

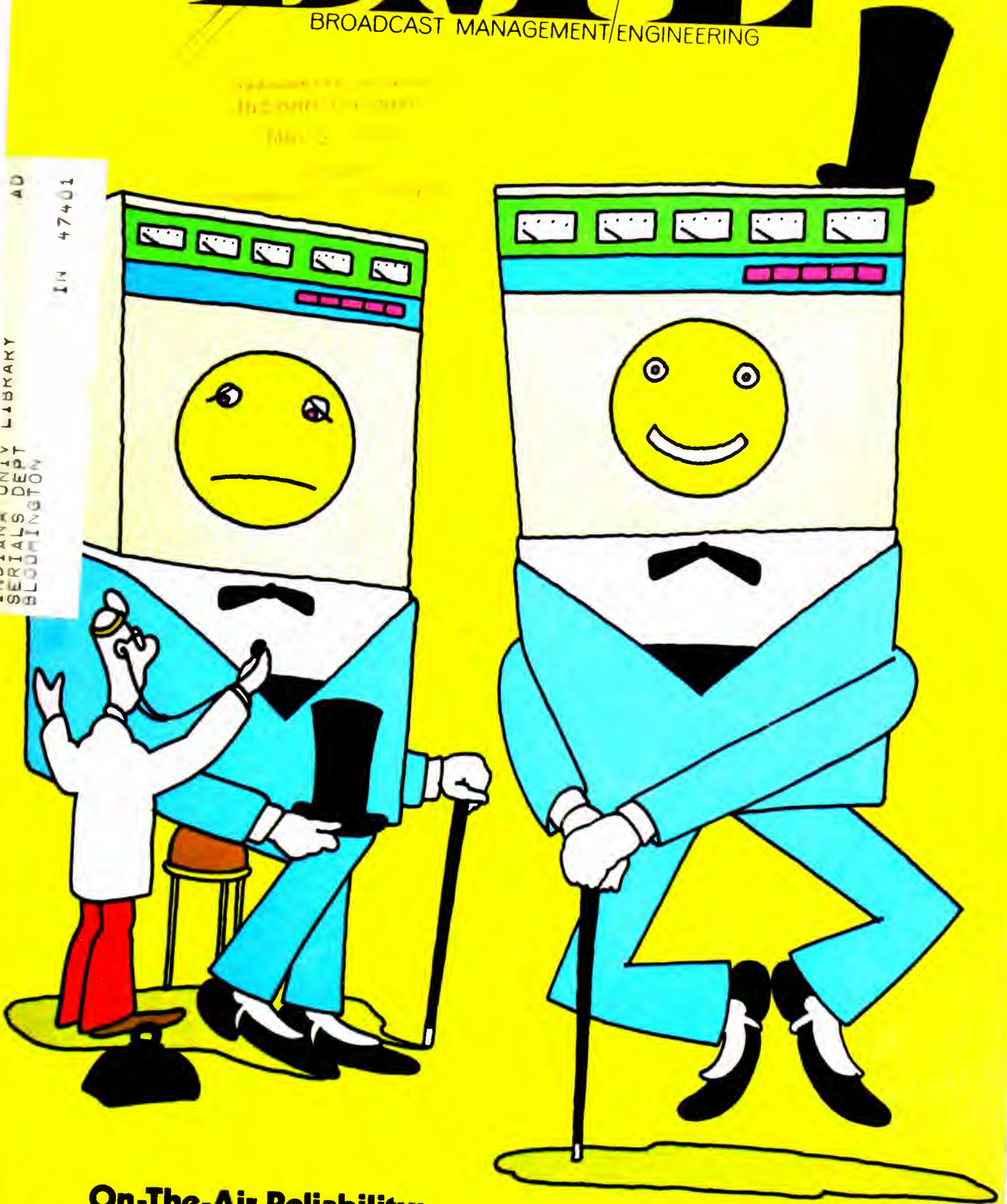
FEBRUARY 1973

BME

BROADCAST MANAGEMENT/ENGINEERING

Volume 11, No. 2
February 1973
\$3.00

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**On-The-Air Reliability:
Dual Transmitters One Answer**

Don't dub 'em, dupe 'em, or dump 'em

Use 'em! Shibaden's dramatically new color cartridge video recorder lets you use all your existing 1/2" EIAJ color or black and white tapes. No need to dupe, or lose resolution by dubbing up to 3/4" or 1" formats.

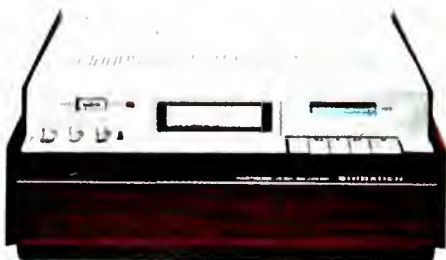
With Shibaden's SV-530 you get fast, convenient record and playback operation. Unexcelled color stability and reproduction. Exceptional reliability.

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

The superbly crafted SV-530 has a decorator wood case, weighs only 46 lbs. and measures less than 20" across. A true portable.

Compatibility with all EIAJ Type-1 VTRs, and considerably less tape storage space and cost than cassettes, are a few of the many other Shibaden pluses to consider.

Consider a demo. Or simply send for our Color Cartridge Video Recorder brochure. From Shibaden . . . "The Image Makers."



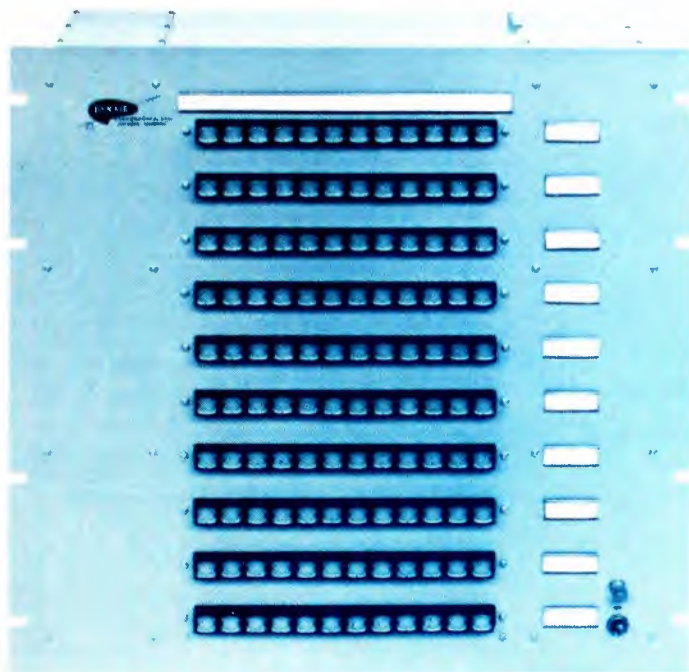
**SHIBADEN CORPORATION
OF AMERICA**

Exec. Off. 58-25 Brooklyn-Queens Exp'y,
Woodside, N.Y. 11377; 21015-21023 S. Figueroa St.,
Carson, Calif. 90745; 1725 No. 33rd Ave.,
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Circle 100 on Reader Service Card



c. ortenblad III



(Patch Cable Eliminator)

Now you can forget about messy patch cables and the tedious task of re-patching to change distribution. DYN AIR's Series-X Switchers provide pushbutton distribution of either 6 or 12 inputs to as many as 12 outputs. A high degree of input-to-output isolation allows any input to be switched to any or all outputs without loading the source.

Series-X Switchers are also available for simultaneous switching of video and audio, further simplifying distribution. All isolation amplifiers are silicon solid-state and full-broadcast quality. The audio and video amplifiers and the power supply are all plug-in modules which may be easily removed from the switcher for maintenance. A 12-MHz bandwidth and excellent differential gain and phase characteristics assure quality color performance.



Rear Panel

Wouldn't a Series-X Switcher solve some of your distribution problems? Write today for full details.

TYPICAL BASE PRICES			
Capacity	Video Only (Base Price)	Video and Audio	Panel Height
6 in, 3 out	840.00	1,575.00	6.0
12 in, 3 out	955.00	1,690.00	6.0
6 in, 6 out	1,455.00	2,625.00	12.25
12 in, 6 out	1,645.00	2,815.00	12.25
6 in, 9 out	2,070.00	3,675.00	15.75
12 in, 9 out	2,335.00	3,940.00	15.75
6 in, 12 out	2,685.00	4,725.00	21.0
12 in, 12 out	3,025.00	5,065.00	21.0

Other input/output configurations available. Options include lighted pushbuttons, bridging inputs, and sync-mixing.



DYN AIR Electronics, Inc.

6360 Federal Blvd., San Diego, Calif. 92114
Telephone (714) 582-9211

Have you seen "Video Switching Techniques"? Yes No
Have you seen "Video Transmission Techniques"? Yes No
Please send information concerning Series-X Switchers

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____



Two heads are better than one, so the saying goes, and two transmitters are also better than one. Paralleling units is a form of insurance against going off the air completely. Most major-market TV stations are doing it.

BROADBAND INFORMATION SERVICES, INC.

274 Madison Ave.
New York, N. Y. 10016
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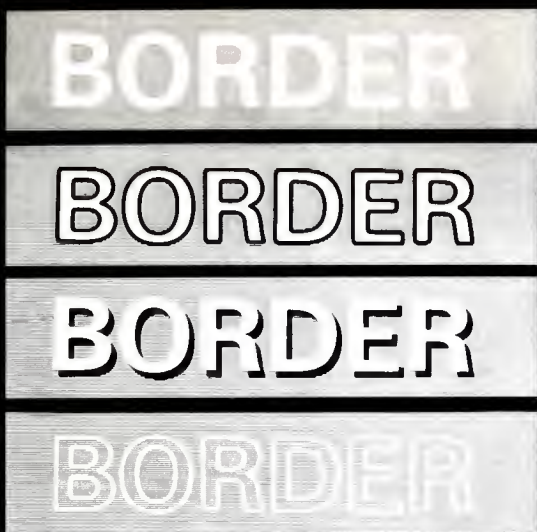
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NEW! BORDERLINE GENERATORS



STARTING WITH A NORMAL KEY SIGNAL,
THE GVG BORDERLINE WILL-----

PROVIDE A BLACK BORDER AROUND
A MATTED TITLE OR -----

PRODUCE A DROPSHADOW EFFECT ON
LETTERING OR TITLING OR -----

PRODUCE OUTLINE LETTERING FROM
A SOLID TITLE SOURCE



DESCRIPTION

Grass Valley Group Borderline Generators are used to add borders to captions and titles from camera video signals or character generators. The added borders greatly enhance the insert visibility, and are particularly effective in situations requiring a white insert into a predominantly white scene.

Model 3271 is for use with GVG switching systems and special effects equipment. The keying circuitry in the special effects amplifier is utilized for the inserting function, thereby enabling effects such as wipe key between bordered inserts.

Model 3272 is for use with special effects equipment of other manufacturers. It provides a widened key signal output which can be connected to the external key input of most special effects systems. The widened key output, together with a slightly delayed (H and V) title video signal, is used to achieve the border effect.

Model 3273 is a complete system which provides bordered inserts into a composite video signal, such as at the output of a switching system. The unit is entirely self-contained and requires no horizontal or vertical driving signals.

Borderline Generators are available for both NTSC and PAL/CCIR standards.

An optional plug-in Colorizer for coloring the insert is available with Models 3272 and 3273. With the Model 3271, insert colorizing is easily accomplished through the associated switcher or special effects.

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(404) 634-0521

BROADCAST INDUSTRY NEWS

BM/E Plans Tour To TV Symposium in Montreux

The Eighth International Television Symposium and Technical Conference, Montreux, the industry's most-prestigious all-world convention, takes place this year May 18 to 25.

To make it possible for more U.S. TV managers and engineers to go, *BM/E* plans a group tour which will include registration fees, round-trip air fare, and up to seven nights at a first-class hotel at Montreux (deluxe and middle-class accommodations also available). There will be one week open after the show for your own trip to Rome, Paris, Munich, etc. The group returns from Zurich on May 31 (flights to and from Europe by Swissair). Anticipated price, per person (double occupancy basis): from New York, \$465; from California, \$595.

The Symposium draws participation from every major television industry in the world, including countries behind the Iron Curtain. Not only the exhibition, but a comprehensive international review of industry status in various countries, serves to supply those at the meeting with an up-to-the-minute view of world television.

For details of the *BM/E* group tour, call or write today: International TV Tour, *BM/E*, 274 Madison Avenue, New York 10016; (212) 685-5320.



Graphic design of Eighth International Television Symposium, 1973.

1973 NAB Convention Preview—See page 25.

Private TV Service To Start with Varian Equipment

An entirely new kind of specialized common-carrier communications service, providing real-time television and data delivery for private use by industrial, institutional, government, and educational organizations, will go into operation early in 1973, with equipment developed by Varian Associates. Two operating firms have already been given FCC construction permits for the system: Microband Corp., for a system in Washington, D.C., and Taft Broadcasting, for Houston, Texas. Called Multipoint Distribution Service (MDS), the new service was approved by a Memorandum Opinion and Order of the FCC, issued in July 1970 in response to a request of Varian Associates. It is designed for low-cost video and data transmission, using omnidirectional radiation, but giving point-to-point service by "scrambling" transmissions, with de-scramblers at the intended reception points. Transmission will use 10 MHz bands at 2150-2160 MHz. The FCC has received more than 300 applications for MDS systems in about 160 cities.

Johnson Tells Broadcasters To Fight For Freedom

FCC Commissioner Nicholas Johnson, often a critic of broadcasters in the past, told a Fall Conference of the NAB that broadcasters carry a heavy responsibility to inform and educate the American people, and must fight off attempts by the government to restrict their freedom of expression. He accused the Administration of trying to control broadcasting to eliminate any criticism of the President. He told the assembled broadcasters: "Now, more than ever, America needs your independence, courage, and leadership."

TPT and Pace College Put Courses on Cable

A second season of "College On the Air," a series of courses prepared by Pace College for university credit, opened on TelePrompTer Cable TV in Manhattan in November. Viewers can earn credit toward a Pace College degree by turning in term papers as directed in the showings. One course will consist of 26 half-hour lectures on appreciation of art, prepared and presented by Dr. Peter Fingesten, head of the Pace College Arts and Music Department.

First New Zealand Color Units Ordered From Marconi

The New Zealand Broadcasting Corporation has ordered two mobile color TV pickup units, the first major purchase for color TV in that country, according to a Marconi announcement, in anticipation of an early start on color there. Each of the two vehicles will be equipped with four of Marconi's Mark VIII automatic color cameras, with all supporting electronics. The mobile units are to be used for sports and outside news.

Cetec, New Firm, Absorbs Electrodyne, Gauss, Langevin

A new firm headquartered in El Monte, Calif., Cetec, Inc., has bought from MCA Technology the Electrodyne, Gauss, and Langevin lines of professional audio equipment. They will continue production and expand marketing of those lines, retaining the existing brand names. Phillip L. Gundy, well-known executive in professional electronics and most recently executive vice president of Computer Equipment Corp. (which is the parent corporation of Cetec), will be president of the new firm. M. Neil Padwa is vice president and general manager. Keith O. Johnson and

continued on page 8

SPARTA PRODUCTS 'JUST RIGHT'

- selection
- quality
- price

CENTURY SERIES modular tape
cartridge machines. Quad cabinet,
all playbacks.

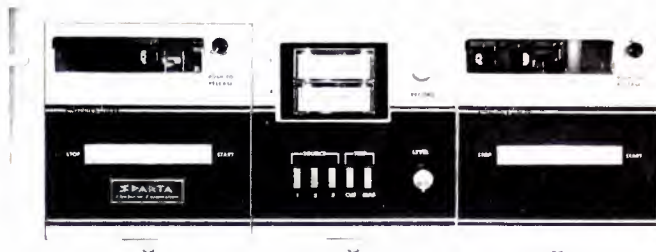
CENTURY SERIES triple rackmount
Record/Playback.

AC155B REMOTE/STUDIO CONTROL
unit. Stereo also available.

AS40B 8 CHANNEL stereo console.
A20B 8 CHANNEL monoural also

GT12 CUSTOM TURNTABLE. Choose
4-pole or synchronous versions.

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enough to be first name friends . . . big
enough to supply EVERYTHING.
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Circle 103 on Reader Service Card

www.americanradiohistory.com

**You get that extra measure
of performance—fast—**



from your RCA Industrial Tube Distributor

More service, more product, more product information... you get it all—faster—when you work with your RCA Distributor. He's in business to help you get the top-quality RCA Industrial Tubes you need when you need them. And, to help you make the best choice, he can provide you with the latest product information—like the newly revised and up-dated 1973 Guide to RCA Industrial Tube Products. More comprehensive than ever before, it covers a total of approximately 800 commercial types—industrial receiving, power, camera, photo, image, microwave, and display tubes. And it also shows how these types can replace nearly 2300 industry types.

Get your copy of this new RCA Guide, the TPG-200H, from your RCA Industrial Tube Distributor today. Or write RCA, Commercial Engineering, Section 21-B/G7, Harrison, New Jersey 07029.

RCA Electronic
Components

NEWS

Don McLaughlin, founders respectively of the Gauss and Electrodyne corporations, will be vice presidents of advanced development and of product planning, respectively, for Cetec, Inc.

Wilkinson Offers Repair Of Plate Capacitors

Wilkinson Electronics of Woodlyn, Penna., has announced the opening of a repair service for FM plate blocking capacitors of the kind used in RCA, ITA, Visual, and AEL FM transmitters and similar types. Heretofore, says Wilkinson, these capacitors have been irreparable. Wilkinson offers to repair them at about 40% of the cost of a new unit.

DuPont Gets License To Make U-Matic Cassettes

The DuPont Company has received from Sony Corporation a non-exclusive world-wide license to make, use, and sell U-Matic video-cassettes. DuPont is already a large supplier of tape for U-Matic cassettes, through its development of Crolyn chromium dioxide tape, advantageous for slow-speed video recording because of its high coercivity and other characteristics. The new agreement will allow DuPont to make finished cassettes and sell them to video distributors, retailers, and duplicators.

Vega Asks FCC To Allocate Channels for Radio Mikes

Pointing out that present assignments of spectrum space and power allotments for wireless microphones are seriously inadequate for the many uses of such mikes, Vega Electronics has petitioned the FCC to assign five MHz channels in the upper part of the VHF television band. Frequencies would be chosen at any location in an unused TV channel. Power would be restricted to 50 milliwatts, frequency modulation used, and antenna gain kept to that of a half-wave dipole, to effectively eliminate interference with TV signals.

Contest Violations Bring Short Renewal to Hawaii Station

The FCC has granted only a short-term one-year renewal to station
continued on page 10

IT'S QUALITY ENGINEERING

THAT MAKES
**RICHMOND HILL
LABORATORIES**
THE LEADER!



Engineers are quick to spot the quality that is built into every RHL product from the smallest amplifier to the largest switcher.

Richmond Hill Laboratories' television broadcast products can broaden your production capabilities from first set-up to going on-air. For example:

- Test Signal Generators for accurate timing/phase/delay etc., to handle all of your on-air scene changes—smoothly.
- Special Video units for Chroma-Key, Digital-Cue and Video Special Effects that can add that 'SPECIAL' flair to great productions.
- Amplifiers for all distribution, clamping and equalizing functions.
- Synchronizing Pulse Generators with peace-of-mind reliability built-in, to get it all together—and keep it that way.

RICHMOND HILL LABORATORIES INC.

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Clark, N.J. 07066
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Telex: 138245

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Ill. 60172
(312) 882-4622

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M1P 2X4
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Pinewood Rd.,
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BE SURE. BUY BUILT-IN QUALITY. SPECIFY. . . .

Circle 104 on Reader Service Card

KNUI, Kahului, Hawaii, charging violations of the rules in a poster contest that the station ran from August 2 to September 14, 1971. According to the FCC, prizes were offered to contestants who correctly identified certain posters, but the contest was manipulated by the station through controlling the distribution of the winning posters, by aiding a participant to win, by continuing to promote the contest after the winners were in, and by other false and misleading advertising. Licensee is Qualitron Aero, Inc. of Burbank, Calif.

Station Has Right To Refuse Public Issue Ad, Says FCC

Station KPLR-TV in St. Louis, Mo., was within its rights in refusing to air a paid statement by the Citizens' Council of America, William B. Ray, chief of the FCC Complaints and Compliance Division, has advised the council. The ad in question was addressed to "the silent majority," and supported private schools, local law enforcement, and "racial integrity." Mr. Ray distinguished FCC policy on paid public-issue ads from the "equal opportunity" rule under Section 315, which applies to statements by bona fide candidates for public office, on issues of public importance, and guarantees equal time to rival candidates. He also distinguished the KPLR-TV action from the Fairness Doctrine, which requires that stations present contrasting views on important public issues "reasonably and in good faith," but with the details of programming to meet this goal left up to each station.

Radio Revenues, Earnings, Up in 1971

The FCC in its annual review of broadcast finances reported that radio revenues were up 10.7% in 1971 over 1970, and earnings were also up 10.7%. Total advertising on radio was \$1,383.7 million. FM revenues were up 35.5%, to a total of \$115.0 million, but a majority of independent FM stations (65.6%) reported losses for the year, against 69% reporting losses in 1970.

Spot Radio Invoice Okayed By RAB, AAAA, IBFM, SRA

The Radio Advertising Bureau announced development of a standard
continued on page 14

THE DOLLAR SAVER...

the STATIONMASTER from Broadcast Products!

- Prepares logs, discrepancy reports, billing and affidavits.
- Prepares payroll, receivables, commission statements.
- Prepares sales reports.
- Gives fixes on availabilities.

Simplified operation with visual readout requires minimum training, allows more efficient usage of present personnel. If your commercial volume exceeds \$100,000, *you can't afford not to own one.*

The **STATIONMASTER**, with software developed and marketed by Broadcast Products, is the only computer exclusively programmed for the Broadcaster. It can be used with most automation systems or by itself. Call Dave Hill, Jim Woodworth or Duncan Mounsey today for details.

BROADCAST PRODUCTS, INC.

660 LOFSTRAND LANE—ROCKVILLE, MD. 20850

(301) 424-4700

See us at NAB, Booth 514, Shoreham

"Video becomes as mobile as film with the Norelco PC-100A and PCP-90B."

... says Warren G. Stitt, President Mobilimage Corporation, Hollywood, California

Warren G. Stitt



When Mobilimage put a complete TV production studio into a small van, they didn't want to compromise on picture quality. So they turned to Norelco.

First for the PCP-90B . . . the world's first and finest hand-held color television camera. Its three-Plumbicon* design produces uncompromised studio-quality color pictures. Operating with pencil-thin triax cable, it weighs just 18 lbs. It can operate anywhere, self-powered from a battery back-pack; and can transmit direct live broadcast by microwave . . . no cables needed.

Second, Mobilimage chose the Norelco PC-100A. It's today's most advanced studio and field camera.

Naturally the PC-100A uses triax cable too. Our exclusive ACT (anti-comet-tail) Plumbicon tubes eliminate the comet-tailing so commonly encountered in remote work.

Warren Stitt says, "Both cameras give immediate registration. They eliminate costly set-up and strike time. They enable Mobilimage to meet the strictest requirements for perfect tape-to-film transfer. And they produce the best color pictures in television today."

Now you can combine the go-anywhere versatility of film with the instant replay, crisp imagery, and electronic control advantages of videotape.

For information on how you too, can get aboard the new-generation mobile TV production band wagon, call your nearest Norelco field representative, or write, today.



* Reg. T.M. N.V. Philips of Holland



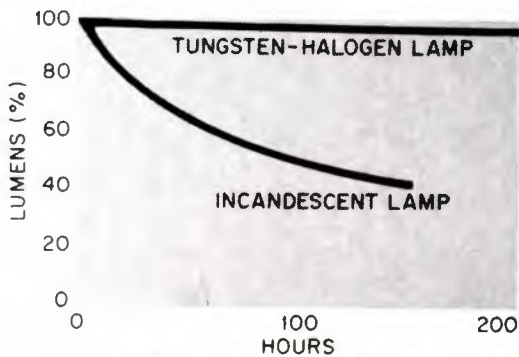
One Philips Parkway,
Montvale, N.J. 07645 • 201/391-1000



10 KW TUNGSTEN-HALOGEN LAMP.



10 KW INCANDESCENT LAMP.



WE'VE CONQUERED THE DROOP.

If you've ever watched those big, fat incandescents deteriorate, you know what a big, fat pain-in-the-neck that is. Their lumen output sinks and their color temperature drops, as the graph shows.

Now Sylvania tungsten-halogen lamps have come to the rescue.

