September 1968

Communications

The Professional Journal of Cable Television

In This Issue...

CATV Aerial Mapping
Underground Construction
New Gaff Safety Test

Some new wrinkles in CATV efficiency

What kind of wrinkles? The rugged kind. The economical kind. The kind that show up in better TV and FM on your subscribers' sets. Three new antennas from Jerrold:

New Jerrold FM OMNI Antenna —the low-cost way to receive local stations within a 40-mile radius. Gain as a single antenna is —1 dBi. In a dual bay array it's +2 dBi. Return loss on both units is 10 dB. The output is matched to 75 ohms and the terminal is weathersealed. OMNI mounts on any mast with an O.D. between 2" and 3".

New Jerrold Low-Band VHF Yagis are log-periodic, cut-to-channel antennas that are optimized for Channels 2, 3, 4, 5, or 6 to provide the best co-channel rejection for the entire angular range from 90° to 270°. Gain is 8.5 dBi, return loss is 12 dB, and back radiation more than 20 dB below the gain of the forward direction. New Jerrold Low-Band VHF Yagis can be individually mounted, or horizontally stacked for greater gain, on any 2" to 4" O.D. mast.

New Parabeam UHF Antenna with Broad-Band Feed is a modified version of our 8-foot dish Parabeam. The trapezoidal-tooth, log-periodic antenna has been added as the broad-band UHF feed. The feed is factory tuned. The antenna needs no re-focusing to cover the UHF band from channels 14 to 70. Whether it's wind, rain, sleet, or snow, this one still gets the picture.

Jerrold CATV Antennas are put together so they stay together . . . your assurance that every subscriber will receive crystal-clear black-and-white or true living color pictures. Keep your customers satisfied. Write or call for more information on Jerrold CATV Antennas. CATV Systems Division, Jerrold Electronics Corporation, 401 Walnut St., Philadelphia, Pa. 19105. Phone: (215) 925-9870, TWX 710-670-0263.

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look to vikoa versatility...

FUTURA
AGC line extender

Model 474 $145.00 Without Fittings
FT 1412 – Fittings for .412 Cable – $1.55
FT 1500 – Fittings for .500 Cable – $1.85

The Vikoa Futura AGC Line Extender Model 474, is designed to compliment the manual line extender, model 461. Its construction and design is comparable to the 461 with the addition of the AGC circuitry. In this respect, it takes a major step forward in line extender design, since its AGC is similar to that found only in expensive trunkline amplifiers. The circuitry is designed to function on multi-carrier, however, it samples the low band and high bands separately and in that way drives dual voltages which control level and tilt independently. Thus, not only does the AGC compensate for level changes, but also fully compensates for changes due to temperature variations.

The Model 474 Line Extender Amplifier w/AGC is housed in a single bolt, hinged case, constructed of die cast aluminum alloy and coated with a special corrision preventative finish. It also is provided with either 412 SM or 500 SM fittings, each having a "one inch" engagement of center conductor.

Minimum full gain, amplifier module in housing: 27 db (input fitting to output fitting)
Operational Gain: 24 db
Frequency response over 50-225 MHz band as measured in conjunction with any cable length within equalization range: ±0.5 db (over entire gain control range)
Temperature range: –40F to +140F
Output capability with –57 db cross-modulation, 12 channels, 5 db block tilt, synchronous modulation, (per NCTA standard): +44 dbmv min. at channel 13 single output
AGC Compensation, level control: ±3 db input ±0.75 db output
Tilt Control: 2 db input tilt = 0.5 db output tilt
Gain control range: 0 to 6 db
Cable equalization to match .412 or .500 aluminum cable: fixed 11 db at channel 13 variable 0 to 11 db at channel 13
Noise figure; measures with fixed cable equalizer in variable equalizer in max. cable position:
at channel 13; – 11 db max.
at channel 2; – 11 db +L/2* max.
Return loss: input – 16 db, output – 16 db
Test points: located on the outside of the case: –20 db ±1 db at input and output.
Plug-in Pads: flat loss and equalizers: 456, 457
Power Requirements: 18–30 volts, rms, at 0.3 amp.
Power Passing: will pass AC power; 8 amps max. Has power passing selector switch.
Surge Protector input and output: Gas tube type surge protectors (90 V)

* L – Loss of cable equalizer at frequency of interest.

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Low-Cost Line Extender Amplifier E-6C
Universal Tapoff SMT Series

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Phone: (301) 622-2000

IN THIS ISSUE

Articles You Can Build On

The emphasis in this issue is on CATV plant construction; a subject uppermost in many cablemen's minds at this time. The subjects covered are varied, as are the system installation, expansion, and maintenance problems confronting operators these days.

It All Starts on Paper

Leading off the feature articles is a detailed introduction to a new system mapping technique developed by Maclean-Hunter Cable TV. That Canadian MSO is producing much more accurate and useful CATV maps by combining aerial photo techniques with strand map layout drafting. See page 46.

Down-to-Earth Approaches

Two features are devoted to the growing field of buried system installation: Beginning on page 64, you'll find a complete discussion of how to put your plant underground—with numerous details and tips taken directly from field problems. And starting on page 56, the specific subject of dry-boring for cable runs under sidewalks and streets is treated in detail.

Rounding Out the Menu . . .

Other aspects of CATV system construction covered this month include: A new foolproof method for checking cable splices using portable X-Ray gear; the special problems encountered in big city system construction; and a new gaff safety testing procedure for all CATV linemen. And for quick-reference of the construction-minded, an up-to-date list of all system construction contractors is also to be found in this issue.

Our Cover: This month's front cover photo was supplied by Clearview of Georgia, Inc., Dublin, Georgia. Clearview has its own construction crew, some of whom are shown here lashing trunk cable from the head-end building in the background.

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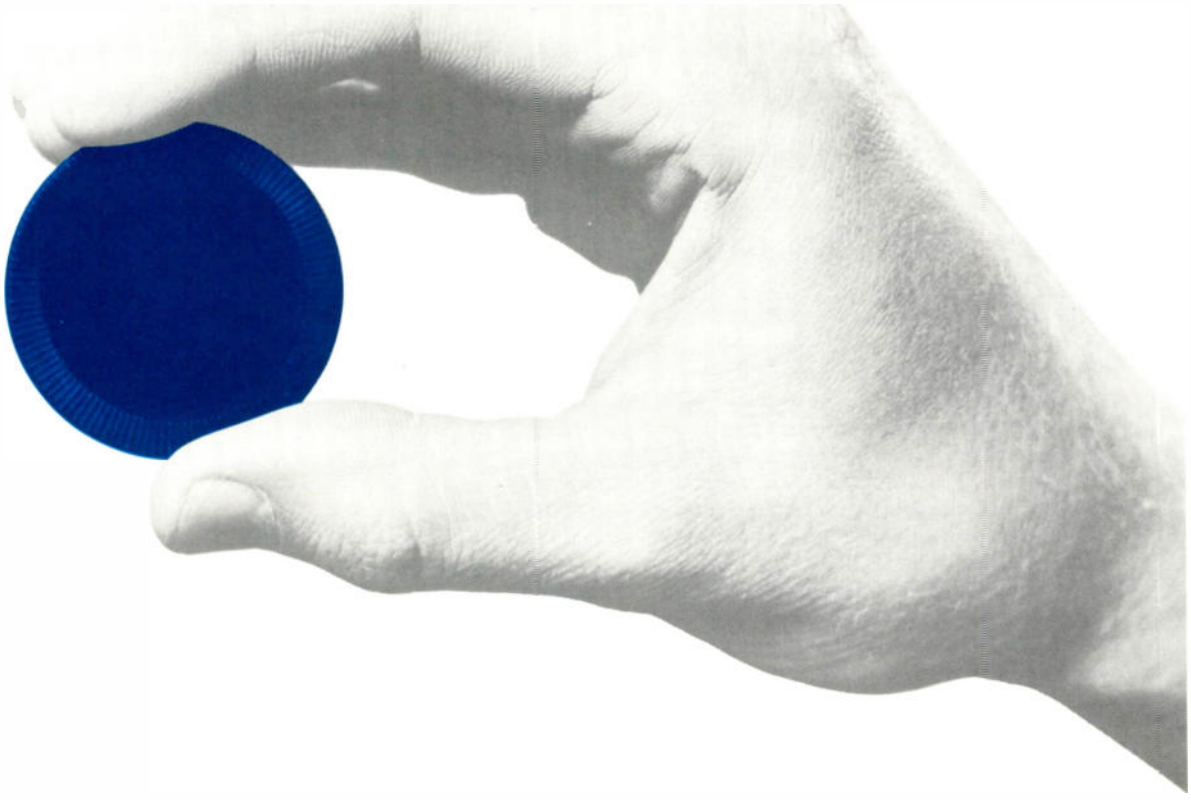
BPA

Published By: COMMUNICATIONS PUBLISHING CORPORATION
207 N. E. 38th • Oklahoma City, Oklahoma 73105 • (405) 528-3523

CIRCULATION: TV COMMUNICATIONS is circulated on the first day of each month to individuals and firms in Cable Television (CATV) and allied industries. Circulation breakdown available upon request. ADVERTISING: Display advertising accepted at discretion of the publishers. Rates available upon request. TV COMMUNICATIONS (title registered at U. S. Post Office) Second Class postage paid at Oklahoma City, Okla.
SUBSCRIPTIONS: One Year $8; Two Years $14, Three Years $19. Foreign subscriptions (except Canada) add $2 per year. Group subscription rates available upon request.



Tip on a CATV Blue Chip

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Staffed with CATV pros. Sound, customer-oriented business policies.

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The TVC Viewpoint

EDITORIAL

Power Play Too Late

Inspired by the High Court's across-the-board ratification of FCC power, the anti-CATV faction of the FCC has launched the predicted crusade for a drastic, long-term freeze on cable television. The spirit of vituperation which Commissioner Ken Cox has always expressed comes through loud and clear in the recommendations of the Broadcast Bureau and the FCC General Counsel. With some quasi compromises thrown in for window dressing, the proposal is clearly aimed at reducing cable television to an emaciated arm of broadcasting. A long-term freeze on importation of distant signals into the top-100 markets, coupled with a prohibition on advertising, is intended to bring cable television expansion to a screeching halt. But it won't work. The power play has come too late. Five years ago . . . even two years ago when the Second Report and Order was adopted, a blanket freeze might have stuck. But the adversaries of cable television within the Commission have allowed too much water to go over the dam.

The 10 million American citizens on the cable and 1400 strong, unified firms serving them can be ignored by neither the FCC nor Congress. It would be naive to suggest that even a very powerful regulatory bureau could clamp a total freeze on a dynamic young industry which has captured the interest of 3-1/2 million American families and a host of substantial and responsible members of the American business community.

For the Commission to adopt the proposed CATV curtailment and freeze would be to invite immediate and fervent onslaught of legal challenges of Commission authority, not to mention an unrelenting drive for counteracting legislation.

In fact, adoption of the brazen power play proposal might be the final straw that would bring about the dissolution of the FCC. Congress is already dissatisfied and impatient with the Federal Communications Commission. For the agency to impose a harsh and prejudicial freeze on an important national communications service at this time would be to invite Congressional repudiation which might go far beyond mere corrective action.

In short, we are confident that Chairman Hyde and at least three of the other Commissioners will follow the dictates of conscience and their instincts of self-preservation. They will have no part of the power play sponsored by the Broadcast Bureau and the General Counsel's office.

Editors Need Help

Cable system managers should be aware that newspaper editors need their assistance. Even the newspapers in cable-served communities carry vague or inaccurate accounts of cable television developments. A case in point is the handling of the recent Supreme Court rulings. Many newspapers in medium and small sized towns relied entirely on syndicated editorials in commenting on the crucial decisions. And, generally speaking, the syndicated commentaries were not particularly helpful to the industry.

Cable operators who have failed to contact local journalists in connection with significant industry developments have missed golden opportunities for improving their own image in their respective communities. The benefits of helping your local editors are two-fold.

First, you can help news reporters put national CATV developments into local perspective, giving readers a better understanding of *your* problems and regulatory limitations. Secondly, good journalists will be appreciative of any help they can get in relating national stories to local people and local interests. And, of course, it's always good business to come to the aid of a local editor or reporter.

Your helpfulness will cause him to be alert to future cable TV stories — and sensitive to *your point of view* in his editorial treatment of such stories.

Stan Searle

The cost of a CATV system has just been reduced!

No matter what kind of system you're planning, new Ultrafoam cables cut costs up to $190 a strand mile. Here's why—

Lowest attenuation. Ultrafoam cables feature an exclusive dielectric. Made from polystyrene foam, its velocity of propagation rating is 93%—resulting in an attenuation 20% lower than foamed polyethylene cables.

Replaces cables 50% larger. Ultrafoam is available in three cable sizes: .412", .500" and .750". Because of its superior electrical characteristics, it replaces foamed polyethylene cables up to 50% larger. But at far less cost! Ultrafoam also matches performance of air dielectric cables but eliminates expensive purging equipment and special fittings.

Fewer amplifiers needed. Ultrafoam's low signal loss lets you extend the distance between amplifiers 600' farther than polyfoam cables of the same size. Because fewer amplifiers are needed, cascading problems are reduced.

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How much savings? One cable operator reports he'll save $190 per strand mile with Ultrafoam .500 and .412 instead of foamed polyethylene .750 and .500. Ask your Amphenol sales engineer how much new Ultrafoam will save you. Or write: Amphenol Cable Division, 6235 S. Harlem Ave., Chicago, Ill. 60638.

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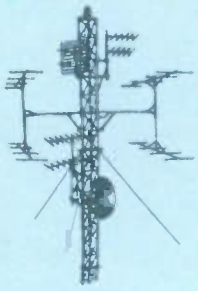

CATV Industry

PERSPECTIVE

It's unlikely that permanent authority over telco applications for leaseback construction certificates under Section 214 will vest anywhere but in the Common Carrier Bureau. That does not mean, however, that the Commissioners themselves will not keep a careful eye on the administration of any rules that will be formulated for certification procedures. The Report and Order requiring certificates was a strongly-worded one and there is every indication that the Commission intends to take steps that will ensure CATV's protection from unfair competition by telephone companies.

Such steps will probably include, for example, a provision that a telco seeking certification must give notice of their filing to all interested parties. Informed sources feel the Common Carrier Bureau, under strong policy guidelines, will be an impartial forum, and the telco applications will be carefully scrutinized. Count on an uphill battle for telco-owned cable firms seeking certificates--chances are the burden of proof will be a heavy one to show why an independent operator shouldn't build instead.

There is no sign so far of Justice Department interest in including CATV in the proposed FCC prohibition against broadcasters owning more than one TV, AM or FM station in any one major market. Justice has called for inclusion of newspaper publishers. . . .but no mention of cable television, which JD has looked on in the past as competition for potentially monopolistic broadcast and print media.

New York City will be going after 25% franchise fees if officials follow the recommendation of Morris Tarshis of NYC Board of Franchises. Tarshis has been quoted as recommending the fee--many times higher than the 5% being paid by the three present franchise-holders--for the long waiting list of applicants. His move reflects the steep escalation in large-city franchise bidding that runs fees up to 10-20% with sliding scales giving the city more than 30% slice at the high end. This can only lead to harassment of operators by city councils and increased vulnerability to public utility-type regulation.

Brokers report vigorous trading and active interest in cable television stocks. Attribute the frank interest of the financial community to recent big-news mergers, loans, as well as the less volatile industry climate created by the Federal-level decisions of the past few months. With new public offerings, such as Cox Cable Communications, Inc., look for increasing number of investors with CATV in their portfolios.

The 8th Circuit's decision in the Black Hills Case--upholding the Second Report & Order--is scarcely a surprise in view of the Supreme Court's San Diego verdict. The question now is whether the nation's highest court will hear an appeal. Of course, a move on the part of the FCC toward recision, or even softening, of the Second Report & Order could obviate the question. Meanwhile, a restless audience of cable and would-be cable viewers--the public in whose interests the FCC is supposed to be acting--is strengthening its voice. Unhappy Californians have been knocking at the Commission's door over the San Diego ruling, and the pressures will become more telling as more American homes are hooked up.

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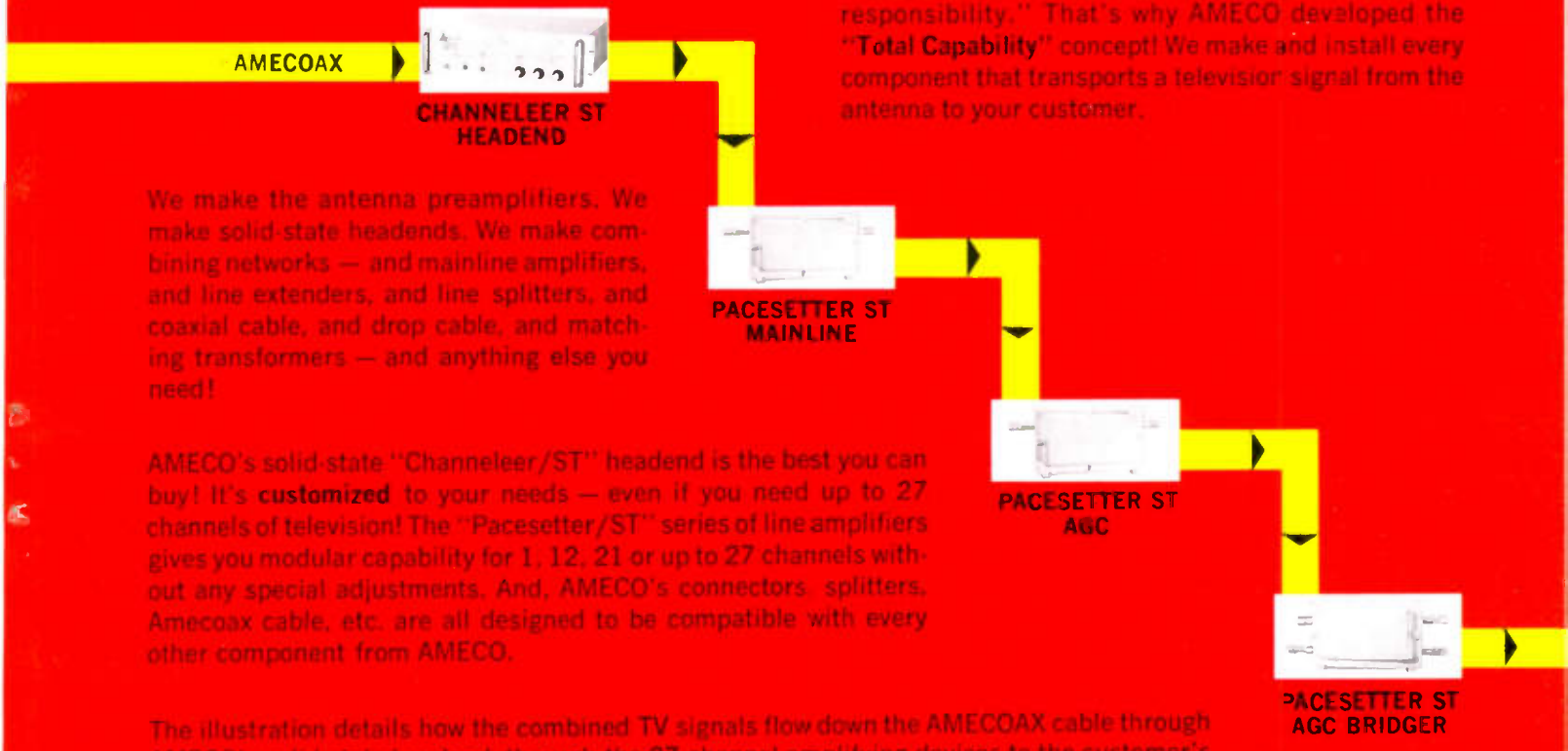

We make the antenna preamplifiers. We make solid-state headends. We make combining networks — and mainline amplifiers, and line extenders, and line splitters, and coaxial cable, and drop cable, and matching transformers — and anything else you need!

AMECO's solid-state "Channeleer/ST" headend is the best you can buy! It's **customized** to your needs — even if you need up to 27 channels of television! The "Pacesetter/ST" series of line amplifiers gives you modular capability for 1, 12, 21 or up to 27 channels without any special adjustments. And, AMECO's connectors, splitters, Amecoax cable, etc. are all designed to be compatible with every other component from AMECO.

The illustration details how the combined TV signals flow down the AMECOAX cable through AMECO's solid-state headend, through the 27 channel amplifying devices to the customer's home television receiver.

Try an AMECO system! The AMECO team is eager to show you the quality equipment that everyone is talking about. Call us or detach and mail the attached card for full information on AMECO solid-state equipment!

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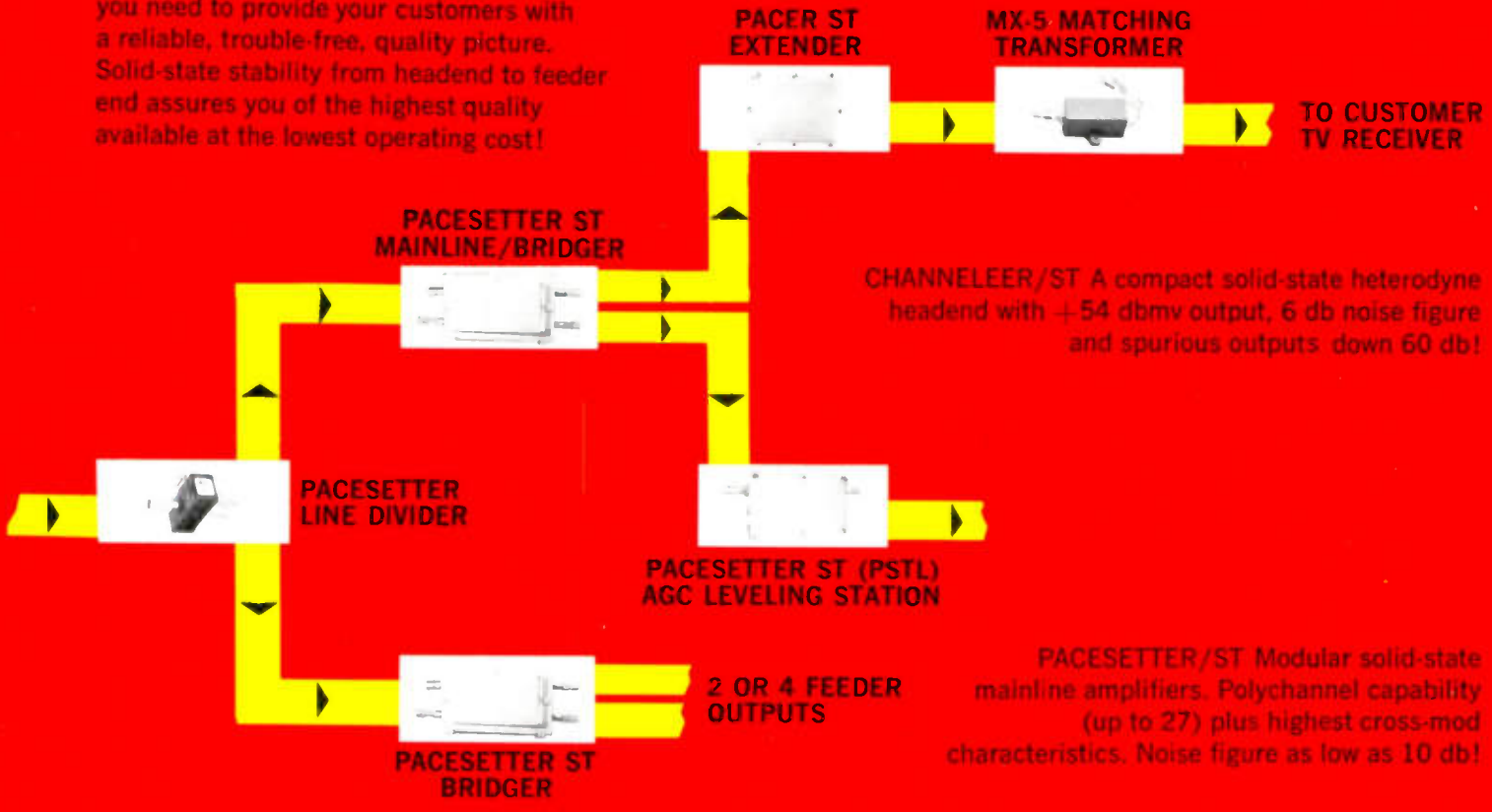

CHANNELEER/ST A compact solid-state heterodyne headend with +54 dbmv output, 6 db noise figure and spurious outputs down 60 db!

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LETTERS

• We have been trying for several weeks to locate the company that manufactures the Sod Master. Your April magazine had a picture of the machine on the front page of the Technicians' Section.

Would you please be so kind as to check your files and see if you would have the company name of this machine.

Randy Scott, Mgr.
Badger CATV
Ashland, Wisconsin

The unit you ask about, Randy, is built by Sod Master Corp., 3456 Washington Avenue, Minneapolis, Minnesota 55412.

• There seems to be some confusion among system operators at this time over the application of the FCC San Diego decision on origination and advertising to other CATV systems. Enclosed is a response on this question from communications attorney Joseph Chachkin, which should clarify the limited nature of the Commission's action.

J. R. Hampton
J. R. Hampton Associates
Littleton, Colorado

The following is the text of Mr. Chachkin's letter to Mr. Hampton.

"This is in reference to your request for an opinion concerning whether the Commission has adopted any regulation or policy limiting or restricting the origination of programming or the carriage of commercial advertising on such program originations.

"Based on my analysis of the Commission's action in this field, it appears that the Commission at this time has in no way established any policy or regulations limiting the origination of programming or the carriage of commercial content. The Commission recently released a decision in the matter of the petition of Mid-West Television, Inc., Docket No. 16786 (FCC 68-662 released June 28, 1968), limiting the carriage of commercials of programs proposed to be originated by the San Diego CATV System. However, the decision makes clear that these limitations pertain solely to the specific San Diego situation and do not have applicability elsewhere. In this connection, it would appear from the Commission's decision that they intend to use the experience gained from the limitations imposed in San Diego as the basis for determining whether a broad policy in this field would be in the public interest. However, it seems clear that any further action by the Commission in this area is at least two or three years away at a minimum."

Joseph Chachkin
Washington, D. C

• The Massachusetts Bay Transportation Authority is presently in a $500 million expansion program. In all, a total of approximately $2 to $4 million will be expended over the next five years on intra system telephones, CCTV and two-way radios. The majority of the coordinating and design of these systems will be under my direction.

The recent program booklet distributed at the 1968 NCTA Convention listed your publication, *TV Communications* magazine. I am very interested in subscribing to this publication. Would you please send me the necessary forms.

R. P. Dandrea
Assistant Supervisor
of Communications
Massachusetts Bay
Transportation Authority

Thank you for your interest in our magazine—subscription information is on the way to you.

• I would like to receive a copy of your brochure entitled "CATV System Cash-Flow Projection" which was listed in the April 1968 issue of the Journal of Commercial Bank Lending. Thank you.

Robert T. Rork
Assistant Vice President
Republic National Bank of Dallas
Dallas, Texas

• Your brochure entitled "CATV System Cash-Flow Projection" would be of interest to us. We would appreciate a copy and any cost will be paid upon billing by you. Thank you.

James H. Williams
Assistant Vice President
The First National Bank
Jersey City, N.J.

Thank you, gentlemen, for your inquiries on the availability of our Cash-Flow Projection Booklet. Copies of our revised edition of this publication are available at $1.95 each (with quantity discounts available) from the Circulation Department, TV Communications, 207 N.E. 38th, Oklahoma City, Oklahoma 73105. TVC

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Designed to be the most reliable television camera for CATV

TMC-2100V

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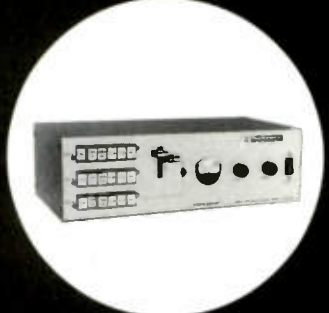

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CATV MANAGEMENT CORNER

The Gift Of Praise

The conference you attended a couple of weeks ago on good management practices is already beginning to pay off. The suggestion that you jot down each time you praise an employee, criticize an employee, or fail to greet an employee in your daily "Action Planner" has been a real eye-opener. It wasn't until you started to use this idea that you suddenly realized you were spending so much of your time criticizing your people, and comparatively little time in praising them.

You remember the speaker saying that even mild criticism, or silence, which a sensitive employee might interpret as criticism, whittles away his self esteem.

One speaker said something that suddenly gave you a clue on how to get Jim, your assistant chief tech to become more interested in his job. You know he's young, intelligent and seemingly ambitious, and you are certain he could become a valuable employee and candidate for promotion, if only you could encourage him to develop himself.

You decide to make a special point to compliment his work at every opportunity and give him greater responsibilities. You ask him his opinion on matters pertaining to his work, and continue to encourage him to use his own initiative whenever he can, without affecting his normal work responsibilities. You help him work his problems out, but let him feel he contributed toward the final decision.

You begin to notice a gradual change in Jim's behavior pattern. He's reading articles on system design and maintenance control. He's talking of what it will take to become a chief tech. He's interested in attending technical and management seminars on his own time.

You suggest several courses and what training is needed for certain types of engineering and management jobs. When he tells you he would like to prepare himself for additional responsibilities and is interested in learning new work and taking on additional responsibilities, you feel your efforts have been worthwhile.

You're glad now, you disciplined yourself to look behind the reasons which cause people to act the way they do, and put your efforts into directing a person's motivation to a constructive direction. You have now benefited and so has your system operation.

Then you remember what the last speaker at the conference had to say: "The man or woman behind the desk or on the poles needs to know that someone there appreciates his work and realizes that he's a human being, not just a cog."

You were glad to be reminded of the importance of speaking to everyone in the company and to call them by name: "A man's name is the liveliest music he can hear."

You took specific note of his warning that managers may set goals without regard to the capacity of the individual, and his reminder that a person may feel frustrated if the goals set are too high for his ability; or he will feel bored if they are too low or not sufficiently challenging.

It's beginning to dawn on you that being a manager was never like this in the old days, when all you had to do was to line up the work and see to it that it was done. You realize more than ever before that your job calls on you to act as a family counselor, an advisor, a friend, as well as a leader.

You rather like the new approach. It makes your job more interesting and more challenging. You find you're not nearly as tired at the end of the day as you used to be, and you know why. It doesn't take nearly as much energy to praise a person as it does to criticize. TVC

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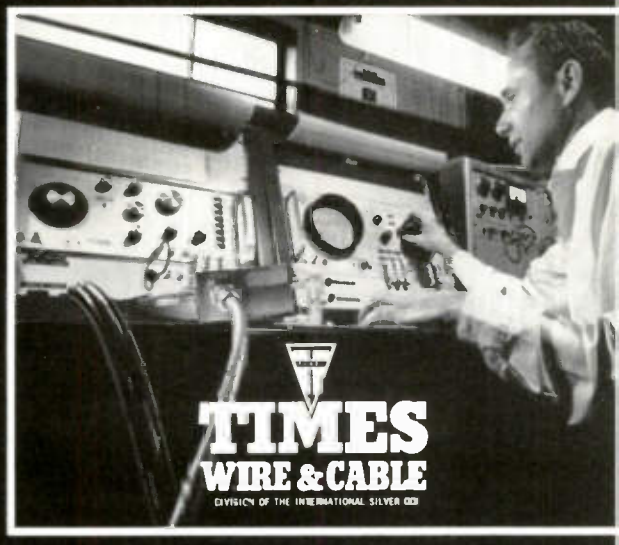

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Construction Reports

Opp, Ala. — A contract for initial construction work on the city-owned and operated system has been awarded to Television Distribution, Inc., a Pennsylvania-based firm. Construction is expected to be completed this month, and the city has announced hopes of signing up 600 subscribers the first year. Rates are $4.75 per month.

Holtville, Calif. — According to Bill Little, manager of Imperial Valley Cable Co., a $20,000 rebuild program has been started in Holtville. A contract for the construction was signed with Burnworth and Coggins Cable TV Construction, Inc., of Phoenix, for the more than 25 miles of cable replacement.

San Bernardino, Calif. — Charles Swenter, general manager of TV Receptors, Inc., has announced that $3 million has been allocated for the expansion of the firm's system. Construction of more than 300 miles of plant has already begun.

San Carlos, Calif. — Peninsula Cable TV has begun installation of its underground system, according to Verne Laughton, president of the firm. Installation is being made by Jardin of California, Inc., a subsidiary of Douglas Jardin, Inc., of Colorado Springs.

Simi, Calif. — A $53,000 expansion program is currently underway for Clarity TV's system. Equipment used for the new facilities will be Cascade.

Elberton, Ga. — Rentavision's new 12-channel system has been energized according to manager Clarence Andrews. The system previously offered 9 channels. The three new channels carry stations from Atlanta, Anderson, S.C., and a time/weather service.

Linton, Ind. — Telesis Corp., parent company of the Linton cable system, reports initiation of service in that community to more than 800 pre-start subscribers.

Portland, Ind. — Omar K. Wright, president of Soundvision, Inc., has announced that the construction contract for the system has been awarded to Com-Tel Construction Co. and that work has already begun.

Albia, Iowa — The last of 480 hookups have been completed for United Transmission by C. L. Davis Cable Construction Co.

Dawson Springs, Ky. — Dawson Springs TV Cable Co. has signed a construction contract with Telesis Construction, Inc. Total construction time for the system is estimated at 3 months.

Somerset, Ky. — Construction is under way on the new 31-mile system for Somerset. Charles Dunbar, president of Commonwealth Cable Co., announced that Jerrold crews have the first phase of the system completed. Subscribers will receive 6 video channels, a time/weather service, a wire new service and FM.

Fitchburg, Mass. — Montachusett Cable Television, Inc., has announced the beginning of the second phase of construction, bringing the system up to 55 miles. The second phase will add 37 miles of plant.

Bad Axe, Mich. — Construction has begun on a 10-channel system to serve the Bad Axe area, according to spokesman for Thumb Broadcasting Company.

Flint, Mich. — Lamb Communications, Inc., reports that 30 additional miles of the proposed 425-mile system have now been energized. The system now has a total of 142 miles in operation, and the entire project, passing 58,000 homes, is expected to be completed by December.

New Ulm, Minn. — Construction of new facilities is nearly completed, it was announced by K. T. McHugo, president of New Ulm TV Signal Co. New services will include public service programming and a time/weather channel. A $.75 per month increase in rates will be effective Oct. 1 to pay for the cost of expansion.

Salem, New Jersey — Ervin G. Ochs, Jr., manager of Tri-County Cable Television, has announced that a tide clock has been installed as an additional service to subscribers. The clock is timed for Salem cove and indicates by a dial the level of the tide at all times.

Grand Forks, North Dakota — GF Cable TV, Inc. has awarded a contract for system engineering and construction to Community Television, Inc., of Denver.

Jackson, Ohio — Squires, Inc. of Columbus has been awarded a contract to install the system for Jackson County Cable Service, Inc. When completed, it will include 60 miles of plant.

Reedsport, Ore. — Cable TV Corp. has announced the awarding of a $55,000 turnkey contract to Cascade Electronics, Ltd. Construction of the 15-mile extension has already begun.

Easton, Pa. — Clearpic Cable TV has announced plans for an extension. In making the announcement, the firm also reported that it had awarded a contract for 120 miles of materials to Cascade.

Clairton, Pa. — The first 16 miles of Center Video's 28 mile system have been energized and 3 miles have been added to the Midland system.

Pierre, Huron, Winner, S.D. — Midcontinent Cable Systems has awarded turnkey contracts for these three systems to Jerrold Electronics Corp. All three are expected to be operative by fall and will provide network programming plus an independent and a continuous weather service.

Cookeville, Tenn. — Work is now under way on the final stages of the first 50-mile leg of the system. Contractor for the job is Comm/Scope Construction Co., of Hickory, N.C. When completed, the system will provide 9 channels and a 24-hour time/weather service.

Beeville, Texas — See-Mor Television, Inc., has instituted a $100,000 rebuild program involving all new head-end and 14 additional miles of plant. New offerings will include signals from Austin and San Antonio.

Rio Grande Valley, Texas — Jerrold Electronics Corp. has announced plans to provide 12-channel cable service to subscribers throughout the Valley. Three major systems will each serve a complex of towns and cities according to Jerrold's district manager Erwin Sharp. With FCC approval of microwave, plans call for providing the 14 communities with signals from Corpus Christi, Harlingen, Weslaco, Monterrey (Mexico), and San Antonio. Each system will also carry a time/weather service and a local origination channel.

Elizabeth, W. Va. — Officials of the Village Cable Corp. report that the grand opening of the system was held recently.

Owen Sound, Ont. — Owen Sound celebrated the opening of their new office facilities with an open house. Plans for a rebuild of the 10-year-old system were also announced, and construction of a new head-end and parabolic antenna are now under way.

Candiac, Que. — The town of Candiac and National Cablevision, Ltd. have signed a contract by which the town will install and finance a CATV system as a municipal service. National Cablevision is to be paid a professional fee to distribute signals and maintain the system.

