay-per-view WVW also provides early window movies for "Impulse pay-per-view" customers.

Yale Video(714) 831-7700
 27285 Las Ramblas
 Ste. 130
 Mission Viejo, CA 92691
PERSONNEL: Bert Yale, President; Ken Creasman, Vice President/Sales Manager
DESCRIPTION: Provide program production services from concept to completion, including scriptwriting, on-location and in-house studio production, stock footage library, on-line editing, digital effects and 3-D computer animation.

Zenith Cable
 Products Division(312) 391-8181
 1000 Milwaukee Ave.
 Glenview, IL 60025
PERSONNEL: James L. Faust, President; Vito Brughiera, Vice President Marketing/Products Division; Charles O. Eissler, Vice President Sales; John Bowler, Vice President; Richard Collie, Sales Manager; Robert Cunningham, Sales Manager; Barry Hardek, Sales Manager; Robert Kuopus, Sales Manager; Mike Adams, Sales Manager; Glen Andrews, Sales Manager-Canada
REGIONAL OFFICES: 28686 Bolanos, Mission Viejo, CA 92692, (714) 855-3278; 2022 Powers Ferry Rd. #180, Atlanta, GA 30339, (404) 951-8425; Londonderry Professional Park, Suite 4B, Route 102, Londonderry, NH 03053, (603) 434-2830; 723 Shyder Mountain Road, Evergreen, CO 80439 (303) 674-2918; 1130 East Sleepy Hollow, Suite A, Olathe, KS 66062 (913) 764-5554; Zenith Radio Canada, Ltd., 1020 Islington Ave., Toronto, ONT Canada M8Z 5X5, (416) 231-4171
DESCRIPTION: Zenith offers a complete line of cable products including Z-TAC baseband addressable decoders, PM RF addressable converters, Pay-Master add-on decoders, impulse pay-per-view (IPPV) systems: Z-View for two-way cable system; Phonevision/ANI telephone system for one-way cable systems; SSAVI, STV and MMDS addressable baseband decoders; Z-LAN data and communication products; VCR interface and TAC-timer.

Zenith Electronics
 Corporation(312) 391-8181
 1000 Milwaukee Ave.
 Glenview, IL 60025
PERSONNEL: Jerry Tearlman, President
DESCRIPTION: Manufacturer of TV and VCRs, computers and other home electronics.



VCR & CATV. TOGETHER AT LAST.

Finally there's a solution to VCR/CATV compatibility. It's called the Video Control Center, and it's made exclusively for the CATV industry by Qintar.

It's the answer to the problem of program selection independence.

The Video Control Center switches up to 4 RF inputs (Basic, Premium, VCR, & AUX) on a VCR.

The affordable Video Control Center, by Qintar, works with either single or dual cable systems and is available in both *passive* or *amplified* versions.

Now there's no need to connect and reconnect wires and



All units can be private-labeled and custom configured. Your logo is displayed (in any color ink) on the front panel. And the switch sequences can be printed to your specifications.

fumble with many A/B switches.

The Video Control Center is built to strict CATV specifications and is sold only to cable companies.

If your system has special needs, call our president, Randy Tishkoff. He'll be happy to discuss a custom switch for your system.

The Video Control Center. Makes VCR + CATV a marriage that's destined to last.

SPECIFICATIONS.

• BANDWIDTH.....	5-450MHZ
• INPUTS.....	4 (CABLE, CONVERTER, VCR, AUX)
• OUTPUTS.....	3 (TV, VCR, AUX)
• INSERTION LOSS-CABLE.....	6.0dB
• INSERTION LOSS-CONVERTER.....	3.5dB
• INSERTION LOSS-VCR.....	3.5dB
• ISOLATION-ALL PORTS.....	BETTER THAN 70dB
• WEIGHT.....	2.5 LBS.
4005A AMPLIFIER SPECS	
• NET GAIN.....	0 TO +3dB (AFTER INTERNAL SPLIT LOSSES)
• NOISE FIGURE.....	LESS THAN 5.5dB
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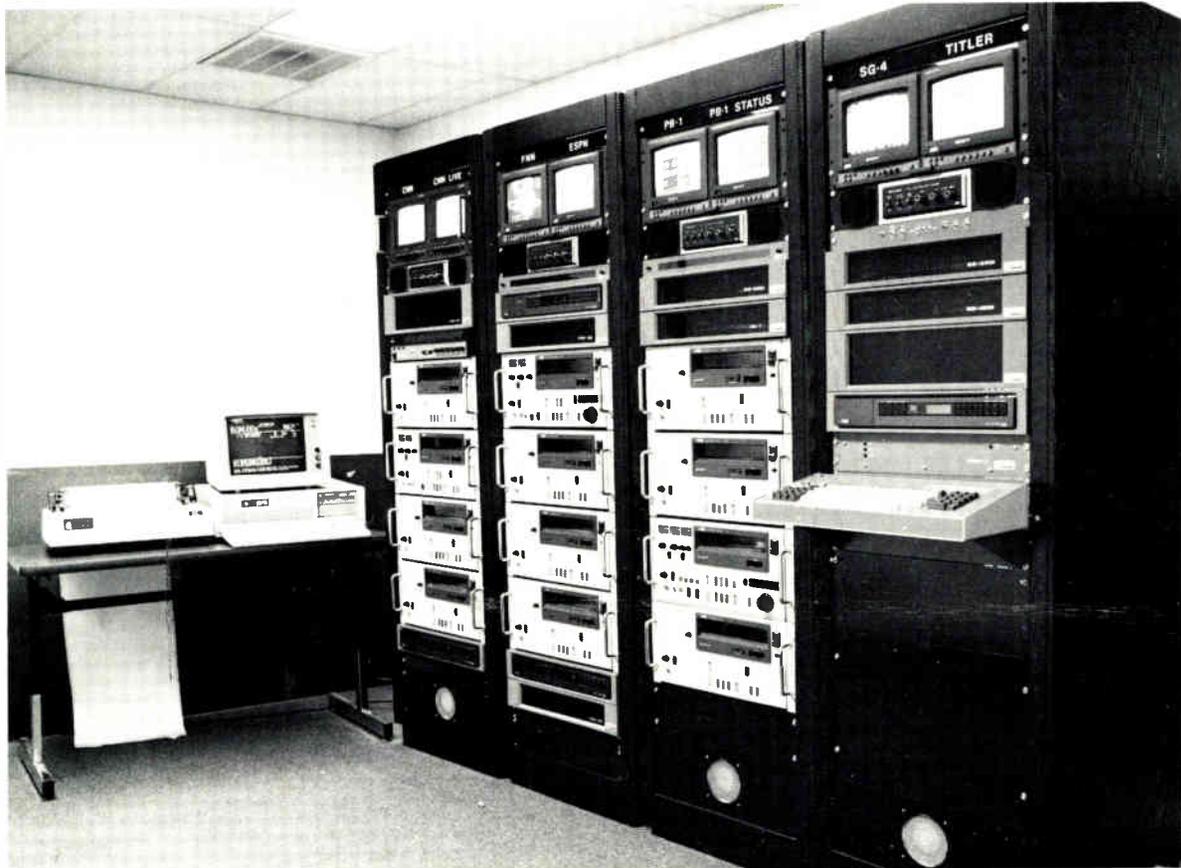
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An alternative is to take it upon yourself and set the precise deviation of the main audio carrier.

Continued from page 34.

FIGURE 3

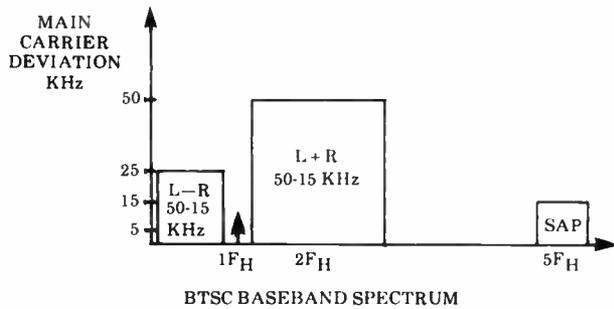


FIGURE 4

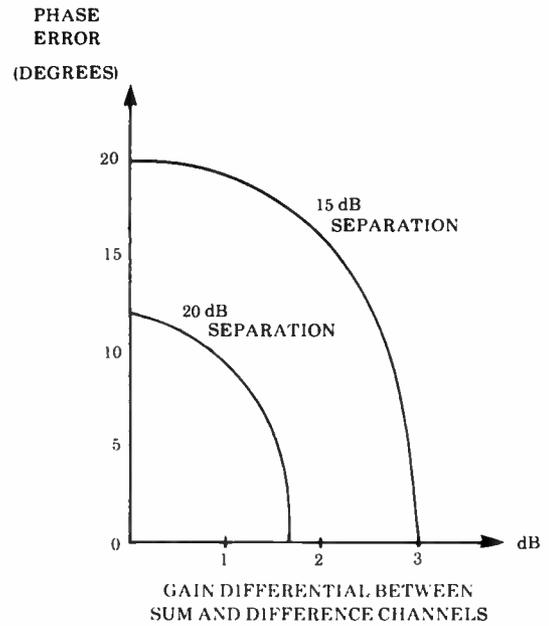


FIGURE 5

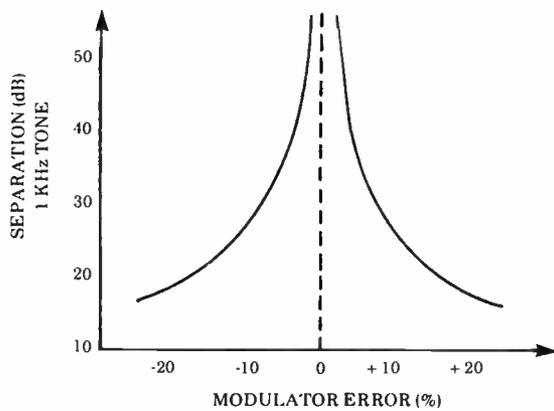
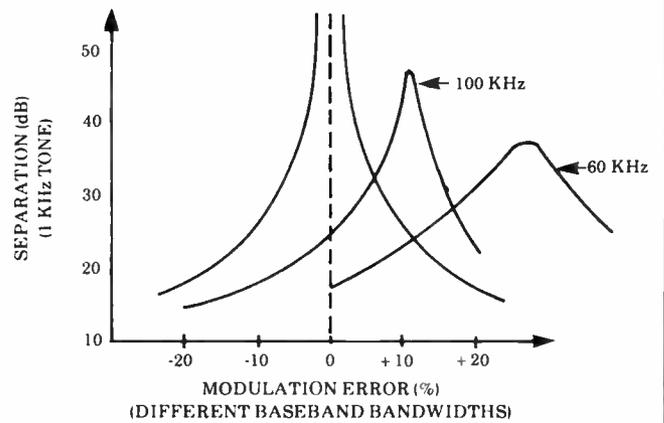


FIGURE 6



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Format control enable selections of desired satellite system. Direct-reading channel selector displays transponder-assigned channel. Second selectable subcarrier and spare for optional third subcarrier or descrambler modules.



One habit which must be eliminated is the daily tweaking of the modulator's deviation pot.

dously. This is not a trivial task when dealing with live audio. In fact, accurately setting the deviation of the system with live audio is next to impossible. For this reason, Scientific-Atlanta has opted to provide the operator with test tone output from the encoder which will help him to precisely set main carrier deviation.

The tone, derived within the encoder, is output to the modulator at a fixed frequency and signal level. The operator simply adjusts the audio modulator's deviation pot until the overdeviation lamp just flickers "on." Once this adjustment has been made, the test tone is turned off and the BTSC signal is applied.

All signal levels out of the BTSC encoder are precisely referenced to the internal test tone thus ensuring precise main carrier deviations. It has been found that with a properly designed overdeviation light on the aural modulator, this method provides extremely accurate results. It also provides a method of alignment without the use of any test equipment.