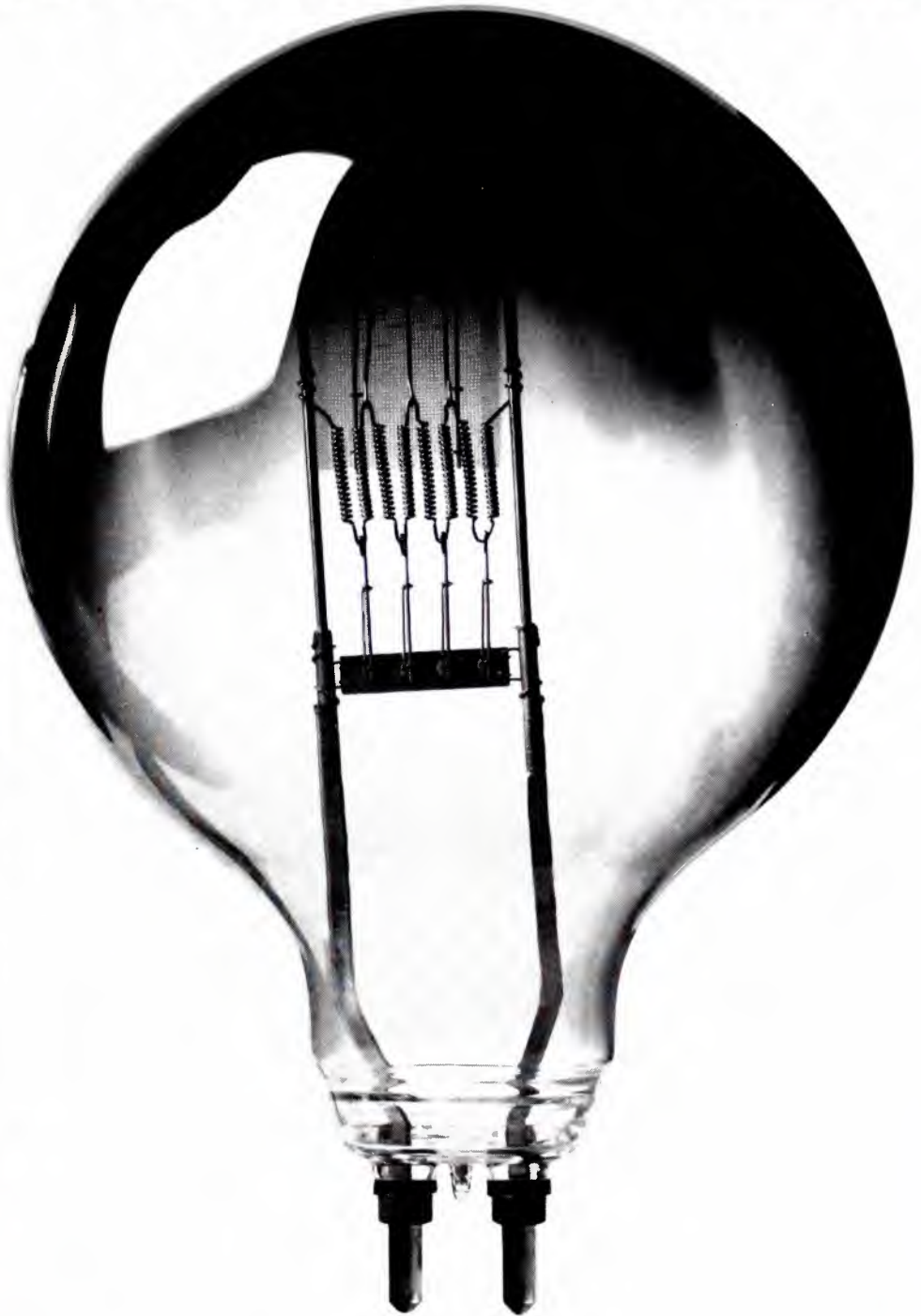
They don't blacken with age, so light output and color temperature don't go into a slump.

That means you don't have to keep

70 HOURS LATER.



10 KW TUNGSTEN-HALOGEN LAMP.



10 KW INCANDESCENT LAMP.

fiddling with the studio lights or camera settings. You get constant color rendition on color film and save money on print correction.

Tungsten-halogen lamps outlast the incandescents 2-to-1. (Or even 3-to-1, since you may have to throw away the blackened lamps before they conk out.)

Then there's size. Why should anyone want big, heavy glass balloons when he can have nice, slim little

lamps that are easy to handle and store?

We've developed two complete lines of Sylvania tungsten-halogen lamps.

The first is a line of direct replacements. These lamps fit into the big, old sockets vacated by the big, fat incandescents.

The second is a line of even smaller tungsten-halogen lamps that you can use to replace our replacements once

you've gotten rid of the old sockets and fixtures. They fit into entirely new, smaller, more efficient fixtures.

Ask us about both our lines. Right away.

Before another 70 hours go by.

We'll be glad to send you an illustrated brochure on each line. For your copies, write: Sylvania Lighting Center, Danvers, Mass. 01923

GTE SYLVANIA

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SUPERIOR 0-1800 MHz SPECTRUM ANALYZER



... one with intermodulation distortion products more than 70 dB down, even with full screen signals.

... one with absolutely calibrated, spurious-free displays that consistently produce better measurements. This analyzer is the TEKTRONIX 7L12, part of the TEKTRONIX 7000 Series of CRT-based measurement products. System prices start at \$5800.

We will send you a detailed booklet about the 7L12. Just complete the coupon and mail to

**Tektronix, Inc., Box 500A
Beaverton, Oregon 97005**

Please send me the booklet

Please arrange a demonstration

Phone _____

Name _____

Position _____

Company _____

Address _____

ZIP _____

Circle 108 on Reader Service Card

NEWS

invoice for spot radio billings, which functions both as an invoice and an affidavit. The AAAA Committee on Broadcast Standardization, the Institute of Broadcasting Financial Management, and the Station Representatives Association have all approved the form, two years in the making. By standardizing size and information, the new form is expected to save large amounts of time at advertising agencies, which now must assign many more man-hours to processing radio station payments because of non-standard billing information. Samples of the new form are available from RAB at 555 Madison Avenue, New York 10022.

AMST Opposes Grant of Channel 14 to Land Mobile Use

The Association of Maximum Service Telecasters has filed a brief with the FCC strongly opposing the allocation of UHF Channel 14, 470-476 MHz, to land mobile use in the Washington, D.C., area. The Land Mobile Communications Council asked for the change; it has been opposed by United Television Company and B & F Broadcasting, as well as by AMST. The latter's petition cites the fact that the channel is not "unoccupied" as defined in the rules, since Station WFAN-TV in Washington is in process of assignment to B & F Broadcasting, with operation on the channel presumptive.

TV Viewing Set All-Time Record in November

Reaching an estimated 7 hours 4 minutes per-home per-day, television viewing in November 1972 set an all-time record high, according to the Television Bureau of Advertising. That is 38 minutes over November 1971, and 3 minutes over the previous high set in January 1972. Figures are from studies by A. C. Nielsen Company.

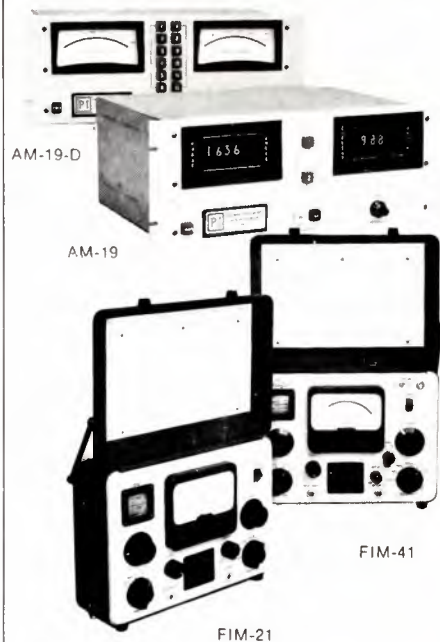
Theta-Com Starts Plant in Phoenix To Consolidate Operations

Theta-Com, maker of components and systems for cable TV, broke ground in Phoenix in December for a new plant of 140,000 square feet for manufacturing those com-

continued on page 16

For Phase-Current Ratio-Signal Strength

WE'VE MADE THE BEST EVEN BETTER!



FIM-21 Field Strength Meter, 535 KHz to 1605 KHz Lightweight, easy-to-use, the '21' is the new solid state replacement for the time-proven Nems-Clarke FIM-120 (RCA WX-2). Using six standard D cells, the unit features a ceramic IF filter, ganged osc/receiver tuning, front panel speaker and illuminated meter and dial. Field strength values between 10 microvolts/Meter and 10 volts/Meter. An external RF input jack is provided for tunable voltmeter applications.

FIM-41 Field Strength Meter, 540 KHz to 4.8 MHz This lightweight unit measures AM broadcast harmonics to -80db. Exceptionally stable over a wide temperature range, it includes the same features as the Model FIM-21. Exceptionally easy to use, it is particularly well suited for transmitter 'proof-of-performance' reporting as defined by FCC Rule 73.47(a)(5).

AM-19 Antenna Monitor The basic instrument for measuring phase and loop current ratio, the AM-19 can monitor up to 12 towers and accommodate DA-1, DA-2 and DA-3 patterns. Phase meter resolution is 0.5 degrees. Loop current accuracy is $\pm 1.5\%$ with a 0.5% resolution.

The **AM-19-D** offers digital readout of phase angle and loop current ratio to provide phase and current resolutions of 0.1 degree and 0.1% respectively.

For complete information, please write or call:



POTOMAC INSTRUMENTS, inc.
932 Philadelphia Ave.
Silver Spring, Md. 20910
Phone: (301) 589-3125

Circle 109 on Reader Service Card

FEBRUARY, 1973—BM/E

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**The Uncommon Solid State Dimmer
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Setting new standards of excellence for accuracy, dependability, versatility and appearance, ASTRAL dimmers are available in power capacities of 2, 3, 6 and 12 kw. All mount in a standard nineteen-inch electronic rack without adaptive hardware. The ASTRAL 2 requires only 1¾ inches of rack space and weighs only 7 pounds. For complete engineering data, write for Bulletin AST-172.

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CORPORATION**

41-43 24th STREET • LONG ISLAND CITY, N.Y. 11101 • (212) 937-1444

A Renaissance of Perfection

Three current B & S production accessories for directors and cameramen, flawlessly designed and precision machined for the most demanding creative challenge.



DIRECTOR'S FINDERS — an essential accessory used world-wide by more than 1,000 pros who know. Shows field of view for various focal length lenses. For both 35mm and 16mm production. MODEL 111-B 35/16 CINEMASCOPE, Cat. 2615, \$119.50; MODEL K 16/35 COMBI-FINDER, Cat. 2606, \$89.50.



MARK II CIN-AR ADAPTER—proven by years of professional use in the industry. Use all Arri lenses on "C" mount cameras. The new, improved CIN-AR has 3-grip lens seats and adjustable aperture viewing. Cat. 1150, only \$39.50.



E-Z-SEE ZOOM SCALE — the only data ring to have both F and T stops. Both in feet and meters. Precision machined and engraved. Makes distance and aperture settings easily visible to the cameraman. Was \$79.50. Now only \$49.50.

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Circle 111 on Reader Service Card

NEWS

ponents. Also headquartered in the plant will be two Theta-Com divisions now in California: AML, which makes microwave equipment, and the SRS Division, making subscriber response systems for two-way cable. Completion of the plant is expected for September 1973.

"Two-Eyed" RCA Camera Tube Boosts Low-Cost Color

RCA announced in December a new tube for TV cameras, which is expected to improve the performance of low-cost color cameras.

Called the Bivicon, the tube has two targets and provides excellent registry between luminance information on one target, and chrominance data, in encoded form, on the other, because the two beams are controlled by a single magnetic focus and deflection system. The Bivicon, according to RCA, is also handy to replace single-target vidicons in one-tube color cameras that separate color with optical filtering. The second target can process the color signals independently. The tube also provides redundancy in surveillance use with, for example, a long-focus lens on one target and wide-angle on the other.

Ampex Offers Free Headwheel Refurbishing With Tape Buy

The Ampex Magnetic Tape Division announced it will pay the cost of refurbishing one Ampex broadcast VTR headwheel assembly (an \$810 value) with each purchase of 100 hours of Ampex Series 175 highband color videotape. The offer became effective December 15, 1972 and will run through June 30, 1973. To make a purchaser eligible, the 100 hours of tape must be delivered to a single purchaser within the 90-day period, starting with the first delivery. A "single purchaser" may be any commercial or educational TV station, or the flagship of a network or station group.

Stations in Jamestown Join For "VD Information Days"

Two radio stations in Jamestown, New York, WJTN and WKSJ, in late November pooled their resources for two days to mount an attack on venereal disease in southwestern New York State. Calling them "VD Information Days," the two stations

continued on page 18

The Pick-Up Pros.




WOR-FM, the country's leading FM Stereo rock station, has been using Stanton cartridges since its inception.

Program Director Sebastian Stone likes the smooth, clean sound the Stanton delivers: the way it is able to pick up everything on the record so that the station can assure high quality transmission of every recording.

Eric Small, Chief Engineer for WOR-FM, likes the way that Stanton cartridges stand up under the wear and tear of continuous use. "We standardized on Stanton a couple of years back," Small said, "and we haven't had a cartridge failure since." Studio Supervisor Artie Altro concurs.

Whether you're a professional or simply a sincere music lover, the integrity of a Stanton 681 Series cartridge delivers the quality of performance you want.

It affords excellent frequency response, channel separation, compliance and low mass and tracking pressure. And every Stanton cartridge is fitted with the exclusive "longhair" brush to keep grooves clean and protect the stylus.

For complete information and specifications on Stanton cartridges, write Stanton Magnetics, Inc., Terminal Drive, Plainview, L.I. 11803.  **STANTON**

All Stanton cartridges are designed for use with all two and four-channel matrix derived compatible systems.

Circle 112 on Reader Service Card
FEBRUARY, 1973—BM/E

Sensitivity 10 mV

Stabilities to ± 5 parts in $10^{10/24}$ hrs.

Battery option

\$770 up, delivery 30 days

All models frequency expandable
Resolution to 9 digits or 0.1 Hz
Small size, 3½" H, ½ rack W
BCD output for systems use
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NEWS

donated large parts of their airtime to community groups for interviews, questions and answers, lectures, designed to arouse listeners to the nature, dangers, and counterattacks for venereal diseases. Cooperating were county health departments, local physicians, hospitals, educational institutions, and the WKSX, WJTN Broadcast Action Council.

SMPTE To Have Tech Conference in Chicago in April

The Society of Motion Picture and Television Engineers announced April 8 to 13, 1973, as the time, and the Hyatt Regency O'Hare Hotel in Chicago as the place, for the 113th Semi-Annual Technical Conference. Matt Herman, of the Geo. W. Colburn Lab., was named Arrangements Chairman. Details: SMPTE, 862 Scarsdale Avenue, Scarsdale, N.Y. 10583.

TPT Buys Cameras To Expand and Upgrade Program Production

With the purchase of 14 new color television cameras, TelPromPTer Corporation is expanding program production, and upgrading signal quality, for cable systems in seven major market areas. The cameras came from Commercial Electronics, Inc., of Mountainview, Cal. According to Leslie H. Read, vice president and general manager of TPT Cable TV Division, the new cameras will eliminate handicaps in coverage of city council meetings, sports events in local gyms, or music and drama in high school auditoriums, where light is apt to be low. Cable systems benefitting are in Los Angeles, Oakland, Reno,

Tacoma, Florence, Ala., Gary, Ind., and Morgantown, W. Va.

NAEB Puts Forward Plan for Five-Year CPB Funding

Educational Television Stations, the television arm of the National Association of Educational Broadcasters, has advanced a three-part proposal for five-year funding of public broadcasting in the United States. The plan includes a five-year total of \$100 million in federal funds for the Corporation for Public Broadcasting: a station operational support fund, partly federal, for local and national program development; and a station facilities support fund for improvement of equipment and building new stations. NAEB sees the CPB as mainly "future oriented," doing innovative program development and providing national leadership, not day-to-day operation.

AVCO and Meredith Join To Make Children's Programs

AVCO Broadcasting and the broadcast division of the Meredith Corporation, each with five television stations, have joined forces to produce a series of prime-time programs for children, the two firms announced in December. There will be nine hour-long specials, two of which were completed at the time of the announcement. One, called "Four Children," displays the life styles of four disadvantaged children, with the story told mainly in the children's own words. Another program is based on the fictional diary of a child coming to America on the Mayflower. The series will be shown on the Meredith and AVCO stations, and is also available to others through AVCO Program Sales, 6 East 46th St., New York 10017.

continued on page 62

COMPUTER-ASSISTED TRANSMITTER REMOTE CONTROL

For Television — Broadcast Applications

See it during the 1973 NAB Convention as presented by Moseley Associates, Inc.



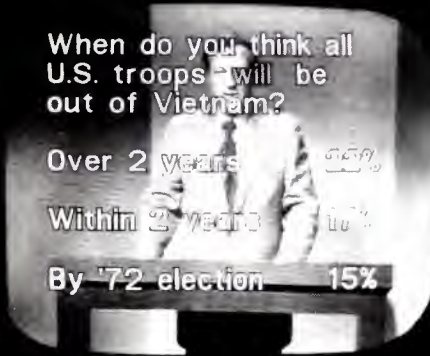
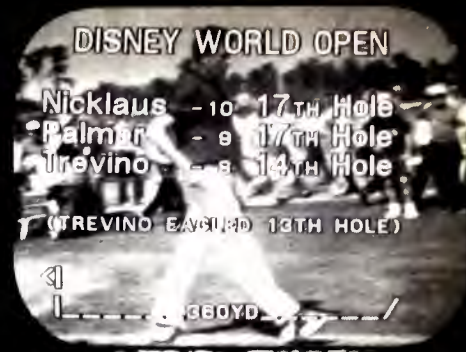
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HIGH.....73
 LOW.....55
 PRESENT.....72
 HUMIDITY.....92%
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INTERPRETING THE **FCC** RULES & REGULATIONS

Broadcast Re-Regulation: Relaxation Of Operating Rules

In separate November and December broadcast actions, the Commission both relaxed and deleted certain operating rules which heretofore caused broadcasters considerable inconvenience. Acting to provide substantial relief from *unnecessary* operating burdens on both itself and the licensee, the Commission issued its actions "to reflect more accurately the present state of broadcast technology and operation." Herein, *BM/E* will treat its changes in rules pertaining to 1) meter reading; 2) transmitter inspection; 3) logging; 4) station identification; 5) identification of taped, filmed, or recorded material; 6) rebroadcasting programs of other stations; and 7) filing certain contracts. The changes follow.

Meter Reading

Recognizing the sophistication of station equipment in general use today, the Commission relaxed the requirement that meter readings of broadcast transmitting systems be made every 30 minutes to reflect present-day performance and reliability norms. The operator need now take such readings 1) at the beginning of each operating mode, and 2) at intervals not exceeding *three hours*, and enter them in the operating log.

Transmitter Inspection

Likewise, recognizing the present state-of-the-art of transmitting equipment, the Commission relaxed its former five-day per week, 12-hour interval inspection requirement. Hereafter, AM, FM, and educational FM transmitting equipment need be inspected at least *once a week*, with an interval of not less than five days between inspection and normally certified conformance via logging. Yet the Commission warns that the operator is in no way relieved of his responsibility to make certain that his station is in conformance with the Commission's Rules and the station authorizations. Relaxation obtains to the procedural requirement, not the substantive compliance.

Logging

Further provision was made for the convenience of the operator to permit him to more conveniently maintain his logs. Now, if he so desires, the operator may keep his operating and maintenance logs in one *technical* log by recording each, individually, on the same sheet in the common log.

Station Identification

Deleting its tedious rules on "program interruption," "deferred station identification," and "equipment performance measurements," the Commission significantly eased its station ID two-minute parameters. It eliminated its previous requirements that 1) TV operators identify their stations within two minutes of the hour, and 2) AM and FM operators identify within two minutes of the hour and half hour. In the provision's place was substituted the requirement that broadcasters identify their station 1) at the customary commencement and close of the day's operations, and 2) as close to the hour as possible, or at "natural breaks" in the program fare. Flexibility has displaced rigidity in the Commission's approach to re-regulation of broadcasters.

Identification of Taped, Filmed or Recorded Material

Recognizing that *recorded* fare (audio and videotaping, filming, and recordings of vocal-instrumental material) serves as the vital basis of both TV and radio programming, the Commission significantly loosened what was formerly known as its "Mechanical Reproduction" rule. The Commission eliminated its *separate* rules for AM, FM, Ed.-FM, and TV. In its stead, it substituted the following. *First*, taped, filmed, or recorded fare must be identified as such (i.e., "taped," "filmed," or "recorded") at the beginning of the program if 1) *time* is of special signifi-

continued on page 66

REEL

PRIME TIME

KPRC-TV, Houston, discovers what our "Cart" machine won't cost them.

At the NAB Convention, Paul Huhndorff saw a lot of possibilities for using our TCR-100 Recorder at his station. He's Vice President—Operations at KPRC-TV.

But then came the big question. Could the Cart machine justify its purchase by the money it saved the station?

Mr. Huhndorff decided to find out with an in-depth cost-effectiveness study.

The first thing it revealed was possible savings in head cost.

KPRC's average spot is 30 seconds, at an average rate of 100 per day. Head contact is about 32 seconds on the TCR-100, compared to

about 120 seconds on a reel machine, for a reduction of about 75%.

Applying this figure to 1971's total head cost of \$12,870, Mr. Huhndorff projected KPRC's savings at \$9,652.

Labor worked out to about 365 man-hours per year for the Cart versus 1,278 hours for a reel-to-reel recorder. That meant savings of about \$9,130 a year.

Total reductions in head cost and labor cost—\$18,782 a year.

And, since the Cart eliminates the need for making up a daily spot reel, further savings accrue—\$10,950 in manpower and \$4,000 in headwheel cost for recording the spots.

This \$14,950 spot reel saving combined with the above \$18,782 reduction in headwheel and labor cost enabled Mr. Huhndorff to project yearly savings of well over \$30,000 for KPRC with the TCR-100.

So the station ordered a TCR-100 and combined it with one of the six RCA TR-70 recorders in their tape room.

Soon after installation, the TCR-100 was handling some 125 playbacks a day, plus recording 25 to 30 new spots each evening for the tape library. Mr. Huhndorff expects to maintain a current "library" of 1,200 to 1,500 carts.



The cost-effective TCR-100 at KPRC-TV.

(Continued on next page)

(Cont'd.)

The TCR-100 is connected to a delegate system which allows it to be remote-controlled from any of four control rooms, especially important in a station with such a strong news emphasis as KPRC-TV.

And the TCR-100 frees for production use a reel machine that was previously tied up full-time handling spot reel commercials.

In fact, the Cart has measured up to expectations so well that the delivery schedule has been accelerated on the second TCR-100 for KPRC.

Mr. Huhndorff foresees many additional advantages from the second Cart machine. It will be located in the film room and used for playbacks, while the TCR-100 in the tape room handles all record functions.

In addition to recording spots, this machine will be used to record network news stories, one segment per cart. This will make it easier for



KPRC to assemble material for daily news programs and to update them for later broadcasts.

Tapes from various news services will also be recorded on carts as in-

TCR-100 Box Score

Number delivered	79
Number of commercials broadcast	1,505,000*
Present rate (commercials/day)	9,100*
Man hours saved	62,290*
* Estimate	

TCR-100's Delivered

KARD-TV, Wichita, Kan.	WBRE-TV, Wilkes Barre, Pa.
KATU-TV, Portland, Ore.	WBTB, Charlotte, N. C.
KBTB, Denver, Colo.	WDAF-TV, Kansas City, Mo.
KCEN-TV, Temple, Texas	WDAY-TV, Fargo, N. D.
KHQ-TV, Spokane, Wash.	WDCA-TV, Washington, D. C.
KIRO-TV, Seattle, Wash.	WEAT-TV, W. Palm Beach, Fla.
KNTV, San Jose, Calif.	WECT-TV, Wilmington, N. C.
KOB-TV, Albuquerque, N. Mex.	WFMY-TV, Greensboro, N. C.
KOCO-TV, Oklahoma City, Okla.	WGN-TV, Chicago, Ill.
KOMO-TV, Seattle, Wash.	WGR-TV, Buffalo, N. Y.
KPLR-TV, St. Louis, Mo.	WISN-TV, Milwaukee, Wisc.
KPRC-TV, Houston, Texas	WJAR-TV, Providence, R. I.
KPTV, Portland, Ore.	WKBW-TV, Buffalo, N. Y.
KRON-TV, San Francisco, Calif. (2)	WKRC-TV, Cincinnati, O.
KSD-TV, St. Louis, Mo.	WKRG-TV, Mobile, Ala.
KSLA-TV, Shreveport, La.	WKYC-TV, Cleveland, O.
KSTP-TV, St. Paul, Minn.	WMAL-TV, Washington, D. C.
KTBS-TV, Shreveport, La.	WMAQ-TV, Chicago, Ill.
KTRK-TV, Houston, Texas	WNCT-TV, Greenville, N. C.
KTSM-TV, El Paso, Texas	WPTV, Palm Beach, Fla.
KVRL-TV, Houston, Texas	WRAL-TV, Raleigh, N. C.
KWGN-TV, Denver, Colo.	WRC-TV, Washington, D. C. (2)
KWTV, Oklahoma City, Okla.	WSAV-TV, Savannah, Ga.
KXZY-TV, Spokane, Wash.	WSB-TV, Atlanta, Ga.
NBC, Network, N. Y. C. (4)	WSOC-TV, Charlotte, N. C.
NBC, Network, Burbank, Calif. (2)	WSPA-TV, Spartanburg, S. C.
WAFB-TV, Baton Rouge, La.	WTAE-TV, Pittsburgh, Pa.
WAPA-TV, San Juan, P. R.	WTAF-TV, Philadelphia, Pa.
WBAL-TV, Baltimore, Md.	WTVC, Chattanooga, Tenn.
WBAP-TV, Fort Worth, Texas (2)	WTVN, Columbus, O.
WBAY-TV, Green Bay, Wisc.	WUAB-TV, Cleveland, Ohio
WBNS-TV, Columbus, O. (2)	WUTV, Buffalo, N. Y.
WBRC-TV, Birmingham, Ala.	WWL-TV, New Orleans, La.

