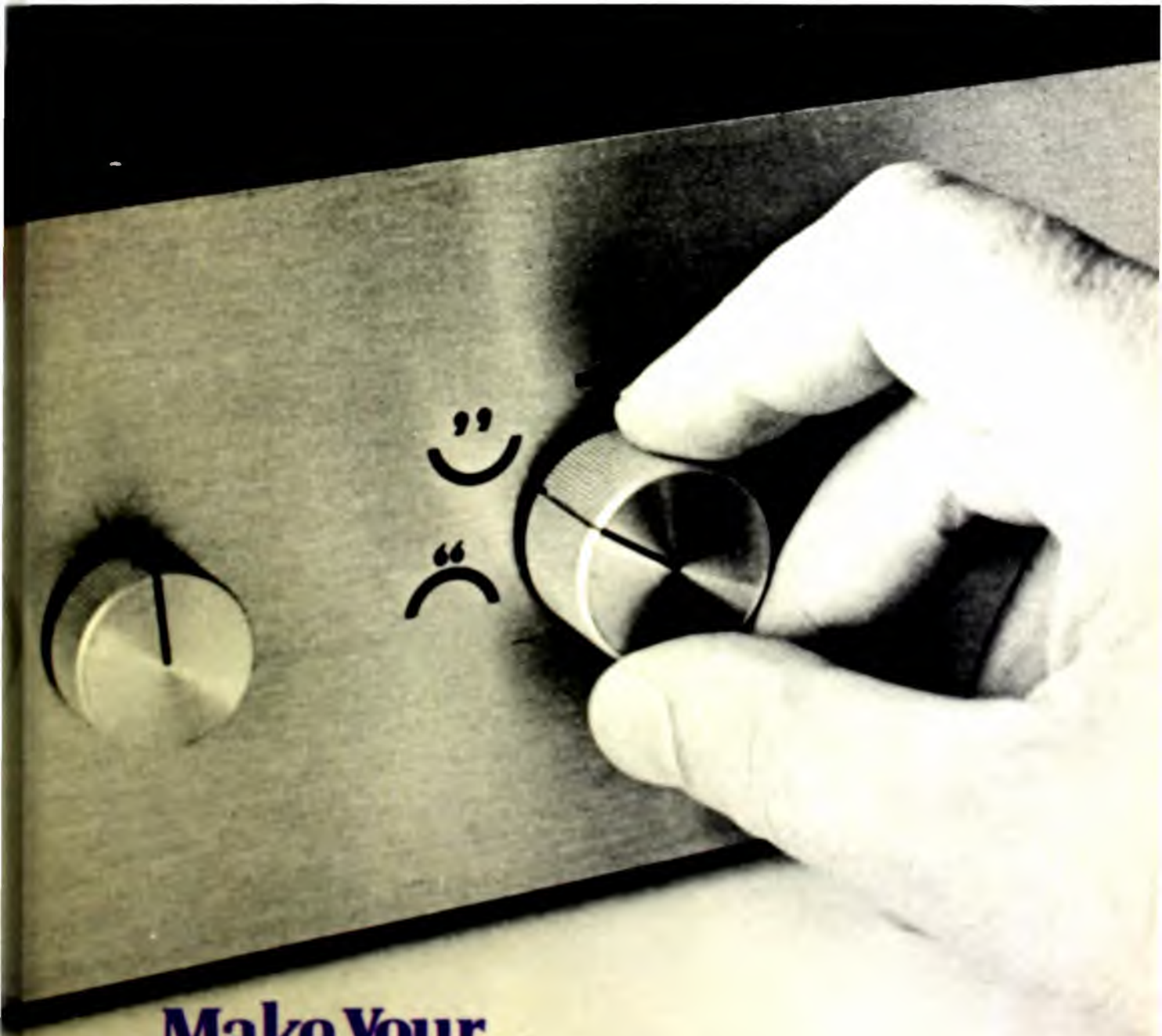
OCTOBER 1973

BME

BROADCAST MANAGEMENT ENGINEERING



Make Your Program Happy

Control The Audio

the end.

½" color cartridge video recorder (SV-530) and 15" color monitor (CM-520).

Reel-to-reel video recorders were the beginning.

We feel our new ½" color cartridge video recorder is the end.

The ½" EIAJ format offers you ½ hour of superior record and playback. And it's only one-fourth the size of a cassette.

The SV-530 lets you use existing ½" EIAJ color or black and white tapes without loss of resolution. No need to dupe or dub.

Pop-in a cartridge. Then, instant-response, solenoid-activated keyboard controls let you move to any function — Play, Record, Fast Forward, Rewind or Positive Stop. The tape rewinds, and the cartridge ejects . . . automatically.

The superbly crafted SV-530 has a decorator wood case and weighs only 46 lbs. A true portable. And it's compatible with all EIAJ type-1 VTRs.

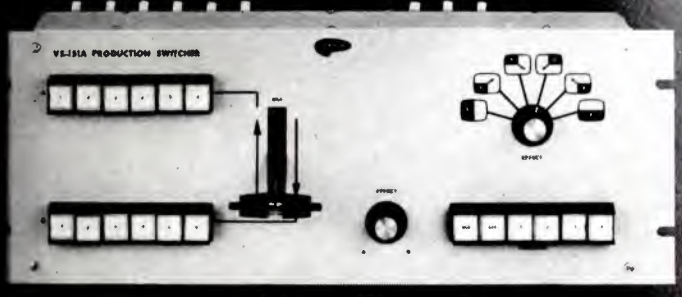
Compare performance and cost of the SV-530 with any other make or format. We think you'll agree from the beginning that ours is the end. From Hitachi-Shibaden . . . "The Image Makers".

HITACHI SHIBADEN
Corporation of America
Exec Off 58-25 Brooklyn-Queens Exp'y.
Woodside, N Y 11377 Phone 212-898-1261
Offices in Chicago, Los Angeles, Dallas, Toronto

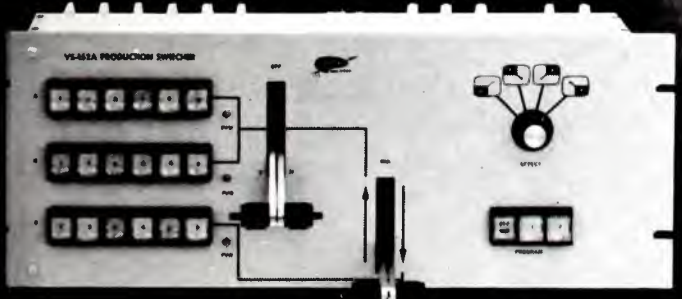
Better performance for less money

...direct result of ...production quantities.

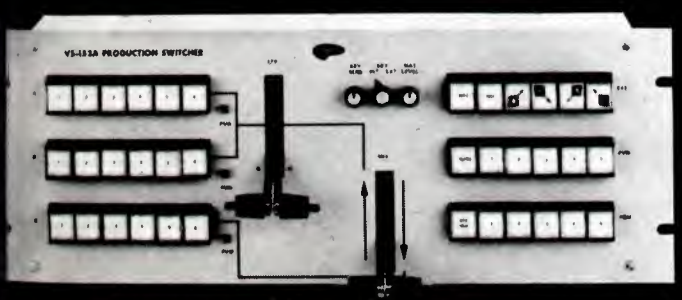
VS-150A VIDEO SWITCHER-FADER



VS-151A PRODUCTION SWITCHER



VS-152A PRODUCTION SWITCHER



VS-153A PRODUCTION SWITCHER

That's right. If you build switchers by the 100's, you can build a better switcher for less. And, DYNAIR produces more switchers in the lower price range than any other manufacturer. We planned it that way.

Proof? You'll find it fast when you check the prices of comparable equipment of other manufacturers. For the same capability, you will pay considerably more. And you probably won't get the quality and reliability of DYNAIR equipment.

You won't find cheap, troublesome sliding fader potentiometers on DYNAIR program switchers; we use quality gear-driven, locking split-lever controls. Nor will you find other inexpensive and unreliable components. The 150 Series uses the latest silicon solid-state devices available – over 80 percent of which are integrated-circuit form – and they are mounted on aerospace quality glass-epoxy circuit boards. Vertical-interval switching and fully color delay compensated too . . . the kind of equipment you can depend on for continuous broadcast quality.

And . . . one of the four units will usually fit your application and your budget. From a basic 5-input self-contained switcher-fader to an 11-input remotely controlled production switcher with special effects . . . that's the 150 Series.

Write today for literature and prices and we'll also send a free copy of our 12-page paper "Facts About Low Budget Video Switching and Special Effects." It contains a wealth of useful information about selecting programming equipment for your studio or remote van.

DYNAIR ELECTRONICS, INC.
8360 FEDERAL BLVD., SAN DIEGO, CALIF. 92114
PHONE: (714) 582-9211

DYNAIR

Circle 101 on Reader Service Card

BM/E
BROADCAST MANAGEMENT/ENGINEERING

OCTOBER 1973/VOLUME 9/NUMBER 10

This month's cover: it's now almost possible to pre-program any ambience you'd like. How it's coming about is described on pages 28-44.

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

Editor
James A. Lippke

Associate Editor
Robin Lanier

Contributing Editor
M.L.H. Smith

Assistant Editor
A.E. Gehlhaar

Editorial Assistant
Alexandra N. Mills

Art Director
Gus Sauter

Production Manager
Arline G. Jacobs

FCC Counsel
Pittman Lovett Ford Hennessey and White

Advertising Director
Charles C. Lenz Jr.

BPA BM/E, BROADCAST MANAGEMENT/ENGINEERING, is published monthly by Broadband Information Services, Inc. All notices pertaining to undeliverable mail or subscriptions should be addressed to 274 Madison Ave., New York, N.Y. 10016. BM/E is circulated without charge to those responsible for station operation and for specifying and authorizing the purchase of equipment used in broadcast facilities. These facilities include AM, FM, and TV broadcast stations; CATV systems; ETV stations; networks and studios; audio and video recording studios; consultants, etc. Subscription prices to others: $15.00 one year, $25.00 two.

Application to mail at Controlled Circulation postage rates pending at Easton, Penna.

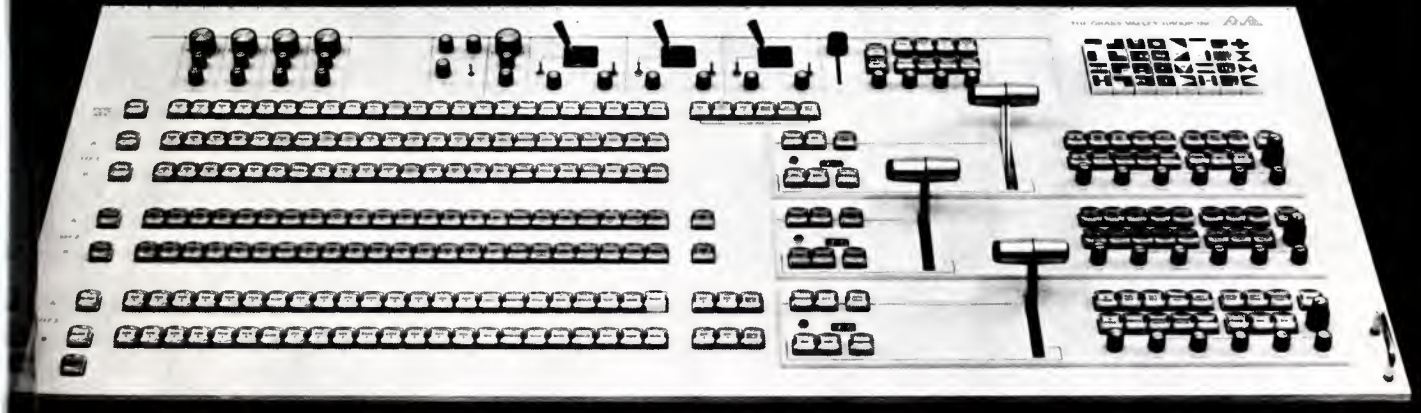
THE 1600 SERIES

LINEAR CHROMA KEY, SOFT WIPE, and ELECTRONIC VIGNETTE are some of the modern concepts in GVG's new 1600 Series television production switching systems. LINEAR CHROMA KEYING is a basic improvement in chroma key technique. Its effect is to virtually eliminate noise and tearing, even in the most difficult chroma key situations, such as keying through glass or smoke.

1600 Series systems are a second generation design which is based upon experience gained in the manufacture of almost three hundred 1400 and 3600 Series switchers. This new design is in direct response to customer requests for fundamental improvements in special effects capability, together with a high standard of electrical performance.

Some of the design concepts employed in the 1600 Series systems constitute an advance in the state of the art and, as such, are offered for the first time. These new concepts include both mechanical and electrical aspects of design and have led to the development of systems which are both compact and cost effective.

1600 Series switchers range in size from Model 1600-2A, with 16 input buses - 4 output buses and one mix/effects system, to Model 1600-7G (illustrated below), with 24 input buses - 7 output buses and three mix/effects systems -- each with separate pattern generator, color matte generator, and modulated positioner.



THE GRASS VALLEY GROUP, INC.

SOLD EXCLUSIVELY BY GRAVCO SALES, INC.

6515 Sunset Blvd.	Station Plaza East	125 South Wilke Road	Redbird Airport	1644 Tullie Circle, N.E.
LOS ANGELES, CALIF.	GREAT NECK, N.Y.	ARLINGTON HEIGHTS, ILL.	DALLAS, TEXAS	ATLANTA, GEORGIA
(213) 462-6618	(516) 487-1311	(312) 394-1344	(214) 330-1245	(404) 634-0521

OVERSEAS - GRASS VALLEY INTERNATIONAL - BOX 1114, GRASS VALLEY, CA 95945 - USA

Circle 102 on Reader Service Card

BROADCAST INDUSTRY NEWS

Miniature Solid-State TV Camera Demonstrated

An all solid-state television camera that is approximately the size of a cigarette package and operates in conditions ranging from bright sunlight to subdued room light was demonstrated recently by the Space & Defense Systems Division of Fairchild Camera & Instrument Corp.

The Model MV-100 is the first in a series of Fairchild television cameras that utilize charge-coupled device (CCD) sensors in place of conventional vidicon tubes. The result is a camera that is extremely small (3½ x 1½ x 2¼ in.) and lightweight (6 oz.), has low power consumption (about 1 watt), and operates under a wide dynamic range of light levels.

The resolution of the initial unit is limited to about 100 lines. Resolution is a function of the number of elements. The unit displayed had 10,000 discrete photosensors. Within two years, sensors with elements adequate for broadcast purposes will be available. Informed opinion holds that cameras of the new type will be ready for the 1976 presidential conventions.

CCD sensors are basically bulk silicon that release charge carriers in proportion to the amount of light reflected from the scene. These charge carriers are transferred by a clocking system and transmitted to a television receiver as standard television signals.

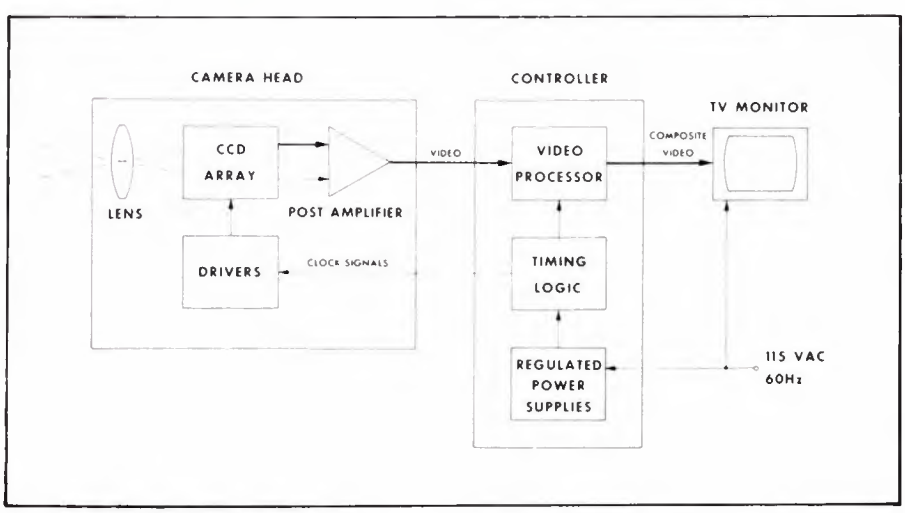
The camera is a result of Fairchild-developed CCD technology augmented by work performed under an ongoing U.S. Navy contract aimed at developing low light level imaging devices.

Although television receivers must be slightly modified for use with the MV-100, videotape recorders need not be changed. Immediate applications for the camera are security, surveillance, medical instrumentation, and process control.

Pricing and availability of the MV-100 television camera will be announced before the end of 1973.

Miniature camera can be used with wireless transmitter to transmit pictures up to one hundred feet.

The CCD sensor takes up only part of the space. A color camera will be no larger.



Block diagram of how the solid state camera operates. All circuits are in camera.

Men's Thoughts on "Women" Explored by CBS Radio

To help kick off a 30-part series of special radio reports with the title "The American Woman," CBS news producer in Washington, Norman Morris, asked a random sample of men what came to mind with the word "woman." The answers are likely to enrage woman's lib battlers: "mother hood," "shape," "con game," and "apple pie" are examples. And nine out of ten agreed that "woman's place is in the home." Morris hopes that the series of programs may open the eyes of some men to women's claims as human beings.

Videodetics Opens Tape Production Studio

The Videodetics Corporation, marketer of industrial and educational television equipment, has opened a videotape production studio at their Anaheim headquarters. Sheldon Pines, president, said that the new studio will allow organizations "... to record their presentations on videotape—whether for training, sales, business communications, entertainment, or education." Included is a large staging area and extensive camera, recording, editing and special effects equipment. The company also announced it will produce videotape programs for na-

continued on page 8

Here are five good reasons to buy IVC's fully-automatic broadcast 240 Film Chain Camera and 4000A Multiplexer.

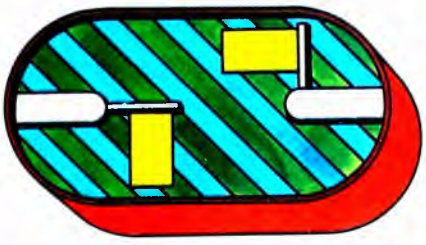
We have dozens more.

Money. We put the latest solid-state circuitry and some clever design techniques into the IVC-240 and the 4000A—not just to make them more reliable, but to give them the industry's finest price/performance ratio. Example: we use costly precision fixtures, like other manufacturers, to align the 240's dichroic mirrors. Unlike other manufacturers, however, we set the mirrors permanently in optical epoxy. The expensive fixtures stay here —but the precise optical alignment stays with the 240—permanently. Features like this hold the price of the 240/4000A combination to less than $30,000.

A free-standing camera cabinet. Ordinarily, if you accidentally bumped into a film-chain camera, you'd disturb the picture. But when the IVC-240's cabinet is accidentally bumped or nudged, picture positional stability, as viewed on a picture monitor, is virtually unaffected. The reason: the optical system and Vidicon/yoke assemblies are mounted on a separate rigid backbone that is lagged directly into the floor through the sheet metal of the cabinet. The effect is the mechanical isolation of optics and cabinet.

Money again: Having a single neutral-density filter wheel inside the camera for automatic white level is a special cost-saving bonus from the IVC-240. This unique arrangement can save you up to $4200 by eliminating the usual separate disc for each projector. The lightweight disc and high-torque motor, which are built into the camera enclosure, respond to light level changes up to 100 to 1 in 0.6 second (maximum). And typical changes are compensated for much faster.

An automatic black level circuit complements the automatic white level control. Result: hands-off operation—all day.



A better mirror system. The IVC-4000A's mirrors swing vertically, like the flag on a taxi meter. This approach makes it difficult for dust to settle on the reflective surfaces and provides a smooth on-air transition; the special tapered mirrors are positioned by self-braking motors in just one fifth of a second. Audio-follow logic is built into the system.

It makes your studio look nicer.

But we can't tell you all about the 240 and the 4000A here—there isn't room to talk about their minimal maintenance requirements, their exceptional stability, their hands-off operation, their automatic features. We suggest you write to Camera Product Manager at the address below.

We'll be glad to give you **all** the reasons why choosing IVC is a good move.

IVC

International Video Corporation

International Video Corporation
990 Almanor Avenue
Sunnyvale, California 94086
Telephone: (408) 738-3900

Circle 103 on Reader Service Card

tional marketing, under direction of John Steven, a veteran in video program production.

FCC Promises Early Rule On AT&T Net Rates

As this issue went to press, the Federal Communications Commission had not yet ruled on the AT&T request for lower rates for television transmission, although an FCC spokesman had predicted in July that the decision would come by "September 1 or thereabouts." In October 1972, AT&T proposed the lower rates in order to compete with independent microwave common carriers, with $55 per mile for 24-hour TV service as the new base rate. The rates charged by microwave common carriers, according to the FCC, range from about $42 per mile up to $58 to $60 per mile.

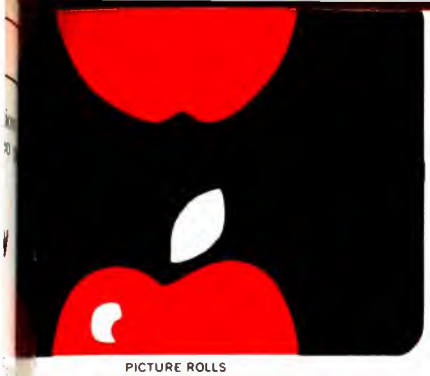
Marine Beat

Bill Hoffman at work off the coast of Massachusetts: his first-hand reports on weather, sea, and fishing conditions, safety hazards and other data useful to boatmen are relayed by Raytheon 25-watt marine radiotelephone to Station WHDH in Boston, and thence to more than a million people in the area.

New Way of Handling Linear FM Signals Promises Big Savings

An order-of-magnitude reduction in complexity as compared with existing

continued on page 10



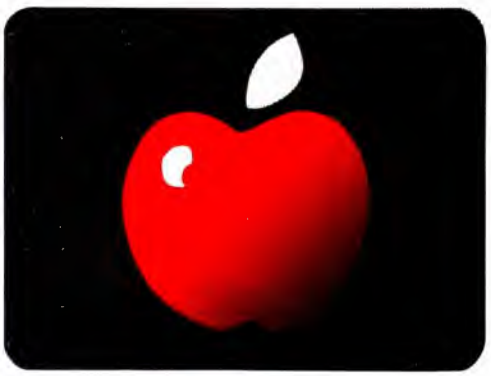
PICTURE ROLLS

TEARING

FLAGWAVING

HUE SHIFT

SKEW ERROR



COLOR STREAKING

How do you like them apples?

ike 'em or not, them apples show composite rrors in video signals which accumulate very time you use VTR equipment. Errors aused by changing tape geometries, varying ape speeds, fluctuating head velocities.

ut how do you get rid of the bad apples?

/ith a standalone Delta Series TBC from elevision Microtime.

)elta TBCs give you broadcast quality from very VTR — 2-inch "quads," 1-inch helicals, ¾-inch cassettes, ½-inch EIAJ — in mono-hrome, or direct or heterodyne NTSC color. nd you can get them with standalone or uilt-in velocity error correction.

)elta accessories convert V-lock VTRs to I-lock operation and add automatic skew ension correction to low cost cassette and IAJ VTRs. Our new full line brochure, *Meet he Compatibles,* describes over 20 different nodels . . . covers time base errors, the auses and the solutions. Use the coupon to end for your free copy. Or send for our pecial tape demonstration. We're available nytime to tell you how we can help solve ime base problems.

Dear Sir,
I want to know more about time base error correction and Delta Series TBCs.

- ☐ Please send me your new brochure: *Meet The Compatibles.*
- ☐ I would like to see your tape demonstration.
- ☐ I want to talk with one of your representatives. My application is:

_____

Name _____

Title _____

Company _____

Address _____

City, State, Zip _____

TELEVISION MICROTIME, INC.
1280 Blue Hills Ave., Bloomfield, Conn. 06002

Circle 105 on Reader Service Card

techniques for digital processing of linear FM signals will result from a new advance by RCA called the "step transform algorithm," according to an announcement from that company. The method will be combined with high-speed complex multipliers using silicon-on-sapphire technology for pulse compression, linear FM waveform generation, and synthetic aperture processing.

NAB Acts on Fees, Translators, Sports Blackouts, Cable Agreement

The National Association of Broadcasters recently took action on a variety of fronts, as follows:

- Petitioned the FCC to change the rules to prohibit construction of any FM translator that would put a signal into an area now served by a commercial FM station;
- Urged the Supreme Court to outlaw as arbitrary and illegal the higher annual fees on broadcasters which have been proposed by the FCC;
- Asked Congress to lift the TV blackout of at-home professional sports when all tickets have been sold in advance, while opposing diverting blacked-out games to subscription TV, or to cable systems that would carry the games into blacked-out areas;
- In a joint statement with the Association of Maximum Service Telecasters, asked for the fixing of CATV copyright fees by arbitration rather than legislation, charging that cable operators had failed to uphold their side of the Consensus Agreement of 1971.

Ockershausen New Chairman of NAB Board of Directors

Andrew M. Ockershausen is the new chairman of the Joint Board of Directors of the NAB, succeeding Richard W. Chapin, who had served two one-year terms. Mr. Ockershausen, a native of Washington, D.C., is vice president of the Evening Star Broadcasting Co. He was elected to the NAB Radio Board of Directors in 1969 and in 1971. He became the Radio Board's vice chairman in 1970, and chairman in 1971 and 1972.

Concert Music Stations Report 100 Success Stories

A study released by the Concert Music Broadcasters Assocation presents 100 advertising success stories from 13 concert-music stations around the country. Ray Nordstrand, president of WFMT, Chicago, who directed the project, said: "The study confirms our belief that classical music listeners are extraordinarily attentive, credible, and loyal. Their responsiveness is far out of proportion to their numbers." Among the highlights were two automotive campaigns that together produced a million dollars in sales: one for Mazda on WFMT, and one for Mercedes-Benz on New York's WQXR. Other highly successful campaigns covered travel, financial services, insurance and real estate, high fidelity, home appliances, musical instruments, furniture, food and beverages, fashion, recreation, business and professional services.

FCC Accepts Ring-Mount for License, Other Papers

In a letter replying to a request from Robert Gonsett, president of Com-

continued on page 12

for consistent colorimetry

Why all the splash about this newest feature of COHU's Model 1500 Color Film Camera? Instant Black Paint is the broadcast engineer's indispensable assurance for consistent video excellence and that's a resource of quality worth recommending. When film or source colorimetry requires refinement, COHU Black Paint allows the option of fingertip accessibility to program temporary adjustments. Convenience is the key and preset color balance is restored for normal operation by only the touch of a button.

The Model 1500 is already recognized as a popular standard for reliability and color fidelity. The addition of Black Paint is COHU's way of delivering to you the best in broadcast performance at no increase in price. You expect more from COHU, and you get it.

For further information, contact your local COHU Sales Engineer or COHU, Inc., Electronics Division, P. O. Box 623, San Diego, Calif. 92112. Phone 714-277-6700. TWX 910-335-1244.

COHU INC
ELECTRONICS DIVISION
SAN DIEGO CALIFORNIA

Circle 107 on Reader Service Card

NEWS

munications General Corp., the FCC has stated that the mounting of the station license and other authorization papers in a ring binder, fastened to the wall, will meet the requirements for public accessibility under Sections 73.92(a) and 73.264(a) of the rules. The FCC letter, dated July 26 and signed by Arthur H. Bernstone, acting chief, Rules and Standards Division, says that the papers will be considered "visible" under the rules, even though only one will be strictly visible at a time, and the viewer must flip through the binder pages to see others.