Keep in mind that while it is important to accurately set modulation levels in the headend in order to achieve optimum stereo separation, separation alone should not be used as a measure of precise modulation levels. A look at Figure 6 will reveal why.

The previous discussion may have led you to believe that one method of setting the main carrier deviation would be to drive only one channel of the stereo encoder with audio while adjusting the deviation of the audio modulator until you hear a null in the undriven channel when the signal is monitored on a stereo TV. While this method does produce optimum stereo separation for that particular TV, it is not an accurate method of setting main carrier modulation levels.

In fact, it has been found that it is possible to actually correct for imperfections in the bandwidth of the television or elsewhere in the transmission path by allowing errors in the modulation level. As shown in Figure 6, if the bandwidth of the transmission path were reduced to 60 kHz, optimum stereo separation would occur at nearly 27 percent overdeviation.

In light of the above discussions, one habit which must be eliminated in the

casual headend is the daily tweaking of the modulator's deviation pot. Once precise deviation levels are set up, leave them alone except for scheduled maintenance where precise test tones can be used to ensure accuracy. Remember, the modulation level cannot be accurately set in the headend with program audio. It is best set through the use of a precise test tone.

Audio in a CATV headend can no longer be ignored. An increased consumer awareness in quality audio is beginning to force the CATV operator to focus his attention on the preservation of good quality stereo audio through the CATV plant. Attention was focused on both the receiver/encoder interface and the encoder/modulator interface to outline the many and varied methods of arranging such equipment for the transmission of BTSC stereo.

In addition, three key rules to follow to ensure the preservation of the stereo

signal were outlined. Of these three, perhaps the most important, and certainly the one which the CATV operator has the most control over, is the set-up and maintenance of accurate main-carrier modulation levels. ■

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Scrambling causes loudness drop for dish owners

When HBO scrambled its signal earlier this year, no one thought that it would create a phenomenon that would result in its signal—or the signal of any programmer using satellite scrambling—experiencing a severe loudness drop among TVRO owners. But it's happening, and unless programmers act soon, the problem isn't going to go away.

At issue is the potential for a significant loudness change to occur during channel changes from scrambled satellite-delivered programming to over-the-air broadcast television stations among TVRO owners who use M/A-COM's VideoCipher 2000 home descrambling unit. It is a problem, despite being recognized by a special NCTA engineering subcommittee, that lacks a clear solution, but promises to take on added significance given that more and more programmers are planning to scramble their broadcasts in the near future.

According to two of the people who know the most about the situation: Mark Medress, vice president of the video products group at M/A-COM; and Matt Miller, Viacom's vice president of science and technology and chairman of the NCTA's ad hoc committee studying the case; the problem, or phenomenon, was created by the VideoCipher's scrambling technology, which employs a better signal-to-noise ratio and a better dynamic range than any previously used technology.

"We have at our disposal the best audio transmission technology that has ever been utilized," says Miller, whose company owns Showtime and MTV Network and has a partial interest in Lifetime. Because the system is so faithful to sound reproduction—the dynamic range (defined as the difference between the loudest and softest parts of the transmission) rivals that of compact disks—and broadcast television stations conversely compress their signals, the over-the-air television station is perceived to be louder than the satellite station by the TVRO owner.

Typically, broadcast television stations compress their signals during processing to accommodate for the home environment, which is usually more noisy than movie theaters. During this compression phase, soft

Problem won't go away unless programmers act soon.

sounds are made louder and the loudest sounds are made softer, resulting in lower dynamic range. For example, the footsteps made by a man sneaking up behind his rival in a spy movie would be almost as loud as the gunfight scene. But because the VideoCipher technology employs sophisticated digital audio transmission techniques, the same movie appearing on a scrambled satellite channel would have a wider dynamic range and the footsteps would sound quieter and the gunfight scene louder.

This difference in "headroom"—the difference in dB between the maximum input the system can accept without distorting or clipping and the typical audio level—has become the crux of the discussion. According to Medress, broadcast television stations typically output their signal with 6 dB to 8 dB of headroom. The satellite channel programmers, however, are currently using about 16 dB of headroom. Hence, a difference of about 8 dB occurs between broadcast and satellite channels.

Normally, this situation is of no consequence for a cable subscriber because operators, at the headend, adjust the signals to bring more parity between the outputs of all channels. "Most cable systems, in the headend, account for loudness variations on their incoming signals and try to minimize the pain to their customers by giving most channels comparable loudness," says Miller.

But the TVRO owner, who has only the descrambler between the incoming signal and his television, doesn't have that adjusting capability and can readily experience the difference in loudness levels. "The TVRO owner has his local over-the-air signal coming in through a satellite receiver. There can be a substantial difference in loudness because he doesn't have all this added processing capability between the two signals."

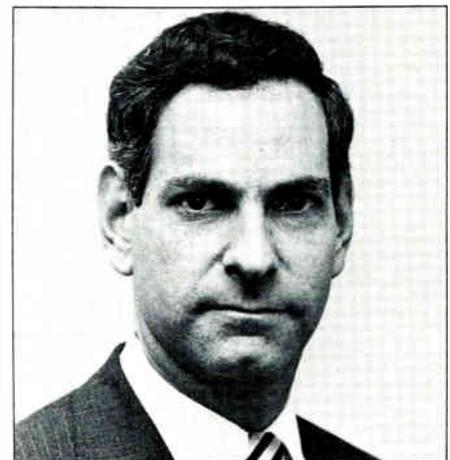
When the situation came to light, the NCTA Engineering Committee formed an ad hoc subcommittee to

study the problem and ordered it to report its findings at the next meeting. However, Miller emphasized that the NCTA will take no action on the subject. "We've looked at the way people handle audio and we've looked at the problems that the handling of audio create and who the problems have been created for," says Miller. "That's all we've done and it's all we're likely to do."

"There is a potential for a disconcerting loudness variation on channel change for a homeowner," says Miller. "But what do you do about it? We've looked at a bunch of possible solutions and I don't know if, as an industry, we're going to do anything. Individual programmers may make their own individual decisions. What we've done in the engineering committee is identify the problem. Where this becomes an issue is that there are more programmers now planning on scrambling."

The options that remain to the industry center on educating the programmers about the situation and allowing them to make their own choice. The most obvious option, of course, is for the programmers to increase their outputs slightly to reduce the difference in headroom between their signals and those of the broadcast stations. But the ramifications of a move like that are enormous.

"This whole hoorah comes down to where to set one knob in your plant," Miller says. "Suppose we decide to twist that knob. That's going to change the sound (level) in every cable system in the country. We're not about



Matt Miller

'Everybody is blaming the scrambling system, but it's not a scrambling issue.'

to do that hastily. We want to talk to our customers—the cable systems—about it before we do it."

Despite the ramifications that exist, programmers may find that changing their levels may be a viable alternative. "I'm not completely convinced that what we're doing is what we should be doing. From what I now know, I might recommend internally that we alter our practice. We might want to bump up our levels slightly," says Miller.

What other programmers, especially those who plan to scramble in the near future, might do about the situation remains unclear. Officials from ESPN declined to comment on the issue.

"One of the potential solutions I have identified is to do nothing," Miller says. "It might turn out that that's the best thing to do. There's nothing wrong with doing nothing as long as you understand *why* you're doing nothing."

For its own part, M/A-COM, which has been a party to the discussions and has expressed a willingness to help work the problem out, has said that it will make a modification to the descrambling unit. "You might argue that the descrambling system should take its remodulator and increase the gain so that the satellite signals will be roughly as loud as a broadcast signal," says Medress. And that's exactly what the manufacturer plans to do—after sales of the descramblers hits 150,000 unit.

"We're going to increase the gain by 3 dB," Medress says. "But when we introduce that gain, we'll also be introducing a little bit of distortion since the maximum input to the descrambler results in the maximum output from the descrambler. But you won't be able to hear the distortion on a typical television set.

"This is something we're doing to help a situation we have no part in, really," says Medress. "Everyone is blaming the scrambling system, but it's not a scrambling issue."

Despite the fact that the problem and its cause have been identified and understood, it remains unlikely that any substantive changes are to be made in the near future, given the ramifications that would result at the local level. In addition, any change, though technical in nature, that could be seen

as affecting programming may open the door to scrutiny from governmental agencies looking for evidence of collusion or antitrust violations.

And although the situation will likely be rectified in the long run, other problems related to audio carriage remain to be encountered, warns Miller. "This is just the first audio issue the industry has had to deal with, there will be more," he says. For instance, Miller wonders what will happen when quality stereo audio is mixed with monaural advertising.

"The customer's going to be sitting and listening to high quality programming with 80 dB signal-to-noise and 40 dB of separation and then all of a sudden along is going to come this (highly compressed) mono ad that sends the speaker cones whistling past his ears. How are you going to handle that? How are you going to handle the problem of having half stereo channels and half mono channels so that every time

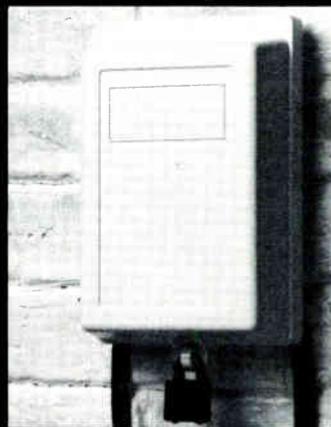
a guy changes channels he's going to have a separation change?"

But one thing that doesn't appear to pose problems for programmers who broadcast in stereo is the ability of commercial insertion equipment, accustomed to finding cue tones on mono sound tracks, to find those tones. Of five different programmers surveyed by *CED*, none thought that the issue posed any problem at all. USA Network, as an example, employs four different subcarriers; one for mono, one each for left and right channels and a separate one for the cue tones. "We can send the tones independent and not have them affect anything," says Steve Saville of USA.

Miller concurs that no problem seems to exist. "At MTV we don't put the tones in the soundtrack," he says. "We send the cues on a subcarrier and we don't interfere with the program material."

—Roger Brown

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product profile

Get a CATV converter to work transparently with all the tuning and remote control functions now found on TVs and VCRs? You'd find it easier to sleep with a wolf. There also isn't any easy way to eliminate redundant tuning circuits in home video equipment any time soon. But there are some ways to reduce the number of separate remotes in a home and restore VCR taping ease. There are three basic ways to attack the problem: smart or "learning" remotes; programmable remotes and VCR timing circuits in converters. Here's a rundown on what's out there.

Learning remotes

GE's Control Central RRC-600 will control up to four different audio/video components by "learning" the various components' infra-red codes. The RRC-600 lists for \$149.95.

The RRC-500 "learning" remote con-

trol unit from GE will be available in September 1986. The 500 will be capable of controlling three different infra-red-compatible components. A throw switch on the RRC-500 will allow the consumer to choose between TV, VCR and auxiliary (stereo, converter or other infra-red-compatible devices).

Contact GE at 804/483-5037.

CL9 Inc. plans a fourth-quarter 1986 release of its smart remote. Steve Wozniak, co-founder of Apple Computer Inc., owns CL9 Inc. and is the inventor/designer of the as-yet-unnamed device.

CL9 President Sam Bernstein says the company's smart remote will "learn the codes of a virtually infinite number of infra-red devices, regardless of brand." The unit's macro-entry feature will enable the consumer to perform multiple operations with a single push of a button. A timing mechanism possessing intelligence will be integrated in CL9's product.

Contact CL9 Inc., at 408/996-9999.

The Model 8550-375 learning remote control from Scientific-Atlanta will enable subscribers to control a Series 8500 set-top terminal, a television and a VCR (or other infra-red-compatible devices) with a single remote control unit. The 8550-375 will support the majority of TV and VCR remote controls now available and all of the company's Series 8500 remote control functions.