Austarama TV, Melbourne, Australia
 CHAN-TV, Vancouver, B. C., Canada
 London Weekend TV, London, United Kingdom
 TIMSA, Mexico City, Mexico
 Venevision, Caracas, Venezuela

KPRC Cost-Effectiveness Study—TCR-100

HEAD COST

Head contact, reel machine (av. 30-sec. commercial)	120 sec.
Head contact, TCR-100	32 sec.
Reduction in head contact	75%

1971 head costs	\$12,870
Projected headwheel savings	\$ 9,652

LABOR COST

Man-hours, reel machine	1,278
Man-hours, TCR-100	365
Man-hours saved	913
Projected operating labor savings	\$ 9,130

ELIMINATION OF SPOT REEL

Labor (3 man-hours per day @ \$10/hr.)	\$10,950
Head cost (2 VTRs at about \$2/hr.)	\$ 4,000
Projected spot reel make-up savings	\$14,950

TOTAL PROJECTED SAVINGS

\$33,732

dividual segments for instant access when needed as "fillers". Until now, several VTRs might be used for these "fillers" in a single newscast, often interrupting KPRC's production schedules.

In addition to operational economies, the TCR-100s will enable KPRC to expand its commercial production capability by making additional tape machines available for this use.

In today's burgeoning Houston, more and more business is expected.

And because KPRC insists on cost-effective equipment, more profit is expected, too.

Circle 160 on Reader Service Card

Repackaging the TK-44 Camera into a studio/portable "convertible".

Because of more and more production demands, CFTO-TV, Toronto, recently needed a couple of hand-held color cameras that could go where their seven TK-44 cameras couldn't.

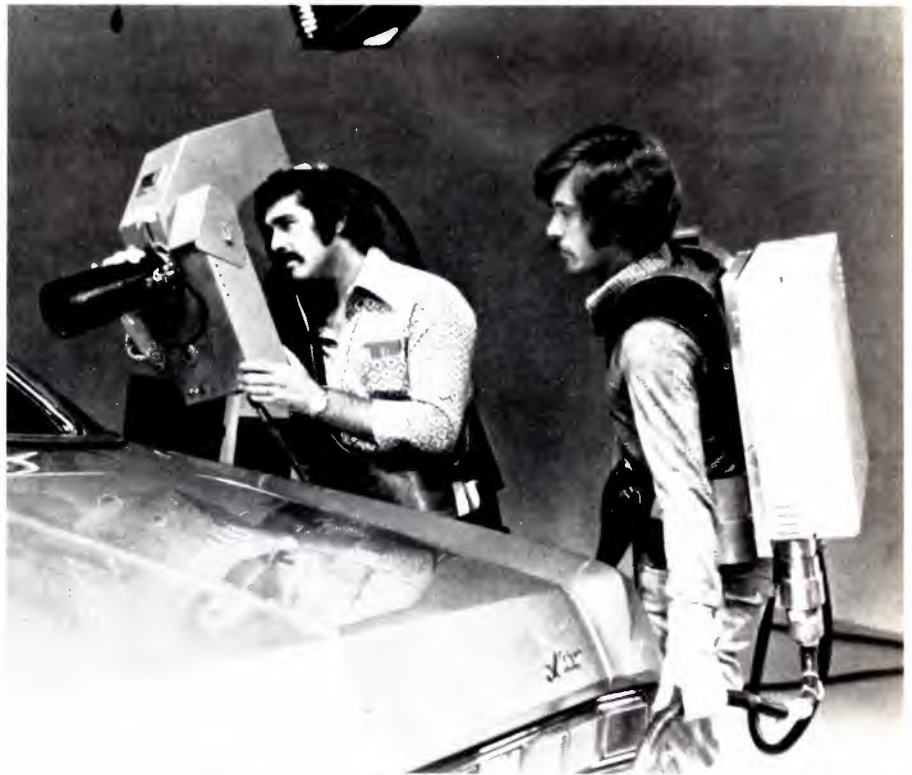
Renting portable cameras was considered and turned down as too expensive. Buying new hand-held cameras was evaluated and rejected as both costly and risky in terms of maintaining picture quality.

CFTO's imaginative solution was to repack two of their TK-44s so that they can be used either as portables or studio cameras. By so doing, they have achieved flexibility, mobility and top quality color at moderate cost.

One of CFTO's hand-held cameras is pictured on a production assignment. The camera head and electronic viewfinder are enclosed in a formed sheet metal housing. Changing the yoke-tube assemblies, beam splitter and preamp electronics over to the new housing takes only about twenty minutes.

In addition to the optics and 10:1 manual zoom lens, the camera head also contains intercom facilities, a call button for video control, and a switch for effects display on the viewfinder. The entire unit weighs 38 pounds.

The back pack contains all the circuit boards from the TK-44 except



On remotes or in the studio, CFTO's hand-held TK-44s provide extra flexibility.

preamps. Conversion of this unit takes only ten minutes.

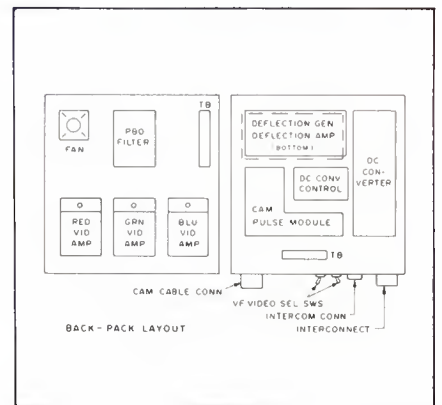
A 15-foot multi-coax cable was custom-made to connect the camera head to the back-pack electronics.

The housing is sheet metal, hinged to open like a book. It weighs twenty pounds fully loaded, including circuit modules, video switching for the viewfinder, cable and control functions, and RGB video triggering switches for making circuit checks.

In studio or hand-held configuration, the convertible cameras operate from the standard TK-44 CCUs, which simplifies control panel layout. And, of course, modules are identical with other cameras in the system, making maintenance easier and reducing spare parts requirements.

The portables have had ample opportunity to prove themselves—at a religious youth rally in Dallas' Cotton Bowl; at Canadian Football League games; and at the 1973 Miss Canada Pageant.

CFTO-TV is enthusiastic about the results of the "new" cameras, particularly noting their ability to get *cinema verité* shots like tight closeups, angles, and tilts, which



makes the units ideal for commercial production.

Results have been so good that a third conversion is now being planned.

It all goes to show what can be done with good equipment... mixed with some imaginative thinking.

For more details on CFTO's convertible TK-44 cameras, see BROADCAST NEWS, Vol. #148 (December, 1972).



Camera-head design permits optics to be adjusted while camera is carried.

Circle 161 on Reader Service Card

RCA headwheel passes 5500-hour mark.

KBTV, Denver, reports some interesting statistics on a VTR headwheel panel.

Installed on one of their TR-70s two years ago, it has now logged over 5,500 operating hours. And the tapes it turns out still show no signs of deterioration.

According to Director of Engineering, Herb Schubarth, pole tip projection has been holding at one mil for the past eight or nine months.

Such stubborn resistance to aging is unusual, even in RCA's durable Alfecon II headwheels. And pampering, certainly, was not the explanation at KBTV.

The work assignments cover the whole gamut—production, dubbing and network delay, with particular emphasis on recording.

And the operating environment doesn't exactly meet "white room" ideals. It's the busy KBTV tape room where all five RCA VTR's are worked hard and given ordinary attention.

But then, long-lasting headwheel replacements aren't a novelty at

KBTV. Another one of their replacement headwheels chalked up 4,100 operating hours before it was retired.

Which means that KBTV is well-qualified for membership in the RCA "1,000-Hour Club", which now numbers 165 customers and 325 headwheel panels.

So if you've got problems with headwheel life, why not follow the example of the experts? Go talk with your RCA representative. He can help your VTR's grow old gracefully. And profitably.



KBTV's long-life Alfecon II headwheel.

Circle 162 on Reader Service Card

The new 3kW BTF-3E1 FM Transmitter is shown here with Phil Roberts, General Manager of station WCBR-FM, Richmond, Ky., owners of the first such transmitter produced.

It's a self-contained 2-tube system built to meet requirements of multiplex and stereo operation. A single compact cabinet houses the entire transmitter, including the harmonic filter.



Products in the news.

The solid-state "Direct FM" modular exciter system, BTE-15A, is mounted for easy visibility and access.

And other interior components are readily available for servicing, with conveniently located meters and operating controls. A swing-out, hinged front panel mounts the controls and relays for local and remote operation.

Circle 163 on Reader Service Card
RCA Type RT-27 Audio Cartridge Tape Recorders are helping the University of Minnesota to service the news media better with quick access to up-to-date briefings.

A simple telephone call connects the dialer with one of three RT-27 recorders loaded with prerecorded messages of interest. The recorders are stacked on a three-line telephone rotary system that starts with the first ring tone.

John Kalbrener, Broadcast Director of the University News Service, observes that "Virtually everyone who uses the facility here lets us know that the sound quality is everything from fantastic and incredible to no less than great."

Circle 164 on Reader Service Card

Our Ampex Mark X headwheel rework program is still going strong, too.

To date, more than 200 customers have had their Ampex Mark X headwheels reworked by RCA, using the Alfecon II material for extended life.

The maximum cost for RCA reworking an Ampex headwheel remains at \$990.

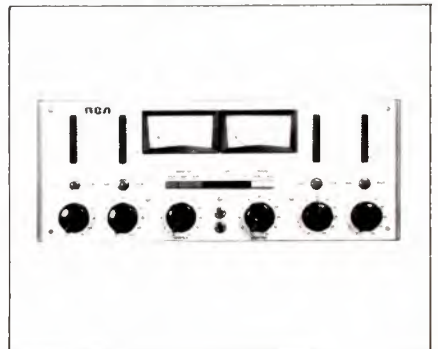
A point worth mentioning is that an RCA rework includes repair or replacement of *all* parts necessary to bring headwheels up to original specifications. Your RCA representative can give you further details on the program.

Low-cost BC-14 Series Audio Consoles for broadcast use and CCTV, CATV and commercial sound systems. There are 6 models, for mono, dual-channel, or stereo, either as console or as rack-mounted units. Prices start at only \$795.

Console features include 4 mixer positions that handle up to 16 inputs; push-button input selection and audition provisions on all input mixer channels; and input transformers and preamplifiers included for all channels.

The consoles contain program and monitor amplifiers, audition/cue with built-in speaker, and speaker muting/warning light relays.

Circle 165 on Reader Service Card



NAB's 51st: Will Be The Biggest Ever In Exhibit Space; Program Still In Development

Facing the problem of fashioning a sequel to their bang-up Golden Anniversary Convention of last year, the National Association of Broadcasters (as this is written in mid-January) is still deep in preparation of the program for the 51st, to run March 25-28 at the Shoreham Hotel in Washington, D.C.

On the exhibit side, the show is already a smasher: the 60,000 square feet available is all sold, with an extensive waiting list. That's more than 10% above last year's 54,000 square feet and an all-time high.

With the U.S. Government right next door, it can be presumed that a good proportion of the programs will include relevant government personnel as speakers or discussants, and that there will be special sessions (or perhaps meetings with congressional or regulatory bodies) on government-relation topics that are stirring the industry: guidelines on license renewals and re-regulation of radio, to mention just two.

Only a few manufacturers had announced the products they intended to show at the time *BM/E* went to press. The following list, therefore, is most preliminary: the complete list will appear in the March issue.

Marconi Communications Systems, Ltd.: New tele-cine equipment.

International Video Corporation: New broadcast cartridge unit with one-inch tape.

Rank Precision Industries: Taylor Hobson Optics.

Rupert Neve and Company: Broadcast consoles.

American Scenic Company: "Insta-Key" non-reflective fabric for "Chroma-Key" background technique.

Moseley Associates: Computer-assisted remote control equipment.

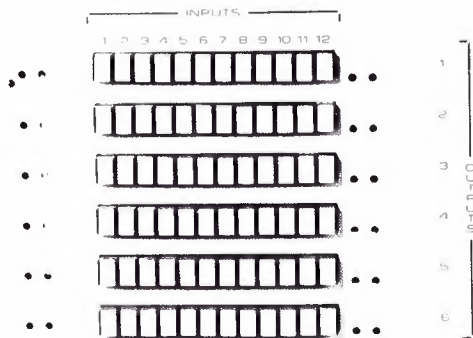
Some other British firms who will be present (products not yet stated) are Autocue, Ltd.; Evershed Power Optics, Ltd.; Link Electronics, Ltd.; Matthey Printed Products, Ltd.; and R. W. Vinten, Ltd.

NAFMB Plans Double-Header

The National Association of FM Broadcasters, meeting in the Hilton Hotel in Washington, March 22-24 (just before the NAB), will have as its convention theme, "FM, The Opportunity Medium." The program is not yet completely blocked out, but advance word is that it will include several sessions on FM sales and promotion, a full complement of engineering sessions, and one or more sessions on quad broadcasting. The annual Armstrong Awards will be given during the meeting.

One topic that will get plenty of attention is the re-regulation of radio which has been opened for discussion—and eventual action—by the FCC. In preparation for the convention sessions, and as a stimulant and guide for action, the NAFMB on February 22 will conduct a one-day meeting in one central city in each state, to which all radio broadcasters in the state will be invited to express themselves fully on the subject of re-regulation. John Richer, president of NAFMB, said: "The FCC has been pleading for feedback from radio broadcasters on re-regulation to help their task force make recommendations that would be practical . . . Broadcasters have not really responded . . . NAFMB decided to provide leadership . . . in this vitally important project."

The VISCOUNT 1050 Series Audio-Video Routing Switcher



VISCOUNT MODEL 1050 ROUTING SYSTEM

Puts Routing Right In Your Budget

This unit is quality engineered to switch video signals (*frequency response ± 1 dB to 8 MHz*) and is fully colour compatible (*Diff. gain < 1%, Diff. Phase < 1°; 10-90% APL*).

Inputs have a high impedance high drive amplifier (*feeds up to 36 outputs without distribution amplifiers*) and output amplifiers have preset corrective circuitry (*Tilt; line < 1%, field < 2%*). The quasi-electronic crosspoint is superior to a mechanical switch (*crosstalk typically -50 dB at 10 MHz*) and all buttons are illuminated (*standard*).

The balanced audio system (*Crosstalk -65 dB*) has solid state input and output amplifiers (*frequency response ± 0.5 dB; 20 Hz to 20 KHz*) with bias and gain adjustment.

Excellent value (compare the price — \$34 per crosspoint for a 12 x 12 Audio follow Video System). Available (*4-6 weeks delivery*) with 12 inputs and 1 - 12 outputs. Looped through inputs allow output expansion to 36 without distribution amplifiers.

All units are aligned, checked and run for two days before a final check against the published specification. Full technical and sales back-up are instantly available from our Vancouver factory. Price includes duty, air freight, one year free parts and repair warranty and a comprehensive manual.

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Circle 117 on Reader Service Card

We Were Losing Track of Air Time Left To Sell—Now Our Computer Tells Us Every Day What's Available

By Tom Devaney

Three radio stations—in Omaha, Indianapolis, and Portland respectively—use a National Cash Register Century 100 computer for automated logging, a daily availability chart, and a lot of other bookkeeping besides.

STAR STATIONS INC., with headquarters in Omaha, operates AM stations KOIL, Omaha; WIFE, Indianapolis; and KISN, Portland, Oregon. KOIL and WIFE have FM affiliates. All have been in a nearly sold-out position a lot of the time in recent years.

It became impossible to get a timely or accurate picture of our advertising availabilities. The reason for this was that we were logging the three AM stations and the two affiliated FM stations locally and manually. We were hard put to keep salesmen current with availabilities. The manual logging also slowed all the general bookkeeping and billing procedures that are dependent upon the log record. Adding even more to this corporate complication is the fact that Star Stations has diversified in recent years—it now has two thriving nonbroadcasting companies whose operations and bookkeeping records are also handled at the central office in Omaha.

The way in which all elements of the corporation are growing thus created a strong need for computerized operations: some of the reports and systems that we needed were impossible to do by hand with enough speed and accuracy to be useful to us. But most important was the automation of the logging operations for the radio stations. Broadcasting is the mainstay of the business. Our capabilities for logging simply had to be improved.

Star Stations installed a low-cost NCR Century 100 computer in the Omaha office, and logging operations started there. Later both Indianapolis and Portland will go on-line with the computer to take advantage of the same programming. Using the computer, Star is now creating logs for the AM and FM operations in Omaha. These logs are produced the day before airing, starting at 2:00 p.m. It takes only about 23 minutes to run each day's 24-hour log for both stations.

One of the advantages of the computer system is that it doesn't restrict the salesmen or change the

method of their operations. The computer was programmed so that it wouldn't. The salesmen's practice has been to sell BTA (best time available) spots in favor of specific time, requesting a preferred time if it is available. While there is no assurance that the advertiser will get his preferred spot in such an arrangement, it is likely that he will come close, and many feel that it is worth the chance. Actually, the computerized log helps the salesmen in these instances by giving them a more timely look at availabilities.

But the greatest advantage is, of course, that the computer-established log assures us that none of the stations will go over the limits of advertising in any given hour. In addition, the system helps us separate spots so that we will have a more even load in any given 15-minute segment.

All logging information is held in the NCR Century computer's magnetic disc file, which holds some 8.4 million characters of information and makes any record available through its random access capabilities. In addition to serving as the basis for the daily log itself, the information in this file is also used to develop a number of reports that will:

- Determine the exact air time that has been sold
- Produce accounts receivable reports and do the full billing operation
- Determine the salesmen's commissions
- Produce a daily recap of the time run
- Produce a monthly recap of the time run
- Produce an availability report (done three times per week) for the next eight-week period, showing the salesmen the time that has been sold by day and by class
- Produce a projection, by salesman, of sales for the coming month

The salesman's order, which is a multi-copy snapout form, provides copies for the accounting, traffic, continuity, and production departments, as well as copies for the salesman and his customer. The broadcast order copy that formerly went to the traffic department is now routed to data processing.

Mr. Devaney is assistant chairman of the board at Star Stations Inc.

Here the account number, the agency number when applicable, and the product code showing the classification of the product advertised, are punched into punch cards. Also included in the card is the time length of the spot and the class of time purchased.

At Indianapolis and Portland, terminals will be used first to capture broadcast order data; then they will be used to transmit this data over telephone lines to Omaha.

It takes the stations no more than an hour and a half to punch and verify all the information that is needed for each daily log, and just over 20 minutes for the computer to process this data and generate data for the next day's log.

All the punched information from the broadcast order form is put into the computer and entered into each station's master file, where it is sorted by the week and day for which the time is ordered. From this the daily reports are made.

The data is then sorted by the length of the spot and its time classification, making the specific hourly separations. At this point, if the computer comes to an hour with more spots allocated than can be allowed, or finds other spots that do not belong together (such as similar advertisers running back to back), it will print out a list of all the spots that cannot be logged.

These unlogged spots are not entered in the computer's magnetic disc files at all, but are printed out on an exceptions list so that the station personnel can determine where they are to be placed. With a new time designated, they are reentered in the time period that is acceptable, exactly as a new order is entered, and then become a part of the master file.

The next sort is an hourly sequence, and this is merged with the public service file to determine the necessary public service time that will be entered.

The result of this last merger is the log itself, which is formatted in pages that hold one-half-hour's programming each. After logs have been processed, the Omaha logs are generated on the computer's own high-speed printer. Log data for Indianapolis and Portland will be prepared on the computer at Omaha and then transmitted back to the outlying offices.

The logs which are produced, in addition to giving the dates and times in each half-hour segment of the 24-hour broadcasting day, show the total length of time, the on-off scheduling for each segment, the type of program, its source, length, and, if taped, the cartridge number. When completed, the disc jockey also writes in the on-off time with the account number.

After the broadcast, the account number and on-off times are entered and merged daily with the master file to produce a recap file. It is this file that is used for billing at the end of each month.

Thus all necessary information for billing, including the aging of accounts receivable, is in the file. The computer, using the master file, can also produce affidavits of broadcasts whenever necessary. Pulling out the affidavits used to be a time consuming chore when it was done by hand. Now we have them in a couple of seconds.

Before we had the computerized log system, with

its vast amount of detailed information stored in the magnetic disc files, billing also was a slow process. Aging reports on accounts were never available to management before the 15th of the month. Now this information is current, and the reports get to management as soon as the accounts are billed, giving an accurate summary of the accounts receivable for all five stations, usually by the second of the month.

The type of personal service we have given our customers has always been very important to us, and a lot of the salesmen were initially afraid that this type of service would be sacrificed to some extent through the automation of our logging.

However, we have found that just the opposite has been true. The salesmen have no less personal contact with their customers and, in addition, are now going to them fortified with timely and accurate information that has never been available to them before.

There was a time in the past when there would be days of being sold out without anyone realizing it. Now the exact status of sales is known to every salesman in all our markets eight weeks in advance, making the computer one of the best selling tools we have ever had.

BM/E



The magnetic disc files of the NCR Century 100 computer, which hold 8.4 million characters of data, provide a random-access store of information from which Star Stations produces logs, availability listings, and affidavits, and from which they are able to do bookkeeping and billing and a number of timely management reports.

An NCR Century 100 computer produces the log for KOIL-AM and stereo FM stations in Omaha. It takes only 23 minutes to log the next day's 24 hours of broadcasting for each station.



An Easy Way To Rate Your AM Signal, And The Competition's Too!

By George Endres

Hook a simple oscilloscope to an AM receiver, with RF on the vertical input and audio on the horizontal; the trapezoidal pattern will tell you a lot about the quality of any AM signal.

THE SIGNAL WHICH EMANATES from an AM transmitter is easily made subject to a rather good arm-chair evaluation by the simple addition of an oscilloscope to your living room hi-fi. By comparison of the image produced by your station and others in your market with the data herein, a new degree of control over your operation will be possible.

The following description is of a technique which is available to technical and non-technical people alike. It is the sole object of this short article to place a good weapon in the hands of better station management. It will cost you under \$100 to add a general purpose oscilloscope to your hi-fi receiver, and could have multifold returns. It will, for the first time, give you some concrete basis for comparison of your "sound" with that of the competition, and provide what some technicians will no doubt consider an "invasion of privacy."

Set up your equipment

Select a fairly high-quality receiver, preferably one upon which you now make subjective evaluations of off-the-air quality. It is necessary to have this set modified by the simple addition of means to sample the RF available within the set, before it is detected and changed to audio (see drawing). A sample of the detected audio is also necessary, and is typically obtained from the receiver's "tape output." The RF is applied to the vertical input, the AF to the horizontal.

The pattern that results is of the category described as "trapezoidal" and is often used to calibrate AM modulation monitors. It has the physical property that at the point where the tapering sides first touch, 100% negative peak modulation occurs, by definition.

The displays available from sets of low quality will be subject to more or less severe looping along

the edges of the display due to amplitude and delay distortions. The receiver used for the oscilloscope picture here was a medium quality transistor portable and gave unclear presentations of highly modulated stations. The looping is evident in the photographs.

Check that modulation

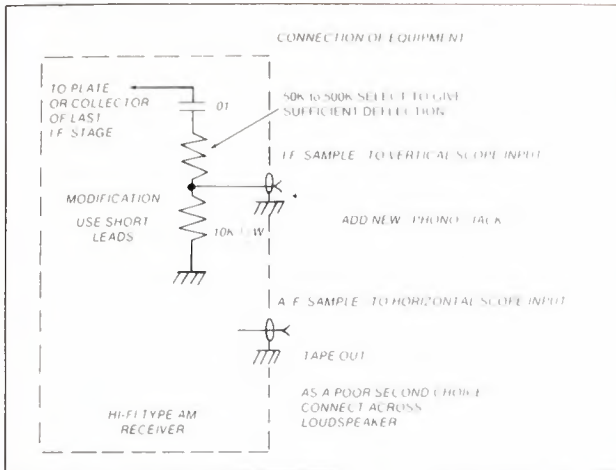
A broadcaster peering at the competition this way for the first time has a discovery experience like walking on the moon. Get acquainted first of all with the fact that all stations do not produce the same pattern. The overall size of the pattern has to do with signal strength. That is pretty much determined by your license and not of concern here. Next you will notice that some stations very nearly drive the trapezoid into a triangle. These are the stations that are reaching peak modulation levels near 100%.

