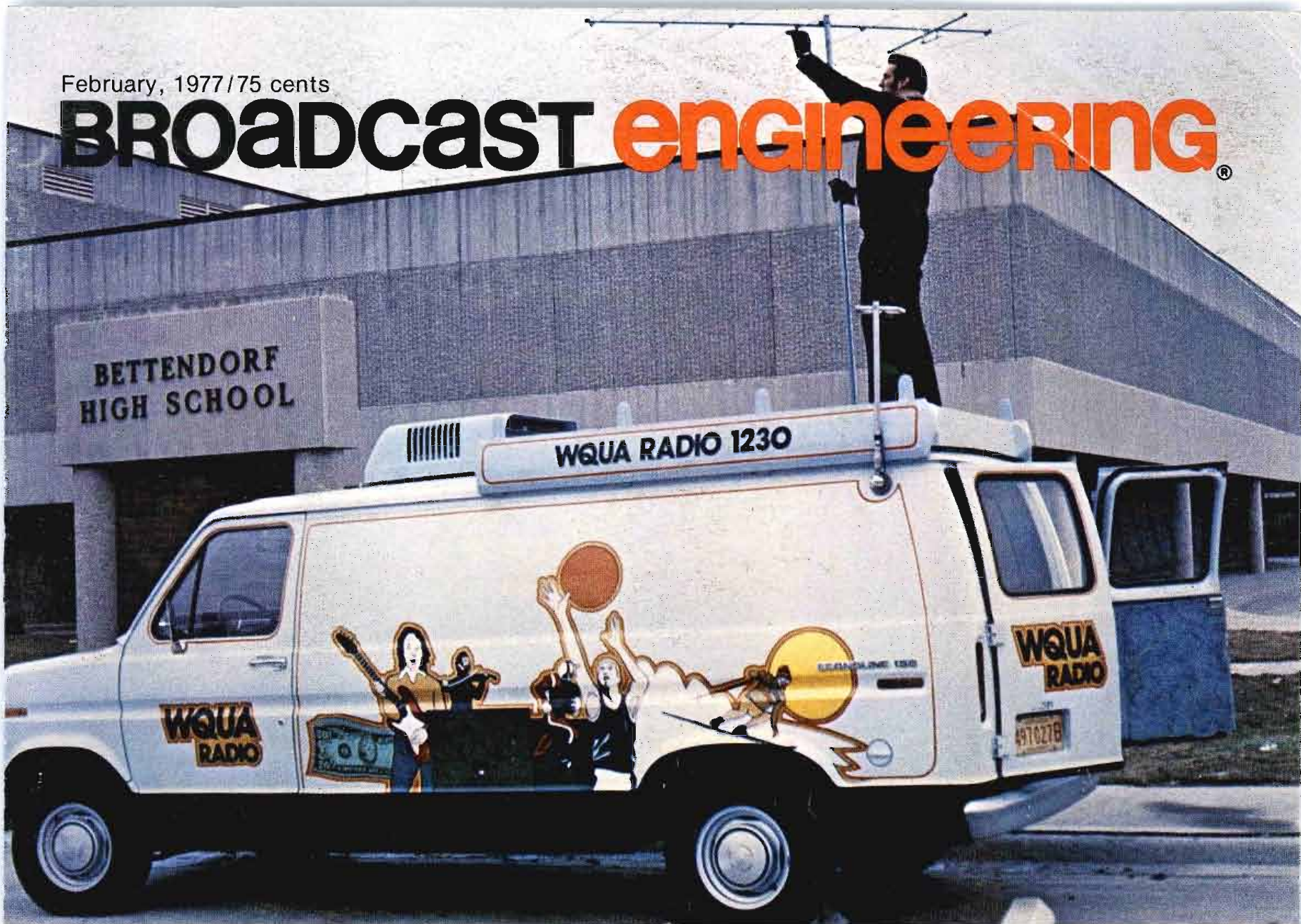


February, 1977/75 cents

BROADCAST **engineering**

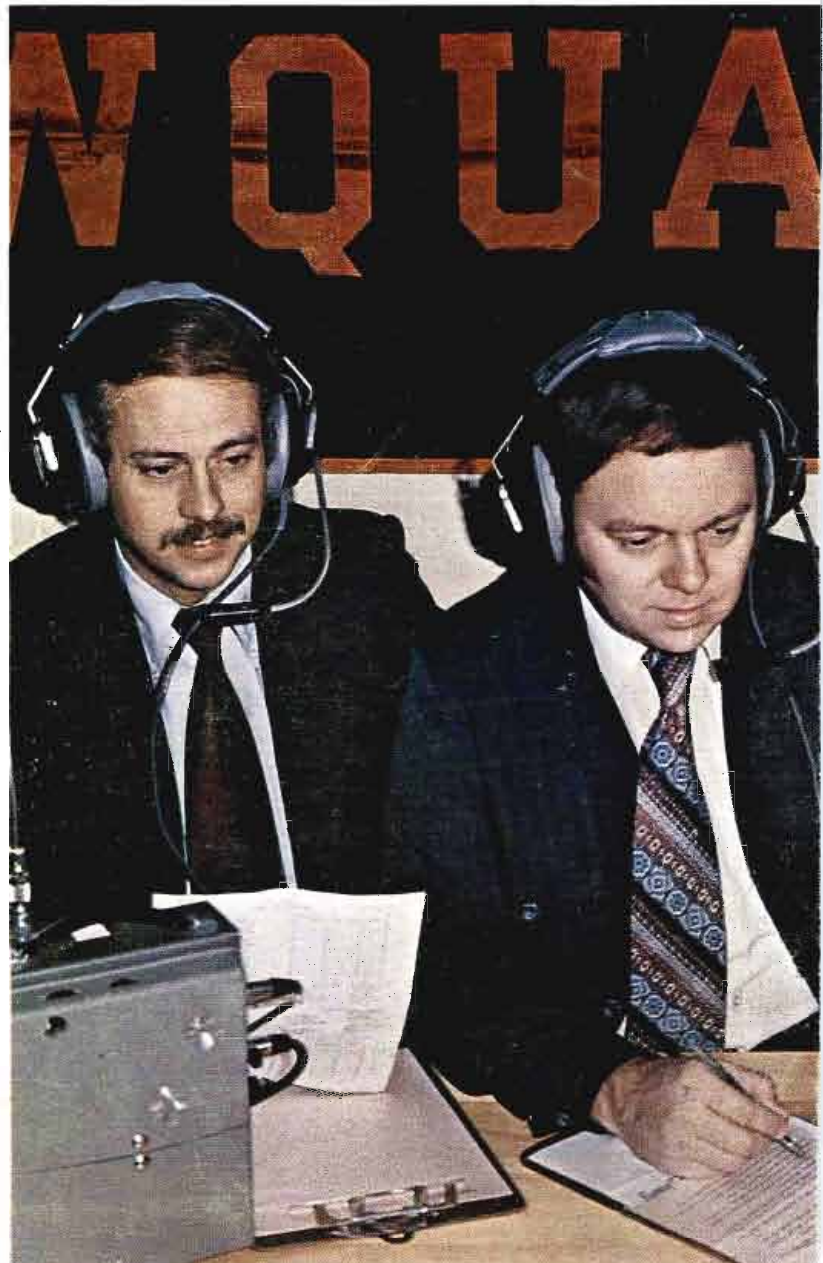


Putting **RENG** *On The Road*

Directional Antenna Basics

TV Cosmetic Techniques

Digital Troubleshooting



Now. The single most powerful FM transmitter in the Collins Generation 4 line: 25 kW.

And yes, two can be joined for 50 kW. First came Generation 4th 9 new FM transmitters from Collins.

Now comes number 10, the new 831G-2C with 25 kilowatts of clear, clean FM power.

All 10 are called Generation 4 because they're the product of four decades of Collins broadcast experience. And all are a full generation ahead of other transmitters on the market.

Collins was the first with Generation 4 and now it's the first major to offer a 25-kW FM transmitter.

At the heart of all Generation 4 Transmitters is Collins' new, field-proven Phase 4th Exciter. The exciter which was selected by the Swedish government for use in every FM station in Sweden. Selected after a year of evaluating the leading FM exciters in the world. Selected by Sweden's top broadcast engineers.

Because it is the world's finest FM exciter.

And the Phase 4 Exciter is only one part of a line of transmitters designed to meet the requirements of today's new generation of radio audiophiles.

So, whether you need a 10-W transmitter, a 50-kW transmitter, or something in between, Generation 4 is the answer.

Generation 4 Transmitters are available right now at very competitive prices. All have the superior Collins quality you have come to expect. And all are backed with the same unexcelled 24-hour parts and field service.

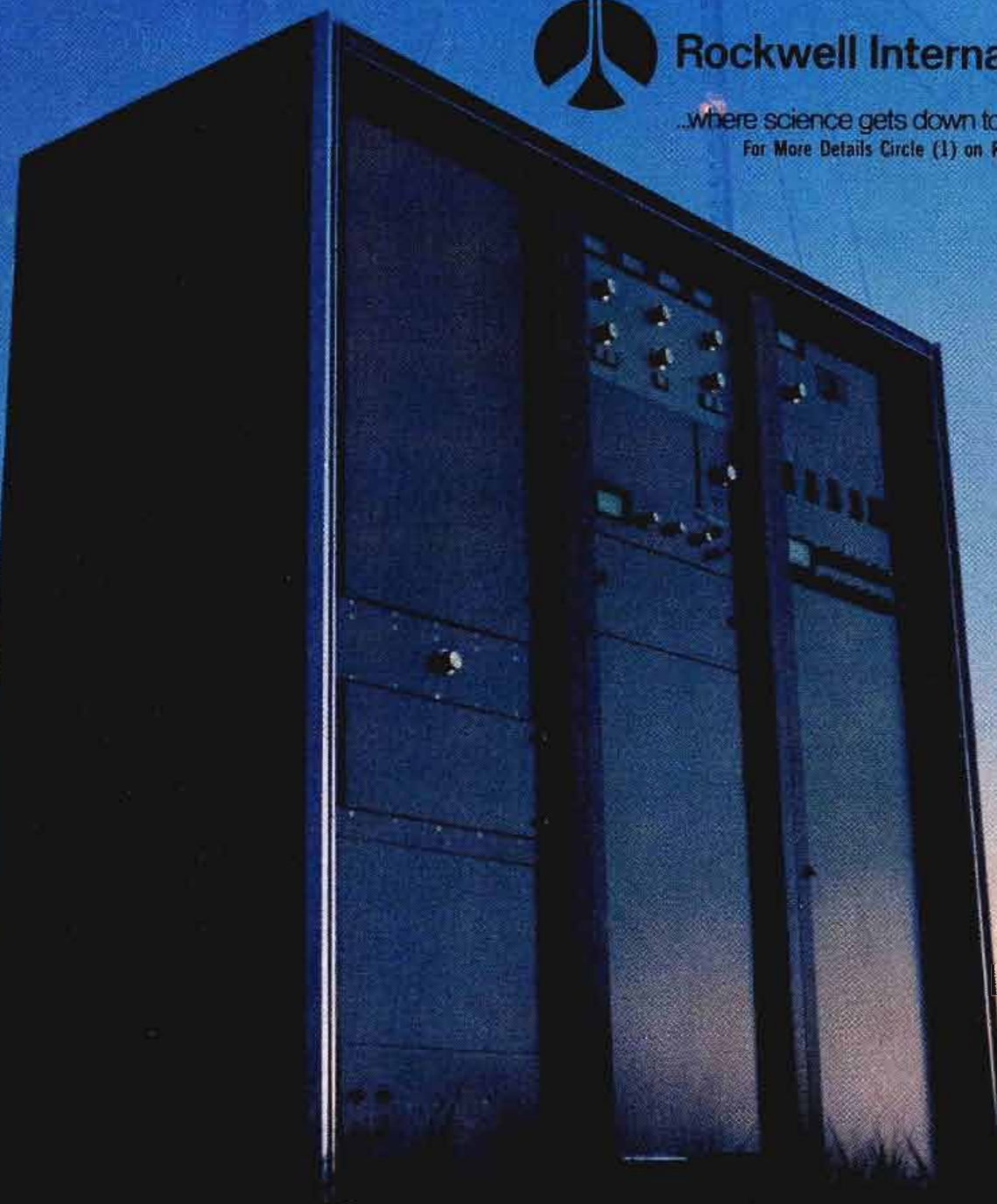
Contact your local Collins Broadcast salesman. Or Broadcast Marketing, Collins Commercial Telecommunications Division, Rockwell International, Dallas, Texas 75207. Phone: (214) 690-5574 or 5424.



Rockwell International

...where science gets down to business

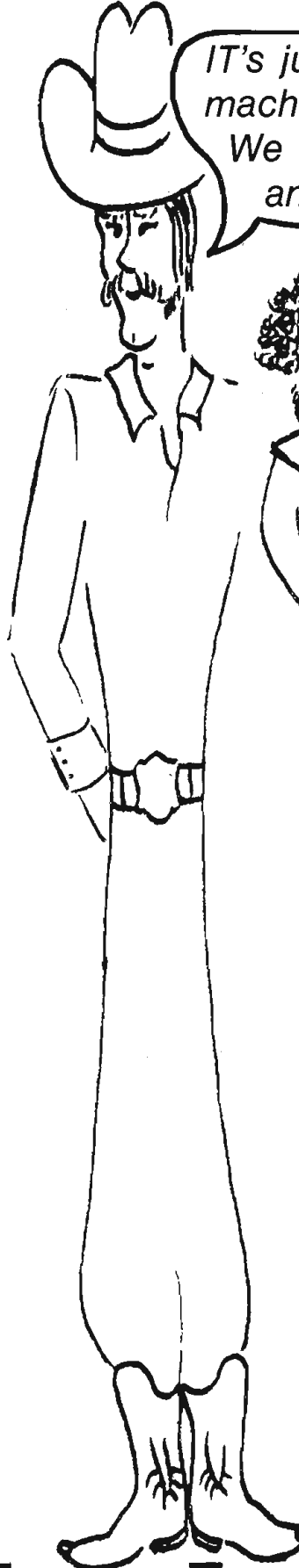
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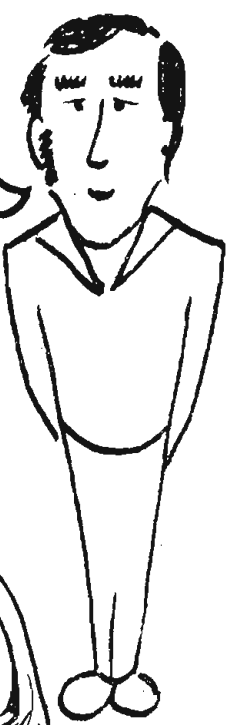


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IT's just a tremendous machine for tape editing. We haven't found anything better.



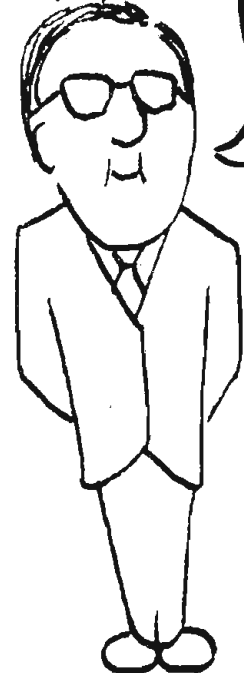
IT's faster than anything on the market. . . IT's flexible.




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IT has what other systems do not have . . . for example, the Intelligent Interface™.



The people who make IT understand our business.

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WASHINGTON, D.C.
MARCH 27-30**

- 24 Put Your Best Face Forward.** Step-by-step procedure for using TV cosmetics accentuate the positive and eliminate the negative features on on-camera talent. *Ron Whittaker.*
- 38 You've Got To Have Room For Creativity.** A noted lighting consultant tells how to plan for enough set lighting room to allow creative lighting. *E. Carlton Winckler.*
- 46 Directional Antenna Basics.** First part of a continuing series on the basics of design and operation of DA's. *Robert Jones.*
- 54 How To Go First Class With RENG.** Our Radio Workshop editor tells how to take advantage of RENG by using a van. *Peter Burk.*
- 58 Digital Lab: Troubleshooting.** Our newest monthly feature gets down to the business of digital troubleshooting basics. *Harold Ennes.*

About The Cover

Our cover this month shows the WQUA remote van at the site of a basketball remote. For details, see the RENG article listed above. (Photo by Peter Burk)

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Robert A. Jones, *Facilities*
Walter Jung, *Solid State*
Peggy Brown, *Editorial Assistant*
Dudley Rose, *Graphic Designer*
Joe Roizen, *Video*
Peter Burk, *Radio Workshop*
Dennis Ciapura, *Audio Editor*

CIRCULATION

Greg Garrison, *Director*
Evelyn Rogers, *Manager*

ADVERTISING SALES

Gloria Parmenter, *Production*
P.O. Box 12901,
Overland Park, KS 66212
(913) 888-4664

Regional advertising sales offices

Indianapolis, Indiana—Roy Henry, 2469 E. 98th St., Indianapolis, Ind. 46280, (317) 846-7026

New York, New York—Stan Osborn, 60 E. 42nd St., Room 1227, New York, N.Y. 10017, (212) 687-7240

Mountain View, California—Dennis Triola, 2680 Bayshore Frontage Rd., Room 102, Mountain View, Ca. 94043, (415) 961-0378

London W.C. 2, England—John Ashcraft & Co., 12 Bear St., Leicester Square, Tele.: 930-0525

Badhoevedorp, Holland—John Ashcraft & Co., John J. Lucassen, Mgr., Sloteweg 303

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Editorial, advertising and circulation correspondence should be addressed to: 9221 Quivira Road, P.O. Box 12901, Overland Park, Kansas 66212, (a suburb of Kansas City, Missouri). (913) 888-4664.

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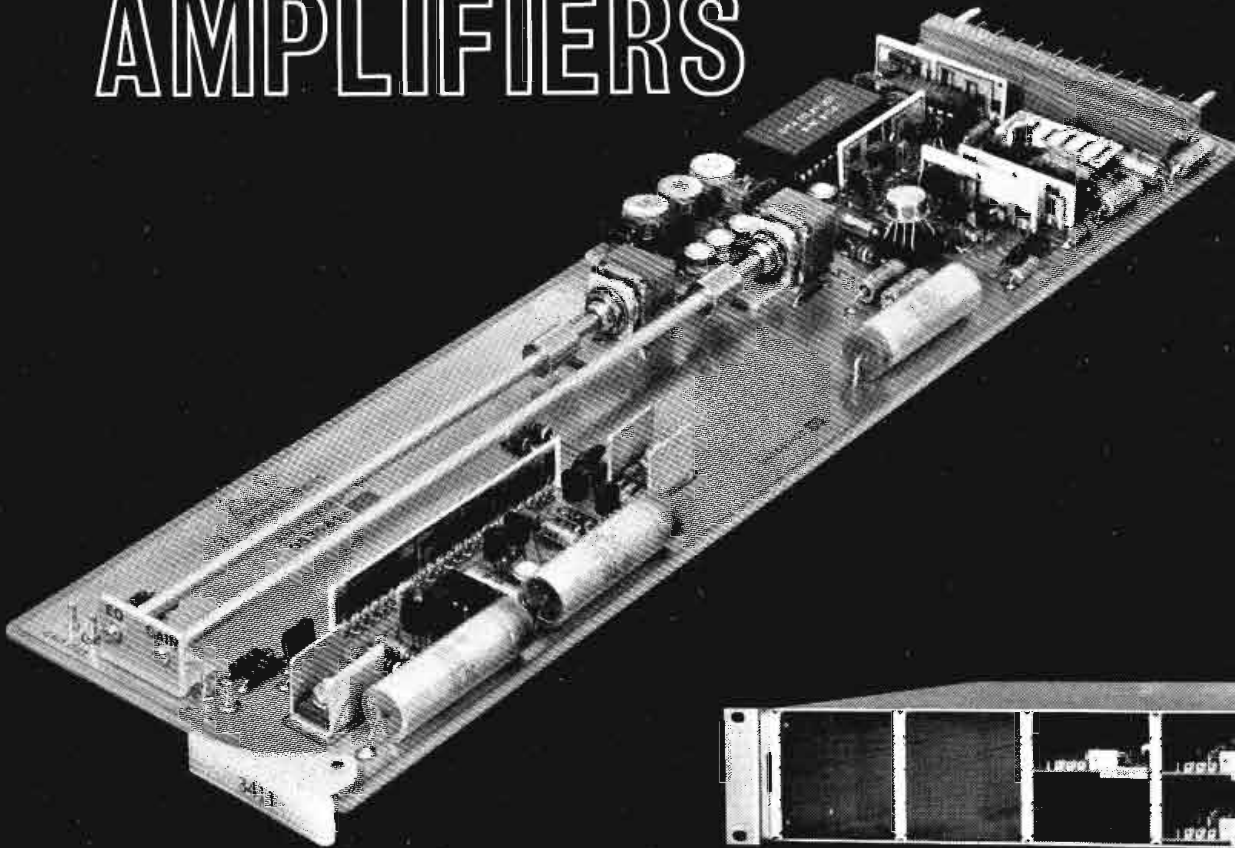


George H. Seferovich, *President*
Mike Kreiter, *Publisher*

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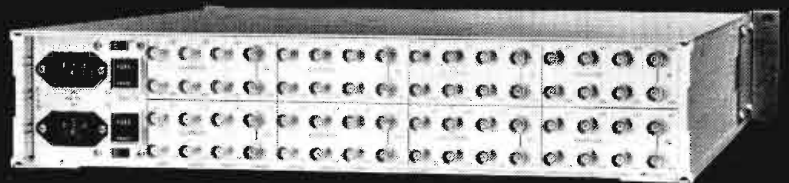
GRASS VALLEY GROUP 
**3400 SERIES
 AMPLIFIERS**



MODEL 3411
 LINEAR
 PULSE
 DISTRIBUTION
 AMPLIFIER



FRONT VIEW (LESS COVER)



REAR VIEW

Model 3411 Linear Pulse Distribution Amplifier is yet another new product in GVG's ever-expanding 3400 Series product line. Basic features of the 3411 include differential input (either terminating or loop-thru), six 75Ω source terminated outputs, controlled rise time — 140 ns for NTSC systems or 240 ns for PAL systems, and variable equalizer control.

The controlled rise time feature is achieved by means of a 7-pole Bessel filter. The variable equalization control allows the

amplifier to compensate for up to 500 feet of Belden 8281 or T3205 cable when an optional equalizer submodule is included. Power consumption is less than 3 watts per amplifier.

The two-rack unit mounting tray, illustrated above, accommodates eight 3400 Series amplifiers and a 3200A power supply, with provision for a second optional supply for emergency protection. A one-rack unit, four-amplifier mounting tray is also available.

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DIRECT CURRENT FROM D.C.



February, 1977/By Howard T. Head and Harold L. Kassens

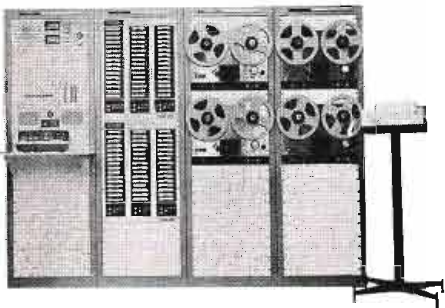
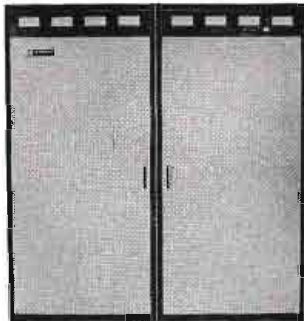
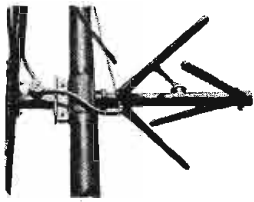
Automatic Transmission Systems Authorized

In a Report and Order, the Commission has adopted rules relating to automatic transmission systems for all FM and non-directional AM stations. Action on AM stations with DA's and TV stations is expected by summer. For the stations so authorized, the usual carrot and stick process applies. The carrots are: only one person with a Restricted Operator Permit need be on duty at the ATS monitoring and alarm point; logging of voltages and currents is no longer required; type acceptance or type approval of the equipment is not required. The sticks are: the transmitting apparatus must be activated manually at the beginning of each day; if the automatic control system fails to adjust the antenna input power below 105 percent after 3 minutes, the transmitter must shut off; if the modulation exceeds more than 10 bursts of 100 percent negative modulation within one minute, or any burst exceeding 125 percent positive, the program input must be adjusted automatically downward; if the station uses more than one power or is restricted in hours of operation, a time clock must automatically prevent the station from being signed on early, must perform all mode switching and must shut off the transmitter at the required time.

The "ATS Monitoring and Alarm Point" may be at the transmitter site, the main studio, an authorized remote control point, or at another authorized location. At this point, the licensee must have installed: a means of turning the transmitter on and off at all times; an off-air monitoring receiver, and an aural alarm signal. The aural alarm signal must activate if: the transmitter is off more than 3 minutes; the output power falls below 90 percent and is not automatically corrected in 3 minutes; there is a malfunction in tower lighting (unless the lights are visually observed). When the aural alarm is activated, it cannot be shut off (unless a visual alarm is also used) until the condition is corrected.

To obtain an authorization to use an automatic transmitter system, an informal request is submitted to the FCC in Washington. The request is to be signed by the licensee and must contain a statement certified by the chief operator, technical director or consulting engineer showing that the station has installed and fully

Continued on page 6



You may not know that Cetec is one of the major producers of radio broadcast equipment. Maybe you should.

Cetec Corporation's major divisions in the broadcast equipment business are now united to meet your expanding needs! The specialists that make up the Cetec Broadcast Group are:

Cetec Schafer. The World renowned leader in radio automation, with a tradition of quality and rugged dependability. Schafer manufactures a wide line of automation for every format and station size . . . all with features that you won't find anywhere else.

Cetec Sparta. The people with a new generation of transmitters including both AM *and* FM all-solid state models. Sparta is also the recognized value leader in audio consoles, with a size to fit every application and every budget.

Cetec Jampro. The antenna specialists with circular FM antennas for every power level . . . each with performance specifications second-to-none. Jampro is now the

company with a circular TV antenna for either VHF or UHF, too!

SERVICE:

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Cetec Broadcast Group

The Broadcast Divisions of Cetec Corporation

75 Castilian Drive Goleta, California 93017
Telephone: (805) 968-1561

DIRECT CURRENT FROM D. C.

Continued from page 4

tested all the necessary apparatus for ATS operation and that the station is in compliance with all the applicable FCC rules including the new ones for ATS operation.

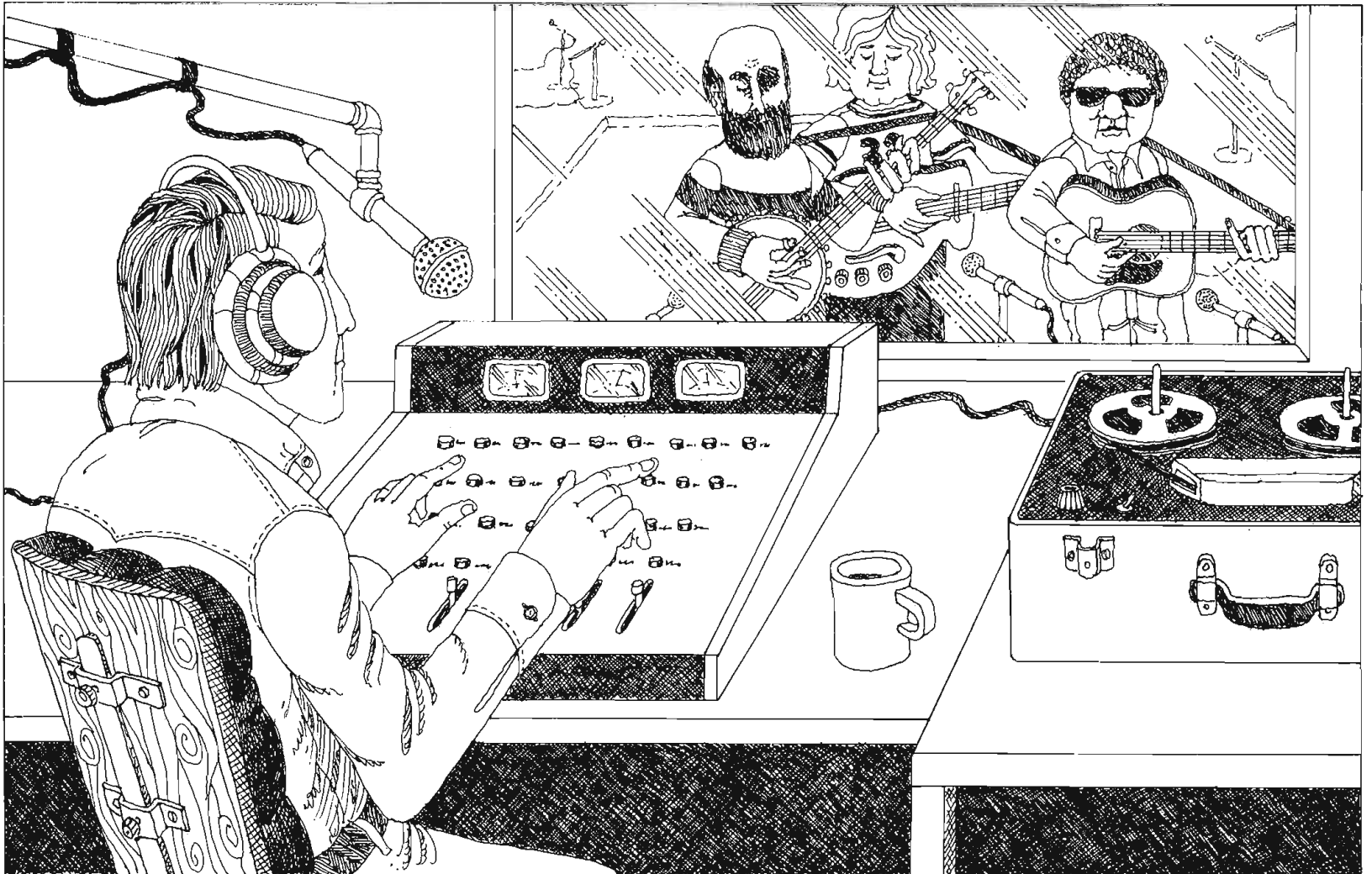
New Government Broadcast Stations

The Commission has granted a one-year experimental authorization for two stations licensed to the Colorado Department of Highways to operate on 1610 kHz. The transmitters have a power input of 106 Watts and are licensed for 10 Watts output. The antenna is described as a "vertical monopole". The purpose of the stations is "Messages for road information directed to motorists on Interstate 70". All equipment is being supplied by the Federal Highway Administration and the locations are at Idaho Springs and Silverthorne, Colorado.

Short Circuits

Two CB operators were arrested for using indecent language on the air...A petition has been filed with the FCC to permit unattended operation of FM translator stations; presently somebody has to monitor them on a receiver located somewhere...Also, a UHF-TV licensee has filed a petition asking for a rule change to require that when a VHF-TV station installs a tall tower, it be required to permit UHF stations to share the tower...The FCC has permanently waived the operator rules for the AM station in American Samoa to permit the use of any class of commercial station permit...A copy of the 16th Order of the Broadcast Reregulation Task Force we mentioned last month is available from the FCC in Washington merely by writing for one. This is the alphabetical index and will not appear in the rules for quite some time...The Commission waived the rules and permitted a station dual identification with another town even though it put 9.6 mV/m over the business district of the additional town. The rules require 25 mV/m, but this was waived because of the low noise level...Starting July 1, 1978, TV receiver manufacturers are required to have a comparable UHF antenna affixed to the receiver if the VHF antenna is affixed...The Commission is pleading with you not to send them any money. All fees have been cancelled and it's terribly difficult and costly for them to return money.

You're sick of stereo recorders built for the home hobby market.



ATR-700 is for the professional.

At last there's a truly *professional* audio recorder/reproducer for radio and TV broadcasters. ATR-700. A portable dual (or single-channel, if you wish) tape machine rugged enough for around-the-clock use in producing commercials, transcribing programs, remote and location recording and post-production work.

Only a recording professional needs (and can appreciate) a stereo recorder with built-in tape timer, motion sensing, synchronous reproduction, dump edit, switchable equalization, full remote control, direct-drive, servoed capstan motor, reel size selection and a 10½ inch reel capability.



You'll probably buy your ATR-700 because it packs all these professional features (and many more) into a compact, portable package that's only 21½" high by 17¾" wide by 9¾" deep. You can use it in the studio one day, out on remote the next, and at home in the

evening for catch-up editing work.

But after your ATR-700 is on the job, producing recordings with a record/reproduce audio range of 40 Hz to 18 kHz, ±2 dB (at 15 ips), you'll enjoy one other advantage. This recorder is *really* rugged. It'll give years of reliable service.

ATR-700 is the professional stereo recorder from Ampex, built for professional engineers who can't take chances.

AMPEX

Complete technical and performance specifications are available in a free brochure. Write us at 401 Broadway, Redwood City, California 94063, or call (415) 367-2011.

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A collect call to the above number will bring you all the facts you need to know about tape cartridge equipment. One call will establish a working relationship between you and our broadcast oriented people...a relationship that delivers dependable performance at a truly competitive price. The relationship will last as long as you use ITC equipment...in the selection of equipment, proper servicing, and adaptation of machines to your broadcast requirements. If you're thinking tape cartridge equipment, find out why hundreds of stations depend on ITC.

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Call collect for
details on ITC's
equipment and
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2425 South Main Street,
Bloomington, Illinois 61701

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INDUSTRY NEWS

NAB Annual Engineering Award Will Go To Daniel H. Smith

Daniel H. Smith, senior vice president for engineering, Capital Cities Communications, Inc., Philadelphia, Pennsylvania, will receive the National Association of Broadcasters' 1977 Engineering Achievement Award.

