May/June '73 vol 9/ no. 1

CABLECASTING

Cable TV Engineering

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The official journal of the
SOCIETY OF CABLE TELEVISION ENGINEERS

THE REAL WORLD OF TWO-WAY

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PEOPLE IN THE NEWS

JUSTO CAFFI has been named general manager of American Cable Television, Inc.'s Napa Valley, Calif. system. Mr. Caffi has been active in system management for more than 10 years, in California and Florida. He was manager of the Sierra Madre, California cable TV system, where he earned a community service award. He began his television career in Argentina, his native country, working in MATV systems.

• • •

CAYWOOD C. COOLEY, JR. has resigned as vice president from the Magnavox Company CATV division. Mr. Cooley will continue to serve Magnavox as a consultant as well as set up a private practice as a CATV systems consultant. He expects soon to move to the Philadelphia area.

• • •

DANIEL J. RYASON has been manager of Field Operations of the CATV division of Theta-Com in Phoenix. Mr. Ryason came to Theta-Com from Ameco, where he was Operations Manager.

• • •

JAMES R. SATTERFIELD has been appointed to the post of General Manager of Cablevision Services Corp. of Houston, Texas. Previous affiliations of Mr. Satterfield include American Telephone & Telegraph and ten years with the U.S. Army.

• • •

RONALD C. HARDACRE has been appointed to the new position of Safety Director for the Cablevision Companies of Houston. He will have responsibility for all safety planning, inspection, analysis, supervision and training for all of the Cablevision Companies. Mr. Hardacre has almost ten years of experience in safety engineering, including on-site experience in the CATV industry.

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JOHN PATTERSON will now cover the Northwest, from his Spokane, Washington headquarters, for Times Wire & Cable. The states he will cover are Washington, Oregon, Utah, Montana, North and South Dakota, Wyoming, Nebraska, and Idaho. Mr. Patterson was, at one time, with Ameco Cable in Phoenix.

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KENNETH E. LANDIS, JR. has been appointed Manager, CATV System Design, by AEL Communications Corp., CATV subsidiary of American Electronic Laboratories, Inc.

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THE REAL WORLD OF TWO-WAY

J. I. Dixon, Director of Engineering
TeleCable Corporation

In the experience of TeleCable, building and operating two-way is not quite as simple as most of what you hear and read might lead you to believe.

TeleCable installed a two-way system utilizing EIE two-way amplifiers and an interactive system conceived, designed and built by Vicom Manufacturing Company of Dexter, Michigan. This equipment provides us the flexibility and capability of testing and evaluating almost every conceivable type of two-way service.

There are rumors that two-way systems have experienced some interference. Well, it's not a rumor. It's a very real problem that must be dealt with. Most two-way gear has been designed to utilize the 5-35 MHz frequency band. Unfortunately, this band is also utilized by many kinds of over-the-air services. These include amateur radio, commercial short-wave radio, WWV broadcasts, teletype transmissions, citizens band services, as well as business radio services.

All of these signals, which are of both local and distant origin, to some degree do get into cable systems that have been built using present day construction practices. There are many variables that determine how objectionable these interfering signals will be in your particular situation. However, I suspect that for most cable operators, it will be necessary to take additional steps to prevent these signals from getting into the cable system.

It is convenient to classify the actual means by which these interfering signals are introduced into the CATV system into three general categories. These are (1), the TV receiver, (2), the drop cable, and (3), the cable system itself. So let's consider these in that order.

The TV receiver is a very good receiver for signals in the 5-35 MHz band. Signals as high as 0 dbmv in this band have been measured at the TV set antenna terminals and sometimes as high as +10 or +20 dbmv. One might hope that the amplitude and phase of these signals as picked up by each TV set would be sufficiently random that they wouldn't add. Unfortunately, this doesn't seem to be true. What this means of course is that the TV set must be isolated from the cable system in the 5-35 MHz band. The easiest way of doing this right now seems to be with a filter that only passes frequencies above 50 MHz.

The next item to be considered is the drop cable. Our experience has indicated that the ordinary braided-shield drop cable acts as an excellent receiving antenna in the 5-35 MHz band. In the experience of TeleCable, there seemed to be two types which had the best isolation. One had an 8 to 10 mil thick aluminum wrap. The other cable had a 1 mil aluminum foil on each side of a mylar or polypropylene base, braid and then foil again. Both types of cables have their disadvantages so that actually, TeleCable does not use either one

of these cables right now. A good compromise solution for us seems to be a cable that has a 1 mil aluminum foil on each side of a mylar or polypropylene base with a 40 to 60% braid over this. However, since there are many variables involved that haven't been mentioned, I would recommend that you make your own tests before committing yourself to any one type of drop cable.

Once you have selected a cable you must decide on the type of fitting to be used and whether it should go over or under the A1 wrap. This is rather critical since as much as 20 db reduction in signal pick-up has been observed after replacing improperly installed connectors. And no matter what type of cable you select, you will find that the isolation is not necessarily uniform from reel to reel of cable or even throughout a particular reel of cable. It appears at this time that you will have to measure the pick-up in your drop cable after installation and replace the fittings or cable as appropriate. Again, since I cannot cover all the possibilities, I recommend that you evaluate these factors with respect to your own particular situation.

In the cable system itself, our experience to date indicates that if amplifiers, taps, splitters and the like meet RF radiation requirements, they will also provide adequate RF susceptibility performance in the 5-35 MHz band. The major problem seems to be in what I call the cable-connector-housing interface. There are as many theories about this as there are cable operators and equipment manufacturers. It seems that what works in one area or for one cable operator does not do as well elsewhere. Therefore, I can only highlight briefly some of the considerations that we have found to be critical and indicate what has worked for us.

One of the decisions that you must make is between a connector that is designed to be tightened until it reaches the end of its thread range, or bottoms out, and a connector that has a much greater thread range which requires a torque wrench or similar device to properly tighten it. If one considers only the manufacturer's specifications on the connector and the cable, one would probably prefer the connector which bottoms out since this greatly simplifies installation. However, at least one major connector supplier maintains that they received so many complaints concerning their connectors which were designed to be tightened until they bottomed out *not* making good connections, that they started providing connectors with a greater thread range.