Regardless of other considerations, every station should be one of these. If the triangle is fully produced on peaks, and in addition has a bright spot at the point where the sides meet, unwanted overmodulation is indicated. Occasionally, one will detect a signal that is apparently severely overmodulated. Be aware that a directional antenna system can often cause an effect similar to "selective fading" (familiar on shortwave) along certain null radials. Along these radials, severely distorted audio results from the carrier being suppressed by the array more greatly than the sidebands. If, at their common points, such stations are not actually overmodulated, they are legal and do not cause any problem at all, except to their own listeners in these areas.

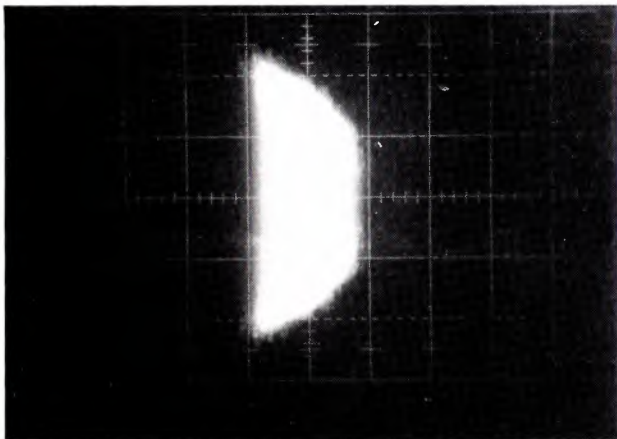
Observe modulation density

Slightly more subtle but far more important in terms of the "sound" of the station are observations you can make on modulation density. Comparison of several stations will often show that although the handling of modulation peaks is similar, some stations will tend to produce much more dense and

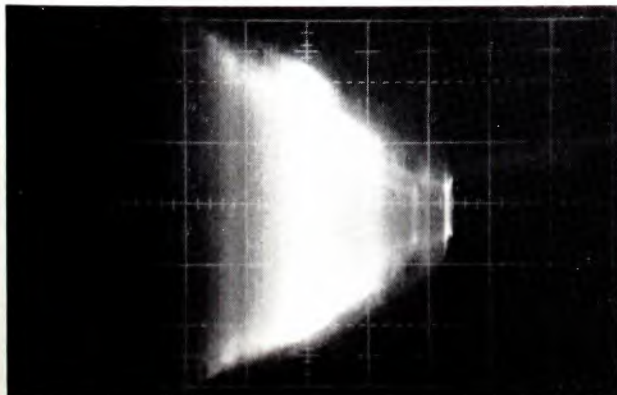
Mr. Endres is assistant to vice president, engineering, RKO General.



Above is the simple modification of a high-quality AM receiver that allows connection of an oscilloscope to show signal modulation patterns.



This is a slow-shutter exposure. It shows heavy peak limiting resulting in dense modulation, however low peaks are indicated.



Light density modulation showing higher level peaks. Note that peaks are symmetrical here, even though this was voice program material.

filled-in trapezoid patterns than others. They sound louder. Some may actually produce a bright triangle almost all the time, but these are stations using excessive peak limiting, to the point of completely distorting the program material. Listen to them on your speaker. You will find that they have a muddy sound. The optimum signal will have strong brightness across its mid-points, but must taper out in density at the end-points. This signal can be made to approach the ultimate loudness, and still retain a "solid" sound.

Stations showing little density throughout the pattern are being under-utilized and are probably experiencing reception problems with local noise which could be overcome with the use of automatic gain devices in the audio chain. But it is considered very poor taste among broadcasters to be able to detect the action of these devices during a program. Several exist which key themselves "on" to reset the gain only when signals above a certain level occur. These can be applied with a far heavier hand and still not become apparent to the listener. They should definitely be sought in any improvement campaign.

Determine peak polarity

For years broadcasters have known that voice, unlike music, has predominant peaks in one direction only. If these peaks are made the AM positive peaks instead of the AM negative peaks, you can use a much higher audio level on the very same carrier because of the larger "room" the FCC allows on positive peaks. Your observation is most easily made by reduction of the rf. (vertical) amplitude so that a sort of tapered horizontal line results with modulation. Set the center point at some convenient reference and merely note the length of the deflection in each direction from the center point. The positive peaks are toward the wide end of the tapered line and should extend further on speech.

How to cheat on the system

If peak polarity and modulation density are the only observations you care to make, it is possible to ignore the rf connection suggested in this article and display only the audio. You can determine the deflection of positive peaks knowing that it is the same as that in which inter-station noise pulses point. You might further increase your eyestrain, but it is also possible to make valid observations on modulation density, using this one-dimensional display, by running the intensity control up and down as you watch.

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When you take Cohu's Model 1500 Color Film Camera and combine it with Eastman Kodak's CT-500, it's quite a system, especially when these two units together are priced nearly the same as the base price of other color film cameras alone. It's like getting two for one.

In addition to its moderate price, the 1500 gives you a proven and superior method of correcting for film base and dye transfer errors utilizing instant black and white paint, auto sensitivity and black level control. For gross film errors, continuously variable gamma correction is available in all three channels.

The Model 1500 was designed with a simple and efficient optical system which transmits better than 65 percent in any one channel through the sealed dichroic beamsplitter.

This permits the camera's vidicons to be operated at relatively low target voltages and very low dark current resulting in low lag, long life, and better black level stability. This sensitivity precludes the need for expensive lead-oxide tubes.

Featuring a rear-loading parallel yoke system that can be retubed in seconds, the Model 1500 is virtually free of registration problems encountered in other color film cameras and can be totally retubed and set up from scratch in 20 minutes by an experienced operator. Cohu's yoke system is not removed

during tube changes and you are not subjected to alignment problems inherent in systems requiring yoke removal.

A passive remote control station is included and does not contain video circuitry which would be subjected to interference and signal degradation. Throughout, this film camera features simple circuitry, unencumbered by the requirement for 'extras' such as complex test equipment for sophisticated circuitry.

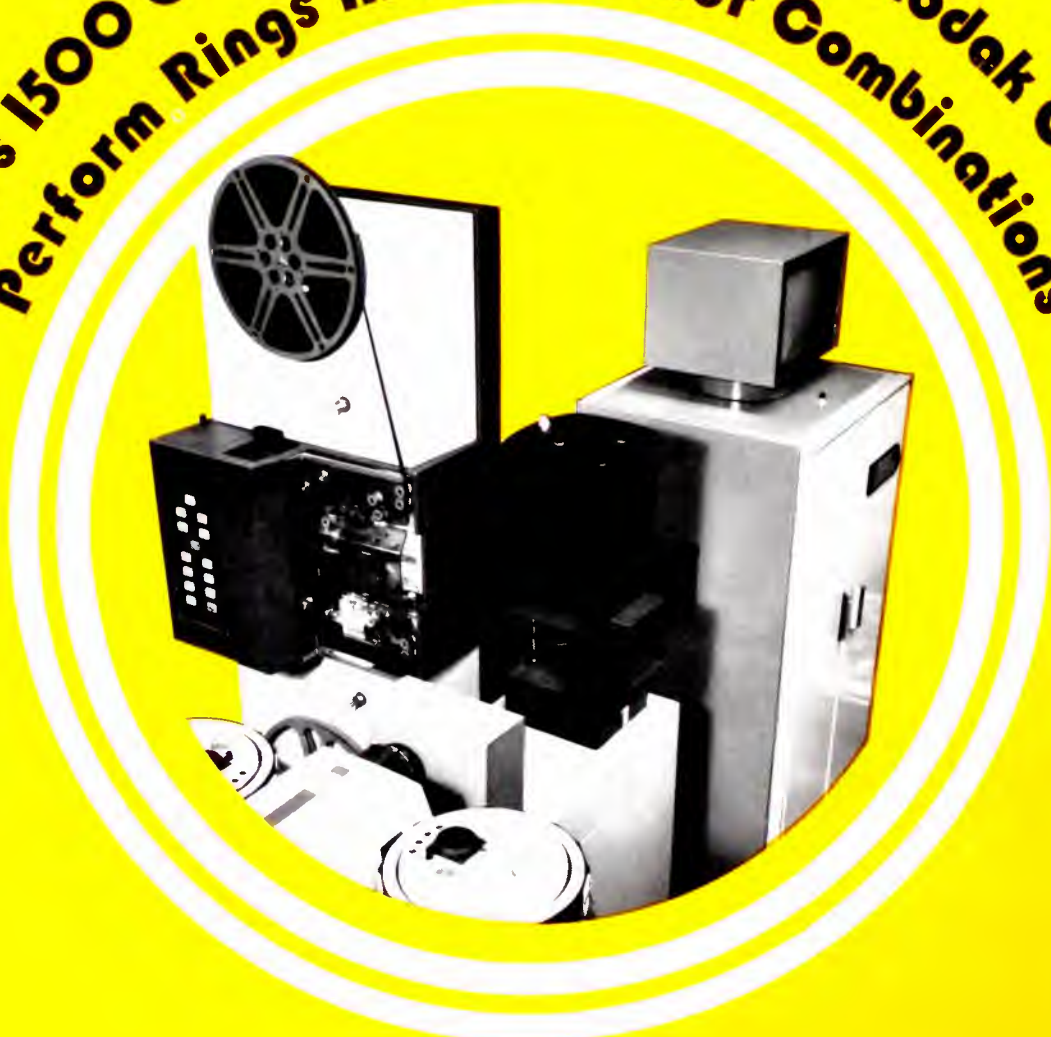
It all adds up to the reason why broadcasters are turning to Cohu's Model 1500 Color Film Camera — it's the choice, not an alternative.

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Cohu's 1500 Color Film Camera & The Kodak CT-500 Perform Rings Around Other Combinations



Transmitters: The Price is Right; Operation is Reliable

TRANSMITTER DEVELOPMENTS move along at a turtle's pace and there's hardly ever a "new generation." The only possible exception might be the differences between the TV transmitter of the 50's and that of the 70's.

A sound transmitter design can stay unchanged for years. There's been a general shift to solid state circuitry up to the final stages, but at least one manufacturer has resisted replacing tubes as long as it takes a half-dozen transistor stages to do the job of a single tube.

There's been an obvious trend toward remote control and practically every transmitter is adaptable to such operation.

True, there have been some modulation innovations, as intermediate frequency modulation in TV transmitters and Amplitude Modulation in AM, but a prime motive for the AM modulation change may have been economy rather than quality improvements, as we shall discuss later.

In fact, one doesn't really pick a transmitter from a point of view of technical innovation or advances—such as superior technical specs. The main consideration is selecting a rig that is easy to operate and maintain. Ability to get back on the air without delay in the case of failure is probably the overriding consideration in picking a transmitter.

Of course, the market for transmitters hasn't been anything to get excited about, thus dampening innovation. With a virtual AM freeze, practically no new AM stations are getting on the air. AM is a replacement market only. If replacement equipment was purchased as soon as the initial investment was fully depreciated, there'd be a market of 500 AM transmitters a year. Unfortunately, from a marketer's point of view, broadcasters get almost double that depreciated life. There's not enough AM market around to keep a good designer on the payroll for the exclusive job of improving the transmitter.

About 100-plus new FM stations may get fired up each year, but a goodly portion of them may be peanut-powered educational stations. Thus FM is not a big market, but at least there is some new market.

In the TV category it is, of course, mostly a replacement market except for a dozen new UHF public stations in the last few years (a rate that will slow in the face of the Nixon budget for HEW and the Administration's miniscule support of public broadcasting). In TV, a replacement market need not be sneezed at. The new class of TV transmitters available since '69-'70 put out better signals. A majority of all the VHF stations are ready to go with

the new gear—particularly as they plan remote control operations.

Shifting sands in the marketplace

The relative smallness of the market coupled with the drop in capital equipment purchases in '70-'71 has been a strain on equipment manufacturers trying to serve the market. Companies with high overheads tend to price themselves out of the market. If they stay competitive, they operate at a loss. Corporate management thus reacts by cutting sales and service functions to the point that broadcasters become leary of the company—which in turn diminishes sales further.

These factors have been responsible for some shuffling in the marketplace and basically there are fewer suppliers than in 1970 when *BM/E* last tabulated manufacturers and transmitters available.

In the TV transmitter area, GE is no longer a separate source (Gates, which purchased the GE broadcast group, already had its own line of transmitters). Visual Electronics has dropped its UHF unit. Standard is, at least presently, out of the business, as is Ampex, but CCA is a new source having purchased the Ampex RF Product lines.

In the FM area, the tables are smaller again through the elimination of Visual and Standard. However, AEL has more types.

In both the FM and AM categories the name "Sparta" replaces "Bauer." Visual has dropped from the AM list, although P.A.T. Products, Bryn Mawr, Pa., traces its lineage to that line. Continental has changed ownership. Original founder, James O. Weldon, has repurchased the operation from Resalab Inc. *BM/E*'s 1970 list was also somewhat padded by non-FCC type-approved units.

As we head into 1973, the supplier picture is more stabilized and a buyer won't have the basic worry about whether his source will be around for servicing. The first evidence of this should be seen in the sales efforts of companies. Those surviving will be aggressively marketing in 1973. Former GE personnel are either now at Gates or elsewhere. Collins Radio, hit by corporate problems, has its financial position squared away and will come on strong to remedy any impression left by competitors that it was out of the picture. RCA is making an impression that it is, without question, in both TV and the AM and FM business and really never ignored the latter. Sparta has problems in getting known as other than a west coast regional company and is in there pitching strong in the east and south. Wilkinson,

having a secure and solid international niche, is in no frenzy for new business but will take orders from anywhere. AEL Broadcast Div. has made a dent in the FM market as mentioned, and is now reworking its AM line to come up with what it terms truly state-of-the-art equipment. (See box.)

Riding a strong upward swing is CCA Electronics. While other companies have been caught up in the turmoil of declining markets and disappearing profits, CCA has moved steadily ahead, shrewdly pricing equipment to increase both sales and profits. CCA's posture at the time of the crunch for others happened to serve it well. First, it was a low overhead company; but more importantly it made a sales virtue out of selling tubes rather than transistors. That is, it sold simplicity of operation and the formula seems to have worked well.

The shake-up has taught everyone lessons. In 1973 there's a clearer understanding on the part of



A transmitter site to visit. Best guide in picking transmitters is to visit installations and talk to operators. Location pictured is a ski-resort/TV transmitter at Jested Mountain, Czechoslovakia. Photo courtesy Telsa Electronics.

the industry that the market is one of replacement rather than new business. As one marketer put it, "We'll stop chasing grant money (for educational stations) and concentrate on selling equipment to fit a station's needs." That should benefit everyone.

In the following pages *BM/E* looks at what will be offered to AM, FM, and TV buyers.

AM Transmitters: Modulation Alternatives Are Available, But Little Other Change

AT THE LOW POWER LEVELS—250W, 1kW, 5kW—the most popular transmitters are yesteryear's models. Until the Gates BC-1H came along, the BC-1G was the largest selling 1kW unit. It was an all-tube affair: even the power supply. The newer models tend to be redesigned earlier units. Manufacturers redesign* the exciter, driver, and modulator, but stay with the same final stage as before.

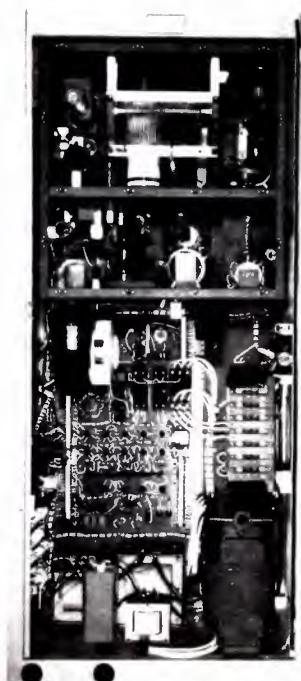
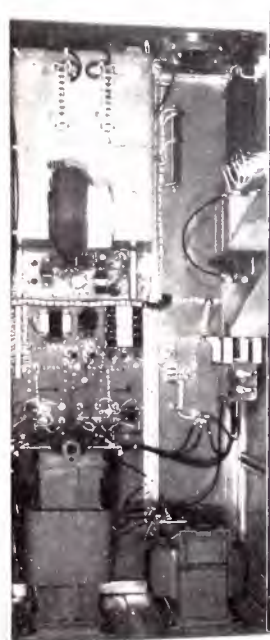
The BC-1H, like its predecessor, uses the 833A triode: two 833As are in the power amplifier stage

and the modulator also uses a pair of 833As. This simplifies the spares problem. The oscillator and power supply are solid-state. Gates stayed with the 833A because it is "husky" and can tolerate load fluctuation and even reduced cooling. Most other manufacturers use parallel 4-400As in the output operating Class C. The CCA AM-1000D and the RCA BTA-1s are typical units. CCA makes a point that these tubes achieve 1000 hours average life. (At \$50 per tube, that's one cent per hour.) CCA is a tube rig (except for power supply), but only three tubes are used: the 4-400A in the PA and modulator, a 6146 in the IPA, and a 12BY7A

*Gates went through two designs: first the Vanguard II, then the BC-1H. The 1H uses fewer and later transistors.

Every manufacturer claims easy accessibility to parts. Photos shown are of CCA 5kW modulator and RF amplifier (which could be paralleled for 10kW). Vacuum capacitors used in tuning.

Most popular transmitter is the one kilowatt. This one is by RCA.



Circle 121 on Reader Service Card →

The Gates TE-201 ...

A 40 lb. color camera that's
uncomplicated and economical.



The Gates TE-201 is a unique combination of long-term operational stability, superior low light level lag performance, and complete broadcast quality in a small, lightweight color camera that can be used in a wide variety of broadcast applications.

The TE-201 features unsurpassed signal-to-noise ratio. A unique AGC system between preamplifiers and processor that maintains highly stable color balance. A single knob, three position sensitivity switch that provides low-light operation *without* loss of color balance.

Easy set-up. 10 to 1 zoom. Virtually all controls are remotely located from the camera head. And the combined weight of the camera head and detachable viewfinder is only 40 lbs.!

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

in the audio driver and oscillator.

Wilkinson uses 4-400As in the power amplifier, but everything else is solid state—the modulator, audio driver, the exciter, and the IPA. Although more transistors than tubes are needed, (a point CCA likes to make) such as in a pre-driver, Wilkinson says these extra stages are broadband circuits that require no tuning.

Both AEL and Collins use extensive solid-state circuitry in their transmitters. Solid state made it possible for RCA to introduce new low power transmitters which use Ampliphase modulation—discussed later.

Five kilowatt transmitters have undergone a bit more redesign. Gates, in the BC-5H, incorporates transistors in the audio amplifiers and driver stages, in the oscillator, and in the IF stages, up to the RF driver.

Collins 820E-1 5kW transmitter uses solid state in everything except the modulator and power amplifier stages. It further incorporates an exciter that uses thin-film circuitry. An ovenless crystal operates in the 2.1 to 4.3 Hz range and is divided down to the broadcast frequency. This provides highly stable frequency.

The Wilkinson 5kW and 10kW units use transistors to drive the modulator final (which uses two pairs of 4-1000A tetrodes), operating Class AB1 to belt out more modulator power than it really needs. The CCA 5kW unit uses tubes throughout; 4-1000 tetrodes as drivers provide ample modulation.

Modulation methods

Classical transmitter design calls for high level plate modulation which is not affected by changes in antenna loading. Furthermore, HLP transmitters are simple to tune. Achieving high level modulation is no trick since at 5kW, 3250 watts of modulation is sufficient. Several tube combinations can be driven by transistors to reach this level.

From the point of view of efficiency, Continental introduced high level screen modulation. The need for efficiency is most obvious at the 50kW level. In the Continental 317C, the PA tubes are operated Class C. To cut down on the modulation power requirements, screen grids are modulated rather than the plates. The final tube in the Continental 5kW and 10kW unit is the 4CX 10,000D.

There are fewer choices in the 10kW category since there are few stations using this power and fewer manufacturers. Designs tend to follow those established with 5kW units.

Because of efficiency and cost considerations, as well as operation, most AM transmitter innovations have taken place at the 50,000W level. We have already noted Continental's screen level modulations scheme which was introduced many years ago.

The Continental approach got away from the need for expensive modulation transformers by using a phase advance network required to drive one of the finals. (This operation was described in *BM/E's* 1970 report.) Another concept that is not new is Ampliphase modulation by RCA. It too eliminates the need for a modulator transformer. The virtue is wide response since no audio transformer or iron is in-

involved. Typical response is plus or minus 1½ dB from 30 to 15,000 Hz. Ampliphase has taken on a new importance because of solid state circuitry.

The solid state exciter is a broadband device with no tuned circuits. Basically, it's a system that uses two carrier wave transmitters combined. A change of phase relationship of the CW signals generates amplitude modulation. Originally developed for high-powered transmitters, RCA is now including the Ampliphase concept in its low power units. The manufacturer also makes the point that the power consumption in an Ampliphase transmitter is less than when typical plate modulation is used.

Is Ampliphase modulation superior? The best bet is to ask the broadcaster who is using it. Competitors say there is no genuine improvement in performance and that the approach was picked primarily to eliminate the cost of expensive modulation transformers. However, the good low response makes transmitters sound good.

The most recent innovation is pulse duration modulation, first shown at the 1972 NAB Convention by Gates. The concept is used in its MW-50 (50kW) transmitter and boasts 90% efficiency. PDM also has the added feature of not requiring a modulation transformer or reactor. In a PDM transmitter the modulator operates in a switching mode as in a digital computer. It has two conditions, on and off. Audio information is contained in the duration of the on pulse. Actually no new modulation processes are involved. PDM modulation is still high level plate modulation of a Class C RF amplifier. The difference is the manner in which it is translated and applied in series with the RF amplifier plate supply. The audio intelligence is superimposed on a 70KHz pulse train at a low level. It is then amplified to a sufficient level to modulate the final RF amplifier. The 70KHz component is then filtered out to leave the amplified audio and a DC component which is the modulated plate voltage for the Class C final amplifier. This eliminates the need for modulation transformer and reactor. (See separate box on how PDM is generated.) Overall efficiency is 60 to 70%. Its distortion is independent of tube linearity.

Although peak voltages appearing at the final amplifier stage are of the same magnitude as exists for any plate modulated class DC amplifier, the location of the common ground point is changed. With no modulation the DC plate to cathode voltage is one-half of the HV power supply voltage. The final amplifier, however, is 28 kilovolts above ground (as competitors are quick to point out).

Although the differences amongst 50,000-watt transmitters are far greater than those of low power units, none of the 500 watt, one kilowatt, or five kilowatt units is exactly alike. Differences merit investigation. CCA uses more tubes than anybody else, but claims easier tuning and operation by inexperienced personnel. Collins says tuning of the 820 E-1 is automatic. A phase comparison circuit in the PA automatically controls the tuning as loading is adjusted. Sliding contacts have been eliminated by many. Several use vacuum variable capacitors.

CCA backs up circuit breakers (standard on all transmitters) with fuses in the bias filament and low

Pulse Duration Modulation: How It Works

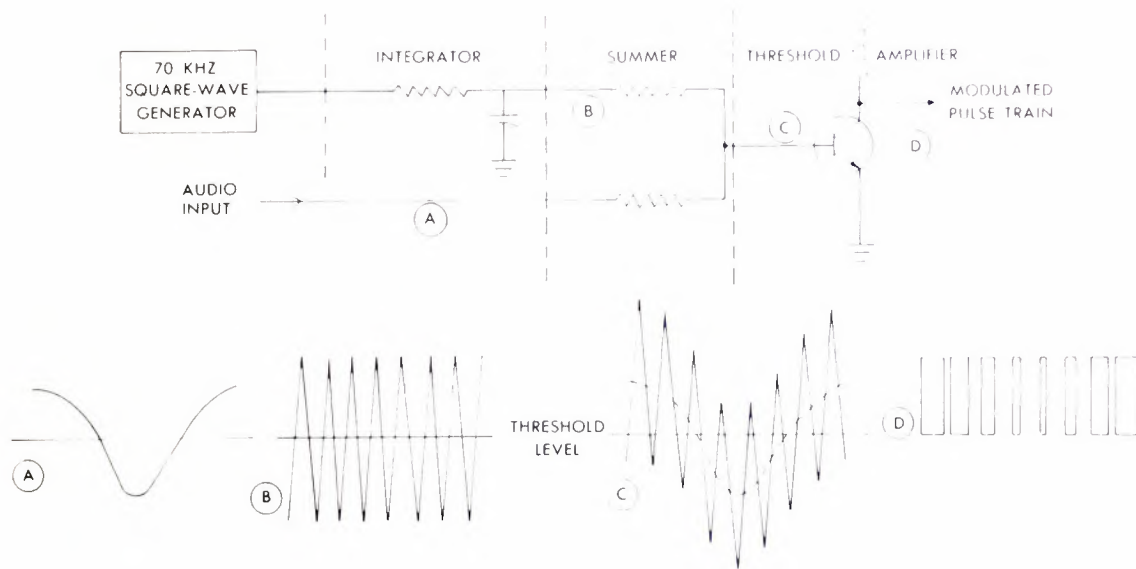
The pulse duration modulator chain starts at a low level with a 70 KHz square-wave generator, which feeds an integrator to produce a 70 KHz sawtooth (waveform B in the drawing). The audio input is summed up with the sawtooth to produce a modulated sawtooth (waveform C in the drawing). Fed to a Schmitt trigger threshold amplifier, this produces the pulse train illustrated in waveform D—a series of pulses with a repetition rate of 70 KHz, with the durations of the pulses representing audio amplitude at each moment.