Marconi Improves Mark VIII Camera with "Super Yokes"

GEC-Marconi Electronics has announced an improvement to the Marconi Mark VIII color camera, consisting of new yokes that allow better registration performance. First deliveries of the new camera, designated Mark VIIIB, will be to Yugoslavia, where 29 cameras have been ordered as part of a 3.25 million-pound TV equipment purchase.

Duluth Station Aids Listeners With Pure Water

When asbestos-like particles in Lake Superior drinking water were declared by medical authorities to be a possible health problem, Station WDIO-TV, in Duluth, offered free water from its own deep well to area residents. During the first month of the offer about 10,000 people came to the station's well and took home over 50,000 gallons of water. General Manager Frank Befera said the well would stay open to all until the Lake Superior water was cleared for drinking, or until a permanent substitute was found.

CMBA Re-Elects Officers

The members of the Concert Music Broadcasters Association unanimously re-elected C.K. Patrick, WCLV, Cleveland, as chairman of the executive committee. Committee members serving again are Ray Nordstrand, WFMT, Chicago; Tom Bird, WNCN, New York; Richard Kaye, WCRB, Boston; and Henry Fogel, WONO, Syracuse. Added to the committee this year to represent middle-size markets was

continued on page 16

Collins broadcast equipment is priced competitively.

And that's where the competition ends.

We'll match our prices with competition anytime. But when it comes to quality, performance, reliability and service, Collins traditionally has been in a class by itself.

You can see the difference. You can hear it.

You get it in every piece of equipment we build. In our transmitters. In our consoles. In our antenna systems. In our programming equipment. In every piece of Collins equipment you use in your station.

And we back everything we make with a two-year warranty. Plus 24-hour, on-call service which means you get help when you need it.

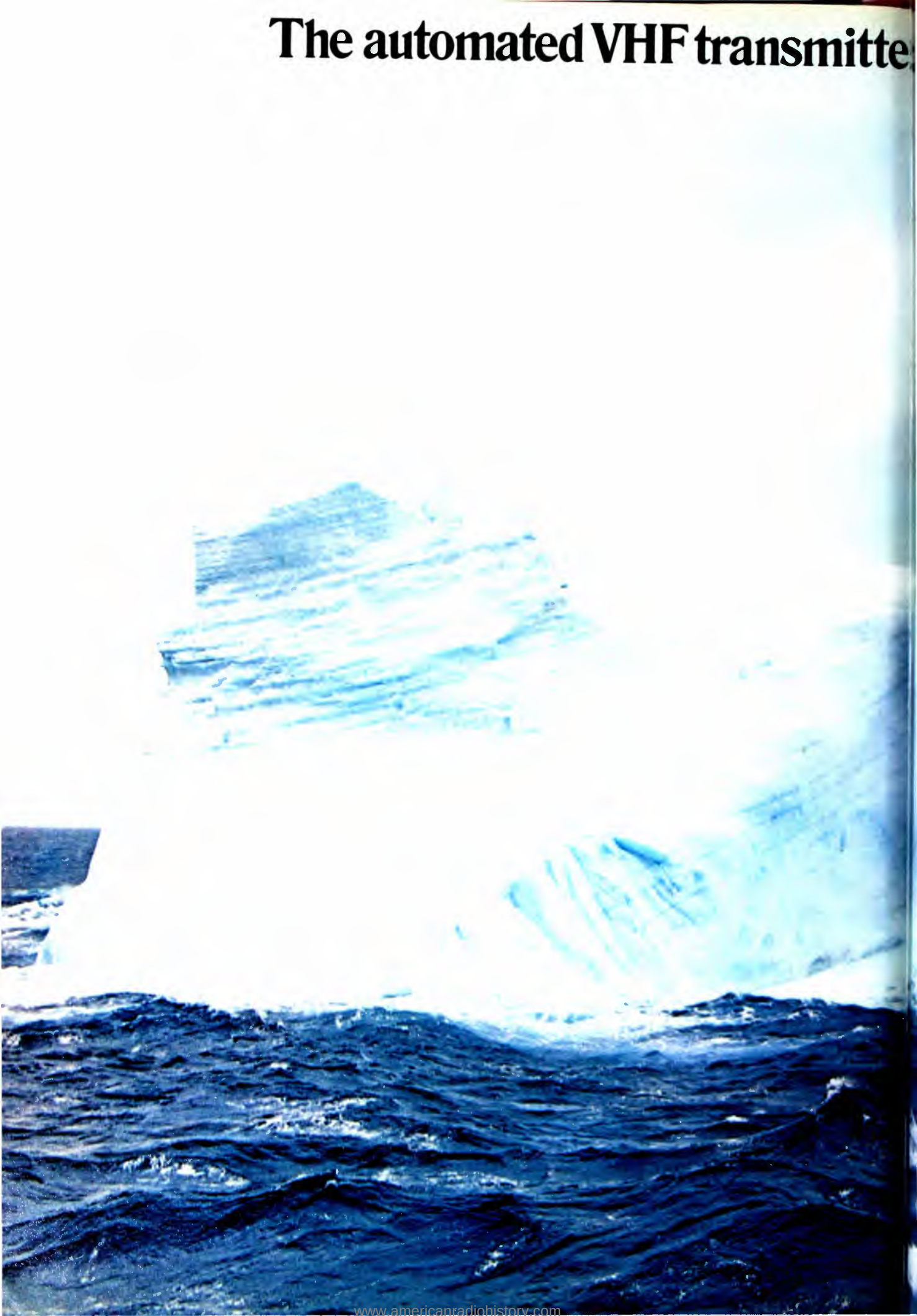
AM. FM. Stereo. Broadcast equipment from Collins. Competitively priced to give you the best sound on the air.

Collins Broadcast Equipment

COLLINS

Circle 109 on Reader Service Card

The automated VHF transmitte



The real thing...not just a remote possibility.

The entire "F" line of RCA transmitters is now tomated.

So they need far less operator attention.

Every tube not absolutely essential was designed t. That means fewer tubes model-for-model than any ner VHF transmitter.

We took out as many tuned circuits as possible. r instance, our totally solid-state IPA has no controls drift or adjust.

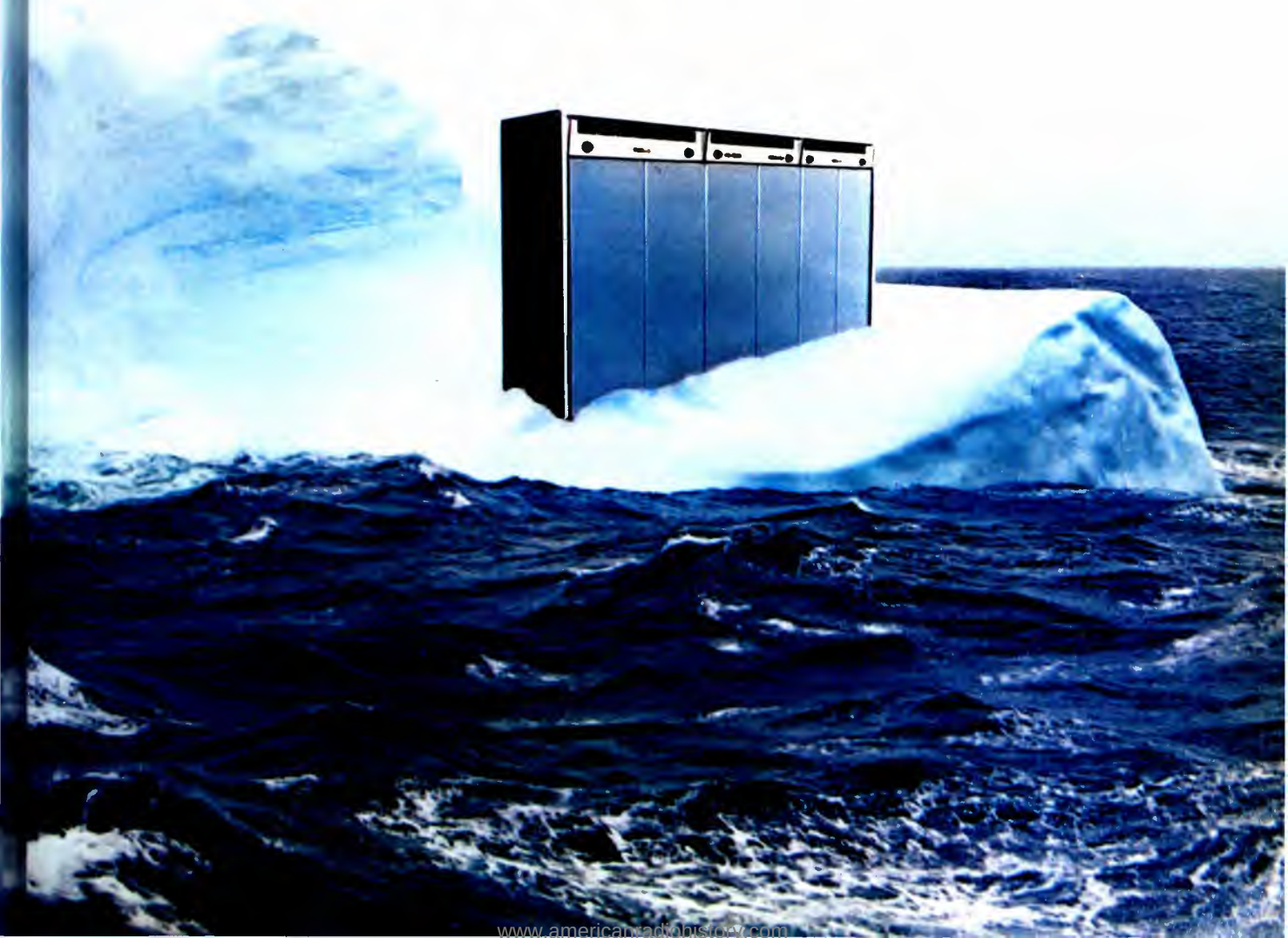
We deleted all the blowers except one. And that ols the whole transmitter.

Then we added automatic control of output power d sync level so you don't have to readjust power.

We topped it off by building in the functions you ed for complete remote control.

Result: transmitters that require less attention. herever they're stationed.

For further details, write RCA Broadcast Systems, dg. 2-5, Camden, N.J. 08102.
see your RCA representative. **RCA**



NEWS

Joseph Field, KLEF, Houston.

In other action, CMBA agreed to continue its fight to get more equitable music licensing fees from ASCAP

One-Time News and Public Affairs Get Blanket Prime-Time Waiver

Waiver of the prime-time access ruling, Section 73.658(k)(1), for one-time-only network news and public affairs programs, has been extended until after an overall decision is made on prime time (Docket 19622).

Canadian Electronics Firm Gets OK For Office in Poland

The Polish Government has approved the opening of a sales office in Warsaw by Conway Electronic Enterprises, Ltd., Canadian manufacturer and distributor of industrial and communications equipment, the first Canadian firm to gain entry to Poland. In making the announcement, Julius C. Conway, president of the firm, invited Canadian and other firms to use Conway for exhibition of their products in permanent displays at the showrooms in Warsaw. "We assess the Polish electronics market at many millions over the next five years," he said. Data: Conway Electronic Enterprises, Ltd., 88-90 Arrow Road, Weston, Ontario, Canada.

IBC Fixes Date For 1974 Meeting

The fifth International Broadcasting Convention has been scheduled for September 23 to 27, 1974, at Grosvenor House, London. As in earlier meetings, technical sessions will cover advances in all aspects of broadcasting and the exhibits will show equipment from manufacturers around the world.

NCTA Publishes Cablecasting Program Guidebook

The National Cable Television Association has published a guidebook to programming for cable, which includes lists of program sources, free and purchasable, data on programming techniques, studio techniques, equipment needs. Also covered are methods for programming community services, education, news, medical data, entertainment. Copies: $15 each to mem-

continued on page 18

bers, $30 to non-members from NCTA, 918 16th Street, N.W., Washington, D.C. 20006.

NSF Sets Up Office of Energy R&D Policy

Dr. H.G. Stever, director of the National Science Foundation, has established an Office of Energy R&D Policy, to provide an independent source of advice and analysis of research into energy production and usage. The advice is primarily for use by the Executive Office of the President, in particular the new Energy Policy Office. Named as director of the new office is Dr. Paul F. Donovan, with Dr. Paul P. Craig as deputy director.

People

Robert G. Giles won promotion to the position of marketing manager for Davis Manufacturing ... **Roger R. Busey** is manager of Anixter-Pruzan's southern office, Atlanta ... **George A. Voehl** was named northeast area sales manager for Cerro CATV cable division.

A. Norman Into was named president, **C. Robert Paulson** vice president for marketing, and **David E. Acker** vice president for engineering, all at Television Microtime, Inc. ... **James Opsta** is new midwest sales representative for International Good Music ... **Kirk Hollingsworth** is national sales manager for Anaconda Electronics.

George A. Livergood was promoted to be sales engineer for C-Cor Electronics ... **Donald T. Dolan** joined Goldmark Communications as senior project engineer ... **William R. Sinkunas** became vice president for corporate development of Warner Cable Corp.

Arthur A. Schubert, Jr. became chief development engineer for Neve Electronic Laboratories in Melbourne, England; previously Mr. Schubert was chief engineer for Rupert Neve Inc. at Bethel, Conn. ... **Hank Booth** was named manager of KLWN and KLWN-FM, Lawrence, Kansas ... **Patrick F. Hayes** was appointed manager of WIVY AM/FM, Jacksonville, Fla.

Price Correction

Incorrect prices were given in the McMartin ad, page 56, August *BM/E*. Correct price for the TBM-3700 is $1350; the TBM-2200A, $1400; TBM-2000B, $1275.

Financial Briefs

Digital Communications, Inc. had record sales of $877,772 for the six months ended June 30, 1973, up from $74,489 the previous year ... **Oak Industries, Inc.** reported sales of $58,128,138, for the six months ended June 30, 1973, and earnings of $1,193,761, up from $783,968.

Briefs

Greater Media, Inc. said that they would reprogram WHFI(FM) and WQTE (AM), Detroit stations recently bought, with Drake/Chenault Enterprises as consultants ... **WTAF-TV, Philadelphia,** will put out the most powerful TV signal in the country, 5 megawatts of ERP, with installation of new **RCA** transmitting equipment ... **Television Bureau of Advertising** reported a study of effects of advertising on shoppers in a major supermarket, showing far higher percentages of regular shoppers among those who saw or heard ads.

Cable Funding Corp., New York, has filed suit in a Wilmington Federal Court to enjoin Coaxial Communica-

continued on page 59

Filmchain Projection Simplified

The new Bell & Howell Model 562 optical/Magnetic Filmchain projector is delivered complete with a base which contains the projector controls and height adjustment to align the projector with TV camera or multiplexer. The projector is very much like the reliable 500 series design manual or read 16mm projector which is widely used in industry and education.

The Model 562 utilizes a synchronous motor, chain-driven film transport system including an automatic loop restorer to assist in providing picture and sound into the camera for transmission over closed circuit or antenna-signal distribution. The pedestal includes facility for easily installing remote operation from the control panel.

Other Features You'll Like

Optical or magnetic sound play back. Choose from a wide variety of standard lamps and Bell & Howell lenses to obtain the optimum lumen output to the camera. A special torque release lever is provided when using reels with small hubs.

Other Important Details

Projector reel arms are gear driven, which provides quiet, reliable operation and constant take-up torque. The "Stellite," 3-tooth shuttle and ground and polished aperture plate, provides careful film handling in the projector transport system.

Self-lubricated bearings and other fine engineering details provide long life. The 500 series product design is well known to the hundreds of Bell & Howell service stations across the country, providing a ready facility to service any projector when maintenance or repair is required.

A Final Thought

The instruction books and service manuals provide the details necessary for installation, both electrical and mechanical, as well as remote control. Contact Bell & Howell, Chicago, for technical literature and the name of the local sources who will help you select the best combination of lens, lamp and equipment to project 16mm films for TV program distribution or local display.

AUDIO VISUAL PRODUCTS DIVISION
7100 McCormick Road, Chicago, Illinois 60645

BELL & HOWELL

We simplify things. Life is complicated enough.

Circle 114 on Reader Service Card

INTERPRETING THE FCC RULES & REGULATIONS

Program Length Commercials

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

Having elucidated its position on program-length commercials in a February 22, 1973, "Public Notice"[1], the Commission has since admonished eight licensees for such broadcasts and has imposed forfeiture notices totalling $31,000.

This article treats three interrelated topics. *First*, an examination of the Commission's "Public Notice" is presented to familiarize broadcasters with the Commission's position on program-length commercials. Therein recent Commission actions are reviewed to inform broadcasters of the extent to which the Commission is monitoring this controversial issue. Second, in view of the numerous recent logging violation admonitions and forfeitures, FCC logging requirements for commercials are discussed.

Program Length Commercials

Working definitions of program-length commercials have been set forth in numerous FCC actions. Essentially, a "program-length commercial" is a program in which the commercial message of the sponsor is so interwoven with the entertainment or informational content of the program that the entire content of the program becomes an advertisement for the sponsor. In effect, the inherent nature of the program is transformed. In one recent case, a program which integrated explicit commercial messages into a narrative of tourist attractions in the immediate geographical area of the program sponsor's real estate development was determined to be a program-length commercial. The Commission found that there was "no difference between program content and the sponsor's sales message."[2]

The Commission has identified three basic objections to the airing of program-length commercials. *First*, the Commission finds that one of the basic tenets of communications regulation, i.e., broadcasting in the public interest, is "subordinated to broadcasting in the interest of salability."[3] There may well be program material that is informative and entertaining to the public, but if such material is subordinated to, and intertwined with, the explicit or veiled advertising programming, then the Commission views the entire program as "commercial" in nature. One case in point involved a program which featured "speed reading." It was argued that the program was of particular public interest because of its informative nature. The Commission rejected this contention, stating that the primary purpose of the program was to persuade the public to take the speed reading course. The entire program, including the informative segments, was classified "commercial."[4]

Second, the Commission, once reclassifying a program as totally "commercial," finds an additional problem. That is, such programs "almost always are inconsistent with the licensee's representations to the Commission as to the maximum amount of commercial matter that will be broadcast in a given clock hour."[5] Should the broadcaster unintentionally mislabel a program as "non-commercial," this contradiction of a prior representation to the Commission may constitute a serious demerit at the station's license renewal proceeding. Moreover, in another recent case (where no action was taken in view of post-violation but pre-hearing corrections), the Commission specifically instructed that information pertaining to the violation be considered in connection with the station's license renewal application.[6]

Third, the Commission also regards the high incidence of logging violations as a serious problem with program-length commercials. The broadcaster may not realize that subordination of the programming in the public interest will render the entire program "commercial" in nature. Therefore, program logs will reflect substantial periods of commercial broadcasting as being "non-commercial," thus violating Commission Rules. Indeed, logging violations have resulted in a substantial number of recent Commission actions involving program-length commercials.

OUCH!

A couple of well aimed bricks. A helicopter crash. Immersion in flood waters...

Caught up in the turbulence of news events as they happen, any camera—no matter how rugged—can get damaged. We ought to know. Our rugged CP-16 TV-news/documentary cameras have seen plenty of action around the world. And, of course, they do get damaged.

That's why we have established—throughout the world—a network of authorized dealer service centers, well stocked with critical replacement parts, and staffed with factory trained technicians. So that you can quickly get your "injured" CP-16 or CP-16/A camera to the nearest service center, in the USA or anywhere else in the world. And be confident that your camera will be quickly and expertly repaired and back to you in a short time. So you can get back to filming the action. Fast.

SYSTEM CP-16

WRITE FOR LISTING OF CP-16 AUTHORIZED SERVICE CENTERS.

cinema products CORPORATION

Technology In The Service Of Creativity

2044 Cotner Avenue, Los Angeles, California 90025
Telephone: (213) 478-0711 ■ Telex: 69-1339 ■ Cable: Cinedevco

Circle 115 on Reader Service Card

FCC Rules & Regs

In a recent action, the Commission admonished a station for broadcasting cinderella ranching programs a total of seven times within three and one-half months. The station's logs showed only 8.8 minutes of commercial time per show. The Commission having decided the entire program to be "commercial" in nature, found the station in violation of its program logging rules by not logging "0" commercial minutes per show.

In another case, a station logged 5.6 commercial minutes during two separate 15 minute art and music programs. Since specific announcements were made during the programs relating to the availability from the programs' sponsors of reproductions of the exhibited art works and recordings of the aired music, the Commission found the programs to be "commercial" in their entirety. Hence, for not logging the entire 15 minute programs as commercial, the station was found to be in violation of Commission logging rules.

In view of the host of Commission actions involving violations of "commercial matter" logging rules, a brief summary of what constitutes "commercial matter" follows:

Commercial Matter

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

Exceptions to the above classifications include:

(a) Promotional announcements, unless they fall into (3) above;

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

(c) Mechanical reproduction announcements;

(d) Public service announcements;

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

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

Furthermore, it is incumbent upon the licensee to make an entry denoting as close an approximation to the *time consumed* (duration of commercial matter) as possible. Notable exceptions to this requirement are *religious* and *political* sponsored programs. Because of the difficulty in measuring the exact length of "commercial continu-

shhhh!

DON'T MAKE A SOUND UNTIL YOU HAVE AUDIMAX AND VOLUMAX.

This is the team that quietly goes to work to produce a perfect sounding program. Audimax eliminates distortions like thumping, audio holes and the "swish-up" of background noises. Volumax prevents overmodulation and limits program peaks, permitting broadcasters to achieve maximum power from each watt of carrier power. Together, Audimax and Volumax produce a new excellence in sound control, increase audience coverage and amplify your station's profits.

CBS LABORATORIES
A Division of Columbia Broadcasting System, Inc.
227 High Ridge Road, Stamford, Connecticut 06905

Circle 117 on Reader Service Card

FCC Rules & Regs

ity" in such programs, the Commission does not require licensees to compute commercial matter.[7] The exception does not, of course, apply to any programs advertising commercial products or services, nor is it applicable to any commercial announcements.

Conclusion

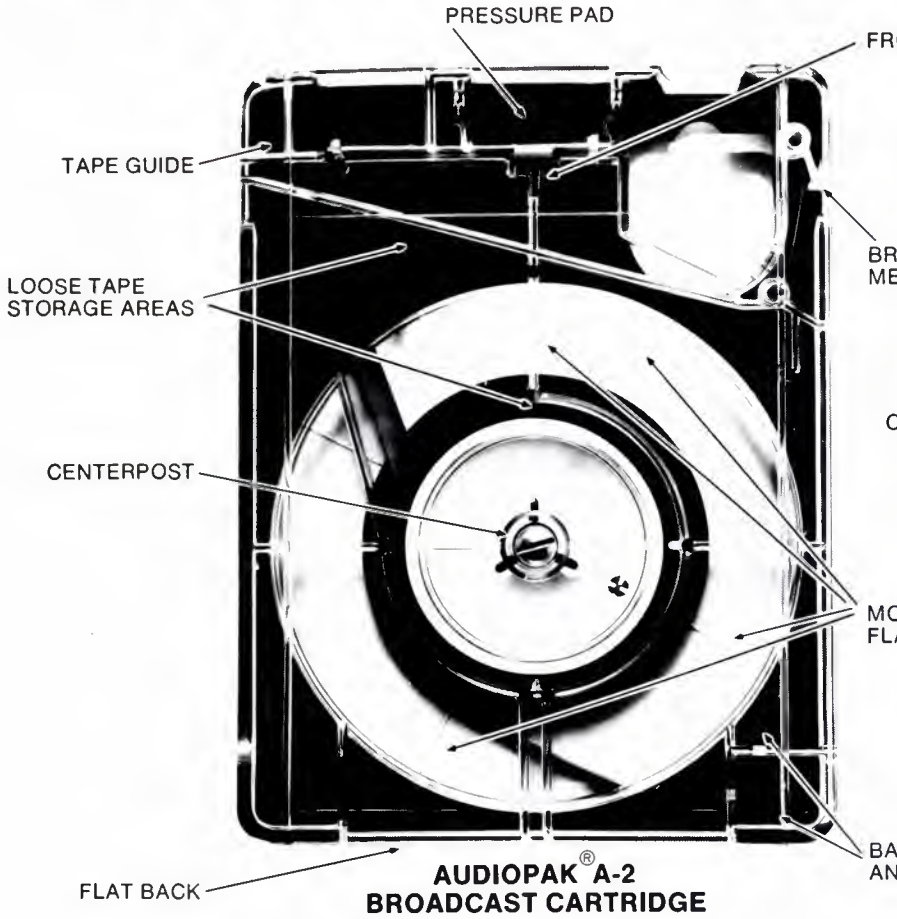
The Commission has imposed more forfeitures upon licensees for violations of commercial logging rules than for any other single category. Such violations are frequently the result of the broadcast of program-length commercials.

The FCC views the broadcast of program-length commercials as a "serious dereliction of (the broadcaster's) duty" and the Commission intends to consider the imposition of more serious sanctions in the future. Such sanctions may include 1) stiffer fines, and 2) increased attention to commercial logging violations and forfeitures at license renewal proceedings.

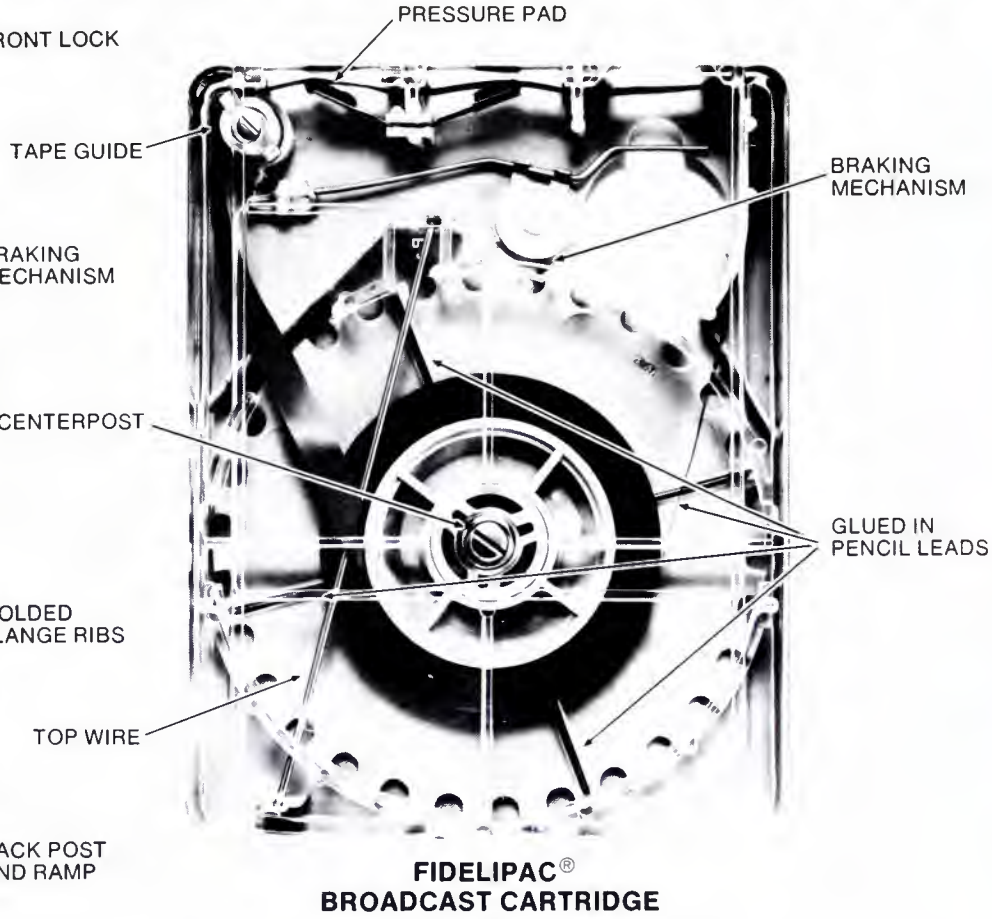
Broadcasters would be well advised to thoroughly familiarize themselves with the elements of a program-length commercial, and exercise caution in logging *all* commercial matter. **BM/E**

[1] *Program Length Commercials*, 39 FCC 2d 1062, 26 RR 2d 1023 (1973).
[2] *Columbus Broadcasting Co., Inc.*, 25 FCC 2d 56, 18 RR 684 (1970).
[3] *Program Length Commercials*, supra.
[4] *Multimedia, Inc.*, 25 FCC 2d 59, 18 RR 2d 687 (1970).
[5] *Program Length Commercials*, supra.
[6] *WFIL, Inc.*, 38 FCC 2d 411, 25 RR 2d 1027 (1972).
[7] *Report and Order*, Docket No. 14187.

