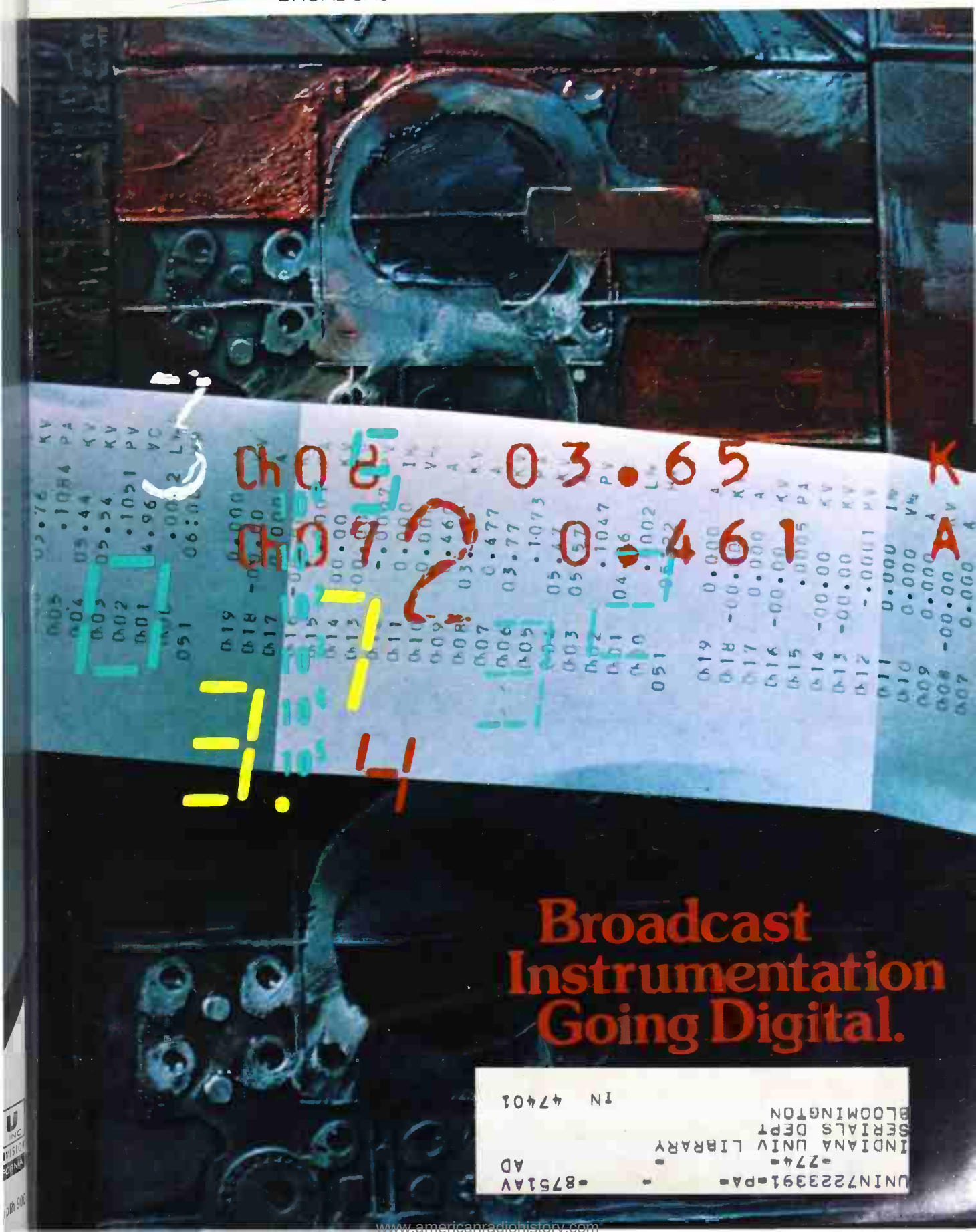
APRIL 1974

BM/E

BROADCAST MANAGEMENT/ENGINEERING



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finally- color film chain versatility!

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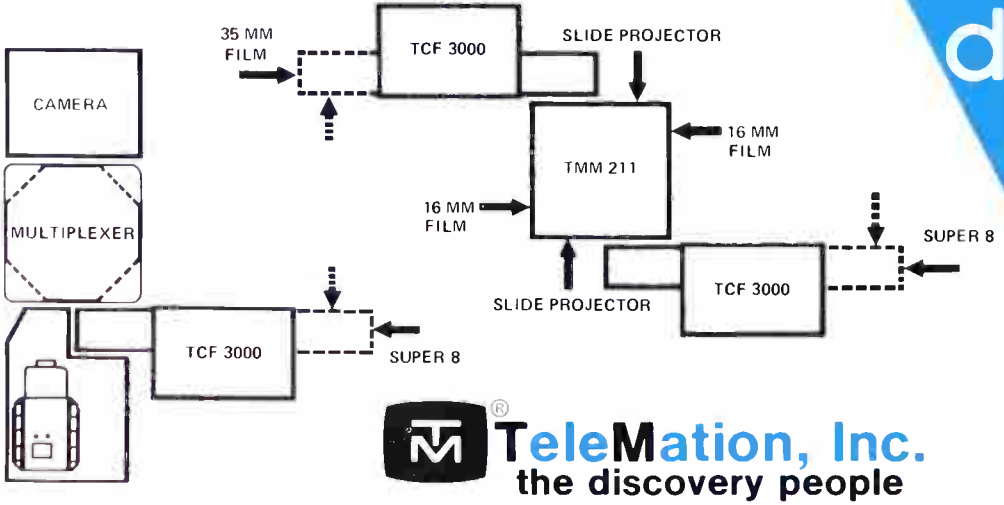

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Any authorized DYNAIR dealer who purchases a TX-3A Modulator is entitled to a full refund at anytime within 30 days after shipment of the unit from the factory, if reasonable proof is shown that the unit was replaced with another manufacturers' modulator at a price not exceeding 150% of the price paid for the TX-3A.

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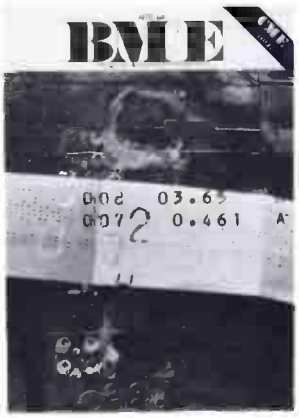

More and more measurements are being done digitally. See section beginning page 30. Collage in background by Gus Sauter, Readout tape courtesy McBee Labs.

Instrumentation: Special Emphasis

CM/E: A supplement for those with cable interest: following page 70.

BROADBAND
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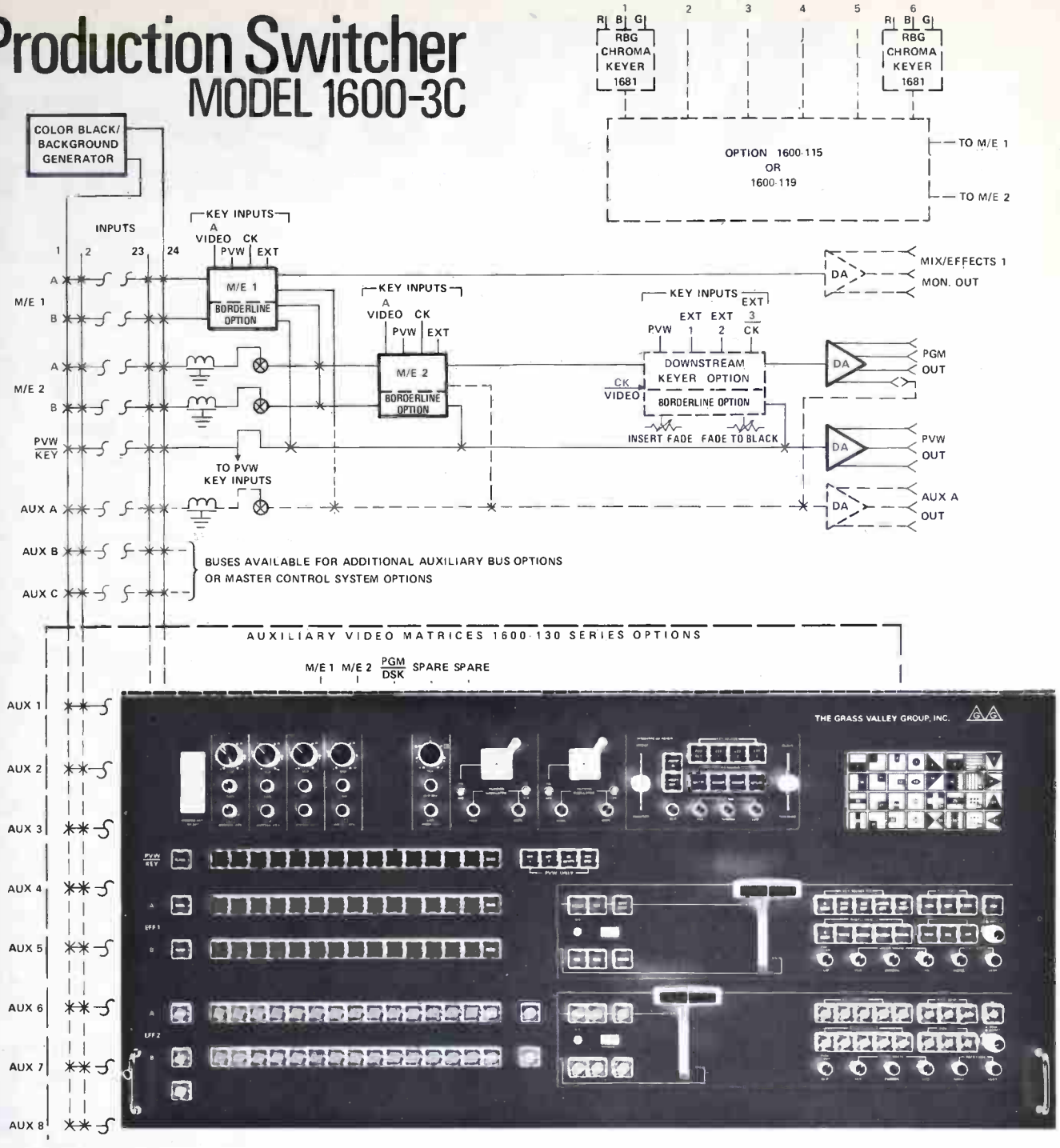
Production Switcher
MODEL 1600-3C



Would a new modern dual effects production switcher fit within your budget? Consider the GVG Model 1600-3C.

This 16 input 5 output bus model provides the production capability formerly found only on larger conventional switchers with six or more operating buses. The 1600-3C features two identical and completely independent mix/special effects systems each including individual pattern generators (32 patterns), color matte generators, and modulated pattern positioner as standard equipment.

Each effects system allows mix or wipe transitions between sources, to a keyed insert, or to a preset split screen without use of the other. Proportional (linear) control elements are used in all modes resulting in adjustable soft wipe or vignette effects and greatly improved keying, especially chroma keying. The fifth bus on the 1600-3C serves as both key signal selector and a preview selector. The base price of the Model 1600-3C is $23,000. Optional items such as chroma key generators, chroma key switchers, Borderline generators, downstream keyer system, and auxiliary bus systems are available at additional cost.

THE GRASS VALLEY GROUP, INC.
A TEKTRONIX SUBSIDIARY

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BROADCAST INDUSTRY NEWS

Nab Attacks Proposal For Percentage Guidelines

The NAB called "absurd" a proposal that FCC establish multiple percentage guidelines for "subgroup" programming aimed at "minorities, women, children, and the poor." Request for these guidelines was made by the National Citizens Committee for Broadcasting (NCCB) and the National Black Meda Coalition (NBMC).

In comments filed with the Commission, the NAB said that the recommendations by these two groups reflect "an alarming dependency upon government intrusion" into programming and "exemplify the very dangers and pitfalls NAB envisioned must result from reliance upon a quantitative concept of substantial service."

The NAB comments indicated concern with where such recommendations, if followed, would lead. "Why stop there?" the broadcasting organization questioned.

The NAB has long been opposed to any minimum program percentages, but noting that the FCC intends to use such an approach for purposes of renewal hearings, the organization offered an alternate proposal: a one percentage figure to apply to all non-entertainment programming broadcast between 6 a.m. and midnight, with stations that met the standards to be ensured renewal.

The broadcasters' filing showed alarm that if NCCB-NBMC recommendations were to become the rule, broadcasters, in attempting to be sure to meet standards, would go further, and that such surplus programming would then be used by the FCC as a guide to increasing the minimum standards.

NAEB to Help Minorities, Women

The board of the National Association of Educational Broadcasters, at its January 28 meeting, directed the NAEB staff to develop an affirmative action plan on behalf of minorities and women. The plan is to be presented to the NAEB executive committee sometime this month.

The action plan will be carried out through staff involvement and through committees. The NAEB already has several staff members coordinating women's activities and minority affairs.

Other actions of the board included: authorization of a Committee on Standards and Recognition, authorization of the designation of a panel to advise the staff and board on matters relating to First Amendment rights and responsibilities, and authorization of the appointing of a committee on the 50th anniversary of NAEB.

Black Coalition Wins Broadcasting Victory

A coalition of eight black citizen groups in Columbia, S.C., aided by the Office of Communication of the United Church of Christ, has won a four-year struggle against alleged employment discrimination and unresponsive programming on white-owned "soul" station WOIC.

Columbia Citizens Concerned with Improved Broadcasting and the United Church of Christ agency, petitioned the FCC in 1969 to deny owner Joe Speidel III renewal of his license, but no action was taken. In April 1972, Speidel proposed to sell WOIC to an all-white organization in Atlanta, Ga., whereupon the coalition and church agency petitioned the FCC to block the sale. Following negotiation, the petitioners agreed last spring to purchase of the station by Nuance Corporation, a black-owned, community-oriented group. Early this year the FCC granted the request filed by petitioners that the WOIC license be assigned to Nuance.

"The Choice Medium"—NCTA Chicago Theme

The battle over subscription cable, how to get a franchise or a rate increase, what is happening on the pole front, what cable is doing in education, and a dozen more hot cable topics will get a concentrated going over at the 23rd annual convention of the National Cable Television Association, at the Conrad Hilton, Chicago, April 20th through 24th.

Theme of the meeting is "Cable —The Choice Medium." The recent difficulties on the cable money front and how the prospects look for the future, will be examined in a session with the title "Cable Today and Tomorrow—How it looks to Outsiders," with "outsiders" from many groups in attendance, including the

continued on page 10

Watching BIAS High-Speed Printer

At seminar on data processing for broadcast stations organized by Data Communications Corp., operators of BIAS data system, new high-speed print-out for BIAS is watched by Risa Darby, of DCC; Roy Watson, Mike Sobel, and Judy Wiegand, of KGTV, San Diego; and George Nedwed, McGraw-Hill Broadcasting.

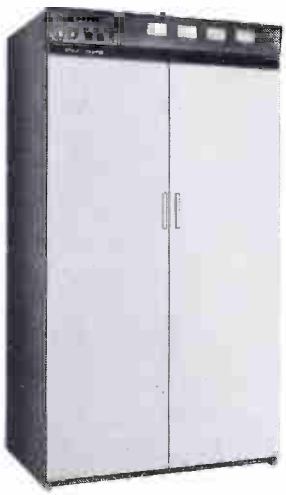
Three ways to spell leadership in transmitter engineering

IF Modulation

Another first — introduced in Gates' color television transmitters. Simplicity of IF MODULATION results in nearly perfect signal linearity for superb color fidelity.

Pulse Duration Modulator

This exclusive, Gates-designed AM modulation system is nearly 90% efficient! Allows an overall efficiency of better than 60% in Gates' MW-50, 50 kilowatt AM transmitter.



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Gates was first with this FM design, where the oscillator operating at the transmitted frequency is modulated, thereby providing greater carrier stability and unsurpassed frequency response.

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The rest is automatic.

When you're on the brink of automation, our Automated ACR-25 is the *only* sound choice in a cassette VTR. There are two reasons: it can be rolled by the computer on cue, and now it actually can be programmed by the computer.

All that's needed besides ACR-25 are two optional accessories: the Identification Data Accessory (IDA) and the Automation Data Accessory (ADA).

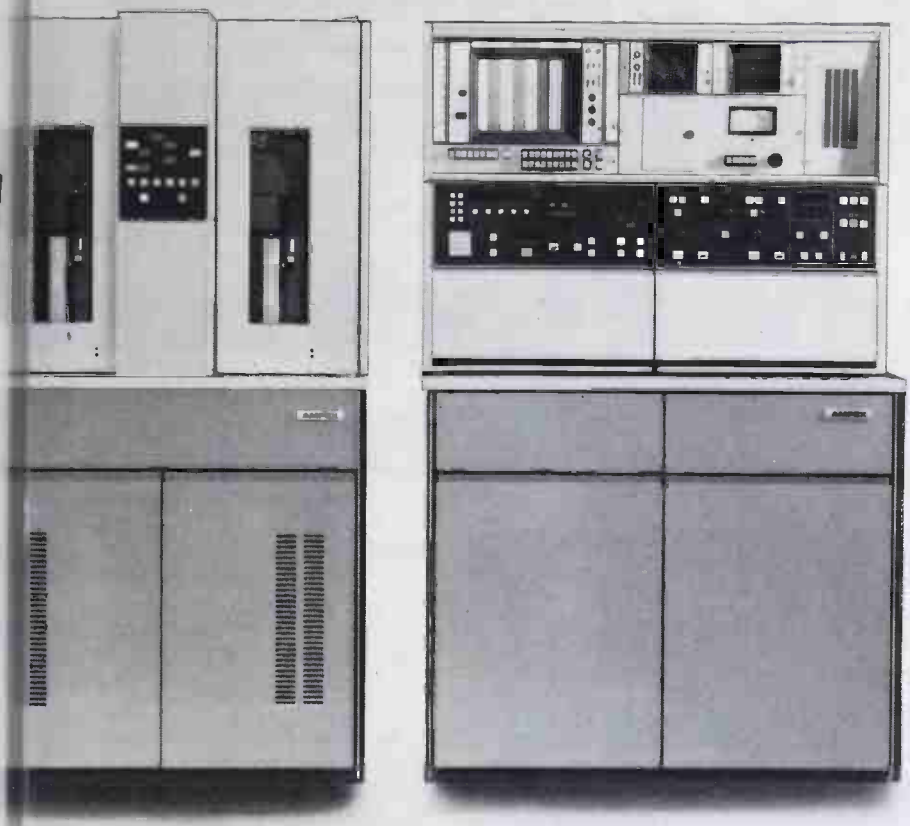
Here's how it works.

Loading. Your operator doesn't have to program the machine. Instead, he simply loads the empty bins of the carrousel in sequential or random fashion. As soon as he shuts the door and walks away, he is free for other, more creative duties.

Reading. Instantly, the IDA comes to life and "reads" each tape in each bin by examining the identification recorded on the Pre-Roll segment of the *cue* track. This is important because it means *there is no wear at all* on the video head.

Table of Contents. Next, ADA wri a Table of Contents, listing the sta and contents of each bin. It stores this in memory and then transmits data to your computer.

Play List. Your computer makes u Play List from your program sched (up to 63 events) and then tells A which spot or segment to run at wh time. ACR-25 then executes it all r ably with split-second timing.



Automated ACR-25

ıding. Bins available for reload- e identified by load control lamps ı light up after the tape is played. reminder, a remoteable signal someone else when less than ns remain to be played.

day long and into the night, the *operator action necessary is to d cassettes as necessary.* After reloading, the ADA automatically tes its Table of Contents, and computer updates the Play List.

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Both the Play List and the Table of Contents are always available for immediate printout, should you desire to reprogram the ACR-25 manually.

Amazing? Yes — more so because it's a reality today.

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financial community.

Other features of the meeting will be an exhibit of cable products with over 100 manufacturers represented, and three days of technical sessions.

Private Television Bigger Than Network TV

Business, government and non-profit organizations produced more television programming for private communications than the prime time TV programs carried by all three major TV networks combined. A special study "Private Television Communications: A Report to Management," conducted by D/J Brush Associates, details the private TV industry, which is expected to almost triple in size over the next three years.

The Federal government and private industry produced more than 13,000 TV "shows" totalling over 3500 hours last year. None of these programs has appeared on a home TV screen and none are likely to; rather, a large portion of the programs originated by "user-producers" were produced for distribution via videotape or closed circuit "networks," according to the report.

As would be expected, training is a major application of private TV. The study found that new applications in the communications, information and sales areas are rapidly expanding.

This study includes the first published information on the Federal government's use of the medium, which totalled approximately $22 million in 1973.

The private TV report is priced at $395 and is available from Knowledge Industry Publications, Inc., Tiffany Towers, White Plains, NY 10602.

Correction

A news brief item in February stated erroneously that Dyma Engineering had won a small suit against C-Cor Electronics. The ruling was against CCA Electronics, not C-Cor.

Interactive Cable Educational Experiment

The cable TV system being constructed by Big Valley Cablevision, Inc., in Stockton and San Joaquin County, California, has been proposed as the site for an experiment in the delivery of educational services via interactive TV, for a $3.2 million grant proposal to the National Science Foundation.

The non profit experiment will be conducted by the Mitre Corp., in partnership with Big Valley Cablevision

continued on page 12

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NEWS

and with the Educational Testing Service.

The Stockton test is proposed to be the first full-scale experiment in two-way educational services via cable television, according to Tim Eller, Mitre's coordinator for the project. Mitre has conducted limited scale testing in Reston, Virginia, utilizing one channel of the Warner cable system connecting a mini computer and one in-home terminal.

Faster "BIAS" Print-Out: Signs Six Storer Stations

New print-out terminals that operate 4 to 10 times faster than earlier models were demonstrated at a seminar on automated data processing for broadcast stations held in Memphis, February 17 to 20 by Data Communications Corp. operators of the "BIAS" data systems.

A few days later Data Communications and Storer Broadcasting jointly announced that all six Storer TV stations would install visual display terminals and high-speed printers to use the BIAS data services, which are based on computer equipment at DCC headquarters in Memphis. Also using the system will be Storer TV sales offices and the Storer corporate offices in Miami.

The seminar attracted more than 100 broadcast executives from around the country, and saw the introduction of a number of expanded services in the BIAS system.

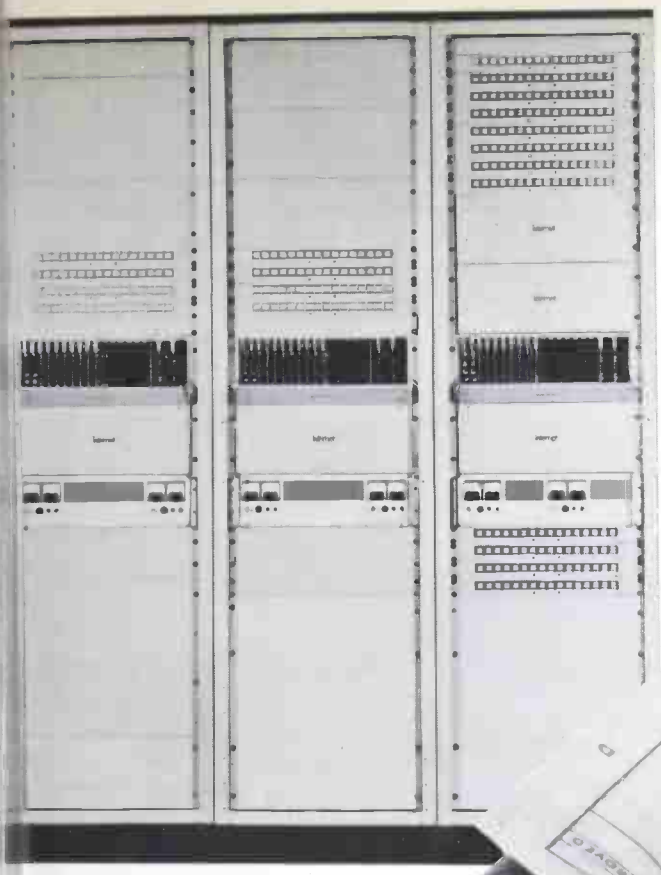
CMX Systems Acquired by Orrox

CMX Systems, joint venture subsidiary of CBS and Memorex, has been acquired by the Orrox Corp., headquartered in Opelika, Ala. Orrox manufacturers iron oxides for recording tape. It is aligned with Bayer AG of Leverhusen, West German in combined research activities in new magnetic materials.

The company has two subsidiaries on the West Coast, Videomax Corp., which rebuilds professional recording heads, and Barger, which builds special-purpose tape and disc drive systems. Acquisition of CMX by Orrox was described by Vice President, William Orr, as another step in a long range program of broadening the company's capabilities in videotape.

Supreme Court Decides For TPT in Copyright Case

In a long-contested suit over copyright fees, the Supreme Court ruled 6 to 3 on March 4th, that TelePrompTer will not have to pay copyright fees to Columbia Broadcasting System for programs



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What's more, we have the experience that assures simplicity of design and high reliability for smooth operation. And, we do it in the most cost-efficient approach anyone can offer.

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"imported" and delivered to subscribers of TPT systems.

Distributing a program to cable subscribers is not a "performance", the Court said, and thus not subject to copyright. The decision got a mixed reception even in cable circles. David Foster, president of the National Cable Television Association, has said his group believes cable operators should pay reasonable copyright fees. The decision, moreover, does not preclude establishment of such fees by Congress under a new law, under discussion in Congress for several years.

Prime Time Access

In November 1973, the FCC liberalized the Prime Time Access ruling, removing some restrictions on the networks, but requiring some of that time for local station's production of community, children's and minority programming. NBC and ABC had responded positively to the new ruling, but CBS president Arthur R. Taylor, has attacked the FCC on this ruling as well as other Commission action relating to the networks.

A report has been published on the new ruling, explaining who is affected, how they are affected, etc. "Prime Time Access Report" is $20.00 plus $1.00 postage, and is available from Information Planning Associates, Inc. FCC Information, "Prime Time Access Report," 310 Maple Drive, Rockville, Md.

The FCC is not the only government agency interested in prime time access. The Justice Department has charged the three commercial networks with illegally monopolizing prime-time entertainment programming. Thus, the Justice Department suit seeks to prohibit the networks from producing their own entertainment programs and movies. ABC, CBS, and NBC have responded with defenses based on First Amendment grounds. In fact, networks charge political motivation for Justice Department actions, as an extension of government's intimidation and pressure on the press. However, this suit was contemplated as far back as 1969, though it was not formally put forward until 1972.

FCC Modifies PSA Order

The Commission modified its daylight savings time order, which permitted some daytime stations previously ineligible for pre-sunrise service authorizations (PSA's) to operate an hour before sunrise with power of 50 watts. Modification gives authority to include stations holding, or eligible for, PSA's of less than 50 watts.

Gross Telecasting Subject of FCC Inquiry

The FCC has ordered a non-public inquiry into the activities of Gross Telecasting, Inc., lincensee of WJIM(AM), WUIM-FM and WJIM-TV, Lansing, Michigan. The Commission said that questions had been raised regarding deliberately distorted or slanted news broadcasts, the use of facilities for private interest instead of public interest, and use of facilities to gain an unfair advantage over competitors or potential competitors in a non-broadcast business enterprise.

Radio Drama is Back— With Great Success

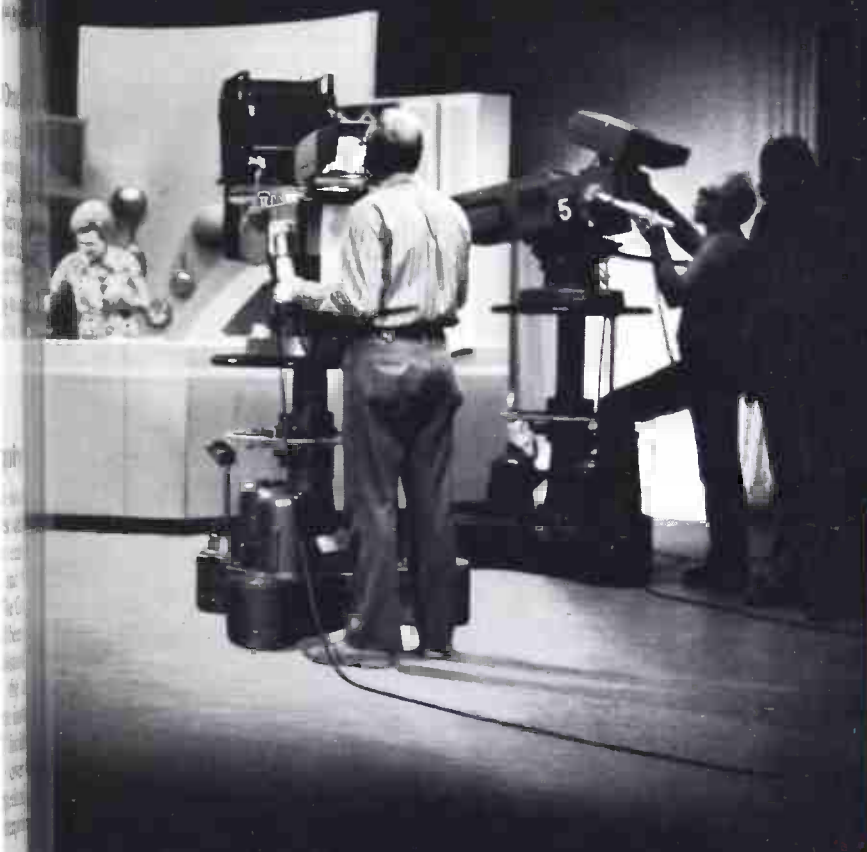
The movement back to radio drama started about two years ago, with public radio stations around the country starting to air old-time radio shows. These are still being broadcast and, National Public Radio (NPR) has initiated several other radio drama projects since then. The latest is a 13-week package of all new avant-garde plays, both mystery and comedy, that starts this month going out over some 160 member stations.