January 1987 availability is projected for the 8550-375.

Contact S-A at 404/441-4100.

Programmable remotes

A programmable remote control unit is available from Oak Industries for its Sigma line of addressable decoders. The RCU allows subscribers to record up to 15 events in their absence and

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ICM VIDEO

The TAC-Timer requires no modification to Z-TAC baseband decoders.

can be set to record programs up to one month in advance.

If an error is made inputting data, the unit's correction function allows it to be corrected without reprogramming the entire event.

Contact Oak at 619/485-9300.

The Model 8550-235 programmable remote control unit from Scientific-Atlanta allows the company's Series 8550 set-top terminals to work in conjunction with VCRs for unattended recording of up to eight events over a 14-day period. The unit also can be programmed to operate at the same time every day, every week or every day except weekends.

The hand-held Model 8550-275 features an LCD screen and a random access memory. The subscriber programs the memory to turn the set-top terminal on, tune to desired channels and turn off—all at specified times. The remote control then is placed where the set-top terminal can receive its infra-red transmission.

The Model 8550-275 will be available in September 1986. Planned price is less than \$30.

Contact S-A at 404/441-4100.

The TAC-Timer from Zenith allows cable subscribers to pre-program their Z-TAC decoders to permit unattended VCR recording from different channels. The VCR first must be programmed to record the Z-TAC output channel at the appropriate times; then the TAC-Timer is programmed with the same timing information—specifying the channels to be recorded.

The TAC-Timer requires no modification to Z-TAC baseband decoders or Zenith's new PM RF addressable decoders (see information below) and can be used with any programmable video recorder. The TAC-Timer can record up to eight events, over a 14-day period and also can be programmed to turn a Zenith television set on or off at any time.

For more information, contact Zenith Electronics at 312/699-2110.

Programmable converters

The STARCOM VI addressable converter from the Jerrold Division of General Instrument features an option

that permits time-controlled VCR recording of multiple cable channels in the subscriber's absence. The option allows unattended recording of up to six events over a 31-day period or up to six programs on a daily basis.

The STARCOM VI may be operated with the SRC II remote control device, although programming of the timing function may be performed on the converter itself. Contact Jerrold at 215/674-4800.

The BA-5000 addressable converter from Pioneer Communications of America features a multi-program timer as a standard feature. This function enables the subscriber to record up to two events over a seven-day period or to program his television for morning wake-up and/or late night shut-off.

The BA-5000 can be programmed with the remote control unit or the converter's set-top keypad.

Contact Pioneer at 614/876-0771.

The 5503-VIP VCR-ready addressable baseband converter from the TOCOM Division of General Instrument features a programmable timer for unattended VCR recording. Subscribers may record up to four events over a seven-day period.

The 5503-VIP may be programmed by TOCOM's full-function remote control or via the set-top terminal itself.

Contact TOCOM at 214/438-7691.

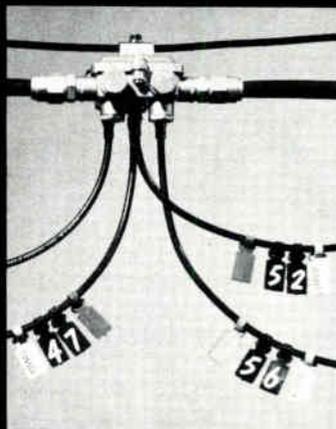
New from Zenith Electronics, the PM converter is an enhanced RF addressable system that features timing circuitry for bi-event recording in the subscriber's absence. The PM remote control unit is necessary to program the timing function. The circuitry, however, resides in the converter itself.

Zenith's TAC-Timer also may be used with the PM system to enable unattended recording of up to eight events over a 14-day period.

Contact Zenith at 312/699-2110.

—Lesley Camino

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Higher prices. . .

Already battered by ferocious competition and ultra-thin margins, converter manufacturers were quick to feel the effects of the dollar's recent 50 percent or so fall against the yen. It means higher costs for all goods made in Japan and sold in the United States. Not surprisingly, then, Jerrold and Tocom recently announced a 10 percent to 15 percent price increase. Others have followed.

More price increases

Effective August 1, 1986, C-COR will be increasing prices on many CATV products from eight to 15 percent. The average increase is 9 percent. All orders received prior to August 1 with scheduled delivery before October 1 will be billed at the current price.

Moving on. . .

Larry Brown and Tom Calabro both have left Pioneer; Cliff Schrock has left C-COR; Bob Dickinson isn't with AM Cable anymore; and Matt Hart has left W&S Systems. Alex Best is now with Cox Communications as vice president, technical operations.

Moving up. . .

John Dawson is now vice president, engineering, at Mile Hi Cablevision. Tom Saylor is Comcast's technical operations manager. Eddie Breen is vice president, marketing, Jerrold subscriber services division; John Dieckman, manager, application engineering, distribution systems. Stephen Necessary is Scientific-Atlanta marketing manager, broadband communications division, Larry Bradner is now general manager of the division, while John Buckett is national sales manager.

Danny O'Connell is now Pico Products executive vice president. Mike Holland is president/CEO of Pico Macom. Walter Curt is manager, R&D at ComSonics.

Graham Mobley is now staff vice president at Scientific-Atlanta. William Wall Jr. and Jack Watson have been named principal engineer/scientist at the company, the highest technical position at S-A. Allen Kirby is

national sales manager for Falcone International.

Trends. . .

Any competent fairy godmother can turn pumpkins into coaches. It will take considerably more to rescue two-way from purgatory. But the needed wand may wave, someday. Especially if local telephone companies begin metering service for local phone calls. Why? Says Sruki Switzer: "There are lots of Hayes modems out there using dial-up lines for free right now. And the CATV industry can't compete with free. But when local calls are metered, we've got an established market for which technology exists today. All you need is a Hayes with an F-connector." Impulse PPV is the other application for which two-way is appropriate, but most companies will find the cost hard to justify.

New gear. . .

Leaming Industries has a new BTSC stereo generator, model MTS-1, available with a two-week lead time. FM Systems has a new FMT633 MTS format multiplexer and modulator.

M/A-COM Comm/Scope has added medium density jacket material to its Parameter III and I series trunk and distribution cables. Blonder-Tongue has released two new headend combiners, the OCA-8 with eight input ports and the OC-8 passive combiner, also with eight ports.

Scientific-Atlanta has introduced the Model 9220 modulator, designed for SMATV use. Panasonic has introduced the TZ-PC150 remote controlled plain vanilla converter, featuring volume control and mute.

The company rolled out its TZ-PC120 plain vanilla converter with 68 channels, last- and favored-channel memory.

Power Guard has a new 15-amp, 60V power supply in a louvered, 26-inch pedestal, the Model NSP-6015-0. Production has begun on Channematic's local ad inserter system. "Li'l Money-maker," selling for \$1,995.

Jerrold now has complete 550 MHz CATV electronics in its Starline X series, including amps, LEs, taps, passives and converters.

Anixter Communications is now dis-

tributing Geltek, a precured, cold applied, sealant that comes in a wrap-around strip. It coats the substrate with silicon, displacing all moisture, and reseals itself in the event of slight abrasion. Application requires no special tools or torching.

Alpha Technologies has a new Apla 250 uninterruptible power supply, designed for 250 watt applications. One hour of backup is standard, three available as an option. Line-Ward has a new reel carrier and a boring attachment, for its L-1 and L-2 cable line layers.

Microwave Filter has a new MDS combiner for 2150-2162 and 2500-2686 MHz. It's for lower power applications of 10 watts or less. Also new: a combiner for eight ITFS channels from two non-adjacent groups; a channel T14 deletion filter; 130 MHz TVRO band-pass filters; a network that deletes channels A-1 and 7 and 8; a single-channel delete filter and a bandsplitter/combiner for local area networks with a low passband set at 54-186 MHz and high band at 222-450 MHz.

Jerrold has introduced a new commercial satellite receiver aimed at the SMATV market. The Model S412R is C/Ku band compatible. Microdyne, meanwhile, has developed an automated C/Ku band receive terminal.

Post-Newsweek Cable bought 25,000 Z-TAC II converters and headend equipment from Zenith Electronics Corp. TAC-timers for VCR unattended recording also are part of the deal.

Microwave Filter's original filter capabilities are described in brochure RFM/86, available now. Also, the company's Model 3378-169/187 highpass filter can be used to protect off-air channels 9-13 from interfering land mobile frequencies.

Pico Products has introduced a new eight-foot mesh antenna for home TVRO systems. The company also has improved T.I. rejection abilities of its notch filter line. Instead of 50 dB depth, Pico's filters are set at 30-40 dB, with a wider notch of 500 kHz.

Multiplex Technology has introduced a new series of SMATV modulators that can be set for any channel between 14 and 60. Call (800) 423-0584.

Blonder-Tongue has two new indoor distribution amplifiers designed for apartment applications, the ACA-30-300 and the ACA-30-450.

The SCTE is planning scholarships for cable installers and low-level technicians.

New for TVRO . . .

Pico Products has a new remote control system for its HR-1000 receiver and PAC-1000 antenna positioner. Also new: a C/Ku band receiver, a low-cost add-on to the HR-1000; a terrestrial interference kit including three filters; a deep dish feedhorn and a signal level meter used for aiming, focusing, peaking and aligning C/Ku band antennas.

M/A-COM Prodelin has a new 1.2 meter Ku band antenna. International Satellite Services has a new hyperband modulator, the GL-2610. Panasonic has a new line of C band block down converters, featuring lower noise than previous models.

R.L. Drake now has eight models of home TVRO systems organized in three lines. The 1000 series has six-foot antennas; the 2000 and 3000 series have six-, eight- and ten-foot antennas.

DX Communications has a new C/Ku band commercial receiver. United Satellite Systems has added a frequency agile modulator to its product line.

Back on the ground

Klein Tools now offers a complete line of conduit benders and hickies, as well as a complete line of manhole and splicing ground tents.

INFO/soft Technology of Seattle now has a low-cost software package for character generation, compatible with NTSC, PAL and SECAM standards, and using Atari microcomputers. Computer Utilities of the Ozarks now has a new release of its Cable/I billing software that interfaces directly with a Scientific-Atlanta addressable transmitter.

The 1986 version of the NCTA Technical Papers is now on sale at a price of

\$30 for members and \$40 for all others, prepaid checks only.

LRC Electronics has made Tele-Wire Supply Corp. a stocking distributor. Also, Winfield Scott & Associates is now sales representative for the company in Texas, New Mexico, Louisiana, Arkansas and Oklahoma.

Polly Rash is national director of sales for the satellite systems division of General Instrument. Tim Meschke is area sales representative for R. Alan Communications. E. Jack Davis is now president for Cable Link.

Pioneer has installed BA-5000 converters in five more Warner Cable systems. Scientific-Atlanta has sold \$1 million of addressable gear to Continental Cablevision of Massachusetts.

The Society of Cable TV Engineers plans to award \$6,000 in scholarships over the next year for cable installers and lower-level technicians. For information call (215) 363-6888.

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MAP/TOP product trickle almost a torrent

If May's MAP/TOP Users' Group meeting is any indication, standards based on the Manufacturing Automation Protocol will increasingly be found on the plant floor, not engineering test beds. Four more vendors announced their support for MAP or TOP, and 18 companies made product announcements. Supporting MAP are Foxboro, a manufacturer of industrial process control equipment, and Sytek, already a leader in the broadband local area network market. Sytek also announced support for the Technical & Office Protocols, as did Ungermann-Bass, an early leader in MAP product sales. International Computers Ltd., a major United Kingdom concern, also said it would support TOP.

Among the product announcements, Advanced Computer Communications expects a third quarter release of its new MAP VX software, allowing VAX computer systems to communicate on MAP 2.1 nets. Allen-Bradley, a leader in industrial control products, introduced the next generation of its MAP line: automation controllers, modems and software. A-B says all of its programmable and numerical controllers will have MAP interfaces.

