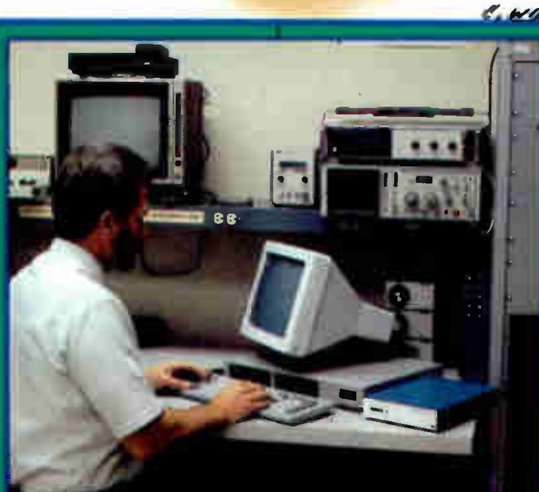
Communications Technology

Official trade journal of the Society of Cable Television Engineers

Untangling the interface dilemma



Data applications on cable

February 1986

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CONTENTS

Departments

Editor's Letter 6

News 9
Advance schedule of technical papers to be presented at NCTA's Dallas '86, plus the latest happenings in the industry.

Blonder's View 12
Will the average TV viewer accept the higher costs that a mandated new aspect ratio will bring? Isaac Blonder thinks not.

Back to Basics 16
Tim Dugan of Times Fiber reviews connector installation on flooded semiflex cable.

System Economy 65
Edward Wittaker of Storer gives the program for a time-saving system of computerized reports.

Product News 68

Construction Techniques 70
Bruce Catter of Jones Intercable shows how a timeline can help organize construction projects.

Keeping Track 72
Promotions and moves in the cable industry.

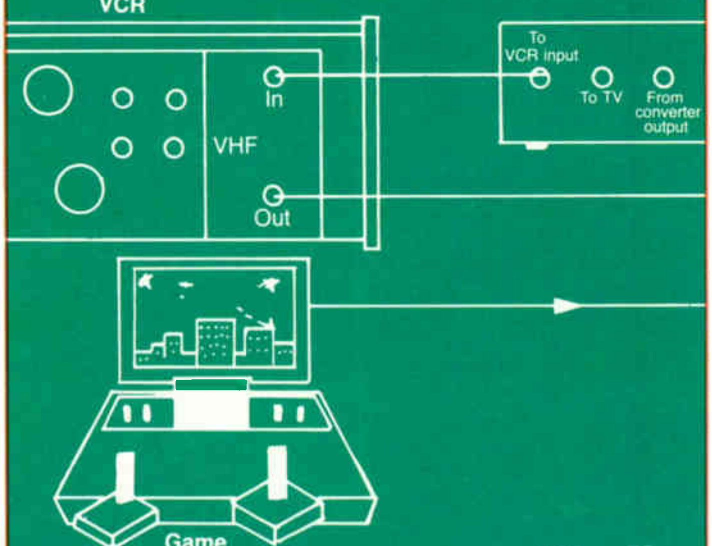
Calendar 76

Ad Index 76

Luff's Comments 78
In the first of a two-part series, Bob Luff explains how the potential technical headaches scrambling might bring can be minimized.

SCTE Interval 35
All the latest publications and products available from the SCTE, as well as news from chapters and meeting groups are featured this month.

News 9



VCC 52

Back to Basics 16

Features

Data and CATV 19
In this, the third article of a four-part series, Richard McKeon and Terry Stanard discuss typical applications of data communications on CATV.

IS-15 points the way to the cable-ready set 27
Graham Stubbs, vice president of science and technology at Oak, believes cable operators hold the key to advancement.

Interface options 48
Dave Wachob of Jerrold gives the pros and cons of four possible approaches to the interface problem.

VCR and CATV: Together at last 52
Another possible cure for the interface blues, the video control center, is prescribed here by Randall Tishkoff, president of Qintar Inc.

Multichannel stereo television sound 60
Stereo quality and building a foundation for the future are covered by Russell Skinner of ATC. Glen Friedman of ATC also gives some additional thoughts on making cable "VCR friendly."

Cover
Cable's interface dilemma is illustrated by Chris Williamson. Photograph of an operator using a PC and RF modem to gain access to a remote headend provided by Dumbauld & Associates.

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Remember, back in 1951, when TV stations were low in power and antennas not very efficient? Milton Jerrold Shapp, the founder of Jerrold, didn't realize he was helping to create a new industry when he developed an amplifier that Bob Tarlton needed for his Lansford, PA community antenna system.

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GENERAL INSTRUMENT

EDITOR'S LETTER

The scramble's on

On Jan. 15, HBO and Cinemax were the first programmers to scramble their satellite feeds. As you'll note in Bob Luff's column (p. 78), almost every programmer except C-SPAN will have scrambled their services by the end of the year.

While it's critical for the CATV industry to scramble, someone must pay the price. That price constitutes the purchase of one VideoCipher II decoder for each scrambled program service, additional racks (if required) and, of course, extra cabling. This is by far no small investment. Considering the importance of this issue, I polled a few people on the system operations side as to their reaction on spending the additional monies needed.

According to Jim Chiddix of Oceanic Cablevision, "The strategic issue is so important the expenses are secondary. We're having to expand our building for equipment," he added, "but it's better than home dish owners getting free signals." Dave Large of Gillcable stressed, "It doesn't bother me at all. The sooner we scramble the better. It's a pretty low cost." Gary Myers of Heritage Cable TV said, "If I'm going to protect my job, I'm going to go along with the expenses. I don't see any way around it." Dan Pike of Prime Cable took a slightly different tack: "Rack space is at a premium. They're doing everyone an injustice," Pike said, "by not making the VideoCipher smaller."

In speaking with Dave Willis of TCI about the added expenses, he stated, "It bothers me in that I wouldn't spend any money if I didn't have to. But our company, as a matter of policy, has stated that to anybody who scrambles in 1986 we'll be happy to supply the scrambler ourselves. I'm all for it. We were the ones who said we'll buy thousands of M/A-COM's VideoCiphers and pushed the whole industry into M/A-COM's camp. Not that we wanted to do anything for M/A-COM," Willis explained, "but we could see that with all the foot-dragging going on, it was going to be years before anything was done."

Minor problems

Whenever new technologies are implemented, there are always a few bugs to work out. M/A-COM has done extensive research into all of the various manufacturers' products. For the most part, everybody they've checked has proven their equipment is compatible with the VideoCipher.

However, some of Microdyne's receivers will require a modification to make them compatible. Microdyne has issued a list of its receivers that are compatible with the VideoCipher. The receivers that won't interact well will cause crackling in the audio, horizontal streaks or may not work at all. The solution, a de-emphasis network, is relatively simple.

A clarification

In the January issue of *CT*, my letter addressed some concerns involving test equipment manufacturers. There is one point I'd like to clarify. In my letter I stated that Wavetek Corp. had lost most of its key personnel. That is not the case! Approximately one year ago, Wavetek initiated a successful restructuring program. John Battin joined the corporation as president and CEO, bringing to the company 26 years' experience from Motorola. Larry Dolan, one of the founders of Midstate (a cable test equipment company that Wavetek acquired in 1981) was promoted to vice president of marketing and sales. At the company's Indiana division, where the cable test equipment products now are designed and manufactured, Jim Walcutt (new general manager) joined Wavetek last April. Walcutt brings to the company 18 years of experience with Tektronix in the electronic instrumentation field.

According to the firm, the priority of these three men was to position Wavetek to return to a healthy, profitable position in 1986. To achieve this, two product lines were sold from the Indiana division (the TV receiver test equipment products and the two-way land mobile service monitors) and the spectrum analyzer operation in Rockleigh, N.J., also was sold.

To reduce expenses and develop a tighter communications network between engineering and marketing, the CATV engineering department was scheduled to relocate to Indiana. However, for personal reasons, the engineering staff preferred to remain in Pennsylvania and resigned from Wavetek. The subsequent restructuring of the engineering department in Indiana today offers a force of 28 engineers and support staff to draw from.

Wavetek's cable sales organization includes talented people like Jack Webb, national sales manager, with 10 years of engineering and manufacturing experience under his belt. The company's regional sales managers, Phyllis Thompson, Greg Marx and Tony Shortt, offer an additional 32 years of combined experience in cable.

An area of concern I addressed in last month's letter concerned R & D relating to test equipment. Wavetek has apparently met that challenge, specifically concerning surface-mount technology. SMT should positively impact equipment reliability as fewer solder joints and interconnections are required; the numbers of cable and harnesses are reduced; PC boards may be smaller and more dense; and supporting mechanical structures can be smaller and less bulky. Congratulations to everyone at Wavetek for high-quality products and on-going R & D.

Toni I. Barnett

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NCTA's Cable '86 offers 'the value of choice' in Dallas

Dallas—The National Cable Television Association and the Texas Cable Television Association are combining forces this year to present "Cable 86: The Value of Choice" in the Dallas Convention Center, March 15-18. Appropriately, the convention will kick off with a big Texas-style barbeque in the convention center Saturday, March 15.

The convention program will open March 16 at 9 a.m. with a general session entitled "More Choice, More Value," the theme of the 1986 show. Exhibits will open at 10:30 that morning.

The latest technical developments and trends will be discussed in 10 technical sessions. Forty-six papers will be the basis for presentations on topics such as impulse pay-per-view, cable interface with consumer electronics and signal security. The papers will be published in the 1986 edition of "NCTA Technical Papers," a softcover volume available for purchase either at the convention or later, by mail, from the NCTA. Two rooms in the west meeting room portion of the Dallas convention center will constitute the 'technical corridor' at this year's show.

Seven tracks of topics—management, finance, legal, programming, marketing, consumer electronics and public policy—are being planned in addition to the technical sessions to accommodate the wide range of interests of cable industry personnel. Over the three days, 14 and one-half hours have been set aside for exclusive viewing of the exhibits with no competing activities scheduled.

SCTE membership meeting upcoming

WEST CHESTER, Pa.—The Brisbane Room of the Hyatt Hotel in Dallas is the planned site this year for the membership meeting of the Society of Cable Television Engineers. The meeting, to be held at 4 p.m. on March 15, coincides with the NCTA Dallas '86 convention, and is expected to be well attended.

Included in the meeting will be status reports on current SCTE projects, introduction of new board members and an opportunity for members to give feedback. Members also will get an update on SCTE's Cable-Tec Expo '86, to be held June 12-15 in Phoenix, Ariz. For current information on the expo, please circle #1 on the Reader Service Card in this issue and drop it into the mail.

Cable '86 technical tracks agenda

Sunday, March 16
3:30-5 p.m.

• Stereo television: Delivering its full potential
Moderator: Walter Ciciora (ATC). *Speakers:* Thomas Martin (Tocom Division/General Instrument), "Compatibility between baseband converters and MTS stereo"; Clyde Robbins (Jerrold Division/General Instrument), "Beating the BTSC buzz"; George Green (Zenith Cable Products Division), "Stereo considerations: An opportunity or a crisis?"; Chris Bowick (Scientific-Atlanta), "The importance of setting and maintaining correct audio modulation levels in a CATV system carrying BTSC stereo signals"; and Paul Beeman (MTV), "Setting and maintaining audio levels."

• Data delivery techniques
Moderator: Ed Milner (Arlington Cable Partners). *Speakers:* Victor Nowakowski (Oak), "Digital data in cable systems: The basics of error control"; Robert Dickinson (Network Technologies Division/AM Cable TV Industries), "Local area networks"; Gregory Woodsum (Zenith Cable Products Division), "Comparative study of one-way data delivery systems"; and Emory McGinty (Scientific-Atlanta), "Using narrow-band data transmission for an information delivery system for CATV applications."

Monday, March 17
9-10:30 a.m.

• Stereo television: Search for the optimum
Moderator: Joseph Van Loan (Viacom). *Speakers:* Thomas Matty (W & S Systems Co.), "Improving FM stereo on cable"; David Large (Gillcable), Catherine Frost (ATC) and Russell Skinner (ATC) also will be presenting papers whose titles have not yet been announced.

• Cable distribution design—Variations of standard techniques
Moderator: Joe Preschutti (AM Cable TV Industries Inc.). *Speakers:* T.M. Strauss (Hughes Aircraft Co.), "System considerations in application of 18 GHz microwave to CATV"; James Chiddix (Oceanic Cablevision), "Optical fiber super-trunking: The time has come—Performance report on a real world system"; Kevin Shergold (British Telecom), "The British Telecom Switched Star System in Westminster, London: An advanced system and the marketing opportunities and experience"; John Powter (British Telecom), "The British Telecom Switched Star System in Westminster, London: The advanced system goes into the real world"; and Bud Campbell (ATC), "In-use fiber optics."

3:30-5 p.m.

• Impulse pay-per-view—The technology is here
Moderator: David Archer (Viacom). *Speakers:* Shellie Rosser (Pioneer Communications), "Alternative technologies for impulse pay-per-view: A decision matrix"; Dennis Clark (Jerrold Division/General Instrument), "Store and forward IPPV via the telephone return path"; Vito Brugliera (Zenith Cable Products Division), "PPV: San Antonio—A system case study"; and Lamar West (Scientific-Atlantic), "Cable television opportunities in the lodging industry with impulse pay-per-view technology."

• Monitoring system performance
Moderator: Brian James (NCTA). *Speakers:* Ronda Bruce (Times Fiber), "Remote diagnostics for off-premises cable systems"; Lee Dusbabek (Jerrold Division/General Instrument), "Effective status monitoring through hierarchical distributed processing"; Richard Merrell (Zenith Cable Products Division), "Data monitor"; Rezin Pidgeon (Scientific-Atlanta), "Cross modulation—Its specification and significance"; and James Sullivan (Midwest Cable &

NCTA Cable '86 agenda

Saturday, March 15
12-6 p.m.—Registration open
6 p.m.—Welcome Texas-style barbeque

Sunday, March 16
7:30 a.m.-6 p.m.—Registration open
9-10:30 a.m.—Opening general session
10:30 a.m.—Grand opening, exhibit hall
10:30 a.m.-6 p.m.—Exhibits open
3:30-5 p.m.—Track sessions

Monday, March 17
7:30 a.m.-6 p.m.—Registration open
9-10:30 a.m.—Track sessions
10 a.m.-6 p.m.—Exhibit hall open
12-2 p.m.—Luncheon
3:30-5 p.m.—Track sessions
6-7:30 p.m.—System ACE celebration

Tuesday, March 18
7:30 a.m.-4 p.m.—Registration open
9-10:30 a.m.—Track sessions
10 a.m.-4 p.m.—Exhibit hall open
3-4:30 p.m.—Track sessions
6:30 p.m.—Gala dinner dance and awards

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Satellite Inc.), "Remote control problems/ solutions."

Tuesday, March 18
9-10:30 a.m.

- Consumer products—Making them work with cable

Moderator: Ed Tingley (EIA). *Speakers:* Richard Merrell (Zenith Cable Products Division), "TAC Timer"; Michael Long (Zenith Cable Products Division), "The VCR interface"; Graham Stubbs (Oak), "User friendliness of baseband converters"; Arie DeJong (Oak), "Time shifting—Easy to use event programming"; and A.E. Vigil (Oak), "Development of a baseband decoder compatible with EIA interface standard for cable receivers and decorders."

- Signal leakage monitoring: Airborne techniques

Moderator: Roy Ehman (Storer Communications Inc.). *Speakers:* Leslie Read (Sammons), "Airspace measurement of CATV system CLI"; Jay Staiger (Magnavox), "Quantifying RFI isolation"; plus two speakers from the FCC who will be discussing signal leakage.

3-4:30 p.m.

- Improving signal security

Moderator: William Riker (SCTE). *Speakers:* Karl Poirier (Triple Crown Electronics Inc.), "Off-premises switching: The scrambling alternative"; Hamid Heidary (C-COR Electronics Inc.), "An improved jamming technique for controlling CATV pay services"; Mohammed Mesiya (Times Fiber Communications Inc.), "Mass descrambling for hybrid addressable systems"; Michael Jeffers (Jerrold Division/ General Instrument), "Hard encrypted video and audio scrambling systems"; and Graham Stubbs (Oak), "New approaches to securing basic services."

- Operations considerations

Moderator: Scott Tipton (Heritage Cablevision). *Speakers:* James Wonn (Group W Cable), "Enhanced TV: Can cable deliver?"; Lawrence Engdahl (Times Fiber), "Mounting off-premises converter enclosures to Bell construction practices"; Kenneth Eichelmann (Jerrold Division/General Instrument), "Two-way cable optimization"; Dan Pike (Prime Cable), "On the use of high-efficiency power supplies"; and Frank Little Jr. (Scientific-Atlanta), "The design of a high-efficiency CATV trunk power supply."

Wavetek profits up

SAN DIEGO—Wavetek Corp. reported net income of $741,000, or 8 cents a share, on sales of $17,893,000, for the fiscal first quarter ended Dec. 28, 1985. This compares with net income of $241,000, or 3 cents per share, on sales of $19,927,000 for the same period the previous year.

Commenting on these results, John Battin, president and chief executive officer, said, "We are pleased with the determined effort of all employees and the new management team to return Wavetek to profitability in early fiscal 1986—a goal we set in July 1985." Wavetek produces a broad line of electronic test and measurement equipment and related products.

R.L. Drake Co. ends search for merger

MIAMISBURG, Ohio—Following a six-month exploration of merger and acquisition options, the R.L Drake Co. has decided to remain an independent, privately held firm.

"During the past few months we've looked at a number of different opportunities to be acquired by or to merge with another company," noted Chairman Peter Drake and President Ron Wysong. "However, none of these offers were to our liking. After weighing all our options, we've concluded that it's in the company's best interests to retain our independence."

Aspect ratio: Cost vs. art

By Isaac Blonder
Chairman, Blonder-Tongue Laboratories Inc.

Aspect ratio is a term commonly associated with the linear rectangular scan in a television system, describing the fixed relationship of the width to the height. Throughout recorded history, mankind has exhibited preferences for various ratios in all fields, particularly the graphic arts.

Human vision capabilities are the foundations for the many-faceted ratios adopted in the past. The subject of human vision has been investigated in depth and electronic designers have ample literature on the subject to guide their electronic systems to fit the vagaries and preferences of the human psyche. Briefly, some of the human visual characteristics that impact the aspect ratio decision are as follows:

- *Isotopers of the retina*: Isotopers are irregular egg-shaped concentric lines of equal threshholds of discernability. The ratio is roughly 1.2:1 of the horizontal to the vertical.
- *Color fields*: The color fields for equal subjective intensities are about 1.3:1.
- *Visual acuity*: Horizontal to vertical ratio is about 1.5:1. The muscular structure of the eye favors horizontal motion over vertical.

Viewers of both movies and television tend to position themselves from the picture at a distance where the graininess of the film or the scanning lines are just invisible. Thus, the viewer is usually seated away about eight times the height of the picture tube for the NTSC 525 line presentation, three times the height of the motion picture screen and also three times the height of the proposed high definition television (HDTV) systems.

Pythagoras was credited with creating the earliest recorded pleasing ratio of the horizontal to the vertical with the dimensions of rectangles, 2:1.

Later came the "divine proportion" of 5:3, then the "dynamic symmetry" of 5:1 and finally the "golden section," 1.618:1. Experiments on observers showed some variation of the golden rule, but the average followed the mathematical formula $a/b = b/(a+b)$ where a and b are the shorter and longer sides of the rectangle.

Visually pleasing furniture dimensions also were investigated and one early study by A. Van Dyck detailed 27 "powerful" ratios in the range of 1:1 to 3.618:1. Sixteen were called "most powerful" ratios. The lesson to be learned from the Van Dyck article, as well as from the earlier ratios, is that there is no one universal absolute that must be incorporated into the television scanning presentations.

The dominant format for motion pictures is 35mm, which has an aspect ratio of 1.375:1. Since the picture quality of 35mm (over 900 lines) is considerably in excess of the 525 line television system capabilities, 16mm film became the standard size for transferring the silver screen to the electronic screen. 16mm has an aspect ratio of 4:3 or 1.333:1. The majority of the TV pioneers of the '30s, both in the United States and abroad, employed the 4:3 ratio with the following exceptions: BBC and Scophony 405 lines (5:4), Baird 3-color (3:4), French 440 lines (5:4), German 441 lines (5:4), Italian 441 lines (5:4) and Russian 441 lines (11:8).

'To create an image of the same physical size...the cost to the average viewer is almost doubled'

Cost realities

With this abundance of information, the one subject overlooked by the researchers of today is economics. How much will one display format cost vis-a-vis another? Once a new art is established, the subsequent practioners of the art tend to reach towards perfection, forgetting to take into account the cost/benefit curve. Occasionally, the author of such a study may drop a casual remark that "in five years other scientists will reduce the production costs of his concepts to acceptable consumer price levels." There is also a well-known bias by the psychological scientist to use intelligent, pliable subjects (usually fellow researchers) whose reactions to the experiment often follow suspiciously Pavlovian paths to a predictable answer. The commerical designer, on the other hand, subjects his brainchildren to the uncaring hands of a randomly chosen panel of jurors who can usually break the unbreakable with surprising ease.

Now to return to the aspect ratio and the price one has to pay for increasing the numbers. At eight times the picture height, the visual angle subtended by the eye is only 10°. Yes, it is true that the visual angle must be increased to 20° or more to experience the sensation of oneness with the program. Cinerama and surround screens exploit the full human vision viewing areas of 80° vertical and 140° horizontal. We have all experienced the daredevil roller-coaster ride with those presentations. It's also important to remember, however, that the primary variable cost in the TV receiver is the diagonal dimension of the picture tube. For the round tube screen, 1:1 is the most efficient use of the phosphor. The reduction in screen area for a 4:3 aspect ratio is only about 5 percent.

Before we tackle the price differential between the different aspect ratios, one subterfuge in the television industry must be included. The TV manufacturer had to build in a horizontal overscan of 10-15 percent to protect against underscan caused by variability in electronic components and line voltage. The modern TV has low-cost voltage regulation, but to produce a television receiver capable of exact registration between the picture and the screen will measurably increase the price.

The television station is well aware of the TV overscan and accordingly, the "made for TV" programs keep all graphics and significant activities within the area limited to 90 percent of the vertical and 80 percent of the horizontal scene as framed by the camera lens. You can observe for yourself that many producers favor talking heads scanned from the forehead to the chin, probably in an attempt to create life size images on the small TV screen.