YOU BE THE JUDGE!



AUDIOPAK® A-2 BROADCAST CARTRIDGE



FIDELIPAC® BROADCAST CARTRIDGE

For your most critical stereo requirements, ask about our "new" Audiopak A-2SP Stereo Phase Broadcast Cartridge.

FOR MORE INFORMATION AND A FREE SAMPLE OF THE A-2, WRITE TO...
AUDIO DEVICES, INC., A CAPITOL INDUSTRIES CO., 100 RESEARCH DRIVE, GLENBROOK, CONN. 06906 • MANUFACTURERS OF AUDIOTAPE,® AUDIOFILM® AND AUDIODISCS.®

Getting a perfect picture no

Picture quality is your whole show.

That's why we designed our AVR-1 to make your life simpler. To solve problems, not create them. To make the world's *best* recordings, and play back the world's *worst* recordings.

First, we made everything we could automatic. Goof-proof.

All the corrective adjustments for playback you'd make *manually* on lesser machines are made *automatically* on the AVR-1.

Playback standards selection, for example, is made automatically, whether it's high or low band color, or low band monochrome.

Automatic tracking lets you play back tapes with poor or missing control tracks—even tapes you thought were unplayable.

Fully synchronous operation is automatic. You make no adjustments to achieve full signal mixing capability.

Next we gave it the fastest lockup time of any VTR. 200 milliseconds. You get a fully framed playback in less than 6 frames, giving you "instant roll" capability. A "wild switch" is reframed in a fraction of a second, and is covered in black. Video is automatically restored when the reframing is complete.

Then we made it simple to operate. There are far fewer controls on the AVR-1. You don't need a graduate engineer to run it, because adjustments once made stay put. Just set the control knobs at unity and your AVR-1 is brought into a standard setup.

completely automatic

Record and play on 2-hour reels, greater program flexibility.
And for pinpoint editing, the new 1 Editec Accessory is now able. It lets you make single- inserts, move cue tones, and placement.
Finally, we wanted all this le, automatic performance to hine and outlast every other in the world. Today and tomorrow.
So we borrowed digital techniques the computer industry, to minimize effects. Integrated circuitry ed throughout.

We made countless design changes to speed and improve tape handling. Vacuum columns maintain constant tape tension, for example, isolating reels from the capstan to help achieve the 200 millisecond lockup. Tape rides on air cushions at all times. The tape shuttles so fast (0 to 400 ips) you can edit in a fraction of the time needed by lesser machines, saving you time and money.

We even eliminated the pinch roller and added a vacuum capstan to eliminate tape speed inaccuracies caused by slippage.

Goof-proof design and performance like this put AVR-1 in a class by itself.

It's the VTR that helps you *make* more money on the tube. Not throw money down it.

For details, contact your local Ampex Broadcast Sales Engineer or write for full information.

AMPEX

Ampex Corporation
Audio-Video Systems Division
401 Broadway
Redwood City, California 94063

Circle 121 on Reader Service Card

Getting a Top-Quality Audio Signal

Several chief engineers who are particularly committed to high-quality audio tell how they are handling noise, distortion, stereo phase errors, compression, etc.

It takes a combination of great care along well-established lines plus, in some cases, new kinds of equipment, to get out the kind of audio a top-grade station owes its listeners today, judging from the testimony of several chief engineers who are on the firing line because of their respective stations' public commitment to the "best sound."

Their problems are the ones everybody has:

- Noise, internal and external (see also the article on a noise resistant console, page 40);
- Distortion, including wow, flutter, and rumble in studio reproducing equipment;
- Stereo phase errors;
- Well-balanced equipment combinations;
- Perhaps the toughest of all: finding the right balance between compression and signal-to-noise on the air.

Most of the stations in *BM/E's* survey are members of the Concert Music Broadcasters' Association and, as such, are certainly not typical of AM or FM stations around the country in small markets and large. By the same token, however, their experiences are especially pertinent to efforts to maintain and improve audio quality, whether an engineer wants to go all the way or only part way along the "best-audio" route.

The most basic good-audio rule of all needs only a mention here: being sure, at all times, that the level at the input to each unit in the line is far enough below the overload point for low distortion, but high enough for a good s/n ratio. That familiar fundamental of good audio behavior depends, first, on a layout with amplification and attenuation so distributed that right levels can be maintained, followed by eternal vigilance to see that they *are* maintained.

Choice of good audio units is another basic mostly taken for granted in the responses to *BM/E's* questions. We report the few cases in which specific units were praised.

Ronald Schacht, chief engineer of WYZZ, Wilkes-Barre, Pa., has carried out a number of experiments with the Dolby "B" system in the attempt to cut noise. Listener reaction depended on the kind of receiver owned. People with high-grade FM receivers (a fairly large proportion of WYZZ's audience) got a too-sharp hissy sound, as would be expected. People with low- to moderate-quality receivers, probably the majority even with a "good-music" station, often liked the improvement in highs. People with Dolby "B" decoders, of course, got the best results: a noticeable drop in noise when they were on the fringe of the station's coverage. But Dolby-equipped receivers are still so few that the engineer, Schacht believes, has a tough decision on Dolby at this point. He must balance the degradation for the top-grade receivers (an important constituency for the good-music station) against the improvement for others.

Schacht pointed to the turntable preamplifier as the often overlooked site of distortion of several kinds. Some of the best-known preamps, he points out, tend to overload at fairly common pickup output levels, and several also have frequency-response errors, with some loading conditions, too large to be tolerated. After seven or eight changes, he got good results with a unit not usually thought of for professional use: the Dynaco PAT-4. Completing the station's disc-playing line are the RCA TU-50 turntables and Stanton 681EE stereo pickups.

Schacht agreed with some other engineers on another practice: developing the composite stereo signal right at the studio, and sending it to the transmitter via microwave, in this case a Moseley STL unit. WYZZ prefers this to sending audio over dual telco lines, for the avoidance of a variety of noise and distortion problems.

Parenthetically: those problems *can* be controlled, of which more in a moment.

Schacht also spoke about the compression-dynamic range confrontation. WYZZ is an MOR station during the day, and uses heavy compression, plus limiting, with Audimax and Volumax units in the line, to good effect. At night, WYZZ becomes a "classical" station and night listeners have complained specifically about the loss of dynamic range when a lot of compression is used. Thus the compression is reduced at night.

But that is not a totally satisfactory approach because of the obvious loss of signal/noise ratio, which is the bind practically all the good-music stations complain about.

At WCRB, Boston, chief engineer Kevin Mostyn has an especially tough problem on maintaining dynamic range because of SCA service to a large number of customers in the area. Since the SCA programming is background music, it must be compressed quite tightly to function properly. But, as one of the longest-established good-music stations in New England, WCRB must

Turntables are a problem. Expensive ones aren't necessarily the answer. Meyer Godesman, chief engineer at WTMI (Miami), finds the $370 Technics SP-10 (Panasonic) outperforms many.

ve classical listeners the best possible shake on dynamic nge and so uses a much lower compression setting on e regular stereo programming.

Related to compression settings are leak-through prob- ms between the two services. Mostyn finds the CBS olumax, with its variable treatment of high frequen- es, something of a help on this.

He freely admits, as do all the other engineers inter- ewed, that compression settings are at best a com- omise for the good-music station. (All-rock and MOR ogrammers have much less of a problem here.)

WCRB puts the Boston Symphony on the air live ery week during the season (of which more in an companying article), and has found it highly desirable use a Dolby "A" encoder at the input to the telco es at the concert hall, with decoding at the studio end the lines. This gives them 10 dB more margin over line ise and, Mr. Mostyn says, they could hardly do with- t that 10 dB improvement. Not only are the concerts t on the air, but they are recorded for distribution to any good-music stations around the country.

The same technique obviously could be used on lines om studio to transmitter, although line noise is likely be less of a problem here. But John Gable, head of dio for WABC's New York station and for owned dio and TV stations around the country, emphasized e old wisdom about studio-transmitter telco lines: n't hit them too hard; stick to the rating level of +8 in ost cases. And, as others have also emphasized, he vises that you *always* check out a telco line for distor- on at a level of +18 (giving you around 10 dB for aks, little enough in most music). The telephone com- any, says Gable, will fix matters pretty fast if a line esn't check out. But Gable agreed with WYZZ that, hen possible, a station should send a composite signal om studio to transmitter via microwave, as in most ses it's subject to fewer audio problems than a pair of lco lines.

At WRR-FM, Dallas, Dave Hultsman, technical direc- r, uses Marti CLA units to provide a modest 6 dB of mpression, which has seemed to satisfy the station's ery faithful good-music constituency quite well.

He has gone to considerable lengths to avoid another roblem too common among the good-music stations: oor turntable performance. Anybody who listens to rious music on FM fairly often has been shocked by rntables that flutter or rumble unmercifully. On the me station, on other occasions, the turntable in use ay perform reasonably well.

This is undoubtedly in large measure a maintenance roblem, but it is obviously to some important degree a hoice-of-equipment problem: in the opinion of *BM/E*, oor turntables are among the most frequent offenders gainst fidelity in FM broadcast studios.

WRR-FM has chosen the EMT tables, very expensive ut also very good. To keep out of the tables vibration om a 25-hp air conditioning compressor and other ibration sources in the building, the tables are mounted n sand-filled pedestals, built with particle board that is ighly damped by its construction, reducing resonant sponses. This "extreme" approach cleans up the bass nd allows a strong bass to be put out with a good ignal/noise ratio.

Interestingly enough, another good-music station, KHI in San Francisco, has gone much the same route n turntables. Chief engineer Fred Krock puts his EMT tables on cabinets, each of which holds 300 pounds of sand and stands on a sandwich of plywood and carpet to isolate the whole assembly from floor vibration. With that much weight, the cabinet-plywood assembly forms a mechanical low-pass filter with a cut-off frequency so low that most building vibration is blocked out of the turntable. It is a long-known approach easily adapted to local needs by any engineer with building-vibration trouble: one form of such a sub-subsonic filter often used in the past is a sheet of marble for the turntable mount.

Mr. Krock's handling of the compression problem includes the maintenance of about 30 dB of dynamic range in FM broadcasts, using Volumax and Audimax units in the audio line. He says that a wider range has resulted in complaints from listeners that they have to turn volume up and down, which is basically a *noise* problem. But he thinks there must be a lot more people with Dolby decoders out there before it will be useful to start encoding at the transmitter end.

In a broadcast set-up that will not be duplicated by many other FM stations, Mr. Krock had a severe stereo phase problem—and the solution seems useful for more usual occasions. A year ago, the station picked up the San Francisco Symphony *live* from Paris—that must be a one and only—using two satellite circuits for the two stereo channels; differential phase shifts were at a fearsome level. The Garron Phase Enhancer, says Mr. Krock, pulled things into usable shape for them. (KKHI's live quad and stereo broadcasts get more description in the accompanying article.)

To get an independent view of the compression-limiting problem, *BM/E* had a talk with Eric Small, who has been chief engineer of several good-music stations and is one of the widest-known authorities on audio in broadcasting. He is currently in business for himself as a broadcast audio consultant, with headquarters in New York. Small puts the problem into perspective this way: *compression* is necessary in good-music FM radio because there is only about 34 dB of "room" in the system and most recorded program sources used by a "classical" station have a much wider range, 40 dB and up. *Limiting* is also necessary because of the preemphasis curve in FM radio. That is essentially why compression-limiting in stereo FM is a "least damage to the music" problem. Mr. Small likes what he calls the "non-brutal" compression of the UREL-Telectronic unit, if a skilled operator is on hand to ride it a bit. He thinks the limiting problem requires the addition of the CBS Labs Volumax.

For a stand-alone unit (no operator), he likes the EMT 156, when properly set up for the station's format. He himself, after a number of years at "classical" stations, is now working in the main for Top-50 and all-rock stations in his consulting capacity. He points out that a "progressive" music station, because of the wide variety of musical styles covered, may present the most difficult compression-limiting problem of all.

And he points to the experimental Dolby "B" unit, which in effect reduces the pre-emphasis from 75 to 25 microseconds, as possibly (if the claims for it prove to be sound) the most hopeful recent development, since it will greatly reduce or eliminate the need for limiting, while improving the signal/noise relation substantially. The Dolby system is now in experimental use by several stations, and hopefully an assessment of its success will be available fairly soon. **BM/E**

Music on "Live" Stereo FM Is Alive and Well

Recorded music is the sole music source, or nearly so, for most stations, and is the major source for even the exceptions to this rule. But the exceptions, few as they are, preserve the glory of live music on stereo FM.

The logic, technical and economic, of using recorded music as the main program source for FM stations is far too strong today for any large counter-trend to live music to get underway.

But live music lives, in occasional programs on many stations, simply because it is too exciting to die. The magic is always there so that, when the circumstances are right, the alert station management will pick up the chance for a one-time ride.

In addition to these scattered programs, a handful of stations continue to put on fairly regular live programs of great significance and reward for the musically-literate listener. In the following, we describe recent activities of several such stations. There are a number of others that should be included, but information was not available at press time: we will take note of them in future issues.

In San Francisco, KKHI and KKHI-FM, among the leaders in "good-music" in the country, have for several years put on quite regular live broadcasts of the San Francisco Opera Company and San Francisco Symphony, during the seasons of these organizations. This year, through a grant from the Standard Oil Company of California, KKHI will broadcast opera performances—one of each of the season's productions.

On FM the broadcasts will be in live quad, using the SQ system. The quality of sound that KKHI gets from its live pickups has amazed and excited San Franciscans, on both FM and AM. That quality comes in large meas-

Quad is Hanging Fire

As was evident at the NAFMB meeting last March (*BM/E*, June 1973), a sizable number of FM broadcasters have had considerable boosts in sales and audience interest from using quad (matrix form, of course). But station managers recently polled by *BM/E* divided in roughly equal numbers between those working with quad and those waiting it out for the EIA's National Quadraphonic Radio Committee, and then the FCC, to specify a system —a two-step process that will take a couple of years.

Meanwhile, Columbia is pushing hard to win the field by establishing squatter's rights for the SQ process. It *is* available for immediate use, which means that the FM broadcaster need only be convinced it is the right method.

A large number of FM receiver manufacturers are incorporating SQ decoders; the audience is already large. The broadcaster can adopt SQ now with the possible necessity of going to a different method when and if the FCC finally acts.

Columbia has further pushed the "ready now" image by removing SQ from consideration by NQRC, on the ground that it is a going system that does not need FCC approval for use. The counter argument of proponents of "discrete" systems is that, if a matrix system becomes the de facto standard by coming into general use at both the broadcasting and receiving end, an irrevocable "decision" has been made and no other system can later be adopted, even though it may be judged superior. Since the quad decision will be binding, whether made by commercial conquest or regulatory action, we had better be sure it is right, say the "let's wait" voices.

It is possible, however, to envision a third outcome: fairly general use of a matrix system now, which will educate the public to quad listening, with a "discrete" (or other) system adopted later after thorough testing. The changeover at the broadcaster's end would probably entail minimal investment. At the receiving end, we run into the moot question of whether or not the incorporation of *another* decoding system is economically feasible: it may be out of the question, but a technological breakthrough might also change that picture completely.

NQRC has announced a six-panel program to evaluate all aspects of the quad broadcasting systems that have been put forward. The panels will consider, respectively: system specifications; interconnecting facilities; broadcast transmitters; broadcast receivers; field tests; and subjective aspects. The effort is being directed by a steering committee, with altogether about 150 people involved.

As this was written, and with the removal of Columbia's SQ, there were six systems before the committee: those of Dorren, General Electric, RCA, Zenith, RPM, and Cooper.

The panel on the subjective aspects is reported to be highly active, with a series of tapes of program material developed especially for the analysis. Listeners of a wide range of musical sophistication are judging discrete and matrixed reproduction for pure preference, for directional accuracy, and for general fidelity. The tests were in full swing as this issue went to press, and the results were being kept confidential at that time.

Technical work continues on all quad fronts. A patent, number 3,746,792, covering matrix systems in very general terms, recently issued to Peter Scheiber, will be available to the Electro-Voice/Columbia consortium and seems likely to strengthen their hold on the matrixing field (if that needs any strengthening at this point). This is Scheiber's second patent in the field; the first one, number 3,632,886, helped give the SQ and Electro-Voice group its original platform.

Scheiber and CBS Labs have also recently demonstrated what they describe as improved decoding circuitry to bring results, they claim, very close to those of discrete systems. Although still in the experimental stage, this decoding technology may have important results at a later date.

e from the dedication and microphone expertise of ed Krock, chief engineer at KKHI. He has studied the ll thoroughly, for both opera and symphony, and veloped mike techniques that preserve the "live" und to a high degree.

Music critics and dyed-in-the-wool symphony goers ke praise the radio sound highly. Even though the namic range on radio must be much less than that of e reality (see article on page 28), the sense of the tual that excellent microphone technique can create at ive pick-up can be musically enthralling.

On the East coast, WCRB in Boston puts on a somehat similar series of live broadcasts of the Boston mphony, from one of the premier acoustic environents in the world, the famed Boston Symphony Hall. ere, too, the "original" pickup is in quad, and it is not ly put on the air directly (through SQ), but also taped r distribution to many other stations. WCRB does a ice-a-week SQ broadcast of at least three hours, in dition to the symphony broadcasts.

Also as in San Francisco, the WCRB live broadcasts ve a fanatical following of music lovers. In cooperaon with WGBH, WCRB put on experimentally a "discete" two-station quad broadcast of the orchestra in ptember 1969, and has been fairly regular with maxed quad in recent years, as noted in the foregoing.

One of the oldest and best-known of the sponsored ious music programs, the Texaco Metropolitan Opera ries, will for the first time reach stereo FM stations live this winter, in addition to going to its long-established 200-station AM network around the country, and to the CBS network in Canada.

RCA announced recently that two new consoles from that company would be installed at the Metropolitan Opera House to allow mixing of the opera programs for simultaneous carriage on the monaural and stereo networks. Each console has 18 mono and 28 stereo inputs allowing for virtually any microphone array the broadcast engineers may devise for the pickup.

The cities that will get the FM stereo broadcasts this coming season are New York, Boston, Philadelphia, Baltimore, Washington, and Hartford.

Three outstanding live stereo broadcasts carried out recently in Washington belong more to the "occasional" than the "regular" category. Jazz Unlimited, an impresario-type organization in Washington, sponsored three jazz concerts in the American Theatre which were picked up by National Public Radio and aired over Washington stereo stations WAMU and WETA. The programs also went live to all 158 stations of the public radio network, using in the main AT&T lines around the country. The Washington consultant firm, Audio-Video Concepts, aided in the technical planning for the pick-up of the concerts, which were outstanding successes with NPR listeners across the country.

Maybe we are seeing a minor trend develop. If it increases the quantity of live music on FM by only 50%, we will be richly rewarded. **BM/E**

Pushbutton Audio Sync Speeds Video Post-Production Work

rans American Video reports high efficiency with 3M Audio Synchronizer.

a little over two years, Trans American Video of ollywood has become one of the largest independent deotape program production companies in the world. n essential part of the firm's efficiency in post-production work, the management reports, comes from their M Series 79 Synchronizer and Audio Recorder.

Jack Calaway, manager of post-production engineering, says: "Our editors are delighted. It's so simple to use nd does the job the way they want it done to the point hat they almost forget it exists."

The use of the Series 79 arrangement, Calaway stresses, has provided more efficient operation and lower osts. "Before, a man had to listen to the audio track nd manually control the speed of the video machine ntil the two tracks were in sync. It was slow and only s reliable as the operator's hearing. In addition, there ere other problems. You couldn't go into the black receding a segment and pick up, for example, because here was nothing to sync from. With the new set-up ith the SMPTE edit code on both video and audio pes, it's a different situation.

"In our usual approach at present, a show is edited totally and any synchronized dialogue is transferred across so that we end up with an audio track and a time code track. These are transferred to an 8-track machine. The client and the audio man then work over segments of the show, adding desired material such as applause or other sound effects. With the 3M equipment, it's possible to stop and start at any point on the tape and still achieve absolute synchronization. We keep doing this until all desired effects are added to the master 8-track. Then the same machine is used to put everything back in sync at the head and we do a mixback to the master video tape to produce a finished, sweetened track.

"If the operators blow any part, they don't have to go back and do the whole show over as they did before. And we can do this going off line using one-inch tape machines instead of the two-inch units required with conventional production methods. Getting away from the two-inch machines frees those units for other work but, more importantly, it can cut the cost of sweetening by one-third."

In the TAV bay in which the Series 79 is used, the audio booth is outfitted with a Philips console. All the

Sound mixer adjusting control on the 3M series 79 recorder. The Synchronizer/Reader unit is on top of the Philips audio mixing console.

Close-up of the Synchronizer/Reader which provides the capability of synchronizing audio with video.

peripheral equipment is Ampex, including ¼- and ½-inch tape recorders. The bay is equipped with echo chambers, sound effects filters, etc. As to the 3M recorder, Calaway says, "The audio quality of the Series 79 machine is superb." The machine is used with either an Ampex VR2000 or AVR-1 video recorder.

In a typical operation using the Synchronizer/Reader, a program log vs. edit code provides the data for the search operation. The display pushbutton on the Synchronizer is activated so that the master code is shown on the Code Reader. The operator uses the master code as a guide to run the VTR controls until the video tape is parked just ahead of the desired program material. The display button is then pushed to switch to the audio tape which is then parked just ahead of the program segment. The digital display permits parking either the audio or video tape within ±30 seconds of synchronism. With a little practice, the operator can use the display to park the tape as close as one second from synchronism.

The Synchronizer is enabled by pushing the proper button, which also causes the enable light on the control panel to go on. When the VTR is started, the master code is applied to the Synchronizer (turning on the appropriate panel light), starting the audio machine with the Synchronizer in the "address" mode. The slave code then is applied to the Synchronizer, turning on the slave light, and when both codes are present, the speed control signal is sent out to change the audio tape speed into sync with the master address.

The frame offset meter indicates the status of the tapes, converging on zero as the two are synchronized. When absolute sync is achieved, the Synchronizer switches to the "flywheel" mode, actuating the flywheel panel light. The changeover to the flywheel mode is performed in order to hold the absolute sync with minimum vulnerability to code disturbances and maximum uniformity of tape speed. The switching operations for the two modes are handled by the Code Difference Converter.

In the address mode, the specific digital edit codes for audio and video are aligned by means of a Code Difference Detector in the Converter circuitry. When the addresses are identical for four consecutive frames, the Synchronizer automatically switches to the flywheel mode. In this mode, the Converter extracts its data from 30Hz signals derived from the codes. These signals are phase locked to the code so that errors are not accumulated. Choice of these signals is based on minimum vulnerability to dropout, the generation of smaller errors when dropouts occur, and immediate phase recovery on the next frame. The flywheel mode is designed to maintain the slave tape speed exactly matched with the master tape speed so that no relative drift occurs even over hours of program length.

If all is in order when the operational stage is reached, all the monitor lights on the Synchronizer are lit. If desired, the two programs can then be offset by means of designated buttons and the frame offset meter. A set of buttons permits offsetting the slave tape either to leading or lagging position. Normal synchronization can be restored by pressing the mode button.

In the present system, the operator stops the VTR manually when the end of the program is reached. The master and sync lights go off as soon as the VTR is stopped, and the audio deck is turned off automatically a brief time afterward. The Synchronizer is automatically preset to the address mode for the next synchronization.

As the foregoing indicates, in the current TAV installation, the audio operator parks his tape within a few seconds of the desired address and then tells the video man to roll his machine. TAV is happy with the results, but is looking forward to the next generation in which the operator sets the desired location into the Synchronizer and the machine does all the tape correlation automatically. The system is designed in the form of two black boxes, a Synchronizer and a Reader, so that the upgrading can be done by replacing only one box.

At the moment, only one of TAV's three editing bays is equipped with the 3M Series 79. It seems likely that at least one additional bay will have a Synchronizer when the company moves to its new plant in Burbank, Calif.

The future significance of a system like the Series 79 is considerable, Calaway points out. "The process of videotape editing is 90% decision making. The amount of time you spend on this is greatly influenced by the time cost. At a typical rate of $300 an hour, it's obvious editing must suffer. By comparison, film people for years took one man and an inexpensive Movieola machine and put a great deal of effort in every cut because of the low cost.

If the tape industry is ever to replace film—and I have a feeling it will eventually—it will be due to techniques like these.

"We haven't gotten the editing costs for tape all the way down to film costs yet, but we are beginning to reduce them enough so that a client can make cut decisions at a dollar value he can afford." **BM/E**

Require Accuracy?

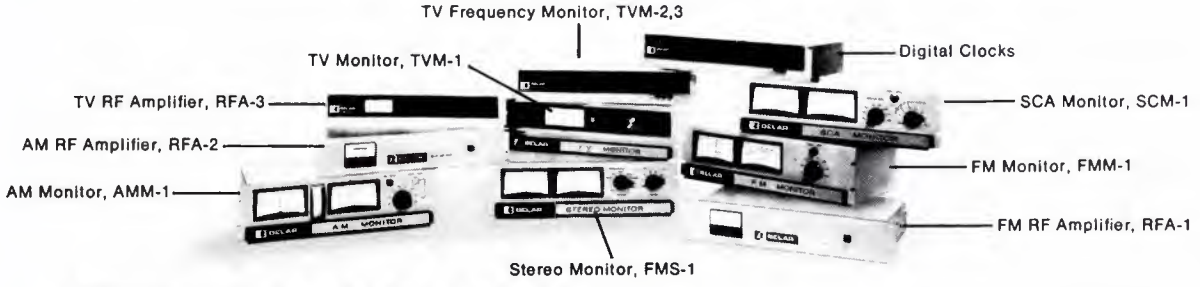
(and peace of mind)

then buy Belar

Here's why:

■Separate 100% negative modulation peak indicator lamp—*detects the absence of carrier on program peaks for a true 100% negative indication.* ■Normal peak indicator lamp may be set to +125% —*an accurate measurement to keep you within FCC modulation limits.* ■Built-in true modulation calibrator —*means that you can check the modulation calibration at any time.* ■ True peak reading modulation meter—*switchable to read either positive or negative peaks, to accurately measure the short duration program peaks encountered in today's programming.* ■ Expanded scale carrier level meter—*allows the accurate measurement of carrier shift.* ■ Extremely low distortion demodulator—*permits accurate proofs at 100% modulation as well as accurate measurement of program peaks.* ■ Built-in off-frequency alarm drivers—*permits unattended measurement of frequency—alarm alerts you to any off-frequency condition.* ■ Digital counter circuit—*will measure any standard broadcast band frequency spaced 1kHz.* ■ Built-in ±20 Hz frequency calibrator—*allows you to check the calibration of external equipment such as automatic loggers.* ■ Built-in carrier-off alarm—*tells you when the transmitter is off.* ■ Off-air monitoring with the addition of the RFA-2 RF Amplifier—*wide range AGC means hands-off operation at the studio.* ■ 100 μV sensitivity with RFA-2—*handles the most difficult receiving problems with ease.*

For further information call or write today.



