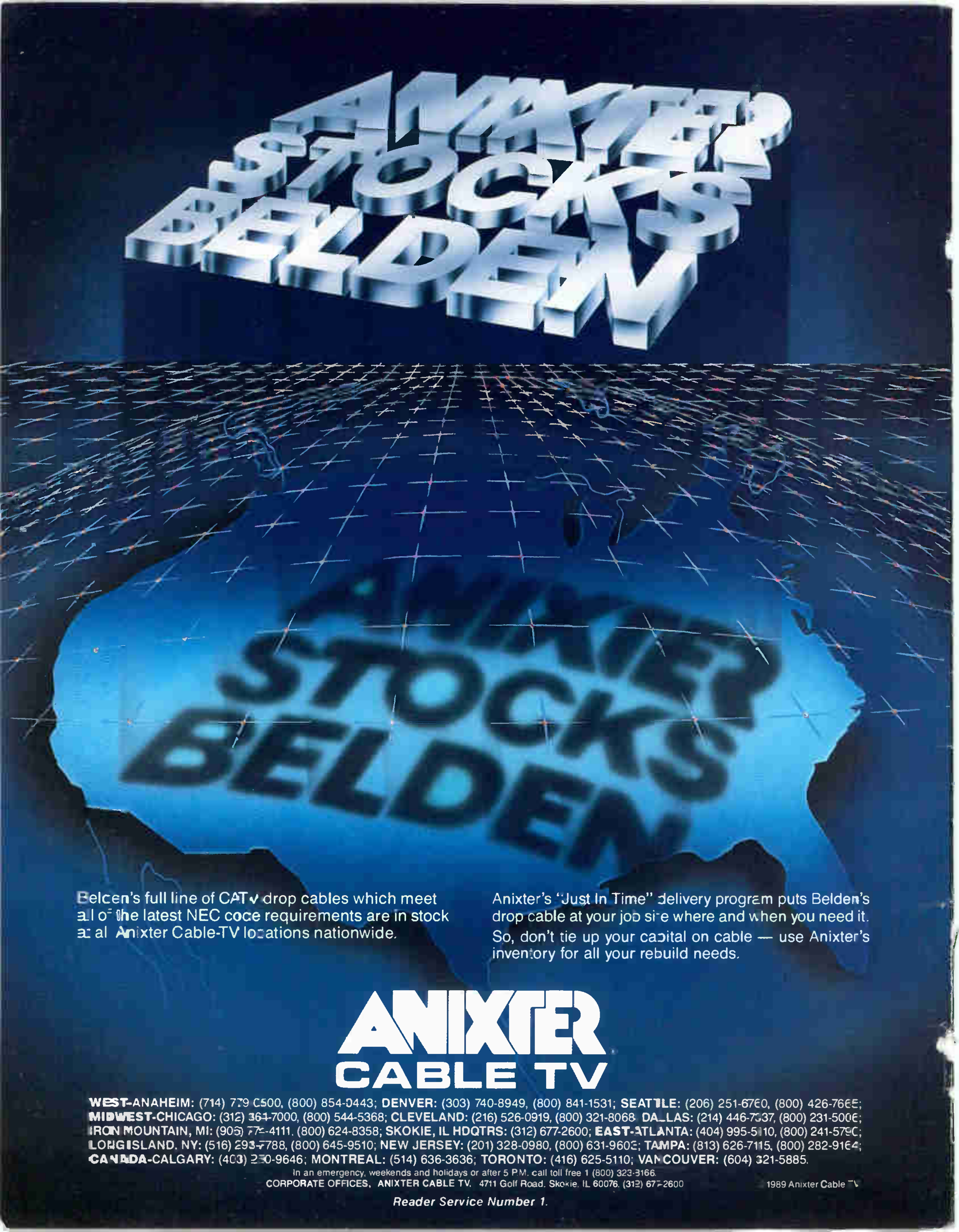
May 1989

IT INSTALLER TECHNICIAN

Focus on installation

The training and educational magazine for cable television technical personnel.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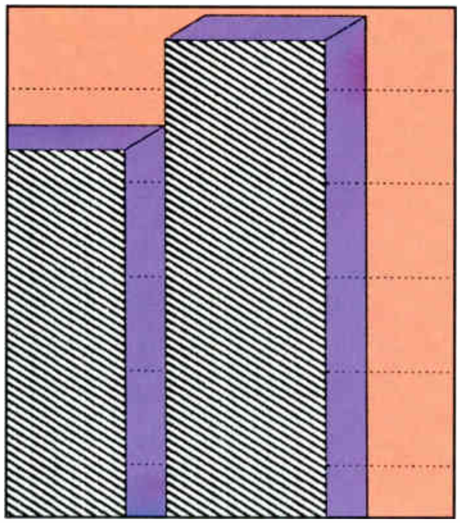

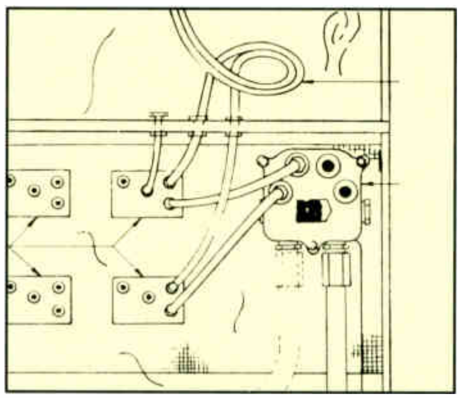

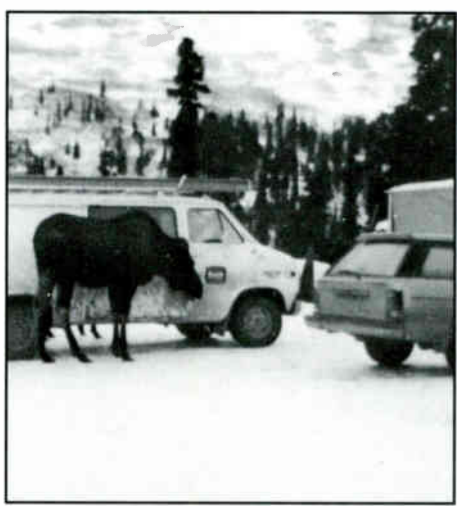

Features

Installer/Technician (ISSN 104-1253) is published monthly by Communications Technology Publications Corp., 12200 E. Briarwood Ave., Suite 250, Englewood, Colo. 80112—or—P.O. Box 3208, Englewood, Colo. 80155, (303) 792-0023. May 1989, Volume 2, Number 1. Office of publication is 12200 E. Briarwood Ave., Suite 250, Englewood, Colo. 80112. Second-class postage paid at Englewood, Colo., and additional mailing offices. POSTMASTER: Please send address changes to *Installer/Technician*, Box 3208, Englewood, Colo. 80155.


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A Lead Others Must Follow

From the Editor

One way or another

It's time to saddle up and head on down to "the big D" for the National Cable Television Association's (NCTA) Cable '89. The technical focus will mainly be on new and blue-sky technologies. Panels on high definition television, fiber-optic delivery systems and potential signal leakage are among the highlights at the show—not to mention the introduction of new hardware.

I know that a lot of technicians and installers are unable to attend this show but there is another way to learn the latest on CATV technology. The NCTA sells a book called *NCTA Technical Papers* that includes all papers presented at the show. If you can't attend, ask someone who is going to purchase a copy. If no one from your system is going, simply contact the NCTA for preorders at 1724 Massachusetts Ave., N.W., Washington, D.C. 20036. The price for NCTA members is $30, and $40 for non-members.

So whether you actually go to the show or just read the book, one way or another, you can take a peek into the future of our industry.

The F word

In the March issue of *IT*, we published an article by Henkels and McCoy on how to prepare an F connector for CATV applications to the home. While the author's method was not incorrect, I received several letters and calls from manufacturers and system operators on a more standard procedure. The following is a guide for preparation of the F connector:

1) Cut the end of the cable squarely and evenly. Cut the jacket 3/8 inch through to the braid. *Do not* cut the braid. Remove the jacket. For tri-shield cable, remove the outer layer of foil. For messenger and dual cables, split the web. Remove the rib over the length of the jacket to be covered by the connector.

2) Fold back braid evenly and smoothly for maximum pull-out strength and shielding integrity. Trim 1/4 inch of dielectric making sure not to score the center conductor. Twist the foil tight in the direction of the overlap. Be certain that no foil slivers remain attached to the cable. Now install the F connector onto the cable and crimp with the proper tool. The center conductor should extend beyond the end of the connector nut by approximately 1/16 to 1/8 inch.

In the same article was an illustration for installing messenger on a span clamp. The method shown might cause a strangulated drop.

When wrapping messenger, a two-five-three procedure often is used. The messenger should go around the clamp two times, back around itself five times and then around the drop three times. This method will keep the wind and the weight of the cable itself from pulling the messenger tight enough to harm the drop. (Many thanks to our friends at Jones, TCI, Macon Cablevision, Cencom Cable TV, Gilbert, LRC and Production Products.)

What's been happening

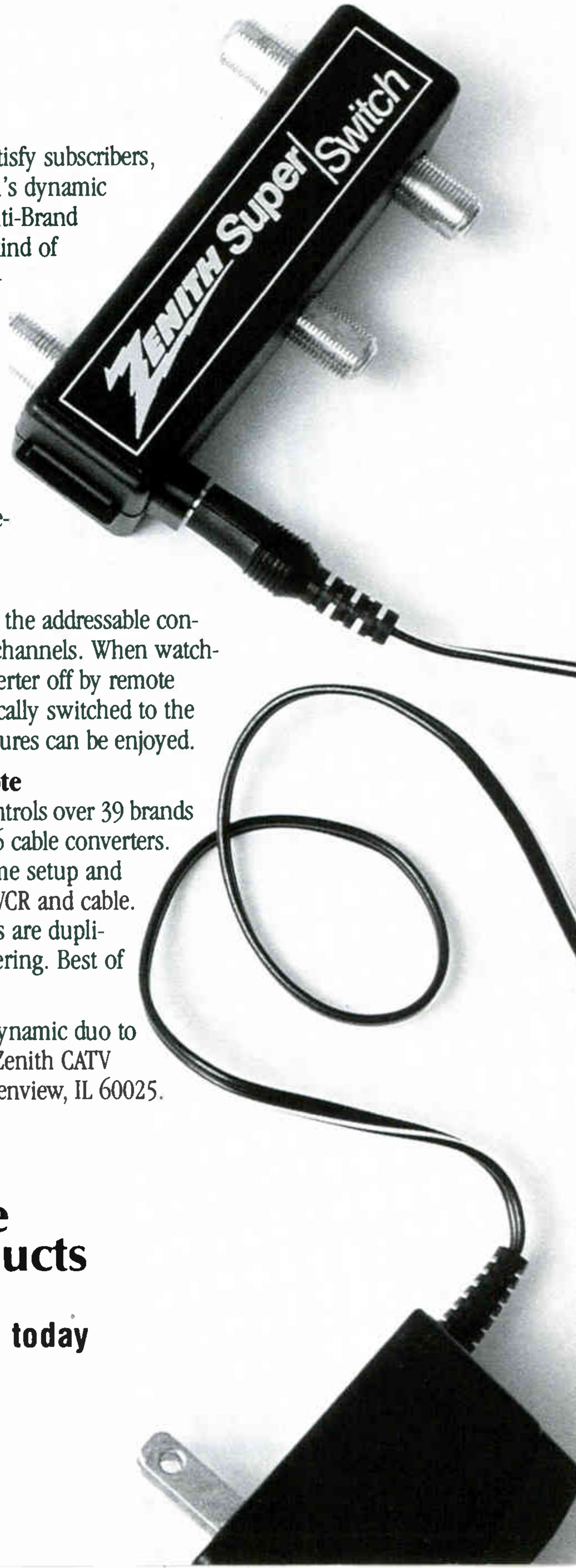
Lately, we've made a few changes that we believe will complement *Installer/Technician*. Patti Wilbourne, previously account executive for the magazine, is now our national sales manager. No rookie to the cable industry, Patti's a seven-year veteran in the cable publishing arena.

Another change you may have noticed on our masthead is the addition of the BPA logo. What this means is that we were audited by Business Publications Audit of Circulation Inc. and passed—in other words, our circulation records were up-to-date and accurate. What this audit also showed was that *IT* enjoys an unequalled reader response with 100 percent of our readers responding with written subscription requests—an unheard of statistic in the magazine biz! And subscription requests continue to grow with an average of 500 new subscribers per month! So thank you all for your enthusiastic response to *IT*. And be assured that we will continue to provide you with an informative and interesting publication.

Toni I. Barnett

Fight Subscriber Blues With

The Dynamic Duo



In the never-ending battle to satisfy subscribers, now you can team up with Zenith's dynamic new SuperSwitch™ and PCC II Multi-Brand Remote Control. No matter what kind of system you have, these two blues-busters are the ammunition you need against the two most common subscriber complaints, "too many remotes" and "unfriendly converters." PCC II turns three remotes into one and SuperSwitch lets pay subscribers enjoy all the features of their cable-compatible sets.

Zenith SuperSwitch ►
With this inexpensive auto-switch the addressable converter is used only on scrambled channels. When watching basic cable, just turn the converter off by remote control and the signal is automatically switched to the cable-compatible TV so all the features can be enjoyed.

◄ Zenith Multi-Brand Remote
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News

Blonder-Tongue Laboratories sold

OLD BRIDGE, N.J.—After more than 38 years in the telecommunications business Issac Blonder and Ben Tongue, Chairman of the Board and President, respectively, of Blonder-Tongue Laboratories, recently sold the company to a closely held group that intends to continue to operate and develop the business from the headquarters here. Retaining the Blonder-Tongue name and rights, the new organization does not plan to alter the company's format and will initially concentrate on developing and expanding penetration into the master antenna, cable, MMDS, satellite and home television reception markets that Blonder-Tongue has serviced over the past third of a century. The investment group has named James Luksch as president and Robert Palle Jr. as executive vice president of the new organization. Under the new leadership, the marketing, sales and distribution of Blonder-Tongue products will remain unchanged.

Jerrold unveils seminar series

HATBORO, Pa.— General Instrument will provide a broad array of technological training for the cable industry through its Jerrold Seminar Series, an offering of Jerrold's Applied Media Lab. According to Jerrold President Hal Krisbergh, the training "targets a wide spectrum of cable TV professionals with a variety of information needs."

Many of the elements of the series have already been cemented including the Jerrold Technical Seminars, which provide attendees with in-depth product-specific information on the technical applications of their cable equipment. Topics covered include feedforward technology, power doubling and addressability.

Another part of the series is Cable Insights, a broad-based look at technology as it relates to non-technical system personnel. Other elements are Future Technologies, Fiber Optics, CTAM General Manager Achievement Series, Broadband LAN Seminars and the Addressable Users Group. According to Krisbergh, this program is designed to "fill an educational niche not currently provided by existing industry and professional associations." Jerrold will work with other organizations where appropriate.

Holland resigns, forms new company

LOS ANGELES—Michael Holland, president of Pico Macom, recently announced his resignation from the company after eight years. He will be starting a new company here called Holland Electronics Corp. that will focus on providing SMATV and CATV headend equipment and accessories.

You and the SCTE

Society membership elects directors

Over 1,500 ballots were received from members of the Society of Cable Television Engineers during its 1989 national election for seven open seats on its board of directors. Re-elected to their current positions on the board are At-Large Directors Richard Covell, General Instrument/Jerrold Division and Robert Luff, Jones Intercable; Region 1 Director Pete Petrovich, Petrovich and Associates, serving California and Nevada; Region 2 Director Ron Hranac, Jones Intercable, serving Arizona, Colorado, New Mexico, Utah and Wyoming; and Region 6 Director Bill Kohrt, Kohrt Communications serving Minnesota, North Dakota, South Dakota and Wisconsin. Newly elected to the board are Region 9 Director Jim Farmer, Scientific-Atlanta, serving Florida, Georgia and South Carolina; and Region 11 Director Pete Luscombe, TKR Cable Co., serving Delaware, Maryland, New Jersey and Pennsylvania.

These individuals join the eight existing board members who are currently serving their second year on the board, including At-Large Director Dave Willis, Tele-Communications Inc.; Region 3 Director Ted Chesley, CDA Cablevision Inc., serving Alaska, Idaho, Montana, Oregon and Washington; Region 4 Director Leslie Read, Sammons Communications, serving Oklahoma and Texas; Region 5 Director Wendell Woody, Anixter, serving Illinois, Iowa, Kansas, Missouri and Nebraska; Region 7 Director Victor Gates, Metrovision, serving Indiana, Michigan and Ohio; Region 8 Director Jack Trower, WEHCO Video Inc., serving Alabama, Arkansas, Louisiana, Mississippi and Tennessee; Region 10 Director Wendell Bailey, National Cable Television Association, serving Kentucky, North Carolina, Virginia and West Virginia; and Region 12 Director Robert Price, BradPTS, serving Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont.

The first meeting of the new 1989 SCTE board of directors will be held May 21 in conjunction with the NCTA Show in Dallas. The board will elect the Society's officers for the coming year at its second meeting, to be held in June at the Cable-Tec Expo in Orlando, Fla.

Local groups and state associations work together

In a recent edition of its monthly newsletter, the Nebraska Cable Communications Association (NCCA) urged its members to support the recently organized Great Plains SCTE Meeting Group. The group has its roots in the Midlands Cable Training Association, which met in Council Bluffs, Iowa, and recently was reorganized and reformed as a more cohesive group based in the Omaha, Neb., area. The NCCA article details the purpose and operation of an SCTE local group. It lists the group's officers (Jennifer Hays, Randy Parker, Abe Workman and Marshall Borchert) and concludes by urging the association's members to donate seed money to the group.

The SCTE Florida Chapter further enhanced the Society's relationship with its state cable association by donating a plaque to the Florida Cable Association to commemorate the opening of its new building in Tallahassee, Fla. Mark Galloway, Richard Kirn, Rick Scheller, Pat Skerry and Denise Turner of the Florida Chapter presented the plaque to the association March 7.

Expo '89 schedule of events

Record attendance is anticipated for the 1989 Cable-Tec Expo, to be held June 15-18 at the Orange County Convention Center in Orlando, Fla. This fully technical conference and trade show will offer a wide variety of educational programs, hands-on training sessions and technical workshops, as well as an instructional exhibit floor featuring all areas of cable industry hardware.

The following is a preliminary schedule for the expo, the 1989 Annual Engineering Conference and a variety of events planned in conjunction with the show. Two highlights of the show for installer/technicians are the workshop entitled "Installer Certification: Assuring Quality Performance" with Richard Covell of Jerrold and Ralph Haimowitz of the SCTE and, for the first time, administration of Installer Certification Program examinations. The workshop will be available during the hands-on workshop periods on June 16 and 17, and the examinations will be administered June 18 from 8:30 a.m. to 12 noon.

Wednesday, June 14
(Stouffer Orlando Resort)
9 a.m.-5 p.m.—NCTA Engineering Committee meeting (Coral)
5-8 p.m.—SCTE Interface Recommended Practices Committee meeting (Yellowtail)
5-8 p.m.—Annual Engineering Conference registration (Atrium)

Thursday, June 15
(Stouffer Orlando Resort)
7:30-8:30 a.m.—Conference registration
8:30 a.m.-5 p.m.—Annual Engineering Conference and membership meeting (Crystal Ballroom)
3-5 p.m.—Cable-Tec Expo registration
6-8:30 p.m.—Welcome reception sponsored by Anixter, AT&T, Raychem and the Florida SCTE Chapter (Poolside)
8-11 p.m.—Jerrold Night at Church Street Station

Friday, June 16
(Orange County Convention Center)
7:30 a.m.-4 p.m.—Expo registration (Lobby)
8 a.m.-12:15 p.m.—Hands-on workshops
Noon-5 p.m.—Exhibit Hall open (Hall D)
6-10 p.m.—Expo Evening at Sea World

Saturday, June 17
(Orange County Convention Center)
8 a.m.-12:15 p.m.—Hands-on workshops
Noon-5 p.m.—Exhibit Hall Open
4-5 p.m.—Exhibitors' Reception (Hall D)
5:30-7 p.m.—Amateur Radio Operators Reception (Stouffers Yellowtail)
7-10 p.m.—Scientific-Atlanta Party (Stouffers Crystal Ballroom)

Sunday, June 18
(Stouffer Orlando Resort)
8:30 a.m.-Noon—BCT/E and Installer Certification Program Examinations (Crystal Ballroom)
9-11 a.m.—Chapter Development Meeting (Japanero)
10 a.m.-2 p.m.—Tours (Koi) →

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SCTE chapters and meeting groups

As a service to SCTE members, the following is an up-to-date listing of the Society chapters and meeting groups, with each group's contact person and phone number. Members should take this opportunity to join a local group.