Testing by TeleCable has confirmed that indeed something does go awry somewhere between the manufacturer's specifications and the cable and connector that is actually installed in your system. There are a number of possible explanations. Cable is subject to out-of-roundness which will not necessarily be corrected by tightening of the connectors. Cable is also subject to temperature effects and cold flow. With respect to temperature effects, it has generally been assumed up until now that the radial or axial expansion and contraction of cable is negligible. However, tests performed by TeleCable indicate that this radial expansion or contraction may be quite significant. And lastly, but perhaps most importantly, the installation process itself is a possible culprit.

Apparently, as a result of some of these problems, many connector suppliers now offer stainless steel sleeves as an option. While the sleeves themselves are not expensive, they can significantly increase your installation costs due to the additional time required to insert them. Another option being offered by some connector suppliers is a conductive "O" ring. Hopefully, this will insure a low RF impedance through the connector. This "O" ring is relatively expensive but there would be no additional installation costs. However, it seems that the apparent cable O. D. variations we have been speaking of up to now could also reduce the effectiveness of these devices. Other alternatives that might not be so dependent on cable O. D., would be a conductive lubricant or a conductive water-proofing compound or some type of ferrite ring designed to absorb energy in the 5-35 MHz frequency band.

Actually, while Telecable continues to test these options for effectiveness, we have not yet found it necessary to use any of them. At this time, we have found that the following will provide us with a tight system:

1. A careful, conservative matching of connector and cable specifications.
2. extra time and effort during installation.
3. extra attention to overall quality control.

Maintenance

The other area that I want to touch on is maintenance. Two-way in a cable system is not a little "extra" that can be handled in the spare time of your regular cable technicians. You should think of the reverse system as a second cable system which must be staffed accordingly.

In addition to the cable system, you will usually have some type of terminal equipment at the subscribers which you will either have to maintain or arrange for a service contract with the firm that supplied it. In addition to this, there will be some kind of central control and processing equipment. Quite often, this involves a very sophisticated computer. Again, you will either have to train additional technicians to take care of this equipment or arrange for some kind of service contract with the company that supplied you with this equipment.

Computers seem to insist on being told what to do. Most of you who are familiar with computers will agree that you quickly find changes that you want to make once you get into operation. You will want to add or delete subscribers, or add or delete information that you provide, or have it provided in a different form, or expand its capabilities. This means changes in what is known as the software. Now software can be much more expensive than hardware initially. But more importantly, changes to software can be very expensive and time consuming. If you have a large operation, then you will want to provide your own programming capability. If you only have a small operation, be sure to ask who is going to make these changes, how much it will cost and how much time it will take.

Maintenance of the reverse cable itself can present some rather interesting problems. At first you will probably not have signals on the whole system all the time as you do in the case of the forward system. In all likelihood, you will have fairly long sections that do not have any kind of reverse system subscribers. What this means of course is that you can't just pick up a FSM and go make a quick check on the operation of your reverse system.

Even where you do have subscribers whose terminals are being sampled every 30 seconds or so, as in most 2-way systems, you might still have a problem. Let's say you are trying to find out how many people are watching channel 2. How do you know the difference between no response because (1) someone is not watching channel 2, (2) the TV set and/or terminal equipment is off, or (3) because there has been a failure in the reverse cable system.

You may have to obtain test equipment that you haven't needed up to now. Some of it, such as spectrum analyzers, are quite expensive. Also, if you do not want to go into subscribers' homes to send signals back for reverse system testing, you may want to provide some type of van with appropriate test equipment and power.

The type of testing and maintenance schedule that you set up will probably depend in part on whether or not you can correct the failure in the reverse system without interfering with or otherwise affecting your subscribers that are on the forward system. This is something you should look at carefully before committing yourself to a particular type of system.

Actually, I suspect that you will find your greatest problem in the maintenance of the reverse system is in the control of interference. To locate the source of interference could be quite a problem if you have two or three hundred miles of system in operation. It is highly desirable that your system be segmented in some way, much as most suppliers suggest that you do for control of noise or noise build-up.

Thus, in a hub system, you could quickly isolate the source of interference to a particular spoke of your hub. However, this can still leave quite a significant amount of system in which to locate the source of the interfering signals. Even in one particular spoke of a hub, there can be many, many connectors, drop cables, and TV sets to check.

One way to locate the source of interfering signals is to disable sections of the reverse system. Since most of the systems we are talking about do involve some kind of computer, the ideal long-range solution may be to build some means into the amplifiers to turn them on and off remotely with the computer. In the meantime, you will probably want to disable the reverse amplifiers manually. Actually, if possible, you will probably find it very desirable to keep most of the reverse system disabled when you are not using it. This will greatly simplify the task of finding the cable section that is causing the interference.

There is another benefit from disabling the reverse system. Keeping local radio services, such as hams, out of the cable system can be a major task. Thus, it would simplify your operations if the area that the ham is in is disabled in the reverse direction when you are not using it. Of course, if you are providing a relatively limited bandwidth service such as digital only, you might think that all you would have to do is select a frequency that isn't in the ham band and you wouldn't have any trouble. That may or may not be true. It is possible for ham signals to get into amplifiers and generate many beats.

If you are to use the 5-35 MHz band, special measures must be taken to prevent the introduction of undesired signals into the cable system. Maintenance of the reverse system requires a full staff, possibly some specially trained technicians, and some careful planning ahead before you build the system. Two-way is not just a nice little "extra" that you get practically for free. It is a complete system in itself with its own special problems which require a system engineering approach.

I hope I have not discouraged you about two-way. We at TeleCable are still very enthusiastic about it and are proceeding with further experiments and testing. We successfully used our two-way system to enable the local schools to do some cablecasting. Very soon nurses in local nursing homes will have complete two-way video, audio, and digital communication capability with doctors in a local hospital. Two-way works. It is just that two-way must be given the same careful attention and thought as your forward system is presently given.

GHOST ELIMINATION BY ECHO EQUALIZATION

By David Emberson
Maclean-Hunter Cable TV Ltd.

