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CATJ VOL. 10 NO. 3

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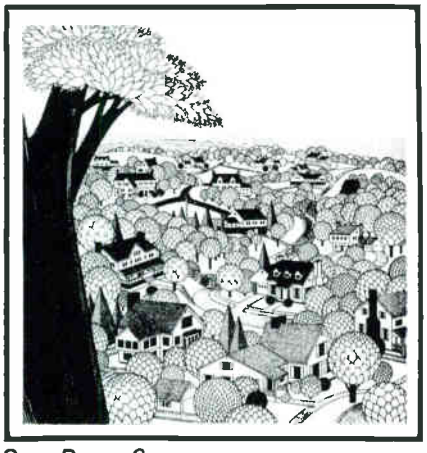

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ON THE COVER

The March cover is a bright rendition of a peaceful community of houses and families; the feature article this month concerns a cabled community such as the one shown.

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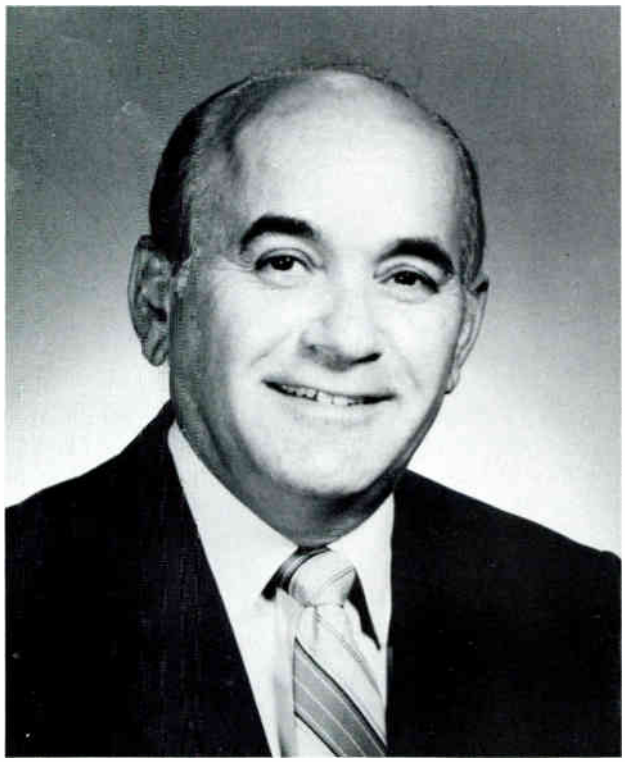

President of CATA – Peter Athanas

The First Amendment – Use It Or Lose It!

There's been a great deal of discussion lately about the use of the First Amendment in cable television. Most of the discussion, unfortunately, has been in legal briefs rather than on cable television systems. The theory, and I stress that at the moment it is just a theory, goes something like this. Cable television is a First Amendment speaker and, therefore, cities do not have the right to take away that First Amendment speech from the cable operator once he is on the poles and in a city operating a system.

Another variation of that theme is that the cities are violating the First Amendment of cable operators, and citizens for that matter, by imposing all sorts of requirements on cable television operators that are not imposed on other First Amendment speakers. That is the crux of the Mountain States Legal Foundation case that is now going on in Denver.

Without getting into a legal discussion of whether this theory could or could not work, it does seem to me that the use of a cable operator's First Amendment rights certainly cannot hurt our cause. CATA has been saying for years that cable operators should indeed organize their subscriber base and let those subscribers know what is going on not only in the cable television industry, but in their communities as well.

Some cable operators have already become active in this regard. They are writing editorials, they are doing newscasts, they are presenting information on their local origination channels that can qualify as First Amendment speech. As a matter of fact, some of those who are using their First Amendment rights are finding that the cable television media is an extremely powerful one when used properly in the city. Elections have been affected by editorials, decisions by the city council have been impacted, and the cable operators have been seen as more than just the deliverer of entertainment programming. There can be no better proof that the First Amendment works, and cable operators ought to use their First Amendment rights regardless of the legal theories to better their own communities and to become a clear speaker within the community and prove cable television's worth.

As I said, I am not going to get into the legal details here of whether that First Amendment speech is, in fact, protecting our ability to be on the poles. There are all sorts of other complications having to do with the use of the streets and ways and the power of the cities in that regard. However, there is no question that if cable television operators are to become more than the deliverers of entertainment, they are going to have to use their rights. It doesn't take much. Even if you don't have a full local origination channel or you don't have a studio to produce editorials, you should have, at the very minimum, a character generator, and information distributed on that character generator, including your own views clearly identified as to what's going on in your city, will put you and your entire system in a new light when it comes to refranchising time. The advice from those who are doing it now is don't be afraid to be controversial; however, be sure to clearly identify your views and also be sure to offer time to others to state their opposing views.

If we are all to sustain the argument that we are the telepublishers of the future, we must begin using those powers today. □

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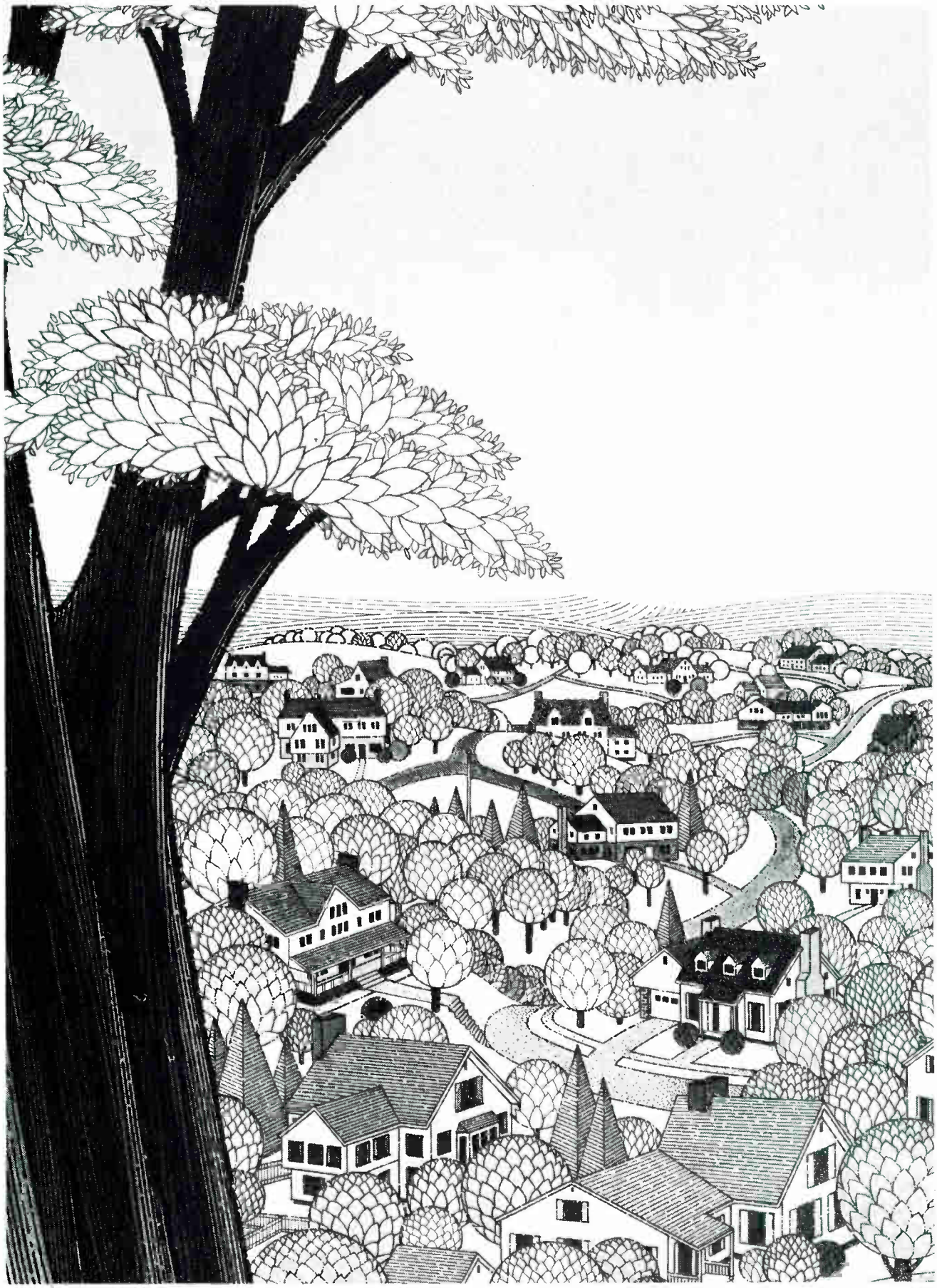

PART I

The Cabled Community

The Design, Construction And Maintenance Of Small Cable Television Systems

by David N. Emberson
Vice-President Marketing
Triple Crown Electronics, Inc.

The availability of television signals from Satellites now permits remote communities to become financially viable Cable Television systems.

While some of these communities will probably only be served by over-the-air broadcast techniques, the addition of more television channels and other services could soon cause Frequency Spectrum congestion in most areas.

The substantial capital costs of over-the-air systems combined with the desire to expand the channel capacity quickly begins to bring to realization the advantages of a **cabled** community.

When more than six or eight channels become available, technical problems become considerably more severe in operating over-the-air systems and the financial aspects of a cabled community become much more desireable.

As the "free-air" spectrum becomes more and more filled, adjacent channel operation is necessary, hence the capital costs increase rapidly due to very stringently improved performance parameters at both the transmit site as well as at the receiver location.

Very quickly the cost differential between over-the-air systems and cable television systems is eliminated and the cost of wiring such a community provides advantages such as:

1. Comparatively low cost adjacent channel operation
2. Convenience of an added FM Radio Band
3. Easier to meet Broadcast Procedure specifications
4. The ultimate in system security, that is the customer must

be actually wired into your system to receive the service.

5. Cable TV is a known media. Hardware and software is readily available to the system owner/operator.

This article is intended to address the matter of designing, constructing and maintaining a most cost effective cable television system in most cost critical situations. (Believe me this **can** work!)

The main areas to be covered will be:

1. System operating criteria.
2. System equipment evaluation.
3. System design and layout.
4. Pole permits and property right-of-ways.
5. Construction techniques and methods.
6. Headend layout and equipment requirements.
7. System activation and fire-up.
8. System maintenance procedures.
9. On going system security (drop audits).

At this point, anyone anticipating embarking on such a venture may have second thoughts — I urge you to read **on** — it only **seems** complicated!

If cable television systems were difficult, only the smart would be in this business such is **not** the case and even you can be successful!

You **could buy** your way into a cable television system but most of the operators must deal with **borrowed** money. It is the aim of this topic to show you how to do it for less and hence pay the bank back quicker.

There are numerous variations on each of the methods, techniques and theories but I shall attempt to simplify these.

Furthermore, I would be delighted to hear from anyone wishing to investigate possible alternatives or suggestions.

System Operating Criteria.

Before anything can be accomplished, it is necessary to determine what the final goal must be.

The following points must be considered:

1. System channel capacity
2. Local channels available off air
3. Impaired cable channels
4. Alternative program sources and or services
5. Channel allocation
6. Method of construction by specific area (aerial or underground)
7. Alternative sources to be provided by the system. (Local Originating digital services, FM Radio etc.)
8. Two way system to provide path back to antenna site

1. The system channel capacity would determine the frequency reponse of the system, in some areas 12 to 20 channels would put the bandwidth necessary at 50MHz to 220MHz. In other areas it might be necessary to have 30 to 36 channels, which then means the upper frequency would be 270 or 300 Megathertz respectively.

The greater the channel capacity, the greater the loading on the amplifiers hence the closer the amplifiers must be placed together (this is called amplifier spacing).

Initially a system can be designed for 20 channels but then expanded to 36 at some future date. This must be established at the time of the 20 channel design and will increase system costs slightly.

2. Local channels available must be assessed to determine the degree by which that channel would be "interfered with" on the cable system by the "direct pick-up" of that local channel by the subscribers receiver.

If the local station is low powered, the effect would be minimal. If the local station is very high powered, the channel could be severely impaired to the point of being unuseable.

3. Impaired channels while not acceptable for on-channel service can be used for alternative services but the equipment must employ "phase-lock" techniques which would permit use of the impaired channel, if point 2 above does not prevail.

4. Alternative program sources and/or services would include satellite television channels, satellite FM radio channels or even local origination programs.

Various sources of digital information can be provided for weather, stock market, local advertising, or even teletexed information. The only limitation here is the imagination.

5. Channel allocation is necessary prior to license application but must be accomplished to a logical result. Most local channels are offset by one channel, either up or down. Where possible channels **must** be carried "on-channel".

Unused channels can be used for extra services such as pay-tv, local origination and/or digital services.

The channels between ch 6 and ch 7 are called "Mid-Band Channels" and can be used as "mildly secure" channels as most TV sets will not tune these. They can be recovered by a special device which converts these signals to a standard television channel between ch 2-6 or ch 7 to ch 13.

To improve security on these channels, some form of TV scrambling device can be employed. These are readily available. The costs usually increase with the security of the system or the difficulty with which the system is defeated.

6. Method of construction would determine if plant is placed on poles (aerially) or underground (buried). This will vary with utility preferences from area to area.

The most cost effective is pole or aerial construction but it is necessary to reach some agreement with that particular utility to receive permission to install your plant on their facilities. Both telephone and power utility poles are available as

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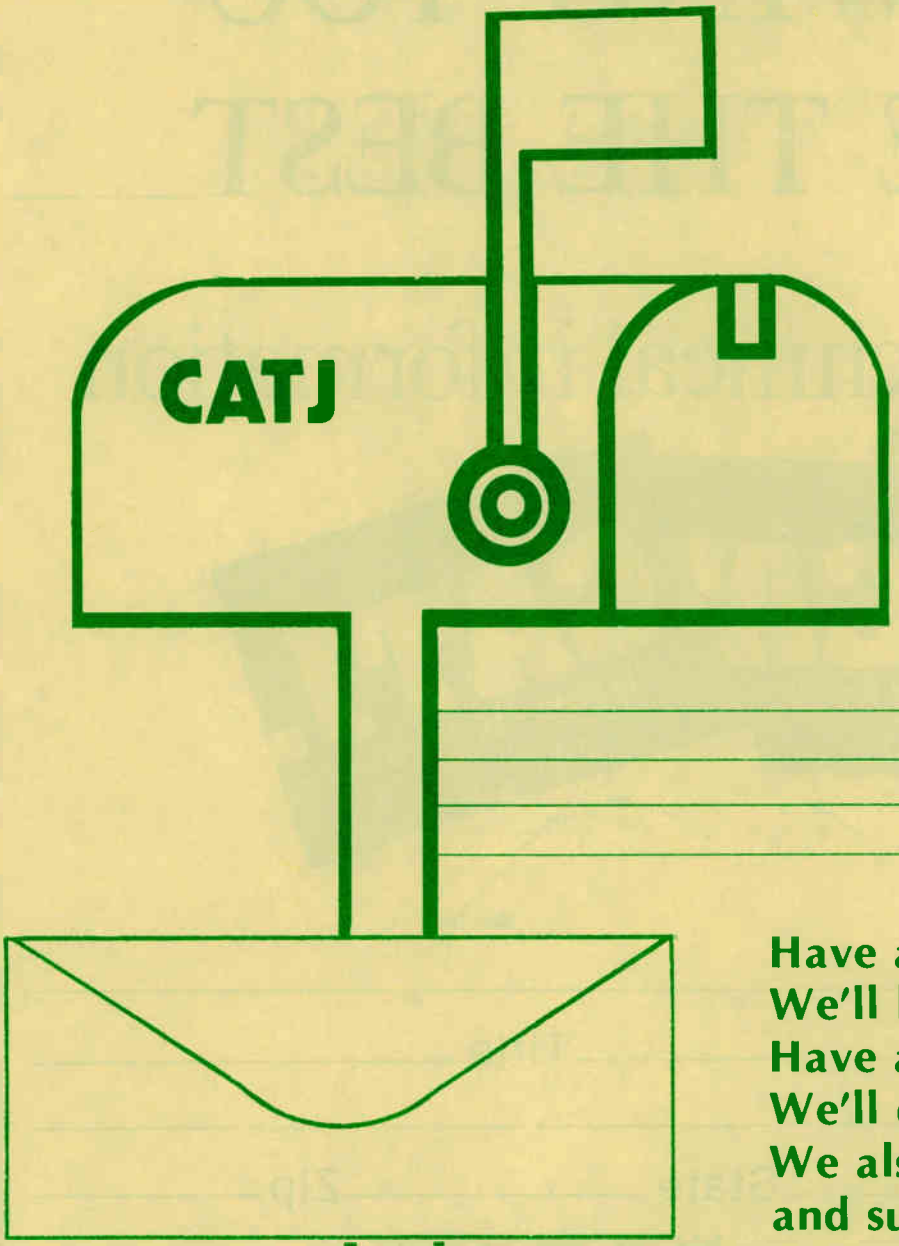

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well as telegraph railway and street light standards. Changing from one utility to another can incurr interconnection procedures and should be avoided where possible.

The contracting of professional services is recommended. A reputable contractor or consultant can avoid costs far exceeding his fee.

7. Alternative sources to be provided to the system must be determined so that channel allocations facilities spectrum and equipment can be provided to the list of equipment to evaluate.

Digital Transceivers to the Antenna site for remote antenna site switching, character Generators, Local Originating studio Equipment and Two Way or reverse amplifiers for the return path to the antenna site from any remote location.

8. The Two Way System must be determined, the route planned and the performance parameters considered to permit the necessary equipment determined which must be evaluated.

SYSTEM EQUIPMENT EVALUATION

The evaluation of equipment must begin with the understanding that:-

"Capital costs occur only once — maintenance goes on forever!"