For more information on becoming a member, contact Pat Zelenka at the SCTE national headquarters, (215) 363-6888.

Appalachian Mid-Atlantic Chapter
Contact: Richard Ginter, (814) 672-5393
Cactus Chapter
Contact: Harold Mackey, (602) 866-0072
Caribbean Area Chapter
Contact: Jerry Fitz, (809) 766-0909
Cascade Range Chapter
Contact: Norrie Bush, (206) 254-3228
Central Illinois Chapter
Contact: Tony Lasher, (217) 784-5518
Central Indiana Chapter
Contact: Joe Shanks, (317) 649-0407
Chattahoochee Chapter
Contact: Jack Connolly, (912) 741-5068
Chesapeake Chapter
Contact: Thomas Gorman, (301) 252-1012
Delaware Valley Chapter
Contact: Diana Riley, (717) 764-1436
Florida Chapter
Contact: Denise Turner, (800) 282-9164
Gateway Chapter
Contact: Darrell Diel, (314) 576-4446
Golden Gate Chapter
Contact: John Parker, (408) 437-7600
Great Lakes Chapter
Contact: Daniel Leith, (313) 549-8288
Greater Chicago Chapter
Contact: Joe Thomas, (312) 362-6110
Heart of America Chapter
Contact: Wendell Woody, (816) 454-3495
Hudson Valley Chapter
Contact: Wayne Davis, (518) 587-7993; or Bob Price, (518) 382-8000
Iowa Heartland Chapter
Contact: Dan Passick, (515) 266-2979
Miss/Lou Chapter
Contact: Rick Jubeck, (601) 992-3377
New England Chapter
Contact: Bill Riley, (617) 472-1231
North Central Texas Chapter
Contact: Vern Kahler, (817) 265-7766
North Country Chapter
Contact: Doug Ceballos, (612) 522-5200
North Jersey Chapter
Contact: Art Muschler, (201) 672-1397
Ohio Valley Chapter
Contact: Robert Heim, (419) 627-0800
Oklahoma Chapter
Contact: Gary Beikman, (405) 842-2405
Old Dominion Chapter
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Piedmont Chapter
Contact: Rick Hollowell, (919) 968-4661
Razorback Chapter
Contact: Jim Dickerson, (501) 777-4684
Rocky Mountain Chapter
Contact: Rikki Lee, (303) 792-0023
Tip-O-Tex Chapter
Contact: Arnold Cisneros, (512) 425-7880
Big Sky Meeting Group
Contact: Marla DeShaw, (406) 632-4200
Bonneville Meeting Group
Contact: Roger Peterson, (801) 486-3036
Central California Meeting Group
Contact: Andrew Valles, (209) 453-7791
Chaparral Meeting Group
Contact: Bill Simons, (505) 988-9841
Dairyland Meeting Group
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Dakota Territories Meeting Group
Contact: A.J. VandeKamp, (605) 339-3339
Dixie Meeting Group
Contact: Greg Harden, (205) 582-6333
Great Plains Meeting Group
Contact: Jennifer Hays, (402) 333-6484
Hawaiian Island Meeting Group
Contact: Howard Feig, (808) 242-7257
Idaho Meeting Group
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Inland Empire Meeting Group
Contact: Michael Lajko, (208) 263-4070
Michiana Meeting Group
Contact: Thomas White, (219) 259-8015
Midlands Cable Training Association
Contact: John Page, (712) 323-0420
Mt. Rainier Meeting Group
Contact: Sally Kinsman, (206) 867-1433
Palmetto Meeting Group
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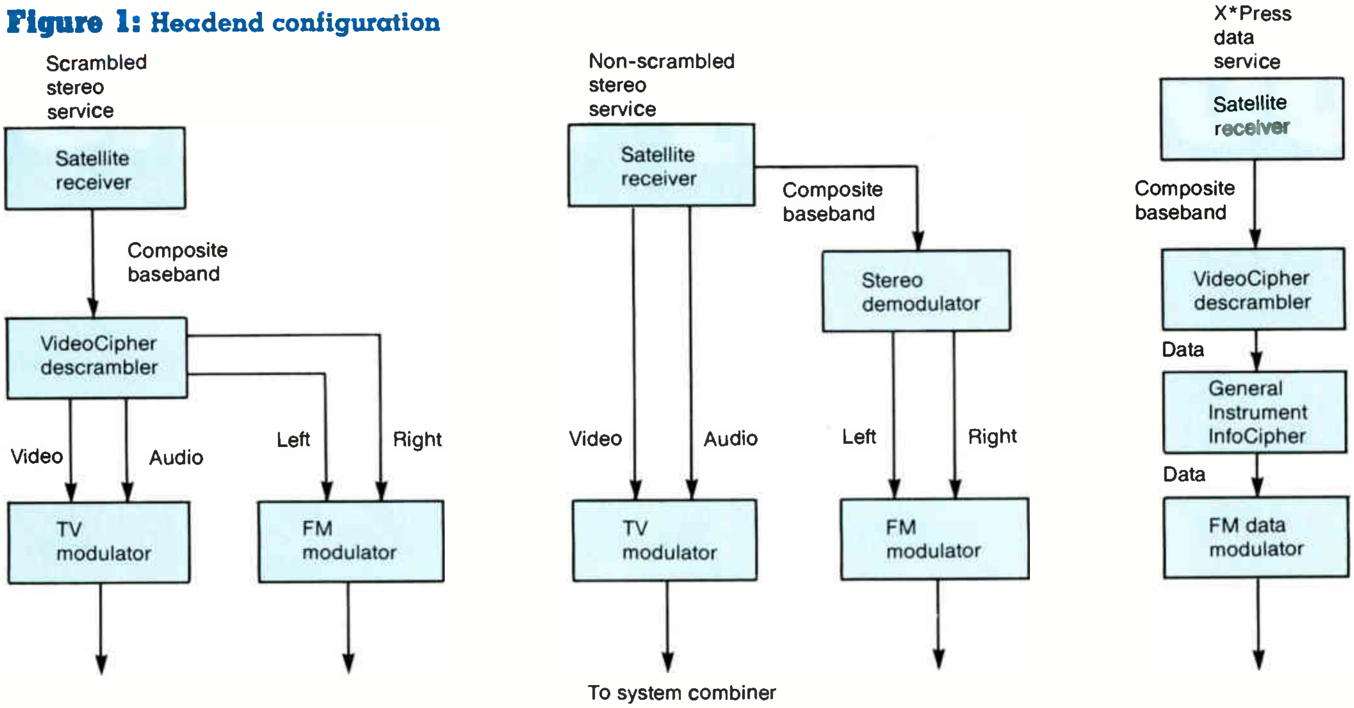
Figure 1: Headend configuration



Installing FM stereo in the subscriber's home

By Steve Fox
Marketing Manager, Cable, Wegener Communications

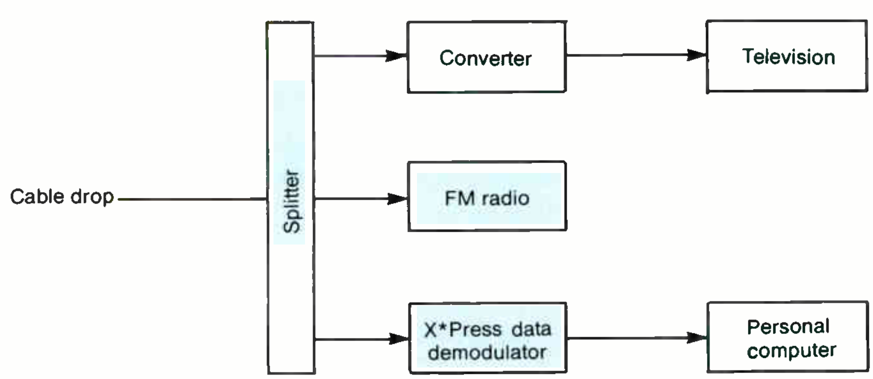
There are three methods of receiving cable audio in a subscriber's home. The primary method, used on all channels, is by delivering monaural audio on the video channel for reception by the subscriber's monaural television set. A second way is to deliver stereo audio as an FM (frequency modulated) stereo signal, much like FM from a radio station. The third and newest method is to deliver stereo audio in the U.S. multichannel sound format (usually referred to as BTSC stereo) on the video channel for reception by stereo television compatible equipment. This article will discuss FM stereo in the cable headend and installation in the home.

The obvious advantage of monaural audio is that the audio signal is tuned along with the video by the television set. FM stereo offers the enhanced sound of stereo but requires splitting the cable and routing one split to the subscriber's FM radio. With FM stereo, when the subscriber changes the television channel he must also change the FM station that is carrying the associated FM stereo signal on his receiver. BTSC stereo, like monaural audio, is tuned along with the video by the television tuner. Such external devices as some stereo VCRs and stereo television decoders also can be used to receive BTSC stereo audio. If the subscriber does not have the equipment to receive BTSC, a monaural television set will process the monaural portion of the BTSC stereo signal.

Most of the programs available for cable now offer stereo audio. Programmers using the VideoCipher scrambling system, including Home Box Office, The Movie Channel and MTV, among others, usually provide stereo audio to the headend. Unscrambled services such as The Nashville Network and USA Network provide stereo audio by transmitting separate stereo subcarriers over their satellite transponders. Other programmers, including WFMT, Gallactic Radio and Tempo Sound, provide audio-only services (programs with audio but no associated video) in stereo or monaural to the headend. Any of these programs can be delivered to the cable subscriber in FM stereo.

There also are a few data information

Figure 2: Subscriber configuration



"BTSC stereo, like monaural audio, is tuned along with the video by the television tuner."

services available for FM delivery to the business or home subscriber. An example is X*Press Information Services, which provides news and financial information over cable to a subscriber's personal computer.

Headend equipment

It is important to have a basic understanding of how the FM signal is generated at the headend. As in any installation, understanding how the signal gets to the subscriber will help ensure correct equipment installation and testing, and proper system performance.

Figure 1 shows a basic block diagram for the generation of two FM stereo programs and an FM data signal at the headend. In all cases, the composite baseband output from the satellite receiver is used as the source of the stereo audio signal. Three outputs are available from a satellite receiver. The video output provides the video portion of the signal received from the satellite transponder the receiver is tuned to (just like a TV set is tuned to a particular television channel). An audio output provides the monaural audio sound that corresponds to the video. The transponder may include other signals in addition to video and monaural audio, however. The third composite baseband output of the satellite receiver provides all of the signals available on the transponder, including video, monaural audio, stereo audio subcarriers if used, and data subcarriers if used.

For a scrambled program, the composite baseband signal is input by the VideoCipher descrambler. Unscrambled video and monaural audio are output to the TV modulator, which modulates these signals onto a particular video channel. Separate left and right audio signals are sent to an FM modulator, which outputs FM stereo. This FM signal resembles the FM stereo generated by an off-air radio station.

If the program is not scrambled or is an audio-only service the composite baseband signal is output to a stereo or monaural subcarrier demodulator pretuned to the audio subcarrier frequencies used on the satellite transponder. Demodulated left and right audio is processed by an FM stereo or monaural modulator as previously described. If the audio corresponds to a video program, video and monaural are provided to a TV modulator from the satellite receiver.

For data programming, composite baseband is input by a descrambler or data subcarrier demodulator. The resulting data output is processed by a General Instrument InfoCipher in the case of X*Press before modulation by an FM data modulator or may be routed directly to the modulator from the subcarrier demodulator. The resulting FM signal again resembles the FM generated by a radio station except in this case the signal is data rather than audio. A cable combiner then accepts the FM and TV signals generated at the headend and combines them into a single output placed on the cable going to the subscribers.

Installs in the home or business

In any installation, prior planning will save you time and help ensure a good install. Identify the placement of the components to be used by the subscriber. Ideally, the FM receiver will be collocated with the TV set. If these devices are located in separate parts of a room or in separate rooms it probably will be necessary to split the cable below the floor and route two or more cables to these individual locations. If the devices are collocated, a single cable split above the floor will suffice. Data services usually require the cable to be split and one output routed to the subscriber's personal computer. You should discuss the advantages of equipment location with the subscriber prior to installing the FM hookup.

The equipment required for the subscriber installation includes an RF splitter, 75 to 300 ohm balun and an RS232 serial cable if a data service is involved. Figure 2 shows a hookup involving television, FM stereo and an FM data signal. First, the cable is split by a two-way or four-way splitter. Use a four-way splitter if multiple TV, FM or computer outlets are involved. One split is input by the cable converter and output to the TV.

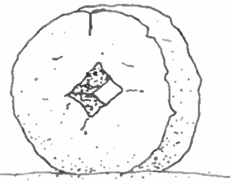
Another of the splitter outputs is converted to 300 ohms by the balun and input to the antenna inputs of the FM receiver. Two major considerations are involved when making this connection. First, since both the cable and off-air FM signals are applied to the receiver antenna terminals, the FM frequencies generated over cable must be offset by at least 400 kHz from non-corresponding off-air frequencies to avoid intermodulation between two different FM signals. Secondly, if an FM antenna is connected to the antenna terminals, it must be isolated from the cable input. If an antenna is connected directly to the cable input, the antenna will radiate the cable signals and signal leakage will result.

The third split is input to an FM data demodulator. The resulting data output is sent through the RS232 cable to a personal or business computer, which interacts with the cable signal and local software to receive the data service. When testing after a data installation has been completed, the subscriber should be available to make sure the data service is being properly received.

When performing the installation do a professional job. You are representing your company as an installer and as a salesman for the cable channels. Minimize the length of wires and cables used. In your preinstallation discussions with the subscriber find out if any components might be moved in the future (for example, if the TV is on a movable stand) and make allowances. Bind and hide wires and cables to improve the appearance of the installation and take care in the placement of all components and wiring.

Only minimal testing is required in an FM installation. Check video and RF levels as you would in any installation. Evaluate stereo performance subjectively by listening to the audio on several FM channels, including off-air channels. You will hear exactly what the subscriber hears so listen carefully for stereo quality and any undesirable background noises. The stereo should be clean and clear. Use both headphones and speakers when conducting these tests and use the amplifier balance control in your evaluation of stereo level and separation on both audio channels.

Don't forget to document your installation. Remember that you may encounter a number of equipment configurations. A well-drawn block diagram will help if problems arise later and also will be useful in future installations. Keep a copy for your files and provide a second copy for the subscriber. Last, make sure the subscriber knows how to operate the system and is comfortable with it. ■



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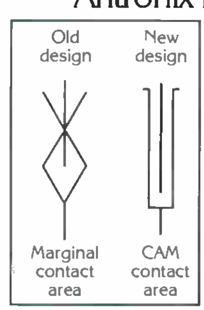

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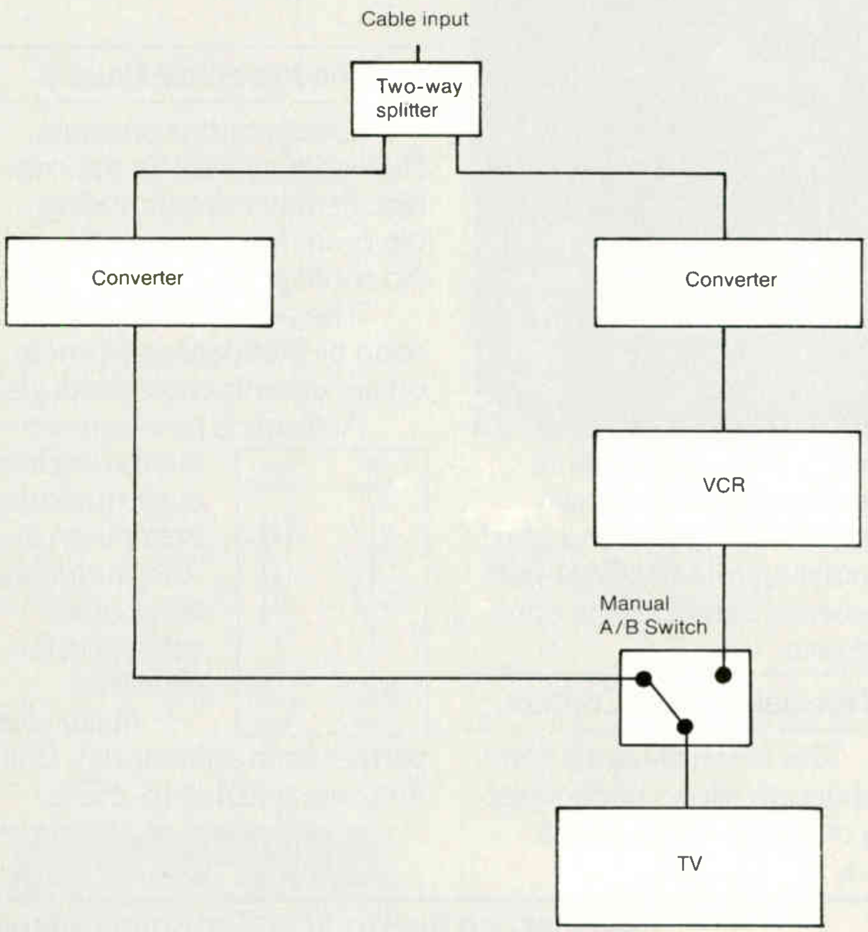
Reader Service Number 17.

Figure 1

Installation options using an auto A/B switch and integrated remote control

Figure 2



By Richard J. Kemp
Manager, Field Service Operations

And William E. Cohn
Field Installation Manager
Zenith Cable Products Division

The installer is in a position to customize an installation that combines cable with a TV set and a VCR. It is a way of giving the customers what they want, not only in viewing and recording options but especially in ease of operation.

In the beginning, there was the "plain vanilla" approach (Figure 1). This simple hookup enables the viewer to watch and/or record a cable channel, so long as only one channel is involved. Figure 2 shows a way of letting the viewer watch a scrambled channel using two converter/decoders.

When used as in Figure 1 or 2, cable-

"The auto A/B switch makes it a snap for the viewer to go from scrambled reception to cable-compatible reception."

