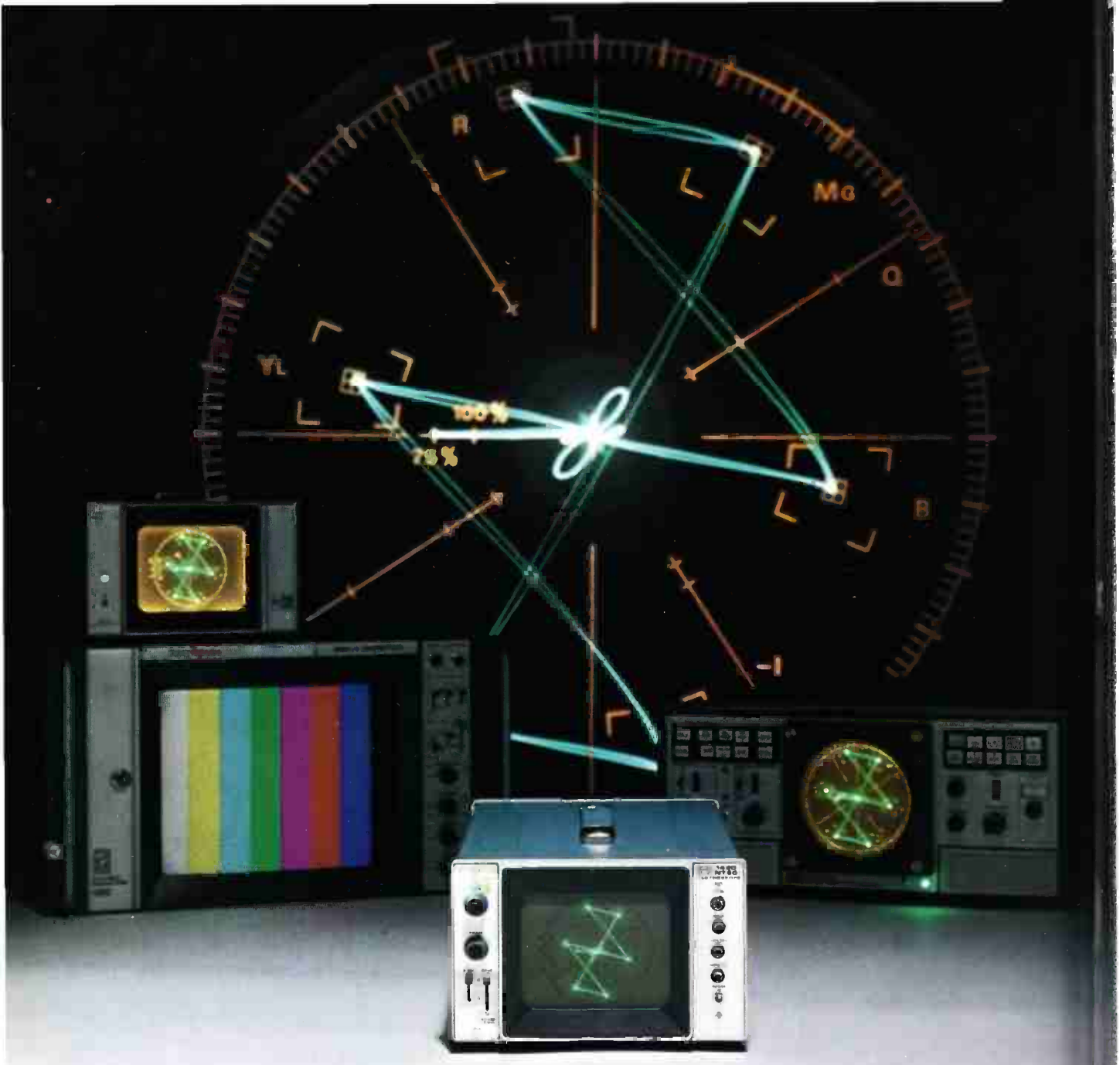
JUNE 1974

BM/E

BROADCAST MANAGEMENT ENGINEERING



A NEW VECTORSCOPE JOINS THE FAMILY..

Now there is a choice of three Vectorscopes from Tektronix—ONE: The new 1420, a compact unit that is especially well suited for camera control units, video tape recorders and similar installations. TWO: The Vector Display Option available with TEKTRONIX Color Picture Monitors. THREE: The 520A, the established standard of vectorscope performance and features.

Vectorscopes are used to examine the chrominance components of the video signal. Where this examination requires a simple but accurate vector display, or when your differential gain or differential phase measurements are to be made with moderate resolution, the 1420 is well worth consideration. The 1420 is half-rack size allowing for side-by-side installation with the 528 Waveform Monitor. In applications that require high-resolution measurements of differential phase and differential gain, or where dual vector displays or time base displays of luminance, red, green, and blue are needed the TEKTRONIX 520A is recommended.

A more specialized, but no less-accurate simple vector display is available as an option with TEKTRONIX Color Picture Monitor The vector option uses calibrated drive signals derived from the precision circuitry of the picture monitor to produce a vector displa on a separate half-rack width monit scope. Display phasing and amplitude are slaved to the hue ar chroma controls of the picture monitor.

TEKTRONIX®
committed to technical excellence

Tektronix, Inc., P.O. Box 500, Beaverton, OR 970

Circle 100 on Reader Service Card:
For demonstration Circle 101

A MODULATOR for all seasons

Four different modulators . . . four different needs.

You've probably never looked at modulators that way . . . but all too often RF systems use modulators whose performance either does not meet, or exceeds by far, the capabilities of the remainder of the system. That's no longer necessary.

DYNAIR now manufactures four different modulators . . . each designed to do the best job necessary for a specific requirement, and priced to fit it too. They save you money, since you pay for only the performance you need . . . no more, no less.

And, as the recognized leader in modulator design, we keep them up to date too. As new techniques are discovered and, particularly, as new integrated circuitry is developed, improvements in our equipment are promptly made. DYNAIR designed the first solid-state modulator and we continue to advance the state-of-the-art.

And – they're *all* modulators for *all* seasons – designed with compensated components to operate over broad temperature ranges. Many modulators won't.

DYNAIR . . . *the modulator people.*

The new MINI-MOD II* is ideal when you want to operate several standard RF receivers from the audio and video outputs of a color VCR or VTR . . . use it in limited channel RF systems. The double-sideband output of the MINI-MOD II would also be seen in adjacent channels! **($250)**

For MATV and educational RF systems, the new TX-3A* does the trick. Its internal filtering licks the adjacent channel color problem so the TX-3A can be added as easily as an off-air signal. **($495)**

But, for critical CATV applications, you should consider the DYNA-MOD II*. It will assure top performance in this more demanding application . . . and it meets the FCC requirements for CATV modulators. **($1250)**

Now, if you are a CATV engineer who is really a purest, or if you have a broadcast, microwave or translator exciter requirement, take a look at the ultimate in currently available modulators – the new TX-40A Television Exciter*. Its performance will seem unbelievable to any engineer who is familiar with the current state of the art. **($2475)**

* Available on CCIR Standards

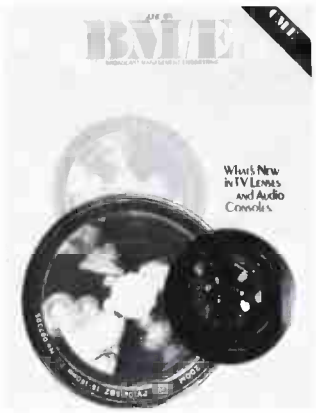
DYNAIR ELECTRONICS, INC.
6360 FEDERAL BLVD. SAN DIEGO, CALIF. 92114
TELEPHONE: 714-582-9211

DYNAIR

Circle 102 on Reader Service Card

BM/E
BROADCAST MANAGEMENT/ENGINEERING

JUNE 1974/VOLUME 10/NUMBER 6



Three lenses are better than one in making an interesting cover. Photos courtesy Rank Precision and Canon. See article beginning page 29.

Special Emphasis: Consoles

Special Emphasis: TV Lenses

CM/E A Supplement for those with cable interests: following page 50

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

Editor
James A. Lippke

Associate Editor
Robin Lanier

Washington Editor
M.L. Hollowell

Contributing Editor
Robert Wollins

Assistant Editor
Djuna Zellmer

Art Director
Gus Sauter

Production Manager
Helen Horan

FCC Counsel
Pittman Lovett Ford and Hennessey

Publisher
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 years.

Controlled circulation postage paid at Easton, Penna.

MODEL 1400-12 VIDEO SWITCHER

PROFESSIONAL PERFORMANCE IN SMALL FORMAT

With over 100 switchers now in service, the reputation of Grass Valley Group's Model 1400-12 switching system is now firmly established. The switcher provides the same type of features you expect in a high-quality studio system. For example: Clamped vertical interval switching, remote controlled matrix, internal/external keying and matte, bordered wipe patterns, and accurate color timing.

Available options include chroma key, color black/matte generator, Borderline, non-sync inhibit, automatic sync-add inputs, and an AFV system. Model 1400-12 is available in NTSC, PAL, and PAL-M versions.

For additional information, call or write the Grass Valley Group, Inc.

THE GRASS VALLEY GROUP, INC.

P.O. BOX 1114 GRASS VALLEY CALIFORNIA USA TEL: (916) 273-8421 TWX: 910-531-8280

A TEKTRONIX COMPANY

BROADCAST INDUSTRY NEWS

ABC Makes Big Purchase of OB TV Lenses

What's claimed as the largest ever single purchase of outside broadcast television lenses was concluded recently between the American Broadcasting Co. and Rank Optics. Announcement was made by John M. Cambell, Rank Precision Industries (Des Plaines, IL), and Julius Barnathan, vice president in charge of ABC's broadcasting operations and engineering.

Under the agreement Rank will supply ABC with fifteen Varotal 16:1 RM lenses—eight for their 30 mm format cameras and seven for their new Norelco PC-100A cameras. The order is valued at a figure in excess of a quarter of a million dollars.

The purchase was made after a long period of exhaustive evaluations by ABC of various factors—lens optics, lens performance and supplier service capability. ABC retained optical experts, Perkin-Elmer Corp. to help evaluations of test lenses' modulation transfer functions.

The Varotal XVIIA lens has a viewing angle of from 30° to 0.7°, and it has a focal length of 25mm-1000mm. Rank reports that more than 100 such long focal length lenses are currently in use by television stations in the U.S.

Rank Precision Industries, Inc. is the American marketing arm of Rank Optics (United Kingdom).

Eros IV Image Evaluator System of Ealing Corp. used by Perkin-Elmer Corp. to test MTF for ABC.

Coming Next Two Months

Special reports on radio and TV automation.

NAFMB Invites AM Broadcasters to Fall Meet

Perhaps opening a long-range problem with their name, the National Association of FM Broadcasters decided at a directors' meeting March 17th to open their fall convention, October 10th-13th in New Orleans, to all radio broadcasters, AM as well as FM. "The problems and opportunities that confront FM broadcasters are often the same for all radio broadcasters," said John Richer, president. ". . . It therefore seems logical to invite all radio people to our 1974 meeting." The convention will be at the Fairmont-Roosevelt Hotel. Info: NAFMB, 420 Madison Avenue, NY 10017.

FCC Invites Comments For Changes in Cable Rules

Noting that two years of operational experience made it a good time for another look at the cable rules, the FCC has announced a "clarification and rule-making" aimed at making the rules "responsive and flexible . . . for a developing industry." Comments are invited by June 7, 1974, on signal carriage regulations, cable access, franchising, technical standards, transfers, complaint responsibility, and other aspects of the rules.

Church of Christ Wants 62 New VHF Channels

A petition for up to 62 new VHF assignments, with emphasis on noncommercial use and on stations with substantial minority ownership, went to the Federal Communications Commission in March from the United Church of Christ. The petition said that a substantial number of new VHF assignments are needed to advance the government's goal of program diversity. In 25 of the 100 top markets, the request said, there is no non-commercial station, and in 38 others the non-commercial station is a UHF. The petitioners held that UHF service does not suffice, since "UHF signals are inferior, reaching far fewer homes with acceptable quality of reception."

FCC Proposes Extension of FM Non-Duplication Rule

Pointing out that the number of independent FM stations has doubled in ten years and that FM receiver penetration, income, and profits have all climbed sharply, the FCC has proposed broadening of the rule against duplication of AM programs on jointly-owned FM stations. Instead of the present rule of a maximum of 50% duplication in cities of 100,000 or more, with no restrictions in smaller cities, the FCC proposes that in cities of 100,000 or more, no duplication be allowed except for news and public affairs, and that the 50% rule be applied in all smaller cities. Comments on the proposal must be received at the FCC by July 2, 1974.

A "New" IGM Being Set Up by Burkhart

As reported in BM/E's NAB coverage in the May issue, International Good Music, Inc., has been in voluntary liquidation and change of ownership with a new IGM to appear later this year. After that issue went to press the news came that Rogan Jones, Jr., president of the "old" IGM, had died; his long illness had been a principal reason for the change in status of the company.

To recap the reassignments of IGM products we reported earlier: the IGM Series 700 computer automation sys-

Continued on page

KDKA
KGO
KING
KMOX
KOB
WABC
WGN
WINS

Gates' 50,000-watt MW-50 keeps some very fine company

The pace-setting AM stations listed above are now broadcasting, or soon will be, with Gates' MW-50, 50 kilowatt PDM (Pulse Duration Modulator) transmitters. With good reason.

The MW-50 signal is strong and clear—backed by a 35% positive peak modulation capability that allows higher average modulation levels.

Overall transmitter efficiency is greater than 60%! And the MW-50 employs only five tubes (with just three tube types). Compact design saves space, and simplifies installation.

There's much more. Investigate today, and find out why the MW-50 is at home in so many of the country's top stations. Write or call Gates.

HARRIS
GATES DIVISION
Quincy, Illinois 62301, U.S.A.

Circle 104 on Reader Service Card

NEWS

tems will be sold by Schafer Elec tronics; the BAT business automatio systems have been taken over by a nev company, Paperwork Systems. Th new IGM will market the 400 and 50 automation systems, the Instacart, an other products. Operating head and principal in the new firm will be Emi C. Burkhart, inventor of the Instacart who built the Instacart for IGM throug his company Northwest Technology Inc.

Armstrong Awards Go To Eight FM Stations

Winners of the 1974 Armstron Awards for FM programming excel lence have been chosen by the Arm strong Memorial Research Foundatio at Columbia University, with the ad vice of a distinguished panel of judges The awards, which honor E.H. Arm strong, inventor of FM broadcasting will be given the winners at the annua convention of the National Associatio of FM Broadcasters in New Orleans October 12th. Winners in the commer cial division are: WPST, Trenton, N.J (community service); WRVR, Nev York City (news); WTIC, Hartford (music); and WFMT, Chicago, (educa tion).

Non-commercial winners are KPFA, Berkeley (community service) WOSU, Ohio State Univ. (news) WITF, Hershey, Pa., (music); an CBL, Toronto (education).

FCC Considering Opening SCA to Non-aural Signals

A rule-making procedure is underwa at the FCC for the opening of FM-SC subcarrier transmission to non-aura signals, in particular facsimile an slow-scan television, the Commissio announced. Technical standards, in cluding those needed for protection o other FM services from possible inte ference, are under consideratior Queries to the FCC should refer t Docket #20012.

NAB Requests Halt In Canadian Ad Substitution

The National Association of Broadca ters called on the U.S. State Depar ment to ask Canadian authorities to sto the widespread practice among Can dian cable systems of deleting Amer can advertisements and substitutir Canadian ones in American broadca

Continued on page

EIMAC's 4CX250BC provides longer life for broadcast service.

The new EIMAC 4CX250BC/8957 premium quality tetrode is a direct replacement for the 4CX250B in broadcast service.

This high quality tetrode features an improved cathode structure, capable of high emission over an extended period of time, greatly reducing frequency of tube replacement. A modified screen grid structure virtually eliminates the possibility of negative screen current which can occur during certain types of operation.

Manufactured under the highest standards of precision and quality control, the 4CX250BC/8957 assures maximum reliability and long life. Reduce transmitter down-time and tube replacement cost with the EIMAC 4CX250BC/8957 premium quality tetrode when you retube. And use this improved tetrode in your new equipment design. Another exclusive example of EIMAC's consistent devotion to quality, reliability and service.

For further information and a data sheet on this new tube, contact EIMAC, Division of Varian, 301 Industrial Way, San Carlos, California 94070. Or any of the more than 30 Varian/EIMAC Electron Device Group Sales Offices throughout the world.

Eimac
DIVISION
varian

Circle 110 on Reader Service Card

programs relayed to Canadian cable subscribers. The Canadian Radio and Television Commission is encouraging this practice, whereas the FCC in this country has forbidden any alteration of Canadian programs relayed by US cable systems.

WLBT—Still Not Owned, But Operating Successfully

The original renewal-challenge case, which sounded a call to arms for community groups across the country, that of WLBT in Jackson, Mississippi, was given still another turn when the FCC recently agreed to re-examine the award of the license to Dixie National Broadcasting Company. The United Church of Christ, original spearhead of the challenge, and community groups in Jackson had charged that some of the officers of Dixie National had improperly exploited their political affiliations to get favors from government agencies. Meanwhile, the station is being operated on a pro-tem basis by Communications Improvements, Inc., non-profit group in Jackson, who have been able to pay back sizeable loans the Methodist Church and others.

Donovan And DCC Join for Service

Donovan Data Systems of New Yo and Data Communications Corp. Memphis announced they would jo forces to supply a complete com puterized data system to keep track spot ads for stations, ad reps, and a agencies. Donovan Data already sup plies data processing service to 14 the 20 largest ad agencies; and DC serves nearly 70 stations with com puterized data handling. The two com panies believe their new service, due t start in 1975, will cut drastically th heavy paperwork load on radio and T advertising, put "spot" billing on same-day basis, and eliminate errors

Western Union Flies West First Domestic Satellite

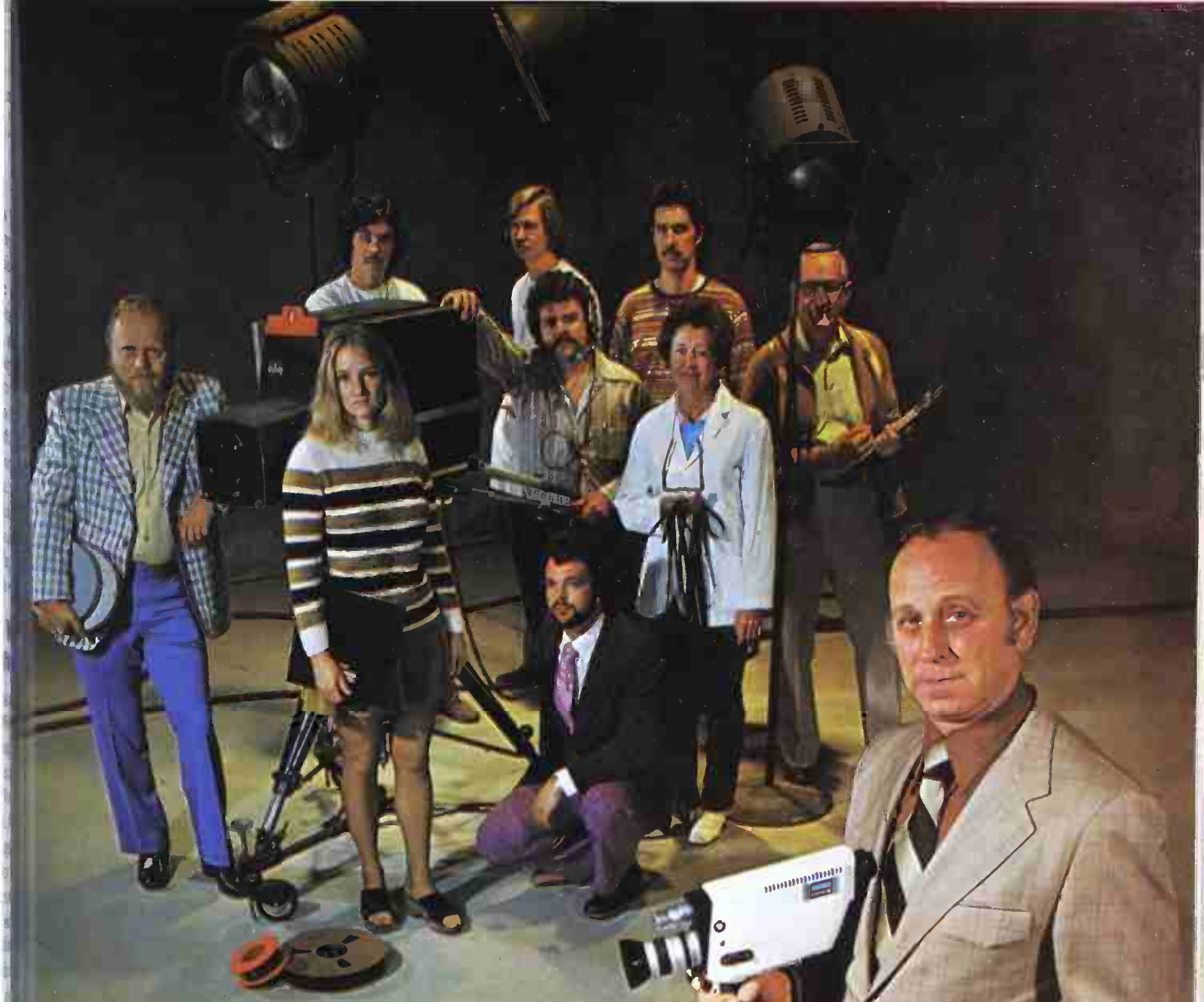
The first domestic communicatio satellite, Western Union's "Westar I, went aloft April 11 to presage larg changes in communications technolog and economics in the U.S. With ear stations ready in New York, Atlant Chicago, Dallas and Los Angeles, a hooked to WU's cross-country micr wave net, the company expects to beg comprehensive voice, data, and telev sion common carrier service about Au ust 1st. WU publicity on the launc was frank on one of the main ob jectives, predicting, for example, coast-to-satellite-to-coast telephor call would cost roughly half as much a cross country call does now. Oth services are also expected to cost le than current prices.

The "bird" itself is a 1,265-poun 6.3 ft. diameter cylinder, with 20,44 solar cells to supply about 300 watts power for its 12 transponders. Ea transponder has a bandwidth of MHz, takes in a signal in the 5.9 to 6 GHz band and emits the "repeated signal in the 3.7 to 4.2 GHz band. Th satellite is in a geo-stationary orb 22,300 miles above a spot in the Paci directly south of Dallas, Texas.

Among the new services promised a great extension of the WU electron "Mailgram," the letter flashed to pc offices in addressed cities for prom U.S. postal delivery there. WU al promised very flexible interconnecti with customer facilities, whether wi or microwave.

WU will put up Westar II in Jun

Continued on page



hink smaller!

ou don't have to carry an albatross around your neck . . . or 75 lbs. on ck and shoulder to shoot great video tape in the field.
nd you don't have to wait for hours—or even days—to see the film you've

AKAI's VTS-150—a *totally portable color* VTR system—takes the burden back. Weighs just 22 lbs. Completely compatible with any other video nt you're now using. And provides direct on-the-air broadcasting capa- when used with any of the time-base correctors available today.
t's battery or AC operated. So it goes wherever you go. Which means ver need film again. Or film processors, soundmen, film editors, lighting ans, deliverymen, directors, lab men, etc.
he AKAI VTS-150 is a *complete* color VTR system. Including a t color camera with 6-to-1 zoom lens, servo-controlled iris and microphone . . . viewfinder/playback monitor . . . and a color or that utilizes inexpensive 1/4" video tape. Plus automatic control, stop-motion and sound dubbing capabilities.
on't let its small size fool you. The VTS-150 is a superbly red *professional* color VTR system with many of the features video systems costing many times more.
nd the smallest part of the system is the price. Only $6495.

e subject to change tice.