CBS Radio has found its new Radio Mystery Theatre to be highly successful. The nightly 52-minute individual suspense dramas, which began i

continued on page 1

WCVB-TV Boston eads broadcasting nto the triax era...

ith Norelco digital cameras all the way.



"Our five PC-100A cameras function beautifully, producing unsurpassed color pictures. We've built a small van around our portable PCP-90B to add to its utility in taping or microwaving live news day in and day out. The three Norelco film chains and audio systems perform flawlessly, as do our Norelco remote-controlled, parallel, redundant transmitters."

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NEWS

January, generated 120,000 pieces of mail in the first six weeks of broadcast. Most of the mysteries are original plays, along with some adaptations of earlier popular series.

In late February, 219 stations were carrying The CBS Mystery Theatre and the list was growing. A CBS Radio spokesman told BM/E that if the success continues, it may eventually trigger a return to day-time drama.

Wiley Takes Over

Richard E. Wiley took over as chairman of the FCC on March 8 when Dean Burch abruptly moved to the White House to take up his duties as counselor to President Nixon.

Coming Soon

In Canadian broadcasting, the 24th Annual Western Association of Broadcast Engineers (W.A.B.E.) Conference will be held in the Palliser Hotel, Calgary, Alberta on May 7, 8 and 9.

The Health Sciences Communication Association is holding its 16th Annual Convention on May 12-15 at the Cosmopolitan and Brown Palace Hotels, Denver, Colorado.

The American Council for Better Broadcasts will hold a Convention Conference in Baton Rouge, Louisiana, on May 25, 1974. Theme is "A 1974 Redefinition of 'The Public Interest, Convenience and Necessity'?"

Business Briefs

Continental Electronics won a $2,281,315 contract from the Republic of Korean Office of Supply, to provide the Korean Broadcasting System with their high-power, short-wave broadcast transmitter.

The W. Bert Knight Co., electronics manufacturers' representatives, recently celebrated its 50th anniversary. At the celebration the company announced its move into new headquarter facilities at Suite 110, 4001 Westerly Place, Newport Beach, CA 92660.

Bonneville Program Services has been re-named Bonneville Broadcast Consultants, to more fully reflect its scope of activity. The company retains its same address in New York.

Sansui Electronics Corp. has appointed new representatives in two territories: Century Sales Ltd., Inc. for Texas, Oklahoma, Louisiana and Arkansas; and Schak & Associates for Minnesota and the Dakotas.

Granger Associates has complete a contract with ITT to provide 960 MH radio terminals for use in the Mississippi Educational Television Micro

ANTENNA MONITORING WITH A COMPLETE

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TRUE DIGITAL SYSTEM

The DAM-1 is a true digital antenna monitor designed specifically for measuring the parameters of broadcast frequency directional antenna systems. Digital data is not obtained by adding an A/D converter to the output of conventional analog circuitry; instead, the latest digital techniques and TTL components are applied to achieve a truly digital approach to phase and current ratio measurements. Data is displayed on front panel seven-segment digital readouts to minimize reading error. A simplified selection system reduces operation of the DAM-1 to a straightforward procedure.

- A true digital antenna monitor specifically designed for broadcast directional antenna systems.
- Complies with FCC monitor and remote reading specifications. DAM-1 has received FCC Type Approved Number 3-218.

TWO WIRE TRANSMISSION REMOTE CONTROL UNITS DAML-1/DAMR-1

The DAML-1 and AMR-1 provide for long distance remote control and readout of the DAM-1. Digital data is transmitted in both directions y integral FSK modems at 300 BPS.

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The DAMH-1 provides for remote control and readout of the DAM-1 at distances to 1,000 feet.

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The DAMX-1 permits the DAM-1 to be used for direction antenna systems with up to 12 towers.

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- A true digital antenna monitor specifically designed for broadcast directional antenna systems.
- Complies with FCC monitor and remote reading specifications. DAM-1 has received FCC Type Approved Number 3-218.

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The DAML-1 and DAMR-1 provide for long distance remote control and readout of the DAM-1. Digital data is transmitted in both directions by integral FSK modems at 300 BPS.

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NEWS

wave Interconnect System. The new statewide educational television broadcasting network centered in Jackson, Miss., will serve the major population centers via 18 sites throughout the state, for the Mississippi Authority for Educational Television.

AEL Communications Corp. (AELCC) was awarded a $1,500,000 turnkey contract for construction of a fully bi-directional cable TV plant in Columbus, Ohio, for Coaxial Communications of Columbus, Inc. AELCC is adding 300 miles to an existing 170 mile plant that serves more than 10,000 subscribers, and is the largest known 2-way pay-TV system in the country.

The Robert E.L. Kennedy broadcast engineering firm has been expanded and reorganized under the name of Kear and Kennedy Associates. Archer S. Taylor, of Malarkey, Taylor and Associates, will act as the supervising engineer of the new firm, which will consist of Bob Kennedy's staff and Dr. Frank G. Kear, Kennedy's original partner, who will assist in special client projects, as a consultant to the new firm.

Now available is an audiocassette soundtrack of **Paul Kagan Associates'** "Cable TV Regulation" seminar held in New York City on Jan. 31, 1974. All conference materials are included with the transcript. Cost is $75 for those who did not attend, and $50 for those who did.

Home Box Office, cable pay TV network, has added service to Corning and Nassau County, N.Y., and Mt. Carmel, Pa. These newly affiliated systems give Home Box Office a total of 21 in Pennsylvania and New York.

Logan Cable Television, with franchises in Bellefontaine, Russells Point and Lakeview, Ohio, has been merged with Communivest, Inc., of Los Angeles, Calif., which presently operates six cable TV systems.

Marconi Communication Systems Limited, a GEC-Marconi Electronics company, will be supplying, installing and commissioning new 15kW v.h.f. TV transmitters for the Singapore Ministry of Culture's Department of Broadcasting. Singapore TV is going into color this year, carrying the new programs on the Marconi transmitters.

Two new audio sales representatives have been appointed for the Northwest and West, by **AKAI America.** The company will be represented in the West by Cable of America, Inc., with headquarters in Commerce City, Colorado and in the Northwest by Ross E. Robbins and Associates, with headquarters in Seattle.

continued on page 2

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ow there is a choice of three ctorscopes from Tektronix— NE: The new 1420, a compact it that is especially well suited r camera control units, video e recorders and similar stallations. TWO: The Vector splay Option available with KTRONIX Color Picture onitors. THREE: The 520A, the tablished standard of ctorscope performance and atures.

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NEWS

At its annual meeting in February **The Arizona Cable Television Association** passed several resolutions: condemnation of NAB and networks' programs opposed to pay cable; support of the McClellan Copyright Bill (S. 1361); protest of present FCC non-duplicating regulations and opposition to all forms of government ownership of cable systems.

Newly-elected ACTA president Bruce Merrill, at ACTA's first annual Legislative Luncheon, explained the association's role in serving the state's communities and stated legislative goals hoped for cable. ACTA and the Arizona League of Cities and Towns, have co-sponsored a bill introduced in the State Senate designating the cities and counties as the local licensing authorities. The bill, if enacted, would seem to rule out any state role in cable regulation.

Leaders of the media are among the invitees to a major national meeting which will bring together decision-makers from many varied fields to explore the energy problem and possible longterm solutions. The meeting, "Energy: Today's Choices, Tomorrow's Opportunities," sponsored by the **World Future Society,** will be held April 24-25, at the Washington Hilton Hotel, Washington, D.C.

Though confronted with a reduction in the availability of vinyl used in manufacturing phonograph records due to the current energy crisis, **the recorded music industry** is projected to rise from a 1972 sales level of $2 billion to $3.4 billion by 1982. This projection is based on a study by Frost & Sullivan, Inc., which revealed that the industry will release less material, concentrating on proven artists and better quality repertories. It is also projected that people having to stay home more often because of the gas shortage, will listen to more records. Increased costs will be justified because of material costs.

American Satellite Corporation (ASC) has taken a major redirection in its plans for a domestic communications satellite for the U.S. Using a leased satellite, for a minimum of two years, instead of purchasing its own satellite, ASC's new operations plan calls for start of communications service in July 1974. Long-range plans still include a satellite system of its own.

Senator Lowell Weicker (R.-Conn.), introduced a bill to abolish the **Office of Telecommunications Policy.** He says the government "should not be in the business of reviewing the quality and scope of non-governmental communications" and has often thwarted work of the FCC.

continued on page 83

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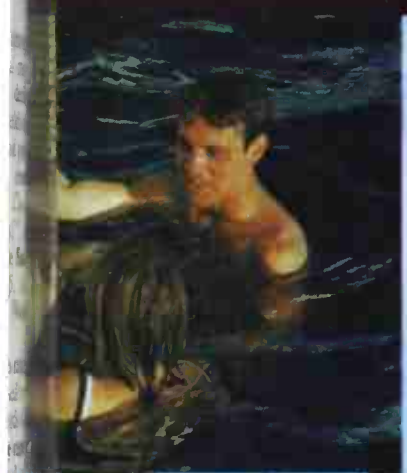
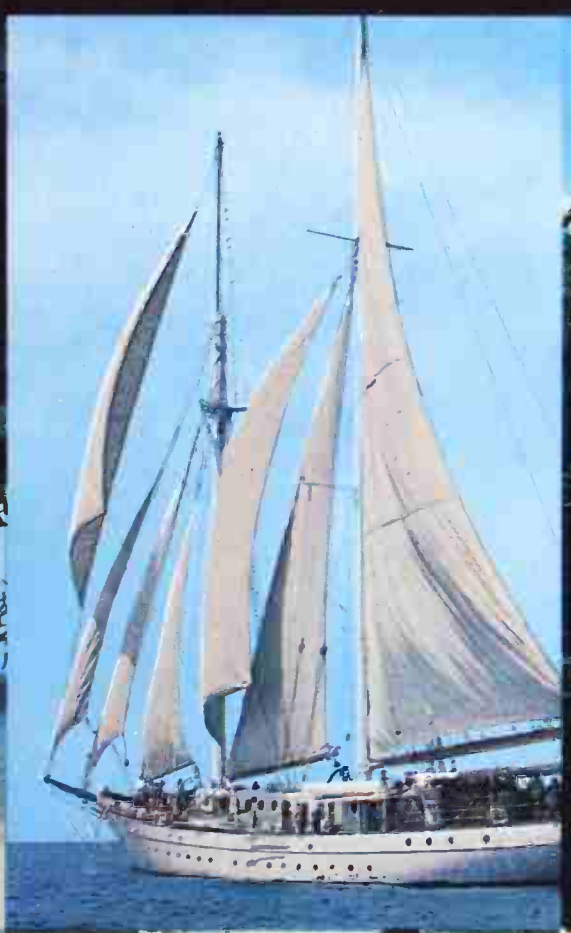
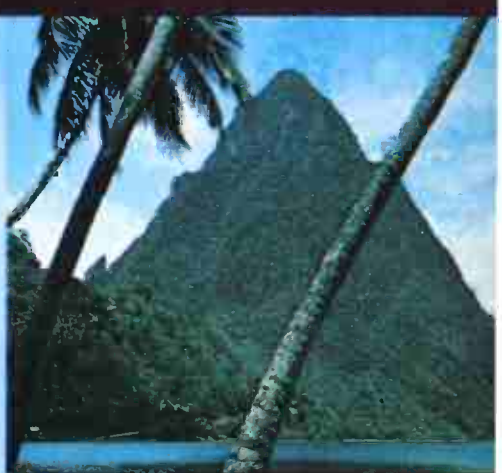



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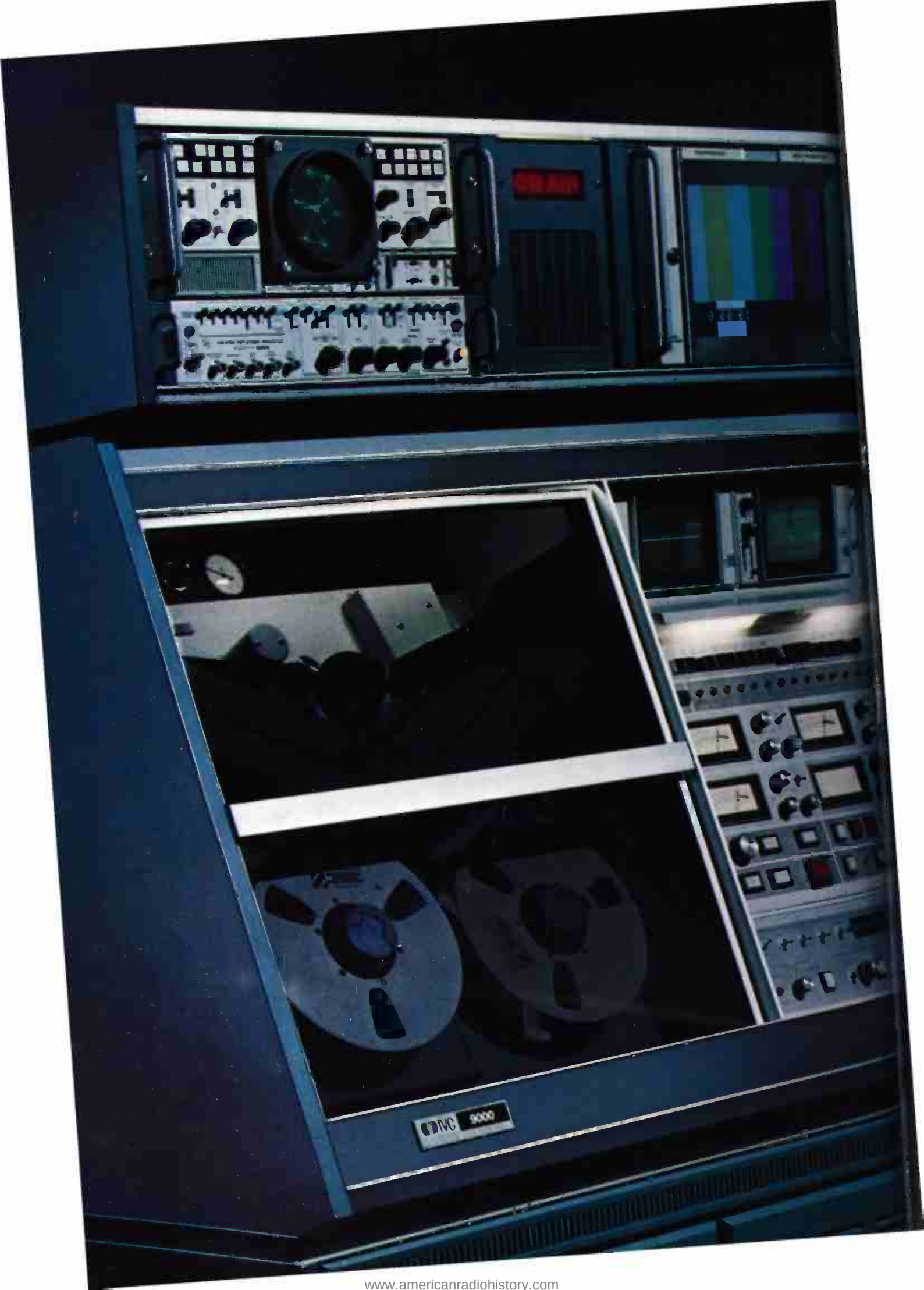

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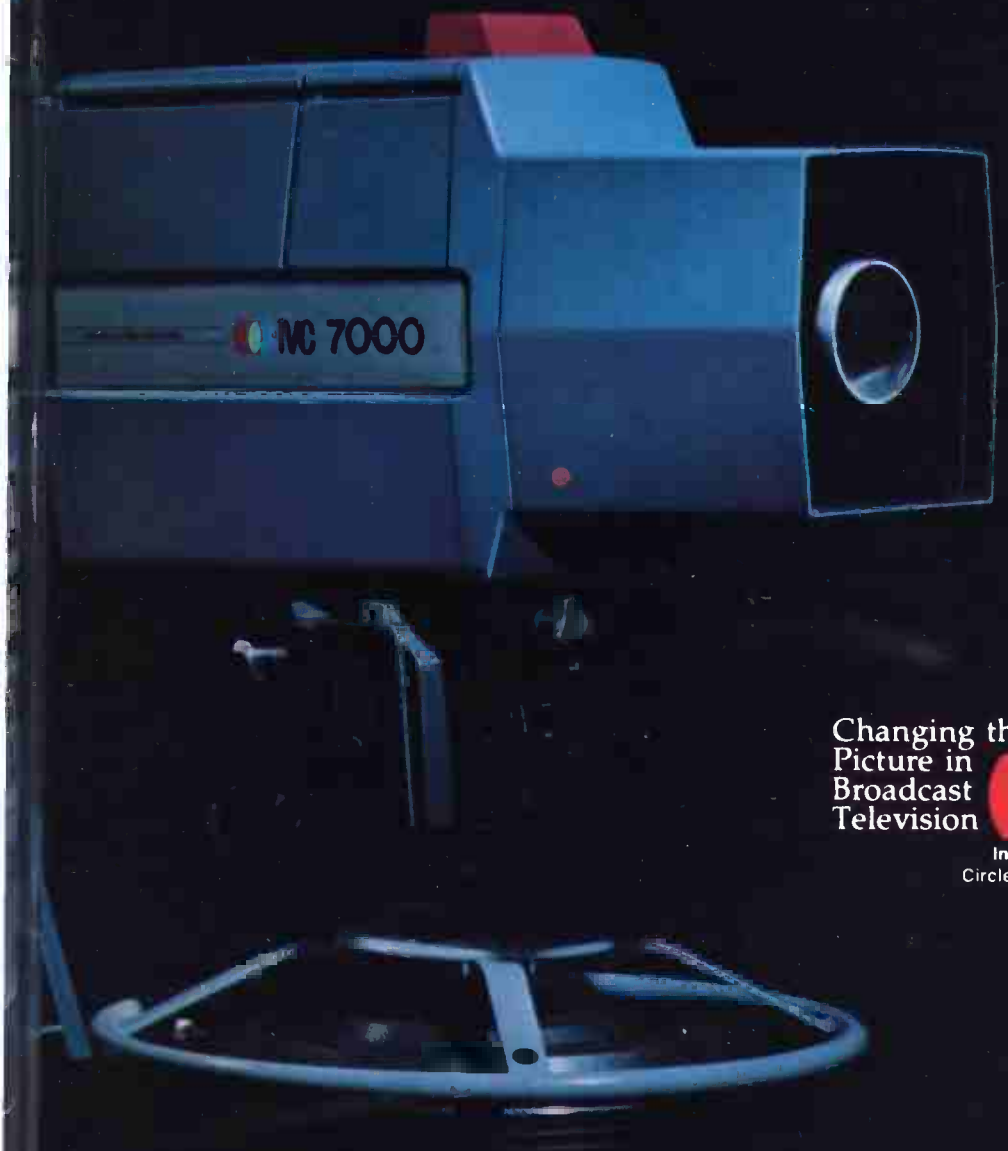

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The "New" Prime Time Access Rule

By Frederick W. Ford and Lee G. Lovett
Pittman, Lovett, Ford and Hennessey
Washington, D.C.

The Commission instituted an inquiry into possible changes in the prime time access rule less than a year after the rule became fully effective.[1] Comments were filed by interested parties (forty in number totalling approximately 1,200 pages). The filing of Reply comments (by fifteen parties) was followed by two days of oral hearings before the Commission *en banc* (July 30 and 31, 1973) in which 54 persons participated. The Commission subsequently adopted a comprehensive 84 page *Report and Order*[2] instituting major revisions in the prime time access rule.

"Old" rule eased

Network affiliates in the top 50 markets[3] will no longer be restricted (as of September 1974) in the programming that they may carry in the first half-hour of prime time (7-7:30 p.m. Eastern and Pacific Time, 6-6:30 p.m. Central and Mountain Time).

The prime time access rule is effectively limited to the second half-hour of the prime time period (7:30-8 p.m. Eastern and Pacific Time, 6:30-7 p.m. Central and Mountain Time), Monday through Saturday. The access rule has been completely eliminated on Sunday. Thus, only six half-hours per week must be "cleared" of *(1)* network, *(2)* off-network and *(3)* feature film programming.

"Off-network" refers to programming formerly on-network, and now in syndication.

All feature film programming must be "cleared" from the access period. This requirement eliminates the definitional controversy between made-for-theater and made-for-television feature films.

One of the six "cleared" half-hours may be network or off-network provided that the programming consists of *(1)* children's specials, *(2)* documentaries or *(3)* public affairs programs.

The Commission defines "documentary" programming as "any new program which is non-fictional and educational or informational, but *not* including programs where the information is used in a contest among participants."

The Commission went to special lengths to emphasize that stations must devote "an appropriate portion" of the "cleared" time to programs *(1)* designed for children, *(2)* dealing with particularly significant interests, problems and affairs of minority groups and, *(3)* dealing with problems and needs of the station's community of service as determined by "its regular efforts to ascertain community needs." Yet it should be noted that the rule, as adopted, contains no specific "cleared" time programming requirements. This may be due, in part, to serious First Amendment considerations relating to government regulation of program content. The Commission may have felt that a more "informal" approach, via discussion in the *Report and Order*, would spur stations to more significant public interest use of "cleared" time. Of course, the Commission has the option of amending the rule should stations prove reluctant to program locally significant material in the "cleared" periods.

Exceptions to the "new" rule

The Commission has recognized a number of situations in which the public interest compels an exception to the ban on network programming during "cleared" time. These include *(1)* sports runovers, *(2)* time zone difference problems, *(3)* exceptional international and national sports event and "special" nature programming, *(4)* pre-game shows in connection with important sports events, and *(5)* fast-breaking and on-the-spot news coverage and political broadcasts.

(1) *Sports runovers:* These situations usually involve late-afternoon sports events, such as football games, which "usually, but not always," end by 7 p.m. The Commission's Rules require that the event be scheduled so that, under normal circumstances, it would end by 7 p.m. If, then, extraordinary circumstances occur (such as double overtime in basketball or rain delay in baseball), the sports event is *not* considered network programming for the purposes of the 7:30-8 p.m. "cleared" time period.

(2) *Time zone difference problems:* The Commission has recognized important problems arising for stations operating in Mountain and Pacific time zones with regard to the new 7:30-8 p.m. "cleared" time period. Problems may arise, for instance, where a sports event (i.e., a World Series game) played in the East, runs from 8 to 11 p.m. Carriage of the game on Western stations would preempt the "cleared" access period. In such "time zone difference" situations, the Commission's "new" rule

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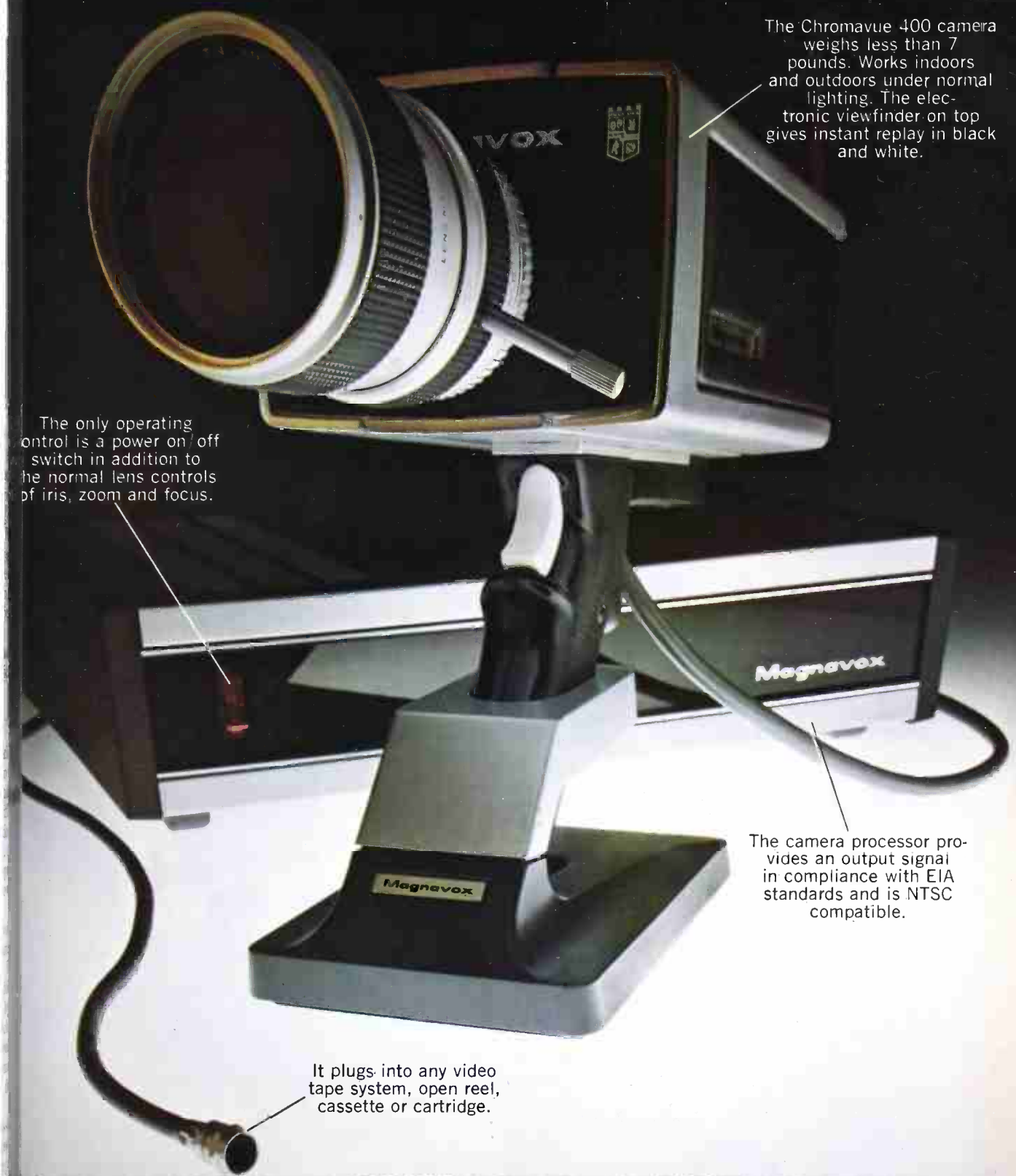

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states that these occurrences are *not* to be considered network programming for the purposes of the access rule since "clearly, it would not be in the public interest to forbid carriage of the games themselves." The Commission further states that there are "too many complexities to warrant the formulation of an iron-clad rule," including requiring stations to "clear" a later half-hour of network, off-network, or feature film programming. Yet, the Commission expects a somewhat vaguely defined voluntary adherence to the "spirit" of the rule. Thus, where the network does not provide programming to a Western station after the "special" event, and the station has a significant amount of prime time available, the Commission would expect that some of the time be devoted to local or "first-run-syndicated" programming, the promotion of which is the prime time access rule's purpose.

(3) *"Special" programming:* When a network devotes "all or substantially all" of its prime time to a particular type of special program, the Commission has decided to permit use of the 7:30-8 p.m. "cleared" period for such programming by affiliated stations. This exception to the general access period rule is most likely a direct result of unanimous disagreement with the 1972 Summer Olympics exemption denial. At the same time, concern is voiced over potential abuse of this "special" program exemption. The Commission has therefore limited the exemption to: "*(1)* international sports events (Summer and Winter Olympics), and perhaps some others such as Pan-American games, *(2)* New Year's Day bowl games (an established situation) and *(3)* other network programming of a special nature which is neither sports events nor motion pictures."

(4) *Pre-game shows:* The Commission noted a significant number of waiver requests (under the "old" access rule) for pre-game shows starting at 7:30 p.m. followed by a sports events at 8 p.m. (i.e., World Series and All-Star games). Pre-emption of the "cleared" time period for such pre-game shows is considered to be in the public interest by the Commission—but only to a very limited extent. The "new" rule therefore permits each affiliated station to present pre-game shows during the "cleared" period *five* times each broadcast year.

(5) *Fast-breaking news and political broadcasts:* The "old" rule exempted special news programs involving *(1)* fast-breaking events, *(2)* on-the-spot coverage of news events, and *(3)* political broadcasts by legally qualified candidates.

The "new" rule liberalizes this exemption in two ways. First, one of the six weekly "cleared" half-hours may contain regular network or off-network public affairs programs. Second, on-the-spot coverage and fast-breaking news coverage may contain "related" programming. The *Report and Order* cites as an example the broadcast, on the night of former President Truman's death, of interviews with him filmed in the past.

The political broadcasting exemption is liberalized to include *any* "political broadcasting activity by or on behalf of a candidate or candidates." This is a significant change from the "old" rule limiting the exemption to political candidate use.