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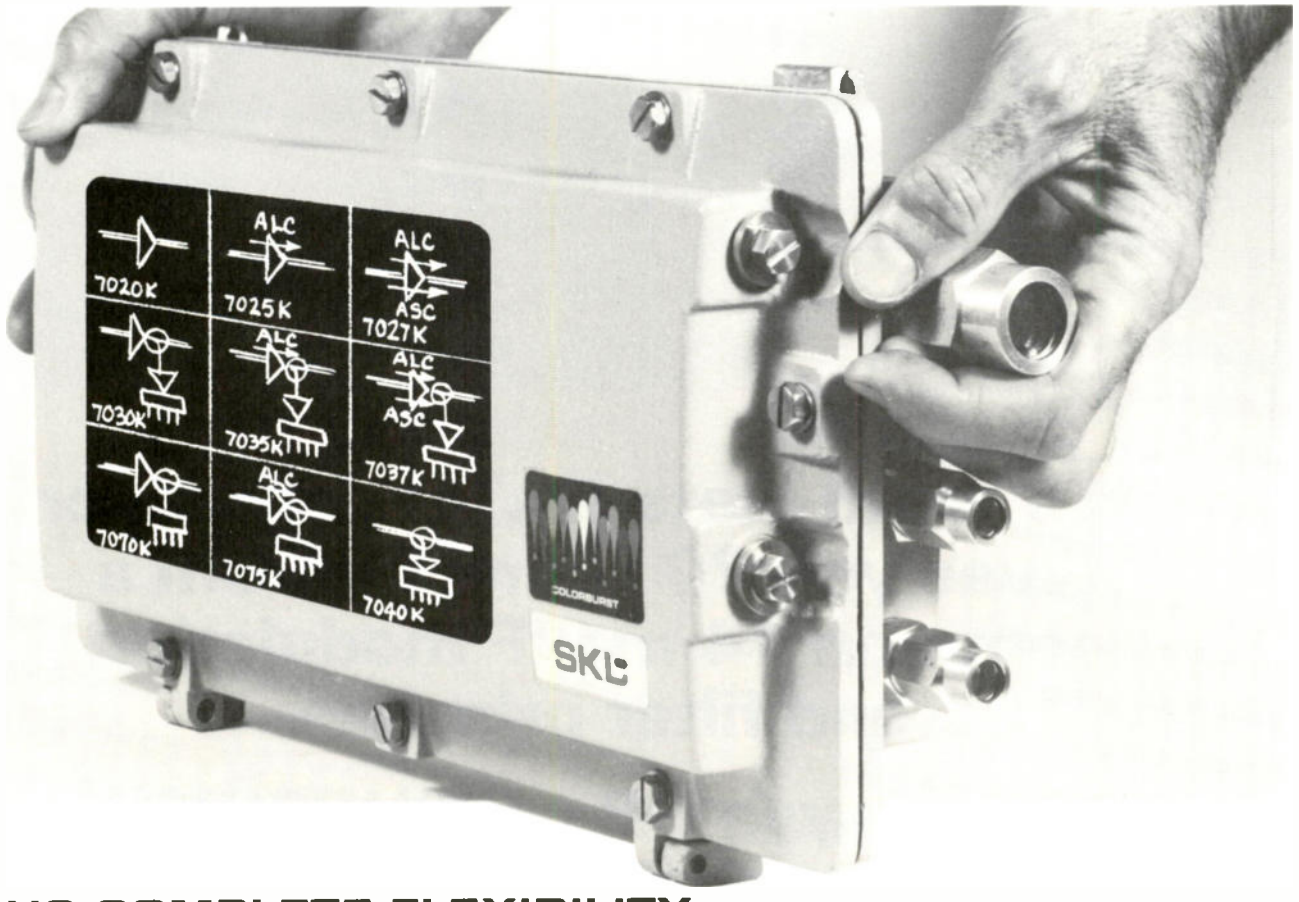

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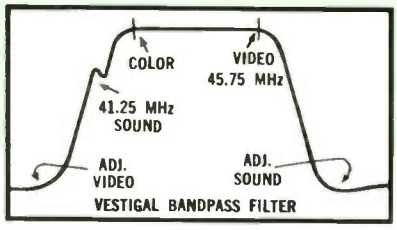

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Late News

VICE-PRESIDENT APPEARS ON CABLECAST

For what is thought to be the first time, a presidential candidate appeared on a cablecast press conference. U.S. Vice President Hubert H. Humphrey recently flew to Allentown, Pa., for a press conference hosted by Clear-Pic Cable TV Co. of Easton, Pa. The conference was arranged for Clear-Pic by Representative Fred B. Rooney (D-Pa.) who himself has appeared on CATV.

According to Danny Notarro, Clear-Pic assistant manager, the 22-minute conference was covered by the three networks as well as another cable system and several local broadcasters. Notarro reported enthusiastic reception of the coverage by everyone--from Humphrey's advance men as well as cable system subscribers. Coverage began with Humphrey's arrival at the Allentown airport and continued through the Vice President's impromptu speech delivered to newsmen at the press conference held in the dining room of a large Allentown department store.

H & B STOCKHOLDERS TO VOTE ON PURCHASE

Stockholders of H&B American Corporation have been invited to a special meeting in New York City on October 10 to vote on H&B's acquisition of Jack Kent Cooke, Inc., and Continental Cablevision, Inc. H&B is proposing to acquire Cooke's cable interests for 1,600,000 shares of common stock. H&B now owns 38 systems serving approximately 132,000 subscribers; the proposed acquisition would add 20 systems with over 80,000 subscribers.

It was simultaneously announced that negotiations for the acquisition of the business and assets of General Television, Inc. have been terminated by mutual agreement.

William M. Jennings, chairman and president of H&B, also made public the company's arrangements with two insurance companies and a bank for financing amounting to $9.5 million. The loans will be used for the construction, extension and acquisition of cable television systems.

NAB CONFERENCES TO SPOTLIGHT CABLE

Cable television will be one of the major topics for discussion at the six Fall Conferences of the National Association of Broadcasters. NAB has promised that conference highlights will be discussion of television's "future in an age of CATV and pay-TV competition." Special attention, NAB added, will be given to the association-sponsored Land Report on "Television and the Wired City."

The Land Report, released this summer, scrutinizes proposals to exchange on-air TV for a nationwide wired system. The survey, which was confined to broadcasters, concluded that switching to wire might result in local programming loss.

Late News (Continued)

COMMISSIONER LEE WILL SPEAK IN N. Y.

A high-powered guest speaker list is focusing attention on the New York State Cable Television Association's annual fall meeting this month. FCC Commissioner Robert E. Lee has agreed to address the meeting during the luncheon to be held on Friday, September 27, just prior to a scheduled session on "CATV and Broadcasters." NCTA president Frederick W. Ford will speak at the Friday evening banquet, and featured guest on Saturday will be Dr. Alfred J. Cali. Dr. Cali, presently on leave from the State University of New York, is Director for the State Study for a Communications Network.

Advance member registrations and supplier reservations for exhibit space indicate that attendance at the fall meeting will set records for the association.

COX CABLEVISION OFFERS PUBLIC STOCK

Cox Cable Communications, newly formed subsidiary of Cox Broadcasting Corporation, has filed with the Securities and Exchange Commission to register a half-million shares of Cox Cable common stock. At a maximum price of $15 per share, the corporation may raise up to $7.5 million from public sale; $654,561 will repay parent corporation Cox Broadcasting and the balance will be used for acquisition and construction of new, or expansion of existing, cable television and microwave systems. Cox cable now has 2 million shares of common stock outstanding, all of it held by Cox Broadcasting.

MSO WINS APPROVAL FOR ADVERTISING PROGRAM

George Green, general manager and newly-appointed vice president of Jefferson-Carolina Corp., Greensboro, N. C., says their system in Greensboro has won unanimous approval from the city council to originate programs and sell advertising on the cable channel. The system was previously prohibited by the city franchise from originating and selling advertising.

Spokesmen for Jefferson-Carolina said they were "under attack" from several broadcasters because of their plans, but the council nevertheless gave permission. City manager John Turner said the city's recommendation was based on a "lengthy study" by the city attorney of FCC regulation of the cable television industry.

COPYRIGHT OWNERS SEEK TPT STALL

More than a dozen large copyright owners have filed a petition with the FCC seeking to bar TelePrompTer's carriage of New York City signals into Trenton, N.J., which is part of the Philadelphia market. TelePrompTer is proposing to carry the signals of nine New York stations. As precedent, the copyright owners cited the Delaware County case where the Commission granted copyright holders the right to participate in the hearings.

FCC Holds Secret CATV Conclave, Hints Compromise Would Be Welcome

The FCC last month held what one observer described as the most significant meeting ever conducted on the subject of CATV, but no immediate decisions were announced nor were further meetings scheduled, although the Commissioners were far from agreement.

The meeting, which was so secret it did not even appear on the FCC agenda, quickly developed into a bitter battle between Sol Schildhause, head of the CATV Task Force, and Broadcast Bureau Chief Counsel Henry Geller.

Sol Schildhause, Task Force head, leads fight against Broadcast Bureau.

Task Force Battles

The Task Force recommendations on FCC regulation of CATV were given first and Geller countered. Among the Commissioners, Chairman Rosel Hyde and Robert Bartley and James Wadsworth were most active with questions. Commissioners Nicholas Johnson and Robert E. Lee had few questions and, surprisingly, Kenneth Cox also spoke relatively little.

According to an observer, the 4-2 split against the CATV industry predicted by some isn't at all a sure thing. This source believes that the majority may be seeking a compromise.

Absolute Freeze Proposed

The Geller proposal for an absolute freeze against outside signals in the top-100 markets for 5 to 10 years seems unlikely to be adopted. On the other hand, the Schildhause proposal for exemption of the second 50 markets from the current top-100 market restrictions also seems lost. There is some hope that the Commission may, however, narrow restrictions on CATV systems in the top-100 markets to merely the top-75 markets.

The CATV debates almost certainly were debates on UHF. The Broadcast Bureau fears that UHF development would be severely restricted if CATV were allowed to directly compete with the U's in the big cities. The freeze that the Broadcast Bureau recommends would last five to ten years, and only then would CATV be considered if UHF promise did not develop.

The CATV Task Force, on the other hand, noted that all UHF stations in the last few years were in the top-50 markets, not the top-100 and therefore it would be quite fair to lift the 100 market ban and only include the top-50.

Freeze "Inconceivable"

Although there is no final word as yet, CATV spokesmen say that it is "inconceivable" that the Commission will continue its freeze on CATV. As one spokesman puts it, "It is likely that the Commission will take a middle-of-the-road policy, compromising between the Task Force proposal and the Broadcast Bureau proposal."

When the Commission does act, it may be setting up the ground rules for CATV for a long time.

Bench Asks Why Non-Duplication When Broadcasters Don't Need It?

The Ninth Circuit Court of Appeals has evidenced considerable interest in the FCC's rule that broadcasters, despite their enormous profits, need not demonstrate any economic injury in order to receive non-duplication protection from a cable television system.

The question arose when attorney Robert D. L'Heureux argued before the bench against non-duplication for Port Angeles (Wash.) Telecable. The system had been ordered by the FCC to protect KVOS-TV in Bellingham, Wash., against two Seattle stations.

Among other arguments, L'Heureux pointed out to the court that the FCC's present rule requires no showing of economic injury to the TV broadcaster. L'Heureux told the court, "The Commission's annually published statistics for the last five years indicate that the average commercial television station in the United States make unprecedented profits by comparison with other businesses. Those statistics prove that the average commercial broadcast station currently makes between 100% and 105% return on its capital investments each year before taxes and depreciation.

"Under the circumstances," he continued, "it is unreasonable, arbitrary and capricious for the Commission to issue a rule that requires protection by a CATV system of a television station without proof of the need of such protection on the part of the broadcast station requesting it through an enforced blackout of the programs of competing television stations in other markets."

When Henry Geller, FCC Counsel, came before the bench, the court questioned him closely on the

cited statistics. When asked by presiding Justice James R. Browning, Geller admitted that the profit figures were correct. Justice Browning and the two other members of the court, Walter Ely, Circuit Judge from Los Angeles, and Vonder Heydt, District Judge from Alaska, fired such questions at Geller as, "Why should the Commission protect them (broadcasters) without proof of need? Why do you need a general rule that applies across the whole field of broadcasting? Why can't you find out if the station needs it?"

Interest of the court in this area was evident as the next case came up before it. A similar non-duplication problem was argued for the Great Falls, Montana, system by attorney John Cole, Jr. Chief Justice Browning was apparently still pondering the statistics since he also questioned Cole about them. Cole, agreeing that the figures were correct, supported L'Heureux's argument that the FCC could not justly give protection to broadcasters unless they found proof of economic injury as a result of CATV

Bob L'Heureux captures judges' attention with broadcast profit figures.

operations, and that there was no such proof either in the Second Report and Order or in the case at hand.

It is not known when the court will hand down a decision; meanwhile, in accordance with an order issued earlier by the Ninth Circuit court, the FCC order has been stayed.

Temple To Sponsor High-Level Seminar

More than 70 cable operators, broadcasters, government leaders, and executives in performing and production fields with an interest in CATV copyright problems have received invitations to a two-day seminar exploring new methods of solving old broadcaster-CATV problems.

Sponsored by Temple University's School of Communications and Theater, the seminar is scheduled September 29-October 1 at The Inn, Buck Hill Falls, Pa., in the Pocono Mountains near Philadelphia. Dr. Kenneth Harwood, dean of the Philadelphia-based sponsoring organization, in extending the invitations, pointed to "a real need for honest, forthright discussions sponsored by a neutral party" as a means for speeding progress toward equitable solutions of long-existing problems of exclusivity, distant signals, copyright, and program origination.

Seminar participants will gather informally on Sunday evening, September 29, and will spend the next two days in small discussion groups, tackling the various problem areas.

Participation is by invitation. "In order to produce real and meaningful results, we must keep discussion groups to a manageable number," he said. "We will certainly share the results of this conference with all interested parties," he added.

Daniels To Distribute Football League Books

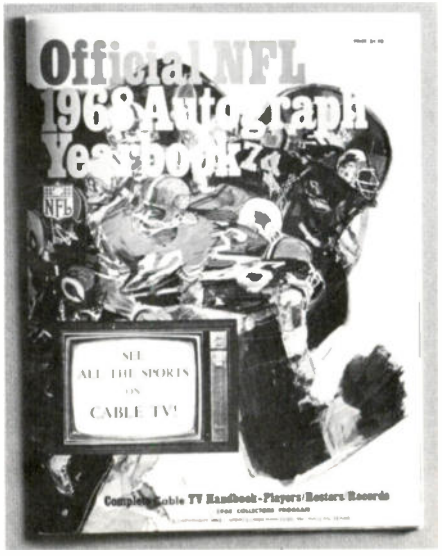
Daniels Management Company, Denver, reports it will be exclusive national distributor in CATV of the official 1968 Yearbooks of the American and National Football Leagues. Bill Daniels, head of the Daniels organization, announced signing of the contract with Sports Underwriters, Inc., of Dallas.

According to Daniels, the 76-page NFL publication and the 68-page AFL book will carry the cable TV story, illustrated in full color, with advertisements for CATV on the front and back covers.

The NFL Yearbook contains autographed photos of the 640 play-

ers and coaches of the 16 teams. The AFL book features 400 autographed photos of players and coaches. Each yearbook also includes full-color action photos as well as results of all 1967 games and a complete 1968 master television schedule of pro-football games.

"We feel the AFL and NFL Yearbooks are 'naturals' for cable system promotions," Daniels said. "When you consider that pro-football has a wider audience appeal



Yearbooks can be used as incentives for new subscriptions.

than anything on television today, it immediately is obvious that the books make excellent special-premium offers to non-subscribers and subscribers alike."

Daniels said the books should be offered to non-subscribers as an incentive to sign for cable service.

Firm Schedules Free Three-Day Tech School

Cascade Electronics, has scheduled a Technicians' School this month at the Cosmopolitan Hotel, Portland, Ore. The three-day training school, Sept. 11, 12, and 13, is being "offered free of charge in the interest of better system performance," according to a Cascade official.

Sessions on system design, construction, operation and maintenance will be conducted by Alan Shiel and Gerry King of the Cascade Systems Engineering Dept.

All systems are invited to send technicians, with travel and ac-

commodation being the systems' responsibility. For further information, operators may contact Don Steele at Cascade headquarters in Vancouver, British Columbia.

Insurance Firms Invest $7 Million in Financing

Two New England insurance companies have extended $7 million in long-term financing to Tele-Vision Communications Corporation. Alfred R. Stern, president and board chairman of TVC, said that John Hancock Mutual Life Insurance Co. and Massachusetts Mutual Life Insurance Co. are each investing $3.5 million in 15-year TVC notes.

The financing will enable the multiple system owners to expand present operations and to extend the present national network of systems. TVC at present operates systems serving 65 thousand subscribers in 10 states.

Stern said that the $7 million financing will put TVC in a strong position.

Al Stern (seated) of TeleVision Communications, signs the agreement with representatives of Massachusetts Mutual and John Hancock insurance companies for $7 million in loans.

We may have the only directional tap design philosophy in the industry... but we try not to act like it... **craftsman**

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Success Threatens In Telephone Company Section 214 Maneuverings

As was expected, the FCC's Section 214 decision has resulted in unequaled behind-the-scenes maneuvering and legal ploys; and it seems the telephone companies have been at least partially successful in subverting the intent of the original decision.

No sooner was the decision released than the telephone companies began filing appeals and petitions for stay of the Commission's orders. The FCC had ruled that telcos must in the future obtain certificates of public convenience and necessity before constructing CATV leaseback facilities. In addition, work in progress was halted and certificates were ordered to be obtained for construction begun after October 21, 1966.

Temporary Stay

Telco petitions for a temporary stay were granted by the Commission on condition that they file an immediate appeal in Federal court and that they undertake no new construction.

The first part of the order was fulfilled; Bell Telephone, General Telephone and United Telephone affiliates combined to ask the U.S. Court of Appeals in the District of Columbia to rule that the FCC exceeded its legal authority in deciding the Section 214 issue.

The brief was drawn up by a New York law firm, Brophy, Shertzer and McCormick, but in association with the powerful Washington communications firm of Arnold and Porter, formerly Arnold, Fortas and Porter.

Following the filing, NCTA requested permission to participate in the case as a representative of most CATV systems. The Association said, "The decision of the Federal Communications Commission and the decision of this court, will have a direct impact on NCTA and its members . . . affirmance or reversal of the Commission decision will be of critical interest and importance to the CATV industry whose interests can be adequately represented and protected only by NCTA's intervention in this action."

NCTA Filing

At the same time, the NCTA filed a brief with the FCC asking the Commission to deny telephone company petitions for a stay of the order pending disposition of the case by the court. The Association said grant of a longer stay "would drastically dilute the Commission's effort to regulate common carrier construction of cable and associated plan for CATV channels service offerings."

NCTA also expressed "the concern of the CATV industry that telephone company construction of 'leaseback' facilities accents a form of national control, and will result in a virtual take-over by the telephone companies of the heretofore independent CATV industry."

Status Quo

Commissioners evidently agreed with NCTA since they denied the telco petition for longer stay. The Commission said, "We deem it advisable in the public interest to maintain the status quo pending resolution by the court of the legal issues."

The effect of the requested stay, said the FCC, "would be to permit unsupervised construction to an unlimited degree." In view of the notice given to telephone companies in 1966 that construction of leaseback would be undertaken at their own risk, claims of "irreparable injury" were dismissed.

Back-door Tactics

Nevertheless, telcos seem to have found a way to get around the Commission order. While the temporary stay was still in effect, ostensibly conditioned on telcos undertaking no new construction, Pacific Telephone and Telegraph bypassed the Commission proper and sought "emergency" permission from the Common Carrier Bureau to continue construction in Mission Viejo.

The Common Carrier Bureau gave Pacific authority to proceed, although with a warning that the authorization would be subject to

New Englanders Take Office

Officers elected at the recent New England CATV Association meeting are: standing, left to right, Paul Clark, director; George Sisson, director; William Roberts, director; Richard Blais, immediate past president; Myron Sherman, director; and Hamilton Krans, treasurer. Seated, John W. P. Mooney, vice president; Richard Surprenant, president; Harold Solomon, secretary. Not pictured is director Philip Lothrop.

"cancellation or revocation" depending upon further action of the Commission.

When this action was challenged by the California CATV Association, the FCC upheld the Common Carrier Bureau, with only Commissioner Nicholas Johnson dissenting.

Blow to CATV

The Commission then dealt another, sharper blow to the CATV industry. In setting up "interim" rules for telephone company application for certificates, the FCC has vested the authority to grant or deny applications in the Common Carrier Bureau. The CATV Task Force will not even be consulted on decisions.

One observer termed this "a first-step grab for CATV" by the Bureau, and cable television interests are concerned about the danger that the Common Carrier Bureau, oriented in its sympathies toward phone companies, will want to assume CATV regulation. The Commission's interim action seems to heighten the further danger of the bureau's success.

Sharfman Asks, "Why Initial Decisions?"

The FCC has rejected a suggestion by one of its hearing examiners to dispense with initial verdicts in CATV waiver proceedings and to merely submit all evidence to the Commission itself.

Herbert Sharfman proposed such a course for the two hearings he is presently conducting—one on distant signal petitions in the top-100 market of Milwaukee and Madison, Wis., and Rockford, Ill., and the other for Peoria-Bartonville, Ill.

Sharfman said he understood the holding in the June 28 San Diego CATV proceedings to be that hearings in major markets were not to adjudicate past or present conduct, but to gather information which would permit the FCC to make policy judgments.

The FCC's Broadcast Bureau said that Sharfman had misconstrued that decision.

According to the Commission, "The San Diego decision was not intended to suggest the procedure urged by the Examiner."

8th Circuit Follows Lead Of High Court In FCC Regulation Decision

The FCC won a not-surprising victory last month when the 8th Circuit Court of Appeals in St. Louis held that all of the regulations in the Second Report and Order are reasonable and are within the FCC's legal authority as defined in the Supreme Court decision in the San Diego CATV case.

Consolidated Cases

The St. Louis case actually consists of seven appeals lodged in various circuits but gathered together into one case in one circuit. Black Hills Video, Midwest Video, Buckeye Cablevision, Ellis Cable Television, Mission Cable TV, Pacific Video Cable and Transvideo Corporation all challenged the right of the Commission to regulate CATV systems, and all challenged the fairness and legality of the rules actually adopted in the Second Report and Order.

The decision of the St. Louis court, which can be appealed to the Supreme Court and probably will be so appealed, held that the U.S. Supreme Court in the *Southwestern Cable* case effectively established the legal right of the FCC to regulate non-microwave CATV systems; and it added that, if anything, the Commission would have even more legal authority to control microwave-using systems.

CATV Objections

The decision of the court summarized the contentions of the seven CATV systems that the Commission lacked legal authority to regulate CATV; that the rules adopted violate the First and Fifth Amendments of the Constitution; that the rules were adopted without adequate notice and opportunity for CATV systems to participate; that selection of February 15, 1966 as the effective date makes the rules invalid retroactive law; that non-duplication and carriage rules are inconsistent with copyright laws; and that the rules are unreasonable and discriminatory and therefore invalid. The court answered the contentions one by one.

Microwave Systems

It said the question of FCC authority was settled in *Southwestern Cable*. As to the differences with respect to microwave, it was conceded that the Supreme Court appeared to reserve judgment on differences, if any. But the decision said, "We do not interpret the statement as casting doubt upon the Commission's authority to regulate microwave-fed CATV. From the brief to the parties, it would appear that all are in agreement that a stronger case is made for regulating microwave-fed CATV than is made with respect to off-the-air CATV."

First Amendment

As to the First Amendment contention, the decision quoted the Supreme Court decision in the *National Broadcasting Company* case that "the right of free speech does not include the right to use the facilities of radio without a license" and "denial of station license (on public interest grounds) . . . is not a denial of free speech."

Said the St. Louis court: "The Commission's effort to preserve local television by regulating CATV has the same constitutional status under the First Amendment as regulation of the transmission of signals by the originating television station. It is irrelevant to the congressional power that the CATV systems do not themselves use the air waves in their distribution system.

Public Interest

The crucial consideration is that they do use radio signals and that they have a unique impact upon, and relationship with, the television broadcast service. Indiscriminate CATV development, feeding upon the broadcast service, is capable of destroying large parts of it. The public interest in preventing such a development is manifest."

On the charge of Fifth Amendment violation, taking of property without compensation, the Supreme Court was again quoted, this time in the *CB&Q v. Illinois* case, "If the injury complained of is only

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Featuring Bonded Jackets and Clad Metal Conductors and Shields

Long term attenuation stability and improved mechanical characteristics by:

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- ☐ Bulletin on Copper Clad Aluminum Wire for CATV Cable

incidental to the legitimate exercise of government powers for the public good, then there is no taking of property for the public use, and a right to compensation, on account of such injury does not attach under the Constitution."

Finally, the Appeals Court held that the cable systems had failed to sustain the burden of the proof that the rules and regulations promulgated by the FCC are "unreasonable and discriminatory." That burden of proof is particularly heavy since the courts are traditionally reluctant to interfere with the judgements and workings of government regulatory bodies.

The St. Louis court emphasized that the FCC has been charged with "protection of public interest in the television field"; and the First and Second Reports, according to the court, are intended only to further that purpose. The court agreed with the FCC that the Commission has a legitimate concern in the possible "splintering" of local TV station audiences by CATV. "Without local stations," said the court, "many viewers who could not afford CATV charges, and others beyond areas where cable connections could be economically provided, would be deprived of television service."

Rifkin Heads New MSO; Authorizes First Purchase

Well-known CATV'er Monroe Rifkin has accepted the presidency of the newly-formed multiple system operator American Television and Communications Corp., Boston. Named as vice president of operations is Doug Dittrick, formerly general manager of General Electric's cable TV division.

ATC recently purchased the United Video group of cable TV systems in Chillicothe, Marysville, Marshall and Boonville, Mo. Falls City and Columbus, Neb. were also included in the sale. The firm says it is "actively engaged in pursuing other potential cable TV acquisitions and expects to be announcing several in the immediate future."

Monroe Rifkin, well-known CATV'er, is chief of new MSO.

Rifkin has been associated with cable television since 1956. He was formerly vice president of TelePrompTer Corp. where he was in charge of the company's cable television operations. In 1963, he joined Daniels & Associates and served as president of Daniels Management Company. A CPA, he has been involved in consultant work and franchise development for Daniels.

He has been a director of the industry trade association since 1966 and presently is treasurer of NCTA.

Dittrick was instrumental in the formation of General Electric Cablevision in 1964. As general manager of GE's cable TV division, he was responsible for system construction and operations. Dittrick has been a director of NCTA and a member of the NCTA budget and audit committee for the last two years.

H & B, Jack Kent Cooke Announce Cable Combine

Merger of two of the nation's largest MSOs was accomplished when H&B American Corp. acquired the CATV interests of millionaire-sportsman Jack Kent Cooke and General Television, Inc.

H&B will pay 1.6 million shares of stock for the Cooke assets and 220,000 shares for the General Television assets. The current market value of the transaction is roughly $35 million.

According to Cooke and William M. Jennings, chairman and president of H&B, the combined companies will have 66 operating systems serving 21,000 subscribers in over 100 communities.

William Bresnan, Cooke's top executive officer, says Cooke will be the principal shareholder in H&B American and will continue to be active in the management of the company. "To my knowledge," said Bresnan, "he will have more money invested in the CATV industry than any other individual."

System Sales

In addition to acquiring the holdings of **Jack Kent Cooke** and **General Television, H & B American** has also purchased cable systems in **Galena** and **Hanover, Ill.** These are adjacent to H & B's sizable system in Dubuque, Iowa.

William B. Smullin, president of **California Oregon Broadcasting, Inc.** (COBi) has announced purchase of the **Southern Oregon Cable TV operation** from **TeleVue.** The group includes systems in Roseburg, Klamath Falls, Grants Pass, Medford and Ashland, Oregon, serving 9,000 subscribers.

George Green, general manager of **Jefferson-Carolina Corp.**, and **Bruce Merrill** of Phoenix have jointly announced purchase of controlling interest of Cablevision of Savannah by the Jefferson-Carolina Corp. When completed, the system will be capable of serving 40,000 subscribers.

Sale has been approved of the **Otto TV Cable Co.**, serving the Milton-Freewater, Oregon, area. **Harrold Otto,** who established the system in 1955, sold it to **William J. Lauritzen** and **Harold R. Stone.**

Reeves Broadcasting Corp. has acquired three CATV systems from **International Telephone and Telegraph Corp.** at a cost in excess of $4.5 million. The systems serve Oswego, N.Y., Seattle, Wash., and the New Jersey communities of Vieland, Bridgeton, Hammonton and Northfield.

General Instrument Corp., parent company of **Jerrold Corp.**, has purchased three New York state systems from **Telihoras Corp.** The systems serve Cortland, Wellsville and Penn Yan. TVC

San Diego Issue Still Far From Quiet; Public May Yet Be Heard

The final word has not yet been heard on the San Diego case, even though it has been before the United States Supreme Court. That court decided that the FCC had the power to regulate CATV; and the Commission, shortly thereafter, exercised that power in deciding that cable firms could not carry Los Angeles signals into San Diego but could originate their own programming as long as they did not sell advertising. Immediately, three cable systems (Mission Cable TV, Pacific Viejo Cable and Trans-Video Corp.) appealed that decision.

But the cable systems are not the only objectors to the decision. California residents have also been making their voice heard through appeals to the FCC and through their local newspapers. Two suburban communities, Imperial Beach and National City, have asked the Commission for new hearings, explaining they didn't appear at the earlier one because they didn't realize how severely their citizens could be penalized by the final ruling.

They asked that new hearings be held in San Diego to permit the citizens to appear and testify in favor of the full television service they desire. Both cities cited not only loss of TV service, but loss of revenues from franchises already granted to Mission TV Cable, Inc.

An editorial in the *National Star News* called for further public action on the matter. It said, "The Federal Communications Commission has made it clear that it serves not the public interest, but the commercial interests of the broadcasting industry it is supposed to regulate." The editorial added that the Commission has "become a willing prisoner" of broadcasters and said "FCC attitudes will change only when the public demands it."

NYC Bank Extends $10-Million Loan

Charles Dolan, president of Manhattan Cable TV in New York City, has announced what he termed "the largest loan ever made to a single system; and perhaps the largest in the industry's history." The firm recently secured a $10 million loan from the Chase Manhattan Bank.

The purpose of the loan is to complete construction of the system in the firm's franchised area from the Battery to East 86th. The $10 million, according to Dolan, will finance the project "to a point where the system will be able to continue its construction out of cash flow."

Manhattan Cable presently has about 3,500 subscribers connected

Charles Dolan's Manhattan Cable TV expands with $10 million financing from Chase Manhattan.

to cable, and has orders on hand for about 15,000. Up until now, Dolan says, the company has been proceeding with their underground construction program "in stages, on the basis of one area at a time," in order to more efficiently solve the unique problems of construction in the high signal density urban center. "This loan," he said, "will allow us to go forward in implementing what is now a field-tested system that is right."

Lakewood System Closes Operations Temporarily

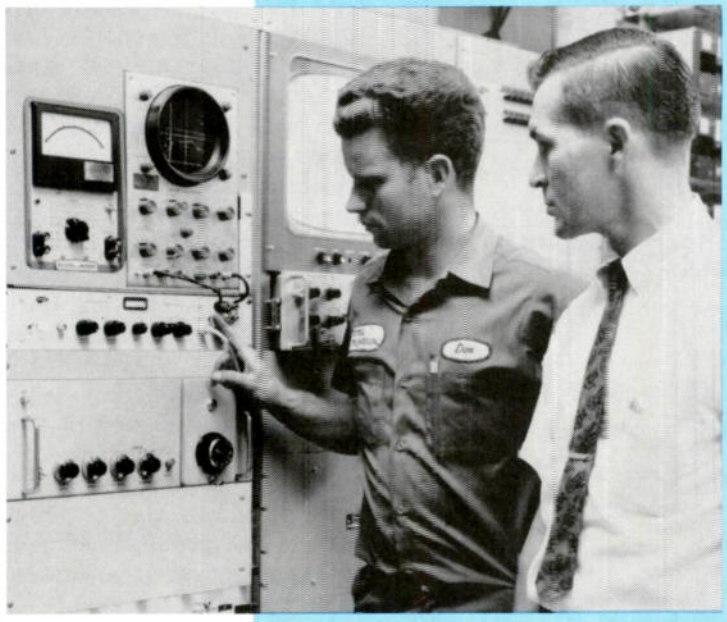
Cleveland Area TV, Inc., the Lakewood, Ohio, system which has received wide publicity for its closed-circuit community service programming, is suspending operations temporarily.

William Pitney, manager of the firm, said that restrictive government regulations have "hampered efforts to gain the necessary subscriber support in Lakewood."

The system emphasized local origination on Channel 6, billed as "Lakewood Television for Lakewood People." Channel 6 programmed live, film and taped shows largely of local interest.

"EVERY CABLE TV SYSTEM USING MODULATORS NEEDS A SIDEBAND ANALYZER,"

says Don Cantrell of TOTAL TV, Santa Rosa, California



Don Cantrell, Chief Technician, demonstrates operation of TS-100B Sideband Analyzer to Jim Monroe, Mgr. of TOTAL TV.

TOTAL TV of Santa Rosa, California has been using a DYNAIR TS-100B Sideband Analyzer for over a year. Here's the way they feel about it . . .

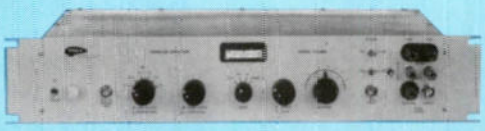
> *"The DYNAIR sideband analyzer allows us to check modulator operation at any time—precisely and in just a matter of minutes. It also greatly shortens the time required for modulator alignment."*

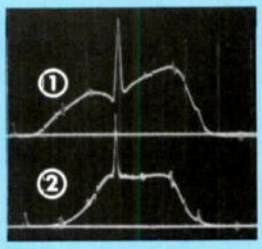
Yes, cable TV operators everywhere have discovered what broadcasters have known for years . . . *the only practical way to check transmitter operation is with a sideband-response analyzer.*

The DYNAIR TS-100B Sideband Analyzer is designed especially for the needs of the CATV operator. It is completely solid state and has a self-contained regulated power supply. It is extremely compact. And it is priced at only $1250 . . . a small price to pay for the savings in time and the increased system performance that are immediately realized. (And an *especially* small price when compared with the $8500-odd worth of standard precision test equipment you would have to assemble to do a roughly equivalent—but many times slower—job!)

These units are available for immediate delivery. Give us a call and place your order today. If you're still not convinced, ask the man who has one.

Dynair also manufactures audio-video modulators, TV demodulators and heterodyne channel converters for CATV use, as well as a complete line of local-origination accessory equipment. Write for complete information.





Actual Sideband Analyzer waveforms indicating (1) poor modulator response and (2) Proper response.

The Dynair TS-100B generates a video sweep signal which is applied to the video input of the modulator under test. The RF output of the modulator is then directed back through the TS-100B, where the RF spectrum is analyzed and then applied to an oscilloscope for display. The display is a precise representation of the sideband response curve, showing both the visual and aural carriers. Markers for frequency measurement are provided at 0.2, 0.5, 1.5, 3.6 and 4.5 mHz to allow exact frequency determination.

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SAN DIEGO, CALIFORNIA

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Justice Dept. Urges Strict Ownership Rule

The latest to file in the FCC's proposed rulemaking procedure to limit multiple ownership of broadcast media in top markets was the Justice Department's Anti-trust Division. Chief Edwin M. Zimmerman said the Commission should adopt much more restrictive rules which should extend as well to reducing newspaper ownership of broadcast facilities.

Broadcasters were predictably early filers in opposing the FCC's proposal which would forbid the owner of a TV, AM or FM station in a major market from also owning another outlet of any of the three types in the same market.

NAB said the proposal "completely ignores the adverse effect such a flat prohibition" will have on expansion of broadcast services in underserved markets.

Rebutting this, the Justice Department said there is monopoly over the communications media in at least 50 major U.S. markets. It told the FCC, "The clear effect of combined ownership of similar broadcast media in the same local market is: it reduces the diversity of news information sources available and lessens the degree of competition of advertising between alternative media."

The Department said its fellow government agency, the FCC, is actually proposing to do very little to combat monopoly.

Football Execs At Odds With CATV'ers in Canada

Canadian Football League executives are at odds with CATV'ers over what they call "the phenomenon" that is emptying stadium seats. CFL president Allan McEachern says, "We simply cannot compete for the audience if fans can see the games at home free of charge."

The problem arises where local stations must black out a home game; the cable operator is able to pick up a signal from another city, where the game is not blacked out, and carry it to his subscribers.

McEachern added that it is a "simple matter for the cable outfits to respect our blackouts. All they have to do is throw a switch. Otherwise, if something can't be done, we may have to seek a decision on our legal position. I should emphasize," he concluded, "that this would be done only as a last resort to other means."

On two points, McEachern and other Canadian football executives are firm: (1) They will not abandon the local blackout, and (2) payment from cable operators will not help.

Calendar

September 11-13. A Cascade Electronic's technician school will be held at the Cosmopolitan Hotel, Portland, Ore.

September 26-28. New York State Cable Television Association will hold its annual fall meeting at Castle Inn Motel, Olean.

September 29-October 2. The fall meeting of the Pacific Northwest CATV Association will be held in Portland, Ore., at the Sheraton-Portland Motor Inn.

October 6-9. The Michigan CATV Association will meet at the Boyne Highlands, Harbor Springs.

October 15-17. The Kentucky CATV Association will meet at Continental Inn, Lexington.

October 24-25. Mid-America CATV Association's annual fall meeting will be held at the Prom-Sheraton Motor Inn, Kansas City, Mo.

October 29-30. The Mississippi CATV Association meeting will be held at the Heidelberg Hotel in Jackson.

November 10-13. The fall meeting of the California CATV Association will take place at the Del Coronado Hotel, Coronado Island.

January 16-18, 1969. Florida CATV Association will meet at Marco Island.

January 17. The Community TV Association of New England will meet at New Hampshire Highway Motel, Concord, New Hampshire.

January 24-25. The Georgia CATV Association will hold its annual meeting at Macon.

March 23-25. The Southern CATV Association will hold its meeting at the Monteleone Hotel in New Orleans, La. TVC

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*12.7 to 13.2 GHz

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Systems

William Schiller, former director of engineering at Storer Radio Co., has been named acting manager of Storer's Redwood (Calif.) Cable TV Co.

Cable TV of Sylacauga (Ala.), Inc., has appointed **Phil W. Edwards** as manager. He was previously with Cablevision of Anniston (Ala.).

John Gelvin, former manager of a Brookfield, Mo., system, has been named manager of the Trenton (Mo.) Cable TV.

Joan Lloyd has been promoted to manager of San Clemente (Calif.) Cable TV. She previously served the company in a sales capacity.

Harold L. Daniels is the new manager of Cable Television Co., Ponca City, Okla.

Shelby (N.C.) Cablevision has appointed **Bob R. Pope** as system manager.