Mail the coupon today for complete information.
AKAI America, Ltd./ BM/E-4
2139 E. Del Amo Blvd,. Compton, Calif. 90220

- ☐ Please send me literature on AKAI's new Color VTR System.
- ☐ Please send me literature on AKAI's Black & White Systems.
- ☐ Please arrange a demonstration of the above.

Name_____ Title_____
Firm_____ Phone_____
Address_____
City_____ State_____ Zip_____

AKAI™
novators
merica, Ltd./
Del Amo Blvd,.
n, Calif. 90220
537-3880

NEWS

and will add more ground stations later in the year.

GTE Sylvania Marks 50th Year as Tube Maker

GTE Sylvania in April celebrated the fiftieth anniversary of Sylvania's entry into vacuum-tube manufacture. Starting in 1924 at Emporium, Penna., Sylvania became the largest "independent" tube maker and made many contributions to tube technology, including the origination of the 6.3 volt tubes that opened the way to the auto radio.

NCTA Asks Cable Coverage of Congressional Activity

In testimony before the Joint Committee on Congressional Operations, Barry Zorthian of Time, Inc., as a director of the National Cable Television Assoc., urged that cable be given access to Congressional activities. He pointed out that cable's "narrow-casting" to pin-pointed audiences would make it possible to cover meetings of interest to small groups of viewers, including coverage of several activities simultaneously with the viewer given a choice. He said that cable could go beyond radio and television "by going into detail about specific issues and allowing members of Congress to offer detailed analyses to constituents."

Spot TV Rose 8% in 1973 to 1.5 Billion Dollars

Spot television investment by national and regional advertisers was up in 1973 to $1.5 billion, from the 1972 total of about $1.4 billion, an increase of 8.6%, the Television Bureau of Advertising reported. As in earlier years, Procter and Gamble led the list with $91.6 million; at the bottom of the top 100, the figure was $3.4 million.

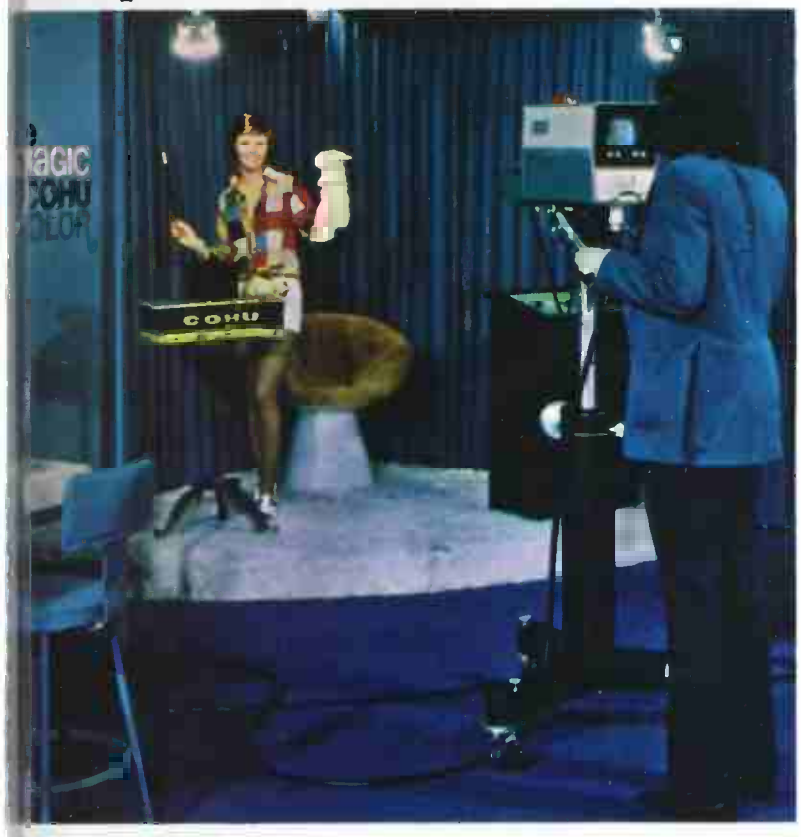
Briefs

A **Video Systems Exposition and Conference** will be a separate, concurrent activity at the Summer Consumer Electronics Show, of the EIA, Chicago June 9 to 12th . . . **Avantek** and **Vicom** have entered an agreement for marketing and servicing by Vicom of Avantek's microwave digital radio equipment; Vicom makes and supplies digital transmission equipment to

continued on page 1

At NAB, NAEB, or wherever the Cohu Model 1230 Color Studio Camera is demonstrated...

People look at the monitors and ask--



"Is that a two or three tube camera?"

e Model 1230 is the only single tube studio color camera avail-le with either a lead oxide or vidicon tube. It out-performs any-ing in its class by offering: Optimum colorimetry with matrix rrection in a built-in encoder—Greater than 300 lines resolu-n—No registration problems—Lower retubing costs—Long-rm stability with automatic electrical focus and automatic rk current compensation—Rapid and easy setup with a built-color bar generator and metering for color balancing and deo level monitoring.

The camera can also be ordered without a view-der as Model 1210 for color film chain/indoor op-ation or in an environment-resistant housing for test amber/outdoor operation as Model 1220.

Contact your local Cohu Sales Engineer or Cohu, Inc., Elec-nics Division, P.O. Box 623, San Diego, CA 92112 or telephone 14) 277-6700. TWX 910-335-1244

You expect more from ...and you get it

COHU INC
ELECTRONICS DIVISION
SAN DIEGO CALIFORNIA

Model 1230 Single tube Color camera

OHU SALES OFFICES:
W ENGLAND Bedford, MA 617-275-0370 • **NEW YORK** Florham Park, NJ 201-377-6636 • **WASHINGTON, DC** 301-656-3061 • **GREAT LAKES** Plaines, IL 312-824-4422 • **NORTH CENTRAL STATES** Lincoln, NE 402-467-2900 • **SOUTHEAST** Orlando, FL 305-896-4881 • **ROCKY MOUNTAIN** ver, CO 303-573-8835 • **TEXAS** Arlington 817-461-1707 • **NORTHWEST** Mercer Island, WA 206-232-3550 • **CALIFORNIA** San Diego 714-278-8931, sand Oaks 805-492-1896, Cerritos 213-926-7002, Palo Alto 415-326-0280

Circle 106 on Reader Service Card

NEWS

common-carrier markets . . . **American Regitel Corp.**, which had been a partly-owned subsidiary of Motorola, was bought by **General Instrument Corp.** and will be operated in a new Unitote/Regitel division.

Ampex announced sale of the 100th ACR-25 automatic cassette system, and of the 350th AVR-1 Videotape recorder . . . **Visual Information Institute,** CCTV test instrument maker, lost its Xenia, Ohio plant in an April tornado, but managed to salvage most tools and equipment for a temporary relocation (there were no casualties) . . . **TelePrompTer** marked the signing of their one-millionth subscriber in March, a first for any cable company.

Correction

In the Show-in-Print coverage of the NAB convention in last month's issue, we referred to the "Schafer Formatter" in the section on radio automation. This, of course, should have been the "SMC Formatter," and BM/E offers apologies to the two companies and its readers.

RCA sold six TCR-100 videotape cartridge systems to Cox Broadcasting . . . **Ameco, Inc.** will supply equipment for a 20-mile cable system for Bedford Improved TV, operating in Everett, Breesewood and Bedford, Pa. . . . Long Island station **WSNL-TV** seems to have a winner with a daily cooking program, with chef Nicola Zanghi demonstrating both simple and fancy recipes.

Eastman Kodak raised prices April 12th an average of 6½% on almost all films, papers, chemicals and processing services . . . **Stations WJCT-TV and WJCT-FM,** Jacksonville, Florida, received the Governor's Award for the Arts for 1974, for continued high—quality programming (example a simulcast of the Jacksonville Symphony).

Times Wire and Cable has settled an 11-month strike at their Wallingford, Connecticut plant . . . **Gates** sold a 50 kW VHF transmitter and a 110 kW UHF transmitter, to Combined Communications Corp. for about $1 million.

Four **IVC-900P** one-inch VTR's will go to the British Broadcasting Corporation for local programming in regional centers . . . Two movies by

Continued on page 17

J20

We've been talking a lot lately about the Ditch Witch Modularmatic concept and what it means to the underground construction industry. The Modularmatic series does provide a tremendous range of job functions; all designed and developed around the basic soundness of design and historic success of the Ditch Witch trencher series. We're mighty proud of it and what it offers, but we realize there are times when the many capabilities of the Modularmatics are not needed. That's why we manufacture our standard line of trenchers.

DON'T FORGET OUR TRENCHERS!

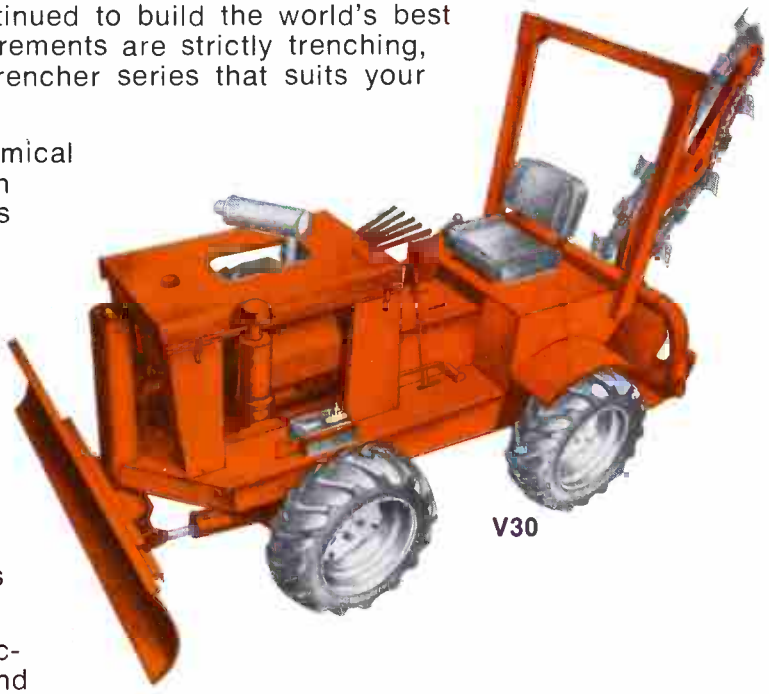
Ditch Witch designed and built the world's first service-line trencher more than 20 years ago. We've continued to build the world's best trenchers ever since. If your job requirements are strictly trenching, there's a model in the Ditch Witch trencher series that suits your needs exactly.

For example, we offer two economical handlebar models, the C and M. Both are self-propelled with power plants ranging from 7- to 12½ horsepower.

If you need a four-wheel-drive machine with full hydraulic control, including power steering, we have the 18-horsepower J20 and 30-horsepower V30.

Should you need a larger trencher, one of our Modularmatic models, equipped as a trencher, gives you the best machine in its class — plus the option of adding other capabilities later.

Whatever your underground construction needs, look first to Ditch Witch and "Don't forget our trenchers!"



V30

C Series

Ditch Witch . . . equipment from 7 - to 195-HP.

CHARLES MACHINE WORKS, INC.
P.O. Box 66
Perry, Oklahoma 73077

DITCH WITCH ®

Circle 113 on Reader Service Card

Servicemen Love Our Guts

Because they know our CP-16 and CP-16/A cameras *inside out.*

They know that our cameras—no matter how rugged and reliable—will eventually end up on their workbench. For normal service. And sometimes, for major repair due to abnormal field damage.

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

They most appreciate the fact that the entire CP-16 or CP-16/A camera mechanism can be removed from the camera body in a matter of minutes, giving the serviceman easy access to all mechanical and electronic components. They also appreciate the fact that the entire CP-1 drive motor system can be easily replaced less than five minutes! And the thoughtful "little touches—like the Bristol knob wrenches tucke away inside our Crystasound amplifiers an auxiliary mixers to aid in field servicing. Maste of their craft, they appreciate the workmanshi the meticulous care and attention to detail assembly, the quality materials and componen that go into the manufacturing of the CP-16 ar CP-16/A cameras.

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

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

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

Cameramen Love Our Guts Too!

cinema products CORPORATION

Technology In The Service Of Creativity

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

Circle 114 on Reader Service Card

Authorized CP-16 Dealers and Service Centers

North American LISTING

CALIFORNIA
D/S — **Alan Gordon Enterprises, Inc.**
5362 N. Cahuenga Blvd.
North Hollywood, Ca. 91601

D/S — **Adolph Gasser Inc.**
5733 Geary Blvd.
San Francisco, Ca. 94121

S — **San Diego Camera Exchange**
1071 Sixth Ave.
San Diego, Ca. 92101

COLORADO
S — **Stan Phillips & Associates/ Camera Service**
2245 W. 30th Avenue
Denver, Colorado 80211

DISTRICT OF COLUMBIA
D/S — **Brenner Cine-Sound**
5215 Wisconsin Ave., N.W.
Washington, D.C. 20015

FLORIDA
D/S — **Image Devices, Inc.**
811 N.W. 111th St.
Miami, Fla. 33168

GEORGIA
D/S — **Atlanta Film Equipment Rentals**
1848 Briarwood Rd., N.E.
Atlanta, Ga. 30329

HAWAII
S — **Pacific Instrumentation**
5388 Papai Street
Honolulu, Hawaii 96821

ILLINOIS
D/S — **Victor Duncan, Inc.**
676 St. Clair St.
Chicago, Ill. 60611

LOUISIANA
D/S — **Pan American Films**
822 N. Rampart St.
New Orleans, La. 70116

MICHIGAN
D/S — **Victor Duncan, Inc.**
11043 Gratiot Ave.
Detroit, Mich. 48213

MINNESOTA
D/S — **Galaxy Film Service**
1511 Hennepin Ave.
Minneapolis, Minn. 55403

NEW YORK
D/S — **The Camera Mart**
456 W. 55th St.
New York, N.Y. 10019

NORTH CAROLINA
D/S — **Standard Theatre Supply Co.**
125 Higgins St.
Greensboro, N.C. 27420

TENNESSEE
D/S — **Motion Picture Laboratories, Inc.**
781 S. Main St.
Memphis, Tenn. 38102

TEXAS
D/S — **Victor Duncan, Inc.**
2659 Fondren Ave.
Dallas, Texas 75206

UTAH
D/S — **Stockdale & Co., Inc.**
200 E. First South
Salt Lake City, Utah 84111

WASHINGTON
D — **Glazer's Camera Supply**
1923 Third Ave.
Seattle, Washington 98101

S — **Phototronics**
223 West Lake North
Seattle, Washington 98109

CANADA
D/S — **Alex L. Clark Limited**
3751 Bloor Street West
Islington, Ontario M9A 1A2

D/S — *Branches:*
1070 Bleury Street
Montreal 128, Quebec

D/S — 7104 Hunterwood Rd., N.W.
Calgary 51, Alberta

MEXICO
D/S — **Alan Gordon Enterprises, Inc.**
c/o R.E.C.E.S.A.
Rio Amazona 85
Mexico 5 D.F.

D — Dealer S — Service D/S — Dealer & Service

Cinema Products CORPORATION

ting as of: Dec. 1, 1973

Circle 115 on Reader Service Card

NEWS

Mulberry Square Productions of Dallas, "Where the Lillies Bloom" and "Benji," got Awards of Merit as outstanding family entertainment from the Southern California Motion Picture Council.

Air Video is a new venture based in New York, offering the "first" successful helicopter-borne remote TV;

equipment includes the Fernseh KCR-40 portable camera in a vibration-resistant mount by Tyler Camera Systems of Hollywood . . . **Association of Maximum Service Telecasters** has filed with the FCC formal opposition to a petition of Solid State Technology; the latter seeks lifting of a 250-box limit on radio call boxes in any single highway system; AMST says that Solid State presents no proof that the call boxes, which operate in the 72-m6 MHz band, have not or will not interfere with TV channels 4 and 5.

Cable Dynamics has opened an office at 7501 Spring Lake Drive, Bethesda, Md. . . . **Myers-Oak Communications Construction Corp.** graduated the first ten men from their course in cable TV construction, held at headquarters in Crystal Lake, Ill. . . . **Daniels and Associates** will supervise design and construction of a cable system in Covington, Louisiana, to pass 3,000 homes.

CBS Radio Network began to attract advertisers for its Radio Mystery Theatre, on 224 stations seven nights a week, with four signed on by early April: Anheuser-Busch, Kellogg Company, Menley and James, and the Seven-Up Co.

People

Society of Broadcast Engineers reelected **J.C. Wulliman,** president; **G.H. Lahmann,** vice president; and **Robert Truscott,** Sec-Treasurer . . . New regional sales managers for Strand Century are **Ed Gallagher** (Eastern region) and **J.C. Clayton** (Southern re-

continued on page 44

INTERPRETING THE FCC RULES & REGULATIONS

State Regulation of Cable Television Part I: Current Statutes

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

Traditionally a local and federal function, regulation of cable television has increasingly been adopted by states. Presently, ten[1] states have enacted CATV statutes.[2] Several others (most notably Maryland) are in various stages of cable regulation consideration. Proponents of state regulation agree that local public interests are more effectively protected by the presence of knowledgeable state regulators. Opponents argue that the addition of state cable regulation creates a three-tiered (federal/state/local) system which will *initially* bog cable operators in a morass of bureaucratic red tape and delay and will ultimately choke the life out of the still-infant cable industry. While never taking a "side" on the issue, the FCC has repeatedly urged a "flexible" regulatory climate to encourage CATV growth; as such, the FCC position has by deduction, opposed state regulation at this time.[3]

This month's article deals with the current regulations in those states with CATV statutes. Next month's article will treat the 40 states which have done nothing or have rejected CATV bills, and will discuss the apparent short- and long-term trends in state cable regulation.

State Regulatory Functions

The currently enacted state CATV statutes are most easily classified by their functional relationships to local municipal bodies. Thus, statutes can be divided into three broad categories: (1) those that *fully pre-empt* local licensing authority, (2) those that perform an *appellate function* (i.e., set minimum franchise standards and review local franchise awards) and (3) those that perform an *advisory function* (i.e., keep local governments advised of developments in federal law, technological advances, etc.). A discussion of each type of state statute follows.

Full pre-emption stutues

Connecticut, Hawaii, Nevada, Rhode Island and *Vermont* have enacted statutes which fully pre-empt the municipal licensing function. Generally, a state administrative body is created to consider cable television applications for local or county franchises. More often than not, these full pre-emption statutes borrow liberally from FCC rules and regulations.[4] The motivation for duplication of federal standards may stem from deference to FCC expertise and experience in the field of cable regulation. However, the opinion has been expressed by some that the real motivation may be fear of state/federal regulatory conflicts, in which the state would almost certainly emerge the loser.

Under the full pre-emption concept, the state deems itself (1) more knowledgeable than the munnicipality in communications regulation, (2) capable of fully and fairly gauging local interests, needs and preferences regarding the selection of a cable franchise applicant and (3) the governmental entity most properly attuned to choosing cable franchisees in order to develop the optimum in *statewide* cable service.[5]

Connecticut enacted a full pre-emption CATV statute in 1963. Prospective cable system operators must obtain a certificate from the State Public Utilities Commission before initiating cable service. To secure a certificate, the prospective franchisee must tender a formal application to the State PUC. The PUC may award a certificate after a public hearing in which the following has been considered: (1) "the public need for the proposed service," (2) "the suitability of the applicant," (3) "the financial responsibility of the applicant" and (4) "the ability of the applicant to perform efficiently the service for which authority is requested." The statute also confers on the PUC the power to issue rules and regulations governing safety of cable system operations.

The "*Hawaii* Cable Television Systems Law" (1970) is another full pre-emption statute which created a CATV Advisory Committee to advise the "Director of Regulatory Activities" regarding issuance of CATV permits to applicants "upon determination that it is in the public interest." The Advisory Committee is composed of five members: one from the CATV industry; one from a public utility; and three from the general public with *no* financial interests in cable companies. (The Hawaii Legislature plans further study to determine the desirability of vesting control over cable in the State PUC.)

The Director must give published notice 60 days prior to a public franchise application hearing. The Director has the power to totally or partially approve and/or limit CATV applications, and award non-exclusive franchises for up to twenty years. The Hawaii statute permits the Director to (a) approve, and maintain surveillance over

continued on page 2

[1] Note that "technically" Wyoming is an eleventh state to assume a role in cable television by designating CATV systems as public utilities subject to state regulation.

[2] Alaska, Connecticut, Hawaii, Massachusetts, Minnesota, Nevada, New Jersey, New York, Rhode Island and Vermont. Most of these states passed CATV statutes *before* the FCC adopted its sweeping CATV regulations in 1972.

[3] At the "franchise session" at the NCTA's April 1974 Convention, an attorney from the FCC's Cable Bureau indicated that the Commission, in framing its 1972 Rules, had assumed that the FCC-delegated franchising functions would be performed by local (not state) governments.

[4] Despite extensive paraphrasing and plagarizing of FCC rules, the several state statutes are sometimes ambiguous and contradictory of FCC rules—making it difficult for the CATV franchisee to comply with FCC rules.

[5] The program interests of the state may often be different from those of the local community. When a CATV is franchised by the state, his first loyalty must be to the state, and this may run contra to the needs and desires of his subscribers. The FCC has recognized CATV's potential to serve as an *outlet* for local expression; as such, it seems fair to conclude that (to stimulate more responsive *local* programming) the FCC would prefer that the CATV's first loyalty be to the local community rather than to the state.

CAN YOU MATCH THESE LENS NUMBERS?

1. 18mm to 675mm	(a) Total Range of Focal Lengths
2. 15 to 1	(b) Geometric Aperture
3. 37.5 to 1	(c) Zoom Range
4. 51°	(d) Minimum Focusing Distance While Still Retaining Full Zoom Capability
5. 25″	(e) Ratio of Focal Lengths Available
6. *f*/2	(f) Minimum Focusing Distance With Close-Up Lens
7. 12.6″	(g) Minimum Object Size To Fill Screen
8. 7mm	(h) Horizontal Wide Angle
9. 1.5, 2.0, 2.5	(i) Zoom Range Extenders

CORRECT MATCH IS: 1a, 2c, 3e, 4h, 5d, 6b, 7f, 8g, 9i

NO MATTER HOW YOU MIX THEM NO OTHER LENS CAN MATCH THE ANGENIEUX 15 to 1's TOTAL CAPABILITY

angēnieux
corporation of america

EAST COAST
440 merrick road
oceanside, n.y. 11572

WEST COAST
13381 beach ave.
calif. 90291

fine optics with imagination

Circle 117 on Reader Service Card

ROCK 'N
FM STEREO 101
KGB
AM
1360

April 19, 1974

Mr. Guffy P. Wilkinson
Wilkinson Electronics, Inc.
1937 Mac Dade Boulevard
Woodlyn, Pennsylvania 19094

Dear Guffy:

The FME-10 exciter and SG1-E stereo generator have been on the air here at KGB-FM for over one week now, and already people are hearing the difference. As a matter of fact, just yesterday I heard from one of the leading sound recording people in the San Diego area. He had just finished evaluating our new "sound" as well as comparing us to the other stations in this market. He says we sound significantly better than the other 12 FM's in the market. He was taking into account stereo separation as well as noise, distortion, and apparent "clarity" or "transparancy" of the audio. Considering some of the other stations do not have the telephone line problems we have since their studios are located at transmitter sites or they use STL's, I think this was an outstanding compliment to pay to your equipment that you should know about. The compliment comes from Bill Blue of Studio West here in San Diego.

One other matter deserves your attention. As you may have heard from your people, I informed them before I placed the units on the air that Airlines dropped the exciter during shipment. Damage to the left hand front side of the exciter was noted on unpacking. The rack mounting panel was severely bent out of shape and the front panel itself was distorted so the modules could not be pulled out. Since I promised the units would be in service in time for the April 11 A.R.B. period, I checked things out as best I could into a dummy load, and straightened out the mechanical damage.