The company's Vista 2000 LAN also will have MAP interfaces. A-B says it is working on 802.4-compliant carrierband products as well. In addition, the firm's Data Highway II LAN will have a MAP carrierband option.

Concord Data Systems, another broadband vendor with an early lead in MAP sales, is shipping carrierband products now, and has announced a new line of 4100 series bridges, allowing broadband-to-carrierband, broadband-to-broadband and broadband to broadband over dial-up line connectors.

More tie-ups

Data General says it will work with Concord Data to hook its computers to MAP nets. Prime Computers says it is purchasing TOP software from Retix. Also, all Prime series 50 computers will be MAP-compliant. Retix is shipping MAP/Top 2.1 version software exclusively: MAP/TOP, NETBIOS, the ASN.1 compiler, LLC, internet, transport, session and FTAM layers.

Hewlett Packard has a joint agree-

Standards are one thing, products quite another. Finally, MAP/TOP is becoming a reality.

ment with Ungermann-Bass for certification of U-B Net One products with HP 1000 and 3000 series computer systems. HP also will hook its 802.3 LAN customers to broadband nets. The company also has signed a joint marketing agreement with INI for MAP-compliant 1000 and 3000 series computer systems.

NCR also is working on MAP compliance, with 1987 product offerings promised.

Intel and Industrial Networking Inc. have a joint marketing agreement that gives INI access to Intel MAP chips. INI has completed conformance testing through all seven layers of MAP, and will ship products within weeks. Systems and components kits now are available for OEMs who want to interconnect proprietary systems on MAP.

Gould has MAP 2.1 compatibility for all its minicomputers, cell controllers and a MAP gateway. A carrierband programmable controller also is available. Fairchild Data is in production with VME and multibus versions of its MAP-compliant modems.

The M8024 modem with a differential interface will be available for third quarter 1986 shipping. The M8824 modem can be ordered third quarter 1986 with delivery in the fourth quarter. A new HR8000 headend remodulator also is available.

Motorola is shipping token bus controller chips now. All seven MAP 2.1

layers will be available in software this month or in August. September production is expected for board-level product.

Honeywell is rolling out MAPstart, a package of gear, software and services for OEMs exploring MAP compatibility. The 2.1 version package includes three controllers, each with 68,000 processor, interface, winchester and floppy drives; six CRTs; four factory data collection terminals; two 50-foot cable spans and a headend remodulator. Its available to Beta sites now. Estimated cost of the package will be \$176,000.

Tekelec now has 30-day shipping times for its portable MAP tester. The ISO and levels three and four are available now. Level five will be out by the end of summer, level seven by the end of the year. The tester allows early conformance testing. It's priced at about \$15,000 in single quantities.

Charles River Data Systems has new software supporting MAP and TOP for the company's super-micro-computers.

More than MAP

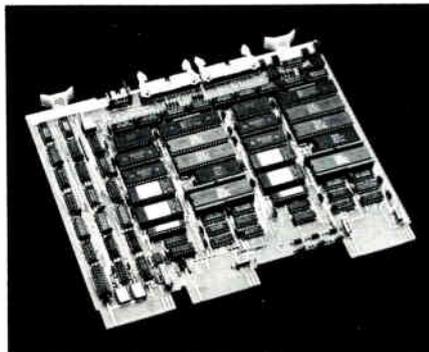
MAP is a big part of the broadband LAN market. It's not the whole market though. EF Data has a new multiplexer-modem putting 12 telephone channels on 500 kHz of bandwidth. It's frequency agile between 5 and 400 MHz.

LanTel Corp. has opened two regional sales offices, headed by Henry Hill (Houston) and Bob Hiscock (Los Angeles). Wavetek has authorized Cable TV Services as a service center for CATV and broadband test equipment. David Slim has joined Wegener Communications as marketing manager, data communications products.

C-COR Electronics is shipping its Model 5141 IBM PC Network frequency translator. Dan Trayler is now C-COR's regional sales executive for the northwest region.

AmeriLink Corp. has named Larry Brown (formerly of Pioneer) vice president, LAN business development and corporate engineering. And Agile Systems has developed the Agilenet 20 LAN, which is compatible with Sytek LocalNet 20.

—Gary Kim



Agile's AN 20/QUAD board.

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 - Rackmount or desktop available



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 - Synchronous



MODEL 8000

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- Six MHz Block Translation
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 - Compatible with all broadband modems
 - Compact unit designed for rack-mounting



MODEL 1700

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 - 1 MHz spacing
 - Remote loopback capability
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 - Switched or constant carrier



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Reader Service Number 39

Optical fiber moves ahead of copper

It is a fait accompli that optical fiber will supersede copper as the principal pipeline for almost all entertainment and communication services. The competitors, copper (coax and twisted pair); will own a diminishing share of the market, with DBS eventually becoming the strong competitor.

The primary interest for the cable industry (should be) who owns and controls the "pipeline;" the delivery system.

There is a slow but unremitting movement by the telephone industry to own and control the "pipeline" to the subscriber. As the phone companies install fiber optics to the subscriber, the ability of the CATV company to contend lessens almost geometrically.

The economics of the matter should be adequate proof. First, with fiber optics requiring minimal maintenance, labor costs are greatly reduced. Economical optical transmit and receive units have life spans of well over 20 years.

There is almost an unlimited bandwidth capacity on fiber that is capable of supporting nearly every communications requirement conceivable within the next 30 to 40 years.

With a head-to-head rivalry the company using fiber can charge less for a comparable service and still make equal or even more profits than a coax or copper based operation, just from the labor and maintenance savings.

Expansion with a fiber optic system is quite simple and can be accomplished with minimum expense.

For example, lets say that John Housing-Project, the developer, commences building a 300 or 400 home subdivision. Naturally, he is going to locate it in the most inaccessible location in relation to, and served only by your most overloaded trunk route.

With a fiber optic system you could use the spare fiber you thoughtfully allocated for growth, to extend your system. Or, if you happened to under-engineer, you could still splice into your existing working fiber, wire the development, and just replace your existing laser transmitter at the headend with a

Therefore, cable's focus should be on owning and controlling the pipeline.

more powerful laser.

In a "worst-case" situation, a small repeater could be installed. However, a well engineered system should be capa-

ble of providing such service without supplementary electronics.

With coax... well, you have been through that, probably time and time again.

The actual route engineering is similar to what is being done with coax or for the telephone companies today. Instead of amplifiers or repeaters, you are dealing with splitters and couplers. Likewise a fiber optic based network

SM Fiber 2 pair

Materials	Cost
1 Mile cable	\$ 1,280.00
Taps/splitters	\$ 1,000.00
Fusion Splices	\$ 1,000.00
Connectors	\$ 80.00
Drop Cable	\$ 6,400.00
Subscriber Premise Equipment	\$50,000.00
Sub Prem Includes:	
2-64 KBT Telephone	
1-19.2 Data Link	
1-64 KBT-Data Link	
1-1.54 MBT XMT Pkg	
A/D converters	
1.6-2 GBT-DE MUX	
1-Upstream MUX	
1-Timing & clock module	
8 hr.-Emergency Power Supply	
Total	\$49,000.00
Note: Two drops per sub	\$59,760.00

Vanilla Coax System

Converters	\$12,000.00
Amplifiers	\$ 2,484.00
.750 Cable	\$ 1,807.00
.500 Cable	\$ 1,500.00
Taps	\$ 134.00
Connectors	\$ 108.00
Drop Cable	\$ 702.00
F-59	\$ 58.00
Telegrrips	\$ 28.00
Hooks	\$ 5.00
Wall Plates	\$ 25.00
Transformers	\$ 29.00
Splitters	\$ 135.00
Power Supply **	\$ 365.00
Power Couplers	\$ 26.00
Ground Rods	\$ 255.00
Ground Blocks	\$ 51.00
Heat Shrink	\$ 15.00
Total	\$19,727.00

By Gary Moore,
Communications Consultant

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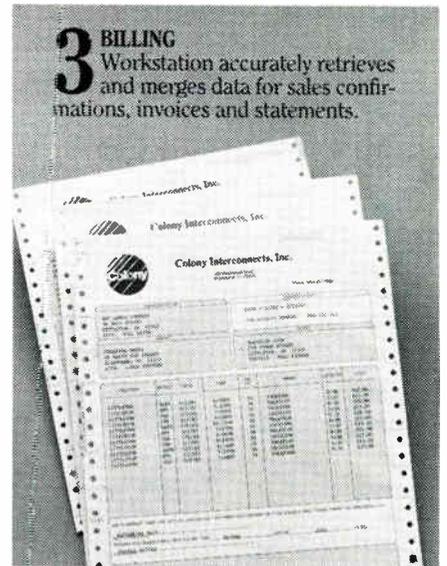
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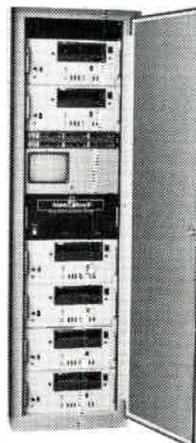
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Distribution routes would be the 'normal' tree and branch layout.

is, or should be, almost 100 percent passive. No electronics in the field.

Distribution routes would be the "normal" tree and branch layout. However, the potential exists for creativity in certain applications.

For a "typical" fiber route you would determine the "loading" or number of subscribers to be served. Two additional sets of calculations would then be performed, first, the maximum dB loss acceptable for that

route. Secondly, the power levels to be maintained at the subscriber.

By juggling the power vs. the sensitivity of the detectors, one can obtain an economical system capable of providing almost every conceivable service the subscriber may eventually need or demand.

The attached cost comparison chart gives you a basis for comparison of a fiber system vs. a copper system.

One of the main difficulties of comparing copper and fiber is categorizing the features in order to obtain an apples and apples comparison.

Thus, the following comparison chart compares what would be a typical fiber optic system against a plain vanilla, unidirectional coax system delivering 40 video channels with mono audio. There is a third column that is a comparison using the closest comparable coax system.

The prices are "typical" small quantity prices as quoted to a 5000 to 10,000 sub CATV operator. The equipment/components are medium to high quality. Your particular costs will probably vary, but should average about the same.

The comparison does not include construction or other mutually common costs.

The preceding cost comparison should provide sufficient evidence as to who is going to own the communications services in your market.

A cursory comparison of CATV industry numbers indicates the typical subscriber should be worth about \$25 per month. Telephone industry figures indicate a subscriber is worth \$30 to \$70 per month in long distance charges.

Previously, there have been both technical and legal obstacles hindering the CATV companies entry into full service communications services.

The FCC and several court rulings have given the cable TV companies an open door, the chance to meet future competition on fairly equitable terms. However, it is up to the CATV companies to take advantage of the opportunity.

If you need additional proof that the phone companies are moving to take over the CATV business, just look at a couple of facts; in Cleveland, Washington, D.C., several locations in Wis-

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Reader Service Number 42

The FCC has tried to encourage the establishment of several nationwide carriers.

consin, Florida and Texas, telephone companies are building and owning the entire plant facilities to the subscriber. They are making deals limiting the cable companies to providing *just* CATV video and no other services. Likewise, they are charging healthy rental rates for that pipeline.

The Wisconsin, Florida and Texas systems are going entirely fiber to the subscriber. An additional three to five fiber systems are expected to be announced by the end of the year. They just happen to be telephone company owned systems.

Since the founding of the FCC (and its predecessor) one of its stated purposes has been to encourage the establishment of several nationwide carriers (*Cable TV Law*, Matthew Bender Co.), and this is happening.

The first phase of fiber-izing the U.S. is almost complete. There is an unbelievable amount of fiber criss-crossing this country, an estimated 10 billion circuit miles. The next phase is now starting... fiber to the subscriber's dwelling or place of business.