George C. Kanen has been named director of engineering for all Foote, Cone & Belding CATV systems. Kanen has previously been vice president of systems division at Entron and a member of Jack A. Rickel Associates, Inc. FCB's vice president has also announced the appointment of **William H. Haze** as

Mr. Kanen

Mr. Haze

general manager of the firm's Oceanside, Calif., system, TV Power of North County. Haze was previously active in management and sales for several newspaper and magazine publishers.

William Alexander, former manager of G'TEC Cable TV in Sun City, Calif., has been appointed manager of California operations

Mr. Alexander

Mr. Williams

for GT&E Communications, Inc. Succeeding Alexander will be **Dennis R. Williams**, former installer/technician in Sun City. Alexander has been with the General system since 1953, and Williams has been with the company since 1965.

Gordon Puffer, formerly assistant chief technician of Jamestown (N.Y.) Cablevision, Inc., has been appointed manager/chief technician for the three systems operated by Oneonta (N.Y.) Video, Inc.

Suppliers

J. R. Hampton and Associates of Littleton, Colo. has named **James T. McGuire** vice president in charge of sales. McGuire, who was formerly a broadcaster, will take over sales of program origination.

According to James D. Confeld, vice president, HTV Systems has made two new appointments to its management staff. **Charles J. Burgio** joins HTV as manager, mechanical engineering. **Richard M. Bottorf** has been named accountant and office manager.

Superior Continental Corporation has announced two new appointments. **Darrell W. Sigmon** has been promoted to technical manager of the Rocky Mount Plant, and **William J. Sweeney** has been given the sales engineer assignment for the New England area. Sigmon has been with Superior since 1965; Sweeney, since 1966.

James Bradfield has been named manager of the newly formed utilities products department of Hewlett-Packard's Delcon Division. The department will be staffed by field engineers with experience as utilities products specialists. Bradfield has been with the Delcon Division sales engineering department for over two years.

Frederick W. DeTurk has been elected assistant vice president in charge of marketing of Phelps Dodge Industries, Inc., according to an announcement by president Edward H. Michaelsen. DeTurk, who will report directly to the president, was formerly market manager for communications in Phelps Dodge Copper Products with market responsibility for coaxial cable and telephone cable products. The same company has also appointed two new district managers: **Richard T. Radcliffe** in Kansas City, Mo. and **Kenneth E. Jackson** in Dallas. Both men report to the southwestern regional manager.

Mr. DeTurk

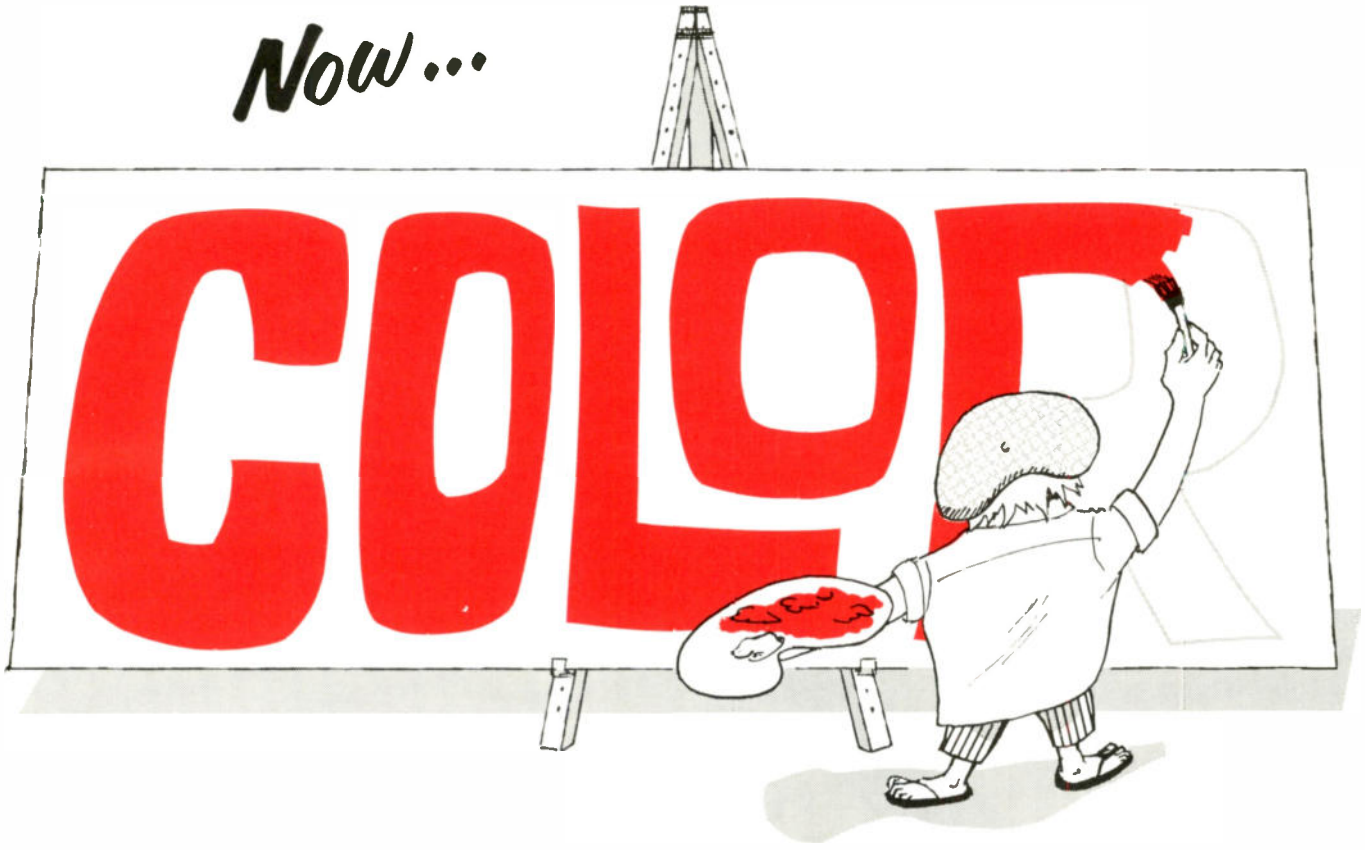
Mr. Moon

TeleMation, Inc., has appointed **Floyd Moon** as new comptroller, according to an announcement by president Lyle O. Keys. Moon will direct all cost and accounting procedures for TeleMation and Electronic Sales Corp. and all affiliated offices. Prior to joining TeleMation, Moon was a senior accountant with Haskins & Sells, national CPA firm, and principal financial officer for Snarr Advertising, Inc. Most recently he was comptroller for Associated Design Group.

Delta Electronics Ltd. of Ontario and Berkshire Electric Cable Co. of Leeds, Mass., will be represented by **Jerry Conn and Associates** of Chambersburg, Pa.

Ampex Corporation has named **Donald V. Kleffman** marketing manager of the video products division. Kleffman joined the company in 1959 and prior to that was

Now...



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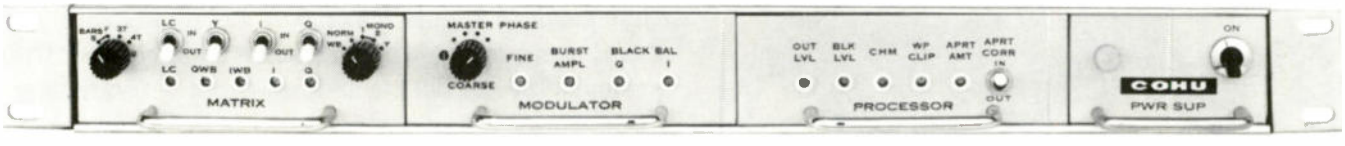

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Unique both in design and construction, "SU" Lifts feature:

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- Unitized drive assemblies with plug-in electrical connections facilitate maintenance

New "SU" lifts incorporate other features once found only in other Telsta lines: Reliable, all-weather electric power from an independent engine generator; cadmium plating of critical wear areas; a self-leveling aerial basket with grounded power outlets and full-depth entry, to name but a few.

Could be the lift you're looking for to beat rising equipment and labor costs. Write Telsta Corporation, a division of General Cable Corp., 1700 Industrial Road, San Carlos, California 94070. Or telephone (415) 591-7611.

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with the engineering department of WHO-TV in Des Moines. In other marketing assignments, Ampex has appointed **Richard Sirinsky** as national sales manager and **Frank B. Thompson** as manager of video product management for the division.

Mr. Haney

Mr. Lindmark

Frank J. Haney has been named to the position of general manager of Visual Electronics Corporation's Sunnyvale Division. He will have overall responsibility for the development and manufacture of video tape recorders and related electronic equipment at the California plant.

Joseph H. Kerner has been named sales manager for the communications and master antenna TV distributor products group of Vikoa, Inc. Prior to joining Vikoa, Kerner was distributor products manager for Jerrold. He has also served as a consultant to electronic, electrical and machinery manufacturers.

The appointment has been announced of **H.E. (Bud) Blaksley** to the position of sales manager of Rohn Communications Facilities Co., Inc. Blaksley was formerly Western Division Manager for Rohn.

Professional

James F. Ackerman, senior vice president of Economy Finance Corp. has been elected executive vice president of Indianapolis Morris Plan. Morris Plan, an industrial loan and investment company, is a wholly owned subsidiary of Economy.

Don Lindmark has joined Communications Publishing Corporation as art director with responsibility for all of the firm's publications including *TV Communications*, *CATV Weekly*, and the *CATV Directories*. Lindmark was previously art director for the United States Jaycees in Tulsa.

Martin F. Malarkey, president of Malarkey, Taylor and Associates, a

Mr. Smith

Mr. Looby

Washington-based CATV consulting firm, has announced the following promotions: **Martin R. Smith**, vice president of finance, became a general partner of the firm on August 1; and **Gerard J. Looby**, director of systems operations for MTA also became a general partner and was appointed vice president of operations.

The law firm Smith, Pepper, Shack & L'Heureux has announced that **Lee F. Holdmann** and **Richard S. Becker** are now with the firm.

FINANCIAL REPORTS

Cox Broadcasting Corp. reports per share earnings of $ .73 for the quarter ending June 30, 1968. This compares with per share earnings of $ .91 for the same period last year. Earnings figures are based on net incomes of $2,102,638 and $2,574,228 for the two periods respectively. Operating revenues were given as $14,961,963 and $13,012,249 for the two periods. Also reported were figures for the 6 month period ending June 30, 1968. Per share earnings for this period were given as $1.24 as compared with $1.47 for the same period last year. Net incomes for the two periods respectively were $3,564,654 and $4,144,666. Operating revenues were given as $27,622,880 for the 1968 period and $24,256,743 for the 1967 period. Results for the 1967 period were restated to include the operations of cable television systems in San Diego and Bakersfield, California. Cox acquired full ownership of these systems in August, 1967. Per share earnings announced were based on 2,878,550 shares outstanding on June 30, 1968, and 2,817,600 shares outstanding a year earlier.

Livingston Oil Company reports per share earnings of $ .28 for the year ending May 31, 1968. This compares with per share earnings of $ .12 for the same period last year. Earnings figures are based on net incomes of $1,533,642 and $626,822 for the two periods respectively. Gross revenues were given as $17,043,409 and $16,218,581 for the two periods. Livingston Oil Company's president, Wayne E. Swearingen announced the company's profit figures for the fiscal year which ended recently. Acquisitions made during the year, including extensive CATV interests, were treated on a pooling of interests basis.

Sterling Electronics Corp. reports per share earnings of $1.66 for the year ending March 30, 1968. This compares with per share earnings of $1.23 for the same period last year. Earnings figures are based on net incomes of $1,840,261 and $1,231,766 for the two periods respectively. Sales were $37,996,058 for 1968 and $33,010,657 for 1967. The firm has become a diversified company engaged in manufacturing, distribution and service activities in the electronics industry. Among its interests, the company owns Manhattan Cable TV.

Community Cable Vision, Inc. has filed articles of incorporation in Washington to operate cable TV systems. Authorized capital has been listed at $50,000. Principal is George E. Ladd of Issaquah, Washington.

At the first shareholders meeting, **HTV Systems, Inc.** president Truman C. Thompson disclosed plans to quadruple plant space with a new 8,000-square-foot facility for the manufacture of CATV amplifiers.

Loral Corp. reported a net loss of $2,640,092 on sales of $55,431,075 for the year ending March 31. One of the company's largest divisions, with 375 employees, is the Alpha Wire Manufacturing division which produces wire and cable for CATV and other industries.

Hewlett-Packard Co. reports per share earnings of $ .77 for the 6 month period ending April 30, 1968. This compares with per share earnings of $ .81 for the same period last year. Earnings figures are based on net incomes of $9,600,000 and $9,900,000 for the two periods respectively. Sales were $127,500,000 for 1968 and $119,000,000 for 1967. Hewlett-Packard's second quarter fiscal record was the best in the company's history, according to company officials. One of the firm's operations, the Delcon Division in Palo Alto, California, manufactures cable fault locators used in CATV applications. TVC

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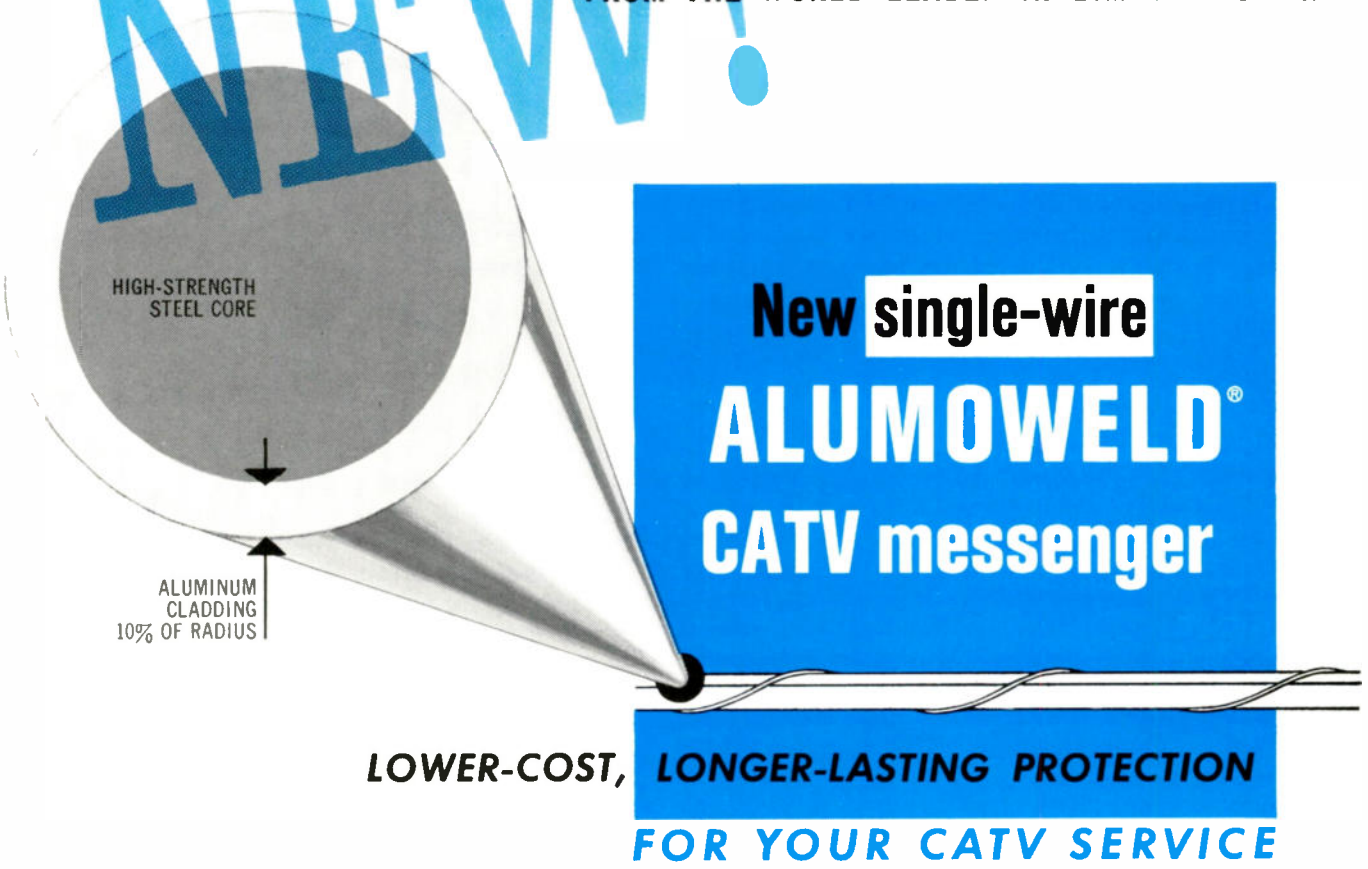
IMPORTANT ADVANCE IN CATV CABLE SUPPORT FROM THE WORLD LEADER IN BIMETALLIC WIRE!



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Improved System Mapping Via Aerial Photo Techniques

A unique, versatile method of mapping has been developed by Maclean-Hunter Cable TV, combining aerial photography with strand layout work. The result is an extremely accurate, useful map.

By I. Switzer
Associate Technical Editor

The design of cable television systems requires the preparation of detailed maps of the area to be served. Frequently, maps suitable for use in system design are difficult to obtain and they often require considerable redrafting before they can be specifically applied to CATV system design. A cable television system in the Toronto area has developed a system of cable television map-making which reduces the time and effort involved in cable television map-making and produces maps and plans which have several advantages over those normally prepared and used by cable television operations.

Aerial photographs have often been used to guide the planning of cable television systems. They permit system designers to distinguish readily between industrial areas and residential ones and help to estimate probable subscriber densities. Detailed street and lot maps prepared from aerial photographs are excellent base maps for cable television purposes but are usually very expensive. Occasionally such maps are available from municipalities which have had them prepared for municipal planning or other purposes, but often they are not available or, if available, are prohibitively expensive. Utility companies are sometimes a source for suitable base maps, but many telephone companies no longer maintain detailed maps of their facilities showing individual pole locations to scale.

When an aerial photo has been obtained, multiple copies of it are produced and are used as worksheets for system designers.

Maclean-Hunter Cable TV Limited has developed a system for producing maps which combine the best features of aerial photographs and ordinary street maps. The basic preparation of these maps involves the drafting of the CATV system design on top of specially prepared and scaled aerial photographs.

In a large metropolitan area like Toronto (metropolitan population approximately 2,000,000) up-to-date aerial photographs of the area are often available at reasonable cost. The cable TV firm orders prints covering the area to be studied to nominal 200 foot to the inch scale and printed on "Photoflex" drafting material.

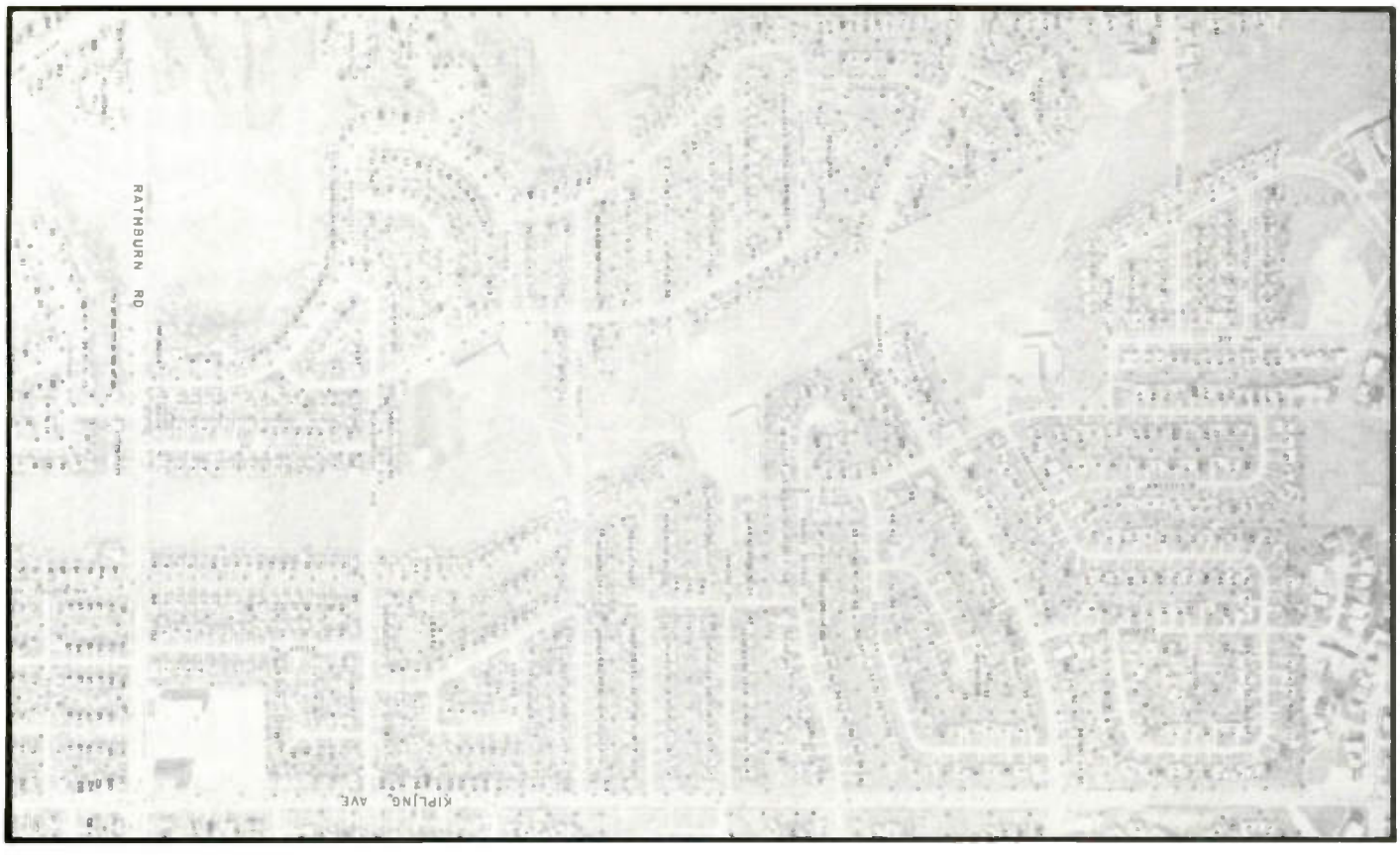
In Toronto, Maclean-Hunter Cable TV gets its photos from Lockwood Survey Corporation which enlarges each aerial negative required to 200 ft. = 1 inch scale on a piece of drafting film 42 inches wide by 48 inches long. The transparency is developed to a special low contrast which permits reproduction in ordinary blueprinting equipment. The film base has a mat surface on one side which permits use of conventional drafting techniques on the film. Each sheet covers an area approximately 1½ miles square.

Maclean-Hunter planning department then obtains ordinary ozalid type prints from this film to use as initial work prints. The prints are marked with street names and house numbers. "Street cruisers" then take these work prints out into the field where house numbers are double checked, poles are located, and notes are taken regarding potential construction and design problems. These blue-line work prints are quite inexpensive and several are prepared for use in initial planning. Main utility routes are also marked on the work sheets for the benefit of system planners.

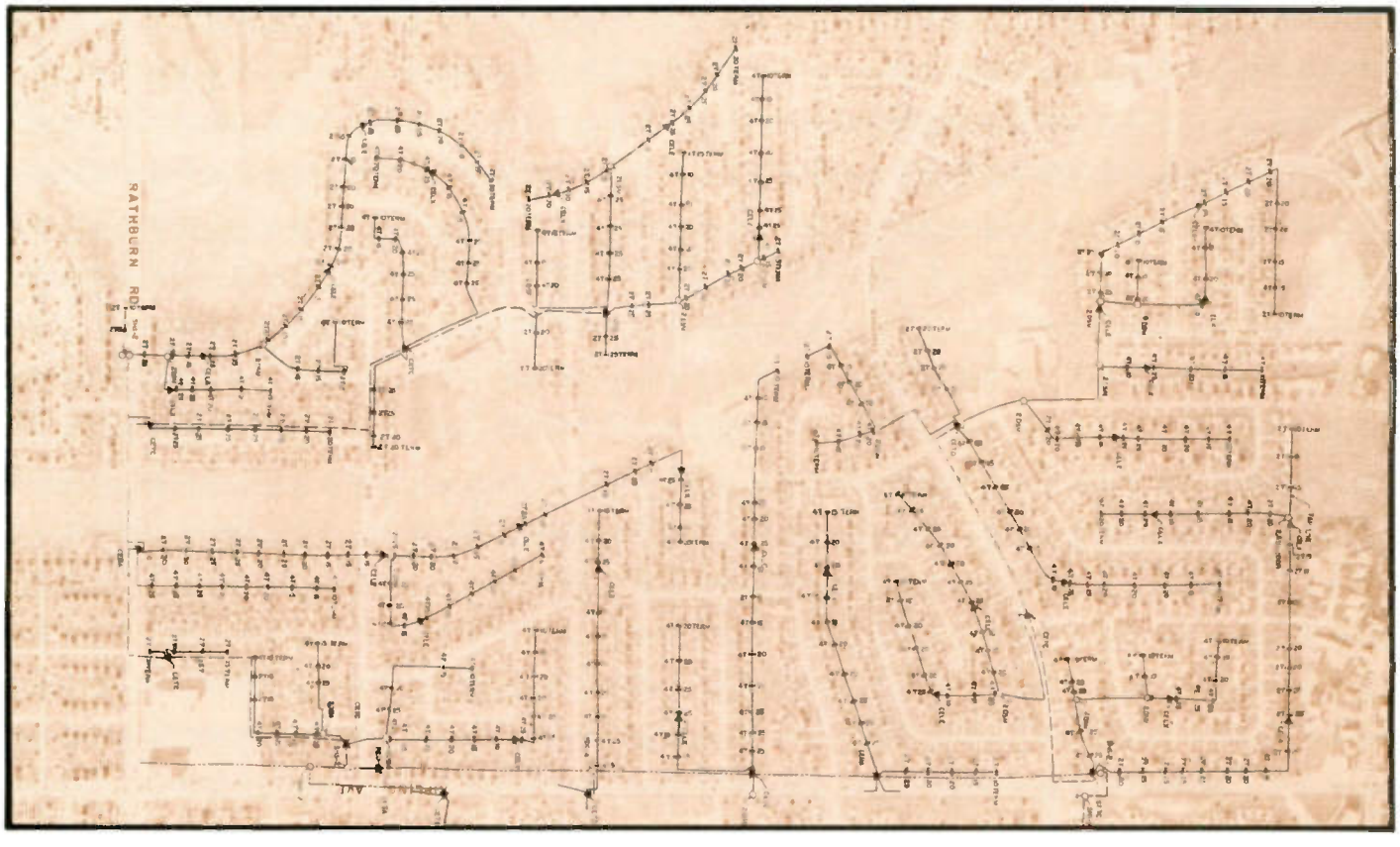
A draftsman then inks in street names, house numbers and pole locations on the 42x48 film. This is now considered the master base film. A sepia film print is prepared and several additional blue-line work prints are made. The sepia film acts as a second generation

sub-master while the paper work prints are used for preparing draft designs of the system. Sepia film is used instead of sepia paper because it produces much clearer third generation prints.

The system designer now has paper work prints on which to do his design work. In addition to street names, house numbers and pole and utility route data which has been added. The map contains much of the

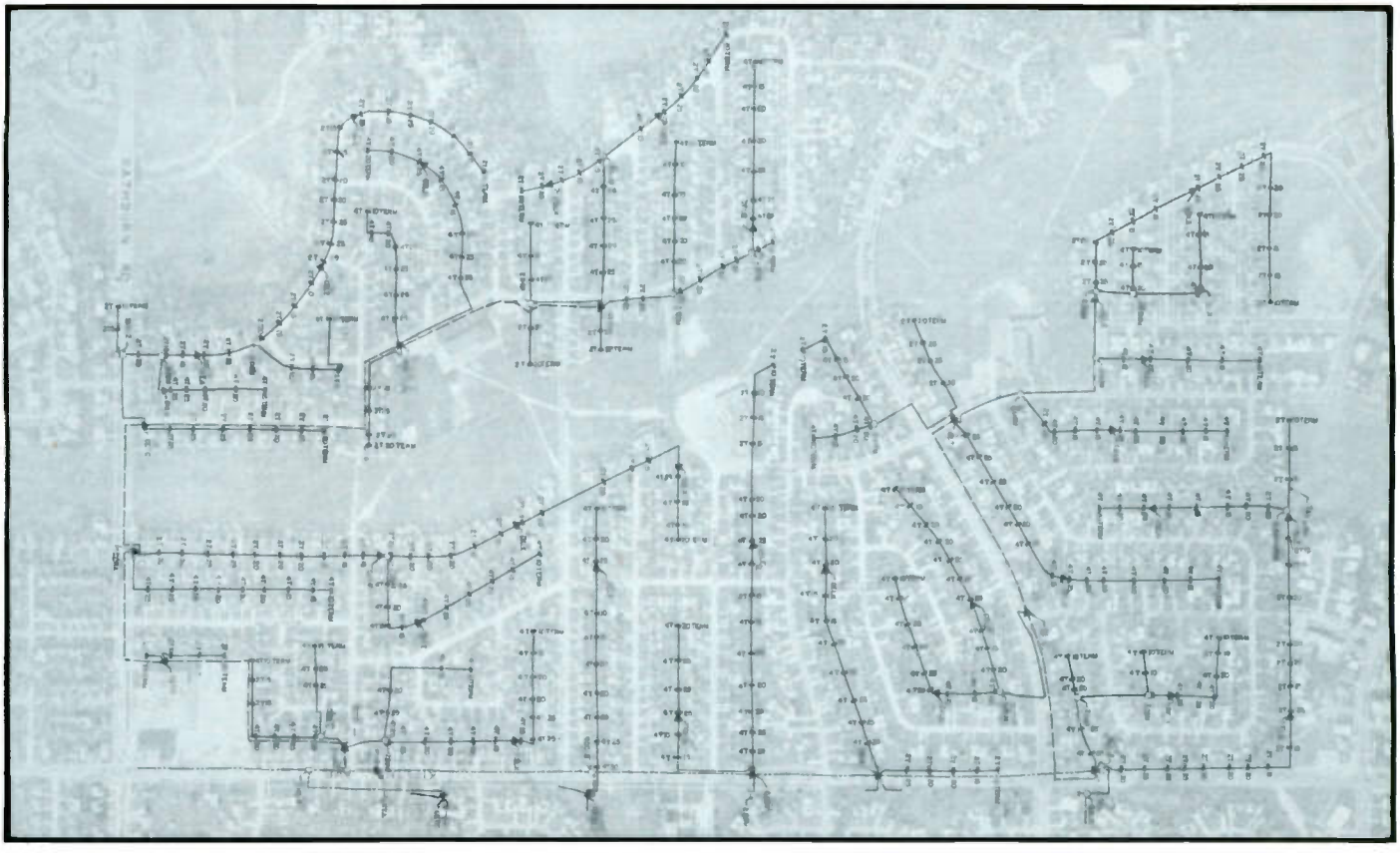


The master film base shown above (1/4 its actual size) has been marked with street names, house numbers and pole locations. The sepia film shown below is used as a master for making final prints, composites of the aerial photo and strand map.

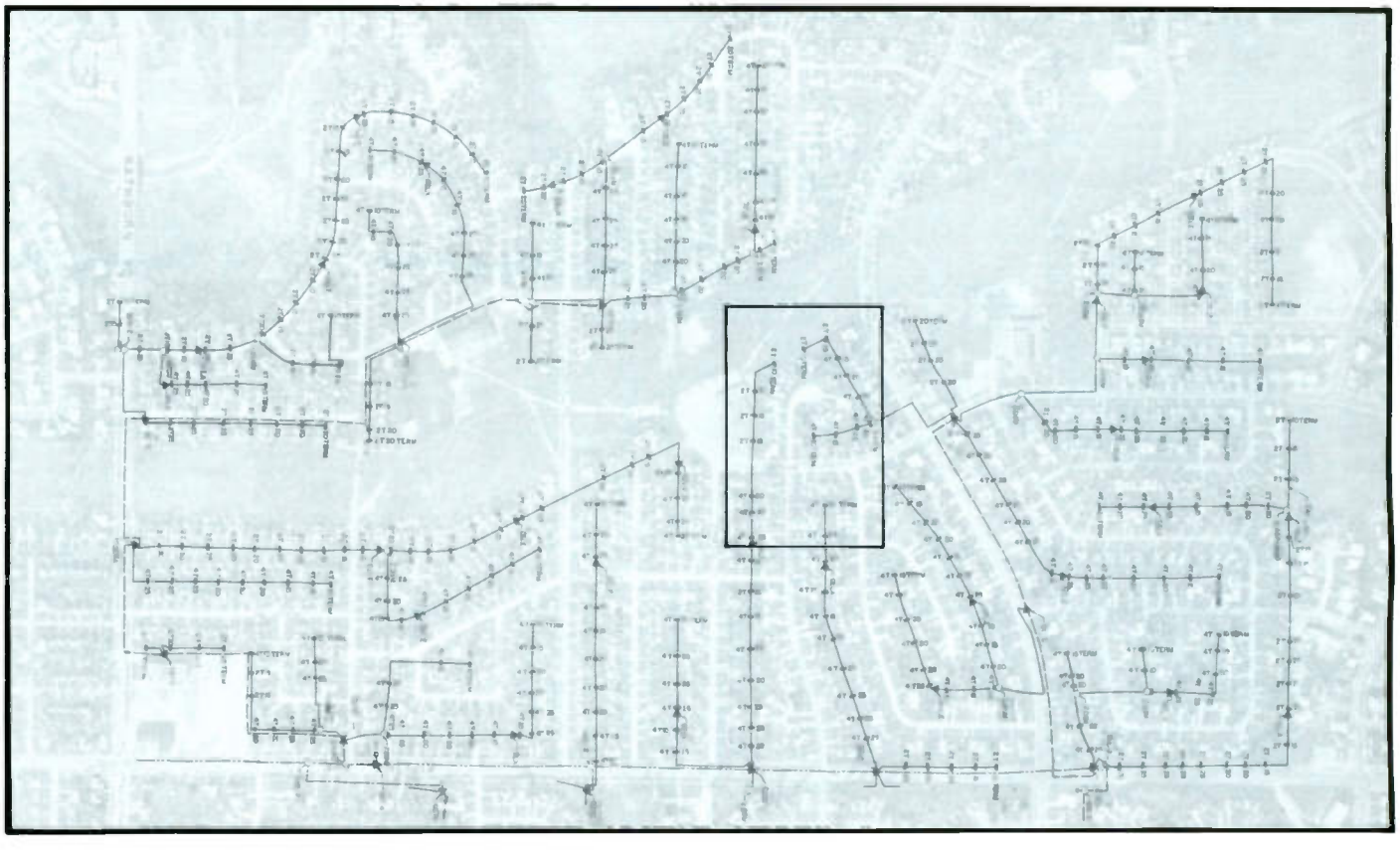


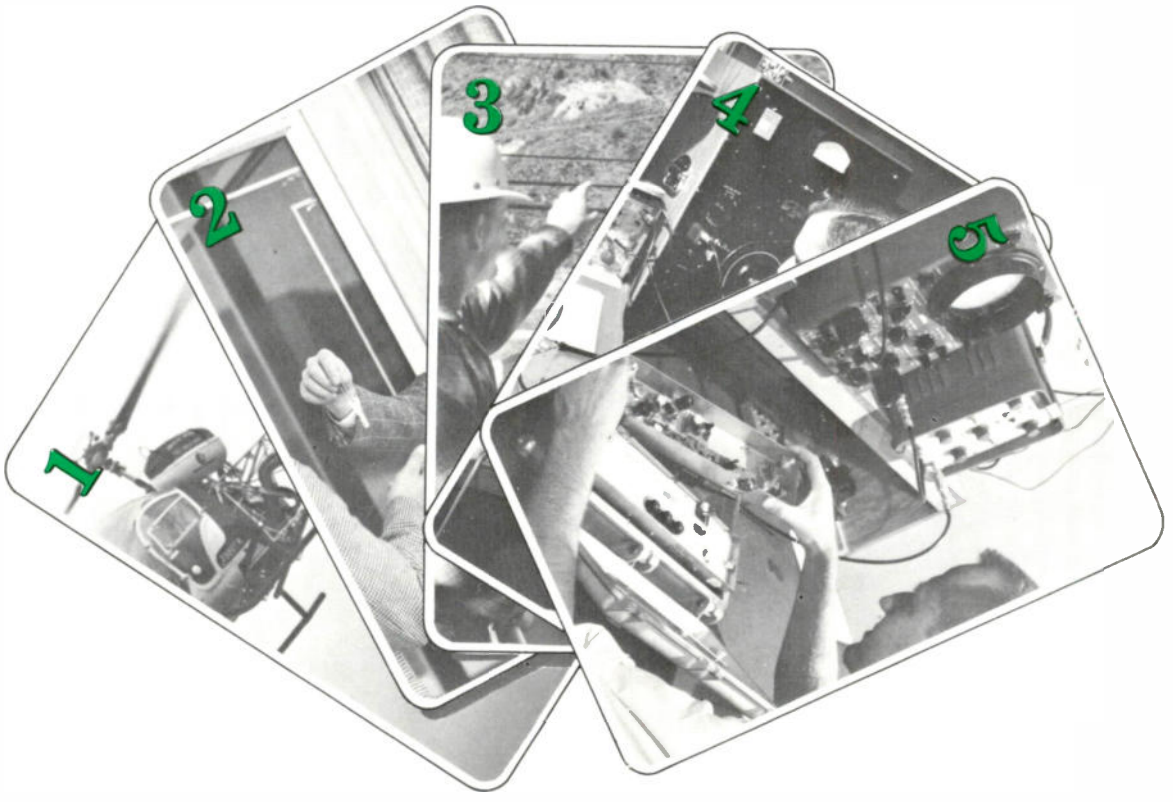
detail of the original photograph. Scale is nominal 200′ = 1 inch, sufficiently accurate for system design purposes.

The system designer can now try various system layouts, sketching in pencil on the work sheets. He can see where the homes are and can plan accurately what kind of subscriber tap facilities to provide. Supplementary municipal directories provide him with information



The sepia master film is used to make different types of prints for special applications. The print above emphasizes photo detail, which has been subordinated in the print below. The marked portion is shown at actual size on page 50.