The award will be presented at the NAB Engineering Conference luncheon on Tuesday, March 29 at the Shoreham Americana hotel in Washington, D.C. The Conference will be held in conjunction with NAB's 55th annual convention.

From the late 1930's until 1942, Smith tested and furnished technical instructions for the installation and maintenance of radio, radio direction finders, underwater sound and electric visual signalling equipment for U.S. Navy ships and shore stations. He also designed and developed antenna systems, radio direction finder corrector installations and filters for power circuits to eliminate interference. In addition, he assisted in the selection of sites for radio and radio direction finder stations and supervised the installation of antenna systems and auxiliary equipment.

From 1942 to 1944, as senior supervisor of the radar laboratory at the Norfolk, Virginia Navy Yard, he was responsible for the optimum performance of radar operations.

In 1944 he joined Western Electric Company where he gained extensive knowledge of the fundamental principles and problems of radar guided missiles. The following year he became involved in the sales engineering of the company's broadcast, marine, aviation and sound equipment.

Four years later, Smith was named technical director of the Maine Broadcasting System in Portland where he designed a complete

new broadcast facility for WCSH-TV. He also had responsibility for the technical performance of radio stations WCSH, Portland; WRDO, Augusta; and WLBZ, Bangor.

In 1954, as technical director, he designed, planned and constructed WTVT, Tampa, Florida, and then became assistant manager of the station. He also accomplished the same functions for WEDU in Tampa from 1957 to 1959.

In 1959, Smith joined Capital Cities Television Corp. as vice president and director of engineering and was later appointed to his present position.

In addition to other industry posts, he was chairman of NAB's Engineering Advisory Committee, the Engineering Handbook Committee and the Engineering Conference Committee.

Educational Program Logs Are Changed

The Commission has amended its rules concerning program logs for non-commercial educational broadcast stations.

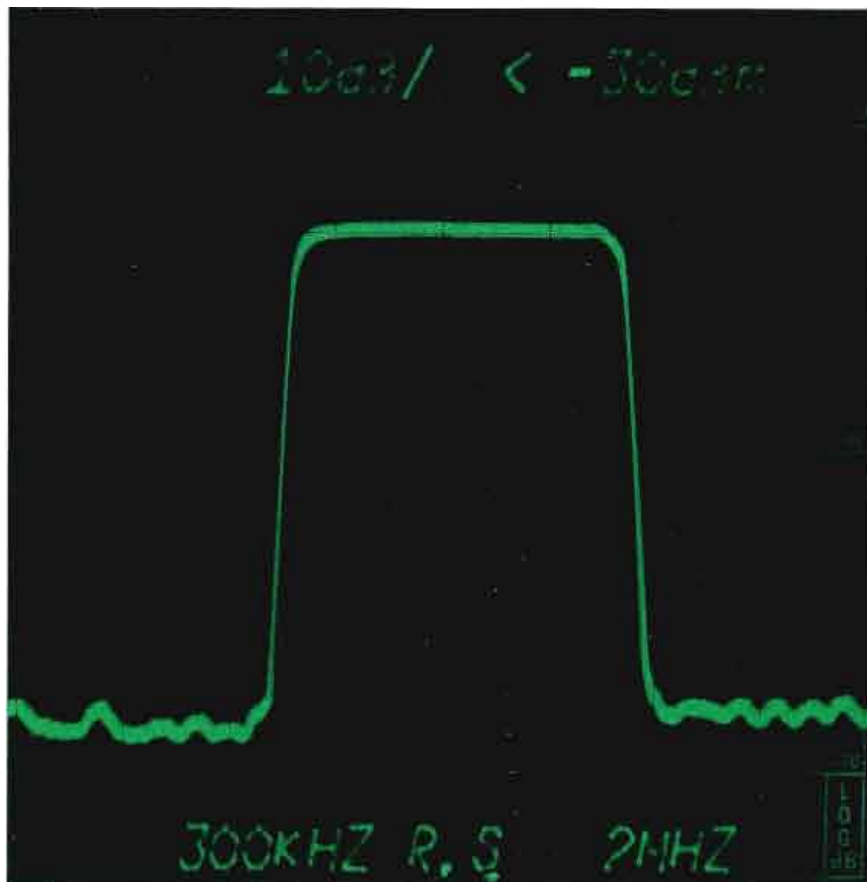
The amendment affects the following three primary areas:

- It permits the stations to log the type and source of programs according to definitions listed on renewal form FCC Form 342 instead of those which previously applied to the rule on program logging.
- It provides the alternative of putting certain donor announcement information in the station's public file instead of in the program log.

Continued on page 10

Announcing the first application of surface acoustic wave (SAW) technology to broadcast equipment

SAW Filter frequency response



The fourth generation of television translators and transmitters has arrived.

Thanks to another technological "first" from EMCEE!

The incorporation of SAW filters in EMCEE broadcast equipment assures significantly improved selectivity... without the group delay distortion associated with current filtering techniques... and providing frequency response curves never before attainable. In translators, for example, it is now possible to employ adjacent channel operation.

In addition to extremely high selectivity, the integrated SAW device insures easy alignment and excellent long term stability.

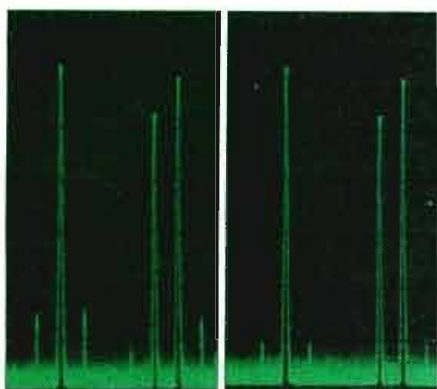
But EMCEE hasn't stopped there with the development of the fourth generation of television translators and transmitters.

There has also been a dramatic improvement in performance — specifically, linearity — as dem-

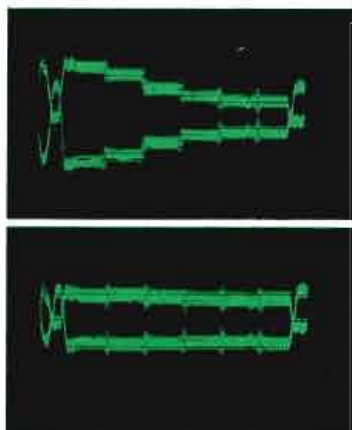
onstrated in the comparison photographs below. New EMCEE technology effectively cancels distortion and simultaneously improves intermodulation products, differential phase, differential gain, and sync compression to minimize signal degradation.

Best yet, EMCEE has achieved this exclusive combination of improved selectivity and linearity *in current equipment and at current prices!*

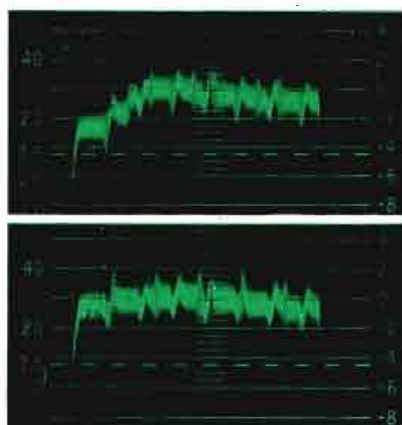
EMCEE. Clearly, the technological leader in translators and transmitters.



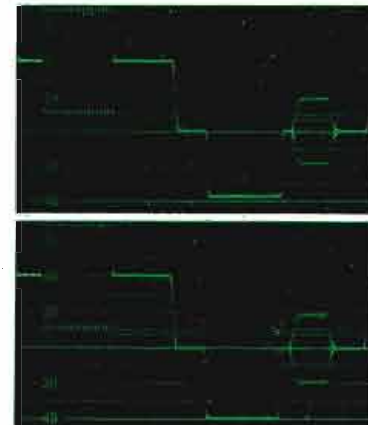
Intermodulation Products
... improved by 6 db



Differential Phase
... reduced by 3°



Differential Gain
... significantly reduced



Sync Compression
... eliminated!



Request free technical paper and data sheet... or call collect

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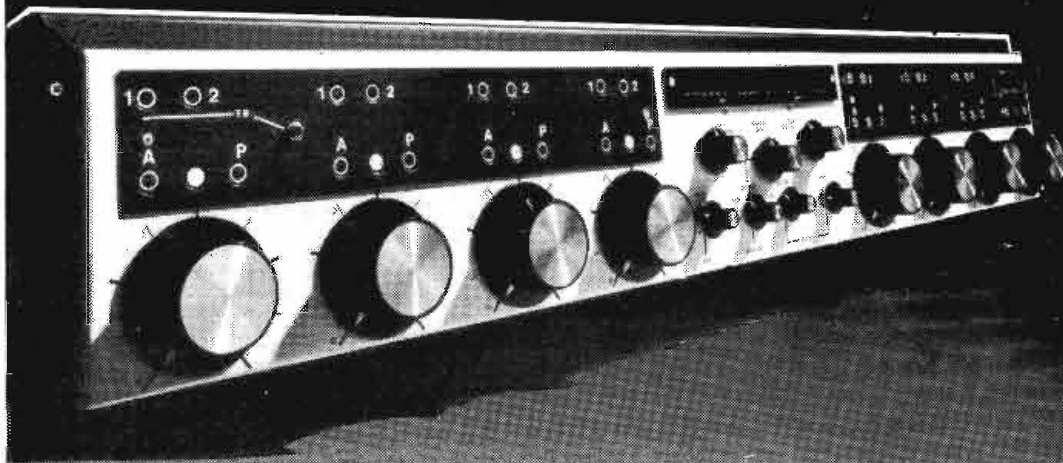
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See us at NAB Booth #110

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ADVANCED TECHNOLOGY MAKES RAMKO CONSOLES THE BEST BUY IN THE INDUSTRY.



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ILLUMINATED TOUCH PAD AUDIO SWITCHING. Your finger tells the audio where to go; light emitting diodes tell which function is on. Your touch gives instant command for COS/MOS audio switcher action.

SOLID STATE 'VU' METERS. Guaranteed to indicate the fastest transient and can be read 20 feet away. Eight red LED's indicate from -21 dbm thru 0 dbm. Two yellow LED's indicate over modulation - +1 dbm and +2.5 dbm.

DC CONTROL OF ALL AUDIO FUNCTIONS. Hum free, noiseless audio processing with remote, mixer control and elimination of stereo pots and their tracking problems. Electronic cue switching eliminates mechanical switches on rear of mixers.

SIMUL-Q MONITORING. Permits simultaneous monitoring of other inputs, while on the air with that same channel.

MANY MORE EXCLUSIVE FEATURES. Ramko consoles also feature Plug-In I.C.'s throughout; RF Suppression through individual tuned circuits; Plug-In Amp Modules; Patch Panel Input Gain Select; Equalizer and Special Effects Interconnects and Patch Panel Monitor and Cue Mute.

NINE CONSOLE MODELS RANGE IN PRICE FROM \$695 TO \$1880. ALL CARRY A 2 YEAR WARRANTY AND 10 DAY FREE TRIAL PERIOD.

CALL COLLECT OR WIRE FOR COMPLETE SPECIFICATIONS. YOU'LL SOON KNOW WHY RAMKO CONSOLES ARE THE BEST BUY IN THE INDUSTRY!

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Industry News

Continued from page 8

- It places into effect a separate program logging rule common to all stations licensed or operating as non-commercial.

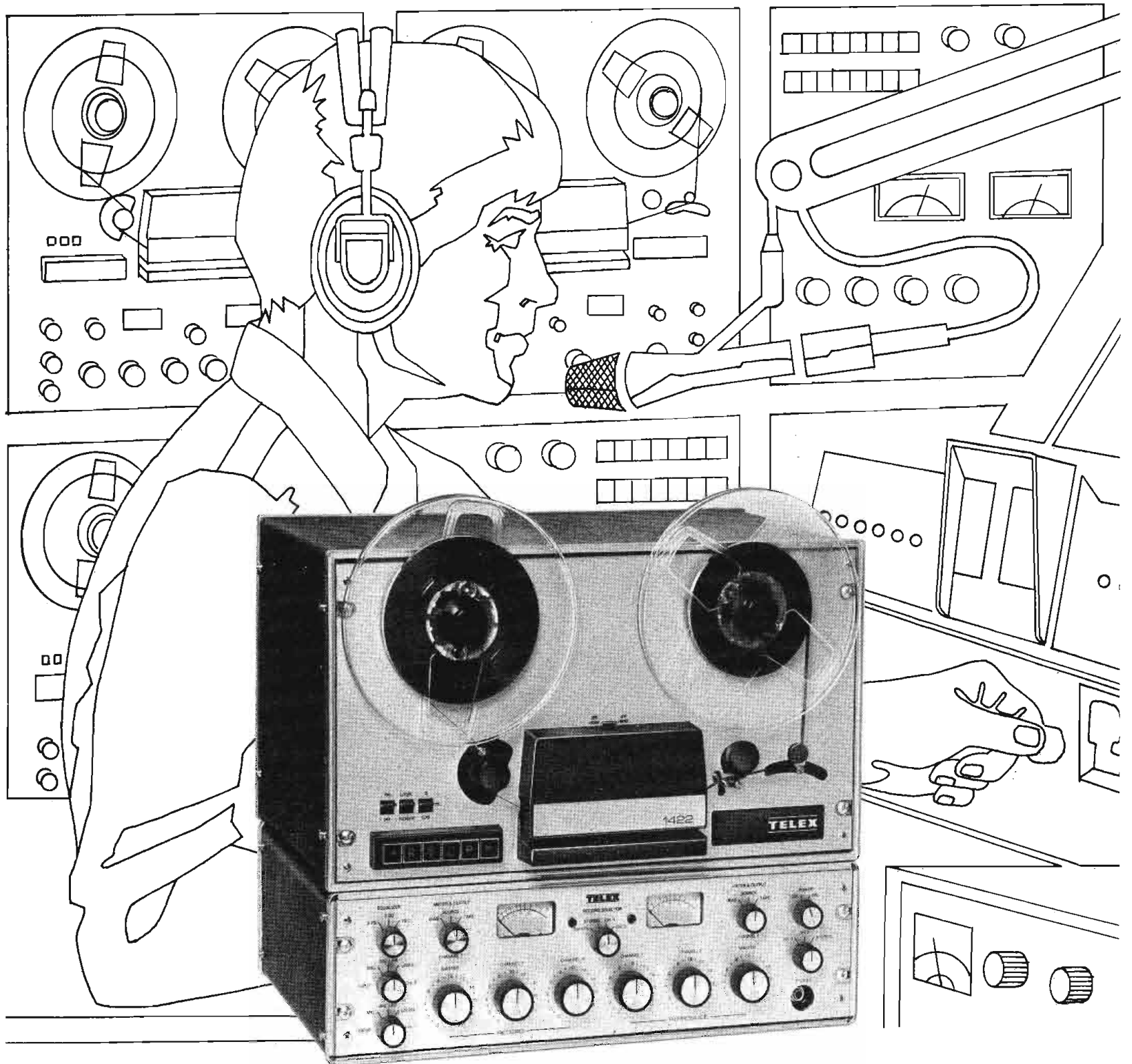
The non-commercial educational broadcast stations have been required to log program types and sources in primary categories titled Agricultural, Entertainment, News, Public Affairs, Religious, Instructional, Sports, Other, and in sub-categories Editorials, Political and Educational Institution. However, in their renewal applications, these stations have been required to list programming information according to program types and sources appearing on FCC Form 342: Instructional, General Educational, Performing Arts, Public Affairs, Light Entertainment and Other.

Now, the FCC said, its rules for program logging specify the same definitions of program types and sources as in Form 342, with an additional entry designation of "News".

With respect to donor information, the Commission said its rules require an entry in the program log of the name of the donor or person furnishing money, service or other valuable consideration. However, since any one program may have as many as five or six donors, licensees may use the words Donor or Donors as alternatives to entering the names of such donors or persons, provided that the log clearly indicates that the name of the donor or person is retained in the station's public file, the Commission said. It reminds licensees who use the alternative that program logs submitted to the FCC must include a list of the names of donors referred to in the logs.

The Commission said that a separate program logging rule common to all stations licensed as non-commercial educational was supported by each of the respondents to the proposal.

**For Latest News
See
Direct Current page 4**



Old-New Reel Time Recorder

Telex/Magnecord series 1400 broadcast quality recorder/reproducer. An old name that spells reliability. A new design for today's state of the art.

The Old. Telex/Magnecord products are still made in the USA so parts and service are always available. The series 1400 is still built on a solid die cast aluminum main frame for reliable operation around the clock. It's still available in full, half and quarter track configurations, has fail safe differential brakes and accepts 8 1/4 inch reels. It also still comes with three motors—but then, that's touching on the new.

The New. A brushless d.c. servo drive with a crystal oscillator control reference so accurate it virtually eliminates program timing errors. New, three speeds: 3 3/4 - 7 1/2 - 15 ips. New catenary head block for straight tape loading, the con-

venience of one hand cueing and the bi-level illumination of push button controls. New DTL logic controls eliminate EMI and provide fast, spill proof tape handling gentle enough for half mil tape. And new electronics, clean to 60 dB S/N at all speeds.

If you're looking for a real time, reel recorder with old name reliability but designed for today's demands, you'll find it in the Telex/Magnecord series 1400. For complete information please write:

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 Europe: 22, rue de la Legion-d'Honneur, 93200 St. Denis, France
 Canada: Telak Electronics, Ltd., Scarborough, Ontario

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Commission Denies Petition That Would Ban TV Drug Ads

The commission has denied a rulemaking petition by Francis X. Bellotti, Massachusetts Attorney General, and 13 other state Attorneys General (Petitioners), seeking a ban on televised advertising of

over-the-counter drugs between the hours of 6 A.M. and 9 P.M.

the FCC stated that "in the absence of empirical evidence to support the claim of a causal connection [between misuse or

abuse of drugs and televised advertisement of over-the-counter drugs] it would be unreasonable and arbitrary for [the Commission] to accept the idea that otherwise lawful advertising should be prohibited...[and that it was] unwilling to adopt such regulations on the basis of mere speculation."

The petitioners and those supporting the rulemaking request contended that repeated exposure to over-the-counter drug advertisements could lead to the poisoning of children through accidental drug ingestion and the development of a "pop-a-pill" society which often involved the misuse of licit drugs or the illicit use of restricted drugs.

Opponents to the petition argued there was no evidence to support a claim of a causal relationship between advertising and drug abuse, and that removal of such advertising from television would be adverse to the public interest since it served a legitimate and valuable purpose by informing viewers of both the nature of various symptoms and the availability of products to treat those symptoms.

In an effort to gather relevant information on the issues, the Commission, jointly with the Federal Trade Commission (FTC), sponsored a series of panel discussions that included representatives of the research community, two of the major networks, a drug manufacturer, industry self-regulatory organizations, and other government agencies.

From information provided by the panelists and others, the Commission said there was little scientific research that specifically addressed the question of a cause and effect relationship between over-the-counter drug advertising and the accidental ingestion or other misuse of drugs by young children.

The Commission noted that the National Center for Vital Statistics indicates that deaths resulting from the ingestion of drugs in children under the age of five has decreased following the adoption of safety packaging regulations by the Consumer Product Safety Commission.

It added that serious studies have examined the question of a possible relationship between television ad-

Continued on page 14



Maximize Your Signal by Optimizing FM Modulation

Broadcast Electronics' new advanced design Stereo AGC/Limiter does everything an FM broadcaster needs to maximize and improve his FM signal. Unique signal processing including peak/average comparator, fast 5 usec attack time, audio gating to minimize unwanted noise and return to normal gain circuitry does it all. Everything is in one compact package.

One stereo processor at \$1795.00 does the work of two conventional AGC's and two limiters. Monaural version FM-600 at \$1495.00 replaces one AGC and one limiter.

For details call or write Broadcast Electronics, 8810 Brookville Road, Silver Spring, Maryland 20910. Telephone: 301/587-1800.

BROADCAST ELECTRONICS, INC.

PRODUCERS OF *Spotmaster*™ TAPE CARTRIDGE EQUIPMENT

A FILMWAYS COMPANY



For More Details Circle (12) on Reply Card

20-1000mm.*

Whether you're the producer, director, cameraman or video man, field remote isn't getting any easier. Neither is big studio work. Assignments are tougher. Production standards, higher. And schedules, shorter than ever. As you can see, we've been listening: our new PV25x20B is proof. A single, rugged 22kg unit that packs a lot of performance into a compact 546mm-long package.

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3245 American Drive, Mississauga, Ontario L4V 1B8, Can.
Canon Amsterdam N.V., Industrial Products Division
De Boelelaan 8, Amsterdam, Netherlands

*PV25x20B is 20-1000mm in 25mm format.
P25x27B is 27-1350mm in 30mm format.

TV ZOOM LENS PV25X20B 25-500mm 1:1.8

For More Details Circle (13) on Reply Card

Industry News

Continued from page 12

vertising and the illicit use of restricted drugs and that these studies do not support the petitioners' hypothesis that drug advertising is an identifiable and measurable cause of drug abuse or misuse, or that repeated exposure of children to televised advertisements of over-the-counter drugs creates a favorable attitude toward the inappropriate use of drugs by young

people.

In the absence of a truly compelling showing to the contrary, the FCC said it must conclude that the public interest would be served by a free flow of information regarding proprietary drugs.

It said this conclusion was reinforced by the fact that any action it might take with regard to the rulemaking petition would have to

be measured against the standards of the First Amendment and the prohibition of censorship contained in the Communications Act.

The FCC added that it no longer was possible to conclude that advertising was outside the protection of the First Amendment simply because it was "commercial" speech. The Commission noted that the U.S. Supreme Court has held that "the free flow of commercial information is indispensable" to the public interest.

The Commission said it did not dispute the fact that drug poisoning of young children and the illicit use of dangerous drugs were serious problems. It said these problems more properly should be addressed through remedies that are demonstrably relevant to their solution and that were less likely to infringe on important values relating to the free flow of information and ideas.

It noted that the problem of drug poisoning is being addressed through educational efforts and through regulations of the Consumer Product Safety Commission.

The FCC said the serious problems relating to the use of illicit drugs are, of course, being addressed through comprehensive government programs involving education, rehabilitation and enforcement of the criminal laws. While the problems of drug abuse and misuse persist in spite of the existence of these programs, the Commission said there was no evidence that the proposed restrictions on drug advertising would bring about any improvement in this situation. Regulations such as those proposed by the petitioners clearly would have a negative impact on the availability of information concerning over-the-counter drugs, the FCC added.

FM Growth Continues

The steady growth of broadcast stations continues, and once again, FM leads the way. This time, however, it's commercial FM that took the biggest jump. Commercial FM totals are now well over 2,860, a jump of 80 stations over the past 12 months.

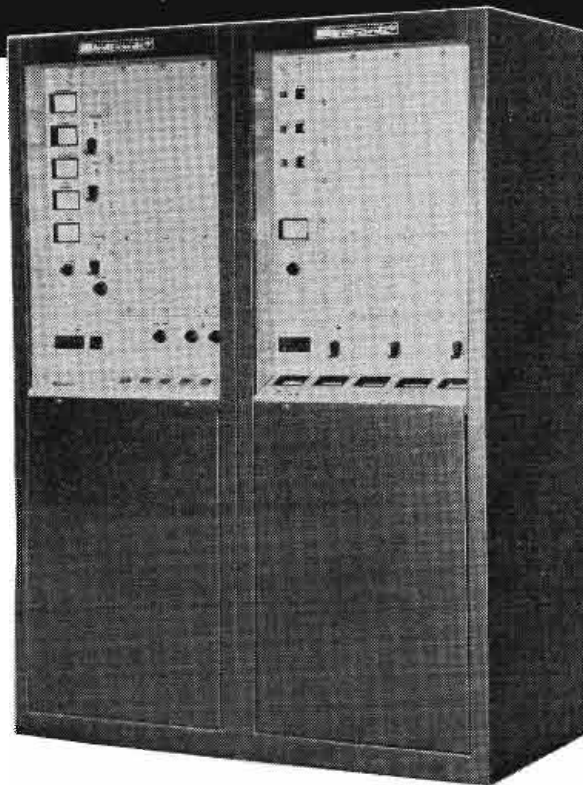
Continued on page 16

Simplicity is Reliability

The **Sintronic** DFM-25K-B

25Kw FM TRANSMITTER

- Grounded Grid Driver
- Grounded Grid Power Amplifier
- Direct FM Solid State Exciter
- Self-Contained: No External Power Vault
- No Neutralization
- Front Panel Power Control From 2Kw to 30Kw
- Rectifiers Engineered to Transformer Characteristics
- VSWR Protection



The SINTRONIC DFM-25K-B FM Transmitter offers the simplicity of "grounded grid on grounded grid" — grounded grid driver and power amplifier — resulting in a considerable reduction of components and a greater increase in stability and reliability. The driver section of the DFM-25K-B is the SINTRONIC DFM-3K-A 3500 watt FM transmitter. This driver operates at 1200 watts for full 25Kw output power but can be used as a 3500 watt emergency transmitter. The DFM-25K-B is FCC type accepted and field proven. The unit is self-contained in two cabinets normally located side-by-side. However, they can be separated according to individual spacing requirements.

SINTRONIC manufactures a complete line of AM and FM Transmitters to satisfy every broadcast requirement. Highest quality components are used throughout. All our transmitters contain design features that increase efficiency, provide greater reliability, and reduce maintenance time and costs.

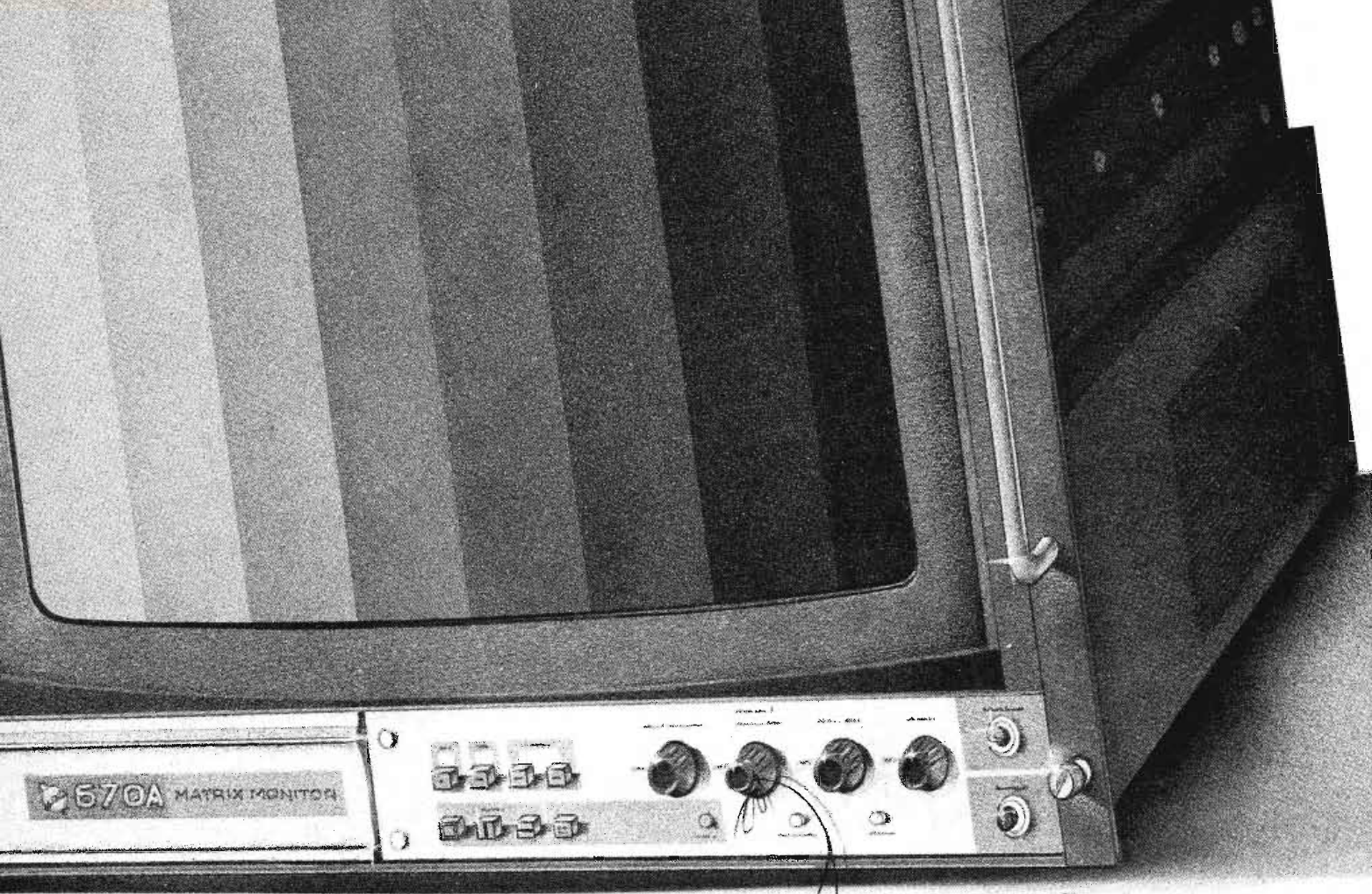
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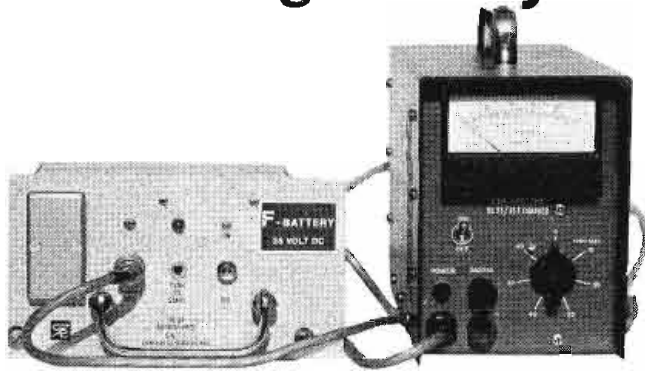
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IS ONLY ONE REASON WHY WE THINK
THE 670A LARGE-SCREEN
MONITOR IS A GOOD BUY**



- The 670A picture is sharp**
Enhanced by variable-aperture correction
- Colors are consistent**
Preset controls and circuit stability insure repeatability
- Excellent EHT regulation**
Less than 1% size change, no perceptible black level change with any APL
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Line by line examination in a "magnified" vertical interval mode
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17-inch Trinitron, one-gun design. The 670A fits your requirements as well as the \$2895 price fits your budget. For demonstration call your Tektronix Television Field Engineer. For a data sheet write TEKTRONIX, INC., Beaverton, Oregon 97077



Frezzi "F" Cell extra-capacity 1 hour recharge Battery Packs



For Ikegami HL-33 & 35 hand-held video color cameras.

Fits backpacks perfectly (photo left).

New high-capacity (6aH) sealed cylindrical, reliable nickel-cadmium cells provide 2½ hours camera operating time. FREZZI-patented undervoltage dropout circuit protects cells from overdischarge.

User Net \$865.

FREZZI "F" Charger (photo right) recharges new 6aH Battery Pack or our standard 4 aH battery Pack in less than 1 hour. User Net \$850.

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Frezzolini Electronics Inc.

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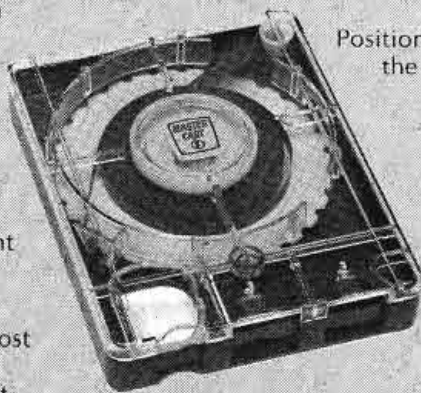
For the cleanest cart sound
your station can broadcast...

MASTER CART

• **STEREO PHASING**
60° normal (45° typical)
to 12,500 Hz.

• **REPEATABILITY**
Phase performance
repeatable with each
cartridge and each stereo
machine assuming correct
guidance to NAB alignment
dimensions.

• **TAPE PATH**
Cone shaped rear corner post
and longer tape path
eliminate tape distortion at
the head area.

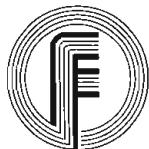


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Positions the cartridge straight into
the heads to minimize unequal
head penetration pressure.

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Individually replaceable...
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friction for extended tape
life... provides full surface
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path tape motion.

Master Cart is easy to
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lengths up to 10½
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Industry News

Continued from page 14

Educational FM bumped its total to 870 stations after adding 55 new ones in 1976. Construction permits will continue to stack up at the FCC as National Public Radio builds toward a record number of network stations.

Meanwhile, AM station figures are at 4,464, a jump of 23, as the new year begins. Commercial and educational television topped out long ago, but eight new educational UHF's signed on for the first time in 1976.

Network Execs To Meet With NAB Code Board

As the result of the Television Code Review Board meeting held on December 13-14, 1976, in Washington, D.C., a committee of the Television Code Review Board and the presidents of each of the three television networks agreed to meet individually during the first week in January to discuss the Board's concerns regarding aspects of television programming.

The committee anticipates holding meetings with the Board of Directors of the Association of Independent Television Stations (INTV), syndicators and members of the creative community for similar discussions.

The Board also directed the NAB to commission an independent evaluation by outside counsel of the parameters within which the Code may operate in light of Judge Ferguson's recent decision in the Writers Guild litigation.