BELAR
ELECTRONICS LABORATORY, INC.
LANCASTER AVENUE AT DORSET, DEVON, PA. 19333 • BOX 826 • (215) 687-5550

Where Accuracy Counts . . . Count on Belar

Circle 158 on Reader Service Card

Keeping Audio Clean—Intermodulation Distortion Testing Up-To-Date

Of the main methods for detecting and measuring distortion, the intermodulation method (SMPTE), provides the most adaptable and accurate service over a broad range of checks.

Intermodulation distortion testing of audio equipment by the SMPTE method, since its introduction quite a few years ago, has had a respectable niche in the audio technology and has been considered essential in much audio design and lab work. But many engineers in radio stations have tended to depend on what seems a quicker, simpler method: the notch-filter test, with the fundamental test frequency filtered out and the harmonics over a wide band measured to indicate total harmonic distortion. Excellent instruments are available for this standard THD method, the cost of which goes up in almost direct relation to the precision provided.

More expensive, and much more revealing, is a top-grade spectrum analyzer. This can, of course, be added to other methods for detailed information on the distortion products. Or it can make various checks alone, usually with medium-high accuracy, depending on the circuit facilities provided.

Recently, however, a number of sources have provided data that brings SMPTE intermodulation distortion testing thoroughly up to date. This has put the IM method to the fore as probably the most adaptable and accurate for all-around work by the radio broadcast engineer.

The long-familiar basics can be stated in one sentence: two signals, one high and one low (60 Hz and 7 KHz could be the values), are applied to a device under test, and filters remove from the output of the device first the low frequency and then the high, so that the meter can read just the cross-modulation products which are clustered fairly near the high frequency.

The engineering literature contains, of course, a large quantity of material on IM testing, and every manual has a section on the basics. But, to take a recent example, the manual provided by Crown for their IMA Intermodulation Distortion Analyzer provides unusual completeness and compactness in its discussion of basics, together with a very wide range of thoroughly documented application guides. From this and many other sources, it is evident that the great *variety* of distortion conditions arising in different types of equipment may be surprising to those who have depended on standard manual discussions of the method.

No method of checking audio distortion is perfect, and each has an area in which it works best. But considering a broad range of the most usual audio checks that broadcast engineer will want to make, the notch-filter method has the following disadvantages:

- The *numbers* found do not consistently correlate with *offensiveness*, because of the well-known fact that harmonics are not always aurally objectionable;
- The measurement is very vulnerable to pollution by frequency instability in the device under test, such as wow and flutter in disc and tape equipment;
- The method does not check the very common distortion arising from interaction between signals at widely separated points in the spectrum;
- Today the method very frequently measures *noise* rather than distortion, because the distortion level in top-grade audio units, particularly amplifiers, has fallen into the noise range in many cases;
- If the engineer wants a reasonably complete checkout at different signal levels and frequencies, he is faced with a very long, tedious series of measurements with a whole flock of opportunities to make mistakes;
- Very high accuracy in notch-filter equipment is expensive.

We can speculate that the notch-filter method has kept its popularity for routine audio checking because it is simple in setup, there is a lack of adequate competition from other methods in terms of easily-used equipment at reasonable cost and high quality, and the hi-fi "numbers game" is better played with the lower numbers commonly found in harmonic distortion testing.

Intermodulation testing eliminates the most basic objections to the notch-filter method by measuring the distortion products fairly close around a high-frequency caused by modulation by a much lower frequency—7 KHz and 60 Hz are typical for high and low.

Since these sum- and difference-products are far more discordant than the harmonic series, the numbers coming out of an intermod check are much more likely to correlate with the ear's assessment of the quality.

Moreover, an intermod analyzer can be designed to be quite immune to frequency instability (the filters do not have to be ultra-narrow). Further, since the *measure-*

continued on page 36

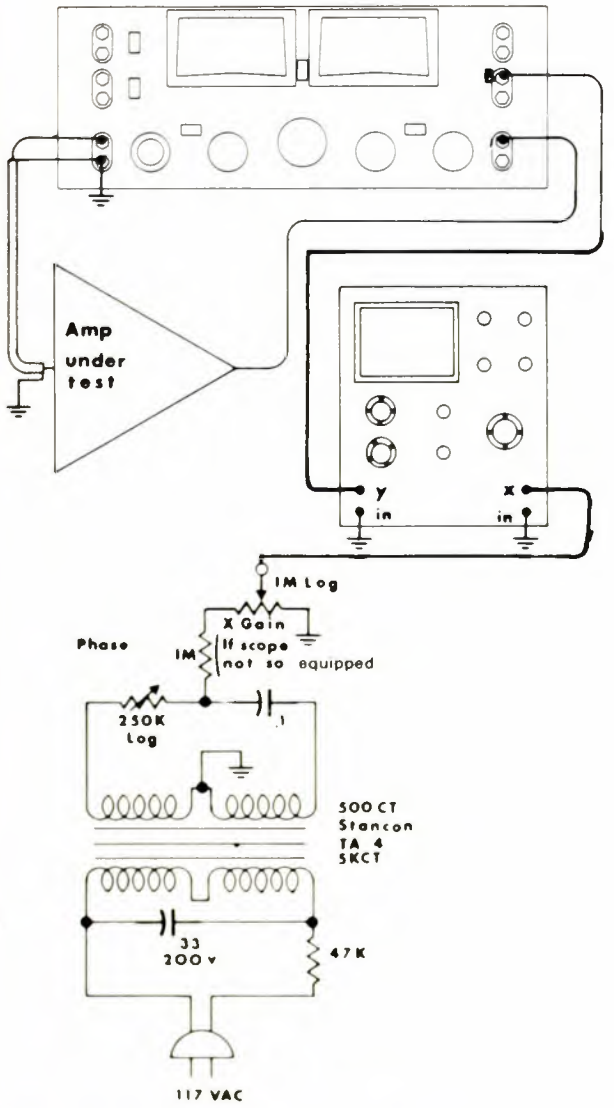


Fig. 1. Scope display method to show gain change versus output of device under test with Crown IMA Analyzer. *(All drawings courtesy Crown International, Inc.)*

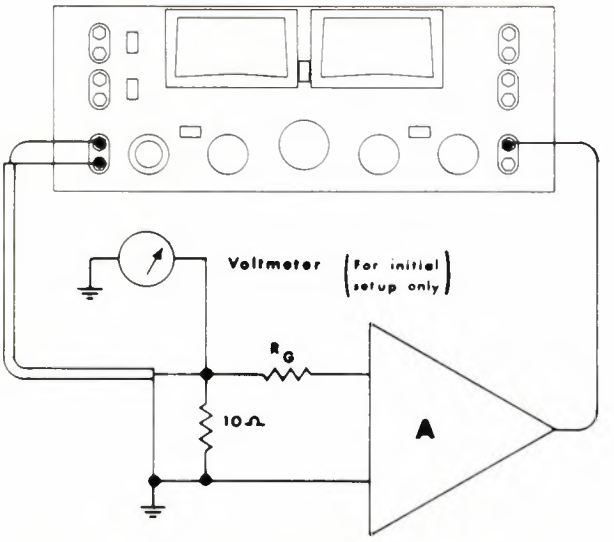


Fig. 3. Test setup which allows noise figure of amplifier to be computed by ratio between signal input and source resistance (for thermal noise).

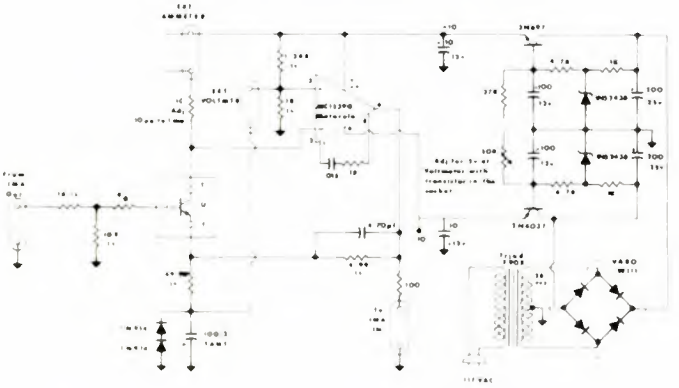


Fig. 4. A test jig for checking noise level of transistors to be used in preamp input stages, most good amplifiers are limited as to noise by their input transistors.

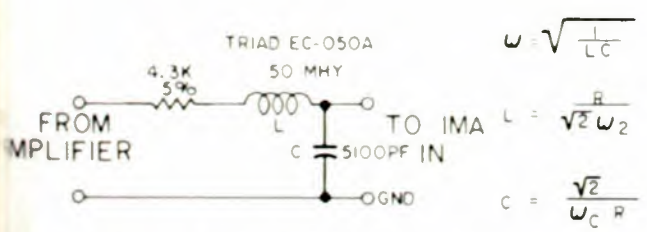


Fig. 2. Filter for removing very high frequency IM products far from pass band of test, usable with amplifier not adversely affected by 5K ohm load.

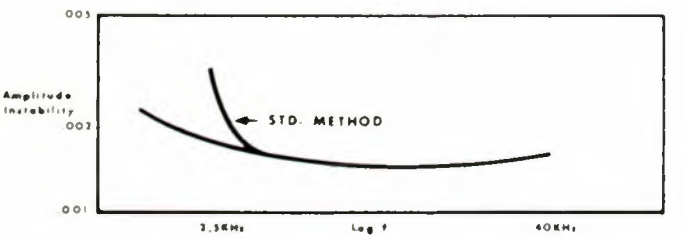


Fig. 5. Plot of tape dropout vs. frequency shows change at various frequencies caused by tape contact difficulties.

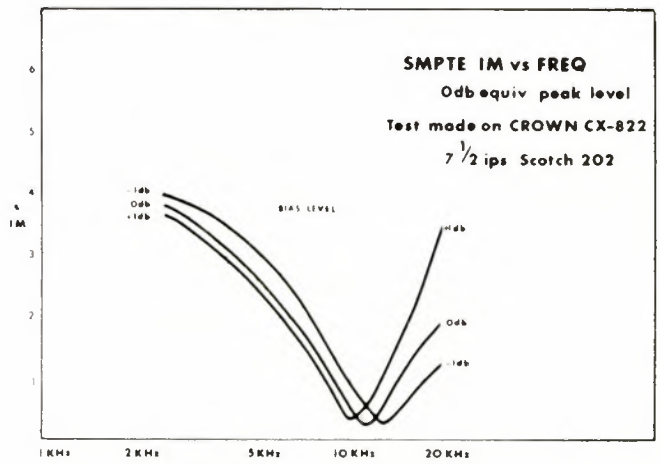


Fig. 6. Typical intermodulation on a tape recorder, as a function of frequency, operating at 7½ ips, has a low around 10 kHz, rises at other frequencies.

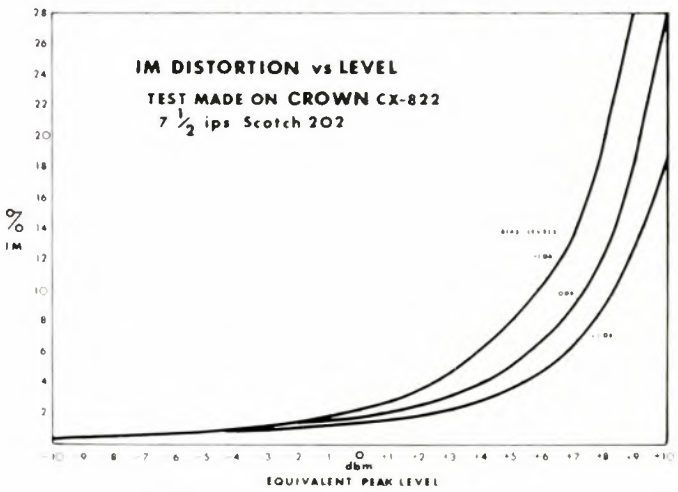


Fig. 7. Intermodulation on a tape recorder, as a function of level, is fairly constant to about 0 dBm, rises at higher levels.

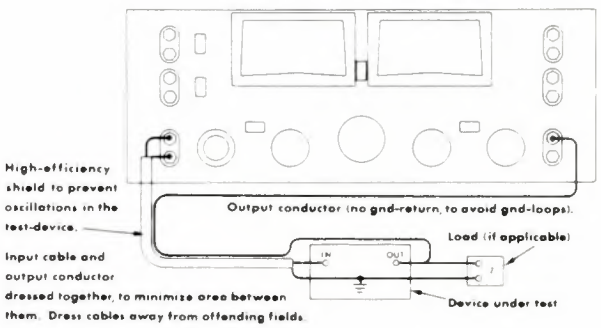


Fig. 8. Method of connecting IM meter to device under test to minimize noise pollution by stray magnetic fields; if fields have high frequency components in pass band of analyzer, reading will be abnormally high.

ment is of a relatively narrow band, rather than the wide-open measurement band of the harmonic checker, noise is far less of a problem for a very wide range of the usual checks. Ultimately, noise becomes a problem with *any* distortion-check method, of which more in a moment.

Intermodulation checking does not, as has been sometimes said, basically measure an amplifier's low-frequency distortion, but rather the *sensitivity of an amplifier's (or other device's) high frequency characteristics to a low-frequency stress.* Since this kind of stress is very common in music, intermod checks correlate well with the device's handling of musical programs.

Is there any constant relation between harmonic and intermodulation distortion? After years of discussion, it is now generally recognized that no relation can be stated that covers even a reasonable proportion of cases. One of the most important reasons is the skew given frequency-dependent characteristics in the device under test. The results vary with the source of the frequency dependence.

When the noise may become an important factor in the check, as it fairly frequently does in the best amplifier designs produced today, a scope or spectrum analyzer can be used to show the output from the device under test. Further highly detailed analysis of the RMS values of both noise and distortion can be made with a wave analyzer.

Several sources stress the high sensitivity of IM checking to the cross-over notch distortion so common in solid-state amplifiers. One gives the example of an actual commercial hi-fi amplifier which measured 0.07% distortion at 100 watts and 0.3% at 1 watt. But the harmonic check did not reveal a whopping 8.6% at 31.6 mw. The dynamic range from 100 watts to 1 watt is 20 dB, whereas musical program material has a much wider range, up to 50-60 dB with the top-grade program sources currently available. Thus the high distortion at 31.6 mw, typical cross-over notch distortion (which occurs mainly in the 10 mw to 1 watt range), was of high significance in evaluating the amplifier, and was undisclosed by the harmonic check.

The Crown IMA Analyzer and other comparable IM instruments are competent down to the milliwatt range. Checking this low range is essential with solid-state amplifiers.

An input-output tracking method will greatly speed intermodulation checks. As the signal input to the device under check is carried through a series of amplitude levels, the input to the analyzer is correspondingly adjusted downward, so that signals reaching the analyzing circuits stay at the same level. This makes recalibration unnecessary during the series of checks. The Crown IMA has a precision tracking facility with ten steps covering a 45 dB range, 5 dB apart.

Similar tracking capability is available with other instruments, or can be added by the engineer who is willing to invest a little time to the project, using precision attenuators of one kind or another.

IM testing is highly sensitive, also, to oscillation in audio equipment. Oscillation may cause IM *inside the analyzer* as well as in the device under test, so that an IM checker may respond better than even a wideband scope. High-negative-feedback devices, of course, are particularly prone to RF oscillation and a checking method

Electronic editing so precise you might kiss tape splicing goodby!

The new Tape-Athon 1001 Recorder/Reproducer has everything the professional studio demands in a precision instrument, plus some exciting innovations we've added to make the 1001 a must-see-it-before-you-invest. Here are the basics: dual capstan, closed loop tape drive for clean, even tape travel with minimum wow and flutter; tach-controlled motion sensing to eliminate tape breakage, stretching or spillage; newly designed tape head section for easy threading, fast lifting; illuminated push button controls, flush mounted.

Now for the innovations, take a look at this control panel.

With the Tape-Athon 1001 you can initiate a "balanced torque mode" on the tape drive by activating the PLAY (or FAST FORWARD) controls simultaneously with the REWIND control. Both drive motors are balancing against one another, allowing the user to manually move the reels in either direction without drag, skipping or tape stretching. You can actually move the tape so precisely for editing purposes that splicing is virtually eliminated.

Call for complete details and specifications on the professional's professional 1001 Recorder/Reproducer (also now available in Reproduce-Only, 14 Inch Reel, and Logger versions for the broadcast industry) or write to:

Tape-Athon Corp.

502 S. Isis, Inglewood, CA 90301 • Tel: (213) 776-6933

Circle 110 on Reader Service Card

WHAT IS YOUR NEXT STEP TOWARDS AUTOMATION?

WHEN CONSIDERING REMOTELY CONTROLLED CAMERA SYSTEMS THEN COME TO POWER-OPTICS.

WE HAVE SUPPLIED OVER 20 SYSTEMS FOR PROFESSIONAL BROADCASTING IN THE USA AND CANADA . . . MORE THAN 60 SYSTEMS IN USE THROUGHOUT THE WORLD.

DESIGNS AVAILABLE FOR: TEN, TWENTY, FIFTY OR TWO HUNDRED SHOTS PER CAMERA.

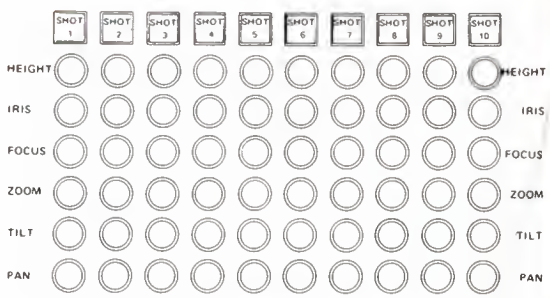
PRECISE SHOTS WITH EXACT RECALL OF:

PEDESTAL HEIGHT... PAN...TILT...ZOOM... FOCUS...IRIS.

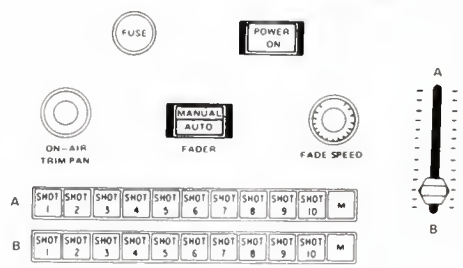
THE SPEED OF SHOT-TO-SHOT TRANSITIONS MAY BE VARIED.

HAND CONTROLS FOR ZOOM, FOCUS, AND PEDESTAL HEIGHT ARE OPTIONAL.

SHOT-SETTING PANEL



CONTROL PANEL



MEMORY CORE STORE AND COMPUTER CONTROLS ARE AVAILABLE.

WE INVITE YOUR INQUIRIES–CATALOG AVAILABLE ON REQUEST.

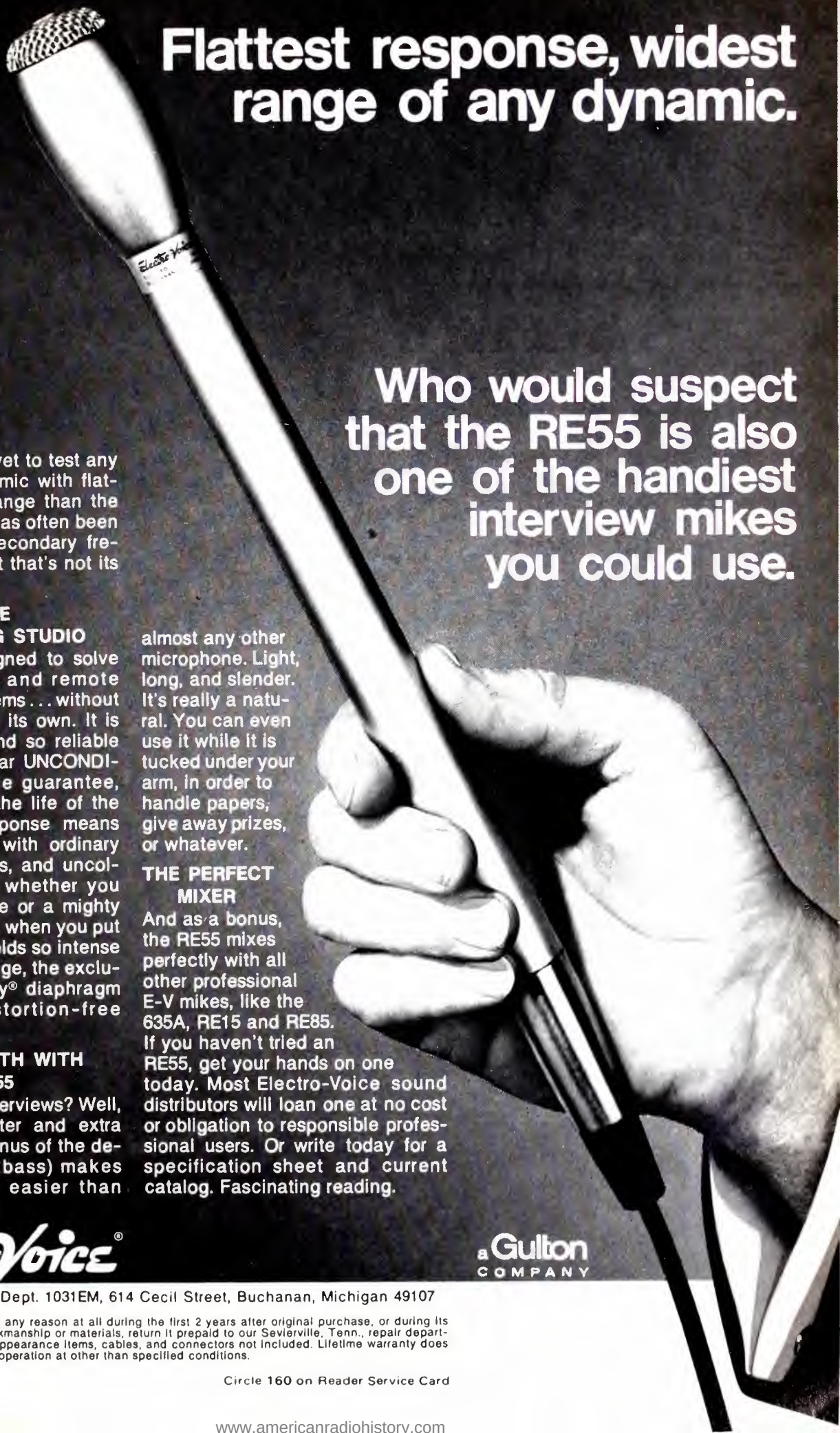
POWER OPTICS, INC.

FAIRVIEW VILLAGE, PA. 19409 • (215) 539-5300

Canadian Inquiries contact: M. S. C. Electronics Ltd., 690 Conacher Drive, Willowdale, Ontario (416) 221-7546

Circle 159 on Reader Service Card

Flattest response, widest range of any dynamic.



Who would suspect that the RE55 is also one of the handiest interview mikes you could use.

s a fact. We have yet to test any nnidirectional dynamic with flat- r, more extended range than the E55. It's so good it has often been ed in labs as a secondary fre- uency standard. But that's not its al purpose in life.

FOR THE HARD-WORKING STUDIO

he RE55 was designed to solve ay-to-day studio and remote und pickup problems . . . without eating problems of its own. It is xtremely rugged, and so reliable e can offer a 2-year UNCONDI- IONAL performance guarantee, us a warranty for the life of the E55*. The flat response means ss feedback than with ordinary nnidirectional mikes, and uncol- ed sound pickup, whether you e listening to voice or a mighty pe organ. And even when you put e RE55 in sound fields so intense s to cause ear damage, the exclu- ve E-V Acoustalloy® diaphragm sponds with distortion-free quanimity.

HAND-TO-MOUTH WITH THE RE55

hat, then, about interviews? Well, e 3/4-inch diameter and extra ngth (which is a bonus of the de- gn for extended bass) makes andling an RE55 easier than almost any other microphone. Light, long, and slender. It's really a natural. You can even use it while it is tucked under your arm, in order to handle papers, give away prizes, or whatever.

THE PERFECT MIXER

And as a bonus, the RE55 mixes perfectly with all other professional E-V mikes, like the 635A, RE15 and RE85. If you haven't tried an RE55, get your hands on one today. Most Electro-Voice sound distributors will loan one at no cost or obligation to responsible professional users. Or write today for a specification sheet and current catalog. Fascinating reading.

Electro-Voice®

a Gulton COMPANY

LECTRO-VOICE, INC., Dept. 1031EM, 614 Cecil Street, Buchanan, Michigan 49107

the RE55 fails to perform for any reason at all during the first 2 years after original purchase, or during its etime due to a defect in workmanship or materials, return it prepaid to our Sevierville, Tenn., repair depart- ent. We'll fix it free. Finish, appearance items, cables, and connectors not included. Lifetime warranty does ot cover things like abuse or operation at other than specified conditions.

Circle 160 on Reader Service Card

They Needed an Audio Console Highly Immune to External Noise

Roy Dodson of WAGA-TV and his staff researched and built it—totally balanced to ground with some surprising and very useful ideas about line amplifiers and ultra-smooth remote control using light-dependent resistors.

WAGA-TV, Atlanta, had the kind of audio noise problem that it just about sure when radio and television transmitters are in the same building as the studio, adding troublesome radiation to that from video monitors, a bevy of motors and SCR light dimmers, and all the other noise sources of an active office-studio-transmitter complex.

About three years ago, the engineering staff decided they must have an audio system totally balanced to ground to get a winner's grip on audio noise. Further, they decided to research and build the console right at home. Roy Dodson, assistant chief engineer, took active charge of the project. The console that he and his staff put on line at the end of the project does everything they wanted it to: it is nearly impervious to external noise; it has internal noise and distortion at extremely low levels; and flat response over the audio spectrum. Further, the system is based on an original, highly useful approach to line amplifier design that many broadcast engineers may find suggestive. And it incorporates a remote fader control system that seems to deserve high marks for smoothness and originality, too.

All the electronic units are built on plug-in cards, to accord with the station's philosophy of plug-in maintenance. The card is the Vector 812WE, a peg-board type using push-in terminals, chosen rather than printed-circuit units to keep circuit flexibility.

Taking up first the basic amplifier developed for the system, we see a reversal of component roles that apparently has excellent results. One of the main components is a miniature audio transformer made by Beyer in Germany, their type BV35570 (Fig. 1). It has a turn ratio of 1:15 and was intended to match a 200-ohm source to a 45K-ohm-load. It has an internal electrostatic shield, Mu-metal shielding, and continuous laminations, superior to the split-core type in resistance to hum pickup.

Fig. 1. Miniature audio transformer which provides gain in amplifiers developed for balanced-to-ground audio console.