Figure 3

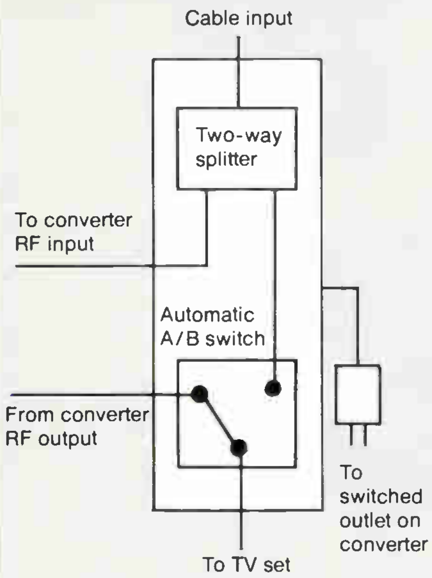
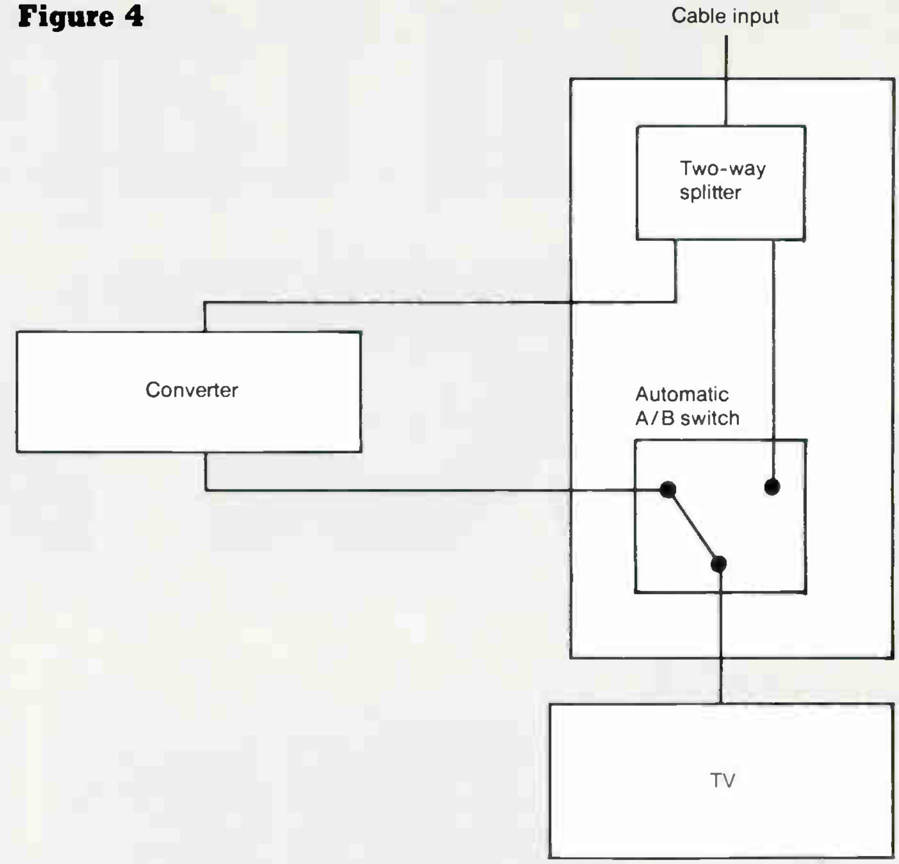


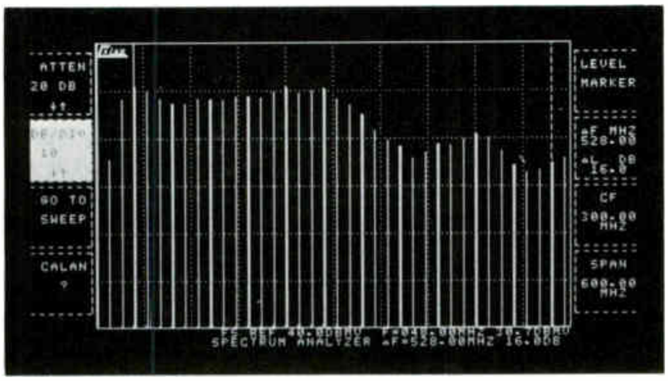
Figure 4



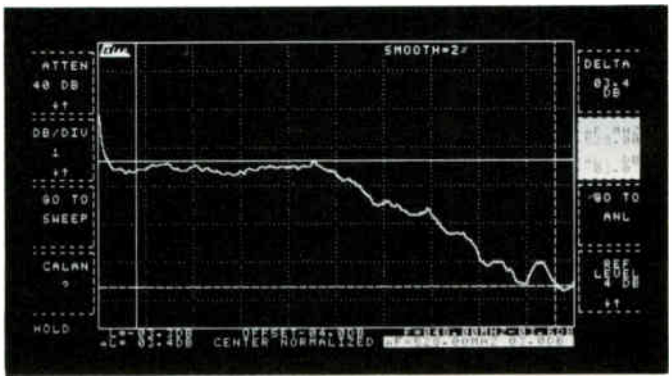
compatible remote-controlled TVs and VCRs create a dilemma for the cable consumer. The TV, VCR and cable converter each have separate remote control devices. If the cable viewer wants to program the VCR and the installer connects the customer's receivers to the cable system, many of the special

How to Improve the PICTURE QUALITY of Your Data Carriers:

PICTURE 1
Spectrum Display



PICTURE 2
Frequency Response



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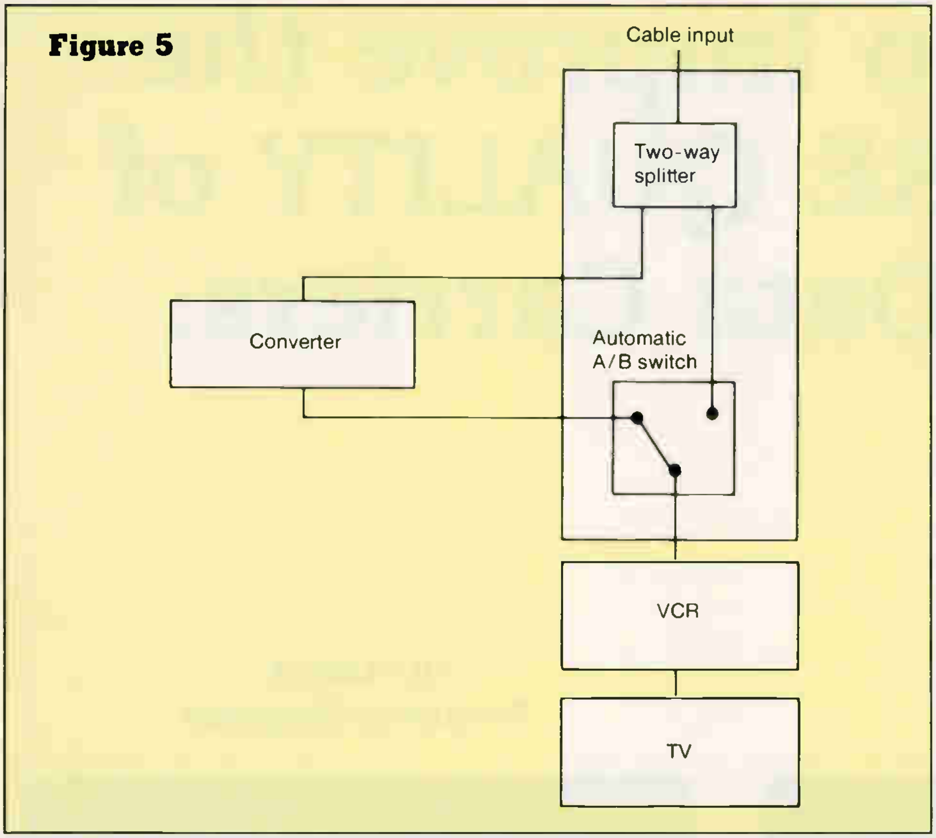

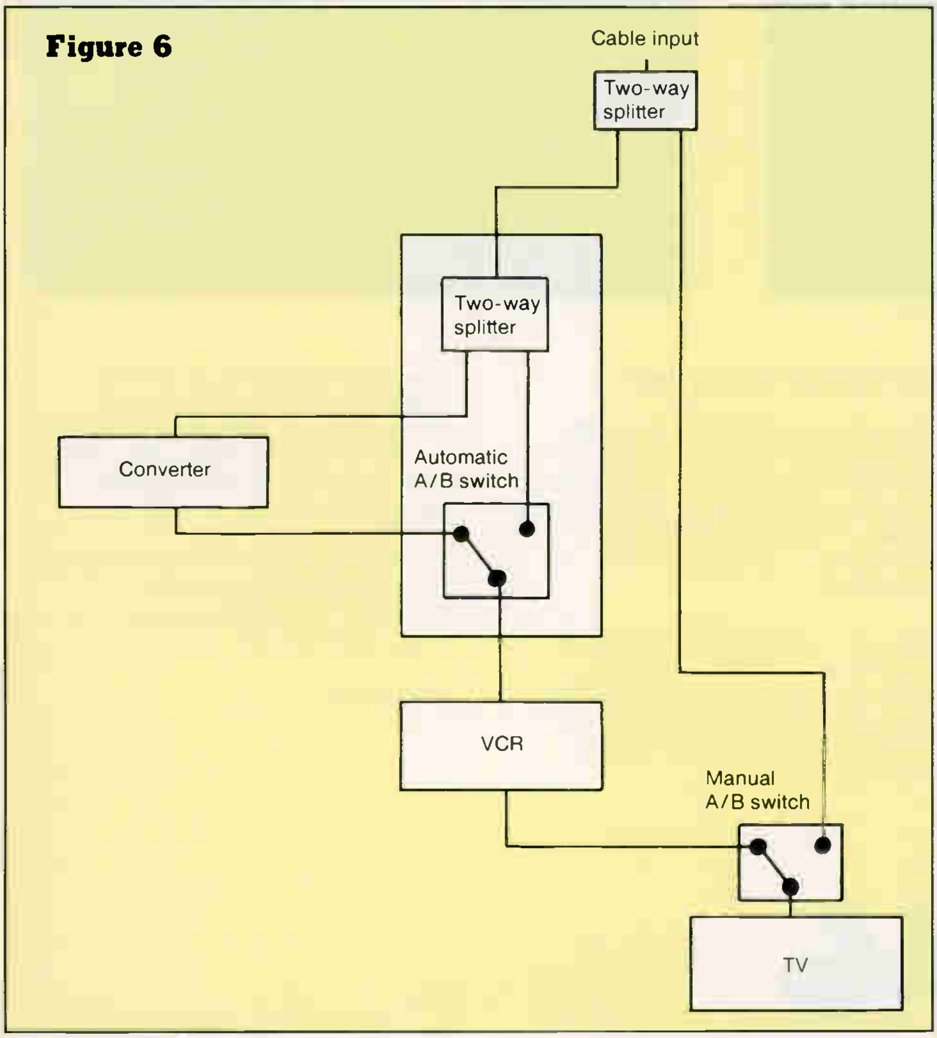

"Several manufacturers and even some cable operators now sell multibrand remote controls that link TVs, VCRs and cable converters."

features on the TV set and VCR are useless.

Some substantial benefits result from two of the simplest options. One is to connect an automatic A/B switch. The other is to set the appropriate switches of an integrated multibrand remote control that operates the converter, VCR and TV.

The auto A/B switch (Figure 3) is simple. It plugs into the switched outlet at the back of the converter and is activated by line power. When the converter is turned on, the switch is in position A; when the converter is off, the switch moves to position B.

The auto A/B switch makes it a snap for the viewer to go from scrambled reception to cable-compatible reception and is an easy way to bypass the converter. When the viewer turns the converter off, he routes the programming directly to his cable compatible VCR or TV without performing the additional manual step of operating the A/B switch.

Hookups for automatic switching

Figure 4 shows a basic hookup that allows the viewer to move from a scrambled to non-scrambled channel just by turning off the converter. The switch from A to B is automatic. As the drawing indicates, the automatic switch contains the splitter as well as the A/B switch. Another option is to insert the VCR just ahead of the TV set, as in Figure 5. Here again, the line-power-activated A/B switch automatically moves the input from scrambled to non-scrambled signals.

For more versatility, use one auto A/B switch, a splitter and an A/B switch (Figure 6). This allows the viewer to watch a non-scrambled channel while recording another channel, or watch and/or record a cable channel. The converter-actuated automatic A/B switch is the top one, the bottom A/B switch may be external or within the TV set.

For even more versatility, two converters (Figure 7) allow the viewer to watch and record two different scrambled or non-scrambled channels. An automatic switch can be used in place of each

YOU'RE WELCOME!

JONES INTERCABLE, INC.

February 22, 1989

RISER-BOND INSTRUMENTS
505 16th St. P.O. Box 188
Aurora, Nebraska 68818

To: Linda Fangman
Sales/Marketing Services

Re: RISER-BOND INSTRUMENTS Model 2901B+

In November 1988, JONES INTERCABLE of Madison, Wisconsin purchased a RISER BOND Model 2901B+ TDR. We were a little skeptical of an instrument that sells for under $800.00 that supposedly will do the same thing (locating faults in cable) as an instrument that sells for over $6,900.00.

We at JONES INTERCABLE in Madison are impressed! The instrument totally surpassed our expectations. We have found the instrument to be invaluable. It is safe to say, IT HAS PAID FOR ITSELF FIVE TIMES OVER IN ONLY FOUR MONTHS.

Case #1: In an 800 ft. span of .500 cable, we were experiencing a higher than normal attenuation of RF, as well as a large loss in AC. A JONES technician put the 2901B+ to the test. He put .500 to F fittings on the cable and took readings from each end. He proceeded to dig up the fault at the distance indicated by the TDR, found the problem, and restored full service in less than three hours!

Case #2: We had a similar situation with a 1300 ft. .750 trunk run. After pinpointing the fault with the 2901B+, we went in with a slit trencher and a back hoe. We were off by only 6 inches! The cost savings is multiplied when I explain that this was done in 24-30 inches of frost. This is a scenario where being off can cost $100.00 per foot! With wind chills of 20-40 below zero, no one wants to be on a roadside any longer than necessary.

We have more examples, but so far, all have been happy endings thanks to the RISER-BOND INSTRUMENTS Model 2901B+.

Although the Model 2901B+ is simple to operate, we opted to purchase the instructional video tape for only $35.00, again, some of the best money we ever spent. This gave our JONES technicians the confidence to trust the instrument, as well as giving them a good understanding of the principal of a TDR. Did we need the video tape? NO, but it did help.

For a very cost effective, easy to operate, dependable, highly accurate cable fault locator, you can't beat the RISER-BOND 2901B+!

Thank you.

Joe Browning
Joe Browning
Chief Engineer

2984 Triverton Pike Road, Madison, Wisconsin 53711-5897 (608) 273-4800

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RISER-BOND
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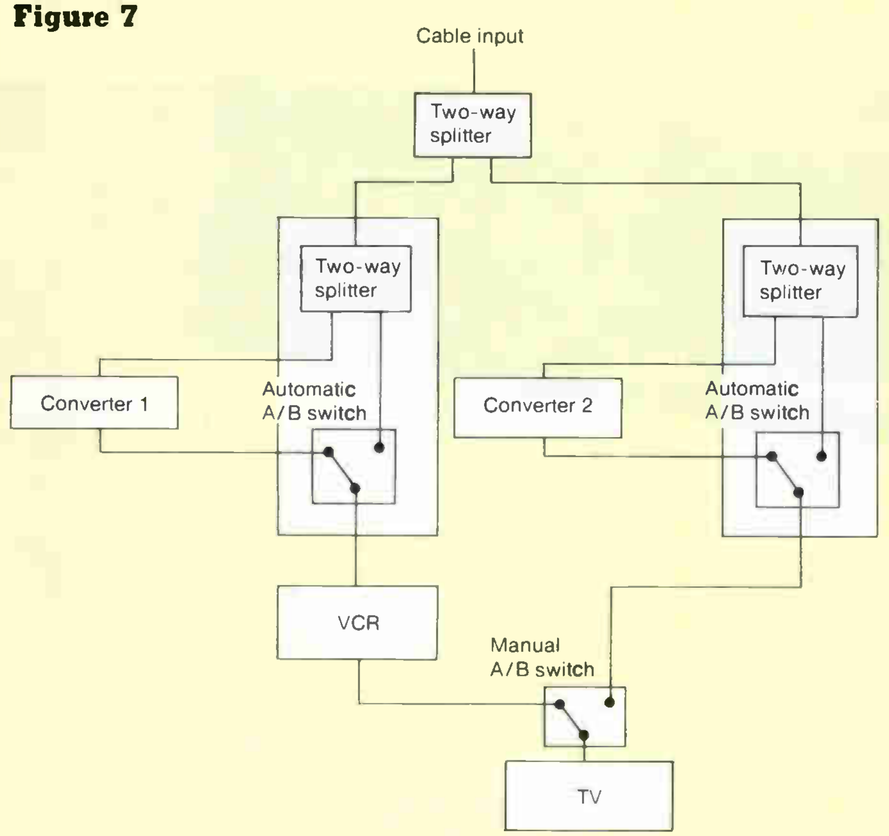
Reader Service Number 20.

Figure 7



manual switch that bypasses a converter. Splitting occurs externally (at the top of the figure) and internally in each automatic switch. The viewer benefits from this complex hookup without the inconvenience of operating two manual A/B switches. The third A/B switch (at bottom) is manual.

Keep in mind that 3 dB is lost for every splitter used. To put it another way, for each split, an additional 3 dB input is needed. The minimum input requirement is +9 dBmV for the arrangement in Figure 6: 3 dB for the two-way split at the top, 3 dB for an automatic switch and 3 dB for the VCR (which has a two-way splitter). Be aware of this limitation when the customer requests hookups in several rooms. A house amplifier may be needed here and the signal should be at least 0 dBmV at the back of each TV set.

The last item the customer needs to tie this installation together is an integrated remote control. This will replace the individual TV, VCR and cable remotes with one easy-to-use unit. Several manufacturers and even some cable operators now sell multibrand remote controls that link TVs, VCRs and cable converters. ■

What to expect in a system upgrade

By Fred Rogers
President, Quality RF Services

Cable systems are similar to snowflakes in that no two are the same. Every system upgrade requires an examination of the complete plant from cable, amplifiers and frequency spacing to passives, connectors, drop cables and levels at customer TV sets. An upgrade must improve the system to today's specification requirements while costing the least amount of money. Savings today will be invested in tomorrow's technology when it is available (and hopefully the pay scale of the system technicians). A checklist for a system upgrade would be similar to the following:

1) Condition of the existing cable and can it be reused? (Surprisingly, aluminum cable has a longer life than was originally projected by cable manufacturers.) Cable must be replaced if:

- It has an extremely high failure due to moisture ingress.
- The cable contains a manufacturing flaw that affects upper frequency response.
- The cable contains flaws that will not allow FCC specifications for signal leakage to be obtained (i.e., extensive wedding ring cracks in drip loops). Use of tools such as TDRs (time domain reflectometer), systems sweeps and return loss bridges will be required to properly evaluate cable conditions; normally about 5 percent of the plant's aluminum must be replaced in an upgrade.

2) Connectors: Must be of an integral sleeve type or equivalent.

3) Passives: Must be sweep tested to ensure desired new frequency bandpass.

4) Amplifiers: Save as much electronics as possible. Do not relocate trunk stations since feeder lines from the

Figure 1: Comparison of power requirements

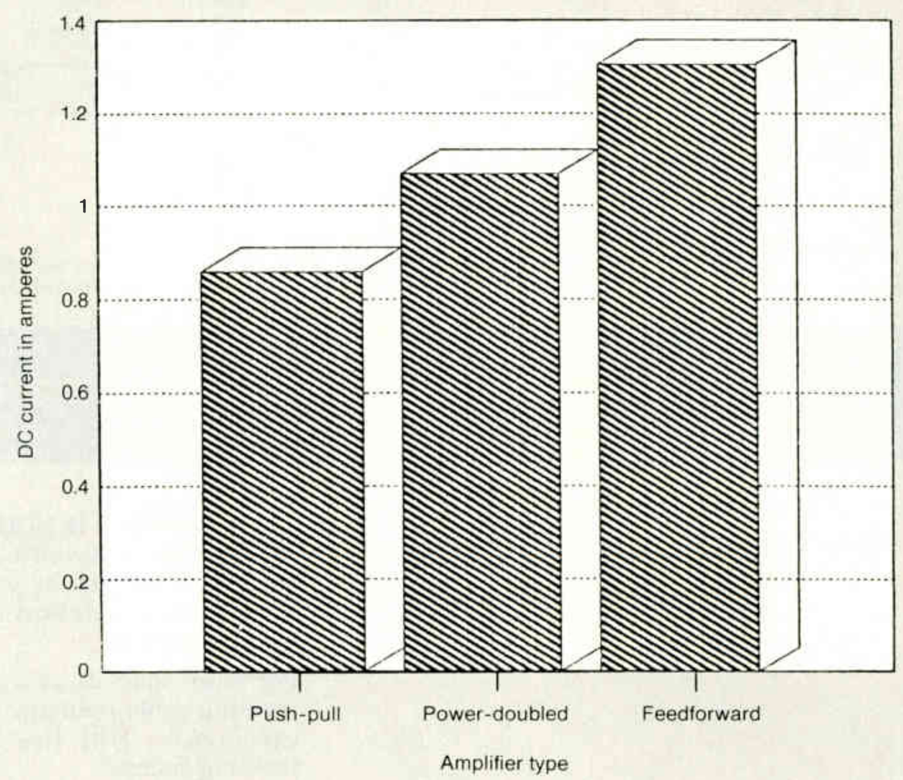
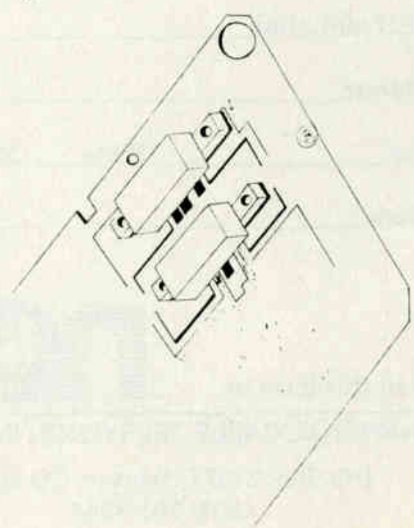


Figure 2: Two hybrids in parallel



bridger then become a nightmare.

- Can the housings be reused? If not, a new amplifier station will be required.
- Will the mother boards pass the new higher bandwidth? If not, replace with new or modify.
- Can high technology amplifiers be used to add channels, frequency bandpass and reliability without changing amplifier locations?

At this point a better understanding of amplifier performances may be advantageous. (See Figure 1.) Basically, there are three technologies available:

High gain push-pull: Many high gain modules today have excellent noise figures and high output capability. Small systems or large systems with short trunk cascades can often upgrade inexpensively with high gain.