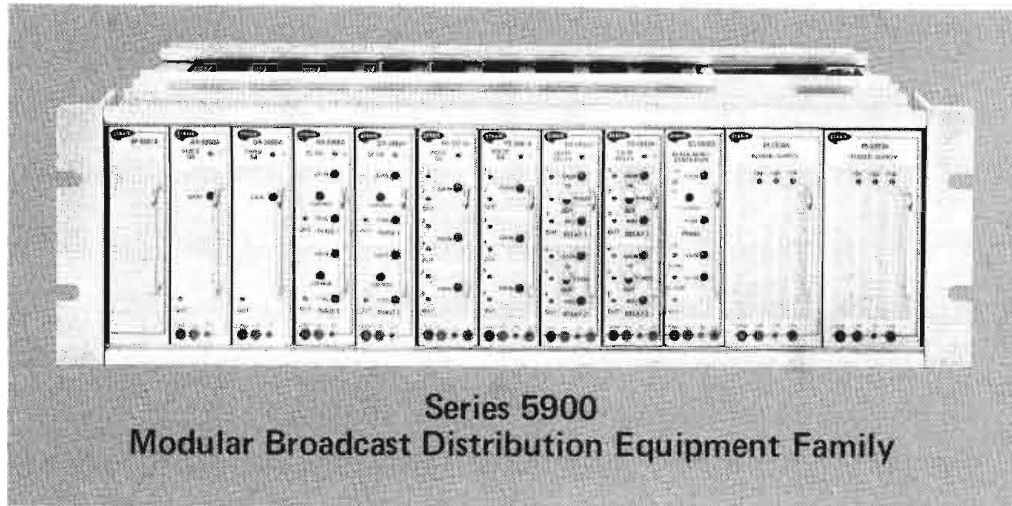
In other actions, the Board—

- Recommended that the NAB Television Board of Directors revoke mandatory Code subscription,
- Requested the Television Board of Directors to change the initial term of membership on the Television Code Review Board to three years and to extend the term of current Code Review Board members by one year.

Continued on page 18

Another member of the FAMILY

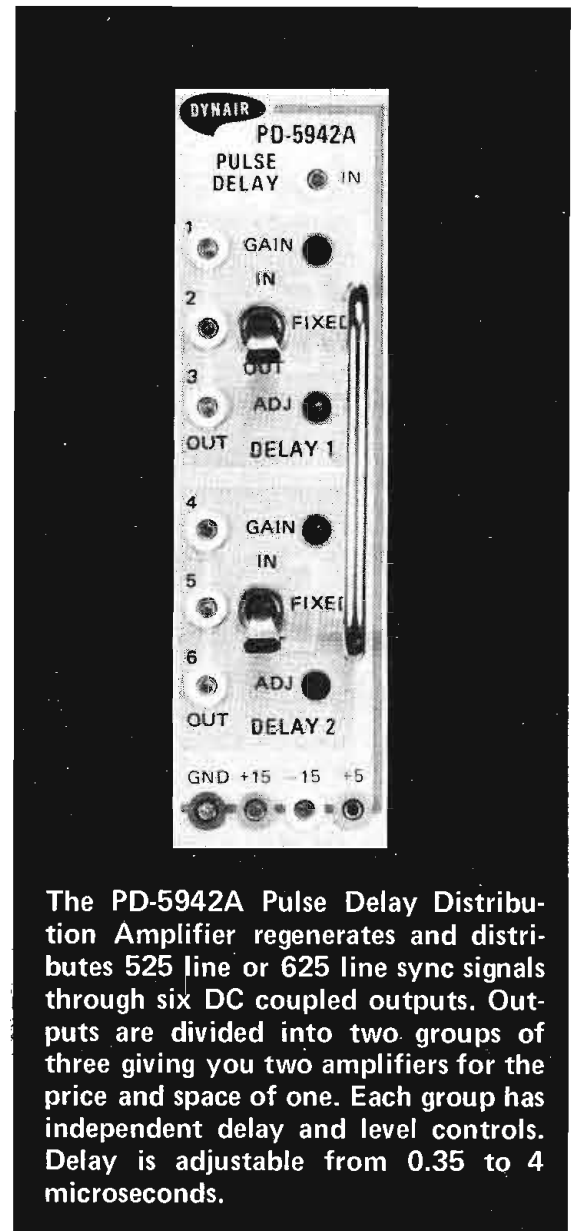
Model PD-5942A Pulse Delay Distribution Amplifier



Series 5900
Modular Broadcast Distribution Equipment Family

MEET SOME OF THE RELATIVES

- **DA-5960A Video Distribution Amplifier** module provides six DC coupled outputs from one differential high-impedance looping input. Frequency response flat ± 0.1 dB to 10 MHz, less than 0.1° differential phase and 0.2% differential gain.
- **DA-5966A Sub-Carrier Distribution Amplifier** module, provides regeneration and distribution of NTSC or PAL sub-carrier through six DC coupled outputs from one high-impedance looping input. Outputs are divided into two groups of three with independent phase and level front panel controls for each group. Phase is adjustable over a 0 to 360° range.
- **PD-5941A Regenerative Pulse Distribution Amplifier** module provides six DC coupled outputs from one high-impedance looping input. Outputs divided into three groups of two outputs with independent level controls for each group.
- **SG-5930A Black Burst Generator** module provides two "black" reference signal outputs for switching and production equipment. Front panel adjustments for sync amplitude, setup, burst level, and burst phase.



The PD-5942A Pulse Delay Distribution Amplifier regenerates and distributes 525 line or 625 line sync signals through six DC coupled outputs. Outputs are divided into two groups of three giving you two amplifiers for the price and space of one. Each group has independent delay and level controls. Delay is adjustable from 0.35 to 4 microseconds.

The DYN AIR Series 5900 Modular Broadcast Distribution equipment is state-of-the-art in design, tops in reliability, and offers performance expected by the broadcaster.

Write or call for additional information and for the name of the broadcast dealer in your area who handles this family of products.

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TEL.: (714) 263-7711 TWX.: (910) 335-2040

DYN AIR

Continued from page 16

All members of the Television Code Review Board were present at the meeting. They are: Robert J. Rich (Chairman), president and general manager, KBJR-TV, Duluth, Minnesota; James Conley, president and general manager, Meredith Broadcasting Group, New York, New York; Wallace Jorgenson, executive vice president, WBTV, Charlotte, North Carolina; Michael S. Kievman, vice president,

programming, Cox Broadcasting Corporation, Atlanta, Georgia; Burton B. LaDow, general manager, KTVK, Phoenix, Arizona; Alred R. Schneider, vice president, American Broadcasting Companies, Inc., New York, New York; Van Gordon Sauter, vice president, program practices, CBS, Inc., New York, New York; James R. Terrell, vice president and general manager, KTVT, Ft. Worth, Texas and

Herminio Traviesas, vice president, broadcast standards, National Broadcasting Company, New York, New York.

FCC Extends Microwave Deadline

The Commission has extended to June 1 the effective date on which all applications for new or modified licenses for private operational-fixed microwave stations and applications for renewal of licenses for those stations, submitted between June 1, 1977 and June, 1982, must be filed on revised FCC Form 402 (1976).

The Commission explained that the postponement of the effective date to June 1 became necessary when delays were encountered in testing parts of a computer program related to the revised form.

FCC Form 402, revised by the FCC May 17, was developed to be used in conjunction with an overall ongoing program designed to develop a complete and accurate microwave data base and a computer-assisted microwave application processing system.

The Commission said the new form should be available for use on a voluntary basis on or after April 1.

March NAB Meet: The Largest Ever

The 1977 version of the NAB national convention will probably be the largest ever held. Largest in terms of total exhibitors, exhibit space, and attendance.

Set for March 27-30 in Washington, D.C., the hot topics are sure to be ENG, satellites, ATS, and AM stereo. ENG will be showing evolutionary changes, while satellites, ATS and AM stereo will be the revolutionaries. Odds are that ATS has a better chance than ever. March could be the key month. And surprisingly, AM stereo is moving right along.

There seems little left in the way of circularly polarized TV antennas except the cost this change would mean to the broadcaster.

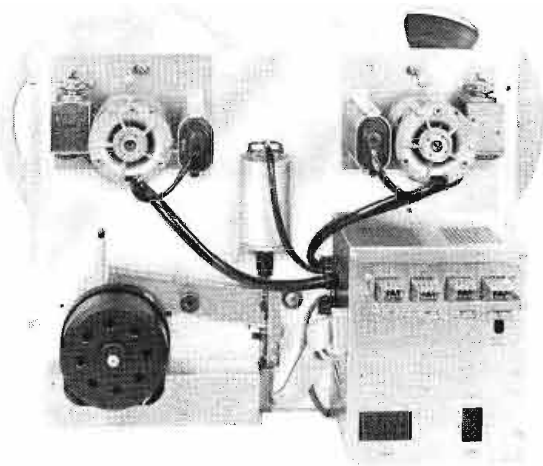
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Built for Professionals



ITC's 750 Series Reproducer

1/2 Track Stereo \$1190



Check with any leading automation company for more information or call ITC collect (309-828-1381).



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The finest multi-core studio and field camera system ever produced by Philips.

Which means the finest multi-core studio and field camera system ever produced.

In the decade since Philips re-invented color with the Plumbicon* tube, its PC-60 and PC-70 have successively stood as *the* reference standard for broadcast performance. Behind Philips leadership, that standard has steadily improved to today's ultimate—the LDK-25.

That Philips has again leapfrogged the competition can surprise no one who knows broadcast cameras...since we created Plumbicon* technology. After a decade of refinement and improvement Philips is still the *only* company that manufactures all of the critical picture determining components—computer-matched yokes, beam splitting prism, deflection circuitry and Plumbicon* tubes. The *only* company that can design each component for optimum performance of the entire camera system. These advantages, of superior Philips design and in-house component availability, offer you unsurpassed stability, picture quality and value.

Further, at Philips, we offer you options that *are* options. The LDK-25 you buy is a custom unit, equipped

with the automatic features you select...not a 'loaded' factory package.

But you can't just read about the LDK-25...you've got to experience it.

Only a demonstration can show you how our anti-comet-tail Plumbicon* tubes handle highlights up to 32x normal peak-white level without blooming or streaking—and without loss of our famous color rendition and resolution. 'Live' is the only way to learn what our Color Line-Up Equipment (CLUE) can do for ease of balance... what electronic color temperature control, auto white balance, flexible auto iris and contrast compression mean in use.

Only after you've seen it all—after you've actually handled this remarkable camera—will you understand why the Philips name is a guarantee of incomparable stability...why no one else can match our 1000-hour performance.

To get your hands on an LDK-25 or to get more information, call us today at (201) 529-5900; (201) 529-3800, or write: Broadcast Products, Philips Audio Video Systems Corp., 91 McKee Drive, Mahwah, N.J. 07430.



LDK-25 IS DECADE TWO

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February, 1977

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19

Increase sharpness... improve camera sensitivity

For the sharpest image, the finest resolution, the best picture quality in your station's ADI, EEV's new 30mm Coaxial Leddicon® Camera Tube is the answer.

Features the fastest leading edge signal level rise and quickest trailing edge fall of any image tube now on the market. Patented coaxial design assures consistently accurate geometry and optimum registration no matter the tube orientation. RESULT . . . a noticeably superior picture quality even under the most difficult lighting conditions.

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Industry News

Continued from page 18

Equally important to all broadcasters will be the changes coming in the Commission. With Hooks on his way to the NAACP and Wiley possibly leaving in the spring, some important changes have to be made. Hopefully, the new faces will include someone familiar with the technical side, especially satellites. By NAB convention time, a number of important announcements should be ready.

NAB Names Regional Manager

J. T. Anderton, City News Bureau Chief, St. Petersburg, Florida, has been named National Association of Broadcasters' regional manager for the northeast area of the United States, Wayne C. Cornils, NAB director of membership, announced.

He assumed his new post January 1.

Before becoming chief, Anderton was the Bureau's special projects coordinator. He previously was morning news anchorman at WSUN Radio, St. Petersburg, and media coordinator for C. Bette Wimbish's campaign for the Florida State Senate. He also was employed by two other Florida radio stations—WDAE, Tampa, as an air personality, and WKTZ AM-FM, Jacksonville, as an announcer. In addition, he worked at three Jacksonville radio stations while attending high school.

Anderton received his Bachelor of Arts degree in political science and sociology in 1971 from Florida Presbyterian College (now Eckerd College).

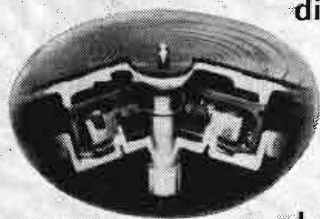
Among his numerous civic activities, he is a member of the St. Petersburg Kiwanis Club and the National Association of Government Communicators, a member of the Board of Directors of the Florida Gulf Coast Symphony, Secretary-Treasurer of the Eckerd College Alumni Association and 1976 chairman of the City Employees United Way Drive.

Your professional turntable cannot match the performance or reliability of this one.



The Technics SP-10 MK II.

Every professional needs the precision of the Technics direct-drive system. That's why radio stations use it. And discos abuse it. But every professional also needs abundant torque. And now you can have it. In the SP-10 MK II.



At 33 $\frac{1}{3}$ RPM, the SP-10 MK II will reach the exact playing speed within 0.25 of a second.

That's less than 1/12 of a turn. While it comes to a dead stop in only 0.3 of a second. And you don't have to worry about subtle slowdowns because a tracking force of even 1,000 grams won't noticeably affect its speed.

You won't find any belts, gears or idlers in the SP-10 MK II. But you will find our lowest wow and flutter ever (0.025% WRMS). Inaudible rumble (-70dB DIN B). And a platter that spins at the exact speed (33 $\frac{1}{3}$, 45 or 78 RPM) regardless of fluctuations in AC line voltage or frequency. The reason: A quartz-locked frequency generator DC servo motor.

And the SP-10 MK II is as reliable as it is precise. Even with its abundant torque, you can stop the platter with your hand. Because we designed it to take all the

punishment a professional can dish out. Even after years of continued use.

You'll also get all the refinements a professional needs. Like a quartz-locked stroboscope. Remote control. Electro-mechanical braking. A dynamically damped platter. And a separately housed power supply.

The SP-10 MK II. One component in the new Professional Series from Technics.

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- Send me technical information on the Technics SP-10 MK II turntable.
 Have a Technics audio specialist call for an appointment.

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For More Details Circle (24) on Reply Card

Zoom In!

This is the official column of the American Society of TV Cameramen (ASTVC). The ASTVC can be contacted by writing to: P.O. Box 296, Sparkill, NY 10976. (914) 359-5985.

Take 1!...The NAB is coming, The NAB is coming...

Get your roller skates out, or rent a Honda...the NAB will be a real challenge this year...March 27 to 31

in the Sheraton Park, the Shoreham, and the Hilton in Washington, D.C....maybe complicated by a visit from the President...

That's right, the exhibits and meetings will be strung out between

three hotels...So you can save yourself a lot of grief by reading over the "hotel articles" in the next issue of BE...and there's a special floor plan section that will help locate the manufacturers on the exhibit floor...there'll be more of those handed out at the convention...but whatever you do, plan ahead...

Take 2! Keep 'Em Coming...

At the NAB Convention...look for more changes in ENG equipment...mostly evolutionary changes in systems and cameras...Cameras are going in the right direction, so let's look for greater flexibility and lighter systems...like where do we really need to cut the weight down anyway?

Also at the convention...Honorary membership award will be presented to BE Editor Ron Merrell...for the help he has given ASTVC...You're invited to drop by the BE hospitality suite Tuesday night of the convention...

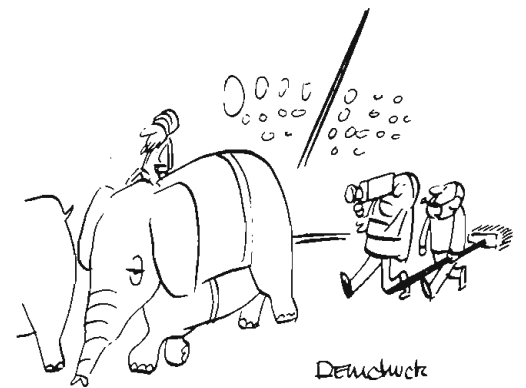
Take 3! Keep Those Cards And Letters Coming...

Keep in touch...and if you need an application form for a friend...send your request directly to: American Society of TV Cameramen (ASTVC), P.O. Box 296, Sparkill, NY 10976.

All requests for BE subscriptions should be sent directly to: Greg Garrison, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212...But be sure to indicate that you are a member of ASTVC...If you are, your subscription is free...

See you at the NAB Convention in March...

Fade to Black...



"Oh well, it's show biz!"

TO MAKE IT PERFECTLY CLEAR

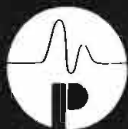


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Multilimiter is the broadcast limiter that's designed to keep your sound clear, clean, and out front... so you can REALLY listen to what you're hearing.

The only way to judge Multilimiter is with your own ears. Call us today for details on our 21 day trial plan. Phone 714-453-3255.

Listen to Multilimiter... we think you'll like what you hear!



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TELEPHONE (714) 453-3255 TELEX 695008

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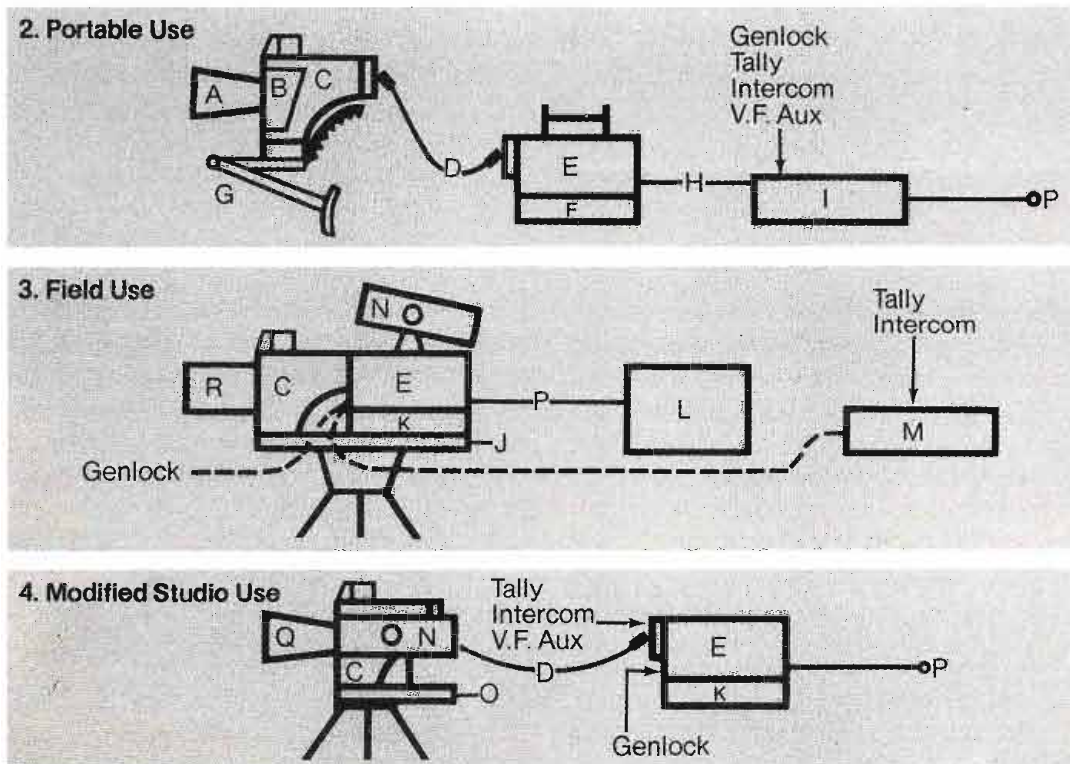
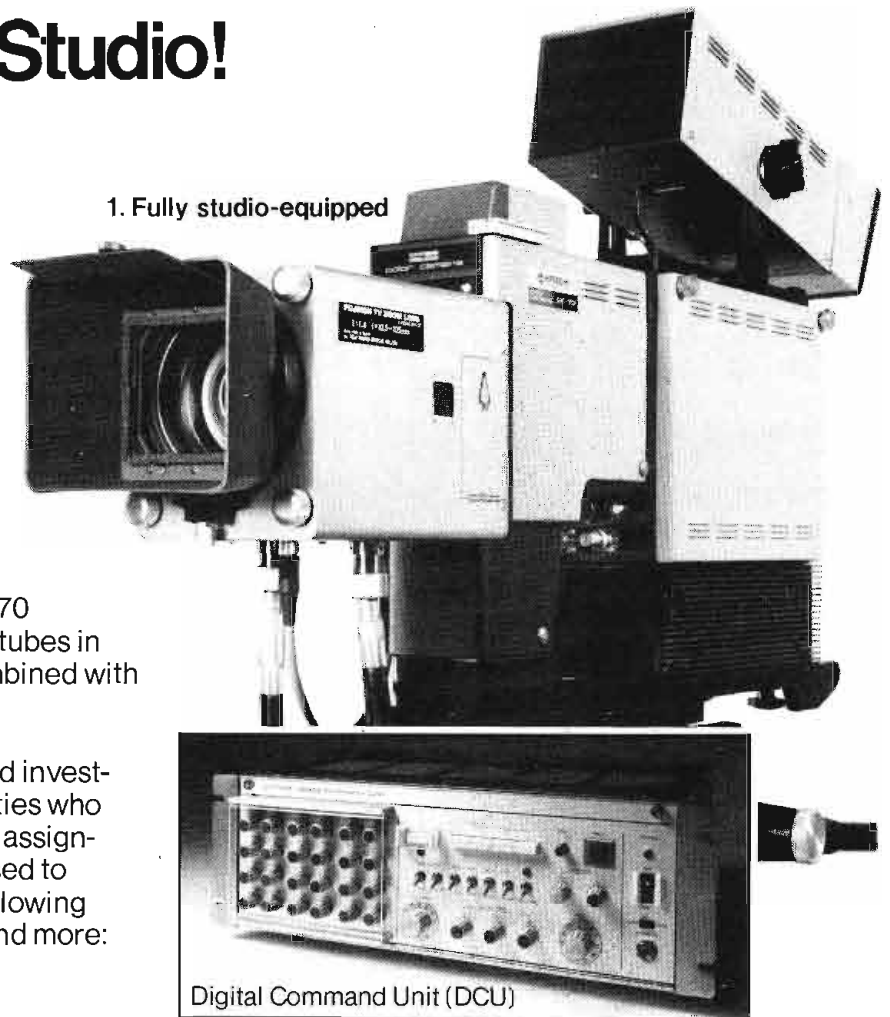
HITACHI SK-70

The One Camera That Can Do The Work Of Four... Inside Or Outside The Studio!

The modular SK-70 converts easily from a fully equipped, self-contained color studio camera to a modified studio camera. In the field, the studio version of the SK-70 can be connected directly to a VTR with only a co-axial cable. And for hand-held portability, the camera head features a shoulder mount, an auto-iris portable zoom lens, and a 1.5" viewfinder, along with a DC and process pack. The Digital Command Unit (DCU) with up to 3000 feet of single co-axial cable strongly enhances the capability of the SK-70. Another striking option is a 22:1 zoom lens that can be used for the studio version of the SK-70 in the field.

No matter which configuration you choose from those shown in the photo and three diagrams, the Hitachi SK-70 offers the precision and reliability of three 2/3" Saticon tubes in the camera head to insure excellent picture quality, combined with all the latest advances in broadcast camera technology.

As you can see, our outstanding Hitachi SK-70 is a sound investment for broadcasters, production studios, and universities who need broadcast quality performance in a wide variety of assignments, all for the price of a single camera. We'd be pleased to arrange a demonstration of how the SK-70 can fit the following camera requirements inside or outside your TV studio, and more:



A)	Portable lens
B)	1.5" viewfinder
C)	Camera head pack
D)	Camera cable (300 ft.)
E)	Process pack
F)	D.C. pack
G)	Shoulder Mount
H)	Co-axial cable (3000 ft.)
I)	DCU
J)	Mount adapter
K)	A.C. pack
L)	VTR or FPU
M)	Operation panel
N)	5" viewfinder
O)	5" V.F. Mounting Plate
P)	Co-axial cable (video)
Q)	Portable lens w/conversion adapter
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Following the basic principles of TV make-up can make a positive difference in the appearance of on-camera talent. But even the experts can be fooled if they don't check it on-camera before airing.

Put your best face forward By Ron Whittaker

Make-up is like many of the "behind-the-scenes" aspects of television in that it is at its best when it goes unnoticed. Unnoticed does not mean unimportant, however. Since television is very much a closeup medium, there is a great emphasis on the human face and its appearance. With most subjects appearing before the camera the use of some amount of make-up is desirable, both to insure that they photograph naturally and to im-

prove their normal appearance through the emphasis of desirable and the de-emphasis of undesirable facial characteristics.

In general, there are three basic reasons for the use of make-up: (1) to compensate for unwanted changes in appearance brought about in the television or film process, (2) to correct flaws in skin, hair, etc., and (3) to bring about a major change in appearance for dramatic roles.



Figure 4. Rouge is then blended on cheekbones below the center of the eyes.



Figure 1. Here the subject has little or no make-up. The object is to subtly use make-up to achieve a natural look for a television situation. (All photos here were shot under typical studio lighting.)



Figure 2. Contouring and highlighting accentuate some facial features and play down others. Lighter make-up is applied around nostrils, under the eyes and in the chin indentation. Darker base is used on cheek hollows and jaw line.



Figure 3. Moist sponge is used to apply a thin coating of pancake base, or foundation, over face and neck.



Figure 5. After applying a thin stroke of eyeliner along the eyelashes and eye shadow on the eyelids, a highlighter is blended into the brow bone. An application of mascara will complete this phase.



Figure 6. The lips are first outlined with a lip brush and then carefully filled in. A light brushing or translucent powder will complete the model's make-up.



Figure 7. The "after" picture shows no dramatic difference. That wasn't the idea. The careful use of make-up can subtly bring out positive facial features (and play down the not-so-positive ones) while still retaining the natural appearance of the subject. Make-up is best when it doesn't call attention to itself.

STEIN'S	FAIR COMPLEXION	MEDIUM TO DARK COMPLEXION
Foundation	Blonde: Natural A Redhead: C-1 Brunette: Cream-B	Blonde: Natural Blush Redhead: Tan-A Brunette: Natural-B
Powder (shades designated by number)	Blonde: 4, 8 or 19 Redhead: 6, 7 or 8 Brunette: 5, 10 or 20	Blonde: 7, 16 or 19 Redhead: 8½ or 20 Brunette: 12, 20 or 22
Lipstick	Blonde: D-Video 3 Redhead: D-Video Blush 2 Brunette: D-Video Medium	Blonde: D-#1 Redhead: D-#2 Brunette: D-#3
Rouge	For moist or dry rouge match lipstick shades	
Eyeshadow	For blue, gray or green eyes: 2, 3, 9, 11, 14, 15 or 16 For brown, hazel or black eyes: 1, 4, 6, 8, 12, 13 or 14	
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Powder	Translucent	
Lipstick	7-22 Society Lipstick: Laguna Peach, California Coral, Capistrano Pink, Tint of Pink, Cherry Frost, Cocoa Frost, Pink Cafe	
Rouge	Pink Tone or Peach Tone	
Eyeshadow	French Blue (muted), Misty White, Soft Blue, Willow Green, Beige Mist, Light Aqua	

**recommended for men

Note: Make-up color chart taken from information provided by:
Stein Cosmetic Company, New York City and Max Factor, Hollywood, California

Best Face Forward (Continued)

Normal skin contains a certain amount of oil at its surface which generally goes unnoticed until it appears full-frame in a carefully focused and lit television picture. This problem is generally intensified by the heat of studio lights and the tension that is usually associated with on-camera appearances. Unless corrective measures are taken through make-up, a distracting and unnatural-looking shine will result. The major problems in this respect are bald heads and shiny noses and foreheads.

There are also a number of less obvious problem areas which may require make-up. Normal skin color consists of subtle green and purple hues which are generally not notice-

able to the eye in most day-to-day situations. These hues can be greatly intensified by the film and television process, and the skin can take on undesirable hues unless the problem is controlled through the appropriate use of make-up.

Shadow areas in the face can also be intensified to an objectionable degree. In particular, the limited brightness range of the television system can exaggerate the dark areas around the eyes, nose and chin. Probably the most significant of the "dark area" problems is represented by men's beards. Without make-up, many cleanly-shaven men will still appear to be very much in need of a shave.

There is also one other area in

which some make-up compensation may be necessary. Fair-skinned subjects who are either placed on camera next to people with very dark complexions, or who appear in a dark studio setting may need to be "toned down" to keep from appearing abnormally light. The problem will be reversed for dark-complected subjects. In these cases, make-up will probably be needed to bring skin tones into a brightness range which will be viewed as being comparatively normal.

Often the motivation for using make-up stops after this first, rather necessary phase—that of just making subjects appear relatively normal on the screen. Beyond this

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Basic Make-Up Materials

- Two or more make-up capes
- Supply of towels
- Supply of cleansing tissues
- Astringent
- Foam rubber sponges
- Eyebrow brush
- Tweezers
- Flat sable brush
- Petroleum jelly
- Hand mirror
- Cleansing cream
- Black and brown eyebrow pencils
- Lipsticks ranging from dark to light red
- A wide variety of colors in make-up bases
- Cream rouge
- Black and brown mascara
- Brown, blue and green eye shadow

Best Face Forward (Continued)

point, however, make-up skills continue into another important area; an area which can be very much an art, demanding a considerable amount of esthetic perception, skill, and experience. At this point, decisions must be made on the emphasis and accentuation of desirable facial features and the de-emphasis of undesirable features. Figures 1 and 7 show a subject before and after the application of make-up by a make-up artist.

The last category, that of character make-up, will not be dealt with here since it is a very specialized

area which has a limited use in most day-to-day television and film production work. Readers who want to develop an understanding of character make-up can find several books available on the subject.

Make-Up Application

The extent to which make-up is used varies considerably, depending upon the people and circumstances. Some situations make it virtually impossible to make up individuals. An example would be people selected from a studio audience to

appear immediately on camera. Sometimes, in television discussion shows, guests arrive at the studio too late to be completely made up. There may only be time to apply an appropriate shade of face powder to dull and objectionable shine. For some small TV stations the total "make-up kit" may consist of only a box of face powder and a couple of powder puffs—which, of course, is better than nothing.

It is an unusual individual, however, who will not benefit significantly from some form of make-up beyond just face powder. People who regularly appear on camera know that any effort and inconvenience which may go into the use of make-up is more than worth it in terms of the increased confidence which comes from knowing that they are appearing to their audience in the best possible way.

Although regular "street" make-up may be suitable for use in film and television, experience has shown that unpleasant surprises can be reduced and consistency increased if the lines of make-up

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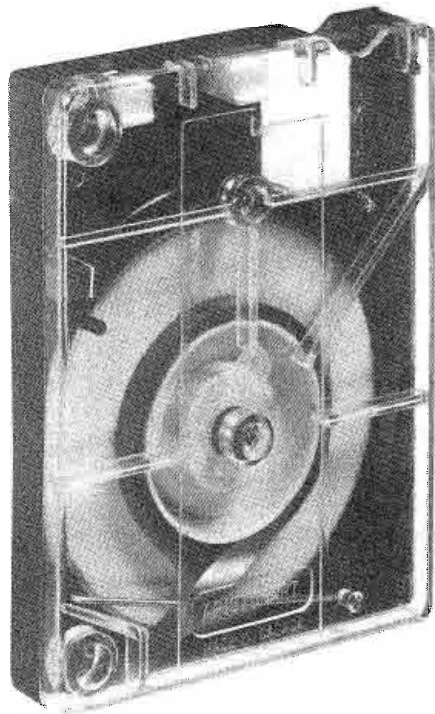
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Best Face Forward

(Continued)

which are especially manufactured for television and film are used. Several well-known manufacturers of cosmetics make complete lines of make-up suitable for any skin coloration—from Caucasian to Oriental to black. Once you become familiar with the color and tone designations of a particular manufacturer, you can quickly build up speed and confidence in the effective use of the product line. A table showing the basic shades of Max Factor and Stein products designed for television use has been included with this article.

Applying The Base

The first step in making up an individual is to prepare the skin for the "base" or "foundation." For men this simply means that a cleansing lotion is used to remove excess oil. In the case of women wearing street make-up, the make-up will have to be completely removed with a cleansing cream or lotion. In both cases, an astringent should be used after cleansing to tighten facial pores.

Base or foundation make-up is available with either an oil or water base. Water-base make-up has a couple of important advantages: it generally does not require the use of face powder, and it is easier to remove. One of the most popular types of water-based foundations is supplied in stick form and is available in about 20 different shades and colors. Two or more shades can be blended together to achieve any desired coloration. **Unless it is desirable to darken or lighten the skin tone, a base shade should be selected (or blended) which most closely approximates the subject's natural skin color.**

Using a foam rubber sponge, the base is carefully applied to the face, ears and neck of the subject being made up. If the applicator is moistened slightly, the base will cover the skin more evenly and smoothly (Figure 3).

Occasionally it is necessary to slightly lighten or darken the natural skin tone. For a person with a very dark tan who must appear with someone with rather light, pallid skin, it will probably be desirable to bring the two subjects closer together in their tonal values.

The dark tan can be lightened by selecting a base shade one to two gradations lighter than the subject's normal skin shade. Conversely, the light-skinned subject can be toned down by the use of a base one to two shades darker than his normal skin shade. However, exceeding two shades of correction in either direction for the make-up base is not recommended.

The degree of control which can be provided should be more than enough to avoid the rather disturbing contrast which can result when the television system tries to cope with great differences in skin tone in the same picture. Keep in mind, however, that these differences will be expected when blacks or dark-skinned people appear in the picture. In such cases you generally only need to use a make-up base which matches their skin coloration.

