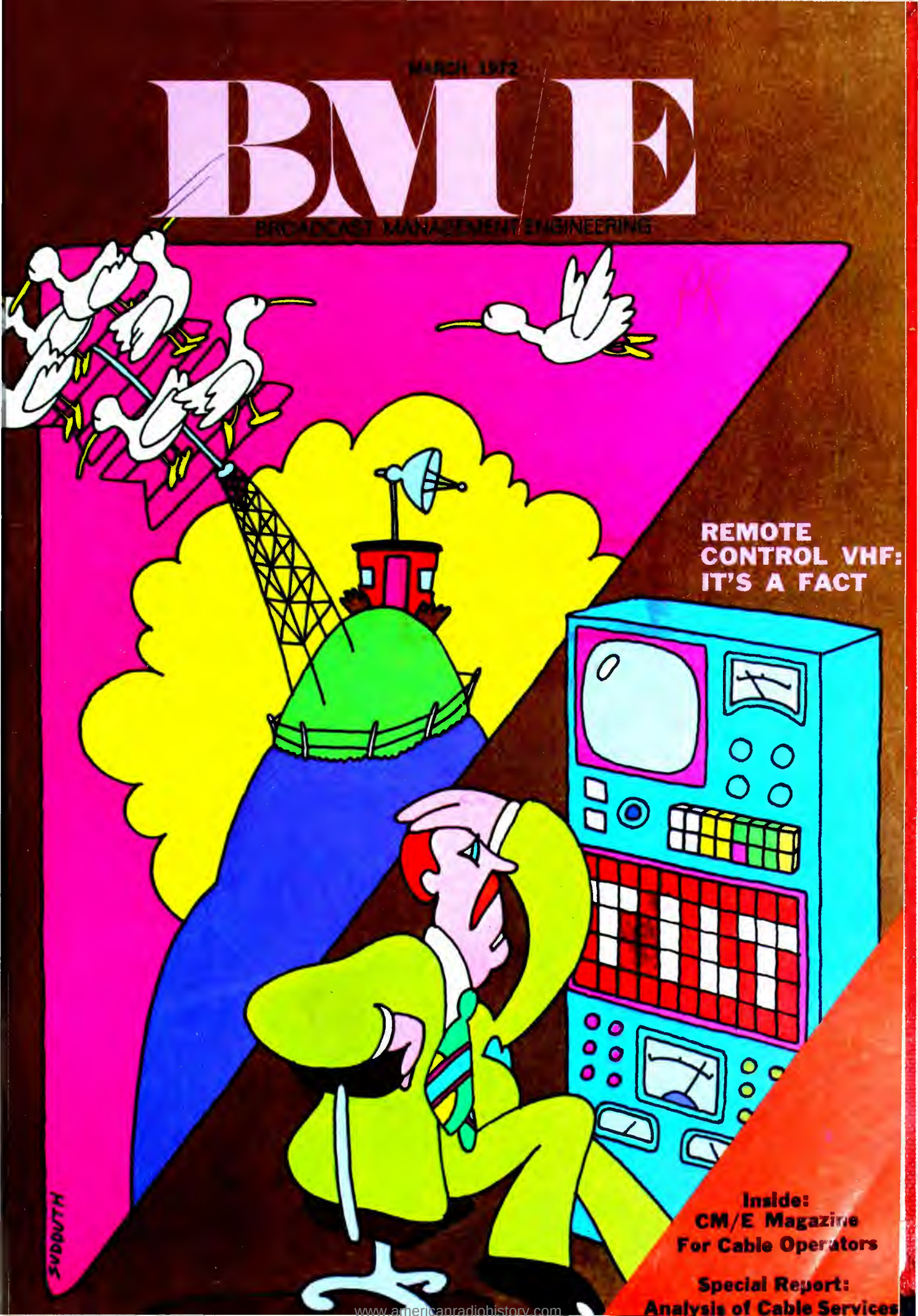
MARCH 1972

BM/E

BROADCAST MANAGEMENT/ENGINEERING



Inside:
CM/E Magazine
For Cable Operators

Special Report:
Analysis of Cable Services

Introducing: The new Sony DXC-5000B color video camera.

It really puts you in control.

Meet the color video camera that gives you life-like pictures . . . right out of the packing carton! We call it the Sony DXC-5000B Color Video Camera . . . you'll call it great!

This is the color camera that gives you professional results . . . first time out . . . whether you're an old timer in VTR or just getting into this dynamic business. Fits right into just about any application like business, industry, CATV, medicine, science and any educational TV system. With its Tricolor Balanced Two-tube System featuring a Color Dissector Tube Assembly, the Sony DXC-5000B delivers faithful color signals . . . always.

Hook up the DXC-5000B and you'll quickly appreciate its features like the manual and automatic gain control, the master and individual white balance controls (with meters), the master and individual pedestal controls, the master and individual level controls, and a special aperture control, which we call an image enhancer.

Pound for pound . . . and the DXC-5000B weighs only 27 pounds . . . you'll find this color camera a rugged, compact, reliable performer under just about any and all operating conditions.

If you're thinking about the next step after black and white VTR, the obvious answer is color. And if you're looking for a color system that delivers quality, look into the new Sony DXC-5000B Color Video Camera . . . it's the one that gets you operational just as soon as you get it unpacked!

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SN-103A

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COMPANY _____

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BM/E
BROADCAST MANAGEMENT/ENGINEERING

MARCH 1972/VOLUME 8/NUMBER 3

Can you really monitor your transmitter without being there? Almost any kind of data can be telemetered. How to interpret it is the subject of most articles, pages 20-28.

BROADBAND INFORMATION SERVICES, INC.
200 Madison Ave.
New York, N. Y. 10016
212-685-5320

Editor:
James A. Lippke

Technical Editor:
Thomas R. Haskett

Contributing Editor:
Robin Lanier

Assistant Editor:
A. E. Gehlhaar

Art Director
Gus Sauter

Production Manager:
Arline G. Jacobs

FCC Counsel:
Pittman Lovett Ford Hennessey and White

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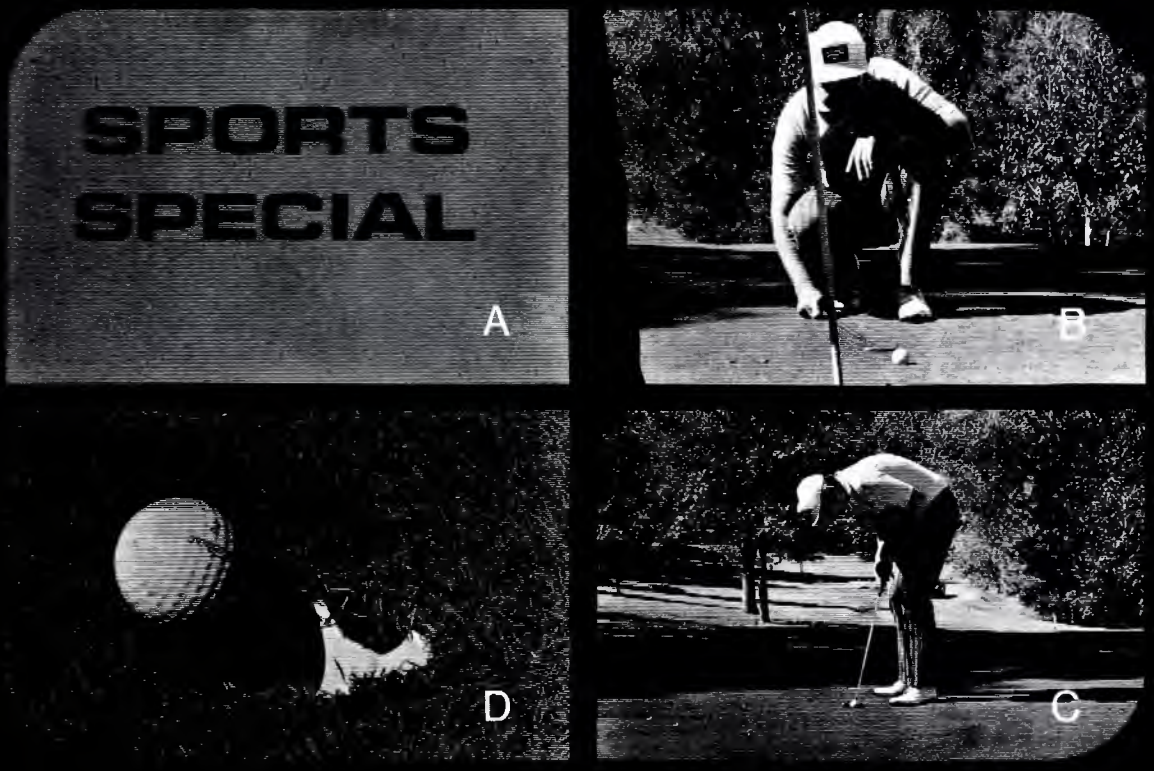
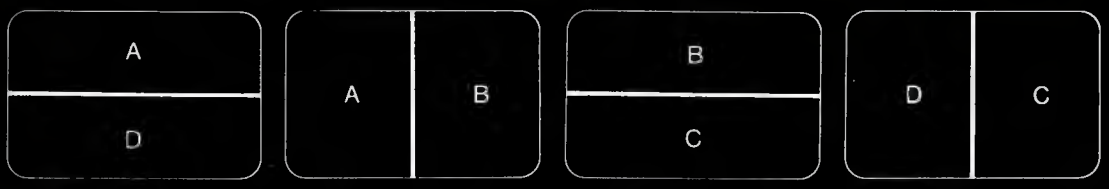
MODEL 938 QUAD SPLIT GENERATOR





Model 938 is a complete special effects system. It permits up to four video signals to be displayed simultaneously. The separation of the four quadrants can be emphasized by the use of a variable width border which can be adjusted to any level from black to white. In addition, borders can be colorized by use of a color background generator.

Complete remote control of the 938 is provided. The horizontal and vertical separation lines can be placed anywhere in the raster or, if desired, wiped completely off the screen to leave two signals separated either horizontally or vertically (see illustration).

The 938 system consists of two plug in modules, plus power supply and mounting frame. A remote control panel is supplied as standard equipment. GVG Model 909 Color Background Generator (optional) is suggested for those users requiring colorized borders.

$1,525

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BROADCAST INDUSTRY NEWS

Dayton Cable Conference: More Questions Than Answers

It was billed as a "Policy Makers' Conference on Urban Cable." Everybody came (over 20 different classes of organizations) and everybody wanted to make policy. But on their terms, which were, sometimes, at odds with the recommendations of the conference sponsors, the Kettering Foundation and the Joint Council of Educational Telecommunications.

The central proposition—formulated by a Rand team in cooperation with 11 local committees—was that the 14 cities and villages making up the Dayton Miami Valley (Dayton and its environs) should cooperate in establishing an area-wide cable communications system. One system serving the entire area would make it economically possible to provide 40-channel dual cable to all areas. Thus at least 18 channels would be available for community, educational, medical and governmental uses. With area-wide coverage, there would be enough homes—40 percent penetration of over 145,000 homes—to make it possible for Wright University to consider starting a "cable university." Rand recommended local area distribution by microwave to do the job of interconnecting six headends and of serving another 20 nearby rural areas if they sought cable services.

In theory the cooperative program sounded great, but practical problems murkied the waters. Only inner-city Dayton and adjacent incorporated city of Kettering were choice, high-density, cable-ripe areas. The other dozen communities very likely could support nothing other than a minimum 12-channel system, which would preclude many of the educational and information channels being established. Thus inner-city Dayton, 30 percent black and going more that way, could be subsidizing white suburbia instead of serving itself. Dayton's black mayor, James McGee, said he wouldn't approve going in with others unless some kind of differential rate structure, or payback to Dayton, could be worked out.

Black representatives of Model Cities complained that they weren't consulted in the planning. They, and blacks from other communities, declared they wanted control of programming in their areas and many wanted ownership—if not all, at least they wanted part of the action through joint venture.

Ownership was a big issue. The Rand report commented on the pros and cons of three alternatives: private, government and non-profit. Rand gave a strong plus to other-than-private ownership as a kind of test to see how well such systems would measure up to private ownership.

Many attendees expressed views reflecting no confidence in private owners as stewards of cable TV for the public's benefit. Their goal was to get profits poured back into social programming.

Cable operators present were subdued — they obviously didn't want to antagonize anyone. They didn't object to a form of joint venture if that was the sentiment of the day. Papernow of Cypress, Stern of TVC, and Hostetter of Continental, praised the Rand report for raising the big issues, but Papernow expressed serious doubt as to the workability of an area-wide system because of the unequal contributions of the communities.

Just about everyone wanted to see open and free access to cable—regardless of who owned it—including the use of production equipment. A few warned that mere access wouldn't accomplish desired goals. If goals are to be met, viewers are needed, and this calls for a high degree of professionalism. Most persons present accepted the fact that somebody has to be responsible for content to minimize libelous attacks. Rand presupposed that private ownership pretty much meant private control, although it suggested that access could be governed by a broadly-based community group.

Cable equipment manufacturers weren't on the program, but they were probably the most perturbed by events. They saw the distinct possibility of franchise awards being repeatedly delayed until the conflicting demands of the many pressure groups got thrashed out and this would curb needed growth. Certainly municipal officers (about 20 percent of those present) saw the prospects of various groups getting into the franchising act in the future. Conflict will be the order of the day.

New Cable Rules Adopted

The long-awaited FCC rules which open the top-100 markets to cable were voted in February 2. All 500 pages of them will go into effect March 31, 1972 — unless some suit is brought to delay action.

Every market can have three nets. Top-50's are permitted three independents; markets 51-100, two; below 100, one. No limit on systems beyond 35 miles of a station. Any educational or foreign language station placing a grade B signal in area must be carried. Significantly-viewed stations are to be carried. Leapfrogging rules have been set and complicated program exclusively must be adhered to.

Twenty-channel capacity must be built into top-100 markets. Three channels must be provided—one each for public access, education and local government. Other channels can be leased. The number of non-broadcast channels available must equal the number of TV signals carried.

Technical standards were also set.

Economics of Two-Way Cable Services To Be Studied

Management consulting firm Arthur D. Little, Inc. will make a further study of the economic viability of in-

continued on page 8

"Scoopic 16 shoots the news faster than any other camera available."...*Says Henk de Wit, Director of Photography at KDFW-TV Dallas.*

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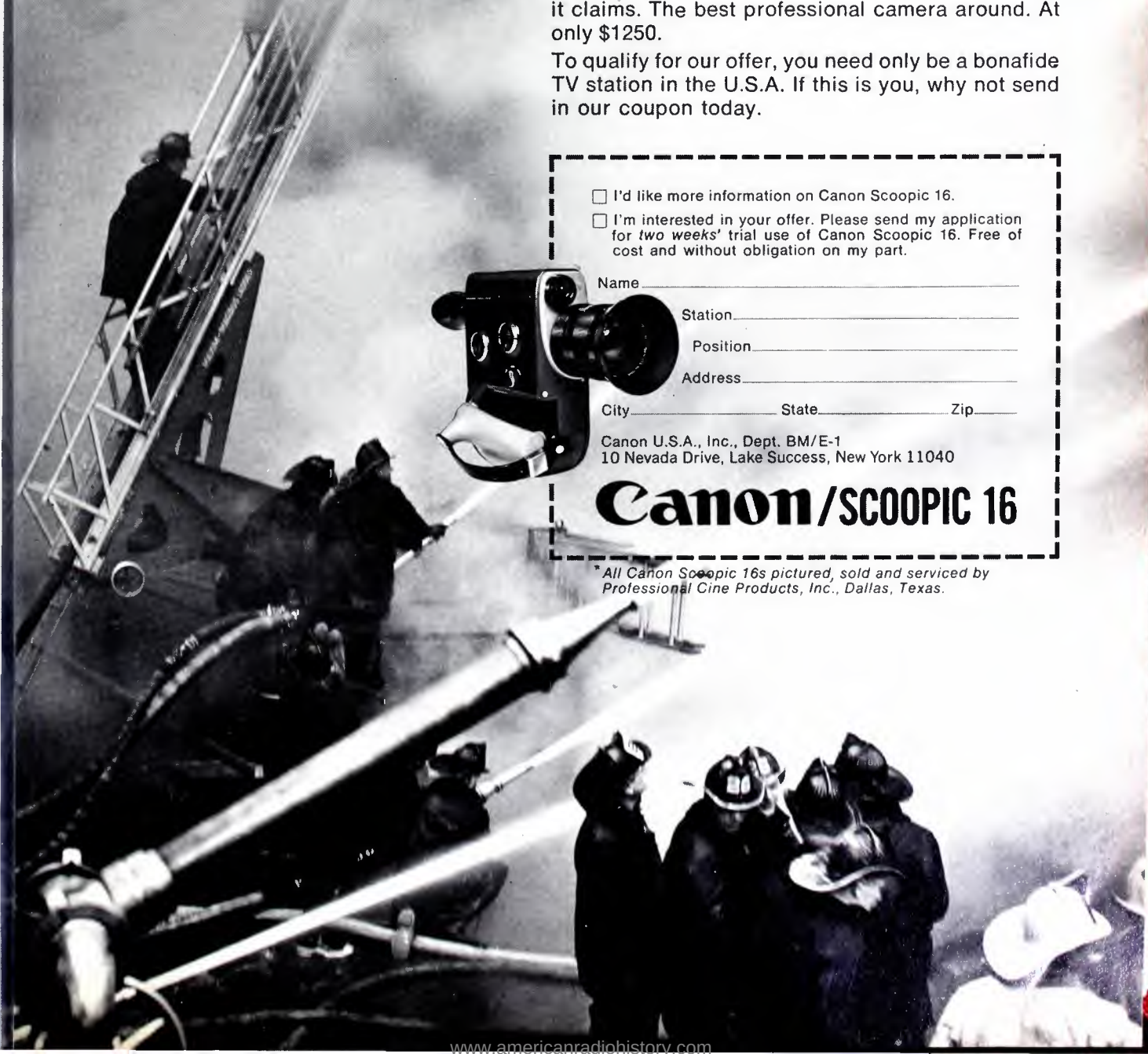
To qualify for our offer, you need only be a bonafide TV station in the U.S.A. If this is you, why not send in our coupon today.



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teractive cable services for a group of United States and Canadian companies, as Phase II of a three-phase project. Phase I, a market study on broadband communications networks, was finished in mid-1971 with a report to the 36 sponsoring firms. Although the first report was confidential, the decision to go to Phase II indicates that profitability for new cable services was found a definite possibility.

Bresnan of TPT Asks Broadcast-Cable Cooperation

In a talk to the Alabama Broadcasters Association Convention in Tuscaloosa in January, W. J. Bresnan, vice president of TelePrompTer Corporation, said that broadcasters and cablemen should explore their mutual interests rather than rehash endlessly their differences. He sharply criticized the letter sent to Congressional leaders by Dr. Frank Stanton, vice chairman of CBS, opposing the compromise of broadcasting and cable interests, calling Stanton's arguments "old, tired, and outmoded."

FCC Will Allow Mail Queries To Find Community Interests

In a positive response to a request by the NAB, the FCC has modified its *Report and Order* on the ascertainment of community problems by broadcast applicants. The original order said that mailing of questionnaires did not appear to be a sound method of getting "appropriate distribution" of the community inquiries. NAB pointed out that there are follow-up procedures for improving mail response rates. The FCC in its answer said that a broadcaster can rely on mailing if he can demonstrate that his method assures distribution to addressees generally throughout the city of license.

WHDH, Boston, Ordered to Cease Operation March 19th

In what may be the end of a long fight by WHDH-TV, Boston, to keep its contested license for Channel 5, the FCC on January 21 ordered WHDH-TV to cease operation at 3 a.m. on March 19; and, at the same time, the FCC granted program test authority to Boston Broadcasters, Inc., to operate WCVB-TV on Channel 5, beginning at that time. WHDH has twice been turned down by the U.S. Supreme Court on appeals from an earlier FCC denial of license. The case has been complicated by SEC charges against Nathan David, a principal of BBI, and the FCC's grant to BBI stipulates that David must be effectively separated from BBI affairs. The Boston Herald Traveler Corp., owner of WHDH-TV, apparently stands to lose a property estimated to be worth $50 million. Harold Clancy, president of Herald-Traveler, vowed to keep up the fight, using as springboard the opinion of FCC Chairman Burch that the decision was "flawed," although apparently required by court decisions.

Vermont Board Orders Cable Operator To Extend Service

State regulation of cable, established by law in Vermont, gave some substance to cablemen's fears of it in a case involving Green Mountain Cable TV of Burlington. A resident of Ethan Allen Farms, a new development near Burlington, complained to the Vermont Public Service Board that Green Mountain Cable would not extend service without a surcharge of $1200, based on the cost of trenching in about 3480 feet of trunk. Later Green Mountain reduced the estimate to $656 and offered to pay $150 of it. But the Public Service Board held that Green Mountain should have installed its cable, as it had the opportunity to do, when power and telephone cables to the development were put in the ground. The Board ordered extension of service with no surcharge to the subscriber.

CBS Pulls Out of EVR Production

In a move that had been rumored but was stunning nevertheless, CBS announced in December a phase-out of its EVR processing operations, with future concentration on production of video program material and licensing to others of the EVR system. Brainchild of Dr. Peter Goldmark, former president of CBS Labs, and result of several years' intensive development work there, EVR reportedly got the CBS axe because it kept losing money, with no relief in sight. The gigantic consumer market for video cassettes, a vision that gave the industry a wild fever for several years, simply did not develop on the expected schedule. In a much cooler mood the industry now looks toward gradual development of the field over a number of years.

Association News

NAB . . . Vincent T. Wasilewski, president of NAB, called the FTC's recommendation that air time be made available for attacks on broadcast advertising "misguided in concept and destructive in effect." He charged that the FTC was sidestepping its statutory responsibilities to police advertising, and attempting to foist on the FCC an ill-conceived plan that would have a shattering effect on broadcasting . . . The NAB TV Code Review Board recommended a cutback in time devoted to commercials and in the number of commercials, on weekend programs aimed for children, along with a ban on using a children's program host to deliver commercials or endorse a product. Recommended maximums would be 11 non-program minutes per hour, with two commercials per half hour and four per hour, between 7 a.m. and 2 p.m. on Saturday and Sunday. The recommendations are subject to approval by the NAB Board of Directors.

CPB . . . The Corporation for Public Broadcasting has awarded $117,485 to Minnesota Educational Radio to help set up a news and public affairs production unit. MER has also received grants from several foundations, totalling about $200,000, to support the unit over a three-year period. Base of operations will be station KSJN in the Twin Cities. The unit will produce 24 hours of programming a week, stressing in-depth reporting of the news, and reaching, with affiliated stations, about 80 percent of the state's population.

Business Briefs

The national convention of the **Association for Educational Communications and Technology** will run April 16 to 20 in Minneapolis and St. Paul, Minnesota, under the general theme, "Design for Education." Further information: Gerald McKay, 440 Coffey Hall, University of Minnesota, St. Paul . . . Bellevue Hospital in New York got on the **Sterling Manhattan** cable with more than 70 receivers in day rooms, nurses' stations, children's waiting rooms, outpatient clinics, and other spaces . . . **EIA** reported **imports of consumer electronic products** up for

continued on page 10

Our new telephone
can save you money on remote broadcasts.

The Bell System's new phone is the simplest equipment yet for originating remote broadcasts.

This set, called the Portable Conference Telephone, plugs directly into a standard telephone jack installed at the broadcast site. It is equipped with two broadcast-quality microphones.

No amplifier is needed. No preamp. In fact none of your station's equipment is needed at the site—and that means no technician need be sent to operate it.

Your reporter simply carries the 19-pound set with him, plugs it into the jack and an AC outlet, dials your studio and is ready to go on the air. By using regular telephone lines, you avoid the expense of special audio channels.

Between remotes, this phone won't loaf on the shelf. For staff meetings, its built-in speaker allows as many as 30 people to listen to a telephone conversation—and the microphones allow them to join in. On an executive's desk, it can permit hands-free talking and listening.

Call your local Bell Telephone representative for details of how this new phone can work for you.

The American Telephone and Telegraph Company and your local Bell Company are continually working to improve service and help you do your job better.