The other main component of the amplifier units is the RCA type CA3036 IC, which has four transistors in a dual Darlington configuration, housed in a TO-5 case (Fig. 2 is the internal schematic). Connected as a balanced impedance transforming device (Fig. 3), the CA3036 with associated components has an input impedance of 135K ohms and an effective output impedance of 22 ohms. Voltage gain is about unity. With a bridging load of 600 ohms, distortion is barely measureable at levels of 0 dBm and lower. At +10 dBm, distortion is still under 0.75%, and clipping occurs at +15 dBm.

Combining the Beyer transformer with the CA3036 (Fig. 4) produces a balanced amplifier with a gain just over 20 dB, an amplifier that turns things a bit upside down by using a transformer for gain and an IC for impedance transformation.

When feeding a 600 ohm load, the amplifier has distortion less than 0.04% over the whole audio range; signal/noise is about 95 dB. If the amplifier is driven from a low-impedance source like another CA3036, the frequency response is very flat over the audio spectrum. Fig. 5 shows this complete 20-dB basic amplifier; it is used with slight variations throughout the system.

For example, it is used on the mike preamp card (Fig. 6) which starts off with one of the transformers and a couple of FETs for the extremely low level section, followed by another of the transformers and its associated CA3036. The FETs were needed because the signal of around −40 dB coming out of the input transformer is too low to drive a CA3036 with good signal/noise ratio. The chain as shown has a gain of 50 to 54 dB up to the output of IC-1. The network between IC-1 and IC-2 provides equalization and precise attenuation so the overall gain of each mike preamp card is exactly 40 dB.

The amplifier is also used on the mixer card to offset the insertion loss of the mixing network, which allows any combination of five sources to be mixed into one. There is also a booster unit which can be used wherever additional gain is needed; it is a card with two

of the basic amplifiers mounted on it.

Certainly other ways of using the combination of the CA3036 (or a similar IC) and a top-quality transformer will occur to engineers engaged in developing audio equipment. The idea seems to be one of those that can be useful across a wide range of applications and variations.

Using light-dependent resistors for remote fader control, as Dodson did in his console, looks like another such idea. Remote control was necessary, of course, with all the electronic units in card racks, at a little distance from the console itself. Having the faders vary the intensity of a light source, which would in turn vary a resistance in the audio line, appealed to Dodson because of the nearly complete isolation between control and controlled circuit; and because the thermal lag of the light swamps out small-scale irregularities (as from dirt) in the fader action. This results in an ultra-smooth amplitude variation in response to fader motion.

The light and the light-sensitive resistor (LDR), used in WAGA's console, come in one unit—the Raytheon CK-1115, which has both mounted in a TO-5 case. At 4 volts on the lamp, the maximum rating, the resistance is about 200 ohms. As light falls, the resistance rises steadily to about 10 megohms, the value with zero voltage on the light.

A basic remote control system with this convenient unit is obvious enough. But, as might be suspected, the resistance/lamp voltage relation is far from being exactly the same from one unit to another. There is the additional complication that the resistance is temperature—as well as light-dependent. A substantial change in level, with the fader, produces quite a temperature change and the temperature, hence the resistance, may take as much as a minute to stabilize at the new level.

Dodson wanted the clear virtues of the light system strongly enough to work for a solution to these problems, and he found a neat one. The complete system for control of one audio line consists of 1) a fader card on which the signal passes through a basic amplifier combination, followed by a balanced pair of the light-resistor units for level control, and a CA3036 for low-impedance output; and 2) a bridge card from which the

continued on page 60

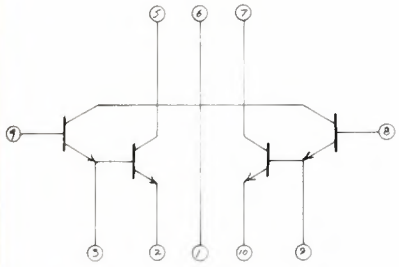


Fig. 2. Internal schematic of RCA CA3036 IC, a dual Darlington unit in TO-5 case, which provides low-distortion, low-noise impedance transformation, as shown in following diagrams.

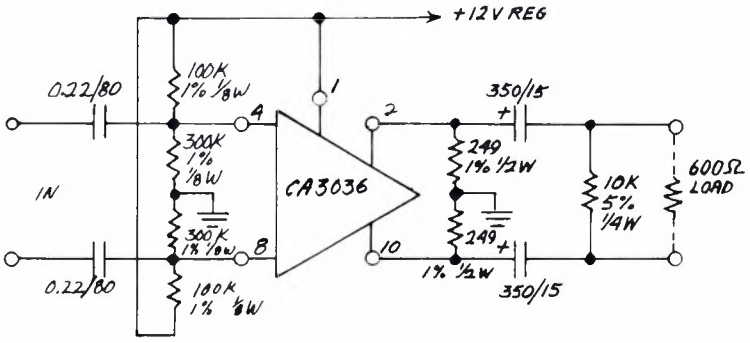


Fig. 3. Method of connecting CA3036 IC as impedance transformer. Input is about 145K ohms; output 22 ohms; gain about unity.

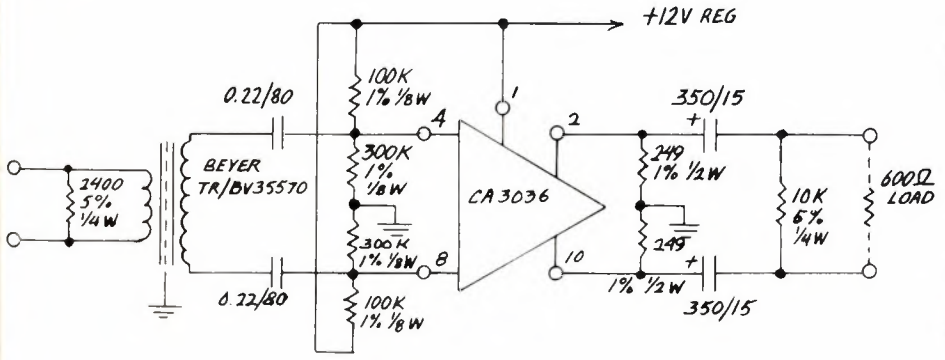


Fig. 4. Combining transformer and IC circuit produces an amplifier balanced to ground, with 20 dB gain and extremely low distortion and noise.

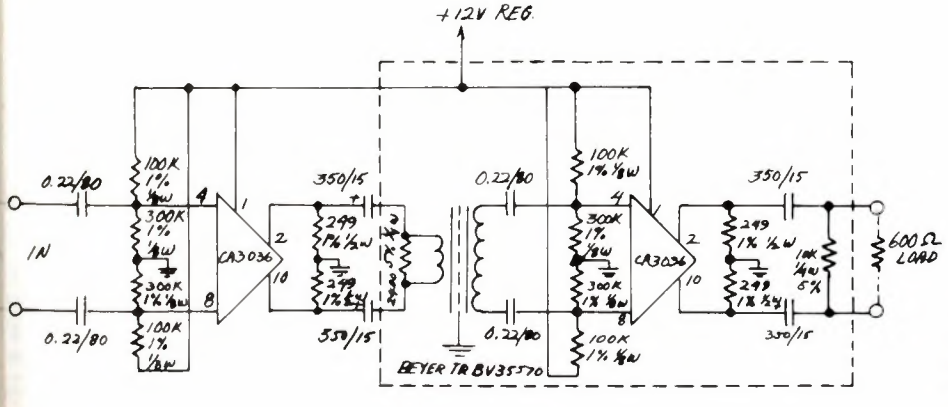


Fig. 5. With second CA3036 at input, the basic amplifier has flat frequency response beyond audio spectrum at both ends, with extremely low noise and distortion.

Off-line Audio Automation

By Carl De Wilde and Saul Walker

Readers have asked for an article on automated mix-down of audio. Here it is, along with a description of what's possible in tape editing as a result of time code synchronization.

Automatic control is becoming routine in the broadcasting industry to the extent that some stations now operate virtually unattended. The equipment involved varies all the way from simple timing motor sequencers to complete general-purpose digital computers, but in all instances, the desired functional sequences are known in advance and are pre-programmed to occur upon initiation of appropriate commands. By interfacing business-oriented data processing systems with the on-line control systems, broadcasters are also able to integrate billing and time availability with on-air functions. It is now possible to extend automation to pre-broadcast activities; i.e., to automate operations in readying program content prior to playing the material on-air.

Recent developments in the recording industry now make it possible to automate several off-line pre-broadcast activities which presently consume so much time and energy. For example, Automated Processes, Inc. has developed a tape machine synchronizer and spliceless editor called "Maglink;" and, in cooperation with Allison Research, Inc. of Nashville, Tenn., they have produced a self-programming audio mix-down memory system.

Maglink synchronizer

Synchronization can be used to simplify both audio and video editing and is a natural for "sweetening" video tapes. Following is a brief description of the modes in which the system can be used.

Recording. When an initial recording is made on the master and/or one of the slaves, a data track is recorded on each machine at the same time. This data can contain the actual time of day, or may be set to any arbitrary tape position when additional material is recorded on either one of these machines. They can both be locked in sync during the recording.

If additional material is to be recorded on a machine on which a data code has not yet been laid down, the code can be dubbed from any other machine in the system.

Synchronization. In this mode the master machine is operated in normal fashion and all slave machines follow the motion of the master precisely as though sprocketed. All slaves will be running at the same speed, and could be in the same location as the master. However, any or all of up to six slaves can be offset or shifted with respect to the master by entering the desired offset through the keyboard, or by depressing the ADVANCE or RETARD pushbutton. The latter provides a means of gradually increasing or decreasing offset at a rate of approximately two frames per second until perfect lip sync is achieved. Total offset is limited only to the maximum count of the time code, which is over 31 hours.

Search. Any of the slaves, as well as the master, can be made to search for, and stop at, a location that is entered through the keyboard. If the master is stopped at a certain location, the slaves will follow since they are all locked in sync to the master.

Pre-programmed operation. Pre-programming may well be the most useful feature of Maglink since it provides a means for automatic spliceless editing.

In the pre-programmed mode, while the master goes through a normal run, the slaves will go through their individually preset programs, each consisting of a number of search and park operations, sync operations with or without offset, and some related switch functions.

A total of over 1000 operations or cues may be executed, with one operation being defined as the complete process of searching for a location, parking there, allowing for a ten-second pre-roll so that the machines will be in sync when they reach the pre-programmed location, switching on and off the master record and slave audio or video, and finally unlocking the machines at the completion of the cue.

The basic organization of Maglink

A central processing unit supervises and controls all operations within the system, in addition to executing the necessary arithmetic and logic operations. It controls a central semiconductor memory while it receives its instructions from a Read Only Memory. It scans the tape machine time codes and the status of the control panel, sends out commands to the master and slave machines,

Messrs. De Wilde and Walker are engineers at Automated Processes, Inc., 80 Marcus Drive, Melville, N.Y.

and updates the position readout displays in the control box. In its standard form, Maglink can control a master and up to six slave machines at the same time—machines that may all be different.

The control panel is shown in Fig. 1. The display on the control panel is divided into two sections, each consisting of eight characters. The lower half displays the location of any of the machines in the system, as selected. The upper half displays the data to which the machine in the lower half is synchronized. Usually this means that the top will display the position of the master, although in the case of a search it will display the location that the machine selected in the lower half is searching for. In most modes of synchronization, the lower half will not show the actual position of the selected machine, but rather the difference in location between the selected machine and the machine to which it is synchronized. The actual time code laid down on the tape is in a completely binary format, with a maximum count equivalent to over 31 hours. The central processor converts this data into any of five formats, as selected on the front panel of the control box for display in video, film, or time standards.

Time code. A 300 bps binary address code is frequen-

Fig. 1. Control panel for Maglink synchronizer.

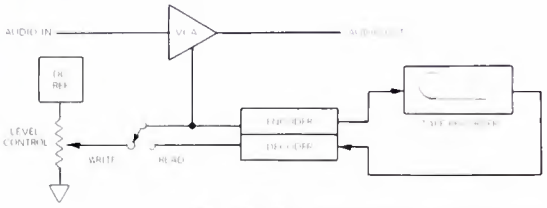


Fig. 2. Simplified block diagram of mixdown memory system.

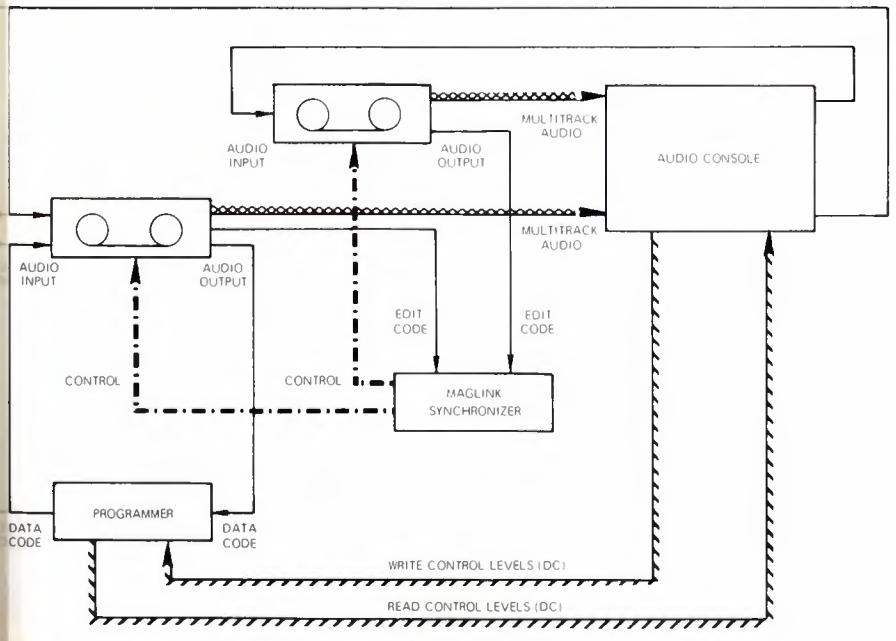


Fig. 3. Block diagram of audio mixdown memory with Maglink synchronizer.

cy shift key (F.S.K.) modulated on a 3.2 kHz carrier, and mixed with a second F.S.K. modulated signal of a bit rate and carrier frequency two orders of magnitude lower. The most apparent advantages of this method are that the data signal does not contain any frequency component above 3.5 kHz, and that additional data can be stored on the same track at one or more higher carrier frequencies. The advantages of F.S.K. modulation have long been known in the data-telecommunications industry, because it allows data to be transmitted using only a narrow part of the frequency spectrum. When, however, data is being recorded in this form and reproduced at a different speed the signal can no longer easily be decoded because the carrier frequency may differ substantially from the original and may be changing continuously as well.

Maglink, therefore, utilizes a digital filter of a proprietary design, which allows decoding of the data over a range of 500 times to .02 times the nominal reproduction speed, thus allowing faster slewing than any machine can provide today, as well as extremely slow handslewing. The unit will even read data at fast speeds with the tape lifted off the head. It requires a signal-to-noise ratio of only 6dB including crosstalk from adjacent tracks and will reject false data when crosstalk is higher or when a temporary loss of data occurs.

Because of the substantial change of level that can be caused by such great speed changes, and by lifting the tape off the reproduce head, an AGC is provided in each input. (AGC is one of the few analog circuits in Maglink.)

SMPTE code compatability. The proposed SMPTE time code has achieved considerable acceptance in the industry. Therefore, a converter was developed which permits SMPTE coded tapes to be controlled by Maglink without disturbing the SMPTE-coded track.

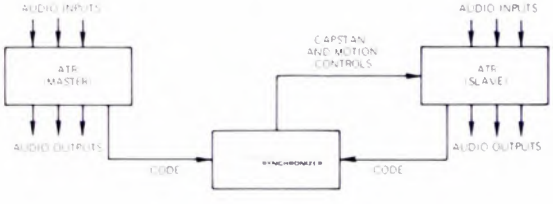
Automated off-line mixing

Multi-track audio program material, although recorded live, is usually mixed off-line to produce the mono or stereo end product (sweetened sound track, jingle, etc.).

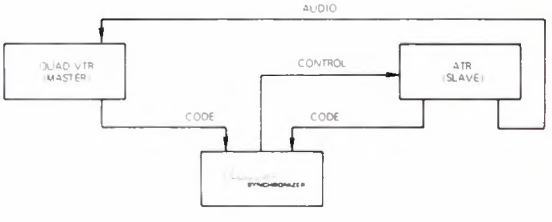
A viable automated mixing system, whether for music,

continued on page 61

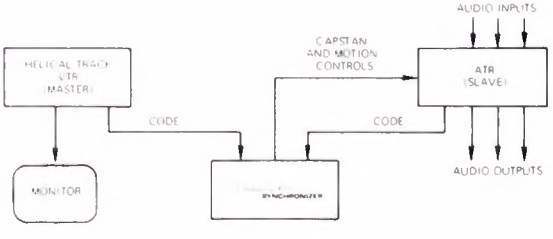
Typical Maglink Applications



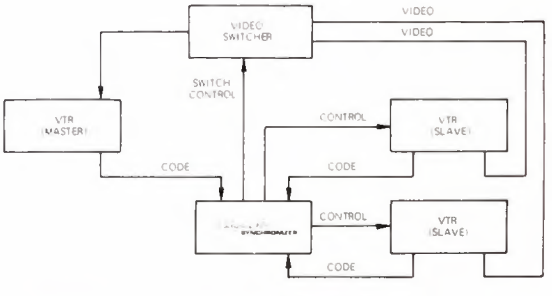
1. Synchronizing audio tape recorders.
Maglink will keep two or more ATRs in sync. For example, two 16-track ATRs can be connected to function as a single 30-channel ATR by means of the edit code recorded on one track of each tape.



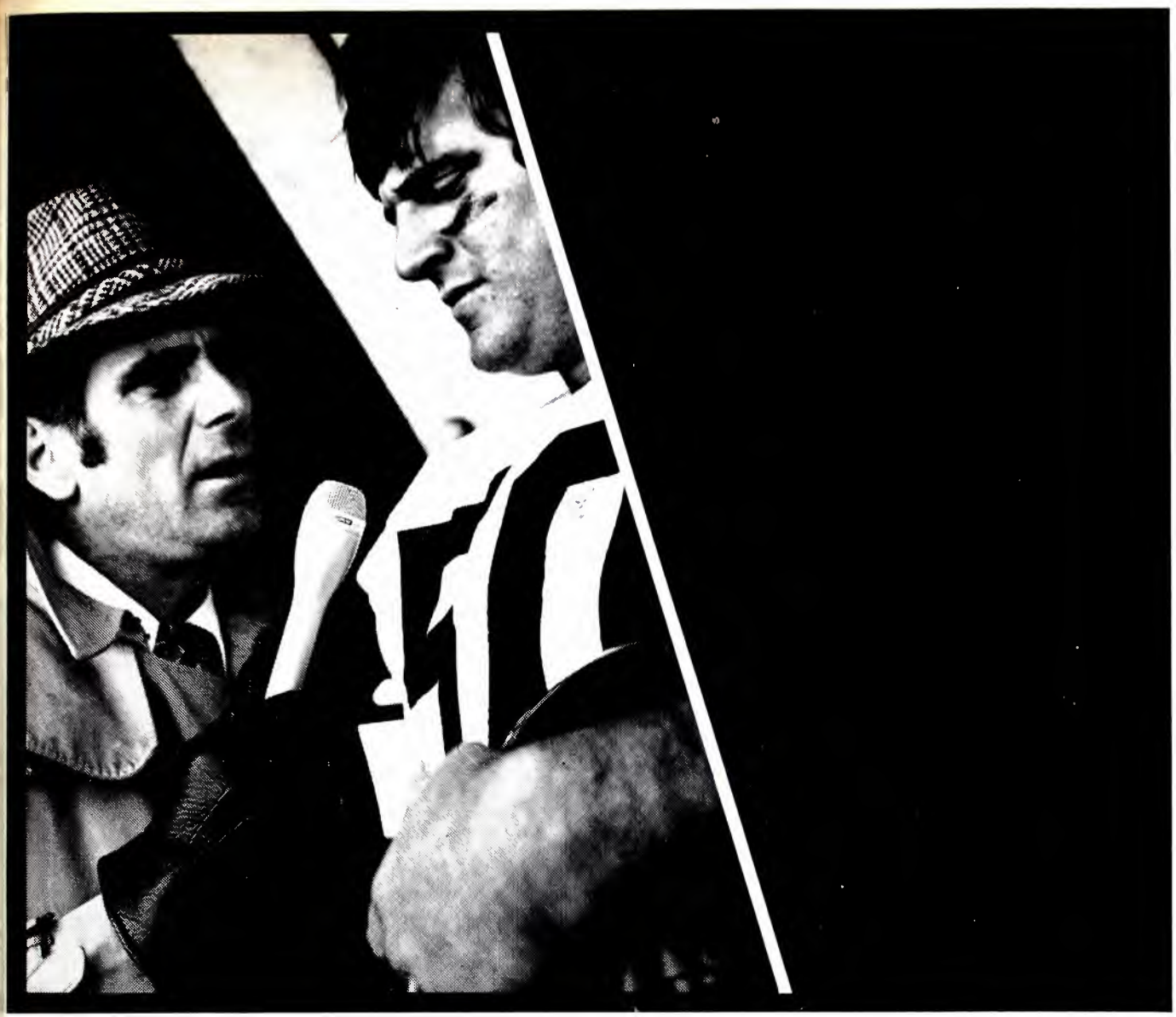
After completion of the audio mix the "sweetened" audio is recorded on the audio track of the Quadruplex VTR master tape from the ATR. Perfect synchronization is maintained throughout the entire sweetening process (including offsets where necessary for lip sync) by means of the edit code.



2. Synchronizing audio and video tape recorders.
Maglink will keep one or more ATRs synchronized with a VTR while recording for audio "sweetening." The edit code is recorded on both the ATR and VTR while a helical video dub is made from the quadruplex master.



3. Synchronizing video tape recorders.
Maglink will operate two or more VTRs in sync, in accordance with predetermined cues entered in the pre-programming mode. This permits spliceless editing and previewing with inexpensive slant track tape. Editing of the original quad tapes may then be automatically accomplished, using the previously programmed edit code format. The pre-programming function may also be used for audio tape editing.



The Quiet One...

Time was when hand-held microphones could mean a handful of problems. Now, the Shure SM61 professional omnidirectional dynamic microphone combines sleek good looks with *extraordinary* reduction in cable and handling noises. The SM61 is built around a shock mount that *effectively reduces cable, handling and mechanical noises to insignificant levels.* A super-efficient "Blast Barrier" cuts wind and breath noise to a negligible minimum. Smooth, wide-range response produces an extremely natural, coloration-free sound that does great things for speech, vocal music and instrumental pickup. The SM61 is beautiful to look at, a delight to work, a pleasure to hear. Write for a complete data sheet to:

Shure Brothers Inc.
222 Hartrey Ave., Evanston, Ill. 60204
In Canada: A. C. Simmonds & Sons Ltd.

SHURE

Circle 161 on Reader Service Card

AES CONVENTION REPORT:

Audio Approaching The Digital Era

New York meeting also shows quad battle in full swing, noise reduction systems getting a toehold in broadcasting, high-quality tape machines abounding, video disc looming over the future of other audio recording media.

Another heavily attended show for the Audio Engineering Society, the Forty-Sixth Convention, which ran at the Waldorf-Astoria Hotel in New York, September 10-13, emphasized the strength of underlying revolutionary trends in audio, rather than raising the curtain on startling new hardware or methods.

The meeting also provided very welcome and enthusiastically received consolidation and enlargement of the profession's sense of its history and perspective on its present achievements. This aspect of the program came through an excellent historical display, a superbly entertaining and instructive evening that illustrated the treatment of music over the whole history of recording, and material in several of the technical papers.

The exhibit of professional audio equipment included a number of items of prime interest to broadcasters, principally consoles, audio processing equipment, tape recorders, noise reduction systems. New items of importance appear under the respective manufacturers' names in the exhibit coverage that follows this convention summary.

The Society inaugurated a new award of special interest to engineers: a biennial prize for the best paper published in the *Journal* over the two-year period. The first such award went to James V. White (then of Stevens Institute, now at CBS Labs) for his paper, "Mechanical Playback Losses in Wideband Phonograph Pickups." Inducted were a new president, John J. Bubbers, who is vice president, engineering, of Acoustic Research, Inc.; and a new president-elect, John Eargle of Altec.

Other Society developments included the appointment of Stephen Temmer, Gotham Audio, as the first international vice president, with the assignment to coordinate growing interest in the Society in Europe and Asia; and the formation of sections in Dallas, Texas, and Nashville. Several other regional sections are in the process of formation.

A paper that combined a summary of the past, statement about the present, and thought-stimulating projection into the future, was that of Stephen Temmer on disc recording. Mr. Temmer reminisced delightfully about professional disc recording in New York and Hollywood in the pre-tape era, and noted the widespread expectation, when tape recording first made its appearance, that the disc was "through." Hindsight, of course, tells us that the disc was far from through in 1947; it has shown an apparently inexhaustible ability to rise to new technical levels and keep its place in the sun.

The latest and most spectacular example is, of course, the video disc. Mr. Temmer supplied some interesting basic data on the Teldec video disc system which will get the commercial go-ahead in Europe this winter. The data showed that the packing density of the system is far superior to that of any other currently used system, tape or film.

Not only is the video disc certain to have enormous impact in video entertainment areas, but it has a staggering

continued on page 65

Wizardry of the modern console was shown by Neve and many others.

Audio/video synchronizing was big at AES. Several manufacturers showed such systems.

Historical exhibit got keen attention. The long way discs have come was evident in papers which described the Teldec video disc.

It's no song and dance.

you're processing video signals, you've ot enough to do without worrying about ie equipment. So at 3M we've reached ito our repertoire and come up with a andful of reliable video products that ork like magic.

The first trick out of the bag is the **elical VTR dropout compensator.** A ombination dropout compensator, ltra-stable processing amplifier, AGC nd automatic chroma level control, corrects, cleans up and stabilizes elical VTR signals.

Next on the bill is the only **dropout ompensator** made that provides proper olor and luminance replacement for uadruplex VTR's. The 3M system elimi- ates white and color flashes, color ismatches and grey-out values, while aintaining full video stability and color nterlace even through multi-generation dubs. An interface kit for your VTR and a test tape are free with your order.

The perfect partner for either of the above units is the 3M **dropout profile recorder.** Operating on-line, it records an hour of playback on a 5" chart for evaluation at a glance. Tapes too degraded to use for new program material can be stored along with a permanent record of their performance. The recorder includes a built-in calibrator and remote control.

Our **color video encoder** works its magic by supplying a standard NTSC color signal from any 3- or 4-channel camera, low-priced or high-priced. Its unique all-digital color bar generator is exceptionally accurate yet never needs adjustment, while its just-as-unique video input clamping eliminates low frequency hum and noise. Other circuits provide sharper, crisper pictures, improved color fidelity and automatic green channel luminance in monochrome.

And as our last act (for now), there's our **10-channel bridging video switcher** with audio-follow. Frequency response is ± 0.25 dB to 10 MHz, low frequency tilt is under 1% and isolation is 52 dB at 3.58 MHz. Both the center conductor and video ground are switched, so connections are easily made and one switching has no effect on other switchers looped to the same input. Routing switchers up to 10 x 20 are readily assembled.

That's the 3M Video Magic Show. We've had to be brief, so why not contact us for the details? In the meantime, you might like to know that in spite of the high performance, we're more than competitively priced.

And if that's not magic, what is?

Mincom Division, 3M Company, 300 South Lewis Road, Camarillo, California 93010. Telephone (805) 482-1911.