Power doubling/parallel hybrids: In most larger systems or any systems with cascades of 30 or so amplifiers, the distortion improvement from power doubling or parallel hybrid (Figure 2) will be required. Power doubling does not in itself result in extra gain. The concept of two hybrids with combined outputs will result in twice the distortion improvement at the same output level in comparison to a high gain push-pull amplifier. Power doubling also is available in high gain versions requiring a 30 percent increase in power per module and improved power pack, and additionally may require system repowering.

Feedforward: This provides the ultimate in distortion improvements but has higher current than power doubling and usually requires a complete new housing. System power will need to be redesigned. Feedforward also is a very expensive mode of amplification.

Refer to the computer analysis of three separate trunk cascades, each using one of the three available technologies (Figure 3).

5) Bridgers and line extenders: One may either raise the levels by installing power doubling modules, high gain push-pull as needed or replace line extender locations forcing the redesign of tap selection.

6) Tap levels and drop cables: Taps must pass the higher frequency required, have integral sleeve connectors and be the correct value to deliver proper signal to the customer's TV set. The drop cables are the number one source of signal leakage. Drops may only need connectors with improved reliability or may be replaced with lower loss cable for improved level to the customer's set. ■

Figure 3: Computer analysis of trunk cascades using available technologies

Power doubled

(System name)					
BW (MHz) 4.0	Trunk	Bridger	Line extender		
Noise figure	8.5	8.0	10.0		
CTB output capacity	35.0	49.0	49.0		
CTB rating (-dBmV)	-89.0	-61.0	-61.0		
X-mod output capacity	35.0	49.0	49.0		
X-mod rating (-dBmV)	-89.0	-61.0	-61.0		
2nd output capacity	35.0	49.0	49.0		
2nd rating (-dBmV)	-85.0	-67.0	-67.0		
Channel capacity	60.0	60.0	60.0		
Manufacturer tilt	5.0	7.0	7.0		
Desired tilt	5.0	7.0	7.0		
Amplifier input	9.0	22.5	20.0		
Gain or BR DC loss	26.0	-12.5	26.0	Total	Trunk and
Amplifier output	35.0	48.0	46.0	system	bridger
Channel loading	60.0	60.0	60.0	performance	performance
Cascade length	25.0	1.0	1.0		
-59.2 C/N	-45.7	-73.7	-69.2	-45.7	-45.7
CTB	-61.0	-63.0	-67.0	-53.8	-55.9
X-mod	-61.0	-63.0	-67.0	-53.8	-55.9
2nd	-71.0	-68.0	-70.0	-64.7	-66.2

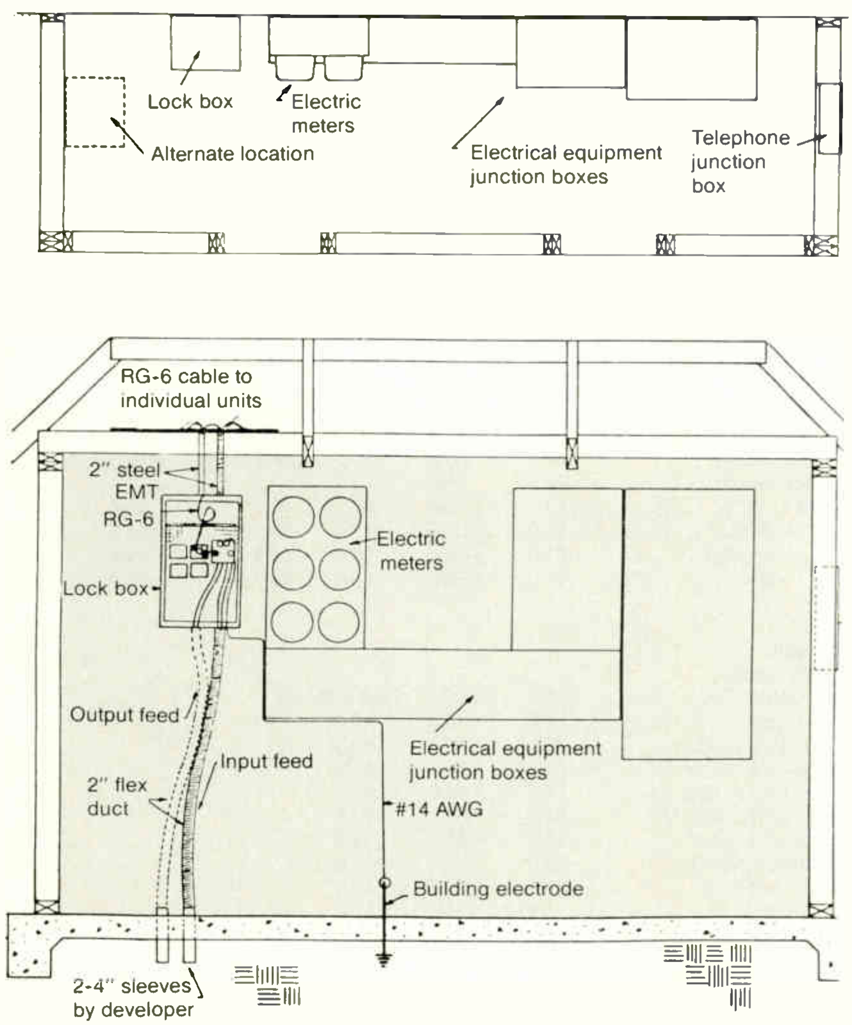
Push-pull

(System name)					
BW (MHz) 4.0	Trunk	Bridger	Line extender		
Noise figure	8.5	8.0	10.0		
CTB output capacity	35.0	49.0	49.0		
CTB rating (-dBmV)	-84.0	-61.0	-61.0		
X-mod output capacity	35.0	49.0	49.0		
X-mod rating (-dBmV)	-84.0	-61.0	-61.0		
2nd output capacity	35.0	49.0	49.0		
2nd rating (-dBmV)	-82.0	-67.0	-67.0		
Channel capacity	60.0	60.0	60.0		
Manufacturer tilt	5.0	7.0	7.0		
Desired tilt	5.0	7.0	7.0		
Amplifier input	9.0	22.5	20.0		
Gain or BR DC loss	26.0	-12.5	26.0	Total	Trunk and
Amplifier output	35.0	48.0	46.0	system	bridger
Channel loading	60.0	60.0	60.0	performance	performance
Cascade length	15.0	1.0	1.0		
-59.2 C/N	-47.9	-73.7	-69.2	-47.9	-47.9
CTB	-60.5	-63.0	-67.0	-53.6	-55.6
X-mod	-60.5	-63.0	-67.0	-53.6	-55.6
2nd	-70.2	-68.0	-70.0	-64.5	-66.0

Feedforward

(System name)					
BW (MHz) 4.0	Trunk	Bridger	Line extender		
Noise figure	10.0	8.0	10.0		
CTB output capacity	35.0	49.0	49.0		
CTB rating (-dBmV)	-102.0	-61.0	-61.0		
X-mod output capacity	35.0	49.0	49.0		
X-mod rating (-dBmV)	-102.0	-61.0	-61.0		
2nd output capacity	35.0	49.0	49.0		
2nd rating (-dBmV)	-92.0	-67.0	-67.0		
Channel capacity	60.0	60.0	60.0		
Manufacturer tilt	5.0	7.0	7.0		
Desired tilt	5.0	7.0	7.0		
Amplifier input	13.0	24.5	20.0		
Gain or BR DC loss	24.0	-12.5	26.0	Total	Trunk and
Amplifier output	37.0	48.0	46.0	system	bridger
Channel loading	60.0	60.0	60.0	performance	performance
Cascade length	40.0	1.0	1.0		
-59.2 C/N	-46.2	-75.7	-69.2	-46.2	-46.2
CTB	-66.0	-63.0	-67.0	-55.6	-58.3
X-mod	-66.0	-63.0	-67.0	-55.6	-58.3
2nd	-74.0	-68.0	-70.0	-65.3	-67.0

Figure 1: Typical utility closet (no scale)



"A lock box with well-mounted splitters, ground and taps make for easier installations and maintenance."

MDU cable construction

By Steve Kerrigan
System Technician, Rancho Santa Margarita Cable Co.

Cable construction of multiple dwelling units, MDUs (e.g., condominiums, apartments, barracks, dormitories), is complicated and should be monitored through all aspects of the project. Quality control of the pipe installation, prewiring, lock box and cable makeup will ensure years of life out of the cable plant. Coordination during construction is essential.

In an MDU environment, cable equipment will quite often be located in the utility or electrical closet. The cable operator can assign a cable inspector to coordinate and inspect the construction activities. The inspector will oversee the cable installation to verify it is being built to the cable operator's specifications.

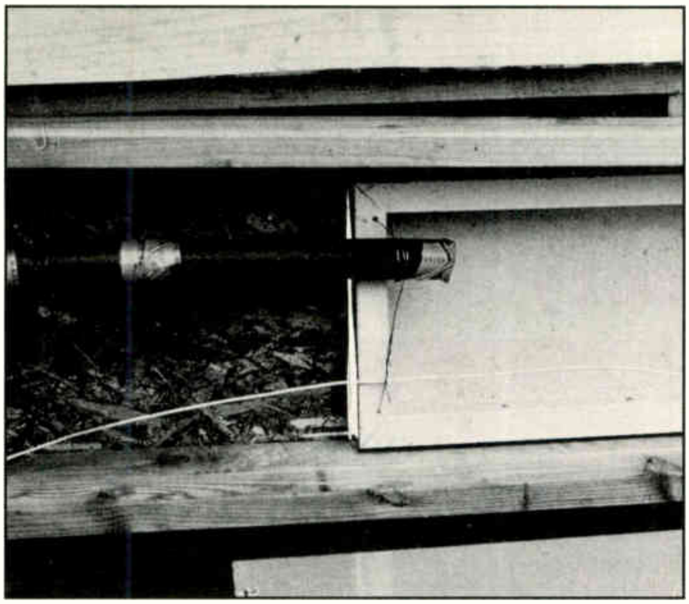
Written specifications given to the builder, utility planners, cable contractors and prewire crews (electricians or TV and telephone prewire companies) prevent oversights and misunderstandings. Specification books with diagrams (see Figures 1 and 2) clearly demonstrate what is required. The work required will be known in advance of the project's start.

In the beginning

Setting up pretrench or preconstruction meetings will help to resolve any potential conflicts during construction. At the pretrench meeting, make sure to have the foundation sleeving placed in sufficient quantity and in the correct position in the utility closet. Foundation sleeves will be needed later to put the conduit into the building. Go over the size of the closet with the builder. Lock boxes should be installed in MDUs to secure the cable equipment from tampering. Be wary of clearance problems with the lock box. Lock box doors and lids must be able to open, and cannot be too close to electric panels and phone terminals. Consulting local building and utility inspectors to learn of required clearances can avert problems before the lock boxes are installed.

Prewire specifications also are important to follow. Prewire contractors must be aware of the type of wire to be installed, minimum number of outlets per unit, style of junction box and proper cable routing.

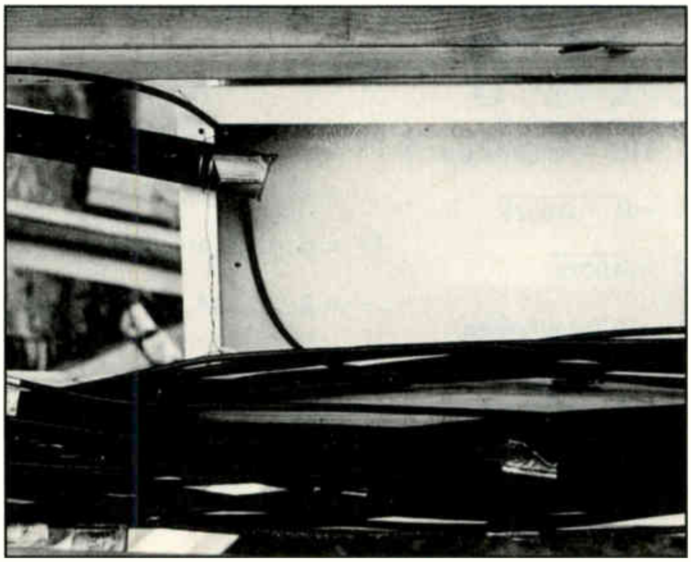
Running "home-runs" (diamond-shaped configurations) from the outlet to the lock box is helpful for outlet control



Flush mounted lock box with pipe and ground wire.

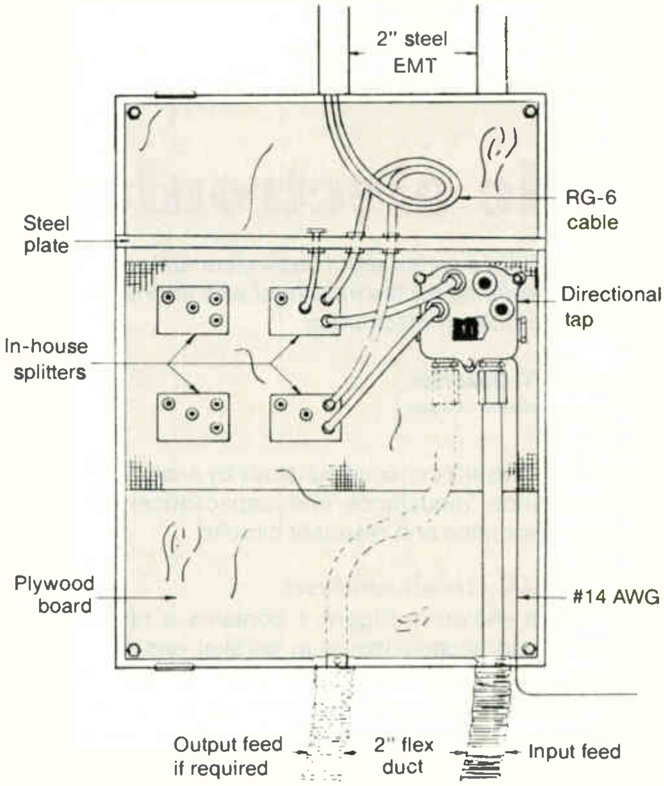
and reduces customer tampering. On the downside home-runs are more costly than inside accesses, or looping the cable from outlet to outlet, because there is more cable used per unit. The initial cost will be recovered in reduced service calls and better control of additional outlets. Also, since there is more cable in the lock box, it will need to be larger to accommodate more splitters.

Using plastic cable clips (often called roca clips) is another spec that reduces service calls. Often, when the cable is secured with electrician's staples when framing, the cable becomes flattened or broken. Using plastic cable clips may reduce bad cable prewires dramatically. Inspecting during construction is needed to make sure the prewire personnel are complying with this spec. Often, workers running prewires do not have cable experience and they do not realize how drop cable should be handled. Electricians often need to be persuaded to use plastic cable clips, since they are probably not familiar with them. Bad prewires are expensive and difficult to repair. Ensuring correct installation of the prewired drops will prevent frustrated subscribers when they move in.



Flush mounted lock box during framing with ground wire, pipe and prewires complete.

Figure 2: **18″ × 24″ × 8″ lock box detail (no scale)**



The cable inspector also has to make sure the prewires are brought into the utility closet directly over or under the lock box. If the prewire is not covered by drywall in the closet, the cables should be protected with plastic or metal flexible conduit. Flush-mounted lock boxes need to be installed during framing. The framing stage is a good time to run ground wire into them. Many times, prewire personnel are not installing the lock box, so they must be instructed as to where to bring the cable into the closet. Communication with the contractors and inspecting their work will prevent errors.

The contractor's role

If an outside contractor is used for underground pipe installation, the contractor will have to be notified as to what date to install the pipe in the open utility trench. Trench dates are usually set weeks in advance. Prior to the trench date, the cable inspector must check with the builder or utility planner to verify that the date has not changed. The contractor is then notified of the confirmed open trench date. Inspection is needed for added security in knowing the proper size and type of conduit being installed and routed to the correct buildings. If vaults and pedestals are being used, care must be taken to raise the pipe up in spots that will not interfere with sidewalks, other utility pedestals and similar conflicts. The cable inspector can watch for this type of conflict and take corrective action.

We strive to have new units active seven days prior to the customer's move-in date. The contractor must schedule his time accordingly. After the utility closet is drywalled and the prewiring is complete, the cable contractor mounts the lock box. (Flush-mounted lock boxes are installed during framing.) Cable is pulled and spliced. Since home-run prewires are

(Continued on page 62)

Basic electronics theory

This is Part XIII of a series about basic electrical and electronic principles, designed for the individual with little or no training in either electricity or electronics.

By Kenneth T. Deschler
Cable Correspondence Courses

This month we will continue our study by analyzing a parallel RLC (resistance, inductance and capacitance) circuit and exploring resonance and resonant circuits.

Parallel RLC circuit analysis

The circuit shown in Figure 1 contains a resistance, an inductance and a capacitance in parallel and is known as a *parallel RLC circuit*. We will use this circuit to amplify all that we have learned about AC circuits up to this time.

When working with a parallel RLC circuit the following formulas should be used:

$I_X = I_L - I_C$ or $I_C - I_L$ $\qquad I_R = E \div R$

$I_Z = \sqrt{I_R^2 + I_X^2}$ $\qquad I_C = E \div X_C$

$Z = E \div I_Z$ $\qquad I_L = E \div X_L$

$X = E \div I_X$ $\qquad PF = I_R \div I_Z$

Using Figure 1 find X_L, X_C, I_R, I_L, PF, Z, TP, X, I_X, I_C, RP, I_Z, and AP.

Solution:

$X_L = 2\pi FL$

$= 6.28 \times 60 \times 20 \times 10^{-3}$

$= 7.536$ ohms

Figure 1

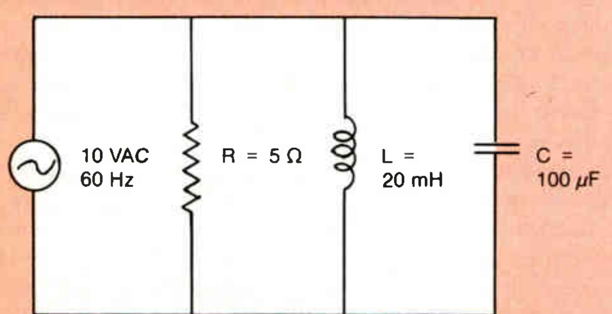
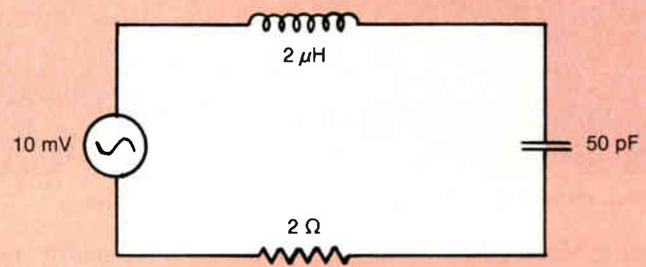


Figure 2



$X_C = \dfrac{.159}{FC}$

$= \dfrac{.159}{60 \times 100 \times 10^{-6}}$

$= 26.5$ ohms

$I_R = E \div R$
$= 10 \div 5$
$= 2$ amperes

$I_L = E \div X_L$
$= 10 \div 7.536$
$= 1.327$ amperes

$I_C = E \div X_C$
$= 10 \div 26.5$
$= 0.377$ ampere

$I_Z = \sqrt{I_R^2 + (I_L - I_C)^2}$

$= \sqrt{2^2 + (1.327 - 0.377)^2}$

$= \sqrt{4 + 0.9025}$

$= \sqrt{4.9025}$

$= 2.214$ amperes

$Z = E \div I_Z$

$= 10 \div 2.214$

$= 4.52$ ohms

$TP = I_R^2 \times R$

$= 4 \times 5$

$= 20$ watts

$X = E \div I_X$

$= 10 \div 0.95$

$= 10.526$ ohms

$RP = I_X^2 \times X$

$= 0.95^2 \times 10.526$

$= 9.5$ VAR

$AP = I_Z^2 \times Z$

$= 2.214^2 \times 4.52$

$= 22.15$ VA

$PF = I_R \div I_Z$ or $TP \div AP$

$= 2 \div 2.214$ or $20 \div 22.15$

$= 0.90$

Resonance

Resonance is the condition that exists within a circuit when the inductive reactance is equal to the capacitive reactance. Earlier in our studies we found that an increase in frequency caused X_L to become larger while X_C became smaller; when the opposite occurred, X_L decreased and X_C increased. With this in mind, there must exist a point where X_L equals X_C. That point is the resonant frequency of that particular circuit. At resonance, only resistance is left to oppose current flow.