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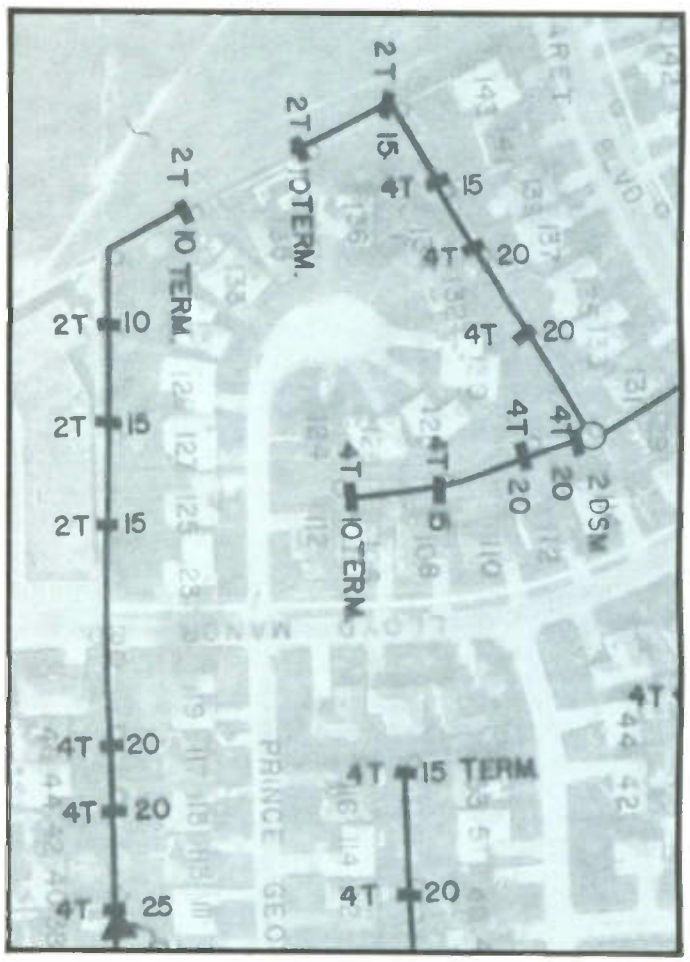
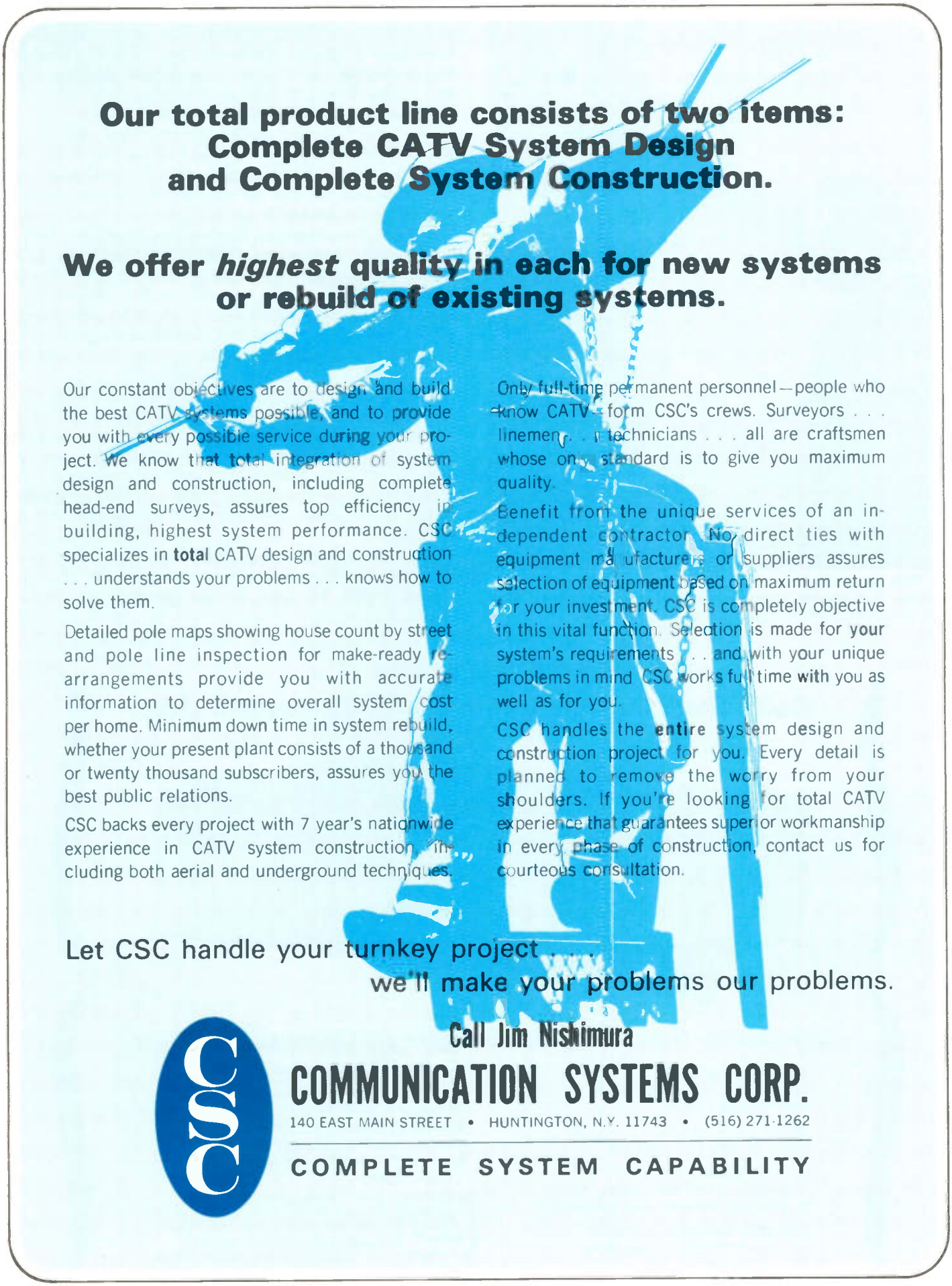
By varying light exposure time while photo-map prints are being made, the aerial photo detail can be "burned out" completely so that only the strand map remains. A portion of one photo-map is shown at actual size below.

on multiple dwellings where these occur, and with some experience he can learn to judge the economic level of the area under design.

When the system designer is satisfied with his layout he turns it over to the draftsman who then transfers the information from the work sheet to the sepia film using adhesive "Chart-Pak" type tapes and symbols. These tapes are available from several suppliers in a variety of widths and patterns. Different

Maclean-Hunter Cable TV draftsman Tom Mitchell prepares final sepia master map, a composite of the aerial photo and strand map.





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COMPLETE SYSTEM CAPABILITY

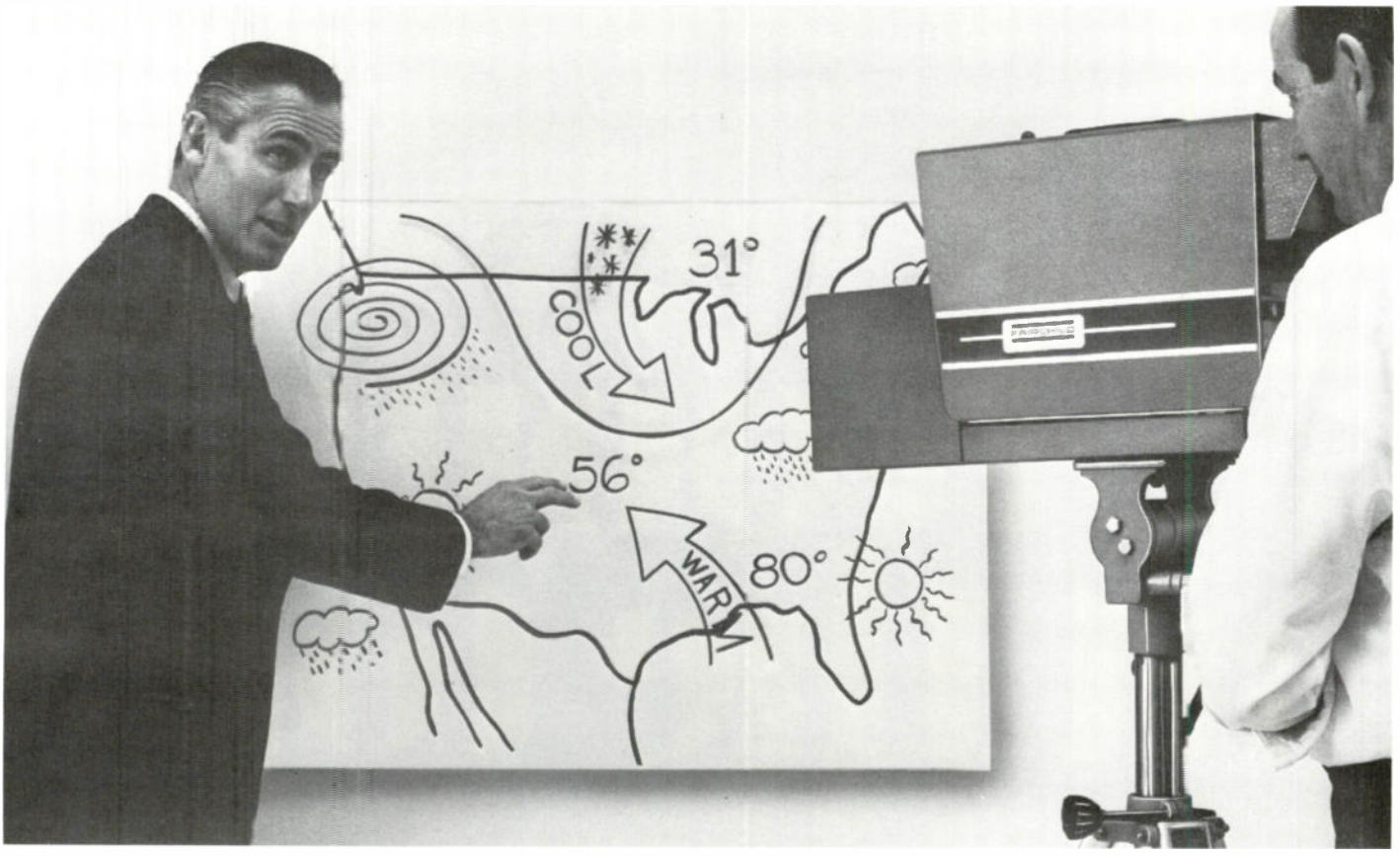
Multiple photo-map prints can be made and pieced together to provide a large-area map which can be used for construction planning, progress recording and general reference.

tape patterns are used for different cable sizes and functions. Similar stick-on symbols are used to designate amplifiers, splitters, multi-taps, etc. Use of these adhesive drafting aids saves considerable drafting time and makes it easy to change the plans later when "as built" information comes back from the field.

The sepia film now carries the system design on top of the aerial photograph. Prints can now be made and used as the construction order for the construction department and for use by various other departments. The relative contrast of aerial photo detail and system plan can be controlled by varying the printing exposure time. Longer printing exposure "burns out" the detail of the photograph, leaving only system plan. Shorter exposures increase the amount of the photographic detail retained. Prints are used by the sales department, maintenance department and general management. Individual sheets can be pasted up into composite assemblies that show larger portions of the system.

This system has been in use by Maclean-Hunter since the beginning of this year and has been used for all planning requirements in areas where photographic technique was applicable. Cable designs for new development areas require conventional mapping techniques based on developers' plans since aerial photography would show only raw land being prepared for building.

The author wishes to acknowledge the assistance of Mr. Alan Lamb, chief system planner for Maclean-Hunter Cable TV Ltd. in the development of this mapping system.



Fairchild's TVF-177 Camera gives this program a network look.

Fairchild TVF-177 viewfinder television camera is the result of recent advances in engineering and Micrologic® circuitry. It produces remarkably stable, crisp, high-contrast pictures—the kind of images that give your programming a network look.

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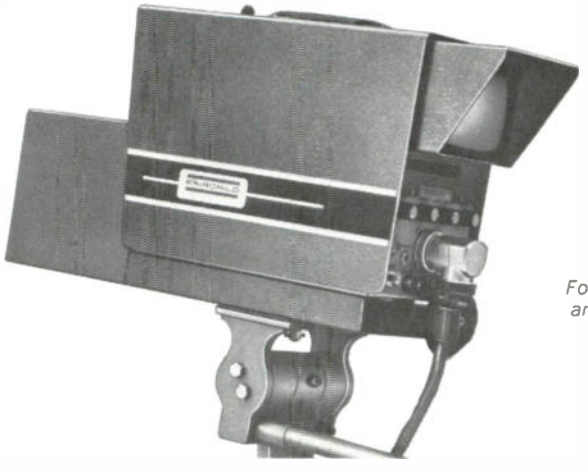

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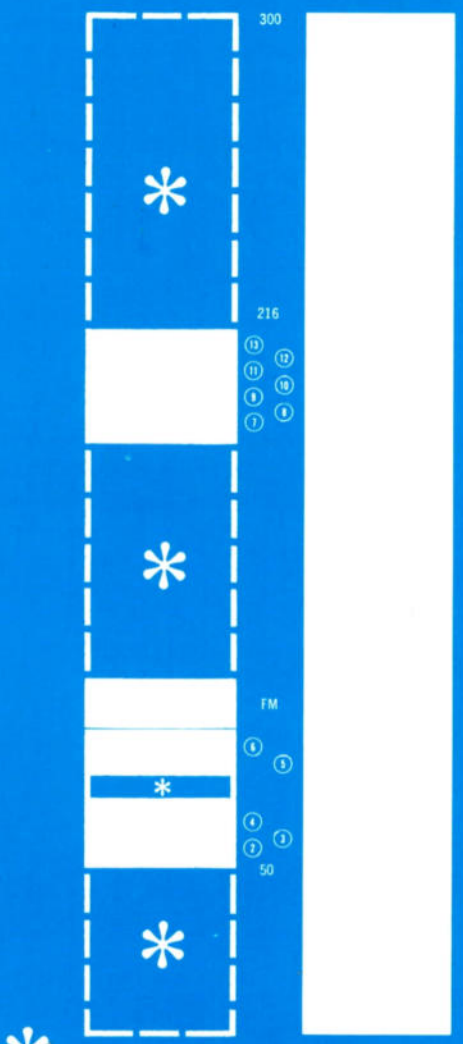

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SUPERIOR CONTINENTAL CORPORATION

Improved Cable Boring With The New Compacting Augers

CATV construction techniques are constantly advancing; thus the development of new methods and equipment, such as the underground boring unit described here, increase in their importance to new and expanding systems.

Along with increased opportunities for CATV in established urban areas have come costly underground construction problems, due to the presence of paved streets, sidewalks, driveways and other surface improvements. The construction costs incidental to breaking through these surfaces for trenching and the necessary restoration expense are substantially greater than when working in open areas where trenchers can operate unhindered. If underground services to meet customer needs are to be economically feasible, the construction costs of these installations must be reduced as much as possible.

Underground Construction Company of San Leandro, Calif. has been easing the task—and cost—of underground CATV cable installations with a relatively new power tool called the Under-taker Compacting Auger, produced by Contender Corporation of Woodland, California. According to Art Seymour, Director of CATV Operations for Underground Construction, his company is installing CATV cable for Cablevision Television Signal Corp. of San Francisco, and is using the compacting auger for about 20 miles of this contract work. The firm has also used the equipment in the installation of several hundred miles of other underground communication cable in the San Francisco area.

Formerly, Underground Construction Co. relied largely on open trenching and water bore equipment for installing cable under streets, driveways and other surfaced areas. Seymour reports that they now handle most of these situations at less cost using two Undertaker units. For example, one of their current contracts calls for installing CATV cable under sidewalks along entire blocks in the Twin Peaks area of San Francisco. Construction cost is being minimized by boring under these sidewalks, breaking the concrete only where necessary to start the bores and where required for house service connections. These openings are spaced to avoid disturbance to driveway approaches and inconvenience to residents. The unit requires only a six-inch wide trench about 15 feet long, so there is no need to break out (and replace) large sections of concrete.

The compacting auger operation is shown in progress here. After the bore is completed, coaxial cable or conduit can be installed by swivel attached to reamer on return pass, or cable can be hand fed through the bore.

The boring head has been started in the soil. The guide tool, has been removed to show detail.

The Undertaker compacting auger has been used in the Twin Peaks area of San Francisco to install coaxial cable under sidewalks. As illustrated above, dry-bore operation does not require large access openings.

In addition to the narrow starting trench, a target trench is dug at the far side of the surfaced area, across the bore path and deep enough to intercept the auger at the completion of its travel. After the two-man team sets up the boring operation, one man tends the power cart and the other aims the auger bit and checks its advance. The progress of the auger can be followed by the vibrations felt on the paved surface as the bit travels below. The compacting auger utilizes a dry-bore compacting operation. Energy is supplied by an 8 HP gasoline engine mounted on a two wheeled power cart about the size of a large lawn mower. By means of a hydraulic transmission system, the power unit rotates a series of coupled 7 ft. shafts to which is attached an auger bit (boring head) 3½ ft. long. In operation, this bit "screws" itself forward, compacting the soil as it advances, forming a tunnel with 1¼ in. clearance.

Here the boring head is cradled in the guide tool, ready for positioning in starting trench.

When the auger bit has completed its bore and is exposed in the target trench, it can be replaced with a reamer of larger diameter. The direction of rotation is reversed, and the reamer worms its way back through the tunnel, further compacting the soil and enlarging the pilot bore.

By means of a swivel that can be attached to the outboard end of the reamer, cable or conduit may be installed at the same time as the reamer is enlarging the bore to the desired size. Reamers of graduated sizes up to 3¼ in. diameter are available.

For the boring operation, the engine is set at full throttle, delivering a constant horsepower supply to the hydraulic system. The hydraulic transmission monitors the soil resistance encountered by the auger bit and "feathers" constantly to provide the appropriate RPM/torque ratio for the particular soil density. At no load, the driveline rotation is about 100 RPM. As soil density is encountered, the RPM slows and torque increases. Maximum torque output is 550 ft. lbs., and at this point the RPM has slowed to zero and the hydraulic system comes to neutral. Because the hydraulic components and the engine are protected from overload, their operating life is said to be considerably extended.

Boring speed averages 3 to 8 ft. per minute, depend-

ing on soil density. Generally, the boring time for the auger bit to make its way under a 60 to 80 ft. street is 15 to 20 minutes. There is no interruption or inconvenience to traffic flow.

Proper aiming prior to the start of boring is the key to accurate results, for once the auger is in the soil, it is "on its own." The driveline transmits the rotation to the bit but does not control or influence its course. Accurate aim is accomplished with the aid of a specially designed guide tool, and the 3½ ft. length of the auger tends to keep the bit from straying from its pre-set course. Dave Burrell of Underground Construction advises that their operators often hit a shovel at distances of 50 ft. or more. Although the compacting auger has been used for spans exceeding 200 feet, most applications involve bores under 100 ft.

Buried obstructions such as boulders may halt the advance of the auger or can force the bit off course. If this occurs, the procedure is to reverse rotation, back out, and start again a few inches to one side or higher or lower than the first try. The time involved in "probing" to find a clear path has been found to be less costly than opening the surface to remove the obstruction.

There are some extreme soil conditions that cannot be penetrated or compacted further by the compacting auger to provide bores of the desired diameter, but most owners do not find this to be a common or frequent problem. Operators indicate cost savings as high as 50, 65 and 80% per foot with the compacting auger. TVC

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Urban System Construction; A Challenge Around Every Corner

As additional urban centers are wired for television, the experience of pioneering Manhattan system operators will be repeated and enlarged upon again and again, thus the following account is pertinent to all cablemen.

S. A. Yager
Chief Engineer
TelePrompTer Manhattan CATV Inc.

The TelePrompTer Corporation has had the unique experience of designing and constructing a cable television system in the nation's most urban area, New York's Manhattan Island. The franchise area contains nearly 400,000 households within its 11 square miles. It has 250 miles of city streets and 10,000 residential buildings.

All utility services within the Borough are required to be installed in underground ducts, and there are a multitude of agencies who claim and exercise authority over these services and whose approval must be sought for extension of such facilities. Those principally involved include the Bureau of Franchises, Department of Highways, Department of Water Supply, Gas and Electricity, Traffic, Fire and Police Departments. Vehicular traffic congestion limits permissible new underground construction projects.

The existing facilities which are available for the system are often inadequate or entirely lacking, forcing us to improvise and invent.

"Fun City," the Mayor's name for New York, has seven VHF and three UHF channels on the air, all but one of which transmit from the Empire State Building. The resulting high field intensity and multipath reflections from the profusion of high rise structures in the area, as well as the local terrain, cause most area citizens to receive some of the poorest television pictures in the country; something they may not realize until they are shown what television should be. New York is truly a "Ghost Town."

TelePrompTer presently operates three head-ends and a fourth is being planned. Each site was chosen with regard to the quality of off-the-air reception, accessibility to duct facilities, availability of roof top facilities such as power and space for head-end gear and means of mounting and phasing antennae.

The resulting three separate distribution systems also offer interesting possibilities for localized public service programming in a city having nothing but mass media presently available.

The northernmost head-end, located atop a 32-story high rise building constructed on air rights over the vehicular approach to the George Washington Bridge, also serves as the transmitting site for the Hughes/TelePrompTer AML 18 Ghz microwave system which will soon be feeding local receivers throughout the area; by-passing trunk cable and amplifiers.

The continuing reconstruction of Manhattan requires constant re-evaluation of off-the-air signals and frequent re-working of antennae arrays. This has already resulted in the relocation of one head-end in its entirety. The rising of the World Trade Center is anticipated to wreak havoc on the multipath ghost situation in the franchise area. TelePrompTer is anticipating this problem and will take necessary measures to protect signal quality.

The design of trunk, feeder and distribution networks is influenced by consideration of these factors: (a) High VHF field strength in the area; (b) Spotty availability of underground ducts; (c) High subscriber density; (d) Right-of-way acquisition into and through each and every building in the area; (e) Atmospheric conditions and their corrosive effects on outdoor plant; (f) Special requirements of apartment house drops such as grounding, room to room cabling, security and customer relations.

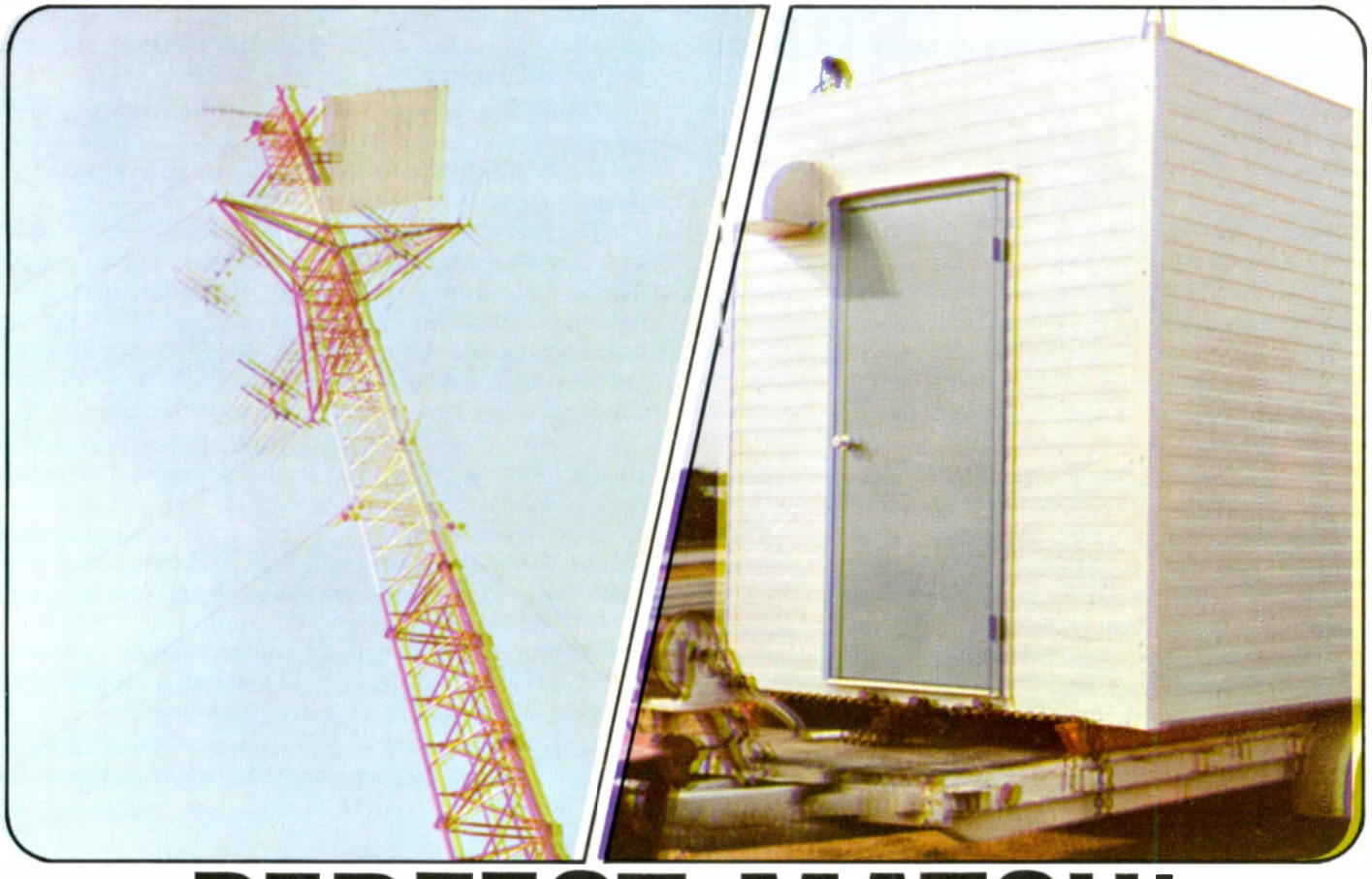
The high field strength in which the systems operate requires strict attention to shielding. Aluminum jacketed cable is used, .500" in trunk and .412" in feeder and distribution lines. All drop cable is of the bonded foil construction rather than braid, using foam dielectric and #18 AWG center conductor.

Black polyethylene jacketing is used on all outside and underground cable; unjacketed aluminum .412 is used in interior vertical risers; white jacketed drop cable is often used for intra-apartment cabling.

Grounding of the plant is accomplished at the feeder entry to each block. Adequate grounds are generally not available within the apartment.

Channel converter "black boxes" are required in the majority of installations due to direct pickup of broadcast signals by the TV receiver. All available models have been used to various degrees of satisfaction.

Trunk line layouts are designed for nominal 24 dB amplifier spacing. However, lack of available ducts



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and problems of right-of-way through buildings force an unusual amount of splitting and branching while the inability to locate amplifiers at calculated locations causes short spacing. The subsequent variations in cable slope and fixed loss suggests the adoption of amplifier systems which are flexible enough to accommodate these variations and which will allow future changes necessitated by the reconstruction of the city's outdated buildings.

Special, city approved sidewalk vaults occasionally house amplifiers in areas where the normal basement installations are not possible. Sidewalk vaults have the disadvantage of making cable access to subscribers more difficult than is normal for the basement type installation.

Gaps in available ducts or difficulties of right-of-way acquisition have similarly been by-passed by an experimental means of inserting cable into a 1½" square slot cut into the sidewalk by a diamond saw. The slot is protected by the insertion of an inverted U shaped steel channel, formed to follow the sidewalk contour. The channel is wedged in place with builder's felt, flush to the surface. This technique permits later access to the cable for maintenance. The technique has proved successful and has withstood four seasonal changes with no damage to the cable, channel or sidewalk.

The layout of trunk and feeder lines generally places a trunk/bridger or intermediate bridger amplifier in every other intersection, located in a corner building. One to four feeder cables are then extended to other corner buildings in the intersection and serve to feed the individual buildings in those blocks.

Trunk line power is kept separate from the feeders, due to the heavy drain of the large number of distribution amplifiers in the block. An individual block power supply is employed.

The feeder cable is tapped by a directional coupler as it passes each building and "line extender" amplifiers are employed to feed the building distribution network. These line extenders are modified for flat gain because the dense tapping and short cable lengths between taps introduces more flat insertion loss than the slope type loss normal to most cable plants.

Exceptionally large buildings may require either a high level distribution amplifier or two or more "line extenders." Buildings with six stories or less are commonly cabled on the rooftop with subscriber taps on the parapet above each row of living room windows. Individual drops are made to the dwelling unit with an entry in the window frame.

Buildings taller than six stories may be cabled on the exterior but with a single riser and a directional tap outside a window of each apartment.

Such buildings are more commonly cabled through the interior with one or more vertical risers through a stairwell and horizontal distribution cables around corridors.

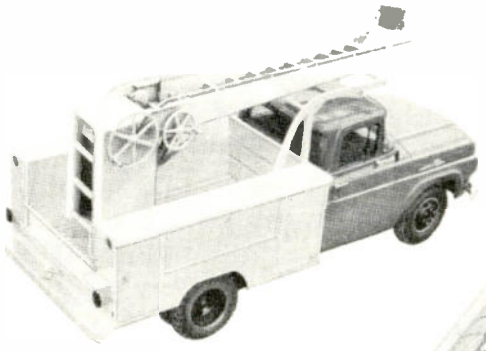
Special methods and materials have been developed with certain manufacturers for these purposes. For example, a corner molding made of 2" wide aluminum strip and affixed to the wall at the juncture of the ceiling by special extruded plastic clips will accommodate up to twelve drop cables or a special directional tap designed to fit the cross section of the space enclosed behind the strip and a single cable. The strip is available in many patterns and colors from stock and may be fitted on the job.

A second example is a single directional tap which is specially molded to mount inconspicuously on the building face of small housings. This device has a skirt and F fittings on the bottom to provide drip protection and one-hole mounting. The device provides a channel for the riser cable.

Directional tap wall plates have been designed and employed where it has been possible to use MATV conduit for distribution.

Special cable clamping devices and methods are also employed, since all feeder and distribution as well as drop cable must be fastened to masonry walls. TelePrompTer has had great success with a specially modified power actuated nailing tool which has the advantages of being self-contained and completely safe, and which leaves no spent cartridges behind to damage floors and roofs.

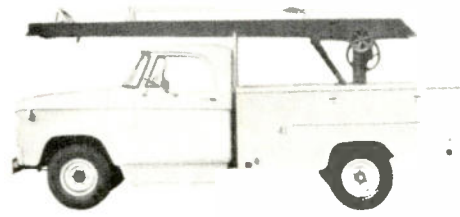
Summing up, urban CATV design and construction does require new materials, new methods and a completely open mind. New requirements appear and must be met each day. Flexibility of thought will continue to be the motto of the day, as it must be throughout our industry in these days of great change. TVC



MODEL EM

MODEL EME

MODEL EMH



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Model EMH has all the desired features for handling any CATV maintenance and construction requirements. It's rugged, compact, and versatile. Self-powered gasoline engine eliminates running of truck engine. Controls located at both pedestal and bucket for convenience. Features a heavy duty hydraulic system, self-leveling, fiberglass upper section and bucket for added safety. The EMH is available in 24 foot to 35 foot ladders. The quality construction of the EMH will carry any CATV workload.

Model ES has been designed for the CATV system with a limited budget. Here is low cost aerial equipment that can be afforded by those that cannot warrant fully-powered aerial equipment. This top quality aerial ladder has manual extension, 12-volt electric power elevation and geared reduction 360 degree continuous rotation. Model ES Ladder can be used at any angle up to a vertical position of 80 degrees. Choice of 26 or 30 foot ladders. Withstands hard use, but requires minimum maintenance.

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If You're Going Underground... Some Key Considerations

The largest all-underground CATV plant built to date is the 400-mile Colorado Springs system. The planning and construction of such a distribution system involves many unusual considerations.

By William L. Ross
Vice President Engineering
Vumore Video Corporation of Colorado

During the past few years cable television operators have become increasingly interested in partial or complete buried plant installation. The reasons for this trend are obvious; continuing pole rental increases, stringent restrictive clauses in pole contract agreements, and demands of beautification groups as well as requirements of various governmental ordinances.

First of all, let me point out that buried cable installation is not new. However, new and improved techniques of installation have been developed along with the addition of new hardware and the modification of existing hardware to fit this specific purpose.

Basic Considerations

There are several factors to be considered for any underground installation which are not normally associated with conventional aerial or overhead construction: (1) Chemical composition of soil; (2) Type and condition of soil; (3) Rodents; (4) Frost; (5) Moisture-(6) Corrosion; (7) Future system expansion. Some of these factors are important to aerial construction, but to a much lesser degree.

A careful examination of each of these factors for a particular system will provide information which can be used to determine method of installation, type of hardware to be utilized, and a proper layout which is designed to include possible future expansion.

Before beginning any buried cable construction project, a chemical analysis of the soil should be obtained. This will serve as an aid in determining the soil's corrosive effect on hardware and what necessary precautions should be taken in the selection of anti-corrosive agents.

The soil should be carefully examined at several locations throughout the proposed system area as to type and condition. This, for the most part, will be the determining factor in method of installation of cable.

The presence of underground rodents must be taken into consideration and protective measures taken to protect the cable in areas suspected of infestation by the little creatures. Generally, if the cable is placed at a minimum depth of 24 inches, trouble from rodents will be avoided. In addition, trouble from frost heaving, from soil bacteria and from accidental dig-ins will be avoided by 24-inch burial.

Moisture, which is ever-present in the soil, is probably the greatest single concern to prospective underground cable TV operators. They fear that the underground system will prove unreliable and extremely costly to maintain. A few years ago this fear was justified. However, this is not the case today. New and improved methods of cable installation, coupled with new underground hardware, waterproofing sealing compounds and other new components have virtually eliminated moisture contamination.

Careful thought must be given to possible future expansion during the engineering layout. A good rule to follow: "If in doubt, place conduit or duct." The cost is negligible if placed at the time of initial plant installation, as opposed to later placement.

There are two methods of placement of cable underground: the open trench, and the plowing method. Each method has its advantages and disadvantages.

Open Trench Burial

There are two general methods of installation in the open trench: direct cable burial and conduit or duct burial. The direct burial installation is more economical than the conduit method. Direct burial results in savings for materials cost in excess of $500 per mile in addition to the savings gained by eliminating the additional labor involved in conduit burial. However, the conduit

Over 400 miles on underground plant make up the Colorado Springs system. The Davis trencher shown is cutting a trench 5" x 24".

method does have several advantages over the direct burial method: (1) It provides a hole in the ground for future cable expansion or replacement, if needed. (2) It protects the cable from damage during installation. (3) It reduces the need for a screening or sand cushion in rocky soil terrain.

Cable pre-assembled in conduit is available on the market today. However, this measure only affords additional protection for cable from damage during the installation process and does not lend itself to future cable replacement.

There are two generally accepted conduits available today that fulfill all requirements for buried cable construction. One is of a virgin polyethylene construction, the other is made of poly-vinyl-chloride, commonly referred to as "PVC." The polyethylene conduit is available in a semi-flexible, smooth wall type, and is very popular in warm climates. The other is a corrugated flexible conduit. The smooth wall conduit is very difficult to use when the ambient termperature is below 50°F, and should be avoided under those conditions. The corrugated flexible conduit lends itself to placement under all temperature conditions. In addition, the flexible conduit, cut to proper length, serves as a sweep at a fraction of the cost of regular rigid sweeps. It will mate with the smooth wall or rigid PVC conduit by use of 12-inch sleeves extruded for that specific purpose.

The sleeves may or may not be sealed to the conduit. This would be determined by the water table level in the area in which conduit is to be installed. If in doubt, use a sealing compound. The rigid PVC, available in 20-foot lengths, should always be used for continuous runs exceeding 300 feet when the ambient temperature is below 50°F. The cost is slightly higher, due to the additional labor involved and the cost of the many couplers required. Again, the corrugated conduit should be used for sweeps. (See Fig. 2).

All trunk and feeder cable should be placed in separate conduits. The reason is very obvious. It will allow for a splice-free run and much easier pull on long runs.

Regardless of the type of conduit utilized, make certain that the bottom of the trench is level and free from humps and loose soil. With a trench 24 inches deep, a 5-inch width is adequate for both trunk and feeder conduits in most cases. All conduit ends should be plugged or taped at the pedestal, vault or amplifier location prior to pulling of cable to prevent water and debris from entering.

When the direct burial method is utilized within an open trench, either random lay, or in the case of joint use trench, 12-inch vertical or horizontal spacing, certain precautions must be taken to prevent damage to the cable during installation. If the soil is rocky, a minimum 6-inch sand screen should be provided. Only cable designed for direct burial should be used. This cable has an outer longitudinal steel tape or equivalent additional protection. All

other cable should be placed in conduit.

Vibratory Plow Installation

The plow method of installation, both direct and indirect placement, has limited use except for house drop or service drops. It is, however, much more economical than the open trench method. The limitation of this method is due to the existence of other facilities, surfaced streets, surfaced alleys, curb and gutter, etc. Another important factor at this time is the unavailability of the direct burial type cable.

Two popular direct burial machines are available, both utilizing the vibratory plow principle. With the direct placement method, the cable is fed directly to the bottom of the cut from a reel conveniently mounted on the machine through a suitable cable guide. With the indirect placement method, long continuous lengths of polyethylene conduit are pulled into the ground by means of a pulling grip attached to the plow blade. The cable is later pulled into the conduit. This method is highly recommended for installation of service drops. Equipment is available which combines the advantages of small size and maneuverability. Very little lawn disturbance is realized when the equipment is employed, and low attenuation foam dielectric cable can be used without fear of damage during installation. Also, the conduit affords protection from accidental dig-ins and cutting in a lawn. The burial depth can be varied from five to twelve inches.