In fact — many dollars saved on the initial installation have cost systems hundreds and thousands of dollars in the "near" future. All aspects of the system must be evaluated but it is imperative that the initial selection be correct. It is better to **over** exaggerate, than to be conservative. This is **not** a political expression! In the initial stages, it is necessary to be optimistic mainly because you will ultimately be pleasantly rewarded. Once a market has been opened, other wares are bound to appear — most unexpectedly.

The evaluation of necessary equipment would be: —

1. Cable
2. Connectors
3. Passive Devices
4. Amplifiers-Transportation, distribution, amplifier.

1. Cable is the most essential component in the system. The larger the cable — the more expensive it is less amplifiers are required. The smaller the cable it is less expensive but more amplifiers are required. It may be necessary to have the system design decide which cable size is most efficient, by application of the design format to be approached later in this article.

A good rule of thumb is to ask some neighbor operator about his experience and talk to a real good distributor in whom you can have **trust** and **faith.** (Those two words might cost you more — but could save you !)

The name of the game is "CABLE" television, the other components can be easily changed — the cable should last for about 25 to 30 years (if it's installed correctly). That topic will be covered later in construction techniques and methods. It is very necessary to understand about jacketing and flooding compounds and correct installation procedures.

2. Connectors are probably to be considered as cable — and most manufacturers are willing to share the knowledge and experiences of correct installation to **your** particular cable. If they should be installed with the cable prepared and cored then the proper coring tool and cable preparation tool should be used by your installer or by the cable contractor doing your **installation.**

If you are in doubt about your connectors — call your cable supplier and ask what they might recommend for best results.

3. Passive devices are now built to a frequency limit of between 330 and 450 Mega Hertz.

The important specifications would be: —

A. Insertion loss — or loss between the "Input" and the "Output port"

B. The top loss — from input to top port on the device

C. The directivity — or loss between the output port and the top port

It is most important to minimize the insertion loss, as this reduces the loss over the entire distribution network.

Passive device losses are predictable and in the system design we shall investigate the extent of the losses for various passive devices.

4. Amplifiers — It is necessary to do an extensive evaluation of amplifiers to maximize the effectiveness of the system proposed by the system criteria. The evaluation of any system is usually left to the designed who can either choose to design by one of two methods.

1. Manual design
2. Computer assisted design (or programmable calculator)

MANUAL DESIGN

The manual design is usually based on fixed parameters for cable and passive losses on the high/and lowband.

Calculations are done independently, regardless of the channel capacity, primarily concerned with the cable/flat loss and amplifier levels provided by some manufacturer of active equipment. This method is **not** recommended.

COMPUTER ASSISTED DESIGN

Numerous programs have been written for various computers and the costs can vary from a few hundred to a few thousand dollars, depending on the complexity of the program.

Small CATV systems do not require (nor can they usually afford) a complex design program. In fact, in my opinion, the program and the machine best suited to small system application has proven to be a program written by Tom Polis for the Texas Instruments Model T159 programmable calculator. This program, written about 1977 while Tom was Manager of International Sales for Magnavox CATV, is simple, easy to learn and inexpensive (about $500.00).

This program performs the following calculations: —

1. Systems Level program which determines the appropriate amplifier operating levels (input and output) for a given set of system parameters.
2. Normalizing System Unit Performance which determines the individual amplifier performance based on the amplifier operating levels established in the Systems level program (in step 1 above). This program considers 5 major distortion parameters

1. Cross Modulation
2. Operational Noise Figure of the amplifier
3. Second Order Distortion
4. Third Order Distortion
5. Composite Triple Beat

3. Analyzing System Performance calculates the total system performance for the Trunk, combined with the Bridger as well as determining the theoretic levels for each of five different parameters at any given Cascade throughout the system. This feature is extremely

helpful in the performance of the system maintenance program.

4. System Design Program permits the operator to place amplifiers, calculate equipment values, record both high and low signal levels throughout the system.

The program accepts predetermined amplifier operating levels, pre-selected multitap values and cable losses. The minimum multitap output levels can be ensured. Total footage accumulation and return or reverse path loss (for two way systems).

5. The system powering program establishes system powering requirements and total power consumption.

The total weight of the entire machine is about 3 kgms and it fits easily into a normal briefcase providing easy portability for use in office, field or at home.

A similar program has been written for the TRS 80 by Mr. Polis. The program is faster, with more features but portability is lost.

Regardless of the program and machine you select, the initial cost will be recovered in construction and maintenance savings over and over again.

As the system design is being completed, these results can be transferred to base maps to show type of amplifier, type of cable, value of passive devices, routing of trunk and distribution cables and location of amplifiers.

It is extremely important that a very strong human element be provided in the design of CATV systems to ensure that maintenance procedures can be performed safely and conveniently.

The maintenance technicians should be involved in the design of the system not only to provide input as to cable routing and equipment location but also to gain important basic education which helps them to understand not only the "how" of the design process but also the "why" of the design process.

If compromise must be made, ensure it is in a conservation manner. Over-spaced amplifiers which are too far apart is the most common error in design. This mistake eventually results in poor system performance after the system has aged a few years and is only corrected by re-locating the amplifiers to the correct original location.

The base map is usually a pole map (aerial) upon which the distance between poles has been measured and recorded. In underground areas, survey maps showing lot lines, easements etc are required.

It is essential that the measurements and map scales be accurate otherwise the quality of the design calculations will deteriorate.

All agreements, easements and property access permissions should be in place and confirmed prior to system design.

Many good designs have been wasted when the intended cable routes were drastically altered before construction.

Pole permits and property right-of-ways must be approached cautiously to ensure that the ar-

rangements do not cause financial burden to the system operation further into the future.

Pole charges vary widely from utility to utility and from area to area. It is also necessary to remember that the cost of plant construction can increase substantially due to the specifications which may have to be adhered to while installing and maintaining the cable TV plant.

"Make ready" costs are the costs that the system must pay to improve the existing utility facilities to allow the installation of the new cable TV cables and equipment.

These costs can range from redrilling a few poles to change the location of the existing utilities plant so that the necessary clearances between the two different systems can be achieved up to changing of actual poles themselves and relocating of existing utility equipment such as transformers in the case of the existing plant being that of a Power Utility. All of these changes are charged directly back to the cable television system and can include everything from direct labor costs, vehicle and machinery charges as well as construction crew expenses incurred in performing the plant "make ready". All of these items must be clearly understood and costed into the construction costs for the CATV system. In addition, the pole rental fee must be fixed for a specific period with some understanding of a specific limit to percentage increases in future years. The pole rental agreement is a legal document and hence must be handled as such, through a lawyer and properly drawn up to be agreeable by both parties. It is also important that the actual mechanics of pole permit application be layed out so that the preparation costs of the applications can be ascertained and understood thoroughly to avoid any surprises in the initial stages of the system design and construction.

This again is when a professional contracting company can save the system owner many, many dollars. The use of professional construction companies is strongly advised and the sooner they are involved into the agreement negotiations and the system design process, the more successful the system operations will be and the easier it will be to maintain. This will be reflected in the reduced maintenance costs and applied over the life of that cable TV plant represents thousands of dollars.

In dealing with the acquisition of property easements, right-of-ways and property access permits, it is necessary to again involve a lawyer as these documents must remain in place virtually for the life of the intended system. Proper registration in the Land Office of the Municipality is essential to protect your investment in system plant and equipment.

The rules for the access to the properties must be established and clearly stated on the registered documentation. It will probably be necessary to retain the services of a good land surveyor to correctly locate the route which you wish to follow and then have a proper survey drawing prepared which would also be registered with the Municipality.

On private property or in subdivisions it will be necessary to deal with the property owner or even the Land Developer. Verbal permissions are very dangerous situations to avoid at all costs. Changes in ownership could cause the installed plant and equipment to sit in hostile territory and major re-routing and changes in system design plus loss of the original cable and equipment can be most expensive and aggravating. It is necessary to avoid conflicts with the local residents because they are ultimately your customers and bad public relations can be disasterous. Again, a few legal fees initially can save a lifetime of woe.

All of these arrangements must be complete before the final system design can be finalized. Rushing at this stage is inevitable because the earlier the system is operating, the sooner the Cash Flow begins. Be very cautious! Use of telegraph poles and railway crossings are very carefully negotiated with the Telegraph company and Railroad as early as possible because these items historically are very time consuming and most difficult to obtain.

Use of Lamp Standards, Street Lighting poles and other such devices are usually negotiated with the municipality, township or local government. Attachments to bridges, viaducts or even use of sewer systems can be considered as other methods of routing cables and attaching equipment but it is again necessary to obtain permission from the proper authority before it is included in the system design of the area. Ensure that the party granting the permission is, in fact, responsible for that area of discussion.

It is also imperative that the specifications be determined and clearly understood — there has to be some standard to which the plant is being constructed and this must be acceptable to both parties. Permission to use a path that turns out to be extravagant in construction costs is really no deal at all. Make sure that the property owner is aware of what the installed plant will look like when it is complete. Also ensure that any landscape restoration is clearly explained and that this is done immediately following the fire-up of that area of the cable TV plant. Nothing disturbs a property owner more than a contractor tearing up lawns, shrubs and gardens and turning into an ugly sea of mud which remains for weeks or months. Construction crews must beware of damage to adjoining properties during the construction period and any damages incurred must be reported immediately in order to avoid any bad publicity and poor public relations. It may be necessary to provide a few bushes or shrubs in some areas to camoflage equipment housings or pedestals, in such case the use of a professional landscaper has always proven to be a wise choice. Make him responsible for the quality and proper planting of the shrubs, trees or whatever is required and get a written guarantee should the item not grow as it should.

Next month, we will examine in depth construction techniques and methods, headend layout and equipment requirements, and antenna site design. If you have any questions or comments to this point, please contact us at CATJ. □

HAIMO-WITS

RALPH HAIMOWITZ, CATA'S DIRECTOR OF ENGINEERING

A MESSAGE TO MANAGEMENT

Here we are in 1983. We all hope that this will prove to be a better year for everyone with improvements in the economy, our business, and expanded cable system coverage and subscribers. It is also the year of the **professionals** in cable.

What do I mean by the year of professionals? The answer is simple, but very complex! Regardless of the size, location, or number of subscribers, the best possible cable television service has arrived if you intend to remain in the cable business or even if you plan to sell your system in the near future.

Demands for more and better cable television services are increasing every day from subscribers and franchising authorities. Records indicate that almost 50% of the existing cable systems currently registered with the FCC will be coming up for franchise renewal by 1990. Unless you insure that you are providing the services and performance expected by consumers and regulatory agencies, you should not be surprised to find your current franchise either cancelled or not renewed. Either way you lose. If you are counting on selling your present system to avoid these problems and make a tidy profit from your labors, do not be amazed to find the value of your system to be somewhat **less** than you expected, because potential buyers will be aware of existing problems in operation and maintenance, and will lower their purchase offer to compensate for what they will have to spend to improve your system to the professional levels where it could and should be.

To be more specific on one or two areas in question, I have heard over and over again how system management just cannot afford to spend the money needed for the proper materials or test equipment needed to do the job right. Friends, the days of keeping it patched together with chewing gum and tape to get by are **over!** There is just too much competition for that attitude to continue — not just from within the cable industry, but from near future services such as **DBS (Direct Broadcast Satellite).**

The solution is obvious. All you need to do is get what you need **to do it right — materials, equipment, and technicians.**

The only answer for the question, **"Where does the money come from to do what has to be done?",** is to face the fact squarely that it **has** to be done and that you, as a responsible system manager, are going to have to come up with the finances to do what has to be done — **not someday, but now!** Look at all of your possible options — such as rate increases, new revenue producing resources like advertising, or financing or raising other investment capitol, and then select the easiest that will allow you to meet your goals.

This, of course, leads to the problem of how to really determine what you actually **need** to do to have a professional cable system. Here you must rely upon your technical staff to inform you of the minimum requirements in tools, materials, and test equipment that you have to have. That brings us to the second specific problem area — **how knowledgeable and capable are your technical people?**

Most of the technicians in this industry have learned their trade through local on-the-job training and through their own mistakes. Those methods got us by years ago, but that just is not good enough with today's equipment and technology. Do your technicians know technically how the component parts that make up a cable system work, why it works or does not work, and what to do to make it work within acceptable minimum standards? Better still, do they know what acceptable minimum standard are and how to perform the tests and measurements that must be accomplished on a professional cable system? The only solution to these questions and the problems that they can cause is **formal training.** You must provide your technicians with the education and knowledge that they need to do their job right. This can easily be done ►

with available video technical training tapes, enrollment in CATV technical correspondence courses, and sending your technicians to technical meetings and seminars.

My job has provided the opportunity to observe and understand just how desperately our cable technicians need formal training. It has also placed me in a position where many system managers have said to me that they want to send their people to training seminars, but they "just can't afford to spare the time and/or money" to do so. Once again the only answer is that **training your technicians** is something that **has to be done.** You cannot keep putting it off and you certainly cannot afford **not** to train them properly.

If you cannot see your way clear to train your technicians, giving them the tools, materials, and test equipment they need to make your cable system reach its peak of operational performance, providing your subscribers the best that the cable industry has to offer, and keeping it that way, then it would be a good idea to start looking for some other business.

The time has come to **"bite the bullet"** and bite it hard. Let's get the job done in this year — **the year of professionalism in cable television.** □

IS IT GOING, GOING, GONE?

There is a lot of talk lately about the small, independent cable system being on the endangered species list. More and more of these systems are selling out to the larger, multiple system owners for a variety of reasons. System owner/operators with small town or rural cable systems feel that they will lose out eventually because they cannot afford to keep up with the competition.

It seems that each issue of every media publication is filled with news about cable systems expanding their channel capacity and services. A twelve channel cable system in communities of less than 3,000 to 5,000 subscribers just cannot afford to rebuild his system to provide 60 channels of television service, or even 35 or 20 channels. Needless to say computerized headends, two-way, an addressability are not even remotely feasible. Cable television was a great business for the little guy not too many years ago when all he had to do was bring in ten or twelve off-the-air TV stations so that the community could get a good variety and selection on their TV set where previously they might only be able to pick up one or two stations from a roof top antenna. Today, however, selling his cable system looks better and better because of all the pressure and demands for more and better television service — and what will happen when he comes up for franchise renewal? After all, isn't everyone saying that you won't be able to compete with the "big guys" when you try to renew your present franchise? Besides, buyers are offering pretty good prices right now for cable systems, so why not get out from under while you can — and make a nice profit at the same time? If that is what you really want to do, then that is fine, and a lot of people are doing just that. Sometimes one questions whether all of these small system sellers really want to get rid of their systems, but they do so because they listen to those who say the small system is doomed. Perhaps it is like a "run on the bank" when people hear that the bank is failing.

Can the small cable system really survive? Let's look at the facts. First, a small isolated community cannot support a 35 channel cable system with all the latest bells and whistles, regardless of who the owner is unless that community is populated by the very wealthy who are willing to pay big bucks for their service. If you have been doing your job, and doing it right, your subscribers are satisfied with the service you have been providing them, and if you have kept good relationships with your franchising authority, you should be on good, solid ground when your franchise renewal comes up. The franchising authority will soon find out that no reputable cable company is going to promise them all of the latest goodies at a loss of thousands and thousands of dollars every year. Anyone who makes a slightly more attractive offer can promise anything, but **can they deliver?** Any half-way decent franchising authority will award renewal of a franchise to the existing cable company it if is doing a good job.

Worried about new technology like **DBS** taking away your subscribers? Evaluate how many channels are available on DBS and the estimated monthly cost for that service compared to the number of channels available on your cable system and your monthly subscribers fee. Consider that if DBS was really a serious threat to cable television would the major MSO's be spending millions of dollars to buy and build new systems?

Let's look at the practical aspects of profitably continuing to operate your small cable system. First of all, you have to determine if your system is capable of delivering good quality pictures to your subscribers at the ends of your cascades. Here are some guidelines to follow:

Technical Standards

	Pre-ferred	Mini-mum	FCC
1. Carrier-to-Noise ratio	44dB	40dB	36dB
2. Cross Modulation	57dB	48dB	46dB
3. Intermodulation	59dB	53dB	46dB
4. Hum	2%	2½%	5%
5. Co-channel	44dB	40dB	36dB

and meet all other requirements for technical standards under 76.605 of the FCC Rules.

Two potential problem areas are **age** of your present cable system and **signal leakage.** Both of these can be overcome with a little advanced planning and minimum of expense. If your system is nearing or past 12-15 years old, it is time to consider **rebuild.** Lay out a scheduled plan of accomplishing this over an acceptable period of time so that you do not have to pay for it all at once. Naturally, you would begin with any specific areas that have deteriorated so badly that they are causing signal reception problems.

After that, begin at the headend and work your way out. While you are at it, make sure that you include any design changes that were in error in the old system. When you finish, your system should have no problems meeting all of the recommended specifications. This scheduled, cost controlled rebuild would also take care of current signal leakage problems. If you do not need to rebuild, but are having serious signal leakage problems, you will be faced with a small expenditure to install a signal leakage detection system, if you do not already have one, and begin a detection and correction program to clear up the problems.

Now for signal carriage. Suppose you have a twelve channel system with no satellite or only one satellite service. All of the rest of your signals are off-the-air. Chances are that you are in the 80% bracket of small, rural systems that do not come under the major or smaller television market rules and regulations, and many of your signals are network duplicates and/or distant signals. The decision here is simple. With the new changes to the Copyright Fee Structure that has recently come about, it only makes sense to chop as many distant signals as possible. What you want to carry is the best quality reception of one of each of the major networks (ABC, CBS, and NBC), one educational station if possible, and at least one independent which could be a local indy or off the satellite. If each of these happens to be an off-the-air station, that is only five channels on your cable system leaving you seven channels to fill. The cost for earth stations, satellite receivers, and modulators has gone down considerably in the past few years, so, with a little more budget planning, you should be able to provide the satellite services from the myraid of satellite signals that are already available which best suit the needs and desires of your community. You might want to look into buying an antenna with multiple feed horn capability so that you would be able to look at more than one satellite in the future. You may even want to have one channel for local time and weather if you do not have this feature already. This type of local origination channel can be placed into your system for as little as $2,100.00 including background audio and the required modulator.