VIDEO PRODUCTS

Mincom Division 3M COMPANY

Circle 162 on Reader Service Card

AMPEX MAKES THE WORLD'S B
AMPEX MAKES THE WORLD'S B
AMPEX MAKES THE WORLD'S B
AMPEX MAKES THE WORLD'S B
AMPEX MAKES THE WORLD'S B
AMPEX MAKES THE WORLD'S B
AMPEX MAKES THE WORLD'S B

FULL COLOR VIDEOTAPE TELEPRODUCTIO CAPABILITY IS WHAT MAKES THE AMPE VPR-7950 THE WORLD'S BEST $40,000 VTR.

When you have to put together sophisticated, broadcast-quality teleproductions in full color, the Ampex VPR-7950 has everything you need.

Because the VPR-7950 is Hi-Band (7-10 MHz), your broadcast or cable originations, as well as your multi-generation dubs, will be amazingly true.

D.O.C., Vel Comp and processing amplifier modules increase picture quality even more, to satisfy the discerning professional.

And because the VPR-7950 has an integral Time Base Corrector, the signal will meet or exceed full FCC/CCIR broadcast specifications for both monochrome and color material.

Ampex packages the VPR-7950 in both low-boy and overhead monitor consoles, with a choice of optional video waveform and picture monitors and vector display. Order the complete package, and you'll be in the broadcast production business; ask for fewer options, and you'll find a happy

fit with most industrial requ ments *and* budgets.

The best way to test our is to ask for a demonstratio Contact your nearest Ampe Office or Ampex headquart in Redwood City – we'll re the message.

Ampex makes the world' videotape recorders.

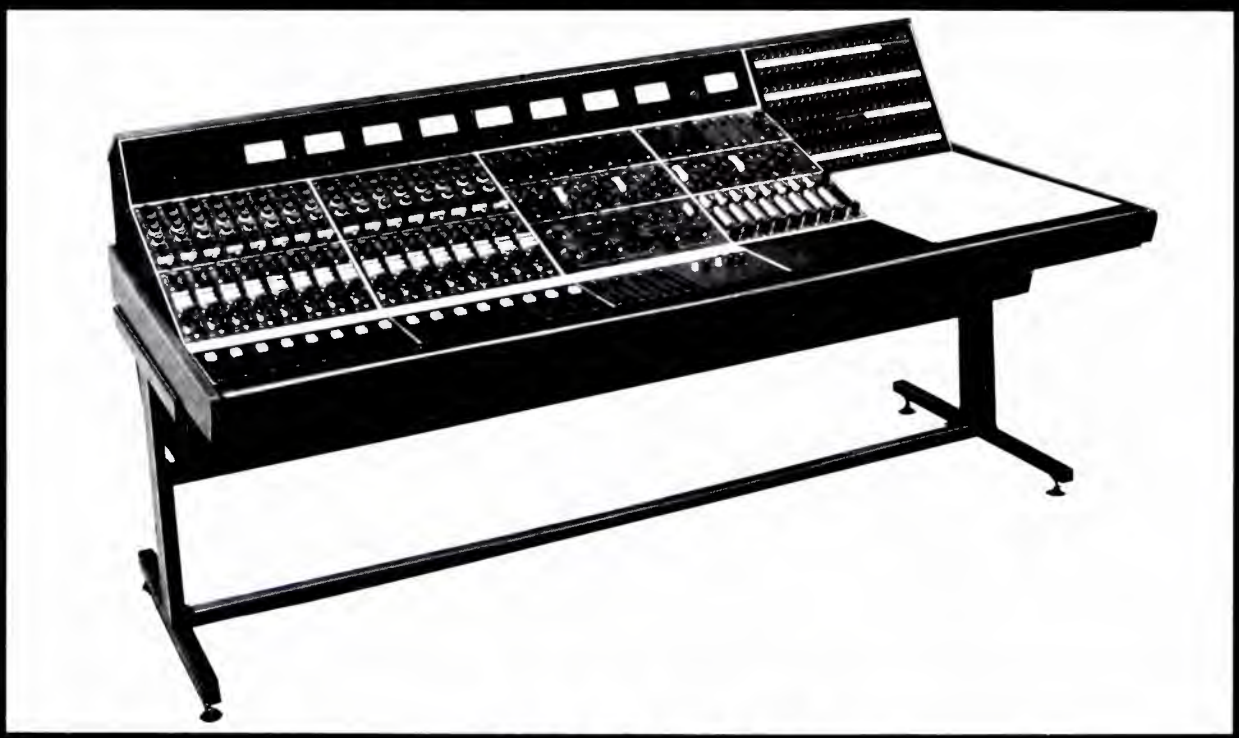
0,000 VIDEOTAPE RECORDER.
5,000 VIDEOTAPE RECORDER.
0,000 VIDEOTAPE RECORDER.
0,000 VIDEOTAPE RECORDER.
2,000 VIDEOTAPE RECORDER.
6,000 VIDEOTAPE RECORDER.
2,600 VIDEOTAPE RECORDER.

AMPEX

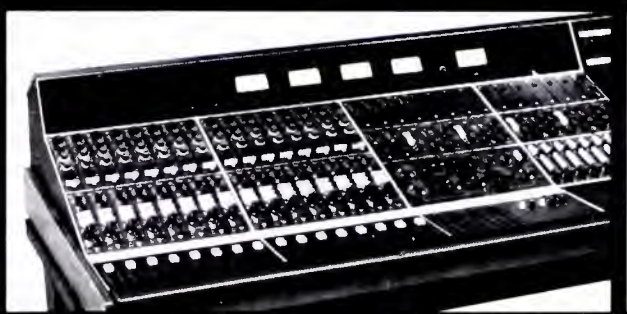
Corporation, Audio-Video Systems Division, 401 Broadway, Redwood City, CA 94063 · (415) 367-2011

Circle 120 on Reader Service Card

Neve presents the 3-in-1 console.



An unbeatable 8-track console.



A deluxe quadraphonic mixdown console.

A great 16-track console for small studio budgets.

It's the Neve 8014. Take your choice of three different meter configurations (shown above). Whether you need a 4-track or 8-track or economy 16-track console, the Neve 8014 will meet your needs to perfection. If you wish, start small and expand later. This versatile console can "grow" as your studio grows.

Fully fitted, the 8014 features 16 input channels; 4 Pgm, 2 Rev and 2 Cue mixing buses; 8-track monitoring and metering; 4 limiter/compressors; talkback and slating; test oscillator; and solo function. Delivery is almost immediate. As in all Neve Consoles, total harmonic distortion is guaranteed to be less than 0.075%.

The sound of Neve is worldwide. Our audio control consoles are used for music recording, film production and broadcasting in studios in 40 countries. Call or write us for more facts. Chances are, we can help you record some new highs in profits.

Rupert Neve Incorporated, Berkshire Industrial Park, Bethel, Conn. 06801. (203) 744-6230
Hollywood: Suite 616, 1800 N. Highland Ave., Hollywood, Ca. 90028. (213) 465-4822
Nashville: Telephone (615) 255-4315
Rupert Neve of Canada, Ltd., 7528 Bath Rd., Malton, Toronto, Ontario, Canada. (416) 677-6611
Rupert Neve & Co., Ltd., Cambridge House, Melbourn, Royston, Herts, England.

Neve

Circle 122 on Reader Service Card

BROADCAST EQUIPMENT

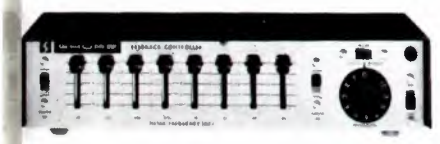
New polystyrene-dielectric coaxial cables come in standard .412 in., .500 in., and .750 in. sizes. Compath 3 and 2- cables have either solid copper or copper-clad aluminum center conductors, with several jacket options. SYSTEMS WIRE AND CABLE. 275

Motorized zoom lens has five-to-one range. Model V18-90M is 2/3 in. diameter, designed for CCTV and surveillance systems, with rating of f/1.8 and injection molded polyurethane drive gears bonded to the lens. VICON INDUSTRIES, INC. 276

N-way power divider/combiners have insertion loss ranging from 0.5 dB to about 2 dB, isolation of 25 to 30 dB. Series MW-1200 comes in a wide range of frequency coverages and number of outputs. AMERICAN ELECTRONIC LABORATORIES, INC. 277

Sound diplexer for broadcasters and common carriers has less than 0.5% harmonic distortion, and 70 dB signal/noise ratio. Model SBC 415 has an optional low-pass video filter providing 30 dB or more of attenuation of unwanted components above the 5.5 MHz pass band. SCOTT BUTTNER COASTCOM. 285

Variable equalizer/feedback controller reduces acoustic feedback in sound reinforcement systems by smoothing out



peaks in total system response. Model M610 has variable-depth filters and roll-off switches to allow reduction of peaks. SHURE BROTHERS. 286

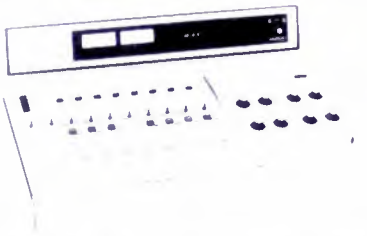
Self-contained digital alarm clock circuit can drive a flourescent tube or liquid crystal display directly. Model MM5316 has all the logic and decoding necessary for several types of clocks and timers. It is triggered by a 50 Hz or 60 Hz input, and display may be timed in hours and minutes, minutes and seconds, alarm set time, or sleep time. NATIONAL SEMICONDUCTOR CORP. 278

Mobile self-supporting antenna tower rises to 100 feet, is mounted on trailer which also carries power for automatic

extension of tower. Eagle mobile tower can operate from a base 9 ft. 6 in. wide, withstands winds to 40 mph. Hydraulic system controlled from trailer extends tower. About $85,000. EAGLE ENGINEERING CO. (UK) 290

Line of **function generators** includes units at 5 MHz, 10 MHz and 20 MHz. Series 500 generators have DC to 65 MHz analog capability and 10 ns rise time for digital capability. All have 1000:1 external voltage control of frequency. AIL TECH. 282

Audio control center has 10 full stereo inputs, 10 stereo remote line inputs, straight line faders with cue positions. Langevin Series 10 has a fail-safe auto-



switched dual power supply and dual 10 watt monitor amplifier. $5,365. CETEC, INC. 279

Coaxial directional couplers cover 2 to 18 GHz. Model 11692D (dual) and 11691D (single) have directivity above 30 dB to 8 GHz, over 26 dB to 18 GHz, with ±1 dB variation over the frequency band. HEWLETT-PACKARD. 283

Twenty-channel remote switching system allows transmission of switching signals over the coaxial cable. No bi-directional filters are needed and there is no interference with normal programming. COMSONICS, INC. 284

In-line chroma keyer is designed to key with any NTSC signal, from tapes, network feeds, or cameras. Model 2860 has a remote control panel which can be up to 500 feet from the main unit. DANSCOLL. 280

Low-cost demodulator receives off-the-air signals, provides composite video-audio signal. Model DEM919 has plug-in modules for easy servicing, four IF stages for high sensitivity. $349. SC ELECTRONICS, INC. 281

continued on page 52

Circle 156 on Reader Service Card

PRODUCTS

Video recording system puts date and time to the second on each frame.

Video Sentry provides record for verification or program logging. VIDEO SENTRY SYSTEMS. **298**

DC conversion of SS-III motion picture camera includes Angenieux 12-120mm zoom lens, viewfinder, 400-foot Mitchell magazine and internal 12-volt 600 m.a.h. battery. Frezzi-Cordless Conversion also includes separate battery eliminator/charger that allows charging battery in or out of camera, or powering camera from 115-vac line. FREZZOLINI ELECTRONICS INC. **288**

Transparent color film adds black-on-blue to long list of colors available. Transparex film, for overhead projection and art applications, is developed in ordinary tap water in a Transparex processor, in about 20 seconds. Resolution is about 4 lines/mm. $15.00 for 50 8½ x 10½ sheets. AGFA-GEVAERT, INC. **305**

Two-inch videotape for Ampex 660 and 1500 video machines is available on metal or plastic reels. Silverchrome tape comes in 30, 60, 120, and 260 minute lengths. KAREX. **310**

Extruded aluminum heat sinks connect to transistors and SCR flat packs with sink mounting tabs. Series 1300 and 1400 include mounting spacings for a variety of transistor case sizes, and have a variety of standard finishes. PRECISION DIPBRAZE TOR, INC. **291**

Arrester mount holds up to three gas-tube lightning arresters for CATV systems. Model TH-507 mount has common ground for all three elements, and mounting fasteners that mate with boot and pedestal bolt holes. TELE-COMMUNICATIONS INDUSTRIES, INC. **292**

Microphone with flexible gooseneck mounting and spring-return switch has low impedance. Model 337-LGS is for paging, language labs, etc. $39.95. ASTATIC. **293**

Price reductions up to 24% were made on **RF peak wattmeters, the 4300 series.** Units measure peak power of pulsed RF systems, 0.45 to 2300 MHz and 1 watt to 10 kilowatts. BIRD ELECTRONIC CORP. **294**

Ground test kit aids in meeting grounding requirements of National Electrical Code and OSHA. Model 18503 includes two 18-inch T rods and associated cables for checking grounds as deep as 20 feet. Ground resistance checker (not included) connects to rods. $115. ASSOCIATED RESEARCH, INC. **295**

RMS-to-DC converter allows any DC meter to read true rms values. Model 731A converts any wave shape to DC output, up to 1 MHz, with its own ranging amplifier covering 10 mv to 300 v. $549. UFAD CORPORATION. **296**

Cabinet for video cassette equipment holds a U-Matic player at operating level and a monitor or receiver above. It has drawer space for cassettes and caster mounting. $695. VIDEO-DETICS CORP. **297**

Rechargeable battery system for ACL camera has 2 amp/hour Nicad battery and charger, plus a voltmeter for battery check. Minibat will run 4000 feet of film through camera on a single 14-hour charge. ECLAIR CORP. **289**

Pneumatic RF relay will switch RF generators, antenna multicouplers, bands on transmitters, etc. Model RF20B1586 will handle up to 15 kv of RF voltage, 400 amperes rms at 400 KHz and 160 amperes at 16 MHz. Switching time is less than 200 ms. $473. ITT JENNINGS. **287**

Film processing unit handles 16 different processes with minor adjustments.

Minaflex handles color reversal, color negative, black-and-white, maintains uniform tension and speed with changes in film size. TREISE ENGINEERING, INC. **299**

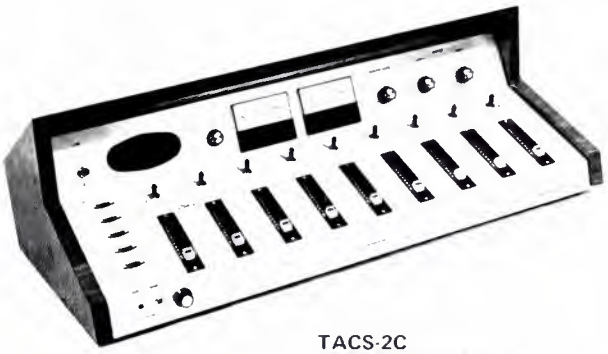
Video cassette camera and recorder ensemble uses ½-in. video tape, is portable with 14 pound recorder and hand-held camera. Model VTC 7150 en-

continued on page 54

UDIO PERFECTION FROM

WILKINSON ELECTRONICS, INC.

TAC-1B
MONAURAL CONSOLE



TACS-2C
STEREO CONSOLE

TSC-4
STEREO CONSOLE

RA-3
REMOTE AMPLIFIER

GCA-1
AGC AMPLIFIERS - MONO AND STEREO

LA-2C
LIMITERS - MONO AND STEREO

7. DA-5
DISTRIBUTION AMPLIFIER

TTP-2B

. MacDADE BLVD., WOODLYN, PA. 19094 TELEPHONE (215) 874-5236/874-5237

Circle 123 on Reader Service Card

PRODUCTS

semble uses rotary four-head playback,

12.5-75mm zoom lens on camera, uses cassette weighing 9 ounces with 20 minutes of programming. SANYO ELECTRIC, INC. **300**

Location lighting kit includes two 600-watt spots with detachable barn

doors, one 600-watt fill light with barn doors. AeroKit also includes cables, stands, grip. $369. CINEMA PRODUCTS CORP. **301**

Automatic cueing of two video or audio tape recorders is provided by **cue controller**. Model BE460 (when used with BE450 synchronizer) gives preset, automatic location of desired tape

parking points, and replaces the manually operated BE420 edit code reader. $4,850. ELECTRONIC ENGINEERING CO. OF CALIFORNIA. **302**

Stereo headphones with "open air" design sit on foam rubber cushions,

continued on page 56

Our installation an
maintenance trucks ar
depots on wheel

The time to think about maintenance is before you buy.

We keep some 85,000 installation and maintenance trucks on the road, operating out of 1,800 service centers that cover the country. So whenever you need repair service, there's someone close at hand.

Even if it's a complex PBX, our repair people know what to bring. And while our trucks are literally depots on wheels, we don't take anything for granted. Just in case, we have well-stocked service centers behind every truck.

But most important, our people know what they're doing. To make sure, each receives an extensive training course before setting foot in your office.

There are many more reasons to choose a Bell System PBX than the maintenance that backs it up, but none that lets you sleep better.

If our maintenance organization says anything about AT&T and your local Bell Company, it says we care about our customers.

We hear you.

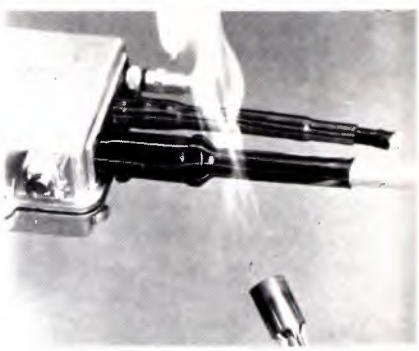
PRODUCTS

above ear. Model HD-424 (like earlier HD-414) has 2000-ohm impedance and high sensitivity, will be "top of the line" model. SENNHEISER ELECTRONICS. **306**

Keyboard uses single integrated circuit module and contactless operation. Model S6802 includes keyboard with capacitive proximity action to transmit key motion to module. 68-key input for module has tri-mode operation giving full 128-character assignment and 14 unassigned keys producing outputs on separate lines. Buffered 8-wire output can drive DTL, TTL or MOS, or others on special order. ALPHAMERIC KEYBOARDS, LTD. (UK). **307**

Demagnetizing kit for audio and video tape recorders includes a pocket magnetometer to measure residual magnetism, a demagnetizer with slip-on extension probe to reach recessed components. Han-D-Kit demagnetizer has field of 350 oersteds at ¼ in. R.B. ANNIS CO. **308**

Heat-shrinkable tubing for cable maintenance and repair gives complete moisture-proofing and electrical isolation of terminations and splices. Cable Sleeves shrink at relatively low temperatures, avoiding damage to heat-sensitive cable dielectrics. Sealing is by



a mastic coating on inside of sleeve. RAYCHEM CORP. **303**

Motor drive for modifying the AVQ-10 weather radar reduces antenna rotation rate, increasing echo signal 3 dB. TSC AVQ-10 Modification Kit is applicable with radar at a fixed site, improves reliability as well as sensitivity and range. TECHNOLOGY SERVICE CORP. **304**

Time lapse VTR can record 66 consecutive hours of video without rewinding on a 2400-foot reel. Model TL-300 uses ½-in. tape, a two-head rotary scanning system. Time ratios can be any odd number from 5:1 to 61:1. $2195. GYYR PRODUCTS, ODETICS, INC. **311**

PRODUCTS

High-speed duplicators for video tape use the S.T.A.M. process, with signals transferred to magnetic belt and thence to copy. Reel-to-reel model,

Video Tape Contact Printer, operates at 75 ips and has multiple width capability. U-matic cassette model runs at 37½ ips. 3M COMPANY. **309**

Portable color video tape recorder-camera system uses ¼-in. tape. Model CVT-150 consists of hand-held camera weighing 5¾ pounds, and VTR weighing 16.4 pounds and operable on battery power, with two-head helical scan and 240-line resolution. A reel runs about 20 minutes. Camera has 300-line resolution, six-to-one zoom lens, automatic iris. AKAI. **312**

Silicon-target vidicon has 2/3 in. diam. eter, magnetic focus and deflection. RCA-4833 has about ten times sensitivity of sulfide carbon vidicons, so can be used to upgrade cameras using such tubes. RCA. **313**

Aerosol spray for cleaning tape heads has no abrasive or chemical dangerous to plastic sufaces. CD-270 is non-flammable and non-conductive, will leave no residue. COLE-FLEX CORP. **314**

Coaxial ceramic triodes for UHF TV translator and driver service have planar structures for models up to 50 watts, cylindrical structures for use up to 250 watts. Conduction-cooled copper grid has high mechanical stability and low grid emission. AMPEREX ELECTRONIC CORP. **315**

Three-phase SCR power supply series has ratings up to 500 amperes at 135 volts. Series "M" has DC voltage continuously adjustable from 0 to maximum, 0.1% current and voltage regulation, remote sensing. CHRISTIE ELECTRIC CORP. **316**

Color sync generator meets NTSC/RS-170 requirements. Model 5000 needs no add-ons or accessories for full capability, can sync an entire video system to an external video source. $995. VIDEO AIDS CORP. OF COLORADO. **317**

NEW LIT

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

Optoelectronic devices, including LED displays and lamps, isolators and photodetectors, are described in new short-form catalog. Hewlett-Packard. **200**

Foam and air coaxial cable, coax hardware and switching, waveguide and accessories, are covered in new 64-page catalog. Cablewave Systems. **201**

Twenty-page catalog and technical bulletin covers **Communications Service Monitor, Model FM-10C**, including the various service plug-ins for FM and AM, and comprehensive technical application notes. Singer. **202**

Brochure describes **Challenger Mark I 270 MHz Colorvue CATV electronics units**, including line, bridging amplifiers, etc. AEL Communications Corp. **203**

Line of broadcast television equipment including cameras and video processing equipment is subject of eight-page catalog with specifications. **204**

Function generators, test instruments, spectrum analyzers, etc., are covered in a new "all-product" catalog. Ail-Tech. **205**

Technical bulletin describes **MU Guard 80, high-permeability shielding material** available in strip and foil. Magnetics. **206**

Three new technical bulletins describe respectively: **CATV stand-by power supplies; AC power supplies for CATV**; and **constant-voltage transformers**. Sola Electric. **207**

"Community Video Report" is a publication just begun by the Washington Community Video Center, describing work done there and around the country in using **video programming for community education, entertainment, self-help.** Address: WCVC, 2414 18th Street NW, Washington, D.C. 20009.

Catalog covering **safety equipment** which meets OSHA, ANSU, and Federal Highway Administration requirements for vehicles, aerial buckets, linemen and work areas. Multiplier Industries Corp. **208**

tions and CNA Financial Corp. from taking over Cable through a "deceptive" common stock offer . . . **WJAC-TV**, Johnstown, Pa., will modernize its plant with $425,000 worth of **RCA** studio and transmitting equipment . . . **Anaconda Electronics** completed construction of a 40-mile dual cable system for Southwestern Cable Co., La Jolla, Calif.

Belar Electronics moved to a new 25,000-square-foot plant in Devon, Pa., greatly increasing office and manufacturing space . . . **Cinema Beaulieu** of Sherman Oaks, Calif., will sell the Stellavox portable tape recorder . . . **Communication Medias**, Allentown, Pa., is exclusive sales distributor for New York (outside N.Y.C.), Pennsylvania, and New Jersey for Broadcast Electronics' Spotmaster equipment.

Ampex Corporation said that the 20th ACR-25 videotape machine for the Australia/New Zealand television market had been sold . . . **Electronic Engineering Co. of California** won a contract from the U.S. General Services Administration to supply video and audio tape editing systems . . . **National TV Cable Company** has bought six cable systems in Tennesee communities from Dr. William C. Pallas of Chattanooga.

International Video Corp. is offering training courses for its full line of television cameras and recorders; for info, write to IVC at 990 Almanor Avenue, Sunnyvale, Calif. . . . **Jerrold Electronics Corp.** will obtain computer-generated layouts for CATV systems from **Network Analysis Corp.** of Glen Cove, N.Y.

Cablecom-General, Inc. said it would sell the cable system in Colorado Springs and adjacent communities to a group headed by Bill Daniels of Denver . . . **KBTV-TV, Denver**, accumulated 6240 operating hours on an **RCA** highband videotape headwheel, believed to be a record . . . **Great Plains National, Lincoln, Neb.**, is offering a color program series for rent or purchase dealing with economics for the secondary school student: the 33 lessons, 20 minutes each, are on quad tape, U-matic cassettes, or 16mm film.

Scientific-Atlanta will manufacture electronic equipment and provide engineering services for **Rollins Protective Services Co.** of Atlanta, which supplies home security service in many cities . . . **Highland Video, Inc.** sold cable systems in Latrobe and Blairsville, Pa., to **Adelphia Communications** . . . **Anaconda Electronics** completed 450 miles of a 700-mile system for Athena Communications in Corpus Christi, Texas.

AUDIO CONSOLE continued from page 41

Rack at left holds most of electronics of audio system, including line and booster amplifiers, light-controlled fader units, equalization, etc. Console at right has remote-control faders, switching.

filaments of the controlling LDR units are fed using a third LDR unit in an automatic bridge circuit with the fader, so arranged that the output voltage tracks the fader exactly. The bridge card has tracking adjustments to bring the three LDR units together; once adjusted, Dodson's thorough tests have shown the units stay together for very long periods of use.

An interesting refinement on the fader card is the method of preventing a signal surge when the fader is moved off the last (off) stop. There is a small voltage left on the lamps in the off fader position, so that signal level does not jump upward abruptly. To prevent signal leak-through in the off position, there is a −20 volt bias applied in this position to IC-2.

The fader card, with its balanced control, also provides a cue output (through IC-1). The power supply for IC-1 is through Q1, normally biased off. To turn it on and pick up the cue signal, pin 6 is grounded through a switch on the fader panel.

These are just some highlights of a complete audio system that was a couple of years in the planning and building. Are Dodson and his staff satisfied with the return on all that work? Emphatically yes; buzz and hum from other equipment in the plant is clean out of their audio programming, breakdowns have been almost non-existent (and immediately remediable with the plug-in electronics set-up), frequency response is flat all the way across, distortion and internal noise way down out of sight. They have the satisfaction of a job extremely well done. **BM/E**

The Allison Automated programmer with model 940 automated fader

film or commercial production, requires that the mixing console be equipped to self-program all relevant control functions in real time. In other words, the console and associated equipment must be capable of normal manual operation, but with the additional capacity to remember what was done, when it was done, and how it was done. It must then be able to precisely re-create the original mix any number of times without degradation, while individual controls are re-adjusted to alter or improve any portion of the recording.

In a typical session, the engineer sits at the console and gets a rough mix. Then changes are expected. Some may be subtle, some drastic, but all must happen at a precise moment and often several changes may be necessary at the same time. Since the human operator is limited in speed, accuracy, and memory, the finished product is invariably a compromise. Then, too, several days or weeks later there may be a request for the identical mix "except bring the lead voice up a little and take the bongos out of the bridge." It would take superhuman memory to remember and re-create the mix.

continued on page 62

without compromise. An automated mixing system can provide that memory.