The formula for finding the resonant frequency (f_r) of a circuit is:

$$f_r = 0.159 \div \sqrt{LC}$$

Where:
L = inductance in henrys.
C = capacitance in farads.

Using Figure 2, let us determine the frequency at which X_L is equal to X_C:

$$f_r = 0.159 \div \sqrt{2 \times 10^{-6} \times 50 \times 10^{-12}}$$

$$= 0.159 \div \sqrt{100 \times 10^{-18}}$$

$$= 0.159 \div (10 \times 10^{-9})$$

$$= 15.9 \text{ MHz}$$

In order to achieve resonance, the frequency of the AC source in Figure 2 should be set at 15.9 MHz. Assuming the source was set at 15.9 MHz, what would be the value of current flowing within this circuit?

Solution:

$$Z = \sqrt{R^2 + X^2}$$

$$= \sqrt{4 + 0}$$

$$= 2 \text{ ohms}$$

$$I = E \div Z$$

$$= 10 \times 10^{-3} \div 2$$

$$= 5 \text{ mA.}$$

If we wished to obtain a resonant circuit but only knew the value of one component, we could find the other through the use of one of the following:

$$L = 1 \div 4\,\pi^2 \times f_r^2 \times C \quad \text{or} \quad C = 1 \div 4\,\pi^2 \times f_r^2 \times L$$

Resonant circuits

Figure 2 is an example of a *series resonant circuit*, which has maximum current and minimum impedance at resonance. One interesting fact about a series resonant circuit is that the voltage across each of the reactors is many times the applied voltage. Using Figure 2 as an example, the voltage across either the inductor or capacitor can be found by multiplying the circuit's current by the reactance of the component as follows:

$$X_L = 2\,\pi\,FL$$

$$= 6.28 \times 15.9 \times 10^6 \times 2 \times 10^{-6}$$

$$= 200 \text{ ohms}$$

$$X_C = 0.159 \div FC$$

$$= 0.159 \div 15.9 \times 10^6 \times 50 \times 10^{-12}$$

$$= 0.159 \div 795 \times 10^{-6}$$

$$= 200 \text{ ohms}$$

$$E_L \text{ or } E_C = I \times X$$

$$= 5 \times 10^{-3} \times 200$$

$$= 1 \text{ volt}$$

Notice that 1 volt is 100 times greater than the applied voltage of 10 millivolts. The reason for this is that the voltages of the two reactors are 180° out of phase.

Figure 3

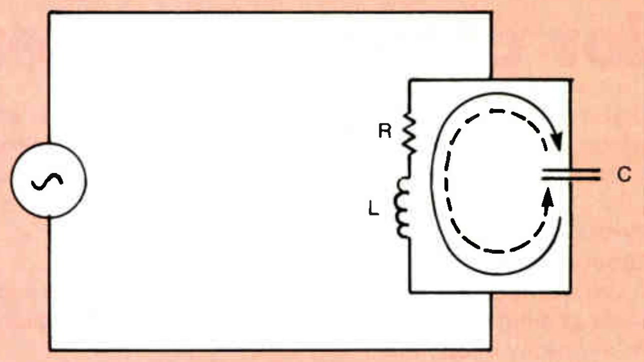


Figure 3 is an example of a *parallel resonant circuit*, in which the applied voltage is across both the inductor and the capacitor equally. Because of this, the capacitor charges to that value. As the polarity of the input voltage changes, current flows alternately from plate to plate causing it to oscillate back and forth. Parallel resonant circuits have minimum current and maximum impedance at resonance.

Next month we will cover the figure of merit of a resonant circuit known as circuit Q, bandwidth and filter circuits.

Test your knowledge

1) Define resonance.
2) What is the resonant frequency of a parallel circuit containing a 5 microhenry inductor and a 30 picofarad capacitor?
3) With respect to I and Z, what are the characteristics of a series resonant circuit?
4) With respect to I and Z, what are the characteristics of a parallel resonant circuit?
5) Why is the voltage across a reactor in a series resonant circuit greater than the applied voltage? ■

Answers

1) The point where X_L equals X_C.
2) $f_r = 0.159 \div \sqrt{5 \times 10^{-6} \times 30 \times 10^{-12}}$
$= 12.98$ MHz.
3) Maximum current and minimum impedance.
4) Minimum current and maximum impedance.
5) Because of the phase difference between voltages associated with the components.

Recommended practices for consumer interfacing

This is the sixth part in a series on connecting consumer electronics products in the subscriber's home. The installation setup guide and Figures 1 through 18 appeared in Parts III, IV and V.

By the NCTA Engineering Committee's Subcommittee on Consumer Interconnection

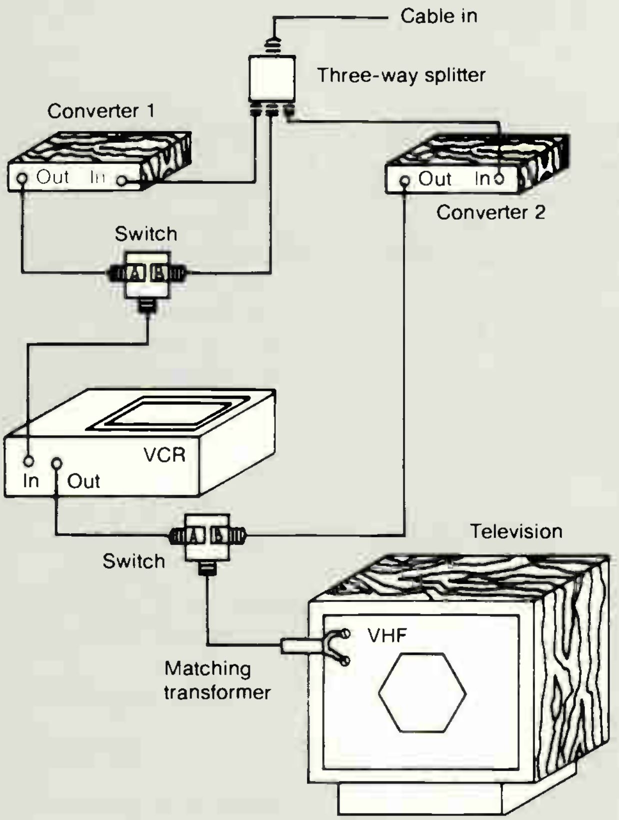
You will need to keep these factors and their relative importance in mind when choosing an installation configuration:

- simplicity of operation
- ability to use TV or VCR remote control (all illustrations allow for use of a converter remote control)
- ability to use timed, multichannel, multievent VCR feature
- total signal attenuation (i.e., if your system levels are near 0 dBmV and the installation diagram calls for a four-way splitter, your subscriber will get snowy pictures)
- number of high-quality A/B switches (yielding 70 to 80 dB of isolation at minimum) needed
- 0 dBmV is assumed to be the minimum input level for a converter
- mid-UHF converters may not translate all super-band channels to UHF
- VCRs in bypass require high drop levels

In the accompanying figures:

1) Some TV sets are shown with 300 ohm input terminals, others

Figure 19



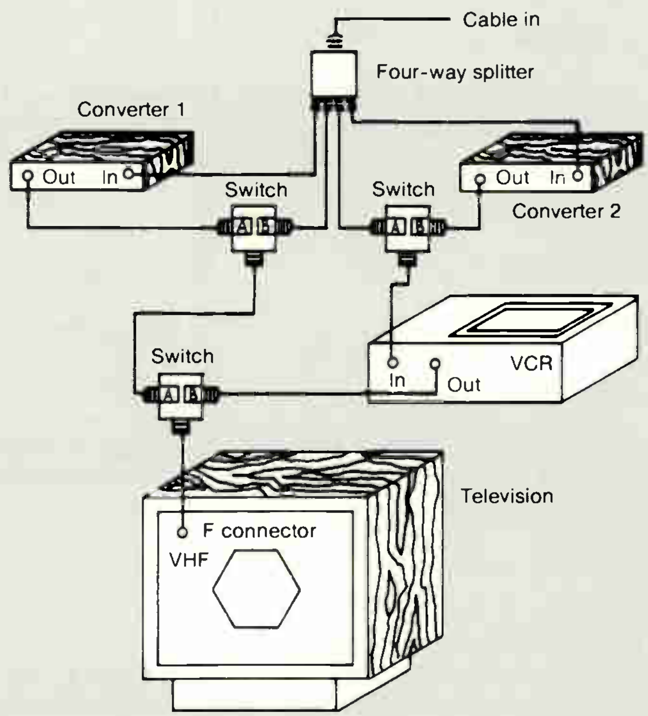
Allows:
- recording of any channel, while viewing any channel

Allows (when VCR in non-converter, bypass mode):
- timed, multichannel, multievent recording (i.e., ability to program VCR to record a movie on Ch. 5 at 6 p.m., and then a second program on Ch. 26 at 8 p.m.)
(non-scrambled channels only)

Precludes (on scrambled channels):
- timed multichannel, multievent recording, use of TV or VCR remotes

Note: use of converter remote control will affect both converters simultaneously
Necessary drop level: +7 dBmV

Figure 20



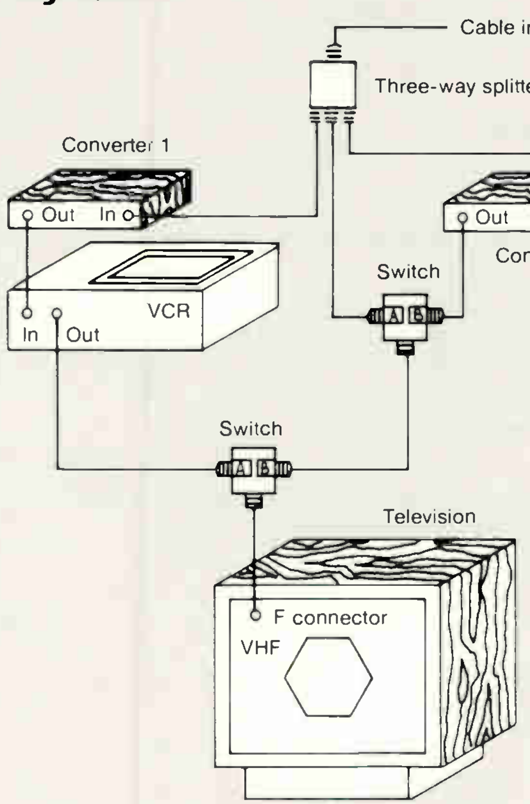
Allows:
- recording of any channel, while viewing any channel

Also allows (for non-scrambled channels only):
- timed, multichannel, multievent recording (i.e., ability to program VCR to record a movie on Ch. 5 at 6 p.m., and then a second program on Ch. 26 at 8 p.m.)
- full use of the TV remote control
- full use of the VCR remote control

Precludes:
- timed multichannel, multievent recording, use of TV or VCR remote control on scrambled channels

Note: converter's remote control will affect both converters simultaneously
Necessary drop level: +7 dBmV

Figure 21

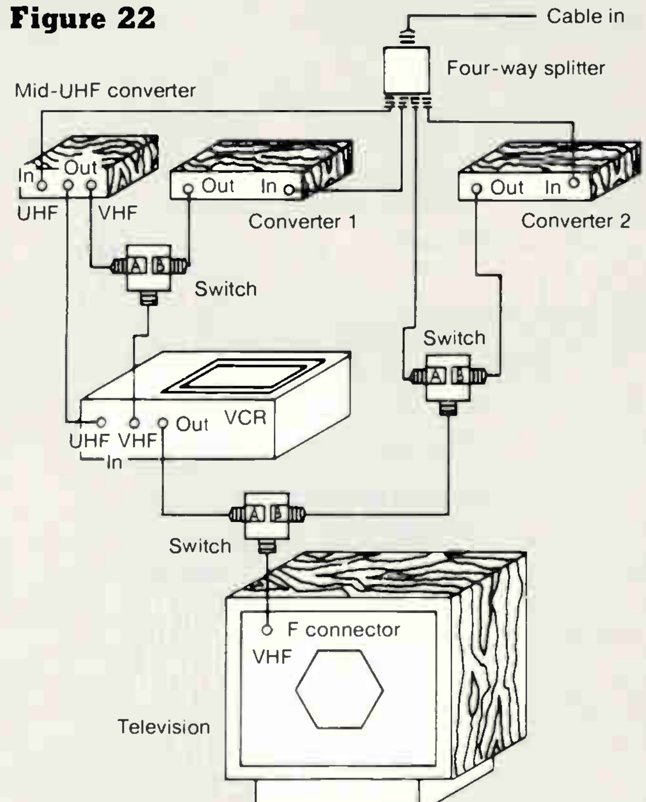


Allows:
- recording of any channel, while viewing any channel
- full use of the TV remote control

Precludes:
- timed, multichannel, multievent recording (i.e. ability to program VCR to record a movie on Ch. 5 at 6 p.m., and then a second program on Ch. 26 at 8 p.m.)
- use of TV remote control for scrambled channels
- channel selection by the VCR remote control

Note: converter's remote control will affect both converters simultaneously
Necessary drop level: +7 dBmV

Figure 22



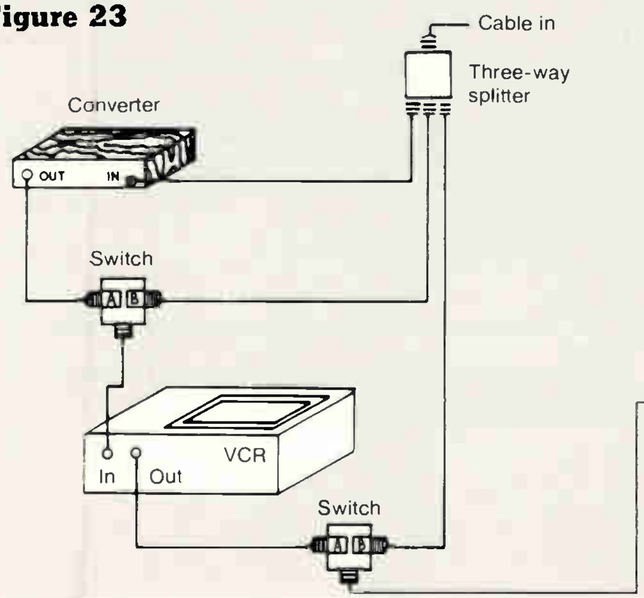
Allows:
- recording of any channel, while viewing any channel

Also allows (for non-scrambled channels only):
- timed, multichannel, multievent recording (i.e., ability to program VCR to record a movie on Ch. 5 at 6 p.m., and then a second program on Ch. 26 at 8 p.m.)
- full use of the TV remote control
- full use of the VCR remote control

Precludes:
- timed multichannel, multievent recording, use of TV or VCR remote control on scrambled channels

Note: converter's remote control will affect both converters simultaneously
Necessary drop level: +7 dBmV

Figure 23



Allows:
- recording of any channel, while viewing a non-scrambled channel

Also allows (for non-scrambled channels only):
- timed, multichannel recording (i.e. can program VCR to record a movie on Ch. 5 at 6 p.m., and then a second program on Ch. 26 at 8 p.m.)
- full use of the TV remote control
- full use of the VCR remote control

Precludes:
- timed multichannel recording, use of TV or VCR remote control for scrambled channels

Necessary drop level: +7 dBmV

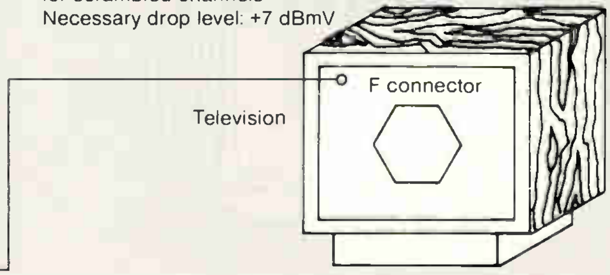
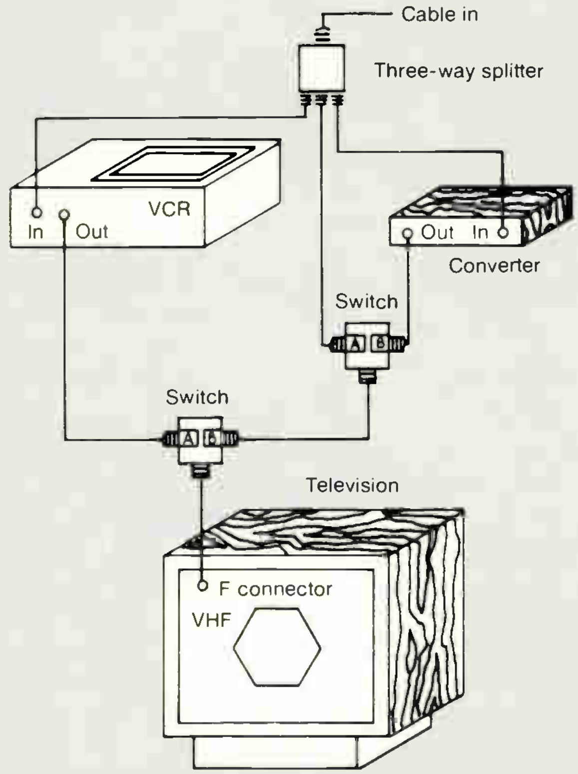


Figure 24



Allows
- recording of a non-scrambled channel, while viewing any channel

Also allows (for non-scrambled channels only):
- timed, multichannel recording (i.e. ability to program VCR to record a movie on Ch. 5 at 6 p.m., and then a second program on Ch. 26 at 8 p.m.)
- full use of the TV remote control
- full use of the VCR remote control

Precludes:
- timed multichannel, multievent recording, use of TV or VCR remote control for scrambled channels
- recording of scrambled channels

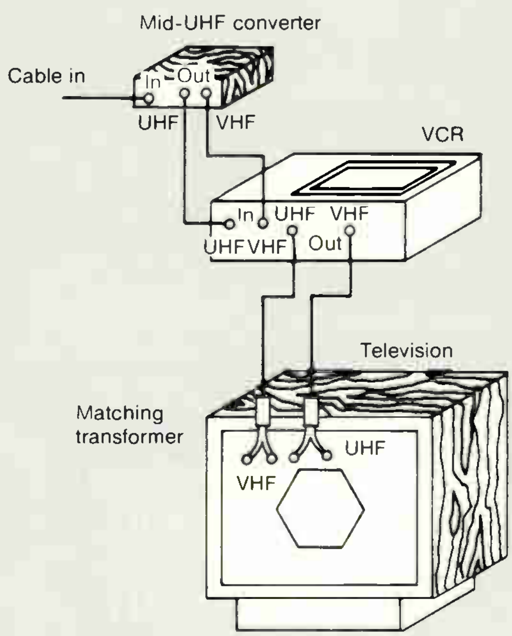
Necessary drop level: +7 dBmV

with direct coaxial inputs. Either input terminal type is acceptable as far as the diagrams are concerned.

2) If direct connection to external antenna systems is part of the installation scheme, operators *have* to keep potential signal leakage in mind and avoid it with proper A/B switch quality and isolation.