When the time comes that 12 channel operation just is not enough because of the growth of your community, then plan to expand your **channel capacity.** Most of you already have equipment in your system that operates from 50MHz to 220 MHz which means it has mid-band capabilities.

Figure on adding only **channels D through I** requiring a six or seven channel block converter. You will note the omission of mid-band channels A-1, A-2, A, B and C. This precludes the problems of compliance with operation in the restricted frequency band 108-136MHz and still provides you with up to 18 channels of operation.

In reality there is no real danger of the small operator being destined for extinction. **Hang in there Independent Operators because nobody does it better.** □

Another Cable Convention? Oh No!

This was TEXAS STYLE!

By: Wayne Sheldon
Chairman
CATA Engineering Committee

They still do it up big in Texas and, as in previous years, the convention and trade show in San Antonio was large, very well presented, and well attended. There was the usual mix of program suppliers, business consulting firms, and hardware suppliers. Along with the standard fare of headend gear, distribution hardware, and test equipment which I never tire of checking out (drooling over), several new items caught my attention.

I was particularly interested in the equipment for putting satellite delivered FM signals on a cable system. This appears to be a good way to make a few extra bucks with a very small investment. Among the services which now or soon will supply stereo audio for use on a high fidelity receiver in conjunction with their video programming are Music Television, The Movie Channel, Bravo, Home Theater Network, The Nashville Network, and The Disney Channel. In addition there are several **audio only** services offering stereo and monoral music. These should sell more FM outlets, plus you may be able to charge extra monthly fees for some of these programs. Stereo sound with MTV is almost a necessity. **Leaming Industries, Catel** and **Wegener Communications** all supply the needed equipment.

Comm/Scope introduced a new cable they designate **Quantum Reach.** This appears to be an improved and updated version of the old Sealmetic cable. The advantages of this cable are that it weighs less and is much more flexible than standard cable. The minimum bend radius is about half that of an equivalent sized standard cable. For these reasons, it will pull into conduit much easier. It does require special tools and special fittings.

A major problem with the old Sealmetic cable was that the outer conductor had a tendancy to crack at the fitting. With the new bonding, thicker outer conductor and the heavier jacket on this cable, this problem may not be as severe.

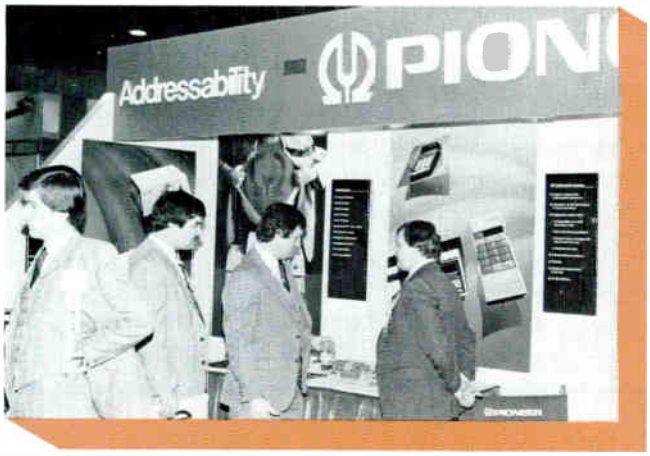
Electron Consulting Associates had a new headend processor for CATV and high quality MATV systems. This unit has a SAW filter on the IF and appears to be well built. Having several options, it is priced to be very attractive for small systems.

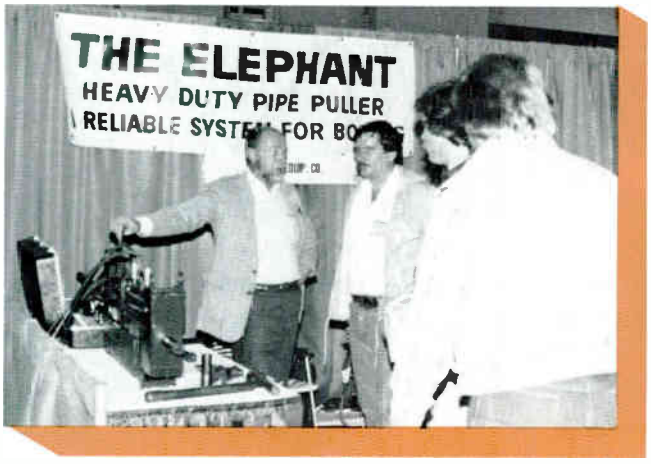
CIC (cable in conduit) is back with us. **Integral Corporation** is supplying preassembled coaxial cable in smooth wall polyethylene conduit. For some types of construction, this is an economical way to go. For other situations it will be cheaper to install the conduit, then pull the cable into it.

CIC was popular about 15 years ago but gradually faded away. There were problems with cable damage in the extrusion process, and it was very expensive. Integral Corporation claims to have solved the damage problem, and their prices seem fair. It is still fairly expensive, but when all costs of installation are considered, it makes economic sense for many situations. It should be especially useful where it is being plowed in.

One extremely interesting item was the Test Van the FCC uses to check out your system. This is the baby that will arrive at your front door some day soon, and your records and system will be thoroughly checked. They certainly have a full load of beautiful test equipment.

I hate to keep harping on this subject, but according to Christopher Papas, the operator of this particular test unit, the cable operators are not yet getting the message. **(See CATJ Jan. 1983).** Many are ignoring the rules and a few even try to fake the tests and recording procedures. This can be a **very expensive mistake.** If you don't know what your system is doing, how can you





record its performance? If the recorded data and the actual performance are **very different,** it is **rather obvious** that you have **"faked it."**

According to Mr. Papas, when they determine whether or not to levy fines and forfeitures for failure to pass all the tests, they look for two things: willfulness and repeat offenses. If you fake your records and get caught, you have no one to blame but yourself. Also, if you find a leakage point on several consecutive tests and you do nothing to repair it, you're asking for trouble if the van comes your way.

Mr. Papas was only half kidding when he said, "If I find a bad leak and look around and see several nearby antennas pointed towards it, I know it didn't just happen yesterday." He went on to say he finds many leaks that exceed 1,000 microvolts per meter. Now that's a **long way** from the limits allowed in the rules.

For those of you interested in the FCC Test Van, Chris Pappas has tentatively agreed to bring it to CCOS '83 to be held in Hot Springs, Arkansas, August 10-14. We hope as he checks his schedule that this will be possible, and we'll advise on this as we get closer to

publishing the program. This would be an excellent opportunity for you cable operators to visit with him and find out that they are serious about signal leakage! We think you'd find that the best thing you could do is keep your system in good enough condition to put Chris and his Test Van out of business; this would not make him the least bit unhappy as he feels the commission has better things to do. They want to be out of the cable regulation business, so again, it's up to you. But somehow, knowing human nature, I doubt that this will happen.

Session — Management and Technical

In planning the schedule, Bill Arnold of the Texas Cable Television Associated is to be commended for the outstanding line-up of sessions dealing with management and technical matters. CATA was well represented in these sessions as the CATA Executive Director, Steve Effros, appeared with Susan McAdams (remember her contribution to the CCOS '82 program?) on a Refranchising presentation. Anyone who attends a session where Steve appears comes out feeling they understood what he was saying — maybe not necessarily agreeing, but he is a master at taking a situation and translating into layman's terms. CATA can be proud of his representation at these various meetings he attends and he certainly gets the attention of his crowd — he doesn't back down!! Simultaneously during the Refranchising session, the CATA Director of Engineering was co-paneling with Jim Grabenstein, Microdyne Corpora-

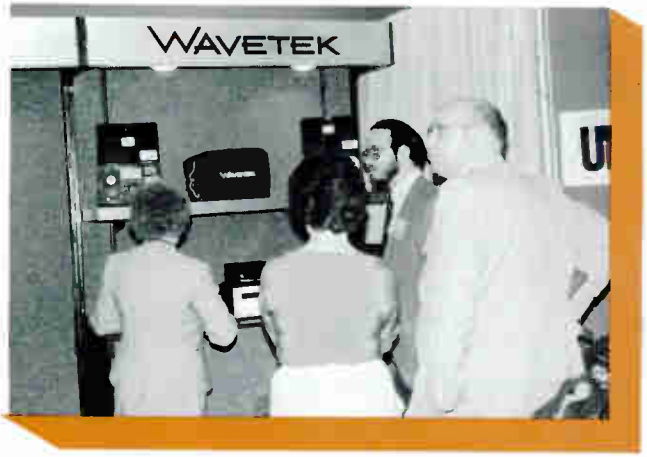
tion, on a subject of vast interest to the cable operators — Two and Three Degree Satellite Spacing. We understand this session was very well received, and is a subject that again was presented on the CCOS '82 program. Mr. Effros appeared in another session on compulsory license, so the program kept him busy as did attendees wanting to have personal conversations with him.

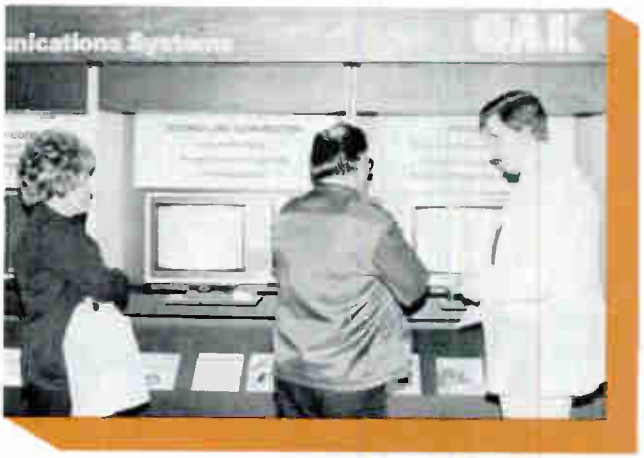
Not only did the program hold these CATA representatives, but the Exhibit Floor welcomed the various CATA Directors who traditionally take advantage of the Texas Show exhibits to make their mid-winter purchases after the Winter Board Meeting and many of the vendors remarked they wondered what these distant visitors were doing in Texas? The plans are again to schedule the Winter Board Meeting at the time of the Texas Show, so they'll be back for more purchases!!

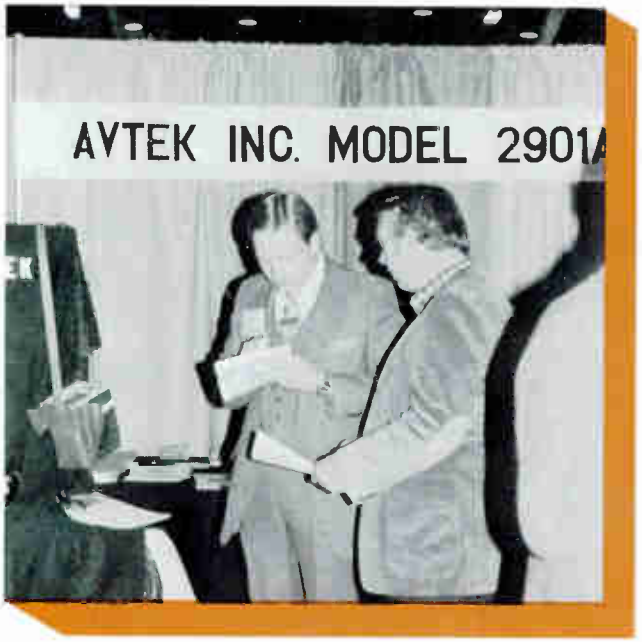
Hospitality is a word synomous with Texas, and it certainly was true with the delightful parties that were scheduled during this convention. Hospitality suites, appreciation dinners, musical entertainment — we could go on and on. Particularly outstanding was the Lynn Anderson program at the barbecue on Wednesday evening sponsored by Showtime, and the B.J. Thomas program, brought by HBO, at the Mexican banquet on Thursday night. These were certainly highlights to talk about when the attendees returned to their homes.

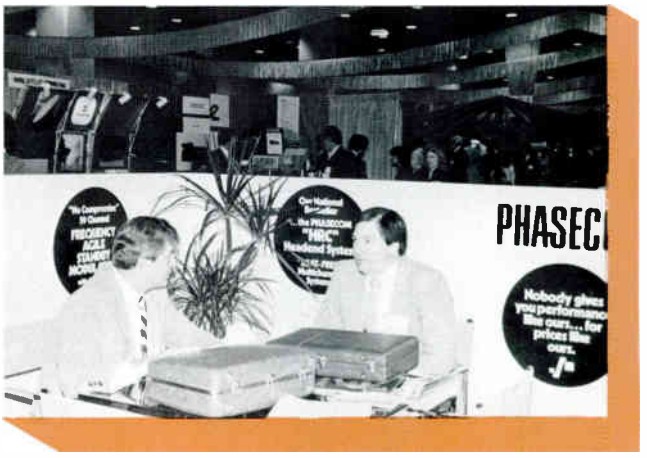
You can always depend on the Texas show being a good one — the 1983 version was no exception!! And when they say, **"Y'all come back now, ya hear?"** you can bet we will! (More pictures on pages 24 and 25.)

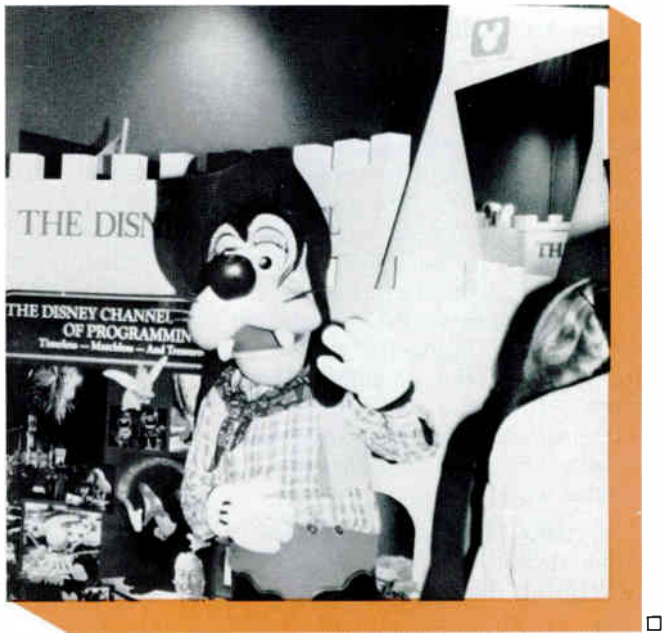
Texas Show Round-Up











S.J. Birkill

EXPERIMENTAL TERMINALS

THE CASSEGRAIN ANTENNA

Fig. 1 shows the **direct feed** method adopted for most small (4.5 meters or less) TVRO antenna. Also known as **front feed** or **prime focus** feed, it places the feed antenna or horn at the focal point of the paraboloid reflector, firing back into the dish. On receive, the planar wavefront is focused by the reflector to converge just inside the mouth of the feed, at the so-called **phase center,** to optimally excite the chosen mode in the feed waveguide (usually TE_{10} in rectangular, TE_{11} in circular waveguide).

Aperture blockage by the feed is minimal, but its location can be inconvenient, requiring that either the LNA be mounted also at prime focus (inaccessible for adjustment, exposed to direct and reflected rays of the sun) or that a transmission line, usually a button-hook waveguide but inevitably introducing additional attenuation and noise temperature, be incorporated to allow mounting of the LNA more conveniently behind the reflector. The waveguide will also contribute to aperture blockage and sidelobe level, reducing the system G/T.

To improve matters, various types of **indirect feed** are used. The simplest approach is shown in Fig. 2. Here a flat reflector has been introduced to deflect the rays from the main reflector before they reach the prime focus, F_r, and bring them instead to a new focus, F_v, closer to the main reflector. A feed horn placed at this new, **virtual** focus F_v, sees an image of the dish reflected in the sub-reflector as if it were in the position shown by the broken curve. So the feed believes it is illuminating this **virtual reflector,** not the real one.