Thus, to create an image of the same physical size vertically as occurs with our present 4:3 aspect ratio, the new 5:3 ratio without overscan, when compared to the 19" set, requires a picture tube with a 26" diagonal. The average list price of the 19" table model today is about $300, a comparably featured 25" set is about $550, thus the cost to the average viewer is almost doubled for what I believe to be unimportant artistic values in the horizontally extended viewing areas created by the 5:3 format.

Movie sized and HDTV formats are not considered here because they consume excessive chunks of cable bandwidth.

Before ATSC mandates the 5:3 ratio, I hope it will conduct some consumer surveys to see if their lauditory comments on 5:3 are shared by the common man, once he is solicited to express his preference after viewing in his home environment the old and new formats, and the assault on his pocketbook.

I predict 4:3 will be the winner!

Reader Service Number 47.

Connector installation for flooded semiflex cables

By Tim Dugan
Product Engineer, Times Fiber Communications Inc.

Special precautions must be taken when installing connectors on flooded cable in order to avoid jacket movement. This phenomenon is common to all manufacturers of flooded cables and is a result of the lubricating effect introduced under the jacket. Before looking at those precautions, however, let's first review some of the special properties of flooding compounds.

The primary use of a flooded cable is for additional corrosion protection. This extra protection is desirable in burial applications and under certain conditions for aerial installations. Currently, Times Fiber uses two types of flooding compounds.

Flooding compund types

Polyisobutylene is used for semiflex burial cable because its permanent fluid properties allow it to cold flow inside the cable jacket. In applications such as cable burial, where jacket damage is always a major concern, the flooding compound can actually provide a seal by filling in the damaged area. A lower molecular weight polyisobutylene with more viscosity is used for drop burial cable. This flooding compound will flow readily within the interstices of the cable's outer braid. (Vistanex brand polyisobutylene is one of several that are available.).

Black asphaltic flooding compound is usually specified for jacketed aerial applications where additional corrosion protection is desired. Unlike the compounds used in burial cables, the asphaltic material has the limited flow properties necessary to prevent the flooding compound from dripping onto the underlying areas. (Farboil brand asphaltic tar is one of the several types that are available.)

In addition to the required viscosity and flow properties, flooding compounds are chosen for compatability with the cable materials used and for overall chemical, oxidation and UV resistance. Flooding materials are also compounded for high tackiness to aluminum, polyethylene and PVC.

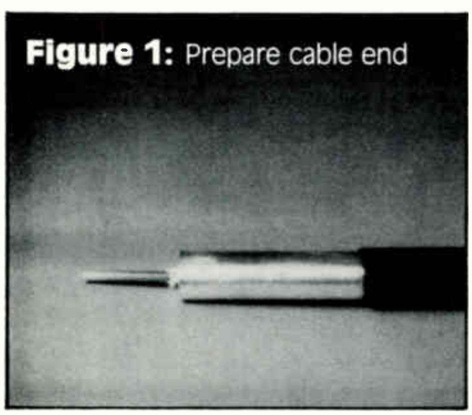


Figure 1: Prepare cable end

Figure 2: Install connector and hose clamp over jacket

Figure 3: Slide heat shrink tube over connector and clamp

Figure 4: Apply heat and shrink tube on cable

> *'The jacket, if not restrained to the sheath...can move anywhere from a few inches to as much as 10 inches'*

Avoiding jacket shrinkback

Since the underground flooding compound is designed to have good cold flow properties, the jacket, if not restrained to the sheath by some external means, can move independently to relieve the normal longitudinal stresses that are built in during the jacket extrusion process. This condition usually makes itself known by means of jacket shrinkback, where the unrestrained jacket can move exposing anywhere from a few inches to as much as 10 inches, thus leaving the aluminum vulnerable to the environment. As indicated, this phenomenon is inherent in the jacket extrusion and will be experienced by any manufacturer using an appropriate flooding compound under the polyethylene jacket.

As the area around the connection may be exposed to water submersion or a corrosive atmosphere, precautions should be taken to prevent the shrinkback, and to protect the aluminum sheath. While heat-shrinkable tubing offers good protection of the exposed aluminum sheath on standard jacketed cables, it may not be sufficient to prevent jacket shrinkback on flooded versions. The following method supplements the shrink tubing and provides a reliable solution.

1) Prepare the cable end per the connector installation instructions (Figure 1). An important step to remember here is that the installation of the connector requires the removal of the flooding compound from the aluminum sheath. Times Fiber has evaluated several removal agents and has found that pre-packaged cleaner wipes, Scotchcast Brand 4415 manufactured by Telcomm Products Division/3M, worked very well. The cleaning agent was safe, easy to work with and did not damage the cable.
2) Slide a common hose clamp over the jacket and tighten. Care must be used to avoid excessive tightening which could degrade the electrical properties of the cable. Install the connector (Figure 2).
3) Slide heat-shrink tubing over the connector and clamp (Figure 3).
4) Apply heat and shrink down tubing onto cable (Figure 4).

Data communications and CATV

This is the third article of a four-part series on data communications and CATV. Having given the background of data communications and cable-based networks in the previous two articles, we are ready this month to have a look at applications. We will describe some typical applications and present arguments for implementing them with a broadband cable-based approach. Some of these applications will be illustrated with case histories. This article will conclude with a summary of the major LAN and broadband data communication product vendors and their offerings.

By Richard J. McKeon
Director of Data Products

And Terry A. Stanard
Dumbauld & Associates

The applications of data communications on broadband systems are many and varied. We are continually seeing new possibilities for cost-effective solutions to customer needs using a cable-based approach. Thus far, the typical applications include: 1) host-to-terminal communications, 2) factory automation, 3) telephone bypass, 4) smart buildings, and 5) remote headend telemetry.

Host-to-terminal communications

Data communications are most commonly required in support of a terminal population. Terminals can take many forms. Typically they take the form of video terminals or printers, but other technologies such as plotters, bar code readers, digitizers, magnetic strip readers and voice-activated terminals also require connectivity to a host computer.

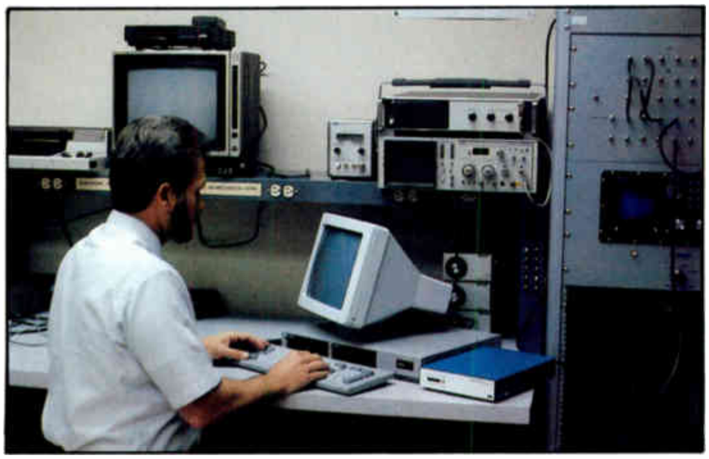
We have been working with Don Cook of the city of Scottsdale, Ariz., and Ted Grycell of United Cable to remote terminal clusters on the city's computer. The application is a polled, multi-drop environment. Each port of the computer can support a cluster of up to 10 terminals. As shown in Figure 1, local distribution within various city buildings takes place with short-haul line drivers, and each terminal cluster has connectivity back to the host with a pair of synchronous point-to-point modems via the CATV network. The RF modems attached to the cable replace voice frequency modems on 3000-type leased telephone lines.

The advantages here are in reliability and cost. The bit error rate on the cable is much lower than on the telephone lines, and 9,600 BPS RF modems cost about $960 each. The comparable voice frequency modems cost $2,450 each. The city is paying about $70 per month for each leased telephone line. While exploring some of the options available, a microwave link between two points was considered. This link alone would cost about $100,000.

It should be apparent that this project holds considerable opportunity for the city, the cable operator and the modem vendor. I must stress, however, that proper marketing and support are essential. As a case in point, we will be installing a short-haul microwave system for a different city government who was using their CATV system, but is "getting off the cable" because they are dissatisfied with the level of support they have received. They don't even want to keep it as a backup in case the microwave link goes down. Instead they feel it is worth the cost to go with a hot standby, automatic switch over and backup power.

Factory automation

Many large manufacturing companies are using broadband cable to do data acquisition and machine control functions on the factory floor. General Motors' new manufacturing automation protocol (MAP) project should help produce standards and multi-vendor compatibility in this area. We are working with a large industrial customer who will be installing and testing a variety of machines on the production line. No matter what form their applications finally take, they will be based on a broadband LAN. We are using our experience in CATV to help us migrate into design and construction of factory LANs.



'An efficient and fairly inexpensive method of remotely monitoring headend levels by using RF data transmission is now in use'

Telephone bypass

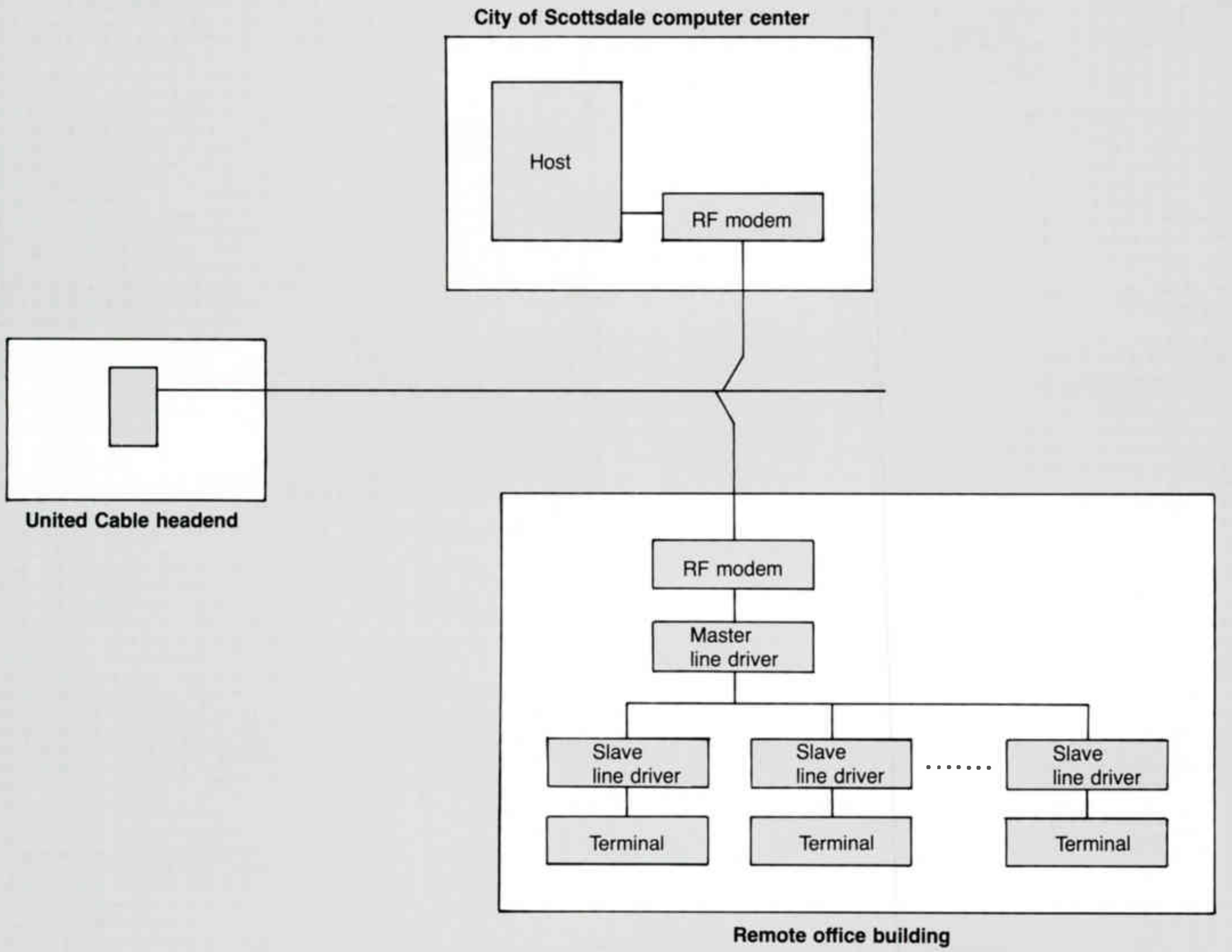
The least expensive T1 circuit will cost about $800 per month from the telephone company, and they are not readily available in many parts of the country. This is the driving force behind the current popularity of 23 GHz microwave radio communication. It also should be a driving force toward high-capacity data links or remote PBX links via cable. Many of the vendors mentioned later in this article provide T1 RF modems. We are proposing a T2 microwave link for a customer in a neighboring city, which will cost them about $50,000. Can it be done for less on cable? Absolutely! The customer would like to explore all the options. Does the cable operator see the potential and is he excited about this possible revenue source? We'll find out when I can get someone there to return my call.

The smart building

The intelligent or "high IQ" building has received much publicity recently. I see more magazine articles than purchase orders crossing my desk in this area. The real estate market in Phoenix is very competitive and many office spaces are vacant. Building owners are looking at the bottom line and can't be sold on the concept just because it is "high tech." We have found that owners of multi-tenant office buildings can't charge much more than the going rate per square foot of office space no matter how intelligent the building is.

Most builders need to be shown how a network in their building is going to pay for itself and make them money. I was told by one builder that he couldn't put another dollar into his new building, but if I was sold on the idea, I had his permission to install a network and keep all the money I made on it. We did not install a broadband cable plant in that building. Now, I don't want to sound too negative with respect to the smart building concept. We are installing a cable plant in a high-tech building. The owner isn't sure how the tenants will use it, but he is convinced that they will. Features such as shared computer resources and peripherals, environmental control, security, electronic mail, video

Figure 1: Remote terminal cluster via the CATV network



conferencing, shared facsimile and telex, access to public data networks and links to CATV services are all valuable. They offer the developer a wider prospective tenant base, increased property value, the opportunity to resell service and reduced operating cost. The potential also is there for him to act as a one-stop shop or broker for telecommunications equipment and services.

From the tenant's point of view, having these services available could reduce capital investments and eliminate start-up delays, offer new opportunities for small companies to enjoy more advanced systems and the simplicity of viewing the developer as a single point of contact for a wide scope of communications services. But someone has to put the whole program together. In the same way that a network is not a one-step solution to all problems, the smart building is a very broad concept, which is being implemented in a piecemeal fashion. There are companies who specialize in this type of construction and who have a more or less full package of tenant services to offer. There is opportunity here for broadband networks.

Remote headend telemetry

An application that we are very excited about and have had quite a bit of success with is that of remote headend telemetry. The use of RF data transmission is certainly not limited to use by second parties. An efficient and fairly inexpensive method of remotely monitoring headend levels by using RF data transmission is now in use.

Figure 2 provides a block diagram of the headend monitor portion of the telemetry package. A computer is used to steer a programmable signal measurement device and acquire the video and audio levels from the headend. The level data is then fed to an RF modem, the output of which is combined with the headend signals.

The bandwidth of the RF output from the modem is approximately 25 kHz. A frequency is selected to place it slightly above the audio carrier of a channel in use in the system, and the level is comparable with the audio. This method allows the data to be transmitted even if microwave distribution is in use. The chronograph allows the testing to be performed at specific times. The printer is a convenience for someone working at the headend and would not be used during normal monitoring of levels.

The remote receiving portion of the headend monitor, shown in Figure 3, is placed at any location within the system. A companion RF modem picks up the headend data and feeds it to a second computer. After all of the data has been received a detailed report of current headend levels is printed.

None of the equipment used for headend telemetry need be expensive, including the computers. We have used this diagnostic system with good success, and feel that it has universal application. We are currently in the process of expanding its functions to include dry contact closure or level sensitive alarm conditions, which might include intrusion, fire, over-current or over-voltage conditions. The potential is

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Figure 2: Headend telemetry, headend monitor

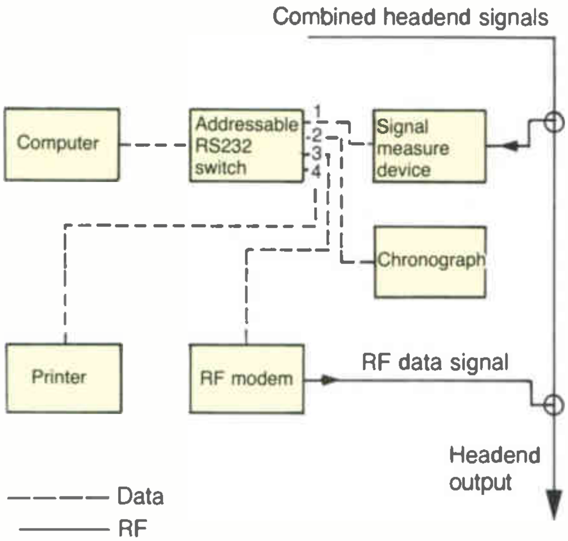
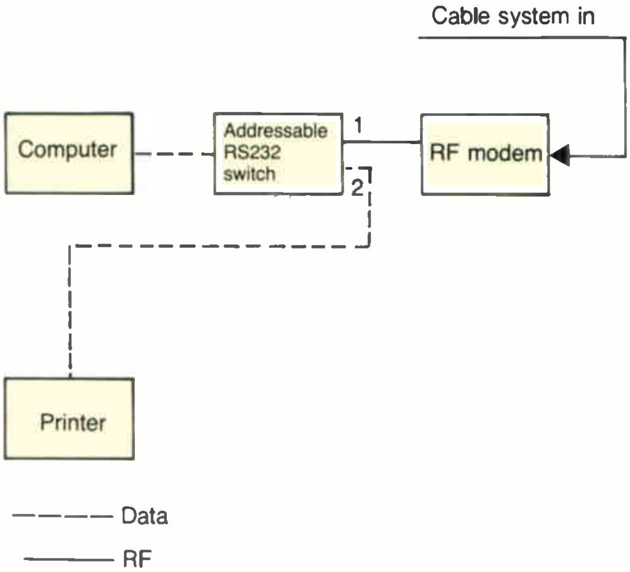


Figure 3: Headend telemetry, remote monitor



open ended. We'll have more to say about this in next month's article in which we will share some of our speculations about the future of CATV.

The preceding examples have hopefully stimulated your thinking and will help point you toward other applications. These might involve energy management, fire control or security within a building, or video conferencing. We typically think of broadband and CATV network applications as being only for large customers, but broadband systems can be small. What's wrong with remoting a few terminals with some point-to-point modems? It is a start, and could serve as a reference account.

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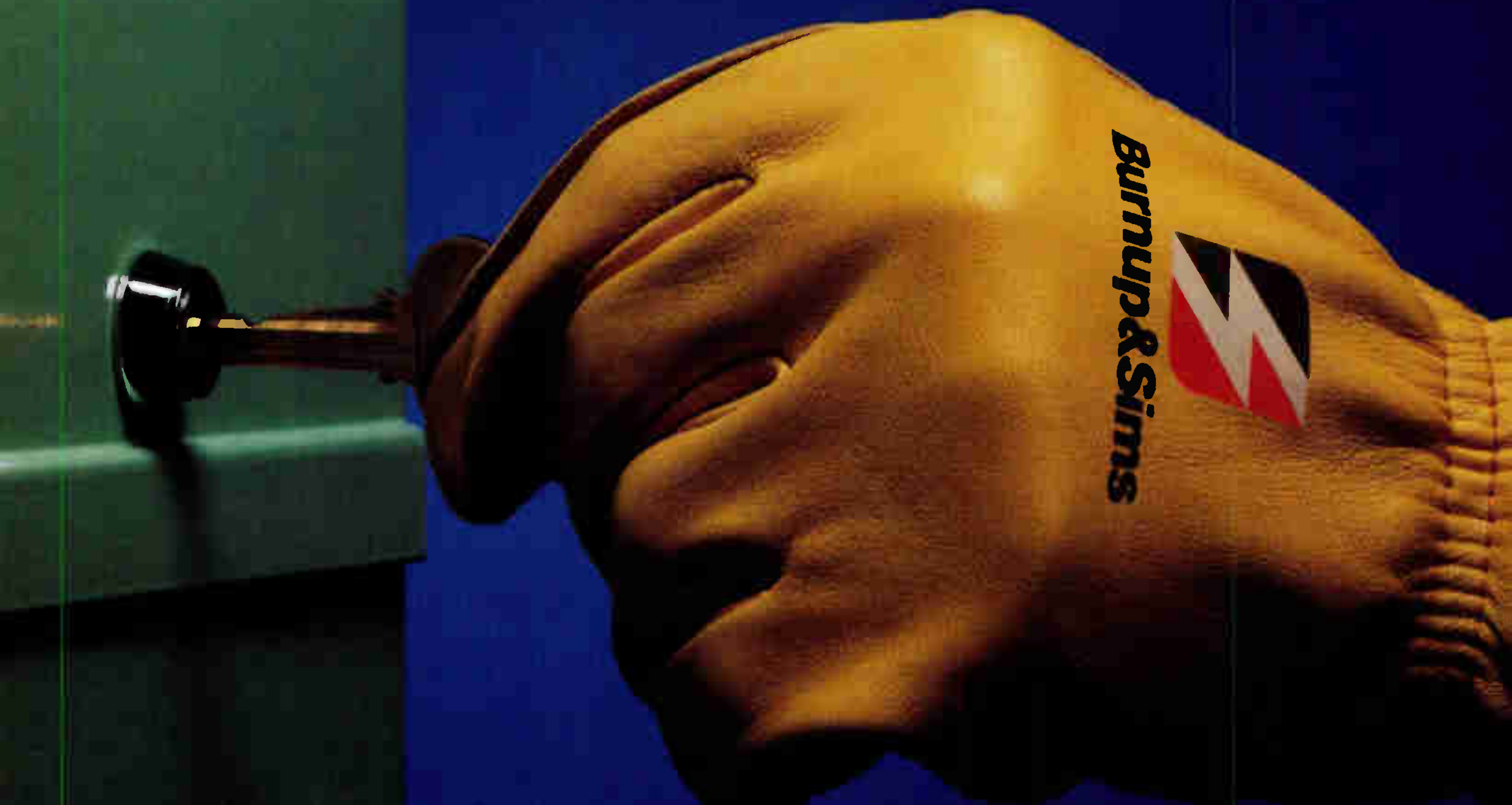

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Mountain View, Calif. 94043
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Yonkers, N.Y. 10701
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Codex Corp.
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Corvus Systems
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(408) 559-7000

Digital Equipment Corp.
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Maynard, Mass. 01754
(617) 897-5111

Equinox Systems Inc.
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Miami, Fla. 33186
(305) 255-3500

Excelan Inc.
2180 Fortune Dr.
San Jose, Calif. 95131
(408) 434-2300

Fox Research Inc.
7005 Corporate Way
Dayton, Ohio 45459
(513) 433-2238

Gateway Communications
16782 Redhill Ave.
Irvine, Calif. 92714
(714) 261-0762

Interactive Systems/3M
225-3 3M Center
St. Paul, Minn. 55144
(612) 736-3035

Intercontinental Micro Systems Corp.
4015 Leaverton Ct.
Anaheim, Calif. 92807
(714) 630-0964

Micom-Interlan Inc.
155 Swanson Rd.
Boxborough, Mass. 01719
(800) 526-8255

Nextar Systems Corp.
2585 E. Bayshore Rd.
Palo Alto, Calif. 94303
(415) 493-2223

Novell Inc.
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Orem, Utah 84057
(801) 226-8202

Orchid Technology Inc.
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Fremont, Calif. 94539
(415) 490-8586

Proteon Inc.
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1365 Shorebird Way
Mountain View, Calif. 94039
(415) 961-9602

Ungermann-Bass Inc.
2560 Mission College Blvd.
Santa Clara, Calif. 95050
(408) 496-0111

Wang Laboratories Inc.
1 Industrial Ave.
Lowell, Mass. 01851
(617) 459-5000

Broadband data product vendors

Catel Telecommunications
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(408) 988-7722

Fairchild Data Corp.
350 N. Hayden Rd.
Scottsdale, Ariz. 85257
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Lantel Corp.
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Norcross, Ga. 30071
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Phasecom Corp.
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Scientific-Atlanta Inc.
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Zeta Laboratories Inc.
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Santa Clara, Calif. 95051
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Who's doing what?