In this case, when you have to broadcast from remote locations.

NEWS continued

the year through November compared to 1970: color TV by 40.6%; monochrome, 12.7%; audio units, 8.7%; videotape units, 23.8%. But electronic exports were up in most categories for the same period, too, with color TV up 77.7%, phonographs up 39.1%. Only tape equipment showed large drops . . . **Cypress Communications Corp.** announced FCC permission for the first microwave relay system in the newly opened CAR's LDS section of the spectrum, using **Laser Link** equipment; purpose is to extend service to sparsely populated areas and separated population clusters in Cypress' Fort Walton Beach, Florida, area . . . **Audio/Video Products** is a new firm in Downey, California, which will make digital clocks, automation systems, and other hardware, and also produce documentaries and commercial shorts for industry . . . **Markit Communications, Inc.,** Los Angeles, will carry out a direct sales campaign in Akron, Ohio, for **Akron Cable-Vision,** according to **Television Communications Corp.** of New York, owner of the Akron system: size of the market, with 150,000 potential subscribers, made an in-house sales effort impractical, said TVC . . . **Ampex Corporation** said it anticipates a loss of about $40-million, or about $4 a share, for the year ending April 29, 1972 . . . **American Television and Communications Corp.** of Denver reported record earnings and sales for the half year ended December 31, 1971, of $554,797 (14 cents per share) and $6,667,743 respectively . . . **Athena Corp.** has awarded to **AEL Communications Corp.** of Colmar, Pennsylvania, the contract for strand mapping and engineering of CATV systems in Rotterdam, Colonie, Glenville, Scotia and Niskayuna, all in New York . . . **Telegen,** Palo Alto, California, has installed **Secam/60** closed-circuit TV at the Santa Anita race track, with about 80 25-inch monitors distributed around the track . . . Third of the new **Intelsat IV** satellites, largest relay satellites so far lofted, was put in orbit in January, adding average capacity of 5000 to 6000 telephones, or 12 TV channels, to the international service . . . **Cox Cable** has signed **Burnup and Sims, Inc.,** of West Palm Beach, Florida, to install cable systems totalling about 500 miles in the midwestern U.S. . . . **Channel One,** a new videotape production and duplicating firm at 620 Alpha Drive, Pittsburgh, Pennsylvania, announced capacity for 285

one-hour color dupes per day, as well as production facilities for training and instructional tapes . . . **Comm/Scope Corp.** started manufacture of wire and cable at its new 55,000-square-foot plant at Angier, North Carolina . . . **Tulsa Technical College,** Tulsa, Oklahoma, has expanded its curriculum with courses in radio broadcasting, covering every aspect from announcing techniques to transmitter operation, and leading to the first-class license exam . . . **Cerro Wire and Cable Company,** which recently took over the Vikoa plant in Freehold, N.J., has started production there of CATV cable with new computer-controlled equipment, which automatically maintains all important cable parameters to close tolerances . . . **Sony Corp. of America** broke ground in San Diego for a plant in which the firm will assemble 5000 Trinitron color tubes a month; later increases will raise this to 20,000 . . . **Bottom Line Associates** of Brookline, Mass., announced a service, Dialasound, allowing subscribing advertisers and agencies to hear the actual sound of a radio or TV station at any time.

People

Harry B. Burley Jr. was elected chairman of the board and chief executive officer of **Boston Insulated Wire and Cable,** succeeding his brother, Joseph C. Burley, who became honorary chairman . . . **Cerid Reed** became program manager of WCNY-FM, Syracuse, central New York's public radio station . . . **G. L. Davenport** was named general manager of Cox Cablevision Corp., **Roger Pierce** was named northwest regional manager, and **J. E. Durham** became manager of Cox's Astoria-Seaside-Long Beach systems . . . **John R. Dawson** is the new manager of application engineering of Philips Broadcast Equipment Corp., subsidiary of North American Philips . . . **Joseph Sharp** became commercial sales and technical advisor for Cable Television Co., of Charlotte, N. C. . . . **Juan Alonso,** former Cuban manufacturer and refugee from Castro's Cuba, was named vice president of McMartin Industries . . . **Elmer Smalling III** has joined Rosner Television Systems, Inc., Plainview, N.Y., as director of engineering: he was formerly director of engineering for Columbia Pictures . . . **Alan F. Culbertson** has been elected president of the newly-formed IEEE Communications Society.

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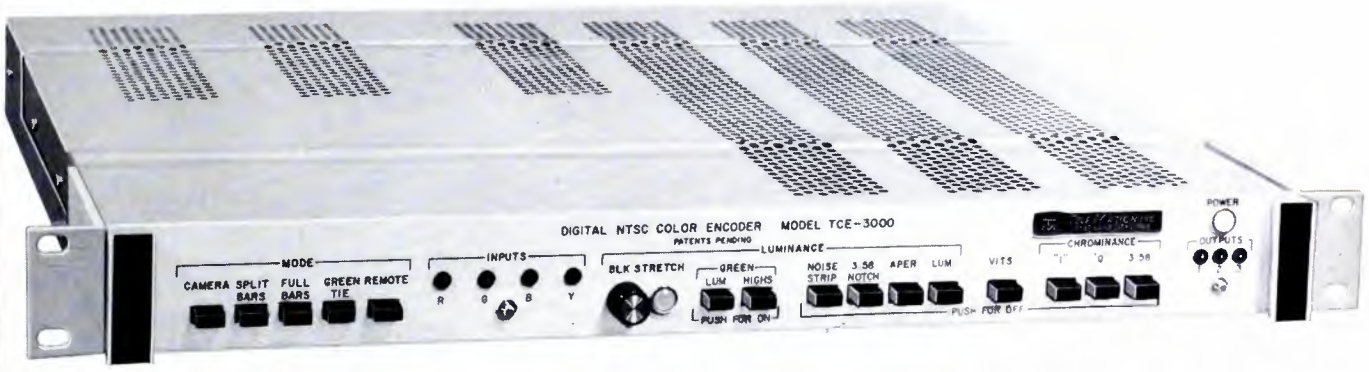

New TeleMation TCE-3000 DIGITAL Color Encoder with these exclusives:

Digital modulators.
Digital bars—±1/2%, ±1/2°, 0-60°C.
Noise stripping (video coring).
Luminance black stretch.
100% circuit access during operation.
55dB carrier rejection, 0-60°C.
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Plus: Level-dependent aperture correction. Video clamping. Mixed highs from green. Full luminance from green. 3- or 4-tube operation. Conforms to NTSC, PAL, PAL-M, BBU and BBC standards.

Anything less isn't the world's most advanced color encoder.
Write or call today for a demonstration of the TeleMation TCE-3000.

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Circle 106 on Reader Service Card

INTERPRETING THE

FCC RULES & REGULATIONS

Program Logs

Commission requirements for disclosure of programming information have long been a source of tedium to broadcasters. In its 1968 Program Logging Rules[1] amending the AM and FM rules designed to "streamline" log keeping and remove archaic requirements, and to conform requirements to provisions of the TV rule, the Commission endeavored to insure that information required by the revised "reporting" forms would be contained in station program logs. Yet, despite these clarifications, Commission sanctions against broadcasters appear to have measurably increased since promulgation of its 1968 Rules.

Forfeitures imposed upon broadcast licensees for "logging" violations have ranged as high as $9000, depending upon 1) the nature of the violation, and 2) the licensee's financial condition. In some cases, "logging" violations serve as one of several grounds for denial of license renewal, particularly when part of a course of "willful, fraudulant conduct." In a series of decisions, the Commission has declared that violations which occur through "ignorance or oversight" and/or those committed by "officers or employees" of the licensee are not excusable. Also, corrective action taken subsequent to Commission citation, though a "mitigating" factor, does not rectify the original violation. Because of the increase in the number of Commission sanctions and the possibility of severe punishment, a review of pertinent elements of the "Program Logging Rules" is in order.

Programs

For each *program,* the Commission requires entries identifying 1) its name or title, 2) its time slot, 3) its type, and 4) its source. (For programs presenting political candidates, an entry must be made showing the candidate's name and political affiliation.) Licensee classifications as to *type* and *source* are often the subject of Commission challenge. Hence, a brief definition of each classification follows.

The definitions of the following eight *types* of programs (a) through (h) are intended *not* to overlap each other and will normally include all the various programs broadcast. Definitions (i) through (k) are sub-categories, and programs falling under one of these three sub-categories will also be classified appropriately under one of the first eight categories. There may be further duplication within types (i) through (k)—a program presenting a candidate for public office, prepared by an educational institution, for instance, would be within both Political (POL) and Educational Institution (ED) sub-categories, as well as within the Public Affairs (PA) category. Program definitions are:

a) Agricultural (A) includes market reports farming, and other information specifically related to the agricultural population. (Too many licensees improperly place agriculture-type fare in the public affairs category.)

b) Entertainment (E) includes all programs intended primarily as entertainment, music, drama, variety, comedy, quiz, etc.

c) News (N) includes reports dealing with current local, national, and international events, including weather and stock market reports; and commentary, analysis and sports news, when an integral part of a news program.

d) Public Affairs (PA) includes talks, commentaries, discussions, speeches, editorials, political programs, documentaries, forums, panels, round tables, and similar programs primarily concerning local, national, and international public affairs. *A public affairs program is one which deals with public issues.* The licensee should expect the Commission to challenge the PA classification of a program which does not have this essential characteristic.

e) Religious (R) includes sermons or devotionals, religious news, and music, drama, and other types of programs designed primarily for religious purposes.

f) Instructional (I) includes programs (other than those classified under Agricultural, News, Public Affairs, Religious or Sports) which deal with the discussion or appreciation of literature, music, fine arts, history, geography, and the national and social sciences; and programs devoted to occupational and vocational instruction, and hobby programs. (Here again, too many licensees erroneously classify "instructional" fare as "public affairs.")

g) Sports (S) includes play-by-play and pre- or post-game related activities, as well as separate programs of sports instruction, news or information—fishing opportunities, golfing instructions, etc.

h) Other (O) includes all programs not falling within categories (a) through (g).

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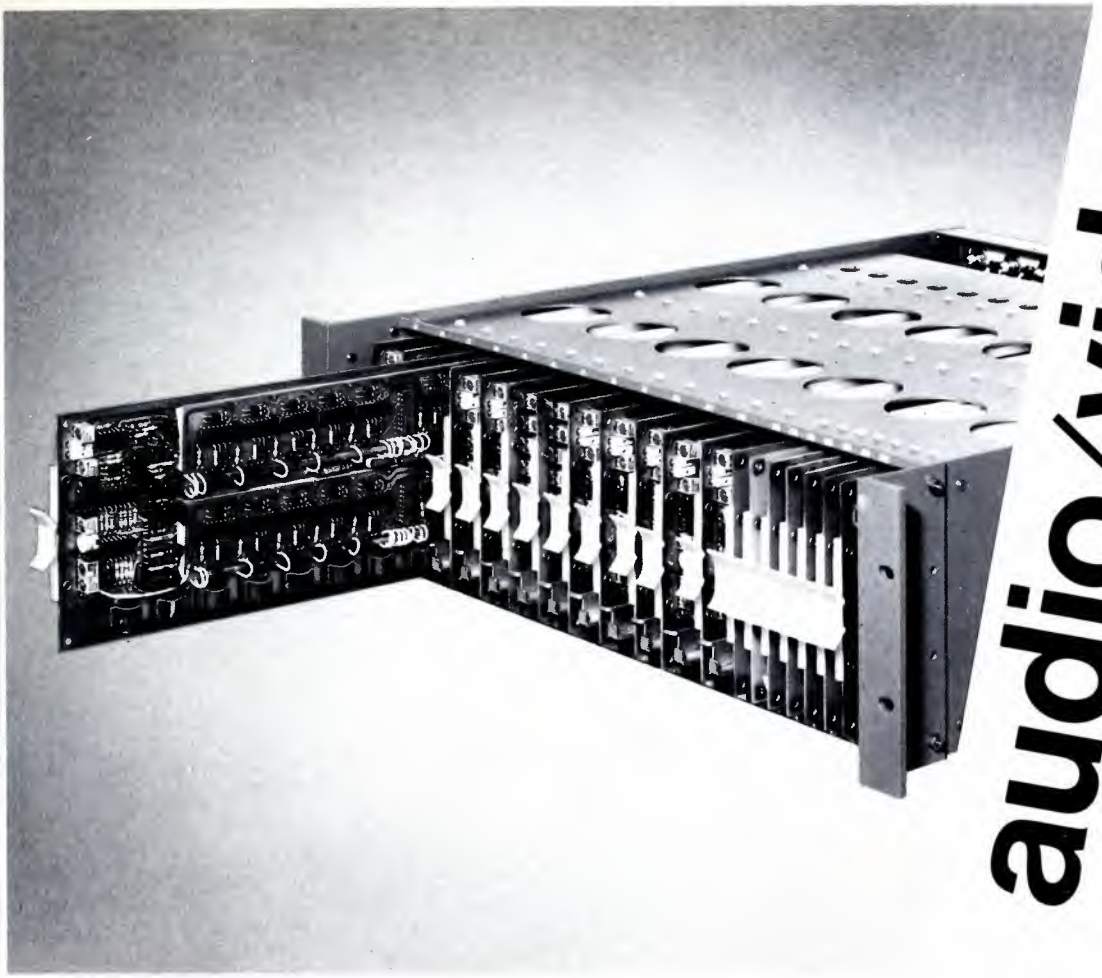

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The new CDL VS-900 is the latest word in 4th generation all solid-state audio/video switching systems for broadcasting, surveillance or instructional uses. It incorporates many advances in control and switching technology and sets new standards in performance, reliability and economy.

- Highest performance standards through newly developed linear integrated circuits.
- Flexible, programmable control and tally through state-of-the-art digital circuitry.
- Fully interchangeable cards without performance compromises.
- Completely solid-state audio systems.
- Program grade, vertical-interval switching on all buses.
- Full selection of economical standard systems — VS-900 has eliminated costly customization of hardware. VS-900 is cost effective over the full range of 10 × 10 up to 300 × 300 inputs and outputs.

You may not need a system as large as that initially, but you might in the future? No problem, CDL Series 900 is modular in concept, and can be expanded at will. The basic building block is an array of ten input, single output switches, each handling ten signals to one destination. Matrices are formed from groups of ten such switches, thus providing one hundred crosspoints in the basic system sub-assembly. You can therefore buy one matrix with ten or even less cards now, and add to it any time later. 'Plug together' in-field expansion is now a reality.

May we have an opportunity to analyse your problem and offer a solution tailored exactly to your requirements?

VS-900 — from Central Dynamics — world leaders in television switching technology.

4th generation CDL series 900

- **Versatile**
- **Economical**
- **Reliable**

CENTRAL DYNAMICS LTD

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U.S.A. - 230 LIVINGSTON ST., NORTHVALE, N.J. 07647

Circle 107 on Reader Service Card

i) Editorials (EDIT) includes programs presented for the purpose of stating opinions of the licensee.

j) Political (POL) includes those which present candidates for public office or which express (except in station editorials) views on candidates or on issues subject to public ballot.

k) Educational institution (ED) includes any program prepared by, on behalf of, or in cooperation with educational institutions, educational organizations, libraries, museums, PTAs or similar organizations. Sports programs are not included.

Program *sources* are classified as either 1) local, 2) network, or 3) recorded, as defined by the following rules.

1) A *Local Program* includes any program which is primarily or wholly produced by the station, taped or recorded, so long as live talent is employed more than 50 percent of the time. In addition, the following programs shall be classified as "local:" a) local program fed to a network, b) non-network news program, and c) identifiable units of programs primarily featuring records or transcriptions which are *live* and separately logged. Yet programs featuring *recorded* records and transcriptions must be classified accordingly even though a station announcer appears in connection with such material.

2) A *Network Program* (NET) is any program furnished to the station by a network (national, regional or special). This includes delayed broadcasts of programs originated by networks.

3) A *Recorded Program* (REC) is any program not otherwise defined—including, without limitation, those using recordings, transcriptions, or tapes.

Commercial Matter

For all *commercial matter* (CM), the Commission requires entries identifying 1) the sponsor(s) of the program, 2) the person(s) who paid for the announcement, or 3) the person(s) who furnished materials or services. In addition, any entry or entries must be made showing the total duration of commercial matter in each hourly time segment or the duration of each commercial message in each hour.

Commercial matter includes "commercial continuity" (CC) i.e., the advertising message for which a charge is made or consideration is received. Included in the latter are 1) "bonus spots," 2) trade-out spots[2], and 3) promotional announcements of a future program where consideration is received for such an announcement or where such announcement identifies the sponsor of a future program beyond mention of the sponsor's name as an integral part of the title of the program (e.g., where the agreement for the sale of time provides that the sponsor will receive promotional announcements, or when the promotional announcement contains a statement such as "Listen tomorrow for the—[program name]—brought to you by—[sponsor's name]—.")

Exceptions to the above classifications include:

a) Promotional announcements, unless they fall in a CA classification;

b) Station identification announcements for which no charge is made;

c) Mechanical reproduction announcements;

d) Public service announcements;

e) Announcements that materials or services have been furnished as an inducement to broadcast a political program or a program involving the discussion of controversial public issues; and

f) Announcements made pursuant to the local notice requirements ("pre-grant" and "designation for hearing").

Furthermore, it is incumbent upon the licensee to make an entry denoting as close an approximation to the *time consumed* (duration of commercial matter) as possible. Notable exceptions to this requirement are *religious* and *political* sponsored programs. Because of the difficulty in measuring the exact length of "commercial continuity" in such programs, the Commission does not require licensees to compute commercial matter.[3] The exception does not, of course, apply to any programs advertising commercial products or services, nor is it applicable to any commercial announcements. Since 1969, the Commission has imposed more forfeitures upon licensees for violations of commercial logging rules than for any other single category. One licensee was fined $2000 for failure to log as "commercial time" the play time of records of artists which were played immediately before and/or after announcements promoting their appearances.[4] In another case, the Commission ruled that "where musical recordings were so combined with commercial announcements, either by the play of such recordings immediately before, immediately after, or simultaneously with voice announcements, that which might otherwise be considered entertainment was instead merely an extension or part of the advertising message of the program sponsor and should have been logged as commercial."[5]

Furthermore, the Commission held that the broadcasting of extraneous, or "ad lib," matter to promote a show or dance represents "commercial matter," and should be logged as such.[6] In light of Commission scrutiny into commercial logging practices, broadcasters would be well advised to exercise caution in reporting same.

Public Service Announcements

For all public service announcements (PSA), the Commission requires an entry showing 1) that it has been broadcast, and 2) the name of the organization or interest on whose behalf it is made. By Commission definition, a PSA is "any announcement for which no charge is made and which promotes programs, activities, or services of federal, state or local governments (e.g., recruiting, sales of bonds, etc.) or the programs, activities or services of non-profit organizations (e.g., UGF, Red Cross, Blood Donations, etc.) and other announcements regarded as serving community interests, excluding time signals, routine weather announcements and promotional announcements."

The subject of certain Commission sanctions, PSAs have often been confused with "commercial"

2. Announcements broadcast in return for receipt of free transportation, prize merchandise or other goods or services are to be logged "commercial." 16 RR 2d 156 (1969).

3. Report and Order, Docket No. 14187.
4. KISD, Inc., 18 RR 2d 1187 (1970).
5. Old Dominion Broadcasting Co., Inc. 20 RR 2d 748 (1970).
6. KOKA Broadcasting Co., Inc., 21 RR 2d 981 (1971).

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AM TRANSMITTERS - 250 W
1 KW - 5 KW - 10 KW - 50 KW

REMOTE AMPLIFIER

FM TRANSMITTER - 10W - 50W
250W - 1 KW - 2.5 KW - 5 KW
7.5 KW - 10 KW - 20 KW - 40 KW

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STEREO GENERATORS

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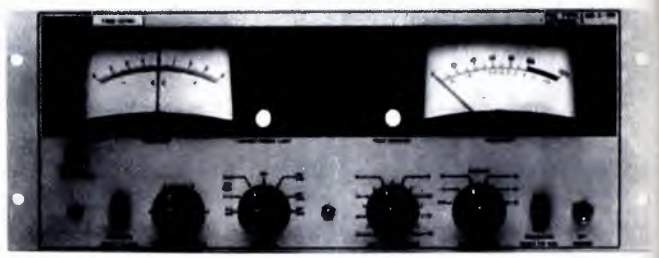
NAB BOOTH 201 WEST HALL

Circle 108 on Reader Service Card

NAB 1972: 50th Convention Shaping Up

Almost as old as broadcasting itself, NAB marks its 50th year this April in Chicago, with the traditional festivities and a program filled with management and engineering goodies. Luncheon speakers include Treasury Secretary John Connally (Monday), CBS Vice Chairman Frank Stanton (Tuesday), and FCC Chairman Dean Burch (Wednesday). Dr. Billy Graham will receive the Distinguished Service Award, and WCCO Director of Engineering John Sherman will receive the Engineering Award.

Technical sessions seem promising: A panel session on quadraphonic broadcasting is scheduled, with broadcasters and manufacturers discussing the merits of discrete vs. matrix techniques. People from the Bonneville International stations will present a report on the many TV translators they use to cover the sparsely populated Utah salt flats. Radio sessions will cover modernization, design of new transmitters, and operation and maintenance of directional antenna arrays. A summary will be given of recent tests conducted in Altoona and Allentown, Pennsylvania, which may indicate the feasibility of circular polarization for TV transmitting antennas. There will also be a report on extensive use of video cart machines at WWL-TV, New Orleans. Continuing the trend into video automation, GE engineers will discuss "The Next Step in Automation."



New frequency and modulation monitor can be seen at the McMartin booth.

New FM Volumax unit will be shown by CBS Labs.

Despite the soft economy, there are signs that all is not lost in the industry. While Ampex reels from a multi-million loss in 1971, some companies report things are looking up. For example, Grass Valley's backlog at December 31, 1971 was $1.3 million, compared with $300,000 at the end of 1970. Broadcasters aren't in as bad shape as you might think. Cox Broadcasting just reported an increase of seven percent in net income over the previous year. TV revenues were even with last year, but radio revenues were ahead nine percent. Cox President J. Leonard Reinsch said recently that while the broadcasting industry still faces difficult problems, particularly on the regulatory side, there has been some lessening of pressures during 1971.

At this early date, the 1972 convention exhibition appears to be shaping up at about the same size as last year. During 1971, many stations have had equipment rebuilt and repaired rather than invest in new gear. Now manufacturers are eyeing these ripe prospects, who will likely buy new equipment with the expected upturn in business.

While it's too early to get a peek at all the equipment surprises planned for the exhibit area, some information is available. Moseley Associates will introduce a new digital TV remote control system using BCD digital techniques. Independent systems provide remote control and telemetry, automatic parameter logging, status indications, individual fulltime parameter display panels, and control system. IGM will introduce its new Aristocart, an audio cartridge said to have less wow and flutter, and the ability to deliver monaural response from

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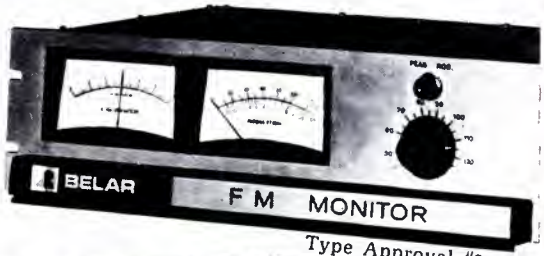
NAFMB Schedules Promotion Awards

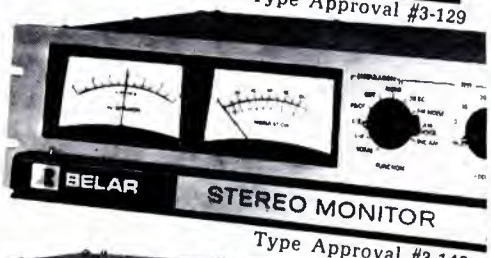
Just ahead of the big convention, NAFMB will meet at the Palmer House in Chicago from April 6 to 9. In addition to the usual management, programming, and engineering sessions, the association inaugurates this year a contest in audience promotion and sales promotion. First, second, and third place winners will be selected in each category, and awards will be presented at a special Honor Luncheon during the convention. Any FM station is eligible, and NAFMB advises that promotions need not be large, elaborate or expensive. Originality, creativity, and effectiveness will count most, and both small and large market stations will be given consideration. This seems a first for the FM industry.

now... a company that has AM, FM and TV frequency and modulation monitoring systems.