The duration-modulated pulse train is amplified in the driver and modulator stages. Since these stages are simple switches, capable of turning on and off at a 70KHz repetition rate with not more than one or two microseconds of rise and fall time,

they a) are very simple and reliable; and b) introduce extremely little noise or distortion.

The final modulator tube feeds the amplified pulse train in series with the RF power amplifier cathode, through a low-pass filter that removes the 70 KHz signal and its sidebands. What reaches the power amplifier cathode for normal amplitude modulation is, therefore, the audio signal, at a level high enough to fully modulate the RF output, and with very low noise and distortion.

As noted in the story, this method has continuous 100% modulation capability over a wide frequency range, with automatic carrier level control and simple power level change. The RF power amplifier plate voltage is determined by the duty cycle of the pulse duration train. The modulator stage has the very high efficiency characteristic of Class D amplifiers—when the pulse train is "off," the tube draws no plate power.



voltage supplies for better protection against short circuits.

Gates builds in a dummy antenna in the BC-1H. With others, this is an accessory. Some manufacturers include more meters for metering points. Just about everybody claims that they have easy access for easy maintenance and that they use only the best components and include oversize blowers. But there are differences which the astute buyer will find. Some will impress him.

AM's future

Everyone's equipment is geared for remote operation, but don't wait for the computer-controlled AM transmitter to appear. At least not one so sophisticated that it senses tube degradation and tells you when to replace it. There will be automatic control as there is now, and there is definitely a trend in design to make it easy for inexperienced personnel to remedy problems. But cost is a big factor in the AM market and it doesn't appear to be a prudent move to replace operators completely. Sophisticated circuitry may help diagnose problems

and suggest remedies, but human operators will be around a long time to make decisions and to actually replace final tubes or modules.

The broadcaster does have certain options in dealing with the problems of inexperienced personnel and reliability. It's possible, for example, to pick dual transmitters with automatic transfer to the standby unit in case of failure. These systems can include two oscillator circuits with automatic switchover in case of failure. However, such systems have not really sold well for the simple reason that the broadcaster would rather rely on his "old" transmitter as the standby unit rather than pay for an extra backup unit.

The ultimate in on-air reliability may never be reached in the AM area. The better transmitters become, and the fewer failures, the poorer operators become in knowing how to cope with the failure when it does strike. Solid state devices are more reliable than tubes, but they are not as well understood by old hands. Solid state circuit design calls for more stages. Although each stage could be separately adjusted—and needed to be in early de-

Table 1: AM Transmitters

Manufacturer	Type No.	Power to kW Maximum Cutback to		Modulation Type	Final Tube(s)	Notes
250 watts						
CCA	AM-250DS	0.35	0.05	HLP	(2) 4-400A	2
Gates	BC-250GY	0.28	0.1	HLP	(2) 810	
RCA	BTA-1S	0.35	0.1	HLP	(2) 4-400A	8
RCA	BTA-1N1	0.35	0.1	LL	(1) 3X3000F1	
Wilkinson	AM-250B	0.35	—	HLP	(2) 4-400	1, 2, 3, 8, 10
500 watts						
CCA	AM-500DS	0.55	0.25	HLP	(2) 4-400A	
Gates	BC-500H	0.55	0.25	HLP	833A	1
RCA	BTA-1S	0.55	0.25	HLP	(2) 4-400A	8
RCA	BTA-1N1	0.55	0.25	LL	(1) 3X3000F1	
Wilkinson	AM-500B	0.55	—	HLP	(2) 4-400A	1, 2, 3, 8, 10
1 kilowatt						
AEL	AM-1KA	1.25	0.5, 0.25	HLP	(2) 4-400A	1, 3, 4
CCA	AM-1000D	1.20	0.5, 0.25	HLP	(2) 4-400A	2
CCA	AM-1000DX	1.50	0.5	HLP	(4) 4-400A	6
Collins	820D-1	1.10	0.5, 0.25	HLP	(2) 5-500A	7, 8, 9, 10
Gates	BC-1H	1.10	0.5, 0.25	HLP	(2) 833A	1
PAT Products	AM-1K A	1.30	0.5, 0.25	HLP	(2) 4-440A	1, 3
RCA	BTA-1S	1.10	0.5, 0.25	HLP	(2) 4-400A	
RCA	BTA-1N1	1.10	0.5, 0.25	LL	(1) 3X3000F1	8
Sparta	701B	1.10	0.5, 0.25	HLP	(2) 4-500A	1, 3, 8, 10
Wilkinson	AM-1000A	1.30	0.5, 0.25	HLP	(2) 4-400A	1, 2
5 kilowatts						
AEL	AM-5KA	5.0	1.0, 0.5	HLP	7237	2, 3, 4
CCA	AM-5000D	5.5	1.0, 0.5	HLP	3CX2500F3	2, 3, 4
CCA	AM-5000DX	7.5	2.5	HLP	(4) 4-1000A	2, 3, 4, 6
Collins	820E-1	5.5	1	HLP	4CX5000A	3, 8, 9, 10
Continental	315 F	5.5	1.0, 0.5	CM	4CX10,000D	3, 4, 8
Gates	BC-5H	5.6	1.0, 0.5	HLP	3CX2500F3	3, 13
RCA	BTA-5U2	5.5	1.0, 0.5	HLP	5762	
RCA	BTA-5L	5.6	1.0, 0.5	PTA	(2) 3CX5000H3	3, 4, 8
Sparta	705	6.0	1.0, 0.5	HLP	(1) 4CX5000A	3, 4, 8, 10
Wilkinson	AM-5000B	5.5	1	HLP	3CX2500F3	3, 8, 10
10 kilowatts						
CCA	AM-10000D	12.0	5.1	HLP	3CX10,000A3	
CCA	AM-10000DX	15.0	5	HLP	(4) 3CX2500F3	6
Collins	820F-1	10.6	5	HLP	(2) 4CX5000A	3, 8, 9, 10
Continental	316 F	10.6	5	CM	(2) 4CX1 000	3, 4, 8
Gates	BC-10H	10.8	5.1	HLP	(2) 3CX2500F3	8, 11
RCA	BTA-10U2	10.6	5.1	HLP	(2) 5762	4, 8
RCA	BTA-10L	10.8	5.1	PTA	(2) 3CX10000H3	3, 4, 8, 11, 12
Sparta	710	12.5	5	HLP	4CX15 000A	
Wilkinson	AM-10000B	12.0	5.1	HLP	3CX10000A3	3, 8, 10
15 kilowatts						
Sparta	715			HLP	4CX15000A	3, 4, 8, 10
25 kilowatts						
AEL	AM-25KA	35.0	10.5	HLP	4CX35 000C	3, 4
CCA	AM-25 000D	30.0	—	HLP	3CX20 000A3	
CCA	AM-25 000DX	30.0	12.5	HLP	(2) 3CX10,000A3	
Sparta	725	27.5	12.5	HLP	(2) 4CX15,000A	3, 4, 6, 8, 10
50 kilowatts						
AEL	AM-50KA	55	25, 10	HLP	4CX35,000C	3, 4
CCA	AM-50000D	55	10	HLP	4CX35,000C	
CCA	AM-50000DX	60	25	HLP	(4) 3CX20,000A3	6
Continental	317 C	53	25, 10	HLS	(2) 4CX35,000C	3, 4
Gates	MW50	60	25, 10	HLP, PDM	(2) HCX35,000C	8, 11,
RCA	BTA-50J	55	25, 10, 5	PTA	(2) 6697	2, 3, 4, 8, 11, 12
Wilkinson	AM-50,000	60	10	HLP	4CX35,000C	3, 8, 10

Notes:

HLP: High level plate
 LL: Low level
 HLS: High level screen
 PTA: Phase to amplitude
 CM: Collector modulation of RF driver stage

1: Built-in dummy load.
 2: All but HV regulated.
 3: Vacuum capacitor PA plate tuning.
 4: Running-time meter.
 5: Available as Kit.
 6: Parallel redundant transmitter.
 7: Automatic power output, control.

8: Partially transistorized.
 9: Automatic PA tuning with change in loading.
 10: Oscillator operates at either two or four times carrier frequency.
 11: Standby exciter built in.
 12: Built-in VSWR protection.

signs—it will increasingly no longer be the case. Sections or stages will (and should) be considered black boxes that work or don't work. This almost calls for training to keep "hands off." However, such a situation intensifies the problem of knowing exactly what to do in the case of failure. Probably some kind of "fire drill" training will have to be instituted.

It seems impractical to build simulators that would prepare transmitter "pilots" for emergencies, but we can envision transmitter "doctor" staffs at various transmitter hospitals who could look at a facsimile copy of all remote control readouts prior to the trouble and prescribe the remedy. After all, if relatively untrained nurses in remote villages of Alaska can save lives by getting expert advice from doctors via satellite radio transmissions, why couldn't a handful of transmitter experts keep all the nation's rigs perking?

For the most part, station managers and chief engineers are not overly concerned with transmitters. *BM/E* recently gave a number of key people the opportunity to comment on transmitter quality, as well as the quality of other gear. A full 35 percent had nothing to say about transmitters. Fifteen percent rated them simply good to excellent. The remaining 40 percent described what they liked or disliked about their gear—and the manufacturers back of it. Most were satisfied. Only one respondent had a troublesome rig, but he was satisfied with the service the manufacturer was offering. Those who wanted more out of their gear wanted more solid state circuitry, better frequency response, and lower noise. (The noise comment applies particularly to FM transmitters.) Better shielding, more extensive metering, and better protection against line voltage transients were some of the features sought by both AM and FM users.

FM: Quality Transmitters

THE HEART OF THE FM TRANSMITTER is the exciter. There have been a few changes since the 1970 *BM/E* report, although most exciters have remained the same. There are two types: direct FM

and direct carrier frequency modulators. Gates' TE-3 exciter reflects the latest design. It is a DCFM type. A digital automatic frequency control module provides excellent carrier stability. Since frequency

Table 1: FM Exciters

Manufacturer	Type No.	Osc. Freq.	Modulation Type	Modulator	Output power watts	Final Amplifier	Active Devices	Notes
AEL	2202	fc	DCFM	Varactor	10	Transistor	AT	1
CCA	FM-10DS	¼ fc	DFM	Varactor	10	7984	PT	1
CCA	FM-40B	fc	DCFM	Varicap	40	Transistor	AT	1
Collins	310Z-1	1/10 fc	DFM	Varactor	20	Transistor	AT	
Gates	TE-3	fc	DCFM	Transistor	10	Transistor	AT	1
P.A.T.	DFM-10A	21.5 MHz	DFM	Transistor	10	Transistor	AT	1
RCA	BTE-15A	fc	DCFM	Varactor	20	Transistor	AT	1, 2, 3
Sparta	680	fc	DCFM	Varactor		Transistor	AT	1
Wilkinson	FME-10	¼ fc	DFM	Transistor	18	Transistor	AT	

DCFM: Direct carrier frequency modulation; DFM: Direct frequency modulation; PM: Phase modulation;

AT: All transistor; PT: Part transistor; VT: Vacuum tube; fc: Carrier frequency.

1: Regulated power supply. 2: Off-frequency detector. 3: Available with stereo and two SCA's, and switchable between stereo/SCA and mono/two SCA's.

Table 2: Stereo Generators

Manufacturer	Type No.	Use	L/R Combiner	Pilot Crosstalk dB*	Stability Hz	Active Devices	Notes
AEL	2203	Complete	Matrix	45	1	T	
CCA	SG-1D	Complete	TDM	45	1	T	1
Collins	786V-1	Plug-In	Matrix	40	2	T	
Gates	6533	Plug-In	Matrix	42	1	T	1
Moseley	SCG-3T	Complete	TDM	50	1	T	2
RCA	BTS-1B	Plug-in/Comp.	TDM	45	1	T	1
Sparta	682	Plug-In	TDM	50	1	T	
Wilkinson	SG-1E	Complete	TDM	65	1	T	

*Main-to-sub or sub-to-main, below 90% modulation.

1: Regulated power supply. 2: With 17 kHz low-pass filter.

TDM: Time-division Multiplex.

A very popular transmitter these days is a 50-watter. These units are generally designed for carrier current use and are not FCC type approved. Such units are not in BM/E tables. Pictured is Model 720B from Sparta LPB Inc. has over a thousand such units in operation.



Only two tubes are employed in Gates' FM-2.5H3 FM transmitter for an output of 2500 watts. Advanced all solid-state TE-3 exciter is used.

Table 3: FM Transmitters

Manufacturer	Type No	Maximum Power kW	Final Tube	Notes
			10 watts	
CCA	FM 10D			
Gates	BFE 10C		6146	
Gates	BFE-10G3		Transistor	
RCA	BIE 15AT	0.020	Transistor	
Sparta	681	0.015	Transistor	
Wilkinson	FM 10E		Transistor	
			50 watts	
Gates	BFE 50C		6146	
Wilkinson	FM 60A		Transistor	
			250 watts	
CCA	FM 250DS	0.275	8875	
Gates	FMS 250H3		4CX250B	
Sparta	400	0.250	4CX350A	
			1 kilowatt	
AEL	FM 1KB	1.2	4CX1000K	1, 2, 4
CCA	FM 1000DS	1.5	3CX1000A7	3
Collins	830D 1B		4CX1000A	
Gates	FMS 1H3		4CX1000A	
RCA	BTF-1E2	1.1	4CX1000A	1, 13, 7
Sparta	601	1.5	5CX1500	12
Wilkinson	FM 1000CS		4CX1000A	3
			2-2.5 kilowatts	
Collins	831D 1		5CX1500A	1, 5, 7
Gates	FMS-2.5H3		5CX1500A	6
RCA	BTF-1+1E2	2.2	(2) 4CX1000A	8, 1, 13, 7
RCA	BTF-1 1E2	2.2	(2) 4CX1000A	9, 1, 13, 7
Sparta	602		5CX1500A	12
Wilkinson	FM		5CX1500A	
			3 kilowatts	
CCA	FM 3000DS	3.5	3CX3000A7	3
Gates	FMS-3H3		4CX5000A	6, 7
RCA	BTF-3E1	3.5	3CX3000A	2, 3, 7
			5 kilowatts	
AEL	FM 5KB	5.5	3CX3000A7	1, 2, 3
CCA	FM 5000DS	6.0	3CX3000A7	3

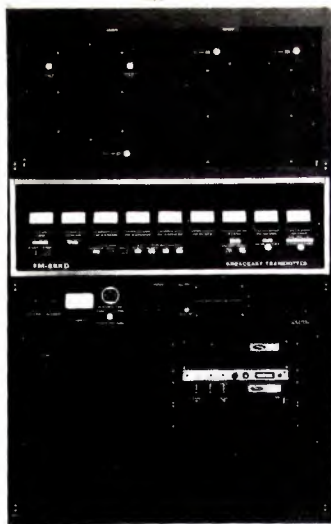
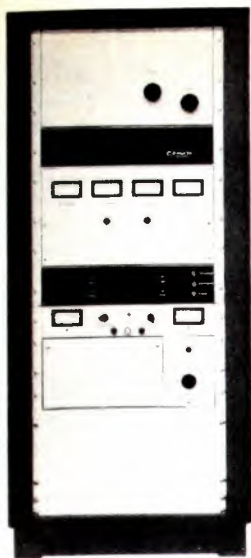
Manufacturer	Type No.	Maximum Power kW	Final Tube	Notes
Collins	830E 1B		4CX5000A	
Gates	FMS-5H3		4CX5000A	6, 7
RCA	BTF 5E1		4CX5000A	2, 7, 13
Sparta	603A5	5.2	(2) 5CX1500A	
			7.5 kilowatts	
Gates	FMS-7.5H3		4CX5000A	6, 7
Wilkinson	FM 7500DS		4CX5000A	
			10-12.5 kilowatts	
AEL	FM12KD	12.5	3CX10.000A7	1, 2, 3, 7
CCA	FM 10000DS	12.5	3CX10.000A7	3
Collins	830F 1B		4CX5000A	
Gates	FMS-10H3		4CX10.000D	6, 7
Gates	FM 5/5H3		(2) 4CX5000A	6, 7, 8, 14
RCA	BTF 10E1		4CX10.000D	2, 10, 12, 13
RCA	BTF 5-5E1		(2) 4CX5000A	2, 8, 10, 12, 13
RCA	BTF 5.5E1		(2) 4CX5000A	2, 9, 12, 13
Sparta	612	13.0	3CX1000A7	2, 3, 5, 10, 12
Wilkinson	FM-10000ES		4CX10.000D	
			20 kilowatts	
CCA	FM-20000DS	22.0	3CX10.000A7	3
Collins	831G-1		4CX15.000A	5
Gates	FMS-20H		4CX15.000A	6, 7
Gates	FM-10/10H3		(2) 4CX1000D	6, 7, 8, 14
RCA	BTF 20E1		4CX15.000A	2, 11, 12, 13
RCA	BTF-10-10E1		(2) 4CX10.000D	2, 8, 11, 12, 13
RCA	BTF-10 10E1		(2) 4CX10.000D	2, 9, 11, 12, 13
Sparta	620	23.0	3CX15.000A7	2, 3, 5, 11, 12
Wilkinson	FH-20000ES		4CX15.000A	
			25 kilowatts	
AEL	FM-25KD	25.0	3CX15.000A7	1, 2, 3, 5, 7
CCA	FM-25000DS	25.0	3CX15.000A7	3
			40 kilowatts	
Collins	831H		(2) 4CX15.000A	1, 5, 7, 9
Gates	FMS-40H3		(2) 4CX15.000A	6, 7, 8
RCA	BTF-40E1		(2) 4CX15.000A	2, 8
Wilkinson			4CX1500A	6, 7, 8

New transmitters pending type approval: CCA—s-s 10, 50 & 100W, 15kW and 30kW
RCA type BTF-1E2 can be used for 250W or 500W service
AEL and CCA 7.5kW units available in 50kW configuration.

Notes:

- 1: Regulated filament supply
- 2: Running-time meter.
- 3: Grounded grid PA
- 4: Grounded screen PA
- 5: Automatic power-output control
- 6: Variable-line PA tuning.
- 7: Power-supply protective circuit
- 8: Parallel-redundant transmitter with single output

- 9: Parallel-redundant transmitter with two half-power outputs
- 10: Field expandable to 20 kW.
- 11: Field expandable to 40 kW.
- 12: Stripline PA tuning
- 13: Grounded cathode PA
- 14: High power coupler (combiner) with RF plumbing



Heart of any FM transmitter is the exciter. Pictured above is one of the latest to be designed, the FME 10 (lower chassis) coupled with a 60W amplifier to make up an all solid-state FM transmitter. Unit is from Wilkinson.

Left: For standby or low power operation is this Model 600 unit from Sparta. The 4CX350A tetrode is modulated directly by the exciter. Unit is 55 in. high. Right: Representing one of the latest designs is this single cabinet 25kW unit from AEL.

multipliers are necessary, there is no concern over phase shift and frequency multiplier tuned circuits. Carrier stability with ± 1 KHz ($\pm .001\%$) of the center frequency is a sure thing. Digital devices count down the output of the modulated oscillator and the crystal frequency for comparison. The two oscillators are then phase locked for frequency control.

AEL, Sparta, and RCA all use DCFM. The others use a direct FM approach. The last manufacturer to switch away from the old phase modulator system was Wilkinson. The Wilkinson FME 10 starts with a free running oscillator (at one-quarter the operating frequency). The oscillator is capacity tuned by two voltage variable capacitors (reversed-biased silicon diodes). Several voltages are applied to these diodes. The AFC zero control provides a bias to produce the nearly exact carrier operator frequency. A voltage from the AFC circuit adds or subtracts to adjust the voltage to exactly the operating frequency. The AC signal which consists of the various audio frequency inputs, produces frequency modulation of the stabilized carrier. Since the audio signal is AC coupled and the AFC is DC coupled, the center frequency is maintained even during modulation. Wilkinson claims a distortion of .25 to 5% which is quite good.

Keeping an FM transmitter from drifting in frequency has been a problem. AFC circuit techniques have not been foolproof. Whenever DC amplifiers are involved, there has to be outstanding drift control. It's not been unknown for a manufacturer to ship several transmitters to a station before getting one that stays within FCC limits. Problems may occur as a result of the stability of the final stage or the control circuitry.

BM/E has no comment on the likelihood of such a problem occurring because of design excellence or design limitation—or manufacturing tolerances for that matter, but buyer beware. You'll get a transmitter that works from any source, but you might have more peace of mind about your rig if you evaluate them all until you find one that gives you

a high feeling of confidence. You don't have to make a technical evaluation based on circuit analysis. Simply call existing owners of different makes to get their reactions and experiences.

As pointed out in the section on AM transmitters, every manufacturer makes a point of accessibility to components and ease of operation and maintenance. As a matter of fact, most transmitters look pretty much alike so that the statement may hold equally well. There is one that is different, however, and that is the AEL line. Most obvious difference is that metering and control circuitry is at mid-cabinet level. This unit further folds down to expose all of the circuitry. Sparta offers a difference in its Strip-line tuning.

Although most current FM designs have been set prior to 1970, the number of transmitters is forever growing. Gates has 14 different models ranging from 10 watts to 40 kilowatts. CCA has a lot. (Actually another transmitter could be included in this count since both Gates and CCA package their exciters to serve as a low power educational facility.)

The largest single unit is a 25 kilowatt. AEL and CCA announced such units in 1970. Gates, Collins, and RCA offer 40 kilowatt units made up of two 20 kilowatt units. AEL and CCA put their 25'ers together for a 50 kilowatt rating.

The different manufacturers take different approaches on the number of tubes. Most use three tubes in the 20 kilowatt unit—a pair of drivers and a single-ended PA such as the 4CX 15000A. The 25 kW rigs (AEL and CCA) use the 3CX-15000A7 in the final stage. AEL uses only two tubes in its system, the driver being a 4CX1000K power tetrode. Grid in the final stage is grounded.

Recent FM transmitters on the low side are two from Wilkinson: a 2.5 kW unit (which features final tuning and loading using variable vacuum capacitors) and a 60W FM unit which is all solid state. The final is a Motorola 2N6166 transistor. In the last year Sparta announced a 250W unit which uses a single tube, a 4CX350B tetrode.

AEL Broadcast Equipment Division: Industry's Most Recent Contender

Getting "hands on" experience is a good way to evaluate a transmitter. AEL's Richardson checks out a visitor.



Although AEL was represented in the list of transmitter sources in 1970, the company really made its move to become a serious contender in 1971. That's the year it introduced the all new FM-25KD (25kW) unit which has been its best seller. In 1972 the AEL Broadcast Div. was formed as a separate activity, but as American Electronic Laboratories' president, Dr. Leon Riebman, is quick to point out, much of the new group's technical expertise is traceable to AEL's resources as a major supplier of military transmitters.

A military-bred concern for reliability is reflected in the company's commercial products and led AEL Broadcast this year to offer the industry's first five-year warranty for broadcast products. This move, however, wouldn't have been possible, says Dr. Riebman, if it weren't for the fact that 1970-type solid state transistors and new ceramic power tubes were available. AEL thinks it's in a technical leadership position since its line was designed three to four years after most of its competitors' designs were frozen—and because AEL's design was fresh from top to bottom.

Only two tubes are needed in the 25 kW unit—a power tetrode driver, 4CX1000K, and a 3CX1500A7 final operated in a grounded grid circuit. A grounded grid triode means stable operation. The compa-

ny claims low noise by virtue of using its own house brand of solid state variable capacitors in the exciter which is of the DCFM type. As a result of being the last to design a system, AEL claims to have the only radio transmitter to use digital type solid state control rather than relays. (One TV transmitter also uses solid-state control circuitry—the recently designed Gates unit.) There are only four relays in AEL transmitters—those necessary to handle power-levels.