Television signals introduced into transmission cables and antennae suffer degradation due to reflections or *ghosts* caused by small imperfections in the transmission system. These ghosts or echoes can be divided into two types, the *post*-ghost and the *pre*-ghost.

The Post-Ghost

The post-ghost is probably the most common type and results in halos or even completely displaced images that appear to the right of the main image on the screen of the television receiver. This post-ghost can be generated in two ways.

The first and most common source of post-ghosts is in the transmission system between the transmitting antenna and the transmitter, or in the reception system between the receiving antenna and the television receiver. As the incident signal encounters discontinuities in the impedance of the system, small amounts of energy are reflected back towards the source of the signal. This reflected signal combines with the incident signal and produces a standing wave, which varies in amplitude or voltage.

The difference between the incident and the reflected signals is the *voltage standing wave ratio.* The value of the voltage standing wave ratio (VSWR) determines the visibility of the reflected signal. The higher the reflected signal, the greater the VSWR and the more visible is the ghost or halo.

The second source of the post-ghost is during propagation from the transmission antenna to the receiving antenna. As the incident signal is radiated out from the transmitting antenna, large objects, such as mountains or tall buildings, can cause small amounts of the incident signal to be reflected in a different direction or path, and this reflected signal arrives at the receiving antenna later than the incident signal. The television receiver, in scanning from left to right, then places this later reflected signal to the right of the main or incident signal.

The Pre-Ghost

The pre-ghost results in small halos that appear to the left of the main image and these are seldom greater than one microsecond delay. This pre-ghost occurs when the main video signal is delayed, but a small amount of the main signal manages to escape this delay and arrives at the receiver before the main or incident signal.

The TV receiver, in scanning from left to right, places this pre-ghost on the screen first and the delayed image on the screen to the right of this non-delayed signal. Since the level of the main signal is higher than that of the non-delayed signal, the delayed signal appears as the main image and the non-delayed signal as the interfering signal, to the left. The distance between the main image and the interfering signal is determined by the amount of delay difference between the two signals; the intensity of the interfering signal is determined by the difference in signal level between the main and the interfering signals.

Some of the post-ghosts that occur during transmission can be corrected with proper antenna arrays to "phase-out" the interfering multipath, but no amount of antenna adjustment or design can eliminate ghosts or echoes produced prior to the transmission antenna or after the receiving antenna.

Both types of ghosts can be corrected, regardless of the point of origination, by using electronic methods. And while the effects of these ghosts

are most commonly seen at video on the TV receiver screen, it is possible to correct these problems at almost any frequency, simply by reversing the manner by which they were originally generated.

Video Echo Equalization

While it is presently felt that equalization can be easily adapted to all cable television systems, there are still a number of different thoughts on how the circuitry can be adapted to suit the purposes of the manufacturer, the cable operator, and the technician.

The manufacturer of such a device must be able to produce sufficient delays to cure problems up to 10-15 microseconds and yet keep it economical enough for a cable operator to be able to employ these devices on *all* channels.

The cable operator, while very conscious of the price, is also concerned with the physical size of the equipment, adaptability to existing equipment, as well as the actual effectiveness of the device and whether it can equalize multiples and/or combinations of pre- or post-ghosts.

The technician must be able to maintain and troubleshoot the device with the minimum of difficulty, as well as using available equipment, such as signal level meters and the standard television receiver.

I will now describe a feasible method by which echo equalization can be accomplished and maintained—economically—by even the smallest cable system operator.

Refer to Figure 1. The RF signal envelope at "A" shows the distortion that has been added due to ghosting from transmission lines or propagation multipath signals. This signal is split through a two-way hybrid splitter with the signal in signal path 1 fed directly to one port of the output combiner. The signal in signal path 2 is delayed by an amount equal to the difference in time between the ghost and the main image, and the phase is adjusted to put the delayed signal 180° out-of-phase with the signal in path 1. The level of this equalizer signal in path 2 is adjusted to equal the level of that of the echo to be eliminated. The signals from both paths are recombined at "D".

The distortion will have been eliminated and the resultant level, assuming a signal level of 35dBmV, is as follows:

Signal 1 is at a level of +35dBmV = 56,230 uvolts

Signal 2 is at a level of +20dBmV = 10,000 uvolts (this is a 15dB ghost).

After re-combination, the resultant level would be 46,230 uvolts = 33.5dBmV. This slight decrease of signal level is easily corrected by amplification, if necessary.

Figure 2 shows how to handle pre-ghosts. The RF envelope at "A" shows pre-echo distortion caused by inadequate video processing equipment. The signal is split equally in a two-way hybrid splitter. The signal through signal path 1 is delayed by an amount equal to the pre-echo delay time. The signal through signal path 2 is phase adjusted so that the signal at "B" is 180° out-of-phase with the equalizer signal in path 2 at "C". The level of the equalizing signal in path 2 is adjusted to equal the level of that of the pre-echo. Both signals 1 and 2 are re-combined at "D" and amplified to the RF signal level that existed at "A".

Much shorter distortions can be corrected with the pre-echo equalization as the main signal is required to be delayed and must be recovered for