Enclosed find a copy of our first external frequency measurement. I think it tells the story of the excellence of your unit quite nicely. Any unit that can be dropped and work like this deserves a great deal of credit. Also note your unit "solved' a problem that bothered us with our former main exciter and also our former spare exciter. Our power company really should give us huskier transformers, because our line regulation is very, very poor. It no longer bothers us since we changed exciters. (I don't intend to let the power company off the hook, though . . .)

Everyone here on up to the ownership is pleased with the dramatic improvement and listener comments are starting to come in. We operate in a very sophisticated audio market here in Southern California. Our coverage even gets us up to L.A. – in fact the owner who lives in L.A. could hear the difference over 120 miles away in Beverley Hills.

Please feel free to have anyone interested in these units contact me for my opinion. Likewise, please do not hesitate to use any or all of the information conveyed in this letter for your own promotional purposes. It is so refreshing to have something in this world live up to the claims its manufacturer makes; that you folks deserve an award for truth in advertising is an understatement!

Best to all at the plant.

Cordially,

Dick

Richard A. Rudman
Chief Engineer, KGB AM/FM

CC RULES AND REGS Cont. from page 18

bscriber rates, (2) hear subscriber complaints, (3) con-ct complaint investigations, and (4) require the cable nchise to post a surety bond of *50% or more* of the cost constructing "incremental" sections of the CATV tem. Furthermore, cable systems must file an annual ort and submit an annual fee to the state (not in excess 5,000). (If interpreted literally and enforced, the 50% d will likely estop CATV development; few bonding npanies will guarantee performance to the tune of 50% construction costs, and few CATV systems are capable pledging cash or collateral in amounts necessary to ure a bond equivalent to 50% of construction costs.)

Nevada enacted a full pre-emption statute in 1967 ich requires cable operators to obtain a "Certificate of blic Convenience and Necessity" before system ener-ation. The Nevada PUC is granted broad authority to ulate cable company rates, services and operations, d may revoke a certificate for "reasonable cause." The tute, through vesting licensing power in the PUC, vides one important exception: If a cable system were perate in a municipality or county wherein the use of blic streets is "essential to such operation," the PUC uld grant a Certificate of Public Convenience only after ity franchise award. Though appearing to controvert l pre-emption, study of Nevada's population density eals the minimal impact of this clause. In any event, statute makes clear the PUC's continuing "exclusive isdiction to regulate matters concerning CATV com-anies."

The *Rhode Island* CATV statute vests franchise-nting power in the State Public Utilities Administrator. e statute refers to utilization of generally accepted ndards of good character, technical, financial and other alifications in choosing a franchisee. Revocation of a ertificate" by the Administrator may be made for (1) lful violation of the statute (or PUC rules). (2) failure commence operations within a reasonable time, or (3) ner reasonable causes.

Vermont has enacted a sketchy full pre-emption cable tute requiring CATV companies to secure an *annual* ense and "Certificate of Public Good" issued by a ublic Service Board."[6] An annual license fee is tied to ss operating revenues for each cable system. The ique character of Vermont's annual certificate require-nt is offset by the paucity of supporting regulations mmon to most other state statutes.

ppellate function statutes

Minnesota, New Jersey, and *New York* Have enacted TV statutes which perform an appellate function; that these statutes *defer* franchising authority to local (mu-ipal or county) governments while reserving to the te the power to review local proceedings. State ap-val does *not* pre-empt federal review (before the FCC). wever, state disapproval *may* effectively pre-empt ul-ate municipal authority in that the local franchising thority may have to reinstitute franchise proceedings or e other remedial measures to "perfect" the franchise it s granted.

Minnesota's CATV statute (1973) clearly illustrates the rementioned appellate function. A seven-man CATV mmission has been created to "prescribe procedures d practices which municipalities shall follow in grant-g franchises." The statute prescribes (1) minimum ap-cant *standards* for inclusion in a franchise, (2) state

e FCC has initiated a Proposed Rule Making And Inquiry, FCC 74-384, Docket 021, to explore possible minimum (as well as maximum) franchise proval/renewal terms (i.e., five years) to be applicable to state and local gulatory bodies.

continued on page 50

Let the Console Do It

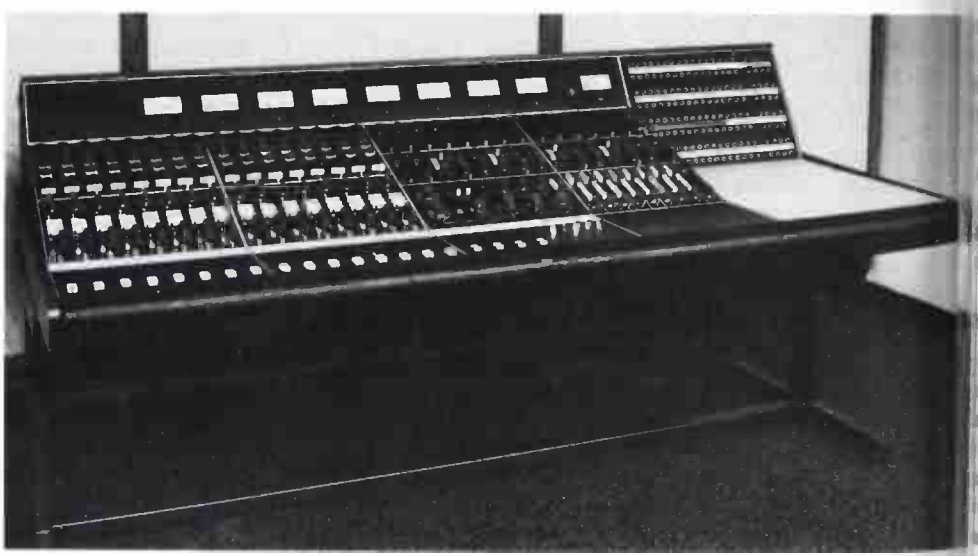
Audio consoles today offer the station operator a far wider variety of functions and conveniences than they used to. He can still choose a console that does just about what they have always done. Or he can choose a board that takes over more of the operating load—opens new, more efficient ways of operating. In either case, quality is almost sure to be considerably higher.

Under pressure from several directions, the latest generation of audio consoles has moved to a new, higher level of performance quality and has developed a much wider range of functions and conveniences. Today almost any class of board can be matched very closely to a station's needs to make the job easier, more efficient and often allowing things to be done that could not be done before.

The main shift in design is toward the concentration of many kinds of switching and control onto the console, a trend evident for some years, but now reaching further than ever. And the end is not in sight—as David Evans of Sparta points out in comments in the accompanying box, we can expect the console to move further into studio, automation, even transmitter operation.

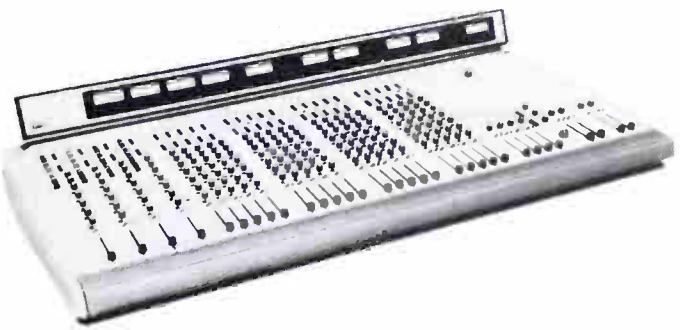
Probably the most important pressure on console quality is coming from users themselves. An audio quality consciousness is spreading among stations large and small. Nearly every console maker interviewed by BM/E for this report testified that buyers now insist on console meeting their specs *in use*, not just on the lab test bench. And users want state-of-the-art specs. There is certainly nothing technologically startling in top-grade audio performance: in a basic sense, audio technology has been mature for a long time, as Welton Jetton suggests in his comments. What is new is that the top level is being *asked for* and *supplied* in such a wide range of consoles.

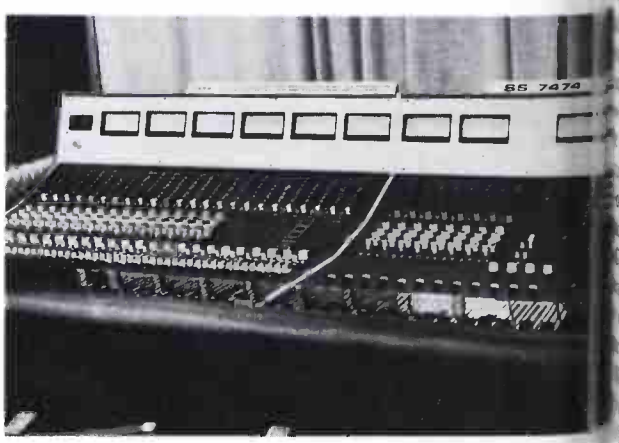
This higher console quality is an essential element in meeting listener "hi-fi" standards of sound quality, a fairly new factor that FM stations, in particular, must increasingly take into account, as noted in the article b



All-out recording-style boards are exemplified by Neve 16-in., 8-out model (right) and similar Dipol (lower right).

Intermediate boards, with many recording-style features, chosen in each case to match user's need, come from Cetec (below), and many others.





gineer Ned Soseman in the March issue of BM/E. Another large source of pressure on broadcast audio soles has come from recording studio practice, with recording style of board showing the way for many adcast developments. BM/E noted this trend in the cember, 1972 issue. It is continuing at an accelerating e.

n general, the recording board has very high perform- e quality and has many mixer channels, reflecting sent multi-channel recording practice with post- ording mixdown. It has elaborate channel-by-channel alization, echo, etc., and very elaborate switching lt in. Broadcasters are finding more and more ways to ke use of some of these functions, as described in more ail in the following.

At the same time that we have this swing to elaboration, long-time basic board style of four to ten channels, ple switching, is continuing with a strong market, ording to nearly every maker in this area. Such boards meet all the needs of many small stations, and they ainly cost considerably less than the recording-style rds. But they are getting some influences from the ier breed, in the growing use of linear faders, for mple, and in modularization that allows quick change nput character, switching line-ups, to match need. re on that in the following.

What it comes down to is that the station operator has y more choices and decisions to make when he comes uy a console today than he did five to ten years ago. station operator and his chief engineer will do well to down and re—analyze their needs. They can simply *ace* the functions their console is performing now. the chances are good that if they look carefully at what can get in the new boards, they will uncover new s of operating that save money or improve the services he station.

s a possible aid to this process, what follows is simply ecklist of the most popular functions, with some inders in each case as to how they can be used.

basic functions

lixer channels. Available designs suggest that four ier channels is about the minimum number for a pro- sional broadcast console. But multiple switched inputs ach channel are now very common: a four-channel rd can handle eight or twelve inputs. At the fancy end he style spectrum, 16 channels has become a kind of tadard: it seems to meet just about any broadcast need.

lonitor circuits. Convenient monitor circuits are prac- lly universal. What the buyer has to watch for is *aitor quality*—consistently high-grade audio pro- mming is not possible without monitoring that is on same high quality level as the program line. Many of latest console designs recognize this with monitor- uit specs that fully match those of the program line- r very nearly do. (Monitor speakers and listening ces are crucial too—but that's another article).

Cue Circuits. Even the simplest boards have conve- nt cue circuits built-in, usually with switching that cuts cued input off the program line, so you can cue one rce while another is on the air.

Muting. Individual studio arrangements are given more more effect in the muting circuits. The muting relay be simply wired to open whenever a particular input is nnected. It can be switchable or programmable.

Modular, interchangeable inputs. A board that allows

Some of the Stations Using the New Console Flexibility to Good Advantage

Here are accounts of just a few stations with consoles at the new high levels of flexibility, or making use of some other feature of the latest consoles—(many other stations could serve as equally good examples):

WXXI, Rochester, NY This community non-profit station, recently installed a Neve 16-in., 8-out console, used for on-air radio and TV audio control, and also for much production of music programs on tape for PBS. Recording is on a Scully/Metrotech eight-track machine. Chief Engineer Joe Grant points to an interesting new use of the multi-channel capability: radio drama production, a program category of sharply growing importance. Contemporary radio drama makes extensive use of multi-channel recording for all kinds of dramatic and background effects—the large cadre of drama producers of 30 and 40 years ago would surely have been delighted with the new techniques. One of the most famous of the old hands, Hy Brown, is running CBS's new Mystery Theatre.) WXXI is getting a new building later in the year, financed by $3 million in community donations; it will have enlarged TV studio facilities, with a new McCurdy multi-channel console in addition to the present one.

CHED, Edmonton, Alberta. Chief Engineer Clint Nichols described the use of a 16-in., 4-out Auditronics console at this Top-40 AM station. CHED produces many commercials for clients, and finds that the multi-channel recording set-up saves money, by allowing great flexibility in use of material; and also gives excellent control of quality, making a "professional" sound much easier to obtain.

WAVA, Arlington, Va. This is an all-news station on both AM and FM (FCC waiver allows 100% duplication). The station has surburban—Washington coverage (AM is 1 kW, FM is 50 kW). Chief Engineer Bill Ashley, who was a DJ and announcer before he became an engineer, has strong ideas about making his console positions easily operable, with "human engineering" that greatly reduces the chances of error. He points out, that since the news is given "live," a newscaster is under nearly constant strain during his time on the air—the announcers get 30 minutes on, 30 off, during the day. A DJ, by contrast, has the time his records are playing to let down and get ready for the next on-air stint.

Accordingly, Ashley wanted consoles with a number of things "up front" that are not often put there: his Belar modulation meters, E.B.S. indicators, as well as pushbutton control (no lever switches) of all recorded sources (commercials are on carts and open-reel tape). All switching in fact, is by pushbuttons that light. Ashley chose a Robins/Fairchild console, with modularized units. He put the console together pretty much himself: "I was building so much myself anyway and by doing nearly the whole job I saved plenty and got exactly what I wanted." Fairchild make special panel cutouts for the modulation meters and other gear Ashley wanted in front of his operators. It has worked out beautifully, and Ashley is planning four more similar consoles, with custom-built interconnection, for a new building they hope to erect this year.

WSM, Nashville, Tenn. This is the radio and television call of the "Grand Ole Opry," which has a brand-new home—a super-modern auditorium seating about 4000, plus radio, TV and record production facilities—all in the same building. A custom-built Neve board, one of the most elaborate consoles anywhere, takes in signals from 40 microphone positions on the stage, sends them to any of 24 outputs. But before that, each mike channel feeds a preamp with four outputs, which act as distribution amplifiers. They can be switched to send the signal to the TV production room; to the house sound, for in-auditorium sound reinforcement; to a foldback circuit so the artists can hear themselves; and/or to the Neve console for radio or TV broadcast.

a plug-in or other simple change to shift an input from one character to another—mike to line, line to phono, etc.—gives insurance against obsolescence, as well as allowing the buyer to tailor a board exactly to need. Console makers who provide this kind of easy adaptability say it is one of the most popular things they have to sell. Of course, the more expensive custom-made boards have long had it. Developments in printed circuit and IC technology have made it easier to provide modularization of this kind and it is spreading among the inexpensive boards.

Those are the main features at the most basic level. Those described in the following allow more flexibility, more variety. Most of them originated, as already noted, in response to the needs of modern multi-channel recording. Thus they are most immediately relevant when a station does some production, whether it is of complete programs and commercials for internal use, or for outside customers; or when a station records all its programming onto carts, for example.

Switching flexibility. The variety of switching functions supplied on the larger consoles these days is startling. Every station engineer can make up his own list of switching needs—and can build the equipment to take care of them. But many will find it more convenient to buy complex switching of many kinds in a new console. The

The Console Field: How It Looks to One Manufacturer

Note: The following are excerpts from comments submitted to BM/E by David W. Evans, Audio Products Manager, Sparta Electronic Corporation.

The broadcaster, if we read his requests rightly, is calling for; (A) more rugged, physically larger consoles, (B) modular designs featuring the utmost in interchangeability of PC boards and other components, (C) definite state-of-the-art design, including rather eager acceptance of the IC, and (D) consoles which *must* meet the manufacturers' specifications without equivocation.

The tendency noted in (A) above is creating a bulkier and heavier console than has been generally sold in recent years. A few years ago during the industry's first romance with the tiny transistor, smaller consoles became the rule simply because it could then be done. The gradual result was consoles which were electronically sophisticated, but mechanically more and more delicate, until a point of diminishing returns was established. It was shown that the typical console failed physically long before it failed electronically, so that trend was partially reversed in favor of physical strength.

The advantages of (B), modular design, plus utmost interchangeability, are an obvious servicing aid.

The state-of-the-art trend noted above at (C), however, puts a strain on both the manufacturer and user in two ways; creating a supply expense problem of the quick-change modules necessary because of complex creations using IC's, and pushing both design and maintenance engineers to know more, do more, and all of it more quickly. This may entail certain design limitations which will eventually prove as reversible as transistorized console miniaturization.

A related observation is (D); there appears to be more and better test equipment at stations today, in the hands of fewer but better qualified (frequently multi-station contract) engineers. This situation calls for completely reliable equipment which will function during long periods while the contract engineer is busy elsewhere. The engineer using very good test equipment further is in a position to insist on equipment which meets published specs without shilly-shallying about special conditions; consoles are needed to perform exactly at the user station, and specs obtainable only at the factory test bench will not satisfy him.

A consideration for the future is that of standardization of control circuits to be compatible with logic levels used in computers. This will facilitate the interfacing of audio equipment with minicomputers and automation controllers. Control circuits operated from TTL logic levels are already being used in some of the large recording studio consoles, where computer controlled mixdown from 16 or more channels is already a reality, if not commonplace.

The advance of LED's into all fields of broadcast equipment design is unstoppable now by any means. They will continue to replace the incandescent lamp rapidly, I think, and are already widely used in light-controlled audio switching circuits. Their use in console design will be likely to make obsolete or supplement the VU meter. Multi-channel consoles of the recording studio type, now finding their way into radio control rooms as broadcasting becomes more complex, simply cannot afford the room for multiple VU meters. Nor can the operator easily scan as many as four VU meters to judge relative gain control. One aid would be use of LED's in closely spaced bargraphs (probably peak reading) so relative levels could be judged by the operator in a small display space. Strip LED's are already available, and yellow and green LED prices are dropping rapidly.

All in all, the radio broadcast industry appears to be in a 'tight ship' position, with greater clarity of what is expected of its every segment and worker. The crunch will come, if it comes, in the areas of such great equipment sophistication that the user station may find itself unable to supply men or equipment to properly or economically maintain the console. The console itself is well on its way, through increased flexibility and space-saving design and components, to become the center of not only studio audio feed, but much larger areas of studio, automation, and even transmitter operation. Computer technology is rapidly cross-fertilizing broadcast electronics, and the shape of tomorrow's 'audio' console, and the role in its maintenance played by the station engineer, may well take directions which we cannot imagine today.

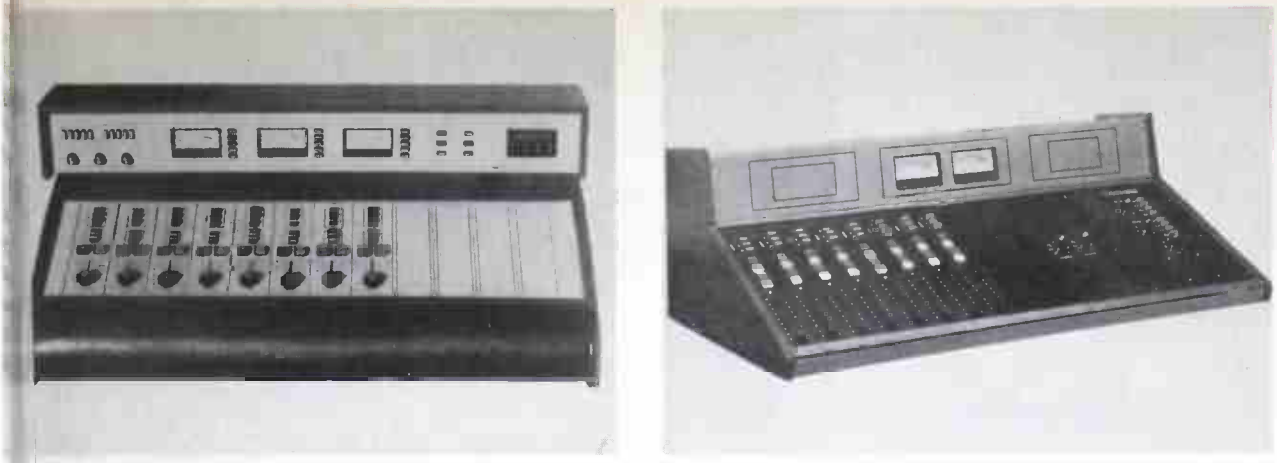
Brief comments by a few other console makers:

Welton Jetton, Auditronics, Inc.,—"There have been no significant improvements in on-air consoles in the last 30 years aside from replacing tubes with transistors . . . Our experience shows that broadcasters get a better on-air sound as an unexpected benefit from equipment designed around recording concepts which demand lower noise and distortion along with greater headroom and bandwidth . . . It is interesting that some foreign networks—in Canada and Australia, for example—have been leaders in adapting recording studio multi-track production methods to broadcasting. This is the trend we are helping set."

Alex Meyer, Ampro—Describes the market for multi-channel consoles in the under-$4000 bracket, with extensive switching built in, as very strong. Confirms testimony of other makers that console buyers are demanding high performance.

Ken Schneider, McMartin—Find excellent response to plug-in modularization, allowing custom design of input facilities, with user tailoring to need. Notes trend to use of linear faders, but also finds demand strong for standard rotary-control designs: no general replacement seems in sight.

Rick Belmont, Robins/Fairchild—Another maker enjoying excellent response to modularization for buyer-tailoring, long available from this source. Finds the "adaptable" console extremely popular with college stations, many of which buy equipment year by year; but commercial broadcasters like it too.



dularization of small consoles, allowing use of any number of mixer channels from four to 12, and use slide faders in place of rotary controls, are shown in models from Sparta (left above) and Broadcast ctronics (right). Robins/Fairchild also emphasizes modularization of smaller and intermediate nsoles.

ndard broadcast boards are available from a number of makers with either rotary or slide controls, as ne two Ampro consoles below. Other makers of the smaller broadcast-style boards include CCA, lins, Gates, LPB, McMartin, Broadcast Electronics.

chnical brochures of such makers as Neve, McCurdy, Ctec, Auditronics, Ward-Beck, Dipol. Sparta, Ampro, bbins/Fairchild are fascinating encyclopedias of the new nsole switching and are worth studying for a wealth of ggestions. Beyond that, most of these console makers fer to incorporate the engineer's own special requirents in the switching circuitry.

Modularization throughout. A number of approaches t system modularization are flourishing, aimed at two ojectives: quick, sure servicing, with plug-ins for quick placement of faulty units; easy rearrangement of system sign to meet new needs by adding new plug-in units or ifting those already installed. The system flexibility that n be achieved with modularization means that every pect of a board, not just the inputs, can be readily ilored to individual need. Modularization of this charac- r is hardly a new idea, it has been spreading more widely audio consoles.

Adjustable equalization. The value of adjustable equalization in raising the quality of a variety of signals, and in getting signals from a variety of sources to "match" when they are being recorded together into a single program, is understood by every broadcast engineer. The engineer gets two choices on equalization today: he can have it separately in each channel, as it is on the more elaborate recording boards; or he can have "outboard" equalization, a single unit through which the board output is fed before it goes to the transmitter. Channel-by-channel equalization is, of course, the more expensive way. But it may be essential if you are trying to make finished programs with a number of different microphones and line sources.

This is especially important for stations doing production work for outsiders. Giving a complicated commercial a fine finish, for example, with sounds from different sources, is far easier with equalization in each channel.

Echo send and receive. The story on this is parallel to

continued on page 26

that on equalization. For high-quality in-house production, one or more reverb units are highly advantageous. Whether or not they work off each channel separately with individual send and receive circuits, or stand in the program line, will depend on each station's practice. Channel-by-channel reverb, like equalization, is very handy when complex multi-source production work is underway.