3) If three-way splitters are used, note that the dot in the illustration's splitter denotes the higher level output leg, assuming one leg at −3.5 dB and two legs at −7 dB. If the splitter has equal splits or is hooked up differently, the minimum accept-

Figure 25



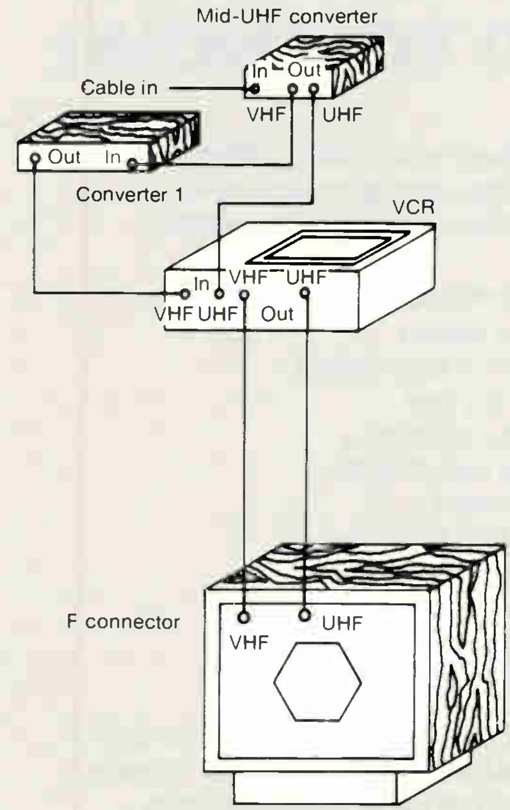
Allows
- recording of non-scrambled channel, while viewing a non-scrambled channel

Also allows (for non-scrambled channels only):
- timed, multichannel, multievent recording (i.e. ability to program VCR to record a movie on Ch. 5 at 6 p.m., and then a second program on Ch. 26 at 8 p.m.)
- full use of the TV remote control
- full use of the VCR remote control

Precludes:
- recording of scrambled channel while viewing a scrambled channel
- timed multichannel, multievent recording, use of TV or VCR remote control on scrambled channels

Necessary drop level: +3.5 dBmV

Figure 26



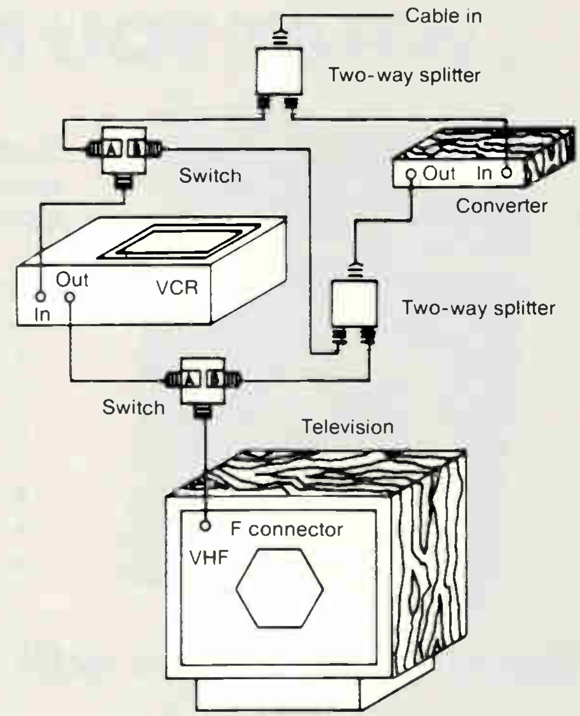
Allows:
- recording of any channel, while viewing a non-scrambled channel

Also allows (for non-scrambled channels only):
- timed, multichannel, multievent recording (i.e. ability to program VCR to record a movie on Ch. 5 at 6 p.m., and then a second program on Ch. 26 at 8 p.m.)
- full use of the TV remote control
- full use of the VCR remote control

Precludes:
- timed multichannel, multievent recording, use of TV or VCR remote control on scrambled channels

Necessary drop level: +0 dBmV

Figure 27



Allows:
- recording of any channel, while viewing the same channel
- recording of any channel, while viewing a non-scrambled channel
- recording of a non-scrambled channel, while viewing any channel

Also allows (for non-scrambled channels only):
- timed, multichannel, multievent recording (i.e. ability to program VCR to record a movie on Ch. 5 at 6 p.m., and then a second program on Ch. 26 at 8 p.m.)
- full use of the TV remote control
- full use of the VCR remote control

Precludes:
- timed multichannel, multievent recording, use of TV or VCR remote control on scrambled channels

Necessary drop level: +7 dBmV

able drop signal level will need to be increased.

4) Where only one input and output cable is shown for a VCR, it is intended to designate the VHF terminals.
5) Presence of cable-compatible TVs and VCRs is assumed in "no-converter" hookups.
6) It is assumed that most converters do not have a timed channel selection scheme.
7) Connections can accommodate two TV sets by the addition of a two-way splitter at the drop.

The following terms are used in the figures:

- Allows: assumes that simultaneous TV and VCR use (to a greater or lesser degree of access to a full range of paid-for cable programming) is the subscriber's aim
- Any channel: "any" means whatever channels a subscriber's home equipment (TV, VCR, converter) is capable of receiving and that a subscriber has paid for
- Scrambled: a signal that requires a descrambler
- Non-scrambled: a signal that is never scrambled; sent in the clear
- Off-air: channels received via an external TV antenna, not delivered via "over-the-wire" cable TV service
- Cable channels: any channels delivered via "over-the-wire" cable TV service that a subscriber has paid to receive
- Recording: videocassette recording ■

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(please describe)

May 1989

IT INSTRUCTIONAL TECHNIQUES

The special advertorial supplement to Installer/Technician magazine

Solving cable TV viewer interface problems

By Paul Harr
Application Engineer, Scientific-Atlanta

Cable TV viewers are often frustrated by the complexity of connecting and effectively operating the various components of their home TV entertainment system. Technical assistance is often hard to find and unreliable. This application note addresses some of the most common of those frustrations with realistic and effective technological solutions including:

Remote control:

- Using a single remote control to operate a cable converter, TV, VCR and other system components

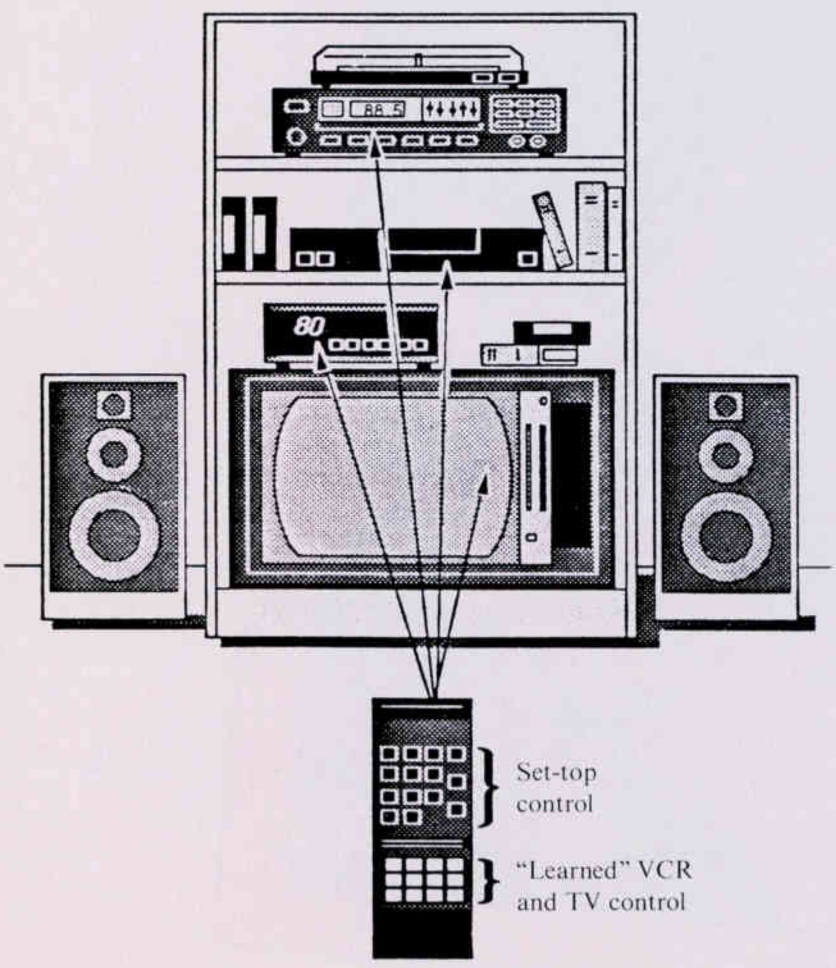
Simultaneous TV viewing and recording:

- Viewing a basic channel while recording a premium channel
- Viewing a basic or premium channel while recording the same channel
- Viewing a premium channel while recording a basic channel
- Viewing a premium channel while recording a different premium channel
- Video switch solution to viewer scenarios

Unattended recording:

- Automatic recording using a cable converter and VCR (susceptible to power interruption)
- Automatic recording using a cable converter with built-in VCR timer and a VCR
- Automatic recording using a remote control with a built-in VCR timer

Figure 1: One remote control for all units



Using a single remote

Some of the convenience of home TV entertainment system remote control is lost when a cable TV viewer is required to manage several remote control units, each controlling a different system component. The obvious answer to this subscriber interface problem is a single remote control that can be used to control all of the system components. Scientific-Atlanta has such a unit. Called the Complete Remote Control (CRC), it incorporates standard converter commands used with all Scientific-Atlanta remote converters with 12 "learn" keys (Figure 1).

With the learn keys, the CRC can learn the infrared commands of other remote controls and retransmit them whenever the learned function key is pressed. CRC controlled functions may include TV volume, VCR functions, stereo remote functions and converter functions. Once the CRC is programmed, the other remote control units can be put away except when used to reprogram the CRC, and the viewer can use all the system features with one control.

Simultaneous viewing and recording

Another source of frustration to cable TV viewers who want to view a program while recording another is the seemingly complex configuration of system components and cabling required to accomplish their viewing/recording objectives. The view/record scenarios presented in this application note represent those commonly sought by cable TV viewers, and the recommended system configurations allow the viewer to maximize system capabilities without being required to swap cabling. (Note: "basic" assumes a non-scrambled channel and "premium" assumes a scrambled channel.)

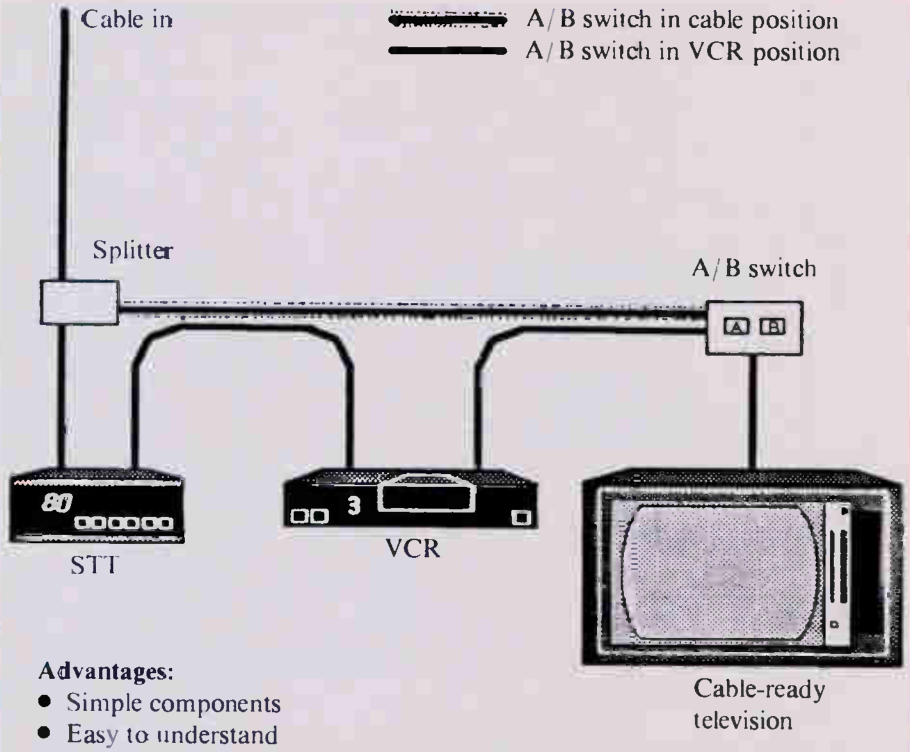
Viewing a basic channel while recording a premium channel: This view/record scenario can be accomplished simply by using a two-way splitter and an A/B switch (both of which can be purchased at any electronics store) in the configuration shown in Figure 2. With this configuration, the viewer can use the A/B switch with a cable-ready TV to select a basic channel to view while the VCR records a premium channel selected on the cable converter. The A/B switch can be used to select the VCR output when the viewer wants to watch the recorded program.

Viewing a basic or premium channel while recording the same channel: This view/record scenario (Figure 3) can be accomplished without splitters or A/B switches. The viewer can tune the set-top terminals to the desired basic or premium channels that can be viewed on the TV and simultaneously recorded on the VCR.

Viewing premium while recording basic channel: This view/record scenario (Figure 4) can be accomplished with a splitter and A/B switch configured to allow the cable signal to go directly to the VCR and set-top terminal. The set-top terminal can be used to select premium channels for viewing while the VCR can be used to select basic programs for recording. The A/B switch selects the output of the VCR or set-top terminal for TV viewing.

Viewing a premium channel while recording a different premium channel: The final view/record scenario we will discuss is one where the viewer wants to view a premium channel while recording a different premium channel.

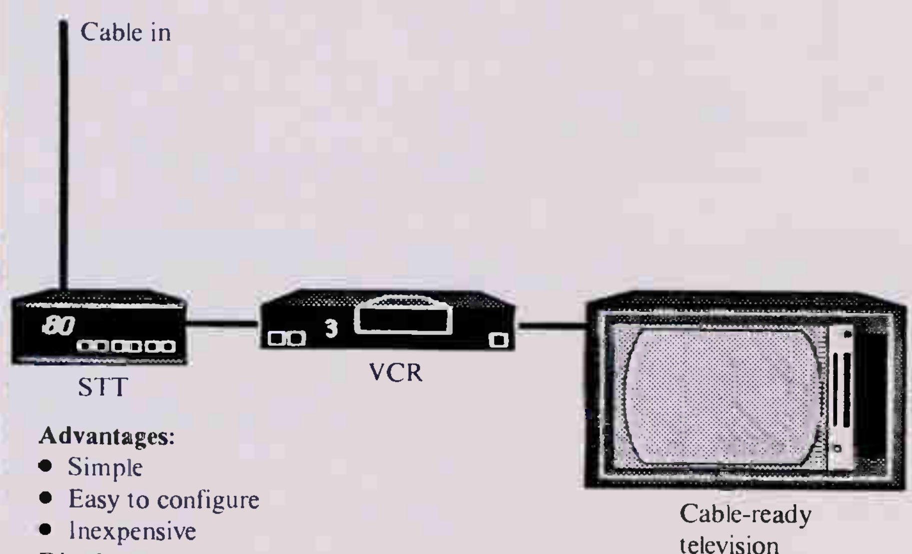
Figure 2



Advantages:
- Simple components
- Easy to understand
- Returns cable-ready features of TV to subscriber
- Allows viewing any basic channel while recording any other channel (TV must be cable-ready)
- Allows viewing a premium channel while recording the same channel

Disadvantages:
- Does not allow viewing of premium channel while recording a basic channel
- Requires manual selection between A and B signals

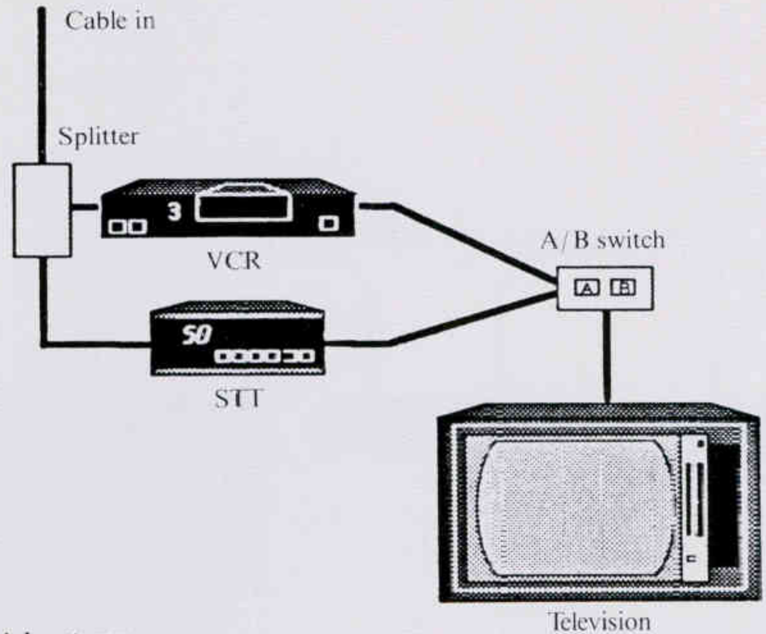
Figure 3



Advantages:
- Simple
- Easy to configure
- Inexpensive

Disadvantages:
- Does not satisfy viewing basic or premium while recording different basic or premium
- Does not allow use of TV or VCR cable-ready features

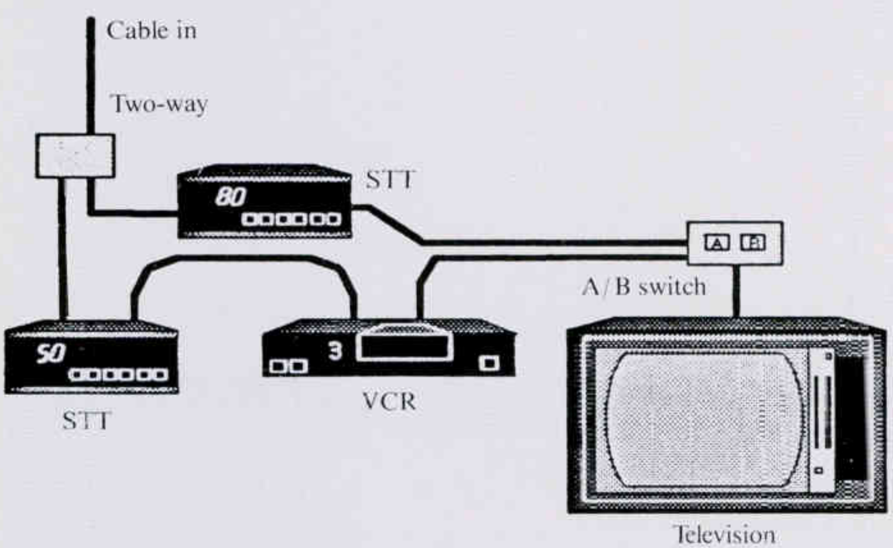
Figure 4



Advantages:
- Allows viewing a premium channel while recording a basic channel
- Returns cable-ready features to VCR

Disadvantages:
- Does not allow recording of premium channels
- Does not allow use of cable-ready TV features
- More complicated cabling requirements

Figure 5



Advantages:
- Allows viewing and recording of different premium channels simultaneously

Disadvantages:
- Requires two converters
- Does not allow use of TV or VCR cable-ready features

Since, to accomplish this, both premium channels must be descrambled simultaneously, two cable converter units must be used in this configuration (Figure 5). A variation of this configuration utilizes a two-way splitter as in our first scenario allowing the viewer to route the cable signal directly to the TV through the A/B switches.

Video switch solution to viewer scenarios: A more expensive approach to meeting cable TV viewer scenarios is with a video control switch that will allow connection of all the video entertainment units to a single switching unit. This setup (Figure 6) allows the viewer to receive basic and scrambled programs through the outputs of a cable converter and of two VCRs. It also allows the viewer to record basic programs, descrambled programs, and use other peripheral video equipment connected to the VCRs.

Unattended recording

Another popular entertainment opportunity available to cable TV viewers includes the ability to record TV programs with unattended equipment. Though relatively simple to accomplish, there are inherent problems that can have disappointing results. The following proposed automatic recording methods are designed to assure successful unattended recording.

The simplest method of automatic recording utilizes a regular cable converter and a programmable VCR. To set up the system to automatically record:

1) Turn on the cable converter.
2) Tune the converter to the channel of the program to be recorded.
3) Program the VCR to come on at the date and time of the program to be recorded.

With this method however, if there is a power interruption while the equipment is unattended, the converter will go off and will not come back on automatically when power is restored. The selected program will not be recorded. Also, only one channel can be time shifted.

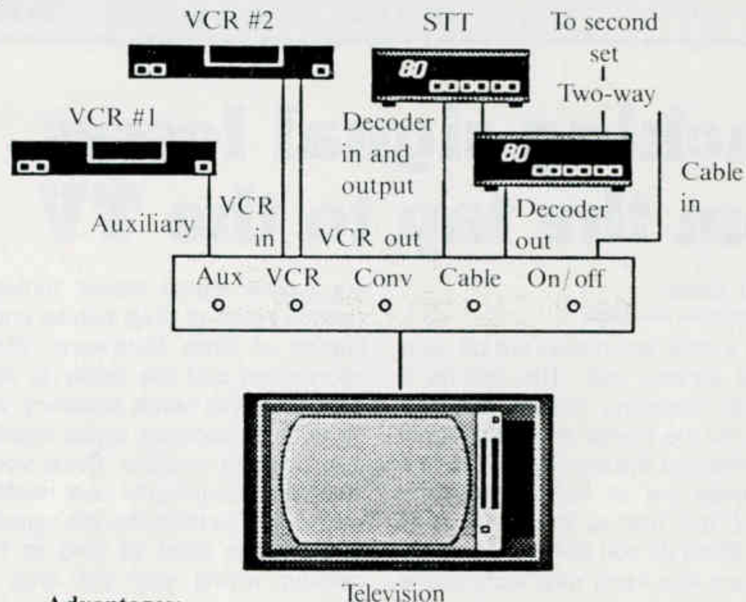
An answer to the power interruption problem is a cable converter with a built-in timer that can be set to come on at a programmed time, tune to the selected channel, record the selected program and turn off again even after power has been temporarily lost. To be effective the timer must have programming flexibility similar to that of the VCR. The Scientific-Atlanta Models 8570, 8580 and 8590 set-top terminals, with eight-event (earlier models have four-event) 14-day programming capability, easily meet the requirements for reliable unattended recording even with power interruptions. To automatically record:

1) Program the VCR to record at the specified TV program times.
2) Program the cable converter to come on at specified TV program times and to tune to program channels.