The advantages of this method are questionable. The feed is brought closer to the dish, so allowing a straight (and short) waveguide run to place the LNA behind the dish (through a suitable hole in the center). But because the subreflector is planar (flat), the virtual reflector has exactly the same profile as the main reflector, so the feed's illumination angle must be the same. This wide angle means that the subreflector must be either (a) very close to the feed, or (b) com-

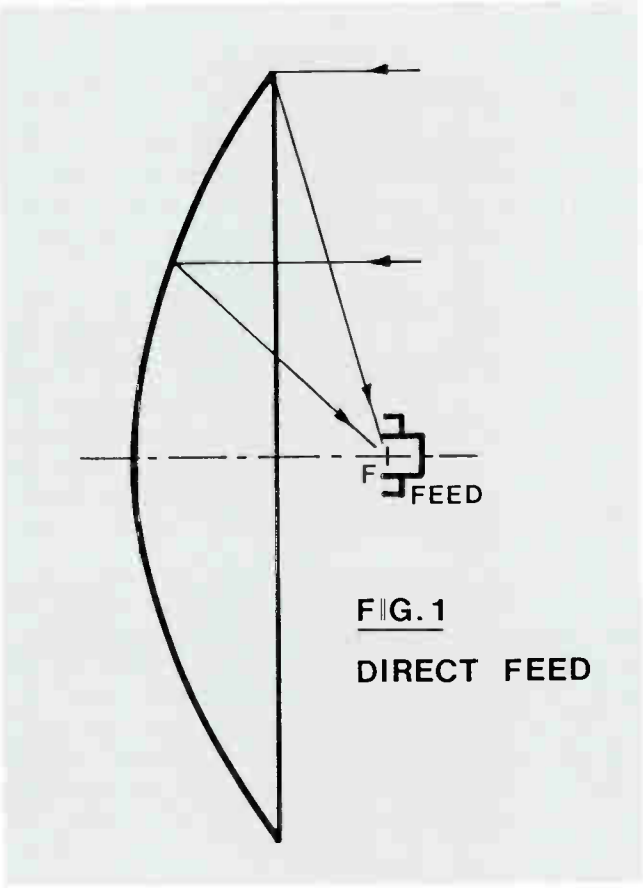


FIG. 1

DIRECT FEED

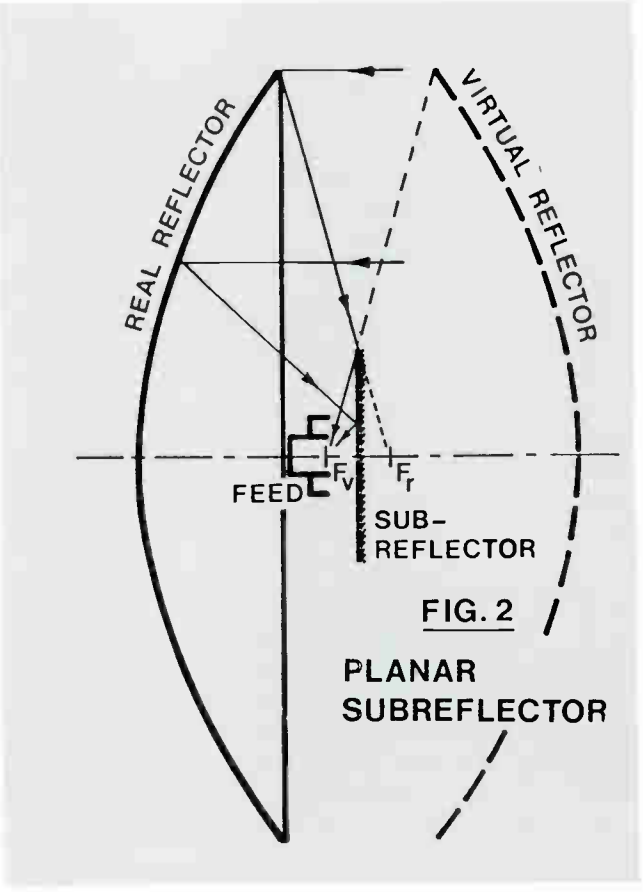


FIG. 2

PLANAR
SUBREFLECTOR

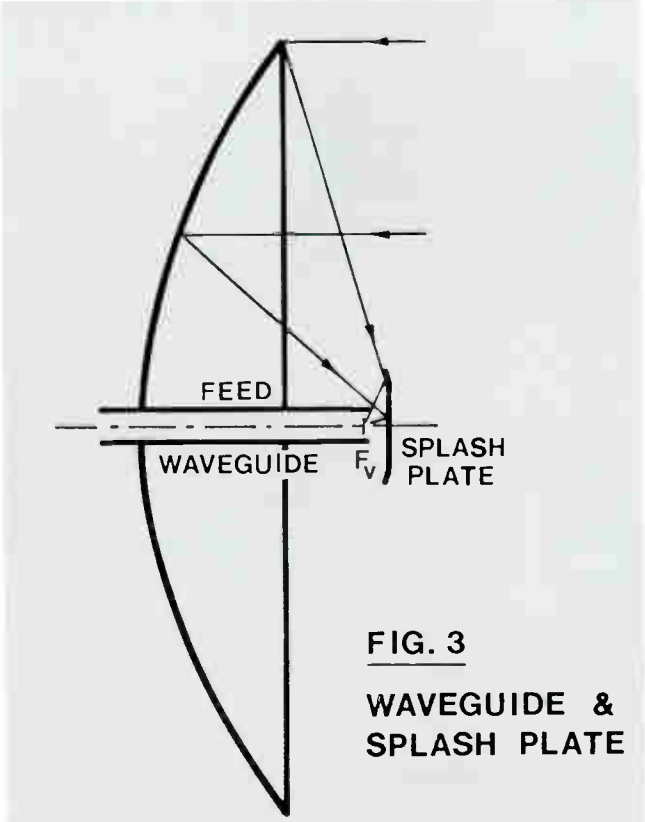


FIG. 3

WAVEGUIDE &
SPLASH PLATE

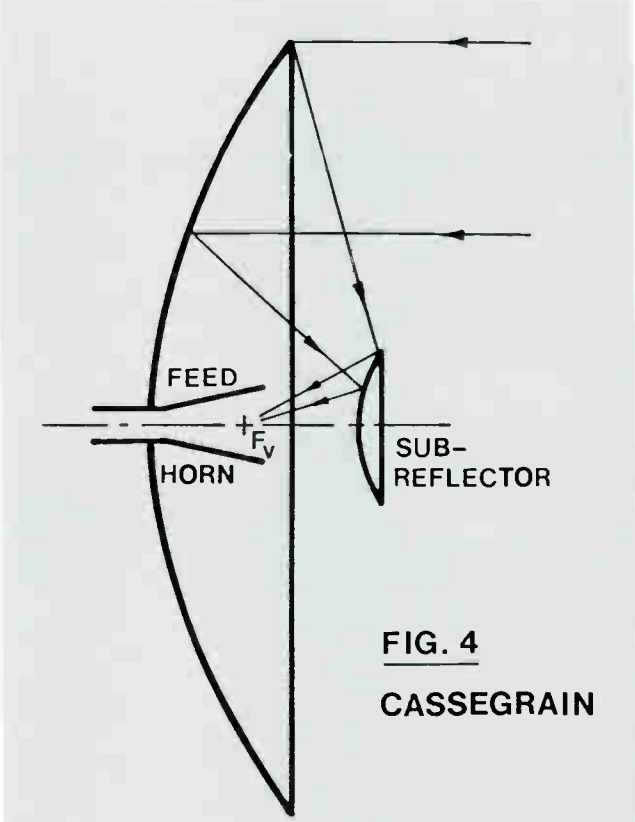


FIG. 4

CASSEGRAIN

paratively large. (a) has the disadvantage that the feed horn itself blocks a large part of the center of the subreflector, that is the feed sees its own reflection rather than the main reflector. Naturally the VSWR of the feed is impaired, resulting in standing wave ripples across the band, or even (with some LNAs) a tendency to instability. (b) results in considerable aperture blockage by the subreflector, whatever the scale of the antenna in terms of wavelenth. A blockage of one-third of the dish diameter will cut gain by over 1 dB even with a flat illumination profile. With a 15 dB edge taper, blockage of the central region can soon cut gain by 3 dB, neglecting the other effects mentioned. A further factor to take into account is the additional **spillover loss** at the edge of any kind of subreflector, where the (forward-facing) feed sees some ground and some sky around the edge of the subreflector, degrading side-lobe performance and antenna noise temperature.

A variant of the planar subreflector approach is shown in Fig. 3. Here the subreflector has been brought close in to the end of the feed waveguide (so reducing its size), and the open end of the waveguide together with the subreflector or 'splash plate', forms a kind of back-firing feed horn. The waveguide size and splash plate spacing are chosen to optimize illumination and VSWR over the band. This type of feed is specified for its convenience rather than its efficiency, but it performs satisfactorily in a well-known make of collapsible 'umbrella' antenna. It is **not** a Cassegrain feed.

Cassegrain

The Cassegrain system is shown in Fig. 4. It is characterized by a convex subreflector and a larger feed aperture than the direct fed antenna (for the same f/D ratio). The geometry of the system can be explained by reference to Fig. 5. Again I have shown the ray paths and extrapolated from F_v back to the **virtual reflector** which the feed is designed to illuminate. The hyperbolic contour of the subreflector adds a magnification factor to the dual-reflector system. F_v is now further from the subreflector than F_r, with the result that the virtual reflector, while having the same diameter, has a longer focal length than the real reflector. The larger f/D ratio requires a narrower feed radiation angle, which in general simplifies feed horn design, allowing improved pattern control affecting VSWR, diffraction and polarization purity. So a Cassegrain system can give to a compact, short-focus antenna the advantages of a high f/D ratio with the convenience of a rear feed.

Cassegrain geometry permits a wide choice of feed parameters. Bringing F_v close to F_r reduces the size of the subreflector, hence its aperture blockage, but the process is limited by diffraction effects below a minimum diameter of about 5 wavelengths, when the expected performance will not be achieved. Increasing the separation between F_v and F_r requires greater subreflector curvature, but can be used to place F_v right back at the vertex of the primary reflector, so the horn feed can be mounted to look through the central hole.

DUAL SHAPED-REFLECTOR ANTENNA

A modification applicable to any dual-reflector antenna is often made to large Cassegrain systems. Aperture efficiency can be improved beyond the 55-60% typical of a prime-focus fed antenna, by matching the feed illumination profile more closely to the antenna aperture. With a simple feed horn, illumination taper is a compromise between gain and spill-over loss. A horn radiates (or receives) maximum power along its axis, and tapers off away from the axis. But there is **no** sharply-defined cut-off point. So the designer must choose an illumination at dish edge which is not so low that the outermost part of the reflector makes negligible contribution to gain, nor so high that appreciable energy is radiated (collected from) beyond the rim of the dish. High gain demands high (perhaps −10 dB relative to center) edge illumination, while for low noise and sidelobes a lower value is required (any −18 dB). For small TVRO antennas a compromise is commonly reached in the vicinity of −14 or −15 dB.

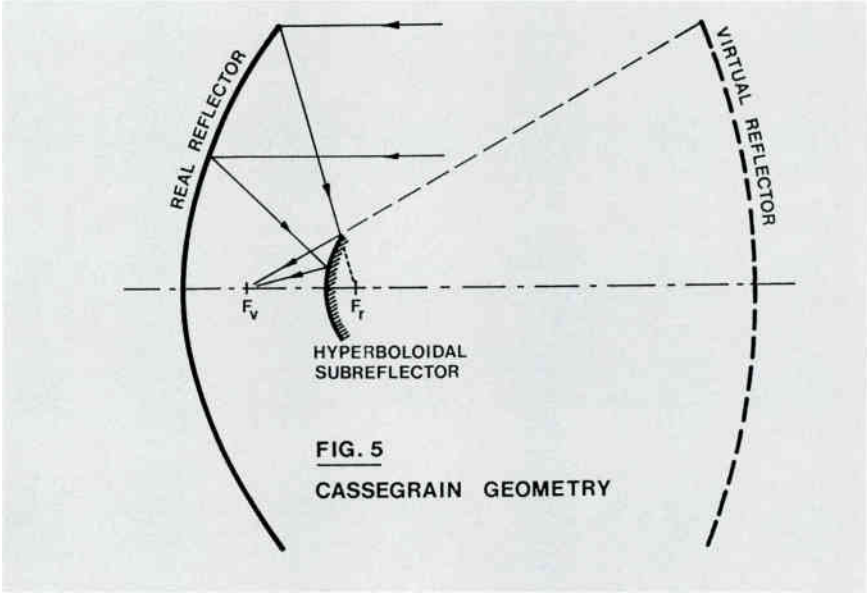


FIG. 5
CASSEGRAIN GEOMETRY

The dual-reflector antenna allows the designer to approximate more closely the ideal of even illumination of the main reflector, without appreciable loss beyond the rim. This is done by changing the profile of the Cassegrain (or other) subreflector so it is no longer a true hyperboloid of revolution. The subtle change of shape causes the mapping of feed pattern on the main reflector to be changed, favoring the region towards the rim, but with a rapid fall-off beyond the rim. The central region, necessarily blocked by the subreflector, is also arranged to see little feed radiation. All very well, but this simple redistribution of power has seriously impaired the Cassegrain's gain, as now the equality of all ray paths from the horn to the far-field region has been

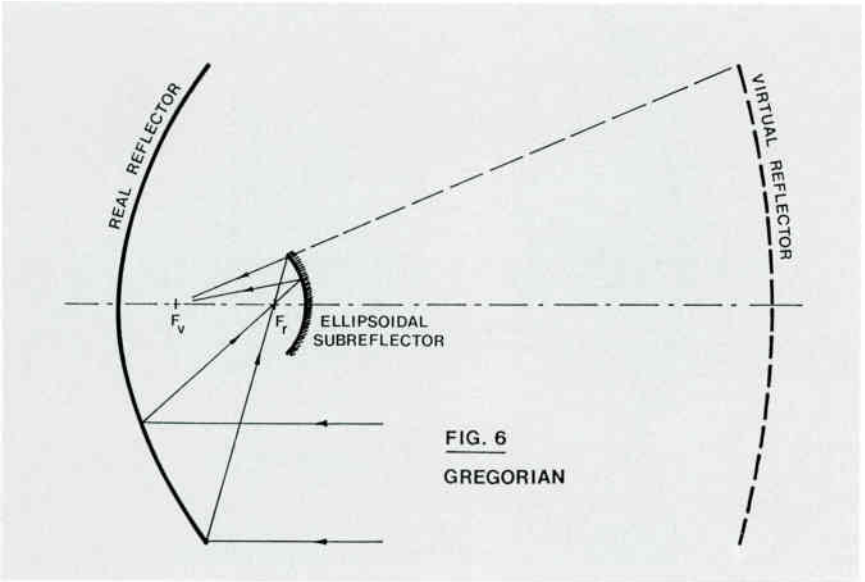


FIG. 6
GREGORIAN

destroyed. Waves reflected from different parts of the dish no longer arrive perfectly in phase at the feed horn. So another change is made, this time to the main reflector profile, making it no longer a paraboloid of revolution, but something just a little different. It **looks** the same to you or me, but the computer-derived profile change is just sufficient to bring all points of the aperture back into phase at the feed horn. The result is an aperture efficiency of up to 78% (typically), or **1.5 dB increase in gain,** for the same size antenna.

Gregorian Antenna

The Cassegrain is one solution to the dual-reflector problem. The Gregorian is another. Here (Fig. 6) the magnification between the two foci is provided by a **concave** subreflector, part of an ellipsoid of revolution, situated beyond the prime focus, as seen from the primary reflector. So rays are brought to a focus at F_r, then diverge again before being intercepted by the subreflector and brought to a new focus at F_v. It can be seen that, for the same size of foci, the Gregorian system has a longer focal length than the Cassegrain. Also it is less compact, the subreflector being further from the dish. The Gregorian has its own advantages and disadvantages, and is used very successfully by Andrew in their larger earth station antennas.

Construction of a Cassegrain subreflector

GRAPHICAL CONSTRUCTION

Fig. 7 shows a graphical method for determining the required hyperbolic contour in a classical Cassegrain system. In general the primary reflector will be determined by availability, but it may be advantageous to specify a smaller value of f/D than would be appropriate for prime focus feeding. For this example I have used a 4 meter dish of f/D 0.3. So its focal length f_r (r for real) is 1.2m. The parameters of subreflector diameter, virtual reflector f/D and feed position must now be selected. Subreflector diameter d should be kept small to minimize blockage, but larger than about 5 wavelengths because of diffraction effects. I chose a value of d equal to 0.6m, a diameter of 7.4 wavelengths at 3.7 GHz.

I selected a feed position well back into the dish to minimize waveguide run, giving a narrow angle corresponding to f_v/D of 1.2. This makes f_v equal to 4.8m. Next the depths of real and virtual reflectors, c_r and c_v are calculated, from $c = D^2/16f$.

The subreflector location is defined by the values

$m = d\,(f_r - c_r)\,/D$ and

$l = d\,(f_v - c_v)\,/D$

The real reflector's profile is plotted for a number of values of y, ideally 10 to 20 points from zero to D/2 (only the upper half need be plotted, thanks to symmetry), from the formula $x = y^2/4f$.

Measuring from the origin, pole or vertex of the real reflector, the value of f_r (1.2m) defines the location of F_r, then towards the dish by m (0.055m) locates the subreflector, a further distance l (0.689m) gives the location of F_v (hence the phase center of the feed). f_v (4.8m) to the right brings us to 0_v, the origin of the virtual reflector. So 0_v is $(f_r - l - m + f_v)$ from the vertex of the real reflector.

The profile of the virtual reflector is then plotted, using the same values of y as were used for the main reflector, (now $x_v = y^2/4f_v$). The points are easier to plot if these values of x_v are subtracted from the previously determined value of o_v (5.256m).

For this simplified example (10 points plotted) the table looks like this:

y	x_r	x_v	$(o_v - x_v)$
0	0	0	5.256
0.2	0.008	0.002	5.254
0.4	0.033	0.008	5.248
0.6	0.075	0.019	5.237
0.8	0.133	0.033	5.223
1.0	0.208	0.052	5.204
1.2	0.300	0.075	5.181
1.4	0.408	0.102	5.154
1.6	0.533	0.133	5.123
1.8	0.675	0.169	5.087
2.0	0.833	0.208	5.048

The next step is to join each plotted point to its respective focus, for real and virtual reflectors. Where the two lines intersect, for a single value of y, is a point on the rquired hyperbola. A smooth curve joining these points gives the required profile, and can be used, scaled as necessary, to make a template for the subreflector. It can be seen that a similar construction will yield the elliptical curve required for a Gregorian subreflector.

By calculation

The general equation of a hyperbola is $x^2 = a^2 + y^2/(e^2 - 1)$, where

$$a = \frac{(l + m)}{2}\left(\frac{f_v - f_r}{f_v + f_r}\right), \text{ and}$$

$$e = \frac{(l + m)}{2a}$$

x is measured from the mid point between F_r and F_v. Subtracting the value corresponding to y = 0 will reference x to the vertex of the subreflector. In this form the profile may be applied to a turning or spinning lathe. Values of f_r, f_v, d, l and m are determined as for the graphical example.

Note that a high degree of accuracy is necessary in positioning the feed and subreflector — there is more chance of a serious alignment error than in a prime focus fed antenna.