Talkback. Every station will have some form of communication between studio and control room. Having communication circuitry built into the console will be convenient for some, redundant for others.

Compression-limiting. Again, we have a function that can be channel-by-channel, or overall, and the more elaborate form is likely to pay for itself if production from a variety of mike sources is underway. The big caveat here is for FM operators who want a really good signal to hold sophisticated listeners: compression is easily overdone in that context, because totally bland, flat-dynamics music does *not* appeal to the musically literate. Mike-by-mike compression should be used simply to get signals within range for subsequent handling.

Foldback. This builds into the console the feeding of program back to performers (usually through headphones) when they are adding a track to previously recorded tracks of music. The engineering department can undoubtedly rig up some form of foldback outside the board. If you are doing a lot of this kind of multi-track recording though, you will probably like to have foldback built in.

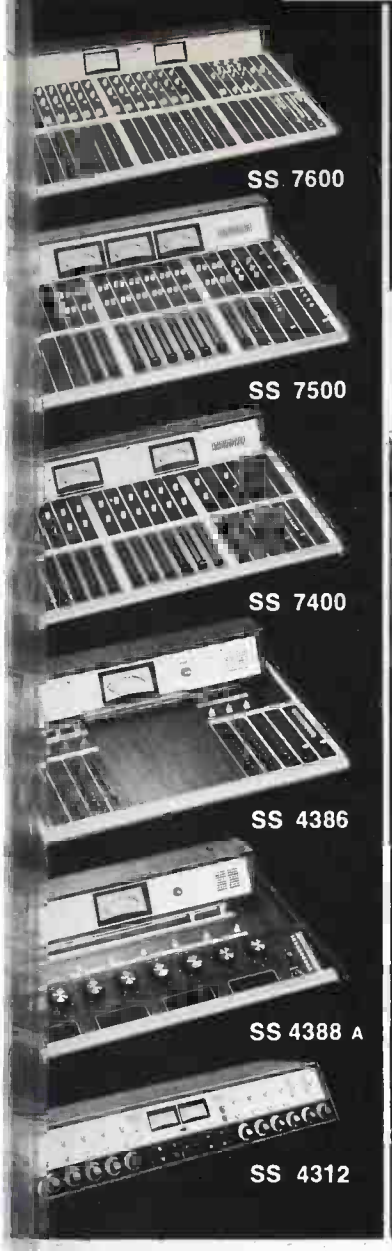
Solo. This lets you switch the monitor to a single input when a number of inputs are being mixed into the program line. It's a handy check-out aid. And it's a switching refinement that you could duplicate yourself at low cost. A number of medium-priced boards include it today as a matter of course.

Multi-channel output. How many program outputs from the console do you need? You can get what you want. This is one of the decisions that need careful analysis on the station management's part. Undoubtedly a lot of small-market AM stations can get along with one. Stations need more if they are feeding network as well as transmitter, or if they want to record programs for production purposes as well as broadcasting, or for any number of other reasons.

Console makers say that FM broadcasters are increasingly asking for four outputs with quad capability, with the idea that we will get some form of quad broadcasting. But even an AM station may be able to make good use of a four-output board; one such is CHED, Edmonton, as described in the accompanying box.

Even four may not be enough if a station is recording music programs by the current multi-mike-plus-mixdown method: recording studios want 8, 12 even 16 outputs for this process.

Automation. Console design is beginning to show the influence of the trend to automation and computer control and BM/E will take that up in some detail in the next two issues, which will cover the automation scene comprehensively. We can say here that as far as consoles are concerned, automation is sharpening the move toward more concentration of control, far more flexibility, in what the console does for a station's operation. **BM/E**



Stereo package shown:
2 SS 3158 turntables, 1 SS 7500 console, 1 SA 10044 cartridge tape housing, 1 SA-10041 reeltape housing & ITC tape equipment.

Here's the McCurdy Package...with options

The McCurdy package approach to the engineering of a system allows the user to easily determine the best selection of standard components to fulfill his requirements.

All aspects of the broadcast function from news booth to full TV or record production can be met with the minimum of interface between units. A full range of furniture allows for the integration for each part of the system into the most convenient working package.

Optional components including disc reproducers, reel tape housings and cartridge tape housings designed for instant operational accessability, combine with any of the consoles shown to fulfill the basic needs of the broadcaster.

Each system is fully pretested as a total unit and will meet or exceed all broadcast specifications.

McCurdy Radio Industries Inc.

1051 CLINTON ST., BUFFALO, N.Y. 14206 TELEPHONE (716) 854-6700

108 CARNFORTH ROAD, TORONTO, ONTARIO M4A 2L4
TELEPHONE (416) 751-6262 TELEX 02-21660

mCCURDY

Circle 121 on Reader Service Card

Good news for news

T2.5 4 5.6 8 11 16 22 32

There are times when only the new Canon Scoopic 16M can bring back the footage. Because it's the truly professional 16mm reporter that goes anywhere you go.

For such a newsworthy camera, the Scoopic 16M is surprisingly light — less than 7½ lbs. And thoughtfully designed, so it's completely natural to hold, to handle, to control. Yet, with all its compactness and maneuverability, the new Scoopic 16m is rock-stable, even on the run.

No wonder it's the unique camera that's perfect for television news and documentary work. Take a look through the viewfinder up above and you'll see for yourself what we mean.

The TV frameline is clearly defined. So, even as you shoot the raw stuff, the end is always in sight. That means shooting remains under control in the fastest-moving circumstances. And you're on the air sooner, with less editing or wasted footage.

The reflex viewfinder is offset to the side of the camera body, and the view through it is now brighter than ever. An all-matte screen makes for faster focusing anywhere in the frame, and also lets you check out multiple focusing points in advance, for faster and more accurate zooming once the action starts.

The eyepiece can be closed to prevent light backflow from altering your readings, and to maintain perfect exposures. The eyepiece is also optically adjustable, so you can work without eyeglasses, if you wish.

A servo-controlled automatic exposure system (ASA 20 to 640) frees you for fast-changing situations, especially where light varies unavoidably and unexpectedly. But you can still work your exposures manually when you prefer. And you see your T-stop in the finder, along with under- and over-exposure warnings. So you know where you are at all times.

The new built-in battery system helps to keep you going, too — through 1600 feet of film at 24 frames per second on a single charge! The 12-volt NiCd is fully rechargeable in about 3½ hours, and external power supplies can also be used.

Filming speeds now include single frame as well as a range of 16 to 64 frames per second, bringing with them the potential for imaginative special effects — plus the ability to handle rough-motion filming without losing projection quality.

The Scoopic 16M comes with a fast new f:1.8 Canon Macro Zoom lens. In addition to Canon's unsurpassed reputation for sharpness, contrast and color accuracy, it has built-in macro capability. Focusing begins at 3½ inches from the front of the lens, and goes from here—to eternity. Focal length ranges from 12.5 to 75mm, so you'll go in and out of the action with unparalleled smoothness at a zoom ratio of 6 to 1.

Working professional or serious filmmaker, you'll find the new Scoopic 16M a rugged, versatile, utterly dependable camera of high precision. It's the sweet 16, now sweeter.

See your local authorized Canon dealer for a demonstration, or write directly to Canon for more information.

Canon

Canon USA, Inc., 10 Nevada Drive, Lake Success, N.Y. 11040
Canon USA, Inc., 123 East Paularino Avenue, Costa Mesa, California 92626
Canon Optics & Business Machines Canada, Ltd., 3245 American Drive, Mississauga, Ontario

Circle 122 on Reader Service Card

What a Broadcaster Should Know About Zoom Lenses

Ken Rice

w to better evaluate that next lens you buy—

at does a broadcaster or production house know about technical aspects of a zoom lens? In most cases very e. Why? Because he is electronically oriented. It is teresting to note how much time is spent on choosing eras and how comparatively little time is spent choos- lenses. In broadcasting we have two important areas ar as lenses are concerned, technical and production.

his article will take you step by step through some anical aspects of lenses, how they can effect your ure quality and how you, the broadcaster, can better valuate the next lens you purchase, technically and oper- tinally.

ou have often heard that a zoom lens is a compromise. , but how little or how much of a compromise is made e fact that determines the degree of excellence the verall design represents. No one wants a lens that will ease color shift or has gross color tracking errors, poor esolution, etc.

he final picture quality can only be as good as its akest link. So remember the lens is where the picture ulity starts.

1018J11, f/2.2. What The Numbers Mean: The first mber 10 is the zoom range. The second number 18 is shortest focal length in millimeters and is the zoom s' widest angle. The J11 in this case is the nufacturer's mechanical and optical design designa- . This varies with different manufacturers and can be ost any letter or number combination.

he f/2.2 means the greatest geometric aperture of ich the lens is capable. In summary, therefore, this lens a basic zoom range of from 18mm to 180mm and a ometric aperture of f/2.2.

neral Rule Of Thumb. When you take a lens off the era, look into the front glass and you will see a bright pt. This is the entrance pupil. When the lens is zoomed the long focal length you will note how the pupil arges in size. This demonstrates the change in size quired in the pupil to maintain the same f number with ange in focal length.

The focal length divided by the diameter of the entrance pil is equal to the f stop. A 200mm lens with a pupil of 0mm makes the lens an f/2 lens. Therefore, it takes ge elements to have a fast lens at long focal lengths.

perture. The smaller the f/stop number the faster the lens or, in effect, the more light it transmits to the pickup tubes. Each full f/stop allows a factor of 2 change in light energy striking the pickup tubes.

Why? The amount of light passed by a lens is inversely proportioned to the square of the f/number. Example:

$$f/2 = \frac{1}{(2)^2} = .25$$

$$f/2.8 = \frac{1}{(2.8)^2} = .1275$$

Here are some examples of changes in aperture expressed in ¼ stop increments. f/1.4, f/1.5, f/1.8, f/2, f/2.1, f/2.3, f/2.5, f/2.8.

It might be interesting to note here that a prism in the camera also has, in effect, an aperture. Therefore, it would be useless to use an f/1.5 lens with a prism that is only an f/2. The reason being the larger bundle of light from the f/1.5 lens must pass through the prism to the pickup tube. Therefore, the prism would have to be physically larger to accept the larger bundle of light.

Now To Transmission. The higher overall transmission, the more light will be on the pickup tubes. However, it is a combination of transmission and f/stop that is the determining factor of how much light is induced onto the tubes.

Example No. 1

Lens #1—f/2	Lens #2—f/2
70% Transmission	80% Transmission

In this case, lens No. 2 is faster because it allows 10% more light to strike the pickup tubes. Both lenses have the same geometric aperture.

Example No. 2

Lens #1—f/2	Lens #2—f/2.2
70% Transmission	80% Transmission

In this case, lens No. 1 allows 5% more light to strike the pickup tubes. If the f/2.2 lens is considered as having admitted 100 units of light, then the f/2 lens has admitted 121 units of light:

Therefore:

f/2 = 121 units × 70% transmission = 85
f/2.2 = 100 units × 80% transmission = 80

The total transmission of the f/2 lens is 5% greater than the f/2.2.

continued on page 30

Mr. Rice is Broadcast Television Sales Manager for ngenieux, Oceanside, New York.

Range Extenders or multipliers, as they are sometimes called, do just that. They multiply or extend the range of focal lengths. A 10 to 1 lens whose range of focal lengths is 18mm to 180mm can be doubled by putting in a 2.0x range extender. The focal lengths now become 36mm to 360mm. Thus, all focal lengths have been doubled from wide angle to narrow angle. Something else happens; the range extender also magnifies any aberrations in the lens system by a factor of the square of the range extender. Example, if there is a focusing error of 2 in the basic lens, then by using a 2x extender the error becomes $(2)^2 = 4$. We now have a focusing error of 4. The extender also cuts down the amount of light that strikes the pickup tubes. By using a 2.0x extender, the loss of light is equal to two f/stops. Some lenses have a variable range extender rather than fixed power multipliers.

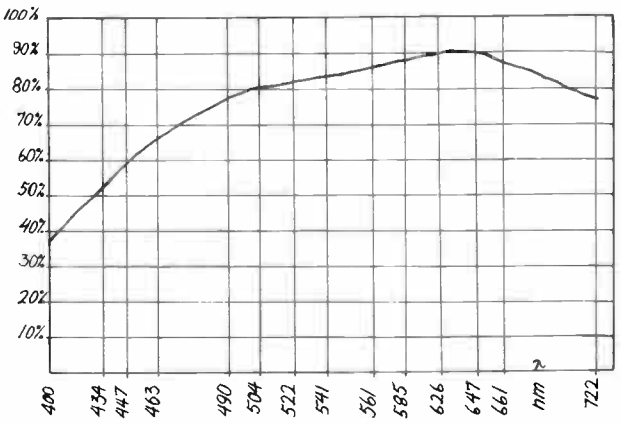


Fig. 1. Spectral transmission characteristic for a typical lens.

Where does a lens give its highest transmission? In this particular lens in Fig. 1, it is 90% in the red, 80% in the green and 52% in the middle of the blue. Some types of glass absorb more blue than other types, and lenses are made with different types of glass to correct for different aberrations. As a rule, the more glass in a lens, the less blue transmission there will be. Another rule of thumb; the wider the angle or the higher the aperture, the closer the focusing or any combination of these the more glass is required. Therefore, a lens that cannot focus as closely or doesn't have as wide an angle will (all other factors being equal) have a better transmission characteristic. However, the loss of close focusing and of a wide angle may be a production drawback.

Color Tracking. One area seldom considered is how well the lens tracks in different colors. If the red goes out of focus as the lens is zoomed, the result will be a deterioration of the overall sharpness of the picture because red makes up 30% of the total picture composition. The blue at 11% may not be as important as red and green, but it is definitely a factor in total picture resolution. Two other factors will determine picture quality; they are image size changes at different parts of the zoom range and M.T.F. The three primary color images must remain in proportion relative to one another during the entire zoom range or the result can be what appears to be misregistration; thus overall picture quality can deteriorate. Each color should remain in focus on the edges at the same time the center is in focus throughout the zoom range.

M.T.F. (Modulation Transfer Function) This is a evaluation of the lens' contrast and resolution. The high the percentage of modulation, the better the resolution an contrast. An important point to take into consideration at what frequency the measurement was taken. Using th same lens, the MTF taken at a lower frequency will sho a higher percentage of modulation than the MTF taken a higher frequency. To be accurate the readings of tw different lenses must be taken at the same frequency an for the same number of TV scan lines if the latter is to b calculated as a variable. If TV scan lines are to be usec the 525 line standard should be utilized. The limitin resolution of the system in horizontal lines is a little ove 400 lines but it is possible to see 800 lines in the vertic wedge.

Vignetting (Portholing) is the amount of light strikin the pickup tubes at the edge of the tube relative to the ligh at the center of the tube. All lenses vignette to a degree Vignetting varies with aperture (f/stop) and focal length In general, in broadcast zoom lenses the differential be tween center and edge is greater at the longer focal length and vignetting is also greater at the higher aperture (f/ etc.). These facts can be noted in Fig. #2.

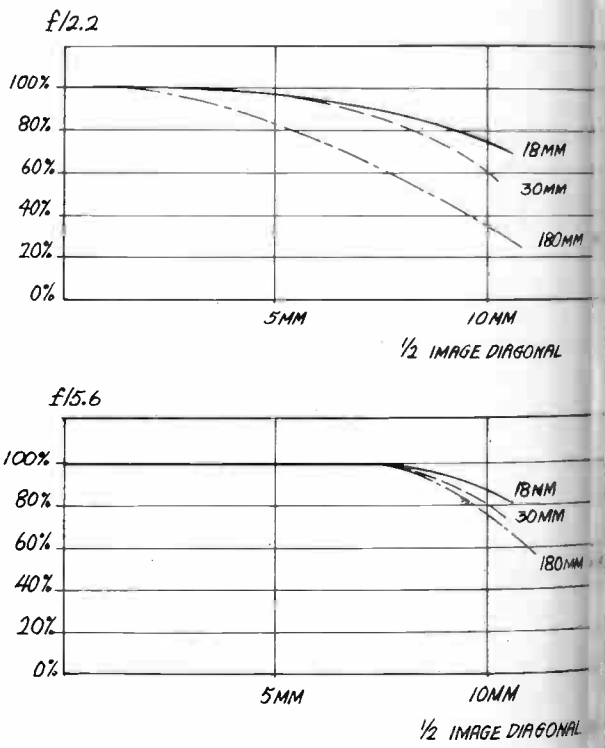


Fig. 2. Vignetting curves for different f stops.

Geometric Distortion. All zoom lenses pincushion certain amount in the long focal lengths and have barr

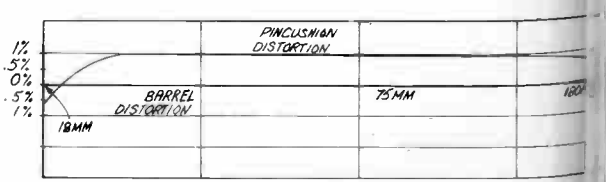


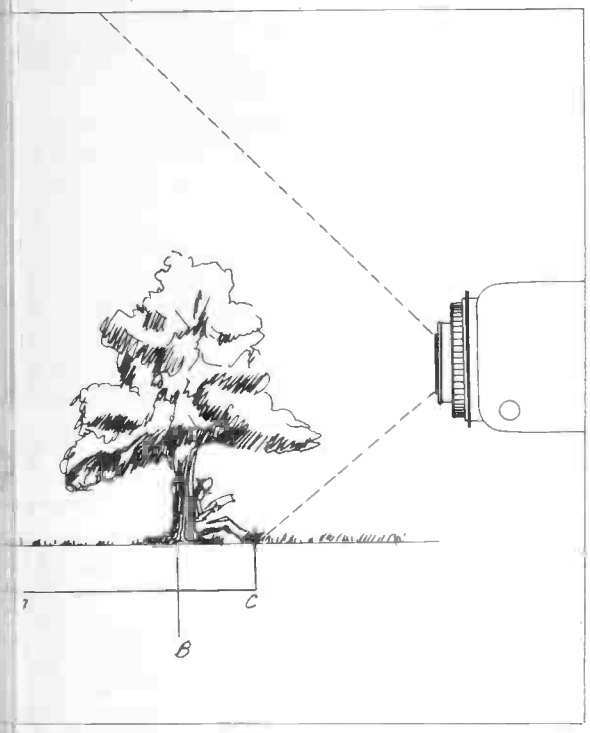
Fig. 3. Pincushion and barrel distortion (no distortion at 22mm

distortion at the short focal lengths (wide angle). Ther fore, there is a crossover point in the zooming range which there is no geometric distortion. On the graph Fig. 3, it is 22mm. It may not be generally known t

mbicons have pincushioning although it is known re is geometric distortion caused by the yokes. It is ssible to see how much pincushioning there is in the nera systems by zooming the lens to its zero distortion nt and measuring the lines of distortion in the follow- manner. Expand the vertical blanking interval on a eo monitor. Now count the horizontal scan lines from bottom of the bow to the top of either the right or left d edge of the raster.

Remember, the pincushion distortion in the lens, yoke Plumbicon are additive: 1% lens plus 1% Plumbicon yoke = 2% distortion in the entire system.

Depth Of Field of a lens is the area that will be in ptable focus before and behind the main object that



4. Depth of field as A-C when focussing on B

dens was focused upon. In Fig. 4 the lens was focused B, therefore, anything within ABC will be in focus. ou will note that the distance "BC" is shorter than ance "AB". The distance from the object toward the era that will be in focus will always be less than that ind the object.

perture and focal length also effect the depth of field. longer the focal length, the shorter the depth of field. lower the f/stop (f/2, f/1.6, etc.) the shorter the depth eld. Therefore, to have the greatest area in focus, stop lens down as far as possible (f/11, f/16, etc.) and zoom to the widest angle possible. The lens is designed so focusing is done by moving the front elements.

ck Focal Distance. The distance from the rearmost ment in a lens to the image plane is the back focal tance.

ck Focusing. On some types of lenses the whole lens be moved away from the pickup tubes, thereby in- asing the back focal distance and allowing the lens to us on an object up to the front glass. This is called Rack cusing. If the lens were to zoom in on the object in this sition, the object would be in focus only during a certain part of the zoom range. It is possible to zoom a very short distance and still be in focus. The distance depends on whether or not the lens is in the long or short focal length of its zoom range. In the short focal length (wide angle) the lens can be zoomed a little more than at the long focal length because of the greater depth of field at short focal lengths. In effect, when the lens is in the rack focus mode, its primary design feature has been destroyed and that is to remain in focus at an infinite number of focal lengths within the design parameters. One other obvious drawback is that it is very difficult to light an object one inch or less from the front glass. Most older type lenses that are not an integral part of the camera can be rack focused.

Close-Up Lenses are normally used to gain in magnification. They allow the zoom lens to focus at a closer distance to an object than it normally could. Close-up lenses allow the zoom lens as it is zoomed to retain focus throughout its entire zoom range unlike rack focusing. However, infinity focus is lost. This means that the zoom lens with a close-up lens on it can only focus on an object lying between two given close-in points (10″ - 20″ or 27″ - 35″ etc.) and cannot zoom and remain in focus on an object beyond these points. So to focus and zoom in on an object 10 ft. away, the close-up lens must be removed.

The Retro Zoom is a zoom lens attachment that gives the narrow angled remote lens a wider angle and closer focusing. This attachment adds measurably to both the length (approximately 9″) and weight (about 20 lbs.) of an already large lens, but it does make a remote lens usable in the studio.

Set Up. To check your lens and also to make sure that your lens is properly set up that you are getting the most from it, do the following:

1. Open the lens to its highest apertures (f/1.6, f/2, f/2.2, etc.)
2. Zoom to its narrowest angle (140, 160, 180, 200, etc.) adjust front focus of lens.
3. Zoom to widest angle (14mm, 16mm, 18mm, etc.).
4. Focus green tube and set sweeps.
5. Repeat steps 2 and 3.
6. Repeat step 4.
7. Zoom to widest angle.
8. Adjust focus and sweeps of red and blue tubes.
9. Register red and blue to green.

Now color tracking, color image, size change, and resolution can be checked.

Production considerations

In the beginning, the user was confined to four lenses on a turret. This made framing a shot difficult as well as time consuming. With the old turreted camera there were only four focal lengths readily available, which necessitated a good deal of dollying with the resultant time loss and undesirable framing of a shot due to the limited number of focal lengths. Then along came the zoom lens with its great number of focal lengths immediately available. The director could now get the exact framing he wanted quickly. Now that it is here, can one zoom do everything? Of course not! The correct lens for your application may not be applicable to someone else's needs. A good studio lens is not a good remote lens

continued on page 32

although it may cover some remote applications. The remote lens works quite often at long focal lengths under low light levels requiring f stops of f/3 at 500mm or f/6 at 1000mm, or better. The average studio lens can attain 500mm with range extenders but it needs over 3 times more light at that focal length due to its limited aperture. The remote lens cannot fulfill all of the requirements in a studio because its close focusing distance is 10 ft. and its wide angle is about 30° less than a studio lens (A cumbersome retro zoom will, however, help measurably). If your studio is small, you will need a lens with a wide angle so that it isn't necessary to dolly back to one side of the studio to get an overall shot of a set on the other side. Close focusing is necessary so that magnification is possible as well as interesting special effect shots. It should be noted here that two lenses with the *same* long focal length and different close focusing capability will magnify an object to a different degree, the greater magnification going with the closer focusing of the two. If commercial production is contemplated, then more capability will be demanded of the lens because agency people, as well as clients, want the dramatic eye-catching shot that will make the product memorable.

Taping time must be held to a minimum to earn more money for the station and less added cost to the advertiser. The lens can be of great help here. If a lens can, in fast sequence, go from an extreme close-up to a wide overall shot and back to a close-up then taping time will be lessened because there will be no need to stop the tape for different shot sequences.

However, if all that is done is news and weather, the simple good quality wide angle 10 to 1 lens may be all that is needed.