A most visible bit of evidence that the company's transmitters depart from the usual design is the fact that metering and control is all at mid-cabinet level. All critical components and modules are very accessible for easy maintenance.

AEL is trying hard to build a good reputation. For one thing, general manager Don Richardson wants every transmitter to work without fail the moment it's properly connected to an antenna. This means every transmitter gets a 100-hour burn-in period before it leaves the plant. A list of satisfied customers is an AEL goal. Right now the company is pleased with itself. If a prospective buyer calls a list of existing customers of AEL gear, not only does he hear that the customer is satisfied, he is quite likely to learn that the customer is enthusiastic. Enthusiasm refers not only to the product but to service. Problems **do** occur. The best way to keep a customer happy is to give him instant service, which Richardson tries hard to do. AEL also pledges to continually service its product. Thus, it agrees to supply spares for any of its transmitters for 20 years.

The best way to sell engineers is for them to get some "hands on" experience. Thus, AEL's Broadcast Marketing Dept. tries hard to get chief engineers to visit the Colmar, Pa., plant. The best way to sell management is to price the product right. Thus, AEL has a wide variety of financing arrangements available. Right now the company has a full line of FM transmitters for sale. It expects to be making some announcements in the 50kW AM area soon. It already has success in the international market with high power (100kW) AM gear.



AEL President Riebman: "We're the first to offer a five-year warranty."

TV: More Combinations

FOLLOWING THE INTRODUCTION of intermediate frequency modulation and solid state design covered in *BM/E's* 1970 transmitter report, the biggest news has been in dual- or parallel-operated transmitters. Design has not changed since then but new power levels have been announced.

Both Gates and RCA announced 50kW UHF units at the NAB in 1971. At that time Gates also promoted its 220kW UHF unit (which went into operation at WDCA-TV, Washington, D.C., on March

16, 1971). RCA announced its 220 kW-UHF unit in 1972. Both Gates and RCA build around 55 kW amplifiers using a single vapor-cooled klystron per unit. Both units are driven by solid state exciters.

In dual operation redundancy can be had at the exciter modulator level in the IPA and final amplifier stages, and in power supplies.

RF combining systems today permit continued operation at half power should one output amplifier fail.

KETC-TV, St. Louis, has paralleled Gates' BT-35 kW units located at Broadcast Center which also houses tape, film, and switching equipment (live studio material is microwaved to B.C.).

Two 14 kW VHF Norelco transmitters in parallel at WCVB, Boston.

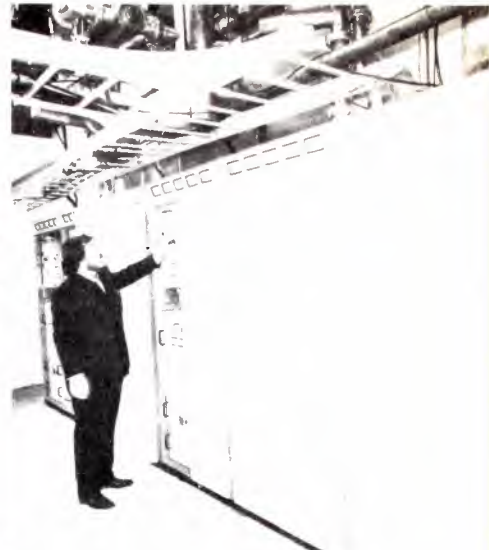


Table 1: UHF TV Transmitters

Manufacturer	Type No.	Peak Power kW	Mod. Type	Visual			Aural				Notes
				AM Noise dB	Single Frame Ampl. Var.	Output Pwr. Reg.	Diff. Phase deg.	Diff. Gain dB	Rms. Power kW	Harm. Dist.	
CCA	TA-15BT (E)	.025	fc	-45	5%	5%	7°			1.5%	
	TA-15BT	15							3.0		8, 9
	TA-30BT	30							6.0		8, 9
	TA-55BT	55							11		8, 9
	TA-60BT	60							12		2, 8, 9
	TA-100BT	100							20		2, 8, 9
Gates	BT-55U	55	i-f	-55	2%	3%	4°	0.5	11	0.5%	
	BT-110U	110*									
	BT-220U	220									
Marconi	B-7318	55	fc	-54	2%	2.5%	3°	0.5	11	1%	
RCA	TTU-30B	30	i-f	-50	2%	3%	±3°	0.5	16	1.0%	
	TTU-60B	60							16		4
	TTU-55B	55							12		
	TTU-110B	110							24		4

Notes:

- a: i-f: intermediate frequency; fc: carrier frequency.
- b: Rms value below 100% modulation.
- c: Referred to sync peak.
- 1: High band only.
- 2: Low band only.
- 3: Parallel-redundant transmitter.
- 4: Parallel-redundant visual PA's.
- 5: Optional rubidium frequency control with stability of 5 parts in 10¹¹/year.

- 6: Stripline tuning of PA stages
- 7: Built-in sweep generator for alignment
- 8: Aural may be multiplexed into visual for emergency operation if aural fails
- 9: Built in test equipment includes frequency and modulation monitor, sideband response analyzer, and oscilloscope and picture monitors.
- 10: Built-in rf envelope monitor
- * Gates 110U to be type approved shortly

Table 2: VHF TV Transmitters

Manufacturer	Type No.	Peak Power kw	Mod. Type	A-m Noise dB	Visual			Aural				Notes
					Single Frame Ampl. Var.	Output Pwr. Reg.	Diff. Phase deg.	Diff. Gain dB	Rms. Power kW	Harm. Dist.		
CCA*	TVL/H 100D	.1	lf	-50	2%	2%	3	1.0	*	5%	5	
	TVL 1000D	1									2, 5	
	TVH 1250D	1.25									1, 5	
	TVL 2500D	2.5									2, 5	
	TVH 4000D	4									1, 5	
	TVL 6000D	6									2, 5	
	TVH 8000D	8									1, 5	
	TVL/H12500D	12.5									5	
	TVL H17500D	17.5									5	
	TVL/H25000D	25									4, 5	
	TVL/H35000D	35									4, 5	
	TVH 50000D	50									1, 4, 5	
	Gates	BT100H	.1	rf	-50	2%	3%	3	0.5	—	.5%	
BT100L		.1							—			
BT1300H		1.3							0.26			
BT100L		1.3							0.26			
BT5H									1.0			
BT5L									1.0			
BT18H									3.6			
BT18L									3.6			
BT18/18H&L									3.6			
BT25H-1									5.0			
BT25L									5.0			
BT25/25H&L									5.0			
BT35H									7.0			
BT35L									7.0			
BT35/35H&L									7.0			
BT50H									10			
Marconi	B7103—10-15 KW units not FCC type approved—											
Philips	PT-6AL	6.0	rf	-54	2%	2%	3	1.0	0.6	0.5%	2	
									1.2			
	PT-12BL	15.0							1.5		2	
									3.0			
	PT-17BH	17.5							1.75		1	
									3.5			
RCA	TT-5EH1S	5.0	fc	-50	4%	4%	±3	.7	5.5	.5%	1	
	TT-6ELS	6.0			4%	4%	±3	.7	5.5	.5%	2	
	TT-12EHS	12.0			4%	4%	±3	.7	2.75	.5%	1	
	TT-15FL	15.0			2%	3%	±2	.5	3.75	.5%	2	
	T-25FL	25.0			2%	3%	±2	1.0	5.5	.5%	2	
	TT-30FL	30.0			2%	3%	±2	.5	11.0	.5%	2, 3	
	T-17FH	17.0			2%	3%	±2	.5	3.87	.5%	1	
	TT-25FH	25.0			2%	3%	±2	.5	5.5	.5%	1	
	TT-35FH	35.0			2%	3%	±2	.5	7.75	.5%	1, 3	
	TT-50FH	50.0			2%	3%	±2	.5	11.0	.5%	1, 3	

Notes: Normally 10-20% of visual power. * CCA TVL/H units are separate type approved models.
 1. High band only 3. Parallel-redundant transmitter 5. Optional rubidium frequency control
 2. Low band only 4. Parallel-redundant visual PA's. with stability of 5 parts in 10¹¹/year.

Through the use of solid state components, transmitters have become more compact. RCA's TT25FL takes half of the floor space of older 25 kW units. Thus, an "alternate main" mode becomes practical—a pair of transmitters taking up no more space than one. This is a boom for stations operating 24 hours a day.

As with AM and FM transmitters, and even more so in TV, ease of operation and maintenance should be of very high priority to a customer. Any downtime is extremely costly and a station that puts out a signal with bad color invites viewers to switch to a better channel.

All new TV transmitters are fully adapted to remote control operation. A customer may have to negotiate, however, to get the desired configuration.

With most current transmitters using IF modulators—Gates, Philips, CCA (old Ampex unit)—

there has been speculation that RCA will change to this form especially since it came out with IF modulation in its UHF transmitter in 1972.

But RCA says it will stay with high level modulation in the VHF band. While it's possible to modulate klystrons at low levels—directly from standard excitors—the ceramic tetrodes require amplifier stages. Although the virtue of IF modulation is very low linear distortion and the ability to shape the vestigial sideband at low levels, linear power tubes must be in the chain. By employing diode modulation at VHF carrier frequency, modulation occurs at the 20 watt level. Amplification to the 26 kilowatt level is then possible with only three or four linear amplifier stages as opposed to nine or ten stages currently employed in IF modulated VHF transmitters. This means fewer tuning controls, tubes and blowers and reliable long term performance. RCA claims. BM/E

BROADCAST EQUIPMENT

Disco-Vision Premiered

With typical Hollywood hoopla and sophisticated press agency, MCA, Inc. unveiled its "Disco-Vision" video disc system on December 12, revealing an (admittedly) technically unperfected system, not promised for commercial release until 1974. The ballyhoo was almost oppressively evident in the magnificently outfitted theatrical setting, catered buffet, dramatic lighting, and array of major name brand television receivers, and by the presence on stage of MCA's per- director Alfred Hitchcock, to add glitter to the event.

The somewhat unfinished character of the system was immediately apparent in the color fidelity, reminiscent of the early days of TV color-casting. The pictures were "soft" and deficient in the red area, there were innumerable dropouts (it is not known whether a drop out compensator is built in to the electronics).

After the demonstration, chaired by VP-in-Charge John W. Emmlater, another company bigwig, David Lipton, while admitting that the system is not fully perfected technically, made no attempt to hide the fact that this possibly premature showing was "necessitated" by MCA's desire not only to crash into the vidisc race but to have *its* system adopted as the industry standard. Disco-Vision has also made it transparently clear that the software, its primary interest, will be available for *sale* at modest prices (typically \$1.99 to \$9.95, depend-

ing upon program content and length) and that it does *not* contemplate leasing, rentals, exchanges, or return of discs (Disco-Vision, to say nothing of competing systems, opens a veritable Pandora's box of copyright, licensing, and royalty problems for both music synchronization, visual material, and story rights involving so-called clearances at the source, plus mechanical royalties and even performance royalties.)



The pickup is a low-powered helium-neon laser read out, according to Vice President Kent Broadbent, director of research. The 4 1/2 inch disc is made of 0.10 inch thick Mylar which has replaced the previously announced PVC material and although metallized is far more pliable than an LP sound record (rigid discs are also under consideration). The disc is inserted into the player (\$400) or changer (\$500) while still in its own plastic tray container, it's single faced and plays on the *bottom* side. Pitch is 80 microns per revolution with 12-500 tracks per radial inch, and speed is 1800 rpm.

Electronic tracking eliminated any physical "groove" contact, thus there is no apparent record wear.

As many as ten discs may be stacked on the 50 pound record changer whose loading mechanism removes from the track the disc to be played. The 40 BB single disc player measures 16 1/2 x 15 x 15 1/2 inches high. Offering 300 lines of color horizontal resolution, audio and video, need to note a note of 10dB are claimed. Anticipated laser life is 2000 hours with simple and inexpensive replacement. Stop action freeze frame is provided with precise selection of the desired information portion and no wear and tear on the disc in this or any mode. Audio and video are together in the track.

Discs are pressed from electro-optically modulated masterings on to nickel plated stampers. Stamping or embossing sheet Mylar delivers the production copies at less than 40 cents each. A standard player will have random access capability merely by pushing the "in" or "out" button to control the positioning of the laser head as it moves across the disc (normal playing is outside in). Forty million information bits per disc give vent to Disco-Vision's claim to the highest information density of *any* medium. In addition to random access and stop motion, the system allows speed up, slow motion, reverse play, and picture by picture replay. Patent protection is currently being sought over and above the six already issued patents, according to Disco-Vision.

(This article was prepared by Oliver Berliner, contributing editor.)

Color studio monitors use Sony trim-tron single-gun system. SMT Series includes 9", 12", 15", 17", and dual 9" rack models. SMT-12 (12 inch) \$795. UNIMEDIA. 315

Star filters fit into camera filter wheel and produce pleasing starlike effects. Gordon Star Filters are available for Norelco PCP70, Marconi Mark VII, RCA TK44, GE PE250, and GE PE350 cameras. ALAN GORDON ENTERPRISES. 316

Compact tripod head for cameras up to 20 pounds has pan and tilt locks, telescoping handle and built in level. "Hydrofluid Mini" will pan 360 degrees and tilt 90 degrees either side, in temperatures from -60 to +150 F. NATIONAL CINE EQUIPMENT. 317

New six-inch Fresnel lamp is available in 750 and 1000 watt ratings. "Sweep Focus Baby" has a new lamp, rapid focus lever, double wall construction for rapid cooling and swing

away front down for easy relamping. \$98. BERKEY CORPORATION. 318

Television camera lens with 56 degree field of view has 10:1 zoom ratio. The Varotal 30 has an 18 in. minimum object distance, is available in Philips, RCA, and Fernseh camera mounts. It has a three member zoom system, servo drive systems for focus, zoom and iris. RANK PRECISION INDUSTRIES INC. 319

(continued on page 49)

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1 KW - 5 KW - 10 KW - 50 KW



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AGC AMPLIFIERS - Mono and Stereo



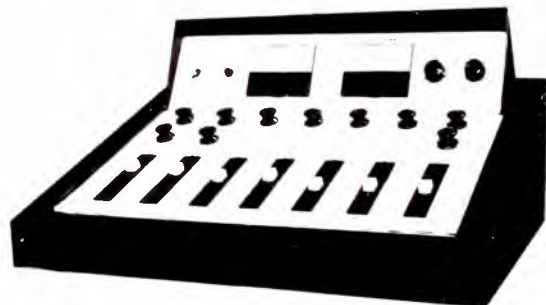
REMOTE AMPLIFIERS



FM TRANSMITTERS 10W - 50W
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7.5 KW - 10 KW - 20 KW - 40 KW



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PRODUCTS

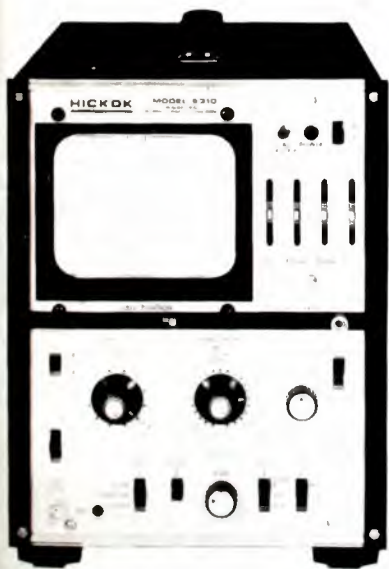
Metal reel for open-reel tape has warp-proof construction, standard slotted hub; **library-shelf storage case** is made of high-strength polystyrene plastic, with self-locking latch. Combination, sold as LR-7M, comes with adhesive labels. \$10.50. TDK CORP. 275

Sequential switchers for auto alarms have manual by-pass, in cycle, bridge, automatic home, automatic VTR start, and audible alarm. The V150AHS Series have terminations for external switch logic, switching time less than one microsecond. VICON INDUSTRIES, INC. 276

50 MHz counter-timer makes direct frequency, time, period, ratio, and totalize measurements. Model 6250 has an automatic "signal grabber" that sets all input adjustments automatically for total hands-off operation. Input sensitivity for sine waves is 25 mV rms. Time base has stability of ± 3 parts/ 10^7 /month, with higher stabilities available with optional bases. \$575.00. SYSTRON DONNER. 277

Compact audio control center has a five-channel monophonic console, two turntables, tone arms, pickup cartridges, equalizer-preamplifier, and desk. DJ-5 Mini-Studio Console is pre-wired and tested just prior to delivery. \$2000. LPB, INC. 278

Moderate-priced 10 MHz oscilloscope uses digital triggering circuits, with



stable triggering to 15 MHz. Model 5310 has vertical sensitivity from 10 mV/cm to 50 volts/cm in 12 calibrated ranges, with accuracy $\pm 3\%$.

Sweep ranges are from 0.5 microsec/cm to 0.2 sec/cm, in 18 calibrated steps. In addition to TV vertical and horizontal active sync separators, field 1 and field 2 VITS can be observed by selecting position on time base control with "automatic VITS." \$425. HICKOK 280

Rubidium frequency standard is designed for color subcarrier generation. Model 600A has built-in time scale selector, can be set to current atomic time scale or to previously used time scales. TRACOR 281

500 MHz real-time general purpose oscilloscope has three compartments

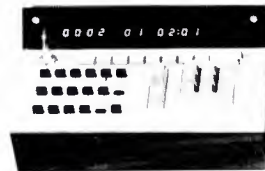
for any of 24 plug-ins available in the TEK 7000 series. The Model R7903 has a new FET probe with high impedance and very wide bandwidth. Basic writing speed is 6.1 cm/nano-seconds. An optional pulsed graticule increases level for one-shot photo exposures. Mainframe (without plug-ins), \$2500. TEKTRONIX. 314

Time gate will pre-program up to 24 external functions, up to one week in advance. Model 5025 has status display showing day of week, time, functions on or off; digital clock for real-time. continued on page 51

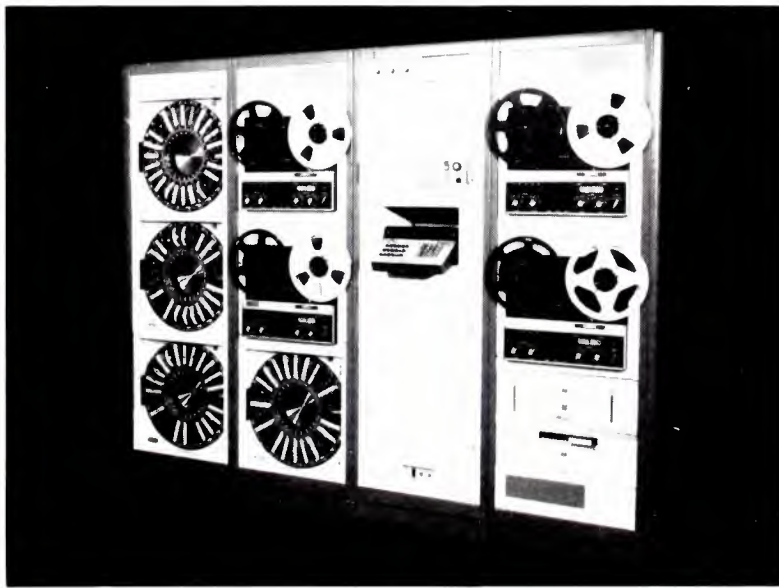
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Nothing could make us happier. Because we take great pains to insure the absolute reliability of these tiny microphones. And frankly, no other type of microphone poses a bigger design problem. The lavalier gets dropped, stepped on, swung by its cord, smashed and banged—not once, but often during its life. Most of the abuse is accidental—but inevitable.

So we developed a “nesting” principle of construction that is based on tolerances so tight that the internal element acts as a solid mass, reducing damage due to shock. And we use nothing but Acoustalloy® diaphragms . . . almost indestructible despite heat, humidity, dirt, or high intensity noise or shock.

We've also spent years developing cable specifications—and methods for attaching it. We've taken into account all the tugs and twists that are the fate of any lavalier cable. That's why our strain relief is so effective. And knowing that no cable can last forever, we've made replacement easy and fast.

Of course reliability by itself is not enough. So our field testing of E-V lavaliers is also devoted to sound quality. We must satisfy major network and independent stations on every score. As a result, E-V lavaliers can be mixed in the same program with stand microphones with no change in voice quality.

In the process of developing the lavalier, we've also made it smaller. Our original model was 7" long and 1" in diameter. Today's Model 649B is just 2-1/4" long, 3/4" in diameter, and weighs a mere 31 grams!



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Of course TV studios aren't the only places you'll find E-V lavaliers. They're used in classrooms, lecture halls, conferences, stages and business meetings. And they offer the same year-round reliability with no compromise of sound quality.

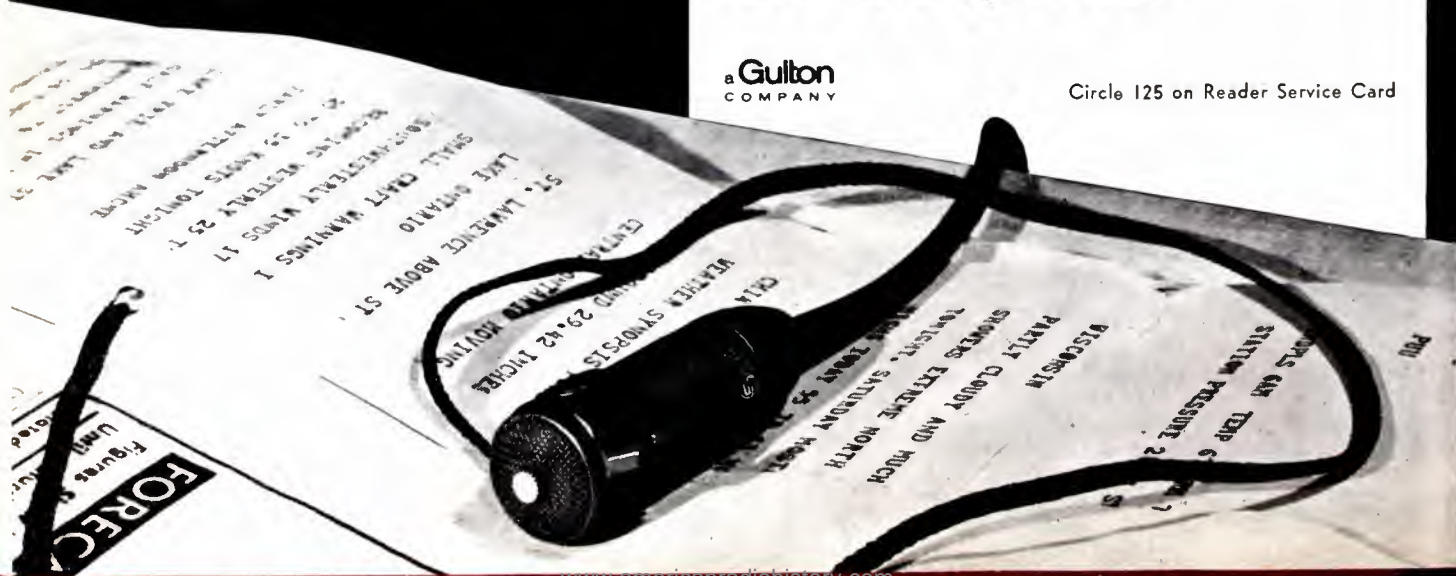
Every E-V professional lavalier is protected by our unique 2-year unconditional warranty against failure of any kind, plus the lifetime guarantee of workmanship and materials that is an integral part of every E-V microphone. Full details are waiting at your nearby Electro-Voice microphone headquarters. Or write us about your special needs. We're ready to solve the toughest sound problems—off the shelf—all year 'round!

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PRODUCTS

time display in hours, minutes, seconds. It runs on 60 Hz, 110 vac, and timing accuracy is ± 2 seconds/year. BROADCAST PRODUCTS, INC. 279

Headset is designed to supply communications to TV camera personnel on musical shows, sporting events, etc., where ambient noise makes hear-



ing the director difficult. Ampligard headphones have power capability of 50 MW, liquid or foam cushions, high-power rocking-armature drivers. TELEVISION EQUIPMENT ASSOCIATES 282

Video impedance converter is an active device for interface between 124-ohm balanced lines and 75-ohm single-ended TV circuits, or to adapt output of 75-ohm single-ended test equipment to 124-ohm TV circuits. Model TSF has unity gain, switching at both input and output for balanced to unbalanced coupling, frequency response ± 0.05 dB to 5 MHz, ± 0.1 dB to 10 MHz. \$495. ROHDE AND SCHWARZ 283

Tracking power supply gives ± 15 volts DC, with load capacity 150 ma each side. Model 2245 has ripple at less than 10 mv p-p, and output regulation of $\pm 0.4\%$, no load to full load. MELCOR ELECTRONICS 284

Field strength meter covers 54 to 216 MHz, and 470 to 890 MHz. Model



FSM-2 has accuracy of ± 1.5 dB and readings from 10 microvolts to 3 volts. Front panel switches choose average or peak, VHF or UHF, and 110 volt AC or battery operation. DC output connector will feed a graphic recorder and modulation test jack. BLONDER-TONGUE LABS 285

Function generators cover the range from 0.001 Hz to 11 MHz. Series 50A have maximum 30 volts p-p output, with VCG range of 1000 to 1. Switch-selectable features are phase lock to fundamental, or a multiple or sub-multiple of a reference frequency; multiple sweep with shift and burst

cycles, pushbutton trigger and gate controls. Waveforms produced are sine, square, triangle, ramps, variable-width pulses down to 75 nanoseconds. \$595 to \$1195. INTERSTATE ELECTRONICS CORP. 286

Wideband ultra-miniature transformers have nearly flat response, 1-110 MHz, at 25 ma DC. Series 18288 transformers have frequency range from 0.3 MHz to 400 MHz, impedance range from 50 to 200 ohms. They are available with unbalanced to balanced form with no DC isolation; unbalanced to balanced with continued on page 53

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A super-sharp teleproducer can see the superior quality of a VPR-7950 picture compared to one from any other 1" recorder.