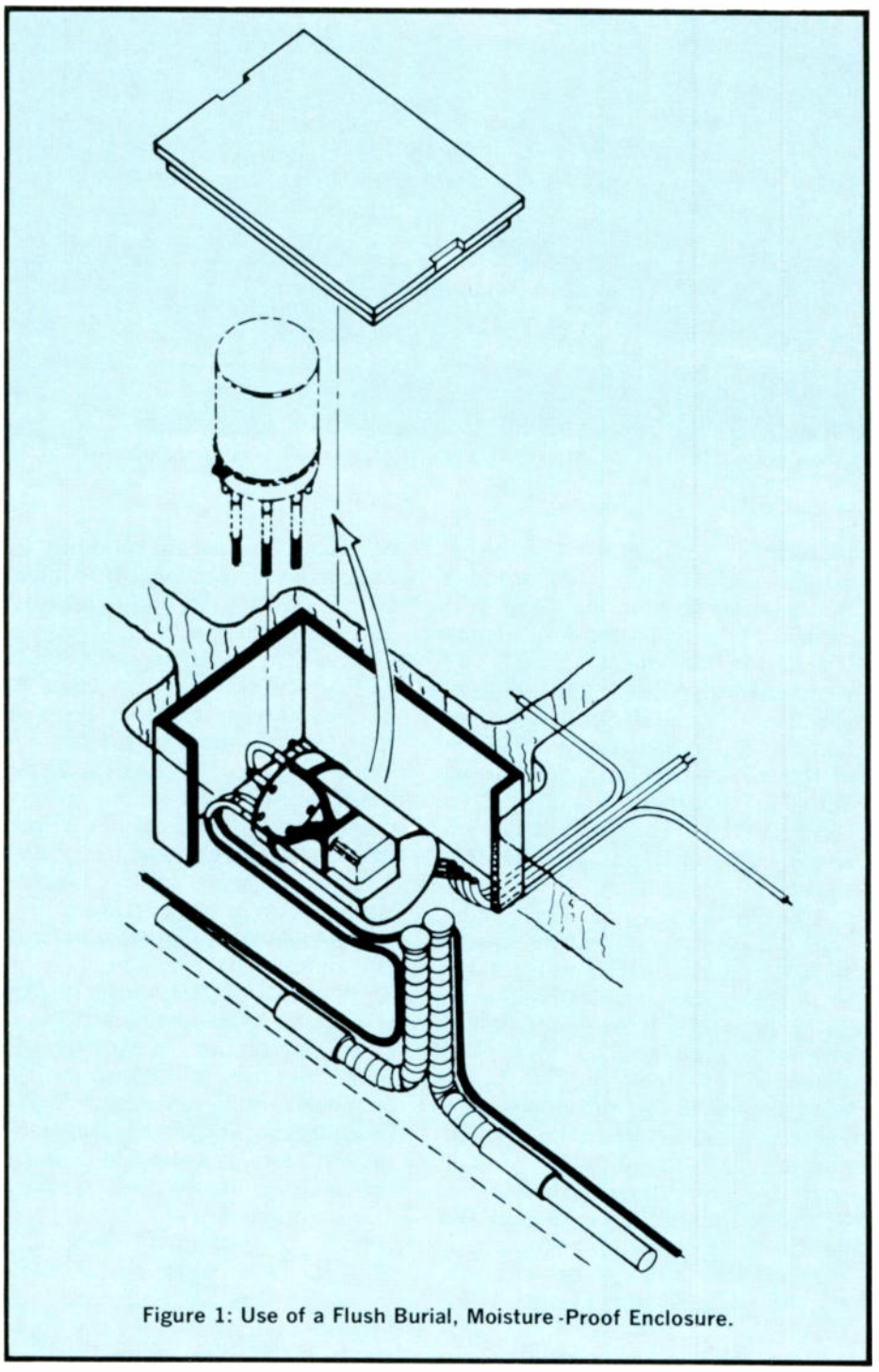

Figure 1: Use of a Flush Burial, Moisture-Proof Enclosure.

An evaluation of the various types of cable suitable for burial must meet certain construction requirements: (1) It must provide an impervious barrier to moisture from the underground environment. (2) The protective covering must be heavy enough to withstand handling incident to installation. (3) It must withstand widely varying chemical soil conditions without deterioration. (4) It must be flexible enough to be installed without damage by kinking.

This would indicate the type of cable to use would be one having a solid copper center conductor, solid dielectric for additional moisture protection to center conductor as opposed to foam dielectric, copper sheath for longer life and a high density polyethylene jacket. For direct burial, the cable would also require a longitudinal steel tape or equivalent additional covering. The steel tape would then be protected by another jacket of high density polyethylene.

The disadvantage of use of this cable is one of high attenuation, as opposed to a foam dielectric cable of equal size. If the size of center conductor and diameter of cable is increased to afford a lower attenuation factor, obtaining the necessary connectors to mate with existing hardware becomes a very serious problem. This would dictate the use of a cable having a standard size center conductor, polyfoam dielectric, a copper sheath with a minimum 5 mil thickness for flexibility and a high density polyethylene jacket covering. Connectors for this type

cable are readily available and are easily adapted to existing hardware. However, due to the high price and scarcity of copper at this time, a substitute material for sheath is indicated. Jacketed aluminum sheathed cable has the necessary electrical and mechanical characteristics for burial purposes, however, the sheath must be thin enough to afford the required flexibility for proper installation. The only problem with the aluminum sheath cable is a physical or chemical one rather than electrical. The insulated inner conductor enclosed in the aluminum sheath is isolated completely from external environmental effects. The only problem is protecting this sheath from chemical effects within the soil which might cause damaging corrosion. Practical and economical solutions to this problem exist by use of sealing compound placed between the outer surface of the sheath and the high density polyethylene jacket. This particular type of cable is available from one manufacturer at the present time. However, other manufacturers are presently in the process of developing an equivalent or improved cable to meet the criteria for buried construction.

If the plant installation is to be one which utilizes the indirect plow method or open trench conduit method, several factors must be given careful consideration when pulling cable in the conduit: (1) Sweep cable before and after pulling to determine structural return loss and possible damage during the pulling process. (2) Use a dynamometer and record total torque placed on cable during pulling. (3) Never exceed 700 pounds pull as indicated on dynamometer at any time during pull. If pull falls between 300 and 700 pounds, cut off and discard at least 3 feet of cable on pulling end before sweeping. (4) Always attach center conductor firmly to pulling grip before attempting to pull any length. (5) Use an approved wire pulling compound liberally on all long pulls. (6) Use electric or air winch on long pulls. (7) Once pull is started, don't stop until the entire length of cable has been pulled.

The real secrets to any successful pull are: proper placement of conduit, center conductor attached

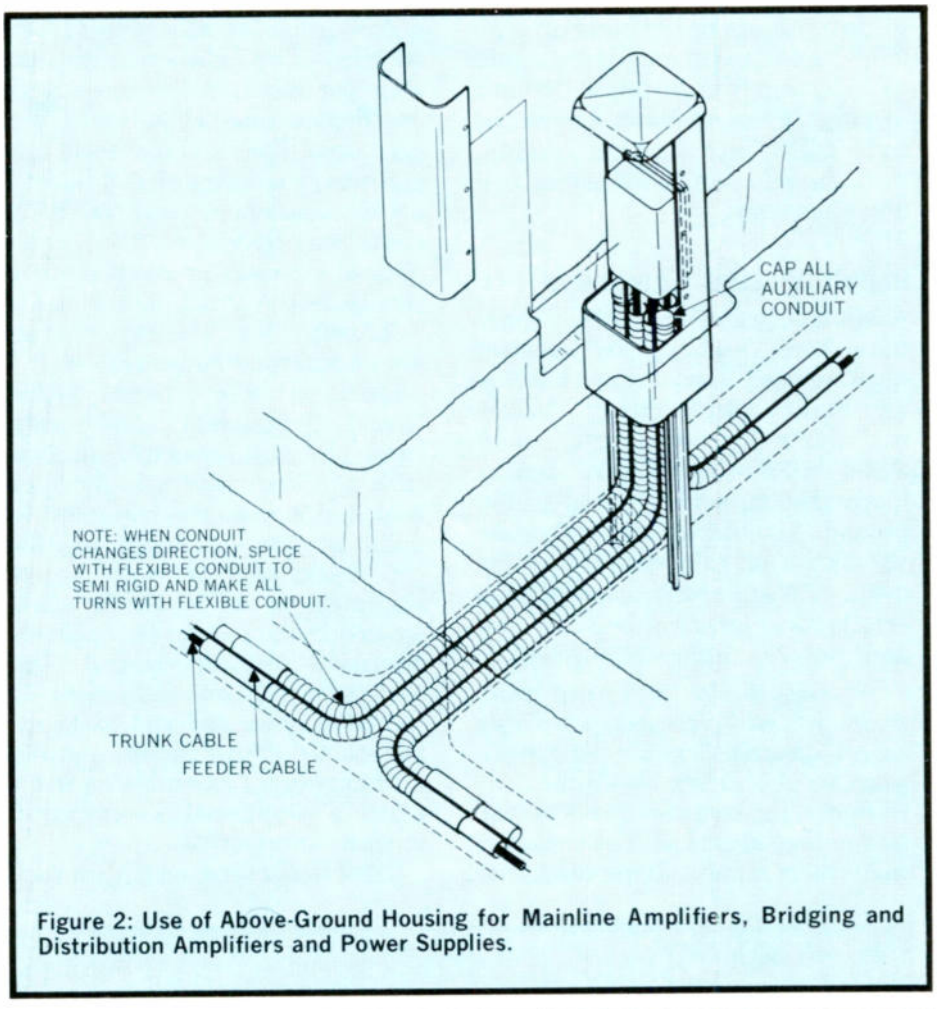

Figure 2: Use of Above-Ground Housing for Mainline Amplifiers, Bridging and Distribution Amplifiers and Power Supplies.

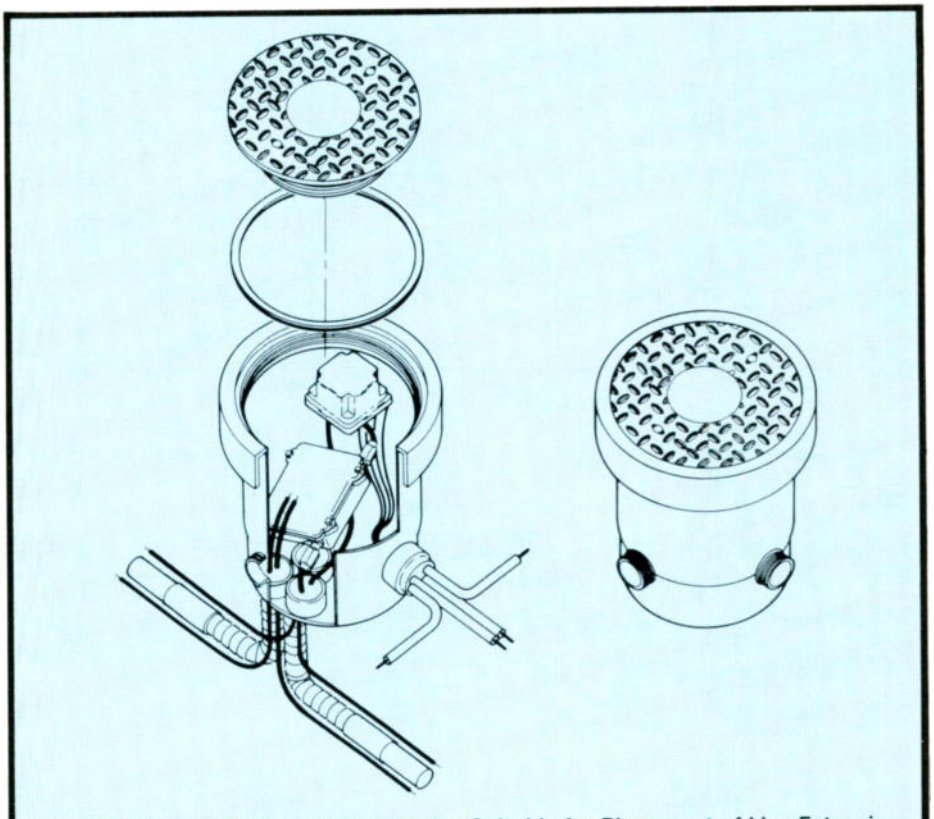

Figure 3: Use of Underground Housing Suitable for Placement of Line Extension Amplifiers, Directional Taps, and Splitters.

to grip, liberal use of pulling compound and continuous steady pull with no stopping during any length of pull. If two or more cables are to be pulled into the same conduit, they should be pulled together and not separately.

Installing Line Equipment

Installation of amplifiers, splice connectors, and passive devices must receive special consideration for buried plant. Many factors not normally associated with aerial construction, arise particularly if equipment is placed underground. Manufacturers are becoming aware of this special requirement, and are presently modifying existing equipment or building new hardware for this specific purpose.

A completely moisture-proof enclosure was recently developed by a California firm for the specific purpose of housing electronic components for underground installation. (See Figure 1). The enclosure material is a polysulfane resin with a 30% glass reinforcement. The addition of this glass produces outstanding resistance to creep under continuous load at elevated temperatures. For example, tests have indicated that after 10,000 hours at 210°F. under a load of 4,000 P.S.I., there was less than 0.5% creep. Tensile strength at room temperature is 18,000 P.S.I. and at 210 F. is 13,000 P.S.I. The material possesses outstanding properties in all respects for direct burial applications. A stainless steel closure band and bolt assembly equipped with a lock nut and hole for a wire lead seal is used to clamp the two units of the enclosure together. The basic seal is made by the clamping of a Buna N gasket located in the base of the enclosure. Thermofit mastic coated, heat sealing sleeves are utilized to seal the cable entry end and to go over the stainless steel clamp to provide a tamper-proof assembly as well as offering additional insurance for moisture protection.

Directional taps, which are waterproofed for buried plant use, are presently available from two CATV equipment manufacturers. One firm's tap is completely potted with a polyurethane foam material and the case is anodized for corrosion protection. The other firm uses an epoxy resin over the entire electronic circuit board within the housing which affords complete moisture protection. Protection to all splitter devices is also provided by the use of the polyurethane foam potting method.

Mainline amplifiers, bridging and distribution amplifiers as well as power supplies may be housed above ground in a metal housing. (See Figure 2). This particular housing contains a provision for locking, and will accommodate existing amplifiers and associated equipment available today including the new 20 channel equipment.

Line extension amplifiers may be placed underground in an enclosure which is large enough to accommodate the amplifier, directional tap and splitter, if required. The enclosure is of the flush mount type and is completely waterproof if installed properly.

Also available is a very attractive, rugged and waterproof pedestal suitable for housing directional taps, splitter devices and splice connectors above ground. (See Figure 4). There are several manufacturers of pedestals that are satisfactory for housing of passive devices. Regardless of the type selected, the above pedestal should be used only in alleys, or back easements and not in conspicuous locations. After all, one of the reasons for going underground with the plant is for beautification purposes. Certainly an above ground pedestal does not add charm and beauty to any area and should be avoided if it is economically feasible to do so.

In conclusion, I would like to point out that an underground plant not only adds to the beauty of an area, and affords easy accessibility and low maintenance cost, but that it also opens up new avenues in the communication field. This is not possible with an aerial plant due to restrictive clauses in the majority of the pole contact agreements as they exist in the United States today. TVC

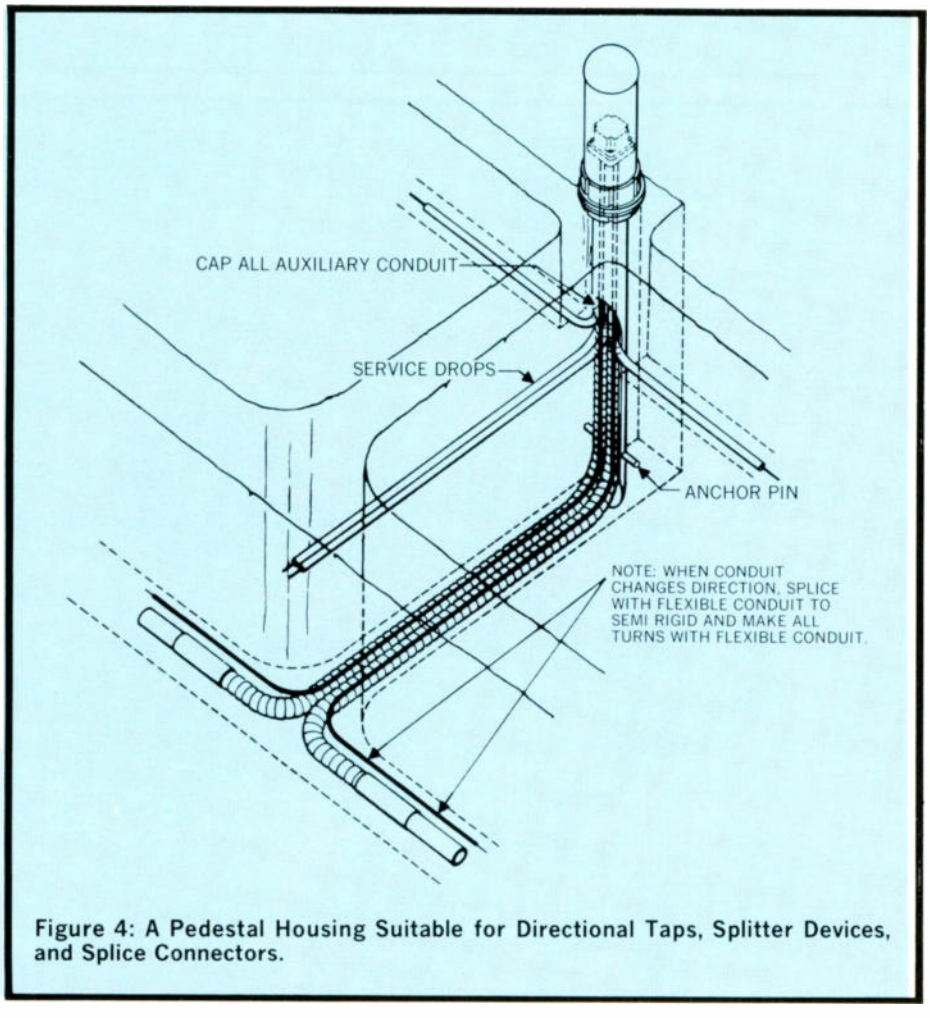

Figure 4: A Pedestal Housing Suitable for Directional Taps, Splitter Devices, and Splice Connectors.

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CATV Construction Contractors Directory

The firms listed here are actively engaged in cable system construction, and should be contacted directly for details of construction capabilities and specialties omitted from this quick-reference listing.

David B. Adams Construction Company; Uniontown, Pennsylvania 15401; Ph. (412) 438-7560; Complete CATV construction services, including cable plowing.

Ameco Inc.; 2949 W. Osborn Road, P.O. Box 13741, Phoenix, Arizona 85002, Ph. (602) 262-5500; Provides engineering, planning and installation. Specializing in complete "turnkey" completions. Complete design of CATV systems from customer maps. Tower site survey.

Anaconda Electronics Company; 1430 South Anaheim Blvd., Box 3772, Anaheim, California; Ph. (714) 635-0150; Complete system planning and turnkey construction service.

B. C. Cable Contractors Ltd.; 1947 Kingsway, Vancouver, B. C., Canada; Ph. (604) 879-2631; CATV engineering and construction.

Beaver Television Associates; 287 Eddystone, Downsview, Ontario, Canada; Ph. (416) 635-0320; Turnkey construction of head-end—signal survey, design, fabrication and installation of towers and antennas.

Benco Television Associates; 27 Taber Road, Rexdale, Ontario, Canada; Ph. (416) 244-4296; Expert assistance in complete CATV systems planning, both new and rebuilt.

Broadway Maintenance Corp.; Long Island City, New York 11101; Ph. (212) 286-3700; CATV design, installation, and maintenance.

Burnup & Sims; P.O. Box 2431, West Palm Beach, Florida; Ph. (305) 683-8311; Services include power and telephone plant re-arrangement and tree trimming. Complete construction.

Cable Construction Company; 514½ River Road, P.O. Box 190, Puyallup, Washington 98371; Ph. (206) 845-7541; Furnishing all types of system construction.

Cable Constructors Inc.; 203 Stephensen Avenue, Iron Mountain, Michigan; Ph. (906) 744-6621; Complete turnkey, engineering and construction supervision capabilities.

Cable TV Construction, Inc.; 223 N. State, Iola, Kansas; all types of aerial and underground construction.

Cable TV, Inc.; P.O. Box 982, Salisbury, Maryland 21801; Ph. (301) 742-5043; Complete construction capabilities for cable systems.

Cal-Tel Construction Company, Inc; 1698 East 25th Street, Signal Hill, California; Ph. (213) 426-7041; Handles all phases of CATV construction.

CAS Manufacturing Co.; P.O. Box 47066, Dallas, Texas 75207; Ph. (214) BL 3-3661; Experienced design, engineering and construction.

Cascade Cable Contractors; P.O. Box 604, Wenatcha, Washington 98801; Ph. (509) 884-7161; Complete turnkey capabilities for new systems or rebuilds.

Cascade Electronics, Ltd.; Electronic Avenue, Port Moody, British Columbia, Canada; Ph. (604) 939-1191; Full CATV system design and engineering services, with complete turnkey construction aid available.

CATV Equipment Co.; 1422-34th Avenue, Seattle, Washington 98122; Ph. (206) 325-6838; Specialists in all-band systems, providing complete construction services, layout, equipment and installation.

CATV Services Co.; P.O. Box 574, Worland, Wyoming 82401; All kinds of cable system engineering and construction.

C-COR Electronics, Inc.; 60 Decibel Road, State College, Pennsylvania; Ph. (814) 238-2461; CATV engineering and construction services.

Co-Ax Construction Co.; 2949 West Osborn Road, Phoenix 17, Arizona; Ph. (602) 252-6041; Specializing in complete turnkey construction. Construction representatives provided on all turnkey jobs. (Subsidiary of Ameco)

Pete Collins Co.; 835 Delaware Ave., Denver, Colorado 80204; Ph. (303) 355-8919. Engineering, construction and maintenance on cable systems.

Communication Systems Corp.; 140 East Main Street, Huntington, New York; Ph. (516) 271-1262; Complete system design and construction capabilities for CATV systems.

Communications Constructors, Inc.; 1852 East Pacific Coast Hiway, Wilmington, California 90744; Ph. (213) 835-0137; Complete CATV construction services.

Comm/Scope; (a division of Superior Cable Corp.) Hickory, North Carolina 28601; Turnkey construction including planning and engineering.

Com-Tel Construction, Inc.; 1721 West Monroe Street, Decatur, Indiana 46733; Ph. (219) 724-2581 or 2690; Aerial and underground system construction, including cable plowing, and system engineering services.

Daniels & Associates, Inc.; 2930 East Third Avenue, Denver, Colo.; Ph. (303) 388-5888; Complete engineering for cable system layout, turnkey, estimates, and engineering studies.

DAVCO Electronics Corp.; P.O. Box 861, Batesville, Arkansas 72501; Ph. (501) 743-3816; Complete services include layout, equipment and installation.

Entron, Inc.; 2141 Industrial Parkway, Silver Spring, Maryland; Ph. (301) 622-2000; Utility pole make-ready studies, system layout. Specializes in turnkey construction.

Foster Associates; 1101 17th Street N.W., Washington, D.C. Consulting services including signal surveys, tower site location and head-end design.

Great West Construction, Inc.; Box 468, Mexia, Texas 76667; Ph. (817) 496-4662; Complete services include field engineering, signal surveys, layout engineering, installation of all electronic components, and testing both aerial and underground systems.

Gregory Electric Company, CATV Division; P.O. Box 76, Columbia, South Carolina 29202; Ph. (803) 256-9926; Complete system design, engineering, and turnkey construction capabilities.

Harris-McBurney Co.; 1006 Airport Road, Box 267, Jackson, Mich.; Ph.

(Continued on page 72.)

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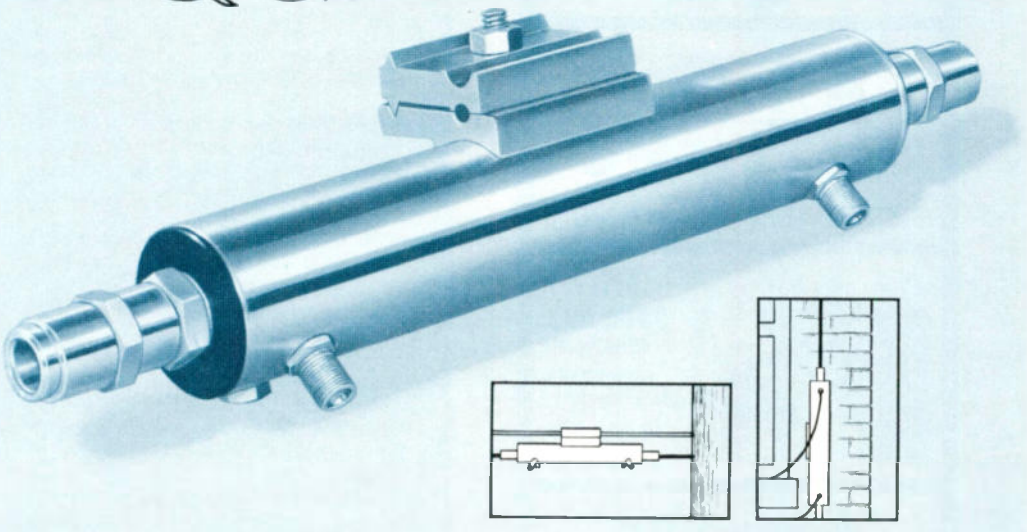

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(Continued)

(517) 787-1800: Complete construction services for CATV

Henkels & McCoy, Inc.; 1800 Johnson Street, Elkhart, Indiana; Ph. (219) 264-1121; engineering and construction.

Highland Associates, Inc.; 600 Marble St., Broomfield, Colo. 80020; Ph. (303) 466-3851: Construction and equipment sales, serving area within 500 mile radius around Denver.

J.H.B. Construction; Box 132, Alexandria, Minn.; Tower erection, painting and complete CATV construction.

Jerrold Electronics Corp.; 401 Walnut St., Philadelphia, Pa.; Ph. (215) 672-0800; Turnkey construction, engineering and surveys.

Kaiser CATV Corp.; 2216 West Peoria Ave., Box 9728, Phoenix, Arizona 85020; Ph. (602) 944-4411; Construction of partial or complete systems, including complete turnkey.

Killoren Company; 925 N. Bluemound Drive, Appleton, Wisconsin; Ph. (414) 734-9278; Engineering construction and maintenance services.

Artie M. Loftis Construction; Box 656, Malakoff, Texas; Ph. (214) HU 9-4666. Complete CATV construction service.

Malarkey, Taylor & Assoc.; 1101 17th Street N.W., Rm. 1303, Wash. D.C.; Professional Engineering services including signal surveys, head-end, system and component design, preparation of pole line and strand maps, proof of performance tests, trouble shooting, engineering statements, and qualified testimony in FCC proceedings or courts as an expert witness.

Master Antenna Service; 248 Wave Street, Laguna Beach, California 92651, Ph. (714) 494-0253; All construction services except overhead and buried trunk.

Multi Media Engineering, Inc.; 2385 Lewis Ave., Rockville, Md., 20851; Ph. (301) 726-1340; Cable television construction and engineering services.

Noram Cable Construction Ltd.; 1111 Albion Road, Rexdale, Ontario; Ph. (416) 741-0566; Complete CATV construction services.

Pacific Pipeline Construction Co.; 1632 S. Greenwood, Montebello, California.

Power Line Construction Co.; 2019 S. E. Hemlock, Portland, Oregon 97214.

Robert G. Owens, Inc.; 150 Washington Blvd., Laurel, Maryland; Ph. (301) 498-0555; Total Turnkey capability.

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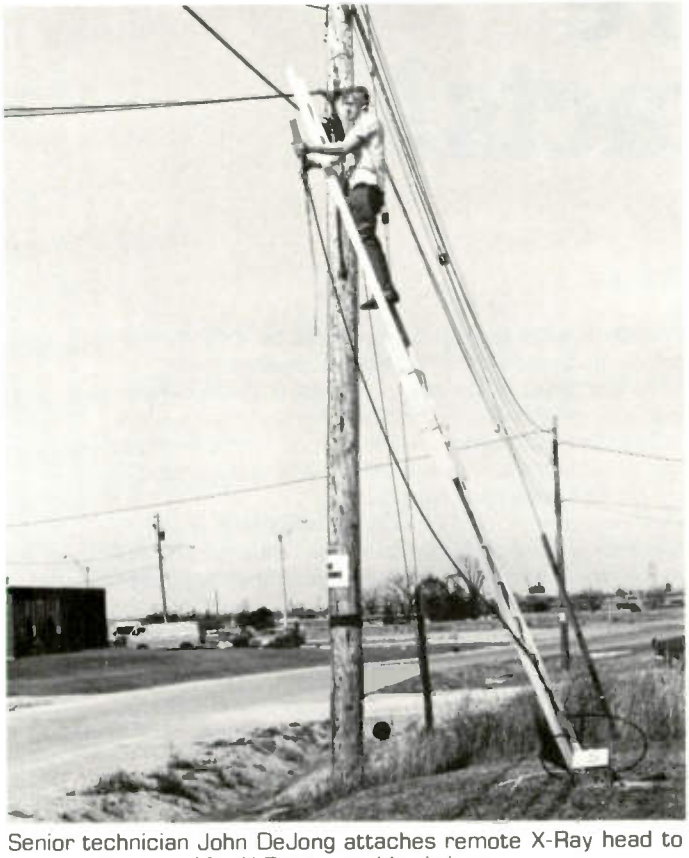
Portable X-Ray Testing For Your Cable Connections

Maintaining quality control in plant installation is always a tall order. The following report, however, describes one method by which QC standards can be clearly defined and closely controlled.

By I. Switzer
Associate Technical Editor

Cable television systems are getting bigger and bigger, and many system engineers are finding that the chain of responsibility in system quality control is getting so long that adequate control is becoming very difficult. Cable installation and splicing crews are usually well trained and use fittings and connectors which have been designed and selected to reduce chances of poor workmanship in installation. Nevertheless faulty workmanship does occur, often in very large systems with longer chains of delegation but with very high standards for system quality and reliability.



Senior technician John DeJong attaches remote X-Ray head to messenger strand for X-Rays on cable sittings.

Since quality standards tend to become less seriously considered as the information is passed down the line, it becomes mandatory to make the maintenance of these standards a mechanical, quantitative thing where possible. A quality check on coaxial connections can now be made in the field by utilizing portable X-Ray equipment, which reveals exactly what kind of connection has been made. Information yielded by the X-Ray technique indicates clearly the standards of construction being maintained.

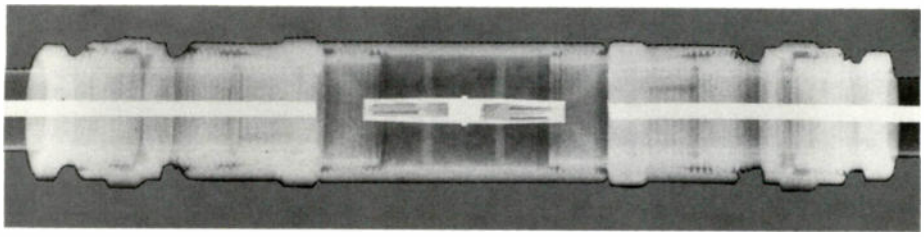
Maclean-Hunter Cable TV Limited, a Canadian group operator presently constructing 600 miles of system in metropolitan Toronto, has started to use a portable X-Ray system, the model 846 Fexitron made by Field Emission Corporation, McMinnville, Oregon. The X-Ray machine is presently being used to spot check quality of splice and connector work by sub-contractors during system construction. After the system is energized, the X-Ray equipment will be used to help find splice and connector problems which turn up after system operation begins.

The 846 is a suit-case sized system which weighs 55 pounds and which runs on conventional 115 volt 60 cycle power. It can be conveniently operated from portable power sources with minimum 1 KVA rating. The X-Ray tube operates at either 100 KV or 150 KV, depending on exposure required. The tube is a cold cathode type developed by Field Emission, and is operated in a pulsed mode. The power supply pulses the tube with 60 nanosecond high voltage pulses and exposure is controlled by a preset counter which controls the number of pulses in the exposure pulse train.

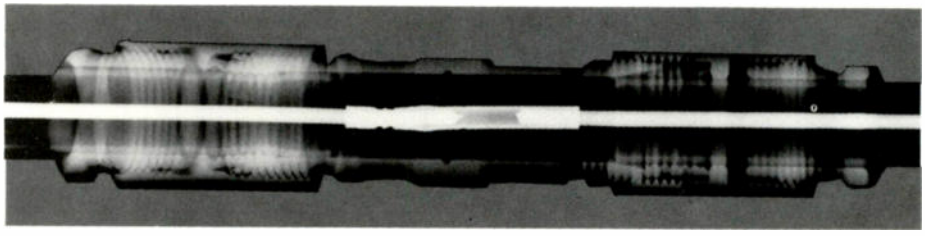
Maclean-Hunter selected an extra long high voltage cable to connect the power supply to a remote tube head. A 25′ cable permits the power supply to remain on the ground while the remote tube head is taken up to the messenger to X-Ray line splices or connectors. A dummy load permits testing and servicing the equipment without unnecessary X-Ray radiation hazards.

The X-Ray equipment is operated by a Maclean-

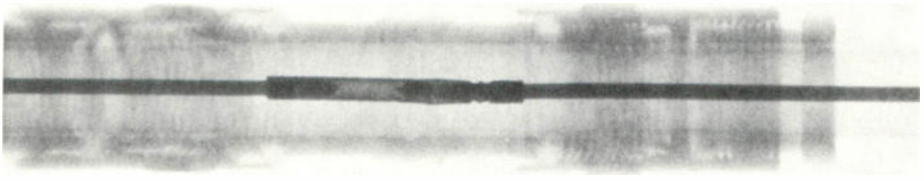
Hunter technician who was previously untrained in X-Ray technique. He was chosen primarily for his responsible attitude toward the work. This is most important. The equipment is very simple to operate, but it is high voltage X-Ray equipment, and can be dangerous if misused. The technician using the equipment wears a film type exposure badge provided by a radiation monitoring service. He has been trained to use the equipment in such a way as to prevent any possible exposure to anyone and to absolutely minimize



X-Ray of cable splice on "wet" film (no screen medical) showing detail of improper splice. Cable ends have just been jammed into splice with no center conductor at all.

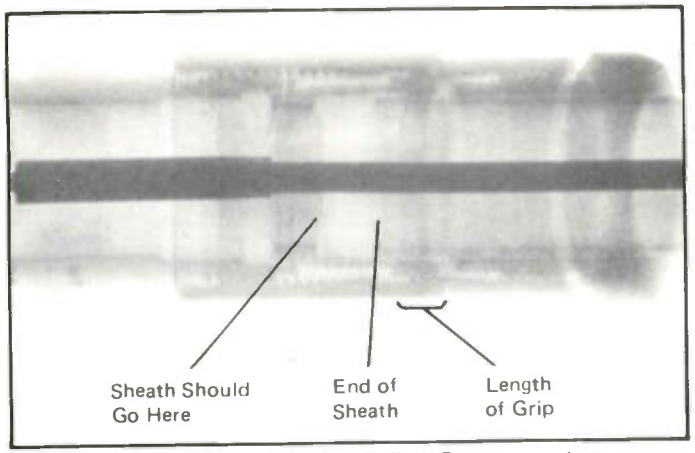


"Wet" film X-Ray of splice in .412 aluminum cable. One side is OK, other side has not been crimped or sheath clamps tightened. Center conductor is too short.



A polaroid X-Ray of the same splice which is shown above. Use of polaroid technology makes it possible for the technician to check his work while in the field. Improper splices can be corrected immediately.

the radiation to himself as the operator. When the equipment is operated sensibly and in accordance to the manuals there is no appreciable radiation exposure to to the operator.



This splice shows questionable quality. Center conductors are into collets OK, but sheath does not go far enough into connector for proper grip by clamps inside. Center conductor was left too long before installation in splice.

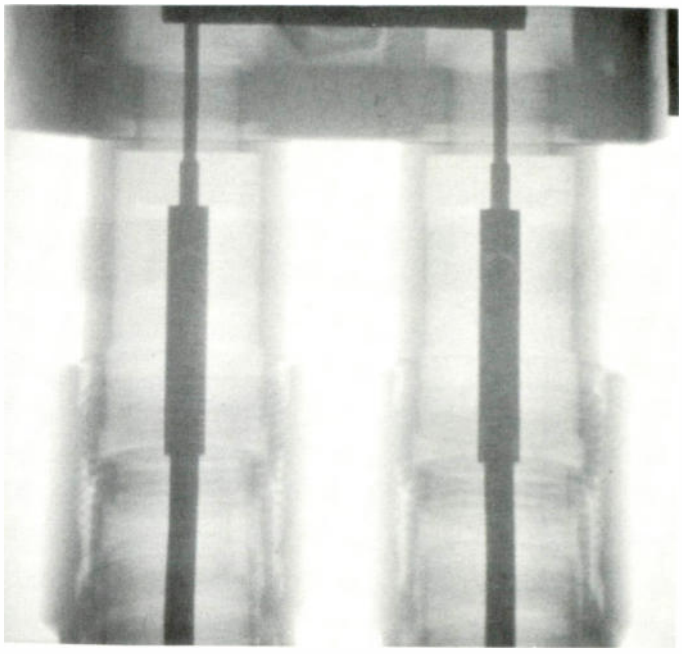
The portable field X-Ray unit can be mounted on a tripod and used to check splices made in pedestals. Here, the technician tapes polaroid film to the splice.

Best results are obtained with industrial type X-Ray films, although the system works quite well with Polaroid material. Polaroid 4" x 5" material is the most convenient to use since it does not require wet development and results can be seen in about 10 seconds. The wet development type materials, such as no-screen

medical film, give better contrast and detail and require somewhat less exposure, thus lengthening the life of the X-Ray tube. They do not give the technician instant feedback about the connection made, of course.

The X-Ray system shows detail within connectors quite clearly and can be used to check the following: (a) penetration of center conductors into collets—Is the

After preparing film and X-Ray unit, the technician steps well back and uses remote control cord to actuate X-Ray mechanism.