A check list

Make sure you check the following:

1. Lens resolution in the corners as well as center during entire zoom range.
2. Does the lens remain in focus in the center at the same time the edge is in focus in each color?
3. Does lens keep image size constant in each of the three primary colors during the zoom range?
4. With the lens wide open, does the aperture remain constant throughout the zoom range (Very few lenses do)?
5. What is the widest angle?
6. Closest focusing?
7. What is the aperture at these angles?
8. What is the entire zoom range capability?
9. Read the lens specifications closely although Nos. 1 & 2 won't be given that is why it is necessary to do your own checking.

When comparing lenses, do it on the same camera at the same focal lengths with the lens wide open. The engraved f stops on the iris ring have a tolerance of only 5%. Therefore, there can be a 10% difference in aperture between two lenses even though they are both on f/5.6. Whatever lens you choose, do it with an eye toward the future because what you buy now may not be adequate six years from now. **BM/E**

Lens Evaluation No Simple Task

by James F. Tennyson
General Manager, Rank Optics, U.S.A.

Factors which must be considered by any buyer of television zoom lenses include performance, reliability, vendor service, price and delivery. Price and delivery can be the most important factors when budget forecasts and on-air deadlines are encountered. Service and reliability is generally determined by past experience. Lens performance, particularly in new lens designs, can only be determined by careful measurements.

According to the American Broadcasting Co.'s Engineering Dept., lens buyers face a complex task in evaluation of lens performance versus specification. In years past, proof of performance was obtained by televising a Retma Chart with the lens in question mounted on a studio camera. Grosser defects of vignetting, poor focus, or low contrast were readily observable. However, lenses make by manufacturers today are so good that comparative evaluation on camera is difficult if not impossible. The buyer must either trust the track record of the manufacturer or go to expense of evaluation by an independent optical laboratory.

Today's zoom lenses are popularly rated as to usefulness by a number expressing the ratio of their widest taking angle to their narrowest; i.e., 10:1, 16:1, 34:1. Manufacturer's enthusiasm for competition with bigger and bigger numbers is limited only by the broadcasters tolerance to proportional loss of qualitative performance in terms of image sharpness, geometry, and photometric efficiency. Generally, the wider the maximum taking angle, the more severe the problem. Image sharpness is particularly hard to assess on camera as it is a variable dependant on many factors. For instance, evaluation of one lens at ten focal settings, three aperture settings, four focal distances in three areas of the image for each of the three color channels, would require 1080 measurements!

Mike Fisher, equipment planning manager for ABC, faced the evaluation problem recently in relation to a major buy of lenses. Fisher went to Perkin-Elmer corp., of Norwalk, Connecticut, who maintain one of the most sophisticated optical testing laboratories in the world. Perkin-Elmer test engineer John Dolnier was given the task of comparative evaluation of the lens candidates. He was directed to measure modulation transfer function, veiling glare, relative illumination, and equivalent focal length. Dolnier's biggest problem was arranging the tests to compare "apples with apples," despite the fact that candidate lenses had differing specifications.

Modulation transfer function (MTF) is the modulus of the fourier transform of a line spread function formed by the lens under test. Perkin-Elmer maintain a quarter-million dollar MTF measurement system developed by Ealing/Beck named "EROS." The Ealing principal of MRF measurement is based upon an optical fourier analyzer which produces a pattern or variable spatial frequency but constant contrast. The technique is somewhat analagous to amplifier response testing by means of a swept sine wave signal of constant amplitude, measurements are made to one percent accuracy and automatically recorded on graph paper.

Veiling glare in today's zoom lens is caused by scattered light in and among the multiplicity of component lenses. While quality of glass and blacking of edges and internal mechanical surfaces are significant factors, the key to a low index of veiling glare is the efficiency of the anti-reflection coatings. Perkin-Elmer points the lens under test into a seven foot diameter uniformly illuminated sphere in the center of which is a black "hole." The veiling glare index is the ratio of minimum illumination in the image of the black hole to the maiximum illumination of the white surround.

Does the focal length of one manufacturer's lens produce the same angular field of view as the same focal length lens made by another maufacturer? The equivalent focal length of any lens is measured exactingly on the EROS equipment by moving the object generator a given angular increment and measuring the shift in image position. To accomplish this measurement with a television camera would require an impossibly precise setting of scanned area on the pickup tubes.

The broadcast industry is fortunate to have professional users who insist on performance in a technically qualitative sense as well as a functional operational sense. The qualitative factors which are so difficult to measure are the same factors which enable good pictures when a cranky client is messing around with weird product shots or when the light is fading on an afternoon sports event. It is to the benefit of the industry that once in a while broadcasters demand that manufacturer specifications be backed by more than a good track record.

Trends in TV Lenses

Frank Beemish

rrent zoom lens designs are quite efficient, optically very good, and erationally flexible. They are as good as fixed focal length lenses. l, there are some points to consider in selecting the right lens.

First TV zoom lens build by Dr. Back.

Zoom lenses appeared not long after the first image orthicon television cameras. Early lenses had maximum zoom ratios of 2X or 3X, and were generally designed as long-focal-length lenses for field use. They were physically large and slow speed. Despite the fact that they represented a great step forward, early zooms exhibited vignetting, poor light transmission, pin-cushioning, barrel distortion, poor linearity, and almost no color correction. Knowledgeable directors considered the zoom lenses to be optically inferior to the fixed-focal-length lenses available at that time. However, current day-technology has brought zoom lens design to the point that zooms now come close to equalling the quality expected from any fixed-focal-length lens.

Developments in the late 50's and early 60's by the European optical manufacturers resulted in new glass and coating formulas, better understanding of zoom lens principles, and new approaches to mechanical design. The result was lenses with zoom ranges of 5X, 10X and even 20X. These lenses had better optical quality and faster f stops with improved light transmission than did earlier versions. Coatings started to improve, reducing flare and internal reflections. Designers thought about color and much better color correction resulted. Improved approaches to the mechanical design resulted in smoother zoom action and better focus tracking throughout the zoom range.

More recently, the Japanese have made some contributions in basic glass and coating research developments. Lenses using the new glass and coating formulas have a 1 to 2 f-stop advantage over the same lens built with the older glass. The new formulations result in better light transmission efficiency, lower internal reflections and flare, and a better depth of modulation giving the picture a much sharper appearance. Today, lens designs are smaller and lighter, are optically of better quality, and more efficient than those of the 60's. Improved mechanical movements give smoother zoom operation and better focus tracking. Recent developments have also improved the practical usable zoom range. Lenses with zoom ranges of 12X, 15X and 17X are now commonplace. The recent development of the double zoom lens or the zooming range extender, have extended the practical zoom range to 34X.

Mr. Beemish is marketing manager, Broadcast Optics, Canon, Lake Success, New York.

The built in zoom

The introduction of the Plumbicon color camera saw the birth of the color separating prism and the built-in zoom lens. There are many practical reasons for the camera manufacturer selecting this as the optical approach for his camera design. Early color cameras used standard Orthicon or Vidicon lenses with a system of field lenses to extend the focal plane of the lenses through the color separating system, to the target of the image pick-up tube. Color separation was effected by a series of three front surface dichroic mirrors. This system had many inherent problems. One, optical alignment was fragile, and optical set-up was time consuming and difficult. Two, the system was susceptible to dirt, and there was inherent light loss due to the field optics; and three, it tended to be physically large. Even though this system lends itself to the use of fixed focal length lenses, it was operationally cumbersome. The field lenses had to be changed to match the focal length of the objective lens being used. This was fine when individual fixed-focal-length lenses were in use, however, it posed a problem when selecting a multiple-focal length-lens such as a zoom lens. The problems generally exhibited themselves as color aberration during some part of the zoom range. Even fixed focal length lenses were not a panacea since the rotating lens turret created many problems of optical alignment.

In the late 50's, Dr. Frank G. Bach patented the use of the color separating splitting prism in combination with a zoom lens. This system has many inherent advantages. Since the system was in effect a single component, optical alignment problems were minimized. Being a sealed system, the problem of dirt was eliminated, and it was much smaller and more compact than the field lens system. Long back focal length zoom lenses could now be designed that would take advantage of the prism glass as part of the lens. These lenses would focus directly on the target of the pick-up tube, thus eliminating the need for field lenses and also compensating for color aberration that had occurred in the field lens system. In general, this system offered better optical quality, and operational flexibility. Since the optical quality of zoom lenses was beginning to

approach that which could nominally be obtained with a fixed-focal-length lens, is it not too difficult to understand why the camera manufacturers elected to follow this particular route. The main objection to the built-in zoom lens seems to be an operational one in that there is still a strong feeling from directors and producers that they would like the flexibility that fixed-focal-length lenses afford. Since color camera optics are no longer compatible with standard film lens formats, in that the back focal length is quite different, fixed lenses would have to be designed to match the internal optics of the color camera in the same way that the zoom lenses are. Since the internal optics of all prism cameras are not completely compatible, practical marketing considerations have, for the most part, blocked the manufacture of fixed-length lenses for color camera use.

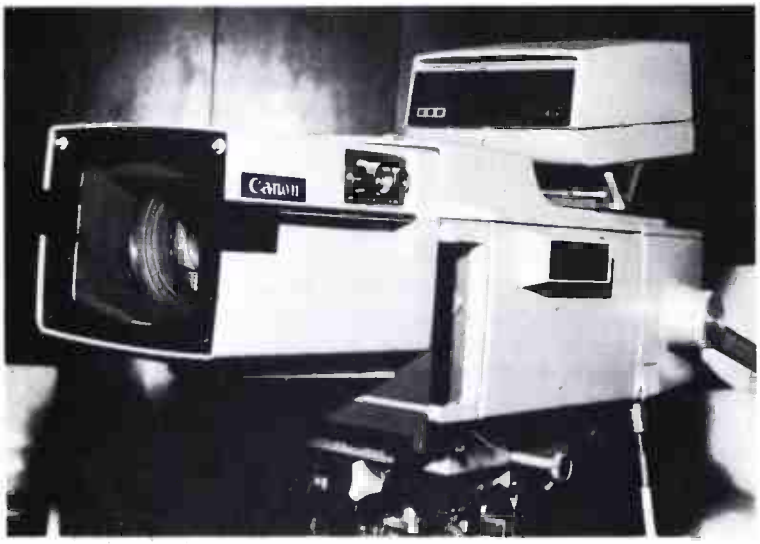
What to consider in picking a lens.

The following are some points that should be considered when selecting a lens:

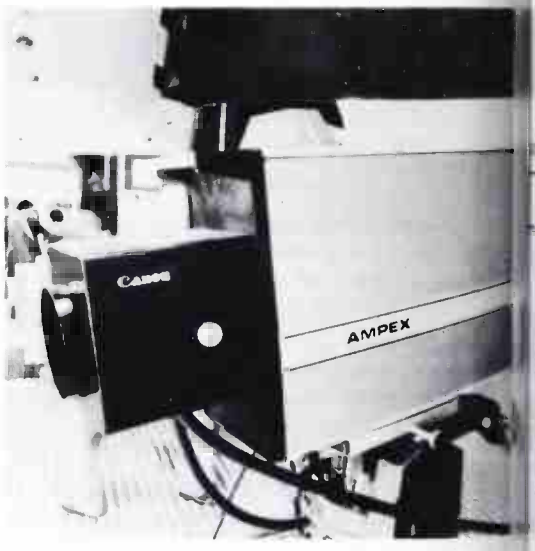
- The price of the camera on which it is to be used.
- The primary use for which the camera is intended.
- Special conditions that may be regularly encountered.
- The operational flexibility that will be required to get full value from the camera.

Zoom lenses designed for use with the mid-price range cameras are generally mechanically simpler, and operationally somewhat more restricted than the lenses available for the "top-of-the-line" broadcast cameras. These lenses are generally of excellent optical quality, however there are some compromises in the optical design that are dictated by price. These are generally zoom range, f stop and minimum close focusing distance. The mechanical mounting is generally direct and does not include a bed with built-in range extenders or sliding carriage for ease of range extender addition. For the most part, range extenders are added by sandwiching them between the lens and the camera. Zoom ranges available for these cameras are generally not in excess of 10X, and for the most part, the lenses are f2.0 or f2.2 for a 1-inch Plumbicon format. The operational and optical quality of these lenses is generally quite good, but depends in great part on the particular model and lens manufacturer selected.

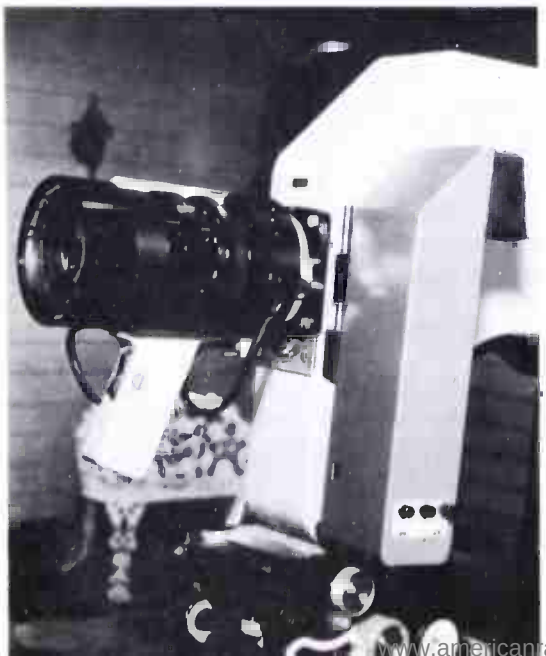
"Top-of-the-line" broadcast camera studio lenses offer greater operational flexibility and performance features. These lenses are generally bed mounted, which allows for addition or change or range extenders without removing the lens from the camera. They are for the most part larger lenses, designed for a faster f-stop than the mid-price range camera lenses.



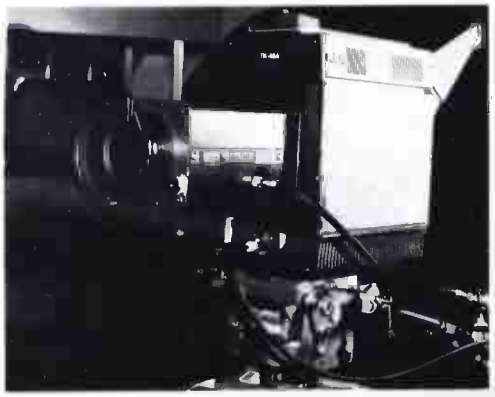
A modern 10X universal zoom lens.



Small 10X studio zoom lens.



A 10X zoom for a hand-held camera.



New 24X double zoom showing third zoom extender control.

The studio lens is defined as being a universal lens ing maximum operational flexibility either in the dio or in the field. General considerations for selecting s type of lens should be zoom range, close focus opera-, angular field of view, ease of changing or adding ge extenders, physical size, optical quality, and light smission efficiency and price. The studio lens should er be selected on the basis of an occasional worse case olication, but should reflect the maximum operational tibility in the day to day use for which it is intended. is is to say one should not select a super-long zoom ge suitable for field use, on the basis that it will be used one or two remotes a year. This lens may restrict ryday operational flexibility, and more than likely, the ple addition of range extenders will solve this occa- nal problem. Selection of a high-speed lens for a cam- that will be used daily in the studio with 100-200 foot dles of light is another case of specification overkill. t practical use to which the camera and lens will be put uld be the prime consideration for the lens selected.

orts lens call for different criteria

Considerations in selecting a sports lens are somewhat ferent than for a universal studio lens. In this case, e are two prime considerations:

- Maximum range of focal lengths from a reasonable wide angle to a long telephoto lens.
- The light gathering capability of the lens at any particular focal length.

Most of the current sports lenses have a good long zoom nge and have some convenient way of adding or changing range extenders without dismounting the lens. As the zoom range becomes greater, in excess of 10X, there is a certain transmission loss which occurs within the lens. Generally, these lenses hold their maximum f-stop rating for the first 10X of the zoom range and then taper off to as much as 3 full f-stops at the maximum focal length. If range extenders are added, the overall available light is diminished by the power of the range magnification, that is to say that a 2X range extender will halve the light available. Considering the inherent transmission losses, within the long sports zooms, lens efficiency becomes a very important consideration.

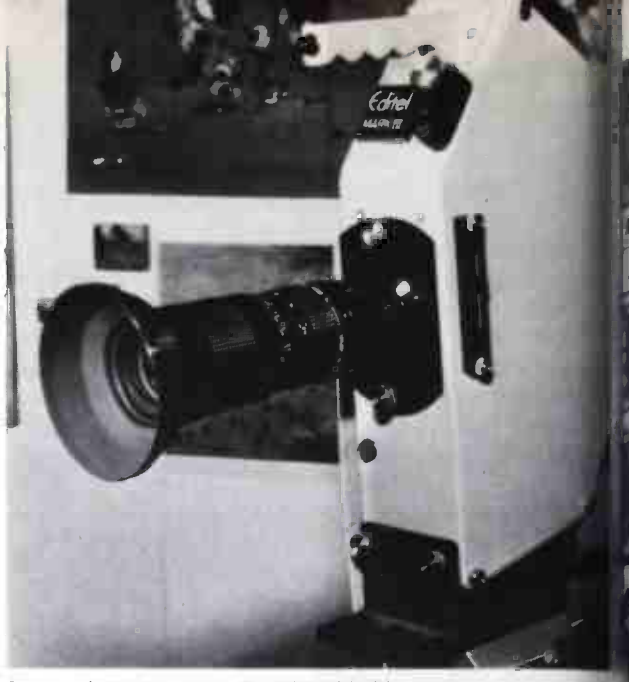
Comparison between lenses should be made at equal focal lengths. When this is done, you will find you are able to make a comparison between two lenses with different focal length zoom ranges; i.e., a 16mm-500mm, f1.7 to f4.5 may not be as efficient as a 24mm-800mm, f1.8 to f4.6. When both lenses are compared at 500mm, the first lens is f4.5, the second lens may be an f3.0, showing that the second lens is more efficient. Another consideration is the ease with which range extenders may be changed. Add-on, slip-in and rotating extenders require the range extension to be made with the camera "off the air."

The new Zoom Extenders have the advantage that the range is infinitely adjustable, and may be changed "on the air." The double zoom or zooming range extender gives the cameraman the flexibility to select the exact range that suits his particular requirements and light availability. Continuously coupled double zoom lenses tend to have the operational problems, in that one must go through the entire zoom range in order to check or adjust focus, and

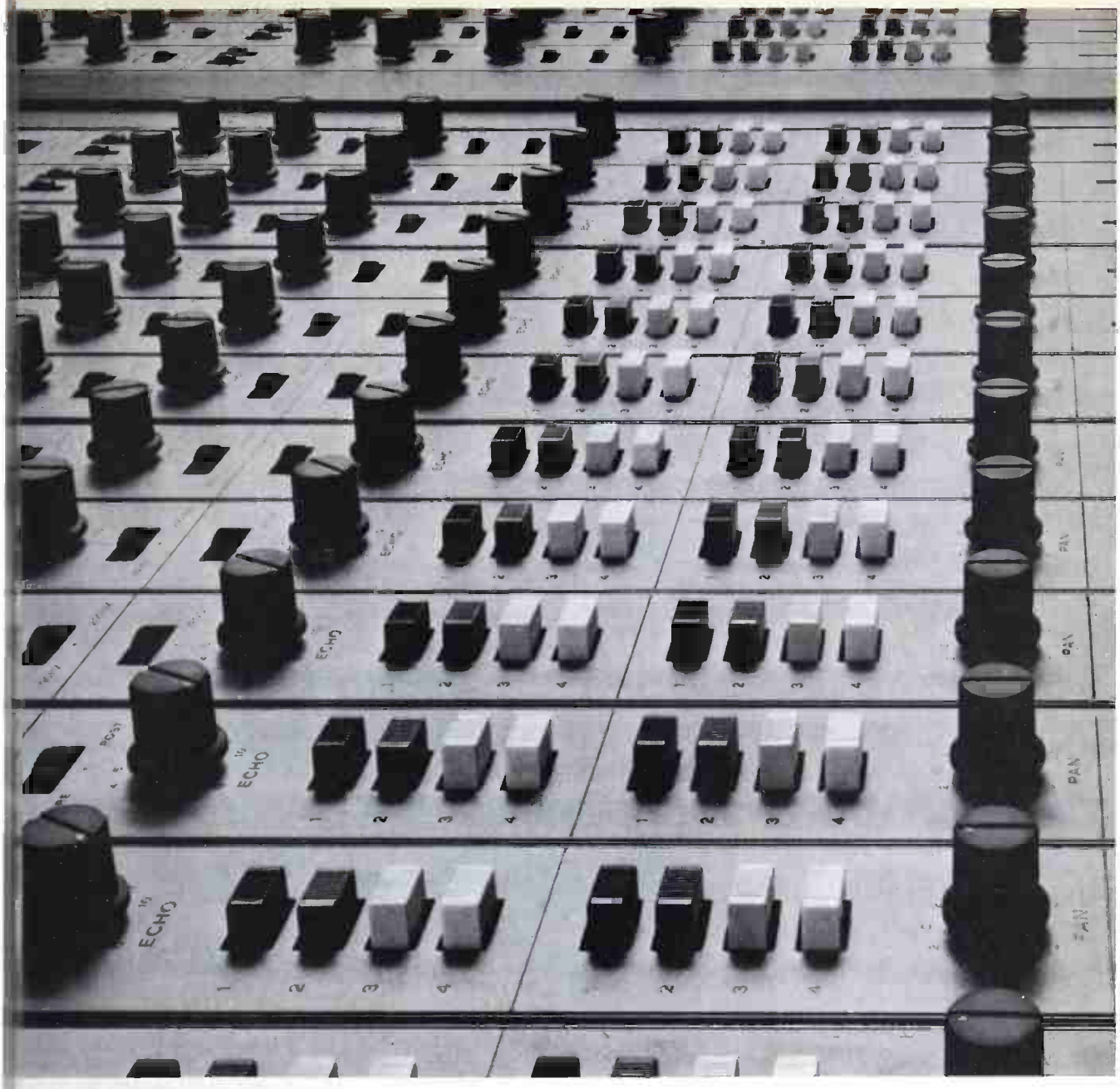
there is no practical method of restricting the zoom when the available light drops below the maximum light gathering capability of the lens. The double zoom, on the other hand, has the operational flexibility to make a continuous long zoom as well as the ability for the cameraman to select the exact range that available light and artistic conditions demand. The operator has a built-in limitation to stop him from zooming to focal lengths where available light becomes unusable. From a practical consideration, it appears as if the double zoom is the operationally more flexible approach.

New problems with portables

Since hand-held or portable cameras have become operationally acceptable, there has been some re-thinking on the lenses that should be used. Early hand-held cameras were generally built with 5X or 6X lenses and were considered purely for hand-held use. As hand-held cameras became operationally acceptable, it was found that they were used as universally portable cameras, and mounted on tripods more often than not. Under these conditions, a 5X or 6X zoom range is not adequate. Practical experimentation has shown that the properly selected 8X or 10X zoom offers far greater flexibility. When selecting a lens for a hand-held camera, one should consider size, weight, range of focal lengths, optical quality, and lens efficiency. The 10X lens for a portable or hand-held camera should have the widest possible angular field of view and the shortest close focusing range. It is also desireable that this lens have some type of "Macro Focus" capability to allow a conveniently operational method of getting an extreme wide-angle close-up when required. The long standing practice of seeking the "universal zoom" is not practical for hand-helds. Common practice is evolving to the use of many specialized zooms and lenses since the size and weight of an operational lens are often limiting factors. When considering lenses for a hand-held, look into lens interchangeability and more than one lens. **BM/E**



Super-wideangle zoom for a hand-held camera.



The Model 10 Mixing Console
When you've got more talent than money

ny mixing console is simply a creative tool. etting the most out of it calls for naginative insight into music and kill in the practical application f sound.