There are many vendors offering fine and competitively priced LAN and broadband data equipment. For your reference and further research, we have compiled a listing of some of these vendors. Although the accompanying list is by no means complete (I apologize in advance to those we may have left out), I need to emphasize that we are writing this article from an unbiased point of view and the vendors discussed here are, in our opinion, simply typical of their industry and not necessarily preferred. With that said, let's look at a few of them.

Interactive Systems/3M is just in the process of being purchased by Allen Bradley. This transaction should strengthen and broaden an already well-developed broadband LAN product line. At this time, Interactive Systems/3M offers products including LANs, point-to-point and multi-drop RF modems, channel converters and automatic protection switches. Its LAN/I offers any point to any point connectivity on a broadband cable plant via network interface units (NIUs) at asynchronous data rates up to 19.2 kBPS. The LAN/PC product consists of an interface board that occupies an expansion slot of an IBM compatible PC together with software to provide networking functions. LAN/II is a new MAP standard product capable of high-speed synchronous data transmission.

Ungermann-Bass offers a variety of products in its Net/One series that run on optical fiber, thin coaxial baseband cable (RG58A/U), Ethernet baseband cable, and broadband CATV cable systems. The broadband NIUs occupy standard 6 MHz channels and transmit at 5 MPBS. Net/One offers a variety of NIUs ranging from a modular, expandable unit, which connects as many as 24 devices, to fixed-function units supporting one to eight devices, to a "Personal NIU," which plugs into an expansion slot in a PC.

Catel Telecommunications is a division of United Scientific Corp. It offers a full line of broadband communication products for video, audio and data, including headend equipment. The firm also has published many interesting and useful technical articles and application notes.

Scientific-Atlanta is another full-line broadband communications company that produces an excellent product. As with Catel, S-A has published a number of informative tutorials on communications. I have found the people of Scientific-Atlanta to be cooperative and helpful. It is refreshing to find people who are willing to spend some of their valuable time discussing applications and answering questions.

Summary

This month we have examined some applications of data communications on broadband and CATV systems. It is our hope that these examples will stimulate you to dig further and uncover more opportunities. The vendors listed in this article have been very cooperative, and are willing to assist in every way. In many ways they are real partners in developing this market. Next month in our concluding article we will present an overview of where we have come from, where we are now and where, with imagination and diligent hard work, we might go from here.

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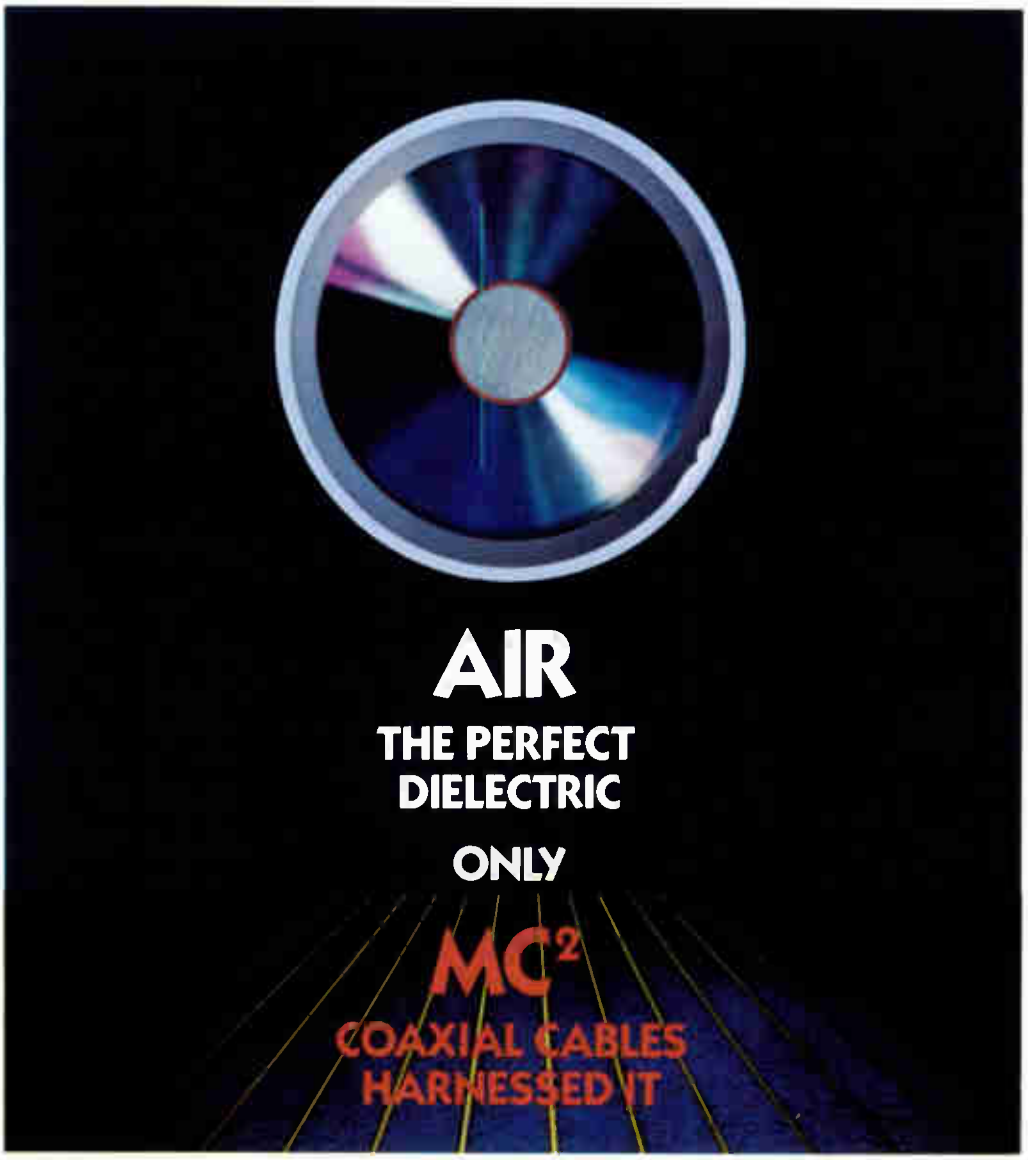

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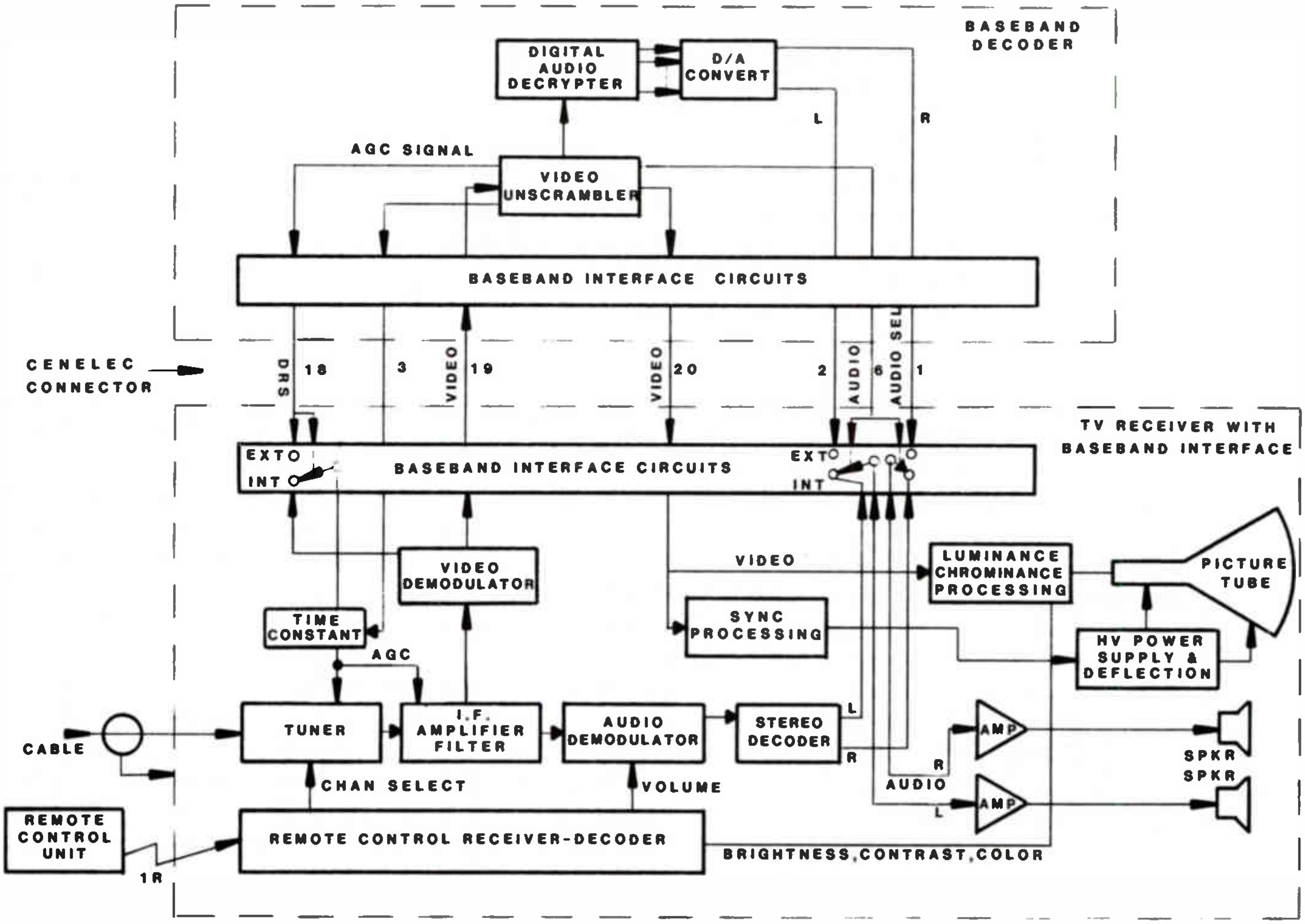
Figure 1: Basic baseband cable decoder and TV receiver functions



IS-15 points the way to the cable-ready set

Imagine a world in which most television receivers could select all cable channels. What if such sets, capable of tuning scrambled channels, could be equipped with a standardized interface to a decoder-only device? The economic impact on the cable business would be tremendous. Minimal numbers of converters would be required. Much reduced decoder costs would change completely the economics of cable addressability. Many more systems would be able to cost justify highly secure encryption-based scrambling systems. The consumer would benefit from a compatible video "component" system that would be much easier both to hook up and use. But of course this isn't today's world. It could, however, be in the future of cable—but only if some joint NCTA/EIA technical developments receive strong economic support from cable operators.

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

Television receivers are being manufactured in increasing numbers with cable-channel tuning capabilities. Through the efforts of a joint NCTA/EIA committee (The Cable Interface Working Group) good progress has been made on the RF interface of cable and receivers with agreements on channel plans, channel identification and shielding against direct pick up. But television receivers that are merely capable of selecting cable channels are not cable-ready when it comes to scrambled channels.

Another EIA committee (with NCTA support) has been working on the problem of receiver compatibility with signals that must be descrambled, and has reached an interim standard that defines the interface between video devices (see reference 1 at the end of this article). While the standard is aimed at the television receiver/decoder interface, it is equally applicable to VCRs and other home video (and audio) components.

'There are some good signs already—manufacturers of decoders and receivers are working together, one on one'

The committee

Some time ago, the Television Systems Committee (see reference 4) of the Electronic Industry Association's (EIA) Consumer Electronics Group formed a separate committee to look at the problem of compatibility between television receivers and cable decoders. It is this Interface Working Group that subsequently defined and specified the interim standard now known as IS-15. (It should be noted that EIA has yet to vote on the adoption of IS-15.) The committee has been chaired by Jim Hettiger (RCA) and guided by Tom Mock, EIA's permanent representative. As EIA is a body representing the consumer electronics industry, the strongest participation in the committee has been by television receiver manufacturers. Nevertheless MSOs and cable equipment manufacturers have participated actively and enthusiastically. The dialogue started within the group has resulted in the development of technical working relationships between decoder manufacturers and several of the television receiver manufacturers.

Baseband interface

The approach selected by the Interface Working Group defines baseband audio and video signals together with appropriate control busses and an AGC signal. Such signals are relatively standard, and the committee anticipated that the same interface could be used with other television peripheral devices (e.g., video discs, video tape recorders, teletext decoders, DBS decoders and personal computers) in addition to cable decoders.

The approach adopted is illustrated in Figure 1. The television receiver includes all of its normal consumer features plus interfacing circuits. Functionally, the decoder is much simpler than the converter/decoders commonly used in cable systems, but it too is provided with interfacing circuits. These interfacing circuits normalize the baseband audio and video signals and generate control signals that are exchanged between the receiver and decoder.

Channel selection is performed by the television receiver's tuner. Baseband video from the receiver's video demodulator passes through the receiver interface circuits and is sent to the decoder. Both scrambled and clear video signals are handled in the same way.

The decoder receives its video through its interface circuits and passes it to its internal video descrambler. The output from the video descrambler circuit is then returned to the television receiver through a similar path. Clear signals pass through the decoder without modification. The baseband video signals passed back to the television receiver are in standard NTSC (CCIR-M) format for both clear and (authorized) scrambled channels.

The decoder also generates control signals that the receiver uses to determine AGC operation and audio source selection, dependent upon whether a received signal is clear or scrambled. In the clear-channel mode, receiver AGC is developed internally and audio is derived from the receiver's internal demodulator. For scrambled channels, AGC is derived from the decoder; the audio itself also may be provided by the decoder if the sound channel is encoded.

The Cenelec connection

The IS-15 interim standard specifies a 20-pin Cenelec connector (see Figure 2), a type already widely used in other countries for video interfacing. The interim standard specifies the type of connector to be provided on television receivers and decoders as well as the functions of 18 of its 20 pins. The length of the interconnecting cable is limited by the standard to a maximum of two meters. Four interface variations are defined:

a) Monaural + composite video
b) Stereo + composite video
c) Monaural + composite video + RGB
d) Stereo + composite video + RGB

Equipment manufactured to any one of these four variations will be required to be clearly labelled as to function.

The video connections between decoder and receiver are:

Pin 19: Video signals (clear or scrambled) from receiver to decoder.
Pin 20: Video signals from decoder to receiver (standard video for clear channels and authorized scrambled channels).
Pin 18: Video/AGC signals from decoder to

receiver depending on mode: 1) video same as Pin 19 during the acquisition mode; 2) DRS (decoder restored sync) for AGC when receiving a scrambled channel; and 3) level high when receiving a clear channel.

When the decoder generates audio signals (in monaural operation the same signal appears on both pins) the audio connections between decoder and receiver are:

Pin 2: Left channel audio from decoder to receiver.
Pin 6: Right channel audio from decoder to receiver.

The control signals between decoder and receiver are:

Pin 1: Signal from decoder to receiver to select audio source (normal TV audio or decoder-generated audio).
Pin 3: Signal from decoder to receiver to select slow, fast or normal receiver AGC time constant.
Pin 14: Signal from receiver to decoder indicating a channel change or power interruption.

Technical problems

Once the first draft of the interim standard was completed, decoder manufacturers and television receiver manufacturers developed prototypes of equipment to meet the draft specifications. As these prototypes were interfaced in actual tests, two technical problems emerged (as anticipated): AGC operation and differences in video DC reference levels.

- *AGC problems*—Television manufacturers vary in their philosophy and methods of achieving AGC. There are variations in loop gain and loop time constants and in the types of detectors used. The television receiver can't use detection of a scrambled signal for AGC and yet the receiver's tuner and IF circuits must be gain-controlled to optimize signal-to-noise ratio and to avoid overload distortion. Thus the committee decided to split the AGC loop function, with the decoder providing the means to sense the level of a scrambled signal, and the gain-controlled elements being within the television receiver.

In the best of conditions the design of a feedback loop for AGC is a complex undertaking. Splitting the loop into two parts, with each to be manufactured independently, resulted in surprises for both decoder and receiver manufacturers with some lessons for each in the functioning of the other's circuits.

The decoder develops a signal (decoder restored sync, or DRS), which is representative of the amplitude of the received scrambled signal. This signal is sent to the receiver where it is low-pass filtered and compared with a reference signal to generate an AGC error correction voltage—used to control the gain of the receiver's tuner and IF circuits. After initial acquisition the AGC loop settles at a level where the output of the decoder's sample-and-hold circuit equals a decoder reference. With everything operating correctly this corresponds to an optimum video level for decoding and optimum IF signal levels for the receiver.

When a scrambled channel is first selected by the receiver, the decoder (receiving a scrambled video signal of uncertain amplitude) requires some time to recognize the scrambled signal and lock onto some characteristic representative of video amplitude. During this mode, the loop time constant is deliberately set in order to give the decoding circuits time to achieve lock. Once the decoding circuits recognize a scrambled signal and lock onto it, the loop time constant may be shortened to permit tracking the normally expected fluctuations in signal amplitude. To achieve a stable feedback loop (consisting of circuits in both the receiver and decoder), the cumulative effects on the phase margin of the AGC system from the combined transfer functions of both must be carefully controlled. The selectable time constant circuits are within the receiver but are controlled from the decoder.

- *Video level variations*—Variations in the absolute level of the video signals delivered to the decoder by different receivers presented a severe problem for some of the early prototype decoders. The various scrambling systems employ reference signals within the video waveform from which the DRS signal is derived. A decoder using a single absolute level within this reference signal is sensitive to level errors and will translate such variations into an error in the DRS signal. Errors in the absolute level of the video reference signal can easily occur due to demodulator DC offsets or nonlinearities, or both.

At Oak Communications, it was found that excellent tolerance to such sources of errors could be obtained if two reference signals were incorporated into the scrambled video signal. With two reference levels and with a properly designed differential circuit, the amplitude measurement of the scrambled video waveform can be obtained accurately, while largely ignoring absolute DC levels common to both received references.

The baseband-only decoder

Oak and other manufacturers of decoders and receivers developed prototypes for compatibility testing. The prototypes were developed originally to test the concepts outlined in the interim specification, and were brought (along with associated encoding equipment) to the three tests held in Denver last year.

At the Western Cable Show this past December, prototypes of Oak's Sigma baseband-only decoder were shown working together with a receiver modified by Sony to the interim specification. This was the first public demonstration of equipment designed to meet IS-15. (A detailed description of the development of a baseband decoder compatible with the IS-15 specification is given in reference 4.)

The Denver tests

During 1985 three multi-supplier tests of the proposed IS-15 standard were conducted. In January, June and November successive tests demonstrated progress by representatives of the cable equipment and television receiver industries in mutually understanding the proposed specification, identifying technical and semantic problems, and in making a variety of decoders and receivers function together. Table 1 shows the participation with equipment in the three tests by representative companies.

The January test put together for the first time prototype equipment developed by four decoder manufacturers and five television receiver manufacturers. Perhaps the most astonishing aspect of this test was the degree of cooperation achieved between so many business adversaries in such a confined space (a modest motel meeting room). Each decoder was tried with each television receiver. Very few combinations worked at first. After modifications to receivers and decoders most combinations functioned after a fashion—but the modifications were not consistent. This valuable experience pointed up the following:

- There was a variety of interpretations of the proposed standard as written.
- Most problems were AGC related.
- There was a diversity of AGC loop gains—and consequently instabilities.

- There were persistent AGC acquisition problems on channel changes.
- There were large differences in DC offsets in the video delivered to decoders by different TV receivers.

By June the committee had revised the proposed interface to include decoder control of the TV receiver AGC time constant. Still, only a few decoder/receiver combinations worked the first time at the June tests, and more changes and adjustments had to be made to both receivers and decoders to correct AGC acquisition problems. The DC offset problem had been alleviated somewhat—but not yet completely solved. This test illustrated that the specification had still not developed to the point where receivers and decoders designed to conform to the specification would function properly together—but we were getting closer.

The November test saw a change in the mix of decoder manufacturer participants and the test for the first time of a baseband decoder of RF gated-sync-suppressed scrambled signals. This time the tests went much more smoothly with almost all decoder/receiver combinations functioning well. Perfection, however, was not achieved. Some combinations exhibited flicker and the time delay experienced between channel changes (even clear channels) was less than satisfactory. The test participants and other members of the committee drafted changes to correct these last problems and to clarify areas that were still subject to varied interpretations.