This is X-Ray of splice actually taken in set up shown above. X-Ray shows that center conductors are properly in collets, with satisfactory arrangement of connector parts and cable.

center conductor just barely making contact and therefore likely to let go during the next cold spell?—Are the serrations on the collet gripping the conductor? (b) detail of crimp sleeves—Has the sleeve been crimped? Has it been crimped the proper number of times? right tool?—Is there proper penetration of conductor into crimp sleeve? (c) detail of sheath clamp—Has the sheath clamping gripped the cable sheath?—Are any

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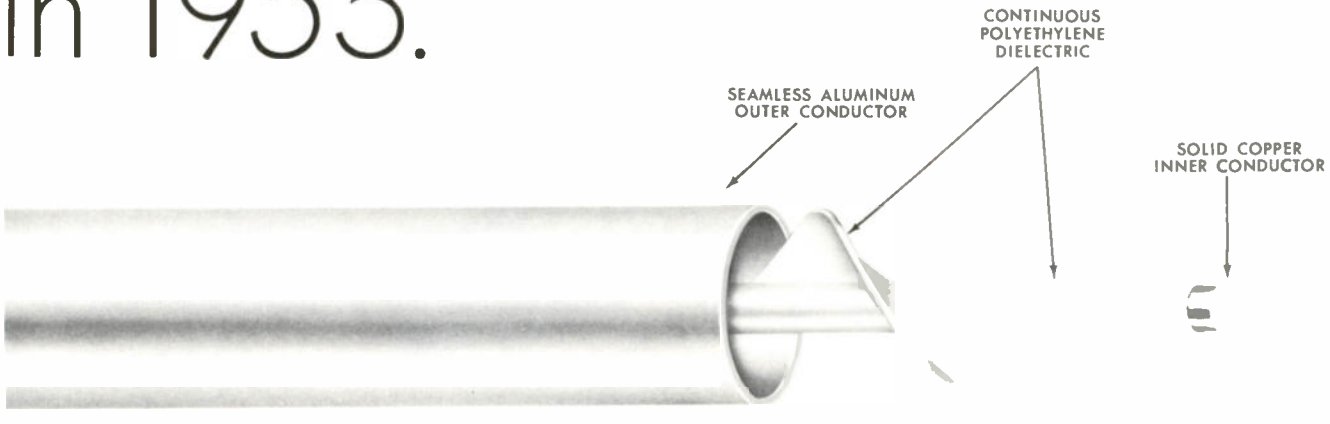

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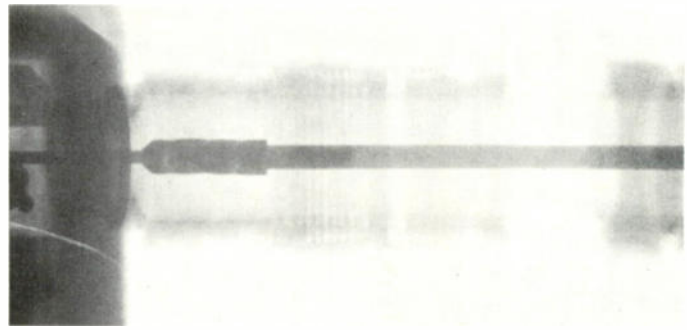
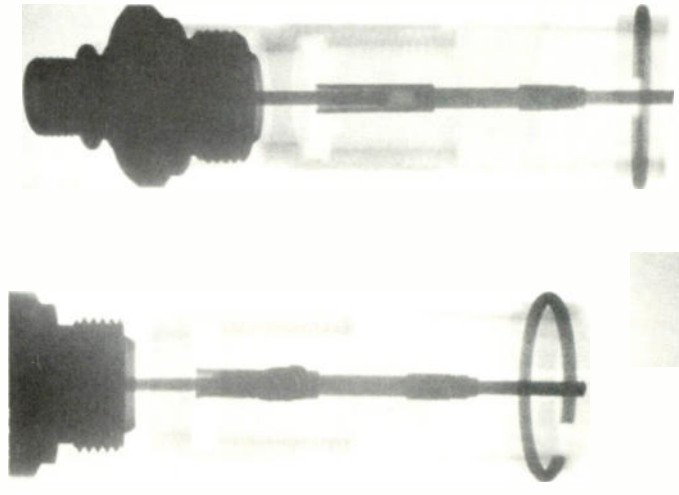


Field X-Ray (polaroid film) of VSF-750A connector on amplifier housing showing adapter pin crimped onto center conductor.

connector parts missing inside? (it does happen) (d) center conductor concentricity—Is there any buckling of the center conductor which could cause short circuit at some future time?

After the system is in operation it is expected that the X-Ray equipment will be used to help track down any intermittent connectors or splices which were missed during construction. X-Ray inspection does not require interruption of service, as does visual inspection which requires that the connector be taken apart. Protective boots and taping can be left in place. The X-Ray looks right through them.

The equipment is moderately expensive—around $3,000— but probably within the means of medium and large size cable TV operations. Systems considering the use of X-Ray equipment must keep in mind the personnel hazards involved in the use of X-Rays and make



Top: cable test adapter connector which was intermittent. Note poor fit of center pin into collet. Bottom: the same connector after repair with solder.

sure that the operator follows all instructions. The X-Ray head is well shielded and no radiation has been recorded so far on the film badge dosimeters of Maclean-Hunter technicians using the equipment.

Careful application of this type of equipment can be used to insure that the highest possible quality standards have been maintained during system construction, and to minimize post construction maintenance problems. TVC

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For Your Protection– Gaff Testing Method For Safety Aloft

The following safety pointers are excerpts from the author's presentation at the recent NCTA convention. CATV'ers can benefit considerably from the safety research carried on by the Bell System, the results of which are freely shared.

By R. H. Griffiths
American Telephone and Telegraph

For many years the telephone and CATV industries have worked together across the country. We have shared many problems and have solved them. One problem that we mutually share is pole safety and the injuries that result when our employees fall from aloft, contact power, or otherwise injure themselves while working on our aerial plant. This area of concern is one that can be solved by applying ourselves to two factors of the safety equation that will, if neglected, contribute to the accidental injury or death of our employees.

The first factor involves the provision of well designed, safe tools and equipment that will enable the employee to work aloft with confidence. Such tools should, if at all possible, be owned by the company so that they can be replaced or updated when they can no longer be used safely or efficiently. Training is the second factor—training that will enable the individual to use his tools and equipment in a safe and productive manner. To be effective, training must be continuous throughout an individual's career, and it must be designed to develop and constantly reinforce those safe working habits that will guard him while aloft.

I don't know what your accident experience may be, but it probably parallels ours to some extent. We find that the number of lost time injuries directly due to working aloft generally equals those experienced due to motor vehicle accidents. Last year, 15% of our lost time accidents involved motor vehicles, while an equal number involved working on poles.

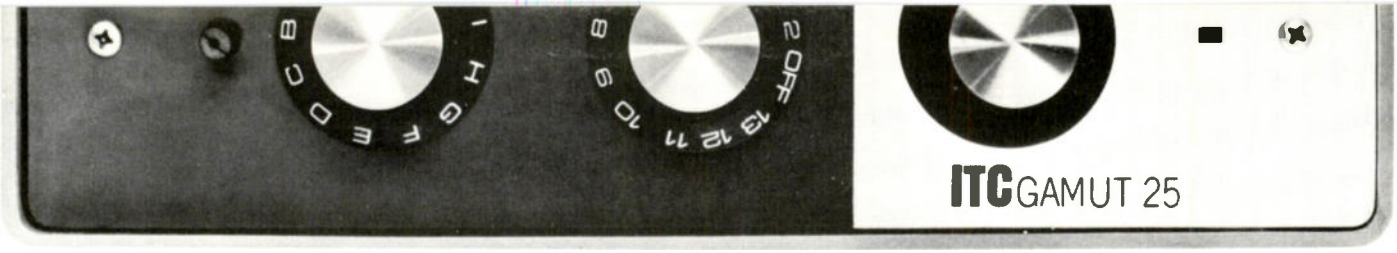
Pole safety is, then, a major area of concern. New employees, slated to become linemen or installers, generally receive a minimum of one week's training before being placed on a productive job. The majority of this training time is devoted to the development of climbing skills and safe working aloft habits that must become second nature if injury is to be avoided.

To these ends, I have prepared the following outline of a climber testing method that accurately simulates the forces applied to a working climber. This test quickly indicates which climbers are safe to use, and which must be either sharpened or discarded if cutouts are to be avoided. The test is much more critical than those generally in use.

Note: AT&T has developed a series of films on safe working aloft for both initial training supplements and continuous on-the-job training for climbing employees. According to Mr. Griffiths, Bell System companies will make these available to cable system operators on a loan basis. Contact them directly through their independent company relations personnel or through your local contact. If unable to secure use of the films in that way, contact William F. Karnes, TeleSystem Services Corporation, 113 South Easton Road, Glenside, Pa. 19038, Telephone (215) 884-6635. Mr. Karnes maintains liaison with Mr. Griffiths at AT&T's New York headquarters.

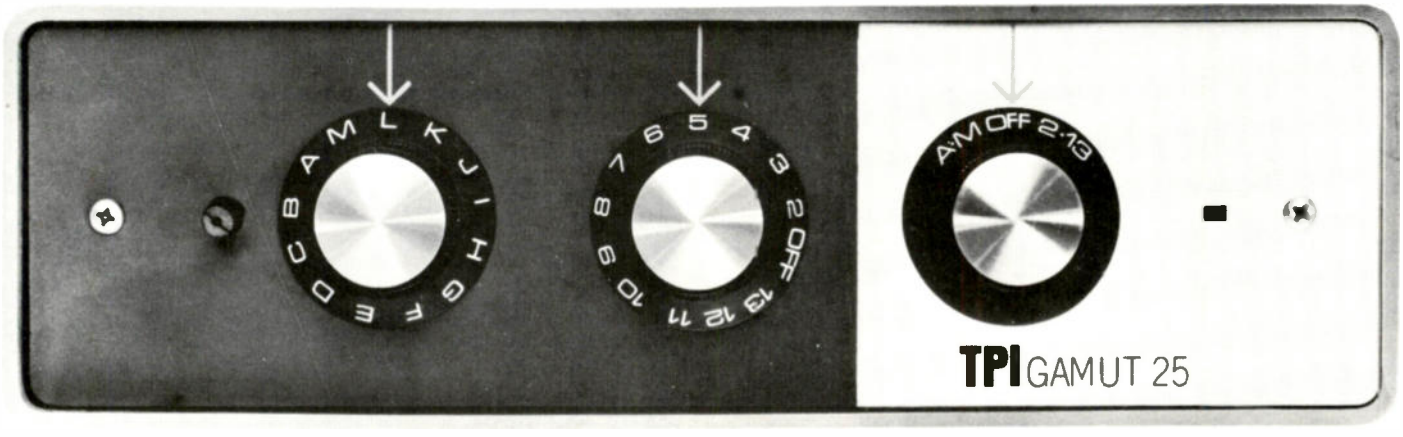
Bell's Pole Cutout Test

Proper use of the pole cutout test will enable you to climb with confidence if you do your part. The



Now that we've made a name for ourselves,

we've gone and changed it.



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test, if passed, shows that the gaffs themselves will cut in, not out. The test, which simulates actual climbing conditions, can be made just before climbing the first pole of the day. Here's how you do it:

1. Put on the climber and fasten the foot strap, but don't fasten the leg strap. Remove the gaff guard and put on both your gloves.

2. Put your hand between your leg and the climber pad with your palm toward the pole. Put your other hand on the pole to balance yourself. With your leg at a 30 degree angle—the normal climbing angle—aim the gaff toward the center of the pole. Then lightly jab it in about ¼ inch, about one foot above ground.

3. Keep just enough pressure on the stirrup to keep the gaff in the pole but not enough to cause it to penetrate any deeper. Then push the climber and your hand toward the pole by moving your knee—push without any downward pressure until the strap loop is against the pole.

4. Make certain that the strap loop is held against the pole and then gradually exert full pressure straight down on the stirrup with your leg. Do not push down with your gloved hand—it's there to protect your knee from splinters. Do not raise your other foot off the ground. It's not necessary and the unbalance caused by lifting your other foot may cause you to pivot on the pole.

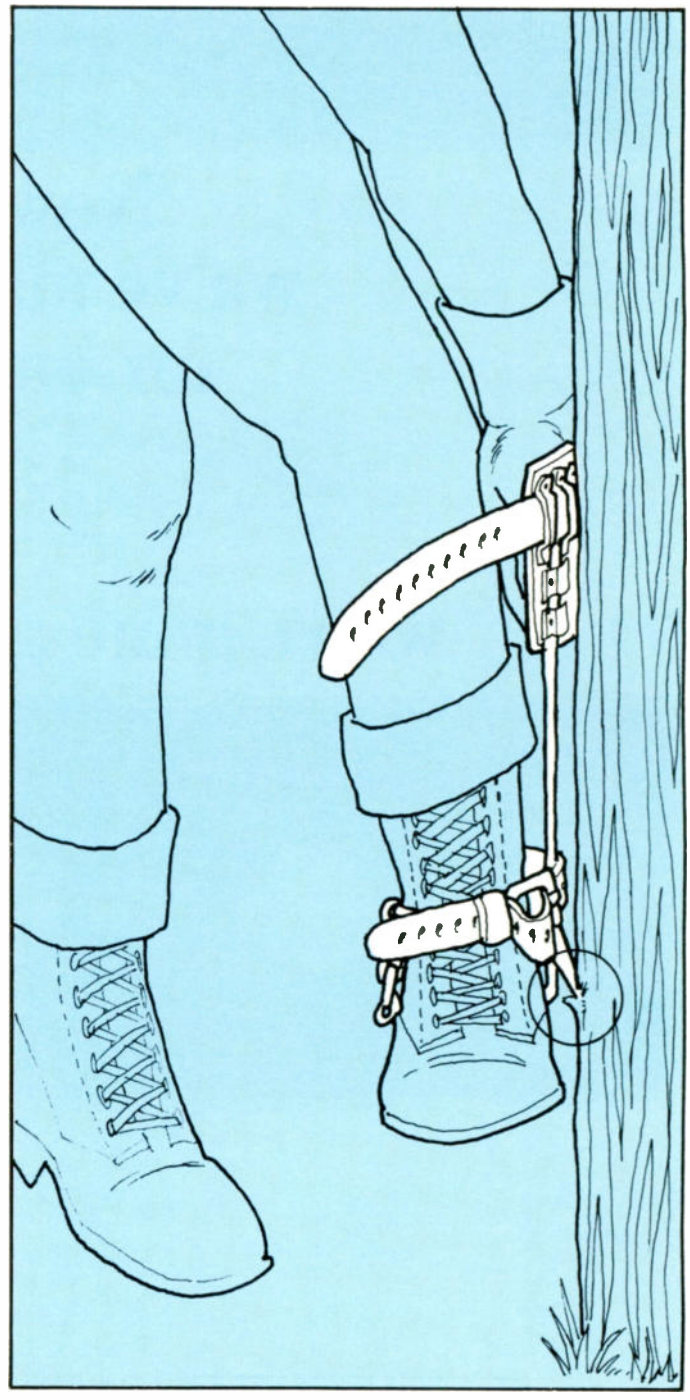
A gaff that is correctly shaped and sharp will cut into the pole and hold within two inches or less—a measurement taken along the entire length of the gaff cut.

Additional Pointers on Gaff Care

Remember—a gaff that is correctly shaped but dull or burred will cut in and hold but the length of the cut will be more than two inches. A very dull gaff or a deformed gaff will cut out or plow through the wood without cutting in.

A dull or slightly burred gaff can be sharpened with a honing stone. If honing does not enable the gaff to pass the cutout test, you must exchange your climbers for a new or machine sharpened pair. Never attempt to sharpen them with a file.

Keep the following points in mind while you make the test:



1. Select a location on the pole that is free and clear of gaff marks, cracks and knots.

2. Make sure the tip of the gaff penetrates the pole just slightly so that each test will be as uniform as possible.

3. Before pushing down with your leg, make sure the ridge of the gaff is straight up and down with the axis of the pole—don't cant or twist the gaff.

4. Measure the entire length of the gaff cut without disturbing the splinter. Measure from the point of entrance to the end of the cut.

During extensive trials conducted by the Bell Telephone Laboratories during the development of the cutout test, one point became very evident: You can't tell about the effectiveness of a gaff by looking at it. Remember: DON'T GUESS—TEST. TVC

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Performance Testing For CATV Coax – Part II

The most vital link in the signal-to-home chain of equipment is the coaxial cable itself. Accurate preconstruction evaluation of coax for electrical performance is essential to insure top signal quality and minimum maintenance problems.

By Walter L. Roberts
Director of Engineering & Research
Superior Continental Corporation

ATTENUATION TESTS

Accurate attenuation measurements are always desirable, but the critical loss and uniformity restrictions of CATV systems invoke unusual demands on precision. Systems are designed with the anticipation of transmitting signals which will arrive at their terminating points with good fidelity and at closely controlled levels. Complete confidence of uniformity on long factory lengths cannot be assured, nor can cable attenuation be guaranteed to close tolerances unless measurements are performed over the entire operating range.

The following is a discussion of some of the factors affecting accuracy of attenuation measurements. Most are applicable whether swept-frequency or point-by-point measurements are involved.

Reflection Errors

Most attenuation measurements on factory or system lengths of cable are more properly termed insertion loss measurements. A "zero loss" reference is established and a new level is measured after inserting the cable into the measuring system. If the impedances of all associated components, including connectors and patch cables match that of the cable (at the test frequency), the measured value should equal the "true" attenuation. Otherwise, effects of mismatch can combine to produce results differing appreciably from that implied by the attenuation constant of the cable. If the attenuation constant of a cable is to be determined from an insertion loss test, the greatest test error is likely to result from measurements taken on short lengths of cable.

If impedance mismatches occur between cable and measuring system, reflections occur at both junctions. In short sections of cable, multiple reflections will alter voltages at both cable input and output terminals as discussed in the previous section. When using swept-frequency techniques, this condition is usually obvious because of the undulations in voltage level observable on the oscilloscope screen. When single-frequency checks or other techniques which do not yield a frequency-voltage display are used, these effects are not so readily detected. Multiple reflections are attenuated as the reflected energy travels from terminal to terminal. If the mismatch is not too serious, a cable length of a few dB loss is sufficient for multiple reflections to become negligible (e.g., if the VSWR at junctions is no more than 2.0, the error produced by multiple reflections is less than ± 0.1 dB if the cable loss is greater than 10 dB; for VSWR = 1.1, the cable loss would have to be greater than 7 dB). The loss produced by the mismatch can be readily determined and corrected

Table I

RETURN LOSS (dB)	VSWR	REFLECTION COEFFICIENT	ATTENUATION DEVIATION	
			PERIODIC (%)*	JUNCTION (dB)
1	17.15	0.890	860	6.8
5	3.56	0.562	92	1.7
10	1.93	0.316	83	0.45
13	1.57	0.224	11	0.22
16	1.38	0.158	5.0	0.10
19	1.25	0.112	2.5	0.056
22	1.17	0.080	1.4	0.029
24	1.14	0.063	1.0	0.020
26	1.10	0.050	0.6	0.012
28	1.08	0.040	0.3	0.007
30	1.06	0.031	0.2	0.005
32	1.049	0.025	0.1	0.0026
35	1.037	0.016	0.07	0.0015
38	1.026	0.013	0.03	0.0008

*AT THE "CRITICAL" FREQUENCY OF THE CABLE PERIODICITY

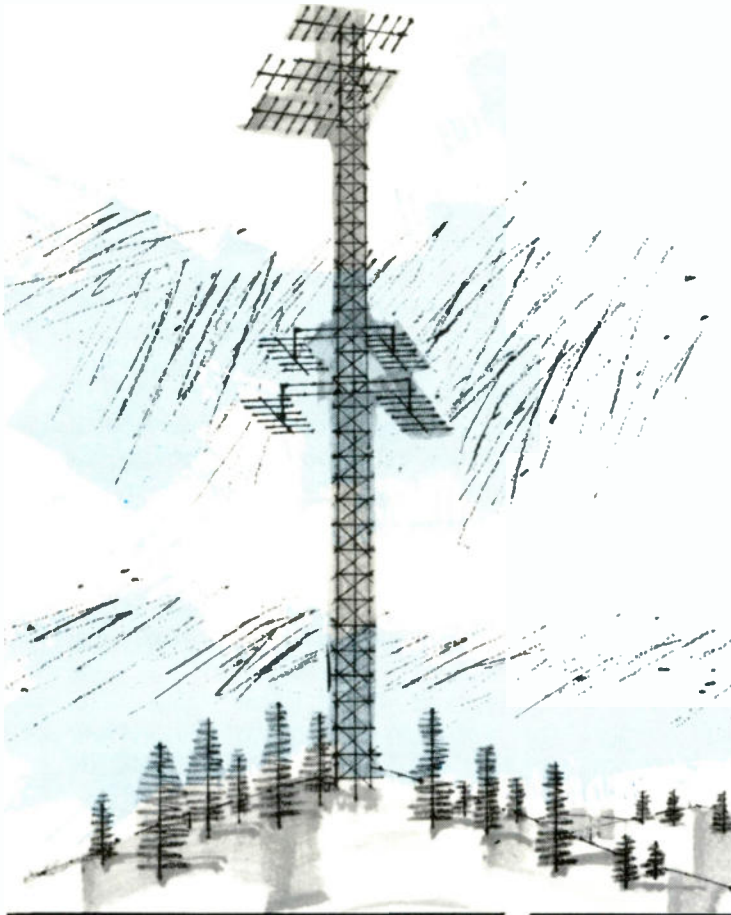
for if the cable is long enough to ignore the multiple reflections (see Table I). Other more obvious sources of error in computed unit loss result from miscellaneous sources of small fixed errors.

In practical work, test leads (coaxial) are necessary evils, particularly where measurements on installed cable are involved. The same remarks regarding multiple reflections apply to them, but use of cables with 10 dB or so loss to dampen multiple reflections would generally be too cumbersome for practical work. Use of 75-ohm, 10-dB fixed attenuators at the test lead ends between which the test cable is to be inserted will provide the attenuation needed to minimize higher order reflections. Also, impedance changes (after connecting the test cable) as viewed by the test equipment will be minimal. Even if the output side of the attenuator were short-circuited, the return loss (as viewed from the signal source, for example) would be at least 20 dB (VSWR: 1.22) with a 10-dB pad.

Length Errors

The accuracy of the calculated attentuation per unit cable length is no better than the uncertainty associated with the length measurement of the cable section. Cable lengths are normally determined and specified to an accuracy within ±1% in manufacturing, but it is seldom that an in-place length of cable is known to this accuracy. There are several techniques available for verification of cable length, in addition to the conventional chaining method. If the cable capacitance per unit length is known, a section may be measured using an accurate capacitance bridge. Capacitance of most currently manufactured CATV coaxial cable is maintained to about ±1.25%. If published data on a particular type is not available, measurements taken on known lengths provides useful data for estimating unknown sections. Naturally, a section must be clear of terminations and other sources of leakage if measurements are to be accurate.

A more sophisticated method for determining length utilizes a pulse echo technique and computation by use of measured time delay for the



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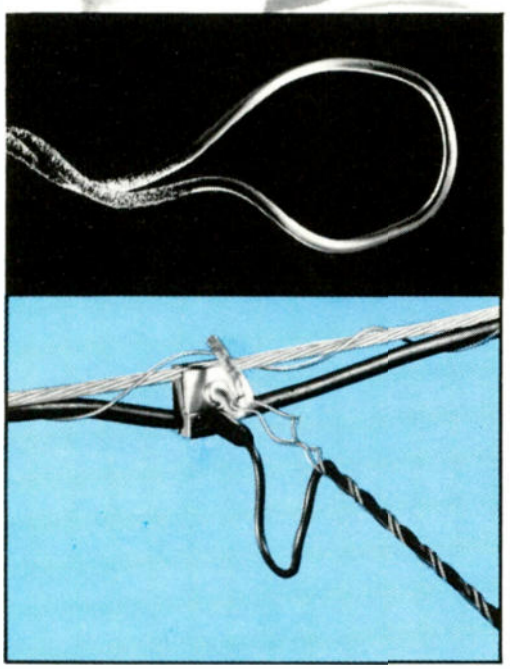

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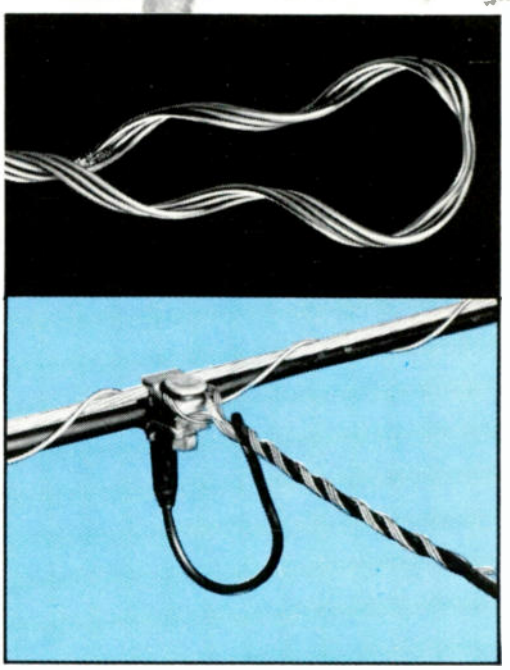

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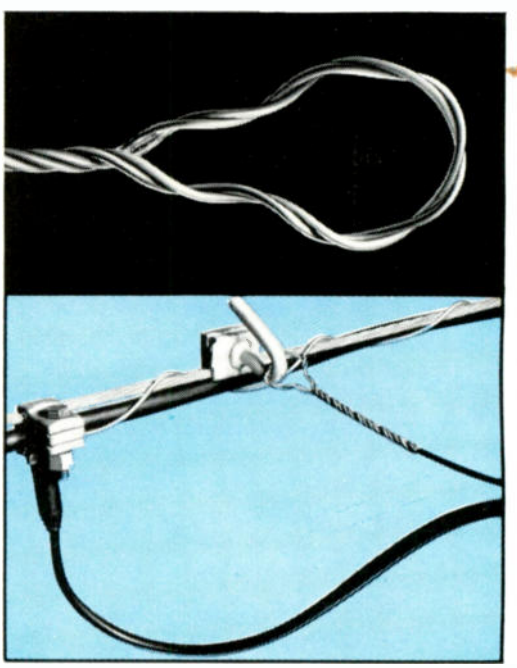

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pulse to traverse the cable and return back at the input. Equipment commercially available is capable of measuring time delay accurate to a few tenths of one percent. Accuracy to which the velocity of propagation is known is usually the limiting factor. Since the velocity is inversely proportional to the square root of the dielectric's permittivity while capacitance is directly proportional to it, the pulse reflection measurement is more immune to error from variations in permittivity. The echo test result is not vitiated by the presence of local minor discontinuities along the cable.

Temperature Effects

High-frequency attenuation of a coaxial cable with copper conductors changes approximately 0.11% per degree F temperature change. This estimate applies with negligible additional error to aluminum sheathed coaxial cable with a copper inner conductor. A limited number of tests performed over a 70°F temperature range (+70 to +140 F) have failed to detect a noticeable deviation from the above approximation when measuring foam polyethylene dielectric, aluminum sheathed cable. Changes in dissipation factor would cause a departure from this approximation, noticeable especially at frequencies in the 200-MHz range. More sensitive tests might reveal a measurable change but, apparently, this can be ignored in practical cases.

If measurements are taken on in-place cable, the actual cable temperature is likely to be uncertain to perhaps ±10 F. Application of the 11% per °F approximation would predict an error of ±1.1%, if temperature correction were made to this accuracy. Failure to reckon at all with temperature could result in a five or six percent error in extreme cases.

Frequency Errors

Attenuation varies approximately with the square root of frequency. Therefore, a one-percent frequency error would cause only a half-percent error in computed attenuation. Crystal controlled frequency markers are commonly used and error from this source should be negligible, if these are used.

Attenuator Errors

As with return loss measurements, an attenuator is the heart of the method. Any error is reproduced directly in the test results. Accurate step attenuators are available at modest costs for use at frequencies covering the CATV range.

Switches can develop subtle problems and resistors can change values after thermal or mechanical shock, so it is wise to have several good, stable fixed attenuators available for quick verification, should there arise any suspicion of error. A means of calibrating is absolutely essential if accuracy is to be preserved.

PROPOSED CABLE TESTS

In order to assure adequate performance in an operational system, sufficient tests must be performed on the cable and realistic test limits must be established and achieved. Obviously, only initial properties can be assured through such tests. Stability and permanence of properties must be assured through proper design, life testing, and experience. Though return loss and attenuation tests have been the object of all of the preceding discussion, there are a couple of relatively simple tests that should be made on all factory lengths of coaxial cable. Dielectric strength tests commensurate with the capabilities of the dielectric medium offer clear proof of integrity of the dielectric. Low-frequency (say 1 kHz) capacitance should be measured on all factory lengths, using an accurate capacitance bridge. Also, DC resistance can be measured simply and accurately using a conventional Wheatstone bridge. Control of DC resistance is of concern where remote powering is employed in the system. It is important to verify that DC continuity is preserved both for center conductor and shield. An actual case can be cited where attenuation and return loss measurements indicated perfectly normal cable for a long factory length of jacketed coaxial cable, yet the outer conductor was completely separ-

ated at a point about halfway through the reel length. A simple DC continuity test was necessary to expose this defect while still on the cable reel.

The following tests should apply to all CATV coaxial cable though specific test values for basic properties (e.g., attenuation constant) must be made consistent with the particular cable design:

(1) High voltage dielectric proof tests (AC or DC) with voltage commensurate with dielectric capability should be performed on every factory length.

(2) DC continuity of center conductor and (when jacketed) also outer conductor should be verified. DC resistance values are preferred and would serve also as continuity verification.

(3) Low-frequency coaxial capacitance should be measured by a method which will assure an error of no more than ±1%.

(4) Return loss should be measured from both ends of every factory length of cable. Return loss should be measured with respect to a fixed, 75-ohm resistive standard. Worst value in the measuring frequency range should be established after reducing the sweep width in the vicinity of the frequency associated with the worst value until the reflected voltage attains a maximum level. Return loss measured at this point will be the minimum for that reel. An acceptable minimum value shall be no less than 26 dB return loss at any frequency in the operating range for trunk and distribution coaxial cable, and no less than 20 dB for drop coaxial cable. It will be recognized that, for frequencies at which the attenuation of the cable exceeds about 25 dB, return loss measurements do not yield significant information about the uniformity of the cable near the center of the length.

(5a) Attenuation (insertion loss) shall be determined at the highest anticipated cable operating frequency. Test method accuracy shall be such that no more than ±2% error will result when cable loss exceeds 15 dB.

(5b) Sweep testing for attenuation uniformity shall be performed over the operating frequency range. If a length has been found to conform to return loss requirements *and* if DC continuity has been established, *and* if attenuation at the highest operating frequency is normal, it may be presumed that attenuation uniformity over the lower frequencies is normal.

(5c) Every length shall exhibit a measured insertion loss equal to or less than the maximum value specified for that particular cable design, after correcting measured results to the temperature specified.

The information provided by this set of tests should be sufficient to define performance for CATV systems. Consideration of other methods should include a careful appraisal to be certain that the test results obtained are meaningful and applicable to system performance. Hopefully, a set of uniform test methods for CATV coaxial cables will soon be realized and accepted in the industry. It is the sincere wish of the author that the preceding discussions will contribute something positive toward that achievement.

APPENDIX A: RETURN LOSS TEST FOR COAXIAL CABLE

I. Scope

This method involves use of a well-balanced RF bridge to compare cable impedance with that of a fixed, 75-ohm resistive element, both functioning as adjacent arms of the bridge circuit. A wide-band swept signal source, equipment for amplifying and detecting the reflected signal, an accurate variable attenuation (all accurate over the test frequency range), and a convenient display device such as an oscilloscope are basic to the method.

The method described is suitable for return loss testing at frequencies up to 300 MHz. The method is essentially that described by Simons[11] except that a fixed, resistive reference arm in the bridge circuit is used. Return loss measurements to approximately 40 dB return loss are possible at frequencies up to about 220 MHz and to about 32 dB up to 300 MHz. Overall accuracy allows measurements with approximately ±1 dB error at 25 to 26 dB return loss levels. The error increases to about ±3 dB at measured values in the region of 34 to 36 dB return loss.

II. Cable Preparation for Test

Matched, 75-ohm connectors compatible with those used on the return loss bridge should be carefully installed on ends of cable to be tested. Use of adaptors to mate test connectors to the bridge should be avoided, if at all possible. Use of "slip fittings" (usually modified permanent connectors) to reduce connection time is permissible if impedance characteristics of the connector are undisturbed.

III. Method

A. Equipment

1. Return Loss Bridge (Spencer-Kennedy Laboratories reflectometer, Model 701, or equal).

2. 75-ohm Termination (SKL Type N, 75-ohm termination).

3. Sweep Generator (Telonic HD 3X8, or equal).

4. Coaxial Switch (Jerrold Electronic Corporation, Model FD-30R).

5. Wide Band Amplifier - 40 dB (Kay Electric, Model 1025B, or equal).

6. Detector (SKL Model 703, or equal).

7. Cathode Ray Oscilloscope (Tektronix 310A, or other general purpose oscilloscope).

8. Variable Precision Attenuator (JEC AV-75, Telonic 9075, or equal).

9. Interconnecting Cables, as required.

10. Camera and Adaptors, if required.

(Note: Rohde & Schwarz Polyskop SWOB and Selektomat USWV may be substituted for Items 3 through 8.)

B. Procedure

1. Connect test equipment as indicated in Figure 2.

2. The following connection precautions should be observed:

(a) Minimize all test lead lengths as much as practical considerations permit. (b) Arrange the equipment to allow direct connection of the RF bridge to the cable being tested. Jumper cables and most connector

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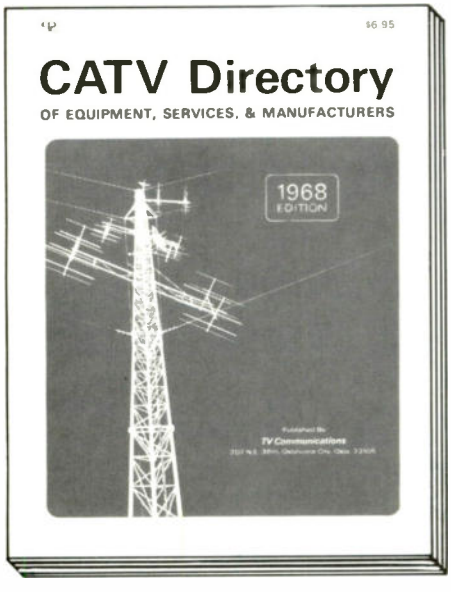

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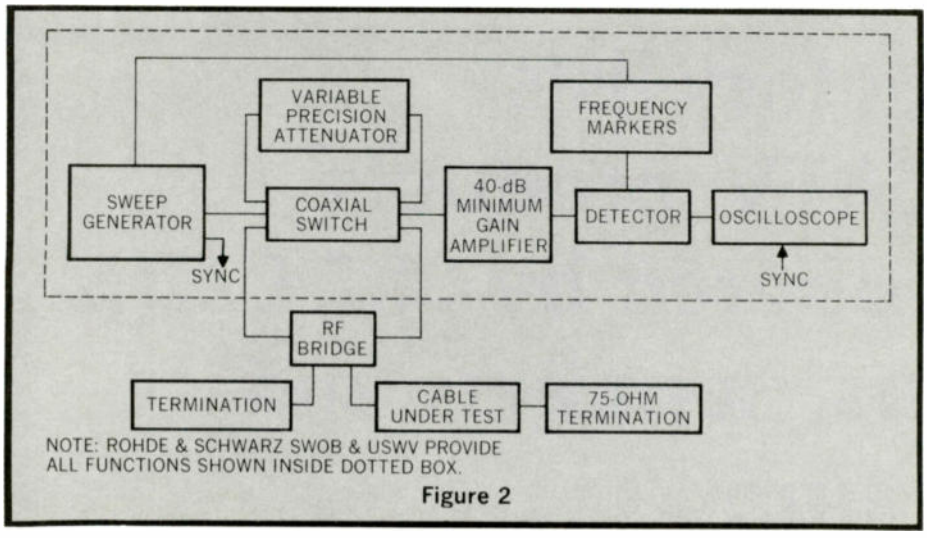

Figure 2

adaptors will produce frequency sensitive reflections sufficient to vitiate test results.

(c) Jumper cables between the coaxial switch and RF bridge should be matched in type and length to jumpers between the coaxial switch and precision attenuator. This will minimize extraneous deviations between reference and test circuits. Otherwise, annoying (frequency related) corrections to the measured return loss may be required.

3. After adjusting equipment to the desired frequency operating range, determine the zero return loss reference level with bridge open-circuited and also short circuited at the test terminals. Both levels should agree to within a couple tenths of one dB. Reduce sweep generator level by 10 to 20 dB, observing coincidence of reference and zero traces to be certain amplifier is not near a saturation level. Record the attenuator setting as "zero return loss reference."

4. Terminate the test terminal of the bridge with a precision 75-ohm termination and verify that balance (to at least 35 dB) is achieved.

5. Connect test cable to bridge and adjust sweep generator and amplifier levels until an easily discerned trace is obtained on the oscilloscope screen.

6. Adjust the precision attenuator until its trace intersects the worst (least return loss value in the frequency range being tested. Note any other values that might be nearly so poor (within 2 to 4 dB) as the worst.

7. Reduce sweep width in the region of the worst value and adjust the precision attenuator to maintain coincidence between the two traces. Continue the sweep width reduction until no further decrease in return loss is noted. Record the value indi-

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cated on the precision attenuator.

8. Restore full sweep width and then repeat step 7 above for the next worst value. If its bandwidth is sufficiently narrower than that of the worst value, it is not uncommon to find that the apparent penultimate value is actually the poorest value at reduced sweep width. If this is found to be the case, record this as the worst value.

9. Subtract the value recorded in step 3 from that recorded in step 7 (or step 8). The resultant is the minimum return loss for that terminal.

10. If a factory length of cable is under test, repeat previous step for the other cable end. The minimum return loss for that reel of cable is then the least value as determined from either cable end.