What is a VPR-7950?

The world's highest performance 1" color/monochrome, helical-scan videotape recorder. It incorporates the same advanced design features of the Ampex VPR-7900 and the TBC-790 time base corrector in a handsome, highly functional console.

Video waveform and picture monitor selector switches may be used together or independently. An eye-level panel includes both monitors as standard equipment and an optional vector display scope.

The VPR-7950 is a complete recorder/reproducer which features:

- Very high carrier mode (7-10 MHz) for exceptional quality in color dubs even down to 3rd and 4th generations; 5th, in black and white.
- Precision, fast, *total*, electronic insert and assemble editing from any signal source.
- Internal digital reference system that includes a horizontal lock servo, frame lock and vertical interval switching.
- Three independent tracks (single video - dual audio), each of which can be used, altered, edited or replaced at any time.
- High efficiency ferrite video head with 500 hour warranty and the fastest, simplest replacement system ever devised.
- Capstan controlled high speed tape cycling modes, velocity loop tension servo, direct coupled drum servo, minutes and seconds coun-



ter, monitor amplifier and cue microphone.

In developing the time base corrector, Ampex engineers discarded current technology and took a new



*Ampex VPR-7900 recorder/reproducer
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digital approach to time base correction that affords the most stable video signal ever produced by a helical-scan recorder. It produces clean fades, lap dissolves and special effects as well as dubs of edited material of outstanding quality to 1" and 1/2" videotape recorders, quadruplex recorders and transfers to film.

Like the VPR-7950, the combination of the VPR-7900 and TBC-790 produces recording capabilities that meet all standard broadcast requirements. The TBC-790 may be purchased with the VPR-7900 you may now own. The VPR-7900/TBC combination is portable enough for use as a mobile unit for location work. Tapes made on the VPR-7900 are completely interchangeable with those made on the VPR-7950.

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AMPEX

PRODUCTS

DC isolation; and unbalanced to unbalanced with no DC isolation. VANGUARD ELECTRONICS 287

Computerized audio controls are sequentially programmable with real-time capability. Series 700 can control voice tracking, with varied transition switching; automatic verified program logging; transmitter control; dual station control. They are available with core memory for as many as 30,000 events or 1230 log lines; or with mass storage in tape or disc form, allowing for English language program display and logging. INTERNATIONAL GOOD MUSIC 288

CATV drop cables have aluminum braid shields for economy, plus an aluminum film-foil laminate. Models 9242 and 9243 have virgin cellular polyethylene insulation, black vinyl jackets. Model 9242 has #22 solid center conductor, attenuation from 1.9 dB/100 feet at 50 MHz to 9. dB at 900 MHz. Model 9243 has #20 conductor, 1.8 dB at 50 MHz and 8.6 dB at 900 MHz. BELDEN CORPORATION 289

Character generator can put one title on the air, simultaneously allow preparation of three others. Model D-2400 makes a display 32 scan lines high; has one-row horizontal crawl, full cursor editing; 8 rows of display (16 characters each) per page; external title storage with standard audio recording equipment. Internal storage is up to 32 one-row titles, with random access. \$4500 up. DATA-VISION, INC. 290

Microfilm cutter uses computer-type digital circuits to scrutinize cut marks and adjust position of cut. Model MT-600 cutter automatically cuts both edges of COSATI or NMA standard sizes, will cut all diazo, vesicular, and silver materials. It will operate at 3600 cuts per hour. TECHNOLOGY INCORPORATED, HF PHOTO SYSTEMS DIVISION 291

Jack panel assemblies are available in up to 50 different configurations. ADC jack panels are molded of black phenolic plastic, come with single, double, or triple rows, for 19-in. or 23-in. racks, with 2-, 4-, or 6-wire applications. ADC PRODUCTS INC. 292

Combination electrostatic - dynamic speakers use wide-band electrostatic units for the highs, acoustic suspension units for the lows. "Auralinear" speaker series have new electrostatic designs for range 350 Hz to beyond 20,000 Hz, with claimed usable frequency response in recommended rooms 22 Hz to 30,000 Hz. Maxi-

mum power ratings are from 40 watts to 150 watts. CROWN INTERNATIONAL 293

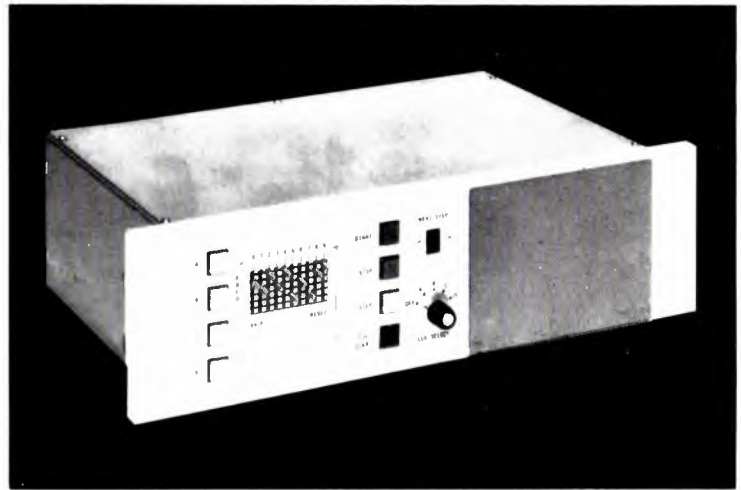
Reverse test signal source, used with tuned RF voltmeter and a way analyzer, will measure cross modulation, second-order beats and hum modulation in reverse amplifiers for CATV. Model RTSS puts out standard "T" channel signals at 7, 13, 19, 25 and 31 MHz, either square-wave modulated or as CW carriers. Outputs are up to 45 dBmV; harmonics and spurious signal down at least 60 dB. THETA-COM. 294

Test chart set includes four charts in one aluminum frame with spring-loaded handle. "Porta-Pattern" test set consists of resolution, linearity, registration, and logarithmic reflectance charts, each in neutral gray frames. After use the front chart is moved to the back, so that all are always protected by case. GRENIER BROTHERS INC. 295

Variable noise gate has attack time of less than 25 microseconds. Model NS-120 has threshold control with LED gating status indication, variable
continued on page 54

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This new SMC FORMATTER can improve the flexibility of your existing automation when used as a music formatter. The FORMATTER can run your night time virtually unattended. The FORMATTER programs up to 10 events from any four audio sources you may select (recorder, cart, equipment, Carousels, etc.). There's even a provision for a digital clock for network joins.

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- Managing Today's Radio Station**—Encompasses management, programming, sales, training, rates, etc. 288 pps. No. 461 \$12.95
- Modern Radio Broadcasting: Management & Operation in Small to Medium Markets**—Straightforward information on all aspects of broadcasting in these markets. 288 pps., 69 illus. No. 482 \$12.95
- Broadcast Station Operating Guide**—An invaluable "nuts & bolts" reference for everyone at your station. 256 p. No. 467 \$12.95
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PRODUCTS

release from 0.03 to 5.0 seconds, attenuation range 0 dB to -50 dB, input for external keying. \$98. QUAD/EIGHT ELECTRONICS. 296

Cartridge racks hold 20 or 40 "A" series cartridges. DM series can be stacked, have walnut-grain finish. DM-20 (20 cartridges) \$14.75. DM-40 (40 cartridges), has a lazy-susan base, \$28.50. BROADCAST ELECTRONICS. 297

Character generators work from the keyboard, or from data stored on standard audio cassette tapes. Units have 512-character internal memory, in 16 lines of 32 characters. Internal



sync gives RS170 color or mono composite for display on standard TV set or video monitor. Other models accept 5-level baudot, 6-level stock ticker code, or other standard formats. VIDEO DATA SYSTEMS, INC. 298

Step track terminal consists of antenna pedestal with servo electronics for use in a ground terminal for synchronous or near-synchronous satellite reception. System provides sky coverage of 30 degrees on both axes. Replaceable links set the center points of scanning range. System finds the point in space of maximum signal, with a tracking rate of 0.001 second. RADIATION, DIVISION OF HARRIS-INTERTYPE. 299

Frequency sensors provide safety switching or alarm signals when power line frequency varies outside pre-specified limits. Series FS sensors have 5% accuracy, are available with 120/208 or 115/200 volts nominal AC input, have DPDT or 3 PDT output contacts, which handle 2 amps or 10 amps total, respectively. LOGITEK, INC. 300

Microphone/headset combination for live broadcasting has a binaural connection without termination so it can be adapted to the application, with one channel for monitoring and the other for cueing, etc. Model CS-90 uses a dynamic, omni-directional mike, temperature and humidity resistant phones. TELEX. 301

Indoor housedrop splitters and transformers for cable television have output impedance of 75 ohms, bandwidth of 5 to 300 MHz. Series 3000 continued on page 56

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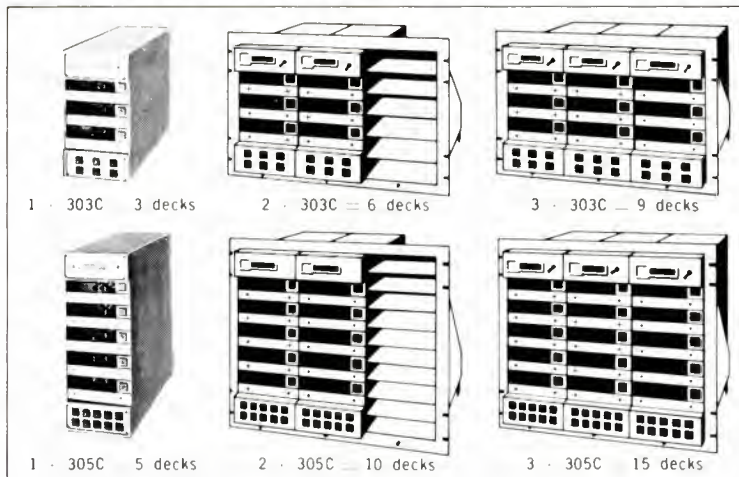
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PRODUCTS

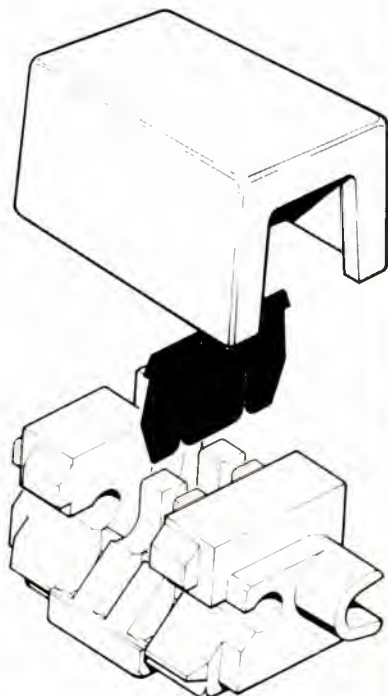
splitters come with two, three, or four outputs. GTE SYLVANIA. **302**

Sweep generator works from 100 KH to 100 MHz. Model 1202 has sweep flat to ± 0.25 dB, 2% linearity and 1 volt output. It has seven plug-in markers and built-in calibrated attenuator for 102 dB in 1 dB steps. \$895. TELONIC INDUSTRIES. **303**

New 16mm camera has automatic exposure control with revolving neutral density disk. Beaulieu R16B Euratom camera, designed primarily for poor lighting of medical applications, automates exposure under any lighting conditions within exposure range \$1995. HERVIC CORP./CINEMA BEAULIEU. **304**

Comprehensive CATV distribution systems include two-way, midsplit, dual trunk, and feeder types; one- and two-way single trunk and feeder types. MX-404 systems are totally modular, with twin-pack hybrid IC modules for all major amplification. All functions are covered with trunk, bridging, termination, and reverse amplification. Two-way systems have 5 to 30 MHz reverse bandwidth. Systems come with or without thermal slope and gain compensation, or reverse thermal compensation. AGC/ASC accepts modulated channel carriers as pilots. MAGNAVOX CATV DIVISION. **305**

Self-stripping connectors allow for bridging connections without wire stripping. Model Scotchlok UB is for No. 22 to No. 26 wire, has built-in



continued on page 58

Circle 132 on Reader Service Card—>

FEBRUARY, 1973—BM/E

The New CP-16/A (with Crystasound). A Cameraman's Kind of Camera.

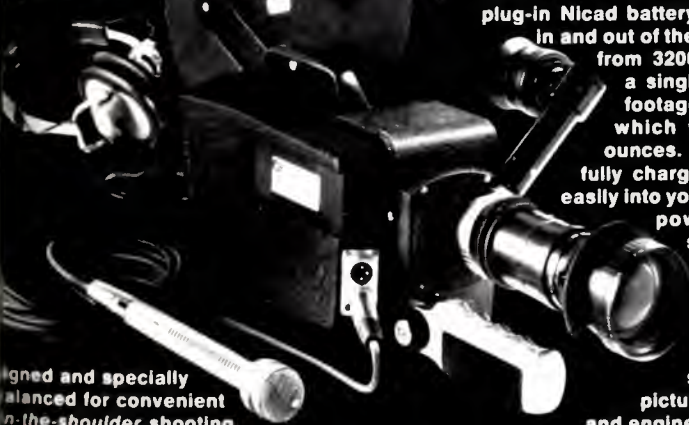


Tired of the daily struggle with backbreaking body braces, unwieldy tripods, and heavy, poorly balanced cameras? Tired of dangling power and sound cables? Encumbered by quickly exhausted battery packs? Frustrated by a noisy camera movement? Annoyed with "back-on" sound equipment? Feeling crushed under the weight of it all?

We, at Cinema Products, believe that we have designed a unified camera and sound system that will solve all of these problems.

Take backaches, for instance. Backaches may sound funny to some people. To a TV-newsfilm cameraman they're no joke. More and more TV-newsfilm cameramen have been reporting severe and crippling backache conditions as a result of carrying heavy and poorly balanced cameras, mounted on uncomfortable body braces, over many long hours.

The CP-16/A 16mm camera has been de-



signed and specially balanced for convenient in-the-shoulder shooting.

It weighs a little less than 17 pounds when fully equipped. And "fully equipped" means fully. With 400-ft. magazine loaded with 400 feet of film. With a 12-120mm Angenieux zoom lens. With a plug-in Nicad battery pack. With a critically accurate crystal-controlled DC servomotor for single and double system sync sound. Plus the Crystasound recording system with built-in amplifier. That's right. Less than 17 pounds!

As for noisy camera movement problems, you've got to "not hear" the CP-16/A to believe how quietly it runs. Our sound tests show approximately 31 dB at 3 feet. But the real

sound test is your professional ear, and the actual quality of the sound recording.

Out-of-sync problems? Our CP-16/A is crystal-controlled to the extremely critical tolerances required by cordless double system recording, with a frame rate accuracy of ± 15 parts per million over a temperature range of 0-140° F. And if something should go wrong, the easily visible out-of-sync warning lamp, located at the front of the camera, will instantly light up.

As for magazine capacity, the CP-16/A accepts standard 400-ft. and 1200-ft. Mitchell-type magazines, and we even designed a special locking stud so that magazines can be easily and instantly snapped on and off the camera.

Then there is the power supply problem. There are no lost shots with our rechargeable plug-in Nicad battery pack. It snaps instantly in and out of the camera body, and drives from 3200 to 4000 feet of film on a single charge. That's a lot of footage from a little battery pack which weighs a mere sixteen ounces. It is so compact—a spare, fully charged battery pack will slip easily into your shirt pocket. And it also powers the CP-16/A sound system.

Lately, more and more TV-newsfilm and documentary cameramen have had to "go it alone," with the responsibility of capturing both picture and sound. Designed and engineered from an overall total systems approach, our CP-16/A with Crystasound makes it seem almost easy.

The Crystasound amplifier is part of the camera, and it is powered from the same battery pack. Switchable, variable compression Automatic Gain Control let's you concentrate on filming the event. The headphone monitoring channel automatically switches from live mike to playback when the camera is turned on. We've even provided a special line feed to a tape recorder for those instances where the cameraman is recording simultaneously for TV and radio. The built-in amplifier has two microphone inputs and one line input,

all with independent volume control. Other features include automatic bias level, with no adjustment required, preview switch, VU meter, and low power consumption.

Our Crystasound recording system features a special record and playback head, encapsulated in the same module to guarantee absolute alignment for its entire life.



Should you need an auxiliary mixer, our Crystasound auxiliary mixer features: four channels of mike input, one channel of

line input, and one condenser mike channel. It also features individual and master volume controls as well as switchable AGC.

For the TV-newsfilm cameraman, the name of the game is "lightweight, extremely mobile and reliable equipment, so that he can capture the spontaneous live feel of a news event as it happens. We are confident that the CP-16/A provides just that.

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For details on the remarkable performance-to-price ratio of this new tape recorder, contact Schafer Electronics Corp., 75 Castilian Dr., Goleta, Ca. 93017, (805) 968-0755. In Canada: Schafer Electronics Ltd., 5824 Burbank Rd. SE, Calgary, Alberta, Can T2H1Z3, (403) 253-0351.

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\$1,195

... for LPB's S-14, 5-Channel, Dual-Output Mono Signature Line Audio Console with 15 inputs. In addition to moderate price and excellent performance, the S-14 features:

- Step attenuator mixers.
- Plug-in fiberglass printed circuits.
- Telephone type switches.
- Individual plug-in program, 12-watt monitor, cue and headphone amplifiers.
- Input transformers.

There are many other plus features you'd expect to find in only higher priced units. If 5 mixers aren't enough, consider LPB's S-15, 8-Channel, Dual-Output Mono Console for only \$1895. Other LPB consoles from \$325.

LPB offers a complete line of broadcast audio equipment. Call or write us for all your audio needs from tone arms to monitor speakers.

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PRODUCTS

strain relief. Model Scotchlok ULG is for filled-core telephone cable, accepts the heavier insulation of such cable, and covers sizes No. 19 to No. 24. Both connectors use Scotchlok crimping tools for final closure. 3M COMPANY. **307**

Radiofacsimile converter converts audio frequency shift signals into amplitude variations. Model 421C has a frequency detector recovering the total modulation envelope of an FM signal. It works with single or double sideband transmission, and with all 3-30 MHz receivers, for HF facsimile weather transmission or other similar communications. \$951. ALDEN ELECTRONIC & IMPULSE RECORDING CO. **306**

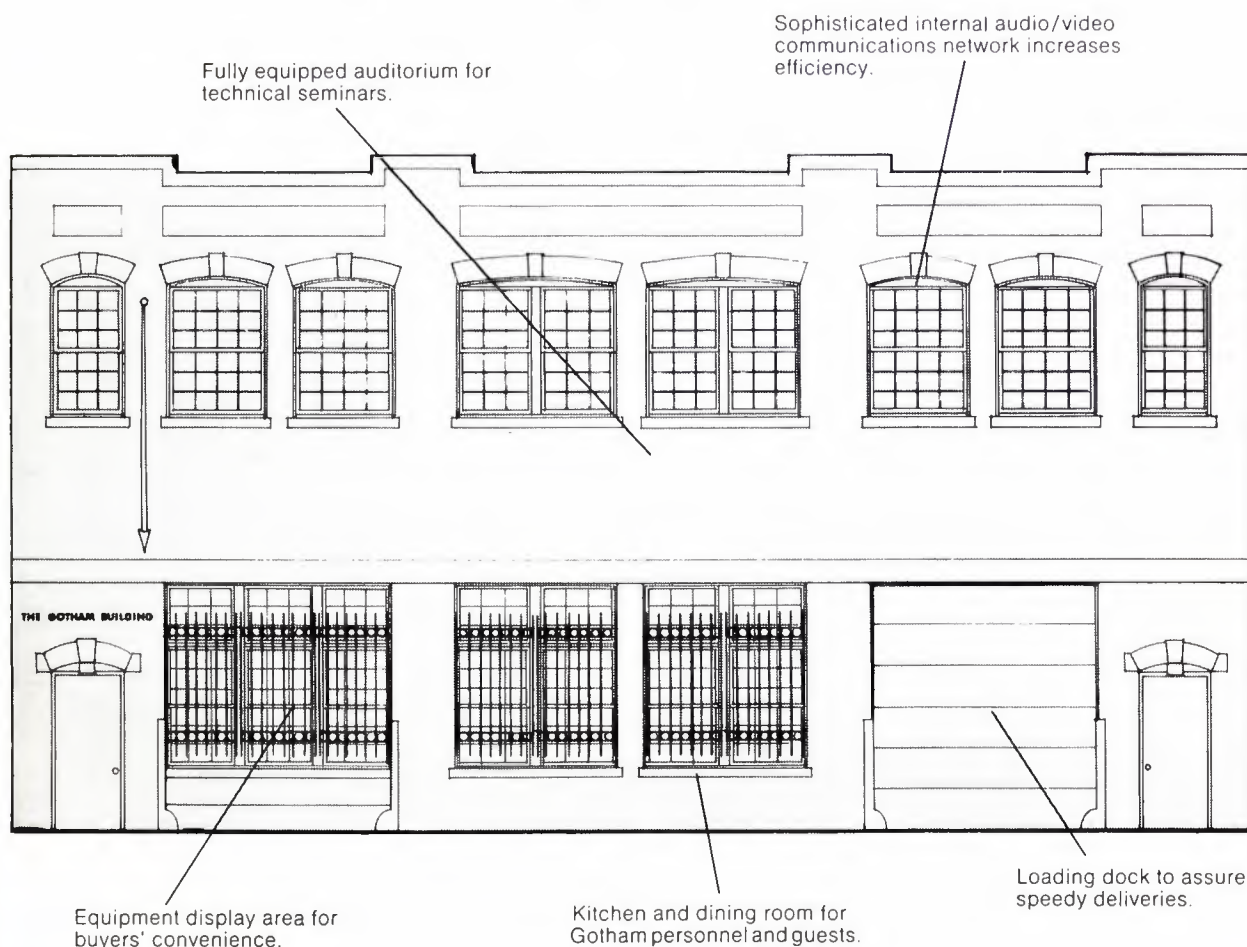
Sound isolation rooms have silenced ventilation systems, range in size from 4 × 5 × 6.5 feet to 6 × 9 × 7 feet. Sides are 4-in. thick steel panels with sound-retardant filling; floors rest on vibration-isolator rails with resonance below 7 Hz. Ventilation systems are guaranteed to be below the binaural M.A.F. 0° azimuth threshold of hearing. INDUSTRIAL ACOUSTICS COMPANY, INC. **308**

RF wattmeter/VSWR monitor shows forward and reflected power, VSWR, all at once on a single meter face. Thru-line Model 4342 has individual pointers for forward and reflected power, and VSWR is read at the intersection of the power pointers. Readings do not require adjustment to full scale deflection or any switching. Plug-ins give a power range from 10 to 5000 watts for forward power, 1 to 500 watts for reflected, in discrete frequency bands from 2 to 2300 MHz. \$265. Plug-ins (minimum of two required), \$30 to \$75. BIRD ELECTRONIC CORPORATION. **309**

Hydraulic frame hinge for cable plows is controllable through a 30-degree vertical arc. Designed for the Ryan Model "D" plow, the hinge facilitates lifting plow over rights of way, leveling on rough terrain, holds depth constant, even pick up a reel of cable. F. B. RYAN MANUFACTURING CO. **312**

Random-access rear-projection read-outs display any standard or custom message that can be put on photographic film. Major series is available in 16, 32, or 64 message sizes. Units have electrical and electronic components to position material properly in front of projector lamp. Access time is 70 msec. Built-in memory retains last selected message without need for signal power. MAJOR DATA CORPORATION. **313**

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NEW LIT

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

Keyboard switches are shown in four-page brochure, which includes cut-away views of momentary form A (SPST NO), momentary dual form A (DPST NO), alternate action (SPST), and shift and lock keys. Cherry Electrical Products Corp. **200**

Revised catalog pages cover **indoor directional couplers** and **indoor splitters** for cable TV systems, showing products with improved characteristics compared with earlier models. Magnavox CATV Division. **201**

"**Super 8 Research News**," publication of the group at KDUB-TV, Dubuque, which evaluates new Super 8 products, in the September 1972 issue lauds the Dynasciences Model 832 image enhancer; discusses Super 8 film processing; and reports enthusiastically on the Yashica 600E camera. **202**

Complete line of **measuring instruments** is shown in 232-page catalog, including power, sweep, noise, frequency, spectrum analyzers, and scores of others. Rohde and Schwarz. **203**

Radio noise meter for range 600 to 1500 KHz is subject of four-page brochure, with complete technical and application information. Singer Instrumentation. **204**

Bulletin (ECR-1162F) describes uses and performance of "Porta-Mobil" **point-to-point mobile radio communications** units. General Electric. **205**

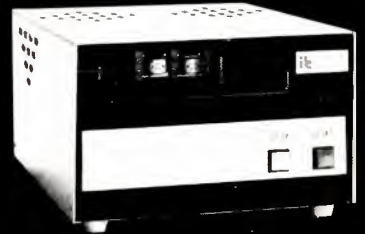
Catalog covers **video, voice and data transmission systems**, including microwave and coaxial cable systems, PCM cable carrier systems, etc. GTE Lenkurt. **206**

Dual trace sampling oscilloscope is subject of four-page technical brochure; instrument has bandwidth to 1.7 GHz, calibrated sensitivity of 1 mV/cm at 1.7 GHz. Test and Measuring Instruments (Philips). **207**

Telephone cables and other communications products are described in detail in comprehensive new catalog, with complete physical and electrical data on cable types. Anaconda Wire and Cable. **208**

Exhaustive technical data sheets on **vidicon camera tubes, XQ1240 and XQ1241**, cover every characteristic and operating condition. North American Philips. **212**

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Some broadcasters want and need an economy line of tape cartridge equipment. We incorporated the best features of our premium line into Encore. We simplified systems, circuits and manufacturing techniques. And we created further economies by selling direct, with payment due when you order. We offer a 30-day guarantee of satisfaction plus a one year warranty. Call us collect today and find out why many broadcasters are finding quality and economy under the Encore name.