It should also be noted that a circularly-polarized wave will undergo an extra reversal in a dual-reflector antenna, and the orientation of a feed polarizer for right-hand circular will look like that required for left-hand circular in a single reflector feed. The definition of a linear polarization is less open to ambiguity, and the plane of polarization is unchanged by reflection. □

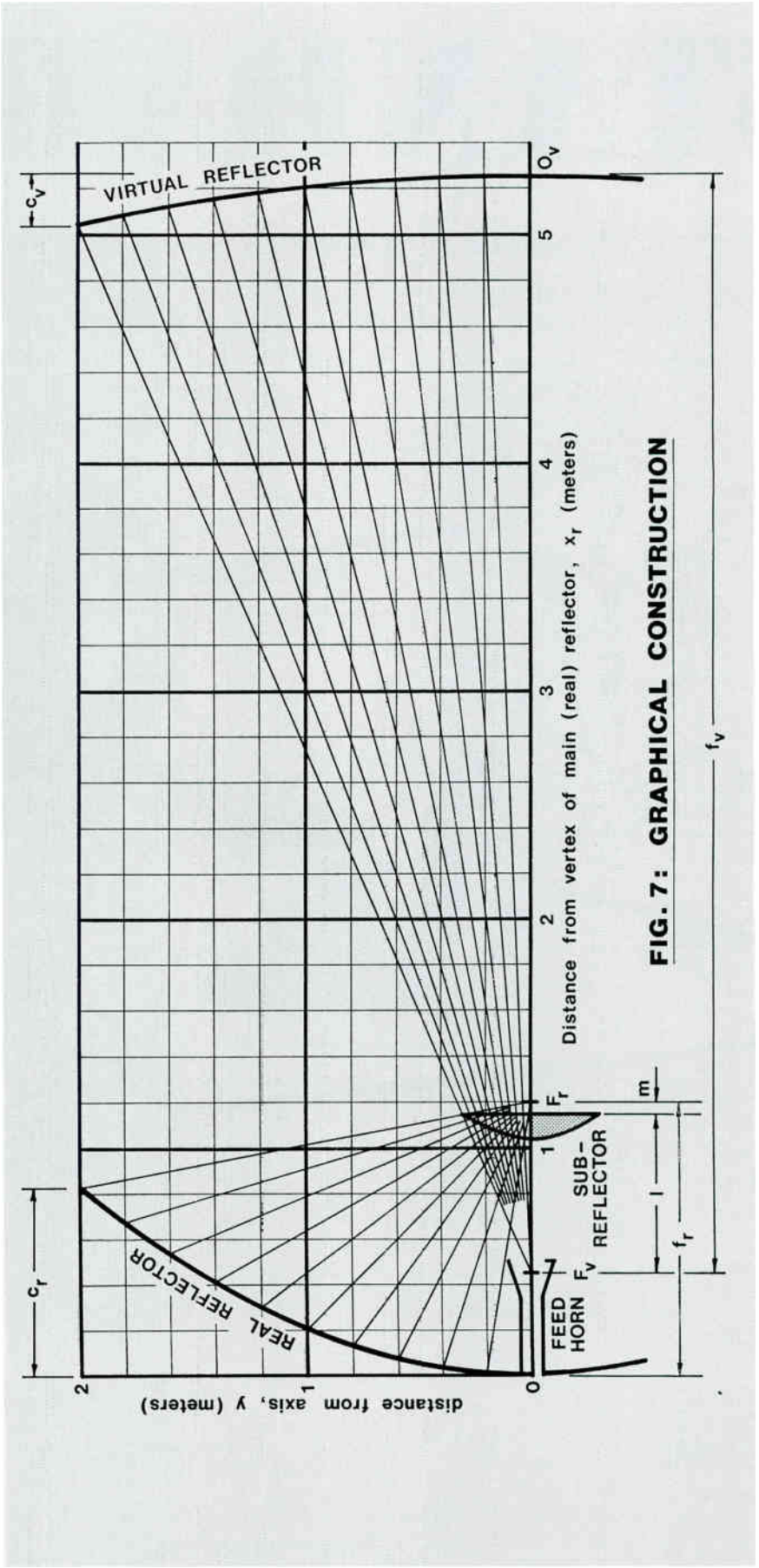


FIG. 7: GRAPHICAL CONSTRUCTION

STANDARDIZE

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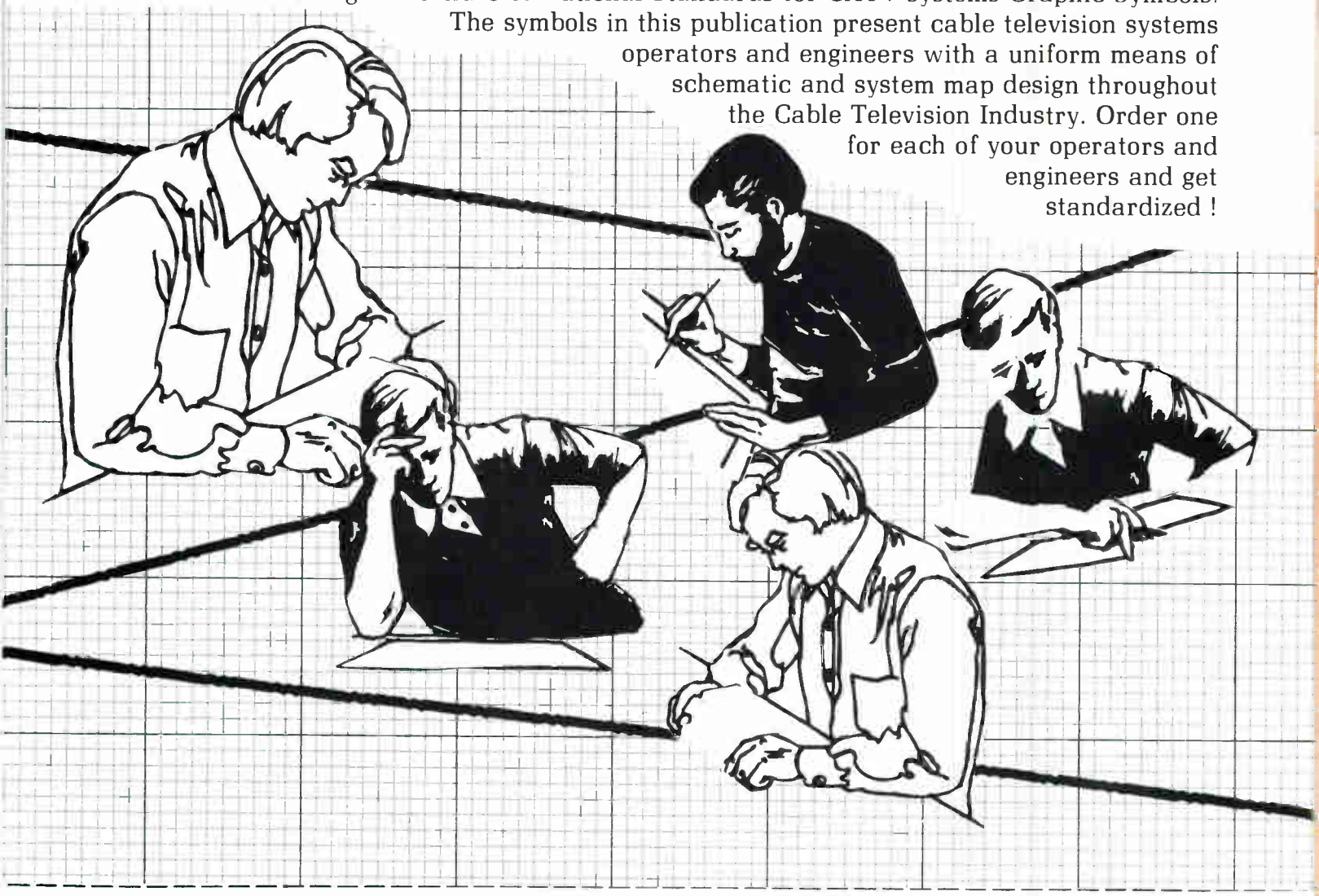
In order to help you standardize your grid and map preparation Television Publications is now offering a brochure of National Standards for CATV systems Graphic Symbols. The symbols in this publication present cable television systems operators and engineers with a uniform means of schematic and system map design throughout the Cable Television Industry. Order one for each of your operators and engineers and get standardized !



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SEND TO:

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PLEASE SEND_____SYMBOLS GUIDES. ENCLOSED IS $_____FOR MY ORDER.

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Return of -

THE FILTERED EARTH STATION #11

Terrestrial Interference Avoidance -

A Comprehensive Approach

By Glyn Bostick
Microwave Filter Co.

Last Time

The tenth of this series **(CATJ, February, 1983)** began a new attack on **Terrestrial Interference (TI):** the **avoidance** or **minimizing** of TI in our system in the hope of avoiding filtering or, failing that, using simple filters.

This Time

We're going to begin the first in a series of five steps to minimize TI. The first step, selecting our TVRO components from a TI susceptibility point of view, will **decrease** the **probability** or **severity** of TI seen at turn on. We won't have space to cover all TVRO components in this installment. This time we'll discuss the key TVRO component — **the antenna.** In later installments, we cover equipment right down on the chain, including the TV set.

The Antenna: Gateway to the TVRO System

The antenna is not only the desired signal gateway, but the major input for TI. So selecting the antenna is our first **big** chance to minimize TI. Later on, we'll discuss some mechanical aspects that make an antenna TI susceptible and how to choose among specs for different models to minimize the **probability** of receiving TI in the first place.

But first, we must choose an adequate **size** antenna to insure receiving enough signal and of getting the desired **quality** of reception: low received signal is often confused with TI and TVROs with marginal signal are more susceptible to degradation by even mild TI.

Although the **amount** of signal is determined by the size of the antenna, the **quality of reception** is determined by the antenna-LNA combination. So we must choose them as a compatible pair.

The "performance number", to which the antenna-LNA must add up, is called the G/T. This is simply the gain of the antenna divided by the total noise of the system, the noise being made up of the noise temperature of the antenna and the LNA combined.

$G/T\ (db) = G\ (dbi) - 10\ Log\ (T_a + T\ell$

(See box for definitions) P.35

Given the G/T specific to your location, you can substitute T_a (antenna noise temperature) into the above equation. Then, by substituting various LNA temperatures into the equation, you can compute the antenna gain required to go with each LNA.

We can then compute the diameter of the dish needed to give us this gain by:

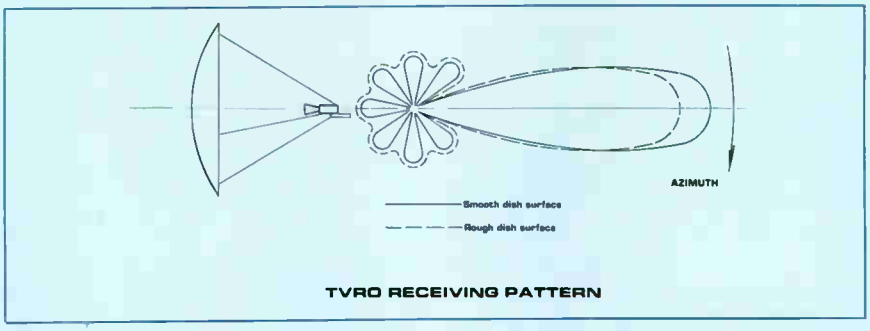
$D\ (meters) = .03 \times 10^{x}$

$x = G\ (dbi)/20$

We now have several pairs of dish size/LNA temperatures to give us the required G/T. So we go shopping to see which pair is most economical. G/T is determined by parameters specific to our location and quality requirement:

$G/T = (C/N)\ db = Pathloss - Kdb + 10Log\ (BW) - EIRP\ (db)$

(See box for definitions)



TVRO RECEIVING PATTERN

Example

Let's use the sample numbers suggested **(see box):** P.35

$G/T = 14 + 196.5 - 228.6 + 75.56 - 33 = 24.46\ db$

So the gain of our antenna must be:

$G\ (dbi) = G/T\ (db) + 10\ Log\ (18.5 + T\ell)$

By substituting for $T\ell$, the standard LNA temperatures 80, 90, 100, 110 and 120°K, and using the previous equation to convert gain to D meters, we get the following choice table. ►

LNA (°K)	G (dbi)	D (meters)
80	44.39	4.975
90	44.81	5.22
100	45.20	5.46
110	45.55	5.68
120	45.87	5.90

Now, it is up to you to shop around for the best cost.

Antenna TI Susceptibility

You **must** get the gain from your antenna which your system calculations expect. Otherwise quality will be poor, signal will be marginal and you'll **think** you have TI or will be unduly bothered by very mild TI.

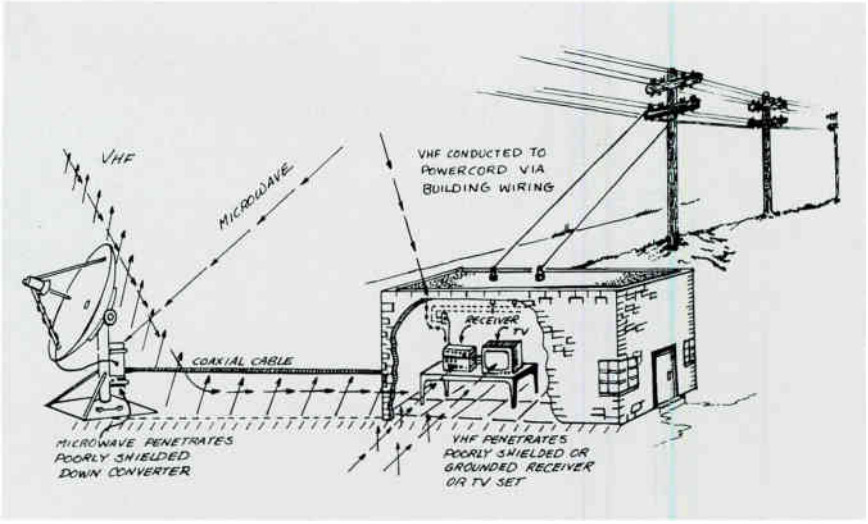
Be wary of specs citing "computed gain" and ask the basis for assumptions going into computations. Place more faith in "measured gain" figures. This may narrow your choice since gain measurement is an extremely sophisticated art and about the only people with the elaborate equipment and experience are the "old line" antenna manufacturers. But some newer companies **do** subcontract type testing to the "oldies." So **do** inquire where measured gain figures are not given. A double check formula, accurate to a few tenths db for antennas with 55% efficiency (industry quality), is:

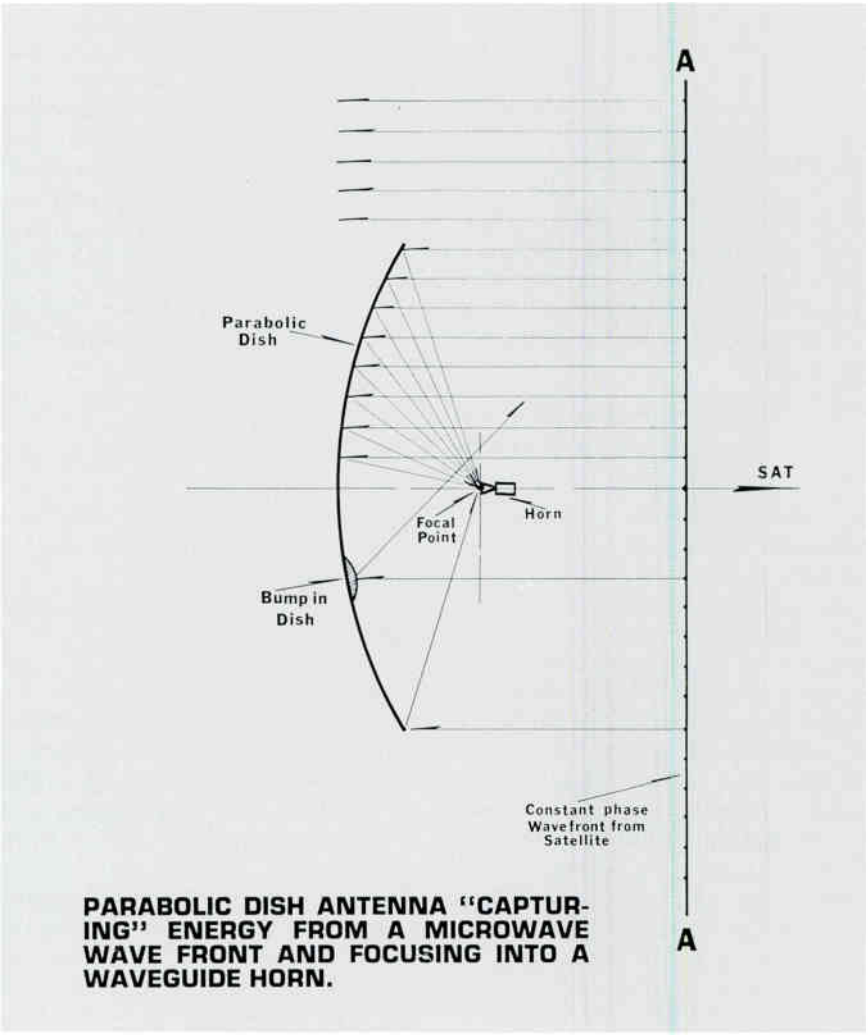
G (dbi) = 20 Log (33 Dmeters)

Try it against the published figures of an old timer like Scientific Atlanta, for example.

Side Lobes (or beams) receive most of the TI we get: only a nut would point his TVRO straight at an ATT microwave tower. And the tower doesn't have to be pointing at us to give us trouble: its side lobes can be talking to our (TVRO) side lobes. So, everything being equal, choose the antenna model with lowest side lobes specs and **reduces** the **probability** of strong TI at turn on.

Surface roughness of the dish is extremely important. The rougher it is, the more **gain** you lose. For example, a roughness of 0.125" RMS can lose you about 1.5db gain. Look carefully at unlaminated wire mesh dishes. Unless tacked to precision metal at very frequent intervals, even the above rough criteria can't be met. And, even if it meets the criteria along the rib, unsupported areas can become wavy and dented in service. So **most** quality dishes have the mesh laminated between controlled sheets of fiberglass. And **nothing** beats precision sheet metal panels for smoothness and high dissipation efficiency. Most quality dish manufacturers spec surface roughness at less than 33% of the above example. Surface roughness also **increases** the size of the side (and back) lobes and "fills in" between them. This creates a higher **probability** of TI problems: higher lobes and more of the side and back





PARABOLIC DISH ANTENNA "CAPTURING" ENERGY FROM A MICROWAVE WAVE FRONT AND FOCUSING INTO A WAVEGUIDE HORN.