Concurrent with this second phase is the installation of a fiber network within the subscribers dwelling and/or office building. These Local Area Networks (LAN's) and/or Integrated Services Digital Networks (ISDN's) will readily interface to the telephone company's facilities and apparatus... and services.

(Note: a LAN is different from an ISDN basically in the signal carried. A LAN carries analog and/or a combination while an ISDN is digital regardless of the actual medium.)

On the residential level, there is a committee of the Electronic Industries Association (EIA) that is in the process of writing a full set of standards for this home-based communications system. A LAN that can evolve into an ISDN... The Consumer Electronics Bus.

The Consumer Electronic Bus standards are being formulated to cover both copper and fiber optic transmission mediums. The CEB committees are expected to issue some preliminary progress reports by mid 1986. ■

Methodology and Data Sources

Assumed: One typical mile of service

route
60 Subscribers Served
Two TV sets Connected
40 channels
Prices are typical and are representative *only*. They were acquired from

valid supplier quotes, for a small or medium sized system (2,000-10,000 subs).

Pole rights, installation costs and common materials are essentially equivalent and thus not shown.

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We can't make a picture better; we can make it worse

"The competition out there, especially in the big city markets, is ferocious," says Ron Cotten, Daniels and Associates vice president, engineering. Consequently, CATV must learn to compete as never before, says Joe Van Loan, Viacom vice president, engineering.

The problem? "Our competitors, especially DBS, have a slight edge in quality and reliability since there are no amps, power supplies or ice storms to knock their signals out," says Bob Luff, United Artists senior vice president, engineering.

Unfortunately, CATV picture quality "varies all over the field," says UA's Steve Raimondi, director of engineering. Some of the problems? "Outages, poor training, not enough preventive maintenance," adds Telecable's Nick Worth. Also, a "my guys can fix anything when they know about it" attitude adds to the problem, says Wendell Bailey, NCTA vice president, science and technology. "That's okay, but you need to spend money on a continuing basis to prevent the plant from deteriorating in the first place."

Some answers

Some of the answers? "We need a spirit of professionalism and customer service standards modeled on those of the telephone companies," says Storer's Roy Ehman. And "people have got to care about what they're doing," says Showtime/TMC Engineering Director Mark Elden. Worried about the cost of maintenance? "It pays for itself," says Media General Vice President, Engineering, Bob Dattner. In the long run, at least. "The mechanics of getting there may cost something in the short run," says Oak Communications Vice President, Science and Technology, Graham Stubbs.

And although the FCC has eased up on its technical regulations governing CATV, that's no excuse to slacken maintenance efforts, says Mile Hi Cable Director of Engineering John Dawson. "The old standards were too lenient anyway, and we should always exceed them."

Worth agrees. "From a strictly legal point of view, cable systems might not have to perform FCC tests and maintain the records any more, but Teleca-

And that's why constant, repeatable vigilance in maintaining cable plant is a must.

ble's going to keep doing it. We're going to modify the FCC's old tests a bit to get more benefit from the picture quality point of view." A good bit of advice. What the FCC's doing is giving the CATV industry a chance to police itself. If the privilege is abused, the rules—and perhaps more onerous rules—could be reinstated.

Quality issues

These are some of the major points leading industry engineers emphasized when *CED* recently polled them on CATV quality and reliability issues. The need to compete in the video marketplace was a big emphasis. "If poor quality of service costs you customers, then the fact that you aren't spending money to fix the problem will create a downward spiral," Bailey says. "Pretty soon you won't have a business anymore."

Panelists say the industry needs:

- more widespread commitment to quality
- better customer service and outage prevention
- to commit resources to do the job right
- a longer-term perspective on plant investment
- constant technical vigilance
- better documentation on how well maintenance programs work
- better staff training

Also, the industry must deal with two consumer interface issues: the VCR and the proposed EIA baseband decoder interface standard. "The optimum long-term solution is the new interface," Van Loan says. "But the industry needs to come to some consensus of opinion on it. The TV set manufacturers will need to spend \$3 to \$5 a set to put the interface in. They're afraid they'll go ahead and do it and the cable industry won't use it. They want some promises." But the CATV industry has to come to grips with it, too.

"Maybe the set manufacturers would have the confidence to go forward if the NCTA endorsed the standard," Van Loan says. "Some of the larger MSOs need to support it too. ATC may. TCI seems to be going the other way—putting in traps—and because of their sheer size could have a profound effect on all of this."

Stubbs agrees. "IS-15 is something that ought to be backed vigorously by cable operators. If it were, in a few years, our present converters would disappear. Much less expensive decoders could take their place and addressability would then be affordable by a lot more systems."

Now, quality, in a strict sense, may not be the reason subscribers give for disconnecting. "People opt out of cable and go with backyard dishes or VCRs or whatever because they want a better choice of viewing, not because of the quality of the signals as such," Ehman emphasizes. Bailey agrees, but says, "People do disconnect because of poor service, and that's closely related to the overall quality of CATV."

No quarrel

Ehman has no quarrel with the need to deliver quality service. "If we don't know how to deliver it at this time in our industry's life, there must be something seriously wrong. We know how to, and can, deliver quality. But the industry's thrust right now must be on improving our interface with the consumer."

"And our attitudes on outages are far too casual," Ehman adds. "We need to think of ourselves as a multi-channel TV station. We can't have channels without audio or video at critical times of day. Adjustments should be made at night or early in the morning—not in the middle of the day. In general, we've got to have more consideration for the viewing public."

The point, Ehman says, is not just good pictures, although that's important. The larger issue is quality of customer service. And some operators keep thinking it's a mistake to put money into preventive maintenance, training or customer service improvements. That's a mistake.

Raimondi couldn't agree more. "If our quality drops, we lose subscribers:

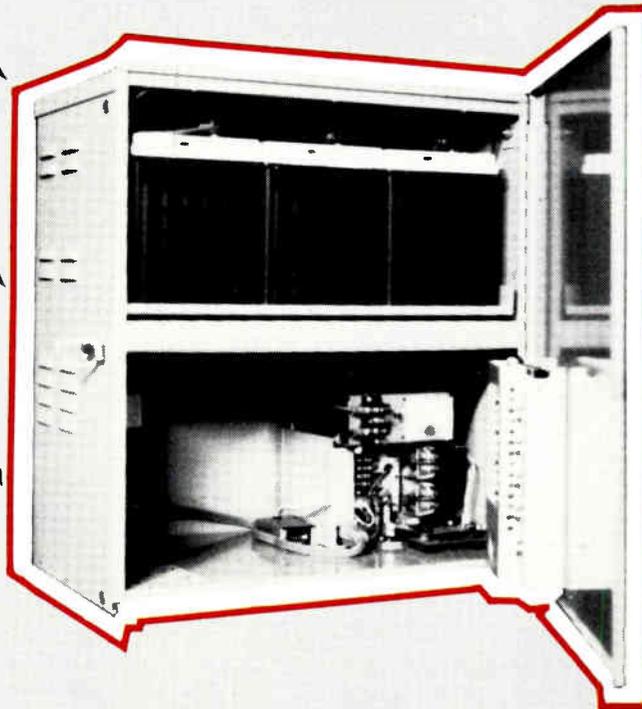
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Reader Service Number 44

CABLE POWER INC.

A Triple Crown



Corporation

There's an enormous lack of training in the industry—right up to the middle management level.

it's that plain and simple." Of course, United Artists has stressed quality control for years, running strong PM and quality control checks.

"If you're out 100 miles from a major market, maybe the tendency is to

expand and not worry too much about the quality of the pictures or service because there isn't much competition." Of course, rural markets, despite the downturn in home TVRO sales, are where the sales have held up best.

The problem is complicated by the fact that "very few systems actually monitor and calculate their monthly performance in signal quality and reliability on a per-channel basis," Luff says. And those signals have to be monitored closely. "Cumulative signal degradation generally happens very slowly. It can go almost unnoticed and requires that the manager and chief tech look at signals closely and track outages," he adds. Accurate record-keeping would help, but there's a human, not technical, problem to be faced.

Quality vs. cost

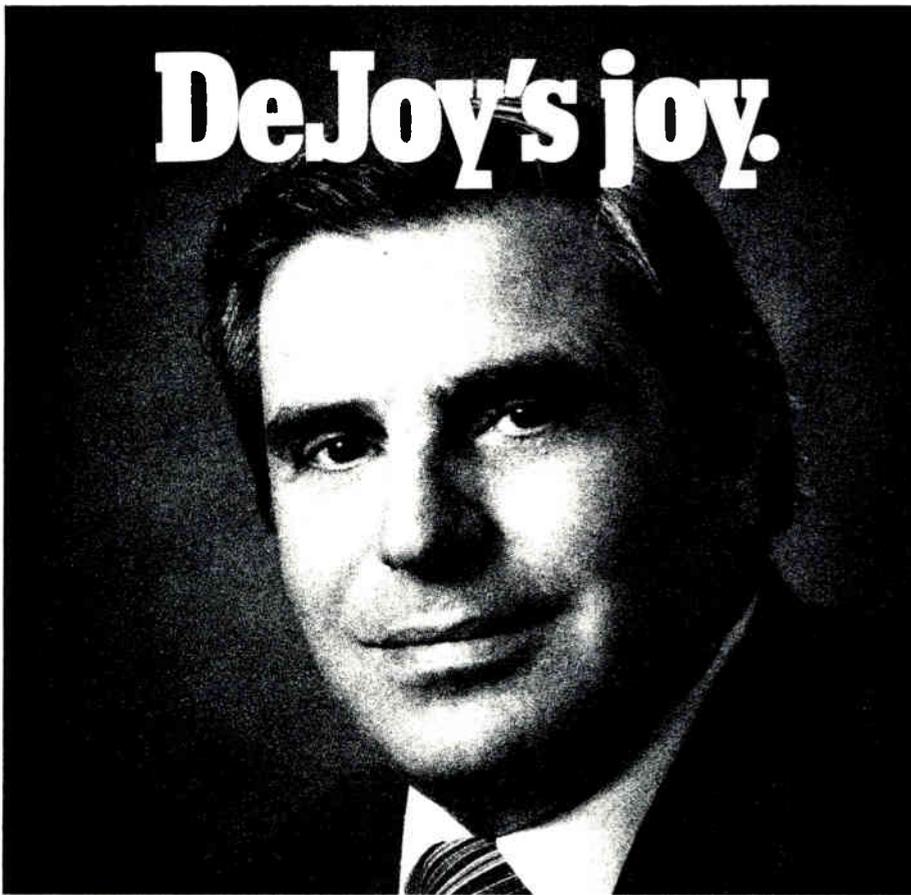
"If you're going to be quality-oriented, then you're going to end up fighting with those who are short-term, cost-oriented," Dattner warns. "Quality pays for itself over many years, but few people keep these kinds of records. And even when somebody does, they might be afraid to show them to anybody because of fear it'll make the local manager look bad."

In particular, Dattner wants to see a good study of trunk amplifiers and how they've performed over the last five years in terms of reliability. "I also have a problem with fuses blowing out in my system," he says. "When I go to buy a trunk amp, I need more information than simply my own experience."

There also are some pitfalls to avoid in the area of record keeping. "If you reduce the number of phone lines you've got, then you can reduce the number of service calls because people give up after getting a busy signal long enough," Dattner says. "So you make yourself look good in the short term. But you're going to get hurt by disconnects and bad public relations. We've found that 30 to 40 percent of truck rolls can be eliminated by using efficient in-house staff procedures."

Another important issue is training. "The technical staff has to get more analytical in its problem-solving, more engineering-oriented and less seat-of-the-pants oriented," Cotten says. "There's an enormous lack of training in the industry, right up to the middle management level. Most of the people out there are good, decent, hard-working and committed.