System Concept. In the automated mixing system, audio (or video) is not fed directly through the front panel controls in the mixing console, but rather each channel is remotely controlled by means of a voltage controlled amplifier (VCA). Each VCA responds to a DC level obtained from the appropriate manual control, i.e., channel fader or master, such that the audio output is proportional to the control setting. Each VCA in the system, therefore, has a DC control voltage present at all times which corresponds with the front panel control settings. These DC levels are sequentially sampled in an encoding unit which converts this level information into a signal which is compatible with conventional audio recorders. In a mixdown from multi-track tape, all encoded level information is recorded (WRITE mode) on one unused track or on a synchronized tape machine. In playback (READ mode), this data track is decoded to re-establish the DC voltages which were previously recorded. A simplified system block diagram is shown in Fig. 2. Updating or re-recording controls are provided to permit alterations to the mix to be recorded on a second data track. This revision process is continued until a satisfactory mix has been accomplished.

While there is no change in the technique for recording the multi-track master from live program material, the mixing procedure is drastically simplified. Since the mix can be easily modified track by track and measure by measure, there is no need for time consuming rehearsals and retakes. During the mixing session only the control positions are recorded, so no audio need be recorded until after the final mix has been approved. In this way, second and third generation dubs are virtually eliminated.

The key component in the system is the Allison Automated Processes Programmer which multiplexes up to 256 control channels on a single audio track of a conventional studio tape recorder. The control signals are sampled and re-established at a rate of 0.5-msec per function; typically less than 100 msec for the entire system. In order to achieve this high data rate in a single audio channel, the programmer employs a newly developed four digit quinary code in which each digit is represented by a complete sine wave cycle. The first cycle of each data word serves both as an analog amplitude reference and as a digital counting reference. The remaining three cycles in each word can vary to any of five amplitudes for a total of 125 possible combinations. In this manner, a dynamic control range of 100 dB is achieved with 0.5 dB increments to −50 and 2 dB increments to −100. Security circuits detect dropouts whether due to tape wear or splices, and cause the decoder to hold the last previous valid data.

Combined Maglink and automated mixing systems

Although the programmer data is normally recorded on otherwise unused tracks of the multi-track master, it is sometimes more convenient to store on an auxiliary tape. This is particularly true of jingles and commercials where the same basic program material is used for a number of applications, each of which requires a different mix. The block diagram in Fig. 3 illustrates how Maglink and automated mixing are integrated into a coordinated off-line system.

BM/E

EEPING AUDIO CLEAN

continued from page 36

ust reveal this to allow proper evaluation of such vices.

An IM tester of sufficient sensitivity and accuracy can used for evaluating noise. Crown recommends the llowing:

As mentioned, noise influences the IMA in a predictable anner. Therefore, if all causes of intermodulation are removed om the device under test, as can usually be accomplished by moving the low frequency part of the test signal, only noise ill be measured. The noise that is measured will be mostly hiss d gathered in a highly rectangular band of 1 KHz bandwidth ound the high frequency test signal plus some subdued reonses further removed. If the higher order responses are t desired, they may be removed by filtering. Fig. 2 shows a ter designed for use with a 7 KHz test frequency, and a test mplifier whose gain would not be adversely affected by a 5KΩ ad.

Thus, the use of the IMA gives a form of spot noise measureent with a very rectangular 1 KHz bandwidth. With a 1 KHz ndwidth, averaging time is acceptable for many production sting purposes. Only for high accuracy applications will a ower metering system be needed. Such can easily be addended using the "B" scope terminals. If desirable, the IM meter may heavily damped by placing a 100mfd or larger capacitor ross the meter terminals of M2.

The discussion continues with an excellent treatment amplifier noise basics in general, and their relation to M checking, a discussion typical of the extremely thorugh handling of basic questions throughout the manual.

An IM analyzer can be used to check the noise figure f individual transistors, which is especially useful for ie input transistors which typically limit the signal/ oise ratio of good amplifiers. The Crown manual, for xample, describes the method as follows:

Since most good amplifier designs are limited by the noise figure of their bipolar input transistors, it is often desirable to pretest the transistors before placing them in an amplifier. Fig. 4 shows a typical test jig for such a pretest operation. The jig is designed for testing NPN bipolar transistors at 5 volts Vcc.

IC may be adjusted (1μA to 1mA) by varying the transistor's collector supply resistor which should be a low noise metal film or wire-wound type resistor. IC, as measured at the external meter terminals, will typically be 200nA greater than the actual due to the MC1539's input bias demands. Typically this resistor would be equal to

$$\frac{5.6}{I_C + 2 \times 10^{-7}}$$

To avoid Vcc errors due to voltage drop across Rp, that is

$$\frac{I_C R_P}{h_{fe}}$$

should be held to .5 volts or less.

Measurement proceeds in the same manner as in the example of the amplifier noise test, except a 40.1 dB preattenuator is built into the input of the jig. All input signals should be divided by this factor to find the true amplifier input level.

In this circumstance, changing transistors should not require any change in the IMA's setup. If the test level were to indicate low, it would be indicative of a bad transistor under test. The system feedback is very high and the measured noise should be solely from the transistor under test (TUT) and would typically be white over the measurement range.

Another extremely useful form of test is for drop-outs on magnetic tape. The method is described as follows:

In magnetic tape recording, rapid fluctuations of recording sensitivity due to problems in the recording media are referred to as drop-outs. Those changes in sensitivity which fall within the low-pass filters response range may be metered by reading the modulation inherent in the playback of a recorded tone (single frequency).

The frequency range of the IMA for such measurements may be extended down to 1 KHz by using the instrument with the METER switch in the OUTput position with the tape recorder feeding the EXTernal HF generator input (No HF generator on). The HF level should be adjusted for full scale on the calibrate meter. Any hum or low frequencies will now be metered as modulation; therefore, the use of this mode of operation is

limited to low-noise and/or high modulation noise applications.

Since drop-out phenomena contain a great abundance of low frequencies, a highly damped meter reading the "B" scope output will probably be found necessary.

Fig. 5 shows a plot of tape drop-out vs. recorder frequency.

An area in which IM testing is particularly enlightening is magnetic tape recorder distortion. The Crown manual says on this topic:

It is particularly enlightening to test tape recorders for SMPTE intermodulation distortion since partial optimization is often available to the user in the form of bias adjustment, and because tape recorders are highly band-limited devices. (Devices that have sharp high-frequency cut-off characteristics will not evidence harmonic distortion if the distortion components are above the cut-off frequency.)

Fig. 6 shows a plot of IM vs. frequency run at a peak equivalent playback level of 0dB (NAB) for several settings of bias. Fig. 7 shows a plot of IM vs. level for several settings of bias. Note that the ultimate residual is limited by tape drop-out phenomena, Fig. 5; therefore, Figs. 6 and 7 were plotted by using a wave analyzer set to 120 Hz, the dominant distortion component seen at the "B" scope output. Viewing the distortion components at "B" scope should evidence only even order harmonics of 60 Hz and drop-out noise. The presence of 60 Hz or odd order harmonics of 60 Hz would indicate even order non-linearities which are not properties of the tape as it possesses only odd order non-linearities. Such distortion could be caused by magnetized heads, distorted bias wave form, or electronic distortion.

Other areas of use which are fairly familiar are checking of phonograph stylus wear, using a pre-recorded IM test record. The same method has been shown to be particularly sensitive, also, to geometry distortion on phono records, and distortion caused by wear of the master used in producing records. Mistracking of a phono stylus from whatever cause (worn stylus, worn record, pickup defect), will in most cases consist of loss of full contact with the groove on large low-frequency modulations, which causes severe intermodulation of th high frequency program.

It is extremely important to minimize pollution various kinds when checking very low levels of distortio with any IM (or any other distortion meter). One sour of trouble that may not occur to some users is mechan cal vibration in the environment. If the instrument subject to vibration, the level settings and stray capac tances associated with input attenuators may be varie enough to produce a false signal that leads to an artif cially high residual distortion level.

Obviously, external magnetic fields which have con ponents in the effective pass band of the instrument wi also add artificially to the distortion reading. Such field may induce signals in the test cables either going into c coming out of the device under test. This kind of field often produced by power transformers and may be har to avoid if the transformer is in the device under tes The connection method shown in Fig. 8 will minimiz pickup of such fields.

Bad connections, particularly at the output of powe amplifiers where large currents must be handled, ma form non-linear resistances that distort the signal if th output impedance is not extremely small. Extremely good contacts are necessary at all cable connection when measuring very low distortion levels.

A final potent source of trouble is pickup of RF signals from nearby sources which may be demodulated in the analyzer circuitry to show artificially high distor tion levels. Radio broadcast engineers have usually hac considerable experience in getting RF out of their audio equipment and can be depended upon to attack the problem, once they know it is there. BM/E

AES continued from page 46

Digital in Europe Too

Neat look of audio console by Schlumberger of Paris accords with neat digital design: both got much attention at the 8th International Television Symposium in Montreux last spring. The six-input four-output console is digitally programmable: digital input from punched tape, magnetic tape, or directly from a computer will control program level, position, equalization, and other console functions. All the functions can, of course, be manually controlled. The attenuators, using MOS analog switchers, are also digitally controllable. A display in front of the operator shows amplifier gain, source number, and other program data.

potential in audio, and seems likely to lift us eventually out of the present struggle over matrix-vs.-discrete methods; the bandwidth of any practical video disc system will accommodate many times the number of audio channels we could conceivably ever want.

At an evening session with the catchy and highly appropriate title, "Look What They've Done to My Song, Ma," a group of New York professionals took the jam-packed audience through examples of recorded material starting all the way back with Berliner disc #158Z, the song "Sweet Marie," recorded by George Gaskin in New York in October 1895. Excerpts from a number of other pre-electric recordings ended with the Tchaikovsky "Romance in F Minor," recorded acoustically by Victor in 1922, and re-recorded electrically in 1925. Juxtaposition of the two recordings gave a particularly clear view of how electrical recording transformed the industry.

Following this, about 30 further examples brought the survey down to the present, through the LP, stereo, quad, 16-channel recording. It ended with an electronic-music composition made especially for the occasion by

Walter Sear, in 16 channels. The survey put in strong relief the effects that recording technique has had on musical quality, from the horn-crowding orchestra setups of the acoustic era, through the steady improvements in fidelity of the electrical era, down to about 1950. Then a new element started to come in: musical "effects," alteration via multiple recording, echo "layering," synthesizers, and eventually all the other "tricks" that are standard today.

The whole program, with excellent commentary, was put on tape mainly by the following: Irv Joel, A&R Recording; Michael Colchamiro, Ultra-Sonic Recording Studios; John Woram, Woram Audio Associates, and Albert B. Grundy, Institute of Audio Research. The crowd was so large that the program, originally set for 7:30 p.m., was repeated at 10 p.m. More than 700 heard the program at the two sessions. Many suggestions came to the sponsors for later repeats of the program, and for taking it "on the road" to other cities.

History got another entertaining

serving in an exhibit of equipment collected by industry veteran John T. Mullen of 3M. It started with a Berliner phono of 1895, lent by grandson Oliver Berliner. Especially interesting was a listen-in stand, with headphones for visitors, with a switch allowing choice of an acoustic or an early electrical recording. Also in the show were, among many other items, a disc-cutting lathe from the "wax" era, a model of the first condenser microphone, used in some of the earliest radio and recording setups; a turntable for playing the 16-inch "transcriptions" used by radio stations in the 1930s and 1940s, and what was probably the first "demo" tape, a paper-backed recording from 1946.

Mr. Mullen was on hand at stated intervals to describe the items in t exhibit, adding a wealth of fascinati detail.

One unexpected but happy result the show was that the Waldorf-Astor stimulated to rummage in its sto rooms, gave to Mr. Mullen for l evolving "museum" some sound-rei forcement equipment from the earlie days of electrical playback, includi ten-foot racks holding huge audio a plifiers. The Society has officially d signated Mr. Mullen as "curator" a is seeking a way to set up a permane home for his outstanding collection, it will be freely available to interest viewers and able to attract further in portant items from the history audio.

A session on broadcast audio inclu ed two papers that *BM/E* hopes t summarize in some detail in lat issues: one on sources of distortion i AM broadcast signal-processing equi ment, which describes methods f minimizing the distortion inevitable i any gain-control or peak-limiting sy tem, presented by W. W. J. Hope, the Nashville Audio Group, Inc.; and survey of the basics of FM modul tion, with application to day-to-da FM station operation, by Arno Meye

of Belar Electronics.

A session on digital techniques included papers covering a very wide range of applications, from making audio recordings of extreme dynamic range, to providing voice control of computer response. Others were on theoretical aspects of digital coding of audio. It was clear that this is an extremely active field that seems certain to become more so, with eventual large effects on audio hardware in general. A paper on the use of digital techniques to "restore" the voice of Enrico Caruso, from an early acoustic recording, described the speech/analysis synthesis system used, which involved establishing the vocal track parameters for the recorded voice. The synthesized recording presented the voice, in the well-known "Vesti la giubba" aria from *Pagliacci*, startingly "real," free from noise (and free of the original orchestral accompaniment as well).

The article on page 30 of this issue presents briefly the current position of the front lines in the battle over quad. At the AES show, most of the main contestants were present in demonstration rooms, away from the main exhibit floor. All were demonstrating improvements in technique. Hardware details are in the exhibit summary below.

The Exhibitors

Product exhibits of main interest were the following:

AKG-North American Philips—Complete line of microphones; the professional reverb unit.

Acoustic Research, Inc.—Two new loudspeakers—The LST-2 is a somewhat smaller version of the LST brought out over a year ago; the LST-2 price is approximately $400. Also new is the AR-8, designed specifically for rock music with an especially efficient woofer and high-power tweeter.

Allison Research, Inc.—Featured an automated mixdown system, subtitled "Memory's Little Helper," with 100 dB of range, up to 256 channels or variable functions, packaged in two small rack units.

Audiotechniques, Inc.—Acting as distributor for many domestic and imported professional audio products. Among the most interesting imported units for broadcasters was the Keith Monks (U.K.) record cleaning machine, which looks capable of solving the record dirt and wear problems that are ever-present for radio stations.

continued on page 68

AES

Ampex Corp.—Had a "live" demonstration of the audio-sync system (see article on another page of this issue). Also: the line of tape recorders and audio tape duplicators.

Audio Devices—The line of mastering tapes, audio cartridges.

Auditronics—Introduced the new 110 console, specifically for broadcast use: up to 18 inputs (with modular channels), four out, XLR connections, solid-state switching, (several were sold to broadcasters at the show). Basic price, $11,700 (with 8 inputs).

Automated Processes, Inc.—Demonstrated "live" the automated mixdown system (see article in this issue). Also the line of plug-in amplifiers, linear faders, compressors, equalizers, tape synchronizers, etc.

BASF Systems, Inc.—Line of tapes, carts, cassettes.

B. & K. Instruments, Inc.—A new high-speed spectrum analyzer showing 1/3-octave bands in separate vertical indications on scope.

Bose Corp.—Showed a new speaker system, the 800, a portable unit embodying the well-known Bose "back-throw" system; and the 1800, a stereo power amplifier rated at 250 watts/channel into 8 ohms.

Burwen Laboratories—Showed th Model 1000 playback noise filter an the Model 2000 encode-decode nois reducer. The former is now in use by number of broadcast stations to cu noise from recording playback (statu of noise reduction systems in broac casting will be covered in an upcomin detailed article).

R. T. Bozak Mfg. Co.—This vetera loudspeaker maker has moved strongl into the professional field; showed th new CM-800 monitor speaker, wit very wide dispersion (price will b $350-400); a series of compact mixers up to 10 inputs; a series of powe amplifiers, single and double, rated 25 50, 100 watts/channel.

CBS Records—Demonstrated playbacl of SQ recordings, using decoder witl the new IC from Motorola.

Crown International Inc.—The line o professional tape recorders; the D-60 D-150 and DC-300A amplifiers.

Custom Fidelity Company, Inc.—In troduced the Pro 16, a 15-30 ips, two inch tape machine aimed at top quali ity 16-channel recording (one of a number of top-grade machines a noted in the following).

DBX, Inc.—Showed the Model 216 tape noise reduction system for 16 channels; other noise reduction units. (Use and applicability in broadcasting will be included in upcoming article on noise reduction systems).

Dolby Laboratories, Inc.—Showing the familiar Dolby "A" noise reduction units; also the new Dolby Model 324 Type "B" encode unit designed specifically for FM broadcasting, which includes the (switchable) option advocated by Dolby for adjusting the pre-emphasis to 25 microseconds (not yet approved by the FCC; as noted in preceding entry, a forthcoming article will cover the principal current noise reduction systems aimed at broadcasting).

Electro-Sound, Inc.—New is the ES505 professional tape recorder, with auxiliary outboard reel to aid in editing, plus a foot switch for brake release; also a new video cassette automatic loader, for ¾-inch tape, and a new intermediate speed tape duplicating system, the 2000 series (to add to the firm's high speed systems).

Elpa Marketing Industries, Inc.—A distributor for a number of domestic and imported products. Some new highlights: a new Ferrograph auxiliary unit, Model ATU, for use with the RTS-2 test set, expands greatly the connection and operating flexibility; a

lew Ferrograph tape recorder series, he Super Seven, aimed at professional pplications; and AmBiChron speech ompressor/expander, which uses a uilt-in variable-speed audio cassette layer/recorder, plus electronic pitch orrection, and costs $695.00.

Eventide Clock Works—Showed digital elay units, Models 1745A and the less xpensive Model 5851; also the "Omipressor," which combines functions f a compressor, expander, noise gate nd limiter in one unit.

Fairchild Sound Equipment Corp.—he full line of small consoles, reverb ystems, switching relays, and other rofessional audio units.

Electro-Voice—Demonstrated adanced monitor loudspeakers with exremely even low bass response; presnted lectures on sound monitoring nd reinforcement technology.

Gately Electronics—Distributor for a umber of professional audio units, inluding the Schoeps microphones, Proit audio units in kit form, "Mom's Wholesome Mixer," a modular system roviding up to 16 inputs.

Gotham Audio Corp.—Distributor of oreign and American units, showed nportant units from EMT, Studer, leumann, Telefunken, etc., including ne new Neumann QM69 quad mike, hich has four condenser mikes all on ne same axis, in a compact housing; nd the new EMT Model 240 reverb nit which uses gold foil as the delay iedium, for a much more compact, iore flexible unit than one using steel; ne Delta-T 101 electronic digital dely system.

Harvey Radio Co., Inc.—Distributor, nowed, among other items, linear lastic faders.

JVC America, Inc.—Developer of the D-4 discrete disc recording system, emonstrated that system, including omplete hardware for playback; pickp, demodulator, four-channel elecronics in several forms; in the demo a umber of RCA quad discs were used. unit, the MM-4, was introduced: it isplays output from each speaker hrough light patterns on scope screen, manating from four corners of screen.

Mark Levinson Audio Systems—A ixer with some new ideas in control, 0 inputs; also a preamplifier, Model NP-2.

Martin Audio/Video Corp.—Distributor, handles products of most leading rofessional audio brands.

MCI—Showed their large recording onsoles.

Magra Magnetic Recorders, Inc.—Their amiliar line of top-grade portable recorders, including the Model IV-S with sync for use in movie sound recording.

Rupert Neve Showed examples of their recording consoles; showed a new modular amplifier channel, the model 1081, adaptable to any control console need, which includes a mike preamp, very flexible equalization (hi, mid, lo, with selectable curves), and flexible switching.

Nippon Columbia Ltd. Demonstrated the four-channel system developed mainly by Dr. Duane Cooper (in broadcast form, it is one of those now before the NQRC).

Pentagon Industries, Inc. A new 8-track recording machine, another candidate for high-grade audio recording applications.

Pratt-Spector Corporation Sensing and splicing tape for all varieties of magnetic tape unit; also labels and label dispensers of many kinds.

QRK-Rek-O-Kut (CCA Electronics subsidiaries) Turntables, preamplifiers, tone arms, studio cabinets, long associated with these names.

RCA A wide range of consoles; monitor speakers; many components for audio systems.

continued on page 70

AES

Recortec, Inc.—A new cassette duplication system, Model CDS, which turns out cassettes at high speed, combining this firm's cassette loader with additional electronics.

Revox Corporation—Introduced a new stereo recorder, the Model A700, with a large array of advanced operating and control features; price about $1800. Also showed the A77 recorder, the tuner and stereo amplifier; Beyer microphones.

Sansui Electric Co. Ltd.—Demonstrated the Sansui matrix quad system; featured the new QSE5B encoder developed especially for FM broadcasters—price about $900.

Scully/Metrotech—Emphasized the new line of tape recorders, compact, top-grade machines introduced at the recent NAB.

L. J. Scully Mfg. Company—Featuring their LJ-10, a tape recorder designed especially for broadcast use, particularly in "extended play" applications, as in automation systems. Also promised, an advance-head tape machine for disc mastering (prototype was on display); and, in about a year, a new Scully disc-cutting lathe, putting the company back in its traditional business.

Sequerra Company, Inc.—Showed the Model FM-1 tuner, a no-holds-barred effort with digital tuning, many far out refinements—price about $1800.00.

Shure Brothers—Showing the line of microphones and mixer equipment, emphasis on the SE30 gated compressor-mixer, useful in many P-A and remote-broadcast applications.

Spectra Sonics—Large recording and broadcast consoles; also the "Complimiter," audio processor popular in broadcasting, which supplies volume compression and peak limiting, either together or separately.

Stanton Magnetics—Featured their new pickup for discrete four-channel records.

Tascam Corporation—Demonstrated their mixing console, Series 70 tape recorders.

3M Company—The full line of audio recording tapes; including cassette and cart tapes.

3M Company, Mincom Division—The professional tape recorder series.

United Recording Electronics Industries—A new item is the BL-40 Modulimiter, using the Teletronix system

)r automatic program levelling in AM roadcasting. ($695). Also: broadcast onsoles, the Cooper time cube (acoustical delay line), the Model 527 graphic equalizer, the Model 1176LN limiting amplifier.

Vestlake Audio—Described their "turnkey" service for studio design.

edit Company—New 8, 16, and 4-track tape recorders, in very compact designs that have a definitely new look.

An FM Audio Design For an Unusual Variety of Programming

Planned for this issue, but unavoidably delayed past press-time, is an article describing a most unusual FM audio system designed for station WGPR in Detroit by Audio Services Inc. of Southfield, Mich. The station puts a wide varity of programs on the air, and also has a large number of standing remotes that put heavy demands on the audio system. The article will appear in the next issue.

BM/E CLASSIFIED MARKETPLACE

CLASSIFIED ADVERTISING RATES

DISPLAY CLASSIFIED ADVERTISING: $22.50 per inch 1x; $22.00 per inch 3x; $21.00 per inch 6x; $20.00 per inch 12x. ALL OTHER CLASSIFIED ADVERTISING 25¢ per word; minimum $3.00. BLIND BOX NUMBER: No extra charge. Replies sent to address below will be forwarded to you. PAYABLE IN ADVANCE; send check with order. CLOSING DATE: 5th of 2nd month preceding issue date.

BM/E, Monterey and Pinola Avenues, Blue Ridge Summit, Pa. 17214 Phone 717/794/2191

HELP WANTED

SYSTEM ENGINEER & TECHNICIANS

System Engineer and Technicians for operating CATV (300 mile) system in Long Island, New York. 500 miles of operating plant by January, 1974.

System Engineer—4 years CATV field experience or equivalent training and experience. Knowledge of microwave system, CATV plant and color studio operation and maintenance. Applicant should have administrative experience to direct technical and other field personnel. Engineering degree required.

Systems Technicians (3)—minimum 2 years CATV systems experience, one of which is in plant maintenance. Must have working knowledge of CATV test equipment including spectrum analyzer, sweep generators and storage scope. Technical school graduate with, or capable of obtaining, first class phone license.

Send complete resume including employment history and salary requirement to: **HUNTINGTON TV CABLE CORP., P.O. BOX 454, Huntington, N.Y. 11743.**

VIDEO ENGINEERS & TECHNICIANS

Fully experienced in maintaining color cameras, 2", 1", and ½" VTRs using latest Tektronix test equipment. Excellent salaries for right men. Send Resumes to: Phil Bewald, F&B/Ceco of Cal., Inc., 7051 Santa Monica Blvd., Hollywood, CA. 90038; Walter Druker, F&B/Ceco, Inc., 315 West 43rd Street, New York, N.Y. 10036.

Television Engineer—First Phone Operator with experience in handling a master control TV Switcher, Ampex VTR 1100 and 1200 B machines, film projectors and audio board. Maintenance and some transmitter experience helpful. Salary depends on experience. Write Box 1073-2, c/o BME, Blue Ridge Summit, PA. 17214.

SITUATIONS WANTED

COMBO MAN: First phone and ability. Five years as jock, engineer for two, music director. Management change forces move. Popular music preferred. I will make you happy. (417) 334-5677. Mike Conner, S.R. 1, Box 1277, Branson, Mo. 65616.

Technician with good background in TV transmitter and studios seeks responsible position in Mid-Atlantic area. Particulars available. Box 1073-4, c/o BME, Blue Ridge Summit, PA. 17214.

EQUIPMENT WANTED

NEED 3—340 foot guyed towers, ground wire, mesh, strap, etc. What do you have, how much, when, and where?

BOX 4371
Inglewood, Calif. 90309.

We are building an entire AM station from scratch. Need studio equipment. What do you have, how much, when, and where?

BOX 4371
Inglewood, Calif. 90309.

EQUIPMENT FOR SALE

PROFESSIONAL RECORDING AND TEST EQUIPMENT for recording studios and broadcasters—Altec, Ampex, 3M, GR, HP, Tektronix-new and used. Free equipment list or drop in. CHAS. E. WASHBURN CO., 6114-M SANTA MONICA BLVD., HOLLYWOOD, CA. 90038.

EQUIPMENT FOR SALE (Contd)

EBS RECEIVERS

FM type. Completely reliable. All solid state. Built for continuous duty. Built-in monitor and alarm. Choice of manual or self-reset alarm function. Rack mount in standard rack, only 3½" of vertical rack space required. Write for additional information. **Tri-Tronics Professional Electronics, 829 Eighth Street, Lillington, N.C. 27546.**

Ready for Video—Painlessly?

We are offering, at a fraction of the original cost, a complete mobile, monochrome studio facility. Included: 2-RCA PK-330 live cameras, RCA 8-input video switcher with Ball Bros. special effects, 2-Ampex 660B VTRs with edicon and full audio mixing facilities, complete pix and waveform monitoring. Everything in working order, housed in 3 integrated 19" consoles with full-length "producer's desk." All you need do is supply A.C.

Detailed list and/or visual inspection upon request. Original cost: approx. $65,000. Make us your best bid.

Norm Friedman
Visual Information Systems
15 Columbus Circle
New York, N.Y. 10023
(212) 541-8080.

ATTENTION CHIEF ENGINEER!

Update your old Ampex with our Solid-State Electronics OR trade it in against our LB-350 Recorder. Clear those old Ampex Electronics and Head Assemblies off your maintenance bench. Send them to us for money. **Lang Electronics, 14 East 39th Street, New York City 10016. (212) 725-8110.**

½" VIDEO TAPE—LOW DROPOUTS HIGH S/N—SPLICE FREE

Suitable for all ½" Video Recorder
2400 ft. reel—$10.50;
1200 ft. reel—$6.25
Satisfaction Guaranteed or Money Refunded Order from:
MEDIA ASSOCIATES—Dept. 105
Box 5209, Stanford, Calif. 95305
Calif. Residents add 6% sales tax

BROADCAST AND RECORDING EQUIPMENT: Scully, V.I.F. International, Metrotech, Langevin, Electrodyne, Q.R.K., Micro-Trak, MRL, Nortronics, McMartin, U.R.E.I., E.V., A.K.G., Sennheiser, Atlas, Ferrograph, HAECO, Stevenson, Gately, D.B.X., Advent, Altec, Fairchild, Audio Designs, 3M, Magnecord, Telex, Inovonics, Nagra, Uher, Tape-Athon, Package Deals, Installations, Service. Request Flyer. Weigand Audio, Middleburg, PA. 17842. (717) 837-1444.