Often with a deeply-tanned person it is necessary to even out the coloration around the eyes or bridge of the nose by mixing the base in these areas with a touch of rouge. Other evidences of an uneven tan, such as the halter strap marks over the shoulders of a woman, can also be "filled in" when applying the make-up base.

As previously mentioned, men's beards (even right after shaving) can be a particularly noticeable problem. This problem can be reduced or eliminated by a subtle blending in of foundation in the beard areas.

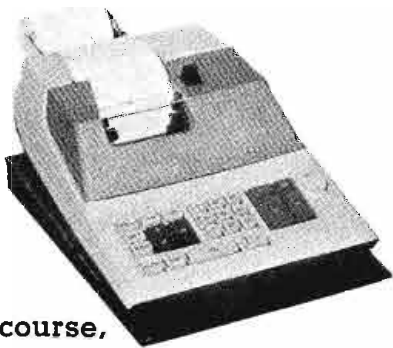
Since few faces are "perfect," it may be necessary to "play down" undesirable facial features or to emphasize stronger elements through the careful use of contouring and highlighting.

When using make-up in this way there is a basic rule: dark shading slims; light shading widens. So, for instance, if you want to make a wide nose appear narrower, you would shade the sides with a make-up a deeper shade than your foundation. High foreheads can be shortened by carefully applying make-up several shades darker than usual from the hairline to the middle of the forehead. Contouring also can help achieve that classic jaw line which most women wish they had. Use a darker base shade and apply the make-up underneath

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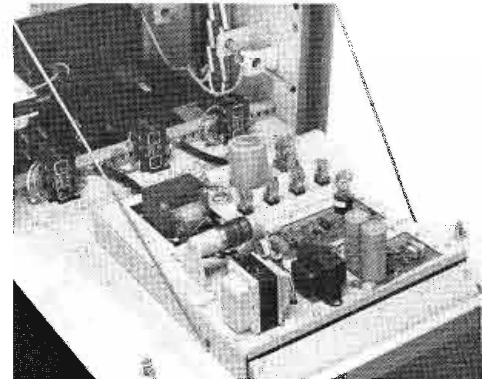
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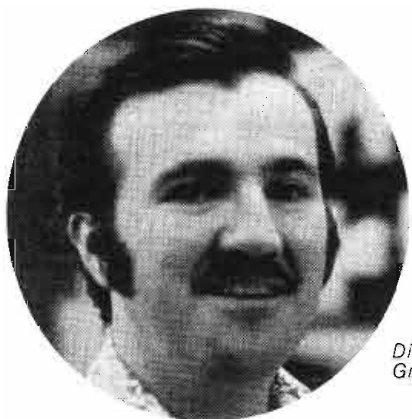
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Best Face Forward (Continued)

the chin line, bringing it up to the earlobe and into the hollows of the cheek (Figure 2).

Contouring and highlighting can be done before applying the foundation (see photos) or after the base is on. In all cases, gently but thoroughly blend the shading together to achieve the desired subtle coloration and contour. Some make-up artists prefer using a tawny blusher for contouring. The "toned down" areas will tend to recede into the brighter areas of the face, since the visual emphasis will be held by the lighter shades.

"Shadowy" areas under the eyes, around the nostrils and under the lower lip may need to be selectively lightened by either using base material one to three shades lighter than normal or by using a translucent white highlighter manufactured especially for this purpose.

Color can be added to the cheeks by mixing a very light trace of rouge in with the existing base make-up. A soft sponge can be used to apply the rouge, blending the color on the cheekbones below the center of the eye up to the hairline (Figure 4). As with lipstick, make sure that the rouge selected does not contain a blue hue. Rouge is appropriate for both men and women to add subtle color to the cheeks.

When the application of the base is completed, it may be necessary to use a light application of translucent powder to dull down facial sheen. This can be done with a powder puff or with a soft, bristled brush. Depending upon the individual circumstances and the effect desired, oil-based make-up will generally require the use of powder and water-based make-up will not. **Do not try to remove all traces of facial sheen, however, since this will appear unnatural. This is especially true for men.**

The Eyes

At this point, attention can be turned to the eyes. Eyebrows should be brushed with a clean eyebrow brush and plucked of any stray or unruly hairs. Though bushy eyebrows may be acceptable for men (a la Pierre Salinger) women should carefully shape their brows into a gentle arch which tapers off at the ends. An eyebrow pencil of an

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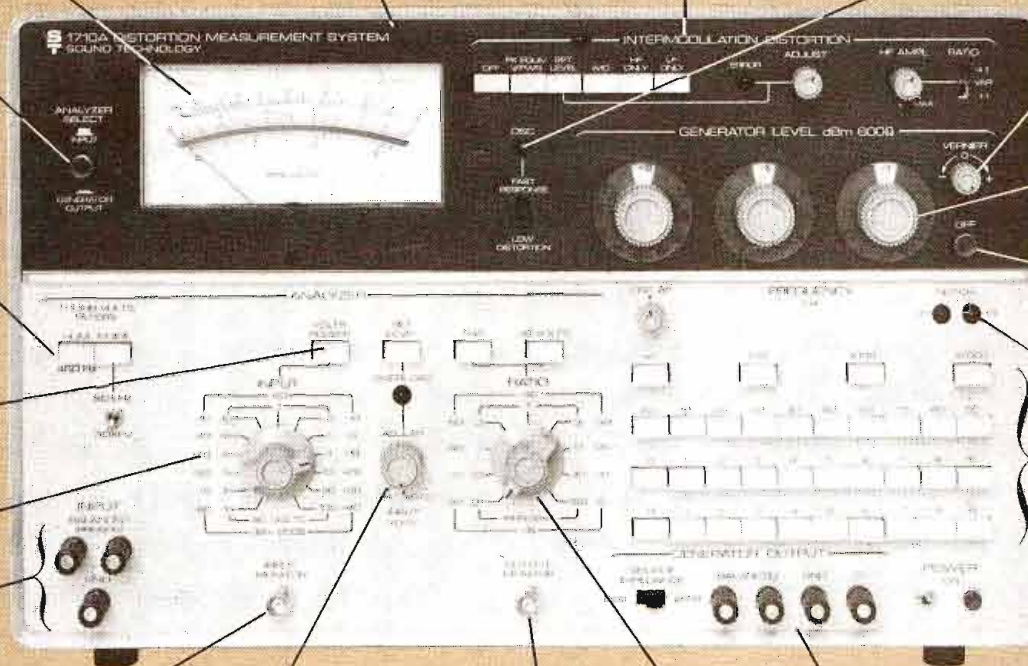
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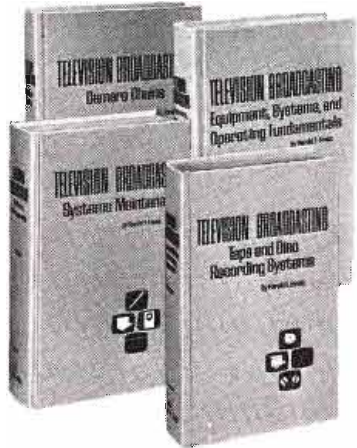
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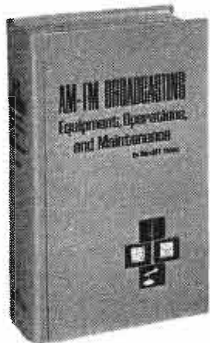
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Best Face Forward (Continued)

appropriate shade may be used to fill in or reshape the eyebrows using fine delicate strokes.

For women, a touch of eyeshadow is generally desirable. The dry powder or cake form of eyeshadow is preferred over the cream type, since it lends itself to easier and more subtle blending and holds up better under hot studio lights. Whether a woman's eyeshadow should match her eyes, clothes or neither is a fashion opinion which sometimes varies from season to season. Whatever the color choice, it should be subtle. A darker shade of the same color used on the eyelids (or a soft brown shade) can be lightly brushed into the lid crease to add depth and size to the eye. Women with heavy-lidded eyes should avoid this last technique since it will probably emphasize their problem. A dot of ivory or pale yellow eyeshadow smoothed under the brow bone will lighten and "open" the eyes (Figure 5). Eyeliner can be applied close to the top lashes using either a soft, fine brush or a sharp eyebrow pencil.

An eyelash curler and a light application of mascara will accent eyelashes. Excess "clumps" of mascara should be removed afterwards with a few upward strokes of a clean brush. False eyelashes also can be used, but they should be carefully trimmed to fit the individual's eyes.

The Lips

Another aspect of particular importance to women is the proper selection of lipstick. **Some types of lipstick not designed for film or television have a latent blue hue, which can take on a decided purple appearance when televised. Orange shades should also be avoided since they may give teeth a yellowish cast.** A pure red hue which will harmonize with the skin coloration and wardrobe is best.

Before applying lipstick, lips should be outlined by using either a lipstick brush or a lip pencil (Figure 6). If the lips are well-proportioned, this serves to accentuate them. But lip outlining can also be used as a corrective technique. People with either overly thin or full lips can improve their lip line by first covering their lips with their

base make-up and then drawing or outlining a more desired shape. A lip brush should also be used to give color to the entire lip. It is important that the tiny lip lines are completely filled in. After the application of lipstick, blot the lips with a tissue to avoid an unnatural shine. **Lip gloss should not be used for television work.**

Although lipstick is not generally used on men, it is sometimes appropriate to add a touch of a natural-colored lipstick to smooth out a possible line between the lips and the beginning of the base make-up. A brown shade of lipstick applied with a brush is recommended.

Hands, Ears And Teeth

If hands are to appear on camera, such as when products are demonstrated through closeup pictures, special care must be taken in their appearance. Nails should be well manicured. Clear or colored fingernail polish can be used. An appropriate shade of make-up base applied to the hands will both insure that they match other parts of the body which have been made up and help to minimize wrinkles and variations in color. **The appearance of the hands should be carefully checked on a TV monitor prior to a production. Sometimes extreme closeups will reveal make-up flaws which are not normally visible.**

Ears can be a special problem, since they are normally slightly lighter and redder than adjacent skin tones. Added to this problem is the fact that back lights will often shine through ears to some limited degree, further raising their tonal value. To control this and bring ears back to their proper tonal perspective, they should be covered with a base make-up which is two or three shades darker than the face. The make-up base should then be covered with a translucent face powder.

Bad teeth can be minimized by the application of an appropriate shade of tooth enamel or dentine fluid. Special coverings are available for this purpose.

Blacks And Dark-Skinned Nationalities

Black women and women of
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Best Face Forward (Continued)

other dark-skinned nationalities will find that their make-up needs are not greatly different from what has already been outlined. Appropriate shades of make-up are available for most of the darker skin tones; however, it may be necessary to do slightly more in the way of blending of different make-up shades to arrive at the tone needed. Generally speaking, make-up with dark-skinned people should be applied more sparingly than with light-skinned subjects.

Black males and males of dark-skinned nationalities may not need make-up at all, since they often photograph quite well without it. Problems can arise, however, with very dark-skinned black males who do not exhibit a natural skin sheen, since the tonal reflectance level can drop so low that a loss of form and dimension will result. Consequently, it is desirable to preserve these natural highlights, and in some cases even accent them through the use of baby oil or glycerine.

Generally speaking, children of

all nationalities will photograph very well without make-up. Occasionally, it may be desirable to apply a base color very sparingly and finish it off with a translucent face powder. Subtle applications of cheek color and lipstick may also be used in certain situations. **However, the rule with children and make-up is: "If in doubt, don't."**

Removal Of Make-Up

Women may prefer to leave their make-up on when they leave the studio. (Contrary to the case with stage make-up, it should be so subtle and natural looking that there would be no need to remove it.) Men, being a bit more sensitive to the wearing of make-up, will probably want it removed.

All make-up should be removed using a cleansing cream or lotion. The application of a mild astringent for women or after-shave lotion for men should leave the skin with a natural feeling.

General Considerations

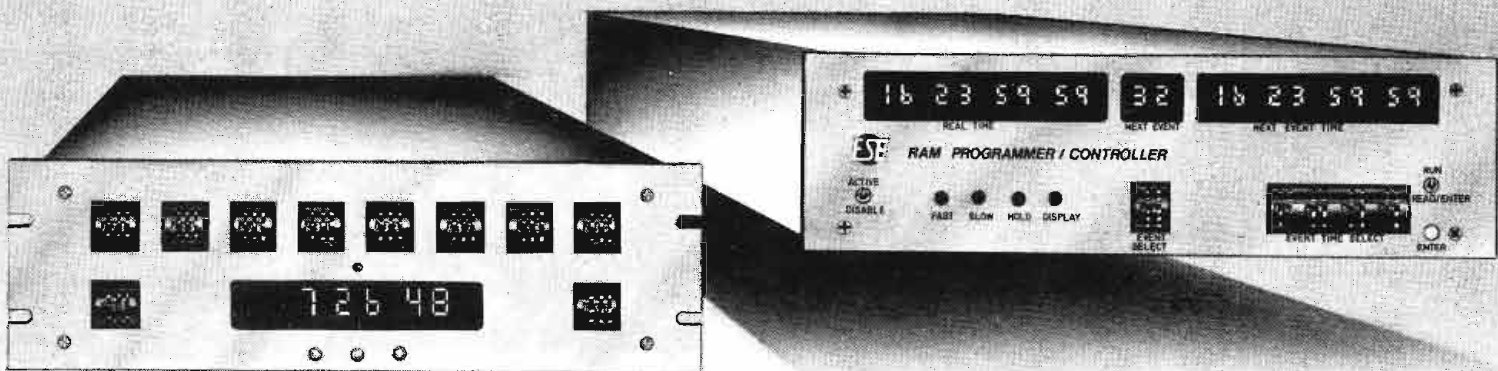
A general rule in the application of make-up is, "Better too little

than too much." As illustrated in Figures 1 and 7, make-up can result in a definite (but subtle) change in appearance. However, make-up also can look very bad if improperly or excessively used.

Since base make-up should be extended right to the fabric line of shirts, blouses, and other wearing apparel, traces of the make-up can easily rub off on clothing. There is no practical solution to this problem other than to be aware of it and frequently clean clothing worn with this make-up. Dark-skinned subjects wearing dark make-up will find this a particular problem, since their make-up can easily be seen on light clothing. Appropriate care must be taken, not only when applying the make-up, but at all times when it is being worn.

Finally, all make-up should be checked "on camera" to insure that some minor point has not been missed or that the television process is not introducing some unexpected effect. Even the experts in make-up are occasionally surprised to find an effect somewhat different than they expected. □

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You've got to have room for CREATIVITY

By E. Carlton Winckler, Imero Fiorentino Associates, NY City.

As a participant in the Art of Lighting—one of many years standing at that—I have no hesitation at all in agreeing that “Lighting Directors are true geniuses capable of coping with all visual problems, no matter how complex”.

The statement I'm agreeing with here was made by a producer to his lighting man when he said, “You always know all the answers—so go fix it—and hurry up!” (Was his tone of voice a bit odd at the time?)

All kidding aside, a competent and well-trained Lighting Director can usually determine the steps necessary to correct a visual problem, even one he may not be responsible for, in television, film work, theatrical or display situations. But even the most skilled and inventive men do need a reasonable selection of lighting equipment and, of course, something to hang it on before they can demonstrate their talents.

To those not actually involved, lighting always looks very simple—when it is finished! It may, in all truth, not take long for a Lighting Director to picture in his mind the finished composition he wants to create, and then work backward from the mental picture to the selection and placement of the lighting units needed to activate the effect. But—hanging, connecting and focusing the luminaires involves **much** physical labor and that takes time. In fact, properly lighting a relatively simple set for television can readily consume two or even three hours. Inadequate time and undue pressure to hurry,

always results in less than an ideal effect.

As a footnote here, it might be pointed out that in non-broadcast television scheduling, less than adequate time for lighting is most unwise, especially when setting and backgrounds tend to be minimal and the role of lighting in picture composition assumes extra proportions.

Good lighting design is an art in the manner of painting, sculpture, and music. Like those other arts, there is considerable mechanical technique involved in its preparation, execution and performance.

The location of a light source in relation to the subject to be illuminated has a key bearing on the effect produced, so does the angle of its projection and the magnitude of its beam. Precisely positioning this source usually involves either temporary or permanent manipulation of its anchorage. A compromise in position or angle naturally results in a compromise result.

Why Compromise?

If position means so much, why on earth should major compromises be necessary? You see, Lighting, being a relative newcomer to the art level, is not yet properly appreciated, so, far too many entrepreneurs do not include its planning early enough in a project's preparatory stages. In fact, lighting is very often an “after thought”—to be inserted between already formalized concepts of other components!

For the most part, there is little choice in the placement of a light unit, since the beam it generates travels in an uncompromising straight line from the source to the subject. Therefore, when a lighting director is expected to “bend” light beams around obstructions so the unit can be put in an out-of-the-way spot otherwise unused—well, as I said, Lighting Directors are good, but not **that** good!

So, if light is wanted, space is required—and in the right place. However, space is not something you can just add to a studio whenever the lighting director says he needs it for a particular job. Space requirements for lighting should be a basic part of the original planning. Sometimes, an existing studio facility can be redesigned to provide more practical use of each area and result in more “working space”, but it is easier to provide it the first time around.

Architects of television studios are faced with a multitude of difficult problems: the many and often confusing demands from consultants and production people, the existing space limitations, air conditioning, sound isolating and electrical distribution needs. The most capable architect, without the background in video, can be thoroughly confused and sometimes forced to make arbitrary decisions to meet construction deadlines. These innocent decisions can later prove enormously costly and extremely restrictive. There is little

Continued...

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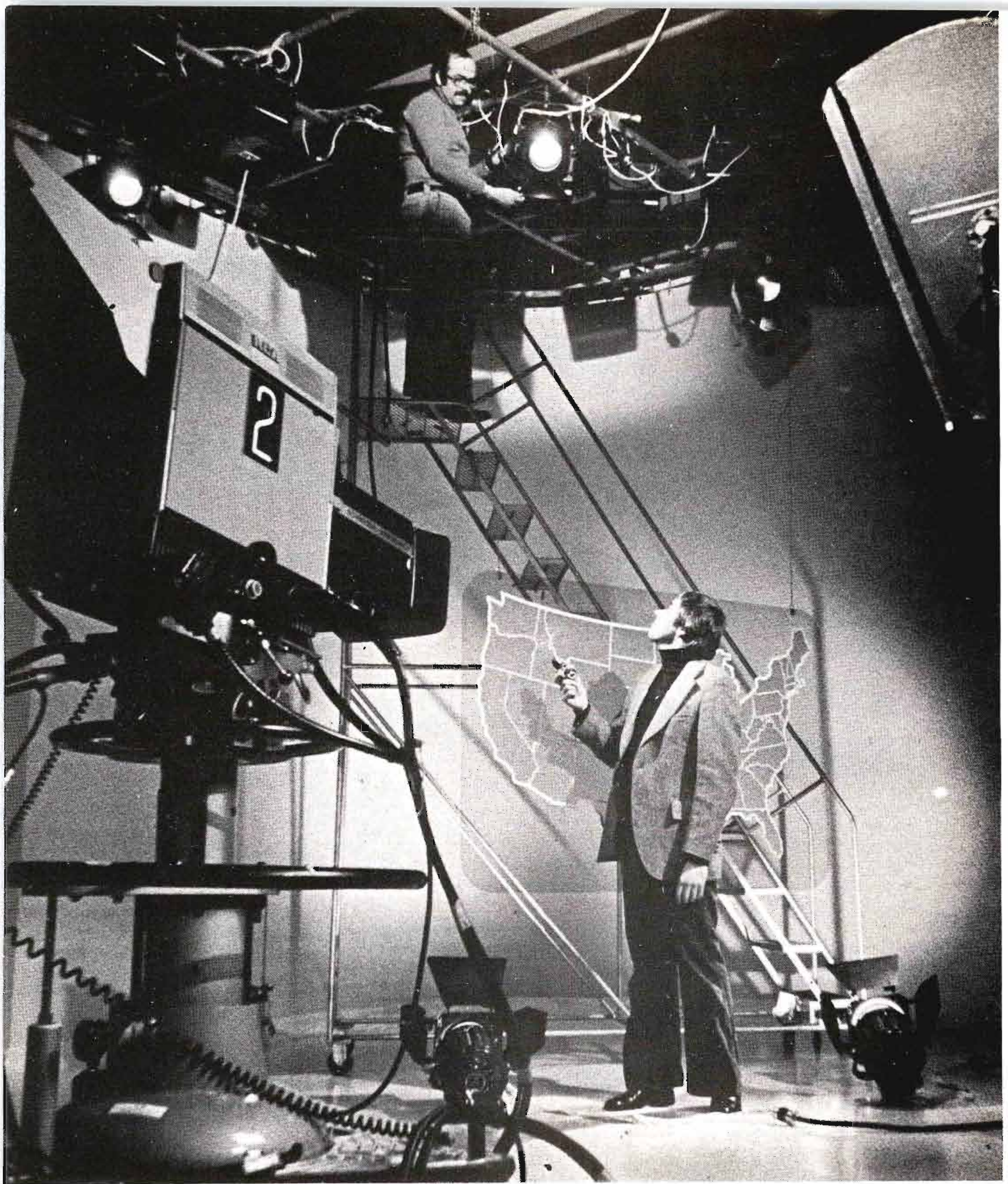
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Imero Fiorentino Associates' lighting director Richard Weiss calls for final adjustments before video-taping. Imero Fiorentino Associates handled the lighting arrangements for the 1976 presidential debates. (Photo by David Clark)

Creativity

(Continued)

doubt that the best of architects should always have a television consultant, thoroughly experienced in both studio design and production

operation, to work with them.

The important qualifying note here is the broad experience of the TV consultant—remember, anyone can have business cards printed saying "Consultant", so it wise to check the operating effectiveness of

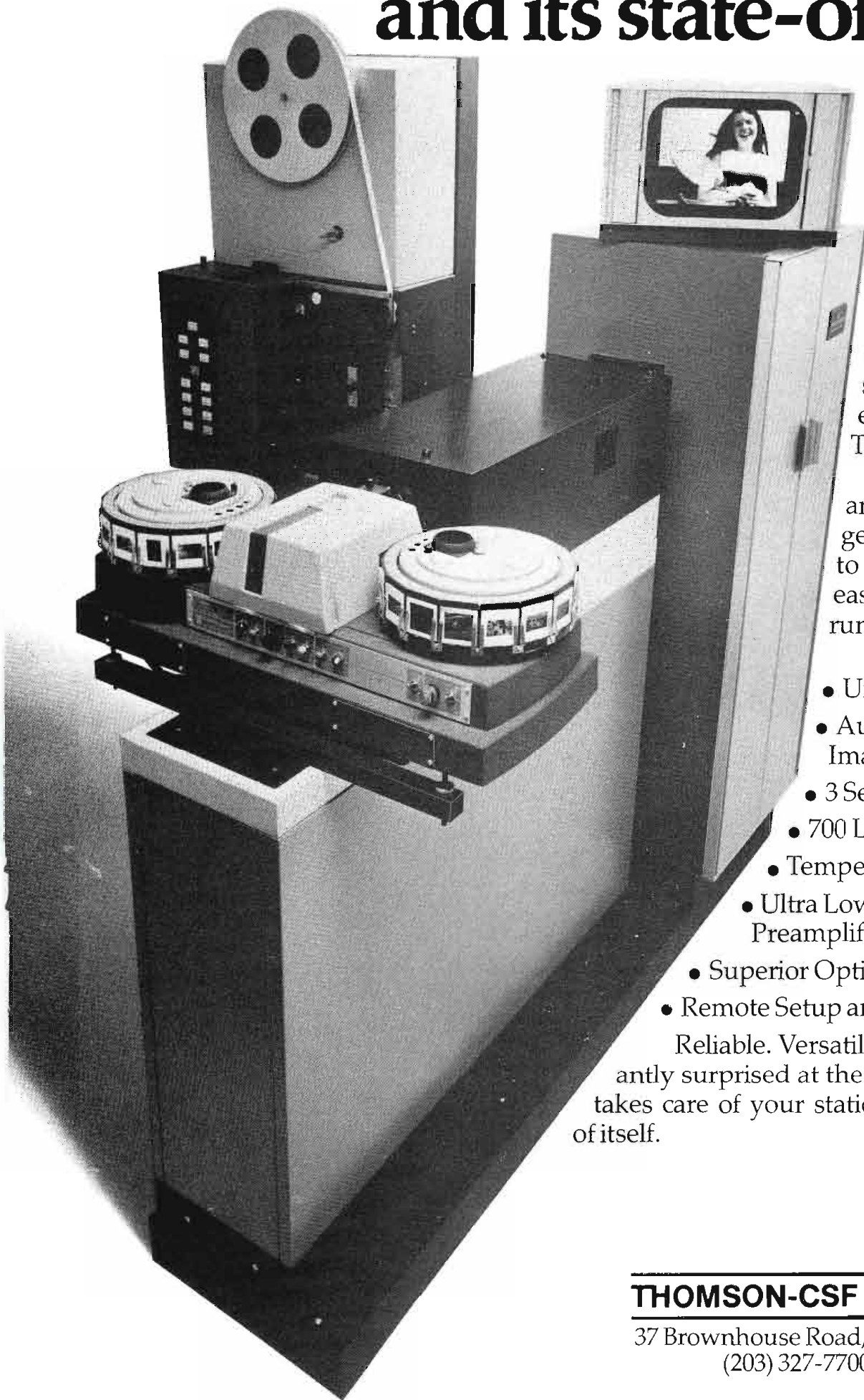
his previous associations before making a selection for this important service.

Space Problems

In most cases the space problems

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Imero Fiorentino adjusts a floor stand-mounted light. See text for floor light considerations.

Creativity

(Continued)

which inhibit the Lighting Director are related to the grid structure erected over the studio area to support the lighting units. A grid less than ten feet above the floor

causes many problems with projection angles of the light, but the most serious part of the dilemma is really plain head room. **Luminaires usually hang down two or more feet below the grid and become a physical hazard for tall people—and also tend to cause lens flares.**

Therefore, twelve to fifteen foot grid heights are certainly more desirable.

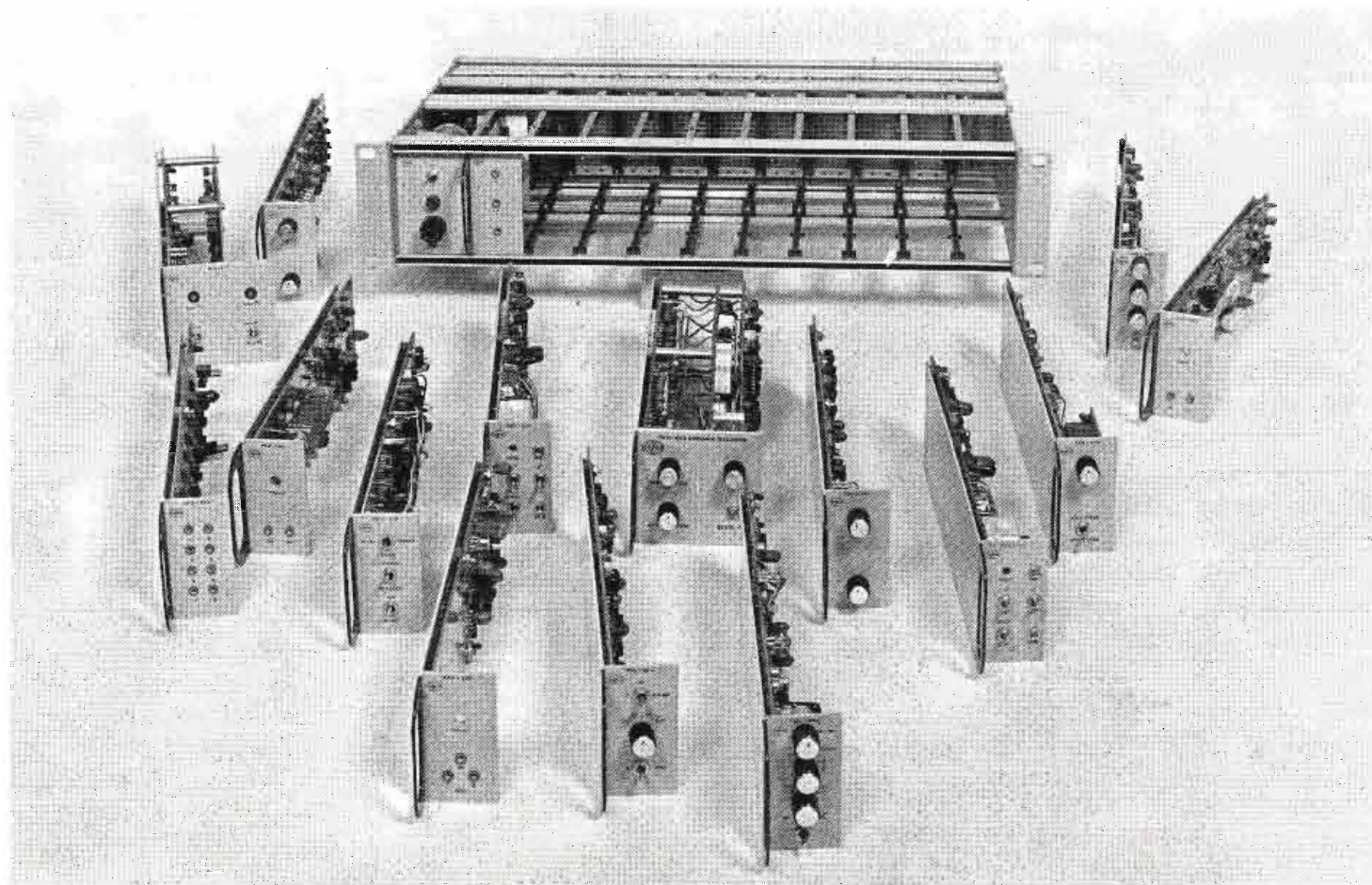
In planning for flexible mounting arrangements for luminaires, we must bear in mind that in order for a unit to project its beam at the

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Creativity

(Continued)

most effective angle for the subject, we must be able to move the light forward or back, left or right, up or down. Most television studios are equipped with some type of lighting grid—usually 1½-inch pipes crossing at 4- or 5-foot intervals, unistrut in similar patterns, or pipe battens which can be raised or lowered on counterweighted lines or winch arrangements. All are equally good, but rarely is a pipe, bar or batten in the exact place the Lighting Director wants to hang his light. (It is not that Lighting Directors are deliberately cantankerous—the projection angle is important, honest!)

If the studio has a grid, it is incomplete without “wild pipes”—peices of the right length to go between existing grid bars, and having a clamp device at each end. This “wild pipe” can then fasten anywhere inside a grid rectangle to meet the forward and back, or left to right moves. However, there must be jumper cables on hand, to extend the fixed power outlets on the permanent grid to reach the luminaire in its portable location. You would be surprised how ineffective a luminaire can be if you can't light it! Yet, so many otherwise well-equipped studios do not have jumper cables available.

Vertical Flexibility

More important, perhaps, than freedom of varied horizontal movement is up and down position flexibility. This directly controls the positioning of shadows in relation to, or even on, the subject. And this control of shadows is one of the very basics of the lighting art. There are two general approaches to vertical light adjustment, which, in spite of its paramount importance, is usually neglected. One is to mount the luminaire on a commercial scissors pantograph, the other is mounting on fixed or sliding rod extensions.

For those not acquainted with the gadget, a slide rod hanger provides a clamp for attachment to grid bar and has another clamp device which allows a vertical rod to slide through it upward or downward until a stop is adjusted to fix the rod in a firm position. The lumi-

naire, attached to the lower end of the rod, may therefore be set solidly at any height within the travel range of the slider. While the adjustable slide rod hanger is preferred because of its capability for rigid positioning and lower cost as compared to a pantograph, it does require space above the grid equal to the desired maximum extension below the grid. Unfortunately, space planning has too often been negligent, and the grid is hung inches below the ceiling. In this restricted situation a stock of varied length extension pipes, each with hanging clamp for attachment to the grid bar and a stirrup which the luminaire clamp may engage, is still preferable to the pantograph which takes space below the grid for itself and is unstable in any position.

Extension Hangers

Even with flying battens, extension hangers are desirable, for the batten usually supports several luminaires used for assorted purposes, each of which may be most effective at different heights. Some lighting grid structures also support the cyclorama track—which is quite alright, as this arrangement assures some kind of support for backlights. Settings often require backlights to be placed over, or at least very close to the “cyc”. However, the grid is often designed to fit inside the cyc track, and consequently the backlight may be forced too far “downstage” (toward normal camera locations), resulting in loss of useable stage space or backlighting projected at so steep an angle as to be visually useless. Gerry rigged extensions can be devised to move the light units back where they should be, and as backlights are almost always desirable, inventive thought should be devoted to finding a practical arrangement for their effective positioning.

Cyc Lighting

As long as I've mentioned the cyclorama, I'd like to point out that its lighting requires a bit of attention too. The expression “washing the cyc with light” is popular but not really very meaningful. Hanging strip lights, broads or scoops more or less against the

top of the cyc and aiming them downward for a wash, sounds right, but achieves little. To effectively light the cyc or any background, the lights should be at least three feet “downstage” from the surface so that the beams or fields of light have a chance to spread and bend to illuminate it somewhat evenly. The farther downstage you can bring these illuminators, the more evenly your cyclorama will be covered. Cycles over 10 or 12 feet may require more than one row of luminaires, with the added rows focused to fill in different levels of the surface.

For real “quickie” jobs, producers often ask the Lighting Director to do the whole job, or at least most of it, with lights mounted on floor stands. This is possible (with some compromises), if the area is not too large and camera movement is sharply restricted. But many attempts at using floor stands have convinced me that people are basically clumsy and if given the chance, will bump into any stand light—thereby moving it off target just enough to require a “stop-tape”. This type of minor catastrophe points out the importance of the Lighting Director as the only man who knows where the displaced beam belongs—but it sure isn't good for the program in progress.