DeJoy's joy.



When they put you in charge of operations for a cable system of 185,000 subscribers, you're faced with a lot of tough decisions.

Frank DeJoy, Vice President of Operations of Suburban Cable in East Orange, New Jersey can testify to that. He and his staff took a year and a half to study all the problems and considerations of addressability for a system as large as Suburban's.

When they finally made their choice, it was Sigma. "It offers security we'll be able to rely on for the next ten years," DeJoy explains, "and technically, it is far superior to anything else we looked at."

But technology wasn't the only reason DeJoy chose Sigma. "I like the cooperation

and support of the Oak organization," and later added, "Oak engineers worked with us to develop an electronic second set relationship which allows the converter of the primary set to authorize the secondary set converter to function."

Oak solved a dilemma for Frank DeJoy and Suburban Cable. And in the process, developed a technology that is now a standard part of Oak's Sigma converter-decoder.

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Reader Service Number 45

It doesn't do any good to give lip service to quality if you won't pay what it takes.

Something to keep in mind: the skills that worked with older 12-channel systems don't work with 300 to 450 MHz systems. "These newer systems won't forgive some of the tricks you can get away with on a smaller system—they're very unforgiving," Dawson says. And that means continuous training.

"When you upgrade equipment, you must upgrade the level of knowledge of the people who will maintain that equipment. Otherwise, you don't gain anything, and you might as well have left the old equipment in there," he adds.

"The name of the game is to bring the quality of your system up to the point where you've got a highly competitive, marketable product. And in order to do that, you need an effective maintenance program. That requires a good training program," Dawson says. And be patient. "Even the best training program won't necessarily show

noticeable results in your system in the first 30 days," he cautions. You need to give it time.

"Do it right the first time" isn't a bad rule to follow. But it helps if you have some way to measure performance on an individual basis. "It isn't just quantity of work, but quality that is important," Van Loan says. Another benefit: you might not have to "shotgun" your training. If you know that just three employees have problems with tight fittings on installs, you can work with those three and spare the rest of your installers the need to sit through extensive training sessions for problems they don't have.

Perhaps it's a bit metaphysical, but in the end it may come down to a simple matter of caring. "Once somebody cares, they'll go out and look for the information they need. It isn't something you can really spoon-feed," says Elden.

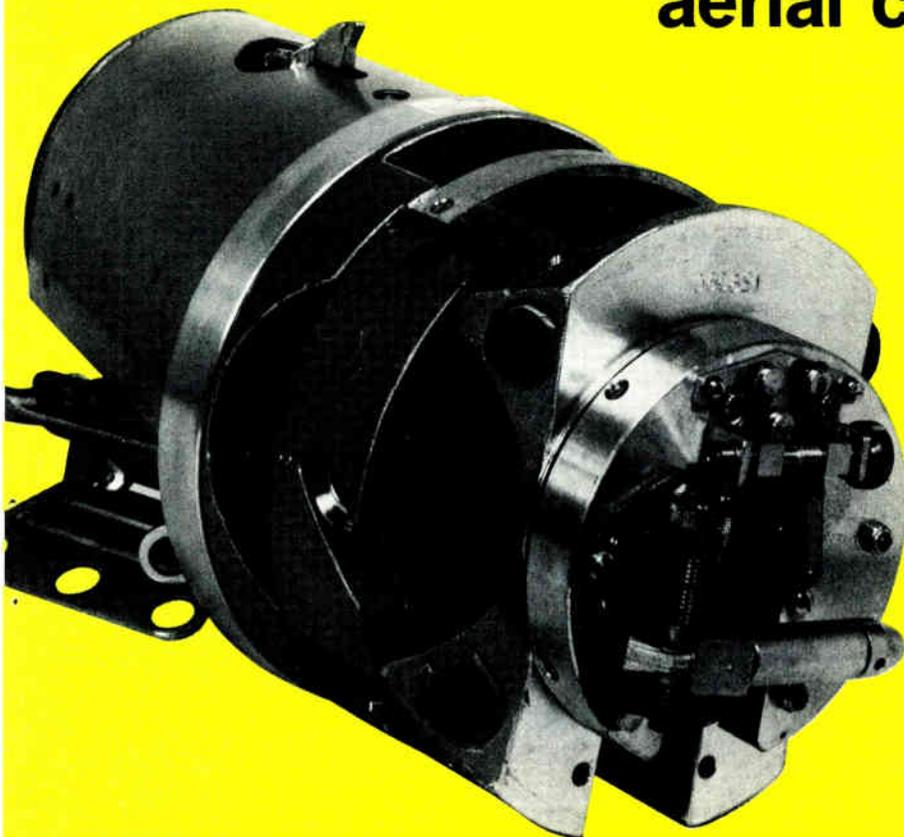
And you need to put your money

where your mouth is. It doesn't do any good to give lip service to quality if you won't pay what it takes. "A vendor told me the other day that his customers wouldn't pay a few cents more to buy a fitting that was properly waterproofed. So the marketing department told the production people to make it cheaper," Worth says. "That's a glaring example of one of the things that has been wrong with our approach." Unfortunately, this is an all-too-common vendor experience. Insisting on quality components and products is a great idea. But you have to buy them.

"The first thing you have to do is build your system with very high-quality materials and build it carefully," he urges. "Poor materials will cause you problems. Then make sure you've got a good PM program, adequate sweeping and leakage repair."

—By Gary Kim and Lesley Camino

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Reader Service Number 46

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A new era in scrambling security

Over the years, a progression of scrambling techniques has been used by the CATV industry. They have all been a variation of suppressing the horizontal synchronization pulse, which results in the familiar scrambled picture.

Among the earliest units incorporating RF sync suppression were RF programmable subscriber terminals which allowed only preset channels to be authorized. Then addressable terminals were developed. Sinewave, pulse, gated pulse and multiple modes of sync attenuation followed.

Baseband terminals offered higher security, but at a price: higher cost. Today, operators want lower cost, secure RF terminals.

Technology considerations

The changing market for addressable subscriber terminals resulted in a rethinking of the appropriate technology. The market wanted the lower costs of RF addressable technology but faced a lower level of security as a consequence.

There are three aspects to horizontal sync suppression systems:

- method of sync suppression
- transmitting of alternate sync
- restoring of original sync

The methods of achieving sync suppression are relatively easy and straightforward at RF or baseband with solid state technology. The method of transmitting the alternate sync, however, is the weakest link in most RF systems. Using an AM modulated flag on the FM modulated aural signal can create problems in the presence of BTSC encoded signals.

Finally, the method of restoring the original sync pulse can involve errors. These errors result from signal to noise degradation from attenuation of the sync pulse prior to restoration. In addition, the reduced bandwidth available on the aural carrier results in timing errors. In the case of multi-mode sync suppression, the errors become more difficult to overcome.

A new technology was developed to

Economy and MTS-transparency are important reasons why operators want secure RF terminals. A new technological approach provides an answer by enhancing old techniques.

overcome many of these problems, while providing increased security and cost effectiveness. It was decided that the new system would be RF. By using RF technology two advantages were achieved:

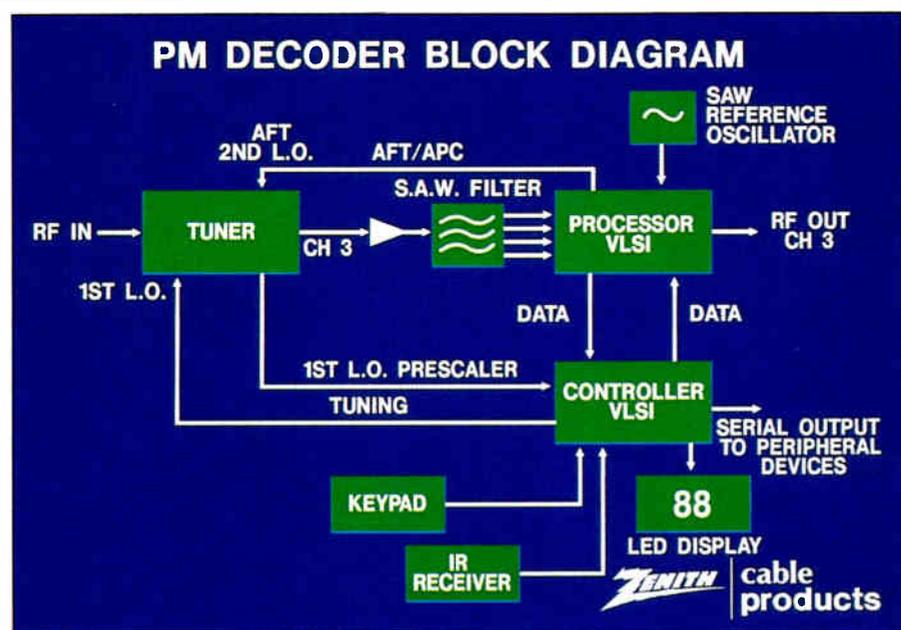
- it costs less than baseband
- the subscriber terminal is transparent to MTS stereo signals.

The latter consideration was very important, despite the advantages of baseband remote audio volume control and mute. The diffusion of stereo television receivers among the cable subscriber population is happening at a rather rapid pace. At this writing, 20 percent of new color television sales

are stereo ready, and for some major brands as much as 50 percent of the product line is stereo. The stereo-ready television receivers are predominantly high-end and come with remote control; fully 60 percent of color television receivers sold are equipped with remote control. As a consequence, forcing customers to pay for remote audio volume and mute denies them a feature for which they have already paid. Customer friendly may mean foregoing revenue. Over 75 percent of the population is able to receive at least one stereo broadcast from among 250 over-the-air television stations.

Process

The new RF scrambling system utilizes a patented technique called PROCESS, which is an acronym for Phase Reversal Of Carrier Encrypted Sync Suppression. The scrambling is provided by dynamically switching the signal and data through separate segments of a multi-element Surface Acoustic Wave (SAW) filter, which provides both phase and amplitude modulation among the picture, chroma and aural carriers. These SAWs are proprietary, using patented multiple non-linear phase and amplitude responses. It is extremely unlikely that such a filter can be replicated or emu-



By Vito Brugliera, Zenith Cable Products Division; Richard Citta, Zenith Electronics Corp.

Security in the hostile home environment and cost effectiveness were important design goals.

lated in any cost effective way. This method provides sync suppression by attenuating the horizontal pulse and phase modulation among the picture, color and aural carriers. Dynamically switched proprietary SAW filters are used to recover amplitude and phase modulation along with a patented synchronous detector.

Because of the phase modulation between picture carrier and chroma, produced by the dynamically switched SAW filters, there is color inversion present in the scrambled picture. This further serves to destroy any value in the received scrambled picture.

The altered phase relation between the aural carrier and picture carrier results in an interesting television receiver sound detection phenomena: the effect, when heard, is described as "sound masking." The net result is that anyone listening to a scrambled channel on a typical television receiver will hear a garbled, extremely distorted audio signal. This, along with the sync suppression and color inversion should diminish any value in viewing the scrambled picture. The sound masking also will serve to ameliorate any concern for sensitive content within the audio portion of the program offending accidental listeners to the scrambled program.

The method of transmitting the alternate sync or data can be either in-band or out-of-band. Both methods, as conventionally employed have good and bad features. In-band signalling eliminates the cost of an additional communication link. However, if both alternate sync and data are in-band, this information can only be received when the subscriber home terminal is tuned to a channel containing the information. Out-of-band receivers require additional circuitry and cost more. Reception of information is independent of the tuning status of the subscriber home terminal. Most RF addressable systems use a combination of in-band and out-of-band techniques. Addressing data is transmitted out-of-band and alternate sync timing and program tags are transmitted in-band as information on the aural carrier.