QUALITY AUDIO CONSOLES are our specialty. Modern styling with slide faders. We manufacture eight standard consoles at very competitive prices. However, if you prefer, we'll manufacture a custom system to your specifications. Also, plug-in audio modules including distribution amplifiers, pre-amplifiers, monitor amplifiers, etc. Write or phone for prices and specifications. SYSTEMS ENGINEERING COMPANY, P.O. Box 49224, Atlanta, GA. 30329. (404) 482-2446.

MOTORS FOR SPOTMASTERS
NEW Papst hysteresis synchronous motor HSZ 20.50-4-470D as used in series 400 and 500 machines. Price $39.00 each prepaid while they last. 90 day warranty. Terms check with order only, no COD's. Not recommended for Tapecaster series 600 or 700.
TAPECASTER TCM, INC., Box 662
Rockville, Maryland 20851

EQUIPMENT FOR SALE (Contd)

SENNHEISER MKH 405 package: 5 MK 405 condenser microphones; 5 MZA 6 battery adaptors; 2 MZN 5-1 AC power supply; with cables. $1300. SHURE M-67 mixer/remote amp $50. SCOTCH 10½" aluminum reels (NAB hubs) New $1.50; with scotch box, $1.75; limited supply. Write Box 1073-1, c/o BME, Blue Ridge Summit, PA. 17214.

PARTS—for SPOTMASTER cartridge units IN STOCK—IMMEDIATE DELIVERY, new and used equipment too, trade-ins accepted. LOW PRICES. COMMUNICATION MEDIAS, Box 54, Allentown, PA. 18105 (215) 437-0607 or 437-9447.

RCA 50,000 KW, model BTA-50G AM Transmitter. Immaculate condition. Now Tuned to 720 KHz. $22,500.00. Box 1073-3, c/o BME, Blue Ridge Summit, PA. 17214.

Solid-state audio modules-console kits, power amplifier kits, power supplies. Octal plug-ins: mic, eq, line, disc, tape play, tape record, amplifiers. Audio & tape bias oscillators. Over 30 audio products. Send for free catalog and applications. Opamp Labs, Inc., 172 So. Alvista Blvd., Los Angeles, Calif. 90036. (213) 934-3566.

CARTRIDGE TAPE EQUIPMENT—Rebuilt. New paint, heads, flywheel, pressure roller, belts, etc. Spotlessly clean and thoroughly tested. 30 day money-back guarantee, 90 day warranty. Also contact us for possible discounts on new equipment and accessories.
AUTODYNE, Box 1004,
Rockville, Maryland 20850
(301/762-7626).

FIELD STRENGTH METER, 540 KHz to 5MHz, Ten microvolts to 10 volts per meter. New solid state design, long battery life. Stable, accurate calibration. Free literature. Solar Electronics, 901 No. Highland Ave., Hollywood, Cal. 90038.

AMERICA'S LARGEST STOCK AND CONSIGNMENT LISTING of new and used broadcast and recording equipment. We trade-sell and buy. THE MAZE CORPORATION, P.O. Box 6636. Birmingham, Ala. 35210.

STL—MARTI M-3B Transmitter/Receiver tuned to your frequency, $1250. Antennas, Transmission line also available. DYMA ENGINEERING, Rt. 1, Box 51, Taos, N.M. 87571.

The complete and reliable source for new and used broadcast equipment. Request our free listings. Broadcast Equipment and Supply Co., Box 3141, Bristol, Tennessee 37620.

CAPSTAN IDLERS for AMPEX 300, 35 440 Series, self aligning with replaceable ball bearings, $22.50 net. VIF INTERNATIONAL, Box 1555, Mtn. View, Ca. 94040.

MICA AND VACUUM transmitting capacitors. Large stock; immediate delivery. Price lists on request. SURCOM ASSOCIATES, 1147 Venice Blvd., Los Angeles, Cal. 90015 (213) 382-6985.

4—650 ft. towers $6500.00 each. Many more. Ground wire 85¢ per xx. lb. Bill Angle, Box 55, Greenville, N.C. 27834. Tel. 919-752-3040.

One stop for all your professional audio requirements. Bottom line oriented. F.T.C. Brewer, Box 8057, Pensacola, Fla. 32505.

WE BUY TUBES, TRANSISTORS & CAPACITORS. Send your lists of sale items. Specialty Supply Ltd., P.O. Box 22391, Denver, Colo. 80222.

Surplus Audio Patch Panels All Standard Configurations. Gulf Telephone & Electronics, Inc. 6235 Beverly Hill, Houston, Texas 77027.

INSTRUCTIONS

FCC FIRST CLASS RADIOTELEPHONE LICENSE IN SIX WEEKS. Classes in Dallas, Atlanta, Denver, Ft. Worth, Hartford, Houston, Memphis, Nashville, New Orleans, Oklahoma City and San Antonio. For information contact Elkins Institute, 2727 Inwood Rd., Dallas, Tex. 75235 214/357-4001.

INSTRUCTIONS (Cont'd)

irst phone through tape recorded lessons at ome plus one week personal instruction in Washington, D.C., Atlanta, Boston, Detroit, ew Orleans, Minneapolis, Seattle, Denver, ortland, Los Angeles. Proven results. Our 17th ear teaching FCC license courses. Bob Johnson roadcast License Training, 1060D Duncan, lanhattan Beach, Calif. 90266. 213-379-4161.

TTENTION VETERANS! First class license five weeks with complete theory and R.C.A.-uipped laboratory training. Approved for terans Tuition $333.00. Housing cost $16.00 r week. American Institute of Radio, 2622 ld Lebanon Road, Nashville, Tenn. 37214. 5-889-0469.

PROGRAM SERVICES

Free" Catalog . . . Everything for the dee-y! Comedy, books, aircheeks, wild tracks, d radio shows, and more! Write: Com-and, Box 26348-A, San Francisco 94126.

eejays! 11,000 classified gag lines. $10.00. nconditionally guaranteed. Comedy cata-g free. Edmund Orrin, Box 679-M, Mari-osa, Cal. 95338.

LD RADIO PROGRAMS FOR SALE. nd $1.00 for a fabulous catalog listing 25 ars of radio's greatest shows. Vintage Ra-o, P.O. Box 2392, Culver City, Cal. 0230.

PROFESSIONAL CARDS

COHEN & DIPPELL
CONSULTING ENGINEERS
Formerly GEO. C. DAVIS
527 Munsey Bldg.
(202) 783-0111
Washington, D. C. 20004
Member AFCCE

JANSKY & BAILEY
TeleCommunications Consulting
Department
CATV & CCTV
Phone 703/354-3400-ext. 722 or 2400
Shirley Hiway at Edsall Road
Alexandria, Virginia 22314
Atlantic Research Corporation

BROADCAST STUDIO DESIGN
Control Systems, Facilities Planning, Plant Layout & Manufacturing
DYMA ENGINEERING, INC.
Route 1, Box 51, Taos, New Mexico 87571
Phone: 505/758-2686

RALPH E. EVANS ASSOCIATES
Consulting Radio Engineers
AM - FM - TV - CATV - ITFS
3500 North Sherman Blvd.
MILWAUKEE, WISCONSIN 53216
Phone: 414-442-4210

McCLANATHAN & ASSOCIATES
Consulting Engineers
APPLICATIONS & FIELD ENGINEERING
TURNKEY INSTALLATIONS — RADIO & TV
Domestic and Foreign
P. O. Box 750
PORTLAND, OREGON 97207
Phone: 503/246-8080

USE BM/E's CLASSIFIED MARKETPLACE TO REACH OVER 28,000 BROADCASTERS!

PROFESSIONAL CARDS (Cont'd)

VIR JAMES
CONSULTING RADIO ENGINEERS
Applications and Field Engineering
Computerized Frequency Surveys
345 Colorado Blvd.—80206
(303) 333-5562
DENVER, COLORADO
Member AFCCE

CHU ASSOCIATES, INC.
Telecommunications Division
AM—FM—TV—CATV
Applications—Facilities Planning
Field Surveys and Proofs
Appraisals
800 Fesler St., El Cajon, Ca. 92020
(714) 442-9459
TWX 910 331 1178

ADVERTISERS' INDEX

SALES OFFICES

Broadband Information Services, Inc.
274 Madison Avenue
New York, New York 10016.

EASTERN STATES
274 Madison Avenue
New York, New York 10016
212-685-5320
Charles C. Horner

MIDWESTERN STATES
New York Office

WESTERN STATES
1111 Hearst Building
San Francisco, California 94130
415-362-8547
William J. Healey
16400 Ventura Blvd.
Encino, California 91316
213-981-4721
Art Mandell

JAPAN
Nippon Keisoku Inc.
P.O. Box 410
Central Tokyo, Japan
Tokyo (03) 667-7681
Yoshi Yamamoto

If you're looking for the easiest way to accurately measure envelope delay, look no further.

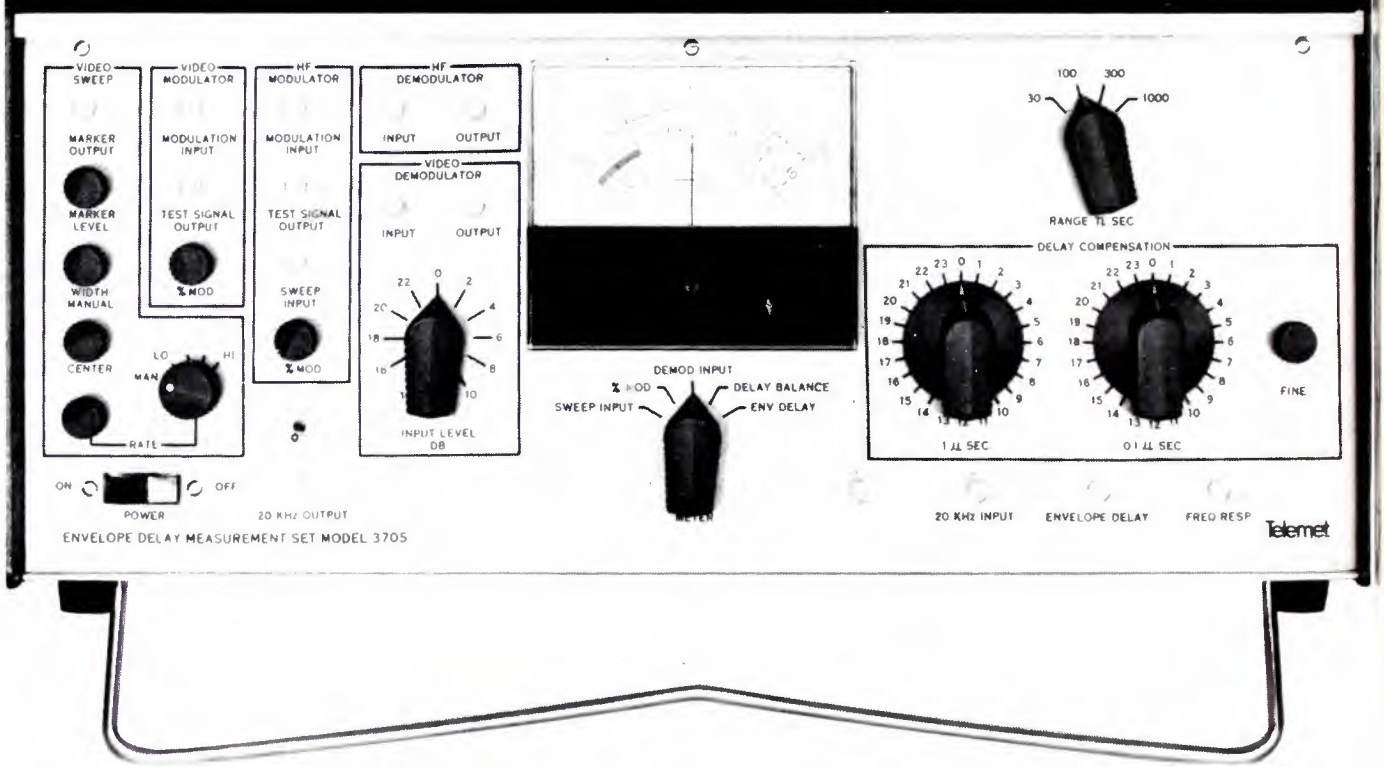
Frequency range is 0.1 to 10 MHz for the Video Modulator and 25 to 250 MHz for the RF Modulator.

We've developed a solid-state measuring system that has everything in one box. And that includes a convenient, low-harmonic content Sweep Generator. The result is exceptionally good accuracy. In fact, delays of ±30 ns to ±1000 ns can be measured in 4 ranges, with a resolution of 2 ns. The test signal is provided with or without sync and blanking for meaningful TV transmitter measurements.

Readout is by way of a front panel meter that provides point by point measurements. And a scope-jack offers continuous sweep display. The price is one more unusual statistic.

Only $3850

We'd like to tell you more. Write or call us today for complete data.
Telemet Company, Amityville, New York 11701, (516) 541-3600.



better ideas for broadcasting

Telemet COMPANY a division of *GEOTEL, INC.*

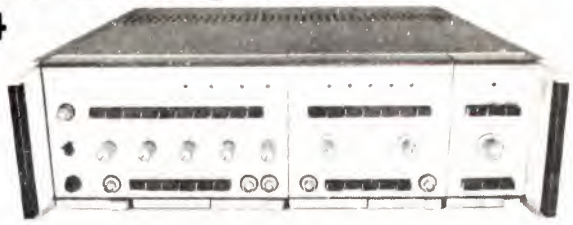
Amityville, New York 11701, (516) 541-3600

REGIONAL OFFICES

Atlanta, Ga. (404) 939-7166 Chicago, Ill. (312) 627-6026 Houston, Tex. (713) 946-5796 Riverside, Calif. (714) 683-0641

See us at NAEB—Booth 99

Generates every specified IEC, CCIR, CMTT Video test signal for color, B/W systems, PHILIPS PM5572/73/74



Three major, professional instruments, physically and functionally integrated in one 19 inch-panel. World's most versatile video-test-signal generator for use in precision tests of transmission links, transmitters and studio equipment. Provides all data required for measurement of insertion loss, linear/non-linear distortion of B/W and color signals. $6350 complete.

- Consists of PM5572 Blanking Mixer, PM5573 Pulse Generator and PM5574 Sine Wave Generator.
- Simple to operate; all functions pushbutton controlled; ideal for mobile applications.
- Swept signals from 100 KHz to 10 MHz with 1 MHz markers; pulse and bar signals in 7 combinations; automatic duty switching . . . and many, many others.

☐ I'd like a demonstration. Contact me.

☐ Send complete specs

NAME _____

TITLE _____ PHONE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE & ZIP _____

PHILIPS TEST & MEASURING INSTRUMENTS INC.
A NORTH AMERICAN PHILIPS COMPANY

Telephone: 516-433-8800

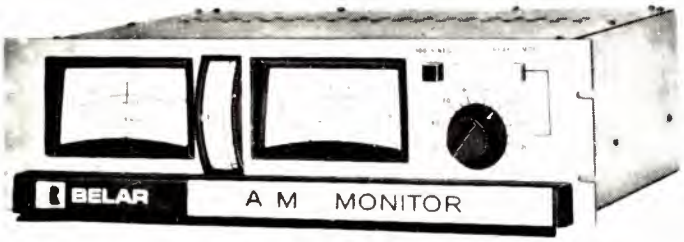
FOR MORE INFORMATION ON signal generator, write to:
TEST & MEASURMENT INSTRUMENTS INC
224 Duffy Ave.
Hicksville, N.Y. 11802

AM STATIONS, ATTENTION!

Comply with new FCC ruling on monitoring 125% positive peaks (and simultaneously measuring 100% negative peak).

Return this card or call Belar Electronics, (215) 687-5550, for full information on our AMM-1 AM frequency and modulation monitor. In addition, send information on FM ☐, TV ☐, monitors. Or skip the AM; just send us information on FM ☐ TV ☐ monitors.

Belar Electronics Laboratory inc., Post Office Box 826, Devon, Pa. 19333



Type Approval #3-176

NAME _____ COMPANY _____ ADDRESS _____ CITY _____ STATE _____ ZIP _____

FOR MORE INFORMATION ON
BELAR ELECTRONICS LABORATORY
P.O. Box 826
Devon, Pa. 19333

Completely AUTOMATIC

SPLICE FINDER & ERASER

- Simplified operation and design. Automatic start and ejection.
- Automatically stops splice within 1" beyond capstan.
- Pressure sensitive function. Does NOT require prerecorded signal.
- Pre-set to sense all 1.5 mil splicing tapes. Can be adjusted.
- No manual positioning of splice is required.
- Eliminates annoying noise effect of recording over splice.
- Accepts A, B, and C size (NAB) tape cartridges.
- Exercises tape to improve performance.
- Detects severe tape fractures.
- Saves studio manhours by minimizing splice search time.
- Built-in bulk eraser.

Model SFE-1	Power:	117V, 60 Hz., 250 Watts
SPLICE FINDER & ERASER	Size:	16⅝" w, 6¼" h, 10⅛" d
PRICE: $325.00	Weight:	18 lbs.
FOB North Haven, Conn.	Tape Speed:	15 IPS

The Senstrol Model SFE-1 SPLICE FINDER & ERASER pays for itself by reducing related operating expenses. Order directly from:

SENSTROL DIVISION, UMC Electronics Co.
460 Sackett Point Road, North Haven, Conn. 06473
Telephone: (203) 288-7731 U.S. Patent Pending

SENSTROL DIV., UMC ELECTRONICS CO.
460 Sackett Point Road
North Haven, Conn. 06473

---

10 kW, 20 kW and NOW 40 kW Self-cooled RF Terminations

need no external water supply.

MODULOAD® Load Resistors are ideal for locations where water supply is unreliable, expensive or simply not available. Self-contained with integral heat exchanger and protective devices, these new coaxial loads operate continuously under full rated RF power in 5° to 45°C ambients (-20°C to +20°C with antifreeze).

MODULOAD systems are designed for CW, AM, FM and TV transmissions to 40kW average and terminate 50-ohm lines with a low 1.1 VSWR from dc – 1300MHz.

THRULINE® RF Wattmeters available as companion packages.

Name ..... Title .....

Company .....

Street .....

BIRD ELECTRONIC CORP.

Bird's Modulod Load Resistors, write to:
BIRD ELECTRONIC CORP.
30303 Aurora Road
Cleveland (Solon), Ohio 44139
Gloucester City, N.J. 08030

FIRST CLASS
PERMIT NO. 1470
HICKSVILLE, N.Y.

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

Postage will be paid by

TEST & MEASURING INSTRUMENTS INC.
A NORTH AMERICAN PHILIPS COMPANY

224 DUFFY AVENUE
HICKSVILLE, NEW YORK 11802

FIRST CLASS
PERMIT NO. 70
DEVON, PA.

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN UNITED STATES

POSTAGE WILL BE PAID BY

Belar Electronics Laboratory Inc.
Post Office Box 826
Devon, Pa. 19333

FIRST CLASS
PERMIT NO. 138
North Haven, Conn.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY—

SENSTROL
A Division of UMC Electronics Co.

460 Sackett Point Road
North Haven, Connecticut 06473

Name _____ Title _____
Signature _____
Station or Firm _____
Address _____
City _____ State _____ Zip _____
☐ Purchase Order #: _____
Delivery Requested _____ (Date)

FIRST CLASS
PERMIT NO. 17175
CLEVELAND, OHIO

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN UNITED STATES

POSTAGE WILL BE PAID BY

BIRD ELECTRONIC CORPORATION
30303 Aurora Road · Cleveland (Solon) Ohio 44139

CCA SOLID STATE 40 WATT HI FIDELITY TRANSMITTERS AND RECEIVERS permit you to originate programs from remote locations — designed for 115VAC or mobile use. Three inputs with mixing — 15 Kc response.

SAVE ON TELEPHONE EXPENSE with CCA REMOTE PICK UP and STUDIO TRANSMITTER LINKS

Send this Postcard for more information

CCA ELECTRONICS CORPORATION
716 Jersey Avenue
Gloucester City, N. J. 08030
(609) 456-1716

CCA SOLID STATE STUDIO-TRANSMITTER LINKS available for 200 Mc, 300 Mc, 450 Mc and 900 Mc. 10 Watts output High Fidelity good for Mono or composite input. Plug in modular construction

Remote Pickup and Studio Transmitter Links, write to:
CCA ELECTRONICS CORP.
716 Jersey Avenue
Gloucester City, N.J. 08030

CCA "CITADEL" CARTRIDGE MACHINES feature direct drive, built-in 150 cycle, at no additional cost, plug-in electronics — full accessibility — Playback $495 for Mono, $725 — Stereo; Record/Play $695 — Mono, $995 — Stereo.

YOUR BEST BUY FOR CARTRIDGE EQUIPMENT

Send this Postcard for more information

CCA ELECTRONICS CORPORATION
716 Jersey Avenue
Gloucester City, N. J. 08030
(609) 456-1716

CCA "CITADEL" PLAY UNITS are only 5¾" wide. Thus, three can be mounted side by side in a standard 19" rack.

Cartridge Equipment, write to:
CCA ELECTRONICS CORP.
716 Jersey Avenue
Gloucester City, N.J. 08030

50 KW AM

with conventional high level modulation and air cooling

You are cordially invited to visit our plant and watch the AM 50,000 go through its paces!

CCA AM/FM TRANSMITTERS ARE WITHOUT COMPARISON

Send this postcard for more information

CCA ELECTRONICS CORPORATION
716 Jersey Avenue
Gloucester City, New Jersey 08030
(609) 456-1716

25 KW FM

air cooled transmitter with independent 3 KW driver and one power amplifier tube

AM/FM Transmitters, write to:
CCA ELECTRONICS CORP.
716 Jersey Avenue
Gloucester City, N.J. 08030

CCA offers a complete line of solid state AM transmitters 4 to 50 watts for campus radio and broadcast emergency service.

YOUR BEST BUY FOR EDUCATIONAL AM & FM

Send this Postcard for more information

CCA ELECTRONICS CORPORATION
716 Jersey Avenue
Gloucester City, N. J. 08030
(609) 456-1716

CCA offers both vacuum tube and solid state FM transmitters from 10 to 100 watts for low power and emergency application.

Educational AM & FM, write to:
CCA ELECTRONICS CORP.
716 Jersey Avenue
Gloucester City, N.J. 08030

Name _____
Station or Firm _____
Address _____
City _____
State _____ Zip _____

FIRST CLASS
PERMIT NO. 128
GLOUCESTER CITY,
NEW JERSEY

BUSINESS REPLY CARD
NO POSTAGE NECESSARY IF MAILED IN THE U. S.

Postage will be paid by:

CCA ELECTRONICS CORP.
716 Jersey Avenue
Gloucester City, New Jersey 08030

Name _____
Station or Firm _____
Address _____
City _____
State _____ Zip _____

FIRST CLASS
PERMIT NO. 128
GLOUCESTER CITY,
NEW JERSEY

BUSINESS REPLY CARD
NO POSTAGE NECESSARY IF MAILED IN THE U. S.

Postage will be paid by:

CCA ELECTRONICS CORP.
716 Jersey Avenue
Gloucester City, New Jersey 08030

Name _____
Station or Firm _____
Address _____
City _____
State _____ Zip _____

FIRST CLASS
PERMIT NO. 128
GLOUCESTER CITY,
NEW JERSEY

BUSINESS REPLY CARD
NO POSTAGE NECESSARY IF MAILED IN THE U. S.

Postage will be paid by:

CCA ELECTRONICS CORP.
716 Jersey Avenue
Gloucester City, New Jersey 08030

Name _____
Station or Firm _____
Address _____
City _____
State _____ Zip _____

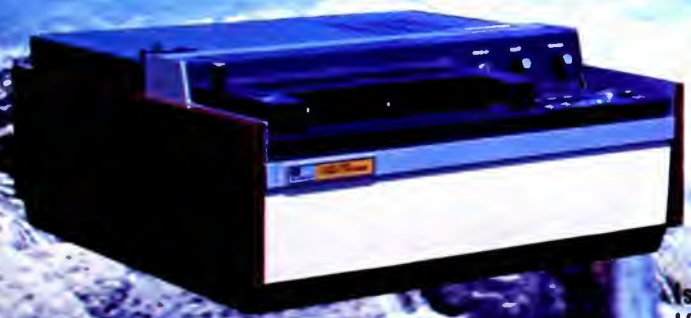
FIRST CLASS
PERMIT NO. 128
GLOUCESTER CITY,
NEW JERSEY

BUSINESS REPLY CARD
NO POSTAGE NECESSARY IF MAILED IN THE U. S.

Postage will be paid by:

CCA ELECTRONICS CORP.
716 Jersey Avenue
Gloucester City, New Jersey 08030

A REFRESHING CHANGE IN VIDEOCASSETTE MACHINES



Is your present videocassette machine a tape eater? If so, take a look at the refreshing changes in TeleMation's new machine.

A new tape threading mechanism that eliminates jamming and tearing.

An all cast aluminum frame for long term alignment. Plug-in circuit boards and removable side panels for unmatched service access. Completely interchangeable with all U-Matic format videocassette tapes.

With innovative features like these and many others, TeleMation's videocassette machines will [illegible] change to your current or contemplated system.

May we send you additional information? TeleMation, Inc. P.O. Box 15068, Salt Lake City, Utah 84115, (801) 487-[illegible].

TeleMation, Inc.

65 on Reader Service Card

For about $9,000 you can buy their color camera.

Or our color camera and control unit, special effects generator, sync generator, and phase shifter.

After years of innovative technological research, Panasonic can offer its Color Camera and Control Unit, the WV-2100P/WV-8200P. At a price so low you can now buy a complete production system.

And you'll be getting a camera that delivers excellent reproduction. Because at the heart of the WV-2100P is a unique configuration of two identical ⅔" separate mesh vidicons. One for luminance. One for chrominance. Since they supply all the signals, you get the kind of sharp, clear picture you'd expect from cameras costing twice as much. The WV-2100P has horizontal resolution over 500 lines. And requires only 50 foot-candles minimum illumination.

And because there are just two vidicons, setup takes less than half an hour. Instead of hours. Then once production begins, you operate only two controls. Horizontal and vertical centering.

To make your productions look even more professional, we've created a new Special Effects Generator, the WJ-5000P. That has internal and external keys. Plus fade-in, fade-out, lap-dissolve, and nine different kinds of wipes. You even get a choice of normal, normal-reverse, or reverse wipe modes.

Then you can add our new Color Sync Generator, the WJ-1000P. Plus our Phase Shifter, the WJ-1700P.

And that's the system. From Color Camera to Phase Shifter. All from Panasonic. All for under $9,000. Just send us the coupon, and we'll be glad to send you detailed literature. Or give you a demonstration. After all, we've waited for this kind of breakthrough as long as you have.

Panasonic VTR-CCTV Dept. BME10
200 Park Ave., N.Y., N.Y. 10017

- ☐ Please send me literature on Panasonic's Color Production System.
- ☐ Please have a Panasonic systems engineer call to arrange a demonstration.

Name _____

Title _____

Company _____

Address _____

City _____

State _____ Zip _____

Panasonic.
just slightly ahead of our time.