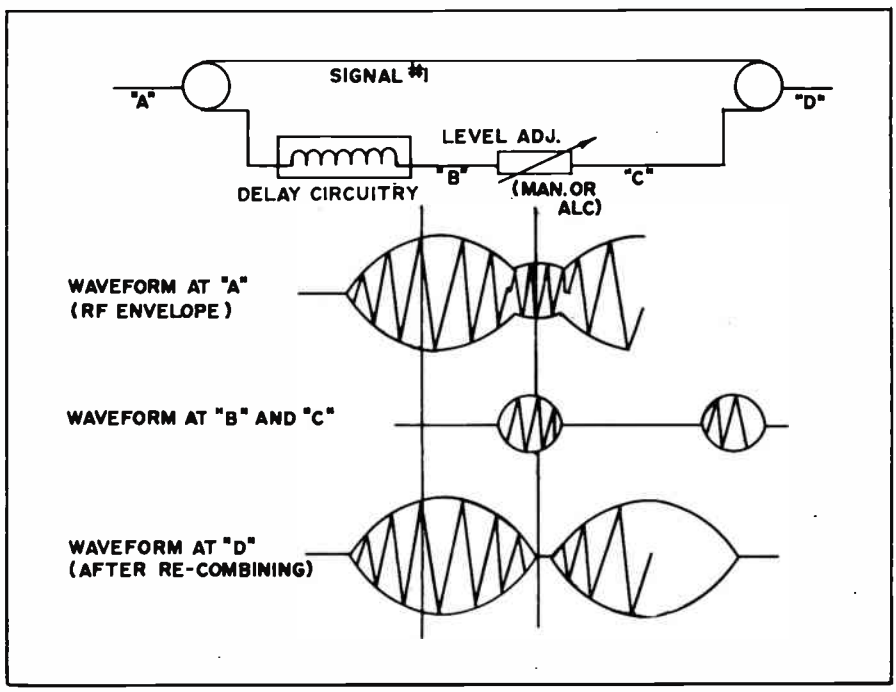

Fig. 1. Post-echo equalization circuitry and waveform diagrams.

use in the system. In the post equalizer, the delayed signal is finally cancelled in the re-combination of signal 1 and signal 2. Pre-echoes are seldom generated above one microsecond.

One application for this particular circuit is in conjunction with a sub-channel-to VHF channel processor at the antenna site. This circuit can sharpen in local orgination channel by eliminating a good amount of the ringing that takes place in the cameras, switchers and modulators in the studio.

There could be several methods of determining the actual delay required for correction of a pre- or post-ghost. A variable delay device could be connected into the circuit and various delays combined and phase adjusted until the ghost was eliminated. The necessary values could then be noted from the variable delay box and this amount of delay would be installed at that location.

A brief, but thorough investigation of delay variation over time has been conducted in Toronto and the variations observed were very minute and considered to be negligible. Minor on site adjustments will probably *not* be needed.

Level Control

Another point of interest is whether some type of automatic level control would be required to adjust the level of the equalizing signal to ensure that it is constantly maintained at the correct level, that is, exactly equal to the interfering signal that it is intended to cancel. An insufficient signal level will not cancel all of the interfering signal; too much signal level will not only cancel the interfering signal, but some part of the cancelling signal would remain to add a ghost of the opposite polarity.

My own thought on this is if the cancelling signal happens to be 15% too low, we have still eliminated 85% of the ghost. If the cancelling signal happens to be 15% too high, we will cancel 100% of the original ghost, but add 15% of a ghost of opposite polarity. However we would have 85% less ghosting than we had originally, before we attempted echo equalization.

Preliminary experimentation on such equalization had been conducted some two years ago in our Toronto system, but due to other priorities, development was postponed, even though the results of our tests were quite encouraging. During the past eight months, a new interest has developed for our company in this project because society continues to construct high-rise buildings around our antenna sites.

In addition to this problem, sub-lowband reverse trunk line channels-are-not-quite as sharp and crisp as they might be Echo equalization could solve that problem.

The experiments that we have conducted were relatively inexpensive, when compared to replacing a modulator or even moving an antenna site. Certain manufacturers are presently actively engaged in producing equipment that contains echo equalization circuits, as well as packages that are easily adaptable to present equipment, so that echo equalization circuitry can be added, inexpensively, soon.

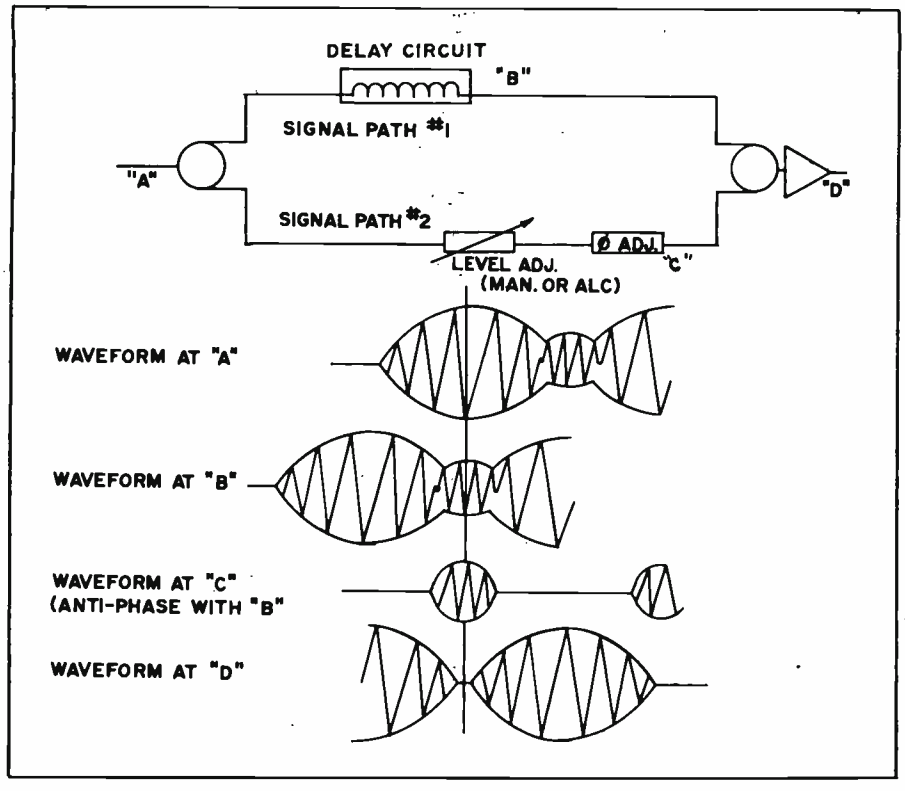

Fig. 2. Pre-echo equalization circuitry and waveform diagrams.

RELIABILITY AND MAINTENANCE OF TOTAL UNDERGROUND SYSTEMS

By Eugene R. Moon
Community Cablevision Company

In order to better understand just what the words *Reliability* and *Maintenance* mean in relation with a total underground system, let's first consult "Webster's Dictionary."