This approach suffers from sync timing inaccuracy because of bandwidth limitations resulting from use of the

aural carrier. Out-of-band data channels have wider bandwidths, which improves the addressing rate and receive data independently of the subscriber terminal channel tuning. This all comes at the added expense of the separate data receiver.

The new addressable subscriber terminal using PROCESS has a new way of transmitting the alternate sync in a very rugged and reliable manner. The alternate sync timing is transmitted by bi-phase shift modulation of the carrier. Instead of the typical narrow bandwidth achievable with an in-band aural carrier approach, this in-band method has a bandwidth of 4 MHz, permitting timing accuracy in the order of 100 nanoseconds.

Whereas conventional RF systems need 25 to 30 dB signal-to-noise (S/N) ratios for reliable data reception, this new system detects data signals reliably at 12 dB S/N in the presence of high noise. There are 262 bits per field, which is ample enough to provide enhanced security with a fully encrypted data protocol with multi-level keys. A session key with an encrypted message is changed periodically. Data packets are fully encrypted with a significant number of bits dedicated to CRC error detection. The address and multi-level keys have billions of possibilities. Security is also enhanced by making each box individually unique, with its identity/address buried and locked into the controller VLSI chip. This address cannot be extracted for cloning. In its present configuration, the system will allow 64 million addresses.

Security in the hostile home environment, as well as cost effective ease of manufacture, were important design goals. The addressable subscriber terminal consists of several functional blocks.

- tuner
- multiple segment SAW
- VLSI controller
- VLSI RF processor
- gain blocks
- power supply

There are only two manufacturing adjustments, both associated with the tuner. The two VLSI chips are new to cable applications, but are remasked proprietary versions of chips used in large volumes in Zenith television re-

ceivers. The use of existing technology and extremely low parts count will aid in assuring reliability and achieving competitive prices. The two VLSIs are procured from different vendors, which are interestingly not from the Far East and less dependent upon the yen for cost.

A port is provided for two data buses: one at approximately 50 kilobits, the other at 300 baud. This port provides for possible future friendly new services, among them data, impulse pay-per-view and others not invented yet.

A very exciting development has been the implementation of PROCESS into an add-on decoder, termed Pay-Master. This is not a tunable RF addressable subscriber terminal. Instead, it utilizes the output of a plain RF tunable converter, with output, for example set to Channel 3. In this configuration, Pay-Master provides all of the addressing and security of the PM addressable subscriber terminal. The absence of a tuner, and reduced requirements for power supply and cabinet result in dramatic reductions in cost of manufacture.

This inexpensive Pay-Master add-on decoder is aimed at the over 25 million cable homes that are not addressable. The low cost of entry to addressable technology can be the catalyst to expand the potential market for impulse pay-per-view.

Along with the development of PM and Pay-Master, a new family of head-end system controllers, encoders and software have been developed. PC compatible microcomputers have been used. The software is extremely user friendly and is menu driven. Standard SDLC protocols are used to communicate between system controller and encoders. Conventional RS232 asynchronous protocols are used for billing computer interface.

The product planning and engineering development of the new PM series employing PROCESS technology have been an exciting challenge. Despite the conventional wisdom, RF sync suppression is far from dead and the price/value relationship of RF addressable technology has changed in such a way that addressable technology with new levels of security and performance is available to a much wider market. ■

A tough nut to crack

Problem: consumer electronics products and systems are often incompatible with each other. TV receivers, decoders and VCRs, for example, are difficult to connect and control. Remotes from one vendor won't control devices from another vendor.

Solution: a high level common language and uniform protocols; logically and physically compatible interfaces between twisted pair, power line, coax, fiber optic, infra-red and radio frequency media.

The nutcracker at work on this ambitious project is the Electronic Industries Association, in particular the Consumer Electronics Bus Committee. At a June IEEE International Conference on Consumer Electronics held in Chicago, Jim Farmer of Scientific-Atlanta, Jud Hofmann of the Matsushita

Home electronics products often are incompatible. Here's an ambitious solution.

Technical Center, and Eugene Lubchenko of Philips Laboratories talked about the project.

The CEBus uses a hierarchical, open architecture, modeled on the Open Systems Interconnection reference model. Gateways and bridges would link existing appliances and media.

The objective is "plug and play" compatibility: connection of all electronic devices through a single wall jack. To adapt an existing house to the CEBus, power line modules are

plugged into the power line, and devices are then hooked to the modules. For twisted pair connections, a module containing a power supply, interface, and perhaps a bridge, would be installed.

The CEBus's original focus was remote controls using infra-red transmission, but the group quickly decided that remote addressing of the power and twisted pair wiring in a home also was necessary. Why? To avoid proliferation of more handheld controllers. Wireless communication between devices in a single room also had to be dealt with.

Five levels of consumer service were defined. One: One-way control of single devices; in essence, a unified remote control system. Two: Two-way control of multiple devices. Validation of communications and resolution of channel contention and collision problems is the trick here. Three: Dedicated, independent multiple audio channels. Compact disk quality audio from multiple sources, shipped to multiple receivers, is the goal here. Alternately, data channels are substituted. Four: High speed data communications. Optical data bandwidths are envisioned for this level. Five: Wideband (video) signaling. An optical, wideband, wireless link is seen here.

The group decided that a unified command and addressing language had to come first, usable by all levels of the CEBus. Levels one and two are being targeted for initial work. It's hoped that breadboards will be ready near the end of 1986 for testing and evaluation.

Work on about two dozen Home Bus projects of various sorts is now taking place in Europe, Japan and the United States. No surprise: much of the work is taking place in Japanese laboratories. The model used by the Nippon Telegraph and Telephone Co. specifies four twisted-pair cables per home with a maximum of 64 ports; two coaxial cables with 64 ports in baseband or 16 in broadband. A 9.6 Kbps transmission speed with CSMA/CD signaling and synchronous transmission with CAK/NAK error control is used. As envisioned, one coaxial cable would transmit control signals and TV; the other, HDTV.

—Gary Kim

General node and one-half of an inter-media gateway

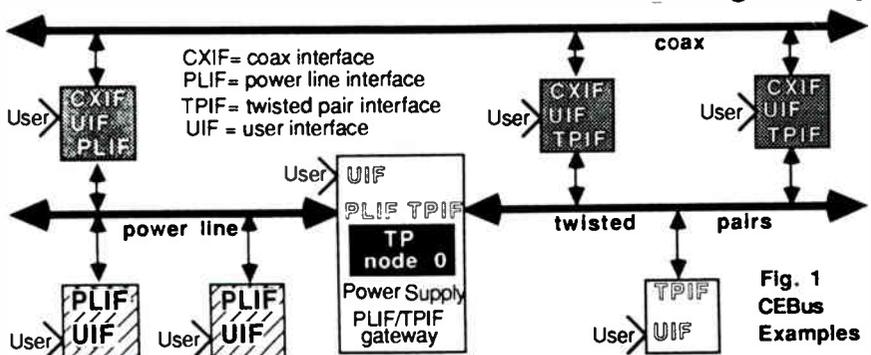
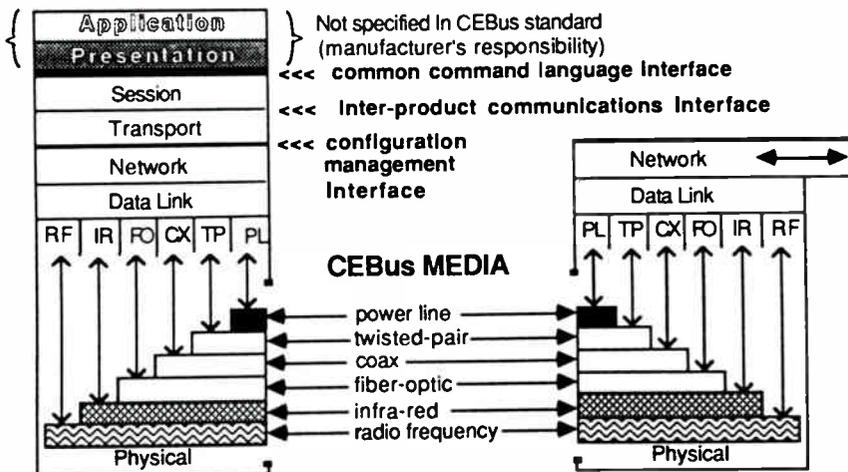


Fig. 1
CEBus
Examples



Charts by Eugene Lubchenko, © 1986, IEEE "Home Box Standardization,"
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One-way addressability: three years later

When talk of addressability began, there were few engineers out there (myself included) that believed a One Way Addressable system would work. The system seemed to be far too complex and too expensive. And there were so many unknowns: Can converters be controlled via a data stream? What types of interferences will affect communication between the addressable computer and converter? Will ingress be a problem? Will the addressable system work in an older cable system? Will a sweep interfere? Will it work in a loop-thru environment? All of my skeptical friends said "Show us!"

But the first series of demos and installations started converting the skeptics. We have learned through several years of experience, that millions of commands can be sent via a data stream to the subscriber's converter—with no errors in communication. There is very little that affects commu-

The first demos and installations of addressability have started converting skeptics.

nication between the addressable computer and converter: FSK is a most reliable type of data communication over a co-axial cable.

Although there was earlier skepticism about an addressable system operating in an older cable system or loop-through environment, we now know that almost any cable system is capable of handling addressability in older or loop-through environments.

Some engineers still have reservations, but today many MSOs continue to convert their systems to addressability. Even the 12 channel systems upgrading channel capacity opt to go

addressable at the same time. And for some good reasons.

Why addressability?

The cost of addressability is going down, and many systems can't afford not to go addressable. Operators are seeing that addressability can save in truck rolls during the seasonal churn periods. As well, addressability forces an operator to start a good inventory control program for converters: Many of the cable systems I visit don't know how many plain jane converters are even installed in their system.

Addressability also presents a number of marketing advantages. Groups or individual channels can be packaged into tiers and changed at will via simple software commands. Subscribers selecting a premium channel that they are not authorized for, view a Barker channel which informs the subscriber of the programming he is missing and how to receive this service.

The most powerful aspect of this technology is the ability to immediately upgrade a subscriber while you are talking with them on the phone. There is no longer a one week delay in dispatching an installer or technician to upgrade the service. The billing can start immediately!

The technicians are relieved from the routine of trap and converter swap-outs. This will give them more time to perform the badly needed and ignored problem of preventative maintenance.

The ability to "force tune" subscribers to one channel when they are past due on their account is also an attention-getter. This type of control saves a phone call generated by a CSR to remind the subscriber that he is past due on the account.