The controversy continues

Opponents of the prime time access rule contend that the rule has had an adequate test and has failed in its

continued on page 81

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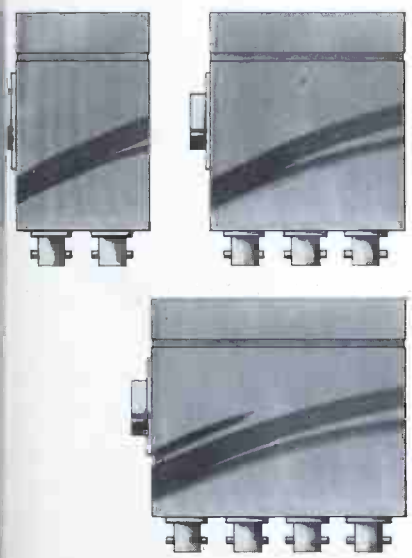

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Understanding Automatic Digital Logging and Data Acquisition

By Virgil D. Duncan, P.E., and Malcolm M. Burleson

Broadcasters can be in the vanguard in taking advantage of state of the art techniques in digital logging—which can be extended into full-fledged automatic control systems. Equipment is available. This article on basics tells broadcasters what's possible now—from it you plan for the future.

Logging is the conversion of analog data, such as meter readings, into numbers or facts which are written down in a log. This is time consuming and directly affects costs, productivity, and ultimately profit. Digital systems offer the advantage of absolute readings, not subject to visual interpretation and human errors, with accuracies up to ten times that of comparable meter readings. An automatic digital logging system can therefore perform this necessary function faster and with a higher degree of accuracy than was previously possible.

With the ever increasing complexity of engineering plants, industrial processes, and control, the use of data-logging techniques is becoming a widespread necessity. Because of the uniformity and accuracy required of the data and the increasing amount of information to be logged during the operating hours, automated techniques of data collection and analysis have become imperative. Manual logging has become too laborious, slow and difficult in terms of both time and accuracy. The problem is further compounded by the spiralling labor costs and the reluctance of persons to undertake routine chores such as reading and recording at regular intervals the values indicated by meters and dials. The installation of a data-logging system is very often the first step toward full automation of the facility. Such a system not only serves as a base which can be extended to a full-fledged control system, but also provides valuable information that can aid in the design of the control devices.

Analog metering via digital recording is an example of broadcast equipment logging. The McBee VII/21 Automatic Digital Logging System was designed for this purpose, and is a complete, self-contained system, including the printer. The system displays and prints date identification, time, channel number, and data such as volts, amps, power, etc. In addition, the Logging System incorporates a real time, solid state, 24-hour digital clock, the time of which can be both visually displayed and printed out.

Fig. 1. Simple chart recorder as a logger.

The simplest data acquisition systems may incorporate no components other than a recorder, shown in Fig. 1, to register these measured values. An example of this is the chart recorder. However, any practical data-logging system includes at least a possibility of primitive evaluation by technical personnel. This appears to be desirable not only to reduce the amount of data involved, but also because the results of the measurements cannot be directly utilized or easily interpreted. For example, the data obtained from different test points have to be correlated, linearized, compared, averaged, or otherwise reduced to make them meaningful for any subsequent use. Automatic control is merely an extension of data-logging techniques.

However, the data acquisition system can be considered as an open-loop control system whereby any control of the process based on the output of evaluation is carried out manually and forms the link between the evaluation and the control functions. Of course, data-logging is a first requirement. Here, data-logging serves primarily for monitoring and investigating the performance and as an aid in the future control of the operation of the equipment. In contrast, in a closed-loop control system, the data output immediately and automatically controls the operation to compensate for any deviation of the performance from the design requirements.

Data acquisition and recording, such as with the V-11/21 Automatic Digital Logger, when operated at three measurements per second, would acquire and record 10,800 readings per hour. This large amount of data is unnecessary in the majority of installations and there is a high degree of redundancy in this information. It is apparent that some form of data reduction must be included. This can take the form of *a.* increased time interval acquisition, *b.* out-of-tolerance or abnormal functions recording, or *c.* a combination of these.

Mr. Duncan is a Consulting Engineer and **Mr. Burleson** is president of McBee Laboratories, Inc., Washington, D.C.

2. *Automatic digital logger and data acquisition system.*

Fig. 4. Special type of DPM comparator.

3. *Typical analog comparator for alarm for controller use.*

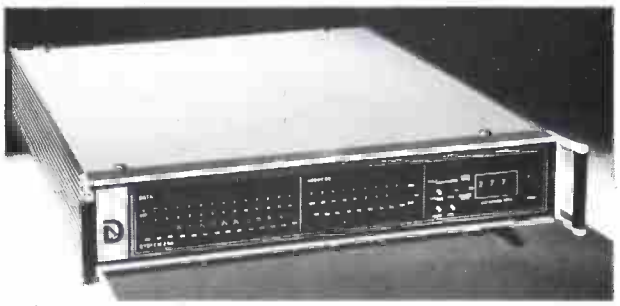


Fig. 5. A 256-point data acquisition system, computer controlled.

An obvious solution is to ignore all data pertaining to rmal operation and to register only data in cases of normal function where permitted. This form of data luction is made possible by limit comparators. The it comparator, as its name implies, compares the asured value with an upper and/or lower limit of the iable beyond which the operation is considered abrmal, and accordingly provides an output.

The comparator can be either digital or analog. In neral, analog tolerance comparators are used directly oss test points to provide continuous tolerance moniing for alarm or control. An analog alarm/controller mparator is required for each test point. A typical alog comparator is shown in Fig. 3.

The digital comparator is generally located after the t point scanner and the analog-to-digital converter DC). Here, the test point must be first scanned and itized before an evaluation comparison can be made. vo types of digital comparators are generally used. The st is a digital comparator with HIGH and LOW set ints for all the channels or test points to be scanned. ly one comparator is required and is satisfactory nen all the channels scanned have the same voltage ale and the same tolerance. The second is a proammed digital comparator which has a HIGH and)W set point programmed for each test point scanned. is type permits the comparator to operate at different ltage levels and different tolerances for each test point anned.

In case of non-critical operation, the comparator out-t may be used simply to activate or inhibit the acquisin or recording device, depending on whether the "NO)" or "GO" output is utilized, to record special markgs alongside the measured data, to print in red, etc. ith the more critical operation, it is often required to rnish an audible alarm, to provide scanning and make peated measurements, or to combine any of these operations. These functions may require special units or may be included in the limit comparator.

Another method of data reduction is to limit the number of data samples measured over a given period of time. This is especially useful where the parameters being monitored may vary slowly. This condition applies to power, voltage, temperature, humidity, pressure, etc. Again, assuming three measurements per second and a minimum of ten input channels, each test point would be sampled at intervals of about three seconds. In many applications, sampling intervals on the order of minutes to hours are acceptable, although to preserve the correlation among the values measured in the different channels, the time difference from one channel to the next must be kept as short as possible. The usual method is to operate the scanner from a digital clock at predetermined intervals: e.g., every ten minutes or every thirty minutes or longer.

The digital clock also furnishes time base gate pulses for operation, as well as providing relative time or time-of-day information for the recorder. In general, a data acquisition and logging system includes both a limit comparator and a digital clock used concurrently. Each scan is triggered at pre-determined intervals, and during the scan cycle all the channels are measured and recorded. The out-of-limit values are distinguished by special markings or ink color. However, all data acquisition systems do not use a real time clock nor do they incorporate a printer or recorder. Such a system is shown in Fig. 5.

In the data-logging operation the test point scanner controls and coordinates the activities of the different instruments of a system. A measurement sequence could be as follows: At the beginning of a measurement, the test point scanner resets the measuring circuits to zero, connects the transducer (corresponding to the test point to be measured) to the input of the analog-to-digital

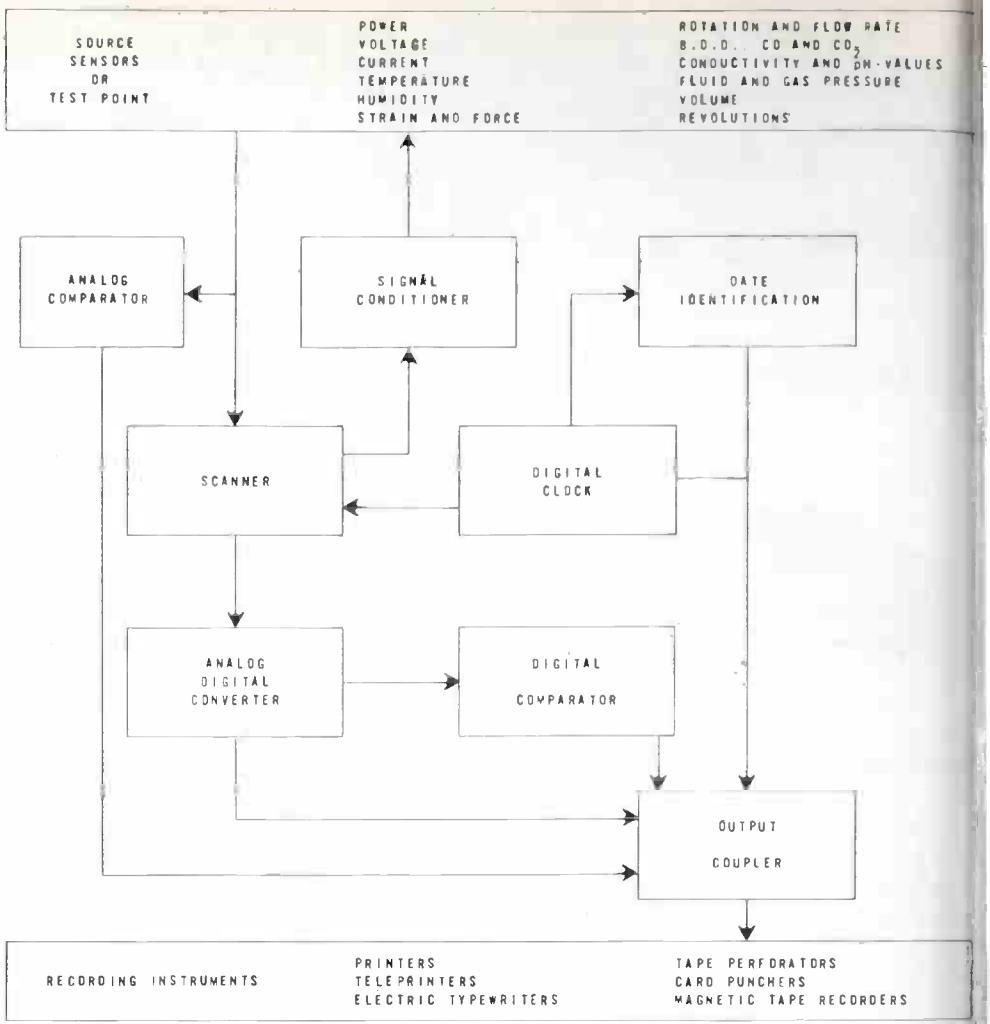


Fig. 6. A block diagram showing a typical digital data acquisition and logging system.

converter, applies excitation voltage to the transducer if necessary, sets the input voltage range and other measuring conditions of the A/D converter, and selects the desired recording format, including symbols. After a suitable delay time, the test point scanner triggers for a measurement to be made. At the end of the measurement, the A/D converter unit sends a signal (conversion is complete) by which the recording device is triggered. After completion of the recording, the test point scanner receives a feedback signal from the recording device, which then disconnects the transducer or measuring point, switches to the next selected test point and begins the next measurement. Different systems operate at different speeds. A small simple system may have one data conversion and one printout per second, while the larger type, such as the System 256, will have analog data sampling at a throughput frequency of 100 KHz. A typical digital data acquisition and logging system is shown in Fig. 6.

In overlapping operation, the test point is disconnected at the end of the measurement at a particular channel, and the test point scanner switches to the next test point even before the recording of the data is completed. Thus, the recording of a measurement in a channel is carried out at the same time as the measurement in the succeeding channel, and so the overall data acquisition speed can be increased.

If the extent of evaluation and processing requirements warrant it, a minicomputer could form part of the data acquisition system. Alternatively, the data acquisition system could be placed under the command of a central computer such as the Naked Mini/Alpha 16 as shown in Fig. 7.

The use of the computer affords more flexibility but has to be paid for in increased system cost. In computer-based operation, the computer can take over not only evaluation of the measured data and the scaling and linearizing operation, but also the control of the complete system, in particular the test point scanner. Thus, scanning need not be carried out sequentially, but can take place randomly depending upon the stored or input program, or even depending upon the results of previous measurements or evaluation. The control of the rest of the system can take place indirectly through the test point scanner as in the data-logger operation or directly by the computer. BM/E

Fig. 7. The naked mini/alpha 16 computer.

Frequency Monitoring—Choose A Counter

The FCC no longer requires a station to use a type—approved unit for monitoring the carrier frequency. But you still have to measure and log at least every 40 days (but never outside a calendar month) for radio; every 30 days for television. And you still have to be *on* frequency, within the FCC tolerances, at all times. The recent advances in digital counter design make them freshly attractive for doing the measuring job.

As reported in this magazine and elsewhere, the Federal Communications Commission is recognizing advances in the accuracy of measuring equipment and the stability of broadcast transmitters by removing, in some applications, the requirement for type approval of the monitoring equipment used by broadcasters.

Carrier frequency monitoring is one of these areas of relaxation. You can now use any frequency measuring equipment you want: the FCC is interested only in the final result, the maintenance of your carrier frequency within the legal tolerances. The measuring requirement as it is now, for radio, at intervals of not more than 40 days, but without skipping a calendar month; and for television, the same with a maximum interval of 30 days. Each measurement must be logged when made, with notation on the method and equipment used. Monitors reading in deviation from frequency are allowable (as noted below), but you must log the *frequency*, not the *deviation*.

Thus a station operator can if he wants, abandon frequency measurement entirely and hire a consulting firm to measure it once a month—or more often if he wants that. He will be within the rules if his frequency has not, in fact, been outside the tolerance.

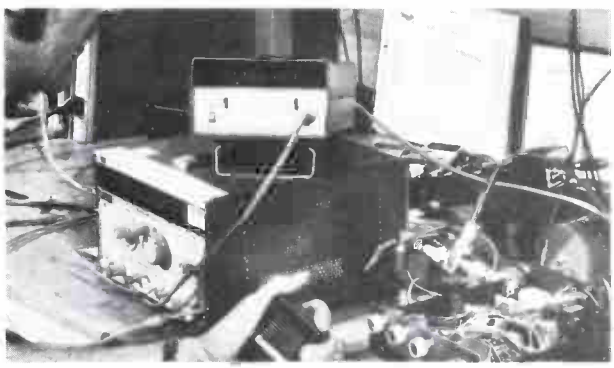
He should remember though, that his responsibility for frequency compliance exists throughout the month, and not just when the measurement is made. Moreover, the responsibility stays with the broadcaster, whether he hires an outsider to do the measurement or does it himself. If the outside firm finds a carrier to be proper when it is in fact out of tolerance, it is the broadcaster's fault and he can't shift the responsibility to anybody else.

Against the option of hiring outside measuring service, the broadcaster can now choose from an abundance of frequency counters and frequency-error monitors that will do the job with all the accuracy required. In the last few years, the range, accuracy and quality-per-dollar of digital frequency counters have all gone up dramatically. As already noted, this fact was a principal reason for the FCC's relaxation of equipment requirements. Thus, the broadcaster who wants to watch his carrier frequency himself can get the equipment to do it at remarkably low prices. He will certainly buy his own equipment if he wants a day-by-day check on carrier frequency, as a great many broadcasters do.

The frequency monitor that reads the deviation from a carrier frequency, in many cases setting off an alarm if the deviation exceeds the allowable amount, is an excellent choice for many stations, and there are hundreds of them in use. However, the broadcaster may well want a separate counter in addition that reads a range of frequencies,

Table I—FCC Tolerances

Broadcast Service	Frequency Assignments	FCC Tolerance	Minimum Tolerance in Parts/Million
AM Broadcasting	535-1600 KHz	20 Hz	12.5
FM Broadcasting	88- 108 MHz	2 KHz	approx. 20
TV Broadcasting	54- 88 MHz	1 KHz	approx. 11
	174- 216 MHz	"	" 4.6
	470- 890 MHz	"	" 1.1
Non Commercial FM, 10 watts only	88 108 MHz	3 KHz	" 30
Remote Pickups, aural	1606-1646 KHz	.01%-.005%, base station;	" 50
	25- 26 MHz		
	152- 170 MHz		
	450- 455 MHz	.02%-.005% remote dependent on power and frequency (Sec. 74.461)	
Aural STL's Intercity Relays	947- 951 MHz	.005%	" 50
TV Remotes, STL's Intercity Relays	1900-2500 MHz	.005%	" 50
	6875-7125 MHz		
	12.7-13.25 GHz		



Typical of latest low-priced counters useful for broadcast frequency monitors is Hewlett-Packard 5381A (small unit on top of cabinet) covering 10 Hz to 80 MHz, good for AM monitoring, with seven-digit accuracy, for $249. Companion unit reaching 225 MHz is also available.

as a check on the deviation monitor and for other uses around the station.

This would be especially true if the broadcaster has responsibility for a number of different carriers: AM, FM, TV, remotes, STL's inter-city relays, etc., in some combination. A counter reaching the highest frequency among the various carriers, with some means of quick connection to any of the RF sources, is close to a necessity. Remote equipment, in particular, needs "tweaking up" fairly frequently. Although the legal tolerances are wider on remotes, the stability is also considerably lower, in general, than that of station equipment.

continued on page 39

Antenna Monitors: The Specs Are Tighter

New FCC rules for directional-antenna monitors make type-approved equipment mandatory, at different times for different categories of stations. Here is the schedule, so you will know when you need such a monitor, and a discussion of the two monitors that have been approved so far.

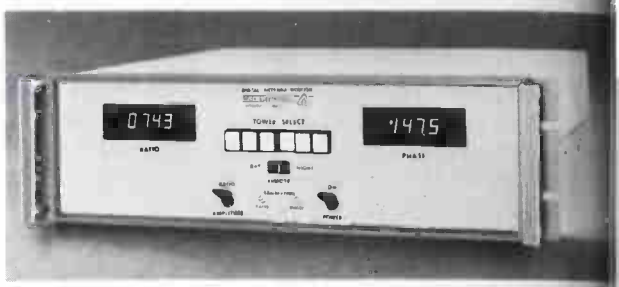
In contrast to the removal of the requirement for type-approval of carrier-frequency monitoring equipment, topic of another article in this issue, the FCC is in process of tightening the requirements for equipment to monitor performance of directional antenna arrays. Type-approved monitors must be installed by different categories of stations over the next several years, as follows:

- New stations with directional arrays, and those making major changes in their antenna systems, must put in type-approved monitors as soon as they are ready to operate.
- Stations taking advantage of the new provision allowing use of lesser-grade operators with directional antennas must have type-approved monitors by June 1, 1974.
- Stations with remote control, reading the information on directional antenna performance from the remote control point, must have type-approved monitors by June 1, 1975.
- Finally, every station with a directional antenna must have an approved monitor by June 1, 1977.

So far, only two firms have received FCC type approval for their directional antenna monitors: Delta Electronics and Potomac Instruments. The FCC told BM/E when this was written that no other firms had even applied for the approval.

The new monitor specifications set out by the FCC in Docket 18471, make it clear that many if not all of the older generation of monitors would not pass, if they were submitted for approval. Highlights of the new tighter specs are:

- Phase relation of current in test tower to that in reference tower to be indicated from 0 to 360 degrees, in increments of 0.5 degrees, with increments of 0.1% readable.
- With multiple inputs (in addition to reference input), the monitor must be switchable from one to another for separate reading.
- Accuracy of phase determination must be ± 1 degree for current ratios between 2:1 and 1:1, and ± 2 degrees for ratios 2:1 up to 5:1.
- Repeatability of phase-ratio readings shall be ± 1 degree; Current amplitude ratio readings must be accurate to ± 2% of ratio up to ratios of 2:1, and 5% at higher ratios, with repeatability of ± 2%.
- Modulation on the carrier, up to 90% over the range 100 Hz to 10,000 Hz, shall cause no deviation in the phase angle reading greater than 0.5 degrees from the reading with no modulation.
- The specs have to be maintained over a 10 to 40 degree centigrade temperature span, and over ± 10 percent variation in supply voltage.



Other directional-array monitoring system so far approved by FCC is Delta Electronics, DAM-1 above. Operation is digital, as described in story.

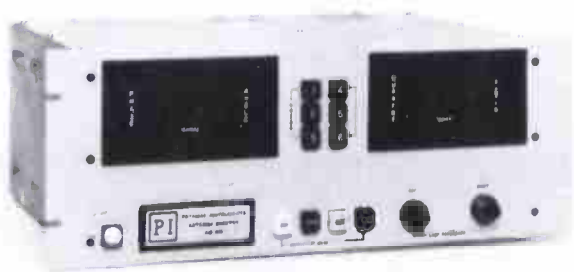
That gives you an outline of what the designer of a directional antenna monitor is now up against. Any station operator who still has a little time before he needs the new monitor, and is thinking about possibly building his own, is advised to read the FCC docket with full care.

The FCC is also developing a set of requirements for the equipment that samples antenna currents, for activation of the monitor (Docket #19692). FCC comments make it clear that a great deal of inaccuracy and uncertainty have been found in some of the sampling equipment in common use. This Docket had not been issued when we went to press.

The broadcaster has to keep in mind that his monitor, standing alone, is only a guide as to what is happening in his antenna array; the proof that his pattern is still the one described in his license depends on field strength measurements along the required number of radials and the other data specified in Section 73.151 of the rules. Monitor data is a required part of the picture, but only one part.

Delta and Potomac have followed somewhat different design routes in their antenna instruments. In the following we consider the two separately.

continued on page 3



Potomac Industries Model AM-19D is one of the two directional-array monitoring systems type approved by FCC, under new rules. It is also available with analog read-out; above is the digital form.

AMPEX AVR-2: ALL THINGS TO ALL PEOPLE

...but most will buy it for what it isn't

ti—all—it isn't big.

it will give big performance, flexibility,
ny. It is a VTR that can be anything or
ing you want it to be: bare bones, fully
ed, studio, portable, or mobile recorder.
re. It's easy to operate and so small you
e it anywhere. It's a **modular system** that
a tailor to any configuration to answer
rticular needs and save you money.

ad—it isn't a whole new standard.

ht means excellence: superb picture quality
ih performance.
R-2 is a single standard (more if you
, igh band recorder that delivers broadcast
riance that will exceed your most critical
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7½ ips or 15 ips, picture quality is matched
the very finest quad recorders. A new
dd-range digital time base corrector means
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through successive dub-downs.
integral sync generator is a standard
and permits "stand-alone" machine
bn.
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r cost; isn't expensive.

R-2 is the first quad to break the barrier of
for true quad performance. It produces a
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by selecting only the features that fit your
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ndular and portable—it isn't immobile.

it together any way you like.
two lightweight modules (transport and
ics) let you assemble any configuration
your space, preference, or budget.
the studio, you can mount the modules in
by console, with an optional monitor
if you like.
location, you can place the modules side
d, or on top of each other, with or without
nitor bridge—any way that fits into a
wagon or van or even a boat or aircraft.
components are light enough so two men
assemble and move AVR-2 in minutes. You
en roll the entire studio console through a
rd 36" doorway. By yourself.

uman engineered"—isn't hard to
te.

a joy to operate, in fact—in the studio or
tion. Because it is a single standard
he, fewer controls are needed, and these
logically grouped and well lighted so
ors can work even under extreme
ions.

Side-by-Side Configuration

Top Stack Configuration

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Full System

Lockup time is 1 second in NTSC, or 2 seconds in PAL/SECAM. Record and play on 90 minute reels (3 hours at 7.5 ips) for greater program flexibility.

It saves money—isn't expensive to operate.

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Other options include Automatic Tracking Control which lets you play back every tape precisely.

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It's a new breed of recorder— not a cut-down version of something else.

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But since every user has different needs, objectives, and budgets, we designed AVR-2 to meet these needs. To provide unmatched flexibility and economy consistent with quadruplex quality.

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Roll the entire studi console through a 3 doorway by yourse

Easy to operate. Fe controls are needed and all are logically grouped and well lighted.

REQUENCY MONITORS cont. from page 33

All right—how does a broadcaster choose a counter
m the scores available? The obvious basic requirement
already been stated: it must reach the highest fre-
ncy the broadcaster has responsibility for. Don't over-
k the other end of the spectrum; you may want the
ity to make a check on the audio signal generators, that
ve out FM audio performance. Enough counters cover
whole thing, from low audio to top RF, to make this an
on. Such total range coverage at very reasonable
es, is the gift of the latest digital techniques, plus
grated circuitry.

/hat about accuracy? In the accompanying table we
w the assigned frequency bands of all the broadcast
ices, and the tolerances now in effect under FCC rules
he carrier frequency in each case. A third column
vs the accuracy required in parts per million. As
vn, the highest accuracy required is for the top of the
F television range—most others are lower, some
h lower. Counters that better these accuracies are
ely available.

/hat about long-term stability? For making sure his
ter stays on the nose, or is periodically put back
, the broadcaster has several methods. He can take
nachine from time to time to a calibration service.
e counter manufacturers have such services. Consult-
irms can be asked to check a counter against their own
lards.

calibrate a counter himself, the broadcaster can set it
read signals from WWV, which is accepted by the
as a standard of frequency. Engineers will think of
mber of ways to do this conveniently.

nother option, more expensive but much less so than
d to be, is to buy with the counter a special time base
a very low aging rate. An oven-stabilized crystal
em can keep a counter on the nose for months or years.
large station with considerable lab work, as well as a
ber of carriers to keep track of, such a time base can
c attractive for a wide range of development, test, and
intenance jobs.

ome of the principal makers of frequency counters for
nter monitoring useful to broadcasters include Ballan-
Laboratories, Belar*, EIP, Inc., John Fluke Co.,
lett-Packard Co., McMartin, Time and Frequency

Coverage counter of extremely high accuracy is exemplified by Systron-Donner 6057, 20 Hz to 18 GHz, for monitoring of any frequency used in broadcasting or microwave relay work, with nine-digit readout.

* Circle 190 on Reader Service Card

Time and frequency Technology Model 723 reads deviation from carrier, allowable under new rules if the frequency is logged. Combination with modulation monitor is convenient for many stations.

Technology*, Tektronix, Systron-Donner and Weston.

In the last few years, their products have, almost without exception, reached a new, much higher level of performance, than any we knew before. **BM/E**

*These companies make frequency counters incorporated in FCC type-approved monitors.

ANTENNA MONITORS cont. from page 34

Digital Interval Counting: Delta's DAM-1.

This recently introduced unit reads the phase angle between the test tower and the reference tower as follows: first, the rf samples are converted to a low-intermediate frequency. Zero crossing detectors open and shut gates to define the interval between the test and reference samples. Gated on and off is a pulse series, with 3600 pulses per cycle of the intermediate frequency. The pulses that pass the gate are counted to indicate the phase angle to 0.1 degree.

The current ratio is computed with the help of an extremely linear voltage-frequency converter, with the ratio shown in the front-panel readout, called up by a switch.

Delta is also marketing new toroidal current transformers which are designed specifically for the sampling process. The transformers have no connection to the current carrying wire, which passes through a hole in the transformer. The induced current is proportional to the current in the wire or rod.

Digital or Analog: Potomac Instruments AM-19 and AM-19 (D).

In these instruments the sampling line inputs are limited and applied to an "and" gate, which puts out a pulse with a duration directly proportional to the phase difference between the signals. This is fed to an integrator which provides a dc linear voltage proportional to the phase difference. A difference of 180 degrees produces maximum output, for full-scale meter deflection, on the AM-19.

On the AM-19D, the current is converted to digital at the meter, for a digital read out. However, in both units the output for connection to remote control systems is in analog form. The maker's philosophy on this is that since most remote control systems operate in analog fashion, it provides a simpler interface to have the antenna monitor's output for remote operation in analog form.

Similar rationale has been applied in the design of the current ratio readings. Here again the sampling and measurement are all-analog in the AM-19, but the readings are converted to digital at the meter in the AM-19D. The remote control output on both models is analog. **BM/E**

Sideband Analysis of TV Transmitters With a Spectrum Analyzer

The Spectrum Analyzer offers advantages over traditional analyzers using sweep generators. This article by Tektronix engineering staff explains why—and how to use the Spectrum Analyzer.

Sideband Analysis of a TV transmitter indicates performance, tuning, vestigial sideband filter tuning and overall response. Many stations, as a matter of preventive maintenance, perform sideband analysis daily before the beginning of the broadcast day. A useful representation of a typical color TV transmitters response is shown in Fig. 1.

The traditional method of doing sideband analysis consists of connecting a swept oscillator (0-6 MHz) to the input of a transmitter and of locking a tracking display receiver to look at the output as shown in Fig. 2. Some sync information must be inserted to "trick" the transmitter into "thinking" it is passing a visual signal, as indicated. A spectrum analysis approach to sideband analysis is a less expensive, more flexible alternative. While spectrum analysis may be unfamiliar at first, it is quickly understood to both evaluate and align TV transmitters.

This article describes four techniques for using the spectrum analyzer in sideband analysis. All have proven to yield excellent results. Some of the techniques are more applicable for *alignment*, and some work better for *measurements*. Any of the four can be used on any transmitter that operates up to 1.8 gHz. This incl UHF or VHF currently being used in the U.S.A. every other known TV transmitting standard used in world today.