DEFINITIONS

(Note: 4 GHz operation assumed)

G/T is the quality figure of merit for a TVRO antenna-LNA combination. The larger it is, the higher will be the performance quality.

= numercial gain of the antenna divided by the total noise power in the receiving band. The noise power is made up of the sum of noise temperatures of the antenna and the LNA.

G/T(db) is simply the ratio expressed in db: 10Log(G/T)

T_a Noise power of the antenna, expressed as a temperature °K. $T_a = 14 + (180/e)$ approximately, where e is elevation angle.

T_ℓ Noise power contributed by the LNA expressed in °K.

i Gain of a mythical isotropic radiator: one which radiates equally in all directions and has a gain of 0 (dbi).

G(dbi) The gain of the antenna expressed in db relative to that of an isotropic radiator.

EIRP(db): The effective isotropic radiated power at the satellite. This is given, for your location, on standard "footprints" of each satellite. Most TVRO equipment suppliers can give you piles of these. For example, we assume a common value of 33db.

Pathloss: This depends on the distance from your TVRO to the satellite. We will use a common value of 196.5db in our example. Again, TVRO suppliers have charts and formulas.

BW This is your receiving bandwidth in Hertz. For most situations this is 36 million hertz (36 MHz) and we use it in our example.

K This is 10Log(k), where k is a widely known Boltzmann's constant. K = 228.6db.

C/N(db) This is the desired satellite receive power divided by the total noise power in the receiving bandwidth expressed in db. It is the critical number that determines G/T-the antenna/LNA requirement.

Reception Quality	C/N(db) required
Network Broadcast	18
Local Broadcast	16
CATV Head end	14 (assumed for example)
CATV near sub	12
CATV far sub	10
Home TVRO (min)	8

area filled in — ready to receive TI. Since TI trouble is proportional to TI strength **relative** to the strength of the desired signal, a rough surface loses in two ways: decreases the gain, and hence the satellite signal, and **increases** the received TI signal.

Contour Fidelity is the faithfulness to which the dish surface follows the designed parabolic curve. Lacking sufficient fidelity, all "rays" impinging from the satellite will not arrive in phase at the feed horn and loss of gain will result. Because it is harder to control, deviations usually occur near the outer rim at the worst possible place: the outer half diameter subtends **three times** the area of the inner diameter half. This would be extremely hard for you to check, even if you could afford to travel to the factory. So your best protection lies in examining the spec for pointing error under, say, 50 mile winds. This should be specified as an error angle, and should be no more than about 20% of the 3db beamwidth. For example, for 3 meter dishes, with beamwidths of about 1.5°, the pointing error should be less than, say 0.3°. If you believe this spec, then you can be sure that the mechanical back up of the dish, including mounting trusses, are sufficient to hold the contour, once accurately tooled. Like surface roughness, departure from contour loses gain and increases side lobe level — both TI susceptibilities.

Horn misalignment can cause loss of gain and encourage reception of TI. With a fine alignment mechanism, most feedhorns have a cross polarization discrimination ability of about 40db, but a misalignment of only 4 degrees (about equal to faraday rotation) can drop this to only 23db. Of course, discrimination can be no better than construction squareness. While slight misalignment will not noticeably decrease gain to the desired polarization, it can cause the horn to become more susceptible to cross-polarized TI signals. Examine the horn spec and be wary of cross-discrimination less than 30db. And, over and above this, make provisions for remote, fine alignment.

If we observe the above practice and cautions in selecting our antenna, then we have greatly **decreased** TI **probability** in our **final** TVRO system.

Next time

We'll consider the **LNA**, see how it is TI susceptible, and show how to examine specs to reduce TI probability.

Acknowledgements

Thanks to:

Chris Bostick for sketches

John Fanetti for technical discussions

Bernadette Andaloro for typing, editing and FED EX, same day. □

literal interpretations. As you all know, no Copyright Law has been passed since the 1976 adoption of the Copyright Act which would correct these inequities. Now what we are doing, and what we are proposing, is exactly the same thing as what the Copyright Office and the Copyright owners have been doing to the cable industry. We are urging that the industry read the rules just as strictly as the Copyright Office has forced us to read them on other occasions, and we are now maintaining that the 3.75% rate increase, when read strictly under the rules, would not apply until any cable operator had exhausted all of the substitutable specialty station signals that were available to any cable system prior to June 24, 1981.

It should be noted that the law written by the Copyright Royalty Tribunal specifically says that the signals in question are those signals which were **permitted** under the FCC rules — not those that were **carried** under the FCC rules, and lest anybody argue that the CRT just made an error in the language — in other portions of the new rulings they do specifically talk about signals that were carried, therefore, we're taking the position that you do not, in fact, have to have carried these specialty stations — you only had to be permitted to carry them in order to be able to now substitute for them. As a matter of fact, several other lawyers in Washington had noticed these provisions with regard to signals that were already being carried, and have asked the Copyright Office about substituting for carried signals. We are taking it to the farthest extent of the law, as written, just as the Copyright Office has done, and we are saying you didn't even have to carry the signal so long as you were permitted to carry the signal because that is what the rules say.

Sure we're aware that a lot of people will start yelling and screaming as soon as they hear this analysis of the rules. So far as we can see, it is a plain and straightforward reading of the rule, and we challenge anybody to show us how the rule can be read any other way on its face. As to the argument that this is not the intent of the rule and that it totally eliminates the effect of the entire proceeding that the CRT just went through, we would only answer the same thing that the Copyright Office answers — and that is, if you don't like a strict, straight interpretation of the law as it is stated, then you should go back to Congress and seek a change in the law because that, so far as the Copyright Office has indicated in the past, is the only remedy. We would welcome such action. We are more than willing to go back to Congress and straighten out the entire Copyright Law, as we have said on many occasions. But as of right now, we don't believe, under a strict interpretation of the law, that any cable operator will have to pay 3.75% for any distant signals carried so long as they're not carrying more than 34 distant independent signals.

Since we are sure that this is going to raise controversy, CATA is willing to support any legal action that might arise to confirm this definition of the rules, but even if none takes place before March 15th, it is hard to see how the Copyright Office could now maintain that the Copyright Law contemplates a distinction between specialty stations and other independent signals when they have forced cable operators to pay for those specialty stations, ignoring any distinction and claiming that they could not make such a distinction in the past. Indeed if they did make such a recommendation today, we would argue that the Copyright Royalty fee pool must then refund a great deal of money to cable operators who have been paying full distant signal equivalents for specialty stations since 1978.

The main point in this argument is that the Copyright Office has never had the authority, under the Copyright Law, to deal with specific signals. The law itself is not signal specific. It merely talks about types of signals, and within those categories cable operators can freely choose which signals to carry. Any other interpretation of the law would allow the Federal Government to interfere with the First Amendment, freeze the ability of cable operators to offer diversity to their subscribers, and frustrate new technologies as new stations come on line.

Well, there it is. As we noted earlier, we've been trying to develop this theory as carefully as possible over the last several weeks. The letters that Gary Christensen got from the various agencies involved are now on public record and confirm the legal elements of the position that we're taking, and the result of all this is that we expect a great deal of action on Capitol Hill in the very near future. **Be prepared!** We'll be talking to you about all of this probably very soon. We would strongly advise that all cable operators looking at the question of deleting signals on March 15th because of the 3.75% rate increase decision, should immediately consult with their lawyers regarding the reading of this rule. CATA **can not** and **is not** giving legal advice on this issue. We are merely supporting a proposition that the law can be read in this way and, in fact, we can't see any other way that the law can be interpreted given the facts and given a history of the Copyright Office strictly interpreting the words of the statute. The decision is up to each individual cable operator and counsel.

GOLDWATER INTRODUCES NEW FRANCHISE BILL

Here we go again! Senator Goldwater has reintroduced what last year we called S. 2172. Now the

new number is **S. 66,** and it looks remarkably like last year's bill. As a matter of fact, **it is** last year's bill with just slight modifications. If you will remember, the principal provisions of the Goldwater Bill of 1982 were that there was a reasonable expectation of renewal for cable franchises, there was a limitation on the cities with regard to regulating rates, and there was also a limitation on the number of access channels that could be required by a city. Of course, there were many other provisions, and we'll go over those in a moment, but this year's bill has most of those provisions intact with the exact same language. Several changes have been made. The first would be that cities would not be allowed to regulate basic service, which is defined as broadcast retransmission only, if there are reasonably available alternatives to basic service programming in the particular goegraphic area or market. Second, unlike the old bill, the new one has no mandatory access requirement for other commercial types of access. If you will remember, S. 2172 required 10% of channel capacity for programming not originated by the system operator. That requirement has been dropped in S. 66, but they have retained a 10% access requirement for public, educational and government access. That 10%, by the way, is defined as channel capacity after the cable operator deducts the number of channels that are taken up by the "must carry" rules and that cannot be used for other technical reasons.

Another change in the new bill is that the provision in S. 2172 exempting all cable television systems of under 2,000 subscribers from any type of regulation has been eliminated. That happened in part because of a CATA request. If you will remember, the language of that provision was so convoluted that it resulted in hurting the smaller operators rather than helping them. Thus, all operators are covered in one package in this bill.

As with the provisions of S. 2172, S. 66 has a strict limitation on any government institution of cable cross ownership or media ownership rules. However, unlike last year the strict foreign ownership provisions have been modified so that rather than the FCC imposing foreign ownership restrictions, all they are now allowed to do is submit foreign ownership information to the U.S. trade representative. CATA will maintain its position that foreign ownership provisions, like other cross ownership provisions, should not be included in the bill at all and we would urge that, that provision be taken out.

An interesting and potentially very important new provision in S. 66 is in the so called "purposes" section of the bill, and for the first time in that section a Congressional bill states explicitly that it is Congress' intent to "allow cable systems to compete in the marketplace on an equal basis with other providers of telecommunications services to the public." That phrase could become as important to us as the old war horse "ancillary to broadcasting".

There are many other provisions of the bill, and we've gone over all of them in the past in analyzing S. 2172. Unfortunately, as with S. 2172 there are also continuing ambiguities in the bill with regard to questions of preemptive powers by the Federal Government and what portions of an existing franchise will remain in effect if this bill gets adopted. One thing that has now been made clear is that any franchise provisions in existing franchises that require access channels in excess of those required by this bill, would be grandfathered and would be allowed to remain in effect. However, there is also a provision that says if the franchise is changed in any way or is renewed at any point, those access requirements would then drop back to the federal standard. What is not clear, at least at this point, is what happens to the other promises that have been made in franchises regarding local origination, access studios and all the other goodies that have cropped up in the latest franchise battles. We hope to get more of a clarification on those points during testimony on February 16th and 17th.

It would appear that S. 66 is as good a bill for cable television as we can possibly expect, and CATA will be supporting the passage of S. 66 with minor modifications. What are the prospects of its carriage? Well, that's a totally different issue. Senator Hollings, who is the ranking minority member on the Communications Subcommittee, has already announced that he opposes the bill because he doesn't think it goes far enough. This is the same process we encountered last year when Senators Cannon and Hollings introduced their own bill that was far more deregulatory — in fact it was totally deregulatory in contrast with the Goldwater Bill. Do they really want to see that much of a deregulatory bill pass? Well, that's a question that has been batted around Washington quite a bit. It's hard to say. One thing that seems to be clear is that from a political standpoint a total deregulation bill would have much less of a chance of getting through both Houses of Congress than a bill that looked something like S. 66.

There is also another political ingredient that has to be thrown into the mix. As everyone is by now aware, the National Cable Television Association and the National League of Cities have been meeting to try to hammer out an agreement on compromises regarding a regulation bill in Congress. We expect that some sort of an agreement will be announced prior to the printing of this Article. How that will affect the Goldwater Bill is not clear at this time. Mr. Goldwater

has said that he would be more than willing to consider modifications of the bill if they were consistent with his philosophy, and until an agreement is reached and publicly announced by the 2 organizations, we'll just have to sit back and wait to see what the political outcome will be. Naturally, even after an agreement is reached there will still be lots of shouting and screaming about the interpretation of any agreement, so we don't look upon this as being an easy process regardless of what happens.

One point that should be kept in mind is that we expect that the process in the Senate will be a lot faster this year than most observers might guess. Mr. Goldwater and his staff have clearly indicated that they intend to push this bill through the Senate as fast as it can go, and that they do not think that it is very necessary to have extensive hearings prior to moving the bill. They do look upon S. 66 as merely the successor of S. 2172 and they are likely to include all the information that was garnered in S. 2172 with the new bill. Thus, we can't expect there to be a lot of delays on the Senate side. It's either going to pass or not pass in a relatively short time span. The fight, of course, will then move to the House and we would expect full and comprehensive hearings to be held by the Communications Subcommittee in the House. There the Chairman, Tim Wirth, has already indicated that he has serious questions about some of the broader provisions of S. 66., so while it may move through the Senate quickly, we would not expect quick passage by the House of Representatives. As usual, we will keep you informed, and should other things calm down over the next month, which unfortunately we don't expect, we will do a full analysis of S. 66 in the next issue so that you can more intelligently discuss it with your city officials. It is going to be important, particularly when we get to the hearings in the House of Representatives if the bill ever gets that far, for city officials to understand fully what the bill does and does not say and, of course, that is doubly true for cable operators.

SPEAKING OF CITIES AND REFRANCHISING — A NEW CONSULTANT IS ON THE HORIZON

If there's one common complaint about the franchising or refranchising process that we hear all the time, it is that a city and its cable operator have been working well over a period of years and when it comes time to refranchise, the city suddenly decides that rather than be capable of making up their own minds, they're going to need a consultant. Naturally, the consultant comes in and in order to justify his or her existence, they show the city how they can get more, more, more; and in another most common situation, the cable operator is required to pay the cost of the consultant. Unfortunately, in many cities the same consultant that is working in the major metropolitan areas is also hired for the smaller communities, and the information that goes back and forth gets somewhat confused as to what is reasonable and what isn't reasonable regarding a major urban cable build and a smaller community build. Now the smaller cities have been offered a new option. Susan McAdams, who used to be the Director of the Telecommunications Project for the National League of Cities, has gone out on her own and is specializing in advising smaller communities, on a consultancy basis, what to do during refranchising and what is reasonable or is not reasonable in the franchise process. Make no mistake about it. Susan is one of the brightest people we know on the city side of this issue. She is a very able and tough negotiator, and she can handle her own with anybody in a debate regarding cable television. However, we also, from experience, believe that Susan is levelheaded, fair, and reasonable regarding an understanding of the problems in the cable television industry. Without saying that this is not true of a lot of other cable consultants, we are saying that we know from personal experience that is true of Susan. So if you want, add her telephone number to the list of cable consultants that you can recommend to a city when they start looking. Her number is area code 213-828-8950.

Continued on p. 42

CATA Announces Seminars Schedule

CATA, under the direction of its Engineering Committee, chaired by Director Wayne Sheldon, has announced the first half of the 1983 schedule for the Basic and Advanced Technical Training Seminars. The Engineering Committee, working closely with CATA's Director of Engineering, Ralph Haimowitz, has designed the schedule in accordance with suggestions and requests received from cable operators over the country. In addition, the Southern Cable Television Association is again cooperating on the sponsorship of three of the first half of 1983 and three scheduled for the second half. The Southern Association co-sponsored two in 1982 and has selected appropriate locations to insure this valuable training, so vital to the entire industry, be available to their membership.

There are some changes in both the Basic and Advanced curriculum as previously presented; both sessions have had an update to cover the additional technical areas where training is needed.

REGISTER NOW!

Following is registration and information that is self-explanatory. If you wish additional information, please contact the CATA Engineering Office (305) 562-7847. Take advantage of this opportunity to add to the experience and expertise of your technical staff and thus help your system become more efficient and better maintained. Use the registration form **TODAY** to register for the seminar more applicable to your needs and location. CATA has arranged with the hotels for reasonable housing rates, and those hotels are listed with the addresses for you to make your **reservations directly with the hotel.** Be sure to list that you are registering for the CATA Seminar so that the discounted rates will be honored with your reservation.

Don't delay . . . take care of your registration today as each seminar is restricted to a certain number so that each attendee will have the full advantage of the equipment and laboratory facilities.

BASIC SEMINAR

(Monday thru Wednesday)

BATON ROUGE, LOUISIANA
JUNE 13 15

TOPICS

SIGNAL SOURCES
Broadcast TV
Satellite TV
Microwave Transmission
Local Origination

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Antennas
Preamplifiers
Receivers
Processors
Modulators
Filters
Combiner

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DISTRIBUTION SYSTEM
Bridgers
Line Extenders
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Splitters/Couplers

SUBSCRIBER MATERIALS
Taps
Drop Cable
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Apartment Amplifiers

HOUSEDROP
Aerial Installation
Underground Installation
Tap Selection
Multiple Outlets
Bonding & Grounding

CONNECTORS
Connector Types
Cable Preparation
Proper Installation
Signal Leakage

FINDING PROBLEMS
Signal Level Meters
Common Cable Problems
Finding Faults

OPERATING PROCEDURES
System Maps & Symbols
Recording Information
Subscriber Relations

LABORATORY
Equipment Identification
Installing Connectors
Measurements With SLM
Troubleshooting

ADVANCED SEMINAR

(Monday thru Friday)

CHARLOTTE, NORTH CAROLINA
MARCH 21 25

ONTARIO CALIFORNIA
APRIL 4 8

NEWARK, NEW JERSEY
MAY 2 6

TOPICS

FUNDAMENTALS REVIEW
Decibels/dBmv
Formulas
Logorithms

OPERATIONAL REQUIREMENTS
FCC Technical Standards
FCC Forms and Records
System Records & Programs

SYSTEM PROBLEMS/FAILURES
Common Cable Faults
Sheath Currents
Impedance Mismatch
Radio Frequency Interference
Signal Leakage

LABORATORY
Days four and five are primarily devoted to hands-on test equipment sessions in the cable system laboratory where attendees actually perform the required tests and measurements

EQUIPMENT
Spectrum Analyzers
Sweep Generators
Sweep Transmitters
Sweep Receivers
Signal Leakage Detectors
Frequency Counters
Fault Finders

TESTS AND MEASUREMENTS
Spectrum Analysis
Bench Sweeping
System Sweeping
Proof of Performance Tests
Isolation
Return Loss Measurements

SYSTEM DESIGN CONCEPTS
Coaxial Cable
Active Equipment
Passive Devices
Grounding & Bonding
Powering
System Noise Limitations
Crossmodulation
Intermodulation
Hum
Reflected Signals

FREQUENCY SPECTRUM
Spectrum Conflicts
Channel Expansion
Frequency Restrictions

REGISTRATION INFORMATION

TO enroll in a CATA CATV Technical Training Seminar,
PLEASE:

1) Complete the form below.
2) Enclose a check payable to CATA in the appropriate amount.
3) Mail the form and your check to:

CATA Technical Seminars
4209 N.W. 23rd, Suite 106
Oklahoma City, OK 73107

Get Your Registration In Today To Insure A Reservation.
Attendance is limited to 50 people at Basic Seminars and 40 people at Advanced Seminars to provide proper laboratory experience.