Type Approval #3-176



Type Approval #3-129



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Type Approval #3-162

Type Approval #3-181

Type Approval Not Required

Now . . . Belar. Belar is the only company that has the necessary type approvals on all three monitoring systems. Belar accuracy permits use of the maximum power allowable and maximum power means maximum profit. Add to this that all Belar equipment is immediately available.

Isn't it time you stopped running around and finally settled for a company that can handle *all* your frequency and modulation monitoring needs? Contact Arno Meyer . . . he'll show you the way.

BELAR

See us at the NAB Show—Booth #239
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Circle 109 on Reader Service Card

VHF TV Remote Control—Status Report II

Last August **BM/E** reported on the problems of going remote. Since then the required VIT signal has been approved to remove one unsettled matter. Biggest concern now is whether the demodulator selected can do the job.

ONE YEAR AGO (in March, 1971) the FCC adopted rules permitting remote control of VHF transmitters. Rules governing UHF remote control were changed to conform with the standard set for V's. Since then 54 applications (FCC form 301A) have been filed—36 V's, 18 U's. Thus far, eight have been granted. Of those not granted, 30 applicants have received letters asking for additional information or clarification of their submission.

Basically, the FCC would like to see quite complete applications including proposed layouts as well as the list of equipment that will be used. The stickiest area involves demodulators, since the demodulator is a major source of distortion.

Envelope detection of color signals reduces luminance more than chrominance. Thus there is a chrominance/luminance ratio error after demodulation.

Since effects of quadrature distortion are proportional to the square of the chrominance/luminance ratio, bright highly-saturated colors have more quadrature distortion than dark colors of lesser saturation. Quadrature distortion will give inaccurate indication of differential gain and phase and distort chrominance/luminance relationships.

Effects of quadrature distortion are alleviated somewhat by reducing the frequency response of the color subcarrier prior to detection and then restoring the video level after detection.

Product detectors get away from effects of quadrature distortion, but a product detector and an envelope react differently to residual incidental phase modulation of a transmitter. Transmitters are normally adjusted for home receivers which are envelope detected. Compensation for this difference can be made so that a product detector demodulator can "read" the right waveform.

The design of a demodulator requires many tradeoffs and all of the specs should be taken into consideration. Details of the most precision demodulators (announced so far) are listed in the accompanying table. In addition to the specs listed, the FCC is interested in stability (short-term and long-term) and the subcarrier relative to the carrier signal at the detector with and without sound traps.

The FCC has indicated it is interested in state-of-the-art demodulators and this eliminates some of the older units on the market. Some applicants have proposed equipment which the manufacturer will not recommend for this purpose.

There has been some question on sensitivity of test equipment. An RF amplifier might be necessary. Such amplifiers should be low in distortion and be matched in bandwidth to the transmitter. Such equipment does not have to be type accepted, but the FCC is extremely interested in specifications.

Gene Napier of WJCT decided to amend his application (after the FCC raised the question) to eliminate the RF amplifier. This necessitated using a separate antenna connected directly to the demodulator. (Originally Napier proposed one antenna and an RF amplifier with a splitter to feed both the aural modulation monitor and the demodulator.) Manufacturers are aware of this problem. McMartin, for example, has come out with a TBM-2500C series designed specifically for use with type approved monitoring equipment.

Test equipment to provide the necessary VIT signal may become a problem. By April 1972 remote systems must incorporate VIT standards (section 73.699). Tektronix has suitable equipment in production (see separate article, page 28) and Telemet indicates it has such equipment. Other manufacturers are expected to follow, but will not have instruments by April. Whether or not the broadcaster will be hard-pressed to get delivery will depend on just how many are ready to begin remote operations come April 30th.

New developments are occurring in remote control equipment. Spantronics has developed a final configuration which they believe is ideal for remote control and future computer control. Moseley and Rust Corporation have come up with new digital TV remote control systems which will be on display at NAB. **BM/E**

Table 1—Demodulator Specifications

Characteristic	RCA* BW-4CI	Rohde & Schwarz AMF	Telemet Model 4501-A1	Scientific Atlanta Model 6200**	Dynair RX-4B	EIE CTDI
Overall Frequency Response (Sound Notch In)***	±0.7 dB ±0.5 dB at 3.58	±.5 dB ±0.9 dB at 3.58	—3 dB ±0.5 dB at 3.58	±0.5 dB to 4.2 MHz	—3 dB ±0.5 at 3.58	±0.5 dB to 4.2 MHz
Lower Sideband Response	—20 dB except —16 dB at —1.25 MHz	—20 dB	—20 dB	—40 dB for Adjacent Carriers	—45 dB for Adjacent Carriers	—30 dB at —1.25 MHz
Input Cable Match (Return Loss)	Not specified	34 dB	18 dB	19 dB	VSWR = 1.5	16 dB
Type Detector	Envelope	Envelope	Envelope	Product	Envelope	Product
Subcarrier Response at Detector	0 dB	—3 dB	—3 dB	0 dB	0 dB	—1 dB Max
Differential Gain	10%	5%	5%	±0.2 dB max.	5%	±2%
Differential Phase	3°	±1°	±1°	±0.5°	±1°	±0.5°
Low Freq. Envelope Delay	50 ±15nS	±15nS	±25nS	±50nS	±50nS	±35 nS
High Freq. Envelope Delay	±30nS to 3.8 +200nS at 4.0	±25nS at 3.58 +160nS at 3.9	±25nS at 3.58 +180nS at 4.0	±50nS	±25nS at 3.58 +150nS at 3.9	±25nS at 3.58 +200nS at 3.90
Hum and Noise	—50 dB	—60 dB	—50 dB	—50 dB below 1.5v out	Not specified	—60 dB
Low Frequency Tilt	2% at 50 Hz	Not specified	2%	2% max. at 50 Hz	2%	2%
2T Sine Squared Pulse	Illustrated but not specified	Not specified	2%	2% K-factor, max.	2%	2%
Vacuum Tube or Solid State	Vacuum Tube	Solid State	Solid State	Solid State	Solid State	Solid State
Susceptibility to High RF Environment	Not specified but OK	Not specified but OK	Not specified but OK	Not recommended	Not specified	Not specified

* Intended for use at transmitter site only.
** Noise Figure 7 dB, VHF; 12 dB, UHF.
Minimum Input Level —20 dBm (100 uv) for maximum output.
AGC Sensitivity +0.5 dB maximum output change for 40 dB input change.
*** RCA, R & S, and Telemet units have switchable sound notches.

Equipment for Going Remote

Numbers in parentheses refer to reader service card. Circle for more info.

Remote Control

Marti Electronics
Remote control system, RMC-2AX 10 and 24 channels for wire or STL **(310)**; automatic digital logging equipment, ACL-100 **(311)**.

Moseley Associates
Digital Remote Control Equipment, consisting of: DCS-1 Digital Control System, capacity through 96 channels **(337)**; DLS-1 Digital Logging System, in groups of 20 parameters **(338)**; DSI-1 Digital Status Indicator System, in blocks of 32 channels; individual parameter display panels for continuous metering of important parameters; and independent control-only systems **(339)**; Remote control systems, 15 and 30 metering channels, 30 and 60 control, PBR-15 **(312)** and PBR-30 **(313)**; status control system, 14 channels, SC5-2 **(314)**; Tolerance Alarm Unit, TAU-2 **(315)**; Automatic Data Printer, ADP-220 **(316)**. Systems have been designed to remove TV transmitter from air after one hour, meeting FCC requirements.

Rust Corp.
Remote control RC-2600A **(317)**; RC-1000, 22 controls **(318)**; Status/Alarm Display CPX-10 **(319)**; Auto Log, AL-400 **(320)**. New digital remote control system **(343)**.

Spantronics Engineering
Digital remote control systems **(334)**.

Measuring Equipment

Dynair
Demodulator RX-4B **(340)**.

Electronic Industrial Engineering
Demodulator CTDI **(341)**.

Scientific-Atlanta
Demodulator 6200 **(342)**.

Rohde & Schwarz
VSB demodulator, type AMF **(321)**. Also front-end receiver HS-2064 for off-air **(322)**. Switchable sound trap and group delay complementary to FCC transmitter specs.

Tektronix
Test signal generator 147 NTSC. Source of all recognized vertical interval and full field test signals (eight) including VIRS **(323)**.

Telemet (Div. of Geotel)
Broadcast demodulator 4501-A1. Field-tested. Input 5mV or 5V. Has frequency response and group delay response meeting FCC requirements. Switchable sound trap. **(324)**. Price $3000. Vertical Interval Test Set as required by FCC Specification #FCC 73.676(f), for remote operation. All signals are available at Full Field modular construction. Price $3900.00 **(336)**.

Monitoring Equipment

Belar Electronics Lab Inc.
TV remote monitoring system includes RF amplifier, RFA-3 **(325)**; digital clock **(326)**; aural modulation monitor TVM-1 **(327)**; and frequency monitor, TVM-2 **(328)**.

McMartin Industries Inc.
VHF aural modulation monitor, TBM-5500 **(329)**. Price $1300. Rf amplifier matched to monitoring equip. TBM-2500C. Price $515. **(335)**.

Time & Frequency Technology
TV frequency and modulation monitor. Model 701, has high sensitivity and includes peak flasher **(330)**; aural modulation monitor, Model 702 **(331)**; remote meter and peak flasher **(332)**; automatic logging adaptor and digital clock **(333)**.

Q and A on the New Remote Control Rules

By Sal Fulchino

RUST LAYOUT SHEET

Station _____ Engineer _____

Xmtr Parallel Transmitters Date _____

Fail Safe to Control PLATES Basic System "RC-2600A"

Pos.	Control	Units	Metering	Units
1	(AB) FIL ON (AB) FIL OFF	(2) 45	FIL ON Indication	6B-1
2	(AB) PLT ON (AB) PLT OFF	(2) 45	TX A Ep	8F
3	(AB) Vis. Pwr Raise (AB) Vis. Pwr Lower	(2) 45	Comb. Vis Power	DCA-1
4	(AB) Aural Power Raise (AB) Aural Power Lower	(2) 45	Comb. Aur. Power	DCA-1
5	EBS Latch ON EBS Latch OFF	(2) 45	Aural Modulation	HP 335
6	AB Mode A Mode	(2) 45	TX A Vis. Ip	9K
7	B Mode Spare	45	TX B Vis. Ip	9K
8	Exciter A ON Exciter B ON	(2) 45	TX A Vis. Pwr.	DCA-1
9	Auto Exc Switch ON Manual Exc Switch ON	(2) 45	TX B Vis. Pwr.	DCA-1
10	(AB) Fault Reset (AB) Ovld. Indicator Reset	/	TX A Ep	/
11	Reject Ovld. Reset Spare	/	TX A Aur Ip	9K
12	Manual APC Auto APC	4C/47	TX B Ep	8F
13	Main STL On Air Stdby STL On Air	4C	TX B Aural Ip	9K
14	Main STL emerg bypass to exc. A (DIRECT) Slide Chain on Air	4C	TX A Aurl. Pwr.	DCA-1
15	Net On Air Emergency Audio on Air	4C	TX B Aur. Pwr.	DCA-1
16			Vis. Carrier Freq.	DCA-1
17			Aur. Carrier/Intercarrier Freq.	DCA-1
18			Tower Light Current	7C
19			1 Line Volts	6B-1
20			2 Line Volts	6B-1
21			3 Line Volts	6B-1
22				
23				
24				
25			Zero Calibrate	--
26			Full Scale Calibrate	--

Fig. 1. Parameters that should be telemetered are paired to the control point.

ADOPTION BY THE FCC OF NEW RULES governing the remote control of VHF-TV stations has, as was certainly to be expected, stirred up a lot of questions on the applications of the rules. My firm has collected the rules questions we are hearing most often from customers. We list them below, with answers we have developed in consultation with FCC staff normally concerned with this field. Thus, although the answers are *not* official FCC statements, those FCC staff members we consulted agreed that, as of this moment, the answers are correct.

Naturally, also piling in are questions on what remote control entails in technique and equipment with various transmitters and station set-ups. What functions *must* be covered, and what additional functions would be advantageous for the operator? What equipment will do the job? How should it be laid out to fit a particular set of station requirements?

The manufacturer of remote control equipment has developed methods for laying out a system efficiently and for integrating it with the station's requirements. For example, our firm uses a layout sheet (Fig. 1) which shows the required and suggested parameters that should be telemetered to the control point, tabled beside the associated control that should be made remote. Listed also is any auxiliary interface equipment required.

This and other similar planning tools developed by remote-control equipment manufacturers are the station operator's best insurance against costly mistakes and systems that don't do the whole job. Omissions that have to be corrected after the system is in place are particularly liable to convert a neat, sound installation into a "haywire" job with a high trouble potential.

Here is our list of questions and answers on the rules. We intend to add to the list as pertinent questions come to us from the field.

If a diode demodulator is used at the transmitter site and a new, exotic demodulator is used at the control point,

a) Is the control point demodulator to be calibrated to the transmitter site diode?

Yes, a calibration graph or table should be de-

Mr. Fulchino is president of Rust Corporation, Everett, Massachusetts.

We've got the remote control rules from the FCC, and putting them into practice is bound to raise a number of unanswered questions. Here is a batch of the questions that station operators are asking, along with answers informally cleared with the FCC.

veloped so that readings on the secondary unit can be read to agree with the selected standard unit.

b) Can the transmitter site demodulator be calibrated to the exotic demodulator at the control point?

Yes, a calibration graph or table should be developed so that readings on the secondary unit can be read to agree with the selected standard unit.

When visitations are made (either five out of seven days, or once per week, whichever rule applies), does there have to be a complete recalibration of all parameters?

Rules call for observation of the transmitter installation during the visitation period. If the observation is that recalibration is necessary, then corrections must be accomplished and noted as required. On the monitoring equipment the operator can check one or several points of the curve. He does not have to check the entire curve.

If the answer to the above is "Yes," will the FCC grant waivers to this visitation requirement after the station has operated for a length of time and can show extreme stability and tracking between the metering at both locations?

Waivers will neither be granted nor needed. If the installation displays such stability, the recalibration will not be necessary anyway.

Can the Aural and Visual Frequency Monitor be located at the transmitter site?

Since FCC rules only require the logging of Aural and Visual frequency once each day, the monitors may be at either location so long as the frequency deviation of the visual and aural transmitters can be measured in accordance with the rules.

If it is not possible to obtain a satisfactory off-the-air signal at the control point, is it permissible to pick up the signal at a location near the control point and feed it to the control point by coax cable?

It is permissible to have reasonable coax feed between the antenna and the receiver, but not between the receiver and the test equipment.

If the TV Transmitter and an FM Transmitter of the one licensee are at the same location, can the metering of one be transmitted to the control point via the subchannel of the other?

NO! Except in an emergency. However, if the TV and FM each have separate control and metering (via its own subchannel), the telemetry of both can be fed to the control point via one of the subchannels for Autolog purposes onto a single log.

Is permission required to do this under emergency conditions?

Permission is required. This permission should be obtained by letter prior to an emergency and displayed to cover the emergency when and if it occurs.

Regarding the rule section which states that "the loss of any telemetry function which provides information necessary to comply with the logging requirements of 73.671 shall result in the actuation of automatic circuitry, etc—," does this apply to aural plate voltage and/or aural plate current?

Yes. Although this may appear contrary to the FM Rules where the transmitter power is determined by the direct method, the TV Rules, as they presently read, do require the logging of Aural Plate Voltage and Aural Plate Current and the activation of the automatic timing circuits of the telemetry if either or both is lost. However, it is expected that this situation will shortly be such that TV Rules will be in comparative agreement with the existing FM Rules.

In an emergency where the telemetering is returned to the control point via the subchannel of the Aural transmitter, and it is not possible to obtain the telemetering because of transmitter problems, can the exciter of the transmitter be radiated to transmit the telemetering to the control point?

Yes, provided prior FCC permission is obtained to do so during an emergency.

If Aural Transmitter subchannel means are used to transmit the telemetering from the transmitter site to the control point, must the Modulation Monitor be capable of accurately reading the modulation of the Aural Carrier by the subchannel?

Yes, (remembering that the Aural Modulation Monitor must be located at the Control Point).

If two stations (different licensee, different ownership) share a transmitter site, can they arrange to

have one engineer perform the transmitter inspections for both stations?
Yes, provided the manpower is on both payrolls.

Is it permissible to remote-control two or more transmitter sites of different ownership from one remote control by an operator of the proper class whose salary is shared by the two or more licensee's?
Yes, but care must be taken to see to it that the operator on duty is not required to perform more duties than one man is capable of performing in a satisfactory manner.

At the present time are subchannel Frequency and Modulation monitors required?
No, but you must have a reliable means of checking the subchannel frequency.

Will a new "Proof of Performance" be required when applying for remote control?
NO!

Paragraph 38 of the "First Report & Order" states that the Control Point located Modulation Monitor "Carrier Level" meter can be used as an indication of transmitter power level in the event of failure of the metering transmission path. Some new monitors have lights to indicate "Carrier Level" rather than a meter—is this acceptable?
Yes.

Has the FCC type approved Modulation or Frequency Monitors for "off-the-air" operation?
Type-approved direct-feed monitoring equipment must be used but there is no such thing as an off-the-air type approval.

Has the FCC type approved RF Preamplifiers for TV?
No, but neither has the FCC prohibited use of such devices. In fact, paragraph 73.676 (2) (4) indicates that the use of such an "apparatus" is allowable.

What are the rule requirements for duties and utility action of the first class operator at the control point?
The rules are essentially the same as for the operator that is located at the transmitter site. While he may be utilized "for other duties," "such duties shall in no way impair or impede the required supervision of the television broadcast transmitter." When operating by remote control, all required monitoring equipment and remote control metering must be "readily accessible and clearly visible to the operator" at all times! The operator must be in the same room as the monitoring and remote control equipment. This does not allow for a room size, wherein the operator can still be in the same room as the equipment but far enough away so that he cannot read the remote control telemetering or determine that the required waveform readings are correct.

A station has separate Aural and Visual transmitters and is capable of multiplexing the Video Signal through the Aural transmitter. The Aural transmitter can meet the 20% power rule of the FCC both as to Video and Aural Power. How often must the transmitter site be inspected?
At least once every seven days.

A station has two transmitter sites—for example, Site "A" the AM site and Site "B" the FM and TV site. Each site has its own remote control system to its control room (both in the same building) with the required class of operator on duty. Each control point has equipment to meet the Alarming requirements of automatic transmitter logging. The two remote control systems share an automatic logging system that is "located in the near vicinity of the operator on duty" and can be "inspected by him periodically during the broadcast day—." Is this in conformity with the present FCC rules?
Yes.

What is the station procedure to be followed if a required piece of off-the-air monitoring equipment becomes inoperative? For example, the demodulator, off-the-air RF amplifier, VIT generator or vectorscope?
Follow the same procedure as for an inoperative modulation monitor. Section 73.691 of the FCC Rules.

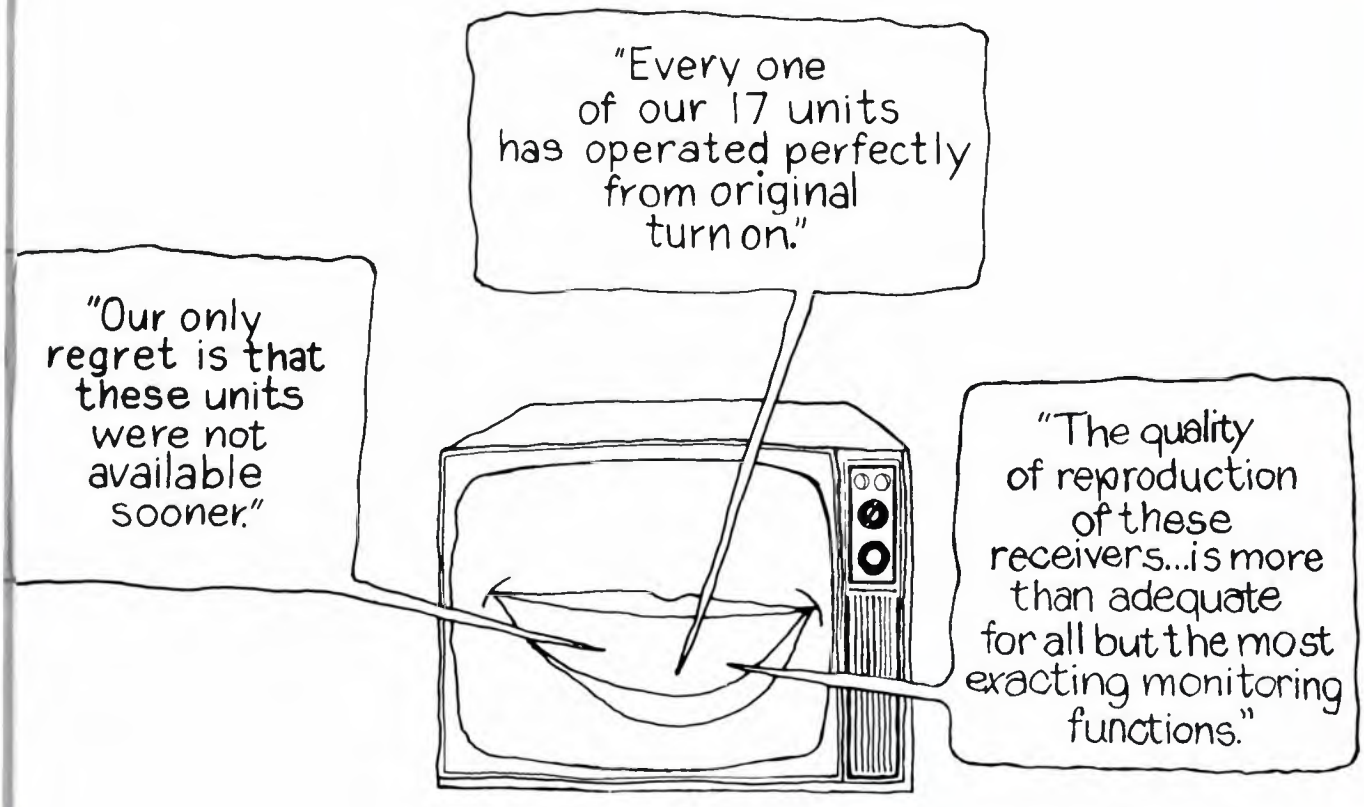
Does the off-the-air monitoring equipment have to be devoted full time to the monitoring of the required signals for remote control operation?
In essence the equipment should continuously monitor the signals required under the TV Remote Control Rules. However, the equipment can be utilized for periodic observations of other signals, provided that the equipment is always immediately returned to the capability to display the required TV Remote Control signals.

What are the unattended transmitter site security requirements?
Security requirements for the transmitter site require that reasonable precautions be taken to see to it that access by unauthorized persons is virtually impossible. However, if access is gained by unauthorized persons, provisions must be made for immediate notification to control point personnel. Minimum requirements should include, but not be limited to, a reasonable fence surrounding the entire area, metal screening or expanded metal covering for building glass area, fail-safe intruder alarm to the control point and/or other locations, such as a police station.

If the remote control point is in the same building or complex as the transmitter, is it necessary to incorporate into the equipment the telemetry one-hour timer circuit?
The Commission has indicated that under some circumstances a waiver may be obtained. The request for waiver should be included in the original remote control application. **BM/E**

COLOR MONITORING FOR UNDER $400 ...AND THE QUALITY SPEAKS FOR ITSELF!

Listen to what Otto Claus, Chief Engineer, WBAL-TV, Baltimore, says about general purpose monitoring with RCA'S low-cost commercial color receiver:



Unlike color sets intended for home use, this receiver is equipped to accept RF or bridged direct video and audio line feed without the need for costly adaptors. *For under $400,* you get every non-critical monitoring function you can ask for — picture, sound, live or tape, color or monochrome. It's especially suitable for monitoring needs backstage, for the band, for the audience, and similar applications.