Another answer to the power interruption problem for those with remote controllable cable converters is to use a programmable remote control with built-in VCR timer and multi-event programming capabilities. The Scientific-Atlanta Programmable Remote Control (PRC) has eight-event, 14-day programming capabilities and can be used with any Scientific-Atlanta remote control cable converter. To automatically record:

1) Program the VCR to record at the specified TV program times.
2) Program the PRC to come on at the specified program times and to tune to the program channels.
3) Place the PRC so that is is properly aimed at the converter. ■

Figure 6



Advantages:
- Satisfies virtually all watch/record scenarios
- Returns cable-ready features of TV and VCR to subscriber
- Aesthetically pleasing (less units)

Disadvantages:
- Expensive
- May be complicated to use
- Requires AC power
- Degrades picture quality
- Requires at least six jumper cables

Scientific Atlanta

Tracking signal losses from the tap to the TV

By Tod D. Dean
Project Coordinator, Alert Cable TV

You're a new technician out on your first solo service call. The call is a subscriber reporting snowy pictures. You go into the house and take signal readings behind the television. You find the readings are all between -3 and -6 dBmV, too low to provide quality pictures. What do you do?

If you are like many new technicians you call for someone more experienced to handle the problem. Why? With a little direction and confidence you could determine whether the problem is between the tap and the subscriber's television (and then hopefully repair it) or report it as a line problem, complete with signal readings out of the tap.

Signal-related drop problems are relatively simple to troubleshoot and repair. What you first need to know are the typical signal losses through the various types of drop cables and other pieces of drop hardware. With this information and the ability to estimate distances with some accuracy you will be able to calculate signal losses from one point to another. Once you have taken an actual signal level reading you will be able to calculate the signal levels at any other point, as long as there is nothing wrong with the drop. If the measured levels at any point differ by more than 1 or 2 dB from the calculated levels, you have narrowed the problem down to a relatively small distance. This can then be inspected and hopefully the problem will be found and corrected.

Locating the problem

Usually when you are in a subscriber's home for a service call the smartest and most convenient thing to do is take signal level readings behind the television set at the input to the converter. This will immediately tell you if the problem is related to signal strength. If the signal levels are good, the next thing to do is check any other sets in the house or use your test television set to see whether the reception problem is in the cable system or the subscriber's television. For the purposes of this article, we will assume that the signal levels are too low to provide good reception.

The next step is to physically inspect the drop cable and note the approximate distance from the television to the splitter or the ground point feeding that television. *Don't* just take the subscriber's word that there is only one television hooked up and there are no splitters. Even if there is only one television connected, there may be splitters left over from a previous homeowner or from lines that were disconnected. Follow the cable route, looking for any unnecessary splitters or any obvious problems, and estimate the length of the cable. This will save you the frustration and embarrassment of having to go back and look after trying to find and fix a problem that really doesn't exist.

Once you are at the splitter or ground point you should have an estimate of the length of cable from that point back to the television. Multiply that distance by the loss for that type cable (found in Table 1). Calculate the losses at both the highest and lowest channels carried by your cable system. Then take the signal levels measured at the television and add the calculated loss for the cable; those figures should be the approximate signal levels you will measure coming out of the device (splitter, ground block, FM splitter, etc.) feeding the piece of cable to the television in question. If the calculated levels are within 1 or 2 dB of the measured levels you know there is nothing wrong with that piece of cable.

Table 2 gives the typical losses for most pieces of drop hardware. If the piece is an FM splitter make sure that the TV leg is the one feeding the television. Make sure that all splitters are installed in the correct direction; backward splitters will cause signal level and reception problems.

Next find the typical loss for the piece of equipment in question. Measure the signal levels coming into the piece,

Table 1: Cable losses

Type	Ch.2 55 MHz	Ch.13 211 MHz	Ch.36 300 MHz	Ch.50 400 MHz	Ch.60 450 MHz	Ch.80 550 MHz
RG-59	2.0	4.0	4.5	5.0	5.5	6.5
RG-6	1.5	3.0	3.5	4.0	4.5	5.5
RG-11	1.0	2.0	2.5	2.75	3.0	4.0

Note: These losses have been rounded off to make mental calculations easier. Actual losses are slightly lower.

Table 2: Hardware losses

Type	Loss
Two-way splitter	3.5 dB each output
Three-way splitter	3.5 dB one output, 7 dB two outputs or 5.5 dB each output
Four-way splitter	7 dB each output
FM splitter	1-1.5 dB TV output, > 7 dB FM output
Ground block	< 0.5 dB
High pass filter	< 1 dB
F-81 splice	< 0.5 dB
Negative trap	usually < 4 dB on channel directly below trapped channel, > 20 dB on the trapped channel, and < 1 dB on all others
Positive trap	< 3 dB on trapped channel, < 1 dB on all others

Losses are approximately equal at all frequencies up to 450 MHz. Losses above that increase approximately 1 dB for each type device. These numbers are all approximations. For exact figures regarding specific brand equipment, please consult manufacturers' specification literature.

reconnect the piece and measure the levels coming out of it. The difference between these two levels should closely match the numbers in the chart. If they don't, replace the piece and take new measurements.

If the problem still hasn't been located, repeat these steps, estimating cable lengths, calculating losses and measuring losses through hardware, until you have either found a point that doesn't meet the specs or you have traced the line all the way back to the tap and discovered the drop and all its parts are performing exactly as they should.

Beyond the drop

If you have worked your way through the entire drop to the tap and determined that the drop is performing as it should it is time to stop and take a look at everything you have found. It is very important to understand that you have determined that the drop is working as it should. This doesn't necessarily mean that the customer has good reception; it merely means that there is nothing between the tap and the television that is "broken," and you cannot find and "fix" something to return the subscriber's reception to the quality it should be.

What do you do in the situation where you have found that the drop is working properly but the signal levels at the subscriber's television are too low? There are a number of solutions. You should check with the system chief technician to see if any of these solutions are not possible alternatives in your system:

1) Are the tap output levels acceptable? The chief technician should be able to tell you what the typical range of tap output levels could be. If the levels you measure out of the tap are within this range you can assume there is no line problem causing the subscriber's problem.

2) If the tap output levels are acceptable what can be done to increase the signal levels at the television? If there is more than one television, could the splitter be arranged to provide a better, more equal split of the available signal?

3) Could any part of the cable be re-run to provide a shorter path (and more signal)?

4) Are there more splits than there are TV sets? If so, take them out.

5) Is the drop too long? Maybe it should be re-run using a lower loss cable. Check with your supervisor.

The next two items vary from system to system and should never be done without the approval of your supervisor.

> ***"With a little direction and confidence you could determine whether the problem is between the tap and the subscriber's television... or report it as a line problem."***

6) Install a mini-amplifier in the home to increase signal levels.

7) Drop the tap plate value to provide additional signal strength into the house.

Once you feel confident using these guidelines you should be able to reduce the number of steps needed to determine where the problem lies. In time you should be able to determine how much signal you need at the input of a ground block or each type splitter to reach each television with enough signal to provide good reception. Once you know this (and it will vary with the amount and type of cable from that point to the television), you can read signal levels at the ground point and know whether or not you should have problems on any set in the house. You will then know which direction to head—either toward the tap or back toward the television—to find the problem.

Let me leave you with this one last scene. Picture the new service technician who goes out to the subscriber's home, reads signal levels behind the television, finds the levels are too low and then proceeds to replace everything in the drop, including all the cable. When he gets done he goes back inside the house only to find the problem is still there, an hour or more wasted, the subscriber upset, and now he must call someone else to find the real problem.

That type of "repair service" makes us all look bad. Take a few minutes to memorize the numbers on the tables, or keep a copy in your vehicle, and familiarize yourself with the procedures outlined in this article. You will find some shortcuts as you get used to the steps but the basics will help you solve more problems with less time and effort and help you look better in the eyes of our subscribers and your supervisor. Happy hunting! ■

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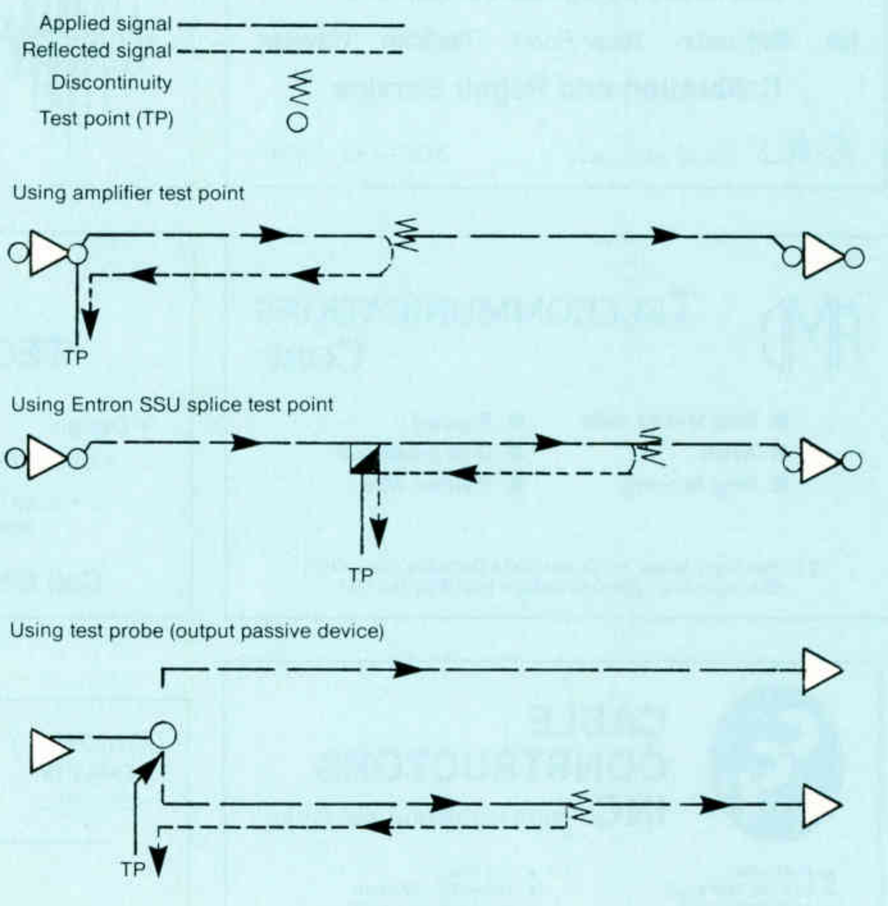
Using your TV receiver as a TDR

By Austin Coryell
Vice President of Engineering, Mile-Hi Cablevision

A television receiver can be used as a time domain reflectometer (TDR) for diagnosing cable discontinuities in trunk and feeder cables when a ghost or delayed picture is observed. This can be accomplished by connecting your television receiver to a test point in the trunk or feeder cable; via test points on electronic equipment; using a test point adapter in an Entron SSU splice block; or connecting a test probe to outputs of all cable devices (see accompanying figure).

A portion of the applied signal will be reflected each time it sees a discontinuity (an impedance change) in the transmission path. The amount of signal that is returned to the source will be dependent on the severity of the discontinuity and the path attenuation. We can take advantage of these reflected signals with the aid of a TV receiver and non-directional test point to determine the location of the discontinuity. These reflected signals will not create a ghost on all television channels in a system. The channels affected will be determined by the distance and severity of discontinuity, and velocity of propagation of the cable.

Test setup for a TV receiver used as a TDR



In a CATV system, the input impedance of a transmission line is the impedance seen at the output of every piece of electronic equipment or passive device. It is the impedance into which the source of power must work when the line is connected. If the load is perfectly matched to the line, the line appears to be infinitely long, and the input impedance to the transmission line is simply the characteristic impedance of the line itself. However, if there are standing waves on the transmission line due to discontinuities, this is no longer true, thus the input impedance may have a wide range of values.

If the line length to the discontinuity is such that standing waves cause the voltage at the input terminals to be high and the current low, then the input impedance is higher than the impedance of the power source and transmission line. Conversely, low voltage and high current at the input terminals mean that the input impedance is lower than the power source and transmission line. In these two cases, the reflected signals are not absorbed in the output of the electronic equipment or passive devices. Consequently, the reflected signals are looking at another discontinuity and again are reflected back in the direction of the applied signal. It is these reflected signals that produce a ghost or delayed image on the television receiver screen.

Test and calculate

The following test method can be used to determine the distance to a cable discontinuity when a ghost is visible. Using a test lead (its length doesn't make any difference because it doesn't have any bearing on this test), connect the television receiver to a test point on the input to an amplifier. If no ghosts are visible, connect the test lead to the output test point. If ghosts are present on output test points, measure the width of the ghost and the horizontal width of the television screen, preferably using an engineer scale ruler. The width of the ghost must be measured as accurately as possible to come close to the point of discontinuity. Look at your system design maps to determine the type of cable being tested. Using the following formulas, calculate the footage to the discontinuity. This footage will be from the test point to the discontinuity.

TX and PIII cables

$$23170 \times \frac{\text{width of ghost}}{\text{width of TV screen}}$$

(Continued on page 62)

Reader Service Number 25.

Converting dBmV to microvolts per meter

By Ron Hranac
Senior Staff Engineer, Jones Intercable Inc.

Signal leakage is one of the most important technical issues facing the cable television industry. The Federal Communications Commission has specified maximum signal leakage limits in microvolts per meter, but leakage measurements often are made in dBmV. This is the beginning of a series of conversion charts that will be part of "Installer's Tech Book" for the next several months. Each chart will be channel-specific and will provide dBmV to microvolts per meter (μV/m) conversions from −60 to +40 dBmV in 1 dB steps. The charts will cover all standard aeronautical channels (+12.5 and +25 kHz offsets), as well as standard, low, mid and high VHF channels.

The following formula was used to derive the conversion data in the charts; an example of its use is shown below.

$$\mu V/m = \left(10^{\frac{dBmV}{20}}\right) \times 1{,}000 \times 0.021 \times F$$

where:
μV/m = microvolts per meter
dBmV = level of signal in dBmV
F = frequency in MHz

Problem:
You have just measured a leak in the feeder portion of your distribution network. The corrected dipole level is −37 dBmV, measured at 121.2625 MHz. What is the level of that leak in microvolts per meter?

Solution:

$$\mu V/m = \left(10^{\frac{-37}{20}}\right) \times 1{,}000 \times 0.021 \times 121.2625$$

$$= (10^{-1.85}) \times 1{,}000 \times 0.021 \times 121.2625$$

$$= (0.014125) \times 1{,}000 \times 0.021 \times 121.2625$$

$$= (0.014125) \times 1{,}000 \times 2.546513$$

$$= (0.014125) \times 2{,}546.513$$

$$= 35.97\ \mu V/m$$

→

Channel 2
(55.25 MHz)

dBmV	μV/m	dBmV	μV/m	dBmV	μV/m
−60	1.16	**−27.31**	**50**	7	2,597.48
−59	1.30	−27	51.83	8	2,914.42
−58	1.46	−26	58.15	9	3,270.03
−57	1.64	−25	65.25	10	3,669.03
−56	1.84	−24	73.21	11	4,116.72
−55	2.06	−23	82.14	12	4,619.04
−54	2.32	−22	92.16	13	5,182.65
−53	2.60	−21	103.41	14	5,815.02
−52	2.91	−20	116.03	15	6,524.57
−51	3.27	−19	130.18	16	7,320.68
−50	3.67	−18	146.07	17	8,213.94
−49	4.12	−17	163.89	18	9,216.19
−48	4.62	−16	183.89	19	10,340.74
−47	5.18	−15	206.32	20	11,602.50
−46	5.82	−14	231.50	21	13,018.22
−45	6.52	−13	259.75	22	14,606.68
−44	7.32	−12	291.44	23	16,388.97
−43	8.21	−11	327.00	24	18,388.72
−42	9.22	−10	366.90	25	20,632.49
−41	10.34	− 9	411.67	26	23,150.03
−40	11.60	− 8	461.90	27	25,974.76
−39	13.02	− 7	518.26	28	29,144.16
−38	14.61	− 6	581.50	29	32,700.29
−37	16.39	− 5	652.46	30	36,690.33
−36	18.39	− 4	732.07	31	41,167.22
−35.27	**20**	− 3	821.39	32	46,190.38
−35	20.63	− 2	921.62	33	51,826.46
−34	23.15	− 1	1,034.07	34	58,150.25
−33	25.97	0	1,160.25	35	65,245.65
−32	29.14	1	1,301.82	36	73,206.83
−31	32.70	2	1,460.67	37	82,139.41
−30	36.69	3	1,638.90	38	92,161.93
−29	41.17	4	1,838.87	39	103,407.39
−28	46.19	5	2,063.25	40	116,025.00
		6	2,315.00		

Channel 3
(61.25 MHz)

dBmV	μV/m	dBmV	μV/m	dBmV	μV/m
−60	1.29	−28	51.21	7	2,879.56
−59	1.44	−27	57.45	8	3,230.91
−58	1.62	−26	64.47	9	3,625.15
−57	1.82	−25	72.33	10	4,067.48
−56	2.04	−24	81.16	11	4,563.79
−55	2.29	−23	91.06	12	5,120.65
−54	2.57	−22	102.17	13	5,745.47
−53	2.88	−21	114.64	14	6,446.52
−52	3.23	−20	128.63	15	7,233.12
−51	3.63	−19	144.32	16	8,115.69
−50	4.07	−18	161.93	17	9,105.95
−49	4.56	−17	181.69	18	10,217.05
−48	5.12	−16	203.86	19	11,463.72
−47	5.75	−15	228.73	20	12,862.50
−46	6.45	−14	256.64	21	14,431.96
−45	7.23	−13	287.96	22	16,192.93
−44	8.12	−12	323.09	23	18,168.76
−43	9.11	−11	362.51	24	20,385.69
−42	10.22	−10	406.75	25	22,873.12
−41	11.46	− 9	456.38	26	25,664.06
−40	12.86	− 8	512.07	27	28,795.55
−39	14.43	− 7	574.55	28	32,309.14
−38	16.19	− 6	644.65	29	36,251.45
−37	18.17	− 5	723.31	30	40,674.80
−36.17	**20**	− 4	811.57	31	45,637.87
−36	20.39	− 3	910.60	32	51,206.53
−35	22.87	− 2	1,021.70	33	57,454.68
−34	25.66	− 1	1,146.37	34	64,465.21
−33	28.80	0	1,286.25	35	72,331.15
−32	32.31	1	1,443.20	36	81,156.89
−31	36.25	2	1,619.29	37	91,059.53
−30	40.67	3	1,816.88	38	102,170.47
−29	45.64	4	2,038.57	39	114,637.15
−28.21	**50**	5	2,287.31	40	128,625.00
		6	2,566.41		

Channel 4
(67.25 MHz)

dBmV	μV/m	dBmV	μV/m	dBmV	μV/m
−60	1.41	−28	56.22	7	3,161.63
−59	1.58	−27	63.08	8	3,547.41
−58	1.78	−26	70.78	9	3,980.26
−57	1.99	−25	79.42	10	4,465.93
−56	2.24	−24	89.11	11	5,010.85
−55	2.51	−23	99.98	12	5,622.27
−54	2.82	−22	112.18	13	6,308.29
−53	3.16	−21	125.87	14	7,078.02
−52	3.55	−20	141.23	15	7,941.67
−51	3.98	−19	158.46	16	8,910.70
−50	4.47	−18	177.79	17	9,997.96
−49	5.01	−17	199.49	18	11,217.90
−48	5.62	−16	223.83	19	12,586.69
−47	6.31	−15	251.14	20	14,122.50
−46	7.08	−14	281.78	21	15,845.71
−45	7.94	−13	316.16	22	17,779.17
−44	8.91	−12	354.74	23	19,948.56
−43	10.00	−11	398.03	24	22,382.65
−42	11.22	−10	446.59	25	25,113.75
−41	12.59	− 9	501.09	26	28,178.09
−40	14.12	− 8	562.23	27	31,616.34
−39	15.85	− 7	630.83	28	35,474.12
−38	17.78	− 6	707.80	29	39,802.61
−37	19.95	− 5	794.17	30	44,659.27
−36.98	**20**	− 4	891.07	31	50,108.52
−36	22.38	− 3	999.80	32	56,222.69
−35	25.11	− 2	1,121.79	33	63,082.89
−34	28.18	− 1	1,258.67	34	70,780.17
−33	31.62	0	1,412.25	35	79,416.65
−32	35.47	1	1,584.57	36	89,106.95
−31	39.80	2	1,777.92	37	99,979.64
−30	44.66	3	1,994.86	38	112,179.01
−29.02	**50**	4	2,238.27	39	125,866.91
−29	50.11	5	2,511.38	40	141,225.00
		6	2,817.81		

From the NCTI

Signal leakage detector sensitivity

The following is an excerpt from NCTI's new lesson "Signal Leakage Detectors II" covering signal leakage detector sensitivity.