I suppose that making quick decisions is an American trait, and that must be the reason executives and architects often plan or approve vital construction without more knowledgeable sources. It also seems to me that entrepreneurs of television take pride (for some reason) in doing things the hard way! But television has opened up so many new approaches that perhaps we could really turn over a new leaf and actually give some thought to (a) providing adequate space to permit lighting equipment to be both effective and efficient, (b) providing supports for this equipment, and (c) (a long shot, of course) scheduling time for the Lighting Director to do his job well. If we could reach this happy plateau we might find ourselves both pleased and proud of the results—and of course, the Lighting Director wouldn't have to work so hard to retain his reputation for genius! □



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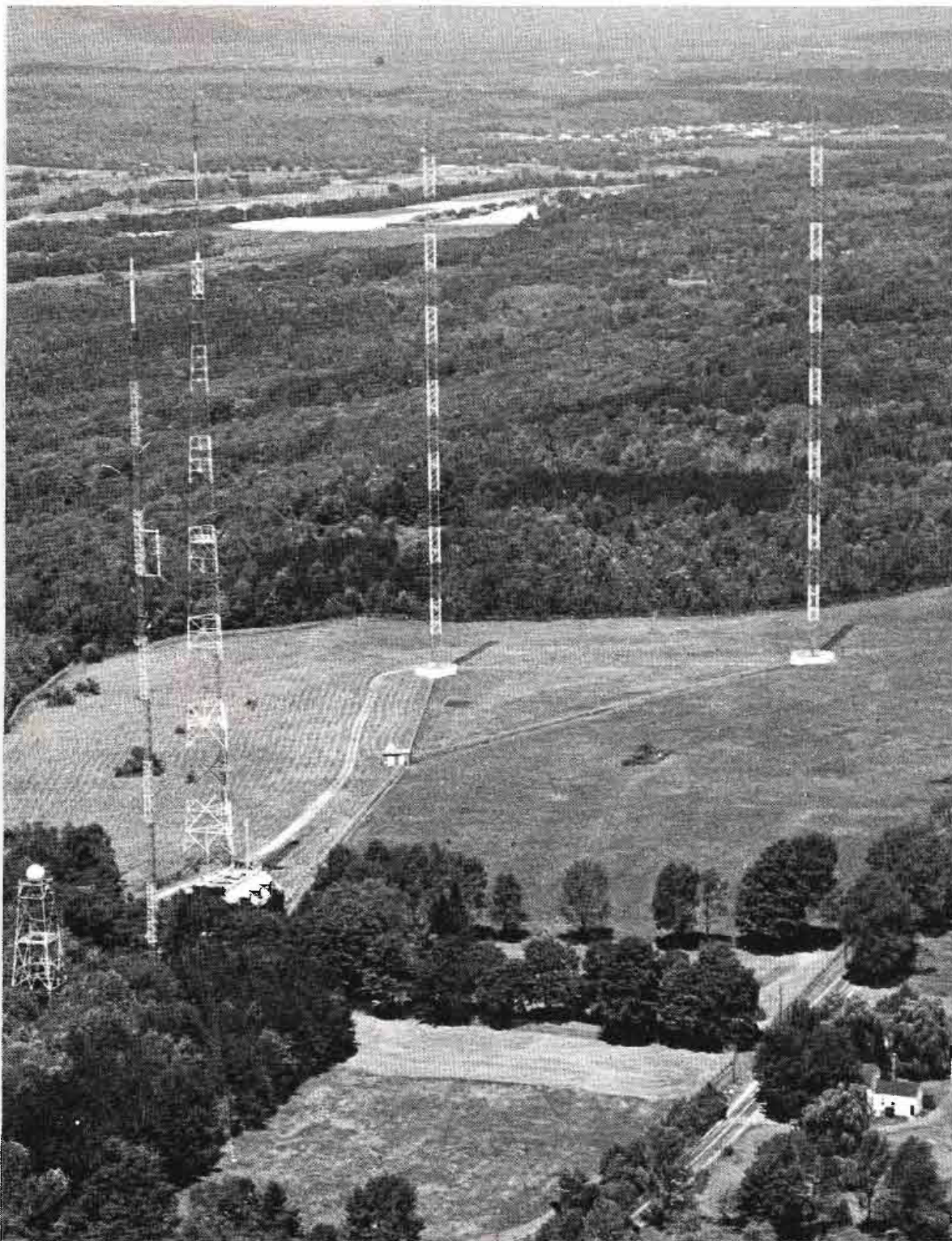
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DIRECTIONAL ANTENNA DESIGN

Part 1 of a series/By Robert A. Jones, Consulting Engineer, La Grange, Ill.



The background two-tower is WTIC-AM. Other antennas and towers are for WWUH-FM, WEDH-TV, WTIC-FM, and WFSB-TV.

To many station operators, the directional antenna is still a mystery. In some circles it's even passed off as a black art!

In order to change this sad state of affairs, we will put a major effort into the editorial pages of **Broadcast Engineering** on the design and operation of directional antenna systems. We'll start out with the basics, and go from there to progressively sophisticated systems. This series will continue in most issues of **BE** this year.

Basic Design Considerations

Any single vertical tower will radiate an equal amount of signal in all directions. For all practical purposes we assume this to be a perfect circular pattern. With the addition of a second vertical tower, inserted into the field radiated by the first tower, the pattern of this first tower will no longer be circular. In other words, our non-directional pattern has been destroyed! Depending upon the electrical height, physical spacing, and current induced in this second antenna, the original circular pattern may be offset, elongated, or even approximate a figure-eight pattern shape.

Sometimes a station ends up with an unwanted directional pattern, when it had hoped for a circular one. This occurs when a non-directional antenna is erected too close to a reflecting object, such as a water tank, a hi-line tower, a metal smoke stack, or a structure capable of re-radiating a broadcast signal. When this second object is

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Antenna Design

(Continued)

“unwanted”, a station has no practical control over its effects, nor can it use the object to achieve any particular desired pattern. Obviously, the best type (and from FCC’s viewpoint, the only kind they will license) is one where each element of the directional system is **controlled**.

The earliest known directional antenna licensed by the FCC was in about 1935 to stations WSUN, St. Petersburg, Florida; and WTMJ, Milwaukee, Wisconsin. Prior to this time all AM stations were considered non-directional, or at least no deliberate efforts had been made

to generate anything other than a circular pattern. Some early stations, particularly those employing “flat top” antennas, noted a directional effect to their coverage. In some cases this was due to the metal supporting towers. However, in the case of WSUN and WTMJ, each station erected two towers and purposely restricted its nighttime pattern in the direction of the other.

These early efforts were successful, and the next few years saw a rapid increase in the use of DA’s, both nighttime and daytime. According to recent FCC station lists, there are at least 1,502 stations utilizing DA’s in the United States today.

Design Factors

Three factors can determine the radiation pattern of any basic daytime pattern. These are electrical spacing between the towers, the amplitude of the tower currents in each element; and the phase angle in degrees between the currents in each element. Once an antenna system has been constructed, the electrical spacing is, of course, fixed. Thus the only variables a station has at that point are currents, and phase angles. By manipulating these parameters, the design engineer can achieve almost any pattern, in addition to the one he desires.

For the purpose of design, it is assumed that each tower, plus its associated ground system, acts as an individual antenna system and radiates its own signal equally in all directions. This is an important fact to remember. Each and every antenna in any directional antenna system is assumed to radiate a perfect circle.

How is it possible to achieve any specific pattern, if all a station ever gets from any tower is a perfectly radiated circle? The trick really comes in knowing how to combine these circles, both as to relative size and as to time-phase relationships. In examples where equal height of towers are used, the relative size of these circles is directly proportionate to the ratio between the individual base currents. Hence, if a station has twice the base current in one tower than in the other, the radius of the individual circles will be on a ratio of two to one.

Special Considerations

The ground system of each tower should be equal, from a design standpoint. If they are not, this could result in some non-circular radiation from any given tower. For example, if one tower has fewer ground radials in a given direction, than other towers in the system, the radiation from that tower in that direction may be impaired due to increased ground losses on that side of the tower.

Another consideration is the antenna ground system that has individual ground wires of one tower overlapping those from an adjacent tower. If the tower spacing is such that radials overlap, each ground

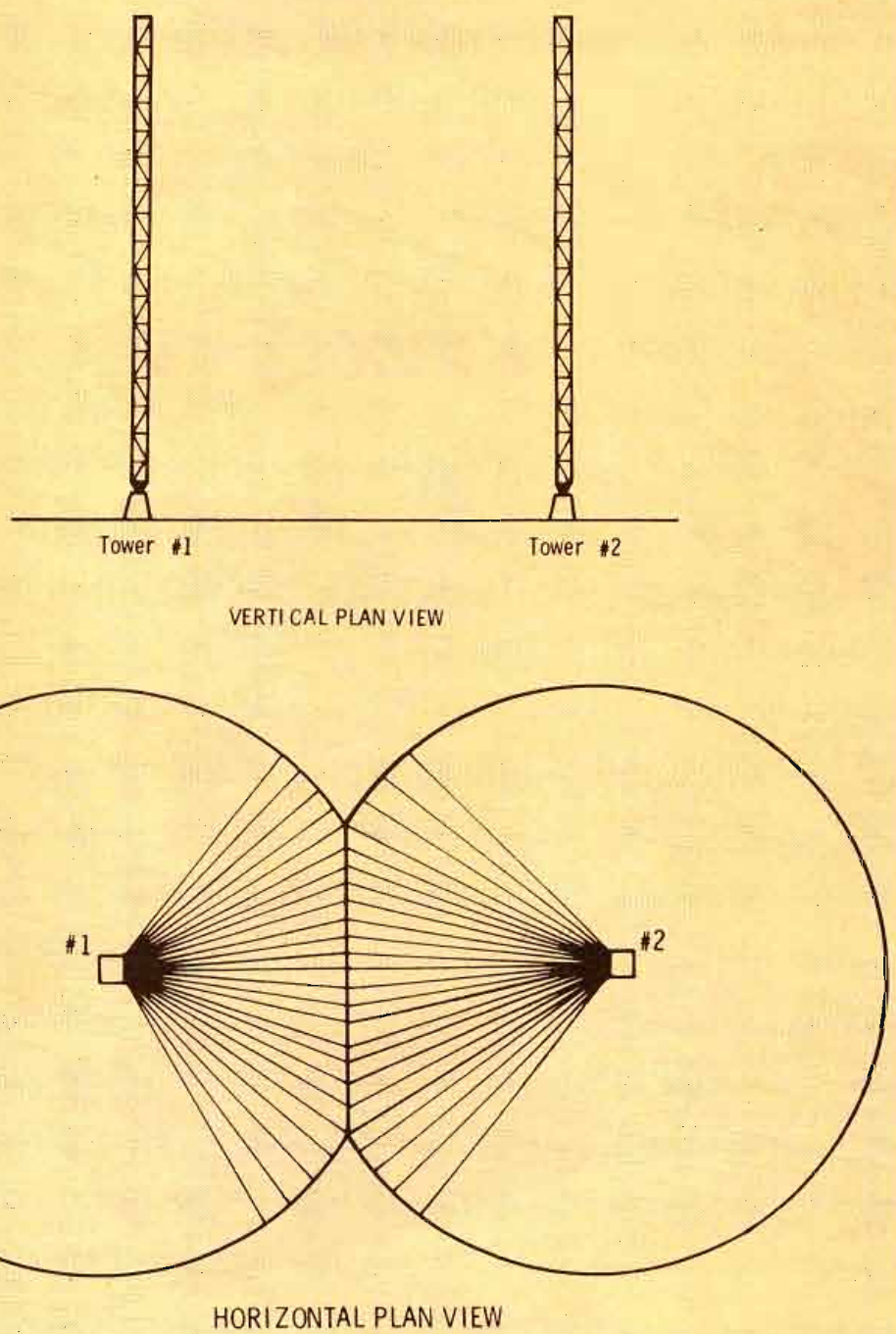


Figure 1 The two tower system with a bird's eye view of the radial layout.

TABLE I
VERTICAL RADIATION CHARACTERISTICS

TOWER HEIGHT	90°	180°	225°	
VERTICAL ANGLE	0°	1.0000	1.0000	1.0000
	10°	.9781	.9418	.9011
	20°	.9143	.7855	.6450
	30°	.8165	.5774	.3291
	40°	.6946	.3696	.0529
	50°	.5591	.2008	-.1248
	60°	.4178	.0873	-.1924
	70°	.2766	.0261	-.1733
	80°	.1377	.0033	-.0993
	90°	0	0	0

wire must be terminated where it meets another and the ends bonded together. The reason for bonding is to eliminate any high resistance joints that can cause power losses in the ground return path. Bonding also eliminates the possibility of corroded joints which could cause cross modulation or harmonic signals.

Two-Tower DA's

Figure 1 shows the simplest and most common type of directional antenna, the two-tower pattern. As a beginning point, let's say these two towers are of equal height, and each has a full and complete ground system. For the first "basic" approach, assume each tower has an equal amount of current flowing in it, and that each tower receives its RF energy at the same identical instant. That is zero time phase difference.

Figure 2 shows what will happen under these conditions as only the physical spacing, or distance, between the respective towers is changed. The pattern to the upper left is for one-quarter wavelength spacing. The next is for three-eighths, the next for one-half; and the pattern to the right is for one full wavelength spacing. By varying only the spacing, and holding currents and phase angles constant, the station ends up with several widely varying patterns.

Now let's use the approach of holding the spacing fixed, at one-quarter wavelength, holding the

individual tower currents equal, but this time varying the phase angle relationship. Figure 3 shows how this one parameter can produce widely varying shapes. The last parameter is shown in Figure 4, as it is varied. In this last case the spacing was held constant at one-quarter wavelength; the phase angle was held constant at 135°; and the current ratio was then varied. The

effects of equal currents in both towers, and where the currents are 2:3 and 2:1 are shown.

In these examples I have varied each of the three basic design parameters separately to show how each can, in and of itself, create directional patterns. In proceeding to the design of a particular pattern shape, the design engineer may choose to use one, two, or all three of these basic factors in combination. In Part II of this series, I will go into detail on how this is accomplished. But first let's complete a basic understanding of the fundamentals of directional antenna patterns.

Other Factors

The first and most obvious of these other design factors is, of course, the amount of power to be fed to this directional antenna pattern. While I don't consider this one of the "big-three" factors, it is an important consideration in any pattern design. In some cases as a design engineer proceeds with a particular allocation study, where the use of a directional antenna is necessary, he finds that higher

Continued...

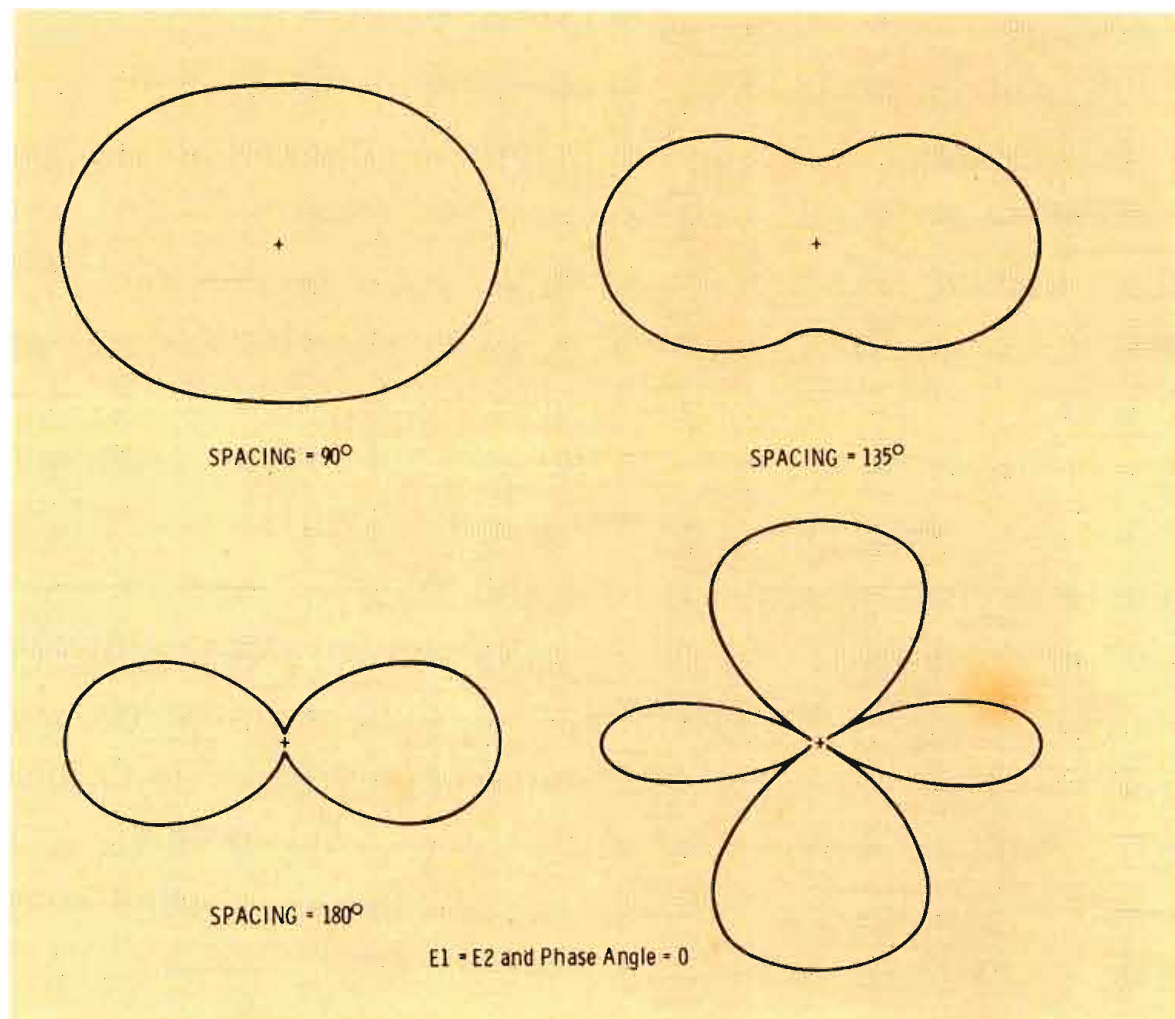


Figure 2 Patterns showing the variation in tower spacing.

Antenna Design

(Continued)

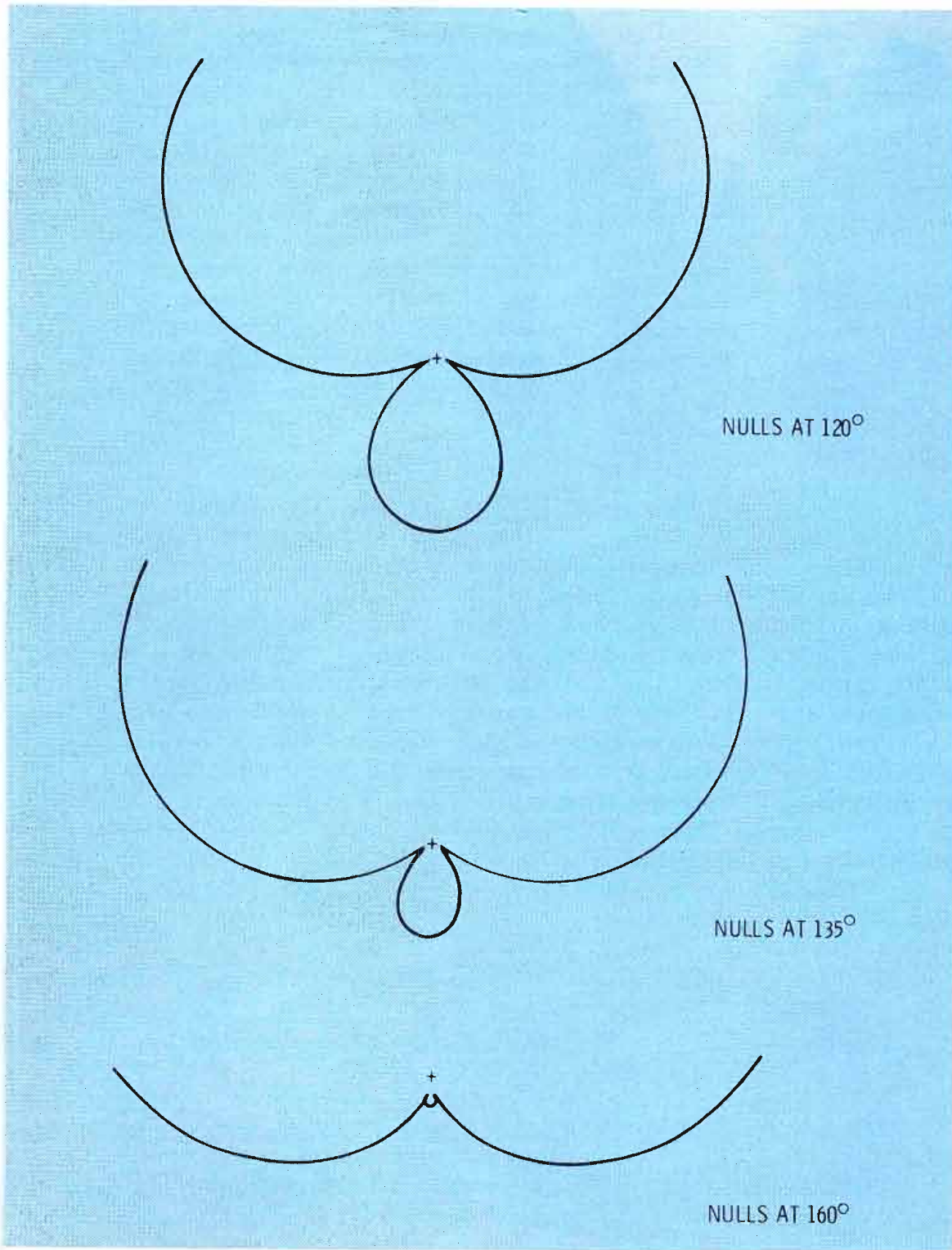


Figure 3 Patterns showing the variation in phase angles.

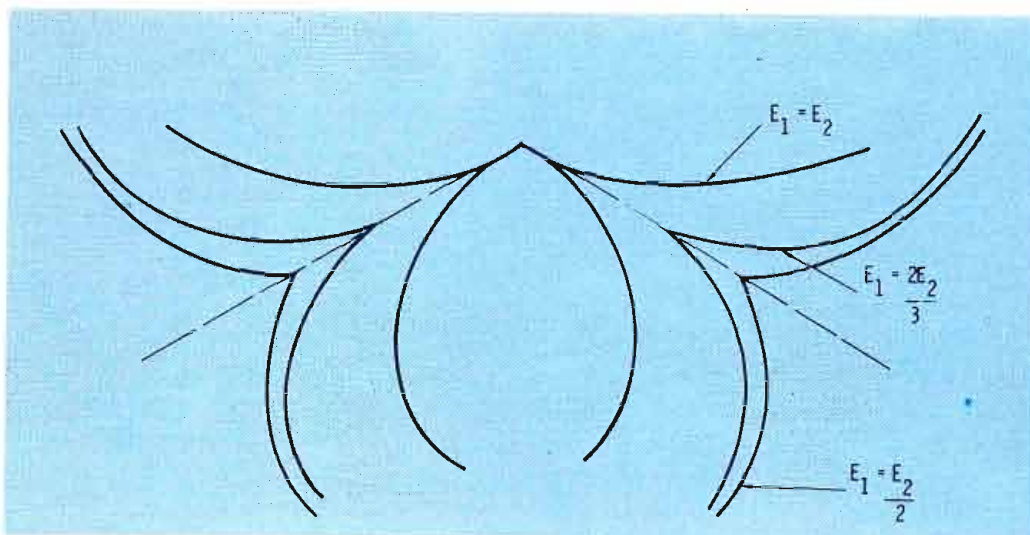


Figure 4 Patterns showing the variation in field ratios.

power can be used. In other cases he may discover that it will take one or two additional towers, to permit the power he is seeking. In this type of situation the design engineer is faced with an economic decision. More later on this point.

The second of these other factors is one of tower orientation. Up to now I have talked only about pattern shape. Obviously a station can point, or aim, a given pattern in any direction it chooses. In other words, it can use the same basic pattern and point it north, or south, or east, or any other direction it may want.

The term "Tower Line" is often used in connection with pattern orientation. By Tower Line, I mean the bearing or direction the row of towers points to. Some types of patterns have more than one tower line, i.e., a parallelogram or dog-leg configuration.

A third factor to consider is electrical tower height. While it is customary to construct most directionals with elements one-quarter wavelength in height, many may use either taller or shorter electrical height towers. The taller a tower is, the more efficient a radiator it will be, up to a height of five-eighths of a wavelength.

Figure 8, from Section 73.18 of the Rules, shows this relationship. For example a tower of 0.25 wavelength has for 1 kw of power an efficiency of 196 MV/M. But for this same power, a 0.50 wavelength tower has 237 MV/M. This is an increase of 41 MV/M over a quarter wavelength tower, yet the power is the same. A 0.625 wavelength tower's efficiency becomes 274 MV/M. This is almost a 50 percent increase in radiated signal, which in power ratio, corresponds to more than a doubling of the transmitter power. If a station desired the maximum efficiency from any given pattern, at any given power, it would use a 5/8 wavelength tower. However, economics may rule out this choice.

In the design of nighttime antenna patterns, note the signal energy radiated at elevation angles above the horizon. This is shown in the reproduction of FCC Figure 5. It shows that for different electrical tower heights, different vertical patterns exist. Keep in mind that these are the vertical patterns of

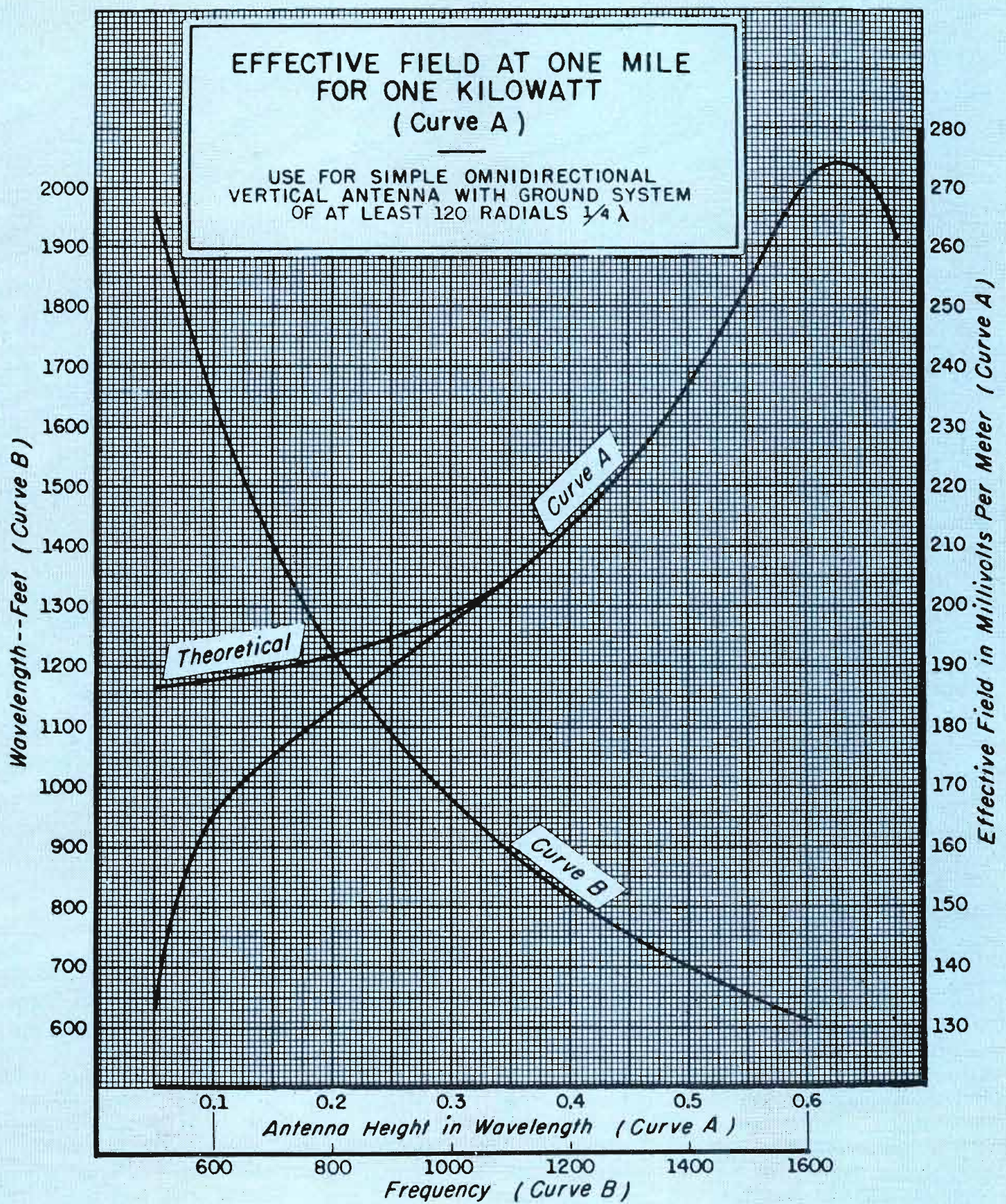


Figure 5 This is the FCC's Figure 8, 73:190.

single towers, not directional antennas! If several single towers are combined, as would be the case in a directional antenna, the vertical pattern of the combination might be quite different. This vertical effect is referred to as the "Vertical Form Factor" of a tower.

It should suffice to point out that by using different heights for the elements in a nighttime directional pattern, you can place vertical angle nulls at the elevation angle most suited to providing skywave protection to any given co-channel station.

Important Definitions

A common expression is "Radiation Resistance". This is the value computed at the point of current measurement. In most cases this is at the input of the tower. This can sometimes be referred to as "Base

Continued...

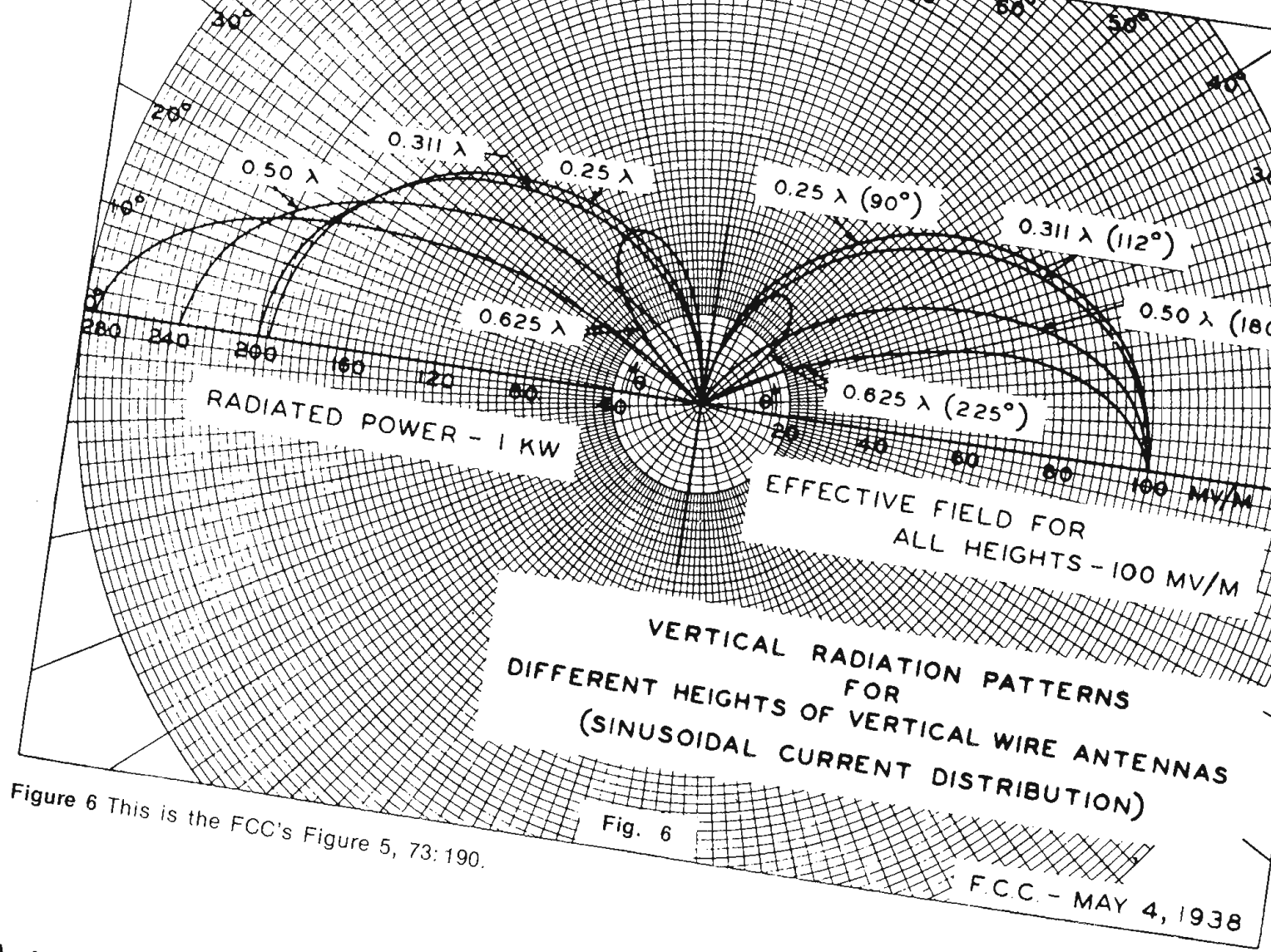


Figure 6 This is the FCC's Figure 5, 73:190.