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2500 kW output

Now—only two tubes are required in the power amplifier stage of a 2500 kW, 100% modulated long, medium or shortwave broadcast transmitter

Shown below are two EIMAC X-2159 developmental tetrodes, the most powerful tubes in the world. A single X-2159 has an anode dissipation of 1250 kW. Two tubes provide a carrier power of 2500 kW, 100% amplitude modulated.

Here is a technological breakthrough permitting a very high power broadcast transmitter to be built, having a single output stage. Now, for the first time, 5 megawatts output, or greater, is practical. Substantially less capital investment is required; driver stages, power supplies, control circuits, cabinets, and floor space may be substantially reduced when these high gain tetrode tubes are employed.

For full specifications on the new EIMAC X-2159 contact any of the more than 30 Varian/EIMAC Electron Tube and Device Group sales offices throughout the world.
Or the EIMAC Division of Varian
301 Industrial Way, San Carlos, California 94070.

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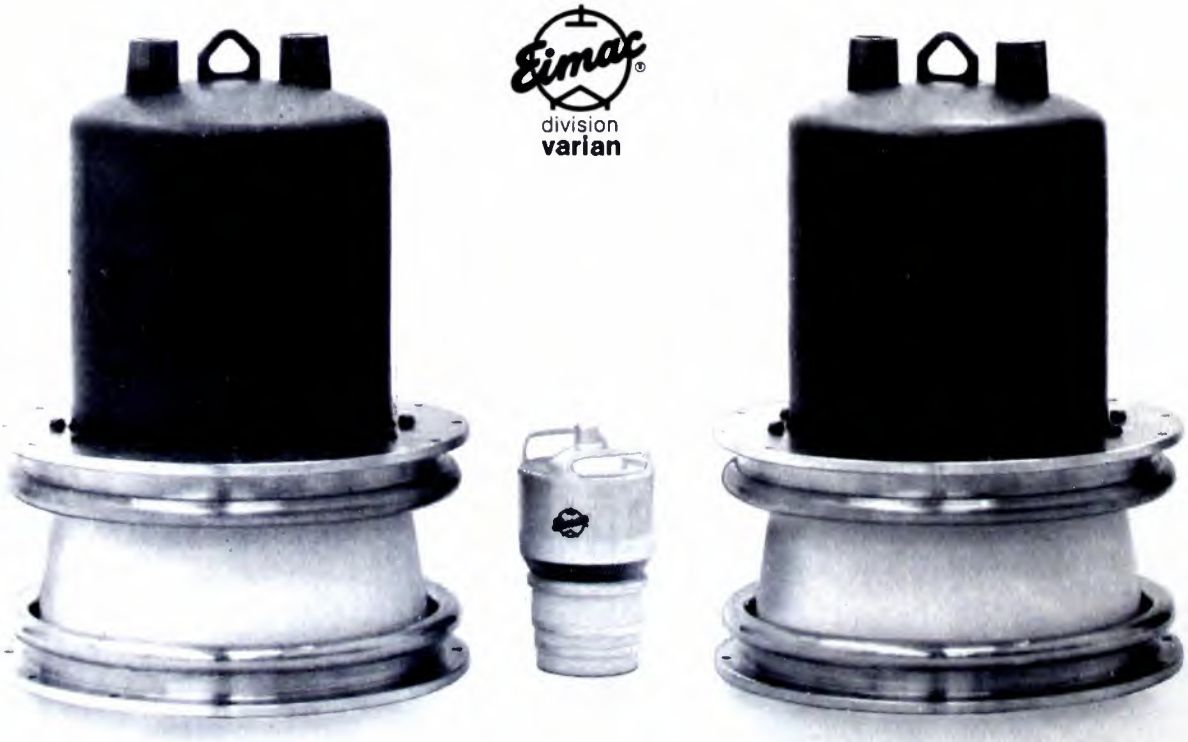


4CX5000A
Shown for
size comparison.

Circle 110 on Reader Service Card

How A Mini-Computer Could Take Over a Broadcast Transmitter

'd. note: Now that the industry has moved another ep toward automation (VHF remote control), the me is ripe to go all the way and use a computer make adjustments. We'd like to report some ac- ial experimental work—who will be first?

N A PAPER, "AUTOMATION OF THE TRANSMITTING YSTEM" presented at the IEEE—GB Broadcast ymposium in Washington, D.C. in September 971, Donald E. Pauley of Smith Electronics sur- eyed in general terms the problems, advantages, ad costs of converting a broadcast transmitter into process control system, with a computer supplying te control. The following is a brief digest of Mr. auley's presentation. (The full text is expected to ppear in a future issue of the IEEE Transactions n Broadcasting.)

Operation and control of broadcast transmitters as not changed substantially in 40 years: the oper- or reads and logs meters periodically, makes an djustment if some parameter is out of limit.

This monitoring-adjustment-logging function could e carried out better by a small process-control omputer and, in addition, the computer could o extensive diagnostics during normal operation. he computer can do more than keep param- ers within assigned FCC and overload lim- s; it can solve the control equations for "best" peration, optimizing desired characteristics of the rocess. One way the computer can do this is by irect on-line experimentation seeking to improve ie operation iteratively.

The process requirements programmed into the omputer can be broken down into: The primary oal of survival of the system, which includes the pecified license parameters and overload param- ters; and secondary goals and functions, such as aximize audio level, minimize noise and distor- ion, maximize transmitter efficiency, maximize life f components (especially power output tubes), log- ing, fault detection and identification, diagnostic nessages, and operator signaling.

For analysis of control problems, the transmitter s broken down into subsections: the audio subsys- em, radio subsystem, power subsystem and antenna ubsystem. Each has its own set of parameters. Di- ect control of the antenna subsystem is complicated ecause all the parameters and variables are strong- y coupled. Procedures for handling such variables re not simple, but they are well developed. They lo require that the computer have somewhat more apacity than it would need for the other subsystems f the transmitter.

Some parameters cannot be measured directly and must be computed or implied. For example, power supply impedance and amplifier transconductance can be computed fairly simply, by a least-squares analysis. Other parameters, such as the radiator loss resistance, are more difficult. But the art is advancing rapidly, and process control of a transmitter already recommends itself as a great cost saver and improver of broadcast operation.

How much will it cost? That depends on how much the operator wants to accomplish with it. Costs on three levels are shown in Tables 1, 2, and 3. The small system should be adequate for a non-directional or FM station, with no diagnostic, and few high level functions attempted. The middle system should permit high level control of simple directional antenna systems and minimum control of the most complex transmitting system. The large system should be adequate for controlling a very complex AM station, and possibly an FM station and TV station in addition. All these costs assume that sufficient developmental work has been completed so that adequate standards are available, and hardware and procedures are type accepted by the FCC.

BM/E

TABLE 1

COST OF SMALL COMPUTER CONTROL SYSTEM

Computer	$ 1,500
Data Storage	500
Interface	2,500
Sensors	2,000
Actuators	4,000
Programming	2,000
Teletype Console	1,000
Engineering Services	4,000
Total	$17,500

TABLE 2

COST OF MEDIUM COMPUTER CONTROL SYSTEM

Computer	$10,000
Data Storage	3,000
Interface	5,000
Sensors	4,000
Actuators	6,000
Programming	5,000
Teletype Control	1,000
Engineering Services	6,000
Total	$40,000

TABLE 3

COST OF LARGE COMPUTER CONTROL SYSTEM

Computer	$25,000
Data Storage	10,000
Interface	8,000
Sensors	8,000
Actuators	10,000
Programming	10,000
Custom Console	5,000
Engineering Services	10,000
Total	$86,000

Test Signals for Monitoring Remotely Controlled TV Transmitters

By Charles W. Rhodes

Part II—The Modified Multiburst; Checking a Demodulator. The new composite signal, including the color bar, was covered in Part I.

WHILE THE MULTIBURST SIGNAL may, at times, be overworked, it remains a very useful tool for the transmitter engineer. The multiburst in §73.699, Fig. 13, includes the frequencies at which the rules specify amplitude/frequency response limits. The 4.10 MHz burst is to permit a sensible tolerance on frequency stability. Otherwise, the specification should be 4.18 MHz maximum. Either way they mean the same thing; that is, it should not exceed 4.18 MHz. The breezeway between successive burst permits ringing following a burst to decay before the next burst. In sharp cutoff systems, this is especially helpful following the 4.1 MHz burst.

Quadrature distortion in the demodulator reduces the amplitude of the bursts above 0.5 MHz as these are radiated as single sideband signals. The apparent gain loss above 0.5 MHz depends upon the demodulator's IF design. Great variety exists in the IF characteristics of available demodulators. Another consequence of quadrature distortion (in the demodulator) is axis shifting of the bursts above 0.5 MHz. As axis shift and frequency response measurements are important as regards the STL and transmitter, the multiburst signal of Fig. 13 was designed to minimize quadrature distortion in the demodulator. Quadrature distortion varies in square law fashion with p-p amplitude of s.s.b. signals at any given AC axis. It varies inversely with the AC axis as percent of sync tip carrier level. Thus, the bursts are all at 60 IRE p-p and at 40 IRE (50% carrier at peak of sync) AC axis. Figures 12 and 13 compare axis shift observed in a demodulator with and without sound traps ON. When switchable, these affect much more than just sound traps in some demodulators. Read the manufacturer's manual carefully.

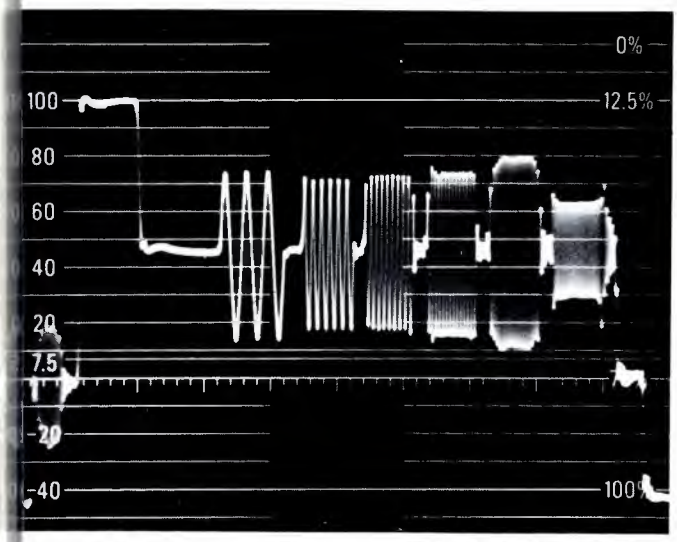
Some quick insight into the effects of quadrature distortion can be gained by observing the multiburst signal as demodulated by the transmission line diode. Here, the demodulated video is essentially free of this form of distortion. Look at the axis shifting, then check it with the station demodulator. The differences are much greater with the customary full amplitude type multiburst than with the signal of Fig. 13 (§73.699). Many engineers have used reduced amplitude multiburst in dealing with VTR's, microwave relays and transmitters so this is not a new concept. The response for full amplitude multiburst of one demodulator, sound trap ON, is shown in Fig. 14; sound trap OFF in Fig. 15. Comparing Figs. 13 and 15 or 12 and 14 shows the reduction in quadrature distortion (axis shift) with the reduced multiburst.

A typical monitoring setup requires a line selecting waveform monitor,† vectorscope (or other means of observing the relative phases of the test signal) and a color picture monitor. A possible arrangement is shown in Fig. 16 (R529, R520, R650, 140 and 147 Option O1 and a Gain Normalizer, Tektronix Type 137). The required test signals are inserted on Line 18 and 19 as detailed in Figs. 13-15 of §73.699. Noise or test signals on these lines (e.g. network VITS) must be *deleted*. At least one test signal generator,* deleter/inserter capable of meeting the requirements when used with a suitable color bar generator,** is available. These two units occupy 7 in. of rack space. The generators may be located wherever convenient. No front panel operating controls need to be manipulated during either color or monochrome operations. The VITS inserter/deleter may be bypassed from a remote location. In this mode, the program signal passes via a relay around the 147 circuitry. Failure within the 147 to gen-lock will automatically inhibit both VITS deletion and insertion until gen-lock is re-established.

The 147 may be placed in its PREVIEW mode to observe that the VITS will be inserted as desired

†For transmitter monitoring, it is desirable that the dc restorer in the waveform monitor works on the tip of sync. The Tektronix 529 is normally wired for backporch dc restoration. The manual shows how to rewire it for sync tip restoration, and this is highly recommended. The 520 vectorscope dc restorer works on tip of sync already.

*Tektronix Type 147
**Tektronix Type 140 (144, 146)



g. 12. Multiburst per FCC §73.669, Fig. 13, demodulated; ound trap ON.

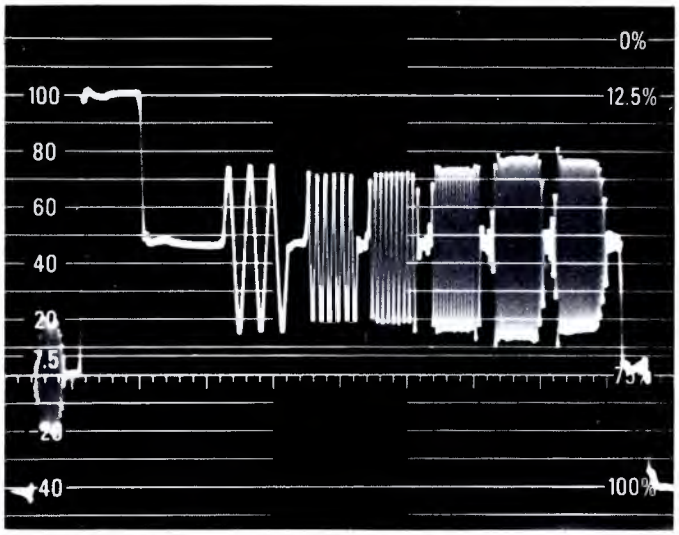
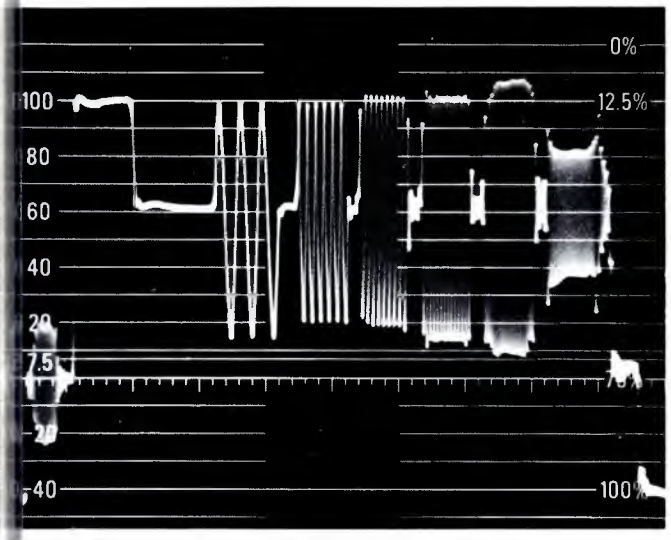


Fig. 13. Multiburst per FCC §73.699, Fig. 13, demodulated; sound trap OFF.



ig 14. Full amplitude multiburst demodulated; sound rap ON.

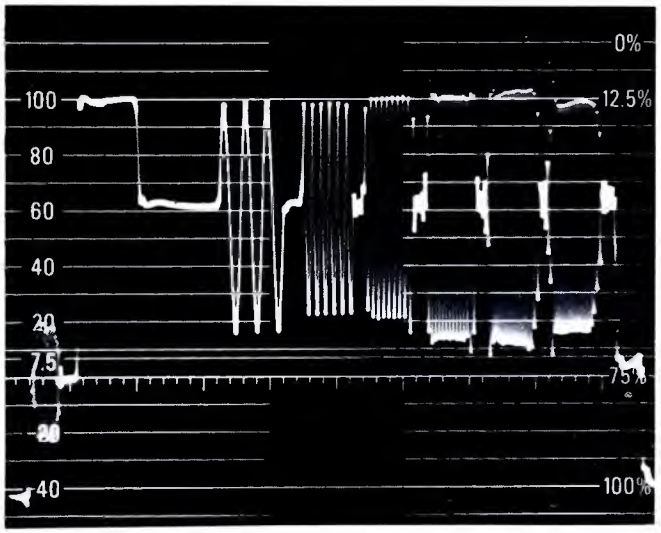


Fig. 15. Full amplitude multiburst demodulated; sound trap OFF.

nto the PROGRAM OUTPUTS. They can be bserved on the PREVIEW monitoring outputs in oth PREVIEW and PROGRAM MODES. Only in ne PROGRAM MODE will any VITS be deleted r inserted on the PROGRAM OUPUTS. The REVIEW-PROGRAM MODE may be remotely ontrolled.

The 147 provides the gen-locking function for the olor bar generator. This provides two operational dvantages, plus cost savings:

1) Correct timing, including color bar phasing (a ne-time manual operation); and

2) Color bar chrominance inhibit when the pro- ram signal is monochrome, i.e. subcarrier output of he 147 is "killed" by lack of burst or lack of color en-lock. This condition can be remotely indicated f desired.

A typical equipment interconnection diagram is shown in Fig. 17. These test signals may be generated as full field test signals identified to the VIT signals. Thus, during a maintenance period, it is possible to verify that the transmitter handles the VITS in the same way as full field signals. This is very important because some processing amplifiers may not.

Checking up on the STL

This problem was considered to be very important as no operator will normally be available to monitor STL output. Several alternatives are open to the broadcaster in his use of Line 19, Field II. The rules provide that the composite test signal, Fig. 15 of §73.699, shall be radiated on Line 19, Field I. The same test signal may be radiated during Line 19, Field II, in one of the following ways:

1) It may be inserted at the input to the STL the

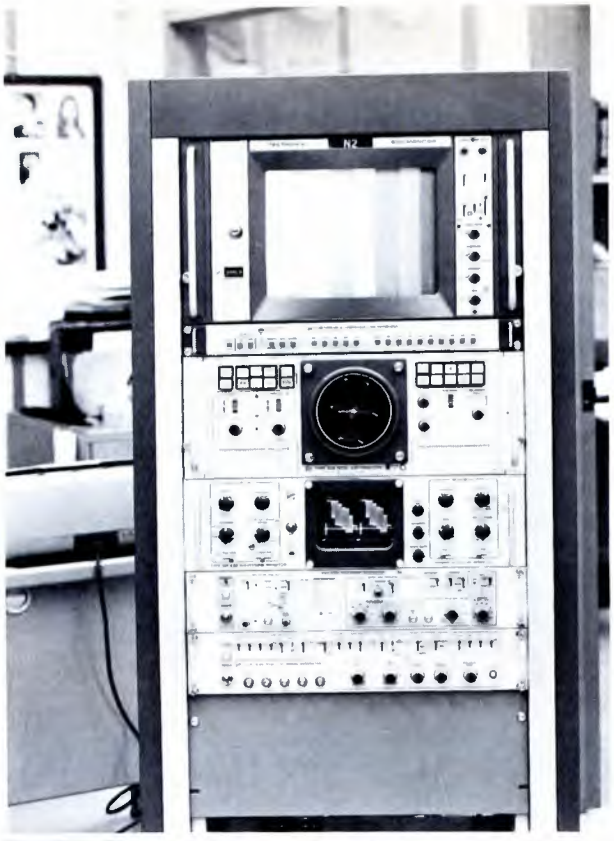


Fig. 16. Photograph of equipment.

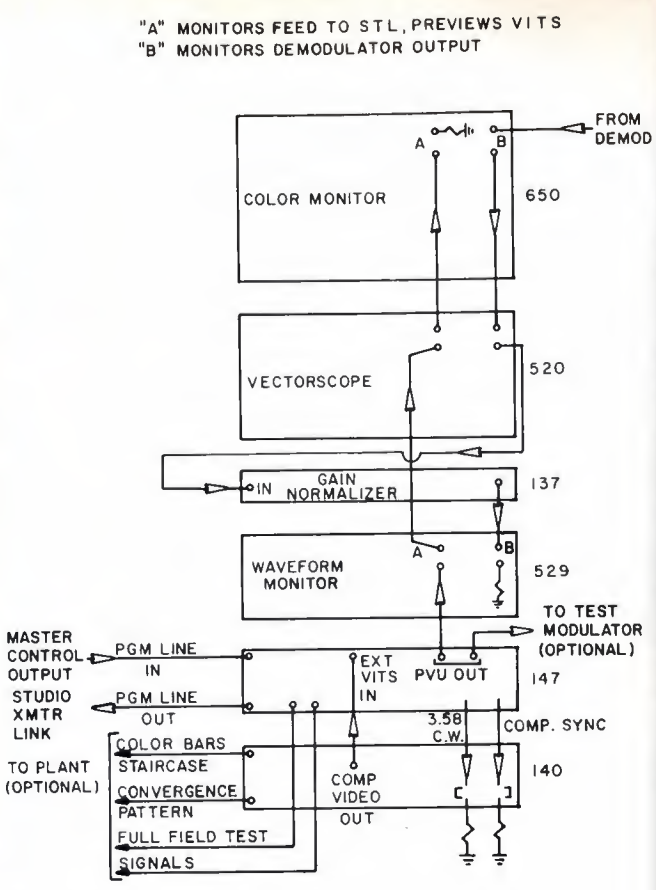


Fig. 17. Equipment interconnection system.

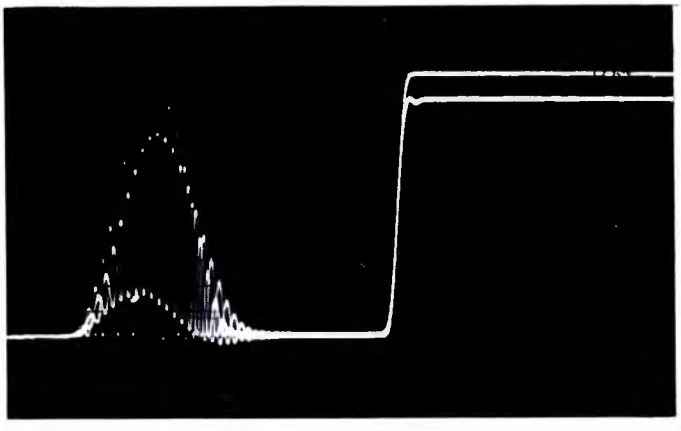
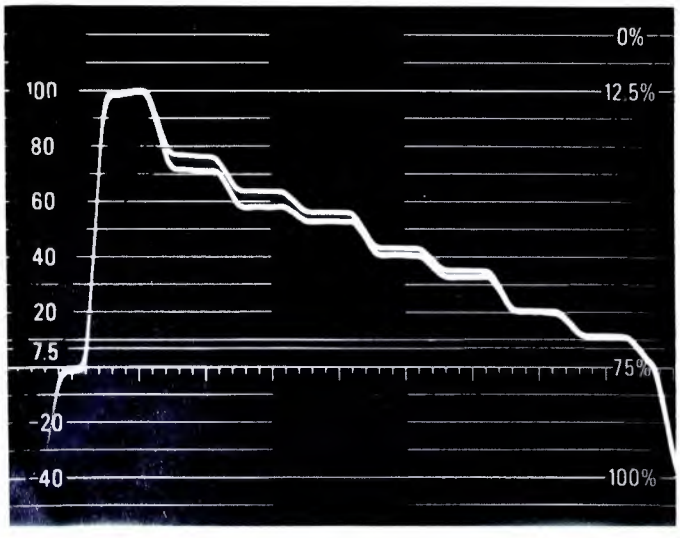


Fig. 18. 12.5T pulse and bar undistorted signal compared with distorted signal from STL. Note bar amplitude, chrominance loss and delay.



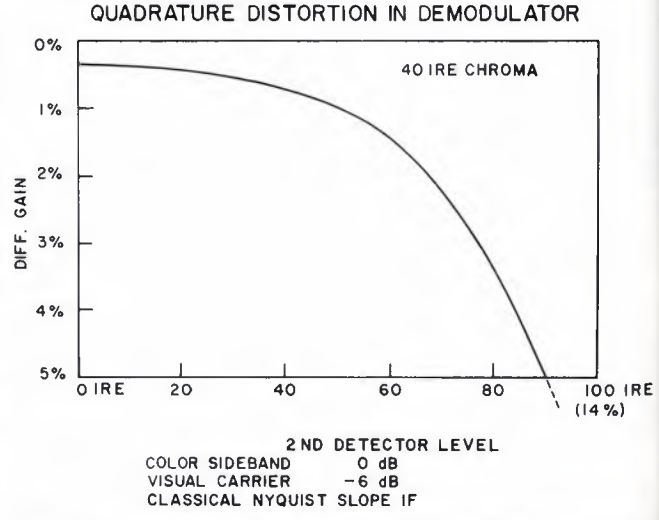


Fig. 19. Differential gain due to quadrature distortion in the demodulator.