IV. Calculations

A. Calculation of return loss for the reel length tested is given in III-9 and III-10.

B. Reflection coefficient, if desired is determined from:

$$\Gamma = \log_{10}^{-1}\left(\frac{RL}{20}\right)$$

where:
Γ = reflection coefficient
RL = return loss (dB)

C. VSWR, if required, is related to the reflection coefficient by:

$$VSWR = \frac{1 + \Gamma}{1 - \Gamma}$$

V. Report

Report the following:

1. Date of test.
2. Test cable identification (cable type, reel number or location if installed, length, etc.).
3. Sweep frequency range tested.
4. Minimum return loss and its related frequency.
5. If required, photos of return loss versus frequency trace with data identifying frequency markers, return loss values, and cable identity.

VI. Accuracy

Accuracy of the precision attenuator used, limits test accuracy in the lower return loss range (20 dB or less) to basically that of the attenuator. Typically ± 0.2 dB is possible through individual attenuator laboratory calibration. Errors tend to increase at higher frequencies, so it is important that working frequency not be indiscriminately extended.

Resolution of oscillographic traces and minimum attenuator steps limit overall test accuracy to about ± 1 dB at return loss values up to about 26 dB. At values appreciably greater than this, reactive residual impedances in connectors, basic bridge balance, and 75-ohm termination precision tend to become limiting.

Calibration of the 75-ohm termination can begin with an accurate DC resistance measurement. Extension of calibration to higher frequencies may be accomplished through impedance bridge measurements, usually limited to a couple MHz, and admittance bridge measurements, extending into VHF and UHF frequency ranges.

Experience with test components cited in this procedure has shown test errors approach ± 3 dB as basic return loss values improve to the 34- to 36-dB range.

APPENDIX B: FIELD ATTENUATION MEASUREMENTS

I. Scope

This procedure is intended for cable loss measurements under field conditions or other circumstances where the cable ends are widely separated. The basic method involves use of a wide-band swept signal source, an accurate step attenuator, and an RF detector preceded by a tuneable band-pass filter whose center frequency is adjusted to the desired test frequency (e.g., a field strength meter). Measurements are made by insertion of the test cable between the generator and standard attenuator and the subsequent restoration of the original detector output level through reduction of the attenuator loss. (A fixed-frequency signal source can be used alternatively if the detector requirements for modulation are met.) The fre-

quency range for the test equipment described is limited to the 54- to 220-MHz range. Use of other generators and detection equipment will allow extension of the frequency range while preserving the basic method.

For best overall results, tests should be conducted on cable lengths and test frequency range sufficient to produce a loss of at least 6 dB. Under this restriction, measurement accuracy will be limited essentially by that of the standard attenuator.

Calculated attenuation per unit cable length will be no more accurate than the accuracy to which the cable length is known. For this reason, included in this procedure is a method for determining the length of the cable whose unit length loss is to be measured. Accurate determination of length is imperative if precise attenuation measurements are to be achieved. A capacitance measurement technique for verification of length is described. If available, a TDR could be used to determine length to even better accuracy than available from the capacitance method.

II. Cable Preparation for Test

Where cable attenuation (as contrasted to system loss) is of primary interest, a cable length free of splices, splitters, taps, or other insertions should be selected for testing. An abnormally large dissipation factor recorded while measuring cable capacitance is good evidence that the cable is not free of insertions and, in such cases, further measurements should be suspended until these have been isolated.

The cable length should be at least a 6-dB section at the lowest test frequency. Matched (75-ohm) connectors are preferred, but other types (UHF, etc.) may be used if stubs between test cable and the 10-dB pads are avoided. (See procedure Section III-B for details.)

III. Method

A. Equipment

1. Impedance Bridge (General Radio Type 1650-A).

2. Step Attenuator (Telonic TG-9075, Type N modified).

3. Sweep Generator (Jerrold 601).

4. Field Strength Meter (Jerrold 704-B).

5. Second Field Strength Meter (or SKL-703 Detector plus Hewlett-Packard VTVM 403-B and Monitor Network—SKL 429-C).

6. Attenuator Pads, 75-ohm, 10-dB (SKL 438-6). (2)

7. AC Voltmeters (150 volts). (2)

8. Powerstats (2 amp, 0 to 150 volts). (2)

9. 120-volt Converter, if required (Daystrom DM-276).

10. Patch Cords and Adaptors, as required.

11. Mercury Thermometer (-20°F to 260°F range).

B. Procedure

1. Connect test equipment as indicated in Figure 3.

2. The following equipment switch settings should be selected and should not be changed during the duration of the tests:

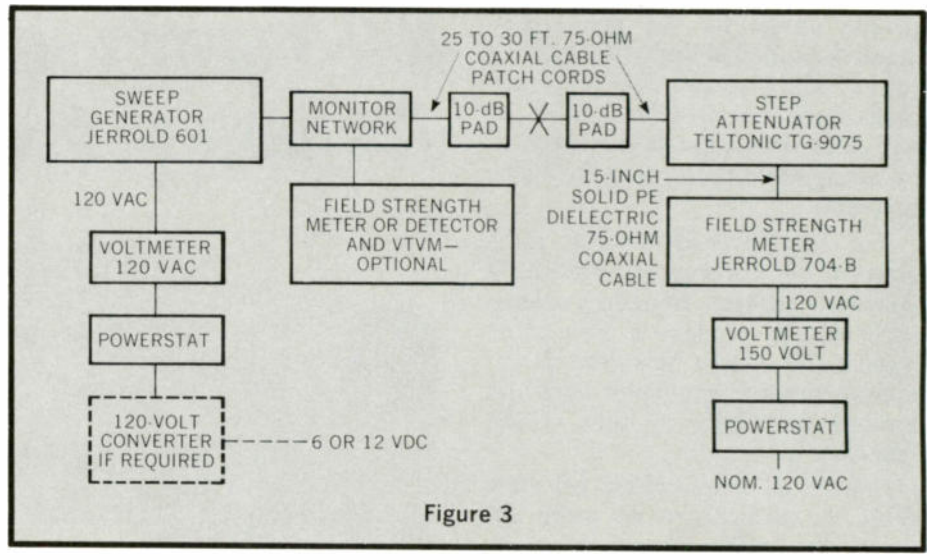
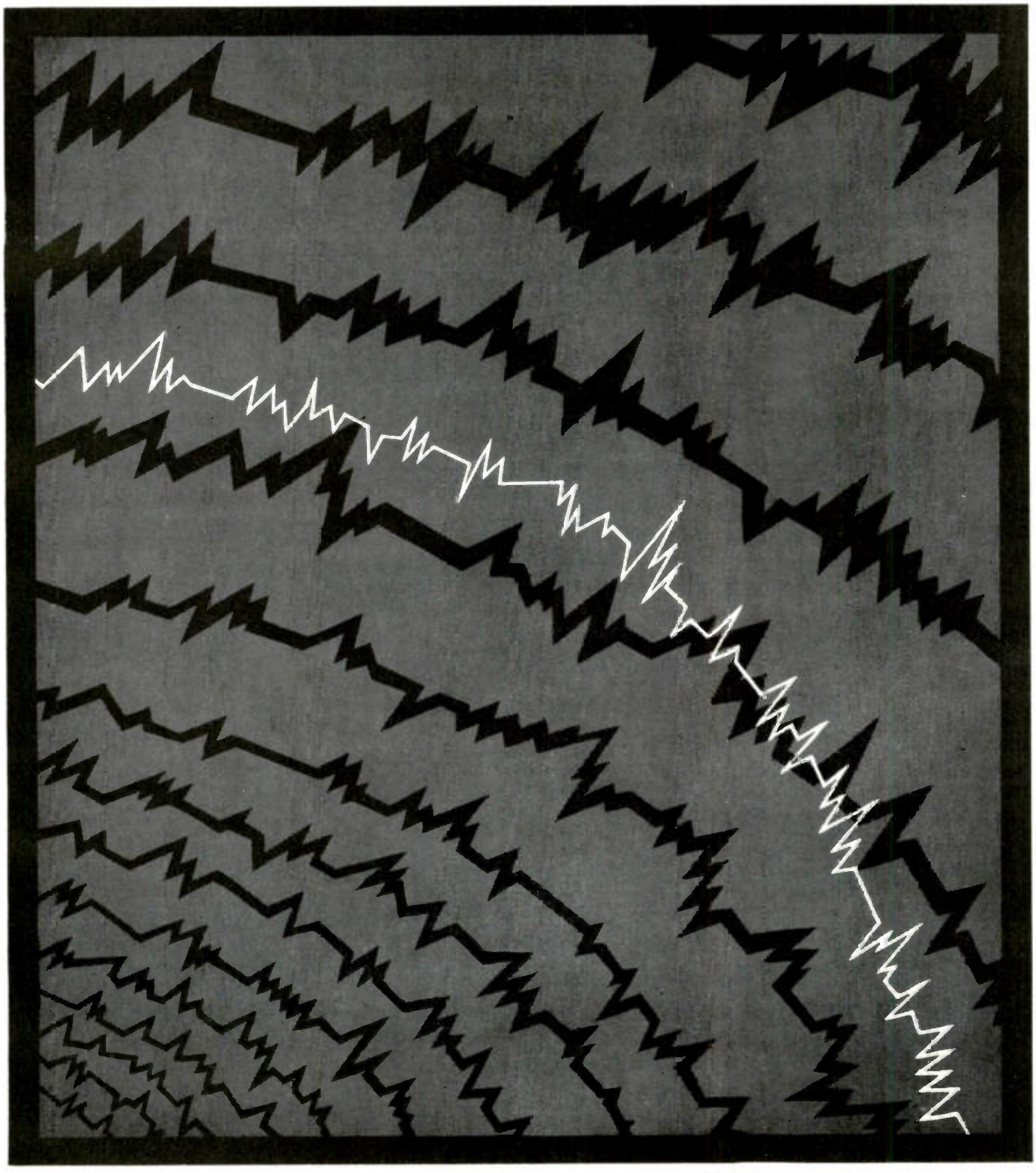


Figure 3

(a) Sweep Generator—1. ALC: about 80% max. (mark knob position). 2. Horizontal Phasing: approximately 50% max. 3. Sweep Range: 45 to 225 MHz (or as desired). 4. Sweep Width: Max. (sweep width should extend at least 2 MHz beyond range to be measured). 5. Switch Attenuator: 10 dB "in." (b) Step Attenuator—1. Switch in sufficient attenuation that a minimum of 10 dB will remain after insertion of the test cable when the original voltage level at the detector is restored. Record this attenuator setting.

(c) Field Strength Meter—1. Tuner Compensator: 50. 2. Function Switch: "Signal Strength."

3. Switch Attenuators: 20 dB "out" (both). 4. Range in Microvolts: 0 dBj.



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3. Turn on equipment and adjust the powerstats for 120 VAC input voltage. Allow 15 minutes initial warm-up.

4. (The following steps assume tests to be made over the VHF range:) Adjust the generator ALC and field strength meter range in microvolts switch to obtain approximately a midscale meter indication on the field strength meter. Tune the meter to Channel 2 picture carrier frequency and record the meter level in dB. Likewise, record the meter level for each of the remaining VHF channels. If the generator output level is monitored with a field strength meter, record the level for any one channel for reference only.

5. Move the sweep generator to far end of the test cable and reconnect power leads to allow warm-up to begin.

6. Disconnect the ends of the test cable. Measure and record the cable capacitance and dissipation factor using the General Radio impedance bridge. If the measured dissipation factor exceeds 0.01, inspect the cable for inserted equipment or splices. If the dissipation factor is less than 0.01, proceed to step 7.

7. Connect the generator and field strength meter to the test cable through their respective 10-dB pads. If generator output is monitored, be certain the level recorded in step 4 has been restored.

8. Tune the field strength meter to Channel 2 and remove sufficient attenuation to reproduce the meter indication recorded for Channel 2 in step 4. It should be possible to reproduce the meter level to within ±0.5 dB of the original value. Record both attenuator and meter levels. Then repeat for all channels through Channel 13.

9. Return the sweep generator to the cable end at which the field strength meter is located and recheck original settings at several frequencies to insure the major shifts have not occurred through inadvertent movement of controls on the equipment.

10. Measure and record outside air temperature in the immediate vicinity of the test cable.

IV. Calculations

A. Calculate cable length from capacitance data.

1. If dissipation factor* cannot be ignored, correct measured capacitance by the following:

$Cm\ (corrected) = Cm\ (1 + D^2)$
where: D = dissipation factor

2. Calculate cable length from:

$L = Cm/Cu$ feet where:

Cm = measured cable capacitance (pF).
Cu = unit cable capacitance (pF/ft).

B. Calculate cable loss at a particular frequency by the following:

$\alpha = A_1 - A_2 + M_1 - M_2$

where:
A_1 = attenuator initial setting (step 4, section III).

A_2 = attenuator final setting (step 7, section III).

M_1 = field strength meter initial level (step 4, section III).

M_2 = field strength meter final level (step 7, section III). (be sure to observe algebraic sign on M_1 & M_2 settings).

C. Correct cable loss by 68°F by the following:

$\alpha_{68} = \alpha_T [1 - 0.0011]$ (T-68)

where:
T = temperature in °F (step 10, section III).

D. Convert cable loss to unit length loss by:

$\alpha = \alpha/L$ dB/foot or
$\alpha/D = 100\ \alpha/L$ dB/100 feet

$D\ actual = D\ apparent^{\frac{-2\pi f (R'C')}{3}}$

(R', C' measured loop resistance and capacitance)

For example: HB 4920, 3000 ft.,
$D_{true} = D_{app} - 0.001$ at 1 kHz

V. Report

A. Report the following:

1. Date of test and cable identification (size, location, etc.).

2. Cable (or outside air) temperature.

3. Cable capacitance and dissipation factor at 1 kHz.

4. Computed cable length.

5. All original signal level and attenuator measurements and test frequencies.

6. Calculated unit loss at each test frequency (converted to equivalent 68°F loss).

VI. Accuracy

1. If the method of this procedure (including the use of all calibration charts) is employed, an overall accuracy to ±6% is achievable when measuring a 6-dB cable section and assuming test errors to combine randomly. For 15-dB or longer sections, an overall accuracy to ±2% is attainable.

2. If the method of this procedure is followed with the exception of use of calibration corrections, the overall error would range from ±7% with 6-dB sections down to ±3% for 15-dB or longer sections.

3. If capacitance measuring techniques cannot be accomplished, length error may predominate, and an error estimate would not be within the scope of this procedure. TVC

11—Simons, K., "A Bridge Method of Sweep Frequency Impedance Measurement," **Jerrold Technical Newsletter,** October 1964.

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CATV Noise Level Standard; New NCTA Tech Proposal

Development and acceptance of technical standards which are both adequate and practical remains as one of the industry's most urgent projects. To that end, the NCTA board has approved this proposed standard, and all pertinent comments are now solicited.

I. Scope

This standard defines terms, specifies test methods, and suggests techniques for determing noise level in cable systems. Reference to this standard may be made by appending the phrase "measured in accordance with NCTA Standard 005-C" to a statement of noise level or signal-to-noise ratio.

II. Definitions

(A) Noise

As used in this standard, the term "noise" refers only to the random energy generated by thermal and shot effects in the system amplifiers. Noise from sources such as ignition interference and other energy received by system antennas as well as noise due to intermittent contacts or components in the system is specifically excluded.

(B) System Noise Power

The system noise power is defined as the noise power delivered by a specified output terminal of the system to a 75 ohm termination. It is either measured with a power meter having a noise bandwidth of 4 MHz centered at a specified visual carrier frequency, or with another instrument, such as a signal level meter (SLM, see definition II H) which has been calibrated to allow conversion of its readings to equivalent power in a 4 MHz band and which is tuned to the specified frequency. While system noise power is being measured, signals normally carried by the system (other than those required to operate the AGC—see Section III B-3) are removed if their presence measurably affects the noise reading. It is essential that each amplifier in the system be operated at normal gain during the test.

(C) System Noise Level

The system noise level, expressed in dBmv is defined by:

$$\text{System noise level} = 10 \log_{10} \frac{\text{(System noise level as defined above)}}{\frac{1}{75} \text{ microwatt}}$$

($\frac{1}{75}$ Microwatt is the power developed by 1 millivolt rms across 75 ohms. This is the power corresponding to 0 dBmv.)

(D) System Signal-to-Noise Ratio

The system signal-to-noise ratio expressed in dB, for given system terminals and a given visual carrier frequency, is defined as the difference between the normal signal level in dBmv at that frequency and the system noise level as defined above, at the given output terminal.

(E) Trunk and Distribution System

A trunk and distribution system is defined for the purposes of this standard as a system whose input terminal is the input terminal of the first trunk line amplifier and whose output terminal is the output terminal of the amplifier removed from the first amplifier by the greatest number of cascaded amplifiers.

(F) Head-End System

A head-end system is defined for purposes of this standard as a system whose input terminals are the input terminals of the antenna preamplifiers, or where a preamplifier is not used, the input terminals of the head-end converter or channel strip amplifier, and whose output terminal is the point at which the signals from all channels are combined in a common cable, following normal test points and AGC control carrier insertion devices.

(G) Complete Cable System

A complete cable system is defined for purposes of this standard as a system whose input terminals are those defined above for the head-end system, and whose output terminal is that defined above for the associated trunk and distribution system.

(H) Signal Level Meter

A selective receiver tunable to the TV channel frequencies and calibrated to measure input voltages in millivolts, and input levels in dBmv. This unit has been known, in the CATV industry, as a field strength meter. Since it is usually used to measure signal level and not field strength, it is felt that it is better described as a "signal level meter" (abbreviated "SLM") and the older designation should be discontinued.

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III. Method of Measuring System Noise Level

(A) Noise measurement is conveniently made at a high level output terminal

Where greatest accuracy is to be attained, it is desirable that the noise level being measured be substantially (15 dB or more) above the noise level inherent in the signal level meter. Where the meter has limited sensitivity, it also is necessary to measure at a point in the system where the noise level is high enough to give an accurate reading on that unit.

These two considerations indicate that the most convenient point in the system at which to measure noise level is at the point where normal signal levels are the highest. In a trunk and distribution system this occurs at distribution amplifier output terminals. At this point, a normal signal level between +40 and +50 dBmv may be expected. (Note: The level at test points is normally too low; the actual distribution terminal must be used). A reasonable signal-to-noise ratio (40 to 50 dB) would indicate noise levels between -10 and +10 dBmv, which would fall within the measuring range of a typical signal level meter used in CATV.

(B) Trunk and Distribution System Noise Level

To measure the trunk and distribution noise level:

(1) Terminate the input terminal of the first trunk amplifier; (the system input defined in Section II E) with a 75 ohm coaxial termination resistor. (Note: Where it is more convenient, this termination may be connected to the input end of a cable of any length which connects to the input terminal of the first amplifier, for example, at the point where this cable leaves the head-end).

(2) Leave the gain controls on all manual amplifier stations at their normal settings.

(3) When the system includes amplifiers with automatic gain control, make sure that these amplifiers are operating at the same gain during the noise level test as during normal operation. (a) This can be done by switching each such amplifier to manual operation prior to the noise level test, adjusting the gain control so the signal output levels (and thus the gain) are the same as in the automatic condition. (b) Where a pilot tone AGC is used, normal gain can be assured by leaving the pilot tone connected to the system at normal level during the noise level test. The input cable in this case should be terminated on the head-end side of the pilot tone injection filter (or directional coupler). (c) With a level control system that responds to the average of some or all of the signals present, it may be possible to obtain normal gain by eliminating all but one of the signals at the head-end and measuring at frequencies well removed from the frequency of that signal. (4) Connect the output terminal of the last amplifier (the trunk and distribution system output terminal as defined in Section II E) to the noise-measuring instrument (calibrated signal level meter) and measure the noise level, applying corrections as required to obtain standard readings. (Note: It is good practice to make this measurement at several channel frequencies spaced across the band in use.)

(C) Head-End System Noise Level

(1) Head-end equipment usually employs automatic

gain control. Prior to the noise level test, switch each channel to the manual condition and adjust the gain control for the same output obtained in the automatic condition. This sets each part of the head-end system to normal gain.

(2) Terminate each input terminal (as defined in Section II F) with a 75 ohm termination resistor.

(3) Connect the output terminal of the head-end system (as defined in Section II F) to the noise-measuring instrument (SLM) and measure the noise level, applying corrections as required to obtain standard readings. (Note: When the normal signal levels at this output terminal are below -40 dBmv, it may be difficult to measure noise level. In this case, introduce the combined output through a variable attenuator into a line amplifier which has been adjusted for flat response. Set the attenuator for a convenient output from the line amplifier (for example +45 dBmv). In this case the output terminal of this amplifier is considered to be the head-end system output terminal. See Appendix II.)

(D) Complete System Noise Level

(1) Adjust head-end equipment gain and terminate as described in Section III C.

(2) Set manual and AGC trunk line amplifiers for normal gain as described in Section III B.

(3) Connect the output terminal of the last distribution amplifier (the Complete System output terminal as defined in Section II G) to the noise-measuring instrument (SLM) and measure the noise level, applying corrections as required to obtain standard readings.

IV. The Noise Calibration of a Signal Level Meter

(A) Broad Band Noise Source

A wide-band high-gain amplifier with its input terminated provides a convenient source of noise at high enough level to permit calibration. The output noise level of such an amplifier is given by:

$$N_O = F + G - 59.1 \text{ dBmv} \qquad \text{(See Appendix III)}$$

Where: N_O is the output noise level within a 4 MHz band in dBmv at a specified center frequency; F is the amplifier noise figure, in dB, at that frequency; G is the gain of the amplifier at that frequency, in dB.

A convenient amplifier is available in CATV practice in the form of a distribution amplifier following a line amplifier, or failing this, two line amplifiers in tandem. As an example: a gain of 45 dB, and a noise figure of 8 dB will give a noise output of $45 + 8 - 59.1 = -6.1$ dBmv.

(B) Sources of Error in Signal Level Meter

The signal level meter does not read noise level without correction for three reasons:

(1) Its bandwidth is generally less than 4 MHz. Since noise power is proportional to bandwidth, the meter reads low in accordance with the bandwidth ratio. For example, due to this cause, a meter with a bandwidth of 0.6 MHz reads low by

$$10 \log_{10} \left(\frac{4}{0.6}\right) = 8.2 \text{ dB}$$

(2) Its detector is generally designed to respond to the sync peak in the TV signal. Since noise has a high peak-to-rms ratio, the detector gives readings higher than would be expected on an rms basis. The meter reads relatively higher at full scale than at the 10 dB down point because the detector is generally more efficient at higher levels.

(3) The bandwidth correction generally has greater effect than the detector correction, so the meter generally reads about 3 to 5 dB low, and the correction varies with the position of the needle on the meter scale.

(C) Measurement of Standard Amplifier

(1) Obtain a broad-band amplifier with gain of 40-50 dB and noise figure 6-10 dB.

(2) Measure its gain as accurately as possible at some convenient frequency. (Since the noise correction of the signal level meter is generally the same at all frequencies the choice of frequency is unimportant).

(3) Measure its noise figure as accurately as possible at that frequency. Noise figure is usually measured with a noise diode. Detailed instructions for this measurement are found in the instruction books accompanying the diode. Suitable noise diode sets are manufactured by the Hewlett-Packard Co. (Model 345B), General Microwave Co. (Model 551A-4), or Kay Electric Co. (Mega-Node).

(4) Terminate the input terminal of the amplifier and connect its output terminal to the signal level meter through a variable attenuator as diagrammed in Figure 1.

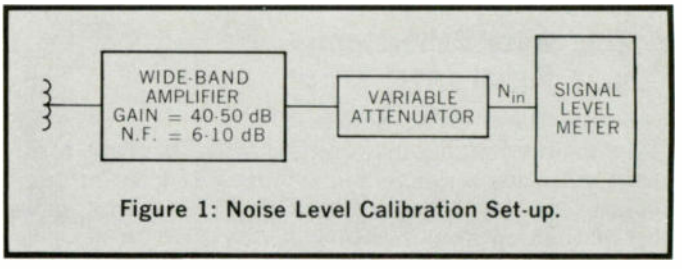


Figure 1: Noise Level Calibration Set-up.

(5) With this connection the noise level at the input terminal of the signal level meter is the output noise level of the amplifier diminished by the attenuation of the attenuator:

$$N_{in} = N_o - A = F + G - 59.1 - A \quad \text{dBmv}$$

Where N_{in} is meter input noise level in dBmv; A is attenuator setting in dB; F, G, N_o as in section IV A. (Note: Average noise calibration data relating to their meter is available from some manufacturers of signal level meters. Average data of this sort can be used where greatest accuracy is not required. For greatest accuracy, calibrate the meter just before using it in either of the following ways:)

(D) Calibration—Constant Reading Method

(1) For greatest accuracy, noise measurements can be made by carrying the variable attenuator around with the signal level meter, adjusting the attenuator for each measurement to give the same reading on the meter. This procedure avoids errors due to varying peak detector efficiency at various points on the scale.

(2) To calibrate, in this case, tune the meter to the

frequency selected in C 2, set the meter at a standard condition (conveniently at maximum sensitivity). Connect as directed in C 4, and adjust the attenuator for a standard reading (conveniently 0 dB on the scale). The calibration data is the meter input noise level under standard conditions, found by subtracting this attenuator setting from the amplifier's output noise level (from C 5).

(3) As an example of the use of this method, suppose a signal level meter is set for maximum gain (corrector, range and manual gain controls set for maximum). Assume that, with a standard amplifier having 8 dB noise figure and 45 dB gain, an attenuator setting of 22.5 dB gives a 0 dB reading. The calibration data is the input noise level (N_{in}) found from:

$$N_{in} = F + G - 59.1 - A \quad \text{(see C 5)}$$

$$= 8 + 45 - 59.1 - 22.5 = -28.6 \text{ dBmv}$$

If an unknown noise source were connected through the attenuator to this meter, and an attenuator setting of 11 dB was required for a 0 reading, the unknown noise level would be found by adding the attenuator setting algebraically to the calibrated input:

$$\text{unknown level} = -28.6 + 11 = -17.6 \text{ dBmv}$$

(E) Calibration—Variable Reading Method

(1) The signal level meter can be used for noise measurements without the attenuator. In this case the unknown noise level is read as if it were a signal, and a correction factor applied to get the noise level.

(2) To calibrate, in this case, tune the meter to the frequency selected in C 2. Set the corrector for this frequency, set the meter on its most sensitive range, and adjust the attenuator to give a number of readings on the meter scale varying from full scale down to the lowest calibrated point on the scale.

(3) The correction factor for each of these points is found by taking the difference between the apparent input level (as indicated by the meter) and the true input noise level (as calculated in C 5).

(4) As an example of this method, suppose a signal level meter is set on its lowest calibrated range (-30 dBmv at 0 on the meter). With a standard amplifier having 45 dB gain and 8 dB noise figure, the attenuator settings giving various readings on the scale are those shown in table I. In each case the correction is found by subtracting the indicated level from the true input noise

Needle Position on Scale	Indicated Level	Attenuator Setting	Input Noise Level	Correction Factor
+10	−20 dBmv	10.3	−16.4 dBmv	3.6 dB
+ 5	−25	15.0	−21.1	3.9
0	−30	20.6	−26.7	4.3
− 5	−35	23.5	−29.6	5.4
−10	−40	27.5	−33.6	6.4

Table I

level. (Input noise level (N_{in}) = F + G -59.1 - A = -6.1 - A in this example.) After this calibration, assume the meter input is connected to a noise source, and indicates a level -28 dBmv (needle at +2 on the -30

range). The noise level is found by adding the correction factor for the nearest calibrated point (4.3 at 0) to the indicated level -28 + 4.3 = -23.7 dBmv.

APPENDIX

I. Relationship Between System Noise Output and System Noise Figure

For short systems, such as head-ends, where the system noise figure is below 20 dB, it may be more accurate to measure the system noise figure directly with a noise diode. The system noise output level is then found by:

$$N_o = -59.1 + F_s + G_s \text{ dBmv}$$

Where: N_o is the system output noise level in dBmv; F_s is the measured system noise figure in dB; G_s is the measured system gain in dB.

II. Measurement of Noise at Levels Below the Calibrated Range of the Signal Level Meter

Measurement of low noise levels is best accomplished by preceding the signal level meter with an amplifier having a low noise figure and sufficient gain to give a comfortable reading (near full scale) on the signal level meter with the amplifier input terminated.

(1) Measure the amplifier noise figure with the amplifier input terminated, call this F_a.

(2) Connect the amplifier output to the signal level meter input.

(3) Measure the amplifier output noise level under this condition, applying corrections as indicated. Call this level L_1.

(4) Connect the unknown noise source to the amplifier's input terminal; the noise output will increase to a new level. Measure this with proper corrections and call it L_2.

(5) The noise level of the unknown is given by:

$$L_3 = -59.1 + F_a + X$$

Where: X is a constant determined by the difference between L_2 and L_1. Table II shows the relationship.

$L_2 - L_1$ (dB)	X (dB)	$L_2 - L_1$ (dB)	X (dB)
0.5	−9.14	10.5	+10.09
1.0	−5.87	11.0	+10.64
1.5	−3.85	11.5	+11.18
2.0	−2.33	12.0	+11.71
2.5	−1.09	12.5	+12.25
3.0	0	13.0	+12.78
3.5	+0.93	13.5	+13.30
4.0	+1.80	14.0	+13.82
4.5	+2.60	14.5	+14.34
5.0	+3.35	15.0	+14.86
5.5	+4.06	15.5	+15.38
6.0	+4.74	16.0	+15.89
6.5	+5.40	16.5	+16.40
7.0	+6.03	17.0	+16.91
7.5	+6.65	17.5	+17.42
8.0	+7.25	18.0	+17.93
8.5	+7.84	18.5	+18.44
9.0	+8.42	19.0	+18.94
9.5	+8.98	19.5	+19.45
10.0	+9.54	20.0	+19.96

Table II

For $L_2 - L_1$ above 20 dB:

$$X = L_2 - L_1$$

Table II is calculated as follows:

$$L_1 = -59.1 + F_a + G = 10 \log_{10} P_1 g_A$$

Where: P_1 is the effective noise input power at the terminated input terminal, and g_A is the amplifier power gain.

When noise power is added to the amplifier input:

$$L_2 = 10 \log_{10} (P_1 + P_3)\, g_A$$

Where: P_3 is the added noise power.

$$L_2 - L_1 = 10 \log_{10} \frac{(P_1 + P_3) g_A}{P_1 g_A} = 10 \log_{10} \left(1 + \frac{P_3}{P_1}\right)$$

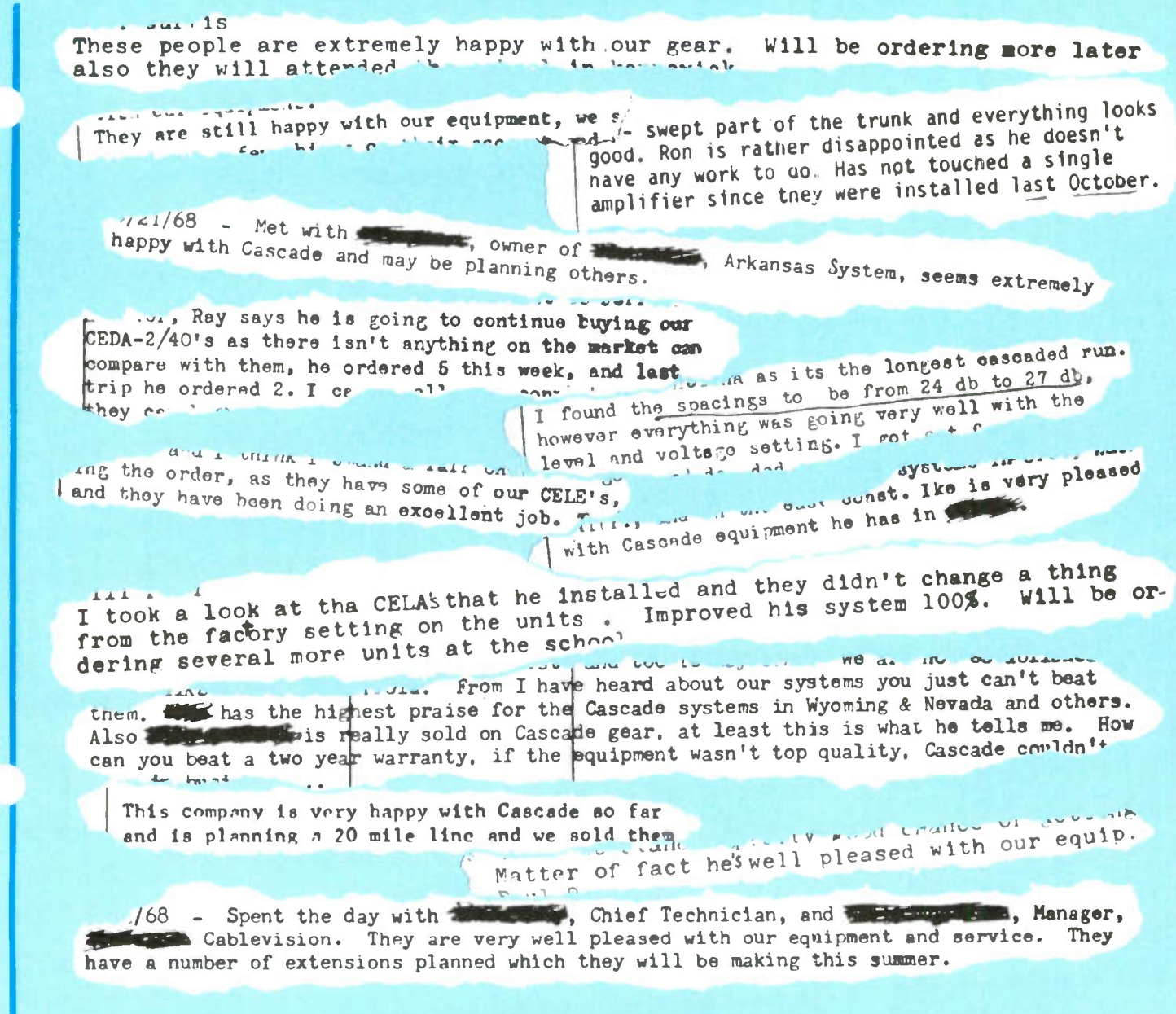
Given $L_2 - L_1$ we can find $1 + \frac{P_3}{P_1}$ and thus $\frac{P_3}{P_1}$.

$$X = 10 \log_{10} \frac{P_3}{P_1} \quad \text{and}$$

$$L_3 = -59.1 + F_a + X = (-59.2 + F_a + G) - (G - X) =$$

$$10 \log_{10} \frac{P_1 G_A}{g_A \frac{P_1}{P_3}}$$

$$= 10 \log_{10} P_3$$



These people are extremely happy with our gear. Will be ordering more later also they will attended

They are still happy with our equipment, we s

- swept part of the trunk and everything looks good. Ron is rather disappointed as he doesn't nave any work to do. Has not touched a single amplifier since tney were installed last October.

/21/68 - Met with [redacted], owner of [redacted], Arkansas System, seems extremely happy with Cascade and may be planning others.

, Ray says he is going to continue buying our CEDA-2/40's as there isn't anything on the market can compare with them, he ordered 6 this week, and last trip he ordered 2. I ce

as its the longest cascaded run.

I found the spacings to be from 24 db to 27 db, however everything was going very well with the level and voltage setting. I got

ing the order, as they have some of our CELE's, and they have been doing an excellent job.

with Cascade equipment he has in [redacted]

I took a look at tha CELA's that he installed and they didn't change a thing from the facory setting on the units . Improved his system 100%. Will be ordering several more units at the schoo

From I have heard about our systems you just can't beat them. [redacted] has the highest praise for the Cascade systems in Wyoming & Nevada and others. Also [redacted] is really sold on Cascade gear, at least this is what he tells me. How can you beat a two year warranty, if the equipment wasn't top quality, Cascade couldn't

This company is very happy with Cascade so far and is planning a 20 mile line and we sold them

Matter of fact he's well pleased with our equip.

/68 - Spent the day with [redacted], Chief Technician, and [redacted], Manager, [redacted] Cablevision. They are very well pleased with our equipment and service. They have a number of extensions planned which they will be making this summer.

Would a Cascade field rep tell a lie?

Every week, each Cascade representative sends a written report to General Sales Manager Pat Brown. Every week, we read statements which would make great Cascade ads . . . if only they didn't sound so unbelievable. After all, who would believe that a Cascade system has been operating for eight months without a housing being opened? Or that CELA-2 amplifiers could improve a system 100%. We're reluctant to believe some of these claims ourselves.

It seems that Cascade equipment is performing as advertised. TLC is compensating for temperature changes, both daily and seasonal. The amplifiers do need a minimum of attention, and do operate reliably over long periods of time.

We have two facts at our fingertips. First, many of the orders we receive are for extensions to existing Cascade systems. The operators must be well satisfied or they would turn elsewhere. Second, with a two-year warranty on all amplifiers, we are painfully aware of each and every malfunction. The percentage of equipment that operates flawlessly through the twenty-four month warranty period is high . . . and getting higher.

Get the story first-hand. Call your nearby Cascade Man and put him on the spot. Let him quote names and places where "they are very well pleased with our equipment and service."

. . . . . .

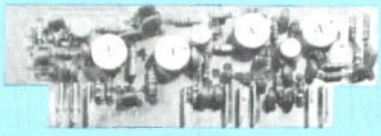
Shown above are actual portions of recent reports sent in by Cascade Sales and Engineering Representatives. The originals are on file in our offices.

TEAR OUT

New Cascade line amplifier has TLC !

The CELA-2/22 is an all-new cable-powered amplifier, suited to both trunk and feeder line applications. An externally-mounted thermistor probe controls amplifier gain to provide accurate automatic compensation for changes in cable attenuation.

The two plug-in modules are housed in a moisture-and radiation-sealed aluminum casting. Circuitry is photo-etched on glass epoxy boards, and includes three-position power director and input pad switches. The full wave power supply module is surge-protected and transistor-regulated.



Plug-in RF module

Power supply module

Models are offered for any application. CELA-2/22C comes complete with regular non-seizing connectors. Amphenol external-seizing connectors are optional at extra cost. CELA-2/22S comes without fittings, but has internal seizing blocks which grip the cable center conductor. CELA-2/20 EB is an Extended Band model. In this application, the standard RF module is factory-aligned for 20 db gain and a bandwidth of 50-240 mHz, ±.5 db. CELA-2/22 P is a pedestal-mount model which uses similar plug-in modules in a very compact cast-aluminum housing.