If you've got the talent but ou don't have the money, you're exactly who we built this board for. The basic 8-in, 4-out board starts at just $1890. From there you can go to 24-in, with options and accessories enough to fill a studio. The TASCAM Model 10. It gets your inside outside.

TASCAM CORPORATION

5440 McConnell Avenue
Los Angeles, Calif. 90066

Circle 125 on Reader Service Card

GREAT IDEA CONTEST

The contest goes on—so keep sending your ideas and please **vote.** Use the ballot or write your choice in on the Reader Service Card.

The Windjammer Cruises go to the highest vote-getters in the categories of TV, FM, AM Class I & II and AM Class II & III.

Leading in votes for March, is Don Ree's idea for modulating tapes for automation.

To enter the contest see rules on page 40.

37. CCTV Isolates Intermittents in Studio.

David L. Sather, KXLO, Lewistown, Montana

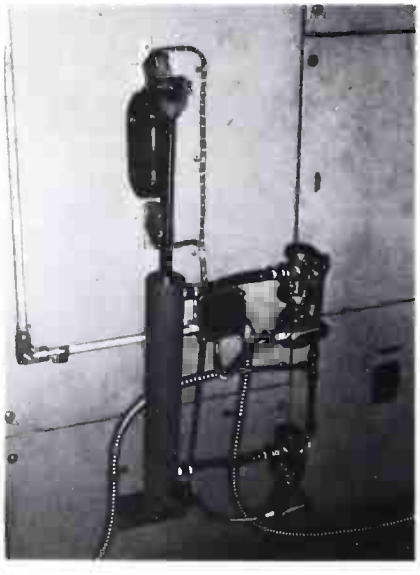
Problem: To isolate intermittent transmitter outage problems via CCTV. Instant outages in the transmitter, with no sign of anything wrong, can plague your operation for several days unless the problem is caught immediately.

Solution: At KXLO we have a portable TV camera, recorder and monitor. Since the modulator tubes were suspect, we videotaped the modulator plate current meter. At the first signs of the next outage, we taped, and waited until the power relay kicked out. Then we played back the tape. Sure enough, we saw a beautiful picture of the meter needle almost pinning before the transmitter overload relay opened up. The problem, faulty modulator tubes, was located far faster and easier than when tubes were changed one at a time in an effort to find the culprit.

38. Pneumatic Stand-by Power Switching Scheme Saves Money.

Peter Baghdasarian, WPRI-TV, Providence, R.I.

Problem: In the process of preparing the transmitter facilities of WPRI-TV, Providence, R.I., for remote control operation, a problem arose regarding the transfer of power from commercial to that delivered via stand-by generator. Power is switched manually at present; provisions had to be made for remote control transfer. As is not uncommon among older stations, generator capacity is such that operation of either the exciter of the main transmitter (RCA TT-1) is allowed, or that of the stand-by G.E. 5KW transmitter.



Pneumatic cylinder operates manual transfer switch remotely.

Capital expenditures did not include an upgrading of generator capacity which would then warrant the purchase of fully automatic power transfer facilities. We were faced with the choice of purchasing an automatic transfer switch, capable of handling the present generator current capacity (cost: about $3,000) which would be obsolete when the generator was eventually upgraded. Or, we could purchase an automatic transfer switch capable of handling the full load (cost: about $8,000). Problem was: either solution involved a considerable expense, and neither was considered entirely satisfactory.

Solution: It was felt that if a way could be found to adapt the existing manual transfer switch so that it could be operated by remote control, an excellent solution would have been found. After investigating various methods, it was decided that a pneumatic cylinder could be attached to the existing switch. The result, although having a home-made appearance, actually works very satisfactorily.

A small compressor is used to charge an air tank to about 40 p.s.i. Two three-way air switches are controlled by the remote control equipment. Micro-switches mounted to both end of the air switches travel, acting as limit switches and provide read-back on the position of the switch to the studio. The operation of the switch is quite fast and visual supervision of operation under load shows no serious arcing.

39. Eliminate VTR Audio Rewind Chatter.

Jack R. Becknell, Jr., Chief Engineer WCTI-TV, New Bern, North Carolina

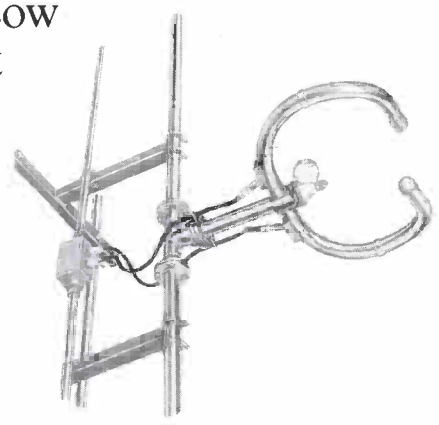
Problem: To prevent VTR audio chatter from accidentally being aired during rewind.

continued on page 4

Saul Esocoff for Phelps Dodge: the fact that we build FM broadcast antennas is one of the best kept secrets in the industry.

We have well over 100 circularly and horizontally polarized FM broadcast antennas radiating signals daily, yet many people in the business don't know we build them. We're counting on the power of product quality to change all that. You see, because of the technology we've developed over the years in land mobile antennas, cavities, duplexers and rigid transmission line we started out a step ahead.

Our FM broadcast antennas are different. The elements are hard drawn high conductivity copper. They are less susceptible to corona. You get perfect phase coincidence of the vertical and horizontal components. There are 24 types to choose from. Low power or high power. You can use an element or a single bay antenna for limited coverage requirements. Or, use multi-element arrays. The model you choose arrives complete, ready for installation, with a tunable input transformer to match the antenna to the location. Deicer kits and radomes are optional. For FM we also have circularly and horizontally polarized stainless steel educational antennas, directional couplers and low pass filters. May I tell you more? Please write or call me: Saul Esocoff, Manager Special Products, Phelps Dodge Communications Company, Rt. 79, Marlboro, N.J. 07746, 201 462-1880.



phelps dodge communications company

Circle 126 on Reader Service Card

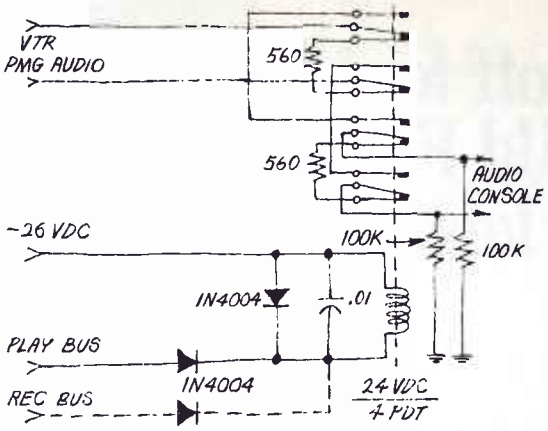
Solution: Mute the VTR audio program line except during the play mode. Although this approach was adapted to RCA machines, it is useful to other VTR makes.

The RCA control circuits operate by bringing the appropriate control bus from its −26 volt "off" condition to ground. By installing relay R1 from the −26 VDC supply to the "play" bus, the relay will be energized only in the "play" mode. The normally closed contacts are used to simultaneously break and terminate the program audio output of the VTR, and the sending end of the line to the audio console. When the machine is playing a tape, the relay connects the program audio in its normal path. There is no program audio output during fast forward, rewind, record, set-up, stand-by or stop modes. No rewind chatter can be aired even if the audio operator fails to cut VTR audio before the tape operator hits rewind.

The 0.01 uF capacitor and diode D1 suppress inductive spikes generated by the relay coil during make or break—thus assuring pop-less audio switching and no false triggering of the VTR control circuits. It may be necessary with some long audio lines not having a ground reference (center-tapped transformer) to install 100,000-ohm resistors (as shown) to eliminate pop caused by static charge build-up.

An added advantage of the system is the elimination of a possible feedback path through the audio console while recording—since it is impossible to feed the same machine's audio back to itself. If it is necessary to monitor the VTR program audio output while recording, install diode D3; however you lose the feedback protection.

The −26 VDC bus and the play mode bus are both acessible from the (RCA) machine remote mode control connector, so no internal modifications are necessary. The entire unit can be housed in a small box mounted near the audio output connector.



Method of muting VTR audio program line during play mode.

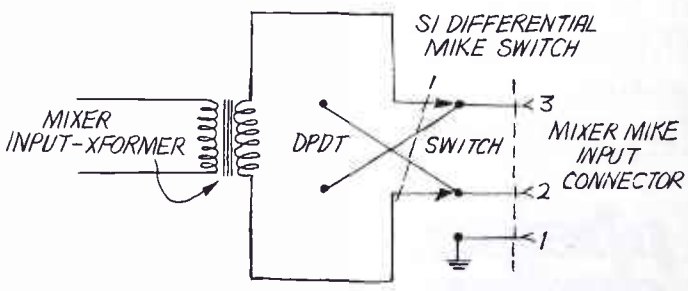
40. DPDT Switch Eliminates Need For a Differential Mike.

J.P. Robillard, Owner & Chief Engineer, KLUV, Haynesville, Louisiana

Problem: To eliminate the need for a differential mike while covering special events. We are a small-market station. On several occasions during the year we are called on to "do the audio work" for school plays, talent shows and parades. It becomes difficult to reduce the noise level during some of these activities, mostly during parades which include bands or piano recitals where the pianist accompanies himself. In order to keep the noise level down for broadcasting or PA work, a differential microphone system should be used. Although small-market stations (like ours) cannot always afford the luxury of extra equipment for these rare occasions, simply wiring two microphones out of phase, while having a cancelling effect on the audio entering the mixer, also presents their special drawbacks.

Solution: There are several ways in which a differential mike can be set up. First, a mike used only for the purpose can be wired out of phase with respect to all other station mikes. Second, a second hot lead can be wired out of phase and carries the out-of-phase signal when the need arises. And last, one channel on the audio mixer can be wired out of phase and so designated.

All of our remotes (and special audio work outside of the station) are done with a Shure model M67 four-channel mixer. Instead of using special connectors or mikes, we wired mixer channel no. 2 with a double-pole double-throw switch as shown. By setting this switch to the "reverse" position, we are able to use any station mike in a differential-like mode. There are no dangling leads to remember—and most important, we do not need a special mike.



Using regular station mikes in a differential-like mode.

41. Semi-Automatic ID Switcher Frees Personnel.

William Pinkston, Chief Engineer WHTV, Meridian, Miss.

Problem: To air local IDs at a satellite station at the proper time interval on a semi-automated basis using readily available equipment.

Our station, WHTV, Meridian, Miss., was sold to another broadcaster in 1970, and since then has operated as their satellite. Since carrying the other station, WTWV, Tupelo, Miss., off the air, WTWV has had to simultaneously air a dual ID; WTWV, Tupelo, and WHTV, Meridian. This soon caused rating problems; though both stations are linked via microwave and carry identical programming, viewers here think of our station as "Meridian" and those within the WTWV pattern consider themselves as watching "Tupelo." To help us strengthen our own local identification, we are no

REAT IDEAS

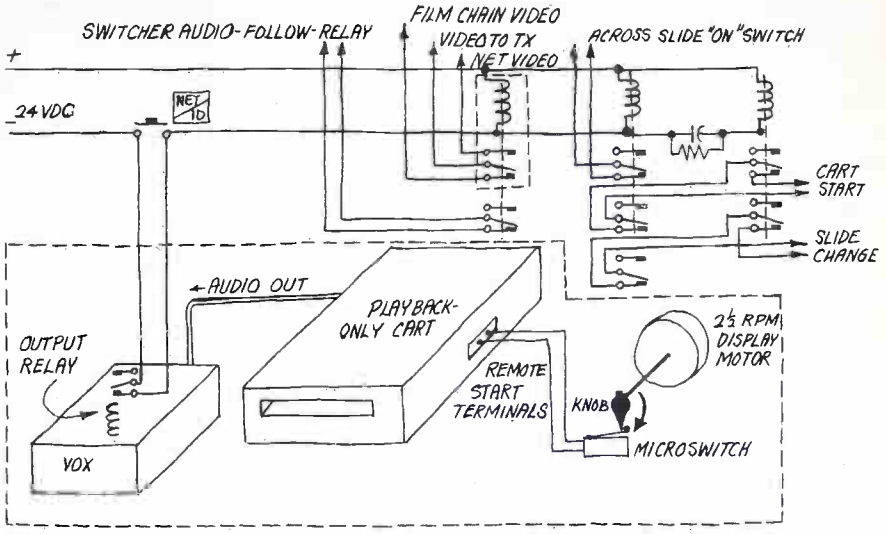
ıg our own IDs, once not consid- practical.

olution: Since our IDs are black & e, the gadget we wired (see dia- n) is called one-button- ochrome. When the device is acti- d, it switches video to the film n, cuts the audio, turns the slide on, rolls the cart all at once. When the ch is returned to normal, video and o resumes, the slide changes, and er is cut to the slide projector. This ked well, but still we had to be on toes.

utomatic IDs proved to be the an- . A discarded display motor found otate at 2½ rpm was salvaged. A p and micro-switch was fastened to motor output shaft. The micro- ch starts an extra audio cart hine every time the knob goes past contacts the micro-switch.

here are 75 cues recorded on the cart: 74 are 4¼ secs, without audio; the last is the length of the ID with a tone recorded. The audio of this cart is fed to a VOX which activates the one-button-monochrome mini switcher. The micro-switch on the cam remains closed for 3 sec., and has a cycle time of 24 sec. That is the limit of cue spacing. On a 5:30 cart, 4.25 secs/cue

continued on page 42



System for putting automatic video ID's on the air.

Rules for BM/E's Great Idea Contest

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

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

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

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

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

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

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

Entry Form for BM/E Great Idea Contest—1974

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

Name _____ *Title* _____

Station Call Letters _____

Address _____

City _____

State _____ *Zip* _____

Licensee _____

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

Title of Entry _____

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

Solution: *(use separate sheet)*

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

Signed _____ *Date* _____

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

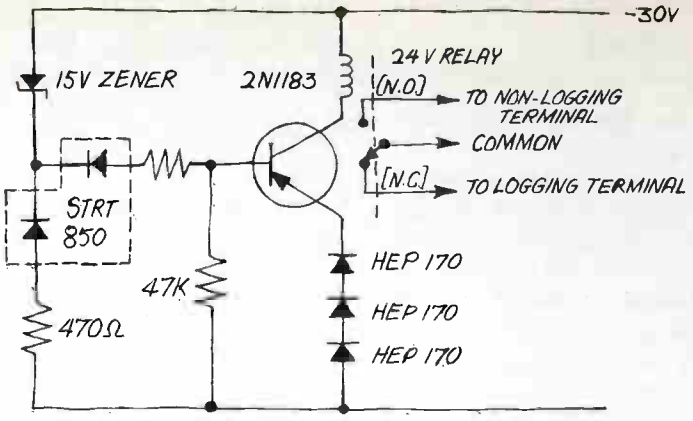
worked out well for 74 cues; the last cue being about 7 sec. The longest cue between last and first is about 15 sec. The biggest problem with our automatic ID switcher is that you have to remember to disable it when airing non-standard IDs.

42. Easy Way To Define Tape Source in Carousel Cart.

Don R. Widders, Engineer, KPAY-FM, Chico, Calif.

Problem: To define tape source as logging or non-logging in a carousel type tape cartridge player. Many carousel-type cartridge players use only one auxiliary cue tone. In an automation system where this tone is used for both logging and end of message information, no message can be shorter than the logging interval. All cue signals are diverted to the logging decoder during this interval, so if an end cue were to fall within this period, it would be lost to the logging decoder.

Solution: In this type of system, some accommodation is made to define each source as a logging or non-logging source. This function can be controlled by a relay actuated by a white tag on cartridges whose message is shorter than the logging period, and need not be logged. In our installation each carousel has been given a cart with nothing on it but an end cue and a white tag. This cartridge is indexed whenever there is nothing else scheduled for that carousel, allowing that carousel to be called on without playing superfluous fill. The diagram shows how we make use of this idea, but it could be adapted to any carousel installation where similiar control function is needed.



Method for determining which sources are logging or non-logging.

43. Automatic AM Turnoff/Alarm for Combo Jocks.

Fred Clinger, Chief Engineer WBCO/WBCO-FM, Bucyrus, Ohio

Problem: To alert the night shi combo operator (at an AM/FM facility

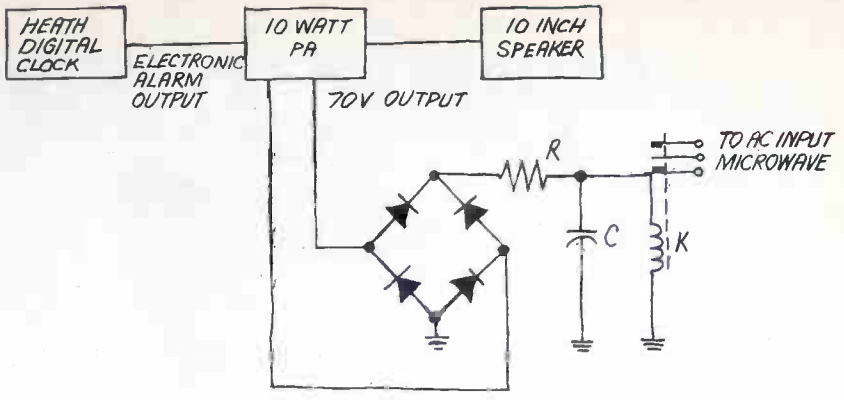
REAT IDEAS

hut down the Am transmitter. Night t operators, often both jock and eer, sometimes don't turn off the l transmitter at the proper time—and ve the station open for an FCC cita-. The problem at our AM/FM sta- was solved using a Heath Co. dig- clock to operate an aural alarm. n, if the boardman misses this cue, unit automatically shuts down the irowave remote controller, which off the AM transmitter.

olution: The digital clock alarm s off, and generates an electronic , which usually can be heard via a ll speaker mounted in the bottom of ase. Alarm output for our applica- is taken from the speaker terminals fed to a 10-watt PA amplifier. The drives a 10-in. speaker mounted in control room.

utput from the 70-volt line in the amp is applied to a diode bridge fier. The resulting DC signal ges capacitor C1 via resistor R1. icient voltage across C1 trips a 12 C relay, which breaks the AC er to the microwave unit. This ac- shuts down both transmitters via microwave carrier relay, and the ament circuits in the transmitters.

Ve have found this to be a very good cational tool. First, the combo man s very quickly since he gets an shattering beep from the PA. Then, r a few seconds the microwave s down both AM and FM transmit- This means that he will be off the FM band about four minutes, due to the cold-filament lockout on the FM transmitter. This happens to the combo man once or twice before he learns to shut down the AM facility on time.



Automatic aural alarm and transmitter turn-off.

44. End-of-record Cue Alert For Tape Carts.

R.A. Shellady, P.D., KXIC, Iowa City, Iowa

Problem: To reduce or eliminate record wear. When we, like so many other stations, decided to dub our records to tape cartridge, we encountered a handling problem in our control room. Since carts appear to be exactly the same at the end of the tune as at the beginning of it, our announcers were having difficulty keeping tight cues—with discs, this is no problem since you simply view the record. Coupled with trick endings and a busy log, the changeover almost created as many problems as it solved.

Solution: We connected a two-wire lead to the normally-open points of the cart relay activated by the secondary (150 Hz) tone. We located the power supply wire energizing the console VU lamps. One side of this circuit was interrupted, and a resistor was inserted in series. The wire pair from the playback machine was connected in parallel with the resistor. The lamps then were replaced with those having a slightly lower voltage rating. When the relay in the play-back cart is activated, the resistor is shorted out, causing an increase in light intensity in the VU meter enclosure.

With this lashup we simply add some 150 Hz pulses to the control track of the cart as the music is dubbed. Now, at the conclusion of a tape, the operator is alerted to be ready with the next element in our programming. This modification is quick, cheap and unfailingly effective.

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

rat Idea Contest
/E
Madison Avenue
e York, N.Y. 10016

e's my ranking on a 0 to 10 scale of the June Great Ideas.

7 CCTV isolates intermittents in studio [ ]
8 Pneumatic stand-by power switching scheme [ ]
9 Eliminate VTR audio rewind chatter [ ]
0 DPDT switch eliminates need for differential mike [ ]
1 Semi-automatic ID switcher frees personnel [ ]
2 Easy way to define tape source in carousel cart [ ]
3 Automatic AM turnoff/alarm for combo jocks [ ]
4 End-of-record cue alert for tape carts

me _____ *Title* _____

tion or Company _____

ter Your Own Great Idea Now. You May Win a Windjammer Cruise. See ntest Rules.

Coming next month—

Remember Burt Fisher's Great Idea for a telephone answering device? Next month he describes how by using a telco interface Recorder Coupler, it can be made compatible with the telephone company tariffs.

Also in the July issue— Special emphasis on automating technical operations in AM, FM and TV.

NEWS

gion); both were formerly with Berke Colortran.

John I. Skarbek is project engineer microwave amplifiers, for Acrodyn Industries . . . **Bob Williams** becam engineering manager for Cablevisio Construction Corporation, Houstor cable management and design com pany . . . **Edwin L. Cole** won ap pointment as general manager o WHCT-TV, Hartford, Conn.

New chief engineer of WEAT-FM and AM, West Palm Beach, is **John W. Herb** . . . **Robert P. Ambrisc** was appointed vice president of th consumer electronics group of th Magnavox Company . . . **Pete Moller** was named national sales man ager of KIOI, San Francisco.

Donald J. Schiller became genera manager of Mohave Cable Company operating in Mohave County, Arizon . . . **Kenneth M. Mason,** recentl made manager of Eastman Kodak' motion picture and audio visual market ing division, was elected an assistan vice president of the company.

Robert G. Holman joined Danie and Associates as vice president i

continued on page 4

If you're still waiting for discrete, you may never catch up with the competition.

The way we figure it, an FM stereo station could suffer a 10 to 15% loss of coverage area if it were to utilize any of the proposed discrete 4-channel broadcasting systems.

This is because any of the systems proposed to date requires an increased band width *beyond* the one now occupied by your normal stereo channel.

As you spread the RF energy from your carrier over a wider base band, you proportionately *reduce* your effective range. Along with the size of your audience and your total rating position.

That's one big disadvantage. There are two others.

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

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

We find it difficult to believe this is what you're waiting for.

Especially when the alternative is economical 4-channel, available *today*. The Sansui QSE-5B 4-channel encoder, for use in any MPX-capable FM operation.

The QSE-5B encodes discrete 4-channel tapes, demodulated Quadradiscs (CD-4) or any of your own live 4-channel material—even your own 4-channel commercial spots—into two channels that you can put on FM MPX waves.

Better yet, it does this while retaining all current standards of hi-fi FM stereo: signal level, S/N, dynamic range, frequency response—handled and controlled just like conventional 2-channel material.

It sounds like an expensive proposition, doesn't it?

It isn't.

Indeed, an investment of about US$900 buys and installs the QSE-5B. And lets you reach the growing millions of people who already own QS-capable 4-channel equipment.

You retain your present service area and still broadcast stunning 4-channel realism. You are perfectly compatible with mono and stereo receivers. And listeners with QS vario-matrix equipment will be able to enjoy the same quality of 4-channel reproduction that discrete 4-channel tapes offer.

Meanwhile, the competition that's waiting for discrete will never catch up with you.

Sansui

For the full 4-channel FM story in QS, contact Sansui today.

QS 4-Channel Stereo. QS Are you listening?

*QS is a trade mark of SANSUI ELECTRIC CO., LTD.