Fig. 20. Luminance component of color bars shifts when chrominance component is switched off. This may be quadrature distortion in the demodulator, or non-linearity in the transmitter.

same as it is during Field I (of course, the same VITS generator can insert the composite signal on either or both fields, same line); or

2) At the STL output, a second generator/inserter may be installed. It would be programmed to delete the test signal coming up on 19-II and insert the composite test signal as generated by the additional generator. The transmitter engineer will readily detect differences between the test signal observed on Field I and II; the Field I signal traversed STL, the Field II signal did not. That is, differences in the two waveforms are due to the STL. Distortions in both waveforms are isolated to the transmitter-radio path-demodulator configuration. Tektronix considers that two Type 147 VITS generators can duplicate each others' waveforms to very high accuracy and over a long period of time without maintenance—largely due to the digital timing circuits. It is possible to compare the Field I and Field II signals on a Tektronix 529 by a simple modification which disables its field selector. This is shown in Fig. 18.

The Commission left room for future test signals to be used on Line 19, Field II. The only requirement is that such signals have approximately the same APL as the composite signal of Fig. 15, 73.699.

It seems highly desirable to be able to localize STL difficulties without traveling to the transmitter site. The economic justification of the second VITS generator/deleter/inserter at the transmitter can also be rationalized by its usefulness as a source of test signals at the transmitter during maintenance visits, independent of the studio or condition of the STL. There is no requirement to have a second VITS unit at the transmitter. Even where a second unit is installed at the transmitter, the first unit must insert the same signal on Line 19 of both fields. It also seems desirable to provide remote bypass capability for the VIT signal generator/deleter/inserter located at the transmitter as its failure might interfere with transmission. The remote bypass relay can and should be controlled from the transmitter control point. Certain failures in the Tektronix 147 would automatically bypass the program signal around the equipment. Should the equipment at the transmitter fail, switching itself into bypass mode (or the operator remotely bypasses it), it would be desirable to indicate this condition. The subcarrier phase of the modulated sine-squared pulse may be offset from burst in each generator to identify it. For example, at the STL input the generator may be set to magenta phase as in Fig. 5, and, at the transmitter site it can be set to green phase as in Fig. 6.

Checking up on the demodulator

There are two ways to evaluate the demodulator performance.

By comparison of the off-the-air demodulator with the diode demodulator at the transmitter, much can be learned about the combined performance of the radio path and demodulator. Standing waves on the receiving antenna down-lead, or frequency peaking of the antenna, or multipath reception will affect the demodulator's performance—more so on test signals than pictures. Sometimes what is taken for misalignment in the demodulator is due to these "perils of the radio path."

The demodulator may also be driven from a high quality CATV or similar modulator. Rohde & Schwarz offers a measuring modulator. As the demodulator must be operated with sound traps on, the test modulator must include the pre-correction filter required of transmitters. Otherwise, large distortions in the 2T pulse, 12.5T modulated sine-squared pulse and bar transitions will be observed through your demodulator.

It is conjecture on the author's part, but the new remote monitoring rules will probably stimulate the development of such test transmitters—perhaps by manufacturers of CATV headend equipment and/or instrumentation manufacturers. If the test transmitter is available, it can be fed test signals from an isolated output of the Tektronix 147. It is absolutely essential that such test transmitters operate at your exact picture carrier frequency. Demodulators are usually fixed-tuned and traps are very steep and sharp. We have seen 100 ns of group envelope delay due to small tuning errors.

Here are a few hints to help resolve transmitter vs demodulator problems. Many transmitters react differently to test signals as a function of APL. Demodulators are not APL sensitive. During maintenance periods, the Tektronix 147 can insert these test signals while its APL bounces automatically every 10 seconds or so from 10% to 90%. Distortions which change are in the transmitter (or STL).

Quadrature distortion is a distortion which is found in all demodulators using envelope type detectors. This distortion causes a form of differential gain which always decreases chrominance towards white (see Fig. 19). It also reduces the luminance of the color bars; especially the bright ones, yellow and cyan (see Fig. 20).

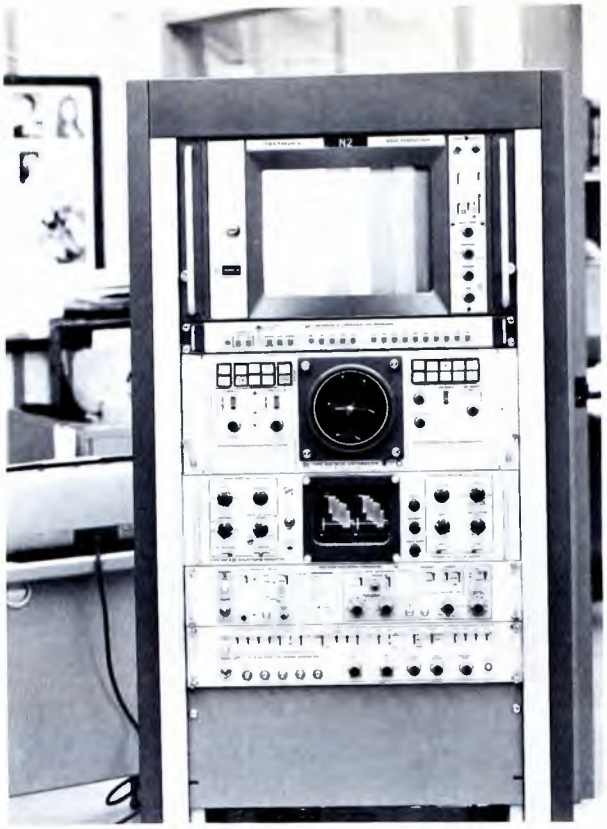
With a diode in the feed line to your transmitting antenna for demodulation, observe the change in the luminance portion of your color bar test signal as you switch ON/OFF both R-Y and B-Y chrominance. Your "diode" will not produce noticeable quadrature distortion. Your transmitter may cause either the same, or opposite effect upon the color bar luminance as chrominance is switched ON/OFF as shown in Fig. 20. We have observed the Y component of red and blue bars shift up with chrominance ON, or the bright bars shift down, or both. By not using the off-the-air demodulator at all, you can isolate these non-linearities to the transmitter or measure just how much distortion your demodulator contributes.

Checking up on the radio path

At your transmitter, the transmission line diode tells you what your transmitter feeds into the transmission line.

What is received at your remote monitoring point includes the cascaded effects of both transmission

continued on page 49



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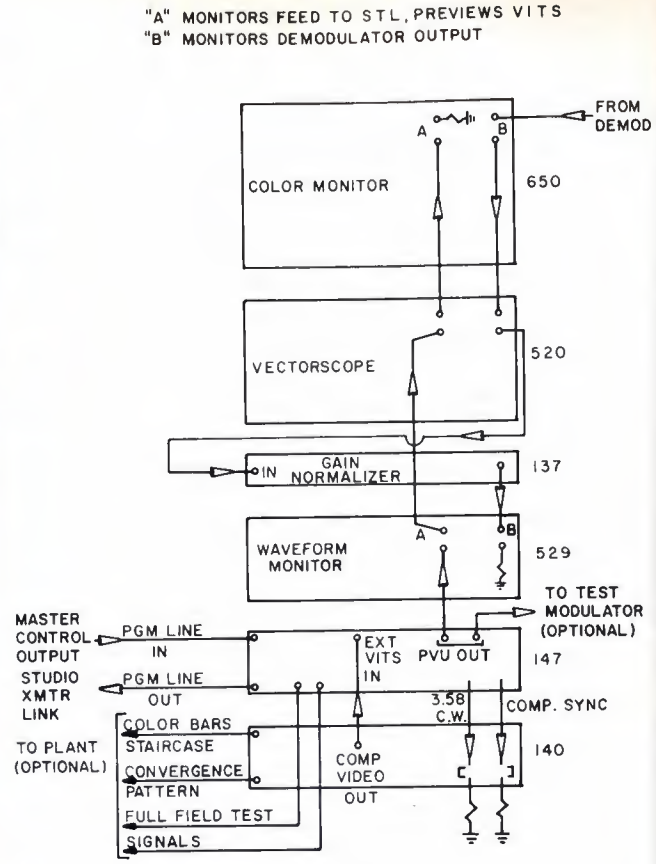

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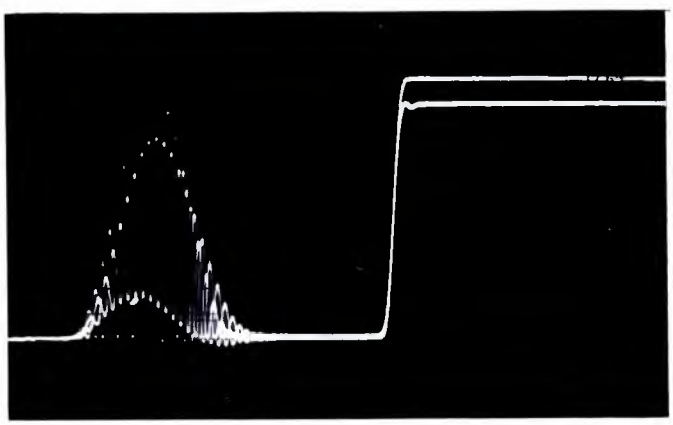

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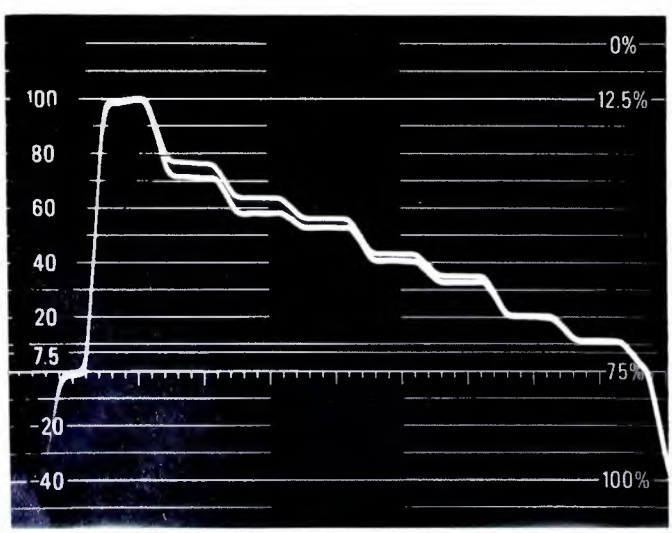

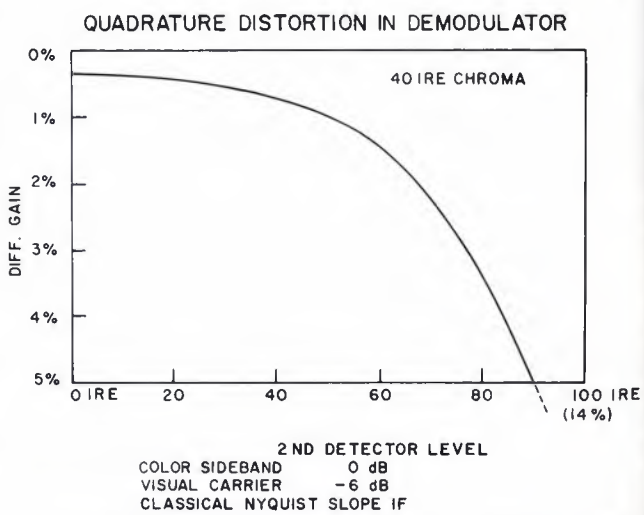

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Here are a few hints to help resolve transmitter vs demodulator problems. Many transmitters react differently to test signals as a function of APL. Demodulators are not APL sensitive. During maintenance periods, the Tektronix 147 can insert these test signals while its APL bounces automatically every 10 seconds or so from 10% to 90%. Distortions which change are in the transmitter (or STL).

Quadrature distortion is a distortion which is found in all demodulators using envelope type detectors. This distortion causes a form of differential gain which always decreases chrominance towards white (see Fig. 19). It also reduces the luminance of the color bars; especially the bright ones, yellow and cyan (see Fig. 20).

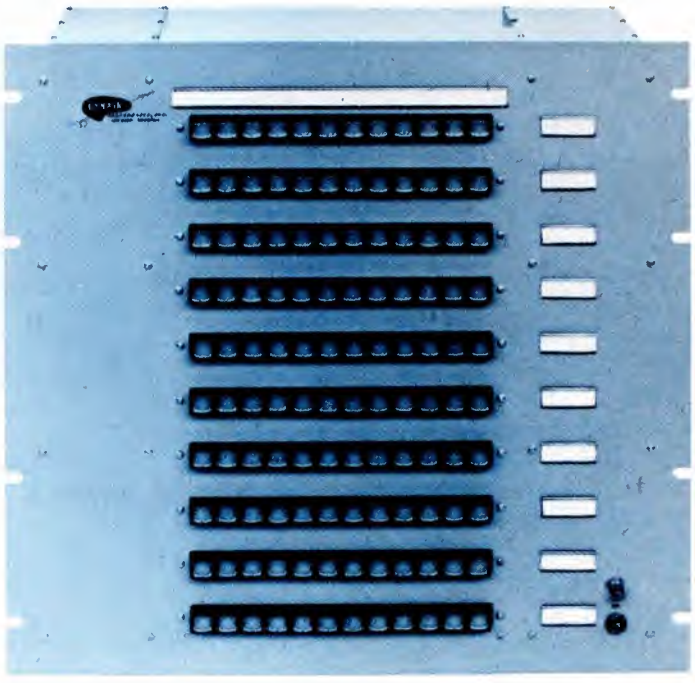
With a diode in the feed line to your transmitting antenna for demodulation, observe the change in the luminance portion of your color bar test signal as you switch ON/OFF both R-Y and B-Y chrominance. Your "diode" will not produce noticeable quadrature distortion. Your transmitter may cause either the same, or opposite effect upon the color bar luminance as chrominance is switched ON/OFF as shown in Fig. 20. We have observed the Y component of red and blue bars shift up with chrominance ON, or the bright bars shift down, or both. By not using the off-the-air demodulator at all, you can isolate these non-linearities to the transmitter or measure just how much distortion your demodulator contributes.

Checking up on the radio path

At your transmitter, the transmission line diode tells you what your transmitter feeds into the transmission line.

What is received at your remote monitoring point includes the cascaded effects of both transmission

continued on page 49



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12 in, 6 out	1,645.00	2,815.00	12.25
6 in, 9 out	2,070.00	3,675.00	15.75
12 in, 9 out	2,335.00	3,940.00	15.75
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Circle 111 on Reader Service Card

Upsurge in Discrete Four-Channel Stereo

THE FOUR-CHANNEL FRONT seems to be developing nto a horse race between the proponents of matrix ystems and a growing group who have cast their lot vith discrete four-channel recording and broadcast- ng.

Among the various matrix systems there is a rend toward standardization, as noted in *BM/E*'s anuary issue. Moreover, one system—Columbia's SQ"—now looks like the dominant matrix system vith many professionals in the field judging it to be ne most effective of those readily available.

But that does not mean that the period of technical ompetition in four-channel stereo is over, because t least two discrete systems, which as little as eight r ten months ago seemed well beyond the horizon, re now threatening to leave the starting gate at any ioment.

The Dorren Quadracast FM system, described in ie July 1971 issue of *BM/E*, has the strong sup- ort of station KIOI in San Francisco, which has etitioned the FCC for the right to use the system in iore or less regular experimental broadcasts. Dor- en uses a subcarrier of 76 KHz for the coding iformation that assigns program material to the our channels. That produces a total deviation, in- luding sidebands, of 92 KHz, rather than the stan- ard 75 KHz.

But the backers of the Dorren system say that ney have the tests and analyses to show that there 'ill be no interference with an FM station on the ext channel, a main concern of the FCC about the ystem. Jim Gabbert, general manager of KIOI and a :ader among the pro-discrete forces, points to tudies showing that Quadracast has *less* sideband nergy than two-channel FM by the present system.

The FCC, in answer to a *BM/E* query, would ive no timetable for action on the KIOI petition. Incidentally, it is worthwhile to note again that use f a matrix system does *not* require FCC approval ince there is no change in the relevant characteris- ics of the transmitted signal.) Meanwhile, the Dor- en system, just as this was written, got a trial by tation CHFI in Toronto, Canada, and won a highly nthusiastic reception. A petition has been filed with he CRTC for permission to use the system in experi- nental broadcasts there.

The discrete method got big-company support rom another direction. RCA, Panasonic, and JVC n November made a joint "progress report" to the rade press on the development of a four-channel nultiplex disc, based on the disc system JVC has been showing for several years (and selling strongly n Japan). RCA and JVC said they were well on :he way to solving the main problem holding up release of the system in this country—making the disc usable on two-channel equipment without damage to the four-channel information. All three firms have supported the KIOI position on the Dor- ren system, Panasonic with a brief to the FCC en- dorsing the KIOI petition.

Jerry Orbach of JVC told *BM/E*, as we went to press, that the "breakthrough" on the disc problem has been made, with the four-channel disc thus much closer to marketability than was thought a short while ago. *BM/E* learned from other sources what must be, at least in part, the basis for this optimism. Lou Dorren, the Quadracast inventor, has further srengthened the position of discrete four-channel by inventing a greatly simplified decoder for the JVC disc system, a decoder that, moreover, makes the system work with *ordinary two-channel stereo pick- ups*. One of the difficulties with the JVC system cited by its opponents in this country was the need for a pickup with flat response to about 45 KHz. The advance information is that Dorren by some technical magic or other has modified or eliminated this requirement. No details were available at press time, but if the advance information on this is cor- rect it is a "breakthrough" indeed, moving the discrete four-channel disc much closer to the mar- ket.

If and when the disc comes, it will affect the FM broadcaster by putting more pressure on the FCC to take some action on the Dorren system, the only discrete system now actually before the FCC. The presence of RCA in the discrete-disc camp means that the disc would bring with it a wealth of pro- gram material, not only from RCA but from other recording firms that would follow RCA's lead.

However, the well-known action rate of the FCC clearly makes it a dubious policy for any FM broad- caster to abandon using a matrix system at the present time, especially if matrixed quad broadcast- ing has stirred strong listener response. The good matrix systems do remarkably enhance the listening experience. With many kinds of program material the difference in results between a matrix system and a discrete system may be very subtle or non- existent: it is far from a clear-cut case of "inferior" and "superior," and the statements of some of the contestants in the field, on both sides, suffer from oversimplification.

However, it does seem that a discrete system, if and when it becomes practicable, *will* do more things than a matrix system. The valid theory of matrix systems has been that the quite subtle limita- tions of matrixing, as compared with discrete, were more than worth accepting for the greatly simplified engineering and ready compatibility of having only two channels in the transmitted signal or on the recording medium. If the engineering for discrete systems is developed to the point of cost, complexi- ty, and compatibility comparable to those of matrix systems, the whole theory will need re-examination.

BM/E

AUDIO FILE:

FOR BETTER IDEAS
FROM AUDIO ENGINEERS

The automation story is now familiar enough, with the new refinements that keep coming along mostly fitting into a pattern based on a separate logic unit that coordinates and controls the many parts of the operation.

But automation built right into an audio console is something else again. When *BM/E* read the description of a series of consoles offered by Broadcast Recorders of Fremont, California, we put in a call to Duke McLane, operations manager of that firm. Mr. McLane said that, as far as he knew, Broadcast Recorders' were the only automated audio consoles now available (a prototype was reported under construction at Fairchild).

Called Program Logic Audio Control, the system is essentially a combination of audio mixing with automation logic. The operator can program a cluster or sequence of commercials, identifications, and other recorded items simply by punching in a pre-set button for each of the sources. The console will take it from there at the push of the start button, activating and mixing in each of the pre-programmed sources in the same order in which the pre-set buttons were pushed. The operator is free to prepare newscasts, plan future program segments, or use his time in other creative ways.

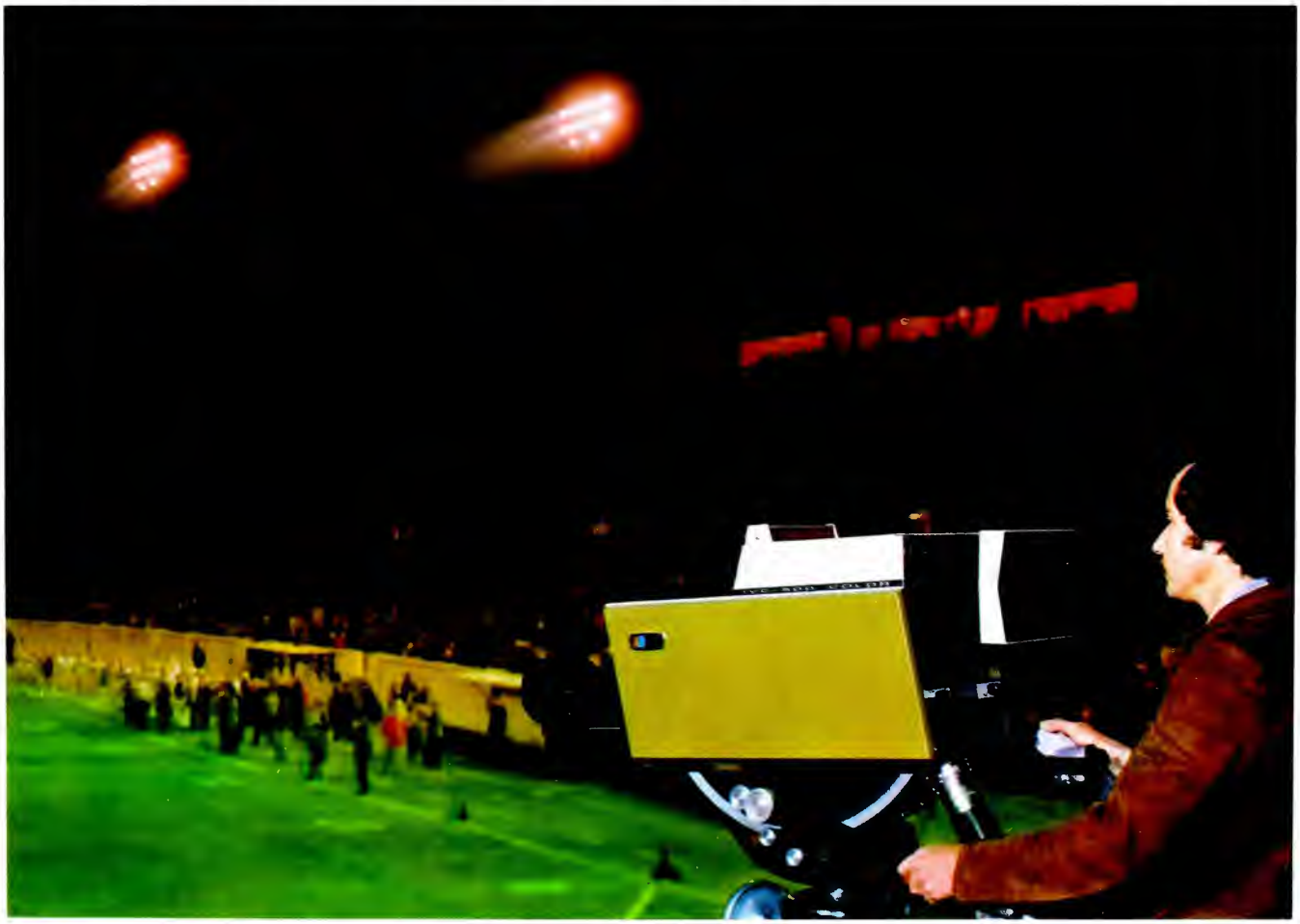
At the same time, said Mr. McLane, the console maintains full control flexibility and person-to-listener contact, important in successful "personality" programs.