GENERAL INFORMATION

Registration is from 8:45 to 9:00 am on the first day. All other technical sessions begin at 8:00 am and end at 5:00 pm each day. Morning and afternoon coffee breaks and all of the required materials for the technical seminars are provided by CATA.

---------- CUT HERE ----------

REGISTRATION FORM

SEMINAR FEE STRUCTURE

	BASIC	ADVANCED
CATA MEMBERS	$ 175.00	$ 250.00
NON-CATA MEMBERS	$ 200.00	$ 275.00

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City State Zip

PERSON TO CONTACT _____

TELEPHONE NUMBER _____

Please reserve _____ seats at the Basic / Advanced Technical Training Seminar in _____
(Location: City & State)

ATTENDEES WILL BE:

_____ _____
_____ _____
_____ _____

WE are / are not CATA MEMBERS

Enclosed is a check in the amount of $_____ to cover registration fees.

CATA CATV TECHNICAL TRAINING SEMINAR
HOTEL INFORMATION

A block of hotel accommodations has been set aside for each seminar at the hotels indicated. Please make your own reservations directly with the hotel by completing and mailing in the hotel reservation form below to the appropriate hotel. For telephone reservations, be sure to include the information that you are attending the CATA CATV Technical Training Seminar to receive the special room rates as indicated.

BASIC

BATON ROUGE, LOUISIANA,
JUNE 13-15

PRINCE MURAT INN
1480 NICHOLSON DRIVE,
BATON ROUGE, LOUISIANA 70802
PHONE: (504) 387-1111

The Prince Murat Inn is located on the Nicholson Drive exit off I-10. Limousine service from airport. Room Rates: $27.00 Single, $36.00 Double.

ADVANCED

CHARLOTTE, NORTH CAROLINA
MARCH 21-25

BEST WESTERN DOWNTOWN
900 NORTH TRYON STREET
CHARLOTTE, NORTH CAROLINA 28206
PHONE: (704) 373-0300

The Best Western Downtown is located in downtown Charlotte. Exit 11A from I-77. Exit 38 from I-85N to I-77 to Tyron Street extension. Room Rates: $24.96 Single, $33.28 Double

ADVANCED

ONTARIO, CALIFORNIA,
APRIL 4-8

UPLANDER MOTOR HOTEL
81 WEST FOOTHILL BOULEVARD
UPLAND, CALIFORNIA 91786
PHONE: (714) 982-8821

The Uplander Motor Hotel is located in Upland, California, approximately 5 miles from the Ontario Airport. Limousine service is provided by the hotel to and from the airport. Room Rates: $28.00 Single, $32.00 Double.

NEWARK, NEW JERSEY,
MAY 2-6

BEST WESTERN COACHMAN INN
10 JACKSON DRIVE
CRANFORD, NEW JERSEY 07016
PHONE: (201) 272-4700

The Best Western Coachman Inn is located in Cranford, N.J. at exit 136 on the Garden State Parkway. Limousine service from airport. Room Rates: $42.00 Single, $46. Double.

CUT HERE

HOTEL RESERVATION FORM

Please reserve the following room requirements in the name of the company or individual shown:

NAME: _____ TELEPHONE: _____
(Company or Individual) Area Code

ADDRESS: _____
(P.O. Box or Street No.) (City) (State) (Zip)

NUMBER OF ROOMS: _____ OCCUPANCY: SINGLE DOUBLE

ARRIVAL: _____ DEPARTURE _____
(Date) (Time) (Date)

SEND DIRECTLY TO HOTEL CATA CATV TECHNICAL TRAINING SEMINAR □

FIRST AMENDMENT LAW SUIT IN OKLAHOMA BACKFIRES — CABLE OPERATORS MAY BE FORCED TO DELETE LIQUOR ADS

This is a case we've been following for quite some time and we mentioned it when it was originally filed. It seems that there are some extremely restrictive constitutional provisions in Oklahoma regarding liquor advertising. Those provisions have applied to television stations in Oklahoma for some time, however, they had not been applied to cable television. The State Attorney General was asked whether the liquor advertising bans did, in fact, apply to cable and he said yes. The cable industry went to court. A lower court decision found that the cable industry was protected by the First Amendment and that Oklahoma's laws were written too broadly. Now the Supreme Court of Oklahoma has overturned that decision and says that the commercial speech involved is not protected by the First Amendment and that Oklahoma does have the right to restrict liquor ads on cable systems even though the cable systems are picking up signals from out of state. Unfortunately, this may put the cable operators in Oklahoma in a very strange position. Under federal rules they're required to carry some out of state "must carry" signals. Under both FCC rules and the Copyright Law, cable operators are prohibited from deleting any of the programming they bring in from broadcast stations whether they are "must carry" or whether they are distant signals. Yet now the Oklahoma Courts are saying that the State of Oklahoma has the right to enforce its laws banning liquor commercials which would mean that the cable operator would either have to delete those commercials from out of state broadcasts, or simply stop carrying those broadcasts all together. Of course, if they're "must carry" signals, as soon as that happened, the cable operator would be violating federal regulations! So it's a no win situation. What happened was that the case, while it was first designed by cable operators to question not only the First Amendment issues, but also issues of the Supremacy Clause of the Constitution and the Interstate Commerce issues, was narrowed down by the judge when some broadcasters in Oklahoma also entered the case. The one unified argument that both the broadcasters and the cable operators had was the First Amendment, and since the lower court judge decided the case in favor of the position of both the broadcasters and the cable operator regarding the First Amendment, he never got to the other issues. Now the Court of Appeals has overturned the lower court's decision. A petition for rehearing has already been filed. This is one to watch closely because if it is not straightened out soon, it could spell a lot of trouble for cable operators in Oklahoma. □

Distributors	Manufacturers	Service Firms
D1—Full CATV equipment line	M1—Full CATV equipment line	S1—CATV contracting
D2—CATV antennas	M2—CATV antennas	S2—CATV construction
D3—CATV cable	M3—CATV cable	S3—CATV financing
D4—CATV amplifiers	M4—CATV amplifiers	S4—CATV software
D5—CATV passives	M5—CATV passives	S5—CATV billing services
D6—CATV hardware	M6—CATV hardware	S6—CATV publishing
D7—CATV connectors	M7—CATV connectors	S7—CATV drop installation
D8—CATV test equipment	M8—CATV test equipment	S8—CATV engineering
D9—Other	M9—Other	S9—Other

Associate Roster

Note: Associates listed with * are Charter Members.

ADT Security Systems,
One World Trade Center,
92nd Fl.,
New York, NY 10048
212—558-1444
(M9 Security Equipment)

Alpha Technologies,
1305 Fraser St. D-G,
Bellingham, WA 98225
206—671-7703
(M9, Standby Power Supplies)

AMCOM, Inc.,
Bldg. E, Suite 200,
5775 Peachtree-Dunwoody Rd., N.E.,
Atlanta, GA 30342
404—256-0228
(S9, Brokering & Consulting)

Amplica, Inc.,
950 Lawrence Dr.,
Newbury Park, CA 91320
805—498-9671
(M4)

* **Anixter Communications**
4711 Golf Road,
Skokie, IL 60076
312—677-2600
(D1)

Apple/Store,
Rte. #1, Box 156,
Beaver Dam, WI 53916
414—885-6249

The Associated Press,
50 Rockfeller Plaza,
New York, NY 10020
212—621-1513
(S9 Automated News SVC)

Automation Techniques,
1846 N. 106th E. Ave.,
Tulsa, OK 74116
918—836-2584
(M9)

Avantek, Inc.,
481 Cottonwood Dr.,
Milpitas, CA 95035
408—946-3080
(M8, 9 TVRO Components)

Avtek, Inc.,
Box 188,
Aurora, NE 68818
402—694-5201
(M8)

BEI
P.O. Box 937,
Olathe, KS 66061
800—255-6226
(M9 Character Generators)

Ben Hughes Communications
P.O. Box AS,
Old Saybrook, CT 06475
203—388-3559
(M6, M9)

Blonder-Tongue Labs, Inc.,
1 Jake Brown Rd.,
Old Bridge, NJ 08857
201—679-4000
(M1, 2, 4, 5)

Broadband Engineering, Inc.,
P.O. Box 1247,
Jupiter, FL 33458
1-800—327-6690
(D9, replacement parts)

Budco, Inc.,
4910 East Admiral Place,
Tulsa, OK 74115
1-800—331-2246
(D9, Security & Identification Devices)

CATEL,
4800 Patrick Henry Dr.,
Santa Clara, CA 95054
408—988-7722

* **C-COR Electronics, Inc.,**
60 Decibel Rd.,
State College, PA 16801
814—238-2461
(M1, M4, M5, S1, S2, S8)

CCS Cable
P.O. Box 14710,
Phoenix, AZ 85063
602—272-6855
(M3)

CWY Electronics,
405 N. Earl Ave.,
Lafayette, IN 74904
1-800—428-7596
(M9, D1)

CableBus Systems,
7869 S.W.
Nimbus Avenue,
Beaverton, OR 97005
503—543-3329
(M1)

Cable Graphic Sciences,
7095 N. Clovis Ave.,
Clovis, CA 93612
209—297-0508
(M9 Character Generators)

Cable Health Network,
2840 Mt. Wilkinson Pkwy.
Atlanta, GA 30339
404—436-0886
(S4)

Cable-Text Instruments,
Div. of Telpar, Inc.
P.O. Box 796
Addison, TX 75001
214—233-6631
(M9 Generators)

Century III Electronics, Inc.
3880 E. Eagle Drive,
Anaheim, CA 92807
630-3714
(M1, M3, M4, M5, M7, M8, S1, S2, S8)

Capscan, Inc.,
P.O. Box 36,
Adelphia, NJ 07710
1-800—CABLETV or 222-5388
(M1, M3, M4, M5)

Channel Master,
Ellenville, NY 12428
914—647-5000
(M2, 3, 4, 5, 6, 7)

Comm/Scope Company,
Rt. 1, Box 199A,
Catawba, NC 28609
1-800—438-3331
(M3)

Communications Equity Associates,
851 Lincoln Center,
5401 W. Kennedy Blvd.,
Tampa, FL 33609
813—877-8844
(S3)

Computer Video Systems, Inc.,
3678 W. 2105 S. Unit 2,
Salt Lake City, UT 84120
1-800—453-8822
(M9)

COMSEARCH INC.,
11503 Sunrise Valley Drive,
Reston, VA 22091
703—620-6300
(S8, S9, Earth station placement frequency coordination)

ComSonics, Inc.,
P.O. Box 1106,
Harrisonburg, VA 22801
1-800—336-9681
(M8, M9, S8, S9)

DF Countryman Co.,
1821 University Ave.,
St. Paul, MN 55104
612—645-9153
(D1, S1, S8)

The Disney Channel
500 S. Buena Vista,
Burbank, CA 91521
213—840-5080
(S4)

Ditch Witch,
P.O. Box 66,
Perry, OK 73077
1-800—654-6481
(M9)

The Drop Shop Ltd., Inc.,
Box 284,
Roselle, NJ 07203
1-800—526-4100 or
1-800—227-0700 (West)
(D3, 4, 5, 6, 7, 8, 9, M5, 6, 7, 8, 9 Plastics)

Durnell Engineering Inc.,
Hwy 4 So.
Emmetsburg, IA 50536
712—852-2611
(M9)

Associate Roster

Eagle Com-Tronics, Inc.,
4562 Waterhouse Rd.,
Clay, NY 13041
1-800—448-7474
(M9 Pay TV Delivery Systems & Products)

Eales Comm. & Antenna Serv.,
2904 N.W. 23rd,
Oklahoma City, OK 73107
405—946-3788
(D1, 2, 3, 4, 5, 6, 7, S1, 2, S7, 8)

Eastern Microwave, Inc.,
3 Northern Concourse,
P.O. Box 4872,
Syracuse, NY 13221
315—455-5955
(S4)

Electroline TV Equipment, Inc.,
8750-8th Ave.,
St. Michel,
Montreal, Canada
H1Z 2W4
514—725-2471
(M4, 5, 7, 9, D7, 9)

Electron Consulting Associates,
Box 2029,
Grove, OK 74344
918—786-5349
(M2, D1, S1, 8)

Elephant Industries,
P.O. Box 3626
N. Ft. Myers, FL 33903
813—995-7383
(M9)

ESPN,
ESPN Plaza,
Bristol, CT 06010
203—584-8477
(S9)

The Entertainment Channel,
1133 Avenue of the Americas,
New York, NY 10036
212—930-4900
(S4)

Franey & Parr of Texas, Inc., (Formerly Doherty & Co.),
One Turtle Creek Village,
Suite 524,
Dallas, TX
214—528-4820
(S9, Insurance)

GTE Products Corp., Sylvania CATV Div.
1790 Lee Trevino Drive,
Suite 600
El Paso, TX 79936
1-800—351-2345
(D7, M1, M4, M5, M9, Converters, S4, S8)

Gardiner Communications Corp.,
3506 Security St.,
Garland, TX 75042
214—348-4747
(M9 TVRO Packages, S1, S2, S8)

General Cable Corp.,
1 Woodbridge Center,
P.O. Box 700
Woodbridge, NJ 07095
1-800—526-4385
(M3)

Gilbert Engineering Co.,
P.O. Box 23189,
Phoenix, AZ 85063
1-800—528-5567 or
602—245-1050

Group W Satellite Communications,
41 Harbor Plaza Dr.,
P.O. Box 10210,
Stamford, CT 06904
203—965-6219
(S4)

H & R Communications,
Rt. 3, Box 102G,
Pocahontas, AK 72455
1-800—643-0102
(M2, D1, S2, S3, S8)

Harris Corporation,
P.O. Box 1700,
Melbourne, FL 32901
305—724-3401
(M2, M9, S2)

Heller-Oak Communications,
105 W. Adams St.,
Chicago, IL 60603
1-800—621-2139 * 7600
(S3)

Home Box Office, Inc.,
7839 Churchwill Way,
Suite 133, Box 63,
Dallas, TX 75251
214—387-8557
(S4)

* **Hughes Microwave Communications Products,**
3060 W. Lomita Blvd.,
Torrance, CA 90505
213—517-6233
(M9)

Ind. Co. Cable TV, Inc.,
P.O. Box 3799
Hwy. 167 N,
Batesville, AR 72501
501—793-4174
(D1)

* **Jerry Conn Associates, Inc.,**
P.O. Box 444,
Chambersburg, PA 17201
1-800—233-7600
1-800—692-7370 (PA)
(D3, D4, D5, D6, D7, D8)

KMP Computer Services, Inc.,
703 Central Ave.,
Los Alamos, NM 87544
505—662-5545
(S4, 5)

Karnath Corporation,
2001 Westridge,
Plano, TX 75075
214—422-7981 or 7055
(S1, 2, 8, 9)

Katek, Inc.,
215 Wood Ave.,
Middlesex, NJ 08846
201—356-8940

Klungness Electronic Supply,
P.O. Box 547,
107 Kent Street,
Iron Mountain, MI 49801
1-800—338-9292
1-800—682-7140 (Mich)
(D1, D8, S2, S8)

LRC Electronics, Inc.,
901 South Ave.,
Horseheads, NY 14845
607—739-3844
(M7)

Larson Electronics,
311 S. Locust St.,
Denton, TX 76201
817—387-0002
(M9 Standby Power)

Lemco Tool Corporation,
Box 330A,
Cogan Station, PA 17728
1-800—233-8713
(M8, 9 Tools)

Lindsay Specialty Products, Ltd.,
50 Mary Street West,
Lindsay,
Ontario, Canada K9V 4S7
705—324-2196
(M1, 2, 4, 5, 7, 9)

Magnavox CATV Division,
100 Fairgrounds Drive,
Manlius, NY 13104
1-800—448-5171 or
1-800—522-7464 (N.Y.)
(D4, 5, 7, M4, 5, 6, 7, S3, 8)

McCullough Satellite Equipment,
Route 5, Box 97,
Salem, AR 72576
501—895-3167
(M2, 9, D3, 4, 6, 7)

Microdyne Corporation,
471 Oak Road,
Ocala, FL 32672
904—687-4633
(M9 Satellite TV Receivers)

Microwave Associates Communications Co.,
777 S. Central Expwy.,
Suite 1G,
Richardson, TX 75080
214—234-3522
(M9 Microwave Radio Systems)

* **Microwave Filter Co.,**
6743 Kinne St., Box 103,
E. Syracuse, NY 10357
1-800—448-1666
(M5 Bandpass Filter)

Midwest Corp.,
P.O. Box 226,
Clarksburg, WV 26301
1-800—624-3845
(D1, 2, 3, 4, 5, 6, 7, 8)

Modern Cable Programs,
5000 Park St. N.,
St. Petersburg, FL 33709
(S4)

Mullen Communications Construction Co., Inc.,
P.O. Box 1387A,
Green Bay, WI 54305
414—468-4649
(S2)

Distributors	Manufacturers	Service Firms
D1—Full CATV equipment line	M1—Full CATV equipment line	S1—CATV contracting
D2—CATV antennas	M2—CATV antennas	S2—CATV construction
D3—CATV cable	M3—CATV cable	S3—CATV financing
D4—CATV amplifiers	M4—CATV amplifiers	S4—CATV software
D5—CATV passives	M5—CATV passives	S5—CATV billing services
D6—CATV hardware	M6—CATV hardware	S6—CATV publishing
D7—CATV connectors	M7—CATV connectors	S7—CATV drop installation
D8—CATV test equipment	M8—CATV test equipment	S8—CATV engineering
D9—Other	M9—Other	S9—Other

Note: Associates listed with * are Charter Members.