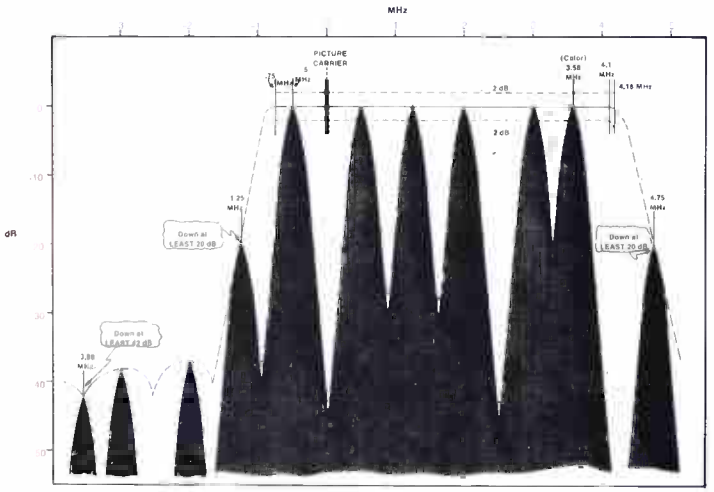


Fig. 1 Idealized color transmitter response (multiburst superimposed).

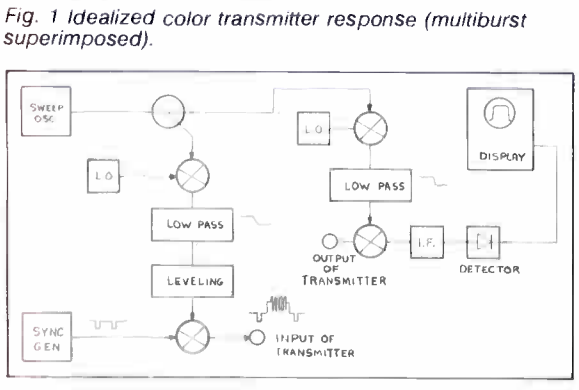


Fig. 2 Traditional sideband analyzer.

Transmitter response specifications are defined by FCC in 73.687. Ideally analysis would show what is in Fig. 1. As a practical matter we can show the resp curve, or with a multiburst, can show a representatio the curve with frequency domain "spikes." The rela ship shown between the spikes and the response cur valid as shown. Some of the advantages of using spectrum analyzer are the following:

- The spectrum analyzer is a calibrated horizontal device, making the use of markers unnecessary (howe the multiburst may be utilized to verify span accura desired).
- Within the scope of sideband analysis, we can a higher versatility than possible with traditional units. iable modulation levels, variable transmitter duty cy and independent analysis of the separate parts of transmitting chain are possible.
- The spectrum analyzer may be used to check any c nel *without* separate or special plug-ins, crystals o modulators. This is an especially attractive featur manufacturers and consultants where a variety of c nels and situations may be encountered.
- The displays of 2 dB/div and 10dB/div are espec convenient and easy to understand.
- The spectrum analyzer has other applications in TV Broadcast stations, including measurement of parameters as intermodulation distortions, signal to hum, field intensity, modulation depth and FM deviat

Procedures 1 and 2 that follow are the primary niques to be used for sideband analysis. Using onl Tektronix 147A test generator and the spectrum anal these two procedures are used to flatten the transm between −.75 MHz and +4.1 MHz within ± ¼ dB then set the filter skirt shapes and lower 3.58 MHz

Procedure 3 is an in-service test using a single li the vertical interval response. This test is particu useful for mid-day tests, and to evaluate equipment operating during icing conditions, after power fail

Procedure 4 is a non-synchronous version of traditi sideband analysis utilizing the spectrum analyzer an generator capable of sweep from approximately 0 MHz. It should be pointed out that presently the FCC do not recognize any sideband analysis techniques,

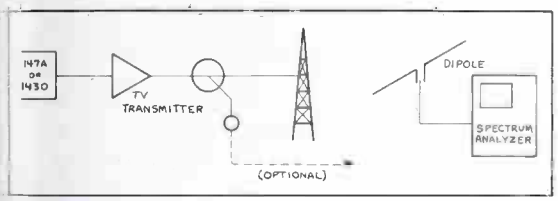
tests using a sine wave oscillator (FCC 73.687). s, the first proof of performjnce on a TV station must erformed with procedure 4. All subsequent tests may erformed using alternate procedures 1, 2 or 3.

1—Full field noise source techniques ideband analysis

his technique is used to generate a display of the uency response of a transmitter at 10 dB/div. This is ticularly useful for seeing the vestigial sideband filter is down 50 dB or more, and for specific measurements ie lower −3.58 MHz notch filter, the lower −1.25 Hz rolloff point, and the upper +4.75 MHz rolloff it.

wideband noise source is used as a signal source. The A or 1430* can be set up to provide full field flat noise ss the video spectrum (0-6 MHz). The spectrum yzer video filter will average the noise, such that the band response will be displayed. The advantages of technique over the use of a tracking generator are s and no synchronization requirements. The primary dvantages are that the noise source represents an ap- able amount of power that can, if improperly ap- id, overload the transmitter or the spectrum analyzer. e Hints and Precautions Box.)

his is primarily a *measurement* technique, resolution ond the picture carrier being limited. This technique

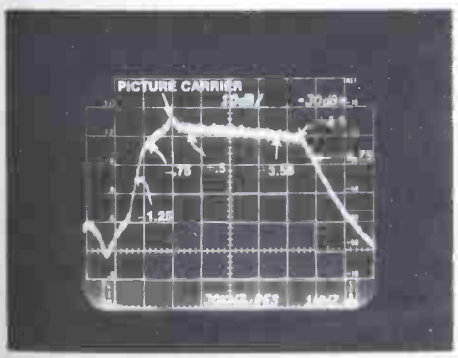


g 3 Set-up procedure No. 1. Equipment required: 7L12 or 7L13 pectrum Analyzer; 700 series mainframe; 147A NTSC signal enrator or 1430 random noise measuring set.

se in conjunction with No. 3 will provide all the *easurement* and *alignment* functions normally required f sideband analyzer. Equipment required is shown in ig 3. The procedure is as follows:

Set up the 147A or 1430 at the input of the transmitter. Many stations already have a 147A located in the transmitter loop that can be utilized. Set the controls for full field noise and dial in 20 dB of noise. (The 148 may be used on foreign standard systems.)

The 7L12 Spectrum Analyzer can be connected to filter an RF testpoint, or a dipole of known response.



4 Sideband response using noise.

l model numbers refer to Tektronix equipment unless otherwise noted.

3. Using the 300 Hz filter, tune in the visual and aural carriers of the transmitter. The results will look similar to Figs. 4 and 5.

4. Care should be taken to use the internal attenuator on the 7L12, so that the analyzer is not in an overload condition. Generally, a display similar to Figs. 4 or 5 is correct, whereas a raised baseline 10 MHz or more away

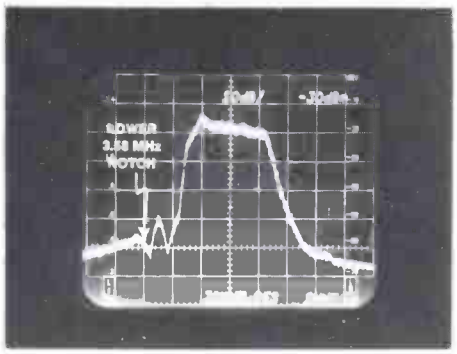


Fig. 5 Sideband response using noise.

from the picture carrier is almost a sure indication of an overload condition. (See Hints and Precautions.)

5. The lower sideband color notch location can be identified by alternately switching in a multiburst signal to identify the position. Then using the full field noise source, the notch should be measured or adjusted to be 42 dB or more below the average working part of the vestigial sideband filter as indicated in Fig. 5.

6. Critical points on the filter curve of −1.25 MHz, −.75 MHz, +.5 MHz, +3.58 MHz, +4.1 MHz and +4.75 MHz can be easily identified and measured in the 1 MHz/div, 10 dB/div mode on the spectrum analyzer as indicated in Fig. 4.

7. If discrepancies are noted at −3.58 MHz, −1.25 MHz, or +4.75 MHz, the displays obtained in this procedure should be used for alignment of the transmitter.

8. If minor flatness discrepancies are noted between −.75 MHz and +4.1 MHz, then use procedure No. 2 which follows.

No. 2.—Using the multiburst for flatness adjustments

This procedure is used primarily to align for flatness between the lower −.75 MHz and upper +4.75 MHz. The spectrum analyzer is used in the 2 dB/div mode such that resolution of ±¼ dB is practical.

The multiburst signal is normally composed of six distinct frequencies: .5 MHz, 1.5 MHz, 2 MHz, 3 MHz, 3.58 MHz, and 4.2 MHz. These are sent in rapid succession for use in determining frequency response with a standard oscilloscope. Multiburst can, however, also be displayed in the frequency domain on a spectrum analyzer for use in studying the sideband response characteristics of a transmitter. While the multiburst does not represent every frequency between 0 and 6 MHz, an excellent representation of the transmitter response can be obtained by first flattening the transmitter using the multiburst, then verify overall response using the noise technique described in procedure No. 1.

Some may wish to use the multiburst as a marker. The Tektronix generators can be readjusted so that the 1.5 MHz burst is 1.25 MHz, and the 4.2 MHz burst 4.1 MHz. The .5 MHz may also be adjusted to .75 MHz. All of these

changes will help identify the critical points on the response curve (per Fig. 1) although the calibrated span of the spectrum analyzer makes the use of markers unnecessary. The equipment that is required is shown in Fig. 6. The procedure is as follows:

1. Setup the 147A at the input of the transmitter. Many stations already have a 147A located in the transmitter

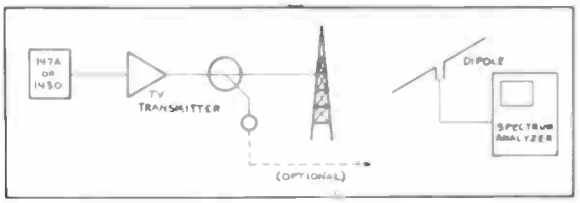


Fig. 6 Set-up procedure No. 2. Equipment required: 7L12 or 7L13 Spectrum Analyzer/ 700 series mainframe; 147A NTSC signal generator.

loop that can be utilized. Set the controls for a full field multiburst signal. (The 148 may be utilized on foreign standard systems.)

2. The 7L12 Spectrum Analyzer can be connected to either an RF test point or a dipole of known response.

3. Using a 30 KHz RESOLUTION and 1 MHz or 2 MHz per division, tune in the picture and sound carriers. Slow down the SWEEP until scan loss is eliminated. The display will look similar to Figs. 7-8.

4. Using 2 dB/div on the Spectrum Analyzer, tune the

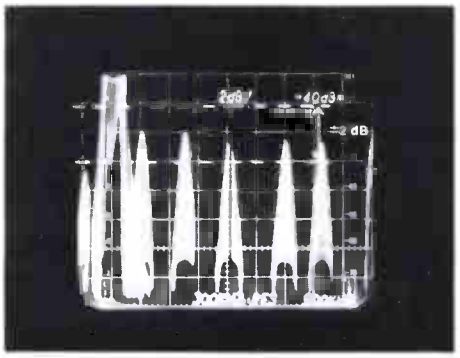


Fig. 7 Sideband response using multiburst.

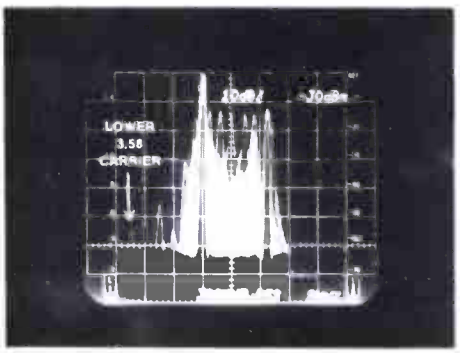


Fig. 8 Sideband response using multiburst.

transmitter for maximum flatness from −.75 to +4.1 MHz.

5. A modulation depth of up to 100% can be selected with the front panel controls on the 147A to verify transmitter performance under different load conditions.

No. 3.—In-service sideband analysis using the vertical interval

These procedures can be used while the transmitter is in-service, causing no visable picture impairment. Many times during icing and other less desirable conditions, it would be nice to verify the performance of the transmission line, filters and antenna. Procedure No. 3 can do just that. Noise and Multiburst signals can be inserted in the VIT interval, and sideband analysis can be performed.

The displays take approximately 30 seconds to build up on the screen of a storage oscilloscope, making this

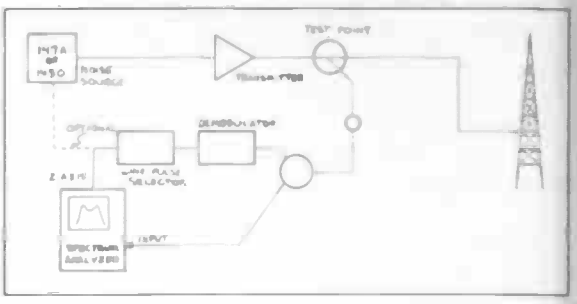


Fig. 9 Set-up procedure No. 3. Equipment required: 7L12 or 7L13 Spectrum Analyzer; 7613 variable persistence or 7313 storage mainframe; 147A NTSC signal generator; 529 line trigger or 1430 random noise measuring set.

primarily a *measurement* technique. Equipment required is shown in Fig. 9. The procedure is as follows:

1. Set up the 147A or 1430 at the input to the transmitter. Set the controls for noise insertion on ½ line and the display should indicate 20 dB.

2. The 7L12 (or 7L13) Spectrum Analyzer can be connected to either an RF test point, or a dipole of known

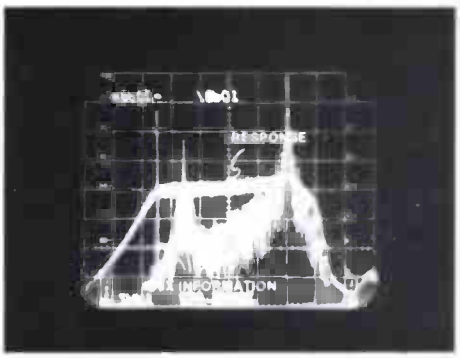


Fig. 10 In-service VIT sideband analysis using noise.

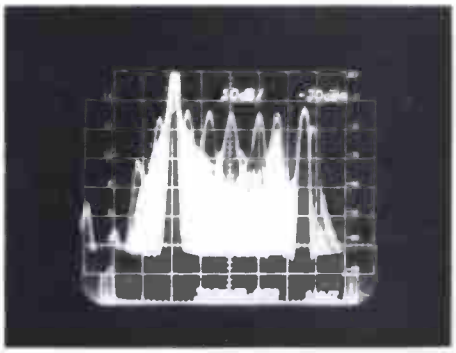


Fig. 11 In-service VIT sideband analysis using multiburst.

response.

3. A means must be provided to supply a pulse to the (intensity) axis of the spectrum analyzer during the noise *line* selected. This pulse can be obtained from the 5 video output jack located on the rear panel. When the spectrum analyzer is used in the same location as the noise inserter (147A or 1430), a pulse can be obtained from the program panel for any line desired.

4. Using storage, a picture of the sideband response will be slowly 'painted' upon the screen similar to Fig. 1

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No.4.—Sideband analysis using a non-synchronous sweep

This procedure satisfies the FCC initial proof of performance requirement for using a sinewave source [FCC 76.687 (4)]. This technique is also particularly useful for checking response close to the picture carrier, the limit being 300 Hz for the 7L12 Spectrum Analyzer. One can usually expect to see about 10 KHz from the picture carrier with the typical sweep generator.

This procedure can also utilize a leveled CW generator *manually* tuned from 0 to 6 MHz with quite usable results. Equipment required is shown in Fig. 12. Procedure is as follows:

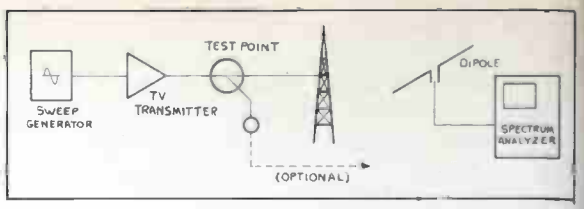

Fig. 12 Set-up procedure No. 4. Equipment required: 7L12 or 7L13 Spectrum Analyzer; 7613 variable persistence or 7313 storage mainframe; Wavetek 1801A38 sweep generator with 15 KHz modulator.

1. Set up the sweep generator at the transmitter input. Use the +57 dBmV output setting (½ volt) and the 15 KHz Square wave modulation. The pin diode attenuator used in the Wavetek 1801A38 makes it possible to attain a symmetry similar to standard video, with the 15 KHz bringing the total envelope to 1 v pp.
2. The 7L12 (or 7L13) Spectrum Analyzer can be connected to either an RF test point, or a dipole of known response, (for remote monitoring or antenna characteristic measurements).
3. Using 30 KHz RESOLUTION BW, the spectrum analyzer is tuned to the output frequency of the transmitter.
4. Either 1 MHz or 2 MHz per division can be selected and the channel can be centered as desired. For convenience, we have centered the picture carrier always on the 4th graticule line from the left when using 1 MHz per division.
5. The sweep generator should be swept slowly (3-5 sec/MHz) from 0 to 6 MHz, while using a fast sweep rate that can be used on the analyzer can be determined by observing sweep rate error on the picture and sound carriers.

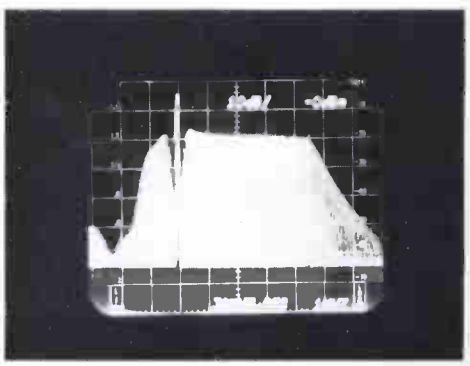

Fig. 13 Non-synchronous sideband analysis using a sweep generator.

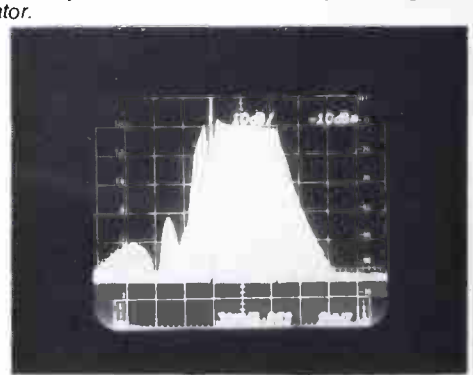

Fig. 14 Non-synchronous sideband analysis using a sweep generator.

6. The results will be similar to those observed in Figs. 13 and 14.

BM/E

Hints and Precautions

CAUTION—You are working with an expensive, high powered RF Transmitter. Take appropriate precautions to insure that operating parameters are not exceeded.

- A sideband analyzer can cause adjacent channel interference when the TV transmitter is out of alignment, and should be handled carefully until proper alignment is attained.
- Flat, white noise used for frequency response represents a lot of power. Most transmitters can be overloaded quite easily. Care should be exercised, not to exceed output power or final plate current ratings.

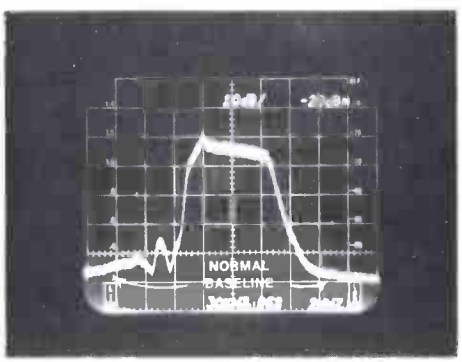

Fig. 15 Normal display.

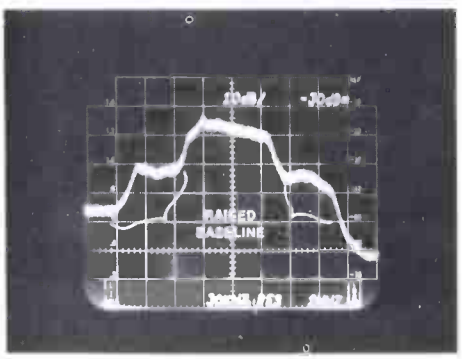

Fig. 16 Overload display.

- A high power RF transmitter can easily overload the mixer in the spectrum analyzer. RF test points should be "padded down" to 0 dB *before* connecting the spectrum analyzer to the test point. An overload generally appear as an erratic display similar to Fig. 16. Insert attenuation with the internal or external pads until the display appears similar to Fig. 15 and remains stable.

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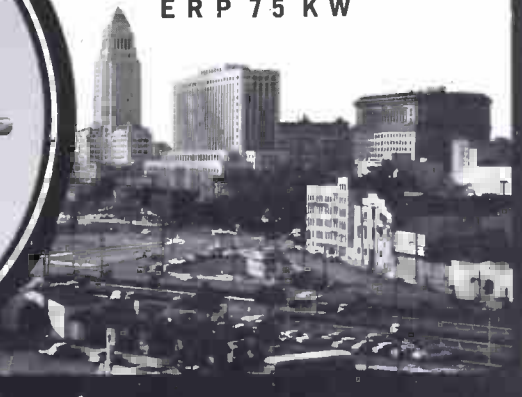
ERP 105 KW

KEZM-FM
ERP 34 KW

KAGB-FM
ERP 3 KW

KJOI-FM
ERP 75 KW



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Lightning Prevention: A Year's Trial

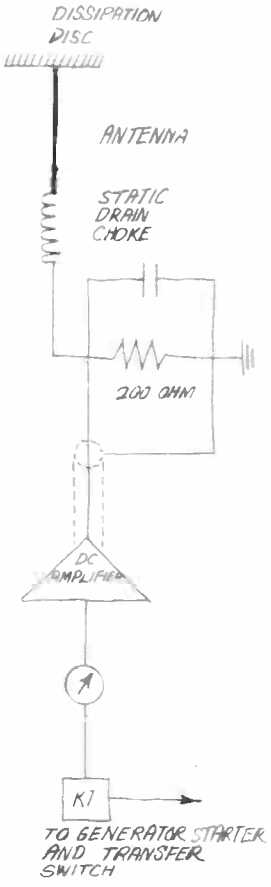
Experience with the charge dissipation system raises hope that lightning *prevention* is on the way to replace methods often ineffective for broadcasters.

Lightning is an extremely serious danger to every human installation, but especially to the broadcaster. His antennas reach up to grab lightning, and although the tower itself may easily survive repeated hits, the electrical equipment on the tower and in the transmitter building is extremely vulnerable to lightning, including the induced currents from strokes a long distance away. Practically every broadcast transmitter, and cable headend as well, has been put off the air time and again by lightning.

That is why *BM/E*, in the September 1972 issue, described in some detail a new system that is put forward for the *prevention* of lightning in a protected area. Developed by Lightning Elimination Associates of Downey, California, the system has a simple basic idea–

Dissipation array forms umbrella on top of tower at CKLW. Each of five towers in the directional antenna system is protected.

Circuit installed by CKLW to use dissipation current to start stand-by generator, eliminating trouble from surges on power lines when storm is in vicinity.



CKLW Has A No-Hit Year

By the Staff of CKLW, Windsor, Ontario

Until recently, lightning was an uncontrollable force of nature that caused seemingly unsolveable problems for AM radio station operations. Now, this natural phenomenon has been harnessed and the havoc lightning has caused with AM radio antenna systems has been brought completely under control.

The first large AM station to bring lightning damage under control was CKLW Radio, Windsor, Ontario. The project was under the guidance of Ed Buterbaugh, chief engineer.

CKLW Radio, a 50kW contemporary powerhouse, is one of only eight stations on the North American continent that is listened to by more than two million people a week. CKLW's antenna system is located just outside Windsor on perfectly flat terrain. Because of its proximity to the vast water masses of the Great Lakes, Windsor has the distinction of having the highest number of lightning days per year in Canada and one of the highest lightning day counts in North America. In 1972 alone, CKLW was put off the air more than 25 times by the seemingly uncontrollable force of nature . . . lightning.

Ed Buterbaugh decided the problem had to be solved. In collaboration with Roy Carpenter of Lightning Elimination Associates, Downey, California, he began exploring what could be done to prevent lightning from disturbing the operation of CKLW's five-tower directional antenna system, and how LEA's proprietary concept could be adapted to an AM broadcast facility.

Three essential problems had to be solved:

1. A dissipation array had to be developed to eliminate a direct hit and also eliminate induced voltages on the towers.

2. Induced voltages on the transmission lines had to be eliminated.

3. Voltage surges on the power supply lines and power supply failures had to be controlled.

The system had to be small enough and efficient enough to prevent lightning without significantly changing the base impedance of the towers or distorting CKLW's signal pattern beyond the point of minor adjustment. A total of nine months of research followed which included an exhaustive study of several different dissipation designs. Finally, a design using an augmented guy wire system to suspend the dissipation elements seemed to meet all the electrical

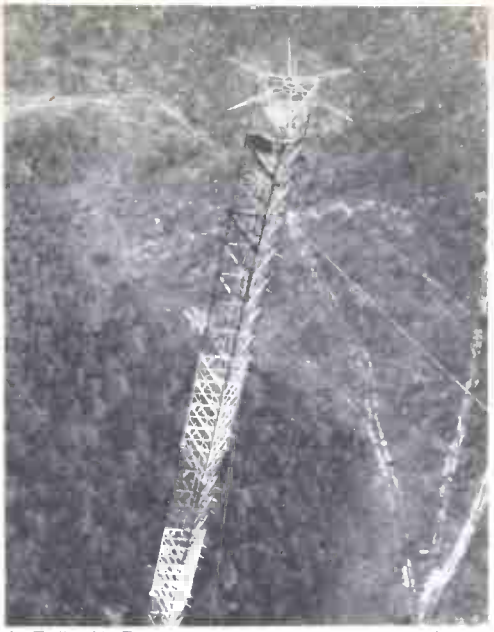
ne reduction of the earth-cloud electric field below the ash-over point by "leaking" energy through an array of harp points.

The knowledge that a sharp point in air in a strong eld will develop a current across the field goes back to enjamin Franklin. But workers in lightning protection ave repeatedly rejected this as a way to reduce the rth-cloud field on the grounds that a single pointed lement could not come even close to dissipating enough nergy to stop lightning.

LEA claims to have met this valid objection head on y using a lot of points, typically from 4,000 to 20,000, n each array. In addition, according to LEA, long re-earch established optimum parameters for the indi-idual points and their disposition in the array.

After *BM/E's* original article appeared we received an rticle by Mr. Marvin Frydenlund, secretary of the Light-ing Protection Institute, expressing the long-standing fficial rejection of the dissipation array. With minor diting, that article appears on page 48.

We now have, however, some initial evidence on the erformance of the LEA system. About half a dozen



At Eglin Air Force Base in Florida, the 1200-foot communications tower has dissipation array at top. Rising out of flat land, tower used to be hit by lightning 100 times a year.

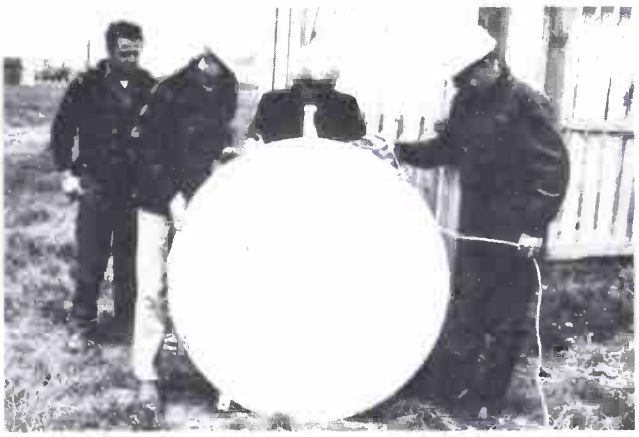
pecifications. The system was totally isolated from the towers by chokes, preventing RF from flowing through the dissipation array and supporting guy system, but providing direct DC path to ground. Upon further investigation, however, it was determined that the system would be approaching the towers' critical stress point, particularly with the additional ice loading that would occur during the winter months.

The final design which CKLW implemented met all physical and electrical loading specifications and utilizes the most efficient dissipation method possible by proper orientation and placement of the dissipation elements. The system consists of a four-foot disc (see photo) mounted at the top of each tower. Each disc contains 500 specially designed points, each capable of dissipating up to 40 microamperes. The discs are electrically bonded to the tops of their respective towers and the DC path to ground is made through the static drain at the base.

The effectiveness of this system is readily apparent when the reader compares the lightning record of 1972 (25 outages directly caused by lightning) to the 1973 experience of no outages directly caused by lightning subsequent to the installation of the dissipation array in April. It should be noted that the lightning activity during the two years was comparable. The system performed exactly as it was designed to by neutralizing the potential between the earth and clouds and developing a protective ionized barrier over the antenna structures.

However, a small problem did still exist. CKLW's feeder system consists of 230-ohm open wire transmission lines, varying in lengths up to 600 feet, and providing the perfect conductor to induced voltages developed by sharp variations in surrounding electrical fields. These variations, of course, are very predominant during an electrical storm and may be caused by lightning miles from the transmitter site. An occasional crackling could be heard as this induced voltage would discharge to the grounded conductor of the open transmission line.