Antenna Design (Continued)

"Radiation Resistance", also commonly used is the expression "Loop Radiation Resistance". This is defined as the resistance at the point of maximum current in the tower. Theoretically, this occurs at a distance one-quarter wavelength below the top of the tower. To compute the power in a tower, multiply the square of the RF current in amps at this radiation resistance point, times the resistance in ohms.

Another term is "Radiation Measurement Standards". In the comparison of antennas, the signal is measured in millivolts per meter at a distance of one mile. This standard of comparing antennas at one mile distance is used only that most engineers say "at one mile"—it is automatically understood. Thus "Measurement" means the length in MV/M at one mile will also refer to the point of radiation efficiency

expressed in millivolts per meter per amp. For every tower there is some finite value of radiated signal at one mile in MV/M that will exist when one amp of current flows in that tower at its Radiation Resistance Point. For example, a quarter wave tower is the one common reference is the one-quarter wave tower with 1 kw of power. This is generally recognized as a standard. A quarter wave tower will radiate, at 1 kw of power, a signal of 196 MV/M at one mile. Also, knowing that such a tower has a theoretical radiation resistance of 36.6 ohms, the following formula can be applied:

$$E = \frac{196 \text{ MV/M}}{\sqrt{\frac{1000 \text{ watts}}{36.6}}} = 37.4 \text{ MV/M/Amp.}$$

This you may recognize as simple ohms law, where

$$I = \frac{\text{Power}}{\sqrt{\text{Resistance}}}$$

In this case each amp of current flowing in this tower will generate a signal of 37.4 MV/M. With a base current of 2.0 amps, the signal would be 74.8 MV/M. Thus the field intensity radiated at one mile is "directly proportional" to the amount of current flowing in the antenna. This is an important consideration to keep in mind.

You often hear about "Antenna Resonance". In practice, the design engineer defines this as the condition which occurs when the Radiation Resistance is pure resistance. This resonance occurs between 0.22 and 0.23 wavelength. For towers of lower heights, the reactance is capacitive. For towers taller than resonance, the reactance is inductive. I won't define reactance, since I assume the reader knows the meaning of this term.

In Part II, next month, I'll guide you through the basic design of the simplest of directional antennas—the two tower

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How to go first class with RENG

By Peter Burk

As we discussed last month, Radio Electronic News Gathering (RENG) can mean much more to your station than voices and actualities for the news department. This month we'll show how you can put together a unit that serves the needs of news, sports and programming. The potential uses of RENG equipment are limited only by your imagination. Here are just a few of the possibilities:

Sports. You can cover all of your local games without ever having to worry about Ma Bell again. You'll have three times the audio bandwidth to boot, and you can do it without having to lug a bunch of heavy equipment up to the press box.

News. Day in and day out, your newsroom will benefit from an increase in the amount of live material used on the air. Even if the story doesn't warrant going live, you'll be able to get a high quality piece back to the newsroom in time for the next newscast.

Remotes. The sales department will love you for the minimal lead time you'll need to do a remote

broadcast. The PD won't have to worry about tune-out because of poor quality either. With the portable unit we'll discuss later, you'll be able to put your announcers right in the middle of the action.

Station Promotion. This one's double barreled. You can do sustaining remotes without having to justify line charges and if you dress up your remote unit, you have a traveling billboard to keep your call letters in everyone's mind.

Once you've made a commitment to RENG, outline the capabilities you need to accomplish your objectives. Every operation will differ to some extent from the one outlined here, but for the starting point consider these criteria that follow.

Low set-up time by non-technical people. Engineers shouldn't have to accompany newsmen or announcers on assignments. This means that the equipment should be set up in the remote unit all the time so that Jeffrey Jock or Sam Scoop don't have to untangle a bunch of cables and try to figure out which plug goes in each socket. There should

be a minimum of knobs and dials that the operators have to be concerned with.

Sufficient range to cover the market. Last month we talked about different types of antennas. For most markets it will take several different antennas to achieve maximum versatility. A permanent small antenna like a halo will cover many situations and requires zero set-up time. For more difficult shots, be prepared to pull out a yagi on a push-up mast.

Full broadcast quality. If you want to go first class, at least 8 kHz response and low noise and distortion are a must. Converted communications equipment just doesn't cut it if you want the sound to approach studio quality.

Operation away from commercial power. At least the primary equipment (mixer, RPU transmitter, etc.) should be capable of 12-volt operation for fast-breaking news coverage and remotes from difficult locations. Additional AC operated equipment may be included for extended remote coverage where power is available. Continued...

Creative RENG

The success of RENG at your station depends on your ability to put the unit to work under a variety of circumstances. Here are a few of the applications for the unit that we've found at WQUA.

Jazz Festival. Live music was fed to the station continuously for three days. The announcer could elect to join the festival at any time, and carry several selections during his show to get the community into the spirit. Quality was comparable to disc.

Golf Tournament. A three-man team covered the tourney with spot reports throughout the day (sold, of course). The anchor man worked from the van, combining taped interviews with the celebrities, reports from the press room, and live coverage from the handheld unit on the greens.

Amusement Park. Two announcers rode on the rides and walked among the people at a large

amusement park, capturing the excitement of the crowd. Although the park was out of range of the station, the full-duplex system permitted an air signal to be fed to the pair from a second phone line.

Independence Hall. On the Fourth of July, the morning announcer and newsmen went to Philadelphia. The announcer worked in taped interviews and commentary, switching to the newsmen with the handheld unit wandering about Independence Square...a remote within a remote.

Air Traffic Reports. For three months a local bridge was out of service causing massive traffic tie ups. A reporter gave traffic conditions and alternate routes from an airplane during rush hour each day. The handheld unit was used with a modified transponder antenna on the aircraft.

Now that's a lot more exciting than slamming in another ton of carts.

OTARI MX-5050 the original (and still the best) compact professional recorder

Just over two years ago, Otari introduced a unique new product—the first truly professional recorder in a compact package—the MX-5050. Since then, the performance and reliability of this innovative new machine have been tested and proven in over a thousand critical professional applications—by broadcasters, recording studios, A/V departments, musicians, and semipro recordists worldwide. Universal acceptance and repeat orders by these satisfied customers tell this remarkable recorder's success story better than we can.



Bias can be re-optimized in seconds.

As you compare the MX-5050 with other recorders, keep this in mind. The MX-5050 is not a hi-fi machine with a few professional features added later as an afterthought. It was designed from the ground up based on Otari's 10 year experience as Japan's leading manufacturer of professional recorders and high speed duplicators. It is a full professional machine with the performance, features, and field proven reliability that you expect to find only in the larger professional recorders.

Here are some of the key reasons why the MX-5050 is the best compact recorder available today.

Production Features: Creative production is simplified with: Front panel edit to spill tape. Lift-up head cover to mark splices and clean heads. Built-in splicing block on head cover. Adjustable cue to defeat head lifters. Selective reproduce to add new tracks in perfect time synchronization. Two speed operation, 15 and 7½ or 7½ and 3¾ ips (field changeable in dc servo versions).

Performance Features: Headroom is 19 dBm, a full 15 dBm over the switch selectable fixed output of +4 dBm. This standard reference level output can be rear panel switched to -10 dBm to drive a PA system or power amplifier. S/N ratio is NAB weighted 69 dB full track, 68 dB half track, and 65 dB quarter track. Crosstalk is greater than 60 dB half track. Outputs are 600 ohm balanced (standard on half track) or unbalanced. Line input and output connectors are XLR.



Operating Features: Bias is front-panel continuously adjustable (not limited to fixed positions). With built-in test oscillator (not available on other compact professional recorders) bias can be optimized in seconds when changing tape. Record EQ and standard reference level are also front adjustable. Straight-line tape path simplifies threading. Capstan is located on back side of tape for improved tape life. An extra reproduce head is standard on all versions to allow playback of tapes in different formats. For pitch control and freedom from power line variations, an optional dc capstan servo is available with ±10% correction range.



Easy threading; capstan on back side.

Versatility: Available in full-track (with half-track reproduce capability standard), two-track, and quarter-track versions. Walnut case (standard), rugged portable road case, rack mounting adaptor, or floor console. Universal power supply standard. Low impedance input and output transformers and remote control also optional accessories.

See your nearest Otari dealer for the full story or contact Otari. And, if it's multichannel you need, ask about the standard-setting four and eight channel versions of the MX-5050.

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RENG

(Continued)

On-location editing capability. This may be optional for your operation. If expense and space allow, a reel-to-reel machine is great for assembling tape right in the field. The idea is that the person who recorded the actuality will be the one who can edit it the most efficiently.

Full duplex communication with the studio. While a simplex system gets the job done, the advantages of full duplex become apparent once you've worked with such a system. Set-up is quicker, and the on-air production is smoother...no more squelch tails on the air either.

Handheld unit to get right to the action. This is really the key to a successful RENG unit. It's really impressive to be able to walk right up to the scene with a five-pound unit and broadcast live not only the voice of your announcer, but the **sounds** of the event as well. It's amazing how many sounds you hear on a high quality system that are lost on a communications bandwidth circuit.

The concept of using the mobile unit as a repeater is not new or original. It's just a logical choice to keep the handheld unit small and yet retain the range of a larger, more powerful transmitter. Wireless mics may seem like a good choice, but we're trying to get a little better range than they can provide, and for radio it isn't necessary to conceal the transmitter. To be practical, a minimum of a half-mile range is necessary. The 700 mW unit shown in Figure 1 actually provides a little better than that even under adverse metropolitan conditions. Over flat terrain the unit is good for four or five miles! The transmitter is flat to 9 kHz and has extremely good noise and distortion figures.

The handheld unit is actually three units in one with the home-brew additions shown in the illustration. Before we go into detail, let's outline the overall radio system that ties studio, mobile unit and field unit (handheld) together. Figure 2 is a block diagram of all the radio links. Three frequencies are used and must be chosen carefully. The two-way channel in this case is



Figure 1. This 700 mW unit provides another dimension for on-the-scene radio remotes.

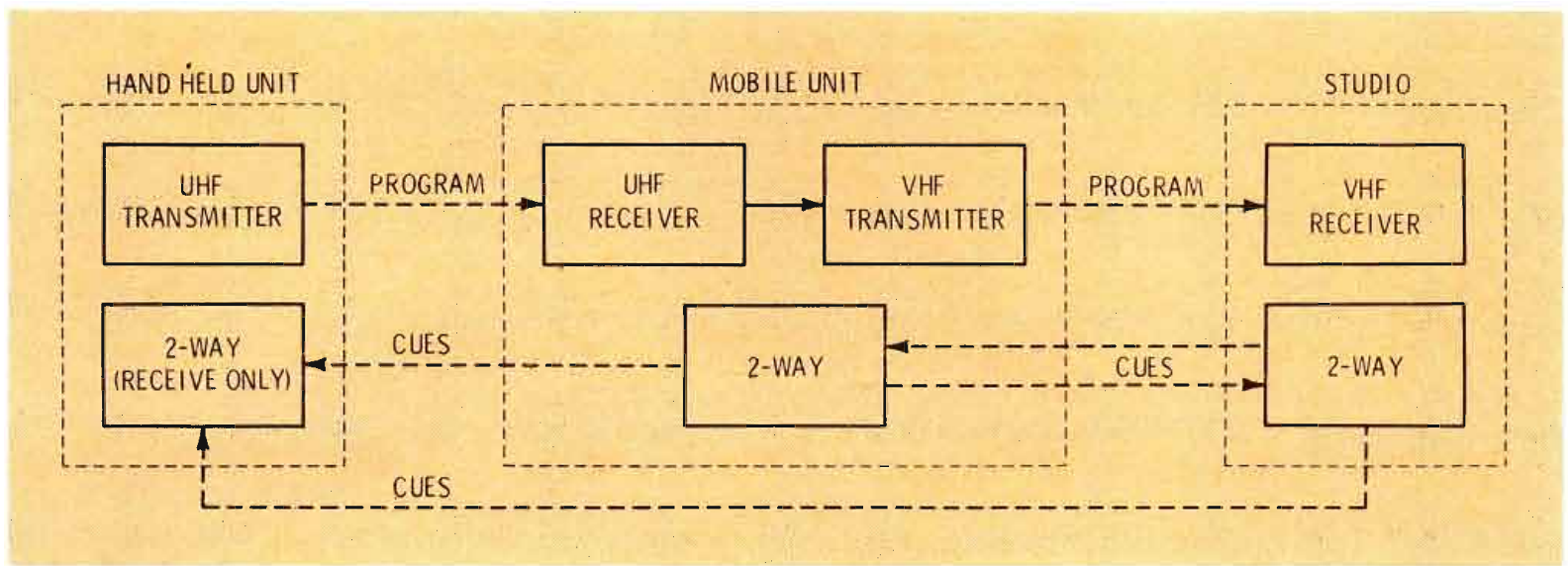


Figure 2. A radio link diagram, connecting studio, mobile unit and field unit.

VHF. This makes it easier to go full duplex with the field unit, which transmits on UHF. The whole system could be done on UHF, since the frequencies are spread out a little better. The primary reason for using UHF for the short link and VHF back to the station was that the VHF system was already in existence.

In practice, the studio operator talks to the mobile unit via two-way to check out the VHF link. If the signal is satisfactory, the newsman then takes the portable unit to the scene. He can still hear the studio on his two-way receiver, and the studio operator hears him on the VHF channel. If an additional person is in the mobile unit, he can communicate in both directions at any time.

The VHF transmitter in the truck is activated by a carrier operated relay in the UHF receiver. To satisfy the monitoring requirements for a temporarily unattended automatic relay station, the receiver in the handheld unit is equipped for two-frequency operation. Before turning the UHF transmitter on, the operator checks the VHF frequency to make certain it isn't being used. As a bonus, he can listen to his signal being repeated to make sure that he isn't out of range of the mobile unit.

The handheld unit has one other built-in goody to minimize the amount of gear the newsman has to carry...a transistor radio to monitor the station. This gives the field person everything he needs to report from the scene, either live or for taping. He's got a high-quality

transmitter, an air monitor, and a cue circuit. And, he can plug in a cassette recorder if he wants.

Studio On Wheels

The mobile unit should be designed primarily to transport the repeater, if news and sports are your primary concern. A small station wagon would be adequate, but that limits the versatility of the unit. A van seems a good choice if you want to do a lot of remote programming. In addition to housing the RF equipment, you can include recorders, a mixer and a comfortable operating position. You can put a platform on the top of the unit to simplify antenna erection. The unit shown on the cover has carpet and insulation to keep out summer heat and extraneous sound. A 10,000 BTU air conditioner keeps things comfortable when AC power is available.

Turn On The Juice

One of the big hassles in equipping an RENG van is the need for more power than you can take from the vehicle battery. The unit may have to remain on the air for as much as four hours at a time, so don't underestimate the power requirements. Divide the desired equipment into three groups: essential DC operated gear, essential AC operated gear, and non-essential equipment.

It's best to operate the essential equipment from a second battery so that you don't run the risk of not being able to start the vehicle. The two batteries can be isolated with

large diodes so that they both charge from the vehicle alternator, but don't discharge each other. If you want to take the easy way out, a recreational vehicle dealer can supply you with a unit that does the same thing, all ready to mount in the vehicle.

Essential AC operated equipment can be powered with an inverter if you are reasonably parsimonious with your demands on the unit. If you haven't used an inverter before, beware of a couple of limitations. Don't try to run a tape recorder or other motor driven or speed sensitive device from an inverter, since the frequency is not very stable and the output is usually a square wave. Watch for ground loops when connecting inverter powered gear with battery operated equipment. If you need to operate a 110 volt tape recorder, you can build a special inverter just for that purpose. Essentially, what you need is a stable 60 Hz oscillator, an amplifier, and a step-up transformer.

Non-essential equipment should be on a separate AC circuit so that it is only energized when commercial power is available. The air conditioner is a good example...it's hardly necessary for spot news coverage, but is really nice to have for extended remotes.

Next month, we'll present a number of illustrations to help you create ideas for your own RENG unit. If you are interested in more information on RENG, or if you would like to share your ideas on this or any other radio topic, write to us in care of the Radio Workshop editor. □

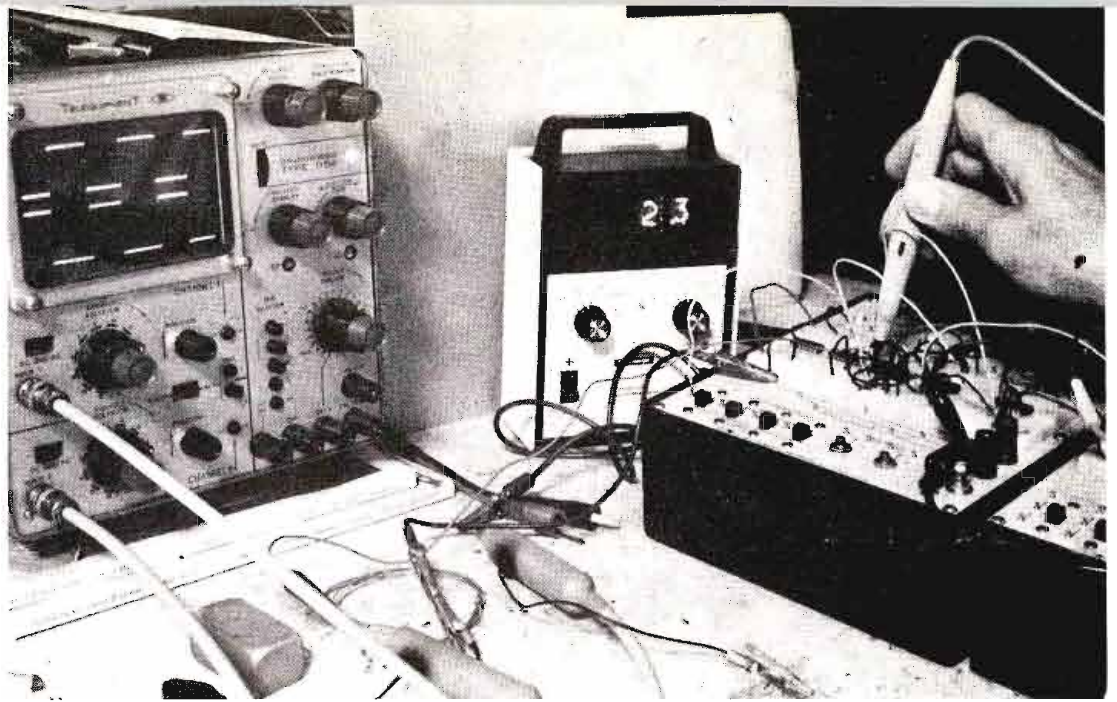


Figure 1. A dual-trace scope, digital VOM, logic probe, and experimental breadboard setup will take you a long way in learning digital technology. A number of "digital designer" breadboards are available.

digitallab

Let's get ready for digital troubleshooting

By Harold Ennes

There is no excuse for a course in basic digital technology to appear "too complicated." I think I can prove this statement by starting where textbooks end; with techniques of troubleshooting digital circuitry. If I succeed, this treatment will not only give you a feel for servicing digital equipment, but will teach you basic digital technology at the same time.

I will assume you have had no previous exposure to the subject. A very basic electronic background is necessary, but only to the extent of knowing how to use your oscilloscope and voltmeter.

Yes, in spite of what you may have read somewhere, the scope and high-impedance voltmeter (preferably digital) are very useful tools, particularly in learning digital IC (integrated circuit) characteristics. You will learn how to use the handier "logic probe" as you progress.

What You Need

You can do "breadboard hookups" for actual "hands-on" ex-

perience. This is preferable to any other method. Or you can simply follow through on the description of these hookups and still gain a fairly practical insight into checking logic gates, which is the first step.

The breadboard (Figure 1) allows extremely fast circuit hookup and changes. IC's plug directly into the board, and inter-connections are made with ordinary 22 gauge or 24 gauge solid wire. You should have a "clock generator" preferably with complementary outputs, as in Figure 2. (More on this soon.) The power supply should be a regulated +5 volt unit, or you can use any good battery such as a 6-volt heavy-duty lantern battery. Any switches used in the signal path must be of the "de-bounced" type (made from IC logic gates) for satisfactory operation. For sources, see "Getting A-HEAD in Digitals," **Broadcast Engineering**, Jan. 1977).

The oscilloscope should preferably be a dual trace, with bandwidth to at least 10 MHz. The high impedance voltmeter is preferably a digital display for fact DC voltage

readings. You should have any of the currently available logic probes, and **practice** using it in conjunction with your scope.

Here are the IC's you will need first (one each is sufficient):

- SN 7400 quad 2-in NAND gate.
- SN 7402 quad 2-in NOR gate.
- SN 7408 quad 2-in AND gate.
- SN 7432 quad 2-in OR gate.
- SN 7486 quad 2-in Exclusive OR gate.
- SN 7490 decade counter.

Truth Tables

Logic circuitry is specified by its truth table. You will troubleshoot individual chips (IC's) and entire systems by truth tables. You will specify desired characteristics for a read-only memory (ROM) by a truth table when you order it programmed from the manufacturer. The truth table is the beginning and the end result of digital circuitry.

Get so familiar with the truth table form that you can draw up a truth table to fit any specific requirement. The series of articles

"Logic Illustrated" (**Broadcast Engineering**, Sept.-Dec. 1976) will help you in this project. Connect the truth table for each logic symbol firmly in your mind. This will be your first prerequisite in continuing this series.

Waveform Readings

Figure 2 shows you exactly what **complementary** waveforms are. If waveform (1) is A, waveform (2) is \bar{A} (A NOT). If waveform A is 010101, then waveform \bar{A} is 101010. Note that in either case, the "low" is ground, and the "high" is +5 volts. This is the most usual clock waveform voltage for TTL (transistor-to-transistor logic).

The clock waveform then is just a simple switch from ground to +5 volts. For a perfectly symmetrical waveform (50 percent duty cycle or square wave) your DC voltmeter will indicate half the peak voltage, or +2.5 volts. If you logic probe has a red and a green indicator, both will be lit simultaneously,

since both a "1" and "0" exist in the pulse train. If the logic probe has a single indicator for "1", this will be brightly lit.

There are at least three basic types of logic probes, all with different pulse characteristics and interpretations. I will leave it up to you to familiarize yourself with any particular logic probe you purchase or borrow. Most have "stretching circuits" for blinking display of very rapid pulses, and you must initially use your more familiar scope to observe what action your particular logic probe shows. Make this a project between now and the next installment. Study your instruction book that accompanies the logic probe, and use your scope to double check your comprehension.

Figure 3 is a "pulse" waveform that is far from being symmetrical. Note again that "low" is ground and "high" is +5 volts. In waveform A, the voltage value for most of the interval is at ground, with

+5 occurring over a relatively short interval. The DC voltmeter will show a voltage much less than +2.5 volts, and the two-light logic probe will have a bright green (logic 0) and dim red (logic 1). How bright and how dim will again depend upon the duty cycle and repetition rate of the pulse, and your particular probe. Note that for waveform B, just the opposite occurs; most of the interval is at +5 volts. The scope can be operated on DC input with choice of proper input attenuation, so that the pulse and DC level are both displayed simultaneously. Note that the "low" level may actually be above ground by 0.2 volt or more, and this must be taken into account.

We will meet here again next month with your type 7408 AND gate. In the meantime, practice with these waveforms and your scope, voltmeter, and logic probe. Practice identifying every logic gate with its corresponding truth table. □

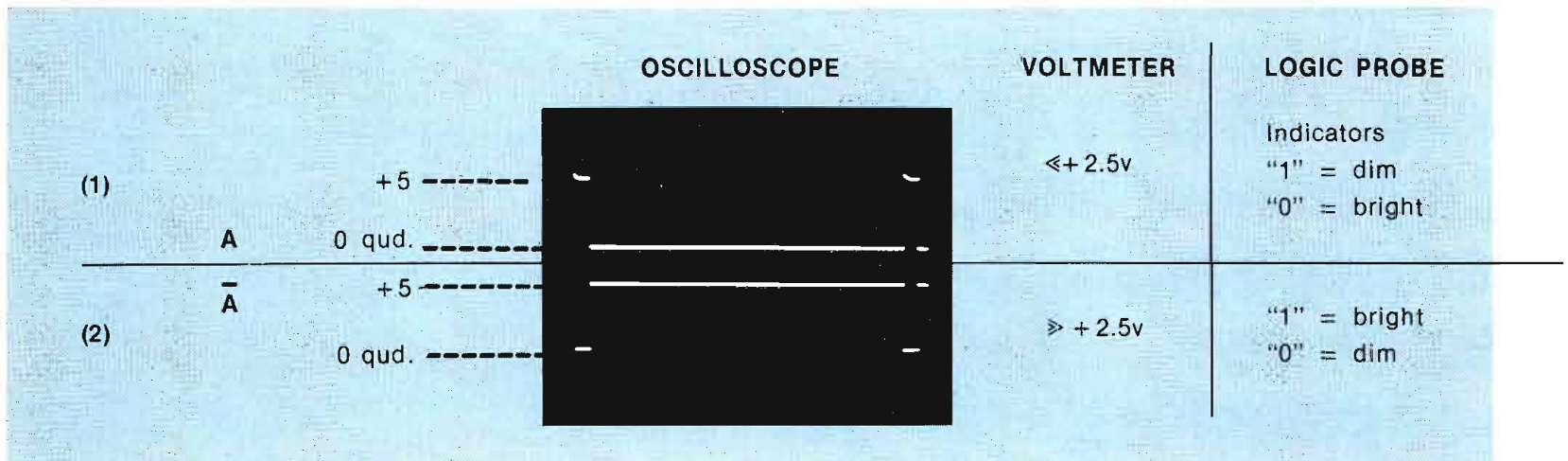


Figure 2. A complementary waveform is inverted, but in both cases, low equals zero or ground, and high equals +5 volts in this example.

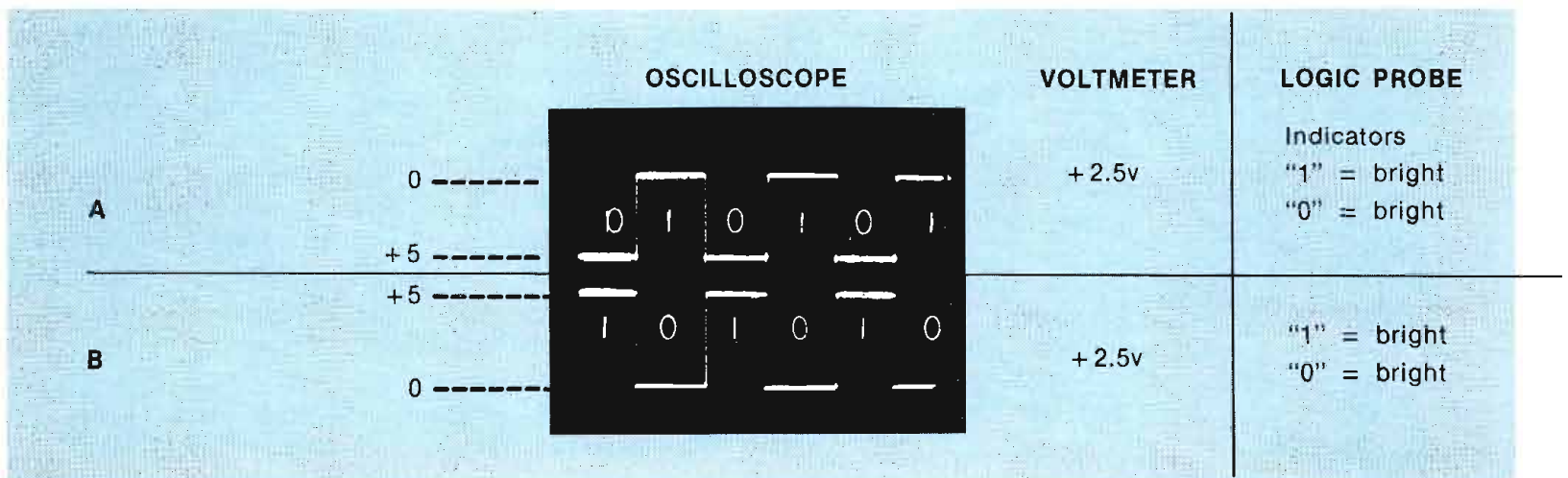


Figure 3. A "pulse" waveform is easily interpreted on the DC input scope trace. The voltmeter and logic probe will depend strictly on the duty cycle and the "setup" of the lowest voltage relative to ground.



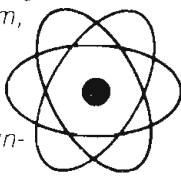
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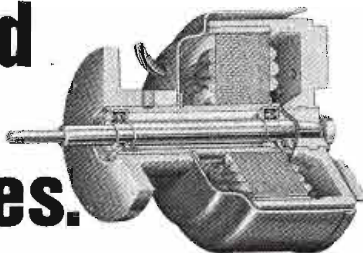
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Type and Models	Beau Prices
Ampex — Model 440	\$210.00
Ampex — Models 350, 351, 354	\$225.00
Scully — Models 270, 275, 280, 282	\$210.00

For fast delivery of cartridge drive motors for ITC, ATC, Gates, Spotmaster, Ampro, and Sparta machines, call (203) 288-7731. Or write for our free Beau motor bulletin.

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UMC ELECTRONICS CO.

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See us at NAB, Shoreham Americana, Booth 562

For More Details Circle (45) on Reply Card

PEOPLE IN THE NEWS

Jack R. Carter has joined Cetec Broadcast Group as Sales Program Manager for the equipment marketing organization, he was formerly manager of KDZA/KZLO-FM, Pueblo, Colorado....**Stephen Koppelman** has been elected President of Electronics, Missiles & Communications by the board of directors.

As part of overall company expansion, **Bill Klages** and **Red McKinnon** have relocated permanently at the Los Angeles branch of Imero Fiorentino Associates. **Klages** is serving as Executive Vice-President. **McKinnon** will continue to light major television programs and specials for IFA. Other changes in the West Coast office include the appointments of **Greg Brunton** as Director of Operations and **Penny Dodson** as Executive Coordinator.

Don James has joined A.F. Associates as Western Regional Sales Manager and established a new office in Palo Alto, California....**Frank J. Haney, P.E.** is the new Systems Project Manager for A.F. Associates.

Two new Sales Engineers have been added to Martin Audio-Video Corporation's staff. They are **Courtney Spencer** and **Tony Hawkins**....**M. E. (Mel) Chester** will be responsible for worldwide marketing, production, and sales promotion in his new position of Marketing Manager, Data Products for Conrac Corporation's Conrac Division....**Robert Newhouse** has been promoted to Engineering Manager, Data Products at Conrac to replace **Chester**.

Lawrence W. Ehnstrom has been appointed Telemation's Midwestern Regional Distributor, OEM and Government Sales Manager....**Hal Loman** is moving to the position of National Sales Manager of Superscope Products. He was formerly Vice President of the company's Midwest subsidiary, Superscope Chicago.

Communications Satellite Corporation has announced the election of **H. William Wood** as Vice President, INTELSAT Management Division, and **Richard R. Colino** as Vice President, U.S. INTELSAT Division. **Wood** succeeds **Martin J. Votaw** who has been elected Vice President-Technical Operations, of Satellite Business Systems.

Frank T. Weems is a new member of the Board of Directors of Granger Associates....**Norfleet R. Turner** is now Chairman of the Board of Directors of Data Communications Corporation....**Harry Dornbrand**, previously President of Fairchild Space & Electronics Company, has been elected President of American Satellite Corporation.

Ted Onishi and **Stu Sakurai** have joined the Hitachi Headquarters engineering staff at Woodside, New York. **Onishi** was formerly Manager of the Hitachi Broadcast Camera Design Group in Japan.

Continued on page 77

PRIME TIME

ANTENNAS AND TRANSMITTERS

WTAF-TV, PHILADELPHIA, BROADCASTS THE WORLD'S MOST POWERFUL OMNIDIRECTIONAL TV SIGNAL.

"When we put our new system on-air in 1974, Ch. 29's 'A' market coverage went up 68% to 9,870 square miles," reports Taft Broadcasting Corporate Vice President Bill Hansher.

"... 'A' market coverage up 68%."

"Viewer reaction was extremely favorable—we were even getting responses from Manhattan, Baltimore and Western Pennsylvania.

"Our 5 megawatt signal makes WTAF-TV the most powerful omnidirectional TV station anywhere—but we achieved our maximum ERP with operating savings of 25%, thanks to RCA planning.

"We selected their TTU-165c transmitter and a 40-gain TFL-40 antenna. Since this 165 kW UHF transmitter needs less primary power, and cost us less than a 220 kW transmitter would have, we realize very welcome economies.

"...operational savings of 25%."

"More than two years later, we're totally pleased with the RCA system's performance."

For more about the WTAF package, see **Broadcast News #155.**



RCA READY WITH THREE CIRCULARLY POLARIZED ANTENNAS.

When FCC approval is granted, RCA will be able to help stations improve their signals with three circularly polarized TV antennas.