SANSUI ELECTRIC CO., LTD. 14-1, 2-Chome, Izumi, Suginami-ku, Tokyo 168, Japan/Telephone: 323-1111 **SANSUI ELECTRONICS CORPORATION** NEWYORK: 55-11 Queens Blvd., Woodside, New York 11377, U.S.A./Telephone: 212-779-5300 LOS ANGELES: 333 W.Alondra Blvd., Gardena, Calif. 90247/Telephone: 213-532-7670 **SANSUI AUDIO EUROPE S.A.** ANTWERP: Diacem Building, Vestingstraat 53-55, 2000 Antwerp, Belgium/Telephone: 3-315663~5 LONDON: 39-41 Maple Street, London, W1P, 5FU, England/Telephone: 580-5353 FRANKFURT: Reuterweg 93, 6 Frankfurt Main, West Germany/Telephone: 590-700

Circle 130 on Reader Service Card

NEWS

brokerage and consulting; he was formerly a regional sales manager for Scientific-Atlanta . . . **Vince Walsh** was named manager of market development for RayCom, telecommunications division of Raychem . . . **Robert J. Horak** became West Coast marketing manager for Ailtech.

Jose M. Kohn, who was southern European manager of International Video Corp. was killed in an auto crash near Paris on March 27th.

Ivan H. Bigelow joined Theta-Com as assistant Western regional sales manager . . ., **Roland C. Leutze** was named sales support supervisor for CATV of GTE Sylvania . . . **Graham S. Stubbs** is the new director of engineering for Jerrold Electronics Corporation, responsible for all engineering programs for cable subscriber terminals, top-of-set converters, and head-end equipment.

Robert M. St. Pierre is vice president and general manager of Sciences and Systems Group, Tracor, Inc. . . . **John P. Weeks** is manager of Anixter-Pruzan's Atlanta district offic . . . **John M. McLane** became easter regional dealer/distributor sales man ager for TeleMation, Inc., based i Beltsville, Md.

Alan B. Bennett became genera manager of Kaiser Broadcasting' WKBF-TV, Cleveland . . . **Frank J Delghan** was named president o Strand Century, Inc. . . . **Gustave M Hauser,** president of Warner Cable Corporation, was renominated for a second term as director at large of th Overseas Private Investment Corpora tion, government group charged wit encouraging American foreig investment.

Hiroshi Tada won promotion fro vice president/general manager to ex ecutive vice president of Sansui Elec tronics Corporation, heading an ex panded executive staff in the U.S. . . **G. Flynn** retired as director of en gineering of WOW, WOW-TV an KEZO, Omaha, after more than 3 years with WOW and an active caree as government advisor, amateur radi operator, broadcast executive.

Gilbert P. Wyland became genera manager, engineering and operation technology, for CBS television station . . . **Lawrence LeKashman** joine Lafayette Radio Electronics as execu tive vice president; he was formerl president of Olson Electronics, and o Electro-Voice, Inc. . . . **Ed Reingold** manager of WNET-Channel 13's fil department, was named chairman o the SMPTE working group on Super film for television.

Don B. Curran became president o Kaiser Broadcasting Corporation Ma 1st, after an eleven-year career as mar ager of ABC radio and television st tions in several cities . . . **Stephe Gordoni** became chief engineer Broadcast Communications, Inc operator of stations WEAW and WO in Chicago.

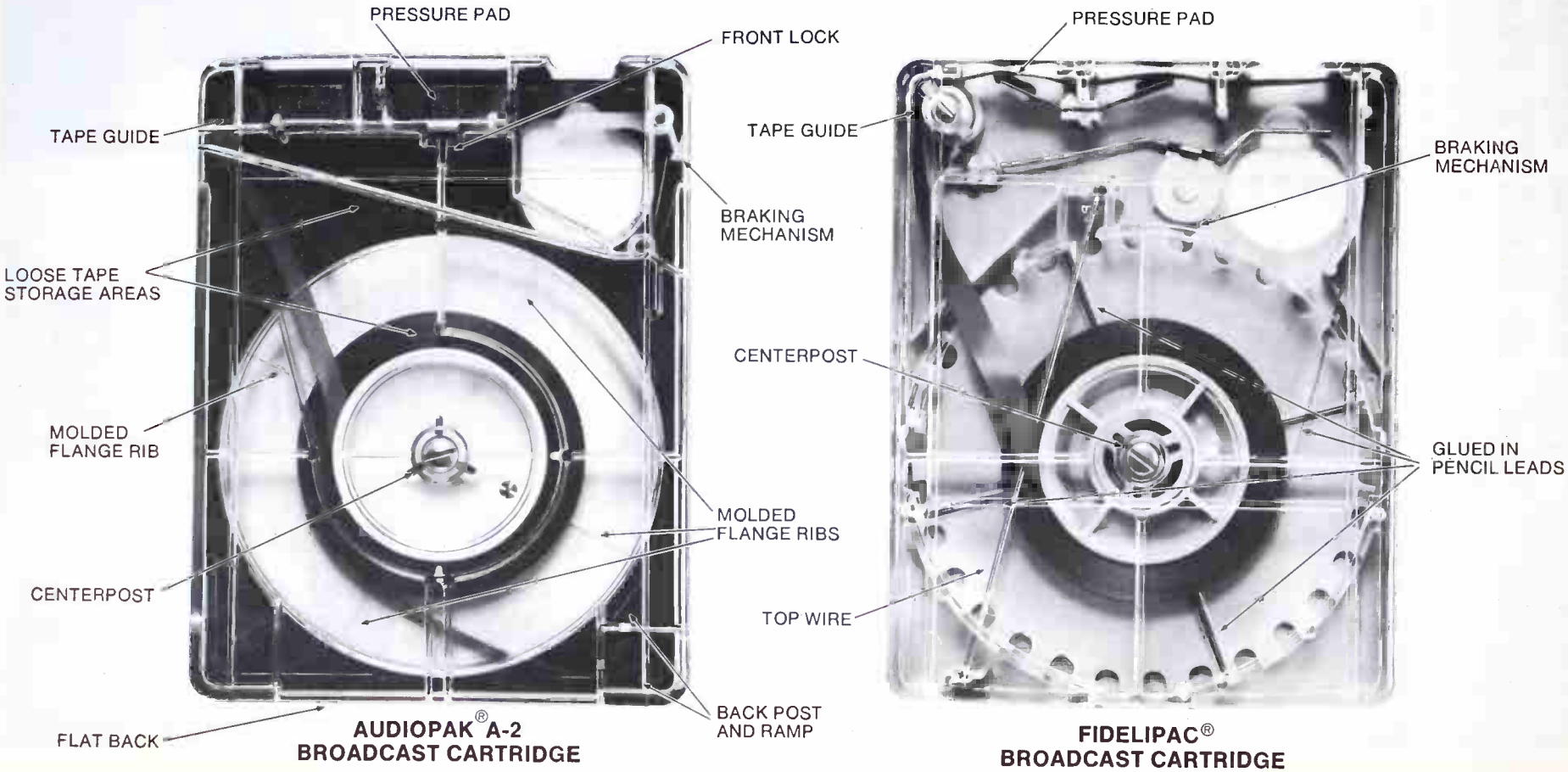
Eight new members on the Telev sion Board of Directors of the NA elected during the March convention Houston, are: **Walter E. Bartlet Charles A. Batson; Kathryn Br man; A. James Ebel; Ray Johnso Daniel T. Pecaro; Robert M. Be nett; and Eugene B. Dodson.**

John A. Montgomery, vice pre dent for programming of the PBS, w an Award for Distinguished Servi for his work with the Central Educ tional Network, midwest ETV associ tion . . . **James L. Wheelan** w named chief technician of Madis County Cablevision, Alton, Ill.

continued on page

Now we'll help you be the judge.

There are at least 10 reasons why the Audiopak A-2 is beating out the competition. Here is Reason No.1. How many times have you had broken or missing pencil leads in a cartridge flange? Can't happen on the Audiopak. There aren't any! We mold the tape support ribs as an integral part of the flange. There are 9 other reasons: write for our literature and free cartridge.



AUDIOPAK® A-2 BROADCAST CARTRIDGE

FIDELIPAC® BROADCAST CARTRIDGE

AUDIO DEVICES, INC., A CAPITOL INDUSTRIES CO., 100 RESEARCH DRIVE, GLENBROOK, CONN. 06906 • MANUFACTURERS OF AUDIOTAPE,® AUDIOFILM® AND AUDIODISCS.®

Circle 132 on Reader Service Card

NEWS

Vidiscs Spotlighted at SMPTE Meet

by Oliver Berliner Contributing Editor

The Los Angeles convention of the Society of Motion Picture & Television Engineers was brought to a dramatic conclusion (April 26) with a technical conference on the subject of mass-produced video discs which brought out a full house of some 500 avid spectators at the Century Plaza Hotel. Unique was the first-time discussion of virtually all of the vidisc systems under development, although the two "mechanical" systems, those of RCA and Telefunken-Decca (British Decca Records, not connected with the U.S.A. label of the same name) were not discussed by representatives of their respective manufacturers. They apparently chose not to present papers, due to silencing imposed upon them by their legal departments. Philips (Holland) discussed its process without a demonstration, apparently due to its inability to work 60Hz.

The Philips disc will presumably rotate at 1500 rpm in Europe and 1800 rpm (for 1800 TV frames) in the U.S.A. The MCA (Universal Pictures) "Disco-Vision" machine also operates at this speed, as do those of I/O Metrics Co. and Zenith Radio Corp. MCA uses a laser beam as the light source which modulates an FM carrier. The recorded portion is on the bottom of the disc while the light source is above and the beam passes through the disc. Philips uses a low-wattage colored lamp (no laser), and all of its scanning apparatus is below the disc. MCA's disc is pliable while Philips' is rigid. Philips incorporates provision for compensation for the fact that the disc tends to "float" at high speed, as focus is critical in all optical systems. Philips records inside-out, feeling that this is more appropriate for use with any small-diameter discs carrying short programs. MCA expects to put up to 4 minutes, perhaps even an hour, of programming on one side of a disc. In the Philips system, double-face (2 record

sides) discs are possible.

Metrics, a small optical-data-rieval California firm, opted for an -the-shelf-parts principle. It uses a roscope lamp light-source. Their c is pliable 4-mil film base, but more ers give more programming (up to 4 ers is deemed practical) by merely nging the focal point. It is therefore sible to imbed various layers of lio and video in a disc and by chang- the light source's focus you can get cess to additional programming t-of-focus video cannot be re- ived). I/O metrics courageously monstrated its lab-bench player, ch produced noisy, jittery, distorted —but showed tremendous promise a worthwhile extremely low-cost tem.

ICA's Disco-Vision showed ked quality gains from the time this er first viewed it. The reds were at good; signal-to-noise improved, the previously noticed drop-outs ever present (caused by a missed -cycle of the FM carrier). Their -frame and slo-mo capabilities were rb, as was the system's ability to kly locate any desired TV frame h is coded in the vertical interval. Metrics proposes to put the *audio* in e vertical-interval, having tried horizontal-interval audio without sufficient success. Disco-Vision's audio is on a 4.5 MHz FM carrier along with video's 7 MHz carrier, where a ± 1 MHz deviation gives 1 volt of video output.

Zenith plays both sides of a translucent flexible disc with no turnover required, for changing laser focus permits playing the flip side. Tracks are less than 1 micron wide with 2.5 micron spacing, .3 micron pits depth (which gives a ¼ wavelength, for ½ wavelength light would cancel out all video.) Zenith uses the Thompson CSF moving disc system (the light source is stationary while the disc rotates on a turntable which is simultaneously traveling down a channel). Disc thickness is 6 mils.; 45-minute playtime. No demo was made by Zenith/Thompson-CSF.

RCA, who claims to have been working on a vidisc for nearly a dozen years, chose a mechanical stylus, like that in a standard gramophone record, and only 450 rpm with a rigid disc and more than 1 TV frame (4, no doubt) per revolution. RCA feels that the mechanical system eliminates costly and "troublesome" servomechanisms needed for tracking and for time base correction.

FCC RULES & REGS

continued from page 21

power to approve or reject cable system boundaries proposed by municipalities, (3) a 1% CATV system gross revenue fee payable to the state, and (4) a "Certificate of Confirmation" (10 year term/5 year renewal) that cable systems must secure prior to initiation of operations. While primarily "appellate" in nature, the state also prescirbes "advisory" functions to the CATV Commission including rate and economic consulting services.

New Jersey has a comprehensive statute supplemented by lengthy regulations. The statute created an Office of Cable Television (in the Department of Public Utility Commissioners) to "supervise and regulate" cable systems, and (1) issue a "Certificate of Approval" to qualified cable systems whose franchises were awarded pursuant to proceedings meeting state-designated minimum standards, (2) review rate changes and (3) hold hearings to resolve disputes between municipalities and franchisees (as well as between municipalities and losing franchise applicants). The statute further limits cable system "municipal fees" to 2% of gross revenues. Mandatory posting of a surety bond and carriage of liability insurance are also required. The regulations prescribe extensive application requirements (modeled after FCC standards). In sum, New Jersey's CATV statute is one of the most comprehensive; yet, the drafters of same made it clear that New Jersey's statute defers to FCC regulations in any current or future point of conflict. The implications of such statutory clauses shall be addressed below.

The final "appellate" state CATV statute is that adopted by *New York* in 1972. This statute decreed the creation of a five-member State Cable Commission whose duty is to "develop and maintain a statewide plan for development of cable television services" which wi achieve "maximum (cable television) penetration as rap idly as possible within the realm of economic capability." The statute echoes other state cable statutes by establish ing (1) standards for local franchise procedures, (2 minimum standards for provisions to be included in cabl television franchises, (3) minimum equipment, servic and safety standards, (4) mandatory state "Certificate o Approval" (5 year term), (5) Certificate revocation fo "willful violation" of any CATV statute provisions an (6) an annual state fee (limited to 1% of gross annua receipts).

Advisory Statutes

Although several other states include advisory man dates in their cable statutes, only Massachusetts ha enacted a purely advisory statute (1971). Specific proce dures and minimum standards are promulgated for loca franchising, including (1) a maximum, non-exlusive, 1 year term (with 10 year renewal), (2) a public hearin wirh prior notice, and (3) revocation for cause clause. Th state has no power to review franchise operations unles 10% of system subscribers petition the State CAT Commission for review. However, the Commission ha authority to mediate between cities and towns regardin conflicts in exercising jurisdiction to authorize or regulat CATV. An evaluation of the effectiveness of advisor statutes must be postponed until more states adopt them

Conclusion

The nature and extent of state CATV statutes has bee discussed herein. Next month's article will treat (1) th states that have not adopted CATV statutes and (2) som of the short-and long-term effects of the statutes discusse above. **BM/**

BROADCAST EQUIPMENT

sette deck with built-in Dolby has ss and crystal head, auto stop at de- d index numbers. Model GXC-75D o has an automatic distortion reduc- a circuit, pause control for editing, will play one way with automatic o, one cycle forward and reverse, or tinuously. $429.95. AKAI AMER- A. **300**

w lightweight camera pedestal/ dy combinations can be set in less than a minute, handle up 250 pounds. Model 730 has 24″ aked lift; Model 729 has 22″ air nter-balanced lift. Both have sepa-

al folding dolly with 10″ wheels for aoring or straight tracking. Model B, $1245; Model 729, $1990. LIS- E TELEVISION EQUIPMENT**301**

per-8 camera has 27x reflex view- screen, 11:1 zoom lens, f/1.8. eulieu Model 4008M3 has variable tter, speeds of 2 to 70 fps, automatic xosure with manual override, sync

nd capability, lens interchangeabil- $849. CINEMA BEAULIEU RVIC CORP). **302**

psed-time indicator cumulates the

time an rf signal between 5 and 900 MHz is below −3dBmV. The DOWN-TIMER is available with Indachron elapsed-time indicator, or with four-digit LED readout, and in 10, 20, 40, or 60-hour capacity. VITEK ELECTRONICS. **303**

Patterns for framing spotlights were designed by leading set designers, made from thin stainless steel. "Designer Patterns" can be used in any brand of lens unit, 4½ to 12-inch diameter, and can be cut to size with scissors. Patterns include such designs as Arabesques, by Boris Aronson. Windows by Jules Fisher, Clouds by Danny Franks. $6 each. BERKEY COLORTRAN. **304**

Sapphire blade module for tape cleaning machines has vacuum cleaning system, four-edged blade. The "Tape Saver" Model 101 is rated for 16,000 half-hour runs per blade, claims 85% or better efficiency in removing contaminants that cause drop outs, when used on Recortec or similar cleaner. Module with one four-edged blade, $650; replacement blade, $200. VIDEO TAPE CO. **305**

New lettering sets in Helvetica type style are for automatic TV titler. New Letertype sets are available in 36 pt., 60 pt., and 96 pt. sizes. REYNOLDS/LETERON. **306**

High-impact-resistant Plexiglas DR is used to make audio carts very resistant to breakage. Fidelipac carts of Plexiglas DR claim virtual freedom from breakage, chipping, with tolerance for strong solvents and high heat. FIDELIPAC. **307**

Digital power meter covers 1 to 18,000 MHz, with dynamic range +10 dBm to −40 dBm. Model 4020 provides direct 4-digit read-out of power from 50 and 75 ohm system, with resolution of 0.01 dB, accuracy ±.04 dB. $1725 and up. SYSTRON-DONNER. **308**

Wide-range FM/AM modulation meter covers FM carriers to 1200 MHz, AM carriers to 400 MHz. Model 2300B measures FM deviation to 500 KHz, AM depth to 95%. Distortion and channel separation performance are said to more than meet FCC requirements. $2650.00 MARCONI INSTRUMENTS. **309**

Remote status monitor for CATV uses digital serially-addressed interogation of on-cable equipment. The Sys-

tem Sentry sends query from a headend console to transponders that reply with a pulse indicating normal operation or a fault. Address of each transponder appears on X-Y LED grid for quick trouble location. Typical cost: less the $75 per mile. MAGNAVOX. **310**

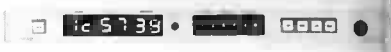
Rubidium frequency standard is newly packaged in cabinet 3.9 x 3.9 x 4.4 inches, weighing 2.2 pounds. Model FRK produced 10 MHz sine

continued on page 52

PRODUCTS

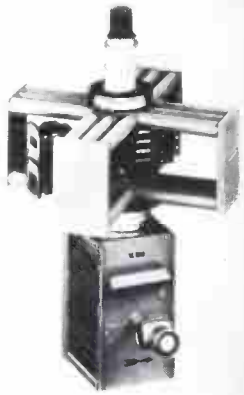
wave with long-term variation less tha $^{1}/_{10}{}^{-10}$ per month, short term variati less than $^{5}/_{10}{}^{-11}$ (1sec.). Trim range is X 10^{-5} (25 turn pot). EFRATO CALIFORNIA INC. 31

Low-cost SMPTE time coo generator and reader each takes 1¾" rack space. Model 5150 generator pu out PCM bi-phase mark code, displa



time on front panel. Model 5250 read accumulates and converts SMPTE co into parallel format for front-panel d play of hours, minutes, seconds, a frame number. DATATRON, INC. 3

TV klystron for 12 GHz is air coole has permanent magent focusing. Mod



YK1210 has more than 48 dB ga needs less than 20 milliwatts of dri power. Ion pump is built in. A PEREX. 3

Transient voltage protector operat at 350 vdc on a 100 v./sec. ramp, wit maximum of 2.0 kv for a kv/microsec. ramp. Model CG-350 rated for 250 operations at 1000 a peres. SIGNALITE. 3

Silicon diode produces 1.5 watts power over the band 4 - 6.4 GH Model 5082-0423 has AM noise −140 dB in 100 Hz bandwidth, 1 K from carrier; and FM noise less tha Hz (RMS) in 100 Hz bandwidth, 1 Hz from carrier. $95 ($75 in quantit HEWLETT-PACKARD.

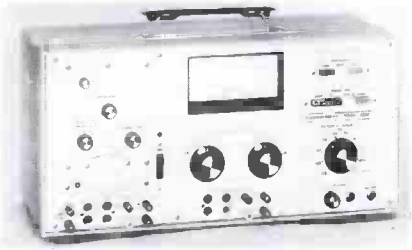
Oscilloscope probe has three mod demoulation, direct, and low capac Triprobe has insulation-piercing po shielded cable with PL-259, BN banana plugs or forked lugs. VAL ENTERPRISE, INC.

Cordless soldering iron has new f charging battery unit. "Quick Char Iso-Tip uses new nicad batteries,

PRODUCTS

charges in one or two hours with partial discharge. Iron recharges automatically when put on stand. WAHL CLIPPER CORP. **317**

Transmission test set measures gain or loss, line noise and distortion in audio systems. Model 12C has send oscillator covering 5 Hz to 55 KHz, receive section with precision step attenuators,



weighting networks; headset and record as well as meter out put. McGRAW-EDISON CO. **318**

Equalizer for individual microphone channels has three independent overlapping ranges, 50 to 500 Hz, 300 Hz to 3 KHz, and 1.5 KHz to 15 KHz, each

with continuously variable center frequency and bandwidth controls. Model 3000 has a voltage controlled in-out switch and LED indicator for automated systems. $325. MODULAR DEVICES. **319**

Input interface bridges 600-ohm balanced or unbalanced high-level program lines to the hi-z input and jack

common on EIAJ vtr's Model AI-12 has two 15k-ohm feeds or a single 60k-ohm feed for greater voltage stepup. $125 (dual feed); $75. ULTRA AUDIO PRODUCTS. **320**

Spectrum analyzer/frequency syn-

Continued on page 54

PRODUCTS

thesizer has analysis range of 0 to 11 MHz with dynamic range above 120 dB; synthesis range is 1 to 110 MHz with 100 dB dynamic range. Series 6000 has noise with respect to input of 30 nanovolts/Hz, allows examination

of random or coherent phenomena with dideband levels as low as 120 dB below carrier, and ± 100 Hz from carrier. As synthesizer, frequency stability is 2 x 10^{-8}/day, with search sweep adjustable ± 1 Hz to ± MHz, harmonic content 40 dB down. ADRET CORP.