No overloads occurred during these few minor arcs because most of the energy was drained off through the dissipation elements on the towers. However, the potential did still exist. This problem was easily corrected by running dissipation wire parallel to the entire length of the transmission lines, approximately ten inches above the outer conductor. The wire was then bonded to the antenna ground system every 25 feet to provide a discharge path for the induced energy long before it reaches arc potential.



One of arrays used on towers at CKLW is inspected by Chief Engineer Ed Buterbaugh (third from left) before being hauled aloft.

With the direct hit and its associated problems solved, Mr. Buterbaugh went on to tackle another potential lightning problem . . . the situation of lightning hitting power lines miles away from the protected area, causing damaging spikes, power failures, and general power unstability. The drawing details the answer to that problem. The dissipation current from one tower is sampled and may reach as high as 20,000 microamperes. This sample current is then fed back to the transmitter building where it is magnified by a DC amplifier.

When an oncoming storm causes the dissipation current to rise to a predetermined level, the system automatically turns on CKLW's new 350kW diesel generator. If the storm continues to intensify around the protected area, the power will automatically transfer to the generator removing any possibility of power failure or damaged equipment due to induced voltage surges. After the storm has passed, the entire system once again returns to commercial power.

The system proved its effectiveness in just one year. As noted already, with comparable lightning activity in 1972 and 1973, CKLW was knocked off the air 25 times by lightning in 1972. Since the installation of the dissipation array in April 1973, the station has not been put off the air once due to direct lightning problems.

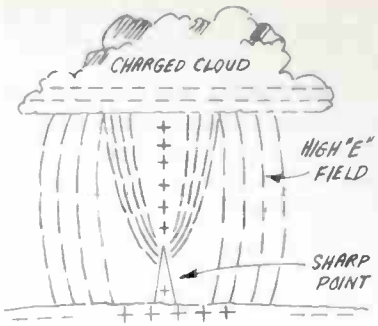
broadcast installations have gone in, as well as arrays at a large oil refinery, and at government locations including a NASA tracking station in North Carolina and Eglin Air Force Base in Florida.

The users with the longest experience to date are KHOF-TV in Los Angeles; CKLW, a 50-kW AM station in Windsor, Ontario; and the Eglin Air Force Base. Most of the others missed some or all of the 1973 lightning season.

The staff of CKLW has written its own report of experience with the LEA array, and it appears in the box on page 00. This recounts what looks like a complete success—a no-hit record during the 1973 season. For incontrovertible statistical evidence, however, we probably need another season or two—the unpredictability of lightning is one of its best known characteristics. But the invariability with which the array responded to a near storm with dissipation current of a significant value (more on that below) suggests strongly that it is working as claimed: CKLW, as they describe, even ran a relay system on the dissipation current which turned on their standby power when an electrical storm was anywhere in the vicinity.

At Eglin Air Force Base, the recording of extensive data on the array performance turned the trial into a bit of scientific experiment. The array is on a 1200-foot communications tower which rises out of flat land, an almost invariable route to ground for lightning strokes over a wide area. The tower, in fact, was struck an average of 100 times every summer, with many strikes putting equipment out of business.

The array forms an umbrella on top of the tower (photo). The current through the array was recorded for many storms through the year up to June 30, 1973.



Simplified representation of action of dissipation system shows how energy leaks across air dielectric between earth and cloud; theory of system is that with enough points, earth-cloud potential can be reduced below the flashover point.

Current went as high as 150,000 microamperes for extended periods; it was always associated with storm "cells" overhead. Calculations indicated that the array was dissipating up to 18 coulombs between near lightning strokes.

In addition, the instrumentation allowed comparison of the field under the array with the field at various distances away, when the same cloud cell was simultaneously over the near and far. The field under the array was always a fraction of that further out.

LEA has issued a detailed report on the Eglin Air Force "experiment," and makes the claim that 1973 saw not a single hit on the tower. Air Force personnel have not yet confirmed or denied this claim. But the current and energy measurements do indicate, that the array is very near, if not completely up to, its design objectives.

Clearly the LEA system deserves the most careful consideration of the broadcast industry and of experts in lightning protection. With nearly a dozen installations now in place, we ought to have some conclusive findings by the end of the 1974 lightning season.

The Lightning Rod—Traditional Defense

By Marvin M. Frydenlund, Executive Secretary, Lightning Protection Institute

Lightning rod production today is in the hands of a few large firms. Among them are Independent Protection Company, Inc., Goshen, Indiana: and Thompson Lightning Protection, Inc., St. Paul, Minnesota.

Says R.W. Lindquist, president of the Thompson company, "Our company accepted the early premise that a lightning rod system has two functions—to dissipate or drain off static electricity and thus reduce the likelihood of a strike, and to ground any strike that did occur.

"That belief was behind the claims that systems were not being struck. A number of years ago, we wiped out any references in our literature to the dissipation theory. That was about the time when we collected many lightning rods which had been struck and the tips melted by lightning, but which had completely protected the buildings."

R.E. Cripe, president of Independent Protection, notes, "A number of years ago our company indirectly referred to the dissipation theory in some of our literature and advertising. We were severely taken to task by General Electric engineers and other experts in high voltage. GE offered evidence that the amount of dissipation in comparison with the magnitude of a lightning stroke is for the most part negligible, and not enough to keep a lightning discharge from occurring."

History repeats

Today, history is repeating itself as statements are again heard that protected properties have not been struck by lightning. This time, the statements are made in evidence of a theory that lightning can be prevented from occurring in an area by a lightning dissipation array system.

It is not the purpose of this article to attempt to refute the dissipation array theory, for even some of those who have most vehemently opposed the dissipation theory since Benjamin Franklin advanced it over two centuries ago admit that it has at least a great deal of theoretical value.

Rather, this article will discuss the dissipation theory as a part of the history of conventional lightning protection systems—those that protect by intercepting and grounding lightning bolts.

What experts say

Two recognized leaders in the lightning protection field today are Dr. R.H. Golde, chairman of the British Lightning Protection Code Committee, and a much-published author on lightning phenomena; and H.M. Towne, retired manager of General Electric Company's Lightning Protection Section.

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In "Proceedings of the Institution of Electrical Engineers," October 1968, Dr. Golde wrote:

"In a recent paper, the author has examined the history of the still widespread belief that a lightning conductor can prevent the occurrence of a lightning flash by silently discharging a thundercloud. To dispel this dangerous misconception, the code unequivocally states that it is the sole function of a lightning conductor to divert to itself a lightning discharge which might otherwise have struck a vulnerable part of the structure to be protected."

In his much circulated booklet, "Lightning, Its Behavior and What to Do About It," Mr. Towne writes:

"The basic function of lightning rods is to intercept or to divert to themselves, any lightning stroke that might hit the building and to conduct it harmlessly over the outside of the building to earth. Contrary to some of Franklin's early misconceptions, lightning rods do not drain static electricity out of air, do not prevent lightning from striking a building, nor even cause any practical change in the probability of lightning striking the building. Indeed, lightning rods offer no offensive performance whatever, to deter, mitigate, repel, or prevent lightning: they offer only defensive performance to direct and safely control the course of a lightning stroke, if and when it strikes the building."

In fairness, it is again pointed out that these statements were made in relation to theories and methods of "conventional" lightning protection systems, based on grounding.

The Lightning Protection Code of the National Fire Protection Association, 1968 edition (latest printing), under the chairmanship of Dr. W.W. Lewis, with J.M. Clayton, secretary, both representing the Institute of Electrical and Electronic Engineers, says under Part II, "Fundamental Principles of Protection":

". . . The purpose of lightning protection is to protect a building or other object in case a lightning stroke occurs, there being no evidence that any form of protection can prevent the occurrence of a lightning stroke."

Lightning strike buildup

As a thundercell moves across an area, the generally positive ground charge follows along like a shadow. Positive ions swarm into and around objects over which the cloud passes.

When the potential between the thundercell and the earth or an object like a transmitting tower is higher than the breakdown point of the air between, a lightning discharge occurs.

Lightning discharges vary greatly, from hundreds of millions of volts and hundreds of thousands of amperes and several miles of stroke length to a million volts and thousand amperes and less than half a mile of length.

Actual voltage depends on current, conductivity of the object struck, and resistance or impedance of the continuing stroke path to ground. In the case of a stroke to a steel tower 200-feet high, for example, the top of the tower could rise to an instantaneous voltage of a million volts or more while the current is building up through the inductance of the tower—even though there is perfect ground at the base.

It is essentially the unpredictability and range of lightning's behavior that led to abandonment of the dissipation theory as a part of "conventional" lightning protection principles. Only interception and grounding theories have been held positive in the face of nature's turbulence and resulting electrical imbalances.

Protection principles and parts

Lightning protection is designed for two objectives—to provide a direct path for the bolt to follow to ground, and to prevent any destruction, damage, injury, or death as the bolt travels that path.

An adequately engineered protection system therefore includes every point the bolt is likely to strike, covers every object to which current might sideflash, and routes the bolt in as straight a path as possible.

Modern lightning protection systems for buildings consist of five main parts—air terminals (rods or points), main conductors, branch conductors, arresters, and grounds.

- **Roof protection**: A standard lightning protection system for a building includes air terminals on roofs, chimneys, dormers and other high points. Heavy, special lightning conducting cables connect all air terminals and lead to a grounding system composed of at least two rods driven to ten foot depths on opposite corners of the building.
- **Equipment protection**: All metal bodies of conductance, like air conditioning units, venting apparatus, electric or electronic equipment and other costly pieces, are protected. They are connected to any down conductor which may be within six feet, to prevent "sideflash" to the equipment during a lightning discharge. Conducting floors may have special protection as well. Electric motors and electronic wiring as well as other equipment are protected by special arresters. The arresters prevent high surges of electric current induced by lightning from entering the equipment.
- **Small antenna protection**: If there are antennas on or adjacent to the buildings, such as communications whips or microwave relay dishes, they should be protected. The typical antenna should have a lightning arrester to divert the bolt to the main lightning conductor cable. Often antenna lightning protection systems alone are not enough. In many cases, it has been found that the down conductor in an antenna-only system is woefully inadequate for the magnitude of currents involved in a lightning strike.
- **Tree protection**: At sites in the country, where trees are likely to be located near buildings or facilities, special protection is needed. Nearby trees which are taller than the structure should be equipped with special copper lightning protection systems to prevent a bolt which may hit the tree from skipping to the building or facility in search of a better path to ground.
- **Power line protection**: Overhead power lines should be equipped with special arresters to prevent surge damage from distant strikes. Even lines from on-site electrical generating facilities should be equipped with arresters for the same reason.

Broadcast equipment protection

Broadcast installations, like power stations and some defense installations, are not easy to protect against lightning, by conventional or any other means. Basic principles do, however, apply, and the more sophisticated and therefore costly the isolation, bonding, and other methods of protecting devices other than structures themselves, the more successful the application.

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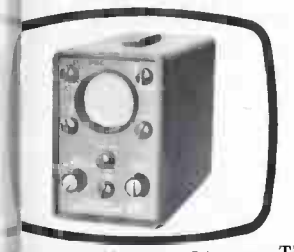
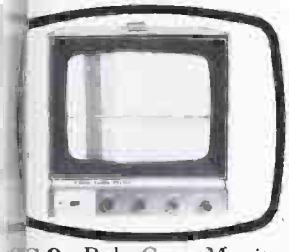
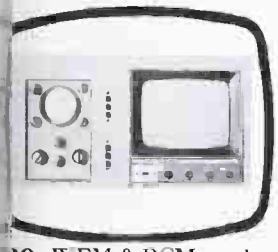


WM-3 WaveForMonitor™



VC-9 PulseCross Monitor



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Chroma Keyer With "Soft" Switching

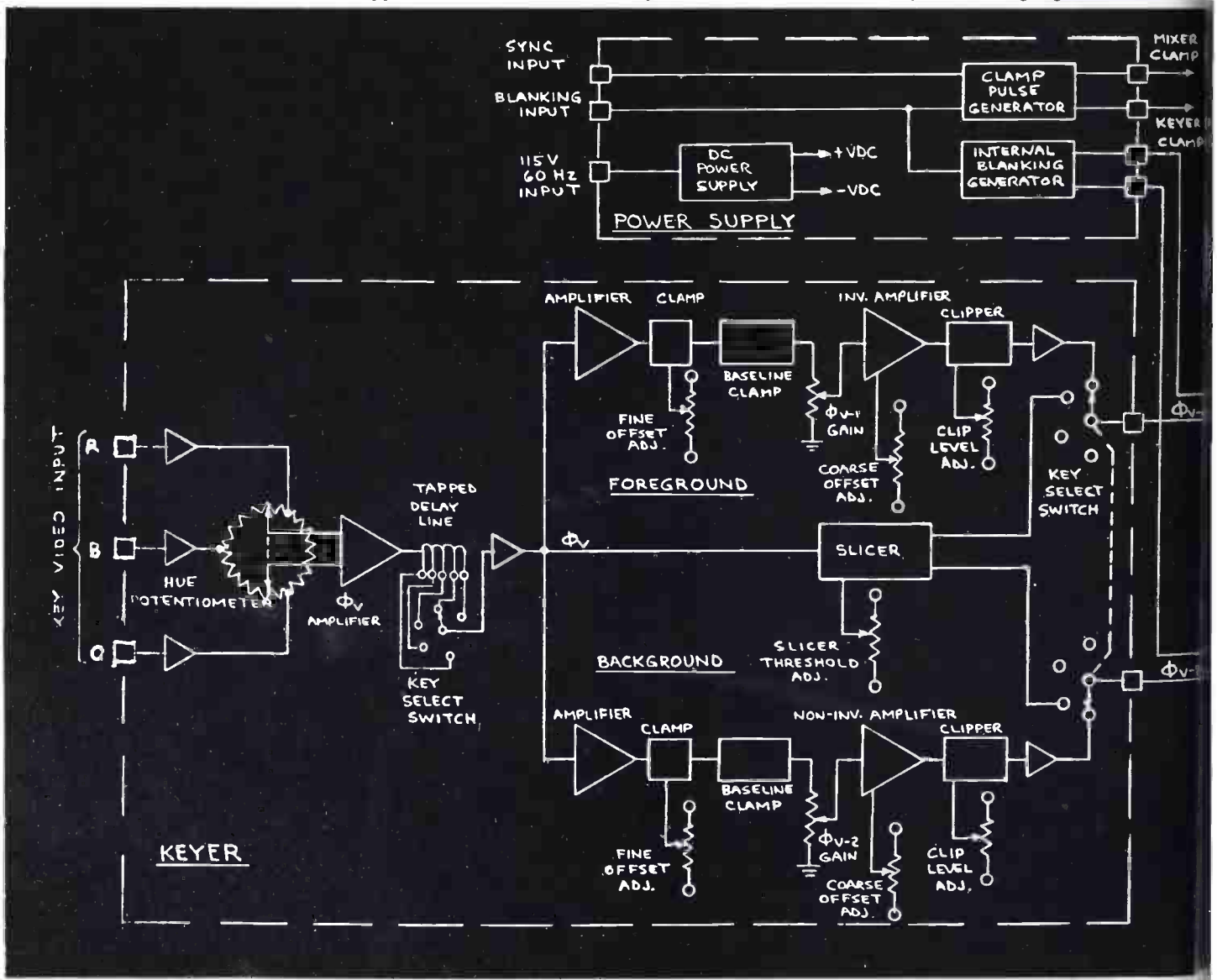
New standalone unit aims at eliminating halos and black outlines caused by "hard" switching in the popular chroma-key technique for superimposing video images.

"Chromatech", developed by American Astrionics Division of Technicolor, Inc., uses the familiar chroma key technique to combine two sources of NTSC video into one composite NTSC video output which can be displayed directly on a monitor, recorded on video tape, or transmitted over the air. The device operates as a stand-alone unit, or with any switcher. It differs from many chroma key units in that the image shifts are implemented by proportional or "soft" keying, rather than "on-off" switching.

When the foreground camera directly scans the saturated backdrop color, the resulting background video at the output is at maximum amplitude. However, when the foreground camera scans the backdrop color through translucent materials or at soft edges, the foreground camera will "see" an apparent reduction in backdrop color luminance, and the foreground and background video signals provided at the Chromatech output terminals will be proportionally suppressed or enhanced. By this technique, abrupt transitions between foreground and background objects are eliminated, and the resulting composite picture tends to have a natural appearance.

Soft keying also allows the creation of many useful special effects, like keying through transparent or translucent objects such as glass, smoke, cellophane, and foreground shadows. All the special effects are easily achieved by simple manipulation of a few front panel control knobs.

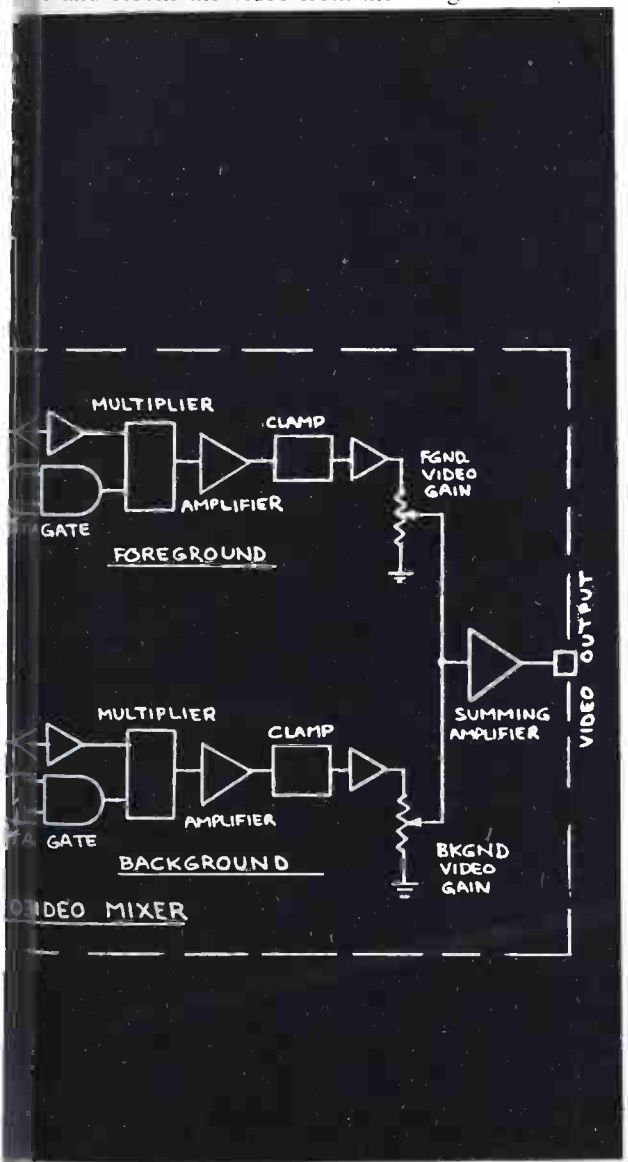
The basic operation is quite similar to that of other color-keying devices. The unit accepts two input sources of NTSC video, with synchronizing signals common to



h. The color-keying signal that causes transitions be-
en foreground and background is developed from the
reground video source, and is provided as RBG video.
e keyer can be preset to gate on any desired backdrop
or by means of a front panel HUE control.

Normally, foreground subjects are positioned in front
he backdrop. The system is generally optimized for a
e backdrop since there is usually no blue in skin tones.
the foreground camera scans its field of view, the RBG
put video is processed to develop a video gating signal
h time the foreground camera "sees" the backdrop
or.

This gate in turn passes the background NTSC video
om the background video source) to the output termi-
s and blocks the video from the foreground camera.



Conversely, when the foreground camera looks at any color but the backdrop (foreground objects), the background video is inhibited, and the foreground NTSC video is passed to the output. At foreground/background transitions, or when transparent foreground objects are utilized, the keying signals allow proportional amounts of foreground and background video to be processed simultaneously, thus allowing for example, a background scene to be seen through a foreground object such as a glass of water.

Soft Keying Technique

The most important engineering innovation is the soft key feature. This feature is described in the following, and functionally illustrated in the block diagram of Figure 1.

Keyer

The keyer accepts an RBG input, normally from the foreground video source, and develops a pair of complementary keying signals, which in turn proportionally control the amount of foreground and background video allowed to pass through the video mixer to the output.

The RBG video is ac coupled into the keyer and then clamped during each horizonal blanking interval. The RBG video signals are then functionally combined in the

continued on page 80

Familiar for many years has been the superposition of multiple video sources with color keying techniques. The system is in essence an electronic adaptation of the blue screen travelling matte technique used by the motion picture industry for superimposing images on film.

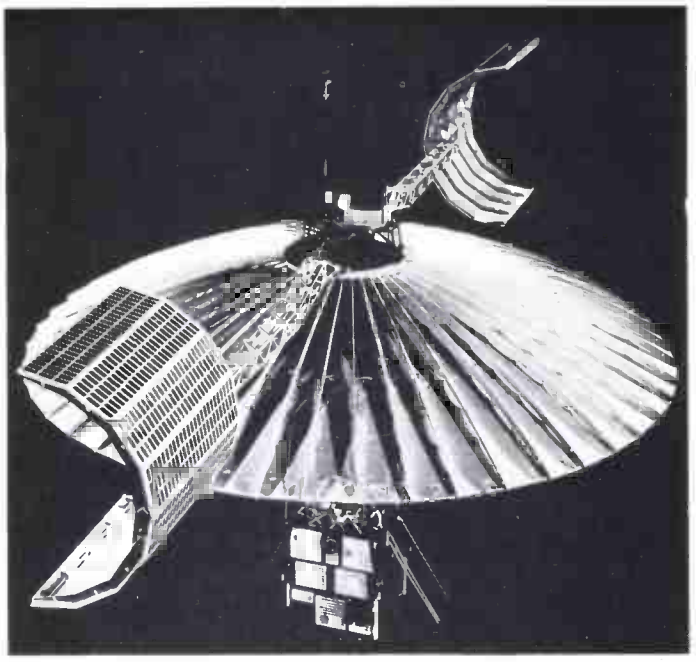
Probably the best known TV color keying device in use today is the chroma keyer, which operates as a color switch keying between two NTSC video sources in accordance with pre-selected color information contained in one of the video sources. A foreground video source for example, might consist of a person standing in front of a blue backdrop; and a background video might be an outdoor scene. Wherever the color "blue" appears in the foreground camera's field of view, the chroma keyer will switch the background scene to the video output. As the foreground camera scans the foreground object (a person in this example), the background scene will be turned off, and the foreground video switched to the output. The resultant composite picture will have the foreground object apparently superimposed in front of the background scene.

Although the chroma keyer makes this superimposition very well, the hard switching action does often produce halos, block scintillation on object outlines, and other forms of picture degradation. The accompanying article describes a new chroma keyer that aims at eliminating these effects with a form of proportional, or "soft" switching.

Fig. 1. Functional diagram of Chromatech shows routing of R, B, and G video inputs through inverting and non-inverting amplifiers, for foreground and background signals, which are put together again in video mixer. "Soft" switching is provided as described in the story; but slicer gives option of "hard" switching, if it is wanted.

Satellite To Schools– Some Via PTV Stations and Cable TV

Rocky Mountain Satellite Technology Demonstration will beam educational programs to schools, PTV stations and cable headends. A 30-foot paraboloid antenna in space makes it possible to use a cheap 10-foot antenna on the ground.



The ATS-F as it will look in space. Thirty foot umbrella is antenna. Launch is now set for late spring rather than April as indicated in text.

It's been popular in this McLuhan Age to put our shrinking planet earth in perspective by calling it a global village. If a person just carries a transistor radio he can nearly always tune in the voices of civilization from somewhere. With the advent of the communications satellite, its possible to pervade nearly all parts of the world with both voice and picture. And you don't need a $100,000 receiving station to be able to do so. The price for a 2600 MHz ground terminal is now down to about $3000.00. For good reason, the ATS-F satellite which will go into orbit late April of this year, is called "people's satellite."

In fact, the Satellite Technology Demonstration (STD) that is planned by the Federation of Rocky Mountain States is capable of bringing in two-channels of color and four voice signals, plus 30 digital channels to nearly 100 rural isolated areas in the Rocky Mountains, Appalachia and Alaska. For reasons of economy, only one TV channel and one uplink voice channel will be used. By using voice return circuit on two other satellites* now in orbit

*Theoretically it is possible to transmit voice return on the ATS-F satellite. The frequencies involved, however, might cause interference on a military band. Consequently, the ATS-1 and 3 will be used for the voice return.

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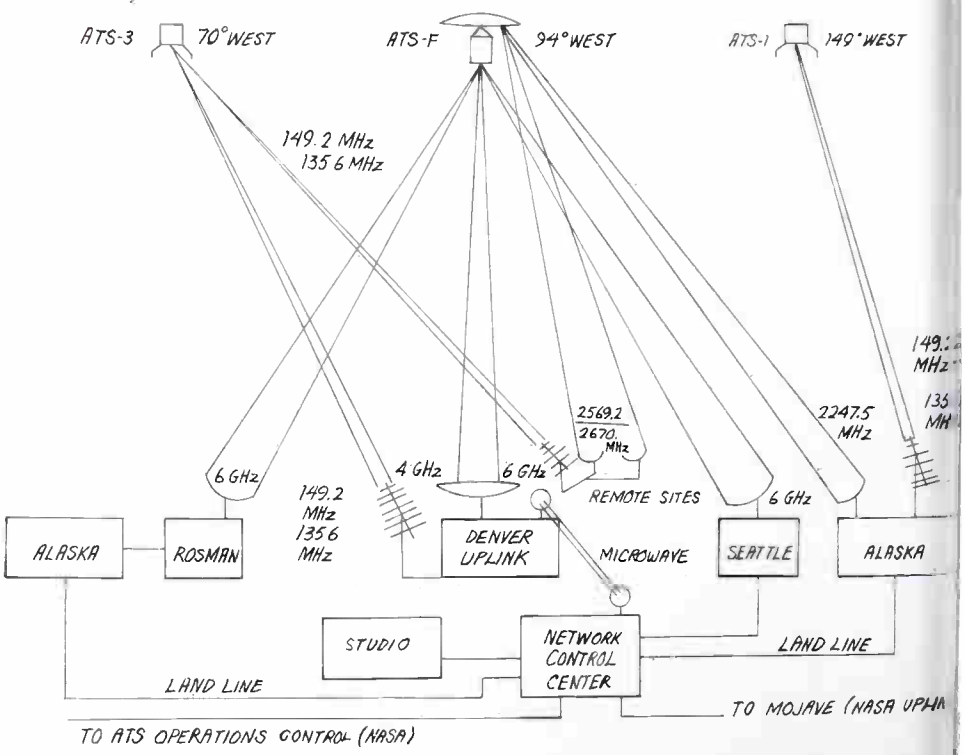

Overall diagram showing various communication links. Network control is in Denver.

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If any of the proposed discrete systems are approved, using them will mean costly elimination or change of the SCA channels you may be using now for Muzak.

Then, there's the multi-path problem. You can pretty much expect it to become more serious with any of the proposed discrete systems.

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Satellite Technology Demonstration Partners

The STD is funded by the U.S. Department of Health, Education and Welfare and the National Aeronautics and Space Administration, and is being developed and managed by the Federation of Rocky Mountain States. Many other entities are also harnessed to the effort: HEW's Office of Telecommunications Policy; the National Institute for Education (which now funds and oversees the STD); the National Council on Educational Technology; the Corporation for Public Broadcasting; the offices of the governors and chief state school officers of the participating states; the Rocky Mountain Corporation for Public Broadcasting; local school superintendents and boards, community leaders—a vast network of national, regional, state, and local participants.

The Federation of Rocky Mountain States, headquartered in Denver, was established in 1966 as a partnership of six mountain states—Idaho, Montana, Wyoming, Utah, Colorado, and New Mexico. (Nevada and Arizona, while not members of the Federation, are also participating in the STD.) Its aim is to involve state governments, their resources and private sectors in a cooperative effort to solve regional problems and to promote and plan for the orderly development of the region. Its councils and committees are involved in numerous studies and activities ranging through transportation, natural resources, market development, human resources, arts and humanities, and telecommunications. It is a unique regional association involving governmental agencies and private industry, business, and institutions of higher learning.

As early as 1968, the Federation began exploring the possibilities of obtaining a satellite-based education project for the Rocky Mountain states, and in 1969 had submitted a proposal to HEW. In 1970, NASA agreed to a HEW request to make $2.5 million in alterations in its planned Applications Technology Satellite "F" (ATS-F) to keep the satellite open for use with a possible low cost receiver system if such were to be developed. During that same year NASA, HEW (through its Office of Telecommunications Policy), and the Federal Communications Commission sent through the U.S. Department of State a proposal to the World Administrative Radio Conference requesting a 2.5 gigahertz (2.5 Ghz) frequency allocation for broadcast via satellite. Such frequencies were available for educational broadcasting and would require relatively inexpensive sending and receiving equipment; higher frequencies are much harder to control, thus necessitating costlier equipment.