First there's *Reliable*; "Webster's Dictionary" says: *"Suitable or fit to be relied on, (trustworthy)"*.

Second, there's *Maintain: "To hold or keep in any condition*, esp. in *a state of efficiency or validity."*

From this point we can move towards the way these definitions affect the bottom line of our individual cable TV systems.

To begin with, we must start with quality components designed with longevity and ease of maintenance for the consumer, in this case the CATV operator. With the wide choice of philosophies, electronic layouts and physical shapes and sizes, this task alone can tend to keep your engineering staff busy for many long tedious hours.

Once the format has been established, long hours of negotiating with the never ending line of equipment brokers and manufacturers begins. Unit price, bulk price, turnkey, MSO discounts, delivery schedules, and financing are some of the language and activities to follow.

While quality components don't necessarily equate to a quality system, to build a reliable system, one which can reduce your maintenance cost, you must begin with quality components.

The Conduit

Now let's talk about methods and manpower which are important to reliability in your total underground system.

Conduit in underground construction is the most important single item next to waterproofing. Plan your conduit system so you have space for future expansion. I believe that most systems that plan on two-way transmissions for the consumer will eventually find more than one cable in their conduits.

Different types of conduit provide different results in the varied earth conditions around the country. Spend some time with the various conduit suppliers, but don't just talk price. Ask about wall strength, couplers, sweeps, and lengths, because once the material is in the ground, you're stuck with it and all its good and bad points.

Engineer your conduit system so your trunk cable and feeder cable are in separate conduits. This allows for possible replacement with minimum down time for any large segment of your system. Design your conduit system and install trunk or feeder cable so that no splices are located in conduit, but in vaults or pedestals.

Damming of conduits in flush vaults is very important, since irrigation of greenbelts and parkways always flood vaults at one time or another.

When installing conduits in vaults, the use of duct tape (silver tape) is inexpensive compared to the labor involved in cleaning conduits later.

Vaults

Concrete vaults are common in a total underground system. Size, location, and lids, are very important items to discuss prior to actual construction.

Size is probably the most important item to understand when designing your system. Actually, the minimum cable bending radius dictates the size—not the price. The unit cost for labor is not much different between a #3 and a #5 water meter vault or box.

Location is next in importance because this element in construction affects the maintenance of the system later. Watch for drainage routes which may leave a vault constantly full of water and make future installations extremely difficult since the vault or box must be drained prior to commencing work.

The location dictates the type of lid required. You should know potential traffic patterns so as not to be required to continually replace broken lids. The steel fishplate traffic lids in some cases will save money because they are less prone to break.

One important item is the care with which vaults or boxes are installed. They should be square with the curb and at a grade commensurate with the surrounding grade or curb. When appropriate, a coat of green asphalt paint will provide good public relations.

Pedestals

Above ground pedestals are the least expensive protection for active and passive components, but they have some pitfalls.

The most common problem is the condensation action when the pedestal has no free air circulation in its design. Past experiences have shown that an adequate air space between the ground level and the base of the pedestal minimizes condensation.

To provide continued protection in the pedestal, use heat shrink sleeves or tape and a coating of liquid neoprene. Above all, don't just think dry construction but practice dry construction.

Waterproofing

This section on construction is without a doubt the most important item relating to reliability and maintenance of total underground systems, for it is waterproofing that will make or break an operator when first getting his feet wet in underground construction.

In the past few years I have been involved in construction and management of a system with 300 cable miles made up of both above ground and flush types of underground construction. The first cable was installed in late 1965, and we've been expanding by approximately 50 miles each year. We serve one of the "master planned cities of the future" just outside the 35-mile zone of the second television market in the world, Los Angeles, California. Our potential mileage is 1,500 to 2,000 miles by the year 2000. I make mention of these facts to emphasize our dedication to reliable underground system construction. As experienced constructors we rely heavily upon good pedestals and hermetically-sealed enclosures. In fact, during the 1971/72 fiscal year with a quarterly subscriber count of 3676, our system service calls per working day were .95% and on a yearly day average were .83%, and that's with 300 miles of plant in the ground.

Our first exposure to completely flush construction was in 1967. From the first, we used the Channel Corporation 6-inch plastic hermetically-sealed enclosures which, to this day, have provided 100% security for our splitters, directional taps, and tap-off units. These units, or one which will provide the same protection, are a must for the dry equipment required for system reliability.

We also believe in heat-shrink sleeves for all connectors not in hermetically-sealed enclosures, in flush-mounted vaults. In above ground installations, the use of heat-shrink sleeves can be augmented with self-vulcanizing tape and liquid neoprene if cost is a major factor. But make sure you use one or the other and not a dab of RTV here and there.

Maintenance

The mere thought of maintenance of a total underground CATV system would almost induce labor pains from a CATV technician who's whole background is in aerial plant maintenance. However there are techniques in protecting CATV components, such as I mentioned earlier, which can make maintenance very easy in underground plant.

The AGC problem is minimized due to the constant temperatures of cable when installed underground. Also system balancing can be performed much more rapidly than in aerial systems.

Commercial power outages are fewer in areas where all utilities are underground. But you should seriously consider installation of battery powered standby power supplies. The prime locations are backbone trunk lines where one small power failure can create one very big system outage.

Preventative maintenance schedules for underground constructed systems should be similar to those for aerial, only because it is good procedure and not because there are more problems.

Pressuring backbone trunk line is one of our practices only because our trunk line is so long. We use air dielectric cable and pressurizing is done with nitrogen gas. Our annual nitrogen expense is less than $100. Pressure gauges and sectioned areas of cable give us good control over this maintenance chore.

A good selection of test equipment is as essential for underground as it is in aerial systems. A fault locator is like your right arm in locating cable for contractors who plan on digging near your cables.

Other items of importance in the maintenance of underground is to keep good up-to-date as-built prints in case repairs are needed. Complete evaluation of service calls will assist in keeping the pulse of your system.

Whatever happened to Craftsman?