The on-air result is a very tight program flow through the automated sequences. That seems to *BM/E* a good example of automation in the service of a more responsive, easier-handled operation. Six of the consoles, Mr. McLane reported, are being installed by KRLD in Dallas, Texas, as part of a comprehensive "logification" at that station.

Contributions from readers are welcome. **BM/E**

Circle 113 on Reader Service Card →

Presenting the first broadcast camera to see reds as they really are-while dramatically reducing studio and remote lighting requirements



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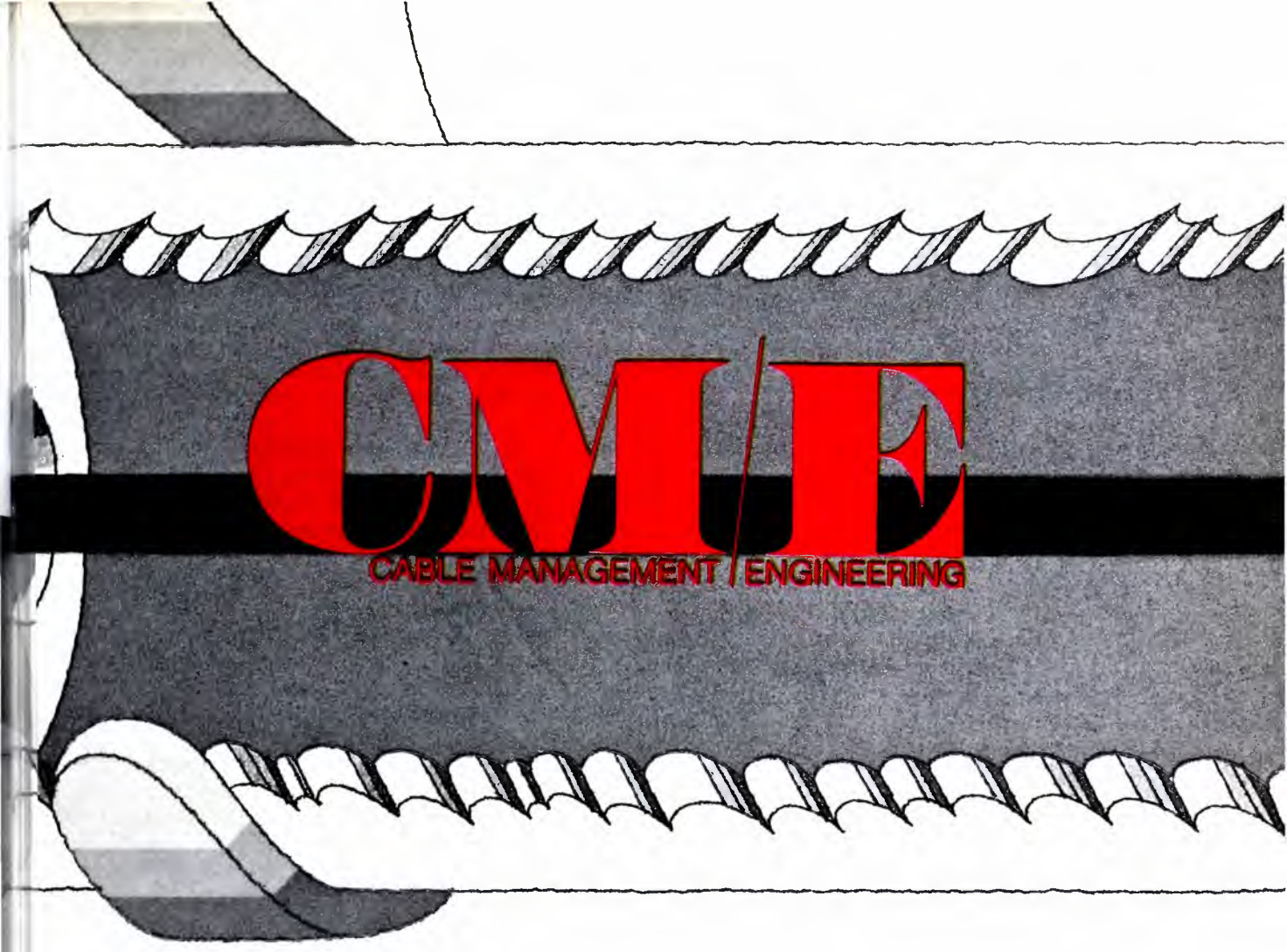


IARCH 1972

pecial Report
he Services of Cable TV Analyzed

he **wired city** is a first step toward the **wired nation.** ut is the wired city, with its promise of extra, on-broadcast services, feasible economically? The ew FCC cable TV rules nudge the industry a little loser to finding out. They call for a minimum of 0 channels in the top-100 markets and two-way apability. For each broadcast signal carried, an quivalent channel must be made available for on-broadcast use. Three are reserved for pro-ramming—one for public access, one for educational, nd the third for local government use. Other hannels can be devoted to other uses. They can e leased to anyone who thinks they might get an dequate return on their investment in either social r monetary terms. Leasees who will offer pay able channels are quite certain they're on the right rack from a money-making point of view, and will ttempt to prove so this year. Beyond that, no one nows for sure what services will be of value. Several able operators do hope to find answers in experi-nents involving extra service: Theta Cable El Segundo, California), TeleCable, (Overland Park, Kansas), Continental Transmission, (Reston, Virginia), and CAS Manufacturing (Irving, Texas), are hose that have announced experiments so far.

For the most part though, cable operators and heir backers are afraid to put up risk capital for such speculative applications. This caution has perturbed the many public study groups who see able as a necessary information transfer delivery system to help solve social problems of all sorts—education, jobs for the unemployed, medical services, crime protection, even dispersing populations. Those with the biggest social vision are more impatient with the slowness of the communications revolution as it is now modulated by private-profit interests. They would like to see some form of non-profit public or municipal ownership evolve with the assumption such a group could issue bonds to construct the ideal system. Inefficiency is not a major concern. These advocates see some evidence that there has to be some net gain for the community if 40-channel systems exist. For example, in the recent Rand report prepared for the Dayton Miami Valley, the commuter colleges could go on cable four days out of five to save students as much as $100 a year on transportation alone—not to count potential savings in buildings and campus land.

Others feel the technology isn't far enough along to justify such risk-taking. And, it now becomes clear, they say, that if a portion of the money given out by foundations to study cable were invested in perfecting the technology instead (such as subscriber response units), or actually building a demonstration system, society would be further ahead at this point in time. Some, such as the Arthur D. Little Company, feel systems capability, as proposed so far, is limited and may be obsolete soon—switched systems should get a test, ADL says. Certainly some of the hopes for cable potential do justify some funds being spent now—if the private money market isn't interested, then some seed money from various federal agencies could be wisely invested now.

What can, or possibly should, be done begins on the following page.

quiries and responses. The upstream channels must be multiplexed to distinguish signals from each individual subscriber. The upstream and downstream channels must be kept separate to avoid interference between them.

Multiplexing can be accomplished by separating signals in frequency, time, or space. In frequency division multiplexing (FDM), a given bandwidth is divided into smaller frequency ranges as is now practiced in cable TV, Fig. 2. Time division multiplexing (TDM), divides a channel into separate time slots for each signal; the time slots are then interleaved together, Fig. 2. Baer points out that computer data and other digital messages are most naturally handled in this manner, although TDM techniques are increasingly being applied to telephone voice transmission. Signals can also be physically separated in space (SDM); that is, sent over entirely different transmission lines. The discrete cables used in the Discade and Rediffusion systems are examples, although Discade combines both by putting several FDM signals on one cable.

These three multiplexing techniques can be combined within a single cable network. The transmission cost of a service will depend in a large part on the amount of information transferred.

Baer says, "Some services, like simple opinion polling, demand only a single bit—yes or no—response. Others, like remote shopping, may require that a few alphanumeric characters or several tens of bits pass upstream from subscriber to headend. Such data or message services, multiplexed by TDM techniques, require only about 100 Hz per subscriber upstream. In contrast, a voice channel requires 3-4 KHz and standard color video transmission uses 6 MHz. Thus color video origination by one subscriber might require more upstream bandwidth than returning digital data from 50,000 households.

"Downstream voice, video, and data can be broadcast to all subscribers or individually addressed to one or many. Information retrieval, such as stock market quotations or reservation services, may involve a display of several lines of characters on the individual subscriber's screen. At six bits per character, and six characters per word, a line of eight words would require about 300 bits, including error checking and control bits. A standard 19-inch television screen can accommodate about 12 lines, or 3600 bits, in each frame for comfortable reading. A still picture on the television screen contains about 250,000 bits of information."

Baer uses the term "narrowband" to describe services requiring transmission bandwidths less than 3 KHz; "voiceband" for 3 to 4 KHz; "wideband" for 4 to 1000 KHz; and "broadband" for bandwidths above one megahertz.

Some terminal equipment has not yet been developed for home use or, at best, is expensive. There is no home facsimile terminal equipment for newspaper delivery. Single-frame storage devices are being developed in several places, but are relatively expensive. (The Mitre report, following, has more on this subject.)

Baer says software ultimately is likely to be as critical as terminal hardware in determining the cost and feasibility of two-way subscriber services. He defines software in the context of cable communications as including, ". . . not only the computer programming necessary to operate a two-way network, but also the computer application software, video programs, and other media material such as pictures, audio recordings, and text needed for each specific service." Baer adds, "Every two-way service, from home shopping to interactive TV games, to automated library reference, will require extensive software development. And for many services—such as alarm monitoring—the communications link will represent only a small fraction of total cost."

Just as computer designers and users underestimated considerably the cost of creating system hardware for time sharing, one might expect the software costs of two-way cable services to run higher than expected—exceeding the cost of the hardware.

New cable services grouped according to their application for a network are shown in Table 1.

The extra hardware for additional one-way broadcast services includes a converter for extra channel reception or two cables and an A-B switch. This adds $30-$60 per subscriber. Limited access or subscription channels call for special encoders and decoder units which add another $25 to $70 per subscriber. Although documentation transmission at high speed sounds appealing, it is not likely to be a viable service. An average 40,000-word newspaper could be recorded in about 13 seconds on videotape (30 frames per second and 100 words per frame). A frame-by-frame videotape recorder would cost upwards of $1000 and the address decoder and logic circuit to control the recorder might add another $100. Since frame-by-frame viewing is not desirable, a hard copy printer would be required. As much as 3500 words per minute over a 240 KHz channel can be scanned and printed by the Xerox LDX system, but this equipment leases for over $1500 *per month*. Newspapers produce one page per customer for about one-third to one-half cent. This low cost is not envisioned by facsimile developers. Thus only the business user is a prospect for such a service.

Narrowband subscriber response services are generally those that send a few digits of information to the central facility. Such a system could also turn switches on or off remotely at the subscriber's location.

Polled narrowband response services require a control scanner and the communication controller can be a standard minicomputer, Fig. 3. The computer selects the addresses to be polled and the function to be queried according to programmed instructions.

Baer says, "The basic subscriber terminal, would include a wideband receiver and demodulator tuned to accept downstream polling signals, and a decoder to compare addresses received with its own address. If the addresses match, the subsequent message is sent on to the control logic unit; otherwise the mess-

Table 1. Categories Of New Cable Communications Services

Service Category	Downstream Signals	Upstream Signals	Equipment Requirements	
			Headend Equipment	Subscriber Equipment
I. One-way broadcast services **A. Additional channels** TV entertainment programs instructional programs coverage of local events local program origination community bulletin board municipal services information (health, housing, welfare, etc.) local ombudsman fm radio foreign radio recorded music **B. Subscription channels** movies entertainment programs instructional programs sports and special events	6 MHz broadcast video channels (FDM) 200 KHz radio channels (FDM)	None, except for local origination which may require one or more video channels from origination points to headend	Additional signal processing and multiplexing equipment; origination equipment Signal scrambler or encoder	Converter or switch to receive > 12 channels Unscrambler, decoder or special converter
II. One-way addressed services electronic mail delivery newspaper and periodical delivery selective video	Individually addressed wideband signals (FDM or TDM)	None	Information storage facilities; document scanner; address generator; communications controller	Address decoder and logic unit; video tape recorder, facsimile or other recording unit
III. Narrowband subscriber response services **A. Interactive television** entertainment programs instructional programs opinion polling remote shopping municipal services information **B. Sensor monitoring** audience counting alarm monitoring meter reading cable system maintenance **C. Control of remote devices** alarm sounding utility load control **D. Subscription television**	Broadcast video (FDM), plus individually addressed narrowband polling signals (TDM) of 100 or fewer bits	Narrowband response digital data (TDM of 100 or fewer bits from individuals to headend)	Central polling scanner, and communications controller (mini-computer) files, displays and other peripherals D. Signal encoder; billing mechanism key	Basic control unit (receiver, digital decoder, control logic, digital encoder, and transmitter); buttons or keyboard, channel monitor A. identification or authorization key B. channel sensor fire and intrusion sensors meter encoders amplifier and other component sensors C. switches and links to controlled devices D. Decoder or special converter; authorization
IV. Shared two-way channels **A. Voice response** instructional programs entertainment programs community service information special interest group conversations local ombudsman **B. Video response** instructional programs remote medical diagnosis neighboring program origination	Same as III.	III, plus A. 3-4 KHz voiceband channel(s) (FDM) B. 4-6 MHz video channel(s) (FDM)	III, plus equipment to recognize and queue requests, enable and disable subscriber equipment	III, plus A. Microphone, speaker and associated equipment B. Camera and associated equipment
V. Subscriber initiated services catalog shopping stock quotations ticket and reservation services information from various directories and references computer time sharing computer assisted instruction checkbook balancing and other banking services dial-up video library business credit checks	III, plus individually addressed information (alphanumeric message or picture); bandwidth dependent on type of information, but usually voiceband or greater	III, with narrowband (but sometimes > 100 bit) response	III, plus source data bases (digital data, pictures, etc.) connected to central controller; billing mechanism	III, plus extended keyboard, local storage (buffer or refresh) and output display device (character generator, strip printer, frame freezing device, videotape recorder or facsimile)
VI. Point-to-point services **A. Message-switched services** message transmission business transactions computer input/output **B. Point-to-point circuits** high speed data exchange facsimile fingerprint or photograph identification teleconferencing closed circuit TV videophone	Individually addressed, variable bandwidths for data, voice and video transmission; primarily FDM with TDM for data	Individually addressed, variable bandwidths for data, voice and video transmission; primarily FDM with TDM for data	A. Store-and-forward processor B. Equipment to set up private or multi-party channels	A. III, plus buffer storage and keyboard printer B. Data, voice, and video terminals as required; special frequency converters and associated logic for channel selection

age is ignored. Responses from the subscriber's push-buttons or keyboard, or from other devices, are assembled by the logic unit, encoded in digital form, and transmitted upstream at the appropriate frequency and sequence. This type of narrowband response subscriber terminal is estimated to cost upward of $300 at the present time, but the cost should drop to $100 to $250 in production quantities of tens of thousands."

To avoid the limitation of only sending data upstream, voice, or possibly video channels, are needed. The telephone could be used as the link, but this is generally an inconvenience.

Baer describes what is needed: "The simplest cable system approach to voice feedback would be to have one or more shared 4 KHz channels (FDM) available for upstream voice response in addition to the channels for subscriber return data. A student would use his digital response unit to signal the headend that he wanted to talk to the instructor. when his turn came, he would be notified (by a light or audible signal) and his microphone-speaker unit would be turned on by headend command. Following his conversation, the channel would be freed for another subscriber's use. The same procedure could be used for shared video response using a 6 MHz upstream channel.

"The cost for the subscriber's microphone, speaker, modulator, frequency converter, enable/disable switch, and associated logic would at present by $50-$100 over and above that for the digital response unit. The cost would be expected to drop by a factor of two if several thousand units were purchased.

"A cheap black-and-white camera, modulator, and associated equipment would today cost about $1500 at each location."

Permitting the subscriber to *initiate* requests for service adds immensely to the range of services possible. Cable subscribers could make a reques using a telephone-like pushbutton device or a ful alphanumeric keyboard.

Baer describes how this would work: "A full lis of services available and their access codes could be sent to each subscriber or displayed on his television screen. The subscriber's request would be processed by the headend computer and referred to the appropriate information source. When the requested information was located, it would be sent back to the headend, tagged with the subscriber's address, and then transmitted downstream over the cable network to him. The headend computer would function, in effect, as a switch connecting the subscriber to the information source.

"An information retrieval system, however, would require a larger computer and more storage capacity at the headend than is needed for subscriber response services. Moreover, developing the computer software for such a system is far from easy. In the past, many millions of dollars have been spent each time a new multiprocessing system has been built. And there are, at present, no user-controlled systems that can serve several thousand terminals simultaneously, as would be contemplated for cable television subscribers.

"Requests for information such as stock prices, bus schedules, locations of health care centers, and the like, would generally require answers of 500 characters or less. A small strip printer, probably available for less than $100, would provide a simple home output device. Still, it is more likely that the response would be displayed directly on the subscriber's television receiver. This can be done either by adding a alphanumeric generator to the subscriber data terminal, or by transmitting a single frame downstream for recording and display as a still picture on the screen. The latter technique, known as "frame grabbing," "frame snatching," or "frame

Table 2. Added Cost Of Two-Way Transmission For a 200 Mile Cable System

Two-way Option	Added Cost in Dollars: Trunk	Feeder	Taps and Drops	Total Cost	Cost Per Mile
1. Wire pairs	17,000	36,000	25,000	$ 78,000	390
2. Single cable FDM	41,000	125,000	0	166,000	830
3. Separate cables	84,000	191,000	50,000	325,000	1,625
4. Separate trunks, FDM on feeders	84,000	125,000	0	209,000	1,045
5. Switched distribution system	—	—	—	425,000-900,000	

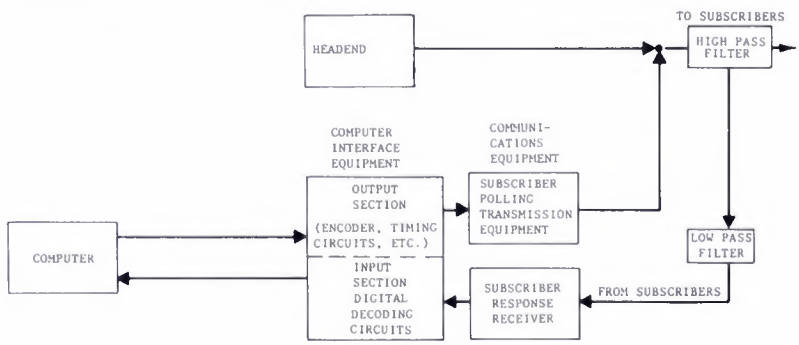
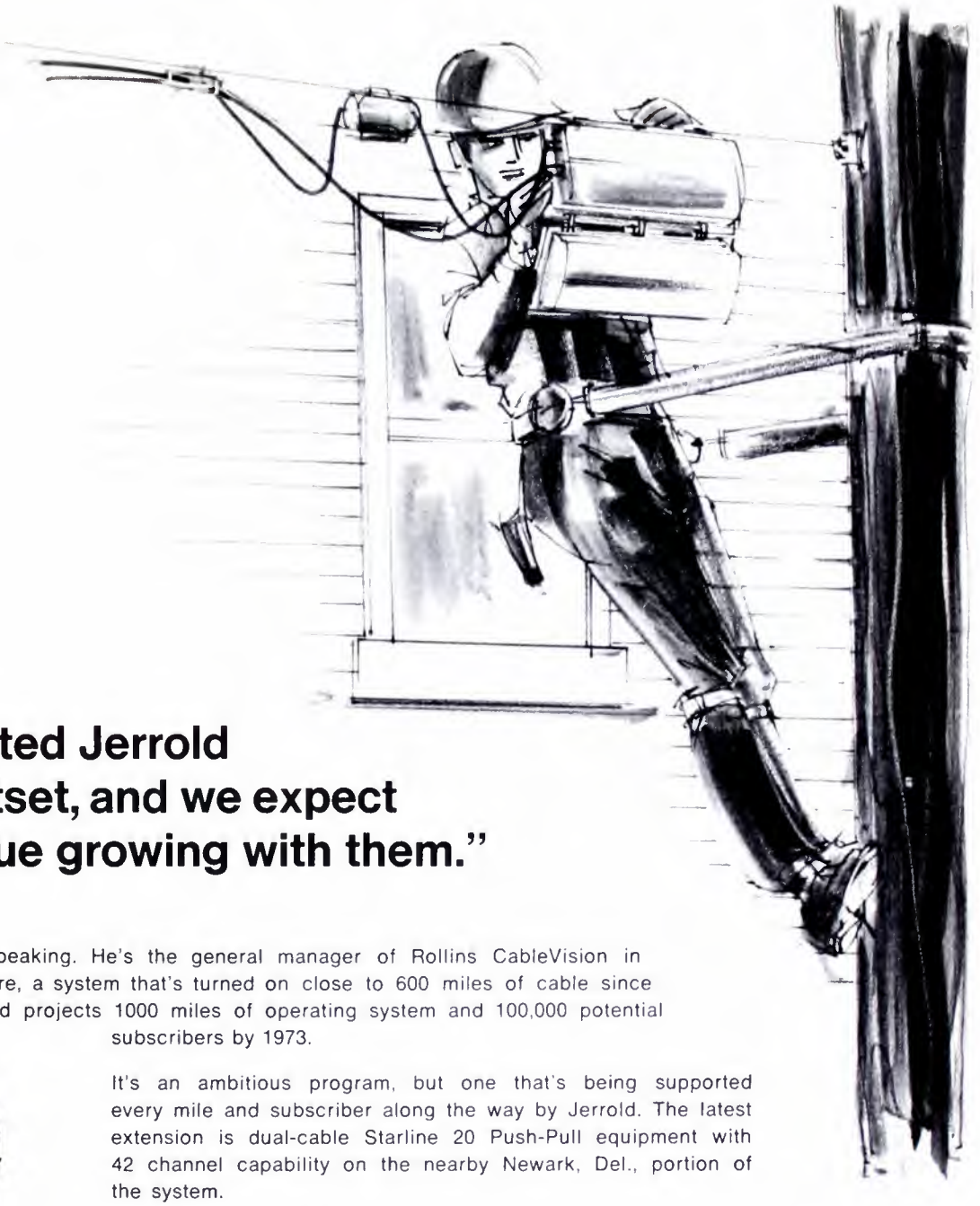


Fig. 3. Block diagram of computer and interface equipment at headend for subscriber response (from Mitre report).



"We selected Jerrold at the outset, and we expect to continue growing with them."

That's Tom Bird speaking. He's the general manager of Rollins CableVision in Wilmington, Delaware, a system that's turned on close to 600 miles of cable since November 1969, and projects 1000 miles of operating system and 100,000 potential subscribers by 1973.

It's an ambitious program, but one that's being supported every mile and subscriber along the way by Jerrold. The latest extension is dual-cable Starline 20 Push-Pull equipment with 42 channel capability on the nearby Newark, Del., portion of the system.

"We decided to take each step with the best equipment we could get," Bird explained, and Rollins CableVision has done just that since 1966 by selecting Jerrold equipment and Turnkey service.

Results to date have proven the Rollins decision correct.

"Experience has taught us that the confidence we placed in Jerrold by delegating turnkey system responsibility to them while we concentrate on the promotional efforts for new subscribers makes a lot of sense. It certainly allows us to move faster than if we tried to handle all aspects of this business ourselves."

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stopping," permits displays of pictures, charts, and drawings as well as alphanumeric characters.

"Functionally, a frame stopping device contains the same sort of receiver and address decoder as a subscriber data terminal, plus electronic or magnetic storage to record a single frame, and a control unit for recording and displaying the frame on a standard television receiver. None of this is technically difficult, but frame storage still is relatively expensive." Baer points out that the Mitre Corporation in Reston, Virginia, has developed a terminal for computer-aided instruction and employs an inexpensive helical scan videotape recorder for frame storage (*CM/E*, October, page 11).

A capability that permits one subscriber to communicate with another (point-to-point), requires a switching center as does the telephone system.

Message switching need not be done in real time. The hub processor serves as a buffer and can load messages on the system with great efficiency.