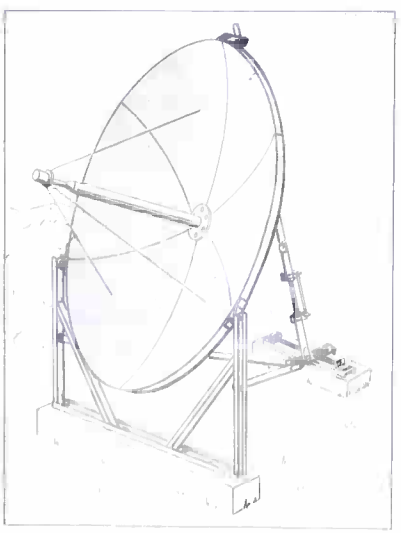
Shortly after this request, HEW's Office of Education awarded a contract to the Federation "to develop and articulate the organizational structure and planning" to prepare for a satellite experiment for the Rocky Mountain Region. (A month later the World Administrative Radio Conference in Geneva agreed to accept the U.S. proposal to allocate the 2.5 gigahertz frequencies.) HEW has stressed that the emphasis of the experiment be placed on the development of the delivery system technology and not on broad educational content areas.

Subsequent to a planning grant of $500,000 being awarded to the Federation, (in January of 1972) work began in earnest. The staff of the Satellite Technology Demonstration group have since worked with representatives of NASA, the Goddard Space Flight Center, and Fairchild Industries (which was constructing the ATS-F satellite).

The STD staff developed the concepts back of the low-cost receiving station. Westinghouse's Defense and Electronic System Center, Baltimore, was awarded a systems contract by HEW to oversee the manufacture and installation of the receiving station. The receiver itself, was built by Hewlett Packard and the antenna was supplied by Prodelin.

the ATS-1 and the ATS-3, these out-of-the-way locations can engage in voice communications with the program origination point located in Denver.

To test the capability of this two-way satellite system as an educational tool, the Federation of Rocky Mountain States plans to beam a career awareness program to junior high schools in the coverage area. In addition, it will transmit several PBS program to hithertofore isolated areas, and, to make full use of the satellite, programs will be transmitted for videotape recording during early a.m. hours. Additional programming will include in-service training programs for teachers.



Receiving antenna is 10-foot parabolic dish weighing 160 lbs. Mount weighs 150 lbs. Height is 13 feet and depth 6 feet.

Receiver made by Hewlett-Packard, converts 2.6 GHz signal to VHF baseband video and audio.

Details of the STD were described at the SMPTE Winter Television Conference in Denver, Jan. 24-25, 1974. This report is based on papers presented at that conference, a publication issued by the Federation of Rocky Mountain States entitled, "Goodbye to the Great Divide," and various other materials put out by system suppliers.*

NASA's Mission for the ATS-F

NASA's three primary goals for the upcoming ATS-F satellite in the STD experiment are:

To demonstrate the feasibility of deploying a 30-foot diameter parabolic antenna in space;

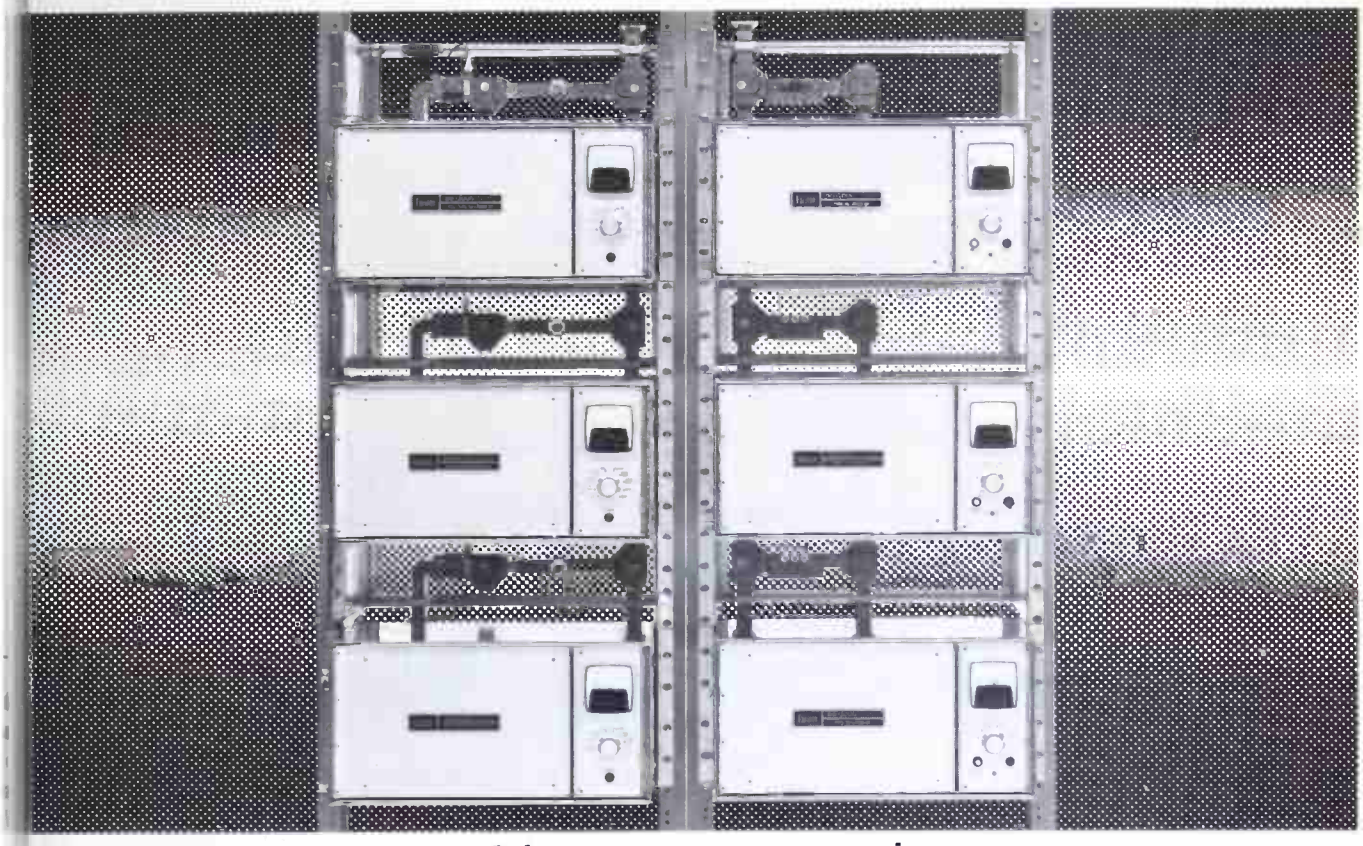
To provide a satellite with fine pointing, slewing (turning, twisting, or swinging about), and tracking capabilities;

To provide an oriented, stable spacecraft platform at synchronous (stable) attitudes for advanced technological experiments.

continued on page 58

*There have been many published references to the ATS-F program. Many are misleading in one aspect or another because of program changes. We believe this report to be up to date regarding the educational uses planned in cooperation with HEW. There are, in addition, several uses planned by the National Institute of Health under a contract with the Univ. of Washington, Seattle. Beyond this, there are a number of scientific experiments planned which are not part of the educational demonstration.

Versatile Stackable Microwave for Video Transmission in the 12-13 GHz Bands



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Terminals may be configured for non-protected or pro- cted one-way or duplex transmission. Farinon's patented On-Line Protection, combining the output of two phase- ocked transmitters, provides doubled power output while in the standby mode. It protects transmission without interruption in case of signal loss on one transmitter. SS12000 also may be equipped for monitored hot standby or diversity protection.

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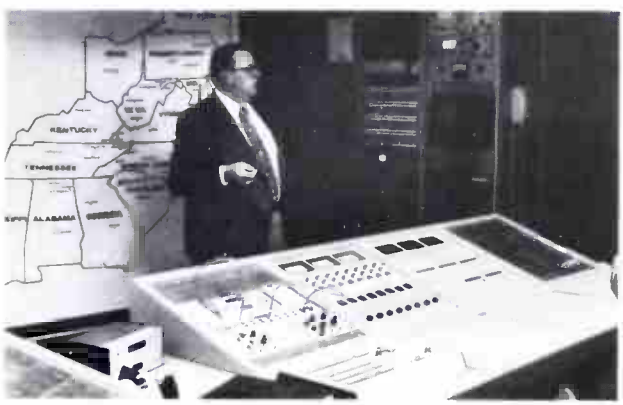
The ATS-F is being assembled at the Fairchild Industries complex in Germantown, Maryland. Fairchild, a prime contractor as well as supplier of major subsystems for numerous NASA missions, contends that the ATS-F will be one of the most reliable and versatile spacecraft ever built. Its on-board attitude sensors, torquers, and controllers are backed up by duplicate or even triplicate components. Its major subsystems are assembled and tested independently of each other. And whereas earlier communications satellites were relatively small, spinning cylinders with comparatively limited capabilities, the ATS-F can be accurately stabilized and pointed, and will carry high-gain antennas and higher-powered transmitters (22 Watts) making its communications role that much more effective.

The spacecraft will be lifted into space by a Titan III-C rocket, and will be positioned 22,300 miles above the equator—more specifically, at 94 degrees west longitude (west of Ecuador and above the Galapagos Islands). Since it will orbit the earth every 24 hours in the same direction as the earth's rotation, the satellite is said to be in geosynchronous orbit, as though it were stationed permanently in one spot in space in relation to the earth. Except for small corrections for station keeping, no energy will be expended in the orbital process. Thus, the craft becomes a true satellite of the earth.



Network Control Center at Denver. Map shows sites in Appalachian region. Rocky Mountain map is out of sight to the left. A lighting code on map shows which sites want to talk back.

Actual Sites in the Rocky Mountain Area

Arizona—Tuba City, Hayden, McNary, Gila Bend, Fredonia, St. Johns and Seligman.

Colorado—Monte Vista, Meeker, Montrose, Antonito, Colbran, Naturita and Craig.

Idaho—Challis, McCall, Lapwai, St. Maries, Salmon, Caldwell and Wallace.

Montana—Busby, Colstrip, Ft. Benton, Roundup, Three Forks, Whitehall and West Yellowstone.

Nevada—Owyhee, McDermitt, Carlin, Winnemucca, Ely, Elko and Battle Mountain.

New Mexico—Penasco, Cuba, Dulce, Springer, Wagon Mound, Questa and Mora.

Utah—Blanding, Enterprise, Heber, Kanab, Morgan, Panguitch and Hyrum.

Wyoming—Saratoga, Pinedale, Riverton, Arapahoe, Dubois, Lovell and Sundance.

The first three mentioned locations in each state will have the two-way facilities.

For about thirty days upon reaching orbit, the satellite will undergo numerous tests after deployment of its solar panels and antenna/reflector, orbit corrections, orientation into proper alignment with the earth, the sun, and Polaris, and other performance checkouts. Then it will be declared operational and renamed ATS-6.

For the ensuing eleven months or so, the Rocky Mountains and two other regions, Alaska and Appalachia as mentioned, will have use of the satellite, all operating through an integrated system and a Network Coordinating Center managed by the STD in Denver. In fact, a total of 23 states will utilize the "bird."

After the ATS-F has been in orbit one year, the spacecraft will be moved to a new location so that its "footprint" will cover India. There it will beam instructional programs to 3000 rural and remote villages.

From NASA's viewpoint alone, there are a number of unknown factors making the entire planning process quite complex. While underlying communications technology is well established, it has never been applied in the manner contemplated for this overall project. Never before have so many satellite earth stations been implemented.

Brief Satellite Description

The ATS-F will weigh about 2,600 pounds and will consist of five major structural elements: *1* a solar array, *2* an earth viewing module, *3* a structural hub, *4* a reflector support truss, and *5* a reflector (the antenna).

The spacecraft will have two booms, or arms, each supporting a *solar array* made up of eight semicylindrical or oval panels covered with solar cells. When both arms are extended out over the bird, they will reach a total combined length of 56 feet from tip to tip. The solar cells—more than 21,000 of them—will capture energy from the sun, this energy to be used primarily to power the craft's communications capabilities. Excess power captured by the cells will be fed into two 19-cell nickel-cadmium batteries, which will provide power when the craft is on the side of the earth away from the sun and during peak usage that exceeds the solar array capabilities. Energy from the two batteries will be used to point the satellite during its operations in space.

The *earth viewing module*, in a box or cubed form, is made up of three subsections: (a) the bottom, the experiment module, houses a number of antennas and other experimental devices requiring an earth viewing location; (b) the center, or service module, contains the attitude control, propulsion, telemetry, and command mechanisms as well as parts of the power supply subsystems; and (c) the upper, or communications module, houses the transponders (signal receivers and emitters), antenna feeds, and associated components. These three modules will be molded together into one.

The *structural hub* supports the thirty-foot diameter antenna/reflector and serves also as the mounting surface for the solar array trusses, or bindings.

The *reflector support truss*, 5½ feet long, connects the earth viewing module and the structural hub. It consists of eight tubular parts, or legs, made of a tough, lightweight graphite fiber reinforced plastic which is impervious to temperature changes in space. The eight tubes are coupled in pairs, each in an A-frame configuration, the entire structure squared at the bottom and top.

The *reflector* is a structure consisting of 48 flexible

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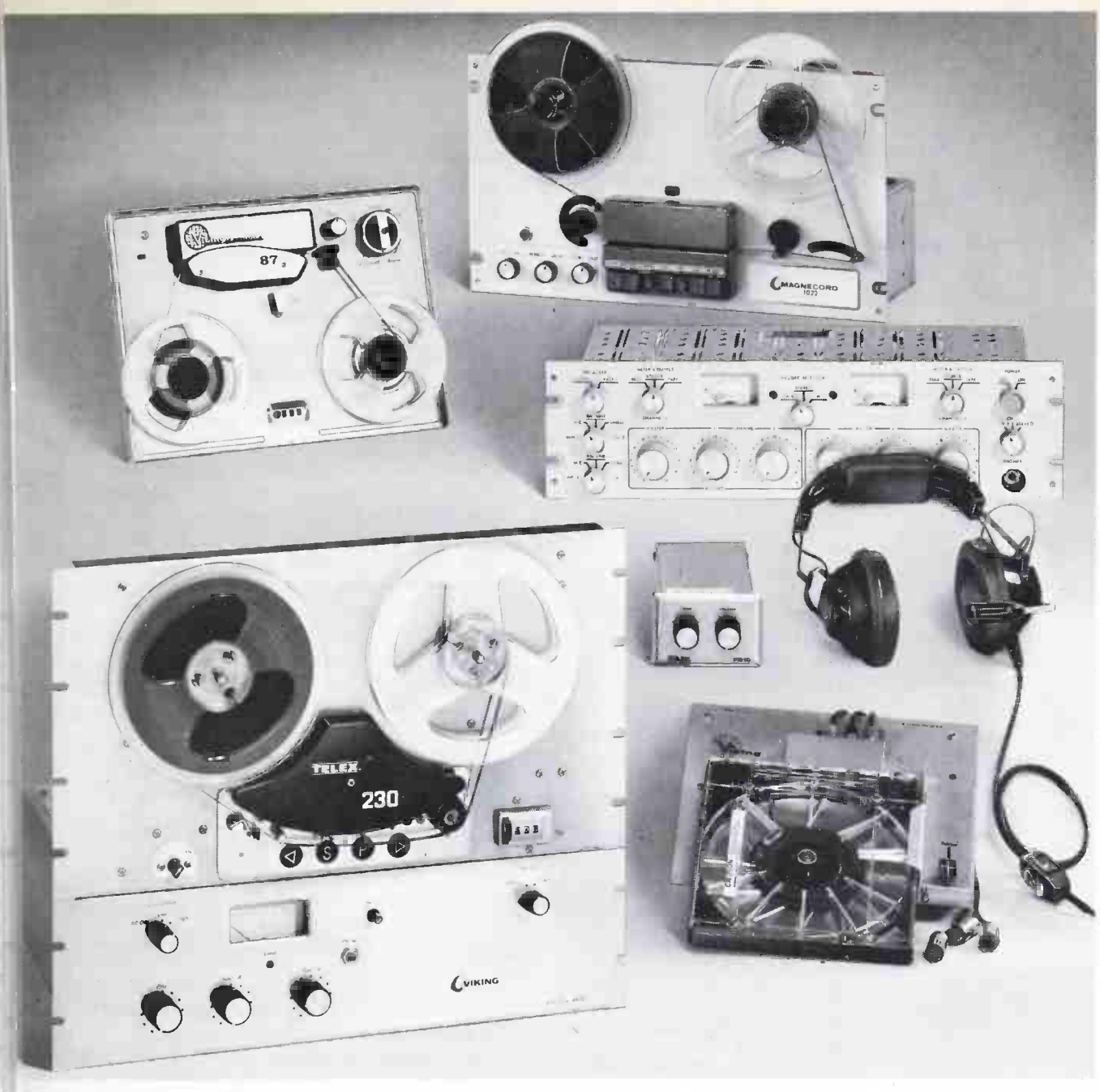

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aluminum radial ribs covered with a Dacron mesh. The ribs are wound around the structural hub in a doughnut shape, 78 inches in diameter during launch; after orbit is attained, the reflector is deployed into a parabolic, or bowl shaped, configuration 30 feet in diameter. It will be the largest antenna yet carried into space.

All of these components add up to a revolutionary new generation of satellites with far greater capability than any geosynchronous spacecraft previously orbited.

Space-To-Ground Operations

The satellite's transmitter will bounce a signal off the parabolic reflector to produce either a southern beam or a northern beam forming a giant "footprint" on the earth. Each beam is approximately 500 miles long and 300 miles wide. Another transmitter will enable STD engineers at the earth station in Morrison, Colorado (13 miles southwest of Denver) to monitor all transmissions. This unit reproduces a "global" beam capable of being received by the high-performance earth station near Denver as well as NASA control stations in Rosman, North Carolina, and Mojave, California.

Present plans call for the STD to broadcast within the eastern half of the Rocky Mountain region for half the total time allotted to it on the satellite each day, approximately four hours. Then the satellite will be repointed and the "footprint" shifted to the western half of the Rocky Mountain region, where the programming will be repeated, the shifting to be accomplished by the ATS Operations Control Center at Greenbelt, Maryland. It will take about five minutes of maneuvering to change the viewing axis of the spacecraft, and about 15 minutes to shift from the Rocky Mountains to Appalachia or Alaska.

Rocky Mountain Area

The low cost antenna/receivers will be installed at 68 sites scattered throughout the eight participating states in the Rocky Mountain area. Twenty-four of these sites are called IT's (for "intensive terminals") and will have two-way broadcasting capabilities. The other 44 are called ROT's (for "receive-only terminals")

The ATS-F signal will be made available through ROT terminals to the twelve Public Broadcast Stations in the region for either live or videotape broadcasts. This will carry the programs into the region's urban areas. Cable systems in at least five states will carry the programs as a result of retransmitting PBS broadcasts. In some cases, a school's receiver will be located at a cable headend. In Nevada a commercial station will be participating. (See Broadcaster/Cable TV/School Cooperation box.)

Other Areas

A similar deployment of antenna receivers will be made in Alaska and the Appalachian area. Thirteen states are involved in the Appalachian Regional Commission: Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennesse, Virginia and West Virginia.

The Receiver

The receiving equipment consists of an ordinary television set, an antenna, and a special receiver to down convert the 2600 MHz signals to standard VHF. The receiver made by Hewlett-Packard, uses thin film microwave circuitry and can operate under extreme environments—as low as −48°C and to 65°C. The circuitry has a low noise figure of 4 dB. With the high-powered transmitters involved (22 watts) and the high gain antenna, the ERP is 150,000 watts in a 2.7 degree beam width. The overall S/N expected is 49 dB. It may be as good as 53 dB.

As mentioned the ATS-3, which was launched November 5, 1967, and now is in geosynchronous orbit over the Atlantic Ocean (at 70 degrees west longitude) is also involved. It will be used to relay audience responses during live broadcasting emanating from the 24 IT's or intensive sites. That is, a student in a classroom will be able to respond during a segment of live broadcasting, his voice "bounced" to ATS-3, then "bounced" back to Denver. This, of course, will enable the programmers in Denver to get instantaneous response to, and participation in, the programming itself. This so-called interactive capability, or two-way transmission, is one of the keys of the demonstration and one of the factors to be studied for both educational and telecommunications implications for the future.

continued on page 8

Broadcasters/Cable TV/School Cooperation

An interesting cooperative effort in Nevada on the part of a commercial broadcaster and cable operator will maximize program coverage, particularly in the western parts of the state.

The eastern part of Nevada can receive direct satellite transmission and several schools will have their own receiver. One receiver can serve several schools if it is tied to a cable system. Thus in Elko, Nevada, (population 8000) the government—supplied receiver will be located at Elko Cable TV headend. Elko Cable (a TCI system) under the direction of Chris Hernandez has wired additional schools in the area to increase coverage.

Western Nevada, however, is not within the footprint of the satellite but through the efforts of the DonRey Media Group and TelePrompTer of Reno, schools in the Washoe County area will not be denied the satellite programming.

Larry Smith, Nevada State Coordinator, is quick to heap praise on Bob Ordonez of KORK-TV, Las Vegas, and Gary Nelson of TPT of Reno for their contributions. Ordonez coordinates the activities of DonRey Media which operates a microwave system between Las Vegas (KORK-TV) and Reno (KOLO-TV), both DonRey stations. DonRey will carry, as a public service, the satellite signal to Reno via the backup channel on its five-hop system. On Slide Mountain outside of Reno, the signal will be converted to video baseband and fed several hundred feet via a balance line to TPT's CARS site. From there it will be sent via CARS (three-hops) to TPT's headend*. TPT of Reno will put the signal on one of the existing channels for distribution to the schools.

To extend coverage, Gary Nelson, general manager of the cable system, has wired up three additional middle schools in the area.

There is hope that the signal can be extended even further via microwave to Carson TV Cable of Carson City (population 12,000) and Fallon CATV Inc. of Fallon (population 11,355). Such an extension would require that the cable operators involved, (TCI at Carson City and ATC at Fallon) build new microwave links. Both were actively considering the step at the time this article was written.

This same pattern of cooperation is being worked out in other states. Another cable TV system to have a satellite receiver, for example, is located at Wallace, Idaho.

*There is an alternate route to the headend. KOLO-TV has an intercity microwave system between its studio and Slide Mountain. If not in use it could bring the satellite signal to downtown Reno from where it could be fed via telephone lines to the cable system's headend building (also downtown Reno).

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precise synchronization, editing, ition logging, or timing, nothing pares with MagLink. We've ated the ideal coupling between ti-track audio, videotape, or gnetic film—to yield an accuracy flexibility not previously sinable. With our unique time code em and optional SMPTE interface, hines may now be locked in sync ffset...and stopped and started reset positions. Pre-programming h memory for up to 1200 rations) and search features nherent and available at r fingertips.

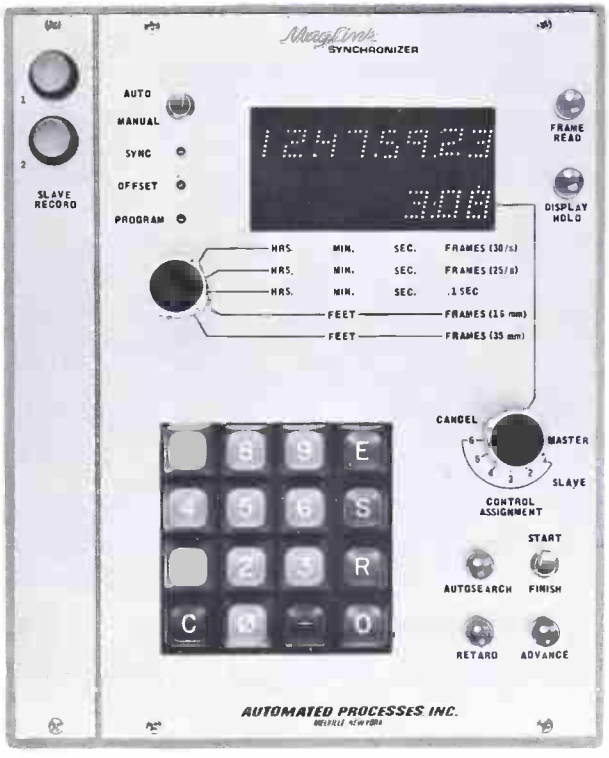
perating odes

ou're working with two or re audio tape machines, gLink will provide variable ixed delay effects. You can nect several multi-track R's and have them function single machine. For mple, three 16 track hines would give you an ivalent 45 track machine! MagLink can be used to keep e or more ATR's perfectly chronized with a VTR for lio "sweetening", including ets when necessary, for sync.

t will also keep one or more R's in perfect sync with a ocketed multi-track magnetic master.

And MagLink will do more! re-recording the timing code will w the recording of remote overdub ks without releasing the original ster tape.

ou can use MagLink's search ction to find any tape position on e or all machines in a group, and TOSEARCH automatically returns a e to a pre-determined point at the ch of a button. You can also pre-gram MagLink to operate two or re VTR's and ATR's, permitting celess editing, previewing, and sequent automatic assembly of original tapes.



Control Unit actual size 8"x10"x4" high.

Fingertip control

MagLink is simple to use. A central processing unit supervises and controls all operations and executes the necessary arithmetic and logic operations. In the pre-programming mode, the positions of all slave machines are controlled by a memory bank within the system.

MagLink allows decoding of data over a range from 400 times nominal reproduction speed down to .02 times, permitting faster slewing than any machine being marketed today as well as manual positioning. It will read data at fast speeds with the tape lifted off the heads, and no modification to the data track playback electronics is required.

Instant information

The MagLink control unit normally displays the position of the master machine and any of up to six slaves. The display is divided in two sections, each consisting of eight characters. The upper section shows the position of the master, and the lower shows the offset of any selected slave from the position of the master. The maximum possible offset for each machine is greater than 24 hours.

In the search mode, the upper section shows the location being searched for, while the lower half displays the progress toward that location.

Data retrieved is instantly converted to hours, minutes, seconds and frames (30, NTSC, EBU) . . . hours, minutes and tenths...or feet and frames for 16mm and 35mm film.

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Automated Processes, developers of MagLink, is one of the most respected names in recording and broadcast equipment. Our consoles and audio components have long been recognized for their quality and performance. This tradition of serving the professional has been continued in the MagLink Synchronizer.

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Circle 133 on Reader Service Card

GREAT IDEA CONTEST

With entries streaming in, it is evident that BM/E's Great Idea Contest will overwhelmingly achieve its main objective: the making available of a great reservoir of front-line engineering experience—the circuits, devices, and systems that operating engineers in broadcasting have created to meet their day-to-day and long-range problems. Each month, we will share as many of the entries with our readers as we have space for.

To get the most out of this unprecedented assembly of successful reports on engineering practice in broadcasting, first **read** all the entries in this issue (and in subsequent issues) carefully: There may be something you can use. Then **vote** on the entries, using the ballot on page 78 or a separate sheet of paper. Finally, **send us your own ideas,** if you haven't done so already, remembering that there is no limit on the number of ideas that one contestant can submit. See the full contest rules on page 76.

Share your ideas—and get a chance for the prizes!

21. Editing Without Splicing.

David Kreiswirth, Engineer, WABC, New York, N.Y.

Problem: To eliminate the need to splice a clean piece of tape on the piece that must have a clean start when it is very tightly butted against another word.

Solution: You merely take the tape off the capstan; then, while holding the reels, put the machine into the record mode. Having previously marked the spot on the tape, merely back the tape over the erase head to erase unwanted sound for a few inches before the spot that you want to come in clean on an instant start.

22. Equalizer for Remote Lines.

Howard L. Enstrom, General Manager, KBMY, Billings, Montana.

Problem: To develop an inexpensive equalizer that would allow improvement of program quality on many remote pickups.

Solution: This is a KBMY-built unit designed to fill the need for equalizing remote lines which are ordered for a one-time use only, when it is not economical to go to the expense of having the local telephone company equalize such lines.

Commercially-built line equalizers, such as the Western Electric Model 23A, are very fine units. However, it was felt that cost could be saved by building our own unit, provided some sacrifice was acceptable in quality. In upgrading the sound of remote broadcasts, usually the main consideration is to restore lost high frequencies, or to reduce 60 cycle line hum or bad room acoustics which may be "boomy," such as in small stadium booths. This equalizer unit helps meet both of the needed conditions. It was not intended that the unit would permit a technician to equalize a line to certain guaranteed specifications, such as one would pay the telephone company for. In other words, the main function is simply to make the remote line provide a higher grade of program quality even if the resultant frequency response is not "flat."

The Remote Program Line Equalizer design is divided into two basic sections. Either section, one a low frequency cut-off, the other a high frequency equalization, may be switched into the signal path independently, or both may be switched in so as to be in tandem. The latter condition would permit restoration of high frequencies while, at the same time, reduce objectionable hum or very low frequency room resonance, for example.

Low Frequency Cut-Off Section. The circuit configuration is the well known Constant –k T Section. Its knee was designed to be 120 Hz. Component values were calculated from the formulas:

$$L = \frac{R}{4\pi F_c} \qquad C = 2X\frac{1}{4\pi F_c R}$$

The inductance value of .395 Henries was secured by purchasing Stancor C-2343 filter choke, which is rated at .75 Henries at 300 ma. DC. The unit was disassembled and the I laminations were removed to reduce the inductance while measurements were made on a Model 650-A General Radio Impedance Bridge, using a 1,000 cycle audio generator and null detector. It was found that four I laminations left across the E-laminations resulted in the required inductance. The remaining lamination space was filled with cardboard and the unit reassembled.