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I've watched us grow to be Magnavox' CATV Division with the most useful spectrum of passive cable TV products available. I'm Bob Greiner, general manager of passive operations and your needs are my first priority. You need a full and complete line of *specialized* passive products for *specific* system jobs! That's what we have and will continue to provide; from transformers to splitters to taps, even the "F"-connector has more special varieties here.

We're set up to give you personal service whether you want ten connectors or thousands of taps. With Eastern and Western distribution centers we can fill your requirement faster and at more competitive prices.

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Magnavox
catv division

22nd Annual NCTA Convention

June 18, 19, 20

Convention Center, Anaheim, California

EYE-OPENER TECHNICAL SESSIONS

PRODUCED AND DIRECTED BY THE SOCIETY OF CABLE TELEVISION ENGINEERS
SCTE PROGRAM CHAIRMAN — ROBERT BILODEAU
SCTE PROMOTION AND CO-ORDINATION — JOHN ORESIC

MONDAY JUNE 18 — 8:00 — 9:30 A.M.
ORANGE COUNTY ROOM 19

STAND BY POWER: WHAT PRICE RELIABILITY?

ORGANIZER/MODERATOR—

Loyal C. Park—	Lincoln Tel. & Tel. Lincoln, Nebraska

PANELISTS—

Robert Cowart—	Vice President and Chief Engineer Gill Cable San Jose, California
Selig Lenefsky—	Vice President of Research & Development Coral Communications Hoboken, New Jersey
A. Robert LeServe—	Director of Engineering Interstate Telephone and Electronics Dallas, Texas
E. Harold Munn, Jr—	President E. Harold Munn, Jr. Associates Inc. Coldwater, Michigan
Robert Schultz—	Assistant to President Glentronics Glendora, California

REPORTER—

John Oresic—	Director, Marketing Development Suburban Cable TV Co., Inc. Wayne, Pa.

TUESDAY JUNE 19 — 8:00 — 9:30 A.M.
ORANGE COUNTY ROOM 19

"THE RELATIONSHIP BETWEEN FEDERAL, STATE, MUNICIPAL CONTROL IN TECHNICAL STANDARDS"

ORGANIZER/MODERATOR—

Joe Hale—	President Cable Dynamics Inc. Burlingame, California

PANELISTS—

Kenneth Foster—	State Commission on Cable Television Albany, New York
Sydney Lines—	Assistant Chief Technical Division Federal Communications Commission Washington, D.C.
Vic Nicholson—	Cable Television Information Center Washington, D.C.
Delmer C. Ports—	Vice President Engineering National Cable Television Association, Inc. Washington, D.C.
Michelle Rosen—	Cable TV Office Newark, New Jersey

REPORTER—

Keith Davis—	Chief Engineer Western TV Cable South San Francisco, California

WEDNESDAY JUNE 20 — 8:00 — 9:30 A.M.
ORANGE COUNTY ROOM 19

THE ELUSIVE SUBSCRIBER: HOW MUCH AND WHEN

ORGANIZER/MODERATOR—

Steve Dourdoufis— Chief Engineer
Vision Cable Communications
Fort Lee, New Jersey

PANELISTS—

Caywood C. Cooley— Cable TV Consultant
Manlius, New York

Jerry Crusan— Chief Engineer
Television Communications Corp.
Pennsauken, New Jersey

Wallace Lambourne— Trans-World Communications
Las Vegas, Nevada

Dr. Pat Nettles— Scientific-Atlanta
Atlanta, Georgia

Abe Reiter— Athena Communications Corp.
New York, N.Y.

Perry Schwartz— Gridtronics Corp.
TV Communications
New York, N.Y.

Dr. John Sie— Jerrold Electronics Corp.
Horsham, Pa.

Gene Walbing— Oak Manufacturing Co.
Crystal Lake, Illinois

REPORTER—

John Oresic— Director, Marketing Development
Suburban Cable TV Co., Inc.
Wayne, Pa.

TECHNICAL PROGRAM
MONDAY, JUNE, 18, 1973

JOINT MANAGEMENT/TECHNICAL SESSION
11:15 A.M. — 12:00 Noon

PLATO IV—LIVE DEMONSTRATION—
Anaheim Room

Session Co-Chairman: Burt Harris
Cypress Communications
Los Angeles, California

Demonstrated by: Dr. Donald L. Bitzer, Director
Computer Based Educational Lab.
University of Illinois

TECHNICAL SESSIONS
2:15 P.M. — 4:15 P.M.

SATELLITES, MICROWAVES, & FIBER-OPTICS—Orange County Room No. 18

Session Chairman: Hubert J. Schlafly
TelePrompTer Corporation
New York, New York

1. "The Effects of Satellites on CATV"—R. W. Swensen & D. W. Lipke, COSMAT, Wash., D.C.
2. "A Cable Television Satellite Earth Station" —Thomas Smith & Peter M. Pifer, Scientific-Atlanta, Atlanta, Ga.
3. "A High Power Single Channel AML Microwave Relay System"—I. Rabowsky, C. Meyers, P. Vaughan, Theta-Com, Los Angeles, Ca.
4. "Towards a More Economic Microwave System for CATV"—J. F. Roche (Raytheon Service Co., Burlington, Mass.

INSTALLATION AND MAINTENANCE—
Orange County Room No. 19

Session Chairman: Charles Henry
Badger CATV
Iron Mountain, Michigan

1. "Lightning and Surge Protection of CATV Facilities"—C. Bruce Barksdale, Telecomunications Industries, Inc., Kansas City, Missouri
2. "The Case of the Disappearing Head Room"—Warren Braun, P.E. Harrisonburg, Virginia
3. "Utility Grounding Practices"—H. M. Smith, P.E., General Electric Cablevision Corporation, San Antonio, Texas
4. "A Study of Aluminum Cable-Connector Interfaces and Their Effect on CATV System RF Ingress"—Eric Winston, Jerrold Electronics, Horsham, Pennsylvania
5. "Destructive Corrosion"—Owen J. McCaughey & Gaylord G. Rogeness, Anaconda Electronics, Anaheim, California

(Continued to page 21)

SCTE

SOCIETY OF CABLE TELEVISION ENGINEERS

NORTH CENTRAL CHAPTER

The Holiday Inn in downtown Minneapolis was the site of the May 18-19 meeting of the North Central Chapter of the Society of Cable Television Engineers. Twenty three members and prospective members were present. Technical presentations were given by Dick Walters of Theta-Com, who spoke on amplitude-modulated microwave links; W. E. Peguignot of Gilbert Engineering, who spoke on the pitfalls in the assembly of CATV connectors and gave many good pointers; and J. Basso of Tektronix, who spoke about his company's "Proof of Performance" concept and test package.