• SPECIFICATIONS •

Maximum Gain	– 24 db
Recommended Spacing (Gain)	– 22 db
Gain Control Range (at Ch 13)	
Continuous	– 7 db Compensated
Switchable	– 0-3-6 db Flat
Slope Control Range (at Ch 2)	– 5 db
Input Return Loss	– 16 db
Output Return Loss	– 12 db
Maximum Noise Figure	– 11 db

Distortion Characteristics
- – 75 db Cross Modulation ratio (output level 32 dbmv)
- – 59 db Cross Modulation ratio (output level 40 dbmv)

Recommended Input and Output Levels
- + 10 dbmv and 32 dbmv in a line amplifier application
- + 18 dbmv and 40 dbmv in a line extender application

Test Points	– -20 db ± 1 db
Power	– 200 mA at 22-30 Volts AC

*Note: Measured under the following conditions:

12 synchronously modulated channels

Output Tilt	–	8 db
Amplifier Slope	–	+11 db
Amplifier Gain	–	+22 db

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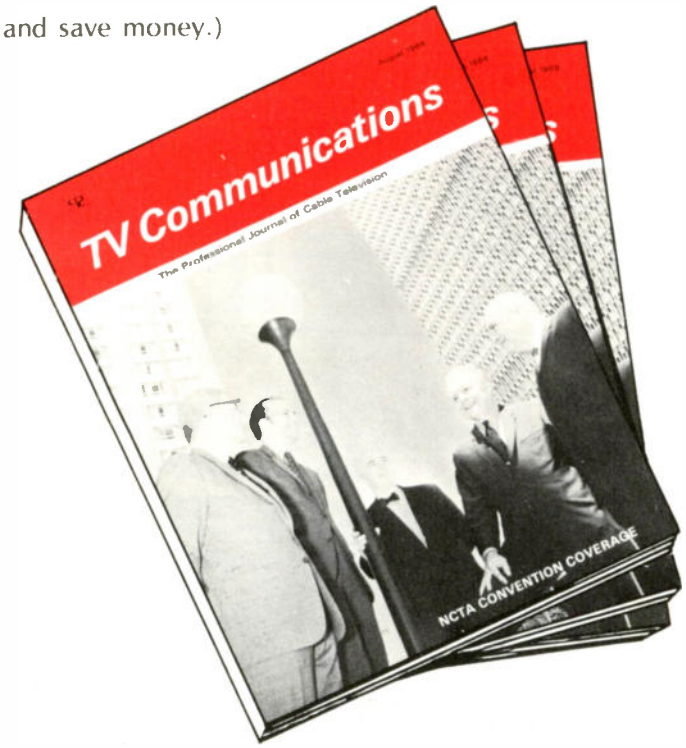

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III. The Development of the Thermal Noise Level

(Where the 59.1 dBmv comes from)

The "available noise power" from a resistive source (which is the noise power it would deliver to a matched, noiseless load) is given by:

$$P_N = kT_K B \text{ watts}$$

Where: $k = 1.38 \times 10^{-23}$ joules per degree (Boltzmann's constant); T_K = the absolute temperature of the source (degrees Kelvin); B = the system bandwidth in hertz. (This relationship is established, for example, in "Noise Performance Factors in Communications System" by W. W. Mumford and Elmer H. Scheibe, published 1968 by Horizon House—Microwave, Inc.—p. 8).

The effective bandwidth of a commercial TV channel is approximately 4 MHz (4×10^6 Hz); so, for this case:

$$P_N = 1.38 \times 10^{-23} \times 4 \times 10^6 \, T_K =$$

$$5.56 \times 10^{-17} \, T_K \text{ watts}$$

The corresponding level, in dBmv, is the dB ratio of this power to $\frac{1}{75}$ microwatt, the basic reference for dBmv:

$$\text{Noise Level} = 10 \log_{10} \frac{5.52 \times 10^{-17}}{\frac{1}{75} \times 10^{-6}} =$$

$$10 \log_{10} 4.14 \times 10^{-9} =$$

$$10 \log_{10} T_K + 10 \log_{10} (4.14 \times 10^{-9}) =$$

$$10 \log_{10} T_K - 83.83 \text{ dBmv}$$

The temperature expressed in degrees Kelvin is related to the temperature expressed in degrees Fahrenheit (T_F) by:

$$T_K = (T_F - 32)\frac{5}{9} + 273.15 \quad \text{Kelvin}$$

T_K and the basic noise level has been calculated for a common range of temperatures, and are shown in table III. As can be seen from table III, the noise level changes quite slowly with temperature. A level of 59.1 dBmv is accurate ±0.1 dB between 63° and 88°, and this is commonly used as the basic noise level at room temperature. TVC

Temperature °Fahrenheit	Temperature °Kelvin	Resistor Noise Level – dBmv
−40°	233.15°	−60.15 dBmv
−20°	244.26°	−59.95
0°	255.37°	−59.76
20°	266.48°	−59.57
40°	277.59°	−59.40
60°	288.71°	−59.23
70°	294.27°	−59.14
80°	299.82°	−59.06
100°	310.93°	−58.90
120°	322.04°	−58.75
140°	333.15°	−58.60

Table III

PRODUCT REVIEW

NEW COMPONENTS FOR CABLE TELEVISION SYSTEMS

CASCADE AMPLIFIERS

Recently introduced by Cascade Electronics is a whole new line of CATV amplifiers. The "Phase Two" units feature slip-in circuit modules, switching-regulator power supplies, stainless steel hardware and internal seizing of cable center conductors. Available are: CELA-2/22 line amplifiers, suited to both trunk and feeder application and featuring level compensation by Cascade's "TLC" method; the CELA-2/22 pedestal model utilizing identical plug-in modules, and built in a compact housing with all connectors on one housing surface to suit popular pedestal mountings; the CELA-2/22 DT incorporating a four-way directional tap within the housing, eliminating the need for a separate DT at the amplifier location; the CELA-2 EB which has been factory-aligned for wideband applications for a gain of 20 dB and a bandwidth of 50-240 MHz, ± .5 dB, and the CELE-1 EB which is available in both standard 12-channel and extended-band configurations, the only difference being a change of plug-in RF modules. The extended band CELE has a bandwidth of 50-245 MHz, ± .5 dB and gain of 20 dB at 240 MHz.

For further information on these new products, contact Cascade Electronics Ltd., Port Moody, British Columbia, Canada.

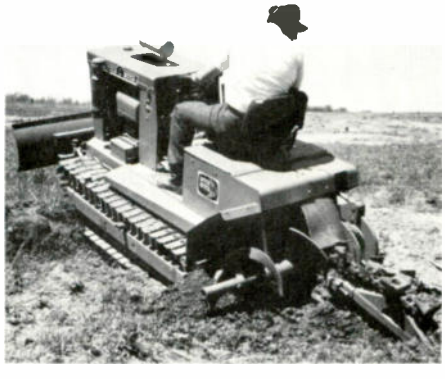
NEW MOBILT EQUIPMENT BUILDINGS

Fort Worth Tower Company has recently introduced a new prefabricated equipment building. According to the manufacturer, the unit is constructed to withstand the rigors of all climatic conditions and provide a dust free and temperature controlled interior for CATV equipment. The standard Mobilt unit is prefabricated and delivered to the site complete with wiring, heater, entrance switch and breaker panel. Air conditioner is optional. Walls and ceiling are insulated with fiberglass. Deviations from the standard design are made at customer's request. Wiring can be surface mounted in EMT or rigid conduit to meet all electrical codes and to handle any special equipment required by system specifications. The building is available with two rooms and one or two outside doors. The portable building can be made to special widths and heights with maximums determined by state highway regulations and permits. Generator can be installed if required.

For further information on this new product, contact Fort Worth Tower Company, Inc., P.O. Box 8597, Fort Worth, Texas 76112, Ph. (817) 536-5676.

NEW TRENCHER FROM DITCH WITCH

Ditch Witch Division of Charles Machine Works has announced the introduction of a track mounter version of its 30 h.p. utility and service line V30 trencher. The new V30T features rear-mounted boom and operator platform, a hydraulic power system coupled with

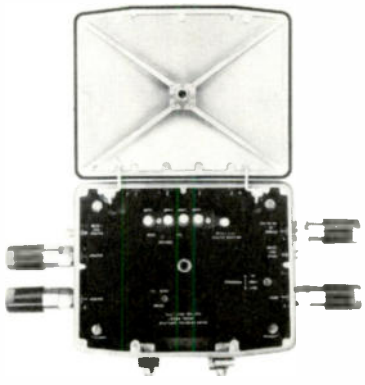


dry friction brake steering, a hydraulic directional control designed to eliminate constant braking on side hills, and a variable hydraulic control system which permits the operator to vary travel and multiple mechanical digging chain speeds independently of one another. Options include the Ditch Witch vibratory plow for installation of underground plant up to 1½" in diameter, Model 110 breakover backhoe featuring a nine-foot reach and 180 degree swing, and Roto Witch boring unit for boring under streets and driveways.

For additional information on this new product, contact Charles Machine Works, Inc., 2701 Elm Street, Perry, Oklahoma 73077. Ph. (405) 336-4404.

ANACONDA AMPLIFIERS

Anaconda Electronics has recently announced the new 8800 Series CATV amplifier line which provides 12 to 20 channel capability. According to the manufacturer, 8800 Series amplifiers offer 40-250 MHz frequency response for 12 to 20 channel operation and AGC-optional pilots at 220 MHz (12 channel operation) or 245 MHz (20 channel operation). A new line extender amplifier, the Model 8844, has been added to the amplifier line. Combination trunk and bridging amplifiers Models 8852 and 8853 have fused bridger outputs. And the new 8856 AGC combination trunk and bridging amplifier features selectable (two or four) bridger outputs. All amplifiers



are supplied with 5/8 inch diameter universal entry fittings. Housing features include the hermetic uniBolt closure, non-corrosive lightweight aluminum housing and FCC Spec. RFI-shielding. A complete new line of waterproof connectors utilizing the seized center-conductor concept is also available for all sizes and types of CATV cable.

For further information on these new products contact Anaconda Electronics Company, 1430 South Anaheim Boulevard, Anaheim, California 92803. Ph. (714) 635-0150.

DANIELS FIRM OFFERS AFL/NFL YEARBOOKS

Daniels Management Company has contracted with Sports Underwriters, Inc. to act as national distributor in the cable TV industry of the official 1968 Yearbooks of the American Football League and the National Football League. The 76-page NFL publication contains autographed photos, biographies, and field records of the 640 players and coaches of the 16 teams. Four hundred autographed photos of players and coaches of the 10 teams in the AFL are featured in the league's 68-page book. Each yearbook also includes 25 action photos in full color, as well as a complete 1968 master

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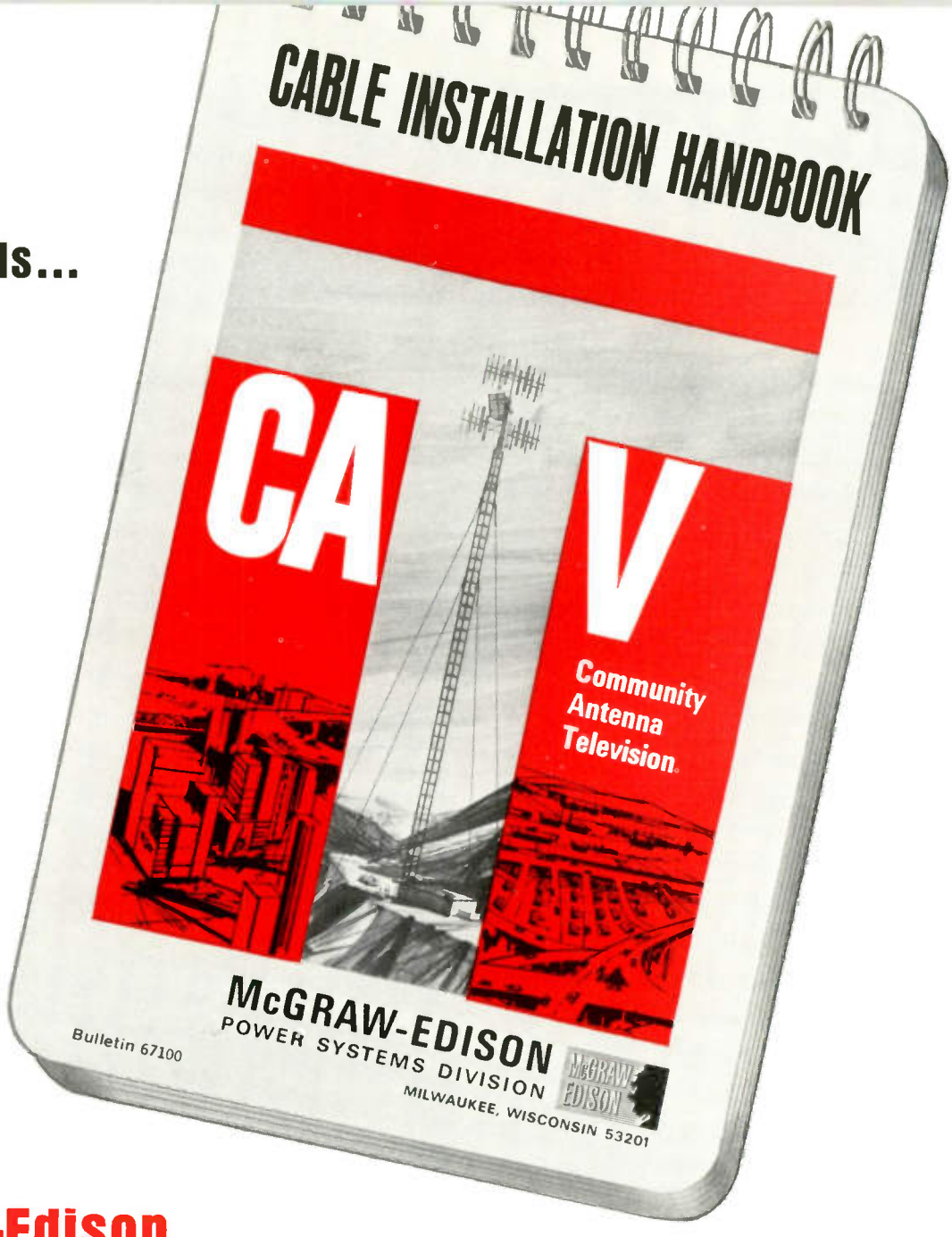
CATV Cable Installation Handbook



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Here's a handy, pocket-size guide to help you in the construction of CATV transmission lines. It's yours *free* for the asking. Provides concise information and detailed illustrations on pole line, aerial, and buried cable techniques. An ideal source for the latest hints on CATV cable construction.

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Everything you need to meet your CATV hardware requirements . . . from nuts and bolts, clamps, aerial cable hardware, and anchors . . . to conduit, pedestals, and enclosures. The broadest line of construction materials available from one manufacturer.

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television schedule of the pro-football games and the results of all 1967 games. All yearbooks will carry the cable TV story, illustrated in full color, and advertisements for cable TV on front and back covers. The books can be offered to non-subscribers as an incentive to sign for cable service, and to subscribers as a "reward" for signing up non-subscribers. In the latter case, both parties would receive the yearbooks.

For further information on this new product, contact Daniels Management Company, 2930 East Third Avenue, Denver, Colorado 80206. Ph. (303) 388-5888.

CRAFTSMAN DIRECTIONAL TAPS

Recently introduced by Craftsman Electronic Products are seven new directional taps. The Model 1500 universal feederline tap offers coverage from 40 MHz to 300 MHz with over twenty variable slope tap modules. Stripline circuitry for the attenuation patterns and isolated outlets is featured on the plug-in boards. Center conductor seizure on the 1500 is supplied with new feedthrough fittings, CFT-412 22 and CFI-500 22. The tap assembly, with two provisions for strand hookup, measures 9½ x 4¼" x 3" and weighs 3½ lbs. Related new products introduced by Craftsman are the Model 1400 directional cable tap with interchangeable tap modules, Model 761 directional wall tap, Model 1100 with four outputs, Model 1300 tube tap for building applications, and the Mini-Tap Model 850 with wideband sloped coverage and outdoor housing for high rise structures in metropolitan areas. On these new tap devices Craftsman offers a variety of attenuation values for all feeder and branch line signal levels.

For further information on these new products, contact Craftsman Electronic Products, Inc., 133 West Seneca St., Manlius, N.Y. 13104. Ph. (315) 682-9105.

NEW INSULATED LIFT

The new "SI" Series aerial lift by Telsta features a triangular boom-support structure and an extension boom of fiberglass construction which protects workmen from electrical shock in ordinary work around power. The lift can be safely operated by one man. At the job, he sets the dual safety brake-lock systems, picks up his tools and supplies in the van, and steps into the aerial basket beside the driver's cab. He booms aloft, completes his assignment, returns the basket to travel position, and re-enters the cab through the van. The aerial basket features self-leveling design, and a full-depth door equipped with recessed lock and safety chain. It is fabricated of welded, lightweight tubular steel, and coated with plastisol (poly vinyl chloride) for secondary cross-phase insulation. Fully insulated lever-type controls govern boom movements, start and stop of the power sources, and the emergency boom-lowering system. Duplicate controls, including emergency lowering, are located in the driver's cab. Telescoping boom achieves a working height of 36 feet, and a horizontal reach of 24 feet to the rim of the basket.

For further information on this new product, contact Telsta division of General Cable Corporation, 1700 Industrial Road, San Carlos, California

DYNAIR ADDS TO MINI-SERIES

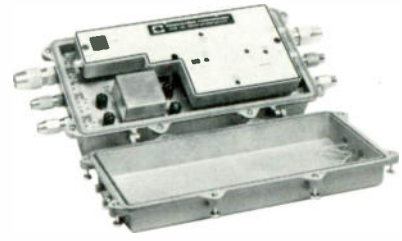
Dynair Electronics, Inc., has added a number of new products to its Mini-series equipment line. The new units include: Mini-Cha channel amplifier which amplifies the passband of a standard low or highband VHF TV signal while suppressing the spurious in the adjacent channels ($175). Mini-

Fade video fader which provides a means of fading between two composite or non-composite video inputs ($220). Mini-Seq sequential switcher which provides automatic sequential switching of multiple camera inputs to a single monitor ($325). Mini-Pre audio preamplifier with a low-impedance mike and a high-impedance phono input and a 600-ohm program level output ($175). Mini-Aud audio power amplifier to drive a speaker for general monitoring applications ($195). Mini-Spk speaker for use with the audio power amplifier ($25). Each unit is 2½ inches high, 4¾ inches wide and 8 inches deep. Dynair has also recently added a video cable equalizer and a digital TV sync generator to its Mini-series line. Called the "Mini-Mop," the equalizer is said to equalize over 4000 feet of balanced or unbalanced coaxial cable and has both 75-ohm balanced and 124-ohm unbalanced inputs and one 75-ohm output, The unit is priced at $450.00. The sync generator, called the Mini-Sync, incorporates silicon solid-state circuitry and is completely self-contained. It meets EIA-170 and RS-330, 525-line output waveforms and features either crystal-control or 60-Hz line-lock operation. It is priced at $650.

For further information on these new products, contact Dynair Electronics, Inc. 6360 Federal Boulevard, San Diego, California 92114. Ph. (714) 582-9211.

CONDUCTRON INTRODUCES AMPLIFIER LINE

Conductron Corporation has recently introduced its new product line of seven CATV amplifiers consisting of: line extender (C-701), trunk (C-711), trunk AGC (C-713), trunk-bridger (C-715), trunk AGC-bridger (C-717), intermediate bridger (C-721), and distribution (C-731) amplifiers. In addition to a bandwidth of 50 MHz to 240 MHz ± 0.25 dB and a minimum operating capability of 20 channels,



the manufacturer lists the following features: each amplifier has its own integral, line-isolated, regulated power supply; the units are modular; each mainline amplifier includes a full range of attenuators (3 dB, 6 dB, 9 dB and 12 dB), while the line extender is provided with a zero dB and 6 dB plug-in attenuator; and plug-in line equalizers (8 dB, 12 dB and 17 dB standard) are provided as specified for the normal range of cable and amplifier spacing.

For further information on this new product, contact Conductron Corporation, 3475 Plymouth Rd., Ann Arbor, Mich. 48107. Ph. (313) 665-9741.

RF SYSTEMS 10 ELEMENT HIGH-BAND ANTENNAS

Availability of two new series of high-band yagi antennas has been announced by RF Systems. The CAT 5 series consists of single channel models covering channels 2 through 6 and the FM Band. Gain is 8.5 dBi, according to the manufacturer, and the horizontal beamwidth is 55 degrees nominal. The CAT 10 series provides single channel models covering channels 2 through 6, FM and channels 7 through 13. These antennas are said to achieve gains of 11.2 dBi or better on the low-band channels and 12.5 dBi or better on the high-band channels. Horizontal beamwidth at low-band is 46 degrees nom-

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inal and at high band is 40 degrees nominal. Other features of the CAT series yagis include: direct 75 ohm, half-inch foam cable input; internal balun; dual boom construction on CAT 10 low-band series; vibration dampeners on long parasitic elements; high-strength aluminum alloy with stainless steel hardware; and captivated nuts for rapid field assembly.

For further information on these new products, contact RF Systems, Inc., 155 King Street, Cohasset, Mass. 02025. Ph. (617) 383-1200.

GROUNDHOG PLOW FROM MIDWEST

A new plow designed to bury distribution lines up to 50" underground, has been introduced by Midwest Utility Plow & Equipment Corp. Designated Groundhog, the 6700 lb. unit features hydraulically adjustable wheels to permit 25° correction of plow position in uneven terrain, 28" colter disc with

safety relief spring, plow tooth vertical adjustment from 0" to 50" and front jack stand. Plow tooth thickness from 2" to 4" is available and the unit buries material up to 3½" O.D. or larger with modifications.

For further information on this new product, contact Midwest Utility Plow & Equipment Corp., 925 Bluemound Dr., Appleton, Wisc. 54911.

BELL & HOWELL FILM CHAIN

Bell & Howell has recently introduced a major addition to its line of closed-circuit color video equipment—the first low-cost 16mm color television film chain priced at $16,000. The film chain is composed entirely of Bell & Howell equipment, and comes complete with a 16mm projector, a uniplexer head, color video camera, and two pedestals containing racks for the installation of video tape recorders or other electronic

equipment. The camera can be quickly removed from its pedestal and with the addition of a standard zoom lens can then be used for normal cablecasting applications. The film chain can be expanded to a multiplex system having up to two more sources—16mm and 2x2 slides. Film chain camera output is NTSC type color that can be utilized by color RF modulators.

For further information on this new product, contact Bell & Howell, 7100 McCormick Road, Chicago, Illinois 60645. Ph. (312) 262-1600.

TRUCK COMPARTMENTS

Pierce Auto Body Works FSM series compartments for pick-up trucks with external fenders are now available from the firm. The Pierce "flip-top" upper compartment runs full length and opens safely upward eliminating

the hazards of a protruding door. Shelving or parts drawers remove easily for interchange. Optional items include: lift gate, material hooks and ladder racks. FSM's are available in four models, 72" to 101" long, to fit ½, ¾ and one ton narrow box pick-ups.

For further information contact Pierce Auto Body Works, Inc., Box 616, Appleton, Wis. 54911.

PACKARD BELL CAMERA

A new, low-cost viewfinder television camera designed for CATV program origination has been announced by Packard Bell. The Model PB-920VF consists of the Packard Bell PB-920

camera plus an integrally mounted, solid-state, five-inch monitor. All controls are located at the rear for operating convenience. The monitor is also offered separately so that present owners of PB-920 and PB-940 cameras

can economically convert them to viewfinders. Two models are available: one for the PB-920 (as shown) and one for the PB-940. Both are offered with zoom lens controls as PB-920VFZ.

For further information on this new product, contact Packard Bell Co., 649 Lawrence Dr., Newbury Park, Calif. 91320, (805), 498-6601.

POWER CABLE DETECTOR

The Power Detector PD-67M, a product of Tel-Design, Inc., was designed primarily to locate power cable when buried in joint trenches with telephone cable. According to the manufacturer the unit is capable of locating buried "power" cable to a depth of six feet. The instrument case of the solid state device is made of aluminum. The total weight, including leather carrying strap, is 5 pounds. The device is priced at $265.00. Where it is desirable to trace the path of CATV cable, a tone source, the Versitone Generator (VG-67), is available from the firm.

For further information on their new product, contact Tel-Design, Inc., 1275 Terra Bella Ave., Mountain View, California 94040. Ph. (415) 961-1300.

TPI ADDS TO ALPHAMATIC NEWS! MARKETS CONVERTERS

Television Presentations Inc. has announced the addition of full color to Alphamatic News, the firm's all-electronic 24-hour news, stock quotations,

and local message origination service.

TPI has also recently announced that it will be marketing International Telemeter Corporation's converter line. Available from the firm will be the TPI Gamut 25, which converts up to 25 channels in the ranges 54 to 88 MHz and from 120 to 240 MHz to Channel 12 or Channel 3, the TPI Focus 12, which is designed to improve reception on 12-channel systems where ghosting is a problem, and the TPI Plus 13, which is designed to provide 25-channel capability by adding 13 new channels to the unimproved original 12, by receiving 9 new channels in the 120 to 174 MHz range and four in the 216 to 240 MHz range.

For further information on these new products contact Television Presentations Inc., 375 Park Avenue, New York, N.Y. Ph. (212) 421-9666.

COMBINATION FAULT-FINDER, CABLE LOCATER

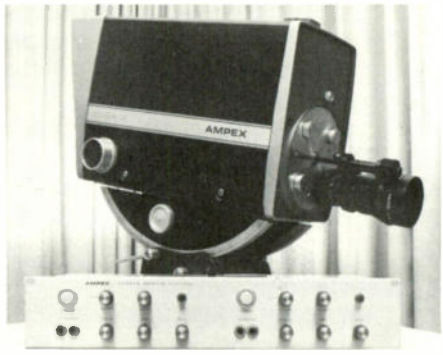
A compact, portable instrumentation package designed for locating and detecting faults in underground cables has been introduced by Radar Engineers. The Model 310A combines, in a 19-pound package, an audio tone tracing system and an earth gradient system for both cable location and fault-finding. The unit includes an automatic current pulse and tone generator, transistorized and battery operated; a portable amplified galvanometer for locating faults; and an audio detector for tracing cables and locating opens and low impedance grounded faults. Ground probes, a search wand and all other necessary equipment are included. The unit is priced at $635.00.

For further information on this new product, contact Radar Engineers, division of EPIC Corporation, 4654 N.E. Columbia Blvd., Portland, Ore., 97208. Ph. (503) 282-3078.

AMPEX VIEWFINDER CAMERA, REMOTE CONTROL UNIT

A new closed-circuit studio television camera designed for local or remote control in multi-camera operations has been placed on the market by Ampex Corporation. The camera features include a 9-inch electronic viewfinder; single cable operation; four-position, rear-actuated "C" mount lens turret; rear operated image tube focusing; top and rear tally lights; composite or non-composite output with internally generated industrial sync; and EIA RS-170 type output, composite and non-composite simultaneously when

driven by an external EIA generator. An optional remote control unit operates system power, beam current, target voltage, pedestal and video gain. It is available on a single rack panel as a one or two-camera remote control. The unit comes ready for mounting in a standard 19-inch relay rack. A switch on the back of the camera is used to select local or remote control. The new camera also features a two-way communications system for dialogue between cameraman and the remote



unit operator. Two headset receptacles on the camera and on the remote control accept standard telephone operator headsets. The CC-327 camera sells for $2,700. Single camera control unit is $300 and double camera unit is $550. A 25-foot length of cable with connectors is $250.

For further information on this new product, contact Ampex Corporation, 205 W. Touhy Avenue, Park Ridge, Illinois 60068. Ph. (312) 692-7191.

BOOM OPTION FOR POLECAT

Pitman Manufacturing Company has recently added a new epoxiglas self-stowing, boom option designed for the PC-M Series Pitman Polecat. The boom option package features three components: a 16 ft. Epoxiglas boom with fold-over, double sheave, hammerhead jib (extends maximum sheave height from 27 to 40 ft.); bucket attachment with disc brake and automatic-latching bucket stow; insulated, telescopic 3 stage bucket controls. A major advantage of the new boom option is that the 3rd stage—the Epoxiglas boom section—can be extended or retracted (manually).

For further information on this new product, contact Pitman Manufacturing Company, Grandview, Missouri 64030.

MULTIPLE-CHANNEL ORIGINATION SYSTEMS

Visual Electronics Corporation has recently announced the availability of automatic cablecasting origination

systems for multiple CATV information channels. According to the manufacturer, the origination systems can provide several channels of local orignation that may be operated without the requirement for vidicon cameras. The systems may be operated unattended via a wire service or locally with a typist-operator. Information may be composed, stored, retrieved at will, updated, communicated over long distances via standard telephone circuits and instantly displayed on standard TV screens. Visual's cablecasting systems can be utilized in the handling and display of news, weather, classified ads, sports scores, local advertising, school bulletins, broadcast program schedules, and stock market information.

For further information on these new products, contact Visual Electronics Corporation, 356 West 40th Street, New York, N.Y. 10018. Ph. (212) 736-5840. TVC

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TV Communications Reply Address: 207 N.E. 38th, Okla. City, Okla. 73105

Rate for classifieds is 25 cents per word for advertising obviously of a non-commercial nature. Add $1.00 for Box Number and reply service, per issue. Advance payment is required; minimum order is $10.00. Classified rate to commercial advertisers is $30.00 per column inch (2¼" col.). Deadline for all classifieds is 1st of preceding month.

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SYSTEM MANAGER

Wanted by MSO for large system in Pennsylvania. Sales and/or management experience required. Reply to **TV Communications,** Dept. T9-1, 207 N.E. 38th Street, Oklahoma City, Okla. 73105.

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CATV National Sales Manager—dynamic go-getter, interested in making change to sales-oriented manufacturer. Several years experience in all phases of CATV sales, including electronics, coaxial cables, and turnkey. Take charge type with "knowhow" and proven ability to increase present sales by large percentage. Complete experience in advertising and sales promotion. Know right companies and contacts to produce big volume sales. All replies kept strictly confidential. Reply **TV Communications,** Dept. T9-4, 207 N.E. 38th Street, Oklahoma City, Okla. 73105.

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TV Communications

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ELECTRONIC TECHNICIAN

Electronic technician for large CATV system vicinity New York City, with local program origination facility. Applicant should be experienced in TV studio or CATV system maintenance or have at least 5 years of equivalent electronics experience. Excellent opportunity, many benefits. Send resume to TV Communications, Dept. T9-6, 207 N.E. 38th Street, Oklahoma City, Okla. 73105.

FIELD ENGINEERS CABLE TV SYSTEMS

If you have 3-5 years supervisory experience in systems equipment installation, we can offer you excellent growth opportunities and fringe benefits. Send your resume and salary requirements to: Director of Personnel, ENTRON, INC., 2141 Industrial Parkway, Silver Spring, Maryland 20904.

SENIOR FIELD ENGINEER CABLE TV SYSTEMS

Responsibilities to include overall systems field supervision with emphasis on head-end installations and antenna orientation. Excellent growth opportunity and fringe benefits. Call or send salary requirements and resume to: Director of Personnel, ENTRON, INC., 2141 Industrial Parkway, Silver Spring, Maryland 20904.

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MSO desires salesman to organize and direct sales and promotion. Related experience required. Reply to **TV Communications,** Dept. T9-2, 207 N.E. 38th Street, Oklahoma City, Okla. 73105.

USE SOME EXTRA CASH?

TVC pays top rates for articles, tech tips, and promotional ideas—any subject of interest to CATV personnel. Send materials, or write for additional information to: Milt Bryan, Managing Editor, TV Communications, 207 N.E. 38th, Okla. City, Okla. 73105.

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the cash, that is, that we pay for photos of CATV subjects. TV Communications pays $20 for any color photo published as the magazine's front cover subject. All photos and negatives will be returned on request, and credit will be given to the photographers whose photos are published.

Photos may include any subject matter related to the cable television industry, and may be submitted in the form of positive transparencies (2¼" square or larger) or as color prints (please include negatives with prints when possible).

Send materials (carefully packaged) to Milt Bryan, Managing Editor, TV Communications, 207 N.E. 38th Street, Oklahoma City, Oklahoma 73105.

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500 each. ±527 Viking FM splitter. $1.50 each.
One each. Antenna TACO Ch. 7. Screen SY42-7. $175.00.
Reply to **TV Communications,** Dept. T9-3, 207 N.E. 38th Street, Oklahoma City, Okla. 73105.

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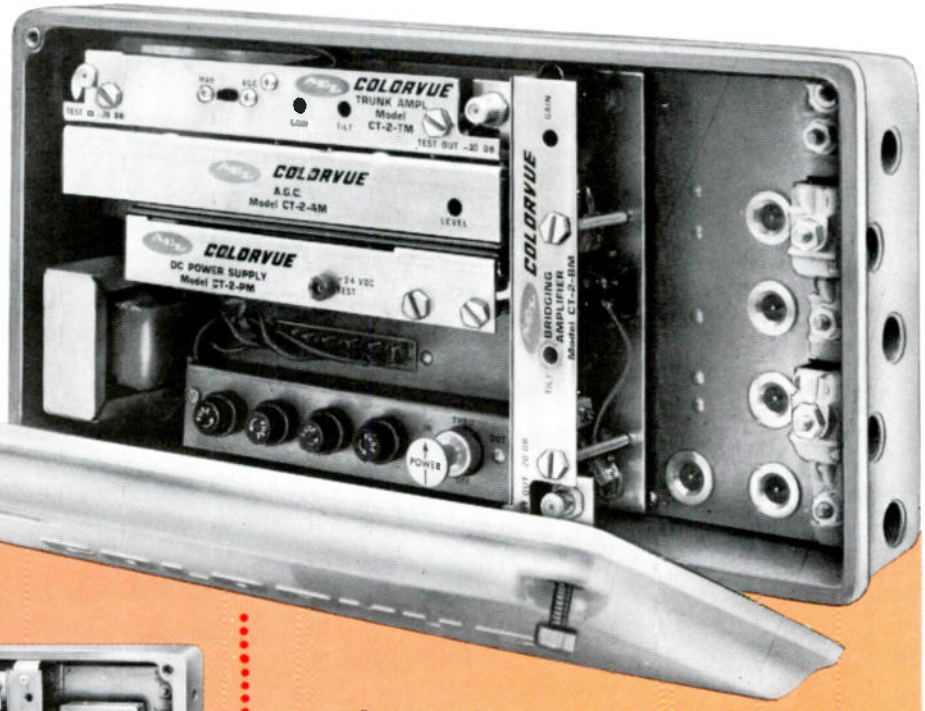

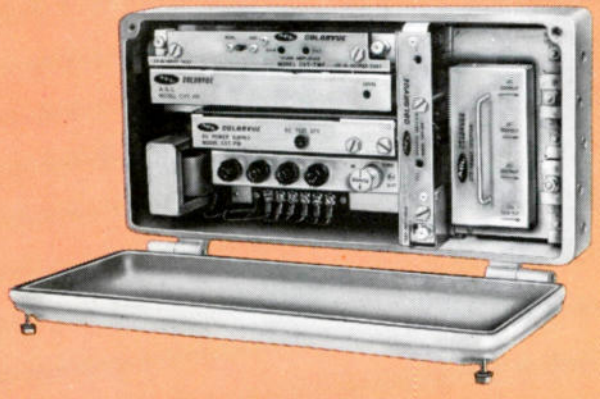

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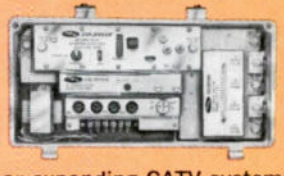

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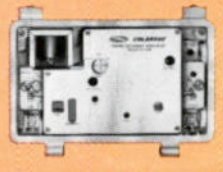

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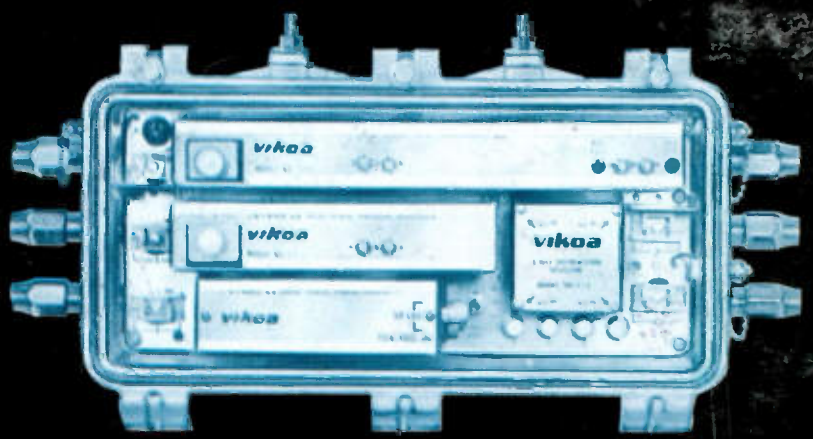

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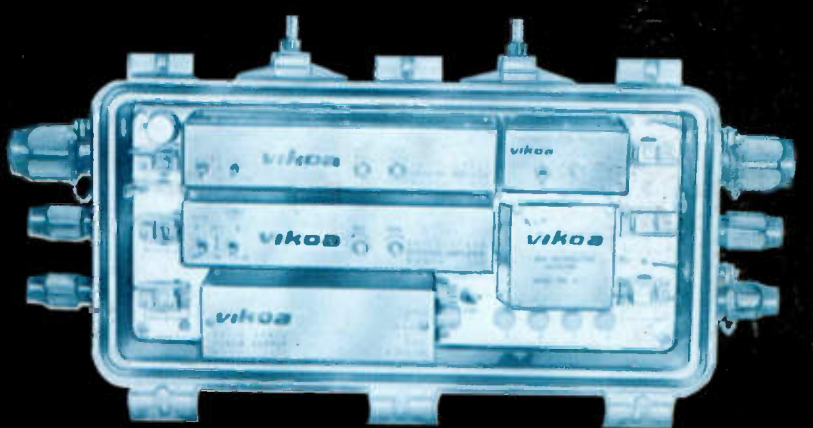

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