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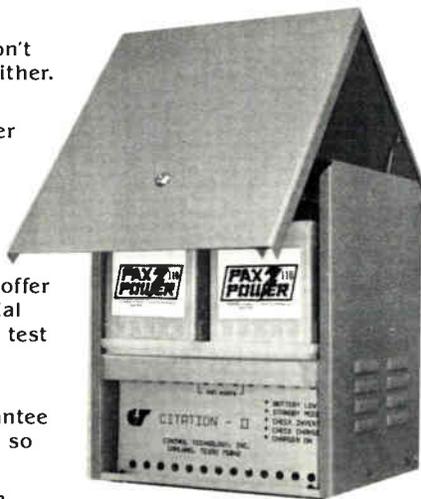
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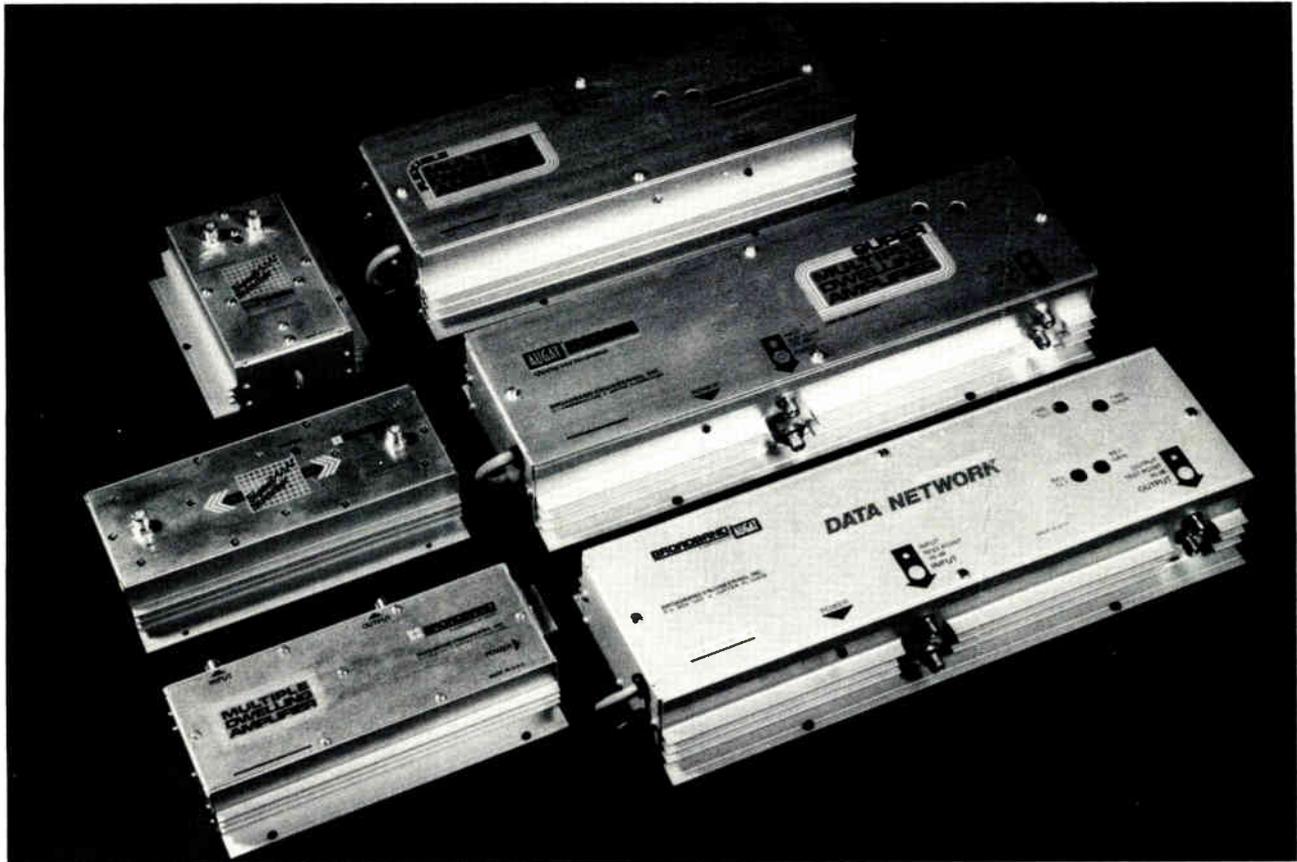
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*Glenn Sigler, Field Service Supervisor,
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Glenn Sigler installed some of the very first addressable systems and has been technically supporting and training cable operators on addressability for the past three years. This article is his view on the evolution of addressability.



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Technicians are concerned that their responsibilities would be eliminated with an addressable system.

ers in the system to one channel. On this particular channel a message could be character generated visually along with an audio message. This is especially important in cities that require cable operator's to have the ability to communicate to all subscribers to alert them of an emergency of some type. When the individual force tune command doesn't work for a subscriber that is past due, the ultimate control is to completely shut down the converter. The converter at this point emulates a "boat anchor" or "door stop."

Advanced functions

The addressable system of today has so many more bells and whistles: favorite channel recall, last channel recall, parental control, volume control, mute, remote control, program timers, down line loadable parameters, Multi-Vendor compatibility and diagnostics.

WE'RE GETTING TOUGH ON CABLE THEFT.

Many of these additional features are addressable which makes for new sources of additional revenue for the cable operator. The addressable vendors need to provide today's cable subscriber with quality service, flexibility and choice. Gone is the day when the CATV vendors dictate to the cable operator what he believes the subscribers need.

Many technicians I talk with are concerned that some of their responsibilities are being eliminated with an addressable system. This fear is unfounded. The diagnostics take the guess work out of most service calls. Before the technician is even dispatched we know if the converter is bad, if the converter has been tampered with, or if the data carrier is too low in amplitude or if the converter has been shut down for non-pay.

An addressable converter still needs to be protected from tampering. We all know how inquisitive some subscribers can be. Many available descrambling converters are easy to defeat once access is gained to the electronics. Two very important security aspects should be designed into all descrambling converters:

1. Make it very difficult to gain access to the converter electronics.
2. If access is gained, the converter electronics should shut down or vaporize.

Without this security, word gets around the neighborhood as to how to cheat the system and subscribers get a premium service at no charge.

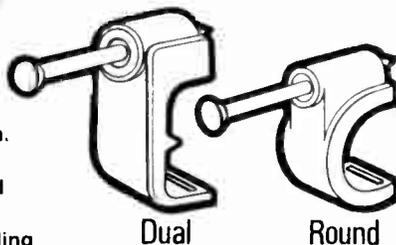
Scrambling has to be used these days for those subscribers and non-subscribers that like to experiment with the full range of their cable ready TV set. The scrambling should be the type that does not degrade picture quality. Would you pay extra for a premium service if it looks worse than a non-pay type source?

To make the scrambling effective over the long haul, the scrambling should have the ability to grow more complex with time. It doesn't make any sense to hit your subscriber base with only one level of scrambling. We shouldn't make it easy on the cheaters. The ability to change scrambling modes and increase the complexity over time is the only way scrambling



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An important aspect of an addressable system is its reliability.

can defeat the electronic hobbyist.

Reliability and support

Another very important aspect of an addressable system is the reliability.

It's all well and good to have the ability to change service levels on a converter from the cable office, but if the converter failure rate is high nothing really is being accomplished with addressability. The addressable con-

verter should never have to be opened to be programmed and once it is installed in the home, it should work for years. To keep the converter safe from the hostile home power surge environment, additional surge protection (more than is required by UL) should be included to extend the converter operating life span.

An important feature that is usually overlooked is the manufacturer's support of his product. From time to time things do go wrong, as most of you who are familiar with the Murphy's Theory of bad luck know. It is quite a relief to know at times like these that if

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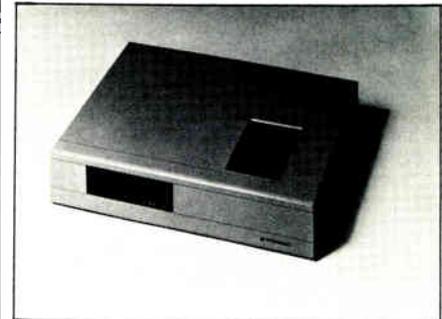
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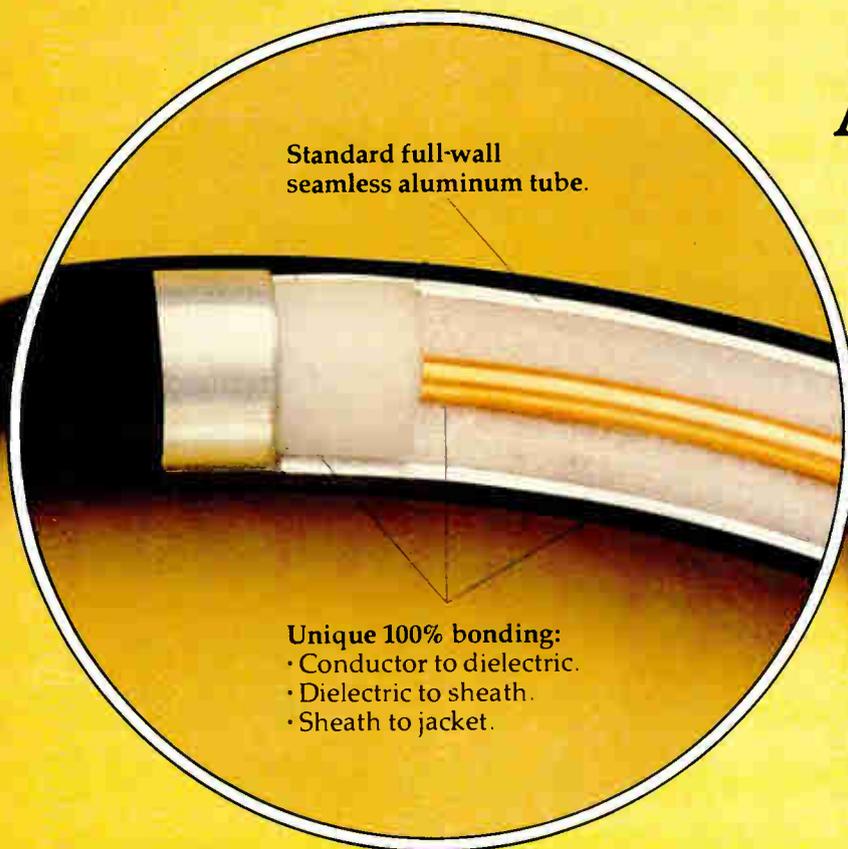
EF Data's Multiplexer-Modem

you need some technical assistance, repair parts, or field support on a problem, help is just a phone call away. Data carrier redundancy is necessary as is spare addressable computer and headend parts which virtually eliminate all downtime in an addressable system.

We are seeing more and more use of limited pay-per-view events in the addressable systems. The next couple of years are going to be very interesting in this respect. Pay-Per-View now is where addressability was three years ago and many people don't believe that PPV can provide bottom line profit. But once it has proven itself, Impulse Pay-Per-View will be needed to support those subscribers that are heavy Pay-Per-View users. The store and forward technology seems to be the best answer for Impulse Pay-Per-View. The existing phone systems just can't handle the volume of traffic that would be encountered during a popular Pay-Per-View event in a large subscriber base.

So what's next? The ultimate would be an off-premise converter that is reliable and affordable. Show me! ■

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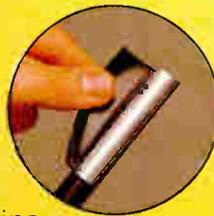
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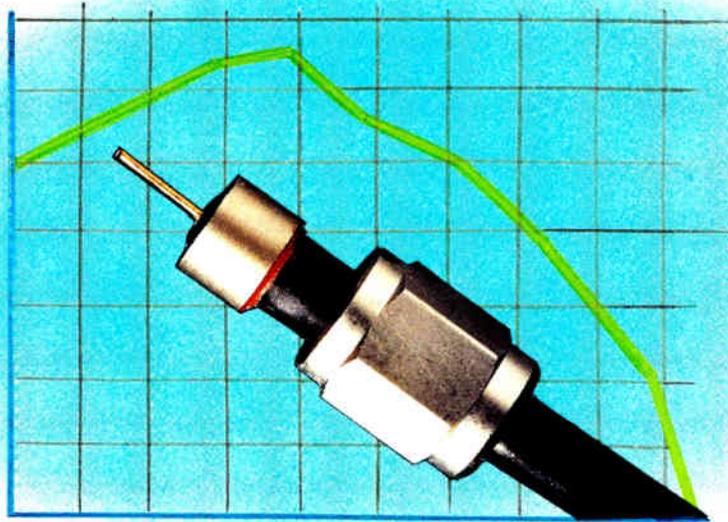
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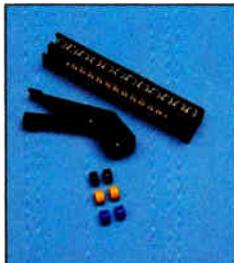
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2. The only connector available today that provides RF shielding of 100 db at 300 MHz after thermal cycling and salt spray exposure.
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