Performance of the low frequency

continued on page 6

COVER THAT SPECIAL EVENT!

with Portability Plus

me of our customers are covering impor- t city council meetings, election returns, ecial sports events and other local origi- ion features with the portable version of r compact Model 1501 AM microwave tem. In other areas, this system is be- used for standby emergency restoration vice.

The simplex system shown here weighs only 31 lbs. and the accompanying control console only 40 lbs. The entire system can usually be set up and on the air in less than 30 minutes. The tripod can be extended to clear a six foot guard fence for clear line-of-sight shots. With a 2-foot antenna, the system has a range of about 6 miles.

is is the identical Soladyne microwave equipment that is serving MSO's across the country permanent installations. For more information, call Fielding Hedges, at (714) 279-7872.

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Circle 134 on Reader Service Card

cut-off filter section is portrayed by the graph shown in Figure 1. The knee occurs very close to 120 Hz, at the 3 db point of attenuation on the curve. From 120 to 25 Hz the attenuation is from +12 to −31 db, or a total of 43 db of attenuation.

The input impedance, measured at 1,000 Hz, is 900 ohms, with a variation of from 400 ohms at 200 Hz to 1,000 ohms at 5,000 Hz.

All measurements shown in Figure 1 were made with a generator terminated with a 600 ohm load, maintaining a constant +21 db. voltage level.

High Frequency Equalization Section: This section is active, alone, when LO-FREQ CUT-OFF switch SW-1 is left, or in the Out position and SW-2 is up, or the In position.

The design simply makes use of either of two series capacitors, for 4 kHz or 8 kHz equalization, and combinations of paralleled resistors to alter the effective capacitive reactance of the elements at various frequencies. Operation of SW-4 to any of the six positions then becomes, in effect, a slope control. The best curve needed to compensate for line loss may be achieved using a combination of either 8 or 4 kHz equalization and the chosen slope control setting.

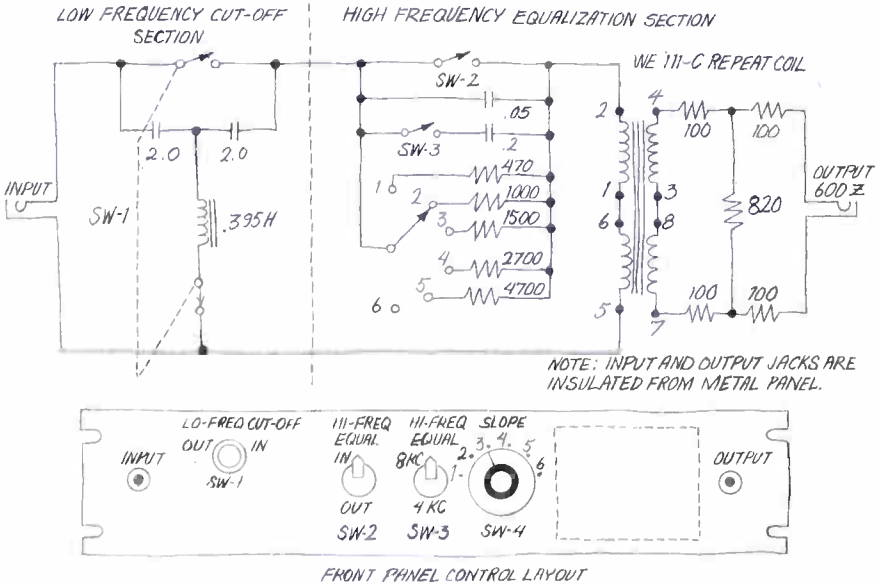
For more permanent lines, the sending end might be provided with an audio generator source calibrated for constant level, while careful adjustments are made at the receiving end for measured equalization. In most cases, a near-perfect reciprocal of line losses may be achieved.

Equalizing losses, however, must be incurred. Thus, a high-quality line amplifier must be used in conjunction with the unit when severe losses must be compensated for. (While the line amplifier is usually located at the receiving end at the studio, a better signal-to-noise ratio may be secured when the line is pre-equalized and level established at the sending end.)

The unit employs the high-quality WE 111-C output coil which is connected in a 600-to-600-ohm configuration. To assure that the coil looks into a purely resistive load, a minimum-loss 6 db. pad is wired in. Thus, we have the need to overcome not only equalization losses, but the additional pad loss. An amplifier used for utility purposes ought to have an available gain of about 50 db, with a 600 ohm input and 600 ohm output impedance.

The Lo-Frequency Cut-Off and the High Frequency Equalization sections may be connected in tandem by operating SW-1 In and SW-2 In. Zero attenuation is achieved when the unit is left in the program circuit and Sw-1 and Sw-2 are in the Out positions.

A hole has been provided below Sw-1, with a plug inserted, for the addition of a switch or other control, in the event that the user may wish to add any other features such as parallel or series elements to modify the unit's performance. While the unit, as manufactured, uses simple two-terminal phone jacks to be compatible with existing patching systems at KBMY, it is recognized that many stations would build the unit using double jacks, for the standard patch cords.



Equalizer for remote pickups designed by Engineer Enstrom, has a bass-cut section with a constant-KT section that puts the knee at about 120 Hz. High-frequency section (which can be used alone or in tandem with low-frequency section) has two turn-over points and five slopes, all selectable by switch. Unit can improve quality on a boomy pickup, or when the line losses in the high end are excessive.

23. Help for Panic Situations.

Richard A. Rudman, Chief Engineer, KGB AM/FM, San Diego, Calif.

Problem: To give 3rd class operators some help in dealing with "panic" situations.

Solution: Simply take a new telephone number directory with an alphabetized slide index on the front and make up tape labels for the major headings of "panic" situations at your station.

Make sure your directory will index properly with the labels you make up so when the slider is opposite a given label, the index will open to the appropriate card.

Then take the cards out of the index and type on them concise procedures for various problems that might come up for your 3rd class operators.

The system I devised has the following headings:

AM off air
FM off air
Fire/Police
E.B.S. Test/Alert
Power Change
Tower Lites
AC Power Failures
Audio Logger
Phone Lines
Audio Switcher

The unit I used that seems to work fine is the Bates List Finder, Secretary Model G. It's been working well for months.

The card procedures are written in "cookbook" fashion with no waste words—just the quickest and best way to isolate and get out of problems.

24. Time Base for Electric Clocks.

George F. Sprague, Chief Engineer, WLOS-TV & FM, Asheville, N.C.

Problem: Recently, when the Western Union time service was phased out in N.C., we were faced with the necessity of providing our own source of time information. There are several clock systems on the market, most of which are quite complex, elaborate and expensive.

continued on page

Cohu's "Performer" can take its knocks

takes a lot more than bumps and
s to upset the performance of
hu's Model 1500 Broadcast Color
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seplate to its turret monitor—all
lecine cameras should be as good.

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ultiplexer rest solidly on a heavy-
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ews, and once positioned, bumps
d jars will not affect alignment.

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dules; baffling and ventilation
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ndards—these are just a few of the
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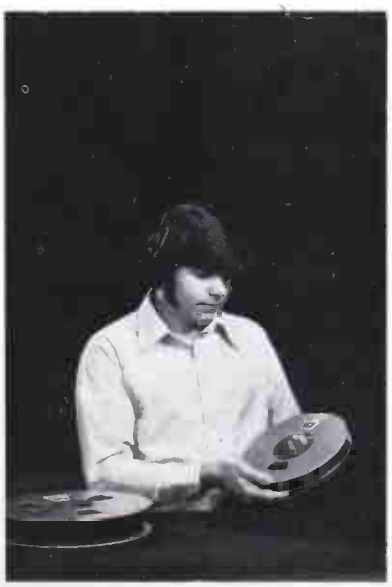
VPR-7950A from Ampex

pex announces a major improvement in **fully** fessional color production one-inch video tape ording: The new VPR-7950A with built-in **digital** e base correction.

Digital TBC means picture stability so remarke that most engineers can't tell it from a quad chine. Digital TBC means new advanced editing ability with lock-up times never before achieved a helical VTR. And Digital TBC means an end to pking and tearing.

No matter what your end product is, from apsulated helical tape programs to quad video es for broadcasting, the VPR-7950A is the right duction recorder. You can take network feeds, duce commercials, assemble full-length grams, respond quickly to opportunities for ote production, dub to any other format, and your technical staff the creative flexibility y want.

For the private television producer, the R-7950A means equipment that into an industrial budget. agine having the options of full adcast techniques with far less stment and operating expense.



Options The new Ampex VPR-7950A is available in a number of optional configurations. The basic unit consists of the transport with all signal and control electronics and the digital time base corrector, all in one unit.

The basic unit also accommodates accessories such as a velocity compensator, a tape tension memory, and a sync pulse driver. Transport controls are remoteable.

Ampex packages the VPR-7950A in low-boy and overhead monitor versions. The monitor bridge has a monochrome or color picture monitor, waveform monitor, and an optional vector display monitor.

More information Full technical specifications are presented in a VPR-7950A product brochure we'll send you without cost or obligation. Ampex distributors can arrange for a demonstration of the equipment, and if a technical question stands between you and a VPR-7950A, they'll send an expert to survey your installation and answer **all** your questions.

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And so, more than anyone else, they are in a position to appreciate the painstaking care Cinema Products design engineers have given to making our cameras easy to maintain, service and repair.

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More than anyone else, servicemen can appreciate why *cameramen* also love our guts!

Because our cameras perform so reliably. Because minor adjustments and repairs can be made rapidly in the field. Because we've made certain that our dealers and authorized service centers—located throughout the USA and all over the world—are well stocked with critical replacement parts. So that when major repair is required, it is so much easier and quicker to get a CP-16 or CP-16/A back into good working order. And back into the hands of the TV-news film cameraman. Fast. So the cameraman can get back to filming the action.

CP-16/A Camera shown with new PLC-4 lightweight 400 ft. magazine.

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Circle 136 on Reader Service Card

Put the Man into Management

By Si Willing

Managing a radio or TV station calls for two-way lines of communication with all department heads. The station manager who is out of reach when needed, or who will not pay full attention to what is going on around him, is a candidate for unemployment.

Alliances and allegiances are quickly formed between and among staff members at all levels; these always preclude the man on top—the station manager. These compacts are made for survival. They are especially effective in non-union shops. Managers who do not communicate in unionized stations are automatically putting themselves into air-tight isolation booths and can easily suffocate.

This writer knows of a station that was owned and managed by a reputable man who thought he was in touch with his personnel. Because he was owner-manager, he was "yessed" by all staff members. Little did he think that he could be wrong once in a while.

The station was sold to an aggressive broadcaster who persuaded the previous owner to "stay a while with full managerial privileges." The ex-owner obliged. But, with salary checks now signed by the new owner, staff members reasoned that the original owner's days were numbered. A conspiracy was organized to hasten the demise of the unsuspecting manager. The new licensee was willing to listen to the staff. The hearing turned out to be a Kangaroo Court. Trumped-up testimony about alleged abuses was presented by staffers and the manager was promptly dismissed. The discharged manager was so confident that he was on top of things, that he never noticed the danger signals such as not getting memos from department heads. He was not aware of the hasty, whispered conferences. Above all, he never realized that the new owner was getting daily reports from staff members, many of them detrimental to him as manager.

At this point, you're probably wondering what all this has to do with the title of this article, "Put the *Man* into Management." Plenty!

If the man who owned the station had realized that his staff was afraid to contradict him when they thought he was wrong; if he had considered that he was not all that infallible; if he had given department heads some personal responsibility; if he had listened to other ideas instead of foisting his own, his staff would have appreciated him as a *man* and not feared him as a *man*ager. He would have earned some of the loyalty that he thought he had.

In this day and age, it is vital to let ideas and suggestions be discussed openly, not stifled by those in command who believe they know best. It is necessary to hear as well as listen.

The terrain is strewn with casualties of men who meant to be direct managers. If they had only put the *man* into their plan, they might now be leading productive and prosperous stations.

Mr. Willing is president of KMAR and KCRF-FM, Winnsboro, Louisiana.

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- Display total tape time.
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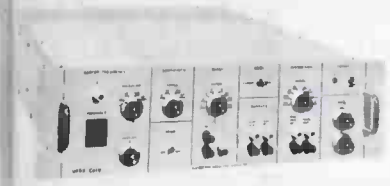
ariable-persistence 60 MHz storage cilloscope allows change in screen me with turn of a dial. Model 03/DF1 can make bright display of tremely fast signals that have a low rate. It also has a half-tone mode for ry high writing speeds, up to 5 /micro-seconds. Persistence can be to integrate repetitive signals but lrop" random noise, pulling signals t of heavy noise pollution. $1925. EKTRONIX. **300**

e-through splice closure for CATV ble is made of high-impact clear plas-, can be buried. "Clearsight Clos-s" keep splices dry, have entries for ecting water-proofing jelly, come in ght diameters from 1" to 6". COM-UNICATIONS TECHNOLOGY ORP. **302**

ying-erase edit units for video-ssettes make assemble edits without ow, roll or moire. Models AVX-308,

VX-309 have controls for in-out edit, p, pause, play, rewind and can be notely controlled. AVONIX. **303**

ogrammable audio distortion alyzer can make six measurements r second at an accuracy of 0.1%, er range 10 Hz to 100 KHz. Model A-72 can be locally operated or re-tely controlled by binary coded



mmand lines. Analog/digital track-filter lets unit be programmed for ut over a full decade of frequency. 200. UFAD CORP. **304**

rew-on dynamic mike with built-in nsistor on any standard desk or wall ephone set, raises voice quality. Voice-Act" does not interfere with rmal operation, takes power from the one, is installed in seconds, has an

external jack for connecting to tape recorder if this is wanted. VOICE ACT, INC. **305**

Low-cost portable oscilloscopes have carrying handles, quickly removable vinyl finished cabinets. Model 37 covers 5 Hz to 2.5 MHz, has 3-inch CRT, sensitivity 50 mV/div to 5V/div. Model 27 covers dc to 2.5 MHz, has 5-inch CRT, sensitivity 10 mV/div to 1V/div. Model 37, $165; Model 27, $280. SYSTEMS ELECTRONICS, INC. **306**

Bonded tape drop cables for CATV have an 8-mil aluminum shield to reduce direct pickup. The cable has

copper-clad steel center conductor and expanded polyethelene dielectric. The shield is overlapped ¼" and bonded permanently to jacket. CERRO WIRE AND CABLE CO. **307**

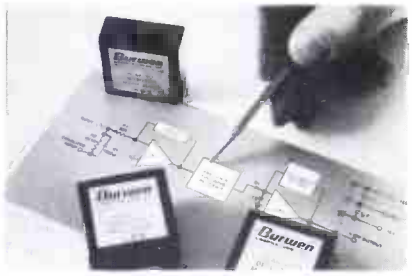
Electrostatic headphones use electrets, need no external power supply. Model EAH-80A weighs 12.5 ounces,

comes with adaptor for connecting to power amplifier output, puts out 101 dB at 1 volt input to adaptor. $79.95. TECHNICS (PANASONIC). **308**

Tripod for Eclair ACL 16mm camera weighs 13 pounds with head. Model ECA has ball and cavity joint, has a fluid movement with adjustable tension for smooth pan and tilt. $450. ECLAIR CORP. **309**

Head demagnetizer with flexible tip reaches into tight spaces around guides, rollers, as well as heads. Model QM-202 turns on with finger pressure when picked up, goes off immediately when put down. Tip is sheathed in plastic to eliminate scratching. $15.90. NORTRONICS. **310**

Modular peak VU detector circuit allows monitoring of peak signal levels, rather than average or rms values. Model VU306 modules, plus standard



D'Arsonval meter, shows peaks down to 5 microseconds, "held" for 2 seconds for easy reading. $85. BURWEN LABORATORIES. **311**

Compact quartz location lighting kit is packaged in a single aluminum carrying case. "Aero-Kit" weighs less than 31 pounds, includes two focusing

600-watt spots, two barndoors, one focusing 600 watt fill light, cables, stands and other accessories. $369.00. CINEMA PRODUCTS, INC. **313**

continued on page 72

PRODUCTS

Integrated-circuit 3-stage FM if amplifier and quadrature detector has a single coil, simplifying alignment. Model 2136 also has internal voltage regulator, stabilizing performance and also supplying voltage for tuner sections. $1.13 (in quantity). FAIRCHILD CAMERA AND INSTRUMENT CORP. **312**

Digitizer for X-Y recording provides either manual or automatic digitalization of the coordinates of data in a standard video signal. Model 622 has

an update rate of 60/sec. and internal calibration. $4500. COLORADO VIDEO, INC. **314**

Complete rf network analyzer covers range to 500 MHz, measures transmission, reflection, phase, group delay in seconds. Model 2260 Automatic Net-

work Analyzer has a resolution of 0.1 Hz and dynamic range of 100 dB. Results are available on large CRT screen, digitally, in hard-copy, or in bright lights. GENERAL RADIO. **315**

Power source converts 48 v dc to regulated 5 v dc for integrated circuits in telecommunications systems. "T-

PAC" has complete ground isolation, two-watt power capability, broad input voltage tolerance. Package can be mounted on standard printed-circuit cards with tenth-inch grids. $49.50 (small quantities), $33.00 (larger quantities). RELIABILITY, INC. **316**

Integrated portable camera-vtr

stem operates on ½" EIAJ standard r color recording. Camera and separate control unit weigh 11 pounds together; camera uses ⅔" electrostatic cus vidicons, 4:1 zoom lens and CRT ewfinder/monitor. Recorder weighs pounds, puts 30 minutes of color on el. JVC INDUSTRIES, INC. **317**

wer supplies for 500-watt loads are ltage-regulated. DCR-B Series covs eight units, meeting most requirents in the range. SORENSON CO., V. OF RAYTHEON. **318**

w system for transferring videotape ograms to film uses automatic wideeen scanning. "Transcan" has tomatic control of horizontal masking from digital cues recorded on the e. GOLDMARK COMMUNIATIONS. **319**

aveform monitor has internal self-ggered sweep, can display luminance ly with selector switch, and has illminated graticule. $595. ULTRA UDIO PIXTEC. **320**

ree-way hybrid splitter for CATV vers 5 to 300 MHz. Model MSB balced splitter provides equal outputs 5 dB below input. AEL COMUNICATIONS CORP. **321**

levision channel demodulator acpts audio and video signals from mera, tape recorder or other source d turns out broadcast-standard NTSC signals. Model AVM-4920 has internal band-pass filters, reducing spurious output and allowing adjacent-channel operation. Video frequency response is 30 Hz to 4.2 MHz, video carrier range includes channels 2 thru 13 and subchannels B1 thru B6. $925. BLONDER-TONGUE LABORATORIES. **322**

Tester for DTL and TTL integrated circuits is usable during operation. Model IFP Logiscope has a large display area, circuit diagram overlay (results appear through transparent schematic), requires no power supply and does not load tested circuit. ROHDE AND SCHWARZ. **323**

Reed switch handles up to 30 watts, up to 150 v dc or 120 v rms ac. Model RI-30 is completely sealed against humidity, has high-pressure inert gas fill to hold off 750 v dc for periods up to 40 years. $0.27 (in large quantities). AMPEREX. **324**

Flat-pack fluorescent readout comes in a one-digit or three-digit package. Digivac 2000 has a rectangular, low-profile package, supplies alpha/numeric/symbolic language, has a broad color spectrum that can be filtered for almost any hue. TUNG-SOL DIV. WAGNER ELECTRIC CO. **325**

Automatic counter covers 10 Hz to 23

PRODUCTS

GHz without plug-ins, range setting or tuning. Model H10-5340A displays eight digits, positions decimal, and indicates units automatically (KHz, MHz, or GHz). It triggers on signals of

−30 dBm at low frequencies, −15 dBm at high. Standard time base is crystal with $3/10^7$/month stability; higher stability is optional. $6100. HEWLETT-PACKARD. **326**

Microwave frequency counters use thin-film technology and heterodyne techniques for high sensitivity and FM tolerance. Series 350D cover 20 Hz to 18 GHz, with resolution variable 1 Hz to 1 MHz, 1-Hz resolution/in one second display time, 11 digit display. 18 GHz model, $5100; 12.4 GHz, $4700. EIP INC. **327**

Comb generator produces pulses at 1 volt at a fixed rate of 15.7 KHz. Model CGV-1 output has −10 dBmV "pickets" 15.75 KHz apart and ranging up to 5 MHz, useful for VHF/UHF modulator response measurements and CAtV system response, with a spectrum analyzer. $225. VITEK ELECTRONICS, INC. **328**

Videotape "Storyboard"—new presentation technique. The long-standard "storyboard," with a series of stills pasted in order on a large board to show the elements of an ad campaign or other visual program, is being replaced in many ad agencies by the "video storyboard," developed by MPCS Communications Industries, New York video production house. The video story board is on video tape and uses a series of stills that zoom, fade, dissolve or intercut, along with script and voice "over" for a more dynamic account of the projected program than the older paste-down variety. MPCS, at 424 West 49th St., New York, offers sample video storyboards on cassettes to any established agency or company.

Solution: Standard electric clocks re readily available and are reasonably riced, and the only limiting factor in heir accuracy is their power source. I ursued the idea of developing a de-endable and accurate 60 Hz source.

First, I found by experiment that he clocks are not very discriminating to waveform and that they will lock to and operate on some very weird-looking forms.

My experiments lead to the configu-tion shown in Fig. 1. For the pur-se of discussion I have divided the stem into four component parts—the Hz time base, the amplifier, the tput circuit, and the standby power cuit.

he 60 Hz Time Base:

In this respect I was fortunate; LOS-FM is program automated and cluded in the automation system is a tes digital clock, a solid state unit ng a crystal as a time base, a vernier quency compensation for regulating clock, and a battery system that lds the time in the logic circuits ring power failure.

By tapping in at the proper point in logic with a high impedance bridg-g take-off, I had the 60 Hz signal I s seeking. The manual for the digital ck indicates this point. Fig. 2 shows waveform and peak-to-peak volt-e of this signal. There is an alterna-e if you have no crystal controlled ck. With the present day stat of the in crystal processing and crystal ens, the construction of a stable he base is a relatively simple and expensive procedure. The crystal fre-ency should, of course, be a multi-e of 60 Hz and should be in a range sected for an optimum stability ystal cut. Crystal manufacturers ually publish specs on the stability various ovens and crystal cuts, so it simple to calculate the maximum ssible clock error over a given period time.

For dividing down to 60 Hz there is almost unlimited supply of inte-ated circuits available. Some of these ll for ridiculously low prices, and are pable of very high division ratios.

he Amplifier:

The amplifier is a conventional pub-address amplifier capable of 50 atts RMS output. Our five clocks ke about three watts each, so we have a big safety factor and room for expansion. We purchased such a unit for slightly over $100 from one of the mail order houses.

For the 40-foot run from time base to amplifier we used RG-59 coaxial cable: I did not want to load down the internal circuits of the time base with capacity. On shorter runs I am sure that ordinary shielded audio cable would suffice. The amplifier input is high impedance so its loading effect would be negligible.

The volume or gain control on the amplifier serves to adjust the output voltage as measured on the meter following the transformer. As the number of clocks in the system is increased, this control must be advanced to compensate for the increased load and maintain the voltage on the clocks between 110 and 120 volts. Curiously, even the tone controls on the amplifier serve a very useful function. By setting them to attenuate the highs, the harmonic content in the waveform is reduced, resulting in something more closely resembling a sine wave. This saves power handling capability by eliminating useless harmonics of the desired 60 Hz. Probably the ultimate refinement would be the incorporation of a low pass filter in the amplifier with negligible insertion loss at 60 Hz but high attention for harmonics.

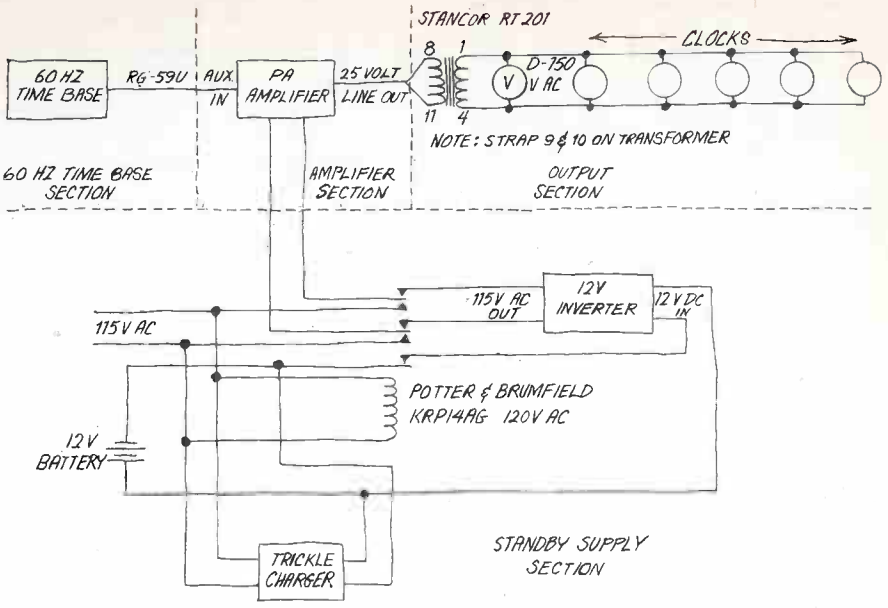


Fig. 1. Engineer Sprague built a highly accurate time base for standard electric clocks by starting with Gates 60 Hz digital clock in automation system, amplifying signal to the 110-volt level needed by the clocks.

The Output Circuit:

The output circuit consists mainly of a low voltage power supply transformer connected in reverse—the original secondary is connected to the 25 volt-line output of the amplifier so the transformer will step the output up to the 110 volts needed by the clocks. A permanently installed ac voltmeter provides a means of checking the line voltage to the clocks.

Fig. 3 shows the waveform in the clock circuit. Any resemblance between it and a sine wave is purely coincidental. It can even be argued that the frequency is not 60 Hz inasmuch as the waveform shown represents one cycle at a 60 Hz sweep rate. However, the clocks couldn't care less, and as far as they are concerned, it is 60 Hz.

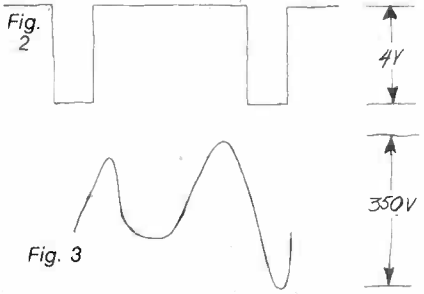


Fig. 2. (above) Waveform out of digital clock is a 4-volt pulse with 60-Hz rep rate. Fig. 3 (below) After passing through amplifier, waveform is far from a sine wave but locked the clocks securely to the rep frequency.

The Standby Supply:

As shown in Fig. 1, the standby supply consists of a standard 12 volt storage battery, as solid state inverter with an output capacity sufficient to handle the primary power requirements for the amplifier, a trickle charger, and a changeover relay.

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A loss of primary power will drop the relay out. The transition from line power to inverter is, of course, a matter of milliseconds. So, with the inertia of the clock motors, the clock error resulting from a relay changeover is negligible. For anyone who feels that this is a factor, it should be a simple matter to design a solid state switch that would be practically instantaneous. Of course, the cost would be somewhat higher, and I question if it is warranted.

The standby power supply is not designed for protracted power interruptions. The current required from the battery to operate the amplifier is substantial. The system is designed to take over only during that interval between the time when commercial power fails and the starting up and taking over by an emergency generator.

The cost of our system, not figuring for the cost of the digital clock, was less than $150. The clocks themselves cost slightly over $10 each.

25. Telephone Answering Device.

Burt Fisher, Chief Engineer, WOCB AM/FM, West Yarmouth, Mass.

Problem: A commercial telephone answering device used as a dial-a-weather phone was expensive, broke down frequently, and had poor audio quality.

Solution: I decided to use an old Spotmaster 505 cart machine as substitute, with the modification made in the enclosed schematic.

The SPDT relay closes upon ringing voltage from the phone line and starts the cart machine by applying voltage from the machine's low voltage supply to the 4PDT relay. This relay feeds cart audio to the phone line and applies power to start the tape motor.

Engineer Fisher's telephone answering device was built with a Spotmaster 505 cart machine, modified as shown at right. The resulting unit has far better audio quality, and far less tendency to break down, than the commercial machine it replaced.

Motor life is greatly lengthened by being in use only when needed. When the cart recues, the 4PDT relay drop out and is ready for the next call.

I later added a counter which receives its voltage from the motor. We've had up to 500 calls on some days. In 7000 calls we've had no problems and the audio quality is excellent. With a little more design, a cart recorder could be used as an automatic beeper taker. This schematic should be adaptable to almost any cart machine.

Incidentally, the messages on the weatherphone are occasionally sponsored, so in addition to being an important public service, it's a money maker.

Rules for BM/E's Great Idea Contest

1. **Eligibility:** All station personnel are eligible. Consultants to the industry may enter if the entry indicates the specific station or stations using the idea or concept. Manufacturers of equipment or their representatives are not eligible.

2. **How to Enter:** Use the Official Entry Form on this page or simply send *BM/E* a description of your work. State the objective or problem and your solution. Include diagrams, drawings, or glossy photos, as appropriate. Material must be legible but need not be directly reproducible—although camera-reproducible material is preferred. Length can vary, but should not exceed 1000 words. *BM/E* reserves the right to edit material. Entry should include: Name, title, station affiliation, and the class of station—TV, FM, AM (Class I or II), or AM (Class III or IV). Indicate if idea is completely original with you.