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Our P-100 proc/amp corrects for high or low contrast, inaccurate or washed-out colors and picture jump or roll.

It replaces the original sync and blanking with EIA-format sync, while our SYNC GUARD circuitry gives you a rock-solid picture even with distorted or industrial sync. It provides dc restoration and removes tilt and bounce. Clips white and black levels and clamps the video signal to reduce noise and transients. Gives you full front panel control of burst amplitude and phase, video and chroma level, sync and set up. And optional plug-in modules are available for video and chroma AGC and color regeneration.

If you've got more problems, add our D-100 Dropout Compensator (DOC). It replaces lost video information with fill-ins perfectly matched for luminance and chrominance, with no lines, no flashes, no color mis-



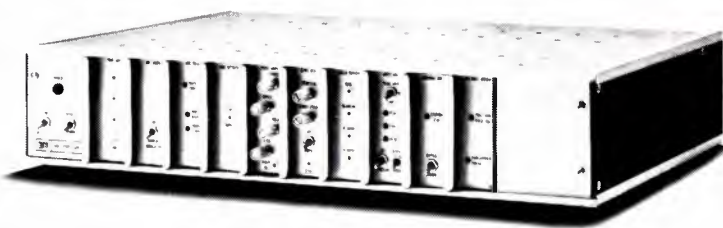
matches. Video stability and full color interlace are maintained even through multi-generation dubs.

And while it does all this, our DOC reduces your system costs by allowing more passes on your tapes because it corrects for dropouts due to wear, while its built-in dropout simulator allows system test without the expense and inconvenience of a test tape.

So whether you use them as stand-alone units or as a complete video processing system, our proc/amp and DOC don't just give you a better picture: they help pay for themselves.

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Available single or double side — 300Ω phone — 100Ω carbon — 100Ω noise cancelling carbon or 300Ω noise cancelling dynamic mike — series or independent earphone wiring — factory terminated Switchcraft® plugs — 3 position mike switch.

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Television Equipment Associates
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Circle 140 on Reader Service Card

BRC and NAB Warn Broadcasters To Avoid "Hypoing"

The Broadcast Rating Council and the National Association of Broadcasters joined in a statement urging broadcasters to omit contests, special promotions, or widespread station activity during audience measurement periods. The two organizations pointed out that such "hypoing" ran counter to FTC guidelines on the subject, and that the FCC, in considering license renewal applications, took into account a station's compliance with FTC guidelines. Hypoing, the statement said, also frustrates industry attempts to provide accurate audience measurements.

Briefs

Collins Radio Company announced sales of \$77 million and a profit of \$1.1 million for the three months ended November 3, 1972; the profit ended a period of losses over the past three years, and led R. C. Wilson, president, to predict profit for the whole year . . . **RCA Jersey Ltd.**, video equipment production facility on the Isle of Jersey, has delivered to Westward Television, English TV program producers, a color TV mobile van, a 10-ton vehicle carrying an RCA TK-44 color camera, a TR-60 VTR, and switching and audio equipment in an air-conditioned control room.

Media Horizons bought KROD-AM El Paso, and KDEF-AM and FM, Albuquerque, from Doubleday and Co., for \$1,250,000 in cash . . .

Comtech is a new firm in Gainesville, Fla., building video products for the OEM market, headed by **Robert E. Bachus**, formerly of Vital Industries. **E-V and CBS** have signed a cross-licensing agreement covering their patents and technical know-how in quadraphonics . . . **Eclair Corporation** has been named exclusive U.S. distributor for the "Univo" crystal-sync motor, for controlling speed and sync of 16mm cameras . . .

Metro-Markets is a new service of **Dun and Bradstreet** which evaluates product sales against competing brands on a store-by-store basis.

The U.S. Labor Department is calling attention to the **Job Development Tax Credit** set up by the Revenue Act of 1971; employers can get a tax credit of 20% of the

continued on page 64

console



MCMARTIN INDUSTRIES INC 605 NORTH THIRTEENTH STREET OMAHA NEBRASKA 68102 TELEPHONE (402) 342-2753

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"FIVE" MIXER AUDIO CONTROL

B-500 series

the B-500 monaural \$750

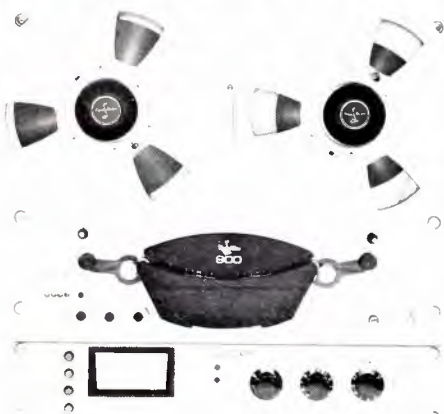
the B-502 stereo \$1050

B-503 dual channel \$950

for complete information please contact the Director of Sales Dept B-50

McMartin

Twenty (20) days of broadcasting* logged on a single 10 1/2" reel.



This Tape-Athon model 900 Logger can operate at 15/32 ips the way most loggers run at 15/16 and 1 7/8. Imagine fidelity to 2500 Hz at 15/32 ips! That extra slow speed allows 409+ hours of recording over 8 channels on 1/2 mil tape with a 10 1/2" reel.

Twenty days of broadcasting on a single reel. Doesn't that eliminate a lot of problems—like tape changing, tape storage, and even the cost of tape? Write now for details.

*Based on a 20 hour broadcast day

Tape-Athon Corp.

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Canon offers the perfect zoom lens for the camera of your choice



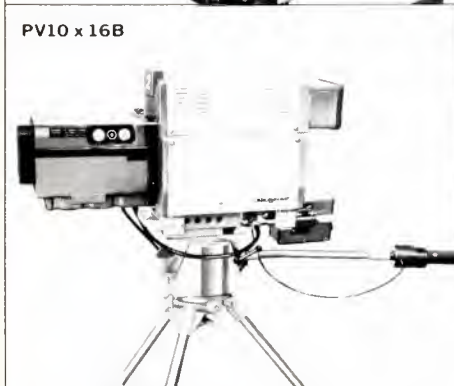
P10 x 20B1



P17 x 30B1



P17 x 30B2



PV10 x 16B



PV17 x 24



PV10 x 15

More and more people are discovering how significantly superior Canon Zoom Lenses are for TV broadcasting purposes. Their outstanding color characteristics, even in dim light, is one of the many reasons why Canon was chosen for telecasting the Munich Olympics.

Canon's wide range of excellent zoom lenses encompass three types of operation control—all-servorized, via flexible cables and by effortless push-pull rod control. And it can be attached to

fit and operate with any make of TV camera.

Shown on this page are only a few examples of the quality lenses Canon has available to more than meet your particular demands. Specify Canon to stay ahead.

The following are Canon TV Zoom Lenses for the Plumbicon® color cameras currently available on the market:

Size of image tube	Lens	Image format covered
1 1/4" Plumbicon® color camera	P10 x 20B4	17.1 x 12.8mm (21.4mmφ)
	P17 x 30B1	
	P17 x 30B2	
1" Plumbicon® color camera	PV10 x 16B1	12.8 x 9.6mm (16mmφ)
	PV10 x 15B2	
	PV17 x 24B1	
	PV 6 x 18B1	

® Reg. TM N.V. Philips of Netherlands.

The Canon TV Lenses Naming System



Applications	Image Format	Pick-up Tubes
P	21.4mm	1 1/4" Plumbicon
PV	16mm	1" Plumbicon

Apart from the above, Canon has available TV zoom lenses for 3" or 4-1/2" image orthicon cameras and can also build special lenses to fit your requirements.

Canon

● CANON U.S.A., INC.: 10 Nevada Drive, Lake Success, Long Island, New York 11040, U.S.A. (Phone) 516-488-6700 ● CANON U.S.A., INC.: 457 Fullerton Ave., Elmhurst, Illinois 60126, U.S.A. (Phone) 312-833-3070 ● CANON OPTICS & BUSINESS MACHINES CO., INC.: 3113 Wilshire Blvd., Los Angeles, California 90005, U.S.A. ● CANON AMSTERDAM N.V.: Gebouw 70, Schiphol Oost, Holland ● CANON LATIN AMERICA, INC.: Apartado 7022, Panama 5, Panama ● CANON INC.: 9-9, Ginza 5 chome, Chuo ku, Tokyo 104, Japan

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**INTRODUCING
the NEW
RUSSCO
"FIDELITY-PRO"
and
"FIDELITY-MASTER"
PRE-AMPS**



Fidelity-Master

Russco's two new lines of top-quality phono pre-amps give you the power where you need it! (+18 DBM) All models are self-powered, available in mono or stereo versions, and feature a unique aluminum case that allows quick and easy service access. Years ahead in engineering, the best news is the Low Prices starting at \$92.00!

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PHONE (209) 299-2167

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NEWS

wages they pay employees taken off welfare rolls . . . **C-Cor Electronics** will build a cable system for Tri-County Cable Television in Seymour, Ind. . . . **WCBS/Newsradio** won a gold medal for excellence in on-air promotion from the Broadcasters Promotion Association.

Western Union International reported revenues of \$47,474,000 and income of \$3,831,000 for the nine months ended September 30, 1972, from \$2,710,000 and \$3,050,000 in 1971 . . . **VCI, Inc.**, New York, will market the Norelco videocassette recorder . . . The Republic of China, Taiwan, has bought a large quantity of **Sparta Electronic** AM transmitters and accessory equipment for a total of about \$250,000.

People

George Manina is the new chief operations officer of Gridtronics, Inc., firm developing hardware-software for delivery of motion pictures to cable systems . . . **Richard E. Myers** was appointed plant manager of RCA's color tube plant in Marion,

Ind. . . **John W. Lyons** won promotion to the position of southeast regional director of engineering; and **Frank J. Herman** became national program director, both of Tele-PromPTer Corp.

Nathan Jurist became president of Zenith-Movado-Time Corporation, marketing subsidiary of Zenith Radio for timepieces produced by Zenith Time, SA, Swiss subsidiary . . . **Abbott Sydney** was named field sales manager of Cinema Products Corporation . . . **L. Wayne Oliver** was promoted to the position of general manager of ITT Cannon Electric-Phoenix.

Rod Calarco recently joined WCBS/Newsradio 88 as account executive in the retail sales department . . . **Peter Albertini** became an account executive for Metro TV Sales, New York . . . **Leonard Goldman** was appointed house counsel and assistant secretary of Jerrold Electronics Corporation.

Joseph H. Burleigh became central region franchise manager for Radio Shack, responsible for all franchise stores in the central and southeastern U.S. . . . **Donald W. Slack** was named director of marketing for Tape-Athon Corporation. **BM/E**

The Aristocart has just made other cartridges obsolete.

New basic design gives you

- Less wow and flutter—Almost reel to reel fidelity
- Accurate phasing—average loss less than 1 db, max. 3db
- Longer head life—up to twice
- Longer tape life
- Full NAB compatibility—great uniformity, cart to cart

No wonder leading broadcast engineers say:

"Tremendous improvement. Consistent cart to cart!"—Tom Milner, KEZR(FM), Anaheim. "Only cart that's really satisfactory!"—Paul Wieman, KKDJ, Los Angeles. "Tested extensively at three stations; very superior phase-wise!"—Will Shimski, Pacific & Southern Broadcasting Co., Inc.



See and hear them at NAB. Distributor inquiries invited.

IGM

3950 Home Road
Bellingham, Wash. 98225

Circle 145 on Reader Service Card

Some Clean-Up On The December

Audio Processors Article

The following addendum to the table in the December issue shows two processing amplifiers we inadvertently overlooked.

Also, at the right is a unit we called the EMT256 on page 44 of the December issue. Here is the correct caption:

Automated Processes Model 525 Limiter/Compressor is a compact unit, usable in mike channels, with de-esser, ceiling control, compression ratios of 20:1 and 2:1, release time 0.1 sec to 2.5 sec.



Audio Processing Amplifiers (Continued)

Brand	Model	Compression Ratio	Attack Time	Release Time	Attenuator	Other Features	Price
Compressor-Limiters							
LPB, Inc.	S-2	2.1dB, ΔP in ΔP out	Instant. lim. 0.66 secs. comp	10 dB/sec. lim. 2 dB/sec. comp.		comp threshold, adj. -40 to -10 db vu	\$475
Rupert Neve	2254A	1.5:1, 2:1, 3:1, 4:1, 6:1.	5 ms. lim. 5 ms. comp	100 mS. 200 mS. 800 mS. "auto", lim. 400 mS 800 mS. 1500 mS. "auto", comp.		auto release is signal controlled	

PERFECT YOUR CCTV SYSTEM WITH COSMICAR[®] LENSES



TV-COSMICAR-EE 16mm F/1.6

The automatic electric-eye diaphragm close down completely provided that subject brightness exceeds approx. LV20 (144,000 cd/m²), 768,000 lx. In case the camera is switched off and not in operation, the automatic diaphragm closes down, completely shutting off the light for protection of the vidicon camera.

The "Change-over Switch" in front of the lens controls the operation of the diaphragm.

When the switch lever is turned on to "EE", the lens diaphragm operates as fully automatic electric-eye, and is brought on to "OPEN", the diaphragm stays fully opened condition.

Be sure to get the finest image recording results with quality Cosmicar lenses.

Also available are scores of other lenses, ranging from 8.5mm to 1,000mm telephoto, zoom and those motordriven among them, for immediate delivery, after being tailored to your specifications.

The TV-COSMICAR-EE 16mm f/1.6 is a high-speed EE lens specially designed for 2/3" vidicon cameras. It maintains image luminance 100 lx against subject brightness between LV11.3 ~ 17 (350 ~ 18,000 cd/m²), about 1,800 ~ 96,000 lx.



COSMICAR OPTICAL CO., LTD.

424, Higashi-Oizumi, Nerima-ku, Tokyo, Japan
Circle 146 on Reader Service Card

Cable Address: "MOVIEKINO TOKYO"

cance to the material, or 2) an *affirmative* attempt is made to create the impression that the material is occurring *simultaneously* with the broadcast. The *raison d'être* for the change in this rule is to protect the viewer listener from being misled as to the nature of the material presented. The rule does *not* apply to commercial, promotional, or public service announcements which are taped, filmed, or recorded. *Second*, the station operator need no longer announce daily that certain of its network programming was taped for later broadcast.

Rebroadcasting Programs of Other Stations

Consistently, the Commission eliminated its separate rules on rebroadcasting programs of other stations for AM, FM, Ed-FM, and TV. Rebroadcast now requires only the consent of the originating station, *not* authority of the Commission as previously required in certain situations (e.g., TV rebroadcasts of FM), or notification of consent to the Commission as previously required in all situations (except Emergency Broadcast System operations). Note: The rebroadcasting station operator must keep copies of the written consent to do so at his station and make same available to the Commission upon request. Provisions on rebroadcast of signals from *non-broadcast* stations (e.g., Naval Observatory time) are

codified from FCC Public Notices and clarified. Exception: The station operator is still required to obtain authority of the Commission to rebroadcast point-to-point messages of 1) government stations, and 2) privately-owned non-broadcast stations.

Filing Certain Contracts

Attempting to reduce its own and the licensee's administrative burdens, the Commission *excluded* from its filing requirements certain contracts which "offer no real support in carrying out the operation duties of . . . the Commission." To wit, copies of Section 1.613 contracts re 1) time brokers; 2) Subsidiary Communications Authorization operations; and 3) time sales over four hours daily to same sponsor, need no longer be filed with the Commission. Rather, they may be kept at the station itself, and be made available for inspection upon request.

The above changes in operating rules provide substantial relief to station operators by eliminating or relaxing certain of the tedious procedural requirements which appeared to be of little use to the Commission. In a later action, the Commission eliminated certain rules re broadcast station reporting and record-keeping. In next month's *BM/E*, we will treat, in depth, these further Commission rule changes.

BM/E

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Air Time — your most valuable and volatile asset must be managed effectively. How? By total integration of traffic and technical operations. You can have confidence in our APC 610—200 — the result of nearly a decade of experience in broadcast automation. To see a system in actual operation please write or call:



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This 2½-digit unit is so versatile, its range covers 99% of your measurements. And its DC accuracy is 1%. The stable 281 also gives you positive over-range and wrong-polarity indications.

It's easy to use (even for semi-skilled people). And easy to read across all 26 ranges, 100mV to 1000V.

Naturally, we're enthused about our Model 281. You will be, too, when you see our complete specs.

Call your B&K distributor. Or write Dynascan Corporation.

In stock at your parts distributor.



\$169⁹⁵



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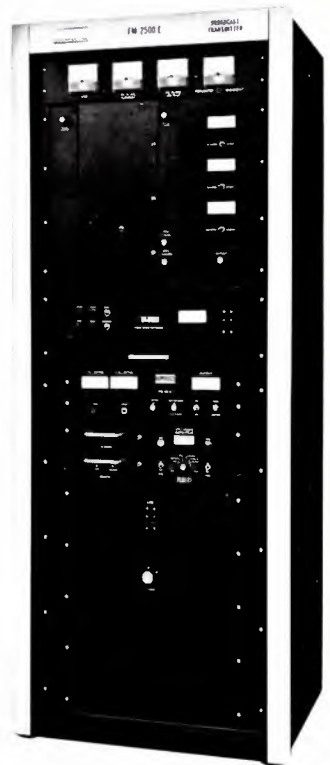
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- ¼ db, 30 H -35 KHz
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ONLY THE WILKINSON FM-2500E HAS ALL THESE FEATURES YET IS PRICED LESS THAN \$9,000.00.

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and wisest choice

Seven models in all — one of which will fit your needs *exactly*. Color or monochrome; uniplex or multiplex; forward or reverse actuation; sequential or random access; 16- to 96-slide capacity. These are thoroughly proved performers, built to the highest professional standards, and recently updated with advanced electronics.

For complete information, write
Spindler & Sauppé, 13034 Satcoy St.,
North Hollywood, Calif. 91605;
phone (213) 764-1800.



SPECTRUM 32B: The most advanced film chain slide projector available. For color or monochrome chains. 32-slide capacity. Many exclusives. Operates at 120V 50/60 Hz. Spectrum 32F operates at 220V 50/60 Hz.



MODEL 332: Newest version of the workhorse of the industry. For monochrome chains. 32-slide capacity. Model 332 single turret for 16 slides, monochrome or color.



MODEL SLX-TV: 96-slide capacity random access. Model SLS-TV 48-slide random access. Model SLD-TV 96-slide sequential. Model SLR-TV 48-slide sequential forward/reverse. All for monochrome or color chains.

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University of Tennessee

Television Services Department

1345 Circle Park Drive

Suite #40

Knoxville, Tenn. 37916

Phone: (615) 974-5272

ATTN: David L. Bower, Chief Engineer

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One inch Video Tape Recorder with full color electronic editor, processing amplifier, used for 180 hours and in like new condition. Cost: \$16,200. Selling Price is \$10,000.

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EQUIPMENT FOR SALE (Cont'd)

Alford type 1052 Duplexing Filter, 500 ft. rigid 3-1/8" coax with bullets and hangers, 5 sections, Alford Ch. 9 Antenna. All in excellent condition, priced to sell individually or as a package. Contact Reggie Moffat, Mid-Fla. TV Corp., PO Box 6103 C. Orlando, Fla. 32803 or phone (305) 841-5040.

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continued on page 70

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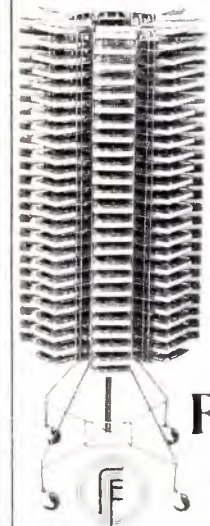
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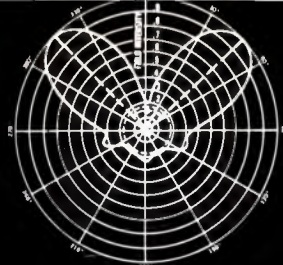
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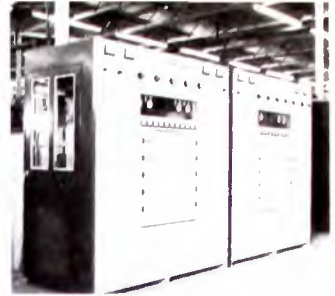
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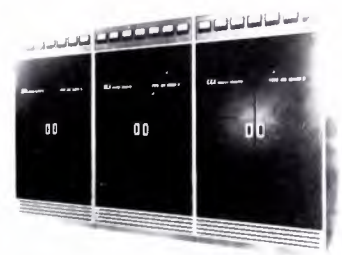


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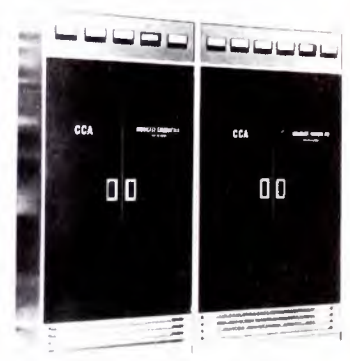
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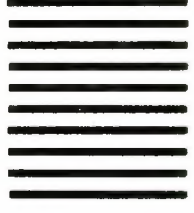
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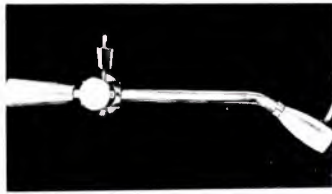


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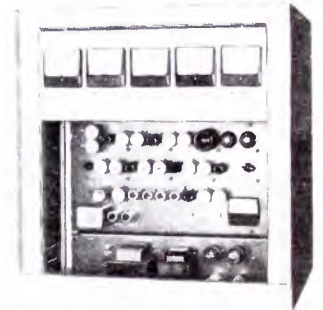


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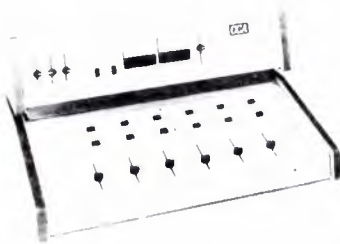
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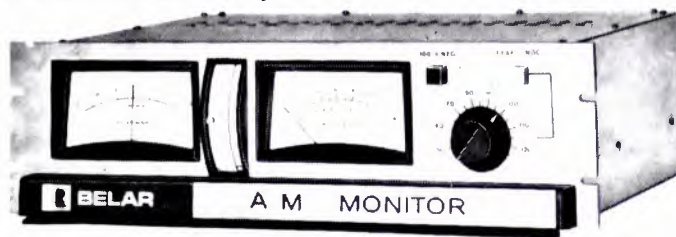


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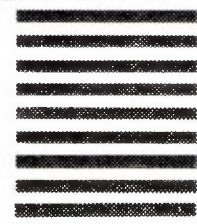
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