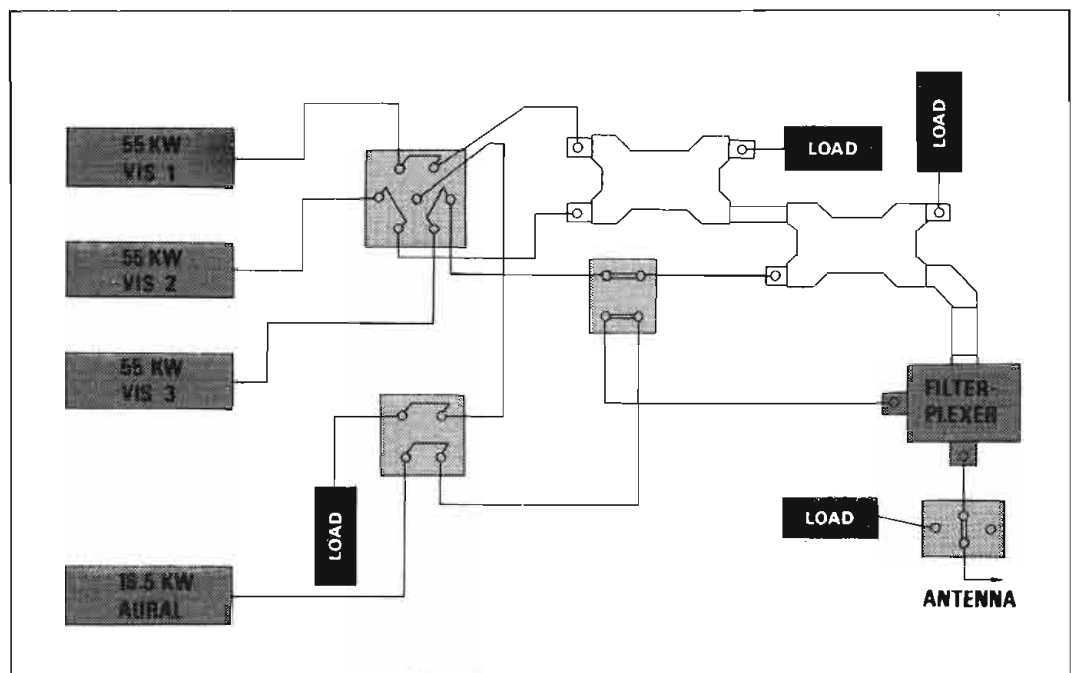
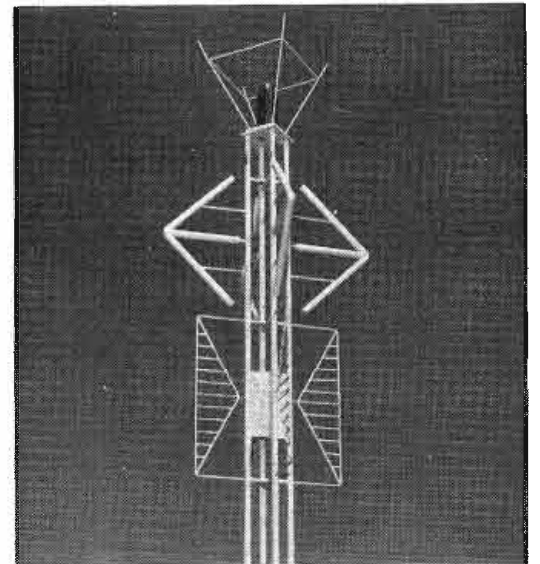
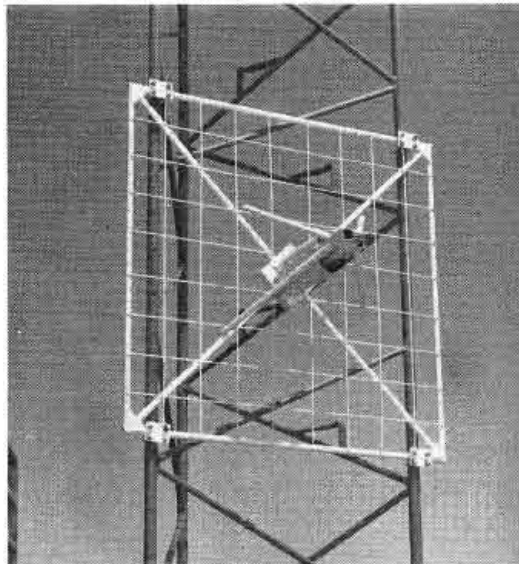
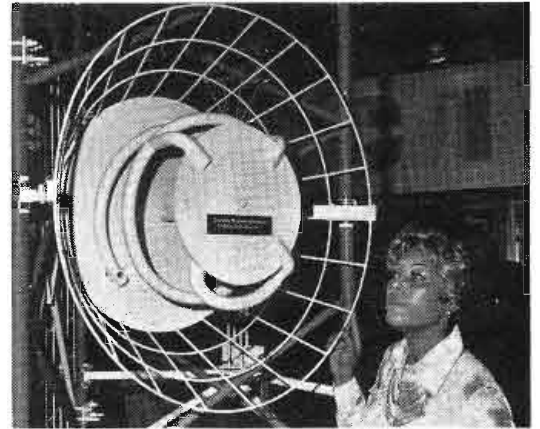
One is a top-mounted Fan-Vee for Channels 2 through 6. It uses individual radiators for horizontal and vertical polarization. They are phased to produce the circularly polarized pattern.

Another circularly polarized antenna, the End Fire Helix, is for Channels 7-13. It uses three small reflecting dishes mounted per layer around the top-mounting pole to

produce an omnidirectional circularly polarized pattern.

A panel antenna for face mounting on the tower (Channels 7-13) may be installed as a horizontally polarized antenna, with the ability to be converted to circular polarization.

Ask your RCA Representative for full antenna information.



Four 55 kW vapor-cooled klystrons are used in the TTU-165c. A unique triplexing system developed for the WTAF-TV transmitting plant combines the outputs of three of the klystrons. As shown in the diagram, visual amplifiers 1

and 2 are combined through a 3 dB combiner to produce 110 kW peak power. The signal is fed through a 4.77 dB combiner where it is added to the output of visual amplifier 3 for combined visual peak power of 165 kW.

For More Details Circle (46) on Reply Card

**WORLD'S BEST STEREO GENERATOR
WILKINSON ELECTRONICS SG1E**

POSITIVE PROOF

- * 60 db separation 50 Hz-7500 Hz
- * 55 db separation 7500 Hz-10000 Hz
- * 50 db separation 10 KHz 15 KHz
- * FM Noise - 75 db Cross Talk - 60 db

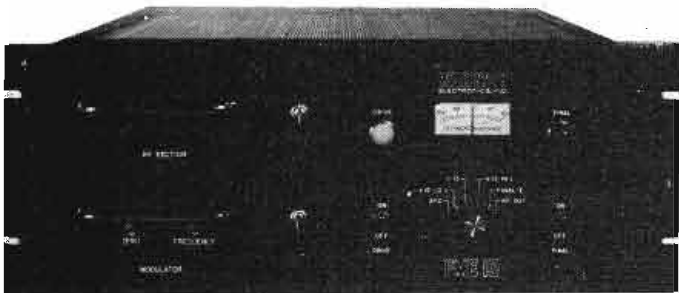


**COMES COMPLETE WITH POWER SUPPLY
REQUIRES ONLY 3½" RACK SPACE
ONLY ONE FRONT PANEL ADJUSTMENT
REMOTE STEREO ON/OFF FUNCTION**

**WORLD'S BEST FM EXCITER
WILKINSON ELECTRONICS FME10**

POSITIVE PROOF

- * Frequency response $\pm 1/4$ DB 15 HZ-350 KHz.
- * FM Noise Level - 70 DB below 100% Mod.
- * Distortion - 0.3%
- * Modulation - Direct FM
- * Power Output - Adjustable to 18 watts
- * Stability 1 part in 100000
- * Requires no oven and is not susceptible to rumble and microphonics



**FCC TYPE ACCEPTED
POWER SUPPLY INCLUDED
REQUIRES 7" VERT. SPACE
IMMEDIATELY USABLE IN ANY TRANSMITTER
SHIELDED BY BOTH STEEL & ALUMINUM
COMPLETELY METERED
ADJUSTMENT FREE**

NO ONE CAN MATCH THIS COMBINATION

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ELECTRONICS, INC.**

**P.O. Box 738
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Telephone (215) 497-5100**



**SOCIETY OF
BROADCAST ENGINEERS, INC.**
P.O. Box 88123, Indianapolis, Indiana 46208

The annual national meeting of the Society will be held on the first day of the NAB convention, Sunday, March 27 in the Shoreham Hotel.

The Board will meet at 12 noon, followed at 3 p.m. by the full membership meeting in the Empire Room. After the meeting there will be a happy hour in the Empire Room.

New BE Address

If you need to correspond with **Broadcast Engineering** concerning your subscription or extra copies of the magazine, use this address: P.O. Box 12901, Overland Park, Kansas 66212. And it helps to speed things up if you clearly indicate that you are an SBE member.

Chapter 1—Binghamton, New York

We received an extensive report on November 9th from Larry Taylor, a board member, concerning the recent board of directors meeting. We discussed the new certification program and its effect on each of us. We then toured B.O.C.E.S., a high school level career school to see the new program of video education. This program is designed to put educational television in every classroom of all schools in Broome and Tioga counties. (Gary Simon, WSYE-TV, P.O. Box 314, Elmira, NY 14902, 607/733-5536)

Chapter 3—Kansas

On November 9th, the Chairman introduced Vern Killion of Harris Broadcast Products who introduced:

- Jerry Collins, Manager of Antenna Operations, Harris, who gave a slide presentation on design, theory and testing of circular polarized antennas for VHF TV.

- Fred Zellner, past Director of Engineers for ABC/WLS-TV, Chicago, who spoke on History of the Industry's Fight for Circular Polarized TV Antennas.

A very informative question and answer session followed with a tour of the KTVH-TV studios and facilities. (Bill Keegan, KTSB, P.O. Box 2700, Topeka, KS 66601, 913/582-4000)

Chapter 16—Seattle, Washington

Chapter 16 met at noon on November 10th at the Norselander Restaurant. After a short business meeting we went to KING-TV where IVC presented papers on portable color TV cameras and broadcast quality helical 1-inch video tape recorders. Robert Kuhl, IVC, presented a paper entitled "A Truly Portable Broadcast Video Tape Recorder". He also demonstrated a Bosch Fernseh BCN video tape recorder. Richard Matuszak demonstrated an IVC 7000P portable broadcast camera and pointed out some of the merits of the system. (Albin Saari, Media Engr., Evergreen St. College, Olympia, WA 98505, 206/866-6270)

Chapter 17—Minneapolis/St. Paul, Minnesota

The October meeting was at Nortronics, hosted by chapter Vice-President Tim Elftman. Paul Lund introduced the Head Sales Engineer for Nortronics, who gave a presentation on recording head construction and adjustment procedures. The presentation was then continued by Joe Dundovic, Vice-President of Market Development for Nortronics. Dundovic proceeded with an explanation of magnetic head relapping techniques as presented in a paper to the 54th annual convention of The Audio Engineering Society of May 5, 1976. (Lance Raygor, Rte. 1, Box 337, Chisago City, MN 55013, 612/373-4807)

Chapter 21—Spokane, Washington

At the November 29th meeting, it was decided to have only noon meetings in December and plan for a good Evening Technical meeting in January 1977. Video and audio transmission via ultra red beams for video program remote pickups was the program subject. Dick Jones of Northwest Electronics, Spokane, put on the program and had a demonstration system and setup in running order. Test pattern transmission was used. (T. O. Jorgenson, KXLY, W. 500 Boone Ave., Spokane, WA 99201, 509/328-9084)

Chapter 22—Central New York

The December 16th meeting covered Digital Logic Analyzers. Bruce Goguen of Tektronix discussed the design, operation and application of such devices. The program included a video tape presentation and a demonstration with an analyzer and logic simulator. (Gary Hartman, WSYR, 1030 James Street, Syracuse, NY 13203, 315/474-3911)

Chapter 24—Madison, Wisconsin

The November 29th meeting agenda included the nomination and election of officers for 1977. (Ken Dixon, WHA, 821 University Avenue, Madison, WI 53706, 608/263-4088)

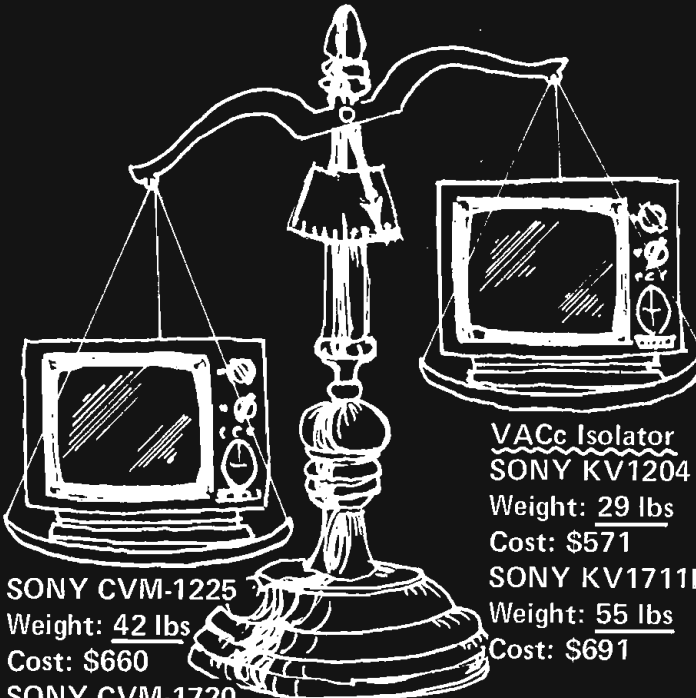
Chapter 25—Indianapolis, Indiana

The November 9th meeting was a joint meeting with the Indianapolis Section of the Audio Engineering Society (AES). The program was presented by 3M Company, "Professional Audio Tape Setup and Demonstration" with Vic Peck and Plant Engineer. (Dwight MacPherson, c/o Indiana University School of Dentistry, 1121 W. Michigan Street, Rm. 506, Indianapolis, Indiana 46202, 317/264-7133)

Chapter 26—Chicago, Illinois

Carl Eilers of Zenith presented the November 16th program from the Receiver Manufacturers point of view. He covered AM Stereo, FM Quad, and TV. There was a group of Zenith Engineers and Designers there to answer the questions. The use of the VIR Signal in TV was covered. It was a program that was of interest to everyone regardless of the area of Broadcast Engineering. (Bob Churchill, SBE, 121 W. Wacker Drive, Rm. 540, Chicago, IL 60601, 312/729-5215)

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VACc Isolator
SONY KV1204
Weight: 29 lbs
Cost: \$571

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Cost: \$660

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Weight: 69 lbs
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Cost: \$691

Electro-optical isolators available for most Sony receivers

EFP/ENG APPLICATIONS

Weigh all the options before you send your crew out for that ENG assignment. Will that lower-priced monitor/receiver your technical crew is using have that SONY performance and reliability? Too heavy you say... or maybe too expensive. Do yourself a favor... install a Video Aids electro optical isolator in a Sony receiver. In less than 30 minutes you have a high quality color monitor while still retaining the receiver function. You only add 8 ounces to the receiver's total weight instead of the typical 12 to 18 pounds most monitor/receivers add. Try it... not only will you like that solid reliability and performance... you'll save money... and your crews will love you for not having to carry those heavy monitor/receivers. Yes, weigh all the options before you make your decision...

Manufacturer's of:

Editor-Programmers Cross Pulse Generators
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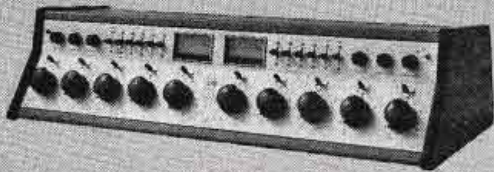


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TO MIX 30 inputs
10 WAYS...



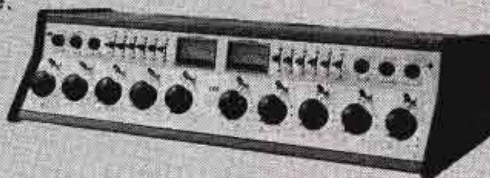
S-21 Ten Mixer Dual Mono Console

One way is the new LPB S-21 Signature II dual mono audio console. Its stereo companion, the S-20, is the other. Either way, you get 30 inputs for 10 mixers.

The S-21, with plug-in capability for up to 30 mics, is ideal for mono broadcast and other professional sound uses, while the S-20, with standard features others offer as options, boasts dual stereo program channels *plus* mono mixdown. Engineered to satisfy the most exacting broadcaster, both are perfect as the centerpiece for the custom designed, wood-grained DJ® 10 studio furniture.

There are two ways of finding out about these and all the other LPB products available...

One: write
Two: phone



S-20 Ten Mixer Dual Stereo Console

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See us at NAB

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From BLUE BANANAS to SAG TAILS

*Do You Take
Wayne King
To Be Your...*

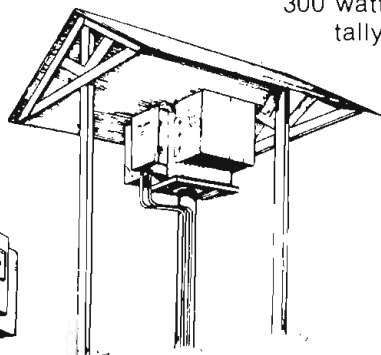
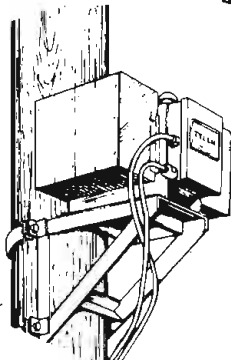
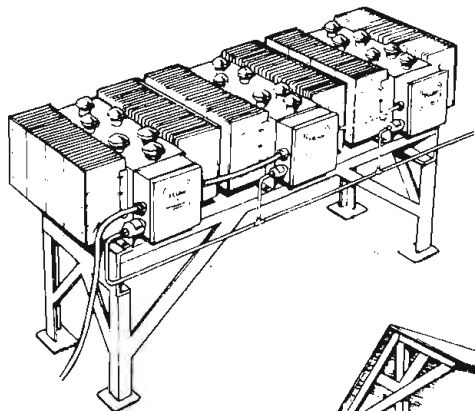
When I was a beginning operator at a class IV operation I had the habit of wearing headphones. Wanting an off-air signal, rather than an output from the console, I developed the habit of putting the phones in a remote line and sending cue through the cue/mix switch. Someone had left a patch cord in place connected to a church where the audio somehow came off the speaker system for the weekly broadcast. When I threw the switch, Wayne King and His Orchestra blasted through the speaker system at the church—or at least was irritating to the wedding taking place at that moment.

Another incident at a class II station involved two church remotes on the same out-of-town line. The telco (a small independent company) would switch it there, but otherwise nobody was on duty. One time they connected the wrong church; I announced the standard intro and opened the pot, and there was a church service. People started calling (one woman told me it wasn't her church, I said it wasn't mine either). After half an hour or so there was a sudden change in the program when someone got to the out-of-town phone company.

Paul Schuett

VERSATILE

mount it anywhere



Continuous, unattended power 10 to 300 watts. That's TELAN. So totally reliable and weather-proof, it'll operate in the most remote and inaccessible locations for months without even a maintenance check. Install it in an hour or two, light a match and forget it. No moving parts and it won't flame out. Uses natural gas, propane or butane fuel. TELAN Thermoelectric Generators.

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NEW PRODUCTS

Black-Burst Generator Kit

Black-burst generator kit offers low-cost solution to drive new color cameras.

Introduced at the NAEB convention in Chicago October 25-27 by **Video Aids Corporation of Colorado** (VACC) their model BBG-1 black-burst generator kit provides easy addition of black-burst to any NTSC color sync generator that does not have black-burst output. The VACC kit will operate in any NTSC color sync generator that has composite sync, burst flag, sub-carrier, blanking, and a +5 volt power supply. The BBG-1 consumes only 12mA.

The VACC black-burst generator kit is designed to drive new color cameras and for users of switchers who desire to fade to color black.

For More Details Circle (90) on Reply Card

Multi-Channel ENG Antenna

Nurad, Inc. has announced a series of microwave antenna systems through which the broadcaster will be able to conduct two or more live remote operations simultaneously and independently with a single set of quad-polarized receive antennas. The Nurad multi-channel systems are based on the 2 GHz Model 20 QP1 and 7 GHz Model 70 QP1 single-channel systems that are now in everyday use for ENG operations throughout the country.

Nurad also offers versions of its quad-polarized ENG systems incorporating higher-gain receive antennas. Such systems are particularly attractive in cases where the area of desired coverage involves ranges beyond those ordinarily reached by the 20 QP1 or 70 QP1. The 20 QP1, for example, covers a line-of-

sight range of approximately 40 miles in its standard configuration. With the new, high-gain quad-polarized antennas this range can be doubled or even tripled without increasing transmitter power.

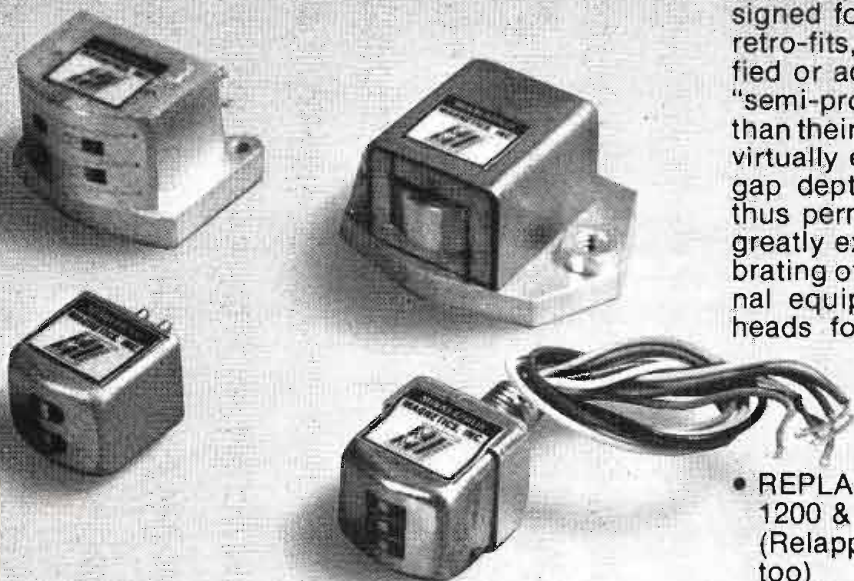
Both the 20 QP1 and 70 QP1 achieve 360° coverage through a set of four 90°-beamwidth, circularly polarized horn antennas mounted at the receive site. With this no-moving-part arrangement, there is no need to pan the receive antenna in order to "find the beam" of the signal from the mobile transmitting source. Thus, the ENG system can be effectively and reliably set up and operating within a few minutes of the time of arrival of the mobile van at the transmit site.

Through the use of circularly polarized signals, the 20 QP1 and 70 QP1 systems reject such multipath effects as "ghosting" or smearing, which not only can severely compromise performance but, if of sufficient magnitude, can

Continued on page 66



-SYMBOL OF PROFESSIONAL TAPE HEADS



MMI Replacement Heads are professional heads — designed for the machines they will be used with — direct retro-fits, both mechanically and electrically — not modified or adapted heads originally intended for "home" or "semi-pro" recorders. But there is more to MMI Heads than their professional performance: An all-metal face that virtually eliminates oxide loading ... More than twice the gap depth-of-metal of some original equipment heads, thus permitting relapping (under normal head wear) for greatly extended head life ... Individual testing and calibrating of each head to insure meeting or exceeding original equipment specifications ... MMI has ¼-inch tape heads for Ampex, ITC, Magnecord, Revox A-77, and Scully. Professional heads for professional recorders — from MMI.

ALSO FROM MMI
(PROFESSIONALLY, OF COURSE) ...

- REPLACEMENT AUDIO HEADS FOR AMPEX VR-1100, 1200 & 2000 VIDEO RECORDERS (Relapping and refinishing of the complete columns, too)
- HEAD ASSEMBLY REFURBISHMENT AND REBUILDING (Loaner Assemblies available for only the shipping costs)
- HEAD RELAPPING AND REFINISHING (No-Charge head evaluation)

NEW! MMI HAS HEADS FOR CART MACHINES!



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Edit Code Reader And Video Display \$1500

BTX 4300 reads time code at play speed down to -15 dBm and generates 7 by 9 dot matrix characters for a full "in video" display.

Use with economical helical editing systems or as an on-line display when recording or playing back video material. May be driven from 1/10 to 80 times play speed by the BTX 4400 Edit Code Decoder.

The BTX 4300, like BTX comparators, readers, decoders, remote digital displays and code generators, is a sensible building block which easily interfaces with, and improves the performance of any editing system at minimum cost. For complete information circle reader service card or contact: The BTX Corporation, 438 Boston Post Road Weston, Massachusetts 02193 • (617) 891-1239



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For Tape Heads Head for TABER

At Taber you get precision work, quality results and low price... unmatched by any other audio head manufacturer.

We will recondition your three head assembly... F/T \$45.00... 2 TRK \$60.00. Three new 2 TRK heads installed and aligned in your AG-440B for \$264.00... Scully 280 at \$270.00.

Ampex VTR audio is priced at only \$385.00 for four new heads installed, or \$110.00 for four reconditioned heads. (Add \$38.50 if monitor post needs lapping.) RCA VTR audio heads are available for only \$475.00.

Loaner assemblies are available.

For heads, head for Taber... the best source available.

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New Products

Continued from page 65

render the received picture unusable and thereby cause a given operation to be "scratched" entirely.

For More Details Circle (91) on Reply Card

In-Line Video Tension Gage

Tentel has announced a new in-line tension gage designed for the Sony 2850 and other second generation Sony video recorders.

The gage measures the critical supply tension to assure horizontal stability and interchangeability. This new gage will also work on virtually any one inch Ampex, one inch I.V.C., 3/4 inch U-matic, or 1/2 inch EIAJ video recorder.

For More Details Circle (92) on Reply Card

One-Inch Videotape Recorder

A console version of the BCN-format one-inch broadcast videotape recorder, the IVC-8050, has been introduced by **International Video Corporation**, it is announced by Ronald H. Fried, President and Chief Executive Officer.

The company first showed BCN-format products at the 1976 National Association of Broadcasters Convention in Chicago. The VTRs were furnished by the Robert Bosch organization, German developer of the BCN concept, who had granted IVC manufacturing and marketing rights to the format. IVC has since restyled the 8050 console and incorporated somewhat less expensive digital timebase correctors not available in the German version.

BCN format videotape recorders offer record and playback quality that equals and in some cases exceeds most quadruplex VTRs, yet they occupy less than one-third the space of quads. While the IVC-8050 is a studio model it is compact enough to be highly mobile, Fried said.

The IVC-8050's segmented recording format includes four longitudinal tracks, a control track and three high-quality audio tracks, two of which are switchable from line

level to microphone level. The third track, although full fidelity, is intended primarily for cue or address recording. All three audio tracks and video can be edited simultaneously or individually.

The IVC-8050 holds reels up to 10½ inches in diameter for a playing time of up to 96 minutes. Insert and assemble editing with preview capability and a 300-i.p.s. shuttle are standard.

The company will introduce the IVC-8020, a portable, battery-operated 44-lb recorder at the 1977 National Association of Broadcasters Convention in Washington, D.C. Together the two units make a complementary portable and studio recording system using the same one-inch format.

For More Details Circle (93) on Reply Card

VSWR Meter

A new VSWR monitor has been introduced by **Sintronic Corporation**. The model LS-VSWR-3 is a VSWR fault detector for transmission lines and antennas of FM & TV broadcast stations. The unit has been designed to detect not only those faults which are of a constant condition but also those which are intermittent or erratic in nature. The unit will detect faults of short duration that will not ever register on the reflected power meter of the transmitter.

The LS-VSWR-3 is complete with 3-1/8 inch EIA line section, electronic detector, and power relay. The entire assembly is factory tested under power and adjusted to the user's desired trip point.

For More Details Circle (94) on Reply Card

Noise Meter

Asaca Corporation has introduced the Shibasoku 925C noise meter which can measure chroma noise as well as video noise.

AM (Amplitude Modulation) noise and PM (Phase Modulation) can be measured separately.

It works with cameras, video tape recorders, video disc units, digital image processors, and more.

The 925C is in production and shipment can be made approximately 4 to 6 weeks.

For More Details Circle (95) on Reply Card

Equalization Analyzer

Shure Brothers Inc. has announced two new products which make it significantly less complicated and costly to (1) find room response trouble spots in sound reinforcement, playback and hi-fi systems and (2) equalize such systems to desired frequency response curves.

The two products, the Shure M615AS Equalization Analyzer System and the SR107 Audio

Equalizer, contribute to simplifying the equalization process.

The second part of the new equalization product combination is the Shure SR107 Audio Equalizer, a highly versatile, compact, easy-to-use unit that provides adjustment of tonal balance on an octave-by-octave basis across the audio frequency range. It is a balanced input and output line level device, designed for installation between the audio console or mixer and the

Continued on page 68

Nobody has it like the new Spotmaster 3000 Series



Model 3100 Slim Line — the space saver for A size cartridges. Available in mono and stereo playback.



Model 3200 Compact — for A and B cartridges. Available in mono and stereo, record/playback and playback only.



Model 3300 Standard — for A, B and C cartridges. Available in mono and stereo, record/playback and playback only.

A new family of professional cart machines with all the standard features: large air-damped solenoid, a direct drive synchronous motor, and a rugged machined deck.

PLUS the Spotmaster exclusives: Phase Lok III head bracket for optimum stereo phasing; a superior, up-to-date, modular electronic package; a unique cartridge guidance system; and a full range of options including manual/automatic fast forward, additional cue tones and microphone input. Available in desk top or rack mounting.

For details call or write Broadcast Electronics, 8810 Brookville Road, Silver Spring, Maryland 20910. Telephone: 301/588-4983.

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Image Enhancers



(Model 877)

Superior Performance . . . Competitive Price . . .

- Up to 175% enhancement—highest in the industry
- Horizontal AND vertical balance adjustment
- Typical S/N ration 65—68 dB, 60 dB minimum
- Used by major networks since 1970
- Comb filter for optimum enhancement, no chroma distortion or noise addition
- Models available for automatic or manual enhancement, encoded or RGB inputs, NTSC, PAL, or SECAM

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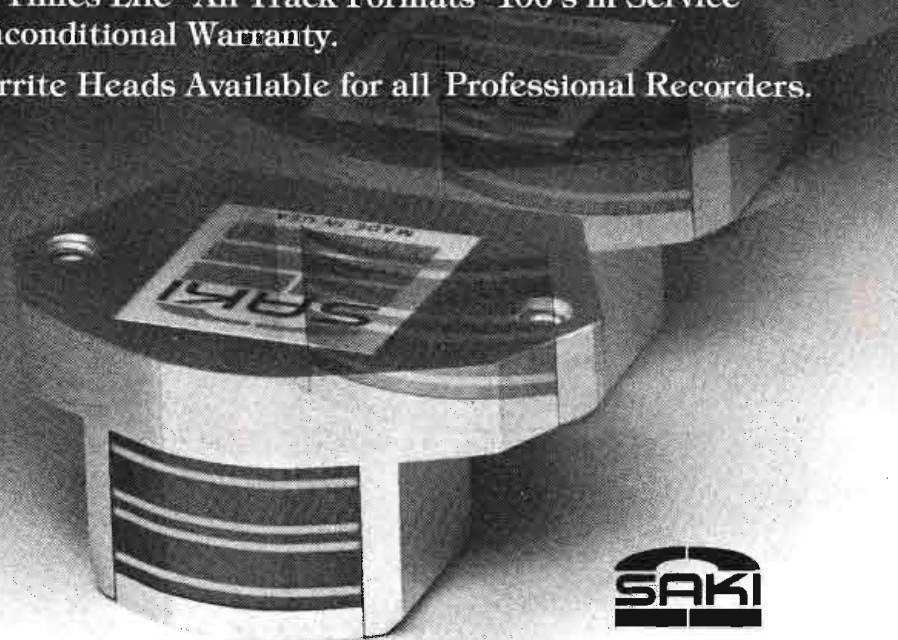
For More Details Circle (54) on Reply Card

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For More Details Circle (85) on Reply Card

New Products

Continued from page 67

power amplifier of a sound system, or between the preamplifier and power amplifier of a hi-fi system.

For More Details Circle (96) on Reply Card

Compact Professional Recorders

Otari Corporation has introduced a new generation of compact professional recorders that combines all the features and benefits of the MX-5050 recorder with several new items not usually found in recorders in this price range.

Model designation of this new machine is the Otari Mark II. Its new features include separate transport and electronics to allow mounting versatility, DC capstan servo with \pm seven percent pitch control as standard instead of an accessory, all plug-in electronics for ease of service, complete accessibility on front and rear panels to electronics adjustments, and an interface jack for coupling a dbx or Dolby noise reduction system.

Two versions of the Mark II are available, both with half-track (0.075 or 1.9 mm track) format: a two channel quarter-inch and a four channel half-inch. Mounting configurations include a table top console and a floor console, both with electronics located above the transport.

Other Mark II features are: smooth tape handling, professional outputs (600 ohm) and connectors (XLR's), fixed output position at standard operating level of +4 dBm or -10 dBm (rear panel selectable), splicing block on head cover (two channel version), and new, easier to operate reel hold down knobs. Options include: low impedance microphone transformers, balanced-line input and output transformers, remote control and floor console.

For More Details Circle (97) on Reply Card

78 Cartridge Handling System

IGM now has a Go-Cart available to handle 78 cartridges, as well as the 42 model.

The 78 works in the same manner as its smaller counterpart, the 42 cartridge Go-Cart. Cartridge carrier trays linked in flexible chain fashion form an oval-shaped carrier belt. When directed to do so by the control system, a desired cartridge is rotated to the play table. There it is removed to a stationary cartridge deck for stable play and accurate tape-to-head alignment. When play is completed, the cartridge is re-wound and automatically replaced in its carrier; and the carrier responds to instructions governing the next cartridge scheduled.