By Ray Rendoff
Technical Training Director
National Cable Television Institute

"Signal Leakage Detectors I" described the purpose, function and physical features of the Sniffer Jr., Searcher and CLR-4. "Signal Leakage Detectors II" discusses detector sensitivity and the physical care and maintenance required for proper, reliable operation of these detectors. After defining sensitivity and discussing the factors that change the sensitivity of detectors, the lesson presents sensitivity data on the Sniffer Jr., Searcher and CLR-4 signal level detectors. The lesson concludes with instructions on physical care of detectors during transit and operation. It also describes battery maintenance and necessary repairs.

When considering detector sensitivity, it must be kept in mind that proper physical care and maintenance of signal leakage detectors is necessary to assure reliable operation, particularly in the area of sensitivity. Although leakage detectors are small, they contain many components, both mechanical and electronic, that are subject to damage by physical shock, misuse, dirt, chemicals or excessive heat and cold. When kept clean, a signal leakage detector can operate properly for a long time. Reliable leakage detection requires checking the battery voltage condition regularly and proper battery recharging and replacement procedures. All maintenance and repairs should only be performed on signal leakage detectors with the express permission of your immediate supervisor and in accordance with your particular system or company policy.

Detector sensitivity: A detector emits an alarm when it detects a signal at its specified frequency when the signal strength exceeds the detector's alarm threshold. Changing the level of this threshold allows a user to locate the source of detected signals, identify them as cable signal leakage and determine the approximate strength of the leakage. After defining detector sensitivity and explaining the factors that change it, this section explains how to change a detector's sensitivity and presents sensitivity data for the Sniffer Jr., the Searcher and the CLR-4.

Defining sensitivity: When the desired antenna and proper batteries are installed and the detector is turned on, a cable video carrier leakage signal activates an alarm when the alarm's preset input threshold is exceeded at the antenna input connector. The strength of this alarm-causing signal defines the sensitivity of the detector. Sensitivity can be expressed in microvolts (μV), microvolts per meter (μV/m) or decibel-millivolts (dBmV). The *higher* the video signal level required to activate the detector's alarm, the *lower* the sensitivity of the detector.

Changing sensitivity: Detector sensitivity changes with the orientation of the detector, its closeness to the user's body, the high or low gain control settings, and the type of antenna used. By changing these factors, it is possible to increase a detector's sensitivity to detect a further or weaker signal and also to decrease sensitivity to detect a signal only when it is stronger or nearer (see table).

- Orientation of detector—Because of the Sniffer Jr.'s internal antenna, the detector's sensitivity varies with orientation. Holding the detector upright with the front Sniffer Jr. logo facing the source of leakage results in highest sensitivity-to-leakage. Pointing the top of the detector at the leakage reduces sensitivity.
- Closeness to body—Carrying a detector close to the body in a pocket or on a belt reduces sensitivity. Holding the Sniffer Jr. in the hand away from the body produces an alarm at a leakage of 20 μV/m at a distance of eight to 12 feet. Carrying the detector on a belt requires 70 μV/m to cause an alarm at this distance.
- High or low gain control settings—Each detector has controls designed to change its sensitivity. The low

Changes in detector sensitivity caused by the indicated factors

Detector model	Hand or belt	Gain control settings	Antenna type	Attenuator (dB)	Distance from leak (feet)	Signal strength causing alarm (μV/m)	Signal strength causing alarm (dBmV)	Video carrier channel
Sniffer Jr.	Hand	High	Internal	None	10 ± 2	20	-42.90	16 (C)
	Belt	High	Internal	None	10 ± 2	70	-32.04	16 (C)
	Hand	Low	Internal	None	10 ± 2	70	-32.04	16 (C)
Searcher	Belt	High	"Rubber ducky"	None	10	20	-42.90	16 (C)
	Hand	Low	"Rubber ducky"	None	10	220	-22.09	16 (C)
CLR-4	Hand	High (minimum squelch)	"Rubber ducky"	None	10	20	-42.52	15 (B)

sensitivity mode button of the Sniffer Jr. reduces the detector's sensitivity by 10-12 dB and the "Gain Lo" key of the Searcher by 30 dB. The CLR-4's variable squelch control, when turned fully clockwise, reduces sensitivity by 40 dB.

- Type of antenna used—With a "rubber ducky" installed the Searcher detects a leakage of 7 μV/m when held in the hand. A Searcher connected to a mobile antenna can detect a smaller leak of 3 μV/m. On the other hand, attenuators reduce sensitivity. A 20 dB attenuator in line with a Searcher's mobile antenna requires leakage of 30 to 40 μV/m to sound an alarm. ■

Technical consultation for this lesson was provided by: Neal Alexander, production test supervisor, ComSonics Inc.; Ted Dudziak, project engineering manager, Wavetek RF Products; Steve Wendell, applications engineer, Wavetek RF Products; Roy Ehman, director of engineering, Jones Intercable Inc.; Jim Kuhns, district technical trainer, Continental Cablevision; Jim Neil, plant manager, Multimedia Cablevision; and Greg Rogers, instrument engineering group manager, Texscan Instruments Inc.

Troubleshooting

(Continued from page 52)

Solid polyethylene dielectric cables

$$17384 \times \frac{\text{width of ghost}}{\text{width of TV screen}}$$

Poly-foam dielectric cables

$$21590 \times \frac{\text{width of ghost}}{\text{width of TV screen}}$$

Polystyrene dielectric cables

$$24084 \times \frac{\text{width of ghost}}{\text{width of TV screen}}$$

Fused disc dielectric cables

$$25012 \times \frac{\text{width of ghost}}{\text{width of TV screen}}$$

The numbers in these formulas were derived from the following formula:

$$\frac{D \times 53.5 \times 10^{-6} \times V}{2} = K$$

Where:

D is the distance radio waves travel through air in feet per second (984,250,000 feet).

V is velocity of propagation of coaxial cable due to different dielectrics used.

53.5×10^{-6} is the time of one scan of the scan of the visible electron beam on the television screen. The horizontal sync and retrace is not visible.

2 is the signal that has to travel in two directions to create a time delay so the distance calculated has to be divided by two. ■

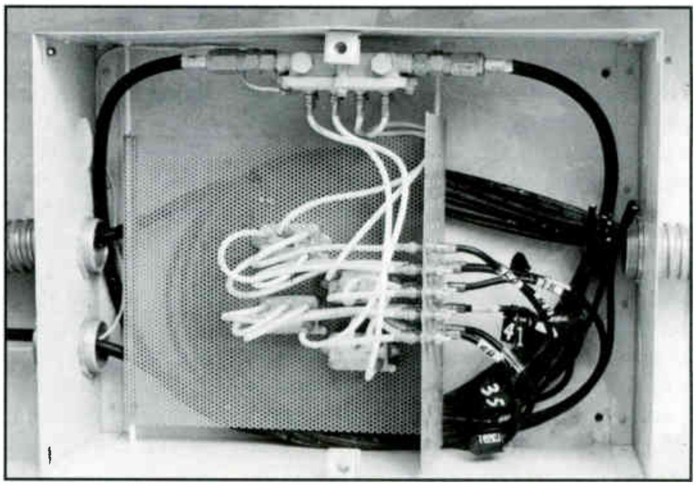
Powering MDUs

(Continued from page 33)

used, and the number per building vary, each lock box has a mounting bracket custom-assembled for each closet. Neatness is important when the lock boxes are made up since as many as 50 cables enter some lock boxes. Labeling and neatness are crucial. A lock box with well-mounted splitters, grounds and taps makes for easier installations and maintenance.

When the cable operator assigns someone in the company to inspect and coordinate all aspects of MDU construction, it makes for quality plant with good mechanical integrity. The cable inspector will follow the projects from the design stage, through construction, and finish with the projects' activation.

The following prewire specifications are used by Rancho Santa Margarita:



Completed lock box.

- RG6 Quad Shield 95 percent RF protection, F6SSV as specified.
- Prewire each residence with a minimum of three television outlets.
- Each outlet shall be wired with a single piece of coaxial cable extending from the junction box to the desired location of the outlet.
- The cable of at least one of the three outlets should be placed over the rafters at a location near an attic access hole, if there is one, or near any point in which access is a practical matter.
- No staples shall be used to secure coaxial cable. Use cable clips wherever cable needs to be secured.
- Where it is necessary to go through wall studs, coaxial cable should be placed in a hole not less than ½ inch in diameter. The cable may be pulled through studs with other services.
- Leave five feet of cable at the outlet location (plaster ring). Take this loop and return it to the top of the studs in which the plaster ring is attached so that the cable will not be damaged during construction but can be pulled out of the plaster ring later.
- Relocations of television outlets prior to the time that the house is completed should be done by an electrician at the owner or developer's expense. After the house is completed the relocations shall be done by the company at their current charges.
- It is imperative that each coaxial cable be free from any damage during its installation. If staples or nails pierce the shield or if the dimensions of the cable are altered as a result of smashing or kinking, the cables may be unusable and require replacement at the developer's expense.
- Tag the destination of each prewire as living room (LR), family room (FR) or master bedroom (MBR).
- The wall plate hole diameter should accommodate standard F-81 cable splice with hardware.
- All service drops must have house number labeled on the cable. ■

ATTENTION CABLE SYSTEM OPERATORS, MANAGERS AND ENGINEERS!

SCTE now has 48 local chapters and meeting groups across the country, each providing low-cost technical training seminars to area cable engineers and technicians.

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Contact: Matt Forgas, (307) 324-2286

Reader Service Number 26.

Training guide

Performance Plus' *1989 Training Resource Directory* contains over 600 individual sources in 11 major categories, including computers and information systems, technical, financial management, project management and safety. Each category is organized into subsections for immediate access to specific training programs. To facilitate training evaluation, each of the individual entries is presented in a one-page format summarizing the topics covered, audience, objectives, delivery system, cost and vendor. It also lists a publications and catalogs section, with over 300 books, newsletters, catalogs and video and audio cassettes.

For more information, contact Performance Plus, 1050 Posse Rd., Castle Rock, Colo. 80104, (303) 688-1734; or circle #129 on the reader service card.

Drop amplifier

Lindsay Specialty Products is offering its Model LDA-10 drop amplifier that provides 10 dB of gain over 650 MHz with a flatness response of ± 1 dB. According to Lindsay, it has a guaranteed 4.5 dB noise figure and superior handling capabilities.

For further details, contact Lindsay Specialty Products Ltd., 50 Mary St., Lindsay, Ontario, Canada K9V 4S7, (705) 324-2196; or circle #125 on the reader service card.

Hanger

Litchfield International is offering the Clic one-piece hanger and support for conduit and cable. The single-hole mounting system is said to simplify and speed the installation of conduit and cable. The Clic system is constructed from corrosion-resistant Nylon 12 Grilamid and allows no galvanic reaction. The fastener clicks shut by applying slight pressure to the jaws and is reusable since it unlocks with a ¼-inch turn with a screwdriver.

For additional details, contact Litchfield International Inc., P.O. Box 1007, 151 Ella Grasso Ave., Torrington Industrial Park, Torrington, Conn. 06790, (203) 489-7765; or circle #121 on the reader service card.

Surge probe

KeyTek Instrument Corp. has announced a differential, high-voltage 10 ns risetime probe for measuring peak surge voltages to 6 kV. The Model PK1001D is said to provide the user with a safe, accurate method of making what previously were difficult high-voltage surge measurements, especially when surges are superimposed on AC power line voltages to 277 VRMS. The probe was designed to eliminate the need for tricky or complicated compensation adjustments, a leading cause of measurement errors.

For more information, contact KeyTek Instrument Corp., 260 Fordham Rd., Wilmington, Mass. 01887, (508) 658-0880; or circle #122 on the reader service card.

Calendar

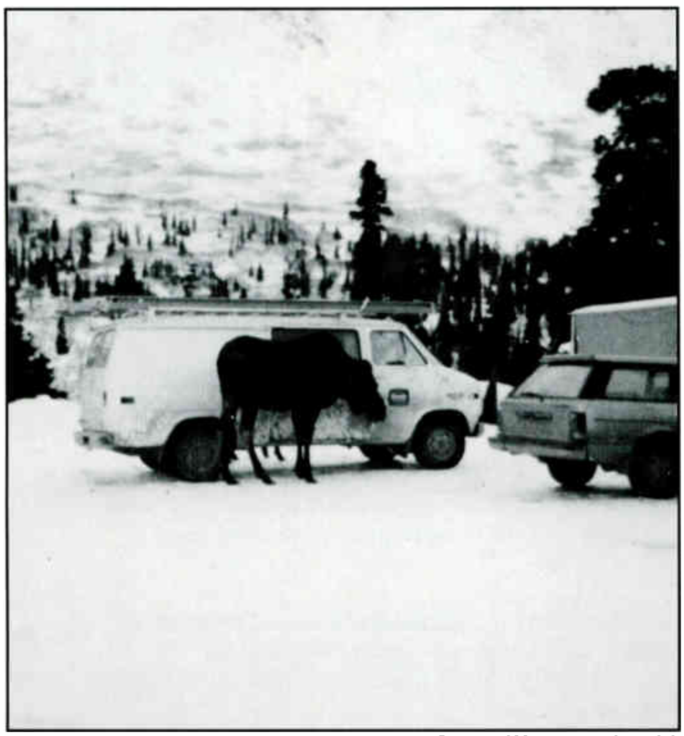
May

May 15-16: Fibertron fiber-optics seminar, Heritage Inn, Fullerton, Calif. Contact Denise Weber, (213) 690-0670.
May 15-17: Magnavox CATV technical seminar, Denver. Contact Amy Haube, (315) 682-9105.
May 16-17: Trellis Communications seminar on fiber-optic networks, O'Hare Hilton, Chicago. Contact Richard Cerny, (603) 898-3434.
May 17: SCTE Razorback Chapter technical seminar, Days Inn, Little Rock, Ark. Contact Jim Dickerson, (501) 777-4684.
May 17: SCTE Dairyland Meeting Group technical seminar on fiber optics, Fanta Suite Hotel, West Bend, Wis. Contact Jeff Spence, (414) 738-3180.
May 17: SCTE North Central Texas Chapter technical seminar. Contact M.J. Jackson, (800) 528-5567.
May 17-18: SCTE Ohio Valley Chapter technical seminar and BCT/E testing. Contact Bill Ricker, (614) 236-1292.
May 18: SCTE Central California Meeting Group technical seminar. Contact Andrew Valles, (209) 453-7791.
May 18: SCTE Oklahoma Chapter technical seminar on system distortions, Applewoods Restaurant, Oklahoma City. Contact Herman Holland, (405) 353-2250.
May 18: SCTE Golden Gate Chapter technical seminar on system powering. Contact Sam Towne, (408) 452-9100.
May 19: SCTE Heart of America Chapter BCT/E testing. Contact Wayne Hall, (816) 942-3715.
May 20: SCTE Great Plains Meeting Group technical seminar, Nebraska Educational TV Center, Lincoln, Neb. Contact Jennifer Hays, (402) 333-6484.
May 21-24: NCTA Show, Convention Center, Dallas. Contact (202) 775-3550.
May 22-23: Biddle Instruments technical seminar on earth resistance testing, Blue Bell, Pa. Contact (215) 646-9200.
May 22-25: Siecor Corp. technical seminar on fiber-optic installation and splicing for LAN, building and campus applications, Hickory, N.C. Contact (704) 327-5998.
May 24: SCTE North Country Chapter BCT/E testing. Contact Douglas Ceballos, (612) 522-5200.
May 24: SCTE Inland Empire Meeting Group technical seminar. Contact Randy Melius, (509) 484-4931.
May 25: SCTE Upstate New York Meeting Group technical seminar on CLI, Rochester, N.Y. Contact Ed Pickett, (716) 325-1111.
May 31: SCTE Piedmont Chapter technical seminar. Contact Rick Hollowell, (919) 968-4631.

Upcoming

June 15-18: Cable-Tec Expo '89, Orange County Convention Center, Orlando, Fla.
Aug. 27-29: Eastern Show, Atlanta Merchandise Mart, Atlanta.
Sept. 20-22: Great Lakes Expo, Convention Center, Columbus, Ohio.
Oct. 3-5: Atlantic Show, Convention Center, Atlantic City, N.J.

Out of Focus


Jim Little

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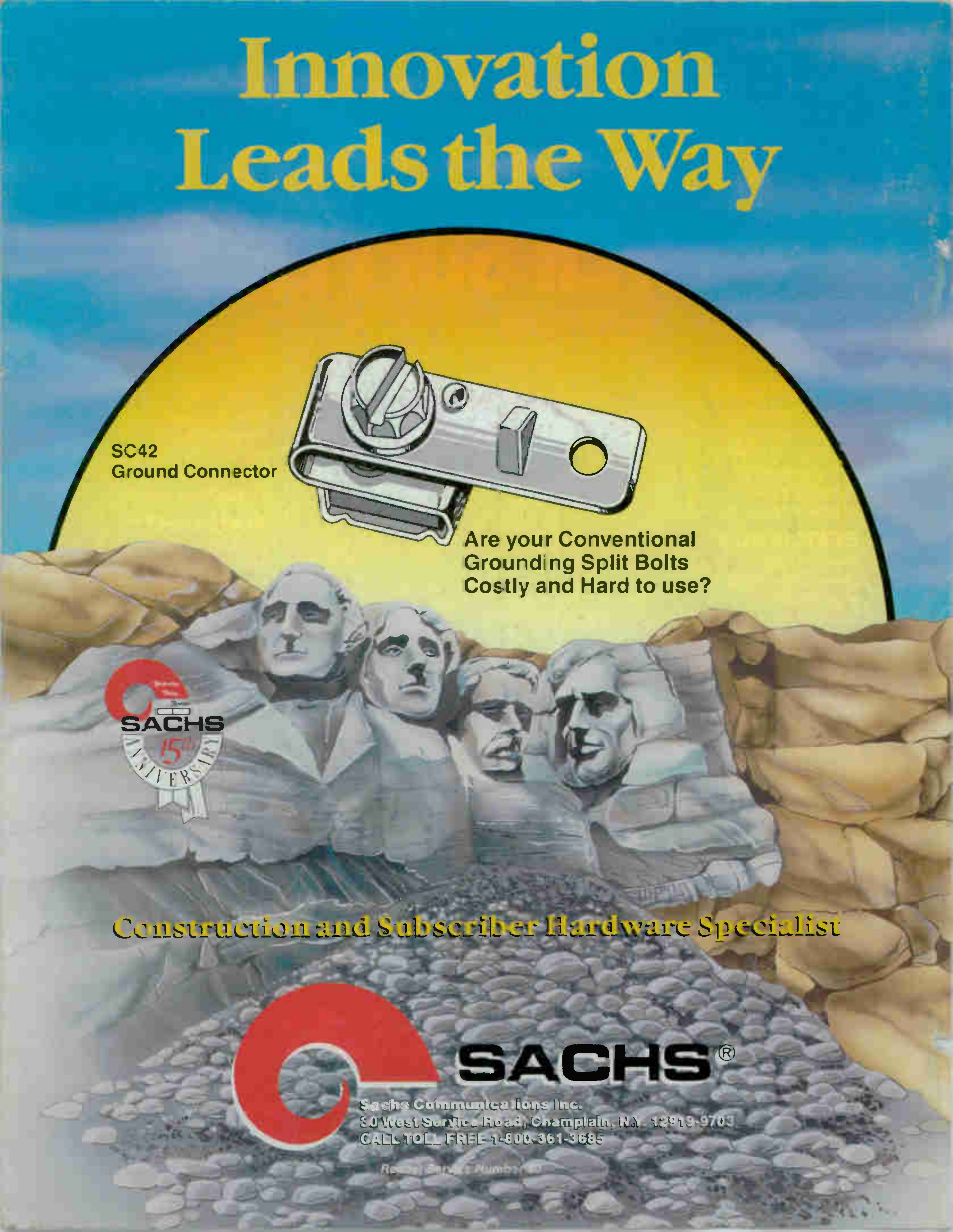

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