The remaining tasks

Just because there have been some relatively successful technical demonstrations of the proposed interface does not necessarily guarantee its successful commercial adoption. There is significant technical development yet to occur. Most importantly, a sufficiently powerful financial driving force has yet to be exerted.

The Denver tests were feasibility demon-

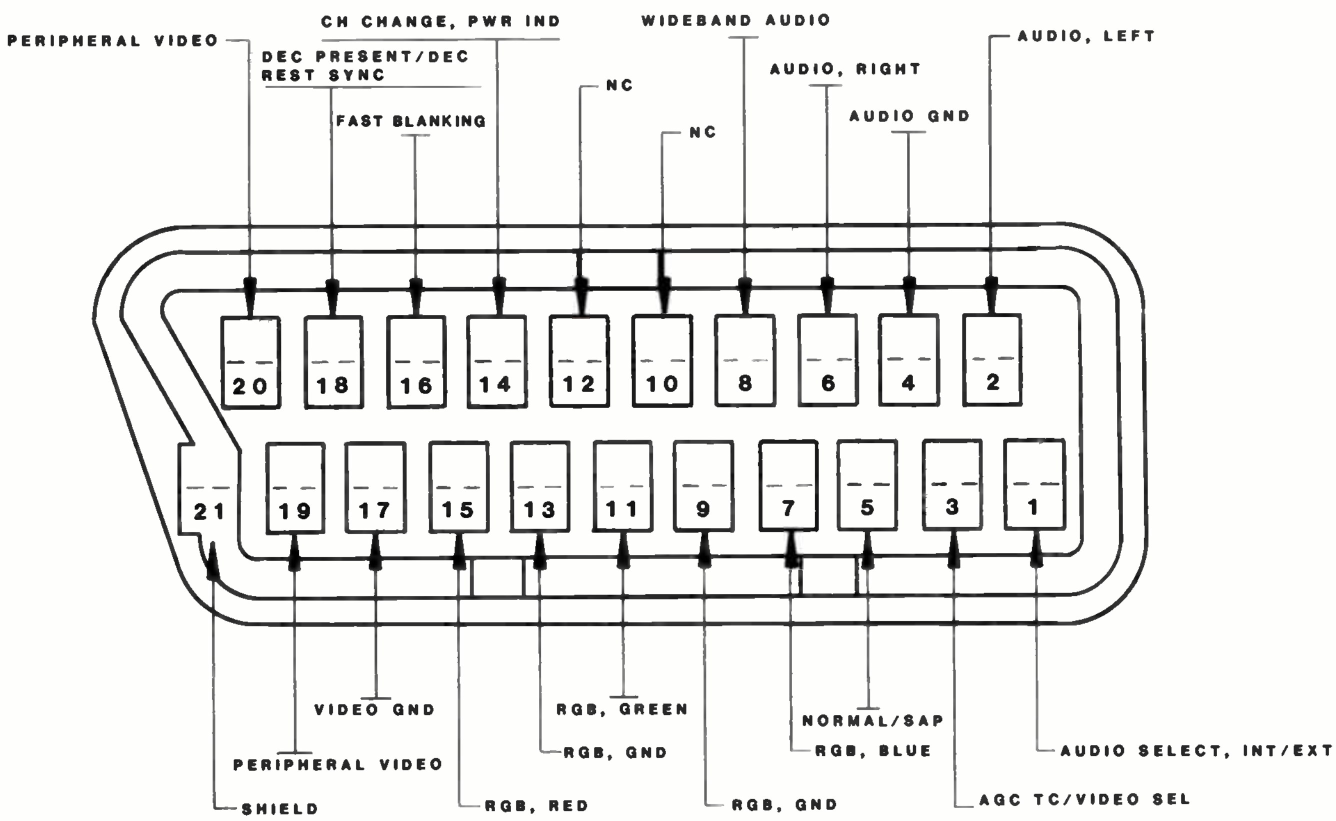
Table 1: Participants in the Denver tests

Companies/test	January	June	November
Decoder manufacturers			
GI/Jerrold	x	x	x
GI/Tocom	x	x	
Oak Communications	x	x	x
Scientific-Atlanta			x
Zenith	x	x	
Television receiver manufacturers			
Matsushita		x	x
Mitsubishi	x	x	x
North American Phillips	x	x	x
RCA	x	x	x
Sony	x	x	x
Zenith	x	x	

Note: Other manufacturers participated in discussion as did representatives of several MSOs.

Reader Service Number 21.

Figure 2: Cenelec connector



strations—not a conclusive proof that equipment manufactured to the interim standard is completely compatible. In fact there were still minor defects in the operation of some of the receiver/decoder combinations. These defects must be eliminated before the specification is acceptable. And because the successful operation of the interface depends upon combinations of equipment, it will take combinations of suppliers (i.e., a committee) to work the problems out. Additionally, as every supplier and user of equipment already knows, there must be extensive field trials of any equipment made to a new specification—in this case complicated by the need to have both decoder and receiver equipment tested together.

There are some good signs already—manufacturers of decoders and receivers are working together, one on one (see reference 3). Beyond the development and trial phases, however, there is need for final product designs by decoder and receiver manufacturers. Such final design work is very costly and is not very likely to occur unless suppliers sense a mutual commitment to produce IS-15 compatible equipment *and* a commitment by cable operators to make it worth everyone's time.

Who ultimately benefits from the IS-15 interface development? The beneficiaries will be the cable operator, who ultimately will need less capital tied up in fully featured converter decoders, and the subscriber, who will have a much simpler system to install and operate in the home.

The cable operator can influence the suppliers of decoders directly by conditioning the purchase of converter/decoders on a commitment by the decoder supplier to produce an IS-15 decoder-only product compatible with those suppliers' scrambling equipment. The interface, although it specifies baseband connections, is capable of working with signals that have been scrambled using *either* RF or baseband techniques.

The cable operator also can influence the television receiver manufacturer by providing a financial incentive to the subscriber to purchase an IS-15 equipped set. Such incentives, either one-time or continuing, are likely to be the strongest driving force to make the adoption of the interface happen on a large scale. Incentive-driven consumer demand is the only thing that will make IS-15 equipped receivers widely available.

The fate of IS-15 is now in the hands of cable operators—not the equipment suppliers. What is needed is operator, especially MSO, commitment to provide the incentives that will drive consumers to demand IS-15 compatible television receivers, VCRs and other consumer electronics equipment. Enlightened leadership by SCTE and NCTA can lead the way to resolution of the remaining technical issues, and to encouragement of creativity in providing the financial incentives to the cable consumer.

Now is the time for cable interests to step forward with the financial commitments and consumer incentives that are necessary if we are to enjoy a world of cable-ready equipment.

Acknowledgments

Acknowledgments are due to Tom Mock of EIA and Jim Hettiger, committee chairman (RCA), who have worked hard to achieve consensus among the committee participants. To Walt Ciciora (ATC) much credit must be given for the great increase in friendly and cooperative dialogue between the consumer electronics and cable industries. Walt Colquitt (ATC) was the host for the three very productive test sessions. My thanks are due to Art Vigil who has led Oak's participation.

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Figure 1: Hookup with VCR in front of converter

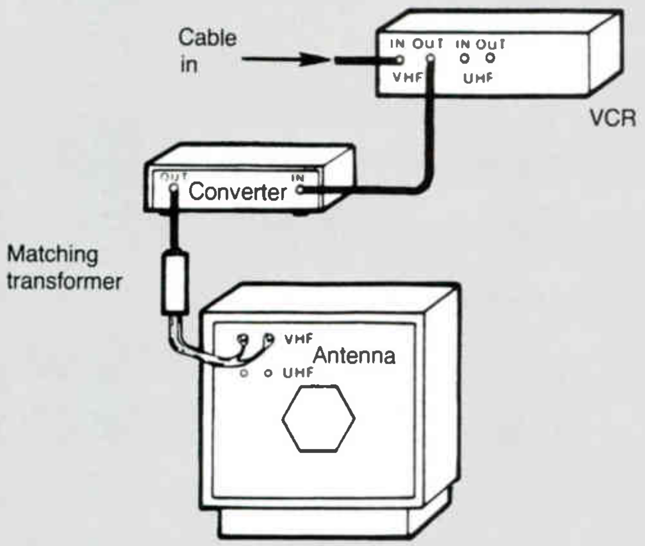
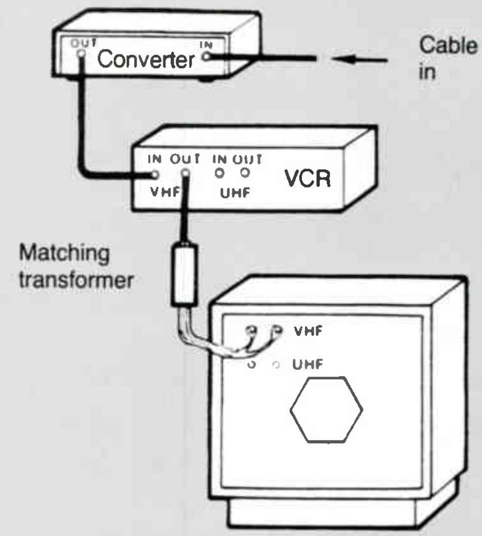


Figure 2: Hookup with converter in front of VCR



Interface options for cable

By Dave Wachob
R.F. Systems Engineer, General Instrument Corp
Jerrold Subscriber Systems Division

Interfacing a VCR to a CATV system can present some interesting problems for both the cable system operator and the subscriber. When handled correctly, the introduction of a video cassette recorder to a CATV environment can enhance, rather than degrade the subscriber's use of his or her cable services. With today's explosive growth of VCRs, it's particularly important that these issues be understood in order to deal effectively with any potential problems before they might arise.

The subscriber's dilemma

The immediate problem facing the CATV subscriber upon receipt of a VCR is how best to hook up the combined system of a converter, VCR and TV to his existing cable. Viewing and recording habits, ease of connection and re-connection, use of remote-control capabilities, baseband inputs or outputs, and any additional hardware that might be required to complete the installation must be taken into consideration at this point. In addition, factors such as the premium services selected by the subscriber, and whether they are scrambled or trapped can affect the configuration and any inherent cable-ready capability of either the VCR or TV. Finally, any limitations imposed by the combined VCR/converter/TV system need to be understood so that they can be accommodated according to the subscribers' particular needs.

Historically, the VCR interface problem has been attacked from a variety of angles with varying degrees of success by the MSOs, CATV equipment manufacturers, VCR manufacturers, subscribers and independent interface hardware manufacturers. These efforts range from letting the subscriber go it alone to making additional unique hardware available in order to maintain complete system flexibility and features. Somewhere in between those two extremes are handbooks to assist the subscriber in hooking up his VCR, possibly including presently available RF splitters and A/B switches.

Each of the above constructive approaches dealing with the VCR interface problem will be discussed separately, as well as thoughts on going forward and dealing with the problem in the future. Many possible solutions exist due to the myriad of products and features present in today's marketplace, more than could be contained in this article. In the interests of time and space, only the main concepts will be discussed here.

Possible solutions

In its most basic form, the addition of a VCR to a subscriber's CATV system can be accommodated in two straightforward approaches, illustrated by Figures 1 and 2.

'In reviewing the pros and cons of the four possible approaches, it is apparent that one solution to the interface problem would be a self-contained RF switcher product'

In Figure 1, the VCR is inserted in front of the converter, which is connected directly to the subscriber's television. Using this setup allows the user to independently record a clear channel while viewing a descrambled on either the same or a different clear channel. This is made possible through the VCR's internal RF splitter when the VCR is in the "TV" mode. In addition, if the VCR is a "cable-ready" model, all clear channels selectable by the VCR can be recorded, otherwise the user is limited to Channels 2-13.

Playback of a pre-recorded VCR tape is accomplished by tuning the converter to the output channel of the VCR (typically Channel 3 or 4), and tuning the television to the output channel of the converter. For the other recording/viewing scenarios, the appropriate channel is tuned on either the VCR or the converter with the television tuned to the output channel of the converter. Unattended program recording is also possible on all of the clear channels that can be selected with the VCR tuner.

Remote-control features associated with both the converter and the VCR remain functional, for both channel tuning and mode selections. For the TV, remote channel tuning is no longer applicable, although volume control is still usable if so equipped.

The biggest limitation of this particular configuration, in addition to the signal losses associated with the VCR's internal splitter, is the inability to record a channel descrambled by the converter. This can be overcome, however, through the use of a baseband converter by

Figure 3: Expanded setup with two-way splitter and A/B switch

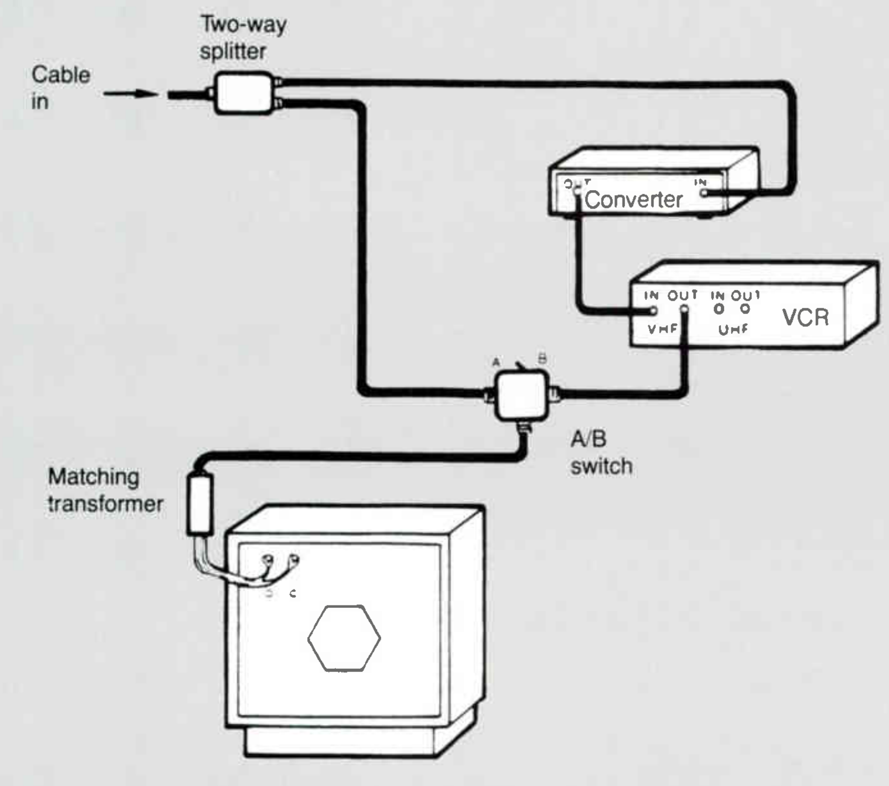
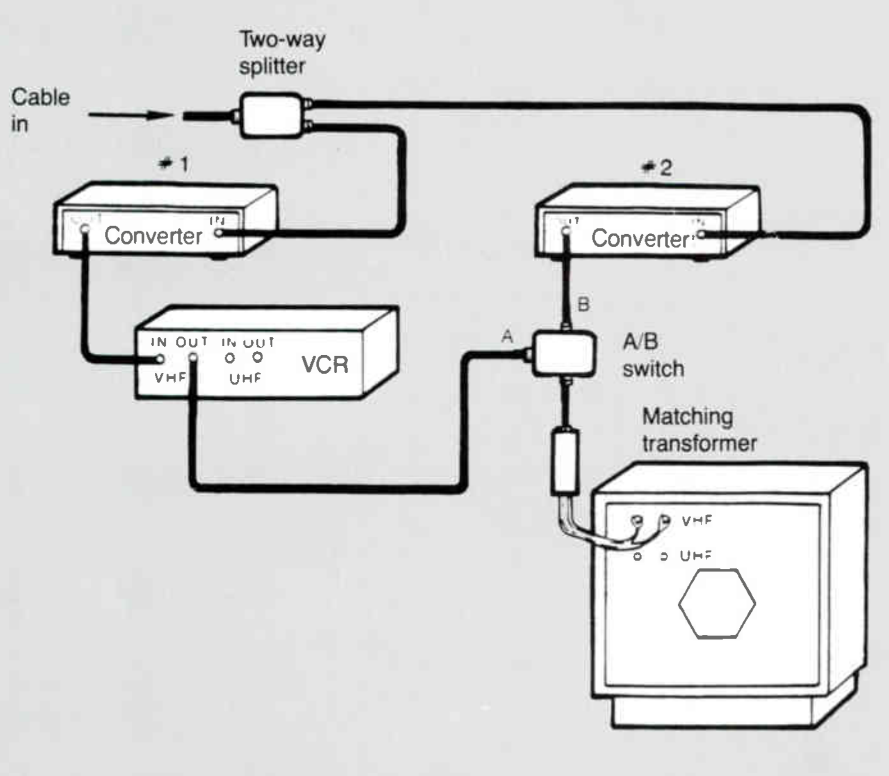


Figure 4: Expanded setup using two converters



looping the converter's baseband outputs back into the VCR's baseband inputs. This approach, in addition to requiring a baseband converter, also requires selecting baseband inputs as the VCR recording source, instead of the usual internal tuner source. Depending on the VCR model utilized, this input is selectable either manually at the VCR, or possibly through the remote hand-held device.

In order to record a descrambled channel using a non-baseband converter, Figure 2 is proposed, placing the converter in front of the VCR, which in turn is connected to the television. In this approach, all channel tuning is performed through the converter since only a single channel is output to the VCR or the TV. As such, only remote tuning through the converter is meaningful.

As mentioned previously, this approach allows for the recording of descrambled channels as well as clear channels. The limitation here, however, is that only one channel at a time can be recorded and or viewed, due to the single channel output of the converter. This applies also to unattended program recording, since typically during unattended recording no one is present to change the converter channel. This is not always the case, however, since in some of the more advanced, state-of-the-art converters, this capacity for time controlled programming of the converter channel is available.

With the time controlled programming feature, the subscriber can program his converter to change channels in his absence, thereby allowing the VCR access to record any of the converter's authorized channels. Typically, programming is accomplished in a manner similar to VCR programming, by specifying the required time, channel and day information necessary to select the desired program to record. System "reference time" is supplied either automatically through the headend, or input manually to the converter, depending on the particular converter model chosen. This feature greatly enhances the effectiveness of the converter in situations such as this, when unattended channel changing is desirable.

Expanded systems

Figure 3 expands upon the basic elements of Figures 1 and 2, in order to increase and combine the capabilities of the previous two approaches. In this setup, the incoming cable signal is first split and then fed to both a converter input and one of the inputs of an A/B RF switch. The output of the converter is connected to the input of the VCR, with its output in turn connected to the other input of the A/B switch. The A/B switch output is connected directly to the input of the TV.

The net effect of the approach in Figure 3 is to allow the subscriber to independently record either a clear or a descrambled channel, while at the same time viewing a different (or the same) clear channel. In the case of a cable-ready TV, the subscriber can view all clear channels tunable on the TV, while recording through the converter. For a conventional TV, he is limited to Channels 2-13. Additionally, the subscriber also can view the same descrambled channel that is being recorded through the converter.

The same limitation for unattended VCR recording as in Figure 2 still applies. That is, only one converter channel at a time can be recorded unless the converter has the capability to switch channels automatically as discussed previously. Moreover, a new "limitation" occurs in the case of remote-control operation, where the user may now have to manually set the A/B switch to the correct viewing position. The extent of this "problem" is determined solely by the recording and viewing habits of the subscriber and his desire for truly remote operation. Additionally, there is no remote visual feedback as to the A/B switch position. Channel tuning is now accomplished either via the converter or the television, depending on the mode selected.

While providing more capabilities to the subscriber, there is additional cost associated with the RF splitter and A/B switch required to support these features. There is also an inherent 3.0 dB minimum loss in the signal level associated with the splitter losses. This could become an issue in an area of the distribution network with a marginal signal-to-noise ratio and result in degraded picture quality.

The approach of Figure 4 overcomes one of the last remaining obstacles associated with Figure 3, that is, the ability to record and watch different descrambled (or clear) channels simultaneously. This capability is accomplished with the use of an additional converter connected in the alternate signal path, whose output is connected to the TV through the A/B switch. Now tuning is controlled by individual converters, with the TV staying on one (or possibly two, depending on the VCR/converter output channel compatibility) channel.

Other than the average noted above, the same limitations as Figure 3 apply, such as true remote capability, single unattended channel recording, increased cost and possible signal degradation. Here the cost increase is substantial due to the additional costs associated with the second converter. Moreover, the wiring "maze" can become unsightly and confusing as the number of system components grow. In addition, possible interactions could exist between the remote controls of the two converters. The benefits of this fourth approach are substantial, however, due to the complete programming and viewing flexibility that is introduced with a second converter.

Going forward

In reviewing the pros and cons of the four possible approaches discussed and building upon their fundamentals, it is apparent that one solution to the interface problem would be a self-contained RF switcher product. Such a product must include the necessary low-loss RF splitters and A/B switching devices, plus the required interconnections for RF signal path and control. To compensate for the inherent internal signal losses of the splitters, internal amplification also should be provided to maintain picture quality. Most important, however, would be its ability to switch the converter's output to either the VCR or TV (or both) when required, and thus maintain maximum versatility with only one converter. Finally, the device would be a convenient tie-in point to connect the cable, converter, VCR and TV, as well as provide visual feedback to the user as to the particular mode in which the system is configured.

Technically, such a product must provide an adequate noise figure, flatness, return loss and cross-modulation performance across the input frequency range—all in addition to the loss compensation discussed previously. Adequate isolation protection also is required to prevent possible signal corruption. This signal distortion occurs as a result of interference between signal sources operating on the same output channel. One such example of this would be if the converter were tuned to watch input Channel 10, and the VCR was tuned to record input Channel 6, and they were both operating on output Channel 3. Absolute minimum isolation protection required in this case would be on the order of 60 dB, with 65 or 70 dB preferred.

In order to meet the future needs of the subscriber and take the concept one step further, the switching capability described above could be included in future converter products. This, in conjunction with possible second tuner/descrambler capabilities in one package, would ensure the greatest flexibility for future (and present) needs. Costs for this approach may be prohibitive for the market to bear, but it would ensure the greatest capability in a single package.