The subscriber terminal would be functionally similar to that for polled, narrowband responses, with the addition of some buffer memory and a keyboard printer. Using an inexpensive teletype printer, the terminal might cost roughly $800 to $1000.

Real time communications links between two or more points can be most easily handled on a cable network by assigning special frequencies for these services. Separate frequencies would be needed for upstream and downstream signals. The caller's signals would go upstream to the headend, be converted to the corresponding downstream frequency, and then be transmitted downstream to the receiver. Alternatively, separate cables could be used for upstream and downstream signals. Some users might be given exclusive use of a frequency band—much like a closed circuit television system. For example, a police department might link all municipal precinct stations for facsimile and two-way video transmission.

Baer points out that to accommodate all of the above services, ". . . a cable subscriber's terminal might include a large color television receiver, a frame-stopping device for alphanumeric character and still picture viewing, a video recorder with enough storage capacity for feature films or several volumes of text, a facsimile receiver, a printer for messages and data, a full keyboard for message entry, a camera and microphone for video and voice communications, links to sensors and appliances, and a sophisticated control unit. Although each of these components already is technically feasible, most are simply too expensive to see wide implementation on cable television systems in the next five or even ten years."

A comparison of estimated terminal costs for the several groups of new services is shown in Fig. 4 for the years 1971 and 1976.

Assuming $15 to $20 a month represents some upper limit most customers will pay, then the capital cost to provide these services must be less than $600 per terminal. Thus, subscriber-initiated services are not likely to be feasible for the next five years.

Baer does feel narrowband subscriber response services can be of value, and he thinks audience counting is one of these. Audience counting will be of value to local spot advertisers and for programmers who want to learn something about audience size for specific instructional materials, community public service, etc. Cable is meant to service smaller specialized audiences and current sampling techniques are not suitable to measure viewing with any degree of precision.

Direct viewer response such as remote shopping and interactive programming, market surveys, and instructional TV with feedback will certainly all be tried in the next few years. They must be viewed as promising until proved otherwise.

Subscription TV is the service most likely to achieve early success. While meter reading won't be valuable unless there is heavy penetration, automatic adjustment of total utility load by selective on-off switching of subscriber appliances is. Baer reports: "The Detroit Edison Company has experimented with radio-controlled switches costing about $45 each for consumer water heaters. The consumer receives a lower rate if he agrees to let the utility disconnect one of his two water heater elements

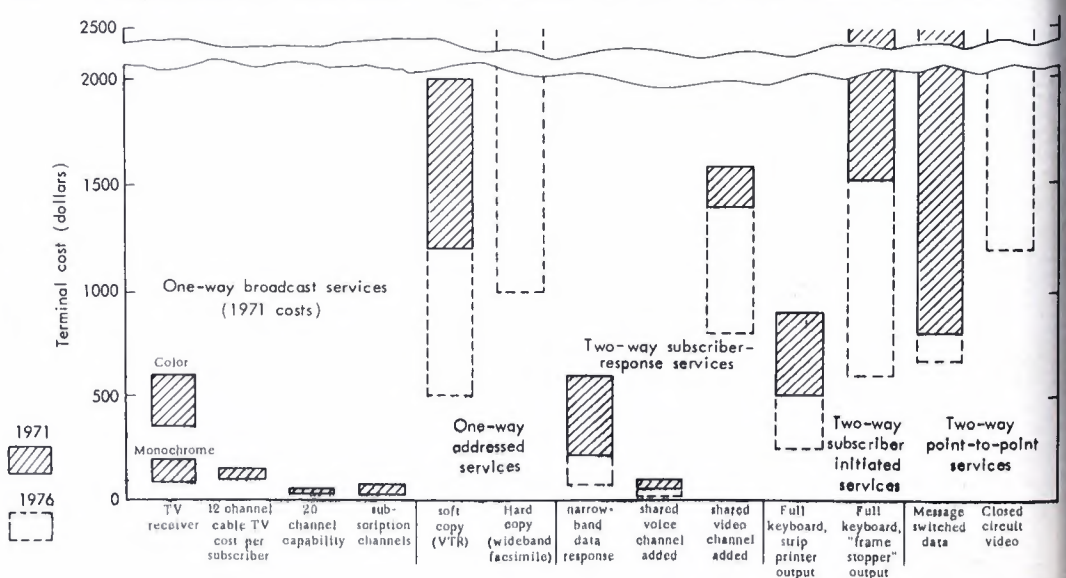

Fig. 4. Subscriber terminal costs for new communication cable services.

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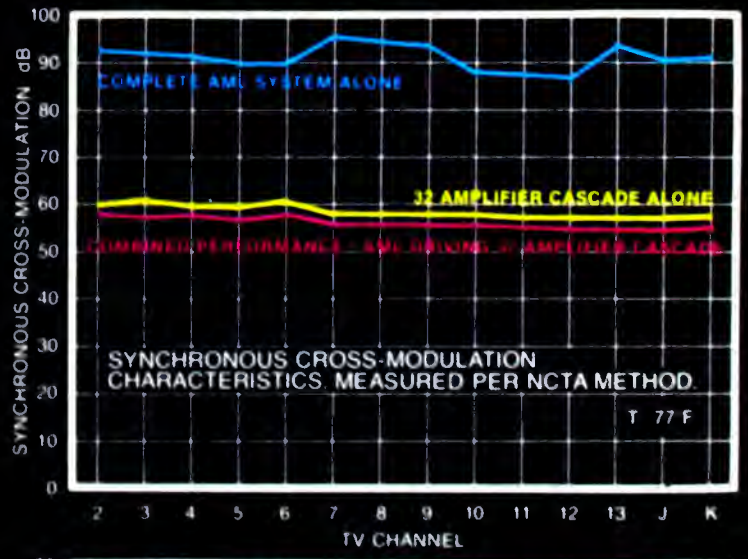

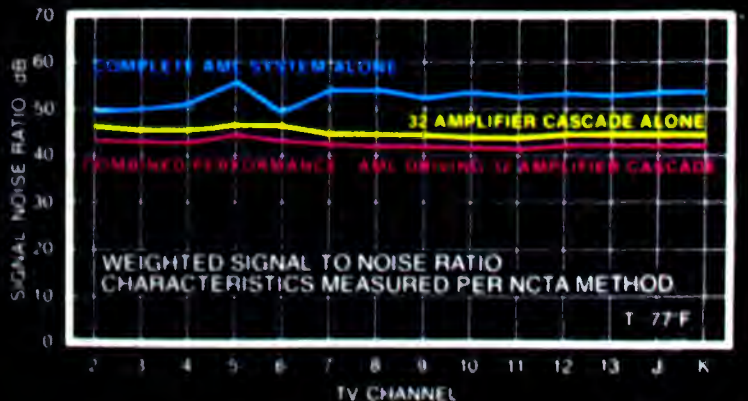

Table 1. Estimates Of Incremental Increase In Penetration By Types Of Service Added, For WCTS Telecasting Net

Type of Service	Estimated % Increase in Penetration
For a fee of $3.50 per month per subscriber for services on first cable	
1. Conventional One-Way	
• Improved DC and Baltimore TV Signals • Imported TV & Cable Signals • Mechanical Services • Local Origination	25% to 29% penetration, without imported signals, with an increase to 32% to 36% with imported signals
2. Additional One-Way	
• Innovative Programs • Occasional Exclusive Sports Programs or Movies • Instructional Programs • Public Information Channel • Subscription Channel • Channels-for-Lease • CCTV and Facsimile • Point-to-Point Net Origination	A 24% to 40% increase, giving penetration of 56% to 76%
For an additional fee of $3.00 per month per subscriber for services on second cable	
3. Limited Two-Way	
• Interactive Entertainment • Interactive Education • Preference Polling • Social Services • Video Library and Facsimile • Shopping Services • Banking and Credit Services • Channels-for-Lease • Alarms • Point-to-Point Net Originations	63% to 78% penetration for the second cable
4. Full Two-Way	
• CCTV and Facsimile with Manual Switching at Headend (no terminals supplied) • Point-to-Point Net Originations	A 2% increase, giving penetrations of 65% to 80% for the second cable
For an additional fee of $2.00 per month per customer for utility services and maintenance	
5. Utility & Maintenance Services	
• Meter Reading • Automatic Billing • Selective Load Control • Load Monitoring • Leak Detection • Monitoring Output Levels of Amplifiers, etc.	100% penetration for second cable

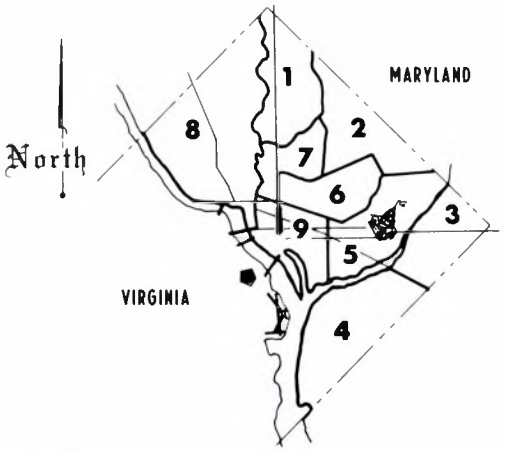

Fig. 2. Map shows how Washington, D. C. is divided into mini areas.

Table 2. Summary Of Basic Two System For WCTS (Cases 2-A and 2-B)

1. Two Parallel Telecasting Cables, Plus Point-to-Point Nets
2. First Telecasting Cable, One-Way; 30 Channels, Fully Operational Throughout D.C.
3. Second Telecasting Cable, Two-Way; 30 Channels Downstream Plus Four Channels Upstream, Fully Operational Throughout D.C. After Third Year of System Operation
4. 100 Subscriber Response Terminals in Service Areas 2 and 7 in First Year, 1100 in Second Year, 6100 in Third Year.° Response Terminals for All Subscribers After Fourth Year.
5. Installation; 5 Phases of One Year Each
6. Total Households Passed; 263,000
7. 1222 Total Street Miles; 1,074 Miles for Telecasting Net, Plus 148 Miles for Point-to-Point Nets
8. Programming Costs: (First Cable) $9.50/Year/Subscriber; (Second Cable) $25.25/Year/Subscriber
9. Asymptotic Penetration (Both Cables) 63% to 78%
10. Subscriber Fees
    First Cable
    Regular $3.50 Per Month Per Subscriber
    Second Set; $2.00 Per Month Per Subscriber
    Second Cable
    Regular; $3.00 Per Month Per Subscriber
    Second Set; No Additional Charge
11. Other Revenues; $12.77 to $13.40/Year/Subscriber For Advertising Leased Channels and Point-to-Point Channels; Plus $2.00/Month/Customer for Utility and Maintenance Services

° No equipment or monthly charge for these first experimental terminals

each area could distribute programs that were unique to its area.

Two types of cable nets comprise the system design developed as a result of the study. These consist of 1) a telecasting net providing both broadcasting and cablecasting services for the 263,000 D.C. households, as well as offices, businesses and other potential subscribers distributed over 1100 street miles; and 2) four point-to-point nets of about 1500 cable miles interconnecting several hundred commercial, institutional and governmental locations.

The telecasting net will have dual cables with the capability of 30 forward channels and four reverse channels per cable. The second cable will initially be quiescent allowing for future expansion of both one-way and two-way services except for S/As 2 and 7. These S/As will use the dual cable with four return channels on the second cable for a number of large scale demonstrations with two-way services. Over 6000 special home terminals will be distributed throughout these two S/As at no cost to the subscribers during the first three years of system operation to support these demonstrations. It is planned that, as the demonstrations indicate desirability, the two-way capability will be implemented

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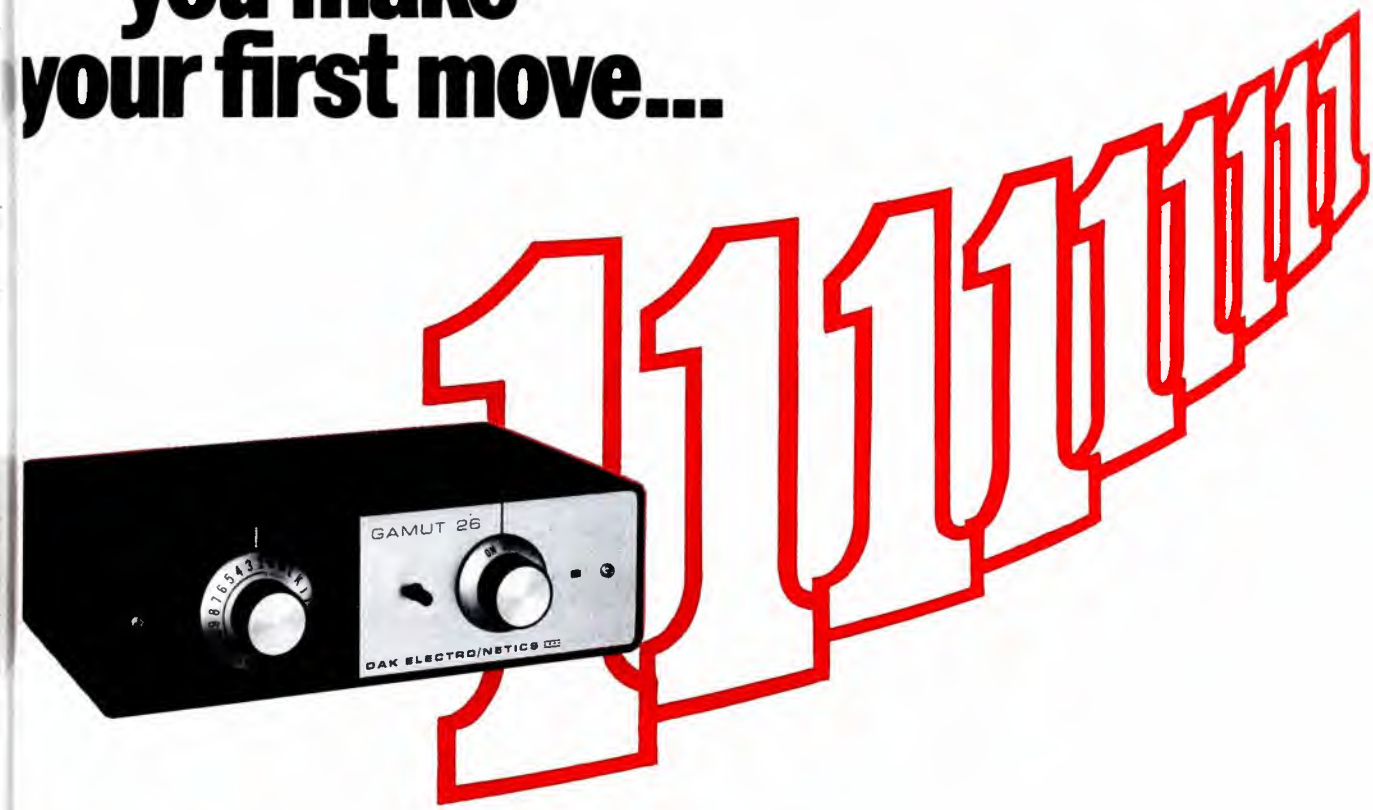

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throughout the entire system. The telecasting network can be thought of as a tree-like distribution system.

Recognizing the special character of the telecommunications needs of the municipal, federal, academic and commercial institutions, four separate "point-to-point" nets have been designed by Mitre to serve them. The number of users of this network will be relatively small, but the data flow rate will be high in both directions on the cable links. It is also a demand-oriented system, in that services will not always be prescheduled and the users will want to send a large volume of data at particular times, but not necessarily periodically. This generates a requirement that the system should be capable of connecting these users rapidly and in a flexible way. In order to provide the necessary system flexibility, an equal number of forward and reverse channels (14-6 MHz channels each way) for two-way service will be provided on the point-to-point nets. Switching provided at the headend and subheadends will be used to satisfy the varying demands of these institutional users. Interconnections between this net and the telecasting net will be provided. A summary of the telecasting and point-to-point nets are illustrated in Fig. 1.

Fig. 2 illustrates the implementation plan for the entire system which will take place in five phases of one year each, with a portion of the city being wired in each phase.

In addition to the initial implementation of a number of conventional one-way services, the system is designed for additional one-way and two-way services, over time. A summary of the system is contained in Table 2.

The Mitre report incorporated an engineering report on technical considerations as prepared by Jansky and Bailey. Speculation on subscriber terminal equipment follows closely that of Baer and the Rand report. However, Jansky and Bailey are more explicit in describing equipment under development.

Of promise as a frame grabber is VIDITEM from System Resources Corp., Plainview, New York. This device uses a circular Mylar disc to capture up to four frames. Its cost in quantities of 50,000 is estimated to be $150 ($180-$190 with color). A storage tube plus converter from Hughes could also be used. Its cost is estimated at $100.

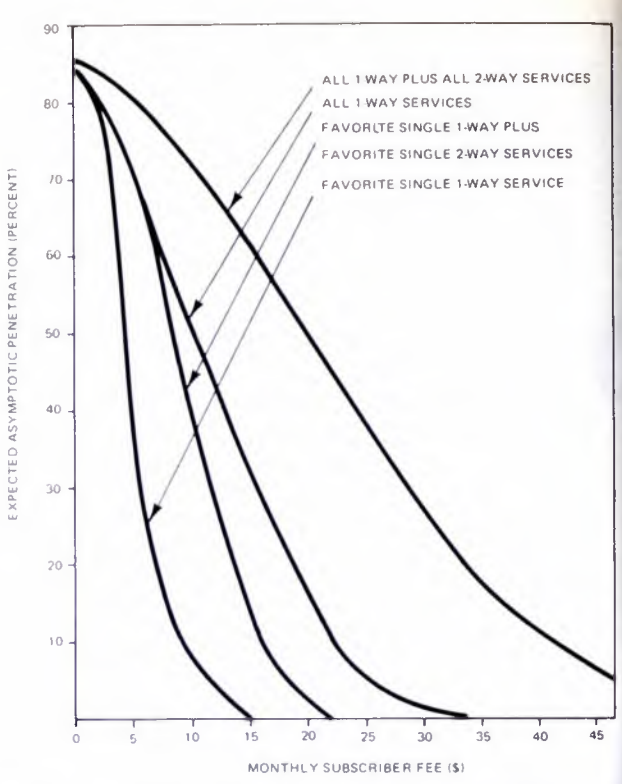


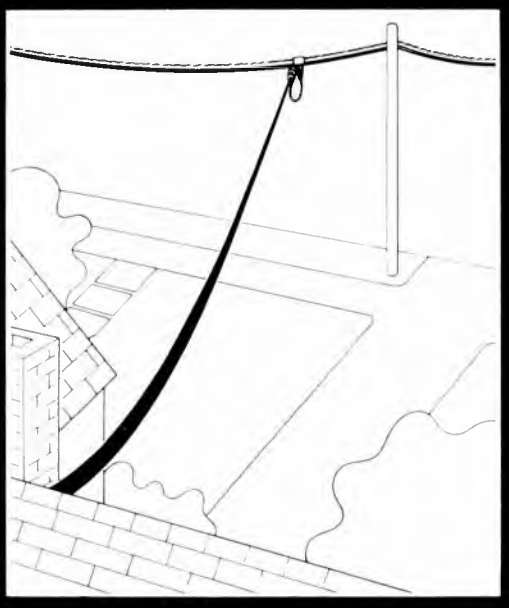
Fig. 3. Expected penetration to monthly subscriber fee for various combinations of service.

The Jansky and Bailey report also cites a 200 KHz facsimile recorder from Toshiba which handles a 12½ in. by 18 in. tabloid newspaper size format. It is said to be able to reproduce both sides of a newspaper in five minutes with a resolution of 200 lines per inch. A single-sided system is expected to cost about $140. Presumably, Mitre feels some of this equipment should be tested in demonstrations.

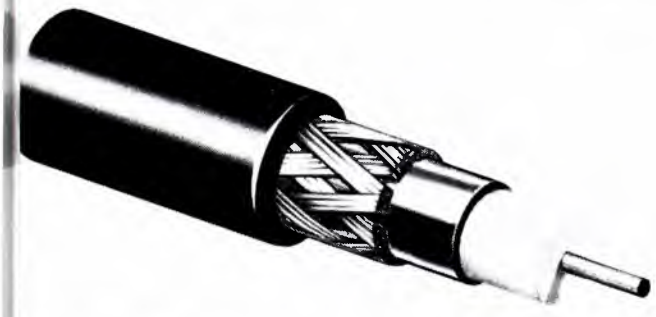
As mentioned, Mitre sees a key issue in subscriber fees vs. penetration. The report says profit-making systems' owners press to increase subscriber

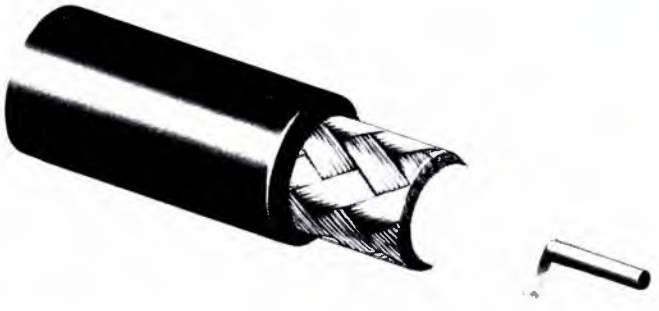
Table 3. Point-To-Point Nets

	Type	Number of Subs.	Length (Miles)	Approx. Cost	Notes
Federal	Capitol Building & Major Federal Buildings Four cables.	54	10	$ 417,000	1) Sixty channel system uses two oppositely directed 30 channel cables and includes a switching facility.
Municipal	Schools, Fire, Police, Hospitals, Sanitation, etc. One cable, fourteen 2-way video channels Police, 2; schools, 6; mayor's office, 2; fire department, 2; hospitals, 1; highways, 1; sanitation, 1.	271	73	$1,000,000	2) Uses subheadends which are colocated with the telecasting net. 3) Privacy is maintained within each community of interest by virtue of converters that do not permit outsiders to obtain access to channels other than their own.
Institutional	Banks, Savings & Loans, Department Stores Credit Associations, Utility Co., etc. One cable, fourteen 2-way video channels. Transit co., 1; metro, 1; utility, 2; banks, 7; store nets, 3.	300	50	$1,000,000	4) Same as Municipal 2) and 3).
Higher Education	American U., Catholic U., Federal City College, Georgetown Univ., George Washington U., Howard U., and the 17 other colleges of Washington, D.C.	23	15	$ 183,000	5) Thirty channels, fourteen one-way, sixteen the other way in a two-way system.



Which drop cable do you prefer?





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fees and reduce penetration to optimize early profitability rather than to sacrifice profit for larger market penetration that will eventually be the key to greater benefits to the entire urban community. The relationship of penetration to fees for various combinations of service are shown in Fig. 3.

Table 4. Possible Channel Allocations For WCTS Telecasting System

CABLE I (Downstream)		
1. D.C. TV Channels	7	A[1]
2. Baltimore TV Channels	6	A
3. Distant TV and Cable Signals	5	A
4. Weather/Time/Stock Market	1	D
5. News/Radio	1	D
6. Service Area Channels		
a. Public Access	1	B
b. Local Origination	1	C
7. TV Channels Guide/Current Events	1	D
8. Dedicated Channels for Lease (1-way)	2	B
9. Public Information Channel	1	C
10. Instructional Channels (1-way): for D. C. Schools and Universities	2	B
TOTAL[4]	28[4]	
CABLE 2 (Downstream)		
1. Distant Cable Signal	1	A
2. Municipal Government Access Channel	1	B
3. Federal Government Access Channel	1	B
4. Channel for Professionals	1	B
5. Innovative Channel (1-way)	1	C
6. Public Interest Channels[2]	4	B
7. Interactive Educational Channel (2-way)	1	C
8. Interactive Entertainment Channel (2-way)	1	C
9. Dedicated Channels for Lease (2-way)[3]	2	1-B, 1-C
10. Video Library	1	B
11. Facsimile Channel	1	B
12. CAI Channels (2-way)	12	B
13. CCTV Channels	1	B
TOTAL[4]	28[4]	
CABLE 2 (Upstream)		
1. Data entry/request channels from terminals to headend or subheadends and video return channels	4	D
TOTAL[4]	4	

[1] **Legend for Programming Categories**

A—Off-the-air local or imported TV signals with no programming required by WCTS.
B—Leased channels with programming supplied by lessee.
C—Channels requiring programming origination by WCTS.
D—Channels requiring minor programming origination by WCTS.