After the technical presentations, Mr. Basso, Bob Cooper, Jr. of CADCO, and Rocky Schlichter of Metro Cable Inc. of Minneapolis, participated in a panel discussion on the requirements for proof of performance testing. Mr. Cooper followed this up, in a later session, with the requirements for such testing as he felt they applied to the smaller system. Mr. Lewis C. Barbe gave a talk on OSHA and its application to the CATV industry.

At the business meeting, held on May 19th, Mr. James B. Bruce of Des Plaines, Ill., was selected as the alternate delegate to the National SCTE meeting to be held in Anaheim on June 17th. September was selected for the next regional meeting and Eau Claire as the site. Mr. Everett Burrows will coordinate this meeting.

• • •

QUEBEC CHAPTER

Some 50 members of the SCTE gathered at the January 27th meeting of the Quebec Chapter held at the Radio-Quebec building. A tour of the studios was featured in the morning. In the afternoon, representatives from Leitch Video gave a discussion on the video signal with emphasis on the sync system.

For information on the next meetings, contact Henri Bertemes, 376 rue Du Roi, Quebec 2, P.Q., Canada.

• • •

NEW ENGLAND CHAPTER

The New England Chapter of the SCTE has held several meetings this year and has experimented with different locations for these meetings. The last few have been held in the vicinity of Springfield, Mass. It is planned to hold the next meeting in the vicinity of Boston.

Cable television engineers and technicians who are interested in attending a Boston vicinity meeting are asked to contact Brian Lenhart of TelePrompter in Danbury, 203/792-0900, for more information.

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WESTERN CANADA

The Western Society of Cable Television Engineers held its last meeting in Penticton, B.C. on April 20th. The technical session included a presentation by Chuck Wright of Western Cablevision Ltd. on methods for getting more mileage out of test measurements.

The next meeting will be held at the Plaza 500 in Vancouver on October 27. Included will be a workshop on typical operating problems and other topics. For more information contact Bing Mui at 5594 Cambie St. in Vancouver 15, B.C., Canada.

• • •

NATIONAL MEETING

The Directors of the SCTE will hold their annual meeting on June 17th, Sunday evening at 8 P.M. in the Engineers Lounge at the Convention Center in Anaheim, California. All members of the Society are invited to attend this meeting.

• • •

TECHNICAL ACHIEVEMENT AWARDS

The first technical achievement awards presented by the NCTA and the SCTE will be presented on MONDAY, June 18th at the Engineers Reception, from 6 to 8 p.m. in the Garden Grove Room No. 13 in the Anaheim Convention Center, during the NCTA annual convention. All SCTE members have been invited to attend.

• • •

APPLICATION FOR MEMBERSHIP

in

THE SOCIETY OF CABLE TV ENGINEERS

(Please Print, fill in completely ond mail to the SCTE. 607 Main St., Ridgefield, Conn. 06877)

Date.....

First Name | Middle Initial | Last Name | Date of Birth

Home Address | City | State | Zip

PRESENT EMPLOYER

Company | Date Employed

Company Address | City | State | Zip

Your Title

Description of Duties

PROFESSIONAL HISTORY

(Give Company Name and Address and Brief Description of Duties)

From	To	

EDUCATION

College or School | Date Graduated

Degree or Certificate

College or School | Date Graduated

Degree or Certificate

Other Schools

(Turn Page Please)

REFERENCES

(Three Society Members Required as References for Grade of Member)

Nome _____ Company _____

Address _____ City _____ State _____ Zip _____

Nome _____ Company _____

Address _____ City _____ State _____ Zip _____

Nome _____ Company _____

Address _____ City _____ State _____ Zip _____

DUES

(Please List All Fees Enclosed)

Annual Dues ($10 per year) ..... $_____

SCTE Pin ($3.) ..... _____

SCTE Tie Clasp ($3.) ..... _____

TOTAL ENCLOSED ..... $_____

I agree to abide by the Constitution and Bylaws of the Society of Cable TV Engineers if admitted to membership.

Signoture _____

Do Not Write Below This Line

Chapter .....

Admissions Committee Action ..... Date .....

Membership Grade:

- ☐ Member
- ☐ Associate Member
- ☐ Sustaining Member

1	2	3	4	5	6	7	8	9	10	11	12	13	14

15	16	17	18	19	20	21	22	23	24	25	26

TECHNICAL PROGRAM

(Continued from page 17)

ENGINEERS RECEPTION
6:00 P.M. — 8:00 P.M.
Garden Grove Room No. 3

Presentation of NCTA Technical Achievement Award

TUESDAY, JUNE 19, 1973

9:45 A.M. — 11:45 P.M.

TELEVISION SYSTEMS—Orange County Room No. 18

Session Chairman: John T. Guarrera, Vice President, IEEE
Guide Scientific Industries, Inc.
Sun Valley, California

1. "Reduction of Co-Channel Interference by Use of Precision Frequency Control in the Originating Transmitters"—I. Switzer, Maclean-Hunter Cable TV Ltd., Rexdale, Ontario, Canada
2. "Local Origination—Laying It on the Line"—Oliver Berliner, Audio International, Burbank, California
3. "The JCIC Ad Hoc Committee on Television Broadcast Ancillary Signals—Why It Was Established, and What It Expects to Accomplish"—Robert A. O'Connor, Chairman, JCIC Ad Hoc Committee on Television Broadcast Ancillary Signals, New York City
4. "A Television Receiver Especially Designed for CATV"—G. W. Bricker & G. C. Hermeling, RCA Sales Corp., Indianapolis, Indiana

SPECIAL APPLICATIONS—Orange County Room No. 19

Session Chairman: Rex Bradley
TeleCable Corporation
Norfolk, Virginia

1. "An Analysis of Proven Pay CATV Systems"—Richard D. Petit, K'Son Corp., Orange, Calif.
2. "Considerations for Reverse Signals in the Feeder Lines"—Robert Wilson, Ameco, Inc., Phoenix, Arizona
3. "The Magnavox Premium TV System"—F. Douglas Forbes & Caywood C. Cooley, Magnavox, Manlius, New York
4. "Pediatrics and Cable Television"—Edward Wallerstein, Mount Sinai School of Medicine, New York, N.Y.