All of the previous approaches presented are aimed at resolving one of the biggest problems confronting the CATV industry today, namely how to effectively interface a VCR into a subscriber's present converter system. How well this goal is achieved in the perception of the subscriber may ultimately determine the future growth of the CATV industry.

Editor's note

The Jerrold Division of General Instrument Corp. has published an informational booklet, complete with cabling diagrams, entitled "How to get the most satisfaction from your cable TV, VCR and video equipment." This booklet was designed to answer the questions most often asked by subscribers and to assist cable operators in the task of interfacing VCRs with cable. This publication is currently available to all cable operators at a modest fee (to cover printing costs) through the General Instrument Jerrold Division Customer Service Department, 2200 Byberry Rd., Hatboro, Pa. 19040. When ordering the booklet, please reference Model VCR-B and part number 924-322-000.

'The VCR was largely ignored by people in cable TV, who believed it to be either a gadget with a short life span. . . or simply a toy for the wealthy'

Using VCRs in CATV systems

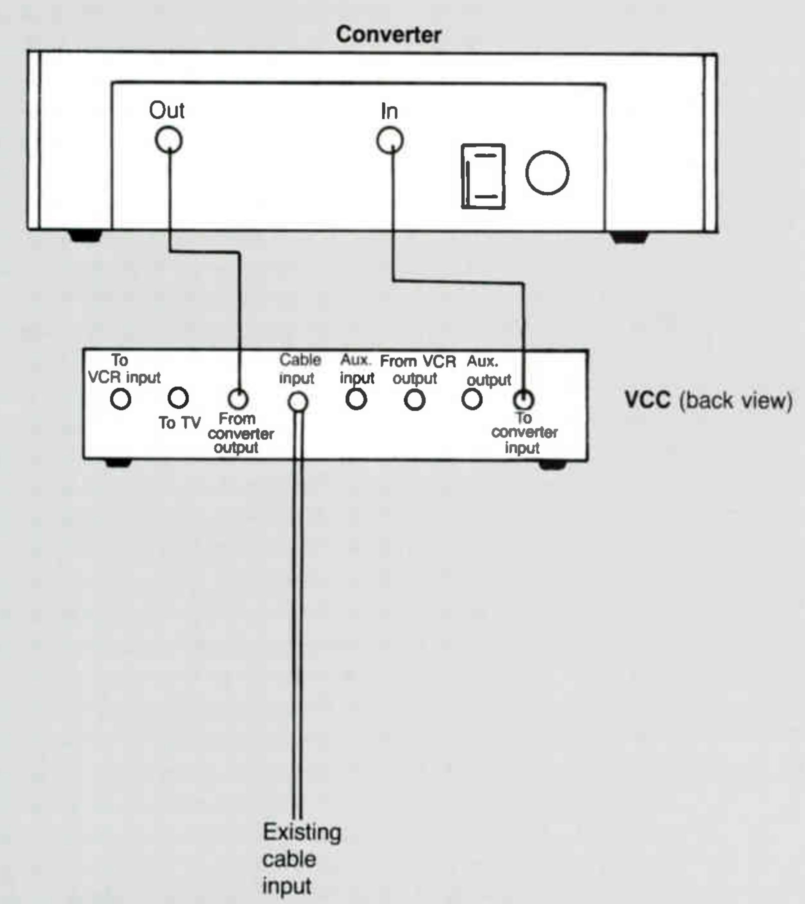
With the recent explosion of VCRs into the average American home, the cable TV subscriber has been left out in the cold in regard to using all of the features of his new VCR, his new "state-of-the-art" TV and his cable TV converter box. This article will give a brief description of the history and options now available to cable companies that will allow a customer to fully interface his VCR, TV set and, most importantly, the programming available from the cable system.

By Randall Tishkoff
President, Qintar Inc.

Up until the mid-70s, when video pong games appeared in the marketplace, a television's VHF input was simply connected to the household antenna or cable TV wire. Even a video game required only a simple A/B switch to complete a satisfactory installation.

With the introduction of scrambled pay TV channels and converters, cable companies now had many more channels available to offer subscribers by utilizing the mid-band and super-band channels. The cable converters usually took any of these VHF channels and converted one at a time to Channel 3 (or 4) for the subscriber's viewing. This standard approach to channel delivery to the home worked well until the early '80s when a phenomenon changed the habits of millions of Americans—the appearance into the marketplace of the video cassette recorder (VCR).

Figure 1: Video control center to converter connection



VCRs and the video control center

The VCR was largely ignored by people in cable TV, who believed it to be either a gadget with a short life span like many fads (the pong games included) or simply a toy for the wealthy. Neither, of course, was true. Today over 1 million pieces per month are sold with many customers choosing to rent a movie from their local video store rather than watch traditional TV (broadcast or cable). VCRs are now found in up to 50 percent of cable TV homes.

VCRs are viewed by some in the cable industry as a cause for subscriber churn and other cable ills. Others, like this author, see VCRs as a selling tool for cable TV and as a popular American consumer item that can enhance a subscriber's perceived value of cable TV.

The VCR is simple to use and hook up as long as there is only one input from an antenna. The complications arise when a cable TV converter box and one or more additional devices are hooked up since, like the TV set itself, the VCR has but one VHF input. If a cable subscriber wants to be able to record (or watch) all of the channels available to him, then a confusing mess of A/B switches, coaxial cables, splitters and instructions are needed. The recent introduction of video control centers by various manufacturers should eliminate this problem, and restore most channels to the cable subscriber's TV, VCR and remote

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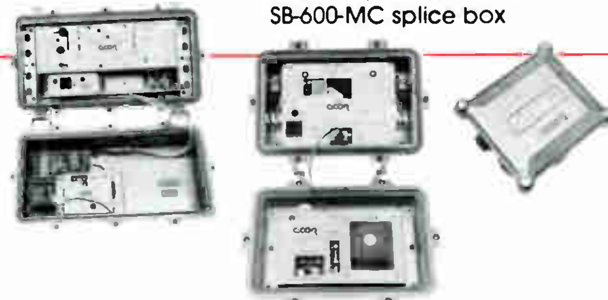

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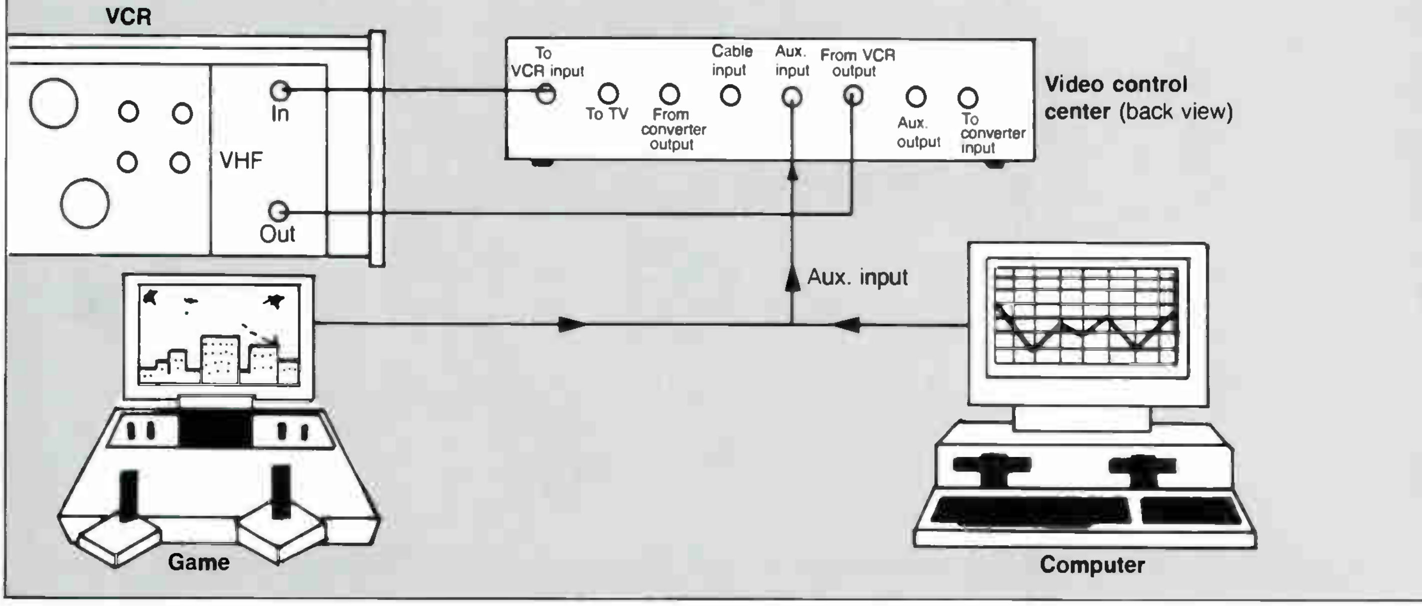
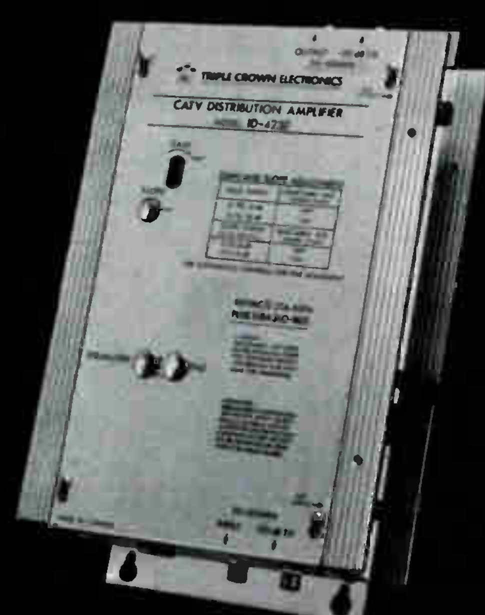
Figure 2: VCR and auxiliary input connections to VCC



control.

Most video control centers (VCCs) are easy to install and use, combining all of the switches and splitters necessary for a subscriber to watch any channel while simultaneously recording any other channel. The only exception is that a subscriber cannot watch a scrambled pay channel while taping a second scrambled pay channel. This would require a second converter/descrambler. A subscriber also might not be able to view mid- or super-band channels in some modes unless he owns a cable-compatible TV.

The VCC accomplishes its job by taking the incoming cable signal and splitting it three



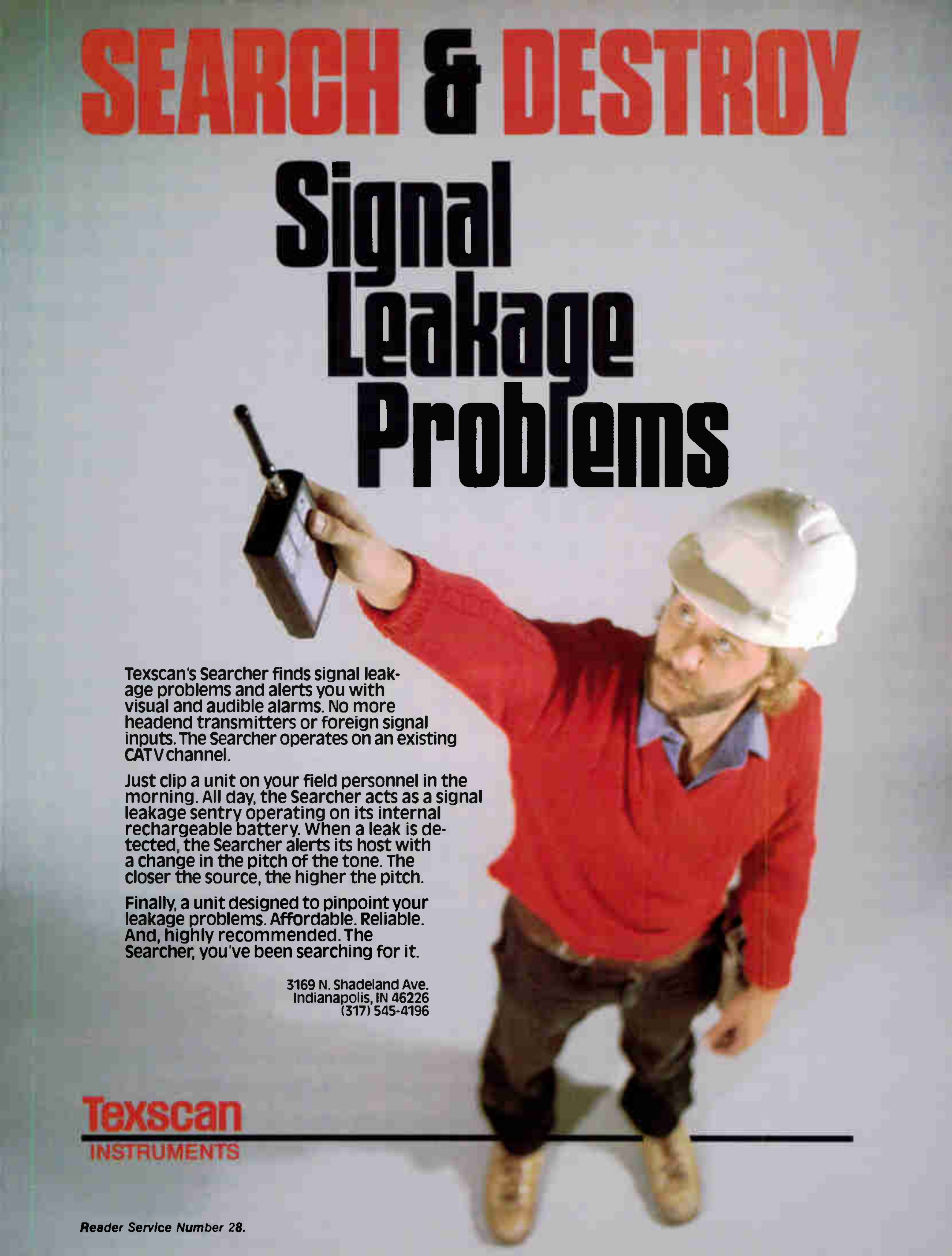

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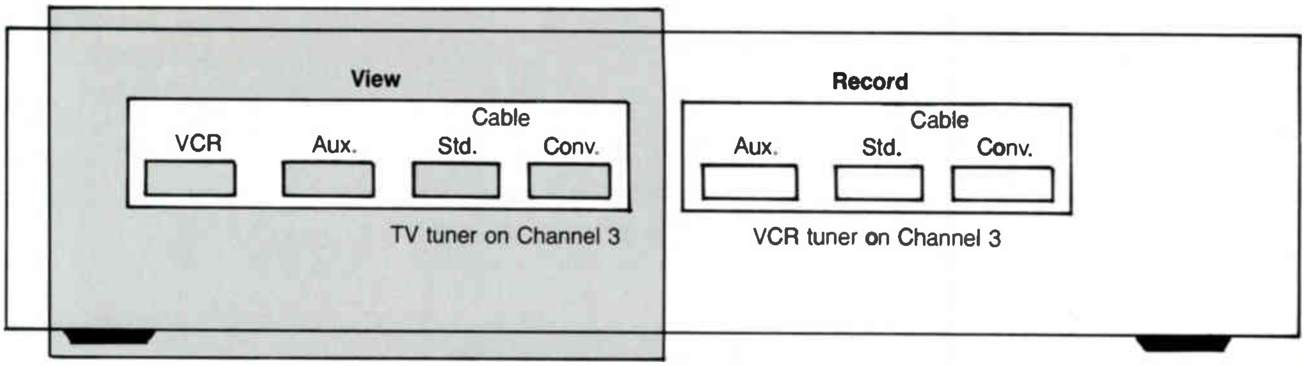
Figure 3: Viewing selections on the VCC



ways. The first leg of the splitter feeds the TV set circuit of the VCC while the second leg of the splitter feeds the VCR circuit of the VCC. The third leg feeds out of the VCC to the input of the cable converter where the wanted signal is downconverted (usually to Channel 3) and fed back into the VCC (Figure 1). The input and output of the VCR are then fed directly into the VCC, as is one other auxiliary device such as a second VCR, video disk, video game, antenna or other RF signal (Figure 2).

The subscriber is now ready to choose from the four signal inputs what he wants to view on the TV set (Figure 3):

- Standard cable—Channels 2-13 (also mid- and super-band if he owns a cable-compatible TV),
- Premium channels—tuning the TV to Channel 3 or setting the converter on the appropriate channel,
- VCR—watching either pre-recorded or rented tapes by tuning the VCR to Channel 3,
- Auxiliary—watching the auxiliary input.

The VCC has three buttons to choose from to record (Figure 4):

- Standard cable,
- Premium cable,
- Auxiliary.

This configuration will enable a subscriber to view, for example, the *Bill Cosby Show* while recording a first-run movie on HBO or Showtime.

VCCs of this type include the Qintar Model 4004B (passive) and 4005A (amplified) and the Jerrold Model VCU (amplified), the Panasonic Model VCS-1 (amplified) and the Pioneer Model AV-70.

A non-mechanical interface is available from Tocom. The VCR mates contain an electronic A/B switch that when interfaced with the Tocom Model 5503-VIP or 5503-A converter, also allows timer recordings and remote volume control. Lastly, Zenith has available a VCR interface that is fully electronic and does not require any customer switching of the box. Standard cable channels are sent to the TV or VCR on their regular channel frequencies while the premium channel out of the converter is converted to a UHF channel for viewing or recording. The Zenith box, however, does not have an auxiliary input, and the subscriber must switch the TV set from the "CATV" mode to the "regular" mode when watching the converted UHF premium channel.

Marketing video control centers

In the two years that Qintar has been marketing a VCC, we have seen a reluctance on the part of cable operators to get involved in retailing hardware—usually a new territory for them. However, virtually all systems that have started using VCCs have been very happy with the results. Qintar offers free bill stuffers, ad slicks and a guaranteed sale/return policy to help systems begin marketing the VCC. It is important that a cable company's engineers not only approve a VCC, but that customer service reps fully understand how those VCCs work and how the sales department plans to market them. During this past year, almost all of the top MSOs have or are in the process of adopting a VCR policy that includes the use of VCCs.

A non-amplified VCC should cost the cable company between $20 and $30, while an amplified VCC should cost between $33 and $49. The cable operator then has several choices as to how to best market the VCC to his subscribers and how much to charge. Some possibilities are:

- The VCC can be rented for approximately $3 per month, giving the operator payback in less than a year with positive cash flow thereafter.
- The VCC can be given away free during special promotions or if a subscriber agrees to sign up for an extra pay service.
- A direct sale can be made, with the cable company charging from $39.95 for a non-amplified VCC to perhaps $65 for an amplified VCC.

Similar units not designed for cable TV specifications are sold for between $29.95 and $89.95 in retail stores and electronic stores such as Radio Shack. Units sold in these stores might cause problems to both the cable subscriber and the cable system as those VCCs that were not built to cable

Figure 4: VCC record options

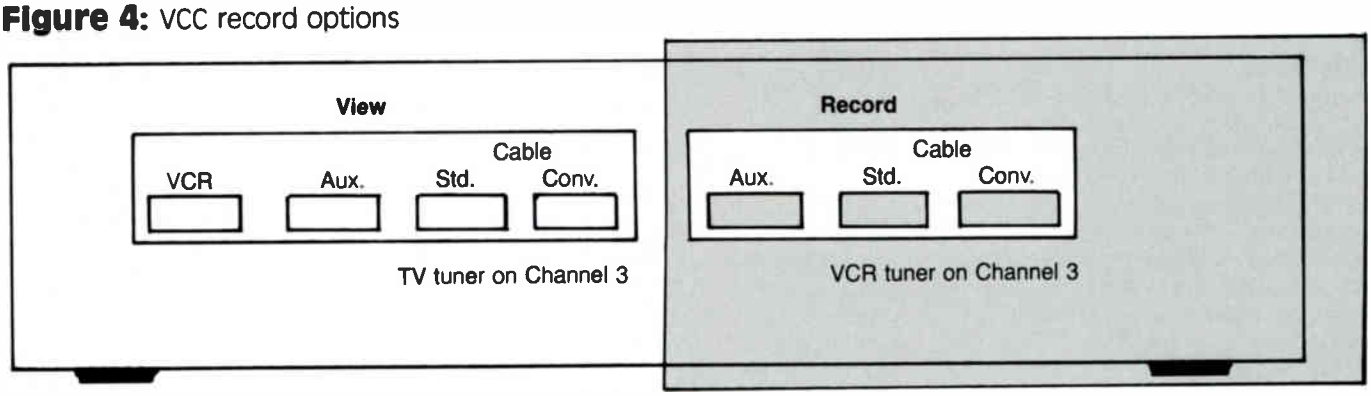
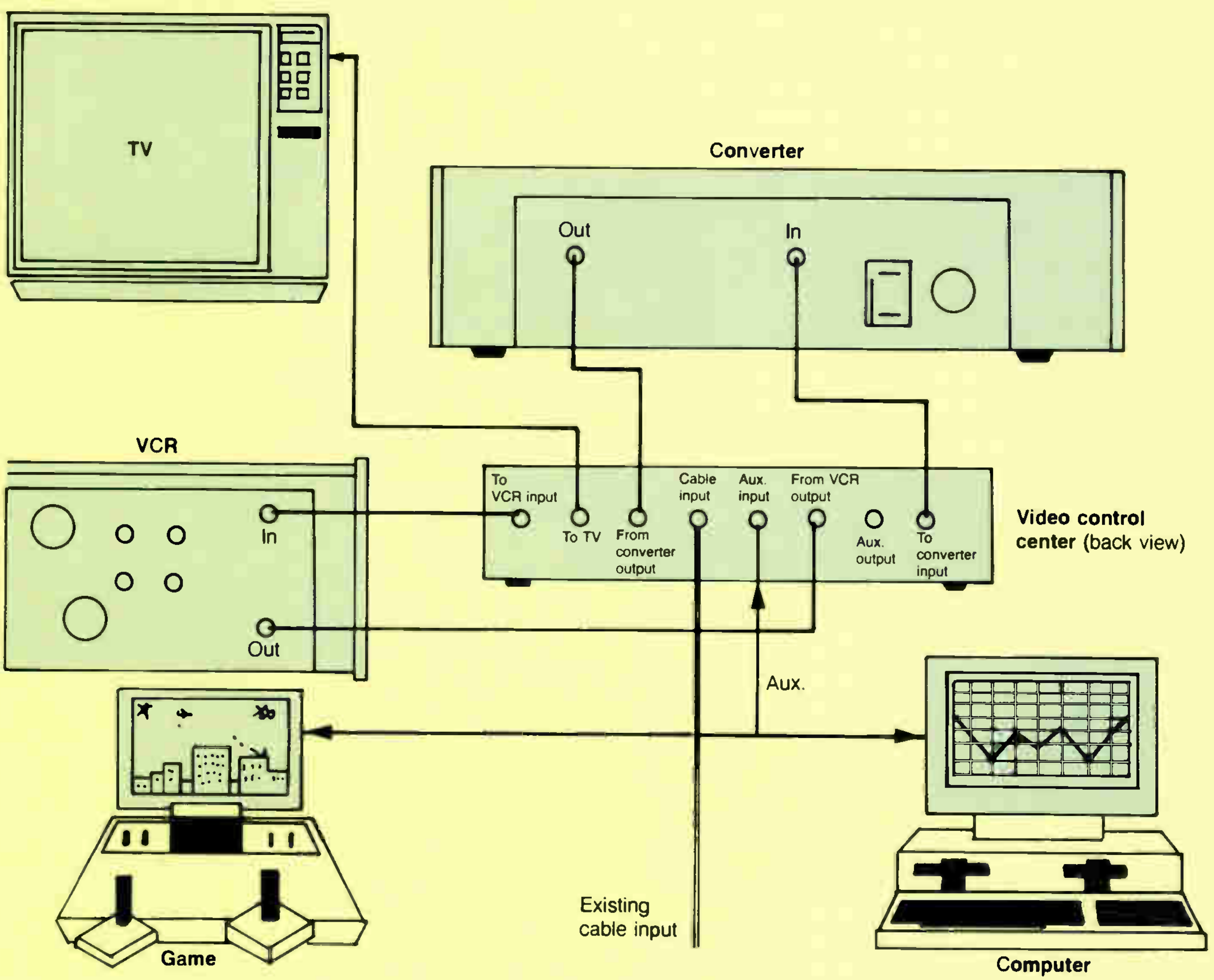


Figure 5: Fully hooked up VCC



TV specifications may have poor isolation. It is best to buy and supply VCCs only from cable TV equipment manufacturers such as those discussed previously. All have VCCs on the market or will during the first quarter of 1986.