NCS Industries, Inc.
2255-E Wyandotte Rd.,
Willow Grove, PA 19090
1-800—523-2342
1-800—492-2032 (PA)
(D1, 2, S8, 9 repair service)

National Farmers Union Property & Casualty Co.,
12025 E. 45th Ave.,
Denver, CO 80251
303—371-1760
(D9, Insurance Service)

North Supply Company,
600 Industrial Pkwy.,
Industrial Airport, KS 66031
913—791-7000
(D1, 2, 3, 4, 5, 6, 7, 8)

Oak Industries, Inc.,
Crystal Lake, IL 60014
815—459-5000
(M1, M9 Converters, S3)

Octagon Scientific, Inc.,
476 E. Brighton Ave.,
Syracuse, NY 13210
315—476-0660
(M9)

Phasecom Corp.,
6365 Arizona Circle,
Los Angeles, CA 90045
213—641-3501
(M1)

Power and Telephone Supply Company, Inc.,
530 Interchange Drive N.W.,
Atlanta, GA 30336
1-800—241-9996
(D1)

M/A Com Prodelin, Inc.,
P.O. Box 100
Claremont, NC 28610
704—459-9762
(M2, M3, M7, S2)

Pyramid Industries, Inc.,
P.O. Box 23169,
Phoenix, AZ 85063
1-800—528-4529
(M7, 8)

RMS Electronics,
50 Antin Place,
Bronx, NY 10462
1-800—223-8312
1-800—221-8857 (Poleline)
(M4, M5, M6, M7, M9)

Reuters,
1212 Avenue of the Americas,, 16th Floor,
New York, NY 10036
212—730-2715
(D9)

Rockwell International,
M.S. 402-101,
Dallas, TX 75207
214—996-5954
(M9, Microwave/Satellite)

S.A.L. Communications, Inc.,
P.O. Box 794,
Melville, NY 11747
1-800—645-9062
(D1)

Sadelco, Inc.,
75 West Forest Ave.,
Englewood, NJ 07631
201—569-3323
(M8)

Scientific Atlanta, Inc.,
3845 Pleasantdale Rd.,
Atlanta, GA 30340
404—449-2000
(M1, M2, M4, M8, S1, S2, S3, S8)

Showtime Entertainment, Inc.,
1633 Broadway,
New York, NY 10019
212—708-1600
(S4)

Southern Satellite Systems, Inc.,
P.O. Box 45684,
Tulsa, OK 74145
918—481-0881
(S9)

TVC Supply Co., Inc.,
1746 E. Chocolate Ave.,
Hershey, PA 17033
717—533-4982
(D1, 2, 3, 4, 5, 6, 7, 8)

Teledac, Inc.,
1575 Tascherean Blvd.,
Longuevil,
Quebec, Canada J4K 2X8
514—651-3716
(M9 Character Generators)

Tele-Wire Supply Corp.,
122 Cutter Mill Rd.,
Great Neck, NY 11021
1-800—325-4868
(D1, 2, 3, 5, 6, 7, 8, 9)

* **Texscan Corp.,**
2446 N. Shadeland Ave.,
Indianapolis, IN 46219
1-800—528-4066
(M8 Bandpass Filters)

* **Theta-Com CATV,**
2960 Grand Avenue,
Phoenix, AZ 85061
602—252-5021
(M1, M4, M5, M7, M8)

* **Times Fiber Communications,**
358 Hall Avenue,
Wallingford, CT 06492
1-800—243-6904
(M3)

Tocom, Inc.,
P.O. Box 47066,
Dallas, TX 75247
214—438-7691
(M1, M4, M5, Converters)

* **Toner Cable Equipment, Inc.,**
969 Horsham Rd.,
Horsham, PA 19044
1-800—523-5947
In Penna. 1-800—492-2512
also 1-800—523-5947 (PA)
(D2, D3, D4, D5, D6, D7)

Triple Crown Electronics, Inc.,
4560 Fieldgate Dr.,
Mississauga, Ontario,
Canada L4W 3W6
416—629-1111
Telex 06-960-456
(M4, M8)

Turner Broadcasting System,
1050 Techwood Dr.,
Atlanta, GA 30318
404—898-8500

Tyton Corp.,
P.O. Box 23055,
Milwaukee, WI 53223
414—355-1130
(M6, 7)

United Press International,
220 East 42nd St.,
New York, NY 10017
212—682-0400
(S9 Automated News Svc.)

United Video, Inc.,
3801 South Sheridan Rd.,
Tulsa, OK 74145
1-800—331-4806
(S9)

Video Data Systems,
205 Oser Ave.,
Hauppauge, NY 11787
516—231-4400
(M9)

Viewstar, Inc.,
705 Progress Ave.,
Unite 53,
Scarborough,
Ontario, Canada M1H 2X1
416—439-3170
(M9 Cable Converter)

Vitek Electronics, Inc.,
4 Gladys Court,
Edison, NJ 08817
201—287-3200

Warner Amex Satellite Entertainment Corporation,
1211 Avenue of the Americas,
New York, NY 10036
212—944-4250
(S4)

* **Wavetek Indiana,**
5808 Churchman,
Beech Grove, IN 46107
1-800—428-4424
TWIX 810—341-3226
(M8)

Weatherscan,
Loop 132,
Throckmorton Hwy.,
Olney, TX 76374
817—564-5688
(D9, Sony Equip. Dist., M9 Weather Channel Displays)

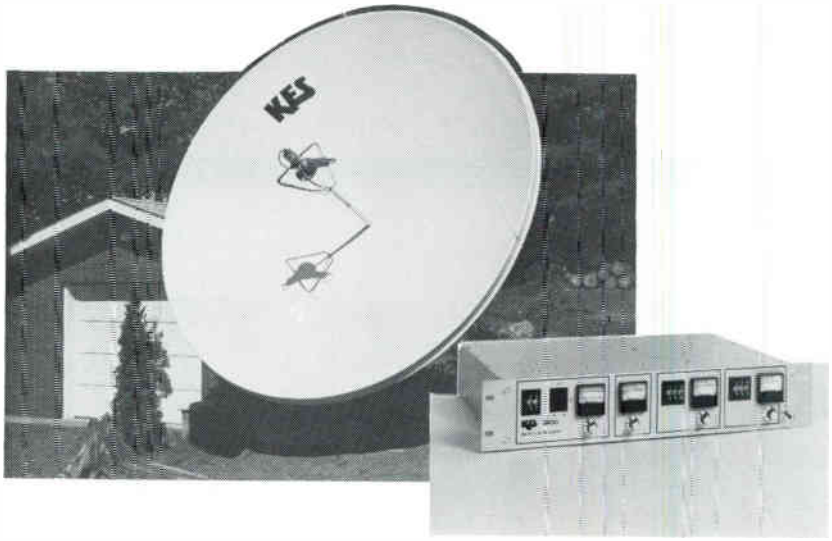
Western Towers
Box 347,
San Angelo, TX 76901
915—655-6262/653-3363
(M2, Towers)

Winegard Company,
3000 Kirkwood Street,
Burlington, IA 52601
1-800—523-2529
(M1, M2, M3, M4, M5, M7) □

Showcase

KES INTRODUCES SATELLITE RECEIVING ANTENNA AND RECEIVER

KES (Klungness Electronic Supply), Iron Mountain, Michigan, distributor of CATV and TVRO systems and supplies, has introduced a new **parabolic deep-dish satellite receiving antenna** that meets 2° spacing requirements and is convertible to 12 GHz. Precision formed of fiberglass with an inner metal fabric laminate, it provides a smoother reflecting surface for better reception and sharper image. A light-weight three-panel design reduces shipping costs and eases installation, yet is strong enough for reliable performance and durability. Available in 3, 3.7 and 5 meter sizes for all satellite receiving applications. Optional monopod or tripod polar post mounts provide quick and easy installation at the antenna site. Because they allow 360° rotation, KES polar mounts only require a level post. They eliminate the need to locate true north and establish center lines, and the cost of repouring cement to obtain accuracy.



KES has also introduced the **KES 7500 satellite receiver.** It features crystal controlled frequency synthesis of thumb wheel selection of 24 transponders; two audio subcarrier demodulators with thumb wheel frequency selectable to the nearest .01 MHz; four separate meters (relative IF/signal level, video level, two independent audio VU); unfiltered video output for external subcarrier demodulation; built-in ferrite isolator, power block and fused LNA power supply; non-PLL digital FM detector for excellent demodulation characteristics and very low threshold level. Specifications and prices on the KES 7500 receiver and the parabolic antenna are available from KES, POB 885, Iron Mountain, MI 49801, toll-free 1-800-338-9292 (US), 1-800-682-7140 (MI). •

DAYTIME REACHES 6.8 MILLION SUBSCRIBERS WITH COMMITMENT FROM WARNER AMEX

Warner Amex Communications Inc. has made a significant commitment to DAYTIME, the women's cable television service from Hearst/ABC Video Services, it was announced today by Kathryn Creech, Vice President, Affiliate Relations.

"We are pleased that Warner Amex has chosen DAYTIME," said Ms. Creech in making the announcement. "Warner Amex's reputation for superior programming and innovative marketing will strengthen and enhance our affiliate base."

Among the many Warner Amex systems which will carry DAYTIME are the systems in Dallas; Cincinnati; Pittsburgh; Reston, Virginia; Nashua, New Hampshire; Hampton, Virginia; and Lynn, Massachusetts.

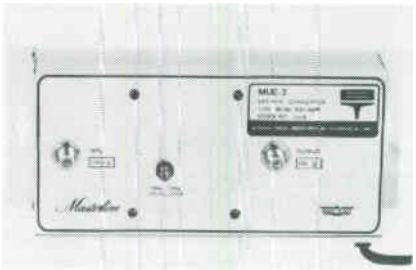
"DAYTIME is an outstanding service providing innovative and original programming created uniquely for cable," said Sheldon Perry, Senior Vice President, Programming for Warner Amex. "We are pleased to be able to offer DAYTIME to our subscribers and expect it to be a strong addition to our programming package."

In six months since DAYTIME's March 15, 1982 launch, the number of DAYTIME subscribers has nearly doubled, from 3.5 million to 6.8 million, with more than 450 systems carrying the service. In addition, 18 of the 20 largest multiple system operators have made commitments to DAYTIME and the network is carried in 13 of the country's 20 largest cable systems. DAYTIME penetration of cable homes exceeds 50% in four of the top ten ADIs and reaches over 25% of the cable homes in all but one of the top ten ADIs.

Warner Amex Cable Communications, Inc., a jointly-owned company of Warner Communications Inc. and American Express Company, operates 147 systems in 27 states serving over 1,000,000 subscribers. For more information contact Warner Amex at 1211 Avenue of the Americas, New York, N.Y. 10036 or call (212) 944-4250. •

NEW SINGLE CHANNEL UHF to VHF CONVERTER INTRODUCED BY BLONDER-TONGUE

Blonder-Tongue Laboratories Inc., Old Bridge, NJ has announced the availability of its new Masterline* MUC-3 Single Channel UHF to VHF Converter. Each converter is factory tuned for a specific customer-selected conversion.



The MUC-3 is designed with a temperature compensated, highly stable L-C oscillator and features uniform gain independent of the channel conversion for stable operation. A sealed RF can minimize radiation and isolates the RF module from undesired signals. The MUC-3 has high input capability with a

low noise figure for wide dynamic range over the entire UHF band. A rigid extruded aluminum base and aluminum cover provide complete protection for all components.

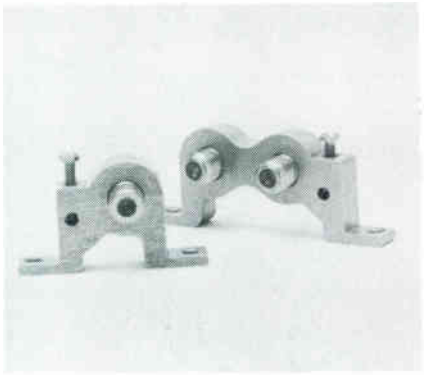
For more information, contact Blonder-Tongue at One Jake Brown Road, Old Bridge, N.J. 08857, or call (201) 679-4000.

*Registered Trademark of Blonder-Tongue Laboratories, Inc. •

GILBERT ENGINEERING INTRODUCES NEW GROUNDING BLOCKS

Gilbert Engineering announces the availability of their **NEW** line of Grounding Blocks.

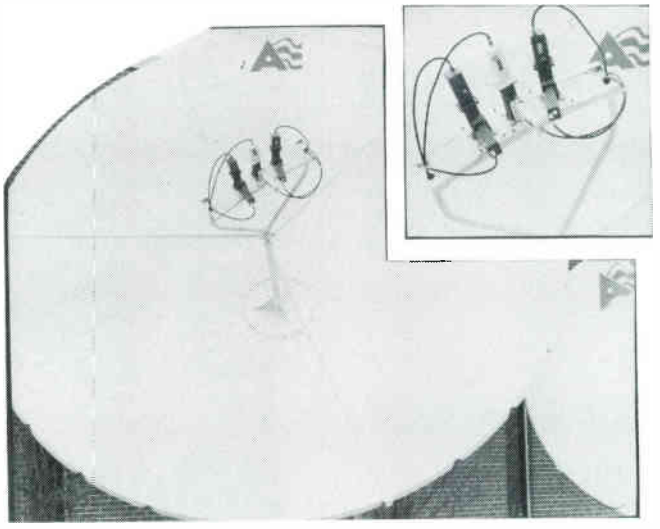
Model GGB-4 for single service drops and GGB-4D for dual service drops are made of high quality, extruded corrosion resistant aluminum alloy. Both models come with GF-81 connectors installed in the extruded mounting bracket and include a grounding wire screw and two (2) mounting screws. The "81" connectors are machined brass with chromate conversion coating over cadmium plating. The mounting bracket also has a chromate conversion finish.



Gilbert also has available Grounding Blocks **Model GGB-3** for single service drops and GGB-3D for dual service drops. They are diecast zinc alloy and incorporate diecast "81" connectors. Both models include a grounding wire screw and two (2) mounting screws, and have a chromate finish for greater corrosion resistance.

All Gilbert Engineering Grounding Blocks were designed to provide the necessary wall clearance for easy accessability for fast hook-up.

For more information, contact Gilbert Engineering at P.O. Box 23189, Phoenix, AZ. 85063-3189 or call their toll-free number 800-528-5567. •



ANIXTER COMMUNICATIONS INTRODUCES MULTI BEAM FEED SYSTEM

Anixter Communications' Mark Antenna Division has introduced a new Multi Beam Feed System for 4.0 and 5.0 earth station antennas. This new Multi Beam Feed System can accommodate up to 5 prime focus feeds and is designed to receive simultaneous programming from the current 4° spaced satellites. Shallow F/D ratio allows the off-access feeding to maintain high level efficiency and consistency: gain of the 4° off-boresight beam is within 0.5 dB down from the original antenna, and gain of the 8° off-boresight beam is less than 1.5 dB down from the original antenna.

The Multi Beam Feed System is available in a complete antenna package or as a retrofit kit for existing 4.0 and 5.0 Mark Antennas. (4.0 earth station antennas can accommodate up to 3 feeds, while 5.0 antennas can accommodate up to 5 feeds.)

For further information contact your local Anixter Communications sales representative, or call (312) 677-2000. •

CATEL INTRODUCES NEW, HIGH-SECURITY PREMIUM AUDIO SCRAMBLER/DESCRAMBLER SYSTEM

Development of a new, high-security, premium audio scrambler/descrambler system for cable FM services has been announced by CATEL, a division of United Scientific Corporation.

According to CATEL sales manager Dick Old, the PAS-2000 system is designed to operate within a two-tier CAFM service, providing maximum protection against theft as well as increased revenue opportunities from cable FM. The system will be available to cable operators by the end of first-quarter 1983.

The headend unit of the PAS-2000 uses S.A.W. filter technology to process cable FM stereo signals into a dual frequency block. One block carries regular FM signals in designated frequency assignments, while the other carries the premium signals at A-1 (114.1 to 119.1 Mhz) for conversion to 102.9 to 107.9 Mhz at the subscriber receiver.

Without the descrambler unit, which uses crystal control for tight frequency stability, subscribers receive only the scrambled signal in the premium section of the band, plus the basic service from 88 to 103 Mhz.

In addition to providing FM security and higher revenues, the new, in-band scrambler system gives operators the option of transmitting an annoying warbler tone or promotional messages on the scrambled premium channels.

The PAS-2000 headend unit will be priced at $2995, and the PAD-2000 descrambler unit at less than $30, including a special FM splitter.

Cable operators desiring additional information can contact CATEL/TOMCO at 4800 Patrick Henry Drive, Santa Clara, CA 95054; (408) 988-7722. •

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TECHNICAL OPPORTUNITIES

Pacific Northwest Cable Communications Association's Annual Convention at the Sheraton Hotel in Spokane, Washington on October 2nd, 3rd and 4th, 1983. Contact: Hank Sexton, Jr. (206) 357-9381.

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Ask 8 of the top 10 MSO's who are now using our programmable descrambler. Developed through engineering expertise and with a unique and practical approach to securing multi-tiered service, our programmable descrambler is the ticket for systems needing to expand service without depleting capital.

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