2:15 P.M. — 4:15 P.M.

ENGINEERING FORUM—Orange County Room No. 18

Sponsors: Coordinating Committee for Cable Communication Systems
Society of Cable Television Engineers

Session Co-Chairmen: Archer S. Taylor, Chairman, CCCCS
Malarky, Taylor & Associates
Washington, D.C.
William Karnes, President, SCTE
Dallas, Texas

COMPUTERS AND DESIGN—Orange Room No. 19

Session Chairman: Herbert P. Michels
Time Life Cable Communications Inc.

WEDNESDAY, JUNE 20, 1973

TECHNICAL SESSIONS
9:45 A.M. — 11:45 A.M.

PROGRAM ORIGINATION—Orange County Room No. 18

Session Chairman: Joseph L. Stern
Goldmark Communications Corp.

CHANNEL ALLOCATIONS—Orange County Room No. 19

Session Chairman: Delmer C. Ports
NCTA

2:15 P.M. — 4:15 P.M.

SYSTEM DESIGN—Orange County Room No. 18

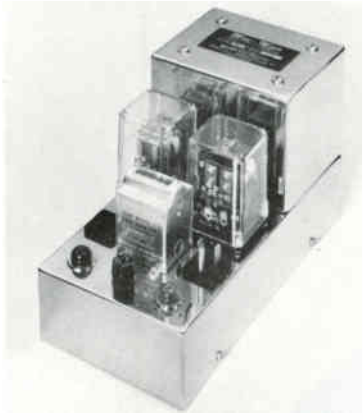
Session Chairman: Michael F. Jeffers
Jerrold Electronics Corp.

OPERATION, MEASUREMENTS, & STANDARDS—Orange County Room No. 19

Session Chairman: Jake Landrum
Commco, Inc.

New Products

SURGE PROTECTOR



A new surge protector called the "Mini-Mizer," designed to protect CATV and other delicate transistorized equipment from damaging power line surges, is being marketed by Brown Electronics (Liberty St., Barbourville, KY 40906). The unit installs directly ahead of the AC power supply and contains a built-in power line filter.

When a surge or high voltage spike attempts to pass through the Mini-Mizer, it is delayed by an AC reactor and shunted to ground. As the surge flows to ground, the relays remove power from the Mini-Mizer for two seconds, after which it is automatically reset and power is restored. There is no power on any of the relays when there is no surge present. Each surge is automatically counted. Two pilot lights show the condition of the unit. The Mini-Mizer is furnished in weather proof, outdoor housings for pole mounting if desired.

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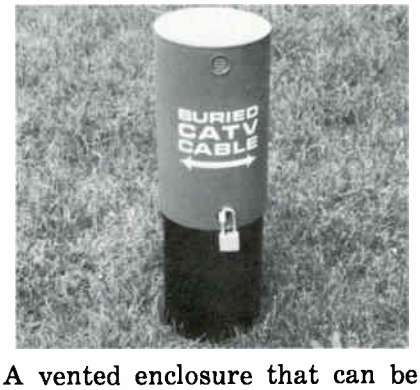
LOW PASS VIDEO FILTERS

Matthey Printed Products (Television Equipment Associates, Box 1391, Bayville, N.Y. 11709) now has available a range of low pass video filters with phase equalization. These 75 ohm units have a sharp cutoff at one of twelve frequencies: 1, 2, 2.5, 3, 3.5 4, 4.5, 4.8, 5, 5.5, 5.8, or 6.5, mHz. The ratio of the 45 dB frequency to the 3 dB frequency is 1.2335 for each filter, it is claimed. They can be supplied with metal boxes or as PCB versions.

• • •

VENTED ENCLOSURE



A vented enclosure that can be locked is now available for buried cable TV systems from Handley Industries, Inc. (2101 Brooklyn Road, Jackson, Mich. 49204). Made of lightweight, non-corroding A.B.S. polymer, the closure features a spring-action loop to accommodate a padlock. The locking mechanism is designed without screws to discourage tampering.

Cell-O-Air® XD Coax. The state of the art at Comm/Scope.

The situation:
it is now well known that expanded polystyrene provides superior electricals in coaxial cable. It permits longer trunk runs using smaller cables with fewer amplifiers, than is possible with expanded polyethylene.

The problem:
in the beginning, polystyrene was not quite as flexible as other dielectrics and had a tendency to buckle occasionally when mishandled. In all other respects, polystyrene was far superior to anything yet developed. It still is.

The solution:
through constant development and testing, Comm/Scope has an extremely high-quality polystyrene dielectric—the specs are ultra-rigid. Then we developed production techniques that guarantee uniformly consistent dielectric properties. And finally, we'll show you some simple procedures for loop formation which maximize service life in the presence of severe changing environments. Our representatives are available to pass these methods on.

So specify Comm/Scope Cell-O-Air XD Coaxials. Copper clad aluminum center conductor. Heavy gauge aluminum outer conductor. And Comm/Scope's exclusive Cell-O-Air expanded polystyrene dielectric.

Available in all standard sizes. For aerial or direct burial applications. For information and prices: Comm/Scope Company, P.O. Box 2406, Hickory, North Carolina 28601. Phone 704/328-5271.

Warehouse locations:
San Rafael and Chula Vista, California; Dallas, Texas; Tampa, Florida; Seattle, Washington; Sherrills Ford and Angier, North Carolina; Woodbridge, New Jersey; Rock Island, Illinois.

Comm/Scope Company
Division of Superior Continental Corporation
A Member of Continental Telephone System