Specifications

The most important VCC specifications to a cable company will be the VCC's port-to-port isolation. Since several signals occupying the same frequency (say Channel 3) will be present at the same time it is important to keep isolation of at least 70 dB on the low-band. Although only one signal above 216 MHz will appear at the box, it is recommended that isolation remain at least 60 dB at these higher frequencies.

Insertion losses will be 6 dB for the cable input. The premium signal going into the VCC will have approximately a 4 dB insertion loss, as with the auxiliary and VCR inputs. If the original cable signal is not above 6 dB at the wall plate, it is recommended that an amplified VCC be used, particularly if the converter is not automatic gain controlled.

Other engineering concerns should include shielding against direct pick-up, reliability of mechanical or electronic switches and overall construction. To compensate for internal splitting losses, amplified versions should have at least a net 0 dB gain but not more than 4 dB gain. Noise figure should be below 7 dB. Second order composite and cross-modulation should be better than 60 dB down. VCCs should be U/L approved. Alternatively, a low-power U/L approved adapter can be used.

Since only modest input levels of 15 dB or less usually will be used, and since only enough gain is needed to overcome internal splitting losses, there is no need for a high-power, high-cost amplifier circuit such as those used on trunk lines.

Conclusion

Although there are dozens of ways to hook up cable TV and VCRs using A/B switches and splitters, virtually all cable systems can have a standard hookup to handle the VCR interface problem by using a VCC. VCCs are low in cost, easy to hook up, and will enable the subscriber to record and view what he wants, when he wants, thus improving his perceived value of cable TV.

All VCC costs should be paid back to the cable company within one year, either through the rental of the VCC unit or its sale to the cable TV subscriber.

12 Channel Headend

The care and feeding of multichannel stereo TV sound

By Russell A. Skinner
Director, Special Projects Engineering
American Television and Communications Corp.

Much has been said about the implementation of the multichannel television sound (MTS) into our cable systems. Quality, or the lack thereof, has been the subject of many discussions. With some 200 television stations now operating in stereo and more coming on line each month, the time is at hand to understand the impact cable systems have on the carriage of MTS and to formulate a delivery plan.

Quality vs. quality

When our subscribers think about stereo, their perception of what it is may conjure up visions of high-tech specifications. A frequency response of ±.25 dB from 20 Hz to 30 kHz, a signal-to-noise ratio (S/N) of 95 dB and a separation greater than 85 dB give the term high quality a new meaning. Solid-state wizardry has allowed high-quality audio to fulfill new consumer expectations. However, when MTS was created, it was never designed to be the ultimate answer in high-quality audio. It was designed to allow the existing television transmission system to provide a new dimension in sound to the consumer.

To allow compatibility with the monaural television audio system in use, a compromise is necessary. With the pilot carrier used to detect stereo at 15,734 Hz, and using a protection bandwidth of ±500 Hz, economical filter design allows the frequency response to be approximately ±.5 dB from 100 Hz to 13.5 kHz; resulting in a signal-to-noise ratio of less than 50 dB and separation as low as 15 dB at the end of the system. Add intercarrier buzz and other artifacts, and MTS may be a far cry from our high-tech vision of high quality.

But is it so bad that it is not functional? Or will the consumer care about specifications if it sounds good and the stereo light is on?

The consumer point of view

Just how important are these specifications to our subscribers? Let's depart for the moment and go back to the basics. Most (approximately 95 percent) of the sound a person can hear occurs from 100 Hz to 15 kHz. In fact, most people cannot hear well above 13 kHz. It seems likely that without an A-B comparison, a large portion of the consumer base cannot perceive the difference between audio using frequencies above 13 kHz and audio that does not.

How about separation? Separation is what allows stereo to be different from monaural. Hearing the unique sounds coming from different speakers, one set up on the right side of the room and one on the left side, gives the stereo effect. In the best of systems, with speakers set up at 45 degrees to the listener, separation can be as low as 10 dB and still sound very good. With speakers only two feet apart in the stereo televisions being sold today, will the consumer hear separation or will he really hear an increase in fidelity? With his need for quality, will the consumer attach his stereo TV to his existing stereo sound system? Will he need to attach external speakers to his new stereo TV? Or, for that matter, can he have stereo TV without buying a new TV or adding an add-on decoder? Will our consumer take note that the noise present on his stereo television channel is less than 50 dB below the

Making cable VCR friendly

By Glen L. Friedman
Corporate Manager of Customer Service
American Television and Communications Corp.

"How can I use my VCR with cable? How do I connect my VCR? Why can't I use all the features of my VCR with cable?"

More and more cable customers are asking their cable operators these tough-to-answer questions. In fact, more than 20 percent of cable customers now own VCRs. The good news is that industry research indicates cable television and VCRs are compatible. Research also indicates VCRs can increase customer's satisfaction, because they can record a wider selection of programs and watch them at their convenience.

Unfortunately, many cable customers who own a VCR do not have it connected to cable or have difficulty using their VCR with cable. To make sure customers see cable as compatible with their VCRs, as opposed to seeing VCRs as an alternative, cable operators must provide service and information to cable customers on how their VCRs and cable work together.

Training and customer education

In order to accomplish this, it is critical to focus on two areas—in-house training and customer education. All office, sales and technical employees need to receive training on VCRs and how they work with cable in your system. The training should include:

- Information on connection charges
- Connection diagrams
- How to make sure customers get the features they want, such as the capability of taping one program while watching another
- "Hands-on training" on how to connect VCRs to cable
- How to communicate the capability of VCRs and cable as an alternative to tape rental

Cable and VCRs should be portrayed as working well together to enable cable customers to get maximum enjoyment from their cable service. This should be communicated to customers, electronics dealers and franchise authorities. To ensure that customers get this information, it is best to use a wide variety of tactics that should include: bill stuffers, bill messages, connection brochures, new customer-install packets, handbooks, on-hold messages, on-system video spots, radio commercials, point-of-purchase displays, and installer and technical leave-behind materials.

By providing VCR training for employees and effectively communicating the compatibility of cable and VCRs, customer frustration can be turned into customer satisfaction.

'By . . . effectively communicating the compatibility of cable and VCRs, customer frustration can be turned into customer satisfaction'

'MTS may be a far cry from our high-tech vision of high quality. But is it so bad that it is not functional?'

signal when most cassette tape players do well to deliver a 45 dB signal-to-noise ratio?

I think we can see that there are a lot of questions and not a lot of answers on the delivery of this very complex technology.

The business plan

In order to evaluate the effect MTS will have on our day-to-day operation, we need to understand and answer a few fundamental questions.

- How good is the MTS technology?
- How good does MTS have to be?
- Can our subscribers tell the difference between MTS and other audio services?
- Will MTS compete with alternate delivery sources (FM, Studioline, D-CAT and other digital formats)?
- Will there be new hardware to suport our systems (converters, encoders and decoders)?
- What is the financial impact to each type of cable system (RF, baseband and sinewave scrambling)?
- Will this technology become a subscriber service problem?

The task force approach

In early 1985, we created our company's stereo task force. Membership represented each of the operational departments, including marketing, new business development, public affairs, research and development, and engineering.

The approach was to identify each area of stereo delivery that needed to be addressed. The areas would then be assigned to the group most suited to handle the issues: technical issues by engineering and R&D, subscriber issues by marketing and new business development. The first two areas our groups approached were:

1) Research focused on listening groups to identify sensitivity to key technical issues.
   A) Monaural vs. new stereo TV in monaural.
   B) Stereo TV vs. stereo TV in monaural.
   C) Stereo TV vs. stereo TV with external speakers.
   D) Sensitivity to noise and artifacts.
   E) MTS vs. FM, Studioline.

These tests were conducted with the support of Gill Cable in San Jose, Calif.

2) Engineering link testing to understand how MTS is tested and then deciding how to evaluate the results.
   A) Testing the full system from the broadcast transmitter to the end of a 25 amplifier 400 MHz cascade.
   B) Dovetail with system testing completed by Gill Cable.

The link testing is to be done in Denver with the help and cooperation of KCNC (an NBC affiliate and the first station to be operational with stereo in Denver), KRMA (PBS) and American Cablevision of Thornton, Colo. (an ATC suburban system).

With the knowledge gained from testing in these two areas, the foundation can be built to allow us to better understand this complex issue. The results of this testing will be shared with the industry at the NCTA convention.

A final word

This is not the first new technology we have been challenged to add to our systems. Without the proper understanding of MTS and its effect on our subscribers, we will be faced with customer service problems as far reaching as those faced with cable-ready TVs and VCRs. We must consider the needs of our subscribers and find the means to deliver this new service to them. We need to find the balance of cost in delivering this technology. The only certainty is that the stereo TV marketplace will develop over the next 10 years, giving us opportunity and challenge.

Even the Soviets couldn't break Sigma's code.

We don't care how good they are, it's virtually impossible to crack Sigma's security system. It's that good. And without getting into a laundry list of technical data, suffice it to say that Sigma's addressable cable system is based on the same technologies developed for the Pentagon to keep America's most important secrets out of the wrong hands.

Considering the cable industry is losing over half-a-billion dollars a year from box and signal theft, this kind of security should be more than a consideration in your choice of addressable systems. It should be the highest priority.

In addition to security, Sigma also offers audio mute, remote on/off, volume control, last channel recall, favorite channel memory and electronic parental control. All things considered, Sigma becomes the ideal system for pay-per-view events and other pay services.

We want to tell you more about Sigma and how it can help you eliminate signal theft and increase your system revenues. Call your nearest Oak representative or contact us directly by calling 619-451-1500.

Sigma. From America with love.

SIGMA

Here Today. Here Tomorrow.

A development of Oak Communications Inc. 16516 Via Esprillo Rancho Bernardo, CA 92127 (619) 451-1500

Reader Service Number 46.

Computers save time

The accompanying program was written on a Commodore B series 80-column computer but will work on any Commodore and most other computers with a few changes. Included in the text are brief descriptions of different line areas that need an explanation or need to be modified for other computers. As well, the program contains several remark statements to help clarify some points.

By Edward B. Wittaker
Plant Manager, Storer Cable Communications

One of our home office requirements to the local systems is that of a monthly report for technical statistics that includes the total number of fixes during each month (Figure 1). In addition, the home office also requires the figuring of an on-time percentage based on

```
1 DIMAN$(404),TT$(404),TL$(404)
2 PRINT"■"
3 PRINT"■■J"
7 REM TO INPUT TRUNK AMPLIFIERS INTO DISK TYPE RUN 4000
8 Y$="":INPUT"DO YOU WISH TO STORE AT THIS TIME (Y/N)";Y$
9 IFY$<>"Y"THEN10:ELSE4000
10 GOSUB1000
90 REM SYSTEM NAME SHOULD BE 14 SPACES LONG]
96 INPUT"SYSTEM NAME ";SS$:SS$=LEFT$(SS$+"              ",14):SS$=LEFT$(SS$,14
)
97 INPUT"MONTH AND YEAR = ";MN$:MN$=LEFT$(MN$+"                 ",17):MN$=LEFT
$(MN$,17)
100 OPEN4,4:PRINT#4,"SYSTEM : ";SS$;CHR$(1)CHR$(1)" STORER ";CHR$(129)"    PREP
ARED BY : ____________"
110 PRINT#4,"MONTH   : ";MN$;CHR$(1)CHR$(1)"  CABLE";CHR$(129)"  APPROVED BY : _
__________(MGR)"
112 REM MONTH SHOULD BE 12 SPACES LONG
114 PRINT#4,TAB(17)CHR$(1)"TECHNICAL STATISTICS"
116 FORT=1TO80:PRINT#4,"¯";:NEXTT
118 PRINT#4,"WEEK  HEAD  SYSTEM  DROP  CONV. SUBS                 LEAK  PH.   VCR
 TOTAL"
120 PRINT#4,"      -END                    DESC. PROB  NTF   N/H   REP.  FIX   CALL
S JOBS"
122 FORT=1TO80:PRINT#4,"¯";:NEXTT
123 S$="   ":REM ALL TOTALS SHOULD BE 3 DIGITS IN LENGTH WITH S$ IN BETWEEN EAC
H FOR PROPER SPACING ON PRINTER
124 FORX=1TO5
125 PRINT#4," ";X;" ";S$;A$(X);S$;B$(X);S$;C$(X);S$;D$(X);S$;E$(X);S$;F$(X);S$;
G$(X);S$;H$(X);S$;J$(X);S$;V$(X);S$;I$(X)
126 FORT=1TO80:PRINT#4,"¯";:NEXTT
128 NEXTX
130 FORX=1TO5
132 AT=AT+VAL(A$(X)):BT=BT+VAL(B$(X)):CT=CT+VAL(C$(X)):DT=DT+VAL(D$(X)):ET=ET+V
AL(E$(X)):FT=FT+VAL(F$(X)):GT=GT+VAL(G$(X)):HT=HT+VAL(H$(X))
```

Figure 1: Sample technical statistics report

SYSTEM : PC — STORER — PREPARED BY : ____________

MONTH : JUNE 85 — CABLE — APPROVED BY : ____________(MGR)

TECHNICAL STATISTICS

WEEK	HEAD -END	SYSTEM	DROP	CONV. DESC.	SUBS PROB	NTF	N/H	LEAK REP.	PH. FIX	VCR CALLS	TOTAL JOBS
1	001	023	043	012	045	004	007	054	004	004	345
2	000	021	043	007	038	002	012	062	021	021	356
3	001	003	004	005	021	009	006	034	009	009	276
4	000	006	042	012	065	008	007	098	021	021	287
5	000	000	000	000	000	000	000	000	000	000	000
TOTAL	2	53	132	36	169	23	32	248	55	55	1264
BLANK											
% OF SUB	0.01%	0.30%	0.75%	0.20%	0.96%	0.13%	0.18%	1.40%	0.31%	0.31%	7.16%
BLANK											
BLANK											

PLANT MILES	FCC SUBS	TOTAL OUTLETS	LEAKS OUTST.	CV/DES TOTAL	TOTAL STAFF	TOTAL OUTAGES	ON-TIME %
458	17652	21544	23	19555	5.5	3	99.9566533 %

the number of amplifiers in the system versus the number and length of time each was out of service during each month.

Originally, it was necessary to count each amplifier and the number of amplifiers affected every month. Because the total number of amplifiers out for various reasons can be considerable each month, I wrote a program to handle the figuring of this on-time percentage, plus print out the total number of problems on a weekly basis. We have found this program to save considerable time at the end of each month and it gives us a very good overview of system performance.

Line number...

8: This area allows you to store the initial amplifier number and the number of trunks and link extenders affected by its being out.

10: Performs a bypass of the "print" program.

1000-1175: Asks for the number of problems under the different catagories by the week. On lines 1042, 1046, 1050, etc., the "input" statement within the quote marks allows the Commodore to put the input question mark at the end of the print statement and on the same line. On some other computers it would be necessary to eliminate the character movement statements within the quote marks. This would put the input question mark on the next line. The "graphics" on lines containing the print statements put the X, which represents the week being input, into "reverse" mode. After each of the input statements (next line) a "right" justification is done to ensure all inputs are five spaces in length and moved to the right.

1180: This line asks for the total number of amplifiers in the system being input. If there is only one system ever to be entered, then this line can be changed to 1180 AA=xxxxx, where xxxxx would equal the total number of amplifiers in the system. Since we have three systems in our reporting area it was necessary to make this an input statement.

1200-1210: If it is not necessary to obtain an on-time percentage then this can be bypassed in these lines and only the system monthly problems printed.

1210: Asks which system is to be used. Here again if only one system is in your area of reporting this line can be eliminated. Note: It would be a good idea to change the system names to your system. If you do this then be sure that you also change all other lines that use this input. See 1214 below.

1214-1218: These lines take the input from 1210 and convert the system name into a disk name for the computer to use to pull the proper record from the disk. Note: If you changed the system names in line 1210 above be sure to also change the two-letter identifier in both places on these lines.

1300-1322: This area pulls into internal memory the amplifier information needed to obtain the on-time percentage.