3. **Material Accepted for Publication:** *BM/E* editors will make all decisions regarding acceptability for publication. If duplicative or similar ideas are received, *BM/E* editors will judge which entry or entries to accept. A $10 honorarium will be paid for each item published.

4. **Voting.** Every reader of *BM/E* is entitled to rank the ideas published. This can be done on the ballot in the magazine or by letters or cards sent to the *BM/E* office. A reader can judge one or all ideas published. Readers must assign a point score to each idea on a scale of 0 to 10: e.g., if you think an idea is excellent, score it 10; if you think it is without merit, score it 0; if you like it but want to discriminate, pick the appropriate number between 1 and 9.

5. **Winners.** Relative ranking of each month's entries will be published after 60 days. Top-rated entries for various categories will be republished in December 1974 for a second and final round of scoring. Final winners will be picked in February 1975 and notified by mail. Winners will be published in the March 1975 issue of *BM/E*.

6. **Prizes and Awards.** Four top prizes will be awarded—each a six-day cruise for two on a Windjammer in the Caribbean.* Cruise awards will be one each in categories of TV, FM, AM (Class I and II), AM (Class III and IV). In addition, highest ranking entries will receive a *BM/E* Certificate of Merit award, one each for the following nine categories: TV, RF; TV, Video; TV, Audio; FM, RF; FM, Audio; Class I and II Radio, RF; Class I and II Radio, Audio; Class III and IV Radio, RF; Class III and IV Radio, Audio.

*Between months of May to November, choice of cruises: Bahamas, Virgin Islands, West Indies. Deck Cabin accommodations. Travel to and from port cities of Miami, San Juan, or Virgin Islands not included. Authors of top-ranked items will receive Windjammer Cruise information in November 1974.

Entry Form for BM/E Great Idea Contest—1974

Mail to: *Editors, BM/E*
274 Madison Avenue
New York, New York 10016

Name _____ *Title* _____

Station Call Letters _____

Address _____

City _____

State _____ *Zip* _____

Licensee _____

Class of Station: TV ____ *AM (Class I or II)* ____
FM ____ *AM (Class III or IV)* ____

Title of Entry _____

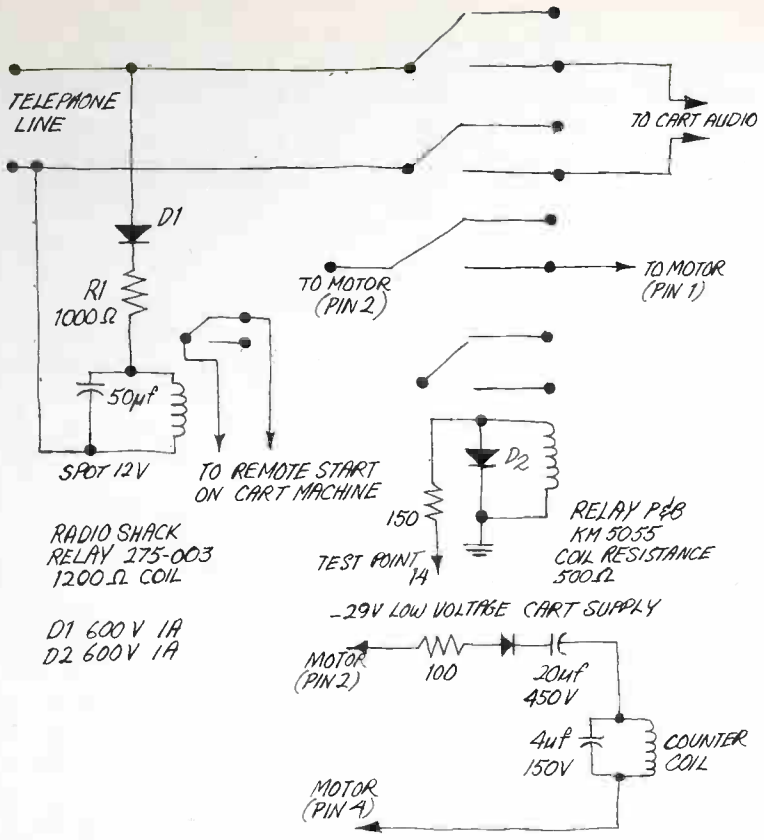
Objective or Problem: *(in few words; use separate sheet for details)* _____

Solution: *(use separate sheet)*

I assert that, to the best of my knowledge, the idea submitted is original with this station; and I hereby give* BM/E *permission to publish the material.*

Signed _____ *Date* _____

*If you feel credit for prior work or antecedents should be given to someone outside of the station, indicate to whom and when:



26. Dual Transport System.

Gerard Fortin, Director of Engineering, CFCM/TV and CKMI/TV, Ste. Foy, Quebec, Canada.

Problem: Our VTR facilities consist of four color AMPEX machines, one of which has electronic editing. In the fall, 1969, we installed color cameras in one of our three studios, and 95% of our VTR operations became color.

Immediately we started having problems with the scheduling of the color machines. Our studio production had to stop for station breaks because, even when commercials and promos were edited in the programs, we needed three and sometimes four color machines for the station breaks. To operate efficiently, we needed an additional color VTR.

Solution: By comparing the VTR with a telecine chain, we realized that if we had two tape transport decks operating into the same electronics, we would have a more efficient use of the expensive electronics and could handle the difficult station breaks.

A short feasibility study indicated

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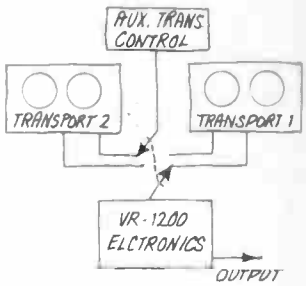
that it could be done without much difficulty if we accepted the restriction that the air to air time between consecutive tapes be at least six seconds. Since we always have a ten second station ident on slide during station breaks, this created no problems.

The machine chosen for the modification was an AMPEX-1002 which had already been converted to color using the solid state units of the VR-1200.

We bought a used VR-1002 tape transport and modified it to take a Mark X head and work with a solid state intersync. All the electrical connections to the transports are switched using two 34 contact relays. The relay contacts are protected by an interlock which prevents switching while voltage is applied to any motor on either transport.

When one of the transports is in use, the other one can be loaded and cued using the audio track and fast forward and rewind buttons on an auxiliary control panel. As soon as a play-back has been completed, the machine is



Block diagram shows how Engineer Fortin uses two VTR transports with one set of electronics, to add flexibility to VTR programming.

Rank each idea on a 0 to 10 scale on the form below, or write your ranking on the Reader Service Card in the back of the magazine in the space "Tell us what you like . . ."

Great Idea Contest
BM/E
274 Madison Avenue
New York, N.Y. 10016

Here's my ranking on a 0 to 10 scale of the April Great Ideas.

21. Editing without splicing	[ ]
22. Equalizer for remote lines	[ ]
23. Help for panic situations	[ ]
24. Time base for electric clocks	[ ]
25. Telephone answering device	[ ]
26. Dual transport system	[ ]

Name _____ *Title* _____

Station or Company _____

Enter Your Own Great Idea Now. You May Win a Windjammer Cruise. See Contest Rules.

The two transports are mounted in racks above the single line of electronic units. Being able to cue up second tape while first is running, has increased station's programming capacity greatly.

ped, the transfer button is pushed, the machine can be restarted im- iately to play-back a second re- ding. We normally cue tapes at ten nds, but as little as six seconds can sed.

lead equalization has not been a olem when going from one trans- to the other. Head life on these sports which are used for play- c only has averaged 700 hours with heads lasting over 1000 hours.

the two years since the dual sport machine has been in opera- , it has played back over 3500 rs of tape with only two errors due to the transport switching system. If it had not been for this added facility, we would not have been able to handle our play-back and recording operations these last two years without buying a full color VTR. We have saved approximately $100,000 in capital investment, and there will also be a saving in operating cost.

The VTR operators like the operation with this dual machine, and every week they find new ways to schedule the play-backs which give more freedom to the studio production. They have already asked to have another machine modified to dual transport.

BM/E

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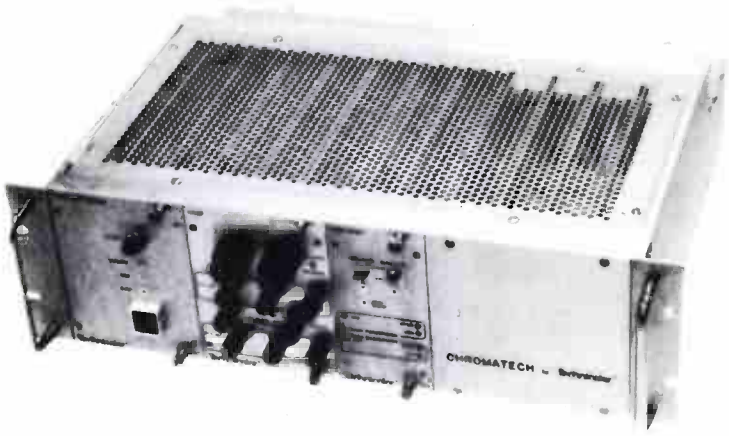

All controls, including color key choice, coarse and fine offset adjustment, slider option, hue potentiometer, are available on front panel of Chromatech.

hue potentiometer, according to the keying equation, $\phi_v = B - \frac{(R + G)}{2}$ which assumes the selected backdrop color is blue. If the selected backdrop color were red or green, the above equation would be adjusted accordingly.

The $B - \frac{(R + G)}{2}$, signal will be positive and negative with respect to zero level (ground) the B component being positive and the (R + G) component negative. Since actual video signals are being combined, the blue components of all parts of the picture are added together. Similarly, the reds and greens are also combined. Then, by clipping all signals below ground, the red and green components of the picture are effectively subtracted out, leaving a pure blue control gate (ϕ_v) that roughly corresponds to the total of all blue in the scan. In addition, the amplitude of this gate is proportional to the intensity of the blue.

The ϕ_v gate is then passed through a 2.0 microsecond tapped delay line which provides a means of timing the keying signal generated from RBG, with foreground/background NTSC video. The delay line has coarse settings of 0.5 microsecond increments, and a fine vernier with steps of 50 nanoseconds. The delayed ϕ_v gate is then applied to the foreground and background key generating circuits, and to the slicer input. The slicer is discussed in a subsequent paragraph.

Foreground Keying Channel

Consider first the foreground keying channel. The ϕ_v signal is amplified, ac coupled and clamped. A fine-offset adjust is included with the clamp circuit to shift the baseline of the bipolar keying signal (blue is positive and red plus green is negative) relative to ground. This is done so that when the baseline clamp (which follows), clamps the keying signal to ground, all the red and green components of the picture can be eliminated. At this point in the circuit, the keying signal ($\phi_v - 1$) is a positive-going gate that occurs wherever there is blue in the foreground video, and with an amplitude proportional to the intensity of the blue.

The $\phi_v - 1$ keying signal then passes through the gain potentiometer, which provides an operator control fo foreground keying signal amplitude. Since the back ground channel has a similar gain control, the operato can use these controls to set foreground and backgrou key signal amplitudes relative to each other.

The key signal is then amplified, and applied to ground-based clipper which clips the key signal amplitud at approximately 700 millivolts above ground. Th clipped $\phi_v - 1$ keying signal is connected through th key-select switch to the appropriate video mixer channel

The polarity of the $\phi_v - 1$ keying signal output is +70 millivolts when there is no blue backdrop color, and zer when the blue occurs. The control circuits in the vide mixer are such that $\phi_v - 1$ causes the foreground channe to be always "on" except when the backdrop color oc curs.

Background Keying Channel

The background key signal circuits are identical to the foreground channel except that a non-inverting amplifier is used ahead of the clipper. Since the foreground channel uses an inverting amplifier, from this point on $\phi_v - 1$ and $\phi_v - 2$ are complementary; when $\phi_v - 1$ is at a maximum of +700 millivolts, $\phi_v - 2$ is at zero, and vice-versa.

Slicer

The slicer is a hard key (on-off switch) included as a switchable option, to allow the unit to be operated as a normal chroma keyer. The threshold adjust allows the operator to set the slicer trigger point at any level of ϕ_v. Each time the slicer triggers, it puts out a pair of full scale (700mv) complementary keying signals.

If the threshold is set very low, the slicer will trigger as soon as any ϕ_v signal appears, and the device will be a true chroma keyer. If, on the other hand, the threshold is set at some higher amplitude, no keying will occur until the backdrop intensity causes ϕ_v to reach the selected thresh old level. This has the effect of keying only on high intensity backdrop levels.

Video Mixing

The video mixer contains two similar video amplifier channels which independently process foreground and background NTSC video in accordance with keying signal information and then mix the two videos to form the combined NTSC output signal.

Foreground Channel

The video mixer foreground channel provides two functions: it processes the foreground video and also provides sync and color burst to the output. The latter function is accomplished with special gating circuits on the $\phi_v - 1$ and $\phi_v - 2$ input lines. During the active portion of each scan, $\phi_v - 1$ and $\phi_v - 2$ are applied to one input of their respective multipliers. The other multiplier input is the video source. The multiplier provides proportional video amplitude control by continuously multiplying the video signal by the keying signal amplitude. A full scale key signal causes multiplication by unity, half scale by 0.5, quarter scale by 0.25, etc. Therefore, the video amplitude is always proportional to the keying signal amplitude. The multiplier output is amplified, clamped, and applied to the output summing amplifier, which in turn combines the foreground and background video signals to provide the video output

CC RULES & REGS

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jective of promoting local and first-run-syndicated pro-
amming. Certainly, they say, stripped game shows and
ove Lucy reruns were not contemplated access period
gramming. They argue that the rule is an undue re-
int on the licensee's freedom in programming and on
e speech and expression. They contend that the
ensee's right of free speech, important as it may be,
es in comparison to the overwhelmingly more funda-
ntal right of the public to receive unrestricted, uncen-
ed ideas in their living room via the medium of televi-
n. The rule, according to opponents, has not generated
and creative programming by diversified production
rces. Indeed, economic reality indicates program pro-
tion of less-than-comparable quality with that of the
vorks.

roponents of the prime time access rule contend that
rule has *not* had an adequate test in its short life. They
ue that the very limited restriction on freedom of pro-
amming during the "cleared" half-hour is more than
let by the benefits of promoting alternative, diverse
rces of local and first-run-syndicated programming.
ced proponents adopt the opponents' First Amend-
t argument by saying that the public should have the
dom to choose what they want to view if they desire
e shows and comedy series repeats, they should not
orced to view local, news, educational, or political
gramming. Proponents of the rule further voice the
ion that repeal of the rule would have a disastrous
ct on independent producers, depriving the public of
one real opportunity to receive fresh, imaginative
gramming."

Conclusion

The Commission has retained the prime time access rule, albeit in a modified form, because it believes *(1)* local stations should be more than a conduit for programs of the three national networks, *(2)* the rule, to some extent, has had a beneficial effect during its short life, *(3)* retention of the "old" rules' inflexibility might, of necessity, result in "waiving it to death" and *(4)* the public will have the opportunity to view significantly more new and innovative, independently produced, local and first-run-syndicated programming in the near future.

The Commission, in closing its *Report and Order*, stated:

> "This proceeding has taken nearly 15 months to resolve from the date of the Notice . . . it is not anticipated that another look at the prime time access rule will be taken in the immediate future . . ."

This may imply that, except for minor adjustments, this "new" prime time access rule may be in effect for a significant period of time.

A note on the subject matter is appropriate. The Commission has recently denied "Petitions For Reconsideration" of the "new" prime time access rule. However, opponents of the "new" rule have filed a "Petition For Stay And Reconsideration" of the "new" rule in the U.S. Court of Appeals for the D.C. Circuit. Chances for grant of the stay appear infinitesimal. We will advise you of judicial action in any event. **BM/E**

[1] *Notice of Inquiry and Notice of Proposed Rule Making,*
[2] 29 RR 2d . . (1974)
[3] The prime time access rule applies only to stations in the top 50 markets. The 1974-75 "Top 50" is identical to that of 1973-74 except for the deletion of Syracuse and Toledo and the addition of Orlando-Daytona Beach and Salt Lake City.

Network Control Center

As indicated, many hours will be spent in testing the system. Both tests and educational programming will be coordinated at Denver through the Network Control Center (NCC). A unique control problem arises in handling voice feedback from the two-way sites when more than one wants to talk to NCC at the same time. To handle traffic, NCC has adopted use of a separate digital coordinating system operating in the 135.6 to 149.2 MHz band. When NCC gets a signal indicating that a site wishes to talk, it will store this on a display board showing all sites. It will send back a coded signal indicating that it is aware of the wish to talk and will tell the caller, through code and flashing lights, to standby. Eventually, a computer will determine the speaking order and do the switching.

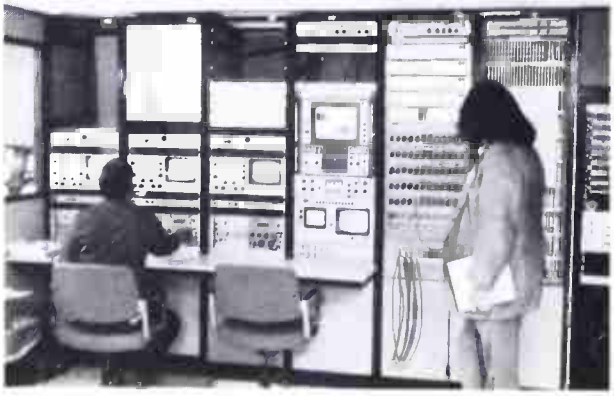
A special low-cost yagi antenna and transceiver have been developed for digital and voice communication. The antenna costs about $440.00 and can be shipped in a six foot box.

Utilization/Field Services/Research

The Satellite Technology Demonstration has its roots in a vast network that links people, content, and technology, and during the planning and development stages, utilization/field services personnel have been engaged in under-girding the project.

They have been establishing a people-based network—a human support system—throughout the region and reaching into selected communities to make certain that the system reflects community, state, and regional needs, and that it is responsive to those needs. The effort in each state is buttressed by a state coordinator with established ties in various state agencies. The state coordinator is, in effect, a circuit rider carrying the message of the STD to local school boards, community leaders, and spokesmen for ethnic groups. The coordinator's efforts, in turn, are supported in each state by the governor's office, chief state school officers, telecommunications councils, departments of human resources and other state agencies.

Since the STD is a unique combination of technology, courseware, and human support services, there is a great need for monitoring and evaluation effects which gather information about the project. Such information is necessary not only for the planning and operational aspects, but also to supply future decision makers a data base sufficient for informed policy making. Thus, a research team has been constituted to serve three major functions: *1* a internal data gathering function to assist project management in planning and operational decisions; *2* a developmental function to field test and evaluate for further refinement various products of the demonstration (including television programming, supplementary instructional materials, field support services, and public information products); *3* a research function to investigate the outcomes of the Demonstration.



View of master control of the Denver production center.

Programming—Content and Production

Rural junior high school students in the 56 sites selected will comprise the primary STD audience. About 35 min. of programming a day will be beamed to them. An important secondary audience, will be teachers, who will be able to take in-service courses for credit (from the Univ. of Nevada or the Univ. of Kentucky). Programming will focus on career development—in an attempt to bridge the differences between basic academic education and vocational preparation.

The total number of those who leave the formal education system in the United States each year without adequate knowledge of, or preparation for, some kind of career poses a critical problem not only for the satellite region but for the nation as a whole. That figure has passed the two million mark annually.

Some career education has already begun at the elementary school level in the Rocky Mountain states. Schools in the Clark County District, Nevada, for example, have an ambitious program underway and use TV for its purpose. It is the 7th, 8th, and 9th graders who score low in career knowledge while at the same time expressing a high interest in the need for such knowledge.

By presenting meaningful as well as entertaining broadcasts, the STD program component hopes not only to help adolescents make decisions but also to lead to better utilization of educational and training resources in the region's rural schools.

A staff of educators and communicators—technical as well as creative production personnel—has been assembled at the STD production facility in Denver to develop both the content structure and the production design to meet these aims.

The production design will consist of a minimum of 18 hours of newly produced material, conceived and executed by the program staff and based on specific user needs; a minimum of 30 hours of existing materials, auditioned and gathered in an intensive nationwide search, and adapted, if necessary, to suit specific content needs and specific audiences; the balance of the programming hours will be live.

The satellite will also be used to relay (in addition to transmitting the career program and in-service courses) other program material for local videotaping. In the Rocky Mountain region, two hours of such programming per week per footprint will be distributed.

All production will be undertaken by in-house personnel and recorded on broadcast quality 2-in. quad video tape. The in-house production facility is equipped with the most modern production equipment, such as Ampex AVR-1 video-tape recorders and time-code editing equipment.

The STD staff at Denver will be responsible for distributing the printed material that will be a part of the course. **BM/E**

EWS continued from page 20

ancial Briefs

etwork TV investments rose 11.4 rent in 1973, above 1972's $1.8 on, topping the $2 billion mark for time. Nighttime TV showed big- gain, 14.3 percent to $1.4 billion. kday daytime increased 7.6 per- to $427.7 million, and weekend ime rose 3.1 percent to $234.9 ion. December network invest- ts went up 10.8 per cent to high of 2 million.

arris-Intertype Corp. had sales ing $235,860,000 and net earnings 9,642,000 or $1.55 per share for half of fiscal year ending next June compared with sales of ,369,000 and net of $7,588,000 or 0 per share in last year's first half.

ulf + Western Industries, Inc. ved approximately 380,000 shares Madison Square Garden common in response to a tender offer, at 0 net per share, which expired in ary. Gulf + Western now holds 0,000 shares of the Garden, or 28 ent of shares outstanding.

ox Broadcasting Corp. reported a rd net income of $10,634,894 or 2 per share for 1973—a 5 percent ease over net income of 101,587 or $1.73 per share, in . . . . **GBC Closed Circuit TV p.** had record sales and earnings for six months of fiscal 1974 which n on June 1, 1973. Net sales were 97,422 and net income was 14,713 or $.32 per share, as com- d to net sales of $3,078,006 and net me of $85,468 or $.28 per share, irst half of preceding year.

ople

icholson & Carter announced that **id S.J. Brown** and **Edward A. man** became associated with the during the last year. Brown was erly administrative assistant to Representative Paul N. McClos- Jr. Geltman was formerly trial sel, Bureau of Competition, Fed- Trade Commission. The firm also unced that **Mary Gardiner s,** formerly Commissioner of the ral Trade Commission, has re- y joined the firm as counsel.

obert H. Wilson, formerly en- ering manager of Ameco, Inc., has named executive vice president general manager of the firm. In the r management reorganization, **ph P. Moran** and **Paul D. Askos** been appointed vice presidents of ations and marketing, respec- y.

James Streevy is general manager at Empire State Cable system in Binghamton, N.Y. He succeeds **Dean Cummings** who has been assigned as general manager of Suburban Cable TV in Wayne, Pa. . . . . **Michael R. Corboy** has been appointed president and chief operating officer of TOCOM, Inc.

Richard O. Williams has been appointed senior applications engineer in Television Microtime's marketing department.

Patricia F. Scott, formerly director of public access programming for Sterling Manhattan Cable Television, Inc. has joined CTIC as a regional director for Ohio, Indiana, Michigan, West Virginia, and Wisconsin . . . . **Donald E. Witheridge** has rejoined the NCTA in the newly created position of director of subscription cablecasting.

Robert N. Vendeland has rejoined DYNAIR Electronics, Inc., as vice president, marketing.

Larry Nelson joined Kliegl Brothers as vice president, television distributor sales; he was formerly sales manager of Century Strand.

Donald W. Slack was named national marketing manager of Cetec Inc., manufacturer of professional audio equipment. **Jack Ames** was named national sales manager for the tape duplicating and recording industry products of Cetic.

J.J. Lenehan has been named vice president, telecommunication programs, London, for Collins Radio Co. . . . . **Harold J. Rainey** has been appointed as a regional sales manager for LPB Inc., manufacturer and distributor of audio components. He will be responsible for sales/engineering advice in New Jersey, Connecticut, Northeastern Pennsylvania and Southeastern New York.

Bob Busnell was named manager of market development and sales engineering at Pacific Recorders and Engineering, Corp. . . . . **James E. Thompson** has been appointed to the newly created post of sales manager with Recortiec, Inc., Sunnyvale, California . . . . **Donald T. Rozak** is manager, special accounts, for TeleMation's corporate marketing division.

Charles F. Hedblosm has moved to position of product line manager of Transducer products, for AILTECH's west coast operations . . . . **Samuel M. Merion** was appointed to the new position of vice president operations, UltraCom, a CATV subsidiary of American Electronic Laboratories, Inc. (AEL). **Robert C. Bailey** was named vice president of AEL Communications Corp. (AELCC), another CATV subsidiary of AEL.

Harry H. Breeze has been elected secretary and director of corporate development of Scientific-Atlanta, Inc.

NEW LIT

For copies of these literature offerings, circle number for appropriate items on Reader Service Card.

Custom audio consoles, equalizer modules, phono playback consoles, monitor speakers, other studio units are covered in catalog and data sheets. McCurdy Radio Industries Ltd. **200**

Remote controllable, programmable waveform monitor, which produces triangle, square, sine, pulses, tone bursts etc, over the range 10 millihertz to 1 MHz, is subject of four-page brochure. AIL Tech. **201**

Technical brochure is on **Mark V series of bi-directional CATY electronic units,** including line amplifiers, forward bridger, return trunk; and many others. AEL Communications Corp. **202**

Frame grabber covered in new data sheet stores TV images and prints out hard copies on demand. Alden Electronic and Impulse Recording Co. **203**

Cable amplification and conversion units, including sub-band amplifiers, UHF to IF converters, preamplifiers, UHF to VHF converters, etc., are described in full technical detail in 44-page catalog. Tomco Communications, Inc. **205**

Line of broadcast monitors is subject of brochure, including modulation and frequency monitors for TV, and the TV rf amplifier for off-air monitoring, both aural and visual. Belar. **206**

Planning Guide gives specific illustrations of variety of combinations of solid-state generators, multiplexers, chroma detectors, and test equipment that can be obtained with Model 2610/2620 series modules and frames. Cohu, Inc., Electronics Division. **207**

EMI/Field Intensity Meter is described in brochure which includes general background information on EMI testing and EMI meters plus specifics on applications, specifications, etc. Data Bulletin RFI-104A. Singer Instrumentation. **208**

The 1974 edition of **Who's Who in Electronics** is available in 14 separate customized editions. Each directory contains three national sections: Manufacturers Alphabetic Representatives, and Distributors Geographic. The buyers guide portion has been customized for 14 geographic regions of the nation. Cost of regional editions is $20.50 each, and a National edition, including all 14 regional sections costs $49.50. Harris Publishing Co., 331 Aurora Rd., Cleveland, Ohio 44139

New data sheet describes **OE recorder** that provides analog reco ing and alphanumeric printing on moving strip chart. Gulton Industrie Inc. 20

Direct drive motors for use in ta recorders, audio turntables, video r cording equipment, data handlin equipment, and telemetering instr ments are described in brochure, i cluding "inside-out" motor desig features, specs., and dimension dra ings. Beau Motor Division, UMC Ele tronics Co. 21

COLOR TELEVISION: Principle and Servicing a new book by Howar Bierman and Marvin Bierman, feature a full-color section to illustrate com mon color faults, and compares colo receiver circuits with similar black and-white onès, wherever possible Paper, $4.95. Hayden Book Co., 5 Essex St., Rochelle Park, NJ 07662

Specification of "special" designs simplified in **electronic wire and cabl design kit** that includes 16-page desig guide, 4-page specification/quotatio form, and catalog. Belden Corp. 21

"Prime Time Access Report" tell who is affected, what program period are affected, obligations of networ and independent stations, etc. $20.0 plus $1.00 for postage and handling Write: Information Planning As sociates, Inc. FCC Information "Prime Time Access Report," 31 Maple Drive, Rockville, Marylan 20850.

New pamphlet describes **coaxia components** and accessories for high frequency applications to 9GHz. Gen eral Radio. 21

"Application Book" contains 2 detailed **application reports for soli state communications.** Initial charg of $15.00 covers all updated and ne reports for 2-year period from date o purchase. Amperex Electronic Corp To order, write: Marty Burden, 23 Duffy Avenue, Hicksville, N.Y 11802.

Watson-Guptill Publications an nounces publication of **World Radi & TV Handbook 1974** ($7.50), an **How to Listen to the World,** new 8t edition ($4.95), a guide to interna tional, medium and shortwave broad casting. Write to: Billboard Book Div sion, 2160 Patterson Street, Cincinnat Ohio 45214.

New data sheet provides informatio on new remote job entry (RJE) softwar package that makes HP 2100 Serie computer able to communicat efficiently and inexpensively with a IBM 360 or 370 "host" compute Hewlett-Packard. 21

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&W and Color CCTV Studios complete or single pents. Example: SHIBADEN portable B&W pro-unit with 2-FP100 Cameras, 1-HV15S Camera, Monitors, 1-503 5" monitor, SD-103 pulse DA, sync, VISCOUNT/DYNAR switcher/fader with -101 effects generator, ALTEC 1567 mic mixer, role rack cases, cables, mics, zooms, etc. $1456.00 available. GILCHRIST COMMUNICATIONS P / 7385 Central Heights Mall / Wichita, Kan. 67212 / 2-5983.

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