[2] These channels would be reserved for health, employment, legal, job training and welfare service.
[3] Including return channels.
[4] The two channels of each cable in the aircraft navigation band would be held in reserve until field measurements to check radiation could be made.

The thirty channel system, with converters, was chosen over the 24 dual cable system, with no converters, primarily because of Washington's four strong VHF television signals. It is estimated that these four signals would reduce the capacity of the dual cable system even further, i.e., to 16 channels, because of direct pickup problems. The discrete switched cable systems, i.e., Rediffusion and Discade, were ruled out because of their generally acknowledged higher cost per subscriber, their lack of flexibility with respect to future expansion, and space requirements for their switching gear.

A converter (the Gamut 26 or equivalent) could be used if modified to include an A/B switch. The subscriber terminal selected is currently in use by Mitre at Reston, Virginia. It will permit the viewer to select private or public information channels—it does not provide for voice or data generation. Additional subscriber response terminals will be introduced for experimental use.

The point-to-point network planned is summarized in Table 3. An example of a possible channel allocation is given in Table 4.

Among the other demonstrations planned for the system is a traffic control plan. Washington currently has a traffic control system which uses telephone wires. A cost-saving of 50 percent per month is envisioned if the cable is used instead. Similarly, the costs of police communications could be cut if its system were integrated with the broadband cable.

An overall picture of revenues and expenditures for all services after ten years is given in Table 5. Mitre also compared total services systems with a one-way system.

By the tenth year, total operating expenses for the two-way systems are almost twice as large as for the one-way systems, and programming costs are about three times as large. By the tenth year, total gross revenues for the two-way systems are about 2.5 times as large as those for the one-way systems. The total equity capital required for the two-way system cases is about two times greater than that required for the one-way systems.

Detailed cash flow projections are contained in the report. **CM/E**

Table 5. Projected 10th Year WCTS Revenues And Expenditures For All One-Way Plus Two-Way Services

	Penetration					
	.30	.40	.50	.60	.70	.80
Annual Subscriber Cost (First Outlet)	$342.00	$282.00	$228.00	$180.00	$126.00	$72.00
Revenue per Household						
a) Subscribers	104.77	115.70	117.60	112.30	93.24	63.36
b) Advertising and Leased Channels	3.27	3.76	4.22	4.53	4.95	5.37
c) Utility Services	24.00	24.00	24.00	24.00	24.00	24.00
TOTAL	$132.04	$143.46	$145.82	$140.83	$122.19	$92.73
Expenditures per Household						
a) Operations, Interest and Depreciation	$ 34.86	$ 39.19	$ 43.76	$ 47.87	$ 51.71	$56.51
b) Taxes	46.50	49.92	48.86	44.52	33.71	18.61
c) Debt Retirement	0	.08	4.72	5.25	4.15	10.27
d) Capital Equipment	.65	.72	.80	.80	.80	.80
TOTAL	$ 82.01	$ 89.91	$ 98.14	$ 98.44	$ 90.37	$86.19
Surplus per Household (Total Revenue Less Total Expenditures)	$ 50.03	$ 53.55	$ 47.68	$ 42.39	$ 31.72	$ 6.54

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For example, the Scala VHF Color Log Antenna is a solution to the problems of metal fatigue and stress: heavy gauge aluminum laminated to resist resonances, mounted at the balance point for extra stability, with non-ferrous hardware.

At the same time, Scala increased electronic efficiency through use of larger active regions, thus providing coverage of channels 2 through 13 with only two Color Log antennas, unlike the requirement of other manufacturers for three or more antennas.

Color Log VHF Antennas:

CL-26 and CL 713 (channels 2-6 and 7-13):
Front-to-back ratio 25 db minimum.
VSWR maximum 1.4, average 1.2

Gain over isotropic source:		Dipole:
CL-26	10 + db	8 + db
CL-713	11 + db	9 + db

Gain throughout any channel is within ½ db, and throughout the spectrum within 1 db.

FM Log Periodic Antenna

Model CLFM (88 108 MHz)
Front-to-back ratio 25 db minimum.
Frequency range: 88-108 MHz.
VSWR: Maximum 1.4:1
Gain over isotropic source: 9.14 db. Dipole 7.0 db.
Gain throughout FM band (88-108 MHz) is within ½ db.

Color Log UHF Antennas:

CL-1483 (channels 14-83)
Front to-back ratio: 35 db minimum
VSWR: Maximum 1.3, average 1.2
Gain over isotropic source 10 + db. Dipole 8 + db.
Gain throughout any channel is within ½ db, and throughout the spectrum within 1 db.

All CL-1483 antenna elements are housed within a fiberglass cover, thereby permitting the design of an antenna of maximum electrical efficiency without concern for mechanical problems.

TWO OR MORE COLOR LOG ANTENNAS MAY BE STACKED TO ACHIEVE MAXIMUM GAIN OR PHASED TO PROVIDE OPTIMUM SOLUTIONS TO CO-CHANNEL MULTIPATH AND OTHER RECEIVING PROBLEMS.

Color Log VHF Antennas

Color Log UHF Antennas

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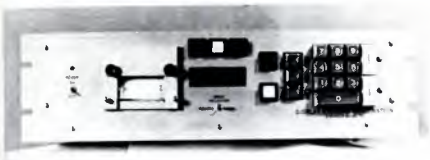
BROADCAST EQUIPMENT

Information dissemination/retrieval equipment provides remote control of audio and video recorders in scattered locations. Telecyclopedia is a system with encoding and decoding units that give schools or individual students fast access to a central library of material. Operators of radio



and TV stations, as well as ITFS, CATV, and CCTV systems, can activate remotely-located recorders, audio or video, to store audio or video material at the subscriber's location, for replay at any subsequent time. DISPLAY SYSTEMS CORP. **275**

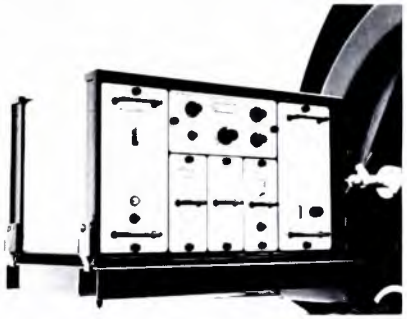
Integrated headend equipment consists of modular units holding modulators, demodulators, and heterodyne processors on a universal main frame. System/7 provides all units for up to seven channels on one frame 19 in. wide, 7 in. high, and 24 in. deep. With optional plug-in combiner all outputs can be combined right on the frame. Power supply and cooling blower are also integral. Modules are unitized on the system level but also internally—plug-in circuit boards carry each major functional section. PHASECOM CORP. **276**

Two-way cable system allows subscriber to request material through a pushbutton subscriber's console. Subscriber Response System (SRS) puts upstream digital signals on 4 MHz band between 21 and 25 MHz. Lo-

cal processing center interrogates each subscriber terminal in sequence at a periodic rate. Action on requests and recording of billing information, (if there is a charge), are automatic. Interrogation cycle is so rapid that subscriber has sense that he initiates request. THETA-COM. **277**

Chrominance/luminance gain normalizer simplifies measurement of chrominance to luminance gain differences and delay calculation in sine-squared pulse testing. Models 137 and 138 allow insertion of calibrated attenuation to achieve deviation symmetry, with the luminance or chrominance gain distortion then read directly from attenuator controls. Model 137 is for systems with 3.58 MHz subcarrier, model 138 for those with 4.43 MHz subcarrier. TEKTRONIX. **278**

All-purpose TV microwave radio operates in band from 2 GHz to 13 GHz, is intended for reliable transmission of NTSC color television signals. TCM-6 Series has plug-in conversion to any frequency band, built-in test and automatic fault isolation, RF units that can be rack, tripod, tabletop, or mast mounted. Tuning



through each band can be fixed or front-panel continuous dial, with crystal reference. TERRACOM **279**

Directional high-power RF wattmeter covers 25 to 500 MHz and 1 watt to 500 watts full scale. Model 4370 Thruline uses precision-machined 50-ohm reference line section inserted between the signal source and the antenna, load, or other component under test. Sensors in this section produce dc voltages proportional to incident and reflected RF power. Insertion VSWR is less than 1.1, accuracy is ±5% on all ranges. $475. BIRD ELECTRONIC CORP. **280**

One-kilowatt AM transmitter uses new Eimac tetrode tube, 4-500A. Model 701 has large blower, the same as on the 5 kw transmitter, and a solid-state dual oscillator. It comes with any two power levels, the most popular being 1000/500 and 1000/250. Nuisance outages are eliminated by automatic resetting of relays on single, short overloads. SPARTA ELECTRONIC CORP. **281**

Trunk amplifier provides either 22 or 25 dB gain at 265 MHz. T-424 has guaranteed bandpass of 50 to 270 MHz, ±0.25 dB over band. Noise figure is 8.5 dB at 265 MHz, cross modulation −93 dB, normal trunk input +10 dBmV at 265 MHz. C-COR ELECTRONICS. **305**

Phaselock modulator for CATV eliminates co-channel interference, makes additional channels usable, by locking output carrier frequency to a

sampled off-the-air signal from a local TV station. Model 7120 can also eliminate co-channel beats in dual cable systems, and can be used to produce a coherent headend, with all channels phaselocked to a common 6 MHz comb generator, eliminating triple beats. PHASECOM CORPORATION. **306**

Noise reduction unit provides Dolby "B" processing for tape recording and playback on tape machine connected to unit. Model 100A also allows decoding and simultaneous recording of Dolby-processed FM broadcasts; decoding of Dolby-processed tapes; and copying of Dolby-processed tapes. $275. ADVENT. **282**

Ultra-high-resolution TV camera can produce up to 1100-line horizontal resolution for CCTV applications. Model CTC-8000 is aimed for use where photographic reproduction of small detail is desired. It is available with any of eight scanning rates from 525 to 1023 lines. Video bandwidth is 30 MHz. Supplied are a camera

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PRODUCTS

and a control unit, connected with a 33 ft cable; latter provides the standard control functions. High sensitivity allows production of a usable picture with 1/10 foot-candle, full resolution at 1 foot-candle. $2495.00. GBC CLOSED CIRCUIT TV CORP. **284**

Electronic chronometer is accurate to better than 0.1 second per day, has a sweep second hand and 4 in. dial that make it easily readable across an average radio or TV control room or small studio. Quartz Crystal Chronometer is driven by a crystal-controlled oscillator and synchronous motor, runs on standard D-cells with battery life of about one year. $575. WEEMS & PLATH. **285**

Line of VTR equipment includes both cassette and reel-to-reel systems. Model 1100SH reel-to-reel, aimed for sports, education, industry and science, has slow-motion capability, seven-hour time-lapse mode, stable still-frame pictures useful in surveillance work, accelerated motion, with playback at one-seventh recording speed, stop motion and frame-by-frame advance. Approximately $2500 (including camera, electronic viewfinder, monitor). SANYO. **286**

Microwave radio system for 12.2 to 13.25 GHz band has maximum capacity of 1200 message channels or a video signal. Model 78E2 power output is 25 dB, receiver noise figure is 11 dB, and the available arrangements include single channel, frequency diversity, crossband diversity, hot standby, space diversity, and two-for-six protective switching. GTE LENKURT. **287**

8mm movie projector with cassette loading works with sound-synchronized system that uses portable cassette tape machine for sound synchronized with separate camera. Model 478Z projector automatically threads, shows, and rewinds film; user simply puts film cassette onto machine. Sound is added by cassette tape recorder connected to projector by a single cord. $249.95. BELL AND HOWELL. **288**

High-speed picture digitizers convert into digital signals any continuous-tone grey scale pictures or objects. Model 108-1 feeds a computer directly. Model 108-2 records onto IBM-compatible tape, Model 108-3 is interface and control for PDP 11/20 Digital Processor. Units are

continued on page 40

PRODUCTS

intended primarily for photometry, micrography, spectrography, digital TV, pattern recognition. $10,000-$17,000. SPATIAL DATA SYSTEMS. **289**

Control unit for use with microphone mixers adds cueing and monitoring facilities; combination is a complete, small-sized broadcast or recording console. Model M675 Broadcast Production Master is designed to go with the M67 series of microphone mixers. M675 also adds four line inputs and built-in battery supply. $250. SHURE. **290**

FM frequency/modulation monitor combines measurement of frequency deviation and modulation percentage in a single unit. Model TBM-3700 has a meter for each function and the two are simultaneously shown without measurement interaction. Internal reference permits calibration of 100% modulation point at any time. $1300. MCMARTIN. **291**

All-channel demodulator is meant primarily for recording off-the-air TV programs, distributing audio and video from TV through educational TV systems, feeding program origination consoles, and for headends in ETV systems. Model UD-283 has fine tuning on all 82 channels, front-panel tuning meter, separate VHF and UHF 75-ohm coaxial inputs, 75-ohm video output and 600-ohm audio output. JERROLD. **292**

Multi-track mastering tape deck has four-channel record and playback, and overdub facilities. Model TCA-43 allows independent recording on each of the four tracks, with exact

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35-KW Diesel-Electric System is described in six-page brochure, with graphs illustrating voltage and frequency characteristics, power ratings, fuel consumption, and other precision performance specifications. Allis-Chalmers. **200**

"News 49," among a number of other articles on general technical topics and on new equipment, carries complete description of sideband adapter for Videoskop III SWOF; the two together permit rapid measurement of frequency response of AM picture transmitters. Rohde and Schwarz. **201**

Instrument control knobs are subject of full-color bulletin; included are illustrations, schematics and specs of round, round-dial, one-bar, two-bar and numerous other knob forms. Nobex Division, Griffith Plastics. **202**

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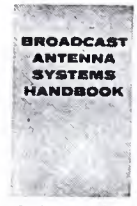

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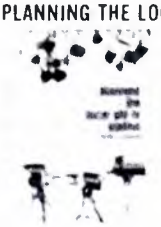

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Tech Notes

The purpose of this column is to present interesting solutions to technical problems, new circuits, and other features that relate to a broadcast engineer's job. We welcome your contributions.

From Sidney King of KVOC(AM), Casper, Wyoming, comes this solution to a remote broadcast problem. For economy, many radio stations use business phones rather than broadcast loops for remotes. The usual interface has been what the telco calls a *recorder coupler*. The remote amplifier drives the coupler, which in turn drives the phone line. The problem: If a disconnect occurs, the man at the remote is unaware. The station then has to use a separate line to call the remote man, so he can hang up the phone and connection can be re-established.

Kvoc and the Monarch Network (a regional sports network) worked with local telco people to solve the problem. Strangely enough, the answer wasn't newly developed equipment. It was a recorder connector which has been part of the Bell Telephone System equipment for many years. Note that the *recorder connector* is completely different in operation from the *recorder coupler*.

The recorder connector (List #1, USOC Code RDC) is a completely self-contained unit which is fed directly from a remote amplifier, and which is connected through a standard telephone plug to the leased phone line. The station originates the call by dialing the assigned number. On the first ring, the recorder connector establishes connection, feeding audio back to the station.

While an ordinary telephone is normally attached to the recorder connector, it's wired so that the transmitter (mouthpiece) will not function when the recorder connector is active. Actually, a broadcast may be originated and completed without the use of a telephone at the remote, in other words using only the recorder connector.

Kvoc and the Monarch Network have mounted both phone and recorder connector on a small portable board with handle (see Fig. 1). Kvoc then requests the telco to install a four-prong standard female telephone jack and determine the telephone number at the origination point. Upon arrival, the recorder connector, using a male phone jack, is plugged in. A 117-Vac source is also required. See Fig. 2 for wiring connections at the 25-pin plug used between the remote amp and the recorder connector. (This plug can be either a Cannon DB-25P-C26 or a Cinch DBM-25P-A115.)

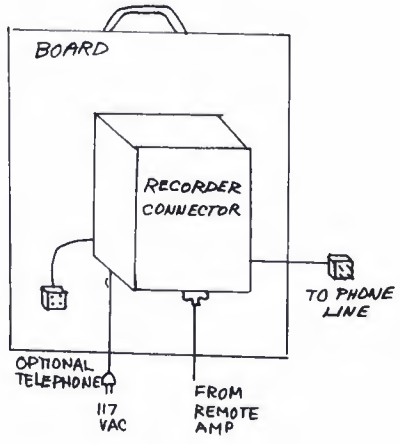

Fig. 1. Portable board with handle holds phone.

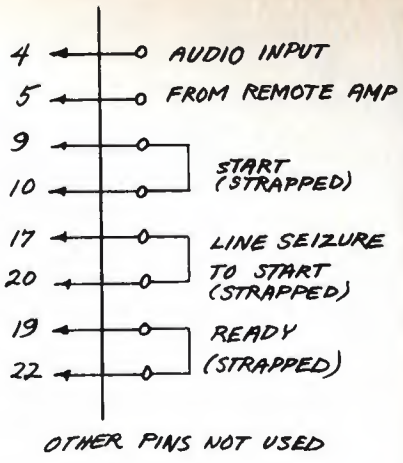

Fig. 2. Wiring diagram.

Photograph of network which feeds sports and other events throughout the state.

Kvoc has found that with this method, when a disconnect occurs, it's only a matter of some 15 seconds for the station to redial the number and be reconnected to the remote.

Monarch Network not only originates its sports events in this manner, but feeds some 15 other radio stations. These network affiliates dial into separate recorder connectors, each with its own telephone number.

A final point: When a broadcast loop breaks down, it takes time to locate and fix the trouble. Using a business phone, if the line breaks down, the station simply hangs up, redials, and gets a new line. **BM/E**

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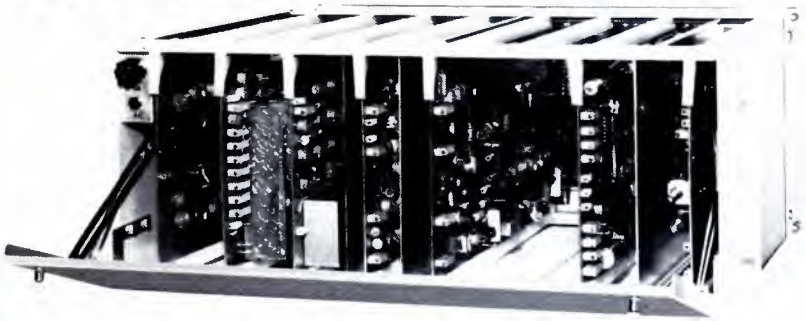

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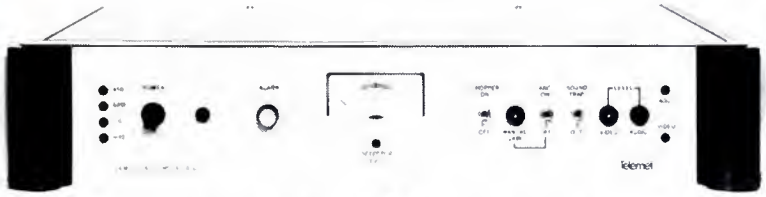

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NAB continued from page 18

stereo material without significant phase cancellation. IGM will also have four complete working radio automation systems on hand. Systems Marketing Corporation (Sono-Mag) will also show radio automation, featuring the DP-1 digital programmer and switching system —a ferrite core random access program system which can handle more than 80 events per hour for 24 hours.

Philips Broadcast Equipment Corp. will show a line of Norelco cameras, introducing the brand new broadcast color studio chain PC-72 (at this point still so new we can't tell you its features). Also on hand will be the latest version of that old favorite, the PC-70S-3, and another broadcast studio model, the PC-100A. You can also see the PCP-90B digital camera and the moderately priced LDH-1 chain. There will be two telecine chains on display, PCF-701 and LDH-1 telecine. Other equipment shown by Philips will include a 17.5-kW TV transmitter, plus much audio gear. (And watch for a big surprise in the area of videotape.)

CBS Labs has a host of products. A new solid state FM Volumax will be unveiled. A unique paralleling processing circuit provides positive peak control yet insures excellent high frequency response even during high levels of limiting. Also on hand from CBS, the Mark III image enhancer and NTSC chroma keyer (model 7000), and a new audio distribution amplifier (16 outputs). CBS's exhibit will include the vidifont titling equipment.

McMartin will be there with a new look—beige panels with wood grain trim is the new emphasis. New equipment includes the TBM-3700 combination FM frequency and modulation monitor. The company will also have a state-of-the-art design FM relay receiver on hand. For VHF-TV, McMartin now offers a complete monitor package: a TBM-5000 frequency monitor has been added to its aural monitor line. The company will be introducing also an RF amplifier for remote monitoring. There will be monitoring equipment for the AM broadcaster and some new mixers.

The Rust Corporation will show a special digital remote control and automatic system for TV installations. It includes new status alarm capabilities with a separate modular expansion feature for control and telemetering functions. **BM/E**

lines, both antennas (over one particular path), multipath reception and mismatches at the demodulator input. These are well known "perils of the radio path." It is well known that pictures suffer a lot less from distortion than do test signals. Test signals are especially designed to be sensitive to specific distortions. A distortionless radio path probably is seldom, if ever, existent. Much more important is its stability. After all, the concept behind remote monitoring of the transmitter lies in detecting changes in its performance, not in conducting continuous proof-of-performance tests. This is recognized in the language of the new rules.

It is interesting to consider the detectability of well displaced echoes using the bar on line 19. It is free of noise and distortions which occur earlier than the STL input or output (Field II). A 40 dB down echo (ghost) will introduce a step of 1 IRE on the top of this bar. This is readily observed and the relative path length readily measured, locating the source of the reflection.

Checking up on the future

Color cameras, videotape recorders and studio video equipment have now reached a performance level that will bring about great pressure to improve the transmitter.

Improvement in transmitters and transmitter operation are clearly possible. Much effort has been expended in the past few years to develop precision video test signal generators and waveform and picture monitors. It appears that transmitter testing may be where significant measurement improvements are most urgently needed and will be forthcoming.

The heart of the transmitter testing is a precision demodulator. New demodulators have recently been introduced and more are coming. These attack the quadrature distortion and group envelope delay problems in a variety of ways.

With standardized test signals, and precision demodulators, the next step will probably be automated video measurements. These could be done at the transmitter and telemetered back to the transmitter operator—possibly using Line 17 of the vertical blanking interval. This eliminates the serious problem of the perils of the radio path in transmitter remote control. The suggested use of Line 17 to telemeter the measurement data is but one possible method. It is one of many potential uses for Line 17, in addition to that already being discussed (test signals on international, i.e. satellite, transmissions). As those signals need not be radiated by the broadcaster, he might seek other uses for this line.

Intelligent speculation about the future need hardly stop here. **BM/E**

classifications. Indeed, the Commission sanctioned one licensee for logging as PSA spot announcements dealing with a drug information program, to be sponsored by industrial concerns in return for "institutional identification" at the beginning and close of the message.[7] Because the licensee is receiving consideration for broadcasting such announcements, he is required to log them "commercial." In an extension of this principle, the Commission held that 1) the fact that the licensee derived no substantial direct benefit from advertisements of a lottery to be held at a county fair, and 2) that his principal intention was to advertise the fair did not constitute a defense to his logging such announcements as PSA.[8] The Commission reasoned, "the very fact that one had to be present at the fair for which admission was charged" constituted a consideration for the announcement which placed it in the "commercial" category.

Because the Commission has, increasingly, been disposed to impose substantial forfeitures on licensees for logging violations, it is the wise broadcaster who exercises due care in meeting Commission requirements in this area. When necessary, broadcasters should 1) supply *extra information* for purposes of clarifying their chosen logging classifications, and 2) *consult* with *communications counsel* when classification difficulties arise. No less an effort will suffice to meet Commission requirements. **BM/E**

7. Chemung County Radio, Inc., 18 RR 2d 165 (1970).
8. 21 RR 2d 203 (1971).

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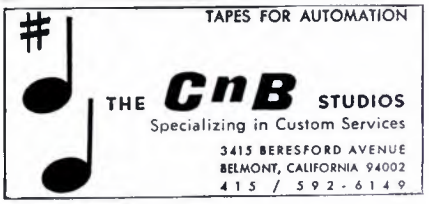

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continued on page 52

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