2000-3012: This area takes each amplifier number, the total number of minutes each was out and uses this to figure the individual on-time. After all the amplifiers out during the

```
 134 IT=IT+VAL(I$(X)):JT=JT+VAL(J$(X)):VT=VT+VAL(V$(X)):NEXTX
 135 AT$=RIGHT$("    "+STR$(AT),3):BT$=RIGHT$("    "+STR$(BT),3):CT$=RIGHT$("    "+
STR$(CT),3):OT$=RIGHT$("    "+STR$(DT),3):ET$=RIGHT$("    "+STR$(ET),3)
 136 FT$=RIGHT$("    "+STR$(FT),3):GT$=RIGHT$("    "+STR$(GT),3):HT$=RIGHT$("    "+
STR$(HT),3):IT$=RIGHT$("    "+STR$(IT),4):JT$=RIGHT$("    "+STR$(JT),3)
 137 TS=VAL(TS$):VT$=RIGHT$("     "+STR$(VT),4)
 144 PRINT#4,"TOTAL    ";AT$;S$;BT$;S$;CT$;S$;OT$;S$;ET$;S$;FT$;S$;GT$;S$;HT$;S$;
JT$;"  ";VT$;" ";IT$
 146 FORT=1TO80:PRINT#4,"-";:NEXTT
 148 PRINT#4,"BLANK"
 150 FORT=1TO80:PRINT#4,"-";:NEXTT
 151 AT=(AT/TS)*100:BT=(BT/TS)*100:CT=(CT/TS)*100:DT=(DT/TS)*100:ET=(ET/TS)*100:
FT=(FT/TS)*100:GT=(GT/TS)*100:HT=(HT/TS)*100:IT=(IT/TS)*100:JT=(JT/TS)*100
 152 IFAT<.01THENAT=.01:IFBT<.01THENBT=.01:IFCT<.01THENCT=.01:IFDT<.01THENDT=.01
:IFET<.01THENET=.001:IFFT<.01THENFT=.01:IFGT<.01THENGT=.01:IFHT<.01THENHT=.01
 153 IFIT<.01THENIT=.01:IFJT<1THENJT=.01
 154 VT=(VT/TS)*100:IFVT<.01THENVT=.01
 155 PRINT#4,"% OF "
 156 PRINT#4,"SUB  "USING"##.##%";AT,BT,CT,DT,ET,FT,GT,HT,JT,VT,IT
 157 FORT=1TO80:PRINT#4,"-";:NEXTT
 158 PRINT#4,"BLANK"
 160 FORT=1TO80:PRINT#4,"-";:NEXTT
 162 PRINT#4,"BLANK"
 164 FORT=1TO80:PRINT#4,"-";:NEXTT
 166 PRINT#4,"PLANT";"   FCC ";"   TOTAL";"   LEAKS ";"   CV/DES";"   TOTAL"
;"   TOTAL";"   ON-TIME"
 168 PRINT#4,"MILES";"   SUBS";"   OUTLETS";"   OUTST.";"   TOTAL ";"   STAFF"
;"   OUTAGES";"     %"
 170 FORT=1TO80:PRINT#4,"-";:NEXTT
 172 PRINT#4,M$;"    ";TS$;"    ";TY$;"    ";TL$;"      ";TC$;"     ";TT$;"     ";TO$
;"     ";TQ;"%"
 173 FORT=1TO80:PRINT#4,"-";:NEXTT
 174 FORT=1TO80:PRINT#4,"-";:NEXTT
 190 PRINT#4,CHR$(12):CLOSE4
 200 Y$="":INPUT"█████DO YOU WISH TO DO ANOTHER SYSTEM (Y/N) ";Y$:IFY$<>"Y"THENE
ND
 202 RUN
 1000 REMA$=HEADEND B$=SYSTEM C$=DROP D$= CONVTER E$=SUB PROBLEM F$= NO PROBLEM
G$=NOT HOME H$= LEAKS REP. I$=TOTAL JOBS  J$=CALLS BY PHONE
 1010 PRINT"██"
 1020 PRINTTAB(20)"█ PRESS ENTER IF NO ENTRY OR COMPLETE":PRINT"█":PRINTCHR$(15
)
 1030 FORX=1TO5
 1040 PRINT"HEADEND PROBLEMS FOR WEEK █";X;"█"
 1042 INPUT"████████████████████████████████";A$(X)
 1043 A$(X)=RIGHT$("000"+A$(X),3)
 1044 PRINT"SYSTEM PROBLEMS FOR WEEK  █";X;"█"
 1046 INPUT"████████████████████████████████";B$(X)
 1047 B$(X)=RIGHT$("000"+B$(X),3)
 1048 PRINT"DROP PROBLEMS FOR WEEK    █";X;"█"
 1050 INPUT"████████████████████████████████";C$(X)
 1051 C$(X)=RIGHT$("000"+C$(X),3)
 1052 PRINT"CONV. PROBLEMS FOR WEEK   █";X;"█"
 1054 INPUT"████████████████████████████████";O$(X)
 1055 O$(X)=RIGHT$("000"+O$(X),3)
 1056 PRINT"SUBS. PROBLEMS FOR WEEK   █";X;"█"
 1058 INPUT"████████████████████████████████";E$(X)
 1059 E$(X)=RIGHT$("000"+E$(X),3)
 1060 PRINT"NO PROBLEM FOUND FOR WEEK █";X;"█"
 1062 INPUT"████████████████████████████████";F$(X)
 1063 F$(X)=RIGHT$("000"+F$(X),3)
 1064 PRINT"NOT HOME  FOR WEEK        █";X;"█"
 1066 INPUT"████████████████████████████████";G$(X)
 1067 G$(X)=RIGHT$("000"+G$(X),3)
 1068 PRINT"LEAKS REPAIRED FOR WEEK   █";X;"█"
 1070 INPUT"████████████████████████████████";H$(X)
 1071 H$(X)=RIGHT$("000"+H$(X),3)
 1072 PRINT"CALLS RES. BY PHONE  WEEK █";X;"█"
 1074 INPUT"████████████████████████████████";J$(X)
 1075 J$(X)=RIGHT$("000"+J$(X),3)
 1076 PRINT"VCR CALLS FOR WEEK        █";X;"█"
 1077 INPUT"████████████████████████████████";V$(X)
 1078 V$(X)=RIGHT$("000"+J$(X),3)
 1080 PRINT"TOTAL JOBS DONE FOR WEEK  █";X;"█"
 1081 INPUT"████████████████████████████████";I$(X)
 1082 I$(X)=RIGHT$("000"+I$(X),3)
 1090 PRINT"█":NEXTX
 1100 INPUT"TOTAL PLANT MILES        = ";M$
 1110 M$=RIGHT$("     "+M$,5)
 1120 INPUT"TOTAL FCC SUBS           = ";TS$
 1125 TS$=RIGHT$("     "+TS$,5)
 1130 INPUT"TOTAL OUTLETS            = ";TY$
 1135 TY$=RIGHT$("     "+TY$,5)
 1140 INPUT"TOTAL LEAKS OUTSTANDING  = ";TL$
 1145 TL$=RIGHT$("     "+TL$,5)
 1150 INPUT"TOTAL CONVERTERS         = ";TC$
 1155 TC$=RIGHT$("     "+TC$,5)
 1160 INPUT"TOTAL TECH. STAFF        = ";TT$
 1165 TT$=RIGHT$("     "+TT$,5)
 1170 INPUT"TOTAL OUTAGES            = ";TO$
 1175 TO$=RIGHT$("     "+TO$,5)
 1180 INPUT"TOTAL NUMBER OF AMPLIFIERS IN THIS SYSTEM = ";AA
 1200 PRINT"█████ON-TIME % MUST BE FIGURED AS A SEPERATE ENTRY"
 1202 V$="":INPUT"TO PROCEED PRESS ENTER  TO PRINT PRESS ANY OTHER KEY";V$
 1204 IFV$=""THEN1210:ELSE RETURN
 1210 INPUT"WHAT SYSTEM  PC=PORT CHARLOTTE  AR=ARCADIA  LE=LEHIGH ";S$
```

```
1214 IFSS$="PC"THENF$="ON %PC,R":GOTO1300
1216 IFSS$="AR"THENF$="ON %AR,R":GOTO1300
1218 IFSS$="LE"THENF$="ON %LE,R":GOTO1300
1220 GOTO10
1300 DOPEN#1,(F$),D1
1304 FORX=1TO400
1306 INPUT#1,AN$(X)
1308 INPUT#1,TT$(X)
1310 INPUT#1,TL$(X)
1312 NEXTX
1314 DCLOSE#1
1320 GOSUB2000
1322 RETURN
2000 PRINT"■":OT=0
2002 AA$="":INPUT"AMPLIFIER NUMBER OUT OF SERVICE (ENTER IF DONE) ";AA$
2004 IFAA$=""THEN2070
2020 INPUT"TIME IN MINUTES AREA OUT ";MM
2030 FORX=1TO400
2032 IFAA$=AN$(X)THEN2040
2034 NEXTX
2036 PRINT"THIS AMPLIFIER NUMBER NOT FOUND":FORT=1TO1500:NEXTT:GOTO2000
2039 REM AA = TOTAL NUMBER OF AMPLIFIERS IN SYSTEM
2040 OT=((VAL(TT$(X))+VAL(TL$(X)))/AA)*MM
2045 PRINTOT,TT$(X),TL$(X):FORT=1TO2000:NEXTT
2050 TQ=TQ+OT
2060 GOTO2000
2070 Y$="":INPUT"■■■■IS THAT ALL (Y/ENTER) ";Y$
2072 IFY$="Y"THEN3000:ELSE2000
2080 GOTO3000
3000 REM THIS SECTION FIGURES ON TIME %
3004 INPUT"NUMBER OF DAYS IN REPORTING PERIOD = ";D
3005 D=D*24*60
3006 TQ=D-TQ
3010 TQ=(TQ/D)*100
3012 RETURN
4000 REM THIS SECTION WILL STORE ALL AMPLIFIERS IN SYSTEM AND THEIR TOTAL TRUNK
AND LINE EXTENDER AMPLIFIERS AFFECTED BY OUTAGE
4001 INPUT"WHAT SYSTEM  PC=PORT CHARLOTTE   AR=ARCADIA   LE=LEHIGH";SS$
4002 IFSS$="PC"THENF$="ON %PC":GOTO4007
4003 IFSS$="AR"THENF$="ON %AR":GOTO4007
4004 IFSS$="LE"THENF$="ON %LE":GOTO4007
4005 GOTO10
4007 PRINT"■■■LOADING PREVIOUS AMPS. INTO MEMORY  PLEASE WAIT":DOPEN#1,(F$),D1
,R:FORX=1TO400:INPUT#1,AN$(X):INPUT#1,TT$(X):INPUT#1,TL$(X):NEXTX:DCLOSE#1
4008 PRINT"■■":FORX=1TO400:IFAN$(X)=""ORAN$(X)="00000"THEN4010:ELSENEXTX
4010 FORR=1TO1:NEXTR:T=X:FORX=TTO400
4015 PRINT"■LAST AMPLIFIER NUMBER ENTERED = ";AN$(X-1)
4020 AN$(X)="":INPUT"AMPLIFIER NUMBER (ENTER IF DONE) ";AN$(X)
4025 IFAN$(X)=""THEN4100
4030 INPUT"TOTAL TRUNK AMPLIFIERS AFFECTED ";TT$(X)
4040 INPUT"TOTAL LINE EXTENDERS AFFECTED ";TL$(X)
4050 NEXTX
4100 FORT=1TO1:NEXTT
4200 DOPEN#1,@(F$),D1,W
4210 FORX=1TO400
4220 IFAN$(X)=""THENPRINT#1,"00000"+CHR$(13):GOTO4230
4225 PRINT#1,AN$(X)
4230 IFTT$(X)=""THENPRINT#1,"00000"+CHR$(13):GOTO4240
4235 PRINT#1,TT$(X)
4240 IFTL$(X)=""THENPRINT#1,"00000"+CHR$(13):GOTO4250
4245 PRINT#1,TL$(X)
4250 NEXTX
4260 DCLOSE#1
4300 GOTO10
5000 IFAT=0THENAT=1
5001 IFBT=0THENBT=1
5002 IFCT=0THENCT=1
5003 IFDT=0THENDT=1
5004 IFET=0THENET=1
5005 IFFT=0THENFT=1
5006 IFGT=0THENGT=1
5007 IFHT=0THENHT=1
5008 IFIT=0THENIT=1
5009 IFJT=0THENJT=1
5010 GOTO151
10000 DIMAN$(404),TT$(404),TL$(404)
10002 INPUT"■INPUT SYSTEM  PC=PORT CHARLOTTE  AR=ARCADIA  LE=LEHIGH ";SS$
10003 IFSS$="PC"THENF$="ON %PC":GOTO10008
10004 IFSS$="AR"THENF$="ON %AR":GOTO10008
10005 IFSS$="LE"THENF$="ON %LE":GOTO10008
10006 GOTO10
10008 DOPEN#4,(F$),D1
10010 FORX=1TO400
10020 INPUT#4,AN$(X)
10030 INPUT#4,TT$(X)
10040 INPUT#4,TL$(X)
10050 NEXTX
10060 DCLOSE#4
10100 OPEN4,4
10110 PRINT#4,CHR$(147)
10140 PRINT#4,"AMP NUMBER          TOTAL TRUNKS       TOTAL LINE EXT."
10150 FORX=1TO400
10155 IFAN$(X)=""ORAN$(X)="00000"THEN10200
10160 PRINT#4,AN$(X),,TT$(X),,TL$(X)
10170 NEXTX
10200 PRINT#4,CHR$(12):CLOSE4:END
```

reporting period are entered, the computer figures the overall on-time percentage (lines 2040, 2050, 3005, 3006 and 3010).

4000-4300: This area is to input the initial number of amplifiers, their system designator number, and the number of trunks and line extenders affected. As written, this will hold a total of 400 different amplifiers. If your system has more than this it will be necessary to change the following lines: 4010, 4210, 10000, 10010, 10150, 1304, 2030 and 1. These lines should be changed so that the "for/to" statement indicates the total number of amplifiers necessary for your system.

10000: This area will print out a list of all amplifiers and the number of trunk and line extenders affected. Again, you will need to change the system name and two-letter identifier. ■

Should anyone have any questions, the author would be more than happy to be of whatever assistance he can. You can contact Ed Whittaker at Storer Cable, P.O. Box 2999, Port Charlotte, Fla. 33949-2999.

PRODUCT NEWS

VCR hookup kit

Viewsonics is offering what it terms a "subscriber friendly" VCR hookup kit. The kit contains all the necessary components for simple installation, including an A/B switch, two-way splitter, three shielded coaxial cables with connectors and instructions.

The subscriber performs his own hookup, thereby eliminating a service call. Viewsonics will customize kits to systems' specifications. It also offers a similar kit for FM hookups.

For more information, contact Viewsonics, Box 36, Jericho, N.Y. 11753, (800) 645-7600, or (516) 921-7080.

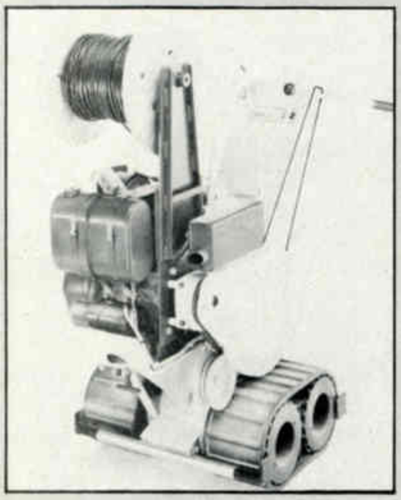
SCPC control

Microdyne's CIM-8511 Communication Information Manager, for use with single channel per carrier (SCPC) networks, provides distribution of voice, text and network control, as well as distribution commands.

The CIM-8511 allows satellite networks to make use of dead air time by transmitting electronic mail and computer data downloads. It also can distribute news alerts and weather bulletins to newspapers and other communications services.

The CIM will handle up to 128,000 addresses, distributing information to the entire network, to a specified zone of receive sites, or to individual addresses. It can be operated on broadcast-quality SCPC radio networks or audio subcarriers of video networks. The CIM's 1,200 baud data rate can provide interaction with low-cost printers that require no buffer memory, and allows the information system to be controlled by personal computer.

For more information, contact Microdyne Corp., P.O. Box 7213, Ocala, Fla. 32672, (904) 687-4633.



Reel carrier attachment

Line-Ward Corp. introduced a reel carrier attachment for its L-1 & L-2 cable line layers. This should provide a productive method to install underground housedrops, the company says, particularly when installing a whole subdivision. The unit can be slipped on or off instantly. For information, contact 8-S-290 Murray Dr., Naperville, Ill. 60540, (312) 983-9850.

Video generator

JDK Images has introduced a new line of cartridge-based software for the Commodore 64, transforming it into a video display generator. Features include 26 pages of internal screen memory, three character sets and full keyboard graphics, multi-color characters, rolls, slides, wipes, screen background grids, logo animation and full editing routines. Complete documentation and a keyboard overlay operation guide are included.

For more information, contact JDK Images, 2224 E. 86th St., Suite 14, Bloomington, Minn. 55420, (612) 854-7793.

Microwave transmitter

A new Channel Master Micro-Beam CARS-band transmitter, Model 6610, allows the transmission of as many as 60 channels up to 20 miles in one direction, up to 18 miles in two directions, or up to 12 miles in each of four directions, according to the firm.

In addition to extra power, the new 5-watt system utilizes GaAs FET amplification, a highly stable microwave oscillator and redundancy of key components to ensure reliable operation and reduce maintenance. A status monitor panel, included with the 5-watt transmitter, allows remote monitoring of all system functions by bringing all test points to the headend or tower base. The transmitter unit is designed for outdoor tower mounting, and is housed in a heavy-duty casting designed for pressurization.

For more information, contact Channel Master, P.O. Box 1416, Industrial Park Dr., Smithfield, N.C. 27577, (919) 934-9711.

Trap security shield

Vitek Electronics Inc., a division of Augat, has introduced a new security shield designed to be used on the company's molded trap strain relief. According to the company, when installed, the security shield becomes an integral part of the trap, yet is easily removed using a special tool.

Both the shield and the strain relief are manufactured of high impact, U.V. resistant plastic. Strain reliefs are available in seven colors for color coding traps.

For more information, contact Vitek Electronics, 901 South Ave., Horseheads, N.Y. 14845, (607) 796-2611.

Digital TDR

Riser-Bond Instruments has introduced an improved digital time domain reflectometer, cable fault locator, with a new adjustable sensitivity control.

Model 2901B with variable sensitivity is adjustable from at least 20 dB to 40 dB return loss. This feature of the model will afford greater flexibility, according to the company, and enable the user to find smaller problems, measure longer cables and look through some multiple faults.

For more information, contact Riser-Bond Instruments, 505 16th St., Box 188, Aurora, Neb. 68818, (402) 694-5201.

Multi-feed system

Miralite Corp. has introduced a new product, the Miralite multiband dual frequency satellite earth station antenna feed system, which operates simultaneously at Ku- and C-bands. Designed to maximize commercial Ku-band performance, the 12 GHz feedhorn is mounted at boresight rather than at the side, and the 4 GHz feedhorn is located only one C-band wavelength away. According to the company, this design offers maximum signal recovery at Ku- and very low gain loss at C-band. Typical C-band loss is less than .5 dB.

The Miralite multiband feed system is universally adaptable to virtually any aperture size earth station antenna within the .3 to .375 F/D range.

For more information, contact Miralite Corp., 4050 Chandler, Santa Ana, Calif. 92704, (714) 641-7000.

Headend converter

Macom Industries/OEM Sales has added a new 19" rack-mounted UHF to VHF crystal stabilized channel converter to its headend line. Model XUV-H,L utilizes synthesizer circuitry to allow the immediate change of conversions while maintaining crystal frequency accuracy. In order to change or set the UHF to VHF conversion, the user only needs to adjust a UHF BPF, VHF BPF and set a switch for the right conversion.

For more information, contact Macom Industries, 8230 Haskell Ave., Van Nuys, Calif. 91406, (818) 786-1335.

Agile Omni, the industry's most advanced receiver designed by the most relied upon name in the business . . . Standard.

With the new Agile Omni, you need no other receiver.

Standard designed it for cable TV operators, broadcasters, CATV, SMATV, and business and special teleconferencing networks—now and in the future.

An onboard microprocessor permits selection of any band available from domestic satellites, including the 32-channel ANIK C2. Channel tuning provides direct reading of the transponder-assigned channel number and a format control permits selection of six frequency band formats—24-channel C-band, SBS/USAT and Spacenet already installed. Select channel and format, and the microprocessor controls frequency, channel spacing, transponder bandwidth, audio frequency and bandwidth, and antenna and video polarity—automatically.

Omni's flexible design can handle up to three separate subcarriers including stereo programming or data. Omni also will accept descrambling modules—eliminating the need for expensive add-on descramblers.

For CATV and SMATV applications, severe microwave terrestrial interference is minimized by optional internal SAW notch filters, automatically programmed to switch in. A 30 MHz low DG/DP LC bandwidth filter is standard, and a second internally installed optional filter of 18, 22, 26, or 36 MHz bandwidth can be controlled by the microprocessor, or manually switched.

Standard's proven RF loop-thru circuitry and blockdown conversion technology combine, with better image rejection and lower differential gain and phase, to provide excellent video performance. C/N threshold is an impressive 6.5 dB at the wide 30 MHz bandwidth.

Agile Omni is an affordable, flexible receiver designed to keep you in business, a commitment Standard backs with its unique 5-year warranty program. Contact us for further information.

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Operating functions including MGC, AGC, AFC, level sets, normal/invert video, clamp/unclamp video, skew subcarrier frequency selection, video and IF test points are conveniently located on the front panel. Meter reads C/N ratio, signal strength or center tune.

Format control enable selections of desired satellite system. Direct-reading channel selector displays transponder-assigned channel. Second selectable subcarrier and space for optional third subcarrier or descrambler modules.

Reader Service Number 34.

Organizing with timelines

By Bruce Catter
Fund Engineer Manager, Jones Intercable

Besides being a cable television engineer, I'm also a pilot. Both activities have certainly taught me the value of using a thorough check list to avoid forgetting important tasks. Neglecting to perform certain duties while operating an aircraft could be costly. A disorganized construction project can be costly, too.

The method described here for planning and executing capital projects is simple to follow and represents a valuable tool for successful completion of your projects.

Begin by making a list of all the job functions necessary to complete the project at hand. Naturally, some projects will command shorter or longer lists and the example shown should be modified as necessary. Once your list is compiled, arrange it in rough chronological order. An accountant's work sheet (columnar pad) with 12 or more columns works well for this purpose.

After you have listed your job functions down the left-hand side of the columnar pad, label the columns across the top by month. For example, if your fiscal year begins in July, label the first column "July," the second column "August," and so on. The idea is that your timeline should coincide with your fiscal year and your budget. My example of a basic aerial plant extention shows both the project evaluation stage and the budgeting process. You may wish to start with strand mapping instead.

Next, assign a time frame to each job function. There are two important things to remember as you proceed. First, make certain to allow enough time for each function. The equipment you intend to use may have a 60-day lead time. Be careful not to cut yourself short. Makeready is another item that can be very time consuming in some parts of the country.

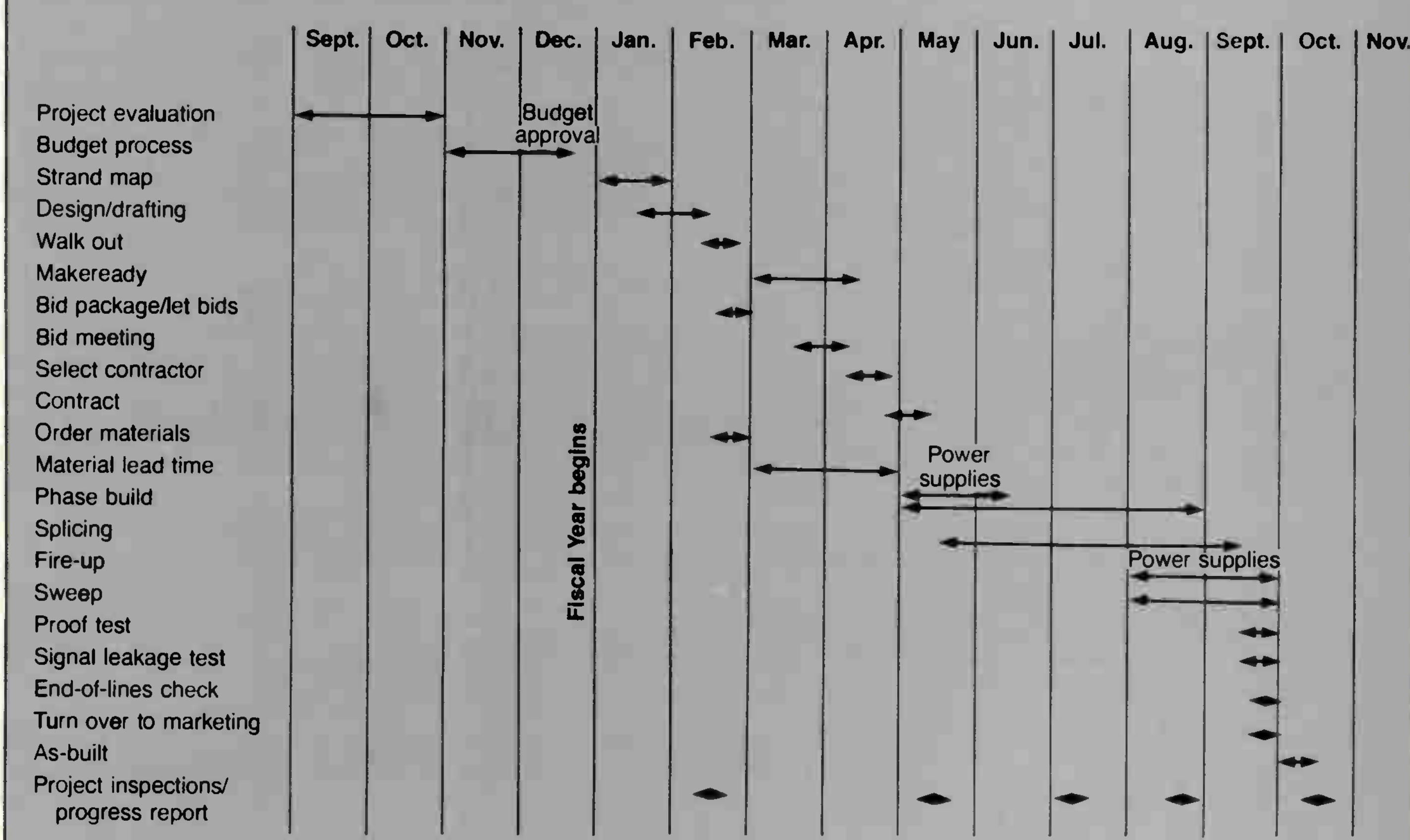
The second item to keep in mind is that you and your manager budgeted for new subscribers to be on the system in certain months. Those numbers drive a lot of other numbers in your system's budget and affect cash flow. If you do not get the subs when planned, system financial performance for the year may be affected. Be realistic when assigning time frames to job functions, but do not pad the numbers. The assigned time frames do not necessarily represent absolute duration for a job function, but do indicate time constraints on completion of the task. As the project matures, it can be defined as being ahead of schedule or behind schedule with reference to assigned time frames.