Maximum worst access time for the 78 Go-Cart is eight seconds, for the 42 it is six seconds. For easy access and maintenance, the entire Go-Cart unit swings out on hinges and, even while opened, the machine remains operational. The Go-Cart is compatible with most existing systems and control devices and, because of its microprocessor computer-based control logic, can be used in diverse ways—both in and out of broadcasting.

For More Details Circle (98) on Reply Card

FSK Filter Modules

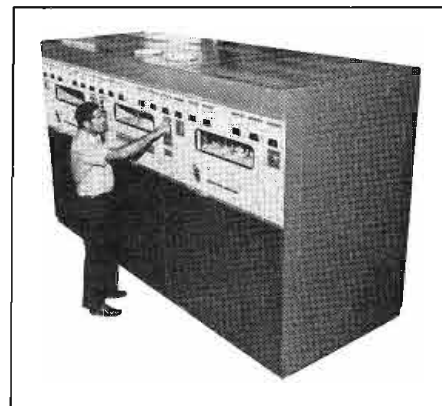
Frequency Devices, Inc., announces the Model 530 FSK Transmit filter and the Model 531 FSK Receiver filter which, when paired in frequency shift keyed (FSK), Bell System Type 103/113 answer the originate modems, permit full duplex operation at a 300 Baud rate over voice grade telephone lines.

A key feature of these units is that they incorporate internal buffered switching which isolates analog circuitry from digital impedances. This permits the external digital control source to set the filter to respond to either the mark or the space frequency, but prevents the digital control source impedance from modifying filter gain, frequency response shape factor and phase response. Depending on the specific filter circuit design, the on resistance of semiconductor switches will shift poles, skewing the frequency response curve and drastically modifying the filter gain at the FSK frequencies. By includ-

Continued on page 70

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Continental Electronics 

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MODEL TFL-280 AUDIO LIMITER FROM MOSELEY ASSOCIATES, INC.*

Using agile level-controlling circuitry, this frequency-conscious limiter cleanly solves the problems associated with the transmission of pre-emphasized audio, including overshoot (overmodulation) produced by low-pass audio filters without the routine use of clipping. The TFL-280 produces an on-air sound almost impossible to distinguish from the original program source. Product Bulletin 255 provides full details of the "clean" TFL-280.

**MOSELEY ASSOCIATES, INC. □ SANTA BARBARA RESEARCH PARK
111 CASTILIAN DRIVE, GOLETA, CA 93017 (805) 968-9621 TELEX: 658448**

*Patent Pending

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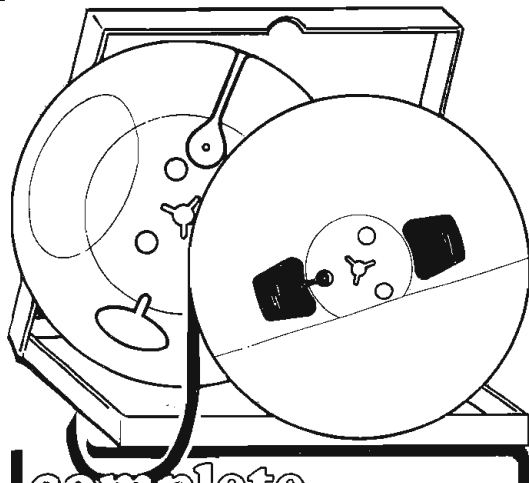


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For More Details Circle (59) on Reply Card

New Products

Continued from page 69

ing the switches in the package and dynamically compensating for their in-circuit effects, this problem is eliminated.

Another key feature, these units incorporate constant bandwidth designs using multipole feedback, "leap frog" techniques. In each model, the dual selectable channels are designed for identical -3dB bandwidth. This minimizes channel-to-channel group delay differences and provides equal transition times when switching from either channel to the other.

For More Details Circle (99) on Reply Card

Video Presence Detector

The Di-Tech Model 403 video presence detector is utilized when automatic video and audio switching is required at unattended sites in the transmission system.

The input circuit detects the horizontal frequency of the composite video, and in the absence of this frequency an external alarm is triggered. The unit then automatically relay switches to the auxiliary video input. Separate auxiliary contacts (two form C) are provided for switching balanced audio.

The 403 can also be triggered to switch at sync levels from 10 to 40 IRE units. A front panel adjustment is available for this setting.

An additional detector and alarm circuit is provided for monitoring the auxiliary input, thereby providing the user with a simultaneous status on both the program and auxiliary video feeds.

For More Details Circle (100) on Reply Card

Audio Cart Machines

Recent additions to the Beucart broadcast audio cartridge tape machine line, produced by the **Beucart Division of UMC Electronics Co.**, are stereo machines which incorporate proprietary cartridge locating features.

Spring-loaded rollers provide repeatable location of each cart's left-corner post. A special tapered

cartridge guide allows each cart to squarely contact the roller and feed smoothly into the machine every time. In addition, a locating spring precisely positions the cart against the right hand guide for positive squareness in relation to the heads.

Perhaps most important of all, patent pending spherical head/conical seat adjusting screws provide uniform, positive azimuth adjustment with the heads immune to movement from external sources. This combination of four mechanical components provides positive positioning of each cart.

Beucart stereo machines are available in two basic sizes for use with all NAB A, B, and C-size cartridges. Compact size, reduced flutter and wow, low operating temperatures, the patented Beau pancake hysteresis synchronous motor, and Beau tape heads are features of all Beucart machines.

For More Details Circle (101) on Reply Card

Live News Helicopter Antenna

Nurad, Inc. has developed a new microwave antenna system for live news coverage via helicopter.

Nurad's system has two modes of operation. In one mode, the signal transmission is originated at the camera-carrying helicopter from which it is beamed to the studio or other designated receive site. (This is the conventional mode of operation used with other existing systems.) In the other mode, the signal is originated on the ground, beamed up to the helicopter, and then transmitted to the receive site, thus making feasible the live coverage of events from locations on the ground where a usable TV signal could not otherwise be obtained.

The heart of the system is an omnidirectional, circularly polarized transmit antenna that is fitted to the helicopter. Because the antenna is omnidirectional, operation of the system is independent of the direction in which the helicopter is facing. This advantage is achieved without the costly and complicated gimbal-mounted arrangements of other systems. The Nurad omnidirectional antenna has no moving parts and is mounted solidly to the helicopter structure.

The Nurad system also offers the

Just A Friendly Reminder

ANTENNA MONITORS

In case it happened to slip your mind and you are one of the few remaining directional stations yet to comply with paragraph 73.69 of the FCC Rules . . . you have until June 1, 1977 to have in operation a "Type Approved" antenna monitor.

WE CAN HELP YOU

We have supplied over 90% of all "Type Approved" antenna monitors (both meter and digital readout) now in service.

We invite your questions concerning installation, operation, remote control, sampling systems, etc.

YOU CAN HELP US

When the last deadline rolled around our order backlog resulted in an eight month delivery cycle. If you order now, you can avoid the last minute rush; we can deliver as required; and you will not risk missing the June deadline.

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For More Details Circle (60) on Reply Card

clusive "shear action" idler wheel is employed to further decouple the motor from the platter, reducing both vertical and horizontal rumble to a minimum.

For More Details Circle (102) on Reply Card

Digital Multimeter

This new battery/ac portable 4½ digit, five-function digital multimeter from **Hewlett-Packard** is low cost and has a unique 'touch-hold' probe available as an accessory. It lets the user 'freeze' the reading on the display—a convenience when probing closely-packed circuit boards.

Called the Model 3465B, the DMM has a DC measurement range from 1 microvolt to 1 kilovolt with a mid-range accuracy of ±(0.02 percent of reading + 0.01 percent of range) for one year. AC measurement range is ten microvolt to 500 volts with a mid-range accuracy of ±(0.15 percent of reading + 0.05 percent of range) over a 40 Hz to 20 kHz bandwidth.

Continued on page 72

advantage of circularly polarized signals. Through circular polarization, multipath effects (such as "ghosting" or smearing of the received picture) are rejected. Not only are such effects highly undesirable, but often they are of such severity as to prohibit a successful TV pickup operation entirely.

For More Details Circle (103) on Reply Card

Transcription Turntable Chassis

The new **Harris CB-1201** 12 inch Professional Transcription Turntable Chassis offers excellent sound reproduction, tight cueing, wow and flutter well below NAB requirements, and precise speed control.

With only three rotating parts in the unit, operation and maintenance are simplified. 24-hour-a-day, top reliability is assured through the rugged motor, simplified motor mounting and an advance shift mechanism. A recessed platter, offset from the center base, allows for plenty of clearance for arm swing plus maximum protection. An ex-

NEW FM AND TV FIELD STRENGTH METER FIM-71

- Accurate — Direct Reading — Volts or dB
- 45 MHz to 225 MHz — Continuous Tuning
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For More Details Circle (61) on Reply Card

New Products

Continued from page 71

AC and DC current measurement range is from ten nanoamps to two amps. DC current accuracy for the ten mA range is $\pm(0.1$ percent of

reading + 0.01 percent of range). AC current measurements are made over a frequency band of 40 Hz to 20 kHz with a mid-band accuracy of $\pm(0.25$ percent of reading + 0.25 percent range).

For More Details Circle (104) on Reply Card

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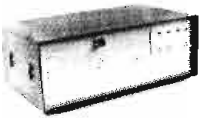
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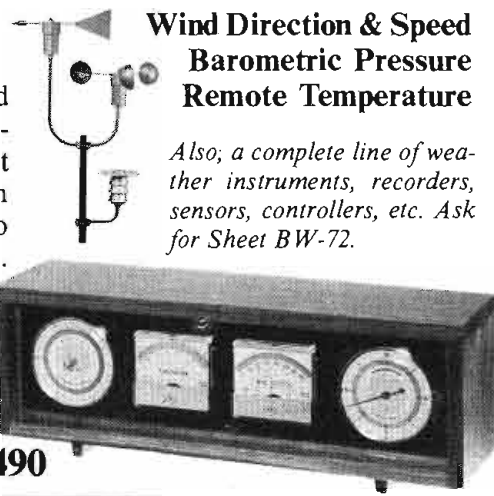
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services.

The operational and functional design of the advanced industrial model is designed for sophisticated information storage and computer applications. For example, in the random access area, the government model permits the automatic search-out of each of the disc's 54,000 frames per side.

For More Details Circle (105) on Reply Card

ENG Camera Alignment Charts

Color balance and registration of ENG and EFP portable cameras to studio standards of precision are a reality with the Porta-Pattern ENG two-chart set manufactured by **Telecommunications Industries Ltd.**

Packaged in a weather-resistant vinyl/nylon-coated storage case for protection in transit storage and on location, the set is available for immediate to 30-day delivery from the manufacturer.

Included in the new system are the standard Porta-Pattern registration chart and a specially designed color balance chart. They are mounted on two hinged, rigid white acrylic plastic sheets which double as a reference surface for automatic color balance. Non-reflective black velcro frames provide a light and dirt seal when the system is closed. The 6.2 by 8.4 inch (16.8 by 21.3 cm) registration chart also includes recommended target scan information.

For More Details Circle (106) on Reply Card

Special Effects

The Digital Video Systems 402 Special Effects is a new all-digital



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system that creates the illusion of a third dimension in television effects by adding rotations, flip-overs, push throughs, page turns, etc. to a list of standard wipes and split screens.

Many effects previously only possible on film with the optical printer are now available to the electronic production house or broadcaster. Microprocessor control permits the use of a simple control panel to achieve a variety of startling new effects.

Color backgrounds and borders are generated digitally and are selected by number for absolute repeatability. The border can be tied to the foreground picture, and moves with it, or the border can be tied to the background and frame the effect.

A basic 32 effects with many variations on each are available in the standard DVS 402.

For More Details Circle (107) on Reply Card

Current Probe/Amplifier

Those difficult current measurements often needed for a complete picture of circuit behavior are made easier by the new Tektronix P6302/AM 503 Current Probe/Amplifier.

Direct readings of current levels up to 20 A (DC plus peak AC) at frequencies ranging from DC to 50 MHz are made quickly, without loading high impedance sources or current-dependent devices like transistors, diodes, etc. Peak AC readings up to 50 A are also possible, provided the current-time product does not exceed 100 amp-microseconds. DC overloading and consequent probe saturation turns on a red warning light to indicate

calibrated limits have been exceeded.

The P6302 probe has a sliding jaw that allows it to be clipped around a conductor without interrupting the circuit under test. Sum or differential measurements can be made by clipping around the conductors, arranged in the proper phase relationships.

The AM 503 is a plug-in unit that fits into any Tektronix TM 500 Series mainframe. The attenuator is calibrated in 12 steps in 1, 2, 5 sequence.

For More Details Circle (108) on Reply Card

Filter

A.P. Circuit has introduced a 25 Hertz sensor tone suppression filter for automated broadcasting systems. The filter suppresses 25 Hertz signals at -20 dB. Fifty Hertz signals are attenuated by less than 1 dB. Higher frequencies than 50 Hertz are passed through at unity gain.

Model APS-10 is a dual channel rack mounted 25 Hertz sensor tone

suppression filter. The unit can accept 600 ohms floating signals and includes a power supply required for the active filters. Input and output terminals are through standard female and male XLR connectors.

For More Details Circle (109) on Reply Card

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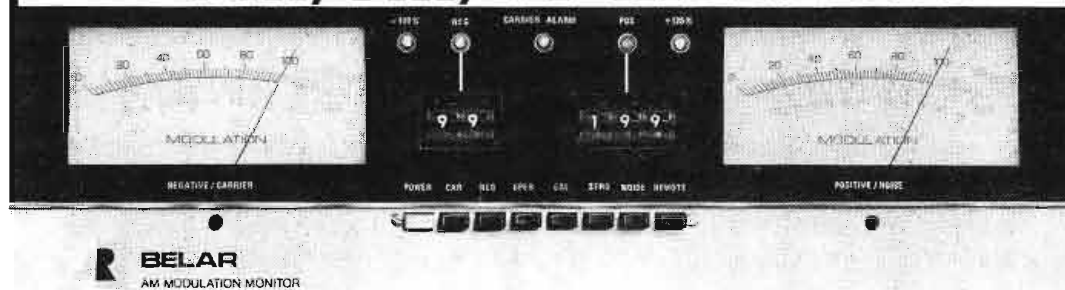


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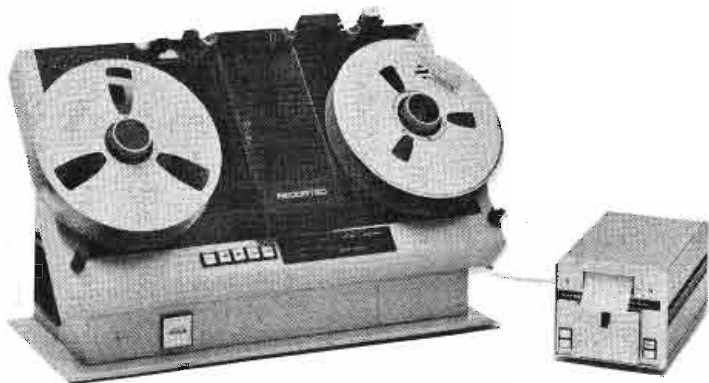


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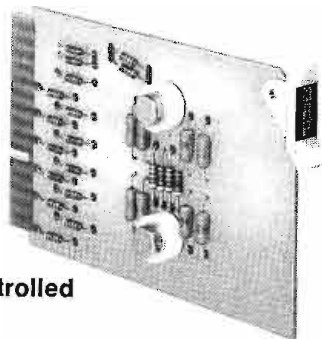
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For More Details Circle (72) on Reply Card

Industry News

Commission Approves ATS For FM, AM Nondirectionals

Automatic transmission systems (ATS) use at FM and AM non-directional stations has been approved by the FCC. The ruling is expected to be effective this month. With ATS, all transmitter adjustments usually performed by the licensed on-duty operator will be handled automatically.

According to the FCC, all such systems must automatically maintain proper modulation and power levels and handle switching functions required by the station's license. This would include reducing power at sunset. However, station operators will still be required to turn the transmitter on manually. When the station is on the air and using ATS, an employee will be required to be at the station or at an ATS alarm point monitoring transmissions.

The FCC says it will allow stations to purchase ATS systems or design and build their own units. FCC type acceptance will not be required. Surely equipment manu-

facturers will make their points at NAB time. Meanwhile, authority to begin ATS operations requires only an informal application which certifies that the chief engineer or TD has installed the system and fully checked it out.

Eventually (probably within a year), the FCC will allow directional AMs and TV stations to use ATS.

- Stations using ATS will not have to use Third-Class operators.
- Reduced power will be allowed during an equipment breakdown.
- Frequency of transmitter inspection by the First-Class operator will be reduced.
- Employment of part-time First-Class operators will be permitted.

The ATS rules do not include provisions for limiting power or changing modulation standards. If such changes are needed, they would affect all stations, requiring a separate proceeding. Look for further clarification of the ATS rules in **Broadcast Engineering**.

FCC Approves 4.5 Meter Dishes

The Commission adopted a declaratory ruling that earth station antennas less than nine meters in diameter could be licensed upon proper technical showing for use with domestic satellites.

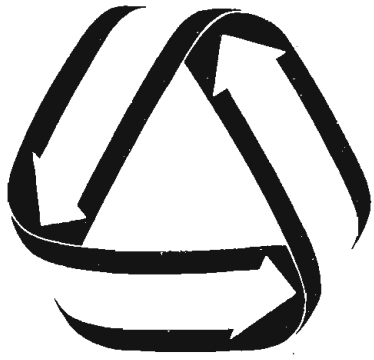
The Commission further ruled that applications proposing antennas as small as 4.5 meters in diameter for receive-only operation by cable television systems would be routinely processed if certain supplemental information were supplied in the applications.

In adopting this ruling, the Commission granted a petition of the Community Antenna Television Association (RM-2725) and denied a petition filed by the American Broadcasting Companies (RM-2614).

The Commission stated that the nine meter criteria was established in 1970 to insure that domestic satellite systems were designed from the outset to achieve reasonably small inter-satellite orbital separations. The Commission further stated that this criteria does not, however, preclude the authorization of smaller antennas when proper technical showings are made to demonstrate that the use of such facilities would not adversely affect the Commission's efforts to achieve 4° satellite separations.

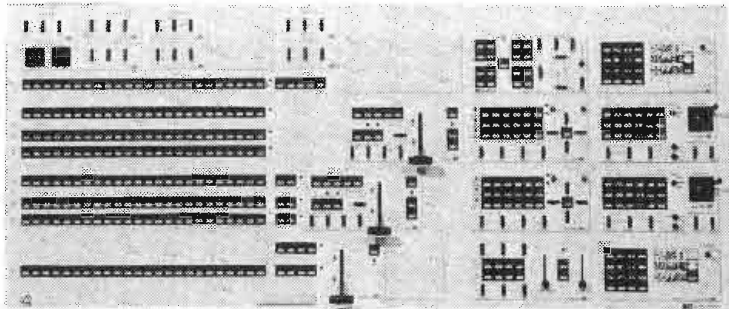
In denying the ABC Petition, the Commission stated that precluding the use of antennas less than nine meters in diameter in the 4 and 6 GHz bands solely on the basis of their size would be inconsistent with the domestic satellite policy objectives adopted in Docket No. 16495.

In granting the CATA Petition,
Continued on page 76



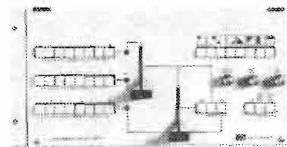
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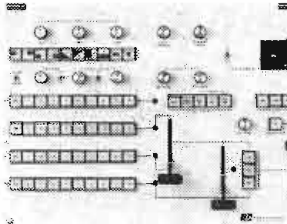
New, Super Powerful CD 480 The Smart Switcher

Revolutionary modular switchers with unprecedented production power. They outperform the largest conventional switchers, yet are extremely simple to operate. Their power and ease of operation are due to CDL's new Sequential Effects (SFX) Amplifier, which can cut, mix or wipe between two Background Sources and two separate Key Sources either individually or in any combination. Models with one or two SFX Amplifiers provide all the standard and optional features you need, including Rotary & Random wipes, RGB Shadow keys, Hard and Soft Color Border wipes, Color Border keys, Quad with Color Borders, Encoded Chroma keying, Key Mask generator, and 16, 24 or 32 inputs. A variety of modular accessories will continue to keep your switcher smarter than the rest as new technology develops.



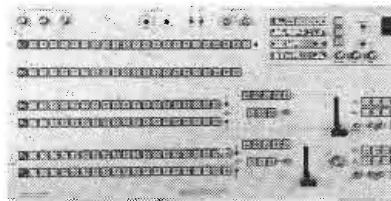
VS-10

An inexpensive broadcast quality 8-input switcher that features flexibility and ease of operation. Self-contained electronics for rapid installation in ENG and other small mobiles.



VS-14

Sophisticated enough for large studio production, yet compact and inexpensive enough for small mobiles. Soft wipes and keys — even a Downstream keyer — are standard. Self-contained and remote versions available.



VSP-1260S

An amazing value

Now the smallest station can afford a conventional 20-input mix/effects switcher of the highest quality and reliability and get it in under 30 days! All features, including an Encoded Chroma keyer and Bordered keys, are standard (not optional, as is often the case). And the price is astonishingly affordable.

Ask about the AFM-10 Audio Mixer/Switcher — an ideal companion to the CDL VS-10 and VS-14 video production switchers.

Automation.



System 100

Computer controlled automation system for Technical Operations that communicates directly with a Business Computer System. Stores and retrieves the schedule with entry error checking, makes automatic time corrections, performs complicated audio/video switching sequences (including dissolves, fades, wipes and keys), assigns machines, verifies material, and prints the "As-Aired" log.

Master Control Switchers

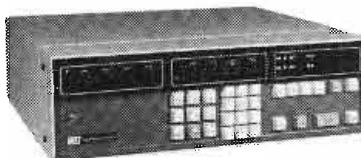
Ranging from CDL's new CD 480 MC to a 2 Bus MCS-829 or a 3 Bus MCS-770. All 3 can be interfaced to System 100 Technical Automation System.

Tape editing systems.



PEC-120 Video Tape Editor

A computer editing System with easily operated control panel and CRT display for rapid and precise control of VTR's & Switcher CDL's unique Self Learning Cueing Software Program is a new feature.



EDS-200 Video Tape Editor

A two machine Time Code microprocessor Editor that interfaces to Quad or Helical VTR's.

Also a complete line of production and TV terminal equipment, including:

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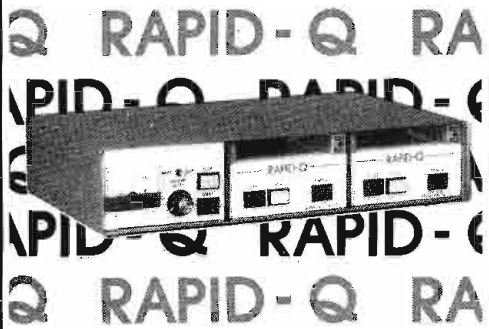
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Industry News

Continued from page 74

the Commission stated that receive-only antennas as small as 4.5 meters would be acceptable for use by cable television systems if sound engineering judgment was used to assess the tradeoffs between antenna size, receiver noise temperature, FM threshold, desired performance and cost of facilities.

Forms Revised

In keeping with the Commission's new EEO guidelines, broadcast renewal application forms have been revised. Forms 303-R and 303—commercial radio and television application forms—already have been modified.

The new revisions will affect the following forms:

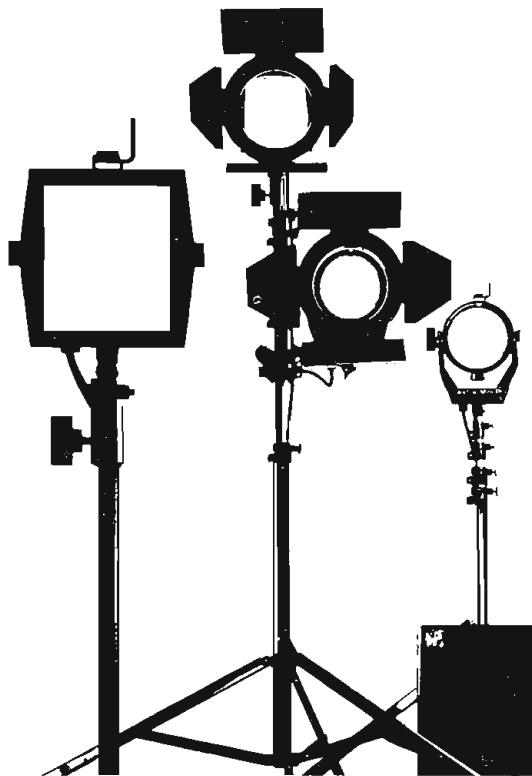
- 301: For new or modified commercial AM, FM or TV broadcast station.
- 309: For new or modified international broadcast station.
- 311: Renewal of license for international broadcast station.
- 314: Assignment of construction permit or license for broadcast station.
- 315: Transfer of control of corporation holding broadcast station construction permit or license.
- 340: New or modified non-commercial educational AM, FM or TV broadcast station.
- 342: Renewal of license for non-commercial educational radio or TV broadcast station.

Shallco Grows

Shallco, Inc. of Smithfield, North Carolina, has acquired the audio attenuator and open-frame rotary switch product lines from McGraw-Edison Company. These lines have been sold under the Daven name for many years and have wide usage and application in broadcast, recording and communication equipment. Shallco is now in production of these products at their Smithfield, North Carolina, plant.

All products will retain the same part numbers and designs.

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BROADCAST ENGINEERING

People

Continued from page 60

Sakurai was Senior Broadcast Project Engineer in Japan.

Ernest L. Adams is retiring after 42 years' service with Cox Broadcasting Corporation. **Robert B. Wehrman** will replace him as Vice President of Engineering....**Jack P. McCarthy** and **Ronald L. Kempff** are also new Cox Broadcasting Vice Presidents in addition to their responsibilities as General Managers, WHIC-TV and WHIO AM-FM, respectively, in Dayton.

James E. Gray, Technical Director, WYDE, was elected President of the Association of Broadcast Technical Consultants and Chief Engineers of Birmingham, Alabama at the organization's first annual meeting. Other officers elected were **Paul Gross**, Technical Director, WAPI-AM, FM, TV, Vice President; and **James Jones**, Technical Director, WBUL, Secretary/Treasurer.

Jonas Heiser is the new AM Engineering Specialist of all Combined Communications AM stations. **Mike Callahan** is serving in the same position for FM stations....**Cyril Brennan**, General Manager and Program Director, WBAM, Montgomery, Alabama, was selected as the 1976 Program Director of the Year for Country Music by Billboard Magazine's International Radio Programming Forum.

Mike Kreiter, formerly Advertising and Marketing Director, is named publisher of **Broadcast Engineering** by George Seferovich, Intertec Publishing's newly-appointed president...**George Laughead, Jr.** is the new Editor/Publisher of **Video Systems**. Laughead had been Coordinator, Television & Media Services, Dodge City (KS) Community College.

Payola-Plugola Continues

The Commission has resumed hearings in its "payola-plugola" docket proceeding to inquire into matters involving these and other related illegal activities.

It said it had received new information and complaints that some broadcast licensees, their employees, and others both in and out of broadcasting might have violated, or might be violating the Communications Act and FCC rules through activities involving payola and plugola.

In 1964, the Commission began this proceeding (which it never has closed) on the basis of allegations indicating the existence of payola, plugola, and other improper similar practices.

The original hearings led to the conviction of a disc jockey at WBNX and a disc jockey at WHOM, both New York City, on payola charges, and a letter to KFWD, Los Angeles, reprimanding the station for its failure to enforce its policies on the outside activities of its employees.

The Commission said that, unlike the 1964 hearings, the current proceeding will be public unless the FCC determines that the public interest would be served by closed hearings.

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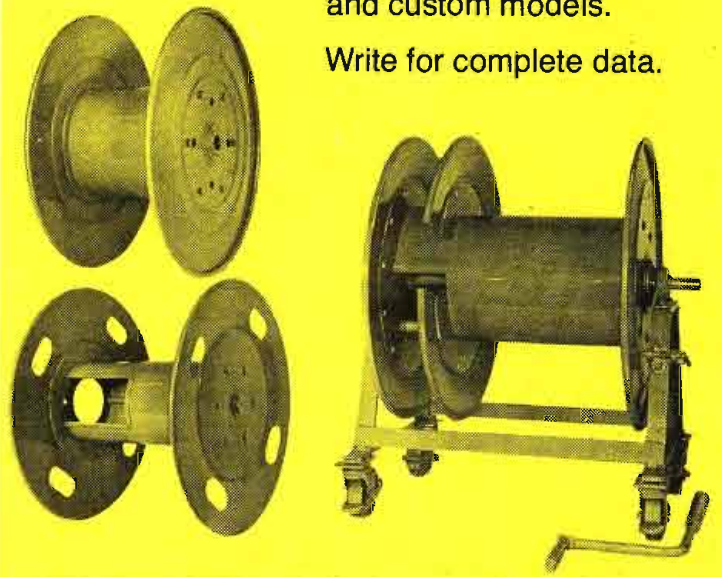
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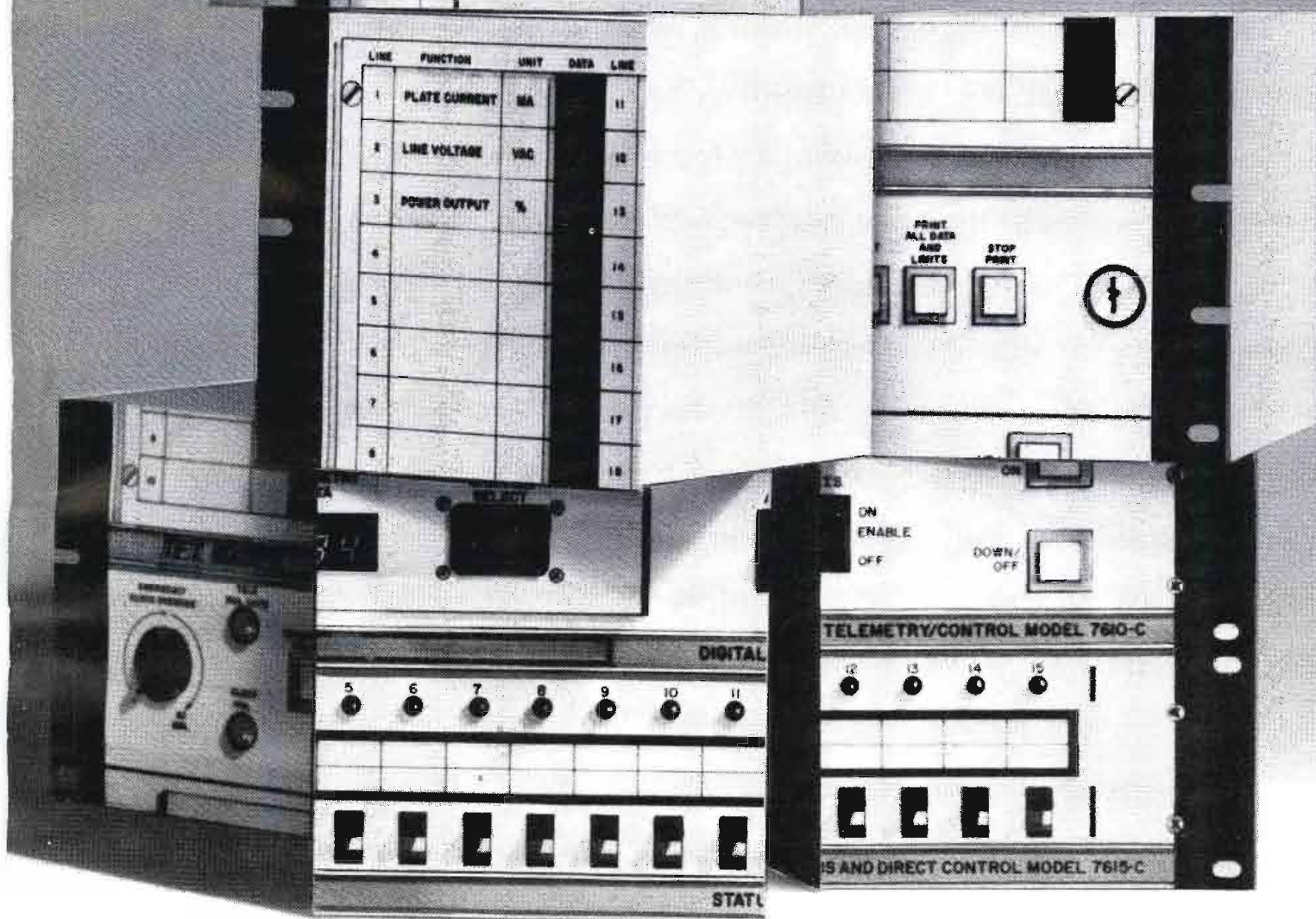
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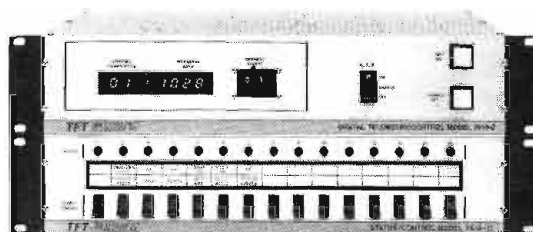
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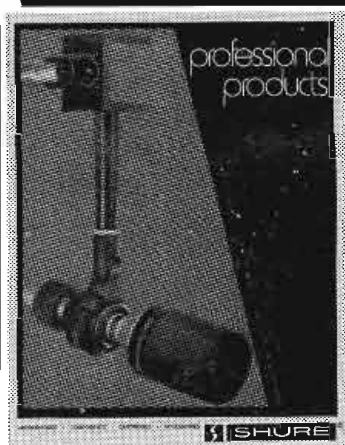
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