Frame-grabber makes hard copies of live TV images. System consists of Model 400 or 600 "push-to-print" recorder plus a scan converter. Latter converts standard 525-line TV images into slow TV frames for transmission

over voice grade telephone lines o graphic printout on recorder. Recorde only: $795 to $2500. ALDEN ELEC TRONIC & IMPULSE RECORDING CO. 32

Distortion analyzer covers 5 Hz to 60 KHz. Model 510A covers distortio from 0.1% to 100%, with accuracy o 3% or 6%, depending on range. Fund amental rejection is 80 dB. 40:1 push pull frequency tuning allows quick set ting. $595. TUCKER ELECTRONIC CO. 32

Low-light-level CCTV cameras oper ate down to 0.01 foot-candels. Model LC-740 and LC-760 (latter with 2: internal sync.) use a new ⅔" Trico image tube that operates from full day light to night without auto iris, CdS. c electronic shutters and filters. They us any standard "C" mount lens LC-740, $795; LC-760, $895. JAVE LIN ELECTRONICS. 32

ODUCTS

d-state oscilloscope, dc-15 MHz, 5" CRT, 10 mV/cm sensitivity. ;lel 459, has sweep adjustable from sec/cm to 0.2 microsec/cm, with matic, normal or free-running :p. Input impedance is a constant 1 ohm, 35 pF (below 15 pF with op- al probe). $425. SIMPSON CTRIC CO. **325**

ti-function test/measurement becomes, with a multi-meter, a pass/band reject tracking filter, tunable notch filter, distortion analyzer, wave analyzer. Model 850 "Lab-All," with an oscilloscope, acts as a servo and network analyzer, phase angle voltmeter. The unit measures phase, frequency and amplitude of all signals having harmonic components, 30 Hz to 100 KHz, even when buried in noise. $2275. UFAD CORP. **326**

Ground tester shows whether grounding is proper on 2 and 3-wire outlets and equipment. Model 317 is plugged into outlet, has probe to check ground condition. BUTRICK MFG. CO. **327**

NEW LIT

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

Line of **snap-action rocker switches** with one, two and three positions, in more than 30 connection configurations, are covered in four-page bulletin. Littelfuse, Inc. **250**

Ampliphase method of modulating AM radio transmitters is fully described in new booklet. RCA. **251**

Short-form catalog lists all **time base correctors** and accessory gear together with extensive technical notes on application, performance. Television Microtime, Inc. **252**

Cable for fire-alarm signal systems, Thermosafe OSHA acceptable, is the subject of new bulletin TSF-2774A. Brand-Rex Co. **253**

RF power sources, including rf signal generators, power amplifiers, and associated items are fully described with technical application notes in 12-page bulletin. Ailtech. **254**

New quarterly, "Calculations," will cover calculator hardware and software, statistics, books in the field, problems, people concerned with calculators. Tektronix. **255**

Handbook of Standards and Procedures for Motion Picture Lab Services covers in exhaustive detail, preparation, techniques, terminology, other important aspects of dealing with movie film labs. Association of Cinema Laboratories. **256**

Brochure on **Model 5403 variable persistence storage oscilloscope** describes use in displaying hard-to-see signals, such as fast signals with slow rates, those buried in noise, etc. Hewlett—Packard. **257**

Line of **videotape editing equipment** is covered in brochure, including Model 5050 Vidicue, time-code generator and reader, 5900 conicidence comparator. Datatron, Inc. **258**

Catalog of **electron tubes** lists and gives full specifications for power, transmitting, receiving, microwave, camera, cathode-ray tubes. English Electric Valve Co. **259**

Complete line of **video and audio tape products** is shown in 16-page brochure. Memorex. **260**

Methods for using a **real-time spectrum analyzer** are described in detail in 32 page booklet. Honeywell, Inc. **261**

Technical description of **transmissio measuring** set is provided in new bull tin. Bowmar Instrument. **26**

New 20-page catalog covers complet line of **dc operational amplifiers,** wit block diagrams, applications data measurement techniques, general tech nical background. Modular Devices Inc. **26**

The 200-page **"RF Capacito Handbook"** provides comprehensiv theoretical and applications data on r circuit design, capacitor dielectrics test data at frequencies from 100 MH to 3 GHz, increasing rf gain and power many other technical topics. America Technical Ceramics. **26**

Eight-page short-form catalog lists lin of **voltage regulator diodes,** wit temperature derating factors, nois generation, other technical data Amperex. **26**

Panel meters, pyrometers, contro meter-relays, meter movements, ar covered in new 4-page short-for catalog. Beede Electrical Inst. **26**

Thin-film hybrid amplifiers fo CATV and discrete transistors are full described in eight-page brochure TRW Semiconductors. **26**

Product locator matches 86 models o **silicon rectifiers** to current and voltag ratings. International Rectifier Co. **26**

BM/E CLASSIFIED MARKETPLACE

CLASSIFIED ADVERTISING RATES

DISPLAY CLASSIFIED ADVERTISING: $32.50 per inch 1x; $30.00 per inch 6x; $27.50 per inch 12x. ALL OTHER CLASSIFIED ADVERTISING 35¢ per word; minimum $3.50. BLIND BOX NUMBER: $1.00 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

EMPLOYMENT OPPORTUNITIES

INTERNATIONAL SALES BROADCASTING EQUIPMENT

New York City Based

Career opportunity for an Area Sales Manager in the International Department of our Radio and TV Broadcast Equipment Division of Harris-Intertype Corporation. You'll be working out of our New York City export department with some overseas travel.

You must have have a strong technical knowledge of radio and TV transmitting equipment and fluency in Spanish, French, or Portuguese.

Excellent salary fully commensurate with responsibilities and company paid benefits.

Send your resume including salary history in confidence to:

GATES DIVISION *Tom Bedford, Employment Supervisor*

HARRIS-INTERTYPE CORPORATION

123 HAMPSHIRE STREET • QUINCY, ILLINOIS 62301 U.S.A.

An Equal Opportunity Employer M/F

GINEERING TECHNICIAN—Immediate opening qualified person to serve as departmental technicexpert in the operation and maintenance of all artmental audio-visual equipment. You'll need rability to service and repair logic and/or transistor ciuitry. And you'll need a sound knowledge of elecnics, broadcast TV cameras and VTR's, profesal audio tape recorders, oscilloscopes and reed equipment.

Vre a major insurance company, with an audiovial department that's second to none. We're ideal located in a progressive college community -way between Chicago and St. Louis. And our eployee benefit package is tops . . . including cost iving adjustments, group insurance and an outnding retirement plan.

rmore information, write Dave Toland, Personnel Dartment, State Farm Insurance Companies, Bomington, Illinois, 61701, or call (309) 6-2162.

An Equal Opportunity Employer

DIRECTOR OF MEDIA PRODUCTION

Ctral N.J. Community College is seeking individual erienced in automated audio and visual distributh systems with background in ITFS programming. Nst have Production and Management experience ivideo, graphics, photography, cinematography, alio and visual recording. Respond in confidence vh full particulars including salary requirements to Bx 674-1, c/o BME, Blue Ridge Summit, PA. 214.

ision Engineer—Michigan State University's Instruc- ol Television Services. Must have at least three years xperience in maintenance, operation and installation of rdcast level equipment. Color experience required. diigan State University is an Equal Opportunity Emp- oy. Personnel Ctr. Mich. State U., E. Lansing, Mich. 88.

EQUIPMENT FOR SALE

ADCAST AND RECORDING EQUIPMENT: Scul- Y.I.F. International, Metrotech, Langevin, Electro- Q.R.K., Micro-Trak, MRL, Nortronics, McMartin, E.I., E.V., A.K.G., Stevenson, Gately, D.B.X., Ad- , Altec, Fairchild, Audio Designs, 3M, Magnecord, Te- Inovonics, Nagra, Uher, Tape-Athon, Package Deals, allations, Service. Request Flyer. Weigand Audio, llieburg, PA. 17842. (717) 837-1444.

i-state audio modules-console kits, power amplifier power supplies. Octal plug-ins—mic, eq. line, disc, play, tape record, amplifiers. Audio & tape bias oscilars. Over 50 audio products. Send for free catalog and ications. Opamp Labs. Inc., 172 So. Alta Vista Blvd., Angeles, Calif. 90036. (213) 934-3566.

EQUIPMENT FOR SALE (Cont'd)

TELESTRATOR: Demonstrator like new-Model 400, complete with external keyer, automated push button control, twelve position symbol generator, spare glass and two pens. Complete price $13,600.00. Will send engineer to install unit.

AMPEX: Demonstrator VPR-5800C Color video tape recorder in like new condition. Price $3,600.00

AMPEX: New VR-7000, in sealed box. 1" VTR with two tracks of audio, audio and video meters, excellent buy Price $1,000.00

If interested call collect
CALHOUN COMPANY, INC.
Edward D. Matthews
phone: 404-659-0750

FOR SALE: 250 Watt RCA AM transmitter, type BTA-250M, excellent condition. Available May 15. Price $2,500. (314) 546-7473. Also FOR SALE: 4 Gates Cartridge II play back machines and 1 Gates Cartridge II recorder/play back machine, and approximately 250 cartridge tapes loaded at various lengths. Price $200 each for the play back machines and $250 for the recorder/play back machine, and $1.00 each for the cartridges. Phone (314) 546-7473.

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

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.

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.

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.

EQUIPMENT FOR SALE

SWEEP GENERATOR Telonic Model PD-8. 374-1000 MHz. Used in all G.E.-UHF transmitters to sweep. R.F. Klystrons. Sweep width 0.2%-15.0%. 4 watts Swept RF. Ideal for testing, aligning and adjusting such passive devices as RF networks, transmission lines, attenuators and RF filters. Particularly valuable for testing solid state frequency muitipliers. New. Was $2,500. $1,495.00

BIRD WATTMETER, Model 460. 2-1000 MHz. Power range 0-50,000 watts with proper standard element. Less element. $125.00

BIRD DIRECTIONAL WATTMETER Model 4930 for 6⅛" 75 OHM line. 50kW rating, 470-890 MHz. $400.00

G.E. CIRCUIT BREAKER, 3 pole, 225A, 600 VAC, 50 NO and 5 NC aux. switches, with enclosure, similar to G.E. type AK1-15. $780.00

G.E. CIRCUIT BREAKER, 3 pole 800A, 600 VAC, 6 NO and 6 NC aux. switches, with enclosure, similar to G.E. type AK2-505. New. $2,100.00

G.E. CIRCUIT BREAKER, 3 pole, 250A, 600 VAC, 5 NO and 5 NC aux. switches, with enclosure, similar to G.E. type AK2-25. New. $925.00

BALL BROTHERS B & W MONITOR 9-inch. Model TE9M New. $100.00

SONY B & W MONITOR 5-inch. Model 5-307BH, no cabinet. New. $50.00

CONRAC SNA 14/R MONOCHROME MONITOR. With tally light. Blue finish. New. Was $580.00. $315.00

CONRAC CYA 17Y COLOR MONITOR 17-inch. Cabinet model with mounting lugs. Blue-finish dress panel. New. Was $2,450.00. $850.00

CONRAC CYB 21/C COLOR MONITOR 21-inch. In metal cabinet. New. Was $2,450.00. $850.00

CONRAC B & W MONITOR 17-inch. CVA 17/C. In metal cabinet. New. $100.00

HOUSTON-FEARLESS PEDESTAL, Model PD-3, heavy duty, counter balanced. Max. capacity 300 lbs. Demonstrator. (GE No. PD5). $1,500.00

HOUSTON-FEARLESS CAM HEAD, Model HFCH inciuding set of cams, tripod riser head, control handle, standard mounting plate plus wedge mount adapter. Demonstrator. $650.00

HOUSTON-FEARLESS CAMERA PEDESTAL, Model PD10. Light duty. Total load capacity 225 lbs., maximum height 35". Weight 78 lbs. New. $175.00

TELEMET TEST SIGNAL GENERATOR Model 3508-C. Fully transistorized portable self-contained test instrument producing video signals expressly designed to measure transmission characteristics of monochrome and color television facilities. Demonstration unit. $1,500.00

RIKER VIDEO TEST GENERATOR Model 15015 $700.00

CENTRAL DYNAMICS DUAL SYNC COMPARATOR Model 2087. New. $450.00

OPTICAL MULTIPLEXER, prism-type. Projects monochrome images into a vidicon (PE27) camera from one 2" x 2" slide projector and two 16mm film projectors. New. (GE No. TV86C1). Was $2,080.00. $400.00

LAMBDA POWER SUPPLY, 280 volt. LA 15-08BM-1336, 1600 mA supply with built-in time delay. New. $300.00

MECHANICAL CONTROL HEAD for use with TS-301 audio/video distribution switching system. New. $200.00

HOUR METER 2½", G.E. Type 236, 240V, 60 hz. $17.00

A wide assortment of 2½" and 3½" G.E. and Weston panel meters available at below cost values. Call Ed Slayton for further information. Area Code 217/224-6200.

GATES DIVISION
HARRIS-INTERTYPE CORPORATION
123 HAMPSHIRE STREET • QUINCY, ILLINOIS 62301 U.S.A.

FOR SALE: McMartin B-803 Dual Channel Mono Console. Less than 2 years old. Good condition. Contact Tedd Tramaloni at WHRW-FM, S.U.N.Y. at Binghamton, Binghamton, N.Y. 13901. Phone: (607) 798-2137.

Two 3M professional audio record/playback tape recorders. Series 410, complete within console cabinets. Purchased new February 1973. Record heads like new. $2900 each, f.o.b. Fresno, Cal. Phone KKNU (209) 485-7272.

continued on next page

EQUIPMENT FOR SALE (Cont'd)

TASCAM, AMPEX, SCULLY: Major pro audio lines for broadcast and recording studios. Professional Audio Video Corp., 342 Main St., Paterson, N.J. 07505 Phone: (201) 523-3333.

CAPSTAN IDLERS for AMPEX 300, 350, 440. Series, self aligning with replaceable ball bearings, $22.50 net. VIF INTERNATIONAL, Box 1555, Mtn. View, Ca. 94040.

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

250 Watt FM transmitter with stereo generator in top condition tuned to 91.1 MHz. WKTZ, Arlington Exwy. Jacksonville, FLA. 32211.

MELLOTRONS-ARP SYNTHESIZERS. Lowest Prices. Write for price quote. Dan Keen, Dept. B, 219 19th Street, Avalon, N.J. 08202.

PROGRAM SERVICES

"Free" Catalog . . . Everything for the deejay! Comedy, books, aircheck, wild tracks, old radio shows, and more! Write: Command, Box 26348-A, San Francisco 94126.

Deejays! New Comedy! 11,000 classified one-line gags, $10. Catalog FREE! Edmund Orrin, 2786-M West Roberts, Fresno, CA. 93705.

JOKES! ONE-LINERS! TOPICAL HUMOR EXCLUSIVELY FOR JOCKS! FREE SAMPLE . . . "Funnies," Box 11-511, Newington, Conn.

INSTRUCTIONS

First phone through tape recorded lessons at home plus one week personal instruction in Washington, D.C., Atlanta, Boston, Detroit, New Orleans, Minneapolis, Seattle, Denver, Portland, Los Angeles. Proven results. Our 17th year teaching FCC license courses. Bob Johnson Broadcast License Training, 1060D Duncan, Manhattan Beach, Calif. 90266. 213-379-4461.

PROFESSIONAL CARDS

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

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

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

RALPH E. EVANS ASSOCIATES
Consulting TeleCommunications Engineers
AM-FM-TV-CATV-ITFS
3500 North Sherman Boulevard
MILWAUKEE, WISCONSIN 53216
Phone: (414) 442-4210
Member AFCCE

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

ADVERTISERS' INDEX

BM/E READER SERVICE CARD / June 1974 Issue

Use this FREE postpaid card for more information on the products described.

NAME ..... TITLE .....

STATION OR COMPANY .....

ADDRESS .....

CITY ..... STATE ..... ZIP .....

TELL US WHAT YOU LIKE OR DISLIKE ABOUT THIS ISSUE:

.....

.....

WHAT ARTICLES WOULD YOU LIKE TO SEE?

.....

.....

100-249: ADS / 250-299: LIT / 300-450: EDITORIAL

USE UNTIL SEPTEMBER 30, 1974

101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135
137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171
173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207
209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243
245 246 247 248 249
250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279
281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299
300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315
317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351
353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387
389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423
425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450

BM/E READER SERVICE CARD / June 1974 Issue

Use this FREE postpaid card for more information on the products described.

NAME ..... TITLE .....

STATION OR COMPANY .....

ADDRESS .....

CITY ..... STATE ..... ZIP .....

TELL US WHAT YOU LIKE OR DISLIKE ABOUT THIS ISSUE:

.....

.....

WHAT ARTICLES WOULD YOU LIKE TO SEE?

.....

.....

100-249: ADS / 250-299: LIT / 300-450: EDITORIAL

USE UNTIL SEPTEMBER 30, 1974

01 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135
37 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171
73 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207
09 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243
45 246 247 248 249
250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279
81 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299
300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315
17 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351
53 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387
89 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423
25 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450

COMPLIMENTARY SUBSCRIPTION QUALIFICATION CARD

1 I would like to receive BM/E ☐ Yes ☐ No

I would like my copies to include CM/E ☐ Yes ☐ No

2 My company is: (Please check ALL items which pertain to your firm.)

- ☐ AM Station(s)
- ☐ FM Station(s)
- ☐ TV Station(s)
- ☐ Instructional TV or CCTV
- ☐ Campus Limited Radio
- ☐ CATV Facilities
- ☐ Telephone Company
- ☐ Program Sources
- ☐ Recording Studios
- ☐ Government
- ☐ Consultant
- ☐ Lawyer
- ☐ Distributor/Manufacturer dealer
- ☐ Other (please specify) .....

.....

3 Are you responsible for more than one station or facility?

Yes ☐ No

4 My primary area of responsibility is: (Please check one)

- Corporate Management
- Engineering & Engineering Management
- Operations Management
- ☐ Station, Production or Program Management
- ☐ Other (please describe)

.....

5 Your signature .....

tle ..... Date .....

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

Station or Co. .....

Street .....

City ..... State ..... Zip .....

If this is an address change, affix label

Is this your business address? ☐ Yes ☐ No

If not, please give us your business address below so that we can avoid sending duplicate copies.

Name .....

Station or Co. .....

Street .....

City ..... State ..... Zip .....

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

FIRST CLASS
Permit No. 665
Duluth, Minnesota

STAGE WILL BE PAID BY

BME
BROADCAST MANAGEMENT ENGINEERING
CME
CABLE MANAGEMENT ENGINEERING

Broadband Information Services, Inc.

P.O. BOX 6058

Duluth, Minnesota 55806

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

FIRST CLASS
Permit No. 665
Duluth, Minnesota

STAGE WILL BE PAID BY

BME
BROADCAST MANAGEMENT ENGINEERING
CME
CABLE MANAGEMENT ENGINEERING

Broadband Information Services, Inc.

P.O. BOX 6058

Duluth, Minnesota 55806

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

FIRST CLASS
Permit No. 665
Duluth, Minnesota

STAGE WILL BE PAID BY

BME
BROADCAST MANAGEMENT ENGINEERING
CME
CABLE MANAGEMENT ENGINEERING

Broadband Information Services, Inc.

P.O. BOX 6056

Duluth, Minnesota 55806

Not just equipment, but live journalism.

We supply you with portable TV pik-up links, mobile van links and back pack camera links in all FCC allocated microwave frequency bands.

So you get fast site-to-studio trasmission that's just right for on-air production processing or vdeo tape storage.

And all our equipment is backed by 20 years of experience making components and subassemblies that are part of over 3,000 systems in 50 countries.

At Microwave, we're working to help you bring the world closer together.

Microwave Associates, Burlington, Mass. 01803. (617) 272-3000. Dunstable Woodside Estate, Dunstable, Beds., United Kingdom. Dunstable 601441

MICROWAVE ASSOCIATES

Circle 154 on Reader Service Card

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

FIRST CLASS
Permit No. 665
Duluth, Minnesota

STAGE WILL BE PAID BY

BME
BROADCAST MANAGEMENT ENGINEERING
CME
CABLE MANAGEMENT ENGINEERING

Broadband Information Services, Inc.

P.O. BOX 6058

Duluth, Minnesota 55806

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

FIRST CLASS
Permit No. 665
Duluth, Minnesota

STAGE WILL BE PAID BY

BME
BROADCAST MANAGEMENT ENGINEERING
CME
CABLE MANAGEMENT ENGINEERING

Broadband Information Services, Inc.

P.O. BOX 6058

Duluth, Minnesota 55806

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

FIRST CLASS
Permit No. 665
Duluth, Minnesota

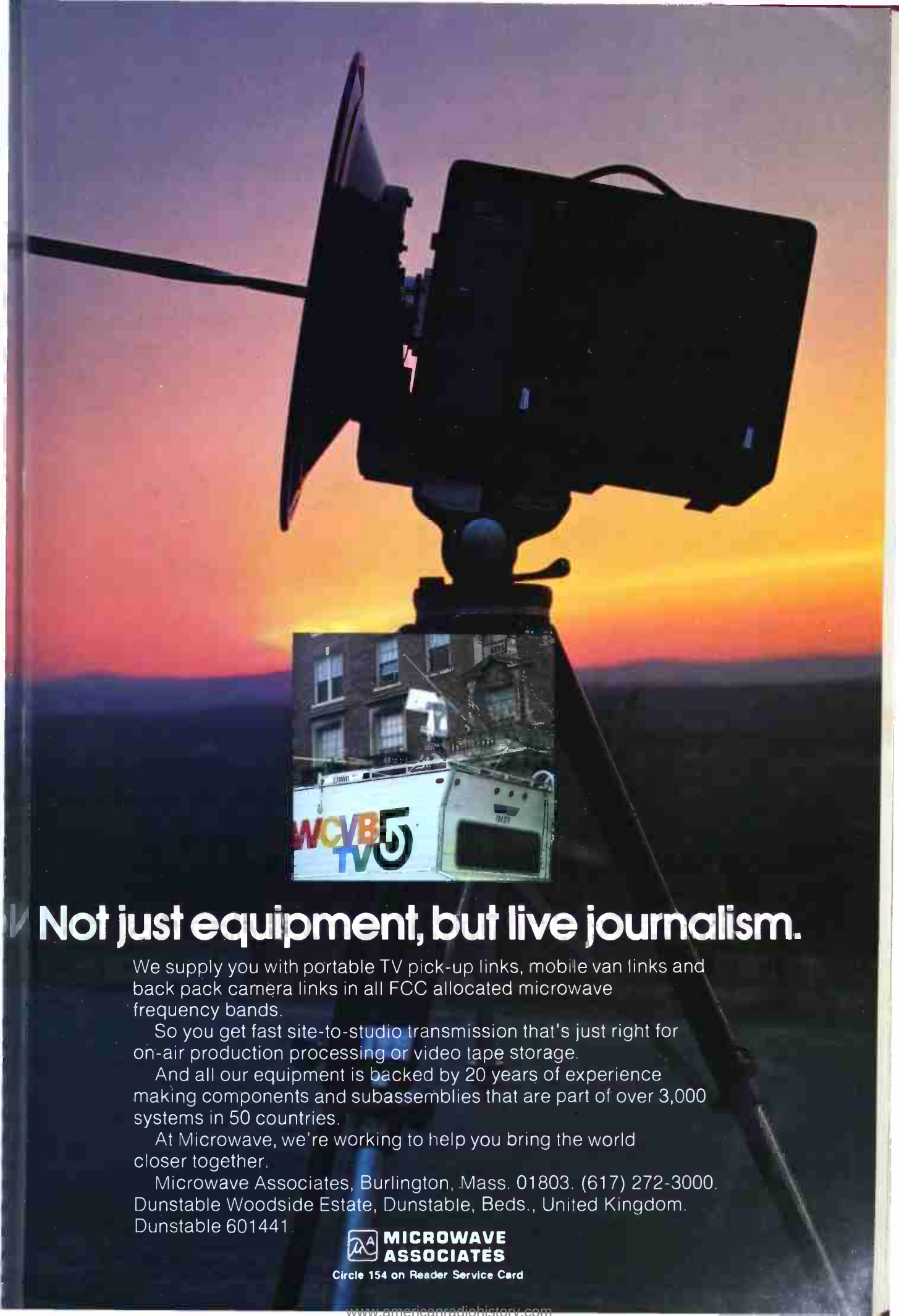
OSTAGE WILL BE PAID BY

BME
BROADCAST MANAGEMENT ENGINEERING
CME
CABLE MANAGEMENT ENGINEERING

Broadband Information Services, Inc.

P.O. BOX 6056

Duluth, Minnesota 55806



Not just equipment, but live journalism.

We supply you with portable TV pick-up links, mobile van links and back pack camera links in all FCC allocated microwave frequency bands.

So you get fast site-to-studio transmission that's just right for on-air production processing or video tape storage.

And all our equipment is backed by 20 years of experience making components and subassemblies that are part of over 3,000 systems in 50 countries.

At Microwave, we're working to help you bring the world closer together.

Microwave Associates, Burlington, Mass. 01803. (617) 272-3000. Dunstable Woodside Estate, Dunstable, Beds., United Kingdom. Dunstable 601441

MICROWAVE ASSOCIATES

Circle 154 on Reader Service Card

Is it live or is it Memorex?

(All unretouched photos.)

With Memorex Chroma 90* Video Tape even Jack Calaway couldn't tell.

Eyes don't lie. Or at least not very often. That's why we asked Jack Calaway, VP Engineering and Operations of Trans-American Video, to loan us his expert eyes for a test.

Here's the test.

First we put Jack in front of a professional broadcast TV monitor. Then we alternated between a live picture (the one at the left) and a Memorex Chroma 90 Video Tape picture.

After Jack had studied both for several minutes, we asked him which was live and which was Memorex.

His answer: "I really thought I could tell the difference . . . but I can't."

*Chroma 90 is our broadcast video tape. Of course, we also make the very highest quality of helical scan tapes, including video cassettes. No matter what kind of video equipment you've got, chances are we've got a tape that'll surprise you.

MEMOREX VIDEO TAPE.

Reproduction so true we can ask, "Is it live or is it Memorex?"

Circle 155 on Reader Service Card