As you look at Figure 1, you can see that the timeline also will serve as a checklist to help keep you from forgetting tasks that must be accomplished within a certain time frame. Just as in flying a plane, if procedures don't occur as needed, the results can be disastrous.

Make notes on your timeline to reflect jobs delegated to other individuals as well as reminders that are specific to the project. Have you ever built a plant extension, had everything ready to go, only to find that the power supplies had not been connected to the secondaries? Suddenly, you are in for delay with some amount of telephone sweet-talking usually required to get the power supplies connected. That delay is lost revenue.

Creating your checklist and developing a timeline is the easy part. Following it, reviewing it and updating it is the challenge. If you create timelines for each of your capital projects, both revenue producing and non-revenue produc-

Figure 1: Timeline for aerial plant expansion



ing, and hide them in a file somewhere never to be seen again, they will do you no good. By keeping your timelines handy and reviewing them at least weekly, you can note progress and deal with problems promptly.

My example revolves around the basic job functions associated with an aerial plant extension. Simply change the job functions to accommodate underground extensions, a new earth station installation, a new microwave receive site, development of a converter repair facility, etc. As you develop the different lists, remember to include the clean-up items. Some clean-up tasks can accomplish a lot more than you might think. For example, a thorough signal leakage test on a new extention can turn up a leak that is a possible ingress point, egress point, moisture entry point, and signal level problem before the extension is marketed. All end-of-line taps should be checked without exception. If you have ever released an extension after the amps were swept and fire-up was reported complete, and then had installers reporting dead taps, you will know how important that final check is.

The checklist/timeline also serves as a good planning tool for use during the budgeting process. Most of us can project the cost and duration of a project through experience. The timeline can serve as backup on paper for discussion and planning purposes. Your timelines can be distributed to other appropriate parties to help ensure interdepartmental coordination. This allows other departments to anticipate project completion and plan their activities accordingly.

After developing timelines for individual projects, you can prepare a master timeline to show where the projects fall in relation to each other. This can help to evaluate manpower and to see that no projects are neglected.

More and more cable companies are making extensive use of personal computers in their organizations; spreadsheets can be easily built and used as a timeline. In fact, software is available specifically for making timelines.

The use of the checklist/timeline should help you remain in charge of the task at hand instead of the task taking charge of you. As every pilot knows, it's a lot easier to follow the checklist than to execute a crash landing.

Edward Drake, vice president for **Satellite Syndicated Systems Inc.** since 1984, has been promoted to senior vice president and chief financial officer for the company. Drake will fill the position left empty by Altus Wilder III who recently resigned from SSS to pursue independent interests.

Drake is a cable veteran with more than 20 years of management experience in the industry. Prior to joining SSS he was president and principal owner of Sooner Cable Services, a consulting service for satellite communications companies. Drake is also past-president of both the Mid-America and Oklahoma cable TV associations, a member of the Cable TV Pioneers and former executive vice president for United Cable Television Corp. Contact: P.O. Box 702160, Tulsa, Okla. 74170, (918) 481-0881.

Robert Sternberg has been appointed president of **Sidereal Corp.,** a wholly owned subsidiary of Lundy Electronics & Systems Inc.

Most recently, Mr. Sternberg was Sidereal's chief operating officer. Prior to joining the company, Sternberg was vice president of finance and Latin American relations at TRT Telecommunications Corp., where he also was a member of the board of directors. Contact: 9600 S.W. Barnes Rd., Portland, Ore. 97225, (800) 547-3222 or (503) 297-5531.

French

Vaningen

Daniel French has been named quality control engineer at **Microwave Filter Co. Inc.** Prior to joining MFC, he worked in quality control for Glomac Plastics Inc., Syracuse, N.Y.

Also at MFC, **John Vaningen** has been named manufacturing engineer. Formerly, he worked as a design drafter for Ingersoll-Rand in Shippensburg, Pa. Contact: 6743 Kinne St., East Syracuse, N.Y. 13057, (800) 448-1666.

Parker Seal Group's Lexington based O-Ring Division has announced the promotion of **Joseph Wilhoite** to the position of technical director. Wilhoite joined Parker in 1980 as a senior compounder. He was promoted to Lexington laboratory manager in 1981, a position he retained until his most recent appointment. Contact: P.O. Box 11751, Lexington, Ky. 40512, (606) 269-2451.

The Professional Video Communications Division of **JVC Company of America** has appointed **Juan Martinez** product engineering manager. Martinez, a JVC employee for more than five years, was most recently a field sales engineer for the West Coast.

JVC also promoted **Dave Walton** to marketing manager, new products. Walton too has been with JVC for more than five years. He was originally a district sales manager in the Midwest, becoming a national product manager in 1982. Contact: 41 Slater Dr., Elmwood Park, N.J. 07407, (201) 794-3900.

First Data Resources has appointed **Mike Parks** as president of the Cable System Services Division. Parks most recently served as vice president of transaction services at FDR, and replaces Matt Gates, who has been appointed the corporate vice president of operations.

Parks will be responsible for the overall sales and operations of the cable division. He joined the company in 1976. Contact: 7301 Pacific St., Omaha, Neb. 68114-5497, (402) 399-7000.

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Draw your cards from a wealth of experience and success . . .

"WTBS continues to fly far above the competition in cable household delivery, yielding more than double the audience delivered by any other service on a round-the-clock basis."

ELECTRONIC MEDIA
May 30, 1985

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"SPN is a network with everyone in mind, and its unusual blend of entertainment, travel and information make it a pleasant change of pace."

CABLEDAY MAGAZINE
June 1985

StarShip Stereo

Add another and you've got three of a kind . . .

"With the cable industry focused on new ways to lure non-subscribers, marketers of cable audio believe audio services to be a hook for reaching the entrenched cable resistors."

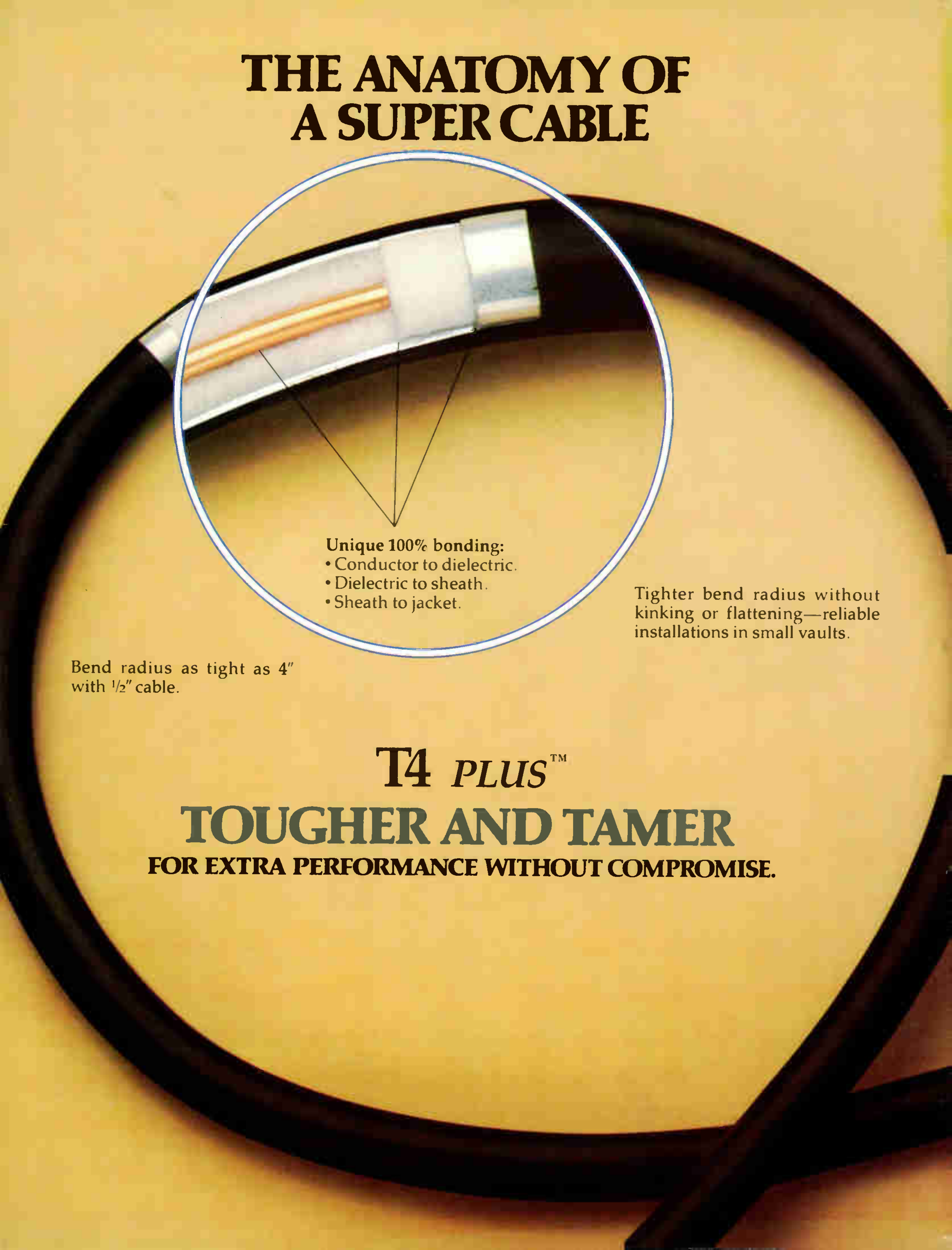
MULTICHANNEL NEWS
June 3, 1985

Don't gamble . . . play with proven winners. Give SSS a call. Today.

Deal Yourself An SSS Discount.

Satellite Syndicated Systems, Inc./P.O. Box 702160/Tulsa, OK 74170/(918) 481-0881

Reader Service Number 33.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Unique 100% bonding:
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Tighter bend radius without kinking or flattening—reliable installations in small vaults.
Bend radius as tight as 4″ with ½″ cable.
T4 PLUS™
TOUGHER AND TAMER
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THE STANDARD IS NOW THE SUPER-STANDARD

Easy coring with standard tools. Full-wall seamless aluminum tube, resistant to connectorization abuse. No objectionable non-conductive dielectric residue left on aluminum ID.

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Jacket bonding prevents concealment of damage to aluminum. Extra-rugged LLDPE* jacket dramatically increases abrasion resistance and provides additional support.

*Linear Low Density Polyethylene is an extra-tough polymer that still can be cut for cold weather connectorization.

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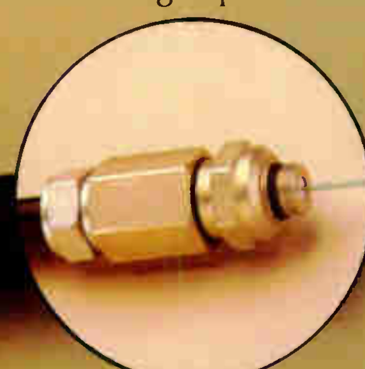
Temperature-stable electrical and mechanical performance, to withstand broad temperature swings and years of winter/summer extremes. All adhesion layers maintain performance over entire temperature range.



For further information on this cable, contact TFC today at P.O. Box 384, Wallingford, CT 06492, (203) 265-8479 or (800) TFC-CATV.

TFC TIMES FIBER COMMUNICATIONS, INC.

See us at the NCTA Show, Booth #1779

Reader Service Number 39.

AD INDEX

Alpha Technologies 24,76
Anixter 80
Broadband Engineering 56,57
Burnup & Sims/Lectro 23
Cable System Survey 29
CADCO 30
CATV Services 33
CATV Subscriber Services 25
C-COR 53
ComSonics 3
CWY Electronics 28
Dialogic 77
Eagle Comtronics 6
General Electric 7
Integral 10
Interface Technology 29
ISS 14-15
Jerrold 5
LRC 61
Macom/OEM 71
Microwave Filter 31
Nexus 59
Oak Communications 62
Qintar 49
RF Analysts 8
Riser-Bond/Avtek 51
R.L. Drake 13
RMT Engineering 24
Sadelco 11
Satellite Syndicated Systems 73
SCTE 47
Standard Communications 69
Tele-Wire 22
Texscan Instruments 55
Times Fiber 74-75
TOCOM/General Instrument 2
Trilogy Communications 26
Triple Crown 54
Utility Locate Service Inc. 72
Viewsonics 21
Zenith 79

CALENDAR

February

Feb. 10-12: Magnavox CATV training seminar, San Jose, Calif. Contact Amy Costello, (800) 448-5171.

Feb. 11-13: Jerrold training seminar, Tampa, Fla. Contact Beth Schaefer, (215) 674-4800.

Feb. 12-13: Michigan Cable Television Association annual meeting, Novi Hilton, Novi, Mich. Contact John Liskey, (517) 351-3800.

Feb. 12-14: Georgia Cable Television Association 18th annual convention, Omni International Hotel, Atlanta. Contact (404) 252-4371.

Feb. 13: New York State Cable Association pay-per-view seminar, Albany, N.Y. Contact Gwenn Bellcourt, (518) 463-6676.

Feb. 13-14: Phillips Publishing third annual "Bypassing the Local Telephone Exchange" seminar, Marriott Crystal Gateway Hotel, Arlington, Va. Contact (301) 340-2100.

Feb. 18: SCTE Delaware Valley Chapter meeting on multichannel sound, Williamson Inn, Horsham, Pa. Contact Bev Zane, (215) 674-4800.

Feb. 19-21: SPACE Show, Convention Center, Las Vegas, Nev. Contact (800) 654-9276.

Feb. 25-27: C-COR Electronics technical seminar, Kansas City. Contact Deb Cree, (814) 238-2461.

March

March 3-5: School of Lightning Protection Technology Inc. seminar, Orlando Airport Marriott, Orlando, Fla. Contact (815) 943-4005.

March 10-12: Arizona State University course on fiber-optic communications, Arizona State University, Tempe, Ariz. Contact (602) 965-1740.

March 15: NCTA Minority Business Symposium in conjunction with the national convention in Dallas. Contact (202) 775-3629.

March 15-18: National Cable Television Association and **Texas Cable Television Association** combined convention, Dallas Convention Center. Contact (202) 775-3606.

March 24-26: American Federation of Information Processing Societies Inc. seventh annual OAC, the Astrohall, Houston. Contact Catherine Shippert (703) 620-8926.

March 26: SCTE Appalachia Mid-Atlantic Chapter, administering BCT/E exam covering distribution systems. Contact Ron Mountain, (717) 984-2878.

March 26-28: School of Lightning Protection Technology Inc. seminar, Sheraton Crown Hotel and Conference Center, Houston. Contact (815) 943-4005.

March 25-27: Magnavox CATV training seminar, Dallas. Contact Amy Costello, (800) 448-5171.

March 31-April 2: Magnavox CATV training seminar, Dallas. Contact Amy Costello, (800) 448-5171.

April

April 6-8: University of Mississippi Center for Telecommunications trade show and conference, "Satellite Opportunities Expo for Business and Home," Opryland Hotel, Nashville, Tenn. Contact (601) 236-5510.

April 15-17: C-COR Electronics technical seminar, Indianapolis, Ind. Contact Deb Cree, (814) 238-2461.

April 15-18: Arizona State University course on antenna analysis, design and measurement, Arizona State University, Tempe. Contact (602) 965-1740.

April 21-23: International Computer and Telecommunications Conference, COMTEL '86, Dallas Convention Center. Contact Tommy Greene, (214) 458-7011.

Planning ahead

March 15-18: National Cable Television Association annual convention, Dallas.

May 13-15: Canadian Cable Television Association annual convention and cablexpo, Vancouver.

June 12-15: Society of Cable Television Engineers' Cable-Tec Expo '86, Phoenix (Ariz.) Convention Center.

July 20-22: Eastern Show, Merchandise Mart, Atlanta.

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

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

Reader Service Number 41.

Scrambling: Are You Ready?

This is the first article in a two-part series on planning for the upcoming universalization of satellite scrambling. This month, Bob Luff looks at planning, ensuring that your system has the right number of decoders and proper installation of the new equipment. Next month's "Comments" will cover hot standbys, password security and spares.

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

Satellite scrambling officially began for the first CATV premium pay-movie service on Jan. 15, 1986. While most systems successfully installed and are operating the extraterrestrial satellite decoder for HBO without problems, it is important to recognize that in less than six months, nearly all of the remaining satellite services will already be scrambled or well underway, with most changeovers and tests occuring during the vacation months of June, July and August. Will our headends be ready? Will you?

The key to any system technical department's successful total satellite descrambling action plan is preparation. And knowing the full extent of the amount of equipment and personal resources necessary to complete the plan before it is even started is paramount. HBO's launch was smooth and painless because over a year's worth of planning, trials and test periods and an overall industrywide concentrated focus ensured that the first CATV full-time satellite scrambling was a success. However, depending on each system's internal planning, the rapidly approaching period of multiple mass deployment of satellite decoder programs may not turn out the same way.

In just the next several months, despite most of the industry just getting used to their new extraterrestrial equipment, many satellite programmers with considerably less experience and overall resources will nonetheless overlap their individual time tables on the industry at large. The result will be that the "bride feeding the groom honeymoon" for satellite decoder implementation will be over before the system's first VideoCipher II's gift wrapping has been thrown away. System technical management teams will have to prepare themselves to tough it through the upcoming taxing period of mass multiple satellite decoder rollout on their own planning and internal resources. What must system technical planners do?

Table 1: Headend satellite decoder worksheet

Services	Scramble date	System carriage?*
HBO	Yes/Jan. 15	
Cinemax	Yes/Jan. 15	
Showtime	Yes/May	
TMC	Yes/May	
Disney	Yes/TBA**	
USA	Yes/TBA	
Nickelodeon	Yes/July	
ESPN	Yes/TBA	
Nashville	Yes/TBA	
WTBS	Yes/July	
WOR	Yes/March	
WGN	Unknown	
Lifetime	Yes/TBA	
FNN	Unknown	
CBN	Yes/Dec.	
CNN	Yes/July	
CNN#2	Yes/July	
MTV	Yes/July	
VH1	Yes/July	
C-SPAN	No	
Weather Channel	Unknown	
Arts	Yes/TBA	
SPN	Yes/TBA	
Playboy	Unknown	
Spares		
Total		

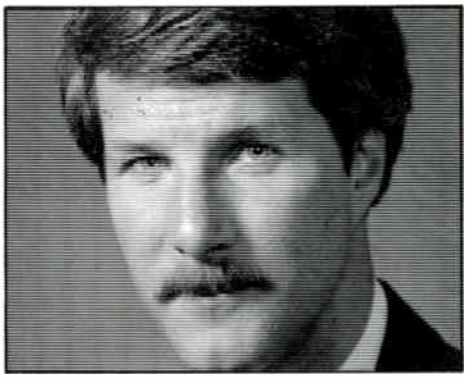
*Check the number of services carried by your system. The total number of checks equals the total number of decoders necessary for your system.
**TBA = to be announced

How many decoders?

Table 1 shows a generic headend satellite decoder worksheet. The worksheet indicates the official announced scrambling date for each satellite service and allows easy accounting of system-by-system or headend-by-headend anticipated decoder requirements. It is important that you check your system's future satellite signal carriage and decoder needs if any upgrades are in the wind.

Once the number of required satellite decoders is known, the system chief engineer and manager should carefully review and take immediate appropriate action on several important points. It must be stressed that while early planning may provide a jump on the industry at large, many of the decisions may require significant lead time and some required purchases, such as additional headend racks, which may be in short supply for those who delay ordering.

Satellite services are a key element to any cable system. It is important that technical departments ensure that all satellite decoders are installed in a professional permanent manner. All satellite decoders should be installed in normal 19-inch equipment cabinets. Hopefully, advance planning can assure that new racks match the styling and color of existing enclosures and preserve the aesthetic harmony of the headend—come on, we all care how our headends look.



'Many of the decisions may require significant lead time, such as . . . headend racks'

Powering for satellite decoders also should be in a professional and permanent manner. Systems that allow decoders to be stacked on top of full racks or powered by extension cords are asking for unnecessary outages of premium services.

Further, good engineering practice requires that all headends have an accurate headend wiring diagram (coax) affixed to the wall or some readily visable location to assure quick tracing of cable in the event of technical problems. All headend diagrams should be updated to reflect the permanent installation of all satellite decoders. This is an important requirement and the system technical management should specifically check for up-to-date and accurate headend diagrams throughout this period.

According to the accompanying "satellite decoder worksheet," most headends will require between seven and 20 satellite decoders with a good average being 10 to 15. A single VideoCipher II in its present configuration will require approximately six inches of standard 19-inch equipment rack space. This means that one-half to over one full 19-inch equipment rack must be provided to properly mount the required satellite decoders. If no rack space is available, systems should be encouraged to order necessary additional racks immediately. Since they are not the only ones installing racks, by summer additional racks may temporarily be in short supply.

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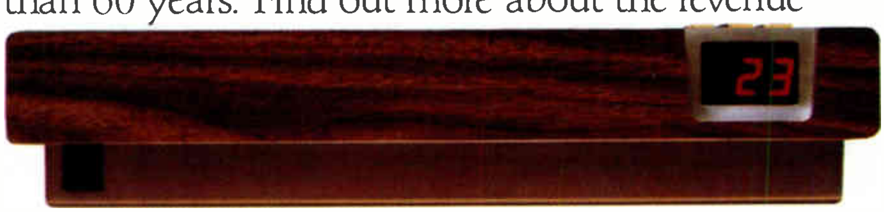

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